The Great Lakes Construction Co.

TRANSMITTAL
No. 175

10737 Medallion Drive
Cincinnati, Ohio 45241

PROJECT: ODOT 150085 HAM 71-1.34

DATE: October 27, 2017

TO: ODOT District 8
505 South SR 741
Lebanon, OH 45036

REF: Low Voltage Switchgear O&M
Line Item: #319.00

ATTN: Marvin Lennon

WE ARE SENDING		SUBMITTED FOR:		ACTION TAKEN:	
	Shop Drawings		Approval		Approved as Submitted
	Letter	X	Your Use		Approved as Needed
	Prints		As Requested		Returned after Loan
	Change Order		Review and Comment		Resubmit
	Plans			X	Submit
	Samples	**SENT VIA:**			Returned
	Specifications	X	Attached		Returned for Correction
X	Other: Switchgear O&M		Separate Cover:		Due Date:

SUBMITTAL	COPIES	DATE	DESCRIPTION
TR85.15-175	1 pdf	10/27/2017	Low Voltage Switchgear O&M, per sheet 451/555, Section 1.5A

REMARKS

CC: Joe Smithson, ODOT D8

Signed: Jacob Elmore

Jacob D. Elmore.

Primary High Current Injection
Field Test Procedure for Modified Differential Ground Fault Protection Systems

Inyección primaria de alta corriente
Procedimiento de pruebas en campo para los sistemas de protección contra falla a tierra diferencial modificada

Injection primaire à courant élevé
Procédure d’essai sur place pour systèmes différentiels modifiés de protection contre les défauts à la terre

Instruction Bulletin
Boletín de instrucciones
Directives d'utilisation

Retain for Future Use. /
Conservar para uso futuro. /
À conserver pour usage ultérieur.

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SQUARE D

Primary High Current Injection

Field Test Procedure for Modified Differential Ground Fault Protection Systems
Class 6036

Instruction Bulletin

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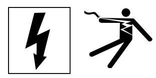
SQUARE D

HAZARD CATEGORIES AND SPECIAL SYMBOLS

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER
DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING
WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION
CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

CAUTION
CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in** property damage.

Provides additional information to clarify or simplify a procedure.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

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SECTION 1—INTRODUCTION

Description

This bulletin contains inspection and testing instructions for modified differential ground fault protection systems manufactured by Schneider Electric.
The modified differential ground fault protection system used in Schneider Electric multiple-source switchboard and switchgear line-ups will use one of two types of ground fault current sensing techniques.

The first type is zero sequence sensing, which uses a single sensor to surround all three phase conductors and the neutral conductor. The second type is residual sensing, where each phase and the neutral conductor are surrounded by its own sensor. In normal conditions, the vector sum of the phase currents with the neutral current should equal zero. In a ground fault condition, the vector sum yields a current that is used in a protective relaying scheme to automatically open main or tie circuit breakers (or switches) as required.

NOTE: All diagrams are shown as residual sensing.

Testing

Paragraph 230-95(c) of the National Electrical Code® (NEC)® requires that all ground fault protection systems be performance tested when first installed. Schneider Electric recommends testing be done:

- When the equipment is installed at its permanent location.
- As a part of normal maintenance.
- If the distribution system is altered in any way.

Field testing determines that the ground fault protection system is operational. Consider the following information when using this instruction bulletin:

- The diagrams in this bulletin are provided to illustrate high current injection test connections, but are not intended to depict the ground fault protection system in its entirety as installed in the field. Review all instruction manuals and wiring diagrams provided with the equipment for actual system configuration. Verify that all sensors are installed and wired with correct polarity per the wiring diagrams.
- This field test procedure is not a check of the calibration of any sensing relay.
- Record results within the ground fault test logs (Tables 1–3 on pages 31–33). If test results are not acceptable, recheck the connections and retest. If results are still unacceptable, contact Square D Services at 1-888-Square D (1-888-778-2733).

Tools Required

The following tools are required to inspect and test the modified differential ground fault protection system:

- A high current injection test unit capable of injecting 1000 A. Test jumpers are typically copper welding cables. Use cables and connections that give low impedance.
- Hand-held test kit by Schneider Electric for Micrologic® Type A, H and P trip units.

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Systems Covered

This test procedure is restricted to the following types of systems:

- Main-Main, Grounded Wye Configuration
- Main-Tie-Main, Grounded Wye, Non-Relayed Tie Configuration
- Main-Tie-Main, Grounded Wye, Relayed Tie Configuration

NOTE: A relayed system has ground fault protection on the Tie device. A non-relayed system has no ground fault protection on the Tie device.

NOTE: Systems with configurations beyond what are covered in this document can be tested with similar methods as those shown. All possible configurations of open and closed circuit breakers must be tested for both TRIP and NO TRIP functionality. TRIP tests always have the TEST JUMPER connected phase-to-ground. NO TRIP tests always have the TEST JUMPER connected phase-to-neutral (if neutral is not present, connect TEST JUMPER phase-to-phase).

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SECTION 2—SAFETY PRECAUTIONS

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This test procedure must be performed only by qualified electrical personnel.
- Turn off all power before working on or inside the equipment. Assume that circuits are live until they have been completely de-energized, tested, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Always use a properly rated voltage sensing device to confirm that all power is off.
- Always practice lock-out/tag-out procedures according to the OSHA requirements.
- Conduct electrical testing to confirm that no short-circuits were created during installation, maintenance, or testing.
- Carefully inspect your work area and remove any tools and objects left inside the equipment.
- Replace all devices, doors, and covers before turning on power to this equipment.
- All instructions in this manual are written with the assumption that the customer has taken these measures before performing maintenance or testing.

Failure to follow these instructions will result in death or serious injury.

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SECTION 3—MAIN-MAIN, GROUNDED WYE CONFIGURATION

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- This equipment must be installed and serviced only by qualified electrical personnel.
- Turn off all power supplying the equipment before working on or inside the equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

1. Turn off all power supplying this equipment before working on or inside equipment. Use a properly rated voltage sensing device to confirm power is off.
2. Verify that all ground bus bar splices are solidly connected. For each main, verify that the ground bonding connection is made ahead of the neutral disconnect link and on the line side of any ground fault sensor. See Figure 1.
3. For each main, verify that a neutral connection exists from the supply transformer to the equipment.
4. For residual sensing systems, verify that all phase and neutral sensors are connected with correct polarity on both primary and secondary. Refer to the drawings supplied with the equipment.
5. For zero sequence sensing systems, verify that all phase conductors and the neutral pass through the sensor in the same direction, and that grounding conductors do not pass through the sensor. Also, verify that the sensor is connected with the correct polarity on both primary and secondary. Refer to the drawings supplied with the equipment.
6. Remove each main’s neutral disconnect link to isolate wiring system neutrals from both supply and ground.
7. Measure the system neutral-to-ground insulation resistance to ensure that no ground connections exist on the load side of the ground fault protection system. The resistance should be at least 1.0 megohm. Remove all connections that exist from neutral-to-ground found during the test. Do not reconnect these grounds after the test is completed.
8. Replace each main’s neutral disconnect link.
9. Record all pick-up and time delay settings for each circuit breaker and/or ground fault relay under test in Table 4 on page 34. After testing, return all settings to original values.
10. Adjust the ground fault pick-up setting on each circuit breaker and/or ground fault relay to its lowest current setting.
11. Adjust the ground fault time delay setting on each circuit breaker and/or ground fault relay under test to 0.1 seconds (I2T OUT or OFF).
12. Adjust the long-time, short-time, and instantaneous pick-up and time delay settings on each circuit breaker under test to their highest settings.
13. For each circuit breaker equipped with the Micrologic® Type A, H, or P trip unit, connect a hand-held test unit, and activate the thermal-imaging inhibit function according to the test unit instructions. This step is necessary to inhibit trip history and contact wear counter functions. After testing, de-activate the thermal-imaging inhibit function according to the

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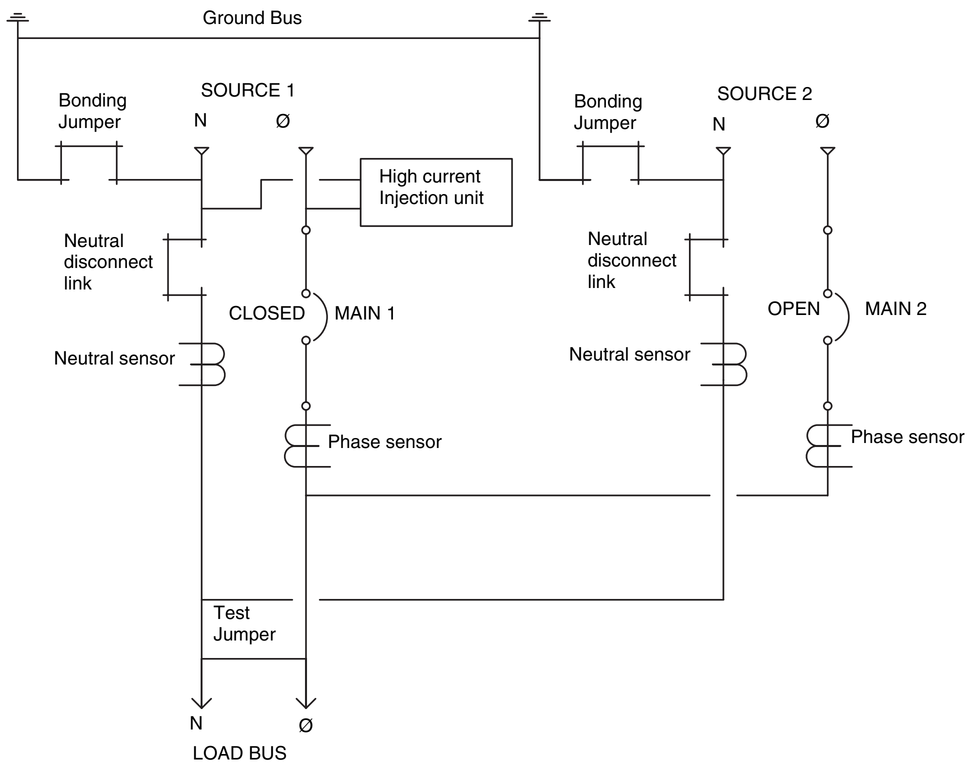
test unit instructions. Refer to bulletin 48049-184-XX for additional information.

14. Disconnect the ground fault protection control power source, if internally derived, and provide control power from an external source. Refer to wiring diagrams supplied for specific connections. After testing, disconnect external control power and re-connect internal control power circuit.

Test No. 1

1. Close MAIN 1 circuit breaker (or switch), and open MAIN 2 circuit breaker (or switch).
2. On the line side of MAIN 1 circuit breaker (or switch), connect the high current injection unit between Phase A and the neutral (N). See Figure 1.
3. On the load bus, connect a high current jumper between Phase A and the neutral (N). See Figure 1.
4. Inject 1000 A into Phase A. MAIN 1 circuit breaker (or switch) should not trip on ground fault. Record the actual results for Test No. 1 in Table 1 on page 31.
5. Repeat Test No. 1 for Phases B and C (not required for zero sequence systems). Record the actual results for this test in Table 1.

Figure 1: Main-Main Test No. 1 (No Trip) Injection Unit and Test Jumper Connections



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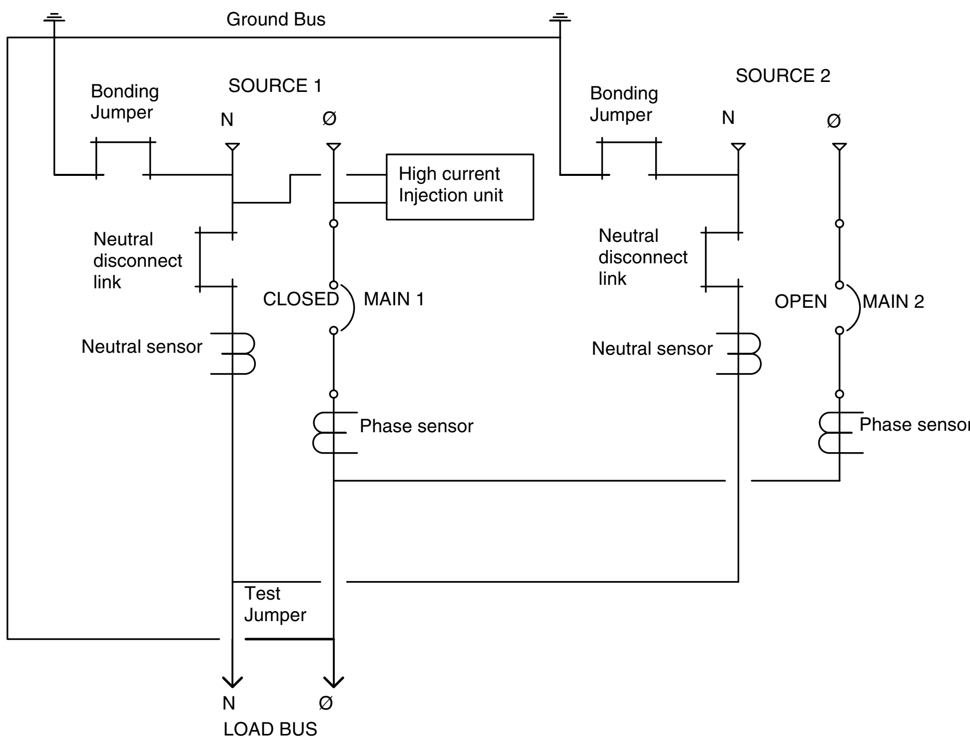
Test No. 2

1. Close MAIN 1 circuit breaker (or switch), and open MAIN 2 circuit breaker (or switch).
2. On the line side of MAIN 1 circuit breaker (or switch), connect the high current injection unit between Phase A and the neutral (N). See Figure 2.
3. On the load bus, connect a high current jumper between Phase A and the ground. See Figure 2.
4. Inject 1000 A into Phase A. MAIN 1 circuit breaker (or switch) should trip on ground fault. Record the actual results for Test No. 2 in Table 1 on page 31.
5. Repeat Test No. 2 for Phases B and C (not required for zero sequence systems). Record the actual results for this test in Table 1.

Figure 2: Main-Main Test No. 2 (Trip) Injection Unit and Test Jumper Connections



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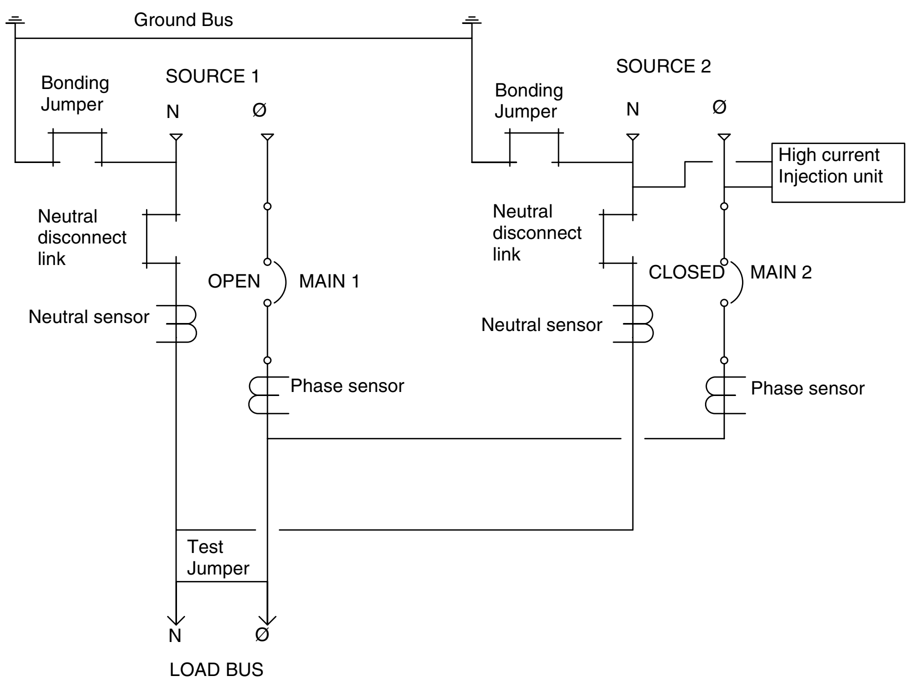
Test No. 3

1. Close MAIN 2 circuit breaker (or switch), and open MAIN 1 circuit breaker (or switch).
2. On the line side of MAIN 2 circuit breaker (or switch), connect the high current injection unit between Phase A and the neutral (N). See Figure 3.
3. On the load bus, connect a high current jumper between Phase A and the neutral (N). See Figure 3.
4. Inject 1000 A into Phase A. MAIN 2 circuit breaker (or switch) should not trip on ground fault. Record the actual results for Test No. 3 in Table 1 on page 31.
5. Repeat Test No. 3 for Phases B and C (not required for zero sequence systems). Record the actual results for this test in Table 1.

Figure 3: Main-Main Test No. 3 (No Trip) Injection Unit and Test Jumper Connections



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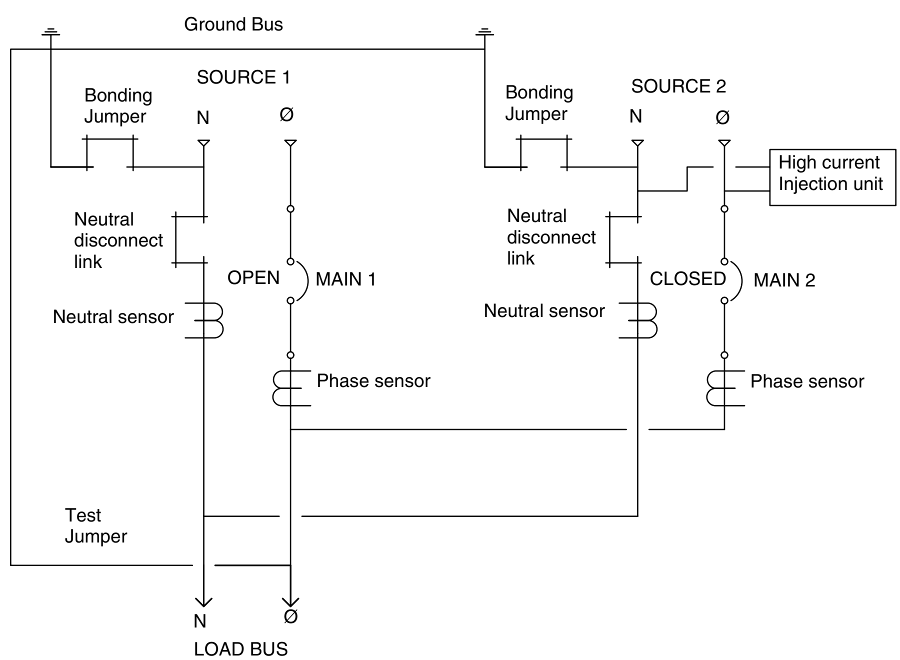
Test No. 4

1. Close MAIN 2 circuit breaker (or switch), and open MAIN 1 circuit breaker (or switch).
2. On the line side of MAIN 2 circuit breaker (or switch), connect the high current injection unit between Phase A and the neutral (N). See Figure 4.
3. On the load bus, connect a high current jumper between Phase A and the ground. See Figure 4.
4. Inject 1000 A into Phase A. MAIN 2 circuit breaker (or switch) should trip on ground fault. Record the actual results for Test No. 4 in Table 1 on page 31.
5. Repeat Test No. 4 for Phases B and C (not required for zero sequence systems). Record the actual results for this test in Table 1.
6. After testing, return all settings to the original values previously recorded.

Figure 4: Main-Main Test No. 4 (Trip) Injection Unit and Test Jumper Connections



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SECTION 4—MAIN-TIE-MAIN, GROUNDED WYE, NON-RELAYED TIE CONFIGURATION

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- This equipment must be installed and serviced only by qualified electrical personnel.
- Turn off all power supplying the equipment before working on or inside the equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

1. Turn off all power supplying this equipment before working on or inside equipment. Use a properly rated voltage sensing device to confirm power is off.
2. Verify that all ground bus bar splices are solidly connected. For each main, verify that the ground bonding connection is made ahead of the neutral disconnect link and on the line side of any ground fault sensor. See Figure 5.
3. For each main, verify that a neutral connection exists from the supply transformer to the equipment.
4. For residual sensing systems, verify that all phase and neutral sensors are connected with correct polarity on both primary and secondary. Refer to the drawings supplied with the equipment.
5. For zero sequence sensing systems, verify that all phase conductors and the neutral pass through the sensor in the same direction, and that grounding conductors do not pass through the sensor. Also, verify that the sensor is connected with the correct polarity on both primary and secondary. Refer to the drawings supplied with the equipment.
6. Remove each main's neutral disconnect link to isolate wiring system neutrals from both supply and ground.
7. Measure the system neutral-to-ground insulation resistance to ensure that no ground connections exist on the load side of the ground fault protection system. The resistance should be at least 1.0 megohm. Remove all connections that exist from neutral-to-ground found during the test. Do not reconnect these grounds after the test is completed.
8. Replace each main's neutral disconnect link.
9. Record all pick-up and time delay settings for each circuit breaker and/or ground fault relay under test in Table 4 on page 34. After testing, return all settings to original values.
10. Adjust the ground fault pickup setting on each circuit breaker and/or ground fault relay to its lowest current setting.
11. Adjust the ground fault time delay setting on each circuit breaker and/or ground fault relay under test to 0.1 seconds (I2T OUT or OFF).
12. Adjust the long-time, short-time, and instantaneous pick-up and time delay settings on each circuit breaker under test to their highest settings.
13. For each main circuit breaker equipped with the Micrologic® Type A, H, or P trip unit, connect a hand-held test unit, and activate the thermal-imaging inhibit function according to the test unit instructions. This step is necessary to inhibit trip history and contact wear counter functions. After testing, de-

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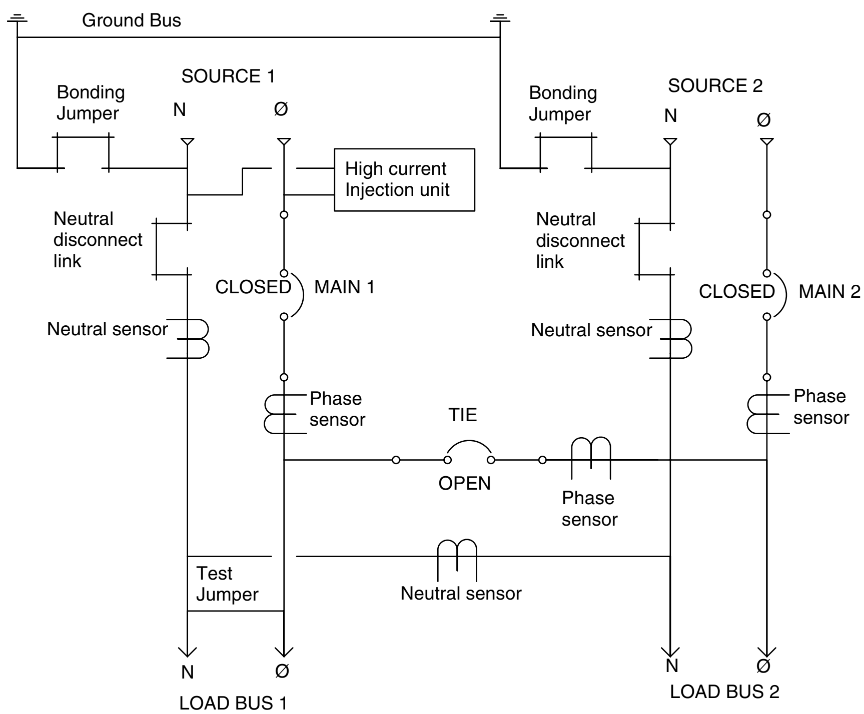
activate the thermal-imaging inhibit function according to the test unit instructions. Refer to bulletin 48049-184-XX for additional information.

14. Disconnect the ground fault protection control power source, if internally derived, and provide control power from an external source. Refer to the wiring diagrams supplied for specific connections. After testing, disconnect external control power and re-connect internal control power circuit.

Test No. 1

1. Close MAIN 1 circuit breaker (or switch). Open TIE circuit breaker (or switch), and close MAIN 2 circuit breaker (or switch).
2. On the line side of MAIN 1 circuit breaker (or switch), connect the high current injection unit between Phase A and the neutral (N). See Figure 5.
3. On the load bus, connect a high current jumper between Phase A and the neutral (N). See Figure 5.
4. Inject 1000 A into Phase A. MAIN 1 circuit breaker (or switch) should not trip on ground fault. Record the actual results for Test No. 1 in Table 2 on page 32.
5. Repeat Test No. 1 for Phases B and C (not required for zero sequence systems). Record the actual results for this test in Table 2.

Figure 5: Main-Tie-Main Test No. 1 (No Trip) Injection Unit and Test Jumper Connections



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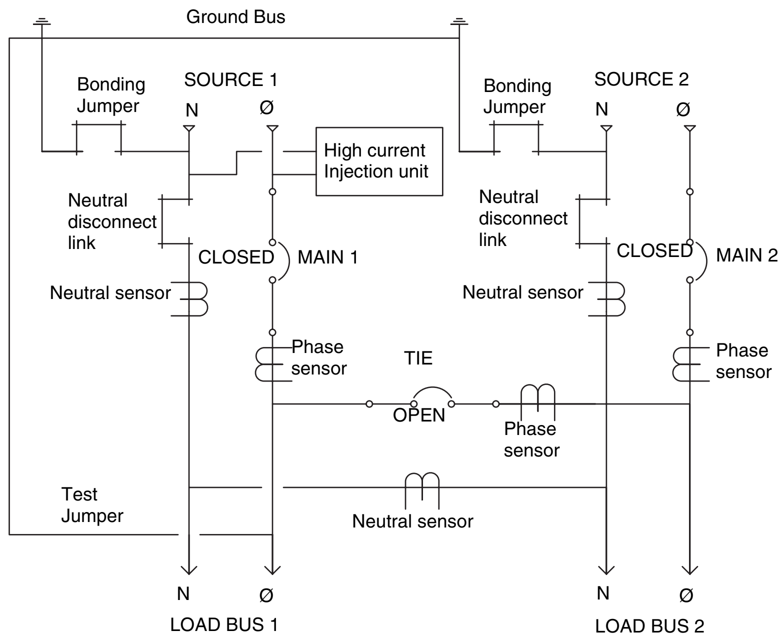
Test No. 2

1. Close MAIN 1 circuit breaker (or switch). Open TIE circuit breaker (or switch), and close MAIN 2 circuit breaker (or switch).
2. On the line side of MAIN 1 circuit breaker (or switch), connect the high current injection unit between Phase A and the neutral (N). See Figure 6.
3. On the load bus, connect a high current jumper between Phase A and the ground. See Figure 6.
4. Inject 1000 A into Phase A. MAIN 1 circuit breaker (or switch) should trip on ground fault. Record the actual results for Test No. 2 in Table 2 on page 32.
5. Repeat Test No. 2 for Phases B and C (not required for zero sequence systems). Record the actual results for this test in Table 2.

Figure 6: Main-Tie-Main Test No. 2 (Trip) Injection Unit and Test Jumper Connections



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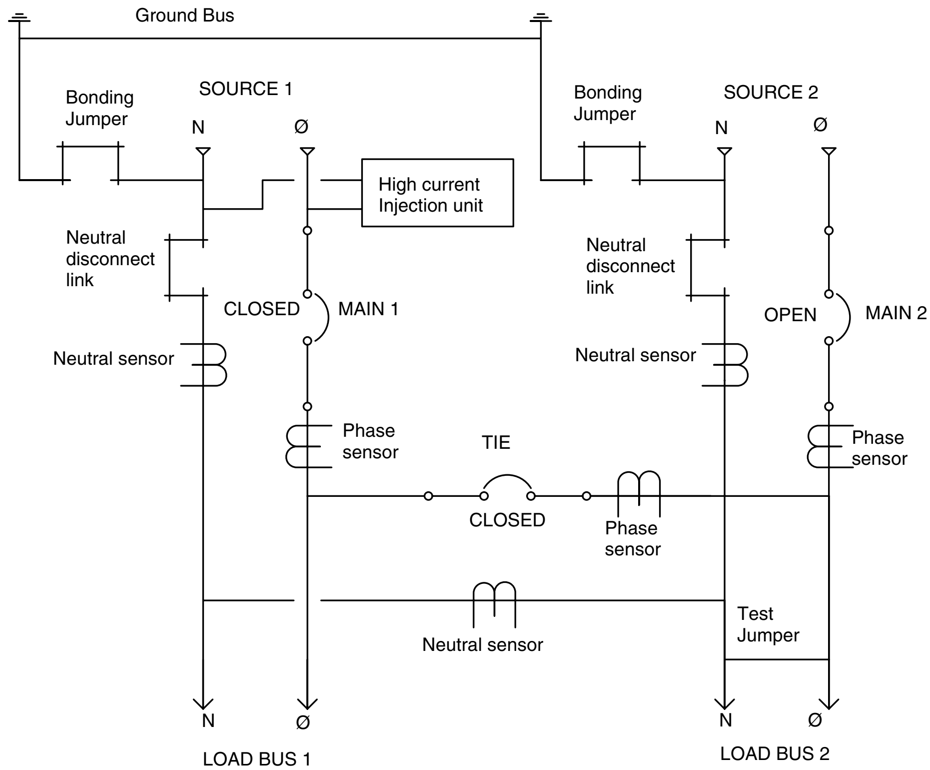
Test No. 3

1. Close MAIN 1 circuit breaker (or switch). Close TIE circuit breaker (or switch), and open MAIN 2 circuit breaker (or switch).
2. On the line side of MAIN 1 circuit breaker (or switch), connect the high current injection unit between Phase A and the neutral (N). See Figure 7.
3. On the load bus, connect a high current jumper between Phase A and the neutral (N). See Figure 7.
4. Inject 1000 A into Phase A. Neither MAIN 1 circuit breaker (or switch) nor TIE circuit breaker (or switch) should trip on ground fault. Record the actual results for Test No. 3 in Table 2 on page 32.
5. Repeat Test No. 3 for Phases B and C (not required for zero sequence systems). Record the actual results for this test in Table 2.

Figure 7: Main-Tie-Main Test No. 3 (No Trip) Injection Unit and Test Jumper Connections



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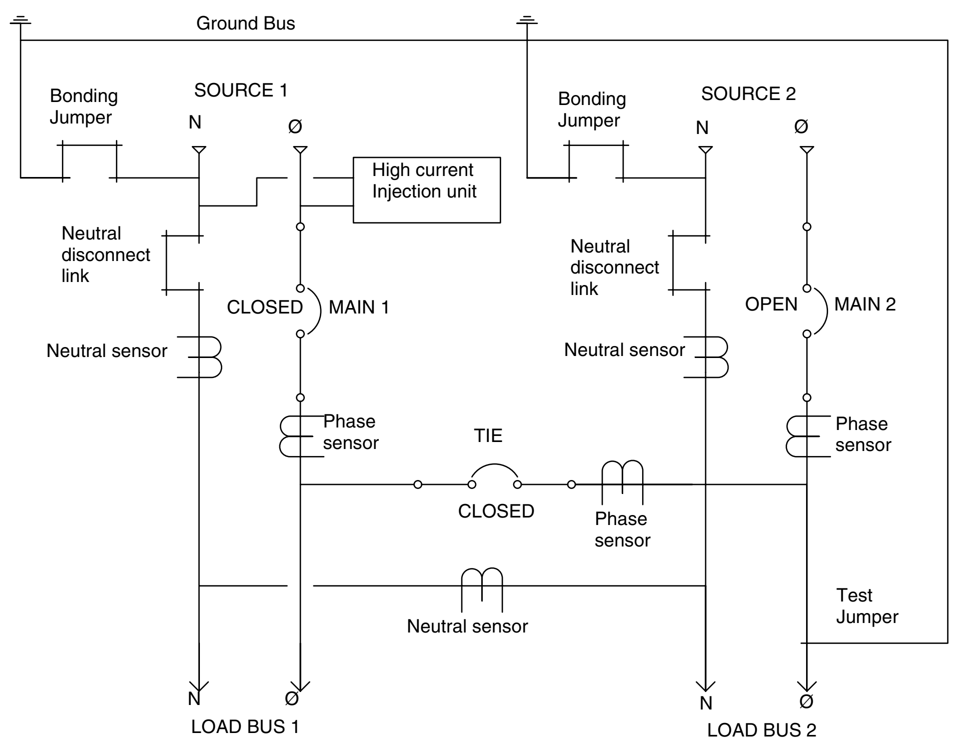
Test No. 4

1. Close MAIN 1 circuit breaker (or switch). Close TIE circuit breaker (or switch), and open MAIN 2 circuit breaker (or switch).
2. On the line side of MAIN 1 circuit breaker (or switch), connect the high current injection unit between Phase A and the neutral (N). See Figure 8.
3. On the load bus, connect a high current jumper between Phase A and the ground. See Figure 8.
4. Inject 1000 A into Phase A. MAIN 1 circuit breaker (or switch) should trip on ground fault, but TIE circuit breaker (or switch) should not trip on ground fault. Record the actual results for Test No. 4 in Table 2 on page 32.
5. Repeat Test No. 4 for Phases B and C (not required for zero sequence systems). Record the actual results for this test in Table 2.

Figure 8: Main-Tie-Main Test No. 4 (Trip) Injection Unit and Test Jumper Connections



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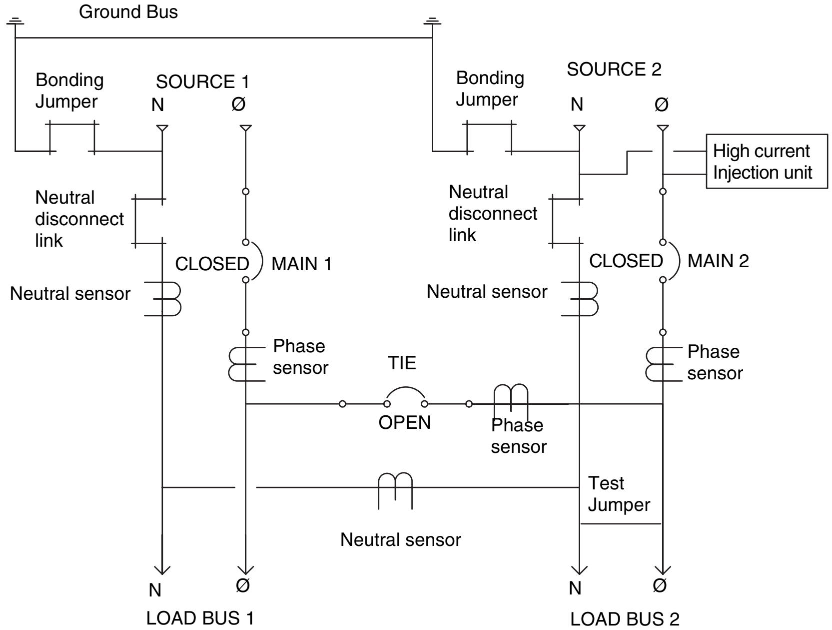
Test No. 5

1. Close MAIN 1 circuit breaker (or switch). Open TIE circuit breaker (or switch), and close MAIN 2 circuit breaker (or switch).
2. On the line side of MAIN 2 circuit breaker (or switch), connect the high current injection unit between Phase A and the neutral (N). See Figure 9.
3. On the load bus, connect a high current jumper between Phase A and the neutral (N). See Figure 9.
4. Inject 1000 A into Phase A. MAIN 2 circuit breaker (or switch) should not trip on ground fault. Record the actual results for Test No. 5 in Table 2 on page 32.
5. Repeat Test No. 5 for Phases B and C (not required for zero sequence systems). Record the actual results for this in Table 2.

Figure 9: Main-Tie-Main Test No. 5 (No Trip) Injection Unit and Test Jumper Connections



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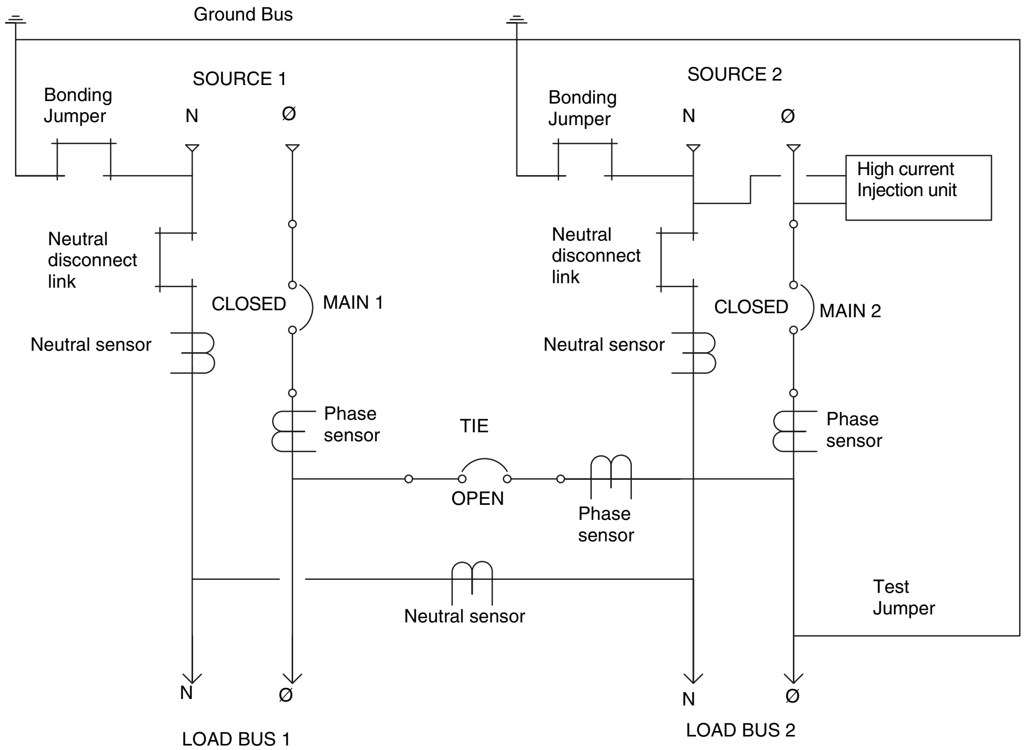
Test No. 6

1. Close MAIN 1 circuit breaker (or switch). Open TIE circuit breaker (or switch), and close MAIN 2 circuit breaker (or switch).
2. On the line side of MAIN 2 circuit breaker (or switch), connect the high current injection unit between Phase A and the neutral (N). See Figure 10.
3. On the load bus, connect a high current jumper between Phase A and the ground. See Figure 10.
4. Inject 1000 A into Phase A. MAIN 2 circuit breaker (or switch) should trip on ground fault. Record the actual results for Test No. 6 in Table 2 on page 32.
5. Repeat Test No. 6 for Phases B and C (not required for zero sequence systems). Record the actual results for this test in Table 2.

Figure 10: Main-Tie-Main Test No. 6 (Trip) Injection Unit and Test Jumper Connections



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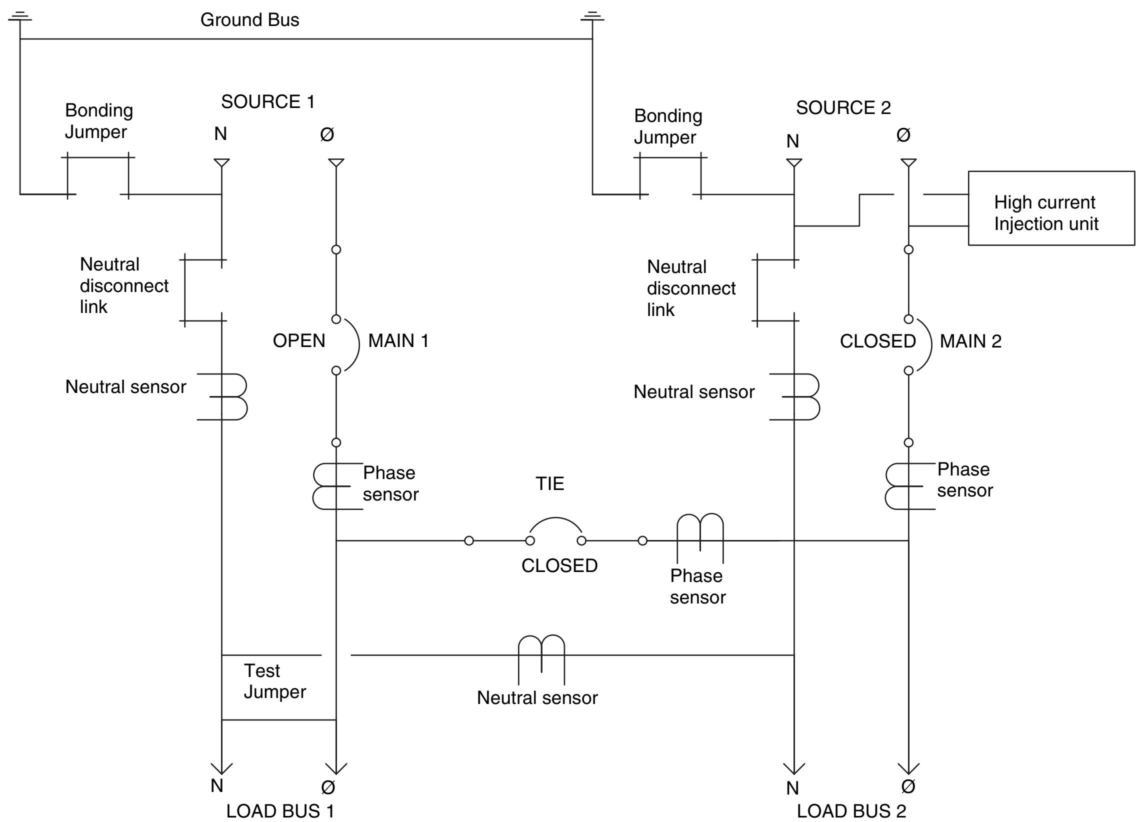
Test No. 7

1. Open MAIN 1 circuit breaker (or switch). Close TIE circuit breaker (or switch), and close MAIN 2 circuit breaker (or switch).
2. On the line side of MAIN 2 circuit breaker (or switch), connect the high current injection unit between Phase A and the neutral (N). See Figure 11.
3. On the load bus, connect a high current jumper between Phase A and the neutral (N). See Figure 11.
4. Inject 1000 A into Phase A. Neither MAIN 2 circuit breaker (or switch) nor TIE circuit breaker (or switch) should trip on ground fault. Record the actual results for Test No. 7 in Table 2 on page 32.
5. Repeat Test No. 7 for Phases B and C (not required for zero sequence systems). Record the actual results for this test in Table 2.

Figure 11: Main-Tie-Main Test No. 7 (No Trip) Injection Unit and Test Jumper Connections



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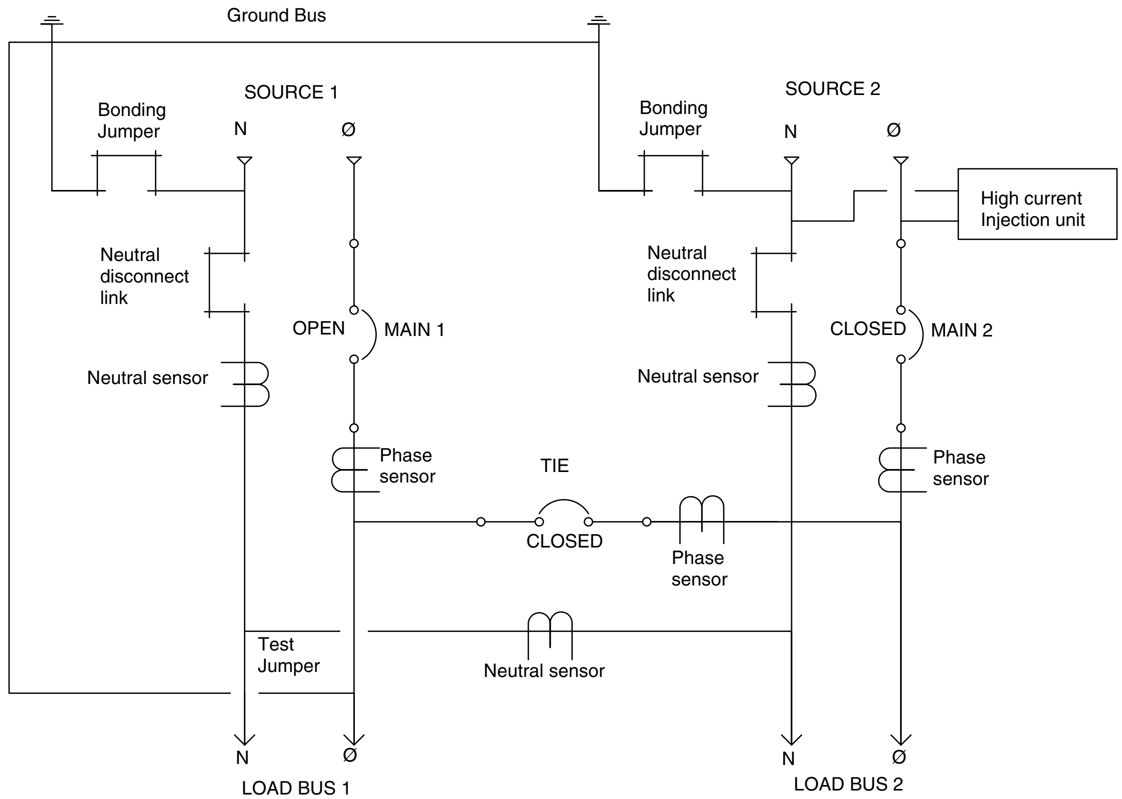
Test No. 8

1. Open MAIN 1 circuit breaker (or switch). Close TIE circuit breaker (or switch), and close MAIN 2 circuit breaker (or switch).
2. On the line side of MAIN 2 circuit breaker (or switch), connect the high current injection unit between Phase A and the neutral (N). See Figure 12.
3. On the load bus, connect a high current jumper between Phase A and the ground. See Figure 12.
4. Inject 1000 A into Phase A. MAIN 2 circuit breaker (or switch) should trip on ground fault, but TIE circuit breaker (or switch) should not trip on ground fault. Record the actual results for Test No. 8 in Table 2 on page 32.
5. Repeat Test No. 8 for Phases B and C (not required for zero sequence systems). Record the actual results for this test in Table 2.
6. After testing, return all settings to the original values previously recorded.

Figure 12: Main-Tie-Main Test No. 8 (Trip) Injection Unit and Test Jumper Connections



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SECTION 5—MAIN-TIE-MAIN, GROUNDED WYE, RELAYED TIE CONFIGURATION

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- This equipment must be installed and serviced only by qualified electrical personnel.
- Turn off all power supplying the equipment before working on or inside the equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

1. Turn off all power supplying this equipment before working on or inside equipment. Use a properly rated voltage sensing device to confirm power is off.
2. Verify that all ground bus bar splices are solidly connected. For each main, verify that the ground bonding connection is made ahead of the neutral disconnect link and on the line side of any ground fault sensor. See Figure 13.
3. For each main, verify that a neutral connection exists from the supply transformer to the equipment.
4. For residual sensing systems, verify that all phase and neutral sensors are connected with correct polarity on both primary and secondary. Refer to the drawings supplied with the equipment.
5. For zero sequence sensing systems, verify that all phase conductors and the neutral pass through the sensor in the same direction, and that grounding conductors do not pass through the sensor. Also, verify that the sensor is connected with the correct polarity on both primary and secondary. Refer to the drawings supplied with the equipment.
6. Remove each main's neutral disconnect link to isolate wiring system neutrals from both supply and ground.
7. Measure the system neutral-to-ground insulation resistance to ensure that no ground connections exist on the load side of the ground fault protection system. The resistance should be at least 1 megohm. Remove all connections that exist from neutral-to-ground found during the test. Do not reconnect these grounds after the test is completed.
8. Replace each main's neutral disconnect link.
9. Record all pick-up and time delay settings for each circuit breaker and/or ground fault relay under test in Table 4 on page 34. After testing, return all settings to original values.
10. Adjust the ground fault pick-up setting on each circuit breaker and/or ground fault relay to its lowest current setting.
11. Adjust the ground fault time delay setting on each circuit breaker and/or ground fault relay under test to 0.1 seconds (I2T OUT or OFF).
12. Adjust the long-time, short-time, and instantaneous pick-up and time delay settings on each circuit breaker under test to their highest settings.
13. For each main and tie circuit breaker equipped with the Micrologic® Type A, H, or P trip unit, connect a hand-held test unit, and activate the thermal-imaging inhibit function according to the test unit instructions. This step is necessary to inhibit trip history and contact wear counter

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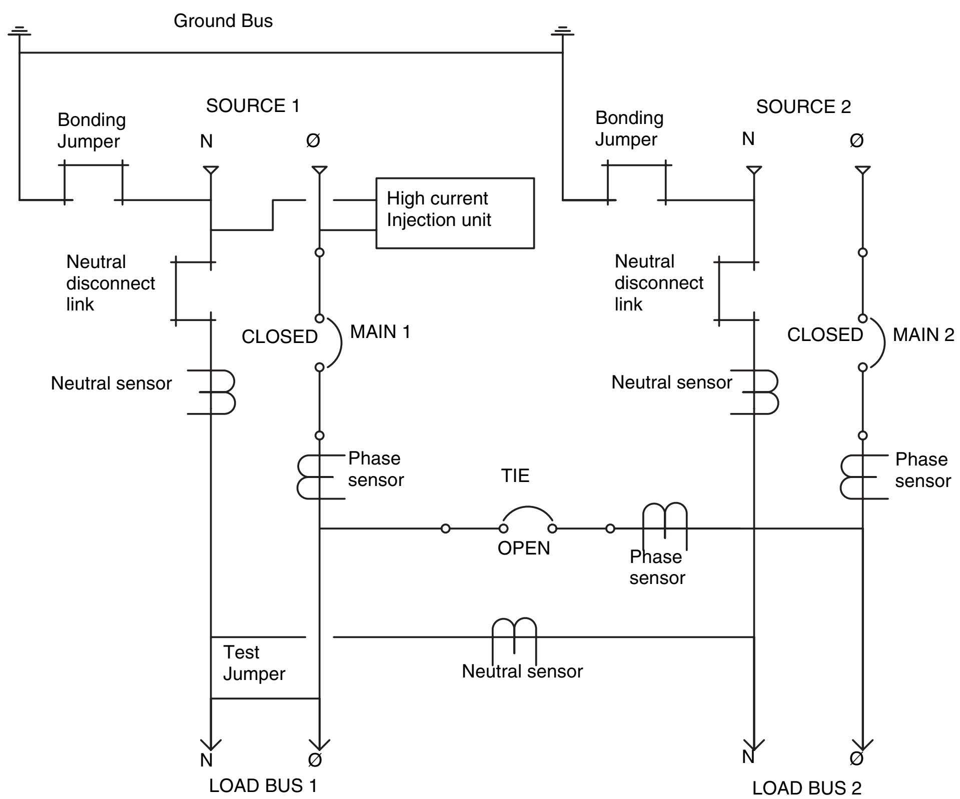
functions. After testing, de-activate the thermal-imaging inhibit function according to the test unit instructions. Refer to bulletin 48049-184-XX for additional information.

14. Disconnect the ground fault protection control power source, if internally derived, and provide control power from an external source. Refer to the wiring diagrams supplied for specific connections. After testing, disconnect external control power and re-connect internal control power circuit.

Test No. 1

1. Close MAIN 1 circuit breaker (or switch). Open TIE circuit breaker (or switch), and close MAIN 2 circuit breaker (or switch).
2. On the line side of MAIN 1 breaker (or switch), connect the high current injection unit between Phase A and the neutral (N). See Figure 13.
3. On the load bus, connect a high current jumper between Phase A and the neutral (N). See Figure 13.
4. Inject 1000 A into Phase A. MAIN 1 breaker (or switch) should not trip on ground fault. Record the actual results for Test No. 1 in Table 3 on page 33.
5. Repeat Test No. 1 for Phases B and C (not required for zero sequence systems). Record the actual results for this test in Table 3.

Figure 13: Main-Tie-Main Test No.1 (No Trip) Injection Unit and Test Jumper Connections



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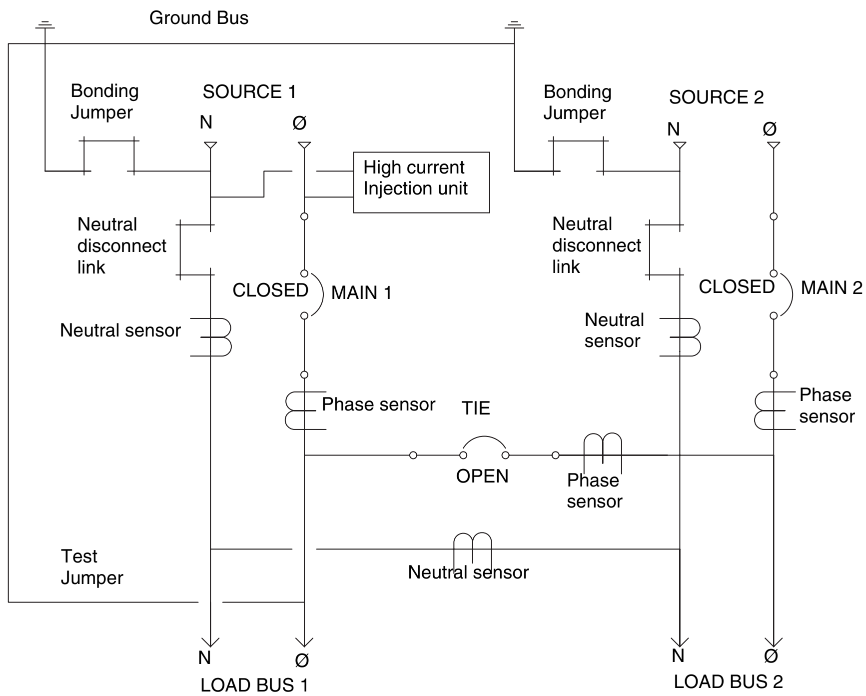
Test No. 2

1. Close MAIN 1 circuit breaker (or switch). Open TIE circuit breaker (or switch), and close MAIN 2 circuit breaker (or switch).
2. On the line side of MAIN 1 circuit breaker (or switch), connect the high current injection unit between Phase A and the neutral (N). See Figure 14.
3. On the load bus, connect a high current jumper between Phase A and the ground. See Figure 14.
4. Inject 1000 A into Phase A. MAIN 1 circuit breaker (or switch) should trip on ground fault. Record the actual results for Test No. 2 in Table 3 on page 33.
5. Repeat Test No. 2 for Phases B and C (not required for zero sequence systems). Record the actual results for this test in Table 3.

Figure 14: Main-Tie-Main Test No. 2 (Trip) Injection Unit and Test Jumper Connections



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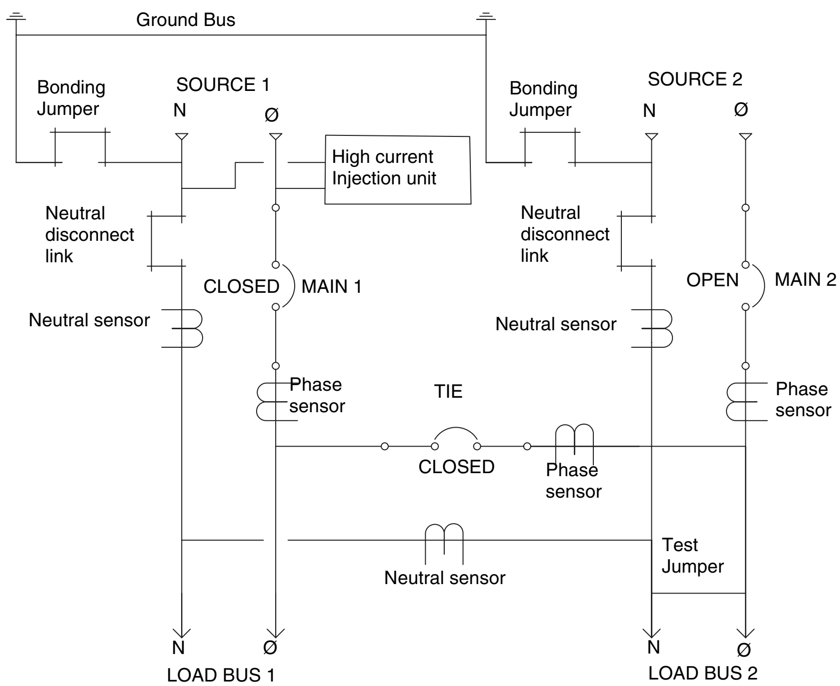
Test No. 3

1. Close MAIN 1 circuit breaker (or switch). Close TIE circuit breaker (or switch), and open MAIN 2 circuit breaker (or switch).
2. On the line side of MAIN 1 circuit breaker (or switch), connect the high current injection unit between Phase A and the neutral (N). See Figure 15.
3. On the load bus, connect a high current jumper between Phase A and the neutral (N). See Figure 15.
4. Inject 1000 A into Phase A. Neither MAIN 1 circuit breaker (or switch) nor TIE circuit breaker (or switch) should trip on ground fault. Record the actual results for Test No. 3 in Table 3 on page 33.
5. Repeat Test No. 3 for Phases B and C (not required for zero sequence systems). Record the actual results for this test in Table 3.

Figure 15: Main-Tie-Main Test No. 3 (No Trip) Injection Unit and Test Jumper Connections



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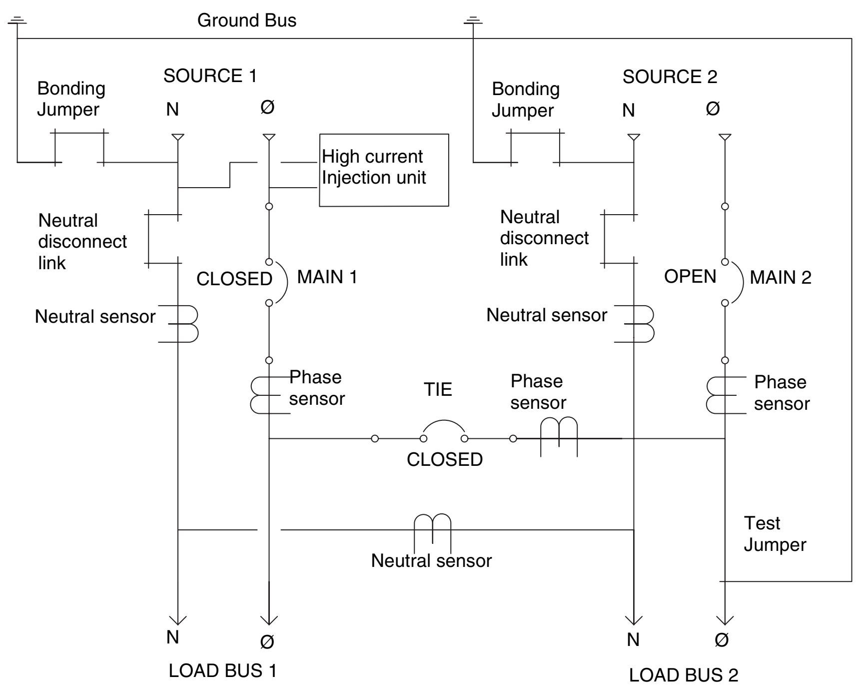
Test No. 4

1. Close MAIN 1 circuit breaker (or switch). Close TIE circuit breaker (or switch), and open MAIN 2 circuit breaker (or switch).
2. On the line side of MAIN 1 circuit breaker (or switch), connect the high current injection unit between Phase A and the neutral (N). See Figure 16.
3. On the load bus, connect a high current jumper between Phase A and the ground. See Figure 16.
4. Inject 1000 A into Phase A. MAIN 1 circuit breaker (or switch) should not trip on ground fault, but TIE circuit breaker (or switch) should trip on ground fault. Record the actual results for Test No. 4 in Table 3 on page 33.
5. Repeat Test No. 4 for Phases B and C (not required for zero sequence systems). Record the actual results for this test in Table 3.

Figure 16: Main-Tie-Main Test No. 4 (Trip) Injection Unit and Test Jumper Connections



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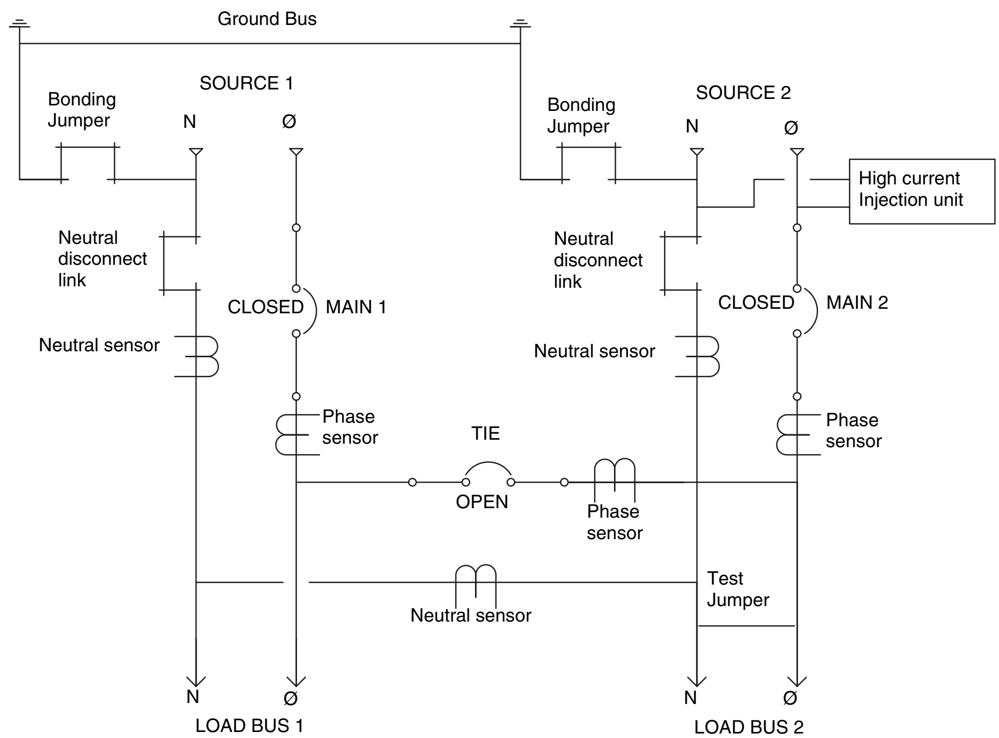
Test No. 5

1. Close MAIN 1 circuit breaker (or switch). Open TIE circuit breaker (or switch), and close MAIN 2 circuit breaker (or switch).
2. On the line side of MAIN 2 circuit breaker (or switch), connect the high current injection unit between Phase A and the neutral (N). See Figure 17.
3. On the load bus, connect a high current jumper between Phase A and the neutral (N). See Figure 17.
4. Inject 1000 A into Phase A. MAIN 2 circuit breaker (or switch) should not trip on ground fault. Record the actual results for Test No. 5 in Table 3 on page 33.
5. Repeat Test No. 5 for Phases B and C (not required for zero sequence systems). Record the actual results for this test in Table 3.

Figure 17: Main-Tie-Main Test No. 5 (No Trip) Injection Unit and Test Jumper Connections



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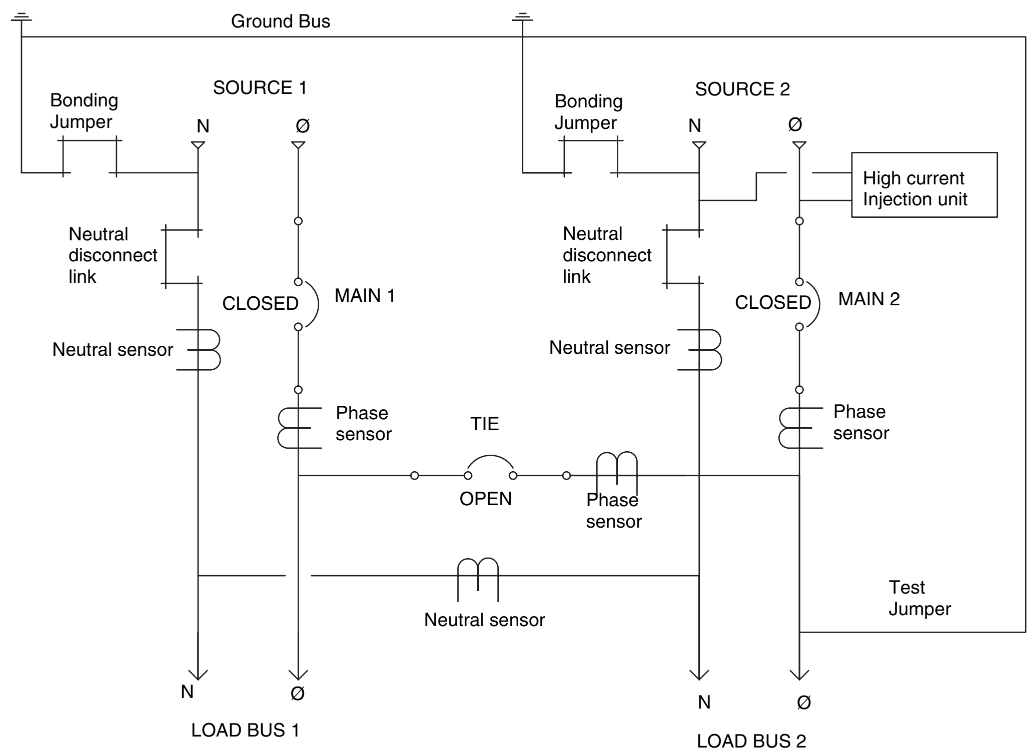
Test No. 6

1. Close MAIN 1 circuit breaker (or switch). Open TIE circuit breaker (or switch), and close MAIN 2 circuit breaker (or switch).
2. On the line side of MAIN 2 circuit breaker (or switch), connect the high current injection unit between Phase A and the neutral (N). See Figure 18.
3. On the load bus, connect a high current jumper between Phase A and the ground. See Figure 18.
4. Inject 1000 A into Phase A. MAIN 2 circuit breaker (or switch) should trip on ground fault. Record the actual results for Test No. 6 in Table 3 on page 33.
5. Repeat Test No. 6 for Phases B and C (not required for zero sequence systems). Record the actual results for this test in Table 3.

Figure 18: Main-Tie-Main Test No. 6 (Trip) Injection Unit and Test Jumper Connections



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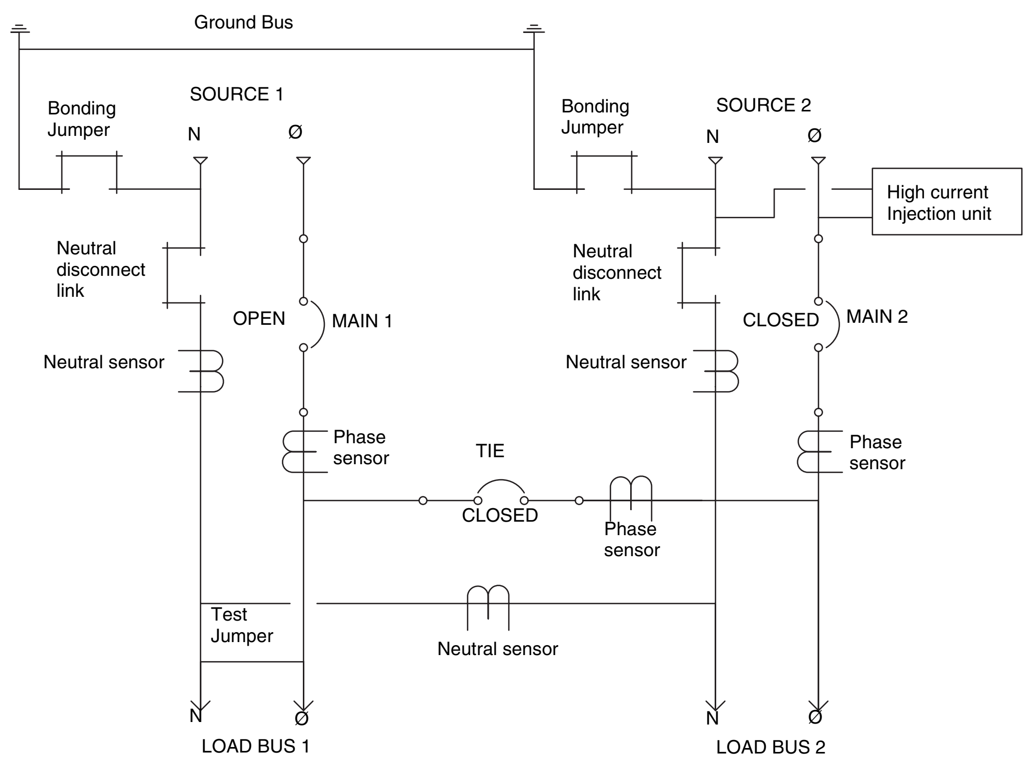
Test No. 7

1. Open MAIN 1 circuit breaker (or switch). Close TIE circuit breaker (or switch), and close MAIN 2 circuit breaker (or switch).
2. On the line side of MAIN 2 circuit breaker (or switch), connect the high current injection unit between Phase A and the neutral (N). See Figure 19.
3. On the load bus, connect a high current jumper between Phase A and the neutral (N). See Figure 19.
4. Inject 1000 A into Phase A. Neither MAIN 2 circuit breaker (or switch) nor TIE circuit breaker (or switch) should trip on ground fault. Record the actual results for Test No. 7 in Table 3 on page 33.
5. Repeat Test No. 7 for Phases B and C (not required for zero sequence systems). Record the actual results for this test in Table 3.

Figure 19: Main-Tie-Main Test No. 7 (No Trip) Injection Unit and Test Jumper Connections



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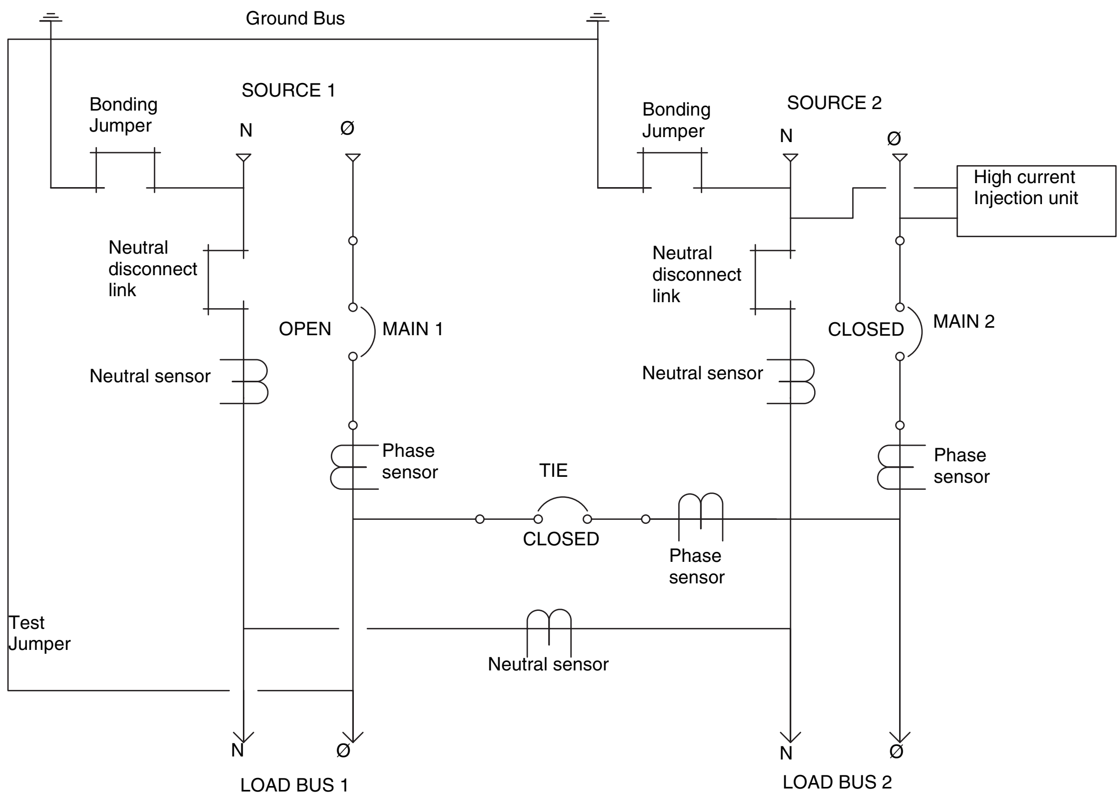
Test No. 8

1. Open MAIN 1 circuit breaker (or switch). Close TIE circuit breaker (or switch), and close MAIN 2 circuit breaker (or switch).
2. On the line side of MAIN 2 circuit breaker (or switch), connect the high current injection unit between Phase A and the neutral (N). See Figure 20.
3. On the load bus, connect a high current jumper between Phase A and the ground. See Figure 20.
4. Inject 1000 A into Phase A. MAIN 2 circuit breaker (or switch) should not trip on ground fault, but TIE circuit breaker (or switch) should trip on ground fault. Record the actual results for Test No. 8 in Table 3 on page 33.
5. Repeat Test No. 8 for Phases B and C (not required for zero sequence systems). Record the actual results for this test in Table 3.
6. After testing, return all settings to the original values previously recorded.

Figure 20: Main-Tie-Main Test No. 8 (Trip) Injection Unit and Test Jumper Connections



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SECTION 6—MAIN-MAIN TEST PROCEDURE LOG

Table 1: Main-Main Test Procedure Log

Test No.	Jumper Connection	Circuit Breaker Status		Injection Current	Expected Results	Actual Results		
		MAIN 1	MAIN 2			Phase A	Phase B	Phase C
1	Phase of LOAD BUS 1 to Neutral of LOAD BUS 1	Closed	Open	1000 A	“No Trip” MAIN 1 Circuit Breaker			
2	Phase of LOAD BUS 1 to Ground of LOAD BUS 1	Closed	Open	1000 A	“Trip” MAIN 1 Circuit Breaker			
3	Phase of LOAD BUS 2 to Neutral of LOAD BUS 2	Open	Closed	1000 A	“No Trip” MAIN 2 Circuit Breaker			
4	Phase of LOAD BUS 2 to Ground of LOAD BUS 2	Open	Closed	1000 A	“Trip” MAIN 2 Circuit Breaker			

Test No.	Jumper Connection	Circuit Breaker Status		Injection Current	Expected Results	Actual Results		
		MAIN 1	MAIN 2			Phase A	Phase B	Phase C
1	Phase of LOAD BUS 1 to Neutral of LOAD BUS 1	Closed	Open	1000 A	“No Trip” MAIN 1 Circuit Breaker			
2	Phase of LOAD BUS 1 to Ground of LOAD BUS 1	Closed	Open	1000 A	“Trip” MAIN 1 Circuit Breaker			
3	Phase of LOAD BUS 2 to Neutral of LOAD BUS 2	Open	Closed	1000 A	“No Trip” MAIN 2 Circuit Breaker			
4	Phase of LOAD BUS 2 to Ground of LOAD BUS 2	Open	Closed	1000 A	“Trip” MAIN 2 Circuit Breaker			

Test No.	Jumper Connection	Circuit Breaker Status		Injection Current	Expected Results	Actual Results		
		MAIN 1	MAIN 2			Phase A	Phase B	Phase C
1	Phase of LOAD BUS 1 to Neutral of LOAD BUS 1	Closed	Open	1000 A	“No Trip” MAIN 1 Circuit Breaker			
2	Phase of LOAD BUS 1 to Ground of LOAD BUS 1	Closed	Open	1000 A	“Trip” MAIN 1 Circuit Breaker			
3	Phase of LOAD BUS 2 to Neutral of LOAD BUS 2	Open	Closed	1000 A	“No Trip” MAIN 2 Circuit Breaker			
4	Phase of LOAD BUS 2 to Ground of LOAD BUS 2	Open	Closed	1000 A	“Trip” MAIN 2 Circuit Breaker			

Test No.	Jumper Connection	Circuit Breaker Status		Injection Current	Expected Results	Actual Results		
		MAIN 1	MAIN 2			Phase A	Phase B	Phase C
1	Phase of LOAD BUS 1 to Neutral of LOAD BUS 1	Closed	Open	1000 A	“No Trip” MAIN 1 Circuit Breaker			
2	Phase of LOAD BUS 1 to Ground of LOAD BUS 1	Closed	Open	1000 A	“Trip” MAIN 1 Circuit Breaker			
3	Phase of LOAD BUS 2 to Neutral of LOAD BUS 2	Open	Closed	1000 A	“No Trip” MAIN 2 Circuit Breaker			
4	Phase of LOAD BUS 2 to Ground of LOAD BUS 2	Open	Closed	1000 A	“Trip” MAIN 2 Circuit Breaker			

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SECTION 7—MAIN-TIE-MAIN NON-RELAYED TEST PROCEDURE LOG

Table 2: Main-Tie-Main Non-Relayed Test Procedure Log

Test No.	Jumper Connection	Circuit Breaker Status			Injection Current	Expected Results	Actual Results		
		MAIN 1	TIE	MAIN 2			Phase A	Phase B	Phase C
1	Phase of LOAD BUS 1 to Neutral of LOAD BUS 1	Closed	Open	Closed	1000 A	“No Trip” MAIN 1 Circuit Breaker			
2	Phase of LOAD BUS 1 to Ground of LOAD BUS 1	Closed	Open	Closed	1000 A	“Trip” MAIN 1 Circuit Breaker			
3	Phase of LOAD BUS 2 to Neutral of LOAD BUS 2	Closed	Closed	Open	1000 A	“No Trip” MAIN 1 Circuit Breaker			
4	Phase of LOAD BUS 2 to Ground of LOAD BUS 2	Closed	Closed	Open	1000 A	“Trip” MAIN 1 Circuit Breaker			
5	Phase of LOAD BUS 2 to Neutral of LOAD BUS 2	Closed	Open	Closed	1000 A	“No Trip” MAIN 2 Circuit Breaker			
6	Phase of LOAD BUS 2 to Ground of LOAD BUS 2	Closed	Open	Closed	1000 A	“Trip” MAIN 2 Circuit Breaker			
7	Phase of LOAD BUS 1 to Neutral of LOAD BUS 1	Open	Closed	Closed	1000 A	“No Trip” MAIN 2 Circuit Breaker			
8	Phase of LOAD BUS 1 to Ground of LOAD BUS 1	Open	Closed	Closed	1000 A	“Trip” MAIN 2 Circuit Breaker			

Test No.	Jumper Connection	Circuit Breaker Status			Injection Current	Expected Results	Actual Results		
		MAIN 1	TIE	MAIN 2			Phase A	Phase B	Phase C
1	Phase of LOAD BUS 1 to Neutral of LOAD BUS 1	Closed	Open	Closed	1000 A	“No Trip” MAIN 1 Circuit Breaker			
2	Phase of LOAD BUS 1 to Ground of LOAD BUS 1	Closed	Open	Closed	1000 A	“Trip” MAIN 1 Circuit Breaker			
3	Phase of LOAD BUS 2 to Neutral of LOAD BUS 2	Closed	Closed	Open	1000 A	“No Trip” MAIN 1 Circuit Breaker			
4	Phase of LOAD BUS 2 to Ground of LOAD BUS 2	Closed	Closed	Open	1000 A	“Trip” MAIN 1 Circuit Breaker			
5	Phase of LOAD BUS 2 to Neutral of LOAD BUS 2	Closed	Open	Closed	1000 A	“No Trip” MAIN 2 Circuit Breaker			
6	Phase of LOAD BUS 2 to Ground of LOAD BUS 2	Closed	Open	Closed	1000 A	“Trip” MAIN 2 Circuit Breaker			
7	Phase of LOAD BUS 1 to Neutral of LOAD BUS 1	Open	Closed	Closed	1000 A	“No Trip” MAIN 2 Circuit Breaker			
8	Phase of LOAD BUS 1 to Ground of LOAD BUS 1	Open	Closed	Closed	1000 A	“Trip” MAIN 2 Circuit Breaker			

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SECTION 8—MAIN-TIE-MAIN RELAYED TEST PROCEDURE LOG

Table 3: Main-Tie-Main Relayed Test Procedure Log

Test No.	Jumper Connection	Circuit Breaker Status			Injection Current	Expected Results	Actual Results		
		MAIN 1	TIE	MAIN 2			Phase A	Phase B	Phase C
1	Phase of LOAD BUS 1 to Neutral of LOAD BUS 1	Closed	Open	Closed	1000 A	“No Trip” MAIN 1 Circuit Breaker			
2	Phase of LOAD BUS 1 to Ground of LOAD BUS 1	Closed	Open	Closed	1000 A	“Trip” MAIN 1 Circuit Breaker			
3	Phase of LOAD BUS 2 to Neutral of LOAD BUS 2	Closed	Closed	Open	1000 A	“No Trip” MAIN 1 Circuit Breaker “No Trip” TIE Circuit Breaker			
4	Phase of LOAD BUS 2 to Ground of LOAD BUS 2	Closed	Closed	Open	1000 A	“No Trip” MAIN 1 Circuit Breaker “Trip” TIE Circuit Breaker			
5	Phase of LOAD BUS 2 to Neutral of LOAD BUS 2	Closed	Open	Closed	1000 A	“No Trip” MAIN 2 Circuit Breaker			
6	Phase of LOAD BUS 2 to Ground of LOAD BUS 2	Closed	Open	Closed	1000 A	“Trip” MAIN 2 Circuit Breaker			
7	Phase of LOAD BUS 1 to Neutral of LOAD BUS 1	Open	Closed	Closed	1000 A	“No Trip” MAIN 2 Circuit Breaker “No Trip” TIE Circuit Breaker			
8	Phase of LOAD BUS 1 to Ground of LOAD BUS 1	Open	Closed	Closed	1000 A	“No Trip” MAIN 2 Circuit Breaker “Trip” TIE Circuit Breaker			

Test No.	Jumper Connection	Circuit Breaker Status			Injection Current	Expected Results	Actual Results		
		MAIN 1	TIE	MAIN 2			Phase A	Phase B	Phase C
1	Phase of LOAD BUS 1 to Neutral of LOAD BUS 1	Closed	Open	Closed	1000 A	“No Trip” MAIN 1 Circuit Breaker			
2	Phase of LOAD BUS 1 to Ground of LOAD BUS 1	Closed	Open	Closed	1000 A	“Trip” MAIN 1 Circuit Breaker			
3	Phase of LOAD BUS 2 to Neutral of LOAD BUS 2	Closed	Closed	Open	1000 A	“No Trip” MAIN 1 Circuit Breaker “No Trip” TIE Circuit Breaker			
4	Phase of LOAD BUS 2 to Ground of LOAD BUS 2	Closed	Closed	Open	1000 A	“No Trip” MAIN 1 Circuit Breaker “Trip” TIE Circuit Breaker			
5	Phase of LOAD BUS 2 to Neutral of LOAD BUS 2	Closed	Open	Closed	1000 A	“No Trip” MAIN 2 Circuit Breaker			
6	Phase of LOAD BUS 2 to Ground of LOAD BUS 2	Closed	Open	Closed	1000 A	“Trip” MAIN 2 Circuit Breaker			
7	Phase of LOAD BUS 1 to Neutral of LOAD BUS 1	Open	Closed	Closed	1000 A	“No Trip” MAIN 2 Circuit Breaker “No Trip” TIE Circuit Breaker			
8	Phase of LOAD BUS 1 to Ground of LOAD BUS 1	Open	Closed	Closed	1000 A	“No Trip” MAIN 2 Circuit Breaker “Trip” TIE Circuit Breaker			

SECTION 9—LOG OF TESTS AND SETTINGS

Table 4: Log of Tests and Settings

Date	Test	Circuit Breaker ID	Settings		Results and Signature
			Pick-Up	Time Delay	
	Installation				

Schneider Electric USA

1010 Airpark Center Drive
Nashville, TN 37217 USA
1-888-SquareD
(1-888-778-2733)
www.us.SquareD.com

04/2005

Inyección primaria de alta corriente

Procedimiento de pruebas en campo para los sistemas de protección contra falla a tierra diferencial modificada
Clase 6036

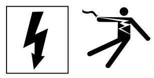
Boletín de instrucciones
Conservar para uso futuro.

una marca de
Schneider
Electric

SQUARE D

CATEGORÍAS DE RIESGOS Y SÍMBOLOS ESPECIALES

Asegúrese de leer detenidamente estas instrucciones y realice una inspección visual del equipo para familiarizarse con él antes de instalarlo, hacerlo funcionar o prestarle servicio de mantenimiento. Los siguientes mensajes especiales pueden aparecer en este boletín o en el equipo para advertirle sobre peligros potenciales o llamar su atención sobre cierta información que clarifica o simplifica un procedimiento.



La adición de cualquiera de estos símbolos a una etiqueta de seguridad de “Peligro” o “Advertencia” indica la existencia de un peligro eléctrico que podrá causar lesiones personales si no se observan las instrucciones.

Este es el símbolo de alerta de seguridad. Se usa para avisar sobre peligros potenciales de lesiones. Respete todos los mensajes de seguridad con este símbolo para evitar posibles lesiones o la muerte.

PELIGRO

PELIGRO indica una situación de peligro inminente que, si no se evita, **podrá** causar la muerte o lesiones serias.

ADVERTENCIA

ADVERTENCIA indica una situación potencialmente peligrosa que, si no se evita, **puede** causar la muerte o lesiones serias.

PRECAUCIÓN

PRECAUCIÓN indica una situación potencialmente peligrosa que, si no se evita, **puede** causar lesiones menores o moderadas.

PRECAUCIÓN

PRECAUCIÓN cuando se usa sin el símbolo de alerta de seguridad, indica una situación potencialmente peligrosa que, si no se evita, **puede** causar daño a la propiedad.

Proporciona información adicional para clarificar o simplificar un procedimiento.

OBSERVE QUE

Solamente el personal especializado deberá instalar, hacer funcionar y prestar servicios de mantenimiento al equipo eléctrico. Schneider Electric no asume responsabilidad alguna por las consecuencias emergentes de la utilización de este material.

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ESPAÑOL

ESPAÑOL

Figura 1: Principal-Principal – Prueba no. 1 (sin disparo) Conexiones de la unidad de inyección y el puente de conexión de prueba 10
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SECCIÓN 1—INTRODUCCIÓN

Descripción

Este boletín contiene las instrucciones de inspección y prueba de los sistemas de protección contra falla a tierra diferencial modificada fabricados por Schneider Electric. El sistema de protección contra falla a tierra diferencial modificada utilizado en agrupaciones de tableros de distribución tipo autosoportado y tableros de fuerza de múltiples fuentes Schneider Electric empleará una de las dos técnicas de detección de corriente de falla a tierra.

La primera técnica es la detección de secuencia cero, que emplea un solo sensor para envolver los tres conductores de fase y el conductor neutro. La segunda técnica es la detección residual, en la que cada fase y el conductor neutro son envueltos por su propio sensor. Bajo condiciones normales, la suma vectorial de las corrientes de fase con la corriente neutra deberá ser igual a cero. Bajo una condición de falla a tierra, la suma vectorial produce una corriente que se usa en un sistema de relevadores de protección para abrir automáticamente interruptores automáticos (o interruptores) principales o de cierre manual a medida que sea necesario.

NOTA: Todos los diagramas muestran detección residual.

Pruebas

El inciso 230-95(c) del National Electri Code® de EUA (NEC®) y NOM-001-SEDE requiere pruebas de los sistemas de protección contra falla a tierra cuando se instalan por primera vez. Schneider Electric recomienda realizar las pruebas:

- una vez que el equipo ha sido instalado en su ubicación final.
- como parte de un servicio de mantenimiento normal.
- si se altera el sistema de distribución en cualquier forma.

Las pruebas en campo determinan si está funcionando correctamente el sistema de protección contra falla a tierra. Tenga en cuenta la siguiente información al utilizar este boletín de instrucciones:

- Los diagramas aquí provistos ilustran las conexiones de las pruebas de inyección de alta corriente; sin embargo, su finalidad, no es ilustrar todo el sistema de protección contra falla a tierra como se encuentra instalado en campo. Revise todos los manuales de instrucciones así como los diagramas de alambrado incluidos con el equipo para conocer la configuración real del sistema. Asegúrese de que todos los sensores hayan sido instalados y conectados con la polaridad correcta según los diagramas de alambrado.
- Este procedimiento de pruebas en campo no tiene como fin verificar la calibración de ninguno de los relevadores de detección.
- Anote los resultados en los registros cronológicos de pruebas de falla a tierra (tablas 1 a 3 en las páginas 34 a 37). Si los resultados de las pruebas no son aceptables, vuelva a verificar las conexiones y vuelva a realizar las pruebas. Si los resultados todavía no son aceptables, póngase en contacto con el Centro de servicios Square D llamando al 1-888-778-2733 en los EUA.

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Herramientas necesarias

La siguientes herramientas son necesarias para inspeccionar y probar el sistema de protección contra falla a tierra diferencial modificada:

- Una unidad de prueba de inyección capaz de inyectar una alta corriente de 1 000 A. Los cables de conexión en puente son típicamente de cobre soldado. Emplee cables y conexiones que proporcionen baja impedancia.
- Equipo de pruebas portátil Schneider Electric para las unidades de disparo Micrologic® tipos A, H y P.

Sistemas que se tratan en este boletín

Este procedimiento de pruebas se limita a los siguientes sistemas:

- Configuración en estrella conectada a tierra, principal-principal
- Configuración de cierre manual sin relevador, en estrella conectada a tierra, principal-cierre manual-principal
- Configuración de cierre manual con relevador, en estrella conectada a tierra, principal-cierre manual-principal

NOTA: Un sistema con relevadores tiene protección contra falla a tierra en el dispositivo de cierre manual. Un sistema sin relevadores no cuenta con protección contra falla a tierra en el dispositivo de cierre manual.

NOTA: Los sistemas con configuraciones diferentes a las que se tratan en este documento pueden ser probados con métodos similares a los mostrados. Todas las configuraciones posibles de interruptores automáticos abiertos y cerrados deben ser probadas para ambas funciones CON DISPARO y SIN DISPARO. Las pruebas CON DISPARO siempre deben tener el PUENTE DE CONEXIÓN DE PRUEBA conectado de fase a tierra. Las pruebas SIN DISPARO siempre deben tener el PUENTE DE CONEXIÓN DE PRUEBA conectado de fase a neutro (si no hay un neutro, conecte el PUENTE DE CONEXIÓN DE PRUEBA de fase a fase).

SECCIÓN 2—INSTRUCCIONES DE SEGURIDAD

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía, consulte la norma 70E de NFPA.
- Este procedimiento de pruebas debe efectuarlo sólo el personal eléctrico calificado.
- Desconecte (O) el equipo antes de efectuar cualquier trabajo dentro o fuera de él. Suponga que los circuitos están “vivos” hasta que hayan sido completamente desenergizados, probados y etiquetados. Preste particular atención al diseño del sistema de alimentación. Tome en consideración todas las fuentes de alimentación, incluyendo la posibilidad de retroalimentación.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Siga todos los procedimientos de bloqueo y etiquetado de acuerdo con los requisitos de OSHA.
- Realice pruebas eléctricas y asegúrese de que no se hayan creado cortocircuitos durante la instalación, servicio de mantenimiento o prueba.
- Inspeccione detenidamente el área de trabajo y retire las herramientas u objetos que hayan quedado dentro del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.
- Todas las instrucciones de este manual fueron escritas suponiendo que el cliente ha adoptado estas medidas de precaución antes de prestar servicios de mantenimiento o realizar una prueba.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

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SECCIÓN 3—CONFIGURACIÓN EN ESTRELLA CONECTADA A TIERRA, PRINCIPAL-PRINCIPAL

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Solamente el personal eléctrico especializado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

1. Desenergice el equipo antes de realizar cualquier trabajo en él. Utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
2. Verifique que todos los empalmes de las barras de conexión a tierra estén bien conectados. Para cada principal, asegúrese de que la conexión a tierra se haya efectuado adelante del cable de desconexión de neutro y en el lado de línea de cualquier sensor de falla a tierra. Vea la figura 1.
3. Para cada principal, cerciórese que exista una conexión de neutro del transformador de alimentación al equipo.
4. Para los sistemas de detección residual, verifique que todos los sensores de fase y neutro estén conectados con la polaridad correcta en ambos, el primario y el secundario. Consulte los dibujos incluidos con el equipo.
5. Para los sistemas de detección de secuencia cero, verifique que todos los conductores de fase y neutro pasen por la ventana del sensor en el mismo sentido y que los conductores de conexión a tierra no pasen por esta ventana. Asimismo, verifique que el sensor esté conectado con la polaridad correcta en ambos, el primario y el secundario. Consulte los dibujos incluidos con el equipo.
6. Retire el cable de desconexión de neutro de cada principal para aislar los neutros del sistema de alambrado de ambos, la alimentación y tierra.
7. Mida la resistencia de aislamiento de neutro a tierra del equipo y asegúrese de que no existan conexiones a tierra en el lado de carga del sistema de protección contra falla a tierra. La resistencia deberá ser de por lo menos 1 megohm. Retire todas las conexiones existentes de neutro a tierra que encontró durante la prueba. No vuelva a conectar estas tierras después de completar la prueba.
8. Vuelva a colocar el cable de desconexión de neutro de cada principal.
9. Anote todos los ajustes de activación y retardo de cada interruptor automático y/o relevador de falla a tierra que esté bajo prueba, consulte la tabla 4 en la página 39. Después de la prueba, restablezca las configuraciones a sus valores originales.
10. Ajuste el valor de activación de falla a tierra en cada interruptor automático y/o relevador de falla a tierra en su ajuste de corriente más bajo.
11. Ajuste el valor de retardo de falla a tierra en cada interruptor automático y/o relevador de falla a tierra bajo prueba en 0,1 segundo (I2T OUT u OFF).
12. Ajuste en su valor más alto la activación de tiempo largo, tiempo corto e instantánea y de retardo en cada interruptor automático bajo prueba.

13. En cada interruptor automático equipado con una unidad de disparo Micrologic® tipo A, H o P, conecte un equipo de pruebas portátil Schneider Electric y active la función de supresión de imágenes térmicas según las instrucciones del equipo de pruebas. Este paso es esencial para suprimir las funciones de historial de disparos y contador de desgaste de los contactos. Después de la prueba, desactive la función de supresión de imágenes térmicas según las instrucciones del equipo de pruebas. Consulte el boletín de instrucciones 48049-184-XX para obtener información adicional.
14. Desconecte la fuente de alimentación de control de protección contra falla a tierra, si proviene del interior, y proporcione alimentación de control de una fuente externa. Consulte los diagramas de alambrado incluidos para conocer las conexiones específicas. Después de la prueba, desconecte la alimentación de control externa y vuelva a conectar el circuito de alimentación de control interno.

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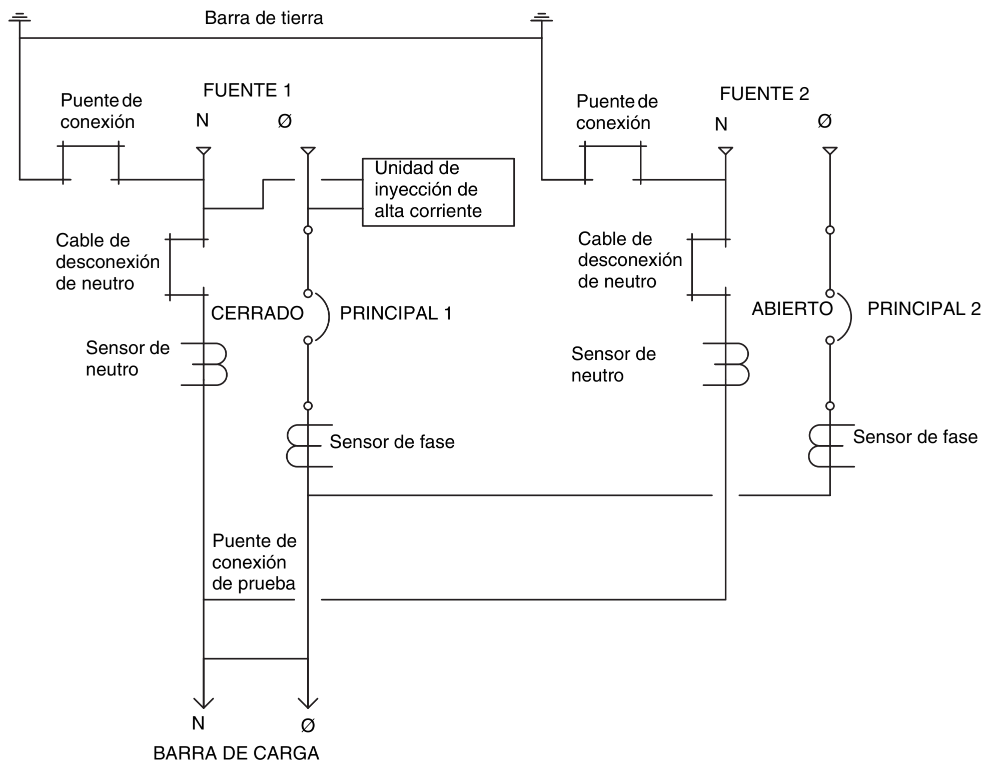
Prueba no. 1

1. Cierre el interruptor automático (o interruptor) PRINCIPAL 1 y abra el interruptor automático (o interruptor) PRINCIPAL 2.
2. En el lado de línea del PRINCIPAL 1, conecte la unidad de inyección de alta corriente entre la fase A y el neutro (N). Vea la figura 1.
3. En la barra de carga, conecte un puente de conexión de alta corriente entre la fase A y el neutro (N). Vea la figura 1.
4. Inyecte 1 000 A en la fase A. El PRINCIPAL 1 no deberá dispararse durante una falla a tierra. Escriba los resultados reales de la prueba no. 1 en la tabla 1 en la página 34.
5. Repita la prueba no. 1 para las fases B y C (no es necesario para los sistema de secuencia cero). Escriba los resultados reales de esta prueba en la tabla 1.

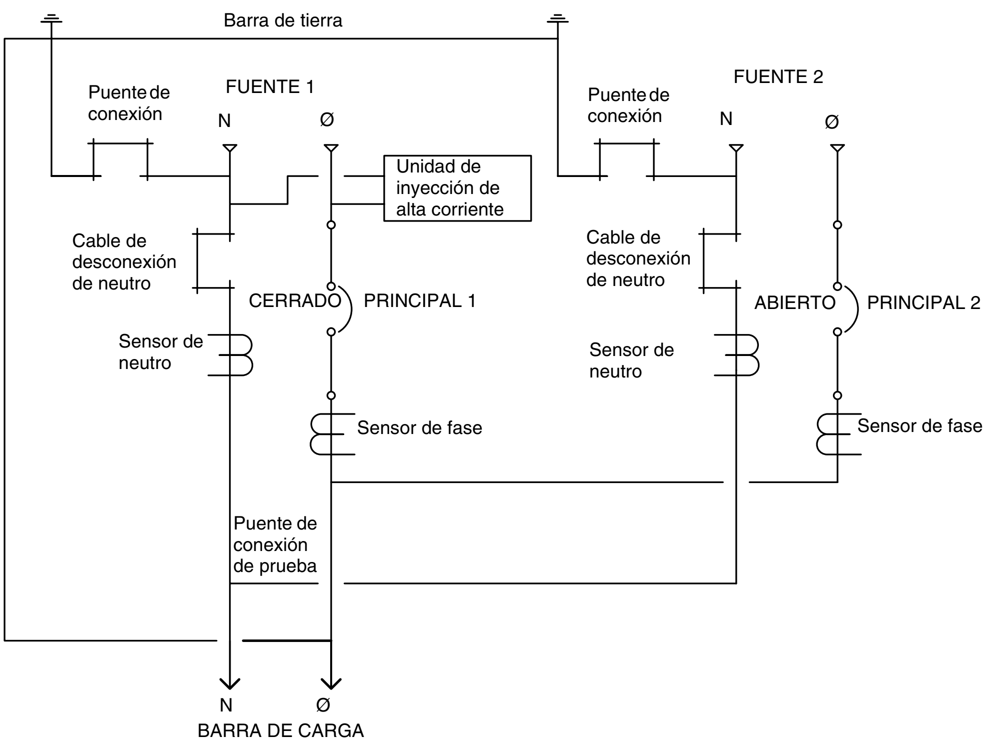
Figura 1: Principal-Principal – Prueba no. 1 (sin disparo) Conexiones de la unidad de inyección y el puente de conexión de prueba



Prueba no. 2

1. Cierre el interruptor automático (o interruptor) PRINCIPAL 1 y abra el interruptor automático (o interruptor) PRINCIPAL 2.
2. En el lado de línea del PRINCIPAL 1, conecte la unidad de inyección de alta corriente entre la fase A y el neutro (N). Vea la figura 2.
3. En la barra de carga, conecte un puente de conexión de alta corriente entre la fase A y tierra. Vea la figura 2.
4. Inyecte 1 000 A en la fase A. El PRINCIPAL 1 deberá dispararse durante una falla a tierra. Escriba los resultados reales de la prueba no. 2 en la tabla 1 en la página 34.
5. Repita la prueba no. 2 para las fases B y C (no es necesario para los sistema de secuencia cero). Escriba los resultados reales de esta prueba en la tabla 1.

Figura 2: Principal-Principal – Prueba no. 2 (con disparo) Conexiones de la unidad de inyección y el puente de conexión de prueba

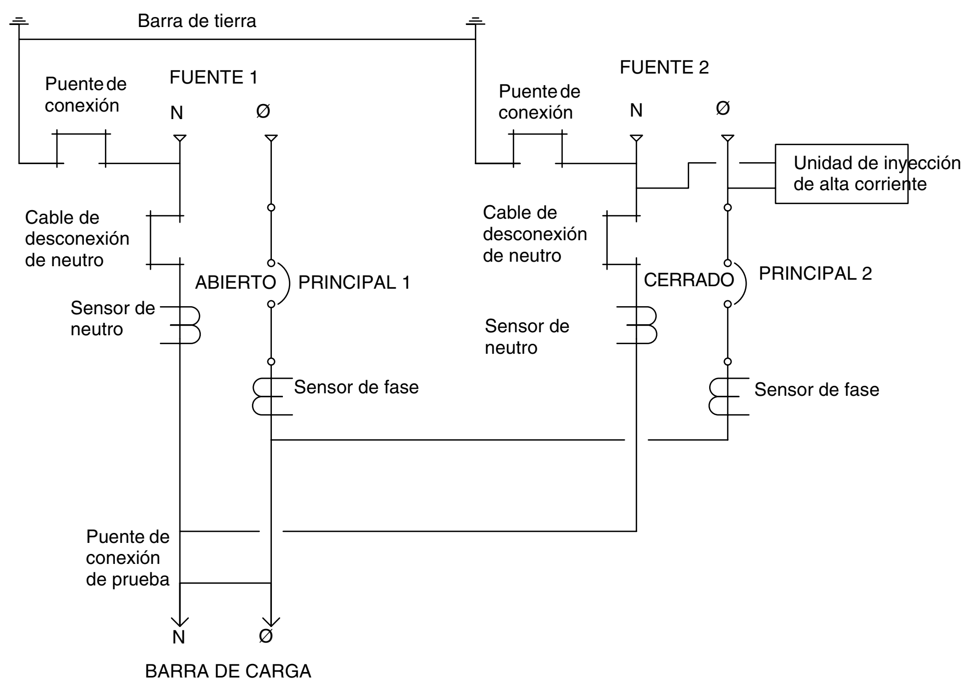


ESPAÑOL

Prueba no. 3

1. Cierre el interruptor automático (o interruptor) PRINCIPAL 2 y abra el interruptor automático (o interruptor) PRINCIPAL 1.
2. En el lado de línea del PRINCIPAL 2, conecte la unidad de inyección de alta corriente entre la fase A y el neutro (N). Vea la figura 3.
3. En la barra de carga, conecte un puente de conexión de alta corriente entre la fase A y el neutro (N). Vea la figura 3.
4. Inyecte 1 000 A en la fase A. El PRINCIPAL 2 no deberá dispararse durante una falla a tierra. Escriba los resultados reales de la prueba no. 3 en la tabla 1 en la página 34.
5. Repita la prueba no. 3 para las fases B y C (no es necesario para los sistema de secuencia cero). Escriba los resultados reales de esta prueba en la tabla 1.

Figura 3: Principal-Principal – Prueba no. 3 (sin disparo) Conexiones de la unidad de inyección y el puente de conexión de prueba



Prueba no. 4

1. Cierre el interruptor automático (o interruptor) PRINCIPAL 2 y abra el interruptor automático (o interruptor) PRINCIPAL 1.
2. En el lado de línea del PRINCIPAL 2, conecte la unidad de inyección de alta corriente entre la fase A y el neutro (N). Vea la figura 4.
3. En la barra de carga, conecte un puente de conexión de alta corriente entre la fase A y tierra. Vea la figura 4.
4. Inyecte 1 000 A en la fase A. El PRINCIPAL 2 deberá dispararse durante una falla a tierra. Escriba los resultados reales de la prueba no. 4 en la tabla 1 en la página 34.
5. Repita la prueba no. 4 para las fases B y C (no es necesario para los sistema de secuencia cero). Escriba los resultados reales de esta prueba en la tabla 1.
6. Después de la prueba, restablezca las configuraciones a sus valores originales.

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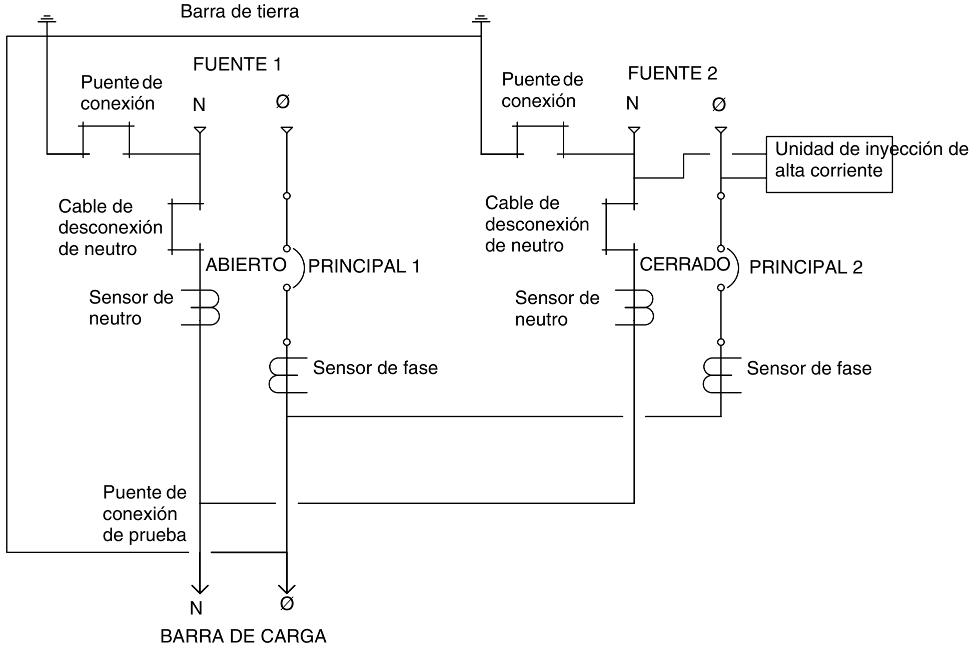
Figura 4: Principal-Principal – Prueba no. 4 (con disparo) Conexiones de la unidad de inyección y el puente de conexión de prueba



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SECCIÓN 4—CONFIGURACIÓN EN ESTRELLA CONECTADA A TIERRA, PRINCIPAL-CIERRE MANUAL SIN RELEVADOR-PRINCIPAL

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Solamente el personal eléctrico especializado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

1. Desenergice el equipo antes de realizar cualquier trabajo en él. Utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
2. Verifique que todos los empalmes de las barras de conexión a tierra estén bien conectados. Para cada principal, asegúrese de que la conexión a tierra se haya efectuado adelante del cable de desconexión de neutro y en el lado de línea de cualquier sensor de falla a tierra. Vea la figura 5.
3. Para cada principal, cerciórese que exista una conexión de neutro del transformador de alimentación al equipo.
4. Para los sistemas de detección residual, verifique que todos los sensores de fase y neutro estén conectados con la polaridad correcta en ambos, el primario y el secundario. Consulte los dibujos incluidos con el equipo.
5. Para los sistemas de detección de secuencia cero, verifique que todos los conductores de fase y neutro pasen por la ventana del sensor en el mismo sentido y que los conductores de conexión a tierra no pasen por esta ventana. Asimismo, verifique que el sensor esté conectado con la polaridad correcta en ambos, el primario y el secundario. Consulte los dibujos incluidos con el equipo.
6. Retire el cable de desconexión de neutro de cada principal para aislar los neutros del sistema de alambrado de ambos, la alimentación y tierra.
7. Mida la resistencia de aislamiento de neutro a tierra del equipo y asegúrese de que no existan conexiones a tierra en el lado de carga del sistema de protección contra falla a tierra. La resistencia deberá ser de por lo menos 1 megohm. Retire todas las conexiones existentes de neutro a tierra que encontró durante la prueba. No vuelva a conectar estas tierras después de completar la prueba.
8. Vuelva a colocar el cable de desconexión de neutro de cada principal.
9. Anote todos los ajustes de activación y retardo de cada interruptor automático y/o relevador de falla a tierra que esté bajo prueba, consulte la tabla 4 en la página 39. Después de la prueba, restablezca las configuraciones a sus valores originales.
10. Ajuste el valor de activación de falla a tierra en cada interruptor automático y/o relevador de falla a tierra en su ajuste de corriente más bajo.
11. Ajuste el valor de retardo de falla a tierra en cada interruptor automático y/o relevador de falla a tierra bajo prueba en 0,1 segundo (I2T OUT u OFF).

12. Ajuste en su valor más alto la activación de tiempo largo, tiempo corto e instantánea y de retardo en cada interruptor automático bajo prueba.
13. En cada interruptor automático principal equipado con una unidad de disparo Micrologic® tipo A, H o P, conecte un equipo de pruebas portátil Schneider Electric y active la función de supresión de imágenes térmicas según las instrucciones del equipo de pruebas. Este paso es esencial para suprimir las funciones de historial de disparos y contador de desgaste de los contactos. Después de la prueba, desactive la función de supresión de imágenes térmicas según las instrucciones del equipo de pruebas. Consulte el boletín de instrucciones 48049-184-XX para obtener información adicional.
14. Desconecte la fuente de alimentación de control de protección contra falla a tierra, si proviene del interior, y proporcione alimentación de control de una fuente externa. Consulte los diagramas de alambrado incluidos para conocer las conexiones específicas. Después de la prueba, desconecte la alimentación de control externa y vuelva a conectar el circuito de alimentación de control interno.

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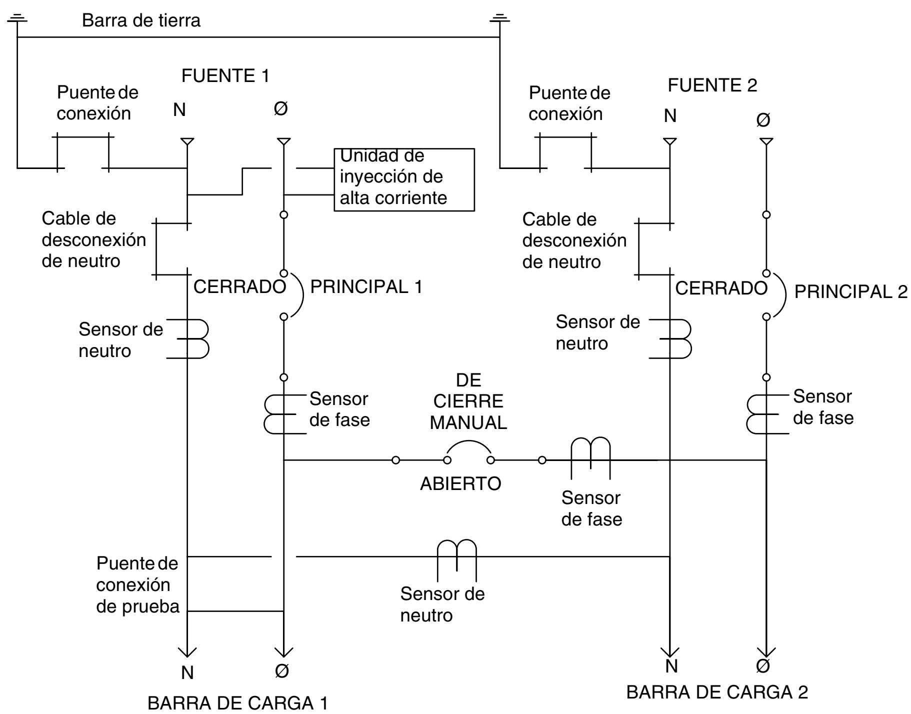
Prueba no. 1

1. Cierre el interruptor automático (o interruptor) PRINCIPAL 1. Abra el interruptor automático (o interruptor) DE CIERRE MANUAL y cierre el interruptor automático (o interruptor) PRINCIPAL 2.
2. En el lado de línea del PRINCIPAL 1, conecte la unidad de inyección de alta corriente entre la fase A y el neutro (N). Vea la figura 5.
3. En la barra de carga, conecte un puente de conexión de alta corriente entre la fase A y el neutro (N). Vea la figura 5.
4. Inyecte 1 000 A en la fase A. El PRINCIPAL 1 no deberá dispararse durante una falla a tierra. Escriba los resultados reales de la prueba no. 1 en la tabla 2 en la página 36.
5. Repita la prueba no. 1 para las fases B y C (no es necesario para los sistema de secuencia cero). Escriba los resultados reales de esta prueba en la tabla 2.

Figura 5: Principal-Cierre Manual-Principal – Prueba no. 1 (sin disparo) Conexiones de la unidad de inyección y el puente de conexión de prueba

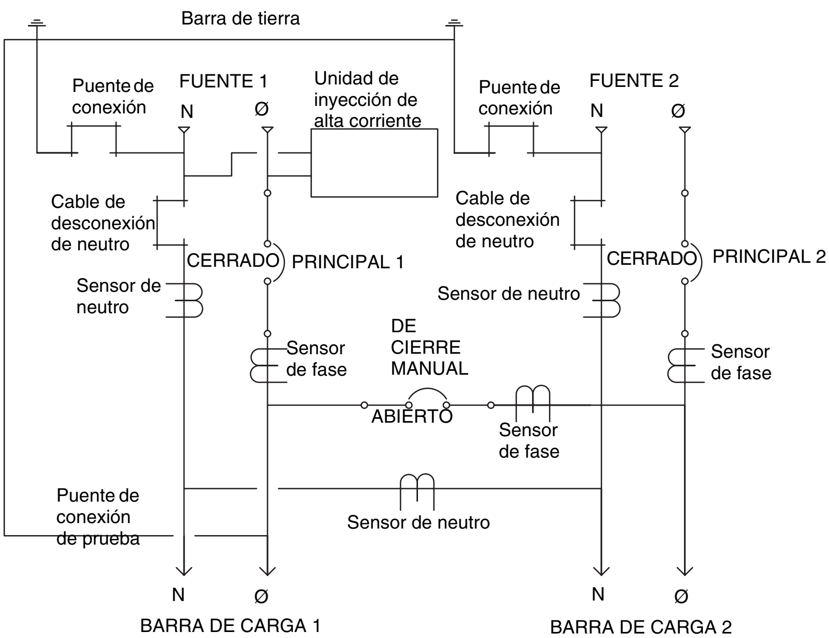


ESPAÑOL

Prueba no. 2

1. Cierre el interruptor automático (o interruptor) PRINCIPAL 1. Abra el interruptor automático (o interruptor) DE CIERRE MANUAL y cierre el interruptor automático (o interruptor) PRINCIPAL 2.
2. En el lado de línea del PRINCIPAL 1, conecte la unidad de inyección de alta corriente entre la fase A y el neutro (N). Vea la figura 6.
3. En la barra de carga, conecte un puente de conexión de alta corriente entre la fase A y tierra. Vea la figura 6.
4. Inyecte 1 000 A en la fase A. El PRINCIPAL 1 deberá dispararse durante una falla a tierra. Escriba los resultados reales de la prueba no. 2 en la tabla 2 en la página 36.
5. Repita la prueba no. 2 para las fases B y C (no es necesario para los sistema de secuencia cero). Escriba los resultados reales de esta prueba en la tabla 2.

Figura 6: Principal-Cierre Manual-Principal – Prueba no. 2 (con disparo) Conexiones de la unidad de inyección y el puente de conexión de prueba



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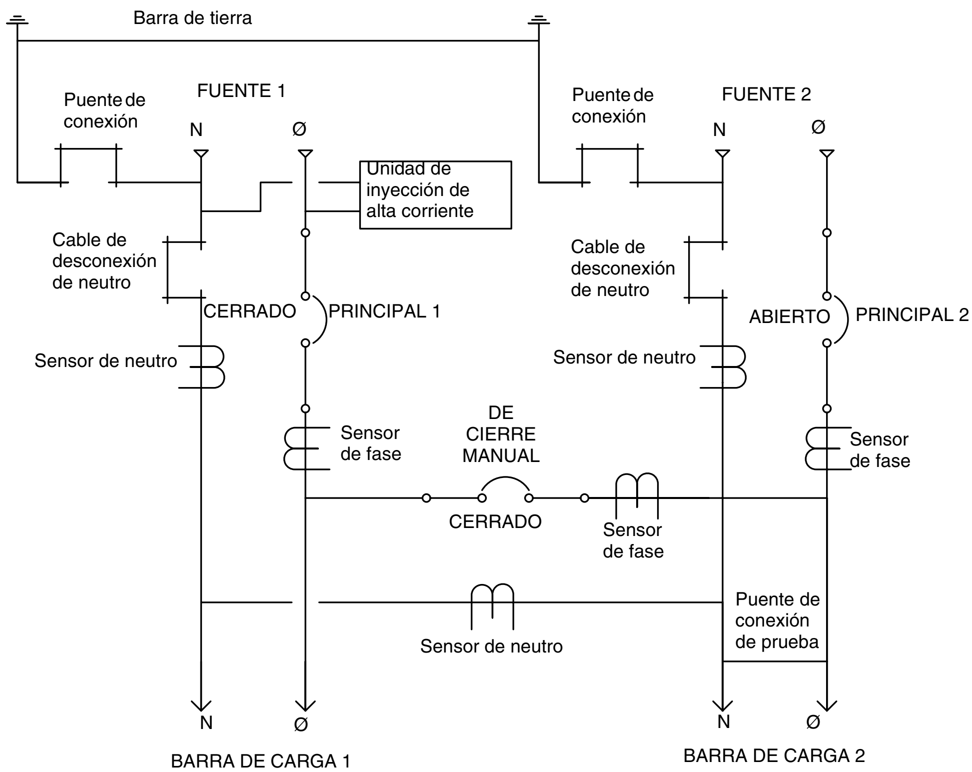
Prueba no. 3

1. Cierre el interruptor automático (o interruptor) PRINCIPAL 1. Cierre el interruptor automático (o interruptor) DE CIERRE MANUAL y abra el interruptor automático (o interruptor) PRINCIPAL 2.
2. En el lado de línea del PRINCIPAL 1, conecte la unidad de inyección de alta corriente entre la fase A y el neutro (N). Vea la figura 7.
3. En la barra de carga, conecte un puente de conexión de alta corriente entre la fase A y el neutro (N). Vea la figura 7.
4. Inyecte 1 000 A en la fase A. El interruptor automático (o interruptor) PRINCIPAL 1 ni el DE CIERRE MANUAL deberá dispararse durante una falla a tierra. Escriba los resultados reales de la prueba no. 3 en la tabla 2 en la página 36.
5. Repita la prueba no. 3 para las fases B y C (no es necesario para los sistema de secuencia cero). Escriba los resultados reales de esta prueba en la tabla 2.

Figura 7: Principal-Cierre Manual-Principal – Prueba no. 3 (sin disparo) Conexiones de la unidad de inyección y el puente de conexión de prueba

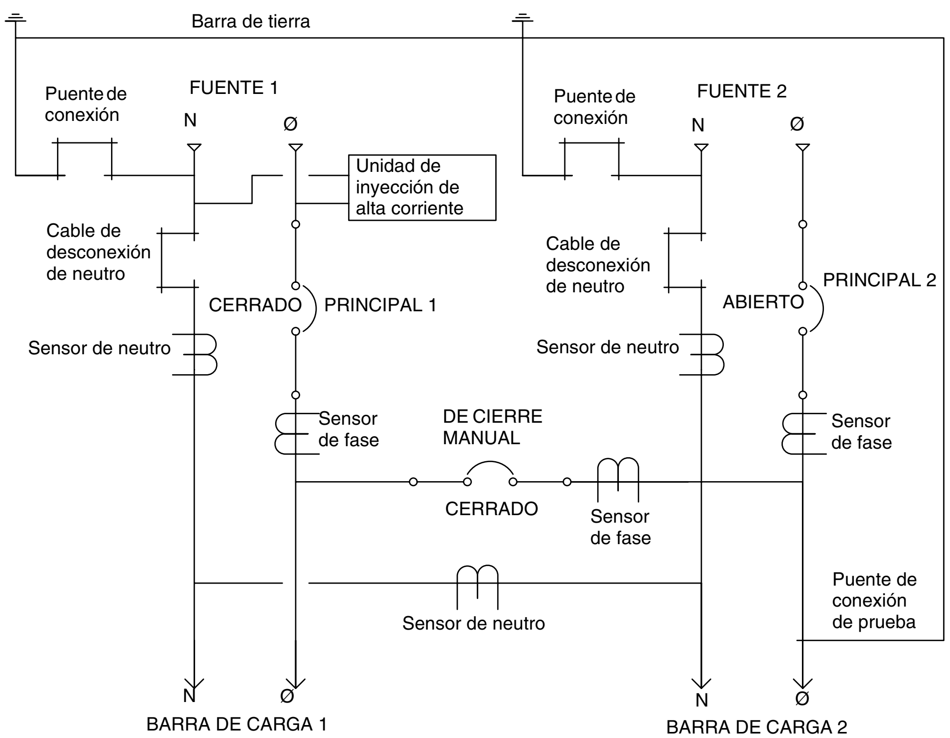


Prueba no. 4

1. Cierre el interruptor automático (o interruptor) PRINCIPAL 1. Cierre el interruptor automático (o interruptor) DE CIERRE MANUAL y abra el interruptor automático (o interruptor) PRINCIPAL 2.
2. En el lado de línea del PRINCIPAL 1, conecte la unidad de inyección de alta corriente entre la fase A y el neutro (N). Vea la figura 8.
3. En la barra de carga, conecte un puente de conexión de alta corriente entre la fase A y tierra. Vea la figura 8.
4. Inyecte 1 000 A en la fase A. El interruptor automático (o interruptor) PRINCIPAL 1 deberá dispararse durante una falla a tierra, pero el interruptor automático (o interruptor) DE CIERRE MANUAL no deberá dispararse durante una falla a tierra. Escriba los resultados reales de la prueba no. 4 en la tabla 2 en la página 36.
5. Repita la prueba no. 4 para las fases B y C (no es necesario para los sistema de secuencia cero). Escriba los resultados reales de esta prueba en la tabla 2.

ESPAÑOL

Figura 8: Principal-Cierre Manual-Principal – Prueba no. 4 (con disparo) Conexiones de la unidad de inyección y el puente de conexión de prueba



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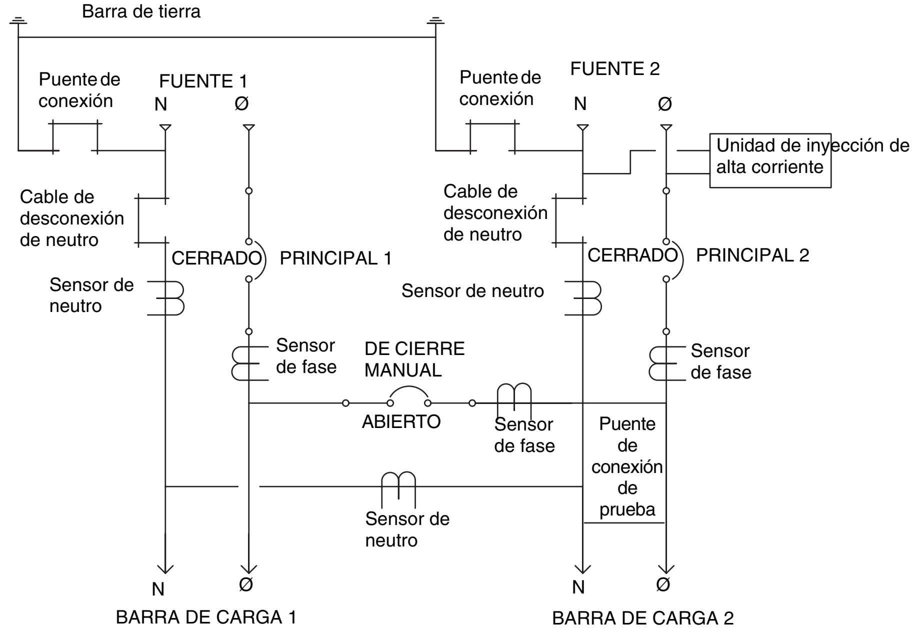
Prueba no. 5

1. Cierre el interruptor automático (o interruptor) PRINCIPAL 1. Abra el interruptor automático (o interruptor) DE CIERRE MANUAL y cierre el interruptor automático (o interruptor) PRINCIPAL 2.
2. En el lado de línea del PRINCIPAL 2, conecte la unidad de inyección de alta corriente entre la fase A y el neutro (N). Vea la figura 9.
3. En la barra de carga, conecte un puente de conexión de alta corriente entre la fase A y el neutro (N). Vea la figura 9.
4. Inyecte 1 000 A en la fase A. El PRINCIPAL 2 no deberá dispararse durante una falla a tierra. Escriba los resultados reales de la prueba no. 5 en la tabla 2 en la página 36.
5. Repita la prueba no. 5 para las fases B y C (no es necesario para los sistema de secuencia cero). Escriba los resultados reales de esta prueba en la tabla 2.

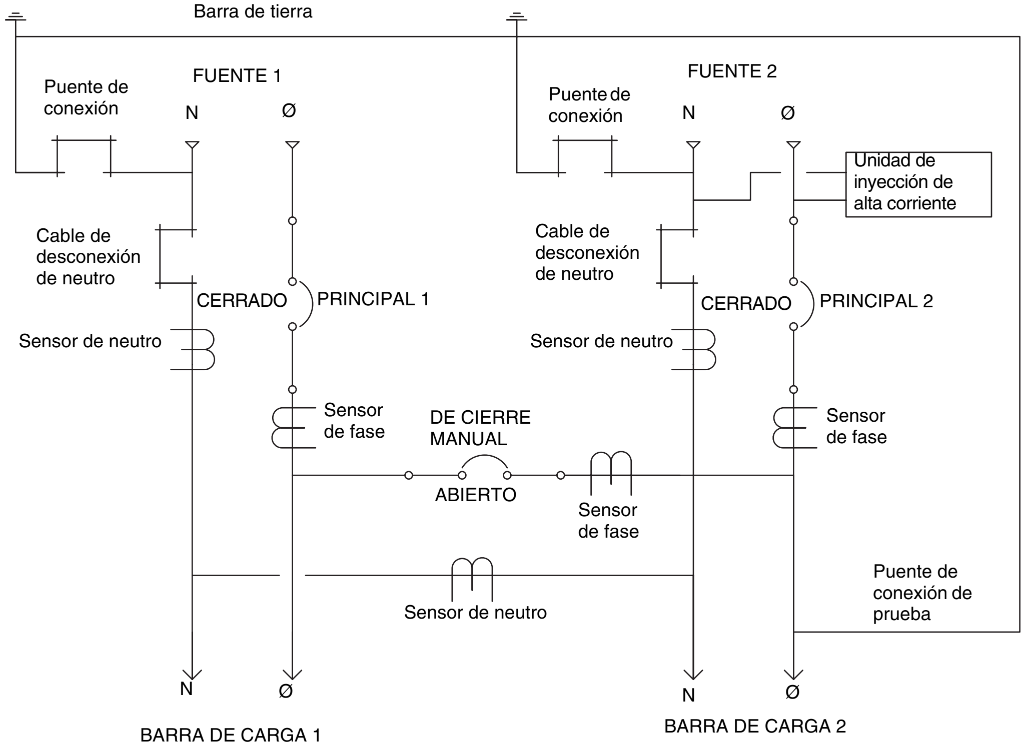
Figura 9: Principal-Cierre Manual-Principal – Prueba no. 5 (sin disparo) Conexiones de la unidad de inyección y el puente de conexión de prueba



Prueba no. 6

1. Cierre el interruptor automático (o interruptor) PRINCIPAL 1. Abra el interruptor automático (o interruptor) DE CIERRE MANUAL y cierre el interruptor automático (o interruptor) PRINCIPAL 2.
2. En el lado de línea del PRINCIPAL 2, conecte la unidad de inyección de alta corriente entre la fase A y el neutro (N). Vea la figura 10.
3. En la barra de carga, conecte un puente de conexión de alta corriente entre la fase A y tierra. Vea la figura 10.
4. Inyecte 1 000 A en la fase A. El PRINCIPAL 2 deberá dispararse durante una falla a tierra. Escriba los resultados reales de la prueba no. 6 en la tabla 2 en la página 36.
5. Repita la prueba no. 6 para las fases B y C (no es necesario para los sistema de secuencia cero). Escriba los resultados reales de esta prueba en la tabla 2.

Figura 10: Principal-Cierre Manual-Principal – Prueba no. 6 (con disparo) Conexiones de la unidad de inyección y el puente de conexión de prueba

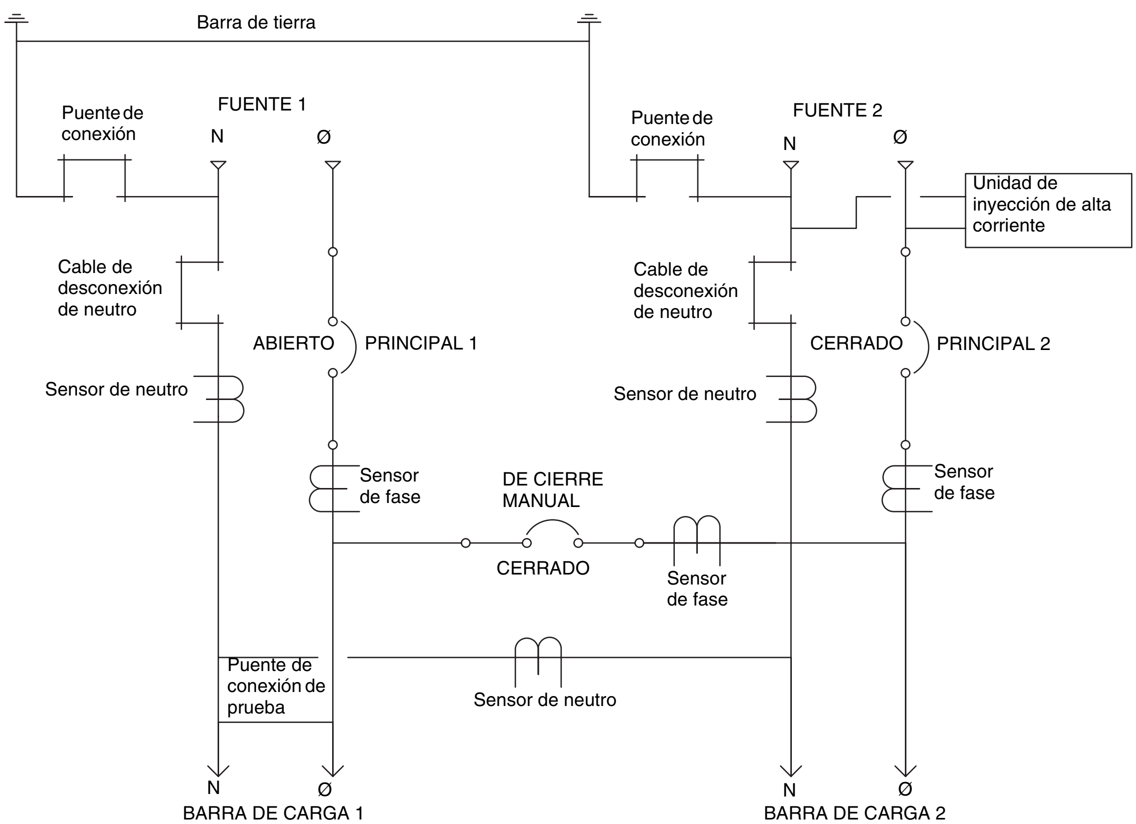


ESPAÑOL

Prueba no. 7

1. Abra el interruptor automático (o interruptor) PRINCIPAL 1. Cierre el interruptor automático (o interruptor) DE CIERRE MANUAL y cierre el interruptor automático (o interruptor) PRINCIPAL 2.
2. En el lado de línea del PRINCIPAL 2, conecte la unidad de inyección de alta corriente entre la fase A y el neutro (N). Vea la figura 11.
3. En la barra de carga, conecte un puente de conexión de alta corriente entre la fase A y el neutro (N). Vea la figura 11.
4. Inyecte 1 000 A en la fase A. El interruptor automático (o interruptor) PRINCIPAL 2 ni el DE CIERRE MANUAL deberá dispararse durante una falla a tierra. Escriba los resultados reales de la prueba no. 7 en la tabla 2 en la página 36.
5. Repita la prueba no. 7 para las fases B y C (no es necesario para los sistema de secuencia cero). Escriba los resultados reales de esta prueba en la tabla 2.

Figura 11: Principal-Cierre Manual-Principal – Prueba no. 7 (sin disparo) Conexiones de la unidad de inyección y el puente de conexión de prueba



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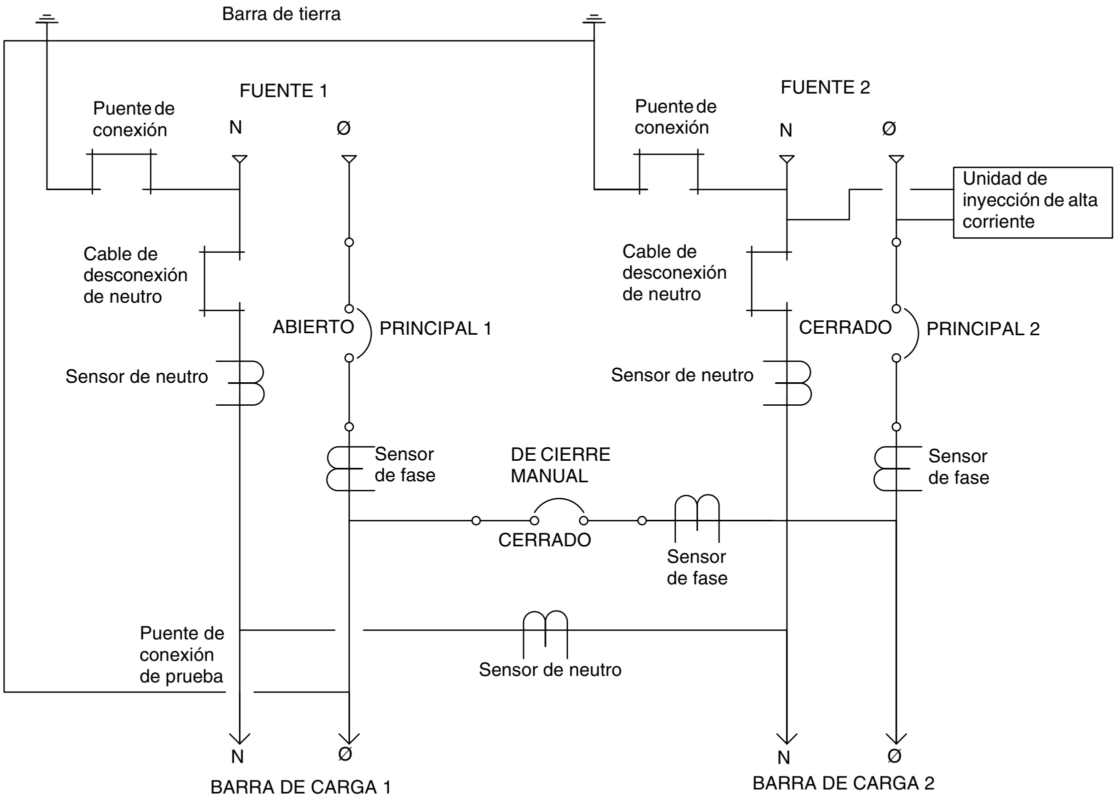
Prueba no. 8

1. Abra el interruptor automático (o interruptor) PRINCIPAL 1. Cierre el interruptor automático (o interruptor) DE CIERRE MANUAL y cierre el interruptor automático (o interruptor) PRINCIPAL 2.
2. En el lado de línea del PRINCIPAL 2, conecte la unidad de inyección de alta corriente entre la fase A y el neutro (N). Vea la figura 12.
3. En la barra de carga, conecte un puente de conexión de alta corriente entre la fase A y tierra. Vea la figura 12.
4. Inyecte 1 000 A en la fase A. El interruptor automático (o interruptor) PRINCIPAL 2 deberá dispararse durante una falla a tierra, pero el interruptor automático (o interruptor) DE CIERRE MANUAL no deberá dispararse durante una falla a tierra. Escriba los resultados reales de la prueba no. 8 en la tabla 2 en la página 36.
5. Repita la prueba no. 8 para las fases B y C (no es necesario para los sistema de secuencia cero). Escriba los resultados reales de esta prueba en la tabla 2.
6. Después de la prueba, restablezca las configuraciones a sus valores originales.

Figura 12: Principal-Cierre Manual-Principal – Prueba no. 8 (con disparo) Conexiones de la unidad de inyección y el puente de conexión de prueba



ESPAÑOL

SECCIÓN 5—CONFIGURACIÓN EN ESTRELLA CONECTADA A TIERRA, PRINCIPAL-CIERRE MANUAL CON RELEVADOR-PRINCIPAL

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Solamente el personal eléctrico especializado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

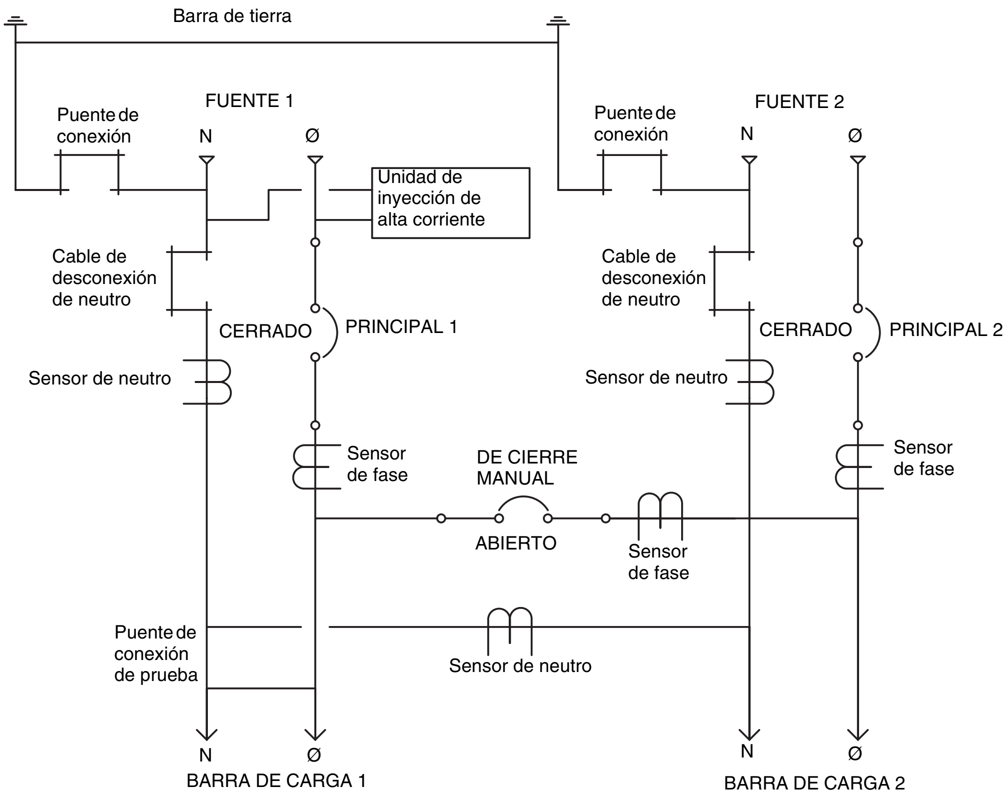
1. Desenergice el equipo antes de realizar cualquier trabajo en él. Utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
2. Verifique que todos los empalmes de las barras de conexión a tierra estén bien conectados. Para cada principal, asegúrese de que la conexión a tierra se haya efectuado adelante del cable de desconexión de neutro y en el lado de línea de cualquier sensor de falla a tierra. Vea la figura 13.
3. Para cada principal, cerciórese que exista una conexión de neutro del transformador de alimentación al equipo.
4. Para los sistemas de detección residual, verifique que todos los sensores de fase y neutro estén conectados con la polaridad correcta en ambos, el primario y el secundario. Consulte los dibujos incluidos con el equipo.
5. Para los sistemas de detección de secuencia cero, verifique que todos los conductores de fase y neutro pasen por la ventana del sensor en el mismo sentido y que los conductores de conexión a tierra no pasen por esta ventana. Asimismo, verifique que el sensor esté conectado con la polaridad correcta en ambos, el primario y el secundario. Consulte los dibujos incluidos con el equipo.
6. Retire el cable de desconexión de neutro de cada principal para aislar los neutros del sistema de alambrado de ambos, la alimentación y tierra.
7. Mida la resistencia de aislamiento de neutro a tierra del equipo y asegúrese de que no existan conexiones a tierra en el lado de carga del sistema de protección contra falla a tierra. La resistencia deberá ser de por lo menos 1 megohm. Retire todas las conexiones existentes de neutro a tierra que encontró durante la prueba. No vuelva a conectar estas tierras después de completar la prueba.
8. Vuelva a colocar el cable de desconexión de neutro de cada principal.
9. Anote todos los ajustes de activación y retardo de cada interruptor automático y/o relevador de falla a tierra que esté bajo prueba, consulte la tabla 4 en la página 39. Después de la prueba, restablezca las configuraciones a sus valores originales.
10. Ajuste el valor de activación de falla a tierra en cada interruptor automático y/o relevador de falla a tierra en su ajuste de corriente más bajo.
11. Ajuste el valor de retardo de falla a tierra en cada interruptor automático y/o relevador de falla a tierra bajo prueba en 0,1 segundo (I2T OUT u OFF).

12. Ajuste en su valor más alto la activación de tiempo largo, tiempo corto e instantánea y de retardo en cada interruptor automático bajo prueba.
13. En cada interruptor automático principal y de cierre manual equipado con una unidad de disparo Micrologic® tipo A, H o P, conecte un equipo de pruebas portátil Schneider Electric y active la función de supresión de imágenes térmicas según las instrucciones del equipo de pruebas. Este paso es esencial para suprimir las funciones de historial de disparos y contador de desgaste de los contactos. Después de la prueba, desactive la función de supresión de imágenes térmicas según las instrucciones del equipo de pruebas. Consulte el boletín de instrucciones 48049-184-XX para obtener información adicional.
14. Desconecte la fuente de alimentación de control de protección contra falla a tierra, si proviene del interior, y proporcione alimentación de control de una fuente externa. Consulte los diagramas de alambrado incluidos para conocer las conexiones específicas. Después de la prueba, desconecte la alimentación de control externa y vuelva a conectar el circuito de alimentación de control interno.

Prueba no. 1

1. Cierre el interruptor automático (o interruptor) PRINCIPAL 1. Abra el interruptor automático (o interruptor) DE CIERRE MANUAL y cierre el interruptor automático (o interruptor) PRINCIPAL 2.
2. En el lado de línea del PRINCIPAL 1, conecte la unidad de inyección de alta corriente entre la fase A y el neutro (N). Vea la figura 13.
3. En la barra de carga, conecte un puente de conexión de alta corriente entre la fase A y el neutro (N). Vea la figura 13.
4. Inyecte 1 000 A en la fase A. El PRINCIPAL 1 no deberá dispararse durante una falla a tierra. Escriba los resultados reales de la prueba no. 1 en la tabla 3 en la página 37.
5. Repita la prueba no. 1 para las fases B y C (no es necesario para los sistema de secuencia cero). Escriba los resultados reales de esta prueba en la tabla 3.

Figura 13: Principal-Cierre Manual-Principal – Prueba no. 1 (sin disparo) Conexiones de la unidad de inyección y el puente de conexión de prueba



Prueba no. 2

1. Cierre el interruptor automático (o interruptor) PRINCIPAL 1. Abra el interruptor automático (o interruptor) DE CIERRE MANUAL y cierre el interruptor automático (o interruptor) PRINCIPAL 2.
2. En el lado de línea del PRINCIPAL 1, conecte la unidad de inyección de alta corriente entre la fase A y el neutro (N). Vea la figura 14.
3. En la barra de carga, conecte un puente de conexión de alta corriente entre la fase A y tierra. Vea la figura 14.
4. Inyecte 1 000 A en la fase A. El PRINCIPAL 1 deberá dispararse durante una falla a tierra. Escriba los resultados reales de la prueba no. 2 en la tabla 3 en la página 37.
5. Repita la prueba no. 2 para las fases B y C (no es necesario para los sistema de secuencia cero). Escriba los resultados reales de esta prueba en la tabla 3.

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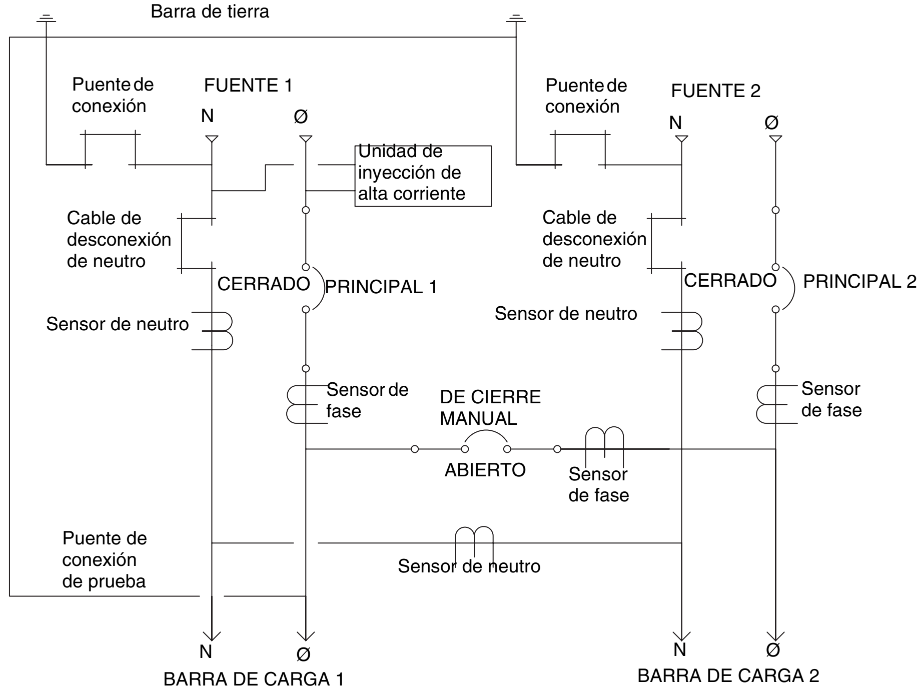
Figura 14: Principal-Cierre Manual-Principal – Prueba no. 2 (con disparo) Conexiones de la unidad de inyección y el puente de conexión de prueba

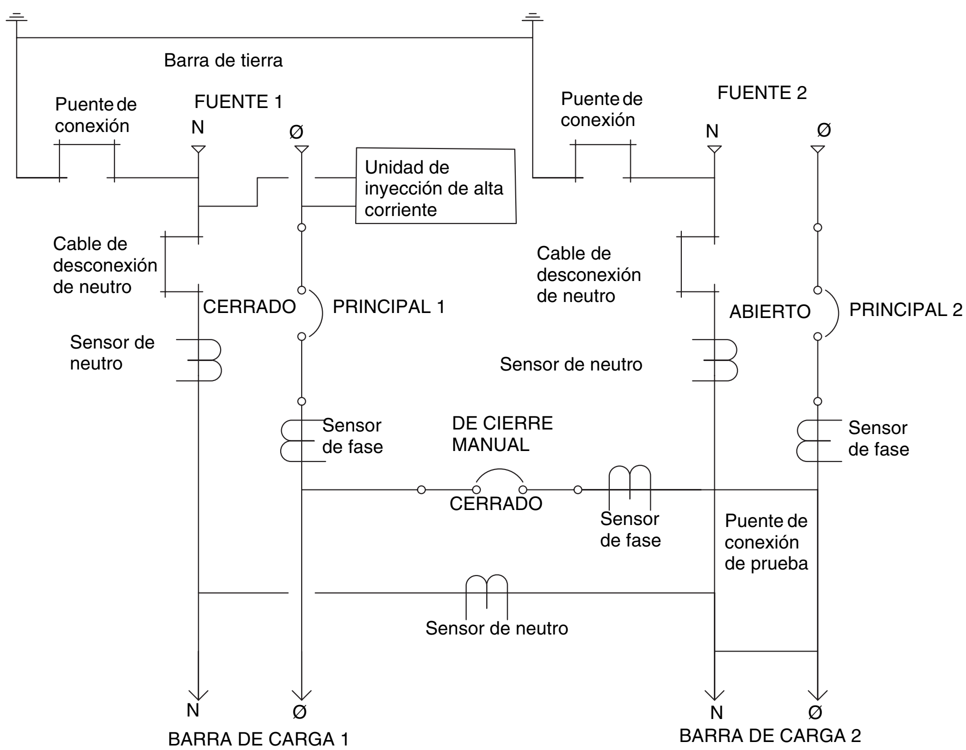


ESPAÑOL

Prueba no. 3

1. Cierre el interruptor automático (o interruptor) PRINCIPAL 1. Cierre el interruptor automático (o interruptor) DE CIERRE MANUAL y abra el interruptor automático (o interruptor) PRINCIPAL 2.
2. En el lado de línea del PRINCIPAL 1, conecte la unidad de inyección de alta corriente entre la fase A y el neutro (N). Vea la figura 15.
3. En la barra de carga, conecte un puente de conexión de alta corriente entre la fase A y el neutro (N). Vea la figura 15.
4. Inyecte 1 000 A en la fase A. El interruptor automático (o interruptor) PRINCIPAL 1 ni el DE CIERRE MANUAL 1 deberá dispararse durante una falla a tierra. Escriba los resultados reales de la prueba no. 3 en la tabla 3 en la página 37.
5. Repita la prueba no. 3 para las fases B y C (no es necesario para los sistema de secuencia cero). Escriba los resultados reales de esta prueba en la Table 3.

Figura 15: Principal-Cierre Manual-Principal – Prueba no. 3 (sin disparo) Conexiones de la unidad de inyección y el puente de conexión de prueba



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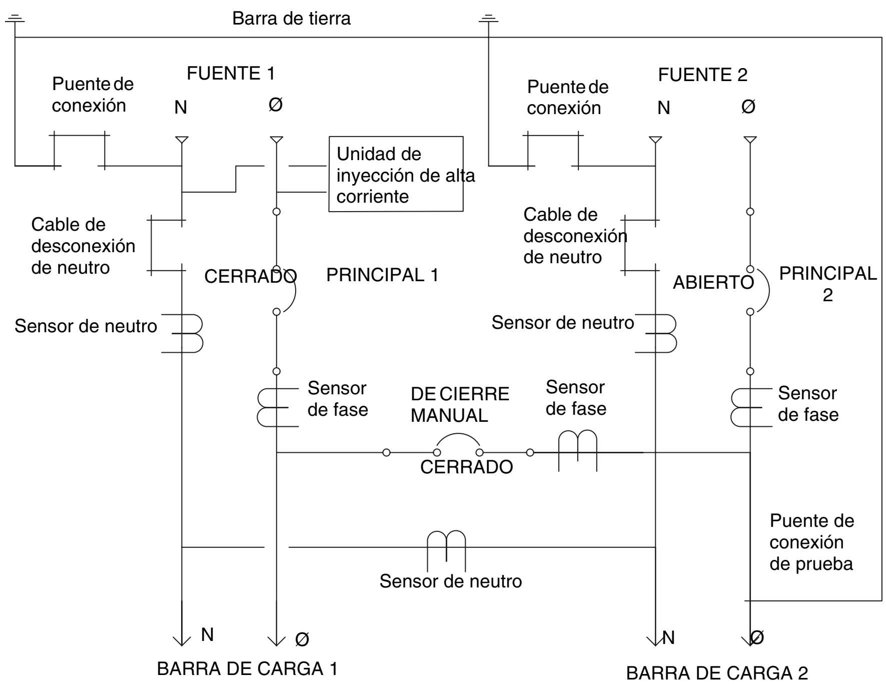
Prueba no. 4

1. Cierre el interruptor automático (o interruptor) PRINCIPAL 1. Cierre el interruptor automático (o interruptor) DE CIERRE MANUAL y abra el interruptor automático (o interruptor) PRINCIPAL 2.
2. En el lado de línea del PRINCIPAL 1, conecte la unidad de inyección de alta corriente entre la fase A y el neutro (N). Vea la figura 16.
3. En la barra de carga, conecte un puente de conexión de alta corriente entre la fase A y tierra. Vea la figura 16.
4. Inyecte 1 000 A en la fase A. El interruptor automático (o interruptor) PRINCIPAL 1 no deberá dispararse durante una falla a tierra, pero el interruptor automático (o interruptor) DE CIERRE MANUAL deberá dispararse durante una falla a tierra. Escriba los resultados reales de la prueba no. 4 en la tabla 3 en la página 37.
5. Repita la prueba no. 4 para las fases B y C (no es necesario para los sistema de secuencia cero). Escriba los resultados reales de esta prueba en la tabla 3.

Figura 16: Principal-Cierre Manual-Principal – Prueba no. 4 (con disparo) Conexiones de la unidad de inyección y el puente de conexión de prueba



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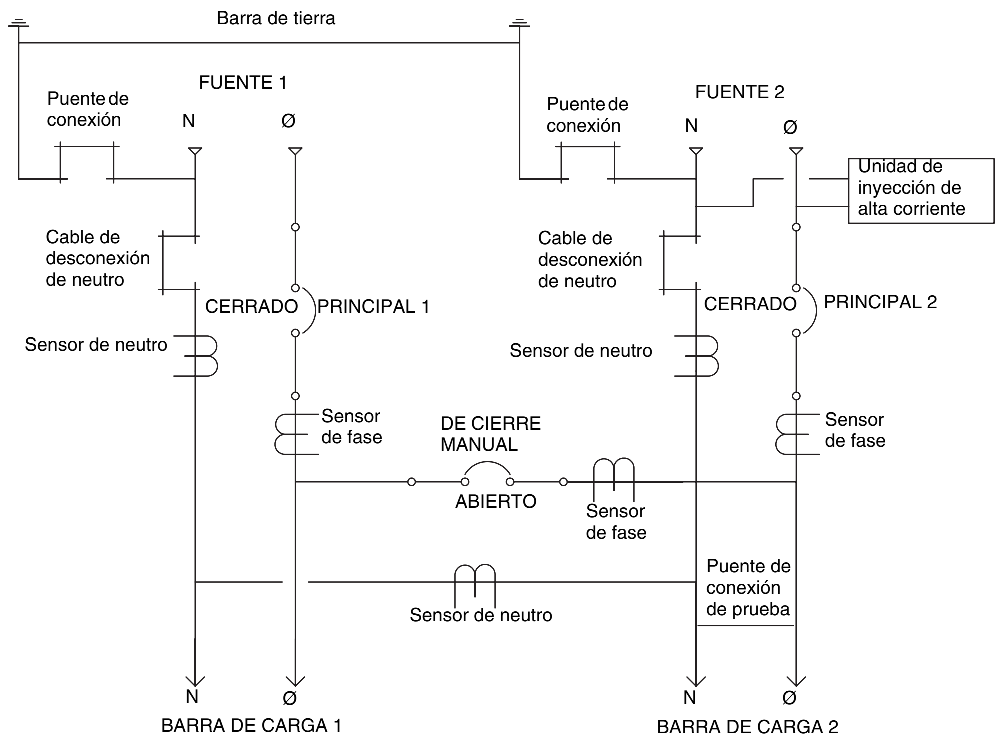
Prueba no. 5

1. Cierre el interruptor automático (o interruptor) PRINCIPAL 1. Abra el interruptor automático (o interruptor) DE CIERRE MANUAL y cierre el interruptor automático (o interruptor) PRINCIPAL 2.
2. En el lado de línea del PRINCIPAL 2, conecte la unidad de inyección de alta corriente entre la fase A y el neutro (N). Vea la figura 17.
3. En la barra de carga, conecte un puente de conexión de alta corriente entre la fase A y el neutro (N). Vea la figura 17.
4. Inyecte 1 000 A en la fase A. El PRINCIPAL 2 no deberá dispararse durante una falla a tierra. Escriba los resultados reales de la prueba no. 5 en la tabla 3 en la página 37.
5. Repita la prueba no. 5 para las fases B y C (no es necesario para los sistema de secuencia cero). Escriba los resultados reales de esta prueba en la tabla 3.

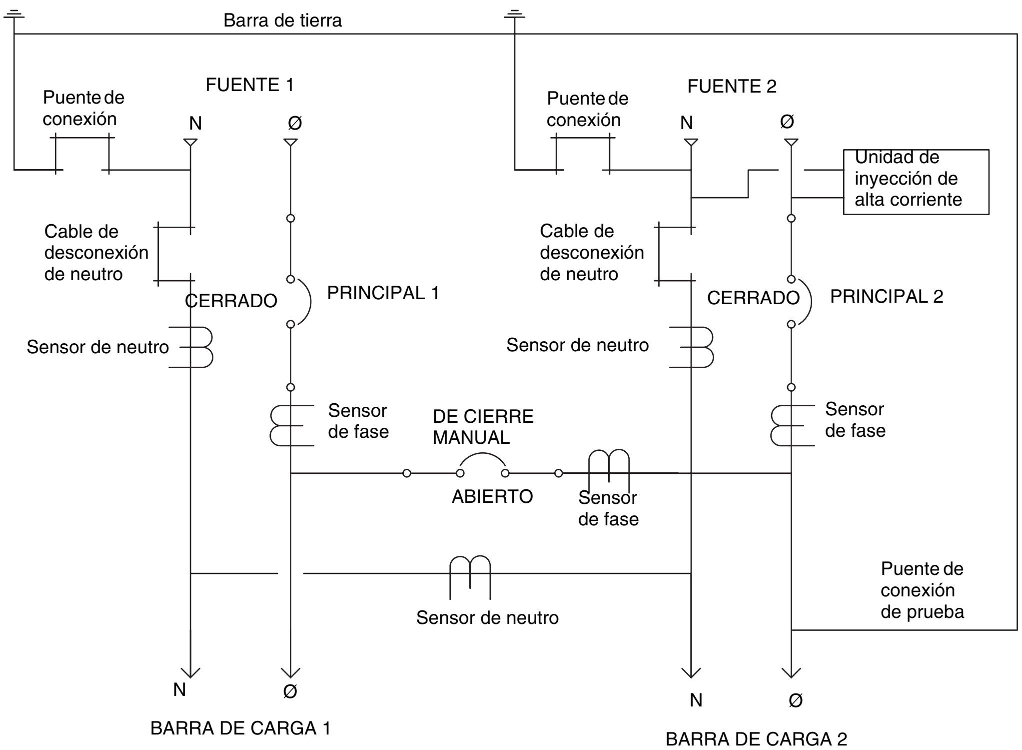
Figura 17: Principal-Cierre Manual-Principal – Prueba no. 5 (sin disparo) Conexiones de la unidad de inyección y el puente de conexión de prueba



Prueba no. 6

1. Cierre el interruptor automático (o interruptor) PRINCIPAL 1. Abra el interruptor automático (o interruptor) DE CIERRE MANUAL y cierre el interruptor automático (o interruptor) PRINCIPAL 2.
2. En el lado de línea del PRINCIPAL 2, conecte la unidad de inyección de alta corriente entre la fase A y el neutro (N). Vea la figura 18.
3. En la barra de carga, conecte un puente de conexión de alta corriente entre la fase A y tierra. Vea la figura 18.
4. Inyecte 1 000 A en la fase A. El PRINCIPAL 2 deberá dispararse durante una falla a tierra. Escriba los resultados reales de la prueba no. 6 en la tabla 3 en la página 37.
5. Repita la prueba no. 6 para las fases B y C (no es necesario para los sistema de secuencia cero). Escriba los resultados reales de esta prueba en la tabla 3.

Figura 18: Principal-Cierre Manual-Principal – Prueba no. 6 (con disparo) Conexiones de la unidad de inyección y el puente de conexión de prueba



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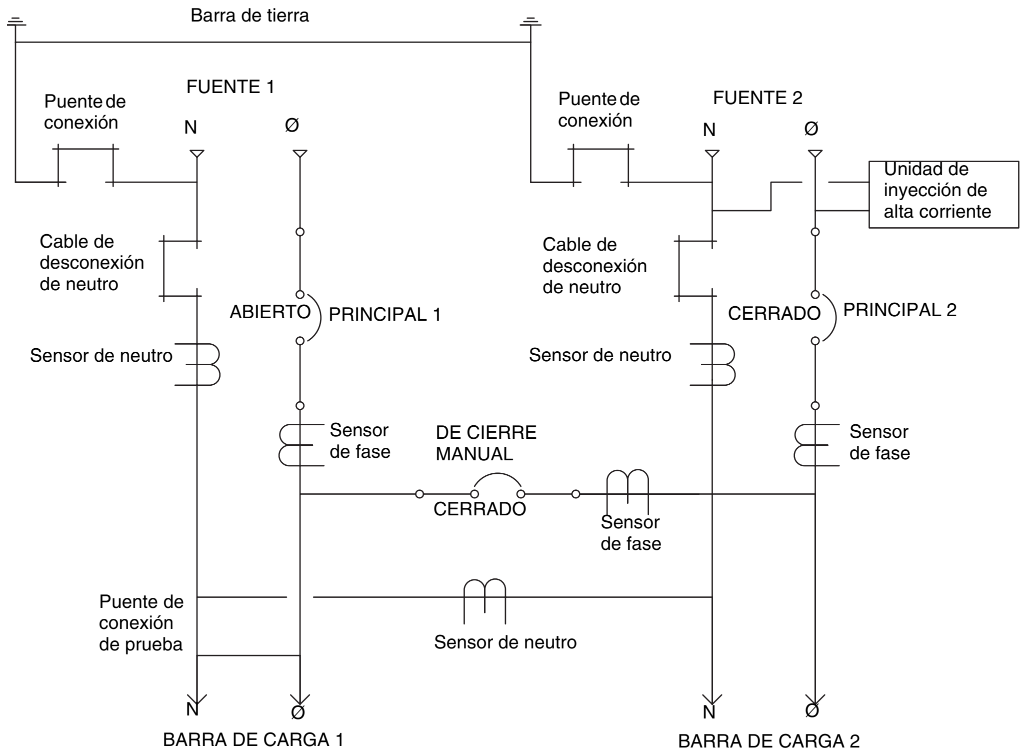
Prueba no. 7

1. Abra el interruptor automático (o interruptor) PRINCIPAL 1. Cierre el interruptor automático (o interruptor) DE CIERRE MANUAL y cierre el interruptor automático (o interruptor) PRINCIPAL 2.
2. En el lado de línea del PRINCIPAL 2, conecte la unidad de inyección de alta corriente entre la fase A y el neutro (N). Vea la figura 19.
3. En la barra de carga, conecte un puente de conexión de alta corriente entre la fase A y el neutro (N). Vea la figura 19.
4. Inyecte 1 000 A en la fase A. El interruptor automático (o interruptor) PRINCIPAL 2 ni el DE CIERRE MANUAL 1 deberá dispararse durante una falla a tierra. Escriba los resultados reales de la prueba no. 7 en la tabla 3 en la página 37.
5. Repita la prueba no. 7 para las fases B y C (no es necesario para los sistema de secuencia cero). Escriba los resultados reales de esta prueba en la tabla 3.

Figura 19: Principal-Cierre Manual-Principal – Prueba no. 7 (sin disparo) Conexiones de la unidad de inyección y el puente de conexión de prueba



Prueba no. 8

1. Abra el interruptor automático (o interruptor) PRINCIPAL 1. Cierre el interruptor automático (o interruptor) DE CIERRE MANUAL y cierre el interruptor automático (o interruptor) PRINCIPAL 2.
2. En el lado de línea del PRINCIPAL 2, conecte la unidad de inyección de alta corriente entre la fase A y el neutro (N). Vea la figura 20.
3. En la barra de carga, conecte un puente de conexión de alta corriente entre la fase A y tierra. Vea la figura 20.
4. Inyecte 1 000 A en la fase A. El interruptor automático (o interruptor) PRINCIPAL 2 no deberá dispararse durante una falla a tierra, pero el interruptor automático (o interruptor) DE CIERRE MANUAL deberá dispararse durante una falla a tierra. Escriba los resultados reales de la prueba no. 8 en la tabla 3 en la página 37.
5. Repita la prueba no. 8 para las fases B y C (no es necesario para la prueba de secuencia cero). Escriba los resultados reales de esta prueba en la tabla 3.
6. Después de la prueba, restablezca las configuraciones a sus valores originales.

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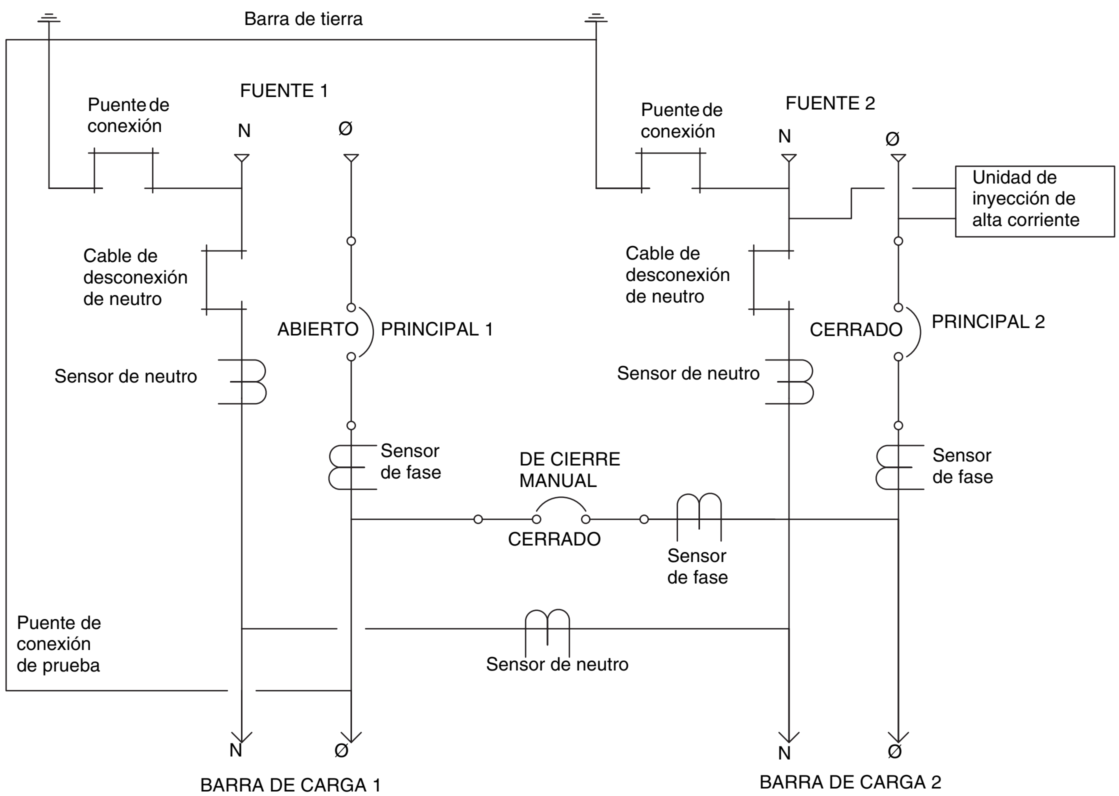
Figura 20: Principal-Cierre Manual-Principal – Prueba no. 8 (con disparo) Conexiones de la unidad de inyección y el puente de conexión de prueba



ESPAÑOL

SECCIÓN 6—REGISTRO CRONOLÓGICO DEL PROCEDIMIENTO DE PRUEBAS, PRINCIPAL-PRINCIPAL

Tabla 1: Registro cronológico del procedimiento de pruebas, principal-principal

Prueba no.	Conexión en puente	Estado del interruptor automático		Corriente de inyección	Resultados esperados	Resultados reales		
		PRINCIPAL 1	PRINCIPAL 2			Fase A	Fase B	Fase C
1	Fase de la BARRA DE CARGA 1 al neutro de la BARRA DE CARGA 1	Cerrado	Abierto	1 000 A	Interruptor auto. PRINCIPAL 1 “Sin disparo”			
2	Fase de la BARRA DE CARGA 1 a tierra de la BARRA DE CARGA 1	Cerrado	Abierto	1 000 A	Interruptor auto. PRINCIPAL 1 “Con disparo”			
3	Fase de la BARRA DE CARGA 2 al neutro de la BARRA DE CARGA 2	Abierto	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 2 “Sin disparo”			
4	Fase de la BARRA DE CARGA 2 a tierra de la BARRA DE CARGA 2	Abierto	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 2 “Con disparo”			

Prueba no.	Conexión en puente	Estado del interruptor automático		Corriente de inyección	Resultados esperados	Resultados reales		
		PRINCIPAL 1	PRINCIPAL 2			Fase A	Fase B	Fase C
1	Fase de la BARRA DE CARGA 1 al neutro de la BARRA DE CARGA 1	Cerrado	Abierto	1 000 A	Interruptor auto. PRINCIPAL 1 “Sin disparo”			
2	Fase de la BARRA DE CARGA 1 a tierra de la BARRA DE CARGA 1	Cerrado	Abierto	1 000 A	Interruptor auto. PRINCIPAL 1 “Con disparo”			
3	Fase de la BARRA DE CARGA 2 al neutro de la BARRA DE CARGA 2	Abierto	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 2 “Sin disparo”			
4	Fase de la BARRA DE CARGA 2 a tierra de la BARRA DE CARGA 2	Abierto	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 2 “Con disparo”			

Prueba no.	Conexión en puente	Estado del interruptor automático		Corriente de inyección	Resultados esperados	Resultados reales		
		PRINCIPAL 1	PRINCIPAL 2			Fase A	Fase B	Fase C
1	Fase de la BARRA DE CARGA 1 al neutro de la BARRA DE CARGA 1	Cerrado	Abierto	1 000 A	Interruptor auto. PRINCIPAL 1 “Sin disparo”			
2	Fase de la BARRA DE CARGA 1 a tierra de la BARRA DE CARGA 1	Cerrado	Abierto	1 000 A	Interruptor auto. PRINCIPAL 1 “Con disparo”			
3	Fase de la BARRA DE CARGA 2 al neutro de la BARRA DE CARGA 2	Abierto	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 2 “Sin disparo”			
4	Fase de la BARRA DE CARGA 2 a tierra de la BARRA DE CARGA 2	Abierto	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 2 “Con disparo”			

Tabla 1: Registro cronológico del procedimiento de pruebas, principal-principal *(continuación)*

Prueba no.	Conexión en puente	Estado del interruptor automático		Corriente de inyección	Resultados esperados	Resultados reales		
		PRINCIPAL 1	PRINCIPAL 2			Fase A	Fase B	Fase C
1	Fase de la BARRA DE CARGA 1 al neutro de la BARRA DE CARGA 1	Cerrado	Abierto	1 000 A	Interruptor auto. PRINCIPAL 1 “Sin disparo”			
2	Fase de la BARRA DE CARGA 1 a tierra de la BARRA DE CARGA 1	Cerrado	Abierto	1 000 A	Interruptor auto. PRINCIPAL 1 “Con disparo”			
3	Fase de la BARRA DE CARGA 2 al neutro de la BARRA DE CARGA 2	Abierto	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 2 “Sin disparo”			
4	Fase de la BARRA DE CARGA 2 a tierra de la BARRA DE CARGA 2	Abierto	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 2 “Con disparo”			

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SECCIÓN 7—REGISTRO CRONOLÓGICO DEL PROCEDIMIENTO DE PRUEBAS PRINCIPAL-CIERRE MANUAL SIN RELEVADOR-PRINCIPAL

Tabla 2: Registro cronológico del procedimiento de pruebas, principal-cierre manual sin relevador-principal

Prueba no.	Conexión en puente	Estado del interruptor automático			Corriente de inyección	Resultados esperados	Resultados reales		
		PRINCIPAL 1	DE CIERRE MANUAL	PRINCIPAL 2			Fase A	Fase B	Fase C
1	Fase de la BARRA DE CARGA 1 al neutro de la BARRA DE CARGA 1	Cerrado	Abierto	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 1 “Sin disparo”			
2	Fase de la BARRA DE CARGA 1 a tierra de la BARRA DE CARGA 1	Cerrado	Abierto	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 1 “Con disparo”			
3	Fase de la BARRA DE CARGA 2 al neutro de la BARRA DE CARGA 2	Cerrado	Cerrado	Abierto	1 000 A	Interruptor auto. PRINCIPAL 1 “Sin disparo”			
4	Fase de la BARRA DE CARGA 2 a tierra de la BARRA DE CARGA 2	Cerrado	Cerrado	Abierto	1 000 A	Interruptor auto. PRINCIPAL 1 “Con disparo”			
5	Fase de la BARRA DE CARGA 2 al neutro de la BARRA DE CARGA 2	Cerrado	Abierto	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 2 “Sin disparo”			
6	Fase de la BARRA DE CARGA 2 a tierra de la BARRA DE CARGA 2	Cerrado	Abierto	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 2 “Con disparo”			
7	Fase de la BARRA DE CARGA 1 al neutro de la BARRA DE CARGA 1	Abierto	Cerrado	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 2 “Sin disparo”			
8	Fase de la BARRA DE CARGA 1 a tierra de la BARRA DE CARGA 1	Abierto	Cerrado	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 2 “Con disparo”			

Prueba no.	Conexión en puente	Estado del interruptor automático			Corriente de inyección	Resultados esperados	Resultados reales		
		PRINCIPAL 1	DE CIERRE MANUAL	PRINCIPAL 2			Fase A	Fase B	Fase C
1	Fase de la BARRA DE CARGA 1 al neutro de la BARRA DE CARGA 1	Cerrado	Abierto	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 1 “Sin disparo”			
2	Fase de la BARRA DE CARGA 1 a tierra de la BARRA DE CARGA 1	Cerrado	Abierto	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 1 “Con disparo”			
3	Fase de la BARRA DE CARGA 2 al neutro de la BARRA DE CARGA 2	Cerrado	Cerrado	Abierto	1 000 A	Interruptor auto. PRINCIPAL 1 “Sin disparo”			
4	Fase de la BARRA DE CARGA 2 a tierra de la BARRA DE CARGA 2	Cerrado	Cerrado	Abierto	1 000 A	Interruptor auto. PRINCIPAL 1 “Con disparo”			
5	Fase de la BARRA DE CARGA 2 al neutro de la BARRA DE CARGA 2	Cerrado	Abierto	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 2 “Sin disparo”			
6	Fase de la BARRA DE CARGA 2 a tierra de la BARRA DE CARGA 2	Cerrado	Abierto	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 2 “Con disparo”			
7	Fase de la BARRA DE CARGA 1 al neutro de la BARRA DE CARGA 1	Abierto	Cerrado	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 2 “Sin disparo”			
8	Fase de la BARRA DE CARGA 1 a tierra de la BARRA DE CARGA 1	Abierto	Cerrado	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 2 “Con disparo”			

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SECCIÓN 8—REGISTRO CRONOLÓGICO DEL PROCEDIMIENTO DE PRUEBAS, PRINCIPAL-CIERRE MANUAL CON RELEVADOR-PRINCIPAL

Tabla 3: Registro cronológico del procedimiento de pruebas, principal-cierre manual con relevador-principal

Prueba no.	Conexión en puente	Estado del interruptor automático			Corriente de inyección	Resultados esperados	Resultados reales		
		PRINCIPAL 1	DE CIERRE MANUAL	PRINCIPAL 2			Fase A	Fase B	Fase C
1	Fase de la BARRA DE CARGA 1 al neutro de la BARRA DE CARGA 1	Cerrado	Abierto	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 1 “Sin disparo”			
2	Fase de la BARRA DE CARGA 1 a tierra de la BARRA DE CARGA 1	Cerrado	Abierto	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 1 “Con disparo”			
3	Fase de la BARRA DE CARGA 2 al neutro de la BARRA DE CARGA 2	Cerrado	Cerrado	Abierto	1 000 A	Interruptor auto. PRINCIPAL 1 “Sin disparo” Interruptor auto. de CIERRE MANUAL “Sin disparo”			
4	Fase de la BARRA DE CARGA 2 a tierra de la BARRA DE CARGA 2	Cerrado	Cerrado	Abierto	1 000 A	Interruptor auto. PRINCIPAL 1 “Sin disparo” Interruptor auto. de CIERRE MANUAL “Con disparo”			
5	Fase de la BARRA DE CARGA 2 al neutro de la BARRA DE CARGA 2	Cerrado	Abierto	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 2 “Sin disparo”			
6	Fase de la BARRA DE CARGA 2 a tierra de la BARRA DE CARGA 2	Cerrado	Abierto	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 2 “Con disparo”			
7	Fase de la BARRA DE CARGA 1 al neutro de la BARRA DE CARGA 1	Abierto	Cerrado	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 2 “Sin disparo” Interruptor auto. de CIERRE MANUAL “Sin disparo”			
8	Fase de la BARRA DE CARGA 1 a tierra de la BARRA DE CARGA 1	Abierto	Cerrado	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 2 “Sin disparo” Interruptor auto. de CIERRE MANUAL “Con disparo”			

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Tabla 3: Registro cronológico del procedimiento de pruebas, principal-cierre manual con relevador-principal *(continuación)*

Prueba no.	Conexión en puente	Estado del interruptor automático			Corriente de inyección	Resultados esperados	Resultados reales		
		PRINCIPAL 1	DE CIERRE MANUAL	PRINCIPAL 2			Fase A	Fase B	Fase C
1	Fase de la BARRA DE CARGA 1 al neutro de la BARRA DE CARGA 1	Cerrado	Abierto	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 1 “Sin disparo”			
2	Fase de la BARRA DE CARGA 1 a tierra de la BARRA DE CARGA 1	Cerrado	Abierto	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 1 “Con disparo”			
3	Fase de la BARRA DE CARGA 2 al neutro de la BARRA DE CARGA 2	Cerrado	Cerrado	Abierto	1 000 A	Interruptor auto. PRINCIPAL 1 “Sin disparo” Interruptor auto. de CIERRE MANUAL “Sin disparo”			
4	Fase de la BARRA DE CARGA 2 a tierra de la BARRA DE CARGA 2	Cerrado	Cerrado	Abierto	1 000 A	Interruptor auto. PRINCIPAL 1 “Sin disparo” Interruptor auto. de CIERRE MANUAL “Con disparo”			
5	Fase de la BARRA DE CARGA 2 al neutro de la BARRA DE CARGA 2	Cerrado	Abierto	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 2 “Sin disparo”			
6	Fase de la BARRA DE CARGA 2 a tierra de la BARRA DE CARGA 2	Cerrado	Abierto	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 2 “Con disparo”			
7	Fase de la BARRA DE CARGA 1 al neutro de la BARRA DE CARGA 1	Abierto	Cerrado	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 2 “Sin disparo” Interruptor auto. de CIERRE MANUAL “Sin disparo”			
8	Fase de la BARRA DE CARGA 1 a tierra de la BARRA DE CARGA 1	Abierto	Cerrado	Cerrado	1 000 A	Interruptor auto. PRINCIPAL 2 “Sin disparo” Interruptor auto. de CIERRE MANUAL “Con disparo”			

SECCIÓN 9—REGISTRO CRONOLÓGICO DE PRUEBAS Y AJUSTES

Tabla 4: Registro cronológico de pruebas y ajustes

Fecha	Prueba	ID del interruptor automático	Ajustes		Resultados y firma
			Activación	Retardo	
	Instalación				

ESPAÑOL

Importado en México por:
Schneider Electric México

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Reemplaza: 80043-058-01 8/2001

04/2005

Injection primaire à courant élevé

Procédure d’essai sur place pour systèmes différentiels modifiés de protection contre les défauts à la terre
Classe 6036

Directives d’utilisation

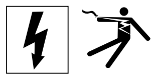
À conserver pour usage ultérieur.

une marque de
Schneider
Electric

SQUARE D

CATÉGORIES DE DANGERS ET SYMBOLES SPÉCIAUX

Lisez attentivement ces directives et examinez l'appareillage pour vous familiariser avec son fonctionnement avant de faire son installation ou son entretien. Les messages spéciaux suivants peuvent apparaître dans les présentes directives ou sur l'appareil pour avertir l'utilisateur de dangers potentiels ou pour attirer l'attention sur des informations qui clarifient ou simplifient une procédure.



L'ajout d'un de ces deux symboles à une étiquette de sécurité de « Danger » ou d'« Avertissement » indique qu'un danger électrique existe et qu'il peut entraîner des blessures corporelles si les directives ne sont pas respectées.

Ceci est le symbole d'alerte de sécurité. Il est utilisé pour vous alerter de dangers de blessures corporelles potentielles. Veuillez vous conformer à tous les messages de sécurité qui suivent ce symbole pour éviter une blessure ou la mort.

⚠ DANGER

DANGER indique une situation de danger imminent qui, si elle n'est pas évitée **entraînera** la mort ou des blessures graves.

⚠ AVERTISSEMENT

AVERTISSEMENT indique une situation de danger potentiel qui, si elle n'est pas évitée, **peut entraîner** la mort ou des blessures graves.

⚠ ATTENTION

ATTENTION indique une situation de danger potentiel qui, si elle n'est pas évitée, **peut entraîner** des blessures mineures ou modérées.

ATTENTION

ATTENTION, utilisé sans le symbole d'alerte de sécurité, indique une situation de danger potentiel qui, si elle n'est pas évitée, **peut entraîner** des dommages matériels.

Fournit des renseignements complémentaires pour clarifier ou simplifier une procédure.

VEUILLEZ NOTER

Seul un personnel qualifié doit effectuer l'installation, l'utilisation, l'entretien et la maintenance du matériel électrique. Schneider Electric n'assume aucune responsabilité des conséquences éventuelles découlant de l'utilisation de cette documentation.

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CHAPITRE 1—INTRODUCTION

Description

Ce bulletin contient les directives d'inspection et de vérification concernant les systèmes différentiels modifiés de protection contre les défauts à la terre fabriqués par Schneider Electric. Le système différentiel modifié de protection contre les défauts à la terre employé dans les alignements de panneaux et d'appareillages de commutation à sources multiples de Schneider Electric utilisera l'un de deux types de techniques de détection de courant de défaut à la terre.

Le premier type est une détection homopolaire, qui utilise un seul capteur pour encadrer les trois conducteurs de phase et le conducteur de neutre. Le second type est une détection résiduelle, où chaque phase et le conducteur de neutre sont encadrés par leur propre capteur. En conditions normales, la somme des vecteurs des courants de phase et du courant du neutre doit être égale à zéro. En condition de défaut à la terre, la somme des vecteurs donne un courant qui est utilisé dans un dispositif utilisant des relais protecteurs pour ouvrir automatiquement les disjoncteurs (ou des interrupteurs) principaux ou de couplage selon le besoin.

REMARQUE : Tous les schémas représentés utilisent la détection résiduelle.

Vérification

Le paragraphe 230-95(c) du National Electrical Code® (NEC®; É.-U.) requiert que tous les systèmes de protection contre les défauts à la terre soient soumis à un essai de fonctionnement quand ils sont installés la première fois. Schneider Electric recommande d'effectuer une vérification :

- quand l'appareil est installé à son emplacement définitif,
- comme partie de l'entretien normal,
- si le système de distribution est altéré d'une façon ou d'une autre.

La vérification sur place détermine si le système de protection contre les défauts à la terre est opérationnel. Tenir compte des informations suivantes lors de l'utilisation de ces directives :

- Les schémas contenus dans ces directives d'utilisation sont fournis pour illustrer les connexions d'essais utilisant l'injection d'un courant élevé, mais n'entendent pas dépeindre le système de protection contre les défauts à la terre dans sa totalité tel qu'il est installé sur place. Consulter tous les manuels d'utilisation et les schémas de câblage fournis avec l'appareil pour la configuration réelle du système. Vérifier si tous les capteurs sont installés et câblés avec la polarité correcte selon les schémas de câblage.
- Cette procédure de vérification sur place n'est pas un contrôle de l'étalonnage d'aucun des relais de détection.
- Noter les résultats dans les journaux des procédures d'essai des défauts à la terre (tableaux 1 à 3 aux pages 34 à 37). Si les résultats des vérifications ne sont pas acceptables, contrôler de nouveau les connexions et faire un nouvel essai. Si les résultats ne sont toujours pas acceptables, contacter les services de Square D au 1-888-Square D (1-888-778-2733 [É.-U.]).

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Outils requis

Les outils ci-après sont requis pour inspecter et vérifier le système différentiel modifié de protection contre les défauts à la terre :

- Une unité d'essai d'injection capable d'injecter un courant de 1000 A. Les cavaliers d'essai sont typiquement des câbles flexibles en cuivre (câbles pour machine à souder à l'arc). Utiliser des câbles et connexions qui produisent une faible impédance.
- Une trousse d'essais portative de Schneider Electric pour les déclencheurs Micrologic® type A, H et P.

Systèmes couverts

Cette procédure d'essai est restreinte aux types de systèmes suivants :

- Configuration principal-principal, en étoile mise à la terre
- Configuration principal-couplage-principal, en étoile mise à la terre, couplage sans relais
- Configuration principal-couplage-principal, en étoile mise à la terre, couplage avec relais

REMARQUE : Un système avec relais possède une protection contre les défauts à la terre sur le dispositif de couplage. Un système sans relais ne possède pas de protection contre les défauts à la terre sur le dispositif de couplage.

REMARQUE : Les systèmes qui ont des configurations au-delà de ce qui est couvert dans ce document peuvent être vérifiés par des méthodes similaires à celles indiquées. La fonctionnalité TRIP (DÉCLENCHEMENT) et NO TRIP (SANS DÉCLENCHEMENT) de toutes les configurations possibles de disjoncteurs ouverts et fermés doit être vérifiée. Les essais de DÉCLENCHEMENT ont toujours le CAVALIER D'ESSAI raccordé de la phase à la terre. Les essais SANS DÉCLENCHEMENT ont toujours le CAVALIER D'ESSAI raccordé de la phase au neutre (en absence de neutre, connecter le CAVALIER D'ESSAI de phase à phase).

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CHAPITRE 2—MESURES DE SÉCURITÉ

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E.
- Seul un personnel qualifié doit effectuer cette procédure d'essai.
- Coupez l'alimentation de cet appareil avant d'y travailler. Présumez que tous les circuits sont sous tension tant qu'ils n'ont pas été complètement mis hors tension, vérifiés et étiquetés. Faites particulièrement attention à l'agencement du système d'alimentation. Considérez toutes les sources d'alimentation, y compris la possibilité de rétro-alimentation.
- Utilisez toujours un dispositif de détection de tension ayant une valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Observez toujours toutes les procédures d'interverrouillage et d'étiquetage selon la réglementation OSHA.
- Effectuez une vérification électrique pour vous assurer qu'aucun court-circuit n'a été créé pendant l'installation, l'entretien ou les essais.
- Inspectez soigneusement la zone de travail et enlevez tous les outils et objets laissés à l'intérieur de l'appareil.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.
- Les explications données dans ces directives présument que le client a pris ces mesures avant d'effectuer un entretien ou des essais.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

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CHAPITRE 3—CONFIGURATION PRINCIPAL-PRINCIPAL, EN ÉTOILE MISE À LA TERRE

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez l'alimentation de l'appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension ayant une valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

1. Couper l'alimentation de l'appareil avant d'y travailler. Utiliser un dispositif de détection de tension ayant une valeur nominale appropriée pour s'assurer que l'alimentation est coupée.
2. S'assurer que tous les raccordements de barres-bus de terre sont solidement connectés. Pour chaque disjoncteur principal, vérifier si le raccordement de mise à la terre est effectué en amont de la barrette de déconnexion du neutre et sur le côté ligne de chaque capteur de défaut à la terre. Voir la figure 1.
3. Pour chaque disjoncteur principal, vérifier si un raccordement de neutre existe à partir du transformateur d'alimentation vers l'appareil.
4. Pour les systèmes à détection résiduelle, vérifier si les capteurs de toutes les phases et du neutre sont raccordés avec la polarité correcte au primaire et au secondaire. Se reporter aux plans fournis avec l'appareil.
5. Pour les systèmes de détection homopolaire, vérifier si les conducteurs de toutes les phases et du neutre passent dans la fenêtre du capteur dans le même sens, et que les conducteurs de mise à la terre ne passent pas dans cette fenêtre. Vérifier également si le capteur est raccordé avec la polarité correcte au primaire et au secondaire. Se reporter aux plans fournis avec l'appareil.
6. Retirer la barrette de déconnexion du neutre de chaque disjoncteur principal pour isoler les neutres du système de câblage à la fois de l'alimentation et de la terre.
7. Mesurer la résistance d'isolation neutre-terre du système afin de s'assurer qu'aucun raccordement à la terre n'existe sur le côté charge du système de protection contre les défauts à la terre. La résistance doit être au moins de 1 mégohm. Retirer tous les raccordements qui existent entre le neutre et la terre trouvés pendant cette vérification. Ne pas raccorder ces mises à la terre une fois la vérification terminée.
8. Replacer la barrette de déconnexion du neutre de chaque disjoncteur principal.
9. Noter tous les réglages d'activation et de temporisation pour chaque disjoncteur ou relais de défaut à la terre en cours d'essai dans le tableau 4 à la page 39. Une fois les essais terminés, remettre tous les réglages à leurs valeurs initiales.
10. Ajuster le réglage d'activation sur défaut à la terre de chaque disjoncteur ou relais de défaut à la terre à son niveau de courant le plus bas.
11. Ajuster le réglage de la temporisation de défaut à la terre de chaque disjoncteur ou relais de défaut à la terre en cours d'essai à 0,1 seconde (I2T OUT ou OFF).

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12. Ajuster les réglages de l'enclenchement de longue durée, à temps court et instantané et de temporisation de chaque disjoncteur en cours d'essai à leurs niveaux les plus hauts.
13. Pour chaque disjoncteur muni d'un déclencheur Micrologic® de type A, H ou P, raccorder une trousse d'essais portative Schneider Electric et activer la fonction d'inhibition d'image thermique conformément aux directives de la trousse. Cette étape est nécessaire pour inhiber les fonctions de l'historique des déclenchements et de l'indicateur de l'usure des contacts. Une fois les essais terminés, désactiver la fonction d'inhibition d'image thermique conformément aux directives de la trousse. Se reporter aux directives d'utilisation 48049-184-XX pour obtenir des informations supplémentaires.
14. Déconnecter la source d'alimentation de contrôle de protection contre les défauts à la terre, au cas ou celle-ci proviendrait d'une dérivation interne, et fournir une alimentation de contrôle à partir d'une source externe. Se reporter aux schémas de câblage fournis pour les raccordements spécifiques. Une fois les essais terminés, déconnecter l'alimentation de contrôle externe et rebrancher le circuit d'alimentation de contrôle interne.

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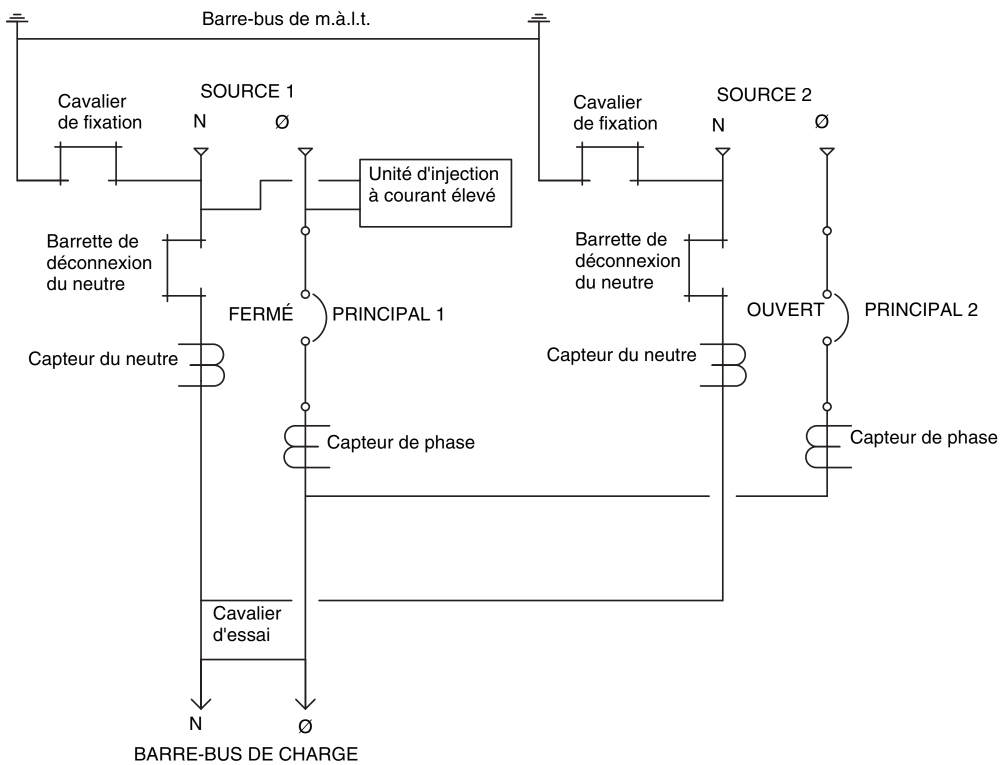
Essai n^{o} 1

1. Fermer le disjoncteur (ou interrupteur) PRINCIPAL 1 et ouvrir le disjoncteur (ou interrupteur) PRINCIPAL 2.
2. Sur le côté ligne du disjoncteur (ou interrupteur) PRINCIPAL 1, raccorder l'unité d'injection à courant élevé entre la phase A et le neutre (N). Voir la figure 1.
3. Sur la barre-bus de charge, raccorder un cavalier pour courant élevé entre la phase A et le neutre (N). Voir la figure 1.
4. Injecter 1000 A dans la phase A. Le disjoncteur (ou interrupteur) PRINCIPAL 1 ne doit pas se déclencher sur un défaut à la terre. Noter les résultats réels pour l'essai n^{o} 1 dans le tableau 1 à la page 34.
5. Répéter l'essai n^{o} 1 pour les phases B et C (non requis pour les systèmes homopolaires). Noter les résultats réels pour cet essai dans le tableau 1.

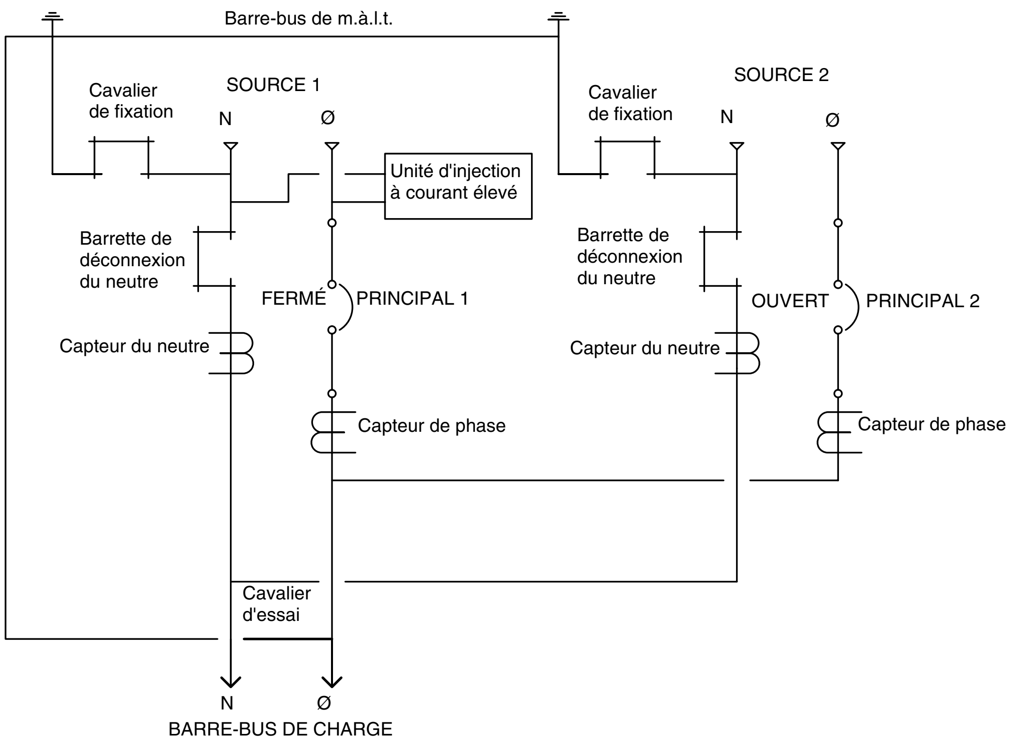
Figure 1 : Raccordements de l'unité d'injection de l'essai n^{o} 1 (sans déclenchement) principal-principal et du cavalier d'essai



Essai n^{o} 2

1. Fermer le disjoncteur (ou interrupteur) PRINCIPAL 1 et ouvrir le disjoncteur (ou interrupteur) PRINCIPAL 2.
2. Sur le côté ligne du disjoncteur (ou interrupteur) PRINCIPAL 1, raccorder l'unité d'injection à courant élevé entre la phase A et le neutre (N). Voir la figure 2.
3. Sur la barre-bus de charge, raccorder un cavalier pour courant élevé entre la phase A et la terre. Voir la figure 2.
4. Injecter 1000 A dans la phase A. Le disjoncteur (ou interrupteur) PRINCIPAL 1 doit se déclencher sur un défaut à la terre. Noter les résultats réels pour l'essai n^{o} 2 dans le tableau 1 à la page 34.
5. Répéter l'essai n^{o} 2 pour les phases B et C (non requis pour les systèmes homopolaires). Noter les résultats réels pour cet essai dans le tableau 1.

Figure 2 : Raccordements de l'unité d'injection de l'essai n^{o} 2 (déclenchement) principal-principal et du cavalier d'essai



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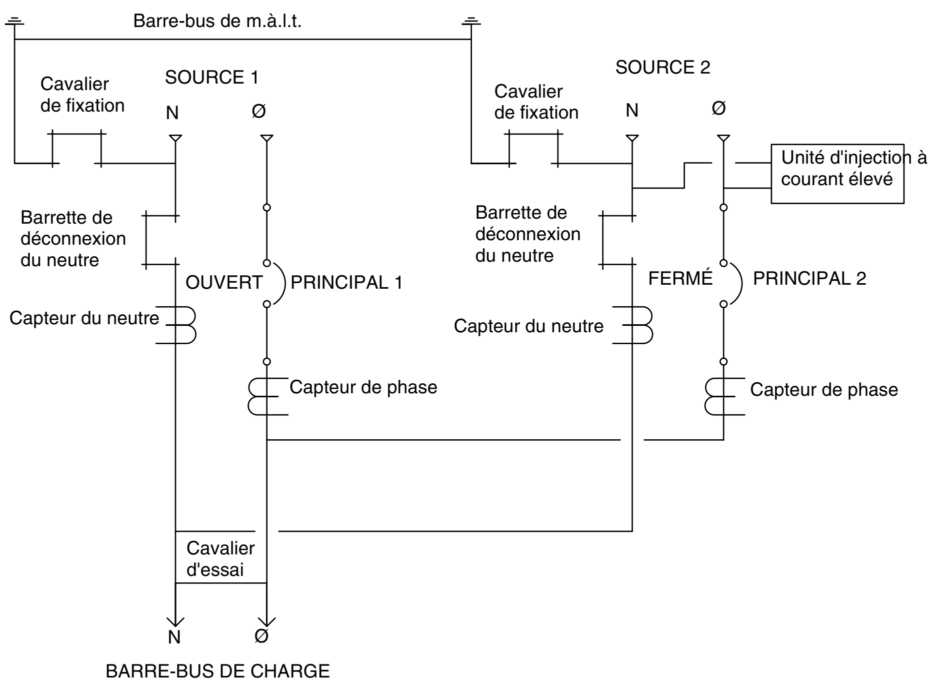
Essai n° 3

1. Fermer le disjoncteur (ou interrupteur) PRINCIPAL 2 et ouvrir le disjoncteur (ou interrupteur) PRINCIPAL 1.
2. Sur le côté ligne du disjoncteur (ou interrupteur) PRINCIPAL 2, raccorder l'unité d'injection à courant élevé entre la phase A et le neutre (N). Voir la figure 3.
3. Sur la barre-bus de charge, raccorder un cavalier pour courant élevé entre la phase A et le neutre (N). Voir la figure 3.
4. Injecter 1000 A dans la phase A. Le disjoncteur (ou interrupteur) PRINCIPAL 2 ne doit pas se déclencher sur un défaut à la terre. Noter les résultats réels pour l'essai n° 3 dans le tableau 1 à la page 34.
5. Répéter l'essai n° 3 pour les phases B et C (non requis pour les systèmes homopolaires). Noter les résultats réels pour cet essai dans le tableau 1.

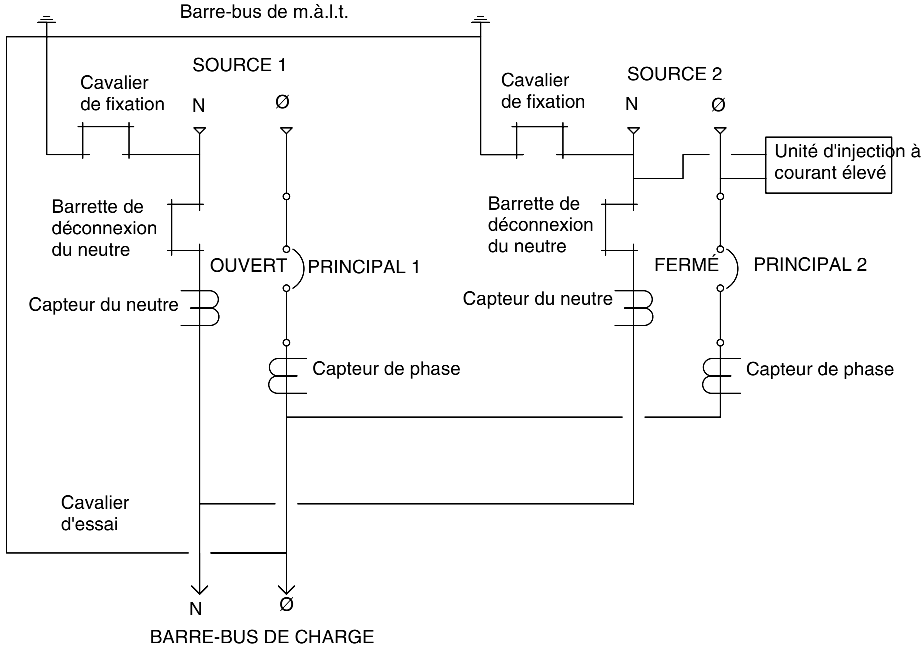
Figure 3 : Raccordements de l'unité d'injection de l'essai n° 3 (sans déclenchement) principal-principal et du cavalier d'essai



Essai n^{o} 4

1. Fermer le disjoncteur (ou interrupteur) PRINCIPAL 2 et ouvrir le disjoncteur (ou interrupteur) PRINCIPAL 1.
2. Sur le côté ligne du disjoncteur (ou interrupteur) PRINCIPAL 2, raccorder l'unité d'injection à courant élevé entre la phase A et le neutre (N). Voir la figure 4.
3. Sur la barre-bus de charge, raccorder un cavalier pour courant élevé entre la phase A et la terre. Voir la figure 4.
4. Injecter 1000 A dans la phase A. Le disjoncteur (ou interrupteur) PRINCIPAL 2 doit se déclencher sur un défaut à la terre. Noter les résultats réels pour l'essai n^{o} 4 dans le tableau 1 à la page 34.
5. Répéter l'essai n^{o} 4 pour les phases B et C (non requis pour les systèmes homopolaires). Noter les résultats réels pour cet essai dans le tableau 1.
6. Une fois les essais terminés, remettre tous les réglages à leurs valeurs initiales.

Figure 4 : Raccordements de l'unité d'injection de l'essai n^{o} 4 (déclenchement) principal-principal et du cavalier d'essai



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CHAPITRE 4—CONFIGURATION PRINCIPAL-COUPLAGE SANS RELAIS-PRINCIPAL, EN ÉTOILE MISE À LA TERRE

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez l'alimentation de l'appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension ayant une valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

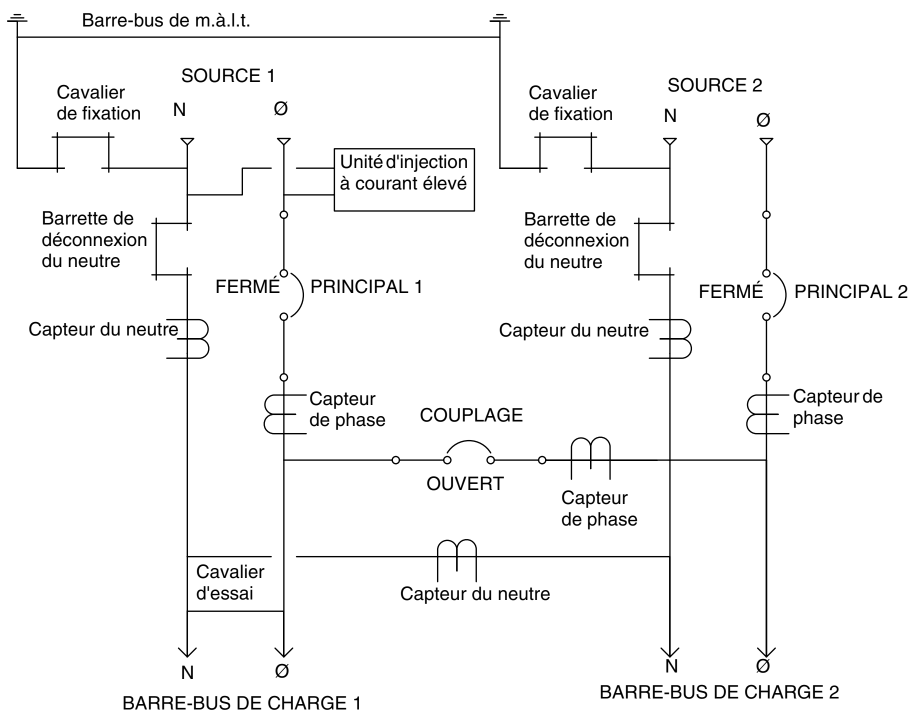
1. Couper l'alimentation de l'appareil avant d'y travailler. Utiliser un dispositif de détection de tension ayant une valeur nominale appropriée pour s'assurer que l'alimentation est coupée.
2. S'assurer que tous les raccordements de barres-bus de terre sont solidement connectés. Pour chaque disjoncteur principal, vérifier si le raccordement de mise à la terre est effectué en amont de la barrette de déconnexion du neutre et sur le côté ligne de chaque capteur de défaut à la terre. Voir la figure 5.
3. Pour chaque disjoncteur principal, vérifier si un raccordement de neutre existe à partir du transformateur d'alimentation vers l'appareil.
4. Pour les systèmes à détection résiduelle, vérifier si les capteurs de toutes les phases et du neutre sont raccordés avec la polarité correcte au primaire et au secondaire. Se reporter aux plans fournis avec l'appareil.
5. Pour les systèmes de détection homopolaire, vérifier si les conducteurs de toutes les phases et du neutre passent dans la fenêtre du capteur dans le même sens, et que les conducteurs de mise à la terre ne passent pas dans cette fenêtre. Vérifier également si le capteur est raccordé avec la polarité correcte au primaire et au secondaire. Se reporter aux plans fournis avec l'appareil.
6. Retirer la barrette de déconnexion du neutre de chaque disjoncteur principal pour isoler les neutres du système de câblage à la fois de l'alimentation et de la terre.
7. Mesurer la résistance d'isolation neutre-terre du système afin de s'assurer qu'aucun raccordement à la terre n'existe sur le côté charge du système de protection contre les défauts à la terre. La résistance doit être au moins de 1 mégohm. Retirer tous les raccordements qui existent entre le neutre et la terre trouvés pendant cette vérification. Ne pas raccorder ces mises à la terre une fois la vérification terminée.
8. Replacer la barrette de déconnexion du neutre de chaque disjoncteur principal.
9. Noter tous les réglages d'activation et de temporisation pour chaque disjoncteur ou relais de défaut à la terre en cours d'essai dans le tableau 4 à la page 39. Une fois les essais terminés, remettre tous les réglages à leurs valeurs initiales.
10. Ajuster le réglage d'activation sur défaut à la terre de chaque disjoncteur ou relais de défaut à la terre à son niveau de courant le plus bas.
11. Ajuster le réglage de la temporisation de défaut à la terre de chaque disjoncteur ou relais de défaut à la terre en cours d'essai à 0,1 seconde (I2T OUT ou OFF).

12. Ajuster les réglages de l'enclenchement de longue durée, à temps court et instantané et de temporisation de chaque disjoncteur en cours d'essai à leurs niveaux les plus hauts.
13. Pour chaque disjoncteur principal muni d'un déclencheur Micrologic® de type A, H ou P, raccorder une trousse d'essais portative Schneider Electric et activer la fonction d'inhibition d'image thermique conformément aux directives de la trousse. Cette étape est nécessaire pour inhiber les fonctions de l'historique des déclenchements et de l'indicateur de l'usure des contacts. Une fois les essais terminés, désactiver la fonction d'inhibition d'image thermique conformément aux directives de la trousse. Se reporter aux directives d'utilisation 48049-184-XX pour obtenir des informations supplémentaires.
14. Déconnecter la source d'alimentation de contrôle de protection contre les défauts à la terre, au cas ou celle-ci proviendrait d'une dérivation interne, et fournir une alimentation de contrôle à partir d'une source externe. Se reporter aux schémas de câblage fournis pour les raccordements spécifiques. Une fois les essais terminés, déconnecter l'alimentation de contrôle externe et rebrancher le circuit d'alimentation de contrôle interne.

Essai n^{o} 1

1. Fermer le disjoncteur (ou interrupteur) PRINCIPAL 1. Ouvrir le disjoncteur (ou interrupteur) de COUPLAGE et fermer le disjoncteur (ou interrupteur) PRINCIPAL 2.
2. Sur le côté ligne du disjoncteur (ou interrupteur) PRINCIPAL 1, raccorder l'unité d'injection à courant élevé entre la phase A et le neutre (N). Voir la figure 5.
3. Sur la barre-bus de charge, raccorder un cavalier pour courant élevé entre la phase A et le neutre (N). Voir la figure 5.
4. Injecter 1000 A dans la phase A. Le disjoncteur (ou interrupteur) PRINCIPAL 1 ne doit pas se déclencher sur un défaut à la terre. Noter les résultats réels pour l'essai n^{o} 1 dans le tableau 2 à la page 36.
5. Répéter l'essai n^{o} 1 pour les phases B et C (non requis pour les systèmes homopolaires). Noter les résultats réels pour cet essai dans le tableau 2.

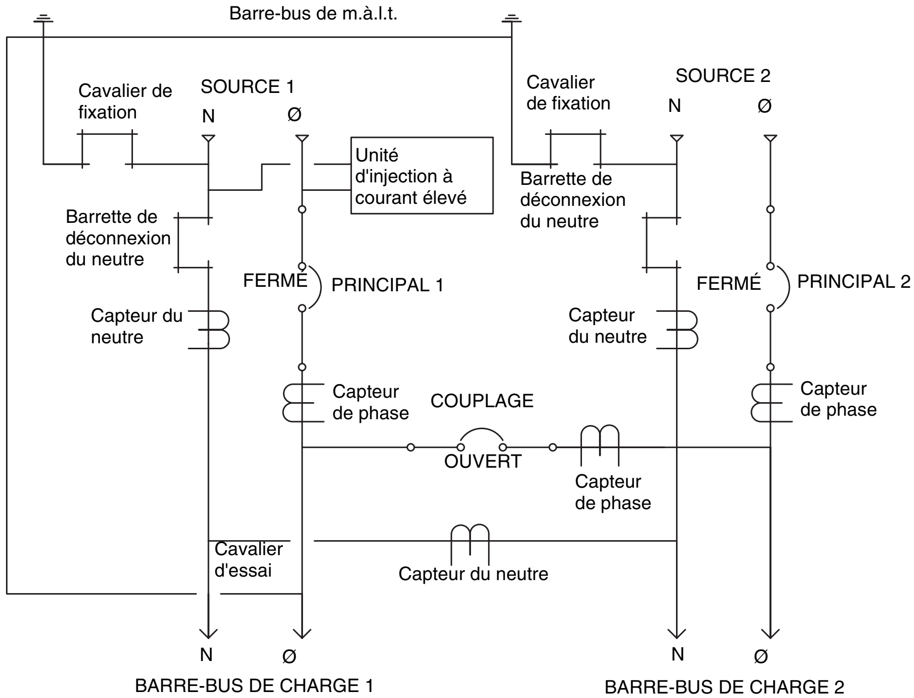
Figure 5 : Raccordements de l'unité d'injection de l'essai n^{o} 1 (sans déclenchement) principal-couplage-principal et du cavalier d'essai



Essai n^{o} 2

1. Fermer le disjoncteur (ou interrupteur) PRINCIPAL 1. Ouvrir le disjoncteur (ou interrupteur) de COUPLAGE et fermer le disjoncteur (ou interrupteur) PRINCIPAL 2.
2. Sur le côté ligne du disjoncteur (ou interrupteur) PRINCIPAL 1, raccorder l'unité d'injection à courant élevé entre la phase A et le neutre (N). Voir la figure 6.
3. Sur la barre-bus de charge, raccorder un cavalier pour courant élevé entre la phase A et la terre. Voir la figure 6.
4. Injecter 1000 A dans la phase A. Le disjoncteur (ou interrupteur) PRINCIPAL 1 doit se déclencher sur un défaut à la terre. Noter les résultats réels pour l'essai n^{o} 2 dans le tableau 2 à la page 36.
5. Répéter l'essai n^{o} 2 pour les phases B et C (non requis pour les systèmes homopolaires). Noter les résultats réels pour cet essai dans le tableau 2.

Figure 6 : Raccordements de l'unité d'injection de l'essai n^{o} 2 (déclenchement) principal-couplage-principal et du cavalier d'essai



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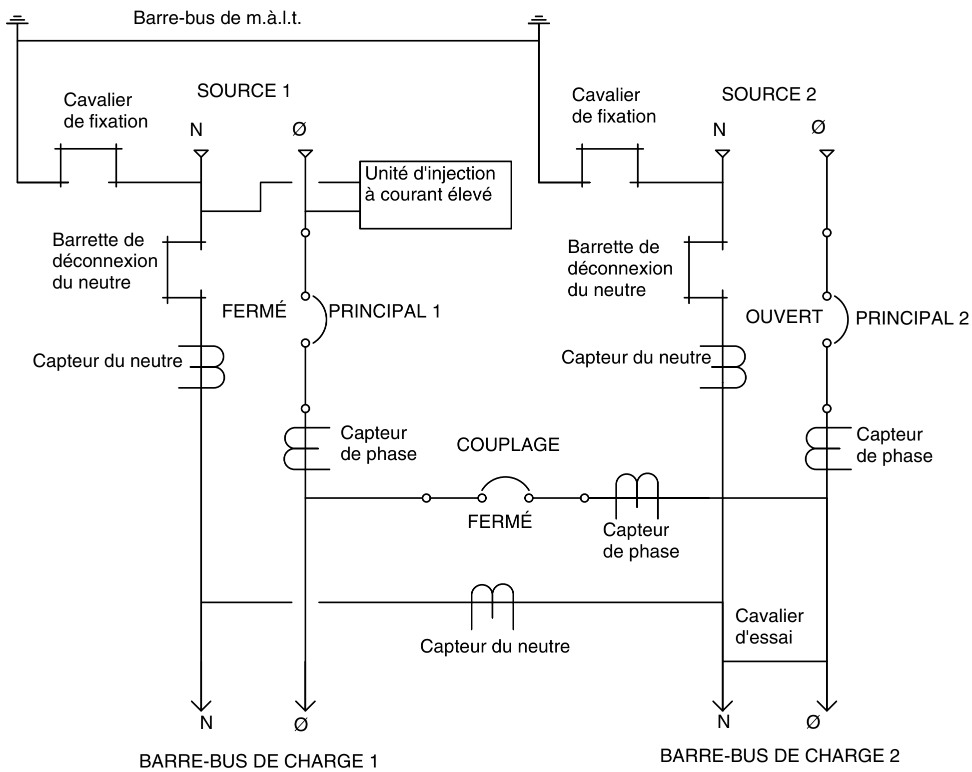
Essai n° 3

1. Fermer le disjoncteur (ou interrupteur) PRINCIPAL 1. Fermer le disjoncteur (ou interrupteur) de COUPLAGE et ouvrir le disjoncteur (ou interrupteur) PRINCIPAL 2.
2. Sur le côté ligne du disjoncteur (ou interrupteur) PRINCIPAL 1, raccorder l'unité d'injection à courant élevé entre la phase A et le neutre (N). Voir la figure 7.
3. Sur la barre-bus de charge, raccorder un cavalier pour courant élevé entre la phase A et le neutre (N). Voir la figure 7.
4. Injecter 1000 A dans la phase A. Ni le disjoncteur (ou interrupteur) PRINCIPAL 1 ni le disjoncteur (ou interrupteur) de COUPLAGE doit se déclencher sur un défaut à la terre. Noter les résultats réels pour l'essai n° 3 dans le tableau 2 à la page 36.
5. Répéter l'essai n° 3 pour les phases B et C (non requis pour les systèmes homopolaires). Noter les résultats réels pour cet essai dans le tableau 2.

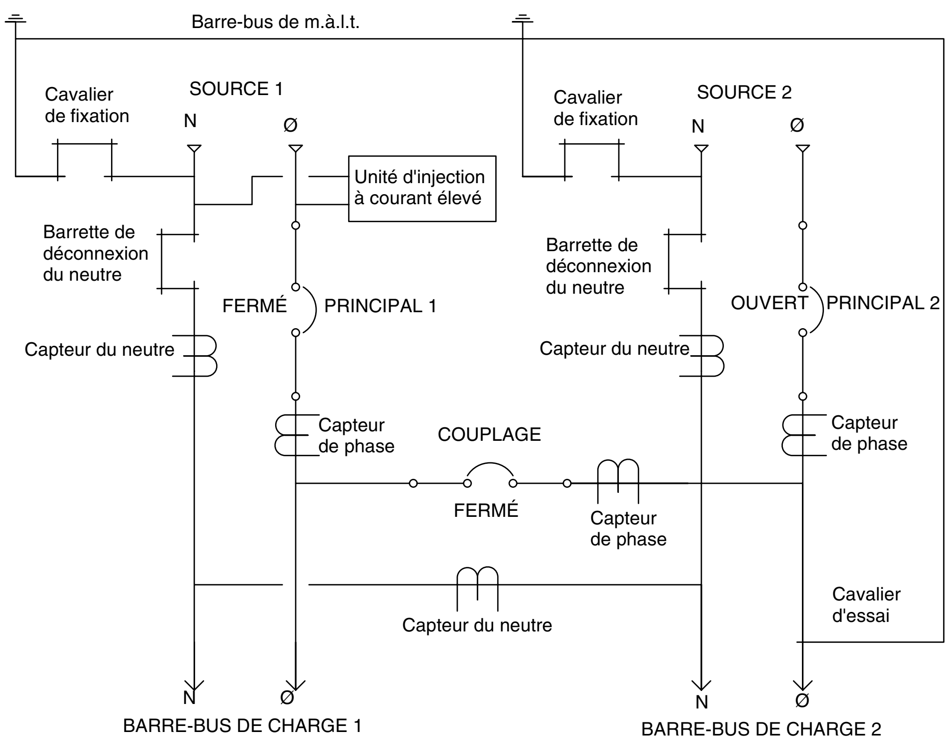
Figure 7 : Raccordements de l'unité d'injection de l'essai n° 3 (sans déclenchement) principal-couplage-principal et du cavalier d'essai



Essai n^{o} 4

1. Fermer le disjoncteur (ou interrupteur) PRINCIPAL 1. Fermer le disjoncteur (ou interrupteur) de COUPLAGE et ouvrir le disjoncteur (ou interrupteur) PRINCIPAL 2.
2. Sur le côté ligne du disjoncteur (ou interrupteur) PRINCIPAL 1, raccorder l'unité d'injection à courant élevé entre la phase A et le neutre (N). Voir la figure 8.
3. Sur la barre-bus de charge, raccorder un cavalier pour courant élevé entre la phase A et la terre. Voir la figure 8.
4. Injecter 1000 A dans la phase A. Le disjoncteur (ou interrupteur) PRINCIPAL 1 doit se déclencher sur un défaut à la terre mais le disjoncteur (ou interrupteur) de COUPLAGE ne doit pas se déclencher sur un défaut à la terre. Noter les résultats réels pour l'essai n^{o} 4 dans le tableau 2 à la page 36.
5. Répéter l'essai n^{o} 4 pour les phases B et C (non requis pour les systèmes homopolaires). Noter les résultats réels pour cet essai dans le tableau 2.

Figure 8 : Raccordements de l'unité d'injection de l'essai n^{o} 4 (déclenchement) principal-couplage-principal et du cavalier d'essai



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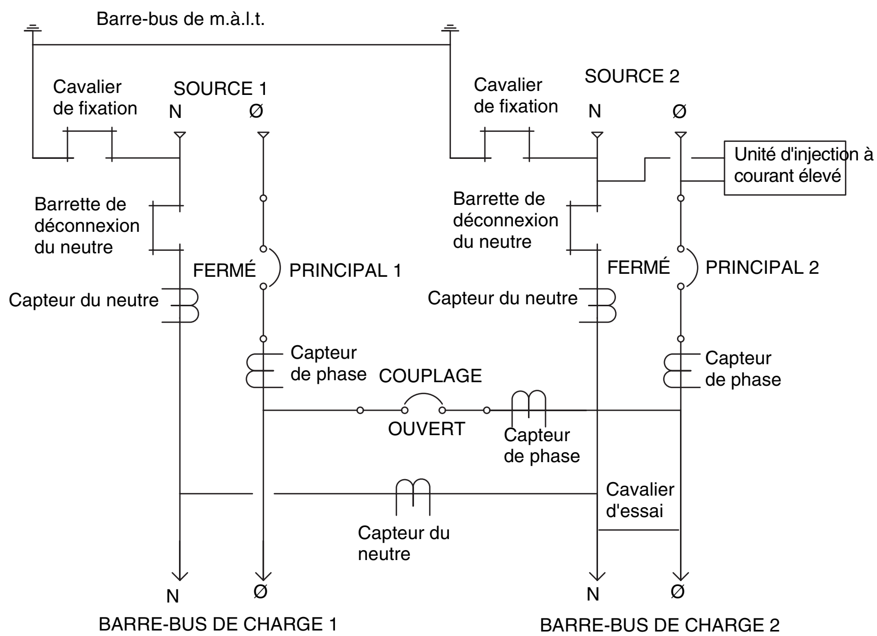
Essai n° 5

1. Fermer le disjoncteur (ou interrupteur) PRINCIPAL 1. Ouvrir le disjoncteur (ou interrupteur) de COUPLAGE et fermer le disjoncteur (ou interrupteur) PRINCIPAL 2.
2. Sur le côté ligne du disjoncteur (ou interrupteur) PRINCIPAL 2, raccorder l'unité d'injection à courant élevé entre la phase A et le neutre (N). Voir la figure 9.
3. Sur la barre-bus de charge, raccorder un cavalier pour courant élevé entre la phase A et le neutre (N). Voir la figure 9.
4. Injecter 1000 A dans la phase A. Le disjoncteur (ou interrupteur) PRINCIPAL 2 ne doit pas se déclencher sur un défaut à la terre. Noter les résultats réels pour l'essai n° 5 dans le tableau 2 à la page 36.
5. Répéter l'essai n° 5 pour les phases B et C (non requis pour les systèmes homopolaires). Noter les résultats réels pour cet essai dans le tableau 2.

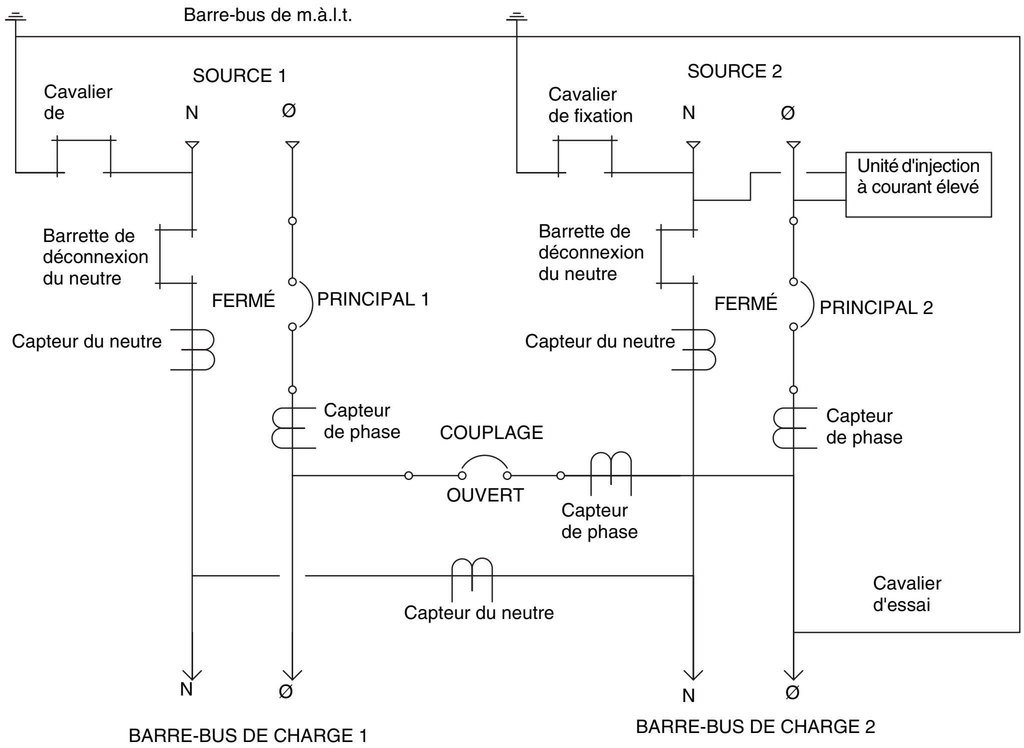
Figure 9 : Raccordements de l'unité d'injection de l'essai n° 5 (sans déclenchement) principal-couplage-principal et du cavalier d'essai



Essai n° 6

1. Fermer le disjoncteur (ou interrupteur) PRINCIPAL 1. Ouvrir le disjoncteur (ou interrupteur) de COUPLAGE et fermer le disjoncteur (ou interrupteur) PRINCIPAL 2.
2. Sur le côté ligne du disjoncteur (ou interrupteur) PRINCIPAL 2, raccorder l'unité d'injection à courant élevé entre la phase A et le neutre (N). Voir la figure 10.
3. Sur la barre-bus de charge, raccorder un cavalier pour courant élevé entre la phase A et la terre. Voir la figure 10.
4. Injecter 1000 A dans la phase A. Le disjoncteur (ou interrupteur) PRINCIPAL 2 doit se déclencher sur un défaut à la terre. Noter les résultats réels pour l'essai n° 6 dans le tableau 2 à la page 36.
5. Répéter l'essai n° 6 pour les phases B et C (non requis pour les systèmes homopolaires). Noter les résultats réels pour cet essai dans le tableau 2.

Figure 10 : Raccordements de l'unité d'injection de l'essai n° 6 (déclenchement) principal-couplage-principal et du cavalier d'essai



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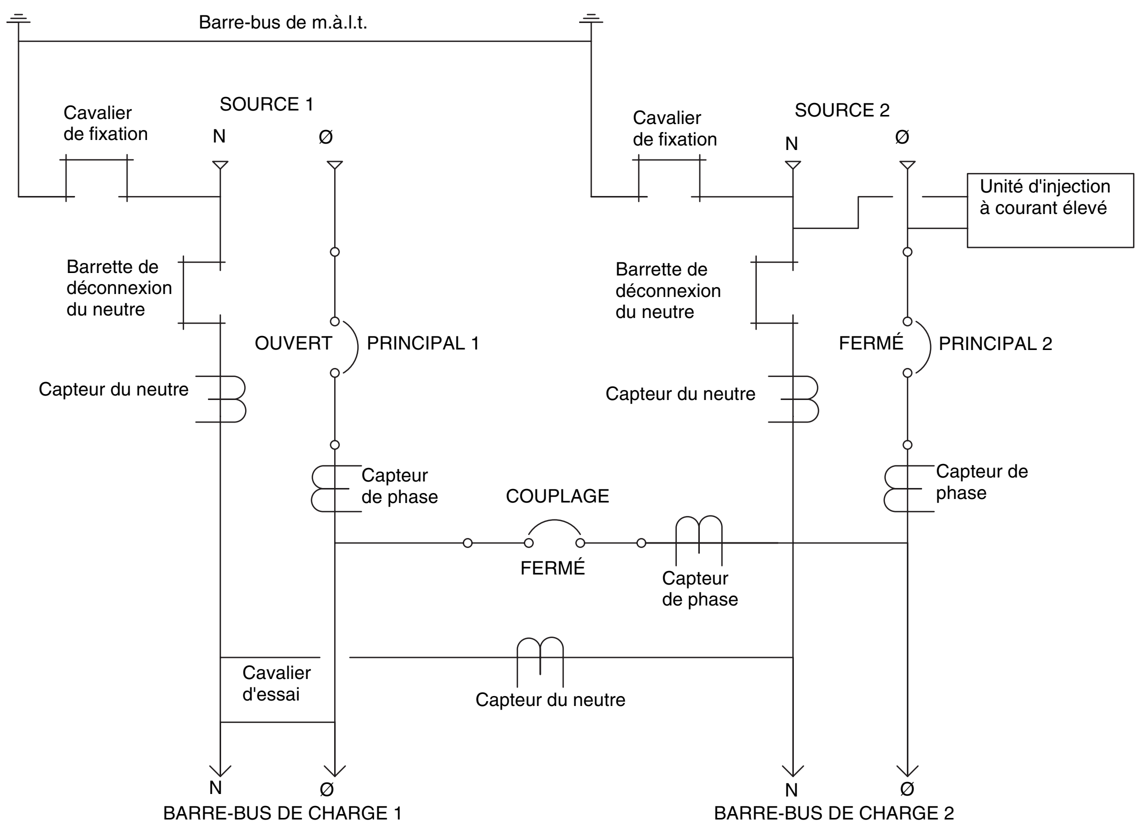
Essai n° 7

1. Ouvrir le disjoncteur (ou interrupteur) PRINCIPAL 1. Fermer le disjoncteur (ou interrupteur) de COUPLAGE et fermer le disjoncteur (ou interrupteur) PRINCIPAL 2.
2. Sur le côté ligne du disjoncteur (ou interrupteur) PRINCIPAL 2, raccorder l'unité d'injection à courant élevé entre la phase A et le neutre (N). Voir la figure 11.
3. Sur la barre-bus de charge, raccorder un cavalier pour courant élevé entre la phase A et le neutre (N). Voir la figure 11.
4. Injecter 1000 A dans la phase A. Ni le disjoncteur (ou interrupteur) PRINCIPAL 2 ni le disjoncteur (ou interrupteur) de COUPLAGE doit se déclencher sur un défaut à la terre. Noter les résultats réels pour l'essai n° 7 dans le tableau 2 à la page 36.
5. Répéter l'essai n° 7 pour les phases B et C (non requis pour les systèmes homopolaires). Noter les résultats réels pour cet essai dans le tableau 2.

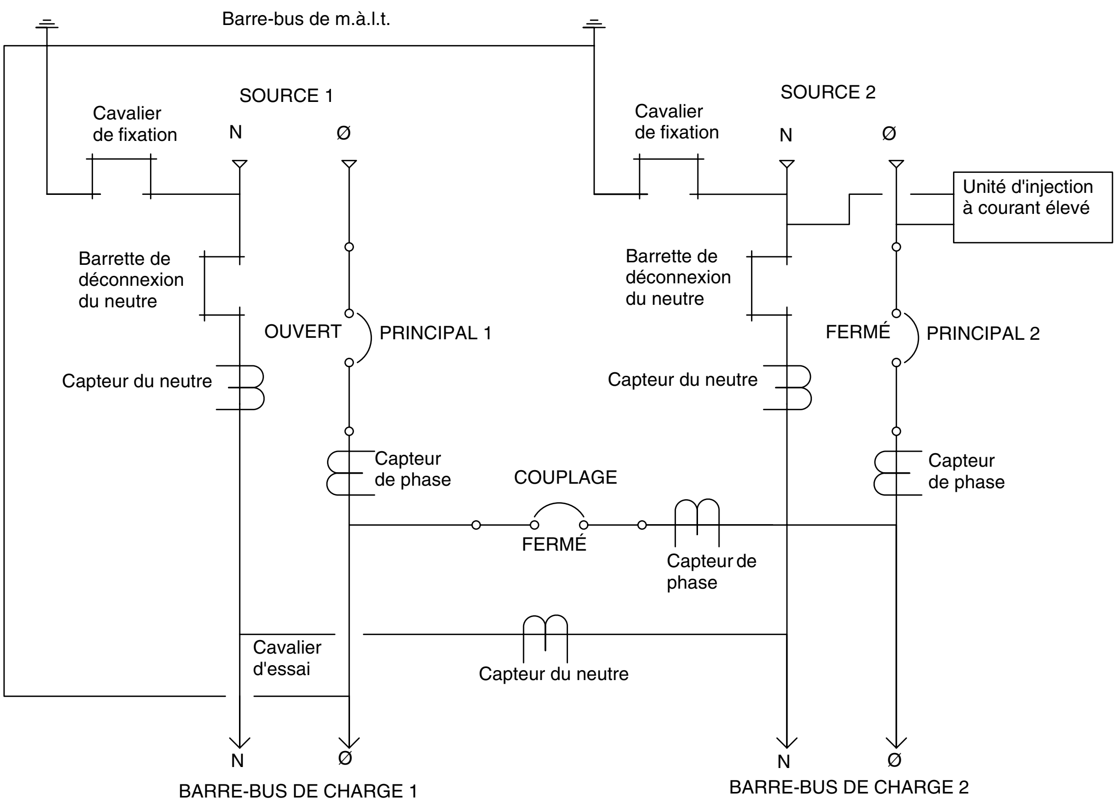
Figure 11 : Raccordements de l'unité d'injection de l'essai n° 7 (sans déclenchement) principal-couplage-principal et du cavalier d'essai



Essai n^{o} 8

1. Ouvrir le disjoncteur (ou interrupteur) PRINCIPAL 1. Fermer le disjoncteur (ou interrupteur) de COUPLAGE et fermer le disjoncteur (ou interrupteur) PRINCIPAL 2.
2. Sur le côté ligne du disjoncteur (ou interrupteur) PRINCIPAL 2, raccorder l'unité d'injection à courant élevé entre la phase A et le neutre (N). Voir la figure 12.
3. Sur la barre-bus de charge, raccorder un cavalier pour courant élevé entre la phase A et la terre. Voir la figure 12.
4. Injecter 1000 A dans la phase A. Le disjoncteur (ou interrupteur) PRINCIPAL 2 doit se déclencher sur un défaut à la terre mais le disjoncteur (ou interrupteur) de COUPLAGE ne doit pas se déclencher sur un défaut à la terre. Noter les résultats réels pour l'essai n^{o} 8 dans le tableau 2 à la page 36.
5. Répéter l'essai n^{o} 8 pour les phases B et C (non requis pour les systèmes homopolaires). Noter les résultats réels pour cet essai dans le tableau 2.
6. Une fois les essais terminés, remettre tous les réglages à leurs valeurs initiales.

Figure 12 : Raccordements de l'unité d'injection de l'essai n^{o} 8 (déclenchement) principal-couplage-principal et du cavalier d'essai



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CHAPITRE 5—CONFIGURATION PRINCIPAL-COUPLAGE AVEC RELAIS-PRINCIPAL, EN ÉTOILE MISE À LA TERRE

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez l'alimentation de l'appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension ayant une valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

1. Couper l'alimentation de l'appareil avant d'y travailler. Utiliser un dispositif de détection de tension ayant une valeur nominale appropriée pour s'assurer que l'alimentation est coupée.
2. S'assurer que tous les raccordements de barres-bus de terre sont solidement connectés. Pour chaque disjoncteur principal, vérifier si le raccordement de mise à la terre est effectué en amont de la barrette de déconnexion du neutre et sur le côté ligne de chaque capteur de défaut à la terre. Voir la figure 13.
3. Pour chaque disjoncteur principal, vérifier si un raccordement de neutre existe à partir du transformateur d'alimentation vers l'appareil.
4. Pour les systèmes à détection résiduelle, vérifier si les capteurs de toutes les phases et du neutre sont raccordés avec la polarité correcte au primaire et au secondaire. Se reporter aux plans fournis avec l'appareil.
5. Pour les systèmes de détection homopolaire, vérifier si les conducteurs de toutes les phases et du neutre passent dans la fenêtre du capteur dans le même sens, et que les conducteurs de mise à la terre ne passent pas dans cette fenêtre. Vérifier également si le capteur est raccordé avec la polarité correcte au primaire et au secondaire. Se reporter aux plans fournis avec l'appareil.
6. Retirer la barrette de déconnexion du neutre de chaque disjoncteur principal pour isoler les neutres du système de câblage à la fois de l'alimentation et de la terre.
7. Mesurer la résistance d'isolation neutre-terre du système afin de s'assurer qu'aucun raccordement à la terre n'existe sur le côté charge du système de protection contre les défauts à la terre. La résistance doit être au moins de 1 mégohm. Retirer tous les raccordements qui existent entre le neutre et la terre trouvés pendant cette vérification. Ne pas raccorder ces mises à la terre une fois la vérification terminée.
8. Replacer la barrette de déconnexion du neutre de chaque disjoncteur principal.
9. Noter tous les réglages d'activation et de temporisation pour chaque disjoncteur ou relais de défaut à la terre en cours d'essai dans le tableau 4 à la page 39. Une fois les essais terminés, remettre tous les réglages à leurs valeurs initiales.
10. Ajuster le réglage d'activation sur défaut à la terre de chaque disjoncteur ou relais de défaut à la terre à son niveau de courant le plus bas.
11. Ajuster le réglage de la temporisation de défaut à la terre de chaque disjoncteur ou relais de défaut à la terre en cours d'essai à 0,1 seconde (I2T OUT ou OFF).

12. Ajuster les réglages de l'enclenchement de longue durée, à temps court et instantané et de temporisation de chaque disjoncteur en cours d'essai à leurs niveaux les plus hauts.
13. Pour chaque disjoncteur principal et de couplage muni d'un déclencheur Micrologic® de type A, H ou P, raccorder une trousse d'essais portative Schneider Electric et activer la fonction d'inhibition d'image thermique conformément aux directives de la trousse. Cette étape est nécessaire pour inhiber les fonctions de l'historique des déclenchements et de l'indicateur de l'usure des contacts. Une fois les essais terminés, désactiver la fonction d'inhibition d'image thermique conformément aux directives de la trousse. Se reporter aux directives d'utilisation 48049-184-XX pour obtenir des informations supplémentaires.
14. Déconnecter la source d'alimentation de contrôle de protection contre les défauts à la terre, au cas ou celle-ci proviendrait d'une dérivation interne, et fournir une alimentation de contrôle à partir d'une source externe. Se reporter aux schémas de câblage fournis pour les raccordements spécifiques. Une fois les essais terminés, déconnecter l'alimentation de contrôle externe et rebrancher le circuit d'alimentation de contrôle interne.

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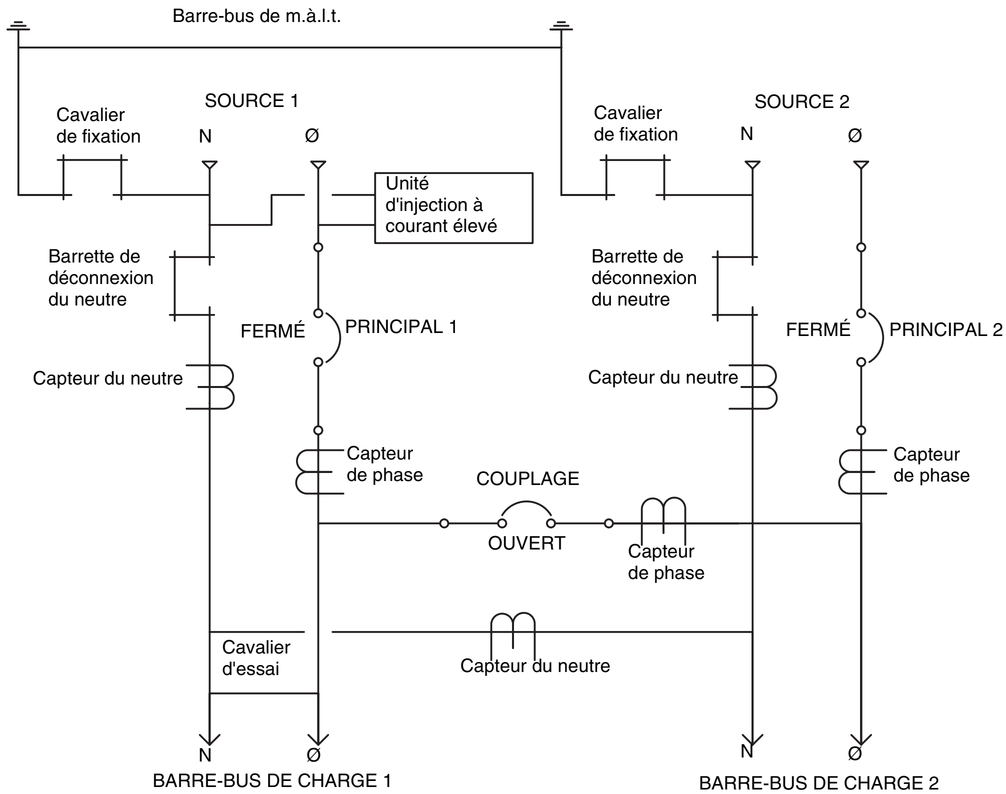
Essai n° 1

1. Fermer le disjoncteur (ou interrupteur) PRINCIPAL 1. Ouvrir le disjoncteur (ou interrupteur) de COUPLAGE et fermer le disjoncteur (ou interrupteur) PRINCIPAL 2.
2. Sur le côté ligne du disjoncteur (ou interrupteur) PRINCIPAL 1, raccorder l'unité d'injection à courant élevé entre la phase A et le neutre (N). Voir la figure 13.
3. Sur la barre-bus de charge, raccorder un cavalier pour courant élevé entre la phase A et le neutre (N). Voir la figure 13.
4. Injecter 1000 A dans la phase A. Le disjoncteur (ou interrupteur) PRINCIPAL 1 ne doit pas se déclencher sur un défaut à la terre. Noter les résultats réels pour l'essai n° 1 dans le tableau 3 à la page 37.
5. Répéter l'essai n° 1 pour les phases B et C (non requis pour les systèmes homopolaires). Noter les résultats réels pour cet essai dans le tableau 3.

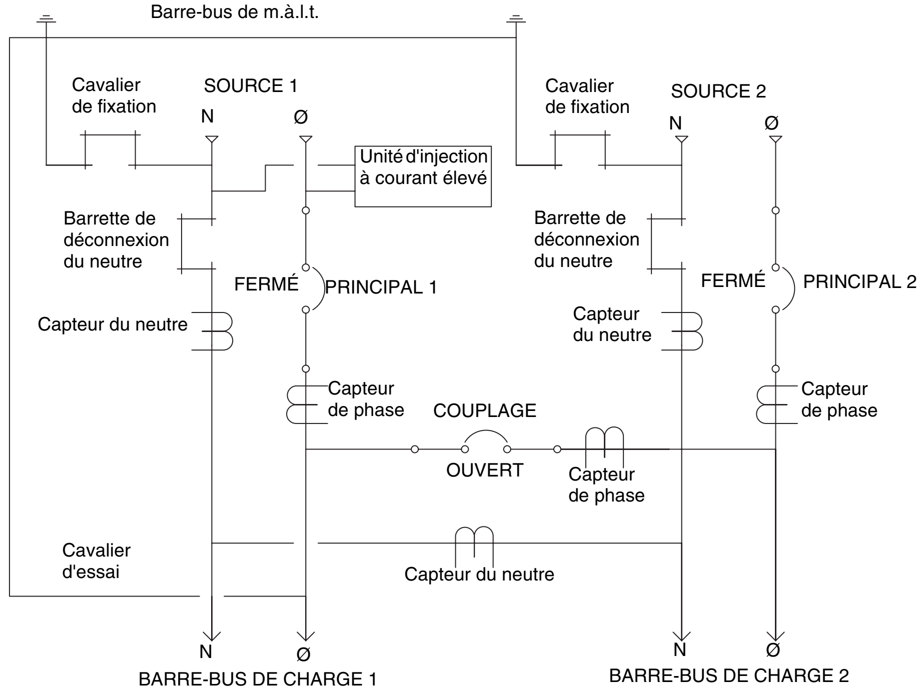
Figure 13 : Raccordements de l'unité d'injection de l'essai n° 1 (sans déclenchement) principal-couplage-principal et du cavalier d'essai



Essai n^{o} 2

1. Fermer le disjoncteur (ou interrupteur) PRINCIPAL 1. Ouvrir le disjoncteur (ou interrupteur) de COUPLAGE et fermer le disjoncteur (ou interrupteur) PRINCIPAL 2.
2. Sur le côté ligne du disjoncteur (ou interrupteur) PRINCIPAL 1, raccorder l'unité d'injection à courant élevé entre la phase A et le neutre (N). Voir la figure 14.
3. Sur la barre-bus de charge, raccorder un cavalier pour courant élevé entre la phase A et la terre. Voir la figure 14.
4. Injecter 1000 A dans la phase A. Le disjoncteur (ou interrupteur) PRINCIPAL 1 doit se déclencher sur un défaut à la terre. Noter les résultats réels pour l'essai n^{o} 2 dans le tableau 3 à la page 37.
5. Répéter l'essai n^{o} 2 pour les phases B et C (non requis pour les systèmes homopolaires). Noter les résultats réels pour cet essai dans le tableau 3.

Figure 14 : Raccordements de l'unité d'injection de l'essai n^{o} 2 (déclenchement) principal-couplage-principal et du cavalier d'essai

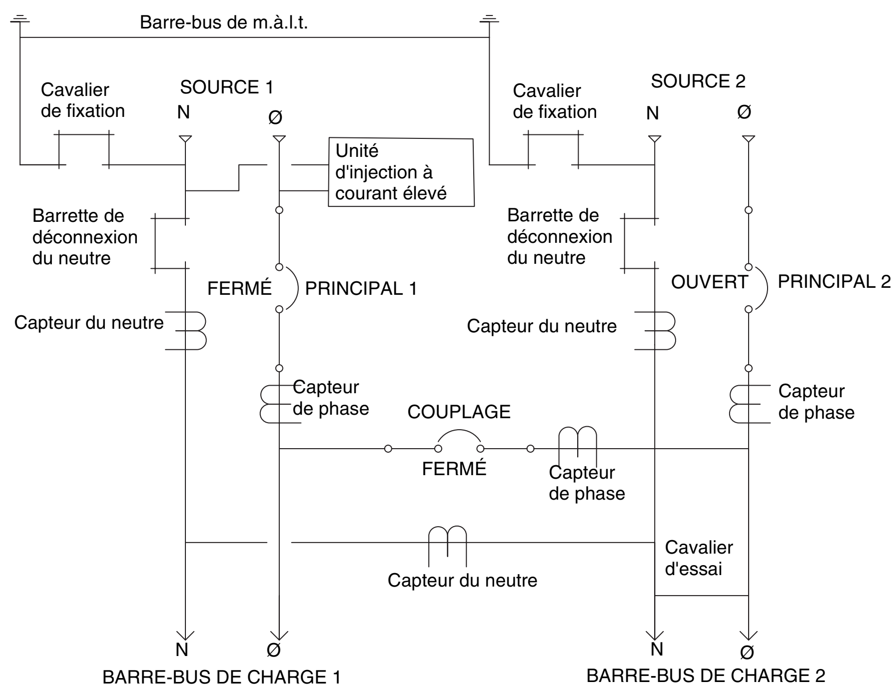


FRANÇAIS

Essai n° 3

1. Fermer le disjoncteur (ou interrupteur) PRINCIPAL 1. Fermer le disjoncteur (ou interrupteur) de COUPLAGE et ouvrir le disjoncteur (ou interrupteur) PRINCIPAL 2.
2. Sur le côté ligne du disjoncteur (ou interrupteur) PRINCIPAL 1, raccorder l'unité d'injection à courant élevé entre la phase A et le neutre (N). Voir la figure 15.
3. Sur la barre-bus de charge, raccorder un cavalier pour courant élevé entre la phase A et le neutre (N). Voir la figure 15.
4. Injecter 1000 A dans la phase A. Ni le disjoncteur (ou interrupteur) PRINCIPAL 1 ni le disjoncteur (ou interrupteur) de COUPLAGE doivent se déclencher sur un défaut à la terre. Noter les résultats réels pour l'essai n° 3 dans le tableau 3 à la page 37.
5. Répéter l'essai n° 3 pour les phases B et C (non requis pour les systèmes homopolaires). Noter les résultats réels pour cet essai dans le tableau 3.

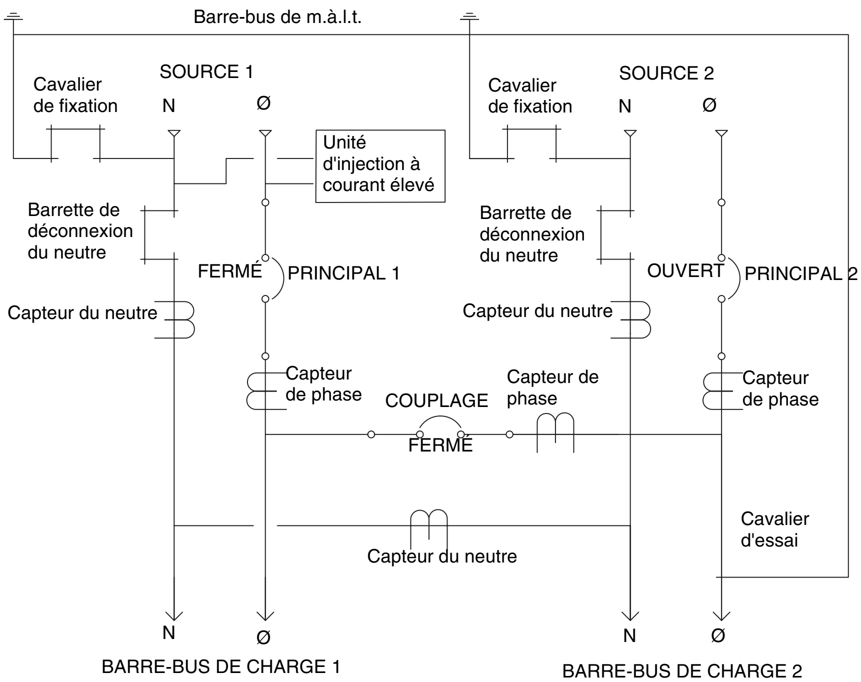
Figure 15 : Raccordements de l'unité d'injection de l'essai n° 3 (sans déclenchement) principal-couplage-principal et du cavalier d'essai



Essai n° 4

1. Fermer le disjoncteur (ou interrupteur) PRINCIPAL 1. Fermer le disjoncteur (ou interrupteur) de COUPLAGE et ouvrir le disjoncteur (ou interrupteur) PRINCIPAL 2.
2. Sur le côté ligne du disjoncteur (ou interrupteur) PRINCIPAL 1, raccorder l'unité d'injection à courant élevé entre la phase A et le neutre (N). Voir la figure 16.
3. Sur la barre-bus de charge, raccorder un cavalier pour courant élevé entre la phase A et la terre. Voir la figure 16.
4. Injecter 1000 A dans la phase A. Le disjoncteur (ou interrupteur) PRINCIPAL 1 ne doit pas se déclencher sur un défaut à la terre mais le disjoncteur (ou interrupteur) de COUPLAGE doit se déclencher sur un défaut à la terre. Noter les résultats réels pour l'essai n° 4 dans le tableau 3 à la page 37.
5. Répéter l'essai n° 4 pour les phases B et C (non requis pour les systèmes homopolaires). Noter les résultats réels pour cet essai dans le tableau 3.

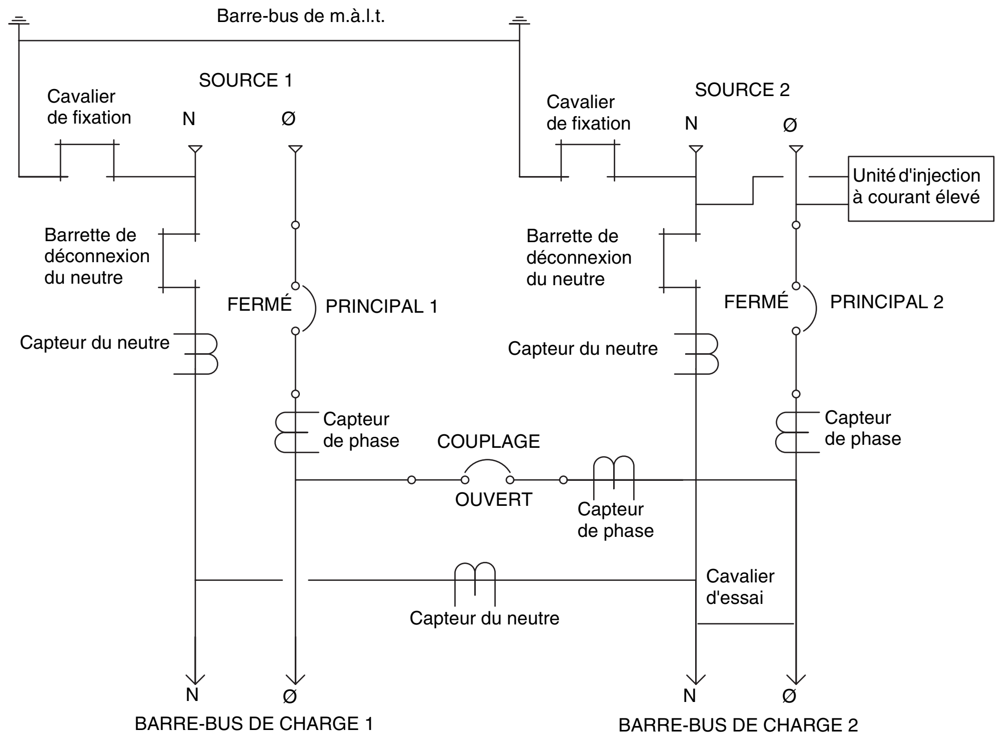
Figure 16 : Raccordements de l'unité d'injection de l'essai n° 4 (déclenchement) principal-couplage-principal et du cavalier d'essai



Essai n^{o} 5

1. Fermer le disjoncteur (ou interrupteur) PRINCIPAL 1. Ouvrir le disjoncteur (ou interrupteur) de COUPLAGE et fermer le disjoncteur (ou interrupteur) PRINCIPAL 2.
2. Sur le côté ligne du disjoncteur (ou interrupteur) PRINCIPAL 2, raccorder l'unité d'injection à courant élevé entre la phase A et le neutre (N). Voir la figure 17.
3. Sur la barre-bus de charge, raccorder un cavalier pour courant élevé entre la phase A et le neutre (N). Voir la figure 17.
4. Injecter 1000 A dans la phase A. Le disjoncteur (ou interrupteur) PRINCIPAL 2 ne doit pas se déclencher sur un défaut à la terre. Noter les résultats réels pour l'essai n^{o} 5 dans le tableau 3 à la page 37.
5. Répéter l'essai n^{o} 5 pour les phases B et C (non requis pour les systèmes homopolaires). Noter les résultats réels pour cet essai dans le tableau 3.

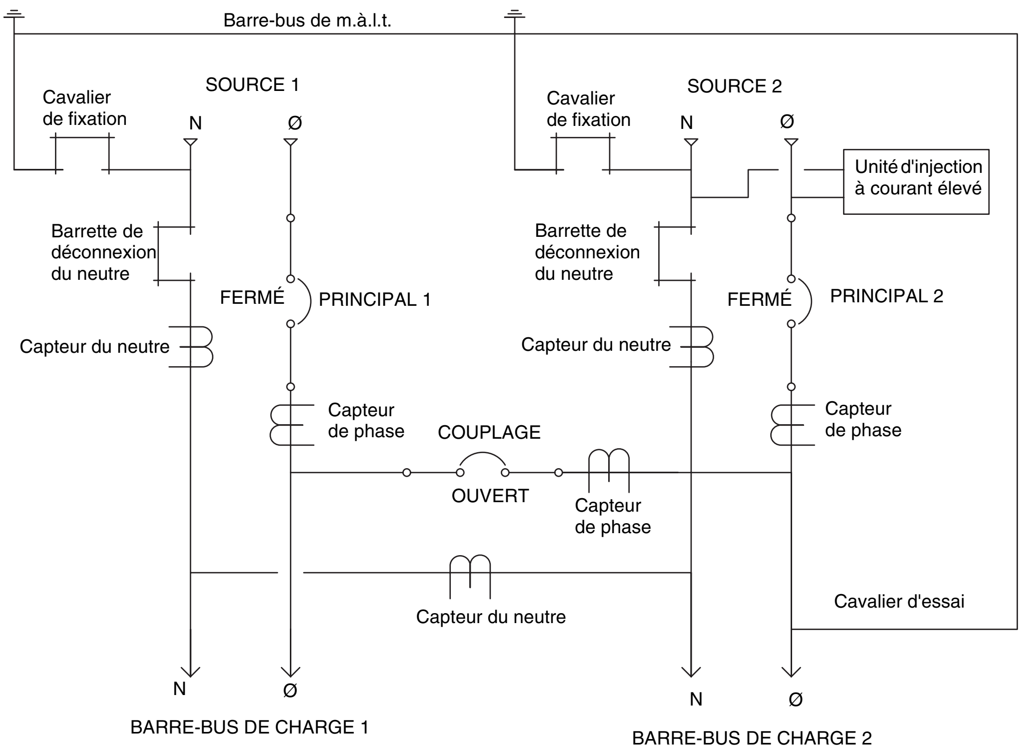
Figure 17 : Raccordements de l'unité d'injection de l'essai n^{o} 5 (sans déclenchement) principal-couplage-principal et du cavalier d'essai



Essai n^{o} 6

1. Fermer le disjoncteur (ou interrupteur) PRINCIPAL 1. Ouvrir le disjoncteur (ou interrupteur) de COUPLAGE et fermer le disjoncteur (ou interrupteur) PRINCIPAL 2.
2. Sur le côté ligne du disjoncteur (ou interrupteur) PRINCIPAL 2, raccorder l'unité d'injection à courant élevé entre la phase A et le neutre (N). Voir la figure 18.
3. Sur la barre-bus de charge, raccorder un cavalier pour courant élevé entre la phase A et la terre. Voir la figure 18.
4. Injecter 1000 A dans la phase A. Le disjoncteur (ou interrupteur) PRINCIPAL 2 doit se déclencher sur un défaut à la terre. Noter les résultats réels pour l'essai n^{o} 6 dans le tableau 3 à la page 37.
5. Répéter l'essai n^{o} 6 pour les phases B et C (non requis pour les systèmes homopolaires). Noter les résultats réels pour cet essai dans le tableau 3.

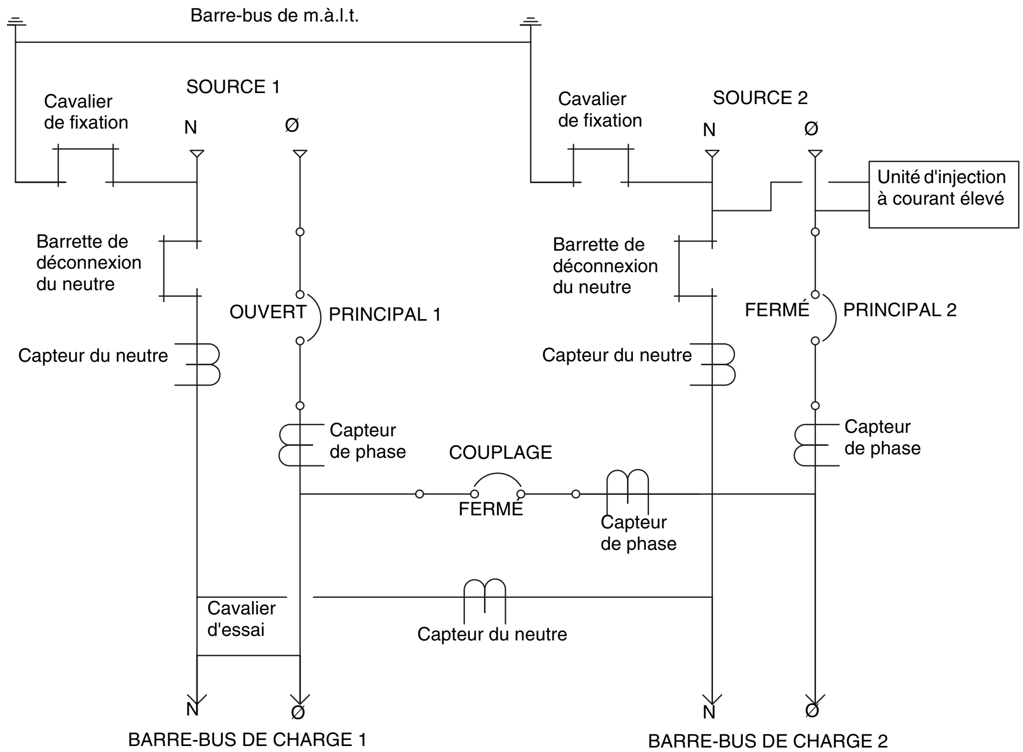
Figure 18 : Raccordements de l'unité d'injection de l'essai n^{o} 6 (déclenchement) principal-couplage-principal et du cavalier d'essai



Essai n^{o} 7

1. Ouvrir le disjoncteur (ou interrupteur) PRINCIPAL 1. Fermer le disjoncteur (ou interrupteur) de COUPLAGE et fermer le disjoncteur (ou interrupteur) PRINCIPAL 2.
2. Sur le côté ligne du disjoncteur (ou interrupteur) PRINCIPAL 2, raccorder l'unité d'injection à courant élevé entre la phase A et le neutre (N). Voir la figure 19.
3. Sur la barre-bus de charge, raccorder un cavalier pour courant élevé entre la phase A et le neutre (N). Voir la figure 19.
4. Injecter 1000 A dans la phase A. Ni le disjoncteur (ou interrupteur) PRINCIPAL 2 ni le disjoncteur (ou interrupteur) de COUPLAGE doivent se déclencher sur un défaut à la terre. Noter les résultats réels pour l'essai n^{o} 7 dans le tableau 3 à la page 37.
5. Répéter l'essai n^{o} 7 pour les phases B et C (non requis pour les systèmes homopolaires). Noter les résultats réels pour cet essai dans le tableau 3.

Figure 19 : Raccordements de l'unité d'injection de l'essai n^{o} 7 (sans déclenchement) principal-couplage-principal et du cavalier d'essai



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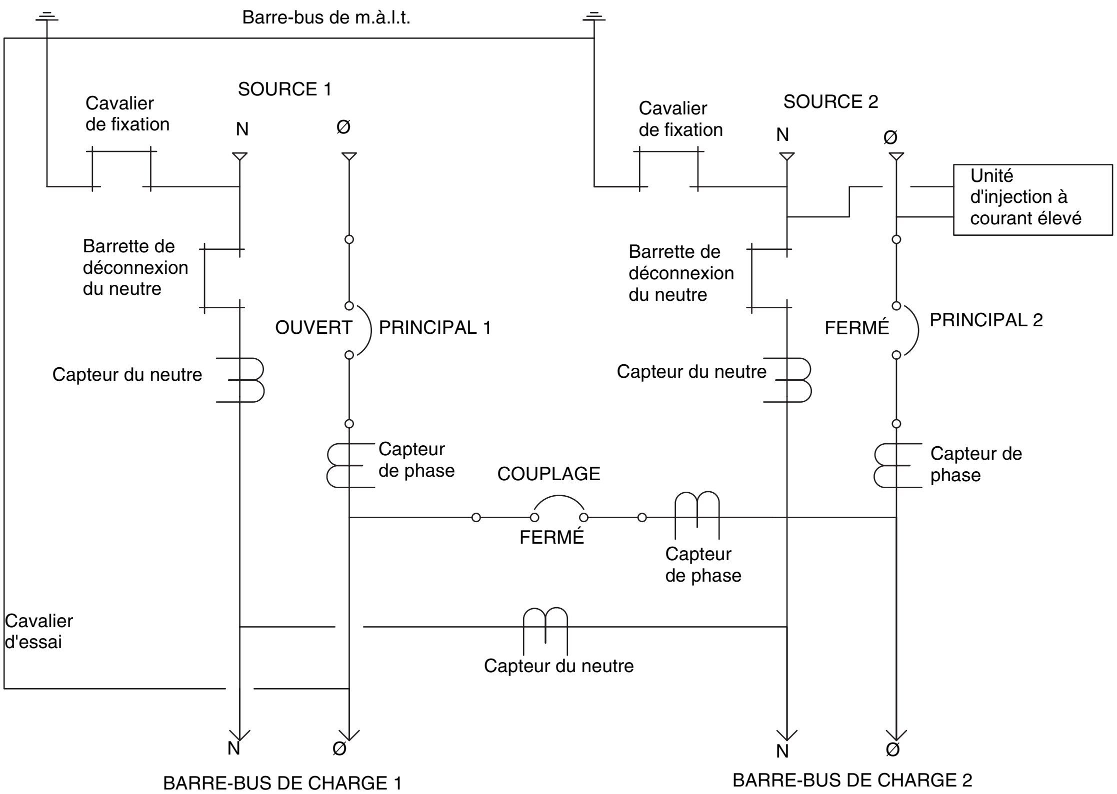
Essai n° 8

1. Ouvrir le disjoncteur (ou interrupteur) PRINCIPAL 1. Fermer le disjoncteur (ou interrupteur) de COUPLAGE et fermer le disjoncteur (ou interrupteur) PRINCIPAL 2.
2. Sur le côté ligne du disjoncteur (ou interrupteur) PRINCIPAL 2, raccorder l'unité d'injection à courant élevé entre la phase A et le neutre (N). Voir la figure 20.
3. Sur la barre-bus de charge, raccorder un cavalier pour courant élevé entre la phase A et la terre. Voir la figure 20.
4. Injecter 1000 A dans la phase A. Le disjoncteur (ou interrupteur) PRINCIPAL 2 ne doit pas se déclencher sur un défaut à la terre mais le disjoncteur (ou interrupteur) de COUPLAGE doit se déclencher sur un défaut à la terre. Noter les résultats réels pour l'essai n° 8 dans le tableau 3 à la page 37.
5. Répéter l'essai n° 8 pour les phases B et C (non requis pour les systèmes homopolaires). Noter les résultats réels pour cet essai dans le tableau 3.
6. Une fois les essais terminés, remettre tous les réglages à leurs valeurs initiales.

Figure 20 : Raccordements de l'unité d'injection de l'essai n° 8 (déclenchement) principal-couplage-principal et du cavalier d'essai



FRANÇAIS

CHAPITRE 6—JOURNAL DES PROCÉDURES D'ESSAI PRINCIPAL-PRINCIPAL

Tableau 1 :   Journal des procédures d'essai principal-principal

Nº de l'essai	Raccordement du cavalier	État du disjoncteur		Courant d'injection	Résultats envisagés	Résultats réels		
		PRINCIPAL 1	PRINCIPAL 2			Phase A	Phase B	Phase C
1	Phase de la BARRE-BUS DE CHARGE 1 au neutre de la BARRE-BUS DE CHARGE 1	Fermé	Ouvert	1 000 A	Disjoncteur PRINCIPAL 1 «sans déclenchement»			
2	Phase de la BARRE-BUS DE CHARGE 1 à la terre de la BARRE-BUS DE CHARGE 1	Fermé	Ouvert	1 000 A	Disjoncteur PRINCIPAL 1 «déclenchement»			
3	Phase de la BARRE-BUS DE CHARGE 2 au neutre de la BARRE-BUS DE CHARGE 2	Ouvert	Fermé	1 000 A	Disjoncteur PRINCIPAL 2 «sans déclenchement»			
4	Phase de la BARRE-BUS DE CHARGE 2 à la terre de la BARRE-BUS DE CHARGE 2	Ouvert	Fermé	1 000 A	Disjoncteur PRINCIPAL 2 «déclenchement»			

Nº de l'essai	Raccordement du cavalier	État du disjoncteur		Courant d'injection	Résultats envisagés	Résultats réels		
		PRINCIPAL 1	PRINCIPAL 2			Phase A	Phase B	Phase C
1	Phase de la BARRE-BUS DE CHARGE 1 au neutre de la BARRE-BUS DE CHARGE 1	Fermé	Ouvert	1 000 A	Disjoncteur PRINCIPAL 1 «sans déclenchement»			
2	Phase de la BARRE-BUS DE CHARGE 1 à la terre de la BARRE-BUS DE CHARGE 1	Fermé	Ouvert	1 000 A	Disjoncteur PRINCIPAL 1 «déclenchement»			
3	Phase de la BARRE-BUS DE CHARGE 2 au neutre de la BARRE-BUS DE CHARGE 2	Ouvert	Fermé	1 000 A	Disjoncteur PRINCIPAL 2 «sans déclenchement»			
4	Phase de la BARRE-BUS DE CHARGE 2 à la terre de la BARRE-BUS DE CHARGE 2	Ouvert	Fermé	1 000 A	Disjoncteur PRINCIPAL 2 «déclenchement»			

Nº de l'essai	Raccordement du cavalier	État du disjoncteur		Courant d'injection	Résultats envisagés	Résultats réels		
		PRINCIPAL 1	PRINCIPAL 2			Phase A	Phase B	Phase C
1	Phase de la BARRE-BUS DE CHARGE 1 au neutre de la BARRE-BUS DE CHARGE 1	Fermé	Ouvert	1 000 A	Disjoncteur PRINCIPAL 1 «sans déclenchement»			
2	Phase de la BARRE-BUS DE CHARGE 1 à la terre de la BARRE-BUS DE CHARGE 1	Fermé	Ouvert	1 000 A	Disjoncteur PRINCIPAL 1 «déclenchement»			
3	Phase de la BARRE-BUS DE CHARGE 2 au neutre de la BARRE-BUS DE CHARGE 2	Ouvert	Fermé	1 000 A	Disjoncteur PRINCIPAL 2 «sans déclenchement»			
4	Phase de la BARRE-BUS DE CHARGE 2 à la terre de la BARRE-BUS DE CHARGE 2	Ouvert	Fermé	1 000 A	Disjoncteur PRINCIPAL 2 «déclenchement»			

Tableau 1 : Journal des procédures d'essai principal-principal *(suite)*

N^{o} de l'essai	Raccordement du cavalier	État du disjoncteur		Courant d'injection	Résultats envisagés	Résultats réels		
		PRINCIPAL 1	PRINCIPAL 2			Phase A	Phase B	Phase C
1	Phase de la BARRE-BUS DE CHARGE 1 au neutre de la BARRE-BUS DE CHARGE 1	Fermé	Ouvert	1 000 A	Disjoncteur PRINCIPAL 1 «sans déclenchement»			
2	Phase de la BARRE-BUS DE CHARGE 1 à la terre de la BARRE-BUS DE CHARGE 1	Fermé	Ouvert	1 000 A	Disjoncteur PRINCIPAL 1 «déclenchement»			
3	Phase de la BARRE-BUS DE CHARGE 2 au neutre de la BARRE-BUS DE CHARGE 2	Ouvert	Fermé	1 000 A	Disjoncteur PRINCIPAL 2 «sans déclenchement»			
4	Phase de la BARRE-BUS DE CHARGE 2 à la terre de la BARRE-BUS DE CHARGE 2	Ouvert	Fermé	1 000 A	Disjoncteur PRINCIPAL 2 «déclenchement»			

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CHAPITRE 7—JOURNAL DES PROCÉDURES D'ESSAI PRINCIPAL-COUPLAGE SANS RELAIS -PRINCIPAL

Tableau 2 : Journal des procédures d'essai principal-couplage sans relais-principal

N° de l'essai	Raccordement du cavalier	État du disjoncteur			Courant d'injection	Résultats envisagés	Résultats réels		
		PRINCIP. 1	COUPLAGE	PRINCIP. 2			Phase A	Phase B	Phase C
1	Phase de la BARRE-BUS DE CHARGE 1 au neutre de la BARRE-BUS DE CHARGE 1	Fermé	Ouvert	Fermé	1 000 A	Disjoncteur PRINCIPAL 1 «sans déclenchement»			
2	Phase de la BARRE-BUS DE CHARGE 1 à la terre de la BARRE-BUS DE CHARGE 1	Fermé	Ouvert	Fermé	1 000 A	Disjoncteur PRINCIPAL 1 «déclenchement»			
3	Phase de la BARRE-BUS DE CHARGE 2 au neutre de la BARRE-BUS DE CHARGE 2	Fermé	Fermé	Ouvert	1 000 A	Disjoncteur PRINCIPAL 1 «sans déclenchement»			
4	Phase de la BARRE-BUS DE CHARGE 2 à la terre de la BARRE-BUS DE CHARGE 2	Fermé	Fermé	Ouvert	1 000 A	Disjoncteur PRINCIPAL 1 «déclenchement»			
5	Phase de la BARRE-BUS DE CHARGE 2 au neutre de la BARRE-BUS DE CHARGE 2	Fermé	Ouvert	Fermé	1 000 A	Disjoncteur PRINCIPAL 2 «sans déclenchement»			
6	Phase de la BARRE-BUS DE CHARGE 2 à la terre de la BARRE-BUS DE CHARGE 2	Fermé	Ouvert	Fermé	1 000 A	Disjoncteur PRINCIPAL 2 «déclenchement»			
7	Phase de la BARRE-BUS DE CHARGE 1 au neutre de la BARRE-BUS DE CHARGE 1	Ouvert	Fermé	Fermé	1 000 A	Disjoncteur PRINCIPAL 2 «sans déclenchement»			
8	Phase de la BARRE-BUS DE CHARGE 1 à la terre de la BARRE-BUS DE CHARGE 1	Ouvert	Fermé	Fermé	1 000 A	Disjoncteur PRINCIPAL 2 «déclenchement»			

Nº de l'essai	Raccordement du cavalier	État du disjoncteur			Courant d'injection	Résultats envisagés	Résultats réels		
		PRINCIP. 1	COUPLAGE	PRINCIP. 2			Phase A	Phase B	Phase C
1	Phase de la BARRE-BUS DE CHARGE 1 au neutre de la BARRE-BUS DE CHARGE 1	Fermé	Ouvert	Fermé	1 000 A	Disjoncteur PRINCIPAL 1 «sans déclenchement»			
2	Phase de la BARRE-BUS DE CHARGE 1 à la terre de la BARRE-BUS DE CHARGE 1	Fermé	Ouvert	Fermé	1 000 A	Disjoncteur PRINCIPAL 1 «déclenchement»			
3	Phase de la BARRE-BUS DE CHARGE 2 au neutre de la BARRE-BUS DE CHARGE 2	Fermé	Fermé	Ouvert	1 000 A	Disjoncteur PRINCIPAL 1 «sans déclenchement»			
4	Phase de la BARRE-BUS DE CHARGE 2 à la terre de la BARRE-BUS DE CHARGE 2	Fermé	Fermé	Ouvert	1 000 A	Disjoncteur PRINCIPAL 1 «déclenchement»			
5	Phase de la BARRE-BUS DE CHARGE 2 au neutre de la BARRE-BUS DE CHARGE 2	Fermé	Ouvert	Fermé	1 000 A	Disjoncteur PRINCIPAL 2 «sans déclenchement»			
6	Phase de la BARRE-BUS DE CHARGE 2 à la terre de la BARRE-BUS DE CHARGE 2	Fermé	Ouvert	Fermé	1 000 A	Disjoncteur PRINCIPAL 2 «déclenchement»			
7	Phase de la BARRE-BUS DE CHARGE 1 au neutre de la BARRE-BUS DE CHARGE 1	Ouvert	Fermé	Fermé	1 000 A	Disjoncteur PRINCIPAL 2 «sans déclenchement»			
8	Phase de la BARRE-BUS DE CHARGE 1 à la terre de la BARRE-BUS DE CHARGE 1	Ouvert	Fermé	Fermé	1 000 A	Disjoncteur PRINCIPAL 2 «déclenchement»			

CHAPITRE 8—JOURNAL DES PROCÉDURES D'ESSAI PRINCIPAL-COUPLAGE AVEC RELAIS-PRINCIPAL

Tableau 3 : Journal des procédures d'essai principal-couplage avec relais-principal

N° de l'essai	Raccordement du cavalier	État du disjoncteur			Courant d'injection	Résultats envisagés	Résultats réels		
		PRINCIP. 1	COUPLAGE	PRINCIP. 2			Phase A	Phase B	Phase C
1	Phase de la BARRE-BUS DE CHARGE 1 au neutre de la BARRE-BUS DE CHARGE 1	Fermé	Ouvert	Fermé	1 000 A	Disjoncteur PRINCIPAL 1 «sans déclenchement»			
2	Phase de la BARRE-BUS DE CHARGE 1 à la terre de la BARRE-BUS DE CHARGE 1	Fermé	Ouvert	Fermé	1 000 A	Disjoncteur PRINCIPAL 1 «déclenchement»			
3	Phase de la BARRE-BUS DE CHARGE 2 au neutre de la BARRE-BUS DE CHARGE 2	Fermé	Fermé	Ouvert	1 000 A	Disjoncteur PRINCIPAL 1 «sans déclenchement», COUPLAGE «sans déclenchement»			
4	Phase de la BARRE-BUS DE CHARGE 2 à la terre de la BARRE-BUS DE CHARGE 2	Fermé	Fermé	Ouvert	1 000 A	Disjoncteur PRINCIPAL 1 «sans déclenchement», COUPLAGE «déclenchement»			
5	Phase de la BARRE-BUS DE CHARGE 2 au neutre de la BARRE-BUS DE CHARGE 2	Fermé	Ouvert	Fermé	1 000 A	Disjoncteur PRINCIPAL 2 «sans déclenchement»			
6	Phase de la BARRE-BUS DE CHARGE 2 à la terre de la BARRE-BUS DE CHARGE 2	Fermé	Ouvert	Fermé	1 000 A	Disjoncteur PRINCIPAL 2 «déclenchement»			
7	Phase de la BARRE-BUS DE CHARGE 1 au neutre de la BARRE-BUS DE CHARGE 1	Ouvert	Fermé	Fermé	1 000 A	Disjoncteur PRINCIPAL 2 «sans déclenchement», COUPLAGE «sans déclenchement»			
8	Phase de la BARRE-BUS DE CHARGE 1 à la terre de la BARRE-BUS DE CHARGE 1	Ouvert	Fermé	Fermé	1 000 A	Disjoncteur PRINCIPAL 2 «sans déclenchement», COUPLAGE «déclenchement»			

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Tableau 3 : Journal des procédures d'essai principal-couplage avec relais-principal *(suite)*

N° de l'essai	Raccordement du cavalier	État du disjoncteur			Courant d'injection	Résultats envisagés	Résultats réels		
		PRINCIP. 1	COUPLAGE	PRINCIP. 2			Phase A	Phase B	Phase C
1	Phase de la BARRE-BUS DE CHARGE 1 au neutre de la BARRE-BUS DE CHARGE 1	Fermé	Ouvert	Fermé	1 000 A	Disjoncteur PRINCIPAL 1 «sans déclenchement»			
2	Phase de la BARRE-BUS DE CHARGE 1 à la terre de la BARRE-BUS DE CHARGE 1	Fermé	Ouvert	Fermé	1 000 A	Disjoncteur PRINCIPAL 1 «déclenchement»			
3	Phase de la BARRE-BUS DE CHARGE 2 au neutre de la BARRE-BUS DE CHARGE 2	Fermé	Fermé	Ouvert	1 000 A	Disjoncteur PRINCIPAL 1 «sans déclenchement», COUPLAGE «sans déclenchement»			
4	Phase de la BARRE-BUS DE CHARGE 2 à la terre de la BARRE-BUS DE CHARGE 2	Fermé	Fermé	Ouvert	1 000 A	Disjoncteur PRINCIPAL 1 «sans déclenchement», COUPLAGE «déclenchement»			
5	Phase de la BARRE-BUS DE CHARGE 2 au neutre de la BARRE-BUS DE CHARGE 2	Fermé	Ouvert	Fermé	1 000 A	Disjoncteur PRINCIPAL 2 «sans déclenchement»			
6	Phase de la BARRE-BUS DE CHARGE 2 à la terre de la BARRE-BUS DE CHARGE 2	Fermé	Ouvert	Fermé	1 000 A	Disjoncteur PRINCIPAL 2 «déclenchement»			
7	Phase de la BARRE-BUS DE CHARGE 1 au neutre de la BARRE-BUS DE CHARGE 1	Ouvert	Fermé	Fermé	1 000 A	Disjoncteur PRINCIPAL 2 «sans déclenchement», COUPLAGE «sans déclenchement»			
8	Phase de la BARRE-BUS DE CHARGE 1 à la terre de la BARRE-BUS DE CHARGE 1	Ouvert	Fermé	Fermé	1 000 A	Disjoncteur PRINCIPAL 2 «sans déclenchement», COUPLAGE «déclenchement»			

FRANÇAIS

CHAPITRE 9—ENREGISTREMENT DES ESSAIS ET DES RÉGLAGES

Tableau 4 : Enregistrement des essais et des réglages

Date	Essai	ID du disjoncteur	Réglages		Résultats et signature
			Activation	Temporisation	
	Installation				

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Injection primaire à courant élevé
Directives d'utilisation

Schneider Electric Canada

19 Waterman Avenue,
M4B 1 Y2
Toronto, Ontario
1-800-565-6699
www.schneider-electric.ca

Remplace: 80043-058-01 8/2001

04/2005

Primary High Current Injection
Inyección primaria de alta corriente
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Hand-Held Test Kit (HHTK)

For Micrologic™ Trip Units and Compact™ NS Circuit Breakers Equipped with STR Trip Units

Retain for future use.

Identification

(A) Battery Compartment (five 9.0 V)

(B) Short-Circuit Trip LED (red)

(C) Ground-Fault Trip LED (red)

(D) Ground-Fault Inhibit LED (green)

(E) Thermal-Imaging Inhibit LED (green)

(F) Trip Unit Power Supply LED (green)

(G) Low Battery LED (amber)

(H) Good Battery LED (green)

(I) Trip Unit Test Cable 10-pin Port

(J) 9 V Battery Test Button

(K) Trip Unit Power Supply Button

(L) Thermal-imaging Inhibit Button

(M) Ground-fault Inhibit Button

(N) Ground-fault Trip Button

(O) Short-circuit Trip Button

Figure 1: Hand-Held Test Kit

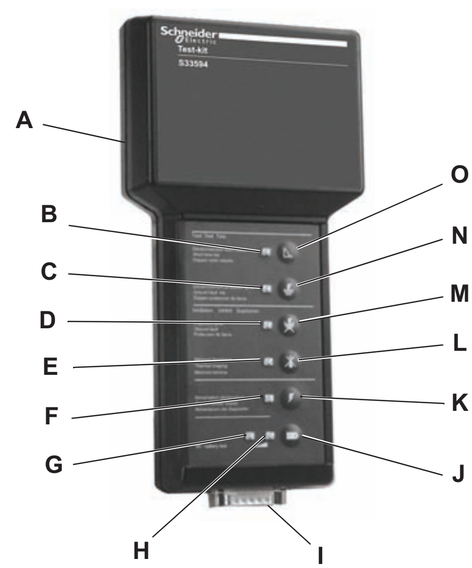

Figure 2: Hand-Held Test Kit Accessories

2-pin Test Cable for STR Trip Units

7-pin Test Cable for Micrologic™ Trip Units

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Battery Installation

NOTE: The Hand-Held Test Kit uses five 9.0 V alkaline batteries (not supplied). Recommended battery is Panasonic Industrial Alkaline 9 V, part number 6AM-6PIX/1S, or equivalent. Do not use nickel metal hydride, NiCd, manganese or lithium batteries as damage can result to the internal circuitry of the Hand-Held Test Kit.

NOTE: There are no repairable internal parts for the Hand-Held Test Kit. Housing should only be opened to install or replace batteries.

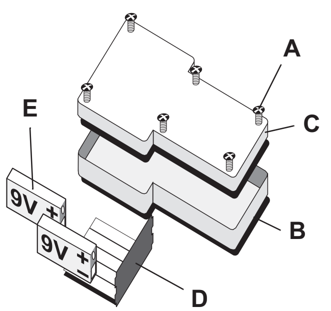
NOTICE

HAZARD OF EQUIPMENT DAMAGE

This equipment uses five 9.0 V alkaline batteries only. Do not use nickel metal hydride, NiCd, manganese or lithium batteries.

Failure to follow these instructions can result in damage to the internal circuitry of this equipment.

Figure 3: Battery Installation



1. Remove six screws **(A)**.
2. Separate front housing **(B)** of Hand-Held Test Kit from back housing **(C)**.
3. Carefully remove battery circuit board **(D)**.
4. If replacing batteries, remove old batteries.
5. Insert new batteries **(E)** making sure polarity is correct.
6. Carefully install battery circuit board **(D)**.
7. Attach back housing **(C)** of Hand-Held Test Kit to front housing **(B)** using six previously removed tapping screws **(A)**.

Determine Trip Unit Compatibility

Table 1: Trip Unit Compatibility [1]

Trip Unit Type		Test Cable	Test Functions		Inhibit Functions		Trip Unit Power Supply	Battery Test
			Short-circuit Trip	Ground-fault Trip	Ground-fault Inhibit	Thermal-imaging Inhibit		
Non-Communicating	STR22, STR23, STR43	2-pin Test Cable	■					■
	STR53		■	■				■
	ET1.0I, ET 1.0M	7-pin Test Cable	■					■
	ET 1.0		■			■		■
	Micrologic 2.0, 3.0, 5.0		■					■
Communicating	Micrologic 2.0A, 3.0A, 5.0A, 5.0P, 5.0H		■			■	■	■
	Micrologic 6.0A, 6.0P, 6.0H, 7.0A, 7.0P, 7.0H		■		■	■	■	■
No Trip Unit Connected		2- or 7-pin Test Cable						■

1 If a non-supported test or inhibit function is initiated on a trip unit, an error message will appear and circuit breaker may trip.

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Connections

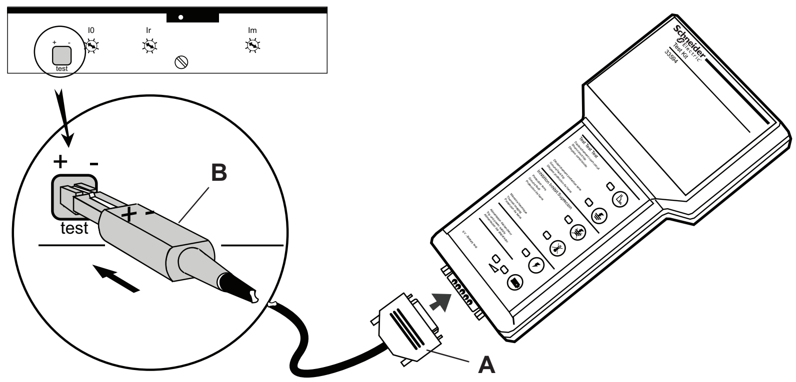
NOTE: Trip unit must be installed in circuit breaker in order to properly execute Hand-Held Test Kit tests and inhibit functions.

Compact™ NS Circuit Breakers Equipped with STR Trip Units

1. Connect test cable 10-pin connector **(A, Figure 4)** to 10-pin port on Hand-Held Test Kit.
2. Connect test cable 2-pin connector **(B)** to test port on STR trip units. Make sure to observe correct polarity.

NOTE: Refer to Ground-fault Trip Test for proper ground-fault connection.

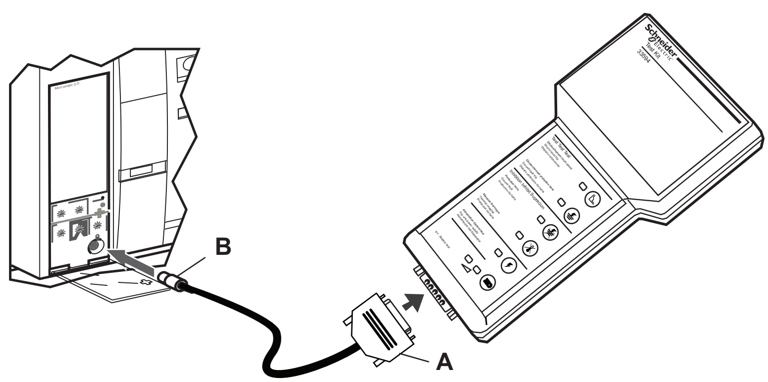
Figure 4: Connection to STR Trip Units



Micrologic™ Trip Units

1. Connect test cable 10-pin connector **(A, Figure 5)** to 10-pin port on Hand-Held Test Kit.
2. Connect test cable 7-pin connector **(B)** to test port on Micrologic trip units. Refer to instruction label on test cable for connection instructions.

Figure 5: Connection to Micrologic Trip Units



Error Message Indication

An error message is indicated by all LEDs lighting at once. If an error message is displayed during Hand-Held Test Kit operation, check all connections then refer to Table 1 and Troubleshooting section.

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Tests

Short-Circuit Trip Test

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

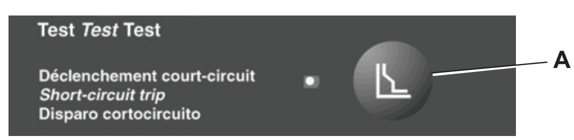
This test verifies operation of trip unit short-circuit protection function. The Hand-Held Test Kit supplies power to trip unit while injecting a secondary fault signal large enough to cause tripping of circuit breaker. For Micrologic A trip units only, performing this test will reset to zero the maximum recorded value on each phase. If necessary, record maximum values before testing.

NOTE: Short-circuit tests will not be recorded in trip log of Micrologic P and H trip units. Advanced protection and alarms will also be disabled during test. Refer to trip unit instruction bulletin for advanced protection features.

1. Close circuit breaker being tested. Use a properly rated voltage sensing device to verify circuit breaker is not carrying current.
2. Press short-circuit trip button **(A, Figure 6)**.
   a. For non-communicating trip units (see Table 1), the red short-circuit trip LED will light solid indicating short-circuit trip test is in progress.
   b. For communicating trip units (see Table 1), the red short-circuit trip LED will flicker indicating communication activity with the trip unit while short-circuit trip test is in progress.

   NOTE: All LEDs lighting at once indicates Hand-Held Test Kit cannot establish communication with trip unit. The trip unit gives communication priority to the circuit breaker communications module (BCM). When BCM is powered and operating, its communication activities take precedence over Hand-Held Test Kit commands. After all LEDs go out, repeat step 2. If all LEDs light up again, disconnect power from E1 and E2 terminals of BCM and repeat step 2.

Figure 6: Short-Circuit Trip Button



3. Confirm test was successful by verifying circuit breaker tripped. Refer to circuit breaker and trip unit instruction bulletins for proper circuit breaker operation.

4. For communicating trip units wait for test exit communication, indicated by flickering red short-circuit trip LED, before disconnecting Hand-Held Test Kit.
5. Test exit communication is complete when red short-circuit trip LED turns off automatically with no error display.

Ground-Fault Trip Test (STR 53 Trip Units Only)

NOTICE

HAZARD OF INVALID READING

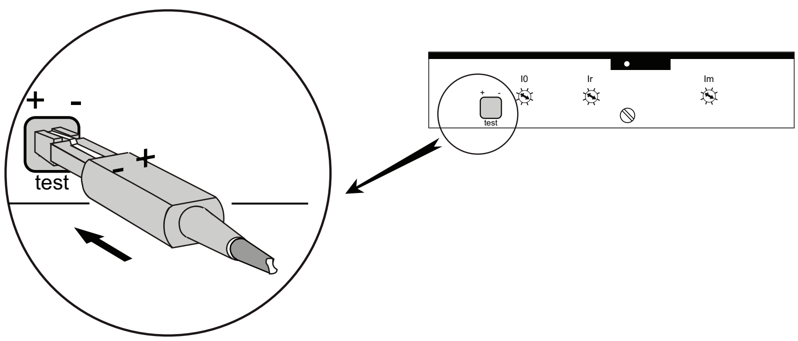
Make sure to reverse the polarity of 2-pin test cable before performing ground-fault trip test.

Failure to follow these instructions can result in inaccurate test results.

The Hand-Held Test Kit can be used to verify ground-fault protection for STR53 trip units only.

1. Close circuit breaker being tested. Use a properly rated voltage sensing device to verify circuit breaker is not carrying current.
2. Make sure to reverse the polarity of 2-pin test cable connection as shown in Figure 7.

Figure 7: Reverse Polarity



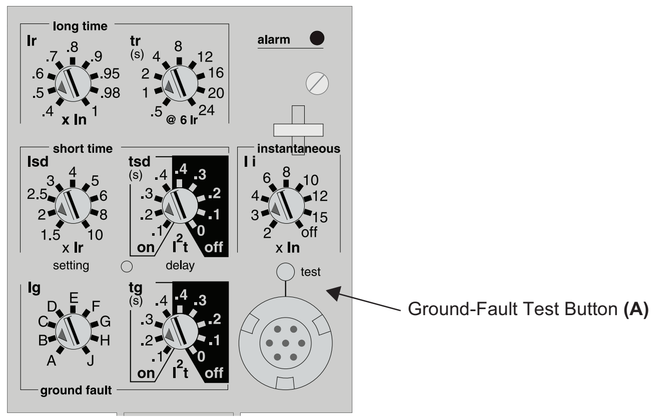
3. Press ground-fault trip button **(A, Figure 8)**. The red ground-fault trip LED will light solid indicating ground-fault trip test is in progress.
4. Confirm test was successful by verifying circuit breaker tripped. Refer to circuit breaker and trip unit instruction bulletins for proper circuit breaker operation.
5. Once ground-fault trip test is successfully completed, red ground-fault trip LED turns off automatically with no error display.

Figure 8: Ground-Fault Trip Button

Ground-Fault Trip Test (Micrologic™ A, P, and H Trip Units)

1. For Micrologic 6.0A, 6.0P, 6.0H, 7.0P, and 7.0H trip unit, use the Hand-Held Test Kit to power the trip unit and iinhibit thermal-imaging as described in this instruction bulletin.
2. Close the circuit breaker being tested. Use a properly rated voltage sensing device to verify circuit breaker is not carrying current.
3. Press the ground-fault test button (A) shown in Figure 9.
4. Confirm test was successful by verifying circuit breaker tripped. Refer to circuit breaker and trip unit instruction bulletins for proper circuit breaker operation.

Figure 9: Ground-fault Test Button



Inhibit Functions

Inhibit functions are only available during long-time, short-time, instantaneous and ground-fault (LSIG) primary-injection testing of certain communicating Micrologic trip units (see Table 1). For Micrologic P and H trip units, inhibit functions disable advanced protection, alarms and logging of events during testing. Refer to trip unit instruction bulletin for advanced protection features.

Ground-Fault Inhibit

NOTE: Activating ground-fault inhibit will automatically activate thermal-imaging inhibit and enable zone-selective interlocking (ZSI) self-restraint.

1. Press ground-fault inhibit button **(A, Figure 10)**. This action, indicated by flickering green ground-fault inhibit LED, powers the trip unit and sends a message to inhibit ground fault, inhibit thermal imaging and ZSI self-restrain the circuit breaker. Once green LED lights solid, ground fault and thermal imaging are being inhibited and the circuit breaker is ZSI self-restrained and ready for primary injection testing. Green LED will remain continuously lit with exception of one flash every minute to indicate communication activity with trip unit.

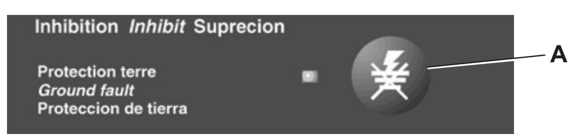
   NOTE: All LEDs lighting at once indicates Hand-Held Test Kit cannot establish communication with trip unit. The trip unit gives communication priority to the circuit breaker communications module (BCM). When BCM is powered and operating, its communication activities take precedence over Hand-Held Test Kit commands. After all LEDs go out, repeat step 2. If all LEDs light up again, disconnect power from E1 and E2 terminals of BCM and repeat step 2.

2. Once primary injection testing is completed, press ground-fault inhibit button **(A)** to terminate ground-fault inhibit, thermal-imaging inhibit and ZSI self-restrain and turn off Hand-Held Test Kit.

   NOTE: When performing multiple primary-injection tests, stop the ground-fault inhibit function between each test by pressing the ground-fault inhibit button **(A)** and waiting until all Hand-Held Test Kit LEDs turn off. Restart the ground-fault inhibit function by following step 2 above.

3. Before disconnecting Hand-Held Test Kit, wait for test exit communication indicated by flickering green ground-fault inhibit LED. Test exit communication is complete when green ground-fault inhibit LED turns off.

Figure 10: Ground-fault Inhibit Button



NOTE: If no buttons are pressed for 15 minutes after ground-fault inhibit is initiated, Hand-Held Test Kit will automatically turn off terminating ground-fault inhibit, thermal-imaging inhibit and ZSI self-restrain.

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Thermal-Imaging Inhibit

Thermal imaging provides continuous temperature rise status of circuit breaker cabling both before and after a device trips. Under normal conditions a 15-minute delay is required following a device tripping to allow system to cool before returning to normal functionality. The thermal-imaging inhibit function inhibits thermal imaging, thus overriding the 15-minute delay and allowing for multiple consecutive primary injection tests.

NOTE: Activating thermal-imaging inhibit will automatically enable zone-selective interlocking (ZSI) self-restraint. However, activating thermal-imaging inhibit will not automatically activate ground-fault inhibit.

1. Press thermal-imaging inhibit button **(A, Figure 11)**. This action, indicated by flickering green thermal-imaging inhibit LED, powers trip unit and sends a message to inhibit thermal imaging and ZSI self-restrain the circuit breaker. Once green LED lights solid, thermal imaging is being inhibited and the circuit breaker is ZSI self-restrained and ready for primary injection testing. Green LED will remain continuously lit with exception of one flash every minute to indicate communication activity with trip unit.

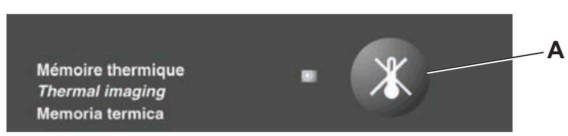
   NOTE: All LEDs lighting at once indicates Hand-Held Test Kit cannot establish communication with trip unit. The trip unit gives communication priority to the circuit breaker communications module (BCM). When BCM is powered and operating, its communication activities take precedence over Hand-Held Test Kit commands. After all LEDs go out, repeat step 2. If all LEDs light up again, disconnect power from E1 and E2 terminals of BCM and repeat step 2.

2. Once primary injection testing is completed, press thermal-imaging inhibit button **(A)** to terminate thermal-imaging inhibit and ZSI self-restrain and turn off Hand-Held Test Kit.

   NOTE: When performing multiple primary-injection tests, stop the thermal-imaging inhibit function between each test by pressing the thermal-imaging inhibit button **(A)** and waiting until all Hand-Held Test Kit LEDs turn off. Restart the thermal-imaging inhibit function by following step 2 above.

3. Before disconnecting Hand-Held Test Kit, wait for test exit communication. Test exit communication is complete when green thermal-imaging inhibit LED turns off.

Figure 11: Thermal-imaging Inhibit Button



NOTE: If no buttons are pressed for 15 minutes after thermal-imaging inhibit is initiated, Hand-Held Test Kit will automatically turn off terminating thermal-imaging inhibit and ZSI self-restrain.

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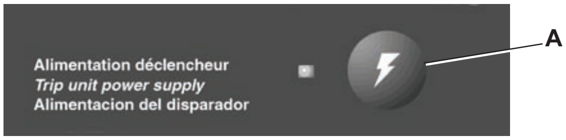
Trip Unit Power Supply

The Hand-Held Test Kit provides power to communicating Micrologic trip units (see Table 1) to allow setup and testing. It can also be used in conjunction with the Full-function Test Kit to verify functionality of zone-selective interlocking (ZSI). In this application, the Hand-Held Test Kit provides power to an upstream trip unit while the Full-function Test Kit performs ZSI test.

1. Press trip unit power supply button **(A, Figure 12)**. The green trip unit power supply LED will light solid indicating Hand-Held Test Kit is providing power to trip unit.
2. Once any setup or testing functions are complete, press trip unit power supply button **(A)** to terminate power to trip unit and to turn off Hand-Held Test Kit.
3. Before disconnecting Hand-Held Test Kit, make sure green trip unit power supply LED turns off.

Figure 12: Trip Unit Power Supply Button



NOTE: If no buttons are pressed for 15 minutes after trip unit power supply function is initiated, Hand-Held Test Kit will automatically turn off and power to trip unit will be terminated.

Battery Test

This function tests voltage of Hand-Held Test Kit's batteries.

1. Press 9 V-battery test button **(A, Figure 13**).
2. Both LEDs will light followed by one of the following:
   — Solid green LED indicates good batteries.
   — Solid amber LED indicates low batteries.

Figure 13: Battery Test Button

NOTE: Both LEDs off indicates exhausted batteries or batteries not installed.

Troubleshooting

Table 2: Troubleshooting

Condition		Probable Causes	Solutions
General	Pressed any button and no LEDs turned on.	1. Exhausted batteries or batteries not installed. 2. Defective Hand-Held Test Kit.	1. Install fresh batteries and press battery test button. 2. Contact local field office.
	Pressed either test button, red LED turned on and then off; circuit breaker did not trip.	1. Circuit breaker not properly reset. 2. Loose test cable connections between Hand-Held Test Kit and trip unit. 3. Defective Hand-Held Test Kit, trip unit or circuit breaker.	1. Verify circuit breaker is reset and closed. 2. Check test cable connections and restart test. 3. Contact local field office.
	Pressed any test or inhibit function button, all LEDs turned on and then off; circuit breaker did not trip.	1. Loose or no test cable connections between Hand-Held Test Kit and trip unit. 2. Test attempted not applicable to trip unit type. 3. Circuit breaker communication module (BCM) is in active communicating mode. 4. Defective Hand-Held Test Kit, trip unit or circuit breaker.	1. Check test cable connections and restart test. 2. Refer to Table 1 to determine if test is applicable to trip unit type. 3. Wait a few seconds and restart test or disconnect power from E1 and E2 terminals on circuit breaker communications module. 4. Contact local field office.
	Pressed any test or inhibit function button and after one minute of duration all LEDs turned on and then off.	Communication error occurred while test in progress.	Wait a few seconds and restart test or disconnect power from E1 and E2 terminals on circuit breaker communications module.
	Pressed any test or inhibit function button and after LED flickered all LEDs turned on and then off.	Circuit breaker communication module (BCM) in active communicating mode.	Wait a few seconds and restart test or disconnect power from E1 and E2 terminals on circuit breaker communications module.
Short-circuit trip test	Pressed short-circuit trip test button, red LED turned on and then off; circuit breaker did not trip.	1. Circuit breaker not properly reset. 2. Loose test cable connections between Hand-Held Test Kit and trip unit. 3. Circuit breaker communication module (BCM) in active communicating mode. 4. Defective Hand-Held Test Kit, trip unit or circuit breaker.	1. Verify circuit breaker is reset. 2. Check test cable connections and restart short-circuit trip test. 3. Wait a few seconds and restart test or disconnect power from E1 and E2 terminals on circuit breaker communications module. 4. Contact local field office.
	Pressed Short-circuit trip test button, red LED turned on followed by all LEDs turning on and then off; circuit breaker did not trip.	1. No test cable connections between Hand-Held Test Kit and trip unit. 2. Communication error with communicating MICROLOGIC trip unit. 3. Circuit breaker communication module (BCM) in active communicating mode.	1. Check test cable connections. 2. Check test cable connections and restart short-circuit trip test. 3. Wait a few seconds and restart test or disconnect power from E1 and E2 terminals on circuit breaker communications module.
Ground-fault trip test	Pressed ground-fault trip test button, red LED turned on and then off; circuit breaker did not trip.	1. Polarity on 2-pin test cable not reversed. 2. Circuit breaker not properly reset. 3. Loose test cable connections between Hand-Held Test Kit and trip unit. 4. Defective Hand-Held Test Kit, trip unit or circuit breaker.	1. Reverse polarity on 2-pin test cable connection. 2. Verify circuit breaker is reset. 3. Check test cable connections and restart short-circuit trip test. 4. Contact local field office.
	Pressed ground-fault trip test button, red LED turned on followed by all LEDs turning on and then off; circuit breaker did not trip.	1. No test cable connections between Hand-Held Test Kit and trip unit. 2. Ground-fault trip test not applicable to trip unit type.	1. Check test cable connections and restart ground-fault trip test. 2. Refer to Table 1 to determine if ground-fault trip test is applicable to trip unit type.

Continued on next page

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Table 2: Troubleshooting *(continued)*

Condition		Probable Causes	Solutions
Ground-fault inhibit function	Pressed ground-fault inhibit button and green LED turned on followed by all LEDs turning on and then off.	1. Loose or no test cable connections between Hand-Held Test Kit and trip unit. 2. Communication error with communicating MICROLOGIC trip unit. 3. Ground-fault inhibit function not applicable to trip unit type. 4. Circuit breaker communication module (BCM) in active communicating mode. 5. Defective Hand-Held Test Kit, trip unit or circuit breaker.	1. Check test cable connections and restart ground-fault inhibit function. 2. Check test cable connections and restart ground-fault inhibit function. 3. Refer to Table 1 to determine if ground-fault inhibit function is applicable to trip unit type. 4. Wait a few seconds and restart test or disconnect power from E1 and E2 terminals on circuit breaker communications module. 5. Contact local field office.
	Circuit breaker trips on ground fault, but Hand-Held Test Kit indicates it is inhibiting ground fault (i.e., green ground-fault inhibit LED is on).	During multiple primary-injection tests, ground-fault inhibit was not stopped and then restarted between each test.	When performing multiple primary-injection tests, stop ground-fault inhibit function between each test by pressing ground-fault inhibit button and waiting until all Hand-Held Test Kit LEDs turn off. Restart ground-fault inhibit function for next primary-injection test.
Thermal-imaging inhibit function	Pressed thermal-imaging inhibit button and green LED turned on followed by all LEDs turning on and then off.	1. Loose or no test cable connections between Hand-Held Test Kit and trip unit. 2. Communication error with communicating MICROLOGIC trip unit. 3. Thermal-imaging inhibit function not applicable to trip unit type. 4. Circuit breaker communication module (BCM) in active communicating mode. 5. Defective Hand-Held Test Kit, trip unit or circuit breaker.	1. Check test cable connections and restart thermal-imaging inhibit function. 2. Check test cable connections and restart thermal-imaging inhibit function. 3. Refer to Table 1 to determine if thermal-imaging inhibit function is applicable to trip unit type. 4. Wait a few seconds and restart test or disconnect power from E1 and E2 terminals on circuit breaker communications module. 5. Contact local field office.
	Circuit breaker trips earlier than expected.	During multiple primary-injection tests, thermal-imaging inhibit was not stopped and then restarted between each test.	When performing multiple primary-injection tests, stop thermal-imaging inhibit function between each test by pressing thermal-imaging inhibit button and waiting until all Hand-Held Test Kit LEDs turn off. Restart thermal-imaging inhibit function for next primary-injection test.
Trip unit power supply	Pressed trip unit power supply button and green LED turned on followed by all LEDs turning on and then off.	1. No test cable connections between Hand-Held Test Kit and trip unit. 2. Trip unit power supply function not applicable to trip unit type.	1. Check test cable connections and restart trip unit power supply function. 2. Refer to Table 1 to determine if trip unit power supply function is applicable to trip unit type.
Battery test	Pressed any button and solid yellow LED turned on and then off.	1. Low batteries.	1. Install fresh batteries and press battery test button.

Schneider Electric USA, Inc.
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Cedar Rapids, IA 52404 USA
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www.schneider-electric.us

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Boletín de instrucciones

Reemplaza 48049-184-03 Rev. 01, 05/2011

Equipo de pruebas portátil (HHTK)

Para las unidades de disparo Micrologic™ e interruptores automáticos Compact™ NS equipados con unidades de disparo STR

Conservar para uso futuro.

Características

(A) Compartimiento de pilas (cinco de 9 V)

(B) LED de disparo por cortocircuito (rojo)

(C) LED de disparo por falla a tierra (rojo)

(D) LED de supresión de falla a tierra (verde)

(E) LED de supresión de imágenes térmicas (verde)

(F) LED de fuente de alimentación de la unidad de disparo (verde)

(G) LED de pila baja (ámbar)

(H) LED de pila en buen estado (verde)

(I) Puerto de 10 espigas del cable de prueba de la unidad de disparo

(J) Botón de prueba de las pilas de 9 V

(K) Botón de la fuente de alimentación de la unidad de disparo

(L) Botón de supresión de imágenes térmicas

(M) Botón de supresión de falla a tierra

(N) Botón de disparo por falla a tierra

(O) Botón de disparo por cortocircuito

Figura 1: Equipo de pruebas portátil

Figura 2: Accesorios para el equipo de pruebas portátil

Cable de prueba con 2 espigas para las unidades de disparo STR

Cable de prueba con 7 espigas para las unidades de disparo Micrologic™

ESPAÑOL

Instalación de las pilas

NOTA: El equipo de pruebas portátil utiliza cinco pilas alcalinas de 9 V (no incluidas). Se recomiendan las pilas industriales alcalinas Panasonic de 9 V, número de pieza 6AM-6PIX/1S u otras pilas equivalentes. No utilice pilas de un híbrido de metal niquelado, NiCd, manganeso o litio ya que pueden dañarse los circuitos internos del equipo de pruebas portátil.

NOTA: No es posible reparar ninguna pieza interna del equipo de pruebas portátil. La caja se deberá abrir solamente para instalar o sustituir las pilas.

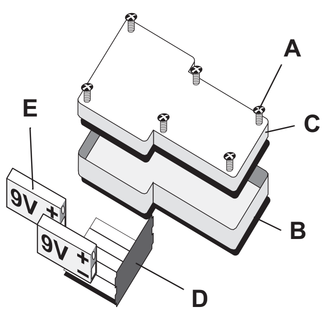
AVISO

PELIGRO DE DAÑO AL EQUIPO

Este equipo utiliza cinco pilas alcalinas de 9 V solamente. No utilice pilas de un híbrido de metal niquelado, NiCd, manganeso o litio.

El incumplimiento de estas instrucciones puede causar daño a los circuitos internos de este equipo.

Figura 3: Instalación de las pilas



1. Retire los seis tornillos **(A)**.
2. Separe la parte frontal **(B)** de la caja del equipo de pruebas portátil de la parte posterior **(C)**.
3. Retire con cuidado la tarjeta de circuitos **(D)** de las pilas.
4. Si va a sustituir las pilas, retire las pilas usadas.
5. Instale las nuevas pilas **(E)**, asegúrese de colocarlas en la polaridad correcta.
6. Instale con cuidado la tarjeta de circuitos **(D)** de las pilas.
7. Instale la parte posterior **(C)** de la caja del equipo de pruebas portátil en la parte frontal **(B)** utilizando los seis tornillos roscantes **(A)** que retiró anteriormente.

Compatibilidad con la unidad de disparo

Tabla 1: Compatibilidad con la unidad de disparo[1]

Tipo de unidad de disparo		Cable de prueba	Funciones de prueba		Funciones se supresión		Fuente de alimentación de la unidad de disparo	Prueba de las pilas
			Disparo por corto-circuito	Disparo por falla a tierra	Supresión de falla a tierra	Supresión de imágenes térmicas		
Sin comunicación	STR22, STR23, STR43	Cable de prueba de 2 espigas	■					■
	STR53		■	■				■
	ET1.0I, ET 1.0M	Cable de prueba de 7 espigas	■					■
	ET 1.0		■			■		■
	Micrologic 2.0, 3.0, 5.0		■					■
Con comunicación	Micrologic 2.0A, 3.0A, 5.0A, 5.0P, 5.0H		■			■	■	■
	Micrologic 6.0A, 6.0P, 6.0H, 7.0A, 7.0P, 7.0H		■		■	■	■	■
No hay una unidad de disparo conectada		Cable de prueba de 2 ó 7 espigas						■

[1] Si se inicia una prueba sin soporte o función de inhibición en una unidad de disparo, un mensaje de error aparecerá y el interruptor automático se puede disparar.

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Conexiones

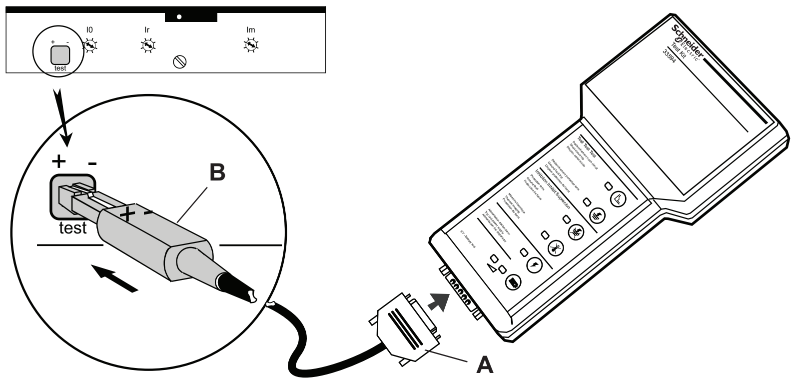
NOTA: La unidad de disparo debe estar instalada en el interruptor automático para realizar correctamente las pruebas con el equipo de pruebas portátil y las funciones de supresión.

Interruptores automáticos Compact™ NS equipados con unidades de disparo STR

1. Conecte el conector de 10 espigas para el cable de prueba **(A, figura 4)** en el puerto de 10 espigas del equipo de pruebas portátil.
2. Conecte el conector de 2 espigas **(B)** del cable de prueba al puerto de pruebas de las unidades de disparo STR. Asegúrese de observar la polaridad correcta.

NOTA: Consulte “Prueba de disparo por falla a tierra” para obtener la conexión a tierra apropiada.

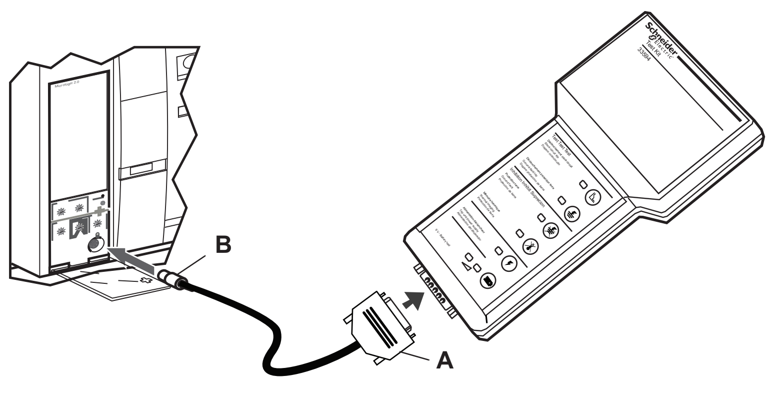
Figura 4: Conexión a las unidades de disparo STR



Unidades de disparo Micrologic™

1. Conecte el conector de 10 espigas para el cable de prueba **(A, figura 5)** en el puerto de 10 espigas del equipo de pruebas portátil.
2. Conecte el conector de 7 espigas **(B)** del cable de prueba en el puerto de pruebas de las unidades de disparo Micrologic. Consulte la etiqueta de instrucciones en el cable de prueba para realizar la conexión correcta.

Figura 5: Conexión a las unidades de disparo Micrologic



Indicación de mensaje de error

Se indica un mensaje de error al iluminarse todos los LED al mismo tiempo. Si se muestra un mensaje de error durante el funcionamiento del equipo de pruebas portátil, revise todas las conexiones luego consulte la tabla 1 y la sección de diagnóstico de problemas.

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Pruebas

Prueba del disparo por cortocircuito

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA y NOM-029-STPS.
- Solamente el personal eléctrico especializado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de volver a energizar el equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

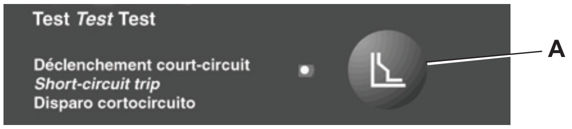
Esta prueba verifica el funcionamiento de la función de protección contra cortocircuitos de la unidad de disparo. El equipo de pruebas portátil suministra alimentación a la unidad de de disparo mientras inyecta una señal de falla secundaria lo suficientemente grande para causar un disparo del interruptor automático. Al realizar esta prueba, las unidades de disparo Micrologic A solamente, pondrán en cero el valor máximo registrado en cada fase. Si es necesario, anote los valores máximos antes de realizar la prueba.

NOTA: Las pruebas de cortocircuito no serán registradas en el registro cronológico de disparos de las unidades de disparo Micrologic P y H. También se desactivarán la protección avanzada y las alarmas durante la prueba. Consulte el boletín de instrucciones de la unidad de disparo para conocer las características de protección avanzada.

1. Cierre el interruptor automático que se está probando. Utilice un dispositivo detector de tensión nominal adecuado para verificar que el interruptor automático no lleve corriente.
2. Presione el botón de disparo por cortocircuito **(A, figura 6)**.
   a. Para las unidades de disparo sin comunicación (consulte la tabla 1), el LED rojo de disparo por cortocircuito se iluminará continuamente lo cual indicará que se está llevando a cabo una prueba de disparo por cortocircuito.
   b. Para las unidades de disparo con comunicación (consulte la tabla 1), el LED rojo de disparo por cortocircuito parpadeará lo cual indicará que hay actividad de comunicación con la unidad de disparo mientras la prueba de disparo por cortocircuito se está llevando a cabo.

   NOTA: Cuando todos los LED se iluminan al mismo tiempo, esto indica que el equipo de pruebas portátil no puede establecer comunicación con la unidad de disparo. La unidad de disparo da prioridad de comunicación al módulo de comunicación del interruptor automático (BCM). Cuando el BCM está energizado y funcionando, sus actividades de comunicación tienen prioridad sobre los comandos del equipo de pruebas portátil. Después de que todos los LED se apagan, repita el paso 2. Si todos los LED se vuelven a iluminar, desconecte la alimentación de las terminales E1 y E2 del BCM y repital el paso 2.

Figura 6: Botón de disparo por cortocircuito



3. Confirme el éxito de la prueba verificando que se haya disparo el interruptor automático. Consulte los boletines de instrucciones del interruptor automático y la unidad de disparo, y asegúrese de que estén funcionando correctamente estos dispositivos.
4. Para las unidades de disparo con comunicación, espere a que aparezcan los mensajes de abandono de la prueba, indicados por el destello del LED rojo de disparo por cortocircuito, antes de desconectar el equipo de pruebas portátil.
5. Los mensajes de abandono de la prueba han terminado cuando el LED rojo de disparo por cortocircuito se apaga automáticamente sin mostrar ningún mensaje de error.

Prueba de disparo por falla a tierra (unidad de disparo STR53 solamente)

AVISO

PELIGRO DE UNA LECTURA NO VÁLIDA

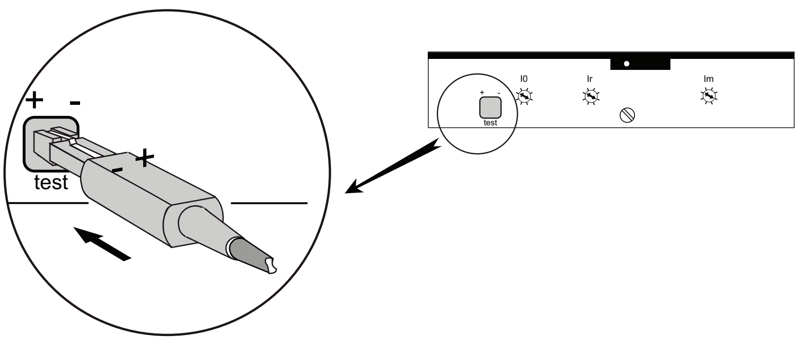
Asegúrese de invertir la polaridad del cable de prueba de 2 espigas antes de realizar una prueba de disparo por falla a tierra.

El incumplimiento de estas instrucciones puede dar lugar a resultados inexactos de las pruebas.

El equipo de pruebas portátil se puede usar para verificar la protección contra fallas a tierra de las unidades de disparo STR53 solamente.

1. Cierre el interruptor automático que se está probando. Utilice un dispositivo detector de tensión nominal adecuado para verificar que el interruptor automático no lleve corriente.
2. Asegúrese de invertir la polaridad de la conexión del cable de prueba de 2 espigas como se muestra en la figura 7.

Figura 7: Polaridad inversa



3. Presione el botón de disparo de falla a tierra **(A, figura 8)**. El LED rojo de disparo por falla a tierra se iluminará continuamente lo cual indicará que se está llevando a cabo una prueba de disparo por falla a tierra.

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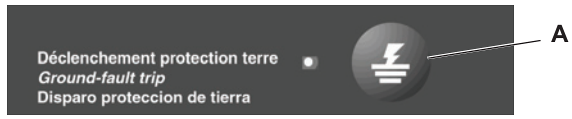
4. Confirme el éxito de la prueba verificando que se haya disparo el interruptor automático. Consulte los boletines de instrucciones del interruptor automático y la unidad de disparo, y asegúrese de que estén funcionando correctamente estos dispositivos.
5. Una vez que se haya realizado satisfactoriamente la prueba de disparo por falla a tierra, se apagará automáticamente el LED rojo de disparo por falla a tierra sin mostrar ningún mensaje de error.

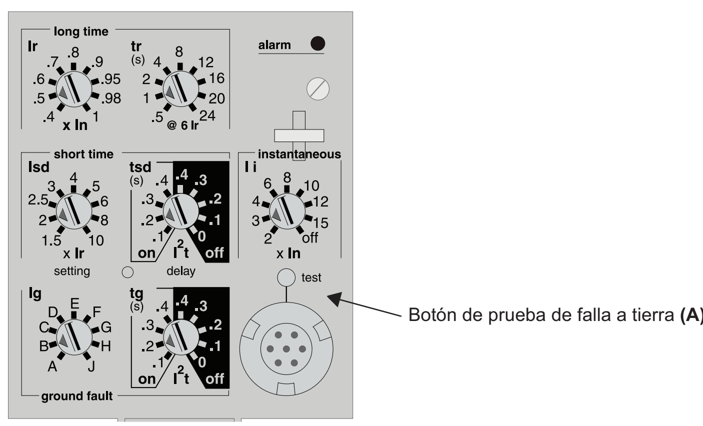
Figura 8: Botón de disparo por falla a tierra



Prueba de disparo por falla a tierra (unidades de disparo Micrologic™ A, P y H)

1. Para las unidades de disparo Micrologic 6.0A, 6.0P, 6.0H, 7.0P y 7.0H, use el equipo de pruebas portátil para energizar la unidad de disparo y suprimir las imágenes térmicas como se describe en este boletín de instrucciones.
2. Cierre el interruptor automático que se está probando. Utilice un dispositivo detector de tensión nominal adecuado para verificar que el interruptor automático no lleve corriente.
3. Presione el botón de prueba de falla a tierra (A) que se muestra en la figura 9.
4. Confirme el éxito de la prueba verificando que se haya disparo el interruptor automático. Consulte los boletines de instrucciones del interruptor automático y la unidad de disparo, y asegúrese de que estén funcionando correctamente estos dispositivos.

Figura 9: Botón de prueba de falla a tierra



Funciones de supresión

Las funciones de supresión están disponibles sólo durante las pruebas de inyección primaria de tiempo largo, tiempo corto, instantáneas y de falla a tierra (LSIG) en algunas unidades de disparo Micrologic con comunicación (consulte la tabla 1). Para las unidades de disparo Micrologic P y H, las funciones de supresión desactivada la protección avanzada, alarmas y el registro cronológico de eventos durante la prueba. Consulte el boletín de instrucciones de la unidad de disparo para conocer las características de protección avanzada.

Supresión de falla a tierra

NOTA: Al activar la supresión de fallas a tierra se activarán automáticamente la supresión de imágenes térmicas y la autorestricción de enclavamiento selectivo de zona (ZSI).

1. Presione el botón de supresión de falla a tierra **(A, figura 10)**. Esta acción, indicada por el destello del LED verde de supresión de falla a tierra, energizará la unidad de disparo y enviará un mensaje para suprimir la falla a tierra e imágenes térmicas, y autorestringir el interruptor automático con un enclavamiento selectivo de zona (ZSI). Una vez que el LED verde deja de parpadear, la falla a tierra e imágenes térmicas se suprimen y el interruptor automático es autorestringido ZSI y está listo para realizar la prueba de inyección primaria. El LED verde permanecerá iluminado pero parpadeará cada minuto para indicar la actividad de comunicación con la unidad de disparo.

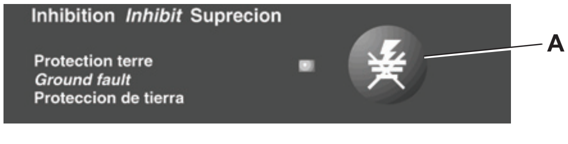
   NOTA: Cuando todos los LED se iluminan al mismo tiempo esto indica que el equipo de pruebas portátil no puede establecer comunicación con la unidad de disparo. La unidad de disparo da prioridad de comunicación al módulo de comunicación del interruptor automático (BCM). Cuando el BCM está energizado y funcionando, sus actividades de comunicación tienen prioridad sobre los comandos del equipo de pruebas portátil. Después de que todos los LED se apagan, repita el paso 2. Si todos los LED se vuelven a iluminar, desconecte la alimentación de las terminales E1 y E2 del BCM y repital el paso 2.

2. Una vez completadas las pruebas de inyección primaria, vuelva a oprimir el botón de supresión de fallas a tierra **(A)** para detener la supresión de falla a tierra, imágenes térmicas y autorestricción ZSI, y desconectar el equipo de pruebas portátil.

   NOTA: Al realizar pruebas múltiples de inyección primaria, detenga la función de supresión de falla a tierra entre cada prueba, presionando el botón **(A)** de supresión de falla a tierra y espere a que se apaguen todos los LED del equipo de pruebas portátil. Vuelva a iniciar la función de supresión de fallas a tierra siguiendo el paso 2 anterior.

3. Antes de desconectar el equipo de pruebas portátil, espere a que aparezcan los mensajes de abandono de la prueba, indicados por el destello del LED verde de supresión de falla a tierra. Los mensajes de abandono de la prueba han terminado cuando el LED verde de supresión de falla a tierra se apaga.

Figura 10: Botón de supresión de falla a tierra



NOTA: Si no se presiona ningún botón durante 15 minutos después de que la supresión de falla a tierra ha sido iniciada, el equipo de pruebas portátil se desconectará automáticamente y se terminará la supresión de imágenes térmicas y autorestricción ZSI.

Supresión de imágenes térmicas

Las imágenes térmicas proporcionan información sobre el estado continuo de elevación de la temperatura de los cables del interruptor automático, antes y después de dispararse un dispositivo. Bajo condiciones normales, se requiere un retardo de 15 minutos después de dispararse un dispositivo para permitir que se enfríe el sistema antes de volver a su funcionamiento normal. La función de supresión de imágenes térmicas suprime las imágenes térmicas anulando el retardo de 15 minutos y permitiendo la realización de varias pruebas de inyección primaria consecutivas.

NOTA: Al activar la supresión de imágenes térmicas se activarán automáticamente la autorestricción de enclavamiento selectivo de zona (ZSI). Sin embargo, al activar la supresión de imágenes térmicas no se activará automáticamente la supresión de fallas a tierra.

1. Presione el botón de supresión de imágenes térmicas **(A, figura 11)**. Esta acción, indicada por el destello del LED verde de supresión de imágenes térmicas, energizará la unidad de disparo y enviará un mensaje para suprimir las imágenes térmicas y autorestringir el interruptor automático con un enclavamiento selectivo de zona (ZSI). Una vez que el LED verde deja de parpadear, las imágenes térmicas se suprimen y el interruptor automático es autorestringido con ZSI y está listo para realizar la prueba de inyección primaria. El LED verde permanecerá iluminado pero parpadeará cada minuto para indicar la actividad de comunicación con la unidad de disparo.

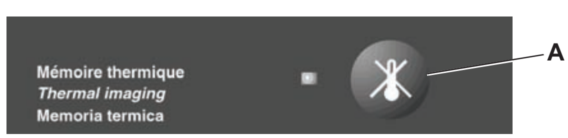
   NOTA: Cuando todos los LED se iluminan al mismo tiempo esto indica que el equipo de pruebas portátil no puede establecer comunicación con la unidad de disparo. La unidad de disparo da prioridad de comunicación al módulo de comunicación del interruptor automático (BCM). Cuando el BCM está energizado y funcionando, sus actividades de comunicación tienen prioridad sobre los comandos del equipo de pruebas portátil. Después de que todos los LED se apagan, repita el paso 2. Si todos los LED se vuelven a iluminar, desconecte la alimentación de las terminales E1 y E2 del BCM y repital el paso 2.

2. Una vez completadas las pruebas de inyección primaria, presione el botón **(A)** de supresión de imágenes térmicas para detener la supresión de imágenes térmicas y autorestricción ZSI y desconectar el equipo de pruebas portátil.

   NOTA: Al realizar pruebas múltiples de inyección primaria, detenga la función de supresión de imágenes térmicas entre cada prueba, presionando el botón **(A)** de supresión de imágenes térmicas y espere a que se apaguen todos los LED del equipo de pruebas portátil. Vuelva a iniciar la función de supresión de imágenes térmicas siguiendo el paso 2 anterior.

3. Antes de desconectar el equipo de pruebas portátil, espere a que aparezcan los mensajes de abandono de la prueba. Los mensajes de abandono de la prueba han terminado cuando el LED verde de supresión de imágenes térmicas se apaga.

Figura 11: Botón de supresión de imágenes térmicas



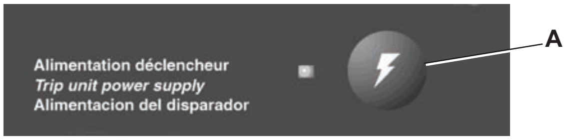
NOTA: Si no se presiona ningún botón durante 15 minutos después de que la supresión de imágenes térmicas ha sido inciada, el equipo de pruebas portátil se desconectará automáticamente y se terminará la supresión de imágenes térmicas y autorestricción ZSI.

Fuente de alimentación de la unidad de disparo

El equipo de pruebas portátil proporciona alimentación a las unidades de disparo Micrologic con comunicación (consulte la tabla 1) para realizar las configuraciones y pruebas. También se puede utilizar junto con el equipo de pruebas de plenas funciones para verificar la funcionalidad del enclavamiento selectivo de zona (ZSI). En esta aplicación, el equipo de pruebas portátil proporciona alimentación a una unidad de disparo de corriente ascendente mientras que el equipo de pruebas de plenas funciones realiza la prueba de ZSI.

1. Presione el botón de fuente de alimentación **(A, figura 12)** de la unidad de disparo. Una vez que el LED de fuente de alimentación de la unidad de disparo se ilumina continuamente, el equipo de pruebas portátil está proporcionando alimentación a la unidad de disparo.
2. Una vez completadas las funciones de configuración y prueba, presione el botón de fuente de alimentación **(A)** de la unidad de disparo para detener la alimentación a la unidad de disparo y desconectar el equipo de pruebas portátil.
3. Antes de desconectar el equipo de pruebas portátil, asegúrese de que el LED verde de fuente de alimentación de la unidad de disparo esté apagado.

Figura 12: Botón de fuente de alimentación de la unidad de disparo



NOTA: Si no se presiona ningún botón durante 15 minutos después de que la función de fuente de alimentación ha sido inciada, el equipo de pruebas portátil se desconectará automáticamente y la unidad de disparo se desenergizará.

Prueba de las pilas

Esta función prueba la tensión de las pilas del equipo de pruebas portátil.

1. Presione el botón de prueba de las pilas de 9 V (**A, figura 13**).
2. Ambos LED se iluminarán después de lo siguiente:
   — LED verde continuo indica pilas en buen estado.
   — LED ámbar continuo indica pilas bajas.

Figura 13: Botón de prueba de las pilas

NOTA: Ambos LED apagados indican pilas usadas o no instaladas.

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Diagnóstico de problemas

Tabla 2: Diagnóstico de problemas

Condición		Causas posibles	Soluciones
Generalidades	Se presionó un botón y ningún LED se iluminó.	1. Las pilas se han desgastado o no se han instalado. 2. Equipo de pruebas portátil defectuoso.	1. Instale pilas nuevas y presione el botón de prueba de las pilas. 2. Póngase en contacto con la oficina local.
	Se presionó el botón de prueba, el LED rojo se iluminó y luego se apagó; el interruptor automático no se disparó.	1. No se ha restablecido correctamente el interruptor automático. 2. La conexión del cable de prueba está suelta entre la unidad de disparo y el equipo de pruebas portátil. 3. Equipo de pruebas portátil, unidad de disparo o interruptor automático defectuoso.	1. Asegúrese de que el interruptor automático haya sido restablecido y que esté cerrado. 2. Revise las conexiones del cable de prueba y vuelva a realizar la prueba. 3. Póngase en contacto con la oficina local.
	Se presionó un botón de las funciones de prueba o supresión, todos los LED se iluminaron y luego se apagaron; el interruptor automático no se disparó.	1. La conexión del cable de prueba está suelta o no se ha realizado entre la unidad de disparo y el equipo de pruebas portátil. 2. La prueba de intento no es aplicable para el tipo de unidad de disparo. 3. El módulo de comunicación del interruptor atomático (BCM) se encuentra en el modo de comunicación activada. 4. Equipo de pruebas portátil, unidad de disparo o interruptor automático defectuoso.	1. Revise las conexiones del cable de prueba y vuelva a realizar la prueba. 2. Consulte la tabla 1 para determinar si la prueba es aplicable para el tipo de unidad de disparo. 3. Espere unos cuantos segundos y vuelva a iniciar la prueba o desconecte la alimentación de las terminales E1 y E2 en el módulo de comunicación del interruptor automático. 4. Póngase en contacto con la oficina local.
	Se presionó un botón de la función de prueba o supresión y después de un minuto todos los LED se iluminaron y luego se apagaron.	Se produjo un error de comunicación mientras se llevaba a cabo la prueba.	Espere unos cuantos segundos y vuelva a iniciar la prueba o desconecte la alimentación de las terminales E1 y E2 en el módulo de comunicación del interruptor automático.
	Se presionó un botón de la función de prueba o supresión y después de esto el LED parpadeo y todos los LED se iluminaron y luego se apagaron.	El módulo de comunicación del interruptor automático (BCM) se encuentra en el modo de comunicación activada.	Espere unos cuantos segundos y vuelva a iniciar la prueba o desconecte la alimentación de las terminales E1 y E2 en el módulo de comunicación del interruptor automático.
Prueba del disparo por cortocircuito	Se presionó el botón de prueba de cortocircuito, el LED rojo se iluminó y luego se apagó; el interruptor automático no se disparó.	1. No se ha restablecido correctamente el interruptor automático. 2. La conexión del cable de prueba está suelta entre la unidad de disparo y el equipo de pruebas portátil. 3. El módulo de comunicación del interruptor automático (BCM) se encuentra en el modo de comunicación activada. 4. Equipo de pruebas portátil, unidad de disparo o interruptor automático defectuoso.	1. Asegúrese de que el interruptor automático haya sido restablecido. 2. Revise las conexiones del cable de prueba y vuelva a realizar la prueba de cortocircuito. 3. Espere unos cuantos segundos y vuelva a iniciar la prueba o desconecte la alimentación de las terminales E1 y E2 en el módulo de comunicación del interruptor automático. 4. Póngase en contacto con la oficina local.
	Se presionó el botón de prueba de cortocircuito, el LED rojo se iluminó y todos los LED se iluminaron y luego se apagaron; el interruptor automático no se disparó.	1. No hay conexión entre el cable de prueba y la unidad de disparo y el equipo de pruebas portátil. 2. Error de comunicación con la unidad de disparo Micrologic con comunicación. 3. El módulo de comunicación del interruptor automático (BCM) se encuentra en el modo de comunicación activada.	1. Revise las conexiones del cable de prueba. 2. Revise las conexiones del cable de prueba y vuelva a realizar la prueba de cortocircuito. 3. Espere unos cuantos segundos y vuelva a iniciar la prueba o desconecte la alimentación de las terminales E1 y E2 en el módulo de comunicación del interruptor automático.

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Tabla 2: Diagnóstico de problemas *(continuación)*

Condición		Causas posibles	Soluciones
Prueba de disparo por falla a tierra	Se presionó el botón de prueba de disparo por falla a tierra, el LED rojo se iluminó y luego se apagó; el interruptor automático no se disparó.	1. No se ha invertido la polaridad en el cable de 2 espigas. 2. No se ha restablecido correctamente el interruptor automático. 3. La conexión del cable de prueba está suelta entre la unidad de disparo y el equipo de pruebas portátil. 4. Equipo de pruebas portátil, unidad de disparo o interruptor automático defectuoso.	1. Invierta la polaridad de la conexión en el cable de 2 espigas. 2. Asegúrese de que el interruptor automático haya sido restablecido. 3. Revise las conexiones del cable de prueba y vuelva a realizar la prueba de cortocircuito. 4. Póngase en contacto con la oficina local.
	Se presionó el botón de prueba de disparo por falla a tierra, el LED rojo se iluminó y todos los LED se iluminaron y luego se apagaron; el interruptor automático no se disparó.	1. No hay conexión entre el cable de prueba y la unidad de disparo y el equipo de pruebas portátil. 2. La prueba de disparo por falla a tierra no es aplicable para el tipo de unidad de disparo.	1. Revise las conexiones del cable de prueba y vuelva a realizar la prueba de disparo por falla a tierra. 2. Consulte la tabla 1 para determinar si la prueba de disparo por falla a tierra es aplicable para el tipo de unidad de disparo.
Función de supresión de falla a tierra	Se presionó el botón de supresión de falla a tierra y el LED verde se iluminó y todos los LED se iluminaron y luego se apagaron.	1. La conexión del cable de prueba está suelta o no se ha realizado entre la unidad de disparo y el equipo de pruebas portátil. 2. Error de comunicación con la unidad de disparo MICROLOGIC con comunicación. 3. La función de supresión de falla a tierra no es aplicable para el tipo de unidad de disparo. 4. El módulo de comunicación del interruptor automático (BCM) se encuentra en el modo de comunicación activada. 5. Equipo de pruebas portátil, unidad de disparo o interruptor automático defectuoso.	1. Revise las conexiones del cable de prueba y vuelva a iniciar la función de supresión de falla a tierra. 2. Revise las conexiones del cable de prueba y vuelva a iniciar la función de supresión de falla a tierra. 3. Consulte la tabla 1 para determinar si la función de supresión de falla a tierra es aplicable para el tipo de unidad de disparo. 4. Espere unos cuantos segundos y vuelva a iniciar la prueba o desconecte la alimentación de las terminales E1 y E2 en el módulo de comunicación del interruptor automático. 5. Póngase en contacto con la oficina local.
	El interruptor automático se dispara durante una falla a tierra, mientras que el equipo de pruebas portátil indica que está suprimiendo la falla a tierra (por ejemplo, el LED verde de supresión de falla a tierra está iluminado).	Durante pruebas múltiples de inyección primaria, no se detuvo la función de supresión de falla a tierra ni tampoco se volvió a iniciar entre cada prueba.	Al realizar pruebas múltiples de inyección primaria, detenga la función de supresión de falla a tierra entre cada prueba, presionando el botón de supresión de falla a tierra y espere a que se apaguen todos los LED del equipo de pruebas portátil. Vuelva a iniciar la función de supresión de fallas a tierra para la siguiente prueba de inyección primaria.
Función de supresión de imágenes térmicas	Se presionó el botón de supresión de imágenes térmicas y se iluminó el LED verde y todos los LED se iluminaron y luego se apagaron.	1. La conexión del cable de prueba está suelta o no se ha realizado entre la unidad de disparo y el equipo de pruebas portátil. 2. Error de comunicación con la unidad de disparo MICROLOGIC con comunicación. 3. La función de supresión de imágenes térmicas no es aplicable para el tipo de unidad de disparo. 4. El módulo de comunicación del interruptor automático (BCM) se encuentra en el modo de comunicación activada. 5. Equipo de pruebas portátil, unidad de disparo o interruptor automático defectuoso.	1. Revise las conexiones del cable de prueba y vuelva a iniciar la función de supresión de imágenes térmicas. 2. Revise las conexiones del cable de prueba y vuelva a iniciar la función de supresión de imágenes térmicas. 3. Consulte la tabla 1 para determinar si la función de supresión de imágenes térmicas es aplicable para el tipo de unidad de disparo. 4. Espere unos cuantos segundos y vuelva a iniciar la prueba o desconecte la alimentación de las terminales E1 y E2 en el módulo de comunicación del interruptor automático. 5. Póngase en contacto con la oficina local.
	El interruptor se dispara antes de lo esperado.	Durante pruebas múltiples de inyección primaria, no se detuvo la función de supresión de imágenes térmicas ni tampoco se volvió a iniciar entre cada prueba.	Al realizar pruebas múltiples de inyección primaria, detenga la función de supresión de imágenes térmicas entre cada prueba, presionando el botón de supresión de imágenes térmicas y espere a que se apaguen todos los LED del equipo de pruebas portátil. Vuelva a iniciar la función de supresión de imágenes térmicas para la siguiente prueba de inyección primaria.
Fuente de alimentación de la unidad de disparo	Se presionó el botón de supresión de fuente de alimentación de la unidad de disparo y el LED verde se iluminó y todos los LED se iluminaron y luego se apagaron.	1. No hay conexión entre el cable de prueba y la unidad de disparo y el equipo de pruebas portátil. 2. La función de fuente de alimentación de la unidad de disparo no es aplicable para el tipo de unidad de disparo.	1. Revise las conexiones del cable de prueba y vuelva a iniciar la función de fuente de alimentación de la unidad de disparo. 2. Consulte la tabla 1 para determinar si la función de fuente de alimentación de la unidad de disparo es aplicable para el tipo de unidad de disparo.
Prueba de las pilas	Se presionó un botón y el LED amarillo sólido se iluminó y luego se apagó.	1. Pilas bajas.	1. Instale pilas nuevas y presione el botón de prueba de las pilas.

ESPAÑOL

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Solamente el personal especializado deberá instalar, hacer funcionar y prestar servicios de mantenimiento al equipo eléctrico. Schneider Electric no asume responsabilidad alguna por las consecuencias emergentes de la utilización de este material.

Directives d’utilisation

Remplace 48049-184-03 Rev. 01, 05/2011

Trousse d’essais portative (HHTK)

Pour déclencheurs Micrologic^{MC} et disjoncteurs Compact^{MC} NS avec déclencheurs STR

À conserver pour usage ultérieur.

FRANÇAIS

Identification

(A) Compartiment des piles (cinq de 9 V)

(B) DÉL de déclenchement sur court-circuit (rouge)

(C) DÉL de déclenchement sur défaut à la terre (rouge)

(D) DÉL d'inhibition des défauts à la terre (vert)

(E) DÉL d'inhibition de l’image thermique (verte)

(F) DÉL de l'alimentation du déclencheur (verte)

(G) DÉL des piles faibles (orange)

(H) DÉL des piles bonnes (verte)

(I) Port à 10 broches du câble d'essai du déclencheur

(J) Bouton d'essai des piles de 9 V

(K) Bouton de l'alimentation du déclencheur

(L) Bouton d'inhibition de l’image thermique

(M) Bouton d'inhibition des défauts à la terre

(N) Bouton de déclenchement sur défaut à la terre

(O) Bouton de déclenchement sur court-circuit

Figure 1 : Trousse d'essais portative

Figure 2 : Accessoires de la trousse d'essais portative

Câble d'essai à 2 broches pour déclencheurs STR

Câble d'essai à 7 broches pour déclencheurs MicrologicMC

Installation des piles

REMARQUE : La trousse d’essais portative utilise cinq piles alcalines de 9,0 V (non fournies). La pile alcaline industrielle Panasonic de 9 V, nº de pièce 6AM-6PIX/1S ou l'équivalent, est recommandée. Ne pas employer de piles au nickel-hydrure métallique, NiCd, au manganèse ou au lithium, sous peine d'endommager le circuit interne de la trousse.

REMARQUE : La trousse d’essais portative ne comporte aucune pièce interne réparable. Le boîtier ne doit être ouvert que pour installer ou remplacer les piles.

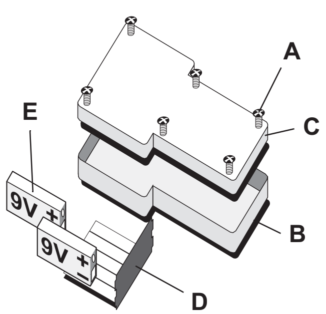
AVIS

RISQUE DE DOMMAGES MATÉRIELS

Cet appareil n'utilise que cinq piles alcalines de 9,0 V. N'utilisez pas de piles au nickel-hydrure métallique, NiCd, au manganèse ou au lithium.

Si ces directives ne sont pas respectées, cela pourra entraîner des dommages au circuit interne de cet appareil.

Figure 3 : Installation des piles



1. Retirer les six vis **(A)**.
2. Séparer la partie avant **(B)** du boîtier de la trousse d'essais portative de la partie arrière **(C)**.
3. Retirer soigneusement la carte de circuit **(D)** des piles.
4. En cas de remplacement des piles, retirer les anciennes piles.
5. Insérer les piles neuves **(E)** en s'assurant que la polarité est correcte.
6. Installer la carte de circuit **(D)** des piles avec soin.
7. Attacher la partie arrière **(C)** du boîtier de la trousse d'essais portative à la partie avant **(B)** à l'aide des six vis auto-taraudeuses **(A)** dévissées précédemment.

Détermination de la compatibilité des déclencheurs

Tableau 1 : Compatibilité des déclencheurs [1]

Type de déclencheur		Câble d'essai	Fonctions d'essai		Fonctions d'inhibition		Alimentation du déclencheur	Essai des piles
			Déclench. sur court-circuit	Déclench. sur défauts à la terre	Inhibition des défauts à la terre	Inhibition de l’image thermique		
Sans communication	STR22, STR23, STR43	Câble d'essai à 2 broches	■					■
	STR53		■	■				■
	ET1.0I, ET 1.0M	Câble d'essai à 7 broches	■					■
	ET 1.0		■			■		■
	Micrologic 2.0, 3.0, 5.0		■					■
Avec communication	Micrologic 2.0A, 3.0A, 5.0A, 5.0P, 5.0H		■			■	■	■
	Micrologic 6.0A, 6.0P, 6.0H, 7.0A, 7.0P, 7.0H		■		■	■	■	■
Aucun déclencheur raccordé		Câble d'essai à 2 ou 7 broches						■

[1] Si un essai ou une fonction d’inhibition non accepté est entrepris sur un déclencheur, un message d’erreur apparaîtra et le disjoncteur peut se déclencher.

Raccordements

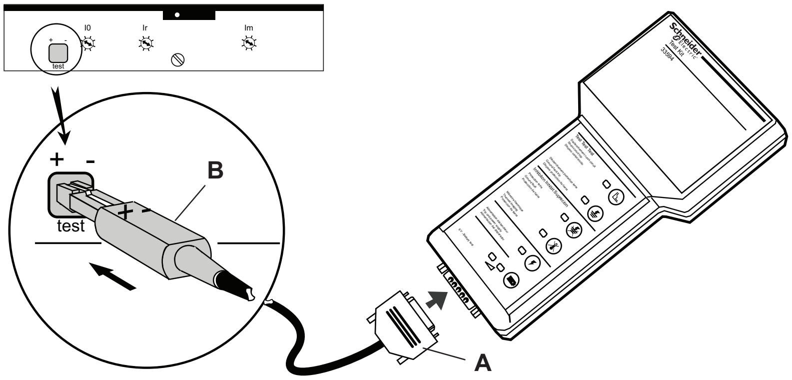
REMARQUE : Un déclencheur doit être installé dans le disjoncteur de façon à pouvoir exécuter adéquatement des essais avec la trousse d’essais portative et les fonctions d’inhibition.

Disjoncteurs Compact^{MC} NS munis de déclencheurs STR

1. Raccorder le connecteur à 10 broches **(A, figure 4)** du câble d'essai au port à 10 broches de la trousse d'essais portative.
2. Raccorder le connecteur à 2 broches **(B)** du câble d'essai au port d'essai des déclencheurs STR. Prendre soin d'observer la bonne polarité.

REMARQUE : Se reporter à l'essai de déclenchement sur défauts á la terre pour le raccordement de défaut à la terre approprié.

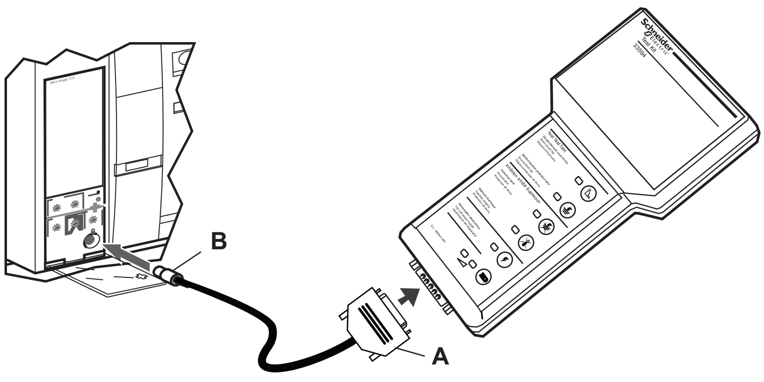
Figure 4 : Raccordement aux déclencheurs STR



Déclencheurs Micrologic^{MC}

1. Raccorder le connecteur à 10 broches **(A, figure 5)** du câble d'essai au port à 10 broches de la trousse d'essais portative.
2. Raccorder le connecteur à 7 broches **(B)** du câble d'essai au port d'essai des déclencheurs Micrologic. Pour les directives de raccordement, consulter l'étiquette de directives sur le câble d'essai.

Figure 5 : Raccordement aux déclencheurs Micrologic



Indication de message d'erreur

Un message d'erreur est indiqué par toutes les DÉL s'allumant en même temps. Si un message d'erreur est affiché pendant le fonctionnement de la trousse d'essais portative, vérifier tous les raccordements, puis consulter le tableau 1 et la section Dépannage.

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Essai

Essai de déclenchement sur court-circuit

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E ou CSA Z462.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez toutes les alimentations de l'appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Cet essai vérifie le fonctionnement de la fonction de protection du déclencheur contre les courts-circuits. La trousse d'essais portative alimente le déclencheur tout en injectant un signal de défaut secondaire suffisamment important pour entraîner le déclenchement du disjoncteur. Pour les déclencheurs Micrologic A seulement, effectuer cet essai remettra à zéro la valeur maximale enregistrée de chaque phase. Si nécessaire, enregistrer les valeurs maximales avant de faire un essai.

REMARQUE : Les essais de court-circuit ne seront pas enregistrés dans le journal des déclenchements des déclencheurs Micrologic P et H. La protection évoluée et les alarmes seront également désactivées pendant l'essai. Consulter les directives d'instructions des déclencheurs pour les caractéristiques de la protection évoluée.

1. Fermer le disjoncteur soumis à l'essai. Utiliser un dispositif de détection de tension ayant une valeur nominale appropriée pour s'assurer que le disjoncteur n'est porteur d'aucun courant.
2. Appuyer sur le bouton de déclenchement sur court-circuit **(A, figure 6)**.
   a. Pour les déclencheurs sans communication (voir le tableau 1), la DÉL rouge de déclenchement sur court-circuit s'allumera de façon fixe, indiquant qu'un essai de déclenchement sur court-circuit est en cours.
   b. Pour les déclencheurs avec communication (voir le tableau 1), la DÉL rouge de déclenchement sur court-circuit clignotera, indiquant une activité de communication avec le déclencheur pendant que l'essai de déclenchement sur court-circuit est en cours.

   REMARQUE : Toutes les DÉL s’allumant à la fois indiquent que la trousse d’essais portative ne peut pas établir la communication avec le déclencheur. Le déclencheur donne la priorité de communication au module de communication du disjoncteur (BCM). Lorsqu’un BCM est sous tension et fonctionne, ses activités de communication ont priorité sur les commandes de la trousse d’essais portative. Une fois toutes les DÉL éteintes, répéter le point 2. Si toutes les DÉL s’allument de nouveau, mettre les bornes E1 et E2 du BCM hors tension et répéter le point 2.

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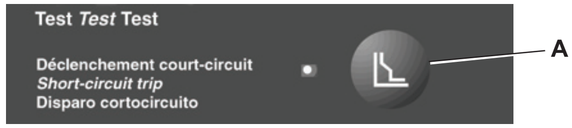
Figure 6 : Bouton de déclenchement sur court-circuit



3. S'assurer de la réussite de l'essai en vérifiant si le disjoncteur s'est déclenché. Se reporter aux directives d'instructions des disjoncteurs et déclencheurs pour le bon fonctionnement des disjoncteurs.
4. Pour les déclencheurs avec communication attendre la communication permettant de quitter l'essai, indiquée par le clignotement de la DÉL rouge de déclenchement sur court-circuit, avant de déconnecter la trousse d'essais portative.
5. La communication permettant de quitter l'essai est complète quand la DÉL rouge de déclenchement sur court-circuit s'éteint automatiquement sans afficher d'erreur.

Essai de déclenchement sur défauts à la terre (déclencheurs STR53 uniquement)

AVIS

RISQUE DE RELEVÉ INVALIDE

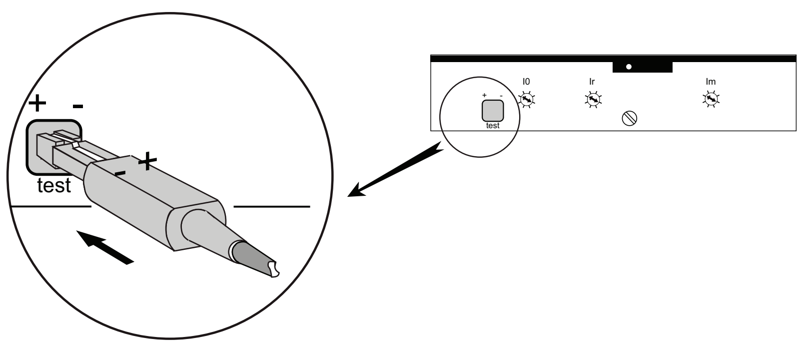
Prenez soin d'inverser la polarité du câble d'essai à 2 broches avant d'entreprendre un essai de déclenchement sur défauts à la terre.

Si ces directives ne sont pas respectées, cela peut entraîner des résultats d'essai imprécis.

La trousse d'essais portative peut être utilisée pour vérifier la protection contre les défauts à la terre pour les déclencheurs STR53 uniquement.

1. Fermer le disjoncteur soumis à l'essai. Utiliser un dispositif de détection de tension ayant une valeur nominale appropriée pour s'assurer que le disjoncteur n'est porteur d'aucun courant.
2. Prendre soin d'inverser la polarité du raccordement du câble d'essai à 2 broches comme indiqué à la figure 7.

Figure 7 : Inversion de la polarité



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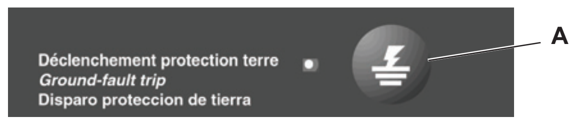
3. Appuyer sur le bouton de déclenchement sur défaut à la terre **(A, figure 8)**. La DÉL rouge de déclenchement sur défaut à la terre s'allumera de façon fixe, indiquant qu'un essai de déclenchement sur défauts à la terre est en cours.
4. S'assurer de la réussite de l'essai en vérifiant si le disjoncteur s'est déclenché. Se reporter aux directives d'instructions des disjoncteurs et déclencheurs pour le bon fonctionnement des disjoncteurs.
5. Une fois l'essai de déclenchement sur défauts à la terre terminé avec succès, la DÉL rouge de déclenchement sur défaut à la terre s'éteint automatiquement sans afficher d'erreur.

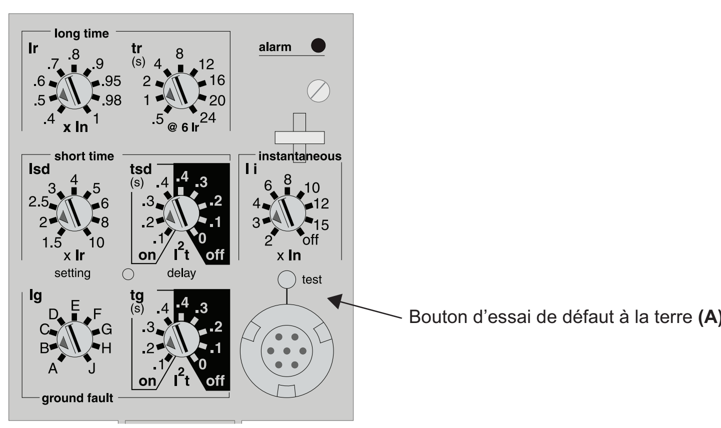
Figure 8 : Bouton de déclenchement sur défaut à la terre



Essai de déclenchement sur défauts à la terre (déclencheurs Micrologic[MC] A, P et H)

1. Pour les déclencheurs Micrologic 6.0A, 6.0P, 6.0H, 7.0P et 7.0H, utiliser la trousse d'essais portative pour mettre le déclencheur sous tension et inhiber l'image thermique comme décrit dans ces directives d'utilisation.
2. Fermer le disjoncteur soumis à l'essai. Utiliser un dispositif de détection de tension ayant une valeur nominale appropriée pour s'assurer que le disjoncteur n'est porteur d'aucun courant.
3. Appuyer sur le bouton d'essai de défaut à la terre (A) représenté à la figure 9.
4. S'assurer de la réussite de l'essai en vérifiant si le disjoncteur s'est déclenché. Se reporter aux directives d'instructions des disjoncteurs et déclencheurs pour le bon fonctionnement des disjoncteurs.

Figure 9 : Bouton d'essai de défaut à la terre



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Fonctions d'inhibition

Les fonctions d'inhibition ne sont disponibles que pendant des essais d'injection primaire de longue durée, à temps court, instantanée et de protection contre les défauts à la terre (LSIG) de certains déclencheurs Micrologic avec communication (voir le tableau 1). Pour les déclencheurs Micrologic P et H, les fonctions d'inhibition désactivent la protection évoluée, les alarmes et l'enregistrement des évènements durant l'essai. Consulter les directives d'instructions des déclencheurs pour les caractéristiques de la protection évoluée.

Inhibition des défauts à la terre

REMARQUE : L'activation de l'inhibition de défaut à la terre active automatiquement l'inhibition de l’image thermique et valide l'auto-entrave de l'interverrouillage sélectif de zone (ZSI).

1. Appuyer sur le bouton d'inhibition des défauts à la terre **(A, figure 10)**. Cette action, indiquée par le clignotement de la DÉL verte d'inhibition des défauts à la terre, active le déclencheur et envoie un message pour inhiber le défaut à la terre, l’image thermique et pour auto-entraver le disjoncteur avec l'interverrouillage sélectif de zone (ZSI). Une fois que la DÉL verte s'allume de façon fixe, le défaut à la terre et l’image thermique sont inhibés et le disjoncteur est auto-entravé ZSI et prêt pour un essai d'injection primaire. La DÉL verte reste continuellement allumée à l'exception d'un clignotement par minute pour indiquer une activité de communication avec le déclencheur.

   REMARQUE : Toutes les DÉL s’allumant à la fois indiquent que la trousse d’essais portative ne peut pas établir la communication avec le déclencheur. Le déclencheur donne la priorité de communication au module de communication du disjoncteur (BCM). Lorsqu’un BCM est sous tension et fonctionne, ses activités de communication ont priorité sur les commandes de la trousse d’essais portative. Une fois toutes les DÉL éteintes, répéter le point 2. Si toutes les DÉL s’allument de nouveau, mettre les bornes E1 et E2 du BCM hors tension et répéter le point 2.

2. Une fois l'essai d'injection primaire terminé, appuyer sur le bouton d'inhibition des défauts à la terre **(A)** pour arrêter la fonction d'inhibition des défauts à la terre, l'inhibition de l'image thermique et l'auto-entrave ZSI et désactiver la trousse d'essais portative.

   REMARQUE : Lors de l’exécution d’essais multiples d’injection primaire, arrêter la fonction d’inhibition des défauts à la terre après chaque essai en appuyant sur le bouton d’inhibition des défauts à la terre **(A)** et attendre jusqu’à ce que toutes les DÉL de la trousse d’essais portative s’éteignent. Relancer la fonction d’inhibition des défauts à la terre en suivant le point 2 ci-dessus.

3. Avant de déconnecter la trousse d'essais portative, attendre la communication permettant de quitter l'essai, indiquée par le clignotement de la DÉL verte d'inhibition des défauts à la terre. La communication permettant de quitter l'essai est complète quand la DÉL verte d'inhibition des défauts à la terre s'éteint.

Figure 10 : Bouton d'inhibition des défauts à la terre

REMARQUE : Si aucun bouton n’est enfoncé au cours des 15 minutes qui suivent la mise en service de l’inhibition des défauts à la terre, la trousse d’essais portative se met automatiquement à l’arrêt, terminant l’inhibition des défauts à la terre, l’inhibition de l’image thermique et l’auto-entrave de l’interverrouillage sélectif de zone (ZSI).

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Inhibition de l’image thermique

L’image thermique fournit en permanence l'état d'échauffement du câblage du disjoncteur, avant et après les déclenchements du dispositif. En conditions normales, un délai de 15 minutes est requis à la suite d'un déclenchement de dispositif pour permettre au système de se refroidir avant de retourner à une fonctionnalité normale. La fonction d'inhibition de l’image thermique inhibe l’image thermique, passant donc outre le délai de 15 minutes et permettant l'exécution de multiples essais d'injection primaires consécutifs.

REMARQUE : L'activation de l'inhibition de l’image thermique valide automatiquement l'auto-entrave de l'interverrouillage sélectif de zone (ZSI). Toutefois, l'activation de l'inhibition de l’image thermique n'active pas automatiquement l'inhibition des défauts à la terre.

1. Appuyer sur le bouton d'inhibition de l'image thermique **(A, figure 11)**. Cette action, indiquée par le clignotement de la DÉL verte d'inhibition de l'image thermique, active le déclencheur et envoie un message pour inhiber l’image thermique et pour auto-entraver le disjoncteur avec l'interverrouillage sélectif de zone (ZSI). Une fois que la DÉL verte s'allume de façon fixe, l’image thermique est inhibée et le disjoncteur est auto-entravé ZSI et prêt pour un essai d'injection primaire. La DÉL verte reste continuellement allumée à l'exception d'un clignotement par minute pour indiquer une activité de communication avec le déclencheur.

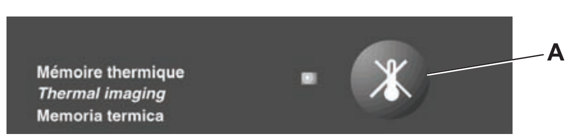
   REMARQUE : Toutes les DÉL s’allumant à la fois indiquent que la trousse d’essais portative ne peut pas établir la communication avec un déclencheur. Le déclencheur donne la priorité de communication au module de communication du disjoncteur (BCM). Lorsqu’un BCM est sous tension et fonctionne, ses activités de communication ont priorité sur les commandes de la trousse d’essais portative. Une fois toutes les DÉL éteintes, répéter le point 2. Si toutes les DÉL s’allument de nouveau, mettre les bornes E1 et E2 du BCM hors tension et répéter le point 2.

2. Une fois l'essai d'injection primaire terminé, appuyer sur le bouton d'inhibition de l'image thermique **(A)** pour arrêter la fonction d'inhibition de l'image thermique et l'auto-entrave ZSI et désactiver la trousse d'essais portative.

   REMARQUE : Lors de l’exécution d’essais multiples d’injection primaire, arrêter la fonction d’image thermique après chaque essai en appuyant sur le bouton d’inhibition de l’image thermique **(A)** et attendre jusqu’à ce que toutes les DÉL de la trousse d’essais portative s’éteignent. Relancer la fonction d’image thermique en suivant le point 2 ci-dessus.

3. Avant de déconnecter la trousse d’essais portative, attendre la communication permettant de quitter l'essai. La communication permettant de quitter l'essai est complète quand la DÉL verte d'inhibition de l'image thermique s'éteint.

Figure 11 : Bouton d'inhibition de l’image thermique



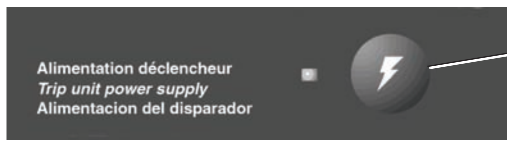
REMARQUE : Si aucun bouton n’est enfoncé au cours des 15 minutes qui suivent la mise en service de l’inhibition de l’image thermique, la trousse d’essais portative se met automatiquement à l’arrêt, terminant l’inhibition de l’image thermique et l’auto-entrave de l’interverrouillage sélectif de zone (ZSI).

Alimentation du déclencheur

La trousse d'essais portative fournit l'alimentation aux déclencheurs Micrologic avec communication (voir le tableau 1) pour permettre la configuration et l'essai. Il peut être également utilisé conjointement avec la trousse d'essais des fonctions complètes pour vérifier la fonctionnalité de l'interverrouillage sélectif de zone (ZSI). Dans ce cas, la trousse d'essais portative fournit l'alimentation à un déclencheur en amont tandis que la trousse d'essais des fonctions complètes effectue l'essai ZSI.

1. Appuyer sur le bouton d'alimentation du déclencheur **(A, figure 12)**. La DÉL verte d'alimentation du déclencheur s'allumera de façon fixe indiquant que la trousse d'essais portative alimente le déclencheur.
2. Une fois les fonctions de configuration ou d'essai terminées, appuyer sur le bouton de l'alimentation **(A)** du déclencheur pour arrêter l'alimentation du déclencheur et désactiver la trousse d'essais portative.
3. Avant de déconnecter la trousse d'essais portative, s'assurer que la DÉL verte d'alimentation du déclencheur s'éteint.

Figure 12 : Bouton de l'alimentation du déclencheur



REMARQUE : Si aucun bouton n’est enfoncé au cours des 15 minutes qui suivent la mise en service de l’alimentation du déclencheur, la trousse d’essais portative se met automatiquement à l’arrêt et l’alimentation du déclencheur sera coupée.

Essai des piles

Cette fonction examine la tension des piles de la trousse d'essais portative.

1. Appuyer sur le bouton d'essai des piles de 9 V **(A, figure 13**).
2. Les deux DÉL s'allument puis l'un des évènements suivants se produit :
   — Une DÉL verte allumée de façon fixe indique des piles en bon état.
   — Une DÉL orange allumée de façon fixe indique des piles faibles.

Figure 13 : Bouton d'essai des piles

REMARQUE : Les deux DÉL éteintes indiquent des piles usées ou non installées

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Dépannage

Tableau 2 : Dépannage

Condition		Causes probables	Solutions
Généralités	L'appui sur l'un quelconque des boutons ne fait allumer aucune DÉL.	1. Piles usées ou non installées. 2. Trousse d'essais portative défectueuse.	1. Installer des piles neuves et appuyer sur le bouton d'essai des piles. 2. Contacter le bureau de service local.
	Après avoir appuyé sur n’importe quel bouton d’essai, la DÉL rouge s’est allumée puis éteinte, le disjoncteur ne s’est pas déclenché.	1. Le disjoncteur n'est pas correctement réarmé. 2. Raccordements du câble d'essai lâches entre la trousse d'essais portative et le déclencheur. 3. Trousse d'essais portative, déclencheur ou disjoncteur défectueux.	1. Vérifier si le disjoncteur est réarmé et fermé. 2. Vérifier les raccordements du câble d'essai et recommencer l'essai. 3. Contacter le bureau de service local.
	Après avoir appuyé sur n’importe quel bouton d’essai ou de fonction d’inhibition, toutes les DÉL se sont allumées puis éteintes, le disjoncteur ne s’est pas déclenché.	1. Raccordements du câble d'essai lâches ou débranchés entre la trousse d'essais portative et le déclencheur. 2. L'essai tenté ne s'applique pas au type de déclencheur. 3. Le module de communication du disjoncteur (BCM) est en mode de communication actif. 4. Trousse d'essais portative, déclencheur ou disjoncteur défectueux.	1. Vérifier les raccordements du câble d'essai et recommencer l'essai. 2. Consulter le tableau 1 pour déterminer si l'essai s'applique au type de déclencheur. 3. Attendre quelques secondes et recommencer l’essai ou mettre les bornes E1 et E2 hors tension sur le module de communication du disjoncteur. 4. Contacter le bureau de service local.
	Après avoir appuyé sur n’importe quel bouton d’essai ou de fonction d’inhibition et après une minute toutes les DÉL se sont allumées puis éteintes.	Une erreur de communication s'est produite en cours d'essai.	Attendre quelques secondes et recommencer l’essai ou mettre les bornes E1 et E2 hors tension sur le module de communication du disjoncteur.
	Après avoir appuyé sur n’importe quel bouton d’essai ou de fonction d’inhibition et après avoir clignoté toutes les DÉL se sont allumées puis éteintes.	Le module de communication du disjoncteur (BCM) est en mode de communication actif.	Attendre quelques secondes et recommencer l’essai ou mettre les bornes E1 et E2 hors tension sur le module de communication du disjoncteur.
Essai de déclenchement sur court-circuit	Après avoir appuyé sur le bouton d’essai de déclenchement sur court-circuit, la DÉL rouge s’est allumée puis éteinte, le disjoncteur ne s’est pas déclenché.	1. Le disjoncteur n'est pas correctement réarmé. 2. Raccordements du câble d'essai lâches entre la trousse d'essais portative et le déclencheur. 3. Le module de communication du disjoncteur (BCM) est en mode de communication actif. 4. Trousse d'essais portative, déclencheur ou disjoncteur défectueux.	1. Vérifier si le disjoncteur est réarmé. 2. Vérifier les raccordements du câble d'essai et recommencer l'essai de déclenchement sur court-circuit. 3. Attendre quelques secondes et recommencer l’essai ou mettre les bornes E1 et E2 hors tension sur le module de communication du disjoncteur. 4. Contacter le bureau de service local.
	Après avoir appuyé sur le bouton d’essai de déclenchement sur court-circuit, la DÉL rouge s’est allumée suivie de toutes les DÉL s’allumant puis s’éteignant, le disjoncteur ne s’est pas déclenché.	1. Raccordements du câble d'essai débranchés entre la trousse d'essais portative et le déclencheur. 2. Erreur de communication avec le déclencheur Micrologic avec communication. 3. Le module de communication du disjoncteur (BCM) est en mode de communication actif.	1. Vérifier les raccordements du câble d'essai. 2. Vérifier les raccordements du câble d'essai et recommencer l'essai de déclenchement sur court-circuit. 3. Attendre quelques secondes et recommencer l’essai ou mettre les bornes E1 et E2 hors tension sur le module de communication du disjoncteur.
Essai de déclenchement sur défauts á la terre	Après avoir appuyé sur le bouton d’essai de déclenchement sur défaut à la terre, la DÉL rouge s’est allumée puis éteinte, le disjoncteur ne s’est pas déclenché.	1. La polarité sur le câble d'essai à 2 broches n'est pas inversée. 2. Le disjoncteur n'est pas correctement réarmé. 3. Raccordements du câble d'essai lâches entre la trousse d'essais portative et le déclencheur. 4. Trousse d'essais portative, déclencheur ou disjoncteur défectueux.	1. Inverser la polarité sur le raccordement du câble d'essai à 2 broches. 2. Vérifier si le disjoncteur est réarmé. 3. Vérifier les raccordements du câble d'essai et recommencer l'essai de déclenchement sur court-circuit. 4. Contacter le bureau de service local.
	Après avoir appuyé sur le bouton d’essai de déclenchement sur défaut à la terre, la DÉL rouge s’est allumée suivie de toutes les DÉL s’allumant puis s’éteignant, le disjoncteur ne s’est pas déclenché.	1. Raccordements du câble d'essai débranchés entre la trousse d'essais portative et le déclencheur. 2. L'essai de déclenchement sur défauts à la terre ne s'applique pas au type de déclencheur.	1. Vérifier les raccordements du câble d'essai et recommencer l'essai de déclenchement sur défauts à la terre. 2. Consulter le tableau 1 pour déterminer si l'essai de déclenchement sur défauts à la terre s'applique au type de déclencheur.

Tableau 2 : Dépannage *(suite)*

Condition		Causes probables	Solutions
Fonction d'inhibition des défauts à la terre	Après avoir appuyé sur le bouton d’inhibition des défauts à la terre et la DÉL verte s’est allumée suivie de toutes les DÉL s’allumant puis s’éteignant.	1. Raccordements du câble d'essai lâches ou débranchés entre la trousse d'essais portative et le déclencheur. 2. Erreur de communication avec le déclencheur Micrologic avec communication. 3. La fonction d'inhibition des défauts à la terre ne s'applique pas au type de déclencheur. 4. Le module de communication du disjoncteur (BCM) est en mode de communication actif. 5. Trousse d'essais portative, déclencheur ou disjoncteur défectueux.	1. Vérifier les raccordements du câble d'essai et recommencer la fonction d'inhibition des défauts à la terre. 2. Vérifier les raccordements du câble d'essai et recommencer la fonction d'inhibition des défauts à la terre. 3. Consulter le tableau 1 pour déterminer si la fonction d'inhibition des défauts à la terre s'applique au type de déclencheur. 4. Attendre quelques secondes et recommencer l’essai ou mettre les bornes E1 et E2 hors tension sur le module de communication du disjoncteur. 5. Contacter le bureau de service local.
	Le disjoncteur se déclenche sur un défaut à la terre, mais la trousse d’essais portative indique qu’il s’agit d’une inhibition des défauts à la terre (autrement dit, la DÉL verte d’inhibition des défauts à la terre est allumée).	Durant plusieurs essais d’injection primaire, l’inhibition des défauts à la terre n’a pas été arrêtée puis relancée après chaque essai.	Lors de l’exécution de plusieurs essais d’injection primaire, arrêter la fonction d’inhibition des défauts à la terre après chaque essai en appuyant sur le bouton d’inhibition des défauts à la terre et attendre jusqu’à ce que toutes les DÉL de la trousse d’essais portative s’éteignent. Relancer la fonction d’inhibition des défauts à la terre pour l’essai d’injection primaire suivant.
Fonction d'inhibition de l’image thermique	Après avoir appuyé sur le bouton d’inhibition de l’image thermique, la DÉL verte s’est allumée suivie de toutes les DÉL s’allumant puis s’éteignant.	1. Raccordements du câble d'essai lâches ou débranchés entre la trousse d'essais portative et le déclencheur. 2. Erreur de communication avec le déclencheur Micrologic avec communication. 3. La fonction d'inhibition de l’image thermique ne s'applique pas au type de déclencheur. 4. Le module de communication du disjoncteur (BCM) est en mode de communication actif. 5. Trousse d'essais portative, déclencheur ou disjoncteur défectueux.	1. Vérifier les raccordements du câble d'essai et recommencer la fonction d'inhibition de l’image thermique. 2. Vérifier les raccordements du câble d'essai et recommencer la fonction d'inhibition de l’image thermique. 3. Consulter le tableau 1 pour déterminer si la fonction d'inhibition de l’image thermique s'applique au type de déclencheur. 4. Attendre quelques secondes et recommencer l’essai ou mettre les bornes E1 et E2 hors tension sur le module de communication du disjoncteur. 5. Contacter le bureau de service local.
	Le disjoncteur se déclenche plus tôt que prévu.	Durant plusieurs essais d’injection primaire, l’inhibition de l’image thermique n’a pas été arrêtée puis relancée après chaque essai.	Lors de l’exécution de plusieurs essais d’injection primaire, arrêter la fonction d’inhibition de l’image thermique après chaque essai en appuyant sur le bouton d’inhibition de l’image thermique et attendre jusqu’à ce que toutes les DÉL de la trousse d’essais portative s’éteignent. Relancer la fonction d’inhibition de l’image thermique pour l’essai d’injection primaire suivant.
Alimentation du déclencheur	Après avoir appuyé sur le bouton d’alimentation du déclencheur, la DÉL verte s’est allumée suivie de toutes les DÉL s’allumant puis s’éteignant.	1. Raccordements du câble d'essai débranchés entre la trousse d'essais portative et le déclencheur. 2. La fonction d'alimentation du déclencheur ne s'applique pas au type de déclencheur.	1. Vérifier les raccordements du câble d'essai et recommencer la fonction d'alimentation du déclencheur. 2. Consulter le tableau 1 pour déterminer si la fonction d'alimentation du déclencheur s'applique au type de déclencheur.
Essai des piles	Après avoir appuyé sur n’importe quel bouton, la DÉL jaune s’est allumée puis éteinte.	1. Piles faibles.	1. Installer des piles neuves et appuyer sur le bouton d'essai des piles.

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Micrologic™ 5.0P and 6.0P Electronic Trip Units

Unidades de disparo electrónico Micrologic™ 5.0P y 6.0P

Déclencheurs électroniques Micrologic^{MC} 5.0P et 6.0P

Instruction Bulletin / Boletín de instrucciones / Directives d’utilisation

48049-137-05
Rev. 02, 08/2015

Retain for future use. / Conservar para uso futuro. / À conserver pour usage ultérieur.

Micrologic™ 5.0P and 6.0P Electronic Trip Units

ENGLISH

Instruction Bulletin

48049-137-05
Rev. 02, 08/2015

Retain for future use.

Schneider Electric™

Hazard Categories and Special Symbols

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a “Danger” or “Warning” safety label

indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **can result in** minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury. The safety alert symbol is not used with this signal word.

NOTE: Provides additional information to clarify or simplify a procedure.

Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

FCC Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. This Class A digital apparatus complies with Canadian ICES-003.

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Section 1— General Information

Introduction

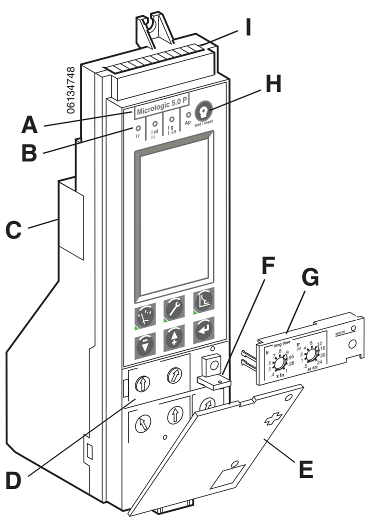
Micrologic™ trip units provide adjustable tripping functions on electronic trip circuit breakers. The product name (A) specifies the level of protection provided by the trip unit.

Micrologic 5.0P

- Type of protection
  - 2—Basic IEC protection (LSO)
  - 3—Basic UL protection (LI)
  - 5—Selective protection (LSI)
  - 6—Selective protection plus ground fault protection for equipment (LSIG)
- Trip unit series
  - 0—Indicates the first version
- Type of measurement
  - None—Provides protection only
  - A—Provides protection plus ammeter measurements
  - P—Provides protection plus power measurements
  - H—Provides protection plus harmonic metering

Micrologic trip units are field replaceable to allow for upgrading of the trip unit in the field. For complete information on available circuit breaker models, frame sizes, interrupting ratings, sensor plugs, rating plugs and trip units, see the product catalog.

Figure 1 – Micrologic Trip Unit



A—Product Name
B—Trip Indicators
C—Battery Housing
D—Adjustable Switches
E—Switch Cover
F—Sealing Tab
G—Adjustable Rating Plug
H—Reset Button for Battery Status Check and Trip Indicators
I—External Terminal Block Connection

Communications

Micrologic trip units can communicate with other devices using “Modbus™” through the Circuit Breaker Communication Module (BCM). For information on the register lists and other communication devices refer to bulletin 0613IB1313: *Modbus Communications System*.

ENGLISH

Power and Control Settings

Using the graphic display screen and keypad on the trip unit, trip unit options can be set or system measurements checked. See Section 2 —Graphic Display Navigation for more information.

Switch Settings

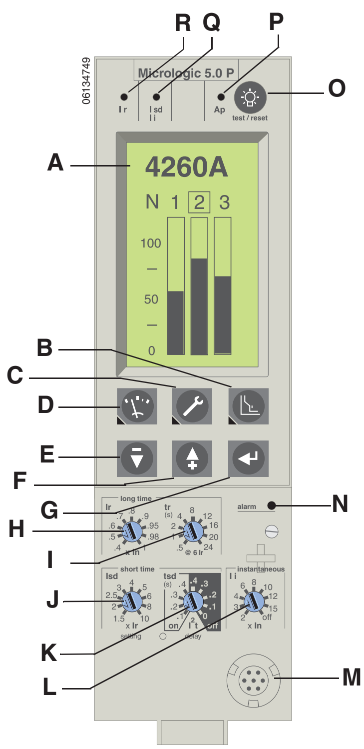
On the face of the trip unit are adjustable switches to allow changing of the LSI or LSIG trip characteristics of the trip unit. Trip units are shipped with the long-time pickup switch set at 1.0 and all other trip unit switches set at their lowest settings. All advanced protection settings are turned “off.”

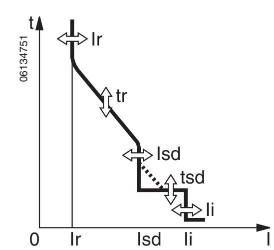
Fine switch adjustments can be made with the navigation keys. See page 29.

Micrologic 5.0P Trip Unit

The Micrologic 5.0P trip unit provides selective (LSI) protection and power measurement.

Figure 2 – 5.0P Trip Unit





A. Graphic display screen
B. Protection menu button[1]
C. Maintenance menu button[1]
D. Metering menu button[1]
E. Down button
F. Up button
G. Enter button
H. Long-time pickup (Ir) switch
I. Long-time delay (tr) switch
J. Short-time pickup (Isd) switch
K. Short-time delay (tsd) switch
L. Instantaneous pickup (Ii) switch
M. Test plug receptacle
N. Long-time pickup overload indicator light
O. Reset button for battery status check and trip indicator LED
P. Self-protection and advanced-protection indicator light
Q. Short-time or instantaneous trip indicator light
R. Long-time trip indicator light

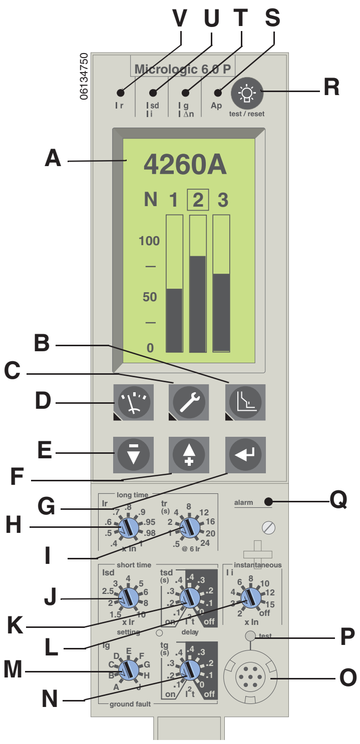
[1] Button includes an LED indicating the active menu.

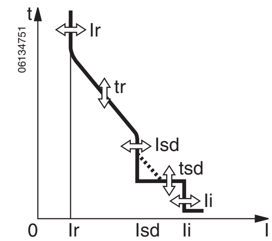
Micrologic 6.0P Trip Unit

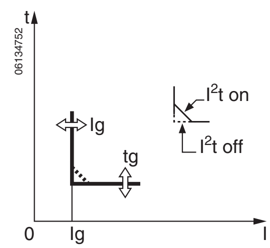
The Micrologic 6.0P trip unit provides selective and ground-fault protection for equipment (≤ 1200 A) (LSIG) and power measurement.

Figure 3 – 6.0P Trip Unit

A. Graphic display screen
B. Protection menu button[1]
C. Maintenance menu button[1]
D. Metering menu button[1]
E. Down button
F. Up button
G. Enter button
H. Long-time pickup (Ir) switch
I. Long-time delay (tr) switch
J. Short-time pickup (Isd) switch
K. Short-time delay (tsd) switch
L. Instantaneous pickup (Ii) switch
M. Ground-fault protection pickup (Ig) switch
N. Ground-fault protection delay (tg) switch
O. Test plug receptacle
P. Ground-fault push-to-trip button
Q. Long-time pickup overload indicator light
R. Reset button for battery status check and trip indicator LED
S. Self-protection and advanced-protection indicator light
T. Ground-fault trip indicator light
U. Short-time or instantaneous trip indicator light
V. Long-time trip indicator light







[1] Button includes an LED indicating the active menu.

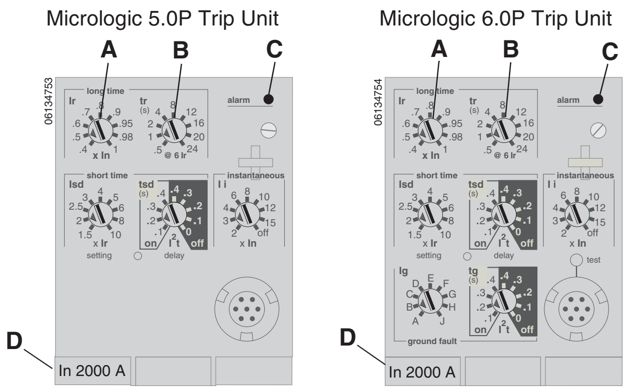
LSIG Protection

Long-Time Protection

Long-time protection protects equipment against overloads.

NOTE: Micrologic trip units are powered from the circuit to always provide fault protection. All other functions (display, metering, communications, etc.) require external power. See page 17 for more information.

Figure 4 – Long-Time Protection Switches



- Long-time protection is standard on all trip units.
- Long-time pickup (Ir) (A) sets the maximum current level based on sensor plug rating (In) which the circuit breaker will carry continuously. If current exceeds this value, circuit breaker will trip after the preset time delay. The long-time pickup (Ir) is adjustable from 0.4–1.0 times the circuit breaker sensor plug rating (In) (D).
- Long-time delay (tr) (B) sets the length of time that the circuit breaker will carry an overcurrent below the short-time or instantaneous pickup current level before tripping. Two options are available:
  - — Standard I^2t long-time delay curve. See Table 1 for I^2t long-time delay settings.
  - — Idmtl (inverse definite minimum time lag) long-time delay curves vary in slope to enhance selectivity.

Option	Description	Curve
DT	Definite time	Constant
SIT	Standard inverse time	$I^{0.5}t$
VIT	Very inverse time	It
EIT	Extremely inverse time	I^2t
HVF	High-voltage fuse compatible	I^4t

Table 1 – Micrologic Trip Unit I^2t Long-Time Delay Values

Setting[1]	Long-Time Delay in Seconds[2]								
tr at 1.5 x Ir	12.5	25	50	100	200	300	400	500	600
tr at 6 x Ir	0.5	1	2	4	8	12	16	20	24
tr at 7.2 x Ir	0.34[3]	0.69	1.38	2.7	5.5	8.3	11	13.8	16.6

[1] Ir = In x long-time pickup. In = sensor rating. Trip threshold between 1.05 and 1.20 Ir.
[2] Time-delay accuracy +0/-20%.
[3] When tsd is set to 0.4 off, then tr = 0.5 instead of 0.34.

- The overload indicator light (C) indicates that the long-time pickup threshold Ir has been exceeded.
- For Masterpact™ NT and NW circuit breakers, sensor value (In) can be changed by replacing sensor plug (D) located below the trip unit. For further information, see the instructions packed with the sensor plug replacement kit.
- Neutral protection is not available when Idmtl protection is selected.
- The Idmtl selections do not utilize the same thermal imaging feature as the I^2t long-time protection function. Both the basic long-time protection and Idmtl EIT are I^2t curves, but the different thermal imaging features result in different system performances. For welding applications it is recommended the basic I^2t long-time protection be used to ensure expected system performance.
- Both long-time pickup and long-time delay are located on the field-replaceable adjustable rating plug. To change settings to more precisely match the application, various rating plugs are available. For instructions on replacing the rating plug, see “Adjustable Rating Plug Replacement” on page 77.
- Long-time protection uses true RMS measurement.

Table 2 – Micrologic Trip Unit Idmtl Long-Time Delay Values

Option	Setting[1]	Long-Time Delay in Seconds									Tolerance
DT	tr at 1.5 x Ir	0.52	1	2	4	8	12	16	20	24	+0/-20%
	tr at 6 x Ir	0.52	1	2	4	8	12	16	20	24	+0/-20%
	tr at 7.2 x Ir	0.52	1	2	4	8	12	16	16.6	16.6	+0/-20%
	tr at 10 x Ir	0.52	1	2	4	8	12	16	16.6	16.6	+0/-20%
SIT	tr at 1.5 x Ir	1.9	3.8	7.6	15.2	30.4	45.5	60.7	75.8	91	+0/-30%
	tr at 6 x Ir	0.7	1	2	4	8	12	16	20	24	+0/-20%
	tr at 7.2 x Ir	0.7	0.88	1.77	3.54	7.08	10.6	14.16	17.7	21.2	+0/-20%
	tr at 10 x Ir	0.7[2]	0.8	1.43	2.86	5.73	8.59	11.46	14.33	17.19	+0/-20%
VIT	tr at 1.5 x Ir	1.9	7.2	14.4	28.8	57.7	86.5	115.4	144.2	173.1	+0/-30%
	tr at 6 x Ir	0.7	1	2	4	8	12	16	20	24	+0/-20%
	tr at 7.2 x Ir	0.7	0.81	1.63	3.26	6.52	9.8	13.1	16.34	19.61	+0/-20%
	tr at 10 x Ir	0.7[2]	0.75	1.14	2.28	4.57	6.86	9.13	11.42	13.70	+0/-20%
EIT	tr at 1.5 x Ir	12.5	25	50	100	200	300	400	500	600	+0/-30%
	tr at 6 x Ir	0.7[3]	1	2	4	8	12	16	20	24	+0/-20%
	tr at 7.2 x Ir	0.7[2]	0.69	1.38	2.7	5.5	8.3	11	13.8	16.6	+0/-20%
	tr at 10 x Ir	0.7[2]	0.7[3]	0.7[3]	1.41	2.82	4.24	5.45	7.06	8.48	+0/-20%
HVF	tr at 1.5 x Ir	164.5	329	658	1316	2632	3950	5265	6581	7900	+0/-30%
	tr at 6 x Ir	0.7[3]	1	2	4	8	12	16	20	24	+0/-20%
	tr at 7.2 x Ir	0.7[2]	0.7[3]	1.1[3]	1.42	3.85	5.78	7.71	9.64	11.57	+0/-20%
	tr at 10 x Ir	0.7[2]	0.7[2]	0.7[3]	0.7[3]	1.02	1.53	2.04	2.56	3.07	+0/-20%

[1] Ir = In x long-time pickup. In = sensor rating. Trip threshold between 1.05 and 1.20 Ir.
[2] Tolerance = +0/-60%
[3] Tolerance = +0/-40%

Thermal imaging provides continuous temperature rise status of the wiring, both before and after the device trips. This allows the circuit breaker to respond to a series of overload conditions which could cause conductor overheating, but would go undetected if the long-time circuit was cleared every time the load dropped below the pickup setting or after every tripping event.

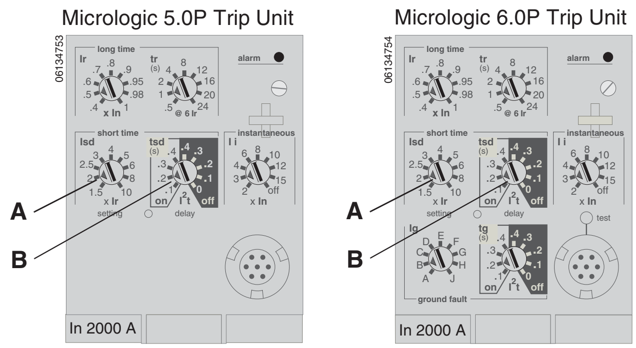
NOTE: If checking trip times, wait a minimum of 15 minutes after circuit breaker trips before resetting to allow the thermal imaging to reset completely to zero or use a test kit to inhibit the thermal imaging.

ENGLISH

Short-Time Protection

Short-time protection protects equipment against short circuits.

Figure 5 – Short-Time Protection Switches



- Short-time protection is standard on 5.0P and 6.0P trip units.
- The short-time pickup (Isd) (A) sets current level (below instantaneous trip level) at which circuit breaker will trip after the preset time delay.
- The short-time delay (tsd) (B) sets the length of time that the circuit breaker will carry an overcurrent above the short-time pickup current level before tripping.

Table 3 – Micrologic Trip Unit Short-Time Delay Values

Setting	Short-Time Delay				
I^2t off (ms at 10 Ir) (seconds)	0	0.1	0.2	0.3	0.4
I^2t on (ms at 10 Ir) (seconds)	–	0.1	0.2	0.3	0.4
tsd (min. trip) (milliseconds)	20	80	140	230	350
tsd (max. trip) (milliseconds)	80	140	200	320	500

- The I^2t on/I^2t off option provides improved selectivity with downstream protective devices:
  - — With I^2t off selected, fixed time delay is provided.
  - — With I^2t on selected, inverse time I^2t protection is provided up to 10 x Ir. Above 10 x Ir, fixed time delay is provided.
- Intermittent currents in the short-time tripping range which do not last sufficiently long to trigger a trip are accumulated and shorten the trip delay appropriately.
- Short-time protection can be zone-selective interlocked (ZSI) with upstream or downstream circuit breakers. Setting tsd to the 0 setting turns off zone-selective interlocking.
- Short-time protection uses true RMS measurement.
- Short-time pickup and delay can be adjusted to provide selectivity with upstream or downstream circuit breakers.

NOTE: Use I^2t off with ZSI for proper coordination. Using I^2t on with ZSI is not recommended as the delay in the upstream device receiving a restraint signal could result in the trip unit tripping in a time shorter than the published trip curve.

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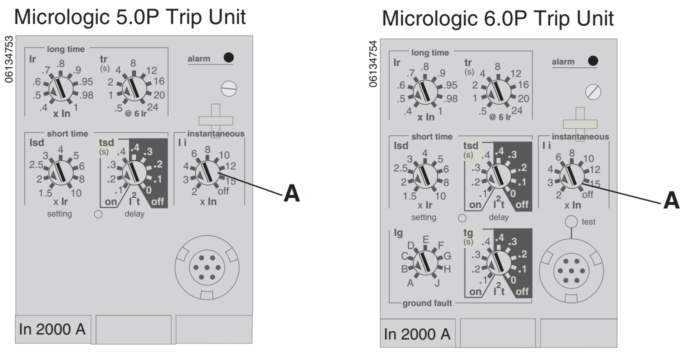
Instantaneous Protection

Instantaneous protection protects equipment against short circuits with no intentional time delay.

Figure 6 – Instantaneous Protection Switches



- Instantaneous protection (Ii) (A) is standard on all trip units.
- Instantaneous protection is based on the circuit breaker sensor rating (In).
- Circuit breaker open command is issued as soon as threshold current is exceeded.
- Instantaneous protection uses peak current measurement.
- When instantaneous protection switch is set to off, the instantaneous protection is disabled.

Table 4 – Micrologic Instantaneous Values

Setting	Interruption Current							
Ii (= In x..)	2	3	4	6	8	10	12	15	off

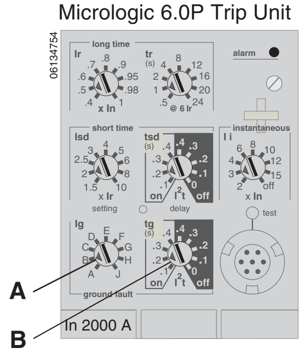
Ii = instantaneous
In = sensor rating
Pickup accuracy ± 10%

Ground-Fault Protection for Equipment

Equipment ground-fault protection protects conductors against overheating and faults from ground-fault currents (≤ 1200 A).

Figure 7 – Ground-Fault Protection Switches

Micrologic 6.0P Trip Unit



- Equipment ground-fault protection is standard on 6.0P trip units.
- Ground-fault pickup (Ig) (A) sets ground current level where circuit breaker will trip after the preset time delay.

Table 5 – Micrologic Trip Unit Ground-Fault Pickup Values

Ig (= In x....)	A	B	C	D	E	F	G	H	J
In ≤ 400 A	0.3	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
400 A < In ≤ 1200 A	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
In > 1200 A	500 A	640 A	720 A	800 A	880 A	960 A	1040 A	1120 A	1200 A

In = sensor rating.
Ig = ground-fault pickup.

- Ground-fault delay (tg) (B) sets the length of time that the circuit breaker will carry a ground-fault current above the ground-fault pickup current level before tripping.

Table 6 – Micrologic Trip Unit Ground-Fault Delay Values

Setting	Ground-Fault Delay				
I^2t off (ms at In) (seconds)	0	0.1	0.2	0.3	0.4
I^2t on (ms at In) (seconds)	–	0.1	0.2	0.3	0.4
tsd (min. trip) (milliseconds)	20	80	140	230	350
tsd (max. trip) (milliseconds)	80	140	200	320	500

- Equipment ground-fault protection can be zone-selective interlocked (ZSI) with upstream or downstream circuit breakers. Setting the ground-fault delay (tg) to the 0 setting turns off zone-selective interlocking.
- Neutral protection and equipment ground-fault protection are independent and can operate concurrently.

NOTE: Use I^2t off with ZSI for proper coordination. Using I^2t on with ZSI is not recommended as the delay in the upstream device receiving a restraint signal could result in the trip unit tripping in a time shorter than the published trip curve.

Energy Reduction Maintenance Settings (ERMS) Function

The energy reduction maintenance setting (ERMS) function is available on circuit breaker fitted with:

- BCM ULP with firmware version 4.1.3 and above.
- Micrologic P or H trip unit with blue ERMS label (A) as shown below.
- IO Module with application switch set to position 3.

Figure 8 – ERMS Label on Trip Unit

See bulletin 0613IB1317: *IO Module - Input/Output Interface for LV Circuit Breakers - User Guide* and bulletin NHA67346: *ERMS Instruction Bulletin* for more information, installation, and testing.

The ERMS function is used to reduce the Ii protection settings in order to trip as fast as possible when a fault occurs. The pre-programmed factory setting for Ii protection in ERMS mode is 2xIn. The ERMS setting can be adjusted using Instruction Bulletin NHA67346.

⚠ DANGER

HAZARD OF ARC FLASH

- Do not change the Micrologic P or H trip unit’s settings while in ERMS mode.
- Seal the transparent cover of the Micrologic P or H trip unit when using the ERMS mode.

Failure to follow these instructions will result in death or serious injury.

If any of the basic protection settings are changed using the rotary dials on the Micrologic control unit while in ERMS mode, the Micrologic control unit switches to the normal mode and then returns automatically to the ERMS mode after 5 seconds.

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Micrologic Trip Unit Configuration

Control Power

The P trip unit is designed to be used with an external 24 Vdc power supply. The large LCD display used by the P trip unit requires too much current to be powered by current flow through the circuit breaker.

The P trip unit has a circuit voltage power supply which will power the trip unit when there is approximately 150 Vac or more between two phases. The standard configuration for the voltage probes inside the circuit breaker is at the bottom connections. If the circuit breaker is open in a top fed application, there is no voltage at the bottom of the circuit breaker and the trip unit will not be powered.

The following will be powered and functional even if the trip unit is not externally powered:

- Fault protection for LSIG functions. The P trip unit is fully circuit powered for fault protection.
- LED trip indication (powered by an onboard battery). The battery's only function is to provide LED indication if all other power is off.
- Ground-fault push-to-trip button works for testing ground fault when the trip unit is powered by the circuit voltage power supply. The ground-fault push-to-trip is also functional if a Hand-Held Test Kit or Full-Function Test Kit is powering the trip unit.

The following will be powered and functional with external power:

- All of the above functions which are functional without external power.
- LCD display and backlight are functional. Backlight intensity is not controlled or adjustable, and may be different from one trip unit to another.
- All metering, monitoring, and history logs are functional.
- Communications from the trip unit to M2C and M6C programmable contact modules are powered by a 24 Vdc power supply at F1 and F2. The M6C also required an external 24 Vdc power supply.
- Modbus communications are functional, using a separate 24 Vdc power supply for the circuit breaker communications module. This separate 24 Vdc power supply is required to maintain the isolation between the trip unit and communications.
- The ground-fault push-to-trip is also functional if a Hand-Held Test Kit or Full-Function Test Kit is powering the trip unit.

External Power Supply

⚠ CAUTION

HAZARD OF SHOCK, ARC FLASH OR EQUIPMENT DAMAGE

Trip unit and communication module must use separate power supplies.

Failure to follow these instructions can result in personal injury or equipment damage.

The trip unit can be powered by:

- 24 Vdc external power supply (recommended).
- Over 150 V on the bottom circuit breaker terminals on two phases.
- Over 150 V on the top circuit breaker terminals with external voltage option.

Table 7 – Power Supply Specifications

Function	Specification
Power for Trip Unit Alone	24 Vdc, 50 mA
Minimum Input-to-Output Isolation	2400 V
Output voltage accuracy (Including Max. 1% Ripple)	±5%
Dielectric Withstand (Input/Output)	3 kV rms
Connections	Connections UC3 F1 (-) F2 (+) 24 Vdc

Power supply is used for:

Graphic screen display when the circuit breaker is open and top fed.

Option of linking an alarm to a relay output.

To maintain date and time when the circuit breaker is open.

Micrologic Setup

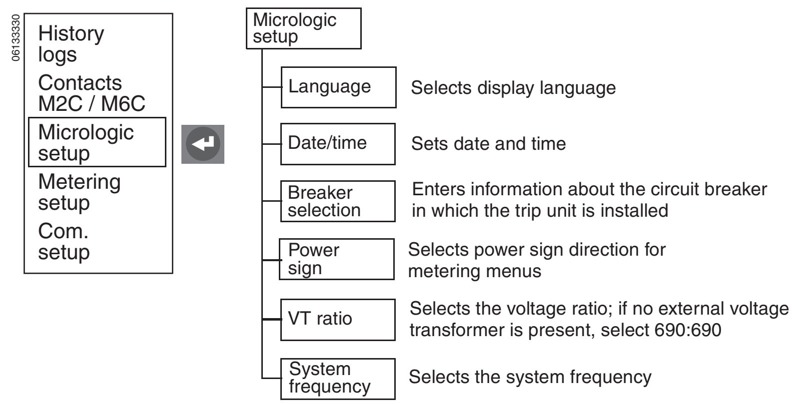
Use the Maintenance Menu by pressing the wrench key.

Micrologic Setup

NOTE: If trip unit is connected to a communication network which provides date and time synchronization, date/time cannot be set from trip unit.

See Section 3 on page 37 for step-by-step instructions to set up the Micrologic trip unit.

Figure 9 – Micrologic Setup



Advanced Protection

Neutral Protection

Neutral protection protects neutral conductors against overheating.

- For a three-pole circuit breaker, neutral protection is possible if a neutral current transformer is used.
  - — Adjust the neutral using the trip unit keypad.
  - — Possible settings are OFF, N/2, N, or 1.6N.
  - — Factory setting is OFF.
  - — Oversize neutral protection (1.6N) requires use of the appropriate oversize neutral current transformer.

NOTICE

HAZARD OF EQUIPMENT DAMAGE

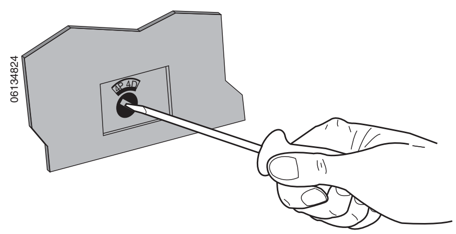
If a four-pole circuit breaker neutral pole switch is set to 4P3D setting, the current in the neutral must not exceed the rated current of the circuit breaker.

For a three-pole circuit breaker with oversize neutral protection (1.6N), select the appropriate oversize neutral current transformer.

Failure to follow these instructions can result in equipment damage.

- For a four-pole circuit breaker, set system type using the circuit breaker neutral selector dial (see Figure 10).
  - — Make fine adjustments using the trip unit keypad, with the circuit breaker dial setting providing the upper limit for adjustment.
  - — Factory setting is 4P4D.

Figure 10 – Four-Pole Circuit Breaker Neutral Selector Dial



Neutral Protection Settings for Four-Pole Circuit Breaker

Circuit Breaker Selector Dial	Available Keypad Setting
4P 3D	Off, N/2, N
3P N/2	N/2
4P 4D	N/2, N

- Neutral protection conductor type has four possible settings:
  - — Off—Neutral protection is turned off.
  - — N/2—Neutral conductor capacity is one-half that of the line conductors.
  - — N—Neutral conductor capacity is the same as that of the line conductors.
  - — 1.6N—Neutral conductor capacity is 1.6 times that of the line conductors. (Three-pole circuit breaker only.)

Table 8 – Micrologic Trip Unit Conductor Type

Setting	Long-Time Pickup		Short-Time Pickup		Instantaneous		Ground-Fault Pickup	
	Trip Unit	Neutral	Trip Unit	Neutral	Trip Unit	Neutral	Trip Unit	Neutral
OFF	Ir	None	Isd	None	Ii	None	Ig	None
N/2	Ir	1/2 Ir	Isd	1/2 Isd	Ii	Ii	Ig	Ig
N	Ir	Ir	Isd	Isd	Ii	Ii	Ig	Ig
1.6N	Ir	1.6 x Ir	Isd	1.6 x Isd*	Ii	Ii	Ig	Ig

*In order to limit the range, limited to 10 x In

Alarms

Alarms can be enabled or disabled for protection or load shedding.

- When an alarm occurs, an entry is made in the alarm log.
- For a trip unit to activate an alarm, both the pickup level and time delay must be exceeded. Therefore for LSIG protection and advanced protection programmed to trip the circuit breaker, the trip unit will not activate the alarm until the circuit breaker trips. (For example, if a relay is programmed for the long-time pickup Ir, the trip unit will not signal an alarm when the long-time overload indicator lights. The trip unit will only activate the alarm once the long-time overload exceeds the time delay and trips the circuit breaker.)
- Link alarms to a visual or audible signal by programming the optional M2C or M6C module contacts, when an external 24 V power supply is used on the trip unit.

- View alarms by:
  - History logs menu
  - The network system management software
- M2C/M6C contact characteristics:
  - Minimum load of 100 mA/24 V
  - Breaking capacity at a 0.7 power factor

240 Vac	5 A
380 Vac	3 A
24 Vdc	1.8 A
48 Vdc	1.5 A
125 Vdc	0.4 A
250 Vdc	0.15 A

- When several alarms are activated, screen response/refresh time will be slower.

See Appendix B for default and range values.

Table 9 – Trip Unit Alarms

Alarm	Menu	Symbol	Alarm	Trip
Long-time pickup	Current protection	Ir	X	X
Short-time pickup	Current protection	Isd	X	X
Instantaneous pickup	Current protection	Ii	X	X
Ground-fault current	Current protection	I⏚	X	X
Ground-fault alarm	Current protection	AI⏚	X	X
Current unbalance	Current protection	Iunbal	X	X
Phase A maximum demand current	Current protection	$\overline{\text{Ia}}$ max	X	X
Phase B maximum demand current	Current protection	$\overline{\text{Ib}}$ max	X	X
Phase C maximum demand current	Current protection	$\overline{\text{Ic}}$ max	X	X
Neutral maximum demand current	Current protection	$\overline{\text{In}}$ max	X	X
Minimum voltage (undervoltage)	Voltage protection	Vmin	X	X
Maximum voltage (overvoltage)	Voltage protection	Vmax	X	X
Voltage unbalance	Voltage protection	Vunbal	X	X
Reverse power	Other protection	rPmax	X	X
Minimum frequency (underfrequency)	Other protection	Fmin	X	X
Maximum frequency (overfrequency)	Other protection	Fmax	X	X
Phase rotation	Other protection	Φ rotation	X	–
Current load shedding	Load shedding I	Ished	X	–
Power load shedding	Load shedding P	Pshed	X	–

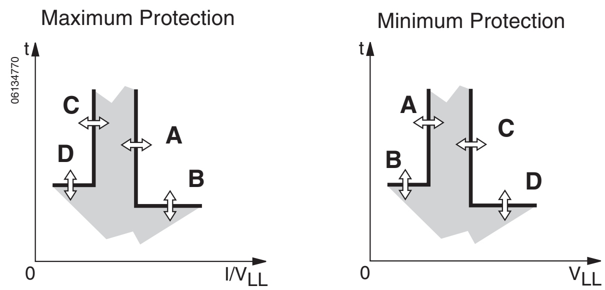
ENGLISH

Minimum (Under) and Maximum (Over) Demand Current and Voltage Protection

Provides pickup and dropout values for alarm, contacts or tripping for current and voltage values. (There is no minimum for current.)

- Pickup value (A) is set to activate an alarm or trip.
- Pickup time delay (B) is set to start timing once the pickup value has been passed.
- Dropout value (C) is set to deactivate the alarm and/or contact.
- Dropout time delay (D) is set to start timing once the dropout value has been passed.

Figure 11 – Minimum/Maximum Protection Curves



- Minimum (under) voltage protection (V_{min}) is activated when any line-line voltage is below the minimum voltage setting.
- Maximum (over) voltage protection (V_{max}) is activated when any line-line voltage is above the maximum voltage setting.
- V_{min} has a dropout value ≥ pickup value.
- V_{max} has a dropout value ≤ pickup value.
- If current or voltage protection trips the circuit breaker, the circuit breaker cannot be reset until the current or voltage problem which caused the trip is corrected.
- Ground-fault alarm on the 5.0P and 6.0P trip unit is based on true rms value of the ground current.
- Ground-fault trip on the 6.0P trip unit is based on true rms value of the ground current.
- Do not set undervoltage protection below 80%[1].

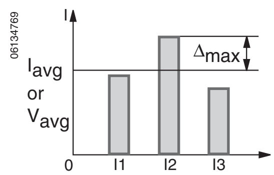
[1] See Appendix D for an explanation of system protection behavior.

Current or Voltage Unbalance Protection

This protection applies to unbalanced values for the three-phase currents and voltages.

- Unbalance values are based on the true RMS values of the three-phase currents.
- Do not set V_{unbal} above 20%[1].
- Do not use voltage unbalance protection to determine the loss of multiple phases[1].

Figure 12 – Current or Voltage Unbalance Protection



$$I_{avg} = \frac{I_a + I_b + I_c}{3} \qquad V_{avg} = \frac{V_a + V_b + V_c}{3}$$

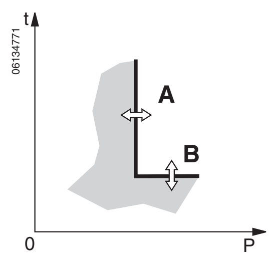
$$I_{unbal} = \frac{|\Delta_{max}|}{I_{avg}} \qquad V_{unbal} = \frac{|\Delta_{max}|}{V_{avg}}$$

Reverse Power Protection (rPmax)

Reverse power protection protects alternators against absorption of the total actual power over all three phases in the event that a drive motor fails.

- Reverse power protection applies a trip curve based on the total actual power value (A) over all three phases.
- A time delay (B) starts timing if the total actual power of the three phases is not flowing in the defined direction and if it exceeds a reverse power threshold.
- The power direction is defined during trip unit setup.

Figure 13 – Reverse Power Protection



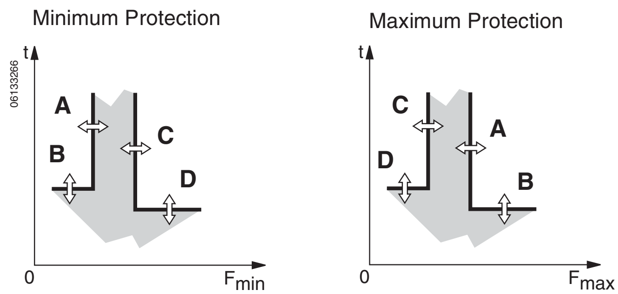
1 See Appendix D for an explanation of system protection behavior.

Minimum (Under) and Maximum (Over) Frequency Protection

Provides pickup and dropout values for frequency.

- Pickup value (A) is set to activate an alarm or trip.
- Pickup time delay (B) is set to start timing once the pickup value has been passed.
- Dropout value (C) is set to deactivate the alarm and/or contact.
- Dropout time delay (D) is set to start timing once the dropout value has been passed.
- F_{min} has a dropout value ≥ pickup value.
- F_{max} has a dropout value ≤ pickup value.
- When system frequency is set to 400 Hz, the frequency protection is disabled.

Figure 14 – Minimum/Maximum Frequency Curves



Load Shedding

Load shedding does not trip the circuit breaker, but may be used to activate an alarm linked to an M2C or M6C contact (controlling non-priority network loads).

- Load shedding is defined by a threshold and time delay:

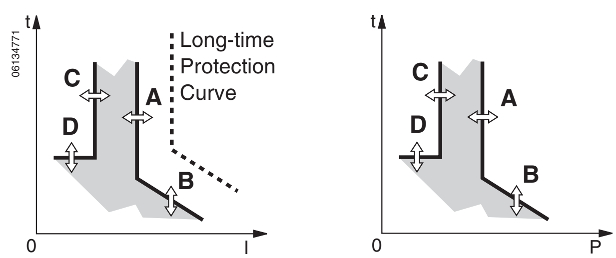
  A—Activation threshold

  B—Activation time delay

  C—Dropout threshold

  D—Dropout time delay
- Power load shedding depends on the flow direction set during trip unit setup.
- Current load shedding is connected to the I^2t or Idmtl long-time delay values.
- Current load shedding cannot be activated if "Long-time OFF" rating plug is installed.

Figure 15 – Load Shedding



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Phase Rotation Protection

Protects the circuit when two of the three phases are reversed.

- If one of the phases is down, this protection is inactive.
- Options are ABC or ACB.
- When system frequency is set to 400 Hz, phase rotation protection is disabled.
- Do not use phase rotation protection to determine the loss of multiple phases in delta connected systems.

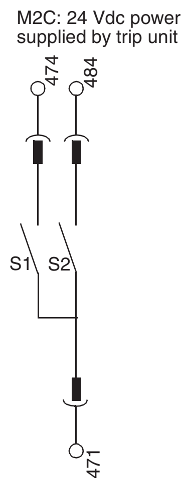
M2C and M6C Programmable Contact Kits

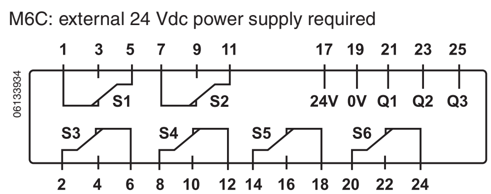
One or more alarms can be activated using an optional M2C or M6C programmable contact kit. The M2C contact kit provides two form A contacts with common neutral. The M6C contact kit provides six form C contacts. Each contact can be programmed through the trip unit for one alarm condition.

A 24 Vdc, 5 W auxiliary power supply is required for operation of trip unit/M2C or M6C contact kit combination.

NOTE: Trip unit and communication modules (BCM and CCM) must use separate power supplies. The M2C and M6C contact kits can share the trip unit auxiliary power supply.

Figure 16 – M2C/M6C Wiring Diagrams





Characteristics for M2C/M6C Programmable Contacts	V	A
Minimum Load	24 Vdc	100 mA
Breaking Capacity at a Power Factor (p.f.) of 0.7	240 Vac	5 A
	380 Vac	3 A
	24 Vdc	1.8 A
	48 Vdc	1.5 A
	125 Vdc	0.4 A
	250 Vdc	0.15 A

Zone-selective Interlocking

Short-time and ground-fault protection can be interlocked to provide zone-selective interlocking.

NOTE: Use I^2t off with ZSI for proper coordination. Using I^2t on with ZSI is not recommended as the delay in the upstream device receiving a restraint signal could result in the trip unit tripping in a time shorter than the published trip curve.

NOTE: Setting short-time delay (tsd) or ground-fault delay (tg) to the 0 setting will eliminate selectivity for that circuit breaker.

Control wiring links several trip units in the distribution network and in the event of a fault, a trip unit will obey the set delay time only if receiving a signal from a downstream trip unit.

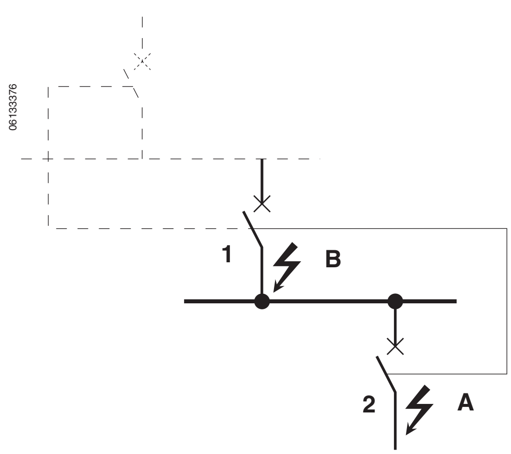
If the trip unit does not receive a signal, tripping will be instantaneous (with no intentional delay).

- The fault is cleared instantaneously by the nearest upstream circuit breaker.
- Thermal stresses (I^2t) in the network are minimized without any effect on the correct time delay coordination of the installation.

Figure 17 shows circuit breakers 1 and 2 zone-selective interlocked.

- A fault at A is seen by circuit breakers 1 and 2. Circuit breaker 2 trips instantaneously and also informs circuit breaker 1 to obey set delay times. Thus, circuit breaker 2 trips and clears the fault. Circuit breaker 1 does not trip.
- A fault at B is seen by circuit breaker 1. Circuit breaker 1 trips instantaneously since it did not receive a signal from the downstream circuit breaker 2. Circuit breaker 1 trips and clears the fault. Circuit breaker 2 does not trip.

Figure 17 – Zone-selective Interlocking



Metering

The Micrologic P trip unit provides continuous metering of system values. Metered values can be checked using the graphic display screen or network system management software.

Trip Unit Testing

Trip unit LSIG functions can be tested using primary injection testing or secondary injection testing. Test trip unit using the full-function test kit or hand-held test kit. (See “Trip Unit Installation Check” on page 76 for more information.)

Operation Counter

The circuit breaker communication module is required to display the total number of times the circuit breaker has opened since initial installation and since the last reset and the day/time of last reset

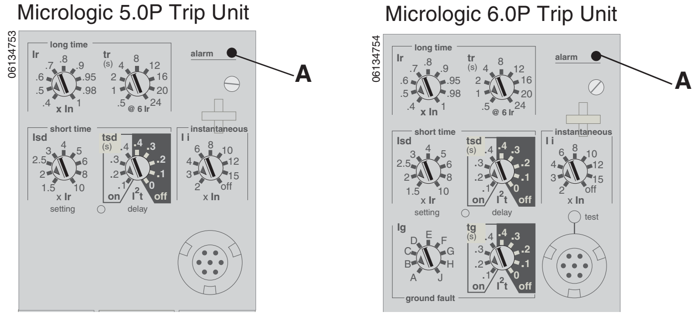
Indicator Lights

Overload Indicator Light

The overload indicator light (A) lights when the Ir long-time pickup level has been exceeded.

Figure 18 – Overload Indicator Light

Micrologic 5.0P Trip Unit Micrologic 6.0P Trip Unit



Trip Indicator Lights

A trip indicator light on the trip unit will light when the circuit breaker trips. If the trip unit has auxiliary power connected, the trip unit will display information about the trip.

> **NOTICE**
>
> **HAZARD OF EQUIPMENT DAMAGE**
>
> If the circuit breaker remains closed and the Ap light remains lit after the reset, open the circuit breaker and contact the sales office.
>
> **Failure to follow these instructions can result in equipment damage**

The trip indicator light will remain lit until it is reset by pressing the reset button (A). Cause of trip should be corrected before resetting.

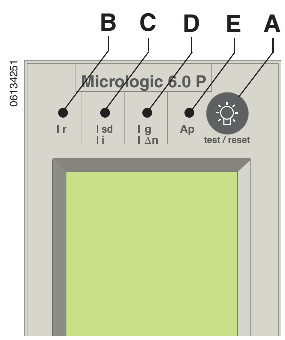
Ir trip indicator light (B) lights when long-time pickup (Ir) signals the circuit breaker to trip.

Isd/Ii trip indicator light (C) lights when short-time pickup (Isd) or instantaneous pickup (Ii) signals the circuit breaker to trip.

Ig trip indicator light (D) lights when ground-fault pickup (Ig) signals the circuit breaker to trip.

Ap self-protection/advanced-protection indicator light (E) lights when the advanced protection features cause a trip to occur, the trip unit overheats, the instantaneous override value is exceeded or a trip unit power supply failure occurs.

Figure 19 – Trip Indicator Lights

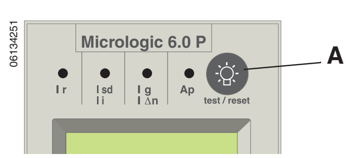


NOTE: In cases where a number of causes may result in tripping, the LED signalling the last cause is the only one to remain on.

Test/Reset Button

The test/reset button (A) must be pressed after a trip to reset the fault information on the graphic display and clear the trip indicator light.

Figure 20 – Reset Button



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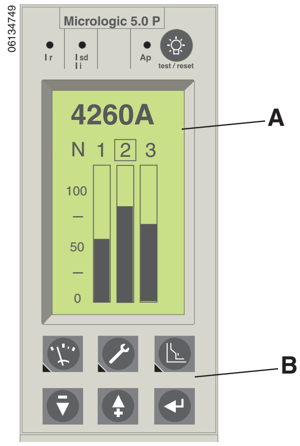
Graphic Display Screen

The graphic display screen (A) shows the trip unit settings and information. Navigation buttons (B) are used to display and modify items on the screen. Default display shows current levels.

Trip unit must be powered for graphic display screen to operate. The trip unit is powered if:

- circuit breaker is on and has more than 150 V of load voltage on two phases (circuit breaker is closed or bottom fed).
- the full-function or hand-held test kit is connected and on.
- the 24 Vdc external power supply is connected.
- an external voltage tap is installed and voltage of more than 150 V is present on two phases.

Figure 21 – Graphic Display Screen



Contact Wear Indicator

The trip unit keeps track of the circuit breaker contact wear when a Masterpact circuit breaker type is selected. The amount of wear on the circuit breaker contacts can be transferred when a trip unit is replaced. (External trip unit power supply is required.)

Section 2— Graphic Display Navigation

Graphic

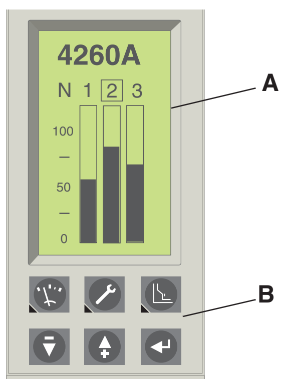
Display

Graphic display (A) functions if the trip unit is connected to a 24 Vdc external power supply or there is 150 V on at least two phases. Current alone (from primary injection test set or electrical system) will power the LSIG protection functions, but will not power the display.

Navigation buttons (B):

	Metering Menu Button—Provides access to metering menus
	Maintenance Menu Button—Provides access to maintenance menus
	Protection Menu Button—Provides access to protection menus
	Down Button—Moves cursor downward or decreases setting value
	Up Button—Moves cursor upward or increases setting value
	Enter Button—Selects an option from a list or enters the set values

Figure 22 – Graphic Display

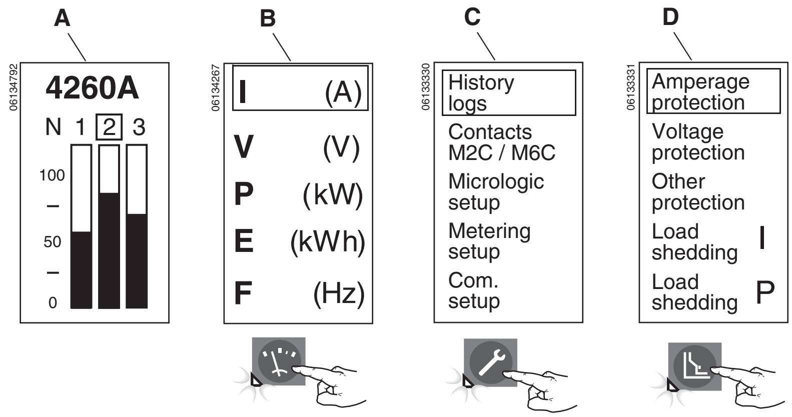


Bar Graph Display and Menus

The Micrologic P trip unit has a default bar graph display of currents and three different menus which can be accessed using navigation buttons:

A. Bar Graph Display—Provides real-time bar graph display of line currents and measurement of line current and neutral current (if applicable) (default display)
B. Metering Menu—Provides access to metered values of current, voltage, power, energy and frequency
C. Maintenance Menu—Allows user to change the trip unit configuration and provides access to history logs
D. Protection Menu—Allows precision adjustments to basic and advanced protection

Figure 23 – Menus



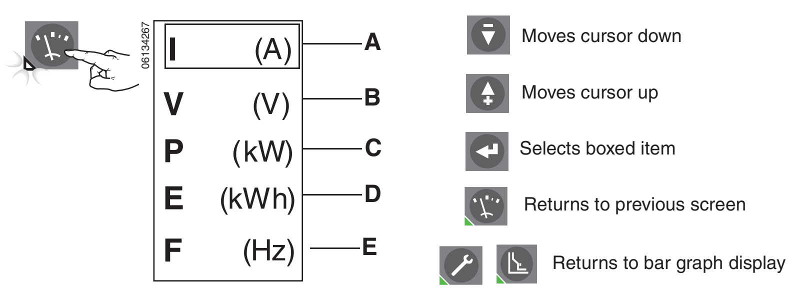
When the switch cover is closed, the trip unit will return to the bar graph (default) display after 3.5 minutes of no input. (If the switch cover is open, the display stays at the window selected.) To access another menu, press the button that corresponds to the desired menu. The menu appears on the display and the green LED below the menu button lights up.

Metering Menu

Use the metering button to access the metered values of:

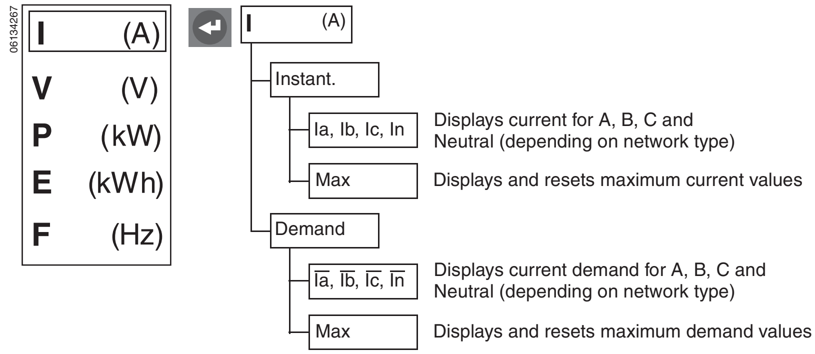
A. Current
B. Voltage
C. Power
D. Energy
E. Frequency

Figure 24 – Metering Menu



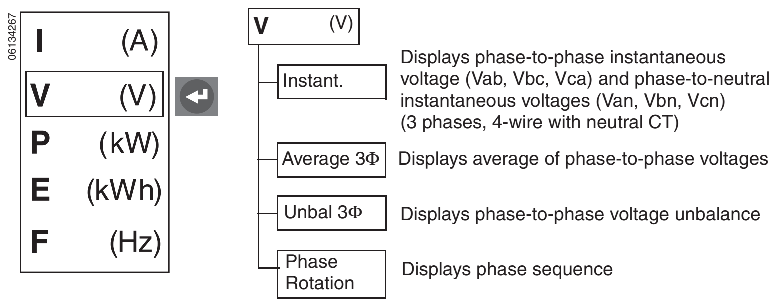
Current

Figure 25 – Current Levels



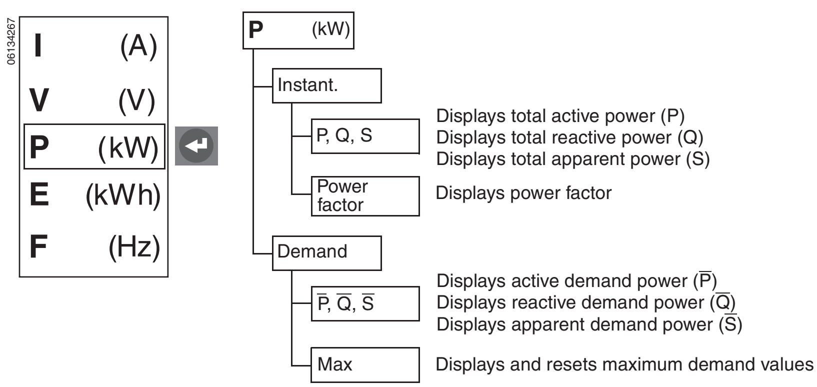
Voltage

Figure 26 – Voltage Levels



Power

Figure 27 – Power Levels



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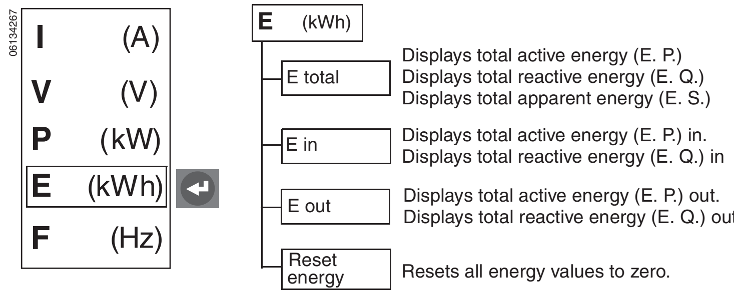
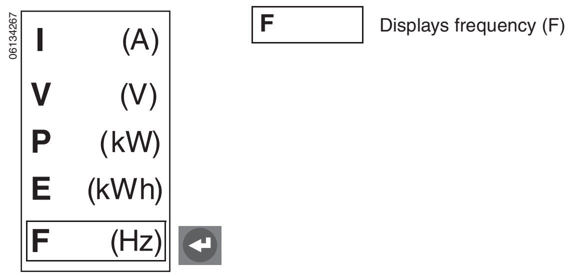
Energy

Figure 28 – Energy Levels



Frequency

Figure 29 – Frequency



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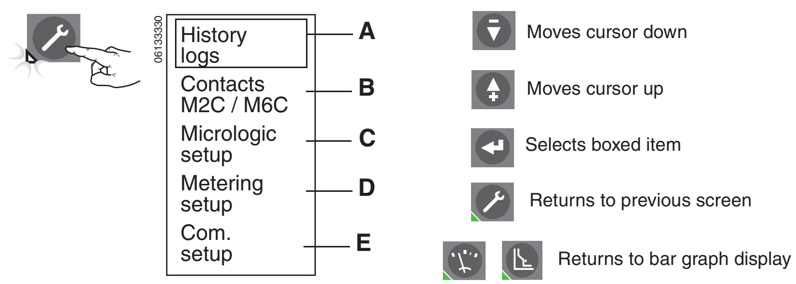
Maintenance Menu

Use the maintenance button to access the maintenance menu.

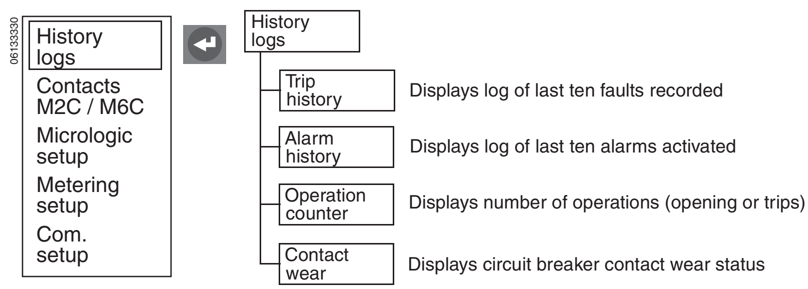
A. To access the history log
B. To set up the M2C/M6C contacts
C. To set up the Micrologic trip unit
D. To set up the metering parameters
E. To set up the communication module

Figure 30 – Maintenance Menu



History Logs

Figure 31 – History Logs

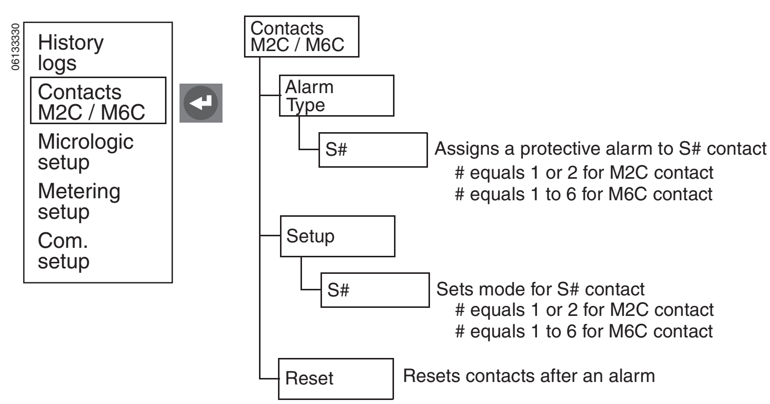


M2C/M6C Programmable Contacts

- Available only if M2C/M6C contacts are installed.
- One alarm per contact.

Can select those set up as “alarm” or “trip” under protection menu.

Figure 32 – M2C/M6C Contacts Setup



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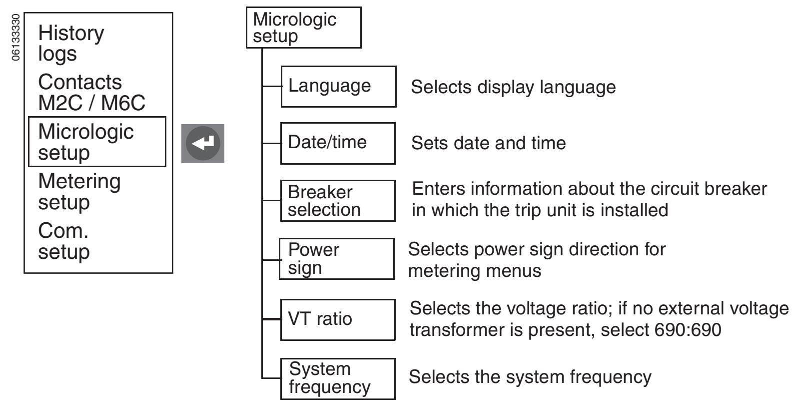
Micrologic Setup

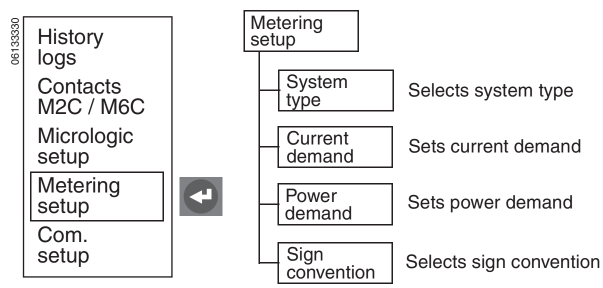
If trip unit is connected to a communication network which provides date and time synchronization, date/time cannot be set from trip unit.

Figure 33 – Micrologic Setup



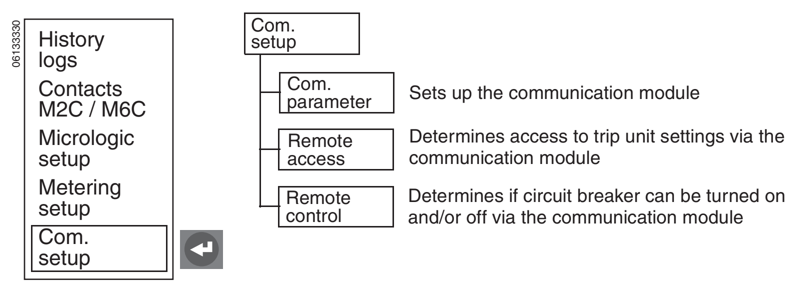
Metering Setup

Figure 34 – Metering Setup



Communication Setup

Figure 35 – Communication Module Setup



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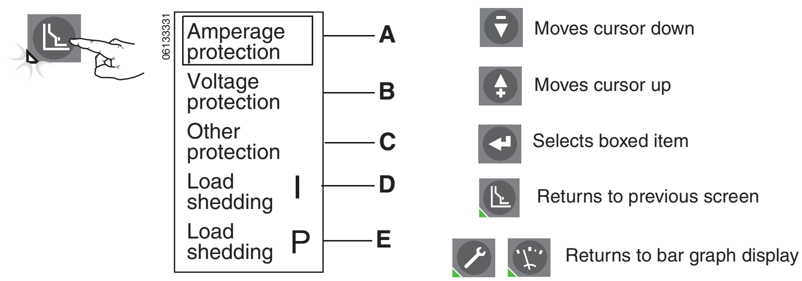
Protection Menu

Use the protection button to access the menus.

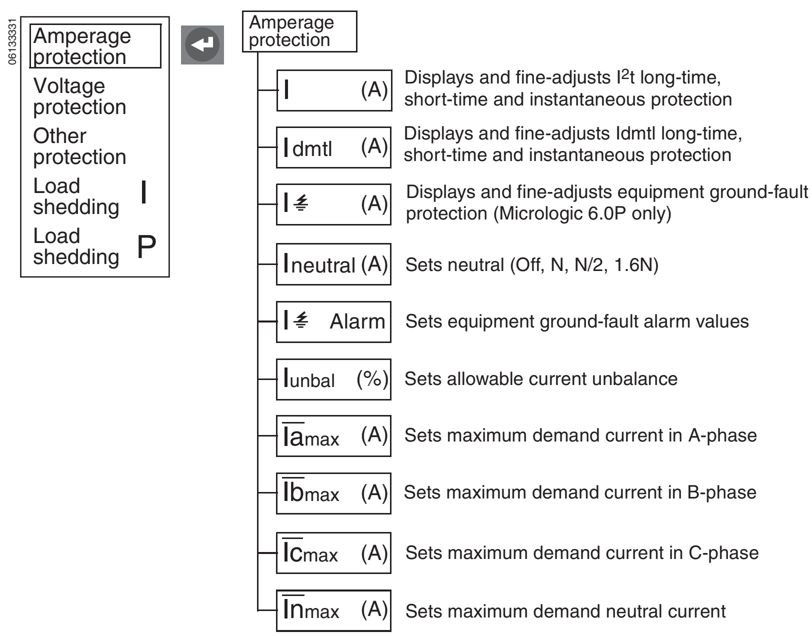
A. To display and adjust current protection
B. To display and adjust voltage protection
C. To display and adjust other protection
D. To set current load shedding
E. To set power load shedding

Figure 36 – Protection Menu



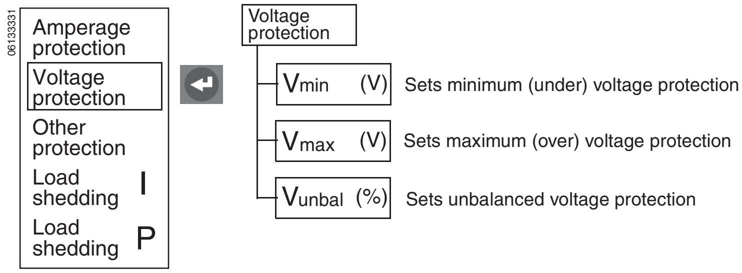
Amperage Protection

Figure 37 – Amperage Protection



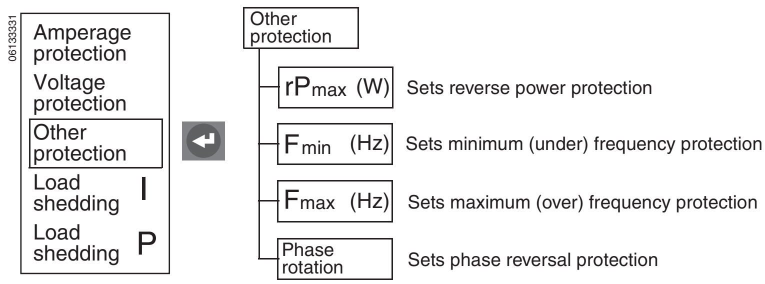
Voltage Protection

Figure 38 – Voltage Protection



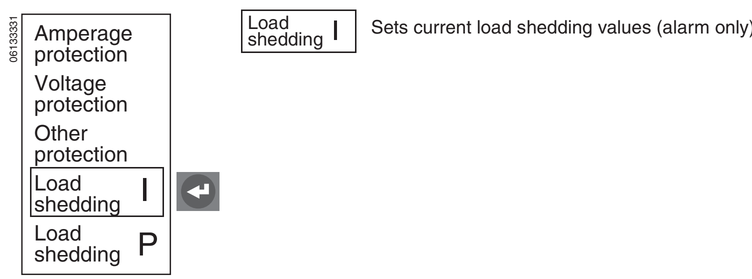
Other Protection

Figure 39 – Other Protection



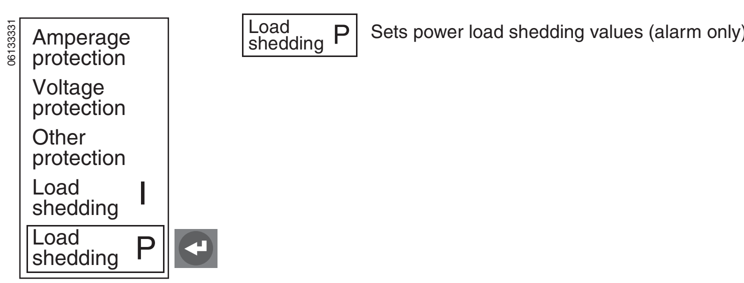
Current Load Shedding

Figure 40 – Current Load Shedding



Power Load Shedding

Figure 41 – Power Load Shedding



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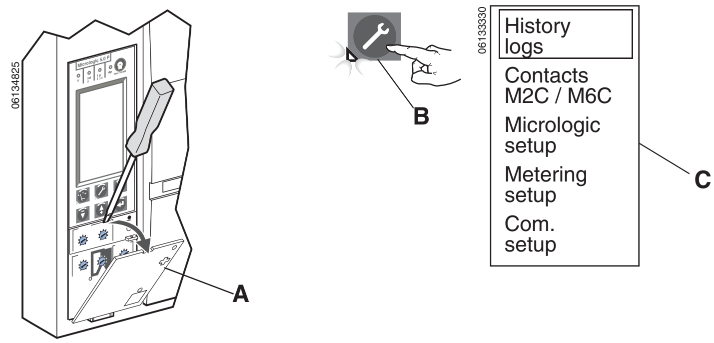
Section 3— Trip Unit Configuration

Trip Unit Parameters Adjustment

NOTE: The protection menu settings cannot be adjusted unless the switch cover is open. When settings have been adjusted, press one of the menus buttons to save the new values.

1. Open switch cover (A).
2. Press maintenance button (B) to bring up maintenance menu (C).

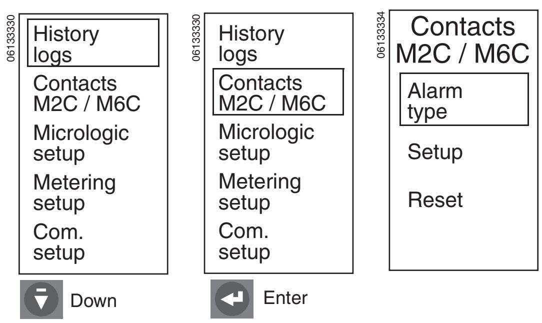
Figure 42 – Maintenance Menu



M2C/M6C Programmable Contacts

If M2C or M6C contact kit is installed, use "Contacts M2C/M6C" menu to set alarm type and operational mode. The M2C kit has S1 and S2 contacts. The M6C kit has S1, S2, S3, S4, S5 and S6 contacts.

Figure 43 – M2C/M6C Contact Kits Setup



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1. Enter M2C/M6C contacts alarm type into trip unit memory. Available alarms are:

   Ir—Long-time pickup

   Ii—Instantaneous pickup

   Isd—Short-time pickup

   I⏚—Ground-fault current

   AI⏚—Ground-fault alarm

   Iunbal—Current unbalanced

   Iamax—Phase A demand overcurrent

   Ibmax—Phase B demand overcurrent

   Icmax—Phase C demand overcurrent

   Inmax—Neutral demand overcurrent

   Vmin—Voltage is below set minimum

   Vmax—Voltage is above set maximum

   Vunbal—Voltage unbalanced

   rPmax—Reversed power

   Fmin—Frequency is below set minimum

   Fmax—Frequency is above set maximum

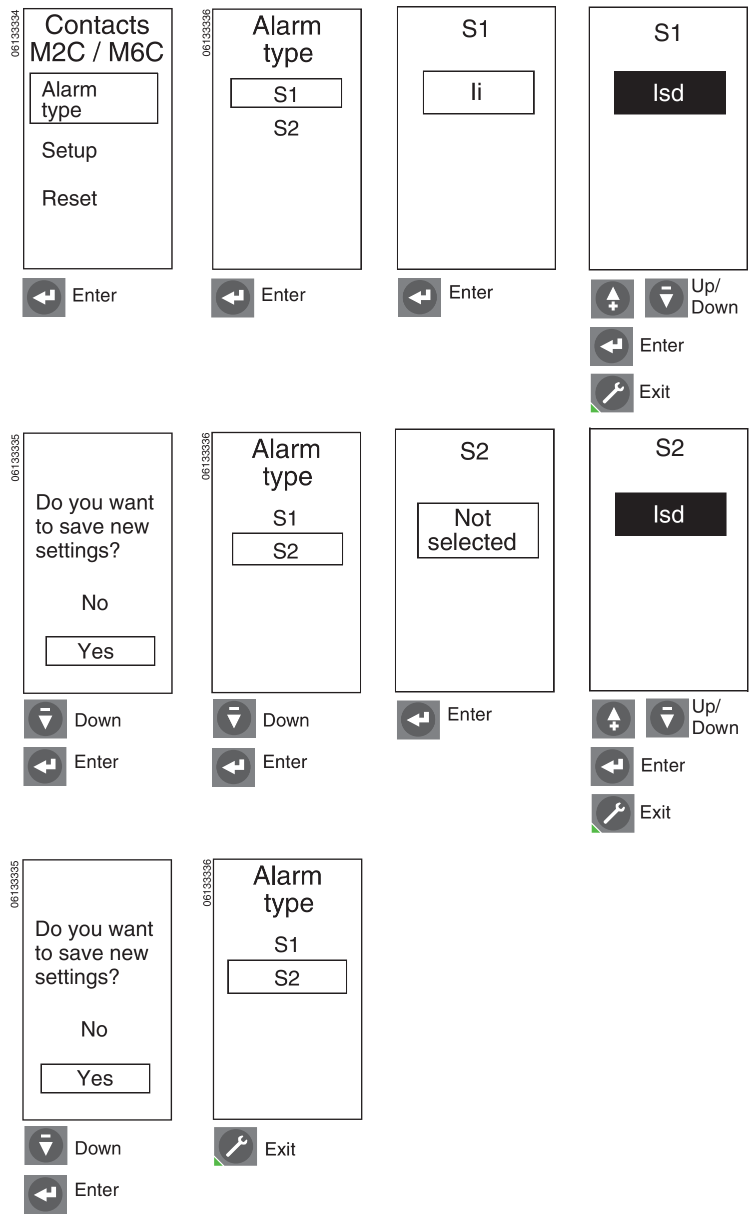
   Φ rot—Phase rotation

   Ished—Current shedding

   Pshed—Power shedding

   Not Selected—No alarms selected

Figure 44 – Set M2C/M6C Contact Alarm Type



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2. Set up M2C/M6C contact alarm mode. Contact modes available are:

   Latching contact—Stays latched until reset

   Nonlatching contact—Drops out after fault is removed.

   Time Delay—Delay placed on contacts

   For troubleshooting purposes only the following modes are available:

   Locked 0—Contacts are locked open

   Locked 1—Contacts are locked closed

   For short-time, instantaneous and ground fault (SIG) alarms only:

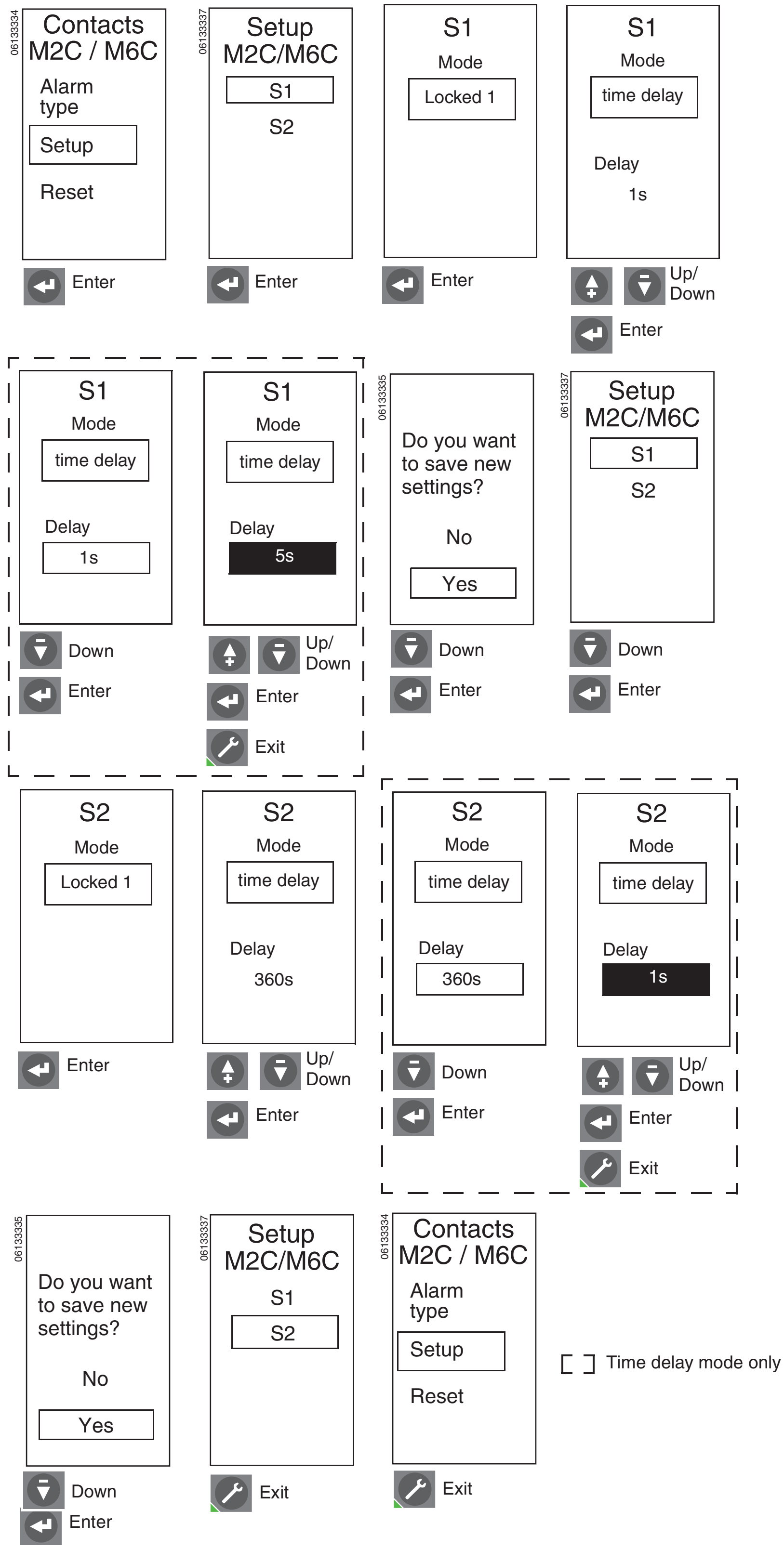
   — Each alarm occurrence will activate the relay and will signal and continue to signal an alarm until the trip unit test/reset button is pressed.

   — This “latching behavior occurs regardless of whether “latching” or “nonlatching” contact mode was used during alarm setup.

3. Reset displays states of relays and allows them to be reset.

   NOTE: Select reset option under the M2C/M6C menu to reset all alarms. The test/reset button on the trip unit will reset the trip unit so that it will stop activating the alarm, but does not reset the M2C/M6C contact.

Figure 45 – Set M2C/M6C Contact Alarm Mode



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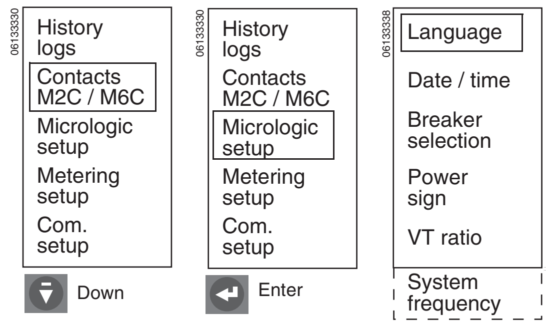
Micrologic Trip Unit Setup

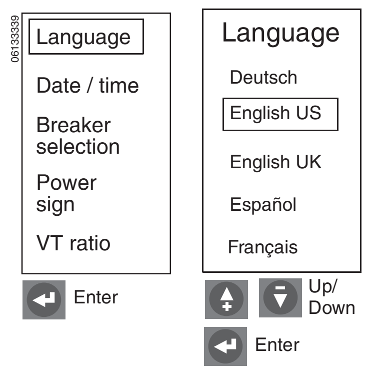
Use “Micrologic setup” menu to set display language, date and time, circuit breaker information, power sign, VT ratio and system frequency.

Figure 46 – Micrologic Trip Unit Setup



1. Set display language.

Figure 47 – Set Language



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2. Set trip unit date and time.

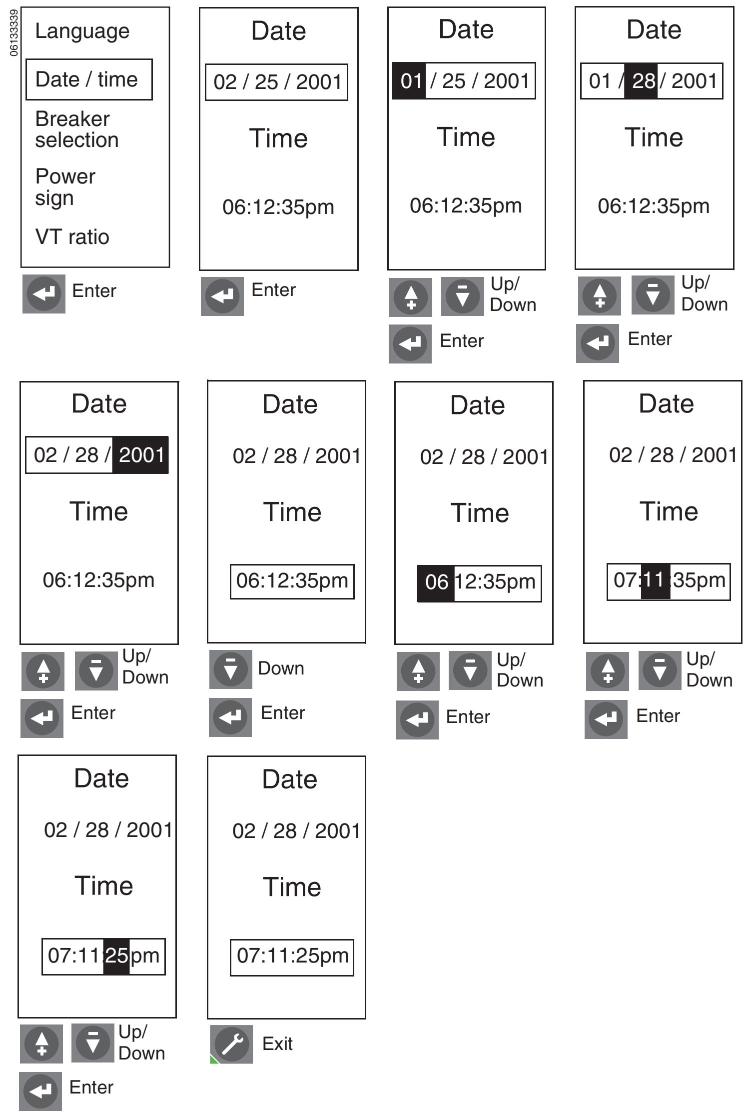
   NOTE: If trip unit is connected to a communication network which provides date and time synchronization, date/time cannot be set from trip unit. If trip unit is not connected to a communication network which provides data and time synchronization, date and time will need to be re-entered every time trip unit power is lost.)

   NOTE: In US English the date format is month/day/year. In all other languages the date format is day/month/year.

   After using the test kit to do secondary injection testing, thermal imaging inhibit, ZSI testing or ground-fault inhibit, the time will need to be reset if the trip unit is not connected to a communication network providing date and time synchronization.

   NOTE: If time is not synchronized by a supervisor using the network system management software, reset time semi-annually, or more often if needed.

Figure 48 – Set Date and Time



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3. Enter circuit breaker information into trip unit memory.The following information must be entered to properly identify the circuit breaker over the communication network:

   Standard—ANSI, UL, IEC or IEC/GB

   Circuit Breaker Family—Masterpact (ANSI, UL, IEC or IEC/GB), Powerpact (UL or IEC) or Compact NS (IEC)

   Circuit Breaker Type—Found on the circuit breaker faceplate

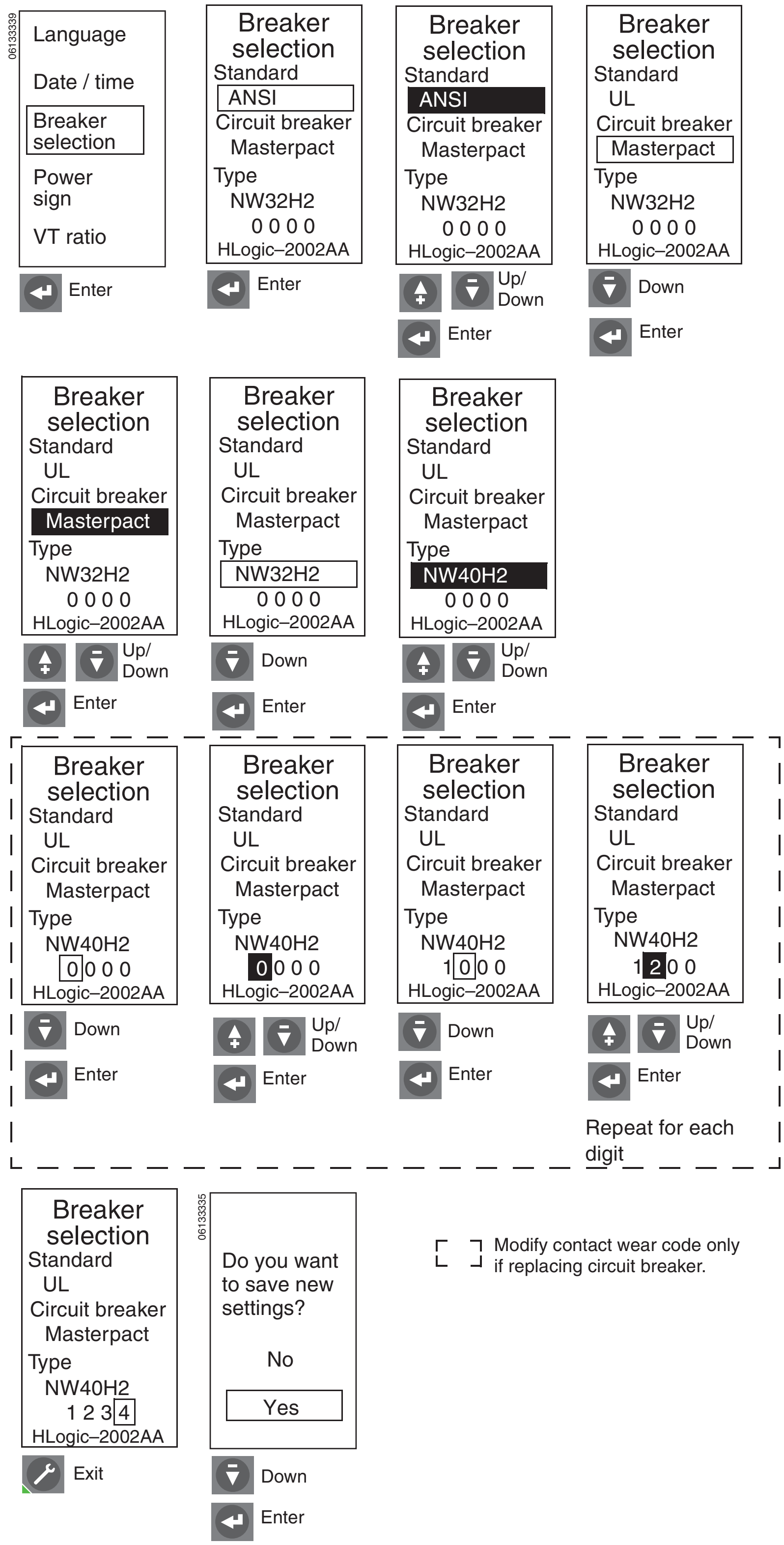
   Circuit Breaker Contact Wear Code–Only modified when replacing an existing trip unit with contact wear information

   NOTE: The contact wear meter is active only when circuit breaker type is Masterpact.

   To maintain contact wear indicator information when replacing an existing trip unit:

   a. Read code on trip unit to be replaced. (The code is a hexadecimal number.)
   b. Remove old trip unit and install new trip unit in circuit breaker.
   c. Enter code from old trip unit in new trip unit.

Figure 49 – Set Circuit Breaker Information



4. Select power sign.

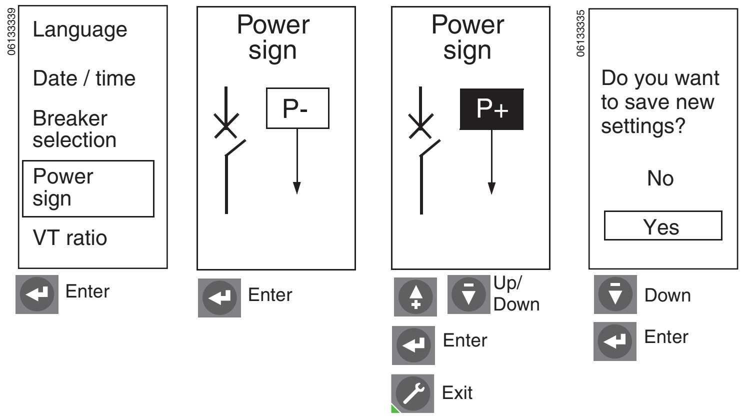
   Choose the signing convention to be used for power metering, energy metering and load shedding:

   — P+: Power absorbed from upstream to downstream (top fed)

   — P-: Power absorbed from downstream to upstream (bottom fed)

   Default value is P+

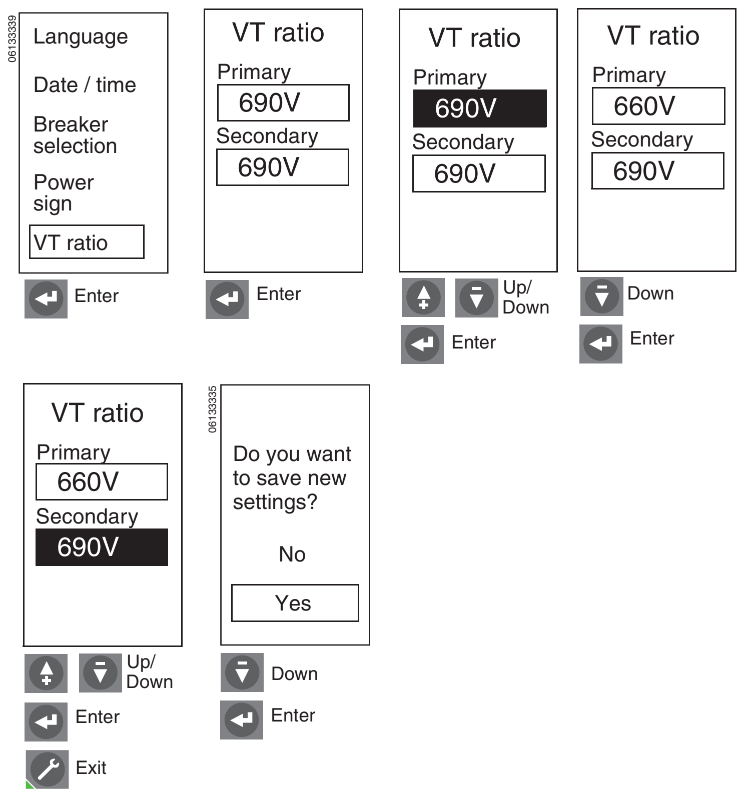
Figure 50 – Set Power Sign



5. Enter VT ratio of external voltage transformer into trip unit memory. If no external voltage transformer is present, set both primary value and secondary value to 690V.

   If supply voltage for the trip unit exceeds 690V, an external voltage transformer is required.

Figure 51 – Set VT Ratio



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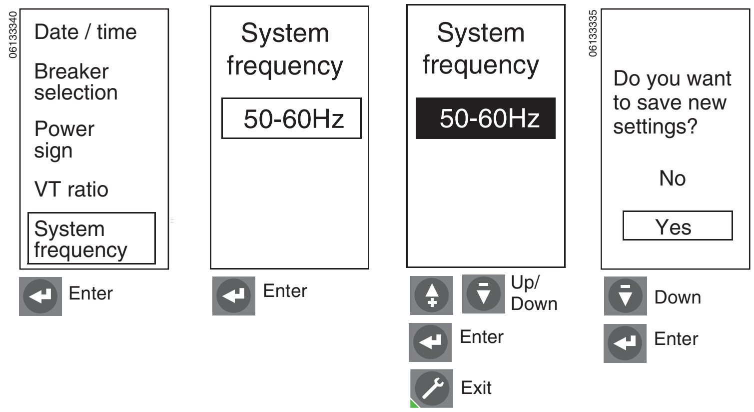
6. Enter system frequency into trip unit memory.

   NOTE: When system frequency is set to 400 Hz:

   — Reactive power absolute value will be correct, but sign will be wrong.
   — PF absolute value will be correct, but sign will be wrong.
   — Frequency value may not be accurate.
   — Frequency protection is disabled.
   — Phase rotation protection is disabled.

Figure 52 – Set System Frequency



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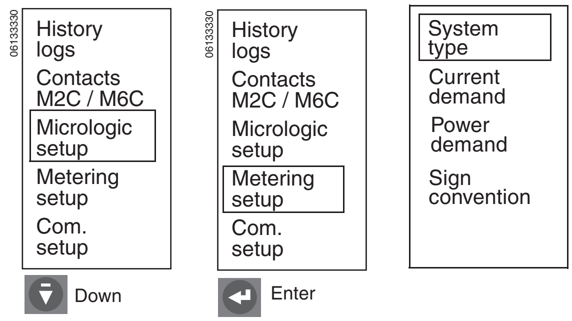
Metering Setup

Use “Metering setup” menu to set parameters for metering system current and power.

Figure 53 – Metering Setup



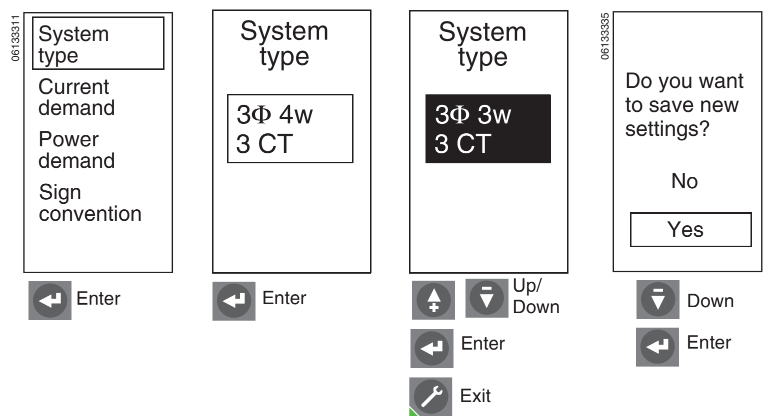
1. Select system type.

   Three measurement options are available:

Network Type	Neutral	Phase Current
3-phase, 3-wire, 3 CT (Uses 2 wattmeters)	No	I_a, I_b and I_c measured
3-phase, 4-wire, 4 CT* (Uses 3 wattmeters)	Yes	I_a, I_b, I_c and I_n measured
3-phase, 4-wire, 3 CT (Uses 3 wattmeters)	No	I_a, I_b and I_c measured

*Do not use “3-phase, 4-wire, 4 CT” type unless neutral is effectively connected to the trip device (neutral voltage connection is external to the 3-pole circuit breaker). (See neutral CT instruction bulletin.)

Figure 54 – Set System Type



NOTE: In the case of a four-pole circuit breaker, the ability to set the neutral is limited by the setting of the neutral type switch on the circuit breaker.

I_n measurement is not available for “3-phase, 4-wire, 3 CT” network types and V_{an}, V_{bn} and V_{cn} simple voltage measurements are not available for “3-phase, 3-wire, 3 CT” network types.

If these measurements are desired, and if the connected system is a wye (4-wire) system, select “3-phase, 4-wire, 4 CT’ and connect to neutral (V_n) voltage terminal on the neutral CT.

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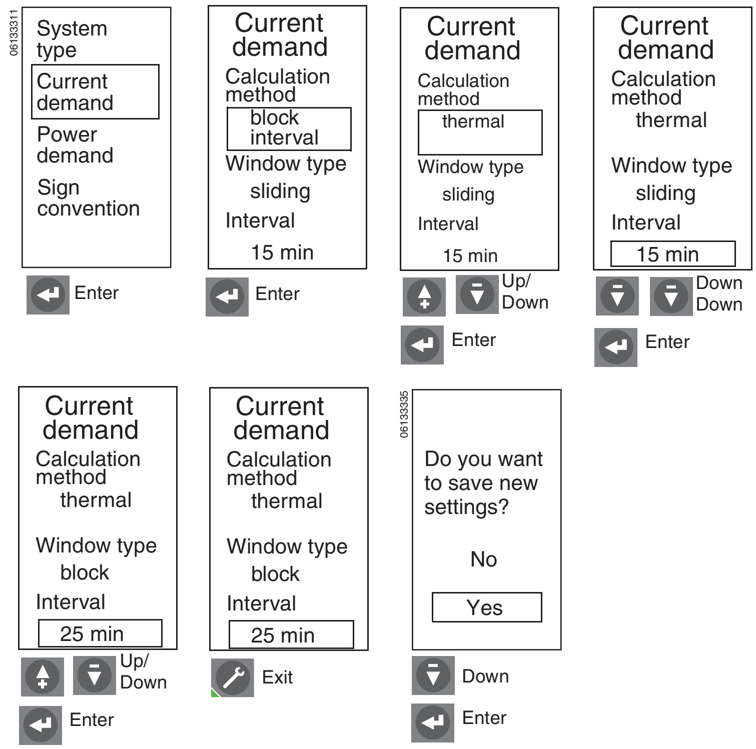
2. Set current calculation method and interval.

   The calculation method can be block interval or thermal calculation.

   The window type is factory set as a sliding window.

   The time interval can be set from five to 60 minutes in one minute increments.

Figure 55 – Set Current Demand



3. Set power calculation method and interval.

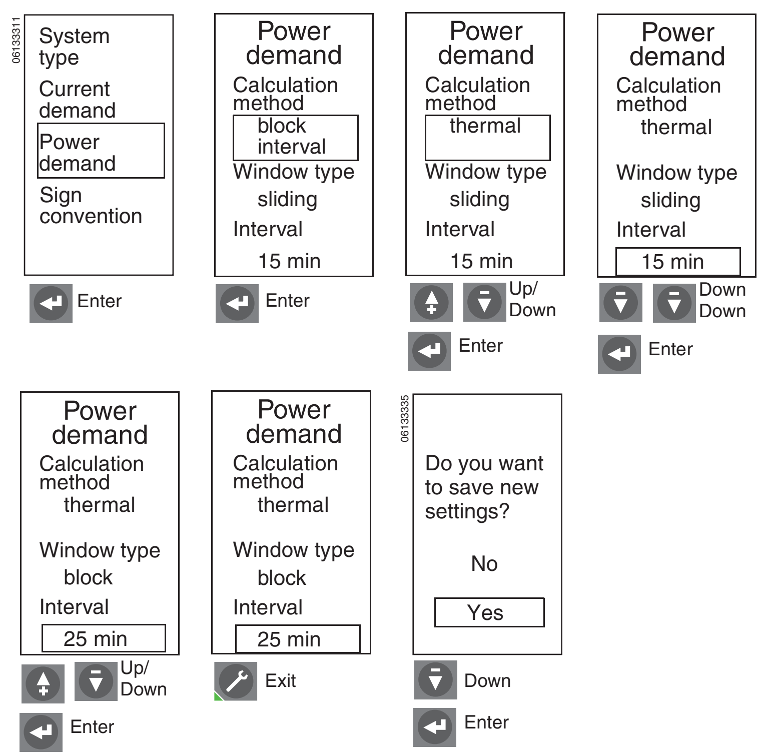
   The calculation method can be block interval, thermal calculation or sync. to comms.

   NOTE: The sync to comms method is available only with the communication option. This function determines demand power based on a signal from the communication module.

   The default window type is sliding.

   The time interval can be set from five to 60 minutes in one minute increments.

Figure 56 – Set Power Demand



4. Select sign convention.

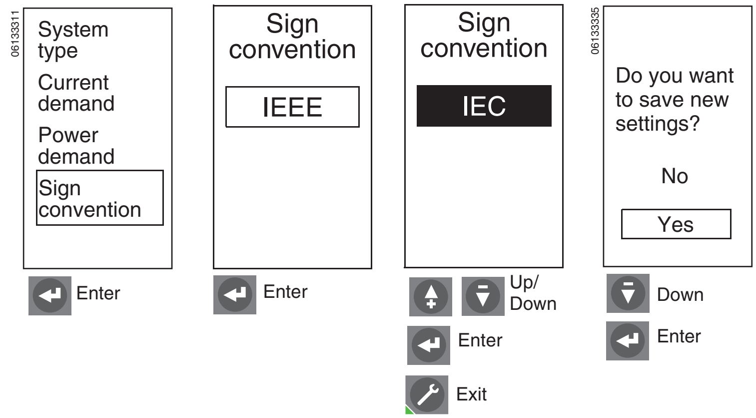
   Choose the signing convention to be used for reactive power (VARS) and reactive energy (VARhrs) and power factor measurements:

   IEEE

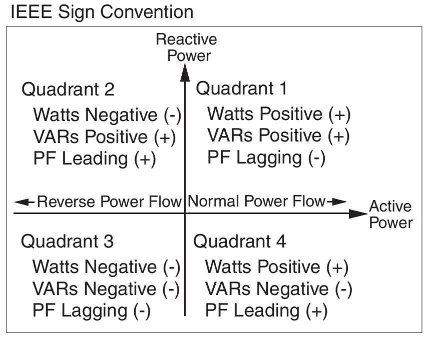
   IEC

   IEEE alt

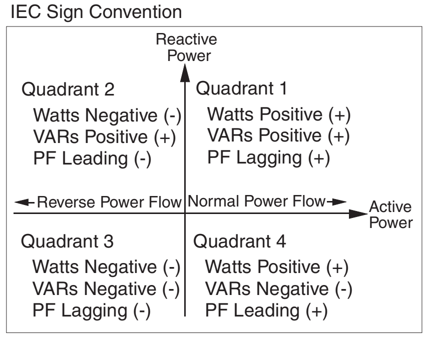
Figure 57 – Set Sign Convention



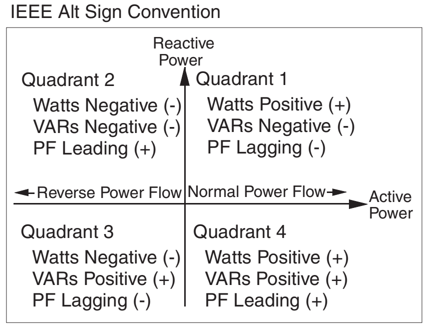
IEEE Sign Convention



IEC Sign Convention



IEEE Alt Sign Convention



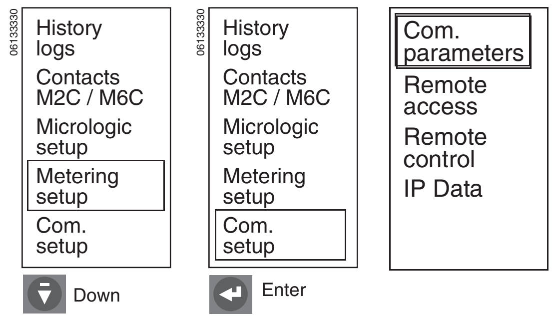
Communication Module Setup

Use “Com. setup” menu to set communication module setup.

NOTE: Com. setup parameters can only be entered if a circuit breaker communication module (BCM) is installed.

NOTE: IP Data displays IFE IP address, if used.

Figure 58 – Communication Module Setup



1. Set up the Modbus address.

   The setting of the Modbus address depends on the COM option. See Table 10.

Table 10 – Modbus Addresses

COM Option	Modbus Address	Modbus Address Range
BCM or BCM ULP is not connected to an IFM or IFE.	The Modbus address is set up on the Modbus Com setting screen, with the parameters of the communication option (see page 49).	1 to 47
BCM ULP is connected to an IFM.	The Modbus address is set up on the two address rotary switches on the front panel of the IFM.	1 to 99 Value 0 is forbidden because it is reserved for broadcasting messages.
BCM ULP is connected to an IFM with legacy firmware.	The Modbus address is set up on the two address rotary switches on the front panel of the IFM.	1 to 47 Value 0 is forbidden because it is reserved for broadcasting messages. Values 48 to 99 are not allowed.
BCM ULP is connected to an IFE.	The Modbus address is fixed and cannot be changed.	255

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2. Set communication parameters. Default values are:

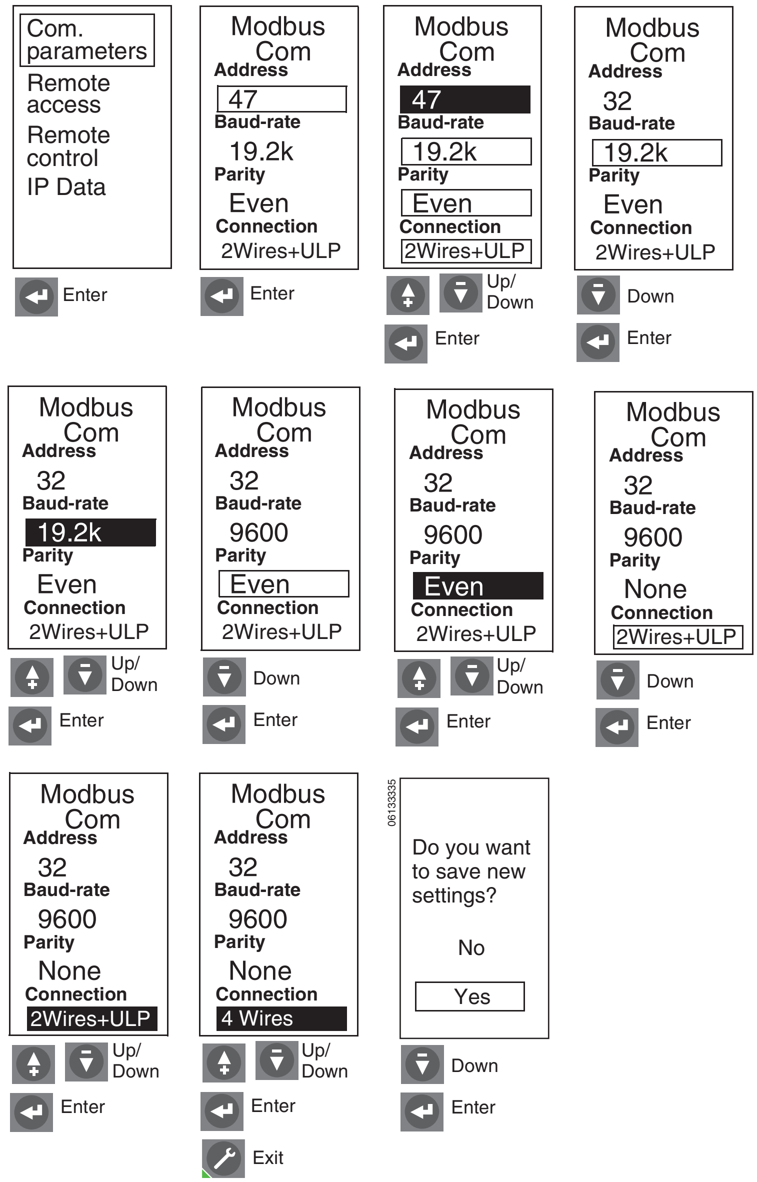
   Address = 47

   Baud-rate = 19.2k

   Parity = even

   Connection = 2 Wires + ULP

Figure 59 – Set Modbus Com Values

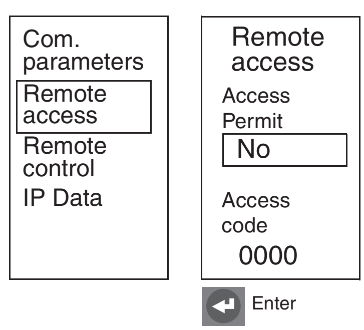


3. Remote access.

   Remote access is factory set and does not require adjustment.

   NOTE: Remote access setting can be changed to allow protection settings to be changed via the communication network. Refer to the *Modbus Communications Guide* 0613IB1313 for other components and setup instructions.

Figure 60 – Check Remote Access



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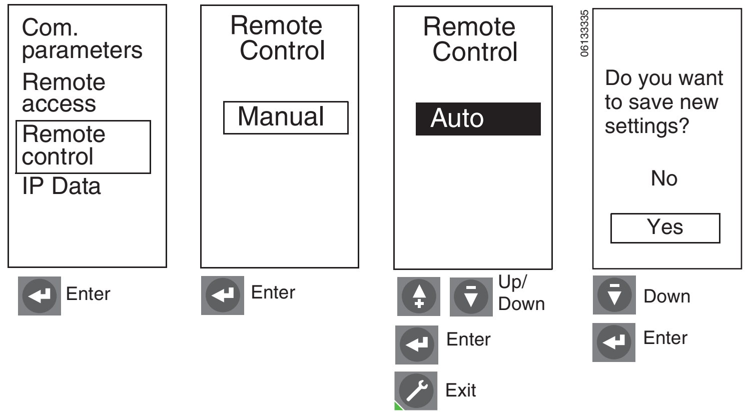
4. Set remote control.

   Manual: The circuit breaker cannot be opened or closed via the network system management software.

   Auto: The circuit breaker can be opened or closed via the network system management software.

   NOTE: For remote operation of the circuit breaker, the BCM must be set to enable opening and/or closing and circuit breaker must have communicating shunt coils with wire harness installed.

Figure 61 – Set Remote Control



Switch Settings Adjustment

NOTICE

HAZARD OF EQUIPMENT DAMAGE

- Using the switches to set trip unit values will override settings made using the keypad.
  - — Changing the switch setting for overload, short-time or instantaneous, or changing the neutral protection selector on a four-pole circuit breaker, will delete all fine adjustments previously made using the keypad for overload, short-time and instantaneous protection.
  - — Changing the switch setting for ground-fault will delete all fine adjustments made with the keypad for ground-fault protection.
- If cover pin located on back of the protective cover is missing, contact sales office for a replacement cover.

Failure to follow these instructions can result in equipment damage.

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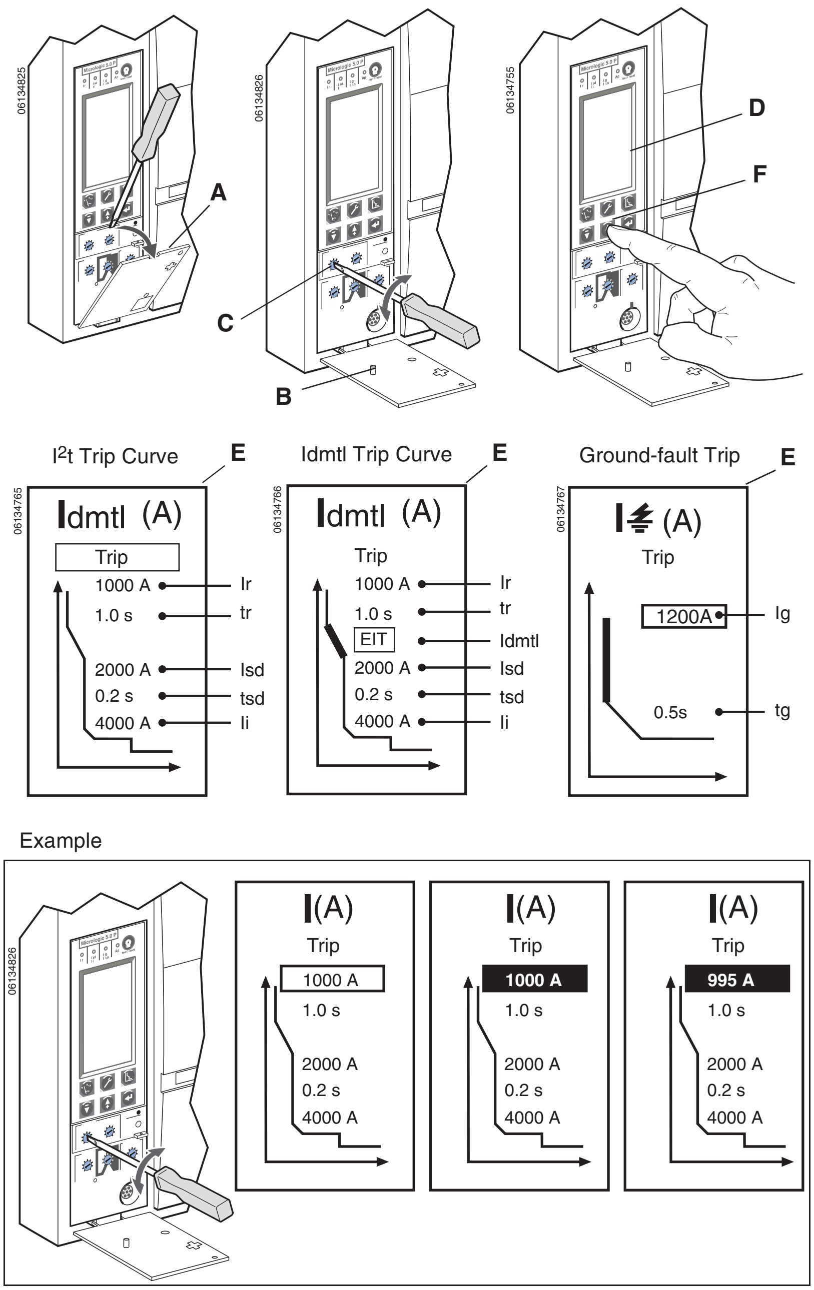
1. Open switch cover (A).
2. Confirm that cover pin (B) is on back of the protective cover. This pin is necessary to lock trip unit settings when they are set to trip.
3. Adjust the appropriate switches (C) to desired values. Display screen (D) automatically shows appropriate setting curve (E). The set value is displayed as a boxed value in amperes or seconds.
4. Make fine adjustments using navigation keys (F) or network system management software. All fine adjustments are stored in non-volatile memory.

   NOTE: Fine adjustments can only be made for values less than those set with the switches. Using switches to set values after making fine adjustments using the keypad will override the keypad adjustments.

   Fine switch settings are in the following increments:

   — Long-time pickup = 1 A
   — Long-time delay = 0.5 sec.
   — Short-time pickup = 10 A
   — Short-time delay = 0.1 sec.
   — Instantaneous pickup = 10 A
   — Ground-fault pickup = 1 A
   — Ground-fault delay = 0.1 sec.

Figure 62 – Adjust Switch Settings



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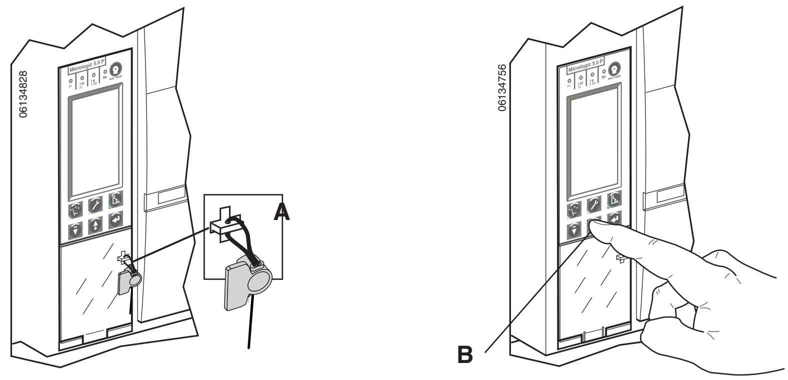
5. Replace switch cover. Use wire seal MICROTUSEAL (A), not supplied, to provide tamper evidence if necessary.

   NOTE: When the cover is closed, the navigation keys can no longer be used to make adjustments to the trip unit settings if they are set to trip.
6. Check settings using keypad (B) and graphic display or the network system management software.

Figure 63 – Check Switch Settings



Examples

Micrologic 5.0P Trip Unit

1. Set switches:

   A—Long-time pickup (Ir)

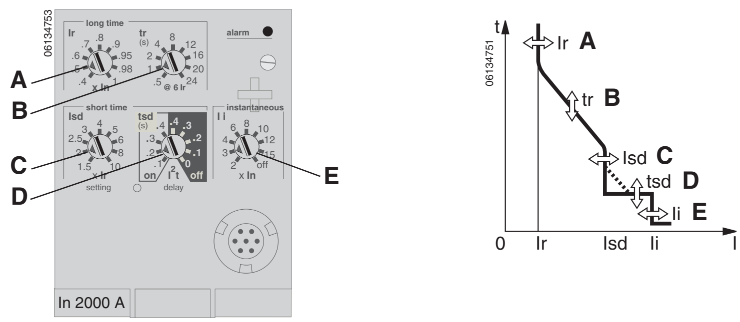
   B—Long-time delay (tr)

   C—Short-time pickup (Isd)

   D—Short-time delay (tsd)

   E—Instantaneous pickup (Ii)
2. Fine-tune adjust using keypad and graphic display screen or the network system management software.

Figure 64 – Set Pickup Levels



Micrologic 6.0P Trip Unit

1. Set switches:

   A—Long-time pickup (Ir)

   B—Long-time delay (tr)

   C—Short-time pickup (Isd)

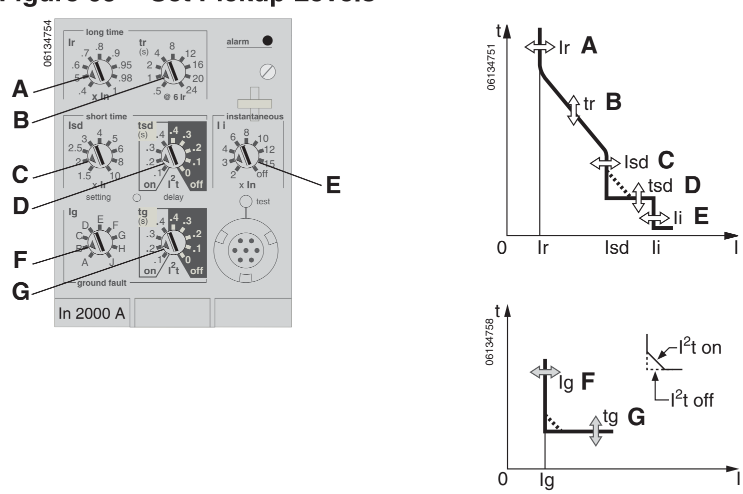
   D—Short-time delay (tsd)

   E—Instantaneous pickup (Ii)

   F—Ground-fault pickup (Ig)

   G—Ground-fault delay (tg)
2. Fine-tune adjust using keypad and graphic display screen or the network system management software.

Figure 65 – Set Pickup Levels



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Zone-Selective Interlocking (ZSI)

The number of devices which can be interlocked are shown in Table 11.

Table 11 – ZSI Combinations

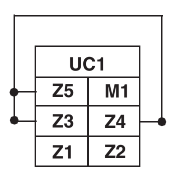
Upstream Device (receives input from RIM) → / Downstream Device (sends output to RIM) ↓	Micrologic #.0x Trip Units	Square D Micrologic Series B Trip Units	Square D GC-100 Ground-Fault Relay for Equipment Protection	Square D GC-200 Ground-Fault Relay for Equipment Protection	Merlin Gerin STR58 Trip Units	Federal Pioneer USRC and USRCM Trip Units
Micrologic #.0x Trip Units	15	R	R	15	15	R
Square D Micrologic Series B Trip Units	R	26	R	R	R	15
Square D GC-100 Ground-Fault Relay for Equipment Protection	R	R	7	R	R	R
Square D GC-200 Ground-Fault Relay for Equipment Protection	15	R	R	15	15	R
Merlin Gerin STR58 Trip Units	15	R	R	15	15	R
Merlin Gerin STR53 Trip Units	15	R	R	15	15	R
Federal Pioneer USRC and USRCM Trip Units	R	15	R	R	R	15
Square D Add-On Ground Fault Module for Equipment Protection	R	5	R	R	R	R

R—RIM module is required to restrain any devices.

Numerical References—Maximum number of upstream circuit breakers which can be restrained without requiring a RIM Module.

Circuit breaker terminals are shipped with terminals Z3, Z4 and Z5 jumpered to self-restrain the short-time and ground-fault functions. Remove the jumpers when activating zone-selective interlocking.

Figure 66 – Jumpered Terminals



Auxiliary Connections

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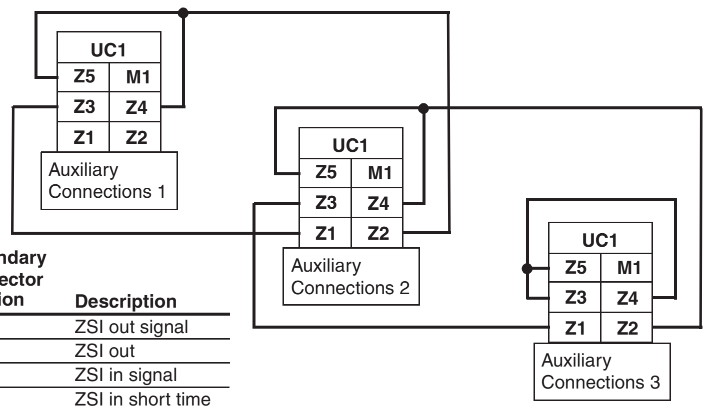
Wire circuit breakers for zone-selective interlocking.

NOTE: Use I^2t off with ZSI for proper coordination. Using I^2t on with ZSI is not recommended as the delay in the upstream device receiving a restraint signal could result in the trip unit tripping in a time shorter than the published trip curve.

Figure 67 – ZSI Wiring Example



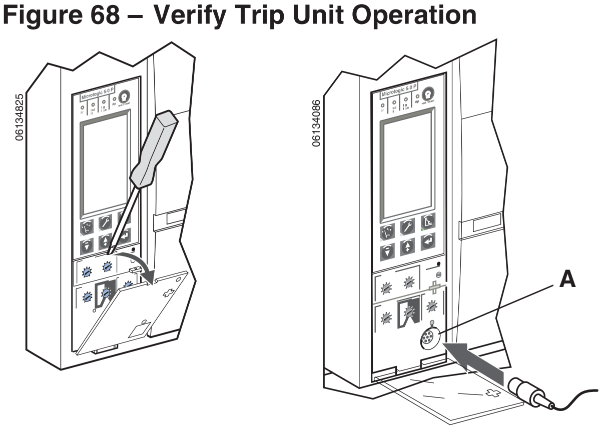
Secondary Connector Position	Description
Z1	ZSI out signal
Z2	ZSI out
Z3	ZSI in signal
Z4	ZSI in short time
Z5	ZSI in ground fault

Trip Unit Operation Verification

Use a test kit connected to the trip unit test plug receptacle (A) to verify trip unit is functioning as desired. See instructions shipped with test kit to perform verification tests.

NOTE: To verify operation of the circuit breaker and trip unit, use primary injection testing. (See “Trip Unit Installation Check” on page 76 for more information.)

Figure 68 – Verify Trip Unit Operation



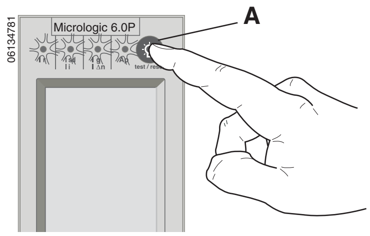
Trip Unit Resetting

When the circuit breaker trips, the fault indicator will remain lit until the trip unit is reset.

Do not return circuit breaker to service until cause of trip is determined. For more information, refer to the circuit breaker installation instructions shipped with the circuit breaker.

Press the reset/test button (A) to reset the trip unit after trip.

Figure 69 – Reset Trip Unit



Equipment Ground-Fault Trip Functions Testing

Paragraph 230-95 (c) of the National Electrical Code requires that all equipment ground-fault protection systems be tested when first installed.

With the trip unit powered and the circuit breaker closed, test the equipment ground-fault (Micrologic 6.0P trip unit) trip function.

The trip unit is powered if:

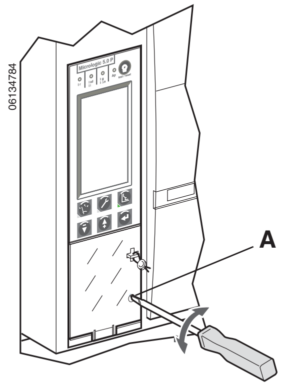
- circuit breaker is on and has more than 150 V of load voltage on two phases (circuit breaker is closed or bottom fed).
- the Full-Function or Hand-Held Test Kit is connected and on.
- the 24 Vdc external power supply is connected.
- an external voltage tap is installed and voltage of more than 150 V is present on two phases.

For instructions on how to close circuit breaker, refer to the circuit breaker installation instructions shipped with the circuit breaker.

To test trip function, press the ground-fault test button (A). Circuit breaker should trip.

If circuit breaker does not trip, contact the local field office.

Figure 70 – Test Equipment Ground-Fault Trip Function



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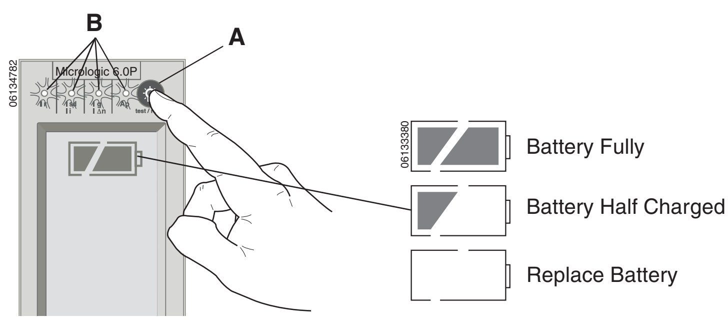
Trip Unit Status Check

Check trip unit battery and trip indicators.

1. Make sure trip unit is powered. The trip unit is powered if:
   - — circuit breaker is on and has more than 150 V of load voltage on two phases (circuit breaker is closed or bottom fed).
   - — the Full-Function or Hand-Held Test Kit is connected and on.
   - — the 24 Vdc external power supply is connected.
   - — the external voltage tap is installed and voltage of more than 150 V is present on two phases.
2. Press test/reset button (A).
   - — All trip indicators (B) will light up
   - — Battery status will be displayed
   - — The battery bar graph reading is valid after the reset button has been released
3. If the battery bar graph shows the battery needs to be changed, use Square D battery catalog number S33593:
   - — lithium battery
   - — 1.2AA, 3.6 V, 800 ma/h

For instructions on replacing battery, see “Battery Replacement” on page 79.

Figure 71 – Check Trip Unit Status



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Section 4— Operation

Metered Values

Use the metering menus to monitor circuit breaker current (I), voltage (V), power (P), energy (E) and frequency (F).

NOTE: System measurements can also be checked remotely using System Manager Software (SMS) (version 3.3 or later) or other network system management software.

Current Levels

I_a—Instantaneous A phase current

I_b—Instantaneous B phase current

I_c—Instantaneous C phase current

I_n—Instantaneous neutral current

I⏚—Instantaneous ground current

$I_a$max—Maximum instantaneous A phase current

$I_b$max—Maximum instantaneous B phase current

$I_c$max—Maximum instantaneous C phase current

$I_n$max—Maximum instantaneous neutral current

I⏚max—Maximum instantaneous ground current

$\overline{I_a}$ —Demand A phase current

$\overline{I_b}$ —Demand B phase current

$\overline{I_c}$ —Demand C phase current

$\overline{I_n}$ —Demand neutral current

$\overline{I_a}$max—Maximum demand A phase current

$\overline{I_b}$max—Maximum demand B phase current

$\overline{I_c}$max—Maximum demand C phase current

$\overline{I_n}$max—Maximum demand neutral current

Maximum measurements can also be reset to zero.

Figure 72 – Metering Menu

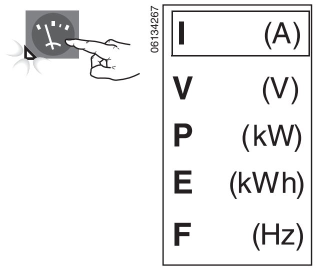
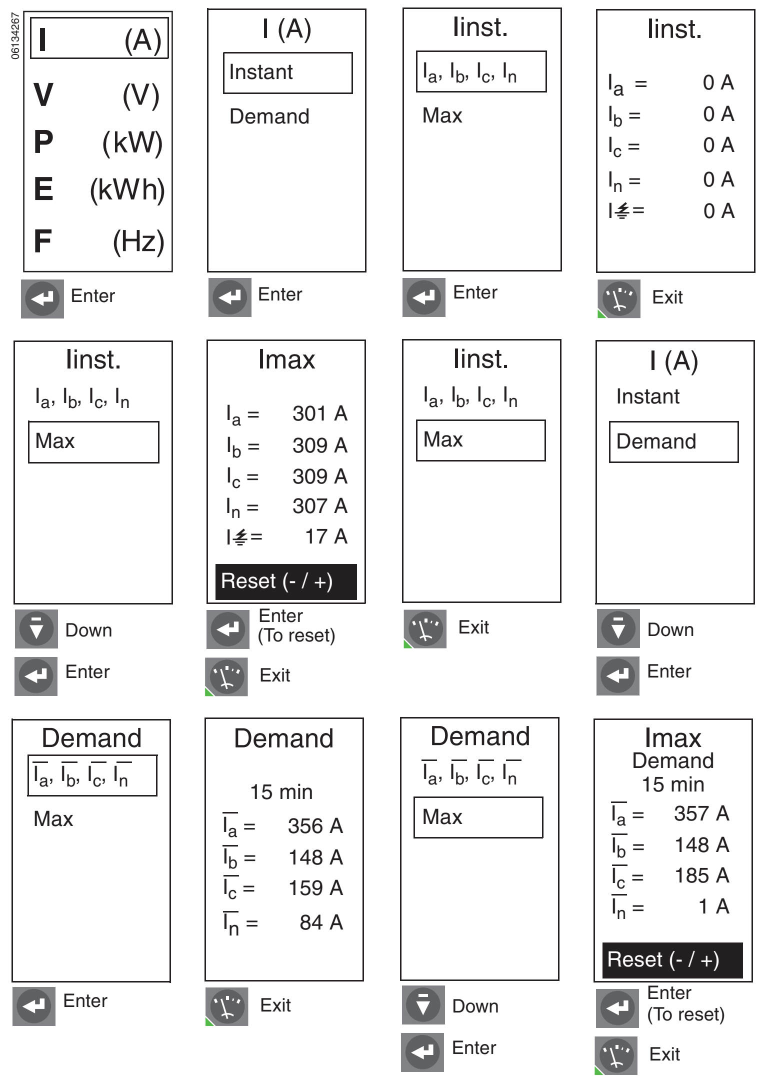


Figure 73 – Check Current Levels



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Voltage Levels

V_{ab}—Instantaneous voltage between A and B phases

V_{bc}—Instantaneous voltage between B and C phases

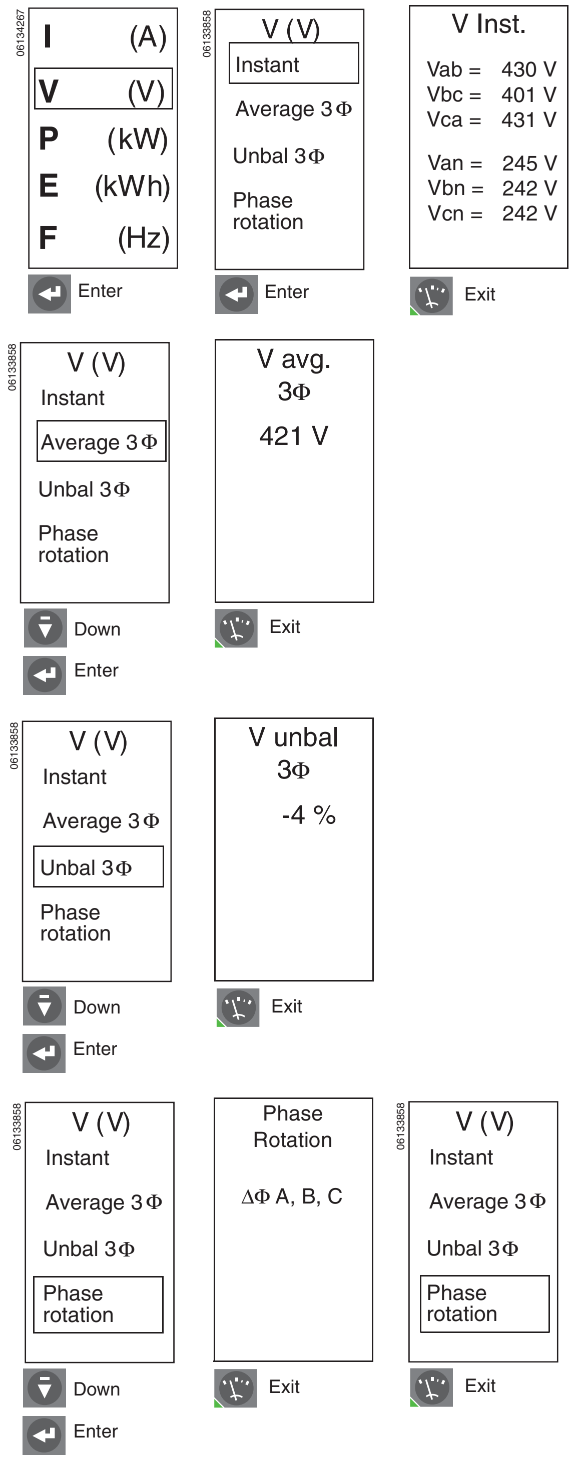
V_{ca}—Instantaneous voltage between C and A phases

V_{an}—Instantaneous voltage between A phase and neutral

V_{bn}—Instantaneous voltage between B phase and neutral

V_{cn}—Instantaneous voltage between C phase and neutral

Figure 74 – Check Voltage Levels



Power Levels

P—Instantaneous active power

Q—Instantaneous reactive power

S—Instantaneous apparent power

Power Factor—Instantaneous power factor

$\overline{P}$—Demand active power

$\overline{Q}$—Demand reactive power

$\overline{S}$—Demand apparent power

$\overline{P}$max—Maximum demand active power

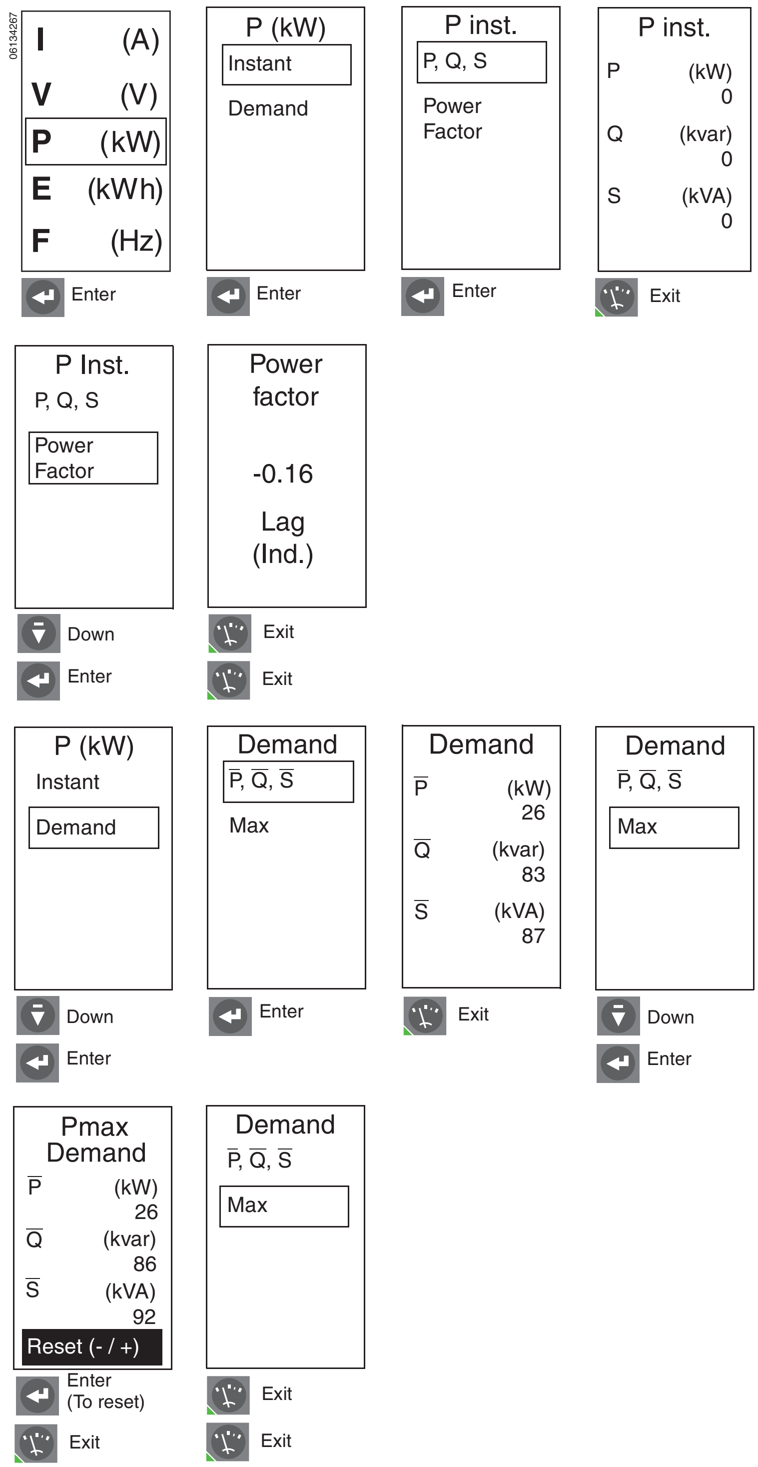
$\overline{Q}$max—Maximum demand reactive power

$\overline{S}$max—Maximum demand apparent power

Maximum measurements can also be reset to zero.

NOTE: To ensure reliable power and power factor measurements, “Power sign” (page 43) and “Sign convention” (page 47) must be set.

Figure 75 – Check Power Levels



Energy Levels

Total active energy (E.P.)

Total reactive energy (E.Q.)

Total apparent energy (E.S.)

Active energy in (E.P.)

Reactive energy in (E.Q.)

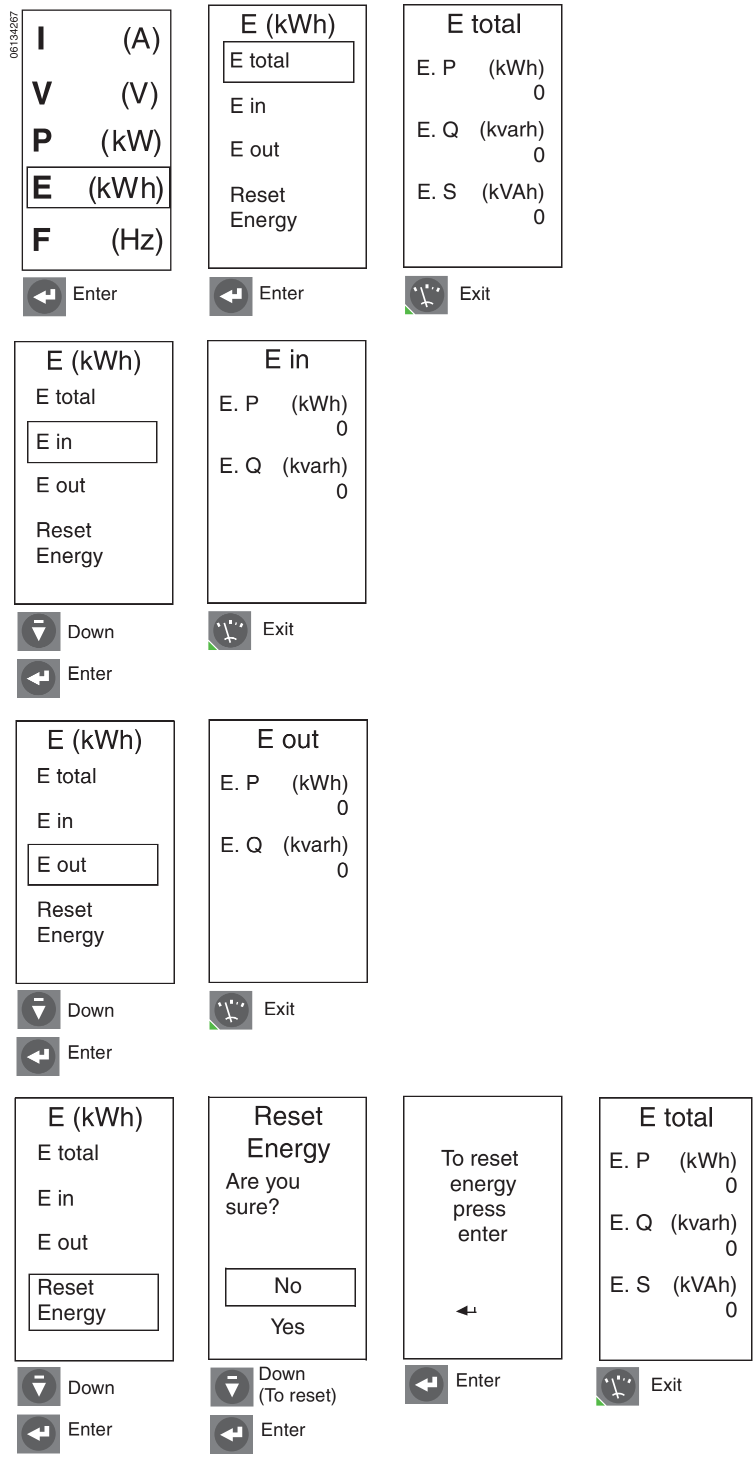
Active energy out (E.P.)

Reactive energy out (E.Q.)

Energy measurements can also be reset to zero.

NOTE: To ensure reliable energy measurements, “Power sign” (page 43) and “Sign convention” (page 47) must be set.

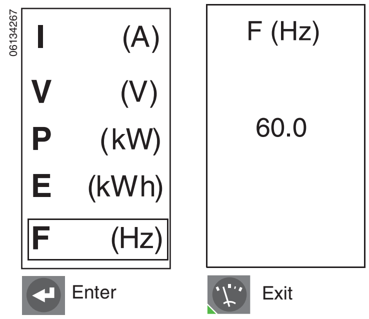
Figure 76 – Check Energy Levels



ENGLISH

Frequency

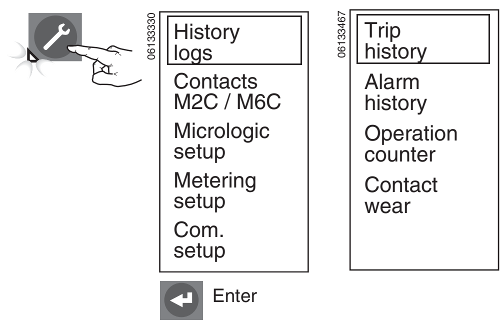
Figure 77 – Check Frequency



Trip Unit History

Use the maintenance menu to review the trip unit history stored in the history logs.

Figure 78 – History Log Menu



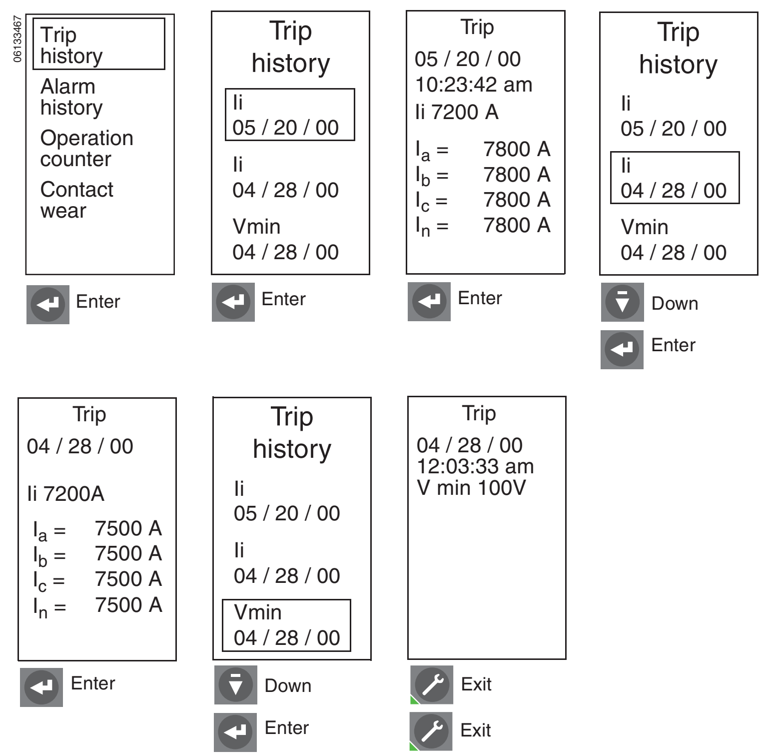
Trip History

The trip unit stores information about the LSIG fault causing the last ten trips. For each fault the following are stored:

- Current values of Ir, Isd, Ii, and Ig
- Pickup setpoint for voltage and other protection
- Date
- Time (hour, minute and second)

NOTE: Trips from use of a test kit are not recorded in the trip history log.

Figure 79 – Check Trip History



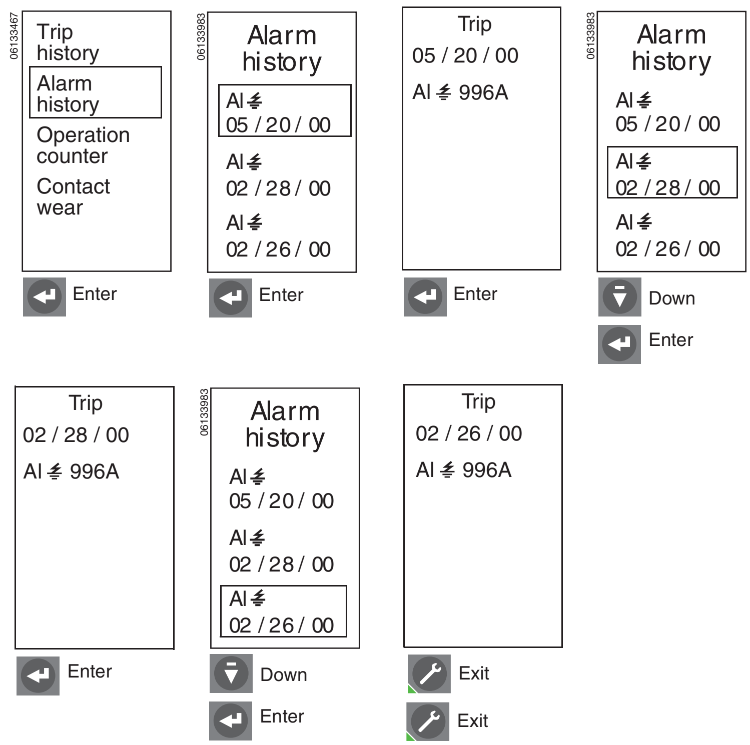
ENGLISH

Alarm History

The trip unit records measurement at each of the last ten alarms activated. For each alarm the following are stored:

- Indication and value of the alarm setting
- Date
- Time (hour, minute and second)

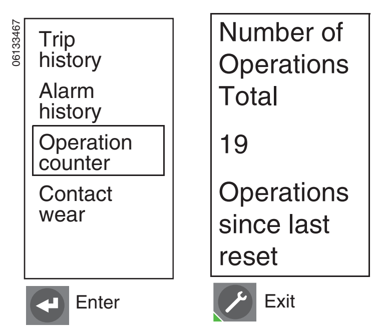
Figure 80 – Check Alarm History



Operation Counter

This displays the maximum number of operations (trip or circuit breaker openings) since the circuit breaker was installed. The number is obtained from the circuit breaker communication module (BCM).

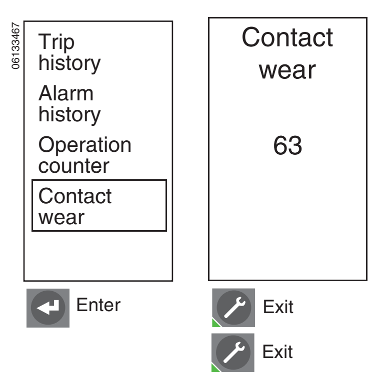
Figure 81 – Check Operation Counter



Contact Wear

This displays the amount of contact wear on the contact with the greatest wear. When this number reaches 100, it is recommended that a visual inspection of the contacts be done. This function works only on Masterpact™ NT and NW circuit breakers.

Figure 82 – Check Contact Wear



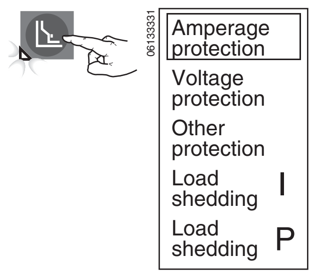
ENGLISH

Protection Setup

Use the protection menus to check protection setup for amperage protection, voltage protection, other protection, current load shedding and power load shedding.

Refer to Appendix B for default settings and setting ranges.

Figure 83 – Protection Menu



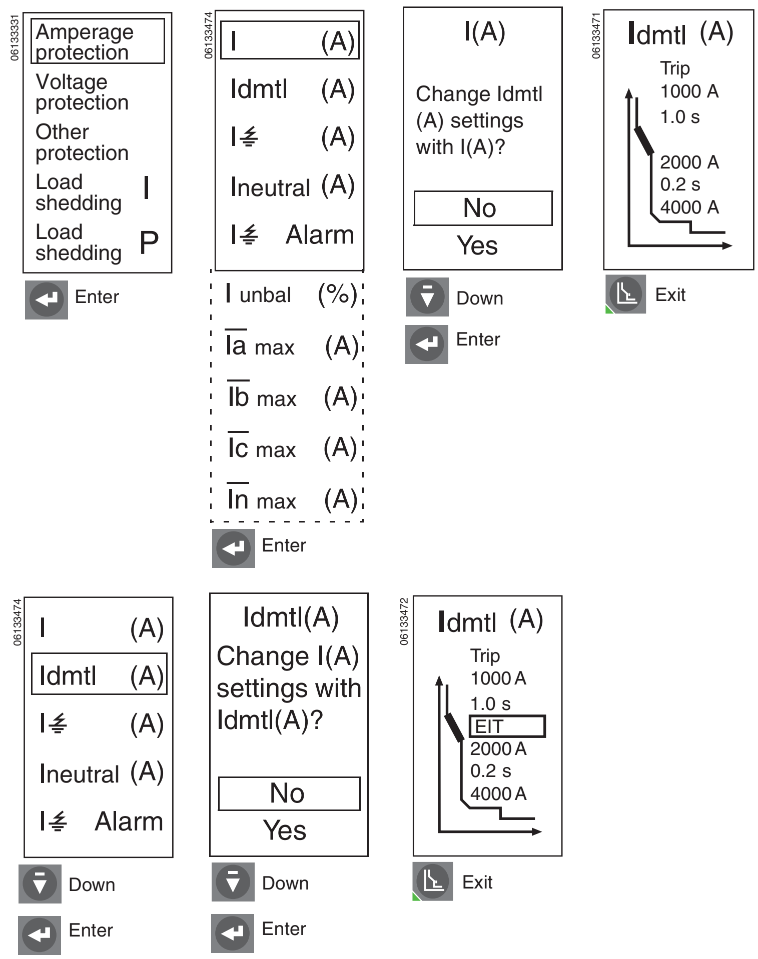
Amperage Protection

The “Change Idmtl (A) setting with I(A)” screen will only appear if long-time, short-time and/or instantaneous adjustments have been previously made under the Idmtl (A) menu screen. If the user responds Yes, the Idmtl (A) settings will be lost when the menu goes to the I(A) adjustment screen. If no adjustments have been made under the Idmtl (A) menu screen, the menu goes directly to the I(A) adjustment screen.

The “Change I (A) setting with Idmtl(A)” screen will only appear if long-time, short-time and/or instantaneous adjustments have been previously made under the I(A) menu screen. If the user responds Yes, the I(A) settings will be lost when the menu goes to the Idmtl(A) adjustment screen. If no adjustments have been made under the Idmtl(A) menu screen, the menu goes directly to the I(A) adjustment screen.

NOTE: Neutral protection is disabled if Idmtl protection is selected.

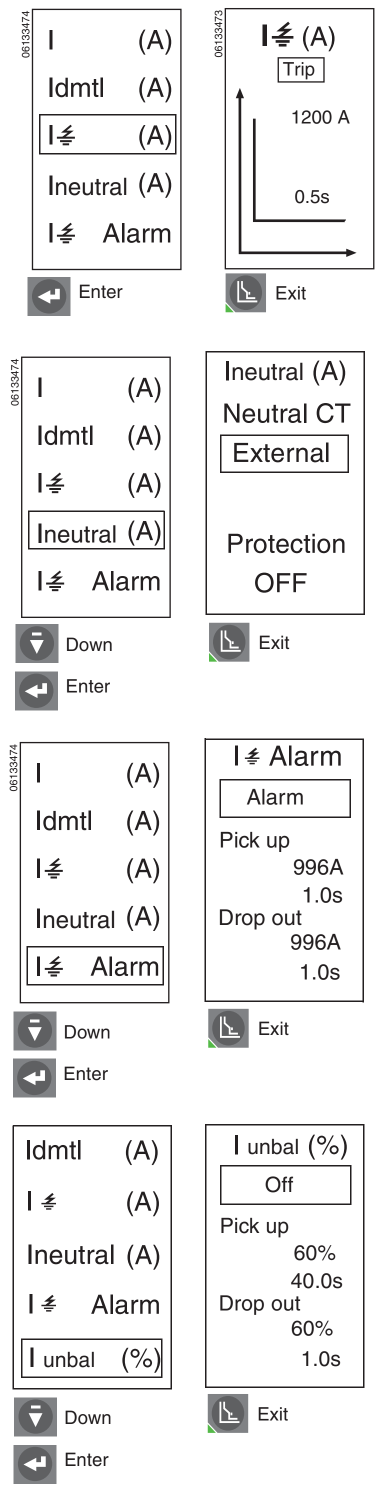
Figure 84 – Check Amperage Protection



Continued on next page

Amperage Protection *(continued)*

Figure 84 – Check Amperage Protection *(continued)*



NOTE: Selection of the CT type determines the Ineutral protection in the Protection menu.

Circuit Breaker	Neutral CT Type	Protection Choices
All	none	disabled
Four-pole	internal	OFF: no neutral protection
		N/2: half neutral protection
		N: full neutral protection
Three-pole	external	OFF: no neutral protection
		N/2: half neutral protection
		N: full neutral protection
		1.6N: oversized neutral protection

Continued on next page

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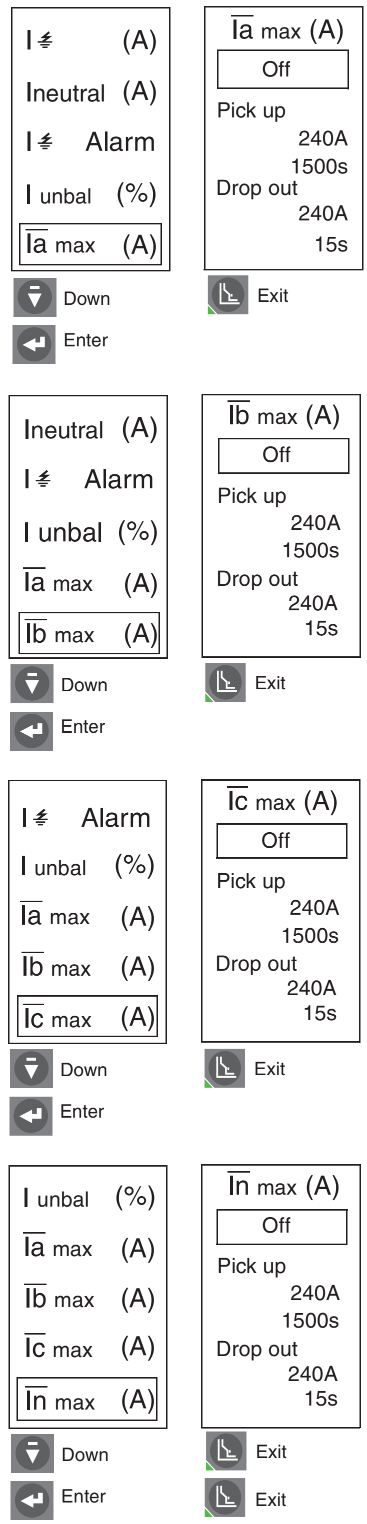
Amperage Protection *(continued)*

Figure 84 – Check Amperage Protection *(continued)*



NOTE: To set In max, the neutral CT must be set to external or internal under Micrologic setup under the maintenance menu .

ENGLISH

Voltage Protection

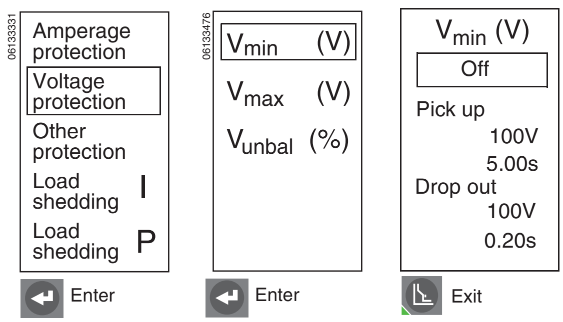
NOTICE

HAZARD OF EQUIPMENT DAMAGE

Setting undervoltage protection (Vmin) below 80% or voltage unbalance (Vunbal) above 20% can cause the trip unit to not perform as expected.

Failure to follow this instruction can result in equipment damage

Figure 85 – Check Voltage Protection

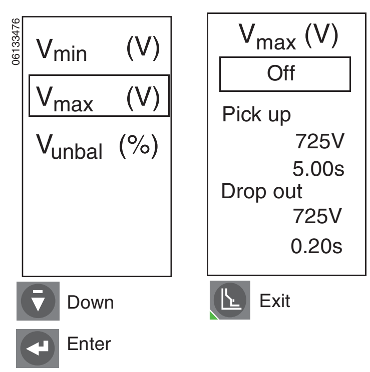


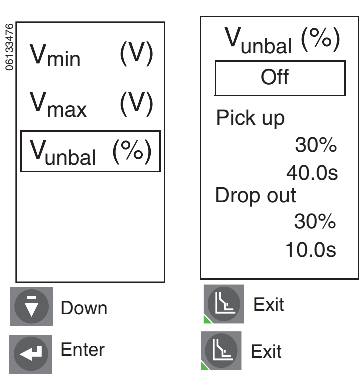
Voltage protection pickup settings are phase-to-phase values.

Unbalance values are based on the true RMS values of the three-phase currents.

Undervoltage alarm drops out upon the loss of the second phase.

NOTE: Do not set undervoltage protection below 80%. Do not set Vunbal above 20%[1].

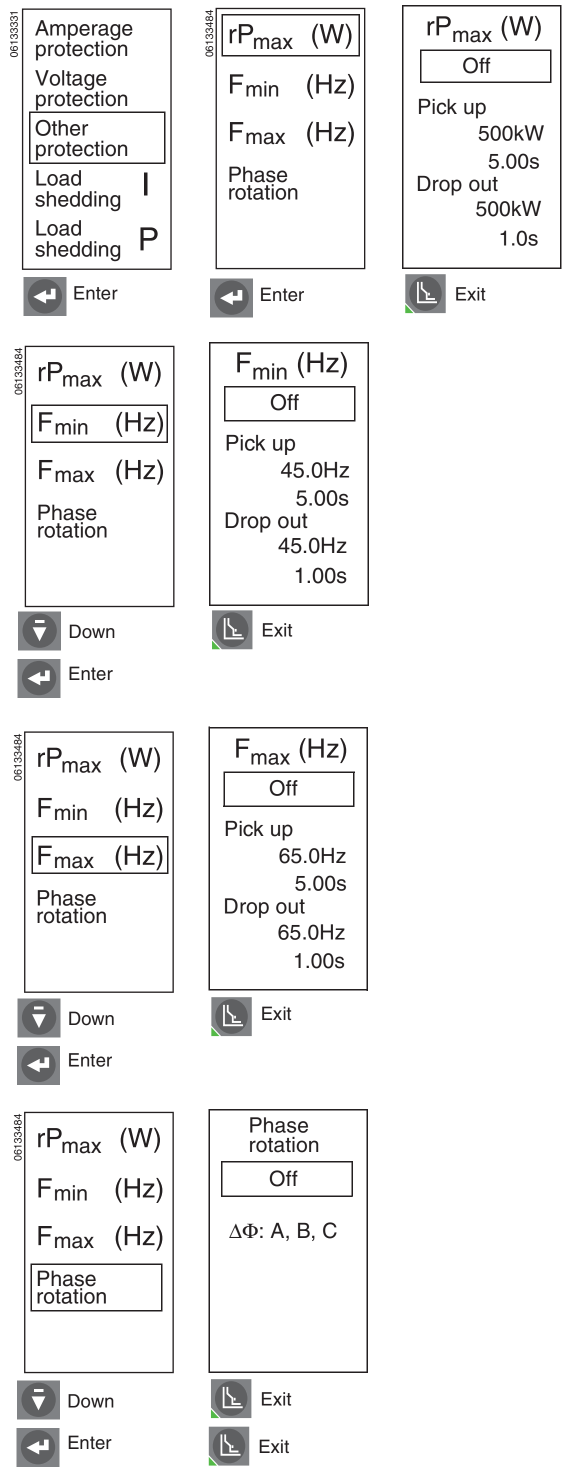




1 See Appendix D for an explanation of system protection behavior.

Other Protection

Figure 86 – Check Other Protection

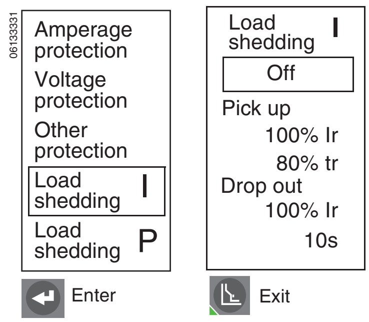


ENGLISH

Current Load Shedding

Current load shedding can be configured for alarm only. It cannot be used to trip the circuit breaker.

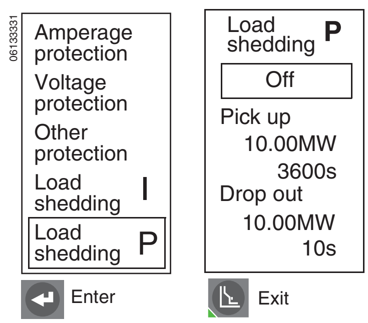
Figure 87 – Check Current Load Shedding



Power Load Shedding

Power load shedding can be configured for alarm only. It cannot be used to trip the circuit breaker.

Figure 88 – Check Power Load Shedding



Section 5— Trip Unit Replacement

Trip unit replacement must be done by qualified persons, as defined by the National Electric Code, who are familiar with the installation and maintenance of power circuit breakers.

Before replacing trip unit, confirm that the circuit breaker is in good working condition. If the condition of the circuit breaker is unknown, do not proceed. For assistance in evaluating the condition of the circuit breaker, call Technical Support.

Read this entire section before starting the replacement procedure.

NOTE: If trip unit being replaced is a Micrologic 2.0, 3.0 or 5.0 trip unit, order connector block S33101 and circuit breaker or cradle wiring harness if necessary.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Failure to follow these instructions for installation, trip test and primary injection testing may result in the failure of some or all protective function.
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462, or NOM-029-STPS.
- Replacement/upgrading of a trip unit in the field must be done by qualified persons, as defined by the National Electric Code, who are familiar with the installation and maintenance of power circuit breakers.
- Before replacing/upgrading trip unit, confirm that the circuit breaker is in good working condition. If the condition of the circuit breaker is unknown, do not proceed. For assistance in evaluating the condition of the circuit breaker, call Technical Support.
- If the circuit breaker fails to function properly in any manner upon completion of the trip unit installation, immediately remove the circuit breaker from service and call Field Services.
- Turn off all power supplying this equipment before working on or inside equipment. Follow instructions shipped with circuit breaker to disconnect and reconnect circuit breaker.
- Replace all devices, doors and covers before returning equipment to service.

Failure to follow these instructions will result in death or serious injury.

ENGLISH

Trip Unit Replacement for Energy Reduction Maintenance Setting (ERMS)

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

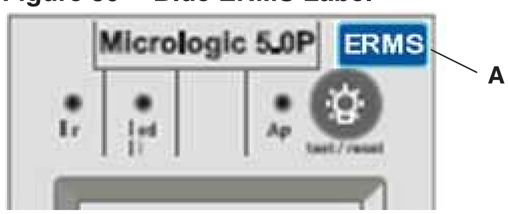
- Use only Micrologic P- or H-frame trip units with the Blue ERMS label for energy reduction maintenance setting systems.
- Review bulletin 0613IB1317, IO Module User Guide, and bulletin NHA67346, ERMS Installation Instructions, for details on installation, testing and operation of the ERMS system.

Failure to follow these instructions will result in death or serious injury.

If you are replacing the trip unit to use in an ERMS system, make sure the trip unit is suitable for this application.

Only Micrologic P- and H-frame trip units built after 15011 with the blue ERMS label (Figure 89, A) are suitable for ERMS application. Verify that the trip unit has the ERMS label at the top right hand corner. Refer to bulletin NHA67346, *ERMS Installation Instructions*, for more information about ERMS systems.

Figure 89 – Blue ERMS Label



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Required Tools

- Torque-controlled screwdriver, set at 7 in-lbs (0.8 N•m) ± 10% (Lindstrom torque driver MAL500-2 or equivalent)
- Micrologic Full-Function Test Kit (part number S33595)

Preparation

Record Switch Settings

Record all trip unit switch and advanced protection settings for later use.

Circuit Breaker Disconnection

Disconnect circuit breaker as directed in the circuit breaker instruction bulletin shipped with the circuit breaker. The circuit breaker must be completely isolated. (For a drawout circuit breaker, place circuit breaker in the disconnected position. For a fixed-mounted circuit breaker, all voltage sources, including auxiliary power, must be disconnected.)

Circuit Breaker Accessory Cover Removal

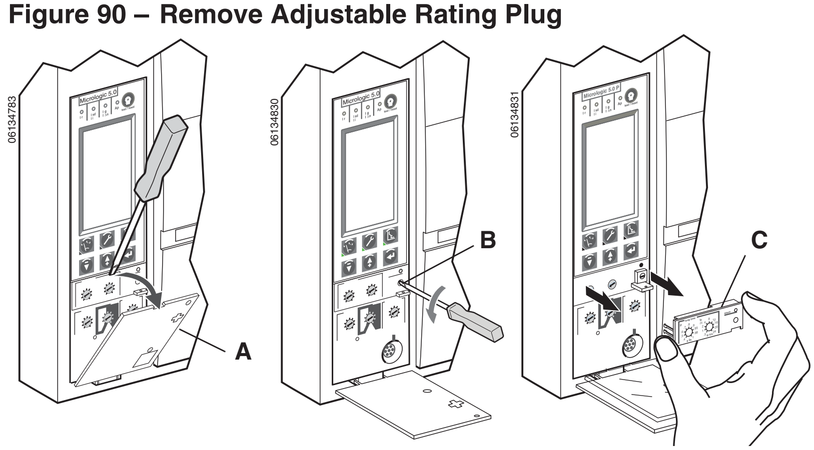
Remove circuit breaker accessory cover as directed in the Install Accessories section of the circuit breaker instruction bulletin shipped with the circuit breaker.

Rating Plug Removal

A small Phillips screwdriver is needed to remove the adjustable rating plug.

1. Open switch cover (A).
2. Unscrew adjustable rating plug mounting screw (B).
3. Remove adjustable rating plug (C). Save for installation in replacement trip unit.

Figure 90 – Remove Adjustable Rating Plug



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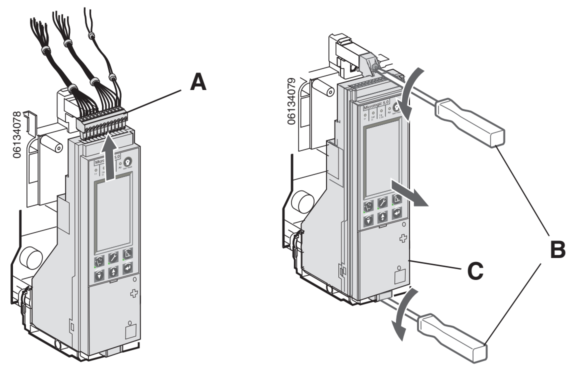
Trip Unit Removal

1. Remove connector block (A) from top of trip unit, if present.
2. Loosen two trip unit screws (B).
3. Slide out trip unit (C).

Figure 91 – Remove Existing Trip Unit



Trip Unit Replacement

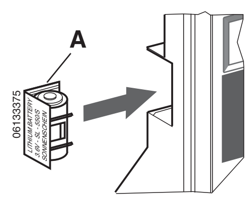
Battery Installation

If a new trip unit is being installed, install the trip unit battery.

Install battery holder with battery (A) in trip unit, observing the correct polarity as indicated on the battery compartment.

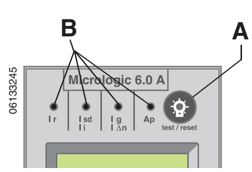
NOTE: Battery holder with battery is located under the side flap in the cardboard box the trip unit is shipped in.

Figure 92 – Install Battery



Press test/reset button (A). All four indicator lights (B) should light. If they do not light, check polarity of battery and retest. If indicator lights still do not light up when test/reset button is pressed, stop installation and contact the local sales office for factory authorized service

Figure 93 – Trip Indicator Lights



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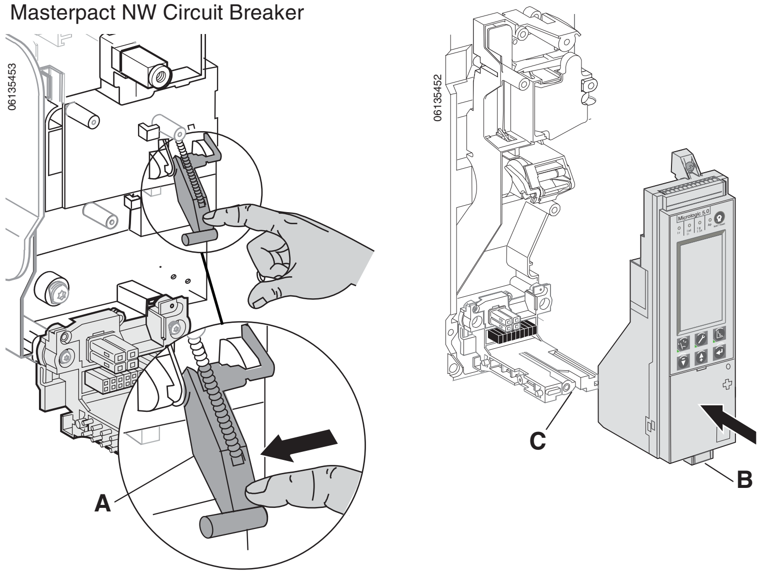
Trip Unit Installation

1. Inspect trip unit connector pins and surfaces. If there is any damage, misaligned pins, or contamination, stop installation and contact the local sales office for factory authorized service.
2. Inspect trip unit mounting base on the circuit breaker. Clear any debris from area and check that all accessory wiring is properly routed for the trip unit being installed. If there is any damage or contamination, stop installation and contact the local sales office for factory authorized service.
3. For Masterpact NW circuit breaker only: Manually depress trip unit interlock (A) and hold it in place during steps 4–6 below.
4. Align guide rail (B) on bottom of trip unit with guide rail slot (C) on trip unit mounting base in circuit breaker and gently slide the trip unit in until it stops.

NOTE: The Masterpact NT and NW trip unit mounting bases are shock mounted and therefore can flex slightly.

Figure 94 – Install Trip Unit

Masterpact NW Circuit Breaker



ENGLISH

NOTICE

HAZARD OF EQUIPMENT DAMAGE

Check installation of trip unit to assure proper connections and seating.

Failure to follow these instructions can result in equipment damage or improper circuit breaker tripping.

5. Align the trip unit so top mounting screw (A) aligns with the top threaded insert and start the screw by turning the screw two full rotations.
6. Use a torque-controlled screwdriver to drive the bottom screw (B) to 7 in-lbs (0.8 N•m) ± 10%. The back of the trip unit must be flush with the trip unit mounting base.
7. Use a torque-controlled screwdriver to drive the top screw to 7 in-lbs (0.8 N•m) ± 10%. Mounting tab must be flush with the mounting standoff and sensor plug.

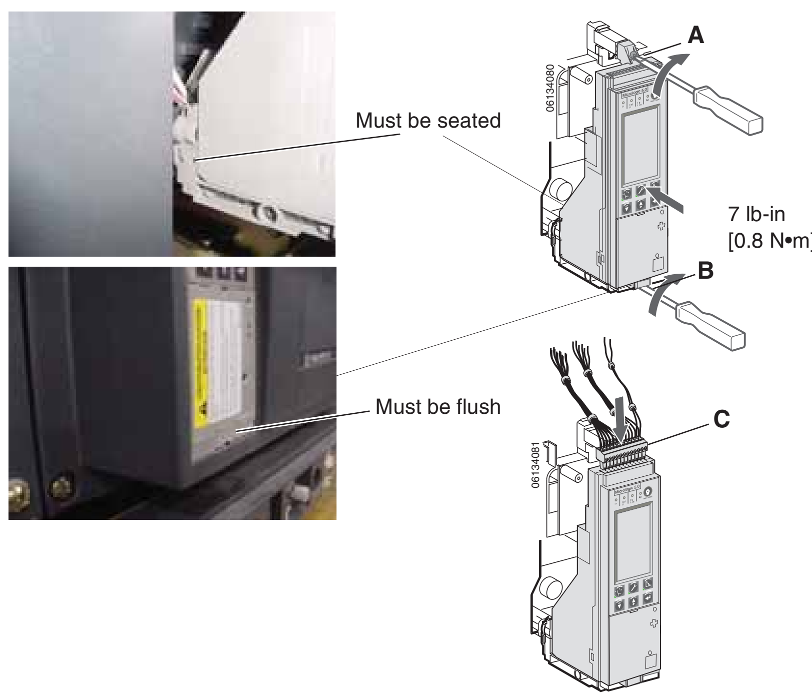
NOTE: The face of the closed switch cover must be flush with adjoining mounting base surfaces. If these surfaces are not flush, stop installation and contact the local sales office for factory authorized service.

NOTE: If you are upgrading from a Micrologic 2.0, 3.0 or 5.0 trip unit, the connector block must be ordered separately (Part Number S33101). See instructions shipped with the connector block for installation into circuit breaker.

Install connector block (C) into top of trip unit.

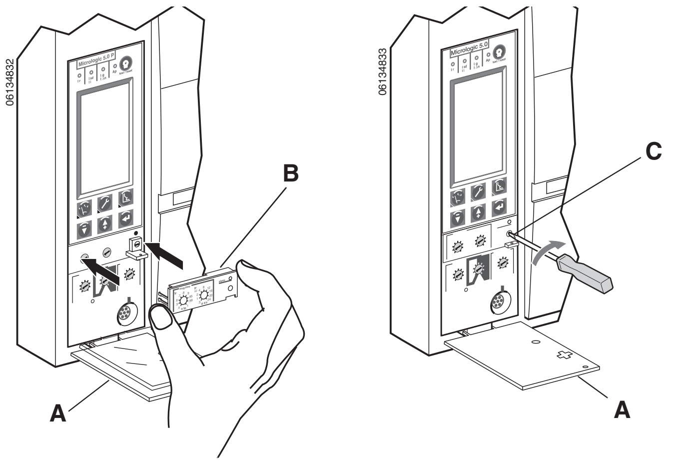
8.

Figure 95 – Secure Trip Unit



9. Install adjustable rating plug into the trip unit.
    a. Open switch cover (A) on new trip unit.
    b. Inspect mounting area for debris and contamination.
    c. Gently push adjustable rating plug (B) into new trip unit.
    d. Tighten adjustable rating plug mounting screw (C). The plug will be drawn into position flush with front face as screw is tightened.
10. Set trip unit switches and advanced protection settings to values recorded above or per coordination study results.
11. Close switch cover (A).

Figure 96 – Install Adjustable Rating Plug



Circuit Breaker Accessory Cover Replacement

Replace circuit breaker accessory cover as directed in the Install Accessories section of the circuit breaker instruction bulletin shipped with the circuit breaker.

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Trip Unit Installation Check

Secondary Injection Testing

Field installation of a trip unit requires secondary injection testing with a Full-Function Test Kit. This will ensure that the newly-installed trip unit is functioning properly. The test will require opening and closing the circuit breaker. Follow the procedures outlined in the instruction bulletins shipped with the circuit breaker and the Full-Function Test Kit.

1. Make sure the circuit breaker is isolated from all upstream and downstream devices.
2. Perform secondary injection testing as outlined in the instruction bulletin shipped with the test kit. Verify that all applicable trip unit functions are operating properly.
3. Repeat step 2 with the circuit breaker in the open position.

   NOTE: The test kit states that the circuit breaker should be closed when performing the test. Do not close the circuit breaker for this step.
4. If any test fails, do not put the circuit breaker into service and contact the local sales office for factory authorization service.

Primary Injection Testing

Primary injection testing is recommended to ensure that all trip system connections have been correctly made. Perform primary injection testing per the instructions in the Field Testing and Maintenance Guide, bulletin 0600IB1201.

Check Accessory Operation

1. Installed accessories – Validate the proper operation of all installed accessories. See the corresponding accessory instruction bulletins for operational testing procedures.
2. Programmable contact module – If circuit breaker has an M2C or M6C programmable contact module installed, validate its proper operation. See the corresponding accessory instruction bulletins for operational testing procedures.
3. Zone selective interlocking – If the circuit breaker is part of a ZSI system, follow the zone selective interlocking test procedures as outlined in the Full Function Test Kit instruction bulletin.
4. Communications – If communication modules exist, validate circuit breaker has re-established communications with the supervisor.

Trip Unit Setup

1. If an auxiliary power supply is being used for the Micrologic trip unit, reconnect the auxiliary power supply.
2. Reset the trip unit switches and advanced protection settings to original values, as recorded at the beginning of this section.

Circuit Breaker Reconnection

Reconnect circuit breaker as directed in the circuit breaker instruction bulletin shipped with the circuit breaker.

Section 6— Adjustable Rating Plug Replacement

NOTE: To select correct replacement rating plug, see the product catalog.

NOTE: Adjustable rating plug must be removed when doing hi-pot testing. Adjustable rating plug must be installed for voltage measurement. If adjustable rating plug is removed, the circuit breaker will default to a long-time pickup rating of 0.4 x sensor size (In) and a long-time delay of whatever setting was selected before the rating plug was removed.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

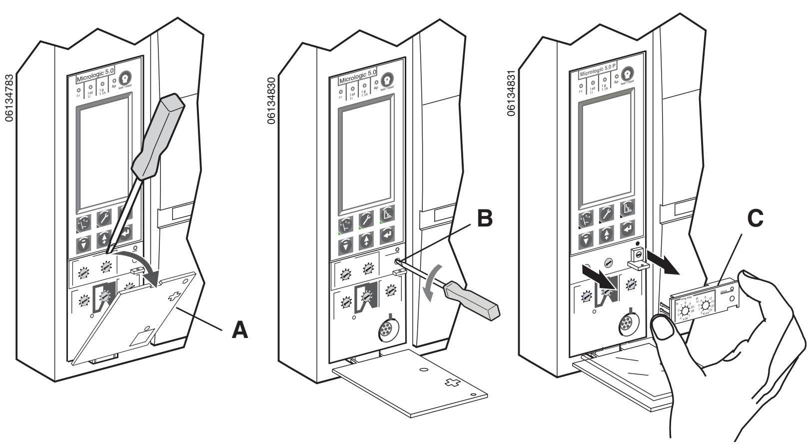
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462, or NOM-029-STPSSee NFPA 70E or CSA Z462.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment. Follow instructions shipped with circuit breaker to disconnect and reconnect circuit breaker.
- Replace all devices, doors and covers before returning equipment to service.

Failure to follow these instructions will result in death or serious injury.

Remove Rating Plug

1. Disconnect circuit breaker as directed in the circuit breaker instruction bulletin shipped with the circuit breaker.
2. Open switch cover (A).
3. Record switch settings in Appendix E (switch settings and those set with graphic screen, if applicable).
4. Unscrew plug mounting screw (B).
5. Remove adjustable rating plug (C).

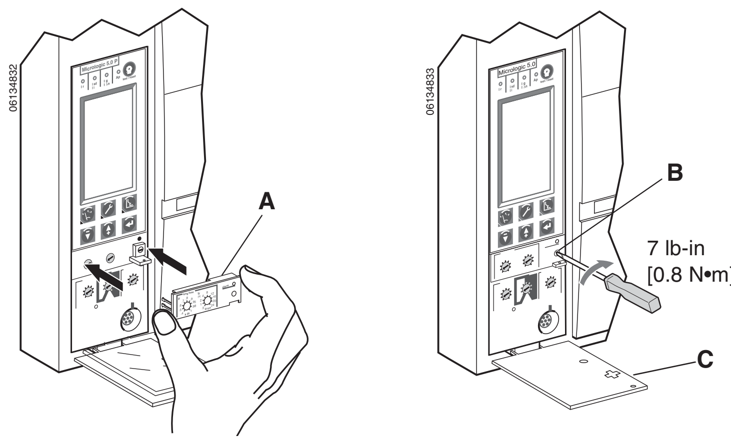
Figure 97 – Remove Adjustable Rating Plug



Install New Rating Plug

1. Inspect mounting area for debris and contamination.
2. Gently push in new rating plug (A).
3. Tighten adjustable rating plug mounting screw (B).
4. Set trip unit settings to values recorded in Appendix E or per coordination study results.
5. Close switch cover (C).

Figure 98 – Install New Adjustable Rating Plug



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Section 7— Battery Replacement

Circuit Breaker Disconnection

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462, or NOM-029-STPS.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment. Follow instructions shipped with circuit breaker to disconnect and reconnect circuit breaker.
- Replace all devices, doors and covers before returning equipment to service.

Failure to follow these instructions will result in death or serious injury.

Disconnect circuit breaker as directed in the circuit breaker instruction bulletin shipped with the circuit breaker.

Accessory Cover Removal

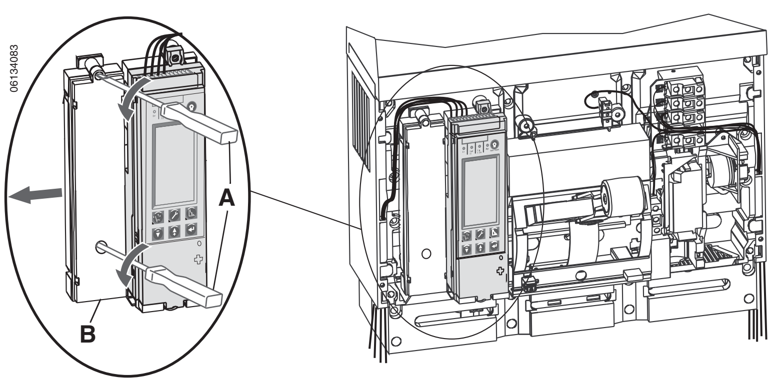
Remove circuit breaker accessory cover as directed in the Install Accessories section of the circuit breaker instruction bulletin shipped with the circuit breaker.

Withstand Module Shifting

NOTE: Some R-frame and NS1600b–NS3200 circuit breakers have a withstand module that needs to be moved to access the battery.

Loosen screws (A) securing withstand module (B). Swing module to side to access trip unit battery cover. Do not remove withstand module connector.

Figure 99 – Shift Withstand Module



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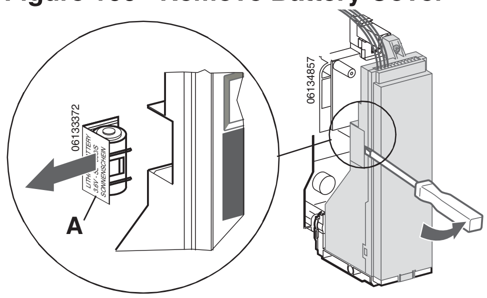
Battery Replacement

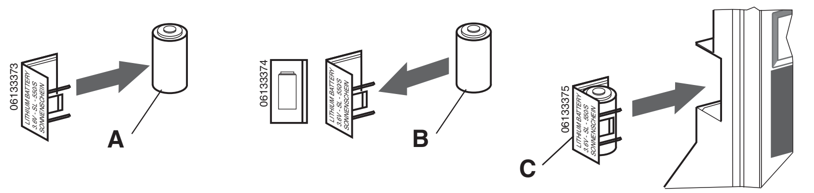
1. Insert small screwdriver blade into battery housing cover notch and rotate to slide battery housing cover (A) out of trip unit.

Figure 100 –Remove Battery Cover



2. Remove battery (A).
3. Insert new battery (B). Make sure that the polarity is correct.
4. Replace battery housing cover (C).

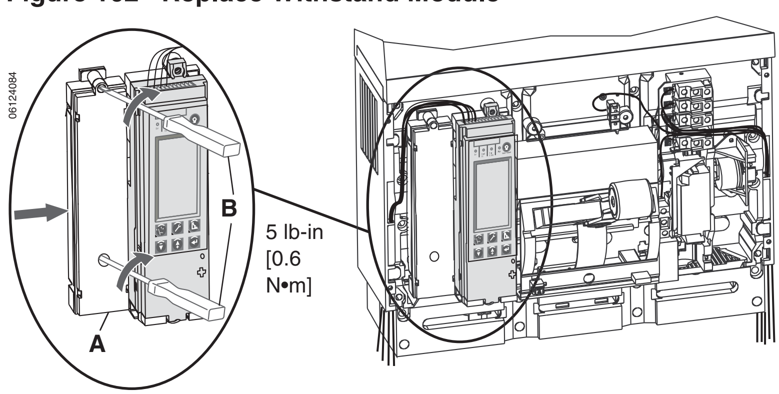
Figure 101 –Replace Battery



Withstand Module Replacement

If the withstand module was moved to access the battery, replace the withstand module (A) and tighten the screws (B).

Figure 102 –Replace Withstand Module



Accessory Cover Replacement

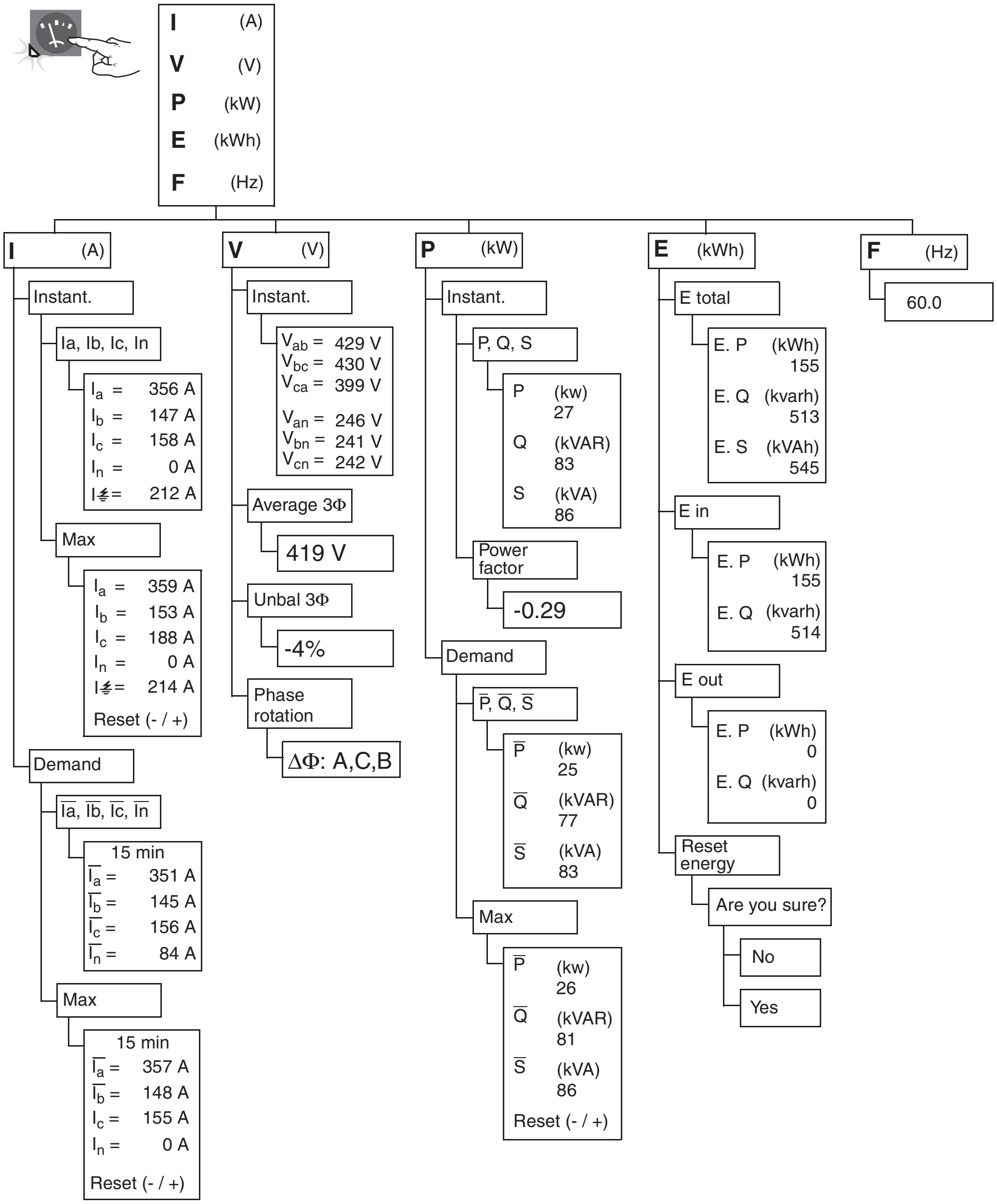
Replace circuit breaker accessory cover as directed in the Install Accessories section of the circuit breaker instruction bulletin shipped with the circuit breaker.

Circuit Breaker Reconnection

Reconnect circuit breaker as directed in the circuit breaker instruction bulletin shipped with the circuit breaker.

Appendix A—Graphic Display Flowcharts

Metering Menu Flowchart



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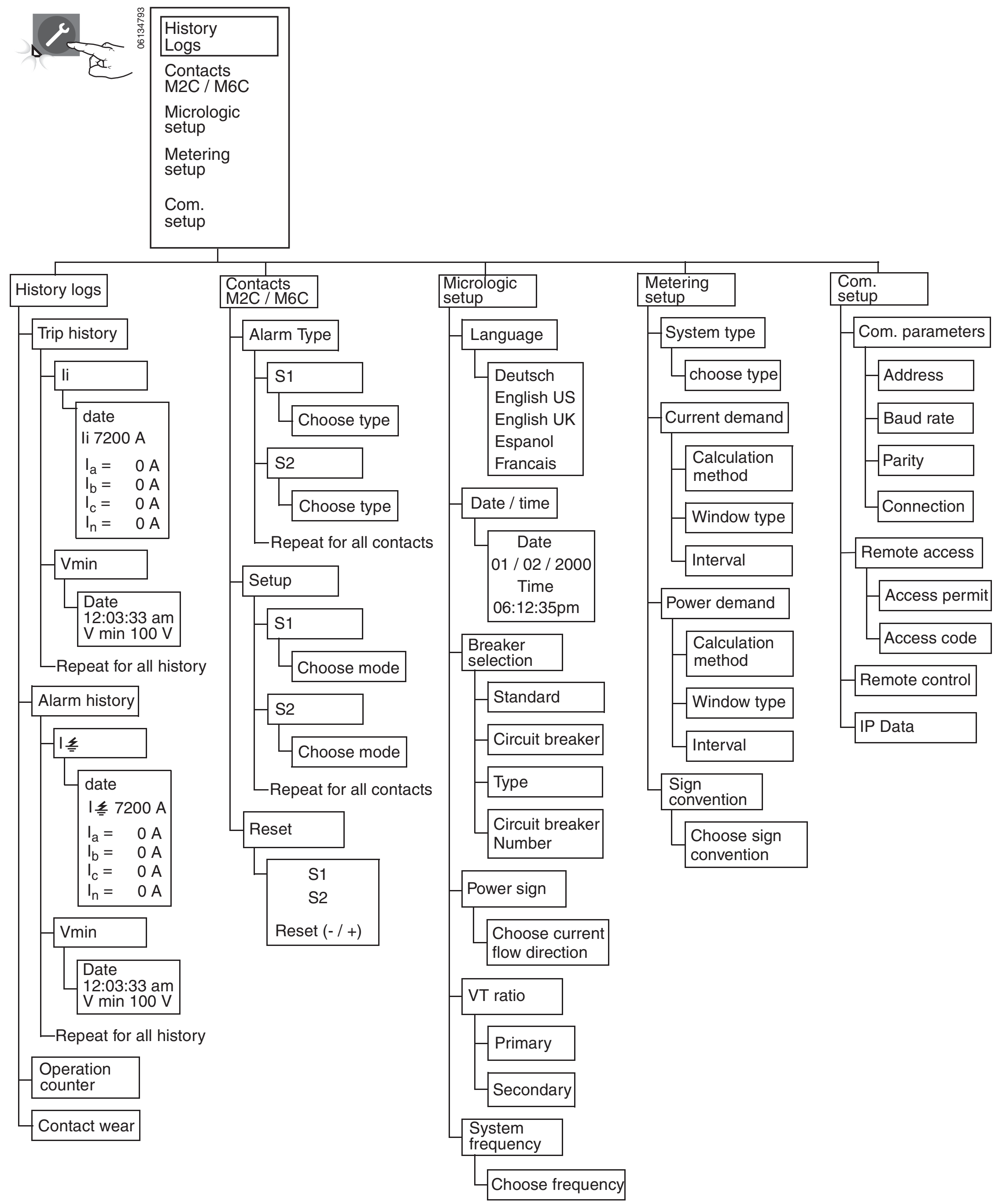
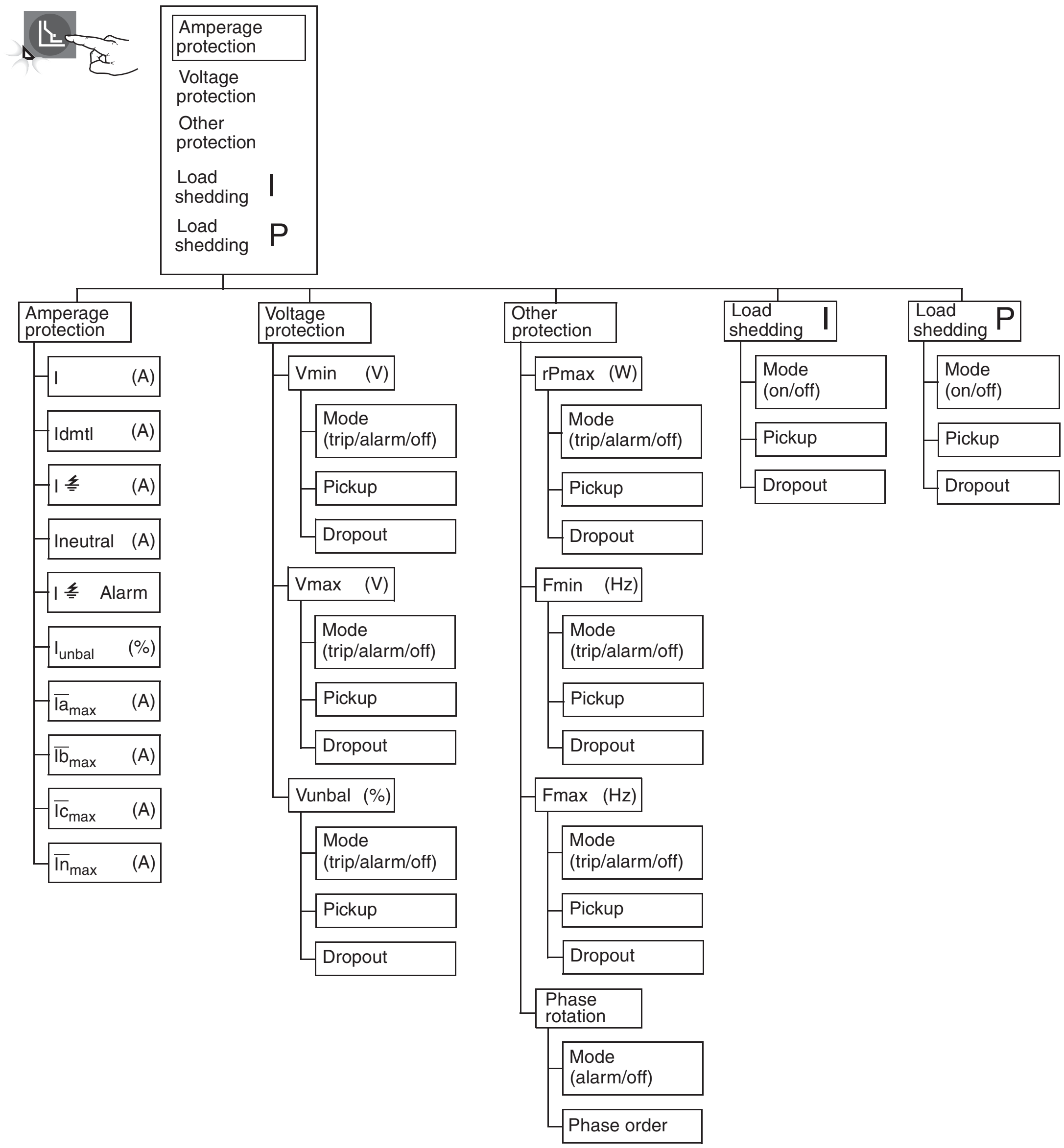
Maintenance Menu Flowchart



Protection Menu Flowchart



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Appendix B—Default Settings and Tolerances

Default Settings

Table 12 – Default Settings—Switches

Description	Symbol	Default Value
Long-time pickup	Ir	Maximum
Long-time delay	tr	Minimum
Short-time pickup	Isd	Minimum
Short-time delay	tsd	Minimum
Ground-fault pickup	Ig	Minimum
Ground-fault delay	tg	Minimum
Instantaneous	Ii	Minimum

Table 13 – Default Settings—Maintenance

Submenu	Description	Line Item	Default Value	Setting Range
M2C/M6C contacts	Alarm type	S#	Not selected	Not selected, Isd, Ir, Iunbal (See Table 9 on page 20)
	Setup	S#	Latching	Latching contact, time delay, non-latching contact, Locked 0, Locked 1
Micrologic setup	Language		English US	Deutsch, English US, English UK, Espanol, Francais
	Date/Time			
	Breaker selection	Standard	NA	Not def, ANSI, IEC, UL, IEC/GB
		Circuit breaker	NA	
		Type	NA	
		Circuit breaker number	0000	0000–FFFF
	Power sign		P+	P+, P-
	VT ratio	Primary	690	000–690
		Secondary	690	000–690
	System frequency		50-60 Hz	50-60 Hz, 400 Hz
Metering setup	System type		3Φ 4 w 4 CT	3Φ 4w 4CT, 3Φ 4w 3CT, 3Φ 3w 3CT
	Current demand	Interval	15 min.	5–60 min
	Power demand	Window type	Sliding	Sliding, block
		Interval	15 min.	5–60 min
	Sign convention		IEEE	IEEE, IEEE alt, IEC
Com setup	Com parameter			
	Remote access		No	Yes, no
	Remote control		Auto	Auto, manual
	IP Data			

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Table 14 – Default Settings—Protection

Submenu	Description	Symbol	Line Item	Default Value	Setting Range	Tolerance
Amperage protection	Long-time pickup	Ir		Maximum		±10%
	Long-time delay	tr		Minimum		-20%, +0%
	Short-time pickup	Isd		Minimum		±10%
	Short-time delay	tsd		Minimum		
	Instantaneous	Ii		Minimum		±10%
	Ground-fault alarm (5.0P trip unit)	I⏚	No protection			
	Ground-fault (6.0P trip unit)	I⏚	Mode	Trip	Trip	
			Pickup	Switch setting	$I_n \leq$ 400 A: 30%–100% I_n 400 < $I_n \leq$ 1200 A: 20%–100% I_n 1200 A < I_n: 500 A–1200 A	±10%
			Pickup delay	Switch setting	1–40 sec.	-20%, +0%
	Neutral current	Ineutral		Off	Off, N/2, N, 1.6N	
	Ground-fault alarm	I⏚ alarm	Mode	Off	Alarm, off	
			Pickup	1200 A	20 x I_n–1200 A	±15%
			Pickup delay	10.0 sec.	1.0–10.0 sec.	-20%, +0%
			Dropout	1200 A	20 A–pickup	±15%
			Dropout delay	1.0 sec.	1.0–10.0 sec.	-20%, +0%
	Current unbalance	Iunbal	Mode	Off	Alarm, trip, off	
			Pickup %	60%	5–60%	-10%, +0%
			Pickup delay	40 sec.	1–40 sec.	-20%, +0%
			Dropout %	I_{unbal} pickup %	5%–pickup %	-10%, +0%
			Dropout delay	10 sec.	10–360 sec.	-20%, +0%
	Max. phase A demand current	$\overline{\mathrm{Ia}}$max	Mode	Off	Alarm, trip, off	
			Pickup	In	0.2 x I_n– I_n	±6.6%
			Pickup delay	1500 sec.	15–1500 sec.	-20%, +0%
			Dropout	$I_a$max pickup	0.2 x I_n–pickup	±6.6%
			Dropout delay	15 sec.	15–3000 sec.	-20%, +0%
	Max. phase B demand current	$\overline{\mathrm{Ib}}$max	Mode	Off	Alarm, trip, off	
			Pickup	I_n	0.2 x I_n–I_n	±6.6%
			Pickup delay	1500 sec.	15–1500 sec.	-20%, +0%
			Dropout	$I_b$max Pickup	0.2 x I_n–pickup	±6.6%
			Dropout delay	15 sec.	15–3000 sec.	-20%, +0%
	Max. phase C demand current	$\overline{\mathrm{Ic}}$max	Mode	Off	Alarm, trip, off	
			Pickup	I_n	0.2 x I_n–I_n	±6.6%
			Pickup delay	1500 sec.	15–1500 sec.	-20%, +0%
			Dropout	$I_c$max pickup	0.2 x I_n–pickup	±6.6%
			Dropout delay	15 sec.	15–3000 sec.	-20%, +0%
	Max. neutral demand current	$\overline{\mathrm{In}}$max	Mode	Off	Alarm, trip, off	
			Pickup	I_n	0.2 x I_n–I_n	±6.6%
			Pickup delay	1500 sec.	15–1500 sec.	-20%, +0%
			Dropout	$I_n$max pickup	0.2 x I_n–pickup	±6.6%
			Dropout delay	15 sec.	15–3000 sec.	-20%, +0%

Continued on next page

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Table 14 – Default Settings—Protection *(continued)*

Submenu	Description	Symbol	Line Item	Default Value	Setting Range	Tolerance
Voltage protection	Minimum (under) voltage	Vmin	Mode	Off	Alarm, trip, off	
			Pickup	100 V	100 V–Vmax pickup	-5%, +0%
			Pickup delay	5 sec.	1.2–5 sec.	-0%, +20%
			Dropout	Vmin pickup	Vmin pickup–1200 A	-5%, +0%
			Dropout delay	1.2 sec.	1.2–36 sec.	-0%, +20%
	Maximum (over) voltage	Vmax	Mode	Off	Alarm, trip, off	
			Pickup	725 V	Vmin–1200 A	-0%, +5%
			Pickup delay	5 sec.	1.2–5 sec.	-0%, +20%
			Dropout	Vmax pickup	100–Vmax pickup	-0%, +5%
			Dropout delay	1.2 sec.	1.2–36 sec.	-0%, +20%
	Voltage unbalance	Vunbal	Mode	Off	Alarm, trip, off	
			Pickup	20%	2–20%[1]	-10%, +0%
			Pickup delay	40 sec.	1–40 sec.	-20%, +0%
			Dropout	Vunbal pickup	2%–Vunbal pickup	-10%, +0%
			Dropout delay	10 sec.	10–360 sec.	-20%, +0%
Other protection	Reverse power	rP	Mode	Off	Alarm, trip, off	
			Pickup	500 kW	5–500kW	± 2.5%
			Pickup delay	20 sec.	0.2–20 sec.	-0%, +20%
			Dropout	rP pickup	5kW–rP pickup	± 2.5%
			Dropout delay	1 sec.	1–360 sec.	-0%, +20%
	Minimum (under) frequency	Fmin	Mode	Off	Alarm, trip, off	
			Pickup	45 Hz	45 Hz–Fmax pickup	± 0.5 Hz
			Pickup delay	5 sec.	1.2–5 sec.	-0%, +20%
			Dropout	Fmin pickup	Fmin Pickup–440 Hz	± 0.5 Hz
			Dropout delay	1 sec.	1–36 sec.	-0%, +20%
	Maximum (over) frequency	Fmax	Mode	Off	Alarm, trip, off	
			Pickup	65 Hz	Fmin Pickup–440 Hz	± 0.5 Hz
			Pickup delay	5 sec.	1.2–5 sec.	-0%, +20%
			Dropout	Fmax pickup	45 Hz–Fmax pickup	± 0.5 Hz
			Dropout delay	1 sec.	1–36 sec.	-0%, +20%
Phase rotation	Phase rotation	—	Sequence	Phase A, phase C, phase B direction	Phase A, phase B, phase C direction or phase A, phase C, phase B direction	
			Mode	Off	Off, alarm	
Load shedding I	Load shedding I	—	Mode	Off	Off, on	
			Pickup %	100% Ir	50% Ir–100% Ir	±6%
			Pickup delay %	80% tr	20–80% tr	-20%, +0%
			Dropout %	Load shedding I pickup	30%–Load shedding I pickup %	±6%
			Dropout delay	10 sec.	10–600 sec.	-20%, +0%
Load shedding P	Load shedding P	—	Mode	Off	Off, On	
			Pickup	10,000 kW	200–10,000 kW	± 2.5%
			Pickup delay	3600 sec.	10–3600 sec.	-20%, +0%
			Dropout	Load shedding P pickup	100 kW–Load shedding P pickup %	± 2.5%
			Dropout delay	10 sec.	10–3600 sec.	-20%, +0%

[1] Do not adjust above 20%

Metering Range and Accuracy

Table 15 – Metering Range and Accuracy

Item	Description	Symbol	Range	Tolerance
Instantaneous Current	Instantaneous current in A phase	I_a	0–32 kA	±1.5%
	Instantaneous current in B phase	I_b	0–32 kA	±1.5%
	Instantaneous current in C phase	I_c	0–32 kA	±1.5%
	Instantaneous current in neutral	I_n	0–32 kA	±1.5%
	Instantaneous current in ground	I⏚	0–32 kA	±1.5%
	Max. instantaneous current in A phase	$I_a$max	0–32 kA	±1.5%
	Max. instantaneous current in B phase	$I_b$max	0–32 kA	±1.5%
	Max. instantaneous current in C phase	$I_c$max	0–32 kA	±1.5%
	Max. instantaneous current in neutral	$I_n$max	0–32 kA	±1.5%
	Max. instantaneous current in ground	I⏚max	0–32 kA	±1.5%
Demand Current	Demand current in A phase	$\bar{I}_a$	0–32 kA	±1.5%
	Demand current in B phase	$\bar{I}_b$	0–32 kA	±1.5%
	Demand current in C phase	$\bar{I}_c$	0–32 kA	±1.5%
	Demand current in neutral	$\bar{I}_n$	0–32 kA	±1.5%
	Max. demand current in A phase	$\bar{I}_a$max	0–32 kA	±1.5%
	Max. demand current in B phase	$\bar{I}_b$max	0–32 kA	±1.5%
	Max. demand current in C phase	$\bar{I}_c$max	0–32 kA	±1.5%
	Max. demand current in neutral	$\bar{I}_n$max	0–32 kA	±1.5%
Voltage	Phase-to-phase instantaneous voltage between A and B phase	V_{ab}	0–1200 V	±0.5%
	Phase-to-phase instantaneous voltage between B and C phase	V_{bc}	0–1200 V	±0.5%
	Phase-to-phase instantaneous voltage between C and A phase	V_{ca}	0–1200 V	±0.5%
	Phase-to-phase instantaneous voltage between A and neutral phase	V_{an}	0–1200 V	±0.5%
	Phase-to-phase instantaneous voltage between B and neutral phase	V_{bn}	0–1200 V	±0.5%
	Phase-to-phase instantaneous voltage between C and neutral phase	V_{cn}	0–1200 V	±0.5%
	Average phase-to-phase voltage	V avg 3Φ	0–1200 V	±0.5%
	Voltage unbalance	V unbal 3Φ	0–100 V	±0.5%
Instantaneous Power	Instantaneous active power	P	0–32 MW	±2%
	Instantaneous reactive power	Q	0–32 Mvar	±2%
	Instantaneous apparent power	S	0–32 MVA	±2%
Power Factor	Power factor	PF	-1–1	±0.01%
Demand Power	Active demand power	P	0–32 MW	±2%
	Reactive demand power	Q	0–32 Mvar	±2%
	Apparent demand power	S	0–32 MVA	±2%
	Max. active demand power since last reset	$\bar{P}$max	0–32 MW	±2%
	Max. reactive demand power since last reset	$\bar{Q}$max	0–32 Mvar	±2%
	Max. apparent demand power since last reset	$\bar{S}$max	0–32 MVA	±2%
Energy Total	Total active power	E. P	-10^{10}–10^{10} Kwh	±2%
	Total reactive power	E. Q	-10^{10}–10^{10} Kvarh	±2%
	Total apparent power	E. S	-10^{10}–10^{10} KVAh	±2%
Energy In	Total active power in	E. P	-10^{10} –10^{10} Kwh	±2%
	Total reactive power in	E. Q	-10^{10}–10^{10} Kvarh	±2%
Energy Out	Total active power out	E. P	-10^{10}–10^{10} Kwh	±2%
	Total reactive power out	E. Q	-10^{10}–10^{10} Kvarh	±2%
Frequency	System frequency	F	45–440 Hz	±0.1 Hz

Appendix C—Network/Com Access

Remotely Readable Values

The communication option can be used to remotely access the Micrologic trip unit, using System Manager Software (SMS) (version 3.3 or later) or other network system management software. See the product catalog for more information on the SMS software.

Table 16 – Remotely Readable Values

Item	Description	Symbol
Current	Instantaneous current in A phase	I_a
	Instantaneous current in B phase	I_b
	Instantaneous current in C phase	I_c
	Instantaneous current in neutral	I_n
	Instantaneous current in ground	I⏚
	Average current in A phase	$I_a$avg
	Average current in B phase	$I_b$avg
	Average current in C phase	$I_c$avg
	Average current in neutral	$I_n$avg
	Average current in ground	I⏚avg
	Maximum instantaneous current in A phase	$I_a$max
	Maximum instantaneous current in B phase	$I_b$max
	Maximum instantaneous current in C phase	$I_c$max
	Maximum instantaneous current in neutral	$I_n$max
	Maximum instantaneous current in ground	I⏚max
	Instantaneous current unbalance in A phase	$I_a$unbal
	Instantaneous current unbalance in B phase	$I_b$unbal
	Instantaneous current unbalance in C phase	$I_c$unbal
	Instantaneous current unbalance in neutral	$I_n$unbal
	Maximum instantaneous current unbalance	Iunbal max
Demand Currents	Demand current in A phase	I_a
	Demand current in B phase	I_b
	Demand current in C phase	I_c
	Demand current in neutral	I_n
	Max. demand current since last reset in A phase	$I_a$max
	Max. demand current since last reset in B phase	$I_b$max
	Max. demand current since last reset in C phase	$I_c$max
	Max. demand current since last reset in neutral	$I_n$max
	Time stamping of demand current max.	

Continued on next page

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Table 16 – Remotely Readable Values *(continued)*

Item	Description	Symbol
Voltage	Instantaneous voltage between A and B phase	V inst V_{ab}
	Instantaneous voltage between B and C phase	V inst V_{bc}
	Instantaneous voltage between C and A phase	V inst V_{ca}
	Instantaneous voltage between A and neutral phase	V inst V_{an}
	Instantaneous voltage between B and neutral phase	V inst V_{bn}
	Instantaneous voltage between C and neutral phase	V inst V_{cn}
	Average phase-to-phase voltage	V avg Vpp
	Average phase-to-neutral voltage	V avg Vpn
	Voltage unbalance between V_{ab} and mean	V unbal V_{ab}
	Voltage unbalance between V_{bc} and mean	V unbal V_{bc}
	Voltage unbalance between V_{ca} and mean	V unbal V_{ca}
	Voltage unbalance between V_{an} and mean	V unbal V_{an}
	Voltage unbalance between V_{bn} and mean	V unbal V_{bn}
	Voltage unbalance between V_{cn} and mean	V unbal V_{cn}
	Max. phase-to-phase voltage unbalance	V max unbal Vpp
	Max. phase-to-neutral voltage unbalance	V max unbal Vpn
Active Power	Instantaneous active power per phase	P
Demand Power	Active demand power	P
	Reactive demand power	Q
	Apparent demand power	S
	Max. active demand power since last reset	$\overline{P}$max
	Max. reactive demand power since last reset	$\overline{Q}$max
	Max. apparent demand power since last reset	$\overline{S}$max
	Predicted active demand power at end of window	
	Predicted reactive demand power at end of window	
	Predicted apparent demand power at end of window	
	Time stamping of demand power max.	
Energy	Total active energy	E
	Active energy in	
	Active energy out	
Fault values	Fault type	
	Interrupted current values	
Frequency	System frequency	F
Update dates	Interval between last update of real-time values and the current table	
	Update date of demand currents, demand power and energy	
History	Trip history	
	Alarm history	
	Event history	
Counters	Contact wear	
	Operation counter since last reset	
	Date/time of last operation counter reset	
	Operation counter total (lifetime)	

Continued on next page

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Table 16 – Remotely Readable Values *(continued)*

Item	Description	Symbol
	Setting of date and time	
	Password	
	Trip unit ID code	
	Trip unit ID name	
	Measurement calculation algorithm	
	Sign convention	
	Total-energy measurement mode	
Setup	Scale factors	
	Demand-current calculation window interval	
	Power quality indication	
	Demand-power calculation mode	
	Demand-power calculation window interval	
	Battery-charge indication	
	Programmable contact assignments	
	Programmable contact setup	
	Circuit breaker rated current	
	Type of neutral protection	
	Long-time protection settings	
	Short-time protection settings	
	Instantaneous protection settings	
Protection	Ground-fault protection settings	
	Current-unbalance protection settings	
	I⏚ alarm settings	
	Maximum-current protection settings	
	Voltage protection settings	
	Other protective functions settings	

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Appendix D—Trip Unit Voltage Supply Architecture

NOTICE

HAZARD OF EQUIPMENT DAMAGE

Setting undervoltage protection (Vmin) below 80% or voltage unbalance (Vunbal) above 20% can cause the trip unit to not perform as expected.

Failure to follow these instructions can result in equipment damage.

The trip unit has an integral internal three-phase voltage power supply which appears as a three-phase delta configured load to the system (Figure 103). This power supply is a three-phase load by itself and will inject voltage on an open phase (Figure 104).

Figure 103 –Integral Internal Three-phase Power Supply

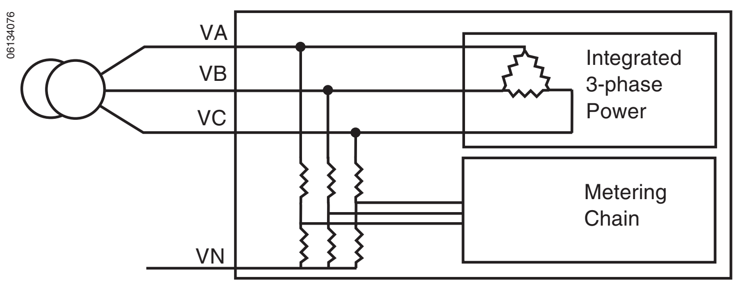
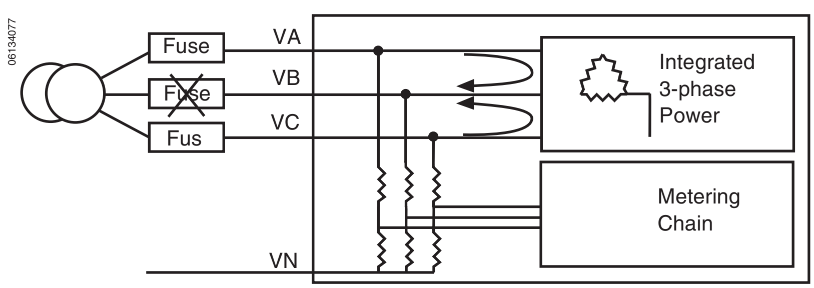


Figure 104 –Open Phase on Three-phase Power Supply



The impact of a three-phase delta configured load on the voltage-based protection functions is as follows:

Minimum Voltage Protection

The minimum (under) voltage protection function is based on phase-to-phase voltage measurement.

For circuit configuration 1 (Figure 105), 2 (Figure 106) or 3 (Figure 107), if a fuse opens the trip unit will inject voltage on the open phase. Therefore the trip unit will meter the voltage being injected on the open phase accurately. The phase-to-phase voltage (V_{LL}) measurement will be higher than when the open phase is at zero volts. The trip unit will also accurately meter the phase-to-neutral voltage (V_{LN}) injected on the open phase and display a value greater than zero.

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Figure 105 –Circuit Configuration 1

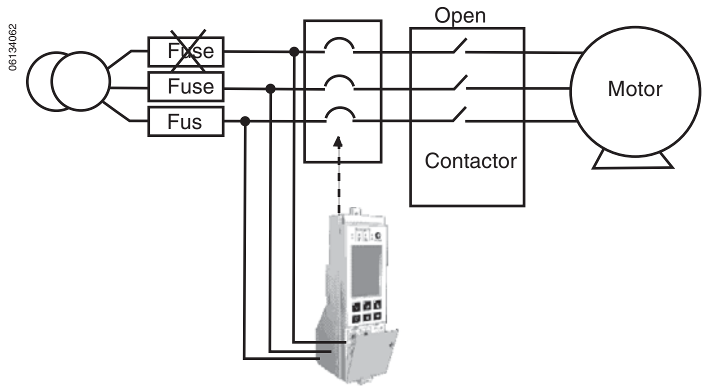


Figure 106 –Circuit Configuration 2

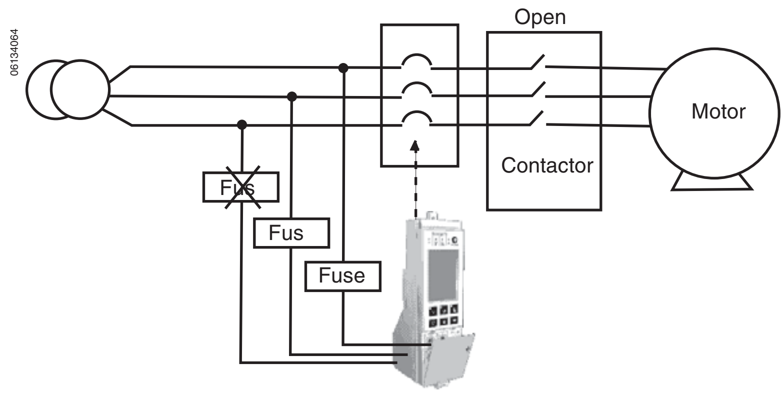
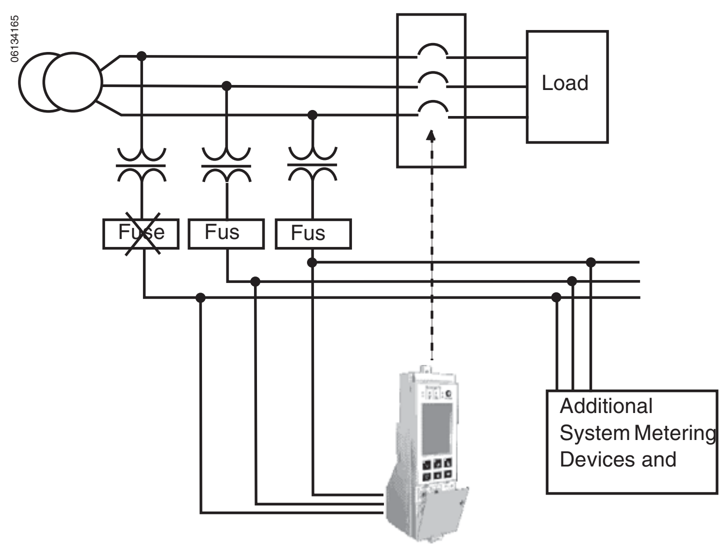


Figure 107 –Circuit Configuration 3



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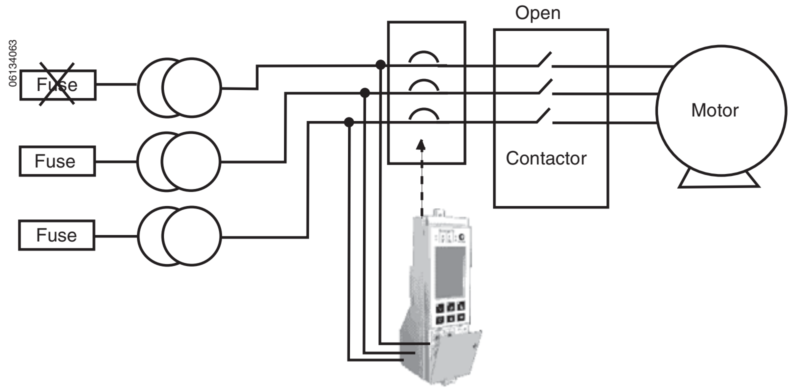
For circuit configuration 4 (Figure 108), the trip unit has a return path through the transformer and the injected voltage on the open phase will be zero. In this configuration the trip unit will accurately meter zero volts on V_{LN}.

To ensure the Micrologic trip system will perform as expected regardless of system configuration the user should limit the undervoltage pickup range to 80%–100% of the nominal phase-to-phase system voltage.

Figure 108 –Circuit Configuration 4



Voltage Unbalance Protection

The voltage unbalance protection function is based on phase-to-phase voltage measurement.

For circuit configuration 1 (Figure 105), 2 (Figure 106) or 3 (Figure 107), if a fuse opens the trip unit will inject voltage on the open phase. Therefore the trip unit will meter the voltage being injected on the open phase accurately.

The phase-to-phase voltage (V_{LL}) measurement will be higher than when the open phase is at zero volts. The trip unit will also accurately meter the phase-to-neutral voltage (V_{LN}) injected on the open phase and display a value greater than zero.

For circuit configuration 4 (Figure 108), the trip unit has a return path through the transformer and the injected voltage on the open phase will be zero. In this configuration the trip unit will accurately meter zero volts on V_{LN}.

To ensure the Micrologic trip system will perform as expected regardless of system configuration the user should limit the voltage unbalance protection settings to 0–20%.

Loss of Multiple Phases

Do not use either minimum voltage protection or voltage unbalance protection to determine the loss of multiple phases.

- The internal voltage power supply requires voltage of two phases to operate. (The voltage power supply has an operating range from 100 V to 690 V.)
- In circuit configurations 1 (Figure 105), 2 (Figure 106) and 3 (Figure 107), when multiple phases are lost the trip unit will measure the system voltage of the remaining phase on all three phases. For example, if two phases are lost on a 480 V three-phase delta system, the trip unit will meter 480 V_{LL} on all three phases.

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Appendix E—Trip Unit Settings

Enter setting values in settings tables.

Table 17 – Settings–Switches

Description	Symbol	Settings
Long-time pickup	Ir	
Long-time delay	tr	
Short-time pickup	Isd	
Short-time delay	tsd	
Ground-fault pickup	Ig	
Ground-fault delay	tg	

Table 18 – Settings—Maintenance Menu

Submenu	Description	Line Item	Trip Unit Setting
M2C/M6C contacts	Alarm type	S#	
	Setup	S#	
Micrologic setup	Language		
	Date/Time		
	Breaker selection	Standard	
		Circuit breaker	
		Type	
		Circuit breaker number	
	Neutral CT		
	VT ratio	Primary	
		Secondary	
	System frequency		
Metering setup	System type		
	Current demand	Interval	
	Power demand	Window type	
		Interval	
	Power sign		
	Sign convention		
Com setup	Com parameter		
	Remote access		
	Remote control		
	IP Data		

Table 19 – Settings—Protection Menu

Submenu	Description	Symbol	Line Item	Trip Unit Setting
Amperage protection	Long-time pickup	Ir		
	Long-time delay	tr		
	Short-time pickup	Isd		
	Short-time delay	tsd		
	Instantaneous	Ii		
	Idmtl Long-time pickup	Idmtl Ir		
	Idmtl Long-time delay	Idmtl tr		
	Idmtl Mode			
	Idmtl Short-time pickup	Idmtl Isd		
	Idmtl Short-time delay	Idmtl tsd		
	Idmtl Instantaneous	Idmtl Ii		
	Ground-fault (6.0P trip unit)	I⏚	Mode	
			Pickup	
			Pickup delay	
	Neutral current	Ineutral		
	Ground-fault alarm	I⏚ alarm	Mode	
			Pickup	
			Pickup delay	
			Dropout	
			Dropout delay	
	Current unbalance	Iunbal	Mode	
			Pickup %	
			Pickup delay	
			Dropout %	
			Dropout delay	
	Max. phase A demand current	$\overline{I}$amax	Mode	
			Pickup	
			Pickup delay	
			Dropout	
			Dropout delay	
	Max. phase B demand current	$\overline{I}$bmax	Mode	
			Pickup	
			Pickup delay	
			Dropout	
			Dropout delay	
	Max. phase C demand current	$\overline{I}$cmax	Mode	
			Pickup	
			Pickup delay	
			Dropout	
			Dropout delay	
	Max. neutral demand current	$\overline{I}$nmax	Mode	
			Pickup	
			Pickup delay	
			Dropout	
			Dropout delay	

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Table 19 – Settings—Protection Menu *(continued)*

Submenu	Description	Symbol	Line Item	Trip Unit Setting
Voltage protection	Minimum (under) voltage	Vmin	Pickup	
Voltage protection	Minimum (under) voltage	Vmin	Pickup delay	
Voltage protection	Minimum (under) voltage	Vmin	Dropout	
Voltage protection	Minimum (under) voltage	Vmin	Dropout delay	
Voltage protection	Maximum (over) voltage	Vmax	Pickup	
Voltage protection	Maximum (over) voltage	Vmax	Pickup delay	
Voltage protection	Maximum (over) voltage	Vmax	Dropout	
Voltage protection	Maximum (over) voltage	Vmax	Dropout delay	
Voltage protection	Voltage unbalance	Vunbal	Pickup	
Voltage protection	Voltage unbalance	Vunbal	Pickup delay	
Voltage protection	Voltage unbalance	Vunbal	Dropout	
Voltage protection	Voltage unbalance	Vunbal	Dropout delay	
Other protection	Reverse power	rP	Pickup	
Other protection	Reverse power	rP	Pickup delay	
Other protection	Reverse power	rP	Dropout	
Other protection	Reverse power	rP	Dropout delay	
Other protection	Maximum (over) frequency	Fmax	Pickup	
Other protection	Maximum (over) frequency	Fmax	Pickup delay	
Other protection	Maximum (over) frequency	Fmax	Dropout	
Other protection	Maximum (over) frequency	Fmax	Dropout delay	
Other protection	Minimum (under) frequency	Fmin	Pickup	
Other protection	Minimum (under) frequency	Fmin	Pickup delay	
Other protection	Minimum (under) frequency	Fmin	Dropout	
Other protection	Minimum (under) frequency	Fmin	Dropout delay	
Other protection	Phase rotation	—	Mode	
Other protection	Phase rotation	—	Sequence	
Load shedding I	Load shedding I	—	Mode	
Load shedding I	Load shedding I	—	Pickup %	
Load shedding I	Load shedding I	—	Pickup delay %	
Load shedding I	Load shedding I	—	Dropout %	
Load shedding I	Load shedding I	—	Dropout delay	
Load shedding P	Load shedding P	—	Mode	
Load shedding P	Load shedding P	—	Pickup	
Load shedding P	Load shedding P	—	Pickup delay	
Load shedding P	Load shedding P	—	Dropout	
Load shedding P	Load shedding P	—	Dropout delay	

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A

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ENGLISH

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Standards, specifications, and designs may change, so please ask for confirmation that the information in this publication is current.

48049-137-05, Rev. 02, 08/2015
Replaces 48049-137-05 Rev. 01, 07/2012

48049-550-01
01/2004
Cedar Rapids, IA, USA

ECN 418B

Dielectric Testing Masterpact® and Powerpact® Circuit Breakers with Micrologic® P and H Trip Systems

Pruebas de rigidez dieléctrica para los interruptores Masterpact® e interruptores Powerpact® con unidades de disparo Micrologic® P y H

Essais diélectriques des disjoncteurs Masterpact® et Powerpact® avec déclencheurs Micrologic® P et H

Retain for future use. / Conservar para uso futuro. / À conserver pour usage ultérieur.

Dielectric tests (high potential, insulation resistance or Megger tests) are used to ensure the proper isolation and insulation between phases and between each phase and ground. The equipment used to conduct these tests creates a high potential voltage (thousands of volts) to verify dielectric or insulation integrity.

Las pruebas de rigidez dieléctrica (de alto potencial, resistencia al aislamiento o pruebas de resistencia eléctrica) se usan para asegurar la separación y el aislamiento apropiados entre las fases y entre cada fase y tierra. El equipo utilizado para realizar estas pruebas crea una tensión de alto potencial (miles de volts) para verificar el valor dieléctrico y la integridad de aislamiento.

Les essais diélectriques (essais haute tension, résistance de l'isolation ou de haute résistance) sont utilisés pour assurer l'isolement et l'isolation appropriés entre les phases et entre chaque phase et la terre. Le matériel employé pour effectuer ces essais crée une haute tension (des milliers de volts) pour vérifier la valeur diélectrique et l'intégrité de l'isolation.

CAUTION / PRECAUCIÓN / ATTENTION

HAZARD OF EQUIPMENT DAMAGE

- Dielectric tests (high potential, insulation resistance, or Megger tests) may damage Micrologic® P and H trip units.
- Remove rating plug from trip unit prior to testing.
- Replace trip unit if rating plug was not removed during tests or if trip unit was exposed to more than 700 Vac.

Failure to follow these instructions can result in equipment damage.

PELIGRO DE DAÑO AL EQUIPO

- Las pruebas de rigidez dieléctrica (de alto potencial, resistencia al aislamiento o pruebas de resistencia eléctrica) pueden dañar las unidades de disparo Micrologic® P y H.
- Retire el calibrador de la unidad de disparo antes de realizar una prueba.
- Sustituya la unidad de disparo si no retiró el calibrador durante las pruebas o si ésta fue expuesta a más de 700 V~ (c.a.).

El incumplimiento de estas instrucciones puede causar daño al equipo.

RISQUE DE DOMMAGES MATÉRIELS

- Les essais diélectriques (essais haute tension, résistance de l'isolation ou de haute résistance) peuvent endommager les déclencheurs Micrologic® P et H.
- Retirez la fiche de valeur nominale du déclencheur avant de procéder aux essais.
- Remplacez le déclencheur si la fiche de valeur nominale n'a pas été retirée durant les essais ou si le déclencheur a été exposé à plus de 700 Vca.

Si ces précautions ne sont pas respectées, cela peut entraîner des dommages matériels.

The rating plug connects/disconnects the trip unit with the voltage connections in the circuit breaker. Before conducting any high-voltage tests, remove the rating plug as shown on page 2.

NOTE: Only Micrologic P and H trip units have phase voltage connections into the trip unit. For other types of trip units, it is not necessary to remove the rating plug prior to dielectric testing.

El calibrador conecta/desconecta la unidad de disparo con las conexiones de tensión en el interruptor. Antes de realizar cualquier prueba de alta tensión, retire el calibrador como se muestra en la página 2.

NOTA: Solamente las unidades de disparo Micrologic P y H tienen conexiones para la tensión de fase. En los demás tipos de unidad de disparo, no es necesario retirar el calibrador antes de realizar la prueba de rigidez dieléctrica.

La fiche de valeur nominale raccorde/déconnecte le déclencheur aux raccordements de tension du disjoncteur. Avant d'effectuer tout essai de haute tension, retirer la fiche de valeur nominale comme indiqué à la page 2.

REMARQUE : Seuls les déclencheurs Micrologic P et H sont munis de raccordements phase-tension. Pour les autres types de déclencheurs, il n'est pas nécessaire de retirer la fiche de valeur nominale avant les essais diélectriques.

TO DO TESTING

1. Open switch cover (A).
2. Unscrew rating plug mounting screw (B).
3. Remove rating plug (C).
4. Perform tests.
5. Replace rating plug (D).
6. Tighten rating plug mounting screw (E).

NOTE: It the rating plug is not installed, the circuit breaker will default to a long-time pickup setting of 0.4 x the sensor (In) and some of the advanced functions will not be operable.

PARA LA PRUEBA

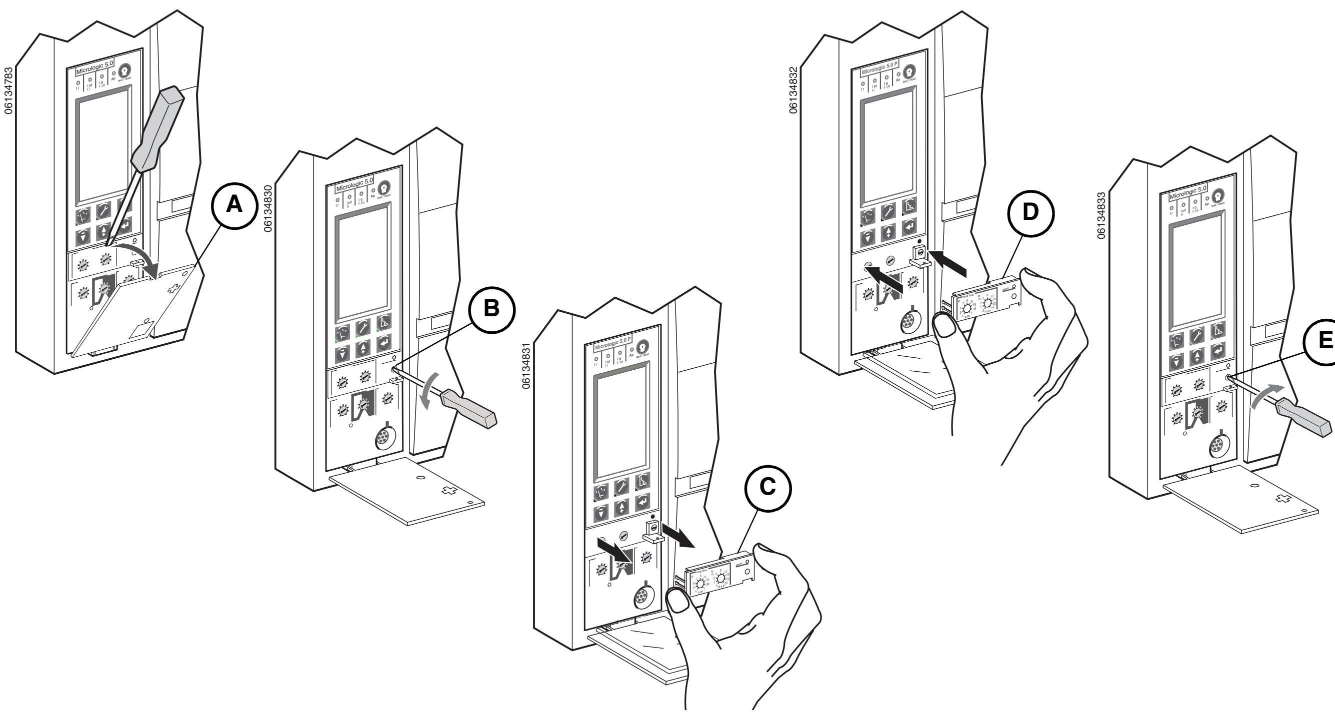
1. Abra la cubierta de los selectores (A).
2. Desatornille el tornillo de montaje (B) del calibrador.
3. Retire el calibrador (C).
4. Realice las pruebas.
5. Vuelva a colocar el calibrador (D).
6. Apriete el tornillo de montaje (E) del calibrador.

NOTA: Si el calibrador no se instala, el interruptor asumirá un valor de ajuste para la activación de largo tiempo de 0,4 x el sensor (In) y algunas de las funciones avanzadas no estarán disponibles.

POUR FAIRE LES ESSAIS

1. Ouvrir le couvercle des commutateurs (A).
2. Dévisser la vis de montage (B) de la fiche de valeur nominale.
3. Retirer la fiche de valeur nominale (C).
4. Effectuer les essais.
5. Remettre en place la fiche de valeur nominale (D).
6. Serrer la vis de montage (E) de la fiche de valeur nominale.

REMARQUE : Si la fiche de valeur nominale n'est pas installée, le disjoncteur se règlera par défaut à un enclenchement de longue durée de 0,4 x le capteur (In) et certaines des fonctions avancées ne seront pas exploitables.



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Solamente el personal especializado deberá instalar, hacer funcionar y prestar servicios de mantenimiento al equipo eléctrico. Schneider Electric no asume responsabilidad alguna por las consecuencias emergentes de la utilización de este material.

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GE
Grid Solutions

469
Motor Management Relay

Instruction Manual

Software Revision: 5.20

Manual P/N: 1601-0122-AJ

Manual Order Code: GEK-106474S

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REGISTERED ISO 9001 GE MULTILIN

WORLDWIDE 10 YEAR WARRANTY

GE Multilin 469 Motor Management Relay instruction manual for revision 5.20.

Part numbers contained in this manual are subject to change without notice, and should therefore be verified by GE Multilin before ordering.

Part number: 1601-0122-AJ (February 2016)

Safety words and definitions

The following symbols used in this document indicate the following conditions:

DANGER	**Indicates a hazardous situation which, if not avoided, will result in death or serious injury.**
WARNING	**Indicates a hazardous situation which, if not avoided, could result in death or serious injury.**
CAUTION	**Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.**
NOTICE	**Indicates practices not related to personal injury.**
NOTE	**Indicates general information and practices, including operational information and practices, that are not related to personal injury.**

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I: INDEX

GE
Grid Solutions

469 Motor Management Relay

Chapter 1: Getting Started

1.1 Important Procedures

1.1.1 Cautions and Warnings

Please read this chapter to guide you through the initial setup of your new relay.

WARNING

Before attempting to install or use the relay, it is imperative that all WARNINGS and CAUTIONS in this manual are reviewed to help prevent personal injury, equipment damage, and/or downtime.

CAUTION

1.1.2 Inspection Checklist

- Open the relay packaging and inspect the unit for physical damage.
- View the rear nameplate and verify that the correct model has been ordered.
- Ensure that the following items are included:
  – Instruction Manual
  – GE EnerVista CD (includes software and relay documentation)
  – mounting screws
- For product information, instruction manual updates, and the latest software updates, please visit the GE Grid Solutions website at http://www.gegridsolutions.com.

NOTE

If there is any noticeable physical damage, or any of the contents listed are missing, please contact GE Grid Solutions immediately.

1.1.3 Manual Organization

Reading a lengthy instruction manual on a new product is not a task most people enjoy. To speed things up, this introductory chapter provides a step-by-step tutorial for a simple motor application. Important wiring considerations and precautions discussed in *Electrical Installation* on page 3–11 should be observed for reliable operation. Detailed information regarding accuracy, output relay contact ratings, and so forth are detailed in *Specifications* on page 2–6. The remainder of this manual should be read and kept for reference to ensure maximum benefit from the 469 Motor Management Relay. For further information, please consult your local sales representative or the factory. Comments about new features or modifications for your specific requirements are welcome and encouraged.

settings and actual values are indicated as follows in the manual:

A3 LEARNED DATA ▷▽ AVERAGE MOTOR LOAD ▷ AVERAGE MOTOR LOAD LEARNED

This 'path representation' illustrates the location of an specific actual value or settings with regards to its previous menus and sub-menus. In the example above, the **AVERAGE MOTOR LOAD LEARNED** actual value is shown to be an item in the **AVERAGE MOTOR LOAD** sub-menu, which itself is an item in the **A3 LEARNED DATA** menu, which is an item of **ACTUAL VALUES**.

Sub-menu levels are entered by pressing the MESSAGE ▶ or ENTER key. When inside a submenu, the ◀ MESSAGE or ESCAPE key returns to the previous sub-menu. The MESSAGE ▼ and MESSAGE ▲ keys are used to scroll through the settings in a sub-menu. The display indicates which keys can be used at any given point.

1.2 Using the Relay

1.2.1 Menu Navigation

The relay has three types of display messages: actual value, settings, and target messages. A summary of the menu structure for settings and actual values can be found at the beginning of chapters 5 and 6, respectively.

Settings are programmable settings entered by the user. These types of messages are located within a menu structure that groups the information into categories. Navigating the menu structure is described below.

Actual values include the following information:

1. Motor and System Status:
   a. Motor status either stopped, starting, or running. It includes values such as motor load, thermal capacity used, motor speed, and instantaneous values of power system quantities.
   b. The status of digital inputs.
   c. Last trip information, including values such as cause of last trip, time and date of trip, motor speed and load at the time of trip, pre-trip temperature measurements, pre-trip analog inputs values, and pre-trip instantaneous values of power system quantities.
   d. Active alarms.
   e. Relay date and time.
   f. Present blocking conditions.
   g. General system status indication including the status of output relays, active pickup, alarm and trip conditions.
2. Metering Data:
   a. Instantaneous current measurements including phase, differential, unbalance, ground, average, and motor load.
   b. RTD Temperatures including hottest RTDs.
   c. Instantaneous phase to phase and phase to ground voltages (depending on the VT connections), average voltage, and system frequency.
   d. Motor Speed
   e. Power Quantities including apparent, real and reactive power.
   f. Current and power demand including peak values.
   g. Analog inputs
   h. Vector information.
3. Motor Learned Data:
   a. Learned and last acceleration time.
   b. Learned and last starting current.

   c. Learned and last starting capacity.
   d. Average motor load.
4. Maintenance data. This is useful statistical information that may be used for preventive maintenance. It includes:
   a. Trip counters
   b. General counter such as number of motor starts, number of emergency restarts, number of starter operations, digital counter for other purposes not listed above.
   c. Timers such as motor running hours, time between starts timer, and five start timers used to calculate the average start time of the motor.
5. RTD Learned Data, which includes the maximum temperature measured by each of the 12 RTDs.
6. Event recorder downloading tool.
7. Product information including model number, firmware version, additional product information, and calibration dates.
8. Oscillography downloading tool.

Alarm, trip conditions, diagnostics, and system flash messages are grouped under *Target Messages*.

▷ Press the MENU key to access the header of each menu, which will be displayed in the following sequence:

```
1. SETPOINTS
Press [▷] for more
```

```
2. ACTUAL VALUES
Press [▷] for more
```

```
3. TARGET MESSAGES
Press [▷] for more
```

To access settings,

▷ Press the MENU key until the display shows the header of the Settings menu.

▷ Press the MESSAGE ▶ or ENTER key to display the header for the first Settings page.
The Settings pages are numbered, have an 'S' prefix for easy identification and have a name which provides a general idea of the settings available in that page.
Pressing the MESSAGE ▼ and MESSAGE ▲ keys will scroll through all the available Settings page headers. Settings page headers look as follows:

```
■ SETPOINTS        [▷]
  S1 469 SETUP
```

To enter a given Settings page,

- ▷ Press the MESSAGE ▶ or ENTER key.
- ▷ Press the MESSAGE ▼ or MESSAGE ▲ keys to scroll through sub-page headers until the required message is reached.
  The end of a page is indicated by the message **END OF PAGE**. The beginning of a page is indicated by the message **TOP OF PAGE**.

To access actual values,

- ▷ Press the MENU key until the display shows the header of the actual values menu.
- ▷ Press the MESSAGE ▶ or ENTER key to display the header for the first actual values page.
  The actual values pages are numbered, have an 'A' prefix for easy identification and have a name, which gives a general idea of the information available in that page.
  Pressing the MESSAGE ▼ or MESSAGE ▲ keys will scroll through all the available actual values page headers. Actual values page headers look as follows:

```
■ ACTUAL VALUES    [▷]
  A1 STATUS
```

To enter a given actual values page,

- ▷ Press the MESSAGE ▶ or ENTER key.
- ▷ Press the MESSAGE ▼ or MESSAGE ▲ keys to scroll through sub-page headers until the required message is reached.
  The end of a page is indicated by the message **END OF PAGE**. The beginning of a page is indicated by the message **TOP OF PAGE**.

Similarly, to access additional sub-pages,

- ▷ Press the MESSAGE ▶ or ENTER key to enter the first sub-page,
- ▷ Press the MESSAGE ▼ or MESSAGE ▲ keys to scroll through the available sub-pages, until the desired message is reached.
  The process is identical for both settings and actual values.

The following procedure illustrates the key sequence to access the Current Demand actual values.

- ▷ Press the MENU key until you reach the actual values main menu.
- ▷ Press MESSAGE ▶ or ENTER key to enter the first actual values page.
- ▷ Press the MESSAGE ▼ or MESSAGE ▲ key to scroll through pages, until the **A2 METERING DATA** page appears.

```
■ ACTUAL VALUES    [▷]
  A2 METERING DATA
```

▷ Press the MESSAGE ▶ or ENTER key to display the first sub-page heading for the Metering Data actual values page:

```
■ CURRENT          [▷]
  METERING
```

Pressing the MESSAGE ▼ or MESSAGE ▲ keys will scroll the display up and down through the sub-page headers.

Pressing the ◀ MESSAGE or ESCAPE key at any sub-page heading will return the display to the heading of the corresponding settings or actual value page.

Pressing it again, will return the display to the main menu header.

▷ Press the MESSAGE ▼ key until the **DEMAND METERING** sub-page heading appears.

```
■ DEMAND           [▷]
  METERING
```

At this point, pressing MESSAGE ▶ or ENTER key will display the messages under this sub-page. If instead you press the MESSAGE ▲ key, it will return to the previous sub-page heading. In this case,

```
■ POWER            [▷]
  METERING
```

When the symbols ■ and [▷] appear on the top line, it indicates that additional sub-pages are available and can be accessed by pressing the MESSAGE ▶ or ENTER key.

▷ Press MESSAGE ▶ or ENTER while at the Demand Metering sub-page heading to display the following:

```
CURRENT
DEMAND:        0 Amps
```

▷ Press ◀ MESSAGE key to return to the Demand Metering sub-page heading.

▷ Press the MESSAGE ▼ key to display the next actual value of this sub-page.
Actual values and settings messages always have a colon separating the name of the value and the actual value or settings. This particular message displays the current demand as measured by the relay.

The menu path to this value is shown as **A2 METERING DATA** ▷▽ **DEMAND METERING** ▷ **CURRENT DEMAND**. Settings and actual values messages are referred to in this manner throughout the manual.

For example, the **A3 LEARNED DATA** ▷ **MOTOR STARTING** ▷ **LEARNED ACCELERATION TIME** path representation describes the following key-press sequence:

▷ Press the MENU key until the actual value header appears on the display, MESSAGE ▶ or ENTER key,

▷ Press the MESSAGE ▼ key until the **A3 LEARNED DATA** message is displayed.

▷ Press the MESSAGE ▶ or ENTER key to display **MOTOR STARTING** message.

▷ Press the MESSAGE ▶ or ENTER key to reach the **LEARNED ACCELERATION TIME** message and the corresponding actual value.

▷ Press the MESSAGE ▼ key to display the next actual value message as shown below:

```
LEARNED STARTING
CURRENT:       0 A
```

▷ Press the MESSAGE ▼ or MESSAGE ▲ keys to scroll the display up and down through all the actual value displays in this corresponding sub-page.

▷ Press the ◀ MESSAGE key to reverse the process described above and return the display to the previous level.

```
■ MOTOR            [▷]
  STARTING
```

▷ Press the ◀ MESSAGE key twice to return to the **A3 LEARNED DATA** page header.

```
■ ACTUAL VALUES    [▷]
  A3 LEARNED DATA
```

1.2.2 Panel Keying Example

The following figure gives a specific example of how the keypad is used to navigate through the menu structure. Specific locations are referred to throughout this manual by using a 'path representation'. The example shown in the figure gives the key presses required to read the learned starting current denoted by the path **A3 LEARNED DATA** ▷▽ **MOTOR STARTING** ▷▽ **LEARNED STARTING CURRENT**.

▷ Press the menu key until the relay displays the actual values page.

```
■ ACTUAL VALUES    [▷]
```

Press the MESSAGE ▷ or ENTER key

```
■ ACTUAL VALUES    [▷]
 A1 STATUS
```

Press the MESSAGE ▽ key

```
■ ACTUAL VALUES    [▷]
 A2 METERING DATA
```

Press the MESSAGE ▽ key

```
■ ACTUAL VALUES    [▷]
 A3 LEARNED DATA
```

MESSAGE ▷

```
■ MOTOR STARTING   [▷]
```

MESSAGE ▷

```
LEARNED ACCELERATION
TIME:   0.0 s
```

MESSAGE ▽

```
LEARNED STARTING
CURRENT:        0 A
```

1.3 Changing Settings

1.3.1 Introduction

There are several classes of settings, each distinguished by the way their values are displayed and edited.

The relay's menu is arranged in a tree structure. Each setting in the menu is referred to as a settings, and each settings in the menu may be accessed as described in the previous section.

The settings are arranged in pages with each page containing related settings; for example, all the Short Circuit Trip settings are contained within the same page. As previously explained, the top menu page of each setting group describes the settings contained within that page. Pressing the MESSAGE keys allows the user to move between these top menus.

All of the 469 settings fall into one of following categories: device settings, system settings, digital input settings, output relay settings, thermal model settings, current element settings, motor starting settings, RTD temperatures settings, voltage element settings, power element settings, monitoring settings, analog input/output settings, two speed motor settings, and testing settings.

NOTE

IMPORTANT: Settings are stored and used by the relay immediately after they are entered. As such, caution must be exercised when entering settings while the relay is in service. Modifying or storing protection settings is not recommended when the relay is in service since any incompatibility or lack of coordination with other previously saved settings may cause unwanted operations.

Now that we have become more familiar with maneuvering through messages, we can learn how to edit the values used by all settings classes.

Hardware and passcode security features are designed to provide protection against unauthorized settings changes. Since we will be programming new settings using the front panel keys, a hardware jumper must be installed across the settings access terminals (C1 and C2) on the back of the relay case. Attempts to enter a new settings without this electrical connection will result in an error message.

The jumper does not restrict settings access via serial communications. The relay has a programmable passcode settings, which may be used to disallow settings changes from both the front panel and the serial communications ports. This passcode consists of up to eight (8) numeric characters.

The factory default passcode is “0”. When this specific value is programmed into the relay it has the effect of removing all settings modification restrictions. Therefore, only the settings access jumper can be used to restrict settings access via the front panel and there are no restrictions via the communications ports.

When the passcode is programmed to any other value, settings access is restricted for the front panel and all communications ports. Write Access via keypad is not permitted until the passcode is entered via the keypad. Write access via communication port is not permitted until the passcode is entered via that port. That is, the passcode must be entered via the port from which access is desired.

Entering the passcode on any communication port automatically restricts the other ports, but does not restrict the keypad. For example, entering the passcode on computer RS485 permits settings write access on computer RS485, and restricts write access on computer RS232, auxiliary RS485, and ethernet.

A front panel command can disable settings access once all modifications are complete. For the communications ports, writing an invalid passcode disables access. In addition, settings access is automatically disabled on an interface if no activity is detected for thirty minutes.

The EnerVista 469 Setup software incorporates a facility for programming the relay's passcode as well as enabling and disabling settings access. For example, when an attempt is made to modify a settings but access is restricted, the software will prompt the user to enter the passcode and send it to the relay before the settings is actually written to the relay. If a SCADA system is used for relay programming, it is the programmer's responsibility to incorporate appropriate security for the application.

1.3.2 The HELP Key

Pressing the HELP key displays context-sensitive information about settings such as the range of values and the method of changing the settings. Help messages will automatically scroll through all messages currently appropriate.

1.3.3 Numerical Settings

Each numerical settings has its own minimum, maximum, and step value. These parameters define the acceptable settings value range. Two methods of editing and storing a numerical settings value are available.

The first method uses the 469 numeric keypad in the same way as any electronic calculator. A number is entered one digit at a time with the 0 to 9 and decimal keys. The left-most digit is entered first and the right-most digit is entered last. Pressing ESCAPE before the ENTER key returns the original value to the display.

The second method uses the VALUE ▲ key to increment the displayed value by the step value, up to a maximum allowed value. Likewise, the VALUE ▼ key decrements the displayed value by the step value, down to a minimum value. For example:

▷ Select the **S2 SYSTEM SETUP ▷▽ VOLTAGE SENSING ▷▽ MOTOR NAMEPLATE VOLTAGE** settings message.

```
MOTOR NAMEPLATE
VOLTAGE: 4000 V
```

▷ Press the 1, 3, 8, 0, and 0 keys. The display message will change as shown.

```
MOTOR NAMEPLATE
VOLTAGE: 13800 V
```

Until the ENTER key is pressed, editing changes are not registered by the relay.

▷ Therefore, press the ENTER key to store the new value in memory. This flash message will momentarily appear as confirmation of the storing process.

```
NEW SETPOINT HAS
BEEN STORED
```

1.3.4 Enumeration Settings

The example shown in the following figures illustrates the keypress sequences required to enter system parameters such as the phase CT primary rating, ground CT primary rating, bus VT connection type, secondary voltage, and VT ratio.

The following values will be entered:

Phase CT primary rating: 600 A
Motor Full Load Current: 318 A
Ground CT ratings: 50/5 A
Phase Differential CT: None
Voltage Transformer Connection Type: Open Delta
Motor Nameplate Voltage: 13800 V
VT Ratio: 115:1

To set the phase CT primary rating, modify the **S2 SYSTEM SETUP ▷ CURRENT SENSING ▷ PHASE CT PRIMARY** settings as shown below.

▷ Press the MENU key until the relay displays the Sepoints menu header.

```
1. SETPOINTS
Press [▷] for more
```

Press MESSAGE ▶ or ENTER

```
■ SETPOINTS       [▷]
  S1 469 SETUP
```

Press MESSAGE ▼

```
■ SETPOINTS       [▷]
  S2 SYSTEM SETUP
```

Press MESSAGE ▶ or ENTER

```
■ CURRENT         [▷]
  SENSING
```

Press MESSAGE ▶ or ENTER

```
PHASE CT PRIMARY:
 OFF
```

Press the VALUE keys until 600 A is displayed, or enter the value directly via the numeric keypad.

```
PHASE CT PRIMARY:
 600 A
```

Press the ENTER key to store the settings.

```
NEW SETPOINT HAS
BEEN STORED
```

To set the phase Motor Full Load Amps FLA, modify the **S2 SYSTEM SETUP ▷ CURRENT SENSING ▷▽ MOTOR FULL LOAD AMPS FLA** settings as shown below.

▷ Press the MENU key until the relay displays the Setpoints menu header.

```
1. SETPOINTS
Press [▷] for more
```

Press MESSAGE ▶ or ENTER

```
■ SETPOINTS          [▷]
  S1 469 SETUP
```

Press MESSAGE ▼

```
■ SETPOINTS          [▷]
  S2 SYSTEM SETUP
```

Press MESSAGE ▶ or ENTER

```
■ CURRENT            [▷]
  SENSING
```

Press MESSAGE ▶ or ENTER

```
PHASE CT PRIMARY:
  600 A
```

Press MESSAGE ▼

```
MOTOR FULL LOAD AMPS
FLA: OFF
```

Press the VALUE keys until 318 A is displayed, or enter the value directly via the numeric keypad.

```
MOTOR FULL LOAD AMPS
FLA: 318 A
```

Press the ENTER key to store the settings.

```
  NEW SETPOINT HAS
  BEEN STORED
```

To set the ground CT ratings, modify the **S2 SYSTEM SETUP ▷ CURRENT SENSING ▷▽ GROUND CT** and the **S2 SYSTEM SETUP ▷▽ CURRENT SENSING ▷▽ GROUND CT PRIMARY** settings as shown below.

▷ Press the MENU key until the relay displays the Setpoints menu header.

```
1. SETPOINTS
Press [▷] for more
```

Press MESSAGE ▶ or ENTER

```
■ SETPOINTS        [▷]
  S1 469 SETUP
```

Press MESSAGE ▼

```
■ SETPOINTS        [▷]
  S2 SYSTEM SETUP
```

Press MESSAGE ▶ or ENTER

```
■ CURRENT          [▷]
  SENSING
```

Press MESSAGE ▶ or ENTER

```
PHASE CT PRIMARY:
 600 A
```

Press MESSAGE ▼

```
MOTOR FULL LOAD AMPS
FLA: 318 A
```

Press MESSAGE ▼

```
GROUND CT:
50:0.025
```

Press the VALUE keys until "5 A Secondary" is displayed.

```
GROUND CT:
5 A Secondary
```

Press the ENTER key to store the settings.

```
NEW SETPOINT HAS
BEEN STORED
```

Press MESSAGE ▼

```
GROUND CT PRIMARY:
 100 A
```

Press the VALUE keys until 50 A is displayed, or enter the value directly via the numeric keypad.

```
GROUND CT PRIMARY:
 50 A
```

Press the ENTER key to store the settings.

```
NEW SETPOINT HAS
BEEN STORED
```

To set the VT connection type and ratings, modify the **S2 SYSTEM SETUP ▷▽ VOLTAGE SENSING ▷▽ VT CONNECTION TYPE** and the **S2 SYSTEM SETUP ▷▽ VOLTAGE SENSING ▷▽ VOLTAGE TRANSFORMER RATIO**, and **S2 SYSTEM SETUP ▷▽ VOLTAGE SENSING ▷▽ MOTOR NAMEPLATE VOLTAGE** settings as shown below.

▷ Press the MENU key until the relay displays the Setpoints menu header.

```
1. SETPOINTS
Press [▷] for more
```

Press MESSAGE ▶ or ENTER

```
■ SETPOINTS          [▷]
  S1 469 SETUP
```

Press MESSAGE ▼

```
■ SETPOINTS          [▷]
  S2 SYSTEM SETUP
```

Press MESSAGE ▶ or ENTER

```
■ CURRENT            [▷]
  SENSING
```

Press MESSAGE ▼

```
■ VOLTAGE            [▷]
  SENSING
```

Press MESSAGE ▶ or ENTER

```
VT CONNECTION TYPE:
None
```

Press the VALUE keys until "Open Delta" is displayed.

```
VT CONNECTION TYPE:
Open Delta
```

Press the ENTER key to store the settings.

```
NEW SETPOINT HAS
BEEN STORED
```

Press MESSAGE ▼

```
ENABLE SINGLE VT:
OPERATION: OFF
```

Press MESSAGE ▼

```
VOLTAGE TRANSFORMER
RATIO:   35.00 : 1
```

Press the VALUE keys until 115.00 : 1 is displayed, or enter the value directly via the numeric keypad.

```
VOLTAGE TRANSFORMER
RATIO: 115.00 : 1
```

Press the ENTER key to store the settings.

```
NEW SETPOINT HAS
BEEN STORED
```

Press MESSAGE ▼

```
MOTOR NAMEPLATE
VOLTAGE: 4000 V
```

Press the VALUE keys until 13800 V is displayed, or enter the value directly via the numeric keypad.

```
MOTOR NAMEPLATE
VOLTAGE: 13800 V
```

Press the ENTER key to store the settings.

```
NEW SETPOINT HAS
BEEN STORED
```

If an entered settings value is out of range, the relay displays the following message:

```
OUT-OF-RANGE! ENTER:
100-36000 by 1
```

"100-36000" indicates the range and "1" indicates the step value

where 100 is the minimum settings value, 36000 is the maximum, and 1 is the step value. To have access to information on maximum, minimum, and step value, press the HELP key.

1.3.5 Output Relay Settings

Output relays (Trip or Alarm) can be associated to the Auxiliary Relays 2 and 3. Each can be selected individually, or in combination, in response to customer specific requirements, which can be initiated by any protection element or function, whose **ASSIGN RELAYS** settings has them selected.

▷ Select the **S6 CURRENT ELEM.** ▷ **SHORT CIRCUIT TRIP** ▷▽ **ASSIGN TRIP RELAYS** settings message.

```
ASSIGN TRIP RELAYS:
Trip
```

If an application requires the short circuit protection element to operate the Auxiliary Output 3 relay,

▷ Select this output relay by pressing the value key until the desired combination appear in the display.

```
ASSIGN TRIP RELAYS:
Trip & Auxiliary3
```

▷ Press the ENTER key to store this change into memory.
As before, confirmation of this action will momentarily flash on the display.

```
NEW SETPOINT HAS
BEEN STORED
```

1.3.6 Text Settings

Text settings have data values which are fixed in length but user-defined in character. They may be composed of uppercase letters, lowercase letters, numerals, and a selection of special characters. The editing and storing of a text value is accomplished using the decimal [.], VALUE, and ENTER keys.

For **example**:

▷ Move to message **S3 DIGITAL INPUTS** ▷▽ **ASSIGNABLE INPUT 1** ▷ **INPUT 1 FUNCTION**, and scrolling with the VALUE keys, select “General Sw. A”.
The relay will display the following message:

```
INPUT 1 FUNCTION:
General Sw. A
```

▷ Press the MESSAGE ▼ key to view the next settings, **SWITCH NAME**.
The name of this user-defined input will be changed in this example from the generic “General Sw. A” to something more descriptive.

If an application is to be using the relay as a station monitor, it is more informative to rename this input “Station Monitor”.

▷ Press the decimal [.] key to enter the text editing mode.
The first character will appear underlined as follows:.

```
SWITCH NAME:
General Sw. A
```

▷ Press the VALUE keys until the character “S” is displayed in the first position.

▷ Press the decimal [.] key to store the character and advance the cursor to the next position.

▷ Change the second character to a “t” in the same manner.

▷ Continue entering characters in this way until all characters of the text “Stn. Monitor” are entered.
Note that a space is selected like a character. If a character is entered incorrectly, press the decimal [.] key repeatedly until the cursor returns to the position of the error. Re-enter the character as required.

▷ Once complete, press the ENTER key to remove the solid cursor and view the result. Once a character is entered, by pressing the ENTER key, it is automatically saved in flash memory, as a new settings.

```
SWITCH NAME:
Stn. Monitor
```

1.4 Application Example

1.4.1 Description

The 469 Motor Management Relay contains many features designed to accommodate a wide range of motor management applications. This chapter is provided to guide you, the first-time user, through a real-world application.

The following is typical example of how to determine the relay settings for a specific motor that has been applied conservatively. This is only an example and may not address all issues relating to your specific application. It is recommended that your local protection engineer determine the settings for your motor protective relaying application. Refer to following figures for schematic diagrams related to this example.

Important points to keep in mind before developing settings for any multifunction numerical device like the 469 Motor Management Relay:

- Gather system data, including, but not limited to:

  – CT primary and secondary ratings for all the CTs used to feed the relay

  – motor name plate data

  – motor operating curves (typical set shown below)

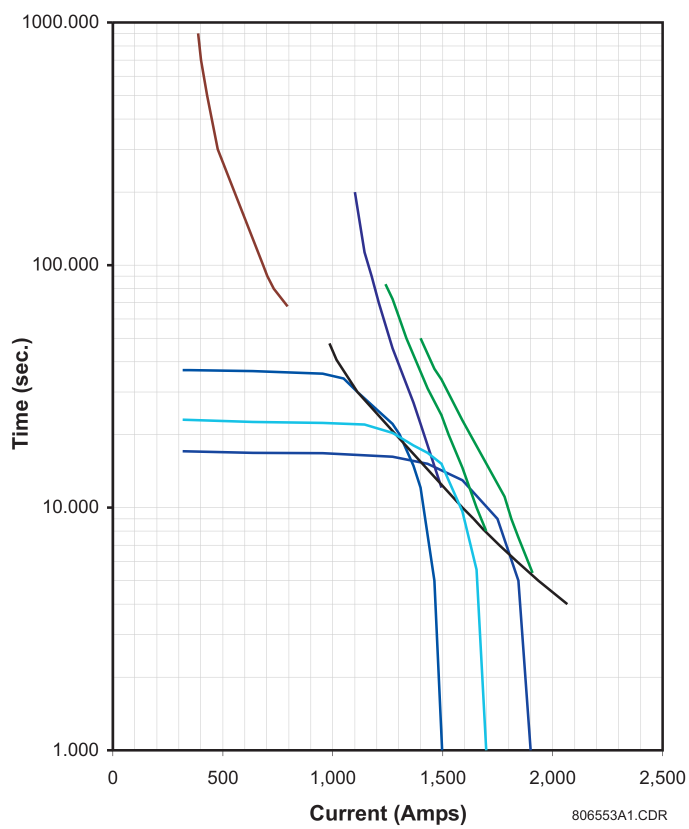


FIGURE 1–1: Typical Motor Curves

– VT primary and secondary ratings

– System frequency

– System phase sequence

- Define the protection elements that will be enabled. Prepare a list of protection functions including the following information. By default, all the protection functions must be assumed “Disabled”:

  – Pickup parameter

  – Operating curve, if applicable

  – Time dial or multiplier

  – Any additional intentional time delay

  – Directionality, if applicable

- Define how many output contacts will be energized in response to a given protection function. Note that the 469 relay can be programmed to Trip or Alarm and, at the same time, to energize one, a combination, or all the 2 auxiliary relays during the process.
- Define if the output relays will be set as failsafe type.
- Define if the 469 relay will be used to start the motor. If so, gather information on the required conditions to execute the command.
- Define if the 469 will be involved in the motor starting process, particularly on reduced voltage start applications.
- Define if the 469 will be applied a multi speed applications.
- Define if the relay will be used to monitor the status of the starter or breaker. It is strongly recommended that the 469 be always programmed to monitor the status of the disconnecting device, by means of a dry contact connected to one of the digital inputs of the relay. Use an auxiliary contact from the breaker or starter either a normally open contact, 52a, which is normally in open position when the disconnecting device is open, or a normally closed contact, 52b, which is in close position when the breaker or starter is open.
- If the 469 will be used to respond to digital inputs, record the following information:

  – Digital Input name

  – Condition by which the digital input would be considered asserted

  – Function that the digital input will initiate within the 469

- If the 469 will be used to perform monitoring functions and act upon certain conditions, record information such as:

  – minimum and maximum values

  – alarm and trip values

  – time delays

- It is important to familiarize yourself with the relay protection and control functions before setting up the relay.

To begin, simply power on the unit and follow the instructions in this tutorial. Assume the following system characteristics and that the 469 settings are unaltered from their factory default values.

Refer to the following figures for schematics related to this application example.

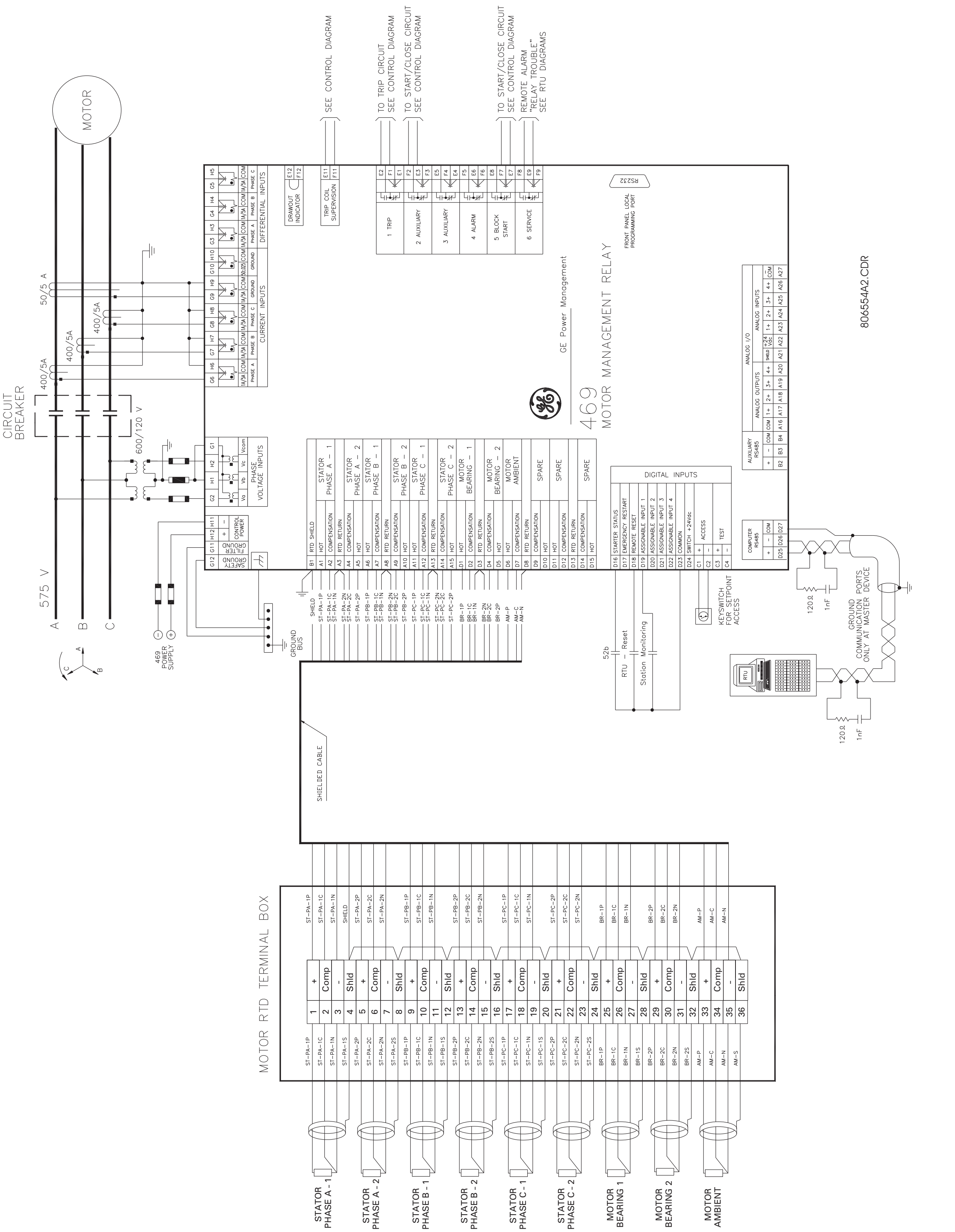


FIGURE 1–2: Typical Relay Connection Diagram

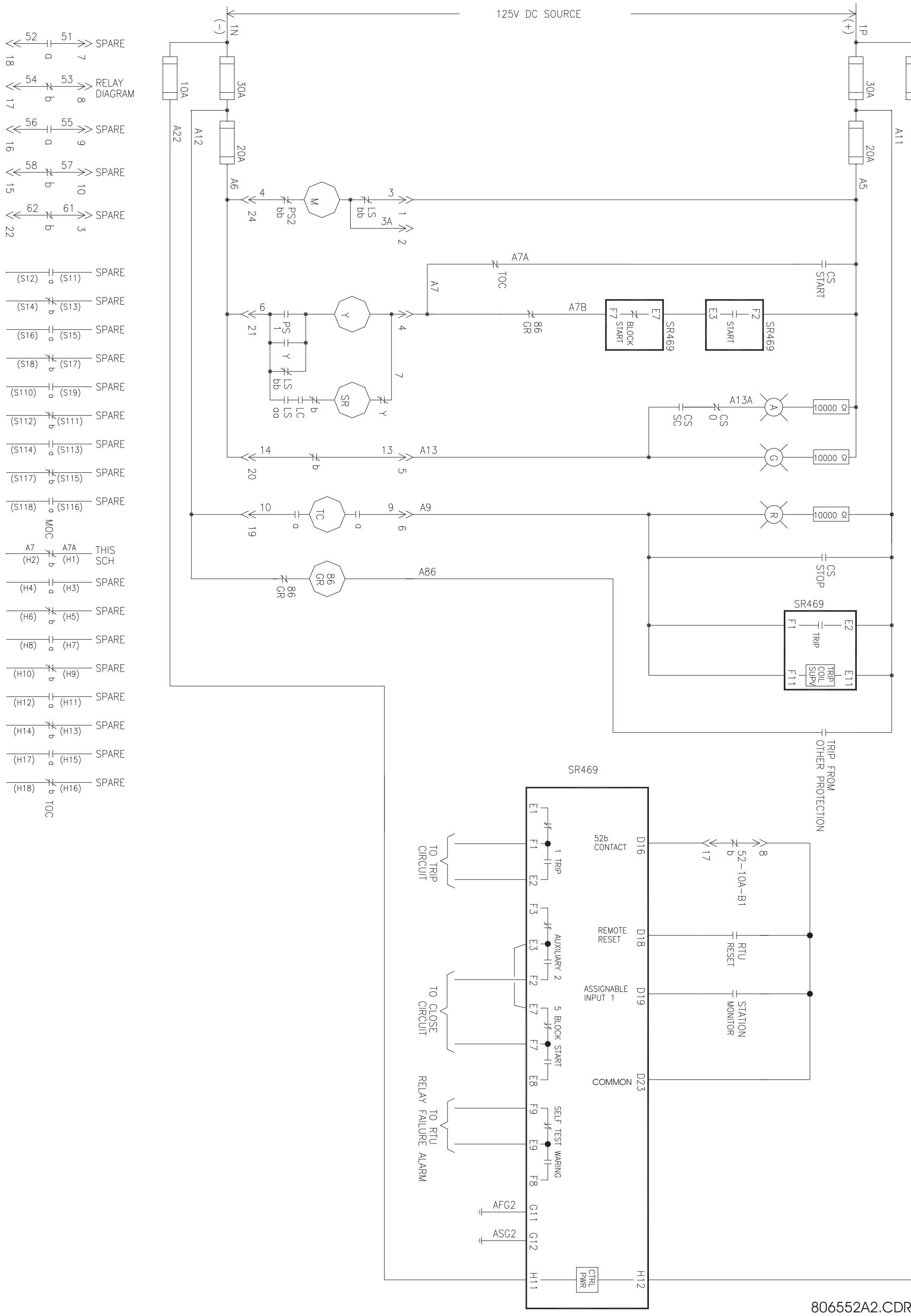


FIGURE 1–3: Typical Control Diagram

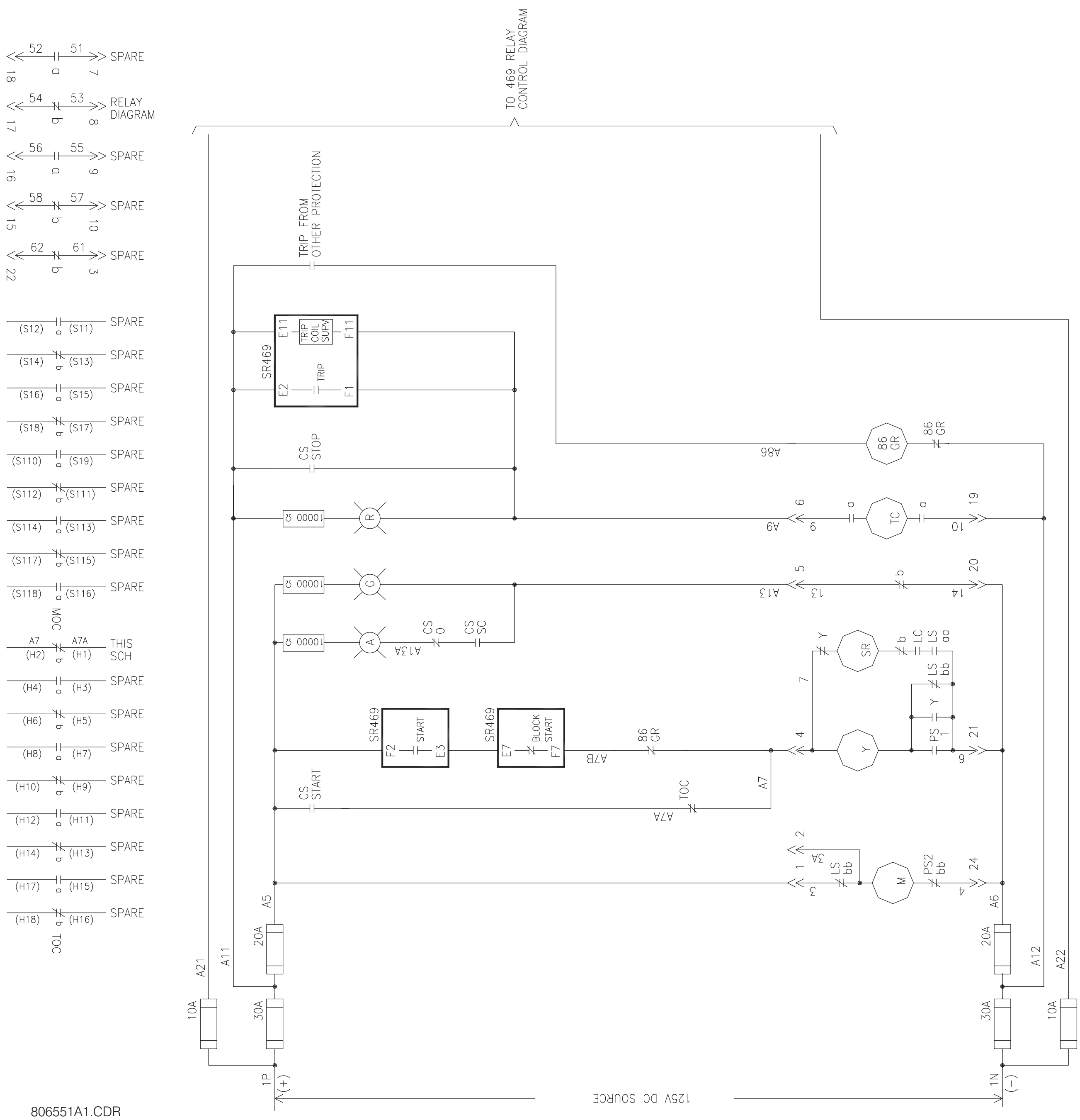


FIGURE 1–4: Typical Breaker Control Diagram

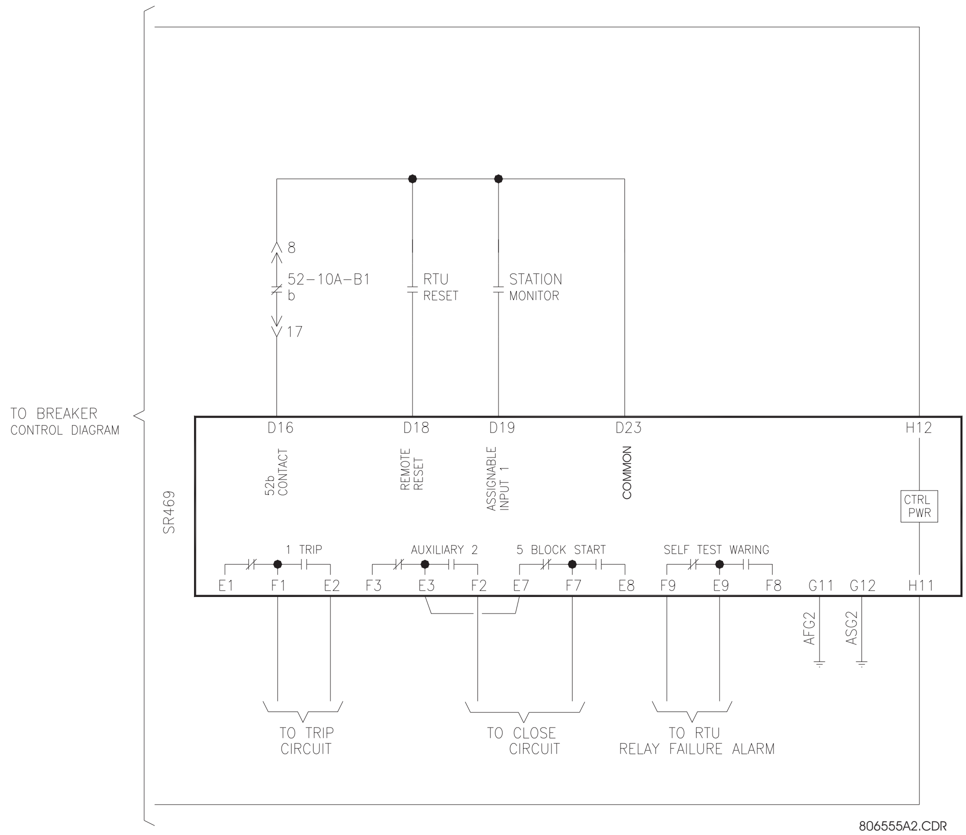


FIGURE 1–5: Typical Relay Control Diagram

- **Power System Data**

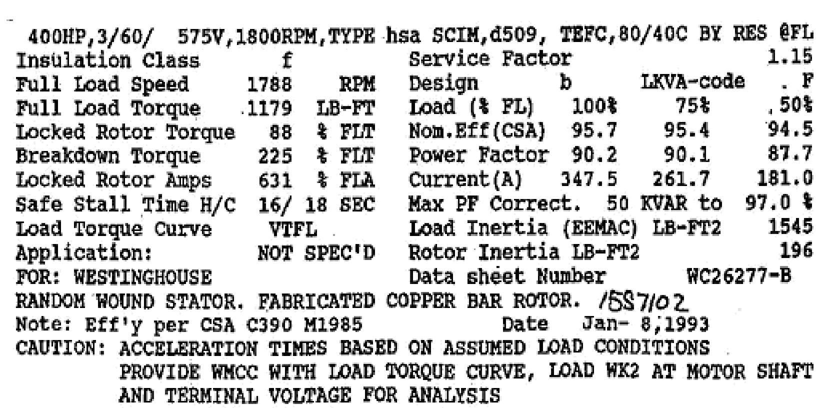
  a) System: 3Φ, 4 wire

  b) Frequency: 60 Hz

  c) Line voltage: 600 V

- **Motor Data**

  As per the following motor data sheet information:



```
400HP,3/60/  575V,1800RPM,TYPE hsa SCIM,d509, TEFC,80/40C BY RES @FL
Insulation Class        f          Service Factor                1.15
Full Load Speed      1788     RPM  Design          b     LKVA-code   . F
Full Load Torque     1179  LB-FT   Load (% FL)   100%     75%       50%
Locked Rotor Torque    88   % FLT  Nom.Eff(CSA)  95.7     95.4      94.5
Breakdown Torque      225   % FLT  Power Factor  90.2     90.1      87.7
Locked Rotor Amps     631   % FLA  Current(A)    347.5   261.7     181.0
Safe Stall Time H/C  16/ 18 SEC    Max PF Correct.  50 KVAR to  97.0 %
Load Torque Curve      VTFL        Load Inertia (EEMAC) LB-FT2     1545
Application:         NOT SPEC'D    Rotor Inertia LB-FT2             196
FOR: WESTINGHOUSE                  Data sheet Number         WC26277-B
RANDOM WOUND STATOR. FABRICATED COPPER BAR ROTOR. /587/02
Note: Eff'y per CSA C390 M1985              Date    Jan- 8,1993
CAUTION: ACCELERATION TIMES BASED ON ASSUMED LOAD CONDITIONS
         PROVIDE WMCC WITH LOAD TORQUE CURVE, LOAD WK2 AT MOTOR SHAFT
         AND TERMINAL VOLTAGE FOR ANALYSIS
```

FIGURE 1–6: Motor Data Sheet Information

- **Motor Operating Curves**

  Motor operating curves as shown below:

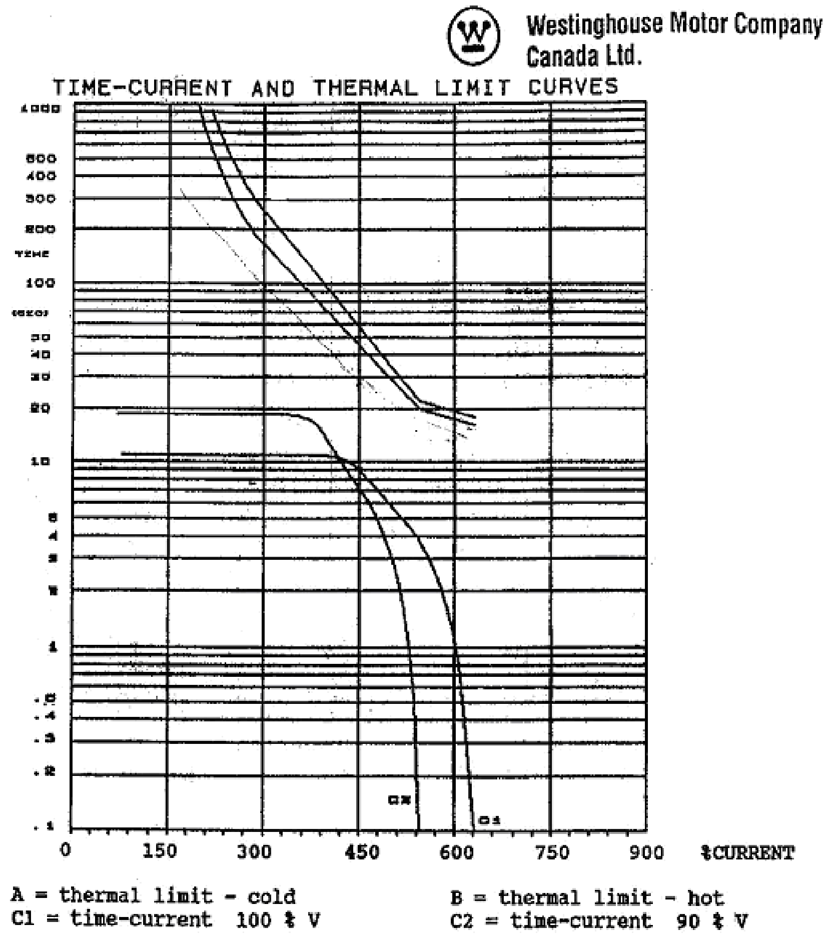


FIGURE 1–7: Motor Operating Curves for Application Example

- **Control System Requirements**

  – All protection elements trip the breaker

  – Breaker position monitoring via 52b contact only

  – Only current metering is required

  – Serial communication remote start from RTU

  – Alarm after 100 s delay from station monitor. This is normally used to signal the remote center when someone has gained access to the substation.

- **Contact Outputs**

  – Trip and close to breaker control circuit (Trip and Auxiliary2 relays)

  – Relay failure alarm to RTU (self-test warning relay, no programming required)

  – Alarm contact (setup in General Sw. A for “Station Monitor”)

  – No data communications to other equipment.

- **RTDs**

  The motor is fitted with the following RTDs:

  – RTD type: 100 Ω Platinum

  – 6 Stator RTDs, 2 per phase

  – 2 Bearing RTDs

  – 1 Ambient RTD

Use the above data to set the output relays to achieve breaker control; to set digital inputs for breaker status, remote operations, remote status, and alarm indication. Assume that the communications between the station and the master control center will be done by the RTU. Alarms, status indication, and breaker commands will be hard-wired from the relay to the RTU. Similar information could be exchanged between the RTU and the relay via an RS485 or RS422 Serial Link using the Modbus RTU protocol. Refer to GE Publication GEK-106491C: *469 Communications Guide* for additional information.

1.4.2 Instrument Transformer Data

- **Voltage Transformers**

  – 2 × Open Delta connected, ratio = 600:120 V

  – Motor System Voltage = 575 V

- **Phase CTs**

  The phase CTs should be chosen such that the FLC is 50% to 100% of CT primary. Since the FLC is 347.5A a 350:5, or 400:5 CT may be chosen; 400:5 is a standard available size and so would probably be selected.

- **Ground CT**

  For high resistive grounded systems, sensitive ground detection is possible with the 50:0.025 CT. Use a 1 A or 5 A secondary CT on solidly grounded or low resistive grounded systems where the fault current is much higher. If a residual connection is chosen, pickup levels and timers must be set with respect to the acceleration time. The chosen zero-sequence CT must be able to handle all potential fault levels without saturating. In this example, 50:5A CT is selected.

- **Motor FLC**

  Set the motor full load current to 348 A, as specified by the data sheets.

  Use the above data to set the relay system parameters, such as CT and VT connections, VT secondary voltage, and CT and VT primary to secondary ratios.

1.4.3 Motor Protection

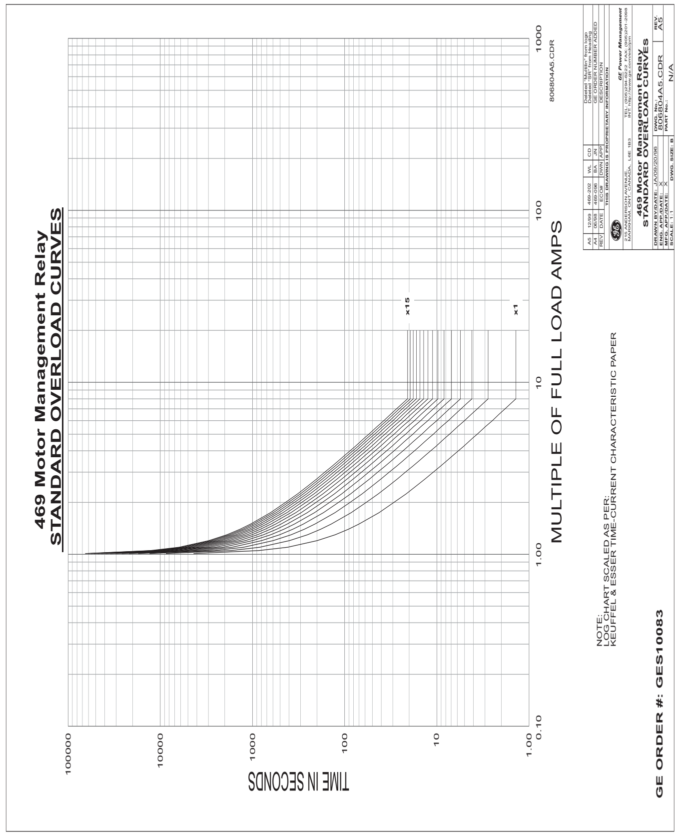
- **Overload Pickup**

  The overload pickup is set to the maximum allowed by the service factor of the motor. Since this motor has RTDs and the relay will be using the RTD bias feature for enhanced protection, set the overload pickup to the highest setting of 1.25 x FLC for the motor service factor of 1.15. If service factor is unknown, assume 1.0.

- **Overload Curve**

  Select the standard overload curve to be just below the cold thermal limit to give maximum process uptime, without compromising protection.

  The best fitting curve is curve 7 (see figure below)



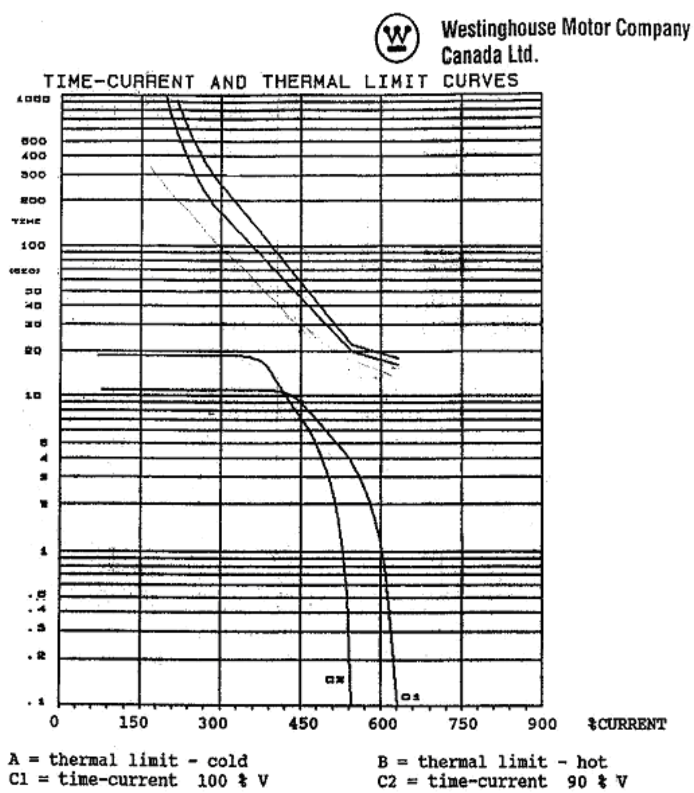


FIGURE 1–8: Overload Curve Matching (Example)

- **Short Circuit Trip**

  The short circuit trip should be set above the maximum locked rotor current but below the short circuit current of the fuses. The data sheets indicate a maximum locked rotor current of 630% FLC or 6.3 × FLC. A setting of 7 × FLC with a instantaneous time delay will be ideal but nuisance tripping may result due to the asymmetrical starting currents and DC offset. If asymmetrical starting currents limits the starting capability, set the S/C level higher to a maximum of 11 × FLC to override this condition (1.7 × 6.3 = 11.7 where 1.7 is the maximum DC offset for an asymmetrical current).

- **Ground Fault**

  Unfortunately, there is not enough information to determine a ground fault setting. These settings depend on the following information:

  1. The ground fault current available.
  2. System grounding; for example, high resistive grounding or solidly grounded
  3. Ground fault CT used.
  4. Ground fault connection; for example, zero-sequence or residual connection

  For the purpose of this example, assume a fault current of 10 Amps or 10/50 = 0.2 × CT, no intentional time delay.

- **Unbalance Alarm and Trip**

  The unbalance settings are determined by examining the motor application and motor design. The heating effect of unbalance will be protected by enabling unbalance input to thermal memory; described in details in Chapter 5, Thermal Model. A setting of 10% for the unbalance alarm with a delay of 10 seconds would be appropriate and the trip can be set to 25% with a delay of 5 seconds.

- **Stopped and Running Cool Times**

  The motor manufacturer usually supplies this information as either cooling times, or cooling time constants not provided in the data sheet issued with this motor. Since RTDs are present and wired to the relay, biasing of the thermal model will be used so it is not critical to have these cooling times from the manufacturer. The default values of motor cooling time constants are 15 and 30 minutes, and can be used for the running and stopped cool times respectively. If the manufacturer provides cooling times instead, the approximate values of the cooling time constants is 1/5th the cooling times provided by the manufacturer.

- **Acceleration Trip**

  This settings should be set higher than the maximum starting time to avoid nuisance tripping when the voltage is lower or for varying loads during acceleration. If reduced voltage starting is used, according to the acceleration curves, a setting of 18 seconds would be appropriate, or if across the line starting is used, a setting of 13 seconds would be appropriate.

- **Enable Start Inhibit**

  This function will limit starts when the motor is already hot. The relay learns the amount of thermal capacity used at start. If the motor is hot, thus having some thermal capacity used, the relay will not allow a start if the available thermal capacity is less than the required thermal capacity for a start.

- **Starts/Hour**

  When available, set starts/Hour to the number of cold starts as per the data sheet.

- **Time Between Starts**

  In some cases, the motor manufacturer will specify the time between motor starts. This information is not given so this feature can be left disabled. If the information is available, the time provided on the motor data sheets should be programmed.

- **Stator RTDs**

  Set the RTD trip level at or below the maximum temperature rating of the insulation. The data available shows class F insulation (temperature rating of 155°C), therefore the Stator RTD Trip level should be set to between 140°C to 155°C, with 155°C being maximum. The RTD alarm level should be set to provide a warning that the motor temperature is rising. For this example, 135°C would be appropriate since this motor is designed for class B rise, 130°C is it's normal hot operating temperature.

- **Bearing RTDs**

  The Bearing RTD alarm and trip settings will be determined by evaluating the temperature specification from the bearing manufacturer.

- **Unbalance bias of thermal capacity**

  Enable the Unbalance Bias of Thermal Capacity so that the heating effect of unbalance currents is added to the Thermal Capacity Used.

- **Unbalance bias *K* factor**

  The *K* value is used to calculate the contribution of the negative-sequence current flowing in the rotor due to unbalance. It is defined as:

$$K = \frac{R_{r2}}{R_{r1}} \qquad \textbf{(EQ 1.1)}$$

where: R_{r2} = rotor negative-sequence resistance
R_{r1} = rotor positive-sequence resistance.

A formula based on empirical data states that *K* is equal to 230 divided by the per-unit locked rotor current squared.

From the data sheet, the locked rotor amps = 631% FLA or 6.31 × FLA. Therefore,

$$K = \frac{230}{(\text{per-unit locked rotor amps})^2} = \frac{230}{6.31^2} \approx 6 \qquad \textbf{(EQ 1.2)}$$

- **Hot/cold curve ratio**

  The hot/cold curve ratio is calculated by simply dividing the hot safe stall time by the cold safe stall time or use the motor thermal limits curve. For this example, both are available. Using the data sheets the, safe stall time H/C or hot/cold curve ratio is given as 16/18 = 0.89

- **Enable RTD Biasing**

  This will enable the temperature from the Stator RTD sensors, to be included in the calculations of thermal capacity. This model determines the thermal capacity used based on the temperature of the Stator and is separate from the overload model for calculating thermal capacity used.

RTD biasing is a back up protection element, which accounts for such things as loss of cooling or unusually high ambient temperature. This measured temperature is used to bias or modify the thermal capacity value stored in the relay.

RTD BIAS MINIMUM: Set to 40°C, which is the ambient temperature, obtained from the data sheets.

RTD BIAS MID POINT: The center point temperature is set to the motor's hot running temperature and is calculated as follows:

Temperature Rise of Stator + Ambient Temperature

The temperature rise of the stator is 80°C (class F rise by resistance) + 10% hot spot allowance, obtained from the data sheets. Therefore, the RTD Center point temperature is set to 90°C + 40°C or 130°C.

RTD BIAS MAXIMUM: This settings is set to the rating of the insulation or slightly less. A class F insulation is used in this motor which is rated at 155°C, so the setting should be “155”.

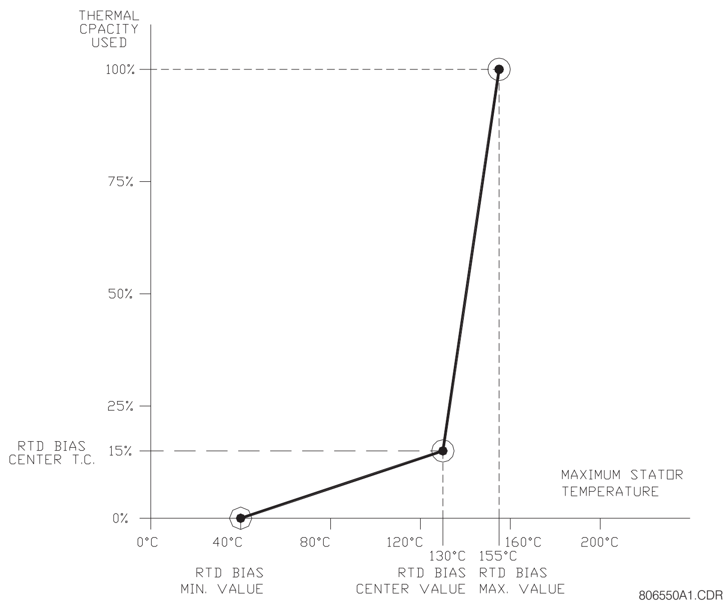


FIGURE 1–9: RTD Bias Example 1

You should now be familiar with maneuvering through and editing settings messages. As such, we will now limit our discussion to just the values that must be programmed to meet the requirements of the example application. Any settings not explicitly mentioned should be left at the factory default value.

1.4.4 S2 System Settings

The S2 settings page contains settings for entering the characteristics of the equipment on the motor electrical system. In our example, these characteristics are specified under the Power System Data and Instrument Transformer Data headings in the previous sub-section. From this information and the resulting calculations, program the page S2 settings as indicated.

For current transformers, make the following change in the **S2 SYSTEM SETUP ▷ CURRENT SENSING** settings page:

PHASE CT PRIMARY: “400 A”
MOTOR FULL LOAD AMPS FLA: “348 A”
GROUND CT: “5 A Secondary”
GROUND CT PRIMARY: “50 A”
PHASE DIFFERENTIAL CT: “None”
ENABLE 2-SPEED MOTOR PROTECTION: “No”

For current transformers, make the following change in the **S2 SYSTEM SETUP ▷▽ VOLTAGE SENSING** settings page:

VT CONNECTION TYPE: “Open Delta”
ENABLE SINGLE VT OPERATION: “Off”
VOLTAGE TRANSFORMER RATIO: “5 : 1”
(for a 600 V system, 600/120 V = 5, where 5 is the VT ratio)
MOTOR NAMEPLATE VOLTAGE: “575 V”

The 469 Motor Management Relay was designed with the ability to display primary system values. Current and voltage measurements are performed at secondary levels, which the relay transforms to primary values using CT and VT ratios, system voltage, as well as the nominal secondary values.

In the case of the phase CTs, configuring the relay for current measurements is simple and it only requires inputting the CT primary current. Phase CT inputs can be 1 A or 5 A, and they must be specified when the relay is purchased.

There is more flexibility with regards to Ground CT inputs, as well as VT inputs, where nominal values are not required ahead of time, before the relay is ordered; therefore more settings are needed to set the relay for measurements.

Make the following change in the **S2 SYSTEM SETUP ▷▽ POWER SYSTEM** settings page to reflect the power system:

NOMINAL SYSTEM FREQUENCY: “60 Hz”
SYSTEM PHASE SEQUENCE: “ABC”

The example calls for remote control via serial communications, received from the master station, through the RTU. Motor starting and stopping is possible via any of the three 469 communication ports.

When a start command is issued, the auxiliary relay assigned for starting control is activated for 1 second to complete the close coil circuit for a breaker application, or complete the start control circuit for a contactor application. A contactor sealing contact would be used to maintain the circuit. For details on issuing a start or stop command via communications, refer to the GE Publication GEK-106491: *469 Communications Guide*.

Make the following changes to the communications settings in the **S2 SYSTEM SETUP ▷▽ SERIAL COMM. CONTROL** page.

SERIAL COMMUNICATION CONTROL: “On”
ASSIGN START CONTROL RELAYS: “Auxiliary2”

The Auxiliary 2 relay will be used to start the motor. Note that this auxiliary relay can not be used for any other application.

Once the signal is received the motor will be started across the line. Therefore, the following settings are left with their default values. In the **S2 SYSTEM SETUP ▷▽ REDUCE VOLTAGE STARTING** settings page:

REDUCE VOLTAGE STARTING: "Off"
ASSIGN CONTROL RELAYS: "Auxiliary3" (available for other use)
TRANSITION ON: "Current Only"
ASSIGN TRIP RELAYS: "Trip"
REDUCE VOLTAGE START LEVEL: "100% FLA"
REDUCE VOLTAGE START TIMER: "200 s"

1.4.5 S3 Digital Inputs Settings

The S3 settings page is for entering the characteristics of the digital inputs. In our example, these characteristics are specified under the Control System Requirements heading. Program the S3 settings as indicated.

Some of the functions assigned to the digital inputs of the 469 Motor Management Relay are pre-defined functions, which can be selected from a list. There are four user-defined functions, called General Switch A to D, associated to the assignable inputs. Set these inputs to operate output relays, with or without delay, responding to the status change of dry contacts connected to the digital input terminals. Use the following procedure to set these functions:

▷ Change the default names to meaningful values so they can be easily identified, either via the LCD or when reviewing event reports.

▷ Identify their asserted logic.

▷ Define the functionality of the digital inputs.

All the other assignable input functions are pre-defined, and when selected, they can be set to generate Trip or Alarms, as well as energize auxiliary outputs as needed.

For breaker position monitoring, set the following pre-defined Digital Input called "Starter Status". As per the information provided above, a 52b contact will be used, and must be connected between terminals D16 to D23:

S3 DIGITAL INPUTS ▷▽ STARTER STATUS ▷ STARTER STATUS SW: "Starter Auxiliary b"

To set the relay to monitor access to the station, use Assignable Input 1 as "General Switch A", as follows. To define the digital input, enter the following data in the **S3 DIGITAL INPUTS ▷▽ ASSIGNABLE INPUT 1** settings page.

To identify the digital input:

INPUT 1 FUNCTION: "General Sw. A"
SWITCH NAME: "Stn. Monitor"

To define the asserted logic:

GENERAL SWITCH A: "Normally Open"

To define the functionality:

BLOCK INPUT FROM START: "0 s"
GENERAL SWITCH A ALARM: "Latched"
ASSIGN ALARM RELAYS: "Alarm"

GENERAL SWITCH A ALARM DELAY: "5.0 s"
GENERAL SWITCH A EVENTS: "On" so this event is registered.
GENERAL SWITCH A TRIP: "Off"

If the relay will not be used to trip the motor when someone gains unauthorized access to the station, the next settings should be left at their default values:

GENERAL SWITCH A TRIP: "Off"
ASSIGN TRIP RELAYS: "Trip"
GENERAL SWITCH A TRIM DELAY: "5.0 s"

1.4.6 S5 Thermal Model

The S5 Thermal Model settings page contains settings for entering settings related to protection of the motor during the starting process as well as during normal operation.

As per the information provided above, the settings for the Thermal Model are entered as follows in the

SELECT CURVE STYLE: "Standard"
OVERLOAD PICKUP: "1.25 x FLA"
ASSIGN TRIP RELAYS: "Trip"
UNBALANCE BIAS K FACTOR: "6"
COOL TIME CONSTANT RUNNING: "15 min."
COOL TIME CONSTANT STOPPED: "30 min."
HOT/COLD SAFE STALL RATIO: "0.89"
ENABLE RTD BIASING: "Yes"
RTD BIAS MINIMUM: "40°C" – ambient temperature
RTD BIAS CENTER POINT: "130°C" – center value
RTD BIAS MAXIMUM: "155°C" – maximum value
THERMAL CAPACITY ALARM: "Unlatched" – recommended for early warning to take corrective actions and prevent the interruption of the process.
ASSIGN ALARM RELAYS: "Alarm" – the Alarm contact could be use for local indication, or to send a local signal to reduce load, before a trip is issued.
THERMAL CAP. ALARM LEVEL: "80%"
THERMAL CAPACITY ALARM EVENT: "Yes" – captures event in the event report.

As well, select the overload curve for the Thermal model with the following settings in the **S5 THERMAL MODEL** ▷▽ **OVERLOAD CURVE SETUP** menu:

STANDARD OVERLOAD CURVE NUMBER: "7"

1.4.7 S6 Current Elements

The S6 Current Elements settings page contains settings for entering protection element characteristics. In our example, these characteristics are specified under Motor Protection heading.

From this data and the resulting calculations, program the S6 settings page as indicated. When setting the relay for the first time, other settings not listed in this example should be left disabled.

For the Short Circuit element, enter the following values in the **S6 CURRENT ELEMENTS ▷ SHORT CIRCUIT TRIP** page. Press the MESSAGE ▼ key after each settings is entered to move to the next message.

SHORT CIRCUIT TRIP: "Latched"
SHORT CIRCUIT TRIP OVEREACH FILETER: "Off" - no filtering of DC component is required (refer to *Short Circuit Trip* on page 5–60 for additional information)
ASSIGN TRIP RELAYS: "Trip"
SHORT CIRCUIT TRIP PICKUP: "11.7"
INTENTIONAL S/C TRIP DELAY: "0 ms" - Instantaneous trip is required.
SHORT CIRCUIT TRIP BACKUP: "On" - if the main disconnect device does not respond to the trip command, a second signal will be initiated via an auxiliary relay to generate a bus shot down; in most cases, the second trip command energizes a lock out relay (86) which is used to trip the upstream breakers
ASSIGN BACKUP RELAYS: "Auxiliary3"
SHORT CIRCUIT TRIP BACKUP DELAY: "200 ms" - this time must be greater than the total time required to trip the main breaker plus a margin

Since the specifications do not indicate values for the following features, they must be left "Off":

OVERLOAD ALARM: "Off"
MECHANICAL JAM: "Off"
UNDERCURRENT: "Off"
PHASE DIFFERENTIAL: "Off"

For the Ground Fault element, enter the following values in the **S6 CURRENT ELEMENTS ▷▽ GROUND FAULT** page. Press the MESSAGE ▼ key after each settings is entered to move to the next message.

GROUND FAULT OVERREACH FILETER: "Off" – no filtering of DC component is required (refer to *Ground Fault* on page 5–65 for additional information)
GROUND FAULT ALARM: "Off" – default setting, no Alarm is required
ASSIGN ALARM RELAYS: "Alarm" – default setting
GROUND FAULT ALARM PICKUP: "0.10 × CT" – default setting
INTENTIONAL GF ALARM DELAY: "0 ms" – default setting
GROUND FAULT ALARM EVENTS: "Off" – default setting
GROUND FAULT TRIP: "Latched" – the output relay will remind energized until the Reset command executed
ASSIGN TRIP RELAYS: "Trip"
GROUND FAULT TRIP PICKUP: "0.20 × CT"
INTENTIONAL GF TRIP DELAY: "0 ms"
GROUND FAULT TRIP BACKUP: "On"
ASSIGN BACKUP RELAYS: "Auxiliary3" - same relay assigned for the Short Circuit Trip Backup
GROUND FAULT TRIP BACKUP DELAY: "200 ms" - same time delay assigned to the Short Circuit Trip Backup

For the Current Unbalance element, enter the following values in the **S6 CURRENT ELEMENTS ▷▽ CURRENT UNBALANCE** page. Press the MESSAGE ▼ key after each settings is entered to move to the next message.

CURRENT UNBALANCE ALARM: "Unlatched"
ASSIGN ALARM RELAYS: "Alarm"
CURRENT UNBALANCE ALARM PICKUP: "10%"
CURRENT UNBALANCE ALARM DELAY: "10 s"
CURRENT UNBALANCE ALARM EVENTS: "On"
CURRENT UNBALANCE TRIP: "Latched" – the output relay will remind energized until the Reset command executed
ASSIGN TRIP RELAYS: "Trip"
CURRENT UNBALANCE TRIP PICKUP: "20%"
CURRENT UNBALANCE TRIP DELAY: "5 s"

1.4.8 S7 Motor Starting

The S7 Motor Starting settings page contains additional settings used to complement the Thermal Model. In our example, these characteristics are specified under Motor Protection heading.

For the Acceleration Timer element, enter the following values in the **S7 MOTOR STARTING ▷ ACCELERATION TIMER** page. Press the MESSAGE ▼ key after each settings is completed to move to the next message.

ACCELERATION TIMER TRIP: "Latched"
ASSIGN TRIP RELAYS: "Trip"
ACCELERATION TIMER FROM START: "13 s" – as shown in the acceleration curves at 100% voltage

For the Start Inhibit element, enter the following values in the **S7 MOTOR STARTING ▷▽ START INHIBIT** page. Press the MESSAGE ▼ key after each settings is completed to move to the next message.

START INHIBIT BLOCK: "On"
TC USED MARGIN: "25%"

With these settings, the 469 relay prevents motor starting if there is insufficient thermal capacity for a successful motor start. Refer to *Start Inhibit* on page 5–68 for additional information.

There is not information available to set Starts/Hour, Time Between Starts, or the Restart Block features. Therefore, the following settings must be disabled:

JOGGING BLOCK: "Off"
RESTART BLOCK: "Off"

1.4.9 S8 RTD Temperature

The S8 RTD Temperature page contains the settings for the twelve (12) field programmable RTDs that are normally used for temperature monitoring. The temperature measured by each RTD can be compared to pickup values, and set to energize Trip or Alarm outputs.

For proper temperature monitoring, enter the RTD types in the **S8 RTD TEMPERTURE ▷ RTD TYPES** page. Press the MESSAGE ▼ key after each settings is completed to move to the next message.

STATOR RTD TYPE: “100 Ohm Platinum”
BEARING RTD TYPE: “100 Ohm Platinum”
AMBIENT RTD TYPE: “100 Ohm Platinum”
OTHER RTD TYPE: “100 Ohm Platinum” – default value

As per the information provided above, there will be six RTDs, two per phase located in the Stator, and two Bearing RTDs, one to monitor the ambient temperature.

For Stator Overtemperature protection, enter the following settings in the **S8 RTD TEMPERTURE** ▷▽ **RTD 1** to **RTD6** menus:

RTD #1 APPLICATION: “Stator”
RTD #1 NAME: “ST Ph A1”
RTD #1 ALARM: “Unlatched”
ASSIGN ALARM RELAYS: “Alarm”
RTD #1 ALARM TEMPERATURE: “135°C”
RTD #1 HIGH ALARM: “Off”
HIGH ALARM RELAYS: “Alarm” - default value
RTD #1 HIGH ALARM TEMPERATURE: “135°C” - default value
RTD #1 ALARM EVENTS: “On”
RTD #1 TRIP: “Latched”
RTD #1 TRIP VOTING: “RTD #5”
ASSIGN TRIP RELAYS: “Trip”
RTD #1 TRIP TEMPERATURE: “155°C”

The settings for the other RTDs are entered in similar fashion. Refer to *S8 RTD Temperature* on page 5–72 for additional settings and additional information on RTD monitoring.

1.4.10 Other Settings

Undervoltage Protection

In addition to the settings illustrated above, there will be cases in motor applications where additional settings will be required, to monitor other system parameters such as voltage levels.

The following sub-section will illustrate the procedures to set the 469 Motor Management Relay to meet those requirements.

Description

Using the same system information, the following example illustrates the steps to set the 469 for Undervoltage protection.

The following settings are provided:

Pickup: 70% of nominal voltage – starting
80% of nominal voltage – running

Time Delay: 13.0 s

Other Considerations

- The function will be active only if there is voltage in the line feeding the motor, to avoid nuisance trips due to the lack of voltage. The 469 will consider the bus energized only if the measured voltage is greater than 20% of nominal voltage. A trip condition will be initiated only if undervoltage is detected in all the phases.

- In order to monitor for VT Fuse Failure or to monitor for undervoltage in one phase only, set an Alarm when the voltage is 90% of nominal voltage both during start and running.

For the Undervoltage element, enter the following values in the **S9 VOLTAGE ELEMENTS** ▷▽ **UNDERVOLTAGE** settings page. Press the ENTER key to save, and then the MESSAGE ▼ key, after each settings is completed, to move to the next message:

U/V ACTIVE ONLY IF BUS ENERGIZED: "Yes"
UNDERVOLTAGE ALARM: "Unlatched"
ASSIGN ALARM RELAYS: "Alarm"
UNDERVOLTAGE ALARM PICKUP: "0.9 × RATED"
STARTING U/V ALARM PICKUP: "0.9 × RATED"
UNDERVOLTAGE ALARM DELAY: "0.0 s"
UNDERVOLTAGE ALARM EVENTS: "Yes"
UNDERVOLTAGE TRIP: "Latched"
UNDRVOLTAGE TRIP MODE: "3-Phase"
ASSIGN TRIP RELAYS: "Trip"
UNDERVOLTAGE TRIP PICKUP: "0.8 × RATED"
STARTING U/V TRIP PICKUP: "0.7 × RATED"
UNDERVOLTAGE TRIP DELAY: "13.0 s"

1.5 Installation

1.5.1 Testing

Extensive commissioning tests are available in Chapter 7. Tables for recording required settings are available in Microsoft Excel format from the GE Grid Solutions website at http://www.gegridsolutions.com/. The website also contains additional technical papers and FAQs relevant to the 469 Motor Management Relay.

GE
Grid Solutions

469 Motor Management Relay

Chapter 2: Introduction

2.1 Overview

2.1.1 Description

The 469 Motor Management Relay is a microprocessor based relay designed for the protection and management of medium and large horsepower motors and driven equipment. The 469 is equipped with six (6) output relays for trips, alarms, and start blocks. Motor protection, fault diagnostics, power metering, and RTU functions are integrated into one economical drawout package. The single-line diagram below illustrates the 469 functionality using ANSI (American National Standards Institute) device numbers

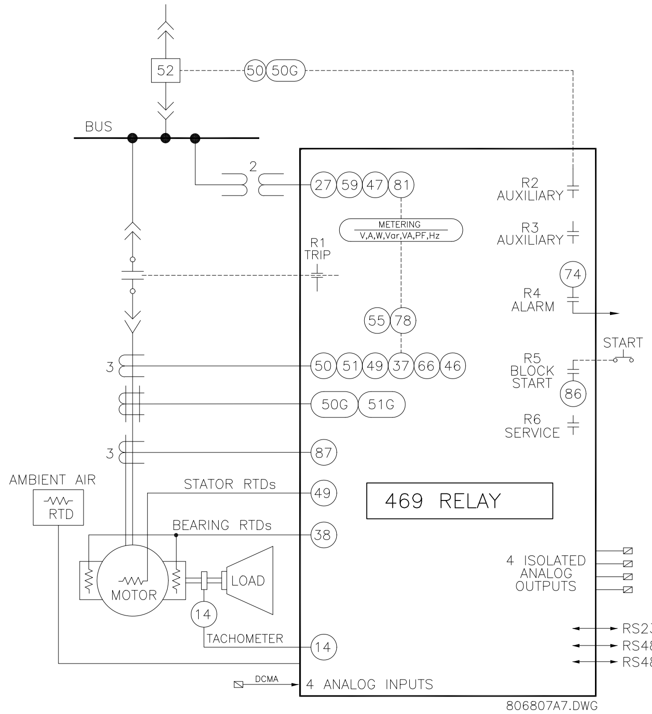


FIGURE 2–1: Single Line Diagram

Typical applications include: pumps, fans, compressors, mills, shredders, extruders, debarkers, refiners, cranes, conveyors, chillers, crushers, and blowers.

Some of the protection highlights are detailed here; a complete list is shown below. Four assignable digital inputs may be configured for a number of different features including tachometer or generic trip and alarm with a programmable name. The thermal model incorporates unbalance biasing, RTD feedback, and exponential cooling. In addition to the 15 standard overload curves, there is a custom curve feature and a curve specifically designed for the starting of high inertia loads, when the acceleration time exceeds the safe stall time. A second overload curve is provided for two-speed motors. Ground faults or earth leakage as low as 0.25 A may be detected using the GE Grid Solutions 50:0.025 Ground CT. CT inputs for phase differential protection are also provided. The 12 RTD inputs provided may be individually field programmed for different RTD types. Voltage transformer inputs allow for numerous protection features based on voltage and power quantities. Four 4 to 20 mA analog inputs may be used for tripping and alarming on any transducer input such as vibration, pressure, flow, etc.

ANSI		Trip	Alarm	Block Start	Control
51	Overload	●	●	●	●
86	Overload Lockout			●	
66	Starts/Hour & Time Between Starts			●	
	Restart Block (Anti-Backspin Timer)			●	
50	Short Circuit & Short Circuit Backup	●		●	
	Mechanical Jam	●		●	●
32	Reverse Power	●	●	●	
37	Undercurrent/Underpower	●	●	●	
46	Current Unbalance	●	●	●	
50G/51G	Ground Fault & Ground Fault Backup	●	●	●	
87	Differential	●		●	
	Acceleration	●		●	
49	Stator RTD	●	●	●	
38	Bearing RTD	●	●	●	
	Other RTD & Ambient RTD	●	●	●	
	Open RTD Alarm		●		
	Short/Low RTD		●		
27/59	Undervoltage/Overvoltage	●	●	●	
47	Phase Reversal	●		●	
81	Frequency	●	●	●	
	Reactive Power	●	●	●	●
55/78	Power Factor	●	●	●	●
	Analog Input	●	●	●	
	Demand Alarm: A kW kvar kVA		●		●
	SR469 Self-Test, Service		●		
	Trip Coil Supervision		●		
	Welded Contactor		●		
	Breaker Failure		●		
	Remote Switch	●	●	●	
14	Speed Switch & Tachometer Trip	●	●	●	
	Load Shed Switch	●		●	
	Pressure Switch	●	●	●	
	Vibration Switch	●	●	●	
19	Reduced Voltage Start				●
48	Incomplete Sequence (Reduced Voltage Start)	●		●	●
	Remote Start/Stop				●
	Over Torque		●		
	Forced Relay Operation				●

PROCTLA5.CDR

FIGURE 2–2: Protection Features

Fault diagnostics are provided through pretrip data, event record, trace memory, and statistics. Prior to issuing a trip, the 469 takes a snapshot of the measured parameters and stores them with the cause of the trip. This pre-trip data may be viewed using the MENU key, viewing the **TARGET MESSAGES** before the trip is reset, or by accessing the **A1 STATUS ▷▽ LAST TRIP DATA** actual values. The 469 event recorder stores up to 256 time and date stamped events including the pre-trip data. Each time a trip occurs, the 469 stores a trace of 8 cycles pre-trip and 8 cycles post-trip for all measured AC quantities. Trip counters record the number of occurrences of each type of trip. Minimum and maximum values for analog inputs, along with maximum values for RTDs, are also recorded. These features enable the operator to pinpoint a problem quickly and with certainty.

Power metering included with the 469 as a standard feature. The table below outlines the metered parameters available either through the front panel or communications ports.

The 469 is equipped with 3 fully functional and independent communications ports. The front panel RS232 port may be used for 469 settings programming, local interrogation or control, and upgrading of 469 firmware. The Computer RS485 port may be connected to a PLC, DCS, or PC based user interface program. The Auxiliary RS485 port may be used for redundancy or simultaneous interrogation and/or control from a second PLC, DCS, or PC software.

There are also four 4 to 20 mA or 0 to 1 mA (as specified with order) transducer outputs that may be assigned to any measured parameter. The range of these outputs is scalable. Additional features are outlined below.

METERING:

- Voltage
- Current and amps demand
- Real power, kW demand, kW power consumption
- Apparent power and kVA demand
- Reactive power, kvar demand, kvar consumption/generation
- Frequency
- Power factor
- RTD
- Speed in RPM with a key phasor input
- User-programmable analog inputs.

ADDITIONAL FEATURES:

- Drawout case (for ease of maintenance/testing)
- Reduced voltage starting control for single transition
- Trip coil supervision
- Flash memory for easy firmware updates

2.1.2 Ordering Information

All 469 features are standard; there are no options. The phase CT secondaries, control power, and analog output range must be specified at the time of order. The 469 differential CT inputs are field programmable for CTs with 1 A or 5 A secondaries. There are two ground CT inputs, one for the GE Grid Solutions 50:0.025 core balance CT and one for a ground CT with a 1 A or 5 A secondary, also field programmable. The VT inputs will accommodate VTs in either a delta or wye configuration. The output relays are always non-failsafe with the exception of the service relay. The EnerVista 469 Setup software is provided with each unit. A metal demo case may be ordered for demonstration or testing purposes.

2.1.3 Order Codes

Table 2–1: 469 Order Codes

	469 –	* –	* –	* –	* –	*	
Base Unit	469						469 Motor Management Relay
Phase Current Inputs		P1					1 A phase CT secondaries
		P5					5 A phase CT secondaries
Control Power			LO				20 to 60 V DC; 20 to 48 V AC at 48 to 62 Hz
			HI				90 to 300 V DC; 70 to 265 V AC at 48 to 62 Hz
Analog Outputs				A1			Four (4) 0 to 1 mA analog outputs
				A20			Four (4) 4 to 20 mA analog outputs
Display							Discontinued: Basic display
					E		Enhanced display, larger LCD
					T		Enhanced with Ethernet (10Base-T)
					D		Enhanced display with DeviceNet
Harsh Environment						H	Harsh (chemical) environment conformal coating

2.1.4 Example Order Codes

1. The 469-P1-LO-A20-E code specifies a 469 Motor Management Relay with 1 A CT inputs, 20 to 60 V DC or 20 to 48 V AC control voltage, 4 to 20 mA analog outputs, and enhanced display option with larger LCD.
2. The 469-P5-HI-A1-T-H code specifies a 469 Motor Management Relay with 5 A CT inputs, 90 to 300 V DC or 70 to 265 V AC control voltage, 0 to 1 mA analog outputs, enhanced display with Ethernet (10Base-T) communications, and a harsh environment conformal coating.

2.1.5 Accessories

The following accessories are available for the 469 Motor Management Relay:

- **EnerVista 469 Setup software:** No-charge software provided with each relay
- **Demo:** Metal Carry Case in which 469 unit may be mounted
- **SR 19-1 Panel:** Single cutout 19-inch panel
- **SR 19-2 Panel:** Dual cutout 19-inch panel
- **SCI Module:** RS232-to-RS485 converter box designed for harsh industrial environments
- **Phase CT:** 50, 75, 100, 150, 200, 250, 300, 350, 400, 500, 600, 750, 1000
- **HGF3, HGF5, HGF8:** For sensitive ground detection on high resistance grounded systems.
- **469 1-inch Collar:** For shallow switchgear, reduces the depth of the relay by 1 3/8 inches
- **469 3-inch Collar:** For shallow switchgear, reduces the depth of the relay by 3 inches
- **Optional Mounting Kit:** Additional mounting support 1819-0030

2.2 Specifications

Specifications are subject to change without notice.

2.2.1 Inputs

ANALOG CURRENT INPUTS

Inputs: ....0 to 1 mA, 0 to 20mA, or 4 to 20 mA (settings)
Input impedance: ....226 Ω ±10%
Conversion range: ....0 to 21 mA
Accuracy:....................±1% of full scale
Type: ....passive
Analog in supply: ....+24 V DC at 100 mA max.
Response time: ....≤100 ms

DIFFERENTIAL CURRENT INPUTS

CT primary: ....1 to 5000A
CT secondary: ....1 A or 5 A (settings)
Burden: ....<0.2 VA at rated load
Conversion range: ....0.02 to 1 × CT primary
Nominal frequency: ....20 to 70 Hz
Frequency range: ....20 to 120 Hz
Accuracy:....................±0.5% of 1 × CT for 5 A
±0.5% of 5 × CT for 1 A
CT withstand: ....1 second at 80 × rated current,
2 seconds at 40 × rated current, continuous at 3 × rated current

DIGITAL INPUTS

Inputs: ....9 opto-isolated inputs
External switch: ....dry contact < 400 Ω, or open collector NPN transistor from sensor; 6 mA sinking from internal 4 KΩ pull-up at 24 V DC with Vce < 4 V DC
See *Digital Inputs* on page 2–11 for additional specifications.

GROUND CURRENT INPUTS

CT primary: ....1 to 5000 A
CT secondary: ....1 A or 5 A (settings)
Burden: ....<0.2 VA at rated load for 1 A or 5 A; <0.25 VA for 50:0.025 CTs
at 25 A
Conversion range: ....0.02 to 1 × CT primary
Nominal frequency: ....20 to 70 Hz
Frequency range: ....20 to 120 Hz
Accuracy:....................±0.5% of 1 × CT for 5 A CTs
±0.5% of 5 × CT for 1 A CTs
±0.125 A for 50:0.025 CTs
CT (1 A/5 A) withstand: ....1 second at 80 × rated current,
2 seconds at 40 × rated current, continuous at 3 × rated current
CT (50:0.025) withstand: ....continuous at 150 mA

PHASE CURRENT INPUTS

CT primary: ....1 to 5000 A

CT secondary: ....1 A or 5 A (specify with order)
Burden: ....Less than 0.2 VA at rated load
Conversion range: ....0.05 to 20 × CT
Nominal frequency: ....20 to 70 Hz
Frequency range: ....20 to 120 Hz
Accuracy: ....at < 2 × CT: ±0.5% of 2 × CT
at ≥ 2 × CT: ±1% of 20 × CT
CT withstand: ....1 second at 80 × rated current,
2 seconds at 40 × rated current, continuous at 3 × rated current

RTD INPUTS
3 wire RTD Types: ....100 Ω Platinum (DIN.43760), 100 Ω Nickel, 120 Ω Nickel, 10 Ω Copper
RTD sensing current: ....5 mA
Isolation: ....36 Vpk (isolated with analog inputs and outputs)
Range: ....–50 to +250°C
Accuracy: ....±2°C
Lead resistance: ....25 Ω Max per lead for Pt and Ni type; 3 Ω Max per lead for Cu type
No sensor: ....>1000 Ω
Short/low alarm: ....<–50°C

TRIP COIL SUPERVISION
Applicable voltage: ....20 to 300 V DC / V AC
Trickle current: ....2 to 5 mA

VOLTAGE INPUTS
VT ratio: ....1.00 to 300.00:1 in steps of 0.01
VT secondary: ....273 V AC (full-scale)
Conversion range: ....0.05 to 1.00 × full scale
Nominal frequency: ....20 to 70 Hz
Frequency range: ....20 to 120 Hz
Accuracy: ....±0.5% of full scale
Max. continuous: ....280 V AC
Burden: ....>500 kΩ
Sensor supply: ....+24 V DC at 20 mA max.

2.2.2 Outputs

ANALOG CURRENT OUTPUT
Type: ....Active
Range: ....4 to 20 mA, 0 to 1 mA
(must be specified with order)
Accuracy: ....±1% of full scale
Max. load: ....4 to 20 mA input: 1200 Ω
0 to 1 mA input: 10 kΩ
Isolation: ....36 V_{pk} (isolated with RTDs and analog inputs)
4 Assignable Outputs: ....phase A, B, and C current; three-phase average current; ground current; phase AN (AB), BN (BC), and CN (CA) voltages; three-phase average voltage; hottest stator RTD; hottest bearing RTD, hottest other RTD; RTDs 1 to 12;

power factor; 3-phase real (kW), apparent (kVA), and reactive (kvar) power; thermal capacity used; relay lockout time, current demand; kvar, kW, and kVA demand; motor load, torque

OUTPUT RELAYS

WARNING

Relay contacts are unsafe to touch when the 469 is energized! If the output relay contacts are required for low voltage accessible applications, it is the customer's responsibility to ensure proper insulation levels.

Configuration: ....6 Electromechanical Form C
Contact material: ....silver alloy
Operate time: ....10 ms
Make/carry: ....10 A continuous
30 A for 0.2 s

Max ratings for 100000 operations:

VOLTAGE		BREAK	MAX. LOAD
DC RESISTIVE	30 V	10 A	300 Ω
	125 V	0.5 A	62.5 Ω
	250 V	0.3 A	75 Ω
DC INDUCTIVE L/R=40ms	30 V	5 A	150 Ω
	125 V	0.25 A	31.3 Ω
	250 V	0.15 A	37.5 Ω
AC RESISTIVE	120 V	10 A	2770 VA
	250 V	10 A	2770 VA
AC INDUCTIVE P.F.=0.4	120 V	4 A	480 VA
	250 V	3 A	750 VA

2.2.3 Protection

ACCELERATION TIMER

Pickup: ....transition of no phase current to > overload pickup
Dropout: ....when current falls below overload pickup
Time delay: ....1.0 to 250.0 s in steps of 0.1
Timing accuracy: ....±100 ms or ±0.5% of total time (Note 1)
Elements: ....Trip

CURRENT UNBALANCE

Unbalance: ....I_2 / I_1 if I_{avg} > FLA
$I_2 / I_1 \times I_{avg}$ / FLA if I_{avg} < FLA
Range: ....0 to 100% UB in steps of 1
Pickup level: ....4 to 40% UB in steps of 1
Time delay: ....1 to 60 s in steps of 1
Pickup accuracy: ....±2%
Timing accuracy: ....±0.5 s or ± 0.5% of total time (Note 1)
Elements: ....Trip and Alarm

FREQUENCY

Req'd voltage: ....>30% of full scale in phase A
Overfrequency pickup: ....25.01 to 70.00 Hz in steps of 0.01
Underfrequency pickup: ....20.00 to 60.00 Hz in steps of 0.01
Accuracy: ....±0.02 Hz
Time delay: ....0.0 to 60.0 s in steps of 0.1

Timing accuracy: ....<100 ms or ±0.5% of total time
Elements:...Trip and Alarm

GROUND INSTANTANEOUS OVERCURRENT

Pickup level: ....0.1 to 1.0 × CT primary in steps of 0.01
Time delay:...0 to 1000 ms in steps of 10
Pickup accuracy: ....as per ground current input
Operate time (0 ms time delay): ....<25 ms @ 60 Hz (I > 1.5 x Pickup)*
<30 ms @ 50 Hz (I > 1.5 x Pickup)*
Timing accuracy: ....+50 ms
Elements:...Trip and Alarm

* Applies if Voltage phase A detected, Motor Status Running and frequency within 5% of nominal (<50ms if these conditions are not met).

JOGGING BLOCK

Starts/hour:...1 to 5 in steps of 1
Time between starts: ....0 to 500 min.
Timing accuracy: ....±0.5 s or ± 0.5% of total time
Elements:...Block

MECHANICAL JAM

Pickup level: ....1.01 to 3.00 × FLA in steps of 0.01 of any one phase, blocked on start
Time delay:...1 to 30 s in steps of 1
Pickup accuracy: ....as per phase current inputs
Timing accuracy: ....±0.5 s (Note 1)
Elements:...Trip

OVERLOAD / STALL PROTECTION / THERMAL MODEL

Overload curves: ....15 standard overload curves, custom curve, voltage dependent custom curve for high inertia starting (all curves time out against average phase current)
Biasing:...Phase unbalance
Hot/cold curve ratio
Stator RTD
Running cool rate
Stopped cool Rate
Line voltage
Overload pickup: ....1.01 to 1.25 (for service factor)
Pickup accuracy: ....as per phase current Inputs
Timing accuracy: ....±100 ms or ±2% of total time (Note 1)
Elements:...Trip and Alarm

OVERVOLTAGE

Pickup level: ....1.01 to 1.10 × rated in steps of 0.01 of any one phase
Time delay:...0.1 to 60.0 s in steps of 0.1
Pickup accuracy: ....as per voltage inputs
Timing accuracy: ....±100 ms or ±0.5% of total time
Elements:...Trip and Alarm

PHASE DIFFERENTIAL INSTANTANEOUS OVERCURRENT

Pickup level: .... 0.05 to 1.0 × CT primary in steps of 0.01 of any one phase
Time delay: .... 0 to 1000 ms in steps of 10
Pickup accuracy: .... as per phase differential current inputs
Timing accuracy: .... +50 ms
Elements: .... Trip

PHASE SHORT CIRCUIT

Pickup level: .... 2.0 to 20.0 × CT primary in steps of 0.1 of any one phase
Time delay: .... 0 to 1000 ms in steps of 10
Pickup accuracy: .... as per phase current inputs
Operate time (0 ms time delay): .... <25 ms @ 60 Hz (I > 1.5 x Pickup)*
<30 ms @ 50 Hz (I > 1.5 x Pickup)*
Timing accuracy: .... +50 ms
Elements: .... Trip

* Applies if Voltage phase A detected, Motor Status Running and frequency within 5% of nominal (<50ms if these conditions are not met).

REDUCED VOLTAGE START

Transition level: .... 25 to 300% FLA in steps of 1
Transition time: .... 1 to 600 s in steps of 1
Transition control: .... Current, Timer, Current and Timer

RESTART BLOCK

Time delay: .... 1 to 50000 s in steps of 1
Timing accuracy: .... ±0.5 s or ±0.5% of total time
Elements: .... Block

RTD

Pickup: .... 1 to 250°C in steps of 1
Pickup hysteresis: .... 2°C
Time delay: .... 4 s
Elements: .... Trip and Alarm

UNDERCURRENT

Pickup level: .... 0.10 to 0.95 × CT primary in steps of 0.01 of any one phase
Time delay: .... 1 to 60 s in steps of 1
Block from start: .... 0 to 15000 s in steps of 1
Pickup accuracy: .... as per phase current inputs
Timing accuracy: .... ±0.5 s or ±0.5% of total time (Note 1)
Elements: .... Trip and Alarm

UNDERVOLTAGE

Pickup Level:
Motor starting: .... 0.60 to 0.99 × Rated in steps of 0.01
Motor running: .... 0.60 to 0.99 × Rated in steps of 0.01 of any one phase
Time delay: .... 0.1 to 60.0 s in steps of 0.1
Pickup accuracy: .... as per voltage inputs
Timing accuracy: .... <100 ms or ±0.5% of total time
Elements: .... Trip and Alarm

VOLTAGE PHASE REVERSAL

Configuration: ....ABC or ACB phase rotation
Timing Accuracy: ....500 to 700 ms
Elements:...Trip

NOTE 1

NOTE

For Timing accuracy specifications marked (Note 1), setpoint "Motor Load Filter Interval" may increase trip/alarm times. When setpoint is greater than 1 cycle, trip/alarm times increase 16.7 ms for each additional cycle in the filter interval.

2.2.4 Digital Inputs

DIGITAL COUNTER

Configuration: ....assign to digital inputs 1 to 4
Frequency:..≤50 times a second
Range:...0 to 1 000 000 000
Elements:...Alarm

GENERAL PURPOSE SWITCH

Configuration: ....assign to digital inputs 1 to 4
Time delay:...0.1 to 5000.0 s in steps of 0.1
Block from start: ....0 to 5000 s in steps of 1
Timing accuracy: ....±250 ms or ±0.5% of total time
Elements:...Trip and Alarm

LOAD SHED

Configuration: ....assign to digital inputs 1 to 4
Timing accuracy: ....100 ms maximum
Elements:...Trip

PRESSURE SWITCH

Configuration: ....assign to digital inputs 1 to 4
Time delay:...0.1 to 100.0 s in steps of 0.1
Block from start: ....0 to 5000 s in steps of 1
Timing accuracy: ....±250 ms or ±0.5% of total time
Elements:...Trip and Alarm

REMOTE SWITCH

Configuration: ....assign to digital inputs1 to 4
Timing accuracy: ....100 ms maximum
Elements:...Trip and Alarm

SPEED SWITCH

Configuration: ....assign to digital inputs1 to 4
Time delay:...1.0 to 250.0 s in steps of 0.1
Timing accuracy: ....250 ms maximum
Elements:...Trip

TACHOMETER

Configuration: ....assign to digital inputs 1 to 4
Range:...100 to 7200 RPM
Pulse duty cycle: ....>10%
Elements:...Trip and Alarm

VIBRATION SWITCH

Configuration: ....assign to digital inputs 1 to 4
Time delay:..0.1 to 100.0 s in steps of 0.1
Timing accuracy: ....±250 ms or ±0.5% of total time
Elements:..Trip and Alarm

2.2.5 Monitoring

DEMAND

Metering: ....maximum phase current
three-phase real power
three-phase apparent power
three-phase reactive power
Measurement type: ....rolling demand
Demand interval: ....5 to 90 min. in steps of 1
Update rate:..1 minute
Elements:..Alarm

METERED REACTIVE ENERGY CONSUMPTION

Description: ....Continuous total reactive energy consumption
Range:..0 to 999999.999 Mvar·hours
Timing accuracy: ....±0.5%
Update rate:..5 seconds

METERED REACTIVE ENERGY GENERATION

Description: ....Continuous total reactive energy generation
Range:..0 to 2000000.000 Mvar·hours
Timing accuracy: ....±0.5%
Update Rate:..5 seconds

METERED REAL ENERGY CONSUMPTION

Description: ....Continuous total real energy consumption
Range:..0 to 999999.999 MW·hours
Timing accuracy: ....±0.5%
Update rate:..5 seconds

MOTOR STATUS

Description: ....Event record of motor start
Timing Accuracy:...+250 ms

OVERTORQUE

Pickup level:...0.1 to 999999.9 Nm/ft·lb in steps of 0.1; torque unit is selectable under torque setup
Time delay:..0.2 to 30.0 s in steps of 0.1
Pickup accuracy: ....±2.0%
Time accuracy:...±100 ms or 0.5% of total time
Elements:..Alarm (induction motors only)

POWER FACTOR

Range:..0.01 lead or lag to 1.00
Pickup level:...0.99 to 0.05 in steps of 0.01, lead and lag
Time delay:..0.2 to 30.0 s in steps of 0.1
Block from start: ....0 to 5000 s in steps of 1
Pickup accuracy: ....±0.02
Timing accuracy: ....±100 ms or ±0.5% of total time (Note 1)
Elements:..Trip and Alarm

THREE-PHASE APPARENT POWER

Range:...0 to 65535 kVA
Accuracy: ....$I_{avg} < 2 \times CT$: ±1% of $\sqrt{3} \times 2 \times CT \times VT \times VT_{full\ scale}$
$I_{avg} > 2 \times CT$: ±1.5% of $\sqrt{3} \times 20 \times CT \times VT \times VT_{full\ scale}$
Elements:..Trip and Alarm

THREE-PHASE REACTIVE POWER

Range:...0 to ±99999 kvar
Pickup level: ....±1 to 25000 kvar in steps of 1
Time delay:..0.2 to 30.0 s in steps of 0.1
Block from start: ....0 to 5000 s in steps of 1
Pickup accuracy: ....at $I_{avg} < 2 \times CT$: ±1% of $\sqrt{3} \times 2 \times CT \times VT \times VT_{full\ scale}$
at $I_{avg} > 2 \times CT$: ±1.5% of $\sqrt{3} \times 20 \times CT \times VT \times VT_{full\ scale}$
Timing accuracy: ....±100ms or ± 0.5% of total time (Note 1)
Elements:..Trip and Alarm

THREE-PHASE REAL POWER

Range:...0 to ±99999 kW
Pickup: ....1 to 25000 kW in steps of 1
Time delay:..1 to 30 s in steps of 1
Block from start: ....0 to 15000 s in steps of 1
Pickup Accuracy: ....at $I_{avg} < 2 \times CT$:±1% of $\sqrt{3} \times 2 \times CT \times VT \times VT_{full\ scale}$
at $I_{avg} > 2 \times CT$±1.5% of $\sqrt{3} \times 20 \times CT \times VT \times VT_{full\ scale}$
Timing accuracy: ....±0.5 s or ±0.5% of total time (Note 1)

NOTE 1

For Timing accuracy specifications marked (Note 1), setpoint "Motor Load Filter Interval" may increase trip/alarm times. When setpoint is greater than 1 cycle, trip/alarm times increase 16.7 ms for each additional cycle in the filter interval.

2.2.6 Power Supply

CONTROL POWER

Options:...LO / HI (must be specified with order)
LO range:...20 to 60 V DC
20 to 48 V AC at 48 to 62 Hz
HI range:..90 to 300 V DC
70 to 265 V AC at 48 to 62 Hz
Power:...45 VA (max), 25 VA typical
Total loss of voltage ride through time
(0% control power): 16.7 ms

FUSE (HI and LO VOLT)

Current rating: ....2.50 A
Type: ....5 × 20 mm SLO-BLO HRC Littelfuse, high breaking capacity
Model no.:..215-02.5

An external fuse must be used if the supply voltage exceeds 250 V.

2.2.7 CPU

COMMUNICATIONS
RS232 port: .... 1, front panel, non-isolated
RS485 ports: .... 2, isolated together at 36 V_{pk}
Baud rates: .... 300, 1200, 2400, 4800, 9600, and 19200 (for RS485); 9600 (for RS232)
Parity: .... None, Odd, Even
Ethernet: .... 10Base-T RJ45 connector
Modbus TCP/IP
Version 2.0 / IEEE 802.3

MODBUS
Modbus: .... Modbus® RTU / half-duplex

DEVICENET
Baud rate: 125K, 250K, 500K
MAC ID: .... 0 to 63 range
Connection type: .... Explicit Messages, Poll I/O, Change Of State
ODVA certified

CLOCK
Accuracy: .... ±5 minutes/month
Supercap backup life: .... 45 days when control power is off

2.2.8 Waveform Capture (Trace Memory)

SAMPLING FREQUENCY
Frequency: .... 720 samples per second for 60 Hertz system
600 samples per second for 50 Hertz system

ANALOG WAVEFORMS
Analog Waveforms: .... Phase currents Ia, Ib, Ic
Phase differential currents Ia Diff., Ib Diff., Ic Diff.
Ground Current
Phase voltages Van(Vab), Vbn, Vcn(Vcb)

DIGITAL WAVEFORMS
Digital Waveforms: .... TRIP RELAY
AUX RELAY 2
AUX RELAY 3
ALARM RELAY
BLOCK START RELAY
SELF TEST RELAY

2.2.9 Testing

TYPE TESTING
The table below lists the 469 type tests:

Standard	Test Name	Level
EIA 485	RS485 Communications Test	32 units at 4000 ft.
GE Digital Energy	Temperature Cycling	–50°C / +80°C

Standard	Test Name	Level
IEC 60068-2-38	Composite Temperature/Humidity	65/–10°C at 93% RH
IEC 60255-5	Dielectric Strength	2300 V AC
IEC 60255-5	Impulse Voltage	5 kV
IEC 60255-5	Insulation Resistance	>100 MΩ / 500 V AC / 10 s
IEC 60255-21-1	Sinusoidal Vibration	2 g
IEC 60255-22-1	Damped Oscillatory Burst, 1 MHz	2.5 kV / 1 kV
IEC 60255-22-2	Electrostatic Discharge: Direct	8 kV
IEC 60255-22-3	Radiated RF Immunity	10 V/m
IEC 60255-22-4	Electrical Fast Transient / Burst Immunity	4 kV
IEC 60255-22-5	Surge Immunity	4 kV / 2 kV
IEC 60255-22-6	Conducted RF Immunity, 150 kHz to 80 MHz	10 V/m
IEC 60255-25	Radiated RF Emission	Group 1 Class A
IEC 60255-25	Conducted RF Emission	Group 1 Class A
IEC 60529	Ingress of Solid Objects and Water (IP)	IP40 (front), IP20 (back)
IEC 61000-4-11	Voltage Dip; Voltage Interruption	0%, 40%, 100%
IEEE C37.90.1	Fast Transient SWC	±4 kV
IEEE C37.90.1	Oscillatory Transient SWC	±2.5 kV
IEEE C37.90.3	Electrostatic Discharge: Air and Direct	15 kV / 8 kV

PRODUCTION TESTS

Thermal cycling: ....Operational test at ambient, reducing to –40°C and then increasing to 60°C

Dielectric strength: ....(order code 'LO') 550 VAC for 1 second
(order code 'HI') 2200 VAC for 1 second

⚠WARNING

DO NOT CONNECT FILTER GROUND TO SAFETY GROUND DURING ANY PRODUCTION TESTS!

2.2.10 Certification

CERTIFICATION

ACA:..conforms to RF emissions for Australia, tick mark
CE:...conforms to EN 55011/CISPR 11, EN 50082-2
EN: ....EN50263 EMC - CE for Europe
FCC:..conforms to RF emissions for North America, part 15
IEC:..conforms to 1010-1, LVD - CE for Europe
ISO: ....Manufactured under an ISO9001 registered system.
UL:...UL listed E83849 for the USA and Canada

2.2.11 Physical

CASE
Type: ....Fully drawout (automatic CT shorts)
Seal: ....Seal provision
Mounting: ....Panel or 19-inch rack mount
IP Class: IP40-X

PACKAGING
Shipping box: ....12″ × 11″ × 10″ (W × H × D)
30.5 cm × 27.9 cm × 25.4 cm
Shipping weight: ....17 lbs Max / 7.7 kg

TERMINALS
Low voltage (A, B, C, D terminals):
12 AWG maximum
High voltage (E, F, G, H terminals):
#8 ring lug, 10 AWG wire std.

2.2.12 Environmental

ENVIRONMENT
Ambient operating temperature:
–40°C to +60°C
Ambient storage temperature:
–40°C to +80°C
Humidity: ....up to 90%, non-condensing.
Altitude: ....up to 2000 m
Pollution degree: 2

NOTE

At temperatures less than –20°C, the LCD contrast may be impaired.

2.2.13 Long-term Storage

LONG-TERM STORAGE
Environment: ....In addition to the above environmental considerations, the relay should be stored in an environment that is dry, corrosive-free, and not in direct sunlight.
Correct storage: ....Prevents premature component failures caused by environmental factors such as moisture or corrosive gases. Exposure to high humidity or corrosive environments will prematurely degrade the electronic components in any electronic device regardless of its use or manufacturer, unless specific precautions, such as those mentioned in the Environment section above, are taken.

NOTE

It is recommended that all relays be powered up once per year, for one hour continuously, to avoid deterioration of electrolytic capacitors and subsequent relay failure.

GE
Grid Solutions

469 Motor Management Relay

Chapter 3: Installation

3.1 Mechanical Installation

3.1.1 Description

The 469 is packaged in the standard GE Grid Solutions SR-series arrangement, which consists of a drawout unit and a companion fixed case. The case provides mechanical protection to the unit and is used to make permanent connections to all external equipment. The only electrical components mounted in the case are those required to connect the unit to the external wiring. Connections in the case are fitted with mechanisms required to allow the safe removal of the relay unit from an energized panel (for example, automatic CT shorting). The unit is mechanically held in the case by pins on the locking handle that cannot be fully lowered to the locked position until the electrical connections are completely mated. Any 469 can be installed in any 469 case, except for custom manufactured units that are clearly identified as such on both case and unit, and are equipped with an index pin keying mechanism to prevent incorrect pairings.

No special ventilation requirements need to be observed during the installation of the unit. The 469 can be cleaned with a damp cloth.

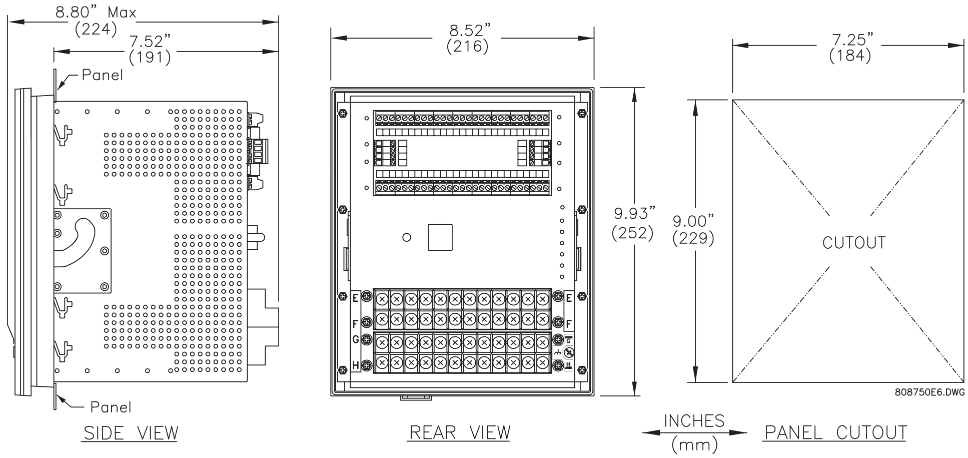


FIGURE 3–1: Dimensions

To prevent unauthorized removal of the drawout unit, a wire lead seal can be installed in the slot provided on the handle. With this seal in place, the drawout unit cannot be removed. A passcode or settings access jumper can be used to prevent entry of settings but allow monitoring of actual values. If access to the front panel controls must be restricted, a separate seal can be installed on the cover to prevent it from being opened.

⚠WARNING

Hazard may result if the product is not used for its intended purpose.

FIGURE 3–2: Seal on Drawout Unit

3.1.2 Product Identification

Each 469 unit and case are equipped with a permanent label. This label is installed on the left side (when facing the front of the relay) of both unit and case. The case label details which units can be installed.

The *case label* details the following information: model number, manufacture date, and special notes.

The *unit label* details the following information: model number, type, serial number, manufacture date, phase current inputs, special notes, overvoltage category, insulation voltage, pollution degree, control power, and output contact rating.

FIGURE 3–3: Case and Unit Identification Labels

3.1.3 Installation

The 469 case, alone or adjacent to another SR-series unit, can be installed in the panel of a standard 19-inch rack (see below for panel cutout dimensions). Provision must be made when mounting for the front door to swing open without interference to, or from, adjacent equipment. Normally the 469 unit is mounted in its case when shipped from the factory, and should be removed before mounting the case in the supporting panel. Unit withdrawal is described in the next section.

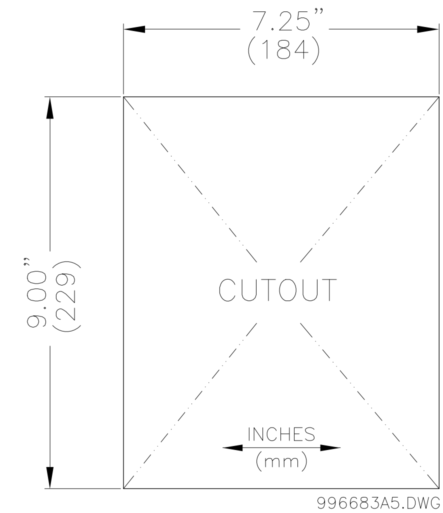


FIGURE 3–4: Single 469 Cutout Panel

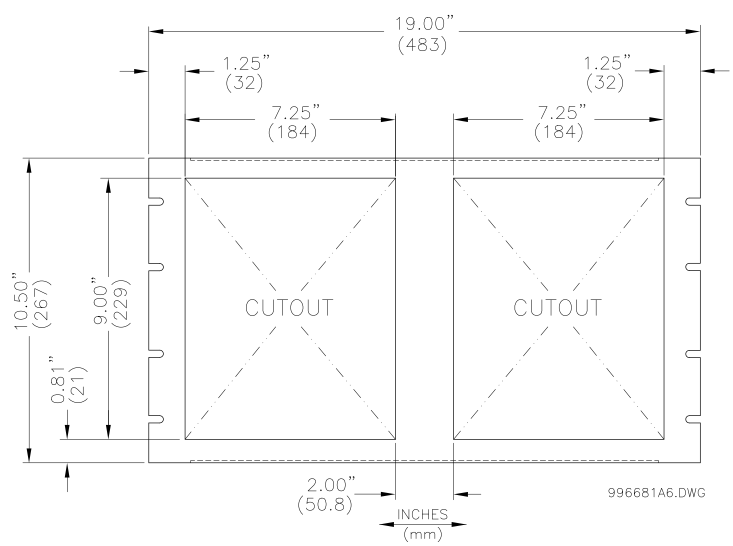
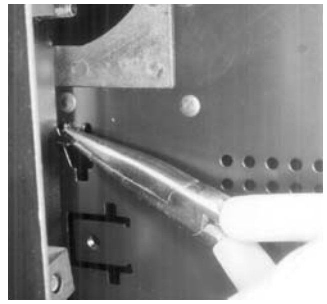


FIGURE 3–5: Double 469 Cutout Panel

After the mounting hole in the panel has been prepared, slide the 469 case into the panel from the front. Applying firm pressure on the front to ensure the front bezel fits snugly against the front of the panel, bend out the pair of retaining tabs (to a horizontal position) from each side of the case as shown below. The case is now securely mounted, ready for panel wiring. If additional support is desired, the SR optional mounting kit may be ordered.



808704A1.CDR

FIGURE 3–6: Bend Up Mounting Tabs

3.1.4 Unit Withdrawal and Insertion

⚠CAUTION

TURN OFF CONTROL POWER BEFORE DRAWING OUT OR RE-INSERTING THE RELAY TO PREVENT MALOPERATION!

⚠CAUTION

If an attempt is made to install a unit into a non-matching case, the mechanical key will prevent full insertion of the unit. Do not apply strong force in the following step or damage may result.

To remove the unit from the case:

- ▷ Open the cover by grasping the center of the right side and then pulling the cover, which will rotate about the hinges on the left.
- ▷ Release the locking latch, located below the locking handle, by pressing upward on the latch with the tip of a screwdriver.

FIGURE 3–7: Press Latch to Disengage Handle

▷ While holding the latch raised, grasp the locking handle in the center and pull firmly, rotating the handle up from the bottom of the unit until movement ceases.

FIGURE 3–8: Rotate Handle to Stop Position

Once the handle is released from the locking mechanism, the unit can freely slide out of the case when pulled by the handle. It may sometimes be necessary to adjust the handle position slightly to free the unit.

FIGURE 3–9: Slide Unit out of Case

To insert the unit into the case:

▷ Raise the locking handle to the highest position.

▷ Hold the unit immediately in front of the case and align the rolling guide pins (near the hinges of the locking handle) to the guide slots on either side of the case.

▷ Slide the unit into the case until the guide pins on the unit have engaged the guide slots on either side of the case.

▷ Grasp the locking handle from the center and press down firmly, rotating the handle from the raised position toward the bottom of the unit.

When the unit is fully inserted, the latch will be heard to click, locking the handle in the final position.

CAUTION

No special ventilation requirements need to be observed during the installation of the unit. The unit does not require cleaning.

3.1.5 Ethernet Connection

If using the 469 with the Ethernet 10Base-T option, ensure that the network cable is disconnected from the rear RJ45 connector before removing the unit from the case. This prevents any damage to the connector.

The unit may also be removed from the case with the network cable connector still attached to the rear RJ45 connector, provided that there is at least 16" of network cable available when removing the unit from the case. This extra length allows the network cable to be disconnected from the RJ45 connector from the front of the switchgear panel. Once disconnected, the cable can be left hanging safely outside the case for re-inserting the unit back into the case.

The unit may then be re-inserted by first connecting the network cable to the units' rear RJ45 connector (see step 3 of *Unit Withdrawal and Insertion* on page 3–5).

CAUTION

Ensure that the network cable does not get caught inside the case while sliding in the unit. This may interfere with proper insertion to the case terminal blocks and damage the cable.

FIGURE 3–10: Ethernet Cable Connection

To ensure optimal response from the relay, the typical connection timeout should be set as indicated in the following table:

TCP/IP sessions	Timeout setting
up to 2	2 seconds
up to 4	3 seconds

3.1.6 DeviceNet Connection

If using the 469 DeviceNet option (Refer to GEK-106491C: *469 Communications Guide)*, ensure that the network cable is disconnected from the rear terminal block before removing the unit out of the case to prevent any damage to the connector.

The unit may also be removed from the case with the network cable connector still attached to the rear terminal block provided that there is at least 16" of network cable available when removing the unit out of the case. This extra length will allow the network cable to be disconnected from the terminal block from the front of the switchgear panel. Once disconnected, the cable can be left hanging safely outside the case for re-inserting the unit back into the case.

The unit may then be re-inserted by first connecting the network cable to the units' rear terminal block (see step 3 of *Unit Withdrawal and Insertion* on page 3–5).

⚠CAUTION

Ensure that the network cable does not get caught inside the case while sliding in the unit. This may interfere with proper insertion to the case terminal blocks and damage the cable.

The DeviceNet port has the following characteristics:

- Connector type: 5-pin Phoenix connector
- Baud rate: 125K, 250K or 500K baud
- Protocol: DeviceNet

The following ports available simultaneously:

- RS232, 2 × RS485/422 with no DeviceNet option
- RS232, 1 × RS485/422 with DeviceNet option

The DeviceNet configuration is shown in the following table:

Pin	Signal	Description
1	V–	Negative supply voltage
2	CAN_L	CAN_L bus line
3	SHIELD	Cable shield
4	CAN_H	CAN_H bus line
5	V+	Positive supply voltage

3.1.7 Terminal Locations

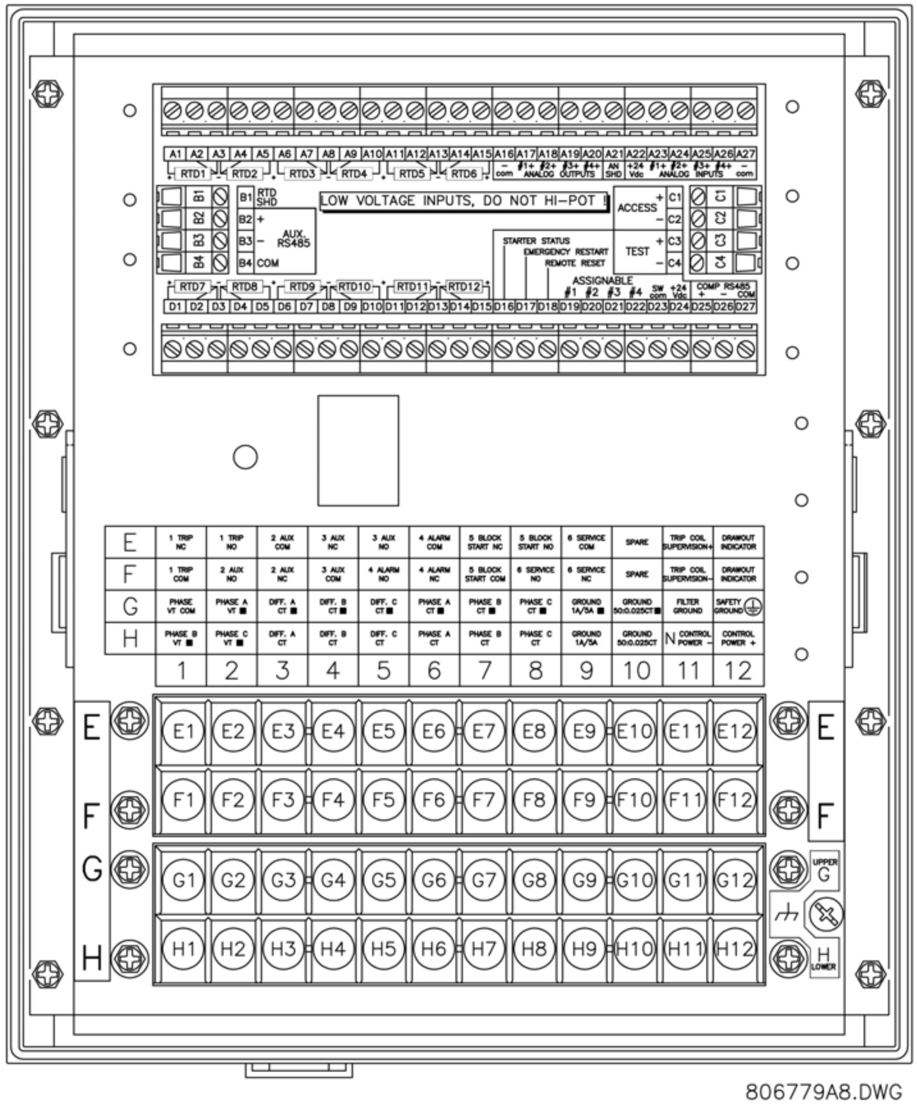


FIGURE 3–11: Terminal Layout

3.1.8 Terminal List

Table 3–1: 469 Terminal List

Terminal	Description	Terminal	Description
A01	RTD #1 Hot	D21	Assignable Switch 3
A02	RTD #1 Compensation	D22	Assignable Switch 4
A03	RTD Return	D23	Switch Common
A04	RTD #2 Compensation	D24	Switch +24 V DC
A05	RTD #2 Hot	D25	Computer RS485 +
A06	RTD #3 Hot	D26	Computer RS485 –
A07	RTD #3 Compensation	D27	Computer RS485 Common
A08	RTD Return	E01	1 Trip NC

Table 3–1: 469 Terminal List

Terminal	Description	Terminal	Description
A09	RTD #4 Compensation	E02	1 Trip NO
A10	RTD #4 Hot	E03	2 Auxiliary Common
A11	RTD #5 Hot	E04	3 Auxiliary NC
A12	RTD #5 Compensation	E05	3 Auxiliary NO
A13	RTD Return	E06	4 Alarm COMMON
A14	RTD #6 Compensation	E07	5 Block Start NC
A15	RTD #6 Hot	E08	5 Block Start NO
A16	Analog Output Common –	E09	6 Service Common
A17	Analog Output 1 +	E10	not used
A18	Analog Output 2 +	E11	Coil Supervision +
A19	Analog Output 3 +	E12	469 Drawout Indicator
A20	Analog Output 4 +	F01	1 Trip Common
A21	Analog Shield	F02	2 Auxiliary NO
A22	Analog In 24 V DC Power Supply +	F03	2 Auxiliary NC
A23	Analog Input 1 +	F04	3 Auxiliary COMMON
A24	Analog Input 2 +	F05	4 Alarm NO
A25	Analog Input 3 +	F06	4 Alarm NC
A26	Analog Input 4 +	F07	5 Block Start Common
A27	Analog Input Common –	F08	6 Service NO
B01	RTD Shield	F09	6 Service NC
B02	Auxiliary RS485 +	F10	not used
B03	Auxiliary RS485 –	F11	Coil Supervision –
B04	Auxiliary RS485 Common	F12	469 Drawout Indicator
C01	Access +	G01	Phase VT Neutral
C02	Access –	G02	Phase A VT •
C03	469 Under Test +	G03	Differential A CT •
C04	469 Under Test –	G04	Differential B CT •
D01	RTD #7 Hot	G05	Differential C CT •
D02	RTD #7 Compensation	G06	Phase A CT •
D03	RTD Return	G07	Phase B CT •
D04	RTD #8 Compensation	G08	Phase C CT •
D05	RTD #8 Hot	G09	1A/5A Ground CT •
D06	RTD #9 Hot	G10	50:0.025 Ground CT •
D07	RTD #9 Compensation	G11	Filter Ground
D08	RTD Return	G12	Safety Ground
D09	RTD #10 Compensation	H01	Phase B VT •
D10	RTD #10 Hot	H02	Phase C VT •
D11	RTD #11 Hot	H03	Differential A CT
D12	RTD #11 Compensation	H04	Differential B CT
D13	RTD Return	H05	Differential C CT
D14	RTD #12 Compensation	H06	Phase A CT
D15	RTD #12 Hot	H07	Phase B CT
D16	Starter Status	H08	Phase C CT
D17	Emergency Restart	H09	1A/5A Ground CT
D18	Remote Reset	H10	50:0.025 Ground CT
D19	Assignable Switch 1	H11	Control Power –
D20	Assignable Switch 2	H12	Control Power +

3.2 Electrical Installation

3.2.1 Typical Wiring

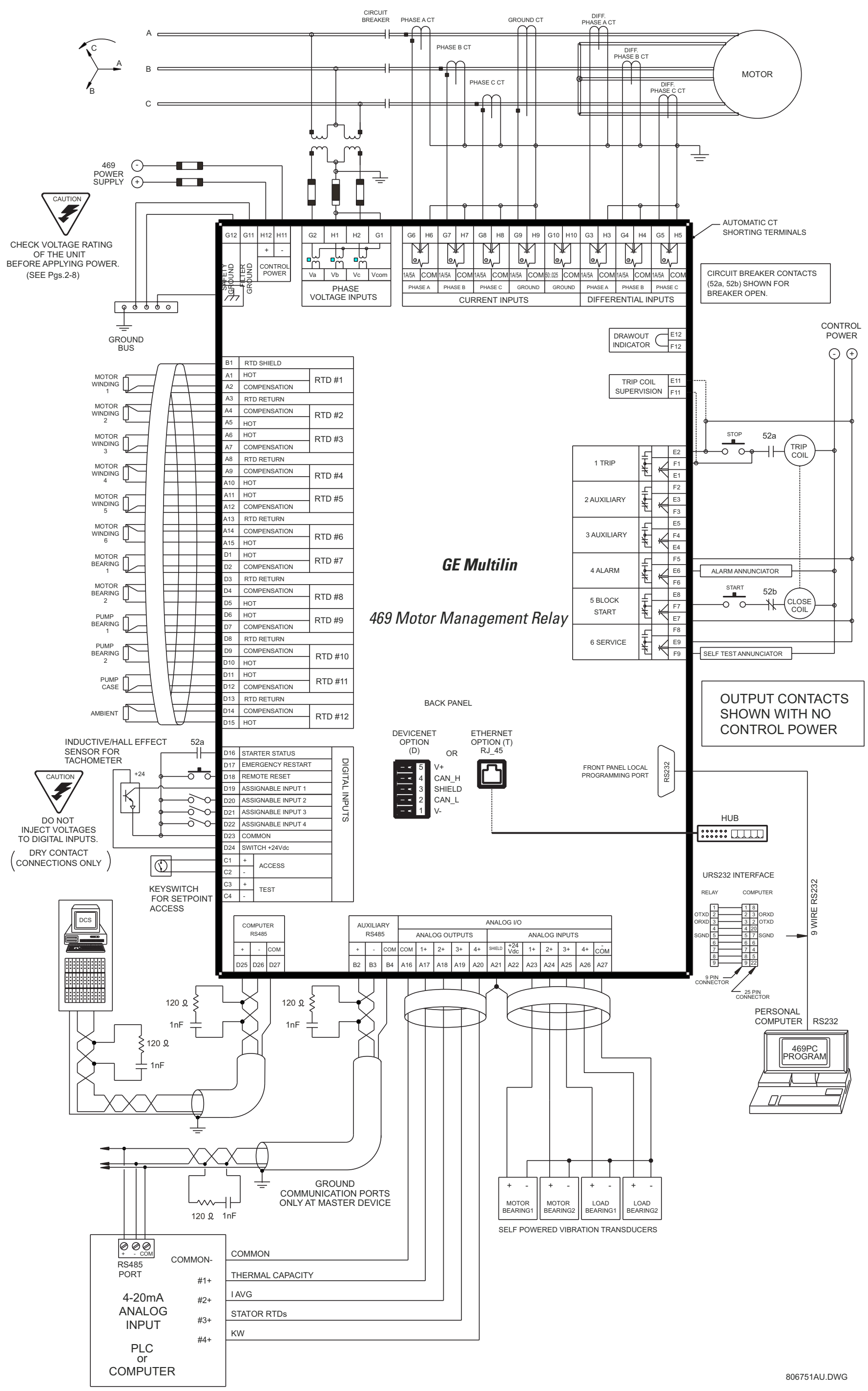


FIGURE 3–12: Typical Wiring Diagram

3.2.2 Description

A broad range of 469 applications are available. Although it is not possible to present typical connections for all possible schemes, this section will cover the interconnections of instrument transformer inputs, other inputs, outputs, communications, and grounding. See FIGURE 3–11: *Terminal Layout* on page 3–9 and Table 3–1: *469 Terminal List* on page 3–9 for terminal arrangement.

3.2.3 Control Power

The order code from the terminal label on the side of the drawout unit specifies the nominal control voltage as follows:

LO: 20 to 60 V DC; 20 to 48 V AC, or
HI: 90 to 300 V DC; 70 to 265 V AC

Ensure applied control voltage and rated voltage on drawout case terminal label match. For example, the HI power supply will work with any DC voltage from 90 to 300 V, or AC voltage from 70 to 265 V. The internal fuse may blow if the applied voltage exceeds this range.

CAUTION

The 469 control power must match the installed switching power supply. If the applied voltage does not match, damage to the unit may occur!

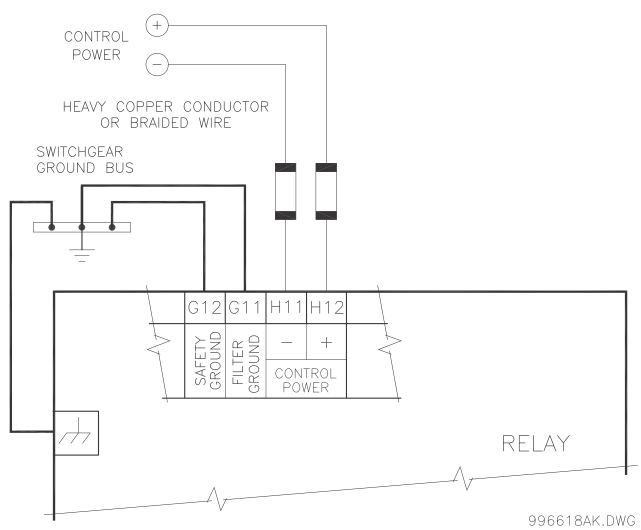


FIGURE 3–13: Control Power Connection

Extensive filtering and transient protection are built into the 469 to ensure proper operation in harsh industrial environments. Transient energy must be conducted back to the source through the filter ground terminal. A separate safety ground terminal is provided for hi-pot testing.

WARNING

All grounds MUST be hooked up for normal operation regardless of control power supply type.

3.2.4 Current Inputs

Phase Current Inputs

The 469 has three channels for phase current inputs, each with an isolating transformer. There are no internal ground connections on the current inputs. If the unit is withdrawn, each phase CT circuit is shorted by automatic mechanisms on the 469 case. The phase CTs should be chosen so the FLA is no less than 50% of the rated phase CT primary. Ideally, the phase CT primary should be chosen such that the FLA is 100% of the phase CT primary or slightly less, never more. This will ensure maximum accuracy for the current measurements. The maximum phase CT primary current is 5000 A.

The 469 correctly measures up to 20 times the phase current nominal rating. Since the conversion range is large, 1 A or 5 A CT secondaries must be specified at the time of order to ensure the appropriate interposing CT is installed in the unit. The chosen CTs must be capable of driving the 469 phase CT burden (see *Specifications* on page 2–6 for ratings).

⚠CAUTION

Verify that the 469 nominal phase current of 1 A or 5 A matches the secondary rating and connections of the connected CTs. Unmatched CTs may result in equipment damage or inadequate protection. Polarity of the phase CTs is critical for Negative Sequence Unbalance calculation, power measurement, and residual ground current detection (if used).

See *Two-Phase CT Configuration* on page 8–1 for 2-phase CT information.

Ground Current Input

The 469 has a dual primary isolating transformer for ground CT connection. There are no internal ground connections on the ground current inputs. The ground CT circuits are shorted by automatic mechanisms on the 469 case if the unit is withdrawn. The 1 A / 5 A tap is used either for zero-sequence / core balance applications or residual ground connections where the summation of the three phase current CTs is passed through the ground current input (see the figure below). The maximum ground CT primary current is 5000 A for the 1 A / 5 A tap. Alternatively, the 50:0.025 ground CT input has been designed for sensitive ground current detection on high resistance grounded systems where the GE Grid Solutions 50:0.025 core-balance CT is to be used. For example, in mining applications where earth leakage current must be measured for personnel safety, primary ground current as low as 0.25 A may be detected with the GE Grid Solutions 50:0.025 CT. Only one ground CT input tap should be used on a given unit.

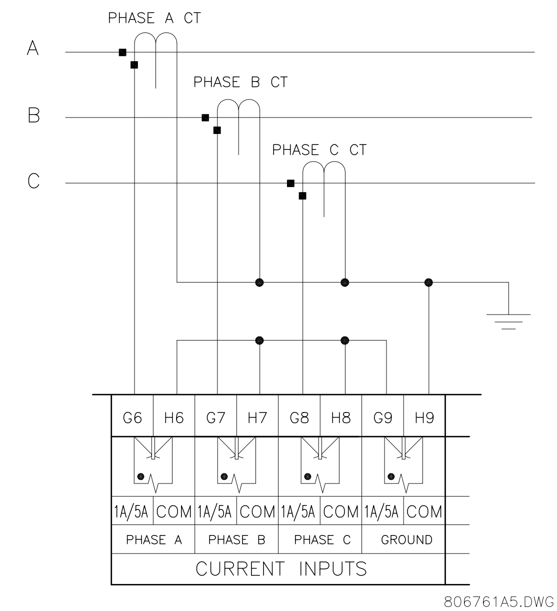


FIGURE 3–14: Residual Ground CT Connection

The 469 measures up to 5 A secondary current if the 1 A / 5 A tap is used. Since the conversion range is relatively small, the 1 A or 5 A option is field programmable. Proper selection of this settings ensures proper reading of primary ground current. The 1 A / 5 A ground CT chosen must be capable of driving the 469 ground CT burden (see *Specifications* on page 2–6). The 469 measures up to 25 A of primary ground current if this tap is used in conjunction with the GE Grid Solutions core balance CT.

NOTE

The zero-sequence connection is recommended. Unequal saturation of CTs, size and location of motor, resistance of power system and motor core saturation density, etc., may cause false readings in the residually connected GF circuit.

NOTE

Only one ground input should be wired – the other input should be unconnected.

The exact placement of a zero-sequence CT to detect only ground fault current is shown below. If the core balance CT is placed over shielded cable, capacitive coupling of phase current into the cable shield during motor starts may be detected as ground current unless the shield wire is also passed through the CT window. Twisted pair cabling on the zero-sequence CT is recommended.

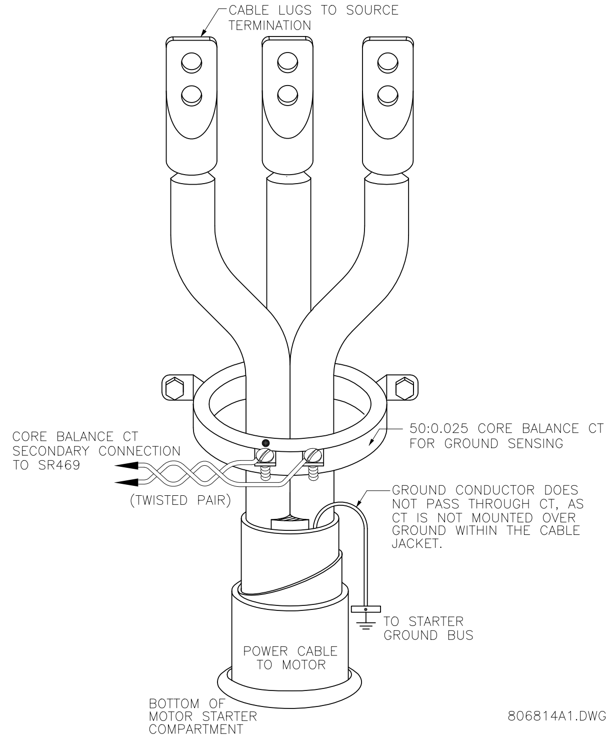


FIGURE 3–15: Core Balance Ground CT Installation – Unshielded Cable

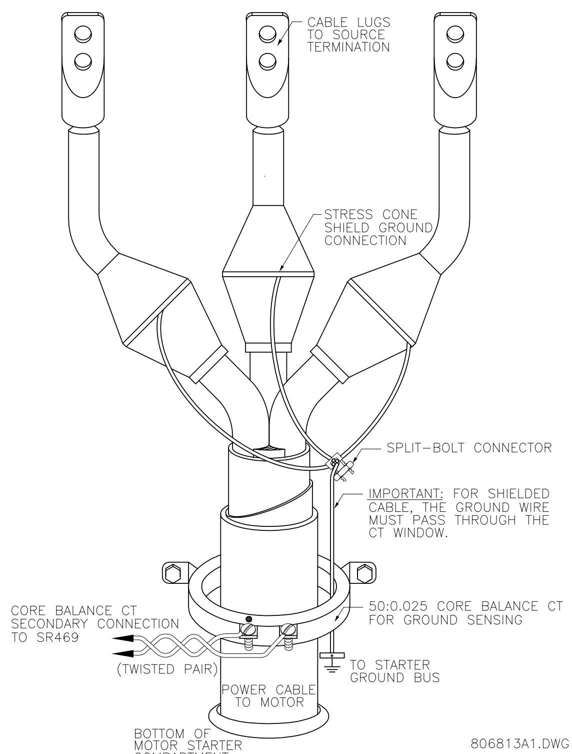


FIGURE 3–16: Core Balance Ground CT Installation – Shielded Cable

Differential Current Inputs

The 469 has three channels for differential current inputs, each with an isolating transformer. There are no internal ground connections on the current inputs. Each differential CT circuit is shorted by automatic mechanisms on the 469 case if the unit is withdrawn. The maximum differential CT primary current is 5000 A.

The 469 measures up to 5 A secondary current for the differential CT inputs. Since the conversion range is relatively small, the 1 A or 5 A option is field programmable. Proper selection of this settings ensures proper reading of primary phase differential current. The 1 A / 5 A differential CT chosen must be capable of driving the 469 differential CT burden (see *Specifications* on page 2–6 for ratings).

The differential CTs may be core balance as shown in the first figure below. Alternatively, the summation of two CTs per phase into the differential input will provide a larger zone of protection. If the summation of two CTs is used, observation of CT polarity is important. The summation method may also be implemented using the phase CTs as shown below. They will have to have the same CT ratio.

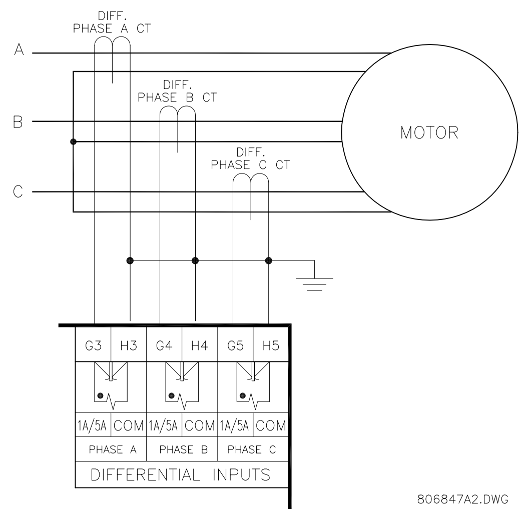


FIGURE 3–17: Core Balance Method

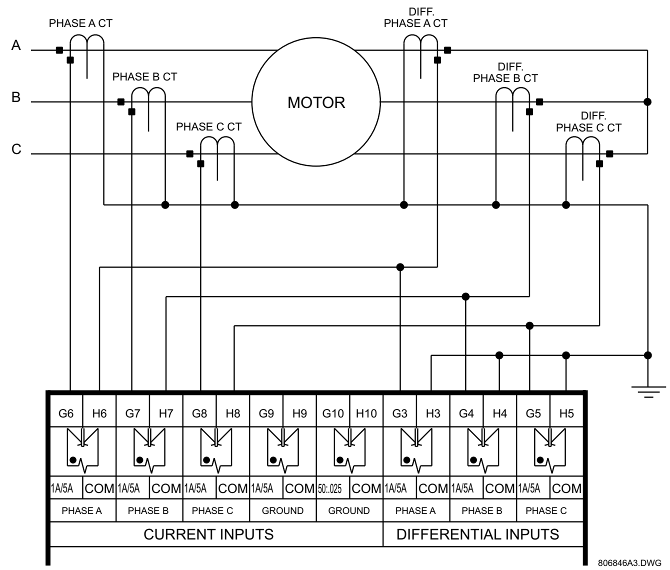


FIGURE 3–18: Summation Method with Phase CTs

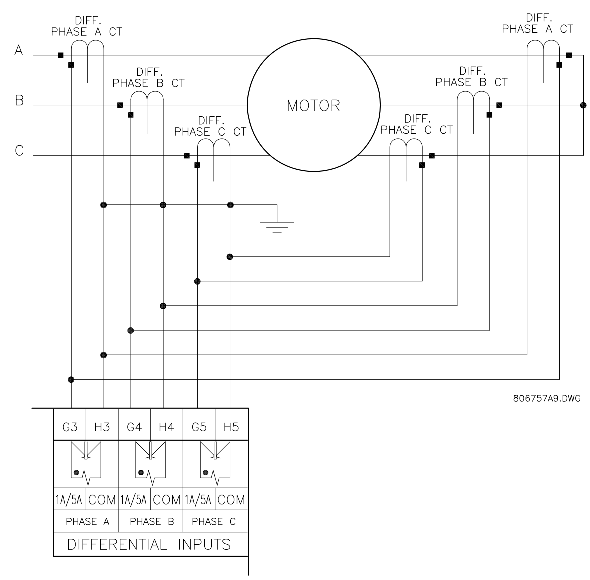


FIGURE 3–19: Summation Method without Phase CTs (Phase CTs wiring is shown in Figure 3-12)

3.2.5 Voltage Inputs

The 469 has three channels for AC voltage inputs, each with an isolating transformer. There are no internal fuses or ground connections on the voltage inputs. The maximum VT ratio is 300.00:1. The two VT connections are open delta (see FIGURE 3–12: *Typical Wiring Diagram* on page 3–11) or wye (see below). The voltage channels are connected in wye internally, which means that the jumper shown on the delta-source connection of the typical wiring diagram, between the phase B input and the 469 neutral terminal, must be installed for open delta VTs.

Polarity of the VTs is critical for correct power measurement and voltage phase reversal operation.

A 1 A fuse is typically used to protect the inputs.

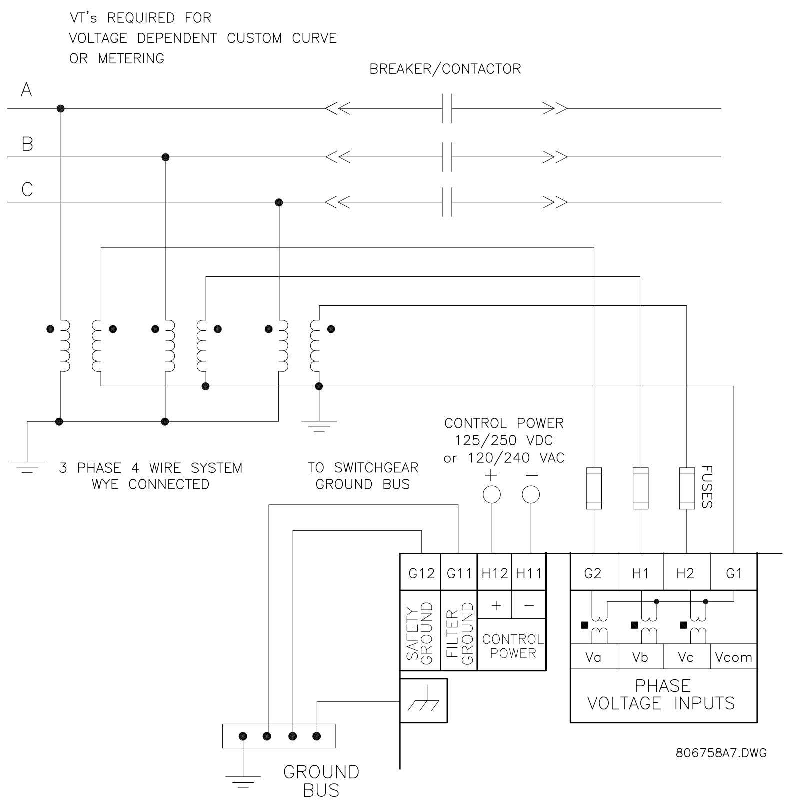


FIGURE 3–20: Wye Voltage Transformer Connection

3.2.6 Digital Inputs

NOTE

The digital inputs of the 469 relay are designed for dry contact connection. In an application where the contact inputs need to be connected to the 469 relay digital inputs using long cable, it is recommended that you use interposing auxiliary contacts to interface between the 469 relay and the long digital input cable. This will help prevent the relay falsely sensing the digital input as "closed" due to induced voltage on the cables as a result of the capacitive effect. It is recommended that you use shielded twisted pair wires grounded at one end only, for digital inputs and avoid locating these wires in close to current carrying cables, contactors or other sources of high EMI.

⚠CAUTION

DO NOT INJECT VOLTAGES TO DIGITAL INPUTS. DRY CONTACT CONNECTIONS ONLY.

There are 9 digital inputs designed for dry contact connections only. Two of the digital inputs (Access and Test) have their own common terminal; the balance of the digital inputs share one common terminal (see FIGURE 3–12: *Typical Wiring Diagram* on page 3–11).

In addition, the +24 V DC switch supply is brought out for control power of an inductive or capacitive proximity probe. The NPN transistor output could be taken to one of the assignable digital inputs configured as a counter or tachometer. Refer to *Specifications* on page 2–6 for maximum current draw from the +24 V DC switch supply.

3.2.7 Analog Inputs

The 469 provides terminals for four 0 to 1mA, 0 to 20mA, or 4 to 20mA current input signals (field programmable). This current signal can be used to monitor external quantities such as vibration, pressure, or flow. The four inputs share one common return. Polarity of these inputs must be observed for proper operation The analog input circuitry is isolated as a group with the analog output circuitry and the RTD circuitry. Only one ground reference should be used for the three circuits. Transorbs limit this isolation to ±36 V with respect to the 469 safety ground.

In addition, the +24 V DC analog input supply is brought out for control power of loop powered transducers. Refer to *Specifications* on page 2–6 for maximum current draw from this supply.

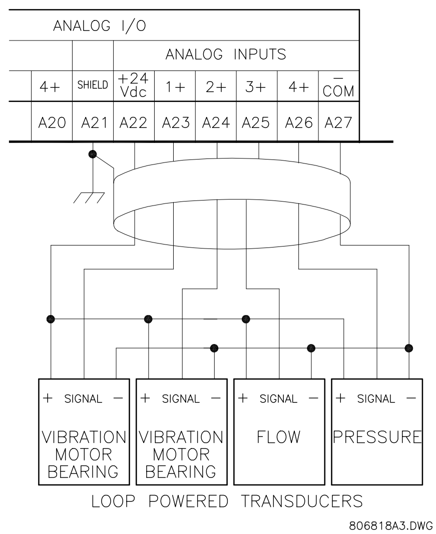


FIGURE 3–21: Loop Powered Transducer Connection

3.2.8 Analog Outputs

The 469 provides 4 analog output channels which may be ordered to provide a full-scale range of either 0 to 1 mA (into a maximum 10 kΩ impedance) or 4 to 20 mA (into a maximum 1200 Ω impedance). Each channel can be configured to provide full-scale output sensitivity for any range of any measured parameter.

As shown in FIGURE 3–12: *Typical Wiring Diagram* on page 3–11, these outputs share one common return. Polarity of these outputs must be observed for proper operation. Shielded cable should be used, with only one end of the shield grounded, to minimize noise effects.

The analog output circuitry is isolated as a group with the Analog Input circuitry and the RTD circuitry. Only one ground reference should be used for the three circuits. Transorbs limit this isolation to ±36 V with respect to the 469 safety ground.

If a voltage output is required, a burden resistor must be connected at the input of the SCADA measuring device. Ignoring the input impedance of the input, $R_{load} = V_{full\ scale} / I_{max}$. For 0 to 1 mA, for example, if 5 V full scale is required to correspond to 1 mA, R_{load} = 5 V / 0.001 A = 5000 Ω. For 4 to 20 mA, this resistor would be R_{load} = 5 V / 0.020 A = 250 Ω.

3.2.9 RTD Sensor Connections

Description

The 469 monitors up to 12 RTD inputs for Stator, Bearing, Ambient, or Other temperature monitoring. The type of each RTD is field programmable as 100 Ω Platinum (DIN 43760), 100 Ω Nickel, 120 Ω Nickel, or 10 Ω Copper. RTDs must be three wire type. Every two RTDs shares a common return.

The RTD circuitry compensates for lead resistance, provided that each of the three leads is the same length. Lead resistance should not exceed 25 Ω per lead for platinum/nickel RTDs or 3 Ω per lead for copper RTDs. Shielded cable should be used to prevent noise pickup in the industrial environment. RTD cables should be kept close to grounded metal casings and away from areas of high electromagnetic or radio interference. RTD leads should not be run adjacent to or in the same conduit as high current carrying wires.

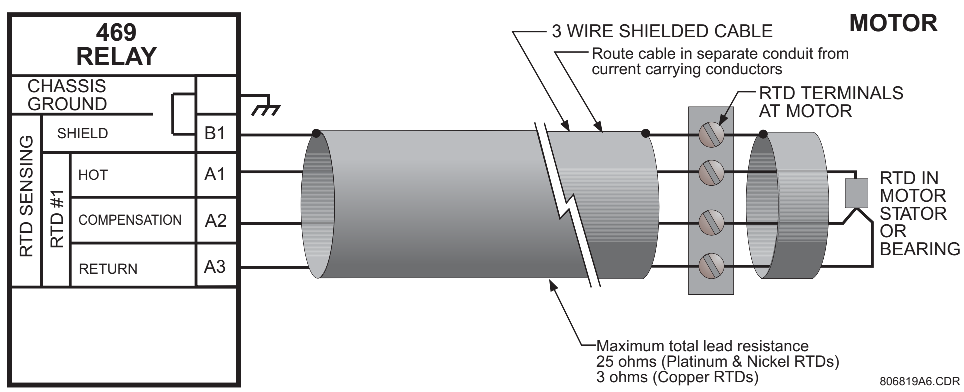


FIGURE 3–22: RTD Wiring

NOTE

IMPORTANT: The RTD circuitry is isolated as a group with the Analog Input circuitry and the Analog Output circuitry. Only one ground reference should be used for the three circuits. Transorbs limit this isolation to ±36 V with respect to the 469 safety ground.

Reduced RTD Lead Number Application

The 469 requires three leads to be brought back from each RTD: Hot, Return and Compensation. This can be quite expensive. It is however possible to reduce the number of leads required to 3 for the first RTD and 1 for each successive RTD. Refer to the figure below for wiring configuration for this application.

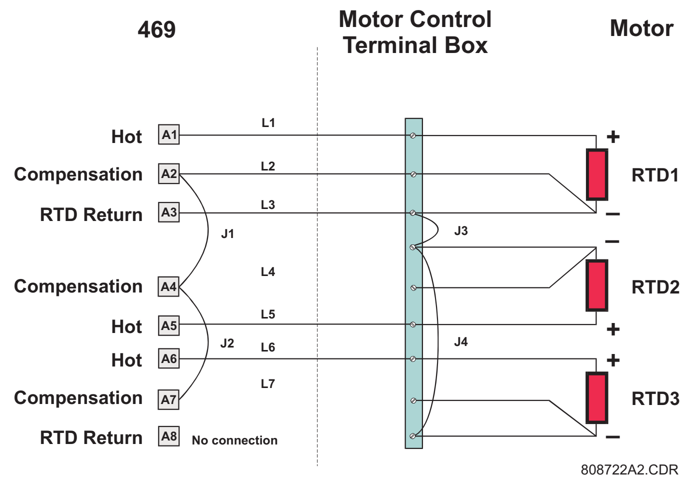


FIGURE 3–23: Reduced Wiring RTDs

The Hot line would have to be run as usual for each RTD. The Compensation and Return leads, however, need only be run for the first RTD. At the motor RTD terminal box, the RTD Return leads must be jumpered together with as short as possible jumpers. The Compensation leads must be jumpered together at the 469.

Note that an error is produced on each RTD equal to the voltage drop across the jumper on the RTD return. This error increases with each successive RTD added.

$V_{RTD1} = V_{RTD1}$
$V_{RTD2} = V_{RTD2} + V_{J3}$
$V_{RTD3} = V_{RTD3} + V_{J3} + V_{J4}$, etc.

This error is directly dependent on the length and gauge of the wire used for the jumpers and any error introduced by a poor connection. For RTD types other than 10 Ω Copper, the error introduced by the jumpers is negligible. Although this RTD wiring technique reduces the cost of wiring, the following disadvantages must be noted:

1. There will be an error in temperature readings due to lead and connection resistances. This technique is **NOT** recommended for 10 Ω Copper RTDs.
2. If the RTD Return lead to the 469 or any of the jumpers break, all RTDs from the point of the break will read open.
3. If the Compensation lead or any of the jumpers break, all RTDs from the point of the break will function without any lead compensation.

Two-Wire RTD Lead Compensation

An example of how to add lead compensation to a two wire RTD may is shown in the figure below.

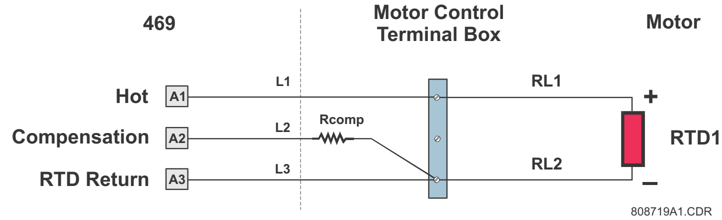


FIGURE 3–24: 2-Wire RTD Lead Compensation

The compensation lead L2 is added to compensate for Hot (L1) and Return (L3), assuming they are all of equal length and gauge. To compensate for leads RL1 and RL2, a resistor equal to the resistance of RL1 or RL2 could be added to the compensation lead, though in many cases this is unnecessary.

RTD Grounding

Grounding of one lead of the RTDs is done at either the 469 or at the motor. Grounding should **not** be done in both places as it could cause a circulating current. Only RTD Return leads may be grounded. When grounding at the 469, only one Return lead need be grounded as they are hard-wired together internally. No error is introduced into the RTD reading by grounding in this manner.

If the RTD Return leads are tied together and grounded at the motor, only one RTD Return lead can be run back to the 469. See the figure below for a wiring example. Running more than one RTD Return lead to the 469 causes significant errors as two or more parallel paths for the return current have been created. Use of this wiring scheme causes errors in readings equivalent to that in the Reduced RTD Lead Number application described earlier.

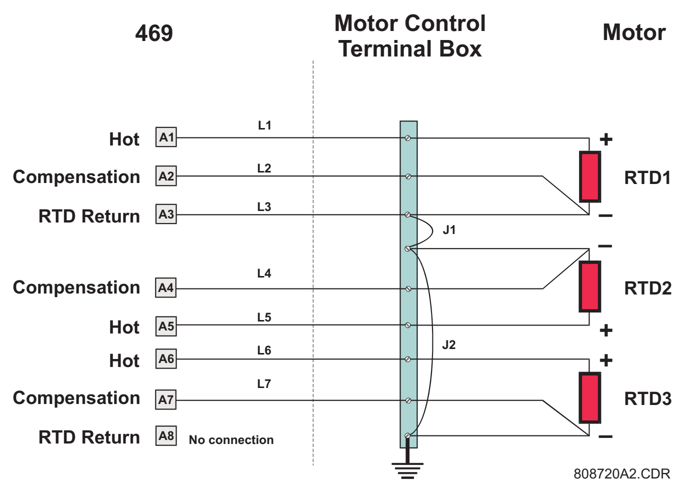


FIGURE 3–25: RTD Alternate Grounding

3.2.10 Output Relays

There are six (6) Form-C output relays (see *Specifications* on page 2–6 for details). Five of the six relays are always non-failsafe; 6 SERVICE is always failsafe. As failsafe, the 6 SERVICE relay is normally energized and de-energizes when called upon to operate. It also de-energizes when 469 control power is lost and will be in its operated state. All other relays, being non-failsafe, will normally be de-energized and energize when called upon to operate. When the 469 control power is lost, these relays are de-energized and in their non-operated state. Shorting bars in the drawout case ensure that no trip or alarm occurs when the 469 is drawn out. However, the 6 SERVICE output will indicate that the 469 has been drawn out. Each output relay has an LED indicator on the front panel that turns on when the associated relay is in the operated state.

⚠WARNING

Relay contacts must be considered unsafe to touch when the 469 is energized! If the output relay contacts are required for low voltage accessible applications, it is the customer's responsibility to ensure proper insulation levels.

- **1 TRIP:** The trip relay should be wired to take the motor off line when conditions warrant. For a breaker application, the normally-open 1 TRIP contact should be wired in series with the Breaker trip coil. For contactor applications, the normally-closed 1 TRIP contact should be wired in series with the contactor coil.

  Supervision of a breaker trip coil requires that the supervision circuit be in parallel with the 1 TRIP relay output contacts. With this connection made, the supervision input circuits place an impedance across the contacts that draws a 2 mA current (for an external supply voltage from 30 to 250 V DC) through the breaker trip coil. The supervision circuits respond to a loss of this trickle current as a failure condition. Circuit breakers equipped with standard control circuits have a breaker auxiliary contact permitting the trip coil to be energized only when the breaker is closed. When these contacts are open, as detected by the Starter Status Digital Input monitoring breaker auxiliary contacts, trip coil supervision circuit is automatically disabled. This logic allows the trip circuit to be monitored only when the breaker is closed.

- **2 AUXILIARY, 3 AUXILIARY:** The auxiliary relays may be programmed for trip echo, alarm echo, trip backup, alarm differentiation, control circuitry, and numerous other functions. They should be wired as configuration warrants.
- **4 ALARM:** The alarm relay should connect to the appropriate annunciator or monitoring device.
- **5 BLOCK START:** This relay should be wired in series with the start pushbutton in either a breaker or contactor configuration to prevent motor starting. When a trip has not been reset on a breaker, the block start relay prevents a start attempt that would result in an immediate trip. Any lockout functions are also directed to the block start relay.
- **6 SERVICE:** The service relay operates if any of the 469 diagnostics detect an internal failure or on loss of control power. This output may be monitored with an annunciator, PLC or DCS. If it is deemed that a motor is more important than a process, the service relay normally-closed contact may also be wired in parallel with the trip relay on a breaker application or the normally-open contact may be wired in series with the trip relay on a contactor application. This will provide failsafe operation of the motor; that is, the motor will be tripped off line in the event that the 469 is not protecting it. If however, the process is critical, annunciation of such a failure will allow the operator or the operation computer to either continue, or do a sequenced shutdown. See the following figure for details.

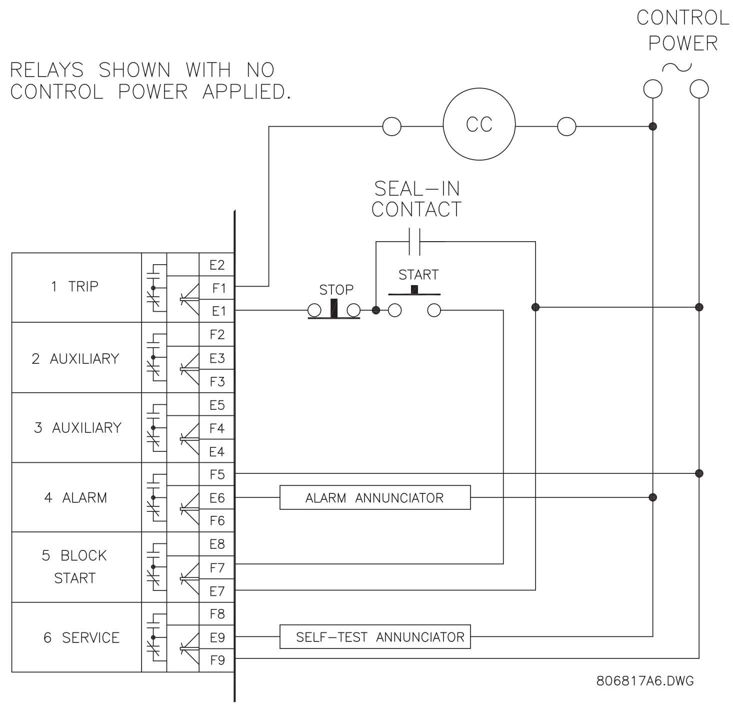


FIGURE 3–26: Alternate Wiring for Contactors

3.2.11 Drawout Indicator

The Drawout Indicator is simply a jumper from terminals E12 to F12. When the 469 is withdrawn from the case, terminals E12 and F12 are open. This may be useful for differentiating between loss of control power as indicated by the 6 SERVICE relay and withdrawal of the unit.

3.2.12 RS485 Communications Ports

Two independent two-wire RS485 ports are provided. Up to 32 469s can be daisy-chained together on a communication channel without exceeding the driver capability. For larger systems, additional serial channels must be added. Commercially available repeaters can also be used to add more than 32 relays on a single channel. Suitable cable should have a characteristic impedance of 120 Ω (e.g. Belden #9841) and total wire length should not exceed 4000 ft. Commercially available repeaters will allow for transmission distances greater than 4000 ft.

Voltage differences between remote ends of the communication link are not uncommon. For this reason, surge protection devices are internally installed across all RS485 terminals. Internally, an isolated power supply with an optocoupled data interface is used to prevent noise coupling.

NOTE

To ensure that all devices in a daisy-chain are at the same potential, it is imperative that the common terminals of each RS485 port are tied together and grounded only once, at the master. Failure to do so may result in intermittent or failed communications.

The source computer/PLC/SCADA system should have similar transient protection devices installed, either internally or externally, to ensure maximum reliability. Ground the shield at one point only, as shown in the figure below, to avoid ground loops.

Correct polarity is also essential. The 469s must be wired with all the '+' terminals connected together and all the '–' terminals connected together. Each relay must be daisy-chained to the next one. Avoid star or stub connected configurations. The last device at each end of the daisy chain should be terminated with a 120 Ω ¼-watt resistor in series with a 1 nF capacitor across the '+' and '–' terminals. Observing these guidelines provides a reliable communication system immune to system transients.

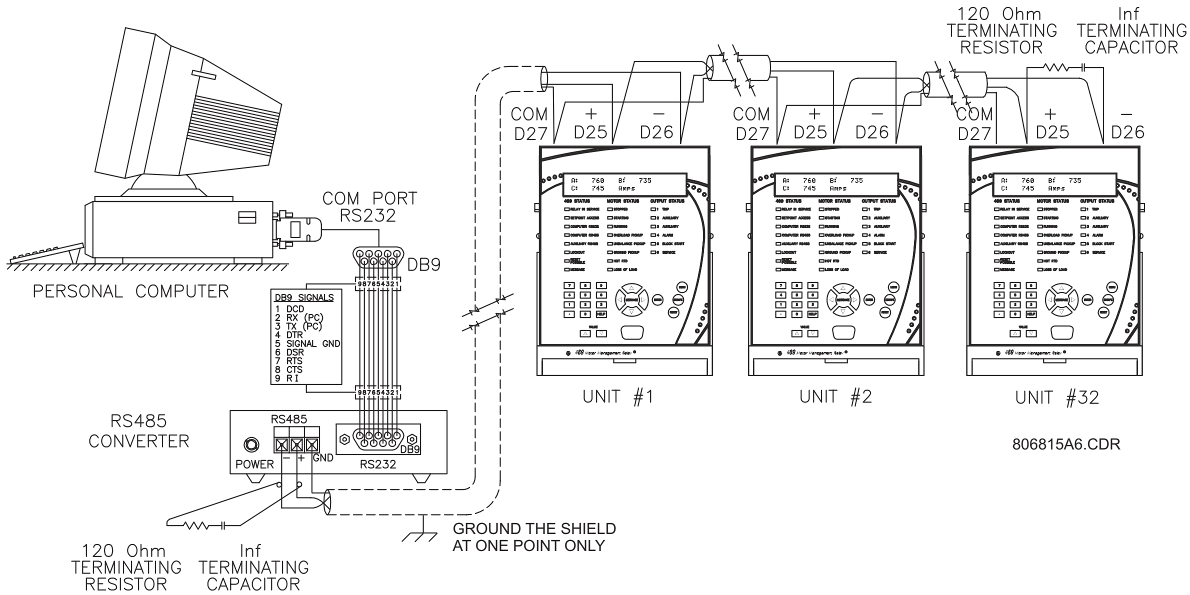


FIGURE 3–27: RS485 Communications Wiring

3.2.13 Dielectric Strength

It may be required to test a complete motor starter for dielectric strength ("flash" or "hipot") with the 469 installed. The 469 is rated for 1.9 kV AC for 1 second, or 1.6 kV AC for 1 minute (per UL 508) isolation between relay contacts, CT inputs, VT inputs, trip coil supervision, and the safety ground terminal G12. Some precautions are required to prevent damage to the 469 during these tests.

Filter networks and transient protection clamps are used between control power, trip coil supervision, and the filter ground terminal G11. This is intended to filter out high voltage transients, radio frequency interference (RFI), and electromagnetic interference (EMI). The filter capacitors and transient suppressors may be damaged by continuous high voltage. Disconnect the filter ground terminal G11 during testing of control power and trip coil supervision. The CT inputs, VT inputs, and output relays do not require any special precautions. Low voltage inputs (less than 30 V), RTDs, analog inputs, analog outputs, digital inputs, and RS485 communication ports are not to be tested for dielectric strength under any circumstance (see below).

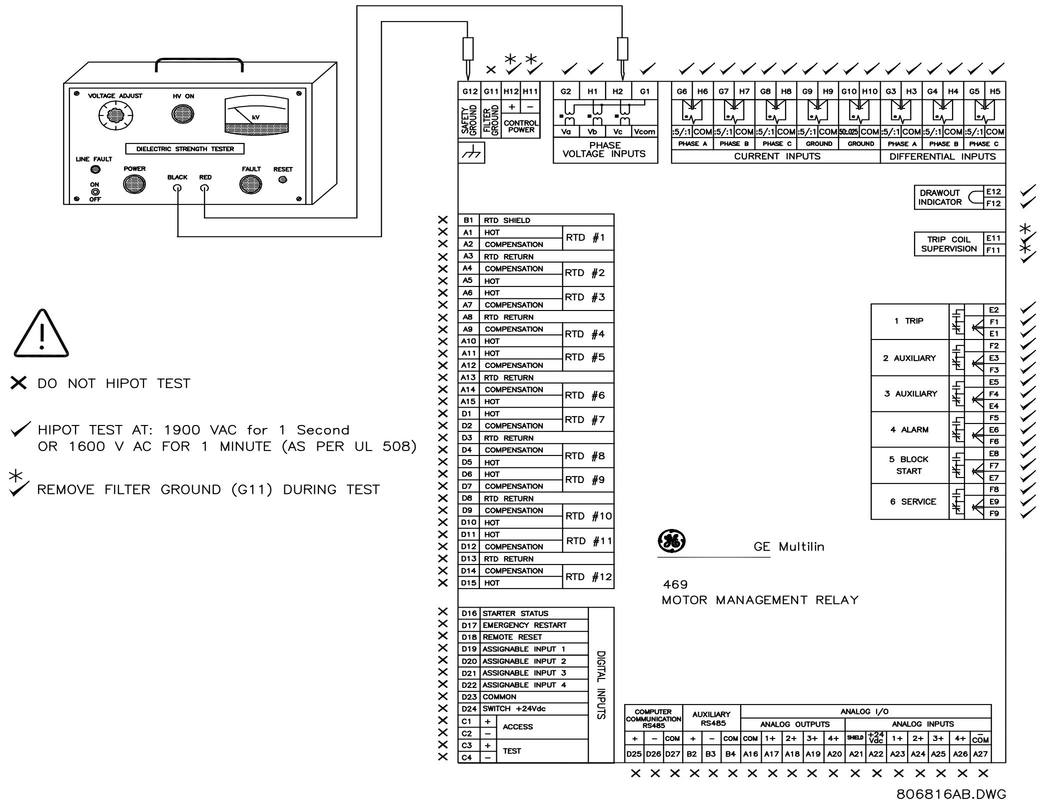
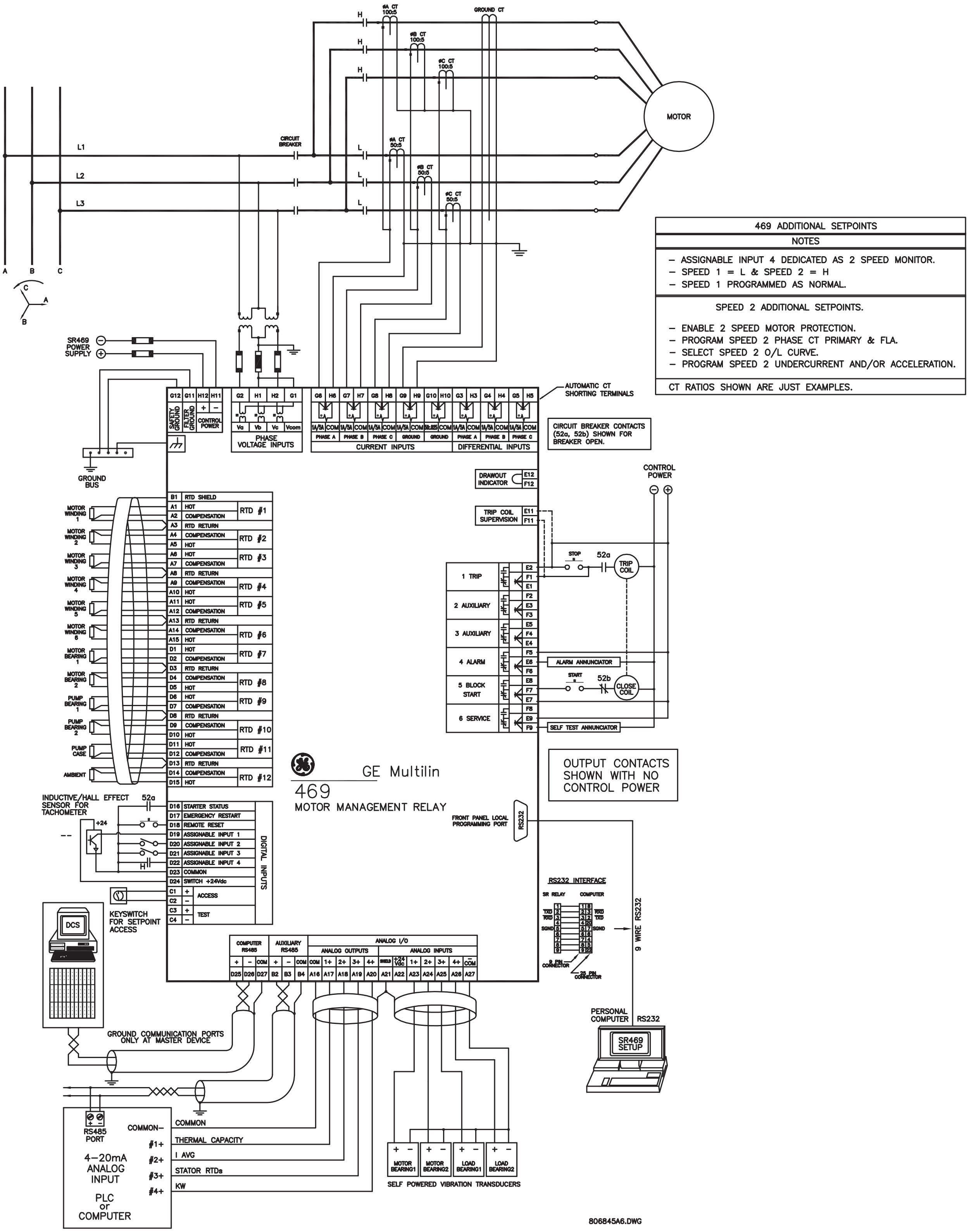


FIGURE 3–28: Testing for Dielectric Strength

3.2.14 2-Speed Motor Wiring



GE
Grid Solutions

469 Motor Management Relay

Chapter 4: Interfaces

4.1 Faceplate Interface

4.1.1 Description

The front panel provides local operator interface with a liquid crystal display, LED status indicators, control keys, and program port. The display and status indicators update alarm and status information automatically. The control keys are used to select the appropriate message for entering settings or displaying measured values. The RS232 program port is also provided for connection with a computer running the EnerVista 469 Setup software.

4.1.2 Display

The 40-character liquid crystal display allows visibility under varied lighting conditions. While the keypad and display are not being used, the screen will display system information by scrolling through a maximum of 20 user-selected default messages. These default messages will only appear after a user programmed period of inactivity. Pressing any key during default message scrolling will return the display to the last message shown before the default messages appeared. Any trip, alarm, or start block is displayed immediately, automatically overriding the default messages.

4.1.3 LED Indicators

There are three groups of LED indicators. They are 469 Status, Motor Status, and Output Relays.

806977A1.CDR

FIGURE 4–1: 469 LED INDICATORS

469 Status LED Indicators

- **469 IN SERVICE:** This LED indicates that control power is applied, all monitored inputs/outputs and internal systems are OK, the 469 has been programmed, and the 469 is in protection mode, not simulation mode. This LED flashes when the 469 is in simulation or testing mode.
- **SETPOINT ACCESS:** This LED indicates that the access jumper is installed and passcode protection has been satisfied; settings may be altered and stored.
- **COMPUTER RS232:** This LED flashes when there is any activity on the communication port. The LED remains on solid if incoming data is valid.
- **COMPUTER RS485:** Flashes when there is any activity on the communication port. Remains on solid if incoming data is valid and intended for the slave address programmed in the relay.
- **AUXILIARY RS485:** Flashes when there is any activity on the communication port. Remains on solid if incoming data is valid and intended for the slave address programmed in the relay.
- **LOCKOUT:** Indicates start attempts will be blocked either by a programmed lockout time or a condition that is still present.
- **RESET POSSIBLE:** A trip or latched alarm may be reset. Press the RESET key to clear the trip or alarm.
- **MESSAGE:** Flashes when a trip, alarm, or start block occurs. Pressing the MESSAGE keys scroll through diagnostic messages. This LED remains solid when settings and actual value messages are being viewed. Pressing the RESET key returns the display to the default messages. Under normal conditions, the default messages selected during settings programming are displayed. If any alarm or trip condition is generated, a diagnostic message overrides the displayed message and this indicator flashes. If there is more than one condition present, MESSAGE ▼ can be used to scroll through the messages. Pressing any other key return to the normally displayed messages. While viewing normally displayed messages, the Message LED continues to flash if any diagnostic message is active. To return to the

diagnostic messages from the normally displayed messages, press the MENU key until the following message is displayed.

```
3. TARGET MESSAGES
Press [▷] for more
```

Now, press the MESSAGE ▶ key followed by the MESSAGE ▼ key to scroll through the messages. Note that diagnostic messages for alarms disappear with the condition while diagnostic messages for trips remain until cleared by a reset.

Motor Status LED Indicators

- **STOPPED:** The motor is stopped based on zero phase current and starter status auxiliary contact feedback.
- **STARTING:** Motor is starting.
- **RUNNING:** Motor is running normally below overload pickup level.
- **OVERLOAD:** Motor is running above overload pickup.
- **UNBALANCE PICKUP:** Level of current unbalance has exceeded the unbalance alarm or trip level.
- **GROUND PICKUP:** Level of ground current has exceeded the ground fault alarm or trip level.
- **HOT RTD:** One of the RTD measurements has exceeded its RTD alarm or trip level.
- **LOSS OF LOAD:** Average motor current has fallen below the undercurrent alarm or trip level; *or* power consumption has fallen below the underpower alarm or trip level.

Output Relay LED Indicators

- **1 TRIP:** The 1 TRIP relay has operated (energized).
- **2 AUXILIARY:** The 2 AUXILIARY relay has operated (energized).
- **3 AUXILIARY:** The 3 AUXILIARY relay has operated (energized).
- **4 ALARM:** The 4 ALARM relay has operated (energized).
- **5 BLOCK START:** The 5 BLOCK START relay has operated (energized).
- **6 SERVICE:** The 6 SERVICE relay has operated (de-energized, 6 SERVICE is failsafe, normally energized).

4.1.4 RS232 Port

This port is intended for connection to a portable PC. Settings files may be created at any location and downloaded through this port with the EnerVista 469 Setup software. Local interrogation of settings and actual values is also possible. New firmware may also be downloaded to the 469 flash memory through this port. Upgrading of the relay firmware does not require a hardware EPROM change.

4.1.5 Keypad

Description

The 469 display messages are organized into main menus, pages, and sub-pages. There are three main menus labeled settings, Actual Values, and Target Messages.

Pressing the MENU key followed by the MESSAGE ▼ key scrolls through the three main menu headers, which appear in sequence as follows:

```
1. SETPOINTS
Press [▷] for more
```

```
2. ACTUAL VALUES
Press [▷] for more
```

```
3. TARGET MESSAGES
Press [▷] for more
```

Pressing the MESSAGE ▶ key or the ENTER key from these main menu pages will display the corresponding menu page. Use the MESSAGE ▼ and MESSAGE ▲ keys to scroll through the page headers.

When the display shows **SETTINGS**, pressing the MESSAGE ▶ key or the ENTER key will display the page headers of programmable parameters (referred to as settings in the manual). When the display shows **ACTUAL VALUES**, pressing the MESSAGE ▶ key or the ENTER key displays the page headers of measured parameters (referred to as actual values in the manual). When the display shows **TARGET MESSAGES**, pressing the MESSAGE ▶ key or the ENTER key displays the page headers of event messages or alarm conditions.

Each page is broken down further into logical sub-pages. The MESSAGE ▼ and MESSAGE ▲ keys are used to navigate through the sub-pages. A summary of the settings and actual values can be found in the chapters 5 and 6, respectively.

The ENTER key is dual purpose. It is used to enter the sub-pages and to store altered settings values into memory to complete the change. The MESSAGE ▶ key can also be used to enter sub-pages but not to store altered settings.

The ESCAPE key is also dual purpose. It is used to exit the sub-pages and to cancel a settings change. The MESSAGE ◀ key can also be used to exit sub-pages and to cancel settings changes.

The VALUE keys are used to scroll through the possible choices of an enumerated settings. They also decrement and increment numerical settings. Numerical settings may also be entered through the numeric keypad.

Pressing the HELP key displays context-sensitive information about settings such as the range of values and the method of changing the settings. Help messages will automatically scroll through all messages currently appropriate.

The RESET key resets any latched conditions that are not presently active. This includes resetting latched output relays, latched Trip LEDs, breaker operation failure, and trip coil failure.

The MESSAGE ▼ and MESSAGE ▲ keys scroll through any active conditions in the relay. Diagnostic messages are displayed indicating the state of protection and monitoring elements that are picked up, operating, or latched. When the Message LED is on, there are messages to be viewed with the MENU key by selecting target messages as described earlier.

Entering Alphanumeric Text

Text settings have data values that are fixed in length but user-defined in character. They may be comprised of upper case letters, lower case letters, numerals, and a selection of special characters. The editing and storing of a text value is accomplished with the use of the decimal [.], VALUE, and ENTER keys.

▷ Move to message **S3 DIGITAL INPUTS ▷▽ ASSIGNABLE INPUT 1 ▷ INPUT 1 FUNCTION**, and scrolling with the VALUE keys, select "General Sw. A".
The relay will display the following message:

```
INPUT 1 FUNCTION:
General Sw. A
```

▷ Press the MESSAGE ▼ key to view the SWITCH NAME settings. The name of this user-defined input will be changed in this example from the generic "General Sw. A" to something more descriptive.

If an application is to be using the relay as a station monitor, it is more informative to rename this input "Station Monitor".

▷ Press the decimal [.] to enter the text editing mode. The first character will appear underlined as follows:

```
SWITCH NAME:
General Sw. A
```

▷ Press the VALUE keys until the character "S" is displayed in the first position.

▷ Press the decimal [.] key to store the character and advance the cursor to the next position.

▷ Change the second character to a "t" in the same manner.

▷ Continue entering characters in this way until all characters of the text "Stn. Monitor" are entered. Note that a space is selected like a character.
If a character is entered incorrectly, press the decimal [.] key repeatedly until the cursor returns to the position of the error. Re-enter the character as required.

▷ Once complete, press the ENTER key to remove the solid cursor and view the result.
Once a character is entered, by pressing the ENTER key, it is automatically saved in Flash Memory, as a new setting.

```
SWITCH NAME:
Stn. Monitor
```

The 469 does not have '+' or '–' keys. Negative numbers may be entered in one of two manners.

- ▷ Immediately pressing one of the VALUE keys causes the settings to scroll through its range including any negative numbers.
- ▷ After entering at least one digit of a numeric settings value, pressing the VALUE keys changes the sign of the value where applicable.

4.1.6 Settings Entry

To store any settings, terminals C1 and C2 (access terminals) must be shorted (a keyswitch may be used for security). There is also a settings passcode feature that restricts access to settings. The passcode must be entered to allow the changing of settings values. A passcode of "0" effectively turns off the passcode feature - in this case only the access jumper is required for changing settings. If no key is pressed for 5 minutes, access to settings values will be restricted until the passcode is entered again. To prevent settings access before the 5 minutes expires, the unit may be turned off and back on, the access jumper may be removed, or the SETTINGS ACCESS settings may be changed to "Restricted". The passcode cannot be entered until terminals C1 and C2 (access terminals) are shorted. When settings access is allowed, the settings Access LED indicator on the front of the 469 will be lit.

Settings changes take effect immediately, even when motor is running. However, changing settings while the motor is running is not recommended as any mistake may cause a nuisance trip.

The following procedure may be used to access and alter settings. This specific example refers to entering a valid passcode to allow access to settings if the passcode was "469".

- ▷ Press the MENU key to access the header of each menu, which will be displayed in the following sequence:

```
1. SETPOINTS
Press [▷] for more
```

```
2. ACTUAL VALUES
Press [▷] for more
```

```
3. TARGET MESSAGES
Press [▷] for more
```

- ▷ Press the MENU key until the display shows the header of the Settings menu.
- ▷ Press the MESSAGE ▶ or ENTER key to display the header for the first settings page.
  The set point pages are numbered, have an 'S' prefix for easy identification and have a name which gives a general idea of the settings available in that page. Pressing the MESSAGE ▼ or MESSAGE ▲ keys will scroll through all the available settings page headers. Settings page headers look as follows:

```
■ SETPOINTS        [▷]
  S1 469 SETUP
```

- ▷ To enter a given Setpoints page, press the MESSAGE ▶ or ENTER key.
- ▷ Press the MESSAGE ▼ or MESSAGE ▲ keys to scroll through sub-page headers until the required message is reached.
  The end of a page is indicated by the message **END OF PAGE**. The beginning of a page is indicated by **TOP OF PAGE**.

Each page is broken further into subgroups.

- ▷ Press MESSAGE ▼ or MESSAGE ▲ to cycle through subgroups until the desired subgroup appears on the screen.
- ▷ Press the MESSAGE ▶ or ENTER key to enter a subgroup.

```
■ PASSCODE          [▷]
```

Each sub-group has one or more associated settings messages.

- ▷ Press the MESSAGE ▶ or ENTER key to enter the setting message.

```
ENTER PASSCODE FOR
ACCESS:
```

- ▷ Press the MESSAGE ▼ or MESSAGE ▲ keys to scroll through more settings messages, if applicable.

The majority of settings are changed by pressing the VALUE keys until the desired value appears, and then pressing ENTER. Numeric settings may also be entered through the numeric keys (including decimals). If the entered settings is out of range, the original settings value reappears. If the entered settings is out of step, an adjusted value will be stored (e.g. 101 for a settings that steps 95, 100, 105 is stored as 100). If a mistake is made entering the new value, pressing ESCAPE returns the settings to its original value. Text editing is a special case described in detail in *Entering Alphanumeric Text* on page 4–5. Each time a new settings is successfully stored, a message will flash on the display stating **NEW SETPOINT HAS BEEN STORED**.

- ▷ Press the 4, 6, 9 keys, then press ENTER. The following flash message is displayed:

```
NEW SETPOINT HAS
BEEN STORED
```

and the display returns to:

```
SETPOINT ACCESS:
Permitted
```

1. Press ESCAPE or MESSAGE ◀ to exit the subgroup. Pressing ESCAPE or MESSAGE ◀ numerous times will always return the cursor to the top of the page.

4.1.7 Diagnostic Messages

Diagnostic messages are automatically displayed for any active conditions in the relay such as trips, alarms, or asserted logic inputs. These messages provide a summary of the present state of the relay. The Message LED flashes when there are diagnostic messages available; press the MENU key until the relay displays **TARGET MESSAGES**, then press the

MESSAGE ▶ key, followed by the MESSAGE ▼ key, to scroll through the messages. For additional information and a complete list of diagnostic messages, refer to *Diagnostic Messages in Chapter 6*.

4.1.8 Self-Test Warnings

The 469 relay performs self test diagnostics at initialization (after power up) and continuously as a background task to ensure the hardware and software is functioning correctly. Self-test warnings indicate either a maintenance alert, or a minor or major problem. Maintenance alerts and minor problems are problems that does not compromise motor protection. Major problems are very serious problems that compromise all aspects of relay operation. Upon detection of either a minor or a major problem the relay will:

- De-energize the self-test warning relay
- Light the self-test warning LED
- Flash a diagnostic message periodically on the display screen

Upon detection of a maintenance alert, the relay will flash a diagnostic message on the screen, or record an event. The self-test relay remains energized and the service LED remains off.

Table 4–1: Self-Test Warnings

Message	Severity	Failure description
Self-Test Warning 1 Replace Immediately	Major	Caused by detection of a corrupted location in the program memory as determined by a CRC error check. Any function of the relay is susceptible to malfunction from this failure.
Self-Test Warning 2 Replace Immediately	Major	Caused by a failure of the analog to digital converter A/D1. The integrity of system input measurements is affected by this failure.
Self-Test Warning 3 Replace Immediately	Major	Caused by a failure of the analog to digital converter A/D2. The integrity of system input measurements is affected by this failure.
Self-Test Warning 5 Replace Immediately	Major	Caused by out of range reading of self-test RTD 13. The integrity of system input measurements is affected by this failure.
Self-Test Warning 6 Replace Immediately	Major	Caused by out of range reading of self-test RTD 14. The integrity of system input measurements is affected by this failure.
Self-Test Warning 7 Replace Immediately	Major	Caused by out of range reading of self-test RTD 15. The integrity of system input measurements is affected by this failure.
Self-Test Warning 8 Replace Immediately	Major	Caused by out of range reading of self-test RTD 16. The integrity of system input measurements is affected by this failure.
Self-Test Warning 9	Maintenance Alert	Occurs if the microprocessor has reset unexpectedly and system input measurements were interrupted for at least 2 seconds. This warning appears in the event recorder.

Table 4–1: Self-Test Warnings

Message	Severity	Failure description
Self-Test Warning 10 Schedule Maintenance	Maintenance Alert	Occurs if factory data was not set or was lost. Factory data includes: serial number, calibration date, and order code.
Clock Not Set Program Date/Time	Minor	Occurs if the clock has not been set.
Unit Temp. Exceeded Service/CheckAmbient	Minor	Caused by the detection of unacceptably low (less than -40°C) or high (greater than +85°C) temperatures detected inside the unit.
Unit Not Calibrated Replace Immediately	Minor	This warning occurs when the relay has not been factory calibrated.
Relay Not Configured Consult User Manual	Minor	This warning occurs when the 469 CT Primary or FLA is set to “None”.
Service Required Schedule Maintenance	Minor	Caused by a failure of the real time clock circuit. The ability of the relay to maintain the current date and time is lost.

4.1.9 Flash Messages

Flash messages are warning, error, or general information messages displayed in response to certain key presses. The length of time these messages remain displayed can be programmed in **S1 RELAY SETUP** ▷▽ **PREFERENCES** ▷▽ **DEFAULT MESSAGE CYCLE TIME**. The factory default flash message time is 4 seconds. For additional information and a complete list of flash messages, refer to *Flash Messages* on page 6–38 .

4.2 EnerVista 469 Setup Software Interface

4.2.1 Overview

The front panel provides local operator interface with a liquid crystal display. The EnerVista 469 Setup software provides a graphical user interface (GUI) as one of two human interfaces to a 469 device. The alternate human interface is implemented via the device's faceplate keypad and display (see the first section in this chapter).

The EnerVista 469 Setup software provides a single facility to configure, monitor, maintain, and trouble-shoot the operation of relay functions, connected over serial communication networks. It can be used while disconnected (i.e. off-line) or connected (i.e. on-line) to a 469 device. In off-line mode, Settings files can be created for eventual downloading to the device. In on-line mode, you can communicate with the device in real-time.

This no-charge software, provided with every 469 relay, can be run from any computer supporting Microsoft Windows 95 or higher. This chapter provides a summary of the basic EnerVista 469 Setup software interface features. The EnerVista 469 Setup help file provides details for getting started and using the software interface.

With the EnerVista 469 Setup running on your PC, it is possible to

- Program and modify settings
- Load/save Settings files from/to disk
- Read actual values and monitor status
- Perform waveform capture and log data
- Plot, print, and view trending graphs of selected actual values
- Download and playback waveforms
- Get help on any topic

4.2.2 Hardware

Communications from the EnerVista 469 Setup to the 469 can be accomplished three ways: RS232, RS485, and Ethernet communications. The following figures illustrate typical connections for RS232 and RS485 communications.

FIGURE 4–2: Communications using The Front RS232 Port

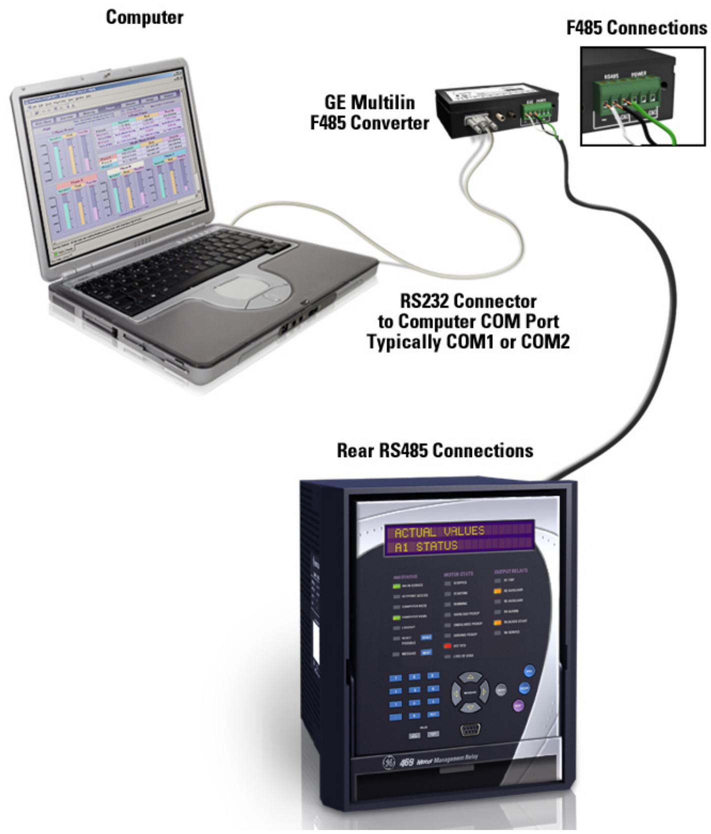


FIGURE 4–3: Communications using Rear RS485 Port

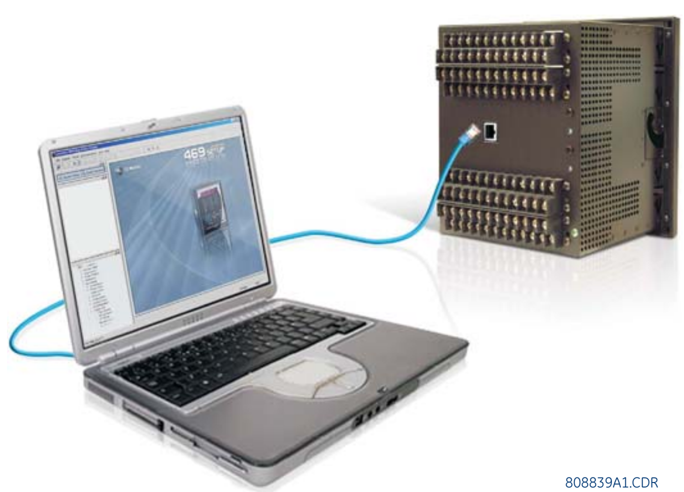


FIGURE 4–4: Communications using Rear Ethernet Port

4.2.3 Installing the EnerVista 469 Setup Software

The following minimum requirements must be met for the EnerVista 469 Setup software to operate on your computer.)

- Pentium class or higher processor (Pentium II 400 MHz or better recommended)
- Microsoft Windows 95, 98, 98SE, NT 4.0 (SP4 or higher), 2000, XP
- 128 of RAM (256 MB recommended)
- Minimum of 200 MB hard disk space

After ensuring these minimum requirements, use the following procedure to install the EnerVista 469 Setup software from the enclosed GE EnerVista CD.

▷ Insert the GE EnerVista CD into your CD-ROM drive.

▷ Click the **Install Now** button and follow the installation instructions to install the no-charge EnerVista software on the local PC.

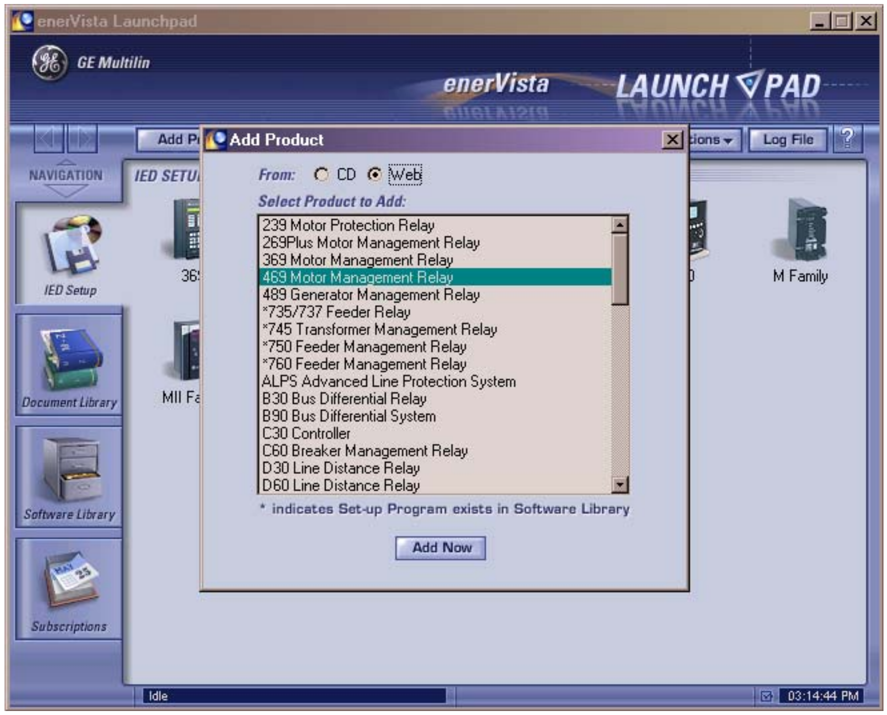
▷ When installation is complete, start the EnerVista Launchpad application.

▷ Click the **IED Setup** section of the **Launch Pad** window.

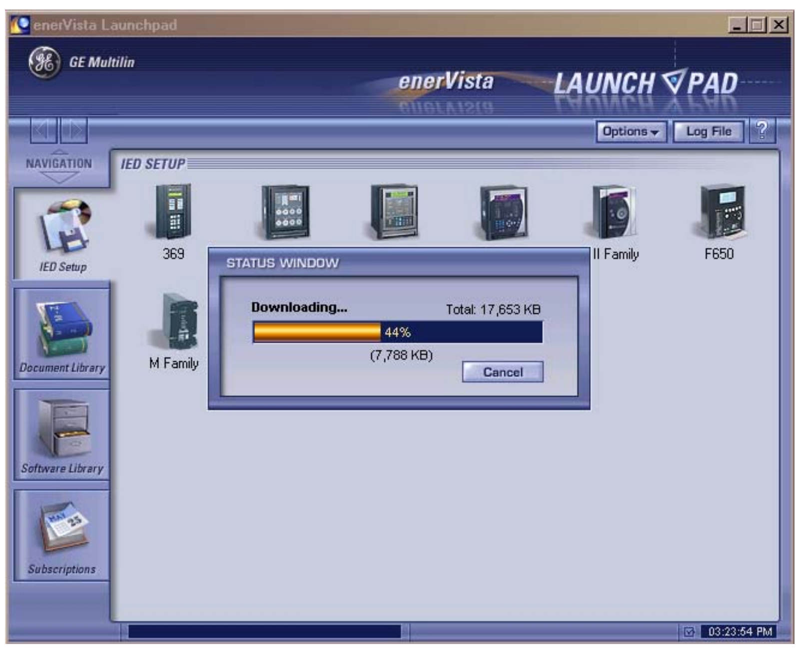
▷ In the EnerVista Launch Pad window, click the **Add Product** button and select the “469 Motor Management Relay” from the Install Software window as shown below.

▷ Select the “Web” option to ensure the most recent software release, or select “CD” if you do not have a web connection.

▷ Click the **Add Now** button to list software items for the 469.



EnerVista Launchpad will obtain the latest installation software from the Web or CD and automatically start the installation process. A status window with a progress bar will be shown during the downloading process.



▷ Select the complete path, including the new directory name, where the EnerVista 469 Setup software will be installed.

▷ Click on Next to begin the installation.
The files will be installed in the directory indicated and the installation program will automatically create icons and add EnerVista 469 Setup software to the Windows start menu.

▷ Click Finish to end the installation.
The 469 device will be added to the list of installed IEDs in the EnerVista Launchpad window, as shown below.

4.3 Connecting EnerVista 469 Setup to the Relay

4.3.1 Configuring Serial Communications

Before starting, verify that the serial cable is properly connected to either the RS232 port on the front panel of the device (for RS232 communications) or to the RS485 terminals on the back of the device (for RS485 communications). See *Hardware* on page 4–11 for connection details.

This example demonstrates an RS232 connection. For RS485 communications, the GE Grid Solutions F485 converter will be required. Refer to the F485 manual for additional details. To configure the relay for Ethernet communications, see *Configuring Ethernet Communications* on page 4–18.

▷ Install and start the latest version of the EnerVista 469 Setup software (available from the GE EnerVista CD).
See the previous section for the installation procedure.

▷ Click on the **Device Setup** button to open the Device Setup window.

▷ Click the **Add Site** button to define a new site.

▷ Enter the desired site name in the **Site Name** field.
If desired, a short description of site can also be entered along with the display order of devices defined for the site. In this example, we will use “Pumping Station 1” as the site name.

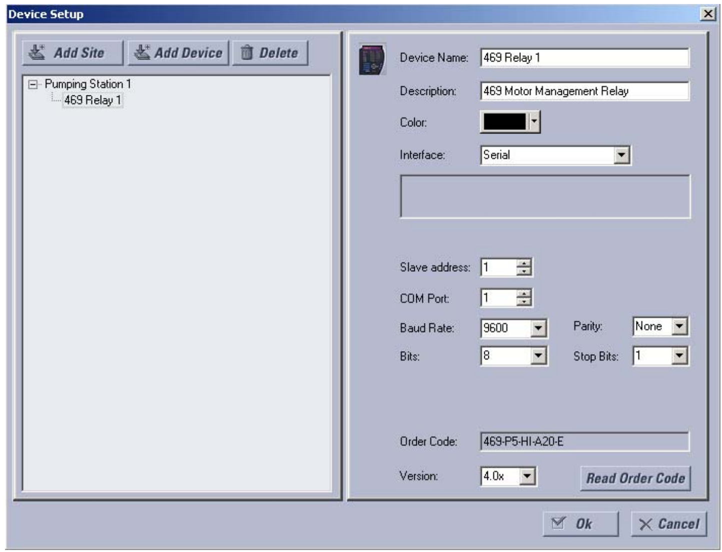
▷ Click the **OK** button when complete.

The new site will appear in the upper-left list in the EnerVista 469 Setup window.

▷ Click the **Add Device** button to define the new device.

▷ Enter the desired name in the **Device Name** field and a description (optional) of the site.

▷ Select "Serial" from the Interface drop-down list.
This will display a number of interface parameters that must be entered for proper RS232 functionality.



– Enter the slave address and COM port values (from the **S1 469 SETUP ▷▽ SERIAL PORTS** menu) in the Slave Address and COM Port fields.

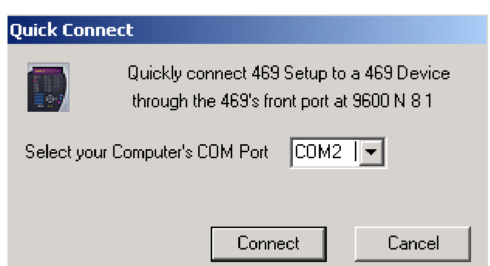
– Enter the physical communications parameters (baud rate and parity settings) in their respective fields. Note that when communicating to the relay from the front port, the default communications settings are a baud rate of 9600, with slave address of 1, no parity, 8 bits, and 1 stop bit. **These values cannot be changed**.

2. Click the **Read Order Code** button to connect to the 469 device and upload the order code. If an communications error occurs, ensure that the 469 serial communications values entered in the previous step correspond to the relay setting values.
3. Click **OK** when the relay order code has been received. The new device will be added to the Site List window (or Online window) located in the top left corner of the main EnerVista 469 Setup window.

The 469 Site Device has now been configured for serial communications. Proceed to *Connecting to the Relay* on page 4–19 to begin communications.

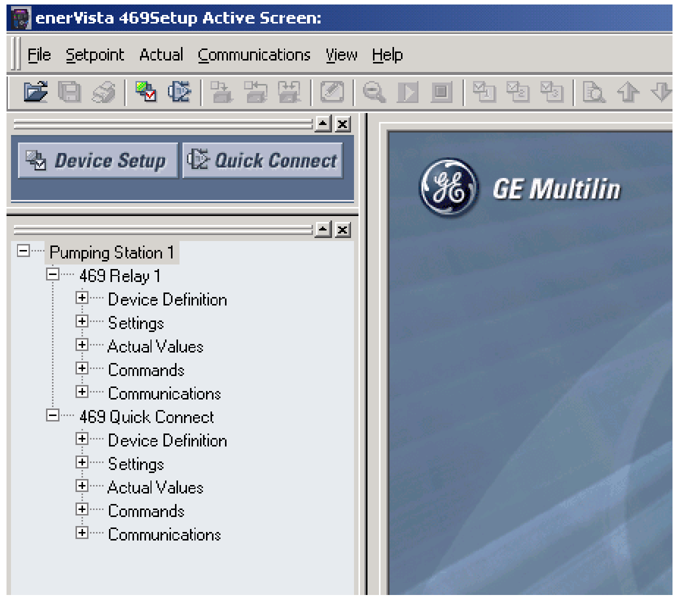
4.3.2 Using the Quick Connect Feature

The Quick Connect button can be used to establish a fast connection through the front panel RS232 port of a 469 relay. The following window will appear when the Quick Connect button is pressed:



As indicated by the window, the Quick Connect feature quickly connects the EnerVista 469 Setup software to a 469 front port with the following settings: 9600 baud, no parity, 8 bits, 1 stop bit. Select the PC communications port connected to the relay and press the **Connect** button.

The EnerVista 469 Setup software will display a window indicating the status of communications with the relay. When connected, a new Site called “Quick Connect” will appear in the Site List window. *The properties of this new site cannot be changed.*



The 469 Site Device has now been configured via the Quick Connect feature for serial communications. Proceed to *Connecting to the Relay* on page 4–19 to begin communications.

4.3.3 Configuring Ethernet Communications

Before starting, verify that the Ethernet cable is properly connected to the RJ-45 Ethernet port.

▷ Install and start the latest version of the EnerVista 469 Setup software (available from the GE enerVista CD). See the previous section for the installation procedure.

▷ Click on the **Device Setup** button to open the Device Setup window and click the **Add Site** button to define a new site.

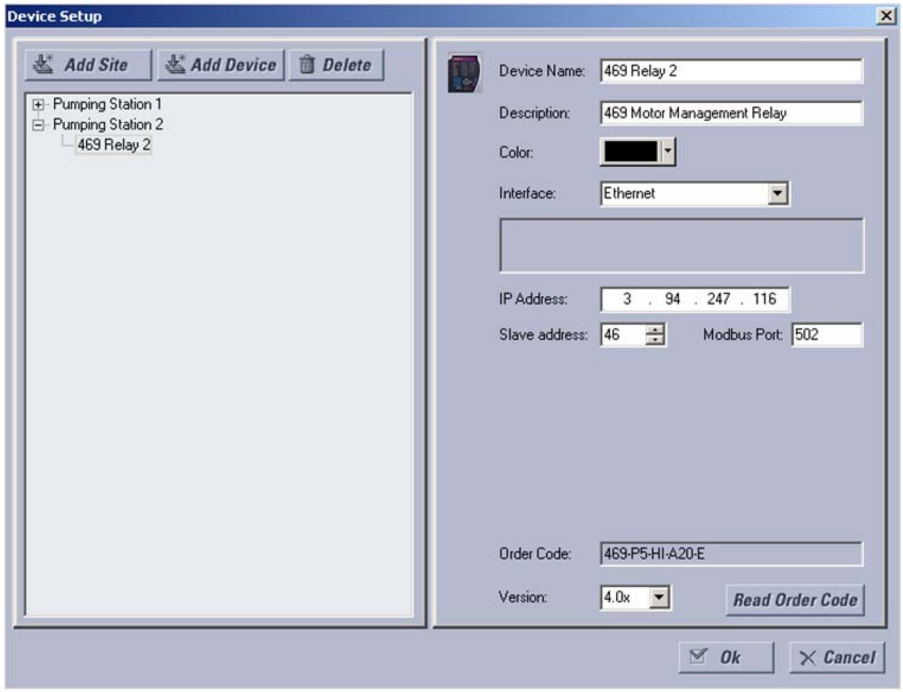
▷ Enter the desired site name in the **Site Name** field. If desired, a short description of site can also be entered along with the display order of devices defined for the site. In this example, we will use “Pumping Station 2” as the site name. Click the **OK** button when complete.

The new site will appear in the upper-left list.

▷ Click the **Add Device** button to define the new device.

▷ Enter the desired name in the **Device Name** field and a description (optional).

▷ Select “Ethernet” from the Interface drop-down list.
This will display a number of interface parameters that must be entered for proper Ethernet functionality.



▷ Enter the IP address assigned to the relay.

▷ Enter the slave address and Modbus port values (from the **S1 469 SETUP ▷▽ SERIAL PORTS** menu) in the **Slave Address** and **Modbus Port** fields. Refer to GEK-106491C: *469 Communications Guide*.

▷ Click the **Read Order Code** button to connect to the 469 device and upload the order code.
If a communications error occurs, ensure that the 469 Ethernet communications values entered in the previous step correspond to the relay setting values.

▷ Click **OK** when the relay order code has been received.
The new device will be added to the Site List window (or Online window) located in the top left corner of the main EnerVista 469 Setup window.

The 469 Site Device has now been configured for Ethernet communications. Proceed to the following section to begin communications.

4.3.4 Connecting to the Relay

Now that the communications parameters have been properly configured, the user can easily connect to the relay.

▷ Expand the Site list by double clicking on the site name or clicking on the «+» box to list the available devices for the given site (for example, in the “Pumping Station 1” site shown below).

▷ Click the «+» box to expand the desired device trees.
The following list of headers is shown for each device:

- Device Definitions
- Settings
- Actual Values
- Commands
- Communications

▷ Expand the **Settings > Relay Setup** list item

▷ Double click on Front Panel to open the Front Panel Settings window as shown below:

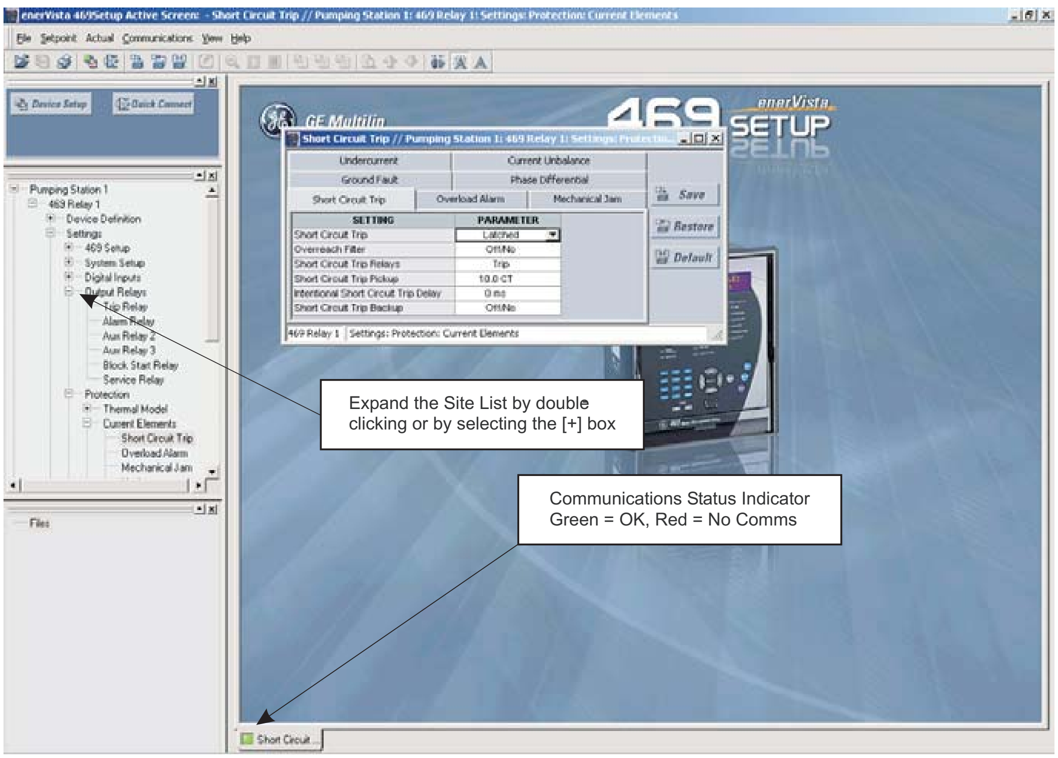


FIGURE 4–5: Main Window after Connection

The Front Panel Settings window will open with a corresponding status indicator on the lower left of the EnerVista 469 Setup window.

If the status indicator is red, verify that the serial cable is properly connected to the relay, and that the relay has been properly configured for communications (steps described earlier).

The front panel settings can now be edited, printed, or changed according to user specifications. Other settings and commands windows can be displayed and edited in a similar manner. Actual values windows are also available for display. These windows can be locked, arranged, and resized at will.

NOTE

Refer to the EnerVista 469 Setup Help File for additional information about the using the software.

4.4 Working with Settings and Settings Files

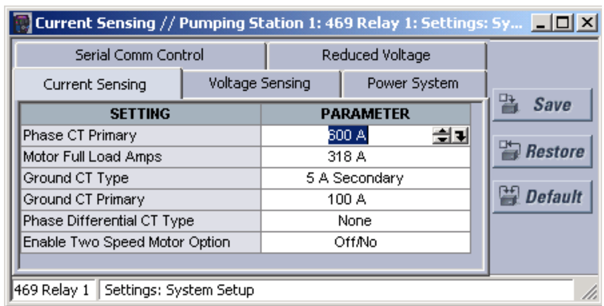
4.4.1 Engaging a Device

The EnerVista 469 Setup software may be used in on-line mode (relay connected) to directly communicate with a 469 relay. Communicating relays are organized and grouped by communication interfaces and into sites. Sites may contain any number of relays selected from the SR or UR product series.

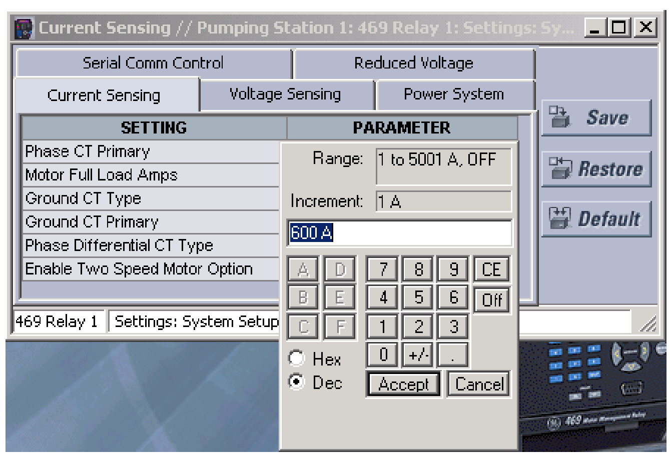
4.4.2 Entering Settings

The System Setup page will be used as an example to illustrate the entering of settings. In this example, we will be changing the current sensing settings.

- ▷ Establish communications with the relay.
- ▷ Select the **Settings > System Setup** menu item. This can be selected from the device settings tree or the main window menu bar.
- ▷ Select the **PHASE CT PRIMARY** settings by clicking anywhere in the parameter box. This will display three arrows: two to increment/ decrement the value and another to launch the numerical calculator.



- ▷ Click on the arrow at the end of the box to display a numerical keypad interface that allows you to enter a value within the settings range displayed near the top of the keypad:

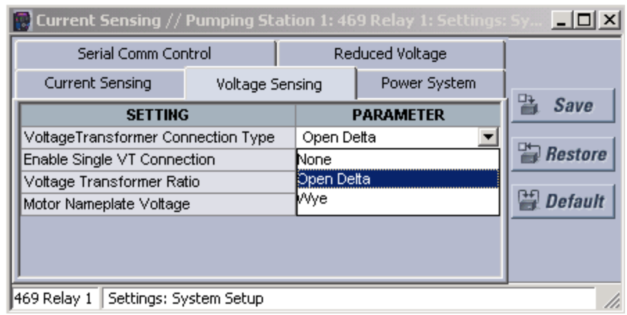


- ▷ Click **Accept** to exit from the keypad and keep the new value.

▷ Click on **Cancel** to exit from the keypad and retain the old value.

▷ For settings requiring non-numerical pre-set values (e.g. VT CONNECTION TYPE above, in the Voltage Sensing tab), click anywhere within the settings value box to display a drop-down selection menu arrow.

▷ Click on the arrow to select the desired settings.



For settings requiring an alphanumeric text string (e.g. message scratchpad messages), the value may be entered directly within the settings value box.

▷ In the Settings / System Setup dialog box, click on **Save** to save the values into the 469.

▷ Click **Yes** to accept any changes.

▷ Click **No**, and then **Restore** to retain previous values and exit.

4.4.3 File Support

Opening any EnerVista 469 Setup file will automatically launch the application or provide focus to the already opened application. If the file is a Settings file (has a '469' extension) which had been removed from the Settings List tree menu, it will be added back to the Settings List tree.

New files will be automatically added to the tree, which is sorted alphabetically with respect to Settings file names.

4.4.4 Using Settings Files

Overview

The EnerVista 469 Setup software interface supports three ways of handling changes to relay settings:

- In *off-line* mode (relay disconnected) to create or edit relay Settings files for later download to communicating relays.
- Directly modifying relay settings while *connected* to a communicating relay, then saving the settings when complete.
- Creating/editing Settings files while *connected* to a communicating relay, then saving them to the relay when complete.

Settings files are organized on the basis of file names assigned by the user. A Settings file contains data pertaining to the following types of relay settings:

- Device Definition
- Product Setup
- System Setup
- Digital Inputs
- Output Relays
- Protection Elements
- Monitoring Functions
- Analog Inputs and Outputs
- Relay Testing
- Settings for Two-Speed Motors
- User Memory Map Setting Tool

Factory default values are supplied and can be restored after any changes.

The EnerVista 469 Setup display relay settings with the same hierarchy as the front panel display. For specific details on settings, refer to Chapter 5.

Downloading and Saving Settings Files

Settings must be saved to a file on the local PC before performing any firmware upgrades. Saving settings is also highly recommended before making any settings changes or creating new Settings files.

The EnerVista 469 Setup window, Settings files are accessed in the Settings List control bar window or the Files Window. Use the following procedure to download and save Settings files to a local PC.

▷ Ensure that the site and corresponding device(s) have been properly defined and configured as shown in *Connecting EnerVista 469 Setup to the Relay* on page 4–16.

▷ Select the desired device from the site list.

▷ Select the **File > Read Settings from Device** menu item to obtain settings information from the device.

After a few seconds of data retrieval, the software will request the name and destination path of the Settings file. The corresponding file extension will be automatically assigned.

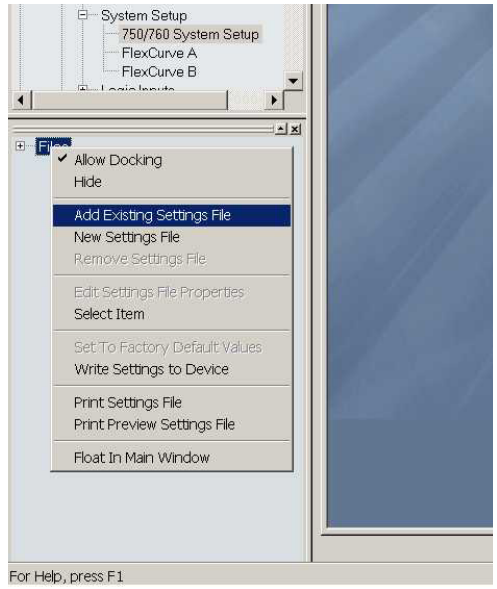
▷ Press **Save** to complete the process. A new entry will be added to the tree, in the File pane, showing path and file name for the Settings file.

Adding Settings Files to the Environment

The EnerVista 469 Setup software provides the capability to review and manage a large group of Settings files. Use the following procedure to add a new or existing file to the list.

▷ In the files pane, right-click on 'Files'.

▷ Select the **Add Existing Settings File** item as shown:



The Open dialog box will appear, prompting for a previously saved Settings file.

▷ As for any other Windows® application, browse for the file to add then click **Open**. The new file and complete path will be added to the file list.

Creating a New Settings File using Motor Settings Auto-Config

The EnerVista 469 Setup software allows the user to create new Settings files independent of a connected device. These can be uploaded to a relay at a later date.

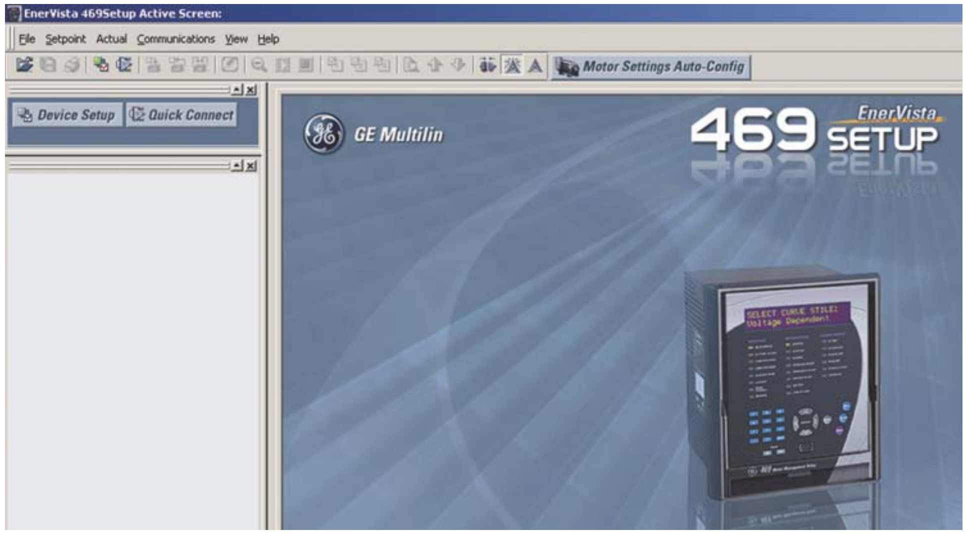
One method of doing this - the **EnerVista Motor Settings Auto-Config** option - allows the user to easily create new Settings Files automatically, using a guided step-by-step process as outlined below.

NOTE

The Motor Settings Auto-Config option does NOT allow the user to configure existing Settings Files.

The following procedure illustrates how to create new Settings Files using the Motor Settings Auto-Config option:

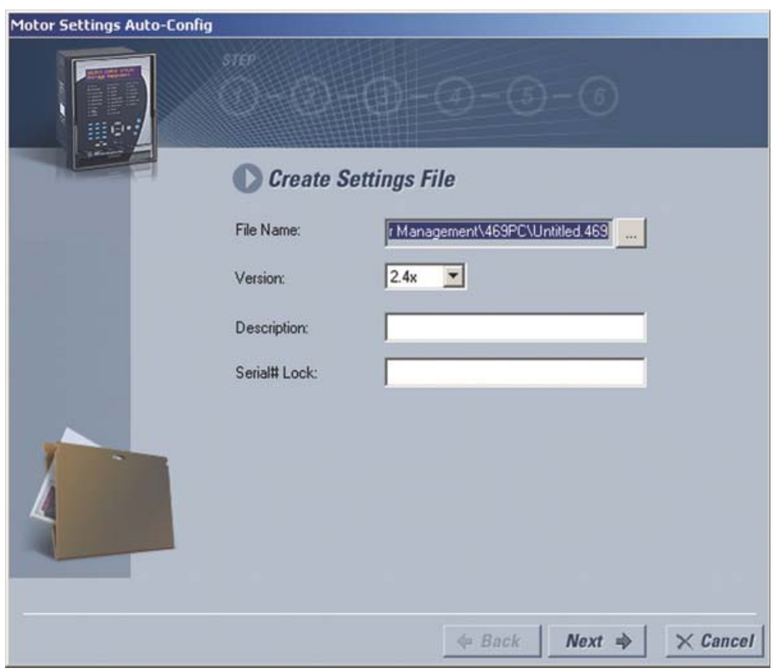
▷ At the top of the screen, click on the **Motor Settings Auto-Config** button.



OR

▷ On the main menu, select **File > Motor Settings Auto-Config**

The EnerVista 469 Setup software displays the following box, allowing the configuration of the Settings File as shown. .



NOTE

It is important to define the correct firmware version to ensure that settings not available in a particular version are not downloaded into the relay

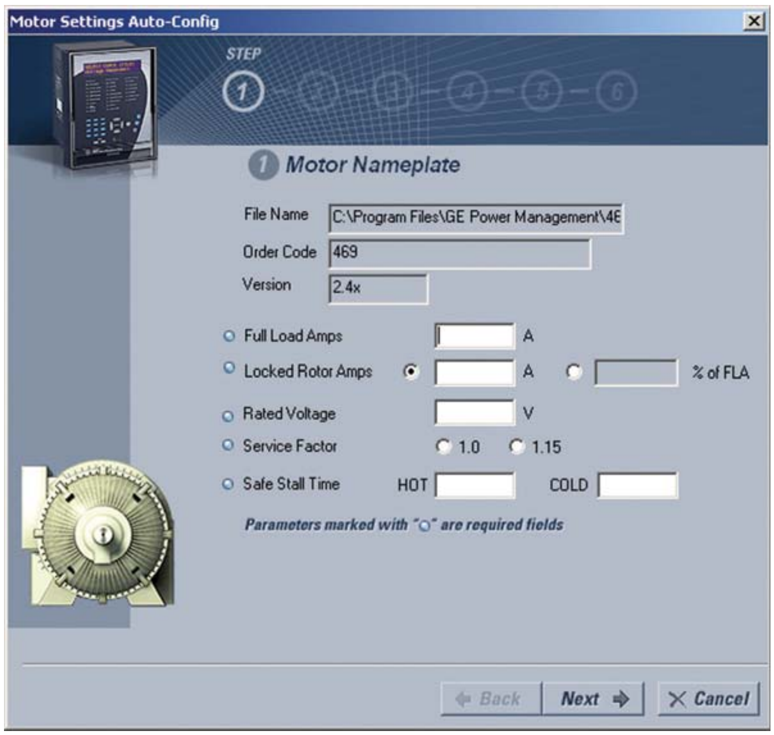
▷ Select the Firmware **Version** for the new Settings File.

▷ For future reference, enter some useful information in the **Description** box to facilitate the identification of the device and the purpose of the file.

▷ To select a file name and path for the new file, click the button [...] beside the **File Name** box.

▷ Select the file name and path to store the file, or select any displayed file name to update an existing file.
All 469 Settings Files should have the extension '469' (for example, 'motor1.469').

▷ Click **Next** and **OK** to continue the process.
A new window - **Step 1** - will appear:

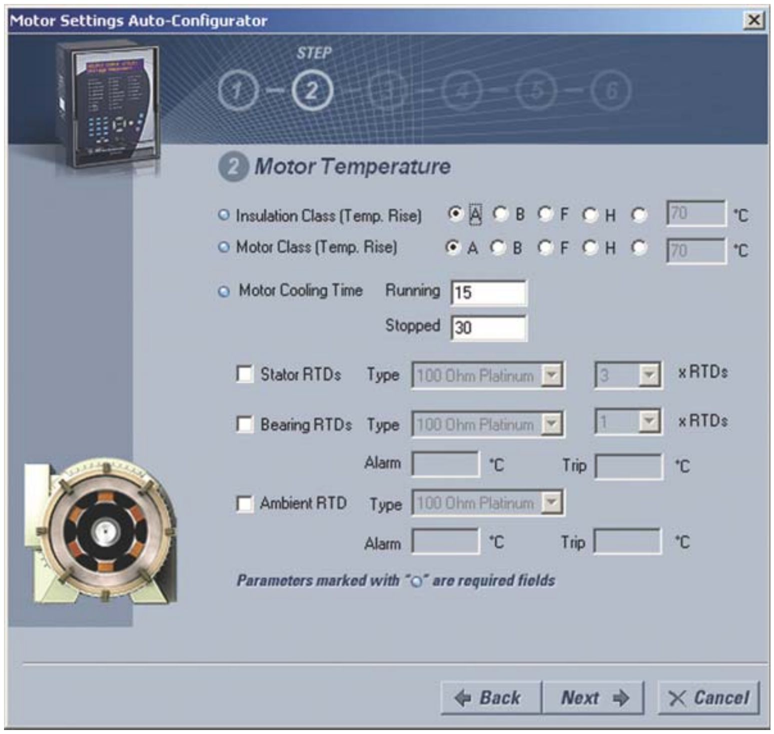


▷ Fill in the fields as indicated.

▷ When complete, **press** Next.
The next window - **Step 2** - will appear as follows:

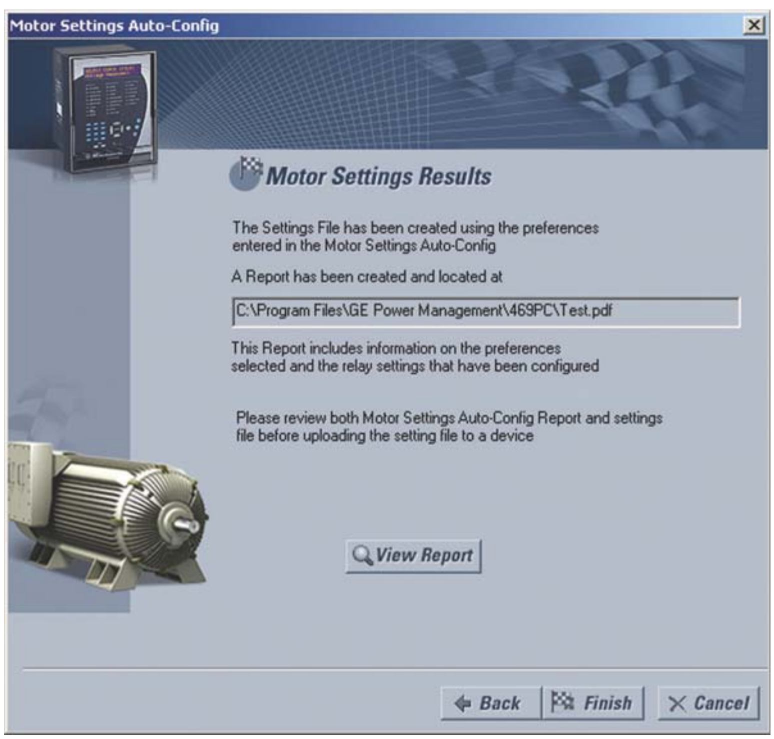
NOTE

As each Step is completed, the user will be prompted to make appropriate changes to what has been entered, if the Auto-Config determines that the parameter entered is incorrect or inappropriate for the situation.



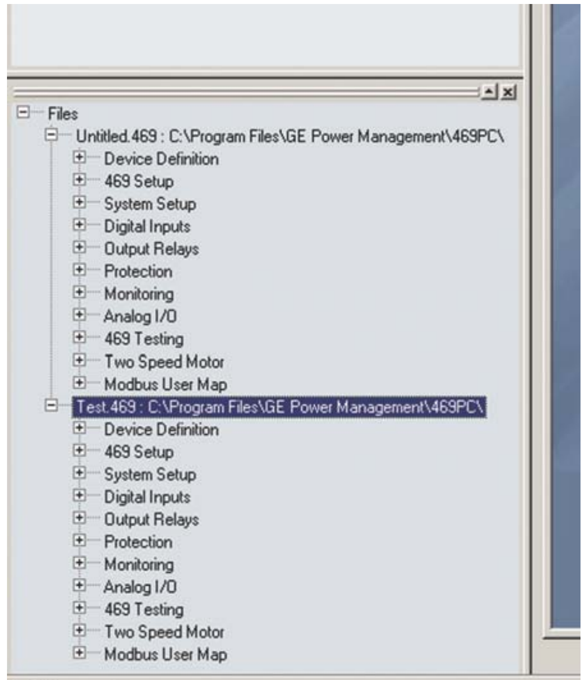
▷ Continue filling in the fields as indicated.

Once you have completed all 6 Steps, the final window will show as follows:



▷ Click **Finish** to complete the Auto-Config procedure.
The Motor Settings Auto-Config window will disappear.

A new Settings File containing the parameters you have just input will appear in the Files pane as shown:



Creating a New Settings File *without* using Motor Settings Auto-Config

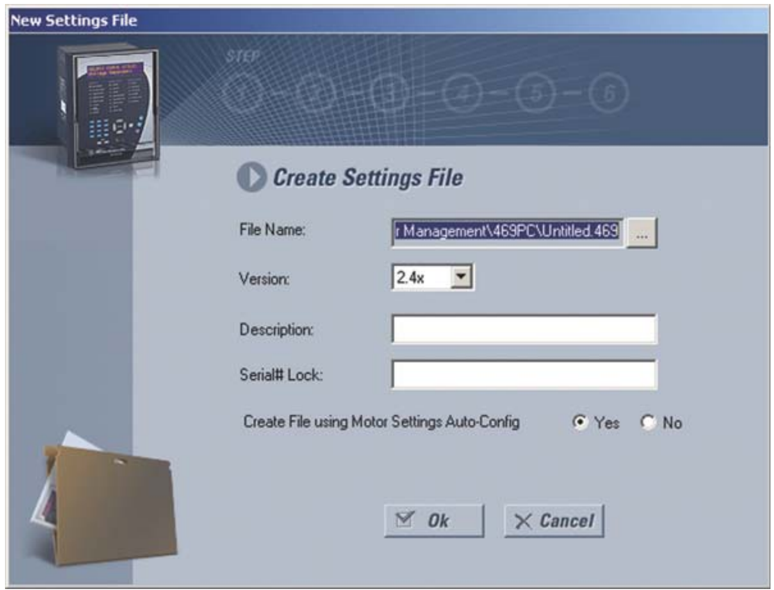
The EnerVista 469 Setup software allows the user to create new Settings files independent of a connected device. These can be uploaded to a relay at a later date. The following manual procedure - as distinct from the Motor Settings Auto-Config option described above - illustrates how to create new Settings Files.

▷ In the File pane, right click on **File**.

▷ Select the **New Settings File** item.
The EnerVista 469 Setup software displays the following window, allowing the configuration of the Settings File as shown below.

NOTE

Note that this window allows you to choose between creating your Settings File manually or using the Motor Settings Auto-Config as detailed above.



NOTE

It is important to define the correct firmware version to ensure that settings not available in a particular version are not downloaded into the relay

▷ Select the Firmware **Version** for the new Settings File.

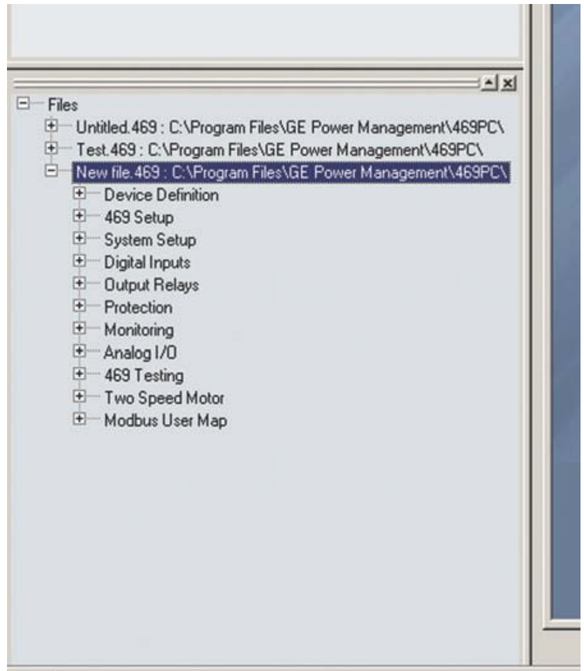
▷ For future reference, enter some useful information in the **Description** box to facilitate the identification of the device and the purpose of the file.

▷ To select a file name and path for the new file, click the button beside the **File Name** box [...].

▷ Select the file name and path to store the file, or select any displayed file name to update an existing file.
All 469 Settings Files should have the extension '469' (for example, 'motor1.469').

▷ Click the appropriate radio button (**yes** or **no**) to choose between Auto-Config or manual creation of the Settings File.

▷ Click **OK** to complete the process.
Once this step is completed, the new file, with a complete path, will be added to the EnerVista 469 Setup software environment.



▷ Enter the appropriate settings manually to complete the new Settings File.

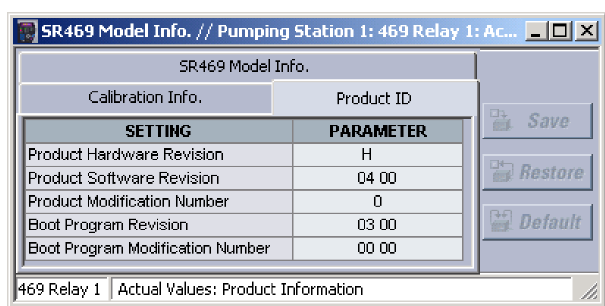
Upgrading Settings Files to a New Revision

It is often necessary to upgrade the revision code for a previously saved Settings file after the 469 firmware has been upgraded (for example, this is required for firmware upgrades). This is illustrated in the following procedure.

▷ Establish communications with the 469 relay.

▷ Select the **Actual > Product Information** menu item.

▷ Record the Software Revision identifier of the relay firmware as shown below.

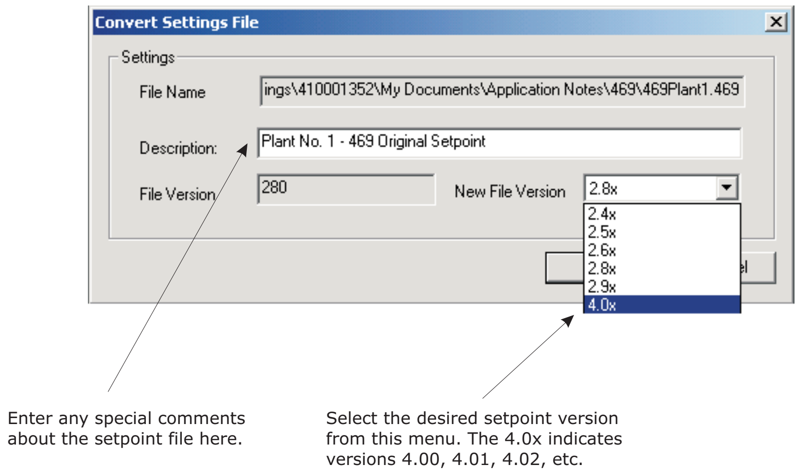


▷ Load the Settings file to be upgraded into the EnerVista 469 Setup environment as described in *Adding Settings Files to the Environment* on page 4–24.

▷ In the File pane, select the saved Settings file.

▷ From the main window menu bar, select the **File > Properties** menu item and note the version code of the Settings file.
If this version (e.g. 4.0X shown below) is different than the **Software Revision** code noted in step 2, select a **New File Version** that matches the Software Revision code from the pull-down menu.

For example, if the software revision is 2.80 and the current Settings file revision is 4.00, change the Settings file revision to "4.0X", as shown below:



▷ When complete, click Convert to convert the Settings file to the desired revision.
A dialog box will request confirmation. See *Loading Settings from a File* on page 4–33 for instructions on loading this Settings file into the 469.

Printing Settings and Actual Values

The EnerVista 469 Setup software allows the user to print partial or complete lists of settings and actual values. Use the following procedure to print a list of settings:

▷ Select a previously saved Settings file in the File pane or establish communications with a 469 device.

▷ From the main window, select the **File > Print Settings** menu item.
The Print/Export Options dialog box will appear.

▷ Select **Settings** in the upper section and select either **Include All Features** (for a complete list) or **Include Only Enabled Features** (for a list of only those features which are currently used) in the filtering section.

▷ Click **OK**.

The process for **File > Print Preview Settings** is identical to the steps above.

Settings lists can be printed in the same manner by right clicking on the desired file (in the file list) or device (in the device list) and selecting the **Print Device Information** or **Print Settings File** options.

A complete list of actual values can also be printed from a connected device with the following procedure:

▷ Establish communications with the desired 469 device.

▷ From the main window, select the **File > Print Settings** menu item. The Print/Export Options dialog box will appear.

▷ Select **Actual Values** in the upper section.

▷ Select either **Include All Features** (for a complete list) or **Include Only Enabled Features** (for a list of only those features which are currently used) in the filtering section.

▷ Click **OK**.

Actual values lists can be printed in the same manner by right clicking on the desired device (in the device list) and selecting the **Print Device Information** option.

Loading Settings from a File

⚠WARNING

An error message will occur when attempting to download a Settings file with a revision number that does not match the relay firmware. If the firmware has been upgraded since saving the Settings file, see *Upgrading Settings Files to a New Revision* on page 4–31 for instructions on changing the revision number of a Settings file.

The following procedure illustrates how to load settings from a file. Before loading a Settings file, it must first be added to the EnerVista 469 Setup environment as described in *Adding Settings Files to the Environment* on page 4–24.

▷ Select the previously saved Settings file from the File pane of the EnerVista 469 Setup software main window.

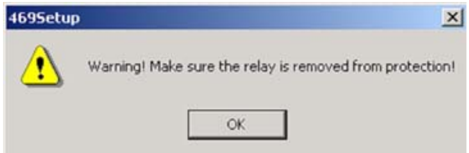
▷ Select the **File > Properties** menu item and verify that the corresponding file is fully compatible with the hardware and firmware version of the target relay.
If the versions are not identical, see *Upgrading Settings Files to a New*

Revision on page 4–31 for details on changing the Settings file version.

▷ Right-click on the selected file.

▷ Select the **Write Settings to Device** item.

The EnerVista 469 Setup software will generate the following warning message, to remind the user to remove the relay from service, before attempting to load settings into an in-service relay.:



▷ Select the target relay from the list of devices shown.

▷ Click Send.
If there is an incompatibility, an error of the following type will occur.

If there are no incompatibilities between the target device and the Settings file, the data will be transferred to the relay. An indication of the percentage completed will be shown in the bottom of the main menu.

4.5 Upgrading Relay Firmware

4.5.1 Description

To upgrade the 469 firmware, follow the procedures listed in this section. Upon successful completion of this procedure, the 469 will have new firmware installed with the original settings.

The latest firmware files are available from the GE Grid Solutions website at http://www.gegridsolutions.com.

4.5.2 Saving Settings to a File

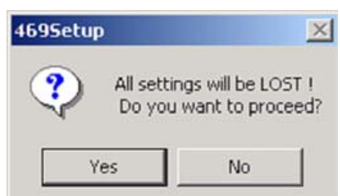
Before upgrading firmware, it is very important to save the current 469 settings to a file on your PC. After the firmware has been upgraded, it will be necessary to load this file back into the 469.

Refer to *Downloading and Saving Settings Files* on page 4–24 for details on saving relay settings to a file.

4.5.3 Loading New Firmware

Loading new firmware into the 469 flash memory is accomplished as follows:

- ▷ Connect the relay to the local PC and save the settings to a file as shown in *Downloading and Saving Settings Files* on page 4–24.
- ▷ Select the **Communications > Update Firmware** menu item.
- ▷ The warning message shown below will appear.
- ▷ Select **Yes** to proceed or **No** the cancel the process.
  Do not proceed unless you have saved the current settings.



An additional message will be displayed to ensure the PC is connected to the relay front port, as the 469 cannot be upgraded via the rear RS485 ports.

The EnerVista 469 Setup software will request the new firmware file.

▷ Locate the firmware file to load into the 469.
The firmware filename has the following format:

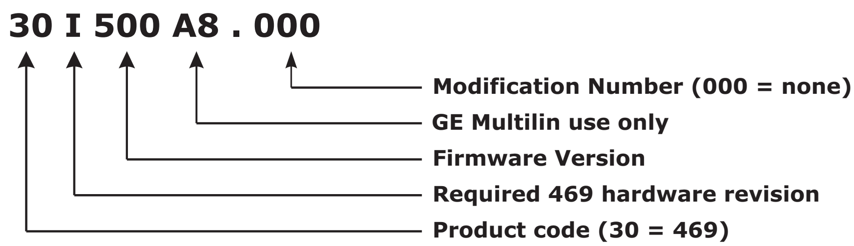


FIGURE 4–6: Firmware File Format

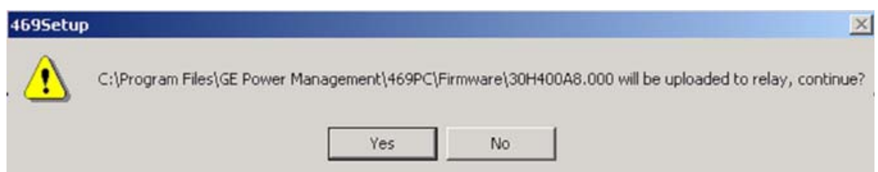
The EnerVista 469 Setup software automatically lists all filenames beginning with '30'.

▷ Select the appropriate file.

▷ Click **OK** to continue.

The software will prompt with another Upload Firmware Warning window. This will be the final chance to cancel the firmware upgrade before the flash memory is erased.

▷ Click **Yes** to continue or **No** to cancel the upgrade.



The EnerVista 469 Setup software now prepares the 469 to receive the new firmware file. The 469 will display a message indicating that it is in Upload Mode. While the file is being loaded into the 469, a status box appears showing how much of the new firmware file has been transferred and how much is remaining, as well as the upgrade status. The entire transfer process takes approximately five minutes.

The EnerVista 469 Setup software will notify the user when the 469 has finished loading the file.

▷ Carefully read any displayed messages.

▷ Click **OK** to return the main screen.

NOTE

Cycling power to the relay is recommended after a firmware upgrade.

After successfully updating the 469 firmware, the relay will not be in service and will require settings programming. To communicate with the relay, the following settings will have to me manually programmed.

MODBUS COMMUNICATION ADDRESS
BAUD RATE
PARITY (if applicable)

When communications is established, the saved settings must be reloaded back into the relay. See *Loading Settings from a File* on page 4–33 for details.

Modbus addresses assigned to firmware modules, features, settings, and corresponding data items (i.e. default values, min/max values, data type, and item size) may change slightly from version to version of firmware. Refer to GEK-106491C: *469 Communications Guide*.

The addresses are rearranged when new features are added or existing features are enhanced or modified. The **EEPROM DATA ERROR** message displayed after upgrading/downgrading the firmware is a resettable, self-test message intended to inform users that the Modbus addresses have changed with the upgraded firmware. This message does not signal any problems when appearing after firmware upgrades.

4.6 Advanced EnerVista 469 Setup Features

4.6.1 Triggered Events

While the interface is in either on-line or off-line mode, data generated by triggered specified parameters can be viewed and analyzed via one of the following:

- **Event Recorder**: The event recorder captures contextual data associated with the last 256 events, listed in chronological order from most recent to the oldest.
- **Oscillography**: The oscillography waveform traces provide a visual display of power system data captured during specific triggered events.

4.6.2 Waveform Capture (Trace Memory)

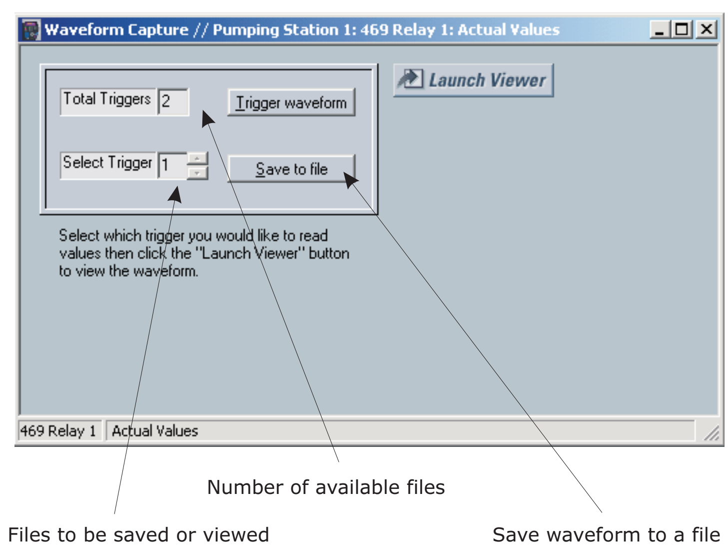
The EnerVista 469 Setup software can be used to capture waveforms (or view trace memory) from the 469 relay at the instance of a trip. A maximum of 128 cycles can be captured and the trigger point can be adjusted to anywhere within the set cycles. A maximum of 16 traces can be buffered (stored) with the buffer/cycle trade-off.

The following waveforms can be captured:

- Phase A, B, and C currents (I_a, I_b, and I_c)
- Differential A, B, and C currents (I_{diffa}, I_{diffb}, and I_{diffc})
- Ground currents (I_g)
- Phase A-N, B-N, and C-N voltages (V_{an}, V_{bn}, and V_{cn}) for wye connections
- Phase A-B and B-C (V_{ab} and V_{bc}) for open-delta connections
- Relay output status.

With EnerVista 469 Setup running and communications established,

▷ Select the **Actual > Waveform Capture** menu item to open the waveform capture setup window:



▷ Click on **Trigger Waveform** to trigger a waveform capture.

The waveform file numbering starts with the number zero in the 469; therefore, the maximum trigger number will always be one less then the total number triggers available.

▷ Click on the **Save to File** button to save the selected waveform to the local PC.
A new window will appear requesting for file name and path.

The file is saved as a CSV (comma delimited values) file, which can be viewed and manipulated with compatible third-party software.

▷ To view a previously saved file, click the **Open** button and select the corresponding CSV file.

▷ To view the captured waveforms, click the **Launch Viewer** button. A detailed Waveform Capture window will appear as shown below:

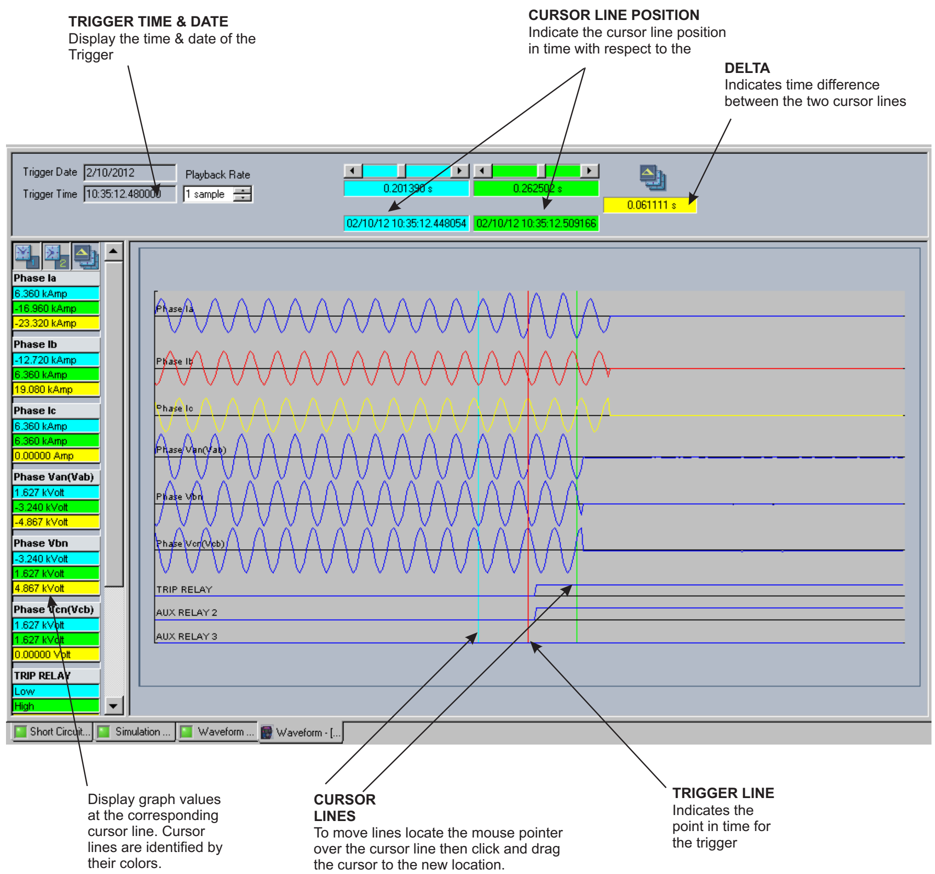
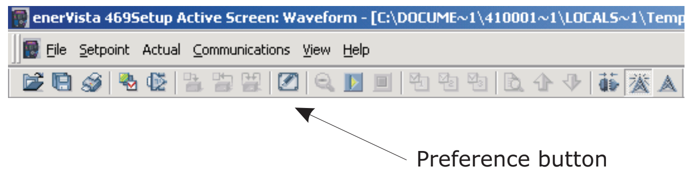


FIGURE 4–7: Waveform Capture Window Attributes

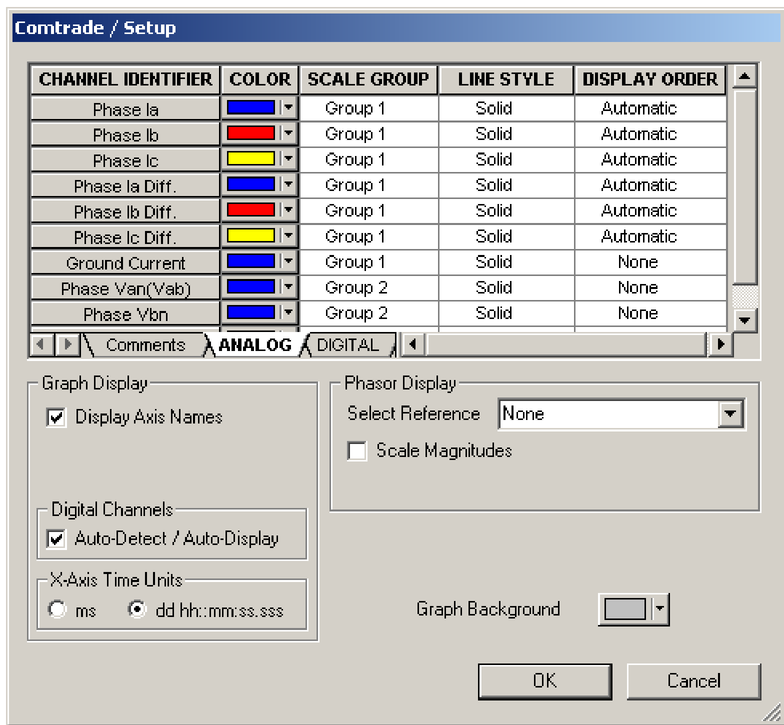
The red vertical line indicates the trigger point of the relay.

The date and time of the trigger is displayed at the top left corner of the window. To match the captured waveform with the event that triggered it, make note of the time and date shown in the graph. Then, find the event that matches the same time and date in the event recorder. The event record will provide additional information on the cause and the system conditions at the time of the event. Additional information on how to download and save events is shown in *Event Recorder* on page 4–44.

▷ From the window main menu bar, press the Preference button to change the graph attributes.



The following window will appear:



▷ Change the color of each graph as desired.

▷ Select other options as required, by checking the appropriate boxes.

▷ Click **OK** to store these graph attributes, and to close the window.

The Waveform Capture window will reappear with the selected graph attributes available for use.

4.6.3 Phasors

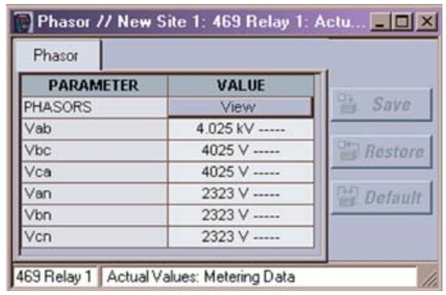
The EnerVista 469 Setup software can be used to view the phasor diagram of three-phase currents and voltages. The phasors are for: phase voltages Va, Vb, and Vc; phase currents Ia, Ib, and Ic.

With the EnerVista 469 Setup software running and communications established,

▷ Open the **Actual Values > Metering Data** window.

▷ Click on the Phasors tab.

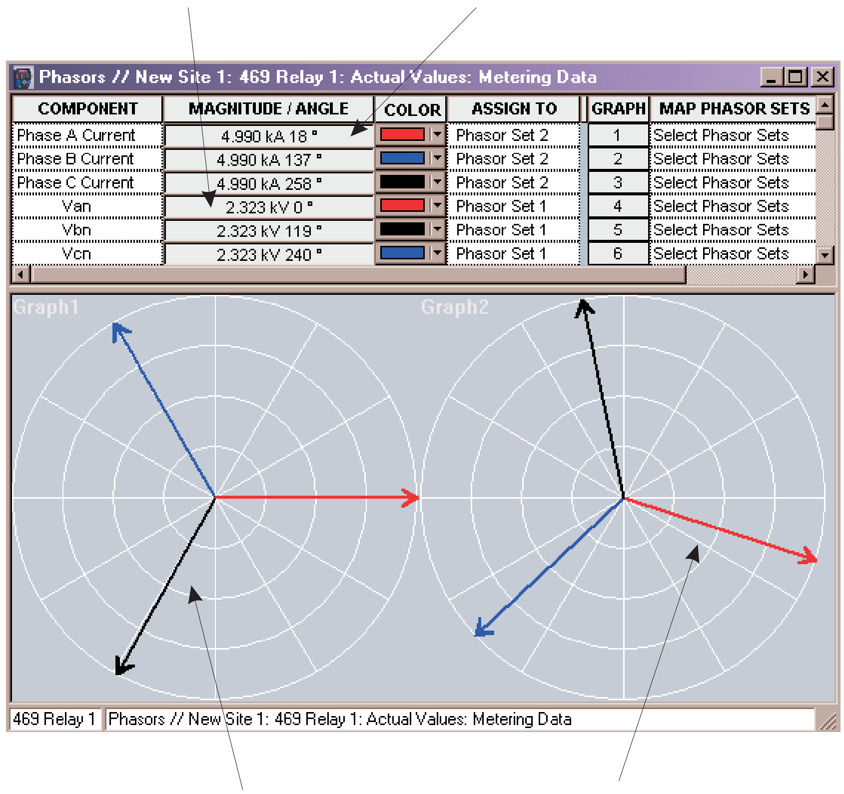
The EnerVista 469 Setup software will display the following window:



▷ Press the “View” button to display the following window:

VOLTAGE LEVEL
Displays the value
and the angle of
the voltage phasors

CURRENT LEVEL
Displays the value
and angle of the
current phasor



VOLTAGE VECTORS
Assigned to Phasor
Set 1, Graph 1

CURRENT VECTORS
Assigned to Phasor
Set 2, Graph 2

The 469 Motor Management Relay was designed to display lagging angles. Therefore, if a system condition would cause the current to lead the voltage by 45°, the 469 relay will display such angle as 315° Lag instead of 45° Lead.

⚠WARNING

When the currents and voltages measured by the relay are zero, the angles displayed by the relay and those shown by the EnerVista 469 Setup software are not fixed values.

4.6.4 Trending (Data Logger)

The trending or data logger feature is used to sample and record up to eight actual values at an interval defined by the user. Several parameters can be trended and graphed at sampling periods ranging from 1 second up to 1 hour. The parameters which can be trended by the EnerVista 469 Setup software are:

- **Currents/Voltages**:

  Phase Currents A, B, and C, and Average Phase Current
  Motor Load
  Current Unbalance
  Ground Current
  Differential Currents A, B, and C
  System Frequency
  Voltages Vab, Vbc, Vca Van, Vbn & Vcn

- **Power**:

  Power Factor
  Real (kW or hp) Reactive (kvar), and Apparent (kVA) Power
  Positive Watthours
  Positive and Negative Varhours
  Torque

- **Temperature**:

  Hottest Stator RTD
  Thermal Capacity Used
  RTDs 1 through 12

- **Demand**:

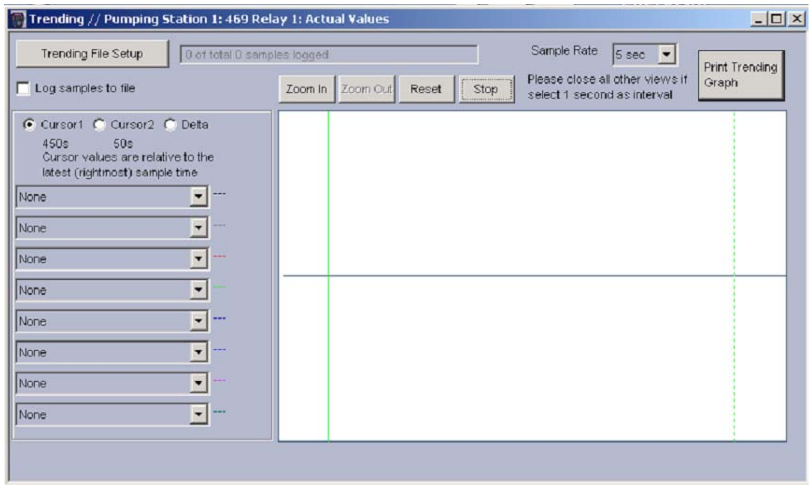
  Current
  Peak Current
  Reactive Power
  Peak Reactive Power
  Apparent Power
  Peak Apparent Power

- **Others**:

  Analog Inputs 1, 2, 3, and 4
  Tachometer

With EnerVista 469 Setup running and communications established,

▷ Select the **Actual Values > Trending** menu item to open the trending window.
The following window will appear.



To prepare for new trending,

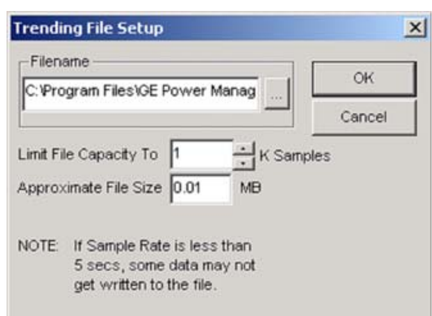
▷ Select **Stop** to stop the data logger and **Reset** to clear the screen.

▷ Select the graphs to be displayed through the pull-down menu beside each channel description.

▷ Select the Sample Rate through the pull-down menu.

If you want to save the information captured by trending,

▷ Check the box besides **Log Samples to File**.
The following dialog box will appear requesting for file name and path. The file is saved as 'csv' (comma delimited values) file, which can be viewed and manipulated with compatible third-party software. Ensure that the sample rate not less than 5 seconds, otherwise some data may not get written to the file.



To limit the size of the saved file,

▷ Enter a number in the **Limit File Capacity To** box.
The minimum number of samples is 1000. At a sampling rate of 5 seconds (or 1 sample every 5 seconds), the file will contain data

collected during the past 5000 seconds. The EnerVista 469 Setup software will automatically estimate the size of the trending file.

▷ Press “Run” to start the data logger.
If the **Log Samples to File** item is selected, the EnerVista 469 Setup software will begin collecting data at the selected sampling rate and will display it on the screen. The data log will continue until the **Stop** button is pressed or until the selected number of samples is reached, whichever occurs first.

During the process of data logging, the trending screen appears as shown below.

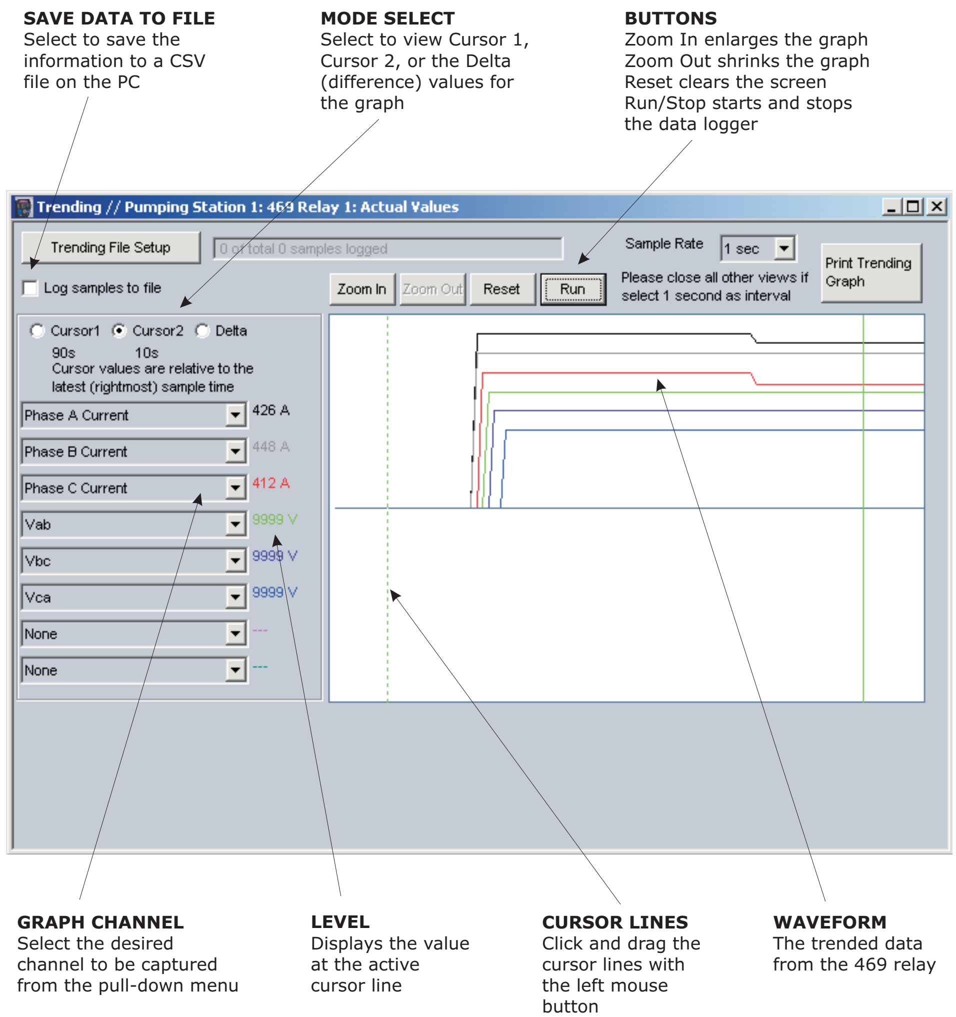


FIGURE 4–8: Trending Screen

4.6.5 Event Recorder

The 469 event recorder can be viewed through the EnerVista 469 Setup software. The event recorder stores generator and system information each time an event occurs (e.g. breaker failure). A maximum of 256 events can be stored, where E256 is the most recent event and E01 is the oldest event. E01 is overwritten whenever a new event occurs. Refer to *Event 01 to Event 256* on page 6–33 for additional information on the event recorder.

Use the following procedure to view the event recorder with EnerVista 469 Setup:

With EnerVista 469 Setup running and communications established,

▷ Select the **Actual > A4 Event Recorder** item from the main menu. This displays the Event Recorder window indicating the list of recorded events, with the most current event displayed first.

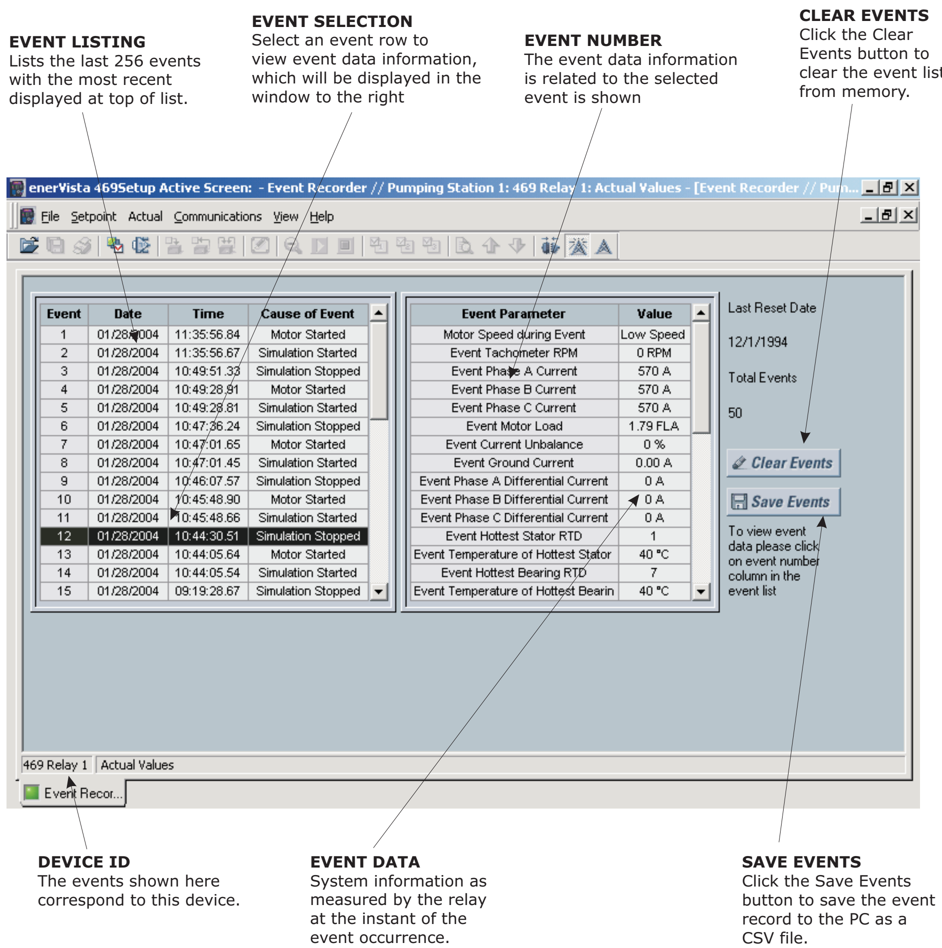


FIGURE 4–9: Event Recorder Window

To view detailed information for a given event and the system information at the moment of the event occurrence,

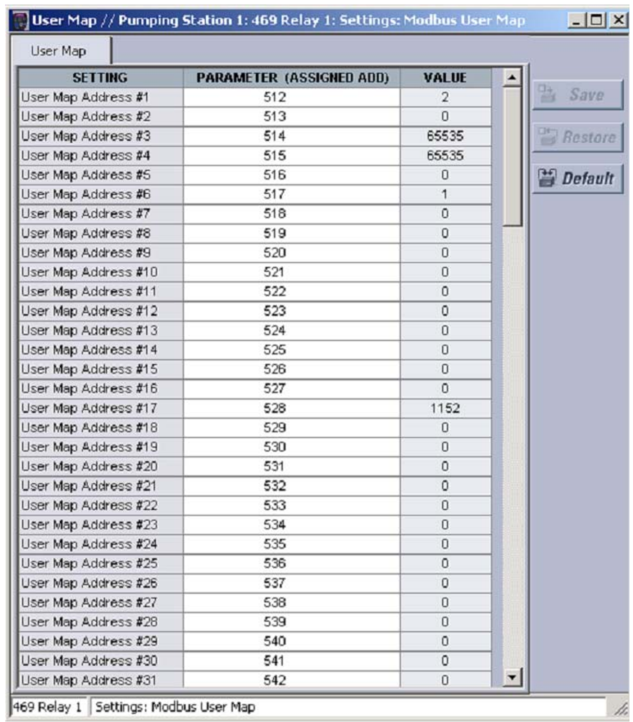
▷ Change the event number on the **Select Event** box.

4.6.6 Modbus User Map

The EnerVista 469 Setup software provides a means to program the 469 User Map (Modbus addresses 0180h to 01F7h). Refer to the *469 Communications Guide* for additional information on the User Map.

▷ Select a connected device in EnerVista 469 Setup.

▷ Select the **Settings > User Map** menu item to open the following window.



SETTING	PARAMETER (ASSIGNED ADD)	VALUE
User Map Address #1	512	2
User Map Address #2	513	0
User Map Address #3	514	65535
User Map Address #4	515	65535
User Map Address #5	516	0
User Map Address #6	517	1
User Map Address #7	518	0
User Map Address #8	519	0
User Map Address #9	520	0
User Map Address #10	521	0
User Map Address #11	522	0
User Map Address #12	523	0
User Map Address #13	524	0
User Map Address #14	525	0
User Map Address #15	526	0
User Map Address #16	527	0
User Map Address #17	528	1152
User Map Address #18	529	0
User Map Address #19	530	0
User Map Address #20	531	0
User Map Address #21	532	0
User Map Address #22	533	0
User Map Address #23	534	0
User Map Address #24	535	0
User Map Address #25	536	0
User Map Address #26	537	0
User Map Address #27	538	0
User Map Address #28	539	0
User Map Address #29	540	0
User Map Address #30	541	0
User Map Address #31	542	0

This window allows the desired addresses to be written to User Map locations. The User Map values that correspond to these addresses are then displayed.

4.6.7 Viewing Actual Values

You can view real-time relay data such as input/output status and measured parameters. From the main window menu bar, selecting Actual Values opens a window with tabs, each tab containing data in accordance to the following list:

1. **Motor and System Status**:
   - Motor status either stopped, starting, or running. It includes values such as motor load, thermal capacity used, motor speed, and instantaneous values of power system quantities.
   - The status of digital inputs.
   - Last trip information, including values such as cause of last trip, time and date of trip, motor speed and load at the time of trip, pre-trip temperature measurements, pre-trip analog inputs values, and pre-trip instantaneous values of power system quantities.

- Active alarms.
- Relay date and time.
- Present blocking conditions.
- General system status indication including the status of output relays, active pickup, alarm and trip conditions.

2. **Metering Data**:
   - Instantaneous current measurements including phase, differential, unbalance, ground, average, motor load, and differential currents.
   - RTD Temperatures including hottest stator RTD.
   - Instantaneous phase to phase and phase to ground voltages (depending on the VT connections), average voltage, and system frequency.
   - Motor Speed
   - Power Quantities including Apparent, Real and Reactive Power.
   - Current and power demand including peak values.
   - Analog inputs
   - Vector information.
3. **Motor Learned Data**:
   - Learned Acceleration Time
   - Learned Starting Current
   - Learned Starting Capacity
   - Last Acceleration Time
   - Last Starting Current
   - Last Starting Capacity
   - Average Motor Load Learned
4. **Maintenance data**

This is useful statistical information that may be used for preventive maintenance. It includes:

- Trip counters
- General counter such as Number of Motor Starts, Number of Emergency Restarts, Number of Starter Operations, Digital Counter for other purposes not listed above.
- Timers such as Motor Running Hours, Time Between Starts Timer, and five Start Timers used to calculate the average start time of the motor.

5. **RTD Learned Data**

This includes the maximum temperature measured by each of the 12 RTDs.

6. **Event recorder downloading tool**
7. **Product information**

This includes model number, firmware version, additional product information, and calibration dates.

8. **Oscillography and data logger downloading tool**

Selecting an actual values window also opens the actual values tree from the corresponding device in the site list and highlights the current location in the hierarchy.

For complete details on actual values, refer to Chapter 6.

To view a separate window for each group of actual values, select the desired item from the tree, and double click with the left mouse button. Each group will be opened on a separate tab. The windows can be re-arranged to maximize data viewing as shown in the following figure (showing actual current, voltage, and motor status values tiled in the same window):

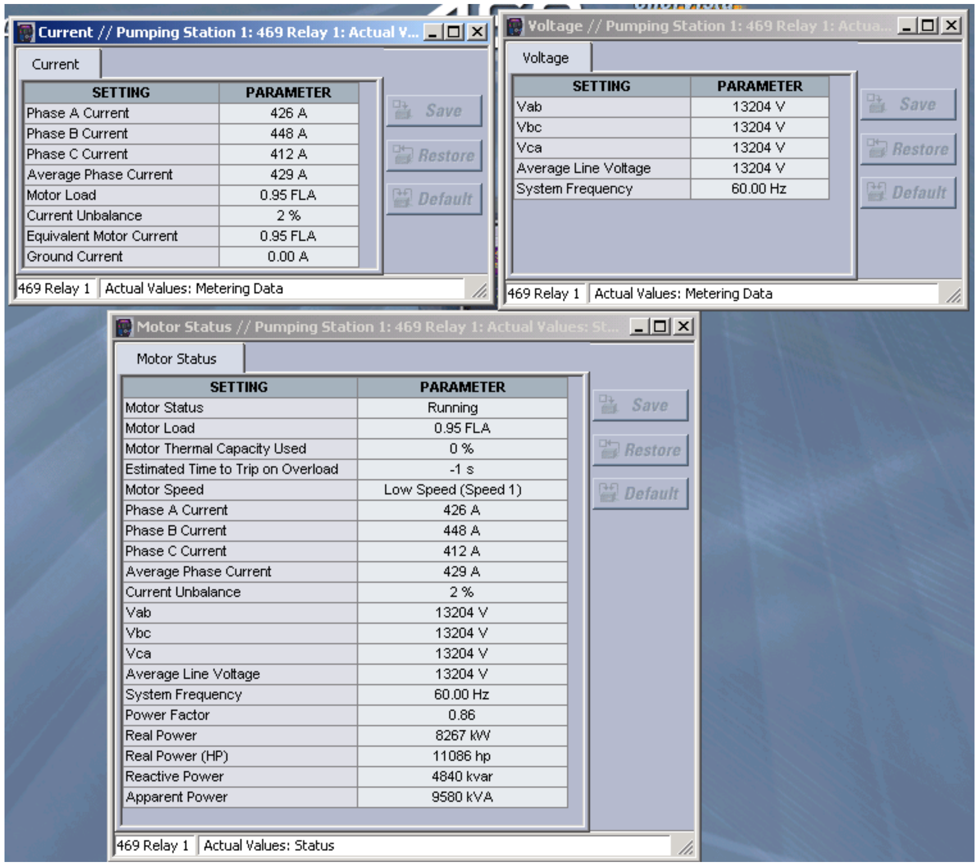


FIGURE 4–10: Actual Values Display

4.7 Using EnerVista Viewpoint with the 469

4.7.1 Plug and Play Example

EnerVista Viewpoint is an optional software package that puts critical 469 information onto any PC with plug-and-play simplicity. EnerVista Viewpoint connects instantly to the 469 via serial, ethernet or modem and automatically generates detailed overview, metering, power, demand, energy and analysis screens. Installing EnerVista Launchpad (see previous section) allows the user to install a fifteen-day trial version of EnerVista Viewpoint. After the fifteen day trial period you will need to purchase a license to continue using EnerVista Viewpoint. Information on license pricing can be found at http://www.enervista.com.

▷ Install the EnerVista Viewpoint software from the GE EnerVista CD.

▷ Ensure that the 469 device has been properly configured for either serial or Ethernet communications (see previous sections for details).

▷ Click the **Viewpoint** window in EnerVista to log into EnerVista Viewpoint.
At this point, you will be required to provide a login and password if you have not already done so.

FIGURE 4–11: EnerVista Viewpoint Main Window

▷ Click the **Device Setup** button to open the Device Setup window.

▷ Click the **Add Site** button to define a new site.

▷ Enter the desired site name in the **Site Name** field.
If desired, a short description of site can also be entered along with the display order of devices defined for the site.

▷ Click the **OK** button when complete.
The new site will appear in the upper-left list in the EnerVista 469 Setup window.

▷ Click the **Add Device** button to define the new device.

▷ Enter the desired name in the **Device Name** field and a description (optional) of the site.

▷ Select the appropriate communications interface (Ethernet or Serial) and fill in the required information for the 469. See *Connecting EnerVista 469 Setup to the Relay* on page 4–16 for details.

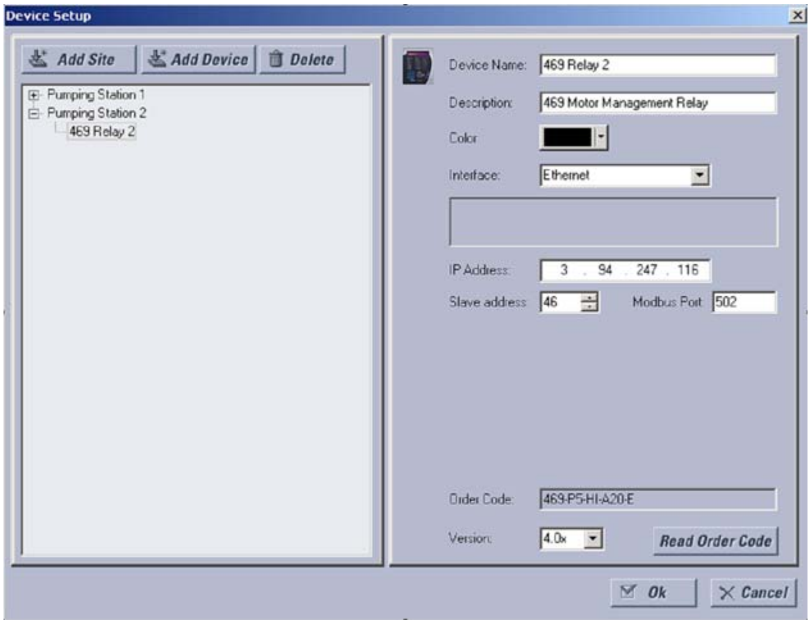


FIGURE 4–12: Device Setup Screen (Example)

▷ Click the **Read Order Code** button to connect to the 469 device and upload the order code.
If a communications error occurs, ensure that communications values entered in the previous step correspond to the relay setting values.

▷ Click **OK** when complete.

▷ From the EnerVista main window, select the **IED Dashboard** item to open the Plug and Play IED dashboard.
An icon for the 469 will be shown.

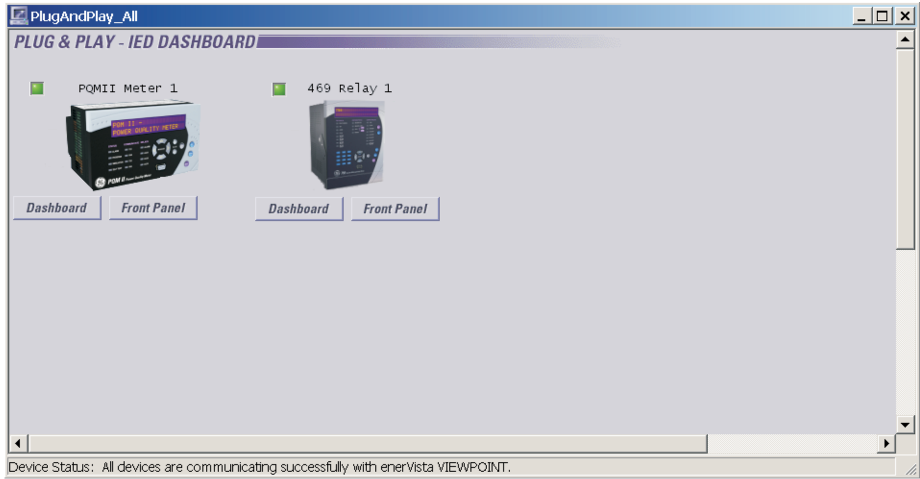


FIGURE 4–13: 'Plug and Play' Dashboard

▷ Click the **Dashboard** button below the 469 icon to view the device information.
We have now successfully accessed our 469 through EnerVista Viewpoint.

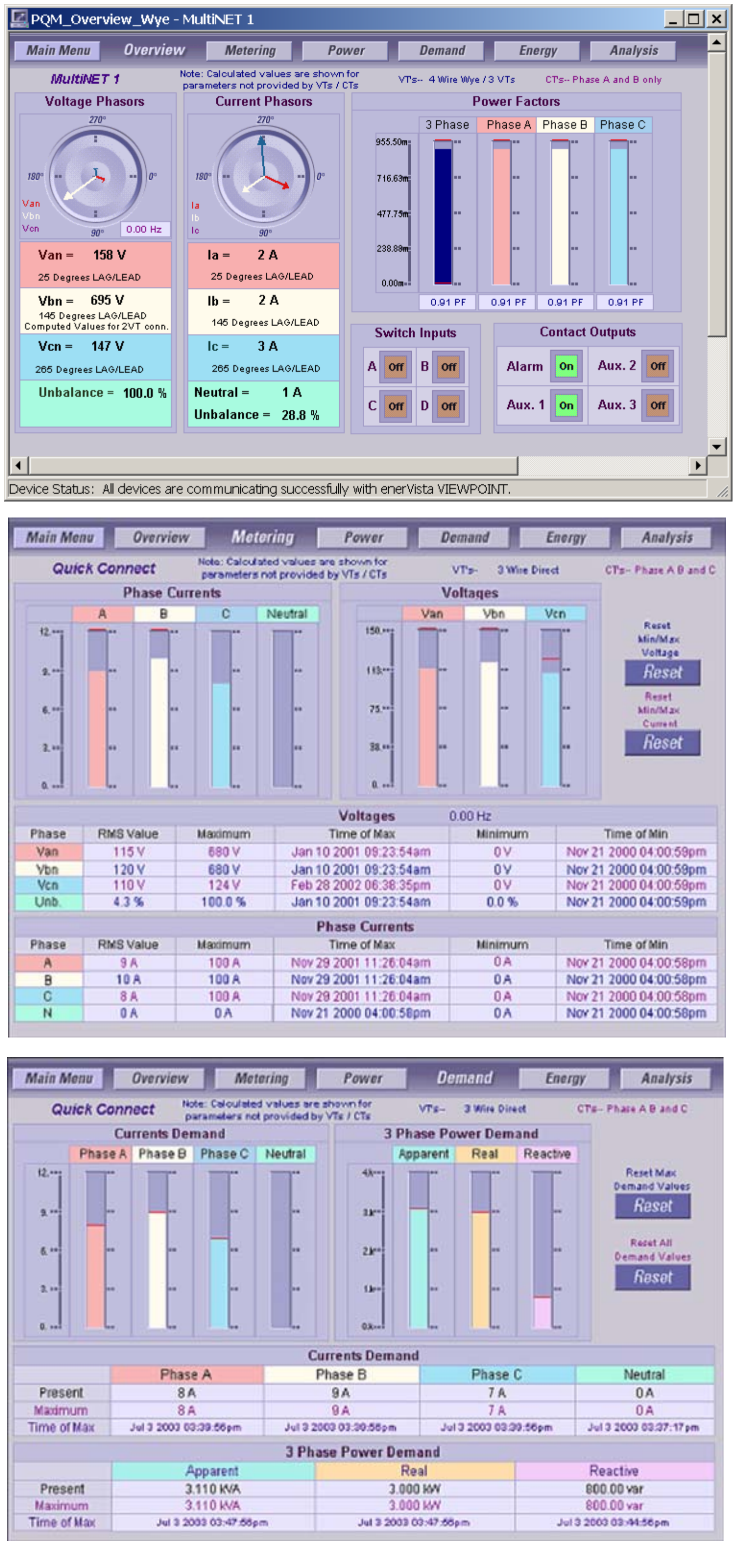


FIGURE 4–14: EnerVista Plug and Play Screens

For additional information on EnerVista viewpoint, please visit the EnerVista website at http://www.enervista.com.

GE
Grid Solutions

469 Motor Management Relay

Chapter 5: Settings

5.1 Overview

5.1.1 Settings Message Map

The 469 has a considerable number of programmable settings which makes it extremely flexible. The settings have been grouped into a number of pages and sub-pages as shown below. Each page of settings (e.g. **S2 SYSTEM SETUP**) has a section which describes in detail all the settings found on that page.

■ SETPOINTS [▷] S1 469 SETUP	■ PASSCODE [▷]	See page -8.
MESSAGE	■ PREFERENCES [▷]	See page -9.
MESSAGE	■COMMUNICATION [▷]	See page -11.
MESSAGE	■ REAL TIME [▷] CLOCK	See page -13.
MESSAGE	■ DEFAULT [▷] MESSAGES	See page -14.
MESSAGE	■ MESSAGE [▷] SCRATCHPAD	See page -15.
MESSAGE	■ CLEAR DATA [▷]	See page -16.
MESSAGE	■ INSTALLATION [▷]	See page -16.
MESSAGE	END OF PAGE	

■ SETPOINTS [▷] S2 SYSTEM SETUP		■ CURRENT [▷] SENSING	See page -18.
	MESSAGE	■ VOLTAGE [▷] SENSING	See page -20.
	MESSAGE	■ POWER [▷] SYSTEM	See page -20.
	MESSAGE	■ SERIAL COMM. [▷] CONTROL	See page -21.
	MESSAGE	■ REDUCED [▷] VOLTAGE STARTING	See page -22.
	MESSAGE	END OF PAGE	

■ SETPOINTS [▷] S3 DIGITAL INPUTS		■ STARTER [▷] STATUS	See page -27.
	MESSAGE	■ ASSIGNABLE [▷] INPUT 1	See page -27.
	MESSAGE	■ ASSIGNABLE [▷] INPUT 2	See page -27.
	MESSAGE	■ ASSIGNABLE [▷] INPUT 3	See page -27.
	MESSAGE	■ ASSIGNABLE [▷] INPUT 4	See page -27.
	MESSAGE	END OF PAGE	

■ SETPOINTS [▷] S4 OUTPUT RELAYS		■ RELAY [▷] RESET MODE	See page -36.
	MESSAGE	■ FORCE [▷] OUTPUT RELAYS	See page -37.
	MESSAGE	END OF PAGE	

■ SETPOINTS [▷] S5 THERMAL MODEL		■ THERMAL [▷] MODEL	See page -40.
	MESSAGE	■ OVERLOAD [▷] CURVE SETUP	See page -41.
	MESSAGE	END OF PAGE	

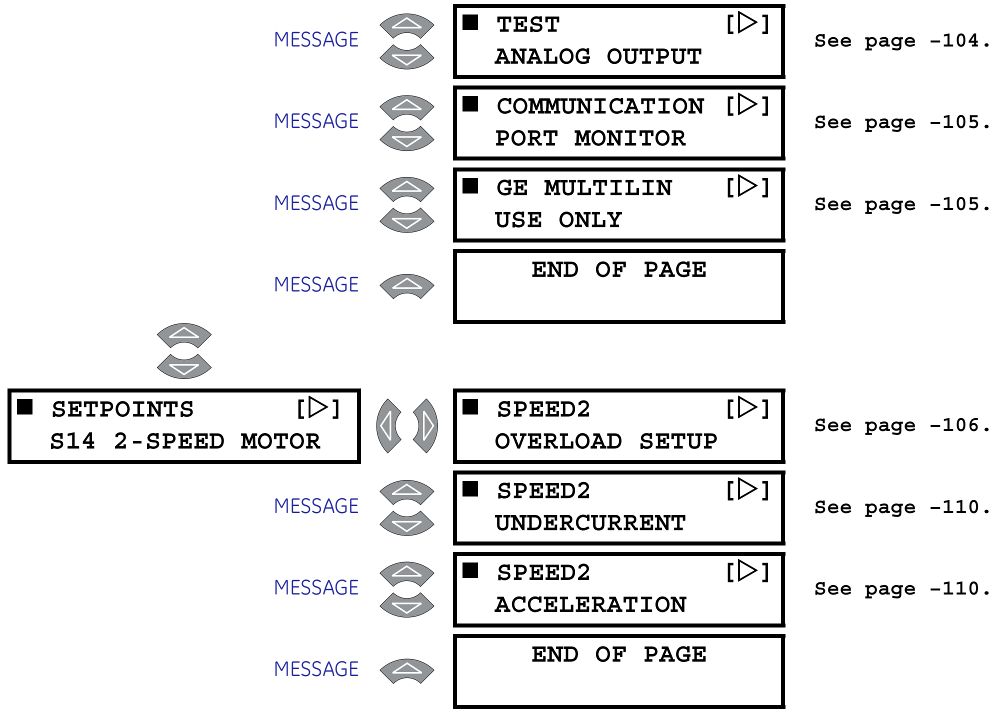
■ SETPOINTS [▷] S6 CURRENT ELEM.		■ SHORT CIRCUIT TRIP [▷]	See page –60.
	MESSAGE	■ OVERLOAD ALARM [▷]	See page –61.
	MESSAGE	■ MECHANICAL JAM [▷]	See page –61.
	MESSAGE	■ UNDERCURRENT [▷]	See page –62.
	MESSAGE	■ CURRENT UNBALANCE [▷]	See page –63.
	MESSAGE	■ GROUND FAULT [▷]	See page –65.
	MESSAGE	■ PHASE DIFFERENTIAL [▷]	See page –66.
	MESSAGE	END OF PAGE	

■ SETPOINTS [▷] S7 MOTOR STARTING		■ ACCELERATION TIMER [▷]	See page –68.
	MESSAGE	■ START INHIBIT [▷]	See page –68.
	MESSAGE	■ JOGGING BLOCK [▷]	See page –69.
	MESSAGE	■ RESTART BLOCK [▷]	See page –71.
	MESSAGE	END OF PAGE	

■ SETPOINTS [▷] S8 RTD TEMPERATURE		■ RTD TYPES [▷]	See page –72.
	MESSAGE	■ RTD #1 [▷]	See page –73.
	MESSAGE	■ RTD #2 [▷]	See page –73.
	MESSAGE	■ RTD #3 [▷]	See page –73.
		↓	
	MESSAGE	■ RTD #12 [▷]	

	MESSAGE	■ OPEN [▷] RTD SENSOR	See page -77.
	MESSAGE	■ RTD [▷] SHORT/LOW TEMP	See page -77.
	MESSAGE	END OF PAGE	
■ SETPOINTS [▷] S9 VOLTAGE ELEM.		■ UNDERVOLTAGE [▷]	See page -78.
	MESSAGE	■ OVERVOLTAGE [▷]	See page -80.
	MESSAGE	■ PHASE [▷] REVERSAL	See page -80.
	MESSAGE	■ FREQUENCY [▷]	See page -81.
	MESSAGE	END OF PAGE	
■ SETPOINTS [▷] S10 POWER ELEMENTS		■ POWER [▷] FACTOR	See page -83.
	MESSAGE	■ REACTIVE [▷] POWER	See page -84.
	MESSAGE	■ UNDERPOWER [▷]	See page -85.
	MESSAGE	■ REVERSE [▷] POWER	See page -86.
	MESSAGE	■ TORQUE [▷] SETUP	See page -86.
	MESSAGE	■ OVERTORQUE [▷]	See page -87.
	MESSAGE	END OF PAGE	
■ SETPOINTS [▷] S11 MONITORING		■ TRIP [▷] COUNTER	See page -88.
	MESSAGE	■ STARTER [▷] FAILURE	See page -88.
	MESSAGE	■ CURRENT [▷] DEMAND	See page -89.
	MESSAGE	■ kW DEMAND [▷]	See page -89.

	MESSAGE	■ kvar DEMAND [▷]	See page –89.
	MESSAGE	■ kVA DEMAND [▷]	See page –89.
	MESSAGE	■ PULSE [▷] OUTPUT	See page –91.
	MESSAGE	END OF PAGE	
■ SETPOINTS [▷] S12 ANALOG I/O		■ ANALOG [▷] OUTPUT 1	See page –94.
	MESSAGE	■ ANALOG [▷] OUTPUT 2	See page –94.
	MESSAGE	■ ANALOG [▷] OUTPUT 3	See page –94.
	MESSAGE	■ ANALOG [▷] OUTPUT 4	See page –94.
	MESSAGE	■ ANALOG [▷] INPUT 1	See page –96.
	MESSAGE	■ ANALOG [▷] INPUT 2	See page –96.
	MESSAGE	■ ANALOG [▷] INPUT 3	See page –96.
	MESSAGE	■ ANALOG [▷] INPUT 4	See page –96.
	MESSAGE	■ ANALOG INPUT [▷] DIFF 1-2	See page –98.
	MESSAGE	■ ANALOG INPUT [▷] DIFF 3-4	See page –99.
	MESSAGE	END OF PAGE	
■ SETPOINTS [▷] S13 469 TESTING		■ SIMULATION [▷] MODE	See page –101.
	MESSAGE	■ PRE-FAULT [▷] SETUP	See page –102.
	MESSAGE	■ FAULT [▷] SETUP	See page –103.
	MESSAGE	■ TEST [▷] OUTPUT RELAYS	See page –104.



5.1.2 Trips, Alarms, and Blocks

The 469 has three basic categories of protection elements. They are *trips*, *alarms*, and *blocks*.

- **TRIPS:** A 469 trip feature may be assigned to any combination of the two Auxiliary relays, 2 AUXILIARY and 3 AUXILIARY, in addition to the 1 TRIP Relay. If a Trip becomes active, the appropriate LED (indicator) on the 469 faceplate will illuminate to show which of the output relays has operated. In addition to the Trip relay(s), a trip will always operate the Block Start relay. Trip features are may be programmed as latched or unlatched. Once a relay has been operated by a latched trip, a reset must be performed to clear the trip when the condition is no longer present. If there is a lockout time, the Block Start relay will not reset until the lockout time has expired. If an unlatched trip feature becomes active, that trip will reset itself (and associated output relays) as soon as the condition that caused the trip ceases. Immediately prior to issuing a trip, the 469 takes a snapshot of motor parameters and stores them as pre-trip values which will allow for troubleshooting after the trip occurs. The cause of last trip message is updated with the current trip and the 469 display defaults to that message. All trip features are automatically logged and date and time stamped as they occur. In addition, all trips are counted and logged as statistics such that any long term trends may be identified.
- **ALARMS:** A 469 alarm feature may be assigned to operate any combination of three output relays, 4 ALARM, 3 AUXILIARY, and 2 AUXILIARY. Also an alarm may be assigned to NONE. When set to 'NONE', an alarm may record an event without operating one of the alarm or auxiliary relays. When an Alarm becomes active, the appropriate LED (indicator) on the 469 faceplate will illuminate when an output relay(s) has operated. Each alarm feature may be programmed as latched or unlatched. Once a latched alarm feature becomes active, the reset key must be pressed to reset that alarm. If the

condition that has caused the alarm is still present (e.g. hot RTD) the Alarm relay(s) will not reset until the condition is no longer present. If on the other hand, an unlatched alarm feature becomes active, that alarm will reset itself (and associated output relay(s)) as soon as the condition that caused the alarm ceases. As soon as an alarm occurs, the alarms messages are updated to reflect the alarm and the 469 display defaults to that message. Since it may not be desirable to log all alarms as events, each alarm feature may be programmed to log as an event or not. If an alarm is programmed to log as an event, when it becomes active, it is automatically logged as a date and time stamped event.

- **BLOCK START:** A 469 Block Start prevents or inhibits the start of the motor based on some logic or algorithm. The Block Start feature is always assigned to the Block Start relay. In addition to the Trip relay(s), a trip always operates the Block Start relay. If the condition that has caused the trip is still present (e.g. hot RTD), or there is a lockout time when the RESET key is pressed, the Block Start relay will not reset until the condition is no longer present or the lockout time has expired. Blocking features are always unlatched and reset immediately when conditions that caused the block cease. In addition to becoming active in conjunction with trips, a block may become active once the motor stops. There are several features that operate as such: Starts/Hour, Time Between Starts, Start Inhibit, Restart Block, and 469 Not Programmed. Block messages are updated to reflect the block when it becomes active (complete with lockout time if required) and the screen defaults to that message. Blocks are normally not logged as events. If however, a motor start or start attempt is detected when a block is active, it is automatically logged as a date and time stamped event. This scenario might occur if someone shorts across the block terminals and overrides the 469 protection to start the motor.

5.1.3 Relay Assignment Practices

There are six output relays. Five of the relays are always non-failsafe, the other (Service) is failsafe and dedicated to enunciate internal 469 faults (these faults include settings Corruption, failed hardware components, loss of control power, etc.). One of the output relays is dedicated as the Block Start relay; it is dedicated to features that are intended to block motor starting. The four remaining relays may be programmed for different types of features depending on what is required. One of the relays, 1 TRIP, is intended to be used as the main trip relay. Another relay, 4 ALARM, is intended to be used as the main alarm relay. The two relays that are left, 2 AUXILIARY and 3 AUXILIARY, are intended for special requirements.

When assigning features to Auxiliary Relays 2 and 3, it is a good idea to decide early on what is required since features that may be assigned may conflict. For example, if 2 AUXILIARY is to be used for upstream trips, it cannot also be used for the control of a Reduced Voltage Start. Similarly, if 3 AUXILIARY is to be dedicated as a relay to echo all alarm conditions to a PLC, it cannot also be used strictly to enunciate a specific alarm such as Undercurrent.

In order to ensure that conflicts in relay assignment do not occur, several precautions have been taken. All trips with the exception of the Short Circuit Backup Trip default to the 1 TRIP output relay. All alarms default to the 4 ALARM relay. Only special control functions are defaulted to Auxiliary Relays 2 and 3. It is recommended that these assignments be reviewed once all the settings have been programmed.

5.2 S1 469 Setup

5.2.1 Passcode

PATH: SETTINGS ▷ S1 469 SETUP ▷ PASSCODE

■ PASSCODE [▷]		ENTER PASSCODE FOR ACCESS:	*Range: 1 to 8 numeric digits*
	MESSAGE	SETPOINT ACCESS: Permitted	*Range: Permitted, Restricted*
	MESSAGE	CHANGE PASSWORD: No	*Range: No, Yes*

A passcode access security feature is provided in addition to the settings access jumper. When shipped from the factory, the passcode is '0'. Settings write access is permitted when the passcode is 0. The settings access jumper is required for changing settings from the front panel keypad.

The **ENTER PASSCODE FOR ACCESS** settings is seen only if the passcode is not 0 and **SETPOINT ACCESS** is "Restricted". The **SETPOINT ACCESS** and **CHANGE PASSWORD** settings are seen only if the passcode is 0 and the **SETPOINT ACCESS** is "Permitted".

To enable passcode protection on a new relay, follow the procedure below:

1. Press MESSAGE ▶ then MESSAGE ▼ until **CHANGE PASSCODE?** is displayed.
2. Select "Yes" and follow the directions to enter a new passcode 1 to 8 digits in length.
3. Once a passcode (other than "0") is programmed, it must be entered each time settings access is restricted. If a non-zero passcode has been programmed and settings access is restricted, then the **ENTER PASSCODE FOR ACCESS** message appears when entering the **S1 469 SETUP ▷ PASSCODE** subgroup.
4. Enter the correct passcode. A flash message will advise if the code is incorrect and allows a retry. If the passcode is correct and the settings access jumper is installed, the **SETPOINT ACCESS: Permitted** message appears.
5. settings can now be entered. Press ESCAPE to exit the **S1 469 SETUP ▷ PASSCODE** group and program the appropriate settings. If no keys are pressed for 5 minutes, programming access will no longer be allowed and the passcode must be re-entered. Removing the settings access jumper or setting the **SETPOINTS ACCESS** settings to "Restricted" will also immediately disable settings access.

If a new passcode is required, gain settings access by entering the valid passcode as described above, then press MESSAGE ▼ to display the **CHANGE PASSCODE** message and follow directions. If an invalid passcode is entered, an encrypted passcode may be viewed by pressing the HELP key. Consult the factory service department with this number if the currently programmed passcode is unknown. Using a deciphering program, the passcode can be determined.

5.2.2 Preferences

PATH: SETTINGS ▷ S1 469 SETUP ▷▽ PREFERENCES

■ PREFERENCES [▷]	DEFAULT MESSAGE CYCLE TIME: 2.0 s	*Range: 0.5 to 10.0 s in steps of 1*
MESSAGE	DEFAULT MESSAGE TIMEOUT: 300 s	*Range: 10 to 900 s in steps of 1*
MESSAGE	AVERAGE MOTOR LOAD CALC. PERIOD: 15 min.	*Range: 1 to 90 min. in steps of 1*
MESSAGE	TEMPERATURE DISPLAY: Celsius	*Range: Celsius, Fahrenheit*
MESSAGE	TRACE MEMORY TRIGGER POSITION: 25%	*Range: 1 to 100% in steps of 1*
MESSAGE	TRACE MEMORY BUFFERS 8x14 cycles	*Range:1x64, 2x42, 3x32, 4x35, 5x21, 6x18, 7x16, 8x14, 9x12, 10x11, 11x10, 12x9, 13x9, 14x8, 15x8, 16x7 cycles.*
MESSAGE	DISPLAY UPDATE INTERVAL: 0.4 s	*Range: 0.1 to 6.0 s in steps of 0.1*
MESSAGE	MOTOR LOAD FILTER INTERVAL: 0 cycles	*Range: 0 to 32 cycles (0 = OFF) in steps of 1*

Some characteristics can be modified for different situations. Normally this subgroup will not require changes.

- **DEFAULT MESSAGE CYCLE TIME:** If multiple default messages are chosen, the display automatically cycles through those messages. The display time can be changed to accommodate different user preferences.
- **DEFAULT MESSAGE TIMEOUT:** If no keys are pressed for a period of time, the relay automatically scans a programmed set of default messages. This time can be user-defined to ensure messages remain on the screen for a suitable time while entering settings or actual values. Once default scanning starts, pressing any key returns the last message viewed.
- **AVERAGE MOTOR LOAD CALCULATION PERIOD:** This settings adjusts the period of time over which the average motor load is calculated. The calculation is a sliding window and is ignored during motor starting.
- **TEMPERATURE DISPLAY:** Temperature measurements may be displayed in either Celsius or Fahrenheit. Each temperature value is displayed as °C or °F. RTD settings are always displayed in degrees Celsius.
- **TRACE MEMORY TRIGGER POSITION:** Sets the trigger position for waveform capture. This value represents the percentage of cycles captured and recorded in the trace memory buffer prior to the trigger (trip).
- **TRACE MEMORY BUFFERS:** Sets the number of traces to capture and the number of cycles captured for each of the waveforms and outputs. Note: 10 analog waveforms and 6 digital outputs are captured for each trace, showing all currents and voltages, and all relay output states

- **DISPLAY UPDATE INTERVAL:** Sets the duration for which the metered current and voltage readings are averaged before being displayed. It does not affect relay protection or function timing in any way. It can be used to steady the display when readings are bouncing.
- **MOTOR LOAD FILTER INTERVAL:** This value (when non-zero) averages current and power factor for the programmed number of cycles using a running average technique. This settings is intended for use on synchronous motors running at low RPM and driving reciprocating loads. The number of cycles to average can be determined by using current waveform capture. The number of cycles to complete one stroke can be determined from this waveform. This value can be used as the starting point for the motor load filter interval. Additional fine tuning may be required. This settings is not seen if **NOMINAL SYSTEM FREQUENCY** is "Variable".

⚠WARNING

When set greater than one cycle, Motor Load Filter Interval may increase trip/alarm times for the following protection elements. No other elements are affected. Trip/alarm times increase 16.7 ms for each additional cycle in the filter interval.

- **Acceleration Timer**
- **Current Unbalance**
- **Mechanical Jam**
- **Overload**
- **Stall**
- **Thermal Model**
- **Reduced Voltage Start**
- **Undercurrent**
- **Demand**
- **Power Factor**
- **Three-Phase Apparent Power**
- **Three-Phase Reactive Power**
- **Three-Phase Real Power**
- **Under Power**
- **Reverse Power**

5.2.3 Communications

Serial Communications

The following settings appear when the relay is ordered with the regular enhanced (E) option.

PATH: SETTINGS ▷ S1 469 SETUP ▷▽ COMMUNICATIONS

■ COMMUNICATIONS [▷]		SLAVE ADDRESS: 254	*Range: 1 to 254 in steps of 1*
	MESSAGE	COMPUTER RS485 BAUD RATE: 9600	*Range: 300, 1200, 2400, 4800, 9600, 19200*
	MESSAGE	COMPUTER RS485 PARITY: None	*Range: None, Odd, Even*
	MESSAGE	AUXILIARY RS485 BAUD RATE: 9600	*Range: 300, 1200, 2400, 4800, 9600, 19200*
	MESSAGE	AUXILIARY RS485 PARITY: None	*Range: None, Odd, Even*

The 469 has three (3) serial communications ports supporting a subset of the Modbus protocol (Refer to GEK-106491C: *469 Communications Guide)*. The front panel RS232 has a fixed baud rate of 9600, a fixed data frame of 1 start, 8 data, and 1 stop bits with no parity. The front port is for local use only and responds regardless of the slave address programmed. This port may be connected to a personal computer running EnerVista 469 Setup. The software can download and upload settings files as well as upgrade the 469 firmware.

For RS485 communications, each 469 must have a unique address from 1 to 254. Address 0 is the broadcast address detected by all relays. Addresses do not have to be sequential but no two units can have the same address or errors will occur. Generally, each unit added to the link uses the next higher address starting at 1. Baud rates can be selected as 300, 1200, 2400, 4800, 9600, or 19200. The data frame is fixed at 1 start, 8 data, and 1 stop bits, while parity is optional. The computer RS485 port is a general purpose port for connection to a DCS, PLC, or PC. The auxiliary RS485 port may be used for redundancy or, it may be used to talk to auxiliary GE Grid Solutions devices. The RS485 COM2 port is disabled if the Ethernet or DeviceNet option is ordered.

Ethernet Communications

The following settings appear when the relay is ordered with the Ethernet (T) option.

PATH: SETTINGS ▷ S1 469 SETUP ▷▽ COMMUNICATIONS

■ COMMUNICATIONS [▷]	SLAVE ADDRESS: 254	*Range: 1 to 254 in steps of 1*
MESSAGE	COMPUTER RS485 BAUD RATE: 9600	*Range: 300, 1200, 2400, 4800, 9600, 19200*
MESSAGE	COMPUTER RS485 PARITY: None	*Range: None, Odd, Even*
MESSAGE	FRONT PORT RS232 BAUD RATE: 19200	*Range: 300, 1200, 2400, 4800, 9600, 19200*
MESSAGE	IP ADDRESS: 0.0.0.0	*Range: standard IP address format*
MESSAGE	SUBNET IP MASK: 255.255.255.000	*Range: standard IP address format*
MESSAGE	GATEWAY IP ADDRESS: 0.0.0.0	*Range: standard IP address format*

The IP addresses are used with the Modbus protocol (Refer to GEK-106491C: *469 Communications Guide)*. Enter the dedicated IP, subnet IP, and gateway IP addresses provided by the network administrator.

To ensure optimal response from the relay, the typical connection timeout should be set as indicated in the following table:

TCP/IP sessions	Timeout setting
up to 2	2 seconds
up to 4	3 seconds

DeviceNet Communications

(Refer to GEK-106491C: *469 Communications Guide)*

The following settings appear when the relay is ordered with the DeviceNet (D) option.

PATH: SETTINGS ▷ S1 469 SETUP ▷▽ COMMUNICATIONS

■ COMMUNICATIONS [▷]	SLAVE ADDRESS: 254	*Range: 1 to 254 in steps of 1*
MESSAGE	COMPUTER RS485 BAUD RATE: 9600	*Range: 300, 1200, 2400, 4800, 9600, 19200*
MESSAGE	COMPUTER RS485 PARITY: None	*Range: None, Odd, Even*
MESSAGE	FRONT PORT RS232 BAUD RATE: 19200	*Range: 300, 1200, 2400, 4800, 9600, 19200*
MESSAGE	DEVICENET MAC ID: 1	*Range: 0 to 63*
MESSAGE	DEVICENET BAUD RATE: 125K	*Range: 125K, 250K, 500K*

Enter the dedicated MAC ID and baud rate as per the DeviceNet design (Refer to GEK-106491C: *469 Communications Guide).* The DeviceNet option is implemented by the 469 relay using the AnyBus-S DeviceNet (HMS) module as a communication adapter. The module is ODVA certified and acts as a server between the relay and the DeviceNet network.

The following master/slave connection objects are supported by the 469 DeviceNet implementation:

- Explicit Messaging Connection
- Poll I/O Connection
- Change of State or Cyclic I/O Connection

The following objects have been implemented:

Object	Class
DeviceNet objects	
Identity object	01h
Message Router object	02h
DeviceNet object	03h
Assembly object	04h
Connection object	05h
Acknowledge Handler object	2Bh
469 specific objects	
I/O Data Input Mapping object	A0h
Parameter Data Input Mapping object	B0h

Refer to publication GEK-106491C: *469 Communications Guide* for additional details on the DeviceNet implementation.

5.2.4 Real Time Clock

PATH: SETTINGS ▷ S1 469 SETUP ▷▽ REAL TIME CLOCK

■ REAL TIME [▷]
CLOCK

DATE (MM.DD.YYYY)
01/01/1994

Range: 01 to 12 / 01 to 31 / 1995 to 2094

MESSAGE

TIME (HH.MM.SS):
12:00:00

Range: 00 to 23 hrs / 00 to 59 min. / 00 to 59 sec.

The correct time and date must be entered for event recorder events to be correctly time/date stamped. A supercap backed internal clock runs for 45 days even when power is off. It has an accuracy of approximately ±5 minutes per month. It must be periodically corrected manually through the front panel or via the RS485 serial link clock update command. If the approximate time an event occurred without synchronization to other relays is sufficient, then entry of time/date from the front panel keys is adequate.

If the RS485 serial communication link is used, then all the relays can keep synchronized time. A new clock time is pre-loaded into the 469 memory via the RS485 port by a remote computer to each relay connected on the communications channel. After the computer broadcasts (address 0) a "set clock" command, all relays in the system begin timing at the same instant. There can be up to 100 ms of delay in receiving serial commands so the clock time in each relay is ±100 ms, ± the absolute clock accuracy in the PLC or PC. Refer to GE publication GEK-106491: *469 Communications Guide* for information on programming the time preload and synchronizing commands.

5.2.5 Default Messages

PATH: SETTINGS ▷ S1 469 SETUP ▷▽ DEFAULT MESSAGES

■ DEFAULT [▷] MESSAGES	◁ ▷	DEFAULT MESSAGES 6 OF 20 ASSIGNED	*Range: N/A*
	MESSAGE △▽	MOTOR STATUS: Stopped	*Range: N/A*
	MESSAGE △▽	A: 0 B: 0 C: 0 Amps	*Range: N/A*
	MESSAGE △▽	MOTOR LOAD: 0.00 x FLA	*Range: N/A*
	MESSAGE △▽	CURRENT UNBALANCE: 0%	*Range: N/A*
	MESSAGE △▽	DATE: 01/01/1995 TIME: 12:00:00	*Range: N/A*
	MESSAGE △	MULTILIN 469 Motor Management Relay	*Range: N/A*

After a period of inactivity, the 469 displays default messages. Between 1 and 20 default messages can be selected. Multiple default messages sequentially scan at a rate determined by the **S1 469 SETUP ▷ PREFERENCES ▷ DEFAULT MESSAGE CYCLE TIME** settings. Any actual value can be selected for default display. In addition, up to five user programmable messages can be created and displayed (message scratchpad). For example, the relay can alternately scan a motor identification message, the current in each phase, and the hottest stator RTD. Default messages are shown in this subgroup.

Use the following procedure to add default messages:

1. Enter the correct passcode for the **S1 469 SETUP ▷ PASSCODE ▷ ENTER PASSCODE FOR ACCESS** settings (unless the passcode has already been entered or the passcode is “0”, defeating the passcode security feature).
2. Move to the message to be added to the default message list using the MESSAGE ▼ and MESSAGE ▲ keys. The selected message can be any actual value or Message Scratchpad message.
3. Press ENTER. The message **PRESS [ENTER] TO ADD DEFAULT MESSAGES** will be displayed for 5 seconds.
4. Press ENTER again while displayed to add the current message to the default message list.
5. If the procedure was followed correctly, the **DEFAULT MESSAGE HAS BEEN ADDED** flash message will be displayed:
6. To verify that the message was added, view the last message in the **S1 469 SETUP ▷▽ DEFAULT MESSAGES** subgroup.

Use the following procedure to remove default messages:

1. Enter the correct passcode for the **S1 469 SETUP ▷ PASSCODE ▷ ENTER PASSCODE FOR ACCESS** settings (unless the passcode has already been entered or unless the passcode is "0", defeating the passcode security feature).
2. Select the message to remove under the **S1 469 SETUP ▷▽ DEFAULT MESSAGES** subgroup.
3. When the default message to be removed is shown, press ENTER. The relay displays the **PRESS [ENTER] TO REMOVE DEFAULT MESSAGE** message.
4. Press ENTER to remove the current message from the default message list.
5. If the procedure was followed correctly, the following flash message will be displayed:

```
DEFAULT MESSAGE
HAS BEEN REMOVED
```

5.2.6 Message Scratchpad

PATH: SETTINGS ▷ S1 469 SETUP ▷▽ MESSAGE SCRATCHPAD

■ MESSAGE [▷] SCRATCHPAD		TEXT 1	*Range: 40 alphanumeric characters*
	MESSAGE	TEXT 2	*Range: 40 alphanumeric characters*
	MESSAGE	TEXT 3	*Range: 40 alphanumeric characters*
	MESSAGE	TEXT 4	*Range: 40 alphanumeric characters*
	MESSAGE	GE MULTILIN 469 MOTOR RELAY	*Range: 40 alphanumeric characters*

Up to five (5) message screens can be programmed under the message scratchpad area. These messages may be notes that pertain to the installation or the motor or any other information deemed pertinent by the user. In addition, these messages may be selected for scanning during default message display. This might be useful for reminding operators to perform certain tasks. The messages may be entered from the communications ports or through the keypad. The following procedure demonstrates the use of the message scratchpad:

1. Select the user message to be changed.
2. Press the decimal [.] key to enter text mode. An underline cursor will appear under the first character.
3. Use the VALUE keys to display the desired character. A space is selected like a character.
4. Press the decimal [.] key to advance to the next character. To skip over a character press the decimal key. If an incorrect character is accidentally stored, press the decimal key enough times to scroll the cursor around to the character.
5. When the desired message is displayed press ENTER to store or ESCAPE to quit. The message is now permanently stored. Press ESCAPE to cancel the altered message.

5.2.7 Clear Data

PATH: SETTINGS ▷ S1 469 SETUP ▷▽ CLEAR DATA

■ CLEAR DATA [▷]	CLEAR LAST TRIP DATA: No	*Range: No, Yes*
MESSAGE	RESET MWh and Mvarh METERS: No	*Range: No, Yes*
MESSAGE	CLEAR PEAK DEMAND DATA: No	*Range: No, Yes*
MESSAGE	CLEAR RTD MAXIMUMS: No	*Range: No, Yes*
MESSAGE	CLEAR ANALOG I/P MIN/MAX: No	*Range: No, Yes*
MESSAGE	CLEAR TRIP COUNTERS: No	*Range: No, Yes*
MESSAGE	PRESET DIGITAL COUNTER: No	*Range: No, Yes*
MESSAGE	CLEAR EVENT RECORDER: No	*Range: No, Yes*

These commands may be used to clear various historical data.

- **CLEAR LAST TRIP DATA:** Clears the last trip data.
- **RESET MWh and Mvarh METERS:** Resets the MWh and Mvarh metering to zero.
- **CLEAR PEAK DEMAND DATA:** Clears the peak demand values.
- **CLEAR RTD MAXIMUMS:** All maximum RTD temperature measurements are stored and updated each time a new maximum temperature is established. This command clears the maximum values.
- **CLEAR ANALOG I/P MIN/MAX:** The minimum and maximum analog input values are stored for each analog input. These minimum and maximum values may be cleared at any time.
- **CLEAR TRIP COUNTERS:** There are counters for each possible type of trip. This command clears these counters.
- **PRESET DIGITAL COUNTER:** When one of the assignable Digital Inputs is configured as "Counter", this command presets the counter. If the counter is an incrementing type, setting the preset value to "0" effectively resets the counter.
- **CLEAR EVENT RECORDER:** The event recorder saves the last 256 events, automatically overwriting the oldest event. If desired, this command can clear all events to prevent confusion with old information.

5.2.8 Installation

PATH: SETTINGS ▷ S1 469 SETUP ▷▽ INSTALLATION

■ INSTALLATION [▷]	RESET MOTOR INFORMATION: No	*Range: No, Yes*

MESSAGE

```
RESET STARTER
INFORMATION: No
```

Range: No, Yes

These commands clear various informative and historical data when the 469 is first applied on a new installation.

- **RESET MOTOR INFORMATION:** Counters for number of motor starts and emergency restarts can be viewed in actual values. The 469 also learns various motor characteristics through motor operation. These learned parameters include acceleration time, starting current, and starting thermal capacity. Total motor running hours may also be viewed in actual values. On a new installation or if new equipment is installed, all this information can be reset with this settings.
- **RESET STARTER INFORMATION:** The total number of starter operations can be viewed in actual values. Use this settings to clear this counter on a new installation or if maintenance work is done on the breaker or contactor.

5.3 S2 System Setup

5.3.1 Current Sensing

PATH: SETTINGS ▷▽ S2 SYSTEM SETUP ▷ CURRENT SENSING

	■ CURRENT SENSING [▷]	
	PHASE CT PRIMARY: Not Programmed	*Range: 1 to 5000 A in steps of 1. Values ≥5001 denote not*
MESSAGE	MOTOR FULL LOAD AMPS FLA: Not Programmed	*Range: 1 to 5000 A in steps of 1. Values ≥5001 denote not*
MESSAGE	GROUND CT: 50:0.025	*Range: None, 1A Secondary, 5A Secondary, 50:0.025*
MESSAGE	GROUND CT PRIMARY: 100 A	*Range: 1 to 5000 A in steps of 1*
MESSAGE	PHASE DIFFERENTIAL CT: None	*Range: None, 1A Secondary, 5A Secondary*
MESSAGE	PHASE DIFFERENTIAL CT PRIMARY: 100 A	*Range: 1 to 5000 in steps of 1*
MESSAGE	ENABLE 2-SPEED MOTOR PROTECTION: No	*Range: No, Yes*
MESSAGE	SPEED2 PHASE CT PRIMARY: 100 A	*Range: 1 to 5000 A in steps of 1*
MESSAGE	SPEED2 MOTOR FLA: 1 A	*Range: 1 to 5000 A in steps of 1*

NOTE

The **GROUND CT PRIMARY** setting is not seen if the **GROUND CT** is set to “1A Secondary” or “5A Secondary”. The **PHASE DIFFERENTIAL CT PRIMARY** is not seen if the **PHASE DIFFERENTIAL CT** is set to “1A Secondary” or “5A Secondary”.

NOTE

The **SPEED2 PHASE CT PRIMARY** and **SPEED2 MOTOR FLA** settings are seen only if two-speed motor protection is enabled.

As a safeguard, **PHASE CT PRIMARY** and **MOTOR FULL LOAD AMPS** are defaulted to “Not Programmed” when shipped. A block start indicates the 469 was never programmed. Once **PHASE CT PRIMARY** and **MOTOR FULL LOAD AMPS** are entered, the alarm resets itself. The phase CT should be chosen so the FLA is no less than 50% of the rated phase CT primary. Ideally, the phase CT primary should be chosen so the FLA is 100% of the phase CT primary or slightly less, never more. The secondary value of 1 or 5 A *must* be specified at the time of order so that the proper hardware is installed. A value for **MOTOR FULL LOAD AMPS** (FLA) must also be entered. The value may be taken from the motor nameplate data sheets. The service factor may be entered as overload pickup (see *S5 Thermal Model* on page 5–38).

For high resistance grounded systems, sensitive ground current detection is possible if the 50:0.025 ground CT input is used. To use the 50:0.025 input, select “50:0.025” for the **GROUND CT** settings. No additional ground CT messages will appear. On solidly grounded systems where fault currents may be quite large, the 469 1A or 5A secondary ground CT input should be used for either zero-sequence or residual ground sensing. If the connection is residual, the Ground CT secondary and primary values should be the same as the phase CT. If however, the connection is zero-sequence, the Ground CT secondary and primary values must be entered. The Ground CT primary should be selected such that potential fault current does not exceed 20 times the primary rating. When relaying class CTs are purchased, this precaution will ensure that the Ground CT does not saturate under fault conditions.

The **PHASE DIFFERENTIAL CT PRIMARY** must be entered if the differential feature is to be used. If two CTs are used per phase in a vectorial summation configuration, the CTs should be chosen to ensure there is no saturation during motor starting. If however, a core balance CT is used for the differential protection in each phase, a low CT rating of 50 or 100 A allows for very sensitive differential protection.

When the two-speed motor feature is used, a value for a second set of Phase CTs and motor FLA must be entered here for Speed 2. If the Phase CTs are the same as the speed 1 phase CTs, simply enter the same value here as well.

Example 1:

Consider a 469 with a 5 A Phase CT secondary and Ground Fault Detection set to Residual and a motor with the following specifications:

Motor Nameplate FLA: 87 A; Low Resistance Grounded; Maximum Fault: 400 A

The following settings are required:

PHASE CT PRIMARY: “100”
MOTOR FULL LOAD AMPS: “87”
GROUND CT: “5 A Secondary”
GROUND CT PRIMARY: “100”

Example 2:

Consider a 469 with a 5 A Phase CT secondary and Ground Fault Detection set to Residual and a motor with the following specifications:

Motor Nameplate FLA: 255 A; Solidly Grounded; Maximum Fault: 10000 A;
Zero Sequence Ground CT: (10000/20) 500:1

The following settings are required:

PHASE CT PRIMARY: “300”
MOTOR FULL LOAD AMPS: “255”
GROUND CT: “5 A Secondary”
GROUND CT PRIMARY: “500”

Example 3:

Again, consider a 469 with a 5 A Phase CT secondary and Ground Fault Detection set to Residual and a motor with the following specifications:

Motor Nameplate FLA: 330 A; High Resistance Grounded; Maximum Fault: 5 A

The following settings are required:

PHASE CT PRIMARY: “350”
MOTOR FULL LOAD AMPS: “330”
GROUND CT: “50:0.025”

5.3.2 Voltage Sensing

PATH: SETTINGS ▷▽ S2 SYSTEM SETUP ▷▽ VOLTAGE SENSING

■ VOLTAGE SENSING [▷]		VT CONNECTION TYPE: None	*Range: Open Delta, Wye, None*
	MESSAGE	ENABLE SINGLE VT OPERATION: OFF	*Range: AN, BN, CN, OFF or AB, BC, OFF*
	MESSAGE	VOLTAGE TRANSFORMER RATIO: 35.00:1	*Range: 1.00:1 to 300.00:1 in steps of 0.01*
	MESSAGE	MOTOR NAMEPLATE VOLTAGE: 4000 V	*Range: 100 to 36000 V in steps of 1*

The manner in which the voltage transformers are connected must be entered here. A value of “None” for **VT CONNECTION TYPE** indicates that no voltage measurement is required. Note that phase reversal is disabled for single VT operation. All voltages are assumed balanced. Also, frequency is only available for AN or AB connections.

The **ENABLE SINGLE VT OPERATION** settings is seen only if the **VT CONNECTION TYPE** is “Open Delta” or “Wye”.

If voltage measurements are to be made, the turns ratio of the voltage transformers must be entered. The **VOLTAGE TRANSFORMER RATIO** must be chosen such that the secondary voltage of the VTs is between 40 and 240 V when the primary is at **MOTOR NAMEPLATE VOLTAGE**. All voltage protection features that require a level settings are programmed as a percent of the **MOTOR NAMEPLATE VOLTAGE** or rated voltage, where **MOTOR NAMEPLATE VOLTAGE** represents the rated design voltage line to line.

For example, given the motor nameplate voltage as 4160 V and the VTs are 4160/120 Open Delta, set the voltage sensing settings as follows:

VT CONNECTION TYPE: “Open Delta”
VT RATIO: “34.67:1”
MOTOR NAMEPLATE VOLTAGE: “4160”

5.3.3 Power System

PATH: SETTINGS ▷▽ S2 SYSTEM SETUP ▷▽ POWER SYSTEM

■ POWER SYSTEM [▷]		NOMINAL SYSTEM FREQUENCY: 60 Hz	*Range: 50 Hz, 60 Hz, Variable*
	MESSAGE	SYSTEM PHASE SEQUENCE: ABC	*Range: ABC, ACB*
	MESSAGE	SPEED2 PHASE SEQUENCE: ABC	*Range: ABC, ACB*

Enter the nominal system frequency here. These settings allow the 469 to determine the internal sampling rate for maximum accuracy.

The 469 may be used on variable frequency drives when the **NOMINAL SYSTEM FREQUENCY** is set to "Variable". All of the elements function in the same manner with the following exceptions:

- If the ratio of the smallest phase RMS to largest phase RMS is more than 70%, **CURRENT UNBALANCE** is calculated from the ratio of phase current RMS values. Phase angles are ignored. With nominal sinusoidal phase inputs, this method produces values about two times the value produced by calculating I_1/I_2.
- If the ratio of the smallest phase RMS to largest phase RMS is less than 70%, a fixed value 40% **CURRENT UNBALANCE** is used. Derating still applies when the average load is less than FLA.

The voltage and power elements work properly if the voltage waveform is approximately sinusoidal. An unfiltered voltage waveform from a pulse width modulated drive cannot be measured accurately; however, the current waveform is approximately sinusoidal and can be measured accurately. All current elements will function properly. Note, however, that undervoltage and underfrequency elements will not work instantaneously using variable frequency. If "Variable" is chosen, the filtering algorithm increases the trip and alarm times by up to 270 ms when the level is close to the threshold. If the level exceeds the threshold by a significant amount, trip and alarm times will decrease until they match the programmed delay. The exceptions to this increased time are the short circuit, ground fault, and differential elements which will trip as per specification.

If the sequence of phase rotation for a given plant is ACB rather than the standard ABC, the **SYSTEM PHASE SEQUENCE** settings may be used to accommodate this. This settings allows the 469 to properly calculate phase reversal, negative sequence, and power quantities. The **SPEED2 PHASE SEQUENCE** can be programmed to accommodate the reversed motor rotation at Speed2 and is seen only if two-speed motor protection is enabled.

5.3.4 Communications Control

PATH: SETTINGS ▷▽ S2 SYSTEM SETUP ▷▽ SERIAL COMM. CONTROL

```
■ SERIAL COMM.  [▷]
  CONTROL
```

```
SERIAL COMMUNICATION
CONTROL: Off
```

Range: On, Off

MESSAGE

```
ASSIGN START CONTROL
RELAYS: Auxiliary2
```

Range: Auxiliary2, Aux2 & Aux3, Auxiliary3

If enabled, motor starting and stopping is possible via any of the three 469 communication ports. Refer to GE publication GEK-106491: *469 Communications Guide* for command formats. When a stop command is issued, the 1 TRIP relay is activated for 1 second to complete the trip coil circuit for a breaker application or break the contact coil circuit for a contactor application. When a start command is issued, the auxiliary relay assigned for starting control is activated for 1 second to complete the close coil circuit for a breaker application or complete the start control circuit for a contactor application. A contactor sealing contact would be used to maintain the circuit.

For details on issuing a start or stop command via communications, refer to GE publication GEK-106491: *469 Communications Guide*.

5.3.5 Reduced Voltage

PATH: SETTINGS ▷▽ S2 SYSTEM SETUP ▷▽ REDUCED VOLTAGE STARTING

■ REDUCED [▷] VOLTAGE STARTING		REDUCED VOLTAGE STARTING: Off	*Range: On, Off*
	MESSAGE	ASSIGN CONTROL RELAYS: Auxiliary3	*Range: Auxilary2, Aux2 & Aux3, Auxiliary3*
	MESSAGE	TRANSITION ON: Current Only	*Range: Current Only, Current or Timer, Current and Timer*
	MESSAGE	ASSIGN TRIP RELAYS: Trip	*Range: Trip, Trip & Aux2, Trip & Aux2 & Aux3, Trip & Aux3*
	MESSAGE	REDUCED VOLTAGE START LEVEL: 100% FLA	*Range: 25 to 300% in steps of 1*
	MESSAGE	REDUCED VOLTAGE START TIMER: 200 s	*Range: 1 to 600 s in steps of 1*

The 469 can control the transition of a reduced voltage starter from reduced to full voltage. That transition may be based on "Current Only", "Current and Timer", or "Current or Timer" (whichever comes first). When the 469 measures the transition of no motor current to some value of motor current, a 'Start' is assumed to be occurring (typically current will rise quickly to a value in excess of FLA, e.g. 3 × FLA). At this point, the **REDUCED VOLTAGE START TIMER** is initialized with the programmed value in seconds.

- If "Current Only" is selected, when the motor current falls below the user's programmed Transition Level, transition will be initiated by activating the assigned output relay for 1 second. If the timer expires before that transition is initiated, an Incomplete Sequence Trip will occur activating the assigned trip relay(s).
- If "Current or Timer" is selected, when the motor current falls below the user's programmed Transition Level, transition will be initiated by activating the assigned output relay for 1 second. If the timer expires before that transition is initiated, the transition will be initiated regardless.
- If "Current and Timer" is selected, when the motor current falls below the user's programmed Transition Level and the timer expires, transition will be initiated by activating the assigned output relay for 1 second. If the timer expires before current falls below the Transition Level, an Incomplete Sequence Trip will occur activating the assigned trip relay(s).

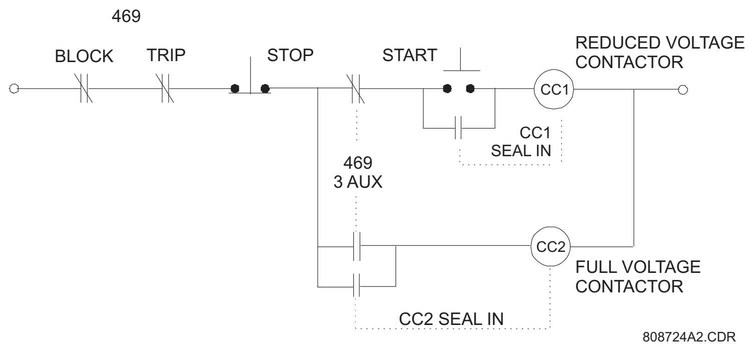


FIGURE 5–1: Reduced Voltage Start Contactor Control Circuit

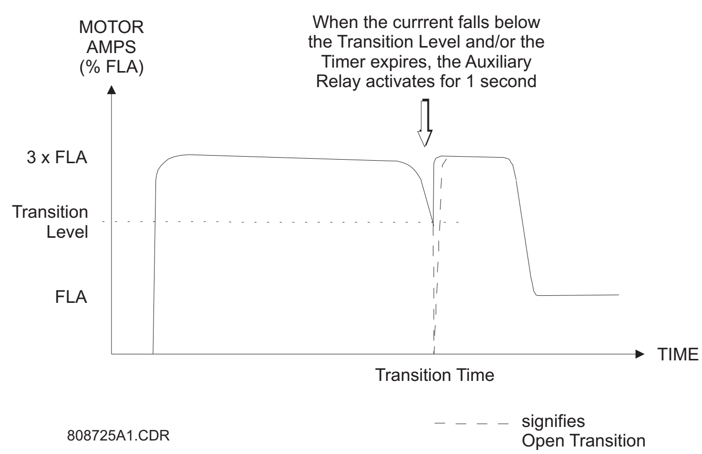


FIGURE 5–2: Reduced Voltage Starting Current Characteristic

NOTE

If this feature is used, the Starter Status Switch input must be either from a common control contact or a parallel combination of Auxiliary 'a' contacts or a series combination of Auxiliary 'b' contacts from the reduced voltage contactor and the full voltage contactor. Once transition is initiated, the 469 assumes the motor is still running for at least 2 seconds. This prevents the 469 from recognizing an additional start if motor current goes to zero during an open transition.

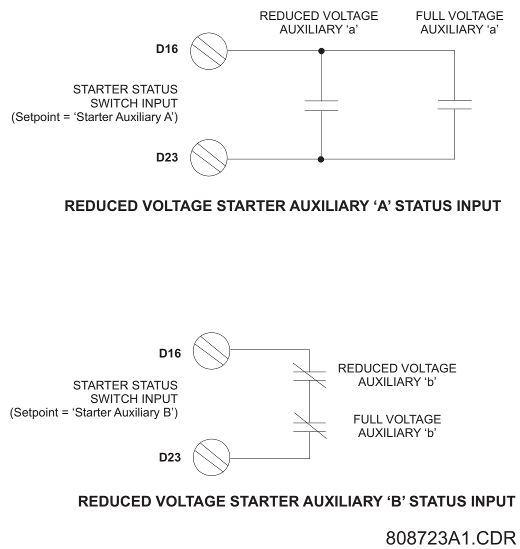


FIGURE 5–3: Reduced Voltage Starter Inputs

5.3.6 Preset Motor Values

PATH: SETTINGS ▷▽ S2 SYSTEM SETUP ▷▽ PRESET MOTOR VALUES

■ PRESET [▷] MOTOR VALUES	MOTOR RUNNING HOURS PRESET: 0	*Range: 0 to 99999 in steps of 1*
MESSAGE	POS WATTHOURS PRESET: 0.000 MWh	*Range: 0 to 999999.999 in steps of .001*
MESSAGE	POS varHOURS PRESET: 0.000 Mvarh	*Range: 0 to 999999.999 in steps of .001*
MESSAGE	NEG varHOURS PRESET: 0.000 Mvarh	*Range: 0 to 999999.999 in steps of .001*

The 469 can preset the following actual value accumulators. When an accumulator is preset, 469 discards the previous value and continues to accumulate starting from the new value.

- Motor running hours

Display and set actual value shown in

ACTUAL VALUES > A4 MAINTENANCE > TIMERS > MOTOR RUNNING HOURS

- Positive watt hours

Display and set actual value shown in

ACTUAL VALUES > A2 METERING DATA > POWER METERING > POSITIVE WATTHOURS

- Positive var hours

Display and set actual value shown in

ACTUAL VALUES > A2 METERING DATA > POWER METERING > POSITIVE VARHOURS

- Negative var hours

Display and set actual value shown in

ACTUAL VALUES > A2 METERING DATA > POWER METERING > NEGATIVE VARHOURS

5.4 S3 Digital Inputs

5.4.1 Description

Overview

The 469 relay has nine (9) digital inputs. Five of the digital inputs have been pre-assigned as switches having a specific function. Four of the five pre-assigned digital inputs are always functional and do not have any settings messages associated with them. The fifth, Starter Status, may be configured for either an 'a' or 'b' auxiliary contact. The remaining four digital inputs are assignable; that is to say, the function that the input is used for may be chosen from one of a number of different functions. Some of those functions are very specific, others may be programmed to adapt to the user requirements. If the Two-Speed Motor feature is enabled, Assignable Input 4 will be dedicated as the Two-Speed Motor Monitor.

Access Switch

Terminals C1 and C2 ***must*** be shorted to allow changing of any settings values. This safeguard is in addition to the settings passcode feature, which functions independently (see *Passcode* on page 5–8).

Test Switch

Once the 469 is in service, it may be tested from time to time as part of a regular maintenance schedule. The relay will have accumulated statistical information relating historically to starter and motor operation. This information includes: last trip data, demand data (if the metering features are in use), MWh and Mvarh metering, RTD maximums, the event record, analog input minimums and maximums, number of motor trips, number of trips by type, total motor running hours, learned parameters, number of starter operations, number of motor starts, number of emergency restarts, and the digital counter. Shorting the 469 Test input (terminals C3 and C4) prevents all of this data from being corrupted or updated when the relay is under test. The In Service LED will flash while the test terminals are shorted.

Emergency Restart

Shorting terminals D17 and D23 discharges the thermal capacity used to zero, sets any Starts/Hour Block lockout to zero, sets any Time Between Starts Block lockout to zero, and reset all Trips and Alarms so that a hot motor may be restarted. However, a Restart Block lockout will remain active (it may be used as a backspin timer) and any trip condition that remains (such as a hot RTD) will still cause a trip. Therefore, while the terminals are shorted, the Trip and Block output relays will remain in their normal non-operated state. In the event of a real emergency, the Emergency Restart terminals should remain shorted until the emergency is over. Also, while the Emergency Restart terminals are shorted, a Service Alarm message indicates any trips or blocks that are active. As the name implies, this feature should only be used in an emergency – using it otherwise defeats the purpose of the relay, namely, protecting the motor. Any Emergency Restart input transition from open to closed or closed to open is logged as an event.

Remote Reset

Shorting terminals D18 and D23 resets any trips or latched alarms provided that the condition that caused the alarm or trip is no longer present. If there is a lockout time the Block Start relay will not reset until the lockout time has expired.

5.4.2 Starter Status

PATH: SETTINGS ▷▽ S3 DIGITAL INPUTS ▷ STARTER STATUS

```
■ STARTER      [▷]        STARTER STATUS SW:
  STATUS                  Starter Auxiliary A
```

Range: *Starter Auxiliary A, Starter Auxiliary B*

This input is *necessary* for all motors. The 469 determines that a motor has stopped when the phase current falls below the level that the relay can measure (5% of CT primary). Monitoring an auxiliary contact from the breaker or contactor prevents the relay from detecting additional starts when an unloaded motor is loaded, or issuing a block start after an unloaded motor is started and running at less than 5% CT rated primary current.

If "Starter Auxiliary A" is chosen, terminals D16 and D23 are monitored to detect the breaker or contactor state, open signifying the breaker or contactor is open and shorted signifying closed. The 469 will then determine that a motor has made the transition from 'running' to 'stopped' only when the measured current is less than 5% CT ratio **and** the 'a' contact is open.

If "Starter Auxiliary B" is chosen, terminals D16 and D23 are monitored to detect the breaker or contactor state, open signifying the breaker or contactor is closed and shorted signifying open. The 469 then determines that a motor has made the transition from 'running' to 'stopped' only when the measured current is less than 5% CT ratio **and** the 'b' contact is closed.

5.4.3 Assignable Inputs 1(4)

Main Menu

PATH: SETTINGS ▷▽ S3 DIGITAL INPUTS ▷▽ ASSIGNABLE INPUT 1(4)

```
■ ASSIGNABLE  [▷]        INPUT 1 FUNCTION:
  INPUT 1                Off
```

Range: *see below*

```
■ ASSIGNABLE  [▷]        INPUT 2 FUNCTION:
  INPUT 2                Off
```

Range: *see below*

```
■ ASSIGNABLE  [▷]        INPUT 3 FUNCTION:
  INPUT 3                Off
```

Range: *see below*

```
■ ASSIGNABLE  [▷]        INPUT 4 FUNCTION:
  INPUT 4                Off
```

Range: *see below*

There are four (4) user-assignable digital inputs configurable to a number of different functions (see below), or turned Off. Once a function is chosen, any messages that follow may be used to set pertinent parameters for operation. Each function may only be chosen once. Assignable Inputs 1 to 4 are activated by shorting D19 to D22 (respectively) with D23.

The range for the **INPUT 1(4) FUNCTION** settings is: Off, Remote Alarm, Remote Trip, Speed Switch Trip, Load Shed Trip, Pressure Sw Alarm, Pressure Switch Trip, Vibration Sw Alarm, Vibration Sw Trip, Digital Counter, Tachometer, General Sw A, General Sw B, General Sw C, General Sw D, Capture Trace, Simulate Pre-Fault, Simulate Fault, Simulate Pre Fault... Fault.

Two-speed motor protection is enabled with the **S2 SYSTEM SETUP ▷ CURRENT SENSING ▷▽ ENABLE 2-SPEED MOTOR PROTECTION** settings. If the two-speed motor feature is enabled, Assignable Input 4 is dedicated as the two-speed motor monitor and terminals D22 and D23 are monitored for a contact closure. Closure of the contact signifies that the motor is in Speed 2 or High Speed. If the input is open, it signifies that the motor is in Speed 1. This allows the 469 to determine which settings should be active at any given point in time.

Remote Alarm

PATH: SETTINGS ▷▽ S3 DIGITAL INPUTS ▷▽ ASSIGNABLE INPUT 1(4)

■ ASSIGNABLE [▷] INPUT 1	INPUT 1 FUNCTION: Remote Alarm	*Range: See above*
MESSAGE	REMOTE ALARM NAME: Remote Alarm	*Range: 20 alphanumeric characters*
MESSAGE	REMOTE ALARM: Unlatched	*Range: Latched, Unlatched*
MESSAGE	ASSIGN ALARM RELAYS: Alarm	*Range: Alarm, Alarm & Aux2, Alarm & Aux2 & Aux3, Alarm & Aux3, Auxiliary2, None*
MESSAGE	REMOTE ALARM EVENTS: Off	*Range: On, Off*

These settings apply only if the **INPUT 1(4) FUNCTION** is "Remote Alarm".

Once the Remote Alarm function is chosen for one of the assignable digital inputs, the settings messages shown here will follow the assignment message. An alarm relay may be selected and the name of the alarm may be altered. A contact closure on the digital input assigned as Remote Alarm will cause an alarm within 100 ms with the name that has been chosen. Multiple sources may be used to trigger a remote alarm by paralleling inputs (see FIGURE 5–4: *Remote Alarm/Trip from Multiple Sources* on page 5–29).

Remote Trip

PATH: SETTINGS ▷▽ S3 DIGITAL INPUTS ▷▽ ASSIGNABLE INPUT 1(4)

■ ASSIGNABLE [▷] INPUT 1	INPUT 1 FUNCTION: Remote Trip	*Range: See above*
MESSAGE	REMOTE TRIP NAME: Remote Trip	*Range: 20 character alphanumeric*
MESSAGE	ASSIGN TRIP RELAYS: Trip	*Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3*

These settings apply only if the **INPUT 1(4) FUNCTION** is “Remote Trip”.

Once the Remote Trip function is chosen for one of the assignable digital inputs, the settings messages shown here will follow the assignment message. A trip relay may be selected and the name of the trip may be altered. A contact closure on the digital input assigned as Remote Trip will cause a trip within 100 ms with the name that has been chosen. Multiple sources may be used to trigger a remote trip by paralleling inputs.

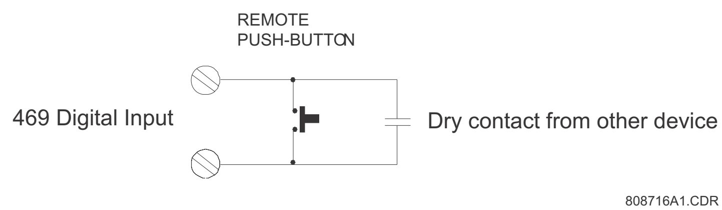


FIGURE 5–4: Remote Alarm/Trip from Multiple Sources

Speed Switch Trip

PATH: SETTINGS ▷▽ S3 DIGITAL INPUTS ▷▽ ASSIGNABLE INPUT 1(4)

■ ASSIGNABLE [▷] INPUT 1		INPUT 1 FUNCTION: Speed Switch Trip	*Range: See above.*
	MESSAGE	ASSIGN TRIP RELAYS: Trip	*Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3*
	MESSAGE	SPEED SWITCH TRIP TIME DELAY: 5.0 s	*Range: 1.0 to 250.0 s in steps of 0.1*

These settings apply only if the **INPUT 1(4) FUNCTION** is “Speed Switch Trip”.

When this function is assigned to a digital input, the following will occur. When a transition from stopped to start is detected a timer will be loaded with the delay programmed. If that delay expires before a contact closure is detected, a trip will occur. Once the motor is stopped, the scheme is reset.

Load Shed Trip

PATH: SETTINGS ▷▽ S3 DIGITAL INPUTS ▷▽ ASSIGNABLE INPUT 1(4)

■ ASSIGNABLE [▷] INPUT 1		INPUT 1 FUNCTION: Load Shed Trip	*Range: See above*
	MESSAGE	ASSIGN TRIP RELAYS: Trip	*Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3*

These settings apply only if the **INPUT 1(4) FUNCTION** is “Load Shed Trip”.

Once the load shed trip function is chosen for one of the assignable digital inputs, the settings messages shown here will follow the assignment message. A trip relay may be selected. A contact closure on the switch input assigned as load shed trip will cause a trip within 100 ms.

Pressure Switch Alarm

PATH: SETTINGS ▷▽ S3 DIGITAL INPUTS ▷▽ ASSIGNABLE INPUT 1(4)

■ ASSIGNABLE [▷] INPUT 1	INPUT 1 FUNCTION: Pressure Sw Alarm	*Range: See above*
MESSAGE	BLOCK PRES. SW. ALARM FROM START: 0 s	*Range: 0 to 5000 s in steps of 1*
MESSAGE	PRESSURE SWITCH ALARM: Unlatched	*Range: Latched, Unlatched*
MESSAGE	ASSIGN ALARM RELAYS: Alarm	*Range: Alarm, Alarm & Auxiliary2, Alarm & Auxiliary2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE	PRESSURE SW. ALARM DELAY: 5.0 s	*Range: 0.1 to 100.0 sec., step: 0.1*
MESSAGE	PRESSURE SW. ALARM EVENTS: Off	*Range: On, Off*

These settings apply only if the **INPUT 1(4) FUNCTION** is "Pressure Sw. Alarm".

Once the pressure switch alarm function is chosen for one of the assignable digital inputs, the settings messages shown here will follow the assignment message. The Pressure Switch alarm feature may be blocked for a specified period of time from a motor start. A value of zero for the block time indicates that the feature is always active, when the motor is stopped or running. After the block delay has expired, the digital input will be monitored. If a closure occurs, after the specified delay, an alarm will occur.

Pressure Switch Trip

PATH: SETTINGS ▷▽ S3 DIGITAL INPUTS ▷▽ ASSIGNABLE INPUT 1(4)

■ ASSIGNABLE [▷] INPUT 1	INPUT 1 FUNCTION: Pressure Switch Trip	*Range: See above*
MESSAGE	BLOCK PRES. SW. TRIP FROM START: 0 s	*Range: 0 to 5000 sec.; step: 1*
MESSAGE	ASSIGN TRIP RELAYS: Trip	*Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3*
MESSAGE	PRESSURE SW. TRIP DELAY: 5.0 s	*Range: 0.1 to 100.0 s in steps of 0.1*

These settings apply only if the **INPUT 1(4) FUNCTION** is "Pressure Switch Trip".

Once the Pressure Switch Trip function is chosen for one of the digital inputs, the settings messages shown here will follow the assignment message. The Pressure Switch Trip feature may be blocked for a specified period of time from a motor start. A value of zero for the Block time indicates that the feature is always active, when the motor is stopped or running. After the block delay has expired, the digital input will be monitored. If a closure occurs, after the specified delay, a trip will occur.

Vibration Switch Alarm

PATH: SETTINGS ▷▽ S3 DIGITAL INPUTS ▷▽ ASSIGNABLE INPUT 1(4)

■ ASSIGNABLE [▷] INPUT 1	INPUT 1 FUNCTION: Vibration Sw Alarm	*Range: See above*
MESSAGE	VIBRATION SWITCH ALARM: Unlatched	*Range: Latched, Unlatched*
MESSAGE	ASSIGN ALARM RELAYS: Alarm	*Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE	VIBRATION SW. ALARM DELAY: 5.0 s	*Range: 0.1 to 100.0 s in steps of 0.1*
MESSAGE	VIBRATION SW. ALARM EVENTS: Off	*Range: On, Off*

These settings apply only if the **INPUT 1(4) FUNCTION** is "Vibration Sw. Alarm".

Once the Vibration Switch Alarm function is chosen for one of the digital inputs, the settings messages shown follow the assignment message. When the motor is stopped or running, the digital input will be monitored. If a closure occurs, an alarm will occur after the specified delay.

Vibration Switch Trip

PATH: SETTINGS ▷▽ S3 DIGITAL INPUTS ▷▽ ASSIGNABLE INPUT 1(4)

■ ASSIGNABLE [▷] INPUT 1	INPUT 1 FUNCTION: Vibration Sw Trip	*Range: See above*
MESSAGE	ASSIGN TRIP RELAYS: Trip	*Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3*
MESSAGE	VIBRATION SW. TRIP DELAY: 5.0 s	*Range: 0.1 to 100.0 s in steps of 0.1*

These settings apply only if the **INPUT 1(4) FUNCTION** is "Pressure Sw. Trip".

Once Vibration Switch Trip is chosen for a digital input, the settings shown follow the assignment message. When the motor is stopped or running, the digital input will be monitored. If a closure occurs, a trip will occur after the specified delay.

Digital Counter

PATH: SETTINGS ▷▽ S3 DIGITAL INPUTS ▷▽ ASSIGNABLE INPUT 1(4)

■ ASSIGNABLE [▷] INPUT 1		INPUT 1 FUNCTION: Digital Counter	Range: See above
	MESSAGE	COUNTER UNITS: Units	Range: 6 alphanumeric characters
	MESSAGE	COUNTER PRESET VALUE: 0	Range: 0 to 1000000000 in steps of 1
	MESSAGE	COUNTER TYPE: Increment	Range: Increment, Decrement
	MESSAGE	COUNTER ALARM: Off	Range: Off, Latched, Unlatched
	MESSAGE	ASSIGN ALARM RELAYS: Alarm	Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None
	MESSAGE	COUNTER ALARM LEVEL: 100	Range: 0 to 1000000000 in steps of 1
	MESSAGE	COUNTER ALARM PICKUP: Over	Range: Over, Under
	MESSAGE	COUNTER ALARM EVENTS: Off	Range: On, Off

These settings apply only if the **INPUT 1(4) FUNCTION** is "Digital Counter".

Once the Digital Counter function is chosen for one of the assignable digital inputs, the settings messages shown here will follow the assignment message. Each closure of the switch will be counted, by either incrementing or decrementing the counter value. An alarm may be configured when a certain count is reached. The counter value may be viewed in the **A4 MAINTENANCE ▷▽ GENERAL COUNTERS ▷▽ DIGITAL COUNTER** actual value.

To initialize the counter, program the counter value here and then change the **S1 469 SETUP ▷▽ CLEAR DATA ▷▽ PRESET DIGITAL COUNTER** settings to "Yes".

For example, a capacitive proximity probe may be used to sense non-magnetic units that are passing by on a conveyor, glass bottles for instance. The probe could be powered from the +24 V from the input switch power supply. The NPN transistor output could be taken to one of the assignable digital inputs configured as a counter.

Tachometer

PATH: SETTINGS ▷▽ S3 DIGITAL INPUTS ▷▽ ASSIGNABLE INPUT 1(4)

■ ASSIGNABLE [▷] INPUT 1		INPUT 1 FUNCTION: Tachometer	Range: See above
	MESSAGE	RATED SPEED: 3600 RPM	Range: 100 to 7200 RPM in steps of 1

MESSAGE	▲▼	TACHOMETER ALARM: Off	*Range: Off, Latched, Unlatched*
MESSAGE	▲▼	ASSIGN ALARM RELAYS: Alarm	*Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE	▲▼	TACHOMETER ALARM SPEED: 10% Rated	*Range: 5 to 100% in steps of 1*
MESSAGE	▲▼	TACHOMETER ALARM DELAY: 1 s	*Range: 1 to 250 s in steps of 1*
MESSAGE	▲▼	TACHOMETER ALARM EVENTS: Off	*Range: On, Off*
MESSAGE	▲▼	TACHOMETER TRIP: Off	*Range: Off, Latched, Unlatched*
MESSAGE	▲▼	ASSIGN TRIP RELAYS: Trip	*Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3*
MESSAGE	▲▼	TACHOMETER TRIP SPEED: 10% Rated	*Range: 5 to 95% in steps of 1*
MESSAGE	▲	TACHOMETER TRIP DELAY: 1 s	*Range: 1 to 250 s in steps of 1*

These settings apply only if the **INPUT 1(4) FUNCTION** is “Tachometer”.

Once the tachometer is chosen for a digital input, the settings shown here follow the assignment message. The period of time between each switch closure is measured and converted to an RPM value based on one closure per revolution.

A trip and alarm may be configured such that the motor or load must be at a certain speed within a set period of time from the motor starting. The tachometer trip and alarm features are configured such that the specified speed (**TACHOMETER TRIP SPEED** or **TACHOMETER ALARM SPEED**) must be reached in the specified time (**TACHOMETER TRIP DELAY** or **TACHOMETER ALARM DELAY**), otherwise the element operates. Initially, the time delay begins when the motor is started and resets when the desired speed is reached. Once the motor is running and the speed drops below the set threshold, the time delay restarts and the designated output contact will operate if the motor fails to reach the set speed in the allotted time. This element is active when motor is running and ignored while the motor is stopped. The RPM value may be viewed with the **A2 METERING ▷▽ SPEED ▷ TACHOMETER** actual value.

For example, an inductive proximity probe or hall effect gear tooth sensor may be used to sense the key on the motor. The probe could be powered from the +24 V from the input switch power supply. The NPN transistor output could be taken to one of the assignable switch inputs configured as a tachometer.

General Switch A to D

PATH: SETTINGS ▷▽ S3 DIGITAL INPUTS ▷▽ ASSIGNABLE INPUT 1(4)

■ ASSIGNABLE [▷] INPUT 1	INPUT 1 FUNCTION: General Sw. A	*Range: See above*
MESSAGE	SWITCH NAME: General Sw. A	*Range: 12 alphanumeric characters*
MESSAGE	GENERAL SWITCH A: Normally Open	*Range: Normally Open, Normally Closed.*
MESSAGE	BLOCK INPUT FROM START: 0 s	*Range: 0 to 5000 s in steps of 1*
MESSAGE	GENERAL SWITCH A ALARM: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN ALARM RELAYS: Alarm	*Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE	GENERAL SWITCH A ALARM DELAY: 5.0 s	*Range: 0.1 to 5000.0 s in steps of 0.1*
MESSAGE	GENERAL SWITCH A EVENTS: Off	*Range: On, Off*
MESSAGE	GENERAL SWITCH A TRIP: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN TRIP RELAYS: Trip	*Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3*
MESSAGE	GENERAL SWITCH A TRIP DELAY: 5.0 s	*Range: 0.1 to 5000.0 s in steps of 0.1*

These settings apply only if the **INPUT 1(4) FUNCTION** is "General Switch A". Similar messages appear for General Switches B, C, and D.

There are four general switch functions assignable to the four digital inputs. Once a general switch function is chosen for one of the digital inputs, the settings messages shown here follow the assignment message. An alarm and/or trip may then be configured for that input. The alarm and/or trip may be assigned a common name and a common block time from motor start if required (if the alarm is to be disabled until some period of time after he motor has been started). A value of "0" for the **BLOCK TIME** settings indicates that the feature is always active, when the motor is stopped or running. The switch may also be defined as normally open or normally closed. After the block delay has expired, the digital input will be monitored. If the switch is not in its normal state after the specified delay, an alarm or trip will occur.

Capture Trace

PATH: SETTINGS ▷▽ S3 DIGITAL INPUTS ▷▽ ASSIGNABLE INPUT 1(4)

■ ASSIGNABLE [▷] INPUT 1	INPUT 1 FUNCTION: Capture Trace	*Range: See above.*

Setting the **INPUT 1(4) FUNCTION** to “Capture Trace” allows for trace capture upon command via a switch input. The captured waveforms can be displayed with the relay software. There are no additional settings associated with this value.

Simulate Pre-Fault

PATH: SETTINGS ▷▽ S3 DIGITAL INPUTS ▷▽ ASSIGNABLE INPUT 1(4)

```
■ ASSIGNABLE [▷]        INPUT 1 FUNCTION:
  INPUT 1               Simulate Pre-Fault
```

Range: See above.

Setting the **INPUT 1(4) FUNCTION** to “Simulate Pre-Fault” allows the user to start the Simulate Pre-Fault mode as per the **S13 469 TESTING ▷ SIMULATION MODE ▷ SIMULATION MODE** setting via a switch input. This is typically used for relay or system testing. There are no additional Digital Input settings associated with this value.

Simulate Fault

PATH: SETTINGS ▷▽ S3 DIGITAL INPUTS ▷▽ ASSIGNABLE INPUT 1(4)

```
■ ASSIGNABLE [▷]        INPUT 1 FUNCTION:
  INPUT 1               Simulate Fault
```

Range: See above.

Setting the **INPUT 1(4) FUNCTION** to “Simulate Fault” allows the user to start the Simulate Fault mode as per the **S13 469 TESTING ▷ SIMULATION MODE ▷ SIMULATION MODE** setting via a switch input. This is typically used for relay or system testing. There are no additional Digital Input settings associated with this value.

Simulate Pre-Fault ...Fault

PATH: SETTINGS ▷▽ S3 DIGITAL INPUTS ▷▽ ASSIGNABLE INPUT 1(4)

```
■ ASSIGNABLE [▷]        INPUT 1 FUNCTION:
  INPUT 1               Sim Pre-Fault.Fault
```

Range: See above.

Setting the **INPUT 1(4) FUNCTION** to “Sim Pre-Fault.Fault” allows the user to start the Simulate Pre-Fault to Fault mode as per the **S13 469 TESTING ▷ SIMULATION MODE ▷ SIMULATION MODE** setting via a switch input. This is typically used for relay or system testing. There are no additional Digital Input settings associated with this value.

5.5 S4 Output Relays

5.5.1 Description

Five of the six output relays are always non-failsafe; the 6 SERVICE relay is always failsafe. As failsafe, the 6 SERVICE relay will be energized normally and de-energize when called upon to operate. It will also de-energize when control power to the 469 is lost and therefore, be in its operated state. All other relays, being non-failsafe, will be de-energized normally and energize when called upon to operate. Obviously, when control power is lost to the 469, the output relays must be de-energized and therefore, they will be in their non-operated state. Shorting bars in the drawout case ensure that when the 469 is drawn out, no trip or alarm occurs. The the 6 SERVICE relay will however indicate that the 469 has been drawn out.

5.5.2 Relay Reset Mode

PATH: SETTINGS ▷▽ S4 OUTPUT RELAYS ▷ RELAY RESET MODE

■ RELAY [▷] RESET MODE		1 TRIP: All Resets	*Range: All Resets, Remote Reset Only, Keypad Reset Only*
	MESSAGE	2 AUXILIARY: All Resets	*Range: All Resets, Remote Reset Only, Keypad Reset Only*
	MESSAGE	3 AUXILIARY: All Resets	*Range: All Resets, Remote Reset Only, Keypad Reset Only*
	MESSAGE	4 ALARM: All Resets	*Range: All Resets, Remote Reset Only, Keypad Reset Only*
	MESSAGE	5 BLOCK START: Auto-Reset	*Range: N/A*
	MESSAGE	6 SERVICE: All Resets	*Range: All Resets, Remote Reset Only, Keypad Reset Only*

A latched trip or alarm may be reset at any time, providing that the condition that caused the trip or alarm is no longer present. Unlatched trips and alarms will reset automatically once the condition is no longer present. If any condition may be reset, the Reset Possible LED will be lit. All Block Start features reset automatically when the lockout time has expired and the trip has been reset.

The other relays may be programmed to All Resets which allows reset from the front keypad or the remote reset switch input or the communications port. Optionally, relays 1 through 6 may be programmed to reset by the "Remote Reset Only" (by the remote reset switch input or the communications port) or "Keypad Reset Only" (reset only by relay keypad).

⚠WARNING

***NO* trip or alarm element must *EVER* be assigned to two output relays where one is Remote Reset Only and the other is Keypad Reset Only. The trip or alarm will not be resettable if this occurs.**

For example, serious trips such as Short Circuit and Ground Fault may be assigned to the 2 AUXILIARY relay so that they can only be reset via the remote reset terminals (D18 and D23) or the communication port. The remote reset terminals should be connected to a keyswitch so that only authorized personnel could reset such a critical trip.

- Assign only Short Circuit and Ground Fault to the 2 AUXILIARY relay
- Program **2 AUXILIARY** to “Remote Reset Only”

5.5.3 Force Output Relay

PATH: SETTINGS ▷▽ S4 OUTPUT RELAYS ▷▽ FORCE OUTPUT RELAYS

■ FORCE [▷] OUTPUT RELAYS		FORCE 1 TRIP RELAY: Disabled	*Range: Disabled, Enabled*
MESSAGE		FORCE TRIP RELAY DURATION: Static	*Range: Static, 1 to 300 s in steps of 1*
MESSAGE		FORCE 2 AUXILIARY RELAY: Disabled	*Range: Disabled, Enabled*
MESSAGE		FORCE 2 AUX RELAY DURATION: Static	*Range: Static, 1 to 300 s in steps of 1*
MESSAGE		FORCE 3 AUXILIARY RELAY: Disabled	*Range: Disabled, Enabled*
MESSAGE		FORCE 3 AUX RELAY DURATION: Static	*Range: Static, 1 to 300 s in steps of 1*
MESSAGE		FORCE 4 ALARM RELAY: Disabled	*Range: Disabled, Enabled*
MESSAGE		FORCE ALARM RELAY DURATION: Static	*Range: Static, 1 to 300 s in steps of 1*
MESSAGE		FORCE 5 BLOCK START RELAY: Disabled	*Range: Disabled, Enabled*
MESSAGE		FORCE BLOCK RELAY DURATION: Static	*Range: Static, 1 to 300 s in steps of 1*

The output relays can be independently forced in static or dynamic mode. In static mode the selected relay will operate as long as it is in the “Enabled” state. Only when the user enters “Disabled” will the selected relay reset. In dynamic mode the user specifies the operate time (1 to 300 seconds) and the selected relay will operate for the specified duration.

The **FORCE OUTPUT RELAY** option is NOT allowed when the selected relay output is already active due to trip or alarm condition, when the 469 is in start block condition, or when the 469 is not in service.

NOTE

IMPORTANT NOTE: The forced relay will override any trip or alarm conditions. (i.e. when the relay is forced and trip occurs, the relay will still be enabled when the trip condition is reset).

Control power loss in the 469 will **reset** all forced relays.

5.6 S5 Thermal Model

5.6.1 Motor Thermal Limits

One of the principle enemies of motor life is heat. When a motor is specified, the purchaser communicates to the manufacturer what the loading conditions and duty cycle will be, as well as, environment and other pertinent information about the driven load such as starting torque, etc. The manufacturer then provides a stock motor or builds a motor that should have a reasonable life under those conditions.

Motor thermal limits are dictated by the design of both the stator and the rotor. Motors have three modes of operation: locked rotor or stall (when the rotor is not turning), acceleration (when the rotor is coming up to speed), and running (when the rotor turns at near synchronous speed). Heating occurs in the motor during each of these conditions in very distinct ways. Typically, during motor starting, locked rotor and acceleration conditions, the motor is rotor limited. That is to say that the rotor will approach its thermal limit before the stator. Under locked rotor conditions, voltage is induced in the rotor at line frequency, 50 or 60 Hz. This voltage causes a current to flow in the rotor, also at line frequency, and the heat generated (I^2R) is a function of the effective rotor resistance. At 50 or 60 Hz, the reactance of the rotor cage causes the current to flow at the outer edges of the rotor bars. The effective resistance of the rotor is therefore at a maximum during a locked rotor condition as is rotor heating. When the motor is running at rated speed, the voltage induced in the rotor is at a low frequency (approximately 1 Hz) and therefore, the effective resistance of the rotor is reduced quite dramatically. During running overloads, the motor thermal limit is typically dictated by stator parameters. Some special motors might be all stator or all rotor limited. During acceleration, the dynamic nature of the motor slip dictates that rotor impedance is also dynamic, and a third overload thermal limit characteristic is necessary.

The figure below illustrates typical thermal limit curves. The motor starting characteristic is shown for a high inertia load at 80% voltage. If the motor started quicker, the distinct characteristics of the thermal limit curves would not be required and the running overload curve would be joined with locked rotor safe stall times to produce a single overload curve.

The motor manufacturer should provide a safe stall time or thermal limit curves for any motor they sell. To program the 469 for maximum protection, it is necessary to ask for these items when the motor is out for bid. These thermal limits are intended to be used as guidelines and their definition is not always precise. When operation of the motor exceeds the thermal limit, the motor insulation does not immediately melt. Rather, the rate of insulation degradation has reached a point that motor life will be significantly reduced if it is run any longer in that condition.

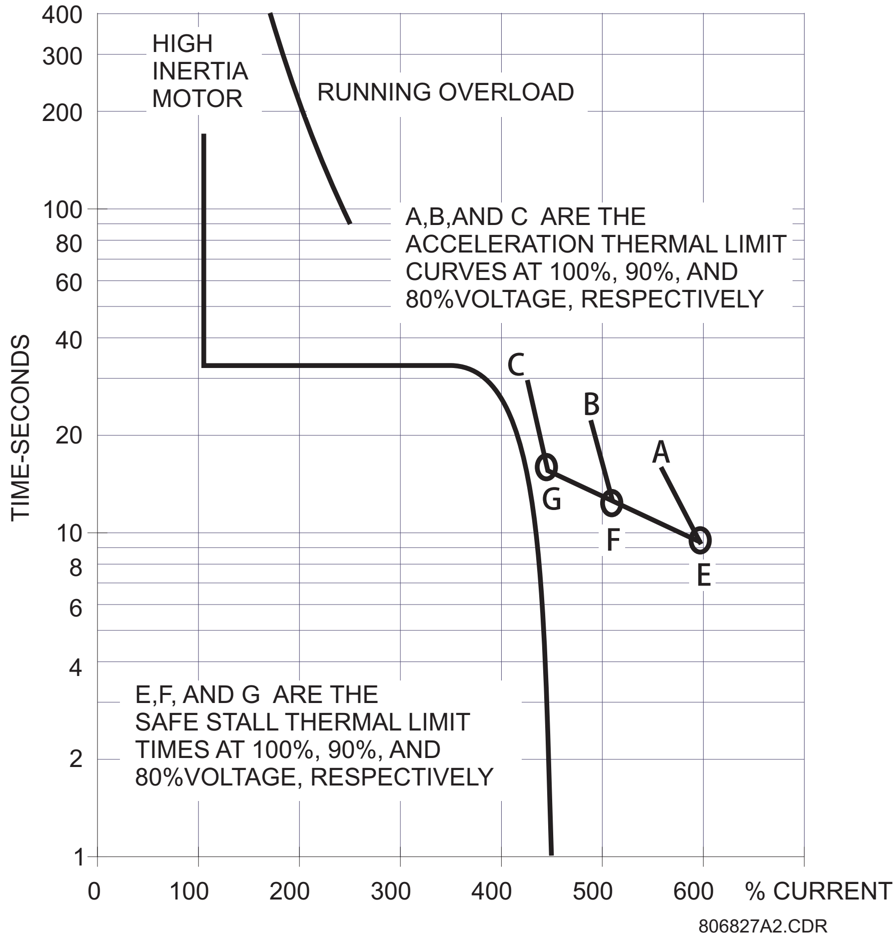


FIGURE 5–5: Typical Time-Current and Thermal Limit Curves (ANSI/IEEE C37.96)

5.6.2 Thermal Model

PATH: SETTINGS ▷▽ S5 THERMAL MODEL ▷ THERMAL MODEL

■ THERMAL MODEL [▷]	
SELECT CURVE STYLE: Standard	*Range: Standard, Custom, Voltage Dependent*
MESSAGE: OVERLOAD PICKUP LEVEL: 1.01 x FLA	*Range: 1.01 to 1.25 in steps of 0.01*
MESSAGE: ASSIGN TRIP RELAYS: Trip	*Range: Trip, Trip & Aux2, Trip & Aux2 & Aux3, Trip & Aux3*
MESSAGE: UNBALANCE BIAS K FACTOR: 0	*Range: 0 to 19 in steps of 1. (0 defeats this feature)*
MESSAGE: COOL TIME CONSTANT RUNNING: 15 min.	*Range: 1 to 1000 min. in steps of 1*
MESSAGE: COOL TIME CONSTANT STOPPED: 30 min.	*Range: 1 to 1000 min. in steps of 1*
MESSAGE: HOT/COLD SAFE STALL RATIO: 1.00	*Range: 0.01 to 1.00 in steps of 0.01*
MESSAGE: ENABLE RTD BIASING: No	*Range: Yes, No*
MESSAGE: RTD BIAS MINIMUM: 40°C	*Range: 0°C to* **RTD BIAS CENTER** *value in steps of 1*
MESSAGE: RTD BIAS CENTER POINT: 130°C	*Range:* **RTD BIAS MINIMUM** *value to* **RTD BIAS MAXMIMUM** *value in steps of 1*
MESSAGE: RTD BIAS MAXIMUM: 155°C	*Range:* **RTD BIAS CENTER** *value to 250°C in steps of 1*
MESSAGE: THERMAL CAPACITY ALARM: Off	*Range: Off, Latched, Unlatched*
MESSAGE: ASSIGN ALARM RELAYS: Alarm	*Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE: THERMAL CAP. ALARM LEVEL: 75% USED	*Range: 10 to 100% in steps of 1*
MESSAGE: THERMAL CAPACITY ALARM EVENTS: Off	*Range: On, Off*

The primary protective function of the 469 is the thermal model. It consists of five key elements: the overload curve and overload pickup level, the unbalance biasing of the motor current while the motor is running, the motor cooling time constants, and the biasing of the thermal model based on Hot/Cold motor information and measured stator temperature. Each of these elements are described in detail in the sections that follow.

The 469 integrates stator and rotor heating into one model. Motor heating is reflected in the **A1 STATUS ▷ MOTOR STATUS ▷▽ MOTOR THERMAL CAPACITY USED** actual value register. If the motor has been stopped for a long period of time, it will be at ambient temperature and the **MOTOR THERMAL CAPACITY USED** should be zero. If the motor is in overload, once the thermal capacity used reaches 100%, a trip will occur. The **THERMAL CAPACITY ALARM** may be used as a warning indication of an impending overload trip.

5.6.3 Overload Curve Setup

Overview

The overload curve accounts for motor heating during stall, acceleration, and running in both the stator and the rotor. The **OVERLOAD PICKUP LEVEL** settings dictates where the running overload curve begins as the motor enters an overload condition. This is useful for service factor motors as it allows the pickup level to be defined. The curve is effectively cut off at current values below this pickup.

Motor thermal limits consist of three distinct parts based on the three conditions of operation: locked rotor or stall, acceleration, and running overload. Each of these curves may be provided for a hot and a cold motor. A hot motor is defined as one that has been running for a period of time at full load such that the stator and rotor temperatures have settled at their rated temperature. A cold motor is a motor that has been stopped for a period of time such that the stator and rotor temperatures have settled at ambient temperature. For most motors, the distinct characteristics of the motor thermal limits are formed into a smooth homogeneous curve. Sometimes only a safe stall time is provided. This is acceptable if the motor has been designed conservatively and can easily perform its required duty without infringing on the thermal limit. In this case, the protection can be conservative and process integrity is not compromised. If a motor has been designed very close to its thermal limits when operated as required, then the distinct characteristics of the thermal limits become important.

The 469 overload curve can take one of three formats: Standard, Custom Curve, or Voltage Dependent. Regardless of the selected curve style, thermal memory is retained in the **A1 STATUS ▷ MOTOR STATUS ▷▽ MOTOR THERMAL CAPACITY USED** register. This register is updated every 100 ms using the following equation:

$$TC_{\text{used at } t} = TC_{\text{used at } t - 100\text{ms}} + \frac{100\text{ ms}}{\text{time to trip}} \times 100\% \qquad \textbf{(EQ 5.1)}$$

where: time_to_trip = time taken from the overload curve at I_{eq} as a function of FLA. The overload protection curve should always be set slightly lower than the thermal limits provided by the manufacturer. this will ensure that the motor is tripped before the thermal limit is reached.

Standard Overload Curves

If the **SELECT CURVE STYLE** is set to "Standard" in the Thermal Model, only the following settings will appear:

PATH: SETTINGS ▷▽ S5 THERMAL MODEL ▷▽ OVERLOAD CURVE SETUP

```
■ OVERLOAD    [▷]        STANDARD OVERLOAD
  CURVE SETUP            CURVE NUMBER: 4
```

Range: 1 to 15 in steps of 1. Seen only if Standard curve is selected.

If the motor starting times are well within the safe stall times, it is recommended that the 469 Standard Overload Curve be used. The standard overload curves are a series of 15 curves with a common curve shape based on typical motor thermal limit curves (see the figure and table below).

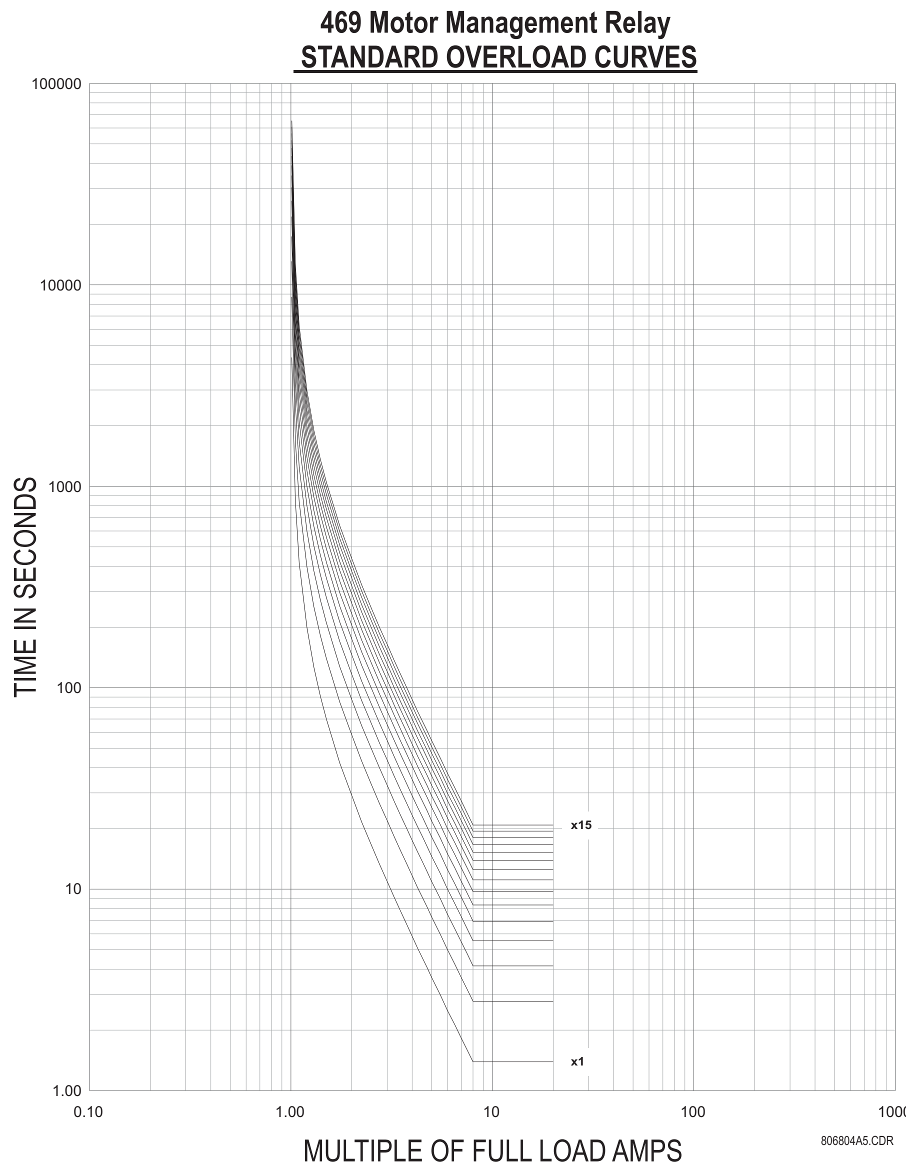


FIGURE 5–6: 469 Standard Overload Curves

Table 5–1: 469 Standard Overload Curve Multipliers

PICKUP (× FLA)	STANDARD CURVE MULTIPLIERS														
	× 1	× 2	× 3	× 4	× 5	× 6	× 7	× 8	× 9	× 10	× 11	× 12	× 13	× 14	× 15
1.01	4353.6	8707.2	13061	17414	21768	26122	30475	34829	39183	43536	47890	52243	56597	60951	65304
1.05	853.71	1707.4	2561.1	3414.9	4268.6	5122.3	5976.0	6829.7	7683.4	8537.1	9390.8	10245	11098	11952	12806

Table 5–1: 469 Standard Overload Curve Multipliers

PICKUP (× FLA)	STANDARD CURVE MULTIPLIERS														
	× 1	× 2	× 3	× 4	× 5	× 6	× 7	× 8	× 9	× 10	× 11	× 12	× 13	× 14	× 15
1.10	416.68	833.36	1250.0	1666.7	2083.4	2500.1	2916.8	3333.5	3750.1	4166.8	4583.5	5000.2	5416.9	5833.6	6250.2
1.20	198.86	397.72	596.58	795.44	994.30	1193.2	1392.0	1590.9	1789.7	1988.6	2187.5	2386.3	2585.2	2784.1	2982.9
1.30	126.80	253.61	380.41	507.22	634.02	760.82	887.63	1014.4	1141.2	1268.0	1394.8	1521.6	1648.5	1775.3	1902.1
1.40	91.14	182.27	273.41	364.55	455.68	546.82	637.96	729.09	820.23	911.37	1002.5	1093.6	1184.8	1275.9	1367.0
1.50	69.99	139.98	209.97	279.96	349.95	419.94	489.93	559.92	629.91	699.90	769.89	839.88	909.87	979.86	1049.9
1.75	42.41	84.83	127.24	169.66	212.07	254.49	296.90	339.32	381.73	424.15	466.56	508.98	551.39	593.81	636.22
2.00	29.16	58.32	87.47	116.63	145.79	174.95	204.11	233.26	262.42	291.58	320.74	349.90	379.05	408.21	437.37
2.25	21.53	43.06	64.59	86.12	107.65	129.18	150.72	172.25	193.78	215.31	236.84	258.37	279.90	301.43	322.96
2.50	16.66	33.32	49.98	66.64	83.30	99.96	116.62	133.28	149.94	166.60	183.26	199.92	216.58	233.24	249.90
2.75	13.33	26.65	39.98	53.31	66.64	79.96	93.29	106.62	119.95	133.27	146.60	159.93	173.25	186.58	199.91
3.00	10.93	21.86	32.80	43.73	54.66	65.59	76.52	87.46	98.39	109.32	120.25	131.19	142.12	153.05	163.98
3.25	9.15	18.29	27.44	36.58	45.73	54.87	64.02	73.16	82.31	91.46	100.60	109.75	118.89	128.04	137.18
3.50	7.77	15.55	23.32	31.09	38.87	46.64	54.41	62.19	69.96	77.73	85.51	93.28	101.05	108.83	116.60
3.75	6.69	13.39	20.08	26.78	33.47	40.17	46.86	53.56	60.25	66.95	73.64	80.34	87.03	93.73	100.42
4.00	5.83	11.66	17.49	23.32	29.15	34.98	40.81	46.64	52.47	58.30	64.13	69.96	75.79	81.62	87.45
4.25	5.12	10.25	15.37	20.50	25.62	30.75	35.87	41.00	46.12	51.25	56.37	61.50	66.62	71.75	76.87
4.50	4.54	9.08	13.63	18.17	22.71	27.25	31.80	36.34	40.88	45.42	49.97	54.51	59.05	63.59	68.14
4.75	4.06	8.11	12.17	16.22	20.28	24.33	28.39	32.44	36.50	40.55	44.61	48.66	52.72	56.77	60.83
5.00	3.64	7.29	10.93	14.57	18.22	21.86	25.50	29.15	32.79	36.43	40.08	43.72	47.36	51.01	54.65
5.50	2.99	5.98	8.97	11.96	14.95	17.94	20.93	23.91	26.90	29.89	32.88	35.87	38.86	41.85	44.84
6.00	2.50	5.00	7.49	9.99	12.49	14.99	17.49	19.99	22.48	24.98	27.48	29.98	32.48	34.97	37.47
6.50	2.12	4.24	6.36	8.48	10.60	12.72	14.84	16.96	19.08	21.20	23.32	25.44	27.55	29.67	31.79
7.00	1.82	3.64	5.46	7.29	9.11	10.93	12.75	14.57	16.39	18.21	20.04	21.86	23.68	25.50	27.32
7.50	1.58	3.16	4.75	6.33	7.91	9.49	11.08	12.66	14.24	15.82	17.41	18.99	20.57	22.15	23.74
8.00	1.39	2.78	4.16	5.55	6.94	8.33	9.71	11.10	12.49	13.88	15.27	16.65	18.04	19.43	20.82
10.00	1.39	2.78	4.16	5.55	6.94	8.33	9.71	11.10	12.49	13.88	15.27	16.65	18.04	19.43	20.82
15.00	1.39	2.78	4.16	5.55	6.94	8.33	9.71	11.10	12.49	13.88	15.27	16.65	18.04	19.43	20.82
20.00	1.39	2.78	4.16	5.55	6.94	8.33	9.71	11.10	12.49	13.88	15.27	16.65	18.04	19.43	20.82

NOTE

Above 8.0 x Pickup, the trip time for 8.0 is used. This prevents the overload curve from acting as an instantaneous element.

The standard overload curves equation is:

$$\text{Time to Trip} = \frac{\text{Curve\_Multiplier} \times 2.2116623}{0.02530337 \times (\text{Pickup} - 1)^2 + 0.05054758 \times (\text{Pickup} - 1)} \qquad \textbf{(EQ 5.2)}$$

Custom Overload Curve

If the **SELECT CURVE STYLE** is set to "Custom" in the Thermal Model, the following settings will appear:

PATH: SETTINGS ▷▽ S5 THERMAL MODEL ▷▽ OVERLOAD CURVE SETUP

■ OVERLOAD [▷] CURVE SETUP	TIME TO TRIP AT 1.01 x FLA: 17414.5 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 1.05 x FLA: 3414.9 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 1.10 x FLA: 1666.7 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 1.20 x FLA: 795.4 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 1.30 x FLA: 507.2 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 1.40 x FLA: 364.6 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 1.50 x FLA: 280.0 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 1.75 x FLA: 169.7 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 2.00 x FLA: 116.6 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 2.25 x FLA: 86.1 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 2.50 x FLA: 66.6 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 2.75 x FLA: 53.3 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 3.00 x FLA: 43.7 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 3.25 x FLA: 36.6 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 3.50 x FLA: 31.1 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 3.75 x FLA: 26.8 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 4.00 x FLA: 23.3 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 4.25 x FLA: 20.5 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 4.50 x FLA: 18.2 s	*Range: 0.5 to 99999.9 s in steps of 0.1*

MESSAGE	TIME TO TRIP AT 4.75 x FLA: 16.2 s	Range: 0.5 to 99999.9 s in steps of 0.1
MESSAGE	TIME TO TRIP AT 5.00 x FLA: 14.6 s	Range: 0.5 to 99999.9 s in steps of 0.1
MESSAGE	TIME TO TRIP AT 5.50 x FLA: 12.0 s	Range: 0.5 to 99999.9 s in steps of 0.1
MESSAGE	TIME TO TRIP AT 6.00 x FLA: 10.0 s	Range: 0.5 to 99999.9 s in steps of 0.1
MESSAGE	TIME TO TRIP AT 6.50 x FLA: 8.5 s	Range: 0.5 to 99999.9 s in steps of 0.1
MESSAGE	TIME TO TRIP AT 7.00 x FLA: 7.3 s	Range: 0.5 to 99999.9 s in steps of 0.1
MESSAGE	TIME TO TRIP AT 7.50 x FLA: 6.3 s	Range: 0.5 to 99999.9 s in steps of 0.1
MESSAGE	TIME TO TRIP AT 8.00 x FLA: 5.6 s	Range: 0.5 to 99999.9 s in steps of 0.1
MESSAGE	TIME TO TRIP AT 10.0 x FLA: 5.6 s	Range: 0.5 to 99999.9 s in steps of 0.1
MESSAGE	TIME TO TRIP AT 15.0 x FLA: 5.6 s	Range: 0.5 to 99999.9 s in steps of 0.1
MESSAGE	TIME TO TRIP AT 20.0 x FLA: 5.6 s	Range: 0.5 to 99999.9 s in steps of 0.1

If the motor starting current begins to infringe on the thermal damage curves, it may become necessary to use a custom curve to tailor the motor protection so that successful starting may occur without compromising protection. Furthermore, the characteristics of the starting thermal damage curve (locked rotor and acceleration) and the running thermal damage curves may not fit together very smoothly. In this instance, a custom curve may be necessary to tailor motor protection to the motor thermal limits so it may be started successfully and be utilized to its full potential without compromising protection. The distinct parts of the thermal limit curves now become more critical. For these conditions, it is recommended that the 469 custom curve thermal model be used. The custom overload curve feature allows the user to program their own curve by entering trip times for 30 pre-determined current levels.

As seen in the figure below, if the running overload thermal limit curve were smoothed into one curve with the locked rotor overload curve, the motor could not start at 80% line voltage. A custom curve is required.

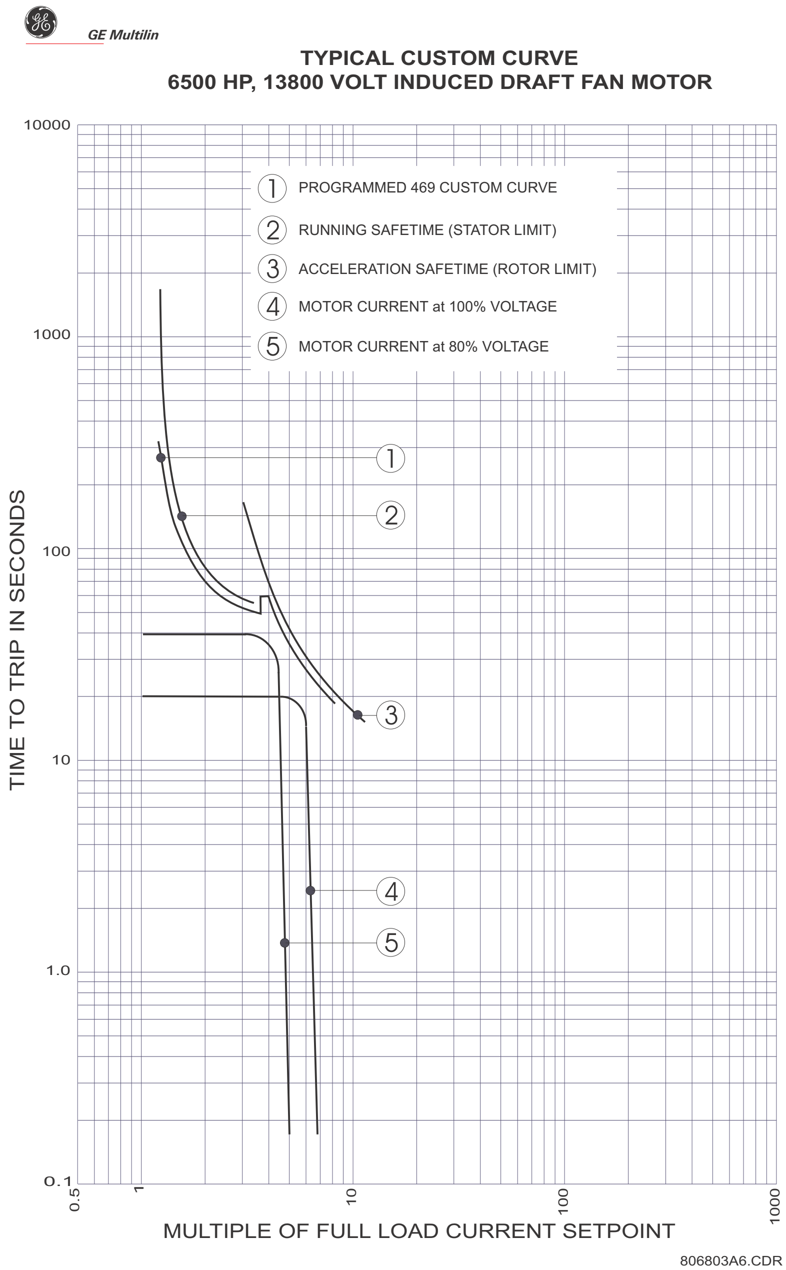


FIGURE 5–7: Custom Curve Example

NOTE

During the interval of discontinuity, the longer of the two trip times is used to reduce the chance of nuisance tripping during motor starts.

Voltage Dependent Overload Curves

If the **SELECT CURVE STYLE** is set to "Voltage Dependent" in the Thermal Model, the following settings will appear:

PATH: SETTINGS ▷▽ S5 THERMAL MODEL ▷▽ OVERLOAD CURVE SETUP

■ OVERLOAD [▷] CURVE SETUP	TIME TO TRIP AT 1.01 x FLA: 17414.5 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 1.05 x FLA: 3414.9 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 1.10 x FLA: 1666.7 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 1.20 x FLA: 795.4 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 1.30 x FLA: 507.2 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 1.40 x FLA: 364.6 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 1.50 x FLA: 280.0 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 1.75 x FLA: 169.7 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 2.00 x FLA: 116.6 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 2.25 x FLA: 86.1 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 2.50 x FLA: 66.6 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 2.75 x FLA: 53.3 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 3.00 x FLA: 43.7 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 3.25 x FLA: 36.6 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 3.50 x FLA: 31.1 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 3.75 x FLA: 26.8 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 4.00 x FLA: 23.3 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 4.25 x FLA: 20.5 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 4.50 x FLA: 18.2 s	*Range: 0.5 to 99999.9 s in steps of 0.1*

MESSAGE	TIME TO TRIP AT 4.75 x FLA: 16.2 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 5.00 x FLA: 14.6 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 5.50 x FLA: 12.0 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 6.00 x FLA: 10.0 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 6.50 x FLA: 8.5 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 7.00 x FLA: 7.3 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 7.50 x FLA: 6.3 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 8.00 x FLA: 5.6 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 10.0 x FLA: 5.6 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 15.0 x FLA: 5.6 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	TIME TO TRIP AT 20.0 x FLA: 5.6 s	*Range: 0.5 to 99999.9 s in steps of 0.1*
MESSAGE	MINIMUM ALLOWABLE LINE VOLTAGE: 80%	*Range: 70 to 95% in steps of 1*
MESSAGE	STALL CURRENT @ MIN Vline: 4.80 x FLA	*Range: 2.00 to 15.00 x FLA in steps of 0.01*
MESSAGE	SAFE STALL TIME @ MIN Vline: 20.0 s	*Range: 0.5 to 999.9 s in steps of 0.1*
MESSAGE	ACCEL. INTERSECT @ MIN Vline: 3.80 x FLA	*Range: 2.00 to* **STALL CURRENT @ MIN VLINE** *– 0.01 in steps of 0.01*
MESSAGE	STALL CURRENT @ 100% Vline: 6.00 x FLA	*Range: 2.00 to 15.00 x FLA in steps of 0.01*
MESSAGE	SAFE STALL TIME @ 100% Vline: 10.0 s	*Range: 0.5 to 999.9 s in steps of 0.1*
MESSAGE	ACCEL. INTERSECT @ 100% Vline: 5.00 x FLA	*Range: 2.00 to* **STALL CURRENT @ MIN VLINE** *– 0.01 in steps of 0.01*

If the motor is called upon to drive a high inertia load, it is quite possible and acceptable for the acceleration time to exceed the safe stall time (keeping in mind that a locked rotor condition is different than an acceleration condition). In this instance, each distinct portion of the thermal limit curve must be known and protection must be coordinated against that curve. The relay protecting the motor must be able to distinguish between a locked rotor condition, an accelerating condition, and a running condition. The Voltage Dependent

Overload Curve feature is tailored to protect these types of motors. Voltage is continually monitored during motor starting and the acceleration thermal limit curve is adjusted accordingly.

The Voltage Dependent Overload Curve is comprised of the three characteristic shapes of thermal limit curves as determined by the stall or locked rotor condition, acceleration, and running overload. The curve is constructed by entering a custom curve shape for the running overload protection curve. Next, a point must be entered for the acceleration protection curve at the point of intersection with the custom curve, based on the minimum allowable starting voltage as defined by the minimum allowable line voltage. The locked rotor current and safe stall time must also be entered for that voltage. A second point of intersection must be entered for 100% line voltage. Once again, the locked rotor current and the safe stall time must be entered, this time for 100% line voltage. The protection curve created from the safe stall time and intersection point will be dynamic based on the measured line voltage between the minimum allowable line voltage and the 100% line voltage. This method of protection inherently accounts for the change in motor speed as an impedance relay would. The change in impedance is reflected by motor terminal voltage and line current. For any given speed at any given line voltage, there is only one value of line current.

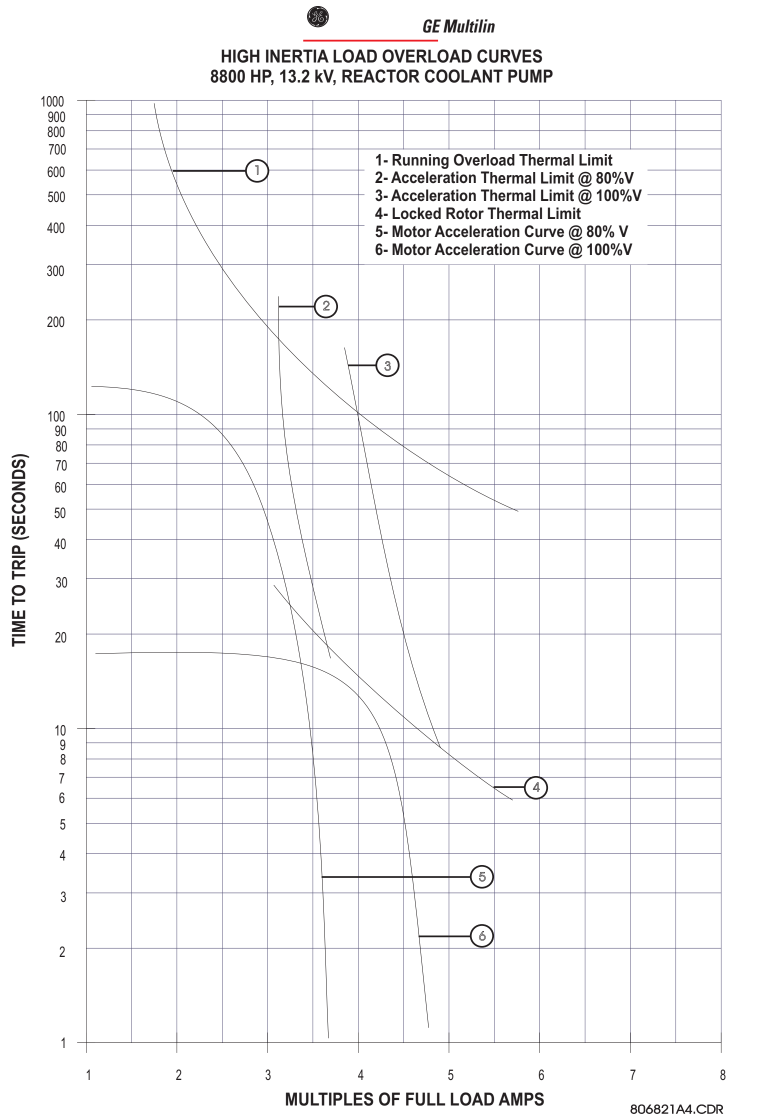


FIGURE 5–8: Thermal Limits for High Inertial Load

To illustrate the Voltage Dependent Overload Curve feature, the thermal limits of FIGURE 5–8: *Thermal Limits for High Inertial Load* will be used.

1. Construct a custom curve for the running overload thermal limit. If the curve does not extend to the acceleration thermal limits, extend it such that the curve intersects the acceleration thermal limit curves (see the Custom Curve below).
2. Enter the per unit current value for the acceleration overload curve intersect with the custom curve for 80% line voltage. Also enter the per unit current and safe stall protection time for 80% line voltage (see the Acceleration Curves below).
3. Enter the per unit current value for the acceleration overload curve intersect with the custom curve for 100% line voltage. Also enter the per unit current and safe stall protection time for 100% line voltage (see the Acceleration Curves below).

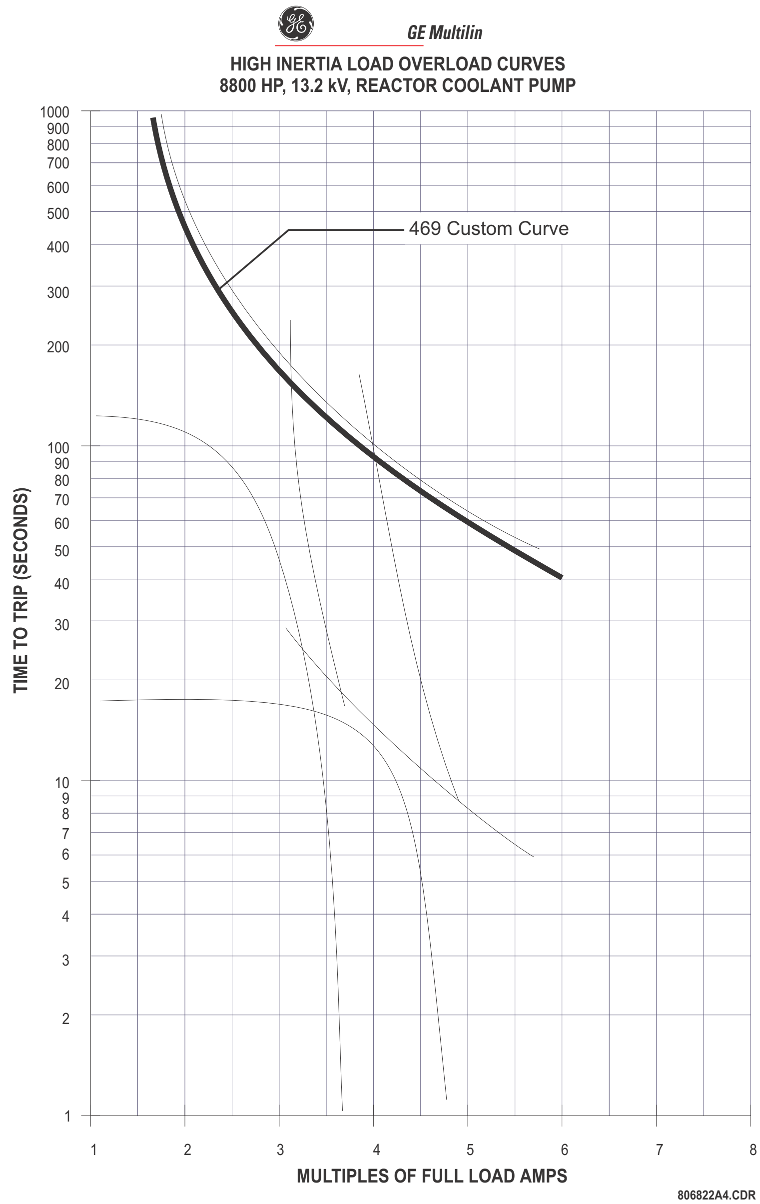


FIGURE 5–9: Voltage Dependent Overload Curve (Custom Curve)

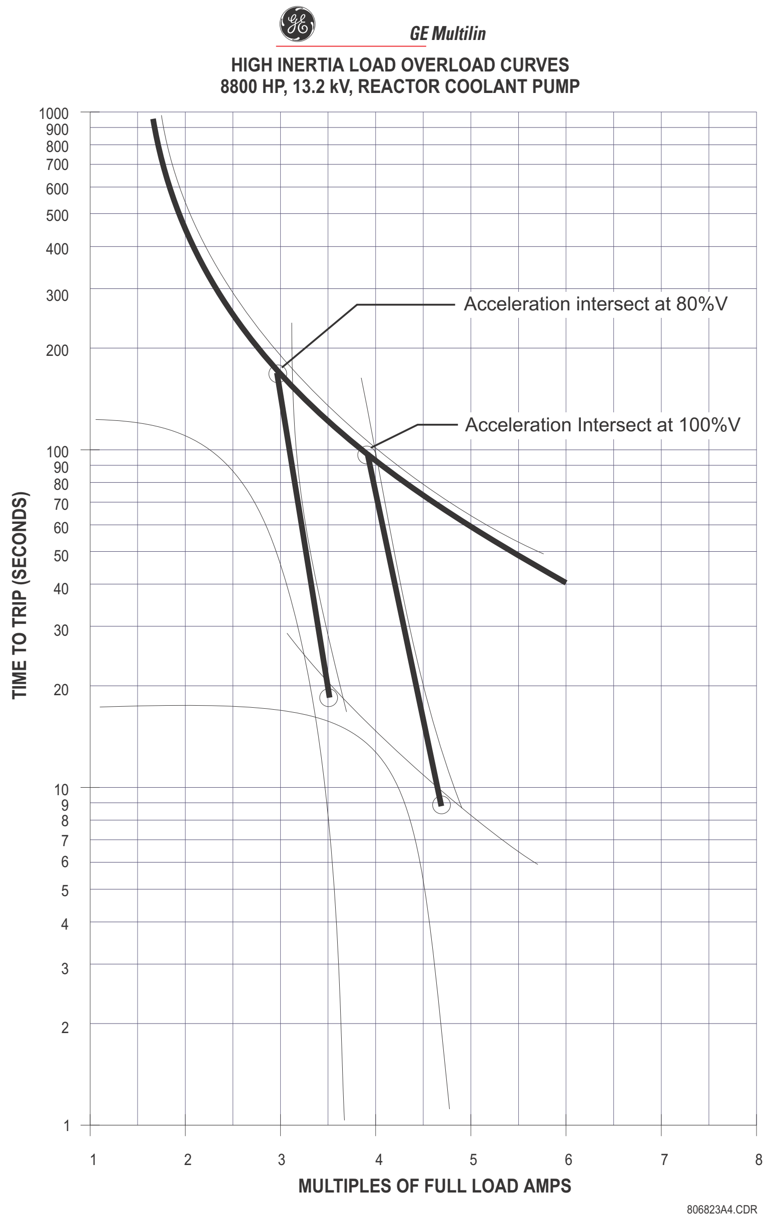


FIGURE 5–10: Voltage Dependent Overload Curves (Acceleration Curves)

The 469 takes the information provided and create protection curves for any voltage between the minimum and 100%. For values above the voltage in question, the 469 extrapolates the safe stall protection curve to 110% voltage. This current level is calculated by taking the locked rotor current at 100% voltage and multiplying by 1.10. For trip times above the 110% voltage level, the trip time of 110% will be used (see figure below).

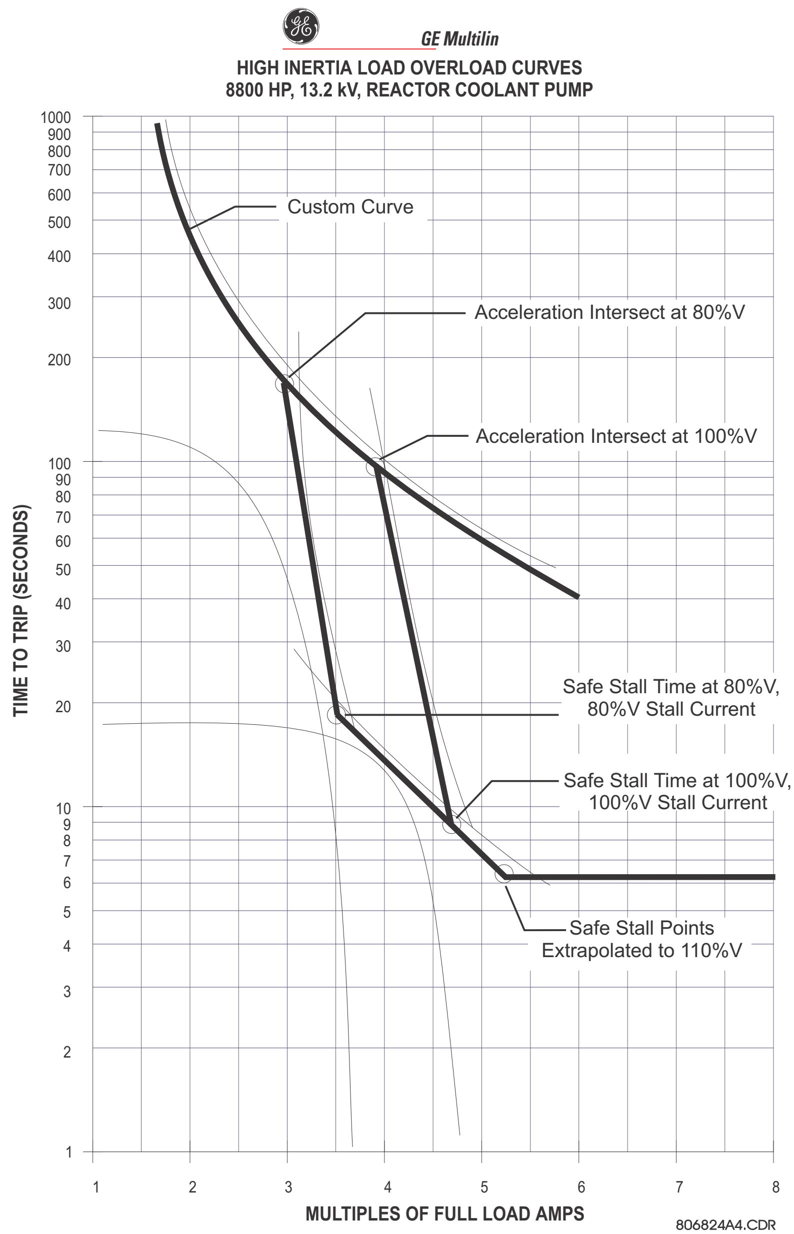


FIGURE 5–11: Voltage Dependent Overload Protection Curves

NOTE

The safe stall curve is in reality a series of safe stall points for different voltages. For a given voltage, there can only be one value of stall current and therefore, only one safe stall time.

The following two figures illustrate the resultant overload protection curves for 80% and 100% line voltage, respectively. For voltages in between, the 469 will shift the acceleration curve linearly and constantly based on measured line voltage during a motor start.

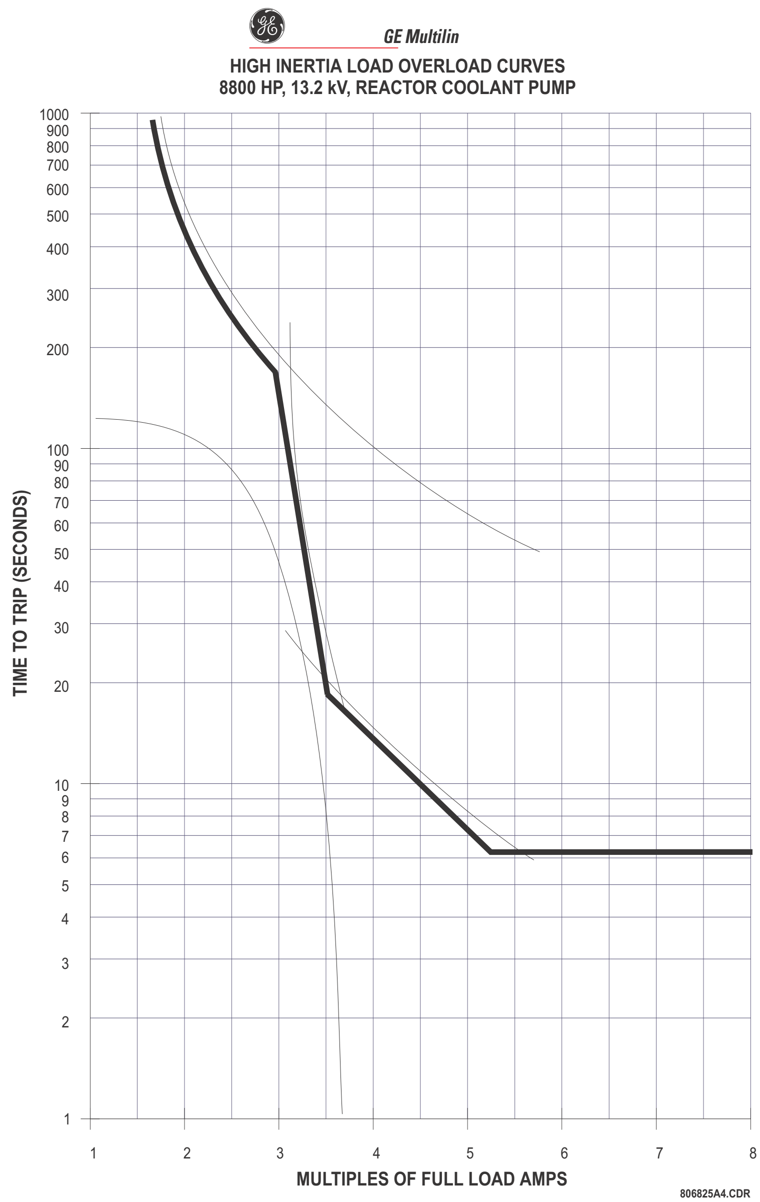


FIGURE 5–12: Voltage Dependent Overload Protection at 80% Voltage

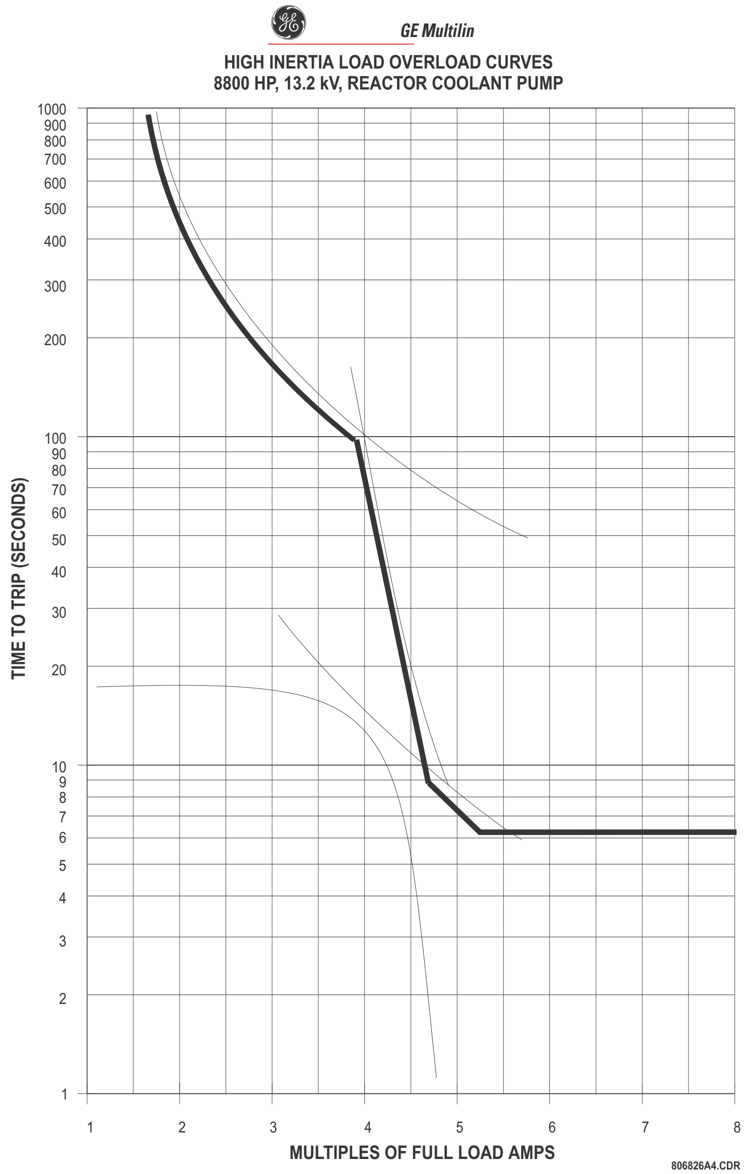


FIGURE 5–13: Voltage Dependent Overload Protection at 100% Voltage

Unbalance Bias

Unbalanced phase currents also cause additional rotor heating not accounted for by electromechanical relays and also not accounted for in some electronic protective relays. When the motor is running, the rotor rotates in the direction of the positive-sequence current at near synchronous speed. Negative-sequence current, with a phase rotation opposite to positive-sequence current (and hence, opposite to the rotor rotation), generates a rotor voltage that produces a substantial rotor current. This induced current has a frequency approximately 2 times the line frequency: 100 Hz for a 50 Hz system or 120 Hz for a 60 Hz system. The skin effect in the rotor bars at this frequency causes a significant increase in rotor resistance and therefore a significant increase in rotor heating.

This extra heating is not accounted for in the thermal limit curves supplied by the motor manufacturer, as these curves assume only positive-sequence currents from a perfectly balanced supply and motor design.

The 469 measures the ratio of negative to positive-sequence current. The thermal model may be biased to reflect the additional heating that is caused by negative sequence current when the motor is running. This biasing is accomplished by creating an equivalent motor heating current rather than simply using average current (I_{per_unit}). This equivalent current is calculated as shown below.

$$I_{eq} = \sqrt{I^2{}_{per\_unit} \cdot \left(1 + k \cdot \left(\frac{I_2}{I_1}\right)^2\right)} \qquad \textbf{(EQ 5.3)}$$

where: I_{eq} = equivalent motor heating current
I_{per_unit} = per unit current based on FLA
I_2= negative sequence current, I_1= positive sequence current
k = constant

The figure below shows recommended motor derating as a function of voltage unbalance recommended by NEMA (the National Electrical Manufacturers Association). Assuming a typical induction motor with an inrush of 6 x FLA and a negative sequence impedance of 0.167, voltage unbalances of 1, 2, 3, 4, and 5% equal current unbalances of 6, 12, 18, 24, and 30% respectively. Based on this assumption, the GE Grid Solutions curve illustrates the motor derating for different values of *k* entered for the **UNBALANCE BIAS K FACTOR** settings. Note that the curve created when k = 8 is almost identical to the NEMA derating curve.

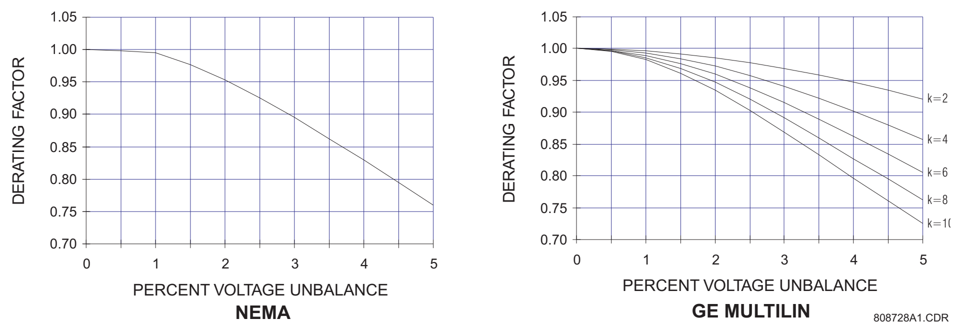


FIGURE 5–14: Medium Motor Derating Factor due to Unbalanced Voltage

If a *k* value of 0 is entered, the unbalance biasing is defeated and the overload curve will time out against the measured per unit motor current. *k* may be calculated as:

$$k = \frac{175}{I_{LR}^2} \text{ (typical estimate); } \quad k = \frac{230}{I_{LR}^2} \text{ (conservative estimate)} \qquad \textbf{(EQ 5.4)}$$

where I_{LR} is the per-unit locked rotor current.

Motor Cooling

The thermal capacity used value decreases exponentially when the motor current is less than the **OVERLOAD PICKUP** settings. This reduction simulates motor cooling. The motor cooling time constants should be entered for both stopped and running cases. Since cooling is exponential, the time constants are one-fifth of the total time from 100% thermal capacity used to 0%. A stopped motor normally cools significantly slower than a running motor. Motor cooling is calculated as:

$$TC_{used} = (TC_{used\_start} - TC_{used\_end})(e^{-t/\tau}) + TC_{used\_end} \qquad \textbf{(EQ 5.5)}$$

$$TC_{used\_end} = \left(\frac{I_{eq}}{ol\_pkp}\right)\left(1 - \frac{hot}{cold}\right) \times 100\% \qquad \textbf{(EQ 5.6)}$$

where: TC_{used} = thermal capacity used
TC_{used_start} = TC_{used} value caused by overload condition
TC_{used_end} = TC_{used} value dictated by the hot/cold safe stall ratio when the motor is running (= 0 when the motor is stopped)
t = time in minutes
τ = Cool Time Constant (running or stopped)
I_{eq} = equivalent motor heating current
ol_pkp = overload pickup settings as a multiple of FLA
hot / cold = hot/cold safe stall ratio

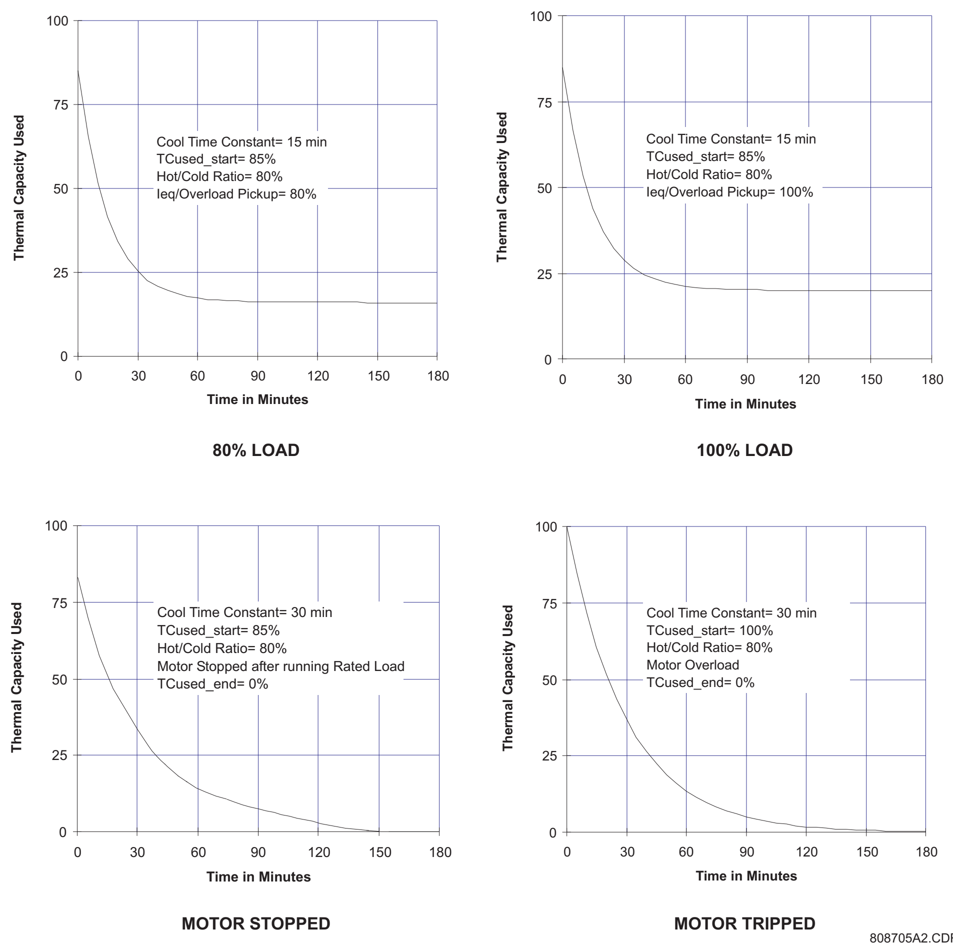


FIGURE 5–15: Thermal Model Cooling

Hot/Cold Safe Stall Ratio

The motor manufacturer may provide thermal limit information for a hot/cold motor. The 469 thermal model adapts for these conditions if the **HOT/COLD SAFE STALL RATIO** settings is programmed. This settings value dictates the level of thermal capacity used the relay will settle at for current levels below the **OVERLOAD PICKUP LEVEL**. When the motor is running at a level that is below the **OVERLOAD PICKUP LEVEL**, the **THERMAL CAPACITY USED** register will rise or fall to a value based on the average phase current and the **HOT/COLD SAFE STALL RATIO** settings. The **THERMAL CAPACITY USED** will either rise at a fixed rate of 5% per minute or fall as dictated by the running cool time constant.

$$TC_{used\_end} = I_{eq} \times \left(1 - \frac{hot}{cold}\right) \times 100\% \qquad \textbf{(EQ 5.7)}$$

where: TC_{used_end} = **THERMAL CAPACITY USED** if I_{per_unit} remains steady state
I_{eq} = equivalent motor heating current
hot / cold = **HOT/COLD SAFE STALL RATIO** settings

The **HOT/COLD SAFE STALL RATIO** may be determined from the thermal limit curves if provided or the hot and cold safe stall times. Simply divide the hot safe stall time by the cold safe stall time. If hot and cold times are not provided, there can be no differentiation and the **HOT/COLD SAFE STALL RATIO** should be entered as “1.00”.

RTD Bias

The 469 thermal replica operates as a complete and independent model. However, the thermal overload curves are based solely on measured current, assuming normal 40°C ambient and normal motor cooling. If the ambient temperature is unusually high, or motor cooling is blocked, the motor temperature will increase. If the motor stator has embedded RTDs, the RTD bias feature should be used to correct the thermal model.

The RTD bias feature is a two-part curve, constructed using 3 points. If the maximum stator RTD temperature is below the **RTD BIAS MINIMUM** settings (typically 40°C), no biasing occurs. If the maximum stator RTD temperature is above the **RTD BIAS MAXIMUM** (typically at the stator insulation rating or slightly higher), then the thermal memory is fully biased and **THERMAL CAPACITY USED** is forced to “100%”. At values between the maximum and minimum, the **THERMAL CAPACITY USED** created by the overload curve and the thermal model is compared to the RTD Bias thermal capacity used from the RTD Bias curve. If the RTD Bias thermal capacity used value is higher, then that value is used from that point onward. The **RTD BIAS CENTER POINT** should be set at the rated motor running temperature. The 469 automatically determines the **THERMAL CAPACITY USED** value for the center point using the **HOT/COLD SAFE STALL RATIO** settings.

$$TC_{used\ at\ RBC} = (1 - hot/cold) \times 100\% \qquad \textbf{(EQ 5.8)}$$

At < RTD_Bias_Center temperature,

$$RTD\_Bias\_TC_{used} = \frac{T_{actual} - T_{min}}{T_{center} - T_{min}} \times TC_{used\ at\ RBC} \qquad \textbf{(EQ 5.9)}$$

At > RTD_Bias_Center temperature,

$$RTD\_Bias\_TC_{used} = \frac{T_{actual} - T_{center}}{T_{max} - T_{center}} \times (100 - TC_{used\ at\ RBC}) + TC_{used\ at\ RBC} \qquad \textbf{(EQ 5.10)}$$

where: $RTD\_Bias\_TC_{used}$ = TC used due to hottest stator RTD
T_{actual} = current temperature of the hottest stator RTD
T_{min} = RTD Bias minimum settings, T_{center} = RTD Bias center settings
T_{max} = RTD Bias maximum settings
$TC_{used\ at\ RBC}$ = TC used defined by the **HOT/COLD SAFE STALL RATIO** settings

In simple terms, the RTD bias feature is real feedback of the measured stator temperature. This feedback acts as correction of the thermal model for unforeseen situations. Since RTDs are relatively slow to respond, RTD biasing is good for correction and slow motor heating. The rest of the thermal model is required during starting and heavy overload conditions when motor heating is relatively fast.

Note that the RTD bias feature alone cannot create a trip. If the RTD bias forces thermal capacity used to 100%, the motor current must be above the overload pickup before an overload trip occurs. Presumably, the motor would trip on stator RTD temperature at that time.

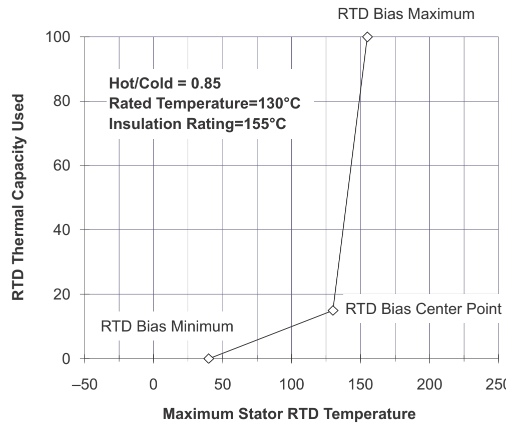


FIGURE 5–16: RTD Bias Curve

5.7 S6 Current Elements

5.7.1 Short Circuit Trip

PATH: SETTINGS ▷▽ S6 CURRENT ELEM. ▷ SHORT CIRCUIT TRIP

■ SHORT [▷] CIRCUIT TRIP	SHORT CIRCUIT TRIP: Off	Range: Off, Latched, Unlatched
MESSAGE	SHORT CIRCUIT TRIP OVERREACH FILTER: Off	Range: On, Off
MESSAGE	ASSIGN TRIP RELAYS: Trip	Range: Trip, Trip & Aux 2, Trip & Aux2 & Aux3, Trip & Aux3, Aux2, Aux2 & Aux3, Aux3
MESSAGE	SHORT CIRCUIT TRIP PICKUP: 10.0 x CT	Range: 2.0 to 20.0 x CT in steps of 0.1
MESSAGE	INTENTIONAL S/C TRIP DELAY: 0 ms	Range: 0 to 1000 ms in steps of 10
MESSAGE	SHORT CIRCUIT TRIP BACKUP: Off	Range: On, Off
MESSAGE	ASSIGN BACKUP RELAYS: Auxiliary2	Range: Auxiliary2, Aux2 & Aux3, Auxiliary3
MESSAGE	SHORT CIRCUIT TRIP BACKUP DELAY: 200 ms	Range: 10 to 2000 ms in steps of 10

⚠WARNING

Care must be taken when turning On this feature. If the interrupting device (contactor or circuit breaker) is not rated to break the fault current, this feature should be disabled. Alternatively, this feature may be assigned to an auxiliary relay and connected such that it trips an upstream device that is capable of breaking the fault current.

If turned on, the Short Circuit element functions as follows.

A trip occurs once the magnitude of either Ia, Ib, or Ic exceeds the Pickup Level × Phase CT Primary for the time specified by **INTENTIONAL S/C TRIP DELAY**. A backup trip feature may also be enabled. The **SHORT CIRCUIT TRIP BACKUP DELAY** should be greater than the **INTENTIONAL S/C TRIP DELAY** plus the breaker clearing time. If the **SHORT CIRCUIT TRIP BACKUP** is “On” and a Short Circuit trip has initiated, a second trip occurs if the motor phase current persists for a time exceeding the **SHORT CIRCUIT TRIP BACKUP DELAY**. It is intended that this second trip be assigned to 2 Auxiliary or 3 Auxiliary which would be dedicated as an upstream breaker trip relay. Whenever the output relay assigned to backup trip operates, it will remain latched regardless of how the trip relay is configured for the Short Circuit Trip element.

Various situations (e.g. charging a long line to the motor or power factor correction capacitors) may cause transient inrush currents during motor starting that may exceed the **SHORT CIRCUIT TRIP PICKUP** level for a very short period of time. The **INTENTIONAL S/C TRIP DELAY** is adjustable in 10 ms increments. This delay can be fine tuned to an application so it still responds very fast but rides through normal operational disturbances. Normally, the **INTENTIONAL S/C TRIP DELAY** is set as quick as possible, 0 ms. This time may be increased if nuisance tripping occurs.

When a motor starts, the starting current (typically 6 × FLA for an induction motor) has an asymmetrical component. This asymmetrical current may cause one phase to see as much as 1.6 times the normal RMS starting current. If the **SHORT CIRCUIT TRIP PICKUP** was set at 1.25 times the symmetrical starting current, it is probable that there would be nuisance trips during motor starting. A rule of thumb has been developed over time that short circuit protection at least 1.6 times the symmetrical starting current value. This allows the motor to start without nuisance tripping.

The overreach filter removes the DC component from the asymmetrical current present at the moment of fault. This eliminates overreach; however, the response time slows slightly (10 to 15 ms) but remains within specification.

5.7.2 Overload Alarm

PATH: SETTINGS ▷▽ S6 CURRENT ELEM. ▷▽ OVERLOAD ALARM

■ OVERLOAD [▷] ALARM	OVERLOAD ALARM: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN ALARM RELAYS: Alarm	*Range: Alarm, Auxiliary2, Auxiliary3, Alarm & Aux2, Alarm & Aux3, Aux2 & Aux3, Alarm & Aux2 & Aux3, None*
MESSAGE	OVERLOAD ALARM DELAY: 0.1 s	*Range: 0.1 to 60 s in steps of 0.1*
MESSAGE	OVERLOAD ALARM EVENTS: Off	*Range: On, Off*

If enabled as “Latched” or “Unlatched”, the Overload Alarm functions as follows. After a motor start, when the equivalent motor heating current exceeds the **OVERLOAD PICKUP LEVEL**, an alarm will occur. If programmed as “Unlatched”, the overload alarm resets itself when the motor is no longer in overload. If programmed as “Latched”, the RESET key must be pressed to reset the alarm once the overload condition is gone. Event recording for all alarm features is optional.

For example, it may be desirable to have an unlatched alarm connected to a PLC that is controlling the load on a motor.

5.7.3 Mechanical Jam

PATH: SETTINGS ▷▽ S6 CURRENT ELEM. ▷▽ MECHANICAL JAM

■ MECHANICAL [▷] JAM	MECHANICAL JAM TRIP: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN TRIP RELAYS: Trip	*Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3*
MESSAGE	MECHANICAL JAM PICKUP: 1.50 x FLA	*Range: 1.01 to 3.00 x FLA in steps of 0.01*
MESSAGE	MECHANICAL JAM DELAY: 1 s	*Range: 1 to 30 s in steps of 1*

If turned On, the Mechanical Jam element function as follows. After a motor start, a Trip occurs once the magnitude of Ia, Ib, or Ic exceeds the Pickup Level × FLA for a period of time specified by the **MECHANICAL JAM DELAY** settings. This feature may be used to indicate a stall condition when running. Not only does it protect the motor by taking it off-line quicker than the thermal model (overload curve), it may also prevent or limit damage to the driven equipment if motor starting torque persists on jammed or broken equipment.

The **MECHANICAL JAM PICKUP** level should be set higher than motor loading during normal operation, but lower than the motor stall level. Normally the delay is set to the minimum time delay or set so that no nuisance trips occur due to momentary load fluctuations.

5.7.4 Undercurrent

PATH: SETTINGS ▷▽ S6 CURRENT ELEM. ▷▽ UNDERCURRENT

■ UNDERCURRENT [▷]	BLOCK UNDERCURRENT FROM START: 0 s	*Range: 0 to 15000 s in steps of 1*
MESSAGE	UNDERCURRENT ALARM: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN ALARM RELAYS: Alarm	*Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE	UNDERCURRENT ALARM PICKUP: 0.70 x FLA	*Range: 0.10 to 0.95 x FLA in steps of 0.01*
MESSAGE	UNDERCURRENT ALARM DELAY: 1 s	*Range: 1 to 60 s in steps of 1*
MESSAGE	UNDERCURRENT ALARM EVENTS: Off	*Range: On, Off*
MESSAGE	UNDERCURRENT TRIP: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN TRIP RELAYS: Trip	*Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3*
MESSAGE	UNDERCURRENT TRIP PICKUP: 0.70 x FLA	*Range: 0.10 to 0.99 x FLA in steps of 0.01*
MESSAGE	UNDERCURRENT TRIP DELAY: 1 s	*Range: 1 to 60 s in steps of 1*

A trip or alarm will occurs once the magnitude Ia, Ib, or Ic falls below the pickup level × FLA for the time specified by the **UNDERCURRENT ALARM DELAY**. The Undercurrent element is active only when the motor is running. It is blocked upon the initiation of a motor start for the time defined by the **U/C BLOCK FROM START** settings (e.g. this block may be used to allow pumps to build up head before the undercurrent element trips). A value of "0" means the feature is not blocked from start. If a value other than "0" is entered, the feature is disabled when the motor is stopped and also from the time a start is detected until the time entered expires. The **UNDERCURRENT ALARM PICKUP** level should be set lower than motor loading during normal operations.

For example, if a pump is cooled by the liquid it pumps, loss of load may mean that the pump overheats. In this case, enable the undercurrent feature. If the motor loading should never fall below 0.75 × FLA, even for short durations, the **UNDERCURRENT TRIP PICKUP** could be set to “0.70” and the **UNDERCURRENT ALARM PICKUP** to “0.75”. If the pump is always started loaded, the **BLOCK UNDERCURRENT FROM START** settings should be disabled (programmed as “0”).

The **UNDERCURRENT ALARM DELAY** or **UNDERCURRENT TRIP DELAY** is typically set as quick as possible, i.e. 1 second.

5.7.5 Current Unbalance

PATH: SETTINGS ▷▽ S6 CURRENT ELEM. ▷▽ CURRENT UNBALANCE

■ CURRENT UNBALANCE [▷]	CURRENT UNBALANCE ALARM: Off	Range: Off, Latched, Unlatched
MESSAGE	ASSIGN ALARM RELAYS: Alarm	Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None
MESSAGE	CURRENT UNBALANCE ALARM PICKUP: 15%	Range: 4 to 40% in steps of 1
MESSAGE	CURRENT UNBALANCE ALARM DELAY: 1 s	Range: 1 to 60 s in steps of 1
MESSAGE	CURRENT UNBALANCE ALARM EVENTS: Off	Range: On, Off
MESSAGE	CURRENT UNBALANCE TRIP: Off	Range: Off, Latched, Unlatched
MESSAGE	ASSIGN TRIP RELAYS: Trip	Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3
MESSAGE	CURRENT UNBALANCE TRIP PICKUP: 20%	Range: 4 to 40% in steps of 1
MESSAGE	CURRENT UNBALANCE TRIP DELAY: 1 s	Range: 1 to 60 s in steps of 1

For the 469 relay, unbalance is defined as the ratio of negative-sequence to positive-sequence current, I_2 / I_1, if the motor is operating at a load (I_{avg}) greater than FLA. If the motor I_{avg} is less than FLA, unbalance is defined as $I_2 / I_1 \times I_{avg}$ / FLA. This derating is necessary to prevent nuisance alarms when a motor is lightly loaded.

The 469 relay employs an alternate method of calculating **CURRENT UNBALANCE** when **NOMINAL SYSTEM FREQUENCY** is set to "Variable" or **MOTOR LOAD FILTER INTERVAL** is enabled. Refer to section 6.3.1 *Current Metering* on page 6–11.

If enabled, a trip and/or alarm occurs once the unbalance magnitude equals or exceeds the **CURRENT UNBALANCE ALARM(TRIP) PICKUP** for a period of time specified by the **CURRENT UNBALANCE ALARM(TRIP) DELAY**. If the unbalance level equals or exceeds 40%, or when $I_{avg} \geq 25\%$ FLA and current in any one phase is zero, the motor is considered single phasing and a trip occurs within 2 seconds. Single phasing protection is disabled if the unbalance trip feature is turned “Off”.

When setting the **CURRENT UNBALANCE ALARM(TRIP) PICKUP** level, note that a 1% voltage unbalance typically translates into a 6% current unbalance. Therefore, to prevent nuisance trips or alarms, the pickup level should not be set too low. Also, since short term unbalances are common, a reasonable delay should be set to avoid nuisance trips or alarms. The unbalance bias feature is recommended to bias the thermal model for motor heating caused by cyclic short term unbalances (see page –55 for details).

NOTE

Unusually high unbalance levels may be caused by incorrect phase CT wiring.

For example, fluctuations of current unbalance levels are typically caused by the supply voltage. It may be desirable to have a latched alarm to capture any such fluctuations that go beyond the Unbalance Alarm parameters. Also, a trip is recommended.

If the supply voltage is normally unbalanced up to 2%, the current unbalance seen by a typical motor is 2 × 6 = 12%. In this case, set the **CURRENT UNBALANCE ALARM PICKUP** to “15” and the **CURRENT UNBALANCE TRIP PICKUP** to “20” to prevent nuisance tripping; 5 or 10 seconds is a reasonable delay.

5.7.6 Ground Fault

PATH: SETTINGS ▷▽ S6 CURRENT ELEM. ▷▽ GROUND FAULT

■ GROUND FAULT [▷]	GROUND FAULT OVERREACH FILTER: Off	Range: On, Off
MESSAGE	GROUND FAULT ALARM: Off	Range: Off, Latched, Unlatched
MESSAGE	ASSIGN ALARM RELAYS: Alarm	Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None
MESSAGE	GROUND FAULT ALARM PICKUP: 0.10 x CT	Range: 0.1 to 1.00 × CT in steps of 0.01 or 0.25 to 25 A in steps of 0.01
MESSAGE	INTENTIONAL GF ALARM DELAY: 0 ms	Range: 0 to 1000 ms in steps of 1
MESSAGE	GROUND FAULT ALARM EVENTS: Off	Range: On, Off
MESSAGE	GROUND FAULT TRIP: Off	Range: Off, Latched, Unlatched
MESSAGE	ASSIGN TRIP RELAYS: Trip	Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3
MESSAGE	GROUND FAULT TRIP PICKUP: 0.20 x CT	Range: 0.1 to 1.00 × CT in steps of 0.01 or 0.25 to 25 A in steps of 0.01
MESSAGE	INTENTIONAL GF TRIP DELAY: 0 ms	Range: 0 to 1000 ms in steps of 1
MESSAGE	GROUND FAULT TRIP BACKUP: Off	Range: On, Off
MESSAGE	ASSIGN BACKUP RELAYS: Auxiliary2	Range: Auxiliary2, Aux2 & Aux3, Auxiliary3
MESSAGE	GROUND FAULT TRIP BACKUP DELAY: 200 ms	Range: 10 to 2000 ms in steps of 10

NOTE

The **GROUND FAULT ALARM PICKUP** and **GROUND FAULT TRIP PICKUP** settings are entered in units of '× CT' if the Ground CT is programmed as 1 A or 5 A Secondary or in units of 'A' is the Ground CT is programmed as "50:0.025".

The Ground Fault element functions as follows. Once the ground current magnitude exceeds the Pickup Level × **GROUND CT PRIMARY** (see 5.3.1: Current Sensing on page –18) for the time specified by the delay, a trip and/or alarm will occur. There is also a backup trip feature that can be enabled. If the **GROUND FAULT TRIP BACKUP** is "On", and a Ground Fault trip has initiated, a second trip will occur if the ground current persists longer than the **GROUND FAULT TRIP BACKUP DELAY**. It is intended that this second trip be assigned to 2 Auxiliary or 3 Auxiliary, which would be dedicated as an upstream breaker trip relay. The **GROUND FAULT TRIP BACKUP DELAY** must be set to a time longer than the breaker clearing time. Whenever the output relay assigned to the backup trip operates, it will stay latched regardless of how the trip relay is configured for the Ground Fault element.

NOTE

Care must be taken when turning On this feature. If the interrupting device (contactor or circuit breaker) is not rated to break ground fault current (low resistance or solidly grounded systems), the feature should be disabled. Alternately, the feature may be assigned to an auxiliary relay and connected such that it trips an upstream device that is capable of breaking the fault current.

Various situations (e.g. contactor bounce) may cause transient ground currents during motor starting that may exceed the Ground Fault pickup levels for a very short period of time. The Ground Fault time delays are adjustable in 10 ms increments. The delay can be fine tuned to an application such that it still responds very fast, but rides through normal operational disturbances. Normally, the Ground Fault time delays are set as quick as possible, that is, 0 ms. Time may have to be increased if nuisance tripping occurs.

Special care must be taken when the ground input is wired to the phase CTs in a residual connection. When a motor starts, the starting current (typically 6 × FLA for an induction motor) has an asymmetrical component. This asymmetrical current may cause one phase to see as much as 1.6 times the normal RMS starting current. This momentary DC component will cause each of the phase CTs to react differently and the net current into the ground input of the 469 will not be negligible. A 20 ms block of the ground fault elements when the motor starts enables the 469 to ride through this momentary ground current signal.

The overreach filter removed the DC component from the asymmetrical current present at the moment a fault occurs. This results in no overreach whatsoever, however, the response time slows slightly (10 to 15 ms) but times still remain within specifications.

5.7.7 Phase Differential

PATH: SETTINGS ▷▽ S6 CURRENT ELEM. ▷▽ PHASE DIFFERENTIAL

■ PHASE DIFFERENTIAL [▷]	PHASE DIFFERENTIAL TRIP: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN TRIP RELAYS: Trip	*Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Auxiliary2, Aux2 & Aux3, Auxiliary3*
MESSAGE	STARTING DIFF. TRIP PICKUP: 0.10 x CT	*Range: 0.05 to 1.00 x CT in steps of 0.01*
MESSAGE	STARTING DIFF. TRIP DELAY: 0 ms	*Range: 0 to 60000 ms in steps of 10*
MESSAGE	RUNNING DIFF. TRIP PICKUP: 0.10 x CT	*Range: 0.05 to 1.00 x CT in steps of 0.01*
MESSAGE	RUNNING DIFF. TRIP DELAY: 0 ms	*Range: 0 to 1000 ms in steps of 10*

These settings program the differential element when the differential feature is in use. This feature consists of three instantaneous overcurrent elements for phase differential protection. Differential protection may be considered first line protection for phase to phase or phase to ground faults. In the event of such a fault, differential protection may limit the damage that may occur.

NOTE

Care must be taken when enabling this feature. If the interrupting device (contactor or circuit breaker) is not rated to break potential faults, the feature should be disabled. Alternately, the feature may be assigned to an auxiliary relay and connected such that it trips an upstream device that is capable of breaking the fault current. A low level differential fault can develop into a short circuit in an instant.

A trip occurs once the magnitude of either I_{aIN}-I_{aOUT}, I_{bIN}-I_{bOUT}, or I_{cIN}-I_{cOUT} (phase differential) exceeds the Pickup Level × Differential CT Primary for a period of time specified by the delay. Separate pickup levels and delays are provided for motor starting and running conditions.

The Differential trip element is programmable as a fraction of the rated CT. The level may be set more sensitive if the Differential CTs are connected in a flux balancing configuration (3 CTs). If 6 CTs are used in a summing configuration, the values from the two CTs on each phase during motor starting may not be equal since the CTs are not perfectly identical (asymmetrical currents may cause the CTs on each phase to have different outputs). To prevent nuisance tripping in this configuration, the **STARTING DIFF. TRIP PICKUP** level may have to be set less sensitive, or the **STARTING DIFF. TRIP DELAY** may have to be extended to ride through the problem period during start. The running differential delay can then be fine tuned to an application such that it responds very fast to sensitive (low) differential current levels.

5.8 S7 Motor Starting

5.8.1 Acceleration Timer

PATH: SETTINGS ▷▽ S7 MOTOR STARTING ▷ ACCELERATION TIMER

■ ACCELERATION TIMER [▷]		ACCELERATION TIMER TRIP: Off	Range: Off, Latched, Unlatched
	MESSAGE	ASSIGN TRIP RELAYS: Trip	Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3
	MESSAGE	ACCELERATION TIMER FROM START: 10.0 s	Range: 1.0 to 250.0 s in steps of 0.1

The thermal model protects the motor under both starting and overload conditions. The acceleration timer trip may be used to complement this protection. For example, if the motor always starts in 2 seconds, but the safe stall time is 8 seconds, there is no point letting the motor remain in a stall condition for 7 or 8 seconds when the thermal model would take it off line. Furthermore, the starting torque applied to the driven equipment for that period of time could cause severe damage.

If enabled, the Acceleration Timer functions as follows. A motor start is assumed to be occurring when the 469 measures the transition of no motor current to some value of motor current. Typically current rises quickly to a value in excess of FLA (e.g. 6 × FLA). At this point, the acceleration timer will be initialized with the **ACCELERATION TIMER FROM START** value in seconds. If the current does not fall below the overload curve pickup level before the timer expires, an acceleration trip will occur. If the acceleration time of the motor is variable, this feature should be set just beyond the longest acceleration time.

Some motor soft-starters allow current to ramp up slowly while others limit current to less than FLA throughout the start. Since the 469 is a generic motor relay, it cannot differentiate between a motor with a slow ramp up time and one that has completed a start and gone into overload. Therefore, if the motor current does not rise to greater than full load within 1 second on start, the acceleration timer feature is ignored. In any case, the motor is still protected by the overload curve.

5.8.2 Start Inhibit

PATH: SETTINGS ▷▽ S7 MOTOR STARTING ▷▽ START INHIBIT

■ START INHIBIT [▷]		START INHIBIT BLOCK: Off	Range: On, Off
	MESSAGE	TC USED MARGIN: 25%	Range: 0 to 25% in steps of 1

The Start Inhibit feature prevents motor starting if there is insufficient thermal capacity. The largest **THERMAL CAPACITY USED** value from the last five successful starts is multiplied by (1 + **TC USED MARGIN**) and stored as the **LEARNED STARTING CAPACITY**. This thermal capacity margin ensures a successful motor start. If the number is greater than 100%, 100% is stored as **LEARNED STARTING CAPACITY**. A successful motor start is one in which phase current rises from 0 to greater than overload pickup and then, after acceleration, falls below the overload curve pickup level. If the Start Inhibit feature is enabled, the amount of thermal capacity available (100% – **THERMAL CAPACITY USED**) is compared to the **LEARNED STARTING CAPACITY** each time the motor is stopped. If the thermal capacity available does not exceed the **LEARNED STARTING CAPACITY**, or is not equal to 100%, the Start Inhibit Block is activated until there is sufficient thermal capacity. When a block occurs, the lockout time will be equal to the time required for the motor to cool to an acceptable start temperature. This time is a function of the **S5 THERMAL MODEL ⇨ THERMAL MODEL ⇨⇩ COOL TIME CONSTANT STOPPED** settings.

If this feature is turned “Off”, the **THERMAL CAPACITY USED** must reduce to 15% before an overload lockout resets. This feature should be turned off if the load varies for different starts.

For example, if the **THERMAL CAPACITY USED** for the last 5 starts is 24, 23, 27, 25, and 21% respectively, the **LEARNED STARTING CAPACITY** is 27% × 1.25 = 33.75% used. If the motor stops with 90% thermal capacity used, a start block will be issued. When the motor has cooled and the level of thermal capacity used has fallen to 66%, a start will be permitted. If the **COOL TIME CONSTANT STOPPED** settings is programmed for 30 minutes, the lockout time will be equal to:

$$TC_{\text{used}} = TC_{\text{used\_start}} \times e^{-t/\tau} \Rightarrow 66\% = 90\% \times e^{-t/30}$$
$$\Rightarrow t = \ln\frac{66}{90} \times -30 = 9.3 \text{ minutes} \qquad \textbf{(EQ 5.11)}$$

5.8.3 Jogging Block

PATH: SETTINGS ▷▽ S7 MOTOR STARTING ▷▽ JOGGING BLOCK

■ JOGGING [▷] BLOCK		JOGGING BLOCK: Off	*Range: On, Off*
	MESSAGE	MAX. STARTS/HOUR PERMISSIBLE: 3	*Range: 1 to 5 in steps of 1*
	MESSAGE	TIME BETWEEN STARTS PERMISSIBLE: 10 min.	*Range: 0 to 500 min. in steps of 1*

The Jogging Block feature may be used to prevent operators from jogging the motor (multiple starts and stops performed in rapid succession). It consists of two distinct elements: Starts/Hour and Time Between Starts.

The Starts/Hour feature does not guarantee that a certain number of starts or start attempts will be allowed within an hour; rather, it ensures that a certain number of start attempts will not be exceeded within an hour. Similarly, the Time Between Starts feature does not guarantee another start will be permitted if the **TIME BETWEEN STARTS PERMISSIBLE** elapses after the most recent start. Rather, it ensures a minimum time between starts. If however, the first start attempt from cold is unsuccessful due to a jam or it takes long because the process is overloaded, the Thermal Model might reduce the number of starts that can be attempted within an hour. It may also cause a lockout time that exceeds a Time Between Starts lockout that may have been active. Such a thermal lockout will remain until the motor has cooled to an acceptable temperature for a start.

- **Max. Starts/Hour Permissible**: A motor start is assumed to be occurring when the 469 measures the transition of no motor current to some value of motor current. At this point, one of the Starts/Hour timers is loaded with 60 minutes. Even unsuccessful start attempts will be logged as starts for this feature. Once the motor is stopped, the number of starts within the past hour is compared to the number of starts allowable. If the two numbers are the same, a block will occur. If a block occurs, the lockout time will be equal to the longest time elapsed since a start within the past hour, subtracted from one hour.

  For example, if **MAX. STARTS/HOUR PERMISSIBLE** is programmed at “2”,

  – one start occurs at T = 0 minutes,
  – a second start occurs at T = 17 minutes,
  – the motor is stopped at T = 33 minutes,
  – a block occurs,
  – the lockout time would be 1 hour – 33 minutes = 27 minutes.

- **Time Between Starts Permissible**: A motor start is assumed to be occurring when the 469 measures the transition of no motor current to some value of motor current. At this point, the Time Between Starts timer is loaded with the entered time. Even unsuccessful start attempts will be logged as starts for this feature. Once the motor is stopped, if the time elapsed since the most recent start is less than the **TIME BETWEEN STARTS PERMISSIBLE** settings, a block will occur. If a block occurs, the lockout time will be equal to the time elapsed since the most recent start subtracted from the **TIME BETWEEN STARTS PERMISSIBLE**. A value of “0” effectively disables this element.

  For example, if **TIME BETWEEN STARTS PERMISSIBLE** is programmed = 25 min.

  – a start occurs at T = 0 minutes,
  – the motor is stopped at T = 12 minutes,
  – a block occurs,
  – the lockout time would be 25 minutes – 12 minutes = 13 minutes

5.8.4 Restart Block

PATH: SETTINGS ▷▽ S7 MOTOR STARTING ▷▽ RESTART BLOCK

■ RESTART [▷] BLOCK		RESTART BLOCK: Off	*Range: On, Off*
	MESSAGE	RESTART BLOCK TIME: 1 s	*Range: 1 to 50000 s in steps of 1*

The Restart Block feature may be used to ensure that a certain amount of time passes between stopping a motor and restarting that motor. This timer feature may be very useful for some process applications or motor considerations. If a motor is on a down-hole pump, after the motor stops, the liquid may fall back down the pipe and spin the rotor backwards. It would be very undesirable to start the motor at this time. In another scenario, a motor may be driving a very high inertia load. Once the supply to the motor is disconnected, the rotor may continue to turn for a long period of time as it decelerates. The motor has now become a generator and applying supply voltage out of phase may result in catastrophic failure.

NOTE

The Restart Block feature is strictly a timer. The 469 does not sense rotor rotation.

5.9 S8 RTD Temperature

5.9.1 RTD Types

PATH: SETTINGS ▷▽ S8 RTD TEMPERATURE ▷ RTD TYPES

■ RTD TYPES [▷]		STATOR RTD TYPE: 100 Ohm Platinum	*Range: see below*
	MESSAGE	BEARING RTD TYPE: 100 Ohm Platinum	*Range: see below*
	MESSAGE	AMBIENT RTD TYPE: 100 Ohm Platinum	*Range: see below*
	MESSAGE	OTHER RTD TYPE: 100 Ohm Platinum	*Range: see below*

Each of the twelve RTDs may be configured as "None" or any one of four application types: "Stator", "Bearing", "Ambient", or "Other". Each of these types may in turn be any one of four different RTD types: "100 Ohm Platinum", "120 Ohm Nickel", "100 Ohm Nickel", or "10 Ohm Copper". The table below lists RTD resistance versus temperature.

Table 5–2: RTD Temperature vs. Resistance

Temperature		100 Ω Pt (DIN 43760)	120 Ω Ni	100 Ω Ni	10 Ω Cu
° C	° F				
–50	–58	80.31	86.17	71.81	7.10
–40	–40	84.27	92.76	77.30	7.49
–30	–22	88.22	99.41	82.84	7.88
–20	–4	92.16	106.15	88.45	8.26
–10	14	96.09	113.00	94.17	8.65
0	32	100.00	120.00	100.00	9.04
10	50	103.90	127.17	105.97	9.42
20	68	107.79	134.52	112.10	9.81
30	86	111.67	142.06	118.38	10.19
40	104	115.54	149.79	124.82	10.58
50	122	119.39	157.74	131.45	10.97
60	140	123.24	165.90	138.25	11.35
70	158	127.07	174.25	145.20	11.74
80	176	130.89	182.84	152.37	12.12
90	194	134.70	191.64	159.70	12.51
100	212	138.50	200.64	167.20	12.90
110	230	142.29	209.85	174.87	13.28
120	248	146.06	219.29	182.75	13.67
130	266	149.82	228.96	190.80	14.06
140	284	153.58	238.85	199.04	14.44
150	302	157.32	248.95	207.45	14.83
160	320	161.04	259.30	216.08	15.22

Table 5–2: RTD Temperature vs. Resistance

Temperature		100 Ω Pt (DIN 43760)	120 Ω Ni	100 Ω Ni	10 Ω Cu
° C	° F				
170	338	164.76	269.91	224.92	15.61
180	356	168.47	280.77	233.97	16.00
190	374	172.46	291.96	243.30	16.39
200	392	175.84	303.46	252.88	16.78
210	410	179.51	315.31	262.76	17.17
220	428	183.17	327.54	272.94	17.56
230	446	186.82	340.14	283.45	17.95
240	464	190.45	353.14	294.28	18.34
250	482	194.08	366.53	305.44	18.73

5.9.2 RTDs 1 to 6

PATH: SETTINGS ▷▽ S8 RTD TEMPERATURE ▷▽ RTD #1(6)

■ RTD #1 [▷]	RTD #1 APPLICATION: Stator	*Range: Stator, Bearing, Ambient, Other, None*
MESSAGE	RTD #1 NAME:	*Range: 8 alphanumeric characters*
MESSAGE	RTD #1 ALARM: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN ALARM RELAYS: Alarm	*Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE	RTD #1 ALARM TEMPERATURE: 130°C	*Range: 1 to 250°C in steps of 1*
MESSAGE	RTD #1 HIGH ALARM: Off	*Range: Off, Latched, Unlatched*
MESSAGE	HIGH ALARM RELAYS: Alarm	*Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE	RTD #1 HIGH ALARM TEMPERATURE: 130°C	*Range: 1 to 250 in steps of 1*
MESSAGE	RTD #1 ALARM EVENTS: Off	*Range: On, Off*
MESSAGE	RTD #1 TRIP: Off	*Range: Off, Latched, Unlatched*
MESSAGE	RTD #1 TRIP VOTING: RTD #1	*Range: RTD #1 to RTD #12*
MESSAGE	ASSIGN TRIP RELAYS: Trip	*Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3*

MESSAGE	RTD #1 TRIP TEMPERATURE: 155°C	Range: *1 to 250°C in steps of 1*

RTDs 1 through 6 default to "Stator" RTD type. There are individual alarm and trip configurations for each RTD. This allows one of the RTDs to be turned off if it malfunctions. The alarm level is normally set slightly above the normal running temperature. The high alarm is usually set as a warning of a trip or to initiate an orderly shutdown before tripping occurs. The trip level is normally set at the insulation rating. Trip voting has been added for extra reliability in the event of RTD malfunction. If enabled, a second RTD must also exceed the trip temperature of the RTD being checked before a trip will be issued. If the RTD is chosen to vote with itself, the voting feature is disabled. Each RTD name may be changed if desired.

5.9.3 RTDs 7 to 10

PATH: SETTINGS ▷▽ S8 RTD TEMPERATURE ▷▽ RTD #7(10)

■ RTD #7 [▷]	RTD #7 APPLICATION: Bearing	Range: *Stator, Bearing, Ambient, Other, None*
MESSAGE	RTD #7 NAME:	Range: *8 alphanumeric characters*
MESSAGE	RTD #7 ALARM: Off	Range: *Off, Latched, Unlatched*
MESSAGE	ASSIGN ALARM RELAYS: Alarm	Range: *Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE	RTD #7 ALARM TEMPERATURE: 80°C	Range: *1 to 250°C in steps of 1*
MESSAGE	RTD #7 HIGH ALARM: Off	Range: *Off, Latched, Unlatched*
MESSAGE	HIGH ALARM RELAYS: Alarm	Range: *Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE	RTD #7 HIGH ALARM TEMPERATURE: 80°C	Range: *1 to 250°C in steps of 1*
MESSAGE	RTD #7 ALARM EVENTS: Off	Range: *On, Off*
MESSAGE	RTD #7 TRIP: Off	Range: *Off, Latched, Unlatched*
MESSAGE	RTD #7 TRIP VOTING: RTD #7	Range: *RTD #1 to RTD #12*
MESSAGE	ASSIGN TRIP RELAYS: Trip	Range: *Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3*
MESSAGE	RTD #7 TRIP TEMPERATURE: 90°C	Range: *1 to 250°C in steps of 1*

RTDs 7 through 10 default to "Bearing" RTD type. There are individual alarm and trip configurations for each RTD. This allows one of the RTDs to be turned off if it malfunctions. The alarm level, high alarm level and the trip level are normally set slightly above the normal running temperature, but below the bearing temperature rating. Trip voting has been added for extra reliability in the event of RTD malfunction. If enabled, a second RTD must also exceed the trip temperature of the RTD being checked before a trip will be issued. If the RTD is chosen to vote with itself, the voting feature is disabled. Each RTD name may be changed if desired.

5.9.4 RTD 11

PATH: SETTINGS ▷▽ S8 RTD TEMPERATURE ▷▽ RTD #11

■ RTD #11 [▷]	RTD #11 APPLICATION: Other	*Range: Stator, Bearing, Ambient, Other, None*
MESSAGE	RTD #11 NAME:	*Range: 8 alphanumeric characters*
MESSAGE	RTD #11 ALARM: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN ALARM RELAYS: Alarm	*Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE	RTD #11 ALARM TEMPERATURE: 80°C	*Range: 1 to 250°C in steps of 1*
MESSAGE	RTD #7 HIGH ALARM: Off	*Range: Off, Latched, Unlatched*
MESSAGE	HIGH ALARM RELAYS: Alarm	*Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE	RTD #11 HIGH ALARM TEMPERATURE: 80°C	*Range: 1 to 250°C in steps of 1*
MESSAGE	RTD #11 ALARM EVENTS: Off	*Range: On, Off*
MESSAGE	RTD #11 TRIP: Off	*Range: Off, Latched, Unlatched*
MESSAGE	RTD #11 TRIP VOTING: RTD #11	*Range: RTD #1 to RTD #12*
MESSAGE	ASSIGN TRIP RELAYS: Trip	*Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3*
MESSAGE	RTD #11 TRIP TEMPERATURE: 90°C	*Range: 1 to 250°C in steps of 1*

RTD 11 defaults to "Other" RTD type. The Other selection allows the RTD to be used to monitor any temperature that might be required, either for a process or additional bearings or other. There are individual alarm, high alarm and trip configurations for this

RTD. Trip voting has been added for extra reliability in the event of RTD malfunction. If enabled, a second RTD must also exceed the trip temperature of the RTD being checked before a trip will be issued. If the RTD is chosen to vote with itself, the voting feature is disabled. The RTD name may be changed if desired.

5.9.5 RTD 12

PATH: SETTINGS ▷▽ S8 RTD TEMPERATURE ▷▽ RTD 12

■ RTD #12 [▷]

◁ ▷	RTD #12 APPLICATION: Ambient	Range: Stator, Bearing, Ambient, Other, None
MESSAGE	RTD #12 NAME:	Range: 8 alphanumeric characters
MESSAGE	RTD #12 ALARM: Off	Range: Off, Latched, Unlatched
MESSAGE	ASSIGN ALARM RELAYS: Alarm	Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None
MESSAGE	RTD #12 ALARM TEMPERATURE: 60°C	Range: 1 to 250°C in steps of 1
MESSAGE	RTD #12 HIGH ALARM: Off	Range: Off, Latched, Unlatched
MESSAGE	HIGH ALARM RELAYS: Alarm	Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None
MESSAGE	RTD #12 HIGH ALARM TEMPERATURE: 60°C	Range: 1 to 250°C in steps of 1
MESSAGE	RTD #12 ALARM EVENTS: Off	Range: On, Off
MESSAGE	RTD #12 TRIP: Off	Range: Off, Latched, Unlatched
MESSAGE	RTD #12 TRIP VOTING: RTD #12	Range: RTD #1 to RTD #12
MESSAGE	ASSIGN TRIP RELAYS: Trip	Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3
MESSAGE	RTD #12 TRIP TEMPERATURE: 80°C	Range: 1 to 250°C in steps of 1

RTDs 12 defaults to "Ambient" RTD type. There are individual alarm, high alarm and trip configurations for this RTD. Trip voting has been added for extra reliability in the event of RTD malfunction. If enabled, a second RTD must also exceed the trip temperature of the RTD being checked before a trip will be issued. If the RTD is chosen to vote with itself, the voting feature is disabled. The RTD name may be changed if desired.

5.9.6 Open RTD Sensor

PATH: SETTINGS ▷▽ S8 RTD TEMPERATURE ▷▽ OPEN RTD SENSOR

■ OPEN [▷] RTD SENSOR	OPEN RTD SENSOR ALARM: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN ALARM RELAYS: Alarm	*Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE	OPEN RTD SENSOR ALARM EVENTS: Off	*Range: On, Off*

The 469 has an Open RTD Sensor alarm. This alarm will look at all RTDs that have either an alarm or trip programmed and determine if an RTD connection has been broken. Any RTDs that do not have a trip or alarm associated with them will be ignored for this feature. When a broken sensor is detected, the assigned output relay will operate and a message will appear on the display identifying the RTD that is broken. It is recommended that if this feature is used, the alarm be programmed as latched so that intermittent RTDs are detected and corrective action may be taken.

5.9.7 RTD Short/Low Temp

PATH: SETTINGS ▷▽ S8 RTD TEMPERATURE ▷▽ RTD SHORT/LOW TEMP

■ RTD [▷] SHORT/LOW TEMP	RTD SHORT/LOW TEMP ALARM: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN ALARM RELAYS: Alarm	*Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE	RTD SHORT/LOW TEMP ALARM EVENTS: Off	*Range: On, Off*

The 469 has an RTD Short/Low Temperature alarm. This alarm will look at all RTDs that have either an alarm or trip programmed and determine if an RTD has either a short or a very low temperature (less than –50°C). Any RTDs that do not have a trip or alarm associated with them will be ignored for this feature. When a short/low temperature is detected, the assigned output relay will operate and a message will appear on the display identifying the RTD that caused the alarm. It is recommended that if this feature is used, the alarm be programmed as latched so that intermittent RTDs are detected and corrective action may be taken.

5.10 S9 Voltage Elements

5.10.1 Undervoltage

PATH: SETTINGS ▷▽ S9 VOLTAGE ELEM. ▷ UNDERVOLTAGE

■ UNDERVOLTAGE [▷]	U/V ACTIVE ONLY IF BUS ENERGIZED: No	*Range: No, Yes*
MESSAGE	UNDERVOLTAGE ALARM: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN ALARM RELAYS: Alarm	*Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE	UNDERVOLTAGE ALARM PICKUP: 0.85 x RATED	*Range: 0.60 to 0.99 x RATED in steps of 0.01*
MESSAGE	STARTING U/V ALARM PICKUP: 0.85 x RATED	*Range: 0.60 to 1.00 x RATED in steps of 0.01. Enter "1.00" to turn this function off.*
MESSAGE	UNDERVOLTAGE ALARM DELAY: 3.0 s	*Range: 0.0 to 60.0 s in steps of 0.1*
MESSAGE	UNDERVOLTAGE ALARM EVENTS: Off	*Range: On, Off*
MESSAGE	UNDERVOLTAGE TRIP: Off	*Range: Off, Latched, Unlatched*
MESSAGE	UNDERVOLTAGE TRIP MODE: 1-Phase	*Range: 1-Phase, 3-Phase*
MESSAGE	ASSIGN TRIP RELAYS: Trip	*Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3*
MESSAGE	UNDERVOLTAGE TRIP PICKUP: 0.80 x RATED	*Range: 0.60 to 0.99 x RATED in steps of 0.01*
MESSAGE	STARTING U/V TRIP PICKUP: 0.80 x RATED	*Range: 0.60 to 1.00 x RATED in steps of 0.01. Enter "1.00" to turn this function off.*
MESSAGE	UNDERVOLTAGE TRIP DELAY: 3.0 s	*Range: 0.0 to 60.0 s in steps of 0.1*

The **U/V ACTIVE ONLY IF BUS ENERGIZED** settings may be used to prevent nuisance alarms or trips when the bus is not energized. If this settings is programmed to "Yes", at least one voltage must be greater than 20% of the nominal nameplate voltage rating for any alarm/trip. If the load is high inertia, it may be desirable to trip the motor off-line or prevent it from starting in the event of a total loss of line voltage. Programming "No" for this settings ensures that the motor is tripped and may be restarted only after the bus is re-energized.

If the undervoltage alarm feature is enabled, an alarm will occur once the magnitude of either Vab, Vbc, or Vca falls below the pickup level while running or starting for a period of time specified by the delay (note that pickup levels are multiples of motor nameplate voltage). The running pickup level also applies when the motor is stopped and the **U/V ACTIVE ONLY IF BUS ENERGIZED** settings is programmed to “No”.

Undervoltage trips can be set for single-phase or three-phase conditions. If undervoltage tripping is enabled, and the **UNDERVOLTAGE TRIP MODE** is set for “3-Phase”, a trip will occur only when the magnitude of all three phases falls below the pickup level while running or starting for a period of time specified by the time delay. On the other hand, if undervoltage trip is enabled, and the **UNDERVOLTAGE TRIP MODE** is set for “1-Phase”, a trip will occur once the magnitude of either Vab, Vbc, or Vca falls below the pickup level while running or starting for a period of time specified by the time delay. Note that pickup levels are multiples of motor nameplate voltage. The running pickup level also applies when the motor is stopped, and the **U/V ACTIVE ONLY IF BUS ENERGIZED** settings is programmed to “No”.

An undervoltage on a running motor with a constant load results in increased current. The relay thermal model typically picks up this condition and provides adequate protection. However, this settings may be used in conjunction with the time delay to provide additional protection that may be programmed for advance warning by tripping.

Attempting to start a large motor when the supply voltage is down may also be undesirable. An undervoltage of significant proportion that persists while starting a motor may prevent the motor from reaching rated speed. This may be especially critical for a synchronous motor. As such, this feature may be used in with a time delay to provide protection for undervoltage conditions before and during starting.

In the event of system problems causing asymmetrical voltage conditions where at least one voltage remains above pickup, an Alarm condition will occur, indicating that the voltage on at least one phase is below acceptable levels. The trip relay will not be energized unless the **UNDERVOLTAGE TRIP MODE** is set to “1-Phase”. The factory default setting for **UNDERVOLTAGE TRIP MODE** is “1-Phase”.

To prevent for nuisance undervoltage trips due to VT Fuse Failure, set the **UNDERVOLTAGE TRIP MODE** to “3-Phase”. The alarm relay will be energized in the event of a single-phase undervoltage, which can also be an indication of a potential VT fuse failure. Typically a fuse failure is detected when there are significant levels of negative-sequence voltage, indicating voltage unbalance due to the loss of one phase, without correspondingly significant levels of negative-sequence current, indicating current unbalance, measured at the output CTs.

If the conditions for Fuse Failure exist, an alarm will occur after a time delay due to an undervoltage condition in at least one phase. If the motor is running, the voltage in the faulted phase will be zero, and the measured load current should not indicate a significant amount of negative or unbalance currents. Therefore the motor can be kept in service until the opportunity to replace the faulty fuse is available.

If the alarm is caused by an abnormal system conditions, a significant amount of unbalance current will be present. If the condition is not detected on time, the unbalance function or the underpower element will trip the motor.

NOTE

Set **UNDERVOLTAGE TRIP MODE** to "3-Phase", when the settings **S2 SYSTEM SETUP** ▷ **VOLTAGE SENSING** ▷▽ **ENABLE SINGLE VT OPERATION** is set to "On". The relay assumes a balanced three phase system when fed from a single VT.

5.10.2 Overvoltage

PATH: SETTINGS ▷▽ S9 VOLTAGE ELEM. ▷▽ OVERVOLTAGE

■ OVERVOLTAGE [▷]	OVERVOLTAGE ALARM: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN ALARM RELAYS: Alarm	*Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE	OVERVOLTAGE ALARM PICKUP: 1.05 x RATED	*Range: 1.01 to 1.20 x RATED in steps of 0.01*
MESSAGE	OVERVOLTAGE ALARM DELAY: 3.0 s	*Range: 0.5 to 60.0 s in steps of 0.1*
MESSAGE	OVERVOLTAGE ALARM EVENTS: Off	*Range: On, Off*
MESSAGE	OVERVOLTAGE TRIP: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN TRIP RELAYS: Trip	*Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3*
MESSAGE	OVERVOLTAGE TRIP PICKUP: 1.10 x RATED	*Range: 1.01 to 1.20 x RATED in steps of 0.01*
MESSAGE	OVERVOLTAGE TRIP DELAY: 3.0 s	*Range: 0.5 to 60.0 s in steps of 0.1*

If enabled, once the magnitude of either Vab, Vbc, or Vca rises above the pickup level for a period of time specified by the delay, a trip or alarm will occur (pickup levels are multiples of motor nameplate voltage).

An overvoltage on running motor with a constant load results in decreased current. However, iron and copper losses increase, causing an increase in motor temperature. The current overload relay will not pickup this condition and provide adequate protection. Therefore, the overvoltage element may be useful for protecting the motor in the event of a sustained overvoltage condition.

5.10.3 Phase Reversal

PATH: SETTINGS ▷▽ S9 VOLTAGE ELEM. ▷▽ PHASE REVERSAL

■ PHASE [▷] REVERSAL	PHASE REVERSAL TRIP: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN TRIP RELAYS: Trip	*Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3*

The 469 can detect the phase rotation of the three phase voltage. If the Phase Reversal feature is turned on when all 3 phase voltages are greater than 50% motor nameplate voltage, and the phase rotation of the three phase voltages is not the same as the settings, a trip and block start will occur in 500 to 700 ms.

NOTE

This feature does not work when single VT operation is enabled.

5.10.4 Frequency

PATH: SETTINGS ▷▽ S9 VOLTAGE ELEM. ▷▽ FREQUENCY

■ FREQUENCY [▷]	FREQUENCY ALARM: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN ALARM RELAYS: Alarm	*Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE	OVER FREQUENCY ALARM LEVEL: 60.50	*Range: 25.01 to 70.00 Hz in steps of 0.01*
MESSAGE	UNDER FREQUENCY ALARM LEVEL: 59.50	*Range: 20.00 to 60.00 Hz in steps of 0.01*
MESSAGE	FREQUENCY ALARM DELAY: 1.0 s	*Range: 0.0 to 60.0 s in steps of 0.1*
MESSAGE	FREQUENCY ALARM EVENTS: Off	*Range: On, Off*
MESSAGE	FREQUENCY TRIP: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN TRIP RELAYS: Trip	*Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3*
MESSAGE	OVER FREQUENCY TRIP LEVEL: 60.50 Hz	*Range: 25.01 to 70.00 Hz in steps of 0.01*
MESSAGE	UNDER FREQUENCY TRIP LEVEL: 59.50 Hz	*Range: 20.00 to 60.00 Hz in steps of 0.01*
MESSAGE	FREQUENCY TRIP DELAY: 1.0 s	*Range: 0.0 to 60.0 s in steps of 0.1*

Once the frequency of the phase AN or AB voltage (depending on wye or delta connection) is out of range of the overfrequency and underfrequency settings, a trip or alarm will occur.

This feature may be useful for load shedding applications on large motors. It could also be used to load shed an entire feeder if the trip was assigned to an upstream breaker.

5.11 S10 Power Elements

5.11.1 Power Measurement Conventions

By convention, an induction motor consumes Watts and vars. This condition is displayed on the 469 as +Watts and +vars. A synchronous motor can consume Watts and vars or consume Watts and generate vars. These conditions are displayed on the 469 as +Watts, +vars, and +Watts, –vars respectively (see the figure below).

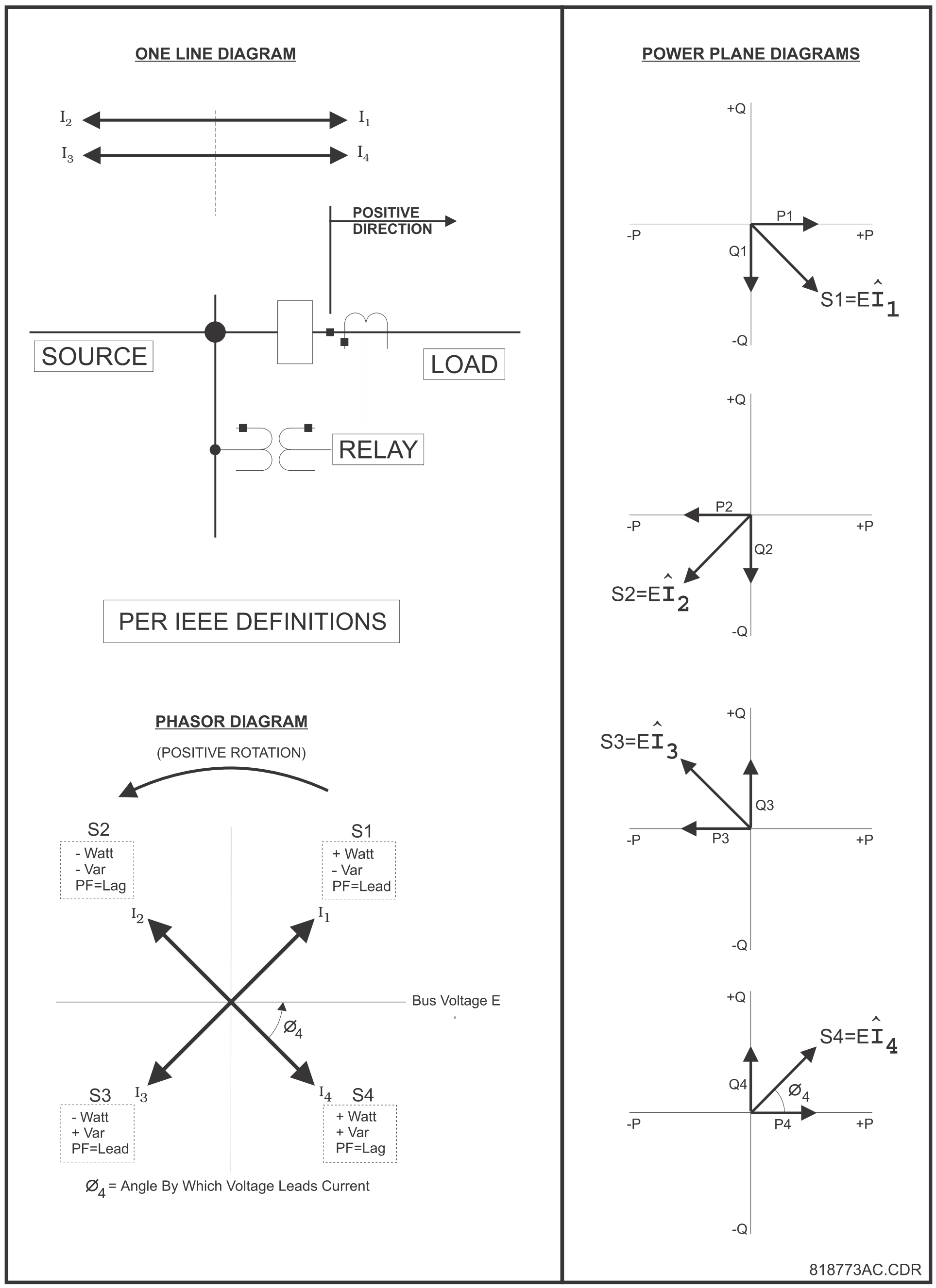


FIGURE 5–17: Power Measurement Conventions

5.11.2 Power Factor

PATH: SETTINGS ▷▽ S10 POWER ELEMENTS ▷ POWER FACTOR

■ POWER FACTOR [▷]	BLOCK PF ELEMENT FROM START: 1 s	*Range: 0 to 5000 s in steps of 1*
MESSAGE	POWER FACTOR ALARM: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN ALARM RELAYS: Alarm	*Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE	POWER FACTOR LEAD ALARM LEVEL: Off	*Range: 0.05 to 1.00 in steps of 0.01. Enter 1.00 to turn feature off.*
MESSAGE	POWER FACTOR LAG ALARM LEVEL: Off	*Range: 0.05 to 1.00 in steps of 0.01. Enter 1.00 to turn feature off.*
MESSAGE	POWER FACTOR ALARM DELAY: 1.0 s	*Range: 0.2 to 30.0 s in steps of 0.1*
MESSAGE	POWER FACTOR ALARM EVENTS: Off	*Range: On, Off*
MESSAGE	POWER FACTOR TRIP: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN TRIP RELAYS: Trip	*Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3*
MESSAGE	POWER FACTOR LEAD TRIP LEVEL: Off	*Range: 0.05 to 1.00 in steps of 0.01. Enter 1.00 to turn feature off.*
MESSAGE	POWER FACTOR LAG TRIP LEVEL: Off	*Range: 0.05 to 1.00 in steps of 0.01. Enter 1.00 to turn feature off.*
MESSAGE	POWER FACTOR TRIP DELAY: 1.0 s	*Range: 0.2 to 30.0 s in steps of 0.1*

If the 469 is applied on a synchronous motor, it is desirable not to trip or alarm on power factor until the field has been applied. Therefore, this feature can be blocked until the motor comes up to speed and the field is applied. From that point forward, the power factor trip and alarm elements will be active. Once the power factor is less than either the Lead or Lag level, for the specified delay, a trip or alarm will occur indicating a Lead or Lag condition. The power factor alarm can be used to detect loss of excitation and out of step.

The 469 is not designed to estimate power factor when both of the following conditions are true:

- setpoint System Nominal Frequency is "Variable"
- Input Voltage is not at frequency 60 Hz.

5.11.3 Reactive Power

PATH: SETTINGS ▷▽ S10 POWER ELEMENTS ▷▽ REACTIVE POWER

■ REACTIVE POWER [▷]	BLOCK kvar ELEMENT FROM START: 1 s	Range: 0 to 5000 s in steps of 1
MESSAGE	REACTIVE POWER ALARM: Off	Range: Off, Latched, Unlatched
MESSAGE	ASSIGN ALARM RELAYS: Alarm	Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None
MESSAGE	POSITIVE kvar ALARM LEVEL: 10 kvar	Range: 1 to 25000 kvar in steps of 1
MESSAGE	NEGATIVE kvar ALARM LEVEL: 10 kvar	Range: 1 to 25000 kvar in steps of 1
MESSAGE	REACTIVE POWER ALARM DELAY: 1.0 s	Range: 0.2 to 30.0 s in steps of 0.1
MESSAGE	REACTIVE POWER ALARM EVENTS: Off	Range: On, Off
MESSAGE	REACTIVE POWER TRIP: Off	Range: Off, Latched, Unlatched
MESSAGE	ASSIGN TRIP RELAYS: Trip	Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3
MESSAGE	POSITIVE kvar TRIP LEVEL: 25 kvar	Range: 1 to 25000 kvar in steps of 1
MESSAGE	NEGATIVE kvar TRIP LEVEL: 25 kvar	Range: 1 to 25000 kvar in steps of 1
MESSAGE	REACTIVE POWER TRIP DELAY: 1.0 s	Range: 0.2 to 30.0 s in steps of 0.1

If the 469 is applied on a synchronous motor, it is desirable not to trip or alarm on kvar until the field has been applied. Therefore, this feature can be blocked until the motor comes up to speed and the field is applied. From that point forward, the kvar trip and alarm elements will be active. Once the kvar level exceeds either the positive or negative level, for the specified delay, a trip or alarm will occur indicating a positive or negative kvar condition. The reactive power alarm can be used to detect loss of excitation and out of step.

5.11.4 Underpower

PATH: SETTINGS ▷▽ S10 POWER ELEMENTS ▷▽ UNDERPOWER

■ UNDERPOWER [▷]	BLOCK UNDERPOWER FROM START: 0 s	*Range: 0 to 15000 s in steps of 1*
MESSAGE	UNDERPOWER ALARM: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN ALARM RELAYS: Alarm	*Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE	UNDERPOWER ALARM LEVEL: 2 kW	*Range: 1 to 25000 kW in steps of 1*
MESSAGE	UNDERPOWER ALARM DELAY: 1 s	*Range: 1 to 30 s in steps of 1*
MESSAGE	UNDERPOWER ALARM EVENTS: Off	*Range: On, Off*
MESSAGE	UNDERPOWER TRIP: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN TRIP RELAYS: Trip	*Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3*
MESSAGE	UNDERPOWER TRIP LEVEL: 1 kW	*Range: 1 to 25000 kW in steps of 1*
MESSAGE	UNDERPOWER TRIP DELAY: 1 s	*Range: 1 to 30 s in steps of 1*

If enabled, once the magnitude of 3Φ total power falls below the Pickup Level for a period of time specified by the Delay, a trip or alarm will occur. The Underpower element is active only when the motor is running and will be blocked upon the initiation of a motor start for a period of time defined by the **BLOCK ELEMENT FROM START** settings (e.g. this block may be used to allow pumps to build up head before the underpower element trips or alarms). A value of 0 means the feature is not blocked from start. If a value other than 0 is entered, the feature will be disabled when the motor is stopped and also from the time a start is detected until the time entered expires. The pickup level should be set lower than motor loading during normal operations.

For example, underpower may be used to detect loss of load conditions. Loss of load conditions will not always cause a significant loss of current. Power is a more accurate representation of loading and may be used for more sensitive detection of load loss or pump cavitation. This may be especially useful for detecting process related problems.

5.11.5 Reverse Power

PATH: SETTINGS ▷▽ S10 POWER ELEMENTS ▷▽ REVERSE POWER

■ REVERSE POWER [▷]	◁ ▷	BLOCK REVERSE POWER FROM START: 0 s	Range: 0 to 50000 s in steps of 1
MESSAGE	△▽	REVERSE POWER ALARM: Off	Range: Off, Latched, Unlatched
MESSAGE	△▽	ASSIGN ALARM RELAYS: Alarm	Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None
MESSAGE	△▽	REVERSE POWER ALARM LEVEL: 2 kW	Range: 1 to 25000 kW in steps of 1
MESSAGE	△▽	REVERSE POWER ALARM DELAY: 1 s	Range: 0.2 to 30.0 s in steps of 0.1
MESSAGE	△▽	REVERSE POWER ALARM EVENTS: Off	Range: On, Off
MESSAGE	△▽	REVERSE POWER TRIP: Off	Range: Off, Latched, Unlatched
MESSAGE	△▽	ASSIGN TRIP RELAYS: Trip	Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3
MESSAGE	△▽	REVERSE POWER TRIP LEVEL: 1 kW	Range: 1 to 25000 kW in steps of 1
MESSAGE	△	REVERSE POWER TRIP DELAY: 1 s	Range: 0.2 to 30.0 s in steps of 1

If enabled, once the magnitude of 3-phase total power exceeds the Pickup Level in the reverse direction (negative kW) for a period of time specified by the Delay, a trip or alarm will occur.

NOTE

The minimum magnitude of power measurement is determined by the phase CT minimum of 5% rated CT primary. If the level for reverse power is set below that level, a trip or alarm will only occur once the phase current exceeds the 5% cutoff.

5.11.6 Torque Setup

PATH: SETTINGS ▷▽ S10 POWER ELEMENTS ▷▽ TORQUE SETUP

■ TORQUE SETUP [▷]	◁ ▷	TORQUE METERING Disabled	Range: Disabled, Enabled
MESSAGE	△▽	STATOR RESISTANCE: 0.004 mΩ	Range: 0.001 to 50.000 mΩ in steps of 0.001
MESSAGE	△▽	POLE PAIRS: 2	Range: 2 to 128 in steps of 1
MESSAGE	△	TORQUE UNIT: Newton-meter	Range: Newton-meter, Foot-pound

Before torque can be determined, the motor stator resistance and number of pole pairs must be entered here. The base stator resistance can be determined from the motor's rated voltage and current. Torque metering is intended for induction motors only, and only positive torque is calculated. Please consult the motor specifications for the stator resistance and the pole pairs.

The default unit for torque is the SI unit of Newton-meter (Nm). The torque unit is selectable to either Newton-meter or foot-pound.

NOTE

1 Nm = 0.738 ft·lb.

5.11.7 Overtorque

PATH: SETTINGS ▷▽ S10 POWER ELEMENTS ▷▽ OVERTORQUE

■ OVERTORQUE [▷]	OVERTORQUE ALARM: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN ALARM RELAYS: Alarm	*Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE	TORQUE ALARM LEVEL: 4000.0 Nm	*Range: 0.1 to 999999.9 Nm (or ft·lb) in steps of 0.1*
MESSAGE	TORQUE ALARM DELAY: 1.0 s	*Range: 0.2 to 30 s in steps of 0.1*
MESSAGE	TORQUE ALARM EVENTS: Off	*Range: On, Off*

Detection of a motor overtorque condition, usually done to protect devices driven by the motor, can be set up here. The assigned relay activates when the torque measured exceeds the specified level for the specified time duration.

5.12 S11 Monitoring

5.12.1 Trip Counter

PATH: SETTINGS ▷▽ S11 MONITORING ▷ TRIP COUNTER

■ TRIP COUNTER [▷]		TRIP COUNTER ALARM: Off	Range: Off, Latched, Unlatched
MESSAGE		ASSIGN ALARM RELAYS: Alarm	Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None
MESSAGE		TRIP COUNTER ALARM LEVEL: 25 Trips	Range: 1 to 50000 Trips in steps of 1
MESSAGE		TRIP COUNTER ALARM EVENTS: Off	Range: On, Off

When the Trip Counter Limit is reached, an alarm will occur. The trip counter must be cleared or the alarm level raised and the reset key must be pressed (if the alarm was latched) to reset the alarm.

For example, it might be useful to set a Trip Counter alarm at 100 so that if 100 trips occur, the resulting alarm prompts the operator or supervisor to investigate the type of trips that occurred. A breakdown of trips by type may be found on **A3 MAINTENANCE\TRIP COUNTERS**. If a trend is detected, it would warrant further investigation.

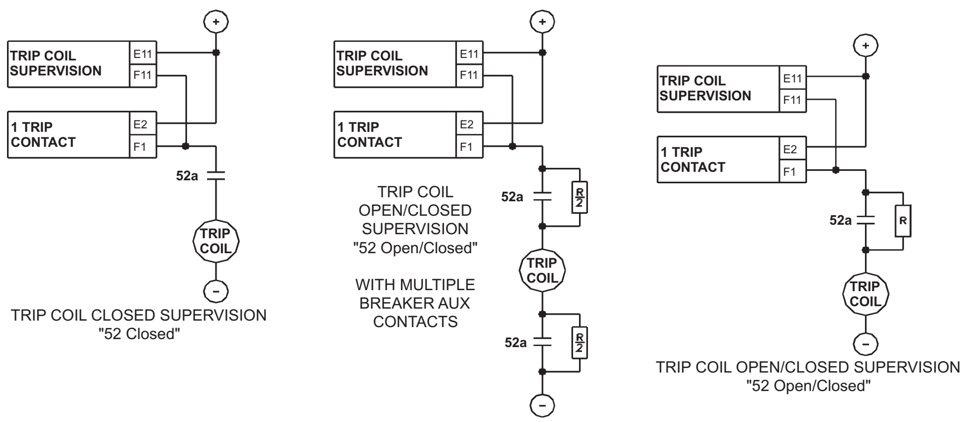
5.12.2 Starter Failure

PATH: SETTINGS ▷▽ S11 MONITORING ELEMENTS ▷▽ STARTER FAILURE

■ STARTER FAILURE [▷]		STARTER FAILURE ALARM: Off	Range: Off, Latched, Unlatched
MESSAGE		STARTER TYPE: Breaker	Range: Breaker, Contactor
MESSAGE		ASSIGN ALARM RELAYS: Alarm	Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None
MESSAGE		STARTER FAILURE DELAY: 100 ms	Range: 10 to 1000 ms in steps of 10
MESSAGE		SUPERVISION OF TRIP COIL: Disabled	Range: Disabled, 52 Closed, 52 Open/ Closed
MESSAGE		STARTER FAILURE ALARM EVENTS: Off	Range: On, Off

If the **STARTER FAILURE ALARM** is set to “Latched” or “Unlatched”, then the Starter Status input and motor current are monitored when the 469 initiates a trip. If the starter status contacts do not change state or motor current does not drop to zero after the programmed time delay, an alarm occurs. The time delay should be slightly longer than the breaker or contactor operating time. If an alarm occurs and “Breaker” was chosen as the starter type, the alarm will be Breaker Failure. If “Contactor” was chosen for starter type, the alarm will be Welded Contactor. Also, if the starter type chosen is “Breaker”, Trip Coil Supervision may be enabled. The **SUPERVISION OF TRIP COIL** settings is seen only if the **STARTER TYPE** is “Breaker”.

- If “52 Closed” is selected, the trip coil supervision circuitry monitors the trip coil circuit for continuity any time the starter status input indicates that the breaker is closed or motor current is detected. If that continuity is broken, a Starter Failure alarm will indicate Trip Coil Supervision.
- If “52 Open/Closed” is selected, the trip coil supervision circuitry monitors the trip coil circuit for continuity at all times, regardless of breaker state. This requires an alternate path around the 52a contacts in series with the trip coil when the breaker is open. See the following figure for modifications to the wiring and proper resistor selection. If that continuity is broken, a Starter Failure alarm will indicate Trip Coil Supervision.



VALUE OF RESISTOR 'R'

SUPPLY	OHMS	WATTS
48 VDC	10 K	2
125 VDC	25 K	5
250 VDC	50 K	5

FIGURE 5–18: Trip Coil Supervision

5.12.3 Demand

PATH: SETTINGS ▷▽ S11 MONITORING ▷▽ CURRENT DEMAND

■ CURRENT DEMAND [▷]	CURRENT DEMAND PERIOD: 15 min.	*Range: 5 to 90 min. in steps of 1*
MESSAGE	CURRENT DEMAND ALARM: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN ALARM RELAYS: Alarm	*Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE	CURRENT DEMAND LIMIT: 100 A	*Range: 10 to 100000 A in steps of 1*

MESSAGE	CURRENT DEMAND ALARM EVENTS: Off	*Range: On, Off*
■ kW DEMAND [▷]	kW DEMAND PERIOD: 15 min.	*Range: 5 to 90 min. in steps of 1*
MESSAGE	kW DEMAND ALARM: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN ALARM RELAYS: Alarm	*Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE	kW DEMAND LIMIT: 100 kW	*Range: 1 to 50000 kW in steps of 1*
MESSAGE	kW DEMAND ALARM EVENTS: Off	*Range: On, Off*
■ kvar DEMAND [▷]	kvar DEMAND PERIOD: 15 min.	*Range: 5 to 90 min. in steps of 1*
MESSAGE	kvar DEMAND ALARM: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN ALARM RELAYS: Alarm	*Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE	kvar DEMAND LIMIT: 100 kvar	*Range: 1 to 50000 kvar, step 1*
MESSAGE	kvar DEMAND ALARM EVENTS: Off	*Range: On, Off*
■ kVA DEMAND [▷]	kVA DEMAND PERIOD: 15 min.	*Range: 5 to 90 min. in steps of 1*
MESSAGE	kVA DEMAND ALARM: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN ALARM RELAYS: Alarm	*Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE	kVA DEMAND LIMIT: 100 kVA	*Range: 1 to 50000 kVA, step: 1*
MESSAGE	kVA DEMAND ALARM EVENTS: Off	*Range: On, Off*

The 469 measures motor demand for several parameters (current, kW, kvar, and kVA). These values may be of interest for energy management programs where processes may be altered or scheduled to reduce overall demand on a feeder.

Demand is calculated as follows. Every minute, an average magnitude is calculated for current, +kW, +kvar, and kVA based on samples taken every 5 seconds. These values are stored in a FIFO (first in, first out) buffer. The buffer size is dictated by the settings demand period. The average value of the buffer is calculated and stored as the new demand value every minute. Demand for real and reactive power is only positive quantities (+kW and +kvar).

$$\text{Demand} = \frac{1}{N}\sum_{n=1}^{N}\left|\text{Average}_N\right| \qquad \textbf{(EQ 5.12)}$$

where: N = programmed demand period in minutes
n = time in minutes.

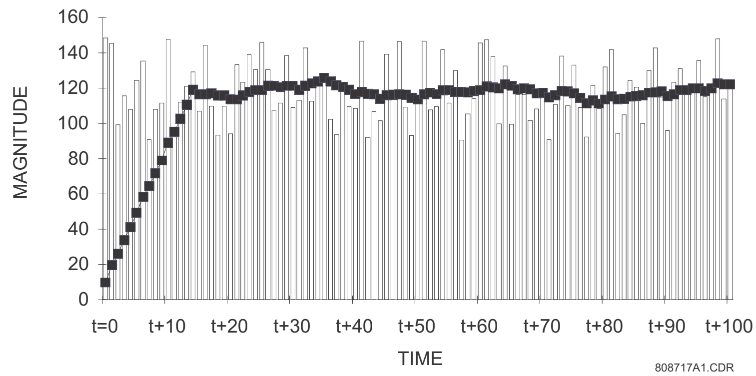


FIGURE 5–19: Rolling Demand (15 Minute Window)

5.12.4 Pulse Output

PATH: SETTINGS ▷▽ S11 MONITORING ▷▽ PULSE OUTPUT

■ PULSE [▷] OUTPUT	POS kWh PULSE OUTPUT RELAY: Off	*Range: Off, Alarm, Auxiliary2, Auxiliary3*
MESSAGE	POS kWh PULSE OUTPUT INTERVAL: 1 kWh	*Range: 1 to 50000 kWh in steps of 1*
MESSAGE	POS kvarh PULSE OUT RELAY: Off	*Range: Off, Alarm, Auxiliary2, Auxiliary3*
MESSAGE	POS kvarh PULSE OUT INTERVAL: 1 kvarh	*Range: 1 to 50000 kvarh in steps of 1*
MESSAGE	NEG kvarh PULSE OUT RELAY: Off	*Range: Off, Alarm, Auxiliary2, Auxiliary3*
MESSAGE	NEG kvarh PULSE OUT INTERVAL: 1 kvarh	*Range: 1 to 50000 kvarh in steps of 1*
MESSAGE	RUNNING TIME PULSE RELAY: Off	*Range: Off, Alarm, Auxiliary2, Auxiliary3*
MESSAGE	RUNNING TIME PULSE INTERVAL: 0 s	*Range: 1 to 50000 s in steps of 1*

This feature configures one or more of the output relays as a pulsed output. When the programmed interval has transpired the assigned relay will be activated for 1 second.

NOTE

This feature should be programmed such that no more than one pulse per second will be required or the pulsing will lag behind the interval activation.

5.12.5 Loss of Communications

PATH: SETTINGS ▷▽ S11 MONITORING ▷▽ LOSS OF COMMS

■ LOSS OF COMMS ▷]	LOSS OF COMMS FUNCTION: Off	*Range: Off, Latched, Unlatched*
MESSAGE	*LOSS OF COMMS FUNCTION TYPE: Alarm	*Range: Alarm, Trip*
MESSAGE	*LOSS OF COMMS PORT: COMP_RS485	*Range: COMP_RS485, **AUX_RS485, **Ethernet-T, **DeviceNet*
MESSAGE	+ASSIGN LOSS OF COMMS RELAY: Alarm	*Range: Alarm, Alarm & Aux2, Alarm & Aux2 & Aux3, Alarm & Aux3, Aux2, Aux2 & Aux3, Aux3,None*
MESSAGE	++ASSIGN LOSS OF COMMS RELAY: Trip	*Range: Trip, Trip & Aux2, Trip & Aux2 & Aux3, Trip & Aux3*
MESSAGE	*LOSS OF COMMS DELAY: 1 s	*Range: 1 to 30 s in steps of 1 s*
MESSAGE	+LOSS OF COMMS ALARM EVENTS: Off	*Range: On, Off*

* Only shown if "LOSS OF COMMS: FUNCTION" selection is not 'Off'.

** Only shown if the Option Code is present.

+ Only shown if "LOSS OF COMMS: FUNCTION" selection is not 'Off' and function type is "Alarm"

+ +Only shown if "LOSS OF COMMS: FUNCTION" selection is not 'Off' and function type is "Trip"

When the SR469 relay detects inactivity in communicating with the master, the enabled port will issue a “Loss of Comms Alarm/Trip” event and operate a combination of output relays.

The communication inactivity detection shown in “Not Communicating” applies to all four of the SR469 communication ports.

The detailed causes for “Not Communicating” are displayed in section S13 469 TESTING - *Communication Port Monitor.*

The Loss of Communication Alarm/Trip function can be programmed for Latched or Unlatched:

- Latched: The programmed output relays and target remain latched until communications with the master are re-established. The latched alarm/trip can be manually reset or remotely reset via a Modbus command.

- Unlatched: The programmed output relays are activated until communication is re-established. Once communication is active, the alarm/trip condition will be cleared and the assigned output relays will deactivate.

5.13 S12 Analog Inputs/Outputs

5.13.1 Analog Outputs 1 to 4

PATH: SETTINGS ▷▽ S12 ANALOG I/O ▷ ANALOG OUTPUT 1

■ ANALOG [▷] OUTPUT 1		ANALOG OUTPUT 1: Therm. Capacity Used	*Range: See Analog Output Parameter Selection Table on page 5–95*
	MESSAGE	THERM. CAPACITY USED MIN: 0%	*Range: 0 to 100% in steps of 1*
	MESSAGE	THERM. CAPACITY USED MAX: 100%	*Range: 0 to 100% in steps of 1*
■ ANALOG [▷] OUTPUT 2		ANALOG OUTPUT 2: Motor Load	*Range: See Analog Output Parameter Selection Table on page 5–95*
	MESSAGE	MOTOR LOAD MIN: 0.00 x FLA	*Range: 0.00 to 20.00 x FLA in steps of 0.01*
	MESSAGE	MOTOR LOAD MAX: 1.50 x FLA	*Range: 0.00 to 20.00 x FLA in steps of 0.01*
■ ANALOG [▷] OUTPUT 3		ANALOG OUTPUT 3: Hottest Stator RTD	*Range: See Analog Output Parameter Selection Table on page 5–95*
	MESSAGE	HOTTEST STATOR RTD MIN: 0°C	*Range: –50 to 250°C (or –58 to 482°F) in steps of 1*
	MESSAGE	HOTTEST STATOR RTD MAX: 250°C	*Range: –50 to 250°C (or –58 to 482°F) in steps of 1*
■ ANALOG [▷] OUTPUT 4		ANALOG OUTPUT 4: Real Power (kW)	*Range: See Analog Output Parameter Selection Table on page 5–95*
	MESSAGE	REAL POWER (kW) MIN: 0 kW	*Range: –50000 to 50000 kW in steps of 1*
	MESSAGE	REAL POWER (kW) MAX: 1000 kW	*Range: –50000 to 50000 kW in steps of 1*

The 469 has four analog output channels (4 to 20 mA or 0 to 1 mA as ordered). Each channel may be individually configured to represent a number of different measured parameters as shown in the table below. The minimum value programmed represents the 4 mA output. The maximum value programmed represents the 20 mA output. If the maximum is programmed lower than the minimum, the output will function in reverse. All four of the outputs are updated once every 50 ms. Each parameter may only be used once.

For example, the analog output parameter may be chosen as "Hottest Stator RTD" for a 4 to 20 mA output. If the minimum is set for "0°C" and the maximum is set for "250°C", the analog output channel will output 4 mA when the Hottest Stator RTD temperature is at 0°C, 12 mA when it is 125°C, and 20 mA when it is 250°C.

Table 5–3: Analog Output Parameter Selection Table

PARAMETER NAME	RANGE / UNITS	STEP	DEFAULT	
			MIN.	MAX
Phase A Current	0 to 100000 A	1	0	100
Phase B Current	0 to 100000 A	1	0	100
Phase C Current	0 to 100000 A	1	0	100
Avg. Phase Current	0 to 100000 A	1	0	100
AB Line Voltage	50 to 20000 V	1	3200	4500
BC Line Voltage	50 to 20000 V	1	3200	4500
CA Line Voltage	50 to 20000 V	1	3200	4500
Avg. Line Voltage	50 to 20000 V	1	3200	4500
Phase AN Voltage	50 to 20000 V	1	1900	2500
Phase BN Voltage	50 to 20000 V	1	1900	2500
Phase CN Voltage	50 to 20000 V	1	1900	2500
Avg. Phase Voltage	50 to 20000 V	1	1900	2500
Hottest Stator RTD	–50 to +250°C or –58 to +482°F	1	0	200
Hottest Bearing RTD	–50 to +250°C or –58 to +482°F	1	0	200
Ambient RTD	–50 to +250°C or –58 to +482°F	1	-50	60
RTD #1 to 12	–50 to +250°C or –58 to +482°F	1	-50	250
Power Factor	0.01 to 1.00 lead/lag	0.01	0.8 lag	0.8 lead
Reactive Power	-50000 to 50000 kvar	1	0	750
Real Power	-50000 to 50000 kW	1	0	1000
Apparent Power	0 to 50000 kVA	1	0	1250
Thermal Capacity Used	0 to 100%	1	0	100
Relay Lockout Time	0 to 500 min.	1	0	150
Current Demand	0 to 100000 A	1	0	700
kvar Demand	0 to 50000 kvar	1	0	1000
kW Demand	0 to 50000 kW	1	0	1250
kVA Demand	0 to 50000 kVA	1	0	1500
Motor Load	0.00 to 20.00 x FLA	0.01	0.00	1.25
Analog Inputs 1-4	–50000 to +50000	1	0	+50000
Tachometer	100 to 7200 RPM	1	3500	3700

Table 5–3: Analog Output Parameter Selection Table

PARAMETER NAME	RANGE / UNITS	STEP	DEFAULT	
			MIN.	MAX
MWhrs	0.000 to 999999.999 MWhrs	0.001	50.000	100.000
Analog In Diff 1-2	–50000 to +50000	1	0	100
Analog In Diff 3-4	–50000 to +50000	1	0	100
Torque	0 to 999999.9	0.1	0	100

5.13.2 Analog Inputs 1 to 4

PATH: SETTINGS ▷▽ S12 ANALOG I/O ▷ ANALOG INPUT 1(4)

■ ANALOG INPUT 1 [▷]	ANALOG INPUT 1: Disabled	*Range: Disabled, 4-20 mA, 0-20 mA, 0-1 mA*
MESSAGE	ANALOG INPUT 1 NAME: Analog I/P 1	*Range: 12 alphanumeric characters*
MESSAGE	ANALOG INPUT 1 UNITS: Units	*Range: 6 alphanumeric characters*
MESSAGE	ANALOG INPUT 1 MINIMUM: 0	*Range: –50000 to 50000 in steps of 1*
MESSAGE	ANALOG INPUT 1 MAXIMUM: 100	*Range: –50000 to 50000 in steps of 1*
MESSAGE	BLOCK ANALOG INPUT 1 FROM START: 0 s	*Range: 0 to 5000 s in steps of 1*
MESSAGE	ANALOG INPUT 1 ALARM: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN ALARM RELAYS: Alarm	*Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None*
MESSAGE	ANALOG INPUT 1 ALARM LEVEL: 10 Units	*Range: –50000 to 50000 in steps of 1 Units reflect* **ANALOG INPUT 1 UNITS** *above*
MESSAGE	ANALOG INPUT 1 ALARM PICKUP: Over	*Range: Over, Under*
MESSAGE	ANALOG INPUT 1 ALARM DELAY: 0.1 s	*Range: 0.1 to 300.0 s in steps of 0.1*
MESSAGE	ANALOG INPUT 1 ALARM EVENTS: Off	*Range: On, Off*
MESSAGE	ANALOG INPUT 1 TRIP: Off	*Range: Off, Latched, Unlatched*
MESSAGE	ASSIGN TRIP RELAYS: Trip	*Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3 Trip & Auxiliary3*

MESSAGE	ANALOG INPUT 1 TRIP LEVEL: 20 Units	*Range: –50000 to 50000 in steps of 1* *Units reflect* **ANALOG INPUT 1 UNITS** *above*
MESSAGE	ANALOG INPUT 1 TRIP PICKUP: Over	*Range: Over, Under*
MESSAGE	ANALOG INPUT 1 TRIP DELAY: 0.1 s	*Range: 0.1 to 300.0 s in steps of 0.1*

There are 4 analog inputs, 4 to 20 mA, 0 to 20 mA, or 0 to 1 mA as selected. These inputs may be used to monitor transducers such as vibration monitors, tachometers, pressure transducers, etc. These inputs may be used for alarm and tripping purposes. The inputs are sampled every 50 ms. The level of the analog input is also available over the communications port.

Before the input may be used, it must be configured. A name may be assigned for the input, units may be assigned, and a minimum and maximum value may be assigned. Also, the trip and alarm features may be blocked from start for a specified time delay. If the block time is 0, there is no block and the trip and alarm features will be active when the motor is stopped or running. If a time is programmed other than 0, the feature will be disabled when the motor is stopped and also from the time a start is detected until the time entered expires. Once the input is setup, both the trip and alarm features may be configured. In addition to programming a level and time delay, the pickup settings may be used to dictate whether the feature picks up when the measured value is over or under the level.

For example, if a pressure transducer is to be used for a pump application, program the following settings:

ANALOG INPUT 1(4) NAME: "Pressure"
ANALOG INPUT 1(4) UNITS: "PSI"
ANALOG INPUT 1(4) MINIMUM: "0"
ANALOG INPUT 1(4) MAXIMUM: "500"

If there is no pressure until the pump is up and running for 5 minutes and pressure builds up, program the **ANALOG INPUT 1 BLOCK FROM START** as 6 minutes ("360 s"). The alarm may be fed back to a PLC for when pressure is under 300 PSI. Program a reasonable delay (e.g **ANALOG INPUT ALARM 1 DELAY** = "3 s") and **ANALOG INPUT ALARM 1 PICKUP** as "Under".

If a vibration transducer is to be used for a pump application, program the following settings:

ANALOG INPUT 1(4) NAME: "Vibration"
ANALOG INPUT 1(4) UNITS: "mm/s"
ANALOG INPUT 1(4) MINIMUM: "0"
ANALOG INPUT 1(4) MAXIMUM: "25"

Program **BLOCK ANALOG INPUT 1(4) FROM START** as "0" minutes. Set the alarm for a reasonable level slightly higher than the normal vibration level. Program a delay of "3 s" and a pickup value of "Over".

5.13.3 Analog Input Diff 1-2

PATH: SETTINGS ▷▽ S12 ANALOG I/O ▷▽ ANALOG INPUT DIFF 1–2

■ ANALOG INPUT [▷] DIFF 1-2	ANALOG IN DIFF 1-2: Disabled	Range: Disabled, Enabled
MESSAGE	ANALOG IN DIFF 1-2 NAME: Analog 1-2	Range: 12 alphanumeric characters
MESSAGE	ANALOG IN DIFF 1-2 COMPARISON: % Diff	Range: % Diff, Abs. Diff
MESSAGE	ANALOG IN DIFF 1-2 LOGIC: 1<>2	Range: 1<>2, 1>2, 2>1
MESSAGE	ANALOG IN DIFF 1-2 ACTIVE: Always	Range: Always, Start/Run
MESSAGE	A/I DIFF 1-2 BLOCK FROM START: 0 s	Range: 0 to 5000 s in steps of 1
MESSAGE	ANALOG IN DIFF 1-2 ALARM: Off	Range: Off, Latched, Unlatched
MESSAGE	ASSIGN ALARM RELAYS: Alarm	Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None
MESSAGE	ANALOG IN DIFF 1-2 ALARM LEVEL: 10%	Range: 0 to 500% in steps of 1 or 0 to 50000 Units in steps of 1
MESSAGE	ANALOG IN DIFF 1-2 ALARM DELAY: 0.1 s	Range: 0.1 to 300.0 s in steps of 0.1
MESSAGE	ANALOG IN DIFF 1-2 EVENTS: Off	Range: On, Off
MESSAGE	ANALOG IN DIFF 1-2 TRIP: Off	Range: Off, Latched, Unlatched
MESSAGE	ASSIGN TRIP RELAYS: Trip	Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3 Trip & Auxiliary3
MESSAGE	ANALOG IN DIFF 1-2 TRIP LEVEL: 10%	Range: 0 to 500% in steps of 1 or 0 to 50000 Units in steps of 1
MESSAGE	ANALOG IN DIFF 1-2 TRIP DELAY: 0.1 s	Range: 0.1 to 300.0 s in steps of 0.1

NOTE

This settings menu is seen only if Analog Inputs 1 and 2 are enabled. The **ANALOG IN DIFF 1-2 TRIP LEVEL** and **ANALOG IN DIFF 1-2 ALARM LEVEL** settings are shown units of "%" if the **ANALOG IN DIFF 1-2 COMPARISON** is "%Diff" or in units defined by the **ANALOG INPUT 1 UNITS** settings if **ANALOG IN DIFF 1-2 COMPARISON** is "Abs Diff".

This feature compares two analog inputs and activate alarms or trips based on their difference, which can be an absolute difference in units or a percentage difference. The second analog input (2 for 1-2) is used as the reference value for percentage calculations. The comparison logic can also be selected as one input greater than the other ("1>2") or vice versa ("2>1") or as absolute difference ("1<>2"). The compared analog inputs must be programmed with the same units type prior to programming this feature.

For example, two motors on a dual motor drive are each protected a 469. The motors should be at the same power level (kW). Connect the analog outputs (programmed for kW) from both relays to the analog inputs of one relay. Program the analog input differential to monitor the two motors kW and trip at a predetermined level.

5.13.4 Analog Input Diff 3-4

PATH: SETTINGS ▷▽ S12 ANALOG I/O ▷▽ ANALOG INPUT DIFF 3–4

■ ANALOG INPUT DIFF 3-4 [▷]	ANALOG IN DIFF 3-4: Disabled	Range: Disabled, Enabled
MESSAGE	ANALOG IN DIFF 3-4 NAME: Analog 3-4	Range: 12 alphanumeric characters
MESSAGE	ANALOG IN DIFF 3-4 COMPARISON: % Diff	Range: % Diff, Abs. Diff
MESSAGE	ANALOG IN DIFF 3-4 LOGIC: 3<>4	Range: 3<>4, 3>4, 4>3
MESSAGE	ANALOG IN DIFF 3-4 ACTIVE: Always	Range: Always, Start/Run
MESSAGE	A/I DIFF 3-4 BLOCK FROM START: 0 s	Range: 0 to 5000 s in steps of 1
MESSAGE	ANALOG IN DIFF 3-4 ALARM: Off	Range: Off, Latched, Unlatched
MESSAGE	ASSIGN ALARM RELAYS: Alarm	Range: Alarm, Alarm & Auxiliary2, Alarm & Aux2 & Aux3, Alarm & Auxiliary3, Auxiliary2, Aux2 & Aux3, Auxiliary3, None
MESSAGE	ANALOG IN DIFF 3-4 ALARM LEVEL: 10%	Range: 0 to 500% in steps of 1 or 0 to 50000 Units in steps of 1
MESSAGE	ANALOG IN DIFF 3-4 ALARM DELAY: 0.1 s	Range: 0.1 to 300.0 s in steps of 0.1
MESSAGE	ANALOG IN DIFF 3-4 EVENTS: Off	Range: On, Off
MESSAGE	ANALOG IN DIFF 3-4 TRIP: Off	Range: Off, Latched, Unlatched
MESSAGE	ASSIGN TRIP RELAYS: Trip	Range: Trip, Trip & Auxiliary2, Trip & Aux2 & Aux3, Trip & Auxiliary3
MESSAGE	ANALOG IN DIFF 3-4 TRIP LEVEL: 10%	Range: 0 to 500% in steps of 1 or 0 to 50000 Units in steps of 1
MESSAGE	ANALOG IN DIFF 3-4 TRIP DELAY: 0.1 s	Range: 0.1 to 300.0 s in steps of 0.1

NOTE

This settings menu is seen only if Analog Inputs 3 and 4 are enabled. The **ANALOG IN DIFF 3-4 TRIP LEVEL** and **ANALOG IN DIFF 3-4 ALARM LEVEL** settings are shown units of "%" if the **ANALOG IN DIFF 3-4 COMPARISON** is "%Diff" or in units defined by the **ANALOG INPUT 3 UNITS** settings if **ANALOG IN DIFF 3-4 COMPARISON** is "Abs Diff".

This feature compares two of the analog inputs and activate alarms or trips based on the difference between them. The difference can be of an absolute difference in units or a percentage difference. The second analog input (4 for 3-4) is used as the reference value for percentage calculations. The comparison logic can also be selected as one input greater than the other ("3>4") or vice versa ("4>3") or as absolute difference ("3<>4"). Note that the compared analog inputs must be programmed with the same unit type prior to using this feature.

5.14 S13 469 Testing

5.14.1 Simulation Mode

PATH: SETTINGS ▷▽ S13 469 TESTING ▷ SIMULATION MODE

■ SIMULATION [▷] MODE		SIMULATION MODE Off	*Range: Off, Simulate Pre-Fault, Simulate Fault, Pre-Fault to Fault*
	MESSAGE	PRE-FAULT TO FAULT TIME DELAY: 15 s	*Range: 0 to 300 s in steps of 1*

The 469 may be placed in several simulation modes. This simulation may be useful for several purposes.

- First, it may be used to understand the operation of the 469 for learning or training purposes.
- Second, simulation may be used during startup to verify that control circuitry operates as it should in the event of a trip, alarm, or block start.
- In addition, simulation may be used to verify that settings had been set properly in the event of fault conditions.

Simulation mode may be entered only if the motor is stopped and there are no trips, alarms, or block starts active. The values entered as Pre-Fault Values will be substituted for the measured values in the 469 when the simulation mode is "Simulate Pre-Fault". The values entered as Fault Values will be substituted for the measured values in the 469 when the simulation mode is "Simulate Fault". If the simulation mode: Pre-Fault to Fault is selected, the Pre-Fault values will be substituted for the period of time specified by the delay, followed by the Fault values. If a trip occurs, simulation mode will revert to Off. Selecting "Off" for the simulation mode will place the 469 back in service. If the 469 measures phase current or control power is cycled, simulation mode will automatically revert to Off.

If the 469 is to be used for training, it might be desirable to allow all learned parameters, statistical information, and event recording to update when operating in simulation mode. If however, the 469 has been installed and will remain installed on a specific motor, it might be desirable to short the 469 Test input (C3 and C4) to prevent all of this data from being corrupted or updated. In any case, when in simulation mode, the 469 In Service LED (indicator) will flash, indicating that the 469 is not in protection mode.

5.14.2 Pre-Fault Setup

PATH: SETTINGS ▷▽ S13 469 TESTING ▷▽ PRE-FAULT SETUP

■ PRE-FAULT [▷] SETUP		PRE-FAULT CURRENT PHASE A: 0.00 x CT	Range: 0.00 to 20.00 x CT in steps of 0.01
	MESSAGE	PRE-FAULT CURRENT PHASE B: 0.00 x CT	Range: 0.00 to 20.00 x CT in steps of 0.01
	MESSAGE	PRE-FAULT CURRENT PHASE C: 0.00 x CT	Range: 0.00 to 20.00 x CT in steps of 0.01
	MESSAGE	PRE-FAULT GROUND CURRENT: 0.0 A	Range: 0.0 to 5000.0 A in steps of 0.1
	MESSAGE	PRE-FAULT VOLTAGES VLINE: 1.00 x RATED	Range: 0.00 to 1.10 x RATED in steps of 0.01
	MESSAGE	PRE-FAULT CURRENT LAGS VOLTAGE: 0°	Range: 0 to 359° in steps of 1
	MESSAGE	PRE-FAULT DIFF AMPS IDIFF: 0.00 x CT	Range: 0.00 to 1.10 x RATED in steps of 0.01
	MESSAGE	PRE-FAULT STATOR RTD TEMP: 40°C	Range: –50 to 250°C in steps of 1
	MESSAGE	PRE-FAULT BEARING RTD TEMP: 40°C	Range: –50 to 250°C in steps of 1
	MESSAGE	PRE-FAULT OTHER RTD TEMP: 40°C	Range: –50 to 250°C in steps of 1
	MESSAGE	PRE-FAULT AMBIENT RTD TEMP: 40°C	Range: –50 to 250°C in steps of 1
	MESSAGE	PRE-FAULT SYSTEM FREQUENCY: 60.0 Hz	Range: 45.0 to 70.0 Hz in steps of 0.1
	MESSAGE	PRE-FAULT ANALOG INPUT 1: 0%	Range: 0 to 100% in steps of 1
	MESSAGE	PRE-FAULT ANALOG INPUT 2: 0%	Range: 0 to 100% in steps of 1
	MESSAGE	PRE-FAULT ANALOG INPUT 3: 0%	Range: 0 to 100% in steps of 1
	MESSAGE	PRE-FAULT ANALOG INPUT 4: 0%	Range: 0 to 100% in steps of 1

The values entered under Pre-Fault Values will be substituted for the measured values in the 469 when the simulation mode is “Simulate Pre-Fault”.

5.14.3 Fault Setup

PATH: SETTINGS ▷▽ S13 469 TESTING ▷▽ FAULT SETUP

	■ FAULT SETUP [▷]	
	FAULT CURRENT PHASE A: 0.00 x CT	*Range: 0.00 to 20.00 x CT in steps of 0.01*
MESSAGE	FAULT CURRENT PHASE B: 0.00 x CT	*Range: 0.00 to 20.00 x CT in steps of 0.01*
MESSAGE	FAULT CURRENT PHASE C: 0.00 x CT	*Range: 0.00 to 20.00 x CT in steps of 0.01*
MESSAGE	FAULT GROUND CURRENT: 0.0 A	*Range: 0.0 to 5000.0 A in steps of 0.1*
MESSAGE	FAULT VOLTAGES VLINE: 1.00 x RATED	*Range: 0.00 to 1.10 x RATED in steps of 0.01*
MESSAGE	FAULT CURRENT LAGS VOLTAGE: 0°	*Range: 0 to 359° in steps of 1*
MESSAGE	FAULT DIFF AMPS IDIFF: 0.00 x CT	*Range: 0.00 to 1.10 x RATED in steps of 0.01*
MESSAGE	FAULT STATOR RTD TEMP: 40°C	*Range: –50 to 250°C in steps of 1*
MESSAGE	FAULT BEARING RTD TEMP: 40°C	*Range: –50 to 250°C in steps of 1*
MESSAGE	FAULT OTHER RTD TEMP: 40°C	*Range: –50 to 250°C in steps of 1*
MESSAGE	FAULT AMBIENT RTD TEMP: 40°C	*Range: –50 to 250°C in steps of 1*
MESSAGE	FAULT SYSTEM FREQUENCY: 60.0 Hz	*Range: 45.0 to 70.0 Hz in steps of 0.1*
MESSAGE	FAULT ANALOG INPUT 1: 0%	*Range: 0 to 100% in steps of 1*
MESSAGE	FAULT ANALOG INPUT 2: 0%	*Range: 0 to 100% in steps of 1*
MESSAGE	FAULT ANALOG INPUT 3: 0%	*Range: 0 to 100% in steps of 1*
MESSAGE	FAULT ANALOG INPUT 4: 0%	*Range: 0 to 100% in steps of 1*

The values entered under Fault Values will be substituted for the measured values in the 469 when the simulation mode is “Simulate Fault”.

5.14.4 Test Output Relays

PATH: SETTINGS ▷▽ S13 469 TESTING ▷▽ TEST OUTPUT RELAYS

■ TEST [▷] OUTPUT RELAYS	FORCE OPERATION OF RELAYS: Disabled	*Range: Disabled, 1 Trip, 2 Auxiliary, 3 Auxiliary, 4 Alarm, 5 Block, 6 Service, All Relays, No Relays*

In addition to the simulation modes, the **TEST OUTPUT RELAYS** settings group may be used during startup or testing to verify that the output relays are functioning correctly.

The output relays can only be forced to operate only if the motor is stopped and there are no trips, alarms, or start blocks active. If any relay is forced to operate, the relay will toggle from its normal state when there are no trips, alarms, or blocks to its active state. The appropriate relay indicator will illuminate at that time. Selecting "Disabled" places the output relays back in service. If the 469 measures phase current or control power is cycled, the **FORCE OPERATION OF RELAYS** settings will automatically become disabled and the output relays will revert back to their normal states.

If any relay is forced, the 469 In Service LED will flash, indicating that the 469 is not in protection mode.

5.14.5 Test Analog Outputs

PATH: SETTINGS ▷▽ S13 469 TESTING ▷▽ TEST ANALOG OUTPUT

■ TEST [▷] ANALOG OUTPUT		FORCE ANALOG OUTPUTS FUNCTION: Disabled	*Range: Enabled, Disabled*
	MESSAGE	ANALOG OUTPUT 1 FORCED VALUE: 0%	*Range: 0 to 100%, step 1*
	MESSAGE	ANALOG OUTPUT 2 FORCED VALUE: 0%	*Range: 0 to 100%, step 1*
	MESSAGE	ANALOG OUTPUT 3 FORCED VALUE: 0%	*Range: 0 to 100%, step 1*
	MESSAGE	ANALOG OUTPUT 4 FORCED VALUE: 0%	*Range: 0 to 100%, step 1*

In addition to the simulation modes, the **TEST ANALOG OUTPUT** settings group may be used during startup or testing to verify that the analog outputs are functioning correctly.

The analog outputs can only be forced if the motor is stopped and there are no trips, alarms, or start blocks active. When the **FORCE ANALOG OUTPUTS FUNCTION** is "Enabled", the output reflects the forced value as a percentage of the 4 to 20 mA or 0 to 1 mA range. Selecting "Disabled" places all four analog output channels back in service, reflecting the parameters programmed to each. If the 469 measures phase current or control power is cycled, the **FORCE ANALOG OUTPUTS FUNCTION** is automatically disabled and all analog outputs revert back to their normal state.

Any time the analog outputs are forced, the 469 In Service LED will flash, indicating that the 469 is not in protection mode.

5.14.6 Comm Port Monitor

PATH: SETTINGS ▷▽ S13 469 TESTING ▷▽ COMMUNICATION PORT MONITOR

■ COMMUNICATION [▷] PORT MONITOR		MONITOR COMM. PORT: Computer RS485	*Range: Computer RS485, Auxiliary RS485, Front Panel RS232*
	MESSAGE	CLEAR COMM. BUFFERS: No	*Range: No, Yes*
	MESSAGE	LAST Rx BUFFER: Received OK	*Range: Buffer Cleared, Received OK, Wrong Slave Addr., Illegal Function, Illegal Count, Illegal Reg. Addr., CRC Error, Illegal Data*
	MESSAGE	Rx1: 02,03,00,67,00, 03,B4,27,//----------	*Range: received data in HEX*
	MESSAGE	Rx2: ---------------- ---------------------	*Range: received data in HEX*
	MESSAGE	Tx1: 02,03,06,00,64, 00,0A,00,0F//--------	*Range: transmitted data in HEX*
	MESSAGE	Tx2: ---------------- ---------------------	*Range: transmitted data in HEX*

During the course of troubleshooting communications problems, it can be very useful to see the data that is first being transmitted to the 469 from some master device, and then see the data that the 469 transmits back to that master device. The messages shown here should make it possible to view that data. Any of the three communications ports may be monitored. After the communication buffers have been cleared, any data received from the communications port being monitored will be stored in the Rx1 and Rx2 buffers with '// ' acting as a character break between messages. If the 469 transmits a message, it will appear in the Tx1 and Tx2 buffers. In addition to these buffers, there is a message that will indicate the status of the last received message.

5.14.7 GR Multilin Use Only

PATH: SETTINGS ▷▽ S13 469 TESTING ▷▽ GE MULTILIN USE ONLY

■ GE MULTILIN [▷] USE ONLY	GE MULTILIN USE ONLY CODE: 0	*Range: N/A*

This section is for use by GE Grid Solutions personnel for testing and calibration purposes.

5.15 S14 Two-Speed Motor

5.15.1 Description

The two-speed motor feature provides proper protection for a two-speed motor where there will be two different full load values. The algorithm integrates the heating at each speed into one thermal model using a common thermal capacity used register value for both speeds.

If the two-speed motor feature is used, Assignable Input 4 is dedicated as the two-speed motor monitor and terminals D22 and D23 are monitored for a contact closure. Contact closure signifies that the motor is in Speed 2; if the input is open, it signifies that the motor is in Speed 1. This allows the 469 to determine which settings should be active at any given point in time. Two-speed motor protection is enabled with the **S2 SYSTEM SETUP ▷ CURRENT SENSING ▷▽ ENABLE 2-SPEED MOTOR PROTECTION** settings.

Speed2 Overload Setup

- **Overview**

The settings corresponding to the Speed2 Overload Curve are closely related to the Thermal Model curve style and overload curve settings. Refer to 5.6.2 *Thermal Model* on page 5–40 and 5.6.3 *Overload Curve Setup* on page 5–41 for details. When setting the Speed2 Overload Curve characteristics, only the relevant settings corresponding to the overload curve style will be shown, as described below.

- **Standard Overload Curves**

If the **SELECT CURVE STYLE** is set to “Standard” in the Thermal Model, the following settings will appear:

PATH: SETTINGS ▷▽ S14 2-SPEED MOTOR ▷ SPEED2 OVERLOAD SETUP

```
■ SPEED2          [▷]
  OVERLOAD SETUP
```

```
SPEED2 STANDARD
CURVE NUMBER: 4
```

Range: 1 to 15 in steps of 1

Refer to *Standard Overload Curves* on page 5–41 for additional details on the standard overload curves available for Speed2.

- **Custom Overload Curves**

If the **SELECT CURVE STYLE** is set to “Custom” in the Thermal Model, the following settings will appear:

PATH: SETTINGS ▷▽ S14 2-SPEED MOTOR ▷ SPEED2 OVERLOAD SETUP

```
■ SPEED2          [▷]
  OVERLOAD SETUP
```

```
SPEED2 TRIP AT
1.01 x FLA: 17414.5 s
```

Range: 0.5 to 99999.9 in steps of 0.1

MESSAGE

```
SPEED2 TRIP AT
1.05 x FLA: 3414.9 s
```

Range: 0.5 to 99999.9 in steps of 0.1

MESSAGE

```
SPEED2 TRIP AT
1.10 x FLA: 1666.7 s
```

Range: 0.5 to 99999.9 in steps of 0.1

MESSAGE

```
SPEED2 TRIP AT
1.20 x FLA: 795.4 s
```

Range: 0.5 to 99999.9 in steps of 0.1

MESSAGE	SPEED2 TRIP AT 1.30 x FLA: 507.2 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 1.40 x FLA: 364.6 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 1.50 x FLA: 280.0 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 1.75 x FLA: 169.7 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 2.00 x FLA: 116.6 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 2.25 x FLA: 86.1 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 2.50 x FLA: 66.6 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 2.75 x FLA: 53.3 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 3.00 x FLA: 43.7 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 3.25 x FLA: 36.6 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 3.50 x FLA: 31.1 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 3.75 x FLA: 26.8 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 4.00 x FLA: 23.2 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 4.25 x FLA: 20.5 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 4.50 x FLA: 18.2 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 4.75 x FLA: 16.2 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 5.00 x FLA: 14.6 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 5.50 x FLA: 12.0 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 6.00 x FLA: 10.0 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 6.50 x FLA: 8.5 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 7.00 x FLA: 7.3 s	*Range: 0.5 to 99999.9 in steps of 0.1*

MESSAGE	SPEED2 TRIP AT 7.50 x FLA: 6.3 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 8.00 x FLA: 5.6 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 10.0 x FLA: 5.6 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 15.0 x FLA: 5.6 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 20.0 x FLA: 5.6 s	*Range: 0.5 to 99999.9 in steps of 0.1*

Refer to *Custom Overload Curve* on page 5–44 for additional details on the custom overload curves available for Speed2.

- **Voltage Dependent Overload Curves**

If the **SELECT CURVE STYLE** is set to “Voltage Dependent” in the Thermal Model, the following settings will appear:

PATH: SETTINGS ▷▽ S14 2-SPEED MOTOR ▷ SPEED2 OVERLOAD SETUP

■ SPEED2 [▷] OVERLOAD SETUP	SPEED2 TRIP AT 1.01 x FLA: 17414.5 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 1.05 x FLA: 3414.9 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 1.10 x FLA: 1666.7 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 1.20 x FLA: 795.4 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 1.30 x FLA: 507.2 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 1.40 x FLA: 364.6 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 1.50 x FLA: 280.0 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 1.75 x FLA: 169.7 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 2.00 x FLA: 116.6 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 2.25 x FLA: 86.1 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 2.50 x FLA: 66.6 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 2.75 x FLA: 53.3 s	*Range: 0.5 to 99999.9 in steps of 0.1*

MESSAGE	SPEED2 TRIP AT 3.00 x FLA: 43.7 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 3.25 x FLA: 36.6 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 3.50 x FLA: 31.1 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 3.75 x FLA: 26.8 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 4.00 x FLA: 23.2 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 4.25 x FLA: 20.5 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 4.50 x FLA: 18.2 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 4.75 x FLA: 16.2 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 5.00 x FLA: 14.6 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 5.50 x FLA: 12.0 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 6.00 x FLA: 10.0 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 6.50 x FLA: 8.5 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 7.00 x FLA: 7.3 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 7.50 x FLA: 6.3 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 8.00 x FLA: 5.6 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 10.0 x FLA: 5.6 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 15.0 x FLA: 5.6 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 TRIP AT 20.0 x FLA: 5.6 s	*Range: 0.5 to 99999.9 in steps of 0.1*
MESSAGE	SPEED2 MIN ALLOWABLE LINE VOLTAGE: 80%	*Range: 70 to 95% in steps of 1*
MESSAGE	SPEED2 ISTALL @ MIN Vline: 4.80 x FLA	*Range: 2.00 to 15.00 x FLA in steps of 0.01*
MESSAGE	SPEED2 SAFE STALL @ MIN Vline: 20.0 s	*Range: 0.5 to 999.9 s in steps of 0.1*

MESSAGE	SPEED2 ACL INTERSECT @MIN Vline: 3.80 x FLA	*Range: 2.00 to* **SPEED2 ISTALL @ MIN VLINE** *– 0.01 in steps of 0.01*
MESSAGE	SPEED2 ISTALL @ 100% Vline: 6.00 x FLA	*Range: 2.00 to 15.00 x FLA in steps of 0.01*
MESSAGE	SPEED2 SAFE STALL @ 100% Vline: 10.0 s	*Range: 0.5 to 999.9 s in steps of 0.1*
MESSAGE	SPEED2 ACL INTERSECT @100% Vline: 5.00 x FLA	*Range: 2.00 to* **SPEED2 ISTALL @ 100% VLINE** *– 0.01 in steps of 0.01*

Refer to *Voltage Dependent Overload Curves* on page 5–47 for additional details on the custom overload curves available for Speed2.

5.15.2 Speed2 Undercurrent

PATH: SETTINGS ▷▽ S14 2-SPEED MOTOR ▷▽ SPEED2 UNDERCURRENT

■ SPEED2 [▷] UNDERCURRENT	BLOCK SPEED2 U/C FROM START: 0 s	*Range: 0 to 15000 s in steps of 1*
MESSAGE	SPEED2 U/C ALARM: Off	*Range: Off, Latched, Unlatched*
MESSAGE	SPEED2 U/C ALARM PICKUP: 0.70 x FLA	*Range: 0.10 to 0.95 x FLA in steps of 0.01*
MESSAGE	SPEED2 U/C ALARM DELAY: 1 s	*Range: 1 to 60 s in steps of 1*
MESSAGE	SPEED2 U/C ALARM EVENTS: Off	*Range: On, Off*
MESSAGE	SPEED2 U/C TRIP: Off	*Range: Off, Latched, Unlatched*
MESSAGE	SPEED2 U/C TRIP PICKUP: 0.70 x FLA	*Range: 0.10 to 0.99 x FLA in steps of 0.01*
MESSAGE	SPEED2 U/C TRIP DELAY: 1 s	*Range: 1 to 60 s in steps of 1*

The addition of a second Undercurrent trip or alarm level may be useful as it will indicate if the wrong settings are being used for the wrong speed i.e. normal running current for Speed 2 may be undercurrent for Speed 1.

5.15.3 Speed2 Acceleration

PATH: SETTINGS ▷▽ S14 2-SPEED MOTOR ▷▽ SPEED2 ACCELERATION

■ SPEED2 [▷] ACCELERATION	SPEED2 ACCEL. TIMER FROM START: 10.0 s	*Range: 1.0 to 250.0 s in steps of 0.1*
MESSAGE	ACCEL. TIMER FROM SPEED1-2: 10.0 s	*Range: 1.0 to 250.0 s in steps of 0.1*

MESSAGE	SPEED SWITCH TRIP SPEED2 DELAY: 5.0 s	*Range: 1.0 to 250.0 s in steps of 0.1. Seen only if one of the digital inputs is assigned as Speed Switch*
MESSAGE	SPEED2 RATED SPEED: 3600 RPM	*Range: 100 to 7200 RPM in steps of 1. Seen only if one of the digital inputs is assigned as Tachometer.*

Two additional acceleration timers are provided for the two speed motor feature. One timer is for a start in Speed 2 from a stopped condition. The other is an acceleration timer for the transition from Speed 1 to Speed 2. Also, while the motor is running, the 469 will ignore Mechanical Jam protection during the acceleration from Speed 1 to Speed 2 until the motor current has dropped below Speed 2 FLA × Overload Pickup value, or the Speed 1-2 acceleration time has expired. At that point in time, the Mechanical Jam feature will be enabled with the Speed 2 FLA.

469 Motor Management Relay

Chapter 6: Actual Values

6.1 Overview

6.1.1 Actual Values Map

The actual values message map is shown below.

■ ACTUAL VALUES [▷] A1 STATUS		■ MOTOR STATUS [▷]	See page 6-4.
	MESSAGE	■ LAST TRIP [▷] DATA	See page 6-4.
	MESSAGE	■ ALARM STATUS [▷]	See page 6-6.
	MESSAGE	■ START BLOCKS [▷]	See page 6-8.
	MESSAGE	■ DIGITAL [▷] INPUTS	See page 6-8.
	MESSAGE	■ REAL TIME [▷] CLOCK	See page 6-9.
	MESSAGE	■ NETWORK STATUS [▷]	See page 6-9.
	MESSAGE	END OF PAGE	
■ ACTUAL VALUES [▷] A2 METERING DATA		■ CURRENT [▷] METERING	See page 6-11.

MESSAGE	■ TEMPERATURE [▷]	See page 6-12.
MESSAGE	■ VOLTAGE METERING [▷]	See page 6-13.
MESSAGE	■ SPEED [▷]	See page 6-13.
MESSAGE	■ POWER METERING [▷]	See page 6-14.
MESSAGE	■ DEMAND METERING [▷]	See page 6-15.
MESSAGE	■ ANALOG INPUTS [▷]	See page 6-15.
MESSAGE	■ PHASORS [▷]	See page 6-16.
MESSAGE	END OF PAGE	

■ ACTUAL VALUES [▷]
A3 LEARNED DATA

	■ MOTOR STARTING [▷]	See page 6-27.
MESSAGE	■ AVERAGE MOTOR LOAD [▷]	See page 6-27.
MESSAGE	■ RTD MAXIMUMS [▷]	See page 6-28.
MESSAGE	■ ANALOG INPUT MIN/MAX [▷]	See page 6-29.
MESSAGE	END OF PAGE	

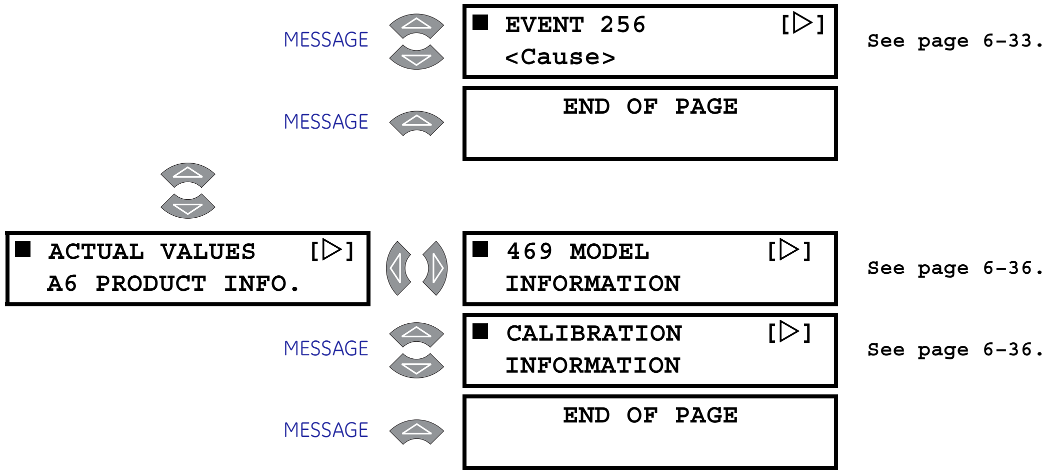
■ ACTUAL VALUES [▷]
A4 MAINTENANCE

	■ TRIP COUNTERS [▷]	See page 6-30.
MESSAGE	■ GENERAL COUNTERS [▷]	See page 6-31.
MESSAGE	■ TIMERS [▷]	See page 6-32.
MESSAGE	END OF PAGE	

■ ACTUAL VALUES [▷]
A5 EVENT RECORD

	■ EVENT 01 <Cause> [▷]	See page 6-33.

↓



6.1.2 Description

Measured values, maintenance and fault analysis information are accessed in Actual Value mode. Actual values may be accessed via one of the following methods:

1. The front panel, using the keys and display.
2. The front program port and a portable computer running the EnerVista 469 Setup software supplied with the relay.
3. The rear RS485 port and a PLC/SCADA system running user-written software.

Any of these methods can be used to view the same information. A computer makes viewing much more convenient, since many variables may be viewed at the same time. Actual value messages are organized into logical groups, or pages, for easy reference. All actual value messages are illustrated and described in blocks throughout this chapter. All values shown in these message illustrations assume that no inputs (besides control power) are connected to the 469.

In addition to the actual value messages, there are also diagnostic messages and flash messages that appear when certain conditions occur. Diagnostic messages are described on page 6–37. Flash messages are described on page 6–38.

6.2 A1 Status

6.2.1 Motor Status

PATH: ACTUAL VALUES ▷ A1 STATUS ▷▽ MOTOR STATUS

```
■ MOTOR STATUS        [▷]
```

	MOTOR STATUS: Stopped	Range: Tripped, Stopped, Starting, Running, Overload
MESSAGE	MOTOR THERMAL CAPACITY USED: 0%	Range: 0 to 100%
MESSAGE	ESTIMATED TRIP TIME ON OVERLOAD: Never	Range: 0 to 10000 sec., Never
MESSAGE	MOTOR SPEED: Low Speed	Range: HIgh Speed, Low Speed. Seen if two speed motor is enabled

These messages describe the motor status at any given point in time. If the motor has been tripped and the 469 has not yet been reset, the **MOTOR STATUS** value will be “Tripped”. The **MOTOR THERMAL CAPACITY USED** reflects an integrated value of both the Stator and Rotor Thermal Capacity Used. The values for **ESTIMATED TRIP TIME ON OVERLOAD** appear whenever the 469 picks up on the overload curve.

6.2.2 Last Trip Data

PATH: ACTUAL VALUES ▷ A1 STATUS ▷▽ LAST TRIP DATA

```
■ LAST TRIP           [▷]
  DATA
```

	CAUSE OF LAST TRIP: No Trip to Date	Range: see below
MESSAGE	TIME OF LAST TRIP: 09:00:00.00	Range: hour:min:sec
MESSAGE	DATE OF LAST TRIP: Jan 01 1995	Range: Month Day Year
MESSAGE	MOTOR SPEED DURING TRIP: Low Speed	Range: High Speed, Low Speed. Seen if two-speed motor is enabled
MESSAGE	TACHOMETER PreTrip: 3600 RPM	Range: 0 to 3600 RPM. Seen if a Digital Input set as Tachometer.
MESSAGE	A: 0 B: 0 C: 0 A PreTrip	Range: 0 to 100000 A
MESSAGE	MOTOR LOAD: 0.00 x FLA PreTrip	Range: 0.00 to 20.00 x FLA
MESSAGE	CURRENT UNBALANCE PreTrip: 0%	Range: 0 to 100%
MESSAGE	GROUND CURRENT PreTrip: 0.00 Amps	Range: 0.0 to 5000.0 A. Not seen if Ground CT is set to “None”.
MESSAGE	A: 0 B: 0 C: 0 A Diff.PreTrip	Range: 0 to 5000 A. Not seen if Differential CT is set as None

MESSAGE	HOTTEST STATOR RTD RTD #1: 0°C PreTrip	*Range: –50 to 250°C or –58 to 482°F. Seen only if at least 1 RTD is set as Stator*
MESSAGE	HOTTEST BEARING RTD RTD #7: 0°C PreTrip	*Range: –50 to 250°C or –58 to 482°F. Seen only if at least 1 RTD is set as Bearing*
MESSAGE	HOTTEST OTHER RTD RTD #11: 0°C PreTrip	*Range: –50 to 250°C or –58 to 482°F. Seen only if at least 1 RTD is set as Other*
MESSAGE	AMBIENT RTD RTD#12: 0°C PreTrip	*Range: –50 to 250°C or –58 to 482°F. Seen only if at least 1 RTD is set as Ambient*
MESSAGE	Vab: 0 Vbc: 0 Vca: 0 V PreTrip	*Range: 0 to 20000 V. Not seen if VT Connection is set as None*
MESSAGE	Van: 0 Vbn: 0 Vcn: 0 V PreTrip	*Range: 0 to 20000 V. Seen only if VT Connection is set as Wye*
MESSAGE	PRETRIP SYSTEM FREQUENCY: 0.00 Hz	*Range: Not seen if VT Connect. set as None*
MESSAGE	0 kW 0 kVA 0 kvar PreTrip	*Range: –50000 to 50000 kVA. Not seen if VT Connection set as None*
MESSAGE	POWER FACTOR PreTrip: 0.00	*Range: 0.01 to 0.99 Lead or Lag, 0.00, 1.00. Not seen if VT Connection is set as "None"*
MESSAGE	Analog I/P 1 PreTrip: 0 Units	*Range: –50000 to 50000. Not seen if Analog Input 1 is "Disabled".*
MESSAGE	Analog I/P 2 PreTrip: 0 Units	*Range: –50000 to 50000. Not seen if Analog Input 2 is "Disabled".*
MESSAGE	Analog I/P 3 PreTrip: 0 Units	*Range: –50000 to 50000. Not seen if Analog Input 3 is "Disabled".*
MESSAGE	Analog I/P 4 PreTrip: 0 Units	*Range: –50000 to 50000. Not seen if Analog Input 4 is "Disabled".*

Immediately prior to issuing a trip, the 469 takes a snapshot of motor parameters and stores them as pre-trip values that allow for troubleshooting after the trip occurs. The **CAUSE OF LAST TRIP** message is updated with the current trip and the screen defaults to that message. All trip features are automatically logged as date and time stamped events as they occur. This information may include motor speed (2-Speed feature or Assignable Digital Input), phase and ground currents, RTD temperatures, voltages, frequency, power quantities, and analog inputs. This information can be cleared using the **S1 469 SETUP** ▷▽ **CLEAR DATA** ▷▽ **CLEAR LAST TRIP DATA** settings.

The **CAUSE OF LAST TRIP** actual value has the following range: No Trip to Date, Incomplete Sequence, Remote Trip, Speed Switch, Load Shed, Pressure Switch, Vibration Switch, General Sw, Overload, Short Circuit, Mechanical Jam, Undercurrent, Current Unbalance, Ground Fault, Phase Differential, Acceleration, Tachometer, RTDs #1 to #12, Undervoltage, Overvoltage, Phase Reversal, Frequency, Reactive Power, Power Factor, Underpower, Analog Inputs 1 to 4, Single Phasing, Reverse Power, Analog Diff 1-2, Analog Diff 3-4, and Loss of Comms Trip.

NOTE

Phase, differential, and ground currents are recorded 1 cycle prior to the trip. All other pre-trip data is recorded 50 ms prior to the trip. Thus some values will not be recorded upon instantaneous trips during a start if the trip is less than 50 ms.

6.2.3 Alarm Status

PATH: ACTUAL VALUES ▷ A1 STATUS ▷▽ ALARM STATUS

■ ALARM STATUS [▷]	NO ALARMS	*Range: N/A. Message seen when no alarms are active*
MESSAGE	REMOTE ALARM STATUS: Active	*Range: Active, Latched*
MESSAGE	PRESSURE SWITCH ALARM STATUS: Active	*Range: Active, Latched*
MESSAGE	VIBRATION SWITCH ALARM STATUS: Active	*Range: Active, Latched*
MESSAGE	DIG. COUNTER ALARM: 1 000 000 000 Units	*Range: 1 to 9999999999. Displays current value of digital counter*
MESSAGE	TACHOMETER ALARM: 3000 RPM	*Range: 0 to 3600 RPM. Displays current Tachometer Digital Input value*
MESSAGE	GENERAL SW. A ALARM STATUS: Active	*Range: Active, Latched*
MESSAGE	THERMAL CAPACITY ALARM: 100% USED	*Range: 1 to 100. Thermal Capacity Used value is shown here*
MESSAGE	XX.XX x FLA OVERLOAD TIME TO TRIP: XXXXX s	*Range: 0 to 99999 s. Shows overload level and estimated time to trip.*
MESSAGE	UNDERCURRENT ALARM Ia = 85 A 85% FLA	*Range: 1 to 5000 A; 5 to 99% FLA. Lowest phase current shown.*
MESSAGE	CURRENT UNBALANCE ALARM: 15%	*Range: 0 to 100%. Reflects the present unbalance level*
MESSAGE	GROUND FAULT ALARM: 25.3 A	*Range: 0.1 to 5000 A. Reflects the present ground current level*
MESSAGE	STATOR RTD #1 ALARM: 135°C	*Range: –50 to 250°C*
MESSAGE	OPEN SENSOR ALARM: RTD # 1 2 3 4 5 6...	*Range: RTD with the open sensor as programmed for RTDs 1 to 12*
MESSAGE	SHORT/LOW TEMP ALARM RTD # 7 8 9 10 11...	*Range: 1 to 12. Shows RTD with the short/low temperature alarm*
MESSAGE	UNDERVOLTAGE ALARM Vab= 3245 V 78%	*Range: 0 to 20000 V; 50 to 99% of Rated*
MESSAGE	OVERVOLTAGE ALARM Vab= 4992 V 120%	*Range: 0 to 20000 V; 101 to 150% of Rated*
MESSAGE	SYSTEM FREQUENCY ALARM: 59.4 Hz	*Range: 0.00, 20.00 to 120.00 Hz*

MESSAGE	POWER FACTOR ALARM PF: 0.00	*Range: 0.00 to 0.99 Lead or Lag, 0.00, 1.00*
MESSAGE	REACTIVE POWER ALARM: +2000 kvar	*Range: –50000 to +50000 kvar*
MESSAGE	UNDERPOWER ALARM: 200 kW	*Range: –50000 to +50000 kW*
MESSAGE	TRIP COUNTER ALARM: 25 Trips	*Range: 1 to 10000 Trips*
MESSAGE	STARTER FAILURE: Trip Coil Super	*Range: Trip Coil Super, Welded Contactor, Breaker Failure*
MESSAGE	CURRENT DEMAND ALARM: 1053 A	*Range: 1 to 10000 A*
MESSAGE	kW DEMAND ALARM: 505 kW	*Range: –50000 to +50000 kW*
MESSAGE	kvar DEMAND ALARM: -2000 kvar	*Range: –50000 to +50000 kvar*
MESSAGE	kVA DEMAND ALARM: 2062 kVA	*Range: 0 to 50000 kVA*
MESSAGE	ANALOG I/P 1 ALARM: 201 Units	*Range: –50000 to +50000*
MESSAGE	EMERGENCY RESTART: Trip Still Present	*Range: Trip Still Present, Block Still Present, No Trips & No Blocks*
MESSAGE	ALARM, 469 NOT INSERTED PROPERLY	*Range: N/A*
MESSAGE	469 NOT IN SERVICE Not Programmed	*Range: Not Programmed, Output Relays Forced, Analog Output Forced, Test Switch Shorted*
MESSAGE	RTD #1 HI ALARM: 135°C	*Range: 1 to 250°C*
MESSAGE	ANALOG 1-2 ALARM: 50%	*Range: 0 to 999 (% Diff) or 0 to 99999 (Abs Diff)*
MESSAGE	ANALOG 3-4 ALARM: 50%	*Range: 0 to 999 (% Diff) or 0 to 99999 (Abs Diff)*
MESSAGE	OVERTORQUE ALARM: 0.00	*Range: 0.00 to 999999.9 Nm*
MESSAGE	*LOSS OF COMMS ALARM STATUS: Latched	*Range: OFF, Not Active, Timing Out, Active, Latched*

*Only shown if " LOSS OF COMMS: FUNCTION " selection is not 'Off'

Any active alarms may be viewed here.

The various alarm and alarm status actual values reflect the Alarm Name as programmed in the first line of the message. The status is “Active” if the condition that caused the alarm is still present.

If the 469 chassis is only partially engaged with the case, the **ALARM, 469 NOT INSERTED PROPERLY** service alarm appears after 1 second. Secure the chassis handle to ensure that all contacts mate properly.

6.2.4 Start Blocks

PATH: ACTUAL VALUES ▷ A1 STATUS ▷▽ START BLOCKS

■ START BLOCKS [▷]		NO START BLOCKS ACTIVE	Range: N/A. Message seen when no start blocks are active
	MESSAGE	OVERLOAD LOCKOUT BLOCK: 25 min.	Note: Message seen only after an overload trip
	MESSAGE	START INHIBIT BLOCK LOCKOUT TIME: 20 min.	Range: 0 to 500 min.
	MESSAGE	STARTS/HOUR BLOCK LOCKOUT TIME: 20 min.	Range: 0 to 60 min.
	MESSAGE	TIME BETWEEN STARTS LOCKOUT TIME: 20 min.	Range: 0 to 500 min.
	MESSAGE	RESTART BLOCK LOCKOUT: 1200 s	Range: 0 to 50000 sec.
	MESSAGE	WARNING 469 NOT PROGRAMMED	Note: Seen only if Phase CT Primary or Motor FLA not programmed

Any active blocking functions may be viewed here. The **WARNING 469 NOT PROGRAMMED** message is seen only if the Phase CT Primary or Motor FLA settings have not been programmed.

6.2.5 Digital Inputs

PATH: ACTUAL VALUES ▷ A1 STATUS ▷▽ DIGITAL INPUTS

■ DIGITAL INPUTS [▷]		ACCESS SWITCH STATE: Open	Range: Open, Shorted
	MESSAGE	TEST SWITCH STATE: Open	Range: Open, Shorted
	MESSAGE	STARTER STATUS SWITCH STATE: Open	Range: Open, Shorted
	MESSAGE	EMERGENCY RESTART SWITCH STATE: Open	Range: Open, Shorted
	MESSAGE	REMOTE RESET SWITCH STATE: Open	Range: Open, Shorted
	MESSAGE	ASSIGNABLE DIGITAL INPUT1 STATE: Open	Range: Open, Shorted
	MESSAGE	ASSIGNABLE DIGITAL INPUT2 STATE: Open	Range: Open, Shorted

MESSAGE
```
ASSIGNABLE DIGITAL
INPUT3 STATE: Open
```
Range: Open, Shorted

MESSAGE
```
ASSIGNABLE DIGITAL
INPUT4 STATE: Open
```
Range: Open, Shorted

MESSAGE
```
TRIP COIL
SUPERVISION: No Coil
```
Range: Coil, No Coil

The messages shown here may be used to monitor Digital Input status. This may be useful during relay testing or during installation.

NOTE

Digital Input states will read as shorted if assigned as a tachometer.

6.2.6 Real Time Clock

PATH: ACTUAL VALUES ▷ A1 STATUS ▷▽ REAL TIME CLOCK

```
■ REAL TIME        [▷]
  CLOCK
```
```
DATE: 01/01/1994
TIME: 12:00:00
```
Range: 01 to 12 / 01 to 31 / 1995 to 2094

The time and date from the 469 real time clock may be viewed here.

6.2.7 Loss of Communications

PATH: ACTUAL VALUES ▷ A1 STATUS ▷▽ LOSS OF COMMS

```
■ LOSS OF COMMS     [▷]
```
```
*LOSS OF COMMS PORT:
Not Communicating
```
Range: Not Communicating, Communicating

*Only shown if " LOSS OF COMMS: FUNCTION " selection is not 'Off'.

6.2.8 Network Status

Ethernet Connection

PATH: ACTUAL VALUES ▷ A1 STATUS ▷▽ NETWORK STATUS

```
■ NETWORK STATUS   [▷]
```
```
Ethernet Lnk Con Dia
Status    [ ] [■] [ ]
```
Range: see description below

MESSAGE
```
MAC Address:
00:20:4A:0B:58:4D
```
Range: six groups of two hexadecimal digits, separated by colons

This actual value appears when the relay is ordered with the Ethernet (T) option.

The MAC address is a unique identifier assigned to the ethernet interface.

The **ETHERNET STATUS** actual value message indicates the status of the Ethernet link, connection, and diagnostic via three indicators. The [■] symbol indicates on, and the [ ] symbol indicates off. There is also a blinking indication.

The box under **LNK** column indicates the Ethernet link status. If it is on, the Ethernet port is connected to the network; if it is off, the port is disconnected. This indicator is normally on.

The box under the **CON** column indicates the connection status. If on, the Ethernet port is configured and ready to transmit and receive data. If blinking, the Ethernet port is either active (transmitting or receiving data) or indicating an error if the diagnostic status is also on or blinking.

The box under the **DIA** column indicates the diagnostic status. If it is on, then either a fatal Ethernet port error has occurred or there is a duplicate IP address on the network. If blinking, then there is a non-fatal network error. Off indicates no errors.

DeviceNet Connection (Refer to GEK-106491C: *469 Communications Guide)*

PATH: ACTUAL VALUES ▷ A1 STATUS ▷▽ NETWORK STATUS

■ NETWORK STATUS [▷]	DEVICENET PORT: Not powered	*Range: Not powered, operational, Data size error, Unrecoverable fault, Minor fault*
MESSAGE	DEVICENET LINK: Not online	*Range: Not online, Online connected, Online disconnected, Critical failure, Connection timeout*
MESSAGE	EXPLICIT CONNECTION: Nonexistent	*Range: Nonexistent, Configuring, Established, Time-out, Deferred Delete*
MESSAGE	POLLED I/O CONNECTN: Nonexistent	*Range: Nonexistent, Configuring, Established, Time-out, Deferred Delete*
MESSAGE	COS CONNECTION STATUS: Nonexistent	*Range: Nonexistent, Configuring, Established, Time-out, Deferred Delete*

These values appear when the relay is ordered with the DeviceNet (D) option.

6.3 A2 Metering Data

6.3.1 Current Metering

PATH: ACTUAL VALUES ▷▽ A2 METERING DATA ▷ CURRENT METERING

■ CURRENT [▷] METERING	◁ ▷	A: 0 B: 0 C: 0 Amps	*Range: 0 to 100000 A*
MESSAGE	△ ▽	AVERAGE PHASE CURRENT: 0 Amps	*Range: 0 to 100000 A*
MESSAGE	△ ▽	MOTOR LOAD: 0.00 x FLA	*Range: 0.00 to 20.00 x FLA*
MESSAGE	△ ▽	CURRENT UNBALANCE: 0%	
MESSAGE	△ ▽	U/B BIASED MOTOR LOAD: 0.00 x FLA	*Range: 0.00 to 20.00 x FLA*
MESSAGE	△ ▽	GROUND CURRENT: 0.00 Amps	*Range: 0.00 to 5000.00 A. Not seen if Ground CT is set as “None”.*
MESSAGE	△	A: 0 B: 0 C: 0 Amps Diff.	*Range: 0 to 5000 A. Seen if Phase Differential CT has 1A/5A Secondary*

All measured current values are displayed here. The **CURRENT UNBALANCE** is defined as the ratio of negative-sequence to positive-sequence current, I_2 / I_1 when the motor is operating at a load (I_{avg}) greater than FLA. If the motor I_{avg} is less than FLA, unbalance is defined as $I_2 / I_1 \times I_{avg}$ / FLA. This derating is necessary to prevent nuisance alarms and trips when a motor is lightly loaded. The **U/B BIASED MOTOR LOAD** value shows the equivalent motor heating current caused by the unbalance *k* factor.

When **NOMINAL SYSTEM FREQUENCY** is set to "Variable", or **MOTOR LOAD FILTER INTERVAL** is enabled (set to a non-zero value), **CURRENT UNBALANCE** is calculated from the ratio of phase current RMS values. Phase angles are ignored. With sinusoidal phase inputs, this produces values about two times the values produced by calculating I_2/I_1. If the ratio of the smallest phase to largest phase is less than 70%, a fixed value 40% **CURRENT UNBALANCE** is used. Derating still applies when the average load is less than FLA.

6.3.2 Temperature

PATH: ACTUAL VALUES ▷▽ A2 METERING DATA ▷▽ TEMPERATURE

■ TEMPERATURE [▷]	HOTTEST STATOR RTD RTD#1: 40°C	*Range: –50 to 250°C, No RTD (open), ---- (shorted)*
MESSAGE	RTD #1 TEMPERATURE: 40°C	*Range: –50 to 250°C, No RTD (open), ---- (shorted)*
MESSAGE	RTD #2 TEMPERATURE: 40°C	*Range: –50 to 250°C, No RTD (open), ---- (shorted)*
MESSAGE	RTD #3 TEMPERATURE: 40°C	*Range: –50 to 250°C, No RTD (open), ---- (shorted)*
MESSAGE	RTD #4 TEMPERATURE: 40°C	*Range: –50 to 250°C, No RTD (open), ---- (shorted).*
MESSAGE	RTD #5 TEMPERATURE: 40°C	*Range: –50 to 250°C, No RTD (open), ---- (shorted).*
MESSAGE	RTD #6 TEMPERATURE: 40°C	*Range: –50 to 250°C, No RTD (open), ---- (shorted)*
MESSAGE	RTD #7 TEMPERATURE: 40°C	*Range: –50 to 250°C, No RTD (open), ---- (shorted).*
MESSAGE	RTD #8 TEMPERATURE: 40°C	*Range: –50 to 250°C, No RTD (open), ---- (shorted)*
MESSAGE	RTD #9 TEMPERATURE: 40°C	*Range: –50 to 250°C, No RTD (open), ---- (shorted)*
MESSAGE	RTD #10 TEMPERATURE: 40°C	*Range: –50 to 250°C, No RTD (open), ---- (shorted)*
MESSAGE	RTD #11 TEMPERATURE: 40°C	*Range: –50 to 250°C, No RTD (open), ---- (shorted)*
MESSAGE	RTD #12 TEMPERATURE: 40°C	*Range: –50 to 250°C, No RTD (open), ---- (shorted)*

The current level of the 12 RTDs is displayed here. If the RTD is not connected, the value will be "No RTD". The values will reflect the RTD names as programmed. The **HOTTEST STATOR RTD** value is shown only if at least one RTD is set as "Stator".

If no RTDs are programmed in **S8 RTD TEMPERATURE**, the **THIS FEATURE NOT PROGRAMMED** flash message will appear when an attempt is made to enter this group of messages.

6.3.3 Voltage Metering

PATH: ACTUAL VALUES ▷▽ A2 METERING DATA ▷▽ VOLTAGE METERING

■ VOLTAGE METERING [▷]	◁ ▷	Vab: 0 Vbc: 0 Vca: 0 Volts	Range: 0 to 20000 V. Not seen if VT Connection is set as None
MESSAGE	△ ▽	AVERAGE LINE VOLTAGE: 0 Volts	Range: 0 to 20000 V. Not seen if VT Connection is set as None
MESSAGE	△ ▽	Van: 0 Vbn: 0 Vcn: 0 Volts	Range: 0 to 20000 V. Seen only if VT Connection is set as Wye
MESSAGE	△ ▽	AVERAGE PHASE VOLTAGE: 0 Volts	Range: 0 to 20000 V. Seen only if VT Connection is set as Wye
MESSAGE	△	SYSTEM FREQUENCY: 0.00 Hz	Range: 0.00, 20.00 to 120.00 Hz

Measured voltage parameters will be displayed here.

If no VT connection type is programmed for the **S2 SYSTEM SETUP ▷▽ VOLTAGE SENSING ▷▽ VT CONNECTION TYPE** settings, the **THIS FEATURE NOT PROGRAMMED** flash message will appear when an attempt is made to enter this group of messages.

6.3.4 Speed

PATH: ACTUAL VALUES ▷▽ A2 METERING DATA ▷▽ SPEED

■ SPEED [▷]	◁ ▷	TACHOMETER 0 RPM	Range: 0 to 7200 RPM

If the Tachometer function is assigned to one of the digital inputs, the tachometer readout may be viewed here.

If no digital input is configured as tachometer in **S3 DIGITAL INPUTS ▷▽ ASSIGNABLE INPUT1(4)**, the **THIS FEATURE NOT PROGRAMMED** flash message will appear when an attempt is made to enter this group of messages.

6.3.5 Power Metering

PATH: ACTUAL VALUES ▷▽ A2 METERING DATA ▷▽ POWER METERING

■ POWER METERING [▷]	POWER FACTOR: 0.00	*Range: 0.01 to 0.99 Lead or Lag, 0.00, 1.00*
MESSAGE	REAL POWER: 0 kW	*Range: 0 to ±99999 kW*
MESSAGE	REAL POWER: 0 hp	*Range: 0 to 65535 hp*
MESSAGE	REACTIVE POWER: 0 kvar	*Range: 0 to ±99999 kvar*
MESSAGE	APPARENT POWER: 0 kVA	*Range: 0 to 65535 kVA*
MESSAGE	POSITIVE WATTHOURS: 0.000 MWh	*Range: 0.000 to 999999.999 MWh*
MESSAGE	POSITIVE VARHOURS: 0.000 Mvarh	*Range: 0.000 to 999999.999 Mvarh*
MESSAGE	NEGATIVE VARHOURS: 0.000 Mvarh	*Range: 0.000 to 999999.999 Mvarh*
MESSAGE	TORQUE: 000.0 Nm	*Range: 0.00 to 999999.9 Nm. Seen only if torque metering is enabled*

The values for power metering and 3-phase total power quantities are displayed here. Watthours and varhours can also be seen here.

NOTE

An induction motor by convention consumes Watts and vars (+Watts and +vars). A synchronous motor can generate vars (–vars) and feed them back to the power system.

If the **S2 SYSTEM SETUP ▷▽ VOLTAGE SENSING ▷▽ VOLTAGE TRANSFORMER RATIO** settings is not programmed, the **THIS FEATURE NOT PROGRAMMED** flash message appears when an attempt is made to enter this group of messages.

NOTE

Real Power (hp) is converted directly from Real Power (kW). This display-only value is not used for protection functions. This message will not display more than 65535 hp regardless of the actual kW that are being metered.

6.3.6 Demand Metering

PATH: ACTUAL VALUES ▷▽ A2 METERING DATA ▷▽ DEMAND METERING

■ DEMAND METERING [▷]	CURRENT DEMAND: 0 Amps	*Range: 0 to 100000 A*
MESSAGE	REAL POWER DEMAND: 0 kW	*Range: 0 to 99999 kW*
MESSAGE	REACTIVE POWER DEMAND: 0 kvar	*Range: 0 to 99999 kvar*
MESSAGE	APPARENT POWER DEMAND: 0 kVA	*Range: 0 to 65535 kVA*
MESSAGE	PEAK CURRENT DEMAND: 0 Amps	*Range: 0 to 100000 A*
MESSAGE	PEAK REAL POWER DEMAND: 0 kW	*Range: 0 to 99999 kW*
MESSAGE	PEAK REACTIVE POWER DEMAND: 0 kvar	*Range: 0 to 99999 kvar*
MESSAGE	PEAK APPARENT POWER DEMAND: 0 kVA	*Range: 0 to 65535 kVA*

The values for current and power demand are shown. The power demand values are not shown if the **VT RATIO** is programmed as "None". Peak Demand information is cleared with the **S1 469 SETUP ▷▽ CLEAR DATA ▷▽ CLEAR PEAK DEMAND DATA** settings. Demand is shown only for positive real and positive reactive power.

6.3.7 Analog Inputs

PATH: ACTUAL VALUES ▷▽ A2 METERING DATA ▷▽ ANALOG INPUTS

■ ANALOG INPUTS [▷]	ANALOG I/P 1 0 Units	*Range: –50000 to 50000. Seen only if Analog Input is programmed.*
MESSAGE	ANALOG I/P 2 0 Units	*Range: –50000 to 50000. Seen only if Analog Input is programmed.*
MESSAGE	ANALOG I/P 3 0 Units	*Range: –50000 to 50000. Seen only if Analog Input is programmed.*
MESSAGE	ANALOG I/P 4 0 Units	*Range: –50000 to 50000. Seen only if Analog Input is programmed.*
MESSAGE	ANALOG 1-2 0 Percent	*Range: –5100 to 4900%. Seen only if Analog In Diff 1-2 set to %Diff*
MESSAGE	ANALOG 1-2 0 Units	*Range: –100000 to 100000. Seen only if Analog In Diff 1-2 is Abs Diff*
MESSAGE	ANALOG 3-4 0 Percent	*Range: –5100 to 4900%. Seen only if Analog In Diff 3-4 set to %Diff*
MESSAGE	ANALOG 3-4 0 Units	*Range: –100000 to 100000. Seen only if Analog In Diff 3-4 is Abs Diff*

The values for analog inputs are shown here. The name of the input and the units will reflect those programmed for each input. If no analog inputs are programmed in **S12 ANALOG I/O ▷ ANALOG INPUT 1(4)**, the **THIS FEATURE NOT PROGRAMMED** flash message will appear when an attempt is made to enter this group of messages.

6.3.8 Phasors

PATH: ACTUAL VALUES ▷▽ A2 METERING DATA ▷▽ PHASORS

■ PHASORS [▷]		Va PHASOR 0.0% AT 0°Lag
MESSAGE		Vb PHASOR 0.0% AT 0°Lag
MESSAGE		Vc PHASOR 0.0% AT 0°Lag
MESSAGE		Ia PHASOR 0.0% AT 0°Lag
MESSAGE		Ib PHASOR 0.0% AT 0°Lag
MESSAGE		Ic PHASOR 0.0% AT 0°Lag

The 469 Motor Management Relay was designed to display lagging angles. Therefore, if a system condition would cause the current to lead the voltage by 45°, the 469 relay will display such angle as 315° Lag instead of 45° Lead.

NOTE

When the currents and voltages measured by the relay are zero, the angles displayed by the relay and those shown by the EnerVista 469 Setup software are not fixed values.

The EnerVista 469 Setup software is a useful tool to view the vectors seen by the relay in graphical format. The same information described above is displayed by the EnerVista 469 Setup software as follows:

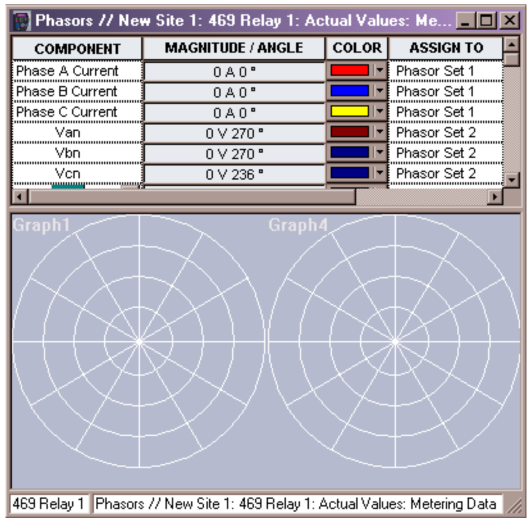


FIGURE 6–1: Vector display in EnerVista 469 Setup

IEEE conventions define vectors in terms of relative angles as shown below:

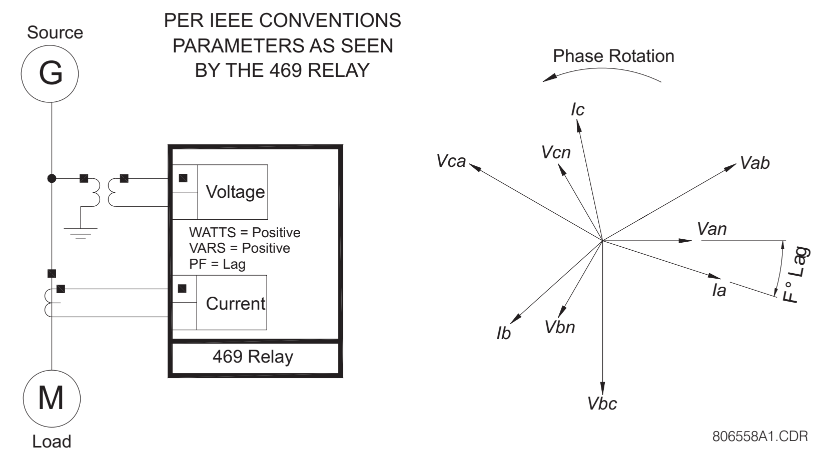


FIGURE 6–2: Flow Direction of Signed Values for Watts and Vars

All phasors calculated by 469 relays are rotating phasors that maintain the correct phase angle relationships with each other at all times.

For display purposes, all phasor angles in a given relay are referred to phase Van or Vab, depending on the **S2 SYSTEM SETUP** ▷▽ **VOLTAGE SENSING** ▷ **VT CONNECTION TYPE** settings. If set to “Wye”, the reference quantity is Van; if set to “Open Delta”, the reference quantity is Vab. If neither voltage is available, the relay uses the current in Phase A as reference.

The phase angles are assigned and displayed as positive angles. However, by design, the relay will always work with angles in the lagging direction. This is illustrated below.

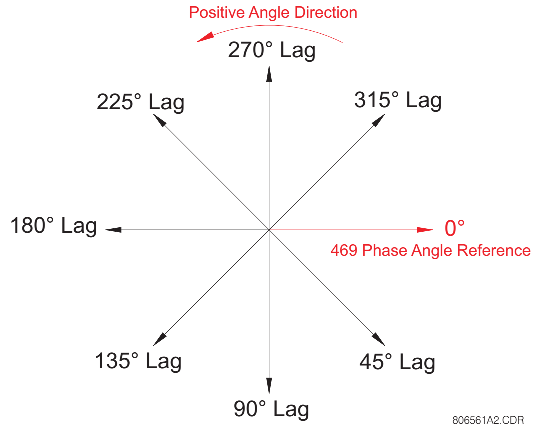


FIGURE 6–3: Phase Angle Measurement Convention

The EnerVista 469 Setup software follows this convention and displays vectors accordingly.

WARNING

The 469 Motor Management Relay works with lagging angles only.

The following is a typical presentation of a three-phase system where current lags the voltage by 30 degrees.

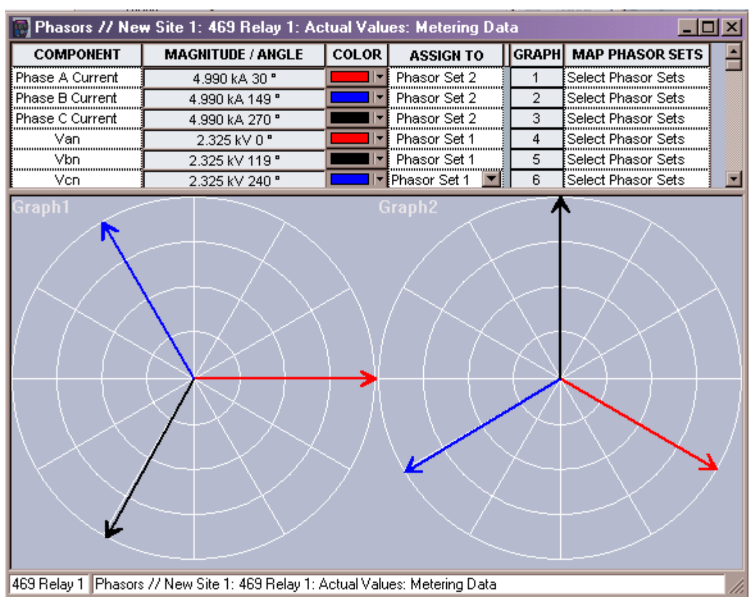


FIGURE 6–4: Current Lagging Voltage by 30° Display

The phasors shown by the relay and the EnerVista 469 Setup software are a clear representation of the relationship between the system quantities as seen by the relay.

The **ACTUAL VALUES ▷▽ PHASORS** page is a useful troubleshooting tool to identify wiring errors. Use the phasors displayed by the relay and the tables on pages 6–22 and 6–25 to determine if VTs and CTs are on the correct phases and their polarity is correct. Problems arising from incorrect wiring include:

- Extremely high unbalance levels (CTs),
- Erroneous power readings (CTs and VTs),
- Phase reversal trips (VTs).

To correct wiring, simply start the motor and record the phasors. The correct phasors can be determined using the tables along with recorded phasors, system rotation, VT connection type, and motor power factor. Note that the phase angle for Va (Vab if delta) is always assumed to be 0° and is the reference for all angle measurements.

Common problems include:

- Phase currents 180° from proper location (CT polarity reversed)
- Phase currents or voltages 120° or 240° out (CT/VT on wrong phase)

An explanation of how the relay identifies and displays system quantities follows. Assume that the relay is connected to a balanced three-phase system and that V_A, V_B, V_C, and V_{COM} are the relay ID names for terminals G2, H1, H2, and G1, respectively.

When the relay is set for the “Open Delta” VT connection type, voltages are measured at terminals G2 (V_A) and H2 (V_C). The voltage at terminal H1 (V_B) is not measured; however, the corresponding system quantity is calculated, assuming a balanced three phase system, where $V_A + V_B + V_C = 0$, leading to $V_B = -(V_A + V_C)$. In the **ACTUAL VALUES ▷▽ VOLTAGE METERING** page, the 469 displays only phase-to-phase voltages. The relationship between the displayed and measured quantities is as follows:

$Vab = V_A$
$Vbc = -V_C$
$Vca = -(V_A + V_C)$ as calculated

In the **ACTUAL VALUES ▷▽ PHASORS** page, the relay displays the relationship between measured quantities. Refer to the figure below for wiring connections.

- The measured voltage phasor between terminals G2 (V_A) and G1 (V_{COM}) is displayed by the relay as “Va Phasor” and “Vab” by the EnerVista 469 Setup software. In this case, Va Phasor is equal to the system quantity Vab.
- The voltage measured between terminals H1 (V_C) and G1 (V_{COM}) is displayed by the relay as “Vc Phasor” and “Vcb” by the EnerVista 469 Setup software. In this case, Vc Phasor is equal to the system quantity Vcb or –Vbc.
- The voltage between H2 (V_B) and G1 (V_{COM}) is zero. Hence, the relay displays a vector with no magnitude.

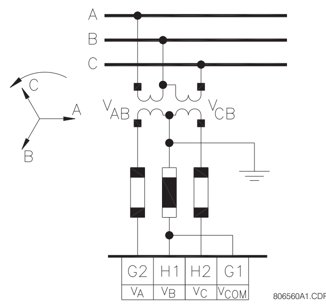


FIGURE 6–5: Open Delta VT Connection

The following phasor diagram presents, in graphic form, the relationship between system quantities and how they are measured, calculated, and displayed. Note that all angles shown are negative or lagging angles.

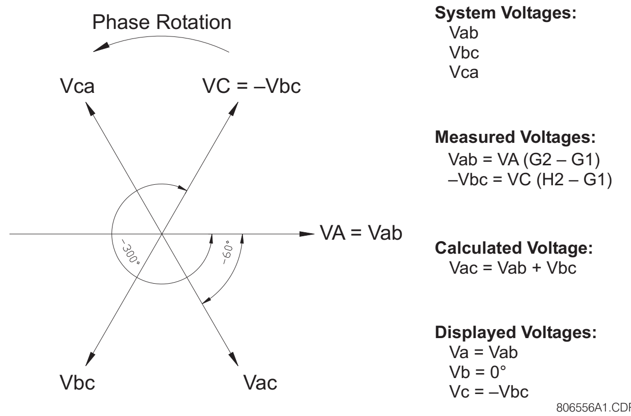


FIGURE 6–6: Typical Phasor Diagram for Open Delta Connection

For example, assume a balanced three phase system with a VT Turn Ratio of 35:1, VT ratings 4200/120 V, and motor running at full load with a power factor of 0.95 (18.2° angle). When the measured phase to phase voltage is 115 V, the following quantities are displayed by the relay and EnerVista 469 Setup software:

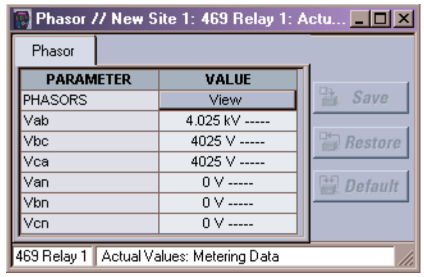
In the **A2 METERING DATA ▷▽ VOLTAGE METERING** menu:

VAB: “4025 Volts”
VBC: “4025 Volts”
VCA: “4025 Volts”
AVERAGE LINE VOLTAGE: “4025 Volts”
SYSTEM FREQUENCY: “60.00 Hz”

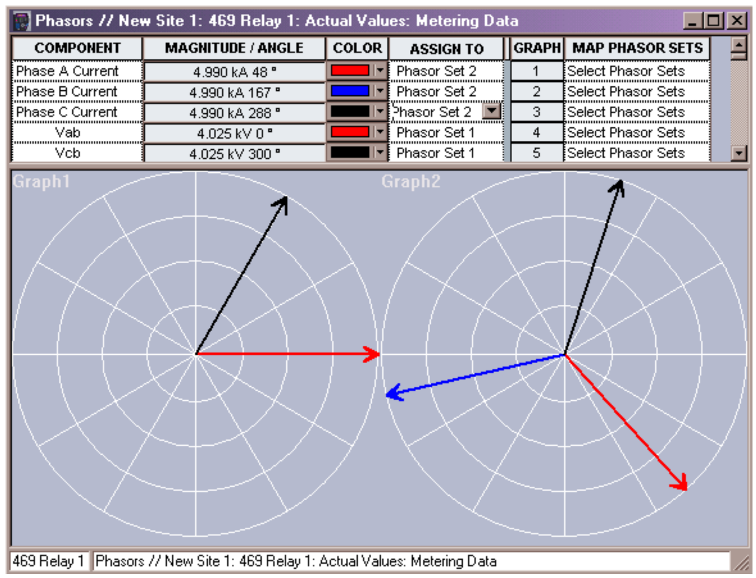
In the **A2 METERING DATA ▷▽ PHASORS** menu:

VA PHASOR: “95.8% at 0° Lag”
VB PHASOR: “0.0% at 48° Lag”
VC PHASOR: “95.8% at 300° Lag”
IA PHASOR: “100.0% at 48° Lag”
IB PHASOR: “100.0% at 168° Lag”
IC PHASOR: “100.0% at 288° Lag”

The EnerVista 469 Setup software displays the following screen for **A2 METERING DATA ▷▽ PHASORS** values:



Pressing the “View” button displays the following screen:



The following phasor diagram illustrates the vector diagram of our example. By definition, power factor is the cosine of the angle between the phase to neutral voltages and the corresponding phase current. In this example, 18.2° is the angle between Van and Ia, Vbn and Ib, and Vcn and Ic. Since the relay is measuring phase-phase quantities, and Vab is the reference phasor, the angle displayed by the relay takes into consideration the 30° angle between phase-phase and phase-neutral voltages.

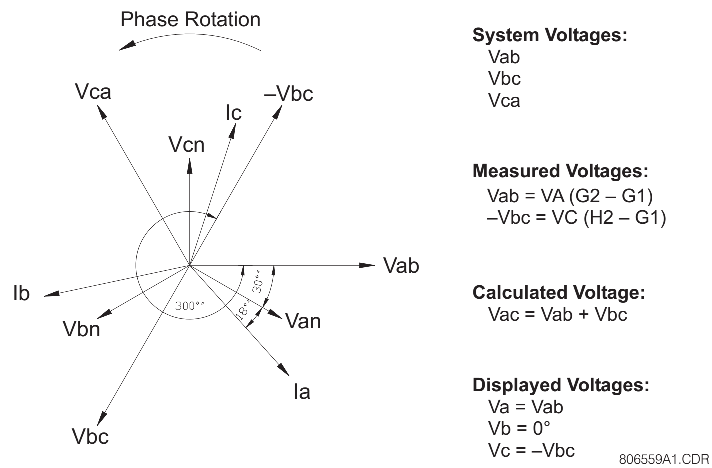


FIGURE 6–7: Phasor Diagram for Open Delta Example

Table 6–1: Three-phase Open Delta VT Connection

ABC Rotation	0.3 pf (72.5°) lag	0.7 pf (45°) lag	1.00 pf (0°) lag	0.7 pf (45°) lead	0.3 pf (72.5°) lead
Va	0	0°	0°	0°	0
Vb	----	----	----	----	----
Vc	300	300	300	300	300
Ia	100	75	30	345	320
Ib	220	195	150	105	80
Ic	340	315	270	225	200
kW	+	+	+	+	+
kVAR	+	+	0	–	–
kVA	+	+	+ (=kW)	+	+

ACB Rotation	0.3 pf (72.5°) lag	0.7 pf (45°) lag	1.00 pf (0°) lag	0.7 pf (45°) lead	0.3 pf (72.5°) lead
Va	0	0°	0°	0°	0
Vb	----	----	----	----	----
Vc	60	60	60	60	60
Ia	45	15	330	285	260
Ib	285	255	210	165	140
Ic	165	135	90	45	20
kW	+	+	+	+	+
kVAR	+	+	0	–	–
kVA	+	+	+ (=kW)	+	+

When the relay set for the “Wye” VT connection type, voltages are measured at terminals G2 (V_A), H1 (V_B), and H2 (V_C) with respect to G1 (V_{COM}). Refer to the figure below for details. The phase-to-phase voltages are calculated using the following relationships:

$$Vab = \sqrt{3} \times VA$$
$$Vbc = \sqrt{3} \times VB$$
$$Vca = \sqrt{3} \times VC$$

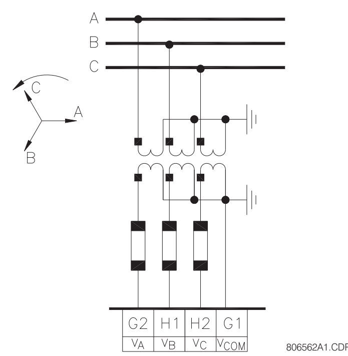


FIGURE 6–8: Wye VT Connection

The quantities displayed by the relay and the EnerVista 469 Setup software are straightforward and follow the phasor diagram shown below. Note that all the angles shown are negative or lagging angles.

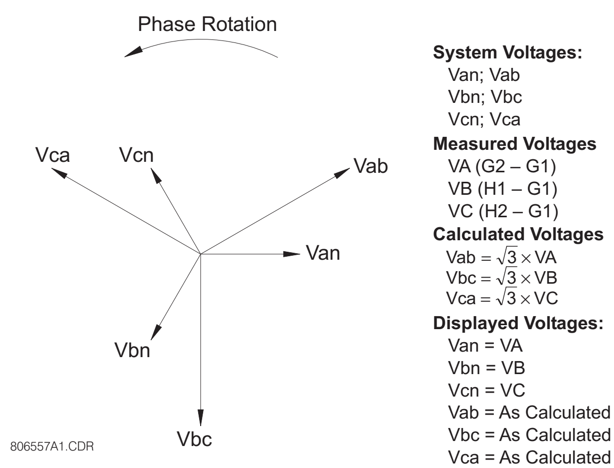


FIGURE 6–9: Typical Phasor Diagram for Wye Connection

Using the same example as for the open delta connection, except for the **VT CONNECTION TYPE** setting to “Wye”, the following quantities are displayed by the relay and EnerVista 469 Setup software:

In the **A2 METERING DATA** ▷▽ **VOLTAGE METERING** menu:

VAB: “4025 Volts”
VBC: “4025 Volts”
VCA: “4025 Volts”
AVERAGE LINE VOLTAGE: “4025 Volts”
VAN: “2323 Volts”

VBN: "2323 Volts"
VCN: "2323 Volts"
AVERAGE PHASE VOLTAGE: "2323 Volts"
SYSTEM FREQUENCY: "60.00 Hz"

In the **A2 METERING DATA** ▷▽ **PHASORS** menu:

VA PHASOR: "95.8% at 0° Lag"
VB PHASOR: "95.8% at 120° Lag"
VC PHASOR: "95.8% at 240° Lag"
IA PHASOR: "100.0% at 18° Lag"
IB PHASOR: "100.0% at 138° Lag"
IC PHASOR: "100.0% at 258° Lag"

The following phasor diagram illustrates the system vector diagram where the **VT CONNECTION TYPE** setting is selected as "Wye". By definition, power factor is the cosine of the angle between the phase to neutral voltages and the corresponding phase current. In this example, 18.2° is the angle between Van and Ia, Vbn and Ib, and Vcn and Ic. The phase-to-phase quantities are not shown in the **A2 METERING DATA** ▷▽ **PHASORS** menu and the EnerVista 469 Setup software. However, they are shown on the following figure.

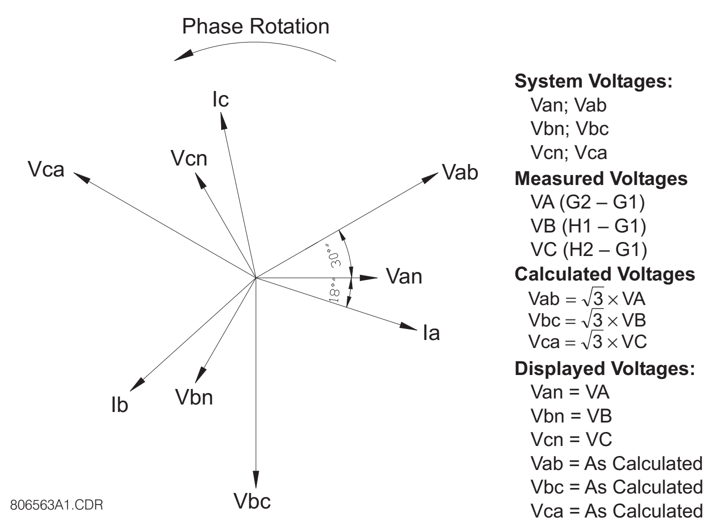
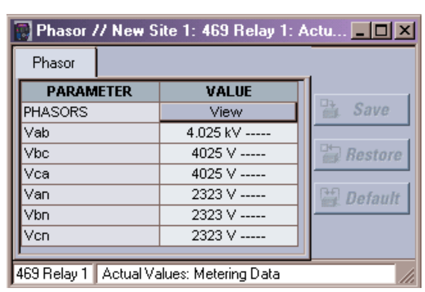


FIGURE 6–10: Typical Phasor Diagram for Wye Connection

The EnerVista 469 Setup software displays the following screen:



PARAMETER	VALUE
PHASORS	View
Vab	4.025 kV -----
Vbc	4025 V -----
Vca	4025 V -----
Van	2323 V -----
Vbn	2323 V -----
Vcn	2323 V -----

Pressing the “View” button displays the following screen:

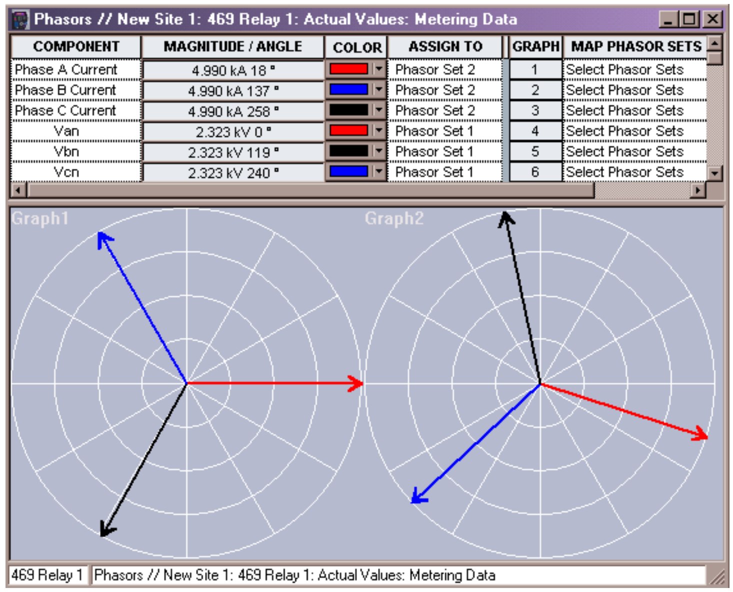


Table 6–2: Three-phase Wye VT Connection

ABC rotation	0.3 pf (72.5°) lag	0.7 pf (45°) lag	1.00 pf (0°) lag	0.7 pf (45°) lead	0.3 pf (72.5°) lead
Va	0	0° lag	0° lag	0° lag	0
Vb	120	120	120	120	120
Vc	240	240	240	240	240
Ia	75	45	0	315	285
Ib	195	165	120	75	45
Ic	315	285	240	195	165
kW	+	+	+	+	+
kVAR	+	+	0	–	–
kVA	+	+	+ (= kW)	+	+

ACB rotation	0.3 pf (72.5°) lag	0.7 pf (45°) lag	1.00 pf (0°) lag	0.7 pf (45°) lead	0.3 pf (72.5°) lead
Va	0	0° lag	0° lag	0° lag	0
Vb	240	240	240	240	240
Vc	120	120	120	120	120
Ia	75	45	0	315	285
Ib	315	285	240	195	165
Ic	195	165	120	75	45

Table 6–2: Three-phase Wye VT Connection

ABC rotation	0.3 pf (72.5°) lag	0.7 pf (45°) lag	1.00 pf (0°) lag	0.7 pf (45°) lead	0.3 pf (72.5°) lead
kW	+	+	+	+	+
kVAR	+	+	0	–	–
kVA	+	+	+ (=kW)	+	+

6.4 A3 Learned Data

6.4.1 Motor Starting

PATH: ACTUAL VALUES ▷▽ A3 LEARNED DATA ▷ MOTOR STARTING

■ MOTOR STARTING [▷]	LEARNED ACCELERATION TIME: 0.0 s	*Range: 0.0 to 200.0 sec.*
MESSAGE	LEARNED STARTING CURRENT: 0 A	*Range: 0 to 50000 A*
MESSAGE	LEARNED STARTING CAPACITY: 0% used	*Range: 0 to 100%*
MESSAGE	LAST ACCELERATION TIME: 0.0 s	*Range: 0.0 to 200.0 sec.*
MESSAGE	LAST STARTING CURRENT: 0 A	*Range: 0 to 50000 A*
MESSAGE	LAST STARTING CAPACITY: 0% used	*Range: 0 to 100%*

The 469 learns the acceleration time, the starting current, as well as, the thermal capacity required during motor starts. This data is accumulated based on the last five starts. The 469 also keeps statistics for last acceleration time, last starting current, and last starting capacity**.** This information can be reset to default using the **S1 469 SETUP ▷▽ INSTALLATION ▷▽ RESET MOTOR INFORMATION** settings.

If motor load during starting is relatively consistent, the **LEARNED ACCELERATION TIME** may be used to fine tune the acceleration protection. Learned acceleration time will be the longest time of the last five successful starts. The time is measured from the transition of motor current from zero to greater than overload pickup, until line current falls below the overload pickup level.

LEARNED STARTING CURRENT is measured 200 ms after the transition of motor current from zero to greater than overload pickup. This should ensure that the measured current is symmetrical. The value displayed is the average of the last 5 successful starts. If there are less than 5 starts, 0s will be averaged in for the full 5 starts.

The **LEARNED STARTING CAPACITY** is used to determine if there is enough thermal capacity to permit a start (refer to *Start Inhibit* on page 5–68 for more information on start inhibit). If there is not enough thermal capacity for a start, a start inhibit will be issued. Starting will be blocked until there is sufficient thermal capacity.

6.4.2 Average Motor Load

PATH: ACTUAL VALUES ▷▽ A3 LEARNED DATA ▷▽ AVERAGE MOTOR LOAD

■ AVERAGE MOTOR LOAD [▷]	AVERAGE MOTOR LOAD LEARNED: 0.00 x FLA	*Range: 0.00 to 20.00*

The 469 can learn the average motor load over a period of time. This time is specified by the **S1 469 SETUP ▷▽ PREFERENCES ▷▽ AVERAGE MOTOR LOAD CALC. PERIOD** settings (default 15 minutes). The calculation is a sliding window and is ignored during motor starting.

6.4.3 RTD Maximums

PATH: ACTUAL VALUES ▷▽ A3 LEARNED DATA ▷▽ RTD MAXIMUMS

■ RTD MAXIMUMS [▷]	RTD #1 MAX. TEMP.: 40°C	*Range: –50 to 250°C*
MESSAGE	RTD #2 MAX. TEMP.: 40°C	*Range: –50 to 250°C*
MESSAGE	RTD #3 MAX. TEMP.: 40°C	*Range: –50 to 250°C*
MESSAGE	RTD #4 MAX. TEMP.: 40°C	*Range: –50 to 250°C*
MESSAGE	RTD #5 MAX. TEMP.: 40°C	*Range: –50 to 250°C*
MESSAGE	RTD #6 MAX. TEMP.: 40°C	*Range: –50 to 250°C*
MESSAGE	RTD #7 MAX. TEMP.: 40°C	*Range: –50 to 250°C*
MESSAGE	RTD #8 MAX. TEMP.: 40°C	*Range: –50 to 250°C*
MESSAGE	RTD #9 MAX. TEMP.: 40°C	*Range: –50 to 250°C*
MESSAGE	RTD #10 MAX. TEMP.: 40°C	*Range: –50 to 250°C*
MESSAGE	RTD #11 MAX. TEMP.: 40°C	*Range: –50 to 250°C*
MESSAGE	RTD #12 MAX. TEMP.: 40°C	*Range: –50 to 250°C*

The 469 will learn the maximum temperature for each RTD. This information can be cleared using the **S1 469 SETUP ▷▽ CLEAR DATA ▷▽ CLEAR RTD MAXIMUMS** settings.

The values in this menu reflect the RTD names as programmed If no RTDs are programmed in **S8 RTD TEMPERATURE**, the **THIS FEATURE NOT PROGRAMMED** flash message will appear when an attempt is made to enter this group of messages.

6.4.4 Analog Input Min/Max

PATH: ACTUAL VALUES ▷▽ A3 LEARNED DATA ▷▽ ANALOG IN MIN/MAX

	■ ANALOG INPUT [▷] MIN/MAX	
	ANALOG I/P 1 MIN: 0 Units	Range: –50000 to 50000
MESSAGE	ANALOG I/P 1 MAX: 0 Units	Range: –50000 to 50000
MESSAGE	ANALOG I/P 2 MIN: 0 Units	Range: –50000 to 50000
MESSAGE	ANALOG I/P 2 MAX: 0 Units	Range: –50000 to 50000
MESSAGE	ANALOG I/P 3 MIN: 0 Units	Range: –50000 to 50000
MESSAGE	ANALOG I/P 3 MAX: 0 Units	Range: –50000 to 50000
MESSAGE	ANALOG I/P 4 MIN: 0 Units	Range: –50000 to 50000
MESSAGE	ANALOG I/P 4 MAX: 0 Units	Range: –50000 to 50000

The 469 will learn the minimum and maximum values of the analog inputs since they were last cleared. This information can be cleared with the **S1 469 SETUP ▷▽ CLEAR DATA ▷▽ CLEAR ANALOG I/P MIN/MAX** settings. When the data is cleared, the present value of each analog input will be loaded as a starting point for both minimum and maximum. The name of the input and the units will reflect those programmed for each input.

The values shown here reflect the programmed analog input names. If no Analog Inputs are programmed in **S12 ANALOG I/O**, the **THIS FEATURE NOT PROGRAMMED** flash message appears when an attempt is made to enter this group of messages.

6.5 A4 Maintenance

6.5.1 Trip Counters

PATH: ACTUAL VALUES ▷▽ A4 MAINTENANCE ▷ TRIP COUNTERS

■ TRIP [▷] COUNTERS		TOTAL NUMBER OF TRIPS: 0	*Range: 0 to 50000*
	MESSAGE	INCOMPLETE SEQUENCE TRIPS: 0	*Range: 0 to 50000. Caused by the Reduced Voltage Start feature*
	MESSAGE	INPUT SWITCH TRIPS: 0	*Range: 0 to 50000 Caused by Remote, Speed, Load Shed, Pressure, Vibration, or General Purpose Switch Trip features*
	MESSAGE	TACHOMETER TRIPS: 0	*Range: 0 to 50000. Caused by Digital Input set as Tachometer*
	MESSAGE	OVERLOAD TRIPS: 0	*Range: 0 to 50000*
	MESSAGE	SHORT CIRCUIT TRIPS: 0	*Range: 0 to 50000*
	MESSAGE	MECHANICAL JAM TRIPS: 0	*Range: 0 to 50000*
	MESSAGE	UNDERCURRENT TRIPS: 0	*Range: 0 to 50000*
	MESSAGE	CURRENT UNBALANCE TRIPS: 0	*Range: 0 to 50000*
	MESSAGE	GROUND FAULT TRIPS: 0	*Range: 0 to 50000*
	MESSAGE	PHASE DIFFERENTIAL TRIPS: 0	*Range: 0 to 50000*
	MESSAGE	ACCELERATION TIMER TRIPS: 0	*Range: 0 to 50000*
	MESSAGE	STATOR RTD TRIPS: 0	*Range: 0 to 50000*
	MESSAGE	BEARING RTD TRIPS: 0	*Range: 0 to 50000*
	MESSAGE	OTHER RTD TRIPS: 0	*Range: 0 to 50000*
	MESSAGE	AMBIENT RTD TRIPS: 0	*Range: 0 to 50000*
	MESSAGE	UNDERVOLTAGE TRIPS: 0	*Range: 0 to 50000*
	MESSAGE	OVERVOLTAGE TRIPS: 0	*Range: 0 to 50000*

MESSAGE	PHASE REVERSAL TRIPS: 0	Range: 0 to 50000
MESSAGE	VOLTAGE FREQUENCY TRIPS: 0	Range: 0 to 50000
MESSAGE	POWER FACTOR TRIPS: 0	Range: 0 to 50000
MESSAGE	REACTIVE POWER TRIPS: 0	Range: 0 to 50000
MESSAGE	REVERSE POWER TRIPS: 0	Range: 0 to 50000
MESSAGE	UNDERPOWER TRIPS: 0	Range: 0 to 50000
MESSAGE	ANALOG I/P 1 TRIPS: 0	Range: 0 to 50000
MESSAGE	ANALOG I/P 2 TRIPS: 0	Range: 0 to 50000
MESSAGE	ANALOG I/P 3 TRIPS: 0	Range: 0 to 50000
MESSAGE	ANALOG I/P 4 TRIPS: 0	Range: 0 to 50000
MESSAGE	ANALOG 1-2 TRIPS: 0	Range: 0 to 50000
MESSAGE	ANALOG 3-4 TRIPS: 0	Range: 0 to 50000
MESSAGE	LOSS OF COMMS TRIPS: 0	Range: 0 to 50000

A breakdown of number of trips by type is displayed here. When the total exceeds 50000, all counters reset to 0. This information can be cleared using the **S1 469 SETUP ▷▽ CLEAR DATA ▷▽ CLEAR TRIP COUNTERS** settings. Messages relating to analog inputs reflect the programmed analog input name.

6.5.2 General Counters

PATH: ACTUAL VALUES ▷▽ A4 MAINTENANCE ▷▽ GENERAL COUNTERS

■ GENERAL [▷] COUNTERS	NUMBER OF MOTOR STARTS: 0	Range: 0 to 50000
MESSAGE	NUMBER OF EMERGENCY RESTARTS: 0	Range: 0 to 50000
MESSAGE	NUMBER OF STARTER OPERATIONS: 0	Range: 0 to 50000
MESSAGE	DIGITAL COUNTER 0 Units	Range: 0 to 1 000 000 000. Seen if a Digital Input is Digital Counter.

Two of the 469 general counters count the number of motor starts or start attempts and the number of Emergency Restarts performed to start a given motor over time. This may be useful information when troubleshooting a motor failure. When either of these counters exceeds 50000, that counter will reset to 0. This information can be cleared with the **S1 469 SETUP ▷▽ INSTALLATION ▷▽ RESET MOTOR INFORMATION** settings. Another of the 469 General counters will count the number of starter operations performed over time. This counter is incremented any time the motor is stopped, either by a trip or normal stop. This may be useful information for starter maintenance. When the counter exceeds 50000, that counter will reset to 0. This information may be cleared with the **S1 469 SETUP ▷▽ INSTALLATION ▷▽ RESET STARTER INFORMATION** settings. If one of the assignable digital inputs is programmed as Digital Counter, that counter measurement will appear here. The counter can be reset to zero if the counter is of the incrementing type or pre-set to a predetermined value using the **S1 469 SETUP ▷▽ CLEAR DATA ▷▽ PRESET DIGITAL COUNTER** settings.

6.5.3 Timers

PATH: ACTUAL VALUES ▷▽ A4 MAINTENANCE ▷▽ TIMERS

■ TIMERS [▷]	MOTOR RUNNING HOURS: 0 hr	*Range: 0 to 100000 hrs.*
MESSAGE	TIME BETWEEN STARTS TIMER: 0 min	*Range: 0 to 500 min.*
MESSAGE	STARTS/HOUR TIMERS 0 0 0 0 0 min	*Range: 0 to 60 min.*

One of the 469 timers accumulates the total running time for the Motor. This may be useful for scheduling routine maintenance. When this timer exceeds 100000, it will reset to 0. This timer can be cleared using the **S1 469 SETUP ▷▽ INSTALLATION ▷▽ RESET MOTOR INFORMATION** settings.

The **TIME BETWEEN STARTS TIMER** value may be viewed here. This value might be useful for planning a motor shutdown. The **STARTS/HOUR TIMER** value is also viewable here.

6.6 A5 Event Recorder

6.6.1 Event 01 to Event 256

PATH: ACTUAL VALUES ▷▽ A5 EVENT RECORDER ▷▽ EVENT 01(256)

■ EVENT 01 [▷] <Cause>	TIME OF EVENT 01: 00:00:00.0	Range: hour:minutes:seconds
MESSAGE	DATE OF EVENT 01: Jan. 01, 1992	Range: month day, year
MESSAGE	MOTOR SPEED DURING EVENT01: Low Speed	Range: High Speed, Low Speed. Seen if two-speed feature is enabled.
MESSAGE	TACHOMETER DURING EVENT01: 0 RPM	Range: 0 to 3600 RPM. Seen only if a Digital Input is Tachometer.
MESSAGE	A: 0 B: 0 C: 0 A EVENT01	Range: 0 to 100000 A
MESSAGE	MOTOR LOAD EVENT01: 0.00 x FLA	Range: 0.00 to 20.00 x FLA
MESSAGE	CURRENT UNBALANCE EVENT01: 0%	Range: 0 to 100%
MESSAGE	GROUND CURRENT EVENT01: 0.00 A	Range: 0.00 to 5000.0 A. Not seen if Ground CT is set as None.
MESSAGE	A: 0 B: 0 C: 0 A Diff. EV01	Range: 0 to 5000 A. Seen only if Phase Differential CT is set.
MESSAGE	HOTTEST STATOR RTD: 0°C EVENT01	Range: –50 to 250°C, --- (no RTD). Seen if at least 1 RTD is set as Stator.
MESSAGE	HOTTEST BEARING RTD: 0°C EVENT01	Range: –50 to 250°C, --- (no RTD). Seen if at least 1 RTD is Bearing.
MESSAGE	HOTTEST OTHER RTD: 0°C EVENT01	Range: –50 to 250°C, --- (no RTD). Seen if at least 1 RTD is set as Other.
MESSAGE	AMBIENT RTD: 0°C EVENT01	Range: –50 to 250°C, --- (no RTD). Seen if at least 1 RTD is Ambient.
MESSAGE	Vab: 0 Vbc: 0 Vca: 0 A EVENT01	Range: 0 to 20000 A. Not seen if VT Connection set as None
MESSAGE	Van: 0 Vbn: 0 Vcn: 0 A EVENT01	Range: 0 to 20000 A. Seen only if VT Connection set as Wye.
MESSAGE	SYSTEM FREQUENCY EVENT01: 0.00 Hz	Range: 0.00, 20.00 to 120.00 Hz. Not seen if VT Connection is None.
MESSAGE	0 kW 0 kVA 0 kvar EVENT01	Range: –50000 to 50000 kVA. Not seen if VT Connection is set as None
MESSAGE	POWER FACTOR EVENT01: 0.00	Range: 0.01 to 0.99 Lead or Lag, 0.00, 1.00 Not seen if VT Connection is set as None.

MESSAGE	⇕	TORQUE EVENT01: 0.0 Nm	*Range: 0 to 999999.9. Seen only if Torque Metering is Enabled*
MESSAGE	⇕	ANALOG I/P 1 EVENT01: 0 Units	*Range: –50000 to 50000. Not seen if Analog Input 1 is Disabled.*
MESSAGE	⇕	ANALOG I/P 2 EVENT01: 0 Units	*Range: –50000 to 50000. Not seen if Analog Input 2 is Disabled.*
MESSAGE	⇕	ANALOG I/P 3 EVENT01: 0 Units	*Range: –50000 to 50000. Not seen if Analog Input 3 is Disabled.*
MESSAGE	⇑	ANALOG I/P 4 EVENT01: 0 Units	*Range: –50000 to 50000. Not seen if Analog Input 4 is Disabled.*

The event recorder stores motor and system information each time an event occurs. An event description is stored along with a time and date stamp for troubleshooting purposes. Events include all trips, any alarm optionally (except Service Alarm, and 469 Not Inserted Alarm, which always records as events), loss of control power, application of control power, emergency restarts, and motor starts when a blocking function is active. The latter event could occur if the block start contacts were shorted out to bypass the 469 and start the motor.

EVENT 01 is the most recent event and **EVENT 256** is the oldest event. Each new event bumps the other event records up one until **EVENT 256** is reached. The event record in **EVENT 256** is lost when a new event occurs. This information can be cleared using the **S1 469 SETUP** ▷▽ **CLEAR DATA** ▷▽ **CLEAR EVENT RECORD** settings.

Table 6–3: Cause of Events (Sheet 1 of 2)

TRIPS			
Acceleration Trip	Analog Diff 1-2 Trip	Analog Diff 3-4 Trip	Analog I/P 1 Trip
Analog I/P 2 Trip	Analog I/P 3 Trip	Analog I/P 4 Trip	Current U/B Trip
Differential Trip	General Sw.A Trip	General Sw.B Trip	General Sw.C Trip
General Sw.D Trip	Ground Fault Backup	Ground Fault Trip	Incomplete Seq Trip
Load Shed Trip	Mechanical Jam Trip	Overload Trip	Overvoltage Trip
Phase Reversal Trip	Power Factor Trip	Pressure Sw. Trip	Reactive Power Trip
Remote Trip	Reverse Power Trip	RTD 1 Trip	RTD 2 Trip
RTD 3 Trip	RTD 4 Trip	RTD 5 Trip	RTD 6 Trip
RTD 7 Trip	RTD 8 Trip	RTD 9 Trip	RTD 10 Trip
RTD 11 Trip	RTD 12 Trip	Short Circuit Backup	Short Circuit Trip
Single Phasing (Unbalanced)	Speed Switch Trip	Tachometer Trip	Undercurrent Trip
Underpower Trip	Undervoltage Trip	Vibration Sw.Trip	Volt. Frequency Trip
Loss of Comms Trip			

Table 6–3: Cause of Events (Sheet 2 of 2)

ALARMS (OPTIONAL EVENTS)			
Analog Diff 1-2 Alarm	Analog Diff 3-4 Alarm	Analog I/P 1 Alarm	Analog I/P 2 Alarm
Analog I/P 3 Alarm	Analog I/P 4 Alarm	Breaker Failure	Control Alarm
Counter Alarm	Current Demand Alarm	Current U/B Alarm	General Sw.A Alarm
General Sw.B Alarm	General Sw.C Alarm	General Sw.D Alarm	Ground Fault Alarm
kVA Demand Alarm	kvar Demand Alarm	kW Demand Alarm	Open RTD Alarm
Overload Alarm	Overtorque Alarm	Overvoltage Alarm	Power Factor Alarm
Pressure Sw. Alarm	Reactive Power Alarm	Remote Alarm	Reverse Power Alarm
RTD 1 Alarm	RTD 2 Alarm	RTD 3 Alarm	RTD 4 Alarm
RTD 5 Alarm	RTD 6 Alarm	RTD 7 Alarm	RTD 8 Alarm
RTD 9 Alarm	RTD 10 Alarm	RTD 11 Alarm	RTD 12 Alarm
RTD 1 High Alarm	RTD 2 High Alarm	RTD 3 High Alarm	RTD 4 High Alarm
RTD 5 High Alarm	RTD 6 High Alarm	RTD 7 High Alarm	RTD 8 High Alarm
RTD 9 High Alarm	RTD 10 High Alarm	RTD 11 High Alarm	RTD 12 High Alarm
Service Alarm	Short/Low RTD Alarm	Starter Failed Alarm	Tachometer Alarm
Thermal Model Alarm	Trip Coil Super.	Trip Counter Alarm	Undercurrent Alarm
Underpower Alarm	Undervoltage Alarm	Vibration Sw. Alarm	Volt. Frequency Alarm
Welded Contactor	Loss of Comms Alarm		
OTHER			
1 TRIP Relay Forced	2 AUX Relay Forced	3 AUX Relay Forced	4 ALARM Relay Forced
469 Not Inserted	5 BLOCK Relay Forced		Control Power Applied
Control Power Lost	Digital Trace Trigger	Emergency Rst. Close	Emergency Rst. Open
Force 1 TRIP Disabled	Force 2 AUX Disabled	Force 3 AUX Disabled	Force 4 ALARM Disabled
Force 5 BLOCK Disabled	Forced Relay	Motor Started	No Event/Trip to Date
Relay Not Inserted	Serial Trace Trigger	Service Alarm	Simulation Started
Simulation Stopped	Start While Blocked	Self-test Warning 9*	

* The event "Self-test warning 9" is caused by unexpected microprocessor reset. System input measurements were interrupted for at least 2 seconds.

6.7 A6 Product Info

6.7.1 469 Model Information

PATH: ACTUAL VALUES ▷▽ A6 PRODUCT INFO ▷ 469 MODEL INFORMATION

■ 469 MODEL [▷] INFORMATION	ORDER CODE: 469-P5-HI-A20-E	*Range: Displays the relay order code and installed options.*
MESSAGE	469 SERIAL NO: A3050001	*Range: Displays the serial number of the relay.*
MESSAGE	FIRMWARE REVISION: 4.00	*Range: Displays the firmware revision of the relay.*
MESSAGE	BOOT REVISION: 3.00	*Range: Displays the boot software revision of the relay.*
MESSAGE	HARDWARE REVISION: H	*Range: Displays the hardware revision of the relay.*
MESSAGE	MOD NUMBER: 004	*Range: Displays the relay modification number.*

All of the 469 model information may be viewed here when the unit is powered up. In the event of a product software upgrade or service question, the information shown here should be jotted down prior to any inquiry.

6.7.2 Calibration Information

PATH: ACTUAL VALUES ▷▽ A6 PRODUCT INFO ▷▽ CALIBRATION INFORMATION

■ CALIBRATION [▷] INFORMATION	ORIGINAL CALIBRATION DATE: Jan 01 1995	*Range: month day year*
MESSAGE	LAST CALIBRATION DATE: Jan 01 1995	*Range: month day year*

The date of the original calibration and last calibration may be viewed here.

6.8 Diagnostics

6.8.1 Diagnostic Messages

Some actual value messages are helpful in diagnosing the cause of Trips, Alarms, or Start Blocks. The 469 automatically defaults to the most important message. The hierarchy is Trip and PreTrip messages, Alarm, and lastly, Start Block Lockout. To simplify things, the Message LED (indicator) will flash, prompting the operator to press the NEXT key. When NEXT is pressed, the next relevant message is automatically displayed. The 469 cycles through the messages with each keypress. When all of these conditions have cleared, the 469 reverts back to the normal default messages.

Any time the 469 is not displaying the default messages because other Actual Value or settings messages are being viewed and there are no trips, alarms, or blocks, the Message LED (indicator) will be on solid. From any point in the message structure, pressing the NEXT key will cause the 469 to revert back to the normal default messages. When normal default messages are being displayed, pressing NEXT displays the next default message immediately.

Example:

When an overload trip occurs, an RTD alarm may also occur as a result of the overload and a lockout time associated with the trip. The 469 automatically defaults to the **A1 STATUS ▷▽ LAST TRIP DATA ▷ CAUSE OF LAST TRIP** actual value message and the Message LED flashes. Pressing the NEXT key cycles through the time and date stamp information as well as all of the pre-trip data. When the bottom of this queue is reached, pressing NEXT again normally returns to the top of the queue. However, because an alarm is active, the display skips to the alarm message at the top of the **A1 STATUS ▷▽ ALARM STATUS** queue. Similarly, pressing NEXT again skips to the **A1 STATUS ▷▽ START BLOCK ▷▽ RESTART BLOCK LOCKOUT** message. Pressing NEXT once final time returns to the original **CAUSE OF LAST TRIP** message, and the cycle could be repeated.

LAST TRIP DATA:

```
CAUSE OF LAST TRIP:
Overload
```

```
TIME OF LAST TRIP:
12:00:00.0
```

```
DATE OF LAST TRIP
Jan 01 1992
```

↓
↓
↓

```
ANALOG INPUT 4
PreTrip: 0 Units
```

ACTIVE ALARMS:

```
STATOR RTD #1
ALARM: 135°C
```

START BLOCK LOCKOUTS:	OVERLOAD LOCKOUT BLOCK: 25 min

When the RESET has been pressed, the hot RTD condition is no longer present, and the lockout time has expired, the display will revert back to the normal Default Messages.

6.8.2 Flash Messages

Flash messages are warning, error, or general information messages that are temporarily displayed in response to certain key presses. These messages are intended to assist with navigation of the 469 messages by explaining what has happened or by prompting the user to perform certain actions.

[.] KEY IS USED TO ADVANCE THE CUR- SOR	ACCESS DENIED, ENTER PASSCODE	ACCESS DENIED, SHORT ACCESS SWITCH	ALL POSSIBLE RESETS HAVE BEEN PER- FORMED
ARE YOU SURE? PRESS [ENTER] TO VERIFY	DATA CLEARED SUCCESSFULLY	DATE ENTRY OUT OF RANGE	DATE ENTRY WAS NOT COMPLETE
DEFAULT MESSAGE HAS BEEN ADDED	DEFAULT MESSAGE HAS BEEN REMOVED	DEFAULT MESSAGE LIST IS FULL	DEFAULT MESSAGES 6 TO 20 ARE ASSIGNED
END OF LIST	END OF PAGE	ENTER NEW PASS- CODE FOR ACCESS	INPUT FUNCTION ALREADY ASSIGNED
INVALID PASSCODE ENTERED!	INVALID SERVICE CODE ENTERED	KEY PRESSED IS INVALID HERE	NEW PASSCODE HAS BEEN ACCEPTED
NEW settings HAS BEEN STORED	NO ALARMS	NO START BLOCKS ACTIVE	NO TRIPS OR ALARMS TO RESET
OUT OF RANGE! ENTER: ####-##### by #	PRESS [ENTER] TO ADD DEFAULT MESSAGE	PRESS [ENTER] TO REMOVE MESSAGE	RESET PERFORMED SUCCESSFULLY
ROUNDED settings HAS BEEN STORED	settings ACCESS IS NOW PERMITTED	settings ACCESS IS NOW RESTRICTED	THIS FEATURE NOT PROGRAMMED
TIME ENTRY OUT OF RANGE	TIME ENTRY WAS NOT COMPLETE	TOP OF LIST	TOP OF PAGE

- **[.] KEY IS USED TO ADVANCE THE CURSOR:** Any time a settings that requires text editing is viewed, this message will appear immediately to prompt the user to use the decimal key for cursor control. If the settings is not altered for one (1) minute, the message will flash again.
- **ACCESS DENIED, ENTER PASSCODE:** The 469 has a passcode security feature. If that feature has been enabled, not only do the access switch terminals have to be shorted, but the passcode must also be entered. If the correct passcode has been lost or

forgotten, contact the factory with the encrypted access code. See *Passcode* on page 5–8 for passcode features.

- **ACCESS DENIED, SHORT ACCESS SWITCH:** In order to store any settings values, the access switch must be shorted. If this message appears and it is necessary to change a settings, short access terminals C1 and C2.
- **ALL POSSIBLE RESETS HAVE BEEN PERFORMED:** If only some of the trip and alarm features that are active can be cleared (i.e. the conditions that caused some of these trips and/or alarms are still present), then this message will appear when a RESET is performed, indicating that only trips and alarms that could be reset have been reset.
- **ARE YOU SURE? PRESS [ENTER] TO VERIFY:** If the RESET key is pressed and resetting of any trip or alarm feature is possible, this message will appear to ask for verification of the operation. If RESET is pressed again while the message is still on the display, the reset will be performed.
- **DATA CLEARED SUCCESSFULLY:** This message confirms that data has been cleared or reset in the **S1 469 SETUP** ▷▽ **CLEAR DATA** or **S1 469 SETUP** ▷▽ **INSTALLATION** settings groups.
- **DATE ENTRY WAS NOT COMPLETE:** Since the **DATE** settings has a special format (MM/DD/YYYY), if ENTER is pressed before the complete value is entered, this message appears and the new value is not stored. Another attempt will have to be made with the complete information.
- **DATE ENTRY WAS OUT OF RANGE:** This message appears if and invalid entry is made for the **DATE** (e.g. 15 entered for month).
- **DEFAULT MESSAGE HAS BEEN ADDED:** Any time a new default message is added to the default message list, this message will appear as verification.
- **DEFAULT MESSAGE HAS BEEN REMOVED:** Any time a default message is removed from the default message list, this message will appear as verification.
- **DEFAULT MESSAGE LIST IS FULL:** If an attempt is made to add a new default message to the default message list when 20 messages are already assigned, this message will appear. In order to add a message, one of the existing messages must be removed.
- **DEFAULT MESSAGES 6 of 20 ARE ASSIGNED:** This message appears each time the **S1 469 SETUP** ▷▽ **DEFAULT MESSAGES** settings group is entered. It notifies the user of the number of assigned default messages.
- **END OF LIST:** This message will indicate when the bottom of a subgroup has been reached.
- **END OF PAGE:** This message will indicate when the bottom of a page has been reached.
- **ENTER NEW PASSCODE FOR ACCESS:** If the passcode is zero, the passcode security feature is disabled. If the Change Passcode settings is entered as yes, this flash message will appear prompting the user to enter a non-zero passcode which in turn will enable the feature.
- **INPUT FUNCTION IS ALREADY ASSIGNED:** The Assignable Digital Input functions may only be used once. If an attempt is made to assign the same function to two different switches, this message will appear.

- **INVALID PASSCODE ENTERED:** If an invalid passcode is entered for passcode security feature, this message will flash on the display.
- **INVALID SERVICE CODE ENTERED:** This message appears if an invalid code is entered in **S13 469 TESTING ▷▽ GE MULTILIN USE ONLY**.
- **KEY PRESSED HERE IS INVALID:** Under certain situations, certain keys have no function (e.g. any number key while viewing Actual Values). If a key is pressed where it should have no function, this message will appear.
- **NEW PASSCODE HAS BEEN ACCEPTED:** This message will appear as an acknowledge that the new passcode has been accepted when changing the passcode for the passcode security feature.
- **NEW settings HAS BEEN STORED:** This message appear each time a settings has been altered and stored as shown on the display.
- **NO ALARMS:** This message appears if an attempt is made to enter the **A1 STATUS ⇨ ALARM STATUS** subgroup when there are no active alarms.
- **NO START BLOCKS ACTIVE:** This message appears if an attempt is made to enter the **A1 STATUS ⇨⇩ START BLOCKS** subgroup when there are no active Start Blocks.
- **NO TRIPS OR ALARMS TO RESET:** If RESET is pressed when there are no trips or alarms present, this message will appear.
- **OUT OF RANGE! ENTER: #### - ##### by #:** If an entered settings value that is outside of the acceptable range of values, the 469 displays this message, substituting the proper values for that settings. An appropriate value may then be entered.
- **PRESS [ENTER] TO ADD DEFAULT MESSAGE:** If the ENTER key is pressed anywhere in the 469 actual value messages, this message prompts the user to press ENTER again to add a new default message. To add a new default message, ENTER must be pressed while this message is being displayed.
- **PRESS [ENTER] TO REMOVE MESSAGE:** If the decimal key is pressed in the **S1 469 SETUP ▷▽ DEFAULT MESSAGES** settings group, immediately followed by the ENTER key, this message prompts the user to press enter to remove a default message. To remove the default message, ENTER must be pressed while this message is being displayed.
- **RESET PERFORMED SUCCESSFULLY:** If all trip and alarm features that are active can be cleared (i.e. the conditions that caused these trips and/or alarms are no longer present), then this message will appear when a reset is performed, indicating that all trips and alarms have been cleared.
- **ROUNDED settings HAS BEEN STORED:** A settings value entered with the numeric keypad may be between valid settings values. The 469 detects this condition and stores a value that has been rounded to the nearest valid settings value. To find the valid range and step for a given settings, simply press HELP while the settings is being displayed.
- **settings ACCESS IS NOW PERMITTED:** This flash message notifies the user that settings may now be altered and stored any time the passcode security feature is enabled and a valid passcode is entered.
- **settings ACCESS IS NOW RESTRICTED:** This message appears if the passcode security feature is enabled, a valid passcode has been entered, and the **S1 469 SETUP ▷**

PASSCODE ▷ SETTINGS ACCESS settings value is Restricted. This message also appears anytime that settings access is permitted and the access jumper is removed.

- **THIS FEATURE NOT PROGRAMMED:** If an attempt is made to enter an actual value message subgroup, when the settings are not configured for that feature, this message will appear.
- **TIME ENTRY WAS NOT COMPLETE:** Since the **TIME** settings has a special format (HH/MM/SS.S), if ENTER is pressed before the complete value entered, this message appears and the new value is not stored. Another attempt will have to be made with the complete information.
- **TIME ENTRY WAS OUT OF RANGE:** If and invalid entry is made for the time (e.g. 35 entered for hour), this message will appear.
- **TOP OF LIST:** This message will indicate when the top of subgroup has been reached.
- **TOP OF PAGE:** This message will indicate when the top of a page has been reached.

GE
Grid Solutions

469 Motor Management Relay

Chapter 7: Testing

7.1 Overview

7.1.1 Test Setup

The purpose of this testing description is to demonstrate the procedures necessary to perform a complete functional test of all the 469 hardware while also testing firmware/hardware interaction in the process. Since the 469 is packaged in a drawout case, a demo case (metal carry case in which an 469 may be mounted) may be useful for creating a portable test set. Testing of the relay during commissioning using a primary injection test set will ensure that CTs and wiring are correct and complete.

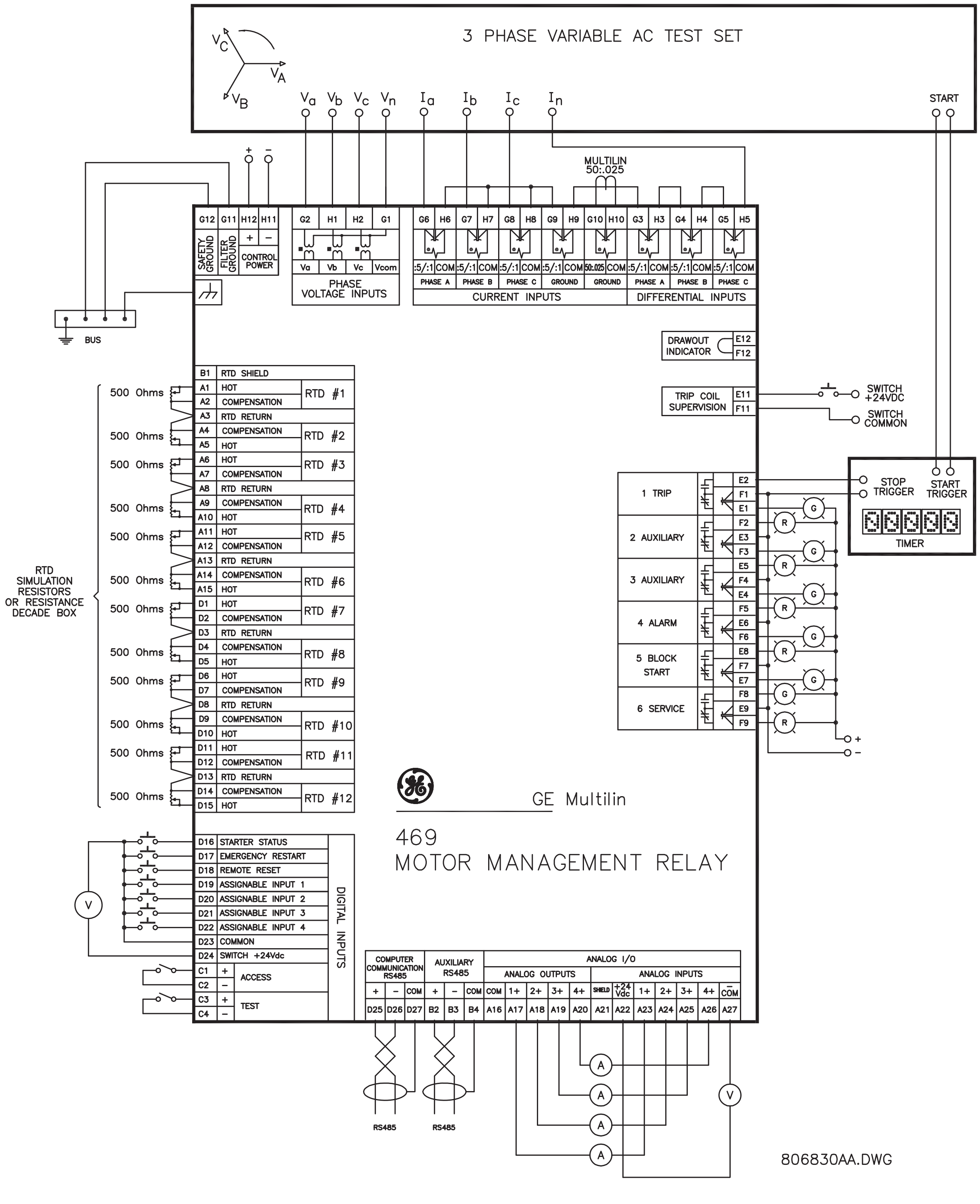


FIGURE 7–1: Secondary Injection Test Setup

7.2 Hardware Functional Testing

7.2.1 Phase Current Accuracy Test

The 469 specification for phase current accuracy is ±0.5% of 2 × CT when the injected current is less than 2 × CT. Perform the steps below to verify accuracy.

▷ Alter the following settings:

S2 SYSTEM SETUP ▷ CURRENT SENSING ▷ PHASE CT PRIMARY: "1000 A"

Measured values should be ±10 A.

▷ Inject the values shown in the table below.

▷ Verify accuracy of the measured values.

▷ View the measured values in:

A2 METERING DATA ▷ CURRENT METERING

INJECTED CURRENT 1 A UNIT	INJECTED CURRENT 5 A UNIT	EXPECTED CURRENT READING	MEASURED CURRENT PHASE A	MEASURED CURRENT PHASE B	MEASURED CURRENT PHASE C
0.1 A	0.5 A	100 A			
0.2 A	1.0 A	200 A			
0.5 A	2.5 A	500 A			
1.0 A	5.0 A	1000 A			
1.5 A	7.5 A	1500 A			
2.0 A	10 A	2000 A			

7.2.2 Voltage Input Accuracy Test

The 469 specification for voltage input accuracy is ±0.5% of full scale (273 V). Perform the steps below to verify accuracy.

▷ Alter the following settings:

S2 SYSTEM SETUP ▷▽ VOLTAGE SENSING ▷ VT CONNECTION TYPE: "Wye"
S2 SYSTEM SETUP ▷▽ VOLTAGE SENSING ▷▽ VOLTAGE TRANSFORMER RATIO: "10.00:1"

Measured values should be ±13.65 V.

▷ Apply the voltage values shown in the table.

▷ Verify accuracy of the measured values.

▷ View the measured values in:

A2 METERING DATA ▷▽ VOLTAGE METERING

APPLIED LINE-NEUTRAL VOLTAGE	EXPECTED VOLTAGE READING	MEASURED VOLTAGE A-N	MEASURED VOLTAGE B-N	MEASURED VOLTAGE C-N
30 V	300 V			
50 V	500 V			
100 V	1000 V			
150 V	1500 V			

APPLIED LINE-NEUTRAL VOLTAGE	EXPECTED VOLTAGE READING	MEASURED VOLTAGE A-N	MEASURED VOLTAGE B-N	MEASURED VOLTAGE C-N
200 V	2000 V			
270 V	2700 V			

7.2.3 Ground and Differential Accuracy Test

The 469 specification for differential current and 1 A/5 A ground current input accuracy is ±0.5% of 1 × CT for the 5 A input and 0.5% of 5 × CT for the 1 A input. Perform the steps below to verify accuracy.

5 A Input

▷ Alter the following settings:

S2 SYSTEM SETUP ▷ CURRENT SENSING ▷▽ GROUND CT: "5A Secondary"
S2 SYSTEM SETUP ▷ CURRENT SENSING ▷▽ GROUND CT PRIMARY: "1000 A"
S2 SYSTEM SETUP ▷ CURRENT SENSING ▷▽ PHASE DIFFERENTIAL CT: "5A Secondary"
S2 SYSTEM SETUP ▷ CURRENT SENSING ▷▽ PHASE DIFFERENTIAL CT PRIMARY: "1000 A"

Measured values should be ±5 A.

▷ Inject the values shown in the table below into one phase only.

▷ Verify accuracy of the measured values.

▷ View the measured values in:

A2 METERING DATA ▷ CURRENT METERING

INJECTED CURRENT 5 A UNIT	EXPECTED CURRENT READING	MEASURED GROUND CURRENT	MEASURED DIFFERENTIAL CURRENT		
			PHASE A	PHASE B	PHASE C
0.5 A	100 A				
1.0 A	200 A				
2.5 A	500 A				
5.0 A	1000 A				

1 A Input

▷ Alter the following settings:

S2 SYSTEM SETUP ▷ CURRENT SENSING ▷▽ GROUND CT: "1A Secondary"
S2 SYSTEM SETUP ▷ CURRENT SENSING ▷▽ GROUND CT PRIMARY: "1000 A"
S2 SYSTEM SETUP ▷ CURRENT SENSING ▷▽ PHASE DIFFERENTIAL CT: "1A Secondary"
S2 SYSTEM SETUP ▷ CURRENT SENSING ▷▽ PHASE DIFFERENTIAL CT PRIMARY: "1000 A"

Measured values should be ±25 A.

▷ Inject the values shown below into one phase only.

▷ Verify accuracy of the measured values.

▷ View the measured values in:

A2 METERING DATA ▷ CURRENT METERING:

INJECTED CURRENT 1 A UNIT	EXPECTED CURRENT READING	MEASURED GROUND CURRENT	MEASURED DIFFERENTIAL CURRENT		
			PHASE A	PHASE B	PHASE C
0.1 A	100 A				
0.2 A	200 A				
0.5 A	500 A				
1.0 A	1000 A				

7.2.4 GE Digital Energy 50:0.025 Ground Accuracy Test

The 469 specification for GE Grid Solutions 50:0.025 ground current input accuracy is ±0.5% of CT rated primary (25 A). Perform the steps below to verify accuracy.

▷ Alter the following settings:

S2 SYSTEM SETUP ▷ CURRENT SENSING ▷▽ GROUND CT: “50:0.025”

Measured values should be ±0.125 A.

▷ Inject the values shown in the table below either as primary values into a GE Grid Solutions 50:0.025 Core Balance CT or as secondary values that simulate the core balance CT.

▷ Verify accuracy of the measured values.

▷ View the measured values in:

A2 METERING DATA ▷ CURRENT METERING

PRIMARY INJECTED CURRENT	SECONDARY INJECTED CURRENT	EXPECTED CURRENT READING	MEASURED GROUND CURRENT
0.25 A	0.125 mA	0.25 A	
1 A	0.5 mA	1.00 A	
10 A	5 mA	10.00 A	
25 A	12.5 mA	25.00 A	

7.2.5 RTD Accuracy Test

The 469 specification for RTD input accuracy is ±2°. Perform the steps below.

▷ Alter the following settings:

S8 RTD TEMPERATURE ▷ RTD TYPES ▷ STATOR RTD TYPE: “100 Ohm Platinum” (select desired type)

S8 RTD TEMPERATURE ▷▽ RTD #1 ▷ RTD #1 APPLICATION: “Stator” (repeat for RTDs 2 to 12)

Measured values should be ±2°C or ±4°F.

▷ Alter the resistances applied to the RTD inputs as per the table below to simulate RTDs.

▷ Verify accuracy of the measured values.

▷ View measured values in:

A2 METERING DATA ▷▽ TEMPERATURE:

Table 7–1: 100 Ω PLATINUM TEST

APPLIED RESISTANCE 100 Ω PLATINUM	EXPECTED RTD TEMPERATURE READING		MEASURED RTD TEMPERATURE SELECT ONE: ____(°C) ____(°F)											
	°Celsius	°Fahrenheit	1	2	3	4	5	6	7	8	9	10	11	12
80.31 Ω	–50°C	–58°F												
100.00 Ω	0°C	32°F												
119.39 Ω	50°C	122°F												
138.50 Ω	100°C	212°F												
157.32 Ω	150°C	302°F												
175.84 Ω	200°C	392°F												
194.08 Ω	250°C	482°F												

Table 7–2: 120 Ω NICKEL TEST

APPLIED RESISTANCE 120 Ω NICKEL	EXPECTED RTD TEMPERATURE READING		MEASURED RTD TEMPERATURE SELECT ONE: ____(°C) ____(°F)											
	°Celsius	°Fahrenheit	1	2	3	4	5	6	7	8	9	10	11	12
86.17 Ω	–50°C	–58°F												
120.00 Ω	0°C	32°F												
157.74 Ω	50°C	122°F												
200.64 Ω	100°C	212°F												
248.95 Ω	150°C	302°F												
303.46 Ω	200°C	392°F												
366.53 Ω	250°C	482°F												

Table 7–3: 100 Ω NICKEL TEST

APPLIED RESISTANCE 100 Ω NICKEL	EXPECTED RTD TEMPERATURE READING		MEASURED RTD TEMPERATURE SELECT ONE: ____(°C) ____(°F)											
	°Celsius	°Fahrenheit	1	2	3	4	5	6	7	8	9	10	11	12
71.81 Ω	–50°C	–58°F												
100.00 Ω	0°C	32°F												
131.45 Ω	50°C	122°F												

Table 7–3: 100 Ω NICKEL TEST

APPLIED RESISTANCE 100 Ω NICKEL	EXPECTED RTD TEMPERATURE READING		MEASURED RTD TEMPERATURE SELECT ONE: ____(°C) ____(°F)											
	°Celsius	°Fahrenheit	1	2	3	4	5	6	7	8	9	10	11	12
167.20 Ω	100°C	212°F												
207.45 Ω	150°C	302°F												
252.88 Ω	200°C	392°F												
305.44 Ω	250°C	482°F												

Table 7–4: 10 Ω COPPER TEST

APPLIED RESISTANCE 10 Ω COPPER	EXPECTED RTD TEMPERATURE READING		MEASURED RTD TEMPERATURE SELECT ONE: ____(°C) ____(°F)											
	°Celsius	°Fahrenheit	1	2	3	4	5	6	7	8	9	10	11	12
7.10 Ω	–50°C	–58°F												
9.04 Ω	0°C	32°F												
10.97 Ω	50°C	122°F												
12.90 Ω	100°C	212°F												
14.83 Ω	150°C	302°F												
16.78 Ω	200°C	392°F												
18.73 Ω	250°C	482°F												

7.2.6 Digital Inputs and Trip Coil Supervision

The digital inputs and trip coil supervision can be verified easily with a simple switch or pushbutton. Verify the SWITCH +24 V DC with a voltmeter. Perform the steps below to verify functionality of the digital inputs.

▷ Open switches of all of the digital inputs and the trip coil supervision circuit.

▷ View the status of the digital inputs and trip coil supervision in:

ACTUAL VALUES ▷ A1 STATUS ▷▽ DIGITAL INPUTS

▷ Close switches of all of the digital inputs and the trip coil supervision circuit.

▷ View the status of the digital inputs and trip coil supervision in:

A1 STATUS ▷▽ DIGITAL INPUTS

INPUT	EXPECTED STATUS (SWITCH OPEN)	PASS / FAIL	EXPECTED STATUS (SWITCH CLOSED)	PASS / FAIL
ACCESS	Open		Shorted	
TEST	Open		Shorted	
STARTER STATUS	Open		Shorted	
EMERGENCY RESTART	Open		Shorted	
REMOTE RESET	Open		Shorted	
ASSIGNABLE INPUT 1	Open		Shorted	
ASSIGNABLE INPUT 2	Open		Shorted	
ASSIGNABLE INPUT 3	Open		Shorted	
ASSIGNABLE INPUT 4	Open		Shorted	
TRIP COIL SUPERVISION	No Coil		Coil	

7.2.7 Analog Inputs and Outputs

The 469 specification for analog input and analog output accuracy is ±1% of full scale. Perform the steps below to verify accuracy. Verify the Analog Input +24 V DC with a voltmeter.

4 to 20 mA Analog Input

▷ Alter the following settings:

S12 ANALOG I/O ▷▽ ANALOG INPUT1 ▷ ANALOG INPUT1: "4-20 mA"

S12 ANALOG I/O ▷▽ ANALOG INPUT1 ▷▽ ANALOG INPUT1 MINIMUM: "0"

S12 ANALOG I/O ▷▽ ANALOG INPUT1 ▷▽ ANALOG INPUT1 MAXIMUM: "1000" (repeat this value for Analog Inputs 2 to 4)

Analog output values should be ±0.2 mA on the ammeter. Measured analog input values should be ±10 units.

▷ Force the analog outputs using the following settings:

S13 TESTING ▷▽ TEST ANALOG OUTPUT ▷ FORCE ANALOG OUTPUTS FUNCTION: "Enabled"

S13 TESTING ▷▽ TEST ANALOG OUTPUT ▷▽ ANALOG OUTPUT 1 FORCED VALUE: "0%" (enter desired value in percent; repeat for Analog Outputs 2 through 4)

▷ Verify the ammeter readings as well as the measured analog input readings.
For the purposes of testing, the analog input is fed in from the analog output (see FIGURE 7–1: *Secondary Injection Test Setup* on page 7–2).

▷ View the measured values in:

A2 METERING DATA ▷▽ ANALOG INPUTS:

ANALOG OUTPUT FORCE VALUE	EXPECTED AMMETER READING	MEASURED AMMETER READING (mA)				EXPECTED ANALOG INPUT READING	MEASURED ANALOG INPUT READING (units)			
		1	2	3	4		1	2	3	4
0%	4 mA					0 mA				
25%	8 mA					250 mA				
50%	12 mA					500 mA				
75%	16 mA					750 mA				
100%	20 mA					1000 mA				

0 to 1 mA Analog Input

▷ Alter the following settings:

S12 ANALOG I/O ▷▽ ANALOG INPUT1 ▷ ANALOG INPUT1: "0-1 mA"

S12 ANALOG I/O ▷▽ ANALOG INPUT1 ▷▽ ANALOG INPUT1 MINIMUM: "0"

S12 ANALOG I/O ▷▽ ANALOG INPUT1 ▷▽ ANALOG INPUT1 MAXIMUM: "1000" (repeat for Analog Inputs 2 to 4)

Analog output values should be ±0.01 mA on the ammeter. Measured analog input values should be ±10 units.

▷ Force the analog outputs using the following settings:

S13 TESTING ▷▽ TEST ANALOG OUTPUT ▷ FORCE ANALOG OUTPUTS FUNCTION: "Enabled"

S13 TESTING ▷▽ TEST ANALOG OUTPUT ▷▽ ANALOG OUTPUT 1 FORCED VALUE: "0%" (enter desired percent, repeats for analog output 2-4)

▷ Verify the ammeter readings as well as the measured analog input readings.

▷ View the measured values in:

A2 METERING DATA ▷▽ ANALOG INPUTS:

ANALOG OUTPUT FORCE VALUE	EXPECTED AMMETER READING	MEASURED AMMETER READING (mA)				EXPECTED ANALOG INPUT READING	MEASURED ANALOG INPUT READING (units)			
		1	2	3	4		1	2	3	4
0%	0 mA					0 mA				
25%	0.25 mA					250 mA				
50%	0.50 mA					500 mA				
75%	0.75 mA					750 mA				
100%	1.00 mA					1000 mA				

7.2.8 Output Relays

To verify the functionality of the output relays, perform the following steps:

Using the settings:

S13 TESTING ▷▽ TEST OUTPUT RELAYS ⇨ FORCE OPERATION OF RELAYS: “1 Trip”

▷ Select and store values as per the table below, verifying operation

FORCE OPERATION SETTINGS	EXPECTED MEASUREMENT 4 FOR SHORT												ACTUAL MEASUREMENT 4 FOR SHORT											
	1		2		3		4		5		6		1		2		3		4		5		6	
	no	nc	no	nc	no	nc	no	nc	no	nc	no	nc	no	nc	no	nc	no	nc	no	nc	no	nc	no	nc
1 TRIP	4			4		4		4		4	4													
2 AUXILIARY		4	4			4		4		4	4													
3 AUXILIARY		4		4	4			4		4	4													
4 ALARM		4		4		4	4			4	4													
5 BLOCK START		4		4		4		4	4		4													
6 SERVICE		4		4		4		4		4		4												
All Relays	4		4		4		4		4			4												
No Relays		4		4		4		4		4	4													

NOTE

The 6 SERVICE relay is failsafe or energized normally. Operating the 6 SERVICE relay causes it to de-energize.

7.3 Additional Functional Testing

7.3.1 Overload Curve Test

The 469 specification for overload curve timing accuracy is ±100 ms or ±2% of time to trip. Pickup accuracy is as per the current inputs (±0.5% of 2 × CT when the injected current is less than 2 × CT and ±1% of 20 × CT when the injected current is ≥ 2 × CT). Perform the steps below to verify accuracy.

▷ Alter the following settings:

S2 SYSTEM SETUP ▷ CURRENT SENSING ▷ PHASE CT PRIMARY: "1000"
S2 SYSTEM SETUP ▷ CURRENT SENSING ▷▽ MOTOR FULL LOAD AMPS FLA: "1000"

S5 THERMAL MODEL ▷ THERMAL MODEL ▷ SELECT CURVE STYLE: "Standard"
S5 THERMAL MODEL ▷ THERMAL MODEL ▷▽ OVERLOAD PICKUP LEVEL: "1.10"
S5 THERMAL MODEL ▷ THERMAL MODEL ▷▽ UNBALANCE BIAS K FACTOR: "0"
S5 THERMAL MODEL ▷ THERMAL MODEL ▷▽ HOT/COLD SAFE STALL RATIO: "1.00"
S5 THERMAL MODEL ▷ THERMAL MODEL ▷▽ ENABLE RTD BIASING: "No"
S5 THERMAL MODEL ▷▽ O/L CURVE SETUP ▷ STANDARD OVERLOAD CURVE NUMBER: "4"

Any trip must be reset prior to each test.

▷ Short the emergency restart terminals momentarily immediately prior to each overload curve test to ensure that the thermal capacity used is zero.
Failure to do so will result in shorter trip times.

▷ Inject the current of the proper amplitude to obtain the values as shown.

▷ Verify the trip times.
Motor load may be viewed in:

A2 METERING DATA ▷ CURRENT METERING.

Thermal capacity used and estimated time to trip may be viewed in

A1 STATUS ▷ MOTOR STATUS.

AVERAGE PHASE CURRENT DISPLAYED	PICKUP LEVEL	EXPECTED TIME TO TRIP	TOLERANCE RANGE	MEASURED TIME TO TRIP
1050 A	1.05	never	n/a	
1200 A	1.20	795.44 sec.	779.53 to 811.35 sec.	
1750 A	1.75	169.66 sec.	166.27 to 173.05 sec.	
3000 A	3.00	43.73 sec.	42.86 to 44.60 sec.	
6000 A	6.00	9.99 sec.	9.79 to 10.19 sec.	
10000 A	10.00	5.55 sec.	5.44 to 5.66 sec.	

7.3.2 Power Measurement Test

The specification for reactive and apparent power is ±1% of $\sqrt{3}$ ×2 × CT × VT × VT full scale at I_{avg} < 2 × CT. Perform the steps below to verify accuracy.

▷ Alter the following settings:

S2 SYSTEM SETUP ▷ CURRENT SENSING ▷ PHASE CT PRIMARY: "1000"
S2 SYSTEM SETUP ▷▽ VOLTAGE SENSING ▷ VT CONNECTION TYPE: "Wye"
S2 SYSTEM SETUP ▷▽ VOLTAGE SENSING ▷▽ VOLTAGE TRANSFORMER RATIO: "10.00:1"

▷ Inject current and apply voltage as per the table below.

▷ Verify accuracy of the measured values.

▷ View the measured values in:

A2 METERING DATA ▷▽ POWER METERING.

INJECTED CURRENT 1A UNIT, APPLIED VOLTAGE (Ia is the reference vector)	INJECTED CURRENT 5A UNIT, APPLIED VOLTAGE (Ia is the reference vector)	EXPECTED LEVEL OF POWER QUANTITY	TOLERANCE RANGE OF POWER QUANTITY	MEASURED POWER QUANTITY	EXPECTED POWER FACTOR	MEASURED POWER FACTOR
Ia = 1 A ∠0° Ib = 1 A ∠120° Ic = 1 A ∠240° Va = 120 V ∠342° Vb = 120 V ∠102° Vc = 120 V ∠222°	Ia = 5 A ∠0° Ib = 5 A ∠120° Ic = 5 A ∠240° Ia = 120 V ∠342° Vb = 120 V ∠102° Vc = 120 V ∠222°	+ 3424 kW	3329 to 3519 kW		0.95 lag	
Ia = 1 A ∠0° Ib = 1 A ∠120° Ic = 1 A ∠240° Va = 120 V ∠288° Vb = 120 V ∠48° Vc = 120 V ∠168°	Ia = 5 A ∠0° Ib = 5 A ∠120° Ic = 5 A ∠240° Va = 120 V ∠288° Vb = 120 V ∠48° Vc = 120 V ∠168°	+ 3424 kvar	3329 to 3519 kvar		0.31 lag	

7.3.3 Unbalance Test

The 469 measures the ratio of negative sequence current (I_2) to positive sequence current (I_1). This value as a percent is used as the unbalance level when motor load exceeds FLA. When the average phase current is below FLA, the unbalance value is de-rated to prevent nuisance tripping as positive sequence current is much smaller and negative sequence current remains relatively constant. The derating formula is:

$$\left|\frac{I_2}{I_1}\right| \times \frac{I_{avg}}{\mathrm{FLA}} \times 100\% \qquad \textbf{(EQ 7.1)}$$

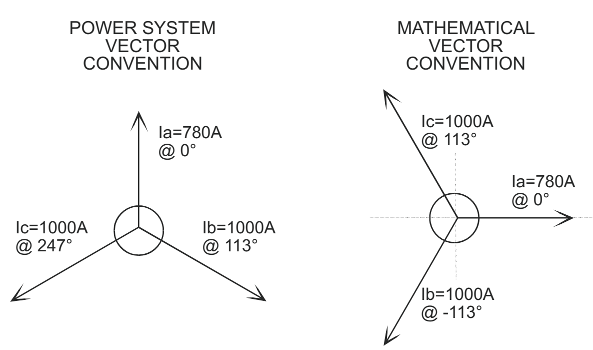


FIGURE 7–2: Three Phase Example for Unbalance Calculation

Symmetrical component analysis of vectors using the mathematical vector convention yields a ratio of negative sequence current to positive sequence current as shown:

$$\frac{I_2}{I_1} = \frac{\frac{1}{3}(I_a + a^2 I_b + a I_c)}{\frac{1}{3}(I_a + a I_b + a^2 I_c)} \quad \text{where } a = 1\angle 120° = -0.5 + j0.886 \qquad \textbf{(EQ 7.2)}$$

Given the values in the figure above, we have:

$$\begin{aligned} \frac{I_2}{I_1} &= \frac{780\angle 0° + (1\angle 120°)^2(1000\angle{-113°}) + (1\angle 120°)(1000\angle 113°)}{780\angle 0° + (1\angle 120°)(1000\angle{-113°}) + (1\angle 120°)^2(1000\angle 113°)} \\ &= \frac{780\angle 0° + 1000\angle 127° + 1000\angle 233°}{780\angle 0° + 1000\angle 7° + 1000\angle 353°} \\ &= \frac{780 - 601.8 + j798.6 - 601.8 - j798.6}{780 + 992.5 + j121.9 + 992.5 - j121.9} = \frac{-423.6}{2765} = 0.1532 \end{aligned} \qquad \textbf{(EQ 7.3)}$$

If FLA = 1000, then:

$$I_{avg} = \frac{780 + 1000 + 1000}{3}\text{ A} = 926.7\text{ A} \qquad \textbf{(EQ 7.4)}$$

and since $I_{avg} = 926.7\text{ A} < 1000 = \text{FLA}$, the 469 unbalance is:

$$469\text{ Unbalance} = |-0.1532| \times \frac{926.7}{1000} \times 100\% = 14.2\% \qquad \textbf{(EQ 7.5)}$$

The 469 specification for unbalance accuracy is ±2%. Perform the steps below to verify accuracy.

▷ Alter the following settings:

S2 SYSTEM SETUP ▷ CURRENT SENSING ▷ PHASE CT PRIMARY: "1000 A"
S2 SYSTEM SETUP ▷ CURRENT SENSING ▷▽ MOTOR FULL LOAD AMPS FLA: "1000 A"

▷ Inject the values shown in the table below.

▷ Verify accuracy of the measured values.

▷ View the measured values in:

A2 METERING DATA ▷ CURRENT METERING

INJECTED CURRENT		EXPECTED UNBALANCE LEVEL	MEASURED UNBALANCE LEVEL
1 A UNIT	5 A UNIT		
Ia = 0.78 A ∠0° Ib = 1 A ∠113° Ic = 1 A ∠247°	Ia = 3.9 A ∠0° Ib = 5 A ∠113° Ic = 5 A ∠247°	14%	
Ia = 1.56 A ∠0° Ib = 2 A ∠247° Ic = 2 A ∠113°	Ia = 7.8 A ∠0° Ib = 10 A ∠247° Ic = 10 A ∠113°	15%	
Ia = 0.39 A ∠0° Ib = 0.5 A ∠247° Ic = 0.5 A ∠113°	Ia = 1.95 A ∠0° Ib = 2.5 A ∠247° Ic = 2.5 A ∠113°	7%	

7.3.4 Voltage Phase Reversal Test

The 469 can detect voltage phase rotation and protect against phase reversal. To test the phase reversal element, perform the following steps:

▷ Alter the following settings:

S2 SYSTEM SETUP ▷▽ **VOLTAGE SENSING** ▷ **VT CONNECTION TYPE:** "Wye" or "Delta"
S2 SYSTEM SETUP ▷▽ **POWER SYSTEM** ▷▽ **SYSTEM PHASE SEQUENCE:** "ABC"

S9 VOLTAGE ELEMENTS ▷▽ **PHASE REVERSAL** ▷ **PHASE REVERSAL TRIP:** "Latched"
S9 VOLTAGE ELEMENTS ▷▽ **PHASE REVERSAL** ▷▽ **ASSIGN TRIP RELAYS:** "Trip"

▷ Apply voltages as per the table below.

▷ Verify the 469 operation on voltage phase reversal.

APPLIED VOLTAGE	EXPECTED RESULT 8 NO TRIP 4 PHASE REVERSAL TRIP	OBSERVED RESULT 8 NO TRIP 4 PHASE REVERSAL TRIP
Va = 120 V ∠0° Vb = 120 V ∠120° Vc = 120 V ∠240°	**8**	
Va = 120 V ∠0° Vb = 120 V ∠240° Vc = 120 V ∠120°	**4**	

7.3.5 Short Circuit Test

The 469 specification for short circuit timing is +50 ms. The pickup accuracy is as per the phase current inputs. Perform the steps below to verify the performance of the short circuit element.

▷ Alter the following settings:

S2 SYSTEM SETUP ▷ **CURRENT SENSING** ▷ **PHASE CT PRIMARY:** "1000"

S6 CURRENT ELEMENTS ▷ **SHORT CIRCUIT TRIP** ▷ **SHORT CIRCUIT TRIP:** "On"
S6 CURRENT ELEMENTS ▷ **SHORT CIRCUIT TRIP** ▷▽ **ASSIGN TRIP RELAYS:** "Trip"
S6 CURRENT ELEMENTS ▷ **SHORT CIRCUIT TRIP** ▷▽ **SHORT CIRCUIT TRIP PICKUP:** "5.0 × CT"
S6 CURRENT ELEMENTS ▷ **SHORT CIRCUIT TRIP** ▷▽ **INTENTIONAL S/C DELAY:** "0"

▷ Inject current as per the table below, resetting the unit after each trip by pressing the RESET key, and verify timing accuracy.

▷ Pre-trip values may be viewed by pressing NEXT after each trip.

INJECTED CURRENT		EXPECTED TIME TO TRIP	MEASURED TIME TO TRIP
5 A UNIT	1 A UNIT		
30 A	6 A	< 50 ms	
40 A	8 A	< 50 ms	
50 A	10 A	< 50 ms	

GE
Grid Solutions

469 Motor Management Relay

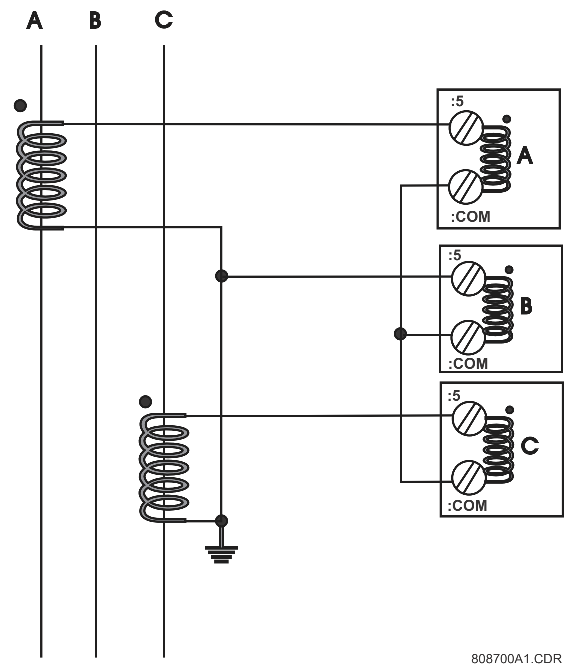
Chapter 8: Appendix

8.1 Two-Phase CT Configuration

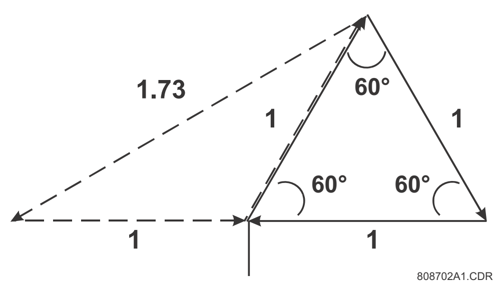
8.1.1 Description

This appendix illustrates how two CTs may be used to sense three phase currents.

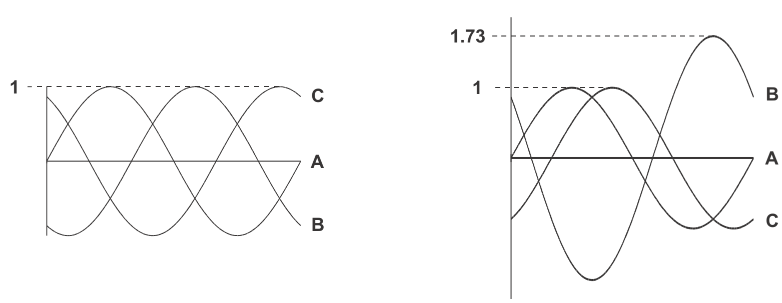
The proper configuration for the use of two CTs rather than three to detect phase current is shown. Each of the two CTs acts as a current source. The current that comes out of the CT on phase A flows into the interposing CT on the relay marked A. From there, the current sums with the current that is flowing from the CT on phase C which has just passed through the interposing CT on the relay marked C. This ‘summed’ current flows through the interposing CT marked B and from there, the current splits up to return to its respective source (CT). **Polarity is very important since the value of phase B must be the negative equivalent of A + C in order for the sum of all the vectors to equate to zero**. Note that there is only one ground connection as shown. If two ground connections are made, a parallel path for current has been created.



In the two CT configuration, the currents will sum vectorially at the common point of the two CTs. The diagram illustrates the two possible configurations. If one phase is reading high by a factor of 1.73 on a system that is known to be balanced, simply reverse the polarity of the leads at one of the two phase CTs (taking care that the CTs are still tied to ground at some point). **Polarity is important**.



To illustrate the point further, the following diagram shows how the current in phases A and C sum up to create phase 'B'.



2-PHASE CT CURRENTS

2-PHASE CT CURRENTS
180° OUT-OF-PHASE

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Once again, if the polarity of one of the phases is out by 180°, the magnitude of the resulting vector on a balanced system will be out by a factor of 1.73.

On a three wire supply, this configuration will always work and unbalance will be detected properly. In the event of a single phase, there will always be a large unbalance present at the interposing CTs of the relay. If for example Phase A was lost, Phase A would read zero while Phase B and C would both read the magnitude of Phase C. If on the other hand, phase B was lost, at the supply, Phase A would be 180° out-of-phase with Phase C and the vector addition would equal zero at Phase B.

8.2 Cool Time Constants

8.2.1 Selection of Cool Time Constants

Thermal limits are not a black and white science and there is some art to setting a protective relay thermal model. The definition of thermal limits mean different things to different manufacturers, and information is often not available. Therefore, it is important to remember the goal of the motor protection thermal modeling: to thermally protect the motor (rotor and stator) without impeding the normal and expected operating conditions of the motor.

The 469 thermal model provides integrated rotor and stator heating protection. If supplied with the motor, the cooling time constants recommended by the manufacturer should be used. Since rotor and stator heating and cooling is integrated into a single model, use of the longest cooling time constants (rotor or stator) is recommended.

If no cooling time constants are provided by the motor manufacturer, settings will have to be determined. Before determining the cool time constant settings, the motor duty cycle must be considered. If the motor is typically started up and run continuously for very long periods of time with no overload duty requirements, the cooling time constants can be large, making the thermal model conservative. If the normal duty cycle of the motor involves frequent starts and stops with a periodic overload duty requirement, the cooling time constants will be shorter and closer to the actual *thermal limit* of the motor.

Normally, motors are rotor limited during starting. Thus RTDs in the stator do not provide the best method of determining cool times. Determination of reasonable settings for the running and stopped cool time constants can be accomplished in one of the following manners listed in order of preference.

1. The motor running and stopped cool times or constants may be provided on the motor data sheets or requested from the manufacturer. Remember that the cooling is exponential and the time constants are one fifth of the total time interval from 100% to 0% thermal capacity used.
2. Attempt to determine a conservative value from the available motor data. See the following example for details.
3. If no motor data is available, an educated guess must be made. Perhaps the motor data could be estimated from other motors of a similar size or use. Note that conservative protection is the best first choice until a better understanding of the motor requirements is developed. Remember that the goal is to protect the motor without impeding the operating duty that is desired.

Example

Motor data sheets state that the starting sequence allowed is two (2) cold or one (1) hot, after which you must wait five (5) hours before attempting another start.

- This implies that under a normal start condition the motor is using between 34 and 50% thermal capacity. Hence, two consecutive starts are allowed, but not three.
- If the hot and cold curves or a hot/cold safe stall ratio are not available, program “0.5” (1 hot / 2 cold starts) as the **HOT/COLD SAFE STALL RATIO**.

- Programming the **START INHIBIT** settings to “On” makes a restart possible as soon as 62.5% (50 × 1.25) thermal capacity is available.
- After two (2) cold or one (1) hot start, the thermal capacity used will approach 100%. The thermal capacity used decays exponentially (see *Motor Cooling* on page 5–56 for details). As such, the thermal capacity used after 1 time constant will be 37%, meaning there is enough thermal capacity available for another start. Program 300 minutes (5 hours) as the **COOL TIME CONSTANT STOPPED** settings. Thus, after two (2) cold or one (1) hot start, a stopped motor will be blocked from starting for 5 hours.
- Since the rotor cools faster when the motor is running, a reasonable setting for the running cool time constant might be half the stopped cool time constant or 150 minutes.

8.3 Current Transformers

8.3.1 Ground Fault CTs for 50:0.025 A CT

CTs that are specially designed to match the ground fault input of GE Grid Solutions motor protection relays should be used to ensure correct performance. These CTs have a 50:0.025A (2000:1 ratio) and can sense low leakage currents over the relay setting range with minimum error. Three sizes are available with 3½-inch, 5½-inch, or 8-inch diameter windows.

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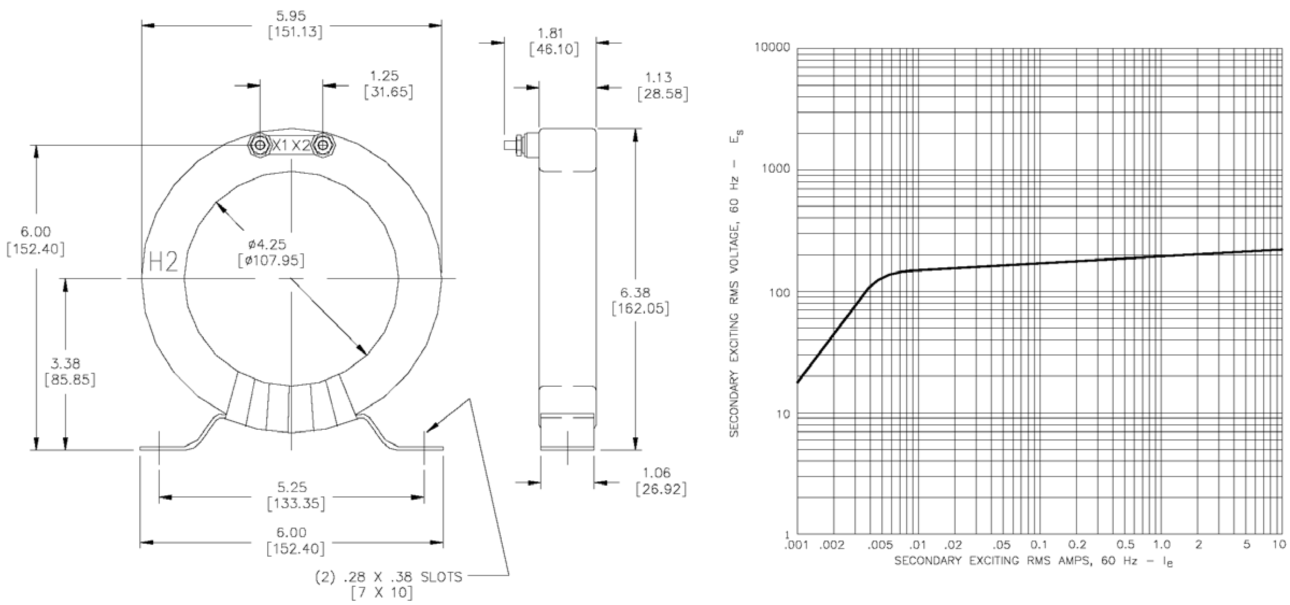

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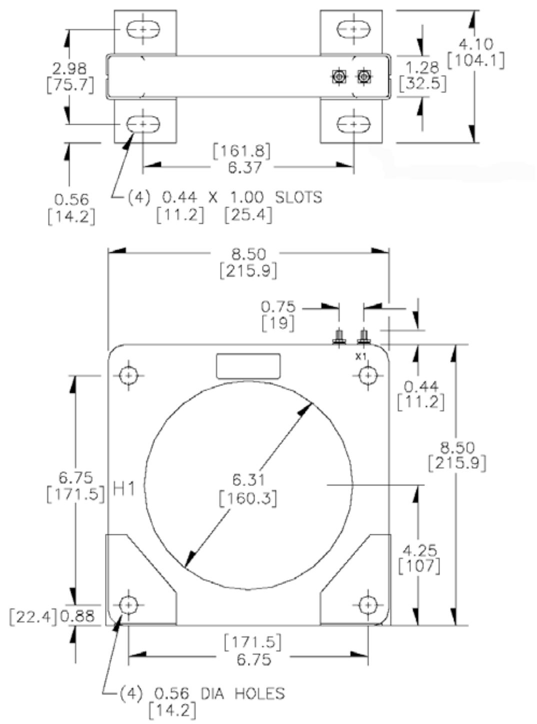

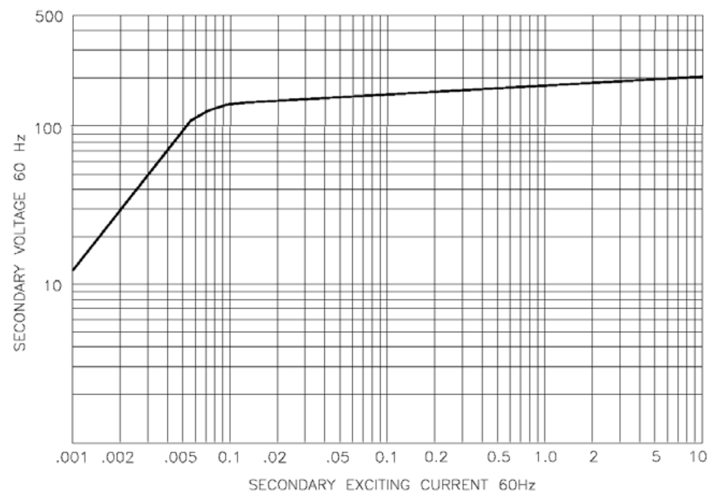

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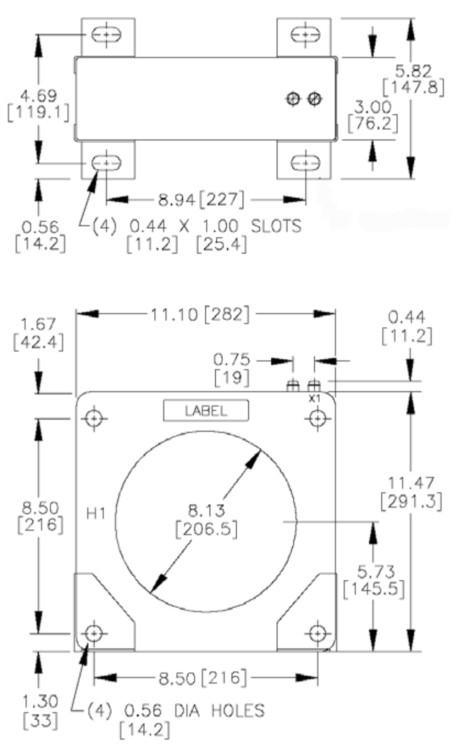
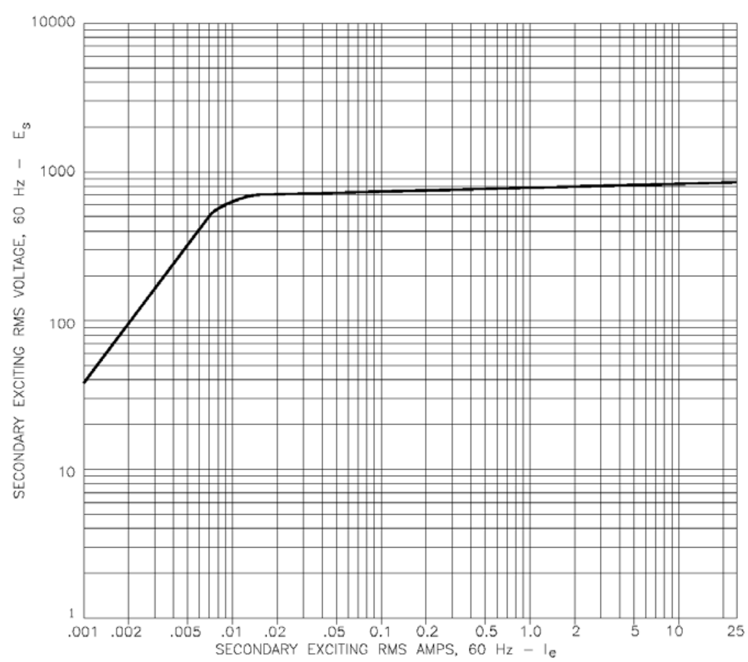
HGF8





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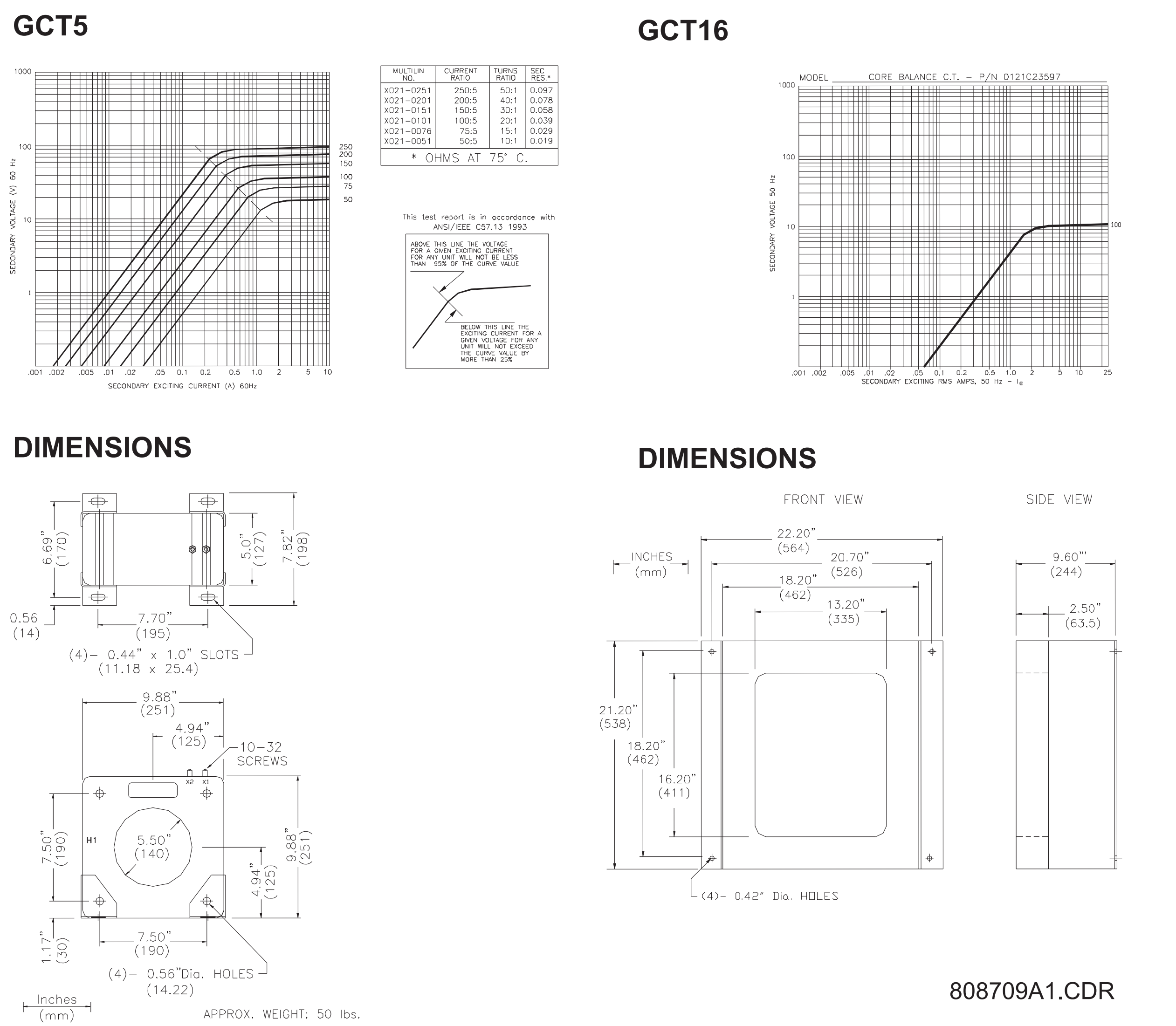
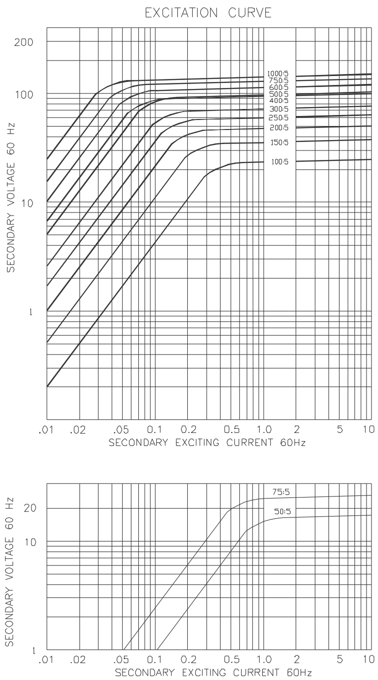
8.3.2 Ground Fault CTs for 5 A Secondary CT

For low resistance or solidly grounded systems, a 5 A secondary CT should be used. Two sizes are available with 5½" or 13" × 16" windows. Various Primary amp CTs can be chosen (50 to 250).



8.3.3 Phase CTs

Current transformers in most common ratios from 50:5 to 1000:5 are available for use as phase current inputs with motor protection relays. These come with mounting hardware and are also available with 1 A secondaries. Voltage class: 600 V BIL 10 kV.



CURRENT TRANSFORMER SPECIFICATIONS				
CURRENT RATIO	WINDOW SIZE	CT CLASS	MULTILIN No.	CT Dims.
50:5	2.75"	C10	X911-0010	A
75:5	2.75"	C10	X911-0011	A
100:5	3.00"	C10	X911-0012	B
150:5	3.00"	C10	X911-0013	B
200:5	3.00"	C20	X911-0014	B
250:5	3.00"	C20	X911-0015	B
300:5	3.00"	C20	X911-0016	B
400:5	3.00"	C20	X911-0017	B
500:5	3.00"	C50	X911-0018	B
600:5	3.00"	C50	X911-0019	B
750:5	3.00"	C50	X911-0020	B
1000:5	3.75"	C50	X911-0021	B

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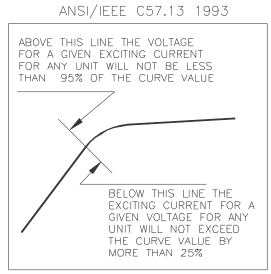
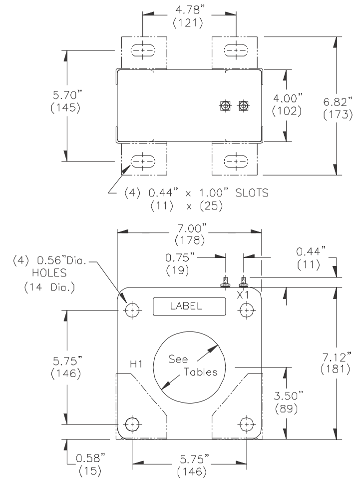
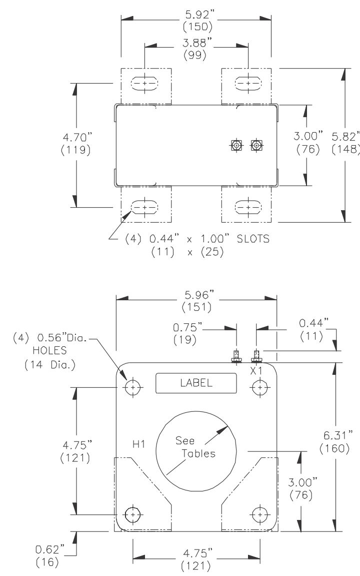
This test report is in accordance with ANSI/IEEE C57.13 1993





CT DIMENSIONS "A"



CT DIMENSIONS "B"

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8.4 EU Declaration of Conformity

8.4.1 EU Declaration of Conformity

EU DECLARATION OF CONFORMITY

Applicable Council Directive(s): 73/23/EEC The Low Voltage Directive
89/336/EEC The EMC Directive

Standards to Which Conformity is Declared:

IEC 1010-1:1990+ A 1:1992+ A 2:1995	Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use
EN 50263:	EMC Product Standard for Measuring Relays and protective Equipment

Manufacturer's Name: General Electric Multilin

Manufacturer's Address: 215 Anderson Ave.
Markham, Ontario, Canada
L6E 1B3

Manufacturer's Representative in the EU: Jokin Galletero
GE Multilin
Avenida Pinoa 10
48170 Zamudio, Spain
Tel.: 34-94-4858817 Fax: 34-94-4858838

Type of Equipment: Motor Protection Relay

Model Number: SR469

First Year of Manufacture: 1995

I the undersigned, hereby declare that the equipment specified above conforms to the above Directives and Standards.

Full Name: Jeff Mazereeuw

Position: Technology Manager

Signature:

Place: 215 Anderson Ave.
Markham, Ontario, Canada
L6E 1B3

Date: June. 11. 2004

8.5 Change Notes

8.5.1 Revision History

MANUAL P/N	REVISION	RELEASE DATE
1601-0122-A1	4.0x	February 09, 2004
1601-0122-A2	4.0x	May 21, 2004
1601-0122-A3	4.0x	May 27, 2005
1601-0122-A4	5.0x	July 12, 2006
1601-0122-A5	5.0x	February 9, 2007
1601-0122-A6	5.0x	March 24, 2008
1601-0122-A7	5.0x	October 7, 2008
1601-0122-A8	5.0x	September 15, 2009
1601-0122-A9	5.1x	April 15, 2010
1601-0122-AA	5.1x	July 13, 2011
1601-0122-AB	5.1x	February 8, 2012
1601-0122-AC	5.1x	March 30, 2012
1601-0122-AD	5.2x	October 19, 2012
1601-0122-AE	5.2x	February 1, 2013
1601-0122-AF	5.2x	July 16, 2013
1601-0122-AG	5.2x	November 6, 2013
1601-0122-AH	5.2x	January 23, 2015
1601-0122-AJ	5.2x	February 3, 2016

8.5.2 Changes to the 469 Manual

Table 8–1: Major Updates for 469 Manual Revision AJ

SECT (AH)	SECT (AJ)	CHANGE	DESCRIPTION
Title	Title	Update	Manual part number to 1601-0122-AJ
Table 4-1	Table 4-1	Update	Added self-test warning 9 and 10.

Table 8–1: Major Updates for 469 Manual Revision AJ

SECT (AH)	SECT (AJ)	CHANGE	DESCRIPTION
5.3.3	5.3.3	Update	Added alternate method for calculating current unbalance.
n/a	n/a	Update	Branding to Grid Solutions throughout.

Table 8–2: Major Updates for 469 Manual Revision AH

SECT (AG)	SECT (AH)	CHANGE	DESCRIPTION
Title	Title	Update	Manual part number to 1601-0122-AH, removed text from ISO image and added 10-year warranty image
2.2.9	2.2.9	Update	Updated Production Test to read 1 second
6.1.1	6.1.1	Update	Fixed page number references
6.2	6.2	Update	Re-ordered section for A1 Status
6.2.1	6.2.8	Update	Fill in missing menu information for Network Status
A.6.1	A.6.1	Update	Changed warranty to 10-year warranty

Table 8–3: Major Updates for 469 Manual Revision AG

SECT (AF)	SECT (AG)	CHANGE	DESCRIPTION
Title	Title	Update	Manual part number to 1601-0122-AG
2.1.3	2.1.3	Update	Updated order code. Discontinued: Basic Display
3.2.1	3.2.1	Update	Typical Wiring Diagram updated
3.2.12	3.2.12	Update	RS485 Communications Wiring updated

Table 8–4: Major Updates for 469 Manual Revision AF

SECT (AE)	SECT (AF)	CHANGE	DESCRIPTION
Title	Title	Update	Manual part number to 1601-0122-AF
3.2.4	3.2.4	Update	Revised Wiring diagram shown in Figure 3-18
3.2.4	3.2.4	Update	Changed caption for Figure 3-19

Table 8–4: Major Updates for 469 Manual Revision AF

SECT (AE)	SECT (AF)	CHANGE	DESCRIPTION
3.2.9	3.2.9	Update	Removed RTD motor terminals in Figure 3-22

Table 8–5: Major Updates for 469 Manual Revision AE

SECT (AD)	SECT (AE)	CHANGE	DESCRIPTION
Title	Title	Update	Manual part number to 1601-0122-AE
2.2.3	2.2.3	Update	Add Note 1 to section and to some specifications
2.2.5	2.2.5	Update	Add Note 1 to section and to some specifications
5.2.2	5.2.2	Update	Warning message

Table 8–6: Major Updates for 469 Manual Revision AD

SECT	SECT (AD)	CHANGE	DESCRIPTION
Title	Title	Update	Manual part number to 1601-0122-AD
	Gen	Update	Information on "Loss of Comms Trip/Alarm"

Table 8–7: Major Updates for 469 Manual Revision AB

SECT (AA)	SECT (AB)	CHANGE	DESCRIPTION
Title	Title	Update	Manual part number to 1601-0122-AB
5, 6	5, 6	Update	Expand "Display Tables" to show full readout
5	5	Correction	Typographical errors (2)
2.2.5	2.2.5	Update	Add "Motor Status" specification

Table 8–8: Major Updates for 469 Manual Revision AA

SECT (A9)	SECT (AA)	CHANGE	DESCRIPTION
Title	Title	Update	Manual part number to 1601-0122-AA

Table 8–8: Major Updates for 469 Manual Revision AA

SECT (A9)	SECT (AA)	CHANGE	DESCRIPTION
1.3.1	1.3.1	Update	Introduction changes: Passcode
5.2.1	5.2.1	Update	Passcode changes
2.2.7	2.2.7	Update	Supercap-backed clock information
5.2.4	5.2.4	Update	Supercap-backed clock information

Table 8–9: Major Updates for 469 Manual Revision A9

SECT (A8)	SECT (A9)	CHANGE	DESCRIPTION
Title	Title	Update	Manual part number to 1601-0122-A9
2.2.3	2.2.3	Update	Ground Inst O/C, Phase S/C Timing Accuracy changes
5.11.2	5.11.2	Update	Power Factor changes

Table 8–10: Major Updates for 469 Manual Revision A8

SECT (A7)	SECT (A8)	CHANGE	DESCRIPTION
Title	Title	Update	Manual part number to 1601-0122-A8
3.1.7	3.1.7	Revision	Figure 3-11 revised
3.2.1	3.2.1	Revision	Figure 3-12 revised
A.3.1	A.3.1	Revision	CT drawings revised

Table 8–11: Major Updates for 469 Manual Revision A7

SECT (A6)	SECT (A7)	CHANGE	DESCRIPTION
Title	Title	Update	Manual part number to 1601-0122-A7
5.11.6	5.11.6	Update	Change Pole Pairs to step 1

Table 8–12: Major Updates for 469 Manual Revision A6

SECT (A5)	SECT (A6)	CHANGE	DESCRIPTION
Title	Title	Update	Manual part number to 1601-0122-A6
2.1.3	2.1.3	Update	Change DC power supply range

Table 8–13: Major Updates for 469 Manual Revision A5

PAGE (A4)	PAGE (A5)	CHANGE	DESCRIPTION
Title	Title	Update	Manual part number to 1601-0122-A5.
2-14	2-14	Update	Changes to ELECTROSTATIC DISCHARGE value

Table 8–14: Major Updates for 469 Manual Revision A4

PAGE (A3)	PAGE (A4)	CHANGE	DESCRIPTION
Title	Title	Update	Manual part number to 1601-0122-A4.
3-22	3-22	Update	Updated DIELECTRIC STRENGTH section

Table 8–15: Major Updates for 469 Manual Revision A3

PAGE (A2)	PAGE (A3)	CHANGE	DESCRIPTION
Title	Title	Update	Manual part number to 1601-0122-A3.
5-47	5-47	Update	Updated THERMAL MODEL COOLING diagram to 808705A2

Table 8–16: Major Updates for 469 Manual Revision A2

PAGE (A1)	PAGE (A2)	CHANGE	DESCRIPTION
Title	Title	Update	Manual part number to 1601-0122-A2.

Table 8–16: Major Updates for 469 Manual Revision A2

PAGE (A1)	PAGE (A2)	CHANGE	DESCRIPTION
Additional changes for revision A2 were cosmetic. There was no change to content.			

8.6 GE Warranty

8.6.1 Warranty

For products shipped as of 1 October 2013, GE warrants most of its GE manufactured products for 10 years. For warranty details including any limitations and disclaimers, see our Terms and Conditions at http s://www.gegridsolutions.com/multilin/warranty.htm

For products shipped before 1 October 2013, the standard 24-month warranty applies.

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Maintenance and Field Testing Guide

Guía de pruebas en campo y servicios de mantenimiento

Guide d’essai sur place et d’entretien

for Masterpact™ NT and NW Circuit Breakers / para los interruptor de potencia Masterpact™ NT y NW / pour disjoncteurs Masterpact^{MC} NT et NW

Instruction Bulletin / Boletín de instrucciones / Directives d’utilisation

0613IB1202 R08/15
08/2015

Retain for future use. / Conservar para uso futuro. / À conserver pour usage ultérieur.

Maintenance and Field Testing Guide

for Masterpact™ NT and NW Circuit Breakers

Class 0613

Instruction Bulletin

ENGLISH

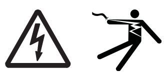
0613IB1202 R08/15
08/2015

Retain for future use.

Schneider Electric™

Hazard Categories and Special Symbols

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER
DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING
WARNING indicates a hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION
CAUTION indicates a hazardous situation which, if not avoided, **can result in** minor or moderate injury.

NOTICE
NOTICE is used to address practices not related to physical injury. The safety alert symbol is not used with this signal word.

NOTE: Provides additional information to clarify or simplify a procedure.

Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

FCC Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. This Class A digital apparatus complies with Canadian ICES-003.

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Section 1— Introduction

The service life of circuit breakers depends on proper application, correct installation, environmental conditions and preventive maintenance.

To maintain the device's operating and safety characteristics, Schneider Electric™ recommends that systematic checks and periodic maintenance be carried out by qualified personnel.

The standard generally used as a basis for field-testing requirements is the National Electrical Manufacturers Association® standard, NEMA AB 4, "Guidelines for Inspection and Preventive Maintenance of Molded Case Circuit Breakers Used in Commercial and Industrial Applications". If additional information, assistance, or on-site service is required contact the local field sales office.

The inspection, preventive maintenance, and field-testing instructions provided in this document are intended for use with Masterpact™ NT and NW circuit breakers with the Micrologic™ electronic trip system. Please read this document carefully and keep it at hand. It provides detailed information on:

- the various types of maintenance required.
- what must receive maintenance.
- the risks involved if the component ceases to operate correctly.
- what is understood by the terms normal, improved and severe environment and operating conditions.
- the periodic preventive maintenance that should be carried out under normal environment and operating conditions as well as the level of competence required for the operations.
- the environment and operating conditions that accelerate device aging and the limits governing use of mechanical and electric accessories and subassemblies.
- the product guides available in order to maintain the device in proper operating condition.

This publication is not intended, nor is it adequate, to verify proper electrical performance of a circuit breaker that has been disassembled, modified, rebuilt, refurbished, or handled in any manner not intended or authorized by Schneider Electric.

Safety Precautions

1. Only qualified electrical workers with training and experience on low-voltage circuits should perform work described in these instructions. Workers must understand the hazards involved in working with or near low-voltage equipment. Such work should be performed only after reading this complete set of instructions.
2. Some inspections or procedures require that certain parts of the electrical system remain energized at hazardous voltage during the procedure. Observe all specific safety messages (Danger, Warning, Caution) throughout this manual.
3. Wear personal protective equipment, recognize potential hazard, and take adequate safety precautions when performing the procedures outlined in this manual.

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Types of Maintenance

There are three types of maintenance discussed in this bulletin:

- Corrective
- Preventive
- Predictive

Corrective Maintenance

Corrective maintenance repairs items that are no longer functioning properly.

Incidents During System Startup

Many problems during system startup result from non-observance of the startup instructions or lack of knowledge concerning the equipment and/or switchgear procedures. Schneider Electric user guides contain instructions for operators or maintenance personnel on how to correct these problems.

- The list of the available user guides and data bulletins may be found at the end of this document.
- The PDF files for these documents may be downloaded from the www.schneider-electric.com site.

Incidents During Operation

Contact the local field sales office.

Preventive Maintenance

Preventive maintenance consists in carrying out, at predetermined intervals or according to prescribed criteria, checks intended to reduce the probability of a failure or deterioration in the operation of a system.

There are two types of preventive maintenance:

- Periodic maintenance
  For each type of product, maintenance recommendations are intended to maintain systems or their subassemblies in correct operating condition over the targeted service life, and must be carried out according to the time intervals stipulated in this document.
  Under no circumstances can Schneider Electric be held responsible for any damage caused by the failure of a device if the periodic checks were not carried out in accordance with the recommendations in this document.
- Conditional maintenance
  Conditional maintenance is performed when programmed alarms indicate that a predefined threshold has been reached. To that end, sensors must be installed on the switchgear and in the switchboard.
  To a certain extent, conditional maintenance reduces the recommended periodic maintenance that requires an annual shutdown of the installation. Conditional maintenance is the means to optimize installation maintenance. For more information on the possibilities offered by conditional maintenance, contact Schneider Electric Services.

Predictive Maintenance

Predictive maintenance is based on the recording and analysis of system parameters to detect drift from the initial state and significant trends. Using predictive maintenance, the customer can anticipate the corrective action required to ensure equipment safety and continuity of service, and plan the action for the most convenient time.

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Section 2— Preventive Maintenance

The tables in this section provide recommended preventive maintenance and time intervals. Recommendations are based on the operating conditions of the device.

Table 1 – Preventive Maintenance

Maintenance Type	Done By	Operating Conditions	Frequency
Type II	Certified customer employee	Normal	Every year
		Favorable	Every two years
		Severe	Twice a year
Type III	Certified customer employee	Normal	Every two years
		Favorable	Every four years
		Severe	Every year
Type IV	Schneider Electric Service	All	• Every five years • After tripping due to a short-time or instantaneous short-circuit • After five trips due to overloads.
Storage Check	Certified customer employee	All	After prolonged storage

Operating Conditions

Normal Conditions

Table 2 – Normal Operating and Environmental Conditions

Temperature	Average annual temperature < 77°F (25 °C) outside the switchboard
Percent load	< 80% of I_n (sensor rating)
Harmonics	Harmonic current per phase < 30% of I_n (sensor rating)
Relative humidity	< 70%
Corrosive atmosphere	Device installed in environment category 3C1 or 3C2 (IEC 60721-3-3) in Tables 14 and 20
Salt environment	No salt mist
Dust	Low level Device protected in switchboard equipped with filters or ventilated IP54 (Nema 3) enclosure
Vibration	Permanent vibration < 0.2 g

Under these conditions, the maintenance that must be carried out every one, two or five years on Masterpact NT/NW subassemblies and the level of competence required on the part of service agents are described in the tables on pages 11, 12, and 13.

At the end of each five year period, the maintenance guide must be systematically repeated.

Beyond the above limits, the circuit breakers suffer accelerated aging that may result in malfunctions. For this reason, periodic checks must be carried out at shorter time intervals. On the other hand, when special efforts are made to improve the operating and environment conditions, the preventive-maintenance operations can be carried out less often.

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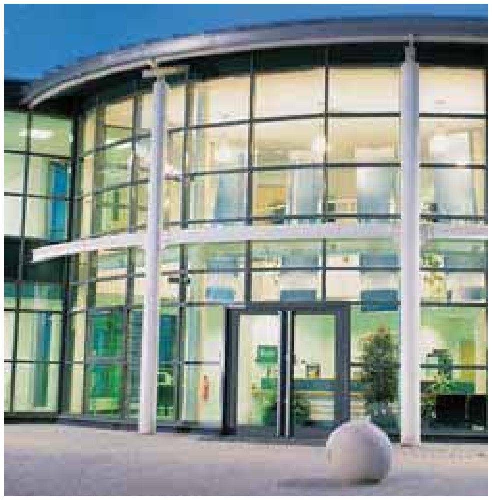
Favorable Conditions

The time interval between Type II and Type III preventive maintenance can be doubled if **all** of the conditions presented below are met. The Type IV preventive maintenance program is still recommended for every 5th year.

Table 3 – Favorable Operating and Environmental Conditions

Protection	Device is protected from environmental conditions
Temperature	Average annual temperature < 77°F (25 °C) outside the switchboard. The device is installed in an air-conditioned room or in a ventilated enclosure
Percent Load	< 50% of I_n (sensor rating)
Relative Humidity	< 50%
Corrosive Atmosphere	Device installed in a protected room (air is conditioned and purified)
Salt Environment	None
Dust	Negligible Device protected in switchboard equipped with filters or ventilated IP54 (Nema 3) enclosure
Vibration	None

Figure 1 – Favorable Conditions



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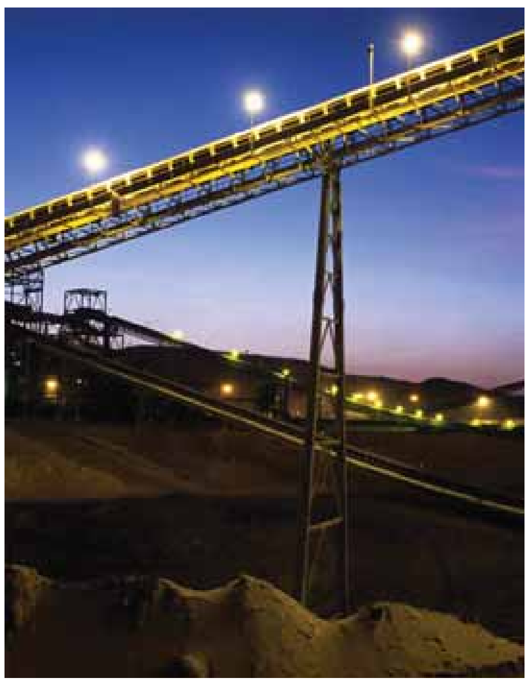
Severe Conditions

The time interval between two preventive maintenance visits must be reduced by half **if any of the conditions** presented below are present unless the device is protected from the condition.

Table 4 – Severe Operating and Environmental Conditions

Temperature (annual average)	Average annual temperature between 95 °F and 113 °F [35 °C and 45 °C] around the switchboard
Percent Load	> 80% of I_n (sensor rating)
Relative Humidity	> 80%
Corrosive Atmosphere	Device installed in environment category 3C3 or 3C4 without any particular protection, see Table 14
Salt Environment	Installation < 6.2 miles (10 kilometers) from seaside and device without any particular protection
Dust	High level of dust and equipment is not protected See Table 13
Vibration	Continuous vibrations between 0.2 and 0.5 g

Figure 2 – Severe Conditions



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Preventive Maintenance Operations

Level II Preventive Maintenance

It is recommended that Level II preventive maintenance be done every year.

Level II maintenance consists of minor preventive maintenance such as greasing and operating checks, as well as repairs by standard exchange of certain assemblies, carried out by a certified customer employee according to the manufacturer maintenance instructions. See the instruction bulletin and user guides for procedures. See Section 4 for what must be maintained.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462, or NOM-029-STPS.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Disconnect all power sources before performing maintenance inspections. Assume that all circuits are live until they are completely de-energized, tested, grounded and tagged. Consider all sources of power, including the possibility of backfeeding and control power.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

Table 5 – Level II Preventive Maintenance

Check	Year					Tool
Device	1	2	3	4	5[1]	
Check the general condition of the device (accessory cover, trip unit, case, cradle, connections)	X	X	X	X	X	None
Mechanism						
Open/close device manually and electrically	X	X	X	X	X	None
Charge device electrically	X	X	X	X	X	None
Check complete closing of device's poles	X	X	X	X	X	None
Check number of device operating cycles	X	X	X	X	X	Operation counter
Breaking Unit (Arc Chutes + Contacts)						
Check the filters cleanliness and the attachment of the arc-chute	X	X	X	X	X	Racking crank
Control Accessories						
Check auxiliary wiring and insulation	X	X	X	X	X	None
Trip Unit						
Trip trip unit using test tool and check operation of contacts SDE and SDE2	X	X	X	X	X	HHTK or FFTK
Check ground fault protection function (Micrologic 6.0)	X	X	X	X	X	None
Device Locking						
Open and close keylocks installed on device	X	X	X	X	X	None
Open and close padlock system installed on device	X	X	X	X	X	None
Cradle (For Drawout Circuit Breakers)						
Remove device from cradle and put it back	X	X	X	X	X	None
Check operation of position contacts (CE, CT, CD, EF)	X	X	X	X	X	None
Check operation of safety shutters	X	X	X	X	X	None
Cradle Locking						
Open and close keylocks installed on cradle	X	X	X	X	X	None
Operate padlocking system	X	X	X	X	X	None

[1] These checks and tests will be carried out by Schneider Electric Services in case of diagnostic the fifth year (see page 13).

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Level III Preventive Maintenance

It is recommended that Level III preventive maintenance be done every two years.

Level III maintenance consists of preventive maintenance such as general adjustments, troubleshooting and diagnosis of breakdowns, repairs by exchange of components or functional parts, minor mechanical repairs, carried out by a qualified customer technician using the tools specified in the manufacturer maintenance instructions. See the instruction bulletin and user guides for procedures.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462, or NOM-029-STPS.
- This equipment must be installed and serviced by qualified electrical personnel.
- Disconnect all power sources before performing maintenance inspections. Assume that all circuits are live until they are completely de-energized, tested, grounded and tagged. Consider all sources of power, including the possibility of backfeeding and control power.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

Table 6 – Level III Preventive Maintenance

Check	Year					Tool
Mechanism	1	2	3	4	5[1]	
Check spring charging motor charging time at 0.85 of rated voltage		X		X	X	Stopwatch + external power supply
Check general condition of mechanism		X		X	X	Screwdriver
Breaking Unit (Arc Chutes + Contacts)						
Check condition of breaking unit		X		X	X	Screwdriver
Control Accessories						
Check operation of indication contacts (OF / PF / MCH)		X		X	X	External power supply
Check closing operation of control auxiliary XF		X		X	X	Ohmmeter
Check opening operation of control auxiliary MX at 0.70 of rated voltage		X		X	X	External power supply
Check operation of control auxiliary MN/MNR between 0.35 and 0.7 of rated voltage		X		X	X	External power supply
Check delay of MNR devices at 0.35 and 0.7 of rated voltage		X		X	X	External power supply
Check MX tripping time		X		X	X	Tester
Trip Unit						
Check tripping curves using test tool, signaling LED (tripped, overload). Save results on PC		X		X	X	FFTK FFTK report generator
Cradle (For Drawout Circuit Breakers)						
Remove dirt and any foreign material, then regrease cradle		X		X	X	Mobilith® SHC00
Regrease disconnecting contact clusters (specific case of corrosive atmosphere)		X		X	X	Mobilith SHC00
Power Connections						
Check and tighten loose connections	Only after a visual inspection showing overheating marks					Racking crank

[1] These checks and tests will be carried out by Schneider Electric Services in case of diagnostic the fifth year (see page 13).

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Level IV Preventive Maintenance

It is recommended that Level IV preventive maintenance be done every five years.

Level IV maintenance consists of manufacturer diagnostic and replacement of components by the Schneider Electric Services support department. See the instruction bulletin and user guides for procedures.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462, or NOM-029-STPS.
- This equipment must be installed and serviced by qualified electrical personnel.
- Disconnect all power sources before performing maintenance inspections. Assume that all circuits are live until they are completely de-energized, tested, grounded and tagged. Consider all sources of power, including the possibility of backfeeding and control power.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

Table 7 – Level IV Preventive Maintenance

Check	Year					Tool
Case	5	10	15	20	25	
Measure insulation resistance	X	X	X	X	X	Ohmmeter
Mechanism						
Check tripping forces (crescent shaped part)	X	X	X	X	X	Tester
Breaking Unit (Arc Chutes + Contacts)						
Measure resistance of input/output contact	X	X	X	X	X	Ohmmeter + injection unit
Control Accessories						
Check the service life of the accessories XF, MX, MN	X	X	X	X	X	“service life” software
Preventative replacement of control accessories	—	—	X	—	—	None
Micrologic Trip Unit						
Check continuity of the tripping chain by primary injection for each phase	X	X	X	X	X	Injection unit
Cradle (For Drawout Circuit Breakers)						
Check connection/disconnection torque	X	X	X	X	X	Racking crank
Clean and regrease racking screw	X	X	X	X	X	Grease

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Maintenance After Storage

Storage Conditions

Devices must be stored in a dry, ventilated area, protected from rain, water and chemical agents. They must be well protected against dust, rubble, paint, etc.

If storage is for an extended period, the following storage conditions are necessary:

- relative humidity in the room must be maintained below 70%.
- circuit breakers with trip units without LCD displays may be stored in the original packaging at temperatures between -40 °F to +185 °F (-40 °C to +85 °C).
- circuit breakers with trip units with LCD displays may be stored in the original packaging at temperatures between -13 °F to +185 °F (-25 °C to +85 °C).
- devices must be stored in the open (OFF) position with the charging springs discharged.

Checks and Maintenance

After extended storage, the checks below must be carried out before installation to ensure correct device operation.

Storage ≤ 2 years

Run the Level II and III second year program on the subassemblies below:

- mechanism
- trip unit
- device and cradle locking
- cradle

Storage > 2 years

Run the Level III and IV fifth year diagnostic program on the subassemblies below:

- mechanism
- control accessories
- trip unit
- device and cradle locking
- cradle

If the devices were stored under severe conditions (high temperature, corrosive atmosphere), it is necessary to:

- check the surface condition of the metal parts (zinc) and the copper parts (silver coatings [Ag] or tinning [Sn]).
- check the greasing for the device and cradle.
- regrease the clusters and check primary contacts.

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Section 3— Accelerated Aging

Causes of Accelerated Aging

A switchboard and the switchgear age, whether they are in operation or not. Aging is due primarily to the influence of the environment and the operating conditions.

Influence of the environment

A device placed in a given environment is subjected to its effects.

The main environmental factors that accelerate device aging are:

- temperature
- percent load
- relative humidity
- salt environment
- current harmonics
- dust
- corrosive atmospheres.

Table 8 – Ambient Temperature (Outside the Switchboard)[1]

Influence	Appearance	Consequences
The mechanical characteristics of plastic parts (insulation, case) are increasingly deteriorated by temperature the higher it rises.	Change in color	Breaking of parts leading to failure of functions
Hardening of grease Elimination of grease on primary contact clusters	Change in color and viscosity Caramel color of grease on clusters	Device cannot be operated Increase of racking forces exerted on clusters
Deterioration of insulating varnishes on coils	Burning smell.	Failure of coils (CT, MN, MX, XF, MCH, electrical reset).
Hardening of glues on labels	Visual	Loss of labels
Deterioration of electronic components	Modified display of LCDs	Loss of display Nuisance tripping or no tripping
Deterioration of opto-electronic devices and SCRs.	Not identifiable	Possible transmission of erroneous orders
Loss of battery backup power	Not identifiable	Fault indications not displayed
Temperature Thresholds in °C		
≤ 77°F (25°C)	78–95°F (26–35°C)	96–113°F (36–45°C)
Optimum operating conditions	An 18°F (10°C) increase in the ambient temperature is equivalent to a 5% increase in the percent load	A 35°F (20°C) increase in the ambient temperature is equivalent to a 10% increase in the percent load
Recommendation		
Preventive maintenance		
Implement the standard program	Carry out more frequent periodic checks (see page 8)	Carry out more frequent periodic checks (see page 8)
Installation		
No particular precautions required	No particular precautions required	Install forced-air ventilation in the switchboard or air-conditioning for the electrical room

1 The ambient temperature affects the device temperature, which is affected by the percent load. Major variations in temperature (greater than 54°F [30°C]) cause both mechanical stresses (thermal expansion) and condensation that can accelerate aging.

Table 9 – Percent Load (Sensor Rating I_n)[1]

Influence	Appearance	Consequences
Aging of plastic insulation	Change in color of insulation	Breaking of parts leading to failure of functions
Aging of grease	Change in color and viscosity	Increase in mechanical friction
Aging of electronic components	Modified display of LCDs	A 10°C increase (i.e. a 90% load) cuts the service life of components by approximately half.
Deterioration of characteristics: • steel springs (above 100°C) • stainless steel springs (above 200°C)	Rupture	Non-operation of mechanism

Thresholds				
≤ 80, 24/24 hours	≤ 90%, 8/24 hours	≤ 90%, 24/24 hours	I_n, 8/24 hours	I_n, 24/24 hours
Maximum percent load generally taken into account in sizing the installation. At this percent load, temperature rise is reduced approximately 40% with respect to a 100 percent load.	At this percent load, temperature rise is reduced only 20%. Heating and cooling cycles impact on the mechanical junctions of the power circuit.	The thermal stress for continuous operation is three times higher than in the previous case, but the absence of thermal cycles slows aging of the electromechanical components.	Between 90 and 100%, temperature rise is close to its maximum value. Heating and cooling cycles impact on the mechanical junctions of the power circuit, with major impact on aging.	Between 90 and 100%, temperature rise is close to its maximum value. This situation has a major impact on aging.
Recommendations				
Preventive Maintenance				
Implement the standard program	Increase frequency of periodic checks (see page 8)	Preventive maintenance is difficult due to the continuous process	Increase frequency of periodic checks (see page 8)	Preventive maintenance is difficult due to the continuous process. Plan more frequent periodic checks.
Installation				
			Provide ventilation for switchboard	Spread the load over other circuit breakers Install a device with a higher rating.

1 The percent load affects the device temperature, which is itself affected by the ambient temperature.

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Table 10 – Relative Humidity

Influence	Appearance	Consequences
Corrosion of metal surfaces that is accelerated when a pollutant is present (corrosive gas, salt, chlorine, etc.)	Appearance of: • red rust on iron • white rust on zinc • blue deposit on copper • black deposit on silver	Increase in friction Risk of mechanical rupture resulting in non-operation of mechanisms Increase in contact resistance (clusters and main contacts)
Deterioration of dielectric qualities of plastics	White traces on case	Risk of a reduction in insulation
Deterioration of electronic components, in particular printed circuit boards and silver-coated components. This phenomenon is worsened by the presence of H_2S corrosive gas (hydrogen sulphide).	Not visible Appearance of dendrites on electronic boards	Short-circuiting of circuits resulting in non-operation of control-unit protection, measurement, indication and communication functions.
Deterioration of electronic components, in particular non-varnished copper circuits.	Not visible Erosion of copper tracks Oxidation of metal connectors of components and metal cases Oxidation of connectors of integrated-circuits mounted on supports	Failure due to short-circuit or open circuit Rupture of component connectors along case Poor contact with integrated-circuit supports
Degradation of opto-electronic components.		Failure of data transmission.
Thresholds in%		
< 70%	70 to 85%	> 85%
Level of relative humidity generally found in continental and temperate zones. The level is generally lower in switchboards due to the internal temperature rise. No significant deterioration is noted at this level.	Level of relative humidity generally found in zones close to water. Possible appearance of condensation on cold parts and accelerated rusting.	Level of relative humidity generally found in tropical zones and certain factories (e.g. paper mills). Increased risk of condensation and rust resulting in difficulties to disconnect devices, risk of non-opening or non-closing.
Recommendation		
Preventive Maintenance		
Preventive maintenance	Carry out more frequent periodic checks (see page 8) Measurement of insulation is advised every 5 years	Carry out more frequent periodic checks (see page 8) Inspect for rust on metal parts Measurement of insulation is imperative every two years
Installation		
No particular precautions required		Install heating elements in the switchboard

Figure 3 – High-Humidity Environment Greenhouse

Table 11 – Salt Environment

Influence	Appearance	Consequences
Corrosion of metal parts	Appearance of: • white rust on zinc coatings • red rust on steel	Increase in friction. Freezing of mechanism Broken springs. Blocking of cores of MX / XF / MN control accessories.
Risk of salt deposits on electronic circuit when thick salt mists occur.	Appearance of salt bridges on electronic boards.	Failure of electronic systems due to short-circuiting of circuits, particularly non-varnished circuits.
Risk of conducting salt deposits on the device when thick salt mists occur.	White deposit	Deterioration of device dielectric withstand resulting in risk of phase-to-frame short circuit and a phase-to-phase short circuit if an overload occurs.
Thresholds		
No salt mist	Moderate salt mist < 6 miles (10 km)from seaside	Significant salt mist < 0.6 miles (1 km) from seaside
No influence.	Moderate aging of switchgear.	Rapid aging of exposed switchgear. On average, service life is divided by a factor of three for non-protected devices.
Recommendation		
Preventive Maintenance		
Implement the standard program.	Carry out more frequent periodic checks (see page 8).	Carry out more frequent periodic checks (see page 8). Test the dielectric withstand every two years.
Installation		
No particular precautions required.	No particular precautions required.	Switchgear must be protected from salt mist. Increase the switchboard protection category to IP54 (NEMA 3). Create a protected room.

Figure 4 – Salt Environment (Seaside)

Table 12 – Harmonics

Influence	Appearance	Consequences
Increase in skin effect, proximity effect, iron losses, eddy currents	Change in color of terminals, insulators and grease Modified display of LCDs	Harmonics cause temperature rise greater than that of the fundamental current
Possible overload of neutral if third-order harmonics and their multiples are present	Distorted waveform	Erroneous current value Nuisance tripping if non-rms trip units
Thresholds in % of I_n		
THDi y 30%	THDi 30 to 50%	THDi > 50%
No notable influence on aging	At 40% THDI, heat loss is approximately 10% higher, corresponding to 5% more current	
Recommendation		
Preventive Maintenance		
Implement the standard program	Carry out more frequent periodic checks (see page 8)	Carry out more frequent periodic checks (see page 8)
Installation		
No particular precautions required	Standard filtering with an inductor to reduce harmonics	If necessary, oversize the neutral Oversize switchgear

Figure 5 – Harmonics

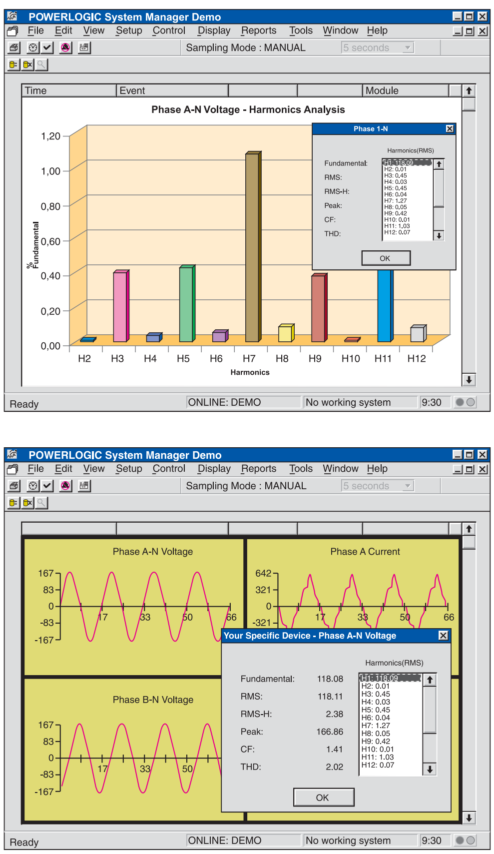

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Table 13 – Dust

Influence	Appearance	Consequences
Deposit on grease of mechanisms (device and cradle)	Change in color and texture of greases	Premature wear of mechanisms because dust mixed with grease can be abrasive Increase in mechanical friction and freezing of moving parts Risk of device not moving on cradle Risk of device non-opening or non-closing
Deposit on grease of clusters	Change in color and texture of greases	Increase in racking forces exerted Increased contact resistance and temperature rise
Deposit on displays		Screen data not legible
Deposit on insulation		Reduced insulation resistance (depends on type of dust) This phenomenon is worsened by the presence of humidity
Deposit on device contacts		Increased contact resistance and temperature rise
Deposit on opto-electronic communication system		Failure of communication-data transmission between devices
Dust Deposit		
Low Level	Moderate	High
Quantity of dust generally deposited on and around devices in commercial buildings and on standard industrial premises	Quantity of dust found in **protected switchboards** installed in dusty environments such as cement works, grain mills, incineration installations, plastic and steel mills, mines, etc.	Quantity of dust deposited on and around devices inside **non-protected switchboards** installed in dusty environments such as cement works, grain mills, incineration installations, plastic and steel mills, mines, etc.
Recommendations		
Preventive maintenance		
Implement the standard program It is advised to vacuum cleaner dust deposits	Carry out more frequent periodic cleaning (see page 8)	Carry out more frequent periodic cleaning (see page 8)
Installation		
Switchboard with standard IP (NEMA 1)	Make sure the switchboard remains closed	Special equipment required to protect the switchgear is mandatory

Figure 6 – Dust Occurrence

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Table 14 – Corrosive Atmosphere

Corrosive atmosphere	Influence	Appearance	Consequences	Thresholds (ppm[1] in volume) Average value (see next page for Categories 3C1, 3C2, 3C3, 3C4)
SO_2 Sulphur dioxide	Corrosion of silver, aluminum and bare copper. Phenomenon accelerated by high temperature and relative humidity.	Blackening of exposed silver surfaces. Appearance of dendrites on electronic and power circuits.	Increased resistance of disconnecting contacts exposed to air. Excessive device temperature rise. Short-circuiting of circuits resulting in non-operation of the trip unit.	3C1: 0.037 3C2: 0.11 3C3: 1.85 3C4: 4.8
H_2S Hydrogen sulphide	Sulphurization of silver, this phenomenon is accelerated by high temperatures.	Major blackening of exposed silver surfaces. Appearance of dendrites on electronic and power circuits.	Increased resistance of disconnecting contacts exposed to air. Excessive device temperature rise. Short-circuiting of circuits resulting in non-operation of the trip unit.	3C1: 0.0071 3C2: 0.071 3C3: 2.1 3C4: 9.9
Cl_2 Chlorine	Corrosion of metal parts.	Oxidation Inter-granular corrosion of stainless steel.	Increase in friction. Risk of mechanical rupture. Breaking of stainless-steel springs.	3C1: 0.034 3C2: 0.034 3C3: 0.1 3C4: 0.2
NH_3 Ammoniac	Attacks polycarbonates, corrodes copper.	Cracking of polycarbonates. Blackening of copper.	Risk of rupture. Increased temperature rise.	3C1: 0.42 3C2: 1.4 3C3: 4 3C4: 49
NO_2 Nitrogen oxide	Corrosion of metal parts.	Oxidation.	Increased temperature rise.	3C1: 0.052 3C2: 0.26 3C3: 1.56 3C4: 5.2
Oily atmospheres	Attacks polycarbonates.	Cracking of polycarbonates.	Risk of rupture. Increased temperature rise.	

1 ppm = Parts Per Million.

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Table 15 – Environment Categories as per Standard IEC 60721-3-3

Class			
3C1	3C2	3C3	3C4
Rural zones or urban zones with low industrial activity.	Urban zones with scattered industrial activity and heavy traffic.	Immediate vicinity of industrial pollution. Example, paper mills, water treatment, chemicals, synthetic fibers, smelting plants.	Inside polluting industrial premises. Example: paper mills, water treatment, chemicals, synthetic fibers, smelting plants.
Presence of Corrosive Gases			
Negligible	Low level	Significant level	High level
Impact on switchgear			
No impact on service life because concentrations are very low.	Moderate impact on service life.	Major impact, particularly concerning temperature rise. For electronic systems, no impact on varnished boards and gold-plated contacts.	Significantly reduced service life if no particular precautions are taken. For electronic systems, no impact on varnished boards and gold-plated contacts.
Recommendation			
Preventive maintenance			
Implement the standard program.	Implement the standard program. "Pyratex" grease can be used for the disconnecting contacts, but must be changed annually (see the manufacturer procedure).	Carry out more frequent periodic checks (see page 8). Change the grease on the disconnecting contacts.	Carry out more frequent periodic checks (see page 8). Change the grease on the disconnecting contacts.
Installation			
No particular precautions required.	No particular precautions required.	Use fixed rather than drawout devices.	Install the switchgear in a room protected from the pollution. Use fixed rather than drawout devices, or use gold-plated disconnecting contacts.

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Operating Conditions

Operating conditions directly affect the service life of switchgear due to the limited electrical and mechanical endurance levels of the various subassemblies. Operating conditions include:

- vibrations,
- the number of operating cycles,
- the interrupted currents.

Table 16 – Vibrations

Influence	Appearance	Consequences	
Premature deterioration of contact surfaces (clusters and main contacts).	Not identifiable.	Increased device temperature rise.	
Loosening of bolted assemblies.	Not identifiable.	Increase in mechanical clearance.	
Wear of mechanical parts.	Not identifiable.	Broken springs. Increase in mechanical clearance between parts.	
Appearance of fretting corrosion on auxiliary connections.	Not identifiable.	Erroneous information or loss of continuity in data or supply, excessive temperature rise.	
Breaking of connectors on large electronic components (e.g. large capacitors).	Not identifiable.	Failure of protection function.	
Wear of adjustment switches on the trip unit.	Not identifiable.	Nuisance tripping or no tripping.	
Thresholds			
< 0.2 g	0.2 g to <0.5 g	0.5 g to 0.7 g	> 0.7 g
Normal condition, no impact on service life.	Reduced service life.	Significant increase in incidents.	Forbidden for standard devices
Recommendation			
Preventive maintenance			
Implement the standard program.	Carry out more frequent periodic checks (see table).	Carry out more frequent periodic checks (see page 8). Check in particular the tightness of connections.	
Installation			
No particular precautions required.	No particular precautions required. Install switchgear on a rubber mounting bushing.	Install switchgear on a rubber mounting bushing.	Use special devices.

Table 17 – Number of Operating Cycles

Influence		Consequences
The number of operating cycles depends directly on the electrical and mechanical endurance of the device.		Device service life depends on the daily number of operating cycles.
Device Service Life (depends on the daily number of operating cycles)		
≤ 30 cycles per month	≤ 60 cycles per month	≤ 120 cycles per month
Corresponds to one cycle per day. For a device endurance of 10,000 cycles and an interrupted current of less than 0.4 I_n, the service life is 30 years.	Corresponds to two cycles per day. For a device endurance of 10,000 cycles and an interrupted current of less than 0.4 I_n, the service life is 15 years.	Corresponds to four cycles per day. For a device endurance of 10,000 cycles and an interrupted current of less than 0.4 I_n, the service life is 10 years.

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Table 18 – Interrupted Current

Influence	Appearance	Consequences
Wear of fixed and moving contacts.	Deterioration of contacts.	Beyond the electrical-endurance limit, device temperature rise increases due to the greater contact resistance and a reduction in the pressure of contacts.
Wear of the arc chutes (insulating materials, separators).	Deterioration of insulation.	Beyond the electrical-endurance limit, the insulation separators). (input/output and between phases) is reduced, which results in a reduction of device suitability for isolation and can create an unsafe condition.
Thresholds		
≤ I_n (Sensor Rating)	> I_n to ≤ 4 I_n (Sensor Rating)	> $4I_n$ to ≤ 8 I_n (Sensor Rating)
This level of interrupted current corresponds to the mechanical durability (see Mechanical endurance).	This level of interrupted current corresponds to expected levels of short time events.	This level of interrupted current corresponds to the severe short circuit events. Requires inspection of contacts and arc chutes.

Figure 7 – Wear on Contacts

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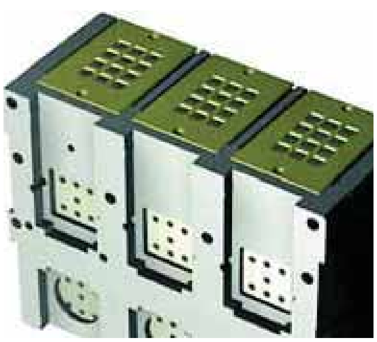
Section 4— What Must be Maintained

Inspect arc chamber/arc chutes, main contacts, spring charging motor, and trip devices after the operations listed in Table 19.

Table 19 – Electrical Operations

Circuit Breaker Type	Number of Electrical Operations (Open-Close Cycle)			
	Arc Chamber	Main Contacts	Spring-Charging Motor (MCH)	Trip Devices (MX/XF)
NW08–NW16 Types N/N1/H/H1/H2/H3/HA/HF	10,000	10,000	12,500	12,500
NW08–NW16 Types L/LF/L1/L1F/HB/HC	3,000	3,000	12,500	12,500
NW20 Types N/H/H1/H2/H3/HA/HF	8,000	8,000	10,000	12,500
NW20 Types L/LF/L1/L1F/HB/HC	3,000	3000	10,000	12,500
NW32 Types H1/H2/H3/HA/HF NW25-NW30 Types H/L/HB/HF	5,000	5,000	10,000	12,500
NW40B (W-Frame) Types H1/H2/H3/HA/HF	5,000	5,000	10,000	12,500
NW40–NW50-NW60 Types H/H2/H3/L/L1/HA/HB/HC/HF NW32 Type L1	1,500	1,500	5,000	12,500

Molded Case



The case is an essential element in the circuit breaker. First, it provides a number of safety functions by:

- providing functional insulation between the phases themselves and between the phases and the exposed conductive parts in order to resist transient overvoltages caused by the distribution system
- providing a barrier, preventing direct user contact with live parts
- protecting against the effects of electrical arcs and overpressures caused by short-circuits.

Second, it serves to support the operating mechanism as well as the mechanical and electrical accessories of the circuit breaker.

On the case, there should be:

- no traces of grime (grease), excessive dust or condensation which all reduce insulation
- no signs of burns or cracks which could weaken the case and thus its capacity to withstand short-circuits.

Preventive maintenance for cases consists of:

- a visual inspection of its condition and cleaning with a dry cloth or a vacuum cleaner. All cleaning products with solvents are strictly forbidden.
- Measuring the insulation every five years and following trips due to a short-circuit.

Replace the circuit breaker if there are signs of burns or cracks.

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Arc Chutes

During a short-circuit, the arc chute serves to extinguish the arc and to absorb the high level of energy along the entire path of the short-circuit. It also contributes to arc extinction under rated current conditions. An arc chute that is not in good condition may not be capable of fully clearing the short-circuit and ultimately result in the destruction of the circuit breaker.

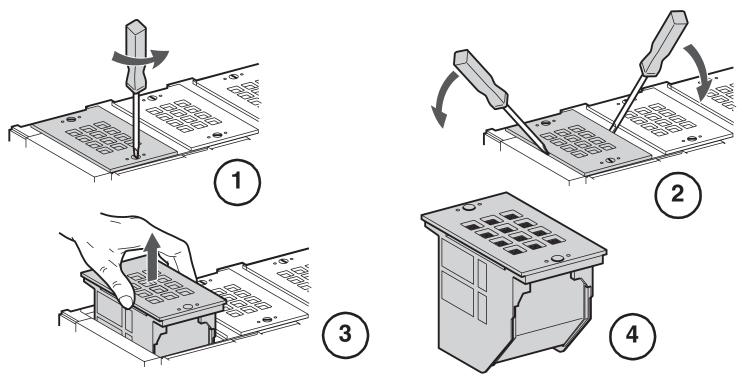
The arc chutes must be regularly checked. The fins of the arc chutes may be blackened (due to the gases produced at I_n) but must not be significantly damaged. What is more, the filters must not be blocked to avoid internal overpressures. Use a vacuum cleaner rather than a cloth to remove dust from the outside of the arc chutes.

Arc Chamber Maintenance

1. Unscrew the mounting screws.
2. Use screwdrivers to lift arc chamber from circuit breaker.
3. Remove arc chamber.
4. Inspect arc chamber. Check that arc chamber body is not broken and that the plates are intact and not significantly burned or melted.

If necessary, replace arc chamber.

Figure 8 – Arc Chamber Maintenance



Main Contacts

The contacts make and break the current under normal conditions (rated current for the installation) and under exceptional conditions (overloads and short-circuits). The contacts are eroded by the many opening and closing cycles and can be particularly deteriorated by short-circuit currents. Worn contacts may result in abnormal temperature rise and accelerate device aging.

It is imperative to remove the arc chutes and visually check contact wear at least once a year and following each short-circuit event.

The contact-wear indicators constitute an absolute minimum value that must not be overrun.

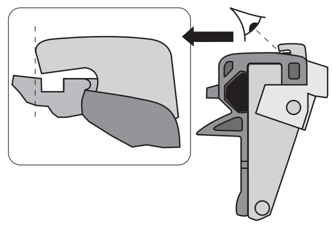
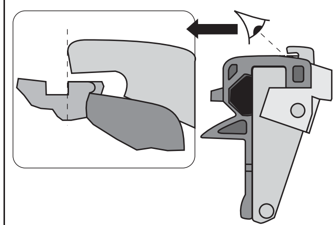
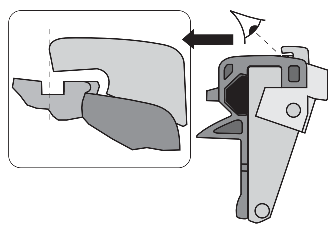
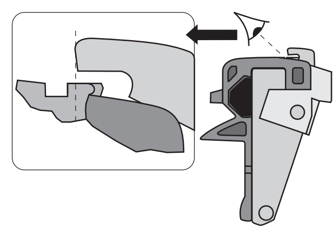
To plan and reduce the number of shutdowns, an electronic wear counter is available with the Micrologic P and H. A visual check is required when the counter reaches 100. When the counter reaches 300, the contacts are worn out and must be replaced.

Main Contact Maintenance

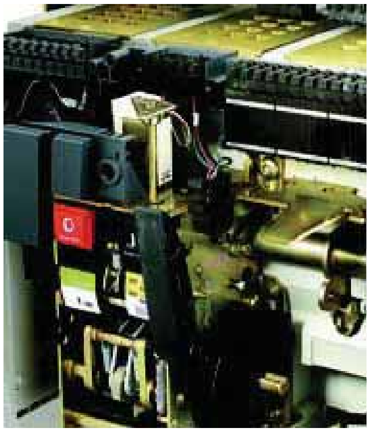
1. Remove the arc chambers.
2. Close the circuit breaker and check the condition of the contacts.

If contacts are worn, the circuit breaker block assembly must be replaced.

Table 20 – Contact Wear

Standard	Frame Size	Interruption Type	Poles	New Contacts	Contacts Need to be Replaced
ANSI	250 A	H1/H2/H3/N1	3P		
	3200–4000 A	H2/H3	3P		
	800–1600 A	N1	4P		
	800–2000 A	H1/HA	4P		
	800–2000 A	H2/H3/HF	3P/4P		
	3200 A	H1/HA/H2/H3/HF	4P		
	3200 A	HF	3P/4P		
UL	250 A	H/N	3P		
	2000–3000 A	L/HB	3P		
	800–3000 A	H/HF	3/4P/4P RHN		
	800–2000 A	N	3P/4P		
ANSI	250 A	L1/L1F	3P		
	800–2000 A	H1/HA/L1/HC/L1F	3P		
	3200–5000 A	L1/HC	3P		
	4000–5000 A	H2/HA/H3/HF	3P/4P		
	800–1600 A	N1	3P		
	3200–4000 A	H1/HA	3P		
UL	250 A	L/LF	30		
	4000–6000 A	H/HF	3P/4P/4P RHN		
	4000–6000 A	L/HB	3P		
	800–1600 A	L/HB	3P		
	800–2000 A	LF	3P		

Device and Cradle Mechanisms



Mechanical operation of the circuit breaker may be hindered by dust, vibration, aggressive atmospheres, no greasing, or excessive greasing. Operating safety is ensured by dusting and general cleaning, proper greasing, and regular opening and closing of the circuit breaker.

Dusting

Dusting is best carried out using a vacuum cleaner.

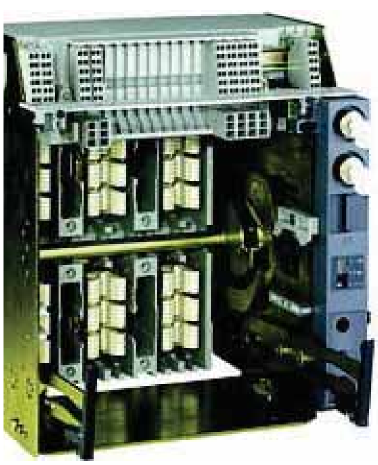
Cleaning

Cleaning should be carried out using a cloth or brush that is perfectly clean and dry, without using any solvents, avoiding greased parts except for grease on electrical contacts. Application of products under pressure or containing solvents (trichloroethane, trichloroethylene, WD40®) is strictly forbidden.

The main problems of products under pressure are the following:

- it may be impossible to regrease inaccessible lubrication points (which are greased for the life of the product)
- corrosion of points that are not regreased
- damage caused by the pressure
- risk of temperature rise due to the presence of an insulating solvent in the contact zones
- elimination of special protection
- deterioration of plastic materials.

Greasing



This operation is carried out after cleaning on certain mechanical parts as described in the maintenance procedures, using the various greases recommended by Schneider Electric. Grease must not be over applied because the excess, if mixed with dust, may result in mechanism malfunctions. Generally speaking, under normal operating conditions, the pole-operating mechanism does not require any regreasing as it is greased for the life of the product.

- The clusters and disconnecting-contacts must be greased according to the defined intervals using the greases indicated by Schneider Electric.
- The main contacts must not be greased.

Operating Cycles

The need for continuity of service in an installation generally means that power circuit breakers are rarely operated. While an excessive number of operating cycles accelerates device aging, it is also true that a lack of operation over a long period can result in mechanical malfunctions. Regular operation is required to maintain the normal performance level of each part involved in the opening and closing cycles.

In installations where power circuit breakers are used in source changeover systems, it is advised to periodically operate the circuit breaker for the alternate source.

Auxiliary Circuits

Control Accessories

MX and XF shunt releases are respectively used to remotely open and close the circuit breaker using an electrical order or through a communication network.

The MN undervoltage release is used to break the power circuit if the distribution system voltage drops or fails.

Communicating MX and XF releases and MN releases are continuously supplied and their internal electronic components may suffer accelerated aging if there is temperature rise in the circuit breaker.

Preventive maintenance consists of periodically checking operation at minimum values.

Auxiliary Wiring

Auxiliary wiring is used to transmit orders to the various control devices and to transmit status condition information. Incorrect connections or damaged insulation may result in either non-operation of the circuit breaker or nuisance tripping.

Auxiliary wiring must be regularly checked and replaced as needed, particularly if there are vibrations, high ambient temperatures or corrosive atmospheres.

Indication Contacts

The contacts indicating the status of the circuit-breaker (ON / OFF), of the cradle (CE, CD, CT), a trip due to an electrical fault (SDE), or that the circuit breaker is ready to close (PF) provide the operator with the status information required to react correspondingly. Any incorrect indications may result in erroneous device operation. Contact failure (wear, loose connections) may result from vibrations, corrosion or abnormal temperature rise and preventive maintenance must ensure that contacts correctly conduct or isolate according to their positions.

Spring Charging Motor

The spring charging motor (MCH) automatically recharges the operating-mechanism springs as soon as the circuit breaker is closed. The spring charging motor makes it possible to instantaneously reclose the device following an opening. This function may be indispensable for safety reasons. The charging lever serves simply as a backup means if the auxiliary voltage fails. Periodic checks on the spring charging motor operation and the charging time are required to ensure the device function.

Electronic Trip Unit

If an electric fault occurs in the installation, the electronic trip unit detects the fault and orders the circuit breaker to open.

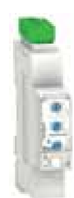
Electronic components and circuit boards are sensitive to the environment (ambient temperature, humid and corrosive atmospheres) and to severe operating conditions (magnetic fields, vibrations, etc.). To ensure correct operation, it is necessary to periodically check:

- the chain of action resulting in a trip
- the response time as a function of the level of the fault current.

Use HHTK or FFTK test kits for secondary injection testing or test with primary injection.

Communication Module and Accessories

I/O Module



IFM Module

IFE Module

Using the communication bus, the communication option transmits data to a remote site for use by various departments (maintenance, management, production, etc.).

A break in the transmission of data can result in:

- production losses due to unawareness concerning the status of a circuit breaker
- financial losses due to incorrect system management, diagnostic errors, etc.

Periodic checks on the orders (read, write, commands) transmitted by the communication bus are required to maintain a high degree of reliability and confidence in the communication system.

Connections

The connections between the various distribution systems in a switchboard (busbars, cables) and the switchgear are a major source of heat loss. Incorrect tightening may lead to thermal runaway which in turn can provoke damage to the device, the cable insulation, or result in a short-circuit and/or a fire. This type of malfunction is often due to disregard for installation requirements during switchboard assembly.

NOTE: Connections must never use different materials (copper/aluminium).

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Fixed Circuit Breakers

Fixed circuit breaker connections use lugs or bars. When made in compliance with Schneider Electric recommendations (tightening torque, hardware, and contact washer), this type of connection does not require any particular maintenance.

Otherwise, regularly check the temperature-rise points. If there is a change in color of copper or tinning:

- dismantle the connections
- clean and scrape the contact surfaces
- then reassemble the connections using new hardware.

Check the terminals.

Drawout Circuit Breakers (Cradle)

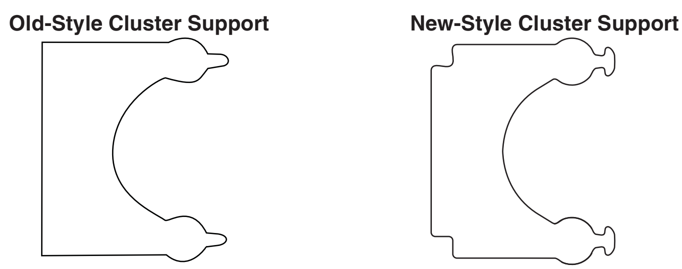
Drawout circuit breaker connections are made up of two parts, the clusters and disconnecting contacts. This type of connection is critical and requires periodic cleaning in compliance with the described procedures. The grease facilitates the connection between the clusters and the disconnecting contacts and avoids damaging the silver-coated surface by reducing the racking-in friction.

In sulphurous (corrosive) atmospheres (H_2S/SO_2), it is necessary to implement the cleaning procedure using the Thiourea solution, with mandatory regreasing using fluorous grease (such as Pyratex® EP). This type of grease protects the silver and copper-coated contacts against sulphurizing. Because silver or copper sulphide is insulating it creates an increase in the contact resistance and thus greater temperature rise. The grease breaks down over time and it is therefore necessary to replace it regularly.

Cluster Inspection and Lubrication (Masterpact NW Drawout Circuit Breakers Only)

1. If the circuit breaker is equipped with cluster retainers, remove the retainers as necessary to inspect the clusters and cluster supports.
2. If the circuit breaker is equipped with ArcBlok or cluster shields, use the S47542 cluster tool to remove the clusters for inspection.

Figure 9 – Cluster Support Profiles



Make sure clusters are installed properly as shown in Table 21.

3. Visually inspect clusters for wear or signs of damage such as:
   - — discolored areas
   - — visible copper on fingers
   - — cracked or broken springs
   - — missing clusters
   - — not aligned with other cluster (indicates spring damage)
4. Visually inspect clusters for wear.

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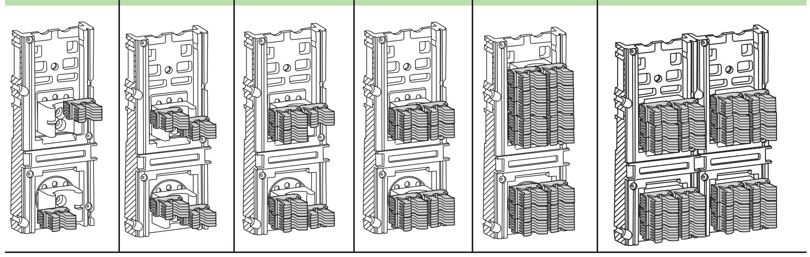
5. For circuit breakers with cluster retainers: check that all clusters have cluster retainers.

NOTE: Circuit breakers with cluster shields or ArcBlok shields do not need the cluster retention kits. Do not attempt to install the cluster retention kits on those circuit breakers.

Table 21 – Cluster Configuration

Number of Clusters Per Pole					
2	4	6	8	16	24



Cluster Replacement

NOTICE

HAZARD OF EQUIPMENT DAMAGE

- If clusters are removed for any reason, clusters must be installed using cluster positioning tool S47542.
- Lubricate clusters as shown in Cluster Lubrication on page 37.
- Do not install anything in the cluster jaw except 3/8 in. (9.5 mm) wide bus bar or Cluster Reset Tool, catalog number CLUSRETOOL.

Failure to follow these instructions can result in equipment damage.

If Masterpact NW clusters are worn or damaged, new clusters must be installed using cluster positioning tool S47542.

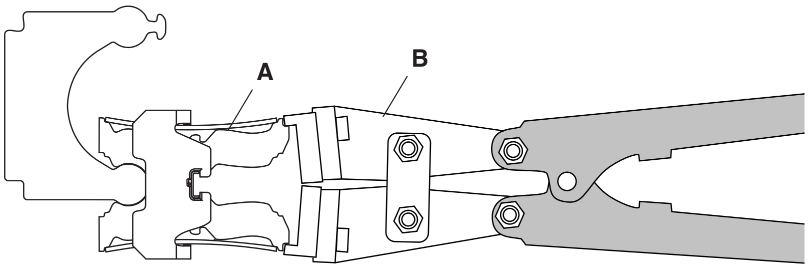
Table 22 – Number of Clusters Per Pole

Type		N/N1	H1	HA	H / H2 / H3 / HF	L / L1 / LF / L1F / HB / NC
V ∽	NW08	2	4	4	4 / 6 / 6 / 4	8
	NW12	2	—	—	4	8
	NW16	6	6	6	6	8
	NW20	8	8	8	8	16
	NW25 / NW30	—	—	—	16	16
	NW32	—	16	16	16	24
	NW40/NW50	—	—	24	24	24
	NW60	—	—	—	24	24
V ⎓	NW80 / NW12 / NW16 / NW20 / NW25	8				
	NW30 / NW40	16				

— Replace worn or damaged clusters on all cluster configurations.

— Install new clusters (Figure 10, A) using cluster positioning tool S47542 (B).

Figure 10 – Cluster Replacement



If clusters and cluster supports are not damaged and the circuit breaker is not equipped with a cluster shield or ArcBlok Shield, you can continue to use the cluster retainer kits. If necessary, retrofit using new cluster supports, finger clusters and cluster shields/ArcBlok shields.

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Table 23 – Cluster Retainer Kits

Description	Frame Size	Interruption Type	Clusters Per Pole	Cluster Retainer Kit		Retainer Color	
				3P	4P	Upper	Lower
UL489 Listed Masterpact NW Circuit Breaker	800/1600 A	N	2 or 6	CRK2000A3P	CRK2000A4P	No Color	No Color
		H	4 or 6	CRK2000A3P	CRK2000A4P	No Color	No Color
		L/LF	8	CRK2000A3P	N/A	No Color	No Color
	2000 A	N/H	8	CRK2000A3P	CRK2000A4P	No Color	No Color
		L/LF	16	CRK3000L3P	N/A	Red	Black
	2500/3000 A	H	16	CRK3200A3P	CRK3200A4P	Red	Black
		L	16	CRK3000L3P	N/A	Red	Black
	4000/5000/6000 A	H	24	CRK6000A3P	CRK6000A4P	Black	Black
		L	24	CRK6000A3P	N/A	Black	Black
UL489 Listed Masterpact NW Automatic Switches	800/1600 A	HF	4 or 6	CRK2000A3P	CRK2000A4P	No Color	No Color
		HB	8	CRK2000A3P	N/A	No Color	No Color
	2000 A	HF	8	CRK2000A3P	CRK2000A4P	No Color	No Color
		HB	16	CRK3000L3P	N/A	Red	Black
	2500/3000 A	HF	16	CRK3200A3P	CRK3200A4P	Red	Black
		HB	16	CRK3000L3P	N/A	Red	Black
	4000/5000/6000 A	HF	24	CRK6000A3P	CRK6000A4P	Black	Black
		HB	24	CRK6000A3P	N/A	Black	Black
ANSI C37 Certified Masterpact NW Circuit Breaker	800/1600 A	N1	2 or 6	CRK2000A3P	CRK2000A4P	No Color	No Color
		H1/H2/H3	4 or 6	CRK2000A3P	CRK2000A4P	No Color	No Color
		L1/L1F	8	CRK2000A3P	N/A	No Color	No Color
	2000 A	H1/H2/H3	8	CRK2000A3P	CRK2000A4P	No Color	No Color
		L1/L1F	16	CRK3000L3P	N/A	Red	Black
	3200 A	H1/H2/H3	16	CRK3200A3P	CRK3200A4P	Red	Black
		L1	24	CRK6000A3P	N/A	Black	Black
	4000/5000 A	H2/H3	24	CRK6000A3P	CRK6000A4P	Black	Black
		L1	24	CRK6000A3P	N/A	Black	Black
ANSI C37 Certified Masterpact NW Non-Automatic Switches	800/1600 A	HA	4 or 6	CRK2000A3P	CRK2000A4P	No Color	No Color
	2000 A	HA	8	CRK2000A3P	CRK2000A4P	No Color	No Color
	3200 A	HA	16	CRK3200A3P	CRK3200A4P	Red	Black
	4000/5000 A	HA	24	CRK6000A3P	CRK6000A4P	Black	Black
ANSI C37 Certified Masterpact NW Automatic Switches	800/1600 A	HF	4 or 6	CRK2000A3P	CRK2000A4P	No Color	No Color
		HC	8	CRK2000A3P	N/A	No Color	No Color
	2000 A	HF	8	CRK2000A3P	CRK2000A4P	No Color	No Color
		HC	16	CRK3000L3P	N/A	Red	Black
	3200 A	HF	16	CRK3200A3P	CRK3200A4P	Red	Black
		HC	24	CRK6000A3P	N/A	Black	Black
	4000/5000 A	HF	24	CRK6000A3P	CRK6000A4P	Black	Black
		HC	24	CRK6000A3P	N/A	Black	Black
Cluster Retainer Clip	All	All	—	CRCLIP	—	—	—

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⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

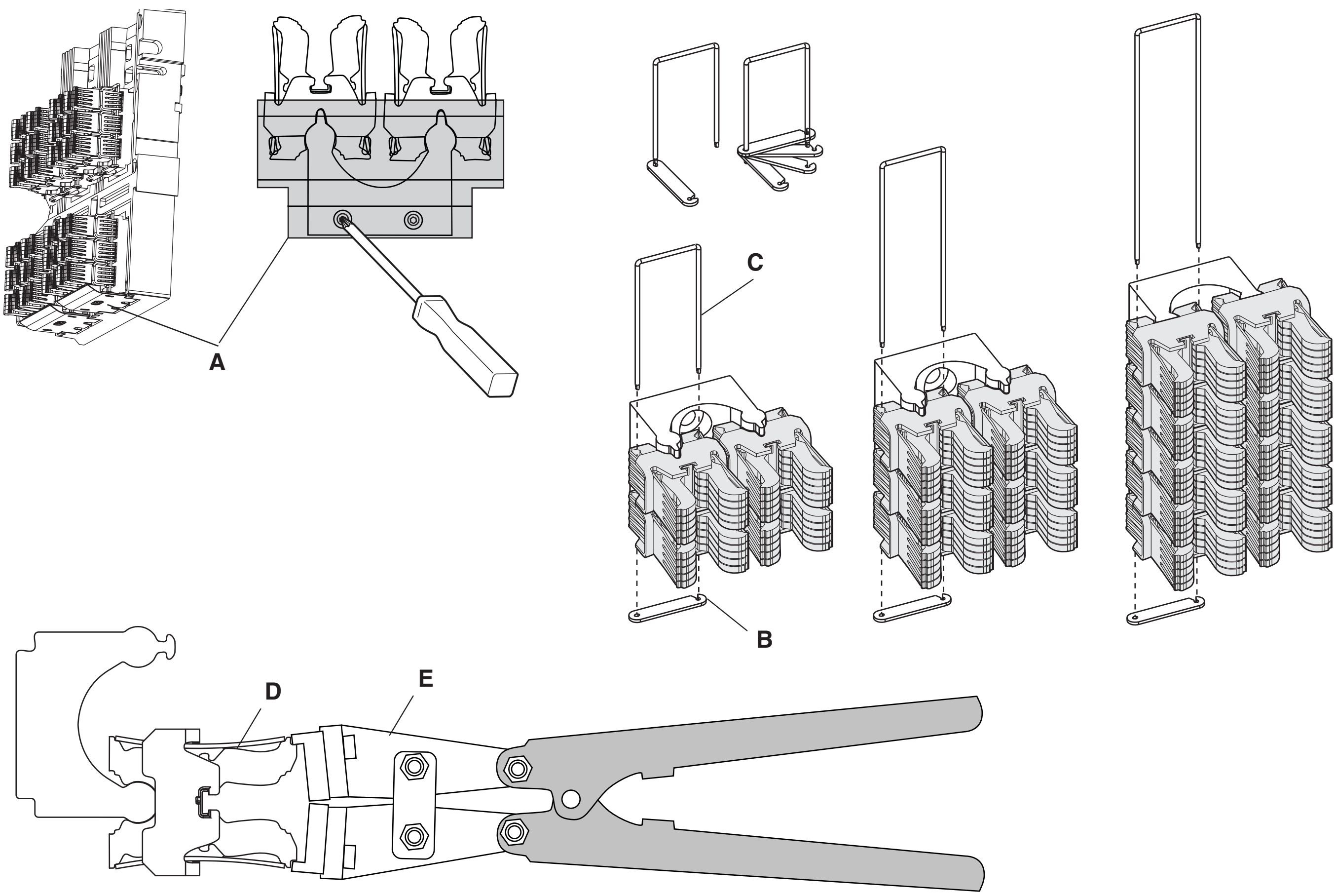
Install the correct cluster retainer identified by color depending on circuit breaker size and type. See Table 23.

Failure to follow these instructions will result in death or serious injury.

NOTE: Cluster retainer clip cannot be reused. Use new cluster retainer clip, part number CRCLIP.

1. Replace worn or damaged clusters on all cluster configurations except lower clusters on 16 and 24 cluster configurations.
   a. Remove lower connector plate (Figure 11, A), if present. Retain plate, screws and washers.
   b. Remove cluster retainer clip (B) and cluster retainer (C), if equipped. Discard cluster retainer clip. Remove worn or damaged clusters.
   c. Install new clusters (D) using cluster positioning tool S47542 (E).
   d. Secure clusters using cluster retainer (C) and new cluster retainer clip (B). See Table 23 for correct cluster retention kit and cluster retainer color.
   e. Replace lower connector plate (A), if previously removed. Secure using previously-retained screws and washers. Torque screws to 17.7 lb-in. (2 N•m).

Figure 11 – Cluster Replacement



ENGLISH

⚠ DANGER

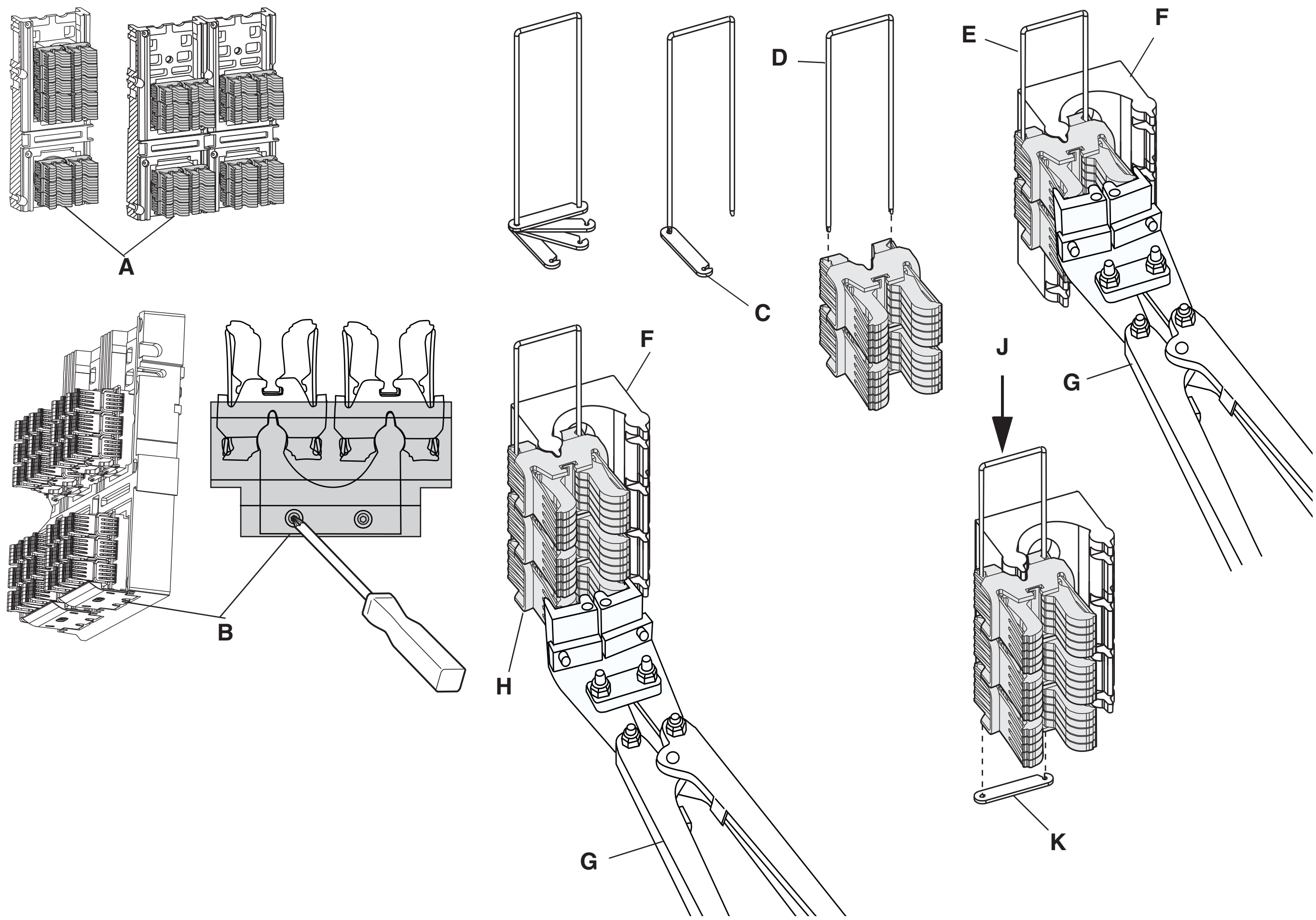
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Install the correct cluster retainer identified by color depending on circuit breaker size and type. See Table 23.

Failure to follow these instructions will result in death or serious injury.

2. Replace worn or damaged clusters on lower set of clusters on 16 and 24 cluster configurations (Figure 12, A):
   a. Remove lower connector plate (B), if present. Retain plate, screws and washers.
   b. Remove cluster retainer clip (C) and cluster retainer (D), if equipped. Discard cluster retainer clip. Remove all clusters, discard worn or damaged clusters.
   c. Slide cluster retainer (D) through two clusters until bottom of cluster retainer is even with bottom of lower cluster. See Table 23 for correct cluster retainer kit and color.
   d. Install the two clusters and cluster retainer (E) on top two notches of cluster support (F) using cluster positioning tool S47542 (G).
   e. Install the third cluster (H) on bottom notch of cluster support (F) using cluster positioning tool S47542 (G).
   f. Slide cluster retainer (J) through third cluster and secure using new cluster retainer clip (K).
   g. Repeat for clusters on other side of cluster support.
   h. Replace lower connector plate (B), if previously removed. Secure using previously-retained screws and washers. Torque screws to 17.7 lb-in. (2 N•m).

Figure 12 – Cluster Replacement



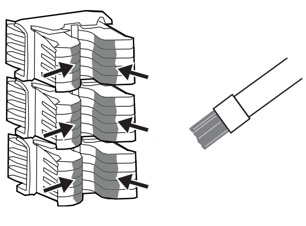
Cluster Lubrication

NOTICE
HAZARD OF EQUIPMENT DAMAGE Inspect the cluster for lubrication when the circuit breaker is removed from the cradle. **Failure to follow these instructions can result in equipment damage.**

Use grease kit (catalog number S48899) to lubricate cluster jaws as shown in Figure 13.

NOTE: Remove any existing grease from cluster assembly before applying new grease to clusters.

Figure 13 – Cluster Grease Application



Cradle Stab Lubrication

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462, or NOM-029-STPS.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

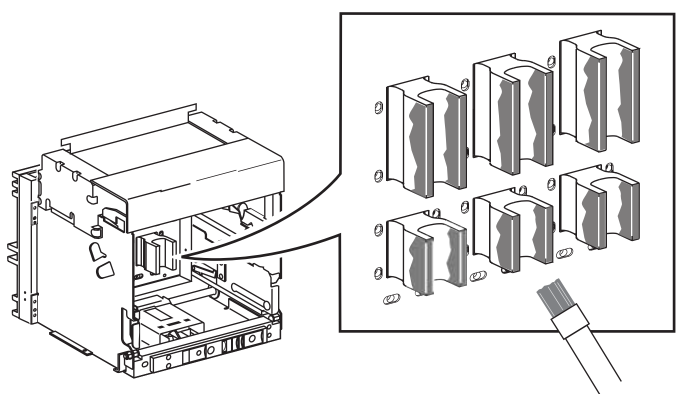
Failure to follow these instructions will result in death or serious injury.

The cradle stabs must be inspected and lubricated when the cradle is first installed and again during maintenance periods after all power has been disconnected.

Confirm that both sides of stab are coated with lubricant. If necessary, use grease kit (catalog number S48899) to lubricate stab.

NOTE: Remove any existing grease from cradle stabs before applying new grease to them.

Figure 14 – Cradle Stab Grease Application



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Section 5— Troubleshooting

Table 24 – Troubleshooting and Solutions

Issue	Probable causes	Solutions
Circuit breaker cannot be closed locally or remotely.	1. Circuit breaker padlocked or keylocked in the "open" position. 2. Circuit breaker interlocked mechanically in a source changeover system. 3. Circuit breaker not completely connected. 4. The reset button signaling a fault trip has not been reset. 5. Stored energy mechanism not charged. 6. MX opening shunt release permanently supplied with power. 7. MN undervoltage release not supplied with power. 8. XF closing release continuously supplied with power, but circuit breaker not "ready to close" (XF not wired in series with PF contact). 9. Permanent trip order of a Micrologic P or H trip unit with minimum voltage and minimum frequency protection in Trip mode and the trip unit powered.	1. Disable the locking function. 2. Check the position of the other circuit breaker in the changeover system. Modify the situation to release the interlock. 3. Complete racking in (connection) of the circuit breaker. 4. Clear the fault. Push the reset button on the front of the circuit breaker. 5. Charge the mechanism manually If it is equipped with an MCH spring charging motor, check the supply of power to the motor. If the problem persists, replace the spring charging motor (MCH). 6. There is an opening order. Determine the origin of the order. The order must be cancelled before the circuit breaker can be closed. 7. There is an opening order. Determine the origin of the order. Check the voltage and the supply circuit ($U > 0.85\ U_n$). If the problem persists, replace the undervoltage release. 8. Cut the supply of power to the XF closing release. then send the closing order again via the XF, but only if the circuit breaker is "ready to close". 9. Disable these protection functions on the Micrologic P or H trip unit.
Circuit breaker cannot be closed remotely but can be opened locally using the closing pushbutton.	Closing order not executed by the XF closing release.	Check the voltage and the supply circuit ($0.85 - 1.1\ U_n$). If the problem persists, replace the XF release.
Unexpected tripping without activation of the reset button signaling a fault trip.	1. MN undervoltage release supply voltage too low. 2. Load-shedding order sent to the MX opening release by another device. 3. Unnecessary opening order from the MX opening release.	1. Check the voltage and the supply circuit ($U > 0.85\ U_n$). 2. Check the overall load on the distribution system If necessary, modify the settings of devices in the installation. 3. Determine the origin of the order.
Unexpected tripping with activation of the reset button signaling a fault trip.	A fault is present: • overload • earth fault • short-circuit detected by the trip unit	Determine and clear the causes of the fault. Check the condition of the circuit breaker before putting it back into service.
Instantaneous opening after each attempt to close the circuit breaker with activation of the reset button signaling a fault trip.	1. Thermal memory. 2. Transient overcurrent when closing. 3. Closing on a short circuit.	1. See the user manual of the trip unit. Press the reset button. 2. Modify the distribution system or the trip unit settings. Check the condition of the circuit breaker before putting it back into service. Press the reset button. 3. Clear the fault. Check the condition of the circuit breaker before putting it back into service. Press the reset button.

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Table 24 – Troubleshooting and Solutions *(continued)*

Issue	Probable causes	Solutions
Circuit breaker cannot be opened remotely, but can be opened locally.	1. Opening order not executed by the MX opening release. 2. Opening order not executed by the MN undervoltage release.	1. Check the voltage and the supply circuit (0.7 - 1.1 U_n). If the problem persists, replace the MX release. 2. Drop in voltage insufficient or residual voltage (> 0.35 U_n) across the terminals of the undervoltage release. If the problem persists, replace the MN release.
Circuit breaker cannot be opened locally.	Operating mechanism malfunction or welded contacts.	Contact a Schneider Electric service center.
Circuit breaker can be reset locally but not remotely.	Insufficient supply voltage for the MCH spring charging motor.	Check the voltage and the supply circuit (0.7 - 1.1 Un). If the problem persists, replace the MCH release.
Nuisance tripping of the circuit breaker with activation of the reset button signaling a fault trip.	Reset button not pushed in completely.	Push the reset button in completely.
Impossible to insert the crank in connected, test or disconnected position.	A padlock or keylock is present on the cradle or a door interlock is present.	Disable the locking function.
Impossible to turn the crank.	The reset button has not been pressed.	Press the reset button
Circuit breaker cannot be removed from cradle.	1. Circuit breaker not in disconnected position. 2. The rails are not completely out.	1. Turn the crank until the circuit breaker is in disconnected position and the reset button out. Remove crank and store it. 2. Pull the rails all the way out.
Circuit breaker cannot be connected (racked in).	1. Cradle/circuit breaker mismatch protection. 2. The safety shutters are locked. 3. The disconnecting-contact clusters are incorrectly positioned. 4. Cradle locked in disconnected position. 5. The reset button has not been pressed, preventing rotation of the crank. 6. The circuit breaker has not been sufficiently inserted in the cradle.	1. Check that the cradle corresponds with the circuit breaker. 2. Remove the lock(s). 3. Reposition the clusters. 4. Disable the cradle locking function. 5. Press the reset button. 6. Insert the circuit breaker completely so that it is engaged in the racking mechanism.
Circuit breaker cannot be locked in disconnected position.	1. The circuit breaker is not in the right position. 2. The crank is still in the cradle.	1. Check the circuit breaker position by making sure the reset button is out. 2. Remove the crank and store it.
Circuit breaker cannot be locked in connected, test or disconnected position.	1. Check that locking in any position is enabled. 2. The circuit breaker is not in the right position. 3. The crank is still in the cradle.	1. Contact a Schneider service center. 2. Check the circuit breaker position by making sure the reset button is out. 3. Remove the crank and store it.
The crank cannot be inserted to connect or disconnect the circuit breaker.	The rails are not completely in.	Push the rails all the way in.
The right-hand rail (cradle alone) or the circuit breaker cannot be drawn out.	The crank is still in the cradle.	Remove the crank and store it.

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Table 24 – Troubleshooting and Solutions *(continued)*

Issue	Probable causes	Solutions
Circuit breaker cannot be closed locally or remotely.	Circuit breaker padlocked or keylocked in the “open” position.	Disable the locking function.
	Circuit breaker interlocked mechanically in a source changeover system.	• Check the position of the other circuit breaker in the changeover system. • Modify the situation to release the interlock.
	Circuit breaker not completely connected.	• Terminate racking in (connection) of the circuit breaker.
	The reset button signaling a fault trip has not been reset.	• Clear the fault. • Push the reset button on the front of the circuit breaker.
	Stored energy mechanism not charged.	• Charge the mechanism manually. • If it is equipped with a an MCH spring charging motor, check the supply of power to the motor. If the problem persists, replace the spring charging motor (MCH).
	MX opening shunt release permanently supplied with power.	• There is an opening order. Determine the origin of the order. • The order must be cancelled before the circuit breaker can be closed.
	MN undervoltage release not supplied with power.	• There is an opening order. Determine the origin of the order. • Check the voltage and the supply circuit ($U > 0.85\ U_n$). If the problem persists, replace the release.
	XF closing release continuously supplied with power, but circuit breaker not “ready to close” (XF not wired in series with PF contact).	Cut the supply of power to the XF closing release, then send the closing order again via the XF, but only if the ‘circuit breaker is “ready to close.”
	Permanent trip order in the presence of a Micrologic P or H trip unit with minimum voltage and minimum frequency protection in Trip mode and the trip unit powered.	Disable these protection functions on the Micrologic P or H trip unit.
Circuit breaker cannot be closed remotely but can be opened locally using the closing pushbutton.	Closing order not executed by the XF closing release	• Check the voltage and the supply circuit ($0.85 - 1.1\ U_n$). • If the problem persists, replace the XF release.
Unexpected tripping without activation of the reset button signaling a fault trip.	MN undervoltage release supply voltage too low.	Check the voltage and the supply circuit ($U > 0.85\ U_n$).
	Load-shedding order sent to the MX opening release by another device.	• Check the overall load on the distribution system • If necessary, modify the settings of devices in the installation
	Unnecessary opening order from the MX opening release.	Determine the origin of the order
Unexpected tripping with activation of the reset button signaling a fault trip.	A fault is present: • overload • earth fault • short-circuit detected by the trip unit	• Determine and clear the causes of the fault. • Check the condition of the circuit breaker before putting it back into service
Instantaneous opening after each attempt to close the circuit breaker with activation of the reset button signaling a fault trip.	Thermal memory.	• See the user manual of the trip unit. • Press the reset button.
	Transient overcurrent when closing.	• Modify the distribution system or the control-unit settings. • Check the condition of the circuit breaker before putting it back into service. • Press the reset button.
	Closing on a short circuit.	• Clear the fault. • Check the condition of the circuit breaker before putting it back into service. • Press the reset button.

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Table 24 – Troubleshooting and Solutions *(continued)*

Issue	Probable causes	Solutions
Circuit breaker cannot be opened remotely, but can be opened locally.	Opening order not executed by the MX opening release.	Check the voltage and the supply circuit (0.7 - 1.1 Un). If the problem persists, replace the MX release.
	Opening order not executed by the MN undervoltage release.	Drop in voltage insufficient or residual voltage (> 0.35 Un) across the terminals of the undervoltage release. If the problem persists, replace the MN release.
Circuit breaker cannot be opened locally.	Operating mechanism malfunction or welded contacts.	Contact a Schneider Electric service center.
Circuit breaker can be reset locally but not remotely.	Insufficient supply voltage for the MCH spring charging motor.	Check the voltage and the supply circuit (0.7 - 1.1 Un). If the problem persists, replace the MCH release.
Nuisance tripping of the circuit breaker with activation of the reset button signaling a fault trip.	Reset button not pushed-in completely.	Push the reset button in completely.
Impossible to insert the crank in connected, test or disconnected position.	A padlock or keylock is present on the cradle or a door interlock is present.	Disable the locking function.
Impossible to turn the crank.	The reset button has not been pressed.	Press the reset button.
Circuit breaker cannot be removed from cradle.	Circuit breaker not in disconnected position.	Turn the crank until the circuit breaker is in disconnected position and the reset button out.
	The rails are not completely out.	Pull the rails all the way out.
Circuit breaker cannot be connected (racked in)	Cradle/circuit breaker mismatch protection.	Check that the cradle corresponds with the circuit breaker.
	The safety shutters are locked.	Remove the lock(s).
	The disconnecting-contact clusters are incorrectly positioned.	Reposition the clusters.
	Cradle locked in disconnected position.	Disable the cradle locking function.
	The reset button has not been pressed, preventing rotation of the crank.	Press the reset button.
	The circuit breaker has not been sufficiently inserted in the cradle.	Insert the circuit breaker completely so that it is engaged in the racking mechanism.
Circuit breaker cannot be locked in disconnected position	The circuit breaker is not in the right position.	Check the circuit breaker position by making sure the reset button is out.
	The crank is still in the cradle.	Remove the crank and store it.
Circuit breaker cannot be locked in connected, test or disconnected position	Check that locking in any position is enabled.	Contact a Schneider service center.
	The circuit breaker is not in the right position.	Check the circuit breaker position by making sure the reset button is out.
	The crank is still in the cradle.	Remove the crank and store it.
The crank cannot be inserted to connect or disconnect the circuit breaker	The rails are not completely in.	Push the rails all the way in.
The right-hand rail (cradle alone) or the circuit breaker cannot be drawn out	The crank is still in the cradle.	Remove the crank and store it.

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Section 6— Testing

Procedures

Visual Inspections During Operation

While circuit breaker is energized:

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462, or NOM-029-STPS.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Take precautions to ensure that no accidental contact is made with live components during this check.

Failure to follow these instructions will result in death or serious injury.

1. Verify circuit breaker application and rating.

   Make sure that the circuit breaker is properly applied within labeled voltage, ampere rating, maximum current interrupting ratings and to Company recommendations. Compare the circuit breaker faceplate data to the installation drawings. Verify trip unit settings on Micrologic electronic-trip circuit breakers with the coordination study. After completing inspection and maintenance procedures, insure that all trip unit settings for all functions are set according to the coordination study.
2. Check for overheating while equipment is energized.

   While the circuit breaker is normally operating, under load and at operating temperature, check the exposed, accessible, insulated face of the circuit breaker and adjacent dead front surfaces of the enclosure for overheating. To do this, use an infrared temperature probe to check the temperature. If the temperature exceeds 140°F (60°C), the cause should be investigated.

   Allow initially energized circuit breaker at least three hours to reach operating temperature. Compare the surface temperature of individual circuit breakers with the surface temperature of other circuit breakers in the installation. Circuit breaker surface temperatures vary according to loading, position in the panelboard and ambient temperature. If the surface temperature of a circuit breaker is considerably higher than adjacent circuit breakers, the cause should be investigated.

   Thermographic inspection methods may also be used to evaluate overheating with equipment energized (see Thermographic Inspection, page 44).
3. Check for cracks in the circuit breaker case.

   Any circuit breaker with a cracked case should be replaced because its ability to withstand short-circuit interruption stresses is reduced.
4. Inspect the enclosure.

   The enclosure should be clean and dry. All covers and trim pieces should be in place.

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Thermographic Inspection

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Only qualified electrical workers with training and experience on low-voltage circuits should perform thermographic inspections. These workers must understand the hazards involved in working with or near low-voltage equipment. Perform such work only after reading this complete set of instructions.

Failure to follow these instructions will result in death or serious injury.

Infrared thermographic inspection techniques may be useful in evaluating the operating condition of circuit breakers and terminations. Comparison to stored infrared thermographic images may be useful for the preventive maintenance of circuit breakers and end-use equipment. The actual amount of heat emitted is a function of both load current and ambient conditions. Interpretation of infrared survey requires experience and training in this type of inspection.

Allow initially energized circuit breakers at least three hours to reach operating temperature. Compare the thermographic images of individual circuit breakers to previously stored images of the same circuit breakers.

Performance Tests

Do the performance tests in the order given to maximize the accuracy of the test results.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462, or NOM-029-STPS.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.
- Do not touch the circuit breaker terminals or the test leads while the circuit breaker is being tested.

Failure to follow these instructions will result in death or serious injury.

NOTE: Never do the contact resistance test before doing the instantaneous primary injection testing. The primary injection testing will ensure the contacts are clear of resistive films, oxidation and foreign material.

The following tests are intended to verify that a circuit breaker is operating properly. Precisely controlled factory testing conditions are used to establish the characteristic trip curves. If field test results fall outside the characteristic trip curve tolerance band, carefully evaluate the test conditions and methods for accuracy.

When questionable conditions or results are observed during inspection and performance tests, consult the local field sales office. Circuit breakers with accessories or factory modifications may require special investigation. If it is necessary to return a circuit breaker to the manufacturing facility, use proper packaging and packing materials to avoid shipping damage.

Dielectric Testing Masterpact Circuit Breakers with Micrologic P or H Trip Systems

NOTICE

HAZARD OF EQUIPMENT DAMAGE

- Dielectric tests (high potential, insulation resistance, or Megger tests) may damage Micrologic P and H trip units.
- Remove rating plug from trip unit prior to testing.
- Replace trip unit if rating plug was not removed during tests or if trip unit was exposed to more than 700 Vac.

Failure to follow these instructions can result in equipment damage.

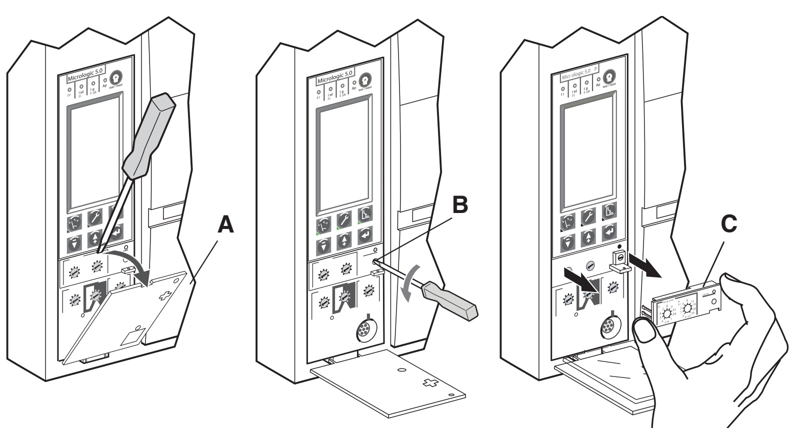
Dielectric tests (high potential, insulation resistance or Megger tests) are used to ensure the proper isolation and insulation between phases and between each phase and ground. The equipment used to conduct these tests creates a high-potential voltage (thousands of volts) to verify dielectric or insulation integrity.

The rating plug on Micrologic P and H trip units connect/disconnect the trip unit with the voltage connections in the circuit breaker. Before conducting any high-voltage tests on circuit breakers with Micrologic P and H trip units, remove the rating plug as shown

NOTE: Only Micrologic P and H trip units have phase voltage connections into the trip unit. For other types of trip units, it is not necessary to remove the rating plug prior to dielectric testing.

1. Open switch cover (Figure 15, A).
2. Unscrew rating plug mounting screw (B).
3. Remove rating plug (C).

Figure 15 – Removing Rating Plug



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NOTICE

HAZARD OF EQUIPMENT DAMAGE

Do not apply test voltage to control circuits or accessory terminals; damage to electronic and/or low-voltage components can result.

Failure to follow these instructions can result in equipment damage.

Insulation Resistance Test

Severe environmental conditions can reduce the dielectric strength of molded case circuit breakers. Check insulation resistance during electrical system testing.

To check the insulation resistance, perform the following steps:

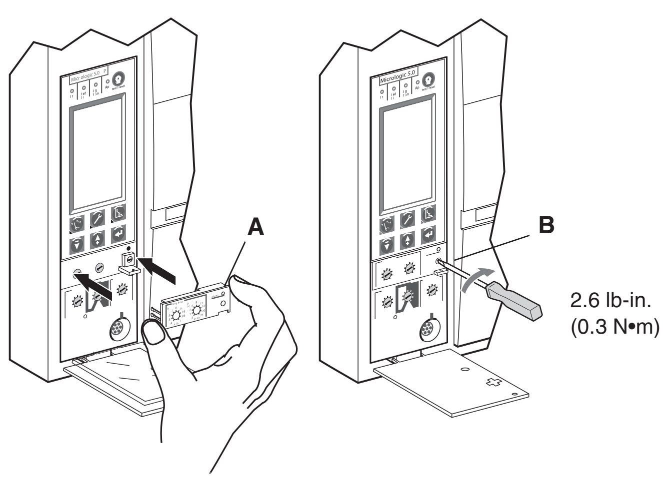
1. De-energize and isolate the circuit breaker:
2. Clean the circuit breaker as described earlier.
3. Using a megohmmeter with a capacity of 500–1000 Vdc, apply voltage from:
   a. Each phase-to-ground with the circuit breaker on (circuit breaker contacts closed).
   b. Phase-to-phase with the circuit breaker on (circuit breaker contacts closed).
   c. Between each line and load terminal with the circuit breaker off (circuit breaker contacts open).
4. Record resistance values. Resistance values of less than one megohm (1,000,000 ohm) should be investigated.

After testing is complete, replace rating plug if previously removed:

1. Replace rating plug (Figure 16, A).
2. Tighten rating plug mounting screw (B).

NOTE: If the rating plug is not installed, the circuit breaker will default to a long-time pickup setting of 0.4 x the sensor (I_n) and some of the advanced functions will not be operable.

Figure 16 – Replacing Rating Plug



Micrologic Trip Unit Checks

Circuit breakers with Micrologic trip units can have their trip unit operation tested with secondary injection testing using the one of the available test kits. (See page 58 for test kits.)

Secondary injection testing does not test the current transformers and connections. Primary injection testing can be used to ensure that all trip system connections have been correctly made.

If the circuit breaker is tested by the primary injection method, the Powerlogic™ system can remain connected to the circuit breaker during testing without affecting the results.

NOTE: Testing a circuit breaker connected to a Powerlogic system causes the Powerlogic system to react as if the circuit breaker were experiencing the actual faults.

Procedure to Defeat Zone-Selective Interlocking

Zone-selective interlocking is a method of communication between electronic-trip overcurrent protective devices. Zone-selective interlocking allows interlocked devices at different levels to work together as a system in which a short circuit or ground fault is isolated and cleared with minimum time delay. The purpose of defeating zone-selective interlocking is to verify the characteristics of the specific circuit breaker short-time and ground-fault trip delay functions. For test purposes, zone-selective interlocking can be inhibited on Masterpact circuit breakers equipped with Micrologic trip units by using the Hand-Held or Full-Function Test Kit.

Secondary Injection Testing

Field installation of a trip unit requires secondary injection testing with a Full-Function Test Kit. This will ensure that the newly-installed trip unit is functioning properly. The test will require opening and closing the circuit breaker. Follow the procedures outlined in the instruction bulletins shipped with the circuit breaker and the Full-Function Test Kit.

1. Make sure the circuit breaker is isolated from all upstream and downstream devices.
2. Perform secondary injection testing as outlined in the instruction bulletin shipped with the full-function test kit. Verify that all applicable trip unit functions are operating properly.
3. Repeat step 2 with the circuit breaker in the open position.

   NOTE: The test kit states that the circuit breaker should be closed when performing the test. Do not close the circuit breaker for this step.
4. If any test fails, do not put the circuit breaker into service and contact the local sales office for factory authorization service.

Primary Injection Testing

Primary injection testing can be used to ensure that all trip system connections have been correctly made.

NOTE: Secondary injection testing continues to be the Schneider Electric preferred method for testing circuit breakers. Improper primary injection testing can cause damage to the circuit breakers. Failure to conduct primary injection testing in the proper manner could result in circuit breakers passing testing, while ultimately damaging the integrity of the circuit breaker long term.

NOTICE

HAZARD OF EQUIPMENT DAMAGE

- Circuit breakers are heavy and can be damaged with improper handling. Use care when handling and transporting circuit breakers to test equipment.
- Make connection to the circuit breaker carefully using rated cable and appropriate connection methods. Do not use clamps or other methods that can score or otherwise damage the finish of the connectors.
- When connecting a drawout-type circuit breaker, use approved primary injection test kit. Adjust circuit breaker position so circuit breaker clusters align with the primary injection test kit.

Failure to follow these instructions can result in equipment damage.

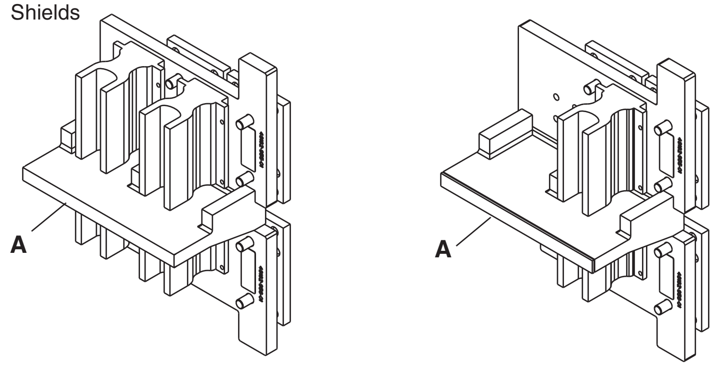
1. If performing primary injection testing on drawout circuit breakers, connect circuit breaker to power supply using primary injection test kits.

Table 25 – Primary Injection Test Kit

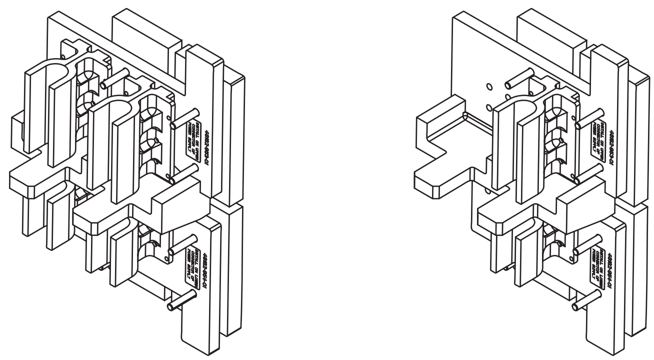
Circuit Breaker Type	Power Supply	Test Kit Required
Masterpact NW without ArcBlok or Cluster Shields	Phoenix®	ULW10025
	MultiAmp ®	ULW10026
Masterpact NW with ArcBlok or Cluster Shields	Phoenix®	ULW10025 and Primary Injection Bumper Kit 84958
	MultiAmp ®	ULW10026 and Primary Injection Bumper Kit 84958
Masterpact NT	Phoenix or MulitAmp	ULW10027
PowerPact	Phoenix or MulitAmp	ULW10027
All Types	Other Than Phoenix or MultiAmp	Contact Field Office

Figure 17 – Masterpact NW Primary Injection Test Assembly

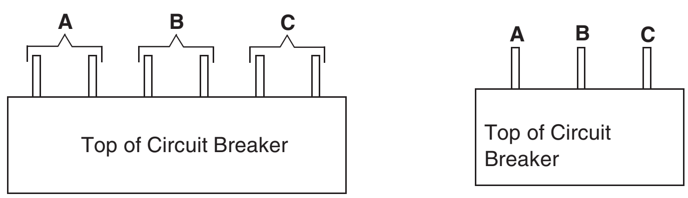
Primary Injection Test Assembly for Circuit Breakers without ArcBlok or Cluster Shields



Primary Injection Test Assembly with Primary Injection Bumper (Kit 84958) for Circuit Breakers with ArcBlok or Cluster Shields



Phases



a. Install primary injection test kit following instructions shipped with the test kit.

b. Adjust height of the circuit breaker so the stop (A, above) between the top and bottom plates of the test kit is between the top and bottom connectors of the circuit breaker when it is in the connected positions.

c. Align the circuit breaker so that the clusters on the circuit breaker phase being tested line up with the connectors with the primary injection test kit.

d. Use grease kit, catalog number S48899, to lubricate connectors. Do not install anything in the cluster jaw except approved test kit.

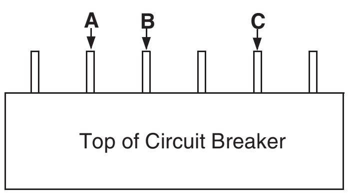
   NOTE: Remove any existing grease from cluster assembly before applying new grease to clusters.

2. If performing primary injection testing on fixed circuit breakers, connect circuit breaker to power supply using rated cable and appropriate connection method.

NOTE: Wide-construction circuit breakers only—When primary injection testing a circuit breaker with six bus connectors, current is injected into phases as shown in Figure 18. Do not inject current into outside busses.

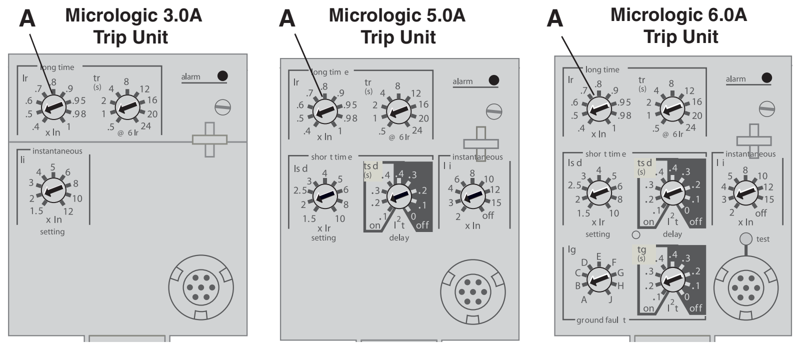
Figure 18 – Wide-Construction Circuit Breakers

Primary Injection Test



3. Record each of the original trip unit switch settings. (Settings must be reset after testing is complete.)
4. Set the long-time pickup (I_r) switch (A) to the minimum setting.

Figure 19 – Record Switch Settings



a. For ground-fault and/or zone-selective interlocked trip units, use the hand-held or full-function test kit to inhibit ground-fault and zone-selective interlocking functions.

b. If an auxiliary power supply is being used for the Micrologic trip unit, disconnect the auxiliary power supply.

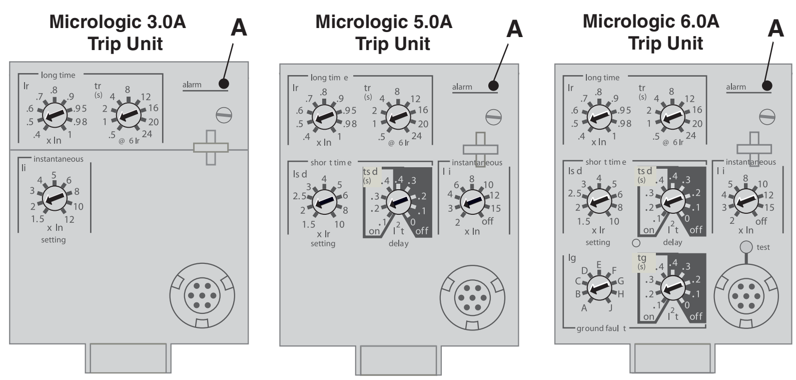
c. Find the primary injection current needed by multiplying the long-time pickup current (long-time pickup setting I_r x sensor plug I_n) x 125% (i.e. I_r x I_n x 1.25).

d. Inject primary current into A-phase and monitor the overload indicator light. Verify that the overload indicator light (A) lights between 105% and 120% of the I_r x I_n value.

e. Repeat for all phases and neutral (if applicable).

f. If overload indicator light does not light correctly, check all trip unit connections and test setup. If unit still fails primary injection testing, contact the local sales office.

Figure 20 – Overload Indicator Light



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Circuit Breakers with Integral Ground Fault Protection

Micrologic electronic-trip circuit breakers with the integral ground-fault protection function require special attention when testing overload and short-circuit functions. The single-pole primary injection tests for the inverse-time overcurrent, short-time and instantaneous functions will cause ground-fault trips due to the return current path not going through the circuit breaker. To overcome this difficulty, use the Hand-Held or Full-Function Test Kit to defeat the ground-fault function on Masterpact or PowerPact™ circuit breakers equipped with Micrologic trip units.

NOTE: When the hand-held or full-function test kits are used to inhibit ground-fault, the test kit puts the trip unit in "TEST MODE". While the trip unit is in this mode, the logs, alarms, and advanced protections are turned off so that a test trip is not recorded as an actual event. See the test kit instructions for further information.

Ground-Fault Protection and Indication Only Tests for Radial Systems

Ground-Fault Trip Test

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462, or NOM-029-STPS.
- This equipment must be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

The ground-fault function of a Micrologic electronic-trip circuit breaker provides ground-fault protection for equipment with adjustable pickup and delay values. the ground-fault delay feature determines how long the circuit breaker waits before initiating a trip signal during a ground fault. Performance of the ground-fault functions of the circuit breaker can be tested using a high-current, low-voltage ac power supply.

Test Procedure

1. Completely de-energize and remove the circuit breaker from service.
2. Before testing, record pickup and delay setting for all functions. Reset the trip unit to these same settings after the test procedure is completed.
3. If testing a circuit breaker that is equipped with zone-selective interlocking, follow the procedure to defeat zone-selective interlocking on page 47. If you are using a secondary injection test kit for these tests, carefully read and follow the test kit instructions about zone-selective interlocking.

   NOTE: Failure to defeat zone-selective interlocking will result in trip time inaccuracy.

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4. Use these settings for the test:

   Long-time Pickup/Ampere Rating = Max.

   Long-time/Overload Delay = Max

   Short-time/Short-circuit Delay = Max. (I^2t IN or ON)

   Instantaneous = Max.

   Ground-fault Pickup = Min.

   Ground-fault Delay = 0.2
5. Follow the hookup procedure appropriate to the test application.

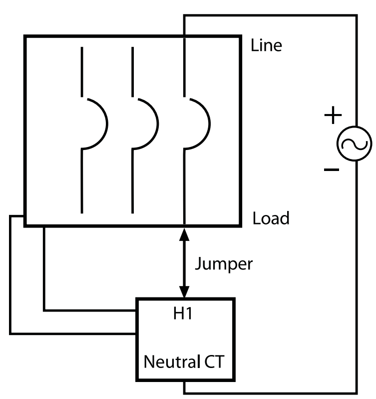
   For circuit breakers without a neutral current transformer, go to step 8.

   For circuit breakers with the integral ground-fault function in a three-phase, four-wire system, an externally-mounted neutral current transformer (CT) must be used. The neutral CT is connected to the circuit breaker by a shielded cable (14 AWG [2.1 mm2] wire is recommended).

   NOTE: When testing, disconnect or turn off 24 Vdc control power to F1 and F2, if equipped and disconnect the Hand-Held or Full-Function Test Kit from the trip unit, if connected.

6. Verify correct phasing of the neutral CT (three-phase, four-wire systems) by performing a No Trip Test as follows:
   a. Connect the circuit breaker and neutral CT as shown in Figure 21. The jumper must go from the load connection on the circuit breaker to the H1 connection on the neutral CT (or the side of the neutral CT that has the red dot). Connect the secondary of the neutral CT according to the circuit breaker instruction manual or the neutral CT instructions.
   b. Apply current above the ground-fault pickup level and maintain longer than the ground-fault delay.
   c. The circuit breaker must not trip. No trip indicates that both the phase CT and neutral CT are phased properly.

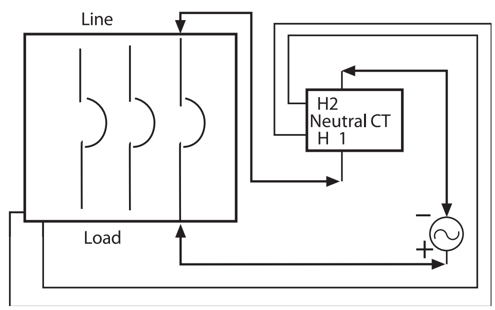
Figure 21 – Test Hookup Diagram for Neutral CT Phasing Test



See circuit breaker instructions bulletin for connections to circuit breaker and neutral CT.

7. Verify the correct size of the neutral CT (three-phase, four-wire systems) by performing a Trip Test as follows:
   a. Connect the circuit breaker and neutral CT as shown in Figure 22. Connect the polarity (+) terminal of the high current injection unit to the load side of the circuit breaker. The jumper must go from the line connection on the circuit breaker to the H1 connection on the neutral CT (or the side of the neutral CT that has the red dot). Connect the non-polarity (-) terminal of the high current injection unit to H2 on the neutral CT (on the line side of the circuit breaker). Connect the secondary of the neutral CT according to the circuit breaker instruction manual or the neutral CT instructions.
   b. Apply current.
   c. The circuit breaker must trip at half the value of the ground-fault pickup. Tripping indicates that both the phase CT and neutral CT have the same turns ratio (same size).

Figure 22 – Test Hookup Diagram for Neutral CT Size Test



See circuit breaker instructions bulletin for connections to circuit breaker and neutral CT.

8. Test ground fault pickup and delay by performing a trip test as follows:
   a. Connect the circuit breaker as shown in Figure 23, (three-phase, three-wire systems) or Figure 24 (three-phase, four-wire systems).

Figure 23 – Test Hookup Diagram for Circuit Breaker Without Neutral CT

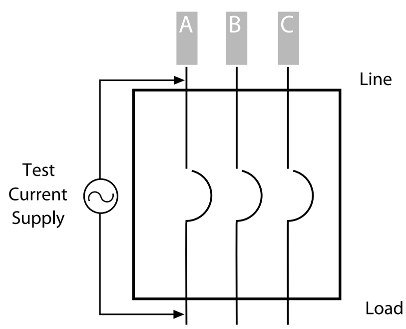


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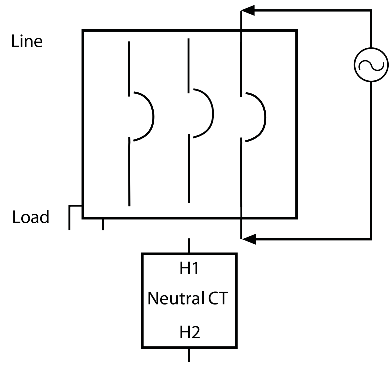
Figure 24 – Test Hookup Diagram for Ground-Fault Pickup and Delay Test



NOTE: The recommended method of testing ground-fault pickup and delay is the “pulse” method. This method will be the most accurate, but requires that the test equipment have a calibrated image-retaining oscilloscope or high-speed sampling rate digital ammeter. An accurate timer is needed to monitor delay time.

b. After the circuit is properly connected and closed, apply current in short pulses of 10-cycle duration. Starting at 70% of the expected trip value,
c. Reclose the circuit breaker and reduce the current level; pulse again to determine if the pickup level found was overshot.
d. Repeat steps b and c to further isolate the pickup point.
e. To determine delay time, test each pole of the circuit breaker individually at 150% of the ground-fault pickup setting. Monitor the time from this pickup point until the circuit breaker trips to obtain the delay time.
f. Record pickup and delay values and compare the results to the trip curve.

The ground-fault test can also be done using secondary injection testing using the Full-Function Test Kit. Secondary injection testing does not test the current transformers and connections.

Table 26 – Maximum Micro-Ohms Per Pole

Masterpact	Micro-Ohms (u ohm)	
Type	**Drawout**	**Fixed**
NT06—NT10 H1/H2/L1	38.72	26.39
NT12–NT16 H1/H2	36	26
NW08 N1	42	19
NW08 H/L	30	13
NW10 N1	42	19
NW10 H/L	30	13
NW12 N1	42	19
NW12 H/L	27	13
NW16 N1	37	19
NW16 H/L	27	13
NW20 H/L	27	13
NW25 H1/H2/H3	19	8
NW 32 H1/H2/H3	13	8
NW40 H1/H2/H3	11	8
NW40b, NW50, NW63	7	5

Contact Resistance Test

Circuit breaker pole resistance tests are not reliable indicators of circuit breaker performance because the resistance values are influenced by a number of transient factors including contact surface oxidation, foreign material between the contacts, and testing methods. NEMA AB 4 paragraph 6.4.1 states: “The millivolt drop of a circuit breaker pole can vary significantly due to inherent variability in the extreme low resistance of the electrical contacts and connectors. Such variations do not necessarily predict unacceptable performance and shall not be used as the sole criteria for determination of acceptability.”

High pole resistance may also be caused by eroded contacts, low contact force, and loose termination. The only one of these factors likely to be present on a new circuit breaker is a loose termination, since the contacts are new and there has been no opportunity for contact pressure to have drifted from the factory setting. A loose termination can be corrected in the field.

If a contact resistance test is done, it is important to do it after the contacts have been conditioned by instantaneous primary injection testing to ensure the contacts are clear of resistive films, oxidation and foreign material. If the circuit breaker has been in service with no performance issues, (overheating or nuisance tripping), contact resistance measurements are redundant and of little value.

Square D™ recommends that a Digital Low Resistance Ohmmeter (DLRO) be used, using a 10 A dc test current for circuit breaker ratings below 100 A, and using 100 A dc for circuit breakers rated 100 A and above. the median (middle) value of three readings (toggling the circuit breaker between each reading) should be recorded for each pole tested. If this value is equal to or less than the value listed in Table 26, the pole is acceptable. If the reading is higher, the cause should be investigated and corrected if possible. Contact your local field office for more information.

Circuit Breakers with Direct Current Protection

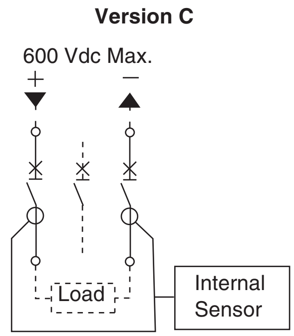
The Masterpact NW DC circuit breakers are designed, manufactured and calibrated for use on ungrounded, uninterruptable power supplies (UPS). The maximum nominal (loaded) voltage is 500 Vdc and the maximum floating (unloaded) voltage is 600 Vdc.

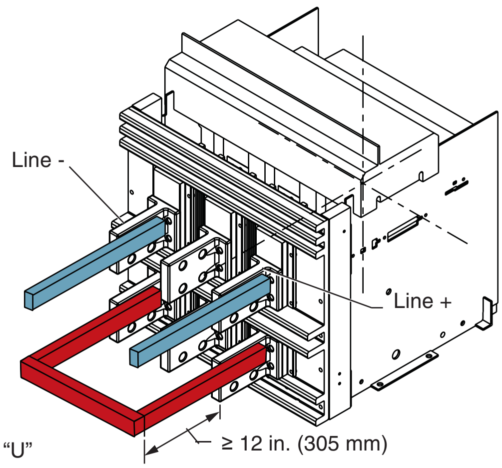
These circuit breakers are UL Listed when applied with all poles connected in series as shown on the label of the circuit breaker. The series connection is customer provided and external to the circuit breakers.

The Masterpact NW DC circuit breakers are special circuit breakers for dc applications only and must be tested using dc current.

- Select the correct time-current trip curve. The trip curves show both the thermal and magnetic trip ranges of the circuit breakers.
- Use a dc power supply to test the circuit breakers as follows:
  - — Time constant ≤ 25 ms
  - — DC ripple constant ≤ 1% rms
- Remove the circuit breaker from the enclosure. If removing the circuit breaker is not practical, test the circuit breaker in the end-use equipment. If the test results fall outside of the trip curve tolerance, remove the circuit breaker from the enclosure and retest.
- Use correctly sized cable (per National Electrical Code® [NEC®] tables) with a minimum of four feet (1.22 m) of cable per connection.
- Connect a dc power supply to the circuit breaker with all poles connected in series as shown on the circuit breaker label (see Figure 25–27).
- Make sure connections to circuit breaker are properly torqued.
- Apply a dc test current to the circuit breaker of approximately 70% of the expected value to trip the circuit breaker. The tripping mechanism in the circuit breaker reacts to the magnetic fields created by the current flowing through the circuit breaker. If the circuit breaker does not trip, increase the test current on successive trials until it does trip. When the circuit breaker trips:
  a. Reset and close the circuit breaker.
  b. Reapply the dc test current to trip the circuit breaker again.
  c. Record the current and compare to the trip curve.

Figure 25 – Version C Wiring Configuration

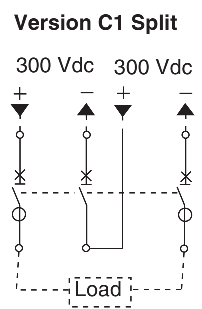


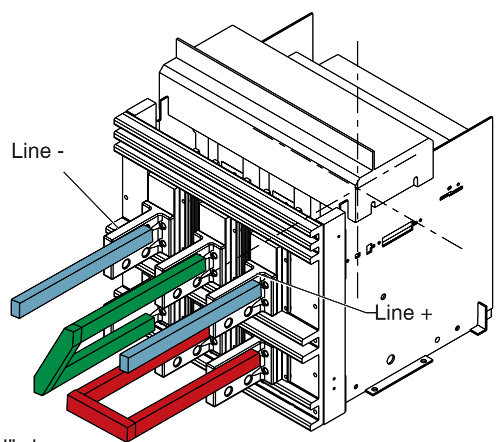


Blue indicates connectors to power supply. Connectors run straight back from terminals.

Red indicates connectors which make a "U" shape. Cables are straight for 12 in. (305 mm) before bending.

Figure 26 – Version C1 Split Configurations





Blue indicates connectors to power supply. Connectors run straight back from terminals.

Red indicates connectors which make a "U" shape between bottom terminals 1 and 2. Cables are straight for 12 in. (305 mm) before bending.

Green indicates connectors which make a "U" shape between top center terminal and bottom terminal 3. Cables are straight for 12 in. (305 mm) before bending.

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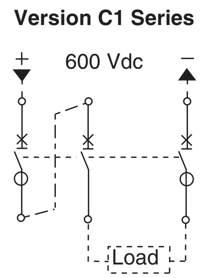
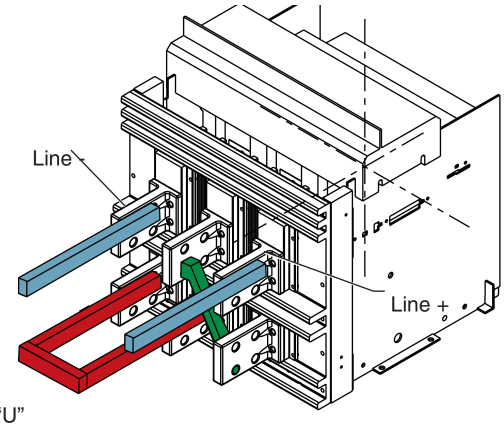
Figure 27 – Version C1 Series Configurations





Blue indicates connectors to power supply. Connectors run straight back from terminals.

Red indicates connectors which make a “U” shape between bottom terminals 2 and 3. Cables are straight for 12 in. (305 mm) before bending.

Green indicates connectors which connect top center terminal and bottom terminal 1.

Remove Test Connections Upon Completing Testing:

— Remove test connections from circuit breaker.

— Inspect connections for damage caused by testing.

— For drawout circuit breakers, inspect, lubricate, and reset clusters before installing circuit breaker, see page 31.

— Reset the long-time pickup switch to original settings, as recorded above.

— If an auxiliary power supply is being used for the Micrologic trip unit, reconnect the auxiliary power supply.

Test Kit Information

Full-Function Test Kit

The Full-Function Test Kit is a microprocessor-based system used to test Compact™ NSJ, Masterpact and PowerPact circuit breakers with Micrologic electronic-trip units. The Full-Function Test Kit is a secondary injection tester and does not test the current transformers and connections.

The Full-Function Test Kit is designed to be used as a stand-alone test unit or in conjunction with a personal computer. The Full-Function Test Kit alone performs the following tests:

- Protection function verification (LSIG)
- Compliance with trip curve
- Electrical and mechanical tests of trip system
- Zone-selective interlocking tests
- Inhibition of ground-fault protection for use during primary injection testing
- Inhibition of thermal imaging for use during primary injection testing
- Supply control power to the trip unit to energize displays

Hand-Held Test Kit

The Hand-Held Test Kit is a small battery-powered unit. It is designed to provide convenient secondary injection tests on Compact NSJ, Masterpact and PowerPact circuit breakers with Micrologic electronic-trip units. The Hand-Held Test Kit is powered by five 9 V batteries and can be used to do the following:

- Verify trip unit operation by tripping the circuit breaker with a secondary injection signal
- Supply control power to the trip unit to energize displays
- Inhibit thermal imaging for primary injection testing
- Inhibit ground-fault for primary injection testing
- Zone-selective interlocking tests[1]

Anti-Pumping Feature

All Masterpact NT and NW circuit breakers are designed with an anti-pumping feature which always gives priority to an opening order over a closing order. Specifically, if opening and closing orders occur simultaneously, the charged mechanism discharges without any movement of the main contacts keeping the circuit breaker in the open (OFF) position. In the event that opening and closing orders are simultaneously maintained, the standard mechanism provides an anti-pumping function which continues to keep the main contacts in the open position. In addition, after fault tripping or opening the circuit breaker intentionally (using the manual or electrical controls and with the closing coil continuously energized) the circuit breaker cannot be closed until the power supply to the closing coil is discontinued and then reactivated.

Anti-Pump Check for Electrically Operated Circuit Breakers

If desired, use the following procedure to assure that the anti-pump feature works properly.

1. Open the circuit breaker.
2. Energize the control power for the spring charging motor, shunt trip and shunt close.
3. Spring charging motor will charge the springs whenever they are discharged (during circuit breaker closing).
4. Make sure all interlocks, etc. are disengaged and the circuit breaker is ready to close. Press and hold the Close pushbutton (use the remote close button connected to the shunt close if desired). Verify the circuit breaker closed. Wait for the spring charging motor to complete the spring charge.
5. While continuing to hold the Close button, press the Open button. Make sure the circuit breaker opens and does not reclose.
6. Release the Close button.
7. If circuit breaker does not attempt to reclose, the anti-pump feature is working correctly.
8. Press the Open button and then the Close button.
9. Press and release the Close pushbutton (use the remote close button connected to the shunt close if desired). Verify the circuit breaker closed. Wait for the spring charging motor to complete the spring charge.

[1] Only provides power to trip unit to indicate a ZSI signal was received. Will not initiate the command to send a ZSI restraint signal.

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10. Press the Open button. Make sure the circuit breaker opens.
11. Repeat steps 8, 9 and 10 to make sure the circuit breaker opens and closes correctly.

Anti-Pump Check for Manually Operated Circuit Breakers

1. Open the circuit breaker.
2. Operate the spring charging handle to charge the closing springs.
3. Make sure all interlocks, etc. are disengaged and the circuit breaker is ready to close. Press and hold the Close pushbutton. Verify the circuit breaker closed.
4. Operate the spring charging handle to charge the closing springs.
5. While continuing to hold the Close button, press the Open button. Make sure the circuit breaker opens and does not reclose.
6. Release Close button.
7. If circuit breaker does not attempt to reclose, the anti-pump feature is working correctly.
8. Press the Open button and then the Close button.

Additional Information

For more information concerning Schneider Electric and Square D brand circuit breakers, refer to the appropriate instruction manual. These manuals contain installation instructions, mounting information, safety features, wiring diagrams, and troubleshooting charts for specific circuit breakers.

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Section 7— Available Bulletins

Table 27 – List of Available Bulletins

	Masterpact NT	Masterpact NW
Catalogs		
Universal Power Circuit Breakers	0613CT0001	0613CT0001
DC Circuit Breakers	—	0613CT0501
Certified to ABS-NVR	0613CT0601	0613CT0601
Instruction Bulletins		
UL rated	HRB39231	HRB28361
IEC Rated	HRB39244	HRB39225
UL Rated DC	—	HRB39255
IEC Rated UL	—	HRB39254
ArcBlok	—	HRB23946
User Guides		
UL Rated	0613IB1209	0613IB1204
IEC Rated	0613IB1210	0613IB1208
UL Rated DC	—	0613IB1211
IEC Rated UL	—	0613IB1212
ArcBlok	—	0613IB1203
Trip Unit User Guide		
Standard (Micrologic 2.0, 3.0 and 5.0) Trip Units	48049-207-05	48049-207-05
Micrologic A Trip Units	48049-136-05	48049-136-05
Micrologic P Trip Units	48049-137-05	48049-137-05
Micrologic H Trip Units	48049-330-03	48049-330-03
Modbus Communication for Micrologic		
Traditional 4-Wire Modbus	0613IB1201	0613IB1201
Ethernet/Modbus + ULP	0613IB1303	0613IB1313
Test Instructions		
Full-Function Test Kit (FFTK)	48049-183-06	48049-183-06
Hand-Held Test Kit (HHTK)	48049-184-03	48049-184-03
Dielectric Testing	48049-550-01	48049-550-01
ERMS Testing	NHA67346	NHA67346
List of Accessory Instructions		
	See the Schneider Electric website.	

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Standards, specifications, and designs may change, so please ask for confirmation that the information in this publication is current.

0613IB1202 R08/15, 08/2015
Replaces 0613IB1202 R07/13

Guía de pruebas en campo y servicios de mantenimiento

para los interruptores de potencia Masterpact™ NT y NW

Clase 0613

Boletín de instrucciones

ESPAÑOL

0613IB1202 R08/15
08/2015

Conservar para uso futuro.

Schneider Electric™

Categorías de riesgos y símbolos especiales

Asegúrese de leer detenidamente estas instrucciones y realice una inspección visual del equipo para familiarizarse con él antes de instalarlo, hacerlo funcionar o prestarle servicio de mantenimiento. Los siguientes mensajes especiales pueden aparecer en este boletín o en el equipo para advertirle sobre peligros o llamar su atención sobre cierta información que clarifica o simplifica un procedimiento.

La adición de cualquiera de estos símbolos a una etiqueta de seguridad de “Peligro” o “Advertencia” indica la existencia de un peligro eléctrico que podrá causar lesiones personales si no se observan las instrucciones.

Este es el símbolo de alerta de seguridad. Se usa para avisar sobre peligros de lesiones personales. Respete todos los mensajes de seguridad con este símbolo para evitar posibles lesiones o la muerte.

PELIGRO

PELIGRO indica una situación de peligro que, si no se evita, **podrá causar** la muerte o lesiones serias.

ADVERTENCIA

ADVERTENCIA indica una situación peligrosa que, si no se evita, **puede causar** la muerte o lesiones serias.

PRECAUCIÓN

PRECAUCIÓN indica una situación peligrosa que, si no se evita, **puede causar** lesiones menores o moderadas.

AVISO

AVISO se usa para hacer notar prácticas no relacionadas con lesiones físicas. El símbolo de alerta de seguridad no se usa con esta palabra de indicación.

NOTA: Proporciona información adicional para clarificar o simplificar un procedimiento.

Observe que

Solamente el personal calificado deberá instalar, hacer funcionar y prestar servicios de mantenimiento al equipo eléctrico. Schneider Electric no asume responsabilidad alguna por las consecuencias emergentes de la utilización de este material.

Aviso FCC

El equipo ha sido probado y cumple con los límites establecidos para los dispositivos digitales Clase A , según la sección 15 de las normas de la FCC (Comisión federal de comunicaciones de los EUA). Estos límites han sido establecidos para proporcionar la protección adecuada contra interferencias que puedan dañar el equipo cuando éste se utiliza en un entorno comercial. Este equipo genera, utiliza y puede radiar energía de radiofrecuencia y, si no se instala y utiliza siguiendo las indicaciones del manual de instrucciones, puede provocar interferencias que afecten a las radiocomunicaciones. Si se utiliza en una zona residencial, las interferencias podrían causar daños. En tal caso, el usuario es el responsable de corregir dichas interferencias por su propia cuenta y riesgo.

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Sección 1—Introducción

La vida útil de los interruptores depende de la aplicación apropiada, instalación correcta, condiciones ambientales y servicio de mantenimiento preventivo.

Para mantener las características de funcionamiento y seguridad del dispositivo, Schneider Electric™ recomienda que personal calificado lleve a cabo mantenimiento periódico y controles sistemáticos.

La norma generalmente usada como base para los requisitos de las pruebas en campo es la norma NEMA AB 4 de National Electrical Manufacturers Association® (Asociación nacional de fabricantes de equipo eléctrico), “Procedimiento de inspección y mantenimiento preventivo de interruptores automáticos en caja moldeada que se utilizan en aplicaciones comerciales e industriales”. Si necesita información, asistencia adicional o para obtener servicio en sus instalaciones, póngase en contacto con la oficina local de ventas.

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Las instrucciones de inspección, mantenimiento preventivo y pruebas en campo descritas en este documento están destinadas al uso con interruptores de potencia Masterpact NT y NW con el sistema de disparo electrónico Micrologic™. Lea cuidadosamente este documento y manténgalo a la mano. Éste proporciona información detallada sobre:

- los distintos tipos de mantenimiento requerido.
- lo que debe recibir mantenimiento.
- los riesgos que implica si el componente deja de funcionar correctamente.
- lo que se entiende por condiciones ambientales normales, mejoradas y severas, y de funcionamiento.
- el mantenimiento preventivo periódico que debe llevarse a cabo bajo condiciones ambientales normales y de funcionamiento así como el nivel de competencia necesario para las operaciones.
- el medio ambiente y condiciones de funcionamiento que aceleran el envejecimiento del dispositivo y los límites que regulan el uso de subensambles y accesorios mecánicos y eléctricos.
- las guías del producto disponibles para mantener el dispositivo en condiciones adecuadas de funcionamiento.

Este documento no tiene como objetivo, ni tampoco es adecuado para, verificar el funcionamiento apropiado de los componentes eléctricos de un interruptor que ha sido desarmado, modificado, restaurado, reconstruido o manipulado de manera inadecuada o no autorizada por Schneider Electric™.

Precauciones de seguridad

1. Solamente el personal eléctrico calificado con capacitación y experiencia en circuitos de baja tensión, deberá realizar el trabajo descrito en estas instrucciones. Estos técnicos deberán entender los riesgos involucrados al trabajar con y cerca de equipo de baja tensión. Este trabajo deberá realizarse sólo después de haber leído todas las instrucciones.
2. Algunas inspecciones o procedimientos requieren que ciertas partes del sistema eléctrico permanezcan energizadas en tensiones peligrosas. Observe todos los mensajes específicos de seguridad (peligro, advertencia, precaución) que figuran en este manual.
3. Use equipo protector, reconozca peligros potenciales y tome medidas de seguridad adecuadas al realizar los procedimientos descritos en este manual.

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Tipos de mantenimiento

En este boletín se describen tres tipos de mantenimiento:

- Correctivo
- Preventivo
- Predecible

Servicio de mantenimiento correctivo

En el mantenimiento correctivo se reparan los componentes que ya no funcionan correctamente.

Incidentes durante el inicio del sistema

Varios de los problemas que surgen durante el inicio del sistema se deben al incumplimiento de las instrucciones de inicio o falta de conocimiento sobre los procedimientos del equipo o tablero de fuerza. Las guías de usuario de Schneider Electric contienen las instrucciones para los operadores o personal de mantenimiento sobre cómo corregir estos problemas.

- La lista de las guías de usuario y boletines de datos disponibles se pueden encontrar al final de este documento.
- Los archivos en PDF de estos documentos pueden descargarse del sitio web www.schneider-electric.com.

Incidentes durante el funcionamiento

Póngase en contacto con Schneider Electric Service. La información de contacto de Schneider Electric Service está disponible en el sitio web www.schneider-electric.com.

Servicio de mantenimiento preventivo

El mantenimiento preventivo consiste en realizar, a intervalos predeterminados o de acuerdo con los criterios prescritos, controles destinados a reducir la probabilidad de una falla o deterioro en el funcionamiento de un sistema.

Hay dos tipos de mantenimiento preventivo:

- Mantenimiento periódico
  Para cada tipo de producto, las recomendaciones de mantenimiento están destinadas a mantener los sistemas, o sus subensambles en buen estado de funcionamiento durante la vida útil específica, y debe ser llevado a cabo de acuerdo con los intervalos de tiempo estipulados en este documento.
  En ningún caso, Schneider Electric se hace responsable de los daños causados por la falla de un dispositivo si los controles periódicos no se llevaron a cabo de acuerdo con las recomendaciones de este documento.
- Mantenimiento condicional
  El mantenimiento condicional se realiza cuando alarmas programadas indican que un umbral predefinido se ha alcanzado. A tal fin, sensores deben estar instalados en el tablero de fuerza y en el tablero de distribución tipo autosoportado.
  En cierta medida, el mantenimiento condicional reduce el mantenimiento periódico recomendado que requiere un cierre anual de las instalaciones. El mantenimiento condicional es el medio para optimizar el mantenimiento de la instalación.
  Para obtener más información sobre las posibilidades que ofrece el

mantenimiento condicional, póngase en contacto con Schneider Electric Services.

Mantenimiento predecible

El mantenimiento predecible se basa en el registro y análisis de los parámetros del sistema para detectar un desvío del estado inicial y tendencias significativas. Si se usa el mantenimiento predecible, el cliente puede anticipar la necesidad de medidas correctoras para garantizar la seguridad del equipo y la continuidad del servicio, y planificar la acción para el momento más conveniente.

Sección 2—Mantenimiento preventivo

Las tablas que se presentan en esta sección proporcionan información para el mantenimiento preventivo e intervalos de tiempo recomendados. Las recomendaciones se basan en las condiciones de funcionamiento del dispositivo.

Tabla 1 – Mantenimiento preventivo

Tipo de mantenimiento	Realizado por	Condiciones de funcionamiento	Frecuencia
Tipo II	Empleado certificado del cliente	Normal	Cada año
		Favorable	Cada dos años
		Severo	Dos veces al año
Tipo III	Empleado certificado del cliente	Normal	Cada dos años
		Favorable	Cada cuatro años
		Severo	Cada año
Tipo IV	Schneider Electric Service	Todas	• Cada cinco años • Después de un disparo por un corto tiempo o cortocircuito instantáneo • Después de cinco disparos debido a sobrecargas.
Controles de almacenamiento	Empleado certificado del cliente	Todas	Después de un almacenamiento prolongado

Condiciones de funcionamiento

Condiciones normales

Tabla 2 – Condiciones de funcionamiento y medio ambiente normales

Temperatura	Temperatura promedio anual <25°C (77°F) en el exterior del tablero de distribución tipo autosoportado
Porcentaje de carga	< 80% de I_n (valor nominal del sensor)
Armónicos	Corriente de armónicos por fase <30% de I_n (valor nominal del sensor)
Humedad relativa	< 70%
Atmósfera corrosiva	Dispositivo instalado en la categoría de entorno 3C1 o 3C2 (IEC 60721-3-3) en las tablas 14 y 20
Medio ambiente salino	Sin bruma salina
Polvo	Bajo nivel Dispositivo protegido en el tablero de distribución tipo autosoportado equipado con filtros o gabinete con ventilación IP54 (NEMA 3)
Vibración	Vibración permanente < 0,2 g

Bajo estas condiciones, el mantenimiento que debe llevarse a cabo cada uno, dos o cinco años en los subensambles Masterpact NT/NW y el nivel de competencia necesario por parte de los agentes de servicio se describen en las tablas de las páginas 12, 13 y 14.

Al final de cada período de cinco años, los procedimientos de mantenimiento debe repetirse sistemáticamente.

Más allá de los límites anteriormente mencionados, los interruptores sufren envejecimiento acelerado que puede resultar en mal funcionamiento. Por este motivo, deben llevarse a cabo controles periódicos a intervalos de tiempo más cortos. Por otro lado, cuando se hacen esfuerzos especiales para mejorar las condiciones de funcionamiento y el entorno, las operaciones de mantenimiento preventivo pueden realizarse con menos frecuencia.

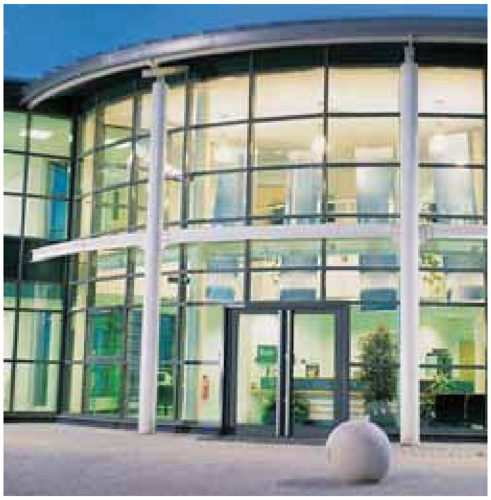
Condiciones favorables

El intervalo de tiempo entre los mantenimientos preventivos de tipo II y tipo III puede duplicarse si se cumplen **todas** las condiciones que se presentan a continuación. El programa de mantenimiento preventivo de tipo IV todavía se recomienda cada 5 años.

Tabla 3 – Condiciones de funcionamiento y entorno favorables

Protección	El dispositivo está protegido de las condiciones ambientales
Temperatura	Temperatura promedio anual <25°C (77°F) en el exterior del tablero de distribución tipo autosoportado El dispositivo está instalado en una sala con aire acondicionado o en un gabinete con ventilación
Porcentaje de carga	< 50% de I_n (valor nominal del sensor)
Humedad relativa	< 50%
Atmósfera corrosiva	Dispositivo instalado en una sala protegida (aire acondicionado purificado)
Medio ambiente salino	Ninguna
Polvo	Insignificante Dispositivo protegido en el tablero de distribución tipo autosoportado equipado con filtros o gabinete con ventilación IP54 (NEMA 3)
Vibración	Ninguna

Figura 1 – Condiciones favorables



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Condiciones severas

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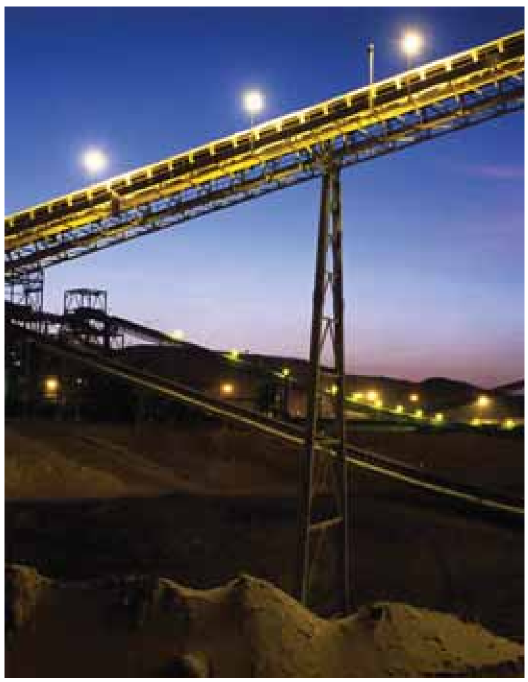
El intervalo de tiempo entre dos visitas de mantenimiento preventivo debe reducirse a la mitad **si alguna de las condiciones** presentadas a continuación están presentes a menos que el dispositivo esté protegido contra esa condición.

Tabla 4 – Condiciones de funcionamiento y entorno severas

Temperatura (promedio anual)	Temperatura promedio anual entre 35°C y 45°C (95°F y 113°F) alrededor del tablero de distribución tipo autosoportado
Porcentaje de carga	> 80% de I_n (valor nominal del sensor)
Humedad relativa	> 80%
Atmósfera corrosiva	Dispositivo instalado en la categoría de entorno 3C3 o 3C4 sin ninguna protección particular, consulte la tabla 14.
Medio ambiente salino	Instalación < 10 kilómetros (6.2 milllas) del mar y dispositivo sin ninguna protección particular
Polvo	Alto nivel de polvo y el equipo no está protegido, consulte la tabla 13
Vibración	Vibraciones continuas entre 0,2 y 0,5 g

Figura 2 – Condiciones severas



Operaciones de mantenimiento preventivo

Mantenimiento preventivo de nivel II

Se recomienda que el mantenimiento preventivo de nivel II se realice cada año.

El mantenimiento de nivel II consta de un mantenimiento preventivo menor tal como engrase y comprobaciones de funcionamiento, así como reparaciones y sustituciones de algunos subensambles, llevados a cabo por un empleado certificado del cliente según las instrucciones de mantenimiento del fabricante. Consulte el boletín de instrucciones y las guías de usuario para conocer los procedimientos. Consulte la sección 4 para obtener información sobre los componentes que necesitan mantenimiento.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA, Z462 de CSA o NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desconecte todas las fuentes de alimentación antes de realizar inspecciones de servicio de mantenimiento. Suponga que todos los circuitos están “vivos” hasta que hayan sido completamente desenergizados, probados, puestos a tierra y etiquetados. Tome en consideración todas las fuentes de alimentación, incluyendo la posibilidad de retroalimentación y alimentación de control.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

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Tabla 5 – Mantenimiento preventivo de nivel II

Control	Año					Herramienta
Dispositivo	1	2	3	4	5[1]	
Comprobar el estado general del dispositivo (cubierta de accesorios, unidad de disparo, caja, cuna, conexiones)	X	X	X	X	X	Ninguna
Mecanismo						
Abrir/cerrar dispositivo manualmente y eléctricamente	X	X	X	X	X	Ninguna
Cargar dispositivo eléctricamente	X	X	X	X	X	Ninguna
Comprobar el cierre completo de los polos del dispositivo	X	X	X	X	X	Ninguna
Comprobar el número de ciclos de funcionamiento del dispositivo	X	X	X	X	X	Contador de operaciones
Unidad de apertura (cámaras de arqueo + contactos)						
Comprobar la limpieza de filtros y la fijación de la cámara de arqueo	X	X	X	X	X	Manivela de inserción/extracción
Accesorios de control						
Comprobar el alambrado auxiliar y aislamiento	X	X	X	X	X	Ninguna
Unidad de disparo						
Disparar la unidad de disparo utilizando una herramienta de prueba y comprobar el funcionamiento de los contactos SDE y SDE2	X	X	X	X	X	Equipo HHTK o FFTK
Comprobar la función de protección de falla a tierra (Micrologic 6.0)	X	X	X	X	X	Ninguna
Bloqueo de dispositivo						
Abrir y cerrar las cerraduras de llave instaladas en el dispositivo	X	X	X	X	X	Ninguna
Abrir y cerrar el sistema de candados instalados en el dispositivo	X	X	X	X	X	Ninguna
Cuna (para los interruptores removibles)						
Retirar el dispositivo de la cuna y volver a colocarlo	X	X	X	X	X	Ninguna
Comprobar el funcionamiento de los contactos de posición (CE, CT, CD, EF)	X	X	X	X	X	Ninguna
Comprobar el funcionamiento de las persianas de seguridad	X	X	X	X	X	Ninguna
Bloqueo de la cuna						
Abrir y cerrar las cerraduras de llave instaladas en la cuna	X	X	X	X	X	Ninguna
Hacer funcionar el sistema de bloqueos con candado	X	X	X	X	X	Ninguna

[1] Estos controles y pruebas serán realizados por Schneider Electric Services en caso de diagnóstico en el quinto año (consulte la página 14).

Mantenimiento preventivo de nivel III

Se recomienda que el mantenimiento preventivo de nivel III se realice cada dos años.

El mantenimiento de nivel III consiste en el mantenimiento preventivo tal como ajustes generales, solución de problemas y diagnóstico de averías, reparaciones y sustituciones de componentes o piezas funcionales, reparaciones mecánicas menores, llevados a cabo por un técnico calificado del cliente, utilizando las herramientas especificadas en las instrucciones de mantenimiento del fabricante. Consulte el boletín de instrucciones y las guías de usuario para conocer los procedimientos.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA, Z462 de CSA o NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desconecte todas las fuentes de alimentación antes de realizar inspecciones de servicio de mantenimiento. Suponga que todos los circuitos están “vivos” hasta que hayan sido completamente desenergizados, probados, puestos a tierra y etiquetados. Tome en consideración todas las fuentes de alimentación, incluyendo la posibilidad de retroalimentación y alimentación de control.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

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Tabla 6 – Mantenimiento preventivo de nivel III

Control	Año					Herramienta
Mecanismo	1	2	3	4	5[1]	
Comprobar el tiempo de carga del motor de carga de resorte en 0,85 de la tensión nominal		X		X	X	Cronómetro + fuente de alimentación externa
Comprobar la condición general del mecanismo		X		X	X	Destornillador
Unidad de apertura (cámaras de arqueo + contactos)						
Comprobar el estado de la unidad de apertura		X		X	X	Destornillador
Accesorios de control						
Comprobar el funcionamiento de los contactos de indicación (OF / PF / MCH)		X		X	X	Fuente de alimentación externa
Comprobar el funcionamiento de control de cierre del accesorio XF auxiliar		X		X	X	Óhmetro
Comprobar el funcionamiento de control de apertura del accesorio MX auxiliar en 0,70 de la tensión nominal		X		X	X	Fuente de alimentación externa
Comprobar el funcionamiento de control del accesorio MN/MNR auxiliar entre 0,35 y 0,7 de la tensión nominal		X		X	X	Fuente de alimentación externa
Comprobar el retardo de los dispositivos MNR en 0,35 y 0,7 de la tensión nominal		X		X	X	Fuente de alimentación externa
Comprobar el tiempo de disparo de MX		X		X	X	Probador
Unidad de disparo						
Comprobar las curvas de disparo utilizando la herramienta de prueba, los LED de señalización (disparado, sobrecarga). Guardar los resultados en la PC		X		X	X	Equipo FFTK Generador de informes FFTK
Cuna (para los interruptores removibles)						
Eliminar la suciedad y cualquier material extraño y, luego, volver a engrasar la cuna		X		X	X	Mobilith® SHC00
Volver a engrasar las pinzas de conexión de los contactos de desconexión (caso específico de atmósfera corrosiva)		X		X	X	Mobilith SHC00
Conexiones de la alimentación						
Revisar y apretar las conexiones sueltas	Sólo después de una inspección visual si muestra marcas de sobrecalentamiento					Manivela de inserción/extracción

1 Estos controles y pruebas serán realizados por Schneider Electric Services en caso de diagnóstico en el quinto año (consulte la página 14).

Mantenimiento preventivo de nivel IV

Se recomienda que el mantenimiento preventivo de nivel IV se realice cada cinco años.

El mantenimiento de nivel IV consiste en diagnóstico del fabricante y sustitución de los componentes por el Departamento de apoyo de Schneider Electric Services. Consulte el boletín de instrucciones y las guías de usuario para conocer los procedimientos.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA, Z462 de CSA o NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desconecte todas las fuentes de alimentación antes de realizar inspecciones de servicio de mantenimiento. Suponga que todos los circuitos están “vivos” hasta que hayan sido completamente desenergizados, probados, puestos a tierra y etiquetados. Tome en consideración todas las fuentes de alimentación, incluyendo la posibilidad de retroalimentación y alimentación de control.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Tabla 7 – Mantenimiento preventivo de nivel IV

Control	Año					Herramienta
Maletín	5	10	15	20	25	
Medir la resistencia de aislamiento	X	X	X	X	X	Óhmetro
Mecanismo						
Comprobar las fuerzas de disparo (piezas en forma de media luna)	X	X	X	X	X	Probador
Unidad de apertura (cámaras de arqueo + contactos)						
Medir la resistencia de contacto de entrada/salida	X	X	X	X	X	Óhmetro + unidad de inyección
Accesorios de control						
Comprobar la vida útil de los accesorios XF, MX, MN	X	X	X	X	X	Software "Service Life" (vida útil)
Sustitución preventiva de los accesorios de control	—	—	X	—	—	Ninguna
Unidad de disparo Micrologic						
Comprobar la continuidad de la cadena de disparo por inyección primaria para cada fase	X	X	X	X	X	Unidad de inyección
Cuna (para los interruptores removibles)						
Comprobar el par de apriete de la conexión/desconexión	X	X	X	X	X	Manivela de inserción/extracción
Limpiar y volver a engrasar el tornillo de inserción/extracción	X	X	X	X	X	Grasa

Mantenimiento después del almacenamiento

Condiciones de almacenamiento

Los dispositivos deben almacenarse en un lugar seco y ventilado, protegido de la lluvia, agua y productos químicos. Debe estar bien protegido contra el polvo, escombros, pintura, etc.

En caso de almacenamiento durante un período prolongado, son necesarias las siguientes condiciones de almacenamiento:

- la humedad relativa en la sala debe mantenerse por debajo del 70%.
- los interruptores con unidades de disparo sin pantallas de cristal líquido pueden almacenarse en su embalaje original a temperaturas entre -40 °C a 85 °C (-40 °F a 185 °F).
- los interruptores con unidades de disparo con pantallas de cristal líquido pueden almacenarse en su embalaje original a temperaturas entre -25 °C a 85 °C (-13 °F a 185 °F).
- los dispositivos deben almacenarse en la posición de abierto (OFF) con los resortes de carga descargados.

Controles y mantenimiento

Después de un almacenamiento prolongado, los controles a continuación deben llevarse a cabo antes de la instalación para asegurar el funcionamiento correcto del dispositivo.

Almacenamiento < 2 años

Realice el programa del segundo año para los niveles II y III en los siguientes subensambles:

- mecanismo
- unidad de disparo
- bloqueo de dispositivo y cuna
- cuna.

Almacenamiento > 2 años

Realice el programa de diagnóstico del quinto año para los niveles III y IV en los siguientes subensambles:

- mecanismo
- accesorios de control
- unidad de disparo
- bloqueo de dispositivo y cuna
- cuna.

Si los dispositivos se almacenan bajo condiciones severas (temperaturas altas, atmósfera corrosiva), es necesario:

- comprobar el estado de la superficie de las piezas de metal (zinc) y las piezas de cobre (revestimientos de plata [Ag] o estañado [Sn])
- comprobar el engrase para el dispositivo y la cuna
- volver a engrasar las pinzas de conexión y comprobar los contactos primarios.

Sección 3—Envejecimiento acelerado

Causas de envejecimiento acelerado

Los tableros de distribución tipo autosoportado y tableros de fuerza se envejecen, independientemente si están en funcionamiento o no. El envejecimiento se debe principalmente a la influencia del medio ambiente y las condiciones de funcionamiento.

Influencia del medio ambiente

Un dispositivo que se coloca en un determinado entorno está sujeto a sus efectos.

Los factores ambientales principales que aceleran el envejecimiento del dispositivo son:

- temperatura
- porcentaje de carga
- humedad relativa
- entorno salino
- armónicos de corriente
- polvo
- atmósferas corrosivas.

Tabla 8 – Temperatura ambiente (fuera del tablero de distribución)[1]

Influencia	Aspecto	Consecuencias
Las características mecánicas de las piezas de plástico (aislamiento, caja) son cada vez más deterioradas por la temperatura entre más se eleva.	Cambio de color	Rotura de piezas, lo que provoca la falla de funciones
Endurecimiento de la grasa Insuficiencia de grasa en las pinzas de conexión de los contactos principales	Cambio de color y viscosidad Color caramelo de la grasa en las pinzas de conexión	El dispositivo no se puede hacer funcionar Fuerza excesiva durante la inserción/extracción ejercida en las pinzas de conexión
Deterioro del barniz aislante en las bobinas	Olor a quemado.	Falla de las bobinas (CT, MN, MX, XF, MCH, restablecimiento eléctrico).
Endurecimiento del pegamento en las etiquetas	Visual	Desprendimiento de etiquetas
Deterioro de componentes electrónicos	Cambio de la visualización de la pantalla de cristal líquido (LCD)	Pérdida de visualización Disparos incorrectos o no disparo
Deterioro de los dispositivos opto-electrónicos y de RCS.	No identificable	Posible transmisión de órdenes erróneas
Pérdida de la alimentación de respaldo de la batería	No identificable	Indicaciones de error no mostradas
Umbrales de temperatura en °C		
≤ 25°C (77°F)	26–35°C (78–95°F)	36-45°C (96-113°F)
Condiciones de funcionamiento óptimas	Un aumento de 10°C (18°F) de la temperatura ambiente es equivalente a un incremento del 5% en el porcentaje de la carga	Un aumento de 20°C (35°F) de la temperatura ambiente es equivalente a un incremento del 10% en el porcentaje de la carga
Recomendación		
Mantenimiento preventivo		
Implementar el programa estándar	Realizar revisiones periódicas más frecuentes (consulte la página 8)	Realizar revisiones periódicas más frecuentes (consulte la página 8)
Instalación		
No hay precauciones especiales requeridas	No hay precauciones especiales requeridas	Instalar ventilación de aire forzado en el tablero de distribución o aire acondicionado para la sala de instalaciones eléctrica

1 La temperatura ambiente afecta la temperatura del dispositivo, que se ve afectada por el porcentaje de la carga. Variaciones mayores en la temperatura (mayores que 30°C [54°F]) causan esfuerzo mecánico (expansión térmica) y condensación que pueden acelerar el envejecimiento.

Tabla 9 – Porcentaje de carga (valor nominal del sensor I_n)[1]

Influencia	Aspecto	Consecuencias
Envejecimiento del aislamiento de plástico	Cambio de color del aislamiento	Rotura de piezas, lo que provoca la falla de las funciones
Envejecimiento de la grasa	Cambio de color y viscosidad	Aumento de la fricción mecánica
Envejecimiento de los componentes electrónicos	Cambio de la visualización de la pantalla de cristal líquido (LCD)	Un aumento del 10°C (es decir, una carga del 90%) reduce la vida útil de los componentes aproximadamente por la mitad
Deterioro de las características: • resortes de acero (por encima de 100°C) • resortes de acero inoxidables (por encima de 200°C)	Ruptura	No funcionamiento de los mecanismos

Umbrales				
≤ 80%, 24/24 horas	≤ 90%, 8/24 horas	≤ 90%, 24/24 horas	I_n, 8/24 horas	I_n, 24/24 horas
Porcentaje máximo de la carga generalmente tomado en cuenta en el dimensionamiento de la instalación. En este porcentaje de carga, el aumento de la temperatura se reduce aproximadamente en el 40% con respecto a un porcentaje de carga de 100.	En este porcentaje de carga, el aumento de la temperatura se reduce sólo 20%. Los ciclos de calefacción y refrigeración tiene impacto sobre las uniones mecánicas del circuito de alimentación.	El esfuerzo térmico para un funcionamiento continuo es tres veces mayor que en el caso anterior, pero la ausencia de ciclos térmicos retrasa el envejecimiento de los componentes electromecánicos.	Entre el 90 y 100%, el aumento de la temperatura está cerca de su valor máximo. Los ciclos de calefacción y refrigeración tienen impacto sobre las uniones mecánicas del circuito de alimentación, con mayor impacto sobre el envejecimiento.	Entre el 90 y 100%, el aumento de la temperatura está cerca de su valor máximo. Esta situación tiene un impacto mayor sobre el envejecimiento.
Recomendaciones				
Mantenimiento preventivo				
Implementar el programa estándar	Aumentar la frecuencia de revisiones periódicas (consulte la página 8)	El mantenimiento preventivo es difícil debido al proceso continuo	Aumentar la frecuencia de revisiones periódicas (consulte la página 8)	El mantenimiento preventivo es difícil debido al proceso continuo Planear revisiones periódicas más frecuentes
Instalación				
			Proporcionar ventilación para el tablero de distribución	Distribuir la carga por otros interruptores Instalar un dispositivo con un valor nominal más alto

1 El porcentaje de carga afecta la temperatura del dispositivo, que es afectado por la temperatura ambiente.

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Tabla 10 – Humedad relativa

Influencia	Aspecto	Consecuencias
Corrosión de las superficies de metal que es acelerada cuando un contaminante está presente (gas corrosivo, sal, cloro, etc.)	Aspecto de: • óxido rojo en hierro • óxido blanco en zinc • depósito azul en cobre • depósito negro en plata	Aumento de la fricción Riesgo de falla mecánica que evita el funcionamiento de los mecanismos Aumento en la resistencia de contacto (pinzas de conexión y contactos principales)
Deterioro de cualidades dieléctricas de materiales plásticos	Marcas blancas en la caja	Riesgo de una reducción en el aislamiento
Deterioro de componentes electrónicos, tarjetas de circuitos impresos en particular y componentes revestidos de plata. Este fenómeno se agrava por la presencia de gases corrosivos de H_2S (sulfuro de hidrógeno).	No visible Presencia de dendritas en tarjetas electrónicas	Circuitos cortocircuitados que evitan el funcionamiento de las funciones de protección, medición, indicación y comunicación de la unidad de control.
Deterioro de componentes electrónicos, circuitos de cobre no barnizados en particular.	No visible Erosión de rastros de cobre Oxidación de conectores metálicos de componentes y cajas metálicas Oxidación de conectores de circuitos integrados montados sobre soportes	Falla debido a un cortocircuito o circuito abierto Falla de los conectores de componentes en la caja Mal contacto con los soportes de circuito integrado
Degradación de componentes opto-electrónicos.		Falla de transmisión de datos.
Umbrales en %		
≤ 70%	70 a 85%	> 85%
Nivel de humedad relativa que generalmente se encuentra en zonas templadas y continentales. El nivel es generalmente menor en los tablero de distribución debido al aumento de la temperatura interna. No se observa ningún deterioro significativo en este nivel.	Nivel de humedad relativa que generalmente se encuentra en zonas cerca del agua. Posible presencia de condensación en piezas fría y oxidación acelerada.	Nivel de humedad relativa que generalmente se encuentra en zonas tropicales y ciertas fábricas (por ejemplo, molinos de papel). Aumento del riesgo de condensación y oxidación lo cual provoca dificultades para desconectar dispositivos, riesgo de no abrirse o no cerrarse.
Recomendación		
Mantenimiento preventivo		
Mantenimiento preventivo	Realizar revisiones periódicas más frecuentes (consulte la página 8) La medición del aislamiento se recomienda cada 5 años	Realizar revisiones periódicas más frecuentes (consulte la página 8) Inspeccione en busca de oxidación en las piezas de metal La medición de aislamiento es imperativa cada dos años
Instalación		
No hay precauciones especiales requeridas		Instalar elementos de calefacción en el tablero de distribución

Figura 3 – Invernadero con alta humedad en el medio ambiente

Tabla 11 – Entorno salino

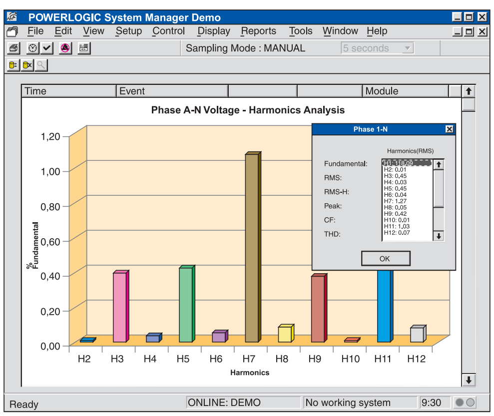
Influencia	Aspecto	Consecuencias
Corrosión de las piezas de metal	Aspecto de: • óxido blanco en los revestimientos de zinc • óxido rojo en acero	Aumento de la fricción. Atascamiento del mecanismo Resortes rotos. Bloqueo de los núcleos de accesorios de control MX / XF / MN.
Riesgo de depósitos de sal en el circuito electrónico cuando hay bruma espesa salina.	Presencia de puentes con sal en tarjetas electrónicas.	Falla de los sistemas electrónicos debido a circuitos cortocircuitados, en particular circuitos no barnizados.
Riesgos de depositos de sal conductivos en el dispositivo cuando hay bruma salina espesa.	Depósito blanco	Deterioro de la resistencia dieléctrica del dispositivo que resulta en un riesgo de cortocircuito de fase a marco y un cortocircuito de fase a fase si se produce una sobrecarga.
Umbrales		
No bruma salina	Bruma salina moderada < 10 km (6 millas) del mar	Bruma salina significativa < 1 km (0.6 millas) del mar
Sin influencia.	Envejecimiento moderado del tablero de fuerza.	Envejecimiento rápido del tablero de fuerza expuesto. En promedio, la vida útil se divide por un factor de tres para los dispositivos no protegidos.
Recomendación		
Mantenimiento preventivo		
Implementar el programa estándar.	Realizar revisiones periódicas más frecuentes (consulte la página 8).	Realizar revisiones periódicas más frecuentes (consulte la página 8). Probar la resistencia dieléctrica cada dos años.
Instalación		
No hay precauciones especiales requeridas.	No hay precauciones especiales requeridas.	El tablero de fuerza debe protegerse de la bruma salina. Aumentar el valor IP del tablero de distribución a IP54 (NEMA 3). Crear una sala protegida.

Figura 4 – Medio ambiente salino (junto al mar)

Tabla 12 – Armónicos

Influencia	Aspecto	Consecuencias
Aumento del efecto pelicular, efecto de proximidad, pérdidas en el hierro, corrientes inducidas	Cambio de color de las terminales, aisladores y grasa Cambio de la visualización de la pantalla de cristal líquido (LCD)	Los armónicos provocan un aumento de temperatura mayor que el de la corriente fundamental
Posible sobrecarga del neutro si los armónicos de tercer orden y sus múltiplos están presentes	Forma de onda distorsionada	Valor de corriente erróneo Disparo incorrecto si las unidades de disparo no proporcionan medidas de rcm
Umbrales en % de I_n		
THDi < 30%	THDi 30 a 50%	THDi > 50%
Sin influencia notable sobre el envejecimiento	En un THDi al 40%, la pérdida de calor es de aproximadamente un 10% más, equivalente a un 5% más de corriente	
Recomendación		
Mantenimiento preventivo		
Implementar el programa estándar	Realizar revisiones periódicas más frecuentes (consulte la página 8)	Realizar revisiones periódicas más frecuentes (consulte la página 8)
Instalación		
No hay precauciones especiales requeridas	Filtrado estándar con una inductancia para reducir los armónicos	Si es necesario, sobredimensionar el neutro Sobredimensionar el tablero de fuerza

Figura 5 – Armónicos



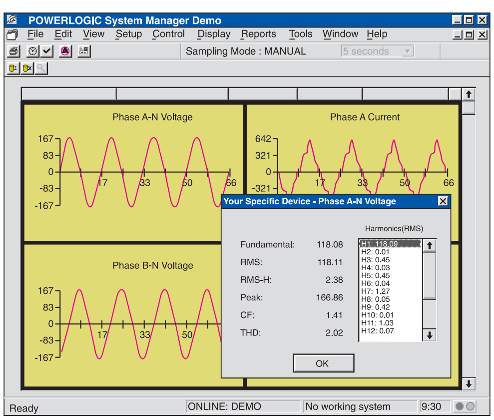


Tabla 13 – Polvo

Influencia	Aspecto	Consecuencias
Depósito en la grasa de los mecanismos (dispositivo y cuna)	Cambio de color y textura de la grasa	Desgaste prematuro de los mecanismos ya que el polvo mezclado con la grasa puede ser abrasivo Aumento de la fricción mecánica y atascamiento de las piezas móviles Riesgo de que el dispositivo no se pueda desplazar a la cuna Riesgo de que el dispositivo no pueda abrirse ni cerrarse
Depósito en la grasa de las pinzas de conexión	Cambio de color y textura de la grasa	Aumento de las fuerzas ejercidas en la inserción/extracción Aumento de resistencia de los contactos y elevación de la temperatura
Depósito en las pantallas		Los datos en la pantalla no son legibles
Depósito en el aislamiento		Reducción de resistencia en el aislamiento (depende del tipo de polvo) Este fenómeno se agrava por la presencia de humedad
Depósito en los contactos del dispositivo		Aumento de resistencia de los contactos y elevación de la temperatura
Depósitos en el sistema de comunicación opto-electrónico		Falla de transmisión de datos de comunicación entre los dispositivos
Depósito de polvo		
Bajo nivel	Moderado	Alto
Cantidad de polvo depositado en general, en y alrededor de los dispositivos en los edificios comerciales e instalaciones industriales estándar	Cantidad de polvo que se encuentra en los **tableros de distribución protegidos** instalados en entornos con mucho polvo, como las fábricas de cemento, molinos de granos, instalaciones de incineración, fábricas de plásticos y acero, minas, etc.	Cantidad de polvo depositado en el interior y alrededor de los dispositivos **tableros de distribución no protegidos** instalados en entornos con mucho polvo, como las fábricas de cemento, molinos de granos, instalaciones de incineración, fábricas de plásticos y acero, minas, etc.
Recomendación		
Mantenimiento preventivo		
Implementar el programa estándar Se aconseja aspirador los depósitos de polvo	Realizar limpieza periódica más frecuente (consulte la página 8)	Realizar limpieza periódica más frecuente (consulte la página 8)
Instalación		
Tablero de distribución con estándar IP (NEMA 1)	Asegúrese de que el tablero de distribución permanezca cerrado	El equipo especial necesario para proteger el tablero de fuerza es obligatorio

Figura 6 – Presencia de polvo

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Tabla 14 – Atmósfera corrosiva

Atmósfera corrosiva	Influencia	Aspecto	Consecuencias	Umbrales (ppm[1] en volumen) Valor promedio (consulte la página siguiente para obtener detalles sobre las categorías 3C1, 3C2, 3C3, 3C4)
Dióxido de azufre SO_2	Corrosión de la plata, el aluminio y el cobre desnudo. Fenómeno acelerado por altas temperaturas y humedad relativa.	Ennegrecimiento de las superficies de plata expuestas. Presencia de dendritas en los circuitos electrónicos y de potencia.	Aumento de resistencia de los contactos de desconexión expuestos al aire. Elevación excesiva de temperatura del dispositivo. Circuitos cortocircuitados que evitan el funcionamiento de la unidad de disparo.	3C1: 0,037 3C2: 0,11 3C3: 1,85 3C4: 4,8
Sulfuro de hidrógeno H_2S	Sulfuración de la plata, este fenómeno se acelera por las altas temperaturas.	Ennegrecimiento excesivo de las superficies de plata expuestas. Presencia de dendritas en los circuitos electrónicos y de potencia.	Aumento de resistencia de los contactos de desconexión expuestos al aire. Elevación excesiva de temperatura del dispositivo. Circuitos cortocircuitados que evitan el funcionamiento de la unidad de disparo.	3C1: 0,0071 3C2: 0,071 3C3: 2,1 3C4: 9,9
Cloro Cl_2	Corrosión de las piezas de metal	Oxidación Corrosión intergranular del acero inoxidable.	Aumento de la fricción. Riesgo de falla mecánica. Falla de los resortes de acero inoxidable.	3C1: 0,034 3C2: 0,034 3C3: 0,1 3C4: 0,2
Amoníaco NH_3	Ataca los policarbonatos, corroe el cobre.	Agrietamiento de policarbonatos. Ennegrecimiento de cobre.	Riesgo de falla. Mayor aumento de la temperatura.	3C1: 0,42 3C2: 1,4 3C3: 4 3C4: 49
Óxido de nitrógeno NO_2	Corrosión de las piezas de metal	Oxidación.	Mayor aumento de la temperatura.	3C1: 0,052 3C2: 0,26 3C3: 1,56 3C4: 5,2
Entornos aceitosos	Ataca policarbonatos.	Agrietamiento de policarbonatos.	Riesgo de falla. Mayor aumento de la temperatura.	

[1] ppm = partes por millón.

Tabla 15 – Categorías de medio ambiente según la norma IEC 60721-3-3

Clase			
3C1	3C2	3C3	3C4
Zonas rurales o urbanas con baja actividad industrial.	Zonas urbanas con actividad industrial dispersa y tráfico pesado.	Proximidad a contaminación industrial. Ejemplo: molinos de papel, tratamiento de agua, productos químicos, fibras sintéticas, plantas de fundición.	Dentro de instalaciones industriales que contaminan. Ejemplo: molinos de papel, tratamiento de agua, productos químicos, fibras sintéticas, plantas de fundición.
Presencia de gases corrosivos			
Insignificante	Bajo nivel	Nivel significativo	Alto nivel
Impacto en el tablero de fuerza			
Ningún impacto en la vida útil porque las concentraciones son muy bajas.	Impacto moderado en la vida útil.	Gran impacto, especialmente en relación con el aumento de temperatura. En sistemas electrónicos, no hay impacto en tarjetas electrónicas barnizadas ni en contactos revestidos de oro.	Vida útil significativamente reducida si no se toman precauciones particulares. En sistemas electrónicos, no hay impacto en tarjetas electrónicas barnizadas ni en contactos revestidos de oro.
Recomendación			
Mantenimiento preventivo			
Implementar el programa estándar.	Implementar el programa estándar. Se puede utilizar grasa "Pyratex" para los contactos de desconexión, pero debe cambiarse cada año (consulte los procedimientos del fabricante).	Realizar revisiones periódicas más frecuentes (consulte la página 8). Cambiar la grasa en los contactos de desconexión.	Realizar revisiones periódicas más frecuentes (consulte la página 8). Cambiar la grasa en los contactos de desconexión.
Instalación			
No hay precauciones especiales requeridas.	No hay precauciones especiales requeridas.	Usar dispositivos fijos en lugar de removibles.	Instalar el tablero de fuerza en una sala protegida de la contaminación. Usar dispositivos fijos en lugar de removibles o contactos de desconexión revestidos de oro.

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Condiciones de funcionamiento

La condiciones de funcionamiento afectan directamente la vida útil del tablero de fuerza debido a los niveles de resistencia mecánica y eléctrica limitados de los subensambles diferentes. Las condiciones de funcionamiento incluyen:

- vibraciones,
- el número de ciclos de funcionamiento,
- las corrientes interrumpidas.

Tabla 16 – Vibraciones

Influencia	Aspecto	Consecuencias	
Deterioro prematuro de las superficies de contacto (pinzas de conexión y contactos principales).	No identificable.	Aumento de la temperatura del dispositivo.	
Aflojamiento de los ensambles atornillados.	No identificable.	Aumento de espacio libre para las conexiones mecánicas.	
Desgaste de las piezas mecánicas.	No identificable.	Resortes rotos. Aumento de espacio libre para las conexiones mecánicas entre las piezas.	
Presencia de vibrocorrosión en las conexiones auxiliares.	No identificable.	Información errónea o pérdida de continuidad en los datos o suministro, aumento de temperatura excesivo.	
Falla de los conectores en los componentes electrónicos grandes (por ejemplo, capacitores grandes).	No identificable.	Falla de la función de protección.	
Desgaste de los selectores de configuración de la unidad de disparo.	No identificable.	Disparos incorrectos o no disparo.	
Umbrales			
< 0,2 g	0,2 g a 0,5 g	0,5 g a 0,7 g	> 0,7 g
Condición normal, sin impacto en la vida útil.	Vida útil reducida.	Aumento significativo de incidentes.	Prohibido para dispositivos estándar
Recomendación			
Mantenimiento preventivo			
Implementar el programa estándar.	Realizar revisiones periódicas más frecuentes (consulte la tabla).	Realizar revisiones periódicas más frecuentes (consulte la página 8). En particular comprobar el apriete de las conexiones.	
Instalación			
No hay precauciones especiales requeridas.	No hay precauciones especiales requeridas. Instalar el tablero de fuerza sobre una bujía de montaje de goma.	Instalar el tablero de fuerza sobre una bujía de montaje de goma.	Utilizar dispositivos especiales.

Tabla 17 – Número de ciclos de operación

Influencia		Consecuencias
El número de ciclos de operación depende directamente en la resistencia eléctrica y mecánica del dispositivo.		La vida útil del dispositivo depende del número de ciclos de operaciones diario.
Vida útil del dispositivo (depende del número de ciclos de operaciones diario)		
≤ 30 ciclos por mes	≤ 60 ciclos por mes	≤ 120 ciclos por mes
Corresponde a un ciclo por día. Para una resistencia del dispositivo de 10 000 ciclos y una corriente interrumpida de menos de 0,4 I_n, la vida útil es de 30 años.	Corresponde a dos ciclos por día. Para una resistencia del dispositivo de 10 000 ciclos y una corriente interrumpida de menos de 0,4 I_n, la vida útil es de 15 años.	Corresponde a cuatro ciclos por día. Para una resistencia del dispositivo de 10 000 ciclos y una corriente interrumpida de menos de 0,4 I_n, la vida útil es de 10 años.

Tabla 18 – Corriente interrumpida

Influencia	Aspecto	Consecuencias
Desgaste de los contactos fijos y móviles.	Deterioro de contactos.	Más allá del límite de la duración eléctrica, la temperatura del dispositivo aumenta debido a la mayor resistencia del contacto y a una reducción en la presión de los contactos.
Desgaste de las cámaras de arqueo (materiales aislantes, separadores).	Deterioro del aislamiento.	Más allá del límite de la duración eléctrica, los separadores de aislamiento (entrada/salida y entre fases) se reducen, y resulta en una reducción de idoneidad del dispositivo para el aislamiento y puede crear una condición insegura.
Umbrales		
≤ I_n (valor nominal del sensor)	> I_n a ≤ 4 I_n (valor nominal del sensor)	> 4 I_n a ≤ 8 I_n (valor nominal del sensor)
Este nivel de corriente interrumpida corresponde a la durabilidad mecánica (consulte la resistencia mecánica).	Este nivel de corriente interrumpida corresponde a los niveles esperados de eventos de corto tiempo.	Este nivel de corriente interrumpida corresponde a los eventos serios de cortocircuito. Requiere la inspección de los contactos y cámaras de arqueo.

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Figura 7 – Desgaste en contactos

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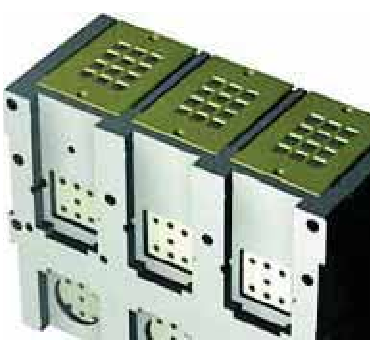
Sección 4—A que se debe dar mantenimiento

Inspeccione las cámaras de arqueo, contactos principales, motor de carga de resorte y dispositivos de disparo después de realizar las operaciones que se enumeran en la tabla 19.

Tabla 19 – Operaciones eléctricas

Tipo de interruptor	Número de operaciones eléctricas (ciclo de apertura y cierre)			
	Cámara de arqueo	Contactos principales	Motor de carga de resorte (MCH)	Dispositivos de disparo (MX/XF)
NW08–NW16 tipos N/N1/H/H1/H2/H3/HA/HF	10 000	10 000	12 500	12 500
NW08–NW16 tipos L/LF/L1/L1F/HB/HC	3 000	3 000	12 500	12 500
NW20 tipos N/H/H1/H2/H3/HA/HF	8 000	8 000	10 000	12 500
NW20 tipos L/LF/L1/L1F/HB/HC	3 000	3 000	10 000	12 500
NW32 tipos H1/H2/H3/HA/HF NW25-NW30 tipos H/L/HB/HF	5 000	5 000	10 000	12 500
NW40B (marco W) Tipos H1/H2/H3/HA/HF	5 000	5 000	10 000	12 500
NW40–NW50-NW60 tipos H/H2/H3/L/L1/HA/HB/HC/HF NW32 tipo L1	1 500	1 500	5 000	12 500

Caja moldeada



La caja es un elemento esencial del interruptor. Primero, ofrece una serie de funciones de seguridad que:

- proporciona un aislamiento funcional entre las propias fases y entre las fases y las partes conductoras expuestas para resistir sobretensiones transitorias causadas por el sistema de distribución
- proporciona una barrera, impidiendo el contacto directo del usuario con piezas vivas
- protege contra los efectos de los arcos eléctricos y presiones en exceso causadas por cortocircuitos.

En segundo lugar, sirve de soporte al mecanismo de funcionamiento, así como a los accesorios mecánicos y eléctricos del interruptor.

En la caja, no debe haber:

- ningún rastro de suciedad (grasa), polvo excesivo o condensación lo cual reduce el aislamiento
- ninguna indicación de quemaduras o grietas que podrían debilitar la caja y, por lo tanto, su capacidad para aguantar los cortocircuitos.

El mantenimiento preventivo para las cajas consiste en:

- una inspección visual de su estado y limpieza con un paño seco o una aspiradora. Todos los productos con solventes son estrictamente prohibidos.
- Mediciones del aislamiento cada cinco años y después de disparos debido a un cortocircuito.

Sustituya el interruptor si hay indicaciones de quemaduras o grietas.

Cámaras de arqueo

Durante un cortocircuito, la cámara de arqueo sirve para extinguir el arco y absorber el alto nivel de energía a lo largo de toda la ruta del cortocircuito. También contribuye a la extinción del arco en condiciones de corriente nominal. Una cámara de arqueo que no está en buenas condiciones puede no ser capaz de eliminar completamente el cortocircuito y finalmente terminará destruyendo el interruptor.

Las cámaras de arqueo deben revisarse regularmente. Las aspas de las cámaras de arqueo pueden enegreserse (debido a los gases producidos en I_n) pero no se debe dañar significativamente. Además, los filtros no deben bloquearse para evitar presiones excesivas internas. Use una aspiradora en lugar de un paño para quitar el polvo del exterior de las cámaras de arqueo.

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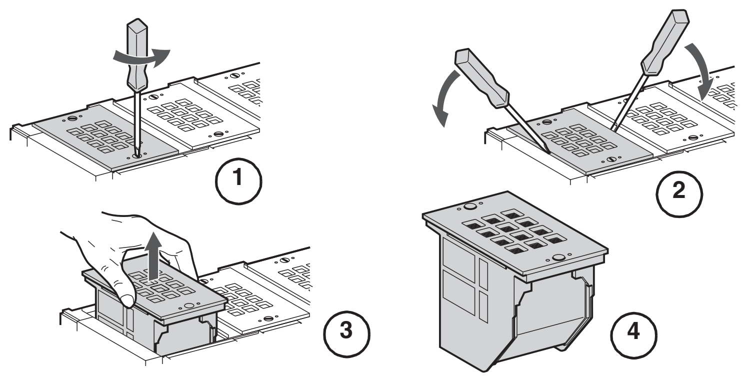
Mantenimiento de la cámara de arqueo

1. Desatornille los tornillos de montaje.
2. Use destornilladores para levantar la cámara de arqueo del interruptor.
3. Retire la cámara de arqueo.
4. Inspeccione la cámara de arqueo. Compruebe que el cuerpo de la cámara de arqueo no esté roto y que las placas estén intactas y que no estén quemadas ni derretidas de manera significativa.

Si es necesario, sustituya la cámara de arqueo.

Figura 8 – Mantenimiento de la cámara de arqueo



Contactos principales

Los contactos se cierran y abren para conectar o desconectar la corriente en condiciones normales (corriente nominal para la instalación) y en condiciones excepcionales (sobrecargas y cortocircuitos). Los contactos son erosionados por los varios ciclos de apertura y cierre y pueden ser deteriorados por las corrientes de cortocircuito. Los contactos desgastados pueden crear un aumento anormal de temperatura y acelerar el envejecimiento del dispositivo.

Es imperativo retirar las cámaras de arqueo y revisar el desgaste de los contactos por lo menos una vez al año y después de cada cortocircuito.

Los indicadores de desgaste de contactos constituyen un valor mínimo absoluto que no debe ser excedido.

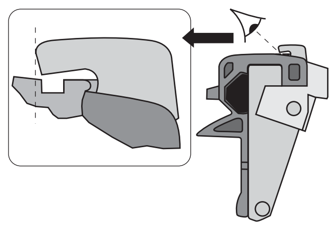
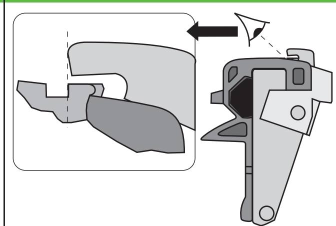
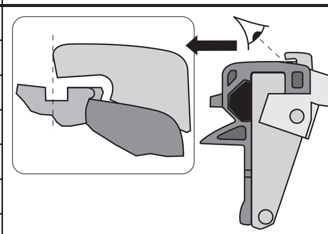
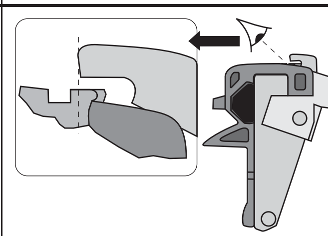
Para planificar y reducir el número de desconexiones, un contador electrónico de desgaste está disponible con la unidad de disparo Micrologic P y H. Una comprobación visual es necesaria cuando el contador llega a 100. Cuando el contador llega a 300, los contactos están desgastados y deben sustituirse.

Mantenimiento de los contactos principales

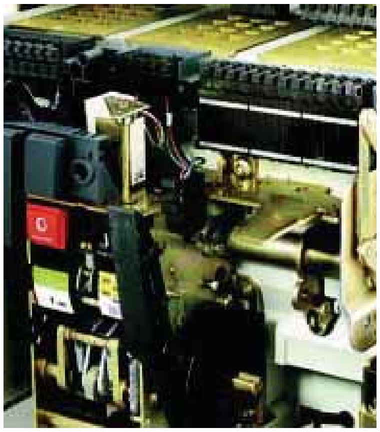
1. Desmonte las cámaras de arqueo.
2. Cierre el interruptor y revise el estado de los contactos.

Si los contactos están desgastados, se deberá sustituir el ensamble de bloque de terminales de interruptor de potencia.

Tabla 20 – Desgaste de los contactos

Estándar	Tamaño de marco	Tipo de interrupción	Polos	Contactos nuevos	Contactos que necesitan sustituirse
ANSI	250	H1/H2/H3/N1	3P		
	3 200-4 000	H2/H3	3P		
	800-1 600	N1	4P		
	800-2 000	H1/HA	4P		
	800-2 000	H2/H3/HF	3P/4P		
	3 200	H1/HA/H2/H3/HF	4P		
	3 200	HF	3P/4P		
UL	250	H/N	3P		
	2 000-3 000	L/HB	3P		
	800-3 000	H/HF	3/4P/4P RHN		
	800-2 000	N	3P/4P		
ANSI	250	L1/L1F	3P		
	800-2 000	H1/HA/L1/HC/L1F	3P		
	3 200-5 000	L1/HC	3P		
	4 000-5 000	H2/HA/H3/HF	3P/4P		
	800-1 600	N1	3P		
	3200-4 000	H1/HA	3P		
UL	250	L/LF	30		
	4 000-6 000	H/HF	3P/4P/4P RHN		
	4 000-6 000	L/HB	3P		
	800-1 600	L/HB	3P		
	800-2 000	LF	3P		

Mecanismos de los dispositivo y de la cuna



El funcionamiento mecánico del interruptor puede ser obstruido por vibraciones, polvo, entornos agresivos, falta de grasa, o grasa excesiva. La seguridad de funcionamiento es garantizada removiendo el polvo y realizando limpieza general, lubricación adecuada, y apertura y cierre regular del interruptor.

Para quitar el polvo

La mejor manera de quitar el polvo es utilizando una aspiradora.

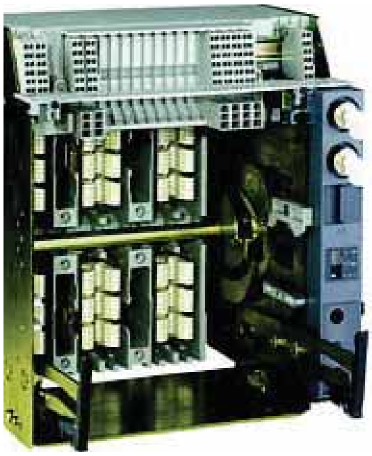
Limpieza

La limpieza debe realizarse con un paño o cepillo que esté completamente limpio y seco, sin utilizar ningún tipo de solvente, evitando las piezas engrasadas excepto la grasa en los contactos eléctricos. La aplicación de productos bajo presión o que contengan solventes (tricloroetileno, tricloroetano, WD40®) está estrictamente prohibida.

Los principales problemas de los productos bajo presión son los siguientes:

- puede ser imposible volver a engrasar los puntos inaccesibles de lubricación (que están engrasados para la vida útil del producto)
- corrosión de los puntos que no pueden volverse a engrasados
- daños causados por la presión
- riesgo de aumento de la temperatura debido a la presencia de un solvente aislante en las zonas de contacto
- eliminación de la protección especial
- deterioro de los materiales plásticos.

Engrasado



Esta operación se lleva a cabo después de limpiar ciertas piezas mecánicas como se describe en los procedimientos de mantenimiento, utilizando las diferentes grasas recomendadas por Schneider Electric. No deberá aplicarse grasa en exceso ya que si se mezcla con el polvo, puede resultar en un mal funcionamiento del mecanismo. En general, bajo condiciones normales de funcionamiento, el mecanismo de funcionamiento de polos no requiere ninguna lubricación posterior ya que viene engrasado de fábrica para la vida útil del producto.

- Las pinzas de conexión y los contactos de desconexión deben engrasarse según los intervalos definidos utilizando las grasas indicadas por Schneider Electric.
- Los contactos principales no deben ser engrasados.

Ciclos de funcionamiento

La necesidad de garantizar la continuidad del servicio en una instalación generalmente significa que los interruptores de potencia rara vez se hagan funcionar. Mientras que un número excesivo de ciclos de funcionamiento acelera el envejecimiento de dispositivos, también es cierto que la falta de funcionamiento durante un largo período puede dar lugar a averías mecánicas. Un funcionamiento regular es requerido para mantener el nivel de rendimiento normal de cada parte involucrada en los ciclos de apertura y cierre.

En instalaciones donde los interruptores de potencia se utilizan en los sistemas de cambio, se recomienda hacer funcionar periódicamente el interruptor de la fuente alternativa.

Circuitos auxiliares

Accesorios de control

Los disparadores de derivación MX y XF se utilizan, respectivamente, para abrir de forma remota y cerrar el interruptor mediante una orden eléctrica o a través de una red de comunicación.

El disparador por baja tensión MN se utiliza para abrir el circuito de alimentación si la tensión del sistema de distribución baja o falla.

Los disparadores MX y XF de comunicación así como el disparador MN se suministran continuamente y sus componentes electrónicos internos pueden sufrir un envejecimiento acelerado si hay aumento de temperatura en el interruptor.

El mantenimiento preventivo consiste en la comprobación periódica del funcionamiento en valores mínimos.

Alambrado auxiliar

El alambrado auxiliar se utiliza para transmitir órdenes a los diversos dispositivos de control y para transmitir la información de estado. Las conexiones incorrectas o el aislamiento dañado puede resultar en el mal funcionamiento del interruptor o disparos incorrectos.

El alambrado auxiliar debe ser regularmente revisado y sustituirse si es necesario, sobre todo si hay vibraciones, altas temperaturas ambientales o atmósferas corrosivas.

Contactos de indicación

Los contactos que indican el estado del interruptor (ON / OFF), de la cuna (CE, CD, CT), un disparo debido a una falla eléctrica (SDE), o que el interruptor está preparado para cerrar (PF) proporcionan al operador la información de estado requerida para reaccionar correspondientemente. Las indicaciones incorrectas pueden provocar un funcionamiento erróneo del dispositivo. La falla de los contactos (desgaste, conexiones sueltas) puede deberse a las vibraciones, corrosión o aumento anormal de la temperatura y, durante el mantenimiento preventivo, debe asegurarse de que los contactos conduzcan o aíslen correctamente de acuerdo con sus posiciones.

Motor de carga de resorte

El motor de carga de resorte (MCH) recarga automáticamente los resortes del mecanismo de funcionamiento, tan pronto como el interruptor se cierra. El motor de carga de resorte hace posible que el dispositivo vuelva a cerrarse instantáneamente después de una apertura. Esta función puede ser indispensable por razones de seguridad. La palanca de carga sirve simplemente como un medio de respaldo si falla la tensión auxiliar. Los controles periódicos del funcionamiento del motor de carga de resorte y el tiempo de carga son necesarios para garantizar el funcionamiento del dispositivo.

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Unidad de disparo electrónico

Si una falla eléctrica se produce en la instalación, la unidad de disparo detecta la falla y ordena al interruptor que se abra.

Los componentes y las tarjetas de circuitos electrónicos son sensibles al medio ambiente (temperatura, humedad y entornos corrosivos) y a las condiciones de funcionamiento severas (campos magnéticos, vibraciones, etc.). Para garantizar un funcionamiento correcto es necesario verificar periódicamente:

- la cadena de acción que produce un disparo
- el tiempo de respuesta como una función del nivel de la corriente de falla.

Utilice un equipo de pruebas HHTK o FFTK para realizar las pruebas de inyección secundaria o inyección primaria.

Módulo de comunicación y accesorios

Modulo de E/S

Modulo IFM

Modulo IFE

A través del bus de comunicación, la opción de comunicación transmite los datos a un sitio remoto para su uso por los diversos departamentos (mantenimiento, administración, producción, etc.).

Una interrupción en la transmisión de datos puede resultar en:

- pérdidas de producción debido al desconocimiento del estado de un interruptor
- pérdidas financieras debido a la administración incorrecta del sistema, errores de diagnóstico, etc.

Controles periódicos en las ordenes (lectura, escritura, comandos) transmitidos por el bus de comunicación son obligatorios para mantener un alto grado de fiabilidad y confianza en el sistema de comunicación.

Conexiones

Las conexiones entre los diversos sistemas de distribución en un tablero de distribución (cables, barras) y el tablero de fuerza son una fuente significante de pérdida de calor. El apriete incorrecto de las conexiones puede crear una fuga térmica que a su vez puede dañar el dispositivo, el aislamiento del cable, o provocar un cortocircuito o un incendio. Este tipo de mal funcionamiento se debe a

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menudo al desconocimiento de los requisitos de la instalación durante el montaje del tablero de distribución.

NOTA: Las conexiones nunca deben utilizar diferentes materiales (cobre / aluminio).

Interruptores fijos

Las conexiones de los interruptores fijos utilizan zapatas o barras. Cuando se realizan de acuerdo con las recomendaciones de Schneider Electric (par de apriete, herrajes y roldanas de los contactos), este tipo de conexión no requiere ningún mantenimiento especial.

De lo contrario, compruebe regularmente los puntos de aumento de temperatura. Si hay un cambio de color del cobre o estañado:

- desmonte las conexiones
- limpie y raspe las superficies de contacto
- luego vuelva a montar las conexiones utilizando nuevos herrajes.

Compruebe las terminales.

Interruptores removibles (cuna)

Las conexiones del interruptor removible se componen de dos partes, las pinzas de conexión y los contactos de desconexión. Este tipo de conexión es crítica y requiere una limpieza periódica en conformidad con los procedimientos descritos. La grasa facilita la conexión entre las pinzas de conexión y los contactos de desconexión y evita dañar la superficie revestida de plata reduciendo la fricción durante la inserción/extracción.

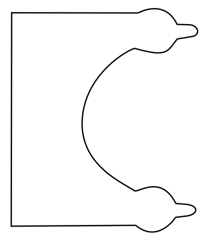
En atmósferas (corrosivas) sulfurosas ($H2S$ / $SO2$), es necesario implementar el procedimiento de limpieza con la solución de tiourea, y es obligatorio volver a engrasar con grasa fluorosa (como Pyratex® EP). Este tipo de grasa protege los contactos de plata y revestidos de cobre contra sulfurización. Como el sulfuro de plata o cobre es aislante, éste crea un aumento en la resistencia del contacto y, por consiguiente, un mayor aumento de la temperatura. La grasa se descompone con el tiempo y por lo tanto es necesario cambiarla regularmente.

Inspección y lubricación de las pinzas de conexión (interruptores removibles Masterpact NW solamente)

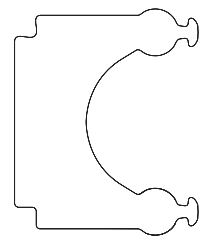
1. Si el interruptor está equipado con sujetadores de pinzas de conexión, quite los sujetadores según sea necesario para inspeccionar las pinzas de conexión y sus soportes.
2. Si el interruptor está equipado con blindaje ArcBlok o protecciones de pinzas de conexión, utilice la herramienta S47542 para quitar las pinzas e inspeccionarlas.

Figura 9 – Perfiles de los soportes para pinzas de conexión

Soporte para pinzas de conexión antigua



Soporte para pinzas de conexión nueva

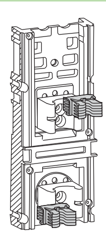
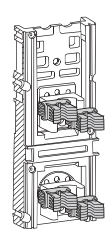
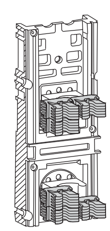
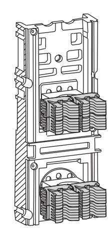
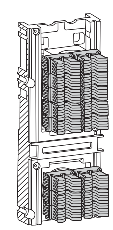
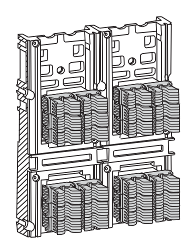


Asegúrese de que las pinzas de conexión estén correctamente instaladas como se muestra en la tabla 21.

3. Realice una inspección visual a las pinzas de conexión para ver si encuentra indicaciones de daños tales como:
   - — Áreas decoloradas
   - — Restos de cobre visibles en los dedos
   - — Resortes rotos o cuarteados
   - — Pinzas de conexión faltantes
   - — Las pinzas no están alineadas (indica daños en los resortes)
4. Realice una inspección visual a las pinzas de conexión para ver si se han desgastado.
5. Para los interruptores con sujetadores de pinzas de conexión: compruebe que todas las pinzas de conexión tengan sujetadores.

NOTA: Los interruptores con protecciones de pinzas de conexión o blindajes ArcBlok no necesitan los kits de retención de las pinzas de conexión. No intente instalar los kits de retención de las pinzas de conexión en estos interruptores.

Tabla 21 – Configuración de las pinzas de conexión

Cantidad de pinzas de conexión por polo					
2	4	6	8	16	24
					

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Sustitución de las pinzas de conexión

AVISO

PELIGRO DE DAÑO AL EQUIPO

- Si se llegasen a retirar las pinzas de conexión por cualquier razón, las pinzas deben ser instaladas empleando la herramienta de posicionamiento S47542.
- Lubrique las pinzas de conexión como se muestra en Lubricación de las pinzas de conexión en la página 39.
- Utilice solamente una barra de 3/8 pulg de ancho o herramienta de ajuste (CLUSRETOOL) en la mordaza de las pinzas de conexión.

El incumplimiento de estas instrucciones puede causar daño al equipo.

Si se llegan a desgastar o dañar las pinzas de conexión de los interruptores Masterpact NW, se deberán instalar nuevas pinzas utilizando la herramienta de posicionamiento S47542.

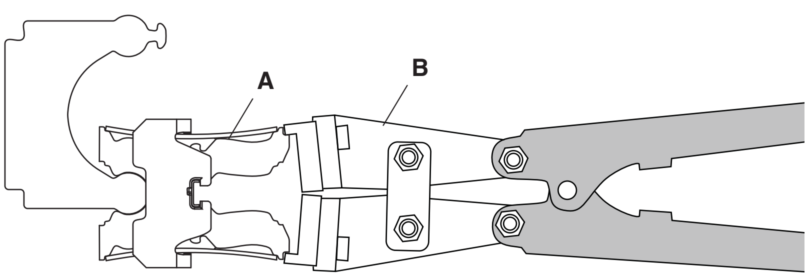
Tabla 22 – Cantidad de pinzas de conexión por polo

Tipo		N / N1	H1	HA	H / H2 / H3 / HF	L / L1 / LF / L1F / HB / NC
V ~	NW08	2	4	4	4 / 6 / 6 / 4	8
	NW12	2	—	—	4	8
	NW16	6	6	6	6	8
	NW20	8	8	8	8	16
	NW25 / NW30	—	—	—	16	16
	NW32	—	16	16	16	24
	NW40/NW50	—	—	24	24	24
	NW60	—	—	—	24	24
V ⎓	NW80 / NW12 / NW16 / NW20 / NW25	8				
	NW30 / NW40	16				

— Sustituya las pinzas de conexión desgastadas o dañadas.

— Instale las nuevas pinzas de conexión (A) utilizando la herramienta de posicionamiento S47542 (B).

Figura 10 – Sustitución de las pinzas de conexión



Si las pinzas de conexión y sus soportes no están dañados y el interruptor no está equipado con una protección de pinzas o blindaje ArcBlok, puede seguir utilizando los kits de sujetadores de pinzas de conexión. Si es necesario, realice una adaptación para utilizar los nuevos soportes de pinzas, las pinzas de conexión y las protecciones de pinzas de conexión/blindaje ArcBlok.

Tabla 23 – Accesorios de sujetador de pinzas de conexión

Descripción	Tamaño de marco	Tipo de interrupción	Pinzas de conexión por polo	Kit sujetador de pinzas de conexión		Color del sujetador	
				3P	4P	Superior	Inferior
Interruptor de potencia Masterpact NW registrado bajo la norma UL489	800/1600 A	N	2 ó 6	CRK2000A3P	CRK2000A4P	Sin color	Sin color
		H	4 ó 6	CRK2000A3P	CRK2000A4P	Sin color	Sin color
		L/LF	8	CRK2000A3P	N/D	Sin color	Sin color
	2000 A	N/H	8	CRK2000A3P	CRK2000A4P	Sin color	Sin color
		L/LF	16	CRK3000L3P	N/D	Rojo	Negro
	2500/3000 A	H	16	CRK3200A3P	CRK3200A4P	Rojo	Negro
		L	16	CRK3000L3P	N/D	Rojo	Negro
	4000/5000/6000 A	H	24	CRK6000A3P	CRK6000A4P	Negro	Negro
		L	24	CRK6000A3P	N/D	Negro	Negro
Interruptores automáticos Masterpact NW registrados bajo la norma UL489	800/1600 A	HF	4 ó 6	CRK2000A3P	CRK2000A4P	Sin color	Sin color
		HB	8	CRK2000A3P	N/D	Sin color	Sin color
	2000 A	HF	8	CRK2000A3P	CRK2000A4P	Sin color	Sin color
		HB	16	CRK3000L3P	N/D	Rojo	Negro
	2500/3000 A	HF	16	CRK3200A3P	CRK3200A4P	Rojo	Negro
		HB	16	CRK3000L3P	N/D	Rojo	Negro
	4000/5000/6000 A	HF	24	CRK6000A3P	CRK6000A4P	Negro	Negro
		HB	24	CRK6000A3P	N/D	Negro	Negro
Interruptor de potencia Masterpact NW certificado bajo la norma ANSI C37	800/1600 A	N1	2 ó 6	CRK2000A3P	CRK2000A4P	Sin color	Sin color
		H1/H2/H3	4 ó 6	CRK2000A3P	CRK2000A4P	Sin color	Sin color
		L1/L1F	8	CRK2000A3P	N/D	Sin color	Sin color
	2000 A	H1/H2/H3	8	CRK2000A3P	CRK2000A4P	Sin color	Sin color
		L1/L1F	16	CRK3000L3P	N/D	Rojo	Negro
	3200 A	H1/H2/H3	16	CRK3200A3P	CRK3200A4P	Rojo	Negro
		L1	24	CRK6000A3P	N/D	Negro	Negro
	4000/5000 A	H2/H3	24	CRK6000A3P	CRK6000A4P	Negro	Negro
		L1	24	CRK6000A3P	N/D	Negro	Negro
Interruptores no automáticos Masterpact NW certificados bajo la norma ANSI C37	800/1600 A	HA	4 ó 6	CRK2000A3P	CRK2000A4P	Sin color	Sin color
	2000 A	HA	8	CRK2000A3P	CRK2000A4P	Sin color	Sin color
	3200 A	HA	16	CRK3200A3P	CRK3200A4P	Rojo	Negro
	4000/5000 A	HA	24	CRK6000A3P	CRK6000A4P	Negro	Negro
Interruptores automáticos Masterpact NW certificados bajo la norma ANSI C37	800/1600 A	HF	4 ó 6	CRK2000A3P	CRK2000A4P	Sin color	Sin color
		HC	8	CRK2000A3P	N/D	Sin color	Sin color
	2000 A	HF	8	CRK2000A3P	CRK2000A4P	Sin color	Sin color
		HC	16	CRK3000L3P	N/D	Rojo	Negro
	3200 A	HF	16	CRK3200A3P	CRK3200A4P	Rojo	Negro
		HC	24	CRK6000A3P	N/D	Negro	Negro
	4000/5000 A	HF	24	CRK6000A3P	CRK6000A4P	Negro	Negro
		HC	24	CRK6000A3P	N/D	Negro	Negro
Clip sujetador de pinzas de conexión	Todos	Todos	—	CRCLIP	—	—	—

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⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

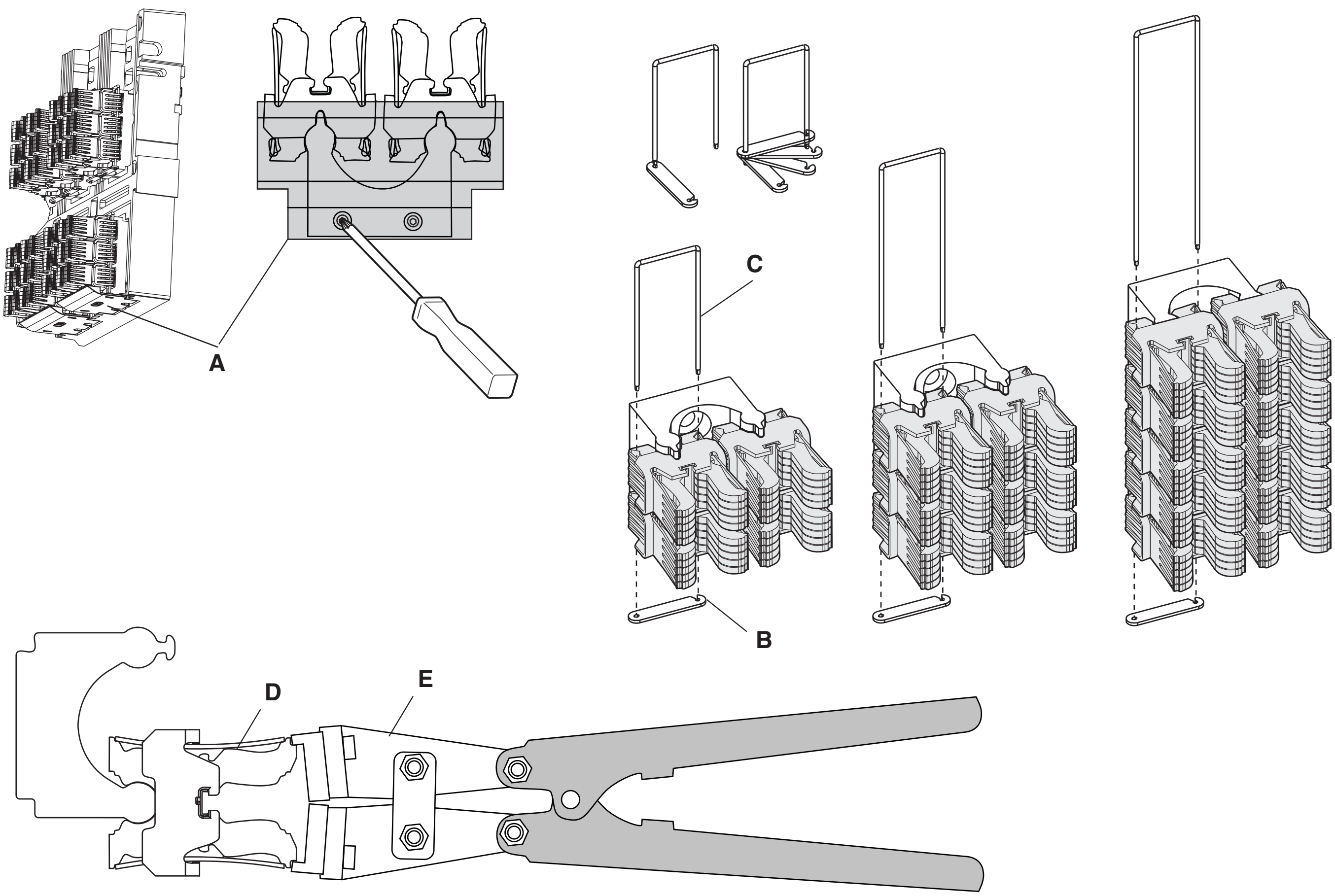
Instale el sujetador de pinzas de conexión correcto identificado por color según el tamaño y tipo de interruptor. Consulte la tabla 23 en la página 35.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

NOTA: El clip sujetador de pinzas de conexión no se puede volver a usar. Utilice un clip sujetador de pinzas de conexión nuevo, número de pieza CRCLIP.

1. Sustituya las pinzas de conexión desgastadas o dañadas en todas las configuraciones excepto las pinzas de conexión inferiores en las configuraciones de 16 y 24 pinzas.
   a. Desmonte la placa conectora (A) inferior, si está presente. Conserve la placa, tornillos y roldanas.
   b. Retire el clip (B) y el sujetador (C) de las pinzas de conexión, si viene equipado con ellos. Deseche el clip sujetador de las pinzas de conexión Retire las pinzas de conexión dañadas o desgastadas.
   c. Instale las nuevas pinzas de conexión (D) utilizando la herramienta de posicionamiento S47542 (E).
   d. Sujete las pinzas de conexión utilizando el sujetador (C) y el nuevo clip (B). Consulte la tabla 23 para obtener información sobre el kit de sujeción de las pinzas de conexión y color de sujetador correctos.
   e. Vuelva a colocar la placa (A) del conector inferior, si fue desmontada previamente. Sujete utilizando roldanas y tornillos que conservó con anterioridad. Apriete los tornillos en 2 N•m (17,7 lbs-pulg).

Figura 11 – Sustitución de las pinzas de conexión



⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

Instale el sujetador de pinzas de conexión correcto identificado por color según el tamaño y tipo de interruptor. Consulte tabla 23 en la página 35.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

2. Sustituya las pinzas de conexión desgastadas o dañadas en el grupo inferior (A) en las configuraciones con 16 y 24 pinzas.
   a. Desmonte la placa conectora (B) inferior, si está presente. Conserve la placa, tornillos y roldanas.
   b. Retire el clip (C) y el sujetador (D) de las pinzas de conexión, si viene equipado con ellos. Deseche el clip sujetador de las pinzas de conexión Retire todas las pinzas de conexión y deseche aquellas que estén dañadas o desgastadas.
   c. Deslice el sujetador (D) por dos pinzas de conexión hasta que la parte inferior del sujetador se encuentre a ras con la parte inferior de la pinza de conexión inferior. Consulte la tabla 23 para obtener el color y kit de

sujetador de pinzas de conexión correctos.

d. Instale las dos pinzas de conexión y el sujetador (E) en las dos muescas superiores del soporte (F) empleando la herramienta de posicionamiento S47542 (G).

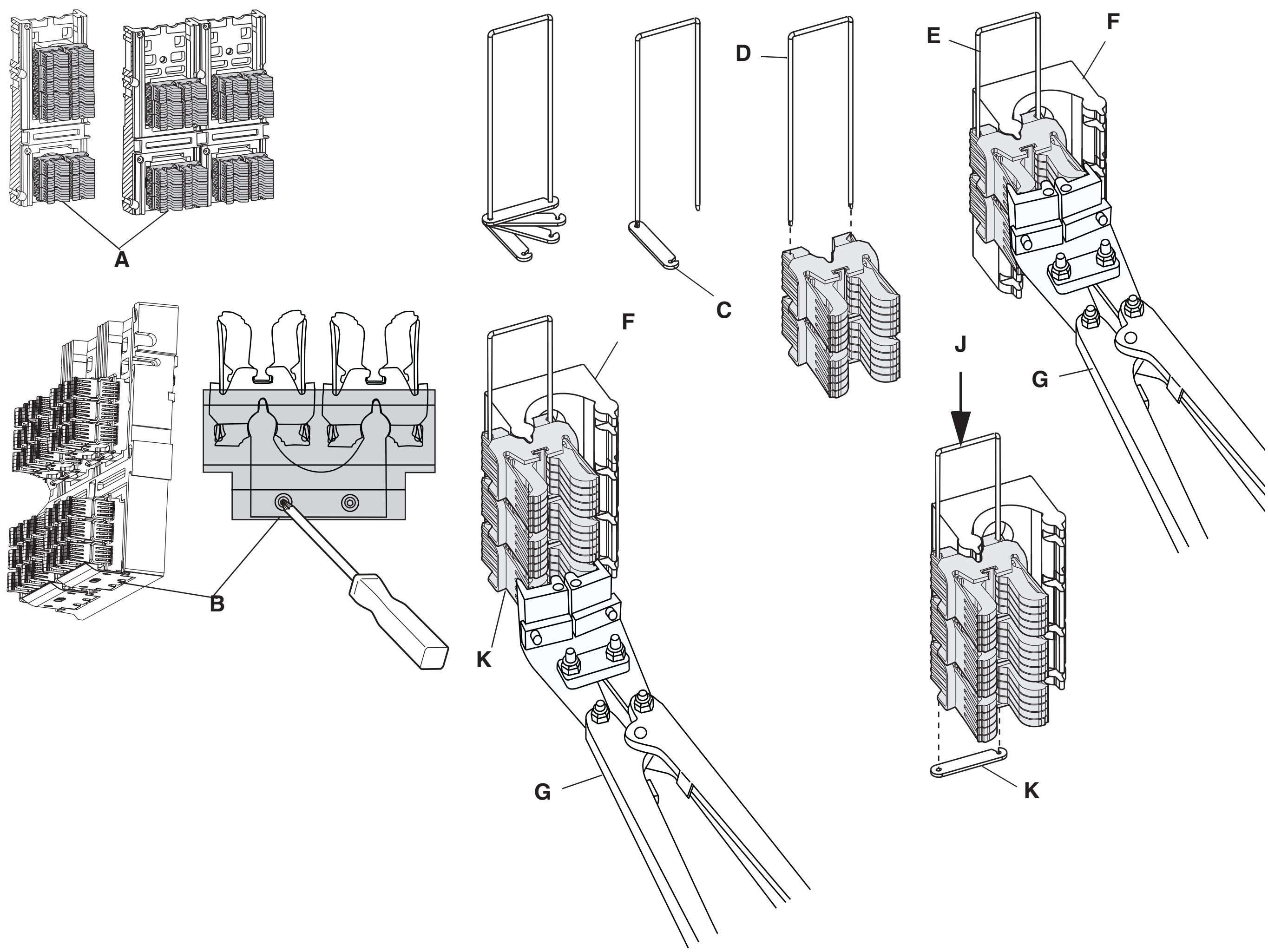
e. Instale la tercer pinza de conexión (H) en la muesca inferior del soporte (F) empleando la herramienta de posicionamiento S47542 (G).

f. Deslice el sujetador (J) por la tercera pinza de conexión y sujétela empleando el nuevo clip sujetador (K).

g. Repita este procedimiento para las pinzas de conexión en el otro lado del soporte.

h. Vuelva a colocar la placa (B) del conector inferior, si fue desmontada previamente. Sujete utilizando roldanas y tornillos que conservó con anterioridad. Apriete los tornillos en 2 N•m (17,7 lbs-pulg).

Figura 12 – Sustitución de las pinzas de conexión



Lubricación de las pinzas de conexión

AVISO

PELIGRO DE DAÑO AL EQUIPO

Inspeccione las pinzas de conexión y asegúrese de que estén lubricadas al desmontar el interruptor de la cuna.

El incumplimiento de estas instrucciones puede causar daño al equipo.

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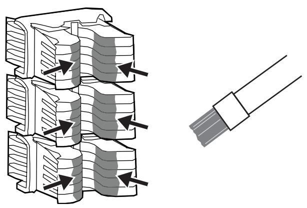
Utilice el kit de grasa S48899 para lubricar las mordazas de las pinzas de conexión, como se muestra en la figura 13.

NOTA: Retire la grasa existente del ensamble de pinzas de conexión antes de aplicar la grasa nueva.

Figura 13 – Aplicación de lubricante en las pinzas de conexión



Lubricación de las lengüetas de la cuna

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA, Z462 de CSA o NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.

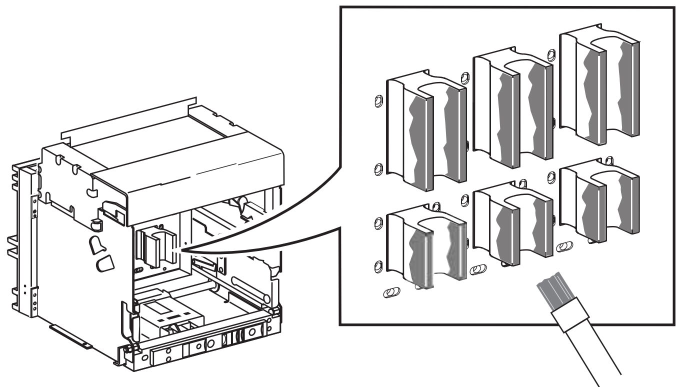
El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Las lengüetas de la cuna deberán ser lubricadas e inspeccionadas visualmente al instalar la cuna por primera vez y de nuevo durante los intervalos de servicio de mantenimiento después de haber desconectado toda la alimentación.

Confirme que ambos lados de las lengüetas estén cubiertos con lubricante. Si fuese necesario, emplee el kit de grasa (número de catálogo S48899) para lubricar las lengüetas.

NOTA: Retire la grasa existente de las lengüetas de la cuna antes de aplicar la grasa nueva.

Figura 14 – Aplicación de lubricante en las lengüetas de la cuna



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Sección 5—Diagnóstico de problemas

Tabla 24 – Diagnóstico y soluciones de problemas

Problema	Causas posibles	Soluciones
El interruptor no se puede cerrar de manera remota ni localmente.	1. Interruptor bloqueado con candado o llave en la posición "OPEN". 2. Interruptor interbloqueado mecánicamente en un sistema de cambio de fuente. 3. El interruptor no está completamente conectado. 4. El botón de restablecimiento que indica un disparo por falla no se ha restablecido. 5. El mecanismo de energía almacenada no está cargado. 6. El disparador en derivación de apertura MX es alimentado con energía permanentemente. 7. Disparador por baja tensión MN no energizado. 8. El disparador de cierre XF está continuamente energizado, pero el interruptor no está "preparado para cerrar" (XF no está conectado en serie con el contacto PF). 9. Comando de disparo permanente de una unidad de disparo Micrologic P o H, con tensión mínima y protección de frecuencia mínima en el modo de disparo y la unidad de disparo energizada.	1. Desactive la función de bloqueo. 2. Compruebe la posición del otro interruptor en el sistema de cambio. Modifique la situación para soltar el bloqueo. 3. Complete la inserción (conexión) del interruptor. 4. Elimine la falla. Pulse el botón de restablecimiento en la parte frontal del interruptor. 5. Cargue el mecanismo manualmente Si está equipado con un motor de carga de resorte MCH, compruebe el suministro de energía al motor. Si el problema persiste, sustituya el motor de carga de resorte (MCH). 6. Hay una orden de apertura. Determine el origen de la orden. La orden debe cancelarse antes de que el interruptor pueda ser cerrado. 7. Hay una orden de apertura. Determine el origen de la orden. Compruebe la tensión y el circuito de alimentación ($U > 0{,}85\ U_n$). Si el problema persiste, sustituya el disparador. 8. Abra el suministro de energía al disparador de cierre XF, luego, envíe nuevamente la orden de cierre con el XF, pero sólo si el interruptor está "preparado para cerrar". 9. Desactive estas funciones de protección en la unidad de disparo Micrologic P y H.
El interruptor no se puede cerrar de forma remota, pero puede abrirse localmente utilizando el botón de cierre.	La orden de cierre no fue ejecutada por el disparador de cierre XF.	Compruebe la tensión y el circuito de alimentación ($0{,}85 - 1{,}1\ U_n$). Si el problema persiste, sustituya el disparador XF.
Disparo accidental sin activación del botón de restablecimiento que indica un disparo por falla.	1. La tensión de alimentación del disparador por baja tensión MN es muy baja. 2. La orden de desconexión de carga fue enviada al disparador de apertura MX por otro dispositivo. 3. Orden de apertura innecesaria del disparador de apertura MX.	1. Compruebe la tensión y el circuito de alimentación ($U > 0{,}85\ U_n$). 2. Compruebe la carga general en el sistema de distribución Si es necesario, modifique los ajustes de los dispositivos en la instalación. 3. Determine el origen de la orden.
Disparo accidental con activación del botón de restablecimiento que indica un disparo por falla.	Una falla está presente: • sobrecarga • falla a tierra • cortocircuito detectado por la unidad de disparo	Determine y elimine las causas de la falla. Compruebe el estado del interruptor antes de volver a ponerlo en servicio.

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Tabla 24 – Diagnóstico y soluciones de problemas *(continuación)*

Problema	Causas posibles	Soluciones
Apertura instantánea después de cada intento de cerrar el interruptor al activar el botón de restablecimiento que indica un disparo por falla.	1. Memoria térmica. 2. Sobrecorriente transitoria al cerrar. 3. Se cierra debido a un cortocircuito.	1. Consulte el manual de usuario de la unidad de disparo. Oprima el botón de restablecimiento. 2. Modifique el sistema de distribución o los ajustes de la unidad de disparo. Compruebe el estado del interruptor antes de volver a ponerlo en servicio. Oprima el botón de restablecimiento. 3. Elimine la falla. Compruebe el estado del interruptor antes de volver a ponerlo en servicio. Oprima el botón de restablecimiento.
El interruptor no se puede abrir de manera remota, pero sí localmente.	1. La orden de apertura no fue ejecutada por el disparador de apertura MX. 2. La orden de apertura no fue ejecutada por el disparador por baja tensión MN.	1. Compruebe la tensión y el circuito de alimentación (0,7 - 1,1 Un). Si el problema persiste, sustituya el disparador MX. 2. La caída de tensión es insuficiente o tensión residual > 0,35 U_n en las terminales del disparador por baja tensión. Si el problema persiste, sustituya el disparador MN.
El interruptor no se puede abrir localmente.	El mecanismo de funcionamiento está averiado o los contactos se han soldado.	Póngase en contacto con un centro de servicio de Schneider Electric.
El interruptor se puede restablecer localmente pero no remotamente.	La tensión de alimentación es insuficiente para el motor de carga de resorte MCH.	Compruebe la tensión y el circuito de alimentación (0,7 - 1,1 Un). Si el problema persiste, sustituya el disparador MCH.
Disparo involuntario del interruptor con activación del botón de restablecimiento que indica un disparo por falla.	El botón de restablecimiento no fue oprimido completamente.	Oprima el botón de restablecimiento completamente.
No se puede insertar la palanca en posición de conectado, prueba o desconectado.	Un candado o cerradura está presente en la cuna o un bloqueo de puerta está presente.	Desactive la función de bloqueo.
No es posible girar la manivela.	El botón de restablecimiento no ha sido oprimido.	Oprima el botón de restablecimiento
El interruptor no se puede retirar de la cuna.	1. El interruptor no está en posición de desconectado. 2. Los rieles no están completamente fuera.	1. Gire la manivela hasta que el interruptor esté en la posición de desconectado y el botón de restablecimiento esté afuera. Retire la manivela y almacénela. 2. Jale los rieles hasta sacarlos completamente.
El interruptor no se puede conectar (insertar).	1. La protección de la cuna / interruptor no coincide. 2. Las persianas de seguridad están bloqueadas. 3. Las pinzas de conexión de los contacto de desconexión están incorrectamente colocadas. 4. Cuna bloqueado en la posición de desconectado. 5. No se ha oprimido el botón de restablecimiento, lo cual impide el giro de la manivela. 6. El interruptor no ha sido insertado suficientemente en la cuna.	1. Compruebe que la cuna corresponda con el interruptor. 2. Quite las cerraduras. 3. Vuelva a colocar las pinzas de conexión. 4. Desactive la función de bloqueo de la cuna. 5. Oprima el botón de restablecimiento. 6. Inserte el interruptor completamente de modo que enganche en el mecanismo de inserción/extracción.
El interruptor no puede bloquearse en la posición de desconectado.	1. El interruptor no se encuentra en la posición correcta. 2. La manivela se encuentra todavía en la cuna.	1. Compruebe la posición del interruptor, asegurándose de que el botón de restablecimiento está fuera. 2. Retire la manivela y almacénela.
El interruptor no puede bloquearse en la posición de conectado, prueba o desconectado.	1. Verifique que el bloqueo en cualquier posición esté activado. 2. El interruptor no se encuentra en la posición correcta. 3. La manivela se encuentra todavía en la cuna.	1. Póngase en contacto con un centro de servicio de Schneider Electric. 2. Compruebe la posición del interruptor, asegurándose de que el botón de restablecimiento está fuera. 3. Retire la manivela y almacénela.

Tabla 24 – Diagnóstico y soluciones de problemas *(continuación)*

Problema	Causas posibles	Soluciones
La manivela no se puede insertar para conectar o desconectar el interruptor.	Los rieles no están completamente dentro.	Empuje los rieles hasta introducirlos completamente.
El riel derecho (de la cuna solamente) o el interruptor no se puede extraer.	La manivela se encuentra todavía en la cuna.	Retire la manivela y almacénela.
El interruptor no se puede cerrar de manera remota ni localmente.	Interruptor bloqueado con candado o llave en la posición "OPEN".	Desactive la función de bloqueo.
	Interruptor interbloqueado mecánicamente en un sistema de cambio de fuente.	• Compruebe la posición del otro interruptor en el sistema de cambio. • Modifique la situación para soltar el bloqueo.
	El interruptor no está completamente conectado.	• Complete la inserción (conexión) del interruptor.
	El botón de restablecimiento que indica un disparo por falla no se ha restablecido.	• Elimine la falla. • Pulse el botón de restablecimiento en la parte frontal del interruptor.
	El mecanismo de energía almacenada no está cargado.	• Cargue el mecanismo manualmente. • Si está equipado con un motor de carga de resorte MCH, compruebe el suministro de energía al motor. Si el problema persiste, sustituya el motor de carga de resorte (MCH).
	El disparador en derivación de apertura MX es alimentado con energía permanentemente.	• Hay una orden de apertura. Determine el origen de la orden. • La orden debe cancelarse antes de que el interruptor pueda ser cerrado.
	Disparador por baja tensión MN no energizado.	• Hay una orden de apertura. Determine el origen de la orden. • Compruebe la tensión y el circuito de alimentación ($U > 0{,}85\ U_n$). Si el problema persiste, sustituya el disparador.
	El disparador de cierre XF está continuamente energizado, pero el interruptor no está "listo para cerrar" (XF no está conectado en serie con el contacto PF).	Abra el suministro de energía al disparador de cierre XF, luego, envíe nuevamente la orden de cierre con el XF, pero sólo si el interruptor está "listo para cerrar".
	Comando de disparo permanente en la unidad de disparo Micrologic P o H, con tensión mínima y protección de frecuencia mínima en el modo de disparo y la unidad de disparo energizada.	Desactive estas funciones de protección en la unidad de disparo Micrologic P y H.
El interruptor no se puede cerrar de forma remota, pero puede abrirse localmente utilizando el botón de cierre.	La orden de cierre no fue ejecutada por el disparador de cierre XF.	• Compruebe la tensión y el circuito de alimentación (0,85 - 1,1 Un). • Si el problema persiste, sustituya el disparador XF.
Disparo accidental sin activación del botón de restablecimiento que indica un disparo por falla.	La tensión de alimentación del disparador por baja tensión MN es muy baja.	Compruebe la tensión y el circuito de alimentación ($U > 0{,}85\ U_n$).
	La orden de desconexión de carga fue enviada al disparador de apertura MX por otro dispositivo.	• Compruebe la carga general en el sistema de distribución • Si es necesario, modifique los ajustes de los dispositivos en la instalación.
	Orden de apertura innecesaria del disparador de apertura MX.	Determine el origen de la orden.
Disparo accidental con activación del botón de restablecimiento que indica un disparo por falla.	Una falla está presente: • sobrecarga • falla a tierra • cortocircuito detectado por la unidad de disparo	• Determine y elimine las causas de la falla. • Compruebe el estado del interruptor antes de volver a ponerlo en servicio.

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Tabla 24 – Diagnóstico y soluciones de problemas *(continuación)*

Problema	Causas posibles	Soluciones
Apertura instantánea después de cada intento de cerrar el interruptor al activar el botón de restablecimiento que indica un disparo por falla.	Memoria térmica.	• Consulte el manual de usuario de la unidad de disparo. • Oprima el botón de restablecimiento.
	Sobrecorriente transitoria al cerrar.	• Modifique el sistema de distribución o los ajustes de la unidad de control. • Compruebe el estado del interruptor antes de volver a ponerlo en servicio. • Oprima el botón de restablecimiento.
	Se cierra debido a un cortocircuito.	• Elimine la falla. • Compruebe el estado del interruptor antes de volver a ponerlo en servicio. • Oprima el botón de restablecimiento.
El interruptor no se puede abrir de manera remota, pero sí localmente.	La orden de apertura no fue ejecutada por el disparador de apertura MX.	Compruebe la tensión y el circuito de alimentación (0,7 - 1,1 Un). Si el problema persiste, sustituya el disparador MX.
	La orden de apertura no fue ejecutada por el disparador por baja tensión MN.	La caída de tensión es insuficiente o tensión residual > 0,35 Un en las terminales del disparador por baja tensión. Si el problema persiste, sustituya el disparador MN.
El interruptor no se puede abrir localmente.	El mecanismo de funcionamiento está averiado o los contactos se han soldado.	Póngase en contacto con un centro de servicio de Schneider Electric.
El interruptor se puede restablecer localmente pero no remotamente.	La tensión de alimentación es insuficiente para el motor de carga de resorte MCH.	Compruebe la tensión y el circuito de alimentación (0,7 - 1,1 Un). Si el problema persiste, sustituya el disparador MCH.
Disparo involuntario del interruptor con activación del botón de restablecimiento que indica un disparo por falla.	El botón de restablecimiento no fue oprimido completamente.	Oprima el botón de restablecimiento completamente.
No se puede insertar la palanca en posición de conectado, prueba o desconectado.	Un candado o cerradura está presente en la cuna o un bloqueo de puerta está presente.	Desactive la función de bloqueo.
No es posible girar la manivela.	El botón de restablecimiento no ha sido oprimido.	Oprima el botón de restablecimiento.
El interruptor no se puede retirar de la cuna.	El interruptor no está en posición de desconectado.	Gire la manivela hasta que el interruptor esté en la posición de desconectado y el botón de restablecimiento esté afuera.
	Los rieles no están completamente fuera.	Jale los rieles hasta sacarlos completamente.
El interruptor no se puede conectar (insertar).	La protección de la cuna / interruptor no coincide.	Compruebe que la cuna corresponda con el interruptor.
	Las persianas de seguridad están bloqueadas.	Quite las cerraduras.
	Las pinzas de conexión de los contacto de desconexión están incorrectamente colocadas.	Vuelva a colocar las pinzas de conexión.
	Cuna bloqueado en la posición de desconectado.	Desactive la función de bloqueo de la cuna.
	No se ha oprimido el botón de restablecimiento, lo cual impide el giro de la manivela.	Oprima el botón de restablecimiento.
	El interruptor no ha sido insertado suficientemente en la cuna.	Inserte el interruptor completamente de modo que enganche en el mecanismo de inserción/extracción.
El interruptor no puede bloquearse en la posición de desconectado.	El interruptor no se encuentra en la posición correcta.	Compruebe la posición del interruptor, asegurándose de que el botón de restablecimiento está fuera.
	La manivela se encuentra todavía en la cuna.	Retire la manivela y almacénela.

Tabla 24 – Diagnóstico y soluciones de problemas *(continuación)*

Problema	Causas posibles	Soluciones
El interruptor no puede bloquearse en la posición de conectado, prueba o desconectado.	Verifique que el bloqueo en cualquier posición esté activado.	Póngase en contacto con un centro de servicio de Schneider Electric.
	El interruptor no se encuentra en la posición correcta.	Compruebe la posición del interruptor, asegurándose de que el botón de restablecimiento está fuera.
	La manivela se encuentra todavía en la cuna.	Retire la manivela y almacénela.
La manivela no se puede insertar para conectar o desconectar el interruptor.	Los rieles no están completamente dentro.	Empuje los rieles hasta introducirlos completamente.
El riel derecho (de la cuna solamente) o el interruptor no se puede extraer.	La manivela se encuentra todavía en la cuna.	Retire la manivela y almacénela.

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Sección 6—Pruebas

Procedimientos

Inspecciones visuales durante el funcionamiento

Mientras el interruptor está energizado:

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA, Z462 de CSA o NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Tome medidas de seguridad apropiadas para asegurarse de que no haya contacto accidental con componentes energizados durante este procedimiento.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

1. Verifique la aplicación y valor nominal del interruptor automático.

   Asegúrese de que el interruptor automático sea adecuado para la aplicación: valores nominales de la corriente máxima de interrupción, tensión e intensidad de la corriente, especificados en la etiqueta y las recomendaciones de la Compañía. Compare la información en la placa frontal del interruptor con los dibujos de la instalación. Verifique los ajustes de la unidad de disparo Micrologic™ en los interruptores de disparo electrónico con los resultados del estudio de coordinación. Después de haber completado los procedimientos de servicio de mantenimiento e inspección, asegúrese de que los ajustes de las funciones de la unidad de disparo hayan sido definidos según los resultados del estudio de coordinación.

2. Revise el equipo mientras está energizado para determinar si hay sobrecalentamiento.

   Mientras el interruptor automático está funcionando normalmente, bajo carga y a una temperatura de funcionamiento adecuada, revise el frente aislado, expuesto y accesible del interruptor así como las superficies del frente muerto adyacente del gabinete para determinar si hay sobrecalentamiento. Para esto, utilice una sonda de temperatura de rayos infrarrojos para verificar la temperatura, Si la temperatura excede 60°C (140°F), la causa deberá ser investigada.

   Si el interruptor automático recién ha sido energizado, déjelo funcionar por lo menos tres horas para alcanzar la temperatura de funcionamiento. Compare la temperatura en la superficie de cada interruptor automático con la temperatura en la superficie de otros interruptores instalados. La temperatura en la superficie de los interruptores varía según la carga, posición en el tablero de distribución y temperatura ambiente. Si la temperatura en la superficie de un interruptor automático es considerablemente más alta que la de los interruptores adyacentes, la causa deberá ser investigada.

Es posible utilizar métodos de inspección termográfica para evaluar el sobrecalentamiento con el equipo energizado (consulte Inspección termográfica en la página 47).

3. Revise la caja del interruptor automático para ver si hay grietas.

   Cualquier interruptor automático en una caja con grietas deberá sustituirse ya que su habilidad para soportar esfuerzos de interrupción de cortocircuito es afectada (reducida).

4. Revise el gabinete.

   El gabinete deberá estar limpio y seco. Todas las cubiertas y piezas del marco deberán estar en su lugar.

Inspección termográfica

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

Solamente el personal eléctrico calificado con capacitación y experiencia en circuitos de baja tensión, deberá realizar las inspecciones termográficas. Estos técnicos deberán entender los riesgos involucrados al trabajar con o cerca de equipo de baja tensión. Este trabajo deberá realizarse sólo después de haber leído todas las instrucciones.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Las técnicas de inspección termográfica infrarroja pueden ser útiles para evaluar la condición de funcionamiento de los interruptores y sus terminaciones. La comparación con las imágenes termográficas infrarrojas almacenadas puede ser útil para realizar mantenimiento preventivo a los interruptores y otro equipo de uso final. La cantidad real de calor emitido es una función de ambos la corriente de carga y las condiciones ambientales. La interpretación de las mediciones de rayos infrarrojos requiere experiencia y capacitación en este tipo de inspección.

Si el interruptor recién ha sido energizado, déjelo funcionar por lo menos tres horas para alcanzar la temperatura de funcionamiento. Compare las imágenes termográficas de cada interruptor con las imágenes almacenadas previamente del mismo interruptor.

Pruebas de funcionamiento

Realice las pruebas de funcionamiento en el orden que figuran para maximizar la precisión de los resultados.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO.

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA, Z462 de CSA o NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.
- No toque las terminales del interruptor ni los conductores de prueba mientras se está probando el interruptor.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

NOTA: Nunca realice la prueba de resistencia de los contactos antes de realizar la prueba de inyección primaria instantánea. La prueba de inyección primaria asegurará que los contactos estén libres de películas resistivas, oxidación y material extraño.

Las siguientes pruebas tienen como objetivo verificar que un interruptor automático esté funcionando correctamente. Las curvas de disparo características son establecidas bajo condiciones de prueba precisas controladas en la fábrica. Si los resultados de la prueba en campo caen fuera de la gama de tolerancia de la curva de disparo característica; con cuidado evalúe las condiciones de la prueba y los métodos utilizados para obtener precisión.

Si durante las pruebas de funcionamiento e inspección los resultados o condiciones son cuestionables, póngase en contacto con la oficina local de ventas. Los interruptores automáticos con accesorios o modificaciones de fábrica pueden requerir atención especial. Si es necesario devolver un interruptor automático a la fábrica, utilice embalaje apropiado para evitar que se dañe durante el transporte.

Prueba de rigidez dieléctrica para los interruptores de potencia Masterpact con unidades de disparo Micrologic P o H

AVISO

PELIGRO DE DAÑO AL EQUIPO

- Las pruebas de rigidez dieléctrica (de alto potencial, resistencia al aislamiento o pruebas de resistencia eléctrica) pueden dañar las unidades de disparo Micrologic™ P y H.
- Retire el calibrador de la unidad de disparo antes de realizar una prueba.
- Sustituya la unidad de disparo si no retiró el calibrador durante las pruebas o si ésta fue expuesta a más de 700 V~ (c.a.).

El incumplimiento de estas instrucciones puede causar daño al equipo.

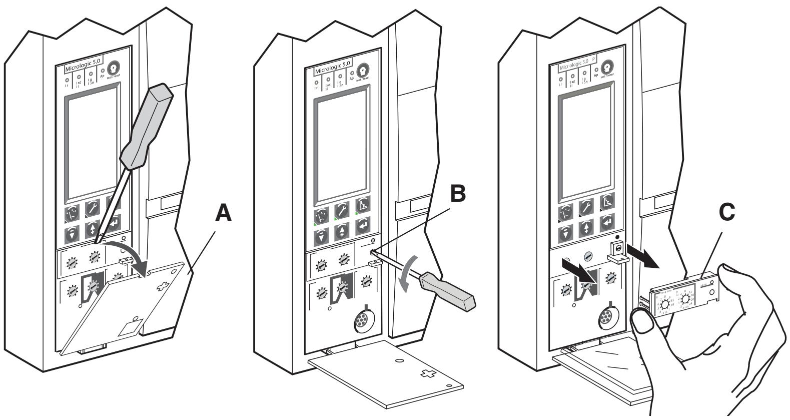
Las pruebas de rigidez dieléctrica (de alto potencial, resistencia del aislamiento o pruebas de resistencia eléctrica) se usan para asegurar la separación y el aislamiento apropiados entre las fases y entre cada fase y tierra. El equipo utilizado para realizar estas pruebas crea una tensión de alto potencial (miles de volts) para verificar la integridad dieléctrica o del aislamiento.

El calibrador en las unidades de disparo Micrologic P y H conecta y desconecta la unidad de disparo con las conexiones de tensión en el interruptor automático. Antes de realizar pruebas de alta tensión en los interruptores automáticos con unidades de disparo Micrologic P y H, retire el calibrador como se muestra.

NOTA: Solamente las unidades de disparo Micrologic P y H tienen conexiones para la tensión de fase. En los demás tipos de unidad de disparo, no es necesario retirar el calibrador antes de realizar la prueba de rigidez dieléctrica.

1. Abra la cubierta de los selectores (figura 15, A).
2. Desatornille el tornillo de montaje (B) del calibrador.
3. Retire el calibrador (C).

Figura 15 – Desmontaje del calibrador



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AVISO

PELIGRO DE DAÑO AL EQUIPO

No aplique tensión de prueba a los circuitos de control ni a las terminales de accesorios, ya que se pueden dañar los componentes electrónicos y/o de baja tensión.

El incumplimiento de estas instrucciones puede causar daño al equipo.

Prueba de resistencia del aislamiento

Condiciones ambientales severas pueden reducir la rigidez dieléctrica de los interruptores automáticos en caja moldeada. Verifique la resistencia del aislamiento durante las pruebas del sistema dieléctrico.

Para verificar la resistencia del aislamiento, realice los siguientes pasos:

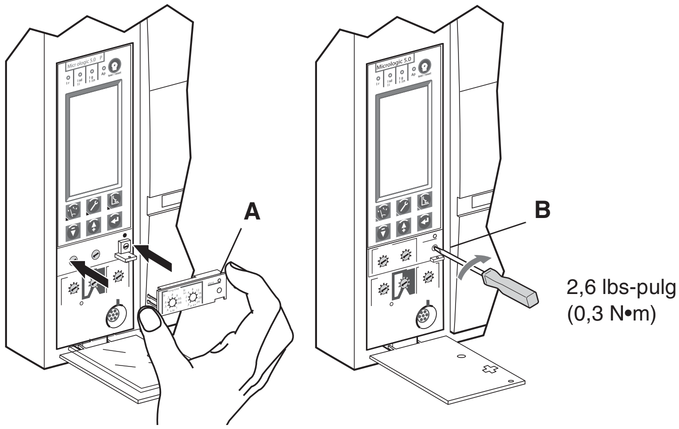
1. Desenergice y aísle el interruptor :
2. Limpie el interruptor automático como se indicó anteriormente.
3. Use un megóhmetro de una capacidad de 500 a 1 000 V c.d. y aplique tensión de:
   a. Cada fase a tierra con el interruptor automático en “I/ON” (contactos del interruptor cerrados).
   b. Fase a fase con el interruptor automático en “I/ON” (contactos del interruptor cerrados).
   c. Entre cada terminal de línea y carga con el interruptor en “O/OFF” (contactos del interruptor abiertos).
4. Anote los valores de resistencia. Los valores de resistencia de menos de 1 megohm (1 000 000 ohms) deberán averiguarse.

Una vez finalizada la prueba, vuelva a colocar el calibrador si fue retirado previamente:

1. Vuelva a colocar el calibrador (figura 16, A).
2. Apriete el tornillo de montaje (B) del calibrador.

NOTA: Si el calibrador no se instala, el interruptor asumirá un valor de ajuste para la activación de largo tiempo de 0,4 x el valor del sensor (I_n) y algunas de las funciones avanzadas no estarán disponibles.

Figura 16 – Colocación del calibrador



Comprobaciones de la unidad de disparo Micrologic™

En los interruptores automáticos con unidades de disparo Micrologic™ es posible verificar el funcionamiento de la unidad de disparo realizando una prueba con inyección secundaria utilizando uno de los equipo de prueba disponibles (consulte la página 63 para obtener información sobre los equipos de pruebas).

Las pruebas de inyección secundaria no prueban los transformadores de corriente ni las conexiones. Es posible realizar pruebas de inyección primaria para asegurarse de haber conectado correctamente el sistema de disparo.

Si el interruptor se prueba con el método de inyección primaria, el sistema Powerlogic™ puede permanecer conectado al interruptor durante la prueba sin afectar los resultados.

NOTA: La prueba de un interruptor conectado a un sistema Powerlogic hace que el sistema reaccione como si el interruptor mismo estuviese experimentando las fallas reales.

Procedimiento para anular el enclavamiento selectivo de zona

El enclavamiento selectivo de zona es un método de comunicación entre los dispositivos de protección contra sobrecorriente de disparo electrónico. El enclavamiento selectivo de zona permite a los dispositivos enclavados, en diferentes niveles, funcionar juntos como un sistema en el que un cortocircuito o falla a tierra es aislada y eliminada con un tiempo de retardo mínimo. El objetivo de este enclavamiento es verificar las funciones de tiempo de retardo por falla a tierra y cortocircuito del interruptor específico. Para las pruebas, el enclavamiento selectivo de zona puede ser inhibido en los interruptores Masterpact equipados con unidades de disparo Micrologic™ empleando el equipo de pruebas portátil o de amplias funciones.

Inyección secundaria

Para la instalación en campo de una unidad de disparo es necesario realizar la prueba de inyección secundaria utilizando un equipo de pruebas de amplias funciones. Esto garantizará el funcionamiento correcto de la unidad de disparo recién instalada. Durante la prueba el interruptor se abrirá y cerrará. Siga los

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procedimientos descritos en los boletines de instrucciones incluidos con el interruptor y el equipo de pruebas de amplias funciones.

1. Asegúrese de que el interruptor automático esté aislado de todos los dispositivos de las corrientes ascendentes y descendentes.
2. Realice las pruebas de inyección secundaria como se describe en el boletín de instrucciones incluido con el equipo de pruebas de amplias funciones. Verifique que todas las funciones aplicables de la unidad de disparo estén funcionando correctamente.
3. Repita el paso 2 con el interruptor en la posición de abierto.

   NOTA: En la documentación del equipo de pruebas se enfatiza que el interruptor deberá estar cerrado al realizar una prueba. Durante este paso, no cierre el interruptor.
4. Si falla alguna de las pruebas, no ponga el interruptor en servicio y póngase en contacto con la oficina de ventas local para solicitar servicio autorizado de fábrica.

Prueba de inyección primaria

Es posible realizar pruebas de inyección primaria para asegurarse de haber conectado correctamente todo el sistema de disparo.

NOTA: Las pruebas de inyección secundaria siguen siendo el método preferido de Schneider Electric para probar los interruptores. Pruebas de inyección primaria inadecuadas pueden causar daños a los interruptores. Si no se lleva a cabo la prueba de inyección primaria de manera adecuada esto puede resultar en la aprobación de las pruebas de los interruptores, dañando la integridad del interruptor a la larga.

AVISO

PELIGRO DE DAÑO AL EQUIPO

- Los interruptores son pesados y se pueden dañar si se manejan incorrectamente. Proceda con cuidado al manejar y transportar los interruptores para probar el equipo.
- Realice las conexiones en el interruptor cuidadosamente empleando cable de tamaño correcto y métodos de conexión apropiados. No utilice pinzas u otros métodos que puedan marcar o dañar el acabado de los conectores.
- Cuando conecte un interruptor removible, utilice un equipo de pruebas de inyección primaria aprobado. Ajuste la posición del interruptor de manera que se alineen sus pinzas de conexión con el equipo de pruebas de inyección primaria.

El incumplimiento de estas instrucciones puede causar daño al equipo.

1. Si realiza pruebas de inyección primaria en los interruptores removibles, conecte el interruptor a la fuente de alimentación empleando un equipo de pruebas de inyección primaria.

Tabla 25 – Equipo de pruebas de inyección primaria

Interruptor	Fuente de alimentación	Equipo de pruebas necesario
Interruptor de potencia Masterpact NW sin blindaje ArcBlok o protecciones de pinzas de conexión	Phoenix®	ULW10025
	MultiAmp ®	ULW10026
Interruptor de potencia Masterpact NW con blindaje ArcBlok o protecciones de pinzas de conexión	Phoenix®	ULW10025 y kit de tope para inyección primaria 84958
	MultiAmp ®	ULW10026 y kit de tope para inyección primaria 84958
Masterpact NT	Phoenix o MultiAmp	ULW10027
PowerPact	Phoenix o MultiAmp	ULW10027
Todos los tipos	Otro que no sea Phoenix o MultiAmp	Póngase en contacto con la oficina de campo.

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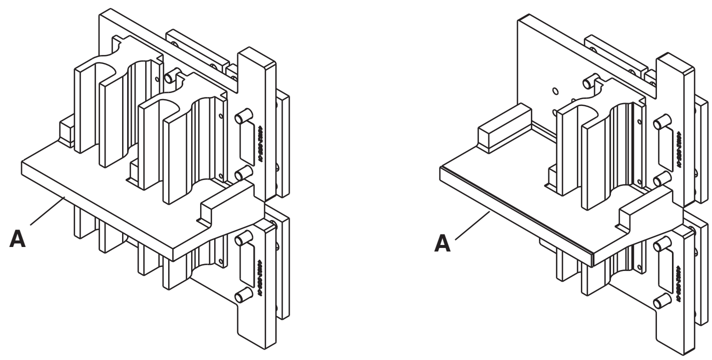
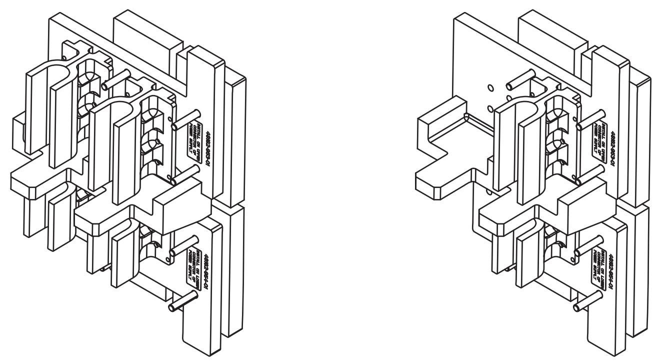
Figura 17 – Ensamble de pruebas de inyección primaria Masterpact NW

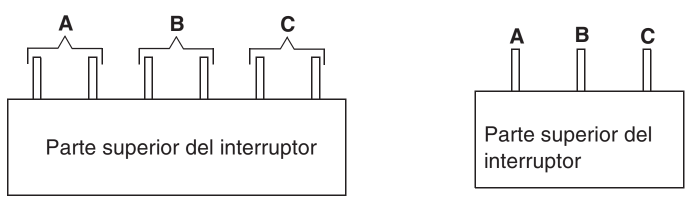
Ensamble de pruebas de inyección primaria para interruptores sin blindaje ArcBlok o protecciones de pinzas de conexión



Ensamble de pruebas de inyección primaria con tope para inyección primaria (kit 84958) para interruptores con blindaje ArcBlok o protecciones de pinzas de conexión



Fases



a. Instale el equipo de pruebas de inyección primaria siguiendo las instrucciones enviadas con el equipo.
b. Ajuste la altura del interruptor de manera que el tope (A, arriba) entre las placas superior e inferior del equipo de pruebas se encuentre entre los conectores superior e inferior del interruptor cuando éste se encuentra en la posición de conectado.
c. Alinee el interruptor de manera que las pinzas de conexión en la fase del interruptor que se está probando se alineen con los conectores con el equipo de pruebas de inyección primaria.
d. Emplee el kit de grasa (número de catálogo S48899) para lubricar los conectores. Para no dañar la mordaza de las pinzas de conexión, utilice sólo un equipo de pruebas aprobado.

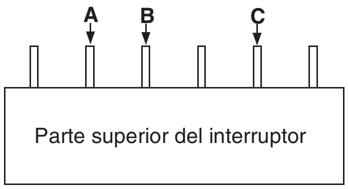
NOTA: Retire la grasa existente del ensamble de pinzas de conexión antes de aplicar la grasa nueva.

2. Si realiza pruebas de inyección primaria en los interruptores fijos, conecte el interruptor a la fuente de alimentación empleando cable de tamaño correcto y un método de conexión apropiado.

   NOTA: Interruptores de construcción amplia solamente—Cuando se realizan pruebas de inyección primaria a un interruptor con seis conectores de barras, se inyecta corriente en las fases, tal como se muestra en la figura 18. No inyecte corriente en las barras de afuera.

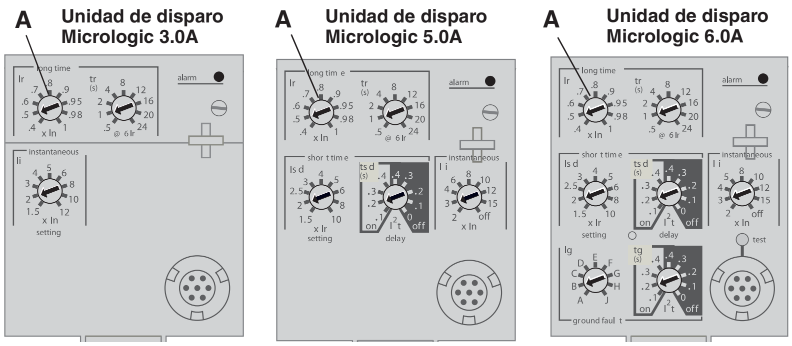
Figura 18 – Interruptores de construcción amplia

Fases de prueba de inyección primaria



3. Anote cada uno de los ajustes de los selectores en la unidad de disparo original. (Los ajustes se deberán restablecer después de completar la prueba).
4. Ajuste el selector de activación de tiempo largo I_r (A) en el valor mínimo de la gama de ajustes.

Figura 19 – Anotación de los ajustes de los selectores



   a. Para las unidades de disparo por falla a tierra y/o enclavamiento selectivo de zona, utilice el equipo de pruebas portátil o el equipo de pruebas de amplias funciones para inhibir las funciones de falla a tierra y del enclavamiento selectivo de zona.
   b. Si se utiliza una fuente de alimentación auxiliar en la unidad de disparo Micrologic, desconéctela.
   c. Determine la corriente de inyección primaria necesaria multiplicando el valor de la corriente de activación de tiempo largo (ajuste de activación de tiempo largo I_r x el enchufe sensor I_n) x 125% (por ej., I_r x I_n x 1,125).
   d. Inyecte corriente primaria en la fase A y monitoree la luz indicadora de sobrecarga. Verifique que la luz indicadora de sobrecarga (A) se ilumine entre el 105% y 120% del valor I_r x I_n.
   e. Repita este paso para cada una de las fases y el neutro (según sea pertinente).
   f. Si el indicador de sobrecarga no se ilumina correctamente, revise todas las conexiones de la unidad de disparo y la configuración de prueba. Si aún fallan las pruebas de inyección primaria de la unidad, comuníquese con la oficina de ventas local.

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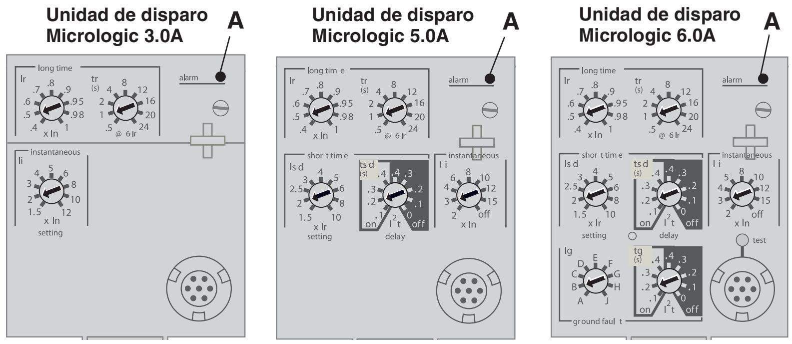
Figura 20 – Luz indicadora de sobrecarga



Interruptores con protección contra fallas a tierra integral

Los interruptores con disparo electrónico Micrologic™ con la función integral de protección contra fallas a tierra requieren atención especial al probar las funciones de sobrecarga y cortocircuito. Las pruebas de inyección primaria de un polo para las funciones de sobrecorriente de tiempo inverso, tiempo corto e instantánea provocarán disparos de falla a tierra debido al trayecto de la corriente de retorno que no pasa por el interruptor. Para evitar esto, utilice el equipo de pruebas portátil o de amplias funciones para anular la función de falla a tierra en los interruptores Masterpact o PowerPact equipados con unidades de disparo Micrologic.

NOTA: Cuando se usan los equipos de pruebas de amplias funciones o portátil para inhibir la falla a tierra, el equipo de pruebas pone la unidad de disparo en "MODO DE PRUEBA". Mientras que la unidad de disparo está en este modo, los registros cronológicos, alarmas y protecciones avanzadas están desactivados para que un disparo de prueba no se registre como un evento real. Consulte las instrucciones del equipo de pruebas para obtener más información.

Pruebas de protección contra fallas a tierra e indicación únicamente para los sistemas radiales

Prueba de disparo por falla a tierra

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO.

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA, Z462 de CSA o NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

La función de falla a tierra de un interruptor con disparo electrónico Micrologic™ proporciona protección contra fallas a tierra al equipo con valores de retardo y activación ajustables. La función de retardo de falla a tierra determina cuánto tiempo esperará el interruptor antes de iniciar una señal de disparo durante una falla a tierra. Las funciones de falla a tierra del interruptor pueden ser probadas empleando una fuente de alimentación de c.a. de baja tensión y alta corriente.

Procedimiento de prueba

1. Desenergice completamente el interruptor y retírelo del servicio.
2. Antes de la prueba, anote los ajustes de retardo y activación de todas las funciones. Ajuste la unidad de disparo en los mismos valores después de haber completado el procedimiento de prueba.
3. Si va a probar un interruptor que está equipado con un enclavamiento selectivo de zona, siga el procedimiento para anular el enclavamiento, en la página 51. Si va a usar un equipo de pruebas de inyección secundaria para este procedimiento, lea y siga cuidadosamente las instrucciones del equipo de prueba sobre el enclavamiento selectivo de zona.

   NOTA: Si no se anula el enclavamiento selectivo de zona se producirán inexactitudes en el tiempo de disparo.
4. Use estos ajustes para la prueba:

   Activación de tiempo largo/Intensidad de la corriente = Máx.

   Tiempo largo/Retardo de sobrecarga = Máx

   Tiempo corto/Retardo de cortocircuito = Máx. (I^2t IN o ON)

   Instantáneo = Máx.

   Activación de falla a tierra = Mín.

   Retardo de falla a tierra = 0,2
5. Siga el procedimiento de conexión apropiado para la aplicación de prueba.

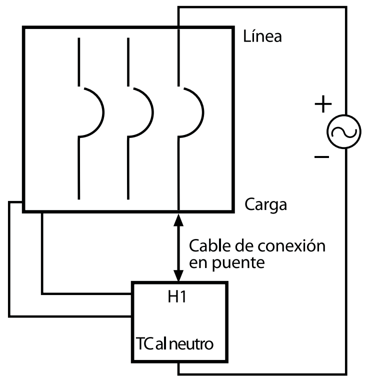
   Para los interruptores sin un transformador de corriente al neutro, vaya al paso 8.

   Para los interruptores con la función integral de falla a tierra en un sistema de tres fases y cuatro hilos, se deberá usar un transformador de corriente al neutro (TC) montado en el exterior. El TC al neutro está conectado al interruptor por un cable blindado (se recomienda el uso de un cable de 14 AWG).

   NOTA: Al realizar las pruebas, desconecte o desenergice la alimentación de control de 24 Vcd en F1 y F2, si está equipado con ellas y, desconecte el equipo de pruebas portátil y de amplias funciones de la unidad de disparo, si está conectado.
6. Verifique la conexión correcta de las fases del TC al neutro (sistemas de tres fases, cuatro hilos) realizando una prueba sin disparo de la siguiente manera:
   a. Conecte el interruptor y TC al neutro como se muestra en la figura 21. El puente debe conectarse de la conexión de carga en el interruptor a la conexión H1 en el TC al neutro (o el lado del TC al neutro que tiene el punto rojo). Conecte el secundario del TC al neutro según las instrucciones en el manual del interruptor o las instrucciones del TC al neutro.
   b. Aplique corriente por encima del nivel de activación de falla a tierra y sosténgalo durante un período mayor que el del retardo de falla a tierra.

c. El interruptor no deberá disparase. Si el interruptor no se dispara esto es una indicación de que ambos, el TC de fase y el TC al neutro, están correctamente en fase.

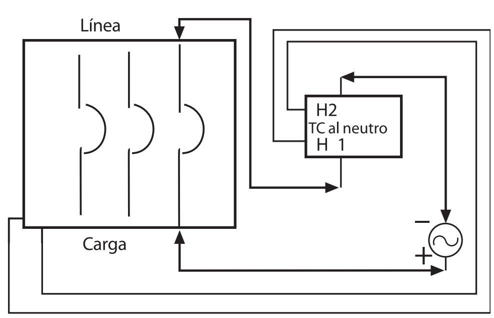
Figura 21 – Diagrama de conexión para la prueba de las fases del TC al neutro



Consulte el boletín de instrucciones incluido con el interruptor para realizar las conexiones al interruptor y TC al neutro.

7. Verifique el tamaño correcto del TC al neutro (sistemas de tres fases, cuatro hilos) realizando una prueba de disparo de la siguiente manera:
    a. Conecte el interruptor y TC al neutro como se muestra en la figura 22. Conecte la terminal de polaridad (+) de la unidad de inyección de alta corriente al lado de carga del interruptor. El puente debe conectarse de la conexión de línea en el interruptor a la conexión H1 en el TC al neutro (o el lado del TC al neutro que tiene el punto rojo). Conecte la terminal sin polaridad (-) de la unidad de inyección de alta corriente a H2 en el TC al neutro (en el lado de línea del interruptor). Conecte el secundario del TC al neutro según las instrucciones en el manual del interruptor o las instrucciones del TC al neutro.
    b. Aplique corriente.
    c. El interruptor se debe disparar a la mitad del valor de la activación de falla a tierra. Si el interruptor se dispara esto es una indicación de que ambos, el TC de fase y el TC al neutro, tienen la misma razón de vueltas (mismo tamaño).

Figura 22 – Diagrama de conexión para la prueba de tamaño del TC al neutro



Consulte el boletín de instrucciones incluido con el interruptor para realizar las conexiones al interruptor y TC al neutro.

8. Pruebe la activación y el retardo de falla a tierra realizando una prueba de disparo de la siguiente manera:

   a. Conecte el interruptor como se muestra en la figura 23 (sistemas de tres fases, tres hilos) o en la figura 24 (sistemas de tres fases, cuatro hilos).

   NOTA: El método de prueba recomendado para la activación y retardo de falla a tierra es el de “impulso”. Este método será el más preciso pero requiere que el equipo de pruebas cuente con un osciloscopio calibrado que almacene imágenes o un ampérmetro digital de alta velocidad de muestreo. También se necesitará un temporizador de precisión para monitorear el tiempo de retardo.

   b. Después de que el circuito ha sido conectado y cerrado correctamente, aplique corriente en impulsos cortos de 10 ciclos aproximadamente. Un ajuste inicial del disparo esperado al 70%, aumenta la corriente de cada impulso sucesivo hasta que el interruptor se dispara.

Figura 23 – Diagrama de conexión de la prueba del interruptor sin TC al neutro

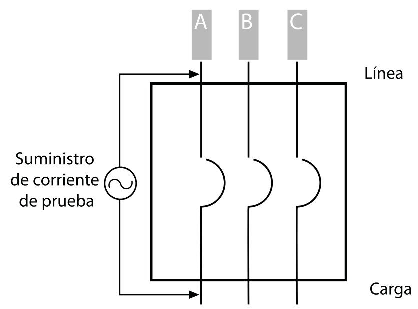
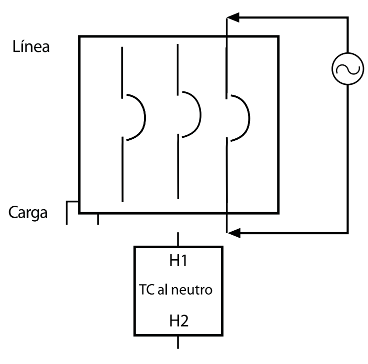


Figura 24 – Diagrama de conexión de la prueba de activación y retardo de falla a tierra



   c. Vuelva a cerrar el interruptor y reduzca el nivel de la corriente, vuelva a pulsar para determinar si el nivel de activación encontrado fue excedido.

   d. Repita los pasos b y c para aislar aun más el punto de activación.

   e. Para determina el tiempo de retardo, pruebe cada polo del interruptor individualmente en el 150% del ajuste de activación de falla a tierra. Monitoree el tiempo a partir de este punto de activación hasta que se dispare el interruptor para obtener el tiempo de retardo.

   f. Anote los valores de activación y retardo y compárelos con los resultados de la curva de disparo.

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La prueba de falla a tierra también puede ser realizada usando pruebas de inyección secundaria con un equipo de pruebas de amplias funciones. Las pruebas de inyección secundaria no prueban los transformadores de corriente ni las conexiones.

Tabla 26 – Máximo micro-ohms por polo

Masterpact	Micro-ohms (u ohm)	
Tipo	**Removible**	**Fijo**
NT06—NT10 H1/H2/L1	38/72	26.39
NT12–NT16 H1/H2	36	26
NW08 N1	42	19
NW08 H/L	30	13
NW10 N1	42	19
NW10 H/L	30	13
NW12 N1	42	19
NW12 H/L	27	13
NW16 N1	37	19
NW16 H/L	27	13
NW20 H/L	27	13
NW25 H1/H2/H3	19	8
NW 32 H1/H2/H3	13	8
NW40 H1/H2/H3	11	8
NW40b, NW50, NW63	7	5

Prueba de resistencia de los contactos

Las pruebas de resistencia de los polos del interruptor automático no son indicadores fiables del funcionamiento del interruptor ya que los valores de resistencia son afectados por varios factores transitorios incluyendo la oxidación en la superficie de los contactos, material extraño entre los contactos así como los métodos de prueba. El inciso 6.4.1 de la norma NEMA AB 4 dice que: La caída de milivolts en los polos de un interruptor automático puede variar considerablemente debido a la variedad inherente en la resistencia extremadamente baja de los conectores y contactos eléctricos. Dichas variaciones no predicen necesariamente un funcionamiento inaceptable, por consiguiente, no deberán utilizarse como criterio único para determinar un funcionamiento aceptable.

La alta resistencia de los polos también puede ser causada por la erosión de los contactos, baja fuerza de los contactos y conexiones sueltas en las terminales. El único factor probablemente presente en un interruptor nuevo es conexiones sueltas en las terminales; como los contactos son nuevos y no han sido expuestos a presión entre ellos, no es posible que se hayan desviado de los ajustes de fábrica. Las conexiones sueltas en las terminales pueden ser corregidas en campo.

Si se realiza una prueba de resistencia a los contactos, es importante hacerlo después de que estos hayan sido acondicionados por las pruebas de inyección primaria instantánea para asegurarse de que los contactos estén libres de películas resistivas, oxidación y material extraño. Si el interruptor automático ha estado en servicio sin problemas de funcionamiento (sobrecalentamiento o disparos incorrectos), las mediciones de resistencia de los contactos son redundantes y de poco valor.

Square D recomienda el uso de un óhmetro digital de baja resistencia (DLRO, por sus siglas en inglés), una corriente de prueba de 10 A de c.d. para los interruptores de menos de 100 A, y una corriente de 100 A de c.d. para los interruptores de 100

A y de mayor valor nominal. El valor medio (promedio) de las tres lecturas (articulación de la palanca del interruptor entre cada lectura) de cada polo probado deberá ser anotado. Si este valor es igual a o menor que el valor en la tabla 26, el polo es aceptable. Si la lectura es mayor, la causa se deberá averiguar y corregir (si es posible). Póngase en contacto con la oficina local para obtener información.

Interruptores de potencia con protección de corriente directa

Los interruptores de potencia Masterpact NW de c.d. han sido diseñados, fabricados y calibrados para usarse en fuentes de alimentación ininterrumpidas (UPS, por sus siglas en inglés) no conectadas a tierra. La tensión (con carga) nominal máxima es de 500 V c.d. y la tensión (sin carga) flotante máxima es de 600 V c.d.

Estos interruptores han sido aprobados por UL cuando se usan con todos los polos conectados en serie como se muestra en la etiqueta del interruptor. La conexión en serie es proporcionada por el cliente y deberá estar instalada fuera de los interruptores.

Los interruptores de potencia Masterpact NW de c.d. son interruptores especiales para aplicaciones de c.d. solamente y deberán probarse usando corriente directa.

- Seleccione la curva de disparo de tiempo-corriente correcta. Las curvas de disparo muestran ambas gamas de disparo térmico y magnético de los interruptores automáticos.
- Utilice una fuente de alimentación de c.d. para probar los interruptores de la siguiente manera:
  - — Constante de tiempo ≤ 25 ms
  - — Constante de ondulación de c.d. ≤ 1% rcm.
- Desmonte el interruptor del gabinete. Si no es práctico desmontar el interruptor, pruébelo en el equipo de uso final. Si los resultados de las pruebas caen fuera de la gama de tolerancia de la curva de disparo; desmonte el interruptor del gabinete y vuelva a probarlo.
- Utilice cable de tamaño correcto (según las tablas del National Electrical Code® [NEC®]) con un tramo mínimo de cable de 1,22 m (4 pies) por conexión.
- Conecte una fuente de alimentación de c.d. al interruptor con todos los polos conectados en serie como se muestra en la etiqueta del interruptor (vea las figuras 25 a 27).
- Asegúrese de que todas las conexiones al interruptor hayan sido apretadas correctamente.
- Aplique una corriente de prueba de c.d. al interruptor de aproximadamente un 70% del valor esperado para dispararlo. El mecanismo de disparo en el interruptor reacciona a los campos magnéticos creados por la corriente que circula por el interruptor. Si el interruptor automático no se dispara, aumente la corriente de prueba durante pruebas sucesivas hasta que se dispare. Cuando el interruptor se dispara:
  a. Restablezca y cierre el interruptor automático.
  b. Vuelva a aplicar la corriente de prueba de c.d. para disparar el interruptor nuevamente.
  c. Anote la corriente y compárela con la curva de disparo.

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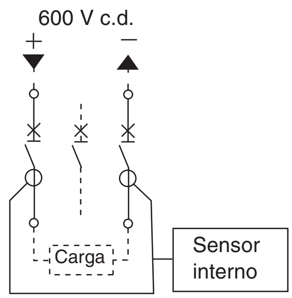
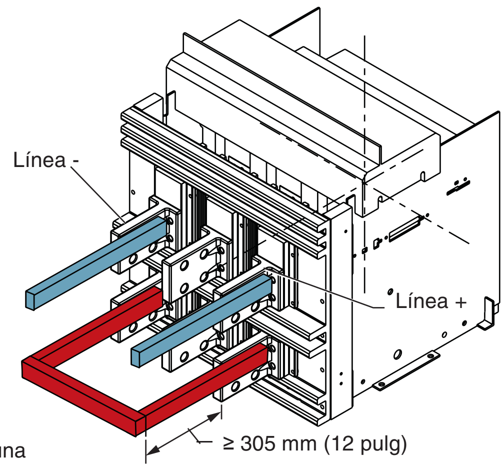
Figura 25 – Configuración del alambrado versión C

Versión C



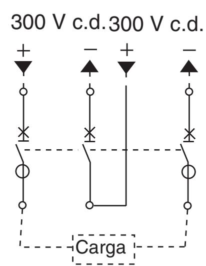


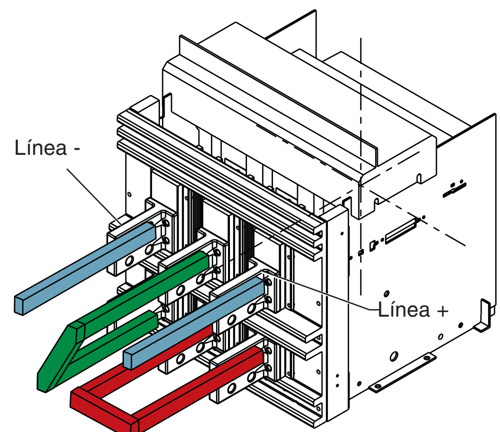
Azul indica los conectores a la fuente de alimentación. Los conectores vienen rectos desde las terminales.

Rojo indica los conectores que forman una "U". Los cables vienen rectos por 305 mm (12 pulg) antes de doblarse.

Figura 26 – Configuraciones de separación versión C1

Separación versión C1



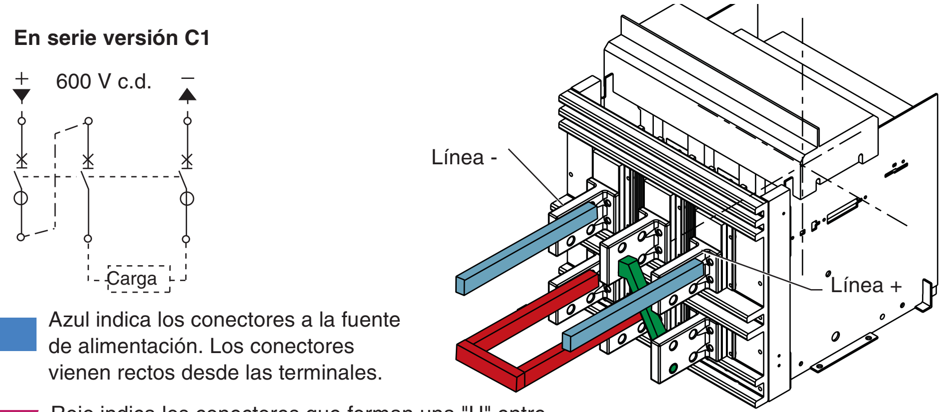


Azul indica los conectores a la fuente de alimentación. Los conectores vienen rectos desde las terminales.

Rojo indica los conectores que forman una "U" entre las terminales 1 y 2 inferiores. Los cables vienen rectos por 305 mm (12 pulg) antes de doblarse.

Verde indica los conectores que forman una "U" entre la terminal intermedia superior y la termina 3 inferior. Los cables vienen rectos por 305 mm (12 pulg) antes de doblarse.

Figura 27 – Configuraciones en serie versión C1



Azul indica los conectores a la fuente de alimentación. Los conectores vienen rectos desde las terminales.

Rojo indica los conectores que forman una "U" entre las terminales 2 y 3 inferiores. Los cables vienen rectos por 305 mm (12 pulg) antes de doblarse.

Verde indica los conectores que conectan la terminal intermedia superior y la termina 1 inferior.

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Retire las conexiones de prueba después de completar la prueba:

— Desconecte todos los cables de prueba del interruptor.

— Realice una inspección visual a las conexiones para determinar si se ha causado daño durante la prueba.

— Para los interruptores removibles, inspeccione, lubrique y ajuste las pinzas de conexión antes de instalar el interruptor, consulte la página 32.

— Vuelva a ajustar el selector de activación de tiempo largo en el valor original que anotó anteriormente.

— Si se utiliza una fuente de alimentación auxiliar en la unidad de disparo Micrologic, vuelva a conectarla.

Información sobre el equipo de pruebas

Equipo de pruebas de amplias funciones

El equipo de prueba de amplias funciones es un sistema basado en un microprocesador usado para probar los interruptores automáticos Compact™ NSJ, Masterpact™ y PowerPact™ con unidades de disparo electrónico Micrologic. El equipo de pruebas de amplias funciones es un probador de inyección secundaria y no prueba los transformadores de corriente ni las conexiones.

El equipo de pruebas de amplias funciones ha sido diseñado como una unidad de pruebas independiente, sin embargo, también se puede usar junto con una computadora personal. El equipo de pruebas de amplias funciones por sí solo realiza las siguientes pruebas:

- Verificar las funciones de protección (LSIG)
- Cumplir con la curva de disparo
- Pruebas eléctricas y mecánicas del sistema de disparo
- Pruebas del enclavamiento selectivo de zona
- Inhibir la protección contra fallas a tierra utilizada durante la prueba de inyección primaria

- Inhibir las imágenes térmicas utilizadas durante la prueba de inyección primaria
- Fuente de alimentación de control que suministra a la unidad de disparo para energizar las pantallas

Equipo de pruebas portátil

El equipo de pruebas portátil es una unidad pequeña energizada por pilas. Éste ha sido diseñado para proporcionar pruebas de inyección secundaria prácticas a los interruptores Compact NSJ, Masterpact y PowerPact con unidades de disparo Micrologic. El equipo de pruebas portátil es energizado con pilas de 9 V y puede usarse para lo siguiente:

- Verificar el funcionamiento de la unidad de disparo disparando el interruptor con una señal de inyección secundaria
- Fuente de alimentación de control que suministra a la unidad de disparo para energizar las pantallas
- para inhibir la imagen térmica de las pruebas de inyección primaria
- Inhibir la falla a tierra de las pruebas de inyección primaria
- Pruebas del enclavamiento selectivo de zona[1]

Función antibombeo

Todos los interruptores de potencia Masterpact NT y NW han sido diseñados con una función antibombeo que siempre da prioridad a una orden de apertura sobre una orden de cierre. En concreto, si las órdenes de apertura y cierre se producen simultáneamente, el mecanismo cargado descarga sin ningún movimiento de los contactos principales manteniendo el interruptor en la posición abierta (OFF). En el caso de que las órdenes de apertura y cierre se mantengan simultáneamente, el mecanismo estándar proporciona una función antibombeo que mantiene los contactos principales en posición abierta. Además, después de una falla por disparo o apertura intencional del interruptor (utilizando los controles manuales o eléctricos y con la bobina de cierre energizada continuamente), el interruptor no se puede cerrar sino hasta que la fuente de alimentación de la bobina de cierre se suspende y vuelve a activarse.

Comprobación de la función antibombeo para los interruptores de funcionamiento eléctrico

Si lo desea, utilice el siguiente procedimiento para asegurarse de que la función antibombeo funciona correctamente.

1. Abra el interruptor.
2. Energice la alimentación de control para el motor de carga de resorte, disparo en derivación y cierre en derivación.
3. El motor de carga de resorte cargará los resortes siempre que estén descargados (durante el cierre del interruptor).
4. Asegúrese de que todos los enclavamientos, etc., estén desenganchados y que el interruptor esté listo para cerrar. Oprima y mantenga oprimido el botón de cierre (utilice el botón de cierre remoto conectado al cierre en derivación si lo desea). Asegúrese de que el interruptor se cierre. Espere a que el motor de carga de resorte termine la carga del resorte.

[1] Solamente proporciona alimentación a la unidad de disparo para indicar la recepción de una señal de ZSI. No iniciará el comando para enviar una señal de restricción ZSI.

5. Mientras sigue oprimiendo el botón de cierre, oprima el botón de apertura. Asegúrese de que el interruptor se abra y que no vuelva a cerrarse.
6. Suelte el botón de cierre.
7. Si el interruptor no intenta volver a cerrarse, la función antibombeo funciona correctamente.
8. Oprima el botón de apertura y luego, el botón de cierre.
9. Oprima y suelte el botón de cierre (utilice el botón de cierre remoto conectado al cierre en derivación si lo desea). Asegúrese de que el interruptor se cierre. Espere a que el motor de carga de resorte termine la carga del resorte.
10. Oprima el botón de apertura. Asegúrese de que el interruptor se abra.
11. Repita los pasos 8, 9 y 10 para asegurarse de que el interruptor se abre y se cierra correctamente.

Comprobación de la función antibombeo para los interruptores de funcionamiento manual

1. Abra el interruptor.
2. Haga funcionar la palanca de carga de resorte para cargar los resortes de cierre.
3. Asegúrese de que todos los enclavamientos, etc., estén desenganchados y que el interruptor esté listo para cerrar. Oprima y mantenga oprimido el botón de cierre. Asegúrese de que el interruptor se cierre.
4. Haga funcionar la palanca de carga de resorte para cargar los resortes de cierre.
5. Mientras sigue oprimiendo el botón de cierre, oprima el botón de apertura. Asegúrese de que el interruptor se abra y que no vuelva a cerrarse.
6. Suelte el botón de cierre.
7. Si el interruptor no intenta volver a cerrarse, la función antibombeo funciona correctamente.
8. Oprima el botón de apertura y luego, el botón de cierre.

Información adicional

Para obtener más información acerca de los interruptores automáticos marca Square D de Schneider Electric, consulte el manual de instrucciones correspondiente. Estos manuales contienen las instrucciones de instalación, información de montaje, funciones de seguridad, diagramas de alambrado y cuadros de diagnóstico de problemas para interruptores automáticos específicos.

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Sección 7—Boletines disponibles

Tabla 27 – Lista de los boletines disponibles

	Masterpact NT	Masterpact NW
Catálogos		
Interruptores de potencia universales	0613CT0001	0613CT0001
Interruptores de cd	—	0613CT0501
Certificados para ABS-NVR	0613CT0601	0613CT0601
Boletines de instrucciones		
Registrado por UL	HRB39231	HRB28361
Registrado por IEC	HRB39244	HRB39225
Registrado por UL / CD	—	HRB39255
Registrado por IEC / UL	—	HRB39254
ArcBlok	—	HRB23946
Guías del usuario		
Registrado por UL	0613IB1209	0613IB1204
Registrado por IEC	0613IB1210	0613IB1208
Registrado por UL / CD	—	0613IB1211
Registrado por IEC / UL	—	0613IB1212
ArcBlok	—	0613IB1203
Guía de usuario de la unidad de disparo		
Unidades de disparo estándar (Micrologic 2.0, 3.0 y 5.0)	48049-207-05	48049-207-05
Unidades de disparo Micrologic A	48049-136-05	48049-136-05
Unidades de disparo Micrologic P	48049-137-05	48049-137-05
Unidades de disparo Micrologic H	48049-330-03	48049-330-03
Comunicación Modbus para las unidades Micrologic		
Modbus tradicional de 4 hilos	0613IB1201	0613IB1201
Ethernet/Modbus + ULP	0613IB1303	0613IB1313
Instrucciones de pruebas		
Equipo de pruebas de amplias funciones (FFTK)	48049-183-06	48049-183-06
Equipo de pruebas portátil (HHTK)	48049-184-03	48049-184-03
Prueba de rigidez dieléctrica	48049-550-01	48049-550-01
Pruebas del ERMS	NHA67346	NHA67346
Lista de instrucciones de los accesorios		
	Consulte el sitio web de Schneider Electric	

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Importado en México por:
Schneider Electric México, S.A. de C.V.
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www.schneider-electric.com.mx

Normas, especificaciones y diseños pueden cambiar, por lo tanto pida confirmación de que la información de esta publicación está actualizada.

0613IB1202 R08/15, 08/2015
Reemplaza 0613IB1202 R07/13

Guide d'essai sur place et d'entretien

pour disjoncteurs Masterpact^{MC} NT et NW

Classe 0613

Directives d'utilisation

0613IB1202 R08/15
08/2015

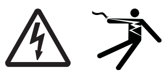
À conserver pour usage ultérieur.

FRANÇAIS

Schneider Electric

Catégories de dangers et symboles spéciaux

Lisez attentivement ces directives et examinez l'appareil pour vous familiariser avec son fonctionnement avant de faire son installation ou son entretien. Les messages spéciaux suivants peuvent apparaître dans les présentes directives ou sur l'appareil pour avertir l'utilisateur de dangers ou pour attirer l'attention sur des informations qui clarifient ou simplifient une procédure.



L'ajout d'un de ces deux symboles à une étiquette de sécurité de « Danger » ou d'« Avertissement » indique qu'un danger électrique existe et qu'il peut entraîner des blessures corporelles si les directives ne sont pas respectées.

Ceci est le symbole d'alerte de sécurité. Il est utilisé pour vous alerter de dangers de blessures corporelles. Veuillez vous conformer à tous les messages de sécurité qui suivent ce symbole pour éviter une blessure ou la mort.

⚠ DANGER
DANGER indique une situation de danger qui, si elle n'est pas évitée, **entraînera** la mort ou des blessures graves.

⚠ AVERTISSEMENT
AVERTISSEMENT indique une situation de danger qui, si elle n'est pas évitée, **peut entraîner** la mort ou des blessures graves.

⚠ ATTENTION
ATTENTION indique une situation de danger qui, si elle n'est pas évitée, **peut entraîner** des blessures mineures ou modérées.

AVIS
AVIS est utilisé pour aborder des pratiques ne concernant pas les blessures. Le symbole d'alerte de sécurité n'est pas utilisé avec ce mot de signal.

REMARQUE : Fournit des renseignements complémentaires pour clarifier ou simplifier une procédure.

Veuillez noter

Seul un personnel qualifié doit effectuer l'installation, l'utilisation, l'entretien et la maintenance du matériel électrique. Schneider Electric n'assume aucune responsabilité des conséquences éventuelles découlant de l'utilisation de cette documentation.

Avis FCC

Cet appareil a subi des essais et a été reconnu conforme aux limites des appareils numériques de classe A, selon le paragraphe 15 de la réglementation FCC (Commission fédérale des communications des É.-U.). Ces limites sont conçues pour fournir une protection raisonnable contre les interférences nuisibles lorsqu'un appareil est employé dans un milieu commercial. Cet appareil produit, utilise et peut rayonner de l'énergie radiofréquence et, s'il n'est pas installé ou utilisé conformément au mode d'emploi, il peut provoquer des interférences nuisibles aux communications radio. Le fonctionnement de cet appareil dans une zone résidentielle est susceptible de provoquer des interférences nuisibles, auquel cas l'utilisateur devra corriger les interférences à ses propres frais. Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

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Section 1—Introduction

La vie utile des disjoncteurs dépend d’une application appropriée, d’une bonne installation, des conditions environnementales et d’un entretien préventif.

Pour maintenir les caractéristiques de fonctionnement et de sécurité du dispositif, Schneider Electric recommande que des vérifications systématiques et un entretien périodique soient effectués par un personnel qualifié.

La norme généralement utilisée comme base d’exigences de vérification sur place est la norme de National Electrical Manufacturers Association® (Association nationale américaine des constructeurs de matériel électrique) « NEMA AB4 - Guidelines for Inspection and Preventive Maintenance of Molded Case Circuit Breakers Used in Commercial and Industrial Application (Directives pour inspection et entretien préventif des disjoncteurs à boîtier moulé utilisés dans les applications commerciales et industrielles) ». Si des informations, une assistance supplémentaires et si un service sur site sont nécessaires, contacter le bureau des ventes local.

Les directives d’inspection, d’entretien préventif et de vérification sur place fournies dans ce document sont destinées à être utilisées avec des disjoncteurs Masterpact NT et NW avec le système de déclenchement électronique Micrologic^{MC}. Lire ce document soigneusement et le conserver à portée de mains. Il fournit des informations détaillées sur :

- les divers types d'entretien requis.
- ce qui doit recevoir un entretien.
- les risques impliqués si le composant cesse de fonctionner correctement.
- ce qu'il faut comprendre par les termes : environnement normal, amélioré et sévère et conditions de fonctionnement.
- l'entretien périodique à effectuer en conditions d'environnement et de fonctionnement normales ainsi que le niveau de compétence requis pour l'exploitation.
- l'environnement et les conditions de fonctionnement qui accélèrent le vieillissement du dispositif et les limites régissant l'emploi d'accessoires et sous-assemblages mécaniques et électriques.
- les guides du produit disponibles de façon à maintenir le dispositif en condition de fonctionnement appropriée.

Cette publication n’est pas destinée et ne convient pas à vérifier la performance électrique correcte d’un disjoncteur qui a été démonté, modifié, remis en état ou manipulé d’une façon non prévue et non autorisée par Schneider Electric^{MC}.

Mesures de sécurité

1. Seuls des électriciens qualifiés ayant une formation et l'expérience des circuits à basse tension doivent effectuer le travail décrit dans ces directives. Le personnel doit connaître les risques encourus à travailler sur ou à proximité des appareils à basse tension. Ces travaux ne doivent être accomplis qu’après avoir lu ces directives d’utilisation dans leur intégralité.
2. Certaines inspections ou procédures nécessitent que certaines parties du système électrique restent sous tension à une tension dangereuse durant la procédure. Observer tous les messages spécifiques de sécurité (Danger, Avertissement, Attention) trouvés dans ce manuel.

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3. Porter un équipement de protection de sécurité, reconnaître les risques potentiels et prendre les mesures de sécurité adéquates lors de l’exécution des procédures décrites dans ce manuel.

Types d'entretien

Trois types d'entretien sont décrits dans ces directives d'utilisation bulletin:

- Correctif
- Préventif
- Prédictif

Entretien correctif

L'entretien correctif répare les éléments qui ne fonctionnent plus correctement.

Incidents pendant le démarrage du système

De nombreux problèmes pendant le démarrage du système proviennent de l'inobservation des directives de démarrage ou du manque de savoir concernant les procédures de l'appareil ou de l'appareillage de commutation. Les guides de l'utilisateur Schneider Electric contiennent des directives pour les opérateurs ou le personnel d'entretien sur la façon de corriger ces problèmes.

- La liste des guides de l'utilisateur et bulletins de données disponibles se trouve à la fin de ce document.
- Les fichiers PDF pour ces documents peuvent être téléchargés du site www.schneider-electric.com.

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Incidents pendant le fonctionnement

Contacter les services de Schneider Electric. Les informations de contact des services Schneider Electric sont disponibles sur le site www.schneider-electric.com.

Entretien préventif

L'entretien préventif consiste à effectuer, à des intervalles prédéterminés ou selon des critères prescrits, des vérifications destinées à réduire la probabilité d'une panne ou détérioration dans le fonctionnement d'un système.

Il y a deux types d’entretien préventif :

- Entretien périodique
  Pour chaque type de produit, les recommandations d'entretien ont pour but de maintenir les systèmes ou leurs sous-assemblages en bonne condition de fonctionnement durant leur vie utile envisagée et doivent être observées en respectant les intervalles stipulés dans ce document.
  Schneider Electric ne saurait, en aucune circonstance, être tenue responsable de dommages causés par la défaillance d'un dispositif si les vérifications périodiques n'ont pas été faites conformément aux recommandations de ce document.
- Entretien conditionnel
  Un entretien conditionnel est effectué quand les alarmes programmées indiquent qu'un seuil prédéfini a été atteint. À cette fin, des capteurs doivent être installés sur l'appareillage de commutation et dans le panneau de commutation.
  Dans une certaine mesure, l'entretien conditionnel réduit l'entretien périodique recommandé qui exige un arrêt annuel de l'installation. L'entretien conditionnel

est le moyen d'optimiser l'entretien de l'installation.
Pour plus de renseignements sur les possibilités offertes par l'entretien conditionnel, contacter les services Schneider Electric.

Entretien prédictif

L'entretien prédictif est basé sur l'enregistrement et l'analyse des paramètres du système afin de détecter une dérive de l'état initial et des tendances notoires. Un utilisant l'entretien prédictif, l'utilisateur peut anticiper l'action corrective requise pour assurer la sécurité de l'appareil et la continuité de son service, et planifier l'action à un moment plus pratique.

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Section 2—Entretien préventif

Les tableaux de cette section fournissent l'entretien préventif recommandé et les intervalles d'entretien. Les recommandations sont basées sur les conditions de fonctionnement du dispositif.

Tableau 1 – Entretien préventif

Type d'entretien	Effectué par	Conditions de fonctionnement	Fréquence
Type II	Employé certifié du client	Normal	Tous les ans
		Favorable	Tous les deux ans
		Sévère	Deux fois par an
Type III	Employé certifié du client	Normal	Tous les deux ans
		Favorable	Tous les quatre ans
		Sévère	Tous les ans
Type IV	Services de Schneider Electric.	Toutes	• Tous les cinq ans • Après un déclenchement dû à une courte durée ou un court-circuit instantané • Après cinq déclenchements dus à des surcharges.
Vérification d'entreposage	Employé certifié du client	Toutes	Après un entreposage prolongé

Conditions de fonctionnement

Conditions normales

Tableau 2 – Conditions normales de fonctionnement et d’environnement

Température	Température annuelle moyenne < 25 °C (77 °F) à l’extérieur du panneau de commutation:
Pourcentage de charge	< 80% de I_n (valeur nominale du capteur)
Harmoniques	Courant harmonique par phase < 30% of I_n (valeur nominale du capteur)
Humidité relative	< 70%
Atmosphère corrosive	Dispositif installé dans la catégorie d'environnement 3C1 ou 3C2 (IEC 60721-3-3) dans les tableaux 14 et 20
Environnement salin	Pas de brouillard salin
Poussière	Bas niveau Dispositif protégé dans un panneau de commutation équipé de filtres ou dans un coffret IP54 (NEMA 3) ventilé
Vibrations	Vibrations permanentes < 0,2 g

Dans ces conditions, l'entretien doit être effectué tous les ans, tous les deux ans ou tous les cinq ans sur les sous-assemblages Masterpact NT/NW et le niveau de compétence requis de la part du personnel d'entretien est décrit dans les tableaux aux pages 12, 13 et 14.

À la fin de chaque période de cinq ans, le guide d'entretien doit être systématiquement renouvelé.

Au-delà des limites ci-dessus, les disjoncteurs souffrent d'un vieillissement accéléré qui peut entraîner des dysfonctionnements. Pour cette raison, les vérifications périodiques doivent être effectuées à des intervalles plus courts. D'autre part, lorsque des efforts spéciaux sont faits pour améliorer les conditions de fonctionnement et d'environnement, les opérations d'entretien préventif peuvent être effectuées moins souvent.

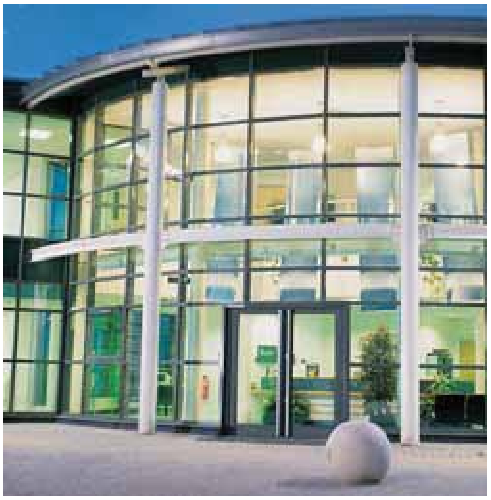
Conditions favorables

L'intervalle de temps entre un entretien préventif de type II et de type III peut être doublé si **toutes** les conditions présentées ci-dessous sont satisfaites. Le programme d'entretien préventif de type IV est encore recommandé tous les 5 ans.

Tableau 3 – Conditions favorables de fonctionnement et d'environnement

Protection	Le dispositif est protégé des conditions environnementales
Température	Température annuelle moyenne < 25 °C (77°F) à l'extérieur du panneau de commutation: Le dispositif est installé dans une salle climatisée ou un coffret ventilé
Pourcentage de charge	< 50% de I_n (valeur nominale du capteur)
Humidité relative	< 50%
Atmosphère corrosive	Le dispositif est installé dans une salle protégée (climatisation et purification de l'air)
Environnement salin	Aucun
Poussière	Négligeable Dispositif protégé dans un panneau de commutation équipé de filtres ou dans un coffret IP54 (NEMA 3) ventilé
Vibrations	Aucune

Figure 1 – Conditions favorables



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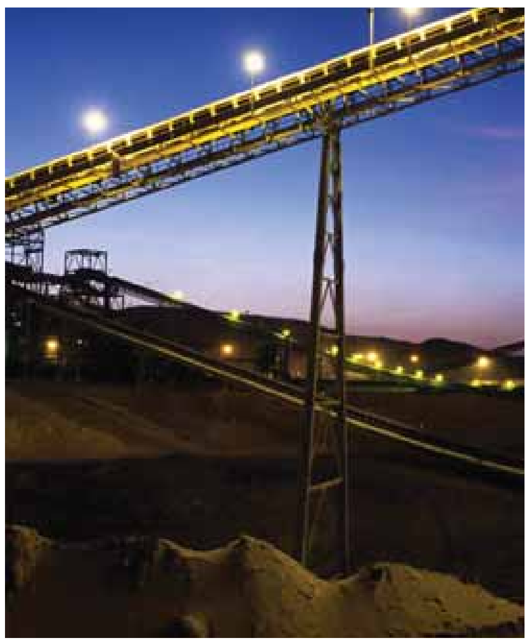
Conditions sévères

L'intervalle entre deux visites d'entretien préventif doit être réduit de moitié **si l'une des conditions** présentées ci-dessous se manifeste à moins que le dispositif soit protégé de cette condition.

Tableau 4 – Conditions sévères de fonctionnement et d’environnement

Température (moyenne annuelle)	Température annuelle moyenne entre 35 °C et 45 °C [95 °F et 113 °F] autour du panneau de commutation
Pourcentage de charge	> 80% de I_n (valeur nominale du capteur)
Humidité relative	> 80%
Atmosphère corrosive	Le dispositif est installé dans une catégorie d'environnement 3C3 ou 3C4 sans aucune protection particulière, voir le tableau Tableau 14 –
Environnement salin	Installation à toute proximité < 10 kilomètres (6.2 miles) du bord de mer avec un dispositif sans protection particulière
Poussière	Un niveau important de poussière et l'appareil n'est pas protégé Voir le tableau 13
Vibrations	Vibrations continues de 0,2 à 0,5 g

Figure 2 – Conditions sévères



Opérations d'entretien préventif

Entretien préventif de niveau II

Il est recommandé d'effectuer l'entretien préventif de niveau II chaque année.

L'entretien de niveau II consiste en un entretien préventif mineur tel que graissage et vérifications de fonctionnement, ainsi qu'en réparations par remplacement standard de certains assemblages, effectué par un employé certifié du client conformément aux directives d'entretien du manufacturier. Voir les directives d'utilisation et les guides de l'utilisateur pour les procédures. Voir la section Section 4 pour ce qui doit être entretenu.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E, CSA Z462 ou NOM-029-STPS.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Déconnectez toutes les sources d'alimentation avant d'effecteur des inspections. Présumez que tous les circuits sont sous tension tant qu'ils n'ont pas été complètement mis hors tension, vérifiés, mis à la terre et étiquetés. Considérez toutes les sources d'alimentation, y compris la possibilité de rétro-alimentation et alimentation de contrôle.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

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Tableau 5 – Entretien préventif de niveau II

Vérification	Année					Outil
Dispositif	1	2	3	4	5[1]	
Vérifier la condition générale du dispositif (couvercle des accessoires, déclencheur, boîtier, berceau, raccordements)	X	X	X	X	X	Aucun
Mécanisme						
Ouvrir et fermer le dispositif manuellement et électriquement.	X	X	X	X	X	Aucun
Armer le dispositif électriquement	X	X	X	X	X	Aucun
Vérifier la fermeture complète des pôles de l’appareil	X	X	X	X	X	Aucun
Vérifier le nombre de cycles de fonctionnement du dispositif	X	X	X	X	X	Compteur de manœuvres
Unité de coupure (chambres de coupure + contacts)						
Vérifier la propreté des filtres et la fixation des chambres de coupure	X	X	X	X	X	Manivelle d'embrochage
Accessoires de contrôle						
Vérifier le câblage auxiliaire et l'isolation	X	X	X	X	X	Aucun
Déclencheur						
Faire déclencher le déclencheur utilisant un outil d'essai et vérifier le fonctionnement des contacts SDE et SDE2	X	X	X	X	X	Trousse HHTK ou trousse FFTK
Vérifier la fonction de protection contre les défauts à la terre (Micrologic 6.0)	X	X	X	X	X	Aucun
Verrouillage de dispositif						
Ouvrir et fermer les verrous à clé installés sur le dispositif	X	X	X	X	X	Aucun
Ouvrir et fermer le système de cadenassage installé sur le dispositif	X	X	X	X	X	Aucun
Berceau (pour les disjoncteurs débrochables)						
Retirer le dispositif du berceau et l'y remettre	X	X	X	X	X	Aucun
Vérifier le fonctionnement des contacts de position (CE, CT, CD, EF)	X	X	X	X	X	Aucun
Vérifier le fonctionnement des volets de sécurité	X	X	X	X	X	Aucun
Verrouillage du berceau						
Ouvrir et fermer les verrous à clé installés sur le berceau	X	X	X	X	X	Aucun
Manœuvrer le système de cadenassage	X	X	X	X	X	Aucun

[1] Ces vérifications et essais seront effectués par les services Schneider Electric en cas de diagnostic la cinquième année (voir la page 14).

Entretien préventif de niveau III

Il est recommandé d'effectuer un entretien préventif de niveau III tous les deux ans.

L'entretien de niveau III consiste en un entretien préventif tel que réglages d'ordre général, dépannage et diagnostic d'arrêts, réparations par remplacement de composants et pièces fonctionnelles, réparations mécaniques mineures, effectués par un technicien qualifié du client à l'aide des outils spécifiés dans les directives d'entretien du manufacturier. Voir les directives d'utilisation et les guides de l'utilisateur pour les procédures.

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⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E, CSA Z462 ou NOM-029-STPS.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Déconnectez toutes les sources d'alimentation avant d'effecteur des inspections. Présumez que tous les circuits sont sous tension tant qu'ils n'ont pas été complètement mis hors tension, vérifiés, mis à la terre et étiquetés. Considérez toutes les sources d'alimentation, y compris la possibilité de rétro-alimentation et alimentation de contrôle.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

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Tableau 6 – Entretien préventif de niveau III

Vérification	Année					Outil
Mécanisme	1	2	3	4	5[1]	
Vérifier le temps d'armement du moteur d'armement du ressort à une tension nominale de 0,85		X		X	X	Chronomètre + alimentation externe
Vérifier la condition générale du mécanisme		X		X	X	Tournevis
Unité de coupure (chambres de coupure + contacts)						
Vérifier la condition de l'unité de coupure		X		X	X	Tournevis
Accessoires de contrôle						
Vérifier le fonctionnement des contacts de signalisation (OF / PF / MCH)		X		X	X	Alimentation externe
Vérifier le fonctionnement de commande de fermeture de l'accessoire XF auxiliaire		X		X	X	Ohmmètre
Vérifier le fonctionnement de commande d'ouverture de l'accessoire MF auxiliaire à une tension nominale de 0,70		X		X	X	Alimentation externe
Vérifier le fonctionnement de commande de l'accessoire MN/MNR auxiliaire à une tension nominale entre 0,35 et 0,7		X		X	X	Alimentation externe
Vérifier le retard des dispositifs MNR à une tension nominale entre 0,35 et 0,7		X		X	X	Alimentation externe
Vérifier le temps de déclenchement de MX		X		X	X	Vérificateur
Déclencheur						
Vérifier les courbes de déclenchement à l'aide d'un outil d'essai, les DÉL de signalisation (déclenché, surcharge). Sauvegarder les résultats sur un PC		X		X	X	Trousse d'essai des fonctions complètes (FFTK) Générateur de rapports de la trousse FFTK
Berceau (pour les disjoncteurs débrochables)						
Enlever la saleté et tout corps étranger, puis regraisser le berceau		X		X	X	Mobilith® SHC00
Regraisser les groupes de connecteurs des contacts de coupure (cas spécifique d'une atmosphère corrosive)		X		X	X	Mobilith® SHC00
Raccordements d'alimentation						
Vérifier et serrer les raccordements desserrés	Seulement après une inspection visuelle montrant des signes de surchauffe					Manivelle d'embrochage

[1] Ces vérifications et essais seront effectués par les services Schneider Electric en cas de diagnostic la cinquième année (voir la page 14).

Entretien préventif de niveau IV

Il est recommandé d'effectuer un entretien préventif de niveau IV tous les cinq ans.

L'entretien préventif de niveau IV consiste en un diagnostic par le fabricant et le remplacement de composants par le département d'assistance des services Schneider Electric. Voir les directives d'utilisation et les guides de l'utilisateur pour les procédures.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E, CSA Z462 ou NOM-029-STPS.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Déconnectez toutes les sources d'alimentation avant d'effecteur des inspections. Présumez que tous les circuits sont sous tension tant qu'ils n'ont pas été complètement mis hors tension, vérifiés, mis à la terre et étiquetés. Considérez toutes les sources d'alimentation, y compris la possibilité de rétro-alimentation et alimentation de contrôle.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Tableau 7 – Entretien préventif de niveau IV

Vérification	Année					Outil
Mallette	5	10	15	20	25	
Mesurer la résistance d'isolation	X	X	X	X	X	Ohmmètre
Mécanisme						
Vérifier les forces de déclenchement (pièce en forme de croissant)	X	X	X	X	X	Vérificateur
Unité de coupure (chambres de coupure + contacts)						
Mesurer la résistance du contact d'entrée/sortie	X	X	X	X	X	Ohmmètre + unité d'injection
Accessoires de contrôle						
Vérifier la vie utile des accessoires XF, MX, MN	X	X	X	X	X	Logiciel de vie utile (service life)
Remplacement préventif d'accessoires de contrôle	—	—	X	—	—	Aucun
Déclencheur Micrologic						
Vérifier la continuité de la chaîne de déclenchement par une injection primaire pour chaque phase	X	X	X	X	X	Unité d'injection
Berceau (pour les disjoncteurs débrochables)						
Vérifier le couple de serrage des raccordements/déconnexions	X	X	X	X	X	Manivelle d'embrochage
Nettoyer et regraisser la vis d'embrochage	X	X	X	X	X	Graisser

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Entretien après un entreposage

Conditions d'entreposage

Les dispositifs doivent être entreposés dans un endroit sec, ventilé, à l'abri de la pluie, de l'eau et des agents chimiques. Ils doivent être bien protégés contre la poussière, la pierraille, la peinture, etc.

Si l'entreposage doit durer longtemps, les conditions d'entreposage suivantes sont nécessaires :

- l'humitidé relative de la pièce doit maintenue à moins de 70 %.
- les disjoncteurs munis de déclencheurs sans afficheur LCD peuvent être entreposés dans leur emballage d'origine à des températures entre -40 °C et +85 °C (-40 °F et +185 °F).
- les disjoncteurs munis de déclencheurs avec afficheur LCD peuvent être entreposés dans leur emballage d'origine à des températures entre -25 °C et +85 °C (-13 °F et +185 °F).
- les dispositifs doivent être entreposés en position ouverte (OFF) avec les ressorts d'armement désarmés.

Vérifications et entretien

Après un entreposage prolongé, les vérifications ci-dessous doivent être effectuées avant toute installation afin d'assurer un fonctionnement correct des dispositifs.

Entreposage de moins de 2 ans

Effectuer le programme de deuxième année de niveaux II et III sur les sous-assemblages ci-dessous :

- mécanisme
- déclencheur
- verrouillage de dispositif et de berceau
- berceau

Entreposage de plus de 2 ans

Effectuer le programme de diagnostic de cinquième année des niveaux III et IV sur les sous-assemblages ci-dessous :

- mécanisme
- accessoires de contrôle
- déclencheur
- verrouillage de dispositif et de berceau
- berceau

Si les dispositifs ont été entreposés dans des conditions sévères (température élevée, atmosphère corrosive), il est nécessaire de :

- vérifier la condition des surfaces des pièces métalliques (zinc) et les pièces en cuivre (revêtements d'argent [Ag] ou étamage [Sn])
- vérifier le graissage pour le dispositif et le berceau
- regraisser les groupes de connecteurs et vérifier les contacts primaires.

Section 3—Vieillissement accéléré

Causes de vieillissement accéléré

Les panneaux et les appareillages de commutation vieillissent qu'ils fonctionnent ou non. Le vieillissement est dû tout d'abord à l'influence de l'environnement et des conditions de fonctionnement.

Influence de l'environnement

Un dispositif placé dans un environnement donné est assujetti à ses effets.

Les principaux facteurs environnementaux qui accélèrent le vieillissement sont :

- température
- pourcentage de charge
- humidité relative
- environnement salin
- harmoniques du courant
- poussière
- atmosphère corrosive

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Tableau 8 – Température ambiante (à l'extérieur du panneau de commutation)[1]

Influence	Aspect	Conséquences
Les caractéristiques mécaniques des pièces en matière plastique (isolation, boîtier) se dégradent sous l'influence de la température d'autant plus rapidement que la température est élevée.	Changement de couleur	Rupture de pièces entraînant la perte de fonctions
Durcissement de la graisse Graisse insuffisante sur les groupes de connecteurs des contacts primaires	Changement de couleur et de viscosité Couleur caramel de la graisse sur les groupes de connecteurs	Le dispositif ne peut pas fonctionner Augmentation des forces d'embrochage exercée sur les groupes de connecteurs
Détérioration des vernis isolants sur les bobines	Odeur de brûlé.	Panne de bobines (CT, MN, MX, XF, MCH, réinitialisation électrique).
Durcissement des colles et étiquettes	Visuel	Perte des étiquettes
Détérioration de composants électriques	Changement d'aspect des afficheurs à cristaux liquides (ACL)	Perte d'affichage Déclenchement intempestif ou pas de déclenchement
Détérioration de dispositifs opto-électroniques et de redresseurs SCR.	Non identifiable	Transmission possible de commandes erronées
Perte de puissance de piles de secours	Non identifiable	Indication des défauts non affichée
Seuils de température en °C		
< 25 °C (77 °F)	26 à 35 °C (78 à 95 °F)	36 à 45 °C (96 à 113 °F)
Conditions optimales de fonctionnement	Une augmentation de 10 °C (18 °F) de la température ambiante est équivalente à une augmentation de 5 % du pourcentage de charge	Une augmentation de 20 °C (35 °F) de la température ambiante est équivalente à une augmentation de 10 % du pourcentage de charge
Recommandation		
Entretien préventif		
Mettre en œuvre le programme standard	Effectuer des vérifications périodiques plus fréquentes (voir la page 8)	Effectuer des vérifications périodiques plus fréquentes (voir la page 8)
Installation		
Aucune précaution particulière n'est requise	Aucune précaution particulière n'est requise	Installer une ventilation à air forcé dans le panneau de commutation ou une climatisation pour la salle électrique

[1] La température ambiante affecte la température du dispositif, laquelle est affectée par le pourcentage de charge. Des variations importantes de température (supérieures à 30 °C [54 °F]) entraînent des contraintes mécaniques (expansion thermique) ainsi qu'une condensation qui peut accélérer le vieillissement.

Tableau 9 – Pourcentage de charge (valeur nominale du capteur [I_n])[1]

<table>
<tr><th colspan="2">Influence</th><th colspan="2">Aspect</th><th>Conséquences</th></tr>
<tr><td colspan="2">Vieillissement de l'isolation plastique</td><td colspan="2">Changement de couleur de l'isolation</td><td>Rupture de pièces entraînant la perte de fonctions</td></tr>
<tr><td colspan="2">Vieillissement de la graisse</td><td colspan="2">Changement de couleur et de viscosité</td><td>Augmentation de la friction mécanique</td></tr>
<tr><td colspan="2">Vieillissement de composants électroniques</td><td colspan="2">Changement d’aspect des afficheurs à cristaux liquides (ACL)</td><td>Une augmentation de 10 °C (soit une charge de 90 %) réduit la vie utile des composants de moitié environ</td></tr>
<tr><td colspan="2">Détérioration des caractéristiques :
• ressorts en acier (au-dessus de 100 °C)
• ressorts en acier inoxydable (au-dessus de 200 °C)</td><td colspan="2">Rupture</td><td>Dysfonctionnement de mécanismes</td></tr>
<tr><td colspan="5">Seuils</td></tr>
<tr><td>≤ 80 %, 24 heures sur 24</td><td>≤ 90%, 8 heures sur 24</td><td>≤ 90%, 24 heures sur 24</td><td>I_n, 8 heures sur 24</td><td>I_n, 24 heures sur 24</td></tr>
<tr><td>Pourcentage de charge maximum généralement considéré dans le dimensionnement de l'installation. À ce pourcentage de charge, la montée de température est réduite d'environ 40 % concernant un pourcentage de charge de 100.</td><td>À ce pourcentage de charge, la montée de température n'est réduite que de 20 %. Les cycles de chauffage et de refroidissement ont un impact sur les jonctions mécaniques sur circuit d'alimentation.</td><td>La contrainte thermique pour un fonctionnement continu est trois fois plus forte que dans le cas précédent, mais l'absence de cycles thermiques ralentit le vieillissement des composants électromécaniques.</td><td>Entre 90 et 100 %, la montée de température est proche de sa valeur maximale. Les cycles de chauffage et de refroidissement ont un impact sur les jonctions mécaniques du circuit d'alimentation, avec un impact important sur le vieillissement.</td><td>Entre 90 et 100 %, la montée de température est proche de sa valeur maximale.
Cette situation a un impact important sur le vieillissement.</td></tr>
<tr><td colspan="5">Recommandations</td></tr>
<tr><td colspan="5">Entretien préventif</td></tr>
<tr><td>Mettre en œuvre le programme standard</td><td>Augmenter la fréquence des vérifications périodiques (voir la page 8)</td><td>L'entretien préventif est difficile à cause du traitement continu</td><td>Augmenter la fréquence des vérifications périodiques (voir la page 8)</td><td>L'entretien préventif est difficile à cause du traitement continu
Planifier des vérifications périodiques plus fréquentes</td></tr>
<tr><td colspan="5">Installation</td></tr>
<tr><td></td><td></td><td></td><td>Fournir de la ventilation au panneau de commutation</td><td>Répartir la charge sur d'autres disjoncteurs
Installer un dispositif d'une valeur nominale plus élevée</td></tr>
</table>

[1] Le pourcentage de charge affecte la température du dispositif, laquelle est elle-même affectée par la température ambiante.

Tableau 10 – Humidité relative

Influence	Aspect	Conséquences
La corrosion de surfaces métalliques qui est accélérée en présence d'un polluant (gaz corrosif, sel, chlore, etc.)	Apparition de : • rouille rouge sur le fer • rouille blanche sur le zinc • dépôt bleu sur le cuivre • dépôt noir sur l'argent	Augmentation de la friction Risque de panne mécanique entraînant le dysfonctionnement de mécanismes Augmentation de la résistance des contacts (groupes de connecteurs et contacts principaux)
Détérioration des qualités diélectriques des matières plastiques	Traces blanches sur le boîtier	Risque de réduction de l'isolation
Détérioration de composants électroniques, en particulier les cartes de circuits imprimés et composants revêtus d'argent. Le phénomène est aggravé par la présence de gaz corrosif H_2S (sulfure d'hydrogène).	Non visible Apparition de dendrites sur les cartes électroniques	Court-circuitage de circuits entraînant le dysfonctionnement des fonctions de protection, de mesure, de signalisation et de communication des unités de contrôle.
Détérioration de composants électroniques, en particulier les circuits en cuivre sans vernis.	Non visible Érosion des pistes en cuivre Oxydation de connecteurs métalliques de composants et de boîtiers en métal Oxydation de connecteurs de circuits intégrés montés sur des supports	Panne due à un court-circuit ou un circuit ouvert Casse de connecteurs de composants le long du boîtier Mauvais contact avec des supports de circuits intégrés
Dégradation de composants opto-électroniques.		Panne de transmission de données.
Seuils en %		
< 70 %	70 à 85%	> 85 %
Niveau d'humidité relative généralement trouvé dans les zones de températures continentales. Le niveau est généralement plus bas dans les panneaux de commutation par suite de la montée de température interne. Une détérioration peu importante est notée à ce niveau.	Niveau d'humidité relative généralement trouvé dans les zones à proximité de l'eau. Apparition possible de condensation sur les pièces froides et formation accélérée de rouille.	Niveau d'humidité relative généralement trouvé dans les zones tropicales et certaines usines (par ex., les papeteries). Risque accru de condensation et de rouille entraînant des difficultés de déconnexion des dispositifs, risque d'impossibilité d'ouverture ou de fermeture.
Recommandation		
Entretien préventif		
Entretien préventif	Effectuer des vérifications périodiques plus fréquentes (voir la page 8) Mesure de l'isolation conseillée tous les 5 ans	Effectuer des vérifications périodiques plus fréquentes (voir la page 8) Voir si de la rouille se forme sur les pièces métalliques La mesure de l'isolation est impérative tous les deux ans
Installation		
Aucune précaution particulière n'est requise		Installer des éléments de chauffage dans le panneau de commutation

Figure 3 – Serre à environnement d'humidité élevée

Tableau 11 – Environnement salin

Influence	Aspect	Conséquences
Corrosion de pièces métalliques	Apparition de : • rouille blanche sur les revêtements en zinc • rouille rouge sur l'acier	Augmentation de la friction. Blocage de mécanisme Casse des ressorts. Blocage de noyaux d'accessoires de contrôle MX / XF / MN.
Risque de dépôts de sel sur un circuit électronique lorsque des brouillards salins épais se produisent.	Apparition de ponts de sel sur les cartes électroniques.	Panne de systèmes électroniques due à un court-circuit de circuits, en particulier les circuits non vernis.
Risque de dépôt de sel sur le dispositif lorsque des brouillards salins épais se produisent.	Dépôt blanc	Détérioration de la résistance diélectrique du dispositif entraînant un risque d'un court-circuit phase-châssis et phase-phase si une surcharge se produit.
Seuils		
Pas de brouillard salin	Brouillard salin modéré < 10 km (6 miles) du bord de mer	Brouillard salin notable < 1 km (0.6 miles) du bord de mer
Pas d'influence.	Vieillissement modéré de l'appareillage de commutation.	Vieillissement rapide de l'appareillage de commutation exposé. En moyenne, la vie utile est divisée par un facteur de trois pour les dispositifs non protégé.
Recommandation		
Entretien préventif		
Mettre en œuvre le programme standard.	Effectuer des vérifications périodiques plus fréquentes (voir la page 8).	Effectuer des vérifications périodiques plus fréquentes (voir la page 8). Essayer la résistance diélectrique tous les deux ans.
Installation		
Aucune précaution particulière n'est requise.	Aucune précaution particulière n'est requise.	L'appareillage de commutation doit être protégé des brouillards salins. Augmenter la valeur IP de l'appareillage de commutation à IP54 (NEMA 3). Créer une salle protégée

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Figure 4 – Environnement salin (bord de mer)

Tableau 12 – Harmoniques

Influence	Aspect	Conséquences
Augmentation de l'effet de peau, de l'effet de proximité, de pertes de fer, de courants à tourbillons	Changement de couleur de bornes, d'isolateurs et de la graisse. Changement d'aspect des afficheurs à cristaux liquides (ACL).	Les harmoniques entraînent une montée de température supérieure à celle du courant fondamental
Surcharge possible du neutre si des harmoniques de troisième ordre et leurs multiples sont présents	Forme d'onde déformée	Valeur de courant erronée Déclenchement intempestif en présence de déclencheurs non-RMS
Seuils en pourcentage de I_n		
THDi < 30 %	30 à 50%	THDi > 50 %
Pas d'influence notable sur le vieillissement	À un THDi de 40 %, la perte de chaleur est d'environ 10 % plus élevée, correspondant à 5 % de plus de courant	
Recommandation		
Entretien préventif		
Mettre en œuvre le programme standard	Effectuer des vérifications périodiques plus fréquentes (voir la page 8)	Effectuer des vérifications périodiques plus fréquentes (voir la page 8)
Installation		
Aucune précaution particulière n'est requise	Filtrage standard avec une inductance pour réduire les harmoniques	Si nécessaire, surdimensionner le neutre Surdimensionner l'appareillage de commutation

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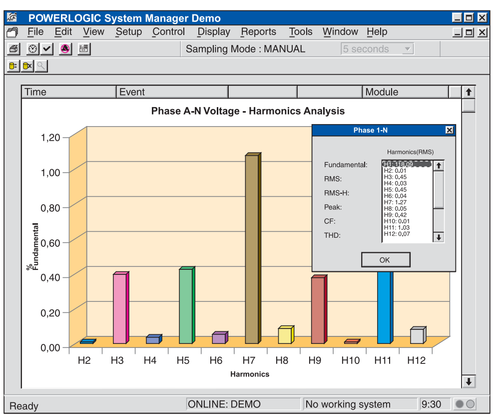
Figure 5 – Harmoniques



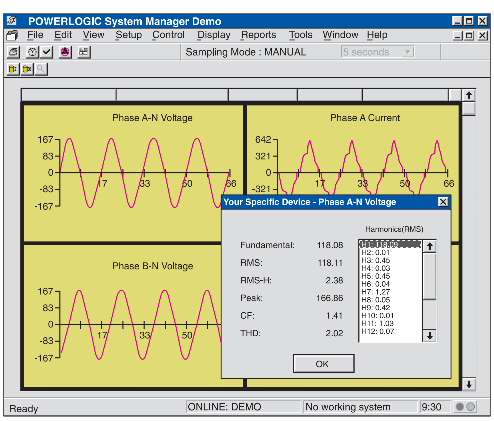


Tableau 13 – Poussière

Influence	Aspect	Conséquences
Dépôt sur la graisse des mécanismes (dispositif et berceau)	Changement de couleur et de texture des graisses	Usure prématurée de mécanismes car le mélange de poussière et de graisse peut être abrasif Augmentation de la friction mécanique et blocage de pièces mobiles Risque d'un dispositif ne bougeant plus dans le berceau Risque d'un dispositif ne s'ouvrant ou ne se fermant plus
Dépôt de graisse sur les groupes de connecteurs	Changement de couleur et de texture des graisses	Influence sur l'augmentation des forces d'embrochage Augmentation de la résistance des contacts et montée de température
Dépôt sur les afficheurs		Données des écrans illisibles
Dépôt sur l'isolation		Résistance de l'isolation réduite (selon le type de poussière) Ce phénomène est aggravé par la présence d'humidité
Dépôt sur les contacts des dispositifs		Augmentation de la résistance des contacts et montée de température
Dépôt sur le système de communication opto-électronique		Défaut de transmission de données de communication entre des dispositifs
Dépôt de poussière		
Niveau peu élevé	Niveau modéré	Niveau élevé
La quantité de poussière généralement déposée sur et autour des dispositifs dans les bâtiments commerciaux et les installations industrielles standard	La quantité de poussière trouvée dans **les panneaux de commutation protégés** installés dans des environnements poussiéreux tels que les cimenteries, minoteries, installations d'incinération, aciéries et usines de matières plastiques, mines, etc.	La quantité de poussière déposée sur et autour de dispositifs à l'intérieur de **panneaux de commutation non protégés** installés dans des environnements poussiéreux tels que les cimenteries, minoteries, installation d'incinération, aciéries et usines de matières plastiques, mines, etc.
Recommandation		
Entretien préventif		
Mettre en œuvre le programme standard Il est conseillé de passer l'aspirateur sur les dépôts de poussière	Effectuer des nettoyages périodiques plus fréquents (voir la page 8)	Effectuer des nettoyages périodiques plus fréquents (voir la page 8)
Installation		
Panneau de commutation avec IP standard IP (NEMA 1)	S'assurer que le panneau de commutation reste fermé	Un équipement spécial requis pour protéger l'appareillage de commutation est obligatoire

Figure 6 – Apparition de poussière

Tableau 14 – Atmosphère corrosive

Atmosphère corrosive	Influence	Aspect	Conséquences	Seuils (volume de ppm[1]) Valeur moyenne (voir la page suivante pour les catégories 3C1, 3C2, 3C3, 3C4)
SO_2 Dioxyde de soufre	Corrosion de l'argent, de l'aluminium et du cuivre à nu. Phénomène accéléré par une température et une humidité relative élevées.	Noircissement des surfaces en argent exposées. Apparition de dendrites sur les circuits électroniques et d'alimentation.	Résistance augmentée des contacts de coupure exposés à l'air. Montée excessive de la température de dispositifs. Court-circuit de circuits entraînant le dysfonctionnement du déclencheur.	3C1 : 0,037 3C2 : 0,11 3C3 : 1,85 3C4 : 4,8
H_2S Sulfure d'hydrogène	Sulfurage de l'argent, ce phénomène est accéléré par des températures élevées.	Noircissement important de surfaces en argent exposées. Apparition de dendrites sur les circuits électroniques et d'alimentation.	Résistance augmentée des contacts de coupure exposés à l'air. Montée excessive de la température de dispositifs. Court-circuit de circuits entraînant le dysfonctionnement du déclencheur.	3C1 : 0,0071 3C2 : 0,071 3C3 : 2,1 3C4 : 9,9
Cl_2 Chlore	Corrosion de pièces en métal.	Oxydation Corrosion inter-granulaire de l'acier inoxydable.	Augmentation de la friction. Risque de panne mécanique. Rupture de ressorts en acier inoxydable.	3C1 : 0,034 3C2 : 0,034 3C3 : 0,1 3C4 : 0,2
NH_3 Ammoniac	Attaque les polycarbonates, corrode le cuivre.	Craquement de polycarbonates. Noircissement du cuivre.	Risque de rupture. Augmentation de la montée de température.	3C1 : 0,42 3C2 : 1,4 3C3 : 4 3C4 : 49
NO_2 Oxyde d'azote	Corrosion de pièces en métal.	Oxydation.	Augmentation de la montée de température.	3C1 : 0,052 3C2 : 0,26 3C3 : 1,56 3C4 : 5,2
Atmosphères huileuses	Attaque les polycarbonates.	Fissuration de polycarbonates.	Risque de rupture. Augmentation de la montée de température.	

[1] ppm = particules par million.

Tableau 15 – Catégories d'environnement selon le standard IEC 60721-3-3

Classe			
3C1	3C2	3C3	3C4
Zones rurales ou urbaines avec une faible activité industrielle.	Zones urbaines avec une activité industrielle dispersée et une circulation élevée.	Proximité immédiate de pollution industrielle. Exemple : papeteries, usines d'épuration, chimiques, de fibres synthétiques, fonderies.	Intérieur des installations industrielles polluantes. Exemple : papeteries, usines d'épuration, chimiques, de fibres synthétiques, fonderies.
Présence de gaz corrosifs			
Négligeable	Niveau peu élevé	Nivean notable	Niveau élevé
Impact sur un appareillage de commutation			
Pas d'impact sur la vie utile car les concentrations sont très faibles.	Impact modéré sur la vie utile.	Impact important, particulièrement concernant la montée de la température. Pour les systèmes électroniques, pas d'impact sur les cartes vernies et les contacts plaqués or.	Vie active réduite de façon notable si aucune précaution particulière n'est prise. Pour les systèmes électroniques, pas d'impact sur les cartes vernies et les contacts plaqués or.
Recommandation			
Entretien préventif			
Mettre en œuvre le programme standard.	Mettre en œuvre le programme standard. La graisse « Pyratex » peut être utilisée pour les contacts de coupure, mais doit être changée tous les ans (voir la procédure du manufacturier).	Effectuer des vérifications périodiques plus fréquentes (voir la page 8). Changer la graisse sur les contacts de coupure.	Effectuer des vérifications périodiques plus fréquentes (voir la page 8). Changer la graisse sur les contacts de coupure.
Installation			
Aucune précaution particulière n'est requise.	Aucune précaution particulière n'est requise.	Utiliser des dispositifs fixes plutôt que débrochables.	Installer l'appareillage de commutation dans une pièce protégée de la pollution. Utiliser des dispositifs fixes plutôt que débrochables, ou utiliser des contacts de coupure plaqués or.

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Conditions de fonctionnement

Les conditions de fonctionnement affectent directement la vie utile de l'appareillage de commutation par suite des niveaux d'endurance électrique et mécanique limités de divers sous-assemblages. Les conditions de fonctionnement comprennent :

- les vibrations,
- le nombre de cycles de manœuvres,
- les courants interrompus.

Tableau 16 – Vibrations

Influence	**Aspect**	**Conséquences**	
Détérioration prématurée des surfaces de contact (groupes de connecteurs et contacts principaux).	Non identifiable.	Augmentation de la montée de température de dispositifs.	
Desserrage d'assemblages boulonnés.	Non identifiable.	Augmentation de l'écart mécanique.	
Usure de pièces mécaniques.	Non identifiable.	Casse des ressorts. Augmentation de l'écart mécanique entre des pièces.	
Apparition de corrosion sur les faces en contact sur les raccordements auxiliaires.	Non identifiable.	Information erronée ou perte de continuité dans les données ou l'alimentation, montée excessive de température.	
Rupture de connecteurs sur des composants électroniques de grande taille (par ex., des gros condensateurs).	Non identifiable.	Défaillance d'une fonction de protection.	
Usure d'interrupteurs de réglage sur le déclencheur.	Non identifiable.	Déclenchement intempestif ou pas de déclenchement	
Seuils			
< 0,2 g	> 0,2 g à 0,5 g	0,5 g à 0,7 g	> 0,7 g
Condition normale, pas d'impact sur la vie utile.	Vie utile réduite.	Augmentation notable des incidents.	Interdit pour les dispositifs standard
Recommandation			
Entretien préventif			
Mettre en œuvre le programme standard.	Effectuer des vérifications périodiques plus fréquentes (voir le tableau).	Effectuer des vérifications périodiques plus fréquentes (voir la page 8). Vérifier en particulier le serrage des raccordements.	
Installation			
Aucune précaution particulière n'est requise.	Aucune précaution particulière n'est requise. Installer l'appareillage de commutation sur un manchon de montage en caoutchouc.	Installer l'appareillage de commutation sur un manchon de montage en caoutchouc.	Utiliser des dispositifs spéciaux.

Tableau 17 – Nombre de cycles de manœuvres

Influence		**Conséquences**
Le nombre de cycles de manœuvres dépend directement de l'endurance électrique et mécanique du dispositif.		La vie utile d'un dispositif dépend du nombre quotidien de cycles de manœuvres.
Vie utile du dispositif (dépend du nombre quotidien de cycles de manœuvres)		
≤ 30 cycles par mois	≤ 60 cycles par mois	≤ 120 cycles par mois
Correspond à un cycle par jour. Pour une endurance de dispositif de 10 000 cycles et un courant interrompu de moins de 0,4 In, la vie utile est de 30 ans.	Correspond à deux cycles par jour. Pour une endurance de dispositif de 10 000 cycles et un courant interrompu de moins de 0,4 I_n, la vie utile est de 15 ans.	Correspond à quatre cycles par jour. Pour une endurance de dispositif de 10 000 cycles et un courant interrompu de moins de 0,4 I_n, la vie utile est de 10 ans.

Tableau 18 – Courant interrompu

Influence	Aspect	Conséquences
Usure des contacts fixes et mobiles.	Détérioration de contacts.	Au-delà de la limite d'endurance électrique, la montée de température du dispositif augmente par suite de la plus grande résistance des contacts et d'une réduction de la pression des contacts.
Usure des chambres de coupure (matériaux isolants, séparateurs).	Détérioration de l'isolation.	Au-delà de la limite d'endurance électrique, l'isolation des séparateurs (entrée/sortie et entre phases) est réduite, ce qui aboutit à une réduction de convenance du dispositif pour son isolation et peut créer une condition risquée.
Seuils		
≤ In (valeur nominale du capteur)	> I_n à ≤ 4 I_n (valeur nominale du capteur)	> 4 I_n à ≤ 8 I_n (valeur nominale du capteur)
Ce niveau de courant interrompu correspond à durabilité mécanique (voir l'endurance mécanique).	Ce niveau de courant interrompu correspond à des niveaux attendus d'évènements à temps court.	Ce niveau de courant interrompu correspond aux évènements de courts-circuits sévères. Nécessite une inspection des contacts et chambres de coupure.

Figure 7 – Usure des contacts

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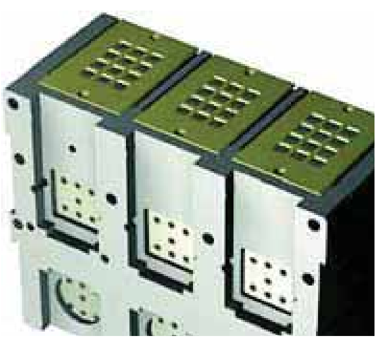
Section 4—Ce qui doit être entretenu

Inspecter les chambres de coupure, les contacts principaux, le moteur d'armement de ressort et les dispositifs de déclenchement après les manœuvres indiquées dans le tableau tableau 19.

Tableau 19 – Manœuvres électriques

Type de disjoncteur	Nombre de manœuvres électriques (cycle ouverture-fermeture)			
	Chambre de coupure	Contacts principaux	Moteur d'armement de ressort (MCH)	Dispositifs de déclenchement (MX/XF)
NW08–NW16 types N/N1/H/H1/H2/H3/HA/HF	10 000	10 000	12 500	12 500
NW08–NW16 types L/LF/L1/L1F/HB/HC	3 000	3 000	12 500	12 500
NW20 types N/H/H1/H2/H3/HA/HF	8 000	8 000	10 000	12 500
NW20 types L/LF/L1/L1F/HB/HC	3 000	3000	10 000	12 500
NW32 types H1/H2/H3/HA/HF NW25-NW30 types H/L/HB/HF	5 000	5 000	10 000	12 500
NW40B (châssis W) Types H1/H2/H3/HA/HF	5 000	5 000	10 000	12 500
NW40–NW50-NW60 types H/H2/H3/L/L1/HA/HB/HC/HF NW32 type L1	1 500	1 500	5 000	12 500

Boîtier moulé



Le boîtier est un élément essentiel du disjoncteur. Premièrement, il offre un certain nombre de fonctions de sécurité :

- en fournissant une isolation fonctionnelle entre les phases elles-mêmes et entre les phases et les pièces conductrices exposées de façon à résister aux surtensions transitoires causées par le système de distribution
- en fournissant un écran, empêchant le contact direct de l'utilisateur avec des pièces sous tension
- en protégeant contre les effets des arcs électriques et surpressions causés par les courts-circuits.

Deuxièmement, il sert de support au mécanisme de fonctionnement ainsi qu'aux accessoires mécaniques et électriques du disjoncteur.

Sur le boîtier, il ne doit exister :

- aucune trace de saleté (graisse), de poussière excessive ou condensation qui réduit l'isolation
- aucun signe de brûlures ou de fissures qui pourrait affaiblir le boîtier et donc sa capacité de résister aux courts-circuits.

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L'entretien préventif pour les boîtiers consiste à :

- inspecter visuellement leur condition et les nettoyer avec un chiffon sec ou un aspirateur. Tous les produits de nettoyage à base de solvant sont strictement prohibés.
- Mesurer l'isolation tous les cinq ans et après des déclenchements causés par des courts-circuits.

Remplacer le disjoncteur s'il montre des signes de brûlures ou de fissures.

Chambres de coupure

Pendant un court-circuit, la chambre de coupure sert à éteindre l'arc et à absorber le haut niveau d'énergie le long du passage entier du court-circuit. Elle contribue également à l'extinction de l'arc dans des conditions de courant nominal. Une chambre de coupure en mauvais état pourrait ne pas être capable de corriger complètement le court-circuit et, par suite, pourrait entraîner la destruction du disjoncteur.

Les chambres de coupure doivent être vérifiées régulièrement. Les ailettes des chambres de coupure peuvent se noircir (par suite des gaz produits à I_n) sans toutefois être endommagées de façon notoire. D'autre part, les filtres ne doivent pas être bloqués, afin d'éviter des surpressions internes. Utiliser un aspirateur plutôt qu'un chiffon pour enlever la poussière sur l'extérieur des chambres de coupure.

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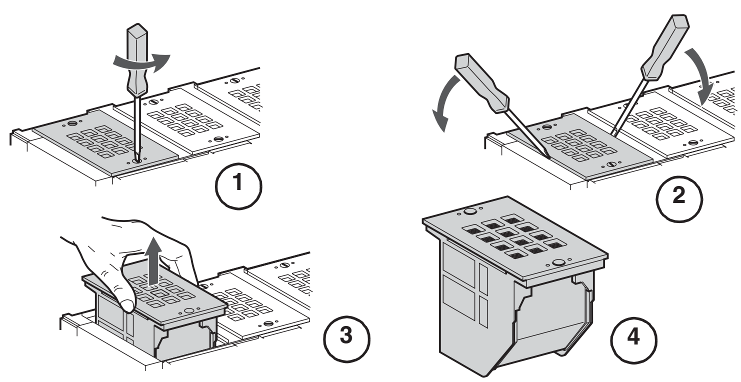
Entretien de la chambre de coupure

1. Desserrer les vis de montage.
2. Utiliser des tournevis pour soulever la chambre à l’extérieur du disjoncteur.
3. Enlever la chambre de coupure.
4. Inspecter la chambre de coupure. S'assurer que le corps de la chambre de coupure n'est pas cassé et que les plaques sont intactes et non brûlées ou fondues de façon notable.

Au besoin, remplacer la chambre de coupure.

Figure 8 – Entretien de la chambre de coupure



Contacts principaux

Les contacts se ferment et s’ouvrent pour établir et couper le courant dans des conditions normales (courant nominal pour l'installation) et dans des conditions exceptionnelles (surcharges et courts-circuits). Les contacts sont érodés par les nombreux cycles d'ouverture et de fermeture et peuvent être détériorés par des courants de courts-circuits. Les contacts usés peuvent entraîner une montée de température anormale et accélérer le vieillissement d'un dispositif.

Il est impératif d'enlever les chambres de coupure et de vérifier visuellement l'usure des contacts au moins une fois par an et après chaque intervention de court-circuit.

Les indicateurs d'usure des contacts constituent une valeur absolue minimale qui ne doit pas être négligée.

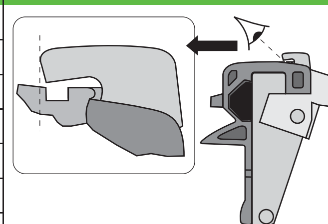
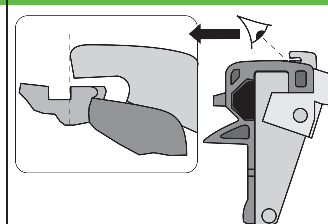
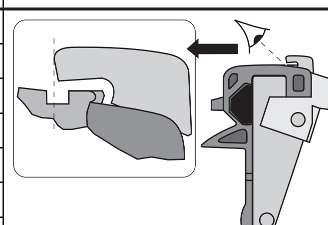
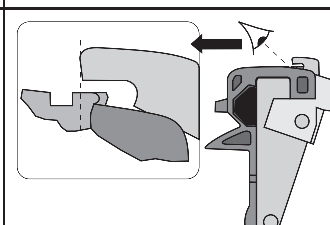
Pour planifier et réduire le nombre d'arrêts, un compteur d'usure électronique est disponible avec le déclencheur Micrologic P et H. Une vérification visuelle est requise lorsque le compteur atteint 100. Lorsque le compteur atteint 300, les contacts sont usés et doivent être remplacés.

Entretien des contacts principaux

1. Enlever les chambres de coupure.
2. Fermer le disjoncteur et vérifier l’état des contacts.

Si les contacts sont usés, l'assemblage de borniers du disjoncteur doit être remplacé

Tableau 20 – Usure des contacts

Norme	Taille du châssis	Type d’interruption	Pôles	Contacts neufs	Contacts nécessitant un remplacement
ANSI	250	H1/H2/H3/N1	3P		
	3200-4000	H2/H3	3P		
	800-1600	N1	4P		
	800-2000	H1/HA	4P		
	800-2000	H2/H3/HF	3P/4P		
	3200	H1/HA/H2/H3/HF	4P		
	3200	HF	3P/4P		
UL	250	H/N	3P		
	2000-3000	L/HB	3P		
	800-3000	H/HF	3/4P/4P RHN		
	800-2000	N	3P/4P		
ANSI	250	L1/L1F	3P		
	800-2000	H1/HA/L1/HC/L1F	3P		
	3200-5000	L1/HC	3P		
	4000-5000	H2/HA/H3/HF	3P/4P		
	800-1600	N1	3P		
	3200-4000	H1/HA	3P		
UL	250	L/LF	30		
	4000-6000	H/HF	3P/4P/4P RHN		
	4000-6000	L/HB	3P		
	800-1600	L/HB	3P		
	800-2000	LF	3P		

Mécanismes des dispositifs et du berceau

La manœuvre mécanique du disjoncteur peut être gênée par de la poussière, des vibrations, des atmosphères agressives, le manque de graisse ou un graissage excessif. La sécurité de manœuvre est assurée par l'époussetage et un nettoyage général, un graissage correct et l'ouverture et la fermeture régulières du disjoncteur.

Époussetage

Le meilleur époussetage se fait à l'aide d'un aspirateur.

Nettoyage

Le nettoyage doit se faire à l'aide d'un chiffon ou d'une brosse parfaitement propre et sec, sans aucun dissolvant, en évitant les pièces graissées sauf pour ce qui est de la graisse sur les contacts électriques. L'application de produits sous pression ou contenant des solvants (trichloroéthane, trichloroéthylène, WD40®) est strictement interdite.

Les principaux problèmes que présentent les produits sous pression sont les suivants :

- il peut être impossible de remettre de la graisse sur des points de lubrification inaccessibles (qui sont graissés pour la vie du produit)
- corrosion des points qui ne peuvent pas être graissés de nouveau
- dommage causé par la pression
- risque de montée de température dû à la présence d'un solvant isolant dans les zones de contacts
- élimination d'une protection spéciale
- détérioration des matières plastiques.

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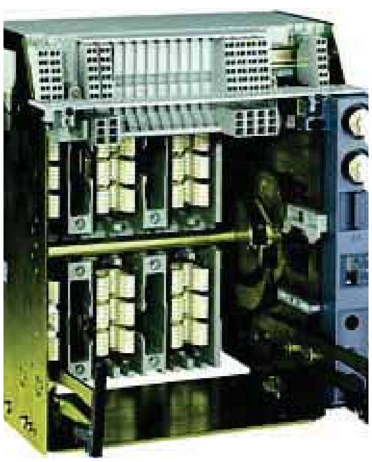
Graissage



Cette opération est effectuée sur certaines pièces mécaniques après un nettoyage comme décrit dans les procédures d'entretien, en employant les diverses graisses recommandées par Schneider Electric. Il faut éviter de mettre trop de graisse car l'excès, mélangé à la poussière, peut entraîner des mauvais fonctionnements de mécanismes. En général, dans des conditions normales de fonctionnement, le mécanisme de manœuvre des pôles n'exige pas de remettre de la graisse du fait qu'il a été graissé pour la durée de vie du produit.

- Les groupes de connecteurs et contacts de coupure doivent être graissés en respectant les intervalles définis et en employant les graisses indiquées par Schneider Electric.
- Les contacts principaux ne doivent pas être graissés.

Cycles de manœuvres

Le besoin de continuité de service dans une installation signifie généralement que les disjoncteurs de puissance sont rarement manœuvrés. Alors qu'un nombre excessif de cycles de manœuvres accélère le vieillissement du dispositif, il est également vrai qu'un manque de manœuvre pendant une longue période peut entraîner des mauvais fonctionnements mécaniques. Une manœuvre régulière est requise pour maintenir le niveau normal de performance de chaque pièce impliquée dans les cycles d'ouverture et de fermeture.

Dans les installations où les disjoncteurs de puissance sont utilisés dans des systèmes de transfert de source, il est conseillé de manœuvrer périodiquement le disjoncteur de la source alternative.

Circuits auxiliaires

Accessoires de contrôle

Les déclencheurs shunt MX et XF sont respectivement utilisés pour ouvrir et fermer le disjoncteur à distance à l'aide d'une commande électrique ou par l'intermédiaire d'un réseau de communication.

Le déclencheur sur baisse de tension MN est utilisé pour ouvrir le circuit d'alimentation si la tension du système de distribution chute ou fait défaut.

Les déclencheurs de communication MX et XF et les déclencheurs MN sont continuellement alimentés et leurs composants électroniques internes peuvent souffrir d'un vieillissement accéléré si une montée de température se produit dans le disjoncteur.

L'entretien préventif consiste à vérifier périodiquement le fonctionnement à des valeurs minimales.

Câblage auxiliaire

Un câblage auxiliaire est utilisé pour transmettre les commandes aux divers dispositifs de contrôle et des informations sur les conditions d'état. Des raccordements incorrects ou une isolation endommagée peuvent entraîner le dysfonctionnement du disjoncteur ou un déclenchement intempestif.

Un câblage auxiliaire doit être vérifié régulièrement et remplacé au besoin, en particulier en présence de vibrations, de températures ambiantes élevées ou d'atmosphères corrosives.

Contacts de signalisation

Les contacts qui signalent l'état du disjoncteur (ON / OFF), du berceau (CE, CD, CT), un déclenchement dû à un défaut électrique (SDE), ou que le disjoncteur est prêt à se fermer (PF), fournissent à l'opérateur les informations d'état nécessaires pour réagir en conséquence. Toutes signalisations incorrectes peuvent entraîner un mauvais fonctionnement de dispositifs. La défaillance de contacts (usure, raccordement lâche ou défait) peut être la conséquence des vibrations, de la corrosion ou une montée de température anormale, et un entretien préventif doit assurer que les contacts conduisent ou isolent correctement en fonction de leurs positions.

Moteur d’armement des ressorts

Le moteur d'armement des ressorts (MCH) réarme automatiquement les ressorts des mécanismes de manœuvre dès que le disjoncteur est fermé. Le moteur d'armement des ressorts rend possible de refermer instantanément le dispositif après une ouverture. Cette caractéristique peut être indispensable pour des raisons de sécurité. Le levier d'armement ne sert que comme moyen de secours en cas de défaillance de la tension auxiliaire. Les vérifications périodiques du fonctionnement du moteur d'armement des ressorts et du temps d'armement sont requises pour assurer le bon fonctionnement du dispositif.

Déclencheur électronique

Si un défaut électrique se produit dans l'installation, le déclencheur électronique détecte le défaut et commande au disjoncteur de s'ouvrir.

Les composants électroniques et les cartes de circuits sont sensibles à l'environnement (température ambiante, atmosphères humides et corrosives) et aux conditions sévères de fonctionnement (champs magnétiques, vibrations, etc.). Pour assurer le bon fonctionnement, il est nécessaire de vérifier périodiquement :

- la chaîne d'action entraînant un déclenchement
- le temps de réponse comme fonction du niveau du courant de défaut.

Utiliser les trousses d'essai HHTK ou FFTK pour des essais d'injection secondaire ou un essai avec une injection primaire.

Module de communication et accessoires

Module d’E/S

Module IFM

Module IFE

En utilisant le bus de communication, l'option de communication transmet des données à un site à distance pour leur utilisation dans des départements variés (entretien, gestion, production, etc.).

Une interruption de transmission des données peut entraîner :

- des pertes de production dues à une ignorance concernant l'état d'un disjoncteur
- des pertes financières dues à une gestion incorrecte du système, des erreurs de diagnostic, etc.

Les vérifications périodiques sur les ordres (lecture, écriture, commandes) transmis par le bus de communication sont requises pour maintenir un haut degré de crédibilité et de confiance dans le système de communication.

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Raccordements

Les raccordements entre les divers systèmes de distribution d'un panneau de commutation (barres-bus, câbles) et l'appareillage de commutation sont une source majeure de perte de chaleur. Un serrage incorrect peut entraîner un emballement thermique qui, à son tour, peut provoquer un endommagement du dispositif, de l'isolation des câbles ou entraîner un court-circuit ou un incendie. Ce type de dysfonctionnement est souvent dû à une négligence envers les exigences d'installation pendant l'assemblage du panneau de commutation.

REMARQUE : Les raccordements ne doivent jamais utiliser des matériaux différents (cuivre / aluminium).

Disjoncteurs fixes

Les raccordements de disjoncteurs fixes utilisent des cosses ou des barres. Lorsque ce type de raccordement est fait en observant les recommandations de Schneider Electric (couple de serrage, quincaillerie et rondelle de contact), il n'exige aucun entretien particulier.

Autrement, vérifier régulièrement les points de montée de température. Si un changement de couleur du cuivre ou de l'étamage se produit :

- défaire les raccordements
- nettoyer et gratter les surfaces de contact
- puis rassembler les raccordements en employant une quincaillerie neuve.

Vérifier les bornes.

Disjoncteurs débrochables (berceau)

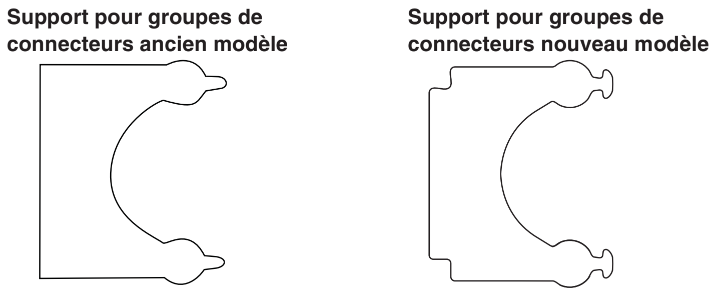
Les raccordements des disjoncteurs débrochables comprennent deux parties, les groupes de connecteurs et les contacts de coupure. Ce type de raccordement est essentiel et nécessite un nettoyage périodique conforme aux procédures décrites. La graisse facilite le raccordement entre les groupes de connecteurs et les contacts de coupure et évite d'endommager la surface revêtue d'argent en réduisant la friction d'embrochage.

Dans les atmosphères sulfureuses (corrosives) ($H2S$ / $SO2$), il est nécessaire d'exécuter la procédure de nettoyage à l'aide de la solution Thiourée, en remettant obligatoirement de la graisse fluorée (telle que Pyratex® EP). Ce type de graisse protège les contacts revêtus d'argent et de cuivre contre la sulfuration. Du fait que le sulfure d'argent ou de cuivre est isolant, il crée une augmentation de résistance des contacts et, par voie de conséquence, une montée de température plus importante. La graisse s'altère avec le temps et il est donc nécessaire de la remplacer régulièrement.

Inspection et lubrification des groupes de connecteurs (disjoncteurs débrochables Masterpact NW uniquement)

1. Si le disjoncteur est muni de dispositifs de rétention des groupes de connecteurs, retirer ces dispositifs autant que nécessaire pour inspecter les groupes de connecteurs et leurs supports.
2. Si le disjoncteur est muni de blindages ArcBlok ou d'écrans de protection des groupes de connecteurs, utiliser l'outil S47542 afin de retirer les groupes de connecteurs en vue de leur inspection.

Figure 9 – Profils de supports de groupes de connecteurs



S'assurer que les groupes de connecteurs sont installés correctement comme indiqué au tableau 21.

3. Faire une inspection visuelle des groupes de connecteurs pour voir s’ils sont usés et déceler des signes d’endommagement tels que :

   — Des zones décolorées

   — Du cuivre visible sur les doigts

   — Des ressorts fêlés ou cassés

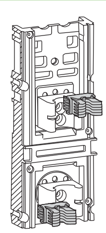
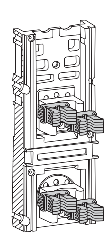
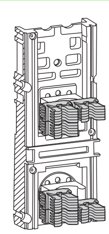
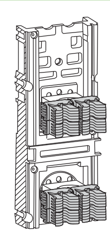
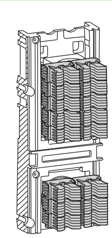
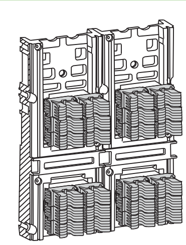
   — Des groupes manquants

   — Manque d’alignement avec d’autres groupes (indique un endommagement du ressort)

4. Faire une inspection visuelle des groupes pour voir s’ils sont usés.
5. Pour les disjoncteurs munis de dispositifs de retenue des groupes de connecteurs : s'assurer que tous les groupes de connecteurs possèdent des dispositifs de retenue.

REMARQUE : Les disjoncteurs munis d'écrans de protection de groupes de connecteurs ou de blindages ArcBlok n'ont pas besoin de kits de rétention de groupes de connecteurs. Ne pas essayer d'installer des kits de rétention de groupes de connecteurs sur ces disjoncteurs.

Tableau 21 – Configuration des groupes de connecteurs

Nombre de groupes de connecteurs par pôle					
2	4	6	8	16	24
					

Remplacement des groupes de connecteurs

AVIS

RISQUE DE DOMMAGES MATÉRIELS

- Si des groupes de connecteurs sont retirés pour quelque raison que ce soit, les groupes de connecteurs doivent être installés à l'aide de l’outil de positionnement S47542.
- Lubrifiez les groupes de connecteurs comme indiqué dans la section Lubrification des groupes de connecteurs à la page 39.
- Installez uniquement une pièce de barre-bus d’une largeur de 3/8 po ou l’outil de réglage (CLUSRETOOL) dans les mâchoires des groupes de connecteurs.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

Si des groupes de connecteurs du disjoncteur Masterpact NW sont usés ou endommagés, des groupes de connecteurs neufs doivent être installés à l'aide de l’outil de positionnement S47542.

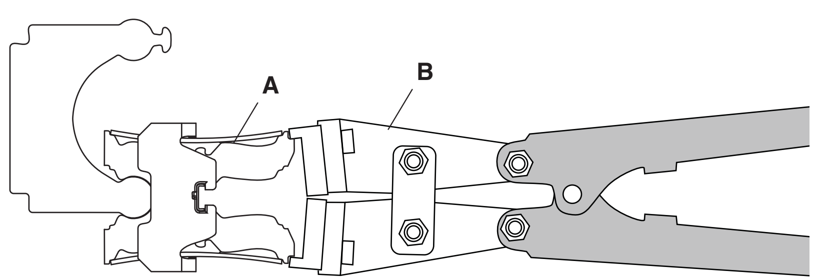
Tableau 22 – Nombre de groupes de connecteurs par pôle

<table>
<tr><th colspan="2">Type</th><th>N / N1</th><th>H1</th><th>HA</th><th>H / H2 / H3 / HF</th><th>L / L1 / LF / L1F / HB / NC</th></tr>
<tr><td rowspan="8">V ∿</td><td>NW08</td><td>2</td><td>4</td><td>4</td><td>4 / 6 / 6 / 4</td><td>8</td></tr>
<tr><td>NW12</td><td>2</td><td>—</td><td>—</td><td>4</td><td>8</td></tr>
<tr><td>NW16</td><td>6</td><td>6</td><td>6</td><td>6</td><td>8</td></tr>
<tr><td>NW20</td><td>8</td><td>8</td><td>8</td><td>8</td><td>16</td></tr>
<tr><td>NW25 / NW30</td><td>—</td><td>—</td><td>—</td><td>16</td><td>16</td></tr>
<tr><td>NW32</td><td>—</td><td>16</td><td>16</td><td>16</td><td>24</td></tr>
<tr><td>NW40/NW50</td><td>—</td><td>—</td><td>24</td><td>24</td><td>24</td></tr>
<tr><td>NW60</td><td>—</td><td>—</td><td>—</td><td>24</td><td>24</td></tr>
<tr><td rowspan="2">V ⎓</td><td>NW80 / NW12 / NW16 / NW20 / NW25</td><td colspan="5">8</td></tr>
<tr><td>NW30 / NW40</td><td colspan="5">16</td></tr>
</table>

— Remplacer les groupes de connecteurs usés ou endommagés.

— Installer des groupes de connecteurs neufs (A) à l'aide de l’outil de positionnement S47542 (B).

Figure 10 – Remplacement des groupes de connecteurs



Si les groupes de connecteurs et leurs supports ne sont pas endommagés et si le disjoncteur ne comporte ni écran de protection ni blindage ArcBlok, l'emploi de kits de rétention des groupes de connecteurs peut continuer. Si nécessaire, moderniser en utilisant des supports de groupes de connecteurs, groupes de connecteurs et écrans de protection/blindages ArcBlok neufs.

Tableau 23 – Kits de dispositifs de retenue de groupes de connecteurs

Description	Taille du châssis	Type d’interruption	Groupes de connecteurs par pôle	Kit de dispositifs de retenue de groupe de connecteurs		Couleur du dispositif de retenue	
				3P	4P	Supérieur	Inférieur
Disjoncteur Masterpact NW inscrit UL489	800/1600 A	N	2 ou 6	CRK2000A3P	CRK2000A4P	Incolore	Incolore
		H	4 ou 6	CRK2000A3P	CRK2000A4P	Incolore	Incolore
		L/LF	8	CRK2000A3P	N/A	Incolore	Incolore
	2000 A	N/H	8	CRK2000A3P	CRK2000A4P	Incolore	Incolore
		L/LF	16	CRK3000L3P	N/A	Rouge	Noir
	2500/3000 A	H	16	CRK3200A3P	CRK3200A4P	Rouge	Noir
		L	16	CRK3000L3P	N/A	Rouge	Noir
	4000/5000/6000 A	H	24	CRK6000A3P	CRK6000A4P	Noir	Noir
		L	24	CRK6000A3P	N/A	Noir	Noir
Interrupteurs automatiques Masterpact NW inscrits UL489	800/1600 A	HF	4 ou 6	CRK2000A3P	CRK2000A4P	Incolore	Incolore
		HB	8	CRK2000A3P	N/A	Incolore	Incolore
	2000 A	HF	8	CRK2000A3P	CRK2000A4P	Incolore	Incolore
		HB	16	CRK3000L3P	N/A	Rouge	Noir
	2500/3000 A	HF	16	CRK3200A3P	CRK3200A4P	Rouge	Noir
		HB	16	CRK3000L3P	N/A	Rouge	Noir
	4000/5000/6000 A	HF	24	CRK6000A3P	CRK6000A4P	Noir	Noir
		HB	24	CRK6000A3P	N/A	Noir	Noir
Disjoncteur Masterpact NW certifiés ANSI C37	800/1600 A	N1	2 ou 6	CRK2000A3P	CRK2000A4P	Incolore	Incolore
		H1/H2/H3	4 ou 6	CRK2000A3P	CRK2000A4P	Incolore	Incolore
		L1/L1F	8	CRK2000A3P	N/A	Incolore	Incolore
	2000 A	H1/H2/H3	8	CRK2000A3P	CRK2000A4P	Incolore	Incolore
		L1/L1F	16	CRK3000L3P	N/A	Rouge	Noir
	3200 A	H1/H2/H3	16	CRK3200A3P	CRK3200A4P	Rouge	Noir
		L1	24	CRK6000A3P	N/A	Noir	Noir
	4000/5000 A	H2/H3	24	CRK6000A3P	CRK6000A4P	Noir	Noir
		L1	24	CRK6000A3P	N/A	Noir	Noir
Interrupteurs non automatiques Masterpact NW certifiés ANSI C37	800/1600 A	HA	4 ou 6	CRK2000A3P	CRK2000A4P	Incolore	Incolore
	2000 A	HA	8	CRK2000A3P	CRK2000A4P	Incolore	Incolore
	3200 A	HA	16	CRK3200A3P	CRK3200A4P	Rouge	Noir
	4000/5000 A	HA	24	CRK6000A3P	CRK6000A4P	Noir	Noir
Interrupteurs automatiques Masterpact NW certifiés ANSI C37	800/1600 A	HF	4 ou 6	CRK2000A3P	CRK2000A4P	Incolore	Incolore
		HC	8	CRK2000A3P	N/A	Incolore	Incolore
	2000 A	HF	8	CRK2000A3P	CRK2000A4P	Incolore	Incolore
		HC	16	CRK3000L3P	N/A	Rouge	Noir
	3200 A	HF	16	CRK3200A3P	CRK3200A4P	Rouge	Noir
		HC	24	CRK6000A3P	N/A	Noir	Noir
	4000/5000 A	HF	24	CRK6000A3P	CRK6000A4P	Noir	Noir
		HC	24	CRK6000A3P	N/A	Noir	Noir
Clip d’attache du groupe de connecteurs	Tous	Tous	—	CRCLIP	—	—	—

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

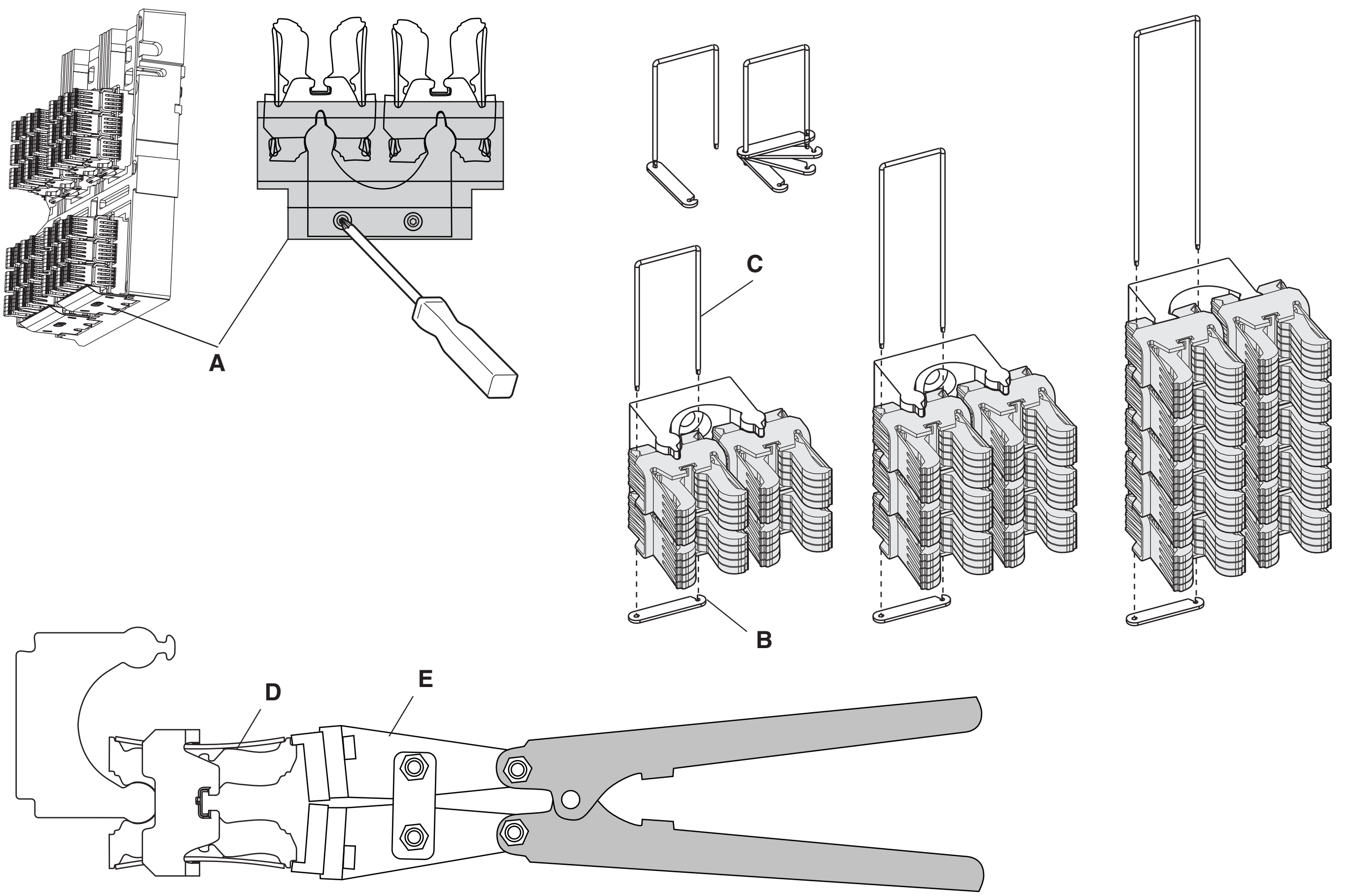
Installez le dispositif de retenue des groupes de connecteurs approprié tel qu’identifié par la couleur en fonction de la taille et du type de disjoncteur. Voir le tableau 23 à la page 35.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

REMARQUE : Le clip d’attache du groupe de connecteurs ne peut pas être réutilisé. Utiliser un nouveau clip d’attache de groupe de connecteurs, numéro de pièce CRCLIP.

1. Remplacer les groupes de connecteurs usés ou endommagés sur toutes les configurations sauf les groupes de connecteurs inférieurs dans les configurations à 16 et 24 groupes.
   a. Enlever la plaque connecteur inférieure (A), si présente. Mettre la plaque, les vis et rondelles de côté.
   b. Retirer le clip d’attache (B) et le dispositif de retenue (C) de groupes de connecteurs, si muni. Jeter le clip d’attache de groupes de connecteurs. Enlever les groupes de connecteurs usés ou endommagés.
   c. Installer des groupes de connecteurs neufs (D) à l'aide de l’outil de positionnement S47542 (E).
   d. Fixer les groupes de connecteurs à l’aide d’un dispositif de retenue (C) de groupe de connecteurs et d’un nouveau clip d’attache (B). Voir le tableau 23 pour le kit de retenue et la couleur du dispositif de retenue corrects de groupes de connecteurs.
   e. Remettre en place la plaque connecteur inférieure (A), si précédemment enlevée. Fixer la plaque à l'aide des vis et rondelles antérieurement mises de côté. Serrer les vis au couple de serrage de 2 N•m (17,7 lb-po).

Figure 11 – Remplacement des groupes de connecteurs



⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

Installez le dispositif de retenue des groupes de connecteurs approprié tel qu'identifié par la couleur en fonction de la taille et du type de disjoncteur. Voir la section tableau 23 à la page 35.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

2. Remplacer les groupes de connecteurs usés ou endommagés dans le jeu inférieur (A) des configurations à 16 et 24 groupes.

   a. Enlever la plaque connecteur inférieure (B), si présente. Mettre la plaque, les vis et rondelles de côté.

   b. Retirer le clip d'attache (C) et le dispositif de retenue (D) de groupes de connecteurs, si muni. Jeter le clip d'attache de groupes de connecteurs. Retirer tous les groupes de connecteurs; mettre au rebut les groupes de connecteurs usés ou endommagés.

   c. Faire passer le dispositif de retenue (D) à travers deux groupes de connecteurs jusqu'à ce que la partie inférieure du dispositif de retenue soit au niveau de la partie inférieure du groupe de connecteurs inférieur. Voir le tableau 23 pour le kit d’attaches et la couleur appropriée des groupes de connecteurs.

d. Installer les deux groupes de connecteurs et le dispositif de retenue (E) sur les deux encoches supérieures du support (F) à l’aide de l’outil de positionnement S47542 (G).

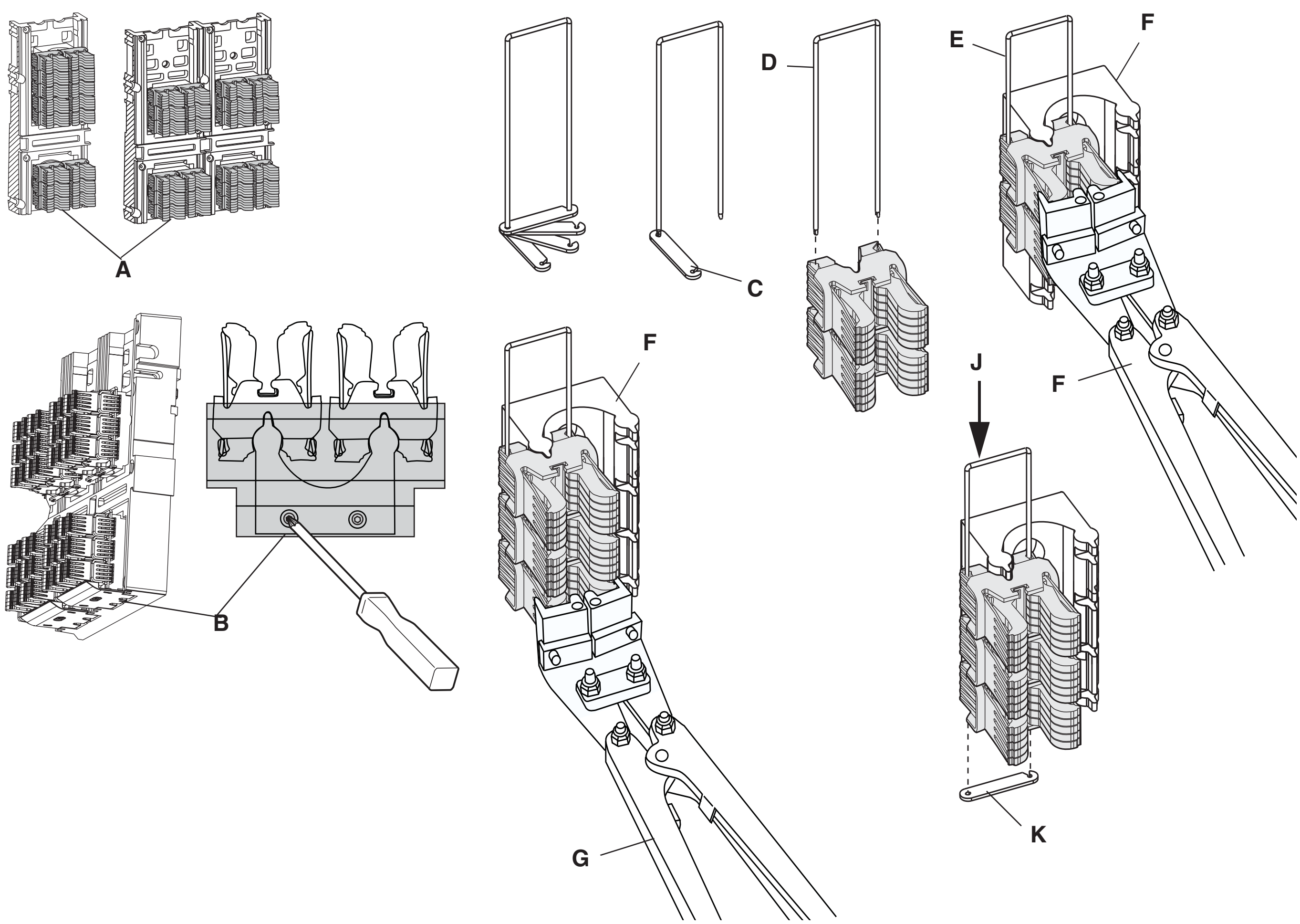
e. Installer le troisième groupe de connecteurs (H) sur l’encoche inférieure du support (F) à l’aide de l’outil de positionnement S47542 (G).

f. Faire passer le dispositif de retenue (J) des groupes de connecteurs à travers le troisième groupe et le fixer à l’aide du nouveau clip d’attache (K).

g. Répéter les points pour les groupes de connecteurs sur l’autre côté du support.

h. Remettre en place la plaque connecteur inférieure (B), si précédemment enlevée. Fixer la plaque à l'aide des vis et rondelles antérieurement mises de côté. Serrer les vis au couple de serrage de 2 N•m (17,7 lb-po).

Figure 12 – Remplacement des groupes de connecteurs



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Lubrification des groupes de connecteurs

AVIS

RISQUE DE DOMMAGES MATÉRIELS

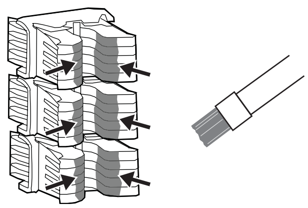
Inspectez la lubrification des groupes de connecteurs lorsque le disjoncteur est retiré du berceau.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

Lubrifier les mâchoires des groupes de connecteurs avec de la graisse du kit (numéro de catalogue S48899), comme indiqué à la figure 13.

REMARQUE : Enlever toute graisse existante de l'assemblage de groupes de connecteurs avant toute nouvelle lubrification.

Figure 13 – Application de graisse sur le groupe de connecteurs



Lubrification des lames de connexion du berceau

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E, CSA Z462 ou NOM-029-STPS.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez toutes les alimentations à cet appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Les lames de connexion du berceau doivent être inspectées et lubrifiées lorsque le berceau est installé pour la première fois et de nouveau durant les périodes d'entretien après avoir déconnecté toute alimentation électrique.

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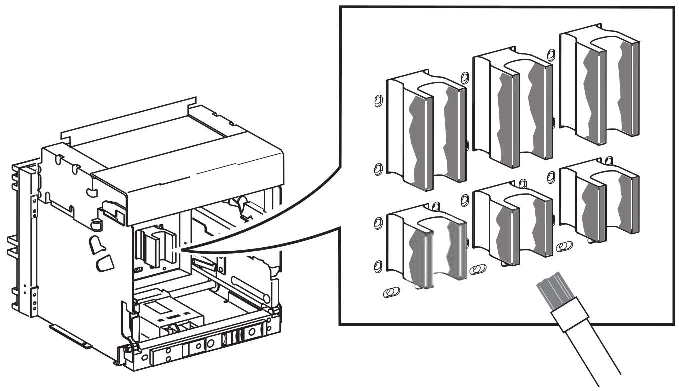
S'assurer que les lames de connexion sont lubrifiées sur les deux côtés. Si nécessaire, utiliser le kit de graisse (numéro de catalogue S48899) pour lubrifier les lames de connexion.

REMARQUE : Enlever toute graisse existante des lames de connexion du berceau avant toute nouvelle lubrification.

Figure 14 – Application de graisse sur les lames de connexion du berceau



Section 5—Dépannage

Tableau 24 – Dépannage et solutions

Problème	Causes probables	Solutions
Le disjoncteur ne peut pas être fermé localement ou à distance.	1. Le disjoncteur est verrouillé en position ouverte avec un cadenas ou une serrure. 2. Disjoncteur interverrouillé mécaniquement dans un système de transfert de source. 3. Disjoncteur pas complètement raccordé. 4. Le bouton de réarmement indiquant qu'un déclenchement sur défaut n'a pas été remis à zéro. 5. Le mécanisme d’énergie accumulée n'est pas armé. 6. Le déclencheur shunt d'ouverture MX est continuellement alimenté. 7. Le déclencheur sur baisse de tension MN n’est pas alimenté. 8. Le déclencheur de fermeture XF est continuellement alimenté, mais le disjoncteur n'est pas prêt à fermer (XF non câblé en série avec un contact PF). 9. Commande de déclenchement permanente d'un déclencheur Micrologic P ou H, avec protection de tension minimale et de fréquence minimale en mode de déclenchement et le déclencheur est sous tension.	1. Désactiver la fonction de verrouillage. 2. Vérifier la position de l'autre disjoncteur dans le système de transfert de source. Modifier la situation pour libérer l'interverrouillage. 3. Achever l'embrochage (le raccordement) du disjoncteur. 4. Corriger le défaut. Appuyer sur le bouton de réarmement sur la face avant du disjoncteur. 5. Armer le mécanisme manuellement. S'il est muni d'un moteur d'armement du ressort MCH, vérifier la fourniture d'alimentation du moteur. Si le problème persiste, remplacer le moteur d'armement du ressort (MCH). 6. Il y a une commande d'ouverture. Déterminer l'origine de la commande. La commande doit être annulée avant de pouvoir fermer le disjoncteur. 7. Il y a une commande d'ouverture. Déterminer l'origine de la commande. Vérifier la tension et le circuit d'alimentation ($U > 0{,}85\ U_n$). Si le problème persiste, remplacer le déclencheur. 8. Couper l'alimentation vers le déclencheur de fermeture XF, puis envoyer de nouveau la commande de fermeture à l'aide du XF, mais seulement si le disjoncteur est prêt à fermer. 9. Désactiver ces fonctions de protection sur le déclencheur Micrologic P ou H.
Le disjoncteur ne peut pas se fermer à distance mais peut être ouvert localement à l'aide du bouton-poussoir de fermeture.	Commande de fermeture non exécutée par le déclencheur de fermeture XF.	Vérifier la tension et le circuit d'alimentation (0,85 - 1,1 U_n). Si le problème persiste, remplacer le déclencheur XF.
Déclenchement inopiné sans activation du bouton de réarmement signalant un déclenchement sur défaut.	1. Tension d'alimentation du déclencheur sur baisse de tension MN trop basse. 2. Commande de coupure de charge envoyée au déclencheur d'ouverture MX par un autre dispositif. 3. Commande d'ouverture inutile provenant du déclencheur d'ouverture MX.	1. Vérifier la tension et le circuit d'alimentation ($U > 0{,}85\ U_n$). 2. Vérifier la charge globale sur le système de distribution. Si nécessaire, modifier les réglages des dispositifs de l'installation. 3. Déterminer l'origine de la commande.
Déclenchement inopiné avec activation du bouton de réarmement signalant un déclenchement sur défaut.	Un défaut est présent : • surcharge • défaut à la terre • court-circuit détecté par le déclencheur.	Déterminer et corriger la cause du défaut. Vérifier l'état du disjoncteur avant de le remettre en service.

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Tableau 24 – Dépannage et solutions *(suite)*

Problème	Causes probables	Solutions
Ouverture instantanée après chaque tentative de fermeture du disjoncteur avec activation du bouton de réarmement signalant un déclenchement sur défaut.	1. Mémoire thermique. 2. Surintensité transitoire lors de la fermeture. 3. Fermeture sur un court-circuit.	1. Voir le guide de l'utilisateur du déclencheur. Appuyer sur le bouton de réarmement. 2. Modifier les réglages du système de distribution ou du déclencheur. Vérifier l'état du disjoncteur avant de le remettre en service. Appuyer sur le bouton de réarmement. 3. Corriger le défaut. Vérifier l'état du disjoncteur avant de le remettre en service. Appuyer sur le bouton de réarmement.
Le disjoncteur ne peut pas s'ouvrir à distance mais peut être ouvert localement.	1. Commande d'ouverture non exécutée par le déclencheur d'ouverture MX. 2. Commande d'ouverture non exécutée par le déclencheur sur baisse de tension MN.	1. Vérifier la tension et le circuit d'alimentation (0,7 - 1,1 U_n). Si le problème persiste, remplacer le déclencheur MX. 2. Chute de tension insuffisante ou tension résiduelle (> 0,35 U_n) aux bornes du déclencheur sur baisse de tension. Si le problème persiste, remplacer le déclencheur MN.
Le disjoncteur ne peut pas être ouvert localement.	Mauvais fonctionnement du mécanisme de fonctionnement ou contacts soudés.	Contacter un centre de services Schneider Electric.
Le disjoncteur peut être réarmé localement mais pas à distance.	Tension insuffisante pour le moteur d'armement du ressort MCH.	Vérifier la tension et le circuit d'alimentation (0,7 - 1,1 Un). Si le problème persiste, remplacer le MCH.
Déclenchement intempestif du disjoncteur avec activation du bouton de réarmement signalant un déclenchement sur défaut.	Le bouton de réarmement n'est pas complètement enfoncé.	Appuyer à fond sur le bouton de réarmement.
Impossible d'insérer la manivelle en position connectée, d'essai ou déconnectée.	Un cadenas ou une serrure est présent sur le berceau ou un interverrouillage de porte est présent.	Désactiver la fonction de verrouillage.
Impossible de tourner la manivelle.	Il n'a pas été appuyé sur le bouton de réarmement.	Appuyer sur le bouton de réarmement.
Impossible de retirer le disjoncteur du berceau.	1. Le disjoncteur n'est pas en position déconnectée. 2. Les rails ne sont pas complètement sortis.	1. Tourner la manivelle jusqu'à ce que le disjoncteur soit en position déconnectée et le bouton de réarmement sorti. Enlever et ranger la manivelle. 2. Tirer les rails à fond.
Le disjoncteur ne peut pas être connecté (embroché).	1. Protection mal assortie du berceau/disjoncteur. 2. Les volets de sécurité sont verrouillés. 3. Les groupes de connecteurs de déconnexion des contacts sont incorrectement positionnés. 4. Le berceau est verrouillé en position déconnectée 5. Il n'a pas été appuyé sur le bouton de réarmement, empêchant la rotation de la manivelle. 6. Le disjoncteur n'a pas été suffisamment inséré dans le berceau.	1. S'assurer que le berceau correspond au disjoncteur. 2. Retirer les verrous. 3. Repositionner les groupes de connecteurs. 4. Désactiver la fonction de verrouillage du berceau. 5. Appuyer sur le bouton de réarmement. 6. Insérer le disjoncteur complètement de sorte qu'il soit engagé dans le mécanisme d'embrochage.
Le disjoncteur ne peut pas être verrouillé en position déconnectée.	1. Le disjoncteur n'est pas à la position correcte. 2. La manivelle est encore dans le berceau.	1. Vérifier la position du disjoncteur en s'assurant que le bouton de réarmement soit dégagé. 2. Enlever et ranger la manivelle.
Le disjoncteur ne peut pas être verrouillé en position connectée, d'essai ou déconnectée.	1. S'assurer que le verrouillage dans n'importe quelle position est activé. 2. Le disjoncteur n'est pas à la position correcte. 3. La manivelle est encore dans le berceau.	1. Contacter un centre de services Schneider Electric. 2. Vérifier la position du disjoncteur en s'assurant que le bouton de réarmement soit dégagé. 3. Enlever et ranger la manivelle.
La manivelle ne peut pas être insérée pour connecter ou déconnecter le disjoncteur.	Les rails ne sont pas complètement en place.	Appuyer à fond sur les rails.

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Tableau 24 – Dépannage et solutions *(suite)*

Problème	Causes probables	Solutions
Le rail de droite (berceau uniquement) ou le disjoncteur ne peut pas être débroché.	La manivelle est encore dans le berceau.	Enlever et ranger la manivelle.
Le disjoncteur ne peut pas être fermé localement ou à distance.	Le disjoncteur est verrouillé en position ouverte avec un cadenas ou une serrure.	Désactiver la fonction de verrouillage.
	Disjoncteur interverrouillé mécaniquement dans un système de transfert de source.	• Vérifier la position de l'autre disjoncteur dans le système de transfert de source. • Modifier la situation pour libérer l'interverrouillage.
	Disjoncteur pas complètement raccordé.	• Achever l'embrochage (le raccordement) du disjoncteur.
	Le bouton de réarmement indiquant qu'un déclenchement sur défaut n'a pas été remis à zéro.	• Corriger le défaut. • Appuyer sur le bouton de réarmement sur la face avant du disjoncteur.
	Le mécanisme d'énergie accumulée n'est pas armé.	• Armer le mécanisme manuellement. • S'il est muni d'un moteur d'armement du ressort MCH, vérifier la fourniture d'alimentation du moteur. Si le problème persiste, remplacer le moteur d'armement du ressort (MCH).
	Le déclencheur d'ouverture shunt MX est continuellement alimenté.	• Il y a une commande d'ouverture. Déterminer l'origine de la commande. • La commande doit être annulée avant de pouvoir fermer le disjoncteur.
	Déclencheur sur baisse de tension MN n'est pas alimenté.	• Il y a une commande d'ouverture. Déterminer l'origine de la commande. • Vérifier la tension et le circuit d'alimentation (U > 0,85 U_n). Si le problème persiste, remplacer le déclencheur.
	Le déclencheur de fermeture XF est continuellement alimenté, mais le disjoncteur n'est pas prêt à fermer (XF non câblé en série avec un contact PF).	Couper l'alimentation vers le déclencheur de fermeture XF, puis envoyer de nouveau la commande de fermeture à l'aide du XF, mais seulement si le disjoncteur est prêt à fermer.
	Commande de déclenchement permanente en présence d'un déclencheur Micrologic P ou H, avec protection de tension minimale et de fréquence minimale en mode de déclenchement et le déclencheur est sous tension.	Désactiver ces fonctions de protection sur le déclencheur Micrologic P ou H.
Le disjoncteur ne peut pas se fermer à distance mais peut être ouvert localement à l'aide du bouton-poussoir de fermeture.	Commande de fermeture non exécutée par le déclencheur de fermeture XF.	• Vérifier la tension et le circuit d'alimentation (0,85 - 1,1 U_n). • Si le problème persiste, remplacer le déclencheur XF.
Déclenchement inopiné sans activation du bouton de réarmement signalant un déclenchement sur défaut.	Tension d'alimentation du déclencheur sur baisse de tension MN trop basse.	Vérifier la tension et le circuit d'alimentation (U > 0,85 U_n).
	Commande de coupure de charge envoyée au déclencheur d'ouverture MX par un autre dispositif.	• Vérifier la charge globale sur le système de distribution. • Si nécessaire, modifier les réglages des dispositifs de l'installation.
	Commande d'ouverture inutile provenant du déclencheur d'ouverture MX.	Déterminer l'origine de la commande.
Déclenchement inopiné avec activation du bouton de réarmement signalant un déclenchement sur défaut.	Un défaut est présent : • surcharge • défaut à la terre • court-circuit détecté par le déclencheur.	• Déterminer et corriger la cause du défaut. • Vérifier l'état du disjoncteur avant de le remettre en service.

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Tableau 24 – Dépannage et solutions *(suite)*

Problème	Causes probables	Solutions
Ouverture instantanée après chaque tentative de fermeture du disjoncteur avec activation du bouton de réarmement signalant un déclenchement sur défaut.	Mémoire thermique.	• Voir le guide de l'utilisateur du déclencheur. • Appuyer sur le bouton de réarmement.
	Surintensité transitoire lors de la fermeture.	• Modifier les réglages du système de distribution ou du déclencheur. • Vérifier l'état du disjoncteur avant de le remettre en service. • Appuyer sur le bouton de réarmement.
	Fermeture sur un court-circuit.	• Corriger le défaut. • Vérifier l'état du disjoncteur avant de le remettre en service. • Appuyer sur le bouton de réarmement.
Le disjoncteur ne peut pas s’ouvrir à distance mais peut être ouvert localement.	Commande d'ouverture non exécutée par le déclencheur d'ouverture MX.	Vérifier la tension et le circuit d'alimentation (0,7 - 1,1 Un). Si le problème persiste, remplacer le déclencheur MX.
	Commande d'ouverture non exécutée par le déclencheur sur baisse de tension MN.	Chute de tension insuffisante ou tension résiduelle (> 0,35 Un) aux bornes du déclencheur sur baisse de tension. Si le problème persiste, remplacer le déclencheur MN.
Le disjoncteur ne peut pas être ouvert localement.	Mauvais fonctionnement du mécanisme de fonctionnement ou contacts soudés.	Contacter un centre de services Schneider Electric.
Le disjoncteur peut être réarmé localement mais pas à distance.	Tension insuffisante pour le moteur d'armement du ressort MCH.	Vérifier la tension et le circuit d'alimentation (0,7 - 1,1 Un). Si le problème persiste, remplacer le MCH.
Déclenchement intempestif du disjoncteur avec activation du bouton de réarmement signalant un déclenchement sur défaut.	Le bouton de réarmement n'est pas complètement enfoncé.	Appuyer à fond sur le bouton de réarmement.
Impossible d'insérer la manivelle en position connectée, d'essai ou déconnectée.	Un cadenas ou une serrure est présent sur le berceau ou un interverrouillage de porte est présent.	Désactiver la fonction de verrouillage.
Impossible de tourner la manivelle.	Il n'a pas été appuyé sur le bouton de réarmement.	Appuyer sur le bouton de réarmement.
Impossible de retirer le disjoncteur du berceau.	Le disjoncteur n'est pas en position déconnectée.	Tourner la manivelle jusqu'à ce que le disjoncteur soit en position déconnectée et le bouton de réarmement sorti.
	Les rails ne sont pas complètement sortis.	Tirer les rails à fond.
Le disjoncteur ne peut pas être connecté (embroché).	Protection mal assortie du berceau/disjoncteur.	S'assurer que le berceau correspond au disjoncteur.
	Les volets de sécurité sont verrouillés.	Retirer les verrous.
	Les groupes de connecteurs de déconnexion des contacts sont incorrectement positionnés.	Repositionner les groupes de connecteurs.
	Le berceau est verrouillé en position déconnectée	Désactiver la fonction de verrouillage du berceau.
	Il n'a pas été appuyé sur le bouton de réarmement, empêchant la rotation de la manivelle.	Appuyer sur le bouton de réarmement.
	Le disjoncteur n'a pas été suffisamment inséré dans le berceau.	Insérer le disjoncteur complètement de sorte qu'il soit engagé dans le mécanisme d'embrochage.
Le disjoncteur ne peut pas être verrouillé en position déconnectée.	Le disjoncteur n'est pas à la position correcte.	Vérifier la position du disjoncteur en s'assurant que le bouton de réarmement soit dégagé.
	La manivelle est encore dans le berceau.	Enlever et ranger la manivelle.
Le disjoncteur ne peut pas être verrouillé en position connectée, d'essai ou déconnectée.	S'assurer que le verrouillage dans n'importe quelle position est activé.	Contacter un centre de services Schneider Electric.
	Le disjoncteur n'est pas à la position correcte.	Vérifier la position du disjoncteur en s'assurant que le bouton de réarmement soit dégagé.
	La manivelle est encore dans le berceau.	Enlever et ranger la manivelle.

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Tableau 24 – Dépannage et solutions *(suite)*

Problème	Causes probables	Solutions
La manivelle ne peut pas être insérée pour connecter ou déconnecter le disjoncteur.	Les rails ne sont pas complètement en place.	Appuyer à fond sur les rails.
Le rail de droite (berceau uniquement) ou le disjoncteur ne peut pas être débroché.	La manivelle est encore dans le berceau.	Enlever et ranger la manivelle.

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Section 6—Essais

Procédures

Inspections visuelles pendant le fonctionnement

Pendant que le disjoncteur est sous tension :

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E, CSA Z462 ou NOM-029-STPS.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Prenez toutes les précautions pour assurer qu’aucun contact accidentel avec des composants sous tension ne se produise durant ce contrôle.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

1. Vérifier l’application et la puissance nominale d’un disjoncteur.

   S’assurer que le disjoncteur est mis en service de façon appropriée correspondant à la tension indiquée sur l’étiquette, à l’intensité nominale, aux valeurs nominales maximales d’interruption de courant et aux recommandations de l’entreprise. Comparer les données de la face avant du disjoncteur aux plans d’installation. Vérifier les réglages du déclencheur Micrologic[MC] sur les disjoncteurs à déclenchement électronique avec l’étude de coordination. Après avoir terminé les procédures d’inspection et d’entretien, s’assurer que tous les réglages du déclencheur pour toutes les fonctions sont conformes à l’étude de coordination.

2. Contrôler pour voir s’il se produit une surchauffe lorsque l’appareil est sous tension.

   Pendant que le disjoncteur fonctionne normalement, sous charge et à la température de fonctionnement, vérifier si la face exposée, accessible, isolée et les surfaces adjacentes du coffret surchauffent. Pour faire cela, utiliser une sonde de température infrarouge pour vérifier la température. Si la température dépasse 60 °C (140°F), la cause doit être recherchée.

   Accorder à un disjoncteur sous tension au moins trois heures pour qu’il atteigne la température de fonctionnement. Comparer la température des surfaces des disjoncteurs individuels à la température des surfaces des autres disjoncteurs de l’installation. Les températures des surfaces des disjoncteurs varient en fonction de leur charge, de l’emplacement sur le panneau de distribution et de la température ambiante. Si la température des surfaces d’un disjoncteur est considérablement plus élevée que pour les disjoncteurs adjacents, la cause doit être recherchée.

   Les méthodes d’inspection thermographiques peuvent être également employées pour évaluer la surchauffe d’un appareil sous tension (voir Inspection thermographique, page 47).

3. Vérifier si le boîtier du disjoncteur est fissuré.

   Tout disjoncteur avec un boîtier fissuré doit être remplacé parce que sa capacité de soutenir les contraintes d’interruption par court-circuit est réduite.

4. Inspecter le coffret.

   Le coffret doit être propre et sec. Tous les couvercles et toutes les pièces de la garniture doivent être en place.

Inspection thermographique

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

Seuls des électriciens qualifiés ayant une formation et l'expérience des circuits à basse tension doivent effectuer l’inspection thermographique. Le personnel doit connaître les risques encourus à travailler sur ou à proximité des appareils à basse tension. N'entreprenez ce travail qu'après avoir lu ces directives d’utilisation dans leur intégralité.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Les techniques d’inspection thermographique à infrarouge peuvent être utiles pour évaluer la condition de fonctionnement des disjoncteurs et des terminaisons. La comparaison aux images thermographiques à infrarouge mises en mémoire peut être utile pour un entretien préventif de disjoncteurs et d’appareils d’utilisation privée. La quantité réelle de chaleur émise est fonction tant du courant de charge que des conditions ambiantes. L’interprétation d’un examen à l’infrarouge exige de l’expérience et une formation à ce type d’inspection.

Accorder aux disjoncteurs initialement mis sous tension au moins trois heures pour atteindre la température de fonctionnement. Comparer les images thermographiques des disjoncteurs individuels aux images antérieurement mises en mémoire des mêmes disjoncteurs.

Essais de performance

Effectuer les essais de performance dans l'ordre donné pour maximiser la précision de leurs résultats.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E, CSA Z462 ou NOM-029-STPS.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez toutes les alimentations à cet appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.
- Ne touchez pas les bornes ou fils de connexion d'essai d'un disjoncteur alors que celui-ci est en cours de vérification.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

REMARQUE : Ne jamais faire d'essai de résistance des contacts avant d'avoir fait des essais d'injection primaire instantanée. Les essais d'injection primaire assureront que les contacts n'ont aucun film résistif, ne sont pas oxydés et ne contiennent pas de corps étrangers.

Les essais ci-après sont destinés à vérifier le bon fonctionnement d'un disjoncteur. Des conditions d'essais contrôlés de façon précise par l'usine sont utilisées pour établir les courbes de caractéristiques du déclenchement. Si les résultats d'essais sur place tombent en dehors de la bande de tolérance des caractéristiques de déclenchement, évaluer soigneusement la précision des conditions et méthodes des essais.

Lorsque des conditions ou résultats douteux sont observés au cours d'une inspection et d'essais de performance, consulter le bureau des ventes local. Les disjoncteurs munis d'accessoires ou modifiés à l'usine peuvent exiger une investigation spéciale. S'il est nécessaire de renvoyer un disjoncteur à l'établissement de fabrication, employer un emballage et des matériaux d'emballage appropriés pour éviter tout endommagement durant le transport.

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Essais diélectriques des disjoncteurs Masterpact avec déclencheurs Micrologic P ou H

AVIS

RISQUE DE DOMMAGES MATÉRIELS

- Les essais diélectriques (essais haute tension, résistance de l'isolation ou avec mégohmmètre) peuvent endommager les déclencheurs Micrologic^{MC} P et H.
- Retirer la fiche de valeur nominale du déclencheur avant de procéder aux essais.
- Remplacez le déclencheur si la fiche de valeur nominale n'a pas été retirée durant les essais ou si le déclencheur a été exposé à plus de 700 Vca.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

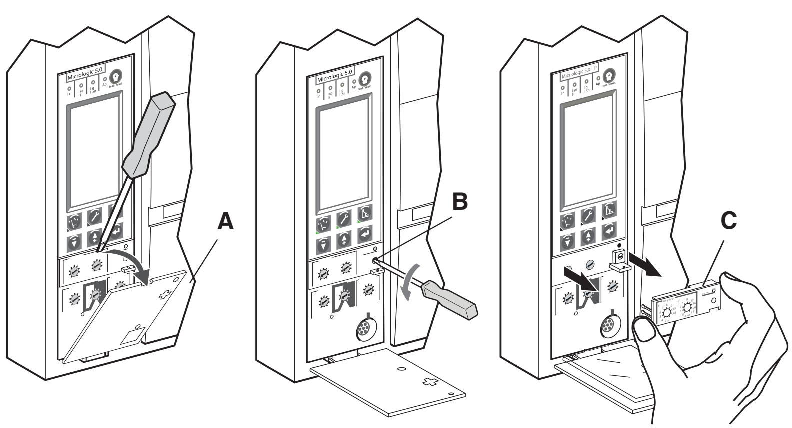
Les essais diélectriques (essais haute tension, résistance de l'isolation ou avec mégohmmètre) sont utilisés pour s'assurer que l'isolement et l'isolation sont appropriés entre les phases et entre chaque phase et la terre. Le matériel employé pour effectuer ces essais crée une haute tension (des milliers de volts) pour vérifier la valeur diélectrique et l'intégrité de l'isolation.

La fiche de valeur nominale sur les déclencheurs Micrologic P et H raccorde/déconnecte le déclencheur aux raccordements de tension du disjoncteur. Avant d'effectuer des essais haute tension sur les disjoncteurs avec les déclencheurs Micrologic P et H, enlever la fiche de valeur nominale comme montré.

REMARQUE : Seuls les déclencheurs Micrologic P et H sont munis de raccordements phase-tension. Pour les autres types de déclencheurs, il n'est pas nécessaire de retirer la fiche de valeur nominale avant les essais diélectriques.

1. Ouvrir le couvercle des commutateurs (Figure 15, A).
2. Dévisser la vis de montage (B) de la fiche de valeur nominale.
3. Retirer la fiche de valeur nominale (C).

Figure 15 – Retrait de la fiche de valeur nominale



AVIS

RISQUE DE DOMMAGES MATÉRIELS

N'appliquez pas la tension d'essai aux circuits de contrôle ou aux bornes d'accessoires; un endommagement des composants électroniques et/ou de basse tension pourraient en résulter.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

Essai de résistance d'isolation

Des conditions d'environnement sévères peuvent réduire la rigidité diélectrique des disjoncteurs à boîtier moulé. Vérifier la résistance de l'isolation pendant un essai du système électrique

Pour vérifier la résistance d'isolation, procéder comme suit :

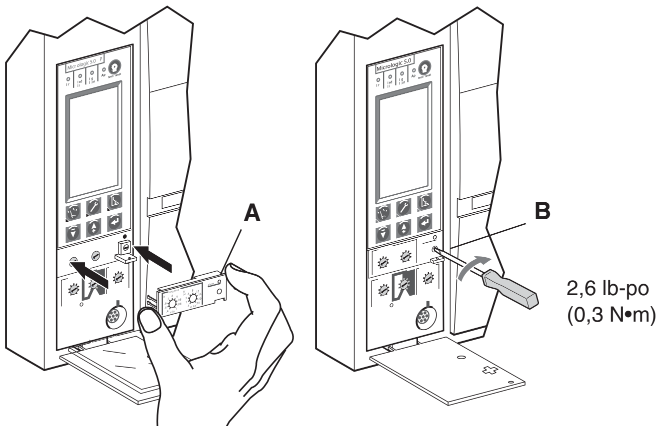
1. Mettre hors tension et isoler le disjoncteur:
2. Nettoyer le disjoncteur comme décrit antérieurement.
3. En utilisant un mégohmmètre avec une capacité de 500 à 1 000 V cc appliquer la tension entre :
   a. Chaque phase et la terre avec le disjoncteur en position de marche (I), contacts du disjoncteur fermés.
   b. Phase à phase avec le disjoncteur en position de marche (I), contacts du disjoncteur fermés.
   c. Entre chaque ligne et chaque borne de charge avec le disjoncteur en position d'arrêt (contacts du disjoncteur ouverts).
4. Noter les valeurs de résistance. Les valeurs de résistance inférieures à un mégohm (1 000 000 Ohms) doivent être examinées.

Après avoir terminé les essais, remettre la fiche de valeur nominale en place si précédemment enlevée.

1. Remettre en place la fiche de valeur nominale (Figure 16, A).
2. Serrer la vis de montage (B) de la fiche de valeur nominale.

REMARQUE : Si la fiche de valeur nominale n'est pas installée, le disjoncteur se règlera par défaut à un enclenchement de longue durée de 0,4 x le capteur (I_n) et certaines des fonctions avancées ne seront pas exploitables.

Figure 16 – Remise en place de la fiche de valeur nominale



Vérifications des déclencheurs Micrologic^{MC}

L'essai de fonctionnement des déclencheurs sur les disjoncteurs munis de déclencheurs Micrologic^{MC} peut se faire au moyen d'une injection secondaire à l'aide d'une des trousses d'essai disponibles. (Voir la page 63 pour les trousses d'essais.)

L'essai d'injection secondaire ne vérifie pas les transformateurs de courant et les raccordements. L'essai d'injection primaire peut être utilisé pour s'assurer que toutes les connexions du système de déclenchement ont été correctement effectuées.

Si le disjoncteur est vérifié par la méthode d'injection primaire, le système Powerlogic^{MC} peut rester raccordé au disjoncteur pendant l'essai sans affecter les résultats.

REMARQUE : L'essai d'un disjoncteur raccordé à un système Powerlogic fait ce dernier réagir comme si le disjoncteur subissait des défauts réels.

Procédure de neutralisation de l'interverrouillage sélectif de zone

L'interverrouillage sélectif de zone est une méthode de communication entre des dispositifs de protection contre un déclenchement électronique sur surintensité. L'interverrouillage sélectif de zone permet aux dispositifs interverrouillés à des niveaux différents de fonctionner ensemble comme un système dans lequel un court-circuit ou un défaut à la terre est isolé et corrigé dans un délai minimum. L'objectif d'une neutralisation d'un interverrouillage sélectif de zone est de vérifier les caractéristiques des fonctions spécifiques du retard de déclenchement de courte durée et sur défaut à la terre du disjoncteur. Pour les besoins des essais, l'interverrouillage sélectif de zone peut être inhibé sur les disjoncteurs Masterpact équipés de déclencheurs Micrologic^{MC} à l'aide d'une trousse d'essai portative ou des fonctions complètes.

Injection secondaire

L'installation sur place d'un déclencheur nécessite un essai d'injection secondaire à l'aide d'une trousse d'essai des fonctions complètes. Cela assurera que le déclencheur nouvellement installé fonctionnera correctement. L'essai impose d'ouvrir et de fermer le disjoncteur. Suivre les procédures détaillées dans les

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directives d'utilisation expédiées avec le disjoncteur et la trousse d'essai des fonctions complètes.

1. S'assurer que le disjoncteur est isolé de tous les dispositifs en amont et en aval.
2. Exécuter un essai d'injection secondaire comme expliqué dans les directives d'utilisation expédiées avec la trousse d'essai des fonctions complètes. Vérifier si toutes les fonctions utilisables du déclencheur fonctionnent correctement.
3. Répéter le point 2 avec l’interrupteur en position ouverte.

   REMARQUE : La trousse d’essai indique que le disjoncteur doit être fermé pendant l’essai. Ne pas fermer le disjoncteur pour ce point.
4. Si certains essais échouent, ne pas mettre le disjoncteur en service et contacter le bureau de vente local pour obtenir un service autorisé par l'usine.

Essai d'injection primaire

L'essai d'injection primaire peut être utilisé pour s'assurer que toutes les connexions du système de déclenchement ont été correctement effectuées.

REMARQUE : L'essai par injection secondaire continue d'être la méthode préférée de Schneider Electric pour les essais de disjoncteurs. Un essai par injection primaire inadéquat peut entraîner l'endommagement des disjoncteurs. L'inobservation de la méthode appropriée pour les essais par injection primaire pourrait aboutir à un essai réussi pour les disjoncteurs, alors qu'en fin de compte l'intégrité à long terme des disjoncteurs sera endommagée.

AVIS

RISQUE DE DOMMAGES MATÉRIELS

- Les disjoncteurs sont lourds et peuvent être endommagés par suite d’une manutention inappropriée. Prenez des précautions lorsque vous manipulez ou déplacez un disjoncteur vers un appareil de vérification.
- Effectuer le raccordement d’un disjoncteur avec soin, en utilisant un câble de valeur nominale appropriée et des méthodes de raccordement adéquates. Ne pas utiliser de colliers, brides ou autres méthodes pouvant rayer ou autrement endommager le fini des connecteurs.
- Lorsque vous raccordez un disjoncteur de type débrochable, utilisez une trousse d’essai d’injection primaire approuvée. Ajustez la position du disjoncteur de sorte que ses groupes de connecteurs s’alignent avec la trousse d’essai d’injection primaire.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

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5. En cas d’exécution d’un essai d’injection primaire sur des disjoncteurs débrochables, raccorder le disjoncteur à l’alimentation à l’aide de trousses d’essais d’injection primaire.

Tableau 25 – Trousses d'essai d'injection primaire

Type de disjoncteur	Alimentation	Trousse d’essai requise
Masterpact NW sans blindages ArcBlok ou écrans de protection des groupes de connecteurs	Phoenix®	ULW10025
	MultiAmp®	ULW10026
Masterpact NW avec blindages ArcBlok ou écrans de protection des groupes de connecteurs	Phoenix®	ULW10025 et kit de butée pour la trousse d’injection primaire 84958
	MultiAmp ®	ULW10026 et kit de butée pour la trousse d’injection primaire 84958
Masterpact NT	Phoenix ou MultiAmp	ULW10027
PowerPact	Phoenix ou MultiAmp	ULW10027
Tous les types	Autre que Phoenix ou MultiAmp	Communiquer avec le service à la clientèle.

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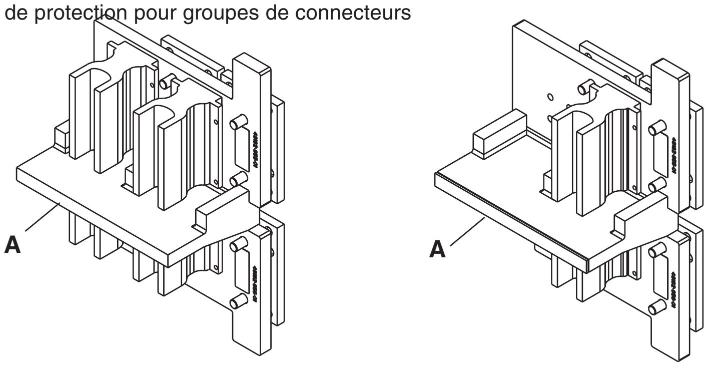
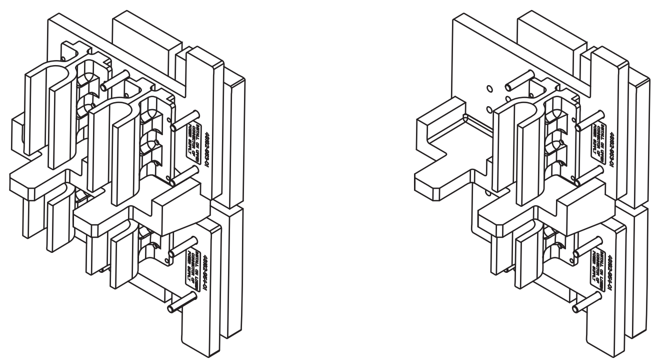
Figure 17 – Trousse d'essai d'injection primaire Masterpact NW

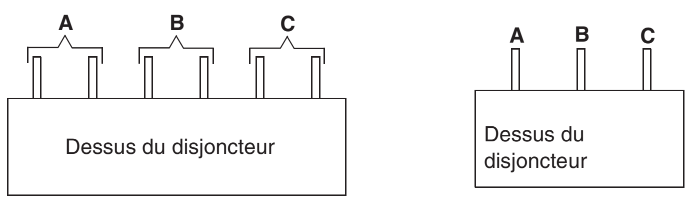
Trousse d'essai d'injection primaire pour disjoncteurs sans blindage ArcBlok ni écran de protection pour groupes de connecteurs



Trousse d'essai d'injection primaire avec butée pour la trousse (kit 84958) pour disjoncteurs avec blindage ArcBlok ou écrans de protection pour groupes de connecteurs



Phases



a. Installer la trousse d’essai d’injection primaire en observant les directives expédiées avec la trousse d’essai.

b. Ajuster la hauteur du disjoncteur de sorte que l’arrêt (A, ci-dessus) entre les plaques supérieure et inférieure de la trousse d’essai se trouve entre les connecteurs du haut et du bas du disjoncteur quand il est en position raccordée.

c. Aligner le disjoncteur de façon à ce que les groupes de connecteurs sur la phase du disjoncteur en cours de vérification s’alignent avec les connecteurs de la trousse d’essai d’injection primaire.

d. Lubrifier les connecteurs avec de la graisse du kit numéro de catalogue S48899. Ne rien installer dans la mâchoire des groupes de connecteurs sauf une trousse d’essai approuvée.

REMARQUE : Enlever toute graisse existante de l'assemblage de groupes de connecteurs avant toute nouvelle lubrification.

6. En cas d’exécution d’un essai d’injection primaire sur des disjoncteurs fixes, raccorder le disjoncteur à l’alimentation en utilisant un câble de valeur nominale appropriée et une méthode de raccordement adéquate.

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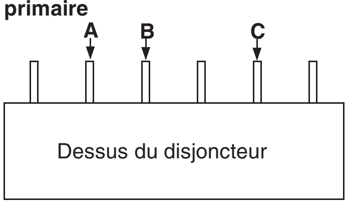
REMARQUE : Pour les disjoncteurs de construction large uniquement— Lors d'un essai d'injection primaire sur un disjoncteur avec six connecteurs de barre-bus, le courant est injecté dans les phases comme indiqué à la figure 18. Ne pas injecter de courant dans des barres-bus extérieurs.

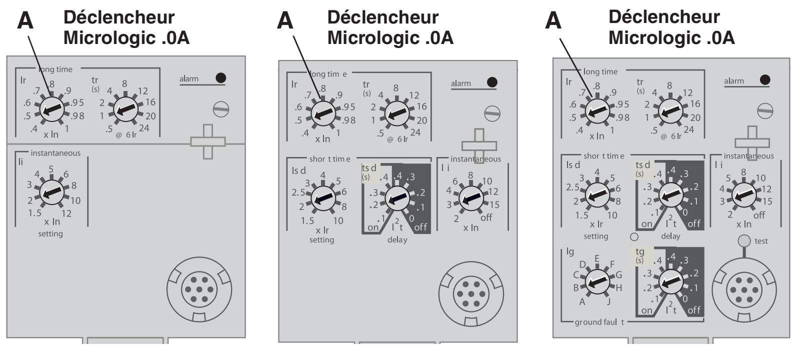
Figure 18 – Disjoncteur de construction large

Phases d'essai d'injection primaire



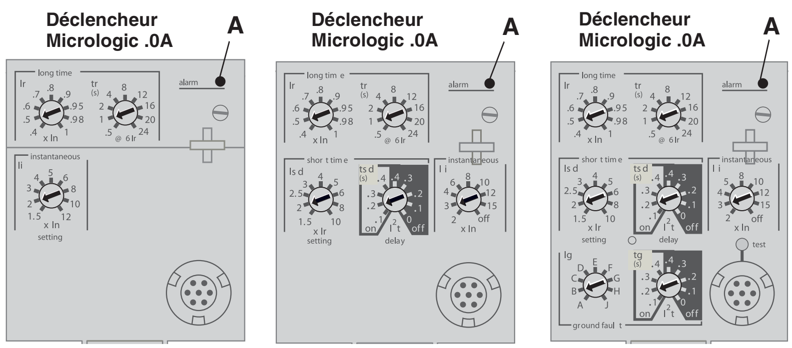
7. Noter tous les réglages d'origine des commutateurs du déclencheur. (Les réglages doivent être refaits après la fin des essais).
8. Régler le commutateur d'enclenchement de longue durée (I_r) (A) au réglage minimum.

Figure 19 – Noter les réglages des commutateurs



a. Pour les déclencheurs sur défaut de terre ou à interverrouillage sélectif de zone, utiliser la trousse d'essais portative ou des fonctions complètes pour inhiber les fonctions de défaut à la terre et d'interverrouillage sélectif de zone.
b. Si une alimentation auxiliaire est utilisée pour le déclencheur Micrologic, débrancher l'alimentation auxiliaire.
c. Trouver le courant d'injection primaire nécessaire en multipliant le courant d'enclenchement de longue durée (réglage d'enclenchement de longue durée I_r x capteur enfichable I_n) x 1,25 % (c.-à-d., I_r x I_n x 1,25).
d. Injecter le courant primaire dans la phase A et surveiller le voyant de surcharge. Vérifier si le voyant de surcharge (A) s'allume dans la gamme de 105 % à 120 % de la valeur de I_r x I_n.
e. Répéter pour toutes les phases et le neutre, le cas échéant.
f. Si un voyant lumineux de surcharge ne s'allume pas correctement, vérifier tous les raccordements du déclencheur et la configuration des essais. Si l'essai d'injection primaire du déclencheur échoue encore, s'adresser au bureau de vente local.

Figure 20 – Voyant de surcharge



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Disjoncteurs avec protection intégrale contre les défauts à la terre

Les disjoncteurs à déclenchement électronique Micrologic^{MC} munis de la fonction de protection intégrale contre les défauts à la terre requièrent une attention spéciale quand les fonctions de surcharge et de court-circuit sont essayées. Les essais d’injection primaire unipolaires pour la surintensité de retard inversé, les fonctions de courte durée et instantanée, entraîneront des déclenchements sur défaut à la terre dus au chemin du courant de retour ne traversant pas le disjoncteur. Pour surmonter cette difficulté, utiliser une trousse d’essai portative ou des fonctions complètes pour neutraliser la fonction de défaut à la terre sur les disjoncteurs Masterpact ou PowerPact équipés de déclencheurs Micrologic.

REMARQUE : Lorsque les trousses d'essai portatives ou trousses d'essai des fonctions complètes sont utilisées pour inhiber un défaut à la terre, la trousse d'essai met le déclencheur en « MODE D'ESSAI ». Alors que le déclencheur est dans ce mode, les journaux, alarmes et protections évolutives sont mis à l'arrêt de sorte qu'un déclenchement d'essai ne soit pas enregistré comme un évènement réel. Consulter les directives de la trousse pour plus de renseignements.

Essais de protection contre les défauts à la terre et signalisation pour les systèmes radiaux uniquement

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Essai de déclenchement sur défauts à la terre

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E, CSA Z462 ou NOM-029-STPS.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez toutes les alimentations à cet appareil avant d’y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

La fonction de défaut à la terre d’un disjoncteur à déclenchement électronique Micrologic^{MC} fournit une protection contre les défauts à la terre à un appareil avec des valeurs d’enclenchement et de retard réglables. La caractéristique de retard de défaut à la terre détermine combien de temps le disjoncteur attend avant d’initialiser un signal de déclenchement durant un défaut à la terre. La performance des fonctions de défauts à la terre du disjoncteur peut être vérifiée à l’aide d’une alimentation ca haut courant, basse tension.

Procédure d’essai

1. Désactiver complètement et retirer le disjoncteur du service.
2. Avant les essais, noter le réglage de l’enclenchement et du retard pour toutes les fonctions. Remettre le déclencheur aux mêmes réglages après avoir terminé la procédure des essais.

3. En cas de vérification d'un disjoncteur équipé d'un interverrouillage sélectif de zone, suivre la procédure pour neutraliser l'interverrouillage sélectif de zone indiquée à la page 51. En cas d'utilisation d'une trousse d'essai d'injection secondaire pour ces essais, lire et suivre attentivement les directives de la trousse d'essai concernant l'interverrouillage sélectif de zone.

   REMARQUE : Ne pas neutraliser l'interverrouillage sélectif de zone aboutira à une imprécision des temps de déclenchement.
4. Utiliser ces réglages pour l'essai :

   Enclenchement de longue durée/Intensité nominale = Max.

   Retard de longue durée/Surcharge retardé = Max

   Retard de courte durée /Court-circuit = Max. (I^2t IN ou ON)

   Instantané = Max.

   Enclenchement sur défaut à la terre = Min.

   Retard de défaut à la terre = 0,2
5. Suivre la procédure de raccordement appropriée pour l'application de l'essai.

   Pour les disjoncteurs sans transformateur de courant de neutre, passer au point 8.

   Pour les disjoncteurs avec la fonction de défaut à la terre intégrée dans un système triphasé à quatre fils, un transformateur de courant (TC) de neutre monté en externe doit être utilisé. Le TC de neutre est raccordé au disjoncteur par un câble blindé (un fil de calibre 14 AWG est recommandé).

   REMARQUE : Lors d'un essai, déconnecter ou couper l'alimentation de contrôle de 24 Vcc vers F1 et F2, si ainsi équipé, et déconnecter la trousse d'essai portative ou des fonctions complètes du déclencheur, si elle est connectée.
6. Vérifier la mise en phase correcte du TC de neutre (systèmes triphasés à quatre fils) en effectuant un essai de non déclenchement comme suit:
   a. Raccorder le disjoncteur et le TC de neutre comme indiqué à la figure 21. Le cavalier doit aller du raccordement de charge sur le disjoncteur au raccordement H1 sur le TC de neutre (ou sur le côté du TC de neutre avec un point rouge). Raccorder le secondaire du TC de neutre conformément au manuel de directives du disjoncteur ou aux directives du TC de neutre.
   b. Appliquer le courant au-dessus du niveau d'enclenchement d'un défaut à la terre et maintenir plus longtemps que le retard de défaut à la terre.
   c. Le disjoncteur ne doit pas se déclencher. L'absence de déclenchement indique que le TC de phase ainsi que le TC de neutre sont à la phase correcte.

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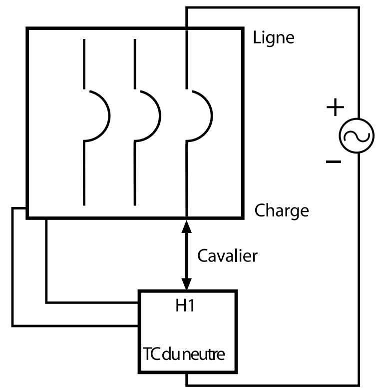
Figure 21 – Schéma de raccordement d'essai pour un essai de mise en phase du TC de neutre



Voir les directives d'utilisation du disjoncteur pour les raccordements au disjoncteur et au TC de neutre.

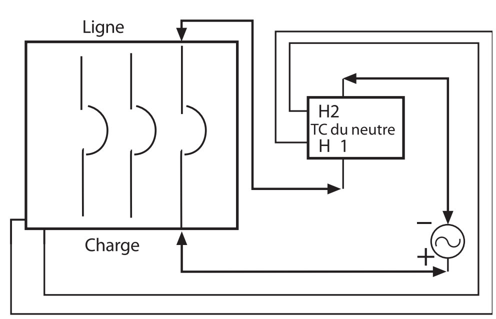
7. Vérifier la taille correcte du TC de neutre (systèmes triphasés à quatre fils) en effectuant un essai de déclenchement comme suit :

   a. Raccorder le disjoncteur et le TC de neutre comme indiqué à la figure 22. Raccorder la borne de polarité (+) de l'unité d'injection de haut courant au côté charge du disjoncteur. Le cavalier doit aller du raccordement de ligne sur le disjoncteur au raccordement H1 sur le TC de neutre (ou sur le côté du TC de neutre avec un point rouge). Raccorder la borne de non polarité (-) de l'unité d'injection de haut courant à H2 sur le TC de neutre (sur le côté ligne du disjoncteur). Raccorder le secondaire du TC de neutre conformément au manuel de directives du disjoncteur ou aux directives du TC de neutre.

   b. Appliquer le courant.

   c. Le disjoncteur doit se déclencher à la moitié de la valeur de l'enclenchement d'un défaut à la terre. Un déclenchement indique que le TC de phase et le TC de neutre ont le même rapport de spires (même taille).

Figure 22 – Schéma de raccordement d'essai pour un essai de taille du TC de neutre



Voir les directives d'utilisation du disjoncteur pour les raccordements au disjoncteur et au TC de neutre.

8. Vérifier l'enclenchement et le retard de défaut à la terre en effectuant un essai de déclenchement comme suit :

   a. Raccorder le disjoncteur comme indiqué à la figure 23, (systèmes triphasés à trois fils) ou à la figure 24 (systèmes triphasés à quatre fils).

   REMARQUE : La méthode recommandée d'essai d'enclenchement et de retard de défaut à la terre est la méthode « d'impulsion ». Cette méthode sera la plus précise, mais nécessite que l'appareil d'essai soit muni d'un oscilloscope étalonné à retenue d'image ou d'un ampèremètre numérique à cadence d'échantillonnage rapide. Un chronomètre précis est nécessaire pour surveiller le retard.

   b. Après avoir raccordé et fermé le circuit correctement, appliquer le courant en impulsions courtes d'une durée de 10 cycles. En démarrant à 70 % de la valeur de déclenchement envisagée, augmenter le courant à chaque impulsion suivante jusqu'à ce que le disjoncteur se déclenche.

Figure 23 – Schéma de raccordement d'essai pour un disjoncteur sans TC de neutre

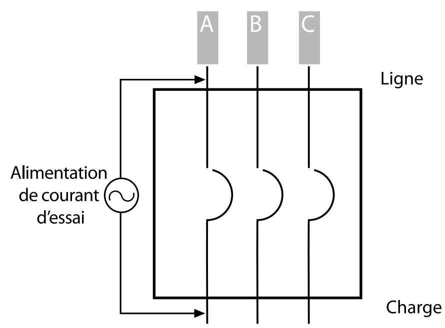
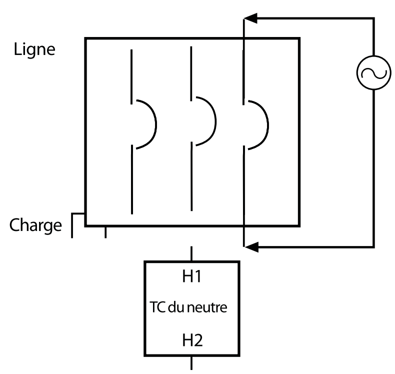


Figure 24 – Schéma de raccordement d'essai pour un essai d'enclenchement et de retard de défaut à la terre



   c. Refermer le disjoncteur et réduire le niveau du courant; lancer une autre impulsion afin de déterminer si le niveau d'enclenchement trouvé a été dépassé.

   d. Répéter les points b et c pour isoler davantage le point d'enclenchement.

   e. Pour déterminer le retard, essayer chaque pôle du disjoncteur individuellement à 150 % du réglage d'enclenchement de défaut à la terre. Surveiller le temps à compter du point d'enclenchement jusqu'à ce que le disjoncteur se déclenche pour obtenir le retard.

   f. Noter les valeurs d'enclenchement et de retard et comparer les résultats à la courbe de déclenchement.

L’essai de défaut à la terre peut se faire également à l’aide d’un essai d’injection secondaire en utilisant la trousse d’essai des fonctions complètes. L’essai d’injection secondaire ne vérifie pas les transformateurs de courant et les raccordements.

Tableau 26 – Valeur maximum de résistance par pôle en micro-Ohms

Masterpact	Micro-ohms (u ohm)	
Type	**Débrochable**	**Fixe**
NT06—NT10 H1/H2/L1	38/72	26,39
NT12–NT16 H1/H2	36	26
NW08 N1	42	19
NW08 H/L	30	13
NW10 N1	42	19
NW10 H/L	30	13
NW12 N1	42	19
NW12 H/L	27	13
NW16 N1	37	19
NW16 H/L	27	13
NW20 H/L	27	13
NW25 H1/H2/H3	19	8
NW 32 H1/H2/H3	13	8
NW40 H1/H2/H3	11	8
NW40b, NW50, NW63	7	5

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Essai de résistance des contacts

Les essais de résistance des pôles du disjoncteur ne sont pas des indicateurs fiables de la performance du disjoncteur parce que les valeurs de résistance sont influencées par un certain nombre de facteurs transitoires, notamment l’oxydation des surfaces de contact, la présence de corps étrangers entre les contacts et les méthodes d’essais. Le paragraphe 6.4.1 de NEMA AB 4 précise: « La chute de millivolts d’un pôle de disjoncteur peut varier de façon notable par suite de la variabilité inhérente à la très faible résistance des contacts et connecteurs électriques. De telles variations ne prédisent pas nécessairement une performance inacceptable et ne devraient pas être utilisées comme seul critère pour déterminer l’acceptabilité ».

Une résistance élevée des pôles peut être également causée par des contacts érodés, une force de contact faible et une terminaison desserrée. Le seul de ces facteurs à être vraisemblablement présent sur un disjoncteur neuf est une terminaison lâche ou défaite, du fait que les contacts sont neufs et que la pression des contacts n’a eu aucune occasion de se dérégler depuis le réglage à l’usine. Une terminaison desserrée peut être corrigée sur place.

Si un essai de résistance des contacts est effectué, il est important de le faire après le conditionnement des contacts par des essais d’injection primaire instantanée afin de s’assurer que les contacts ne montrent aucun film résistif, aucune oxydation et ne comportent pas de corps étrangers. Si le disjoncteur a été en service sans problèmes de performance (surchauffe ou déclenchement intempestif), les mesures de résistance des contacts sont superflues et de peu de valeur

Square D recommande d’utiliser un ohmmètre numérique à faible résistance DLRO (Digital Low Resistance Ohmmeter), avec un courant d’essai cc de 10 A pour les disjoncteurs d’une intensité nominale inférieure à 100 A, et un courant cc de 100 A pour les disjoncteurs d’une intensité nominale de 100 A et au-dessus. La valeur médiane (du milieu) de trois relevés (en basculant la manette du disjoncteur entre chaque relevé) doit être notée pour chaque pôle essayé. Si cette valeur est égale ou inférieure à la valeur indiquée dans le tableau 26, le pôle est acceptable. Si le relevé est supérieur, la cause doit être recherchée et corrigée si possible. Contacter le bureau de vente local pour plus de renseignements.

Disjoncteurs avec protection du courant continu

Les disjoncteurs cc Masterpact NW sont conçus, fabriqués et étalonnés pour une utilisation sur des systèmes d'alimentation sans coupure UPS (Uninterruptable Power Supplies) non mis à la terre. La tension nominale maximale (chargée) est de 500 Vcc et la tension flottante maximale (déchargée) est de 600 Vcc.

Ces disjoncteurs sont inscrits UL quand ils sont appliqués avec tous les pôles raccordés en série comme indiqué sur l'étiquette du disjoncteur. Le raccordement en série est fourni par le client et est externe aux disjoncteurs.

Les disjoncteurs cc Masterpact NW sont des disjoncteurs spéciaux pour les applications cc uniquement et doivent être essayés à l'aide de courant continu.

- Sélectionner la courbe de déclenchement temps-courant correct. Les courbes de déclenchement indiquent les gammes de déclenchement thermiques et magnétiques des disjoncteurs.
- Utiliser une alimentation cc pour essayer les disjoncteurs comme suit :
  - Constante de temps ≤ 25 ms
  - Constance d'ondulation cc ≤ 1 % RMS.
- Enlever le disjoncteur du coffret. Si le retrait du disjoncteur n'est pas pratique, essayer le disjoncteur dans l'appareil d'utilisation finale. Si les résultats de l'essai tombent en dehors de la tolérance pour la courbe de déclenchement, retirer le disjoncteur du coffret et faire une nouvelle vérification.
- Utiliser un câble de calibre correct, selon les tableaux du National Electrical Code® [NEC®, Code national de l'électricité de É.-U.]) avec un câble d'au moins 1,22 m (4 pieds) de longueur par raccordement.
- Raccorder l'alimentation cc au disjoncteur avec les pôles raccordés en série comme indiqué sur l'étiquette du disjoncteur (voir les figures 25 à 27).
- S'assurer que les raccordements au disjoncteur sont serrés au couple approprié.
- Appliquer un courant d'essai cc au disjoncteur, d'environ 70 % de la valeur envisagée pour déclencher le disjoncteur. Le mécanisme de déclenchement du disjoncteur réagit aux champs magnétiques créés par le courant qui traverse le disjoncteur. Si le disjoncteur ne se déclenche pas, augmenter le courant

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d’essai au cours de tentatives successives jusqu’à ce qu’il se déclenche. Lorsque le disjoncteur se déclenche :

a. Réarmer et fermer le disjoncteur.

a. Appliquer de nouveau le courant d’essai cc pour déclencher le disjoncteur une autre fois.

a. Noter le courant et comparer à la courbe de déclenchement.

Figure 25 – Configuration de câblage version C

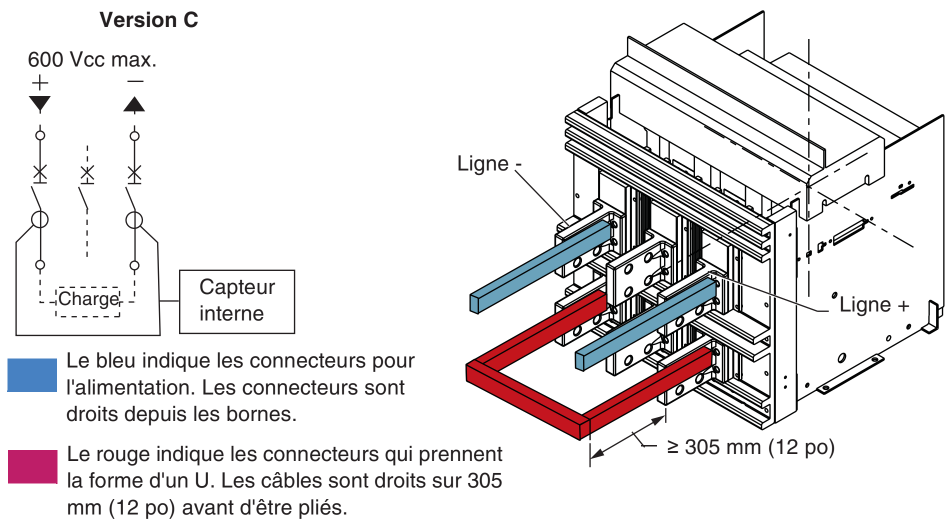

Figure 26 – Configurations fractionnées version C1

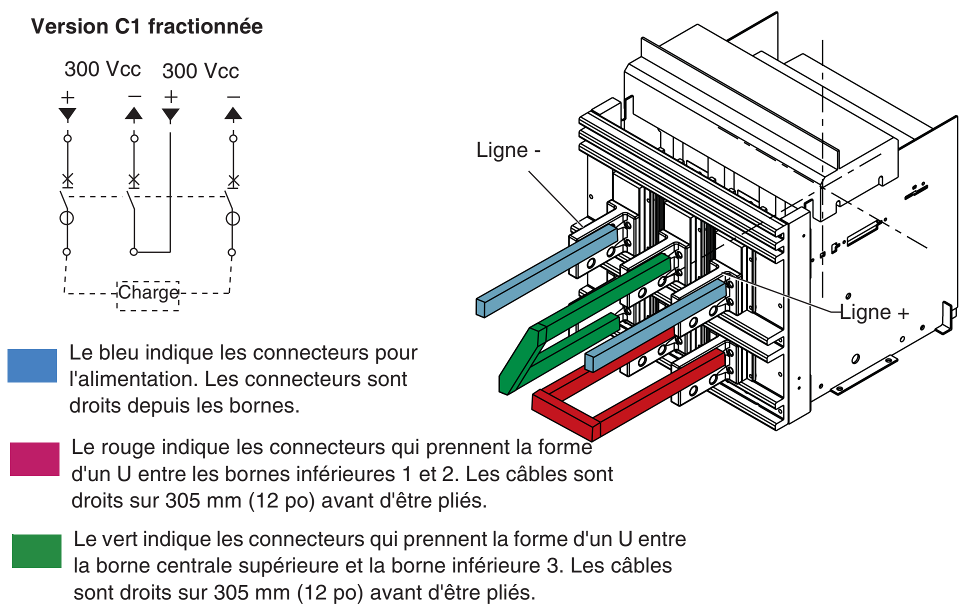

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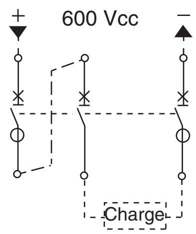
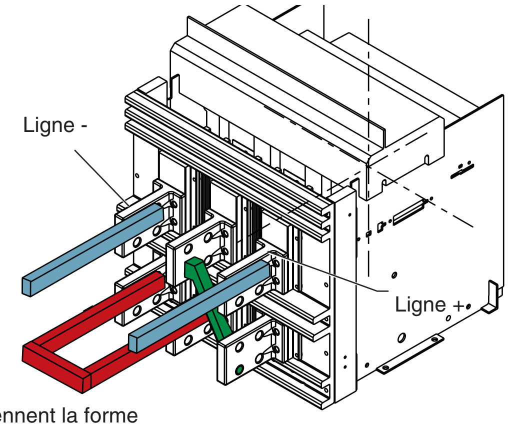
Figure 27 – Configurations en série version C1

Version C1 en série





Le bleu indique les connecteurs pour l'alimentation. Les connecteurs sont droits depuis les bornes.

Le rouge indique les connecteurs qui prennent la forme d'un U entre les bornes inférieures 2 et 3. Les câbles sont droits sur 305 mm (12 po) avant d'être pliés.

Le vert indique les connecteurs qui raccordent la borne centrale supérieure et la borne inférieure 1.

Déconnecter les connexions d'essais dès la fin des essais :

— Retirer les raccordements d’essai du disjoncteur.

— Inspecter les raccordements afin de voir s’ils ont été endommagés par les essais.

— Pour les disjoncteurs débrochables, inspecter, lubrifier et réarmer les ressorts des groupes de connecteurs avant d’installer le disjoncteur, se reporter à la page 32.

— Remettre le commutateur d'enclenchement de longue durée à ses réglages d’origine, telle que notée ci-dessus.

— Si une alimentation auxiliaire est utilisée pour le déclencheur Micrologic, rebrancher l'alimentation auxiliaire.

Information sur les trousses d’essai

Trousse d’essai à fonctions complètes

La trousse d’essai à fonctions complètes est un système utilisant un microprocesseur pour vérifier les disjoncteurs Compact[MC] NSJ, Masterpact et PowerPact avec les déclencheurs électroniques Micrologic. La trousse d’essai à fonctions complètes est un vérificateur à injection secondaire et ne vérifie pas les transformateurs de courant et les raccordements.

La trousse d’essai à fonctions complètes est conçue pour une utilisation comme unité d’essai autonome ou conjointement avec un ordinateur personnel. La trousse d’essai à fonctions complètes à elle seule effectue les essais suivants :

- Vérification des fonctions de protection (LSIG)
- Conformité avec la courbe de déclenchement
- Essais électriques et mécaniques du système de déclenchement
- Essais de l’interverrouillage sélectif de zone
- Inhibition de la protection contre les défauts à la terre pour une utilisation durant un essai d’injection primaire

- Inhibition de l’imagerie thermique pour une utilisation durant un essai d’injection primaire
- Fournir une alimentation de commande au déclencheur pour mettre les afficheurs sous tension

Trousse d'essai portative

La trousse d’essai portative est une petite unité alimentée par piles. Elle est conçue pour fournir des essais d’injection secondaire commodes sur les disjoncteurs Compact NSJ, Masterpact et PowerPact dotés d’unités de déclenchement électronique Micrologic. La trousse d’essai portative est alimentée par cinq piles de 9 V et peut être utilisée pour faire les opérations suivantes :

- Vérifier le fonctionnement du déclencheur en déclenchant le disjoncteur par un signal d’injection secondaire
- Fournir une alimentation de commande au déclencheur pour mettre les afficheurs sous tension
- Inhiber la fonction d'imagerie thermique pour l'essai d'injection primaire.
- Inhiber le défaut de m.àl.t. pour l'essai d'injection primaire.
- Essais de l’interverrouillage sélectif de zone[1]

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Fonction anti-pompage

Tous les disjoncteurs Masterpact NT et NW sont conçus avec une fonction anti-pompage qui donne toujours la priorité à une commande d'ouverture avant une commande de fermeture. Spécifiquement, si des commandes d'ouverture et de fermeture se produisent simultanément, le mécanisme chargé se décharge sans aucun mouvement des contacts principaux, maintenant le disjoncteur en position ouverte (OFF). Au cas où des commandes d'ouverture et de fermeture sont maintenues simultanément, le mécanisme standard fournit une fonction anti-pompage qui continue à maintenir les contacts principaux en position ouverte. De plus, après un déclenchement sur défaut ou une ouverture intentionnelle du disjoncteur (à l'aide de contrôles manuels ou électriques et avec la bobine de fermeture continuellement sous tension), le disjoncteur ne peut pas être fermé tant que l'alimentation de la bobine de fermeture est coupée puis restaurée.

Vérification de la fonction anti-pompage pour les disjoncteurs manœuvrés électriquement

Si désiré, utiliser la procédure suivante pour s'assurer que la fonction anti-pompage fonctionne correctement.

1. Ouvrir le disjoncteur.
2. Activer l'alimentation de contrôle pour le moteur d'armement des ressorts, le déclenchement shunt et la fermeture shunt.
3. Le moteur d'armement des ressorts armera ceux-ci à chaque fois qu'ils seront désarmés (pendant la fermeture du disjoncteur).
4. S'assurer que tous les interverrouillages, etc. soient désengagés et que le disjoncteur soit prêt à se fermer. Appuyer sur le bouton-poussoir de fermeture et le maintenir enfoncé (utiliser le bouton de fermeture à distance raccordé à la fermeture shunt si désiré). Vérifier si le disjoncteur est fermé. Attendre que le moteur d'armement des ressorts termine leur armement.

[1] Fourni seulement une alimentation au déclencheur pour indiquer qu’un signal de ZSI (d’interverrouillage sélectif de zone) a été reçu. N’initialisera pas la commande pour envoyer un signal d’entrave de ZSI.

5. Tout en maintenant le bouton de fermeture enfoncé, appuyer sur le bouton d'ouverture. S'assurer que le disjoncteur s'ouvre et ne se referme pas.
6. Relâcher le bouton de fermeture.
7. Si le disjoncteur ne tente pas de se refermer, c'est que la fonction anti-pompage fonctionne correctement.
8. Appuyer sur le bouton d'ouverture puis sur le bouton de fermeture.
9. Appuyer sur le bouton-poussoir de fermeture et le relâcher (utiliser le bouton de fermeture à distance raccordé à la fermeture shunt si désiré). Vérifier si le disjoncteur est fermé. Attendre que le moteur d'armement des ressorts termine leur armement.
10. Appuyer sur le bouton d'ouverture. S'assurer que le disjoncteur s'ouvre.
11. Répéter les points 8, 9 et 10 pour être sûr que le disjoncteur s'ouvre et se ferme correctement.

Vérification de la fonction anti-pompage pour les disjoncteurs manœuvrés manuellement

1. Ouvrir le disjoncteur.
2. Utiliser la poignée d’armement pour armer les ressorts de fermeture.
3. S'assurer que tous les interverrouillages, etc. soient désengagés et que le disjoncteur soit prêt à se fermer. Appuyer sur le bouton-poussoir de fermeture et le maintenir enfoncé. Vérifier si le disjoncteur est fermé.
4. Utiliser la poignée d’armement pour armer les ressorts de fermeture.
5. Tout en maintenant le bouton de fermeture enfoncé, appuyer sur le bouton d'ouverture. S'assurer que le disjoncteur s'ouvre et ne se referme pas.
6. Relâcher le bouton de fermeture.
7. Si le disjoncteur ne tente pas de se refermer, c'est que la fonction anti-pompage fonctionne correctement.
8. Appuyer sur le bouton d'ouverture puis sur le bouton de fermeture.

Renseignements supplémentaires

Pour plus de renseignements sur les disjoncteurs des marques Schneider Electric et Square D, se reporter au manuel de directives approprié. Ces manuels contiennent des directives d’installation, des renseignements de montage, des mesures de sécurité, des schémas de câblage et des tableaux de dépannage pour des disjoncteurs spécifiques.

Section 7—Directives d'utilisation disponibles

Tableau 27 – Liste des Directives d'utilisation disponibles

	Masterpact NT	Masterpact NW
Catalogues		
Disjoncteurs de puissance universels	0613CT0001	0613CT0001
Disjoncteurs cc	—	0613CT0501
Certifiés ABS-NVR	0613CT0601	0613CT0601
Directives d'utilisation		
Classifié UL	HRB39231	HRB28361
Classifié IEC	HRB39244	HRB39225
Classifié UL DC	—	HRB39255
Classifié IEC UL	—	HRB39254
ArcBlok	—	HRB23946
Guide de l’utilisateur		
Classifié UL	0613IB1209	0613IB1204
Classifié IEC	0613IB1210	0613IB1208
Classifié UL DC	—	0613IB1211
Classifié IEC UL	—	0613IB1212
ArcBlok	—	0613IB1203
Guide de l’utilisateur du déclencheur		
Déclencheurs (Micrologic 2.0, 3.0 et 5.0) standard	48049-207-05	48049-207-05
Déclencheurs Micrologic A	48049-136-05	48049-136-05
Déclencheurs Micrologic P	48049-137-05	48049-137-05
Déclencheurs Micrologic H	48049-330-03	48049-330-03
Communication Modbus pour déclencheur Micrologic		
Modbus traditionnel à 4 fils	0613IB1201	0613IB1201
Ethernet/Modbus + ULP	0613IB1303	0613IB1313
Directives d’essai		
Trousse d’essai des fonctions complètes (FFTK)	48049-183-06	48049-183-06
Trousse d'essai portative (HHTK)	48049-184-03	48049-184-03
Essais diélectriques	48049-550-01	48049-550-01
Essai de l'ERMS	NHA67346	NHA67346
Liste des directives pour les accessoires		
	Consulter le site Web de Schneider Electric	

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Schneider Electric Canada, Inc.
5985 McLaughlin Road
Mississauga, ON L5R 1B8 Canada
800-565-6699
www.schneider-electric.ca

Du fait que les normes, caractéristiques et conceptions peuvent changer, demander confirmation que l'information contenue dans cette publication est à jour.

0613IB1202 R08/15, 08/2015
Remplace 0613IB1202 R07/13

Schneider Electric USA, Inc.
800 Federal Street
Andover, MA 01810 USA
888-778-2733
www.schneider-electric.us

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0613IB1202 R08/15, 08/2015
Replaces 0613IB1202 R07/13

Importado en México por:
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55-5804-5000
www.schneider-electric.com.mx

Normas, especificaciones y diseños pueden cambiar, por lo tanto pida confirmación de que la información de esta publicación está actualizada.

0613IB1202 R08/15, 08/2015
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Masterpact™ NW Low-Voltage Power/Insulated Case Circuit Breaker—Installation

Interruptor de potencia Masterpact™ NW en baja tensión / en caja aislada—Instalación

Disjoncteur Masterpact^MC NW de puissance à basse tension / à boîtier isolé—Installation

Instruction Bulletin
Boletín de instrucciones
Directives d'utilisation

HRB28361
Rev. 02, 02/2015

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Masterpact™ NW Low-Voltage Power/Insulated Case Circuit Breaker—Installation

ENGLISH

Class 0613

Instruction Bulletin

HRB28361
Rev. 02, 02/2015

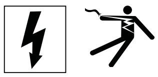
Retain for future use.

SQUARE D™

by Schneider Electric

Hazard Categories and Special Symbols

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

ANSI

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, **can result in** death or serious injury.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **can result in** minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury. The safety alert symbol is not used with this signal word.

NOTE: Provides additional information to clarify or simplify a procedure.

Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

FCC Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. This Class A digital apparatus complies with Canadian ICES-003.

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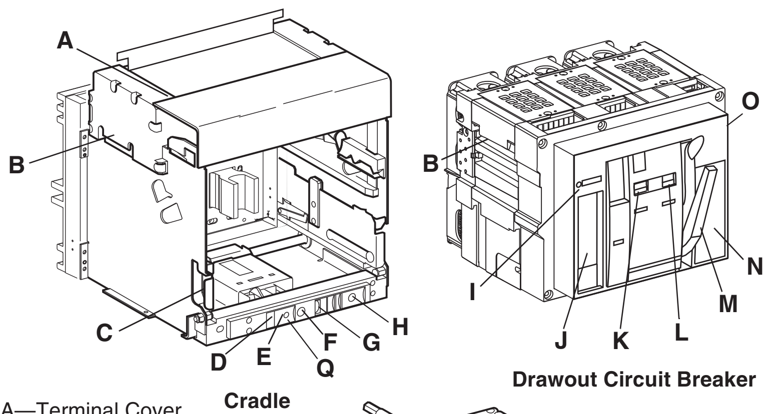
ENGLISH

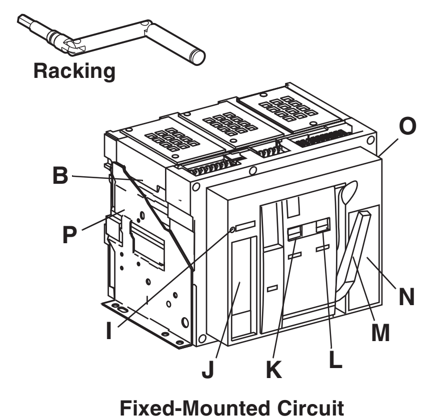
Section 1— General Information

Introduction

The Masterpact NW low-voltage power circuit breaker[1] and insulated case circuit breaker are designed to mount in a drawout cradle, using rear-mounted, plug-on pressure connections to provide electrical connection to the cradle. A fixed-mounted circuit breaker is also available.

Figure 1 – Circuit Breaker and Cradle





A—Terminal Cover
B—Lifting Flanges
C—Extension Rail Handle
D—Padlock Provision
E—Stop Release Button
F—Racking Handle Insertion Opening
G—Position Indicator
H—Racking Handle Storage Space
I—Fault Trip Reset Button
J—Trip Unit
K—Push to Open Button
L—Push to Close Button
M—Charging Handle
N—Faceplate
O—Accessory Cover
P—Fixed Mounting Brackets
Q—Cradle Date Code

These circuit breakers comply with the following standards:

Low-Voltage Power Circuit Breaker (Drawout and Fixed)	**Insulated Case Circuit Breaker (Drawout and Fixed)**
ANSI C37.13 ANSI C37.16 ANSI C37.17 ANSI C37.50 UL1066[1] CSA C22.2 No 31[1] NEMA SG3	UL489[2] NEMA AB1 CSA C22.2 No. 5-02[3]

1 cULus

2 UL® Listed

3 CSA® Certified

1 In this manual the phrase “circuit breaker” means circuit breaker and switch.

Type L1F 800–2000 A low-voltage power circuit breakers and Type LF 800–2000 A insulated case circuit breakers are tested to show the arc-flash hazard risk category as referenced by NFPA 70E.

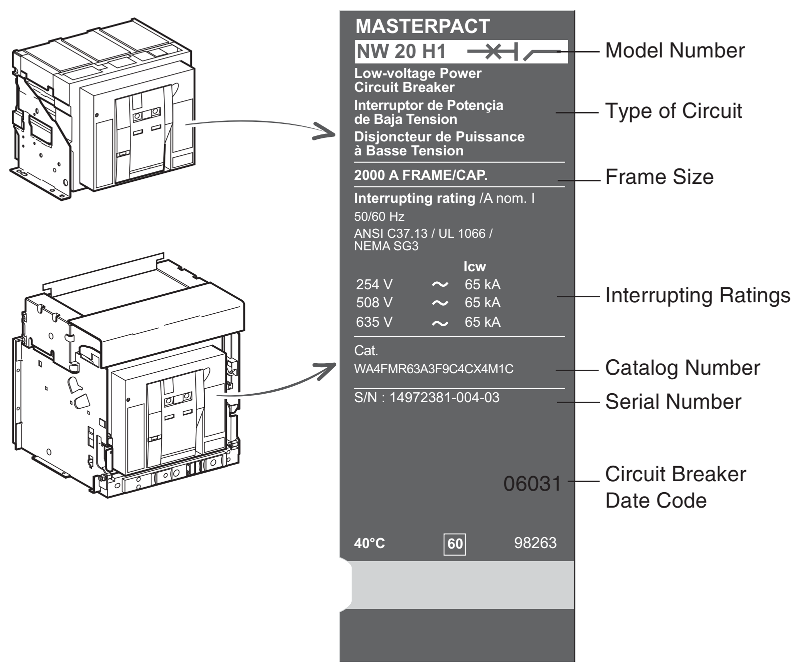
This bulletin provides installation instructions for Masterpact NW circuit breakers. Tripping functions are controlled by the Micrologic™ trip unit.

Information about a specific circuit breaker can be found on the faceplate label on the front of the circuit breaker.

Information about the accessories installed in the circuit breaker can be found on the accessory label on the right side of the circuit breaker.

For complete information on available circuit breaker models, frame sizes, interrupting ratings, sensor sizes and trip units, see catalog 0613CT1001, *Masterpact NT and NW Universal Power Circuit Breakers* on the Schneider Electric website.

Figure 2 – Faceplate Information



For additional information see the following user guides available on the Schneider Electric™ website:

- Bulletin 0613IB1204: *Masterpact™ NW Low-Voltage Power/Insulated Case Circuit Breaker User Guide*
- Bulletin 0613IB1205: *Masterpact™ NW Dimensional Drawings*
- Bulletin 0613IB1202: *Masterpact™ NT and NW Field Testing and Maintenance Guide*
- Bulletin 48049-136-05: *Micrologic 2.0A, 3.0A, 5.0A, and 6.0A Electronic Trip Units*
- Bulletin 48049-330-03: *Micrologic 5.0H and 6.0H Electronic Trip Units*
- Bulletin 48049-137-05: *Micrologic 5.0P and 6.0P Electronic Trip Unit*
- Bulletin 48049-207-05: *Micrologic 2.0, 3.0 and 5.0 Electronic Trip Units*

To access the website go to:

http://www.schneider-electric.com

For application assistance, please call 1-888-778-2733.

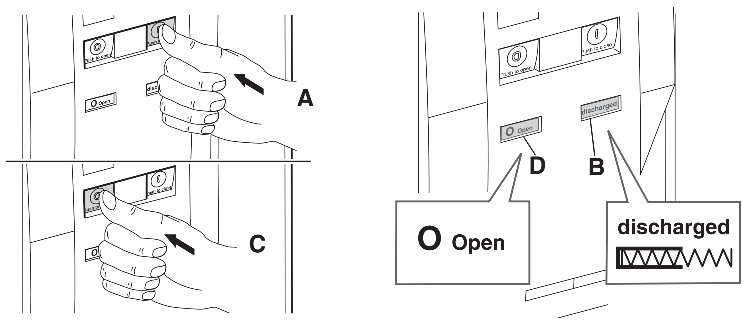
Before Working on Circuit Breaker

1. Turn circuit breaker off:

   Press “Push to close” button (**Figure 3, A**) to discharge spring, as indicated by window (**B**).

   Press “Push to open” button (**C**) to open contacts, as indicated by window (**D**).

Figure 3 – Turn Off Circuit Breaker



2. Disconnect power from circuit breaker.

   — For drawout circuit breaker: rack circuit breaker to disconnected position (**Figure 4, A**). See Drawout Circuit Breaker Disconnection, page 70.

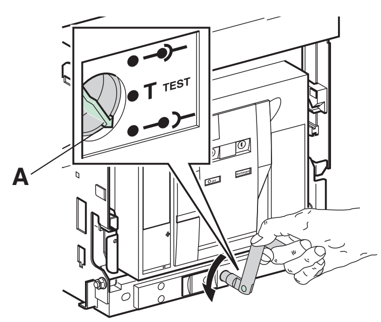
⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Beware of potential hazards, wear personal protective equipment and take adequate safety precautions.

Failure to follow these instructions will result in death or serious injury.

Figure 4 – Disconnect Drawout Circuit Breaker



ENGLISH

— For fixed-mounted circuit breaker: turn off all power supplying equipment before working on or inside equipment.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

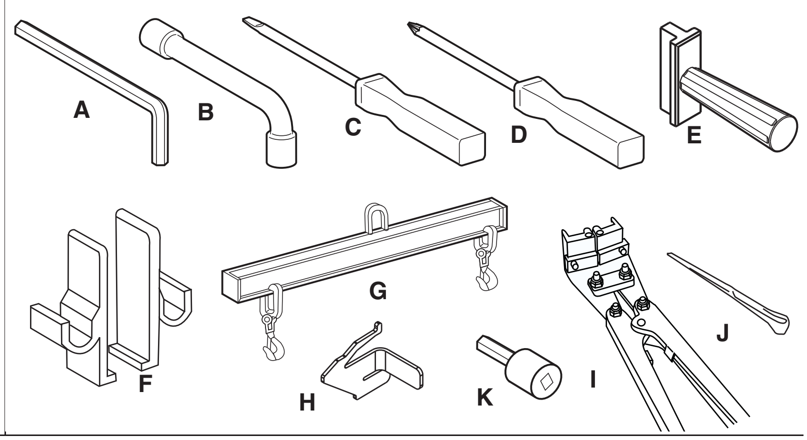
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

Tools

Table 1 – Tools Required

A. Hex Key, 5 mm
B. Angled Socket Wrench, 1/2 in.
C. Straight Blade Screwdriver (#2 Pozidriv® or Slotted)
D. Torx® 20 Screwdriver
E. Cluster Reset Tool, Cat. No. CLUSRETOOL
F. Lifting Hooks, Cat. No. S48906
G. Crossbar
   W-Frame, Cat. No. S48900
   Y-Frame, Cat. No. S48901
H. Cradle Interlock Defeat Tool (Drawout Circuit Breaker Only, Provided)
I. Cluster Positioning Tool, Cat. No. S47542
J. Wago® Wire Insert Tool, Wago Part No. 209-129
K. 10 mm Hex Adapter for Cradle Racking Mechanism



Unpacking and Inspection

NOTE: Repacking instructions can be found in bulletin 0613IB1203, *Masterpact NW Low-Voltage Power/Insulated Case Circuit Breaker–User Guide*, found on the Schneider Electric™ web site (see page 5).

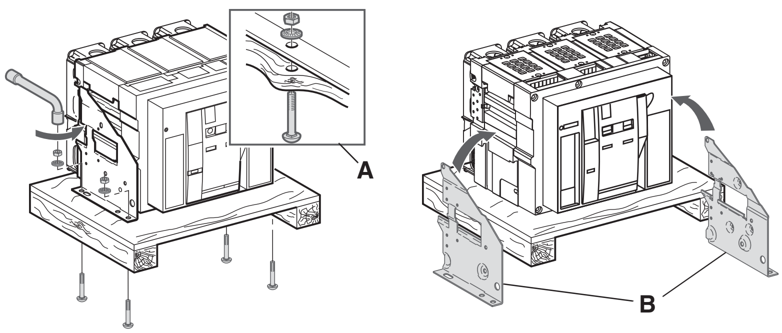
NOTICE
HAZARD OF EQUIPMENT DAMAGE Do not place circuit breaker on its back. Doing so can damage the clusters. **Failure to follow these instructions can result in equipment damage.**

Unpack Circuit Breaker

NOTE: Do not place the circuit breaker on its back. Doing so can damage the clusters.

1. Remove the four bolts, nuts and washers (**Figure 5, A**) securing the circuit breaker to the pallet.
2. On drawout circuit breakers only: remove the shipping brackets (**B**).

Figure 5 – Unpack Circuit Breaker

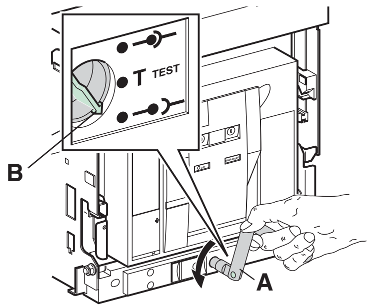


ENGLISH

Unpack Circuit Breaker Shipped in Cradle

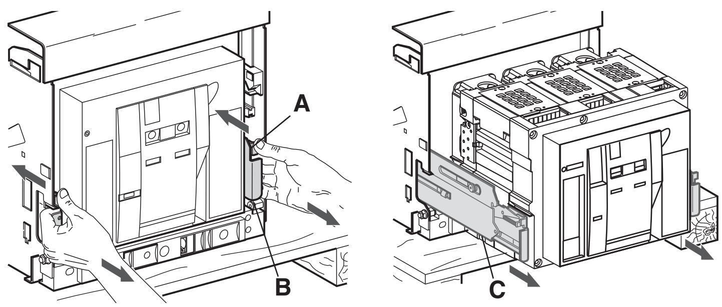
1. Rack the circuit breaker (**Figure 6, A**) to the disconnected position (**B**) (refer to Drawout Circuit Breaker Disconnection, page 70).

Figure 6 – Disconnect Circuit Breaker



2. Pressing in the latching tabs (**Figure 7, A**), pull out on the extension rail handles (**B**) until the extension rails are fully extended (**C**).

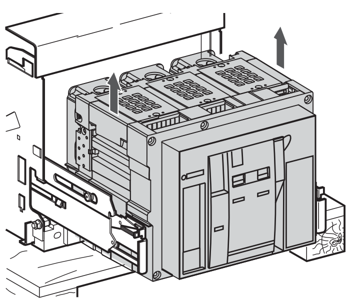
Figure 7 – Pull Out Circuit Breaker



NOTE: Do not place the circuit breaker on its back. Doing so can damage the clusters.

3. Remove circuit breaker. See Cradle Removal, page 37.

Figure 8 – Remove Circuit Breaker and Cradle



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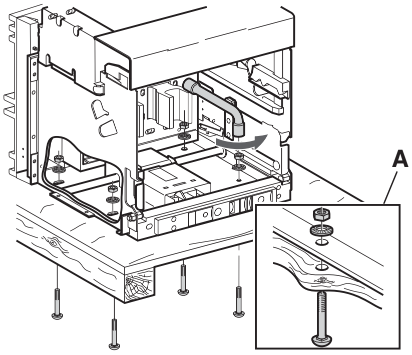
Unpack Cradle

1. Remove the four bolts, nuts and washers (Figure 9, A) securing cradle to pallet.
2. Remove cradle from pallet. See Lifting, page 16.

Figure 9 – Unpack Cradle



Cluster Inspection, Replacement and Lubrication

Cluster Inspection

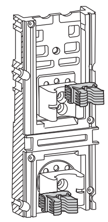
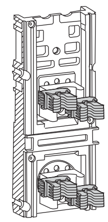
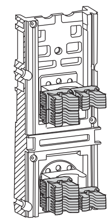
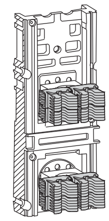
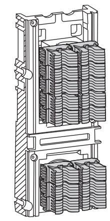
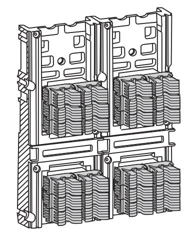
1. Inspect clusters and cluster supports on back of the drawout circuit breaker. Make sure clusters are installed and configured properly as shown in Table 3.
2. Visually inspect clusters for signs of damage such as:
   - — Discolored areas
   - — Visible copper on fingers
   - — Cracked or broken springs
   - — Not aligned with other clusters (indicates spring damage)
3. Visually inspect clusters for wear.

Table 2 – Number of Clusters Per Pole

Type	N / N1	H1	HA	H / H2 / H3 / HF	L / L1 / LF / L1F / HB / HC
NW08	2	4	4	4 / 4 / 6 / 4	8
NW12	2	—	—	4	8
NW16	6	6	6	6	8
NW20	8	8	8	8	16
NW25/NW30	—	—	—	16	16
NW32	—	16	16	16	24
NW40/NW50	—	—	24	24	24
NW60	—	—	—	24	24

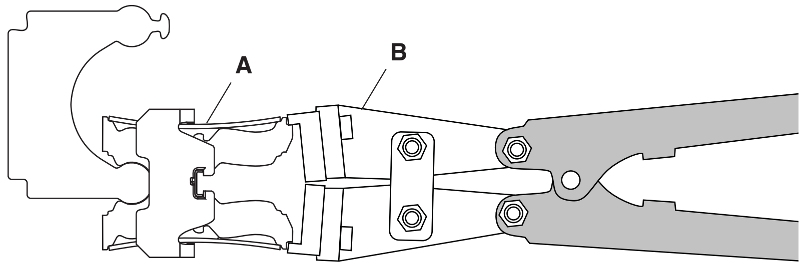
Table 3 – Cluster Configuration

Number of Clusters Per Pole
NOTE: Cluster shields are not shown.

2	4	6	8	16	24
					

4. Replace any cluster which does not pass inspection. Install new clusters (A) using cluster positioning tool (B).

Figure 10 – Install New Clusters

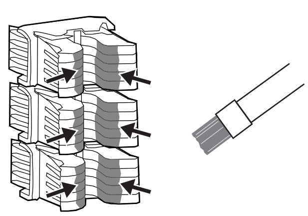


Cluster Lubrication

CAUTION
HAZARD OF EQUIPMENT DAMAGE
Inspect the cluster for lubrication when the circuit breaker is removed from the cradle.
Failure to follow these instructions can result in equipment damage.

Use grease kit (catalog number S48899) to lubricate cluster jaws as shown in Figure 11.

Figure 11 – Cluster Grease Application



Cradle Stab Lubrication

The cradle stabs must be inspected and lubricated when the cradle is first installed and again during maintenance periods after all power has been disconnected.

⚠ DANGER

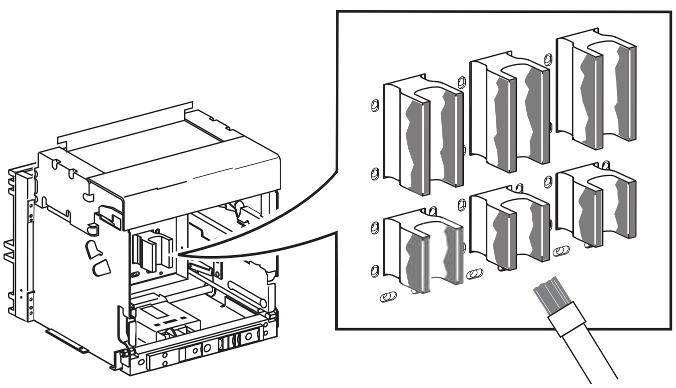
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

Confirm that both sides of stab are coated with lubricant. If necessary, use grease kit (catalog number S48899) to lubricate stab.

Figure 12 – Cradle Stab Grease Application



ENGLISH

Section 2— Lifting and Transporting

Both the circuit breaker and cradle have lifting flanges for lifting. To lift circuit breaker, use an overhead lifting device attached to the lifting flanges, following the directions given in this section.

⚠ DANGER

HAZARD OF DEVICE FALLING

- Be sure lifting equipment has lifting capacity for the unit being lifted.
- Follow manufacturer's instructions for use of lifting equipment.
- Wear hard hat, safety shoes and heavy gloves.

Failure to follow these instructions will result in death or serious injury.

Weights

Table 4 – Weights

Frame Rating	Connector Type[1]	Weights (lb./kg.)								
		Circuit Breaker		Cradle		Connector		Pallet	Total	
		3-Pole	4-Pole	3-Pole	4-Pole	3-Pole	4-Pole		3-Pole	4-Pole
800–2000 A, Drawout	FCF	109/50	142/65	97/44	116/53	42/19	55/25	17/8	265/121	330/151
	FCT	109/50	142/65	97/44	116/53	84/38	109/50	17/8	307/140	384/176
	RCTH/RCTV	109/50	142/65	97/44	116/53	17/8	22/10	17/8	240/110	297/136
800–2000 A, Fixed-Mounted	FCF	109/50	142/65	—	—	42/19	55/25	17/8	168/77	214/98
	FCT	109/50	142/65	—	—	84/38	109/50	17/8	210/96	268/123
	RCTH/RCTV	109/50	142/65	—	—	17/8	22/10	17/8	143/66	181/83
2500–3000 A, Drawout	RCTH/RCTV	127/58	165/75	124/57	149/68	26/12	34/15	17/8	294/135	365/166
	FCT	127/58	165/75	124/57	149/68	80/36	104/47	17/8	348/159	435/198
2500–3000 A, Fixed-Mounted	FCT	127/58	165/75	—	—	80/36	104/47	17/8	224/102	286/130
	RCTH/RCTV	127/58	165/75	—	—	26/12	34/15	17/8	170/78	216/98
2000 A L1/L1F & 3200 A, Drawout	RCOV	127/58	165/75	124/57	149/68	100/46	130/59	17/8	368/169	461/210
3200 A, Fixed	RCOV	127/58	165/75	—	—	100/46	130/59	17/8	244/112	312/142
4000 A, (W-Frame) Fixed-Mounted	RCOV (Special)	127/58	165/75	—	—	115/52	145/66	17/8	259/118	327/149
3200 A L1 & 4000 A, Drawout	FCF	227/103	295/134	278/126	334/152	84/38	109/50	39/18	628/285	777/354
	FCT	227/103	295/134	278/126	334/152	168/76	218/99	39/18	712/324	886/403
	RCTH/RCTV	227/103	295/134	278/126	334/152	52/24	68/31	39/18	596/271	736/335
4000 A, Fixed-Mounted	RCTH/RCTV	227/103	295/134	—	—	52/24	68/31	39/18	318/145	402/183
5000 A, Drawout	FCT	227/103	295/134	278/126	334/152	168/77	218/99	39/18	712/324	886/403
	RCTH/RCTV	227/103	295/134	278/126	334/152	52/24	68/31	39/18	596/271	736/335
5000 A, Fixed-Mounted	RCTH/RCTV	227/103	295/134	—	—	52/24	68/31	39/18	318/145	402/183
6000 A, Drawout	RCTV	227/103	295/134	278/126	334/152	396/180	528/240	39/18	940/427	1196/544
6000 A, Fixed-Mounted	RCTV	227/103	295/134	—	—	396/180	528/240	39/18	662/301	862/392

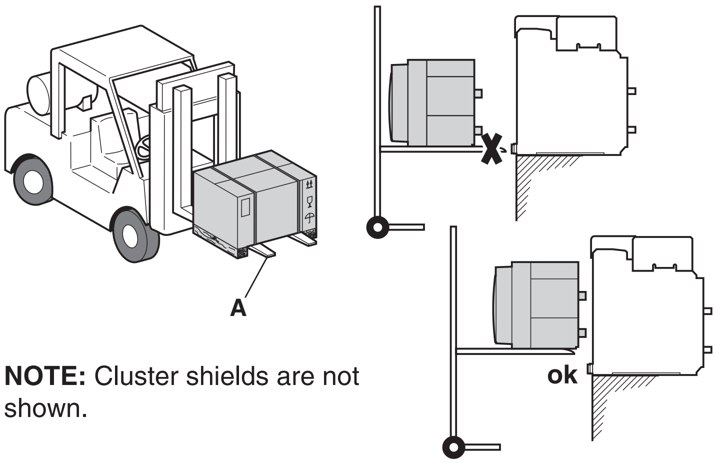
[1]FCF = Front-connected flat connector.
FCT = Front-connected "T" connector.
RCTH = Rear-connected "T" horizontal connector.
RCTV = Rear-connected "T" vertical connector.
RCOV = Rear-connected offset vertical.

ENGLISH

Using a Platform Lift

When using a platform lift, lift flanges (**Figure 13, A**) should not extend beyond the back of the circuit breaker.

Figure 13 – Using a Platform Lift



NOTE: Cluster shields are not shown.

ENGLISH

Lifting

Lifting Drawout Circuit Breaker

NOTICE
HAZARD OF EQUIPMENT DAMAGE
Cradle must be secured before installing or removing circuit breaker.
Failure to follow these instructions can result in equipment damage.

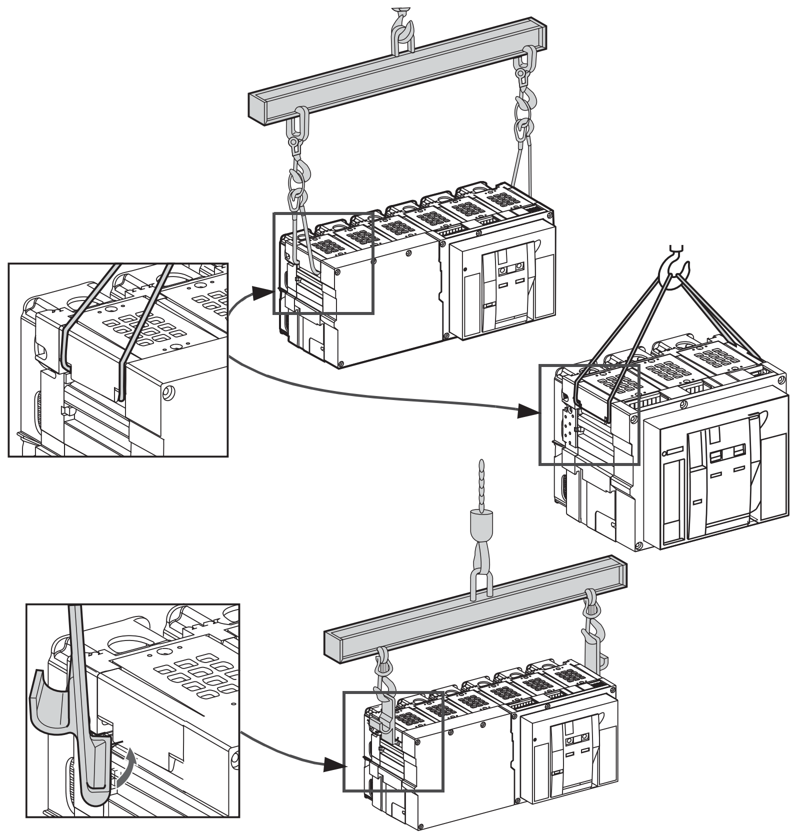
Lift using lifting flanges on sides of the circuit breaker, lifting hooks, and crossbar.

Lifting Hook Kit: S48906

W-Frame Crossbar Kit: S48900

Y-Frame Crossbar Kit: S48901

Figure 14 – Lifting Drawout Circuit Breaker

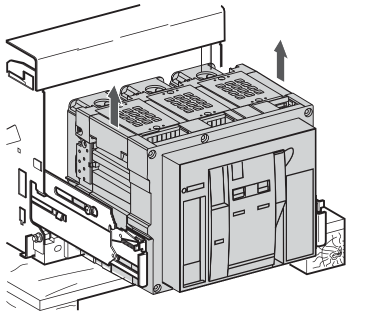


ENGLISH

Lifting Cradle or Fixed-Mounted Circuit Breaker

NOTE: If circuit breaker is installed in cradle, remove circuit breaker from cradle before lifting cradle. To remove circuit breaker, see page 46.

Figure 15 – Removing Circuit Breaker From Cradle



Lift using the lifting flanges on the sides of the cradle or circuit breaker, a piece of bar stock through the connectors, lifting hooks, and crossbar.

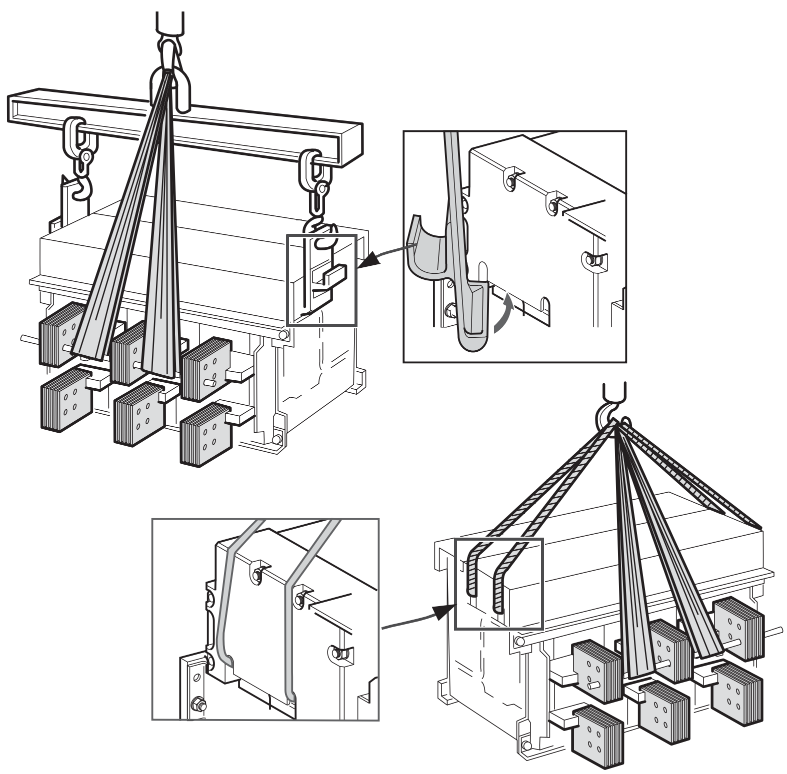
Lifting Hook Kit: S48906

W-Frame Crossbar Kit: S48900

Y-Frame Crossbar Kit: S48901

NOTE: Connectors must be supported while lifting cradle or fixed-mounted circuit breaker.

Figure 16 – Lifting Cradle or Fixed-Mounted Circuit Breaker



ENGLISH

Section 3— Drawout Circuit Breaker Installation

Equipment is normally shipped with cradles installed and circuit breakers shipped separately.

For equipment shipped without cradles installed, install cradles as described below.

For equipment shipped with cradles installed, see page 38 for circuit breaker installation.

NOTE: When cradles are shipped separately from equipment:

- Standard-width 800–3000 A and 3200 A circuit breakers can be shipped installed in the cradles;
- Wide-construction 3200 A L1 and 4000–6000 A circuit breakers must be shipped separately.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

Cradle Installation

Install Accessories

Install any required cradle accessories which were not factory installed.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Do not place tools or other materials on top of cradle.

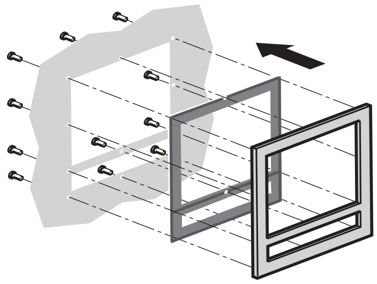
Failure to follow these instructions will result in death or serious injury.

Install Door Escutcheon

If equipment has a door cutout, install the escutcheon shipped with cradle.

1. If not already present, cut opening in the equipment door and drill holes around the opening for the escutcheon. For opening dimensions and hole spacing, refer to bulletin 0613IB1205 on the Schneider Electric™ website (for website information see page 5).
2. Install escutcheon.

Figure 17 – Install Door Escutcheon

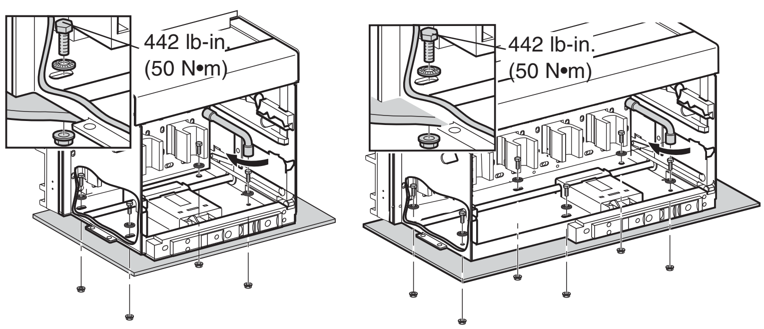


Secure Cradle

1. Turn off all power supplying the equipment before working on or inside equipment.

1. If mounting holes are not already present, drill mounting holes in the pan for mounting the cradle. For cradle mounting hole pattern dimensions, refer to bulletin 0613IB1205 on the Schneider Electric website (for website information see page 5).
2. Check flatness of the mounting surface. Surface must be flat to within 0.08 in. (2 mm).
3. Mount the cradle to the pan, using 3/8 in. bolts, washers, and nuts.

Figure 18 – Secure Cradle



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Clearance Requirements

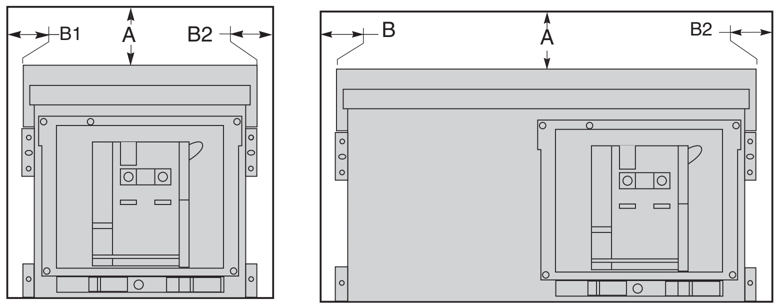
⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Clearance requirements must be met for proper operation of the equipment.

Failure to follow these instructions will result in death or serious injury.

Table 5 – Clearance Requirements



Minimum Clearance	UL 1066 Listed (ANSI C37.50)				UL 489 Listed			
	A		B1 + B2		A		B1 + B2	
	in.	mm	in.	mm	in.	mm	in.	mm
Insulated Parts	0	0	0	0	0	0	0	0
Metal Parts	0	0	2.36	60	0	0	4.36	111

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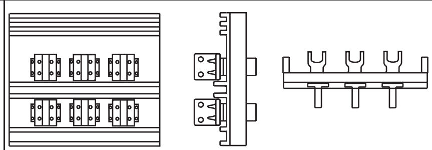
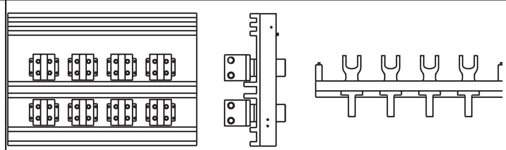
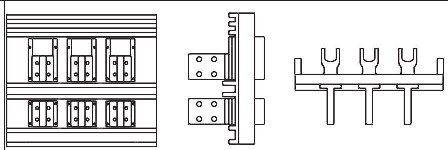
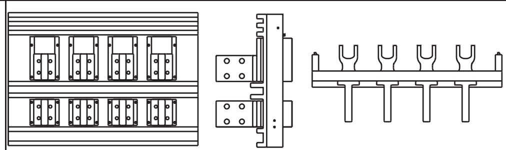
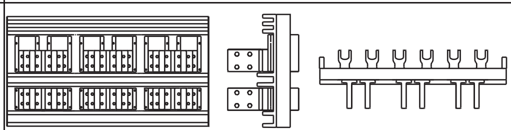
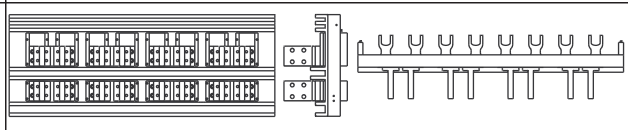
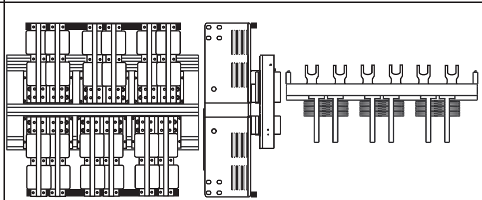
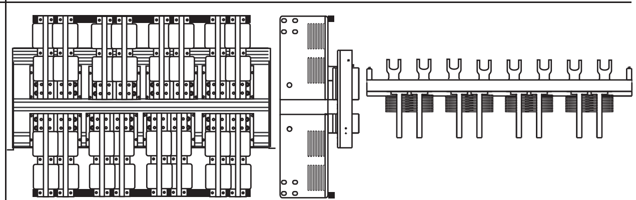
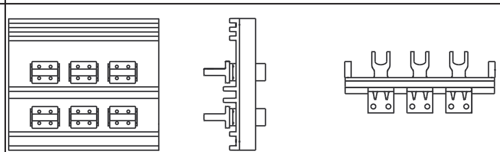
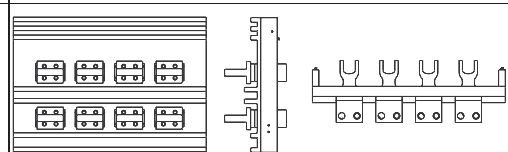
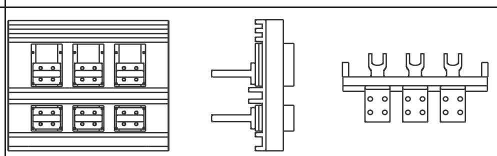
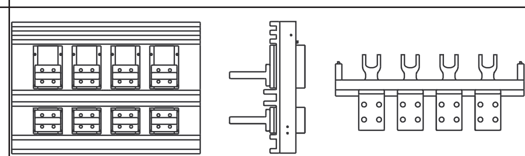
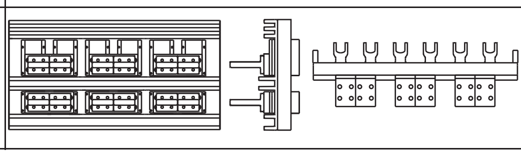
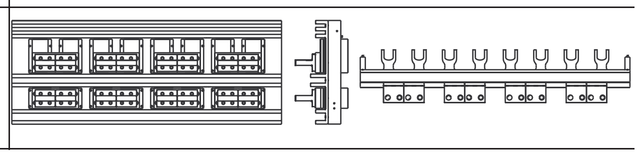
Install Connectors

Standard connectors are shown in Table 6. Secure connectors and torque bolts to 142–159 lb-in. (16–18 N•m). For information on non-standard connectors, contact the field office.

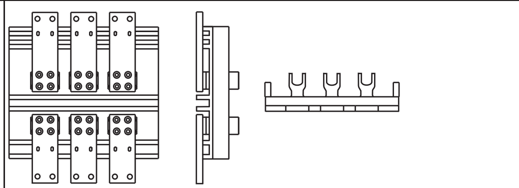
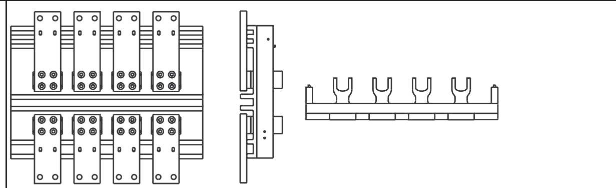
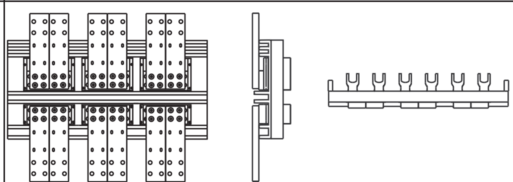
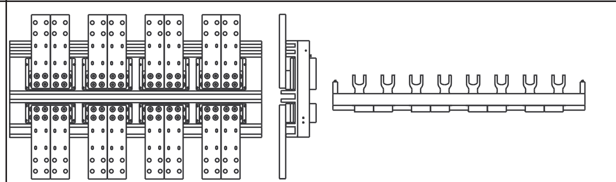
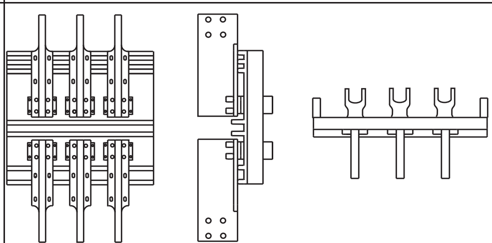
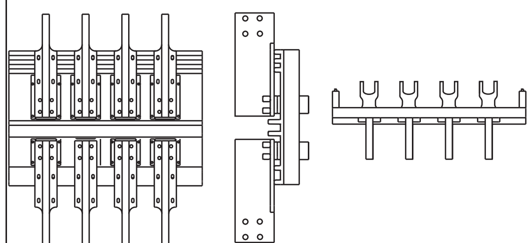
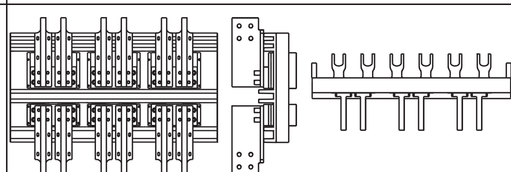
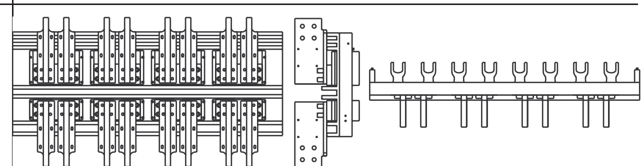
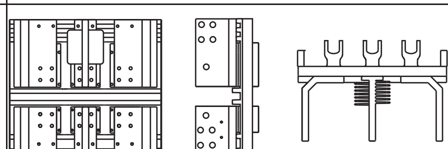
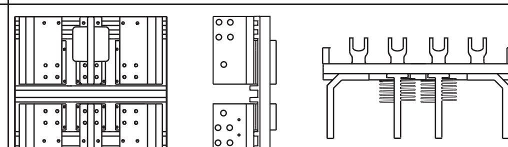
For connector dimensions, refer to bulletin 0613IB1205 on the Schneider Electric website (for website information see page 5).

Table 6 – Standard Connectors

Type	Rating	Three-Pole Layout Front – Side – Top	Four-Pole Layout Front – Side – Top
Rear-Connected "T" Vertical (RCTV)	800–2000 A		
	2500–3000 A		
	4000–5000 A		
	6000 A		
Rear-Connected "T" Horizontal (RCTH)	800–2000 A		
	2500–3000 A		
	3200 A L1 4000–5000 A		

Continued on next page

Table 6 – Standard Connectors *(continued)*

Type	Rating	Three-Pole Layout Front – Side – Top	Four-Pole Layout Front – Side – Top
Front-Connected Flat (FCF)	800– 2000 A		
	3200 A L1 4000 A		
Front-Connected “T” (FCT)	800– 3000 A		
	3200 A L1 4000– 5000 A		
Rear-Connected Offset Vertical (RCOV)	3200 A 2000 A L1/L1F		

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Install Bussing

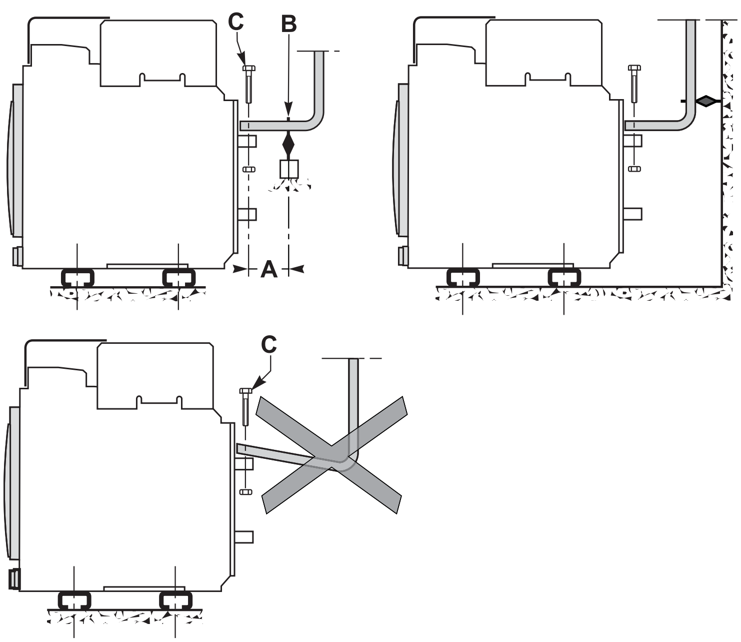
NOTICE
HAZARD OF EQUIPMENT DAMAGE The busbar supports must be placed to support the weight of the bussing system and to withstand magnetic forces caused by short-circuit currents. See **Figure 19, A**. **Failure to follow these instructions can result in equipment damage.**

NOTE: Installer is responsible for bussing to connectors.

- Bus supports must be braced (**Figure 19, B**) to prevent short circuit forces from deflecting the connectors. The busbar supports (**A**) must be placed to support the weight of the bussing system and to withstand magnetic forces caused by short-circuit currents.
- Busbars should be adjusted to ensure that the connection points are correctly positioned before the bolts (**C**) are inserted. Bussing must be supported by framework of the switchgear, with no weight on connectors.

Bussing requirements by the circuit breaker and connectors are shown in Table 7.

Figure 19 – Busbar Connections



NOTE: The installer is responsible for bussing to the connectors. Bussing must be supported by the framework of the switchgear, with no weight on the connectors. Bus supports must be braced to prevent short circuit forces from deflecting the connectors.

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Table 7 – Bus Size Required

Circuit Breaker		Complies with	Connectors	Bus Per Connector	
Rating	Type			Number	Size
800 A, 1200 A	N/N1/H/H1/H2/H3/L/LF/L1/L1F	ANSI C37.50 UL 489	RCTH, RCTV, FCF, FCT	1	0.25 x 3 in. (6 x 76 mm)
1600 A	N/N1/H/H1/H2/H3/L/LF/L1/L1F	ANSI C37.50 UL 489	RCTH, RCTV, FCF, FCT	2	0.25 x 3 in. (6 x 76 mm)
2000 A	N/N1/H/H1/H2/H3/L/LF	ANSI 37.50 UL 489	RCTH	3	0.25 x 3 in. (6 x 76 mm)
			RCTV, FCT	2	0.25 x 4 in. (6 x 102 mm)
			FCF	3	0.25 x 3 in. (6 x 76 mm)
	L1/L1F	ANSI 37.50	RCOV	2	0.25 x 4 in. (6 x 102 mm)
2500 A	H/L	UL 489	RCTH	5	0.25 x 3 in. (6 x 76 mm)
			RCTV, FCT	2	0.25 x 5 in. (6 x 127 mm)
3000 A	H/L	UL 489	RCTH	8	0.25 x 3 in. (6 x 76 mm)
	H/L		RCTV, FCT	4	0.25 x 4 in. (6 x 102 mm)
3200 A	H1/H2/H3	ANSI 37.50	RCOV	3	0.25 x 5 in. (6 x 127 mm)
	L1		RCTH, FCF	3	0.25 x 6 in. (6 x 152 mm)
	L1		RCTV,FCT	3	0.25 x 5 in. (6 x 127 mm)
4000 A	H/H2/H3/L/L1	ANSI 37.50 UL 489	RCTH	4	0.25 x 6 in. (6 x 152 mm)
			RCTV, FCT	4	0.25 x 5 in. (6 x 127 mm)
		ANSI 37.50	FCF	4	0.25 x 6 in. (6 x 152 mm)
		UL 489	FCF	5	0.25 x 6 in. (6 x 152 mm)
5000 A	H/H2/H3/L/L1	ANSI 37.50 UL 489	RCTH	8	0.25 x 6 in. (6 x 152 mm)
			RCTV, FCT	6	0.25 x 5 in. (6 x 127 mm)
6000 A	H/L	UL 489	RCTV	6	0.25 x 6 in. (6 x 152 mm)

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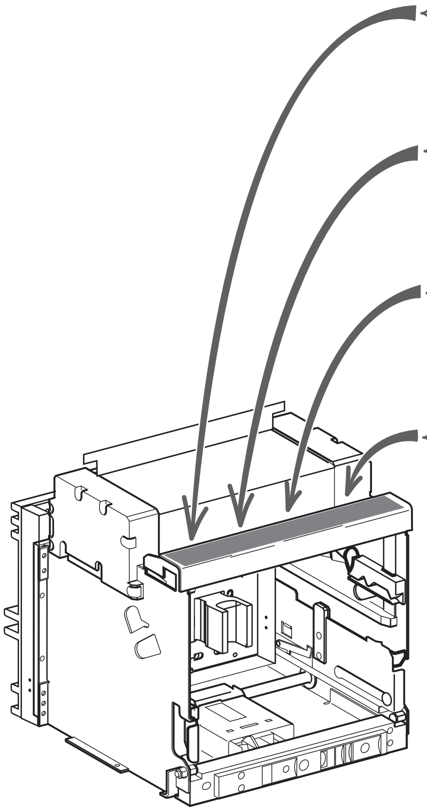
Accessory Connections Using Push-In Connectors

Figure 20 – Terminal Layout for Push-In Connector Installation



CD3	CD2	CD1
834	824	814
832	822	812
831	821	811

or

CE6	CE5	CE4
364	354	344
362	352	342
361	351	341

Com		UC1		UC2		UC3	UC4	M2C/M6C	SDE2/RES	SDE1	CE3	CE2	CE1
E5	E6	Z5	M1	M2	M3	F2 +	V3	484/Q3	184/K2	84	334	324	314
E3	E4	Z3	Z4	T3	T4	VN	V2	474/Q2	182	82	332	322	312
E1	E2	Z1	Z2	T1	T2	F1 -	V1	471/Q1	181/K1	81	331	321	311

MN/MX2	MX1	XF	PF	MCH
D2/C12	C2	A2	254	B2
/C13	C3	A3	252	B3
D1/C11	C1	A1	251	B1

OF24	OF23	OF22	OF21	OF14	OF13	OF12	OF11	OF4	OF3	OF2	OF1	CT3	CT2	CT1
244	234	224	214	144	134	124	114	44	34	24	14	934	924	914
242	232	222	212	142	132	122	112	42	32	22	12	932	922	912
241	231	221	211	141	131	121	111	41	31	21	11	931	921	911

or

EF24	EF23	EF22	EF21	EF14	EF13	EF12	EF11
248	238	228	218	148	138	128	118
246	236	226	216	146	136	126	116
245	235	225	215	145	135	125	115

or

CE9	CE8	CE7
394	384	374
392	382	372
391	381	371

or

CD6	CD5	CD4
864	854	844
862	852	842
861	851	841

Function	Connector	Description
Auxiliary Contacts	OF[1]	Open/Closed Circuit Breaker or Switch Position Contacts
	EF	Combined Connected and Closed Contact
Cradle Contacts	CD	Disconnected Position Contacts
	CE	Connected Position Contacts
	CT	Test Position Contacts
Remote Operation	SDE	Electrical Fault Alarm Contact
	RES	Remote Reset
	MN	Undervoltage Trip Device
	MX[2]	Shunt Trip
	XF[2]	Shunt Close
	PF	Ready-to-Close Contact
	MCH	Spring-Charging Motor

[1] OF1, OF2, OF3 and OF4 contacts are standard.

[2] When communicating MX1 or XF coils are used, terminal (C3 or A3) must be connected to line even if the communication module is not installed. The bypass circuit through terminal C2/A2 is only momentary duty (0.5 sec). For continuous duty, use the communications command.

Trip Unit Type					
Basic	A	P	H	Connector	Description
–	•	•	•	Com: E1–E6	Communication
–	•	•	•	UC1: Z	Zone-Selective Interlocking Z1 = ZSI OUT signal Z2 = ZSI OUT Z3 = ZSI IN Signal Z4 = ZSI IN Short Time Z5 = ZSI IN Ground Fault
–	•	•	•	UC1: M1	Modified Differential Ground Fault (MDGF)
–	•	•	•	UC2: T	External Neutral
–	•	•	•	UC2: M	Modified Differential Ground Fault (MDGF)
–	•	•	•	UC3: F	24 Vdc External Power Supply
–	–	•	•	UC3: Vn	External Neutral Plug
–	–	•	•	UC4	External Phase Voltage Sensing
–	–	•	•	M2C/M6C	Two Programmable Contacts (internal relay) or Six Programmable Contacts (for connection to external M6C module).

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Accessory Connections Using Ring Terminal Connectors

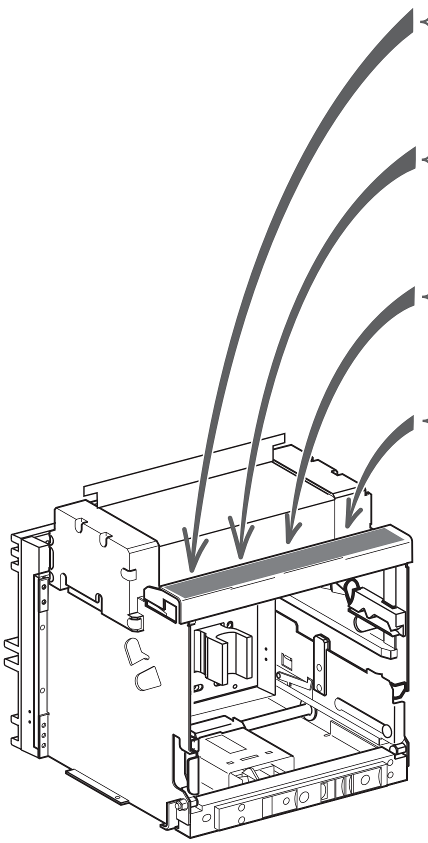
Figure 21 – Terminal Layout for Ring Terminal Connector Installation

CD3	CD2	CD1
834/832	824/822	814/812
831	821	811

Com		UC1		UC2		UC3	UC3a	M2C/M6C	M2Ca/M6Ca	SDE2/RES	SDE2a	SDE1	SDE1a
E5	E6	Z5	M1	M2	M3	F2	VN	484/Q3	474/Q2	184/K2	182	84	82
E3	E4	Z3	Z4	T3	T4	F1		471/Q1		181/K1		81	
E1	E2	Z1	Z2	T1	T2								

MN	MX1	MX1a	XF	XFa
D2	C2	C3	A2	A3
D1	C1		A1	

PF	CT1	MCH	MCHa	OF14	OF13	OF12	OF11	OF4	OF3	OF2	OF1	CE3	CE2	CE1
252	914/912	B2	B3	144	134	122	112	44	34	22	12	334/332	324/322	314/31
251	911	B1		141	131	121	111	41	31	21	11	331	321	311



Function	Connector	Description
Auxiliary Contacts	OF[1]	Open/Closed Circuit Breaker or Switch Position Contacts
	EF	Combined Connected and Closed Contact
Cradle Contacts	CD	Disconnected Position Contacts
	CE	Connected Position Contacts
	CT	Test Position Contacts
Remote Operation	SDE	Electrical Fault Alarm Contact
	RES	Remote Reset
	MN	Undervoltage Trip Device
	MX[2]	Shunt Trip
	XF[2]	Shunt Close
	PF	Ready-to-Close Contact
	MCH	Spring-Charging Motor

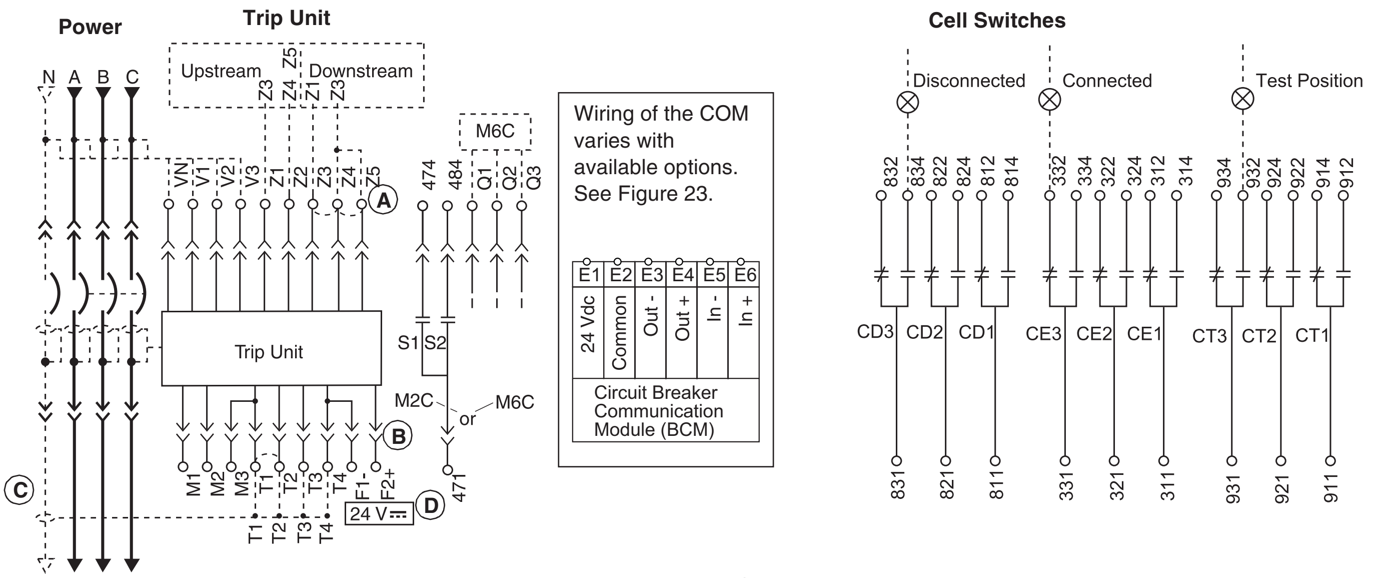
[1] OF1, OF2, OF3 and OF4 contacts are standard.
[2] When communicating MX1 or XF coils are used, terminal (C3 or A3) must be connected to line even if the communication module is not installed. The bypass circuit through terminal C2/A2 is only momentary duty (0.5 sec). For continuous duty, use the communications command.

Trip Unit Type					
Basic	A	P	H	Connector	Description
–	•	•	•	Com: E1–E6	Communication
–	•	•	•	UC1: Z	Zone-Selective Interlocking
					Z1 = ZSI OUT Signal
					Z2 = ZSI OUT
					Z3 = ZSI IN Signal
					Z4 = ZSI IN Short Time
					Z5 = ZSI IN Ground Fault
–	•	•	•	UC1: M1	Modified Differential Ground Fault (MDGF)
–	•	•	•	UC2: T	External Neutral
–	•	•	•	UC2: M	Modified Differential Ground Fault (MDGF)
–	•	•	•	UC3: F	24 Vdc External Power Supply
–	–	•	•	UC3: Vn	External Neutral Plug
–	–	•	•	UC4	External Phase Voltage Sensing
–	–	•	•	M2C/M6C	Two Programmable Contacts (internal relay) or Six Programmable Contacts (for connection to external M6C module)

Wiring Diagrams for Auxiliary Connections

NOTE: All diagrams are showing circuit breaker open, connected and charged.

Figure 22 – Wiring Diagrams for Auxiliary Connections



A—Do not remove factory-installed jumpers between Z3, Z4 and Z5 unless ZSI is connected.
B—Do not remove factory-installed jumper between T1 and T2 unless neutral CT is connected. Do not install jumper between T3 and T4.
C—For proper wiring of neutral CT, refer to wiring schematics, pages 32 and 33.
D—24 Vdc power supply for trip unit must be separate and isolated from 24 Vdc power supply for communication modules.

Markings for Push-In Type Terminals

Cell Switches		
CD3	CD2	CD1
834	824	814
832	822	812
831	821	811

or

CE6	CE5	CE4
364	354	344
362	352	342
361	351	341

Trip Unit								Cell Switches		
COM	UC1	UC2	UC3	UC4	M2C/M6C	SDE2/Res.	SDE1	CE3	CE2	CE1
E5 E6	Z5 M1	M2 M3	F2+	V3	484/Q3	184/K2	84	334	324	314
E3 E4	Z3 Z4	T3 T4	VN	V2	474/Q2	182	82	332	322	312
E1 E2	Z1 Z2	T1 T2	F1–	V1	471/Q1	181/K1	81	331	321	311

Markings for Ring Terminals

Cell Switches		
CD3	CD2	CD1
834/832	824/822	814/812
831	821	811

Trip Unit										
COM	UC1	UC2	UC3	UC3a	M2C/M6C	M2Ca/M6Ca	SDE2/Res.	SDE2a	SDE1	SDE1a
E5 E6	Z5 M1	M2 M3	F2	VN	484/Q3	474/Q2	184/K2	182	84	82
E3 E4	Z3 Z4	T3 T4	F1		471/Q1		181/K1		81	
E1 E2	Z1 Z2	T1 T2								

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Figure 23 – Wiring Diagrams for the COM Option

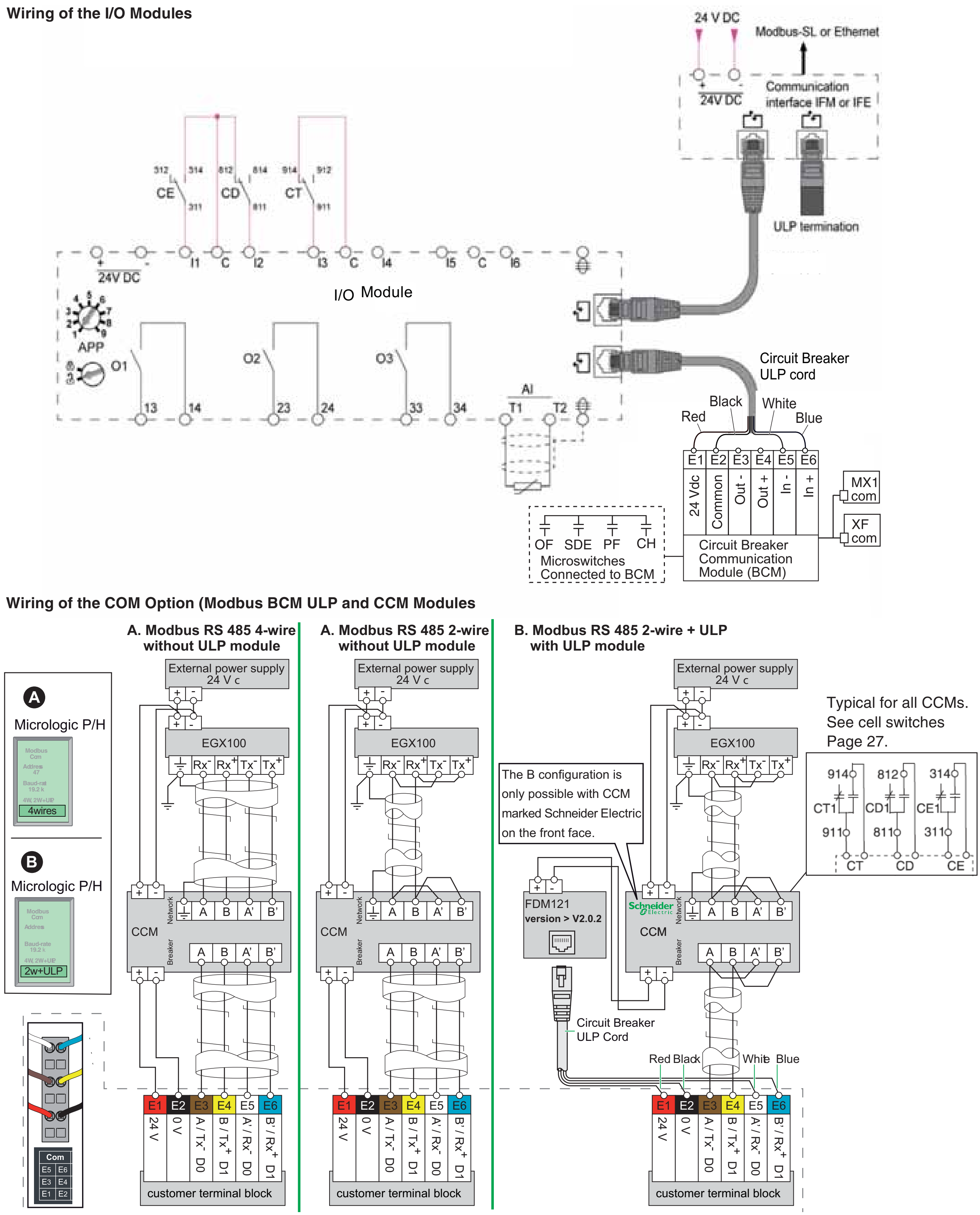

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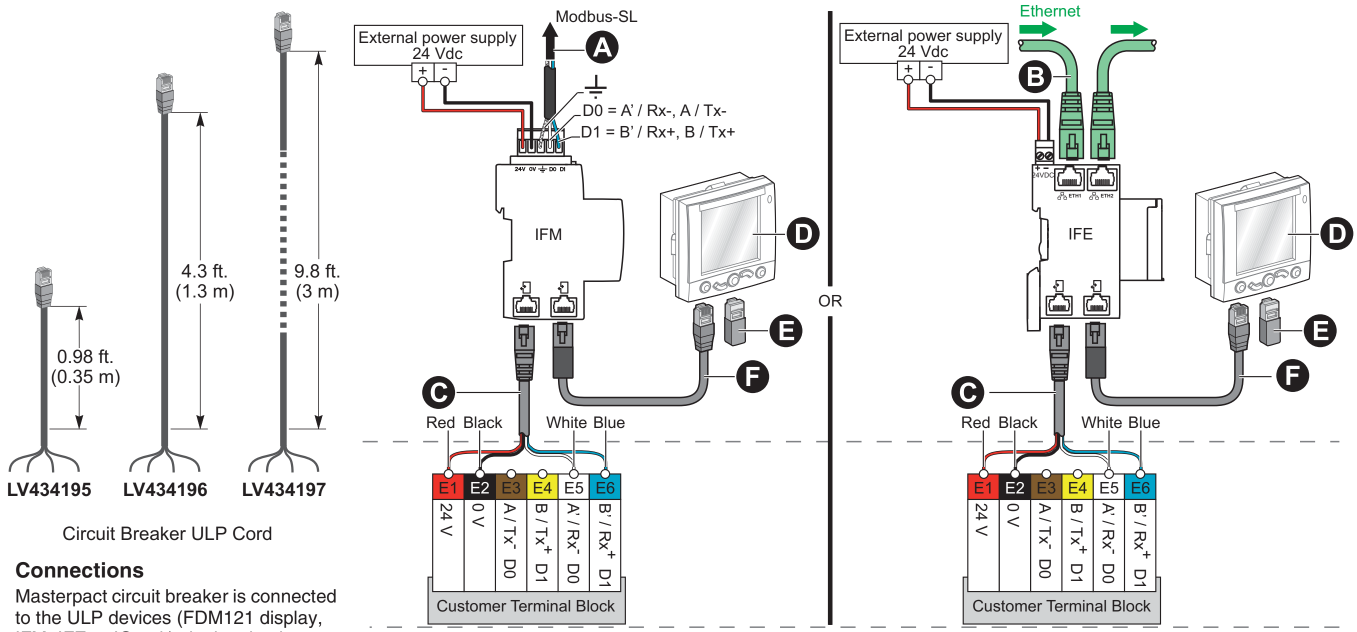
Figure 24 – Communication Components and FDM121 Connections



Connections

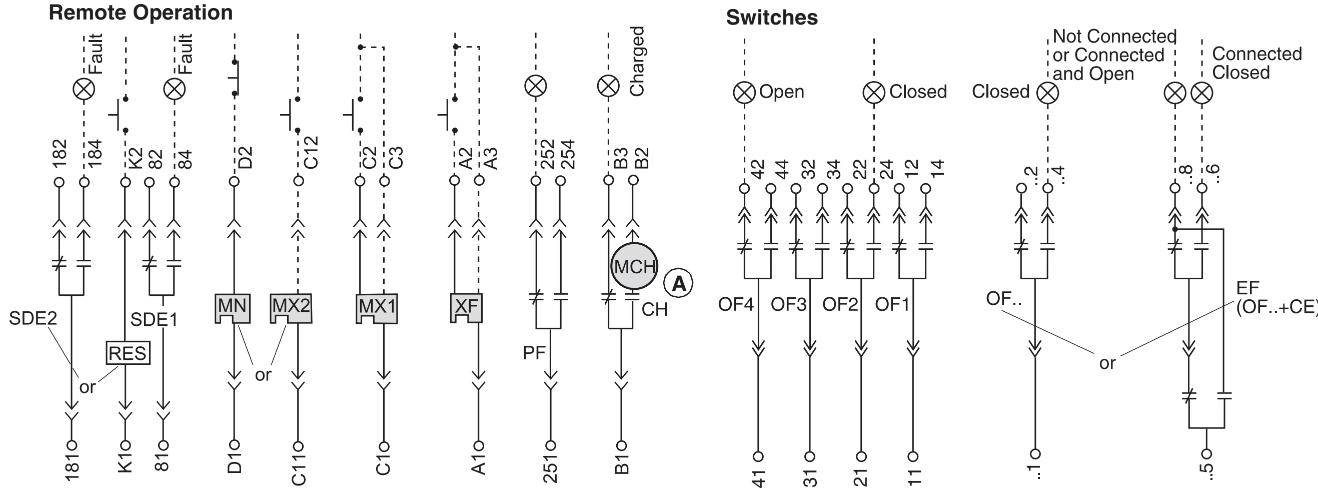
Masterpact circuit breaker is connected to the ULP devices (FDM121 display, IFM, IFE or IO unit) via the circuit breaker ULP cord.

- Cord is available in three lengths: 0.98 ft. (0.35 m), 4.3 ft. (1.3 m) and 9.8 ft. (3 m).
- Lengths up to 32.9 ft. (10 m) are possible using extensions.

A. Modbus Network
B. Ethernet Network
C. Circuit Breaker ULP Cord
D. FDM Display
E. ULP Termination
F. ULP Cable

NOTE: All diagrams are showing circuit breaker open, connected and charged.

Figure 25 – Wiring Diagrams for Auxiliary Connections



A—When remote operation features are used, make sure there is a minimum of four seconds for the spring charging motor (MCH) to completely charge the circuit breaker closing springs prior to actuating the shunt close (XF) device.

Markings for Push-In Type Terminals

Remote Operation					Auxiliary Switches												Cell Switches		
MN/MX2	MX1	XF	PF	MCH	OF24	OF23	OF22	OF21	OF14	OF13	OF12	OF11	OF4	OF3	OF2	OF1	CT3	CT2	CT1
D2/C12	C2	A2	254	B2	244	234	224	214	144	134	124	114	44	34	24	14	934	924	914
C13	C3	A3	252	B3	242	232	222	212	142	132	122	112	42	32	22	12	932	922	912
D1/C11	C1	A1	251	B1	241	231	221	211	141	131	121	111	41	31	21	11	931	921	911

or

EF24	EF23	EF22	EF21	EF14	EF13	EF12	EF11
248	238	228	218	148	138	128	118
246	236	226	216	146	136	126	116
245	235	225	215	145	135	125	115

or

CD6	CD5	CD4
864	854	844
862	852	842
861	851	841

or

CE9	CE8	C7
394	384	374
392	382	372
391	381	371

Markings for Ring Terminals

Remote Operation									Auxiliary Switches								Cell Switches		
MN	MX1	MX1a	XF	XFa	PF	CT1	MCH	MCHa	OF14	OF13	OF12	OF11	OF4	OF3	OF2	OF1	CE3	CE2	CE1
D2	C2	C3	A2	A3	252	914/912	B2	B3	144	134	122	112	44	34	22	12	334/332	324/322	314/312
D1	C1		A1		251	911	B1		141	131	121	111	41	31	21	11	331	321	311

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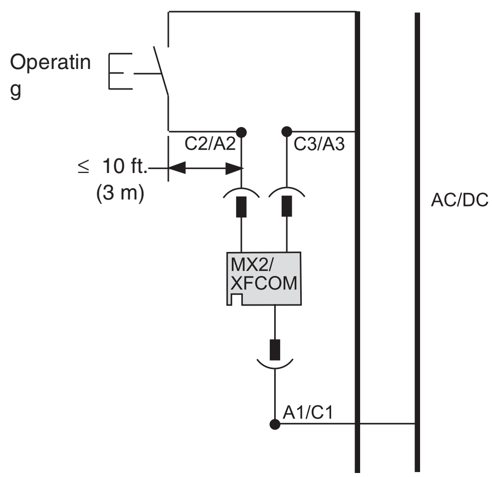
Communicating Shunt Trip (MX) and Shunt Close (XF)

A recommended wiring schematic for the communicating style shunt trip or shunt close coils is shown in Figure 26. Induced voltages in the circuit at terminal C2 and/or A2 can cause the shunt trip or shunt close to not work properly. The best way to prevent the induced voltages is keep the circuit to terminal C2 and A2 as short as possible. If it is impossible to keep the circuit less than ten feet (three meters), use an interposing relay near terminal C2 or A2.

Figure 26 – Communicating Wiring Schematic

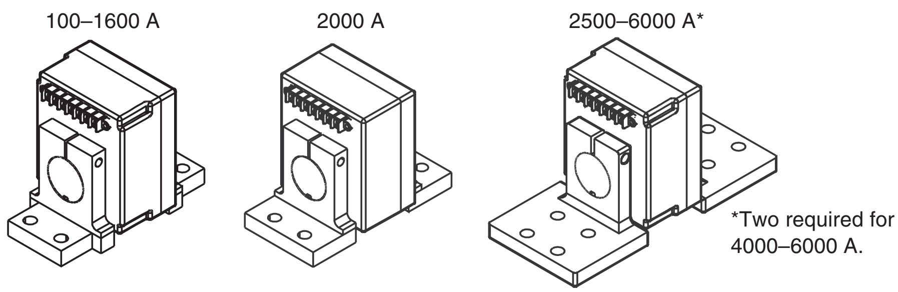


Ground-Fault Protection for Equipment

If the circuit breaker does not have an integral ground-fault tripping or alarm, skip this subsection.

A three-phase, four-wire circuit requires an external neutral current transformer (CT).

Figure 27 – Neutral Current Transformers



Connect the neutral CT to the circuit breaker according to wiring diagrams.

1. Connect the primary:
   — If the load is connected to lower end of the circuit breaker, connect the load neutral to the H1 terminal of the neutral CT.
   — If the source power is connected to the lower end of the circuit breaker, connect the source neutral to the H1 terminal of the neutral CT.

NOTE: The equipment grounding connection must be upstream (line side) of the neutral CT and a neutral connection must exist from the supply transformer to the equipment.

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For circuit breakers using Micrologic™ 5.0P, 5.0H, 6.0P, or 6.0H trip units, connect terminal Vn on the neutral current transformer to the Vn terminal of the control wiring terminal. (This is necessary to allow the trip unit to make voltage measurements.) Terminals Vc and Vn are internally connected.

NOTICE

HAZARD OF IMPROPER TRIP SYSTEM OPERATION

F1 and F2 must be isolated from ground. Verify all wiring per the instructions in this bulletin.

Failure to follow these instructions can result in a nuisance trip during closing.

2. Remove the factory-installed jumper connecting T1 and T2.
3. Feed the Belden® cable and plastic conduit from the neutral CT to the cradle terminals.
4. Connect the cable per the appropriate schematic in Figure 28 or 29.
5. Verify all wiring.

NOTE: Modified differential ground-fault circuitry and ground-source return ground-fault circuitry require the use of a modified differential ground-fault module (MDGF) and special current transformers. For wiring of those systems, see the instructions with the MDGF.

Figure 28 – Wiring Schematic for 800–4000 A Standard-Width NW Circuit Breakers

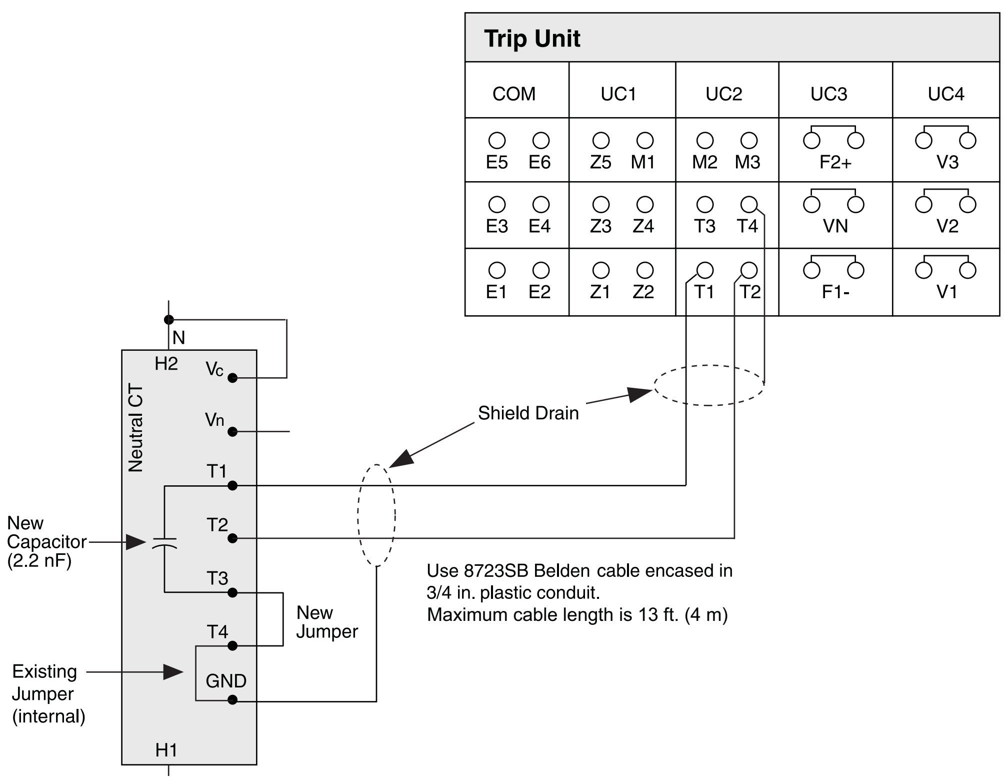

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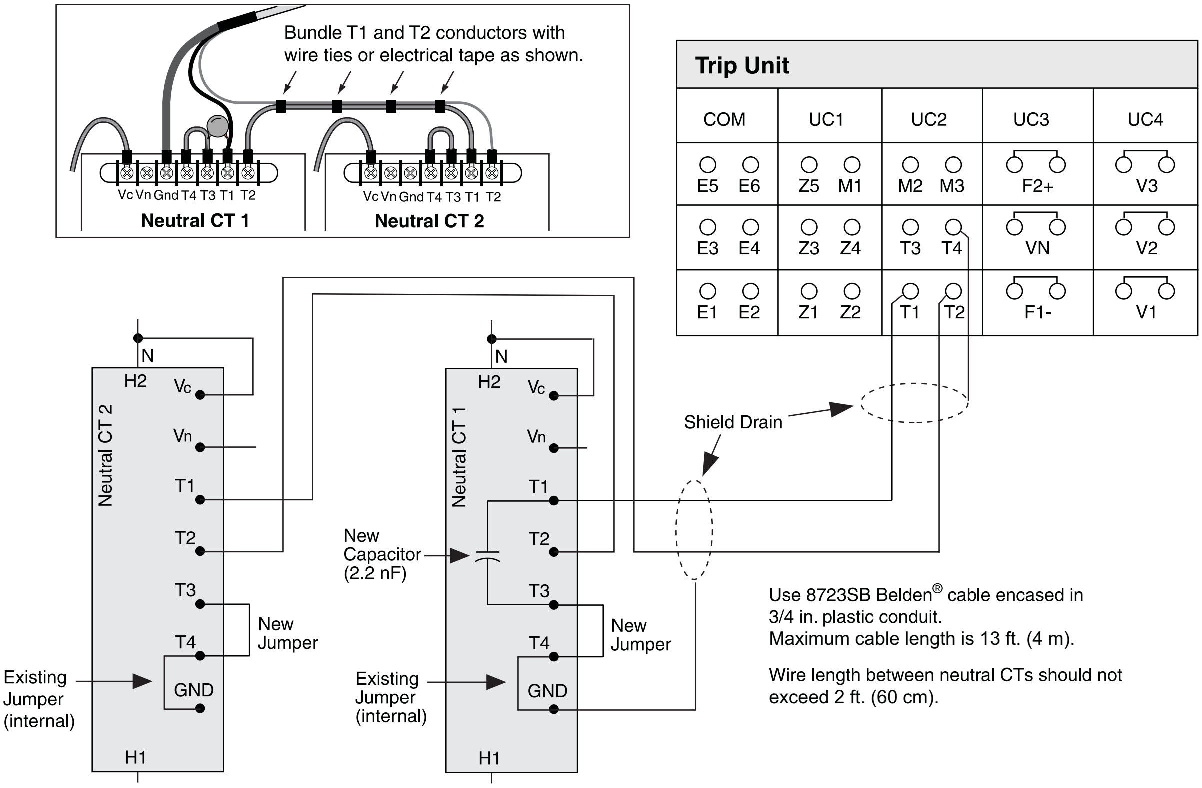
Figure 29 – Wiring Schematic for 3200–6000 A Wide-Construction NW Circuit Breakers

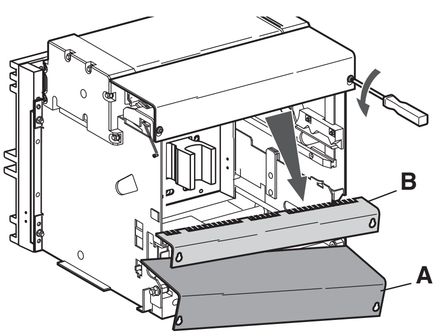


Accessory Wiring—Push-In Connectors

NOTE: Place cradle in test position to install or remove push-in connectors. Place in test position as described on page 70.

1. Remove the optional terminal cover (**Figure 30, A**), if installed, and the wiring cover (**B**).

Figure 30 – Remove Covers



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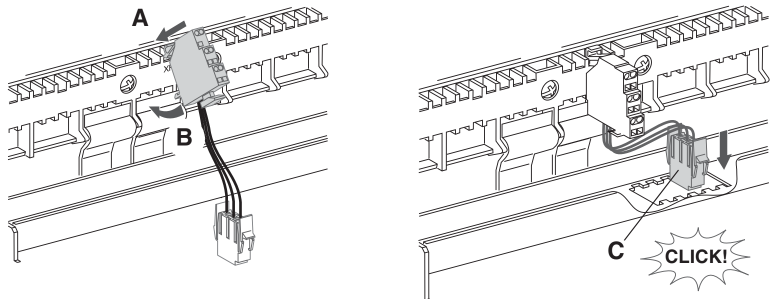
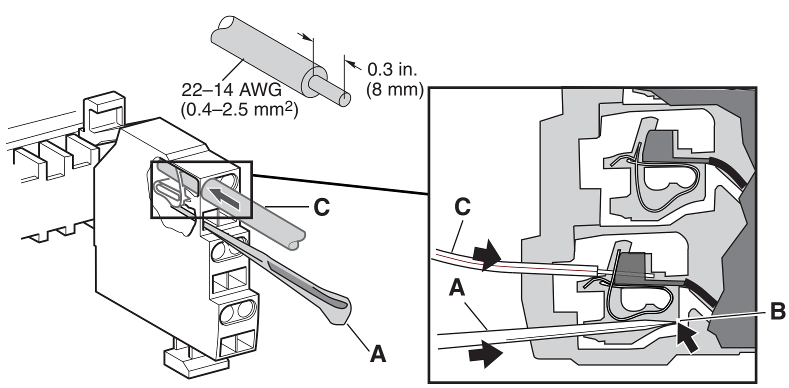
2. Install each push-in connectors in the correct slot (**Figure 31, A**). (Refer to the label on the cradle for standard positioning information.) Rotate the push-in connector down (**B**) to snap in place.
3. Install the wiring connector (**C**). Connector positions are indicated on front of the connector support.

Figure 31 – Install Push-In Connector



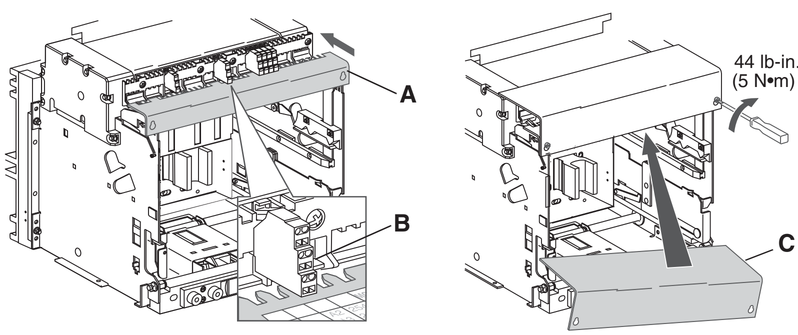
4. Push the Wago wire insert tool (**Figure 32, A**, Wago part no. 209-129) fully into the connector (to point **B**) and install control wires (**C**).

Figure 32 – Install Control Wires



5. Replace the wiring cover (**Figure 33, A**), sliding the top under the installed push-in connectors (**B**).
6. Replace the optional terminal cover (**C**), if installed.

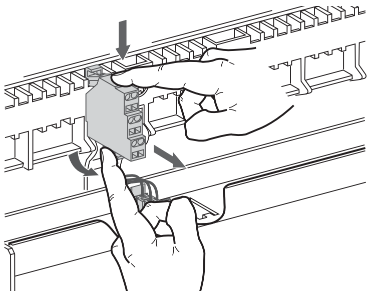
Figure 33 – Replace Covers



NOTE: Remove a push-in connector in reverse order of installation.

Remove the connector by pressing down on top of connector (**Figure 40, A**) while pushing up and out on bottom (**B**) to rotate connector off of latch.

Figure 34 – Remove Push-In Connector

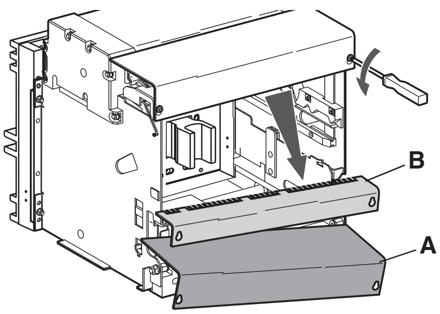


Accessory Wiring—Ring Terminal Connector

NOTE: Place the cradle in its test position to install or remove ring terminal connectors. Place in test position as detailed on page 70, Drawout Circuit Breaker Disconnection.

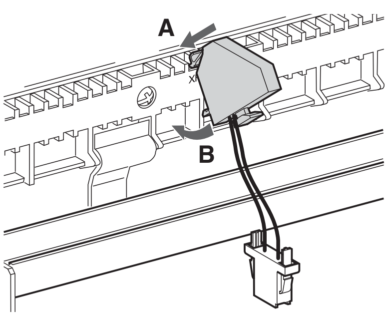
1. Remove the optional terminal cover (**Figure 35, A**), if installed, and the wiring cover (**B**).

Figure 35 – Remove Covers



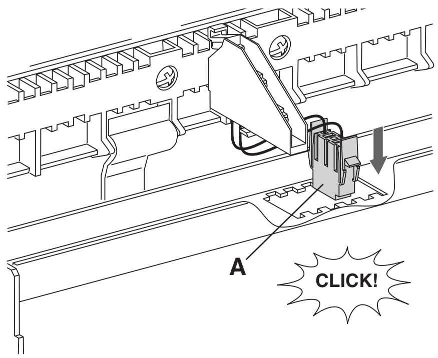
2. Install each ring terminal connector in the correct slot (**Figure 36, A**). (Refer to the label on the cradle for standard positioning information.) Rotate the ring terminal block down (**B**) to snap in place.

Figure 36 – Install Ring Terminal Connector



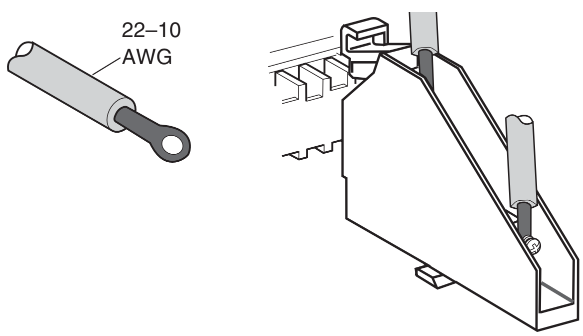
3. Install the wiring connector (**Figure 37, A**). Connector positions are indicated on front of the connector support.

Figure 37 – Install Wiring Connector



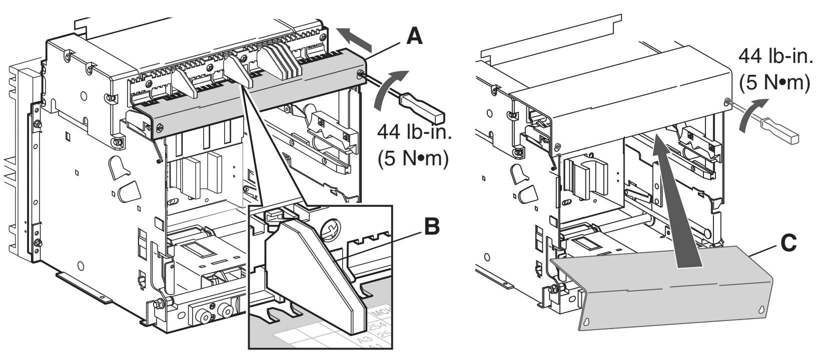
4. Install the ring terminals on the control wire. Secure the ring terminal on the ring terminal block.

Figure 38 – Install Control Wires



5. Replace the wiring cover (**Figure 39, A**), sliding the top under the installed ring terminal connectors (**B**).
6. Replace the optional terminal cover (**C**), if installed.

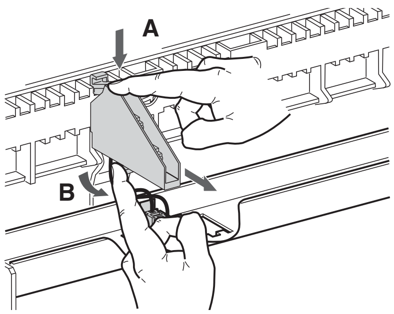
Figure 39 – Replace Wiring Cover



NOTE: To remove a ring terminal connector, the circuit breaker must be in test position. Remove the ring terminal connector in reverse order of installation.

Remove the connector by pressing down on top of connector (**Figure 40, A**) while pushing up and out on bottom (**B**) to rotate connector off of latch.

Figure 40 – Remove Ring Terminal Connector



Cradle Removal

1. Turn off all power supplying the equipment before working on or inside equipment.
2. Remove the cradle in reverse order of installation.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.

Failure to follow these instructions will result in death or serious injury.

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Circuit Breaker Installation

Cradle Rejection Kit

To prevent a Masterpact circuit breaker with an inappropriate ampacity or interrupting rating from being installed in the cradle, install rejection pins on cradle and circuit breaker prior to installing circuit breaker.

1. Determine rejection pin pattern required. (See Table 8 or 9.)

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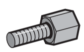
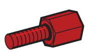
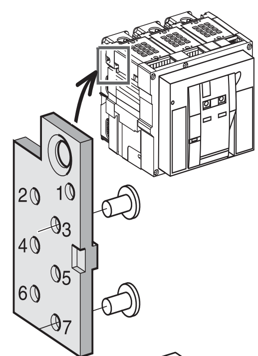
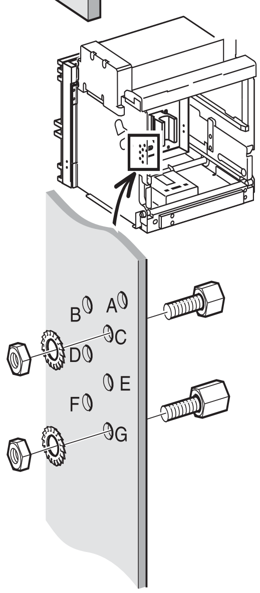
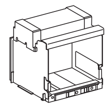
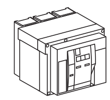
Table 8 – Recommended Cradle Rejection Pin Keying for Standard UL 1066 (ANSI C37.50) Listed Circuit Breakers

Cradle Rejection Hexes	Circuit Breaker Rejection Pins
 Short Hex (Blue)	 Short Pin (Blue)
 Medium Hex (Black)	 Medium Pin (Black)
 Long Hex (Red)	 Long Pin (Red)





Type														
	A	B	C	D	E	F	G	1	2	3	4	5	6	7
800 A N1	Black	Black	Black	Red	Blue	Blue	Black	Blue	Blue	Blue	—	Black	Black	Blue
800 A H1	Black	Black	Black	Blue	Red	Black	Blue	Blue	Blue	Blue	Black	—	Blue	Black
800 A H2	Black	Black	Black	Red	Red	Blue	Blue	Blue	Blue	Blue	—	—	Black	Black
800 A H3	Black	Black	Black	Blue	Blue	Red	Blue	Blue	Blue	Blue	Black	Black	—	Black
800 A L1	Black	Black	Black	Red	—	Red	Blue	Blue	Blue	Blue	—	Red	—	Black
800 A L1F	Black	Black	Black	—	Red	Red	Blue	Blue	Blue	Blue	Red	—	—	Black
800 A HF	Black	Black	Black	Blue	—	Red	Red	Blue	Blue	Blue	Black	Red	—	—
800 A HC	Black	Blue	Black	Red	—	Red	Red	Blue	Black	Blue	—	Red	—	—
800 A HA	Black	Black	Black	Red	Red	—	Red	Blue	Blue	Blue	—	—	Red	—
1600 A N1	—	Red	Blue	Red	Blue	Blue	Black	Red	—	Black	—	Black	Black	Blue
1600 A H1	—	Red	Blue	Blue	Red	Black	Blue	Red	—	Black	Black	—	Blue	Black
1600 A H2	—	Red	Blue	Red	Red	Blue	Blue	Red	—	Black	—	—	Black	Black
1600 A H3	—	Red	Blue	Blue	Blue	Red	Blue	Red	—	Black	Black	Black	—	Black
1600 A L1	—	Red	Black	Red	—	Red	Blue	Red	—	Blue	—	Red	—	Black
1600 A L1F	—	Red	Black	—	Red	Red	Blue	Red	—	Blue	Red	—	—	Black
1600 A HF	—	Red	Black	Blue	—	Red	Red	Red	—	Black	Black	Red	—	—
1600 A HC	—	Red	Blue	Red	—	Red	Red	Red	—	Black	—	Red	—	—
1600 A HA	—	Red	Blue	Red	Red	—	Red	Red	—	Black	—	—	Red	—
2000 A H1	Red	—	Red	Blue	Red	Black	Blue	—	Red	—	Black	—	Blue	Black
2000 A H2	Red	—	Red	Red	Red	Blue	Blue	—	Red	—	—	—	Black	Black
2000 A H3	Red	—	Red	Blue	Blue	Red	Blue	—	Red	—	Black	Black	—	Black
2000 A L1	Red	—	Red	Red	—	Red	Blue	—	Red	—	—	Red	—	Black
2000 A L1 Wide*	—	Red	Red	Red	Blue	Red	Black	Red	—	—	—	Black	—	Blue
2000 A L1F	Red	—	Red	—	Red	Red	Blue	—	Red	—	Red	—	—	Black
2000 A HF	Red	—	Red	Blue	—	Red	Red	—	Red	—	Black	Red	—	—
2000 A HC	Red	—	Blue	Red	—	Red	Red	—	Red	Black	—	Red	—	—
2000 A HA	Red	—	Red	Red	Red	—	Red	—	Red	—	—	—	Red	—
3200 A H1	Blue	Black	Red	Black	Red	Black	Black	Black	Blue	—	Blue	—	Blue	Blue
3200 A H2	Blue	Black	Red	Red	Red	Black	Blue	Black	Blue	—	—	—	Blue	Black
3200 A H3	Blue	Black	Red	Blue	Black	Red	Blue	Black	Blue	—	Black	Blue	—	Blue
3200 A HF	Blue	Black	Red	—	—	Red	Red	Black	Blue	—	Red	Red	—	—
3200 A HC	—	Black	Red	Red	—	Red	Red	Red	Blue	—	—	Red	—	—
3200 A HC Wide*	Red	Blue	Black	Red	Black	Red	Red	—	Black	Blue	—	Blue	—	—
3200 A L1 Wide*	Red	Black	Blue	Red	Black	Red	Black	—	Blue	Black	—	Blue	—	Blue
3200 A HA	—	Black	Red	Red	Red	—	Red	Black	Blue	—	—	—	Red	—
4000 A H2 Wide*	Black	Red	Blue	Red	Red	Black	Blue	Blue	—	Black	—	—	Blue	Black
4000 A H3 Wide*	Black	Red	Blue	Blue	Black	Red	Blue	Blue	—	Black	Black	Blue	—	Black
4000 A HA Wide*	Blue	Red	Blue	Red	Red	—	Red	Black	—	Blue	—	—	Red	—
4000 A HC Wide*	Blue	Red	Blue	Red	Blue	Red	Red	Black	—	Blue	—	Black	—	—
4000 A HF Wide*	Blue	Red	Blue	Blue	Black	Red	Red	Black	—	Blue	Black	Blue	—	—
4000 A L1 Wide*	Black	Red	Blue	Red	Blue	Red	Black	Blue	—	Black	—	Black	—	Blue
5000 A H2	Red	Black	Black	Red	Red	Black	Blue	—	Blue	Blue	—	—	Blue	Black
5000 A H3	Red	Black	Black	Blue	Black	Red	Blue	—	Blue	Blue	Black	Blue	—	Black
5000 A HA	Red	Black	Blue	Red	Red	—	Red	—	Blue	Black	—	—	Red	—
5000 A HF	Red	Black	Blue	Blue	Black	Red	Red	—	Blue	Black	Black	Blue	—	—
5000 A HC	Red	Black	Blue	Red	Blue	Red	Red	—	Blue	Black	—	Black	—	—
5000 A L1	Red	Black	Black	Red	Blue	Red	Black	—	Blue	Blue	—	Black	—	Blue
6000 A H2	Black	Black	Red	Red	Red	Black	Blue	Blue	Blue	—	—	—	Blue	Black
6000 A H3	Black	Black	Red	Blue	Black	Red	Blue	Blue	Blue	—	Black	Blue	—	Black
6000 A HA	Blue	Blue	Red	Red	Red	—	Red	Black	Black	—	—	—	Red	—
6000 A HF	Blue	Blue	Red	Blue	Black	Red	Red	Black	Black	—	Black	Blue	—	—
6000 A HC	Blue	Blue	Red	Red	Blue	Red	Red	Black	Black	—	—	Black	—	—
6000 A L1	Black	Black	Red	Red	Blue	Red	Black	Blue	Blue	—	—	Black	—	Blue

* Wide construction version.

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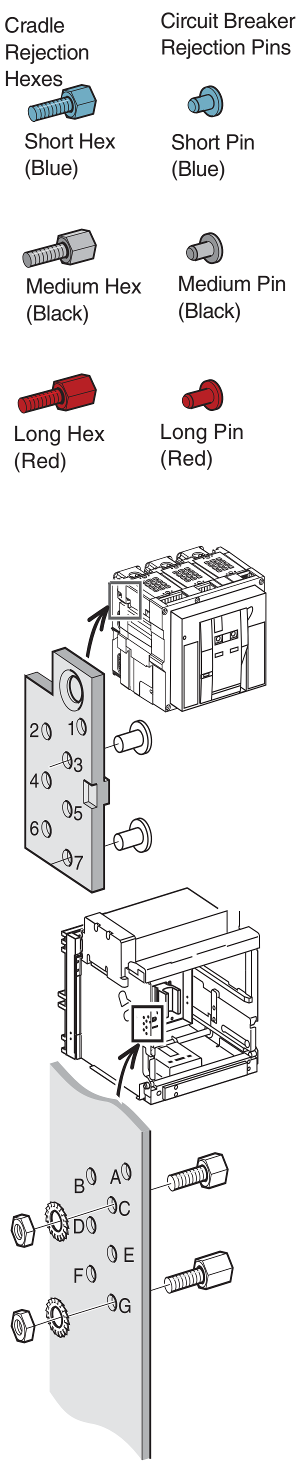
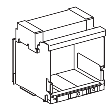
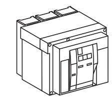
Table 9 – Recommended Cradle Rejection Pin Keying for Standard UL 489 Listed Circuit Breakers

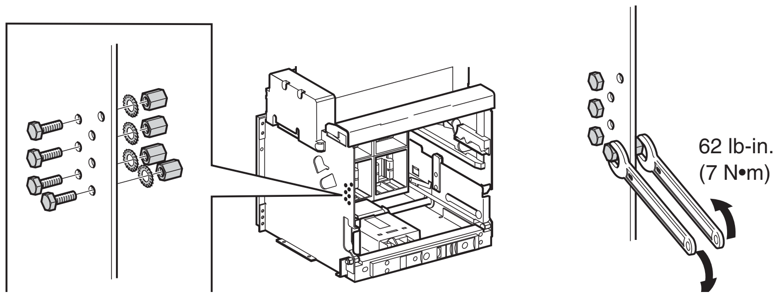


Type														
	A	B	C	D	E	F	G	1	2	3	4	5	6	7
800 A N	Black	Black	Black	Red	Red	Red	—	Blue	Blue	Blue	—	—	—	Red
800 A H	Black	Black	Blue	Blue	Blue	Blue	Red	Blue	Blue	Black	Black	Black	Black	—
800 A L	Black	Black	Black	Red	—	Blue	Red	Blue	Blue	Blue	—	Red	Black	—
800 A LF	Black	Blue	Black	Blue	Red	Blue	Red	Blue	Black	Blue	Black	—	Black	—
800 A HF	Black	Blue	Black	—	Red	Red	Black	Blue	Black	Blue	Red	—	—	Blue
800 A HB	Blue	Black	Black	Red	Red	Red	Black	Black	Blue	Blue	—	—	—	Blue
1200 A N	Red	Blue	Black	Red	Red	Red	—	—	Black	Blue	—	—	—	Red
1200 A H	Red	Blue	Black	Blue	Blue	Blue	Red	—	Black	Blue	Black	Black	Black	—
1200 A L	Red	Blue	Black	Red	—	Blue	Red	—	Black	Blue	—	Red	Black	—
1200 A LF	Red	Blue	Blue	Blue	Red	Blue	Red	—	Black	Black	Black	—	Black	—
1200 A HF	Red	Black	Blue	—	Red	Red	Red	—	Blue	Black	Red	—	—	—
1200 A HB	Black	Blue	Blue	Red	Red	Red	Red	Blue	Black	Black	—	—	—	—
1600 A N	—	Red	Blue	Red	Red	Red	—	Red	—	Black	—	—	—	Red
1600 A H	—	Red	Black	Blue	Blue	Blue	Red	Red	—	Blue	Black	Black	Black	—
1600 A L	—	Red	Black	Red	—	Blue	Red	Red	—	Blue	—	Red	Black	—
1600 A LF	—	Red	Blue	Blue	Red	Blue	Red	Red	—	Black	Black	—	Black	—
1600 A HF	—	Red	Blue	—	Red	Red	Red	Red	—	Black	Red	—	—	—
1600 A HB	—	Red	—	Red	Red	Red	Red	Red	—	Red	—	—	—	—
2000 A N	Red	—	Red	Red	Red	Red	—	—	Red	—	—	—	—	Red
2000 A H	Red	—	Red	Blue	Blue	Blue	Red	—	Red	—	Black	Black	Black	—
2000 A L	Red	—	Red	Red	—	Blue	Red	—	Red	—	—	Red	Black	—
2000 A LF	Red	—	Black	Blue	Red	Blue	Red	—	Red	Blue	Black	—	Black	—
2000 A HF	Black	—	Red	—	Red	Red	Red	Blue	Red	—	Red	—	—	—
2000 A HB	Red	—	—	Red	Red	Red	Red	—	Red	Red	—	—	—	—
2500 A H	—	Blue	Red	Red	Red	Red	—	Red	Blue	—	Black	Black	Black	—
2500 A L	—	Black	Red	Blue	Blue	Blue	Red	Red	Black	—	—	—	—	Red
2500 A HF	—	Blue	Red	—	Red	Red	Red	Red	Black	—	Red	—	—	—
2500 A HB	—	—	Red	Red	Red	Red	Red	Red	Red	—	—	—	—	—
3000 A H	Blue	Red	—	Red	Red	Red	—	Black	—	Red	—	—	—	Red
3000 A L	Black	Red	—	Blue	Blue	Blue	Red	Blue	—	Red	Black	Black	Black	—
3000 A HF	Blue	Red	—	—	Red	Red	Red	Black	—	Red	Red	—	—	—
3000 A HB	—	Black	Blue	Red	Red	Red	Red	Red	Blue	Black	—	—	—	—
4000 A H Wide*	Black	Red	Blue	Blue	Blue	Black	Red	Blue	—	Black	Black	Black	Blue	—
4000 A L Wide*	Black	Red	Blue	Red	Blue	Blue	Red	Blue	—	Black	—	Black	Black	—
4000 A HF Wide*	Blue	Red	Blue	—	Red	Red	Red	Black	—	Blue	Red	—	—	—
4000 A HB Wide*	Blue	Red	Blue	Black	Red	Blue	Red	Black	—	Blue	Blue	—	Black	—
5000 A H	Red	Black	Black	Blue	Blue	Black	Red	—	Blue	Blue	Black	Black	Blue	—
5000 A L	Red	Black	Black	Red	Blue	Blue	Red	—	Blue	Blue	—	Black	Black	—
5000 A HF	Red	Black	Blue	—	Red	Red	Red	—	Blue	Black	Red	—	—	—
5000 A HB	Red	Black	Blue	Black	Red	Blue	Red	—	Blue	Black	Blue	—	Black	—
6000 A H	Black	Black	Red	Blue	Blue	Black	Red	Blue	Blue	—	Black	Black	Blue	—
6000 A L	Black	Black	Red	Red	Blue	Blue	Red	Blue	Blue	—	—	Black	Black	—
6000 A HF	Blue	Blue	Red	—	Red	Red	Red	Black	Black	—	Red	—	—	—
6000 A HB	Blue	Blue	Red	Black	Red	Blue	Red	Black	Black	—	Blue	—	Black	—

* Wide construction version.

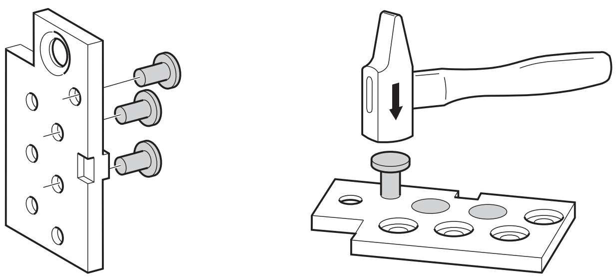
2. Install cradle rejection pins in the pattern determined from Table 8 or 9.

Figure 41 – Install Cradle Rejection Pins



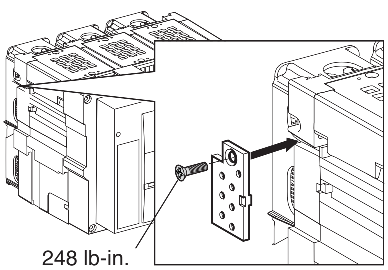
3. Install the circuit breaker rejection pins into the rejection pin plate in the pattern determined from Table 8 or 9.

Figure 42 – Install Circuit Breaker Rejection Pins



4. Install the rejection pin plate on the circuit breaker.

Figure 43 – Install Rejection Pin Plate



Install Accessories

Install any required circuit breaker accessories which were not factory installed.

If installing electrical accessories, remove accessory cover.

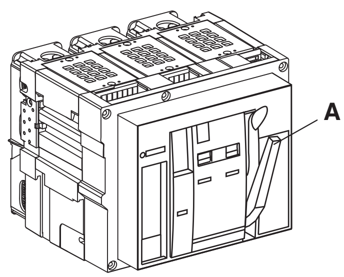
NOTICE

HAZARD OF EQUIPMENT DAMAGE

Use caution when removing or replacing the circuit breaker accessory cover. The spring-charging handle (**Figure 44, A**) extends through the circuit breaker accessory cover and can be damaged when removing the accessory cover.

Failure to follow these instructions can result in equipment damage.

Figure 44 – Spring Charging Handle

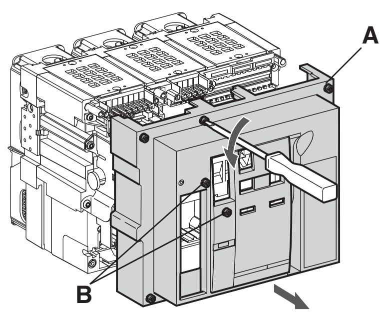


Loosen the accessory cover screws and remove the accessory cover (**Figure 45, A**).

NOTE: Screws (**B**) are for Type L, LF, L1, and L1F circuit breakers only.

Install accessory as instructed in the instructions packed with each accessory.

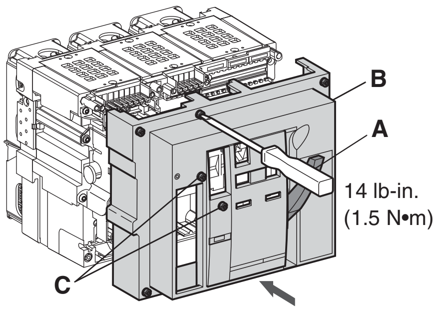
Figure 45 – Remove Accessory Cover



Replace the accessory cover by pulling the handle (**Figure 46, A**) forward and sliding the circuit breaker accessory cover (**B**) down over the handle. Tighten the accessory cover screws.

NOTE: Screws (**C**) are for Type L, LF, L1, and L1F circuit breakers only.

Figure 46 – Replace Accessory Cover

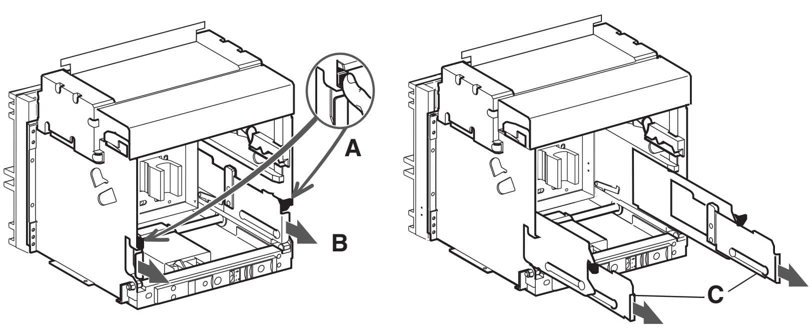


Install Circuit Breaker

> ## *NOTICE*
> **HAZARD OF EQUIPMENT DAMAGE**
>
> Cradle must be secured when installing or removing circuit breaker.
>
> **Failure to follow these instructions can result in equipment damage.**

1. Press the latching tabs (**Figure 47, A**), then pull out the extension rail handles (**B**) until the extension rails (**C**) are fully extended.
2. Inspect the circuit breaker clusters for missing or misaligned clusters. See page 11 for information on checking, installing, and lubricating clusters.

Figure 47 – Pull Out Rails



ENGLISH

NOTICE

HAZARD OF EQUIPMENT DAMAGE

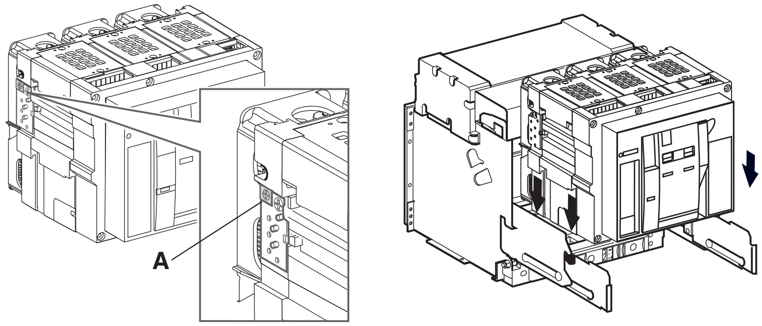
The shutter actuator must be installed on the circuit breaker for proper operation of cell shutters.

Failure to follow these instructions can result in equipment damage.

3. For cells with shutters, check that the shutter actuator (**Figure 48, A**) is installed on the circuit breaker.
4. Install the circuit breaker on the extension rails. See page 16 for proper lifting equipment.

   NOTE: The cradle must be secured on a pallet if it is not installed in the equipment prior to installing the circuit breaker.

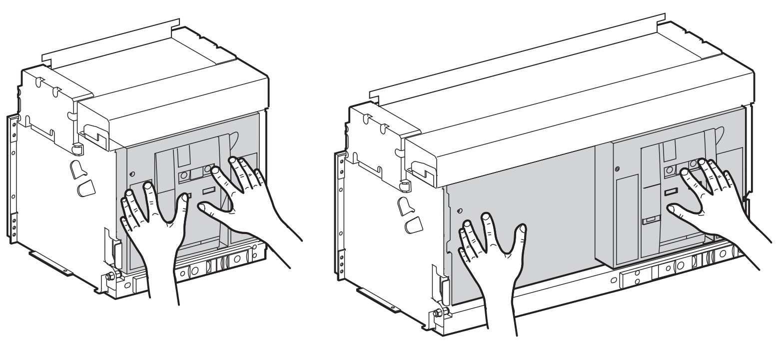
Figure 48 – Check Shutter Actuator



5. Push in the circuit breaker.
6. Connect the circuit breaker. See page 68, Drawout Circuit Breaker Connection for instructions on connecting the circuit breaker.

   See Section 6—Operation for instructions on operating the circuit breaker.

Figure 49 – Push In Circuit Breaker



Test Equipment Ground-Fault Protection

Paragraph 230-95(c) of the National Electrical Code requires that all equipment ground-fault protection systems be tested when first installed. If the circuit breaker has equipment ground-fault protection installed, test it at this time.

Make sure the trip unit is powered. The trip unit is powered if:

- The circuit breaker is closed or bottom-fed and has more than 100 V of load voltage on two phases (P or H trip unit only).
- The full-function or hand-held test kit is connected and on.
- A 24 Vdc external power supply is connected.
- An external voltage tap is installed and a voltage of more than 100 V is present on two phases (P or H trip unit only).

If this is a radial (single-ended) system, press the ground-fault push-to-test button (**Figure 50, A**). The circuit breaker will trip and the trip unit ground-fault indicator light will come on.

Record results in Table 10.

If a complete check of the ground-fault system is necessary, use primary injection testing. If the system has multiple sources and/or requires field connections at the job site, use primary injection testing.

Figure 50 – Test Ground-Fault Push-to-Test

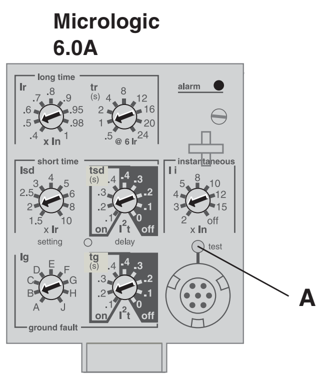


Table 10 – Ground-Fault Test Results

Date	Ground-Fault Settings	Test Results	Signature

ENGLISH

Circuit Breaker Removal

NOTICE

HAZARD OF EQUIPMENT DAMAGE

Cradle must be secured when installing or removing circuit breaker.

Failure to follow these instructions can result in equipment damage.

⚠ DANGER

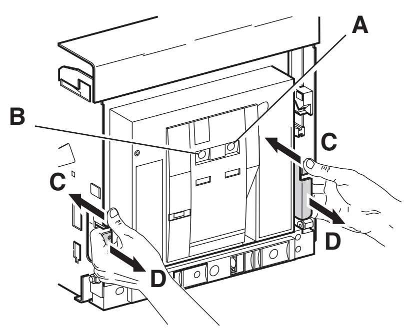
HAZARD OF DEVICE FALLING

- Be sure lifting equipment has lifting capacity for the unit being lifted. Follow manufacturer's instructions for use of lifting equipment.
- Wear hard hat, safety shoes and heavy gloves.

Failure to follow these instructions will result in death or serious injury.

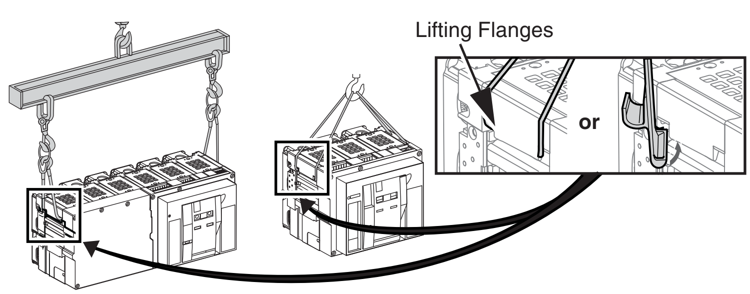
1. Disconnect circuit breaker as detailed on page 70, Drawout Circuit Breaker Disconnection.
2. With the circuit breaker in the disconnected position, press the "push ON" button (**Figure 51, A**) to close the circuit breaker.
3. Press the "push OFF" button (**B**) to open the circuit breaker.
4. Press latching tabs (**C**), then pull out extension rail handles (**D**).

Figure 51 – Circuit Breaker Removal



5. Remove circuit breaker from cradle rails using lifting flanges on sides of circuit breaker, see Section 2—Lifting and Transporting.

Figure 52 – Overhead Lifting



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Section 4— Fixed-Mounted Circuit Breaker Installation

Circuit Breaker Installation

Turn off all power supplying this equipment before working on or inside equipment.

Install Accessories

Install circuit breaker accessories not purchased as factory installed at this time.

If installing electrical accessories, remove accessory cover.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

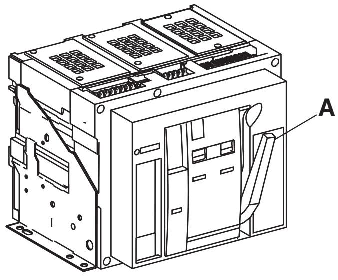
NOTICE

HAZARD OF EQUIPMENT DAMAGE

Use caution when removing or replacing the circuit breaker accessory cover. The spring-charging handle (**Figure 53, A**) extends through the circuit breaker accessory cover and can be damaged when removing the accessory cover.

Failure to follow these instructions can result in equipment damage.

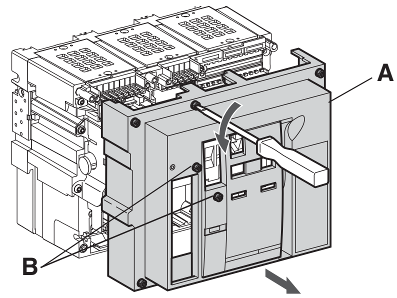
Figure 53 – Spring Charging Handle



1. Loosen the accessory cover screws and remove the accessory cover (**Figure 54, A**).

   NOTE: Screws (**B**) are for Type L and L1 circuit breakers only.
2. Install accessories as instructed in the instructions packed with each accessory.

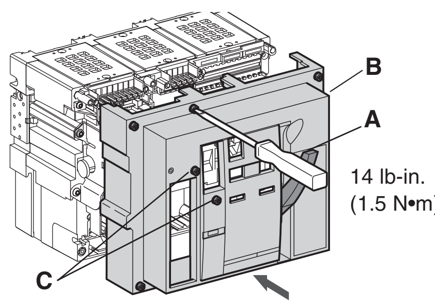
Figure 54 – Remove Accessory Cover



3. Replace the accessory cover by pulling the handle (**Figure 55, A**) forward and sliding the circuit breaker accessory cover (**B**) down over the handle. Tighten the accessory cover screws.

   NOTE: Screws (**C**) are for Type L and L1 circuit breakers only.

Figure 55 – Replace Accessory Cover



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Clearance Requirements

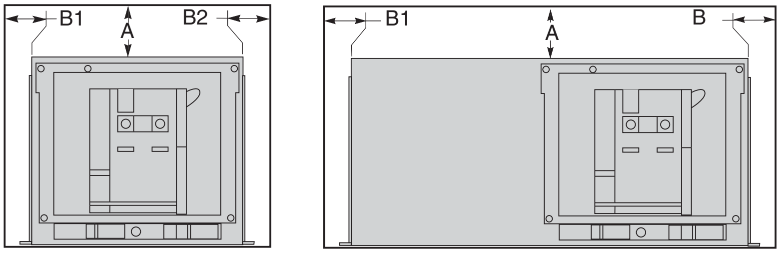
⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Clearance requirements must be met for proper operation of the equipment.

Failure to follow these instructions will result in death or serious injury.

Table 11 – Clearance Requirements



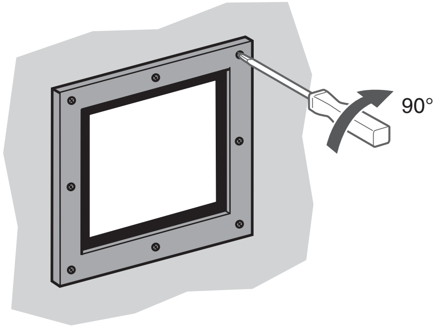
Minimum Clearance	A		B1 + B2	
	in.	mm	in.	mm
Insulated Parts	5.91	150	2.36	60
Metal Parts	5.91	150	5.72	120

Install Door Escutcheon

If the equipment has a door cutout, install the escutcheon shipped with circuit breaker.

1. If not already present, cut an opening in the equipment door for the escutcheon. For the opening dimensions, refer to bulletin 0613IB1205 on the Schneider Electric™ website (for website information see page 5).
2. Install the escutcheon.

Figure 56 – Install Door Escutcheon



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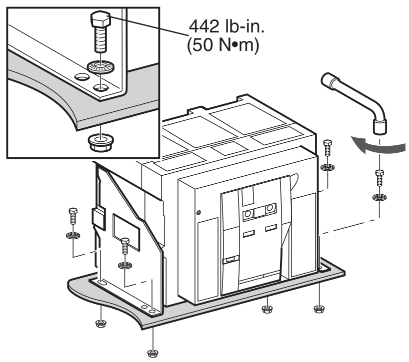
Install Circuit Breaker

1. If mounting holes are not already present, drill the mounting holes in the pan for mounting the circuit breaker. For circuit breaker mounting hole pattern dimensions, refer to bulletin 0613IB1205 on the Schneider Electric website (for website information see page 5).
2. Check flatness of the mounting surface. Mounting surface must be flat to within 0.08 in. (2 mm).
3. Mount the circuit breaker to pan, using 3/8 in. bolts, washers, and nuts.

NOTE: Vertical mounting brackets are available, if needed.

Figure 57 – Secure Circuit Breaker



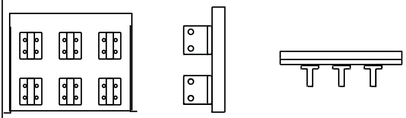
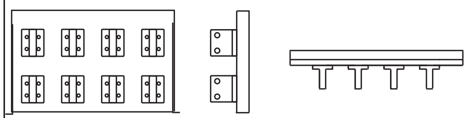
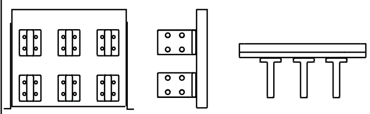
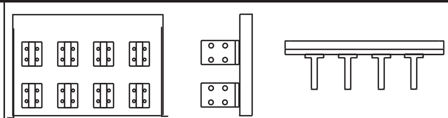
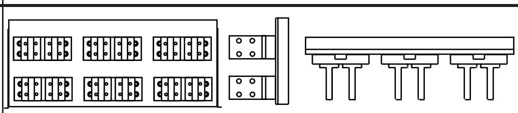
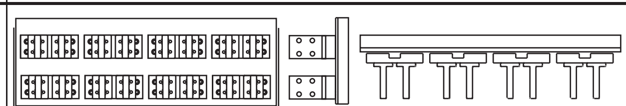
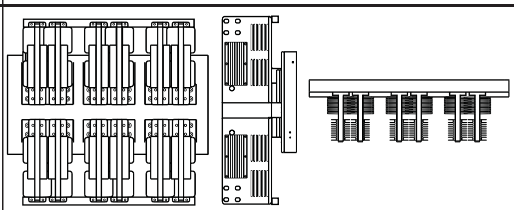
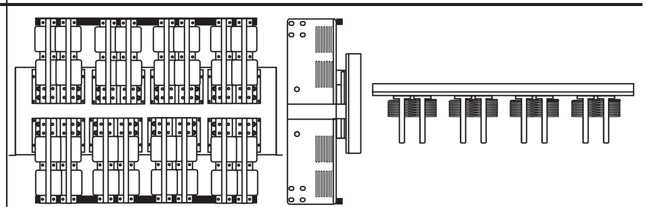
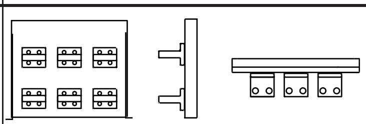
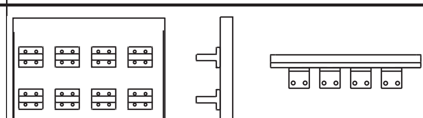
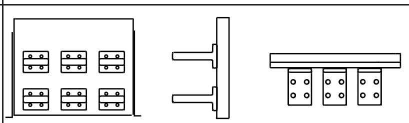
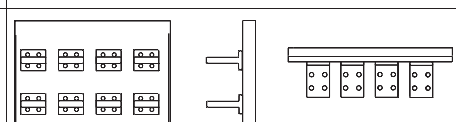
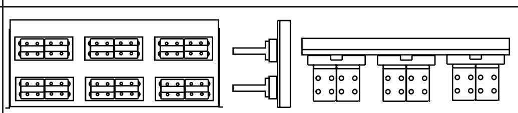
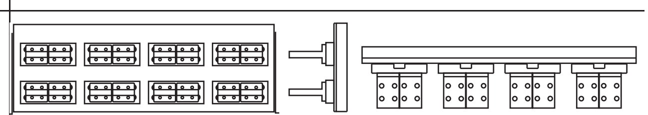
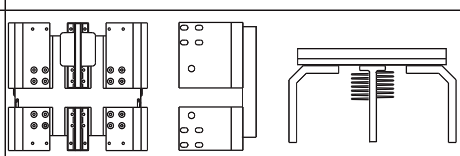
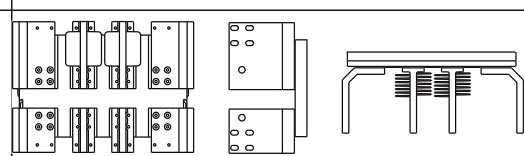
Install Connectors

Standard connectors are shown in Table 12. Tighten the mounting screws to 142–159 lb-in. (16–18 N•m).

For information on non-standard connectors, contact the field office.

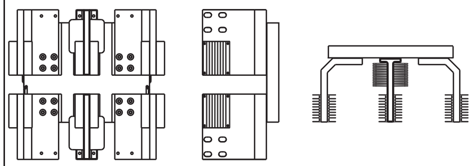
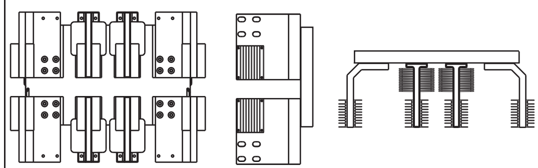
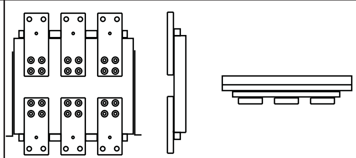
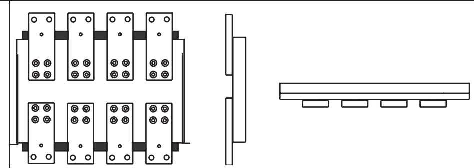
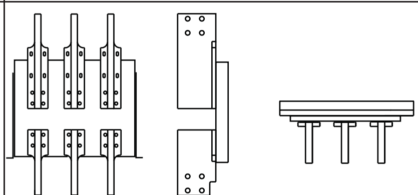
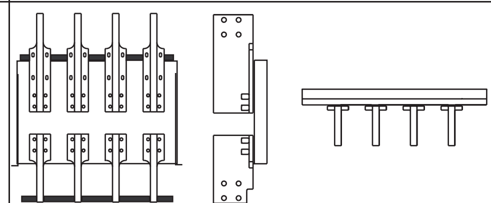
For connector dimensions, refer to bulletin 0613IB1205 on the Schneider Electric website (for website information see page 5).

Table 12 – Standard Connectors

Type	Rating	3-Pole Layout Front – Side – Top	4-Pole Layout Front – Side – Top
Rear-Connected "T" Vertical (RCTV)	800–2000 A		
	2500–3000 A		
	4000–5000 A		
	6000 A		
Rear-Connected "T" Horizontal (RCTH)	800–2000 A		
	2500–3000 A		
	4000–5000 A		
Rear-Connected Offset Vertical (RCOV)	3200 A		

Continued on next page

Table 12 – Standard Connectors *(continued)*

Type	Rating	3-Pole Layout Front – Side – Top	4-Pole Layout Front – Side – Top
Rear-Connected Offset Vertical (RCOV Special)	4000 A W-frame		
Front-Connected Flat (FCF)	800–2000 A		
Front-Connected “T” (FCT)	800–3000 A		

Install Bussing

NOTICE

HAZARD OF EQUIPMENT DAMAGE

The busbar supports must be placed to support the weight of the bussing system and to withstand magnetic forces caused by short-circuit currents. See **Figure 58, A**.

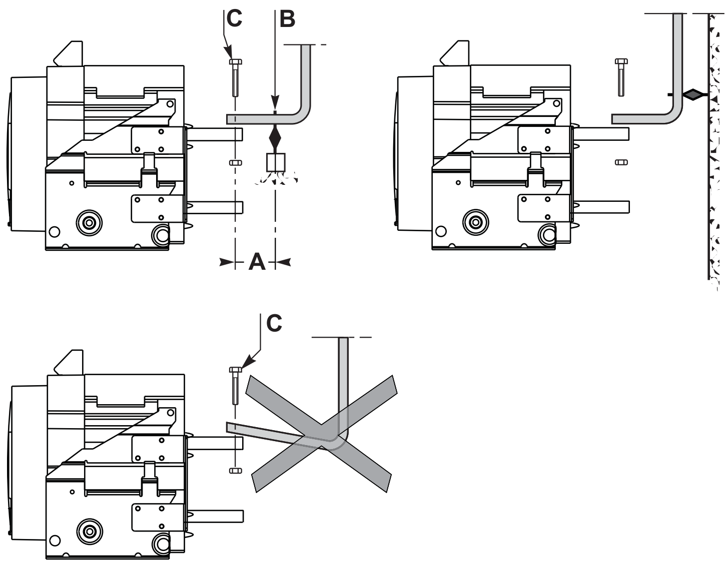
Failure to follow these instructions can result in equipment damage.

NOTE: Installer is responsible for bussing to connectors.

- Bus supports must be braced (**Figure 58, B**) to prevent short circuit forces from deflecting the connectors. The busbar supports (**A**) must be placed to support the weight of the bussing system and to withstand magnetic forces caused by short-circuit currents.
- Busbars should be adjusted to ensure that the connection points are correctly positioned before the bolts (**C**) are inserted. Bussing must be supported by framework of the switchgear, with no weight on connectors.

Bussing requirements by circuit breaker and connector are shown in Table 13.

Figure 58 – Busbar Connections



NOTE: The installer is responsible for bussing to connectors. Bussing must be supported by framework of the switchgear, with no weight on the connectors. Bus supports must be braced to prevent short circuit forces from deflecting the connectors.

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Table 13 – Bus Size Required

Circuit Breaker		Complies with	Connectors	Bus Per Connector	
Rating	Type			Number	Size
800–1200 A	N/N1/H/H1/H2/H3	ANSI C37.50 UL 489	RCTH, RCTV, FCF, FCT	1	0.25 x 3 in. (6 x 76 mm)
1600 A	N/N1/H/H1/H2/H3	ANSI C37.50 UL 489	RCTH, RCTV, FCF, FCT	2	0.25 x 3 in. (6 x 76 mm)
2000 A	N/N1/H/H1/H2/H3	ANSI 37.50 UL 489	RCTH	3	0.25 x 3 in. (6 x 76 mm)
			RCTV, FCT	2	0.25 x 4 in. (6 x 102 mm)
			FCF	3	0.25 x 3 in. (6 x 76 mm)
2500 A	H	UL 489	RCTH	5	0.25 x 3 in. (6 x 76 mm)
			RCTV, FCT	2	0.25 x 5 in. (6 x 127 mm)
3000 A	H	UL 489	RCTH	8	0.25 x 3 in. (6 x 76 mm)
	H		RCTV, FCT	4	0.25 x 4 in. (6 x 102 mm)
3200 A	H1/H2/H3	ANSI 37.50	RCOV	3	0.25 x 5 in. (6 x 127 mm)
4000 A (W-Frame)	H1/H2/H3	ANSI 37.50	RCOV (Special)	4	0.25 x 5 in. (6 x 127 mm)
4000 A	H/H2/H3	ANSI 37.50 UL 489	RCTH	4	0.25 x 6 in. (6 x 152 mm)
			RCTV, FCT	4	0.25 x 5 in. (6 x 127 mm)
		ANSI 37.50	FCF	4	0.25 x 6 in. (6 x 152 mm)
		UL 489	FCF	5	0.25 x 6 in. (6 x 152 mm)
5000 A	H/H2/H3	ANSI 37.50 UL 489	RCTH	8	0.25 x 6 in. (6 x 152 mm)
			RCTV, FCT	6	0.25 x 5 in. (6 x 127 mm)
6000 A	H	UL 489	RCTV	6	0.25 x 6 in. (6 x 152 mm)

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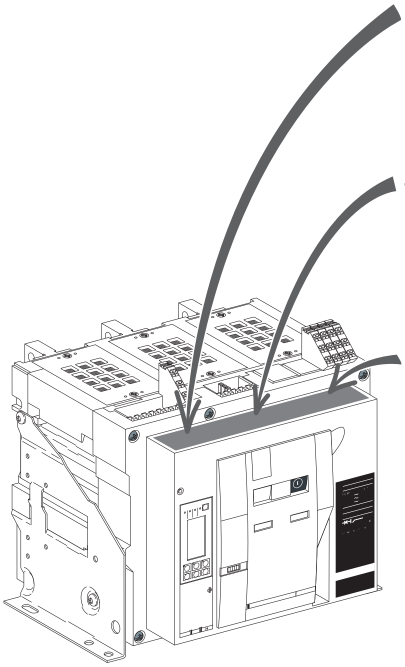
Accessory Connections Using Push-In Connectors

Table 14 – Terminal Layout for Push-In Connector Installation

Com		UC1		UC2		UC3	UC4	M2C/M6C	SDE2/RES	SDE1
E5	E6	Z5	M1	M2	M3	F2 +	V3	484/Q3	184/K2	84
E3	E4	Z3	Z4	T3	T4	VN	V2	474/Q2	182	82
E1	E2	Z1	Z2	T1	T2	F1 -	V1	471/Q1	181/K1	81

MN/MX2	MX1	XF	PF	MCH
D2/C12	C2	A2	254	B2
C13	C3	A3	252	B3
D1/C11	C1	A1	251	B1

OF24	OF23	OF22	OF21	OF14	OF13	OF12	OF11	OF4	OF3	OF2	OF1
244	234	224	214	144	134	124	114	44	34	24	14
242	232	222	212	142	132	122	112	42	32	22	12
241	231	221	211	141	131	121	111	41	31	21	11



Function	Connector	Description
Auxiliary Contacts	OF[1]	Open/Closed Circuit Breaker or Circuit Breaker Position Contacts
	EF	Combined Connected and Closed Contact
Remote Operation	SDE	Electrical Fault Alarm Contact
	RES	Remote Reset
	MN	Undervoltage Trip Device
	MX[2]	Shunt Trip
	XF[2]	Shunt Close
	PF	Ready-to-Close Contact
	MCH	Spring-Charging Motor

[1] OF1, OF2, OF3 and OF4 contacts are standard.
[2] When communicating MX1 or XF coils are used, terminal (C3 or A3) must be connected to line even if the communication module is not installed. The bypass circuit through terminal C2/A2 is only momentary duty (0.5 sec). For continuous duty, use the communications command.

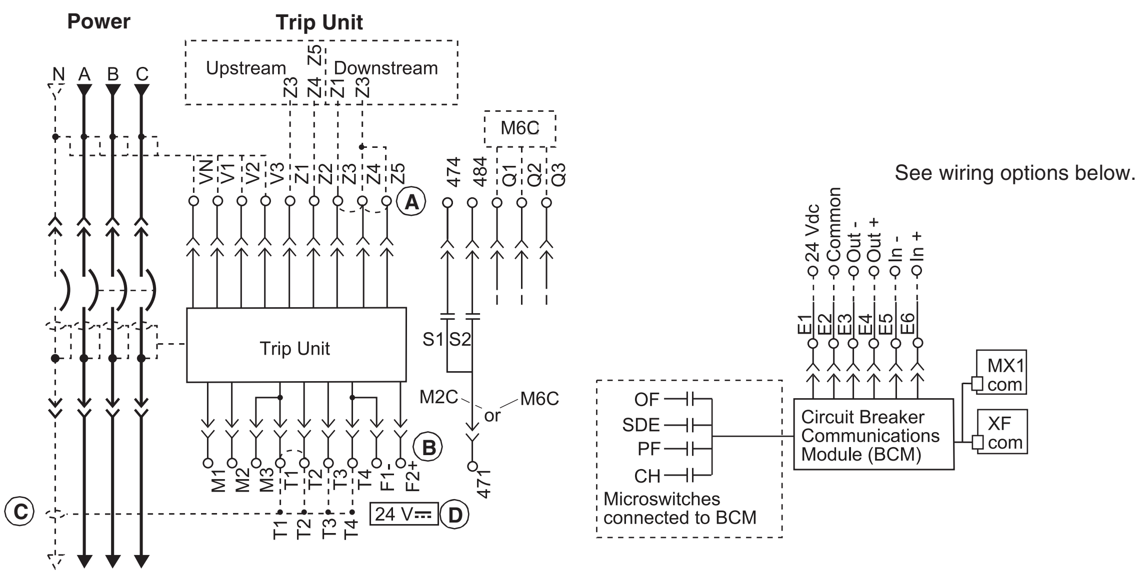
Trip Unit Type					
Basic	A	P	H	Connector	Description
–	•	•	•	Com: E1–E6	Communication
–	•	•	•	UC1: Z	Zone-Selective Interlocking
					Z1 = ZSI OUT Signal
					Z2 = ZSI OUT
					Z3 = ZSI IN Signal
					Z4 = ZSI IN Short Time
					Z5 = ZSI IN Ground Fault
–	•	•	•	UC1: M1	Modified Differential Ground Fault (MDGF)
–	•	•	•	UC2: T	External Neutral
–	•	•	•	UC2: M	Modified Differential Ground Fault (MDGF)
–	•	•	•	UC3: F	24 Vdc External Power Supply
–	–	•	•	UC3: Vn	External Neutral Plug
–	–	•	•	UC4	External Phase Voltage Sensing
–	–	•	•	M2C/M6C	Two Programmable Contacts (internal relay) or Six Programmable Contacts (for connection to external M6C module)

ENGLISH

Wiring Diagrams for Auxiliary Connections

NOTE: All diagrams are showing circuit breaker open, connected and charged.

Figure 59 – Wiring Diagrams for Auxiliary Connections



A—Do not remove factory-installed jumpers between Z3, Z4 and Z5 unless ZSI is connected.
B—Do not remove factory-installed jumper between T1 and T2 unless neutral CT is connected. Do not install jumper between T3 and T4.
C—For proper wiring of neutral CT, refer to wiring schematics on page 61.
D—24 Vdc power supply for trip unit must be separate and isolated from 24 Vdc power supply for communication modules.

Wiring of the COM Option (Modbus BCM with or without ULP Module)

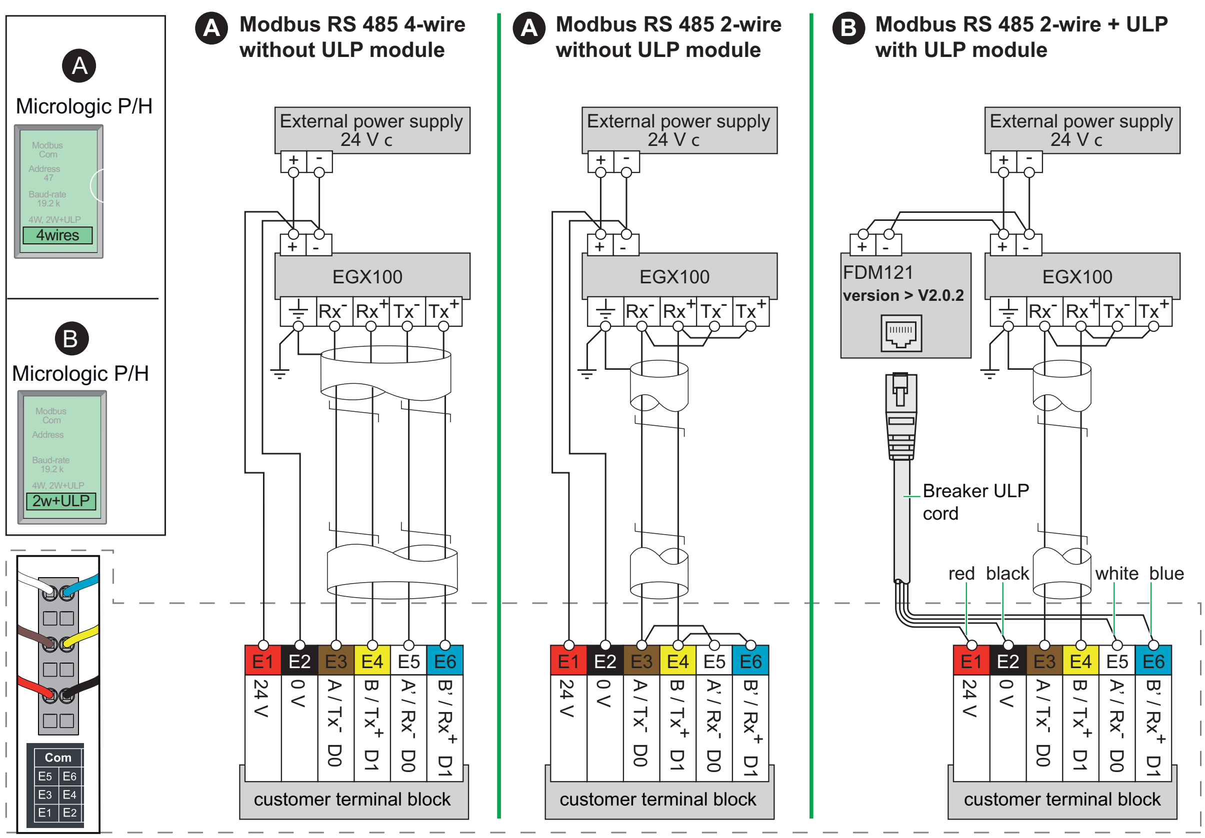


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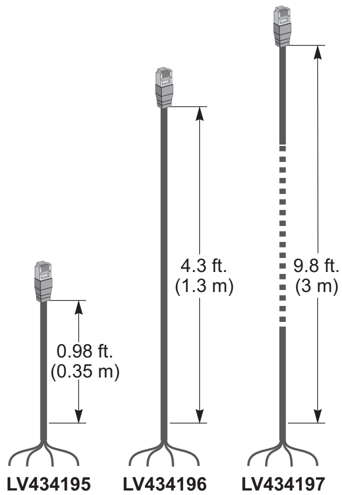
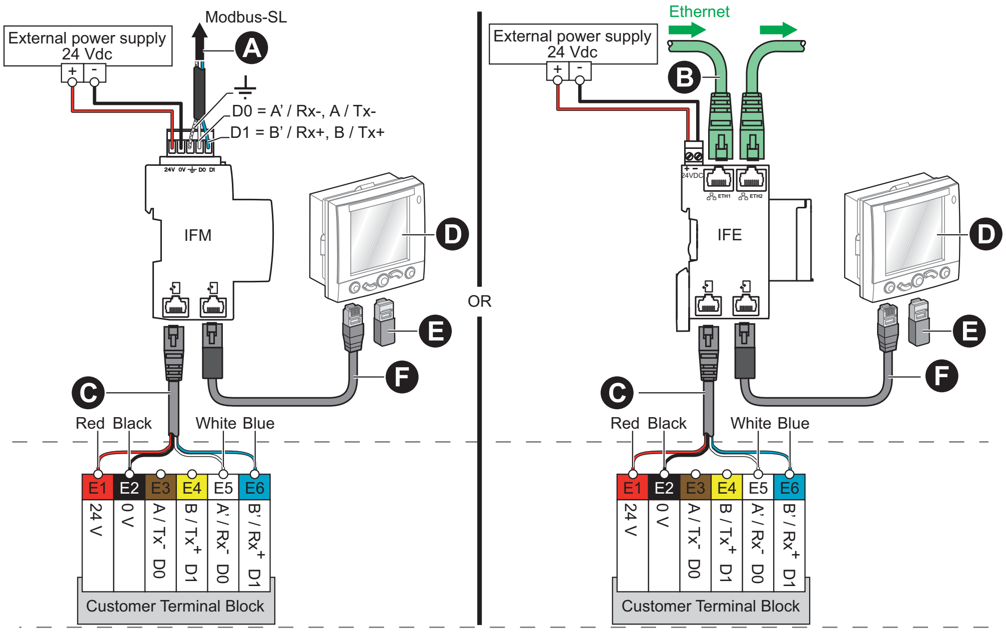
Figure 59 – Wiring Diagrams for Auxiliary Connections *(continued)*

Communication Components and FDM121 Connections



Circuit Breaker ULP Cord



A. Modbus Network
B. Ethernet Network
C. Circuit Breaker ULP Cord
D. FDM Display
E. ULP Termination
F. ULP Cable

Connections

Masterpact circuit breaker is connected to the ULP devices (FDM121 display, IFM, IFE or IO unit) via the circuit breaker ULP cord.

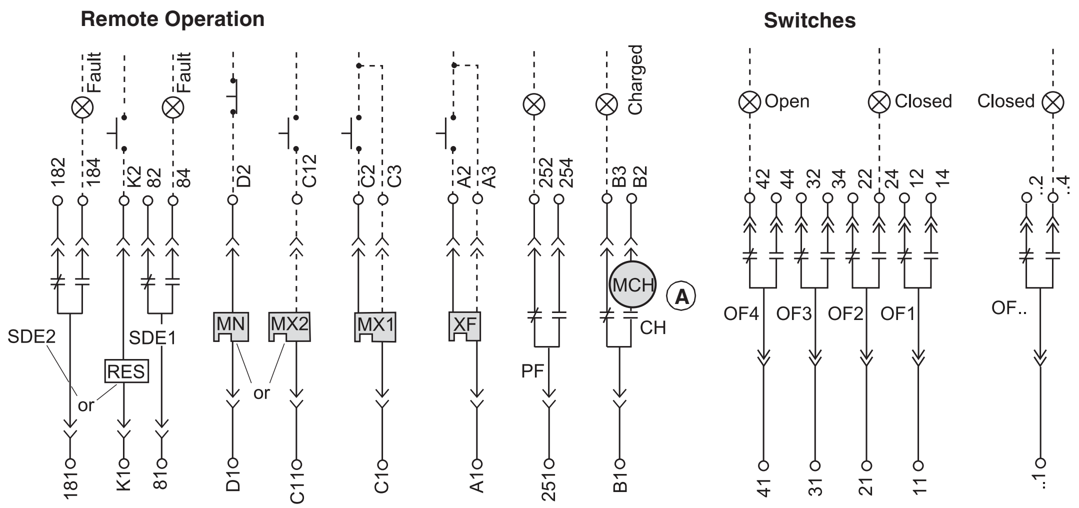
- Cord is available in three lengths: 0.98 ft. (0.35 m), 4.3 ft. (1.3 m) and 9.8 ft. (3 m).
- Lengths up to 32.9 ft. (10 m) are possible using extensions.

Markings for Push-In Type Terminals

Trip Unit							
COM	**UC1**	**UC2**	**UC3**	**UC4**	**M2C/M6C**	**SDE2/Res.**	**SDE1**
E5 E6	Z5 M1	M2 M3	F2+	V3	484/Q3	184/K2	84
E3 E4	Z3 Z4	T3 T4	VN	V2	474/Q2	182	82
E1 E2	Z1 Z2	T1 T2	F1–	V1	471/Q1	181/K1	81

NOTE: All diagrams are showing circuit breaker open, connected and charged.

Figure 60 – Wiring Diagrams for Auxiliary Connections



A—When remote operation features are used, make sure there is a minimum of four seconds for the spring charging motor (MCH) to completely charge the circuit breaker closing springs prior to actuating the shunt close (XF) device.

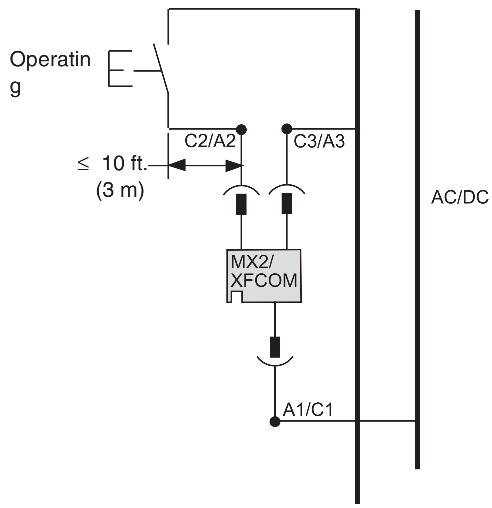
Markings for Push-In Type Terminals

Remote Operation					Auxiliary Switches											
MN/MX2	MX1	XF	PF	MCH	OF24	OF23	OF22	OF21	OF14	OF13	OF12	OF11	OF4	OF3	OF2	OF1
D2/C12	C2	A2	254	B2	244	234	224	214	144	134	124	114	44	34	24	14
C13	C3	A3	252	B3	242	232	222	212	142	132	122	112	42	32	22	12
D1/C11	C1	A1	251	B1	241	231	221	211	141	131	121	111	41	31	21	11

Communicating Shunt Trip (MX) and Shunt Close (XF)

A recommended wiring schematic for the communicating style shunt trip or shunt close coils is shown in Figure 61. Induced voltages in the circuit at terminal C2 and/or A2 can cause the shunt trip or shunt close to not work properly. The best way to prevent the induced voltages is keep the circuit to terminal C2 and A2 as short as possible. If it is impossible to keep the circuit less than ten feet (three meters), use an interposing relay near terminal C2 or A2.

Figure 61 – Communicating Wiring Schematic

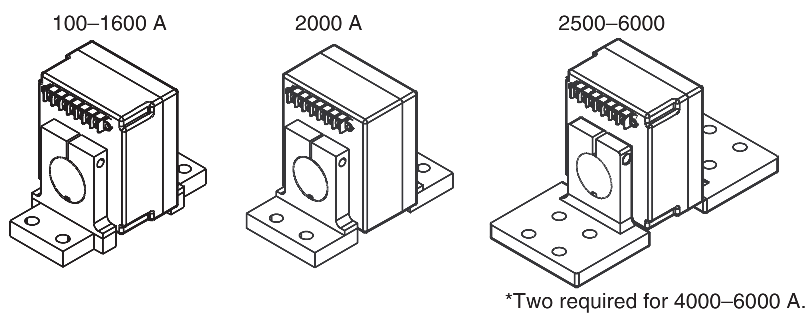


Ground-Fault Protection for Equipment

If the circuit breaker does not have integral ground-fault tripping or alarm, skip this subsection.

A three-phase, four-wire circuit requires an external neutral current transformer (CT). Connect the neutral CT to the circuit breaker according to the wiring diagrams in Figures 63 and 64.

Figure 62 – Neutral Current Transformers



1. Connect the primary:
   - — If load is connected to the lower end of the circuit breaker, connect the load neutral to the H1 terminal of neutral CT.
   - — If the source power is connected to the lower end of the circuit breaker, connect the source neutral to the H1 terminal of the neutral CT.

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NOTE: The equipment grounding connection must be upstream (line side) of the neutral CT and a neutral connection must exist from the supply transformer to the equipment.

2. For circuit breakers using Micrologic™ 5.0P, 5.0H, 6.0P, or 6.0H trip units, connect terminal Vn on the neutral current transformer to the Vn terminal of the control wiring terminal. (This is necessary to allow the trip unit to make voltage measurements.) Terminals Vc and Vn are internally connected.

CAUTION

HAZARD OF IMPROPER TRIP SYSTEM OPERATION

F1 and F2 must be isolated from ground. Verify all wiring per the instructions in this bulletin.

Failure to follow these instructions can result in a nuisance trip during closing.

3. Remove the factory-installed jumper connecting T1 and T2.
4. Feed Belden cable from the neutral CT to the cradle terminals.
5. Connect the cable per the appropriate schematic in Figure 63 or 64.
6. Verify all wiring.

NOTE: Modified differential ground-fault circuitry and ground-source return ground-fault circuitry require the use of a modified differential ground-fault module (MDGF) and special current transformers. For wiring of those systems, see the instructions with the MDGF.

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Figure 63 – Wiring Schematic for 800–4000 A Standard-Width NW Circuit Breakers

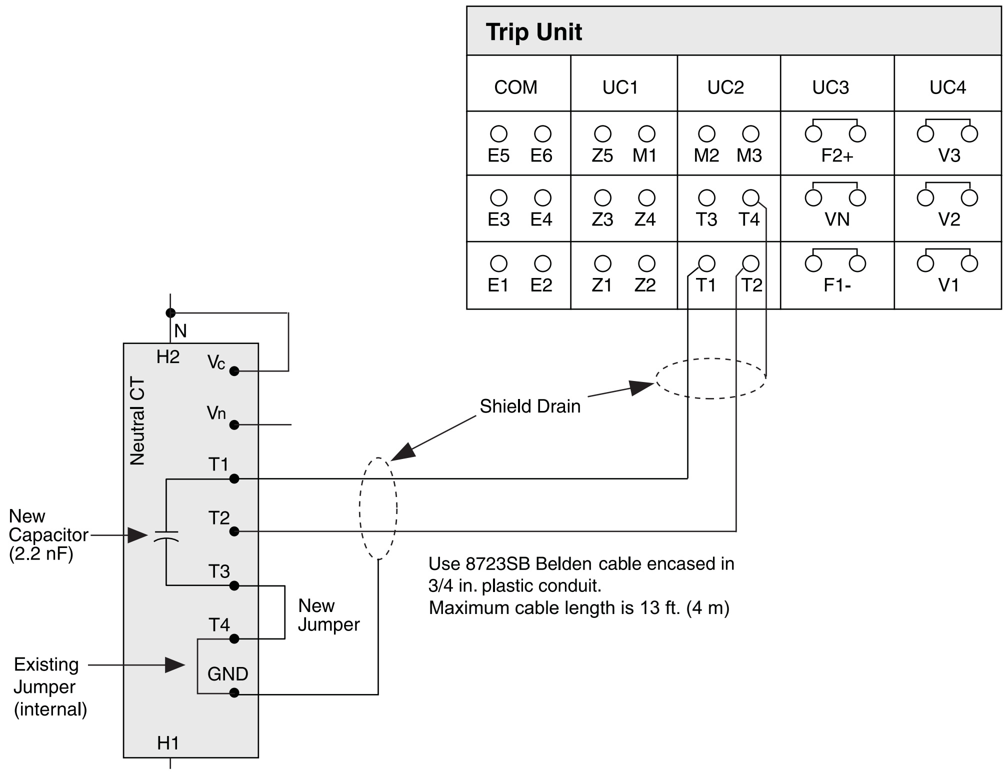
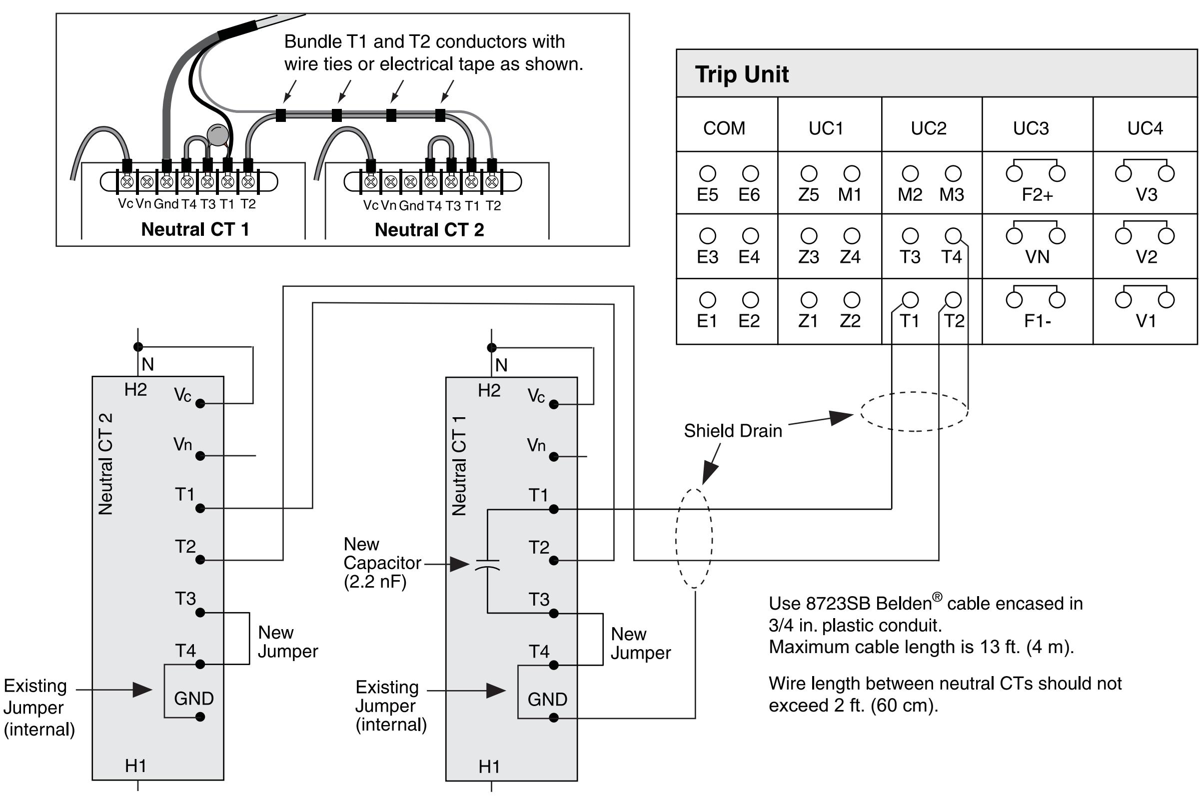


Figure 64 – Wiring Schematic for 3200–6000 A Wide-Construction NW Circuit Breakers



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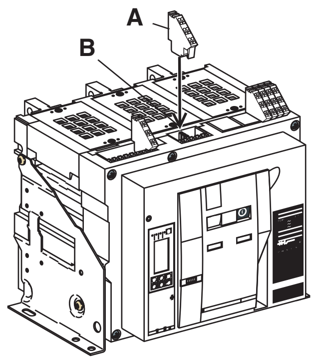
Accessory Wiring

1. Install push-in connector (**Figure 65, A**) in the correct slot (**B**). Connector positions are shown on label next to connector slots.

Figure 65 – Install Push-In Connector

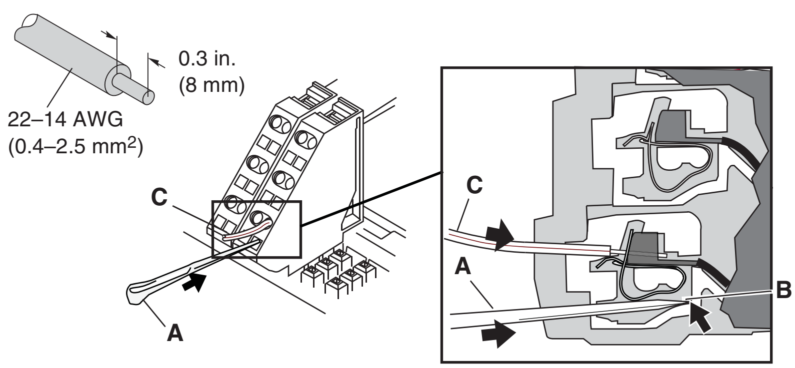


2. Push a Wago wire insert tool (**Figure 66, A**, Wago part no. 209-129) fully into the connector (to point **B**) and install the control wires (**C**).

NOTE: Remove a push-in connector in reverse order of installation.

See Section 6—Operation for instructions on operating circuit breaker.

Figure 66 – Install Control Wires



Test Equipment Ground-Fault Protection

Paragraph 230-95(c) of the National Electrical Code requires that all equipment ground-fault protection systems be tested when first installed. If the circuit breaker has equipment ground-fault protection installed, test it at this time.

Make sure the trip unit is powered. The trip unit is powered if:

- The circuit breaker is closed or bottom-fed and has more than 100 V of load voltage on two phases (P or H trip unit only).
- A full-function or hand-held test kit is connected and on.
- A 24 Vdc external power supply is connected.
- An external voltage tap is installed and voltage of more than 100 V is present on two phases (P or H trip unit only).

If this is a radial (single-ended) system, press the ground-fault push-to-test button (**Figure 67, A**). The circuit breaker will trip and the trip unit ground-fault indicator light will come on.

Record results in Table 15.

If a complete check of the ground-fault system is necessary, use primary injection testing. If the system has multiple sources and/or requires field connections at the job site, use primary injection testing.

Figure 67 – Test Ground-Fault Push-to-Test

Micrologic 6.0A Trip Unit

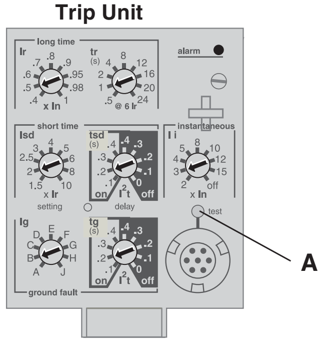


Table 15 – Ground-Fault Test Results

Date	Ground-Fault Settings	Test Results	Signature

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Circuit Breaker Removal

1. Turn off all power supplying this equipment before working on or inside equipment.
2. Remove the circuit breaker in reverse order of installation. Use lifting methods as detailed in Section 2—Lifting and Transporting.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

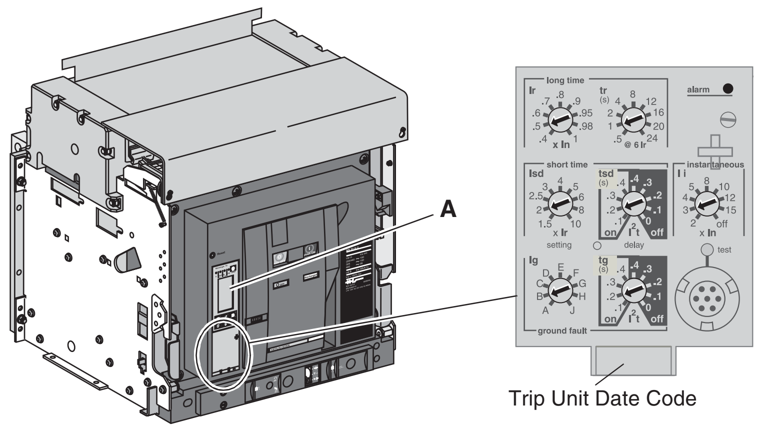
Section 5— Trip Unit

Protective functions, measurement functions, and communications are controlled by the Micrologic™ trip unit (**Figure 68, A**) installed in the circuit breaker. The trip unit is field replaceable for easy upgrading of functionality.

For complete information on the trip unit, its functions, and field replacement, see the trip unit user guide available from the Schneider Electric™ website.

For complete information on which trip units are available and their capabilities, see catalog 0613CT1001, *Masterpact NT and NW Universal Power Circuit Breakers* on the Schneider Electric website (for website information see page 5).

Figure 68 – Micrologic Trip Unit



Section 6— Operation

Drawout Circuit Breaker Status

⚠ DANGER

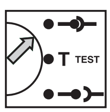
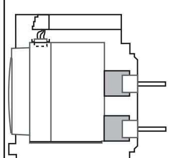
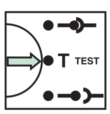
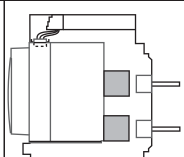
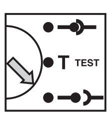
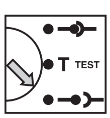
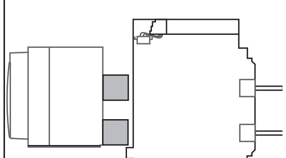
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.

Failure to follow these instructions will result in death or serious injury.

Connection or disconnection of the drawout circuit breaker requires insertion of the racking handle (while pressing the “Push to open” button). If interlocks, padlocks, or an open door lock are in place, the racking handle cannot be inserted.

Table 16 – Drawout Circuit Breaker Positions

Position Indicator	Connector Position (Cluster shield not shown)	Connectors		Circuit Breaker Status
		Clusters	Secondary (Control)	
Connected 		Engaged	Engaged	Can be operated. Ready for service.
Test 		Disengaged	Engaged	Can be operated. Can have operation and control systems tested.
Disconnected 		Disengaged	Disengaged	Can be operated. Can be removed from carriage.
Withdrawn 		Disengaged	Disengaged	Removed from carriage.

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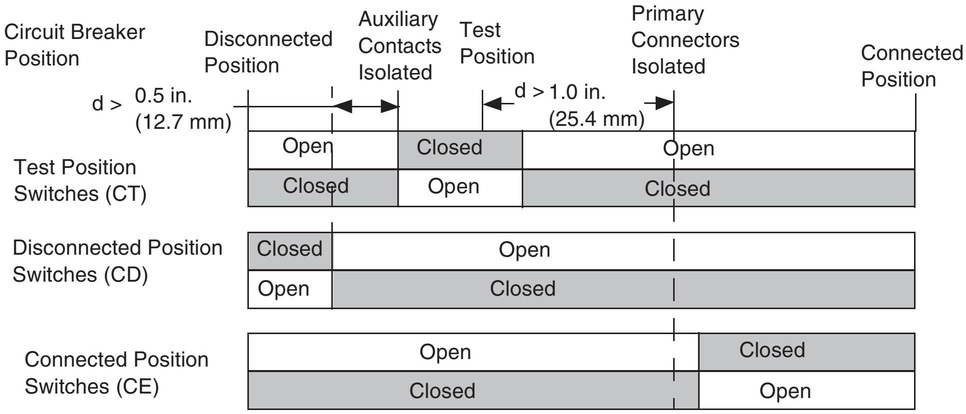
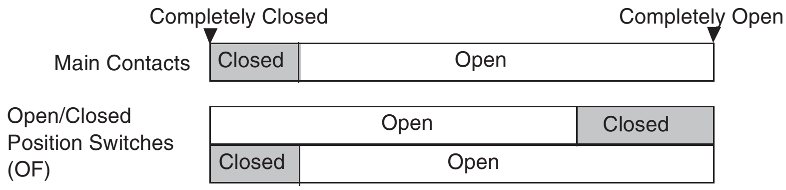
As the circuit breaker position changes, the position contacts change states.

Figure 69 – Device Position Operation



As the circuit breaker main contacts operate, the auxiliary contacts change positions.

Figure 70 – Device Contact Operation



Drawout Circuit Breaker Connection

NOTICE

HAZARD OF EQUIPMENT DAMAGE

- Use the racking handle provided to rack the circuit breaker into or out of the cradle.
- Do not use power tools for racking.
- Do not continue to turn handle after stop release button has popped out.

Failure to follow these instructions can result in equipment damage.

⚠ DANGER

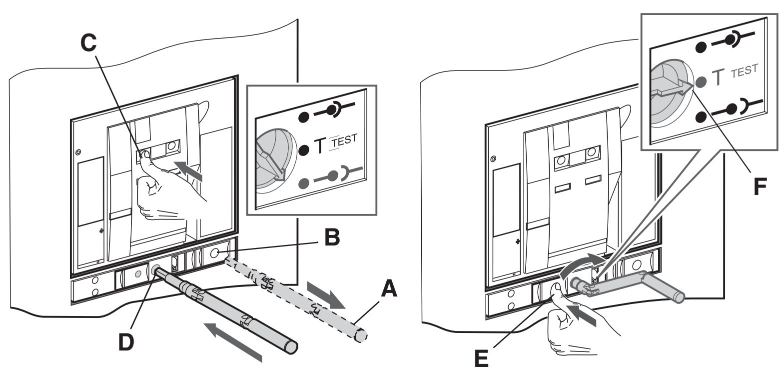
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.

Failure to follow these instructions will result in death or serious injury.

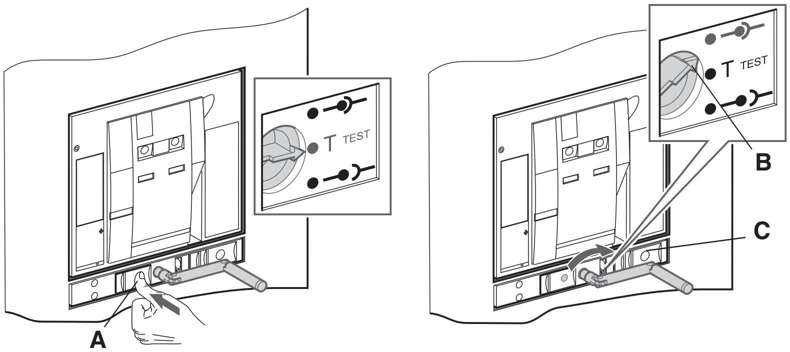
1. Disconnect the load from the secondary disconnects.
2. Remove the racking handle (**Figure 71, A**) from its storage hole (**B**).
3. While pressing the "Push to open" button (**C**), insert the racking handle in the racking slot (**D**).
4. Push the stop release button (**E**).
5. Turn the racking handle clockwise until the test position (**F**) is reached. The stop release button will pop out.

Figure 71 – Rack Circuit Breaker to Test Position



6. Push the stop release button (**Figure 72, A**).
7. Turn the racking handle clockwise until the connected position (**B**) is reached. The stop release button will pop out. Replace the racking handle in its storage hole (**C**).
8. Reconnect the load to the secondary disconnects.

Figure 72 – Rack Circuit Breaker to Connected Position



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Drawout Circuit Breaker Disconnection

NOTICE

HAZARD OF EQUIPMENT DAMAGE

- Use the racking handle provided to rack the circuit breaker into or out of the cradle.
- Do not use power tools for racking.
- Do not continue to turn handle after stop release button has popped out.

Failure to follow these instructions can result in equipment damage.

⚠ DANGER

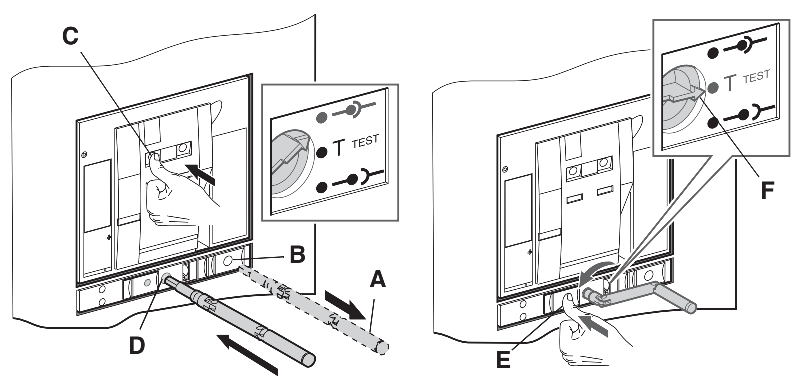
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.

Failure to follow these instructions will result in death or serious injury.

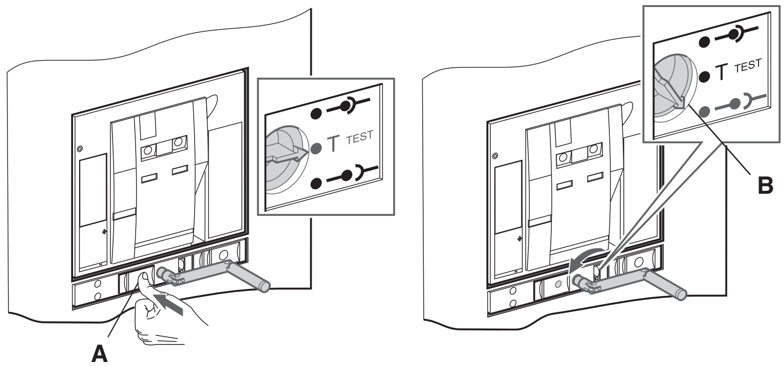
1. Remove the load from the secondary disconnects.
2. Remove the racking handle (**Figure 73, A**) from its storage hole (**B**).
3. While pressing the “Push to open” button (**C**), insert the racking handle in the racking slot (**D**).
4. Push the stop release button (**E**). Turn the racking handle counterclockwise until the test position (**F**) is reached. The stop release button will pop out.

Figure 73 – Rack Circuit Breaker to Test Position



5. Push the stop release button (**Figure 74, A**).
6. Turn the racking handle counterclockwise until the disconnected position (**B**) is reached. The stop release button will pop out. Replace the racking handle in its storage hole.
7. Reconnect the load to the secondary disconnects.

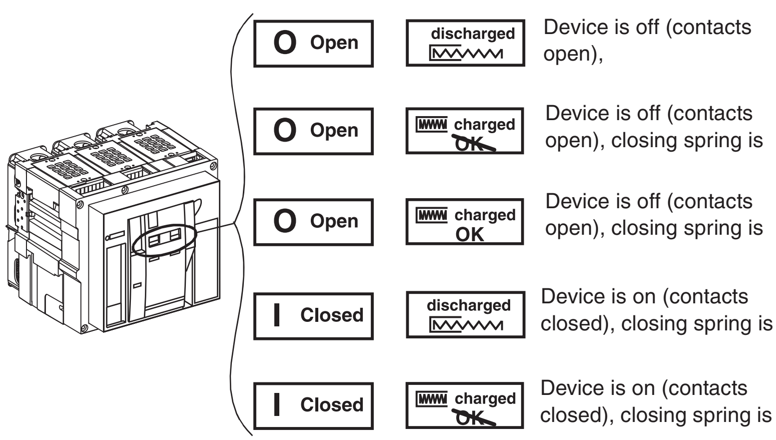
Figure 74 – Rack Circuit Breaker to Disconnected Position



Circuit Breaker Operation

The circuit breaker is closed by means of a two-step stored energy mechanism. Status indicators on the front of the circuit breaker indicate whether the circuit breaker is open or closed, and whether the closing spring is charged or discharged. The opening springs are automatically charged when the circuit breaker closes.

Figure 75 – Status Indicators



1 Not OK to turn on will be shown if:
Shunt trip is energized
Circuit breaker is not connected, test, disconnected or withdrawn position
Undervoltage trip is not energized

Anti-Pumping Function

The Masterpact circuit breaker is designed to mechanically provide an anti-pumping function. If either the shunt close or shunt trip coil is continuously powered, or both are powered at the same time, the circuit breaker will open and cannot be closed until the power has been removed. This prevents the circuit breaker from cycling between closing and opening (called pumping).

ENGLISH

When remote operation features are used, make sure there is a minimum of four seconds for the spring charging motor (MCH) to completely charge the circuit breaker closing springs prior to actuating the shunt close (XF) coil. The ready-to-close switch (PF) can be series connected with the shunt close (XF) coil to prevent premature closing.

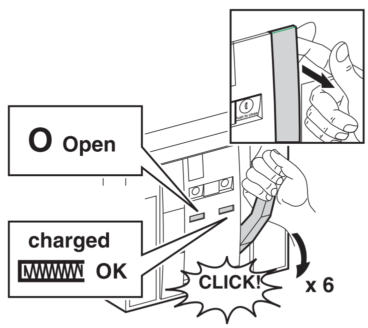
Charging the Closing Spring

To close the circuit breaker, the closing spring must be charged with sufficient energy for closing.

- Manual Charge: Use the charging handle to charge the closing spring.
- Automatic Charge: If the optional MCH spring-charging motor is installed, the spring is automatically charged after closing.

NOTE: The closing spring on the drawout circuit breaker will automatically discharge when the circuit breaker is moved from the disconnect to the withdrawn position.

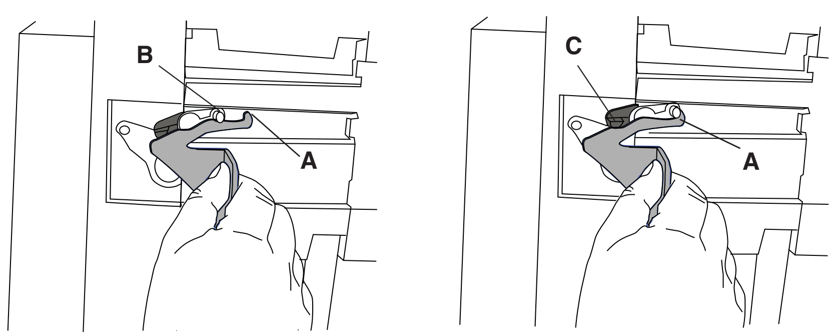
Figure 76 – Manual Spring Charge



NOTE: To close a drawout circuit breaker when it is not installed in the cradle, the cradle interlock must be defeated before the circuit breaker charging spring can be charged. A cradle interlock defeat tool is shipped with every circuit breaker. To install:

1. Slide the interlock defeat tool (**Figure 77, A**) into the groove under the interlock lever (**B**) on the right side of the circuit breaker.
2. Slide the tool toward the front of the circuit breaker and lock it in place under the cradle interlock shaft (**C**).

Figure 77 – Defeating Cradle Interlock



Close Circuit Breaker

To close the circuit breaker, the following conditions must be met:

- The device is open (O).
- The charging spring is charged.
- “OK” is displayed.

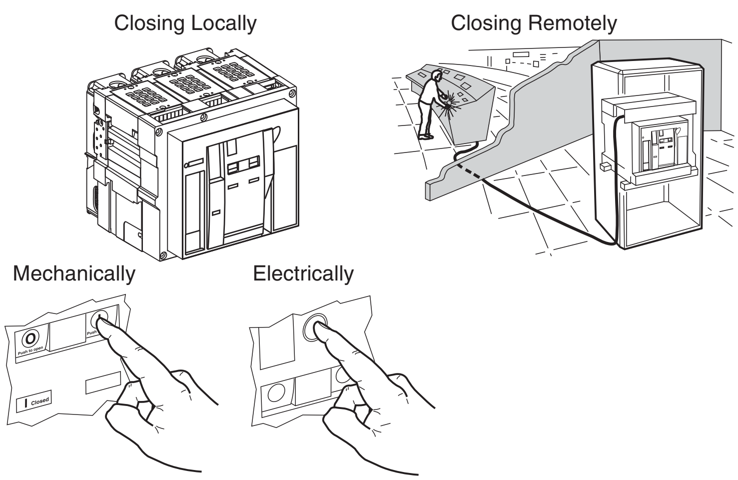
NOTE: The circuit breaker cannot be closed while an opening order is being received. If the “not OK” symbol is displayed, an order to open is being received (electrically or manually) and must be ended before the “OK” will be displayed.

If the above conditions are met, close the device:

- Mechanically: press the “Push to close” button on the circuit breaker.
- Electrically: if the optional shunt close (XF) is installed, press the optional electrical-close push button (BPFE) on the circuit breaker or a push button at a remote location.

  For more information, refer to the circuit breaker user guide on the Schneider Electric™ website (for website information see page 5).

Figure 78 – Close Circuit Breaker

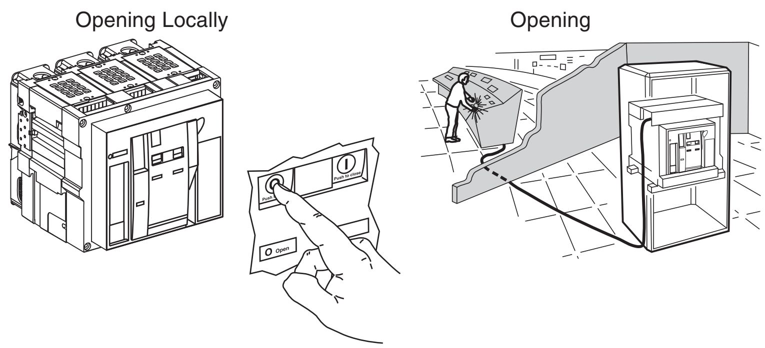


Open Circuit Breaker

- Mechanically: press the “Push to open” button on the circuit breaker.
- Electrically: operate remotely through the optional shunt trips (MX1 and MX2), undervoltage trip device (MN), or time-delay module for undervoltage trip accessory (MNR).

  For more information, refer to the circuit breaker user guide on the Schneider Electric website (for website information see page 5).

Figure 79 – Turn Off Circuit Breaker



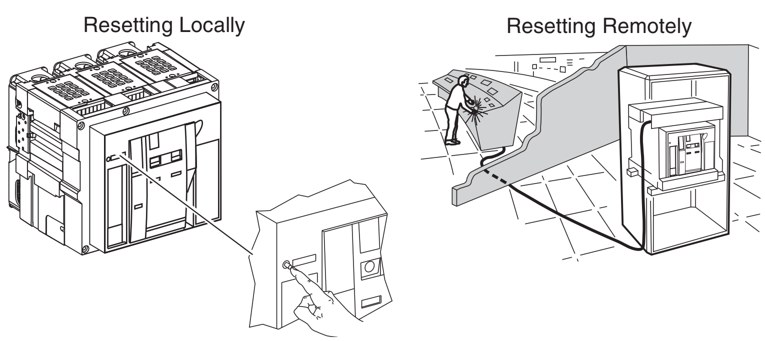
Reset Circuit Breaker

After a fault trip, the circuit breaker must be reset.

- Mechanically: press the “Reset” button located above the trip unit.

  Electrically: use the electrical reset option (RES) after an electrical fault. For more information, refer to the circuit breaker user guide on the Schneider Electric website (for website information see page 5).

Figure 80 – Reset Circuit Breaker



Neutral Protection

Neutral protection protects the neutral conductors against overheating.

- For a three-pole circuit breaker with a P or H trip unit, neutral protection is possible if a neutral current transformer is used.
  - — Adjust the neutral using the trip unit keypad of the P or H trip unit.
  - — Possible settings are OFF, N/2, N, or 1.6N.
  - — Factory setting is OFF.

Oversize neutral protection (1.6N) requires the use of the appropriate oversize neutral current transformer. See price list for correct neutral current transformer.

NOTICE

HAZARD OF EQUIPMENT DAMAGE

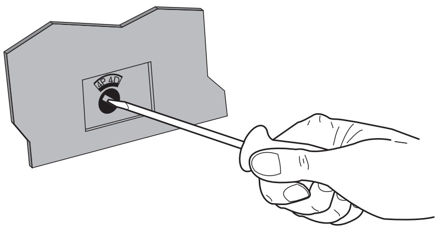
If a four-pole circuit breaker neutral pole switch is set to 4P 3D setting, the current in the neutral must not exceed the rated current of the circuit breaker.

For a three-pole circuit breaker with oversize neutral protection (1.6N), select the appropriate oversize neutral current transformer.

Failure to follow these instructions can result in equipment damage.

- For a four-pole circuit breaker, set the system type using the circuit breaker neutral selector dial (see Figure 81).
  - — With a P or H trip unit, make fine adjustments using the trip unit keypad, with the circuit breaker dial setting providing the upper limit for adjustment.
  - — Factory setting is 4P 4D.

Figure 81 – Four-Pole Circuit Breaker Neutral Selector Dial



Neutral Protection Settings for Four-Pole Circuit Breaker

Circuit Breaker Selector Dial	P or H Trip Unit Keypad Setting
4P 3D	Off, N/2, N
3P N/2	N/2
4P 4D	N/2, N

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- Neutral protection conductor type has four possible settings:
  - Off (4P 3D)—Neutral protection is turned off.
  - N/2 (3P N/2)—Neutral conductor capacity is one-half that of the line conductors.
  - N (4P 4D)—Neutral conductor capacity is the same as that of the line conductors.
  - 1.6N—Neutral conductor capacity is 1.6 times that of the line conductors. (Three pole circuit breaker with P or H trip unit only.)

Table 17 – Micrologic™ Trip Unit Conductor Type

Setting	Long-Time Pickup		Short-Time Pickup		Instantaneous		Ground-Fault Pickup	
	Trip Unit	Neutral	Trip Unit	Neutral	Trip Unit	Neutral	Trip Unit	Neutral
OFF	Ir	None	Isd	None	Ii	None	Ig	None
N/2	Ir	1/2 Ir	Isd	1/2 Isd	Ii	Ii	Ig	Ig
N	Ir	Ir	Isd	Isd	Ii	Ii	Ig	Ig
1.6N	Ir	1.6 x Ir	Isd	1.6 x Isd*	Ii	Ii	Ig	Ig

*In order to limit the range, limited to 10 x In.

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Section 7— Locks, Interlocks, and Accessories

A number of optional locking and interlocking devices and accessories are available for the Masterpact circuit breaker and cradle. The operation of these devices is described in bulletin 0613IB1203: *Masterpact™ NW Low-Voltage Power/Insulated Case Circuit Breaker with ArcBlok Technology—User Guide* available on the Schneider Electric™ website (for website information see page 5).

For a complete listing of the available locks, interlocks, and accessories, see catalog 0613CT1001, *Masterpact NT and NW Universal Power Circuit Breakers* on the Schneider Electric website. For more information, refer to the circuit breaker user guide on the Schneider Electric website (for website information see page 5).

For detailed installation instructions on field-installable locks, interlocks, and accessories refer to the installation instructions shipped with the devices.

Accessories can be installed in an installed circuit breaker or an installed cradle.

Installing Circuit Breaker Accessories

Place the circuit breaker in the disconnect position. See Circuit Breaker Disconnection, page 70, for instructions on disconnecting the circuit breaker.

Install circuit breaker accessories, see “Install Accessories” on page 42.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.

Failure to follow these instructions will result in death or serious injury.

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Installing Cradle Accessories

1. Turn off all power supplying this equipment before working on or inside equipment.
2. Remove the circuit breaker from the cradle. See Circuit Breaker Removal, page 46 for instructions on removing the circuit breaker.
3. Install accessory as instructed in the instructions packed with the individual accessory.
4. Replace the circuit breaker in the cradle. See Circuit Breaker Installation, page 38, for instructions on installing the circuit breaker.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

Section 8— Testing, Maintenance and Troubleshooting

For information on field testing, maintenance, and troubleshooting see bulletin 0613IB1201, Masterpact NT and NW Field Testing and Maintenance Guide, which can be found on the Schneider Electric website:

http://www.schneider-electric.com

For application assistance, please call 1-888-778-2733.

Table 18 – Troubleshooting Guide

Problem	Probable Causes	Solutions
Circuit breaker cannot be closed locally or remotely	Circuit breaker padlocked or keylocked in the “OPEN” position.	Disable the locking function.
	Circuit breaker interlocked mechanically in a source changeover system.	• Check the position of the other circuit breaker in the changeover system. • Modify the situation to release the interlock.
	Circuit breaker not completely connected.	Complete racking in (connection) of the circuit breakers.
	The reset button signalling a fault trip has not been reset.	• Clear the fault. • Push the reset button on the front of the circuit breaker.
	Stored energy mechanism is not charged.	• Charge the mechanism manually. • If it is equipped with an MCH spring charging motor, check the supply of power to the motor. If the problem persists, replace the spring charging motor.
	MX opening shunt release (shunt trip) is permanently supplied with power.	There is an opening order. Determine the origin of the order. The order must be cancelled before the circuit breaker can be closed.
	MN undervoltage release (UVR) not supplied with power.	• There is an opening order. Determine the origin of the order. • Check the voltage and the supply circuit (V 0.84 Vn). • If the problem persists, replace the release.
	XF closing release (shunt close) continuously supplied with power, but circuit breaker is not “ready to close” (XF not wired in series with PF contact).	Open the supply of power to the XF closing release, then send the closing order again using the XF, but only if the circuit breaker is “ready to close”.
	Circuit breaker uses a Micrologic P or H trip unit, which has a permanent trip order with minimum voltage and minimum frequency protection in the Trip mode and the trip unit powered.	Disable these protection function son the Micrologic P or H control unit.
Circuit breaker cannot be closed remotely but can be opened locally using the closing pushbutton.	Closing order not executed by the XF closing release (shunt close).	Check the voltage on the supply circuit (0.85–1.1 Vn). If the problem persists, replace the XF release.
Circuit breaker cannot be opened remotely but can be opened locally	Closing order not executed by the MX opening release (shunt trip).	Check the voltage on the supply circuit (0.7–1.1 Vn). If the problem persists, replace the XF release.
	Opening order not executed by the MN undervoltage release (UVR).	Drop in voltage is insufficient or residual voltage (> 0.35 Vn) across the terminals of the undervoltage release. If the problem persists, replace the MN release.
Circuit breaker cannot be opened locally.	Operating mechanism malfunction or damaged contacts.	Contact a Schneider Electric service center.
Circuit breaker can be reset locally but not remotely.	Insufficient supply voltage for the MCH spring charging motor.	• Check the voltage and the supply circuit (0.7–1.1 Vn). • If the problem persists, replace the MCH release.
Unexpected tripping with activation of the reset button signalling a fault trip.	A fault is present: • Overload • Earth fault (ground fault) • Short-circuit detected by the trip unit.	• Determine and clear the causes of the fault. • Check the condition of the circuit breaker before putting it back into service.

Table 18 – Troubleshooting Guide

Problem	Probable Causes	Solutions
Unexpected tripping without activation of the reset button signalling a fault	MN undervoltage release (UVR) supply voltage too low.	Check the voltage on the supply circuit (V>0.58 Vn).
	Load-shedding order sent to the MX opening release (shunt trip).	• Check the overall load on the distribution system. • If necessary, modify the settings of the devices in the installation.
	Unnecessary opening order from the MX opening release (shunt trip).	Determine the origin of the order.
Instantaneous opening after each attempt to close the circuit breaker with activation of the reset button signalling a fault trip.	Thermal memory.	• See the trip unit user manual. • Press the reset button.
	Transient overcurrent when closing.	• Modify the distribution system or the trip unit settings. • Check the condition of the circuit breaker before putting it back into service. • Press the reset button.
	Closing on a short-circuit.	• Clear the fault. • Check the condition of the circuit breaker before putting it back into service. • Press the reset button.
Nuisance tripping of the circuit breaker with activation of the reset button signalling a fault trip.	Reset button is not pushed in completely.	Push the reset button in completely.
Cannot insert crank in connected, test, or disconnected position.	A padlock or keylock is present on the cradle or a door interlock is present.	Disable the locking function.
Cannot turn the crank.	The reset button has not been pressed.	Press the reset button while turning racking handle (crank).
Circuit breaker cannot be removed from the cradle.	Circuit breaker is not in the disconnected position.	Turn the racking handle (crank) until the circuit breaker is in the disconnected position and the reset button is out.
	The rails are not completely out.	Pull the rails all of the way out.
	Racking handle (crank) has not been removed from the racking mechanism.	Remove and store the racking handle.
Circuit breaker cannot be racked in (placed in connected position).	Cradle/ circuit breaker mismatch protection (cell keying) is preventing racking.	Check that the cradle corresponds with the circuit breaker.
	The disconnecting-contact clusters are incorrectly positioned.	Reposition the clusters.
	Cradle is locked in the disconnected position.	Disable the cradle locking function.
	The reset button has not been pressed, preventing rotation of the crank.	Press the reset button while turning racking handle (crank).
	The circuit breaker has not been sufficiently inserted into the cradle.	Insert the circuit breaker completely so that it is engaged in the racking mechanism.
Circuit breaker cannot be locked in disconnected position.	The circuit breaker is not in the right position.	Check the circuit breaker position by making sure that the rest button is out.
	Racking handle (crank) has not been removed from the racking mechanism.	Remove and store the racking handle.
Circuit breaker cannot be locked in connected or test position.	Check that locking in any position is enabled.	Contact a Schneider Electric service center.
	The circuit breaker is not in the right position.	Check the circuit breaker position by making sure the reset button is out.
	Racking handle (crank) has not been removed from the racking mechanism.	Remove and store the racking handle.
The crank cannot be inserted to connect or disconnect the circuit breaker.	The rails are not completely in.	Push the rails all the way in.
The right-hand rail of the cradle or the circuit breaker cannot be drawn out.	Racking handle (crank) has not been removed from the racking mechanism.	Remove and store the racking handle.

ENGLISH

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Standards, specifications, and designs may change, so please ask for confirmation that the information in this publication is current.

HRB28361, Rev. 02, 02/2015
Replaces HRB28361 05/2014

Instalación del interruptor de potencia Masterpact™ NW en baja tensión / en caja aislada

ESPAÑOL

Clase 0613

Boletín de instrucciones

HRB28361
Rev. 02, 02/2015

Conservar para uso futuro.

SQUARE D
by Schneider Electric

Categorías de riesgos y símbolos especiales

Asegúrese de leer detenidamente estas instrucciones y realice una inspección visual del equipo para familiarizarse con él antes de instalarlo, hacerlo funcionar o prestarle servicio de mantenimiento. Los siguientes mensajes especiales pueden aparecer en este boletín o en el equipo para advertirle sobre peligros potenciales o llamar su atención sobre cierta información que clarifica o simplifica un procedimiento.

La adición de cualquiera de estos símbolos a una etiqueta de seguridad de “Peligro” o “Advertencia” indica la existencia de un peligro eléctrico que podrá causar lesiones personales si no se observan las instrucciones.

Este es el símbolo de alerta de seguridad. Se usa para avisar sobre peligros potenciales de lesiones personales. Respete todos los mensajes de seguridad con este símbolo para evitar posibles lesiones o la muerte.

⚠ PELIGRO

PELIGRO indica una situación de peligro que, si no se evita, **podrá causar** la muerte o lesiones serias.

⚠ ADVERTENCIA

ADVERTENCIA indica una situación peligrosa que, si no se evita, **puede causar** la muerte o lesiones serias.

⚠ PRECAUCIÓN

PRECAUCIÓN indica una situación peligrosa que, si no se evita, **puede causar** lesiones menores o moderadas.

AVISO

AVISO se usa para hacer notar prácticas no relacionadas con lesiones físicas. El símbolo de alerta de seguridad no se usa con esta palabra de indicación.

NOTA: Proporciona información adicional para clarificar o simplificar un procedimiento.

Observe que

Solamente el personal calificado deberá instalar, hacer funcionar y prestar servicios de mantenimiento al equipo eléctrico. Schneider Electric no asume responsabilidad alguna por las consecuencias emergentes de la utilización de este material.

Aviso FCC

El equipo está probado y cumple con los límites establecidos para los dispositivos digitales de la clase A de acuerdo con la parte 15 de las normas de la FCC (Comisión federal de comunicaciones de los EUA). La intención de estos límites es proporcionar un grado razonable de protección contra interferencias dañinas cuando el equipo opere en ambientes comerciales. Este equipo genera, usa y puede radiar energía de radio frecuencia que, si no se instala siguiendo las indicaciones del manual de instrucciones, puede afectar negativamente a las comunicaciones de radio. Operar este equipo en un área residencial podría ocasionar interferencias nocivas, de ser así, el usuario tendrá que corregir dicha interferencia por su propia cuenta y riesgo. Este aparato digital clase A cumple con la norma canadiense ICES-003.

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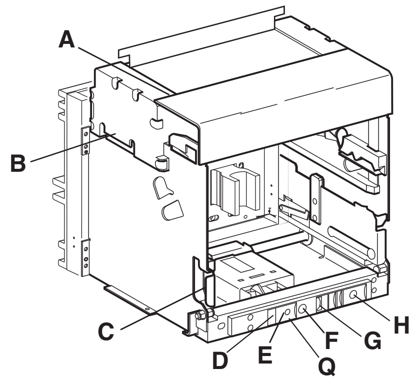
Sección 1—Información general

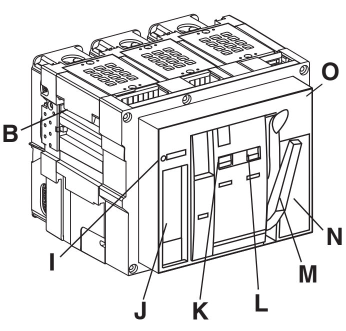
Introducción

El interruptor de potencia Masterpact NW en baja tensión[1] y el interruptor en caja aislada están diseñados para ser montados en una cuna removible y las conexiones eléctricas a la cuna se realizan desde la parte posterior con conectores de encaje a presión. También se encuentra disponible un interruptor de montaje fijo.

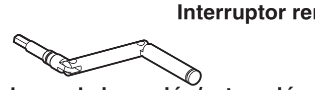
Figura 1 – Interruptor automático y cuna



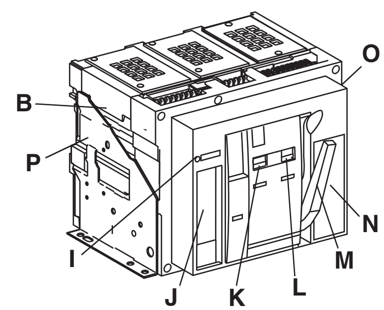
Cuna



Interruptor removible



Palanca de inserción/extracción



Interruptor automático fijo

A—Cubierta de terminales
B—Bridas de levantamiento
C—Palanca del riel extensible
D—Receptáculo para el candado
E—Botón de paro y liberación
F—Cavidad para inserción de la palanca de inserción/extracción
G—Indicador de posición
H—Espacio para guardar la palanca de inserción/extracción
I—Botón de restablecimiento del disparo por falla
J—Unidad de disparo
K—Botón de apertura
L—Botón de cierre
M—Palanca de carga
N—Placa frontal
O—Cubierta de accesorios
P—Soportes de montaje fijo
Q—Código de fecha de la cuna

Estos interruptores cumplen con lo estipulado en las siguientes normas:

Interruptor de potencia en baja tensión (removible y fijo)	Interruptor en caja aislada (removible y fijo)
ANSI C37.13 ANSI C37.16 ANSI C37.17 ANSI C37.50 UL1066[1] CSA C22.2 No 31[1] NEMA SG3	UL489[2] NEMA AB1 CSA C22.2 No. 5-02[3]

1 cULus.

2 Registrado por UL®.

3 Certificado por CSA ®.

1 En este manual, la terminología "interruptor" se refiere al interruptor de potencia y desconectador.

Los interruptores de potencia en baja tensión de 800–2 000 A, tipo L1F e interruptores en caja aislada de 800–2 000 A, tipo LF han sido probados para mostrar la categoría de riesgo de peligro de destello de arco según la norma NFPA 70E.

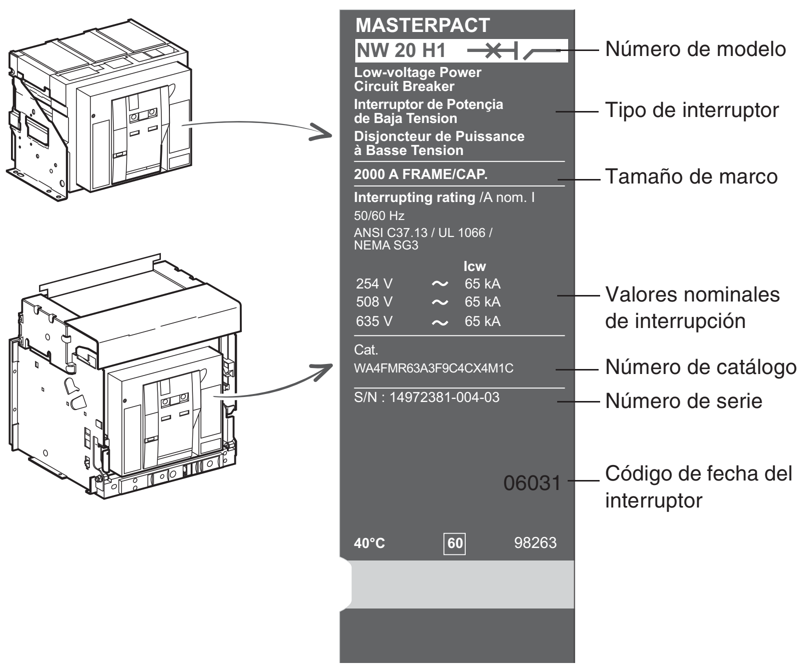
Este boletín proporciona las instrucciones de instalación para los interruptores de potencia Masterpact NW. La unidad de disparo Micrologic™ controla todas las funciones de disparo.

Consulte la etiqueta ubicada en la placa frontal para obtener información acerca del interruptor.

La información relativa a los accesorios instalados en el interruptor se puede encontrar en la etiqueta de accesorios ubicada en el costado derecho del interruptor.

Para obtener información completa sobre los modelos disponibles de interruptores, tamaños de marcos, valores nominales de interrupción, tamaños de sensores y unidades de disparo, consulte el catálogo 0613CT1001, *Interruptores de potencia Masterpact NT y NW universales,* en nuestro sitio web.

Figura 2 – Información en la placa frontal



Para obtener información adicional, consulte las siguientes guías del usuario disponibles en nuestro sitio web:

- Boletín 0613IB1204 *Interruptor de potencia Masterpact™ NW en baja tensión / en caja aislada guía del usuario*
- Boletín 0613IB1205: *Dibujos dimensionales del Masterpact™ NW*
- Boletín 0613IB1202: *Guía de servicio de mantenimiento y pruebas en campo de los interruptores de potencia Masterpact™ NT y NW*
- Boletín 48049-136-05: *Unidades de disparo electrónico Micrologic 2.0A, 3.0A, 5.0A y 6.0A*
- Boletín 48049-330-03: *Unidades de disparo electrónico Micrologic 5.0H y 6.0H*
- Boletín 48049-137-05: *Unidades de disparo electrónico Micrologic 5.0P y 6.0P*
- Boletín 48049-207-05: *Unidades de disparo electrónico Micrologic 2.0, 3.0 y 5.0*

Para acceder a nuestro sitio web, vaya a:

http://www.schneider-electric.com

Para obtener asistencia, llame al
1-888-778-2733 en EUA o al 01800- 724634337 en México.

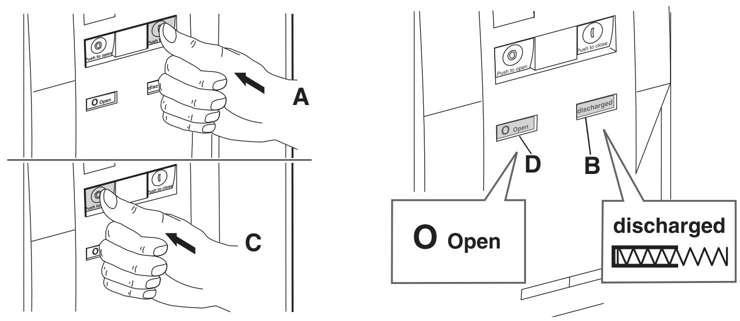
Antes de realizar cualquier trabajo en el interruptor

1. Desenergícelo:

   Presione el botón de cierre (**figura 3, A**) para descomprimir el resorte, lo cual se indica en la ventana (**B**).

   Presione el botón de apertura (**C**) para abrir los contactos, lo cual se indica en la ventana (**D**).

Figura 3 – Desconexión del interruptor



2. Desenergice el interruptor.

   — Con la manivela de inserción/extracción saque el interruptor hasta la posición de desconectado (**figura 4, A**). Consulte la sección “Desconexión del interruptor removible”, página 72.

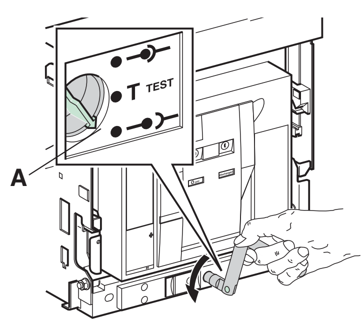
⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA o Z462 de CSA y NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Figura 4 – Desconexión del interruptor removible



   — En el interruptor fijo: desenergice el equipo antes de realizar cualquier trabajo en él.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA o Z462 de CSA y NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.

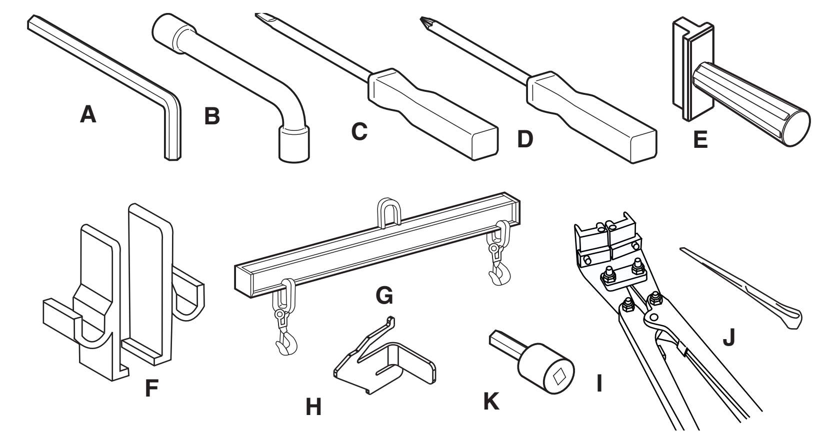
El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

ESPAÑOL

Herramientas

Table 1 – Herramientas necesarias

A. Llave Allen de 5 mm
B. Llave de tubo angular de 1/2 pulg
C. Destornillador de punta plana (Pozidriv®/ranurada)
D. Destornillador Torx® 20
E. Herramienta de ajuste de las pinzas de conexión, no. de cat. CLUSRETOOL
F. Ganchos de levantamiento, no. de cat. S48906
G. Barra cruzada
Marco W, no. de cat. S48900
Marco Y, no. de cat. S48901
H. Herramienta de desenganche del bloqueo de la cuna (provista solamente con el interruptor removible)
I. Herramienta de posicionamiento, no. de cat. S47542
J. Herramienta de inserción de cables Wago, Pieza no. Wago 209-129
K. Adaptador hexagonal de 10 mm para el mecanismo de inserción/extracción de la cuna



Desempaque e inspección

NOTA: El boletín 0613IB1203 proporciona las instrucciones de reempaquetado, *Interruptor de potencia Masterpact NW en baja tensión / en caja aislada – Guía del usuario*, disponible en el sitio web de Schneider Electric (consulte la página 7).

AVISO

PELIGRO DE DAÑO AL EQUIPO

No coloque el interruptor sobre la parte posterior. ya que podrían dañarse las pinzas de conexión.

El incumplimiento de estas instrucciones puede causar daño al equipo.

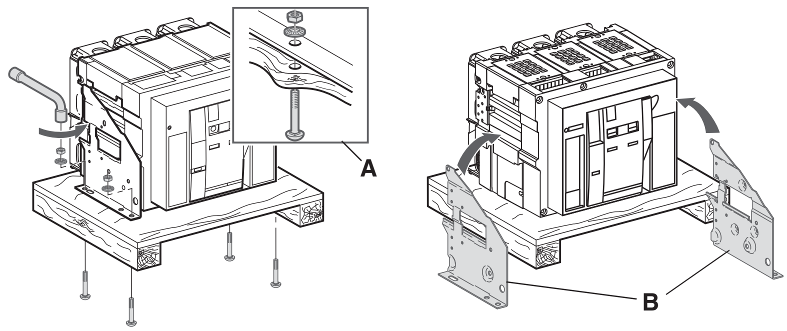
ESPAÑOL

Desempaque del interruptor

NOTA: No coloque el interruptor sobre su parte posterior. ya que podrían dañarse las pinzas de conexión.

1. Retire los cuatro tornillos, tuercas y roldanas (**fIgura 5, A**) que sujetan el interruptor a la plataforma para manejo de mercancías.
2. En los interruptores removibles solamente: desmonte los soporte de transporte (**B**).

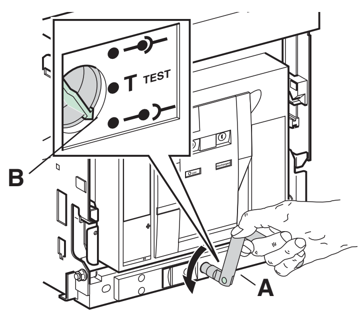
Figura 5 – Desempaque del interruptor



Desempaque del interruptor enviado dentro de la cuna

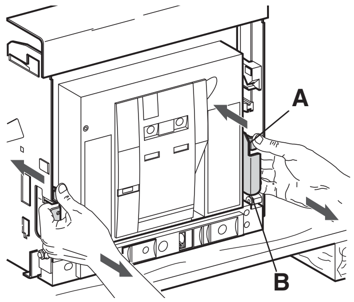
1. Con la manivela de inserción/extracción saque el interruptor (**figura 6A**) hasta la posición de desconectado (**B**), consulte la sección “Desconexión del interruptor removible”, página 72.

Figura 6 – Desconexión del interruptor



2. A la vez que presiona las lengüetas de enganche (**figura 7, A**), jale las palancas de los rieles extensibles (**B**) hasta que éstos (**C**) estén totalmente extendidos.

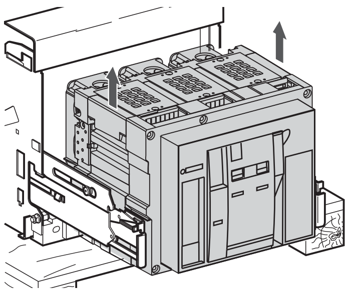
Figura 7 – Extracción del interruptor



NOTA: No coloque el interruptor sobre su parte posterior, ya que podrían dañarse las pinzas de conexión.

3. Desmonte el interruptor, consulte Desmontaje de la cuna, en la página 39.

Figura 8 – Desmontaje del interruptor y de la cuna

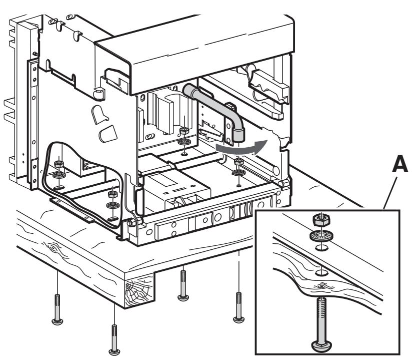


ESPAÑOL

Desempaque de la cuna

1. Quite los cuatro tornillos, tuercas y roldanas (**figura 9, A**) que sujetan la cuna a la plataforma para manejo de mercancías.
2. Quite la cuna de la plataforma para manejo de mercancías. (Consulte “Levantamiento” en la página 17).

Figura 9 – Desempaque de la cuna



Inspección, sustitución y lubricación de las pinzas de conexión

Inspección de las pinzas de conexión

1. Inspeccione las pinzas de conexión y sus soportes situados en la parte de atrás del interruptor removible. Asegúrese de que las pinzas de conexión estén

correctamente instaladas y configuradas como se muestra en la tabla 3.

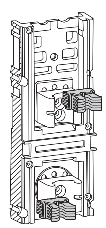
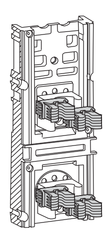
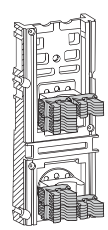
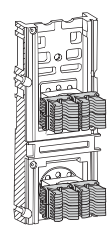
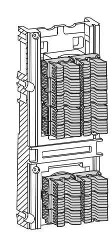
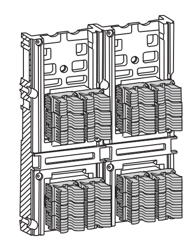
2. Realice una inspección visual a las pinzas de conexión para ver si encuentra daños tales como:
   - — Áreas decoloradas
   - — Restos de cobre visibles en los dedos
   - — Resortes rotos o cuarteados
   - — Las pinzas no están alineadas (indica daños en los resortes)
3. Realice una inspección visual a las pinzas de conexión para ver si se han desgastado

Tabla 2 – Cantidad de pinzas de conexión por polo

Tipo	N / N1	H1	HA	H / H2 / H3 / HF	L / L1 / LF / L1F / HB / HC
NW08	2	4	4	4 / 4 / 6 / 4	8
NW12	2	—	—	4	8
NW16	6	6	6	6	8
NW20	8	8	8	8	16
NW25/NW30	—	—	—	16	16
NW32	—	16	16	16	24
NW40/NW50	—	—	24	24	24
NW60	—	—	—	24	24

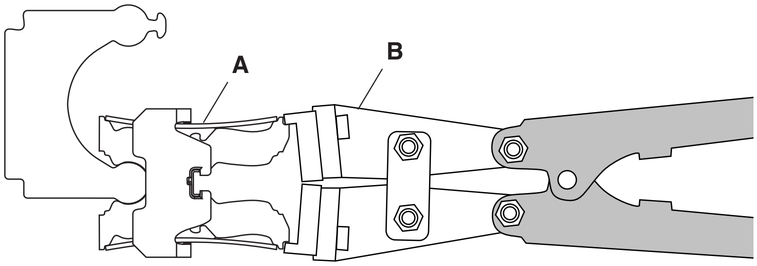
Tabla 3 – Configuración de las pinzas de conexión

Cantidad de pinzas de conexión por polo
NOTA: Las protecciones de las pinzas de conexión no se muestran

2	4	6	8	16	24
					

4. Sustituya las pinzas de conexión que no pasen la inspección. Instale las nuevas pinzas de conexión (**figura 10, A**) utilizando la herramienta de posicionamiento (**B**).

Figura 10 – Instalación de las nuevas pinzas de conexión

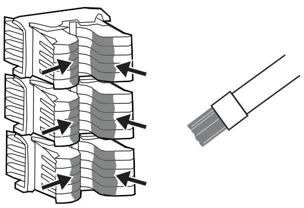


Lubricación de las pinzas de conexión

AVISO
PELIGRO DE DAÑO AL EQUIPO
Inspeccione las pinzas de conexión y asegúrese de que estén lubricadas al desmontar el interruptor de la cuna.
El incumplimiento de estas instrucciones puede causar daño al equipo.

Utilice el kit de grasa S48899 para lubricar las mordazas de las pinzas de conexión, como se muestra en la figura 11.

Figura 11 – Aplicación de lubricante en las pinzas de conexión



ESPAÑOL

Lubricación de las lengüetas de la cuna

Las lengüetas de la cuna deberán ser lubricadas e inspeccionadas visualmente al instalar la cuna por primera vez y de nuevo durante los intervalos de servicio de mantenimiento después de haber desconectado toda la alimentación.

⚠ PELIGRO

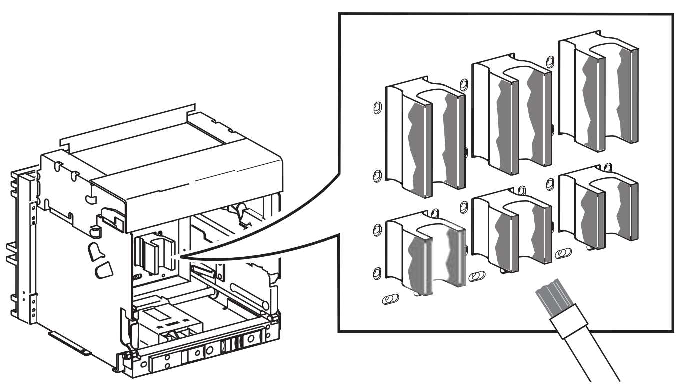
PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA o Z462 de CSA y NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Confirme que ambos lados de las lengüetas estén cubiertos con lubricante. Si fuese necesario, emplee el kit de grasa (número de catálogo S48899) para lubricar las lengüetas.

Figura 12 – Aplicación de lubricante en las lengüetas de la cuna



Sección 2—Levantamiento y transporte

Tanto el interruptor como la cuna disponen de lengüetas de levantamiento para elevarlos. Para levantar el interruptor, utilice un dispositivo de levantamiento aéreo y sujételo a las lengüetas de levantamiento, siga las instrucciones que se detallan en esta sección.

⚠ PELIGRO

PELIGRO DE QUE EL DISPOSITIVO SE CAIGA

- Asegúrese de que el equipo de levantamiento tenga capacidad suficiente para levantar la unidad.
- Siga las indicaciones del fabricante para manejar el equipo de levantamiento.
- Utilice casco, calzado de seguridad y guantes de trabajo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Peso

Tabla 4 – Peso

Valor nominal del marco	Tipo de conector[1]	Peso (lbs/kg)								
		Interruptor		Cuna		Conector		Plataforma para manejo de mercancías	Total	
		3P	4P	3P	4P	3P	4P		3P	4P
800 A–2 000 A, removible	FCF	109/50	142/65	97/44	116/53	42/19	55/25	17/8	265/121	330/151
	FCT	109/50	142/65	97/44	116/53	84/38	109/50	17/8	307/140	384/176
	RCTH/RCTV	109/50	142/65	97/44	116/53	17/8	22/10	17/8	240/110	297/136
800 A–2 000 A, fijo	FCF	109/50	142/65	—	—	42/19	55/25	17/8	168/77	214/98
	FCT	109/50	142/65	—	—	84/38	109/50	17/8	210/96	268/123
	RCTH/RCTV	109/50	142/65	—	—	17/8	22/10	17/8	143/66	181/83
2 500 A–3 000 A, removible	RCTH/RCTV	127/58	165/75	124/57	149/68	26/12	34/15	17/8	294/135	365/166
	FCT	127/58	165/75	124/57	149/68	80/36	104/47	17/8	348/159	435/198
2 500 A–3 000 A, fijo	FCT	127/58	165/75	—	—	80/36	104/47	17/8	224/102	286/130
	RCTH/RCTV	127/58	165/75	—	—	26/12	34/15	17/8	170/78	216/98
2 000 A L1/L1F & 3 200 A, removible	RCOV	127/58	165/75	124/57	149/68	100/46	130/59	17/8	368/169	461/210
3 200 A, fijo	RCOV	127/58	165/75	—	—	100/46	130/59	17/8	244/112	312/142
4 000 A, (marco W) fijo	RCOV (especial)	127/58	165/75	—	—	115/52	145/66	17/8	259/118	327/149
3 200 A L1 y 4 000 A, removible	FCF	227/103	295/134	278/126	334/152	84/38	109/50	39/18	628/285	777/354
	FCT	227/103	295/134	278/126	334/152	168/76	218/99	39/18	712/324	886/403
	RCTH/RCTV	227/103	295/134	278/126	334/152	52/24	68/31	39/18	596/271	736/335
4 000 A, fijo	RCTH/RCTV	227/103	295/134	—	—	52/24	68/31	39/18	318/145	402/183
5 000 A, removible	FCT	227/103	295/134	278/126	334/152	168/77	218/99	39/18	712/324	886/403
	RCTH/RCTV	227/103	295/134	278/126	334/152	52/24	68/31	39/18	596/271	736/335
5 000 A, fijo	RCTH/RCTV	227/103	295/134	—	—	52/24	68/31	39/18	318/145	402/183

Tabla 4 – Peso *(continuación)*

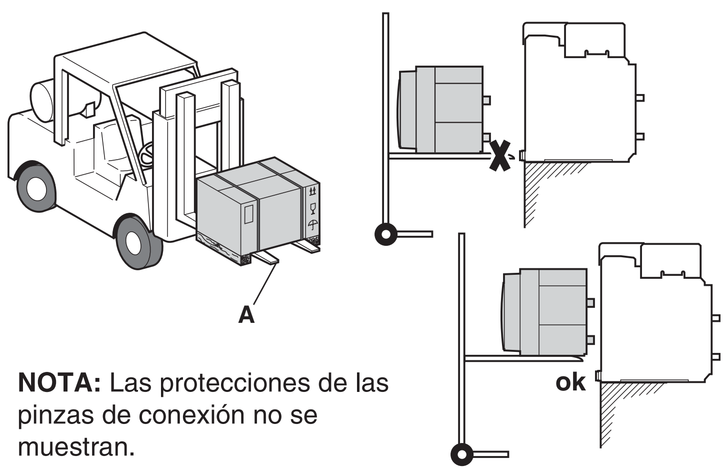
Valor nominal del marco	Tipo de conector[1]	Peso (lbs/kg)								
		Interruptor		Cuna		Conector		Plataforma para manejo de mercancías	Total	
		3P	4P	3P	4P	3P	4P		3P	4P
6 000 A, removible	RCTV	227/103	295/134	278/126	334/152	396/180	528/240	39/18	940/427	1196/544
6 000 A, fijo	RCTV	227/103	295/134	—	—	396/180	528/240	39/18	662/301	862/392

[1]FCF = Conector plano con conexión frontal.
FCT = Conector en “T” con conexión frontal.
RCTH = Conector horizontal en “T” con conexión posterior.
RCTV = Conector vertical en “T” con conexión posterior.
RCOV = Conector de desplazamiento vertical con conexión posterior.

Uso del montacargas

Cuando utilice un montacargas, las bridas de levantamiento (**figura 13, A**) no debe sobrepasar la parte posterior del interruptor.

Figura 13 – Uso del montacargas



NOTA: Las protecciones de las pinzas de conexión no se muestran.

Levantamiento

Levantamiento del interruptor removible

AVISO

PELIGRO DE DAÑO AL EQUIPO

La cuna debe estar bien sujetada antes de instalar o desmontar el interruptor.

El incumplimiento de estas instrucciones puede causar daño al equipo.

ESPAÑOL

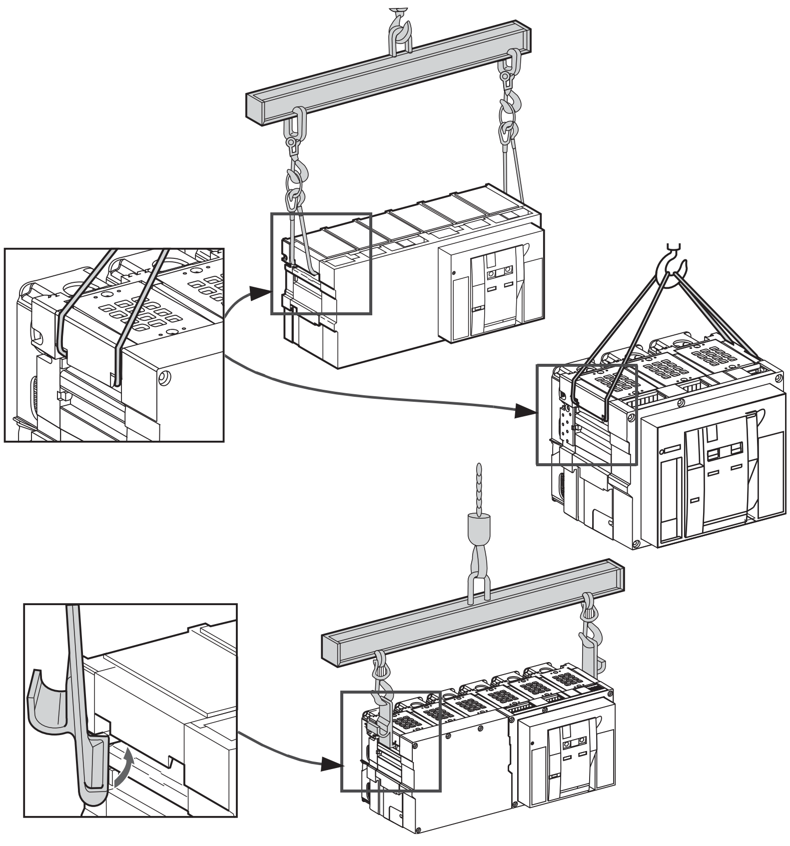
Levante utilizando las bridas de levantamiento que están a los lados del interruptor, ganchos y barra transversal.

Kit de gancho de levantamiento: S48906

Kit de barra transversal para interruptor marco W: S48900

Kit de barra transversal para interruptor marco Y: S48901

Figura 14 – Levantamiento del interruptor removible

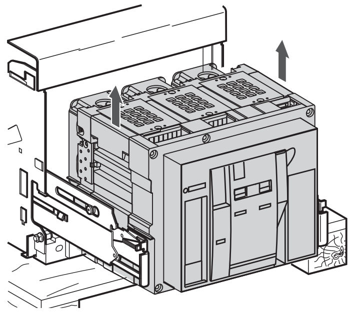


ESPAÑOL

Levantamiento de la cuna o el interruptor fijo

NOTA: Si el interruptor está instalado en la cuna, desmonte el interruptor de la cuna antes de levantar ésta. Para desmontar el interruptor, consulte la página 48.

Figura 15 – Desmontaje del interruptor de la cuna



Levante utilizando las bridas de levantamiento que están a los lados de la cuna o interruptor, un pedazo de barra metálica en los conectores, ganchos y barra transversal.

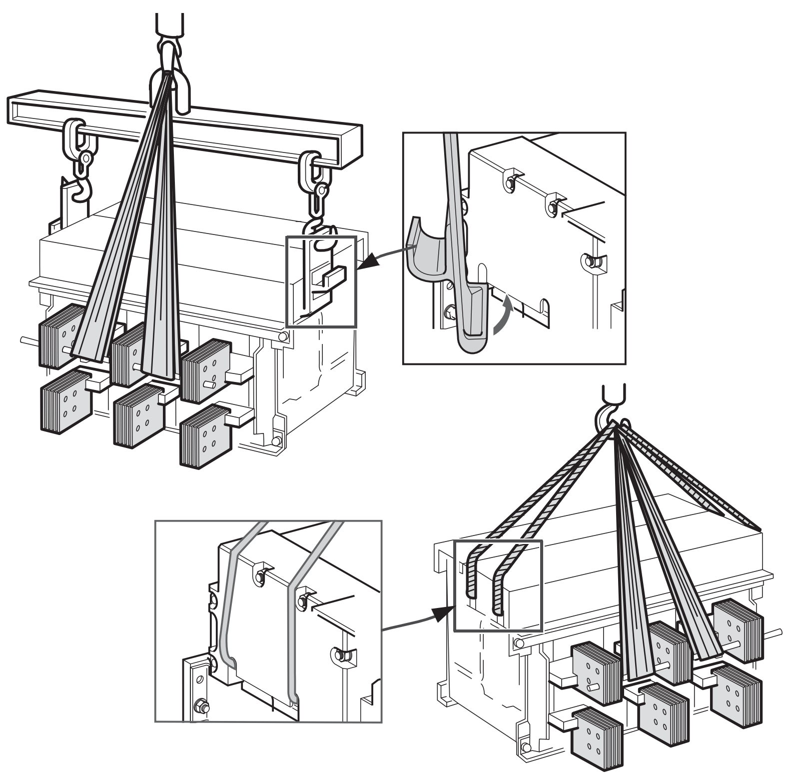
Kit de gancho de levantamiento: S48906

Kit de barra transversal para interruptor marco W: S48900

Kit de barra transversal para interruptor marco Y: S48901

NOTA: Los conectores tienen que estar sujetos durante el levantamiento de la cuna o del interruptor fijo.

Figura 16 – Levantamiento de la cuna o del interruptor fijo



Sección 3—Instalación del interruptor removible

Normalmente, el equipo se entrega con las cunas instaladas y los interruptores se entregan por separado.

Para el equipo que se envía de fábrica sin las cunas instaladas, instale las cunas de acuerdo con las instrucciones a continuación.

Si su equipo viene con las cunas instaladas, consulte la página 40 para obtener las instrucciones de instalación de los interruptores.

NOTA: Cuando las cunas son enviadas de fábrica por separado del equipo:

- los interruptores de 800 a 3 000 A y 3 200 A, de ancho estándar, pueden ser enviados instalados en las cunas.
- los interruptores L1 de construcción ancha de 3 200 A y de 4 000 a 6 000 A deberán enviarse por separado.

ESPAÑOL

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA o Z462 de CSA y NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Instalación de la cuna

Instalación de los accesorios

Instale los accesorios de cuna necesarios que no fueron instalados en la fábrica.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

No ponga herramientas ni otros objetos sobre la cuna.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

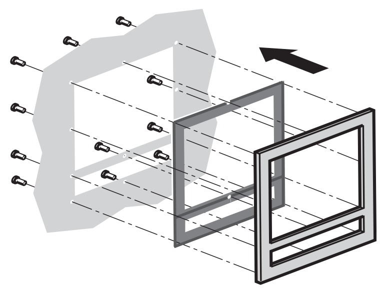
ESPAÑOL

Instalación del escudo de la puerta

Si el equipo tiene un recorte en la puerta, instale el escudo incluido con la cuna.

1. Si el recorte no existe, corte la puerta del equipo y taladre los agujeros alrededor. Para obtener las medidas del recorte y la separación de los agujeros, consulte el boletín 0613IB1205 en nuestra página web (para más información sobre la página web consulte la página 7).
2. Instale el escudo.

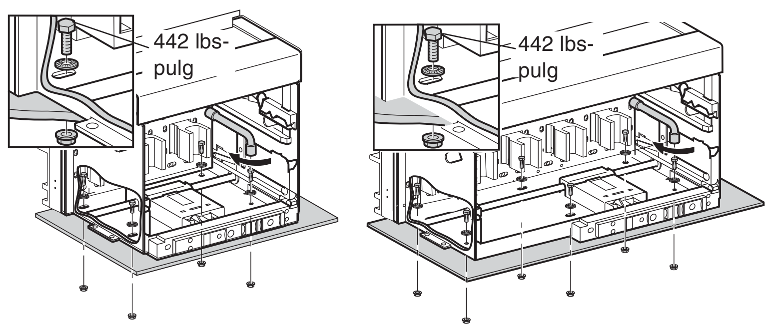
Figura 17 – Instalación del escudo de la puerta



Sujeción de la cuna

1. Desenergice el equipo antes de realizar cualquier trabajo en él.
2. Si los agujeros de montaje no existen, taladre los agujeros en la bandeja para montar la cuna. Para obtener las medidas del patrón de los agujeros de montaje de la cuna, consulte el boletín 0613IB1205 en nuestra página web (para más información sobre la página web consulte la página 7).
3. Asegúrese de que la superficie de montaje esté completamente plana. La superficie deberá estar plana con una desviación permitida de 2 mm (0,08 pulg).
4. Utilice tuercas, roldanas y tornillos de 3/8 para montar la cuna en la bandeja.

Figura 18 – Sujeción de la cuna



Requisitos de espacio libre

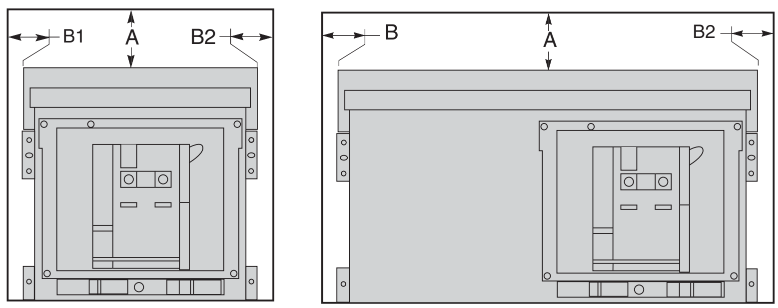
⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

Deberá cumplir con los requisitos de espacio libre para que funcione correctamente el equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Tabla 5 – Requisitos de espacio libre



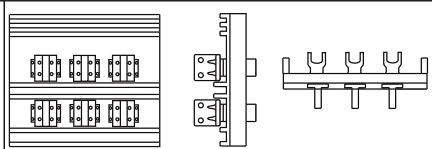
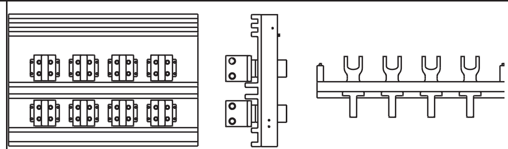
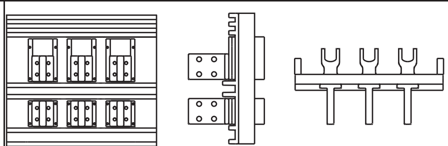
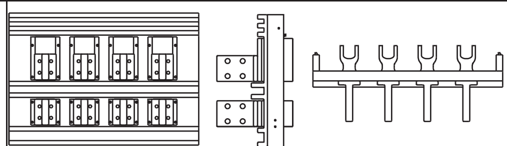
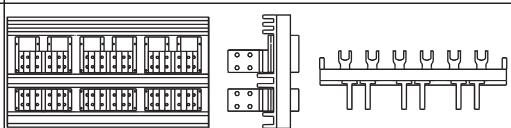
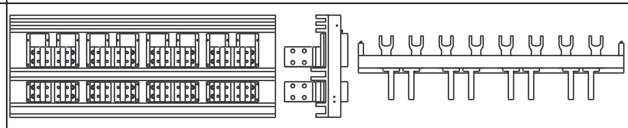
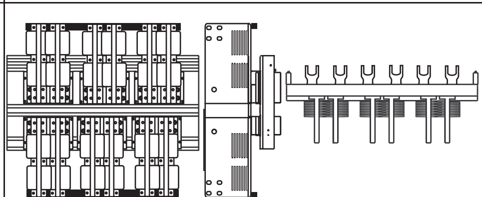
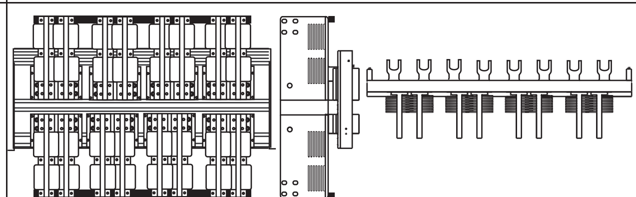
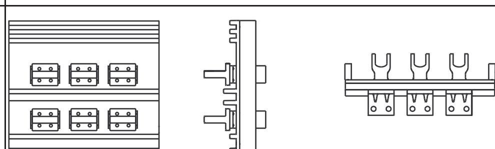
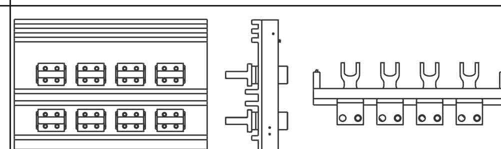
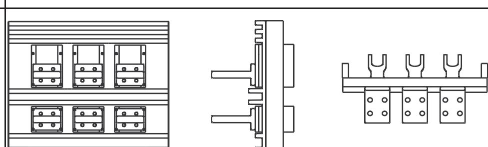
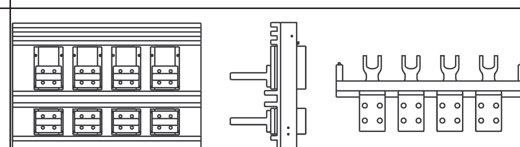
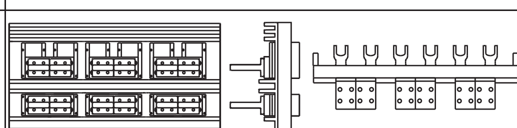
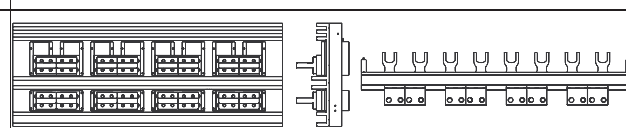
Espacio libre mínimo	Registrado bajo la norma UL 1066 (ANSI C37.50)				Registrado bajo la norma UL 489			
	A		B1 + B2		A		B1 + B2	
	pulg	mm	pulg	mm	pulg	mm	pulg	mm
Piezas aisladas	0	0	0	0	0	0	0	0
Piezas metálicas	0	0	2,36	60	0	0	4,36	111

Instalación de conectores

Consulte la tabla 6 para obtener información sobre los conectores estándar. Asegure los conectores y apriete los tornillos de 16-18 N•m (142-159 lbs-pulg). Comuníquese con la oficina de campo para obtener información sobre los conectores no estándar.

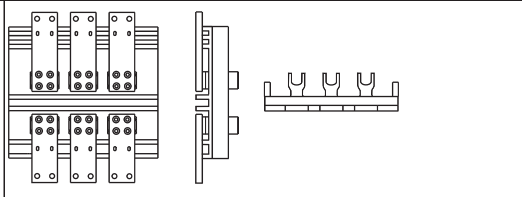
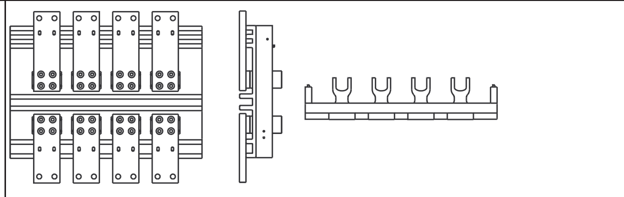
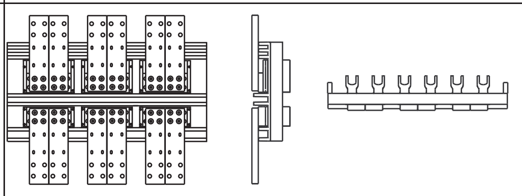
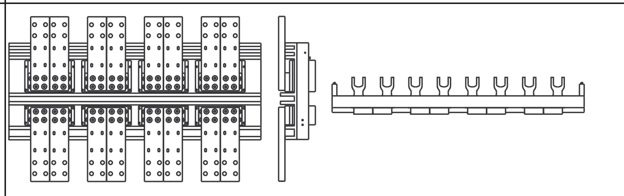
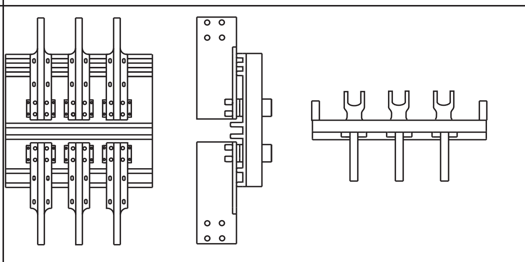
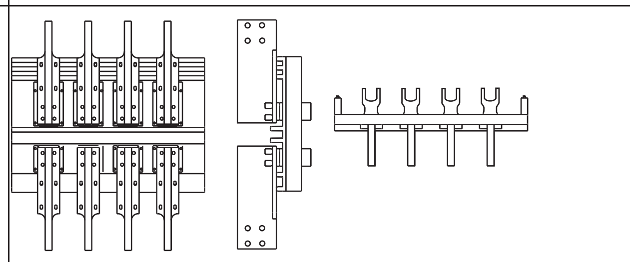
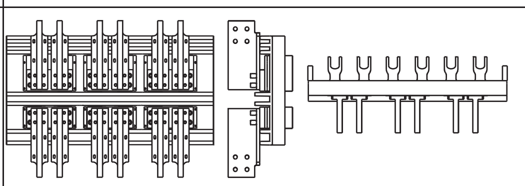
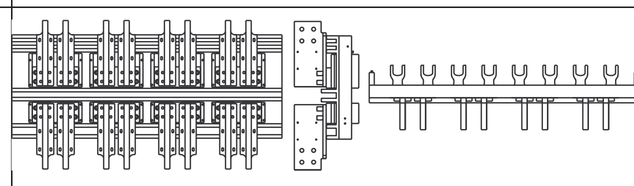
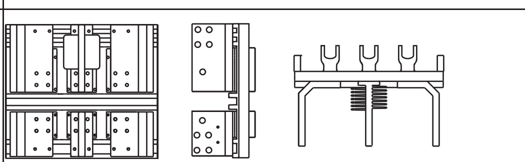
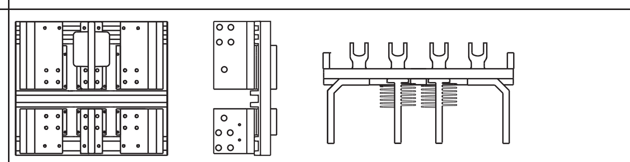
Para obtener las dimensiones de los conectores, consulte el boletín 0613IB1205 en nuestra página web (para mayor información consulte la página 7).

Tabla 6 – Conectores estándar

Tipo	Valor nominal	Configuración de 3 polos Frontal – Lateral – Superior	Configuración de 4 polos Frontal – Lateral – Superior
Vertical en "T" con conexión posterior (RCTV)	800 A– 2 000 A		
	2 500 A– 3 000 A		
	4 000 A– 5 000 A		
	6 000 A		
Horizontal en "T" con conexión posterior (RCTH)	800 A– 2 000 A		
	2 500 A– 3 000 A		
	3 200 A L1 4 000 A– 5 000 A		

Continúa en la siguiente página

Tabla 6 – Conectores estándar *(continuación)*

Tipo	Valor nominal	Configuración de 3 polos Frontal – Lateral – Superior	Configuración de 4 polos Frontal – Lateral – Superior
Plano con conexión frontal (FCF)	800 A– 2 000 A		
	3 200 A L1 4 000 A		
En "T" con conexión frontal (FCT)	800 A– 3 000 A		
	3 200 A L1 4 000 A– 5 000 A		
De desplaza-miento vertical con conexión posterior (RCOV)	3 200 A 2 000 A L1/L1F		

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Instalación de las barras de distribución

AVISO

Los soportes de las barras deben ser colocados de manera que puedan aguantar el peso del sistema de barras y las fuerzas magnéticas causadas por corrientes de cortocircuito. Vea la **figura 19, A**.

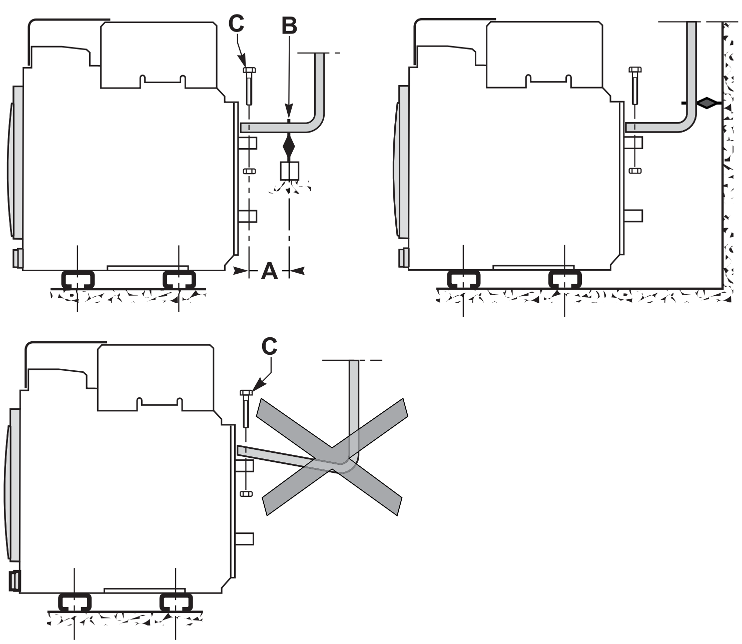
El incumplimiento de estas instrucciones puede causar daño al equipo.

NOTA: El encargado de la instalación es responsable de realizar la conexión de las barras a los conectores.

- Los soportes de las barras deben estar reforzados (**figura 19, B**) para evitar que las fuerzas de cortocircuito desvíen los conectores. Los soportes de las barras (**A**) deben ser colocados de manera que puedan aguantar el peso del sistema de barras y las fuerzas magnéticas causadas por corrientes de cortocircuito.
- Las barras se deben ajustar para asegurarse de que los puntos de conexión estén correctamente colocados antes de que los tornillos (**C**) sean insertados. Las barras deben estar bien sujetadas por la estructura del tablero de fuerza para evitar que su peso descanse en los conectores.

Consulte la tabla 7 para obtener información sobre los requisitos necesarios para las barras de los interruptores y conectores.

Figura 19 – Conexiones de las barras de distribución



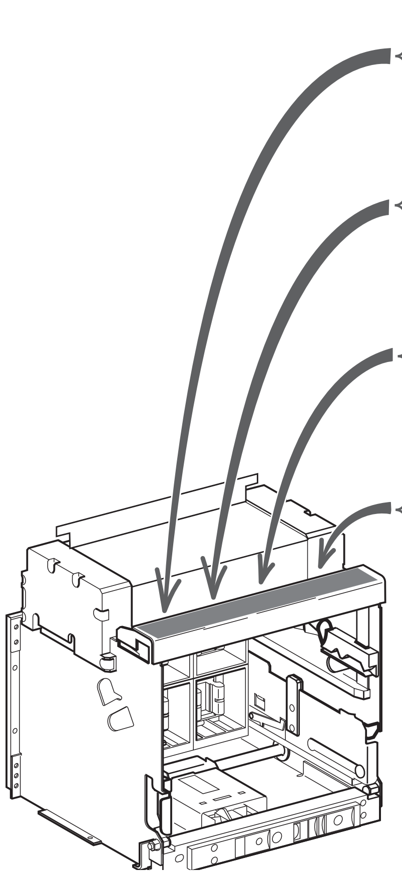
NOTA: El encargado de la instalación es responsable de realizar la conexión de las barras a los conectores. Las barras de distribución deben ser sujetadas por la estructura del tablero de fuerza para evitar que su peso descanse en los conectores. Los soportes de las barras deben estar reforzados para evitar que las fuerzas de cortocircuito desvíen los conectores.

Tabla 7 – Tamaño de barra necesario

Interruptor		Cumple con	Conectores	Barras por conector	
Valor nominal	**Tipo**			**Número**	**Tamaño**
800 A, 1 200 A	N/N1/H/H1/H2/H3/L/ LF/L1/L1F	ANSI C37.50 UL 489	RCTH, RCTV, FCF, FCT	1	6 x 76 mm (0,25 x 3 pulg)
1 600 A	N/N1/H/H1/H2/H3/L/ LF/L1/L1F	ANSI C37.50 UL 489	RCTH, RCTV, FCF, FCT	2	6 x 76 mm (0,25 x 3 pulg)
2 000 A	N/N1/H/H1/H2/H3/L/ LF	ANSI 37.50 UL 489	RCTH	3	6 x 76 mm (0,25 x 3 pulg)
			RCTV, FCT	2	6 x 102 mm (0,25 x 4 pulg)
			FCF	3	6 x 76 mm (0,25 x 3 pulg)
	L1/L1F	ANSI 37.50	RCOV	2	6 x 102 mm (0,25 x 4 pulg)
2 500 A	H/L	UL 489	RCTH	5	6 x 76 mm (0,25 x 3 pulg)
			RCTV, FCT	2	6 x 127 mm (0,25 x 5 pulg)
3 000 A	H/L	UL 489	RCTH	8	6 x 76 mm (0,25 x 3 pulg)
	H/L		RCTV, FCT	4	6 x 102 mm (0,25 x 4 pulg)
3 200 A	H1/H2/H3	ANSI 37.50	RCOV	3	6 x 127 mm (0,25 x 5 pulg)
	L1		RCTH, FCF	3	6 x 152 mm (0,25 x 6 pulg)
	L1		RCTV,FCT	3	6 x 127 mm (0,25 x 5 pulg)
4 000 A	H/H2/H3/L/L1	ANSI 37.50 UL 489	RCTH	4	6 x 152 mm (0,25 x 6 pulg)
			RCTV, FCT	4	6 x 127 mm (0,25 x 5 pulg)
		ANSI 37.50	FCF	4	6 x 152 mm (0,25 x 6 pulg)
		UL 489	FCF	5	6 x 152 mm (0,25 x 6 pulg)
5 000 A	H/H2/H3/L/L1	ANSI 37.50 UL 489	RCTH	8	6 x 152 mm (0,25 x 6 pulg)
			RCTV, FCT	6	6 x 127 mm (0,25 x 5 pulg)
6 000 A	H/L	UL 489	RCTV	6	6 x 152 mm (0,25 x 6 pulg)

Conexiones de los accesorios con conectores de encaje a presión

Figura 20 – Configuración de las terminales para la instalación de los conectores de encaje a presión



CD3	CD2	CD1
834	824	814
832	822	812
831	821	811

o

CE6	CE5	CE4
364	354	344
362	352	342
361	351	341

Com		UC1		UC2		UC3	UC4	M2C/M6C	SDE2/RES	SDE1	CE3	CE2	CE1
E5	E6	Z5	M1	M2	M3	F2 +	V3	484/Q3	184/K2	84	334	324	314
E3	E4	Z3	Z4	T3	T4	VN	V2	474/Q2	182	82	332	322	312
E1	E2	Z1	Z2	T1	T2	F1 -	V1	471/Q1	181/K1	81	331	321	311

MN/MX2	MX1	XF	PF	MCH
D2/C12	C2	A2	254	B2
/C13	C3	A3	252	B3
D1/C11	C1	A1	251	B1

OF24	OF23	OF22	OF21	OF14	OF13	OF12	OF11	OF4	OF3	OF2	OF1	CT3	CT2	CT1
244	234	224	214	144	134	124	114	44	34	24	14	934	924	914
242	232	222	212	142	132	122	112	42	32	22	12	932	922	912
241	231	221	211	141	131	121	111	41	31	21	11	931	921	911

o o o

EF24	EF23	EF22	EF21	EF14	EF13	EF12	EF11
248	238	228	218	148	138	128	118
246	236	226	216	146	136	126	116
245	235	225	215	145	135	125	115

CE9	CE8	CE7
394	384	374
392	382	372
391	381	371

o

CD6	CD5	CD4
864	854	844
862	852	842
861	851	841

Función	Conector	Descripción
Contactos auxiliares	OF[1]	Contactos de posición abierto/cerrado del desconectador seccionador o interruptor
	EF	Contacto combinado conectado y cerrado
Contactos de la cuna	CD	Contactos en posición de desconectado
	CE	Contactos en posición de conectado
	CT	Contactos en posición de prueba
Funciona-miento remoto	SDE	Contacto de alarma de falla eléctrica
	RES	Restablecimiento remoto
	MN	Dispositivo de disparo por baja tensión
	MX[2]	Disparo en derivación
	XF[2]	Cierre en derivación
	PF	Contacto preparado para cerrar
	MCH	Motor de carga de resorte

[1] Los contactos OF1, OF2, OF3 y OF4 son estándar.
[2] Si se utiliza la bobina MX1 o XF en la comunicación, ésta deberá conectarse a la terminal (C3 o A3) en el lado de línea aun cuando no esté instalado el módulo de comunicación. El circuito en derivación que pasa por las terminales C2/A2 es sólo para servicio momentáneo (0,5 s). Para servicio continuo, utilice el comando de comunicaciones.

Tipo de unidad de disparo					
Básico	A	P	H	Conector	Descripción
–	•	•	•	Com: E1–E6	Comunicación
–	•	•	•	UC1: Z	Enclavamiento selectivo de zona
					Z1= señal de salida de ZSI
					Z2= salida de ZSI
					Z3= señal de entrada de ZSI
					Z4= tiempo corto de entrada de ZSI
					Z5 = falla a tierra en la entrada de ZSI
–	•	•	•	UC1: M1	Falla a tierra diferencial modificada (MDGF)
–	•	•	•	UC2: T	Neutro externo
–	•	•	•	UC2: M	Falla a tierra diferencial modificada (MDGF)
–	•	•	•	UC3: F	Fuente de alimentación externa de 24 Vcd
–	–	•	•	UC3: Vn	Enchufe del neutro externo
–	–	•	•	UC4	Detector de tensión de fase externa
–	–	•	•	M2C/M6C	Dos contactos programables (relevador interno) o seis contactos programables (para la conexión al módulo M6C externo)

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Conexiones de los accesorios con conectores de terminal de anillo

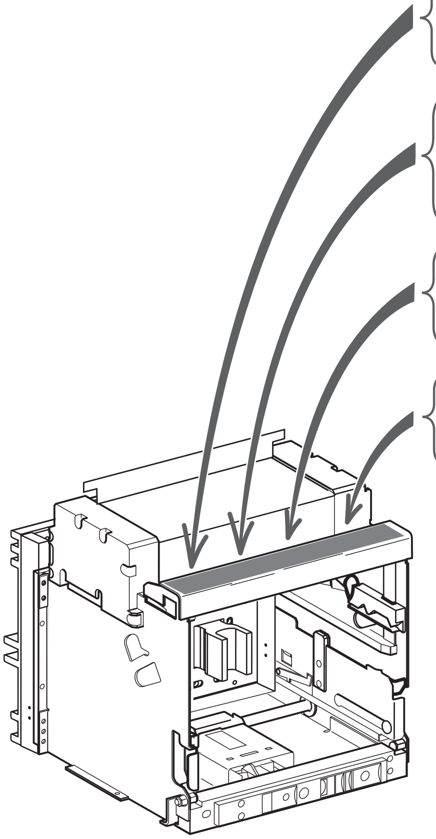
Figura 21 – Arreglo de las terminales para la instalación de los conectores de terminal de anillo

CD3	CD2	CD1
834/832	824/822	814/812
831	821	811

Com		UC1		UC2		UC3	UC3a	M2C/M6C	M2Ca/M6Ca	SDE2/RES	SDE2a	SDE1	SDE1a
E5	E6	Z5	M1	M2	M3	F2	VN	484/Q3	474/Q2	184/K2	182	84	82
E3	E4	Z3	Z4	T3	T4	F1		471/Q1		181/K1		81	
E1	E2	Z1	Z2	T1	T2								

MN	MX1	MX1a	XF	XFa
D2	C2	C3	A2	A3
D1	C1		A1	

PF	CT1	MCH	MCHa	OF14	OF13	OF12	OF11	OF4	OF3	OF2	OF1	CE3	CE2	CE1
252	914/912	B2	B3	144	134	122	112	44	34	22	12	334/332	324/322	314/31
251	911	B1		141	131	121	111	41	31	21	11	331	321	311



Función	Conector	Descripción
Contactos auxiliares	OF[1]	Contactos de posición abierto/cerrado del desconectador seccionador o interruptor
	EF	Contacto combinado conectadoy cerrado
Contactos de la cuna	CD	Contactos en posición de desconectado
	CE	Contactos en posición de conectado
	CT	Contactos en posición de prueba
Funcionamiento remoto	SDE	Contacto de alarma de falla eléctrica
	RES	Restablecimiento remoto
	MN	Dispositivo de disparo por baja tensión
	MX[2]	Disparo en derivación
	XF[2]	Cierre en derivación
	PF	Contacto preparado para cerrar
	MCH	Motor de carga de resorte

[1] Los contactos OF1, OF2, OF3 y OF4 son estándar.

[2] Si se utiliza la bobina MX1 o XF en la comunicación, ésta deberá conectarse a la terminal (C3 o A3) en el lado de línea aun cuando no esté instalado el módulo de comunicación. El circuito en derivación que pasa por las terminales C2/A2 es sólo para servicio momentáneo (0,5 s). Para servicio continuo, utilice el comando de comunicaciones.

Tipo de unidad de disparo					
Básico	**A**	**P**	**H**	**Conector**	**Descripción**
–	•	•	•	Com: E1–E6	Comunicación
–	•	•	•	UC1: Z	Enclavamiento selectivo de zona
					Z1= señal de salida de ZSI
					Z2= salida de ZSI
					Z3= señal de entrada de ZSI
					Z4= tiempo corto de entrada de ZSI
					Z5 = falla a tierra en la entrada de ZSI
–	•	•	•	UC1: M1	Falla a tierra diferencial modificada (MDGF)
–	•	•	•	UC2: T	Neutro externo
–	•	•	•	UC2: M	Falla a tierra diferencial modificada (MDGF)
–	•	•	•	UC3: F	Fuente de alimentación externa de 24 Vcd
–	–	•	•	UC3: Vn	Enchufe del neutro externo
–	–	•	•	UC4	Detector de tensión de fase externa
–	–	•	•	M2C/M6C	Dos contactos programables (relevador interno) o seis contactos programables (para la conexión al módulo M6C externo)

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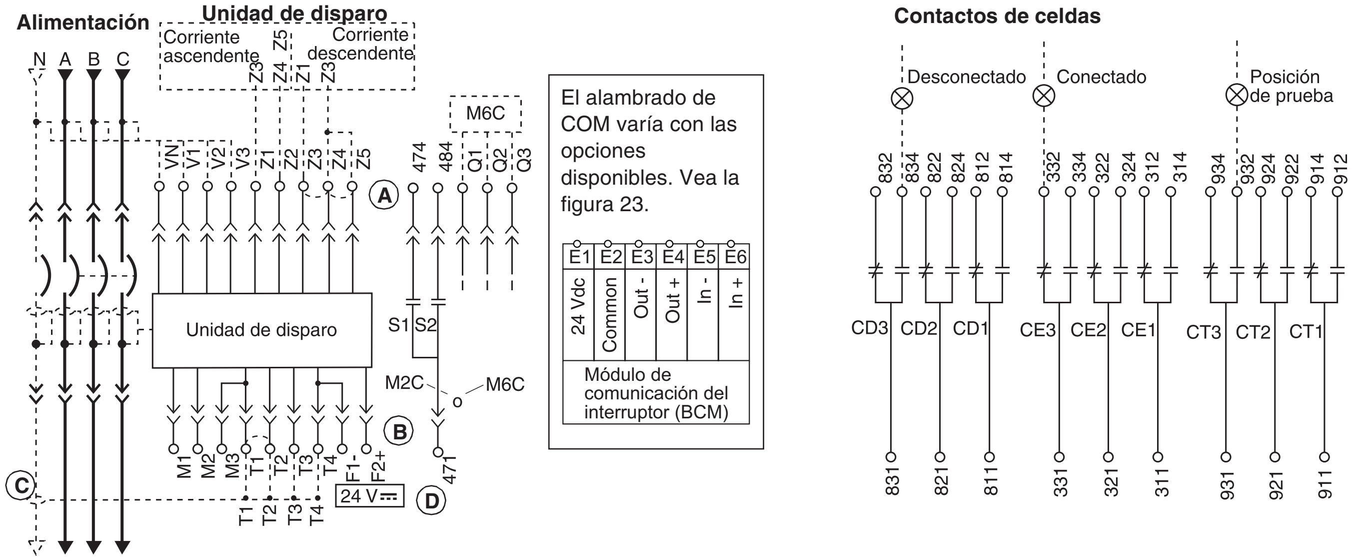
Diagramas de alambrado para las conexiones auxiliares

NOTA: Todos los diagramas se muestran con el interruptor automático abierto, conectado y cargado.

Figura 22 – Diagramas de alambrado para las conexiones auxiliares



A—No retire los cables de conexión en puente instalados en la fábrica entre Z3, Z4 y Z5 a no ser que esté conectado un enclavamiento selectivo de zona (ZSI).

B—No retire el cable de conexión en puente instalado en la fábrica entre T1 y T2 a no ser que esté conectado un TC al neutro. No instale el cable de conexión en puente entre T3 y T4.

C—Para conectar correctamente el TC al neutro, consulte los diagramas de alambrado en las páginas 34 y 34.

D—La fuente de alimentación de 24 V (c.d.) de la unidad de disparo deberá estar independiente y aislada de la fuente de alimentación de 24 V (c.d.) de los módulos de comunicación.

Marcas para las terminales de encaje a presión

Contactos de celdas		
CD3	CD2	CD1
834	824	814
832	822	812
831	821	811

o

CE6	CE5	CE4
364	354	344
362	352	342
361	351	341

Unidad de disparo								Contactos de celdas		
COM	UC1	UC2	UC3	UC4	M2C/M6C	SDE2/Res.	SDE1	CE3	CE2	CE1
E5 E6	Z5 M1	M2 M3	F2+	V3	484/Q3	184/K2	84	334	324	314
E3 E4	Z3 Z4	T3 T4	VN	V2	474/Q2	182	82	332	322	312
E1 E2	Z1 Z2	T1 T2	F1–	V1	471/Q1	181/K1	81	331	321	311

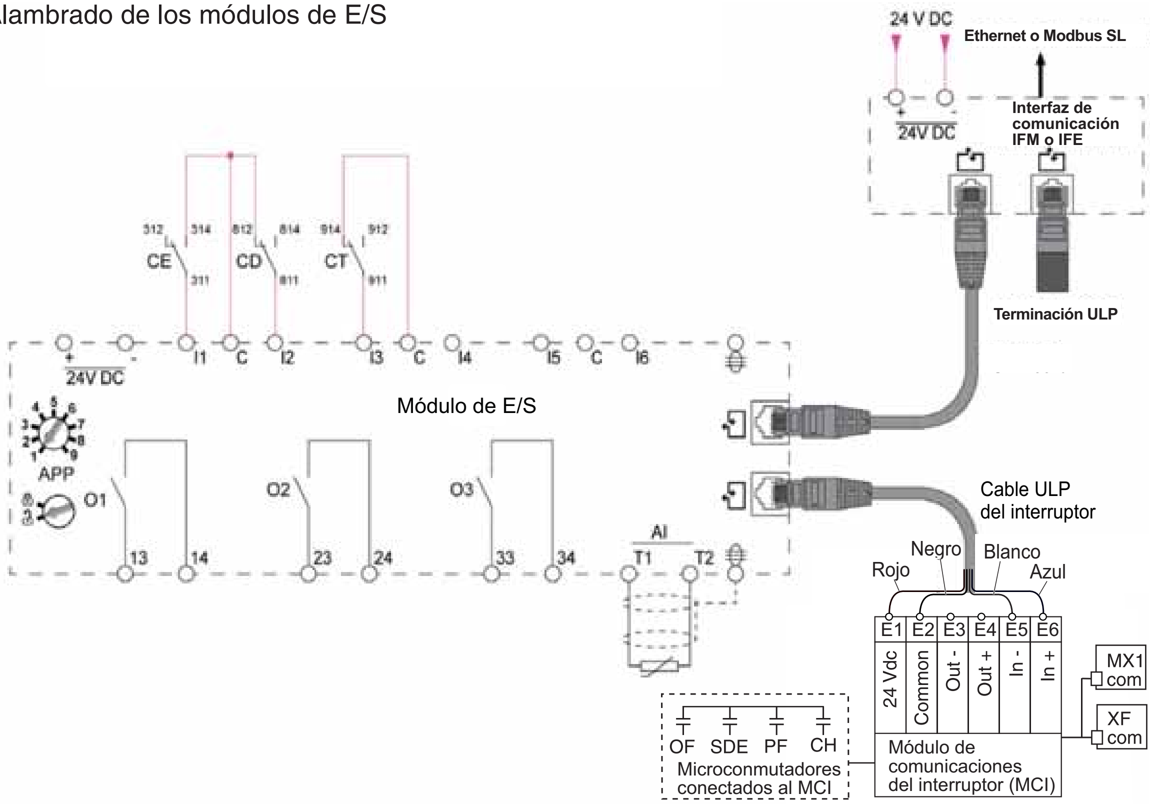
Marcas para las terminales de anillo

Contactos de celdas		
CD3	CD2	CD1
834/832	824/822	814/812
831	821	811

Unidad de disparo										
COM	UC1	UC2	UC3	UC3a	M2C/M6C	M2Ca/M6Ca	SDE2/Res.	SDE2a	SDE1	SDE1a
E5 E6	Z5 M1	M2 M3	F2	VN	484/Q3	474/Q2	184/K2	182	84	82
E3 E4	Z3 Z4	T3 T4	F1		471/Q1		181/K1		81	
E1 E2	Z1 Z2	T1 T2								

Figura 23 – Diagramas de alambrado para la opción de COM

- Alambrado de los módulos de E/S



Alambrado de la opción COM (módulos Modbus ULP MCC y MCI)

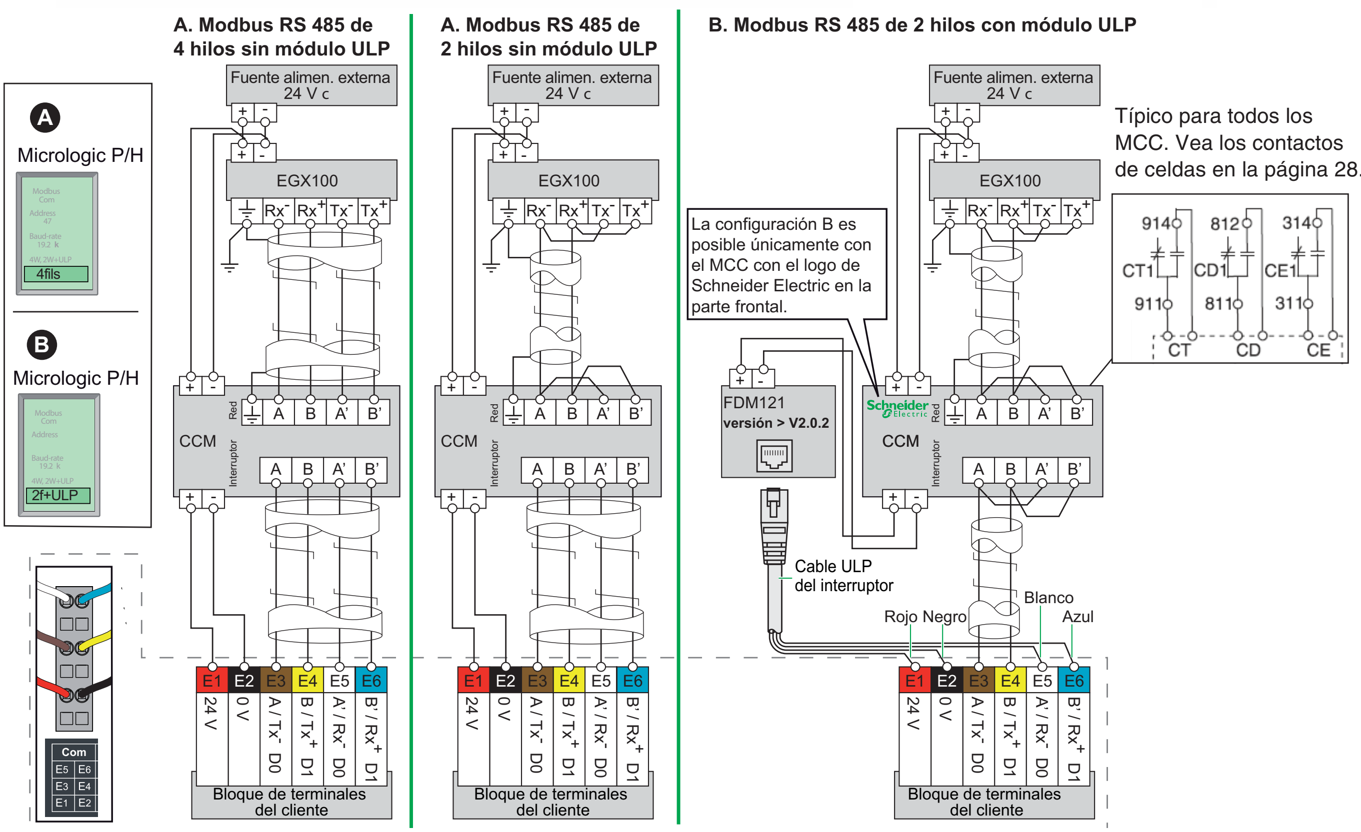


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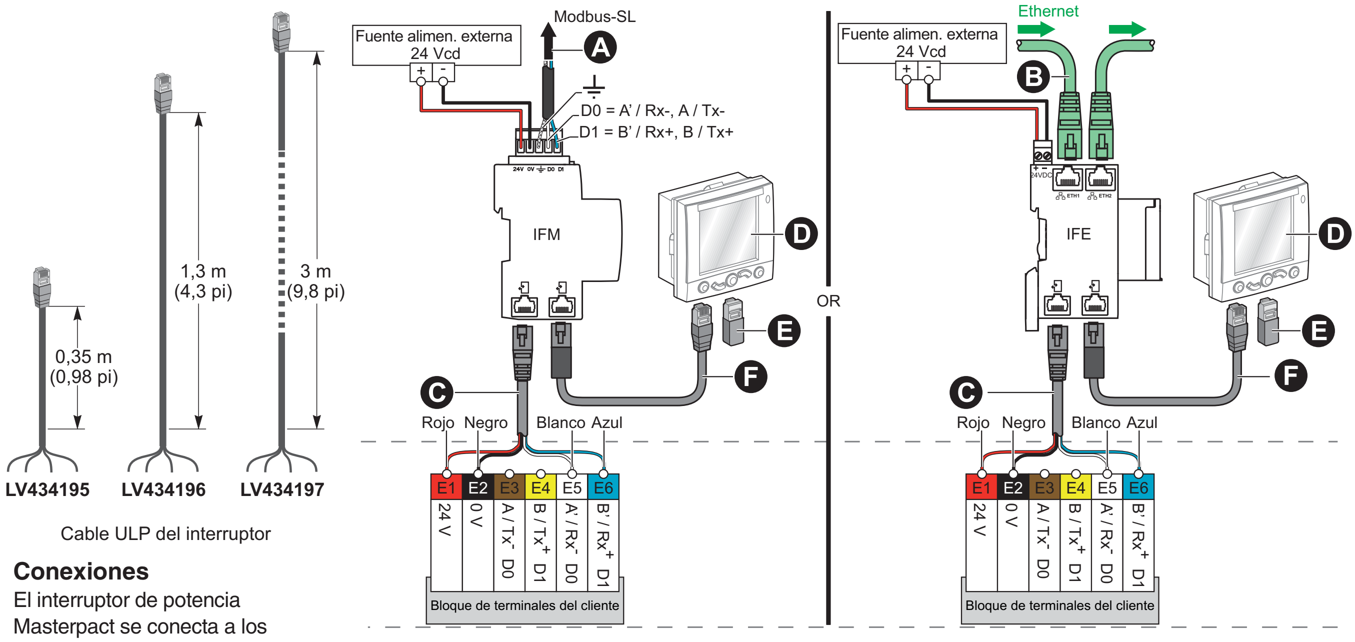
Figura 24 – Componentes de comunicación y conexiones del FDM121



A. Red Modbus
B. Red Ethernet
C. Cable ULP del interruptor
D. Pantalla del FDM
E. Terminación ULP
F. Cable ULP

Conexiones

El interruptor de potencia Masterpact se conecta a los dispositivos ULP (pantalla del FDM121, IFM, IFE o unidad de E/S) a través del cordón eléctrico del conector ULP del interruptor.

- El cordón eléctrico está disponible en tres longitudes: 0,35 m (0,98 pies), 1,3 m (4,3 pies) y 3 m (9,8 pies).
- Es posible tener longitudes de hasta 10 m (32,9 pies) usando extensiones.

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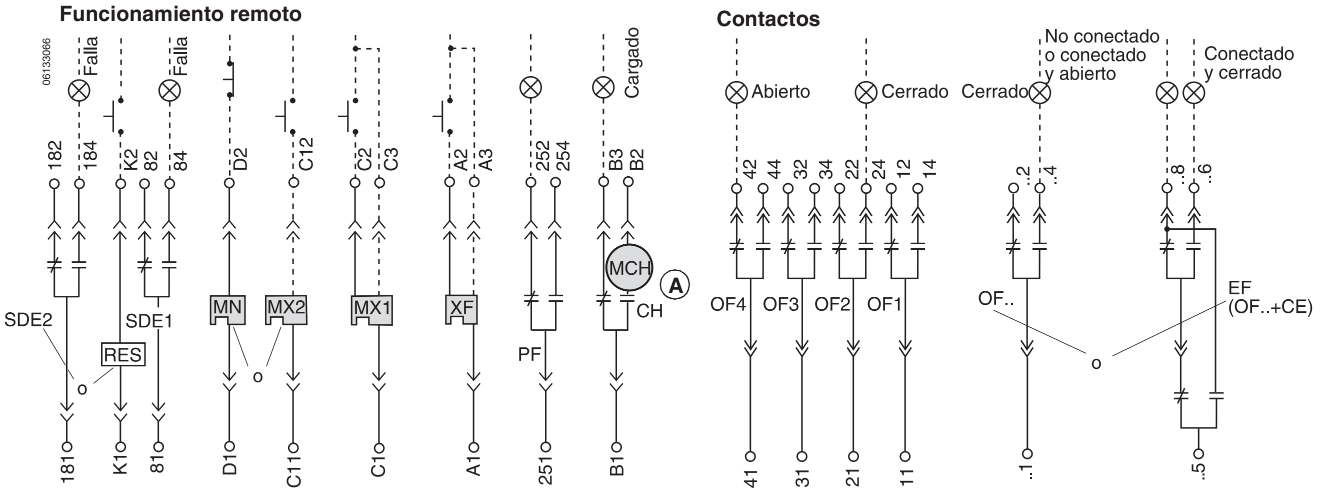
NOTA: Todos los diagramas se muestran con el interruptor automático abierto, conectado y cargado.

Figura 25 – Diagramas de alambrado para las conexiones auxiliares



A—Cuando se usan las opciones de funcionamiento remoto, asegúrese de que transcurran por lo menos cuatro segundos para que el motor de carga de resorte (MCH) cargue completamente los resortes de cierre del interruptor antes de activar el dispositivo de cierre en derivación (XF).

Marcas para las terminales de encaje a presión

Funcionamiento remoto					Contactos auxiliares												Contactos de celdas		
MN/MX2	MX1	XF	PF	MCH	OF24	OF23	OF22	OF21	OF14	OF13	OF12	OF11	OF4	OF3	OF2	OF1	CT3	CT2	CT1
D2/C12	C2	A2	254	B2	244	234	224	214	144	134	124	114	44	34	24	14	934	924	914
C13	C3	A3	252	B3	242	232	222	212	142	132	122	112	42	32	22	12	932	922	912
D1/C11	C1	A1	251	B1	241	231	221	211	141	131	121	111	41	31	21	11	931	921	911

o

EF24	EF23	EF22	EF21	EF14	EF13	EF12	EF11
248	238	228	218	148	138	128	118
246	236	226	216	146	136	126	116
245	235	225	215	145	135	125	115

o

CD6	CD5	CD4
864	854	844
862	852	842
861	851	841

o

CE9	CE8	C7
394	384	374
392	382	372
391	381	371

Marcas para las terminales de anillo

Funcionamiento remoto									Contactos auxiliares								Contactos de celdas		
MN	MX1	MX1a	XF	XFa	PF	CT1	MCH	MCHa	OF14	OF13	OF12	OF11	OF4	OF3	OF2	OF1	CE3	CE2	CE1
D2	C2	C3	A2	A3	252	914/912	B2	B3	144	134	122	112	44	34	22	12	334/332	324/322	314/312
D1	C1		A1		251	911	B1		141	131	121	111	41	31	21	11	331	321	311

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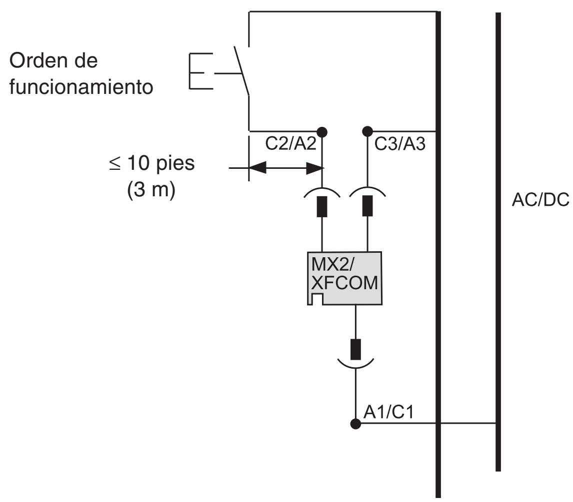
Disparo en derivación (MX) y cierre en derivación (XF) con comunicación

La figura 26 muestra un diagrama esquemático de alambrado recomendado para las bobinas de disparo en derivación o cierre en derivación con comunicación. Las tensiones inducidas en el circuito en la terminal C2 y/o A2 pueden causar el mal funcionamiento del disparo en derivación o cierre en derivación. La mejor manera de evitar tensiones inducidas es manteniendo el circuito a la terminal C2 o A2 lo más corto posible. Si no es posible mantener el circuito a menos de 3 m (10 pies), utilice un relevador de interposición cerca de la terminal C2 o A2.

Figura 26 – Diagrama esquemático de alambrado - con comunicación

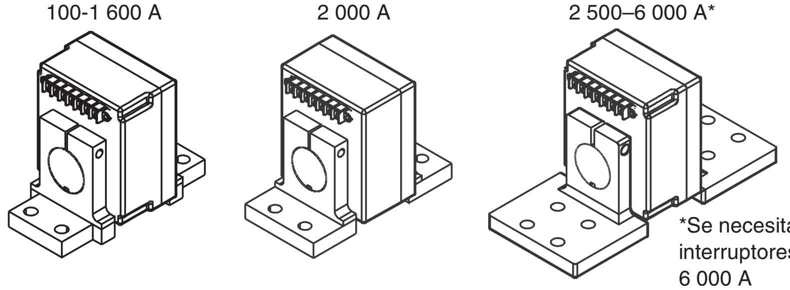


Protección contra fallas a tierra del equipo

No es necesario leer esta subsección si su interruptor no dispone de un disparo integral contra fallas a tierra o de alarma.

Un circuito de tres fases y cuatro hilos necesita un transformador de corriente al neutro (TC) externo.

Figura 27 – Transformadores de corriente al neutro



Conecte el neutro del TC al interruptor de acuerdo con los diagramas de alambrado.

1. Conecte el primario:
   - — Si la carga está conectada al extremo inferior del interruptor, conecte el neutro de la carga a la terminal H1 del TC al neutro.
   - — Si la alimentación de la fuente está conectada al extremo inferior del interruptor, conecte el neutro de la fuente a la terminal H1 del TC al neutro.

NOTA: La conexión a tierra del equipo se debe realizar en la corriente ascendente (en el lado de línea) del TC al neutro y debe contar con una conexión del neutro desde el transformador de alimentación hasta el equipo.

Para interruptores que utilicen unidades de disparo Micrologic™ 5.0P, 5.0H, 6.0P o 6.0H conecte la terminal Vn del transformador de corriente del neutro a la terminal Vn de la terminal del alambrado de control; así, la unidad de disparo puede realizar mediciones de tensión. Las terminales Vc y Vn se encuentran conectadas internamente.

AVISO

PELIGRO DE FUNCIONAMIENTO INAPROPIADO DEL SISTEMA DE DISPARO

F1 y F2 deberán ser aislados de tierra. Asegúrese de que todo el alambrado haya sido instalado de acuerdo con las instrucciones de este boletín.

El incumplimiento de estas instrucciones puede causar disparos incorrectos durante la operación de cierre.

2. Retire el cable de conexión en puente en T1 y T2, instalado en la fábrica.
3. Conecte el cable Belden® y el tubo conduit de plástico del TC al neutro a las terminales de la cuna.
4. Conecte el cable como se ilustra en el diagrama esquemático en la figura 28 ó 29.
5. Revise todos los cables.

NOTA: Los circuitos de falla a tierra diferencial modificada y los circuitos de falla a tierra de retorno por tierra, requieren el uso de un módulo de falla a tierra diferencial modificada (MDGF) y transformadores de corriente especiales. Para el alambrado de estos sistemas, consulte las instrucciones que acompañan al módulo.

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Figura 28 – Diagrama esquemático de alambrado de los interruptores de potencia NW (ancho estándar) de 800 a 4 000 A

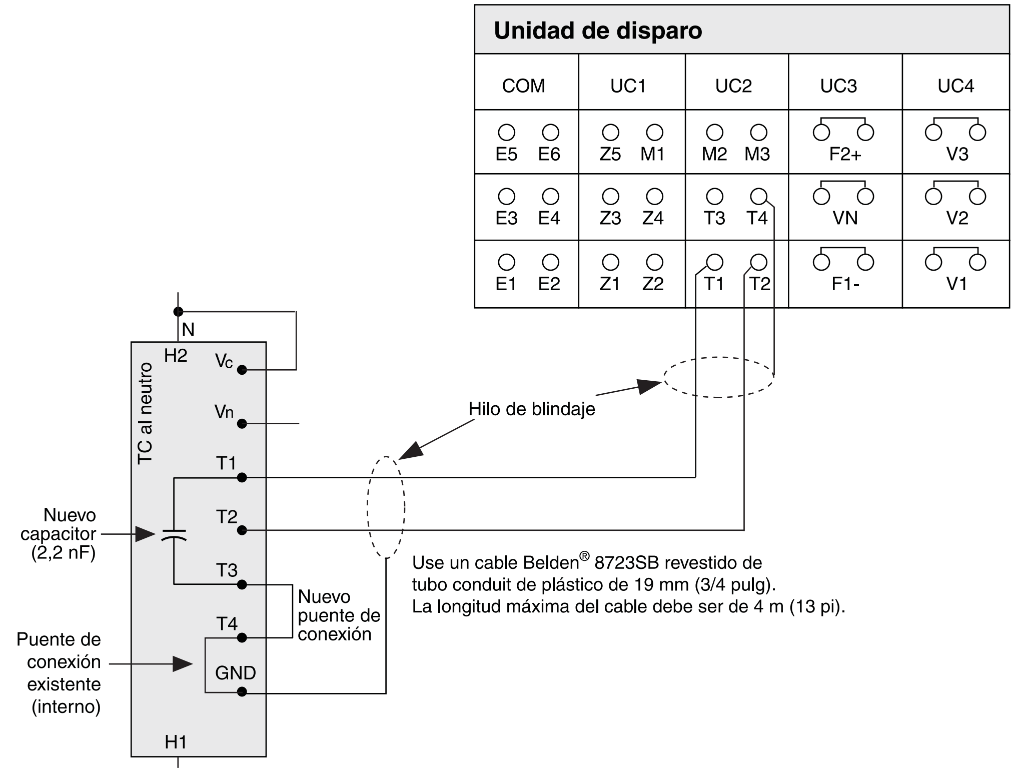
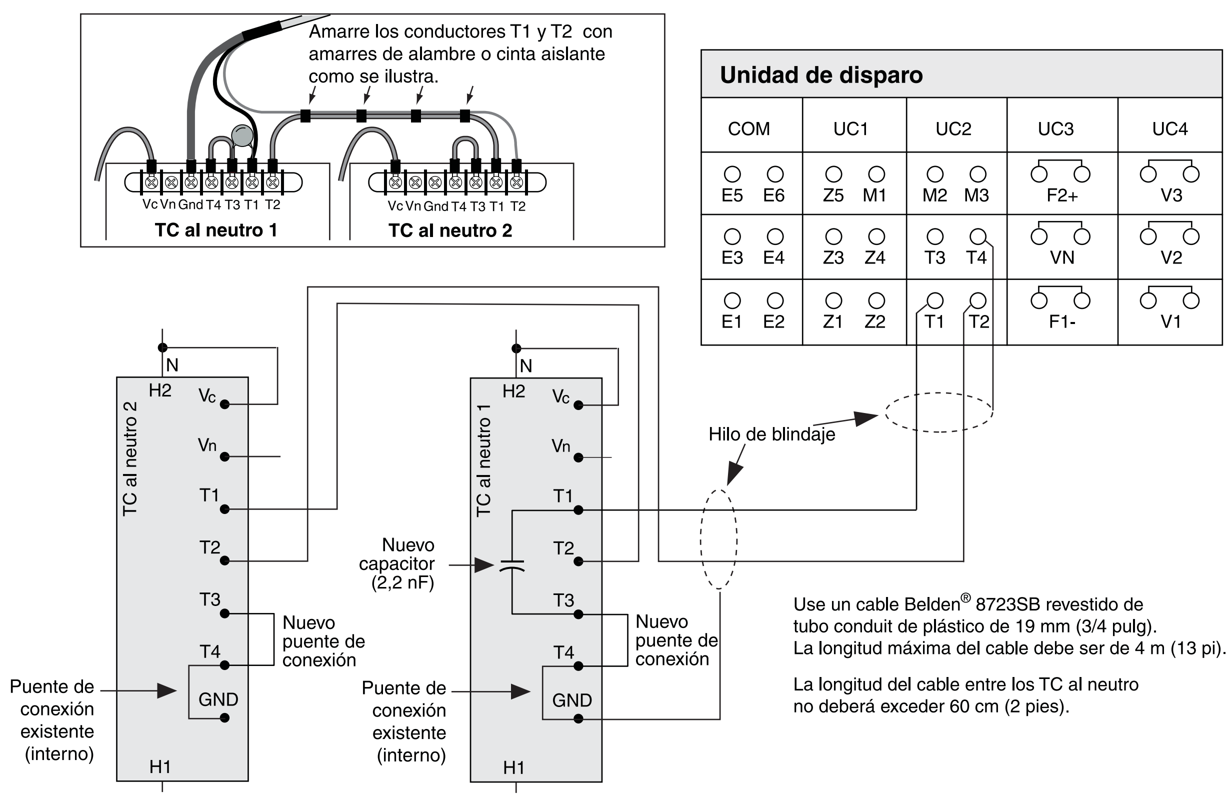


Figura 29 – Diagrama esquemático de alambrado de los interruptores de potencia NW (diseño amplio) de 3 200 a 6 000 A

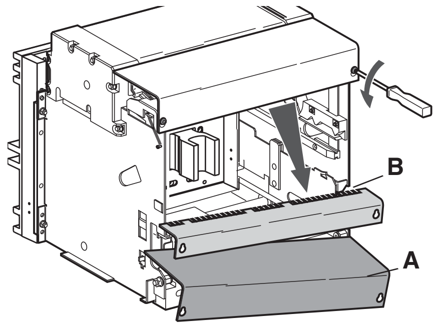


Alambrado de los accesorios—Conectores de encaje a presión

NOTA: Para instalar o quitar los conectores de encaje a presión, coloque la cuna en posición de prueba. Coloque en posición de prueba como se describe en la página 71.

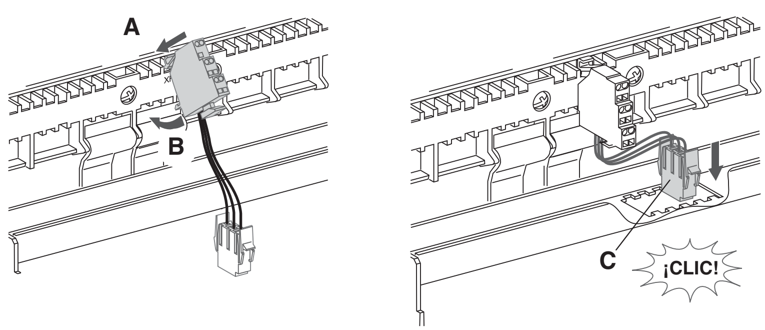
1. Retire la cubierta de terminales opcional (**figura 30, A**), si está instalada, y la cubierta de los cables (**B**).

Figura 30 – Desmontaje de las cubiertas



2. Instale cada conector a presión en la ranura correcta (**figura 31, A**). (Para obtener información relativa al posicionamiento estándar, consulte la etiqueta de la cuna.) Gire y presione el conector de encaje a presión (**B**) hasta encajar en su lugar.
3. Instale el conector de cables (**C**). (Las posiciones del conector están señaladas en el frente del soporte del conector).

Figura 31 – Instalación del conector de encaje a presión



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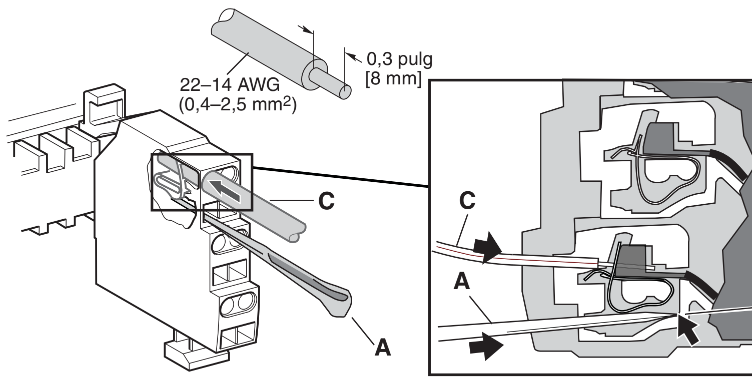
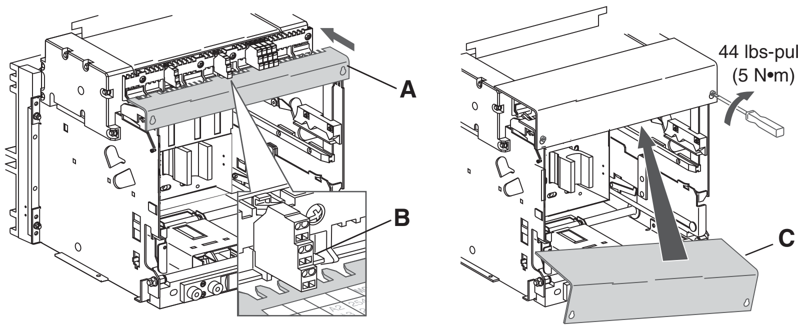
4. Encaje la herramienta de inserción de cables Wago® (**figura 32, A**, Wago no. de pieza 209-129) completamente en el conector (en el punto **B**) e instale los cables de control (**C**).

Figura 32 – Instalación de los conductores de control



5. Vuelva a colocar la cubierta del alambrado (**figura 33, A**), deslice la tapa por debajo de los conectores de encaje a presión instalados (**B**).
6. Vuelva a colocar la tapa de terminales opcional (**C**), si está instalada

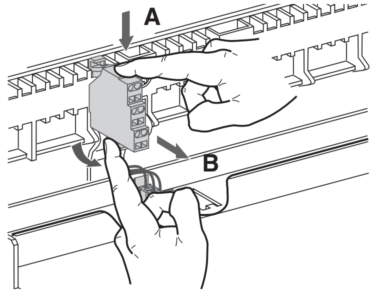
Figura 33 – Colocación de las cubiertas



NOTA: Retire el conector de encaje a presión en el orden inverso al de su instalación.

Retire el conector haciendo presión en su parte superior (**figura 34, A**) mientras empuja hacia arriba y hacia afuera en la parte inferior (**B**) para girar el conector y desengancharlo.

Figura 34 – Extracción del conector de encaje a presión

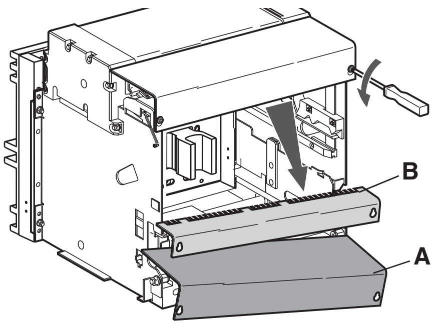


Alambrado de los accesorios—conector de terminal de anillo

NOTA: Para instalar o quitar los conectores de terminal de anillo, ponga la cuna en posición de prueba. Para esto, siga las instrucciones de la page 72, Desconexión del interruptor removible.

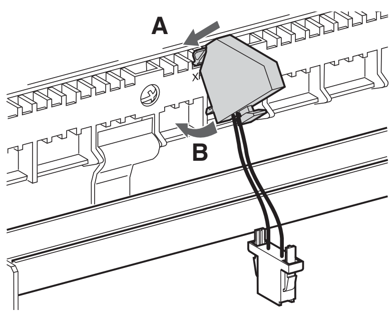
1. Retire la cubierta de terminales opcional (**figura 35, A**), si está instalada, y la cubierta de los cables (**B**).

Figura 35 – Desmontaje de las cubiertas



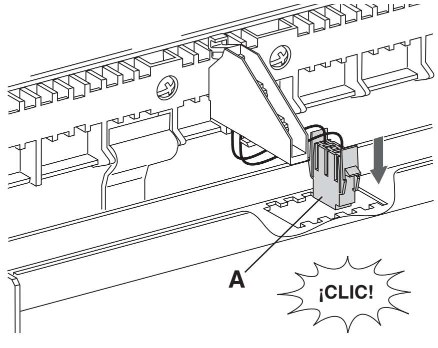
2. Instale cada conector de terminal de anillo en la ranura correcta (**figura 36, A**). (Para obtener información relativa al posicionamiento estándar, consulte la etiqueta de la cuna.) Presione y gire el bloque de terminales (**B**) hasta encajar en su lugar.

Figura 36 – Instalación del conector de terminal de anillo



3. Instale el conector de cables (**figura 37, A**). (Las posiciones del conector están señaladas en el frente del soporte del conector).

Figura 37 – Instalación del conector del alambrado



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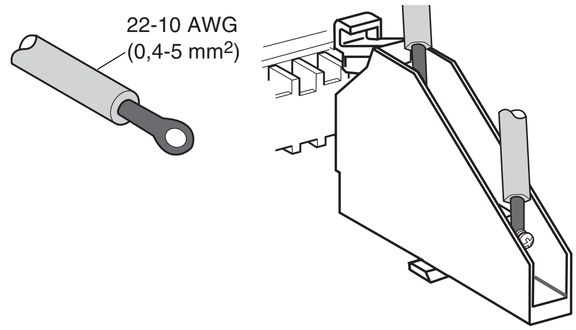
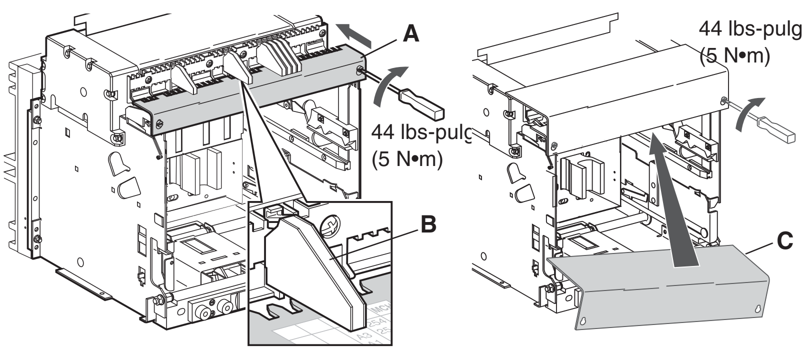
4. Instale las terminales de anillo en el cable de control. Sujete bien la terminal de anillo en el bloque de terminales de anillo.

Figura 38 – Instalación de los conductores de control



5. Vuelva a colocar la cubierta del alambrado (**figura 39, A**), deslice la tapa por debajo de los conectores de terminal de anillo instalados (**B**).
6. Vuelva a colocar la tapa de terminales opcional (**C**), si está instalada.

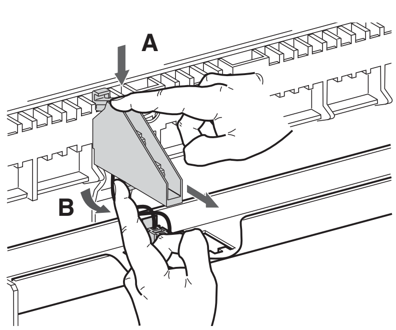
Figura 39 – Colocación de la cubierta del alambrado



NOTA: Para quitar un conector de terminal de anillo, el interruptor deberá estar en posición de prueba. Retire el conector de terminales de anillo en el orden inverso al de su instalación.

Retire el conector haciendo presión en su parte superior (**figura 40, A**) mientras empuja hacia arriba y hacia afuera en la parte inferior (**B**) para girar el conector y desengancharlo.

Figura 40 – Extracción del conector de terminal de anillo



Desmontaje de la cuna

1. Desenergice el equipo antes de realizar cualquier trabajo en él.
2. Quite la cuna en el orden inverso al de su instalación.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA o Z462 de CSA y NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Instalación del interruptor

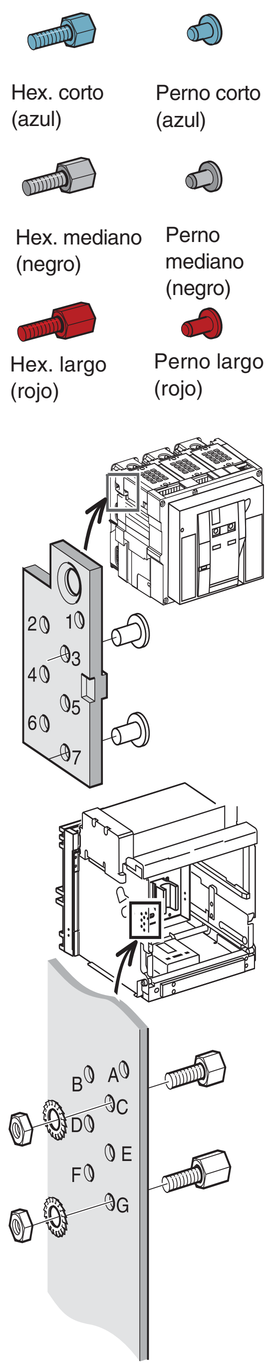
Accesorio de rechazo de la cuna

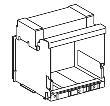
Para prevenir la instalación en la cuna de un interruptor Masterpact con capacidad de conducción o valor nominal de interrupción inadecuado, instale los pernos de rechazo de la cuna y el interruptor antes de instalar este último.

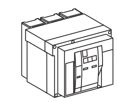
1. Establezca un patrón adecuado de los pernos de rechazo (consulte la tabla 8 u 9).

Tabla 8 – Configuración recomendada de los pernos de rechazo de la cuna para los interruptores estándar aprobados por UL bajo la norma 1066 (ANSI C37.50)

Pernos de rechazo de la cuna | Pernos de rechazo del interruptor



Tipo							
	A	B	C	D	E	F	G
800 A N1	Negro	Negro	Negro	Rojo	Azul	Azul	Negro
800 A H1	Negro	Negro	Negro	Azul	Rojo	Negro	Azul
800 A H2	Negro	Negro	Negro	Rojo	Rojo	Azul	Azul
800 A H3	Negro	Negro	Negro	Azul	Azul	Rojo	Azul
800 A L1	Negro	Negro	Negro	Rojo	—	Rojo	Azul
800 A L1F	Negro	Negro	Negro	—	Rojo	Rojo	Azul
800 A HF	Negro	Negro	Negro	Azul	—	Rojo	Rojo
800 A HC	Negro	Azul	Negro	Rojo	—	Rojo	Rojo
800 A HA	Negro	Negro	Negro	Rojo	Rojo	—	Rojo
1600 A N1	—	Rojo	Azul	Rojo	Azul	Azul	Negro
1600 A H1	—	Rojo	Azul	Azul	Rojo	Negro	Azul
1600 A H2	—	Rojo	Azul	Rojo	Rojo	Azul	Azul
1600 A H3	—	Rojo	Azul	Azul	Azul	Rojo	Azul
1600 A L1	—	Rojo	Negro	Rojo	—	Rojo	Azul
1600 A L1F	—	Rojo	Negro	—	Rojo	Rojo	Azul
1600 A HF	—	Rojo	Negro	Azul	—	Rojo	Rojo
1600 A HC	—	Rojo	Azul	Rojo	—	Rojo	Rojo
1600 A HA	—	Rojo	Azul	Rojo	Rojo	—	Rojo
2000 A H1	Rojo	—	Rojo	Azul	Rojo	Negro	Azul
2000 A H2	Rojo	—	Rojo	Rojo	Rojo	Azul	Azul
2000 A H3	Rojo	—	Rojo	Azul	Azul	Rojo	Azul
2000 A L1	Rojo	—	Rojo	Rojo	—	Rojo	Azul
2000 A L1 *	—	Rojo	Rojo	Rojo	Azul	Rojo	Negro
2000 A L1F	Rojo	—	Rojo	—	Rojo	Rojo	Azul
2000 A HF	Rojo	—	Rojo	Azul	—	Rojo	Rojo
2000 A HC	Rojo	—	Azul	Rojo	—	Rojo	Rojo
2000 A HA	Rojo	—	Rojo	Rojo	Rojo	—	Rojo
3200 A H1	Azul	Negro	Rojo	Negro	Rojo	Negro	Negro
3200 A H2	Azul	Negro	Rojo	Rojo	Rojo	Negro	Azul
3200 A H3	Azul	Negro	Rojo	Azul	Negro	Rojo	Azul
3200 A HF	Azul	Negro	Rojo	—	—	Rojo	Rojo
3200 A HC	—	Negro	Rojo	Rojo	—	Rojo	Rojo
3200 A HC *	Rojo	Azul	Negro	Rojo	Negro	Rojo	Rojo
3200 A L1	Rojo	Negro	Azul	Rojo	Negro	Rojo	Negro
3200 A HA	—	Negro	Rojo	Rojo	Rojo	—	Rojo
4000 A H2 *	Negro	Rojo	Azul	Rojo	Rojo	Negro	Azul
4000 A H3 *	Negro	Rojo	Azul	Azul	Negro	Rojo	Azul
4000 A HA *	Azul	Rojo	Azul	Rojo	Rojo	—	Rojo
4000 A HC *	Azul	Rojo	Azul	Rojo	Azul	Rojo	Rojo
4000 A HF *	Azul	Rojo	Azul	Azul	Negro	Rojo	Rojo
4000 A L1 *	Negro	Rojo	Azul	Rojo	Azul	Rojo	Negro
5000 A H2	Rojo	Negro	Negro	Rojo	Rojo	Negro	Azul
5000 A H3	Rojo	Negro	Negro	Azul	Negro	Rojo	Azul
5000 A HA	Rojo	Negro	Azul	Rojo	Rojo	—	Rojo
5000 A HF	Rojo	Negro	Azul	Azul	Negro	Rojo	Rojo
5000 A HC	Rojo	Negro	Azul	Rojo	Azul	Rojo	Rojo
5000 A L1	Rojo	Negro	Negro	Rojo	Azul	Rojo	Negro
6000 A H2	Negro	Negro	Rojo	Rojo	Rojo	Negro	Azul
6000 A H3	Negro	Negro	Rojo	Azul	Negro	Rojo	Azul
6000 A HA	Azul	Azul	Rojo	Rojo	Rojo	—	Rojo
6000 A HF	Azul	Azul	Rojo	Azul	Negro	Rojo	Rojo
6000 A HC	Azul	Azul	Rojo	Rojo	Azul	Rojo	Rojo
6000 A L1	Negro	Negro	Rojo	Rojo	Azul	Rojo	Negro

Tipo							
	1	2	3	4	5	6	7
800 A N1	Azul	Azul	Azul	—	Negro	Negro	Azul
800 A H1	Azul	Azul	Azul	Negro	—	Azul	Negro
800 A H2	Azul	Azul	Azul	—	—	Negro	Negro
800 A H3	Azul	Azul	Azul	Negro	Negro	—	Negro
800 A L1	Azul	Azul	Azul	—	Rojo	—	Negro
800 A L1F	Azul	Azul	Azul	Rojo	—	—	Negro
800 A HF	Azul	Azul	Azul	Negro	Rojo	—	—
800 A HC	Azul	Negro	Azul	—	Rojo	—	—
800 A HA	Azul	Azul	Azul	—	—	Rojo	—
1600 A N1	Rojo	—	Negro	—	Negro	Negro	Azul
1600 A H1	Rojo	—	Negro	Negro	—	Azul	Negro
1600 A H2	Rojo	—	Negro	—	—	Negro	Negro
1600 A H3	Rojo	—	Negro	Negro	Negro	—	Negro
1600 A L1	Rojo	—	Azul	—	Rojo	—	Negro
1600 A L1F	Rojo	—	Azul	Rojo	—	—	Negro
1600 A HF	Rojo	—	Negro	Negro	Rojo	—	—
1600 A HC	Rojo	—	Negro	—	Rojo	—	—
1600 A HA	Rojo	—	Negro	—	—	Rojo	—
2000 A H1	—	Rojo	—	Negro	—	Azul	Negro
2000 A H2	—	Rojo	—	—	—	Negro	Negro
2000 A H3	—	Rojo	—	Negro	Negro	—	Negro
2000 A L1	—	Rojo	—	—	Rojo	—	Negro
2000 A L1 *	Rojo	—	—	—	Negro	—	Azul
2000 A L1F	—	Rojo	—	Rojo	—	—	Negro
2000 A HF	—	Rojo	—	Negro	Rojo	—	—
2000 A HC	—	Rojo	Negro	—	Rojo	—	—
2000 A HA	—	Rojo	—	—	—	Rojo	—
3200 A H1	Negro	Azul	—	Azul	—	Azul	Azul
3200 A H2	Negro	Azul	—	—	—	Azul	Negro
3200 A H3	Negro	Azul	—	Negro	Azul	—	Azul
3200 A HF	Negro	Azul	—	Rojo	Rojo	—	—
3200 A HC	Rojo	Azul	—	—	Rojo	—	—
3200 A HC *	—	Negro	Azul	—	Azul	—	—
3200 A L1	—	Azul	Negro	—	Azul	—	Azul
3200 A HA	Negro	Azul	—	—	—	Rojo	—
4000 A H2 *	Azul	—	Negro	—	—	Azul	Negro
4000 A H3 *	Azul	—	Negro	Negro	Azul	—	Negro
4000 A HA *	Negro	—	Azul	—	—	Rojo	—
4000 A HC *	Negro	—	Azul	—	Negro	—	—
4000 A HF *	Negro	—	Azul	Negro	Azul	—	—
4000 A L1 *	Azul	—	Negro	—	Negro	—	Azul
5000 A H2	—	Azul	Azul	—	—	Azul	Negro
5000 A H3	—	Azul	Azul	Negro	Azul	—	Negro
5000 A HA	—	Azul	Negro	—	—	Rojo	—
5000 A HF	—	Azul	Negro	Negro	Azul	—	—
5000 A HC	—	Azul	Negro	—	Negro	—	—
5000 A L1	—	Azul	Azul	—	Negro	—	Azul
6000 A H2	Azul	Azul	—	—	—	Azul	Negro
6000 A H3	Azul	Azul	—	Negro	Azul	—	Negro
6000 A HA	Negro	Negro	—	—	—	Rojo	—
6000 A HF	Negro	Negro	—	Negro	Azul	—	—
6000 A HC	Negro	Negro	—	—	Negro	—	—
6000 A L1	Azul	Azul	—	—	Negro	—	Azul

* Versión de construcción ancha

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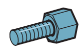
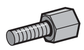
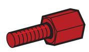
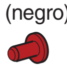
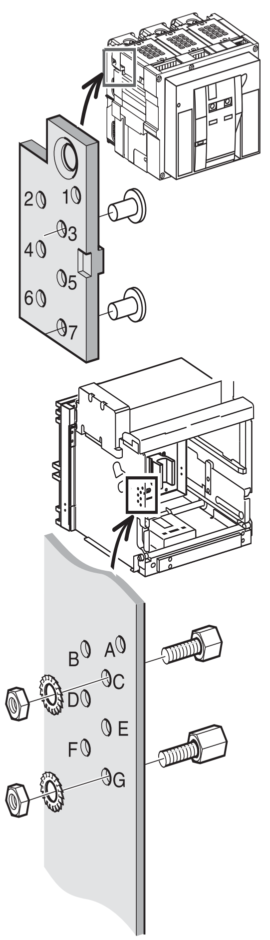
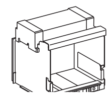
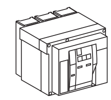
Tabla 9 – Configuración recomendada de los pernos de rechazo de la cuna para los interruptores estándar aprobados por UL bajo la norma 489

Pernos de rechazo de la cuna	Pernos de rechazo del interruptor
 Hex. corto (azul)	 Perno corto (azul)
 Hex. mediano (negro)	 Perno mediano (negro)
 Hex. largo (rojo)	 Perno largo (rojo)

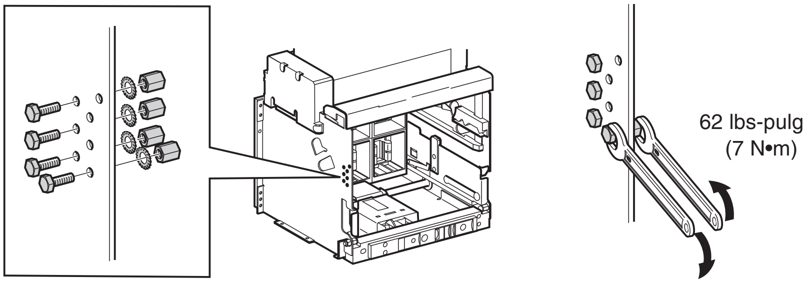


Tipo														
	A	B	C	D	E	F	G	1	2	3	4	5	6	7
800 A N	Negro	Negro	Negro	Rojo	Rojo	Rojo	—	Azul	Azul	Azul	—	—	—	R
800 A H	Negro	Negro	Azul	Azul	Azul	Azul	Rojo	Azul	Azul	Negro	Negro	Negro	Negro	—
800 A L	Negro	Negro	Negro	Rojo	—	Azul	Rojo	Azul	Azul	Azul	—	Rojo	Negro	—
800 A LF	Negro	Azul	Negro	Azul	Rojo	Azul	Rojo	Azul	Negro	Azul	Negro	—	Negro	—
800 A HF	Negro	Azul	Negro	—	Rojo	Rojo	Negro	Azul	Negro	Azul	Rojo	—	—	A
800 A HB	Azul	Negro	Negro	Rojo	Rojo	Rojo	Negro	Negro	Azul	Azul	—	—	—	A
1200 A N	Rojo	Azul	Negro	Rojo	Rojo	Rojo	—	—	Negro	Azul	—	—	—	R
1200 A H	Rojo	Azul	Negro	Azul	Azul	Azul	Rojo	—	Negro	Azul	Negro	Negro	Negro	—
1200 A L	Rojo	Azul	Negro	Rojo	—	Azul	Rojo	—	Negro	Azul	—	Rojo	Negro	—
1200 A LF	Rojo	Azul	Azul	Azul	Rojo	Azul	Rojo	—	Negro	Negro	Negro	—	Negro	—
1200 A HF	Rojo	Negro	Azul	—	Rojo	Rojo	Rojo	—	Azul	Negro	Rojo	—	—	—
1200 A HB	Negro	Azul	Azul	Rojo	Rojo	Rojo	Rojo	Azul	Negro	Negro	—	—	—	—
1600 A N	—	Rojo	Azul	Rojo	Rojo	Rojo	—	Rojo	—	Negro	—	—	—	R
1600 A H	—	Rojo	Negro	Azul	Azul	Azul	Rojo	Rojo	—	Azul	Negro	Negro	Negro	—
1600 A L	—	Rojo	Negro	Rojo	—	Azul	Rojo	Rojo	—	Azul	—	Rojo	Negro	—
1600 A LF	—	Rojo	Azul	Azul	Rojo	Azul	Rojo	Rojo	—	Negro	Negro	—	Negro	—
1600 A HF	—	Rojo	Azul	—	Rojo	Rojo	Rojo	Rojo	—	Negro	Rojo	—	—	—
1600 A HB	—	Rojo	—	Rojo	Rojo	Rojo	Rojo	Rojo	—	Rojo	—	—	—	—
2000 A N	Rojo	—	Rojo	Rojo	Rojo	Rojo	—	—	Rojo	—	—	—	—	R
2000 A H	Rojo	—	Rojo	Azul	Azul	Azul	Rojo	—	Rojo	—	Negro	Negro	Negro	—
2000 A L	Rojo	—	Rojo	Rojo	—	Azul	Rojo	—	Rojo	—	—	Rojo	Negro	—
2000 A LF	Rojo	—	Negro	Azul	Rojo	Azul	Rojo	—	Rojo	Azul	Negro	—	Negro	—
2000 A HF	Negro	—	Rojo	—	Rojo	Rojo	Rojo	Azul	Rojo	—	Rojo	—	—	—
2000 A HB	Rojo	—	—	Rojo	Rojo	Rojo	Rojo	—	Rojo	Rojo	—	—	—	—
2500 A H	—	Azul	Rojo	Rojo	Rojo	Rojo	—	Rojo	Azul	—	Negro	Negro	Negro	—
2500 A L	—	Negro	Rojo	Azul	Azul	Azul	Rojo	Rojo	Negro	—	—	—	—	R
2500 A HF	—	Azul	Rojo	—	Rojo	Rojo	Rojo	Rojo	Negro	—	Rojo	—	—	—
2500 A HB	—	—	Rojo	Rojo	Rojo	Rojo	Rojo	Rojo	Rojo	—	—	—	—	—
3000 A H	Azul	Rojo	—	Rojo	Rojo	Rojo	—	Negro	—	Rojo	—	—	—	R
3000 A L	Negro	Rojo	—	Azul	Azul	Azul	Rojo	Azul	—	Rojo	Negro	Negro	Negro	—
3000 A HF	Azul	Rojo	—	—	Rojo	Rojo	Rojo	Negro	—	Rojo	Rojo	—	—	—
3000 A HB	—	Negro	Azul	Rojo	Rojo	Rojo	Rojo	Rojo	Azul	Negro	—	—	—	—
4000 A H *	Negro	Rojo	Azul	Azul	Azul	Negro	Rojo	Azul	—	Negro	Negro	Negro	Azul	—
4000 A L *	Negro	Rojo	Azul	Rojo	Azul	Azul	Rojo	Azul	—	Negro	—	Negro	Negro	—
4000 A HF *	Azul	Rojo	Azul	—	Rojo	Rojo	Rojo	Negro	—	Azul	Rojo	—	—	—
4000 A HB *	Azul	Rojo	Azul	Negro	Rojo	Azul	Rojo	Negro	—	Azul	Azul	—	Negro	—
5000 A H	Rojo	Negro	Negro	Azul	Azul	Negro	Rojo	—	Azul	Azul	Negro	Negro	Azul	—
5000 A L	Rojo	Negro	Negro	Rojo	Azul	Azul	Rojo	—	Azul	Azul	—	Negro	Negro	—
5000 A HF	Rojo	Negro	Azul	—	Rojo	Rojo	Rojo	—	Azul	Negro	Rojo	—	—	—
5000 A HB	Rojo	Negro	Azul	Negro	Rojo	Azul	Rojo	—	Azul	Negro	Azul	—	Negro	—
6000 A H	Negro	Negro	Rojo	Azul	Azul	Negro	Rojo	Azul	Azul	—	Negro	Negro	Azul	—
6000 A L	Negro	Negro	Rojo	Rojo	Azul	Azul	Rojo	Azul	Azul	—	—	Negro	Negro	—
6000 A HF	Azul	Azul	Rojo	—	Rojo	Rojo	Rojo	Negro	Negro	—	Rojo	—	—	—
6000 A HB	Azul	Azul	Rojo	Negro	Rojo	Azul	Rojo	Negro	Negro	—	Azul	—	Negro	—

* Versión de construcción ancho

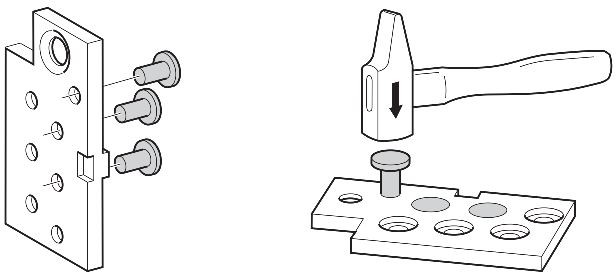
2. Instale los pernos de rechazo de la cuna en el patrón determinado según las tablas 8 ó 9.

Figura 41 – Instalación de los pernos de rechazo de la cuna



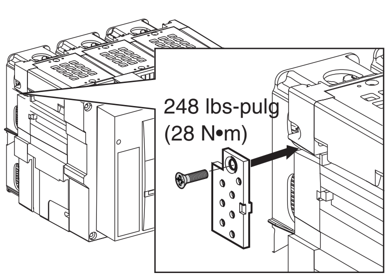
3. Instale los pernos de rechazo del interruptor en la placa de pernos de rechazo en el patrón determinado según la tabla 8 ó 9.

Figura 42 – Instalación de los pernos de rechazo del interruptor



4. Instale la placa de pernos de rechazo en el interruptor.

Figura 43 – Instalación de la placa de pernos de rechazo



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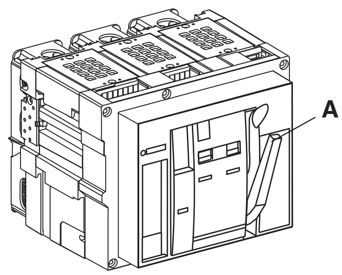
Instalación de los accesorios

Instale los accesorios del interruptor necesarios que no fueron instalados en la fábrica.

Si va a instalar accesorios eléctricos, quite la cubierta de accesorios.

AVISO
PELIGRO DE DAÑO AL EQUIPO Proceda con cuidado al retirar o volver a colocar la cubierta de accesorios del interruptor. La palanca de carga de resorte (**figura 44, A**) pasa a través de la cubierta de accesorios del interruptor y puede dañarse al sacar la cubierta. **El incumplimiento de estas instrucciones puede causar daño al equipo.**

Figura 44 – Palanca de carga de resorte

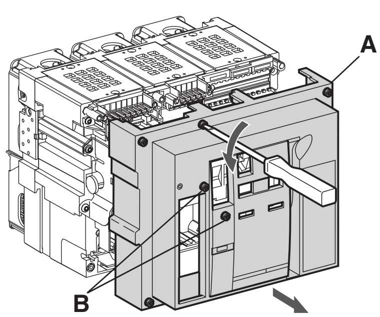


Afloje los tornillos de la cubierta de accesorios y desmóntela (**figura 45, A**).

NOTA: Los tornillos (**B**) son para los interruptores automáticos tipos L, LF, L1 y L1F solamente.

Instale los accesorios de acuerdo con las instrucciones provistas.

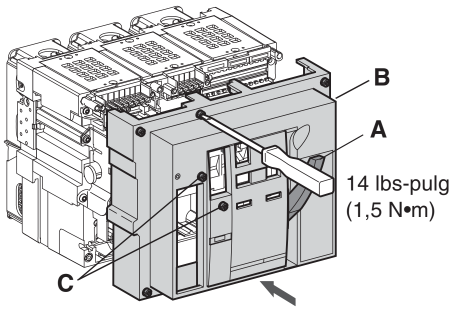
Figura 45 – Desmontaje de la cubierta de accesorios



Para volver a colocar la cubierta de accesorios, jale la palanca (**figura 46, A**) hacia adelante y deslice la cubierta de accesorios (**B**) del interruptor hacia abajo por la palanca. Apriete los tornillos de la cubierta de accesorios.

NOTA: Los tornillos (**C**) son para los interruptores automáticos tipos L, LF, L1 y L1F solamente.

Figura 46 – Colocación de la cubierta de accesorios

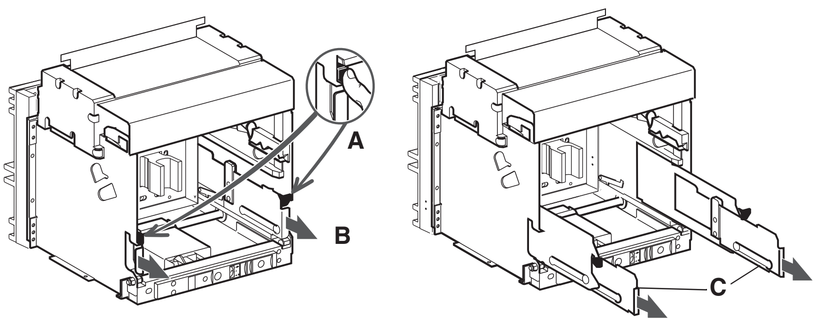


Instalación del interruptor

AVISO
PELIGRO DE DAÑO AL EQUIPO La cuna deberá estar bien sujetada durante el proceso de instalación o desmontaje del interruptor. **El incumplimiento de estas instrucciones puede causar daño al equipo.**

1. Presione las lengüetas de enganche (**figura 47, A**), jale las palancas de los rieles extensibles (**B**) hasta que éstos (**C**) estén totalmente extendidos.
2. Inspeccione las pinzas de conexión del interruptor y asegúrese de que no haga falta ninguna ni que estén desalineadas. Consulte página 11 para obtener información sobre cómo verificar, instalar y lubricar las pinzas de conexión.

Figura 47 – Extracción de los rieles



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AVISO

PELIGRO DE DAÑO AL EQUIPO

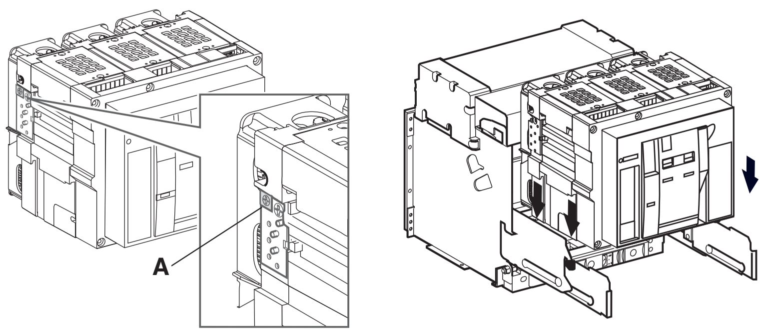
El accionador de las persianas de seguridad debe estar instalado en el interruptor para que funcionen correctamente las persianas de las celdas.

El incumplimiento de estas instrucciones puede causar daño al equipo.

3. Para las celdas con persianas de seguridad, asegúrese de que el accionador de las persianas (**figura 48, A**) esté instalado en el interruptor.
4. Instale el interruptor en los rieles de extensión. Consulte la página 17 para conocer el equipo necesario para el levantamiento.

   NOTA: La cuna deberá estar bien sujetada a una plataforma para manejo de mercancías, si no está instalada en el equipo, antes de instalar el interruptor.

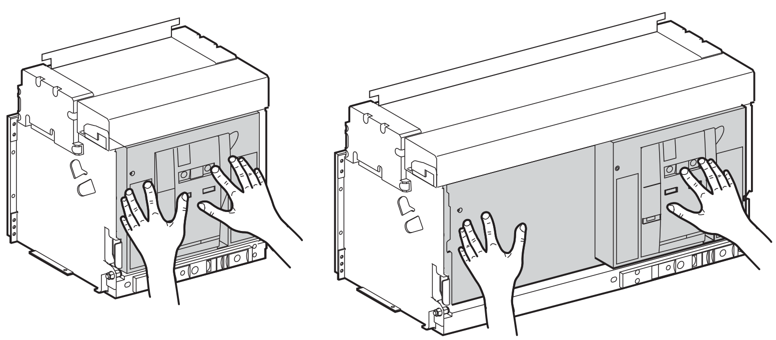
Figura 48 – Verificación del funcionamiento del accionador de las persianas de seguridad



5. Empuje para insertar el interruptor.
6. Conecte el interruptor automático. Consulte “Conexión del interruptor removible” en la página 71, para obtener instrucciones sobre cómo conectar el interruptor.

   Consulte la sección 6—Funcionamiento para obtener las instrucciones sobre el funcionamiento del interruptor.

Figura 49 – Inserción del interruptor



Prueba de protección contra fallas a tierra del equipo

El inciso 230-95(c) del Código nacional eléctrico de EUA (NEC) y la NOM-001-SEDE requiere pruebas de los sistemas de protección contra fallas a tierra cuando se instalan por primera vez. Si el interruptor automático dispone de esta protección, pruebe el sistema de protección contra fallas a tierra en este momento.

Asegúrese de que la unidad de disparo esté energizada. La unidad de disparo está energizada si:

- El interruptor está cerrado o recibe alimentación por la parte inferior y tiene más de 100 V de tensión de carga en dos fases (en las unidades de disparo P o H solamente).
- El equipo de pruebas de amplias funciones o portátil está conectado y energizado.
- La fuente de alimentación externa de 24 Vcd está conectada.
- Una toma de tensión externa está instalada y hay más de 100 V~ en dos fases (en las unidades de disparo P o H solamente).

Si el sistema es radial (de un solo extremo), pulse el botón de disparo por falla a tierra (**figura 50, A**). El interruptor se disparará y el indicador de falla a tierra de la unidad de disparo encenderá la luz.

Anote los resultados en la tabla 10.

Si es necesario realizar una prueba completa al sistema de falla a tierra, realice una prueba de inyección primaria. Si el sistema tiene múltiples fuentes y/o se requiere conectarlo en campo, utilice una prueba de inyección primaria.

Figura 50 – Verificación de la protección contra fallas a tierra

Unidad de disparo Micrologic 6.0A

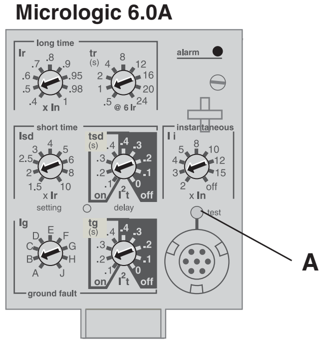


Tabla 10 – Resultados de la prueba por falla a tierra

Date	Ajustes de la falla a tierra	Resultados de la prueba	Firma

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Desmontaje del interruptor automático

AVISO

PELIGRO DE DAÑO AL EQUIPO

La cuna deberá estar bien sujetada durante el proceso de instalación o desmontaje del interruptor.

El incumplimiento de estas instrucciones puede causar daño al equipo.

⚠ PELIGRO

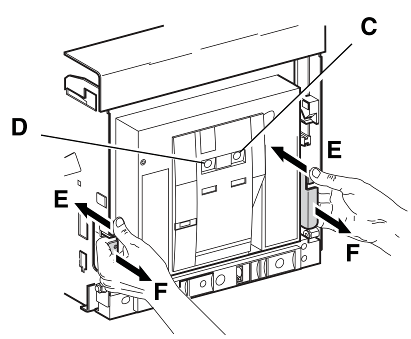
PELIGRO DE QUE EL DISPOSITIVO SE CAIGA

- Asegúrese de que el equipo de levantamiento tenga capacidad suficiente para levantar la unidad. Siga las indicaciones del fabricante para manejar el equipo de levantamiento.
- Utilice casco, calzado de seguridad y guantes de trabajo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

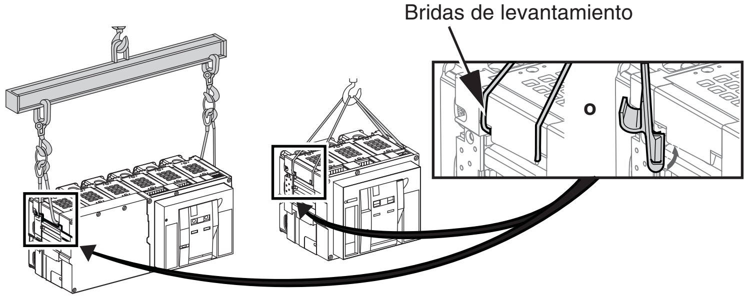
1. Desconecte el interruptor como se detalla en la sección Desconexión del interruptor removible, página 72.
2. Con el interruptor en la posición de desconectado, presione el botón de cierre "**I**" (**C**) para cerrar el interruptor.
3. Presione el botón de apertura "O" (**D**) para abrir el interruptor.
4. Presione las lengüetas de enganche (**E**), luego jale las palancas de los rieles extensibles (**F**).

Figura 51 – Desmontaje del interruptor automático



5. Desmonte el interruptor de los rieles de la cuna empleando las bridas de levantamiento que están a los lados del interruptor, consulte la Sección 2—Levantamiento y transporte.

Figura 52 – Levantamiento aéreo



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Sección 4—Instalación del interruptor fijo

Cómo instalar un interruptor automático

Desenergice el equipo antes de realizar cualquier trabajo dentro o fuera de él.

Instalación de los accesorios

Los accesorios adquiridos independientemente (no instalados de fábrica) del interruptor se deben instalar en este momento.

Si va a instalar accesorios eléctricos, quite la cubierta de accesorios.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA o Z462 de CSA y NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

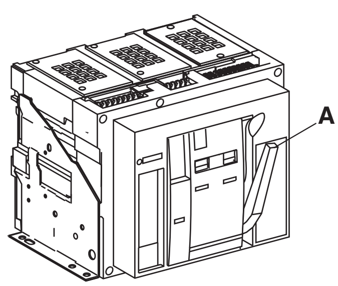
AVISO

PELIGRO DE DAÑO AL EQUIPO

Proceda con cuidado al retirar o volver a colocar la cubierta de accesorios del interruptor. La palanca de carga de resorte (**figura 53, A**) pasa a través de la cubierta de accesorios del interruptor y puede dañarse al sacar la cubierta.

El incumplimiento de estas instrucciones puede causar daño al equipo.

Figura 53 – Palanca de carga de resorte

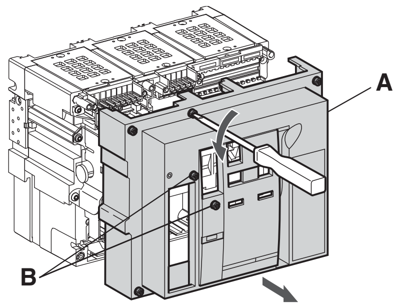


1. Afloje los tornillos de la cubierta de accesorios y desmóntela (**figura 54, A**).

   NOTA: Los tornillos (**B**) son exclusivamente para los interruptores tipos L y L1.

2. Instale los accesorios de acuerdo con las instrucciones provistas.

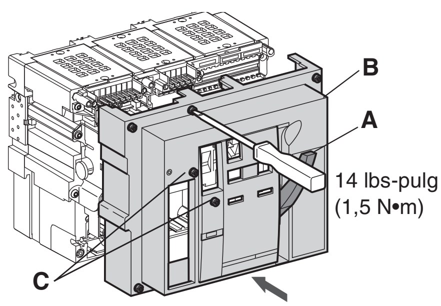
Figura 54 – Desmontaje de la cubierta de accesorios



3. Para volver a colocar la cubierta de accesorios, jale la palanca (**figura 55, A**) hacia adelante y deslice la cubierta de accesorios (**B**) del interruptor hacia abajo por la palanca. Apriete los tornillos de la cubierta de accesorios.

   NOTA: Los tornillos (**C**) son exclusivamente para los interruptores tipos L y L1.

Figura 55 – Colocación de la cubierta de accesorios



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Requisitos de espacio libre

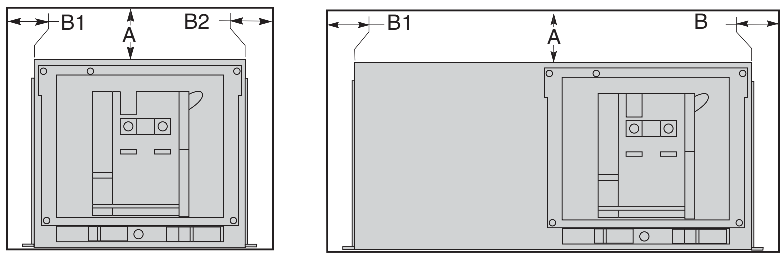
⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

Deberá cumplir con los requisitos de espacio libre para que funcione correctamente el equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Tabla 11 – Requisitos de espacio libre



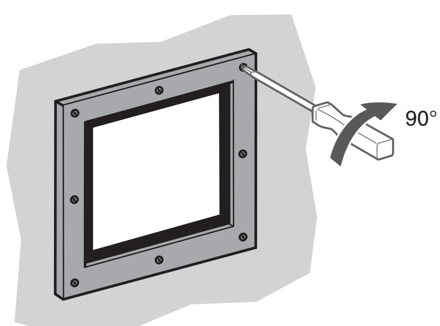
Espacio libre mínimo	A		B1 + B2	
	pulg	mm	pulg	mm
Piezas aisladas	5,91	150	2,36	60
Piezas metálicas	5,91	150	5,72	120

Instalación del escudo de la puerta

Si el equipo tiene un recorte en la puerta, instale el escudo incluido con el interruptor.

1. Si el recorte no existe, corte la puerta del equipo para instalar el escudo. Para obtener las dimensiones del recorte, consulte el boletín 0613IB1205 en nuestra página web (para mayor información consulte la página 7).
2. Instale el escudo.

Figura 56 – Instalación del escudo de la puerta

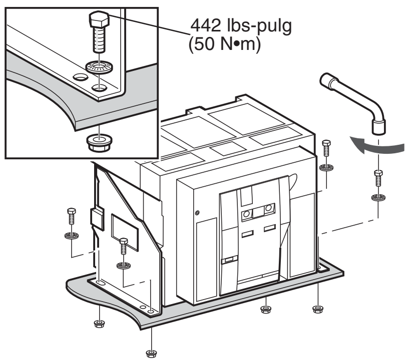


Instalación del interruptor

1. Si los agujeros de montaje no existen, taladre los agujeros en la bandeja para montar el interruptor. Para obtener las dimensiones del patrón de agujeros de montaje del interruptor, consulte el boletín 0613IB1205 en nuestra página web (para mayor información consulte la página 7).
2. Asegúrese de que la superficie de montaje esté completamente plana. La superficie de montaje deberá estar plana con una desviación permitida de 2 mm (0,08 pulg).
3. Monte el interruptor en la bandeja, utilice los tornillos, roldanas y tuercas de 3/8.

NOTA: Se encuentran disponibles soportes de montaje vertical, si fuesen necesarios.

Figura 57 – Sujeción del interruptor



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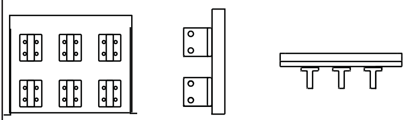
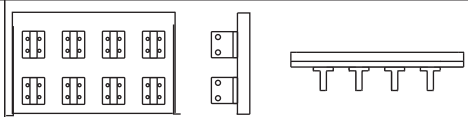
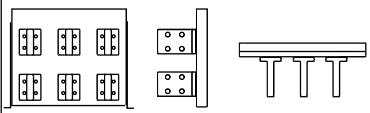
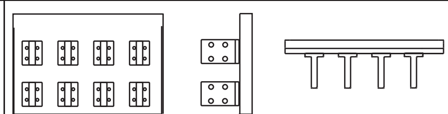
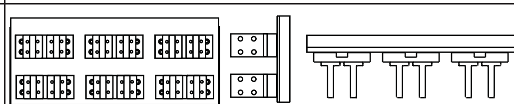
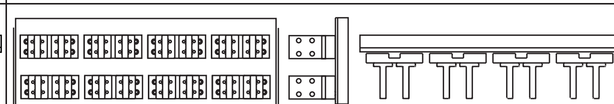
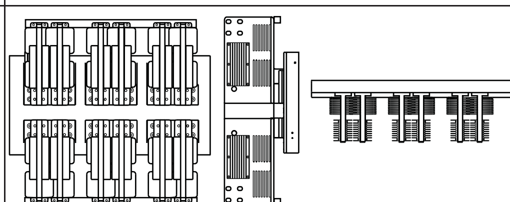
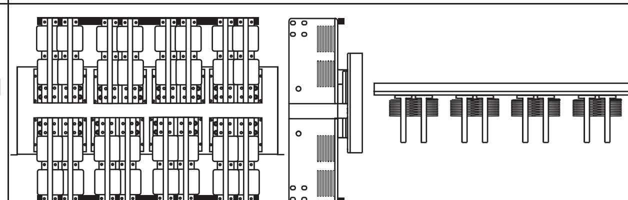
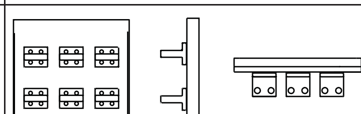
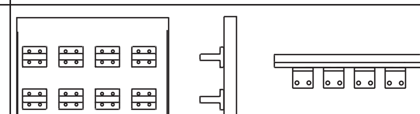
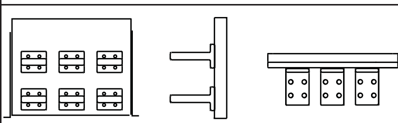
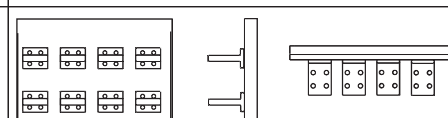
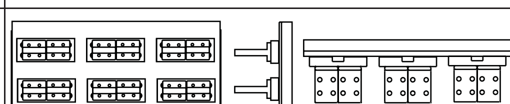
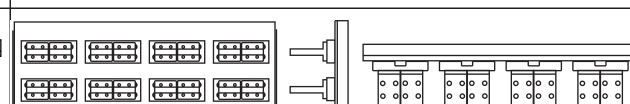
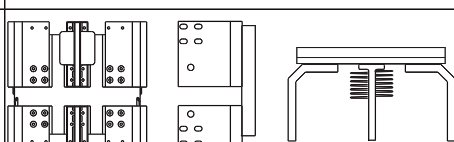
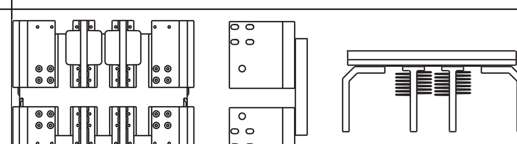
Instalación de conectores

Consulte la tabla 12 para obtener información sobre los conectores estándar. Apriete los tornillos de montaje de 16 a 18 N•m (142 a 159 lbs-pulg).

Comuníquese con la oficina de campo para obtener información sobre los conectores no estándar.

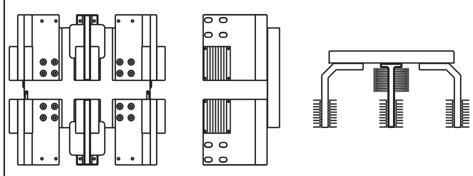
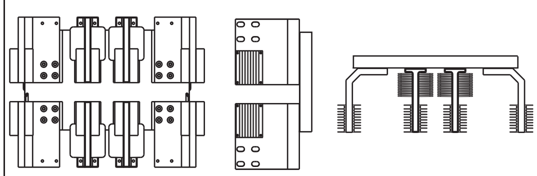
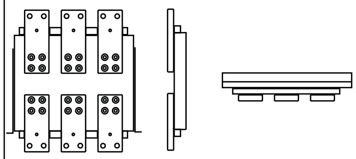
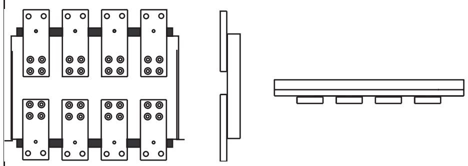
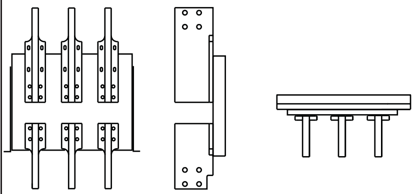
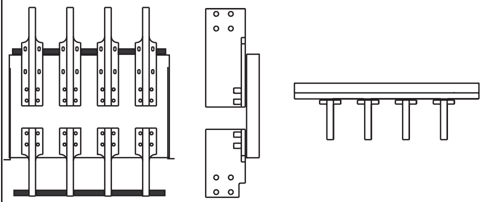
Para obtener las dimensiones de los conectores, consulte el boletín 0613IB1205 en nuestra página web (para mayor información consulte la página 7).

Tabla 12 – Conectores estándar

Tipo	Valor nom.	Configuración de 3 polos Frontal – Lateral – Superior	Configuración de 4 polos Frontal – Lateral – Superior
Vertical en “T” con conexión posterior (RCTV)	800 A–2 000 A		
	2 500 A–3 000 A		
	4 000 A–5 000 A		
	6 000 A		
Horizontal en “T” con conexión posterior (RCTH)	800 A–2 000 A		
	2 500 A–3 000 A		
	4 000 A–5 000 A		
De desplaza-miento vertical con conexión posterior (RCOV)	3 200 A		

Continúa en la siguiente página

Tabla 12 – Conectores estándar *(continuación)*

Tipo	Valor nom.	Configuración de 3 polos Frontal – Lateral – Superior	Configuración de 4 polos Frontal – Lateral – Superior
De desplazamiento vertical con conexión posterior (RCOV especial)	4 000 A marco W		
Plano con conexión frontal (FCF)	800 A–2 000 A		
En “T” con conexión frontal (FCT)	800 A – 3 000 A		

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Instalación de las barras de distribución

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AVISO

Los soportes de las barras deben ser colocados de manera que puedan aguantar el peso del sistema de barras y las fuerzas magnéticas causadas por corrientes de cortocircuito. Vea la **figura 58, A**.

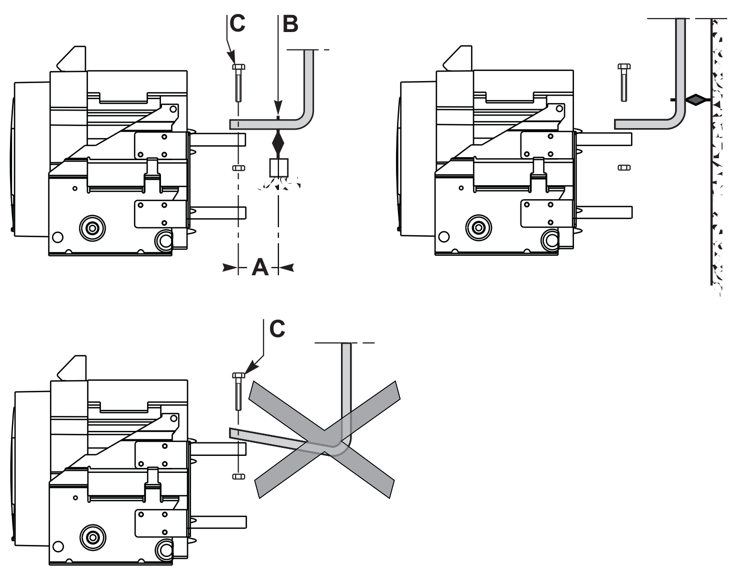
El incumplimiento de estas instrucciones puede causar daño al equipo.

NOTA: El encargado de la instalación es responsable de realizar la conexión de las barras a los conectores.

- Los soportes de las barras deben estar reforzados (**figura 58, B**) para evitar que las fuerzas de cortocircuito desvíen los conectores. Los soportes de las barras (**A**) deben ser colocados de manera que puedan aguantar el peso del sistema de barras y las fuerzas magnéticas causadas por corrientes de cortocircuito.
- Las barras se deben ajustar para asegurarse de que los puntos de conexión estén correctamente colocados antes de que los tornillos (**C**) sean insertados. Las barras deben estar bien sujetadas por la estructura del tablero de fuerza para evitar que su peso descanse en los conectores.

Consulte la tabla 13 para obtener información sobre los requisitos necesarios para las barras de los interruptores y conectores.

Figura 58 – Conexiones de las barras de distribución



NOTA: El encargado de la instalación es responsable de realizar la conexión de las barras en los conectores. Las barras de distribución deben ser sujetadas por la estructura del tablero de fuerza para evitar que su peso descanse en los conectores. Los soportes de las barras deben estar reforzados para evitar que las fuerzas de cortocircuito desvíen los conectores.

Tabla 13 – Tamaño de barra necesario

Interruptor		Cumple con	Conectores	Barras por conector	
Valor nominal	Tipo			Número	Tamaño
800 A, 1 200 A	N/N1/H/H1/H2/H3	ANSI C37.50 UL 489	RCTH, RCTV, FCF, FCT	1	6 x 76 mm (0,25 x 3 pulg)
1 600 A	N/N1/H/H1/H2/H3	ANSI C37.50 UL 489	RCTH, RCTV, FCF, FCT	2	6 x 76 mm (0,25 x 3 pulg)
2 000 A	N/N1/H/H1/H2/H3	ANSI 37.50 UL 489	RCTH	3	6 x 76 mm (0,25 x 3 pulg)
			RCTV, FCT	2	6 x 102 mm (0,25 x 4 pulg)
			FCF	3	6 x 76 mm (0,25 x 3 pulg)
2 500 A	H	UL 489	RCTH	5	6 x 76 mm (0,25 x 3 pulg)
			RCTV, FCT	2	6 x 127 mm (0,25 x 5 pulg)
3 000 A	H	UL 489	RCTH	8	6 x 76 mm (0,25 x 3 pulg)
	H		RCTV, FCT	4	6 x 102 mm (0,25 x 4 pulg)
3 200 A	H1/H2/H3	ANSI 37.50	RCOV	3	6 x 127 mm (0,25 x 5 pulg)
4 000 A (marco W)	H1/H2/H3	ANSI 37.50	RCOV (Special)	4	6 x 127 mm (0,25 x 5 pulg)
4 000 A	H/H2/H3	ANSI 37.50 UL 489	RCTH	4	6 x 152 mm (0,25 x 6 pulg)
			RCTV, FCT	4	6 x 127 mm (0,25 x 5 pulg)
		ANSI 37.50	FCF	4	6 x 152 mm (0,25 x 6 pulg)
		UL 489	FCF	5	6 x 152 mm (0,25 x 6 pulg)
5 000 A	H/H2/H3	ANSI 37.50 UL 489	RCTH	8	6 x 152 mm (0,25 x 6 pulg)
			RCTV, FCT	6	6 x 127 mm (0,25 x 5 pulg)
6 000 A	H	UL 489	RCTV	6	6 x 152 mm (0,25 x 6 pulg)

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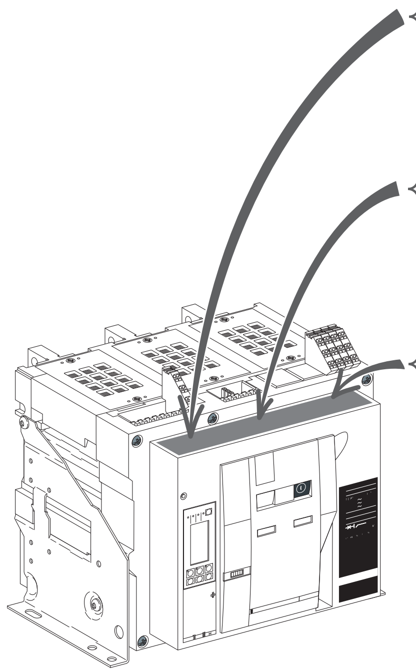
Conexiones de los accesorios con conectores de encaje a presión

Tabla 14 – Configuración de las terminales para la instalación de los conectores de encaje a presión



Com		UC1		UC2		UC3	UC4	M2C/M6C	SDE2/RES	SDE1
E5	E6	Z5	M1	M2	M3	F2 +	V3	484/Q3	184/K2	84
E3	E4	Z3	Z4	T3	T4	VN	V2	474/Q2	182	82
E1	E2	Z1	Z2	T1	T2	F1 -	V1	471/Q1	181/K1	81

MN/MX2	MX1	XF	PF	MCH
D2/C12	C2	A2	254	B2
C13	C3	A3	252	B3
D1/C11	C1	A1	251	B1

OF24	OF23	OF22	OF21	OF14	OF13	OF12	OF11	OF4	OF3	OF2	OF1
244	234	224	214	144	134	124	114	44	34	24	14
242	232	222	212	142	132	122	112	42	32	22	12
241	231	221	211	141	131	121	111	41	31	21	11

Función	Conector	Descripción
Contactos auxiliares	OF[1]	Contactos de posición de abierto/cerrado del interruptor
	EF	Contacto combinado conectado/cerrado
Funciona-miento remoto	SDE	Contacto de alarma de falla eléctrica
	RES	Restablecimiento remoto
	MN	Dispositivo de disparo por baja tensión
	MX[2]	Disparo en derivación
	XF[2]	Cierre en derivación
	PF	Contacto preparado para cerrar
	MCH	Motor de carga de resorte

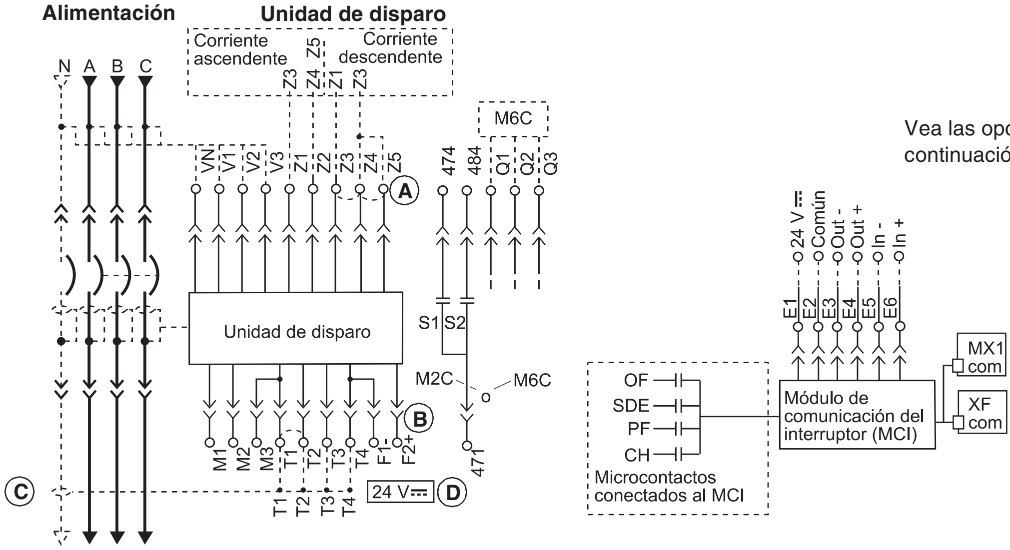
[1] Los contactos OF1, OF2, OF3 y OF4 son estándar.
[2] Si se utiliza la bobina MX1 o XF en la comunicación, ésta deberá conectarse a la terminal (C3 o A3) en el lado de línea aun cuando no esté instalado el módulo de comunicación. El circuito en derivación que pasa por las terminales C2/A2 es sólo para servicio momentáneo (0,5 s). Para servicio continuo, utilice el comando de comunicaciones.

Tipo de unidad de disparo					
Básico	A	P	H	Conector	Descripción
–	•	•	•	Com: E1–E6	Comunicación
–	•	•	•	UC1: Z	Enclavamiento selectivo de zona
					Z1= señal de salida de ZSI
					Z2= salida de ZSI
					Z3= señal de entrada de ZSI
					Z4= tiempo corto de entrada de ZSI
					Z5 = falla a tierra en la entrada de ZSI
–	•	•	•	UC1: M1	Falla a tierra diferencial modificada (MDGF)
–	•	•	•	UC2: T	Neutro externo
–	•	•	•	UC2: M	Falla a tierra diferencial modificada (MDGF)
–	•	•	•	UC3: F	Fuente de alimentación externa de 24 Vcd
–	–	•	•	UC3: Vn	Enchufe del neutro externo
–	–	•	•	UC4	Detector de tensión de fase externa
–	–	•	•	M2C/M6C	Dos contactos programables (relevador interno) o seis contactos programables (para la conexión al módulo M6C externo)

Diagramas de alambrado para las conexiones auxiliares

NOTA: Todos los diagramas se muestran con el interruptor automático abierto, conectado y cargado.

Figura 59 – Diagramas de alambrado para las conexiones auxiliares



A—No retire los cables de conexión en puente instalados en la fábrica entre Z3, Z4 y Z5 a no ser que esté conectado un enclavamiento selectivo de zona (ZSI).
B—No retire el cable de conexión en puente instalado en la fábrica entre T1 y T2 a no ser que esté conectado un TC al neutro. No instale el cable de conexión en puente entre T3 y T4.
C—Para conectar correctamente el TC al neutro, consulte los diagramas de alambrado en la página 64.
D—La fuente de alimentación de 24 V c.d. de la unidad de disparo deberá estar independiente y aislada de la fuente de alimentación de 24 V c.d. de los módulos de comunicación.

Alambrado de la opción COM (módulos Modbus ULP MCC y MCI)

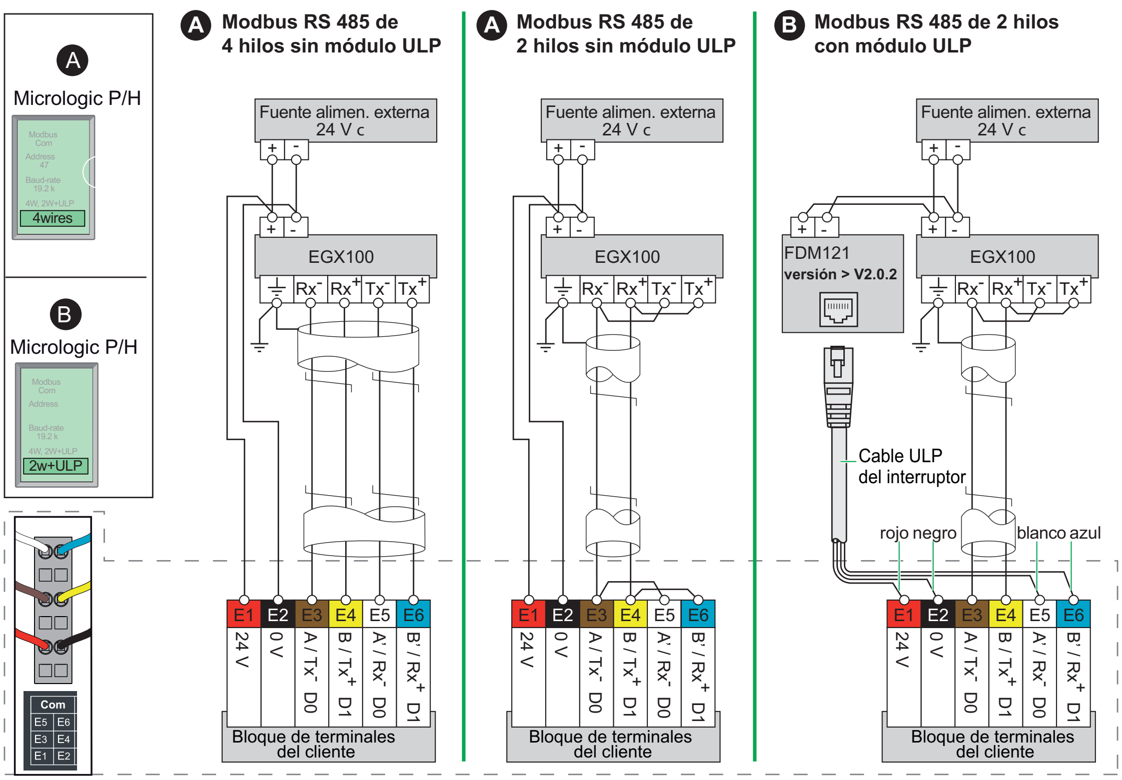
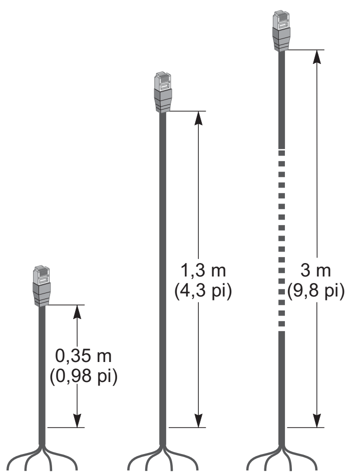


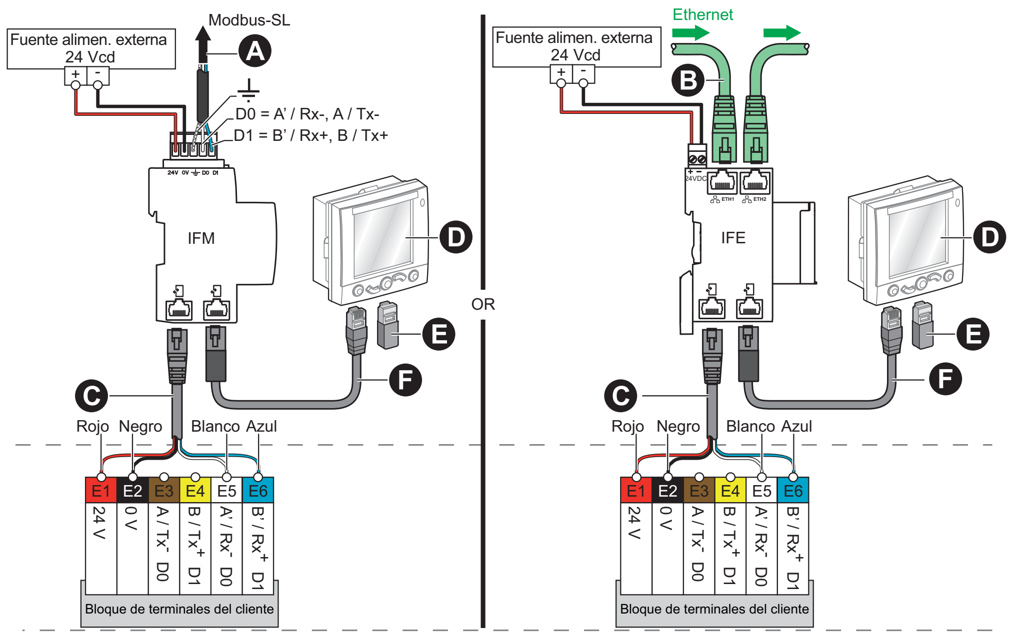
Figura 59 – Diagramas de alambrado para las conexiones auxiliares *(continuación)*

Componentes de comunicación y conexiones del FDM121



LV434195 **LV434196** **LV434197**

Cable ULP del interruptor



A. Red Modbus
B. Red Ethernet
C. Cable ULP del interruptor
D. Pantalla del FDM
E. Terminación ULP
F. Cable ULP

Conexiones

El interruptor de potencia Masterpact se conecta a los dispositivos ULP (pantalla del FDM121, IFM, IFE o unidad de E/S) a través del cordón eléctrico del conector ULP del interruptor.

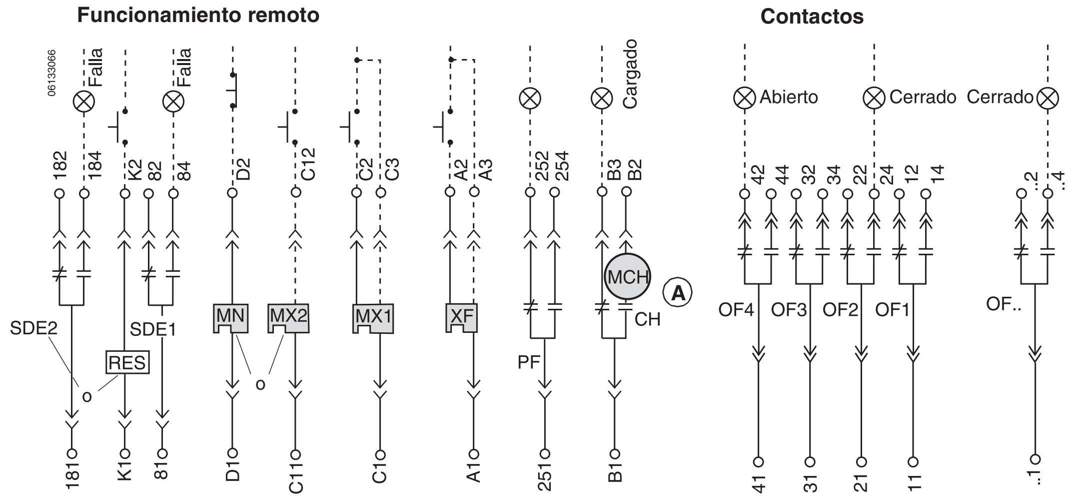
- El cordón eléctrico está disponible en tres longitudes: 0,35 m (0,98 pies), 1,3 m (4,3 pies) y 3 m (9,8 pies).
- Es posible tener longitudes de hasta 10 m (32,9 pies) usando extensiones.

Marcas para las terminales de encaje a presión

Unidad de disparo							
COM	**UC1**	**UC2**	**UC3**	**UC4**	**M2C/M6C**	**SDE2/Res.**	**SDE1**
E5 E6	Z5 M1	M2 M3	F2+	V3	484/Q3	184/K2	84
E3 E4	Z3 Z4	T3 T4	VN	V2	474/Q2	182	82
E1 E2	Z1 Z2	T1 T2	F1–	V1	471/Q1	181/K1	81

NOTA: Todos los diagramas se muestran con el interruptor automático abierto, conectado y cargado.

Figura 60 – Diagramas de alambrado para las conexiones auxiliares



A—Cuando se usan las opciones de funcionamiento remoto, asegúrese de que transcurran por lo menos cuatro segundos para que el motor de carga de resorte (MCH) cargue completamente los resortes de cierre del interruptor antes de activar el dispositivo de cierre en derivación (XF).

Marcas para las terminales de encaje a presión

Funcionamiento remoto					Contactos auxiliares											
MN/MX2	**MX1**	**XF**	**PF**	**MCH**	**OF24**	**OF23**	**OF22**	**OF21**	**OF14**	**OF13**	**OF12**	**OF11**	**OF4**	**OF3**	**OF2**	**OF1**
D2/C12	C2	A2	254	B2	244	234	224	214	144	134	124	114	44	34	24	14
C13	C3	A3	252	B3	242	232	222	212	142	132	122	112	42	32	22	12
D1/C11	C1	A1	251	B1	241	231	221	211	141	131	121	111	41	31	21	11

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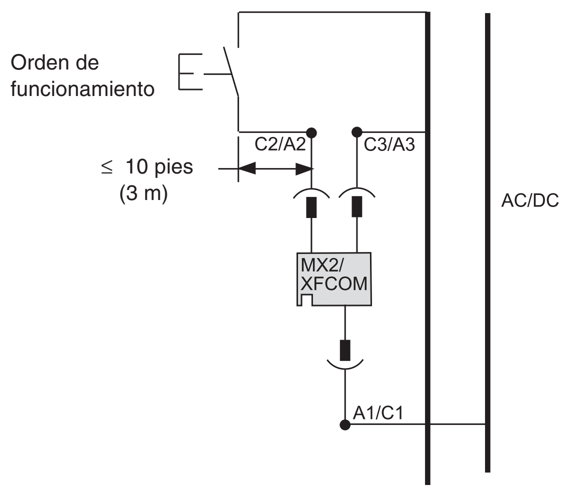
Disparo en derivación (MX) y cierre en derivación (XF) con comunicación

La figura 61 muestra un diagrama esquemático de alambrado recomendado para las bobinas de disparo en derivación o cierre en derivación con comunicación. Las tensiones inducidas en el circuito en la terminal C2 y/o A2 pueden causar el mal funcionamiento del disparo en derivación o cierre en derivación. La mejor manera de evitar tensiones inducidas es manteniendo el circuito a la terminal C2 o A2 lo más corto posible. Si no es posible mantener el circuito a menos de 3 m (10 pies), utilice un relevador de interposición cerca de la terminal C2 o A2.

Figura 61 – Diagrama esquemático de alambrado - con comunicación

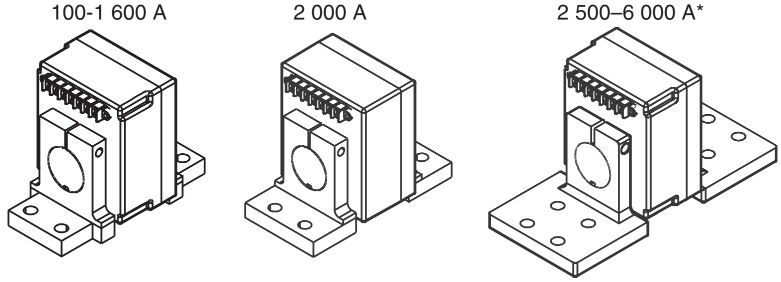


Protección contra fallas a tierra del equipo

No es necesario leer esta subsección si su interruptor no dispone de un disparo integral contra fallas a tierra o de alarma.

Un circuito de tres fases y cuatro hilos necesita un transformador de corriente al neutro (TC) externo. Conecte el neutro del TC al interruptor de acuerdo con los diagramas de alambrado en las figuras 63 y 64.

Figura 62 – Transformadores de corriente al neutro



*Se necesitan dos para los interruptores de 4 000–6 000 A

1. Conecte el primario:

   — Si la carga está conectada al extremo inferior del interruptor, conecte el neutro de la carga a la terminal H1 del TC al neutro.

   — Si la alimentación de la fuente está conectada al extremo inferior del interruptor, conecte el neutro de la fuente a la terminal H1 del TC al neutro.

NOTA: La conexión a tierra del equipo se debe realizar en la corriente ascendente (en el lado de línea) del TC al neutro y debe contar con una conexión del neutro desde el transformador de alimentación hasta el equipo.

2. Para interruptores que utilicen unidades de disparo Micrologic™5.0P, 5.0H, 6.0P o 6.0H conecte la terminal Vn del transformador de corriente del neutro a la terminal Vn de la terminal del alambrado de control; así, la unidad de disparo puede realizar mediciones de tensión. Las terminales Vc y Vn se encuentran conectadas internamente.

AVISO

PELIGRO DE FUNCIONAMIENTO INAPROPIADO DEL SISTEMA DE DISPARO

F1 y F2 deberán ser aislados de tierra. Asegúrese de que todo el alambrado haya sido instalado de acuerdo con las instrucciones de este boletín.

El incumplimiento de estas instrucciones puede causar disparos incorrectos durante la operación de cierre.

3. Retire el cable de conexión en puente en T1 y T2, instalado en la fábrica.
4. Conecte el cable Belden® del TC al neutro a las terminales de la cuna.
5. Conecte el cable como se ilustra en el diagrama esquemático en la figura 63 ó 64.
6. Revise todos los cables.

NOTA: Los circuitos de falla a tierra diferencial modificada y los circuitos de falla a tierra de retorno por tierra, requieren el uso de un módulo de falla a tierra diferencial modificada (MDGF) y transformadores de corriente especiales. Para el alambrado de estos sistemas, consulte las instrucciones que acompañan al módulo MDGF.

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Figura 63 – Diagrama esquemático de alambrado de los interruptores de potencia NW (ancho estándar) de 800 a 4 000 A

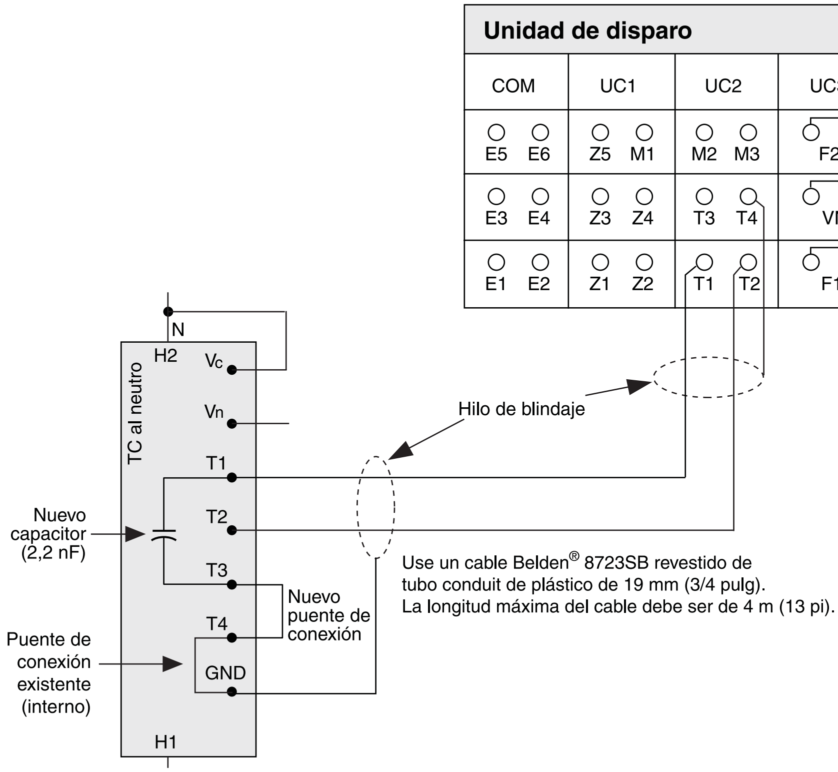
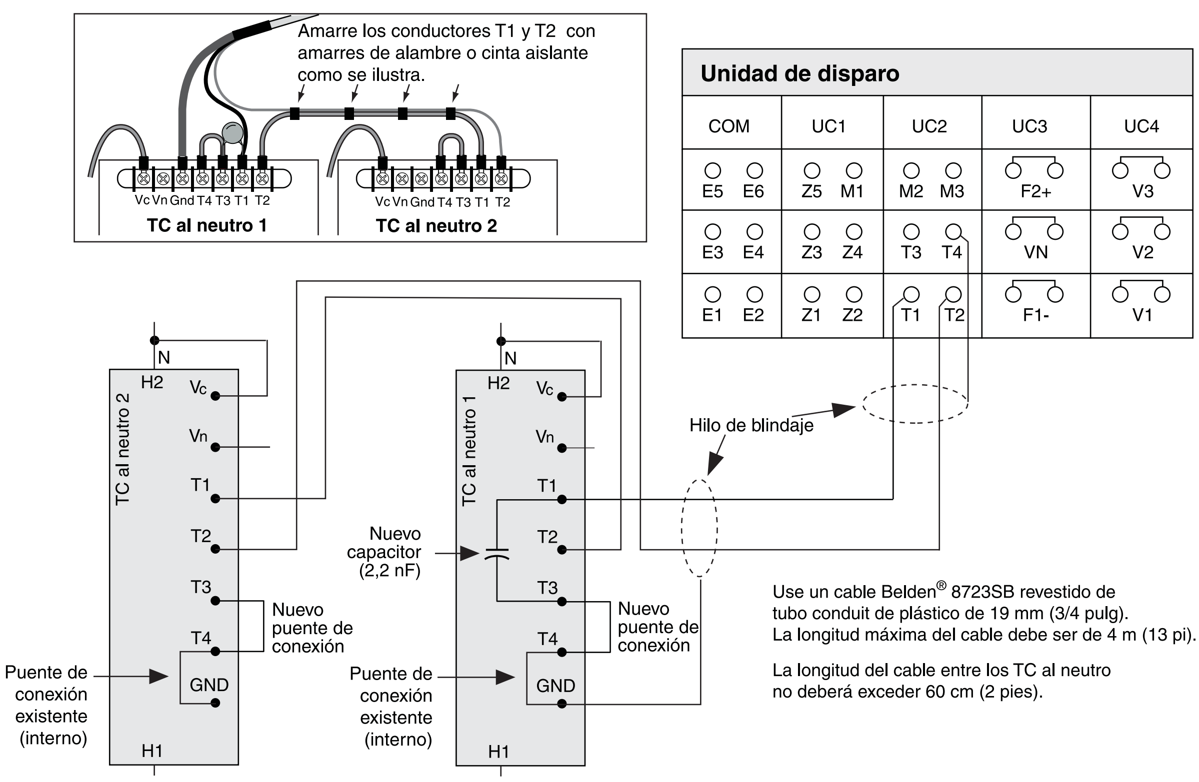


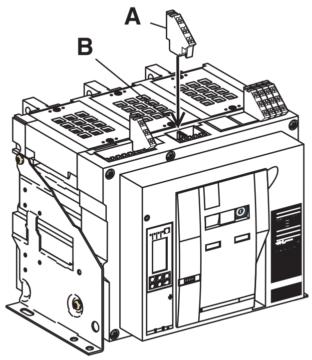
Figura 64 – Diagrama esquemático de alambrado de los interruptores de potencia NW (diseño amplio) de 3 200 a 6 000 A



Alambrado de los accesorios

1. Instale el conector de encaje a presión (**figura 65, A**) en la ranura correspondiente (**B**). (La etiqueta junto a las ranuras del conector muestra la posición de éste.)

Figura 65 – Instalación del conector de encaje a presión

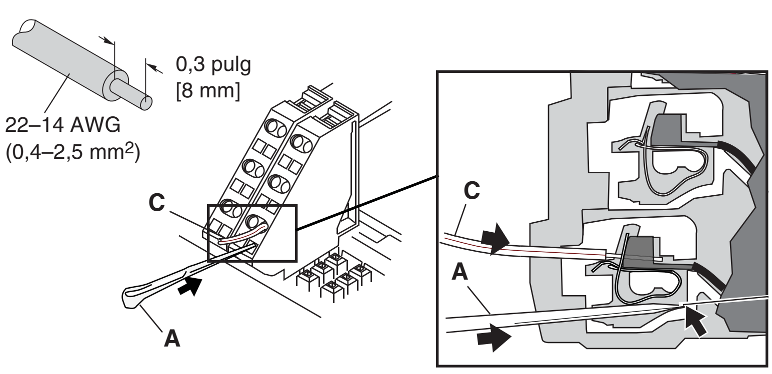


2. Encaje la herramienta de inserción de cables Wago® (**figura 66, A**, Wago no. de pieza 209-129) completamente en el conector (en el punto **B**) e instale los cables de control (**C**).

NOTA: Retire el conector de encaje a presión en el orden inverso al de su instalación.

Consulte la sección 6 para obtener las instrucciones sobre el funcionamiento del interruptor.

Figura 66 – Instalación de los conductores de control



ESPAÑOL

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Prueba de protección contra fallas a tierra del equipo

El inciso 230-95(c) del Código nacional eléctrico de EUA (NEC) y la NOM-001-SEDE requiere pruebas de los sistemas de protección contra fallas a tierra cuando se instalan por primera vez. Si el interruptor automático dispone de esta protección, pruebe el sistema de protección contra fallas a tierra en este momento.

Asegúrese de que la unidad de disparo esté energizada. La unidad de disparo está energizada si:

- el interruptor está cerrado o recibe alimentación por la parte inferior y tiene más de 100 V de tensión de carga en dos fases (en las unidades de disparo P o H solamente).
- un equipo de pruebas de amplias funciones o portátil está conectado y energizado.
- la fuente de alimentación externa de 24 V c.d. está conectada.
- una toma de tensión externa está instalada y hay más de 100 V c.a. en dos fases (en las unidades de disparo P o H solamente).

Si el sistema es radial (de un solo extremo), pulse el botón de disparo por falla a tierra (**figura 67, A**). El interruptor se disparará y el indicador de falla a tierra de la unidad de disparo encenderá la luz.

Anote los resultados en la tabla 15.

Si es necesario realizar una prueba completa al sistema de falla a tierra, realice una prueba de inyección primaria. Si el sistema tiene múltiples fuentes y/o se requiere conectarlo en campo, utilice una prueba de inyección primaria.

Figura 67 – Verificación de la protección contra fallas a tierra

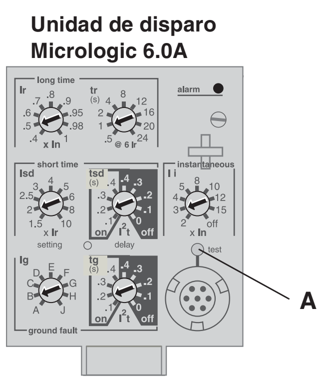


Tabla 15 – Resultados de la prueba por falla a tierra

Date	Ajustes de la falla a tierra	Resultados de la prueba	Firma

Desmontaje del interruptor automático

1. Desenergice el equipo antes de realizar cualquier trabajo dentro o fuera de él.
2. Desmonte el interruptor en el orden inverso al de su instalación. Utilice los métodos de levantamiento y transporte detallados en la sección 2 “Levantamiento y transporte”.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA o Z462 de CSA y NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

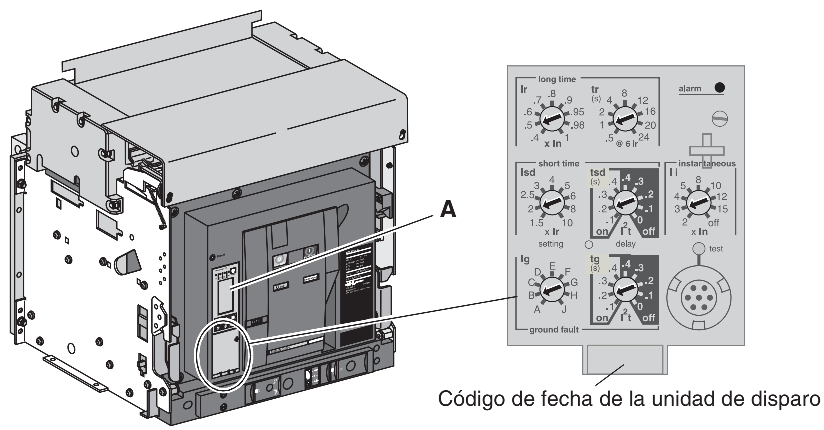
Sección 5—Unidad de disparo

Las funciones de protección, medición y comunicaciones son controladas por la unidad de disparo Micrologic™ (**figura 68, A**) instalada en el interruptor. La unidad de disparo se puede sustituir en campo para la fácil actualización de estas funciones.

Para obtener información completa sobre la unidad de disparo, sus funciones y su sustitución en campo consulte la guía del usuario de la unidad disponible en sitio web de Schneider Electric, para mayor información consulte la página 7.

Para obtener información completa sobre las unidades de disparo disponibles y sus funciones, consulte el catálogo 0613CT1001, *Interruptores de potencia Masterpact NT y NW universales,* en nuestro sitio web.

Figura 68 – Unidad de disparo Micrologic



Sección 6—Funcionamiento

Estado del interruptor removible

⚠ PELIGRO

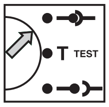
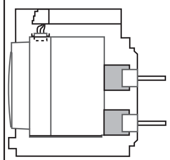
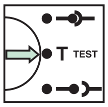
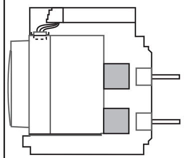
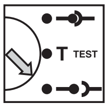
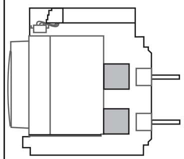
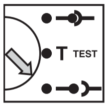
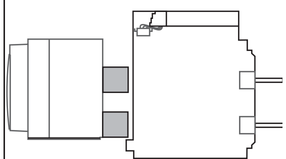
PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA o Z462 de CSA y NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

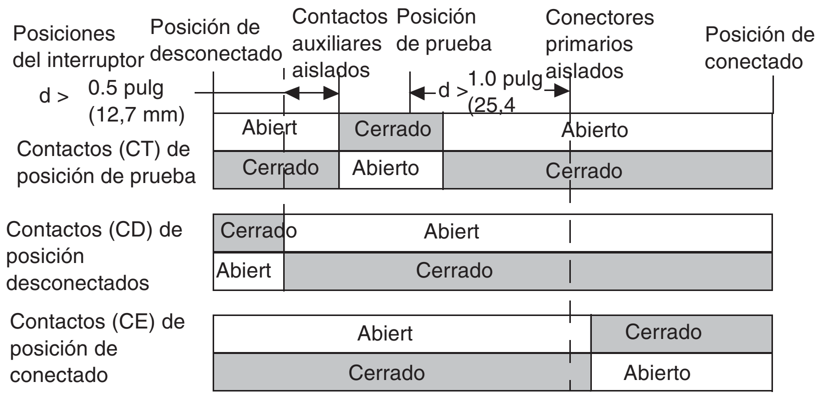
La conexión o desconexión del interruptor removible requiere insertar la palanca de inserción/extracción (mientras mantiene oprimido el botón de apertura). Si hay bloqueos, candados o una cerradura de puerta, no se puede insertar la palanca.

Tabla 16 – Posiciones del interruptor removible

Indicador de posición	Posición del conector (No se muestran las protecciones de las pinzas de conexión)	Conectores		Estado del interruptor
		Pinzas de conexión	Secundario (control)	
Conectado 		Enganchado	Enganchado	Puede hacerse funcionar. Listo para ponerse en servicio.
Prueba 		Des-enganchado	Enganchado	Puede hacerse funcionar. Se pueden realizar pruebas a los sistemas de funcionamiento y control.
Des-conectada 		Des-enganchado	Des-enganchado	Puede hacerse funcionar. Se puede quitar del carro.
Retirado 		Des-enganchado	Des-enganchado	Desmontado del carro.

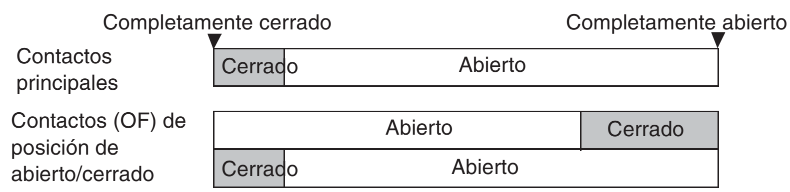
Al cambiar la posición del interruptor, los contactos de posición cambian de estado.

Figura 69 – Funcionamiento según la posición del dispositivo



Al entrar en funcionamiento los contactos principales del interruptor, los contactos auxiliares cambian de posición.

Figura 70 – Funcionamiento de los contactos del dispositivo



Conexión del interruptor removible

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AVISO

PELIGRO DE DAÑO AL EQUIPO

- Utilice la palanca de inserción/extracción proporcionada para insertar y extraer el interruptor de la cuna.
- No utilice herramientas eléctricas para esto.
- No continúe girando la palanca después que se haya botado el botón de paro y liberación.

El incumplimiento de estas instrucciones puede causar daño al equipo.

⚠ PELIGRO

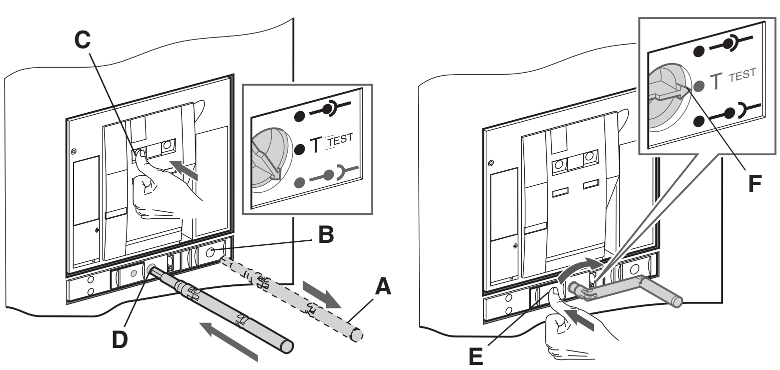
PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA o Z462 de CSA y NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

1. Desconecte la carga de los desconectadores secundarios.
2. Retire la palanca de inserción/extracción (**figura 71, A**) del agujero de almacenamiento (**B**).
3. Con el botón de apertura (**C**) oprimido, inserte la palanca de inserción/extracción en la ranura (**D**).
4. Presione el botón de paro y liberación (**E**).
5. Gire la palanca de inserción/extracción en sentido de las manecillas del reloj hasta llegar a la posición de prueba (**F**). El botón de paro y liberación se botará.

Figura 71 – Inserción del interruptor en la posición de prueba



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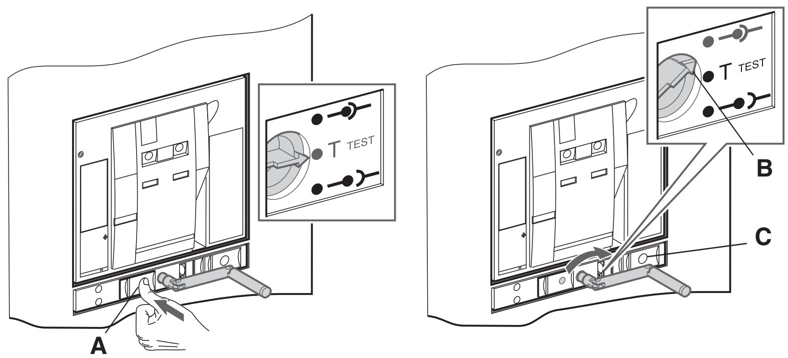
6. Presione el botón de paro y liberación (**figura 72, A**).
7. Gire la palanca de inserción/extracción en sentido de las manecillas del reloj hasta llegar a la posición de conectado (**B**). El botón de paro y liberación se botará. Vuelva a colocar la palanca de inserción/extracción en su agujero de almacenamiento (**C**).
8. Vuelva a conectar la carga a los desconectadores secundarios.

Figura 72 – Inserción del interruptor en la posición de conectado



Desconexión del interruptor removible

AVISO

PELIGRO DE DAÑO AL EQUIPO

- Utilice la palanca de inserción/extracción proporcionada para insertar y extraer el interruptor de la cuna.
- No utilice herramientas eléctricas para esto.
- No continúe girando la palanca después que se haya botado el botón de paro y liberación.

El incumplimiento de estas instrucciones puede causar daño al equipo.

⚠ PELIGRO

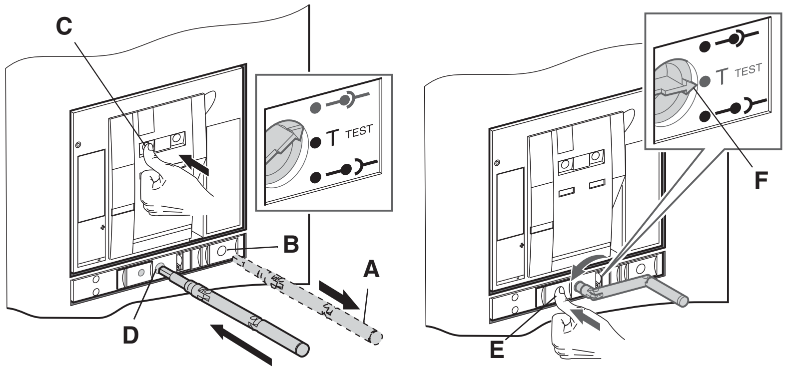
PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA o Z462 de CSA y NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

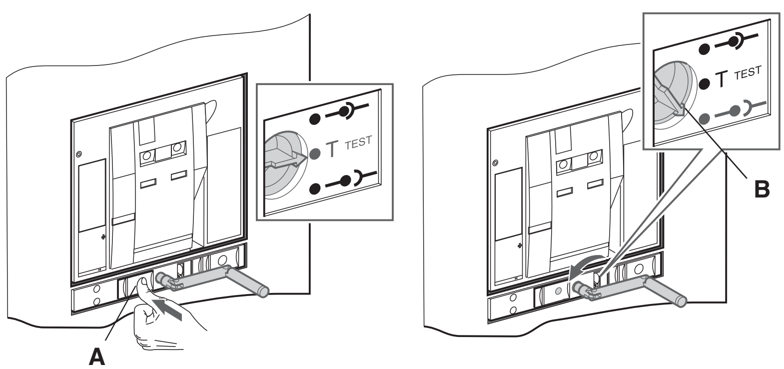
1. Retire la carga de los dispositivos de desconexión secundarios.
2. Retire la palanca de inserción/extracción (**figura 73, A**) del agujero de almacenamiento (**B**).
3. Con el botón de apertura (**C**) oprimido, inserte la palanca de inserción/extracción en la ranura (**D**).
4. Presione el botón de paro y liberación (**E**). Gire la palanca de inserción/extracción en sentido contrario a las manecillas del reloj hasta llegar a la posición de prueba (**F**). El botón de paro y liberación se botará.

Figura 73 – Extracción del interruptor en la posición de prueba



5. Presione el botón de paro y liberación (**figura 74, A**).
6. Gire la palanca de inserción/extracción en sentido contrario de las manecillas del reloj hasta llegar a la posición de desconectado (**B**). El botón de paro y liberación se botará. Vuelva a colocar la palanca de inserción/extracción en su agujero de almacenamiento.
7. Vuelva a conectar la carga en los dispositivos de desconexión secundarios.

Figura 74 – Extracción del interruptor en la posición de desconectado



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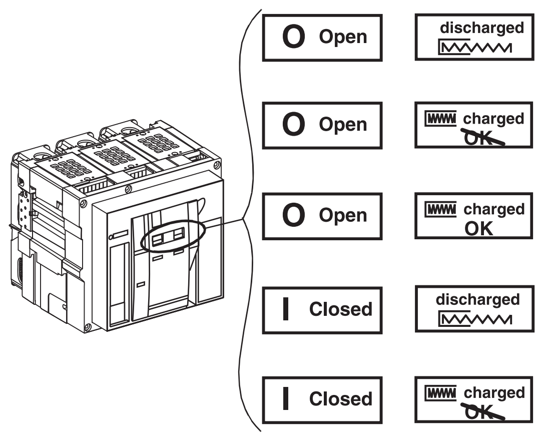
Funcionamiento del interruptor

El interruptor se cierra por medio de un mecanismo de dos pasos de energía almacenada. Los indicadores de estado en la parte frontal del interruptor indican si el interruptor está abierto o cerrado, y si el resorte de cierre está cargado o descargado. Los resortes de apertura se cargan automáticamente cuando el interruptor se cierra.

Figura 75 – Indicadores de estado



Dispositivo desconectado (contactos abiertos), el resorte de cierre está descargado

Dispositivo desconectado (contactos abiertos), el resorte de cierre está cargado, NO debe conectarse el dispositivo[1]

Dispositivo desconectado (contactos abiertos), el resorte de cierre está cargado, el dispositivo puede conectarse

Dispositivo conectado (contactos cerrados), el resorte de cierre está descargado

Dispositivo conectado (contactos cerrados), el resorte de cierre está cargado

[1] NO conectarse se mostrará si:
El disparo en derivación está energizado
El interruptor no está en la posición de conectado, prueba, desconectado o retirado
El disparo por baja tensión no está energizado
El entrelace mecánico está bloqueando el mecanismo en la posición de abierto

Función antibombeo

El interruptor de potencia Masterpact ha sido diseñado para proporcionar mecánicamente una función anti-bombeo. Si la bobina de cierre en derivación o de disparo en derivación es energizada continuamente, o ambas son energizadas a la vez, el interruptor se abrirá y no se podrá cerrar sino hasta que haya sido desenergizado. Esto evita que se apague y vuelva a encender el interruptor entre cierres y aperturas (función conocida como bombeo).

Cuando se usan las opciones de funcionamiento remoto, asegúrese de que transcurran por lo menos cuatro segundos para que el motor de carga de resorte (MCH) cargue completamente los resortes de cierre del interruptor antes de activar la bobina de cierre en derivación (XF). El contacto preparado para cerrar (PF) puede estar conectado en serie con la bobina de cierre en derivación (XF) para evitar un cierre prematuro.

Carga del resorte de cierre

Para cerrar el interruptor, el resorte de cierre debe tener la suficiente carga de energía para poder cerrar.

- Carga manual: Utilice la palanca de carga para cargar el resorte de cierre.
- Carga automática: Si está instalado el motor de carga de resorte opcional MCH, el resorte se carga automáticamente al cerrar.

NOTA: El resorte de cierre en el interruptor removible se descargará automáticamente al cambiar el interruptor de la posición de desconexión a retirado.

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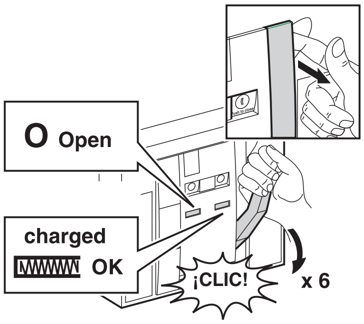
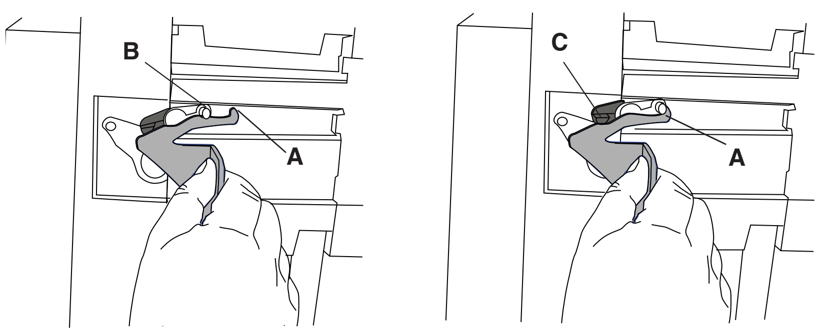
Figura 76 – Carga de resorte manual



NOTA: Para cerrar un interruptor removible sin que esté instalado en la cuna, el bloqueo de la cuna debe ser anulado antes de que el resorte de carga del interruptor pueda cargarse. Todos los interruptores incluyen una herramienta de anulación de bloqueo de la cuna. Para instalarla:

1. Deslice la herramienta de anulación del bloqueo (**figura 77, A**) en la ranura debajo de la palanca (**B**) del bloqueo en el costado derecho del interruptor.
2. Deslice la herramienta hacia el frente del interruptor y sujétela bien debajo del eje (**C**) del bloqueo de la cuna.

Figura 77 – Anulación del bloqueo de la cuna



Cierre del interruptor

Para cerrar el interruptor, se deben cumplir las siguientes condiciones:

- El dispositivo está abierto (O).
- El resorte de carga está cargado.
- Se muestra “OK”.

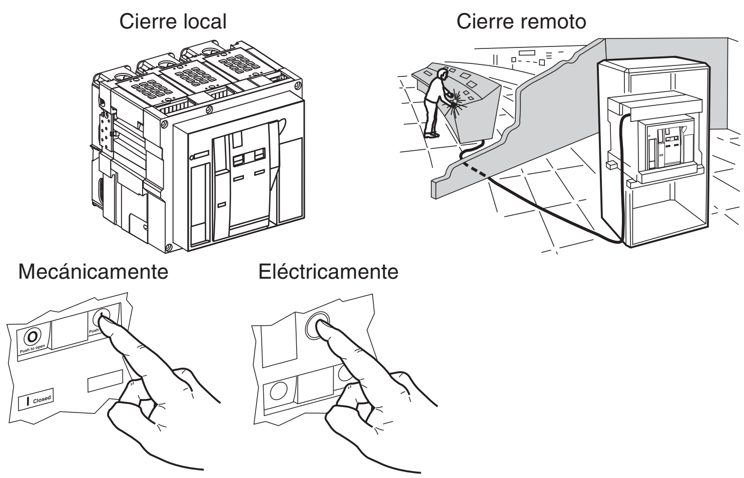
NOTA: El interruptor no se puede cerrar mientras se esté recibiendo una orden de apertura. Si se muestra el símbolo “not OK”, se está recibiendo una orden de apertura (eléctrica o manualmente) y ésta se debe terminar para que aparezca el “OK”.

Si se cumplen las condiciones arriba mencionadas, cierre el dispositivo:

- Mecánicamente: presione el botón de cierre del interruptor.
- Eléctricamente: si está instalado el cierre en derivación (XF), presione el botón de cierre eléctrico opcional (BPFE) del interruptor o un botón en un sitio remoto.

  Para obtener más información, consulte la guía del usuario del interruptor en nuestra página web (para mayor información consulte la página 7).

Figura 78 – Cierre del interruptor

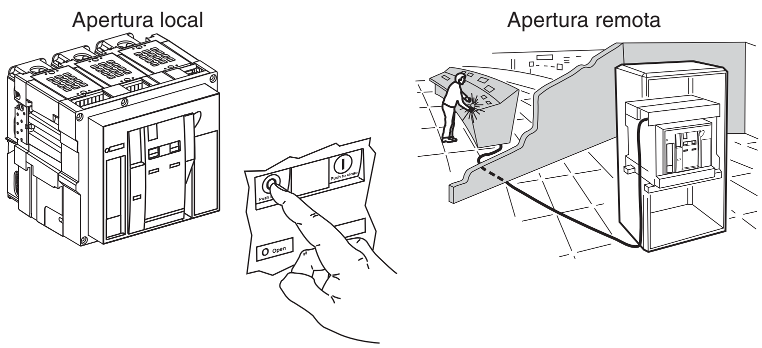


Apertura del interruptor

- Mecánicamente: presione el botón de apertura del interruptor.
- Eléctricamente: haga funcionar remotamente en través de disparos en derivación opcionales (MX1 y MX2), un dispositivo de disparo por baja tensión (MN) o un accesorio de disparo por baja tensión sin retardo de tiempo (MNR).

  Para obtener más información, consulte la guía del usuario del interruptor en nuestra página web (para mayor información consulte la página 7).

Figura 79 – Desconexión del interruptor



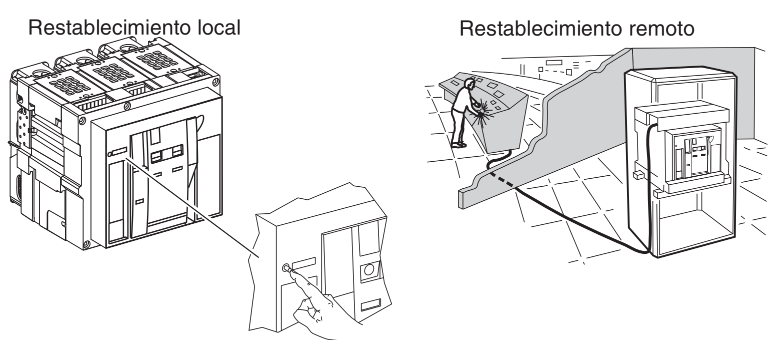
Restablecimiento del interruptor

Después de una falla por disparo, se debe restablecer el interruptor.

- Mecánicamente: presione el botón de restablecimiento situado en la parte superior de la unidad de disparo.

  Eléctricamente: utilice la opción de restablecimiento eléctrico (RES) después de una falla eléctrica. Para obtener más información, consulte la guía del usuario del interruptor en nuestra página web (para mayor información consulte la página 7).

Figura 80 – Restablecimiento del interruptor



Protección de neutro

La protección neutra protege a los conductores del neutro contra el sobrecalentamiento.

- En un interruptor de tres polos con una unidad de disparo P o H, la protección del neutro es posible si se utiliza un transformador de corriente al neutro.
  - — Ajuste el neutro utilizando la terminal de programación y ajustes de la unidad de disparo P o H.
  - — Los ajustes posibles son OFF, N/2, N ó 1.6N.
  - — El ajuste de fábrica es OFF.

La protección del neutro extra grande (1.6N) requiere el uso de un transformador de corriente al neutro extra grande apropiado. Consulte la lista de precios para obtener el transformador de corriente al neutro correcto.

AVISO

PELIGRO DE DAÑO AL EQUIPO

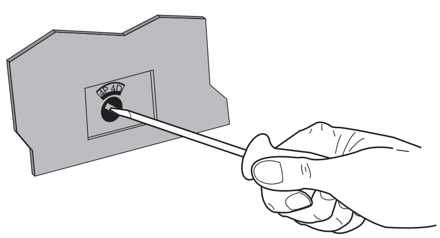
Si un desconectador con polo neutro e interruptor de cuatro polos es configurado en 4P3D, la corriente en el neutro no debe exceder la corriente nominal del interruptor.

Para un interruptor de tres polos con protección de neutro extra grande (1.6N), seleccione el transformador de corriente al neutro extra grande apropiado.

El incumplimiento de estas instrucciones puede causar daño al equipo.

- Para un interruptor de cuatro polos, configure el tipo de sistema mediante el selector de neutro del interruptor (vea la figura 81).
  - — Con una unidad de disparo P o H, realice ajustes finos utilizando la terminal de programación y ajustes de la unidad de disparo, con el ajuste del selector del interruptor en el límite superior.
  - — El ajuste de fábrica es 4P 4D.

Figura 81 – Selector de neutro del interruptor de cuatro polos



Ajustes de protección del neutro para el interruptor de cuatro polos

Selector del interruptor	Ajustes de la unidad de disparo P o H a través de la terminal de programación y ajustes
4P 3D	Off, N/2, N
3P N/2	N/2
4P 4D	N/2, N

- La protección neutra para conductores tiene cuatro ajustes posibles:
  - — OFF (4P 3D) — La protección de neutro está desactivada.
  - — N/2 (3P N/2) — La capacidad del conductor neutro es la mitad de la de los conductores de línea.
  - — N (4P 4D) — La capacidad del conductor neutro es igual que la de los conductores de línea.
  - — 1.6N — La capacidad del conductor neutro es 1,6 veces la de los conductores de línea. (interruptor de 3P con unidad de disparo P o H solamente).

Tabla 17 – Tipo de conductor de la unidad de disparo Micrologic™

Ajuste	Activación de tiempo largo		Activación de tiempo corto		Instantáneo		Activación de falla a tierra	
	Unidad de disparo	Neutro	Unidad de disparo	Neutro	Unidad de disparo	Neutro	Unidad de disparo	Neutro
OFF	Ir	Ninguna	Isd	Ninguna	Ii	Ninguna	Ig	Ninguna
N/2	Ir	1/2 Ir	Isd	1/2 Isd	Ii	Ii	Ig	Ig
N	Ir	Ir	Isd	Isd	Ii	Ii	Ig	Ig
1.6N	Ir	1.6 x Ir	Isd	1.6 x Isd*	Ii	Ii	Ig	Ig

*A fin de limitar la gama, limitado en 10 x In

Sección 7—Seguros, bloqueos y accesorios

Se encuentran disponibles una variedad de dispositivos y accesorios para cerrar y bloquear la cuna y el interruptor de potencia Masterpact. El funcionamiento de estos dispositivos se describe en el boletín 0613IB1203: *Interruptor de potencia Masterpact™ NW en baja tensión / en caja aislada con tecnología ArcBlok — Guía del usuario* disponible en nuestro sitio web (para mayor información consulte la página 7).

Para obtener una lista completa de los seguros, bloqueos y accesorios disponibles, consulte el catálogo 0613CT1001, *Interruptores de potencia Masterpact NT y NW universales* en nuestro sitio web. Para obtener más información, consulte la guía de usuario del interruptor en nuestro sitio web (para mayor información consulte la página 7).

Para obtener instrucciones detalladas sobre los seguros, bloqueos y accesorios que se pueden instalar en campo, consulte las instrucciones de instalación que acompañan a estos dispositivos.

Los accesorios se pueden instalar en un interruptor o cuna instalado.

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Instalación de los accesorios en el interruptor

Coloque el interruptor en la posición de desconectado. Consulte la sección “Desconexión del interruptor”, en la página 72, para obtener instrucciones.

Instale los accesorios del interruptor, consulte “Instalación de los accesorios” en la página 44.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA o Z462 de CSA y NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Instalación de los accesorios en la cuna

1. Desenergice el equipo antes de realizar cualquier trabajo dentro o fuera de él.
2. Retire el interruptor de la cuna. Consulte la sección “Desmontaje del interruptor” en la página 48, para obtener instrucciones sobre cómo desmontar el interruptor.
3. Instale los accesorios como se indica en las instrucciones provistas con cada accesorio.
4. Vuelva a colocar el interruptor en la cuna. Consulte la sección “Instalación del interruptor” en la página 40, para obtener instrucciones sobre cómo instalarlo.

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⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA o Z462 de CSA y NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Sección 8—Prueba, servicio de mantenimiento y diagnóstico de problemas

Para obtener información sobre las pruebas de campo, servicios de mantenimiento y solución de problemas consulte el boletín 0613IB1201, Guía de mantenimiento y pruebas de campo de los interruptores Masterpact NT y NW, que puede encontrarse en nuestro sitio web:

http://www.schneider-electric.com

Para obtener asistencia sobre alguna aplicación, llame al 1-888-778-2733 en EUA y al 55-5804-5000 en México.

Tabla 18 – Guía de diagnóstico de problemas

Problema	Causas posibles	Soluciones
El interruptor no se puede cerrar de manera remota ni localmente.	Interruptor bloqueado con candado o llave en la posición "OPEN".	• Desactive la función de bloqueo.
	Interruptor interbloqueado mecánicamente en un sistema de cambio de fuente.	• Compruebe la posición del otro interruptor en el sistema de cambio. • Modifique la situación para soltar el bloqueo.
	El interruptor no está completamente conectado.	• Complete la inserción (conexión) de los interruptores.
	El botón de restablecimiento que indica un disparo por falla no se ha restablecido.	• Elimine la falla. • Pulse el botón de restablecimiento en la parte frontal del interruptor.
	El mecanismo de energía almacenada no está cargado.	• Cargue el mecanismo manualmente. • Si está equipado con un motor de carga de resorte MCH, compruebe el suministro de energía al motor. Si el problema persiste, sustituya el motor de carga de resorte.
	El disparador en derivación de apertura MX (disparo en derivación) es alimentado con energía permanentemente.	• Hay una orden de apertura. Determine el origen de la orden. La orden debe cancelarse antes de que el interruptor pueda ser cerrado.
	Disparador por baja tensión MN (UVR) no energizado.	• Hay un orden de apertura. Determine el origen de la orden. • Compruebe la tensión y el circuito de alimentación (V > 0,84 Vn). • Si el problema persiste, sustituya el disparador.
	El disparador de cierre XF (cierre en derivación) está continuamente energizado, pero el interruptor no está "preparado para cerrar" (XF no está conectado en serie con el contacto PF).	• Abra el suministro de energía al disparador de cierre XF, luego, envíe nuevamente la orden de cierre con el XF, pero sólo si el interruptor está "preparado para cerrar".
	El interruptor utiliza una unidad de disparo Micrologic P o H, que tiene una orden de disparo permanente con tensión mínima y protección de frecuencia mínima en el modo de disparo y la unidad de disparo energizada.	• Desactive estas funciones de protección en la unidad de control Micrologic P o H.
El interruptor no se puede cerrar de forma remota, pero puede abrirse localmente utilizando el botón de cierre.	La orden de cierre no fue ejecutada por el disparador de cierre XF (cierre en derivación)	• Compruebe la tensión en el circuito de alimentación (0,85–1,1 Vn). Si el problema persiste, sustituya el disparador XF.
El interruptor no se puede abrir de manera remota, pero sí localmente.	La orden de cierre no fue ejecutada por el disparador de apertura MX (disparo en derivación)	• Compruebe la tensión en el circuito de alimentación (0,7–1,1 Vn). Si el problema persiste, sustituya el disparador XF.
	La orden de apertura no fue ejecutada por el disparador por baja tensión MN (UVR).	• La caída de tensión es insuficiente o la tensión residual (> 0,35 Vn) en las terminales del disparador por baja tensión. Si el problema persiste, sustituya el disparador MN.
El interruptor no se puede abrir localmente.	El mecanismo de funcionamiento está averiado o los contactos están dañados	• Póngase en contacto con un centro de servicio de Schneider Electric

Tabla 18 – Guía de diagnóstico de problemas *(continuación)*

Problema	Causas posibles	Soluciones
El interruptor se puede restablecer localmente pero no remotamente.	La tensión de alimentación es insuficiente para el motor de carga de resorte MCH.	• Compruebe la tensión en el circuito de alimentación (0,7–1,1 Vn). • Si el problema persiste, sustituya el disparador MCH.
Disparo accidental sin activación del botón de restablecimiento que indica una falla	La tensión de alimentación del disparador por baja tensión MN (UVR) es muy baja.	• Compruebe la tensión en el circuito de alimentación (V>0,58 Vn).
	La orden de desconexión de carga fue enviada al disparador de apertura MX (disparo en derivación)	• Compruebe la carga general en el sistema de distribución. • Si es necesario, modifique los ajustes de los dispositivos en la instalación.
	Orden de apertura innecesaria del disparador de apertura MX (disparo en derivación)	• Determine el origen de la orden.
Disparo accidental con activación del botón de restablecimiento que indica un disparo por falla.	Una falla está presente: • sobrecarga • falla a tierra • cortocircuito detectado por la unidad de disparo.	• Determine y elimine las causas de la falla. • Compruebe el estado del interruptor antes de volver a ponerlo en servicio.
Apertura instantánea después de cada intento de cerrar el interruptor al activar el botón de restablecimiento que indica un disparo por falla.	Memoria térmica	• Consulte el manual del usuario de la unidad de disparo • Oprima el botón de restablecimiento
	Sobrecorriente transitoria al cerrar	• Modifique el sistema de distribución o los ajustes de la unidad de disparo. • Compruebe el estado del interruptor antes de volver a ponerlo en servicio. • Oprima el botón de restablecimiento
	Cierre en un cortocircuito	• Elimine la falla • Compruebe el estado del interruptor antes de volver a ponerlo en servicio. • Oprima el botón de restablecimiento.
Disparo involuntario del interruptor con activación del botón de restablecimiento que indica un disparo por falla.	El botón de restablecimiento no fue oprimido completamente.	• Oprima el botón de restablecimiento completamente.
No se puede insertar la palanca en posición de conectado, prueba o desconectado.	Un candado o cerradura está presente en la cuna o un bloqueo de puerta está presente.	• Desactive la función de bloqueo.
No se puede girar la manivela.	El botón de restablecimiento no ha sido oprimido.	• Oprima el botón de restablecimiento mientras se gira la palanca (manivela) de inserción/extracción.
El interruptor no se puede retirar de la cuna.	El interruptor no está en la posición de desconectado.	• Gire la palanca de inserción/extracción (manivela) hasta que el interruptor esté en la posición de desconectado y el botón de restablecimiento esté afuera.
	Los rieles no están completamente fuera.	• Jale los rieles hasta sacarlos completamente.
	La palanca (manivela) de inserción/extracción no ha sido retirada del mecanismo de inserción/extracción.	• Retire y guarde la manivela de inserción/extracción.
El interruptor no se puede insertar (colocarlo en la posición de conectado).	La protección inapropiada (identificación de celdas) de la cuna / interruptor está impidiendo la inserción.	• Compruebe que la cuna corresponda con el interruptor.
	Las pinzas de conexión de los contacto de desconexión están incorrectamente colocadas.	• Vuelva a colocar las pinzas de conexión.
	La cuna está bloqueada en la posición de desconectado	• Desactive la función de bloqueo de la cuna.
	No se ha oprimido el botón de restablecimiento, lo cual impide el giro de la manivela.	• Oprima el botón de restablecimiento mientras se gira la palanca de extracción/inserción (manivela).
	El interruptor no ha sido insertado suficientemente en la cuna.	• Inserte el interruptor completamente de modo que enganche en el mecanismo de inserción/extracción.
El interruptor no puede bloquearse en la posición de desconectado.	El interruptor no se encuentra en la posición correcta.	• Compruebe la posición del interruptor, asegurándose de que el botón de restablecimiento está fuera.
	La palanca (manivela) de inserción/extracción no ha sido retirada del mecanismo de inserción/extracción.	• Retire y guarde la manivela de inserción/extracción.

Tabla 18 – Guía de diagnóstico de problemas *(continuación)*

Problema	Causas posibles	Soluciones
El interruptor no puede bloquearse en la posición de conectado o prueba.	Verifique que el bloqueo en cualquier posición esté activado.	• Póngase en contacto con un centro de servicio de Schneider Electric.
	El interruptor no se encuentra en la posición correcta.	• Compruebe la posición del interruptor, asegurándose de que el botón de restablecimiento está fuera.
	La palanca (manivela) de inserción/extracción no ha sido retirada del mecanismo de inserción/extracción.	• Retire y guarde la manivela de inserción/extracción.
La manivela no se puede insertar para conectar o desconectar el interruptor.	Los rieles no están completamente dentro.	• Empuje los rieles hasta introducirlos completamente.
El riel derecho de la cuna o el interruptor no se puede extraer.	La palanca (manivela) de inserción/extracción no ha sido retirada del mecanismo de inserción/extracción.	• Retire y guarde la manivela de inserción/extracción.

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Importado en México por:
Schneider Electric México, S.A. de C.V.
Av. Ejercito Nacional No. 904
Col. Palmas, Polanco 11560 México, D.F.
55-5804-5000
www.schneider-electric.com.mx

HRB28361, Rev. 02, 02/2015
Reemplaza HRB28361, 05/2014

Disjoncteur Masterpact^{MC} NW de puissance à basse tension / à boîtier isolé—Installation

Classe 0613

Directives d'utilisation

HRB28361
Rév. 02, 02/2015

À conserver pour usage ultérieur.

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Schneider Electric™

Catégories de dangers et symboles spéciaux

Lisez attentivement ces directives et examinez l'appareillage pour vous familiariser avec son fonctionnement avant de faire son installation ou son entretien. Les messages spéciaux suivants peuvent apparaître dans les présentes directives ou sur l'appareil pour avertir l'utilisateur de dangers potentiels ou pour attirer l'attention sur des informations qui clarifient ou simplifient une procédure.

L'ajout d'un de ces deux symboles à une étiquette de sécurité de « Danger » ou d'« Avertissement » indique qu'un danger électrique existe et qu'il peut entraîner des blessures corporelles si les directives ne sont pas respectées.

Ceci est le symbole d'alerte de sécurité. Il est utilisé pour vous alerter de dangers de blessures corporelles potentielles. Veuillez vous conformer à tous les messages de sécurité qui suivent ce symbole pour éviter une blessure ou la mort.

⚠ DANGER
DANGER indique une situation de danger qui, si elle n'est pas évitée, **entraînera** la mort ou des blessures graves.

⚠ AVERTISSEMENT
AVERTISSEMENT indique une situation de danger qui, si elle n'est pas évitée, **peut entraîner** la mort ou des blessures graves.

⚠ ATTENTION
ATTENTION indique une situation de danger qui, si elle n'est pas évitée, **peut entraîner** des blessures mineures ou modérées.

AVIS
AVIS est utilisé pour aborder des pratiques ne concernant pas les blessures. Le symbole d'alerte de sécurité n'est pas utilisé avec ce mot de signal.

REMARQUE : Fournit des renseignements complémentaires pour clarifier ou simplifier une procédure.

Veuillez noter

Seul un personnel qualifié doit effectuer l'installation, l'utilisation, l'entretien et la maintenance du matériel électrique. Schneider Electric n'assume aucune responsabilité des conséquences éventuelles découlant de l'utilisation de cette documentation.

Avis FCC

Cet appareil a subi des essais et a été reconnu conforme aux limites des appareils numériques de classe A, suivant le paragraphe 15 de la réglementation FCC (Commission fédérale des communications des É.-U.). Ces limites sont conçues pour fournir une protection raisonnable contre les interférences nuisibles lorsqu'un appareil est employé dans un milieu commercial. Cet appareil produit, utilise et peut rayonner de l'énergie radioélectrique et, s'il n'est pas installé ou utilisé conformément au mode d'emploi, il peut provoquer des interférences nuisibles aux communications radio. Le fonctionnement de cet appareil dans une zone résidentielle est susceptible de provoquer des interférences nuisibles, auquel cas l'utilisateur est obligé de corriger les interférences à ses propres frais. Cet appareil numérique de la classe A est conforme à la norme ICES-003 du Canada.

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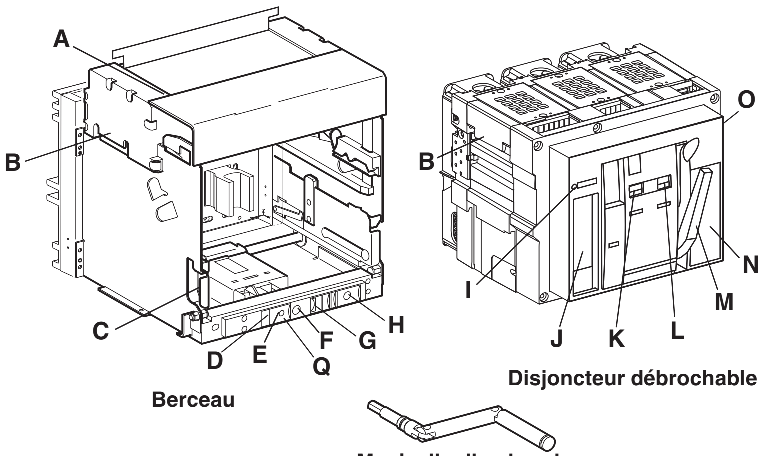
Section 1—Généralités

Introduction

Le disjoncteur[1] de puissance Masterpact NW à basse tension et le disjoncteur à boîtier isolé sont conçus pour être montés dans un berceau débrochable, à l'aide de connexions pour montage arrière et enfichables par pression, afin de fournir la connexion électrique au berceau. Un disjoncteur à montage fixe est également disponible.

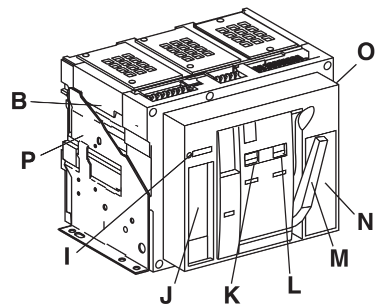
Figure 1 – Disjoncteur et berceau



Berceau

Disjoncteur débrochable

Manivelle d’embrochage



Disjoncteur fixe

A—Couvercle de bornes
B—Brides de levage
C—Poignée du rail d’extension
D—Option de cadenassage
E—Bouton Arrêt-dégagement
F—Trou d’insertion de la manivelle d'embrochage
G—Indicateur de position
H—Espace de rangement de la manivelle
I—Bouton de réarmement de déclench. sur défaut
J—Déclencheur
K—Bouton pousser-pour-ouvrir
L—Bouton pousser-pour-fermer
M—Poignée de chargement
N—Plaque avant
O—Couvercle des accessoires
P—Supports de montage fixe
Q—Code de date du berceau

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[1]Dans ce manuel, le mot « disjoncteur » signifie à la fois disjoncteur et interrupteur.

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Ces disjoncteurs sont conformes aux normes suivantes.

Disjoncteur de puissance à basse tension (débrochable et fixe)	**Disjoncteur à boîtier isolé (débrochable et fixe)**
ANSI C37.13 ANSI C37.16 ANSI C37.17 ANSI C37.50 UL1066[1] CSA C22.2 No 31[1] NEMA SG3	UL489[2] NEMA AB1 CSA C22.2 No. 5-02[3]

1 cULus.

2 Inscrit UL®

3 Certifiés CSA®

Les disjoncteurs de puissance à basse tension type L1F, 800 à 2000 A et les disjoncteurs à boîtier isolé type LF, 800 à 2000 A, sont vérifiés afin de montrer la catégorie de risque de danger d'éclats d'arc selon NFPA 70E ou CSA Z462.

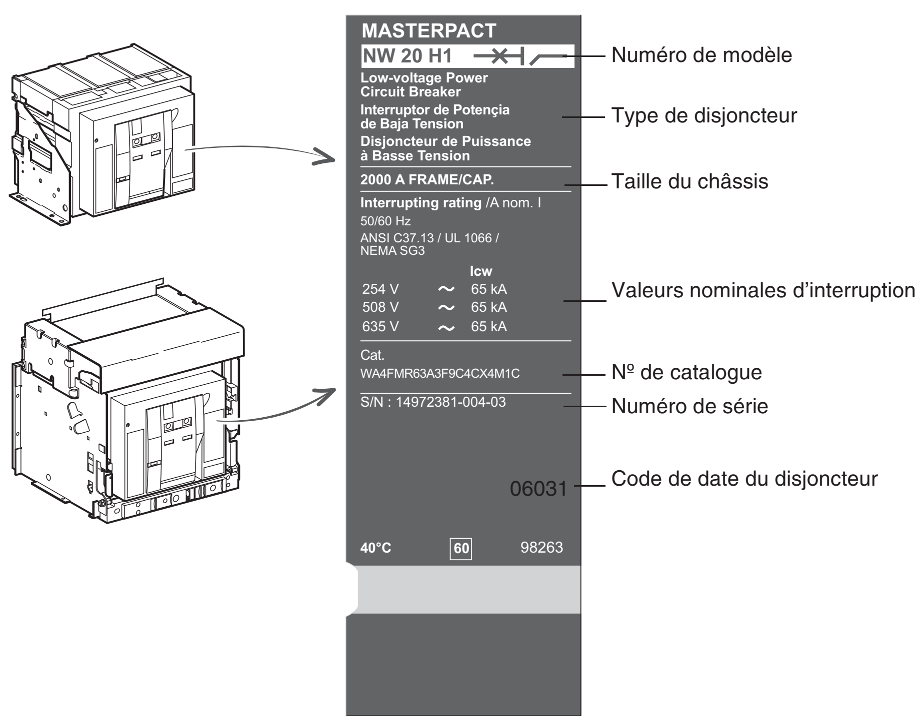
Ce bulletin contient les directives d'installation des disjoncteurs Masterpact NW. Les fonctions de déclenchement sont commandées par le déclencheur Micrologic[MC].

On peut trouver les renseignements au sujet d’un disjoncteur donné sur l’étiquette de la plaque avant située à l’avant du disjoncteur.

On peut trouver les renseignements au sujet des accessoires installés sur le disjoncteur sur l’étiquette de l’accessoire située sur le côté droit du disjoncteur.

Pour des renseignements complets au sujet des modèles de disjoncteurs, des capacités de châssis, des valeurs nominales d'interruption, des tailles de détecteurs et des déclencheurs disponibles, voir le catalogue 0613CT1001, *Disjoncteurs de puissance Masterpact NT et NW universels* sur notre site Web.

Figure 2 – Informations sur la plaque avant



Pour obtenir des informations supplémentaires, consulter les guides de l'utilisateur suivants sur notre site Web :

- Directives n^{o} 0613IB1204 : *Disjoncteur Masterpact^{MC} NW de puissance à basse tension / à boîtier isolé guide de l'utilisateur*
- Directives n^{o} 0613IB1205 : *Plans d'encombrement de Masterpact^{MC} NW*
- Directives n^{o} 0613IB1202 : *Guide d'essai sur place et d'entretien pour disjoncteurs Masterpact^{MC} NT et NW*
- Directives n^{o} 48049-136-05 : *Déclencheurs électroniques Micrologic 2.0A, 3.0A, 5.0A et 6.0A*
- Directives n^{o} 48049-330-03 : *Déclencheurs électroniques Micrologic 5.0H et 6.0H*
- Directives n^{o} 48049-137-05 : *Déclencheurs électroniques Micrologic 5.0P et 6.0P*
- Directives n^{o} 48049-207-05 : *Déclencheurs électroniques Micrologic 2.0, 3.0 et 5.0*

Pour accéder à notre site Web aller à :

http://www.schneider-electric.com

Pour une assistance concernant les applications, appeler le 1-888-778-2733 (É.-U).

FRANÇAIS

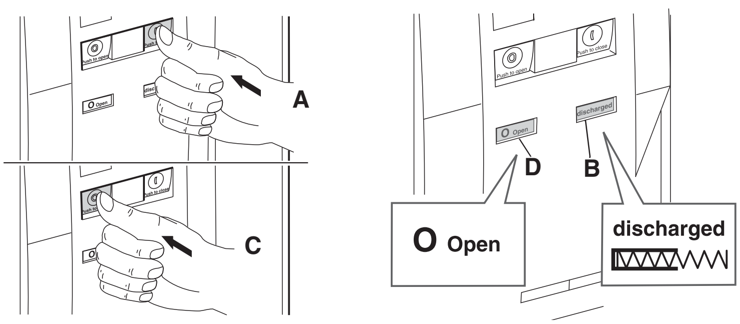
Avant de travailler sur le disjoncteur

1. Couper l'alimentation du disjoncteur :

   Appuyer sur le bouton « Pousser pour fermer » (**figure 3, A**) pour décharger le ressort, comme indiqué dans l'encadré (**B**).

   Appuyer sur le bouton « Pousser pour ouvrir » (**C**) pour ouvrir les contacts, comme indiqué dans l'encadré (**D**).

Figure 3 – Mise hors tension (O) du disjoncteur



2. Mettre le disjoncteur hors tension.

   — Pour les disjoncteurs débrochables : débrocher le disjoncteur sur la position déconnectée (**figure 4, A**). Voir Déconnexion du disjoncteur débrochable, page 70.

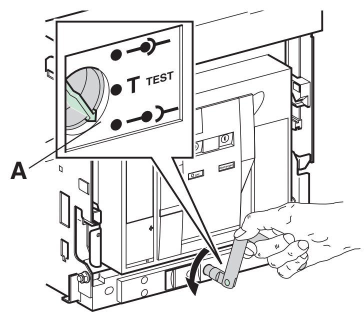
⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLATS D'ARC

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E ou CSA Z462.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Figure 4 – Débrancher le disjoncteur débrochable



— Pour les disjoncteurs fixes : couper l'alimentation de l'appareil avant d'y travailler.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLATS D'ARC

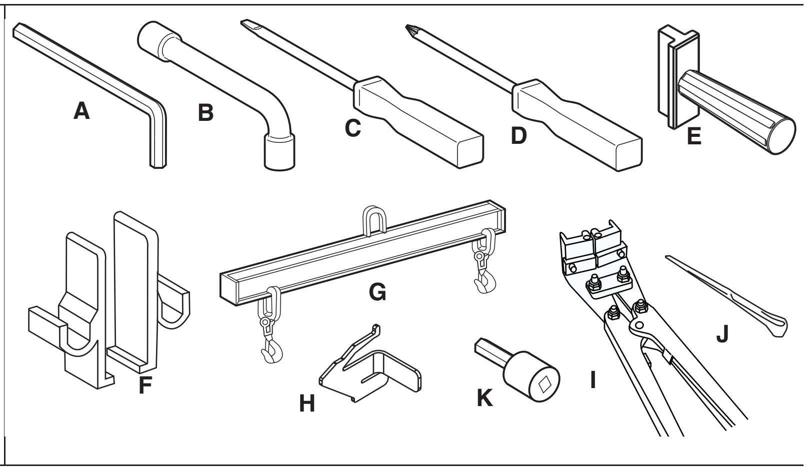
- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E ou CSA Z462.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez toutes les alimentations à cet appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Outils

Tableau 1 – Outils requis

A. Clé hexagonale, 5 mm
B. Clé à douille angulaire, 1/2 po
C. Tournevis à lame droite (Pozidriv®/à fente n^{o} 2)
D. Tournevis Torx® 20
E. Outil de réglage de groupes de connecteurs, n^{o} de cat. CLUSRETOOL
F. Crochets de levage, n^{o} de cat. S48906
G. Barre transversale
   Châssis W, n^{o} de cat. S48900
   Châssis Y, n^{o} de cat. S48901
H. Outil de neutralisation de l’interverrouillage du berceau (disjoncteur débrochable uniquement, fourni)
I. Outil de positionnement de groupes de connecteurs, n^{o} de cat. S47542
J. Outil d’insertion de fils Wago, n^{o} de pièce Wago 209-129
K. Adaptateur hex. de 10mm pour le mécanisme d'embrochage du berceau



Déballage et inspection

REMARQUE : Les directives de remballage peuvent être trouvées dans les directives d'utilisation 0613IB1203, *Disjoncteur Masterpact NW de puissance à basse tension / à boîtier isolé–Guide de l’utilisateur*, que vous pouvez trouver sur le site Web de Schneider Electric (voir la page 7).

AVIS

RISQUE DE DOMMAGES MATÉRIELS

Ne pas poser le disjoncteur sur sa face arrière. Cela pourrait endommager les groupes de connecteurs.

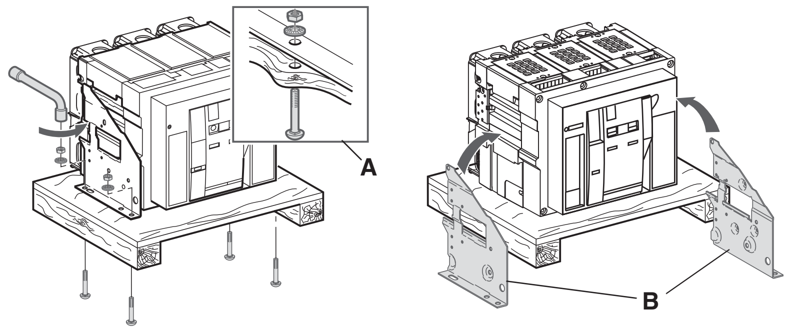
Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

Déballage du disjoncteur

REMARQUE : Ne pas poser le disjoncteur sur sa face arrière. Cela pourrait endommager les groupes de connecteurs.

1. Enlever les quatre boulons, écrous et rondelles (**figure 5, A**) fixant le disjoncteur à la palette.
2. Sur les disjoncteurs débrochables uniquement : enlever les supports de transport (**B**).

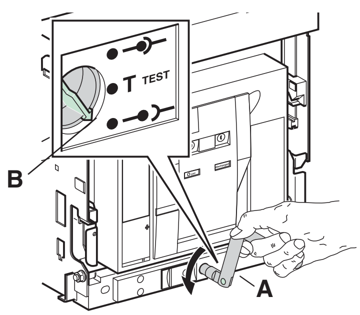
Figure 5 – Déballage du disjoncteur



Déballage du disjoncteur expédié dans le berceau

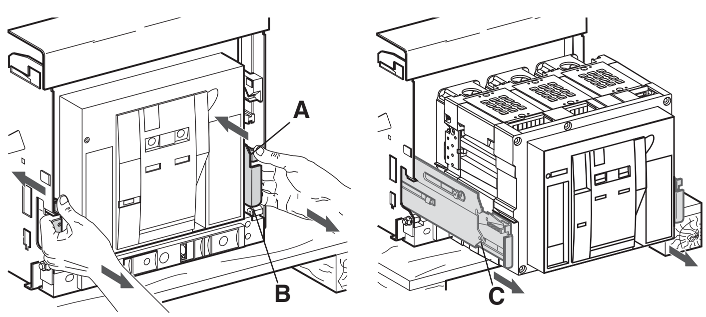
1. Débrocher le disjoncteur (**figure 6, A**) sur la position déconnectée (**B**) (se reporter à Déconnexion du disjoncteur débrochable, page 70).

Figure 6 – Débranchement du disjoncteur



2. En appuyant sur les pattes de verrouillage (**figure 7, A**), retirer les poignées (**B**) de rails d'extension, jusqu'à ce que les rails (**C**) soient complètement déployés.

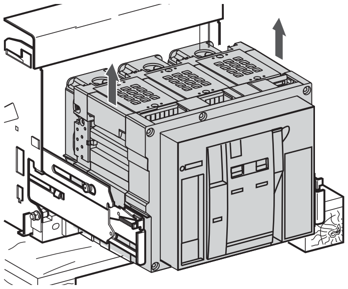
Figure 7 – Retrait du disjoncteur



REMARQUE : Ne pas poser le disjoncteur sur sa face arrière. Cela pourrait endommager les groupes de connecteurs.

3. Enlever le disjoncteur. (Voir « Démontage du berceau » à la page 38.)

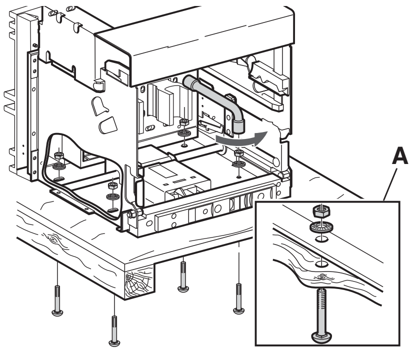
Figure 8 – Démontage du disjoncteur et berceau



Déballage du berceau

1. Enlever les quatre boulons, écrous et rondelles (**figure 9, A**) fixant le berceau à la palette.
2. Enlever le berceau de la palette. (Voir Levage, page 16.)

Figure 9 – Déballage du berceau



Inspection, remplacement et lubrification des groupes de connecteurs

Inspection des groupes de connecteurs

1. Inspecter les groupes de connecteurs et leurs supports situés à l'arrière du disjoncteur débrochable. S'assurer que les groupes de connecteurs sont installés et configurés correctement comme indiqué au tableau 3.
2. Faire une inspection visuelle des groupes de connecteurs pour déceler des signes d'endommagement de ce type :
   - — Des zones décolorées
   - — Du cuivre visible sur les doigts
   - — Des ressorts fêlés ou cassés
   - — Manque d'alignement avec d'autres groupes (indique un endommagement du ressort)
3. Faire une inspection visuelle des groupes pour voir s'ils sont usés.

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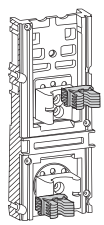
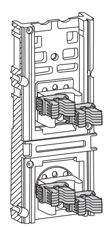
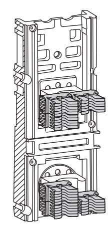
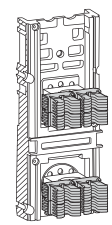
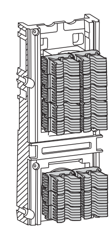
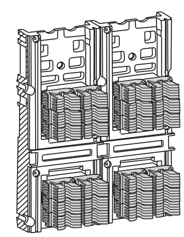
Tableau 2 – Nombre de groupes de connecteurs par pôle

Type	N / N1	H1	HA	H / H2 / H3 / HF	L / L1 / LF / L1F / HB / HC
NW08	2	4	4	4 / 4 / 6 / 4	8
NW12	2	—	—	4	8
NW16	6	6	6	6	8
NW20	8	8	8	8	16
NW25/NW30	—	—	—	16	16
NW32	—	16	16	16	24
NW40/NW50	—	—	24	24	24
NW60	—	—	—	24	24

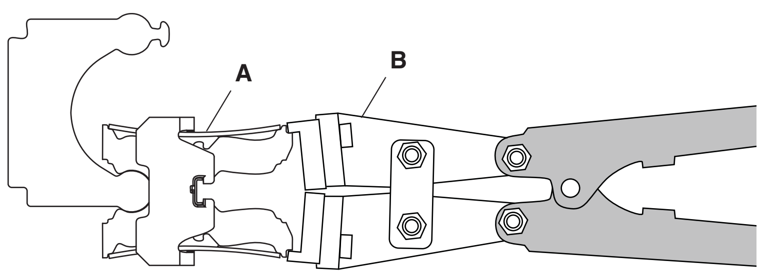
Tableau 3 – Configuration des groupes de connecteurs

Nombre de groupes de connecteurs par pôle
REMARQUE : Les écrans de protection de groupes de connecteurs ne sont pas représentés.

2	4	6	8	16	24
					

4. Remplacer tous les groupes de connecteurs qui ne passent pas l'inspection. Installer des groupes de connecteurs neufs (**figure 10, A**) à l'aide de l’outil de positionnement (**B**).

Figure 10 – Installation des groupes de connecteurs neufs



Lubrification des groupes de connecteurs

AVIS

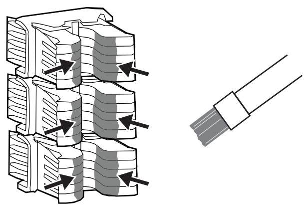
RISQUE DE DOMMAGES MATÉRIELS

Inspectez la lubrification des groupes de connecteurs lorsque le disjoncteur est retiré du berceau.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

Lubrifier les mâchoires des groupes de connecteurs avec de la graisse du kit (numéro de catalogue S48899), comme indiqué à la figure 11.

Figure 11 – Application de graisse sur le groupe de connecteurs



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Lubrification des lames de connexion du berceau

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLATS D'ARC

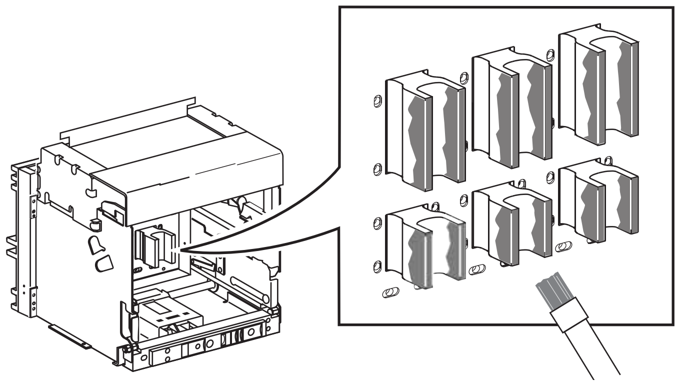
- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E ou CSA Z462.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez toutes les alimentations à cet appareil avant d’y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Les lames de connexion du berceau doivent être inspectées et lubrifiées lorsque le berceau est installé pour la première fois et de nouveau durant les périodes d’entretien après avoir déconnecté toute alimentation électrique.

S'assurer que les lames de connexion sont lubrifiées sur les deux côtés. Si nécessaire, utiliser le kit de graisse (numéro de catalogue S48899) pour lubrifier les lames de connexion.

Figure 12 – Application de graisse sur les lames de connexion du berceau



FRANÇAIS

Section 2—Levage et transport

Le disjoncteur et le berceau ont tous les deux des brides de levage pour le soulevage. Pour soulever le disjoncteur, utiliser un dispositif de levage aérien fixé aux brides de levage, selon les consignes fournies dans cette section.

⚠ DANGER

RISQUE DE CHUTE DU DISPOSITIF

- Assurez-vous que l'appareil de levage a la capacité de levage pour l'appareil à soulever.
- Suivez les consignes du fabricant lors de l'utilisation de l'appareil de levage.
- Portez un casque de protection, des chaussures de sécurité et des gants épais.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Poids

Tableau 4 – Poids

Capacité du châssis	Type de connecteur[1]	Poids (lb/kg)								
		Disjoncteur		Berceau		Connecteur		Palette	Total	
		3P	4P	3P	4P	3P	4P		3P	4P
800 A à 2 000 A, débrochable	FCF	109/50	142/65	97/44	116/53	42/19	55/25	17/8	265/121	330/151
	FCT	109/50	142/65	97/44	116/53	84/38	109/50	17/8	307/140	384/176
	RCTH/RCTV	109/50	142/65	97/44	116/53	17/8	22/10	17/8	240/110	297/136
800 A à 2000 A, fixe	FCF	109/50	142/65	—	—	42/19	55/25	17/8	168/77	214/98
	FCT	109/50	142/65	—	—	84/38	109/50	17/8	210/96	268/123
	RCTH/RCTV	109/50	142/65	—	—	17/8	22/10	17/8	143/66	181/83
2500 A à 3000 A, débrochable	RCTH/RCTV	127/58	165/75	124/57	149/68	26/12	34/15	17/8	294/135	365/166
	FCT	127/58	165/75	124/57	149/68	80/36	104/47	17/8	348/159	435/198
2500 A à 3000 A, fixe	FCT	127/58	165/75	—	—	80/36	104/47	17/8	224/102	286/130
	RCTH/RCTV	127/58	165/75	—	—	26/12	34/15	17/8	170/78	216/98
2000 A L1/L1F et 3200 A, débrochable	RCOV	127/58	165/75	124/57	149/68	100/46	130/59	17/8	368/169	461/210
3200 A, fixe	RCOV	127/58	165/75	—	—	100/46	130/59	17/8	244/112	312/142
4 000 A, (châssis W) fixe	RCOV (Special)	127/58	165/75	—	—	115/52	145/66	17/8	259/118	327/149
3200 A L1 et 4000 A, débrochable	FCF	227/103	295/134	278/126	334/152	84/38	109/50	39/18	628/285	777/354
	FCT	227/103	295/134	278/126	334/152	168/76	218/99	39/18	712/324	886/403
	RCTH/RCTV	227/103	295/134	278/126	334/152	52/24	68/31	39/18	596/271	736/335
4000 A, fixe	RCTH/RCTV	227/103	295/134	—	—	52/24	68/31	39/18	318/145	402/183
5000 A, débrochable	FCT	227/103	295/134	278/126	334/152	168/77	218/99	39/18	712/324	886/403
	RCTH/RCTV	227/103	295/134	278/126	334/152	52/24	68/31	39/18	596/271	736/335
5000 A, fixe	RCTH/RCTV	227/103	295/134	—	—	52/24	68/31	39/18	318/145	402/183

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Tableau 4 – Poids *(suite)*

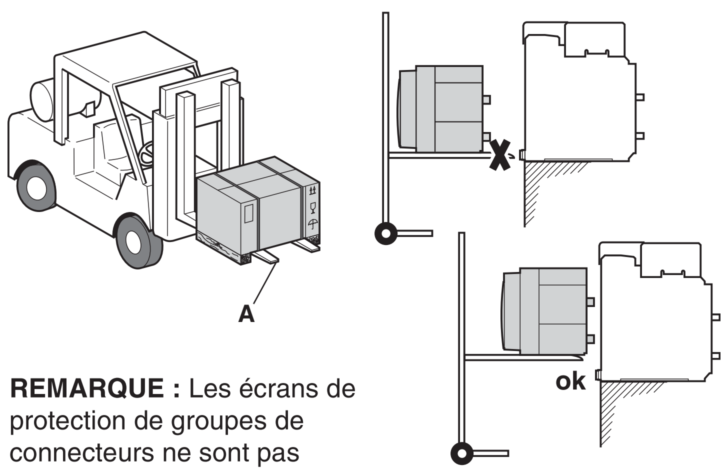
Capacité du châssis	Type de connecteur[1]	Poids (lb/kg)								
		Disjoncteur		Berceau		Connecteur		Palette	Total	
		3P	4P	3P	4P	3P	4P		3P	4P
6000 A, débrochable	RCTV	227/103	295/134	278/126	334/152	396/180	528/240	39/18	940/427	1196/544
6000 A, fixe	RCTV	227/103	295/134	—	—	396/180	528/240	39/18	662/301	862/392

[1]FCF = Connecteur plat avec connexion par l'avant.
FCT = Connecteur en T avec connexion par l'avant.
RCTH = Connecteur horizontal en T avec connexion par l'arrière.
RCTV = Connecteur vertical en T avec connexion par l'arrière.
RCOV = Connecteur vertical décalé avec connexion par l'arrière.

Utilisation d’un chariot élévateur

Quand on utilise un chariot élévateur, les fourches de levage (**figure 13, A**) ne doivent pas dépasser le rebord arrière du disjoncteur.

Figure 13 – Utilisation d’un chariot élévateur



REMARQUE : Les écrans de protection de groupes de connecteurs ne sont pas représentés.

Levage

Levage du disjoncteur débrochable

AVIS

RISQUE DE DOMMAGES MATÉRIELS

Fixez le berceau avant d’installer ou d’enlever le disjoncteur.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

FRANÇAIS

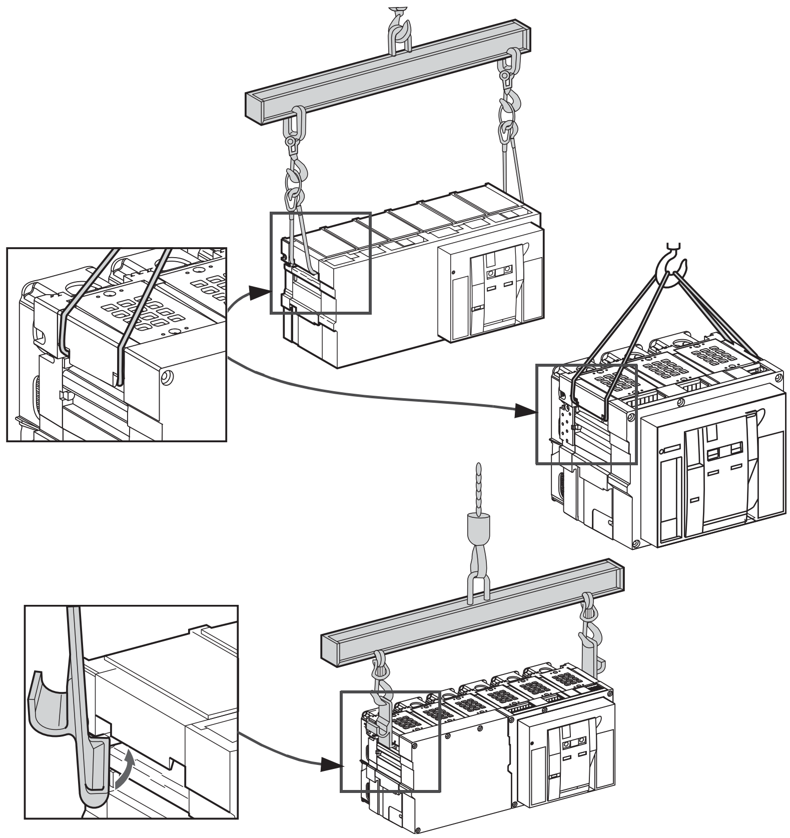
Soulever à l'aide de crochets de levage, d'une entretoise et de brides de levage situées sur le côté du disjoncteur.

Kit de crochet de levage : S48906

Kit d'entretoise pour disjoncteur à châssis W : S48900

Kit d'entretoise pour disjoncteur à châssis Y : S48901

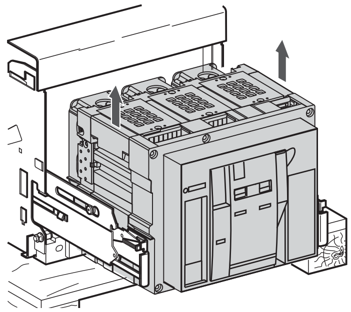
Figure 14 – Levage du disjoncteur débrochable



Levage du berceau ou du disjoncteur fixe

REMARQUE : Si le disjoncteur est installé dans le berceau, retirer le disjoncteur du berceau avant de soulever le berceau. Pour retirer le disjoncteur, voir la page 46.

Figure 15 – Retrait du disjoncteur du berceau



Soulever à l'aide de brides de levage situés sur le côté du berceau ou du disjoncteur, de barres à travers les connecteurs, de crochets de levage et d’une entretoise.

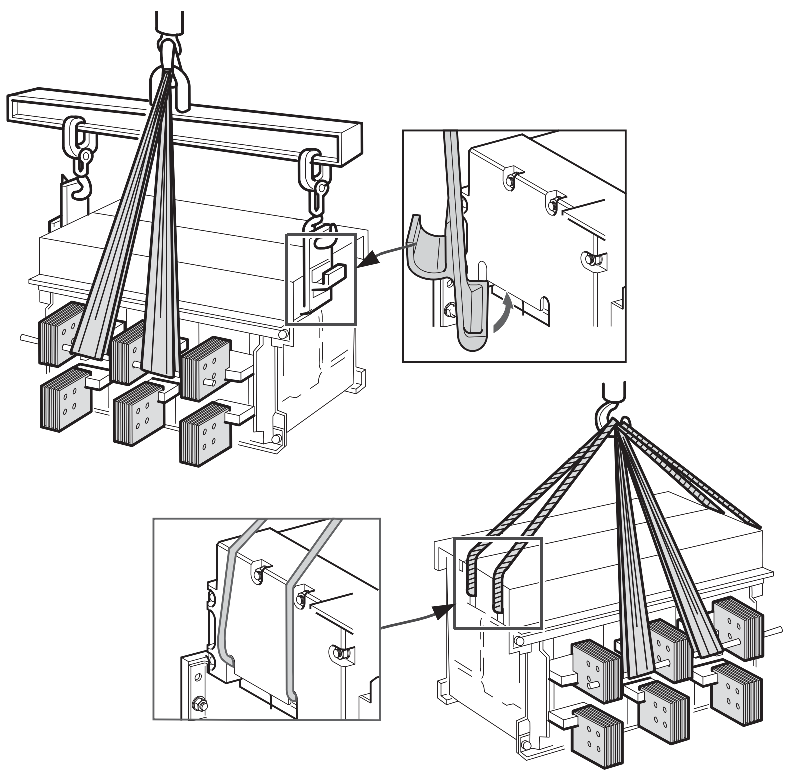
Kit de crochet de levage : S48906

Kit d’entretoise pour disjoncteur à châssis W : S48900

Kit d’entretoise pour disjoncteur à châssis Y : S48901

REMARQUE : Les connecteurs doivent être soutenus lorsqu'on soulève le berceau ou le disjoncteur fixe.

Figure 16 – Levage du berceau ou du disjoncteur fixe



FRANÇAIS

Section 3—Installation du disjoncteur débrochable

L’appareil est normalement expédié avec les berceaux installés et les disjoncteurs sont expédiés séparément.

Pour les appareils expédiés sans berceaux, installer les berceaux comme décrit ci-dessous.

Pour les appareils expédiés avec le berceau installé, voir la page 38 pour l’installation du disjoncteur.

REMARQUE : Lorsque les berceaux sont expédiés séparément de l'appareil :

- les disjoncteurs de largeur standard de 800 à 3000 A et de 3200 A peuvent être expédiés installés dans les berceaux,
- les disjoncteurs 3 200 A L1 et 4 000 à 6 000 A, de construction large, doivent être expédiés séparément.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLATS D'ARC

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E ou CSA Z462.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez toutes les alimentations à cet appareil avant d’y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

FRANÇAIS

Installation du berceau

Installation des accessoires

Installer les accessoires du berceau requis non installés à l'usine.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLATS D'ARC

Ne posez pas d’outils ou autres matériaux sur le dessus du berceau.

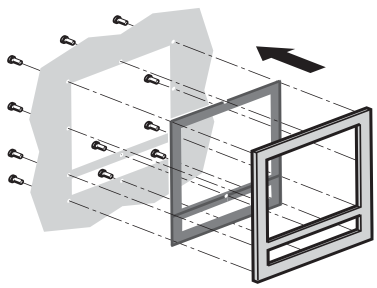
Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Installation du cache-entrée de porte

Si l’appareil comporte un découpage de porte, installer le cache-entrée de porte expédié avec le berceau.

1. Si elle n’existe pas déjà, découper une ouverture dans la porte de l’appareil et percer des trous autour de l’ouverture pour le cache-entrée de porte. Pour les dimensions d’ouverture et l’espacement des trous, se reporter aux directives d'utilisation 0613IB1205 sur notre site Web (pour plus d'informations sur le site Web, voir la page 7).
2. Installer le cache-entrée de porte.

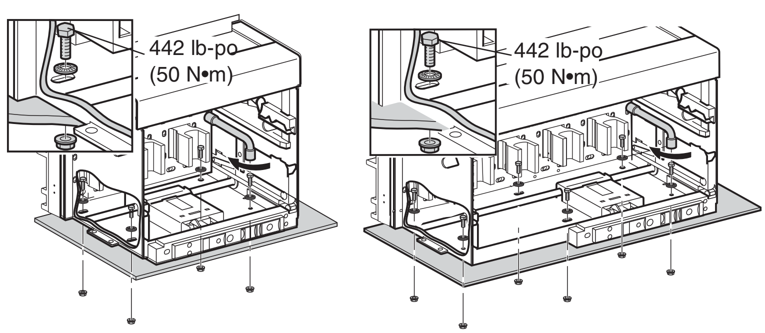
Figure 17 – Installation du cache-entrée de porte



Fixation du berceau

1. Couper l'alimentation de l'appareil avant d'y travailler.
2. Si les trous de montage n'existent pas déjà, les percer dans la cuve pour monter le berceau. Pour la configuration des trous de montage du berceau, se reporter aux directives d'utilisation 0613IB1205 sur notre site Web (pour plus d'informations sur le site Web, voir la page 7).
3. Vérifier si la surface de montage est bien plate. La surface doit être plate avec une tolérance de 2 mm (0,08 po).
4. Fixer le berceau à la cuve, à l’aide de boulons de 3/8 po (9,5 mm), de rondelles et d’écrous.

Figure 18 – Fixer le berceau



Exigences d’espace

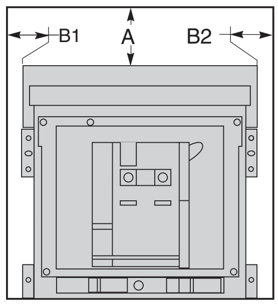
⚠ DANGER

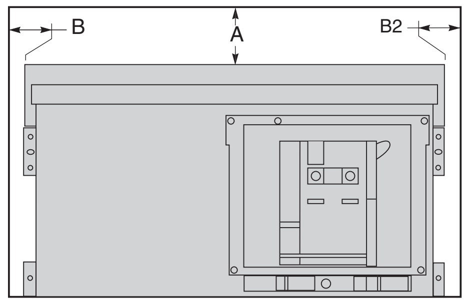
RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLATS D'ARC

Les exigences d’espace doivent être respectées pour obtenir un bon fonctionnement de l’appareil.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Tableau 5 – Exigences d’espace





Espace minimal	Inscrits UL 1066 (ANSI C37.50)				Inscrit UL 489			
	A		B1 + B2		A		B1 + B2	
	po	mm	po	mm	po	mm	po	mm
Pièces isolées	0	0	0	0	0	0	0	0
Pièces métalliques	0	0	2,36	60	0	0	4,36	111

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Installation des connecteurs

Les connecteurs standard sont indiqués dans le tableau 6. Fixer les connecteurs et serrer les boulons au couple de 16 à 18 N•m (142 à 159 lb-po). Pour des renseignements au sujet des connecteurs non standards, contacter le service à la clientèle.

Pour les dimensions des connecteurs, se reporter aux directives d'utilisation 0613IB1205 sur notre site Web (pour plus d'informations sur le site Web, voir la page 7).

Tableau 6 – Connecteurs standard

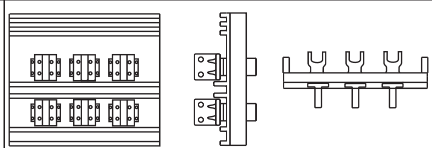
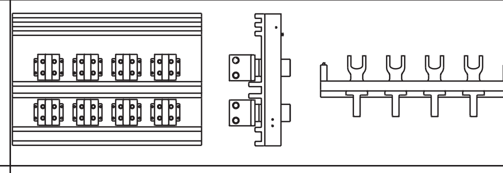
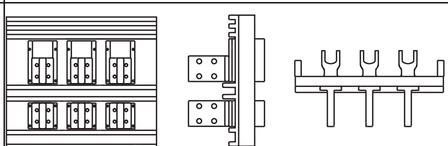
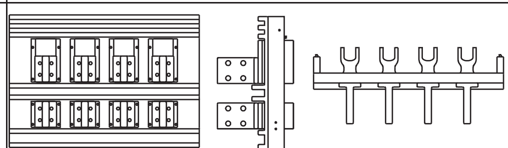
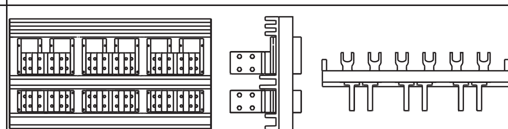
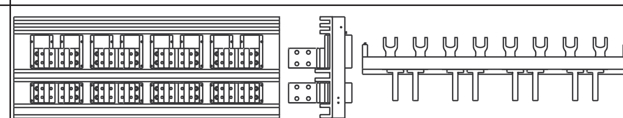
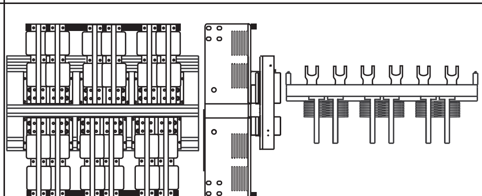
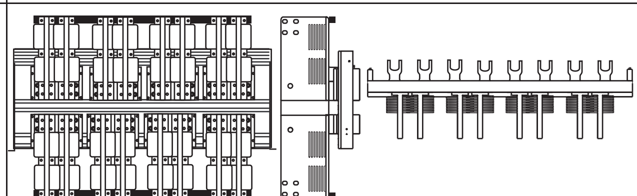
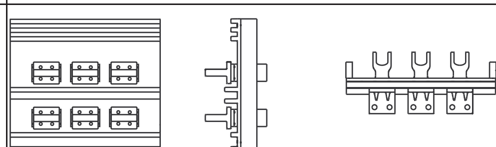
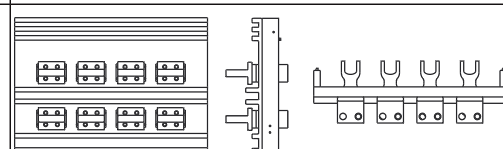
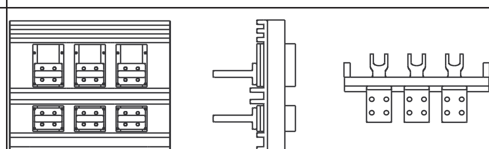
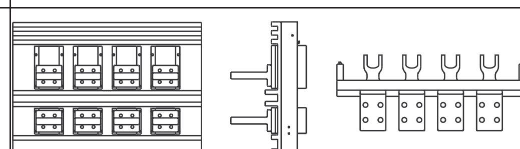
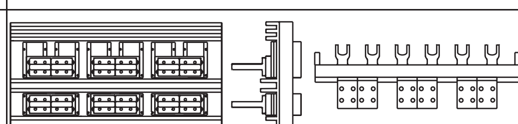
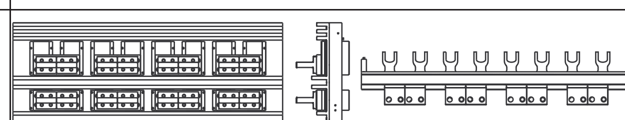
Type	Val. nom.	Agencement à 3 pôles Avant – côté – dessus	Agencement à 4 pôles Avant – côté – dessus
Vertical en T à connexion par l'arrière (RCTV)	800 A à 2000 A		
	2500 A à 3000 A		
	4000 A à 5000 A		
	6000 A		
Horizontal en T avec connexion par l'arrière (RCTH)	800 A à 2000 A		
	2500 A à 3000 A		
	3200 A L1 4000 A à 5000 A		

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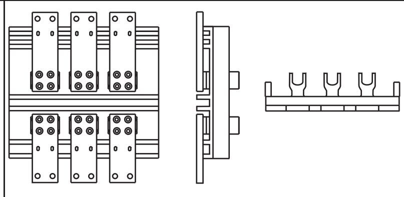
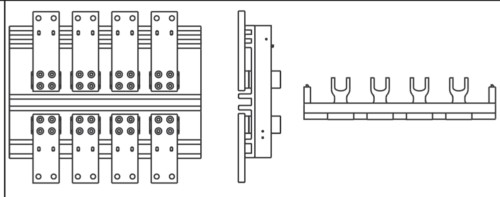
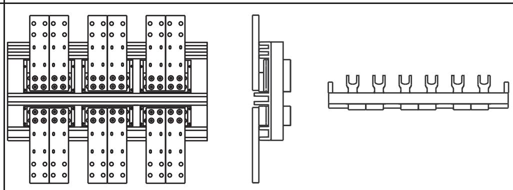
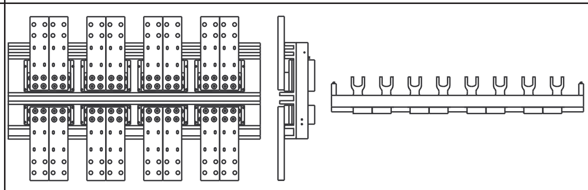
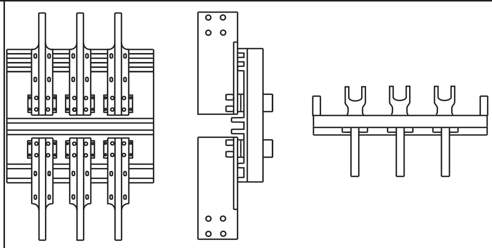
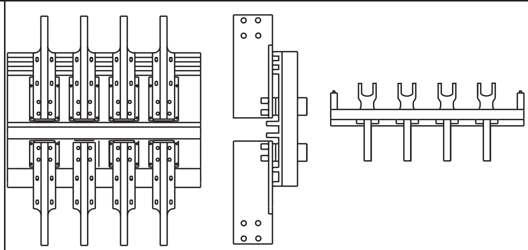
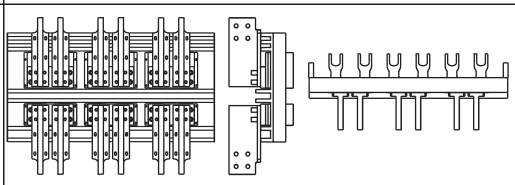
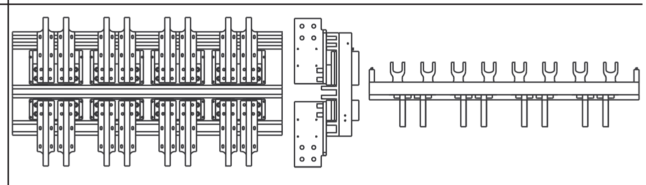
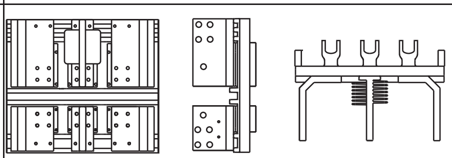
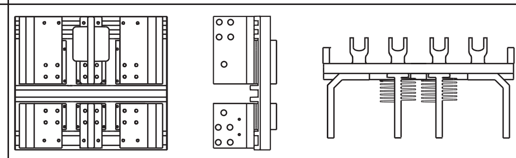
Tableau 6 – Connecteurs standard *(suite)*

Type	Val. nom.	Agencement à 3 pôles Avant – côté – dessus	Agencement à 4 pôles Avant – côté – dessus
Plat à connexion par l'avant (FCF)	800 A à 2000 A		
	3200 A L1 4000 A		
En T avec connexion par l'avant (FCF)	800 A à 3000 A		
	3200 A L1 4000 A à 5000 A		
Vertical décalé avec connexion par l'arrière (RCOV)	3200 A 2000 A L1/L1F		

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Installation du système de transmission par bus

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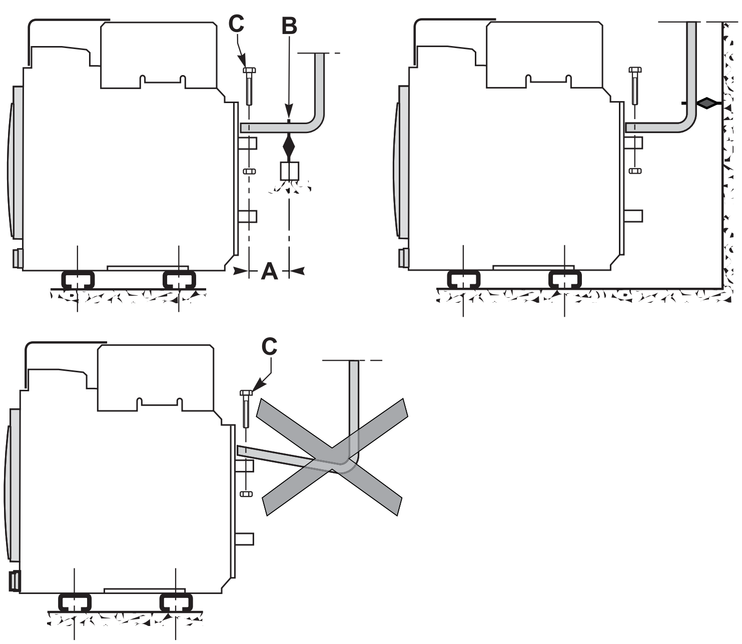
Les supports de barres-bus doivent être placés pour supporter le poids du système de transmission par bus et pour résister aux forces magnétiques causées par les courants de courts-circuits. Voir la **figure 19, A**. **Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.**

REMARQUE : L'installateur est responsable du câblage des barres-bus vers les connecteurs.

- Les supports de barre-bus doivent être renforcés (**figure 19, B**) afin d'éviter que la force des courts-circuits n'entraîne une déviation des connecteurs.Les supports de barres-bus (**A**) doivent être placés pour supporter le poids du système de transmission par bus et pour résister aux forces magnétiques causées par les courants de courts-circuits.
- Les barres-bus doivent être réglées pour assurer que les points de connexion sont correctement positionnés avant d'insérer les boulons (**C**). Les barres-bus doivent être supportées par l'ossature de l'appareillage de commutation, sans aucun poids sur les connecteurs.

Les exigences des barres-bus du disjoncteur et des connecteurs sont indiquées au tableau 7.

Figure 19 – Connexions des barres-bus



REMARQUE : L'installateur est responsable du câblage des barres-bus vers les connecteurs. Les barres-bus doivent être supportées par l'ossature de l'appareillage de commutation, sans aucun poids sur les connecteurs. Les supports de barre-bus doivent être renforcés afin d'éviter que la force des courts-circuits n'entraîne une déviation des connecteurs.

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Tableau 7 – Taille de barre-bus requise

Disjoncteur		Conforme à	Connecteurs	Barre-bus par connecteur	
Val. nom.	**Type**			**Numéro**	**Taille**
800 A, 1200 A	N/N1/H/H1/H2/H3/ L/LF/L1/L1F	ANSI C37.50 UL 489	RCTH, RCTV, FCF, FCT	1	6 x 76 mm (0,25 x 3 po)
1600 A	N/N1/H/H1/H2/H3/ L/LF/L1/L1F	ANSI C37.50 UL 489	RCTH, RCTV, FCF, FCT	2	6 x 76 mm (0,25 x 3 po)
2000 A	N/N1/H/H1/H2/H3/ L/LF	ANSI 37.50 UL 489	RCTH	3	6 x 76 mm (0,25 x 3 po)
			RCTV, FCT	2	6 x 102 mm (0,25 x 4 po)
			FCF	3	6 x 76 mm (0,25 x 3 po)
	L1/L1F	ANSI 37.50	RCOV	2	6 x 102 mm (0,25 x 4 po)
2500 A	H/L	UL 489	RCTH	5	6 x 76 mm (0,25 x 3 po)
			RCTV, FCT	2	6 x 127 mm (0,25 x 5 po)
3000 A	H/L	UL 489	RCTH	8	6 x 76 mm (0,25 x 3 po)
	H/L		RCTV, FCT	4	6 x 102 mm (0,25 x 4 po)
3200 A	H1/H2/H3	ANSI 37.50	RCOV	3	6 x 127 mm (0,25 x 5 po)
	L1		RCTH, FCF	3	6 x 152 mm (0,25 x 6 po)
	L1		RCTV,FCT	3	6 x 127 mm (0,25 x 5 po)
4000 A	H/H2/H3/L/L1	ANSI 37.50 UL 489	RCTH	4	6 x 152 mm (0,25 x 6 po)
			RCTV, FCT	4	6 x 127 mm (0,25 x 5 po)
		ANSI 37.50	FCF	4	6 x 152 mm (0,25 x 6 po)
		UL 489	FCF	5	6 x 152 mm (0,25 x 6 po)
5000 A	H/H2/H3/L/L1	ANSI 37.50 UL 489	RCTH	8	6 x 152 mm (0,25 x 6 po)
			RCTV, FCT	6	6 x 127 mm (0,25 x 5 po)
6000 A	H/L	UL 489	RCTV	6	6 x 152 mm (0,25 x 6 po)

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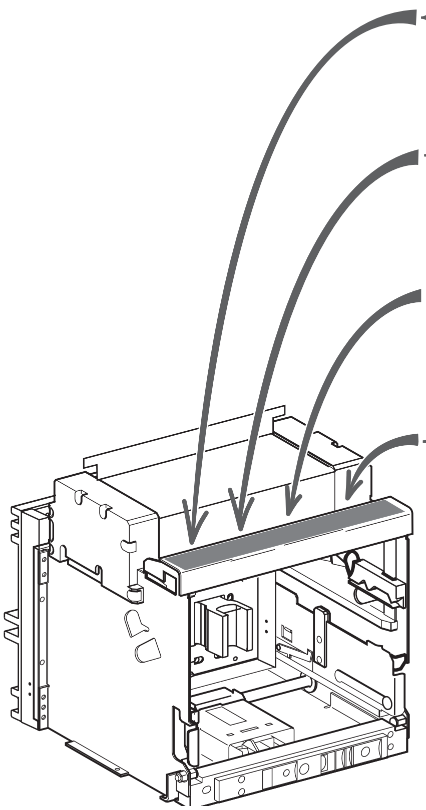
Connexions des accessoires utilisant des connecteurs-poussoirs

Figure 20 – Disposition des bornes pour l’installation des connecteurs-poussoirs



CD3	CD2	CD1
834	824	814
832	822	812
831	821	811

or

CE6	CE5	CE4
364	354	344
362	352	342
361	351	341

Com		UC1		UC2		UC3	UC4	M2C/M6C	SDE2/RES	SDE1	CE3	CE2	CE1
E5	E6	Z5	M1	M2	M3	F2 +	V3	484/Q3	184/K2	84	334	324	314
E3	E4	Z3	Z4	T3	T4	VN	V2	474/Q2	182	82	332	322	312
E1	E2	Z1	Z2	T1	T2	F1 -	V1	471/Q1	181/K1	81	331	321	311

MN/MX2	MX1	XF	PF	MCH
D2/C12	C2	A2	254	B2
/C13	C3	A3	252	B3
D1/C11	C1	A1	251	B1

OF24	OF23	OF22	OF21	OF14	OF13	OF12	OF11	OF4	OF3	OF2	OF1	CT3	CT2	CT1
244	234	224	214	144	134	124	114	44	34	24	14	934	924	914
242	232	222	212	142	132	122	112	42	32	22	12	932	922	912
241	231	221	211	141	131	121	111	41	31	21	11	931	921	911

or

EF24	EF23	EF22	EF21	EF14	EF13	EF12	EF11
248	238	228	218	148	138	128	118
246	236	226	216	146	136	126	116
245	235	225	215	145	135	125	115

or

CE9	CE8	CE7
394	384	374
392	382	372
391	381	371

or

CD6	CD5	CD4
864	854	844
862	852	842
861	851	841

Fonction	Connecteur	Description
Contacts auxiliaires	OF[1]	Contacts de position ouvert/fermé du disjoncteur ou d'interrupteur
	EF	Contact combiné connecté et fermé
Contacts du berceau	CD	Contacts de position déconnectée
	CE	Contacts de position connectée
	TC	Contacts de position d'essai
Fonction-nement à distance	SDE	Contact d'alarme de défaut électrique
	RES	Réarmement à distance
	MN	Déclencheur sur baisse de tension
	MX[2]	Déclencheur shunt
	XF[2]	Fermeture en shunt
	PF	Contact prêt à fermer
	MCH	Moteur d'armement de ressort

[1] Les contacts OF1, OF2, OF3 et OF4 sont standard.
[2]Lorsque des bobines de communication MX1 ou XF sont utilisées, la borne (C3 ou A3) doit être connectée à la ligne même si le module de communication n'est pas installé. Le circuit de contournement par la borne C2/A2 n'est destiné qu'à un service momentané (0,5 s.). Pour service continu, utiliser la commande de communication.

Type de déclencheur					
De base	A	P	H	Connecteur	Description
–	•	•	•	Com : E1–E6	Communication
–	•	•	•	UC1 : Z	Interverrouillage sélectif de zone Z1 = signal de sortie ZSI Z2 = sortie ZSI Z3 = signal d'entrée ZSI Z4 = court retard d'entrée ISZ Z5 = défaut à la terre d'entrée ZSI
–	•	•	•	UC1 : M1	Défaut à la terre différentiel modifié (MDGF)
–	•	•	•	UC2 : T	Neutre externe
–	•	•	•	UC2 : M	Défaut à la terre différentiel modifié (MDGF)
–	•	•	•	UC3 : F	Alimentation externe 24 Vcc
–	–	•	•	UC3 : Vn	Prise neutre externe
–	–	•	•	UC4	Détection de tension de phase externe
–	–	•	•	M2C/M6C	Deux contacts programmables (relais interne) ou six contacts programmables (pour le raccordement au module M6C externe)

Connexions des accessoires utilisant des connecteurs de bornes à anneau

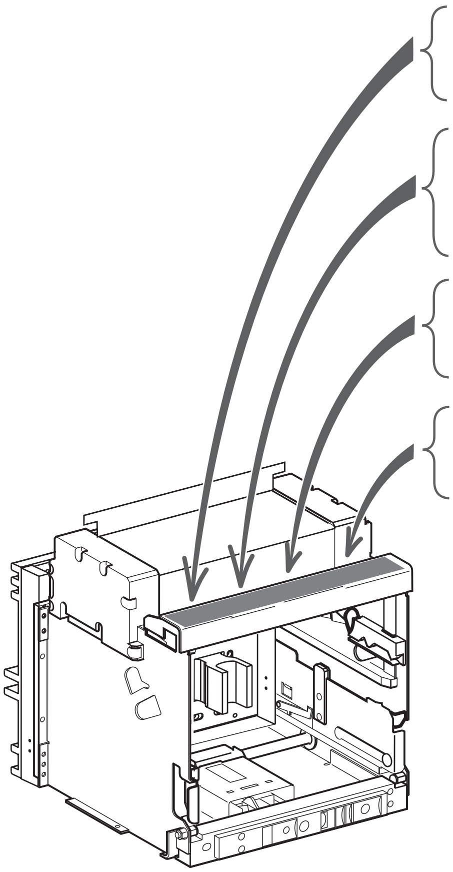
Figure 21 – Disposition des bornes pour l'installation des connecteurs de bornes à anneau

CD3	CD2	CD1
834/832	824/822	814/812
831	821	811

Com		UC1		UC2		UC3	UC3a	M2C/M6C	M2Ca/M6Ca	SDE2/RES	SDE2a	SDE1	SDE1a
E5	E6	Z5	M1	M2	M3	F2	VN	484/Q3	474/Q2	184/K2	182	84	82
E3	E4	Z3	Z4	T3	T4	F1		471/Q1		181/K1		81	
E1	E2	Z1	Z2	T1	T2								

MN	MX1	MX1a	XF	XFa
D2	C2	C3	A2	A3
D1	C1		A1	

PF	CT1	MCH	MCHa	OF14	OF13	OF12	OF11	OF4	OF3	OF2	OF1	CE3	CE2	CE1
252	914/912	B2	B3	144	134	122	112	44	34	22	12	334/332	324/322	314/31
251	911	B1		141	131	121	111	41	31	21	11	331	321	311



Fonction	Connecteur	Description
Contacts auxiliaires	OF[1]	Contacts de position ouvert/fermé du disjoncteur ou d'interrupteur
	EF	Contact combiné connecté et fermé
Contacts du berceau	CD	Contacts de position déconnectée
	CE	Contacts de position connectée
	TC	Contacts de position d'essai
Fonction-nement à distance	SDE	Contact d'alarme de défaut électrique
	RES	Réarmement à distance
	MN	Déclencheur sur baisse de tension
	MX[2]	Déclencheur shunt
	XF[2]	Fermeture en shunt
	PF	Contact prêt à fermer
	MCH	Moteur d'armement de ressort

[1] Les contacts OF1, OF2, OF3 et OF4 sont standard.
[2] Lorsque des bobines de communication MX1 ou XF sont utilisées, la borne (C3 ou A3) doit être connectée à la ligne même si le module de communication n'est pas installé. Le circuit de contournement par la borne C2/A2 n'est destiné qu'à un service momentané (0,5 s.). Pour service continu, utiliser la commande de communication.

Type de déclencheur					
De base	A	P	H	Connecteur	Description
–	•	•	•	Com : E1–E6	Communication
–	•	•	•	UC1 : Z	Interverrouillage sélectif de zone Z1 = signal de sortie ZSI Z2 = sortie ZSI Z3 = signal d'entrée ZSI Z4 = court retard d'entrée ISZ Z5 = défaut à la terre d'entrée ZSI
–	•	•	•	UC1 : M1	Défaut à la terre différentiel modifié (MDGF)
–	•	•	•	UC2 : T	Neutre externe
–	•	•	•	UC2 : M	Défaut à la terre différentiel modifié (MDGF)
–	•	•	•	UC3 : F	Alimentation externe 24 Vcc
–	–	•	•	UC3 : Vn	Prise neutre externe
–	–	•	•	UC4	Détection de tension de phase externe
–	–	•	•	M2C/M6C	Deux contacts programmables (relais interne) ou six contacts programmables (pour le raccordement au module M6C externe)

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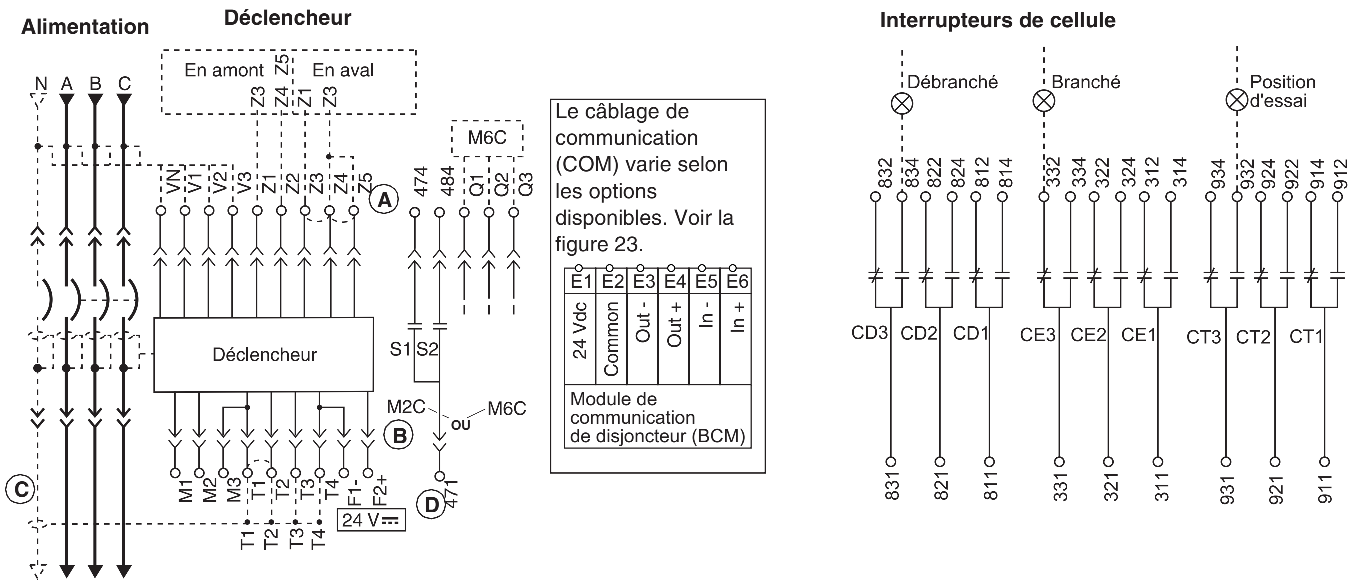
Schémas de câblage pour les connexions auxiliaires

REMARQUE : Tous les schémas indiquent un disjoncteur ouvert, connecté et armé.

Figure 22 – Schémas de câblage pour les connexions auxiliaires



A—Ne pas retirer les cavaliers installés à l'usine entre Z3, Z4 et Z5 sauf si ZSI est raccordée.
B—Ne pas retirer le cavalier installé à l'usine entre T1 et T2 sauf si le TC de neutre est raccordé. Ne pas installer un cavalier entre T3 et T4.
C—Pour obtenir un câblage approprié du TC de neutre, se reporter aux schémas de câblage, pages 33 et 34.
D—L'alimentation 24 Vcc du déclencheur doit être séparée et isolée de l'alimentation 24 Vcc des modules de communication.

Marques pour les bornes de type à pousser

Interrupteurs de cellule		
CD3	CD2	CD1
834	824	814
832	822	812
831	821	811

Déclencheur							
COM	UC1	UC2	UC3	UC4	M2C/M6C	SDE2/Res.	SDE1
E5 E6	Z5 M1	M2 M3	F2+	V3	484/Q3	184/K2	84
E3 E4	Z3 Z4	T3 T4	VN	V2	474/Q2	182	82
E1 E2	Z1 Z2	T1 T2	F1–	V1	471/Q1	181/K1	81

Interrupteurs de cellule		
CE3	CE2	CE1
334	324	314
332	322	312
331	321	311

ou

CE6	CE5	CE4
364	354	344
362	352	342
361	351	341

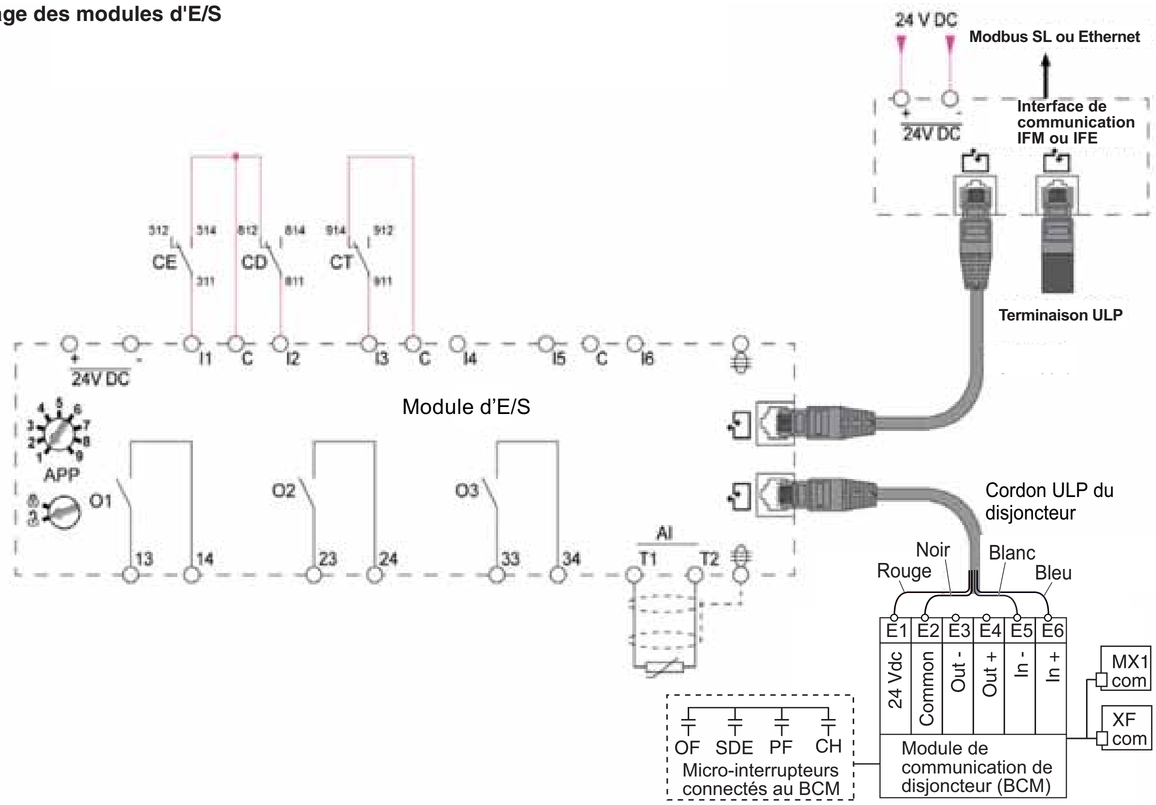
Marques pour les bornes de type à anneau

Interrupteurs de cellule		
CD3	CD2	CD1
834/832	824/822	814/812
831	821	811

Déclencheur										
COM	UC1	UC2	UC3	UC3a	M2C/M6C	M2Ca/M6Ca	SDE2/Res.	SDE2a	SDE1	SDE1a
E5 E6	Z5 M1	M2 M3	F2	VN	484/Q3	474/Q2	184/K2	182	84	82
E3 E4	Z3 Z4	T3 T4	F1		471/Q1		181/K1		81	
E1 E2	Z1 Z2	T1 T2								

Figure 23 – Schémas de câblage pour l'option de COM

Câblage des modules d'E/S



Câblage de l'option de COM (Modules Modbus BCM ULP et CCM)

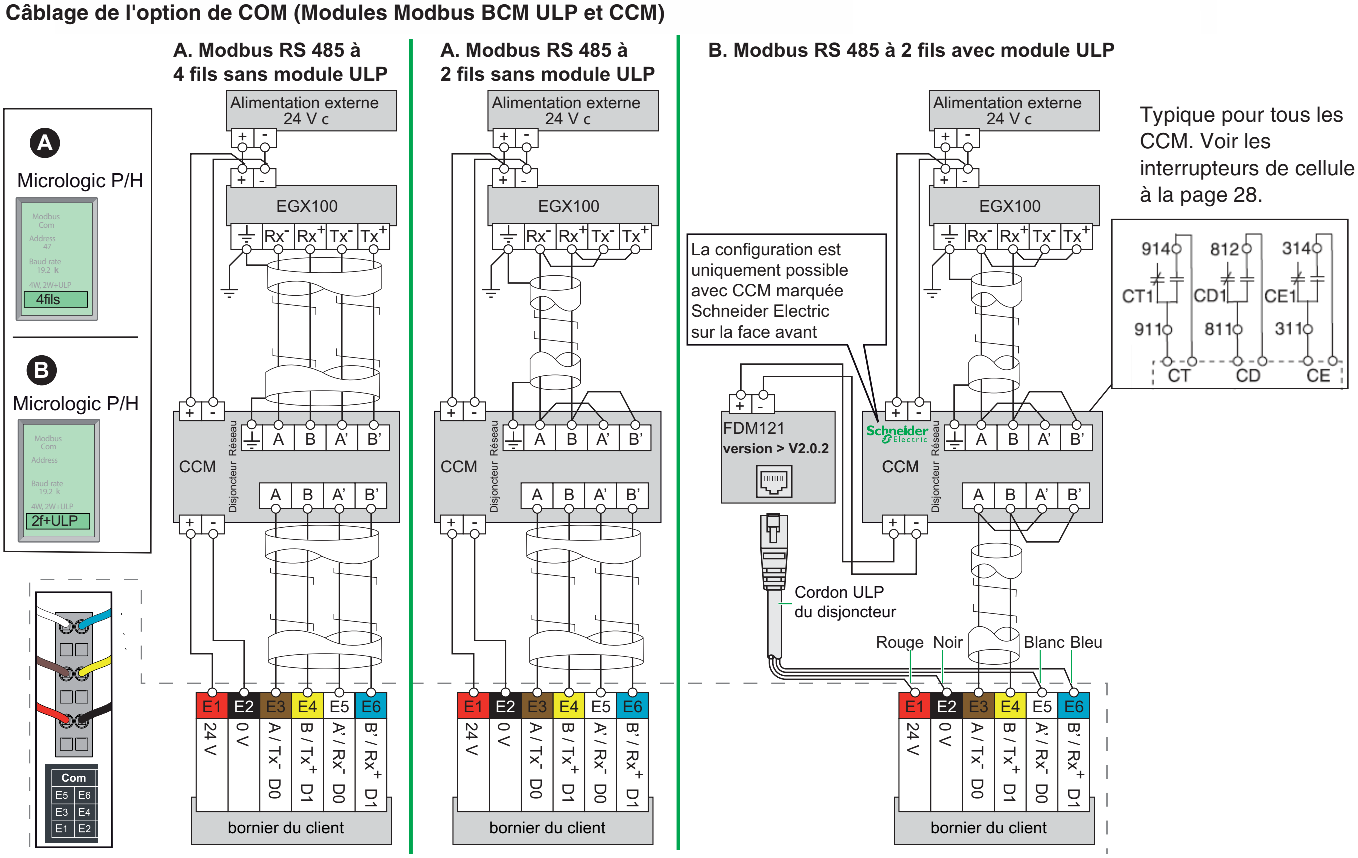


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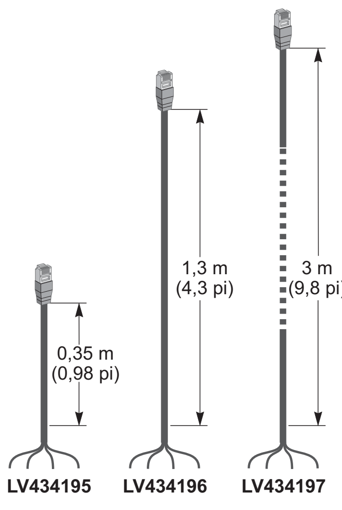
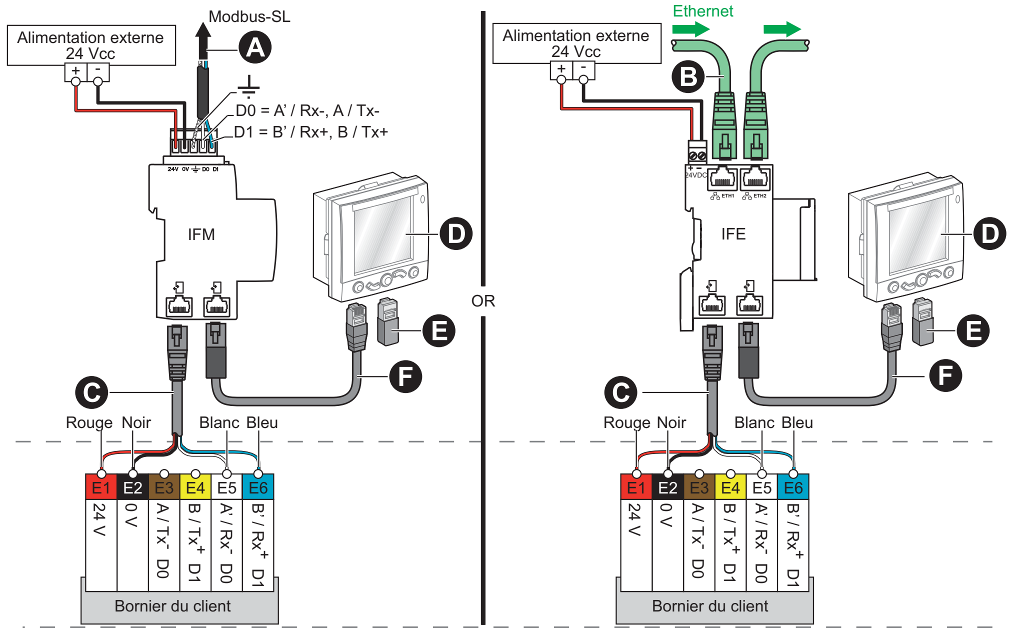
Figure 24 – Composants des communications et raccordements du FDM121





A. Réseau Modbus
B. Réseau Ethernet
C. Cordon ULP du disjoncteur
D. Afficheur de tableau (FDM)
E. Terminaison ULP
F. Câble ULP

Raccordements

Le disjoncteur Masterpact est raccordé aux dispositifs ULP (afficheur FDM121, unité IFM, IFE ou IO) au moyen du cordon ULP pour disjoncteur.

- Le cordon est disponible en trois longueurs : 0,35 m (0,98 pi), 1,3 m (4,3 pi) et 3 m (9,8 pi).
- Des longueurs jusqu'à 10 m (32,9 pi) sont possibles à l'aide de prolongateurs.

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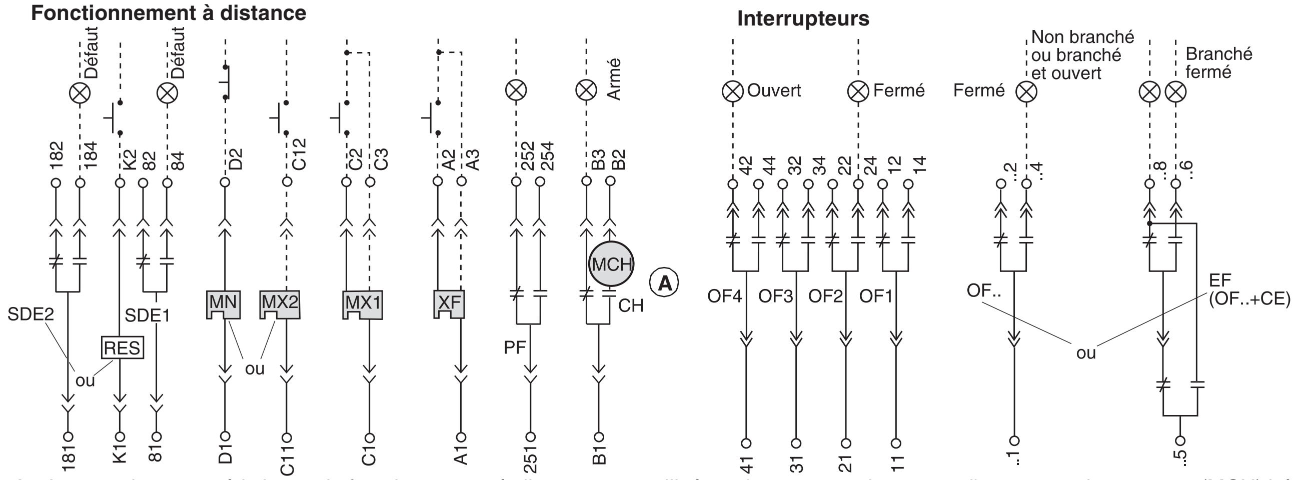
REMARQUE : Tous les schémas indiquent un disjoncteur ouvert, connecté et armé.

Figure 25 – Schémas de câblage pour les connexions auxiliaires



A—Lorsque les caractéristiques de fonctionnement à distance sont utilisées, s'assurer que le moteur d'armement des ressorts (MCH) bénéficie d'un minimum de quatre secondes pour tendre complètement les ressorts de fermeture du disjoncteur avant d'actionner la bobine de fermeture en shunt (XF).

Marques pour les bornes de type à pousser

Fonctionnement à distance					Interrupteurs auxiliaires												Interrup.de cellule		
MN/MX2	MX1	XF	PF	MCH	OF24	OF23	OF22	OF21	OF14	OF13	OF12	OF11	OF4	OF3	OF2	OF1	CT3	CT2	CT1
D2/C12	C2	A2	254	B2	244	234	224	214	144	134	124	114	44	34	24	14	934	924	914
C13	C3	A3	252	B3	242	232	222	212	142	132	122	112	42	32	22	12	932	922	912
D1/C11	C1	A1	251	B1	241	231	221	211	141	131	121	111	41	31	21	11	931	921	911

ou (OF24–OF21) / ou (OF14–OF11)

EF24	EF23	EF22	EF21	EF14	EF13	EF12	EF11
248	238	228	218	148	138	128	118
246	236	226	216	146	136	126	116
245	235	225	215	145	135	125	115

ou (CT3–CT1)

CD6	CD5	CD4
864	854	844
862	852	842
861	851	841

ou

CE9	CE8	C7
394	384	374
392	382	372
391	381	371

Marques pour les bornes de type à anneau

Fonctionnement à distance									Interrupteurs auxiliaires								Interrup. de cellule		
MN	MX1	MX1a	XF	XFa	PF	CT1	MCH	MCHa	OF14	OF13	OF12	OF11	OF4	OF3	OF2	OF1	CE3	CE2	CE1
D2	C2	C3	A2	A3	252	914/912	B2	B3	144	134	122	112	44	34	22	12	334/332	324/322	314/312
D1	C1		A1		251	911	B1		141	131	121	111	41	31	21	11	331	321	311

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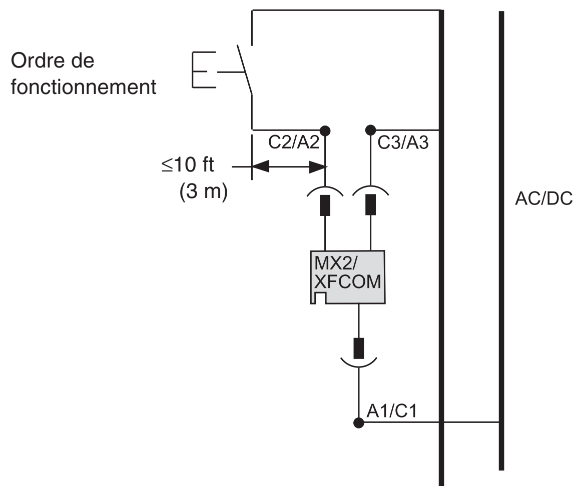
Déclencheur shunt (MX) et fermeture en shunt (XF) avec communication

Un schéma de câblage recommandé pour les bobines de déclencheur shunt ou de la fermeture en shunt avec communication est indiqué à la figure 26. Les tensions induites dans le circuit à la borne C2 et/ou à la borne A2 peuvent entraîner un mauvais fonctionnement du déclencheur shunt ou de la fermeture en shunt. La meilleure façon d'empêcher les tensions induites est de maintenir le circuit aux bornes C2 et A2 aussi court que possible. S'il est impossible de maintenir le circuit en dessous de 3 m (10 pi), utiliser un relais d'interposition près de la borne C2 ou A2.

Figure 26 – Schéma de câblage avec communication



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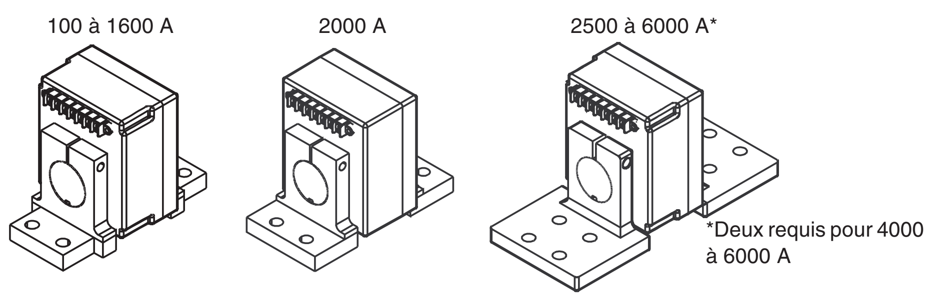
Protection d'appareils contre les défauts de mise à la terre

Si le disjoncteur ne possède pas un déclenchement ou une alarme intégrée sur défaut à la terre, sauter cette sous-section.

Un circuit triphasé à quatre fils nécessite l’emploi d’un transformateur de courant (TC) de neutre externe.

Figure 27 – Transformateurs de courant du neutre



Brancher le TC du neutre au disjoncteur selon les schémas de câblage.

1. Connecter le primaire :
   — si la charge est connectée à la partie inférieure du disjoncteur, connecter le neutre de la charge à la borne H1 du TC du neutre.
   — si l'alimentation est connectée à la partie inférieure du disjoncteur, connecter le neutre de l'alimentation à la borne H1 du TC du neutre.

REMARQUE : La connexion de mise à la terre de l'appareil doit être en amont (côté ligne) du TC du neutre et une connexion au neutre doit exister entre le transformateur d’alimentation et les appareils.

Pour les disjoncteurs utilisant les déclencheurs Micrologic^MC 5.0P, 5.0H, 6.0P ou 6.0HP, connecter la borne Vn sur le transformateur de courant du neutre à la borne Vn de la borne du câblage de contrôle. (Cela est nécessaire pour permettre au déclencheur d'effectuer les mesures de tension.) Les bornes Vc et Vn sont raccordées intérieurement.

AVIS

RISQUE DE MAUVAIS FONCTIONNEMENT DU SYSTÈME DE DÉCLENCHEMENT

F1 et F2 doivent être isolées de la terre. Vérifiez tout le câblage en suivant les directives de ce bulletin.

Si ces directives ne sont pas respectées, cela peut entraîner un déclenchement intempestif pendant la fermeture.

2. Retirer le cavalier installé à l'usine reliant T1 et T2.
3. Faire passer le câble Belden® et le conduit en plastique du TC du neutre aux bornes du berceau.
4. Raccorder le câble selon le schéma approprié dans la figure 28 ou 29.
5. Vérifier tout le câblage.

REMARQUE : Les circuits différentiels modifiés de défaut à la terre et les circuits de défaut à la terre par retour à la source de terre exigent l'utilisation d'un module différentiel modifié de défaut à la terre (MDFG) et des transformateurs de courant spéciaux. Au sujet du câblage des systèmes ci-dessus, voir les directives qui accompagnent le MDFG.

Figure 28 – Schéma de câblage de disjoncteurs Masterpact NW de 800 à 4000 A, de largeur standard

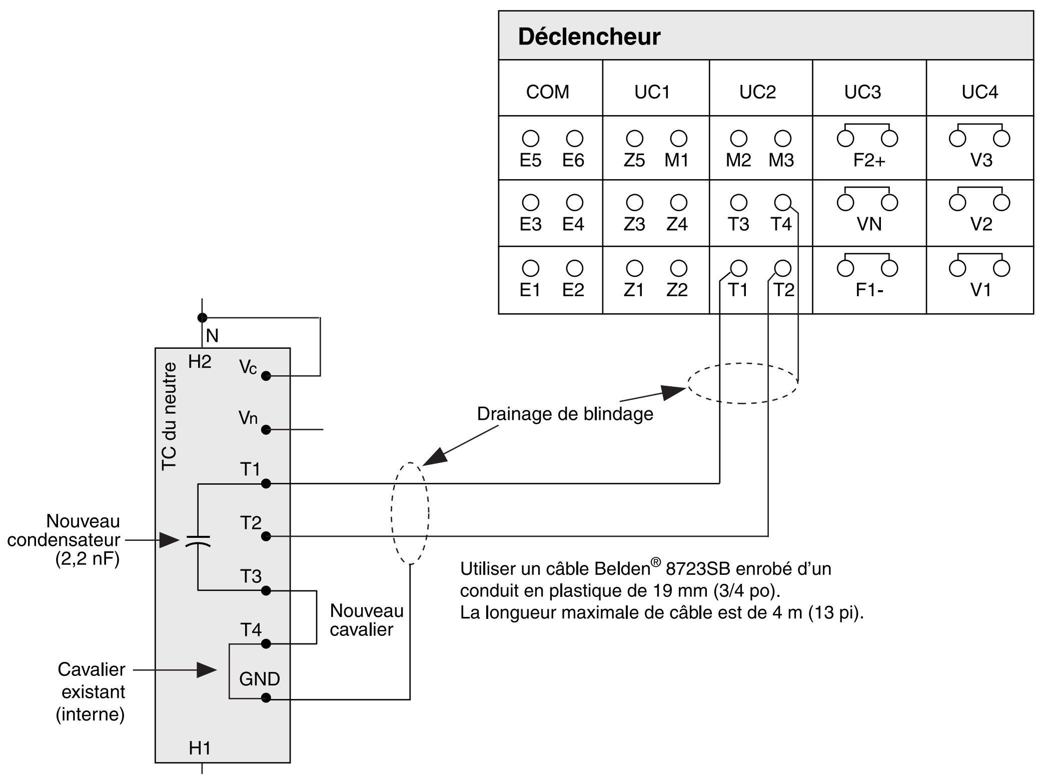


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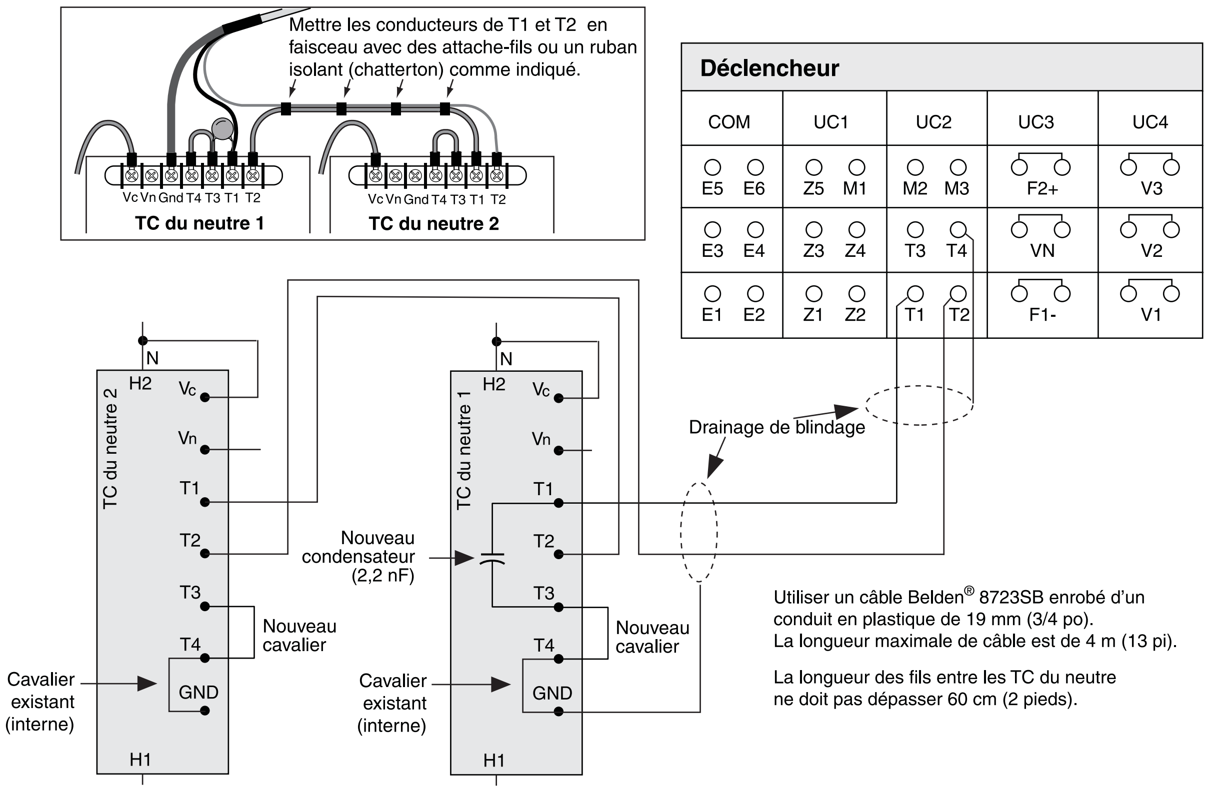
Figure 29 – Schéma de câblage de disjoncteurs Masterpact NW de 3200 à 6000 A, construction large

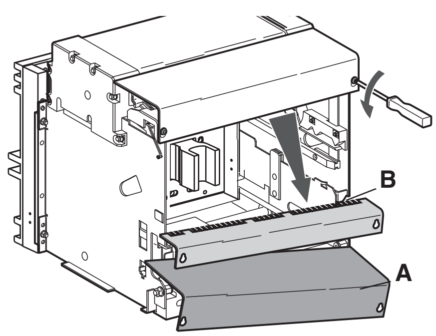


Câblage d'accessoires—Connecteurs-poussoirs

REMARQUE : Placer le berceau en position d'essai pour installer ou enlever les connecteurs-poussoirs. Placer en position d'essai comme décrit à la page 70.

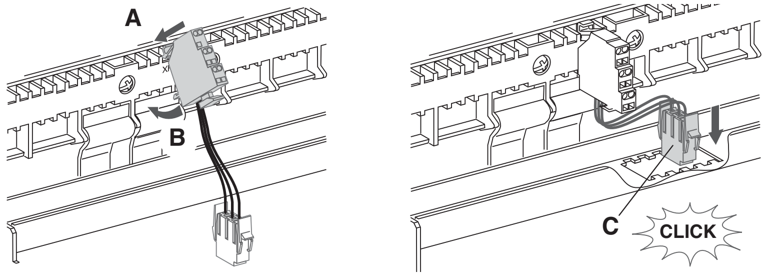
1. Enlever le couvercle de bornes (**figure 30, A**) optionnel, s'il est installé et le couvercle du câblage (**B**).

Figure 30 – Retrait des couvercles



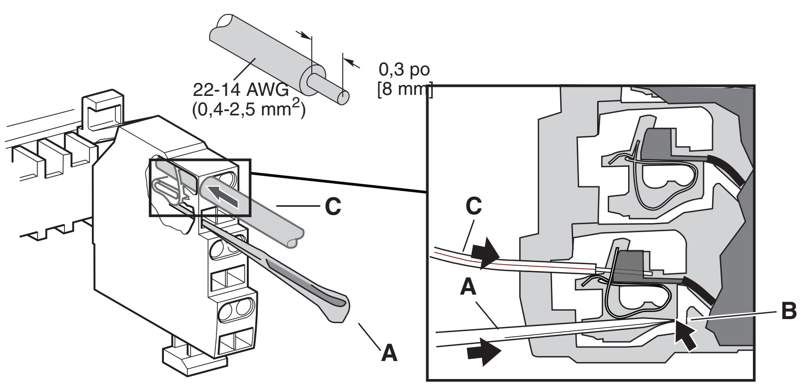
2. Installer le connecteur-poussoir dans la fente correcte (**figure 31, A**). (Se reporter à l'étiquette sur le berceau pour les informations sur le positionnement standard.) Faire tourner le connecteur-poussoir vers le bas (**B**) pour le mettre en place.
3. Installer le connecteur du câblage (**C**). (Les positions du connecteur sont indiquées à l'avant du support du connecteur.)

Figure 31 – Installation du connecteur poussoir



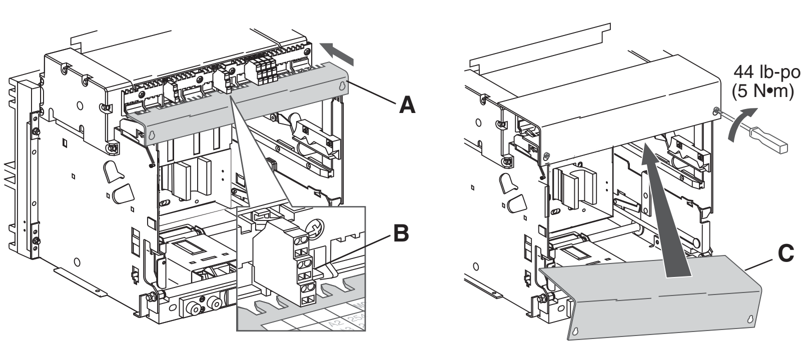
4. Introduire l'outil d'insertion de fils Wago® (**figure 32, A**, n° de pièce Wago 209-129) complètement dans le connecteur (jusqu'au point **B**) et installer les fils de contrôle (**C**).

Figure 32 – Installation des fils de contrôle



5. Remettre en place le couvercle du câblage (**figure 33, A**), en glissant la partie supérieure sous les connecteurs-poussoirs installés (**B**).
6. Remettre en place le couvercle de bornes (**C**) optionnel, s'il est installé.

Figure 33 – Remise en place des couvercles



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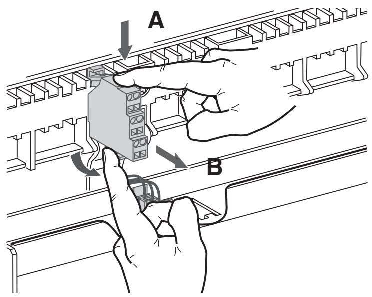
REMARQUE : Enlever le connecteur-poussoir dans l’ordre inverse de l’installation.

Retirer le connecteur en appuyant sur sa partie supérieure (**figure 34, A**) tout en poussant la partie inférieure (**B**) vers le haut et l'extérieur pour pivoter le connecteur hors du verrou.

Figure 34 – Retrait du connecteur-poussoir

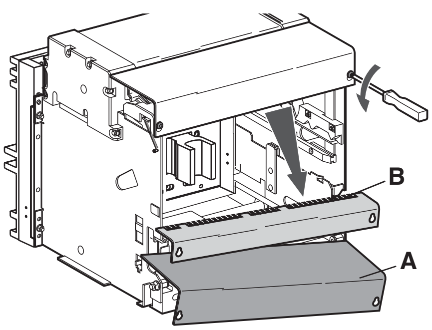


Câblage d’accessoires—Connecteur de borne à anneau

REMARQUE : Placer le berceau en position d’essai pour installer ou enlever les connecteurs de borne à anneau. Placer en position d’essai comme précisé à la page 70, Déconnexion du disjoncteur débrochable.

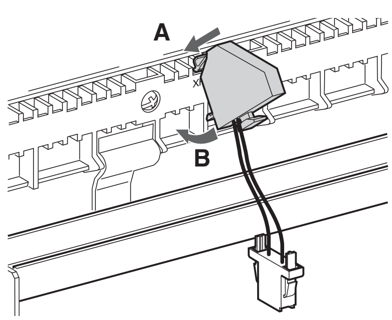
1. Enlever le couvercle de bornes (**figure 35, A**) optionnel, s’il est installé et le couvercle du câblage (**B**).

Figure 35 – Retrait des couvercles



2. Installer chaque connecteur de borne à anneau dans la fente correcte (**figure 36, A**). (Se reporter à l’étiquette sur le berceau pour les informations sur le positionnement standard.) Faire tourner la borne à anneau vers le bas (**B**) pour le mettre en place.

Figure 36 – Installer le connecteur de borne à anneau



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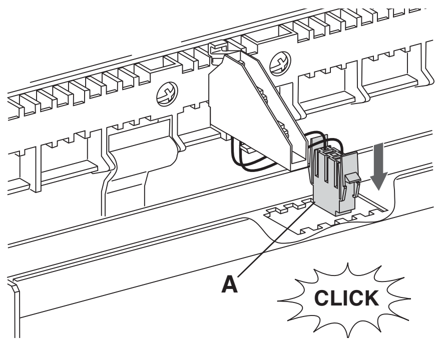
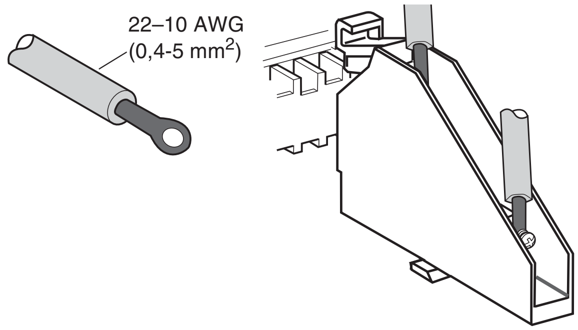
3. Installer le connecteur du câblage (**figure 37, A**). (Les positions du connecteur sont indiquées à l'avant du support du connecteur.)

Figure 37 – Installer le connecteur du câblage



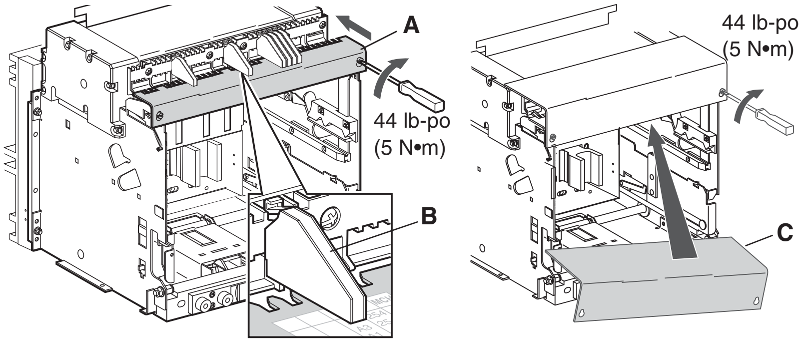
4. Installer les bornes à anneau sur le fil de contrôle. Fixer la borne à anneau sur le bornier à anneau.

Figure 38 – Installation des fils de contrôle



5. Remettre en place le couvercle du câblage (**figure 39, A**), en glissant la partie supérieure sous les connecteurs de borne à anneau installés (**B**).
6. Remettre en place le couvercle de bornes (**C**) optionnel, s'il est installé.

Figure 39 – Remettre en place le couvercle du câblage



REMARQUE : Pour enlever le connecteur de borne à anneau, l'interrupteur doit être dans la position d'essai. Enlever le connecteur de borne à anneau dans l'ordre inverse de l'installation.

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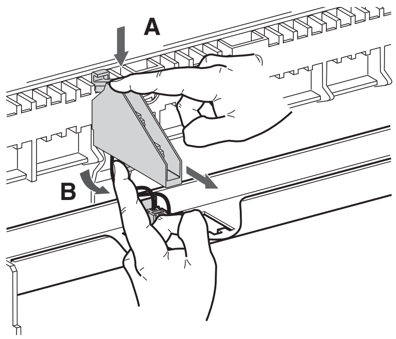
Retirer le connecteur en appuyant sur sa partie supérieure (**figure 40, A**) tout en poussant la partie inférieure (**B**) vers le haut et l'extérieur pour pivoter le connecteur hors du verrou.

Figure 40 – Enlever le connecteur de borne à anneau



Démontage du berceau

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1. Couper l'alimentation de l'appareil avant d'y travailler.
2. Enlever le berceau dans l’ordre inverse de l’installation.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLATS D'ARC

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E ou CSA Z462.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

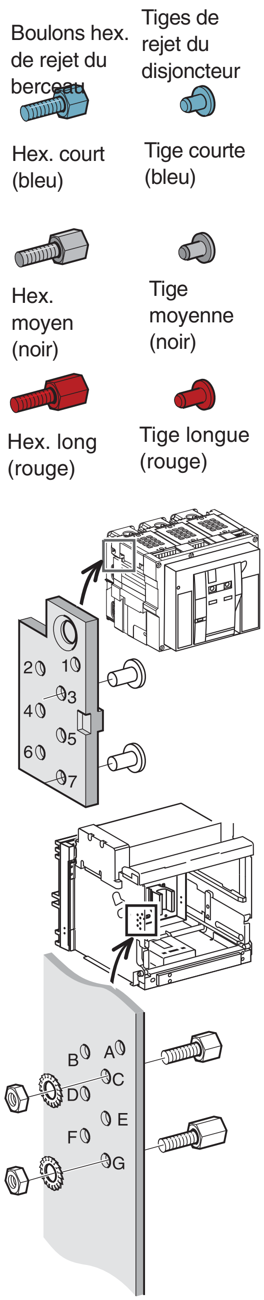
Installation du disjoncteur

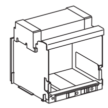
Kit de rejet du berceau

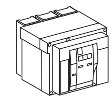
Pour empêcher qu’un disjoncteur Masterpact comportant une mauvaise valeur de courant admissible ou une mauvaise valeur nominale d’interruption soit installé dans le berceau, installer les tiges de rejet sur le berceau et le disjoncteur avant d’installer le disjoncteur.

1. Déterminer la configuration requise des tiges de rejet (voir le tableau 8 ou 9).

Tableau 8 – Configuration des tiges de rejet du berceau recommandée pour disjoncteurs inscrits UL 1066 [ANSI C37.50] standards







Type	A	B	C	D	E	F	G	1	2	3	4	5	6	7
800 A N1	Noir	Noir	Noir	Rouge	Bleu	Bleu	Noir	Bleu	Bleu	Bleu	—	Noir	N	B
800 A H1	Noir	Noir	Noir	Bleu	Rouge	Noir	Bleu	Bleu	Bleu	Bleu	Noir	—	B	N
800 A H2	Noir	Noir	Noir	Rouge	Rouge	Bleu	Bleu	Bleu	Bleu	Bleu	—	—	N	N
800 A H3	Noir	Noir	Noir	Bleu	Bleu	Rouge	Bleu	Bleu	Bleu	Bleu	Noir	Noir	—	N
800 A L1	Noir	Noir	Noir	Rouge	—	Rouge	Bleu	Bleu	Bleu	Bleu	—	Rouge	—	N
800 A L1F	Noir	Noir	Noir	—	Rouge	Rouge	Bleu	Bleu	Bleu	Bleu	Rouge	—	—	N
800 A HF	Noir	Noir	Noir	Bleu	—	Rouge	Rouge	Bleu	Bleu	Bleu	Noir	Rouge	—	—
800 A HC	Noir	Bleu	Noir	Rouge	—	Rouge	Rouge	Bleu	Noir	Bleu	—	Rouge	—	—
800 A HA	Noir	Noir	Noir	Rouge	Rouge	—	Rouge	Bleu	Bleu	Bleu	—	—	R	—
1600 A N1	—	Rouge	Bleu	Rouge	Bleu	Bleu	Noir	Rouge	—	Noir	—	Noir	N	B
1600 A H1	—	Rouge	Bleu	Bleu	Rouge	Noir	Bleu	Rouge	—	Noir	Noir	—	B	N
1600 A H2	—	Rouge	Bleu	Rouge	Rouge	Bleu	Bleu	Rouge	—	Noir	—	—	N	N
1600 A H3	—	Rouge	Bleu	Bleu	Bleu	Rouge	Bleu	Rouge	—	Noir	Noir	Noir	—	N
1600 A L1	—	Rouge	Noir	Rouge	—	Rouge	Bleu	Rouge	—	Bleu	—	Rouge	—	N
1600 A L1F	—	Rouge	Noir	—	Rouge	Rouge	Bleu	Rouge	—	Bleu	Rouge	—	—	N
1600 A HF	—	Rouge	Noir	Bleu	—	Rouge	Rouge	Rouge	—	Noir	Noir	Rouge	—	—
1600 A HC	—	Rouge	Bleu	Rouge	—	Rouge	Rouge	Rouge	—	Noir	—	Rouge	—	—
1600 A HA	—	Rouge	Bleu	Rouge	Rouge	—	Rouge	Rouge	—	Noir	—	—	R	—
2000 A H1	Rouge	—	Rouge	Bleu	Rouge	Noir	Bleu	—	Rouge	—	Noir	—	B	N
2000 A H2	Rouge	—	Rouge	Rouge	Rouge	Bleu	Bleu	—	Rouge	—	—	—	N	N
2000 A H3	Rouge	—	Rouge	Bleu	Bleu	Rouge	Bleu	—	Rouge	—	Noir	Noir	—	N
2000 A L1	Rouge	—	Rouge	Rouge	—	Rouge	Bleu	—	Rouge	—	—	Rouge	—	N
2000 A L1 *	—	Rouge	Rouge	Rouge	Bleu	Rouge	Noir	Rouge	—	—	—	Noir	—	B
2000 A L1F	Rouge	—	Rouge	—	Rouge	Rouge	Bleu	—	Rouge	—	Rouge	—	—	N
2000 A HF	Rouge	—	Rouge	Bleu	—	Rouge	Rouge	—	Rouge	—	Noir	Rouge	—	—
2000 A HC	Rouge	—	Bleu	Rouge	—	Rouge	Rouge	—	Rouge	Noir	—	Rouge	—	—
2000 A HA	Rouge	—	Rouge	Rouge	Rouge	—	Rouge	—	Rouge	—	—	—	R	—
3200 A H1	Bleu	Noir	Rouge	Noir	Rouge	Noir	Noir	Noir	Bleu	—	Bleu	—	B	B
3200 A H2	Bleu	Noir	Rouge	Rouge	Rouge	Noir	Bleu	Noir	Bleu	—	—	—	B	N
3200 A H3	Bleu	Noir	Rouge	Bleu	Noir	Rouge	Bleu	Noir	Bleu	—	Noir	Bleu	—	B
3200 A HF	Bleu	Noir	Rouge	—	—	Rouge	Rouge	Noir	Bleu	—	Rouge	Rouge	—	—
3200 A HC	—	Noir	Rouge	Rouge	—	Rouge	Rouge	Rouge	Bleu	—	—	Rouge	—	—
3200 A HC *	Rouge	Bleu	Noir	Rouge	Noir	Rouge	Rouge	—	Noir	Bleu	—	Bleu	—	—
3200 A L1 *	Rouge	Noir	Bleu	Rouge	Noir	Rouge	Noir	—	Bleu	Noir	—	Bleu	—	B
3200 A HA	—	Noir	Rouge	Rouge	Rouge	—	Rouge	Noir	Bleu	—	—	—	R	—
4000 A H2 *	Noir	Rouge	Bleu	Rouge	Rouge	Noir	Bleu	Bleu	—	Noir	—	—		N
4000 A H3 *	Noir	Rouge	Bleu	Bleu	Noir	Rouge	Bleu	Bleu	—	Noir	Noir	Bleu	—	N
4000 A HA*	Bleu	Rouge	Bleu	Rouge	Rouge	—	Rouge	Noir	—	Bleu	—	—	R	—
4000 A HC*	Bleu	Rouge	Bleu	Rouge	Bleu	Rouge	Rouge	Noir	—	Bleu	—	Noir	—	—
4000 A HF *	Bleu	Rouge	Bleu	Bleu	Noir	Rouge	Rouge	Noir	—	Bleu	Noir	Bleu	—	—
4000 A L1 *	Noir	Rouge	Bleu	Rouge	Bleu	Rouge	Noir	Bleu	—	Noir	—	Noir	—	B
5000 A H2	Rouge	Noir	Noir	Rouge	Rouge	Noir	Bleu	—	Bleu	Bleu	—	—	B	N
5000 A H3	Rouge	Noir	Noir	Bleu	Noir	Rouge	Bleu	—	Bleu	Bleu	Noir	Bleu	—	N
5000 A HA	Rouge	Noir	Bleu	Rouge	Rouge	—	Rouge	—	Bleu	Noir	—	—	R	—
5000 A HF	Rouge	Noir	Bleu	Bleu	Noir	Rouge	Rouge	—	Bleu	Noir	Noir	Bleu	—	—
5000 A HC	Rouge	Noir	Bleu	Rouge	Bleu	Rouge	Rouge	—	Bleu	Noir	—	Noir	—	—
5000 A L1	Rouge	Noir	Noir	Rouge	Bleu	Rouge	Noir	—	Bleu	Bleu	—	Noir	—	B
6000 A H2	Noir	Noir	Rouge	Rouge	Rouge	Noir	Bleu	Bleu	Bleu	—	—	—	B	N
6000 A H3	Noir	Noir	Rouge	Bleu	Noir	Rouge	Bleu	Bleu	Bleu	—	Noir	Bleu	—	N
6000 A HA	Bleu	Bleu	Rouge	Rouge	Rouge	—	Rouge	Noir	Noir	—	—	—	R	—
6000 A HF	Bleu	Bleu	Rouge	Bleu	Noir	Rouge	Rouge	Noir	Noir	—	Noir	Bleu	—	—
6000 A HC	Bleu	Bleu	Rouge	Rouge	Bleu	Rouge	Rouge	Noir	Noir	—	—	Noir	—	—
6000 A L1	Noir	Noir	Rouge	Rouge	Bleu	Rouge	Noir	Bleu	Bleu	—	—	Noir	—	B

* Modèle de construction large

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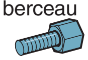
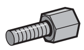
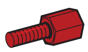
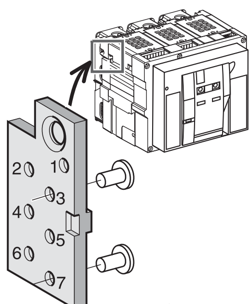
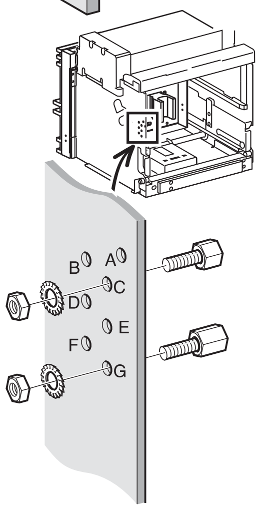
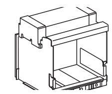
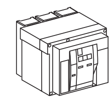
Tableau 9 – Configuration des tiges de rejet du berceau recommandée pour disjoncteurs inscrit UL 489 standards

Boulons hex. de rejet du berceau	Tiges de rejet du disjoncteur
 Hex. court (bleu)	 Tige courte (bleu)
 Hex. moyen (noir)	 Tige moyenne (noir)
 Hex. long (rouge)	 Tige longue (rouge)





Type / Tipo / Type														
	A	B	C	D	E	F	G	1	2	3	4	5	6	7
800 A N	Noir	Noir	Noir	Rouge	Rouge	Rouge	—	Bleu	Bleu	Bleu	—	—	—	R
800 A H	Noir	Noir	Bleu	Bleu	Bleu	Bleu	Rouge	Bleu	Bleu	Noir	Noir	Noir	Noir	—
800 A L	Noir	Noir	Noir	Rouge	—	Bleu	Rouge	Bleu	Bleu	Bleu	—	R	Noir	—
800 A LF	Noir	Bleu	Noir	Bleu	Rouge	Bleu	Rouge	Bleu	Noir	Bleu	Noir	—	Noir	—
800 A HF	Noir	Bleu	Noir	—	Rouge	Rouge	Noir	Bleu	N	Bleu	R	—	—	Bleu
800 A HB	Bleu	Noir	Noir	Rouge	Rouge	Rouge	Noir	Noir	Bleu	Bleu	—	—	—	Bleu
1200 A N	Rouge	Bleu	Noir	Rouge	Rouge	Rouge	—	—	Noir	Bleu	—	—	—	R
1200 A H	Rouge	Bleu	Noir	Bleu	Bleu	Bleu	Rouge	—	Noir	Bleu	Noir	Noir	Noir	—
1200 A L	Rouge	Bleu	Noir	Rouge	—	Bleu	Rouge	—	Noir	Bleu	—	R	Noir	—
1200 A LF	Rouge	Bleu	Bleu	Bleu	Rouge	Bleu	Rouge	—	Noir	Noir	Noir	—	Noir	—
1200 A HF	Rouge	Noir	Bleu	—	Rouge	Rouge	Rouge	—	Bleu	Noir	R	—	—	—
1200 A HB	Noir	Bleu	Bleu	Rouge	Rouge	Rouge	Rouge	Bleu	Noir	Noir	—	—	—	—
1600 A N	—	Rouge	Bleu	Rouge	Rouge	Rouge	—	R	—	Noir	—	—	—	R
1600 A H	—	Rouge	Noir	Bleu	Bleu	Bleu	Rouge	R	—	Bleu	Noir	Noir	Noir	—
1600 A L	—	Rouge	Noir	Rouge	—	Bleu	Rouge	R	—	Bleu	—	R	Noir	—
1600 A LF	—	Rouge	Bleu	Bleu	Rouge	Bleu	Rouge	R	—	Noir	Noir	—	Noir	—
1600 A HF	—	Rouge	Bleu	—	Rouge	Rouge	Rouge	R	—	Noir	R	—	—	—
1600 A HB	—	Rouge	—	Rouge	Rouge	Rouge	Rouge	R	—	R	—	—	—	—
2000 A N	Rouge	—	Rouge	Rouge	Rouge	Rouge	—	—	R	—	—	—	—	R
2000 A H	Rouge	—	Rouge	Bleu	Bleu	Bleu	Rouge	—	R	—	Noir	Noir	Noir	—
2000 A L	Rouge	—	Rouge	Rouge	—	Bleu	Rouge	—	R	—	—	R	Noir	—
2000 A LF	Rouge	—	Noir	Bleu	Rouge	Bleu	Rouge	—	R	Bleu	Noir	—	Noir	—
2000 A HF	Noir	—	Rouge	—	Rouge	Rouge	Rouge	Bleu	R	—	R	—	—	—
2000 A HB	Rouge	—	—	Rouge	Rouge	Rouge	Rouge	—	R	R	—	—	—	—
2500 A H	—	Bleu	Rouge	Rouge	Rouge	Rouge	—	R	Bleu	—	Noir	Noir	Noir	—
2500 A L	—	Noir	Rouge	Bleu	Bleu	Bleu	Rouge	R	Noir	—	—	—	—	R
2500 A HF	—	Bleu	Rouge	—	Rouge	Rouge	Rouge	R	Noir	—	R	—	—	—
2500 A HB	—	—	Rouge	Rouge	Rouge	Rouge	Rouge	R	R	—	—	—	—	—
3000 A H	Bleu	Rouge	—	Rouge	Rouge	Rouge	—	Noir	—	R	—	—	—	R
3000 A L	Noir	Rouge	—	Bleu	Bleu	Bleu	Rouge	Bleu	—	R	Noir	Noir	Noir	—
3000 A HF	Bleu	Rouge	—	—	Rouge	Rouge	Rouge	Noir	—	R	R	—	—	—
3000 A HB	—	Noir	Bleu	Rouge	Rouge	Rouge	Rouge	R	Bleu	Noir	—	—	—	—
4000 A H *	Noir	Rouge	Bleu	Bleu	Bleu	Noir	Rouge	Bleu	—	Noir	Noir	Noir	Bleu	—
4000 A L *	Noir	Rouge	Bleu	Rouge	Bleu	Bleu	Rouge	Bleu	—	Noir	—	Noir	Noir	—
4000 A HF *	Bleu	Rouge	Bleu	—	Rouge	Rouge	Rouge	Noir	—	Bleu	R	—	—	—
4000 A HB *	Bleu	Rouge	Bleu	Noir	Rouge	Bleu	Rouge	Noir	—	Bleu	Bleu	—	N	—
5000 A H	Rouge	Noir	Noir	Bleu	Bleu	Noir	Rouge	—	Bleu	Bleu	Noir	Noir	Bleu	—
5000 A L	Rouge	Noir	Noir	Rouge	Bleu	Bleu	Rouge	—	Bleu	Bleu	—	Noir	Noir	—
5000 A HF	Rouge	Noir	Bleu	—	Rouge	Rouge	Rouge	—	Bleu	Noir	R	—	—	—
5000 A HB	Rouge	Noir	Bleu	Noir	Rouge	Bleu	Rouge	—	Bleu	Noir	Bleu	—	Noir	—
6000 A H	Noir	Noir	Rouge	Bleu	Bleu	Noir	Rouge	Bleu	Bleu	—	Noir	Noir	Bleu	—
6000 A L	Noir	Noir	Rouge	Rouge	Bleu	Bleu	Rouge	Bleu	Bleu	—	—	Noir	Noir	—
6000 A HF	Bleu	Bleu	Rouge	—	Rouge	Rouge	Rouge	Noir	Noir	—	R	—	—	—
6000 A HB	Bleu	Bleu	Rouge	Noir	Rouge	Bleu	Rouge	Noir	Noir	—	Bleu	—	Noir	—

* Modèle de construction large

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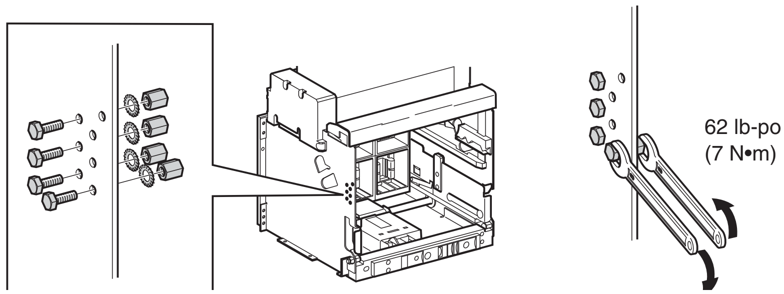
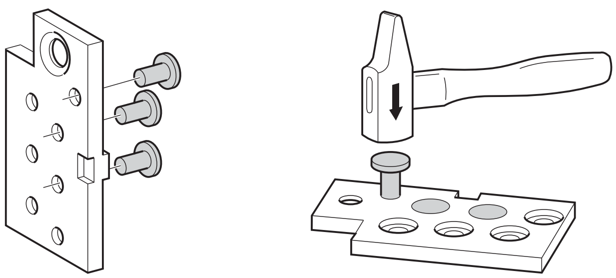
2. Installer les tiges de rejet du berceau selon la configuration déterminée dans les tableaux 8 ou 9.

Figure 41 – Installation des tiges de rejet du berceau



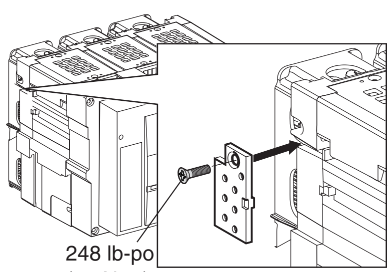
3. Installer les tiges de rejet du disjoncteur dans la plaque des tiges de rejet selon la configuration déterminée dans les tableaux 8 ou 9.

Figure 42 – Installation des tiges de rejet du disjoncteur



4. Installer la plaque des tiges de rejet sur le disjoncteur.

Figure 43 – Installation de la plaque des tiges de rejet



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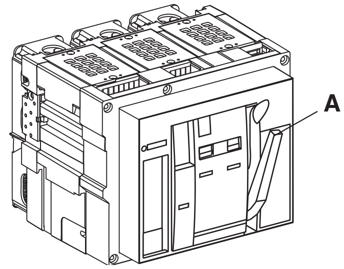
Installation des accessoires

Installer les accessoires du disjoncteur requis non installés à l'usine.

En cas d'installation des accessoires électriques, enlever le couvercle des accessoires.

> **AVIS**
>
> **RISQUE DE DOMMAGES MATÉRIELS**
>
> Prenez des précautions lors du retrait ou du remplacement du couvercle des accessoires du disjoncteur. La poignée d'armement du ressort (**figure 44, A**) se prolonge au-delà du couvercle des accessoires du disjoncteur et peut s'endommager lors du retrait du couvercle des accessoires.
>
> **Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.**

Figure 44 – Poignée d'armement du ressort

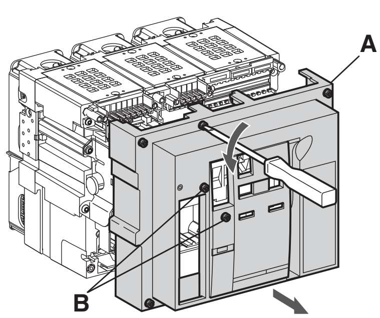


Desserrer les vis du couvercle des accessoires et enlever le couvercle des accessoires (**figure 45, A**).

REMARQUE : Les vis (**B**) sont pour les disjoncteurs types L, LF, L1 et L1F seulement.

Installer l'accessoire comme indiqué dans les directives fournies avec chaque accessoire.

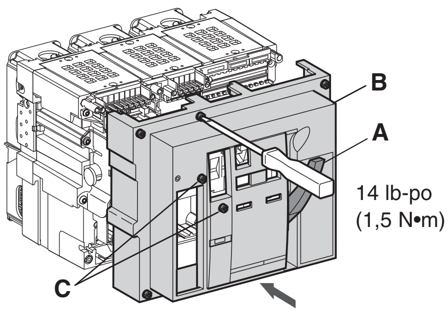
Figure 45 – Retrait du couvercle des accessoires



Remettre en place le couvercle des accessoires en tirant la poignée (**figure 46, A**) vers l'avant et en glissant le couvercle des accessoires (**B**) du disjoncteur vers le bas par-dessus de la poignée. Serrer les vis du couvercle des accessoires.

REMARQUE : Les vis (**C**) sont pour les disjoncteurs types L, LF, L1 et L1F seulement.

Figure 46 – Remise en place du couvercle des accessoires

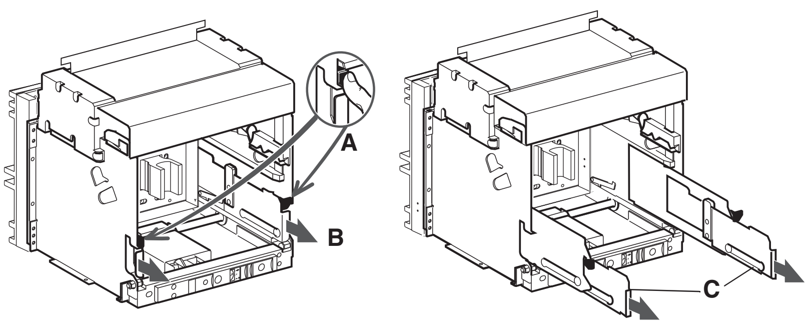


Installation du disjoncteur

> ## *AVIS*
>
> **RISQUE DE DOMMAGES MATÉRIELS**
>
> Fixez le berceau avant d'installer ou d'enlever le disjoncteur.
>
> **Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.**

1. Appuyer sur les pattes de verrouillage (**figure 47, A**), puis retirer les poignées de rails d'extension (**B**), jusqu'à ce que les rails (**C**) soient complètement déployés.
2. Inspecter les groupes de connecteurs du disjoncteur pour s'assurer qu'il n'en manque pas ou qu'ils sont bien alignés. Se reporter à la page 11 pour les informations concernant la vérification, l'installation et la lubrification des groupes de connecteurs.

Figure 47 – Retrait des rails



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AVIS

RUE DE DOMMAGES MATÉRIELS

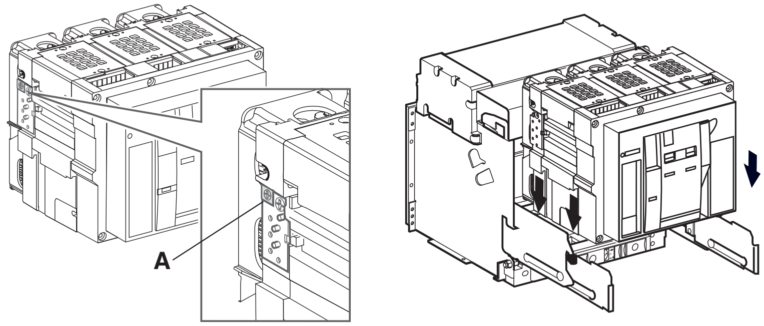
L'actionneur du volet doit être installé sur le disjoncteur pour assurer le bon fonctionnement des volets de cellules.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

3. Pour les cellules munies d'un volet, vérifier que l'actionneur (**figure 48, A**) du volet est installé sur le disjoncteur.
4. Installer le disjoncteur sur les rails d'extension. Voir page 16 pour le bon appareil de levage.

   REMARQUE : Le berceau doit être fixé à la palette s'il n'est pas installé dans l'appareil avant d'installer le disjoncteur.

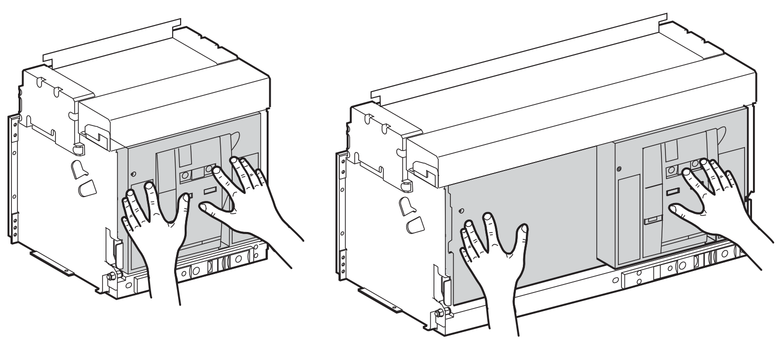
Figure 48 – Vérifier l'actionneur du volet



5. Pousser le disjoncteur vers l'intérieur.
6. Brancher le disjoncteur. Voir Connexion du disjoncteur débrochable, page 68, pour les directives de connexion du disjoncteur.

   Voir la section 6—"Fonctionnement" , pour les directives de fonctionnement du disjoncteur.

Figure 49 – Pousser le disjoncteur vers l'intérieur



Vérification de la protection d'appareils contre les défauts à la terre

Le paragraphe 230-95(c) du Code national de l'électricité (NEC; É.-U.) requiert que tous les systèmes de protection d'appareils contre les défauts à la terre soient vérifiés quand ils sont installés la première fois. Si le disjoncteur possède des équipements de protection contre les défauts à la terre, vérifier le système de protection à ce moment-là.

S'assurer que le déclencheur est sous tension. Celui-ci est sous tension si :

- le disjoncteur est fermé ou alimenté par le bas et a une tension de charge de plus de 100 V sur deux phases (déclencheurs P ou H uniquement).
- la trousse d'essais des fonctions complètes ou portative est raccordée et sous tension.
- une alimentation externe de 24 V cc est raccordée.
- un dérivateur de tension externe est installé et une tension de plus de 100 V est présente sur deux phases (déclencheurs P ou H uniquement).

S'il s'agit d'un système radial (à une seule extrémité), vérifier la protection contre les défauts à la terre en appuyant sur le bouton pousser-pour-vérifier (**figure 50, A**). Le disjoncteur se déclenchera et le voyant lumineux de défaut à la terre du déclencheur s'allumera.

Enregistrer les résultats sur le tableau 10.

Si une vérification complète du système de défaut à la terre est nécessaire, faire un essai d'injection primaire. Si le système est muni de plusieurs sources ou nécessite des raccordements sur place, utiliser un essai d'injection primaire.

Figure 50 – Vérification de la protection contre les défauts à la terre (bouton pousser-pour-vérifier)

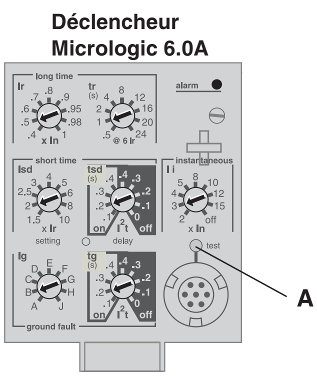


Tableau 10 – Résultats de l'essai de défauts à la terre

Date	Réglages du défaut à la terre	Résultats de l'essai	Signature

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Retrait du disjoncteur

AVIS

RISQUE DE DOMMAGES MATÉRIELS

Fixez le berceau avant d'installer ou d'enlever le disjoncteur.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

⚠ DANGER

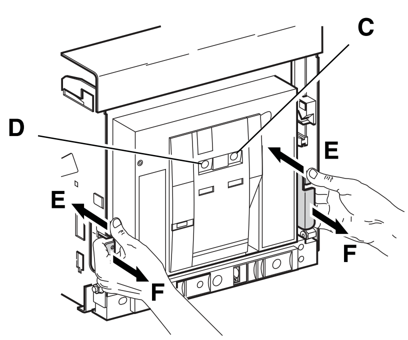
RISQUE DE CHUTE DU DISPOSITIF

- Assurez-vous que l'appareil de levage a la capacité de levage pour l'appareil à soulever. Suivez les consignes du fabricant lors de l'utilisation de l'appareil de levage.
- Portez un casque de protection, des chaussures de sécurité et des gants épais.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

1. Débrancher le disjoncteur, de la façon décrite à la page 70, “Déconnexion du disjoncteur débrochable” .
2. Le disjoncteur étant en position déconnectée, appuyer sur le bouton-poussoir de marche (I) (**C**) pour fermer le disjoncteur.
3. Appuyer sur le bouton-poussoir d'arrêt (O) (**D**) pour ouvrir le disjoncteur.
4. Appuyer sur les pattes de verrouillage (**E**), puis tirer sur les poignées d'extension des rails (**F**).

Figure 51 – Démontage du disjoncteur



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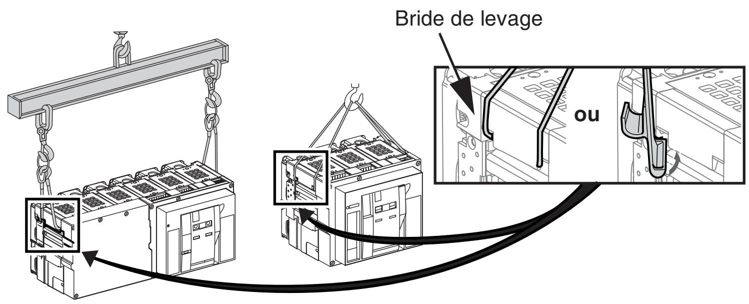
5. Dégager le disjoncteur des rails du berceau à l'aide de brides de levage sur les côtés du disjoncteur, voir la section Section 2—Levage et transport.

Figure 52 – Dispositif de levage aérien



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Section 4—Installation du disjoncteur fixe

Installation du disjoncteur

Couper toutes les alimentations à cet appareil avant d’y travailler.

Installation des accessoires

Installer à ce moment-ci les accessoires du disjoncteur non achetés comme appareil installé à l’usine.

En cas d'installation des accessoires électriques, enlever le couvercle des accessoires.

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⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLATS D'ARC

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E ou CSA Z462.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez toutes les alimentations à cet appareil avant d’y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

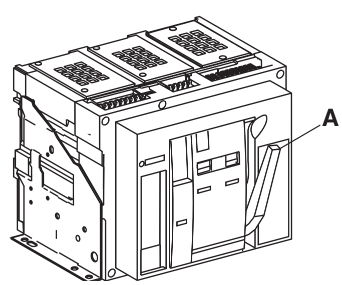
AVIS

RISQUE DE DOMMAGES MATÉRIELS

Prenez des précautions lors du retrait ou du remplacement du couvercle des accessoires du disjoncteur. La poignée d’armement du ressort (**figure 53, A**) se prolonge au-delà du couvercle des accessoires du disjoncteur et peut s’endommager lors du retrait du couvercle des accessoires.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

Figure 53 – Poignée d’armement du ressort

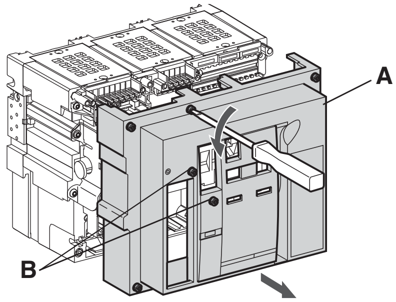


1. Desserrer les vis du couvercle des accessoires et enlever le couvercle des accessoires (**figure 54, A**).

   REMARQUE : Les vis (**B**) sont pour les disjoncteurs L/L1 seulement.

2. Installer les accessoires comme indiqué dans les directives fournies avec chaque accessoire.

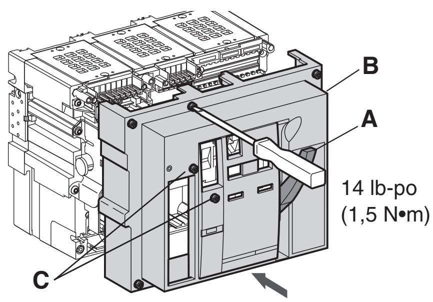
Figure 54 – Retrait du couvercle des accessoires



3. Remettre en place le couvercle des accessoires en tirant la poignée (**figure 55, A**) vers l'avant et en glissant le couvercle des accessoires (**B**) du disjoncteur vers le bas par-dessus de la poignée. Serrer les vis du couvercle des accessoires.

   REMARQUE : Les vis (**C**) sont pour les disjoncteurs types L et L1 seulement.

Figure 55 – Remise en place du couvercle des accessoires



Exigences d'espace

⚠ DANGER

RISQUE 'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLATS D'ARC

Les exigences d'espace doivent être respectées pour obtenir un bon fonctionnement de l'appareil.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

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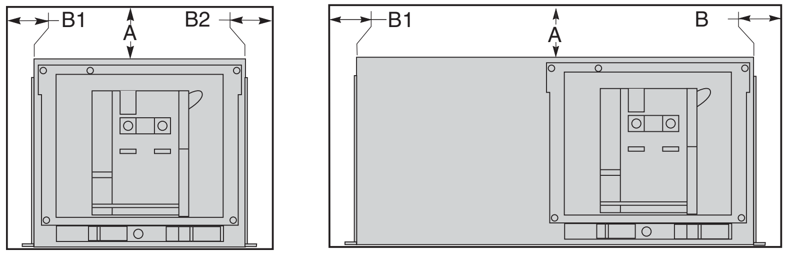
Tableau 11 – Exigences d’espace



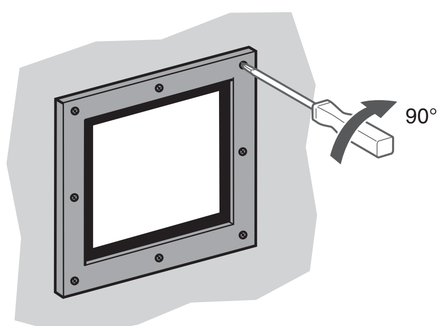
Espace minimal	A		B1 + B2	
	po	mm	po	mm
Pièces isolées	5,91	150	2,36	60
Pièces métalliques	5,91	150	5,72	120

Installation du cache-entrée de porte

Si l’appareil comporte un découpage de porte, installer le cache-entrée de porte expédié avec le disjoncteur.

1. Si elle n’existe pas déjà, découper une ouverture dans la porte de l’appareil pour le cache-entrée de porte. Pour les dimensions de l'ouverture, se reporter aux directives d'utilisation 0613IB1205 sur notre site Web (pour plus d'informations sur le site Web, voir la page 7).
2. Installer le cache-entrée.

Figure 56 – Installation du cache-entrée de porte

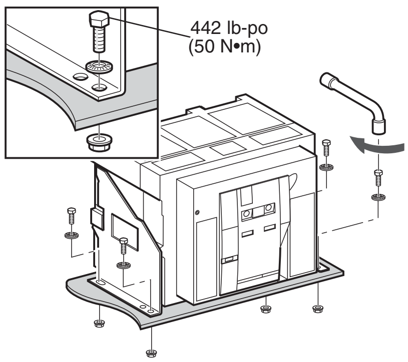


Installation du disjoncteur

1. Si les trous de montage n'existent pas déjà, les percer dans la cuve pour monter le disjoncteur. Pour la configuration des trous de montage du disjoncteur, se reporter aux directives d'utilisation 0613IB1205 sur notre site Web (pour plus d'informations sur le site Web, voir la page 5).
2. Vérifier si la surface de montage est bien plate. La surface de montage doit être plate avec une tolérance de 2 mm (0,08 po).
3. Fixer le disjoncteur à la cuve, à l'aide de boulons, de rondelles et d'écrous de 9,5 mm (3/8 po).

REMARQUE : Des supports de montage vertical sont disponibles, si nécessaire.

Figure 57 – Fixer le disjoncteur



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Installation des connecteurs

Les connecteurs standard sont indiqués dans le tableau 12. Serrer les vis de montage au couple de 16 à 18 N•m (142 à 159 lb-po).

Pour des renseignements au sujet des connecteurs non standards, contacter le service à la clientèle.

Pour les dimensions des connecteurs, se reporter aux directives d'utilisation 0613IB1205 sur notre site Web (pour plus d'informations sur le site Web, voir la page 7).

Tableau 12 – Connecteurs standard

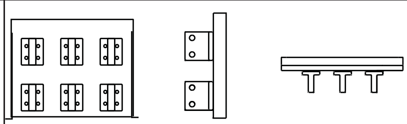
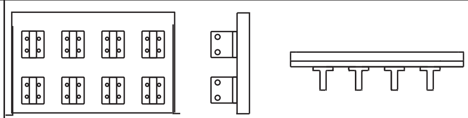
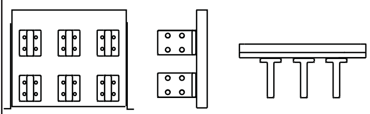
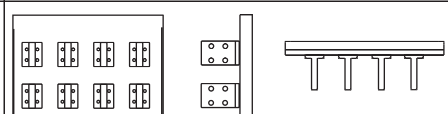
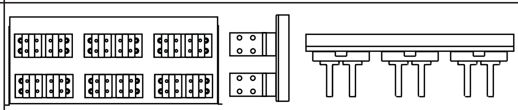
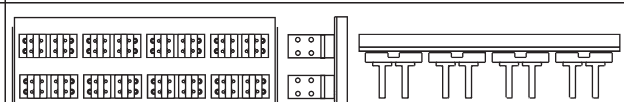
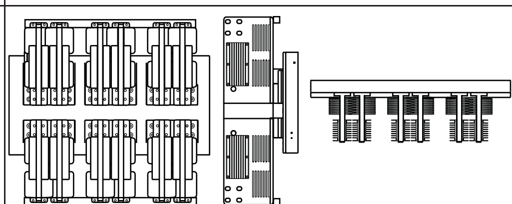
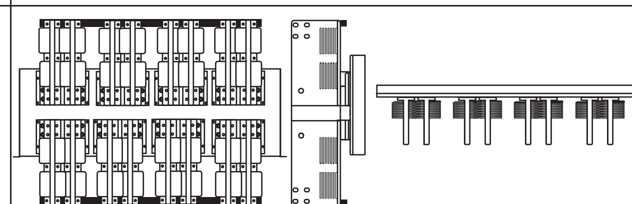
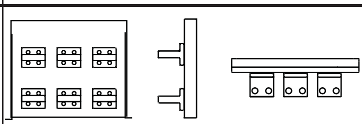
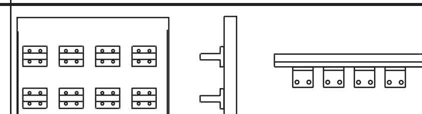
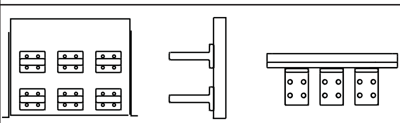
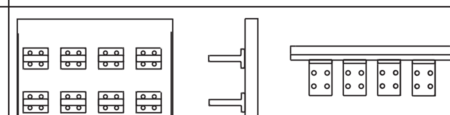
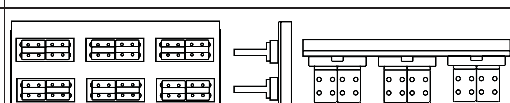
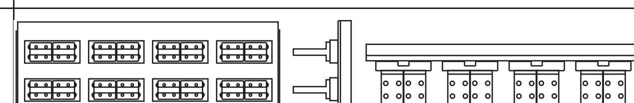
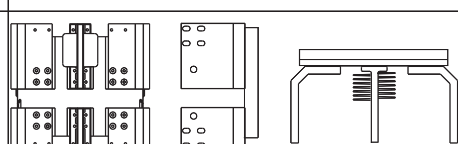
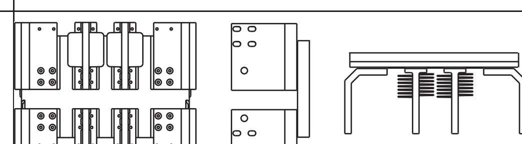
Type	Val. nom.	Agencement à 3 pôles Avant – côté – dessus	Agencement à 4 pôles Avant – côté – dessus
Vertical en T à connexion par l'arrière (RCTV)	800 A à 2000 A		
	2500 A à 3000 A		
	4000 A à 5000 A		
	6000 A		
Horizontal en T à connexion par l'arrière (RCTH)	800 A à 2000 A		
	2500 A à 3000 A		
	4000 A à 5000 A		
Vertical décalé avec connexion par l'arrière (RCOV)	3200 A		

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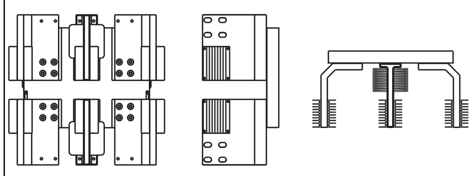
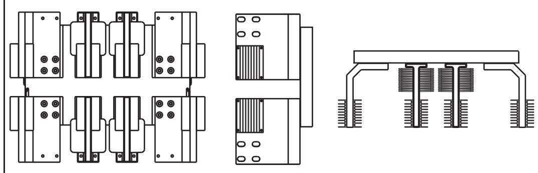
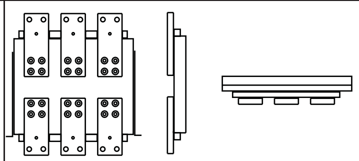
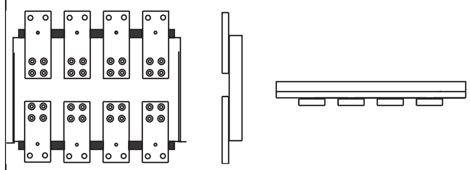
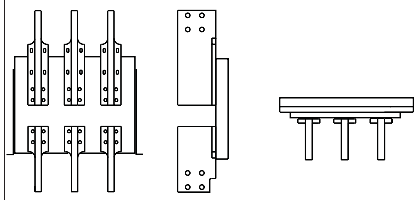
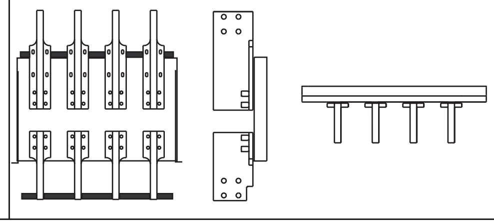
Tableau 12 – Connecteurs standard *(suite)*

Type	Val. nom.	Agencement à 3 pôles Avant – côté – dessus	Agencement à 4 pôles Avant – côté – dessus
Vertical décalé avec connexion par l'arrière (RCOV spéciaux)	4000 A châssis W		
Plat à connexion par l'avant (FCF)	800 A à 2000 A		
En T avec connexion par l'avant (FCF)	800 A à 3000 A		

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Installation du système de transmission par bus

AVIS

Les supports de barres-bus doivent être placés pour supporter le poids du système de transmission par bus et pour résister aux forces magnétiques causées par les courants de courts-circuits. Voir la **figure 58, A**.

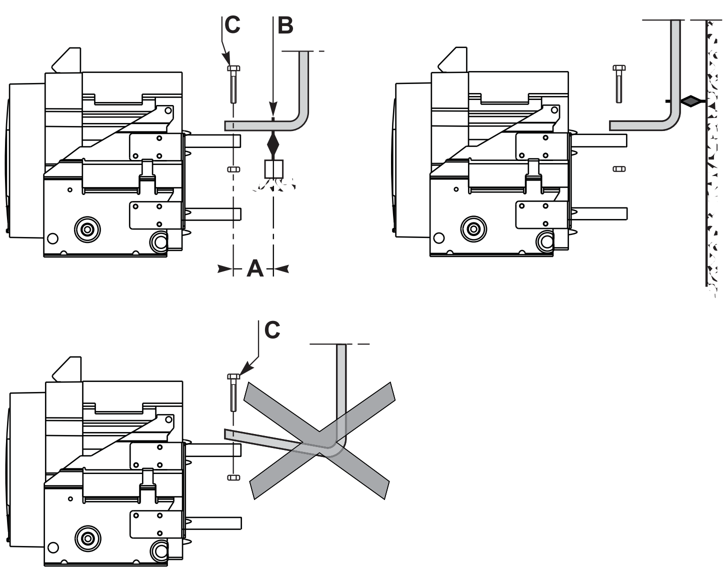
Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

REMARQUE : L'installateur est responsable du câblage des barres-bus vers les connecteurs.

- Les supports de barre-bus doivent être renforcés (**figure 58, B**) afin d’éviter que la force des courts-circuits n’entraîne une déviation des connecteurs.Les supports de barres-bus (**A**) doivent être placés pour supporter le poids du système de transmission par bus et pour résister aux forces magnétiques causées par les courants de courts-circuits.
- Les barres-bus doivent être réglées pour assurer que les points de connexion sont correctement positionnés avant d’insérer les boulons (**C**). Les barres-bus doivent être supportées par l'ossature de l'appareillage de commutation, sans aucun poids sur les connecteurs.

Les exigences des barres-bus du disjoncteur et des connecteurs sont indiquées au tableau 13.

Figure 58 – Connexions des barres-bus



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Les exigences des barres-bus du disjoncteur et des connecteurs sont indiquées au tableau 13.

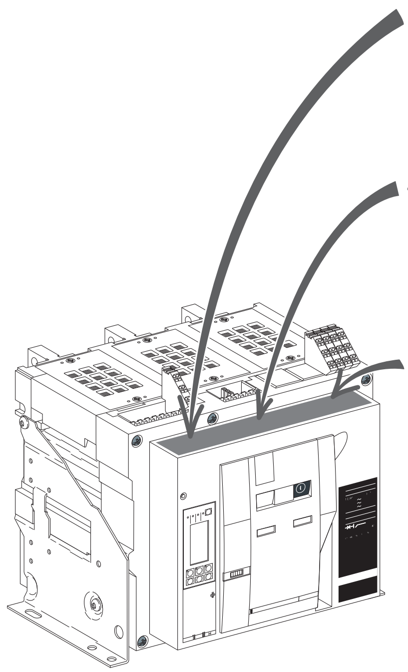
REMARQUE : L'installateur est responsable du câblage des barres-bus vers les connecteurs. Les barres-bus doivent être supportées par l'ossature de l'appareillage de commutation, sans aucun poids sur les connecteurs. Les supports de barre-bus doivent être renforcés afin d'éviter que la force des courts-circuits n'entraîne une déviation des connecteurs.

Tableau 13 – Taille de barre-bus requise

Disjoncteur		**Conforme à**	**Connecteurs**	**Barre-bus par connecteur**	
Val. nom.	**Type**			**Numéro**	**Taille**
800 A, 1200 A	N/N1/H/H1/H2/H3	ANSI C37.50 UL 489	RCTH, RCTV, FCF, FCT	1	6 x 76 mm (0,25 x 3 po)
1600 A	N/N1/H/H1/H2/H3	ANSI C37.50 UL 489	RCTH, RCTV, FCF, FCT	2	6 x 76 mm (0,25 x 3 po)
2000 A	N/N1/H/H1/H2/H3	ANSI 37.50 UL 489	RCTH	3	6 x 76 mm (0,25 x 3 po)
			RCTV, FCT	2	6 x 102 mm (0,25 x 4 po)
			FCF	3	6 x 76 mm (0,25 x 3 po)
2500 A	H	UL 489	RCTH	5	6 x 76 mm (0,25 x 3 po)
			RCTV, FCT	2	6 x 127 mm (0,25 x 5 po)
3000 A	H	UL 489	RCTH	8	6 x 76 mm (0,25 x 3 po)
	H		RCTV, FCT	4	6 x 102 mm (0,25 x 4 po)
3200 A	H1/H2/H3	ANSI 37.50	RCOV	3	6 x 127 mm (0,25 x 5 po)
4000 A (châssis W)	H1/H2/H3	ANSI 37.50	RCOV (Special)	4	6 x 127 mm (0,25 x 5 po)
4000 A	H/H2/H3	ANSI 37.50 UL 489	RCTH	4	6 x 152 mm (0,25 x 6 po)
			RCTV, FCT	4	6 x 127 mm (0,25 x 5 po)
		ANSI 37.50	FCF	4	6 x 152 mm (0,25 x 6 po)
		UL 489	FCF	5	6 x 152 mm (0,25 x 6 po)
5000 A	H/H2/H3	ANSI 37.50 UL 489	RCTH	8	6 x 152 mm (0,25 x 6 po)
			RCTV, FCT	6	6 x 127 mm (0,25 x 5 po)
6000 A	H	UL 489	RCTV	6	6 x 152 mm (0,25 x 6 po)

Connexions des accessoires utilisant des connecteurs-poussoirs

Tableau 14 – Disposition des bornes pour l’installation des connecteurs-poussoirs



Com		UC1		UC2		UC3	UC4	M2C/M6C	SDE2/RES	SDE1
E5	E6	Z5	M1	M2	M3	F2 +	V3	484/Q3	184/K2	84
E3	E4	Z3	Z4	T3	T4	VN	V2	474/Q2	182	82
E1	E2	Z1	Z2	T1	T2	F1 -	V1	471/Q1	181/K1	81

MN/MX2	MX1	XF	PF	MCH
D2/C12	C2	A2	254	B2
C13	C3	A3	252	B3
D1/C11	C1	A1	251	B1

OF24	OF23	OF22	OF21	OF14	OF13	OF12	OF11	OF4	OF3	OF2	OF1
244	234	224	214	144	134	124	114	44	34	24	14
242	232	222	212	142	132	122	112	42	32	22	12
241	231	221	211	141	131	121	111	41	31	21	11

Fonction	Connecteur	Description
Contacts auxiliaires	OF[1]	Contacts de position ouvert/fermé du disjoncteur
	EF	Contact combiné connecté et fermé
Fonctionnement à distance	SDE	Contact d'alarme de défaut électrique
	RES	Réarmement à distance
	MN	Déclencheur sur baisse de tension
	MX[2]	Déclencheur shunt
	XF[2]	Fermeture en shunt
	PF	Contact prêt à fermer
	MCH	Moteur d'armement de ressort

[1] Les contacts OF1, OF2, OF3 et OF4 sont standard.
[2]Lorsque des bobines de communication MX1 ou XF sont utilisées, la borne (C3 ou A3) doit être connectée à la ligne même si le module de communication n'est pas installé. Le circuit de contournement par la borne C2/A2 n'est destiné qu'à un service momentané (0,5 s.). Pour service continu, utiliser la commande de communication.

Type de déclencheur					
De base	A	P	H	Connecteur	Description
–	•	•	•	Com : E1–E6	Communication
–	•	•	•	UC1 : Z	Interverrouillage sélectif de zone Z1 = signal de sortie ZSI Z2 = sortie ZSI Z3 = signal d'entrée ZSI Z4 = court retard d'entrée ISZ Z5 = défaut à la terre d'entrée ZSI
–	•	•	•	UC1 : M1	Défaut à la terre différentiel modifié (MDGF)
–	•	•	•	UC2 : T	Neutre externe
–	•	•	•	UC2 : M	Défaut à la terre différentiel modifié (MDGF)
–	•	•	•	UC3 : F	Alimentation externe 24 Vcc
–	–	•	•	UC3 : Vn	Prise neutre externe
–	–	•	•	UC4	Détection de tension de phase externe
–	–	•	•	M2C/M6C	Deux contacts programmables (relais interne) ou six contacts programmables (pour le raccordement au module M6C externe)

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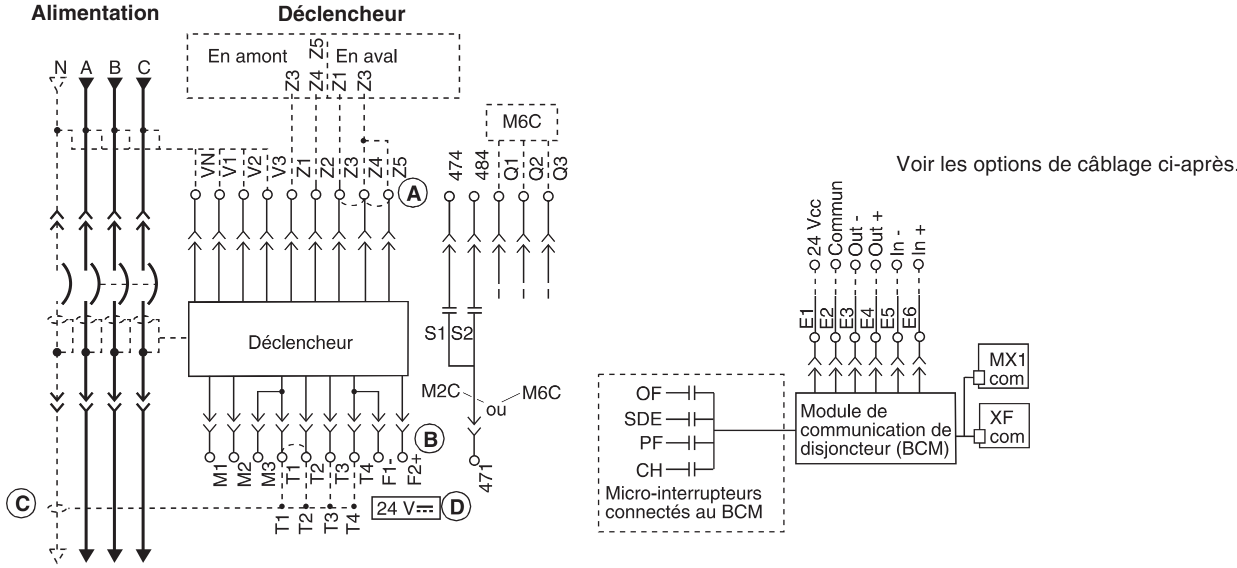
Schémas de câblage pour les connexions auxiliaires

REMARQUE : Tous les schémas indiquent un disjoncteur ouvert, connecté et armé.

Figure 59 – Schémas de câblage pour les connexions auxiliaires



A—Ne pas retirer les cavaliers installés à l'usine entre Z3, Z4 et Z5 sauf si ZSI est raccordée.
B—Ne pas retirer le cavalier installé à l'usine entre T1 et T2 sauf si le TC de neutre est raccordé. Ne pas installer un cavalier entre T3 et T4.
C—Pour obtenir un câblage approprié du TC de neutre, se reporter aux schémas de câblage, page 62.
D—L'alimentation 24 Vcc du déclencheur doit être séparée et isolée de l'alimentation 24 Vcc des modules de communication.

Câblage de l'option de COM (Modules Modbus BCM ULP et CCM)

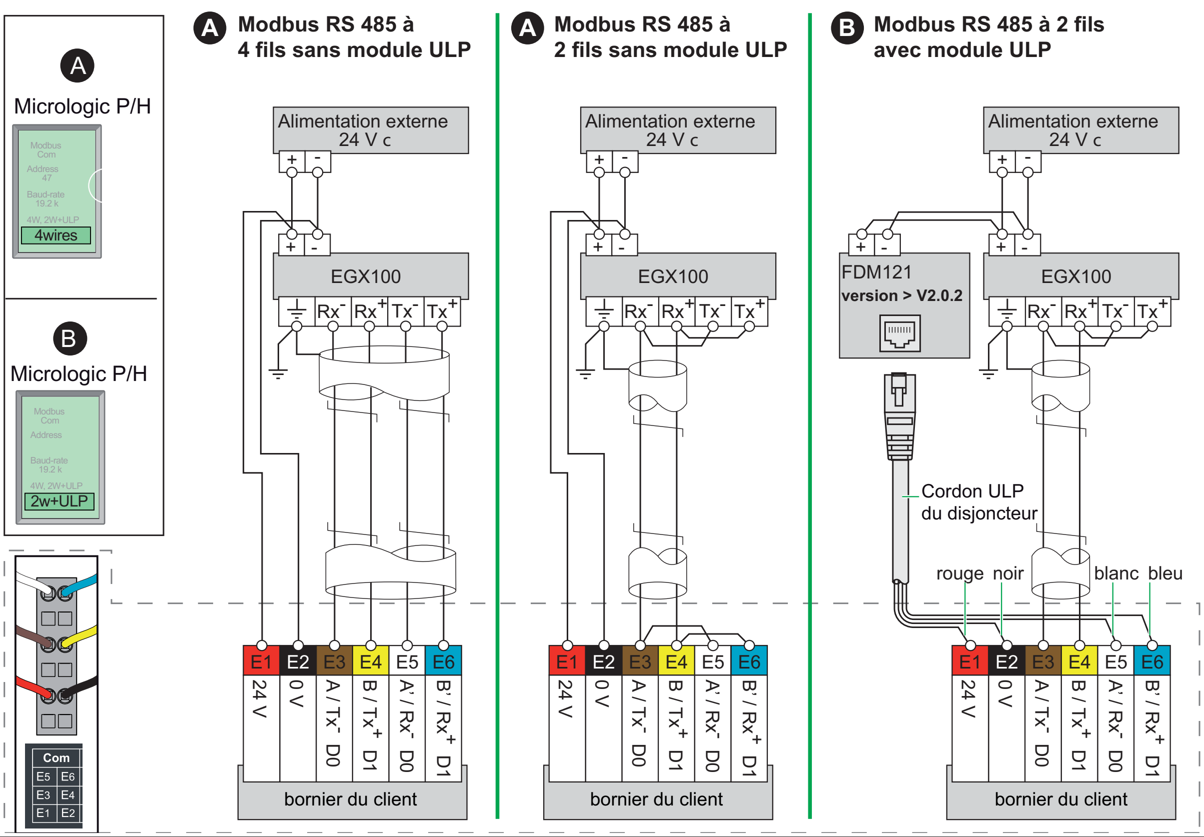
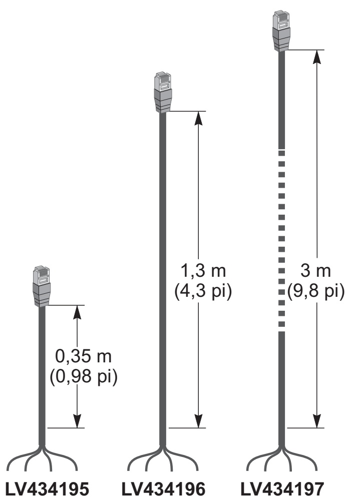
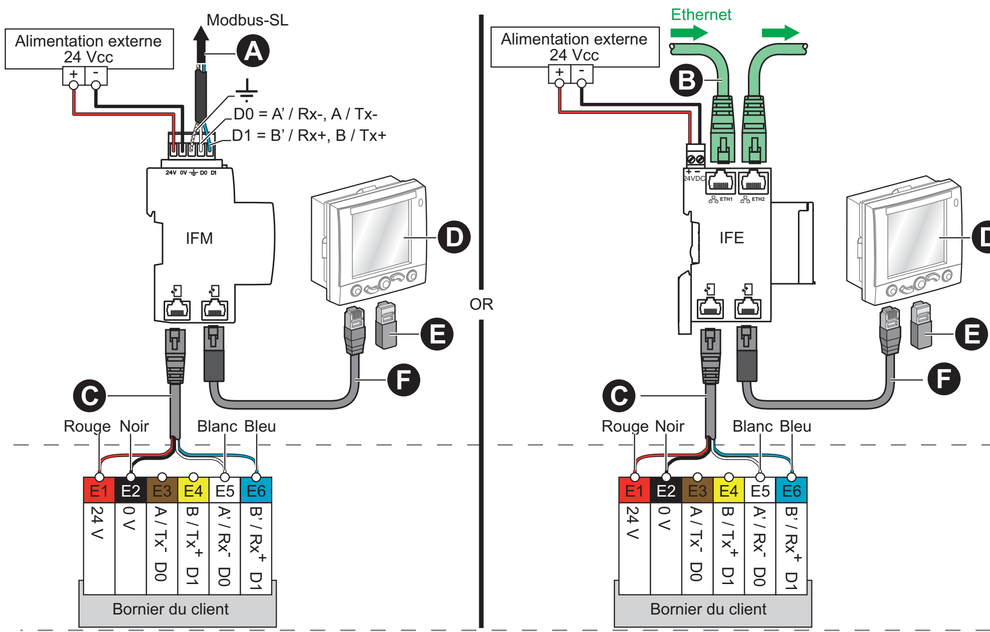


Figure 59 – Schémas de câblage pour les connexions auxiliaires *(suite)*

Composants des communications et raccordements du FDM121



Cordon ULP du disjoncteur



A. Réseau Modbus
B. Réseau Ethernet
C. Cordon ULP du disjoncteur
D. Afficheur de tableau (FDM)
E. Terminaison ULP
F. Câble ULP

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Raccordements

Le disjoncteur Masterpact est raccordé aux dispositifs ULP (afficheur FDM121, unité IFM, IFE ou IO) au moyen du cordon ULP pour disjoncteur.

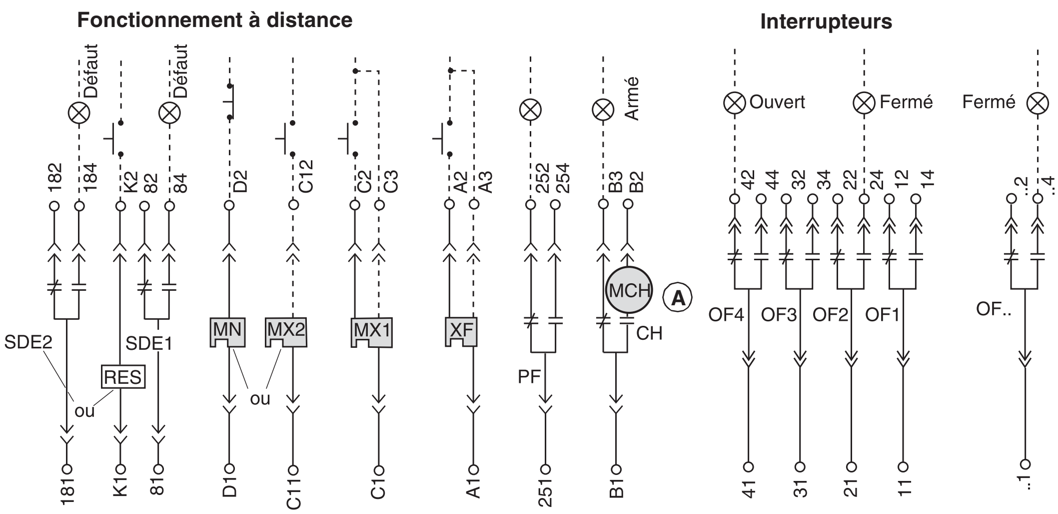
- Le cordon est disponible en trois longueurs : 0,35 m (0,98 pi), 1,3 m (4,3 pi) et 3 m (9,8 pi).
- Des longueurs jusqu'à 10 m (32,9 pi) sont possibles à l'aide de prolongateurs.

Marques pour les bornes de type à pousser

Déclencheur							
COM	**UC1**	**UC2**	**UC3**	**UC4**	**M2C/M6C**	**SDE2/Res.**	**SDE1**
E5 E6	Z5 M1	M2 M3	F2+	V3	484/Q3	184/K2	84
E3 E4	Z3 Z4	T3 T4	VN	V2	474/Q2	182	82
E1 E2	Z1 Z2	T1 T2	F1–	V1	471/Q1	181/K1	81

REMARQUE : Tous les schémas indiquent un disjoncteur ouvert, connecté et armé.

Figure 60 – Schémas de câblage pour les connexions auxiliaires



A—Lorsque les caractéristiques de fonctionnement à distance sont utilisées, s'assurer que le moteur d'armement des ressorts (MCH) bénéficie d'un minimum de quatre secondes pour tendre complètement les ressorts de fermeture du disjoncteur avant d'actionner la bobine de fermeture en shunt (XF).

Marques pour les bornes de type à pousser

Fonctionnement à distance					Interrupteurs auxiliaires											
MN/MX2	**MX1**	**XF**	**PF**	**MCH**	**OF24**	**OF23**	**OF22**	**OF21**	**OF14**	**OF13**	**OF12**	**OF11**	**OF4**	**OF3**	**OF2**	**OF1**
D2/C12	C2	A2	254	B2	244	234	224	214	144	134	124	114	44	34	24	14
C13	C3	A3	252	B3	242	232	222	212	142	132	122	112	42	32	22	12
D1/C11	C1	A1	251	B1	241	231	221	211	141	131	121	111	41	31	21	11

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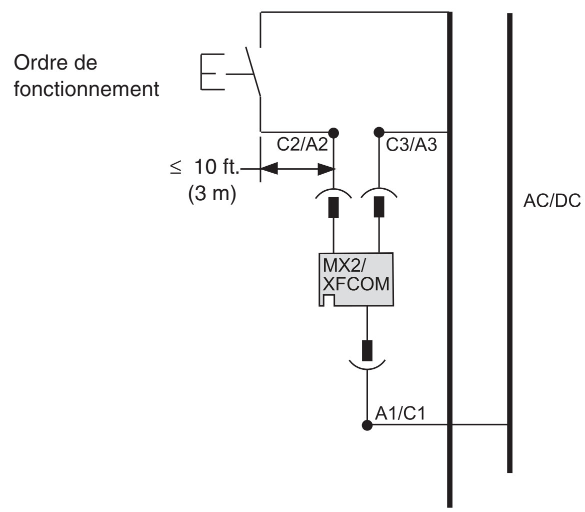
Déclencheur shunt (MX) et fermeture en shunt (XF) avec communication

Un schéma de câblage recommandé pour les bobines de déclencheur shunt ou de la fermeture en shunt avec communication est indiqué à la Figure 61. Les tensions induites dans le circuit à la borne C2 et/ou à la borne A2 peuvent entraîner un mauvais fonctionnement du déclencheur shunt ou de la fermeture en shunt. La meilleure façon d'empêcher les tensions induites est de maintenir le circuit aux bornes C2 et A2 aussi court que possible. S'il est impossible de maintenir le circuit en dessous de 3 m (10 pi), utiliser un relais d'interposition près de la borne C2 ou A2.

Figure 61 – Schéma de câblage avec communication

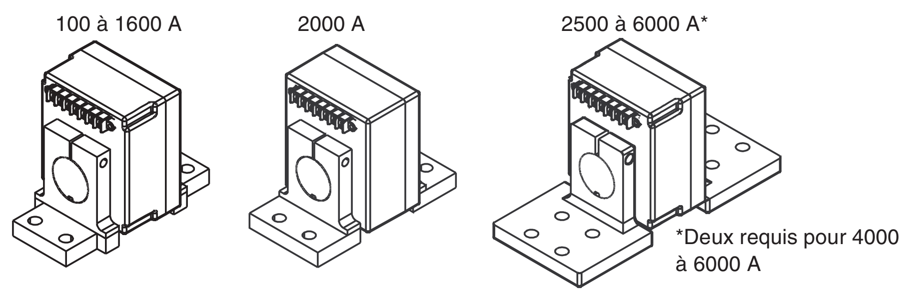


Protection d'appareils contre les défauts de mise à la terre

Si le disjoncteur ne possède pas un déclenchement ou une alarme intégrée sur défaut à la terre, sauter cette sous-section.

Un circuit triphasé à quatre fils nécessite l’emploi d’un transformateur de courant (TC) de neutre externe. Brancher le TC du neutre au disjoncteur selon les schémas de câblage dans les figures 63 et 64.

Figure 62 – Transformateurs de courant du neutre



1. Connecter le primaire :

   — si la charge est connectée à la partie inférieure du disjoncteur, connecter le neutre de la charge à la borne H1 du TC du neutre.

   — si l'alimentation est connectée à la partie inférieure du disjoncteur, connecter le neutre de l'alimentation à la borne H1 du TC du neutre.

REMARQUE : La connexion de mise à la terre de l'appareil doit être en amont (côté ligne) du TC du neutre et une connexion au neutre doit exister entre le transformateur d’alimentation et les appareils.

2. Pour les disjoncteurs utilisant les déclencheurs Micrologic^{MC} 5.0P, 5.0H, 6.0P ou 6.0HP, connecter la borne Vn sur le transformateur de courant du neutre à la borne Vn de la borne du câblage de contrôle. (Cela est nécessaire pour permettre au déclencheur d’effectuer les mesures de tension.) Les bornes Vc et Vn sont raccordées intérieurement.

AVIS

RISQUE DE MAUVAIS FONCTIONNEMENT DU SYSTÈME DE DÉCLENCHEMENT

F1 et F2 doivent être isolées de la terre. Vérifiez tout le câblage en suivant les directives de ce bulletin.

Si ces directives ne sont pas respectées, cela peut entraîner un déclenchement intempestif pendant la fermeture.

3. Retirer le cavalier installé à l'usine reliant T1 et T2.
4. Faire passer le câble Belden® du TC du neutre aux bornes du berceau.
5. Raccorder le câble selon le schéma approprié dans la figure 63 ou 64.
6. Vérifier tout le câblage.

REMARQUE : Les circuits différentiels modifiés de défaut à la terre et les circuits de défaut à la terre par retour à la source de terre exigent l’utilisation d’un module différentiel modifié de défaut à la terre (MDFG) et des transformateurs de courant spéciaux. Au sujet du câblage des systèmes ci-dessus, voir les directives qui accompagnent le MDFG.

FRANÇAIS

Figure 63 – Schéma de câblage de disjoncteurs Masterpact NW de 800 à 4000 A, de largeur standard

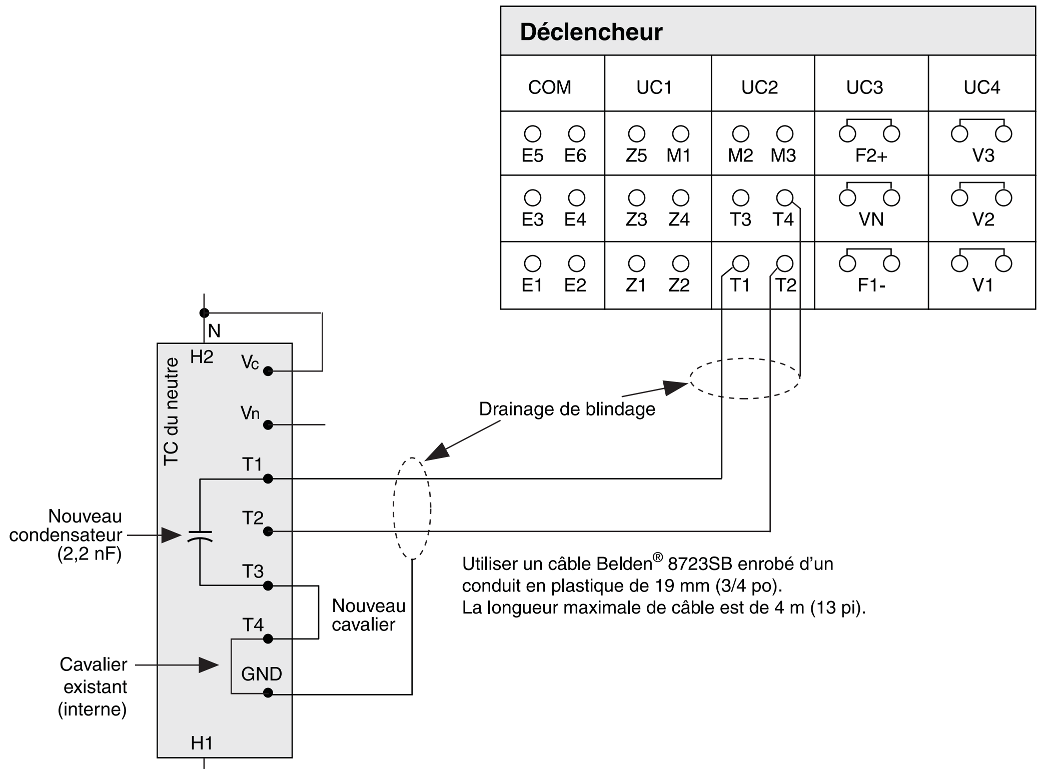
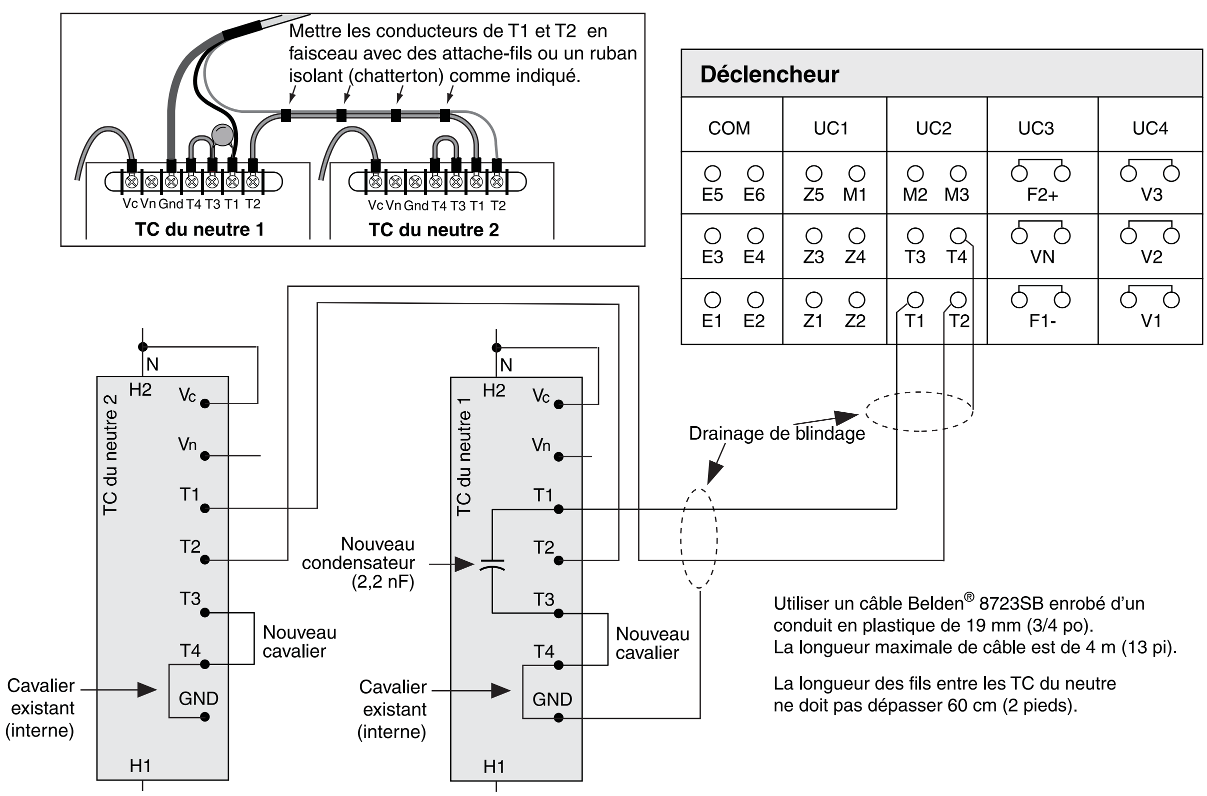


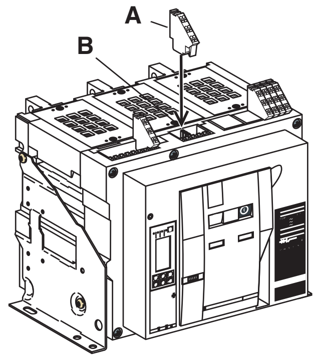
Figure 64 – Schéma de câblage de disjoncteurs Masterpact NW de 3200 à 6000 A, construction large



Câblage d’accessoires

1. Installer le connecteur-poussoir (**figure 65, A**) dans la fente correcte (**B**). (Les emplacements de connecteurs sont indiqués sur l'étiquette à côté des fentes pour les connecteurs.)

Figure 65 – Installer le connecteur poussoir

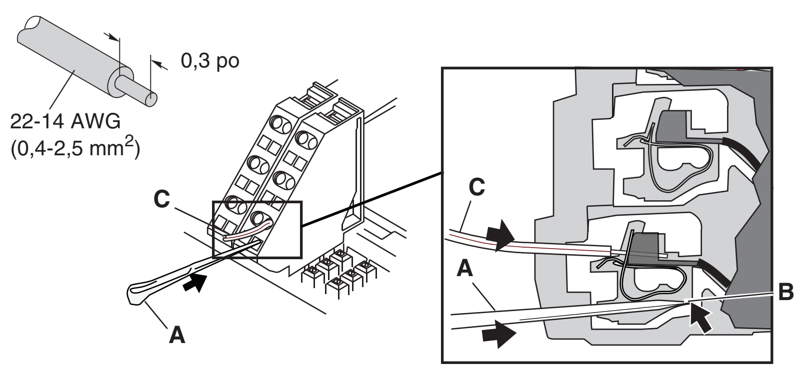


2. Introduire l’outil d’insertion de fils Wago® (**figure 66, A**, n^{o} de pièce Wago 209-129) complètement dans le connecteur (jusqu’au point **B**) et installer les fils de contrôle (**C**).

REMARQUE : Enlever le connecteur-poussoir dans l’ordre inverse de l’installation.

Voir la section 6—Fonctionnement, pour les directives de fonctionnement du disjoncteur.

Figure 66 – Installation des fils de contrôle



FRANÇAIS

Vérification de la protection d'appareils contre les défauts à la terre

Le paragraphe 230-95(c) du Code national de l'électricité (NEC; É.-U.) requiert que tous les systèmes de protection d'appareils contre les défauts à la terre soient vérifiés quand ils sont installés la première fois. Si le disjoncteur possède des équipements de protection contre les défauts à la terre, vérifier le système de protection à ce moment-là.

S'assurer que le déclencheur est sous tension. Celui-ci est sous tension si :

- le disjoncteur est fermé ou alimenté par le bas et a une tension de charge de plus de 100 V sur deux phases (déclencheurs P ou H uniquement).
- une trousse d'essais des fonctions complètes ou portative est raccordée et sous tension.
- une alimentation externe de 24 V cc est raccordée.
- un dérivateur de tension externe est installé et une tension de plus de 100 V est présente sur deux phases (déclencheurs P ou H uniquement).

S'il s'agit d'un système radial (à une seule extrémité), vérifier la protection contre les défauts à la terre en appuyant sur le bouton pousser-pour-vérifier (**figure 67, A**). Le disjoncteur se déclenchera et le voyant lumineux de défaut à la terre du déclencheur s'allumera.

Enregistrer les résultats sur le tableau 15.

Si une vérification complète du système de défaut à la terre est nécessaire, faire un essai d'injection primaire. Si le système est muni de plusieurs sources ou nécessite des raccordements sur place, utiliser un essai d'injection primaire.

Figure 67 – Vérification de la protection contre les défauts à la terre (bouton pousser-pour-vérifier)

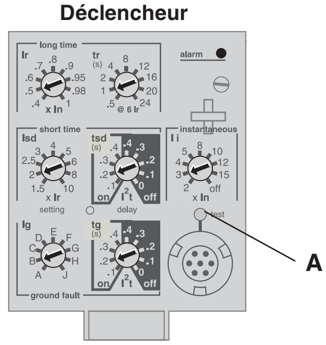


Tableau 15 – Résultats de l'essai de défauts à la terre

Date	Réglages du défaut à la terre	Résultats de l'essai	Signature

Retrait du disjoncteur

1. Couper toutes les alimentations à cet appareil avant d’y travailler.
2. Retirer le disjoncteur dans l'ordre inverse de son installation. Utiliser les méthodes de levage détaillées dans la section 2—Levage et transport.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLATS D'ARC

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E ou CSA Z462.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez toutes les alimentations à cet appareil avant d’y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

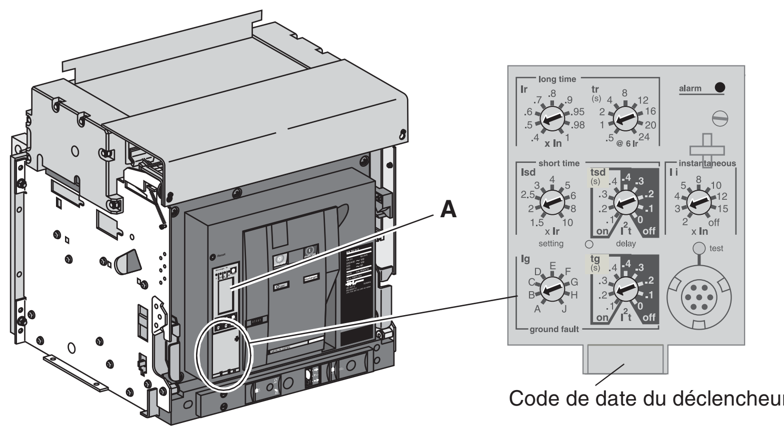
Section 5—Déclencheur

Les fonctions de protection, les fonctions de mesure et de communication sont commandées par le déclencheur Micrologic^{MC} (**figure 68, A**) installé dans le disjoncteur. Le déclencheur est remplaçable sur place pour faciliter la mise à niveau des fonctions.

Pour des renseignements complets au sujet du déclencheur, ses fonctions et le remplacement sur place, voir le guide de l'utilisateur du déclencheur que vous pouvez trouver sur le site Web de Schneider Electric^{MC}, voir la page 5.

Pour des renseignements complets au sujet des déclencheurs disponibles et de leurs fonctions, se reporter au catalogue 0613CT1001, *Disjoncteurs de puissance Masterpact NT et NW universels* sur notre site Web.

Figure 68 – Déclencheur Micrologic



Section 6—Fonctionnement

État du disjoncteur débrochable

⚠ DANGER

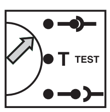
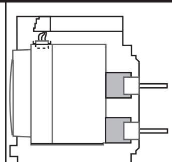
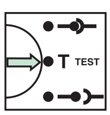
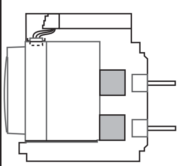
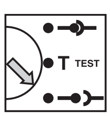
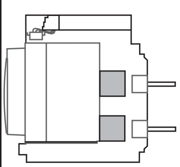
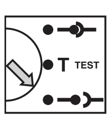
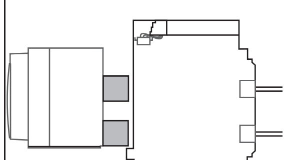
RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLATS D'ARC

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E ou CSA Z462.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

La connexion ou la déconnexion du disjoncteur débrochable requiert l’insertion de la manivelle d’embrochage (alors qu’on appuie sur le bouton Pousser pour ouvrir). Si des interverrouillages, des cadenas ou une serrure de porte ouverte sont en place, la manivelle d’embrochage ne peut pas être insérée.

Tableau 16 – Positions du disjoncteur débrochable

Indicateur de position	Position du connecteur (Écran de protection de groupes de connecteurs pas représenté.)	Connecteurs		État du disjoncteur
		Groupe de connecteurs	Secondaires (contrôle)	
Raccordé 		Engagés	Engagés	Peut être utilisé. Prêt à l’emploi.
Essai 		Désengagés	Engagés	Peut être utilisé. Peut vérifier les systèmes de fonctionnement et de commande.
Déconnecté 		Désengagés	Désengagés	Peut être utilisé. Peut être retiré du chariot.
Retirée 		Désengagés	Désengagés	Retiré du chariot.

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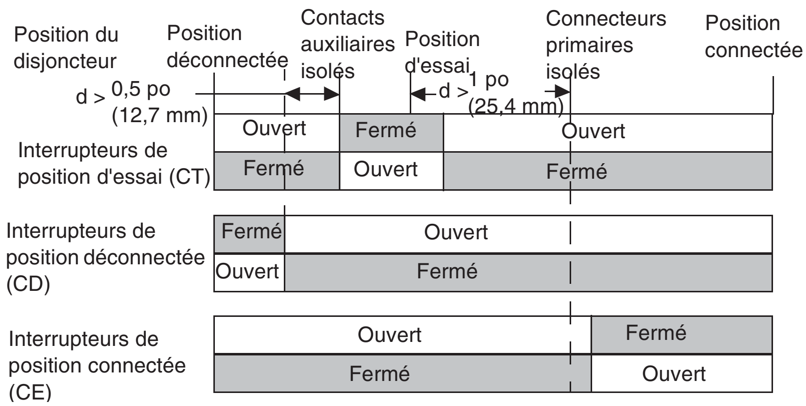
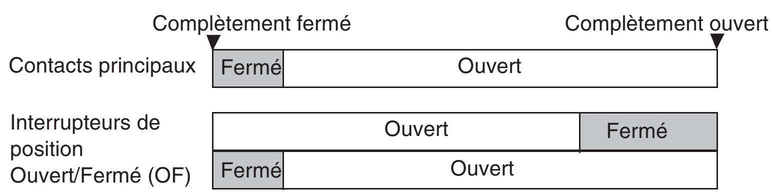
Quand la position du disjoncteur change, les contacts de position changent d'état.

Figure 69 – Fonctionnement selon la position du dispositif



Quand les contacts principaux du disjoncteur fonctionnent, les contacts auxiliaires changent de position.

Figure 70 – Fonctionnement des contacts du dispositif



Connexion du disjoncteur débrochable

AVIS

RISQUE DE DOMMAGES MATÉRIELS

- Utilisez la manivelle d'embrochage fournie pour embrocher le disjoncteur dans le berceau ou à l'extérieur de ce dernier.
- N'utilisez pas d'outils électriques pour l'embrochage.
- Ne continuez pas à tourner la manette après la parution du bouton Arrêt-dégagement.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

FRANÇAIS

⚠ DANGER

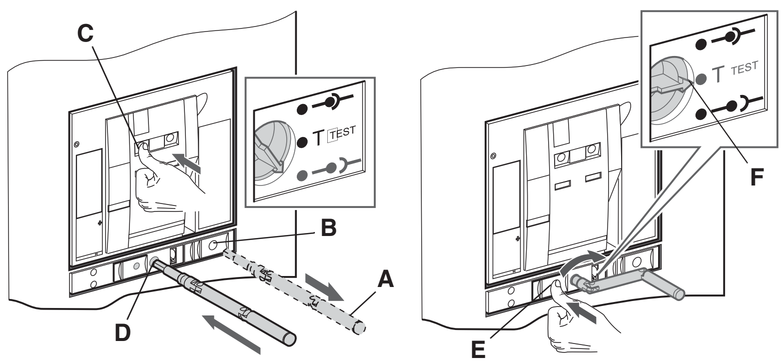
RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLATS D'ARC

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E ou CSA Z462.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

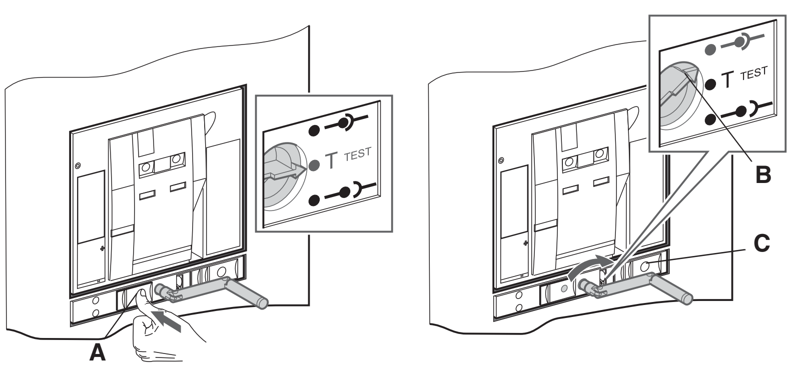
1. Débrancher la charge des sectionneurs secondaires.
2. Retirer la manivelle d'embrochage (**figure 71, A**) du trou de rangement (**B**).
3. Tout en appuyant sur le bouton « Pousser pour ouvrir » (**C**), insérer la manivelle dans la fente d'embrochage (**D**).
4. Pousser sur le bouton Arrêt-dégagement (**E**).
5. Tourner la manivelle d'embrochage dans le sens horaire jusqu'à ce que la position d'essai (**F**) soit atteinte. Le bouton Arrêt-dégagement ressortira.

Figure 71 – Embrocher le disjoncteur sur la position d'essai



6. Pousser sur le bouton Arrêt-dégagement (**figure 72, A**).
7. Tourner la manivelle d'embrochage dans le sens horaire jusqu'à ce que la position connectée (**B**) soit atteinte. Le bouton Arrêt-dégagement ressortira. Replacer la manivelle d'embrochage dans son trou de rangement (**C**).
8. Rebrancher la charge aux sectionneurs secondaires.

Figure 72 – Embrocher le disjoncteur sur la position connectée



FRANÇAIS

Déconnexion du disjoncteur débrochable

AVIS

RISQUE DE DOMMAGES MATÉRIELS

- Utilisez la manivelle d'embrochage fournie pour embrocher le disjoncteur dans le berceau ou à l'extérieur de ce dernier.
- N'utilisez pas d'outils électriques pour l'embrochage.
- Ne continuez pas à tourner la manette après la parution du bouton Arrêt-dégagement.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

⚠ DANGER

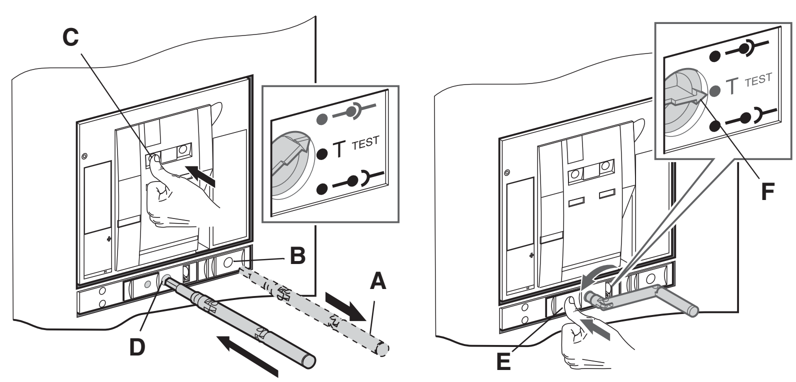
RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLATS D'ARC

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E ou CSA Z462.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

1. Débrancher la charge des sectionneurs secondaires.
2. Retirer la manivelle d'embrochage (**figure 73, A**) du trou de rangement (**B**).
3. Tout en appuyant sur le bouton « Pousser pour ouvrir » (**C**), insérer la manivelle dans la fente d'embrochage (**D**).
4. Pousser sur le bouton Arrêt-dégagement (**E**). Tourner la manivelle d'embrochage dans le sens anti-horaire jusqu'à ce que la position d'essai (**F**) soit atteinte. Le bouton Arrêt-dégagement ressortira.

Figure 73 – Embrocher le disjoncteur sur la position d'essai



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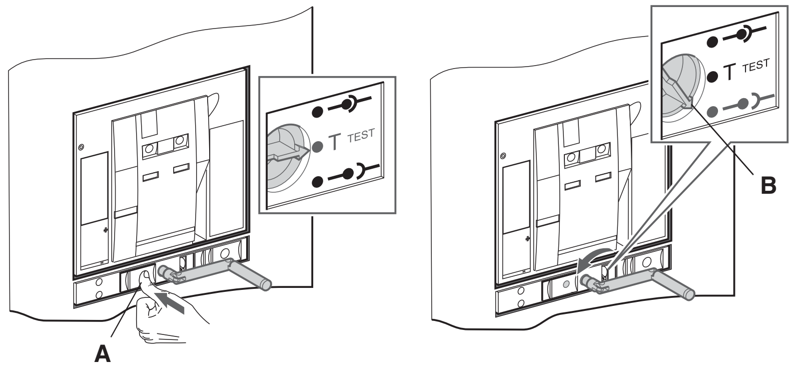
5. Pousser sur le bouton Arrêt-dégagement (**figure 74, A**).
6. Tourner la manivelle d’embrochage dans le sens anti-horaire jusqu’à ce que la position déconnectée (**F**) soit atteinte. Le bouton Arrêt-dégagement ressortira. Replacer la manivelle d’embrochage dans son trou de rangement.
7. Rebrancher la charge aux sectionneurs secondaires.

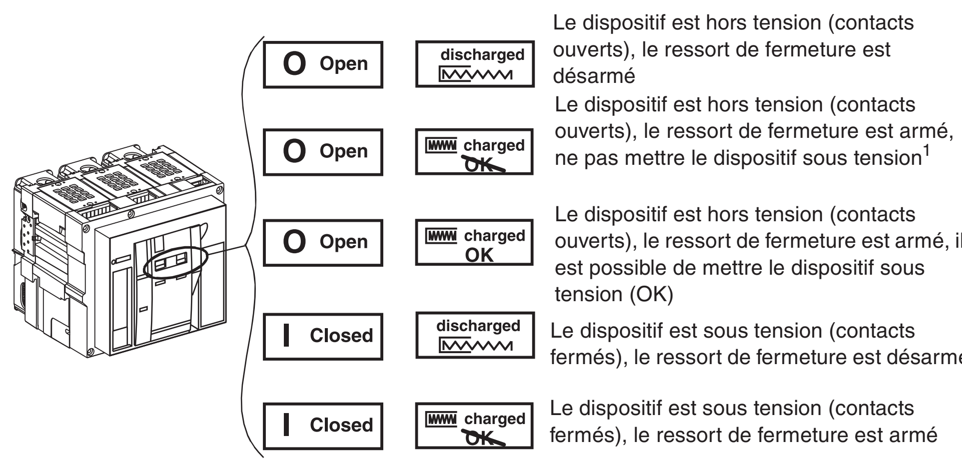
Figure 74 – Embrocher le disjoncteur sur la position déconnectée



Fonctionnement du disjoncteur

Le disjoncteur est fermé au moyen d’un mécanisme à énergie accumulée en deux étapes. Les indicateurs d’état à l’avant du disjoncteur indiquent si le disjoncteur est ouvert ou fermé et si le ressort de fermeture est chargé ou déchargé. Les ressorts d’ouverture sont armés automatiquement quand le disjoncteur se ferme.

Figure 75 – Indicateurs d’état



[1] *Ne pas mettre sous tension (not OK) sera indiqué si :
Le déclencheur shunt est mis sous tension
Le disjoncteur n'est pas en position connectée, d'essai, déconnectée ou retirée
Le déclencheur sur baisse de tension est hors tension
L'interverrouillage mécanique verrouille le mécanisme en position ouverte

FRANÇAIS

Fonction antipompage

Le disjoncteur Masterpact est conçu pour fournir mécaniquement une fonction anti-pompage. Si la bobine de la fermeture en shunt ou celle du déclencheur shunt est continuellement sous tension, ou si les deux bobines sont sous tension en même temps, le disjoncteur s'ouvrira et ne pourra pas être refermé tant que l'alimentation n'aura pas été coupée. Cela empêche le disjoncteur de passer de fermé à ouvert et inversement (action définie comme pompage).

Lorsque les caractéristiques de fonctionnement à distance sont utilisées, s'assurer que le moteur d'armement des ressorts (MCH) bénéficie d'un minimum de quatre secondes pour tendre complètement les ressorts de fermeture du disjoncteur avant d'actionner la bobine de fermeture en shunt (XF). L'interrupteur prêt à fermer (PF) peut être raccordé en série avec la bobine de fermeture en shunt (XF) pour empêcher une fermeture prématurée.

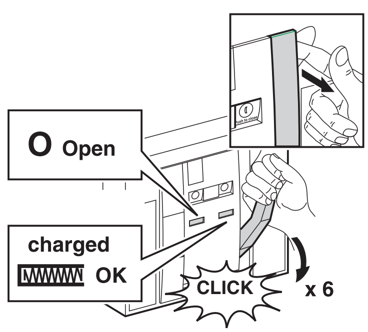
Armement du ressort de fermeture

Pour fermer le disjoncteur, le ressort de fermeture doit être armé avec suffisamment d'énergie pour se fermer.

- Armement manuel : Utiliser la poignée d'armement pour armer le ressort de fermeture.
- Armement automatique : Si le moteur d'armement de ressort MCH optionnel est installé, le ressort est automatiquement armé après la fermeture.

REMARQUE : Le ressort de fermeture du disjoncteur débrochable se désarme automatiquement lorsque le disjoncteur passe de la position déconnectée à la position retirée.

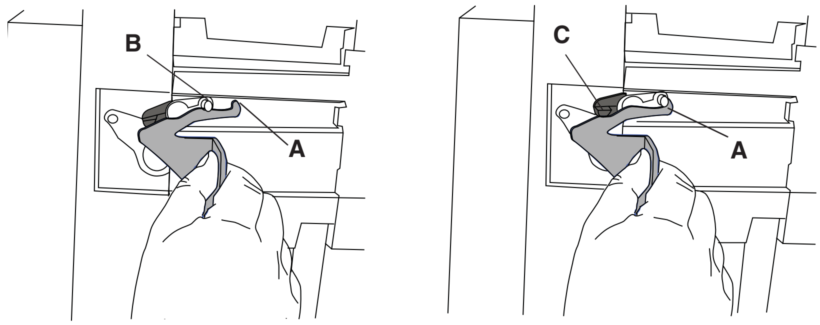
Figure 76 – Armement manuel du ressort



REMARQUE : Pour fermer le disjoncteur débrochable alors qu'il n'est pas installé dans le berceau, l'interverrouillage du berceau doit être neutralisé avant de pouvoir armer le ressort d'armement du disjoncteur. Un outil de neutralisation de l'interverrouillage du berceau est expédié avec chaque disjoncteur. Pour l'installer :

1. Glisser l'outil de neutralisation (**figure 77, A**) de l'interverrouillage dans la rainure sous le levier d'interverrouillage (**B**) sur le côté droit du disjoncteur.
2. Glisser l'outil en direction de l'avant du disjoncteur et verrouiller en place sous l'arbre (**C**) de l'interverrouillage du berceau.

Figure 77 – Neutralisation de l'interverrouillage du berceau



Fermer le disjoncteur

Pour fermer le disjoncteur, les conditions suivantes doivent être réunies :

- Le dispositif est ouvert (O).
- Le ressort d'armement est chargé.
- OK est affiché.

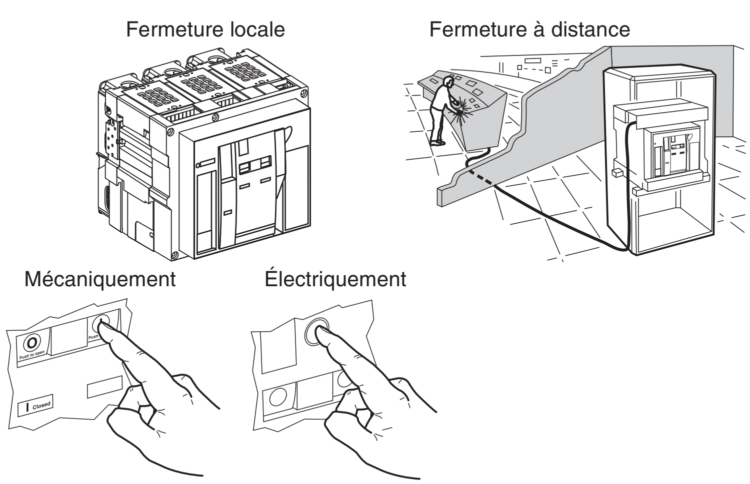
REMARQUE : Le disjoncteur ne peut pas être fermé lorsqu'une commande d'ouverture a été reçue. Si le symbole « Not OK » est affiché, une commande d'ouverture a été reçue (électriquement ou manuellement) et doit être terminée avant que le symbole « OK » ne soit affiché.

Si les conditions ci-dessus sont réunies, fermer le dispositif :

- Mécaniquement : Appuyer sur le bouton Pousser pour fermer du disjoncteur.
- Électriquement : Si la fermeture en shunt (XF) optionnelle est installée, appuyer sur le bouton-poussoir de fermeture électrique (BPFE) optionnel du disjoncteur ou un bouton-poussoir à distance du dispositif.

  Pour de plus amples renseignements, se reporter au guide de l'utilisateur du disjoncteur sur notre site Web (pour plus d'informations sur le site Web, voir la page 5).

Figure 78 – Fermer le disjoncteur



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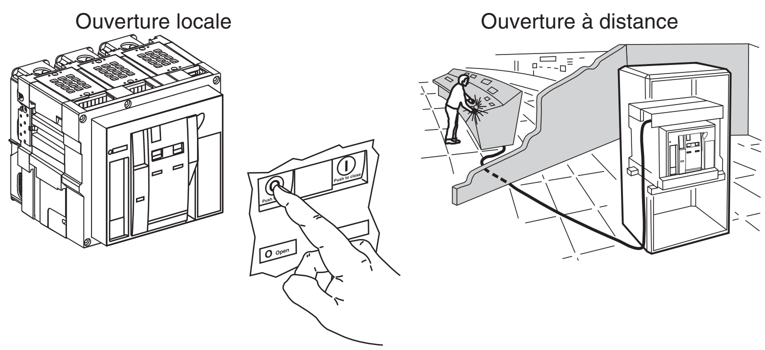
Ouvrir le disjoncteur

- Mécaniquement : Appuyer sur le bouton Pousser pour ouvrir du disjoncteur.
- Électriquement : Le fonctionnement à distance peut être effectuée au moyen de déclencheurs shunt (MX1 et MX2) optionnels, de déclencheurs sur baisse de tension (MN) ou de module de temporisation pour le déclencheur sur baisse de tension (MNR).

  Pour de plus amples renseignements, se reporter au guide de l'utilisateur du disjoncteur sur notre site Web (pour plus d'informations sur le site Web, voir la page 5).

Figure 79 – Couper l'alimentation du disjoncteur



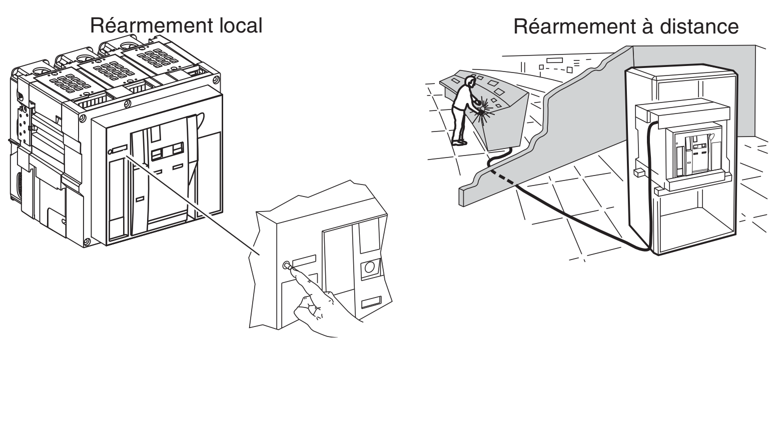
Réarmement du disjoncteur

Après un déclenchement sur un défaut, le disjoncteur doit être réarmé.

- Mécaniquement : Appuyer sur le bouton de réarmement (Reset) situé au-dessus du déclencheur.

  Électriquement : Utiliser l'option de réarmement électrique (RES) après un défaut électrique. Pour de plus amples renseignements, se reporter au guide de l'utilisateur du disjoncteur sur notre site Web (pour plus d'informations sur le site Web, voir la page 5).

Figure 80 – Réarmement du disjoncteur



Protection du neutre

La protection du neutre protège les conducteurs du neutre contre la surchauffe.

- Pour un disjoncteur tripolaire avec un déclencheur P ou H, la protection du neutre est possible si un transformateur de courant de neutre est utilisé.
  - — Régler le neutre à l'aide du terminal d’exploitation du déclencheur P ou H.
  - — Réglages possibles : OFF, N/2, N, ou 1.6N.
  - — Le réglage d’usine est OFF.

La protection du neutre surdimensionné (1.6N) exige l’utilisation d’un transformateur de courant de neutre surdimensionné approprié. Voir la liste de prix pour le bon transformateur de courant neutre.

AVIS

RISQUE DE DOMMAGES MATÉRIELS

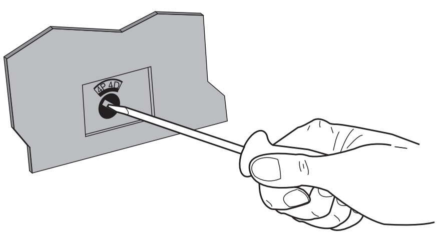
Si l'interrupteur du pôle du neutre d'un disjoncteur à quatre pôles est réglé à 4P3D, le courant du neutre ne doit pas dépasser le courant nominal du disjoncteur.

Pour un disjoncteur tripolaire avec protection de neutre surdimensionné (1.6N), sélectionnez un transformateur de courant de neutre surdimensionné approprié.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

- Pour un disjoncteur à 4 pôles, régler le type de système à l'aide du sélecteur du neutre du disjoncteur (voir la figure 81).
  - — Pour un déclencheur P ou H, effectuer les ajustements méticuleux à l'aide du terminal de programmation du déclencheur, avec le réglage du cadran du disjoncteur donnant la limite supérieure pour l'ajustement.
  - — Le réglage d’usine est 4P 4D.

Figure 81 – Sélecteur du neutre du disjoncteur à 4 pôles



Réglages de la protection du neutre pour un disjoncteur à 4 pôles

Sélecteur du disjoncteur	Réglage du terminal de programmation du déclencheur P ou H
4P 3D	Off, N/2, N
3P N/2	N/2
4P 4D	N/2, N

- Le type de conducteur de protection du neutre offre quatre réglages possibles :
  - — Off (4P 3D)—La protection du neutre est désactivée.
  - — N/2 (3P N/2)—La capacité des conducteurs du neutre est la moitié de celle des conducteurs de ligne.
  - — N (4P 4D)—La capacité des conducteurs du neutre est la même que celle des conducteurs de ligne.
  - — 1.6N—La capacité des conducteurs du neutre est de 1,6 fois que celle des conducteurs de ligne. (disjoncteur 3P avec déclencheur P ou H uniquement.)

Tableau 17 – Type de conducteurs du déclencheur Micrologic[MC]

Réglage	Enclenchement de longue durée		Enclenchement de courte durée		Instantané		Enclenchement sur défaut à la terre	
	Déclen-cheur	Neutre	Déclen-cheur	Neutre	Déclen-cheur	Neutre	Déclen-cheur	Neutre
OFF	Ir	Aucun	Isd	Aucun	Ii	Aucun	Ig	Aucun
N/2	Ir	1/2 Ir	Isd	1/2 Isd	Ii	Ii	Ig	Ig
N	Ir	Ir	Isd	Isd	Ii	Ii	Ig	Ig
1.6N	Ir	1.6 x Ir	Isd	1.6 x Isd*	Ii	Ii	Ig	Ig

*Pour limiter la gamme, limité à 10 x In

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Section 7—Verrous, dispositifs d'interverrouillage et accessoires

Un certain nombre de dispositifs de verrouillage et d'interverrouillage et accessoires optionnels existe pour le berceau et le disjoncteur Masterpact. Le fonctionnement de ces dispositifs est décrit dans les directives d'utilisation 0613IB1203 : *Disjoncteur Masterpact^{MC} NW de puissance à basse tension / à boîtier isolé avec technologie ArcBlok—Guide de l'utilisateur* disponible sur notre site Web (pour plus d'informations sur le site Web, voir la page 5).

Pour une liste complète des accessoires, verrous et dispositifs d'interverrouillage disponibles, se reporter au catalogue 0613CT1001, Disjoncteurs de puissance Masterpact NT et NW universels sur notre site Web. Pour de plus amples renseignements, se reporter au guide de l'utilisateur du disjoncteur sur notre site Web (pour plus d'informations sur le site Web, voir la page *5*).

Pour obtenir des directives d'installation détaillées sur les verrous, dispositifs d'interverrouillage et accessoires installables sur place, se reporter aux directives d'installation accompagnant les dispositifs.

Les accessoires peuvent être installés dans un disjoncteur installé ou dans un berceau installé.

Installation des accessoires du disjoncteur

Placer le disjoncteur en position déconnectée. Voir Déconnexion du disjoncteur, page 70, pour les directives de déconnexion du disjoncteur.

Installer les accessoires du disjoncteur, voir la section « Installation des accessoires » à la page 42.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLATS D'ARC

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E ou CSA Z462.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

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Installation des accessoires du berceau

1. Couper toutes les alimentations à cet appareil avant d’y travailler.
2. Enlever le disjoncteur du berceau. Voir « Retrait du disjoncteur » à la page 46, pour les directives d’enlèvement du disjoncteur.
3. Installer l'accessoire comme indiqué dans les directives fournies avec l'accessoire.
4. Replacer le disjoncteur dans le berceau. Voir « Installation du disjoncteur » à la page 38, pour les directives d’installation du disjoncteur.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLATS D'ARC

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E ou CSA Z462.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez toutes les alimentations à cet appareil avant d’y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

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Section 8—Essai, entretien et dépannage

Pour obtenir des informations sur les essais sur place, l'entretien et le dépannage voir les directives 0613IB1201, Guide d'essai sur place et d'entretien pour disjoncteurs Masterpact NT et NW, qui se trouve sur notre site Web :

http://www.schneider-electric.com

Pour une assistance concernant les applications, appeler le 1-888-778-2733 (É.-U.).

Tableau 18 – Guide de dépannage

Problème	Causes probables	Solutions
Le disjoncteur ne peut pas être fermé localement ou à distance.	Le disjoncteur est verrouillé en position de marche (I/ON) avec un cadenas ou une serrure.	• Désactiver la fonction de verrouillage.
	Disjoncteur interverrouillé mécaniquement dans un système de transfert de source.	• Vérifier la position de l'autre disjoncteur dans le système de transfert de source. • Modifier la situation pour libérer l'interverrouillage.
	Disjoncteur pas complètement raccordé.	• Achever l'embrochage (le raccordement) des disjoncteurs.
	Le bouton de réarmement indiquant qu'un déclenchement sur défaut n'a pas été remis à zéro.	• Corriger le défaut. • Appuyer sur le bouton de réarmement sur la face avant du disjoncteur.
	Le mécanisme d'énergie accumulée n'est pas armé.	• Armer le mécanisme manuellement. • S'il est muni d'un moteur d'armement du ressort MCH, vérifier la fourniture d'alimentation du moteur. Si le problème persiste, remplacer le moteur d'armement du ressort.
	Le déclencheur d'ouverture shunt MX (déclencheur shunt) est continuellement alimenté.	• Il y a une commande d'ouverture. Déterminer l'origine de la commande. La commande doit être annulée avant de pouvoir fermer le disjoncteur.
	Déclencheur sur baisse de tension (UVR) MN n'est pas alimenté.	• Il n'y a pas de commande d'ouverture. Déterminer l'origine de la commande. • Vérifier la tension et le circuit d'alimentation (V>0,84 Vn). • Si le problème persiste, remplacer le déclencheur.
	Le déclencheur de fermeture XF (fermeture shunt) est continuellement alimenté, mais le disjoncteur n'est pas prêt à fermer (XF non câblé en série avec un contact PF).	• Ouvrir l'alimentation vers le déclencheur de fermeture XF, puis envoyer de nouveau la commande de fermeture à l'aide du XF, mais seulement si le disjoncteur est prêt à fermer.
	Le disjoncteur utilise un déclencheur Micrologic P ou H, qui a une commande de déclenchement permanente avec protection de tension minimale et de fréquence minimale en mode de déclenchement, le déclencheur étant sous tension.	• Désactiver ces fonctions de protection sur le déclencheur Micrologic P ou H.
Le disjoncteur ne peut pas se fermer à distance mais peut être ouvert localement à l'aide du bouton-poussoir de fermeture.	Commande de fermeture non exécutée par le déclencheur de fermeture XF (fermeture shunt)	• Vérifier la tension sur le circuit d'alimentation (0,85–1,1 Vn). Si le problème persiste, remplacer le déclencheur XF.
Le disjoncteur ne peut pas s'ouvrir à distance mais peut être ouvert localement.	Commande de fermeture non exécutée par le déclencheur d'ouverture MX (déclencheur shunt)	• Vérifier la tension sur le circuit d'alimentation (0,7–1,1 Vn). Si le problème persiste, remplacer le déclencheur XF.
	Commande d'ouverture non exécutée par le déclencheur sur baisse de tension (UVR) MN.	• Chute de tension insuffisante ou tension résiduelle (> 0,35Vn) aux bornes du déclencheur sur baisse de tension. Si le problème persiste, remplacer le déclencheur MN.

Tableau 18 – Guide de dépannage

Problème	Causes probables	Solutions
Le disjoncteur ne peut pas être ouvert localement.	Mauvais fonctionnement du mécanisme de fonctionnement ou contacts endommagés	• Contacter un centre de services Schneider Electric
Le disjoncteur peut être réarmé localement mais pas à distance.	Tension insuffisante pour le moteur d'armement du ressort MCH.	• Vérifier la tension et le circuit d'alimentation (0,7–1,1 Vn). • Si le problème persiste, remplacer le MCH.
Déclenchement inopiné sans activation du bouton de réarmement signalant un défaut.	Tension d'alimentation du déclencheur sur baisse de tension (UVR) MN trop basse.	• Vérifier la tension sur le circuit d'alimentation (V>0,58 Vn).
	Commande de coupure de charge envoyée au déclencheur d'ouverture MX (déclencheur shunt).	• Vérifier la charge globale sur le système de distribution. • Si nécessaire, modifier les réglages des dispositifs de l'installation.
	Commande d'ouverture inutile provenant du déclencheur d'ouverture MX (déclencheur shunt)	• Déterminer l'origine de la commande.
Déclenchement inopiné avec activation du bouton de réarmement signalant un déclenchement sur défaut.	Un défaut est présent : • surcharge • défaut de terre (défaut de m.à.l.t.) • Court-circuit détecté par le déclencheur.	• Déterminer et corriger la cause du défaut. • Vérifier l'état du disjoncteur avant de le remettre en service.
Ouverture instantanée après chaque tentative de fermeture du disjoncteur avec activation du bouton de réarmement signalant un déclenchement sur défaut.	Mémoire thermique	• Voir le guide de l'utilisateur du déclencheur • Appuyer sur le bouton de réarmement.
	Surintensité transitoire lors de la fermeture	• Modifier les réglages du système de distribution ou du déclencheur. • Vérifier l'état du disjoncteur avant de le remettre en service. • Appuyer sur le bouton de réarmement.
	Fermeture sur court-circuit	• Corriger le défaut • Vérifier l'état du disjoncteur avant de le remettre en service. • Appuyer sur le bouton de réarmement.
Déclenchement intempestif du disjoncteur avec activation du bouton de réarmement signalant un déclenchement sur défaut.	Le bouton de réarmement n'est pas complètement enfoncé.	• Appuyer à fond sur le bouton de réarmement.
Impossible d'insérer la manivelle en position connectée, d'essai ou déconnectée.	Un cadenas ou une serrure est présent sur le berceau ou un interverrouillage de porte est présent.	• Désactiver la fonction de verrouillage
Impossible de tourner la manivelle.	Il n'a pas été appuyé sur le bouton de réarmement.	• Appuyer sur le bouton de réarmement tout en tournant la manivelle d'embrochage.
Impossible de retirer le disjoncteur du berceau.	Le disjoncteur n'est pas en position déconnectée.	• Tourner la manivelle d'embrochage jusqu'à ce que le disjoncteur soit en position déconnectée et le bouton de réarmement sorti.
	Les rails ne sont pas complètement sortis.	• Tirer les rails à fond.
	La manivelle d'embrochage n'a pas été retirée du mécanisme d'embrochage.	• Enlever et ranger la manivelle d'embrochage.
Le disjoncteur ne peut pas être embroché (placé en position connectée).	Une protection mal assortie du berceau/disjoncteur (manipulation de cellules) empêche l'embrochage.	• S'assurer que le berceau correspond au disjoncteur.
	Les groupes de connecteurs de déconnexion des contacts sont incorrectement positionnés.	• Repositionner les groupes de connecteurs.
	Le berceau est verrouillé en position déconnectée	• Désactiver la fonction de verrouillage du berceau.
	Il n'a pas été appuyé sur le bouton de réarmement, empêchant la rotation de la manivelle.	• Appuyer sur le bouton de réarmement tout en tournant la manivelle d'embrochage.
	Le disjoncteur n'a pas été suffisamment inséré dans le berceau.	• Insérer le disjoncteur complètement de sorte qu'il soit engagé dans le mécanisme d'embrochage.

Tableau 18 – Guide de dépannage

Problème	Causes probables	Solutions
Le disjoncteur ne peut pas être verrouillé en position déconnectée.	Le disjoncteur n'est pas à la position correcte.	• Vérifier la position du disjoncteur en s'assurant que le bouton de réarmement soit dégagé.
	La manivelle d'embrochage n'a pas été retirée du mécanisme d'embrochage.	• Enlever et ranger la manivelle d'embrochage.
Le disjoncteur ne peut pas être verrouillé en position connectée ou d'essai.	S'assurer que le verrouillage dans n'importe quelle position est activé.	• Contacter un centre de services Schneider Electric.
	Le disjoncteur n'est pas à la position correcte.	• Vérifier la position du disjoncteur en s'assurant que le bouton de réarmement soit dégagé.
	La manivelle d'embrochage n'a pas été retirée du mécanisme d'embrochage.	• Enlever et ranger la manivelle d'embrochage.
La manivelle ne peut pas être insérée pour connecter ou déconnecter le disjoncteur.	Les rails ne sont pas complètement en place.	• Appuyer à fond sur les rails.
Le rail de droite du berceau ou du disjoncteur ne peut pas être débroché.	La manivelle d'embrochage n'a pas été retirée du mécanisme d'embrochage.	• Enlever et ranger la manivelle d'embrochage.

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Du fait que les normes, caractéristiques et conceptions peuvent changer, demander confirmation que l'information contenue dans cette publication est à jour.

HRB28361, Rév. 02, 02/2015
Remplace HRB28361 05/2014

Masterpact™ NW Low-Voltage Power/Insulated Case Circuit Breaker Installation
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Installation du disjoncteur Masterpact^{MC} NW de puissance à basse tension / à boîtier isolé

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HRB28361 Rev. 02, 02/2015
Remplace HRB28361 05/2014

Instruction Bulletin

ECN 733C Replaces 48049-251-01 03/2004

M-frame Circuit Breakers

Retain for future use.

NECESSARY TOOLS

Screwdriver, Pozidriv® #2 or 3, or slotted

Socket Wrench, 7 mm internal hex

Screwdriver, long-shanked slotted

Torque Wrench, 5/16 in. or 8 mm

INSTALL CIRCUIT BREAKER

1. Turn off all power supplying this equipment before working on or inside equipment.
2. Make sure circuit breaker is in tripped or off position

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices.See NFPA 70E.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

Individually-mounted Circuit Breaker Installation

⚠ DANGER

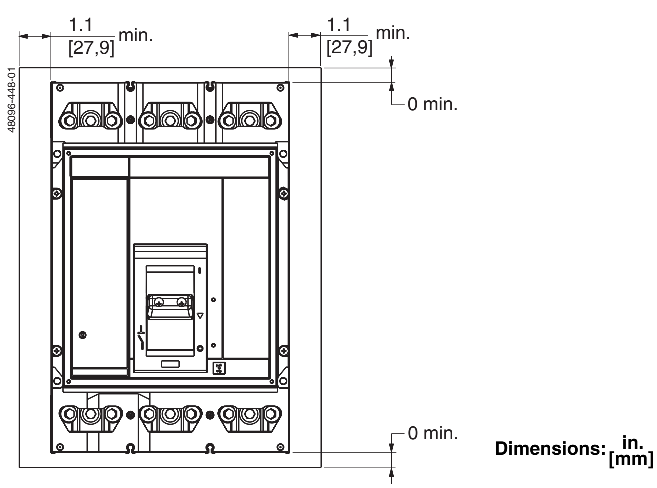
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Install circuit breaker so minimum clearance distance to grounded metal is maintained.

Failure to follow this instruction will result in death or serious injury.

3. Check clearances between circuit breaker and closest grounded metal. (Minimum enclosure dimensions are given in Table 5.)

Figure 1: Minimum Clearance to Metal Requirement

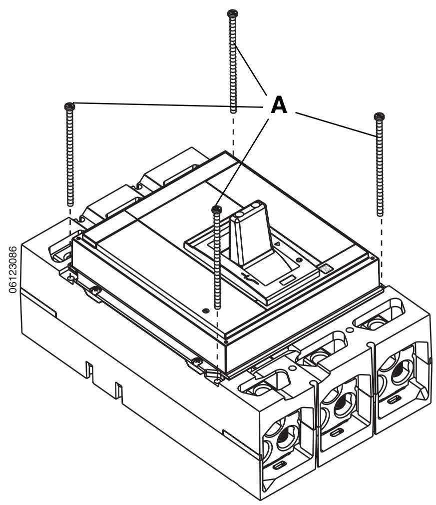


ENGLISH

4. Prepare enclosure for circuit breaker (See Figure 18 for mounting hole and cover cutout dimensions).
   — Drill mounting holes in mounting surface. Tap holes for 10-32 threads.
   — Cut opening in cover for circuit breaker handle, handle escutcheon, accessory cover, or accessory cover escutcheon.

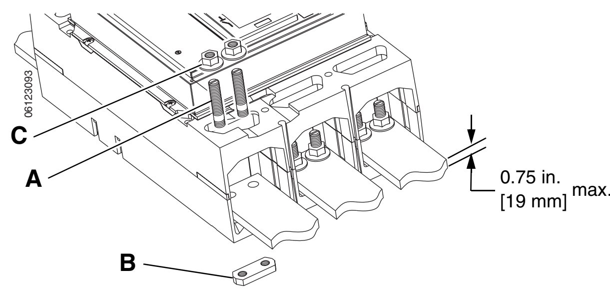
5. Mount circuit breaker using four 10-32 x 4.5 in. screws (A, provided). Torque screws to 36 lb-in (4 N•m)

Figure 2: Mount Circuit Breaker



6. For bus-connected circuit breakers, bolt bus to circuit breaker by inserting bolt (A, provided) through holes in bus into circuit breaker nut plate (B). Secure bus with nut (C, provided). Torque nuts to 250 in-lb (28 N•m)

Figure 3: Install Bus



I-Line® Circuit Breaker Installation

1. Place circuit breaker in the tripped or off position.

CAUTION

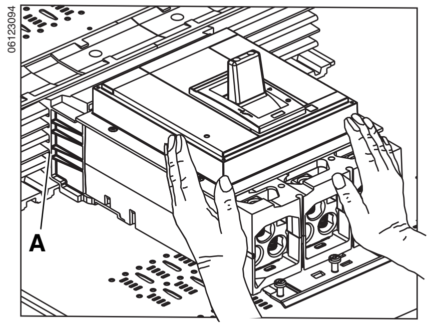
HAZARD OF EQUIPMENT DAMAGE

- Do not adjust jaws.
- Do not remove joint compound.
- If necessary, use Square D joint compound PJC7201.

Failure to follow this instruction can result in equipment damage.

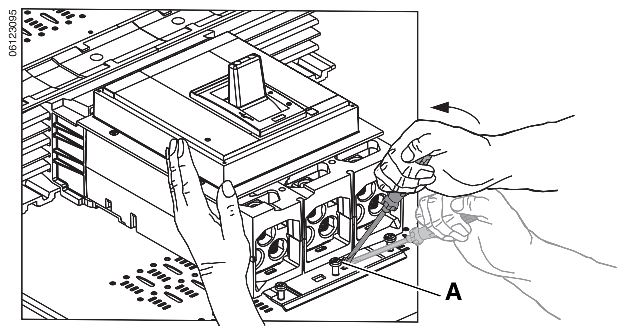
2. Place circuit breaker on I-Line pan with jaws (A) pushed against bus

Figure 4: Place Circuit Breaker on Pan



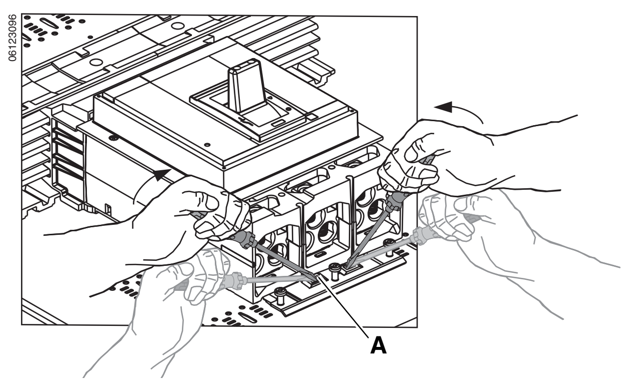
3. Insert long-shanked slotted screwdriver (A) into slot. Rack circuit breaker onto bus.

Figure 5: Start Racking Circuit Breaker onto Bus



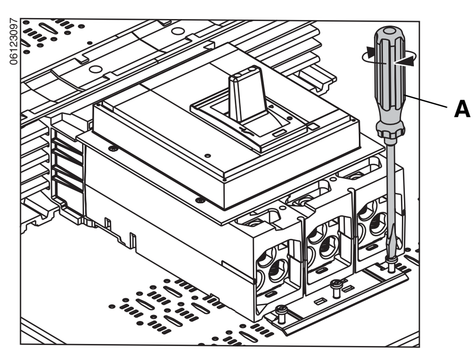
4. Insert second screwdriver (A) into bottom slot. Rack circuit breaker further onto bus, using alternate screwdrivers until circuit breaker jaws completely engage bus bars and mounting screws align with teardrop opening in pan.

Figure 6: Rack Circuit Breaker Completely onto Bus



5. Tighten all mounting bracket screws (A) firmly without bending mounting bracket.

Figure 7: Tighten Mounting Bracket Screws



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INSTALL CABLE

Square conductor ends and preform conductors to final configuration. Using a proper insulation stripping tool, strip conductor ends as recommended in Table 1. Do not nick strands.

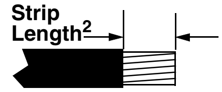
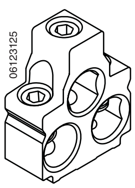
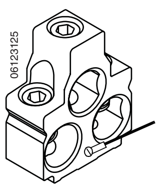
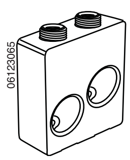
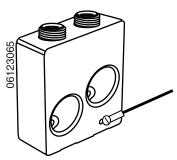
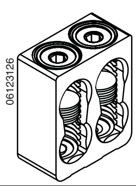
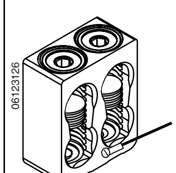
CAUTION

HAZARD OF FALSE TORQUE INDICATION

Do not allow conductor strands to interfere with threads of wire binding screw.

Failure to follow this instruction will result in equipment damage.

Table 1: Circuit Breaker Lug Information

Lug	Lug with Optional Control Wire Installed	Catalog Number	Conductor				Screw Torque	
			Type	Size	Qty.	Strip Length[2] 	Wire Binding Screw	Control WIre Screw
		AL800M23K[1]	Al/Cu	3/0–500 kcmil (95–240 mm^2)	3	1.0 in. (25 mm)	442.5 lb-in (50 N•m)	9–12 lb-in (1–1.3 N•m)
		CU800M23K	Cu					
		AL800P6K[1]	Al/Cu	3/0–600 kcmil (95–300 mm^2)	2	1.2 in. (30 mm)	442.5 lb-in (50 N•m)	9–12 lb-in (1–1.3 N•m)
		AL1200P24K[1]	Al/Cu	3/0–500 kcmil (95–240 mm^2)	4	1.2 in. (30 mm)	442.5 lb-in (50 N•m)	9–12 lb-in (1–1.3 N•m)
		CU1200P24K	Cu					

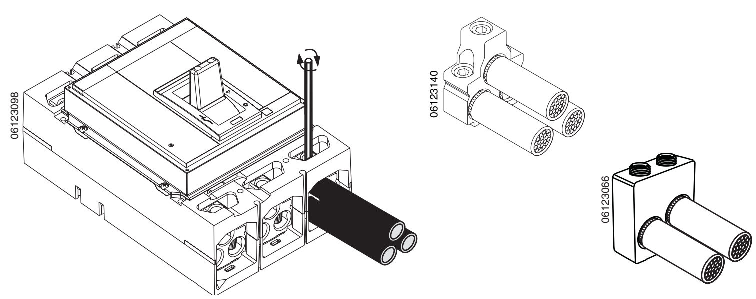
1 For version with tapped hole for control wire add a T before the K to the catalog number (i.e. AL800M23TK).
2 Conductors must be cut square for secure termination.

AL800M23K and CU800M23K and AL800P6K Lug Kits

NOTE: For unused lug holes, screw wire binding screw down until seated against bottom of lug hole.

1. For factory-installed lugs, install cables in lug and torque wire binding screw as recommended on faceplate and Table 1.
2. For field-installable lug kits, see instruction bulletin shipped with kit.

Figure 8: AL800M23K, CU800M23K and AL800P6K Lug Cable Installation



AL1200P24K and CU1200P24K Lug Kits

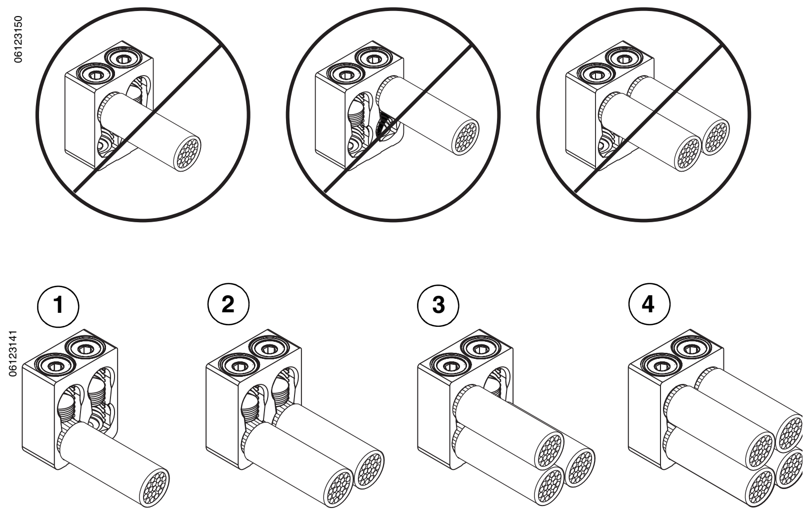
For factory-installed lugs, install cable in order listed and torque wire binding screw as recommended on the faceplate and Table 1.

NOTE: Install bottom cables first. Bottom wire binding screws must be fully tightened before installing top cables. Remove foam spacer before installing cable. If not using all lug holes, use bottom holes first and seat screws for unused lug holes by screwing wire binding screws down until seated.

1. Install left bottom cable and torque wire binding screw.
2. Install right bottom cable and torque wire binding screw.
3. Install left top cable and torque wire binding screw.
4. Install right top cable and torque wire binding screw.

For field-installable lug kits, see instruction bulletin shipped with kit.

Figure 9: AL1200P24K and CU1200P24K Lug Cable Installation



RESTRAIN CABLE

CAUTION

HAZARD OF CONDUCTOR MOVEMENT UNDER SHORT-CIRCUIT CONDITIONS

Restrain circuit breaker conductors as required in Table 2.

Failure to follow this instruction will result in equipment damage.

Table 2: Cable Restraint Recommendations

Frame Size	Available Fault Current	Conductors Used	Unsupported Cable Length	Restraint Recommended
800 A	≤ 65 kA	Three 300 kcmil or larger	≤ 11 in. (279 mm)	No*
	All other cases			Yes

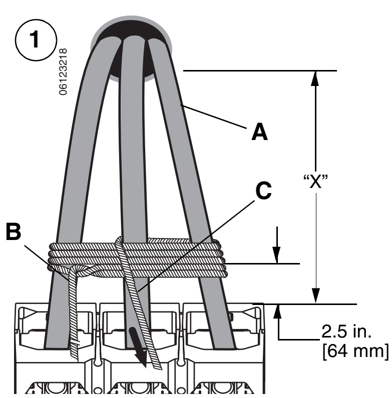
* All requirements must be met for restraint not to be required.

Restrain circuit breaker conductors as indicated in Table 2.

Wrap conductors using 30 ft. (9 m) of 3/8 in. (9.5 mm) sisal rope or equivalent.

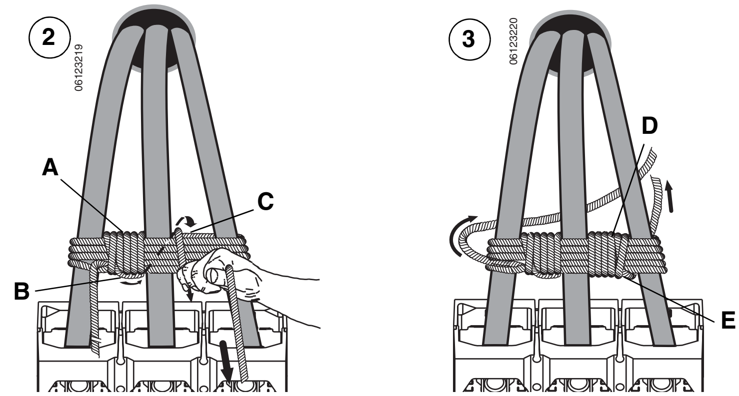
1. Begin wrapping conductors (A) 2.5 in. (64 mm) above circuit breaker. Wrap conductors five times, leaving 12 plus “X” ft. (4 + “X” m) of excess rope at the first end (B). Pull rope (C) taut.

Figure 10: Wrap Conductors



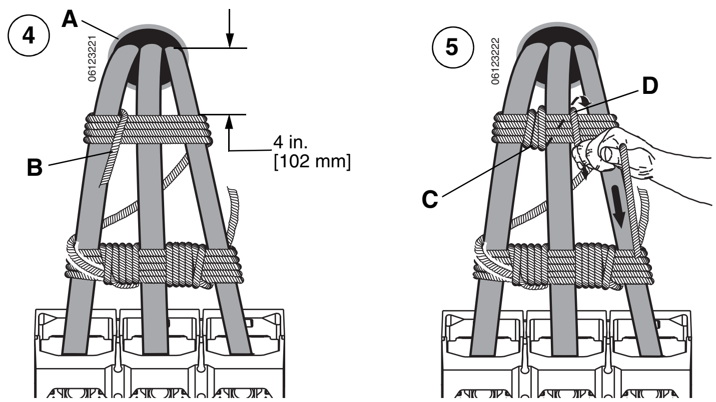
2. Wrap rope (A) several times until space between first two sets of conductors is completely filled. Weave final rope loop underneath previous loop (B). Bring rope (C) through right-hand space. Pull rope taut.
3. Wrap rope (D) several times until space between second and third set of conductors is completely filled. Weave final rope loop (E) underneath previous loop as shown. Pull rope taut.

Figure 11: Wrap Rope



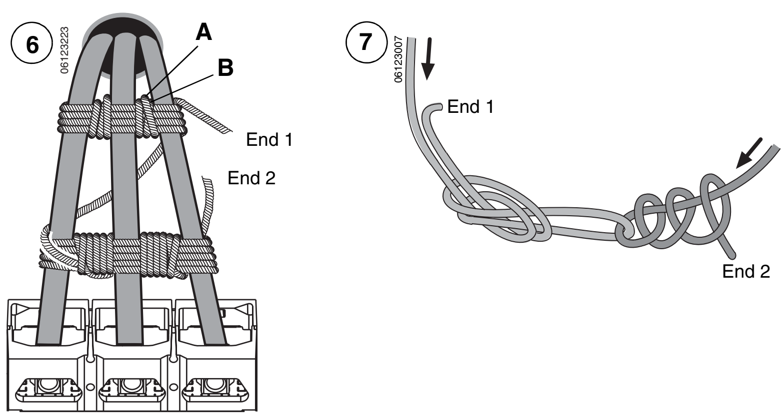
4. Wrap rope four times around conductors 4 in. (102 mm) below where conductors exit enclosure (A). Pull rope (B) taut.
5. Wrap rope (C) several times until space between first two sets of conductors is completely filled. Bring rope (D) through right-hand space. Pull rope taut.

Figure 12: Wrap Conductors



6. Wrap rope (A) several times until space between second and third set of conductors is completely filled. Weave final rope loop (B) underneath previous loop as shown. Pull rope taut.
7. Tie rope End 1 and End 2 together as shown. Rope must be taut. Cut off excess rope and tape ends to prevent fraying.

Figure 13: Wrap Rope



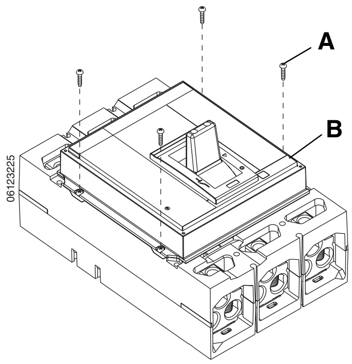
INSTALL ACCESSORIES

This subsection applies if circuit breaker has factory-installed or field-installed accessories.

Remove Accessory Cover

1. Make sure circuit breaker is in tripped or off position.
2. Loosen four accessory cover screws (A) and remove accessory cover (B).

Figure 14: Remove Accessory Cover



Install Accessories and Control Wiring

⚠ WARNING

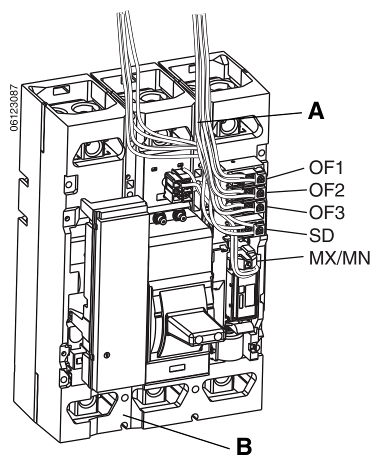
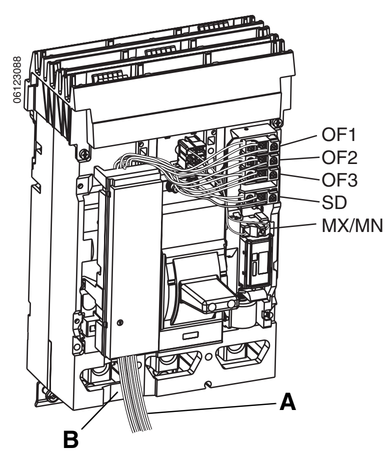
HAZARD OF SHOCK, EXPLOSION OR EQUIPMENT DAMAGE

Wires (A) must be routed as shown. Do not route wires below handle or around outside rim of circuit breaker. Wires exiting from off end of circuit breaker must be routed beneath trip unit (see label B).

Failure to follow this instruction can result in injury or equipment damage.

1. Install field-installable circuit breaker accessories as instructed in the instructions packed with each accessory.
2. Install control wiring (A) to accessories. Torque terminal screws to 10 lb-in (1.2 N•m).

Table 3: Accessory Control Wiring

Individually-mounted Circuit Breaker	I-Line Circuit Breaker
	

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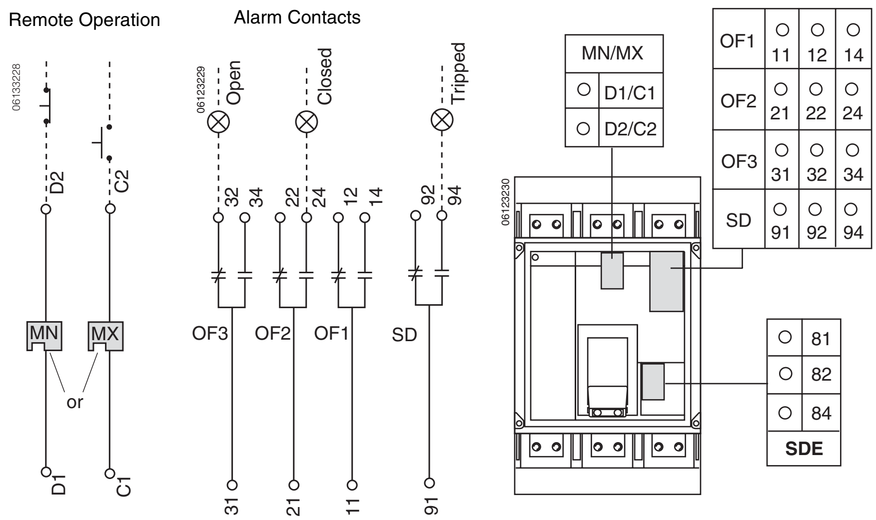
Note: All diagrams show circuit breaker in tripped position

Table 4: Accessory Control Wiring Diagrams

Function	Connector	Description
Auxiiliary Contacts	OF	Open/Closed circuit breaker or switch position contacts
	SD	Bell alarm
Remote Operation	MN	Undervoltage trip device
	MX	Shunt trip



Replace Accessory Cover

CAUTION

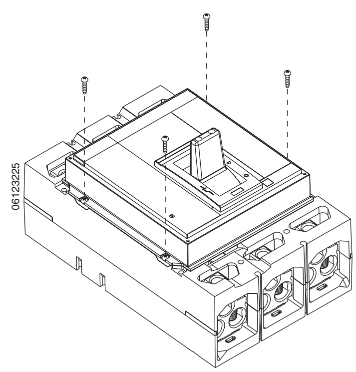
HAZARD OF EQUIPMENT DAMAGE

Accessory cover must be secured with all four screws tightened to stated torque. Do not overtorque screws. Do not use power equipment to torque screws.

Failure to follow this instruction can result in equipment damage.

Replace accessory cover. Replace all four accessory cover screws. Hand tighten screws to 11–13 lb-in (1.2–1.5 N•m). Do not exceed torque specification of screws.

Figure 15: Replace Accessory Cover



CIRCUIT BREAKER REMOVAL

Turn off all power supplying this equipment before working on or inside equipment.

Remove circuit breaker in reverse order of installation.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

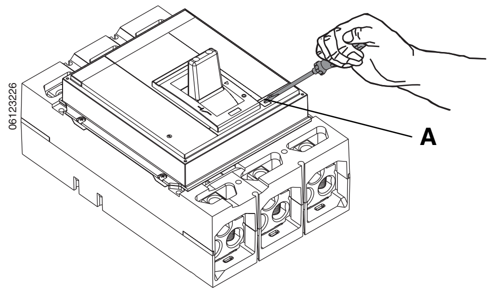
Failure to follow this instruction will result in death or serious injury.

OPERATION

Press push-to-trip button (A) at installation to check operation. Repeat once a year to exercise circuit breaker.

NOTE: Push-to-trip button will not trip circuit breaker if it is in the off (O) position.

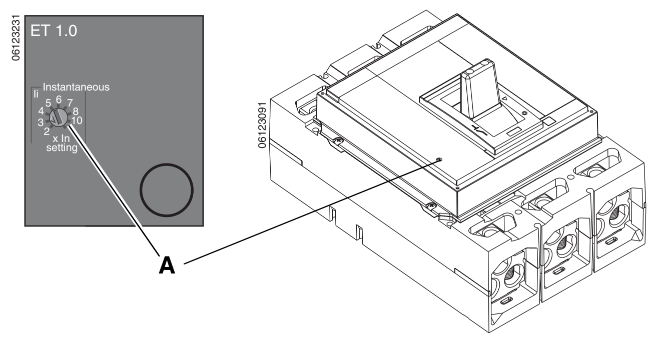
Figure 16: Press Push-to-trip Button



TRIP UNIT ADJUSTMENT

Adjust instantaneous trip (Ii) by adjusting switch (A).

Figure 17: Adjust Instantaneous Trip Switch



TESTING

Circuit breaker trip unit operation can be tested using primary injection testing or the full-function test kit.

NOTE: Older ET1.0 trip units have test port covered. Cut label as described in full-function test kit instructions to access the trip unit port.

TROUBLESHOOTING

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Troubleshooting may require energizing auxiliary devices with a test power supply. Make sure that the power supply is off before connecting or disconnecting it to the auxiliary device.
- Do not touch the terminals of the device during the test.

Failure to follow this instruction will result in death or serious injury.

If problems occur during installation, refer to information below. If trouble persists, contact the field office.

Condition	Possible Causes	Solution
Circuit breaker fails to stay closed.	1. Trip adjustment set too low. 2. Undervoltage trip not energized. 3. Shunt trip energized. 4. Short circuit or overload on system.	1. Adjust trip setting. 2. Energize undervoltage trip. 3. De-energize shunt trip. 4. Check system for short circuit or overload.
Circuit breaker trips, but no short circuit or overload is evident.	1. Trip adjustment set too low. 2. Voltage is below undervoltage trip setting.	1. Adjust trip setting. 2. Check system for low voltage.
Push-to-trip button will not trip circuit breaker.	Circuit breaker already tripped or off (O).	Move circuit breaker handle to reset, then to on (I).
Circuit breaker cannot be opened manually.	Damage to current path.	Contact local field office.

ENGLISH

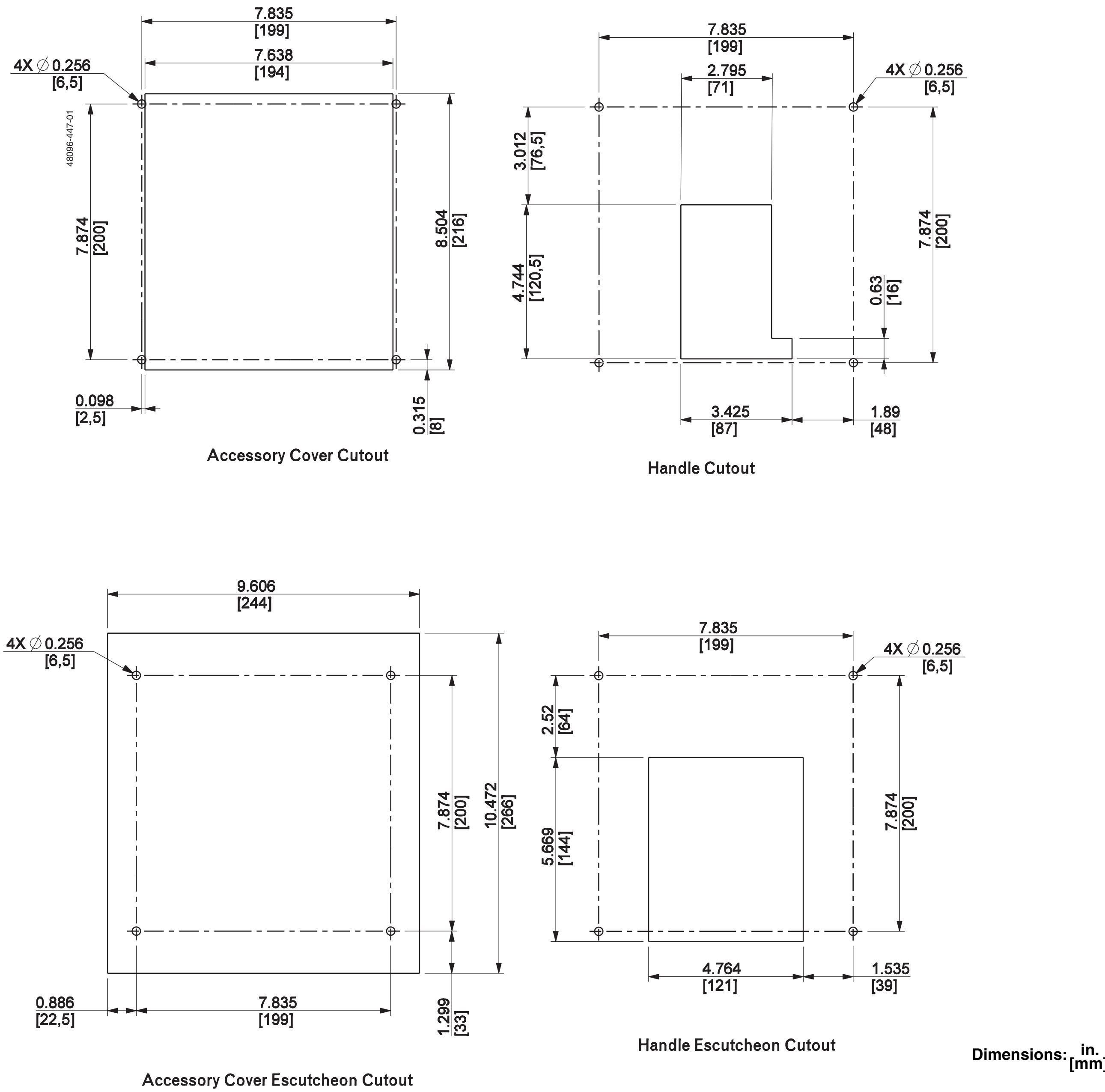
DIMENSIONS

Enclosure Information

Table 5: Enclosure Dimensions

Circuit Breaker Enclosure Dimensions (H x W x D)	
in.	**mm**
51.9 x 20.25 x 7.75	1318.3 x 514.4 x 196.9

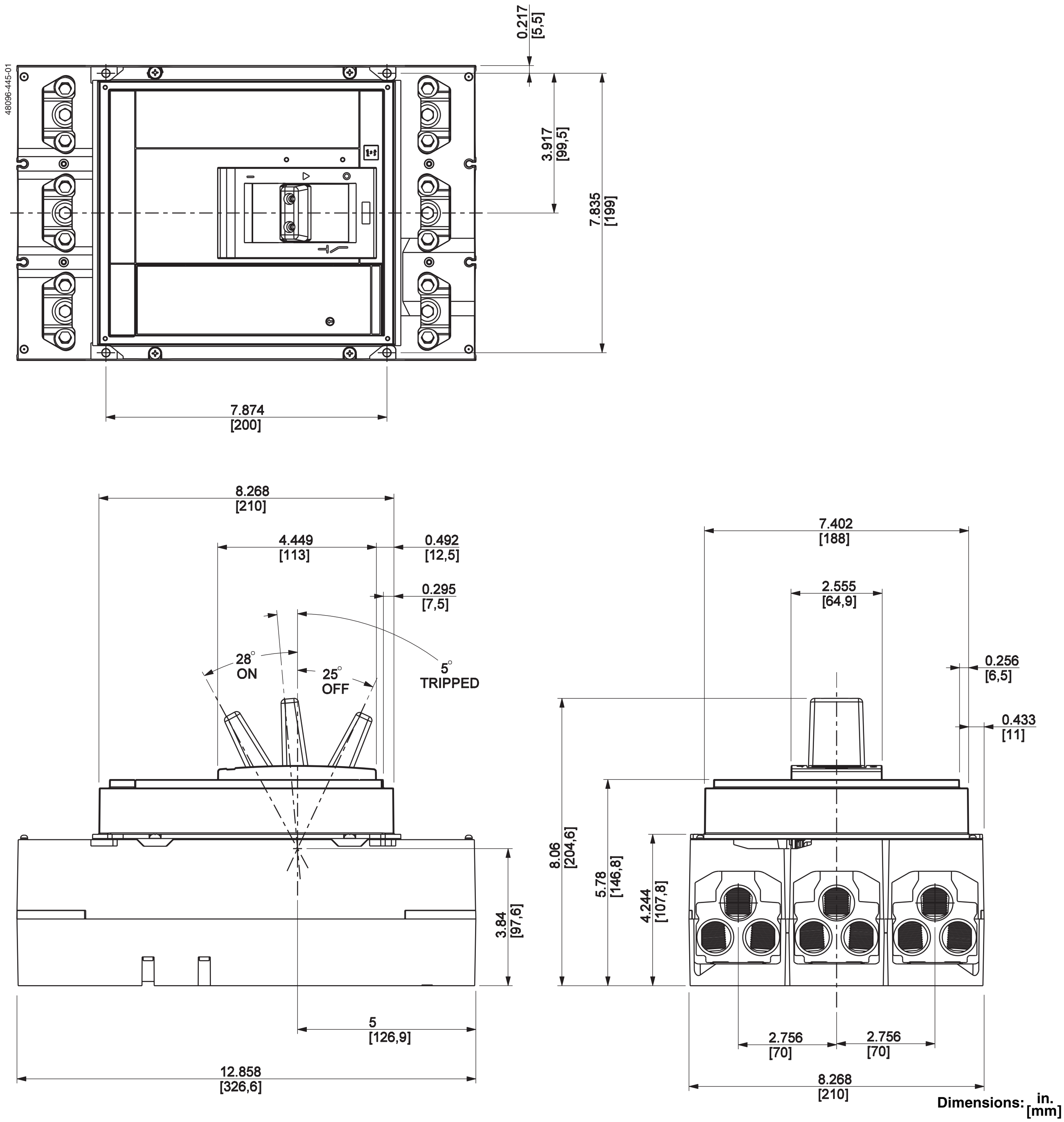
Figure 18: Enclosure Mounting Holes and Door Cutout Dimensions



ENGLISH

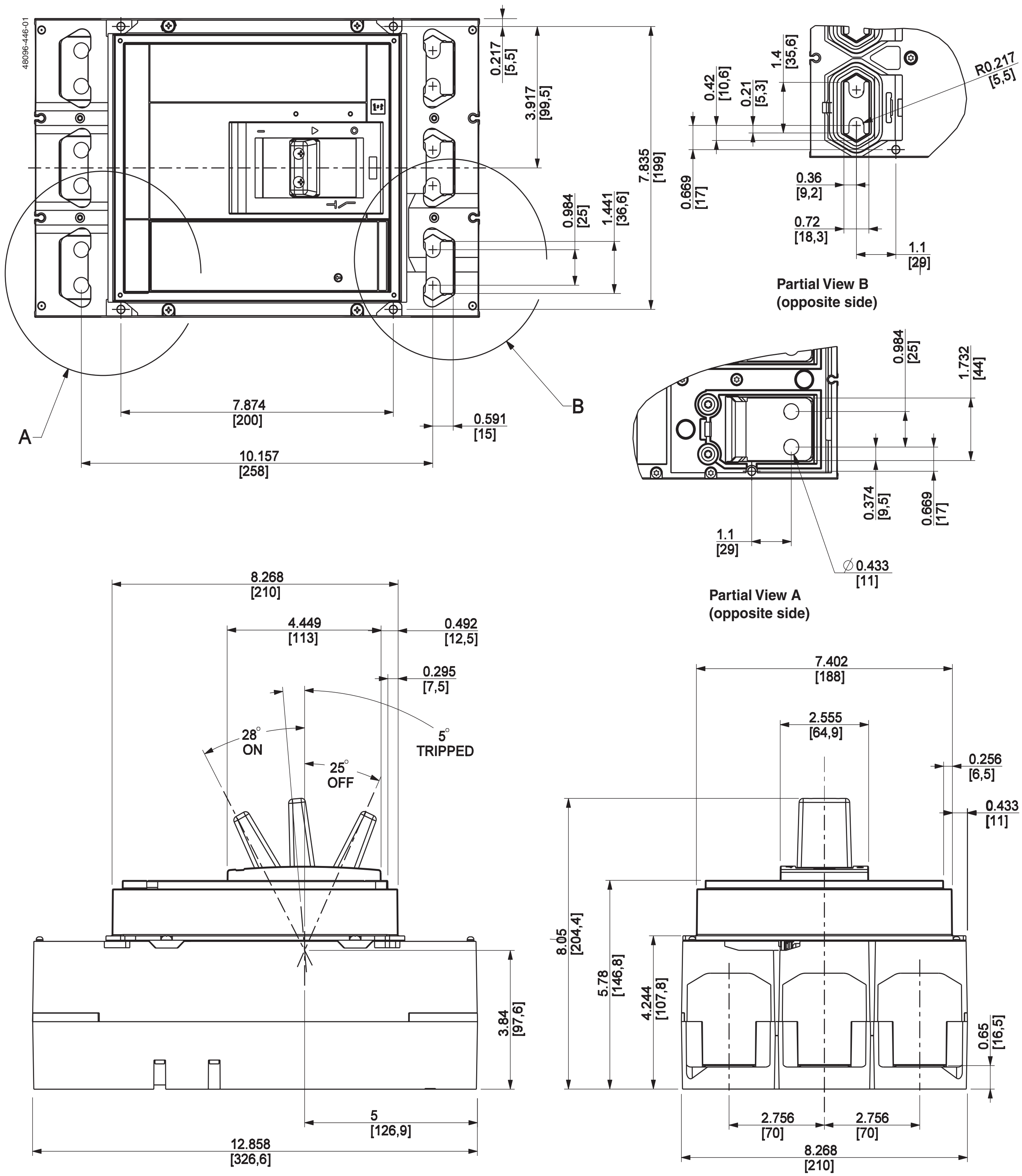
Circuit Breaker Dimensions

Figure 19: Individually-mounted 800 A 3-pole Circuit Breaker with Lugs at Both Ends



ENGLISH

Figure 20: Individually-mounted 800 A 3-pole Circuit Breaker without Lugs



Dimensions: in. [mm]

Boletín de instrucciones

ECN 733C Reemplaza 48049-251-01 03/2004

Interruptores automáticos con marco M

Conservar para uso futuro.

HERRAMIENTAS NECESARIAS

Desatornillador, Pozidriv® no. 2 ó 3, o de punta plana

Llave de cubo, cavidad hexagonal interna de 7 mm

Desatornillador de punta plana y cuerpo largo

Llave de apriete prefijado, de 5/16 pulg. o 8 mm

INSTALACIÓN DEL INTERRUPTOR AUTOMÁTICO

1. Desenergice el equipo antes de realizar cualquier trabajo en él.
2. Asegúrese de que el interruptor esté en posición de disparado o abierto.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía (consulte la norma NFPA 70E).
- Solamente el personal eléctrico especializado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo en él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de volver a energizar el equipo.

El incumplimiento de esta instrucción podrá causar la muerte o lesiones serias.

Instalación del interruptor automático de montaje individual

⚠ PELIGRO

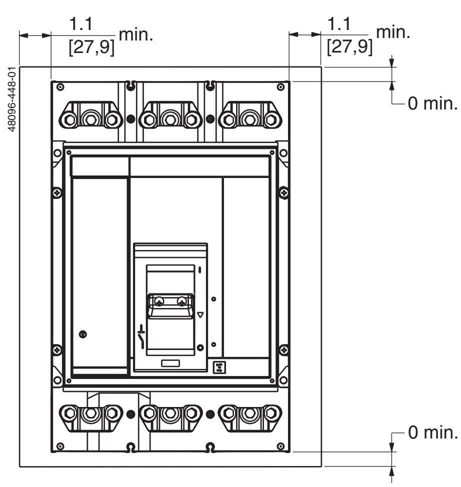
PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

Instale el interruptor automático de manera que se conserve la distancia mínima de espacio libre a las partes metálicas conectadas a tierra.

El incumplimiento de esta instrucción podrá causar la muerte o lesiones serias.

3. Asegúrese de que se cumpla con el requisito de espacio mínimo entre el interruptor automático y las partes metálicas conectadas a tierra más cercanas. (Consulte la tabla 5 para obtener las dimensiones mínimas del gabinete).

Figura 1: Requisito de espacio libre mínimo a las partes metálicas



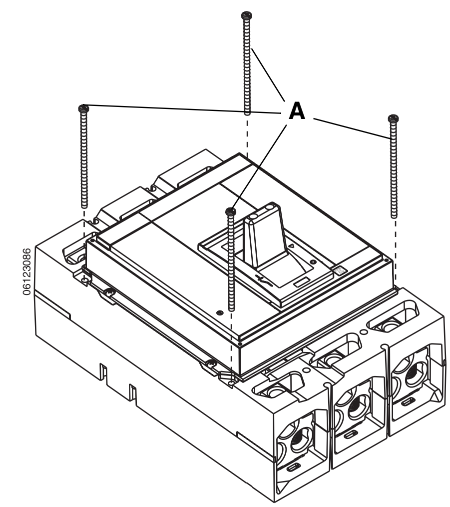
Dimensiones: pulg [mm]

ESPAÑOL

4. Prepare el gabinete para instalar el interruptor automático (vea la figura 18 para obtener las dimensiones de los agujeros de montaje así como de los recortes en la cubierta.
   - — Perfore los agujeros en la superficie de montaje para tornillos con roscas de 10-32.
   - — Haga un recorte en la cubierta para la palanca del interruptor automático, el escudo de la palanca, la cubierta de accesorios o el escudo de la cubierta de accesorios.

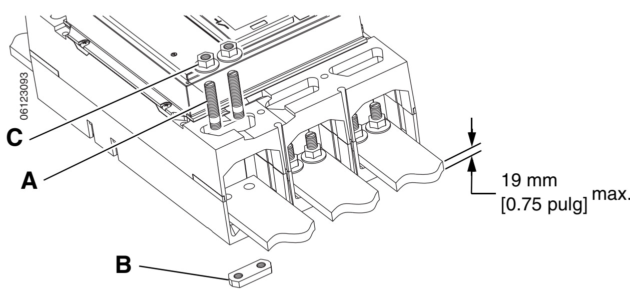
5. Instale el interruptor automático utilizando los cuatro tornillos de 10-32 x 4,5 (A) incluidos. Apriete los tornillos a 4 N•m (36 lbs-pulg).

Figura 2: Montaje del interruptor automático



6. Para los interruptores automáticos conectados a la barra, atornille la barra al interruptor insertando el tornillo (A), incluido, pasando por los agujeros en la barra y en la placa para tuercas (B) del interruptor. Sujete la barra con la tuerca (C) incluida. Apriete las tuercas a 28 N•m (250 lbs-pulg).

Figura 3: Instalación de la barra



Instalación del interruptor automático I-Line®

1. Ponga el interruptor automático en posición de disparado o abierto.

PRECAUCIÓN

PELIGRO DE DAÑO AL EQUIPO

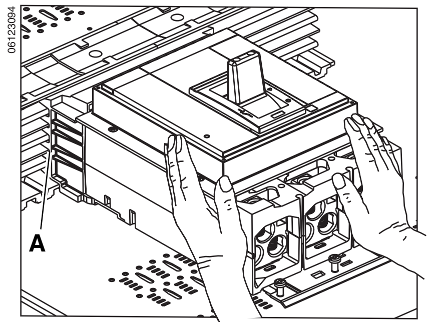
- No ajuste las mordazas.
- No retire el compuesto para juntas.
- Si es necesario, utilice el compuesto para juntas PJC7201 de Square D.

El incumplimiento de esta instrucción puede causar daño al equipo.

ESPAÑOL

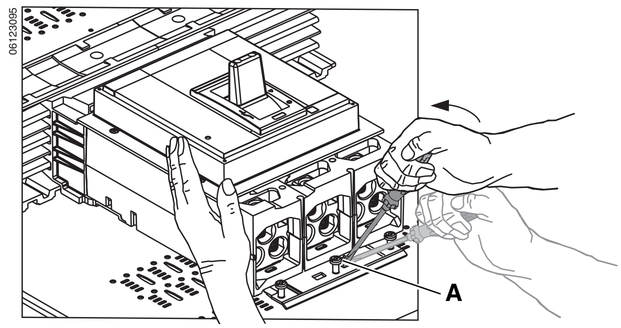
2. Coloque el interruptor automático en la bandeja I-Line con las mordazas (A) totalmente encajadas en la barra.

Figura 4: Colocación del interruptor automático en la bandeja



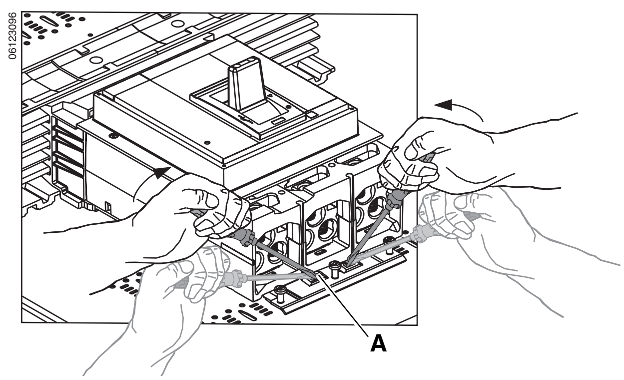
3. Inserte el desatornillador de punta plana y cuerpo largo (A) en la ranura. Monte el interruptor automático sobre la barra hasta que las mordazas enganchen completamente en las barras.

Figura 5: Inserción del interruptor automático en la barra



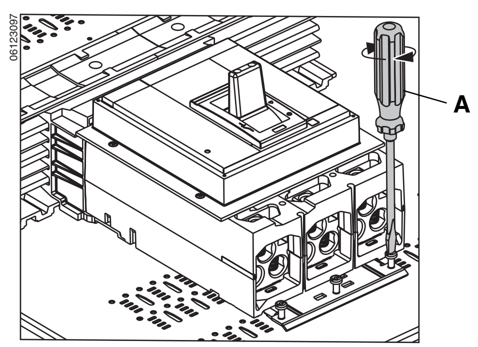
4. Inserte el segundo desatornillador (A) en la ranura inferior. Monte el interruptor automático sobre la barra utilizando los desatornilladores alternadamente hasta que las mordazas enganchen completamente en las barras y los tornillos de montaje estén alineados con los agujeros rasgados en la bandeja.

Figura 6: Interruptor enganchado completamente en la barra



5. Apriete firmemente los cinco tornillos (A) del soporte de montaje sin doblarlo.

Figura 7: Apriete de los tornillos del soporte de montaje



INSTALACIÓN DE CABLES

Corte las puntas de los conductores en forma cuadrada y preformelos en la configuración final. Con una herramienta de aislamiento adecuada, pele las puntas de los conductores en las medidas recomendadas en la tabla 1. No ranure los hilos.

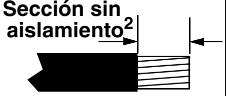
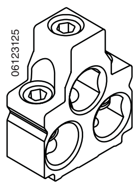
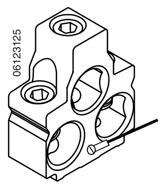
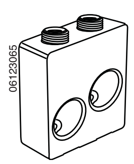
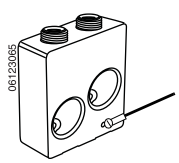
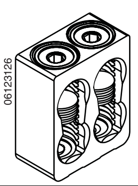
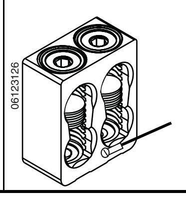
PRECAUCIÓN

PELIGRO DE INDICACIÓN FALSA DEL PAR DE APRIETE

No permita que los hilos del conductor interfieran con las roscas del tornillo de sujeción de cables.

El incumplimiento de esta instrucción podrá causar daño al equipo.

Tabla 1: Información sobre las zapatas del interruptor automático

Zapata	Zapata con cable de control opcional instalado	Número de catálogo	Conductor				Valor de par de apriete	
			Tipo	Calibre	Cont.	Sección sin aislamiento[2] 	Tornillo de sujeción de cables	Tornillo del cable de control
		AL800M23K[1]	Al/Cu	3/0–500 kcmil (95–240 mm^2)	3	25 mm (1 pulg)	50 N•m (442,5 lbs-pulg)	1 a 1,3 N•m (9 a 30 lbs-pulg)
		CU800M23K	Cu					
		AL800P6K[1]	Al/Cu	3/0-600 kcmil (95–300 mm^2)	2	30 mm (1,2 pulg)	50 N•m (442,5 lbs-pulg)	1 a 1,3 N•m (9 a 12 lbs-pulg)
		AL1200P24K[1]	Al/Cu	3/0-500 kcmil (95–240 mm^2)	4	30 mm (1,2 pulg)	50 N•m (442,5 lbs-pulg)	1 a 1,3 N•m (9 a 12 lbs-pulg)
		CU1200P24K	Cu					

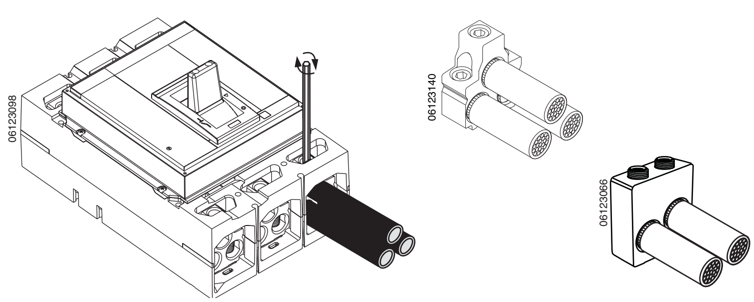
1 En las versiones con agujero roscado para el cable de control agregue la letra "T" antes de la "K" al número de catálogo (AL800M23TK).
2 Para obtener una conexión segura en las terminaciones, corte en forma cuadrada los conductores.

Accesorios de zapatas AL800M23K, CU800M23K y AL800P6K

NOTA: En los agujeros de las zapatas sin usar, atornille el tornillo de sujeción de cables hasta que esté bien apoyado en la parte inferior del agujero.

1. Para las zapatas instaladas en fábrica, instale los cables en la zapata y apriete el tornillo de sujeción de cables en los valores recomendados en la placa frontal y en la tabla 1.
2. Consulte el boletín de instrucciones incluido con los accesorios de zapatas para su instalación en campo.

Figura 8: Instalación de los cables en las zapatas AL800M23K, CU800M23K y AL800P6K



Accesorios de zapatas AL1200P24K y CU1200P24K

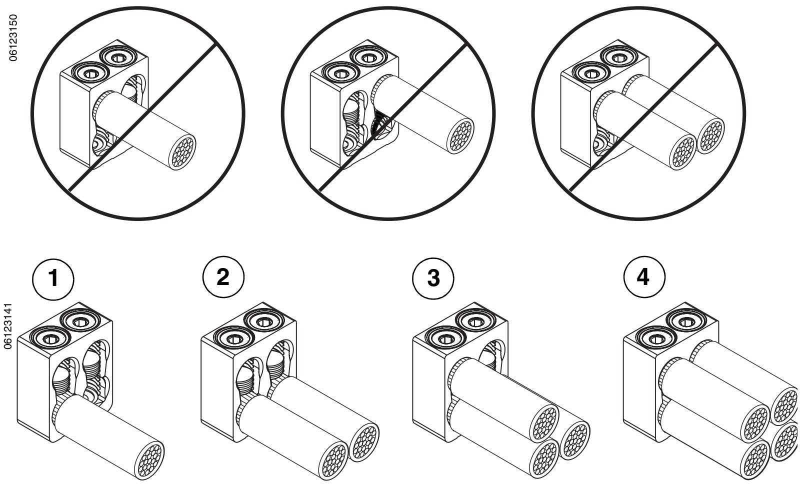
Para las zapatas instaladas en fábrica, instale los cables en el orden indicado y apriete el tornillo de sujeción de cables en los valores recomendados en la placa frontal y en la tabla 1.

NOTA: Instale primero los cables inferiores. Los tornillos de sujeción de cables inferiores deben estar totalmente apretados antes de instalar los cables superiores. Retire el espaciador de espuma antes de la instalación del cable. Si no se utilizan todos los agujeros de las zapatas, utilice primero los agujeros inferiores; coloque los tornillos de sujeción de cables en los agujeros sin utilizar hasta que estén bien apoyados en la parate inferior.

1. Instale el cable inferior izquierdo y apriete el tornillo de sujeción de cables.
2. Instale el cable inferior derecho y apriete el tornillo de sujeción de cables.
3. Instale el cable superior izquierdo y apriete el tornillo de sujeción de cables.
4. Instale el cable superior derecho y apriete el tornillo de sujeción de cables.

Consulte el boletín de instrucciones incluido con los accesorios de zapatas para su instalación en campo.

Figura 9: Instalación de los cables en las zapatas AL1200P24K y CU1200P24K



ESPAÑOL

INMOVILIZACIÓN DE CABLES

PRECAUCIÓN
PELIGRO DE MOVIMIENTO DE CONDUCTORES BAJO CONDICIONES DE CORTOCIRCUITO Inmovilice los conductores del interruptor de acuerdo con las recomendaciones de la tabla 2. **El incumplimiento de esta instrucción podrá causar daño al equipo.**

Tabla 2: Recomendaciones de uso del inmovilizador de cables

Tamaño de marco	Corriente de falla disponible	Conductores utilizados	Longitud de cable sin necesidad de inmovilización	Inmovilizador recomendado
800 A	≤ 65 kA	Tres de 300 kcmil o de mayor tamaño	≤ 279 mm (11 pulg)	No*
	Todos los demás casos			Sí

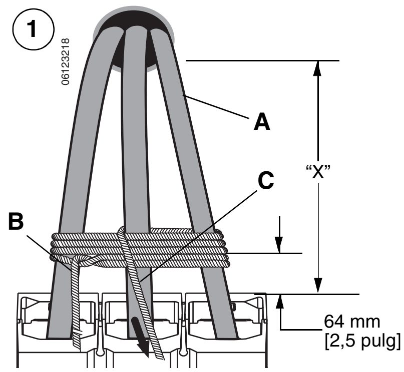
* Se deberán cumplir con todos los requisitos para que no sea necesario utilizar un inmovilizador de cables.

Inmovilice los conductores del interruptor automático de acuerdo con las recomendaciones de la tabla 2.

Enrede los conductores con 9 m (30 pies) de cuerda de sisal de 9,5 mm (3/8 pulg) o equivalente.

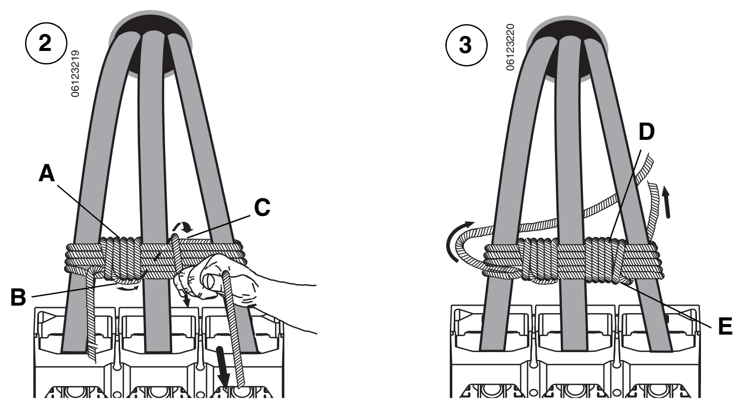
1. Comience a enredar los conductores (A) 64 mm (2,5 pulg) por encima del interruptor automático. Enrede los conductores cinco veces, dejando 4 + “X” m (12 + “X” pies) de cuerda en el primer extremo (B). Jale la cuerda (C) hasta tensarla.

Figura 10: Entrelace de los conductores



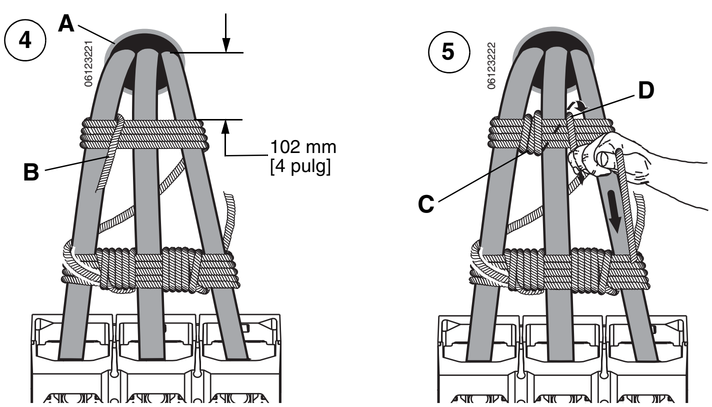
2. Enrede la cuerda (A) varias veces hasta llenar completamente el espacio entre los primeros dos grupos de conductores. Entrelace el bucle final de la cuerda debajo del bucle anterior (B). Pase la cuerda (C) por el espacio del lado derecho. Jale la cuerda hasta tensarla.
3. Enrede la cuerda (D) varias veces hasta llenar completamente el espacio entre el segundo y tercer grupo de conductores. Entrelace el bucle final de la cuerda (E) debajo del bucle anterior, como se muestra. Jale la cuerda hasta tensarla.

Figura 11: Entrelace de la cuerda



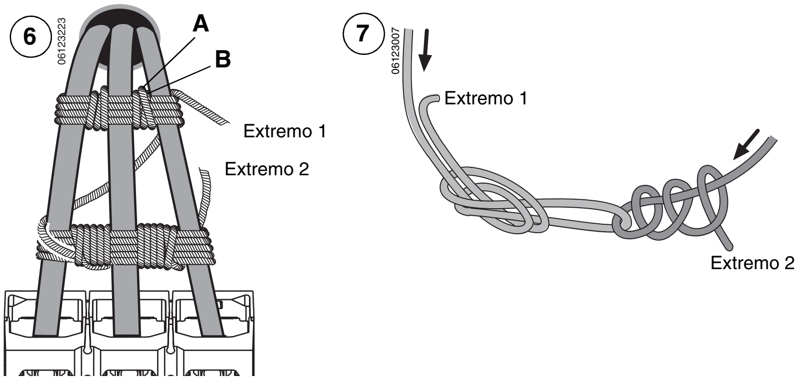
4. Enrede la cuerda cuatro veces alrededor de los conductores 102 mm (5 pulg) justo donde los conductores salen del gabinete (A). Jale la cuerda (B) hasta tensarla.
5. Enrede la cuerda (C) varias veces hasta llenar completamente el espacio entre los primeros dos grupos de conductores. Pase la cuerda (D) por el espacio del lado derecho. Jale la cuerda hasta tensarla.

Figura 12: Entrelace de los conductores



6. Enrede la cuerda (A) varias veces hasta llenar completamente el espacio entre el segundo y tercer grupo de conductores. Enrede el bucle final de la cuerda (B) debajo del bucle anterior, como se muestra. Jale la cuerda hasta tensarla.
7. Amarre los extremo 1 y 2 de la cuerda, como se muestra. La cuerda deberá estar tensa. Corte el exceso de cuerda y ponga cinta de aislar en las puntas para evitar que se deshilache.

Figura 13: Entrelace de la cuerda



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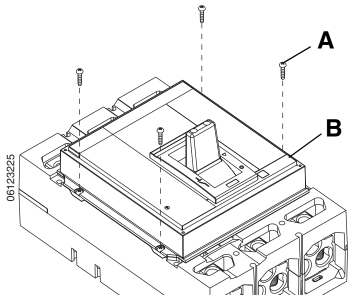
INSTALACIÓN DE LOS ACCESORIOS

Subsección aplicable para los interruptores con accesorios instalados en la fábrica o en campo.

Desmontaje de la cubierta de accesorios

1. Asegúrese de que el interruptor automático esté en posición de disparado o abierto.
2. Afloje los cuatro tornillos (A) de la cubierta de accesorios y retírela (B).

Figura 14: Desmontaje de la cubierta de accesorios



Instalación de los accesorios y alambrado de control

⚠ ADVERTENCIA

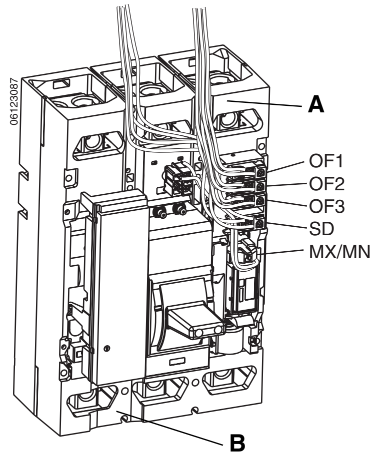
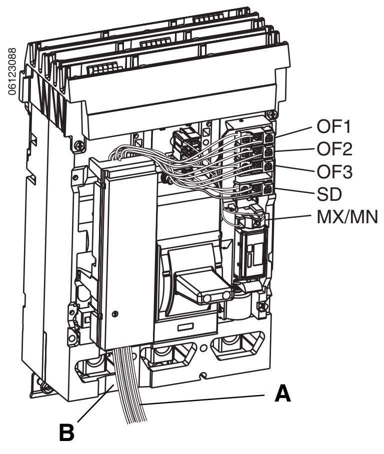
PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DAÑO AL EQUIPO

Los cables (A) deben dirigirse de la manera mostrada. No dirija los cables por debajo de la palanca o alrededor del borde exterior del interruptor automático. Los cables que salen del extremo abierto (O) del interruptor automático deben dirigirse por debajo de la unidad de disparo (consulte la etiqueta B).

El incumplimiento de esta instrucción puede causar lesiones personales o daño al equipo.

1. Instale los accesorios del interruptor automático para su instalación en campo de acuerdo con las instrucciones incluidas en cada accesorio.
2. Instale los cables de control (A) en los accesorios. Apriete los tornillos de las terminales a 1,2 N•m (10 lbs-pulg).

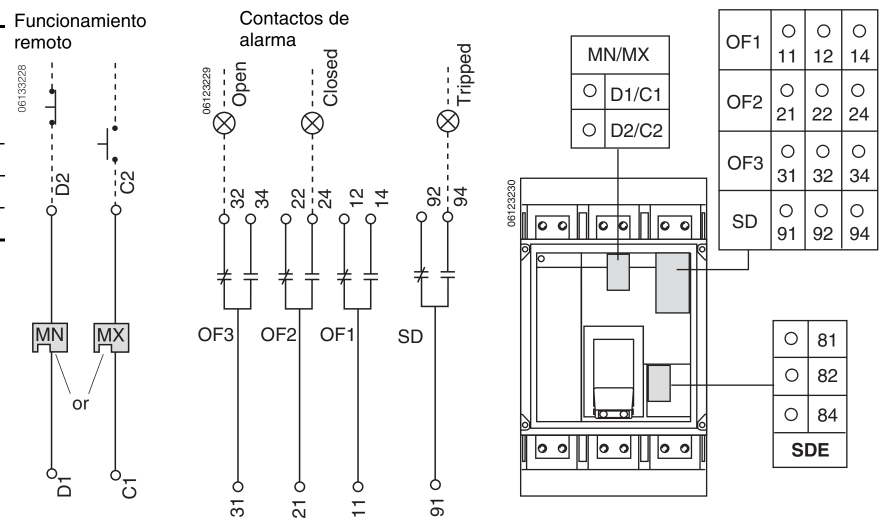
Tabla 3: Alambrado de control de los accesorios

Interruptor automático de montaje individual	Interruptor automático I-Line
	

Nota: Todos los diagramas muestran el interruptor automático en posición de disparado.

Tabla 4: Diagramas del alambrado de control de los accesorios

Función	Conector	Descripción
Contactos auxiliares	OF	Contactos del interruptor automático o desconectador en posición de abierto/cerrado
	SD	Timbre de alarma
Funcionamiento remoto	MN	Disparo por baja tensión
	MX	Disparo en derivación

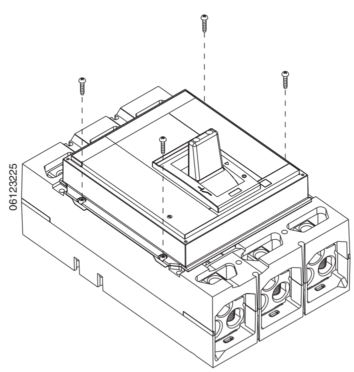


Colocación de la cubierta de accesorios

PRECAUCIÓN
PELIGRO DE DAÑO AL EQUIPO
Apriete los cuatro tornillos según el valor indicado para sujetar la cubierta de accesorios. No apriete los tornillos en exceso. No utilice herramientas eléctricas para esto.
El incumplimiento de esta instrucción puede causar daño al equipo.

Vuelva a colocar la cubierta de accesorios. Vuelva a colocar los cuatro tornillos de la cubierta de accesorios. Apriete los tornillos con la mano de 1,2 a 1,5 N•m (11 a 13 lbs-pulg). No sobrepase los valores de par de apriete especificados para los tornillos.

Figura 15: Colocación de la cubierta de accesorios



DESMONTAJE DEL INTERRUPTOR AUTOMÁTICO

Desenergice el equipo antes de realizar cualquier trabajo en él.

Desmonte el interruptor automático en el orden inverso al de su instalación.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía (consulte la norma NFPA 70E).
- Solamente el personal eléctrico especializado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo en él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de volver a energizar el equipo.

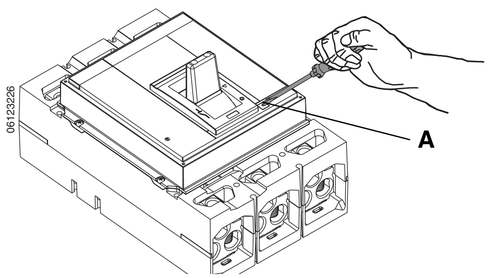
El incumplimiento de esta instrucción podrá causar la muerte o lesiones serias.

FUNCIONAMIENTO

Pulse el botón de disparo (A) durante la instalación para comprobar el funcionamiento. Repita una prueba anual para volver a verificarlo.

NOTA: El botón de disparo no disparará el interruptor automático si se encuentra en la posición de abierto (O).

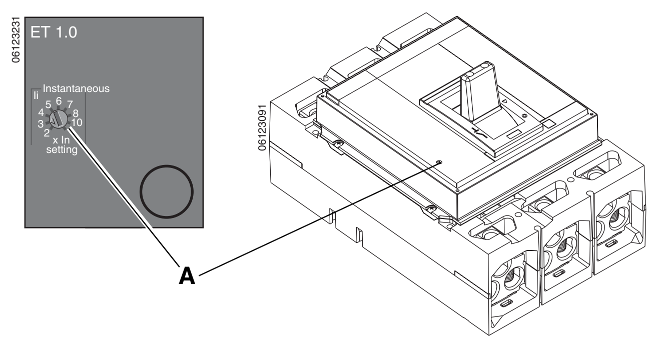
Figura 16: Botón pulsador de disparo



AJUSTE DE LA UNIDAD DE DISPARO

Ajuste el disparo instantáneo (Ii) en el selector (A).

Figura 17: Ajuste del interruptor de disparo instantáneo



PRUEBAS

Utilice pruebas de inyección primaria para verificar el funcionamiento de la unidad de disparo del interruptor automático.

Utilice pruebas de inyección primaria o el equipo de pruebas de amplias funciones para verificar el funcionamiento de la unidad de disparo del interruptor.

NOTA: Las unidades de disparo ET1.0 más antiguas tienen el puerto de prueba cubierto. Corte la etiqueta como se describe en las instrucciones del equipo de pruebas de amplias funciones, para tener acceso al puerto de la unidad de disparo.

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DIAGNÓSTICO DE PROBLEMAS

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía (consulte la norma NFPA 70E).
- Solamente el personal eléctrico especializado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Al realizar el diagnóstico de problemas tal vez sea necesario energizar los dispositivos auxiliares con una fuente de alimentación de pruebas. Asegúrese de que ésta esté desenergizada antes de conectarla o desconectarla al dispositivo auxiliar.
- No toque las terminales que se conectan al dispositivo durante las pruebas.

El incumplimiento de esta instrucción podrá causar la muerte o lesiones serias.

Si se presentan problemas durante la instalación, consulte la siguiente información. Si persiste el problema, póngase en contacto con su distribuidor más cercano.

Condición	Causas posibles	Solución
El interruptor no permanece cerrado.	1. El ajuste de disparo es muy bajo. 2. El disparo por baja tensión no está energizado. 3. Disparo en derivación energizado. 4. Cortocircuito o sobrecarga en el sistema.	1. Ajuste el disparo. 2. Energice el disparo por baja tensión. 3. Desenergice el disparo en derivación. 4. Revise el sistema para ver si encuentra un cortocircuito o una sobrecarga.
El interruptor se dispara, pero no es evidente un cortocircuito o una sobrecarga.	1. El ajuste de disparo es muy bajo. 2. La tensión es inferior al valor de ajuste de disparo por baja tensión.	1. Ajuste el disparo. 2. Revise el sistema para ver si encuentra tensión baja.
El botón de disparo no dispara el interruptor.	El interruptor ya se encuentra en la posición de disparado o abierto (O).	Para restablecerlo, ponga la palanca en la posición de restablecimiento y luego en cerrado (I).
El interruptor no se puede abrir manualmente.	Está dañada la ruta de corriente.	Póngase en contacto con su distribuidor más cercano.

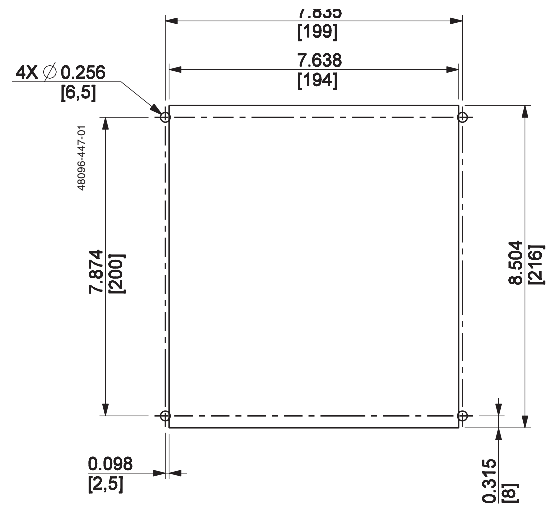
DIMENSIONES

Características del gabinete

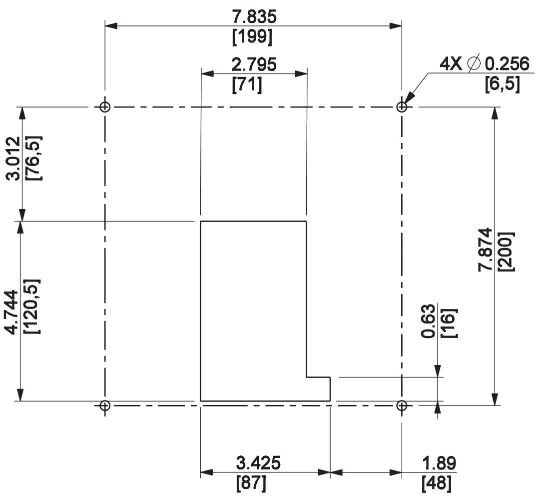
Tabla 5: Dimensiones del gabinete

Dimensiones del gabinete del interruptor automático (alto x ancho x profundidad)	
pulg	**mm**
51,9 x 20,25 x 7,75	1318,3 x 514,4 x 196,9

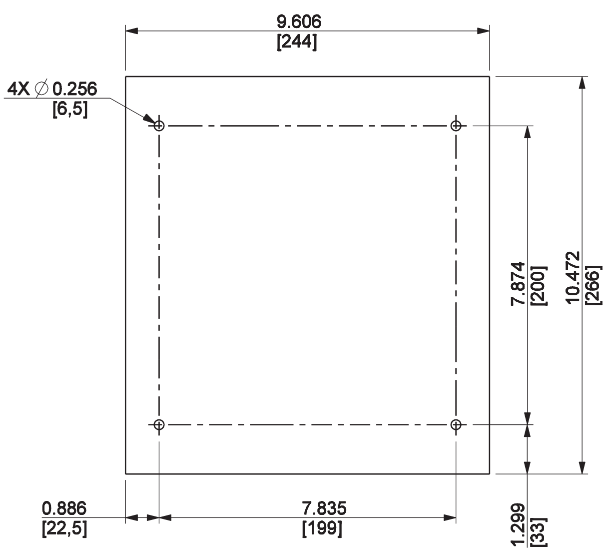
Figura 18: Dimensiones de los agujeros de montaje y de los recortes de la puerta del gabinete



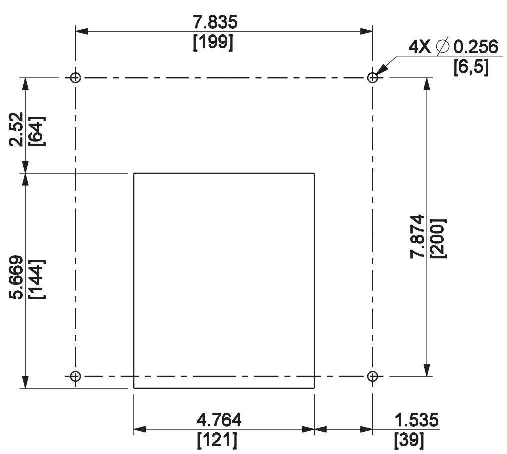
Recorte para la cubierta de accesorios



Recorte para la palanca



Recorte para el escudo de la cubierta de accesorios



Recorte para el escudo de la palanca

Dimensiones: pulg [mm]

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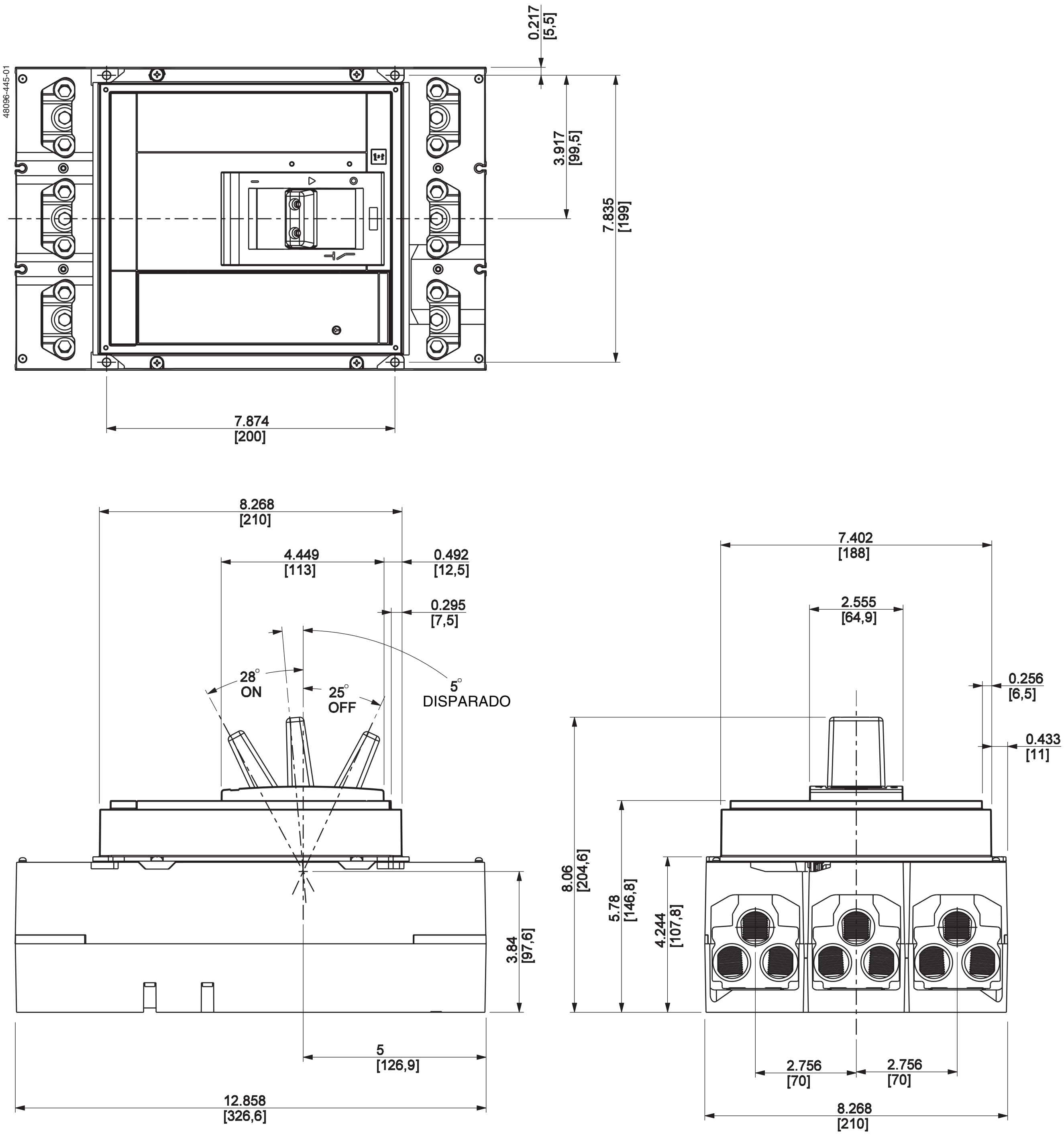
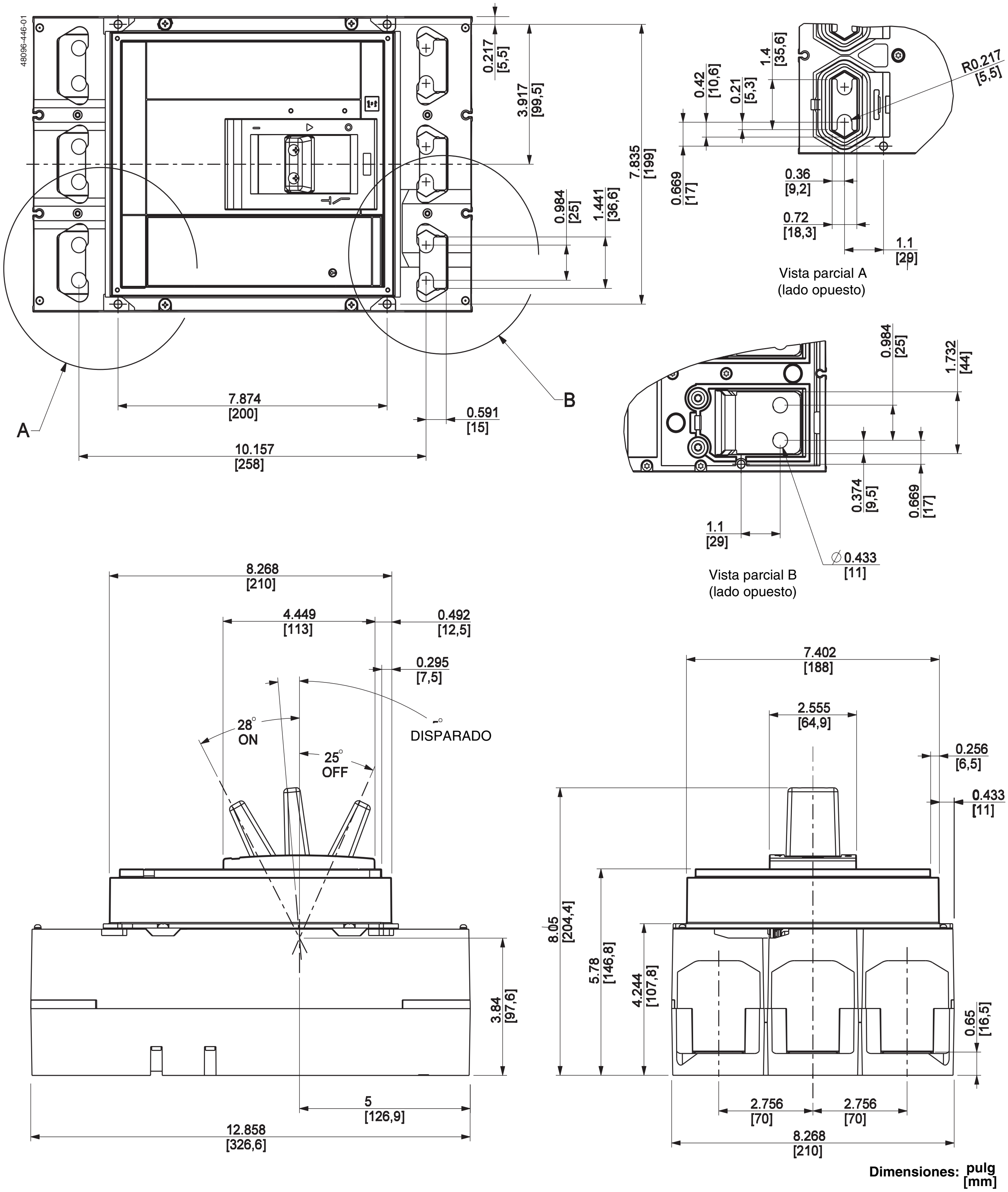
Dimensiones del interruptor automático

Figura 19: Interruptor automático de montaje individual de 3 polos, 800 A con zapatas en ambos extremos



Dimensiones: pulg [mm]

Figura 20: Interruptor automático de montaje individual de 3 polos, 800 A sin zapatas



ESPAÑOL

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Directives d'utilisation

Disjoncteurs à châssis M

À conserver pour usage ultérieur.

OUTILS NÉCESSAIRES

Tournevis, Pozidriv® n° 2 ou 3 ou plat

Clé à douille, hex interne de 7 mm

Tournevis, plat à longue tige

Clé dynamométrique, 5/16 po ou 8 mm

INSTALLATION DU DISJONCTEUR

1. Couper l'alimentation de l'appareil avant d'y travailler.
2. S'assurer que le disjoncteur est en position de déclenché ou d'arrêt.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

- Portez un équipement de protection personnel (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez l'alimentation de l'appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour s'assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si cette précaution n'est pas respectée, cela entraînera la mort ou des blessures graves.

Installation du disjoncteur monté individuellement

⚠ DANGER

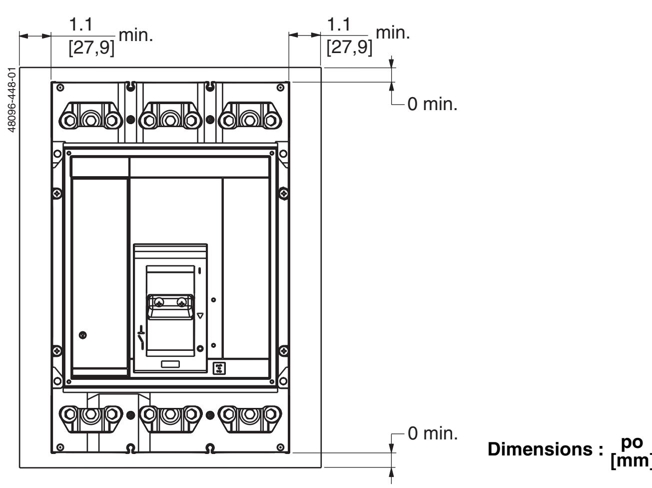
RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

Installez le disjoncteur de sorte qu'une distance d'isolement minimale avec le métal mis à la terre soit maintenue.

Si cette précaution n'est pas respectée, cela entraînera la mort ou des blessures graves.

3. Vérifier l'espace entre le disjoncteur et le métal mis à la terre le plus proche. (Se reporter au tableau 5 pour obtenir les dimensions minimales du boîtier.)

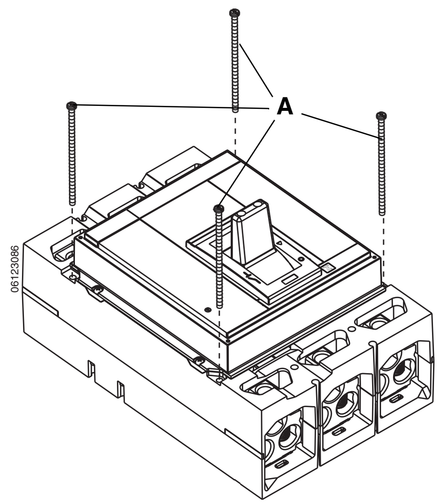
Figure 1 : Exigences d'espace minimum avec du métal



4. Préparer le boîtier pour le disjoncteur (voir la figure 18 pour les dimensions des trous de montage et des découpages du couvercle).
   — Percer les trous de montage dans la surface de montage. Tarauder les trous pour filetage de 10-32.
   — Découper une ouverture dans le couvercle pour la manette du disjoncteur, le plastron de la manette du disjoncteur, le couvercle des accessoires ou le plastron du couvercle des accessoires.

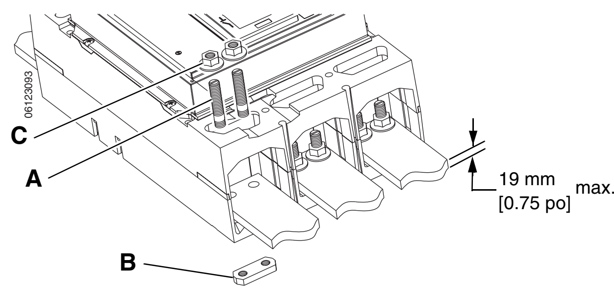
5. Monter le disjoncteur à l'aide des quatre vis de 10-32 x 4,5 po (A, fournies). Serrer les vis au couple de 4 N•m (36 lb-po).

Figure 2 : Montage du disjoncteur



6. Pour les disjoncteurs raccordés par barres-bus, boulonner la barre-bus au disjoncteur en insérant le boulon (A, fourni) par les trous de la barre-bus dans la plaque-écrou (B). Fixer la barre-bus avec l'écrou (C, fourni). Serrer les écrous au couple de 28 N•m (250 lb-po).

Figure 3 : Installation des barres-bus



Installation du disjoncteur I-Line®

1. Placer le disjoncteur dans la position de déclenché ou d'arrêt.

ATTENTION

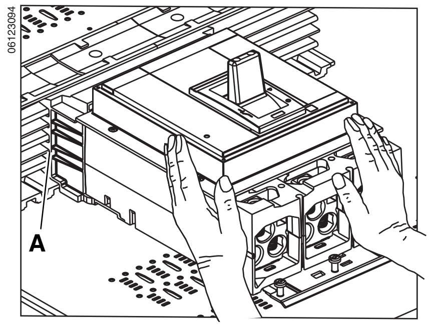
RISQUE DES DOMMAGES MATÉRIELS

- N'ajustez pas les mâchoires.
- Ne retirez pas la pâte à joint.
- Si nécessaire, utilisez la pâte à joint Square D PJC7201.

Si cette précaution n'est pas respectée, cela peut entraîner des dommages matériels.

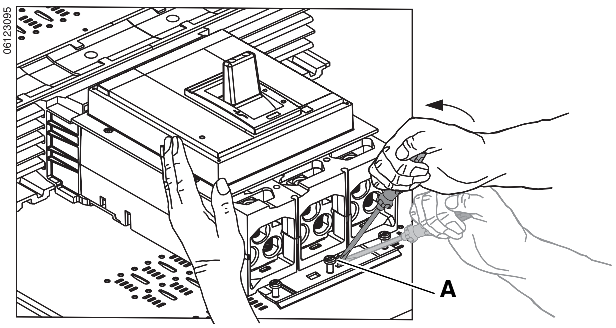
2. Placer le disjoncteur sur la cuve I-Line avec les mâchoires (A) contre la barre-bus.

Figure 4 : Placer le disjoncteur sur la cuve



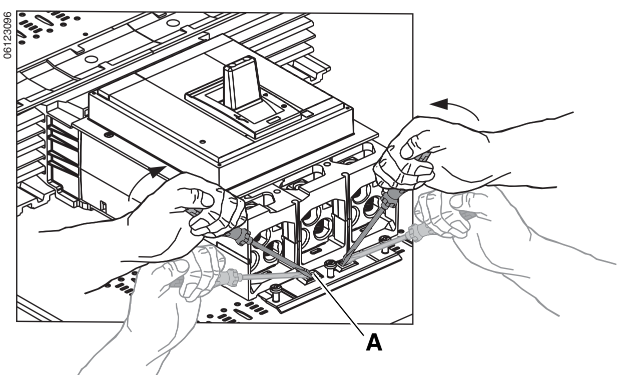
3. Insérer un tournevis plat à longue tige (A) dans une fente. Embrocher le disjoncteur sur la barre-bus jusqu'à ce que les mâchoires du disjoncteur s'engagent sur les barres-bus.

Figure 5 : Commencer à embrocher le disjoncteur sur les barres-bus



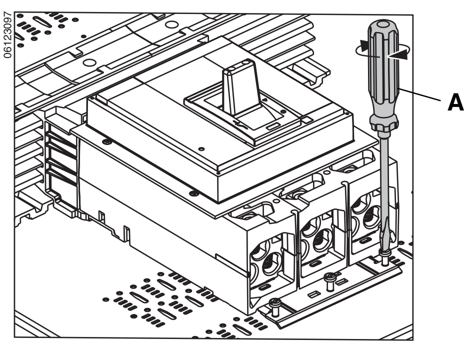
4. Insérer un deuxième tournevis (A) dans une fente inférieure. Embrocher le disjoncteur sur la barre-bus en employant les tournevis alternativement jusqu'à ce que les mâchoires du disjoncteur s'engagent complètement sur les barres-bus et les vis de montage s'alignent avec la fente oblongue de la cuve.

Figure 6 : Embrocher le disjoncteur complètement sur les barres-bus



5. Serrer fermement les vis (A) du support de montage sans tordre le support.

Figure 7 : Serrer les vis du support de montage



FRANÇAIS

FRANÇAIS

INSTALLATION DES CÂBLES

Couper les extrémités des conducteurs bien droit et leur donner leur configuration définitive. Au moyen d'un outil à dénuder l'isolation approprié, dénuder les extrémités des conducteurs comme recommandé au tableau 1. Ne pas entailler les torons.

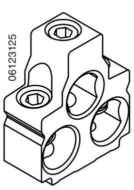
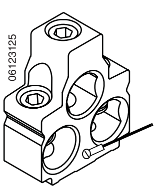
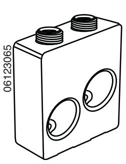
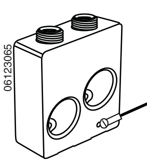
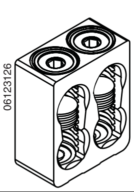
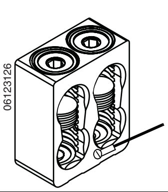
ATTENTION

RISQUE D'INDICATION ERRONÉE DU COUPLE

Ne laissez pas les torons du conducteur s'engager dans les filets de la vis de fixation.

Si cette précaution n'est pas respectée, cela entraînera des dommages matériels.

Tableau 1 : Information sur les cosses du disjoncteur

Cosse	Cosse avec fil de contrôle optionnel installé	N° de catalogue	Conducteur				Couple de serrage	
			Type	Calibre	Qté	Longuer de dénudage[2]	Vis de fixation de fils	Vis du fil de contrôle
 06123125	 06123125	AL800M23K[1]	Al/Cu	3/0 à 500 kcmil (95 à 240 mm²)	3	25 mm (1,0 po)	50 N•m (442,5 lb-po)	1 à 1,3 N•m (9 à 12 lb-po)
		CU800M23K	Cu					
 06123065	 06123065	AL800P6K[1]	Al/Cu	3/0 à 600 kcmil (95 à 300 mm²)	2	30 mm (1,2 po)	50 N•m (442,5 lb-po)	1 à 1,3 N•m (9 à 12 lb-po)
 06123126	 06123126	AL1200P24K[1]	Al/Cu	3/0 à 500 kcmil (95 à 240 mm²)	4	30 mm (1,2 po)	50 N•m (442,5 lb-po)	1 à 1,3 N•m (9 à 12 lb-po)
		CU1200P24K	Cu					

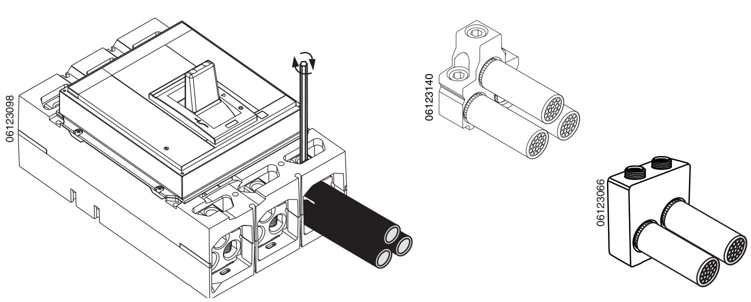
1 Pour le modèle avec le trou taraudé pour le fil de contrôle, ajouter un T devant le K au numéro de catalogue (AL800M23TK).
2 Les conducteurs doivent être coupés droits pour assurer une terminaison sûre.

Kits des cosses AL800M23K, CU800M23K et AL800P6K

REMARQUE : Pour les trous de cosses non utilisés, visser la vis de fixation de fil jusqu'à ce qu'elle touche le fond du trou de cosse.

1. Pour les cosses installées à l'usine, installer les câbles dans les cosses et serrer la vis de fixation de fils au couple recommandé sur la plaque avant et au tableau 1.
2. Pour les kits de cosses à installer sur place, consulter les directives d'utilisation expédiées avec le kit.

Figure 8 : Installation des câbles des cosses AL800M23K, CU800M23K et AL800P6K



Kits de cosses AL1200P24K et CU1200P24K

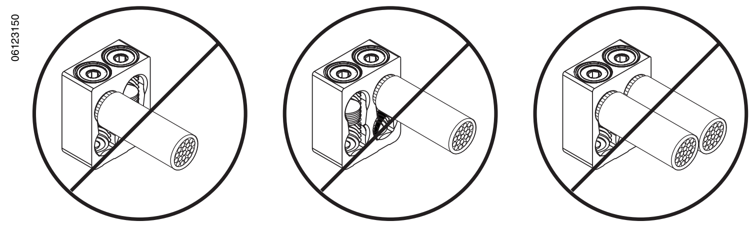
Pour les cosses installées à l'usine, installer les câbles dans l'ordre indiqué et serrer la vis de fixation de fils au couple recommandé sur la plaque avant et au tableau 1.

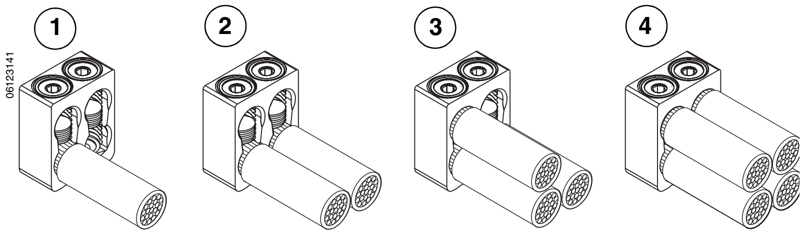
REMARQUE : Installer les câbles inférieures d'abord. Les vis de fixation de fils inférieurs doivent être serrées à fond avant d'installer les câbles supérieurs. Retirer l'entretoise en mousse avant d'installer les câbles. Si tous les trous de cosses ne sont pas utilisés, utiliser le trous inférieurs en premier et placer des vis dans les trous de cosses non utilisés en vissant des vis de fixation de fil jusqu'à ce qu'elles touchent le fond.

1. Installer le câble inférieur gauche et serrer la vis de fixation de fils.
2. Installer le câble inférieur droit et serrer la vis de fixation de fils.
3. Installer le câble supérieur gauche et serrer la vis de fixation de fils.
4. Installer le câble supérieur droit et serrer la vis de fixation de fils.

Pour les kits de cosses à installer sur place, consulter les directives d'utilisation expédiées avec le kit.

Figure 9 : Installation des câbles des cosses AL1200P24K et CU1200P24K





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ENTRAVE DE CÂBLE

ATTENTION

RISQUE DE DÉPLACEMENT DES CONDUCTEURS DANS DES CONDITIONS DE COURT-CIRCUIT

Entravez les conducteurs du disjoncteur comme requis au tableau 2.

Si cette précaution n'est pas respectée, cela entraînera des dommages matériels.

Tableau 2 : Recommandations de l'entrave de câble

Capacité de châssis	Courant de défaut disponible	Conducteurs utilisés	Longueur de câble non soutenue	Entrave recommandée
800 A	≤ 65 kA	Trois de 300 kcmil ou plus gros	≤ 279 mm (11 po)	Non*
	Tous les autres cas			Oui

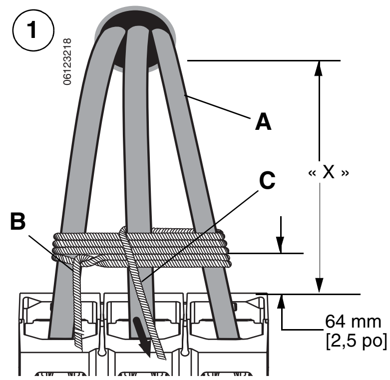
* Toutes les exigences doivent être satisfaites pour que l'entrave ne soit pas nécessaire.

Entraver les conducteurs du disjoncteur comme indiqué au tableau 2.

Entourer les conducteurs à l'aide de 9 m (30 pi) de corde en sisal de 9,5 mm (3/8 po) ou l'équivalent.

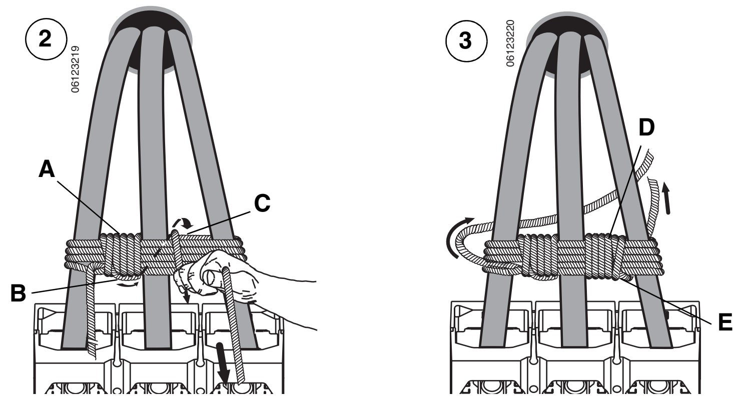
1. Commencer à entourer les conducteurs (A) à 64 mm (2,5 po) au-dessus du disjoncteur. Entourer les conducteurs 5 fois, en laissant 4 + « X » m (12 + « X » pi) d'excès de corde à la première extrémité (B). Tirer sur la corde (C) et bien la tendre.

Figure 10 : Entourer les conducteurs



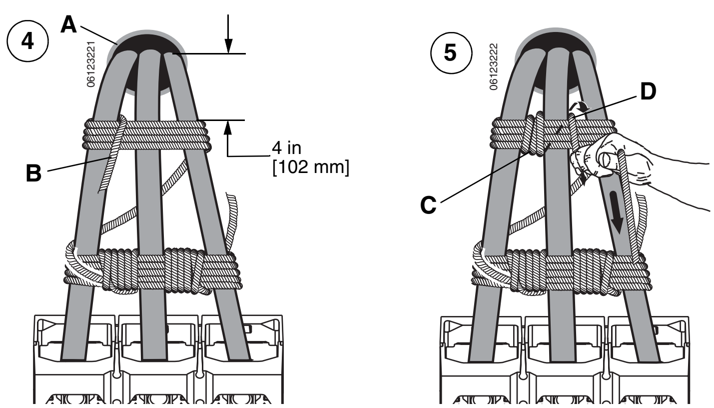
2. Faire plusieurs tours avec la corde (A) jusqu'à ce qu'elle remplisse complètement l'espace entre les premiers deux jeux des conducteurs. Faire passer la dernière boucle de la corde sous la boucle précédente (B). Engager la corde (C) dans l'espace de droite. Tirer sur la corde et bien la tendre.
3. Faire plusieurs tours avec la corde (D) jusqu'à ce qu'elle remplisse complètement l'espace entre le deuxième et le troisième jeu des conducteurs. Faire passer la dernière boucle de la corde (E) sous la boucle précédente, comme indiqué. Tirer sur la corde et bien la tendre.

Figure 11 : Entourer de corde



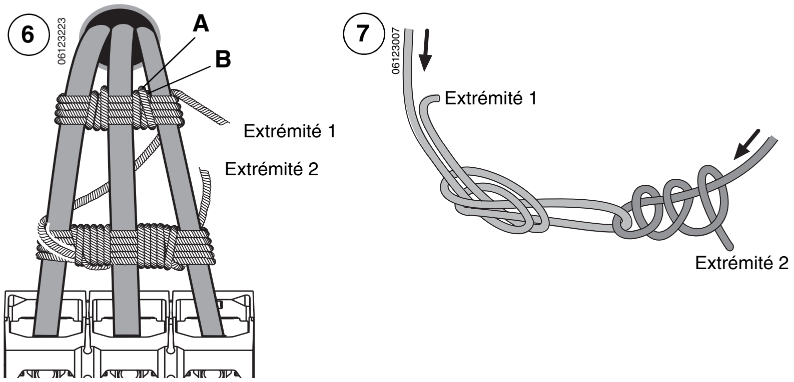
4. Faire quatre tours de corde autour des conducteurs de 102 mm (4 po) en dessous de l'endroit de sortie des conducteurs du boîtier (A). Tirer sur la corde (B) et bien la tendre.
5. Faire plusieurs tours avec la corde (C) jusqu'à ce qu'elle remplisse complètement l'espace entre les premiers deux jeux des conducteurs. Engager la corde (D) dans l'espace de droite. Tirer sur la corde et bien la tendre.

Figure 12 : Entourer les conducteurs



6. Faire plusieurs tours avec la corde (A) jusqu'à ce qu'elle remplisse complètement l'espace entre le deuxième et le troisième jeu des conducteurs. Faire passer la dernière boucle de la corde (B) sous la boucle précédente, comme indiqué. Tirer sur la corde et bien la tendre.
7. Attacher ensemble les extrémités 1 et 2 comme indiqué. Tirer sur la corde et bien la tendre. Couper l'excès de corde et fixer les extrémités avec un ruban adhésif pour les empêcher de s'effilocher.

Figure 13 : Entourer de corde



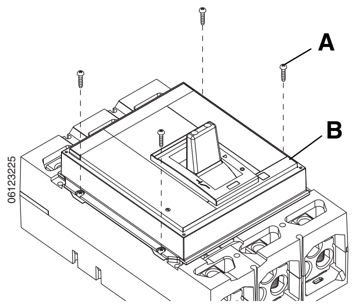
INSTALLATION DES ACCESSOIRES

Cette sous-section s'applique si le disjoncteur possède des accessoires installés à l'usine ou sur place.

Retrait du couvercle des accessoires

1. S'assurer que le disjoncteur est en position de déclenché ou d'arrêt.
2. Desserrer les quatre vis (A) du couvercle des accessoires et retirer le couvercle (B).

Figure 14 : Retrait du couvercle des accessoires



Installation des accessoires et du câblage de contrôle

⚠ AVERTISSEMENT

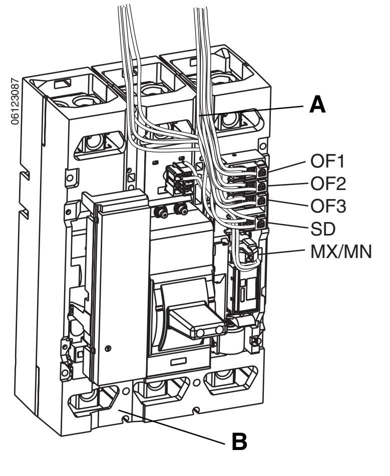
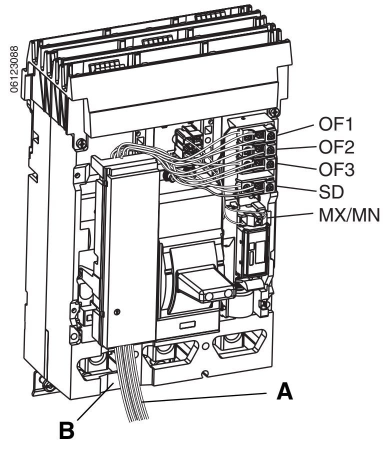
RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU DES DOMMAGES MATÉRIELS

Les fils (A) doivent être acheminés comme indiqué. N'acheminez pas les fils en dessous de la manette ou autour le bord extérieur du disjoncteur. Les fils sortant de l'extrémité arrêt du disjoncteur doivent être acheminés sous le déclencheur (voir l'étiquette B).

Si cette précaution n'est pas respectée, cela peut entraîner des blessures ou des dommages matériels.

1. Installer les accessoires à installer sur place du disjoncteur comme indiqué dans les directives fournies avec chaque accessoire.
2. Installer le câblage de contrôle (A) aux accessoires. Serrer les vis de bornes à 1,2 N•m (10 lb-po).

Tableau 3 : Câblage de contrôle des accessoires

Disjoncteurs montés individuellement	Disjoncteurs I-Line®
	

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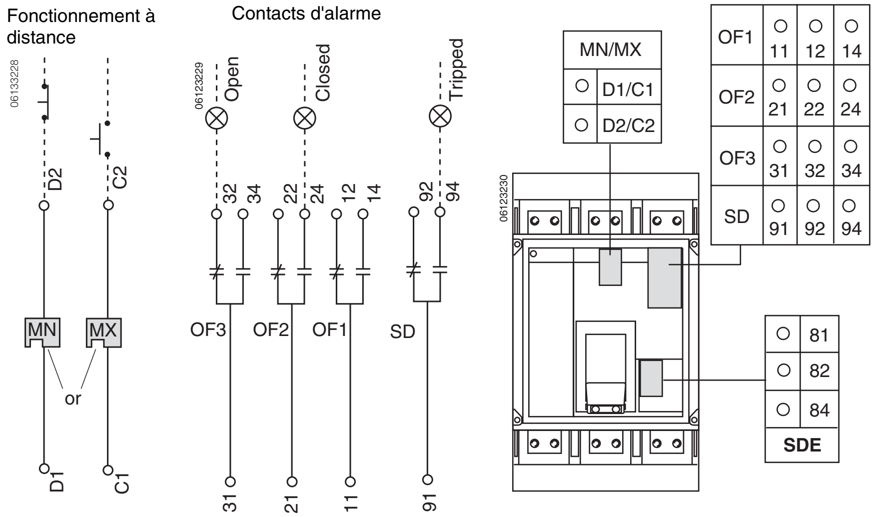
Remarque : Tous les schémas indiquent un disjoncteur dans la position déclenché.

Tableau 4 : Schémas de câblage de contrôle des accessoires

Fonction	Connecteur	Description
Contacts auxiliaires	OF	Contacts de disjoncteur ou d'interrupteur en position ouvert/fermé
	SD	Alarme sonore
Fonctionnement à distance	MN	Déclencheur sur baisse de tension
	MX	Déclencheur shunt



Remettre en place le couvercle des accessoires

ATTENTION

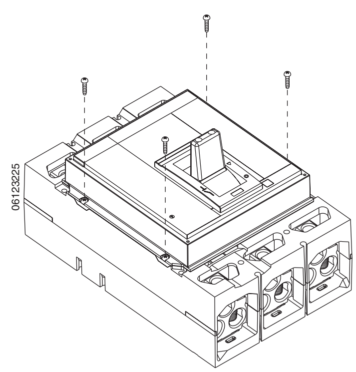
RISQUE DES DOMMAGES MATÉRIELS

Le couvercle des accessoires doit être fixé avec les quatre vis serrées au couple précisé. Ne serrez pas à un couple excessif. N'utilisez pas un outil électrique pour serrer les vis.

Si cette précaution n'est pas respectée, cela peut entraîner des dommages matériels.

Remettre en place le couvercle des accessoires. Replacer les quatre vis du couvercle des accessoires. Serrer à la main les vis à un couple entre 1,2 et 1,5 N•m (11 et 13 lb-po). Ne pas dépasser les spécifications de couple des vis.

Figure 15 : Remettre en place le couvercle des accessoires



DÉMONTAGE DU DISJONCTEUR

Couper l'alimentation de l'appareil avant d'y travailler.

Retirer le disjoncteur dans l'ordre inverse de son installation.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

- Portez un équipement de protection personnel (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez l'alimentation de l'appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour s'assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

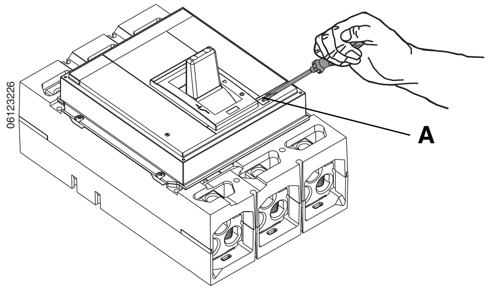
Si cette précaution n'est pas respectée, cela entraînera la mort ou des blessures graves.

FONCTIONNEMENT

Appuyer sur le bouton pousser pour déclencher (A) au moment de l'installation afin de vérifier le fonctionnement. Répéter une fois par an simplement pour manœuvrer le disjoncteur.

REMARQUE : Le bouton pousser-pour-déclencher ne provoque pas le déclenchement du disjoncteur si ce dernier est en position d'arrêt (O).

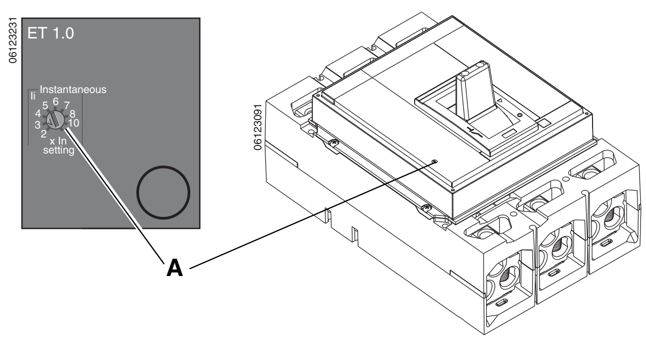
Figure 16 : Bouton pousser-pour-déclencher



RÉGLAGE DU DÉCLENCHEUR

Régler le déclenchement instantané (Ii) en ajustant le commutateur (A).

Figure 17 : Réglage du commutateur de déclenchement instantané



VÉRIFICATION

Le fonctionnement du déclencheur de disjoncteur peut être vérifié à l'aide d'un essai d'injection primaire.

Le fonctionnement du déclencheur de disjoncteur peut être vérifié à l'aide d'un essai d'injection primaire ou de la trousse d'essai des fonctions complétes.

REMARQUE : Le port d'essai des anciens déclencheurs ET1.0 est recouvert. Couper l'étiquette comme décrit dans les directives de la trousse d'essai des fonctions complètes afin d'accéder au port du déclencheur.

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DÉPANNAGE

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

- Portez un équipement de protection personnel (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Le dépannage peut nécessiter l'activation de dispositifs auxiliaires avec une alimentation d'essai. Assurez-vous que l'alimentation est désactivée avant tout branchement ou débranchement avec le dispositif auxiliaire.
- Ne touchez pas aux bornes du dispositif pendant l'essai.

Si cette précaution n'est pas respectée, cela entraînera la mort ou des blessures graves.

Si des problèmes surviennent pendant l'installation, se reporter aux consignes suivantes. Si les problèmes persistent, contacter le bureau de service local.

Condition	Causes possibles	Solution
Le disjoncteur ne reste pas fermé.	1. Réglage de déclenchement trop bas. 2. Le déclencheur sur baisse de tension est hors tension. 3. Le déclencheur shunt est sous tension. 4. Un court-circuit ou surcharge est présent dans le système.	1. Ajuster le réglage de déclenchement. 2. Mettre le déclencheur sur baisse de tension sous tension. 3. Mettre le déclencheur shunt hors tension. 4. Rechercher un court-circuit ou une surcharge dans le système.
Le disjoncteur se déclenche, mais aucune évidence de court-circuit ni de surcharge.	1. Réglage de déclenchement trop bas. 2. La tension est inférieure au réglage du déclencheur sur baisse de tension.	1. Ajuster le réglage de déclenchement. 2. Vérifier si une basse tension est appliquée au système.
Le bouton pousser-pour-déclencher ne déclenche pas le disjoncteur.	Le disjoncteur est déjà déclenché ou à l'arrêt (O).	Placer la manette du disjoncteur à réarmement, puis sur marche (I).
Le disjoncteur ne peut pas être ouvert manuellement.	Trajet de courant endommagé.	Contacter le bureau de service local.

DIMENSIONS

Informations sur les boîtiers

Tableau 5 : Dimensions du boîtier

Dimensions du boîtier du disjoncteur (haut. x larg. x épais.)	
po	**mm**
51,9 x 20,25 x 7,75	1318,3 x 514,4 x 196,9

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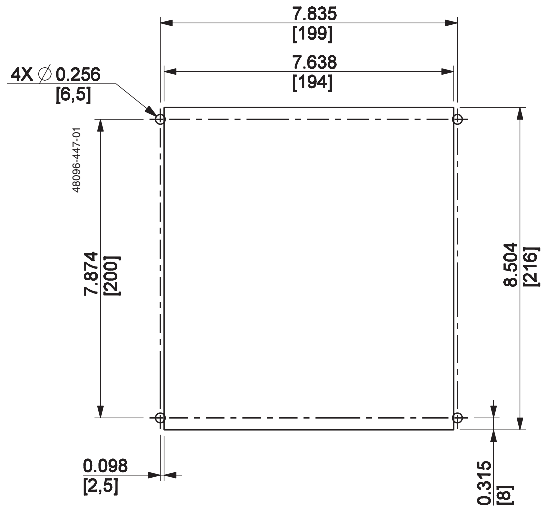
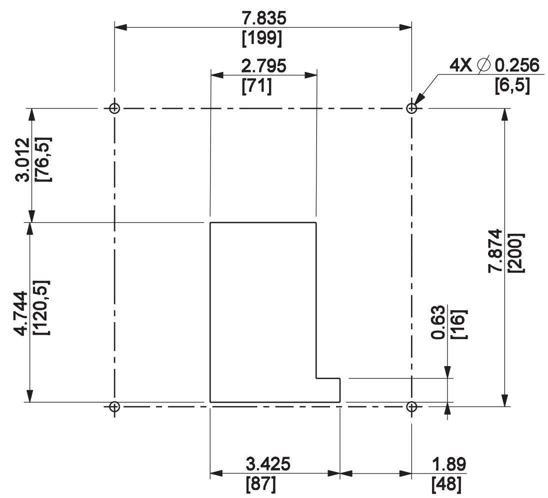
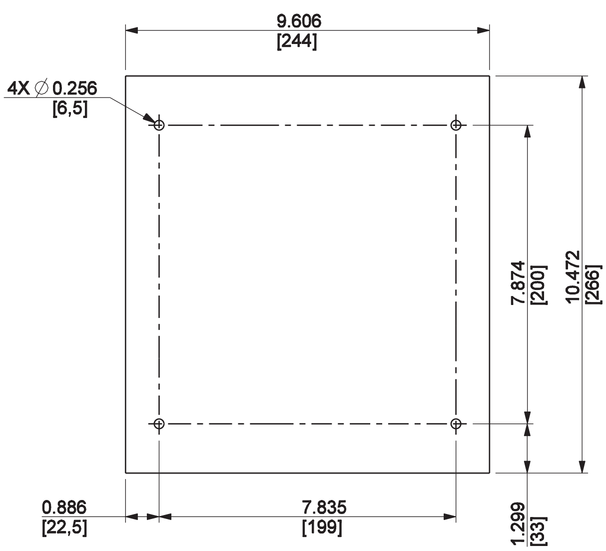
Figure 18 : Dimensions des trous de montage et des découpages du couvercle du boîtier



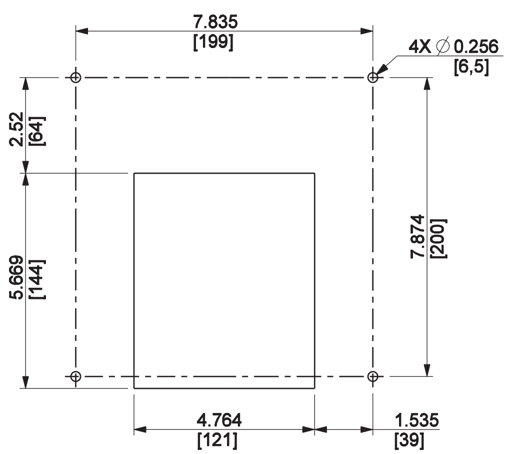
Découpage pour le couvercle des accessoires



Découpage pour la manette



Découpage pour le plastron du couvercle des accessoires



Découpage pour le plastron de la manette

Dimensions : po [mm]

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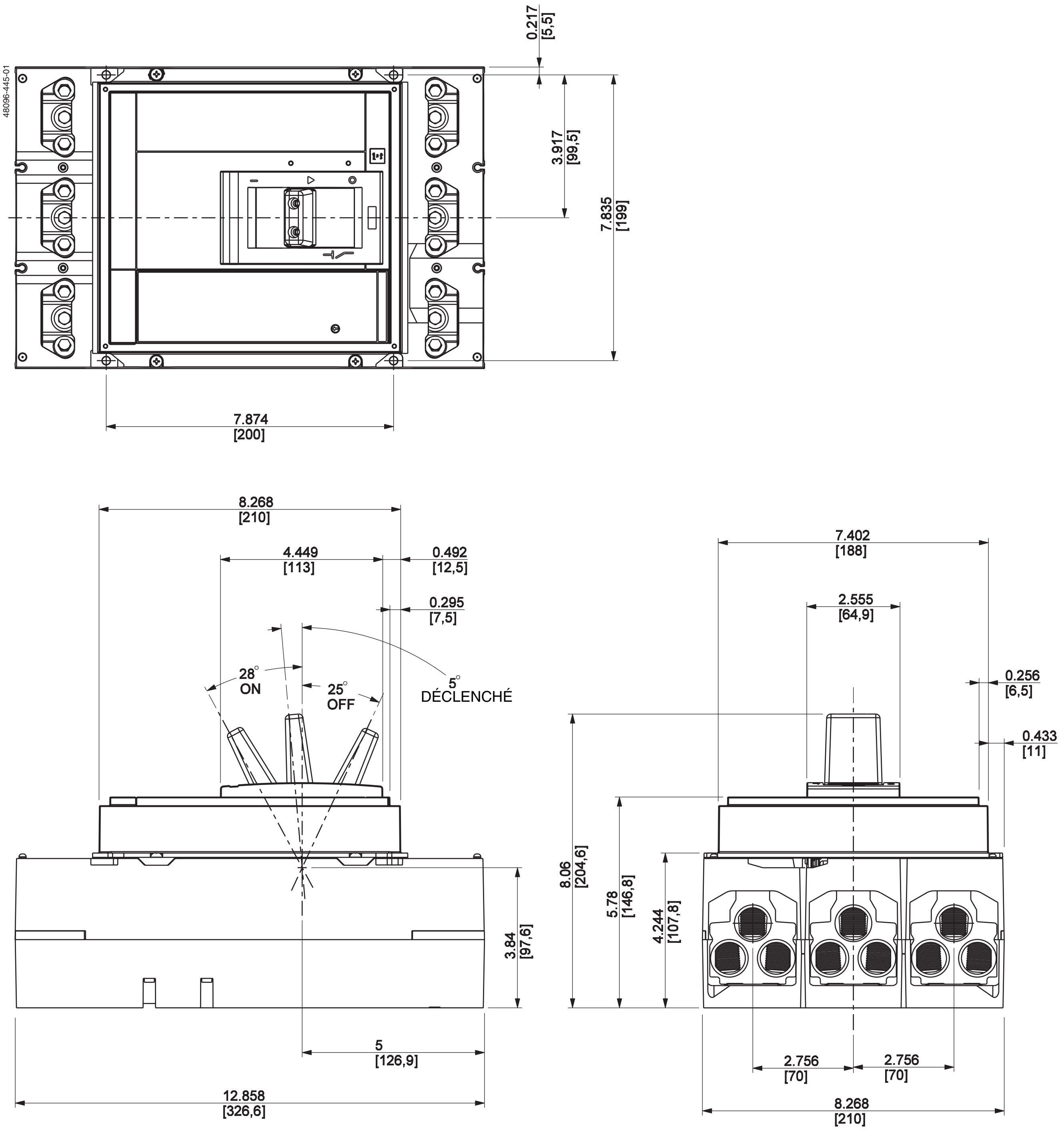
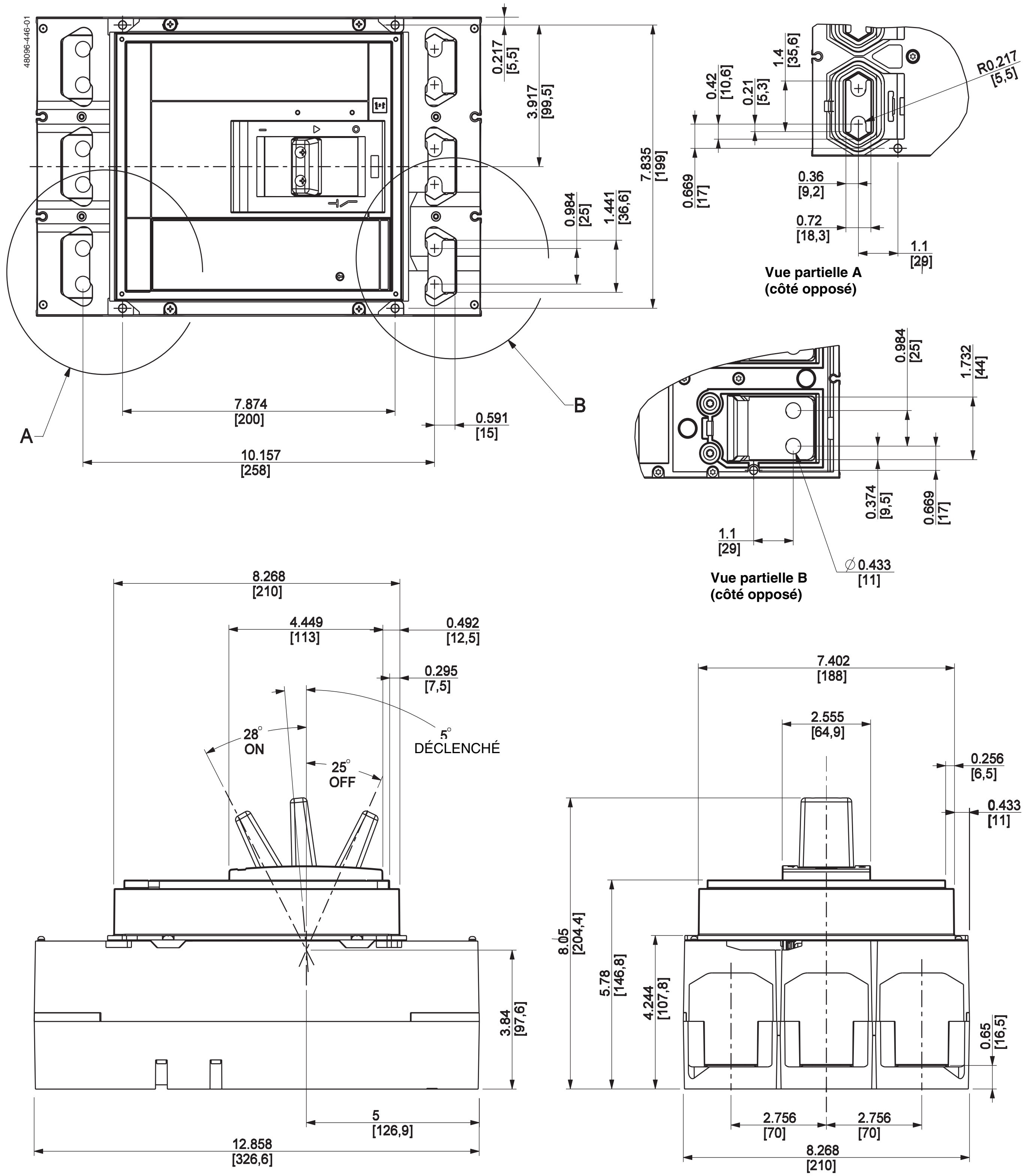
Dimensions du disjoncteur

Figure 19 : Disjoncteur monté individuellement, à 3 pôles, 800 A, avec cosses aux deux extrémités



Dimensions : po / [mm]

Figure 20 : Disjoncteurs montés individuellement, à 3 pôles, 800 A, sans cosses



Dimensions : po [mm]

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Disjoncteurs à châssis M
Interruptores automáticos con marco M
Disjoncteurs à châssis M

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

Schneider Electric
3700 Sixth St. SW
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1-888-SquareD (1-888-778-2733)
www.SquareD.com

48049-251-01
ECN 733C

Solamente el personal especializado deberá instalar, hacer funcionar y prestar servicios de mantenimiento al equipo eléctrico. Schneider Electric no asume responsabilidad alguna por las consecuencias emergentes de la utilización de este material.

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Tel. 55-5804-5000
www.schneider-electric.com.mx

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Seul un personnel qualifié doit effectuer l'installation, l'utilisation, l'entretien et la maintenance du matériel électrique. Schneider Electric n'assume aucune responsabilité des conséquences éventuelles découlant de l'utilisation de cette documentation.

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Toronto, Ontario
1-800-565-6699
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ECN 733C

02/2006

NF/NFOM Panelboards

Information Manual

Tableros de alumbrado y distribución NF y NFOM

Manual de información

Panneaux de distribution NF/NFOM

Directives d’utilisation

Instruction Bulletin
Boletín de instrucciones
Directives d’utilisation

80043-741-03 Rev. 02
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SQUARE D™

by Schneider Electric

NF/NFOM Panelboards
Information Manual

ENGLISH

Instruction Bulletin

80043-741-03 Rev. 02

06/2015

Retain for future use.

SQUARE D

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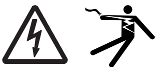
Hazard Categories and Special Symbols

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER
DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING
WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION
CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

NOTICE
NOTICE is used to address practices not related to physical injury. The safety alert symbol is not used with this signal word.

NOTE: Provides additional information to clarify or simplify a procedure.

Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

ENGLISH

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Introduction

This bulletin contains instructions for installing Square D™ brand NF and NFOM circuit breaker panelboards. These panelboards are Underwriters Laboratories (cULus) listed and accept ECB, EDB, EGB, and EJB branch circuit breakers.

For technical support on the installation of this panelboard, contact the Schneider Electric Customer Information Center at 1-888-778-2733.

See the labels on the equipment for rating and safety information. Additional equipment labels are provided with this document.

Safety Precautions

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HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462, or NOM-029-STPS.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside the equipment.
- Always use a properly rated voltage sensing device to confirm all power is off.
- Read and understand this entire instruction bulletin and the included NEMA PB 1.1 standards publication before installing, operating, or maintaining this equipment.
- Local codes vary, but are adopted and enforced to promote safe electrical installations. A permit may be needed to do electrical work, and some codes may require an inspection of the electrical work.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

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Installation

This section provides instructions for the following NF/NFOM panelboard procedures:

- “Interior Mounting for Square D Brand Enclosures” on page 6
- “Neutral Bonding Strap Installation” on page 9
- “ECB, EDB, EGB, and EJB Circuit Breaker Installation and Removal” on page 13
- “Circuit Breaker Reset Instructions” on page 15
- “Interior Trim Preparation” on page 16

Interior Mounting for Square D Brand Enclosures

A separate standards publication, titled “General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less” (NEMA PB1.1), has been provided with this equipment. Familiarize yourself with the content of this document before proceeding with any of the following procedures.

If you did not receive a copy of this document, or if you have any questions regarding this equipment, contact your local distributor or Schneider Electric representative.

NOTICE

HAZARD OF EQUIPMENT DAMAGE DUE TO LOOSE CONNECTIONS

- Ensure all connections are properly tightened.
- Refer to the torque information label provided on the panelboard before tightening the connections.

Failure to follow these instructions can result in equipment damage.

To properly mount and install the NF/NFOM panelboard interior, please refer to the NEMA PB 1.1 standards publication, and follow the instructions below for either “Surface Mounting (Enclosure Mounted on Wall)” on page 7” or “Flush Mounting (Enclosure Recessed in Wall)” on page 7.”

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Surface Mounting (Enclosure Mounted on Wall)

1. Mount the enclosure as instructed in the NEMA PB 1.1 standards publication.
2. Remove the interior trim from the trim brackets.
3. Install the interior as described below:
   a. Set the interior on the enclosure studs. (See Figure 1 on page 8).
   b. Tighten the flange nuts against the interior side rails until the rails are against the back of the enclosure. Do not over tighten. Over tightening the flange nuts can cause the interior to bow out in the center.
   c. Remount the interior trim after wiring.
4. If used as service entrance equipment, neutral bonding is required. See the “Neutral Bonding Strap Installation” instructions on page 9.
5. Apply equipment labels (located in the bag assembly) as directed by the instructions on the back of the equipment label sheet.

Flush Mounting (Enclosure Recessed in Wall)

1. Mount the enclosure as instructed in the NEMA PB 1.1 standards publication.
2. Remove the interior trim from the trim brackets.
3. Install the interior as described below:
   a. Thread the provided elevating nuts on the enclosure studs.
   b. Set the interior on the enclosure studs (see Figure 1 on page 8). Place the flange nuts onto the enclosure studs, but do not tighten.
   c. Adjust the elevating nuts so that the lip of the interior trim is approximately 0.25 inches (6.35 mm) from the wall line.
   d. Tighten the flange nuts against the side rails.
   e. Remount the interior trim after wiring.
4. If used as service entrance equipment, neutral bonding is required. See the “Neutral Bonding Strap Installation” instructions on page 9.
5. Apply equipment labels (located in the bag assembly) as directed by the instructions on the back of the equipment label sheet.

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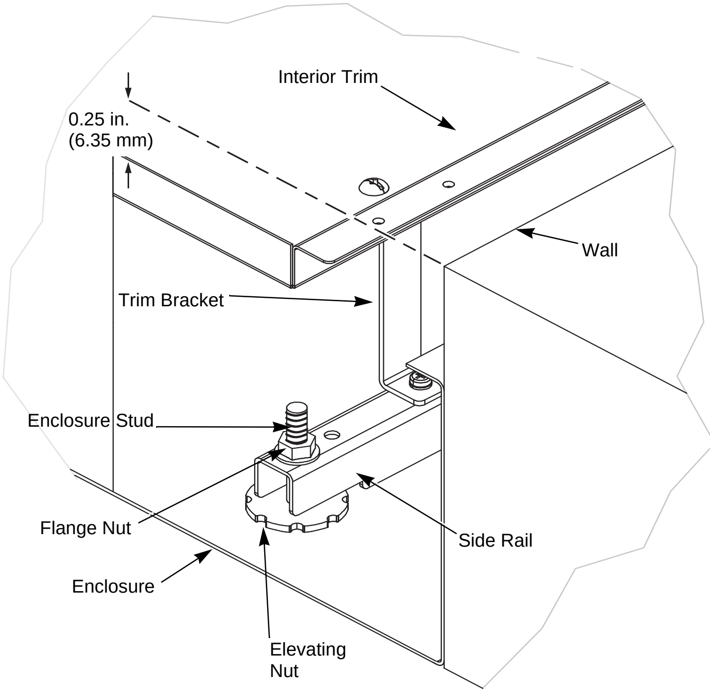
Figure 1: Interior Mounting of Square D Brand Enclosures



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Neutral Bonding Strap Installation

The neutral bonding strap should be used only when the panelboard is **installed** as service equipment.

To properly bond the neutral to the panelboard, follow the instructions for either “125 A or 250 A Maximum NF Panelboards”, “400 A or 600 A Maximum NF Panelboards”, or “800 A Maximum NF Panelboards” below, and on pages 10–12.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462, or NOM-029-STPS.
- Turn off all power supplying this equipment before working on or inside the equipment.
- The main bonding strap should be used only when the panelboard is installed as service equipment.
- Do not mix the mounting screws with the interior trim screws.

Failure to follow these instructions will result in death or serious injury.

NOTE: The bonding strap parts are found in the bag assembly provided with the interior.

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125 A or 250 A Maximum NF Panelboards

To install a neutral bonding strap on a 125 A or 250 A maximum NF panelboard, refer to Figure 2 and follow the instructions below.

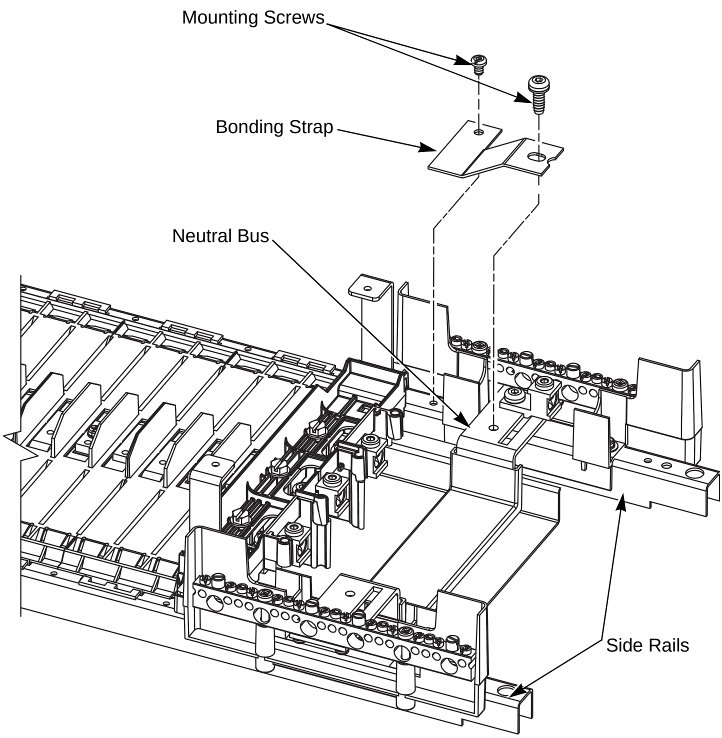
1. Align the bonding strap on the side rail, as pictured.

   NOTE: For some applications, it may be necessary to remove the lug (not pictured) before installing the bonding strap.

2. Insert the two mounting screws, as pictured. Tighten the 10-32 screw to 10–12 lb-in (1.1–1.4 N•m) and the 1/4-20 screw to 25–30 lb-in (2.8–3.4 N•m).

   NOTE: If the lug was removed in Step 1, reinstall it on top of the bonding strap. Use the 1/4-20 x 3/4 in. mounting screw. Lug mounting screws are provided in the bonding strap bag assembly.

Figure 2: Bonding Strap Installation — 125 A or 250 A Maximum NF Panelboards



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400 A or 600 A Maximum NF Panelboards

To install a neutral bonding strap on a 400 A or 600 A maximum NF panelboard, refer to Figure 3 and follow the instructions below.

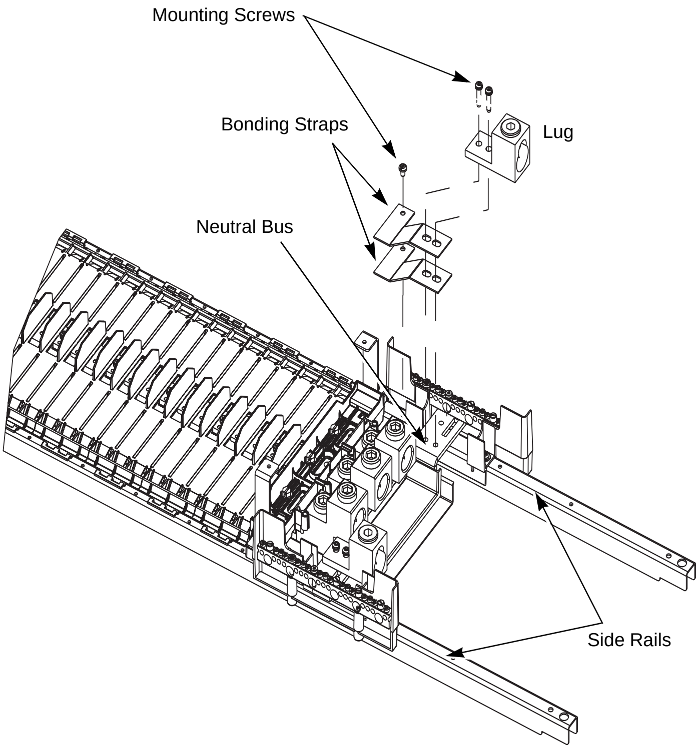
1. Align the two bonding straps on the side rail, as pictured.

   NOTE: For some applications, it may be necessary to remove the lug before installing the bonding strap.

2. Insert the three mounting screws, as pictured. Tighten the 10-32 screw to 10–12 lb-in (1.1–1.4 N•m) and the two 1/4-20 screws to 60–65 lb-in (6.8–7.3 N•m).

   NOTE: If the lug was removed in Step 1 above, reinstall it on top of the bonding straps. Use the 1/4-20 x 1 1/8 in. mounting screws. Lug mounting screws are provided in the bonding strap bag assembly.

Figure 3: Bonding Strap Installation — 400 A or 600 A Maximum NF Panelboards



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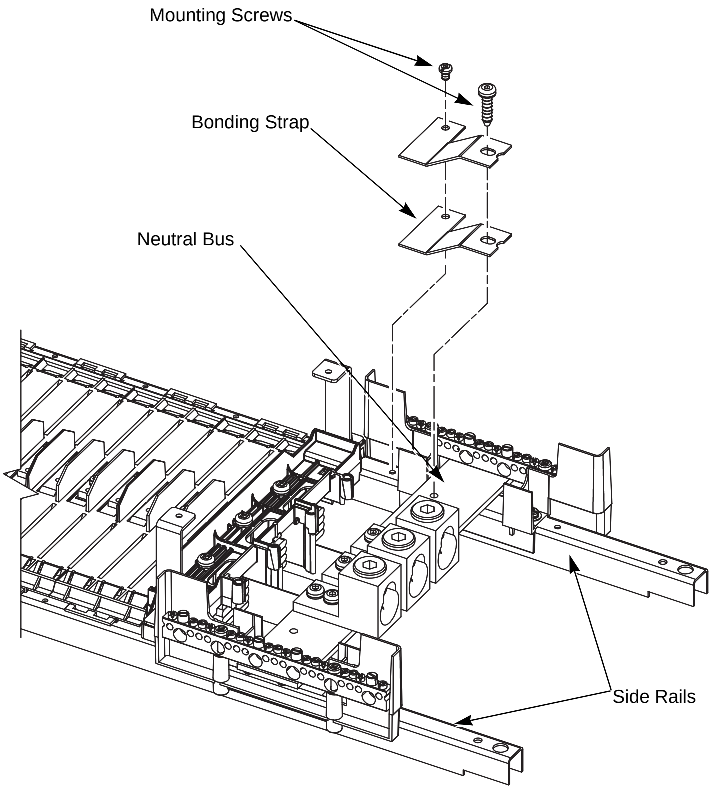
800 A Maximum NF Panelboards

To install a neutral bonding strap on an 800 A maximum NF panelboard, refer to Figure 4 and follow the instructions below.

1. Align the two bonding straps on the side rail, as pictured.
2. Insert the two mounting screws, as pictured. Tighten the 10-32 screw to 10–12 lb-in (1.1–1.4 N•m) and the 1/4-20 screw to 60–65 lb-in (6.8–7.3 N•m).

Figure 4: Bonding Strap Installation — 800 A Maximum NF Panelboards



ECB, EDB, EGB, and EJB Circuit Breaker Installation and Removal

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462, or NOM-029-STPS.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm that all power is off.
- All unused spaces must be filled with blank fillers.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

ECB, EDB, EGB, and EJB Circuit Breaker Installation

Refer to Figure 5 on page 14 for the following instructions:

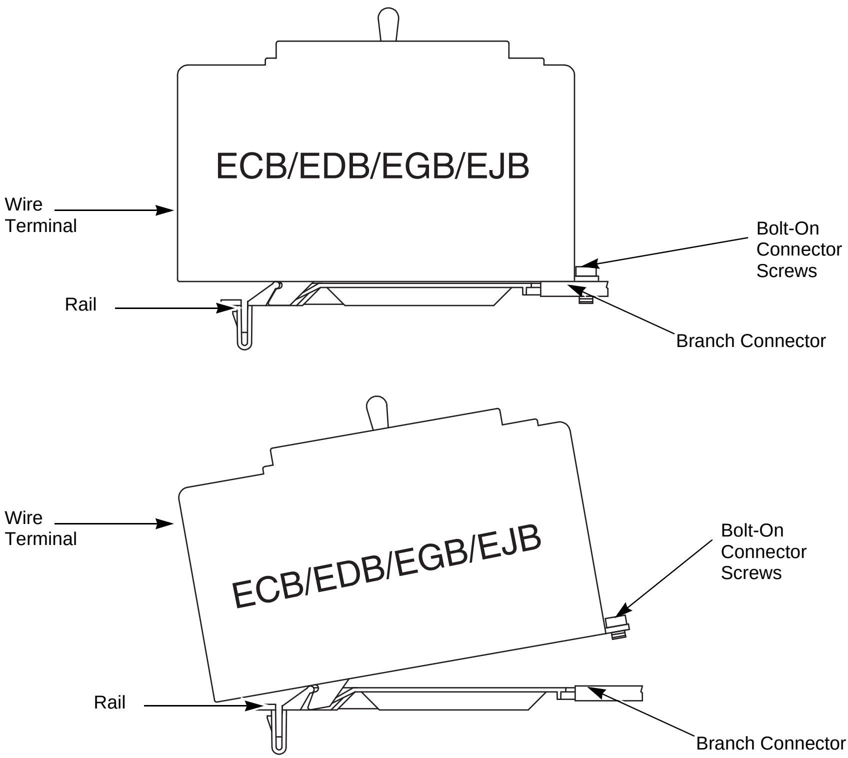
1. Turn off all power to the panelboard.
2. Turn the circuit breaker off.
3. Remove the interior trim.
4. With the bolt-on connector end of the circuit breaker slightly elevated, insert the mounting foot into the slot in the phase cover.
5. Rotate the circuit breaker down and back until the captive screw(s) align with the tapped holes in the circuit breaker connectors.
6. Engage the screw into the branch connector hole and tighten it to the torque values shown on the interior wiring and torque label.
7. Install the load wire.
8. Reinstall the interior trim.

ECB, EDB, EGB, and EJB Circuit Breaker Removal

Refer to Figure 5 for the following instructions:

1. Turn off all power to the panelboard.
2. Remove the interior trim.
3. Turn the circuit breaker off.
4. Remove the load wire.
5. Loosen the screw(s) in the circuit breaker connector and lift the circuit breaker off of the panelboard.
6. Reinstall the interior trim.

Figure 5: ECB, EDB, EGB, and EJB Circuit Breaker Installation and Removal



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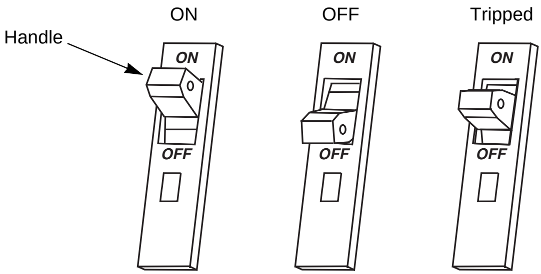
Circuit Breaker Reset Instructions

If the circuit breaker is tripped, the handle will be at the mid-position between ON and OFF. To reset the circuit breaker, push the handle to the OFF position, then to the ON position.

Figure 6: Circuit Breaker Handle Positions



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Interior Trim Preparation

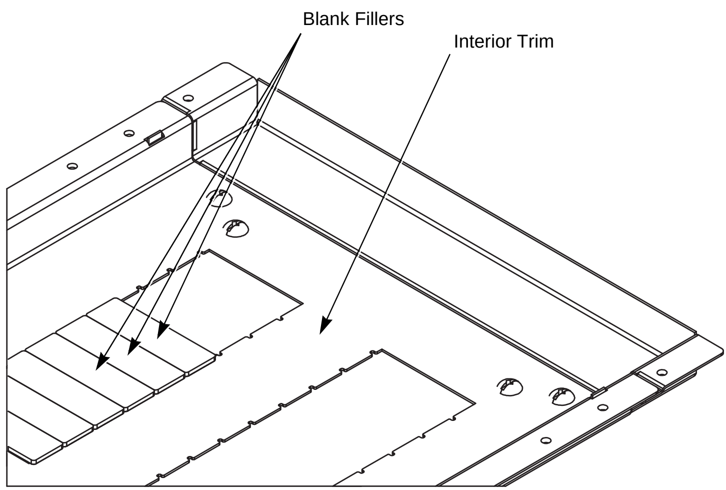
⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462 or, NOM-029-STPS.
- Before energizing the panelboard, all unused spaces must be filled with blank fillers.
- Replace all devices, doors, and covers before energizing this equipment.

Failure to follow this instruction will result in death or serious injury.

Figure 7: Interior Trim Diagram



NOTE: The back of the interior trim lists the catalog number for its corresponding compatible blank fillers.

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Panelboards Equipped with Motor Operators for PowerPact H and J Frame Circuit Breakers

⚠ DANGER

HAZARD OF ELECTRICAL SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462 or, NOM-029-STPS.
- This equipment must be installed and serviced only by properly trained qualified electrical personnel according to OSHA 1910.331 through 1910.335.
- Turn off all power sources supplying this equipment and de-energize all primary and secondary circuits before working on or inside equipment.
- Locking the manual operation or locking the motor cover does not disconnect the secondary motor circuit.
- Always use a properly rated voltage-sensing device to confirm equipment is de-energized.
- Always practice lock-out tag-out procedures according to OSHA requirements.
- Do not disable, remove, or modify any mechanical, electrical interlock or safety feature.

Failure to follow these instructions will result in death or serious injury.

Appendix 1: Specifications

Typical Wiring

NOTE: Do not use on 600 V or 480 V, 3-phase 3-wire delta systems.

Table 1: Panelboard Typical Wiring[1]

	1-Phase Panelboards		3-Phase Panelboards	
Voltage AC	Phase	Wires	Phase	Wires
600Y/347	1	3	3	4
480Y/277	1	3	3	4

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Table 1: Panelboard Typical Wiring[1]

Voltage AC	1-Phase Panelboards Phase	1-Phase Panelboards Wires	3-Phase Panelboards Phase	3-Phase Panelboards Wires
208Y/120	1	3	3	4
120/240	1	3	—	—
240[2]	1	2	3	3
240	1	3	—	—
240/120[3]	—	—	3	4 Delta

1 Additional information is provided on the panelboard. See the main circuit breaker rating, if used.

2 For this system, the neutral is not used.

3 When wiring for a delta system, phases “A” and “C” must be 120 V to neutral, phase “B” 208 V to neutral.

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Integral Main or Sub-Feed
(FI, KI, H, J, LA, LC, LH, EDB, EGB, EJB)

Figure 8: NF/NFOM 125–250 A Main Lugs or Main Breaker Diagram

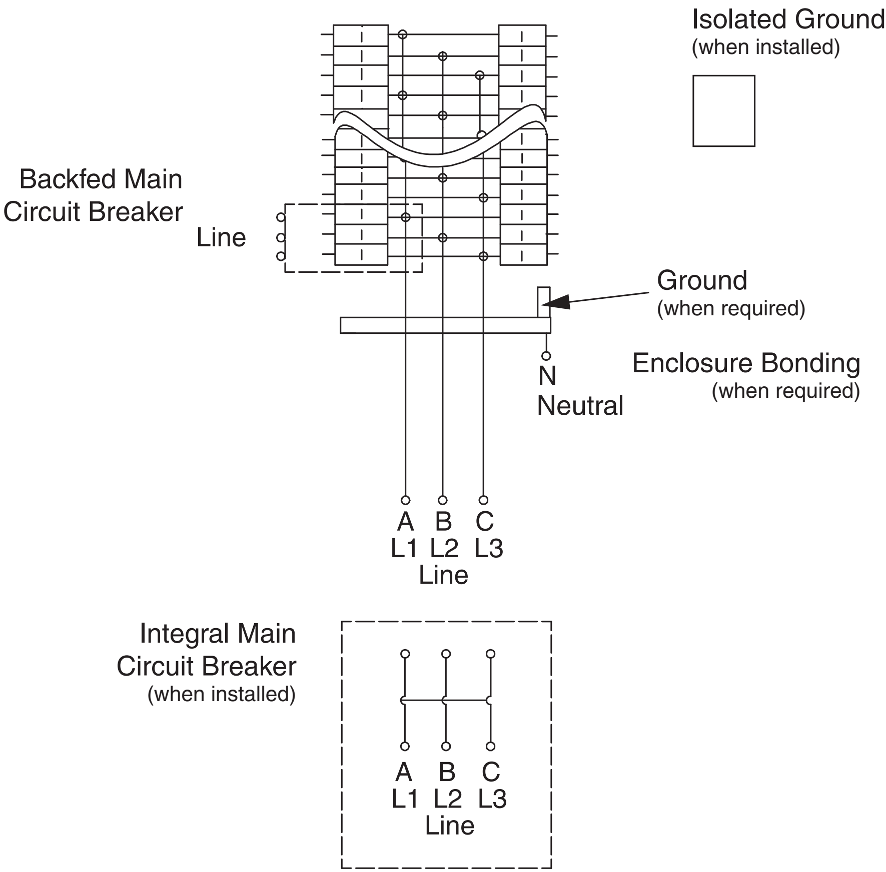

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Figure 9: NF 400–800 A Main Lugs or Main Circuit Breaker with or without Feed-Through Lugs Diagram

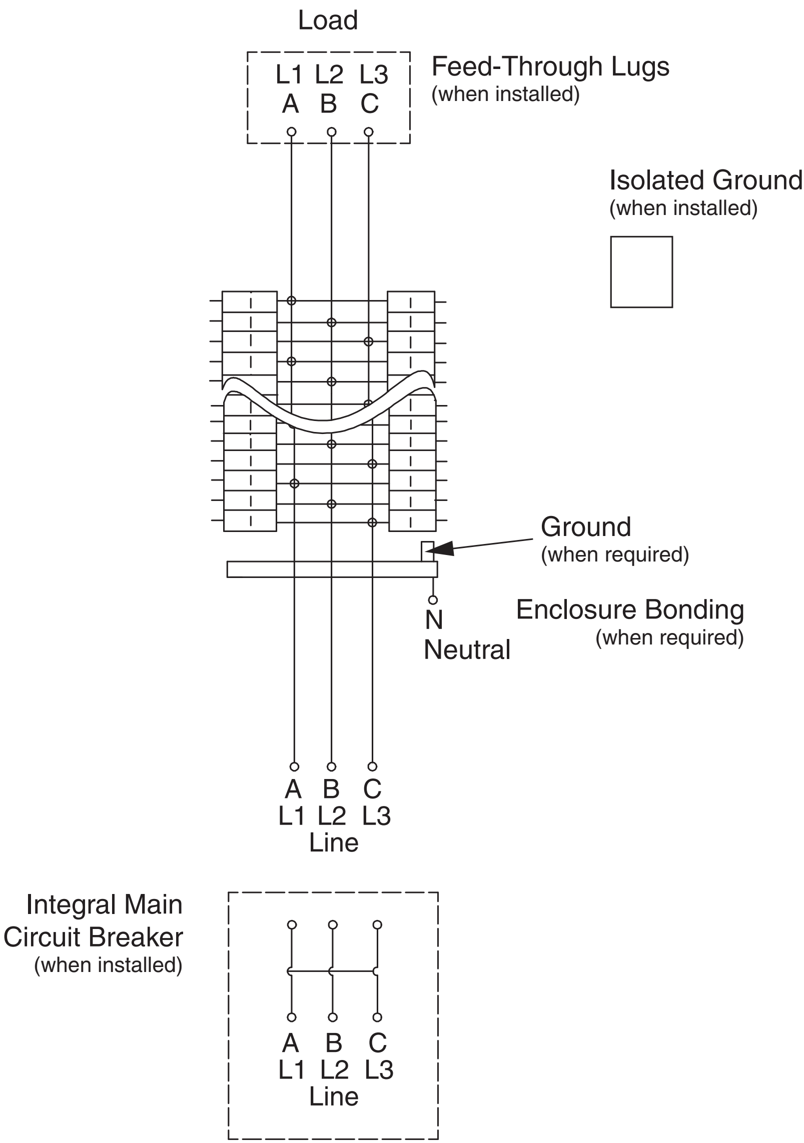

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Figure 10: NF 400–800 A Main Circuit Breaker with Feed-Through Lugs or Sub-Feed Circuit Breakers Diagram

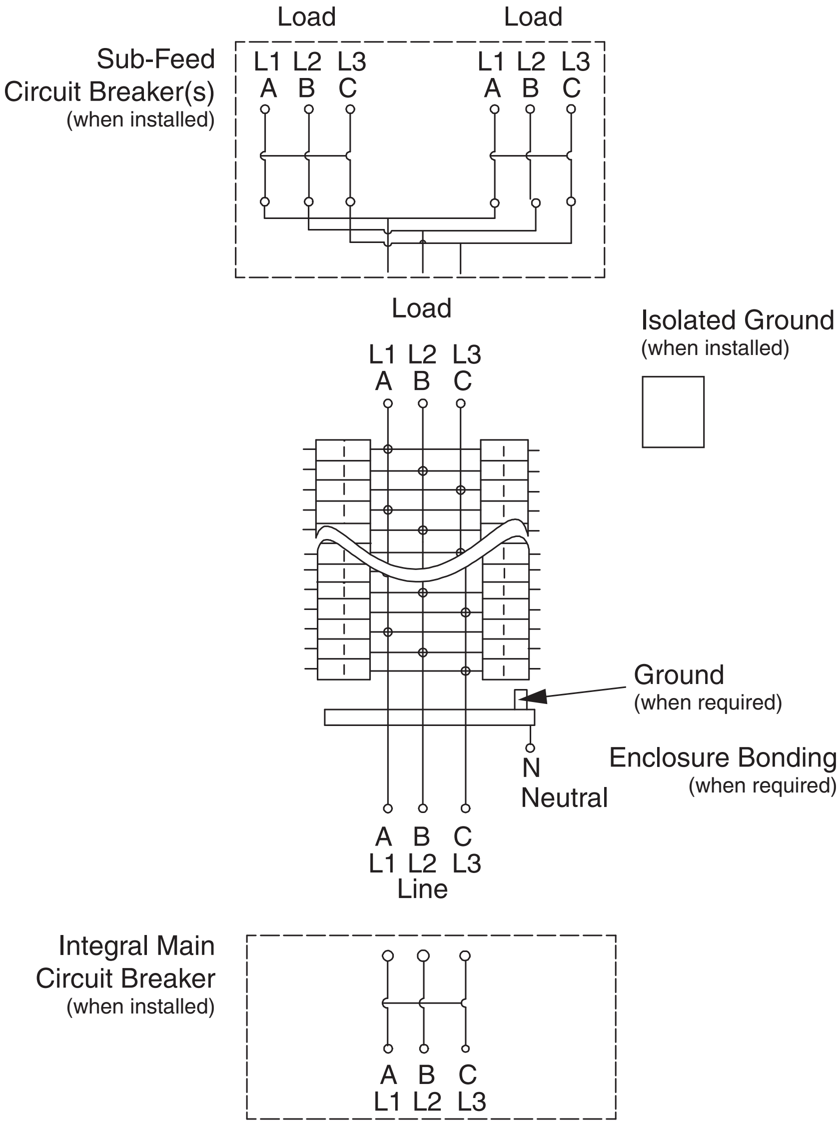
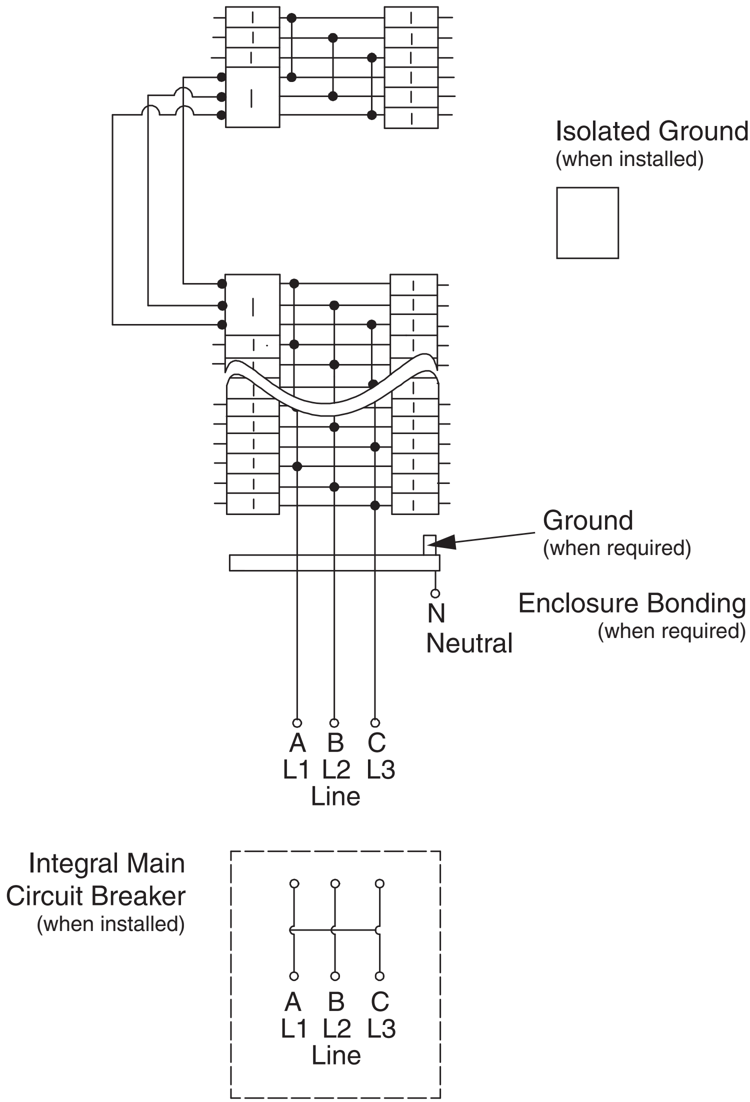


Figure 11: Typical NF Panelboard with Split Bus Diagram



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Panelboard Ratings

Refer to NEC section 110-22 and CEC rule 14-014 for more information. The series rated system label is located in the bag assembly.

NOTE: 125 A ED/EG/EJ breakers are 480Y/277 Vac maximum only.

Table 2: Series Connected Breaker Ratings (RMS Symmetrical)

Max. System Voltage AC[1]	Max. Short Circuit Current Rating	Square D Brand Integral or Remote Main Circuit Breakers and Remote Main Fuses[2]	Square D Brand Branch Circuit Breaker Catalog Designation and Allowable Ampere Ranges
120 120/240 240	65,000	EG, FH, FG, KH, LH, MH, MX, HG, JG, DG	EDB, EDB-EPD
		LG	EDB
		EG	ECB-G3
	100,000	EJ, FC, FJ, KC, LC, LX, HJ, JJ	EDB, EDB-EPD, EGB
		DJ, LJ	EDB, EGB
		EJ, FC, KC, HJ, JJ	ECB-G3
	125,000	HL, JL	EDB, EDB-EPD, EGB, ECB-G3
	200,000	FI, KI, LI, LXI, HR, JR, LR	EDB, EDB-EPD, EGB, EJB
		FI, KI, HR, JR	ECB-G3
		Class J or T (600 V) 200 A Max Fuses	ECB-G3
277 480Y/277	35,000	EG. FG, KH, LH, HG, JG, DG, LG	EDB, EDB-EPD
		EG, HG, JG	ECB-G3
	65,000	EJ, FC, FJ, KC, LC, LX, HJ, JJ, DJ	EDB, EDB-EPD, EGB
		EJ, FC, KC, HJ, JJ	ECB-G3
		LJ	EDB, EDB-EPD, EGB, EGB-EPD
		LL	EDB-EPD, EGB-EPD
	100,000	HL, JL	EDB, EDB-EPD, EGB, EJB
		DL, LL	EDB, EGB, EJB
		400 A Max Fuses	EDB, EDB–EPD, EGB, EJB
	200,000	FI, KI, LI, LXI, HR, JR, LR	EDB, EDB–EPD, EGB, EJB
		FI, KI, HR, JR	ECB-G3
		200 A Max Fuses	EDB, EDB-EPD, EGB, EJB, ECB-G3

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Table 2: Series Connected Breaker Ratings (RMS Symmetrical) *(suite)*

Max. System Voltage AC[1]	Max. Short Circuit Current Rating	Square D Brand Integral or Remote Main Circuit Breakers and Remote Main Fuses[2]	Square D Brand Branch Circuit Breaker Catalog Designation and Allowable Ampere Ranges
600Y/347	18,000	HG, JG, MG	EDB
		LG	EDB (15–110 A)
	25,000	EJ, FI, KH, KI, LC, LE, LX, LI, LXI, HJ, JJ	EDB, EGB
		LJ	EDB (15–110 A), EGB (15–110 A)
		LH	EDB (15–70 A), EGB
	35,000	LC, LE, LX	EDB, EGB, EJB
	50,000	HL, JL	EDB, EGB, EJB
		LL	EDB (15–110 A), EGB (15–110 A), EJB (15–110 A)
	65,000	FI, KI, HR, JR	EDB, EGB, EJB
		LI, LXI, LR	EJB
	200,000	Class J or T (600 V) 200 A Max Fuses	EDB, EGB, EJB

[1] Short circuit tests are conducted at 100–105% of the maximum rated voltage of the panelboard.

[2] Use only one wire per phase for incoming circuit breaker connections when the integral LH main circuit breaker is upstream of the feed-through lugs.

Table 3: NF Panel Mission Critical Breaker Selectivity

Maximum SCCR (RMS Symmetrical)	Integral or Remote Main Circuit Breakers	Branch Circuit Breakers			
		Type[1]	1-pole	2-pole	3-pole
Series Rated and Selective to 18 kA at 240 Vac	J-W, 250 A	ED, EG, EJ	15–70	15–125	15–125
Series Rated and Selective to 7 kA at 480Y/277 Vac	J-W, 250 A	ED, EG, EJ	15–70	70–125	70–125
Series Rated and Selective to 10 kA at 480Y/277 Vac	J-W, 250 A	ED, EG, EJ	15–60	15–60	15–60
Series Rated and Selective to 30 kA at 480Y/277 Vac or at 240 Vac	L-W, 250 A L-W, 400 A L-W, 600 A	ED, EG, EJ	15–70	15–125	15–125

[1] Including EPD circuit breakers

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Short Circuit Current Rating for Main Lug Interiors with Sub-Feed or Feed-Through Lugs

Main lug interiors equipped with sub-feed or feed-through lugs, where the device feeding the interior is unknown or not a Square D brand device, are rated to 25,000 RMS symmetrical amperes at 600Y/347 Vac maximum for three cycles. Use of one of the Square D brand circuit breakers of the correct ampere rating, listed as main circuit breakers on page 17, ahead of these lugs will result in a rating equal to that of the circuit breaker.

CE Marking

- Interiors with the "CE" mark meet the IEC 61439-1 and IEC 61439-2 standards.
- Main lug interiors with the "CE" mark have been tested to withstand 10,000 RMS symmetrical amperes for 30 cycles.
- Interiors with the "CE" mark must be used with ED breakers that have been tested to IEC standards. This limits the breakers used to the single pole EDB breaker (see Digest for details).
- Main breaker interiors with the "CE" mark are limited to a maximum short circuit rating equal to the IEC rating of the main breaker (see Digest for details). Main breakers must be series rated with the EDB single pole breakers.

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Appendix 2: Accessory Kits

An assortment of field-installable accessory kits is available for NF panelboards:

- Equipment Ground Bar Kits, on page 27
- Sub-Feed Lug Kits 125–400 A Panelboards, on page 27
- Main Lug Kits
  - Mechanical Lug Kits — Aluminum, on page 28
  - Mechanical Lug Kits — Copper, on page 28
  - Versa-Crimp® Compression Lug Kits — Aluminum, on page 29
  - Versa-Crimp Compression Lug Kits — Copper, on page 29

Equipment Ground Bar Kits

Equipment ground bar kits, suitable for copper or aluminum wire, meet the grounding needs of NF panelboards.

Table 4: Equipment Ground Bar Kits Specifications

Panelboard		Use Ground Bar Kit Catalog Number	
Branch Circuit	**Mains Rating**	**Aluminum[1]**	**Copper[2]**
1–42	800 A Maximum	(1) PK27GTA	(1) PK27GTACU
54–84		(2) PK27GTA	(2) PK27GTACU

1 Aluminum bars suitable for 60° C or 75° C Copper or Aluminum conductors.

2 Copper bars suitable for 60° C or 75° C Copper conductors.

Ground bar mounting locations are identified by the ground symbol ⏚ stamped into the back wall of the enclosure.

Sub-Feed Lug Kits 125–400 A Panelboards

Sub-feed main lugs are available for 125, 250, or 400 A applications.

Table 5: Sub-Feed Lugs kits for 125–400 A Panelboard Applications

Main Amps	Kit Catalog Number	Maximum Circuits
125	NF125SFL	18, 30
250	NF250SFL	30, 42, 54, 66, 84
400	NF400SFL	30, 42, 54, 66, 84

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Main Lug Kits

Table 6: Mechanical Lug Kits — Aluminum

Panelboard Amps	Kit Catalog Number	Wire Range
125	Standard	#6–350 kcmil (13.3–177.3 mm^2)
250	Standard	
400	Standard	(1) 1/0–750 kcmil (2) 1/0–350 kcmil ([1] 53.48–380 mm^2) ([2] 53.48–177.3 mm^2)
600	Standard	(2) 1/0–750 kcmil ([2] 53.48–380 mm^2)
800	Standard	(3) 1/0–750 kcmil ([3] 53.48–380 mm^2)

Table 7: Mechanical Lug Kits — Copper

Panelboard Amps	Kit Catalog Number	Wire Range
125	NFCUM1	#6–350 kcmil (13.3–177.3 mm^2)
250	NFCUM2	
400	NFCUM4	(1) 1/0–750 kcmil (2) 1/0–350 kcmil ([1] 53.48–380 mm^2) ([2] 53.48–177.3 mm^2)
600	NFCUM6	(2) 1/0–750 kcmil ([2] 53.48–380 mm^2)

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Table 8: Versa-Crimp® Compression Lug Kits — Aluminum

Panelboard Amps	Kit Catalog Number	Wire Range	Crimp Tool
125	NFALV1	#4–300 kcmil (21.15–152 mm^2)	VC6
250	NFALV2	250–350 kcmil (126.7–177.3 mm^2)	
400	NFALV4	(2) 2/0–500 kcmil ([2] 67.43–253.4 mm^2)	
600	NFALV6		

Table 9: Versa-Crimp Compression Lug Kits — Copper

Panelboard Amps	Kit Catalog Number	Wire Range	Crimp Tool
125	NFCUV1	#6–1/0 kcmil (13.30–53.48 mm^2)	VC6-3
250	NFCUV2	(1) 2/0–300 kcmil ([1] 67.43–152 mm^2)	VC6-FT, VC7, VC7-FT, VC8
400	NFCUV4	(1) 400–750 kcmil ([1] 202.7–380 mm^2)	
600	NFCUV6	(2) 250–500 kcmil ([2] 126.7–253.4 mm^2)	VC6 Series

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Document Title
Instruction Bulletin

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80043-741-03 Rev. 02 06/2015
Replaces 80043-741-03 Rev.01, 02/2015

Tableros de alumbrado y distribución NF NFOM

Manual de información
Clase 1670

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Boletín de instrucciones

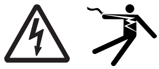
80043-741-03 Rev. 02
06/2015

Conservar para uso futuro.

SQUARE D by Schneider Electric

Categorías de riesgos y símbolos especiales

Asegúrese de leer detenidamente estas instrucciones y realice una inspección visual del equipo para familiarizarse con él antes de instalarlo, hacerlo funcionar o prestarle servicio de mantenimiento. Los siguientes mensajes especiales pueden aparecer en este boletín o en el equipo para advertirle sobre peligros potenciales o llamar su atención sobre cierta información que clarifica o simplifica un procedimiento.



La adición de cualquiera de estos símbolos a una etiqueta de seguridad de “Peligro” o “Advertencia” indica la existencia de un peligro eléctrico que podrá causar lesiones personales si no se observan las instrucciones.

Este es el símbolo de alerta de seguridad. Se usa para avisar sobre peligros potenciales de lesiones. Respete todos los mensajes de seguridad con este símbolo para evitar posibles lesiones o la muerte.

PELIGRO
PELIGRO indica una situación de peligro inminente que, si no se evita, **podrá** causar la muerte o lesiones serias.

ADVERTENCIA
ADVERTENCIA indica una situación potencialmente peligrosa que, si no se evita, **puede** causar la muerte o lesiones serias.

PRECAUCIÓN
PRECAUCIÓN indica una situación potencialmente peligrosa que, si no se evita, **puede** causar lesiones menores o moderadas.

AVISO
AVISO se usa para hacer notar prácticas no relacionadas con lesiones físicas. El símbolo de alerta de seguridad no se usa con esta palabra de indicación.

NOTA: Proporciona información adicional para clarificar o simplificar un procedimiento.

Observe que

Solamente el personal especializado deberá instalar, hacer funcionar y prestar servicios de mantenimiento al equipo eléctrico. Schneider Electric no asume responsabilidad alguna por las consecuencias emergentes de la utilización de este material.

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Introducción

Este boletín contiene las instrucciones de instalación de los tableros de alumbrado y distribución NF y NFOM con interruptores automáticos marca Square D™. Estos tableros de alumbrado han sido registrados con Underwriters Laboratories (cULus) y aceptan interruptores automáticos derivados ECB, EDB, EGB y EJB.

Para obtener asistencia técnica sobre la instalación de este tablero, póngase en contacto con el Centro de información al cliente de Schneider Electric llamando al 1-888-778-2733 (en EUA).

Consulte las etiquetas en el equipo para obtener información de seguridad y valores nominales. Con este documento se incluyen etiquetas adicionales del equipo.

Precauciones de seguridad

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía, consulte la norma 70E de NFPA, Z462 de CSA y NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice (O) el equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión adecuado para confirmar la desenergización del equipo.
- Asegúrese de leer y entender todo el contenido de este boletín de instrucciones así como la publicación de normas NEMA PB 1.1 (incluida) antes de instalar, hacer funcionar o prestar servicio de mantenimiento a este equipo.
- Las normas locales varían, se aceptan y hacen cumplir para fomentar la seguridad en instalaciones eléctricas. Es posible que necesite un permiso para realizar el trabajo eléctrico, y en algunos casos, algunos reglamentos pueden requerir una inspección del trabajo eléctrico efectuado.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de volver a energizar el equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Instalación

Esta sección proporciona instrucciones para los siguientes procedimientos de los tableros NF/NFOM:

- “Montaje de interiores en gabinetes marca Square D” en la página 6
- “Instalación de la barra de conexión del neutro” en la página 9
- “Instalación y desmontaje de los interruptores automáticos ECB, EDB, EGB y EJB” en la página 13
- “Instrucciones para restablecer el interruptor automático” en la página 15
- “Preparación del marco interior” en la página 16

Montaje de interiores en gabinetes marca Square D

Con este equipo, se ha incluido (por separado) la publicación NEMA PB 1.1 "Instrucciones generales apropiadas de instalación, funcionamiento y servicios de mantenimiento de tableros de alumbrado de 600 V o menos". Familiarícese con el contenido de este documento antes de continuar con los siguientes procedimientos.

Si no recibió una copia de esta publicación, o si tiene alguna pregunta con respecto al equipo, póngase en contacto con su distribuidor o representante local de Schneider Electric.

AVISO

PELIGRO DE DAÑO AL EQUIPO DEBIDO A CONEXIONES FLOJAS

- Asegúrese de que todas las conexiones estén bien apretadas.
- Consulte la etiqueta de información de par de apriete incluida con el tablero antes de apretar las conexiones.

El incumplimiento de estas instrucciones puede causar daño al equipo.

Para montar e instalar correctamente el interior de un tablero NF/NFOM, consulte la publicación de normas NEMA PB 1.1, y siga las instrucciones a continuación para “Montaje para sobreponer (gabinete montado en la pared)” en la página 7 o “Montaje para empotrar (gabinete empotrado en la pared)” en la página 7.

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Montaje para sobreponer (gabinete montado en la pared)

1. Monte el gabinete como se indica en la publicación de normas NEMA PB 1.1.
2. Retire el marco interior de sus soportes.
3. Instale el interior como se describe a continuación:
   a. Coloque el interior sobre los pernos del gabinete (vea la figura 1 en la página 8).
   b. Apriete las tuercas con brida en los rieles laterales del interior hasta que los rieles estén bien apoyados en la parte trasera del gabinete. No apriete demasiado. Si se aprieta demasiado las tuercas con brida puede que el interior se arquee en el centro.
   c. Vuelva a montar el marco interior después de realizar el alambrado.
4. Si se utiliza como equipo de entrada de acometida, será necesaria la barra de conexión del neutro. Consulte las instrucciones en Instalación de la barra de conexión del neutro en la página 9.
5. Coloque las etiquetas del equipo (incluidas en la bolsa de herrajes) siguiendo las instrucciones de la etiqueta colocada en la parte trasera del marco interior.

Montaje para empotrar (gabinete empotrado en la pared)

1. Monte el gabinete como se indica en la publicación de normas NEMA PB 1.1.
2. Retire el marco interior de sus soportes.
3. Instale el interior como se describe a continuación:
   a. Rosque las tuercas elevadoras (incluidas) en los pernos del gabinete.
   b. Coloque el interior sobre los pernos del gabinete (vea la figura 1 en la página 8). Coloque las tuercas con brida sobre los pernos del gabinete, sin apretarlas.
   c. Ajuste las tuercas elevadoras de manera que el reborde del marco interior se encuentre 0,25 pulg (6,35 mm) de la pared.
   d. Apriete las tuercas con brida en los rieles laterales.
   e. Vuelva a montar el marco interior después de realizar el alambrado.
4. Si se utiliza como equipo de entrada de acometida, será necesaria la barra de conexión del neutro. Consulte las

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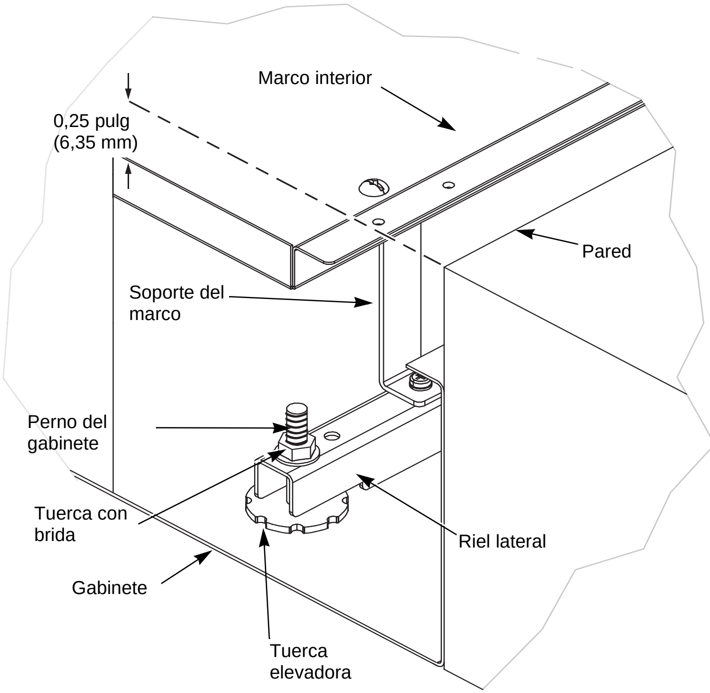
instrucciones en Instalación de la barra de conexión del neutro en la página 9.

5. Coloque las etiquetas del equipo (incluidas en la bolsa de herrajes) siguiendo las instrucciones de la etiqueta colocada en la parte trasera del marco interior.

Figura 1: Montaje del interior en gabinetes marca Square D



Instalación de la barra de conexión del neutro

La barra de conexión del neutro deberá usarse sólo cuando el tablero de alumbrado ha sido **instalado** como equipo de acometida.

Para conectar correctamente el neutro al tablero, siga las instrucciones para Tableros de alumbrado NF de 125 ó 250 A como máximo, Tableros de alumbrado NF de 400 ó 600 A como máximo o Tableros de alumbrado NF de 800 A como máximo en las páginas 10–12.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía, consulte la norma 70E de NFPA, Z462 de CSA y NOM-029-STPS
- Desenergice el equipo antes de realizar cualquier trabajo en él.
- La barra de conexión del neutro deberá usarse sólo cuando el tablero de alumbrado ha sido instalado como equipo de acometida.
- No mezcle los tornillos de montaje con los tornillos del marco interior.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

NOTA: Las piezas de la barra de conexión del neutro se encuentran en la bolsa de accesorios incluida con el interior.

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Tableros de alumbrado NF de 125 ó 250 A como máximo

Para instalar la barra de conexión del neutro en un tablero NF de 125 ó 250 A como máximo, consulte la figura 2 y siga las instrucciones a continuación.

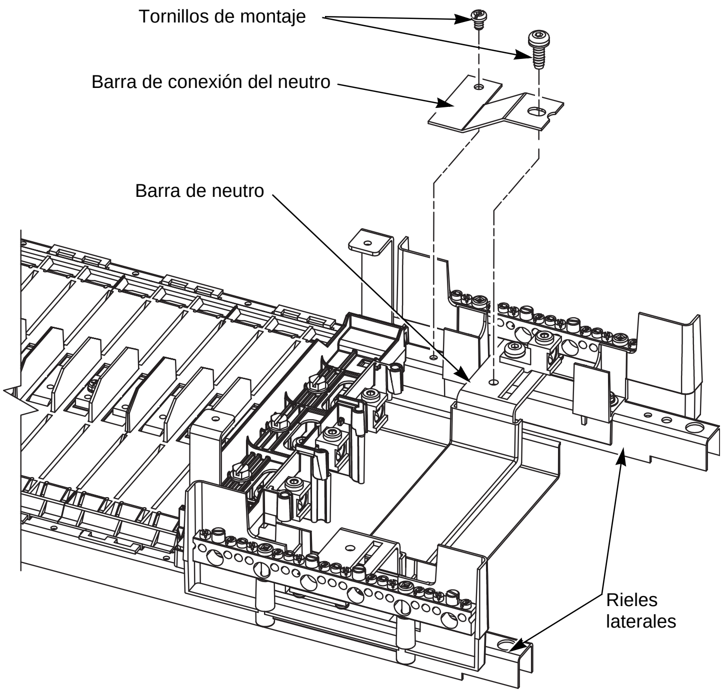
1. Alinee la barra de conexión del neutro en el riel lateral, como se ilustra.

   NOTA: En algunas aplicaciones, tal vez sea necesario retirar la zapata (no ilustrada) antes de instalar la barra de conexión.

2. Inserte los dos tornillos de montaje, como se ilustra. Apriete el tornillo de 10-32 de 1,1 a 1,4 N•m (10–12 lbs-pulg) y el tornillo de 1/4-20 de 2,8 a 3,4 N•m (25–30 lbs-pulg).

   NOTA: Si la zapata fue retirada en el paso 1, vuélvala a instalar encima de la barra de conexión del neutro. Emplee el tornillo de montaje de ¼-20 x ¾ pulg. Los tornillos de montaje de la zapata vienen incluidos en la bolsa de accesorios de la barra de conexión del neutro.

Figura 2: Instalación de la barra de conexión del neutro— Tableros NF de 125 ó 250 A como máximo



Tableros de alumbrado NF de 400 ó 600 A como máximo

Para instalar la barra de conexión del neutro en un tablero NF de 400 ó 600 A como máximo, consulte la figura 3 y siga las instrucciones a continuación.

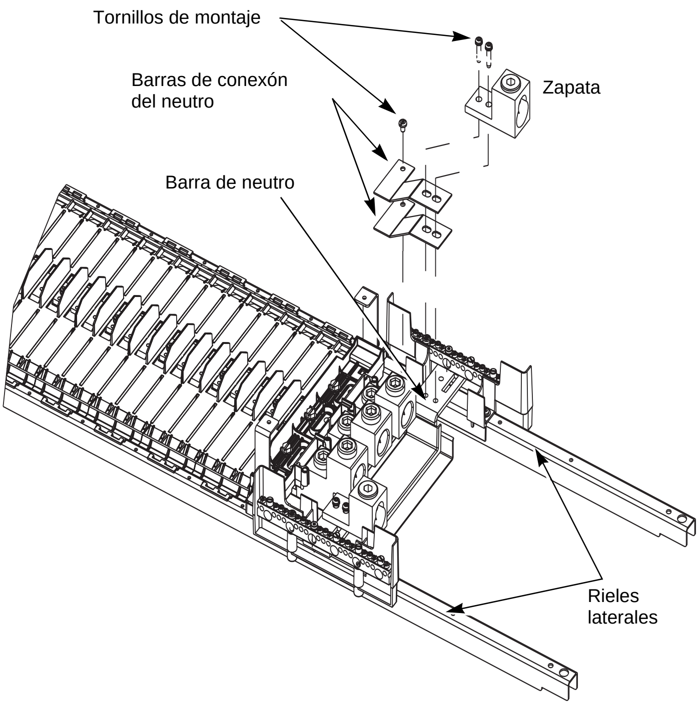
1. Alinee las dos barras de conexión del neutro en el riel lateral, como se ilustra.

   NOTA: En algunas aplicaciones, tal vez sea necesario retirar la zapata antes de instalar la barra de conexión del neutro.

2. Inserte los tres tornillos de montaje, como se ilustra. Apriete el tornillo de 10-32 de 1,1 a 1,4 N•m (10–12 lbs-pulg) y los dos tornillos de 1/4-20 de 6,8 a 7,3 N•m (60–65 lbs-pulg).

   NOTA: Si la zapata fue retirada en el paso 1 anterior, vuélvala a instalar encima de la barra de conexión del neutro. Emplee los tornillos de montaje de ¼-20 x 1 1/8 pulg. Los tornillos de montaje de la zapata vienen incluidos en la bolsa de accesorios de la barra de conexión del neutro.

Figura 3: Instalación de la barra de conexión del neutro— Tableros NF de 400 ó 600 A como máximo

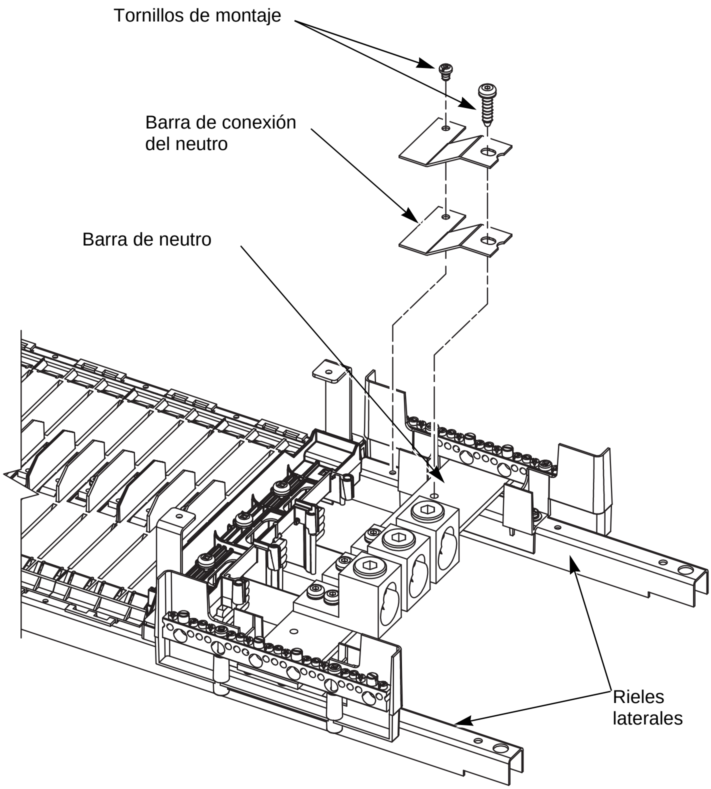


Tableros de alumbrado NF de 800 A como máximo

Para instalar la barra de conexión del neutro en un tablero NF de 800 A como máximo, consulte la figura 4 y siga las instrucciones a continuación.

1. Alinee las dos barras de conexión del neutro en el riel lateral, como se ilustra.
2. Inserte los dos tornillos de montaje, como se ilustra. Apriete el tornillo de 10-32 de 1,1 a 1,4 N•m (10–12 lbs-pulg) y el tornillo de 1/4-20 de 6,8 a 7,3 N•m (60–65 lbs-pulg).

Figura 4: Instalación de la barra de conexión del neutro—Tableros de alumbrado NF de 800 A como máximo



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Instalación y desmontaje de los interruptores automáticos ECB, EDB, EGB y EJB

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía, consulte la norma 70E de NFPA, Z462 de CSA y NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Todos los espacios sin utilizar deben cubrirse con placas de relleno.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de volver a energizar el equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Instalación de los interruptores automáticos ECB, EDB, EGB y EJB

Consulte la figura 5 en la página 14 para completar las siguientes instrucciones.

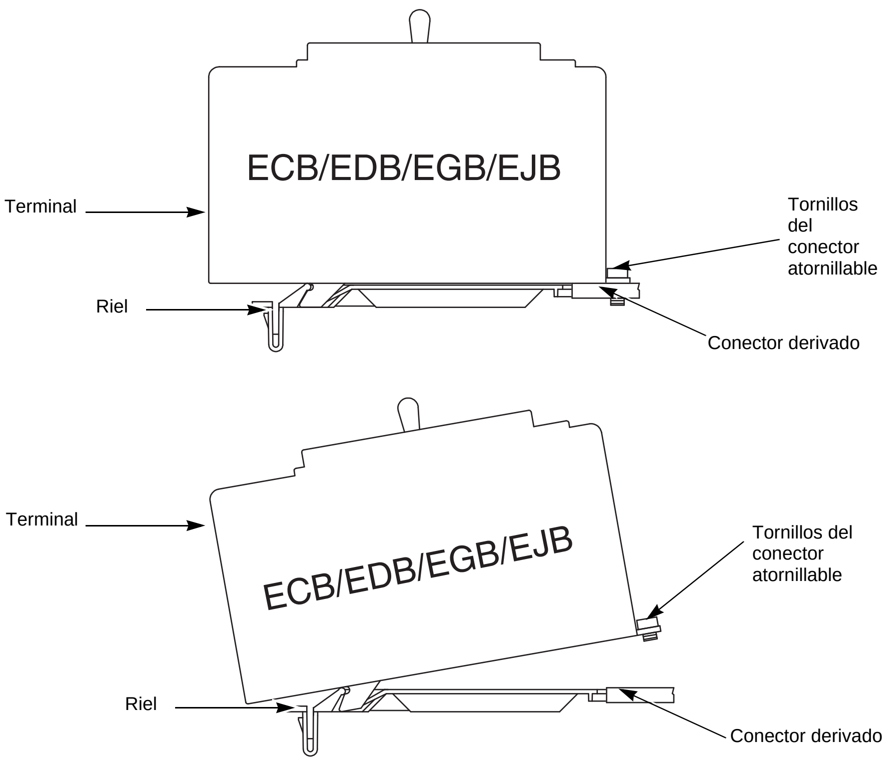
1. Desenergice (Off/O) el tablero.
2. Mueva la palanca del interruptor a la posición de abierto (Off/O).
3. Retire el marco interior.
4. Con el extremo del interruptor automático con conector atornillable ligeramente elevado, inserte la pata de montaje en la ranura en la cubierta de fases.
5. Gire el interruptor automático hacia abajo y hacia atrás hasta que los tornillos cautivos se alineen con los agujeros roscados en los conectores del interruptor.
6. Inserte los tornillos en los agujeros de los conectores derivados y apriételos en los valores de par de apriete especificados en la etiqueta de alambrado y valores de par de apriete del interior.
7. Instale el conductor de carga.
8. Vuelva a instalar el marco interior.

Desmontaje de los interruptores automáticos ECB, EDB, EGB y EJB

Consulte la figura 5 para completar las siguientes instrucciones.

1. Desenergice (Off/O) el tablero.
2. Retire el marco interior.
3. Mueva la palanca del interruptor automático a la posición de abierto (Off/O).
4. Retire el conductor de carga.
5. Afloje los tornillos en el conector del interruptor automático y levante el interruptor hasta desengancharlo del tablero.
6. Vuelva a instalar el marco interior.

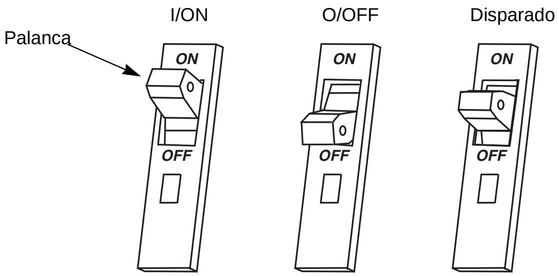
Figura 5: Instalación y desmontaje de los interruptores automáticos ECB, EDB, EGB y EJB



Instrucciones para restablecer el interruptor automático

Si se dispara el interruptor automático, la palanca se encontrará en la posición intermedia entre la posición de abierto (O/OFF) y cerrado (I/ON). Para restablecer el interruptor automático, mueva la palanca a la posición de abierto (O/OFF) y luego a la posición de cerrado (I/ON).

Figura 6: Posiciones de la palanca del interruptor automático



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Preparación del marco interior

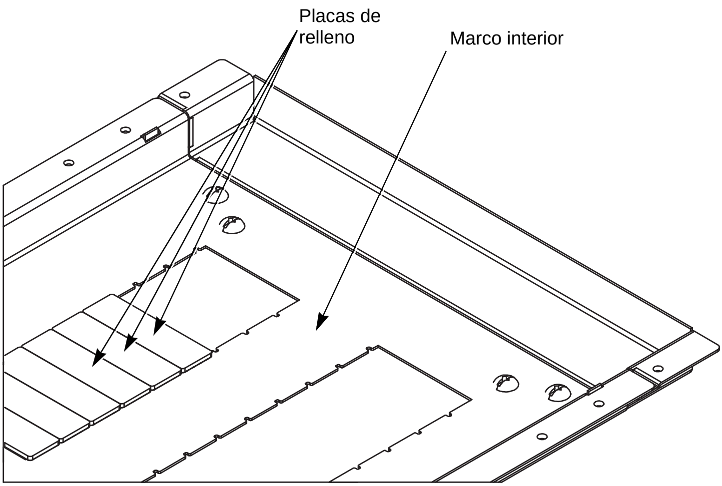
⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía, consulte la norma 70E de NFPA, Z462 de CSA y NOM-029-STPS.
- Antes de energizar el tablero de alumbrado, todos los espacios sin utilizar deben cubrirse con placas de relleno.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.

El incumplimiento de esta instrucción podrá causar la muerte o lesiones serias.

Figura 7: Diagrama del marco interior



NOTA: La parte posterior del marco interior contiene una lista de números de catálogo para las placas de relleno compatibles correspondientes.

Tableros equipados con operadores de motor para los interruptores automáticos PowerPact marcos H y J

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía, Consulte la norma 70E de NFPA, Z462 de CSA o NOM-029-STPS.
- Solamente el personal eléctrico calificado, correctamente capacitado, deberá instalar y prestar servicio de mantenimiento a este equipo de acuerdo con las normas 1910.331 a 1910.335 de OSHA.
- Desenergice todas las fuentes de alimentación que suministran a este equipo y desenergice todos los circuitos primarios y secundarios antes de realizar cualquier trabajo dentro o fuera de él.
- El bloqueo del funcionamiento manual o el bloqueo de la cubierta del motor no desconecta el circuito secundario del motor.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Siga todos los procedimientos de bloqueo y etiquetado de acuerdo con los requisitos de OSHA.
- No desactive, retire o modifique ningún enclavamiento mecánico ni eléctrico o función de seguridad.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

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Anexo 1: Especificaciones

Alambrado típico

NOTA: No lo utilice en sistemas delta de 600 ó 480 V, de 3 fases y 3 hilos.

Tabla 1: Alambrado típico del tablero de alumbrado[1]

	Tableros de alumbrado de 1 fase		Tableros de alumbrado de 3 fases	
Tensión de ~	**Fase**	**Conductores**	**Fase**	**Conductores**
600Y/347	1	3	3	4
480Y/277	1	3	3	4
208Y/120	1	3	3	4
120/240	1	3	—	—
240[2]	1	2	3	3
240	1	3	—	—
240/120[3]	—	—	3	4, delta

1 El tablero de alumbrado incluye información adicional. Consulte el valor nominal del interruptor automático principal, si se usa.

2 Para estos sistemas, el neutro no se utiliza.

3 Cuando las conexiones son para un sistema delta, las fases "A" y "C" deben ser de 120 V a neutro, la fase "B" de 208 V a neutro.

Interruptores automáticos integrales, principales o de subalimentación
(FI, KI, H, J, LA, LC, LH, EDB, EGB, EJB)

Figura 8: Diagrama del tablero NF/NFOM de 125–250 A con zapatas principales o interruptor automático principal

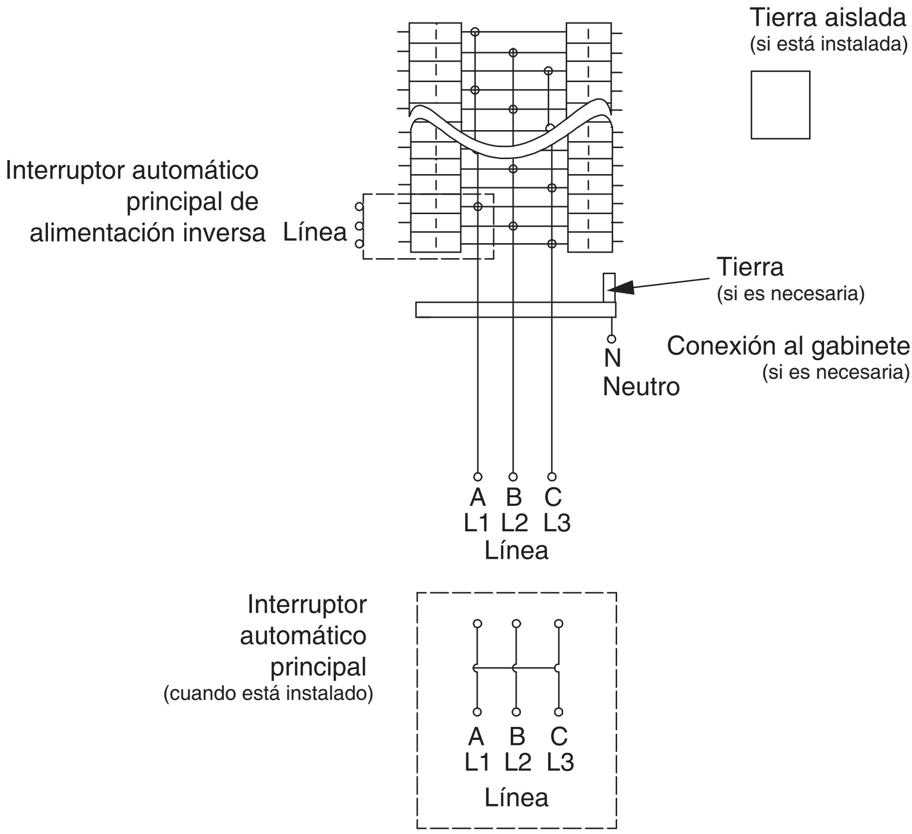

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Figura 9: **Diagrama del tablero NF de 400–800 A con zapatas principales o interruptor automático principal con o sin zapatas de paso**

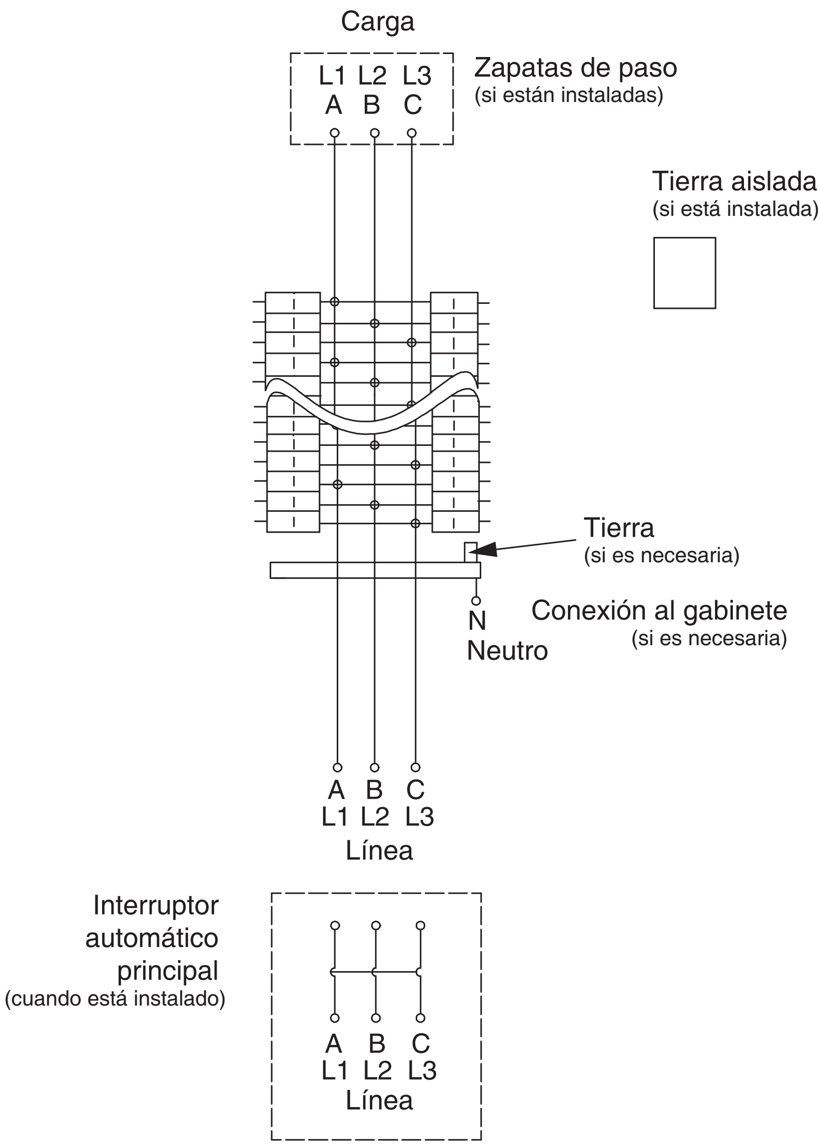

Figura 10: Diagrama del tablero NF de 400–800 A con interruptor automático principal con zapatas de paso o interruptores de subalimentación

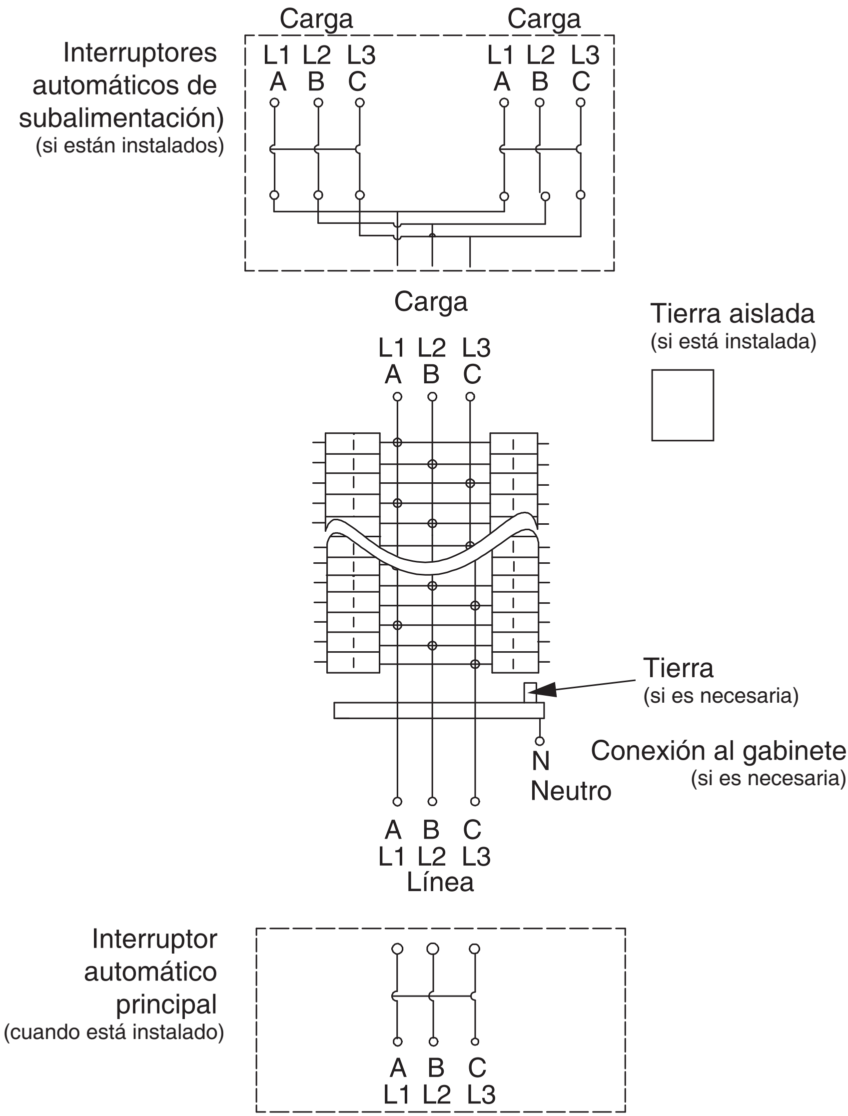

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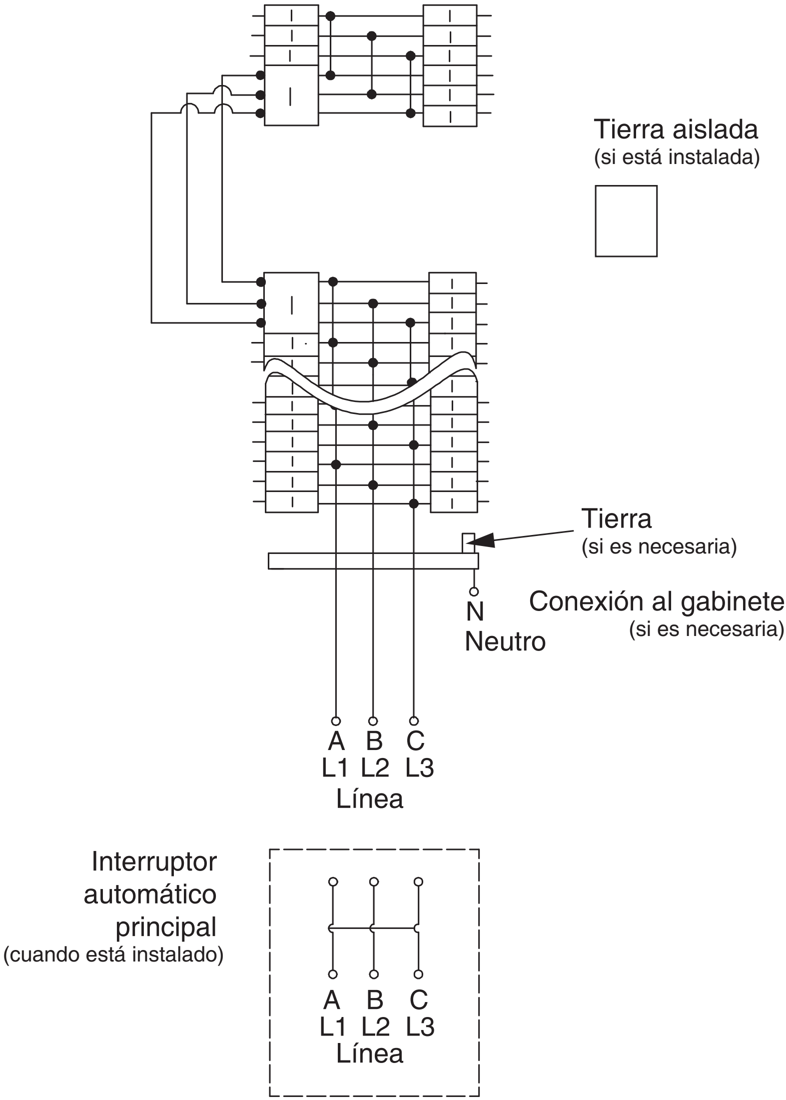
Figura 11: Diagrama del tablero de alumbrado NF típico con barras divididas



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Valores nominales del tablero

Consulte la sección 110-22 del NEC y de la NOM-001-SEDE y la norma 14-014 de CEC para obtener más información. La etiqueta del sistema en serie se encuentra en la bolsa de accesorios.

NOTA: Los interruptores automáticos ED/EG/EJ de 125 A son únicamente de 480Y/277 V~ como máximo.

Tabla 2: Valores nominales del interruptor automático conectado en serie (rcm simétricos)

Tensión[1] máxima del sistema, ~	Corriente nom. máx. de corto-circuito	Interruptores automáticos principales integrales o remotos y fusibles principales remotos marca Square D[2]	Designación de catálogo de los interruptores automáticos derivados marca Square D y gamas de corriente permitidas
120 120/240 240	65 000	EG, FH, FG, KH, LH, MH, MX, HG, JG, DG	EDB, EDB–EPD
		LG	EDB
		EG	ECB–G3
	100 000	EJ, FC, FJ, KC, LC, LX, HJ, JJ	EDB, EDB-EPD, EGB
		DJ, LJ	EDB, EGB
		EJ, FC, KC, HJ, JJ	ECB–G3
	125 000	HL, JL	EDB, EDB–EPD, EGB, ECB–G3
	200 000	FI, KI, LI, LXI, HR, JR, LR	EDB, EDB-EPD, EGB, EJB
		FI, KI, HR, JR	ECB-G3
		Fusibles clase J o T (600 V) de 200 A como máx.	ECB–G3
277 480Y/277	35 000	EG. FG, KH, LH, HG, JG, DG, LG	EDB, EDB-EPD
		EG, HG, JG	ECB–G3
	65 000	EJ, FC, FJ, KC, LC, LX, HJ, JJ, DJ	EDB, EDB-EPD, EGB
		EJ, FC, KC, HJ, JJ	ECB-G3
		LJ	EDB, EDB-EPD, EGB, EGB-EPD
		LL	EDB-EPD, EGB-EPD
	100 000	HL, JL	EDB, EDB–EPD, EGB, EJB
		DL, LL	EDB, EGB, EJB
		Fusibles de 400 A como máx.	EDB, EDB–EPD, EGB, EJB
	200 000	FI, KI, LI, LXI, HR, JR, LR	EDB, EDB–EPD, EGB, EJB
		FI, KI, HR, JR	ECB-G3
		Fusibles de 200 A como máx.	EDB, EDB–EPD, EGB, EJB, ECB–G3

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Tabla 2: Valores nominales del interruptor automático conectado en serie (rcm simétricos) *(continuación)*

Tensión[1] máxima del sistema, ~	Corriente nom. máx. de corto-circuito	Interruptores automáticos principales integrales o remotos y fusibles principales remotos marca Square D[2]	Designación de catálogo de los interruptores automáticos derivados marca Square D y gamas de corriente permitidas
600Y/347	18 000	HG, JG, MG	EDB
		LG	EDB (15–110 A)
	25 000	EJ, FI, KH, KI, LC, LE, LX, LI, LXI, HJ, JJ	EDB, EGB
		LJ	EDB (15–110 A), EGB (15–110 A)
		LH	EDB (15–70 A), EGB
	35 000	LC, LE, LX	EDB, EGB, EJB
	50 000	HL, JL	EDB, EGB, EJB
		LL	EDB (15–110 A), EGB (15–110 A), EJB (15–110 A)
	65 000	FI, KI, HR, JR	EDB, EGB, EJB
		LI, LXI, LR	EJB
	200 000	Fusibles clase J o T (600 V) de 200 A como máx.	EDB, EGB, EJB

1 Las pruebas de cortocircuito son conducidas entre el 100 y 105% de la tensión nominal máxima del tablero de alumbrado.

2 Utilice únicamente un conductor por fase para las conexiones entrantes del interruptor automático cuando el interruptor automático principal LH integral se encuentra en la corriente ascendente (lado de línea) de las zapatas de paso.

Tabla 3: Selectividad de interruptores automáticos para aplicaciones críticas en tableros NF

SCCR máxima (simétricos rcm)	Interruptores automáticos principales integral o remoto	Interruptores automáticos derivados			
		Tipo[1]	1-polo	2-polos	3-polos
Valor nominal en serie y selectivo hasta 18 kA en 240 V~	J-W, 250 A	ED, EG, EJ	15–70	15–125	15–125
Valor nominal en serie y selectivo hasta 7 kA en 480Y/277 V~	J-W, 250 A	ED, EG, EJ	15–70	70–125	70–125
Valor nominal en serie y selectivo hasta 10 kA en 480Y/277 V~	J-W, 250 A	ED, EG, EJ	15–60	15–60	15–60
Valor nominal en serie y selectivo hasta 30 kA en 480Y/277 V~ o en 240 V~	L-W, 250 A L-W, 400 A L-W, 600 A	ED, EG, EJ	15–70	15–125	15–125

1 Incluyendo los interruptores automáticos EPD

Corriente nominal de cortocircuito para los interiores tipo zapatas principales equipados con zapatas de subalimentación o de paso

Los interiores tipo zapatas principales equipados con zapatas de subalimentación o de paso, en los que el dispositivo que alimenta el interior es desconocido o no es uno de marca Square D, son adecuados para 25 000 A simétricos rcm en 600Y/347 V~ como máximo durantes tres ciclos. El uso de un interruptor automático marca Square D de corriente nominal correcta, que figura en la lista como un interruptor automático principal en la página 18, delante de estas zapatas, producirá una corriente nominal igual a la del interruptor.

Marcado CE

- Interiores con el marcado "CE" cumplen con las normas IEC 61439-1 e IEC 61439-2.
- Los interiores con zapatas principales y marcado "CE" han sido probados para soportar 10 000 amperes simétricos rcm durante 30 ciclos.
- Los interiores con el marcado "CE" deben usarse con los interruptores automáticos ED que han sido probados con las normas de IEC. Esto limita los interruptores automáticos utilizados al interruptor EDB de un polo (consulte el Compendiado para obtener más detalles).
- Los interiores de interruptores automáticos principales con el marcado "CE" están limitados a una corriente de cortocircuito máxima igual al valor nominal de IEC del interruptor principal (consulte el Compendiado para obtener más detalles). Los interruptores automáticos principales deben ser clasificados en serie con los interruptores EDB de un polo.

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Anexo 2: Accesorios

Se encuentran disponibles una variedad de accesorios de instalación en campo para los tableros de alumbrado NF:

- Kits de barra de tierra del equipo, en la página 27
- Kits de zapatas de subalimentación para los tableros de 100 a 400 A, en la página 27
- Kits de zapatas principales
  - — Kits de zapatas mecánicas de aluminio, en la página 28
  - — Kits de zapatas mecánicas de cobre, en la página 28
  - — Kits de zapatas de compresión Versa-Crimp® de aluminio en la página 29
  - — Kits de zapatas de compresión Versa-Crimp de cobre, en la página 29

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Kits de barra de tierra del equipo

Los kits de barra de tierra del equipo son adecuados para conductores de cobre o aluminio y cumplen con los requisitos de conexión a tierra de los tableros NF.

Tabla 4: Especificaciones de los kits de barra de tierra del equipo

Tablero de alumbrado		Utilice el kit de barra de tierra con número de catálogo	
Cant. de circuito	Capacidad nominal	Aluminio[1]	Cobre[2]
1–42	800 A máx.	(1) PK27GTA	(1) PK27GTACU
54–84		(2) PK27GTA	(2) PK27GTACU

1 Barras de aluminio adecuadas para conductores de Cu o Al de 60° C o 75° C

2 Barras de cobre adecuadas para conductores de Cu de 60° C o 75° C

Las ubicaciones de montaje de la barra de puesta a tierra han sido identificadas por el símbolo de tierra ⏚ estampado en la pared trasera del gabinete.

Kits de zapatas de subalimentación para los tableros de 125 a 400 A

Se encuentran disponibles zapatas principales de subalimentación para las aplicaciones de 125, 250 ó 400 A.

Tabla 5: Kits de zapatas de subalimentación para aplicaciones de tableros de 125 a 400 A

Capacidad (A)	No. de catálogo del kit	Cantidad máxima de circuitos
125	NF125SFL	18, 30
250	NF250SFL	30, 42, 54, 66, 84
400	NF400SFL	30, 42, 54, 66, 84

Kits de zapatas principales

Tabla 6: Kits de zapatas mecánicas de aluminio

Tablero (A)	No. de catálogo del kit	Tamaño del conductor
125	Estándar	no. 6–350 kcmil 13,3–177,3 mm^2
250	Estándar	
400	Estándar	(1) 1/0–750 kcmil (2) 1/0–350 kcmil (1) 53,48–380 mm^2 (2) 53,48–177,3 mm^2
600	Estándar	(2) 1/0–750 kcmil (2) 53,48–380 mm^2
800	Estándar	(3) 1/0–750 kcmil (3) 53,48–380 mm^2

Tabla 7: Kits de zapatas mecánicas de cobre

Tablero (A)	No. de catálogo del kit	Tamaño del conductor
125	NFCUM1	no. 6–350 kcmil 13,3–177,3 mm^2
250	NFCUM2	
400	NFCUM4	(1) 1/0–750 kcmil (2) 1/0–350 kcmil (1) 53,48–380 mm^2 (2) 53,48–177,3 mm^2
600	NFCUM6	(2) 1/0–750 kcmil (2) 53,48–380 mm^2

Tabla 8: Kits de zapatas de compresión Versa-Crimp® de aluminio

Tablero (A)	No. de catálogo del kit	Tamaño del conductor	Herramienta de compresión
125	NFALV1	no. 4–300 kcmil 21,15–152 mm²	VC6
250	NFALV2	250–350 kcmil 126,7–177,3 mm²	
400	NFALV4	(2) 2/0–500 kcmil (2) 67,43–253,4 mm²	
600	NFALV6		

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Tabla 9: Kits de zapatas de compresión Versa-Crimp de cobre

Tablero (A)	No. de catálogo del kit	Tamaño del conductor	Herramienta de compresión
125	NFCUV1	no. 6–1/0 kcmil 13,30–53,48 mm²	VC6-3
250	NFCUV2	(1) 2/0–300 kcmil (1) 67,43–152 mm²	VC6-FT, VC7, VC7-FT, VC8
400	NFCUV4	(1) 400–750 kcmil (1) 202,7–380 mm²	
600	NFCUV6	(2) 250–500 kcmil (2) 126,7–253,4 mm²	Serie VC6

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Importado en México por:
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www.schneider-electric.com.mx

Solamente el personal especializado deberá instalar, hacer funcionar y prestar servicios de mantenimiento al equipo eléctrico. Schneider Electric no asume responsabilidad alguna por las consecuencias emergentes de la utilización de este material.

80043-741-03 Rev. 02, 06/2015
Reemplaza 80043-741-03 Rev. 01, 02/2015

Panneaux de distribution NF/NFOM
Directives d'utilisation
Classe 1670

Directives d'utilisation

80043-741-03 Rev. 02
06/2015

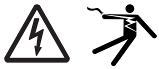
À conserver pour usage ultérieur.

FRANÇAIS

by Schneider Electric

Catégories de dangers et symboles spéciaux

Lisez soigneusement ces directives et examinez l’appareillage afin de vous familiariser avec lui avant son installation, son fonctionnement ou son entretien. Les messages spéciaux qui suivent peuvent apparaître dans ce document ou sur l’appareillage. Ils vous avertissent de dangers potentiels ou attirent votre attention sur des renseignements pouvant éclaircir ou simplifier une procédure.



L’ajout de l’un ou l’autre des symboles à une étiquette de sécurité « Danger » ou « Avertissement » vous indique qu’un danger électrique existe et qu’il pourra y avoir des blessures corporelles si les directives ne sont pas suivies.

Ceci est le symbole d’une alerte de sécurité. Il sert à vous avertir d’un danger potentiel de blessures corporelles. Respectez toutes les consignes de sécurité accompagnant ce symbole pour éviter toute situation potentielle de blessure ou de mort.

⚠ DANGER
DANGER indique une situation de danger imminent qui, si elle n’est pas évitée, **entraînera** la mort ou des blessures graves.

⚠ AVERTISSEMENT
AVERTISSEMENT indique une situation de danger potentiel qui, si elle n’est pas évitée, **peut entraîner** la mort ou des blessures graves.

⚠ ATTENTION
ATTENTION indique une situation de danger potentiel qui, si elle n’est pas évitée, **peut entraîner** des blessures mineures ou modérées.

AVIS
AVIS est utilisé pour commenter des pratiques sans rapport avec les blessures physiques. Le symbole d'alerte de sécurité n'est pas employé avec ce mot de signalement.

REMARQUE : Fournit des renseignements complémentaires pour clarifier ou simplifier une procédure.

Veuillez noter

Seul un personnel qualifié doit effectuer l’installation, l’utilisation, l’entretien et la maintenance du matériel électrique. Schneider Electric n’assume aucune responsabilité des conséquences éventuelles découlant de l’utilisation de cette documentation.

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Introduction

Ce bulletin contient les directives pour l'installation des panneaux de distribution NF et NFOM à disjoncteurs de la marque Square DMC. Ces panneaux de distribution sont inscrits UL (cULus) et acceptent les disjoncteurs de dérivation ECB, EDB, EGB et EJB.

Pour obtenir une assistance technique sur l'installation de ce panneau de distribution, contacter le centre d'informations à la clientèle Schneider Electric au 1-888-778-2733 (É.-U.).

Consulter les étiquettes sur l'appareil pour les renseignements de capacité et de sécurité. Des étiquettes supplémentaires pour l'appareil sont fournies avec ce document.

Mesures de sécurité

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E, CSA Z462 ou NOM-029-STPS.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez l'alimentation de l'appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension ayant une valeur nominale appropriée pour s'assurer que l'alimentation est coupée.
- Lisez et comprenez entièrement ces directives d'utilisation et la publication des normes NEMA PB 1.1 incluse avant d'installer, d'utiliser ou d'assurer l'entretien de cet appareil.
- Les codes locaux varient mais sont adoptés et appliqués pour assurer des installations électriques sécuritaires. C'est peut-être nécessaire d'avoir un permis pour exécuter des travaux sur des circuits électriques et certains codes peuvent exiger que le travail électrique accompli soit inspecté.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Installation

Cette section fournit les directives pour les procédures suivantes concernant les panneaux de distribution NF/NFOM :

- « Montage de l’intérieur pour coffrets de la marque Square D »
- « Installation de la tresse de mise à la masse du neutre » à la page 9
- « Installation et démontage des disjoncteurs ECB, EDB, EGB et EJB » à la page 13
- « Directives de réarmement du disjoncteur » à la page 15
- « Préparation de la garniture intérieure » à la page 16

Montage de l’intérieur pour coffrets de la marque Square D

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Une publication séparée, intitulée « Directives générales pour l’installation, le fonctionnement et l’entretien des panneaux de distribution d’une valeur nominale de 600 V ou moins » (NEMA PB 1.1) a été fournie avec cet appareil. Se familiariser avec le contenu de ce document avant d’entreprendre l’une quelconque des procédures ci-après.

Si un exemplaire de cette publication n’était pas joint, ou si des questions se posent concernant cet appareil, contacter le distributeur local ou un représentant de Schneider Electric.

AVIS

RISQUE DE DOMMAGES MATÉRIELS DUS À UN RACCORDEMENT DÉFAIT OU LÂCHE

- Assurez-vous que tous les raccordements sont correctement serrés.
- Reportez-vous à l’étiquette de renseignements sur les couples de serrage, placée sur le panneau de distribution, avant de serrer les raccordements.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

Pour monter et installer correctement l’intérieur du panneau de distribution NF/NFOM, consulter la publication NEMA PB 1.1 et observer les directives ci-dessous concernant « Montage en surface (coffret monté sur un mur) » ou « Montage encastré (coffret encastré dans le mur) ».

Montage en surface (coffret monté sur un mur)

1. Monter le coffret comme indiqué dans la publication NEMA PB 1.1.
2. Enlever la garniture intérieure des supports de garniture.
3. Installer l’intérieur comme décrit ci-après :
   a. Placer l’intérieur sur les goujons du coffret (voir la figure 1 à la page 8).
   b. Serrer les écrous à brides sur les rails latéraux de l’intérieur jusqu’à ce que les rails se trouvent contre l’arrière du coffret. Ne pas trop serrer. Un serrage excessif des écrous à brides peut faire l'intérieur s'enfler au milieu.
   c. Remonter la garniture intérieure une fois le câblage effectué.
4. Si l’appareil est utilisé comme appareil d’entrée de service, une mise à la masse du neutre est nécessaire. Voir les directives dans la section « Installation de la tresse de mise à la masse du neutre » à la page 9.
5. Poser les étiquettes de l’appareil (fournies dans le sac de l’assortiment) comme indiqué aux directives, au dos de la feuille d’étiquettes de l’appareil.

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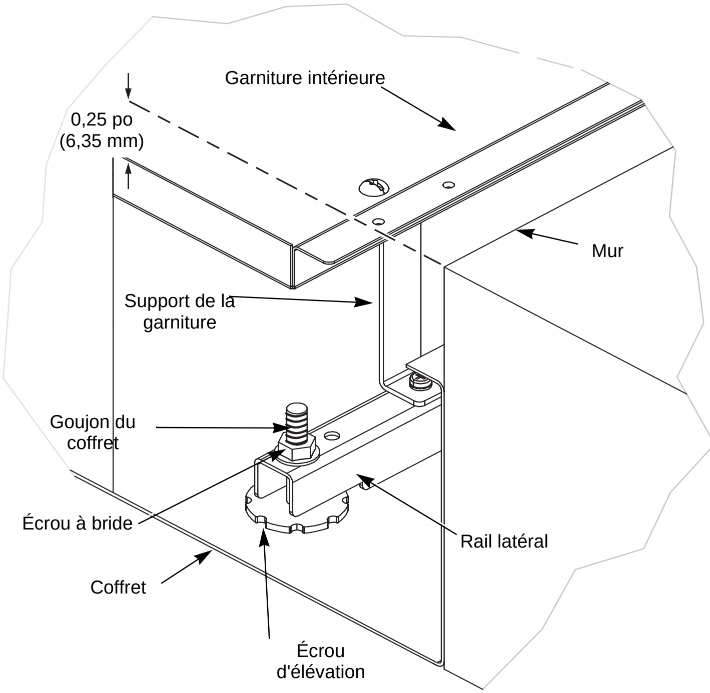
Montage encastré (coffret encastré dans le mur)

1. Monter le coffret comme indiqué dans la publication NEMA PB 1.1.
2. Enlever la garniture intérieure des supports de garniture.
3. Installer l’intérieur comme décrit ci-après :
   a. Visser les écrous d'élévation (fournis) sur les goujons du coffret.
   b. Placer l’intérieur sur les goujons du coffret (voir la figure 1 à la page 8). Placer les écrous à bride sur les goujons du coffret, mais ne pas les serrer.
   c. Ajuster les écrous d'élévation de façon à ce que le rebord de la garniture intérieure soit à environ 0,25 po (6,35 mm) du mur.
   d. Serrer les écrous à bride sur les rails latéraux.
   e. Remonter la garniture intérieure une fois le câblage effectué.
4. Si l’appareil est utilisé comme appareil d’entrée de service, une mise à la masse du neutre est nécessaire. Voir les directives dans

la section « Installation de la tresse de mise à la masse du neutre » à la page 9.

5. Poser les étiquettes de l’appareil (fournies dans le sac de l’assortiment) comme indiqué aux directives, au dos de la feuille d’étiquettes de l’appareil.

Figure 1 : Montage de l’intérieur des coffrets de la marque Square D



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Installation de la tresse de mise à la masse du neutre

La tresse de mise à la masse du neutre ne doit être utilisée que lorsque le panneau de distribution est **installé** comme appareil de service.

Pour fixer correctement le neutre au panneau de distribution, suivre les directives pour « Panneaux de distribution NF de 125 ou 250 A au maximum », « Panneaux de distribution NF de 400 ou 600 A au maximum » ou pour « Panneaux de distribution NF de 800 A au maximum » ci-après et aux pages 10 à 12.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E, CSA Z462 ou NOM-029-STPS.
- Coupez l'alimentation de l'appareil avant d'y travailler.
- La tresse de mise à la masse ne doit être utilisée que lorsque le panneau de distribution est installé comme appareil de service.
- Ne mélangez pas les vis de montage avec les vis de la garniture intérieure.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

REMARQUE : Les pièces de la tresse de mise à la masse se trouvent dans le sac de l’assortiment fourni avec l’intérieur.

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Panneaux de distribution NF de 125 ou 250 A au maximum

Pour installer une tresse de mise à la masse du neutre sur un panneau de distribution NF de 125 ou 250 A au maximum, se reporter à la figure 2 et suivre les directives ci-dessous.

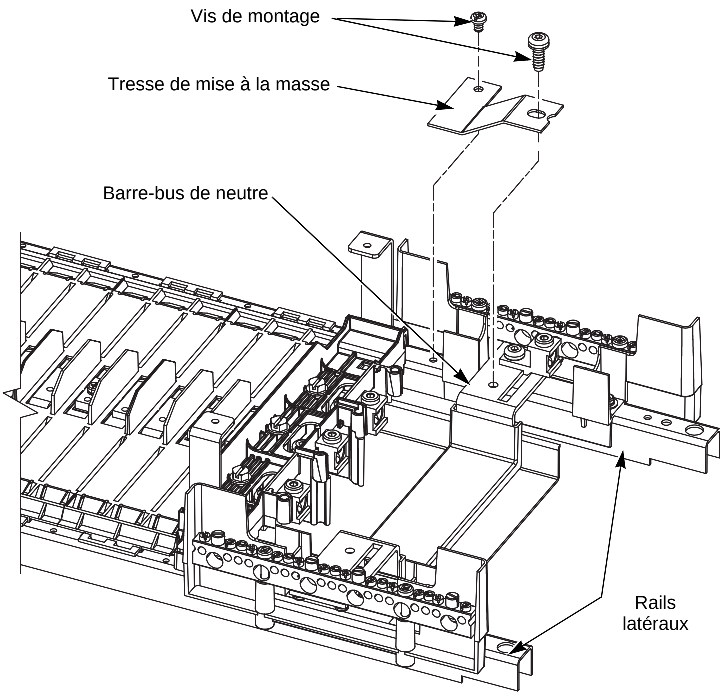
1. Aligner la tresse de mise à la masse sur le rail latéral, comme illustré.

   REMARQUE : Pour certaines applications, il peut être nécessaire de retirer la cosse (non représentée) avant d'installer la tresse.

2. Insérer les deux vis de montage, comme illustré. Serrer la vis de 10-32 au couple de 1,1 à 1,4 N•m (10 à 12 lb-po) et la vis de 1/4-20 au couple de 2,8 à 3,4 N•m (25 à 30 lb-po).

   REMARQUE : Si la cosse a été retirée au point 1 ci-dessus, la réinstaller sur le dessus de la tresse de mise à la masse. Utiliser la vis de montage de ¼-20 x 3/4 po. Les vis de montage de cosses sont fournies dans le sac de l'assortiment de la tresse de mise à la masse.

Figure 2 : Installation de la tresse de mise à la masse — Panneaux NF de 125 ou 250 A au maximum



Panneaux de distribution NF de 400 ou 600 A au maximum

Pour installer une tresse de mise à la masse du neutre sur un panneau de distribution NF de 400 ou 600 A au maximum, se reporter à la figure 3 et suivre les directives ci-dessous.

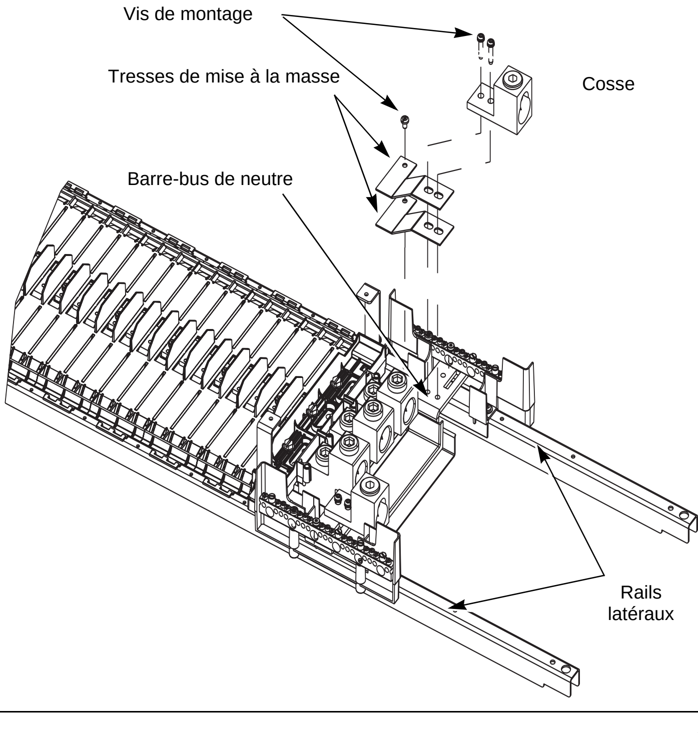
1. Aligner les deux tresses de mise à la masse sur le rail latéral, comme illustré.

   REMARQUE : Pour certaines applications, il peut être nécessaire de retirer la cosse avant d'installer la tresse de mise à la masse.

2. Insérer les trois vis de montage, comme illustré. Serrer la vis de 10-32 au couple de 1,1 à 1,4 N•m (10 à 12 lb-po) et la vis de 1/4-20 au couple de 6,8 à 7,3 N•m (60 à 65 lb-po).

   REMARQUE : Si la cosse a été retirée au point 1 ci-dessus, la réinstaller sur le dessus de la tresse de mise à la masse. Utiliser les vis de montage de ¼-20 x 1 1/8 po. Les vis de montage de cosses sont fournies dans le sac de l'assortiment de la tresse.

Figure 3 : Installation de la tresse de mise à la masse — Panneaux NF de 400 ou 600 A au maximum

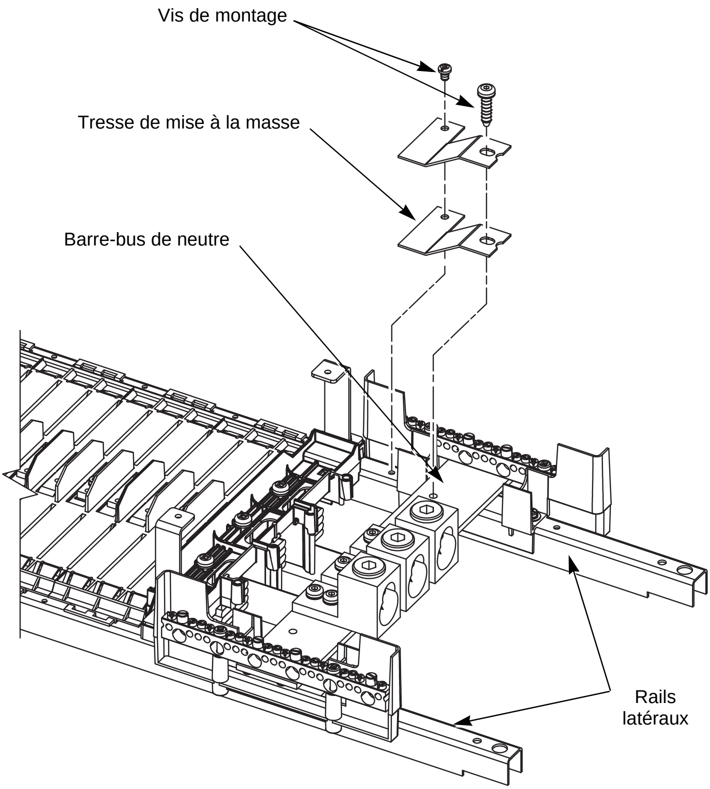


Panneaux de distribution NF de 800 A au maximum

Pour installer une tresse de mise à la masse du neutre sur un panneau de distribution NF de 800 A au maximum, se reporter à la figure 4 et suivre les directives ci-dessous.

1. Aligner les deux tresses de mise à la masse sur le rail latéral, comme illustré.
2. Insérer les deux vis de montage, comme illustré. Serrer la vis de 10-32 au couple de 1,1 à 1,4 N•m (10 à 12 lb-po) et la vis de 1/4-20 au couple de 6,8 à 7,3 N•m (60 à 65 lb-po).

Figure 4 : Installation de la tresse de mise à la masse — Panneaux de distribution NF de 800 A au maximum



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Installation et démontage des disjoncteurs ECB, EDB, EGB et EJB

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E, CSA Z462 ou NOM-029-STPS.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez toutes les alimentations de l'appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Tous les espaces inutilisés doivent être remplis avec des plaques de remplissage.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

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Installation des disjoncteurs ECB, EDB, EGB et EJB

Pour les directives suivantes, consulter la figure 5 à la page 14.

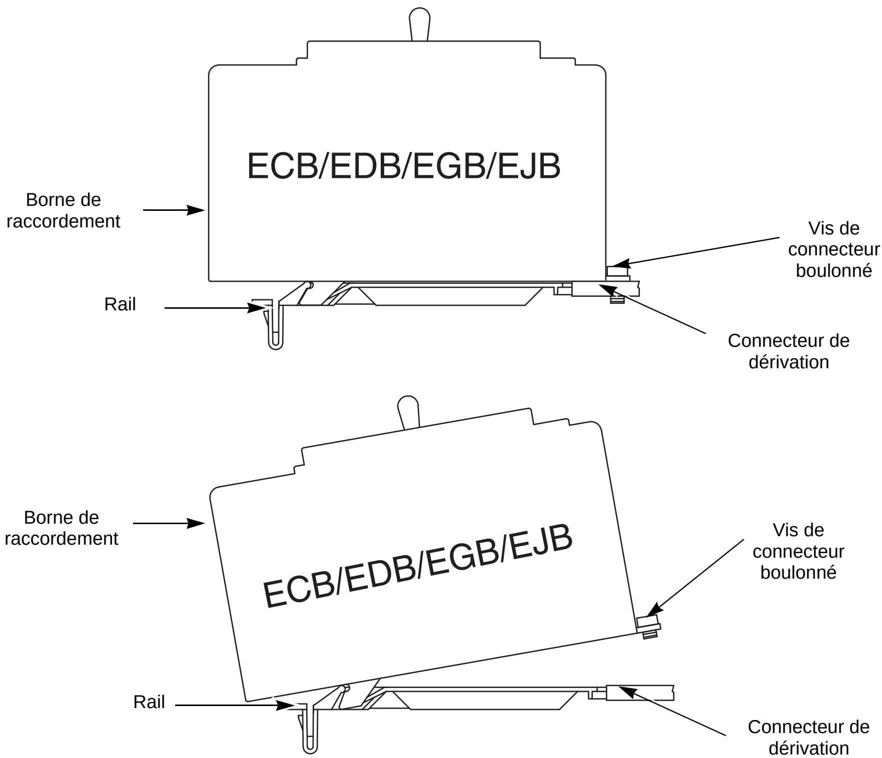
1. Couper (O) toutes les alimentations du panneau de distribution.
2. Mettre le disjoncteur hors tension (O).
3. Enlever la garniture intérieure.
4. Avec l’extrémité du disjoncteur avec le connecteur boulonné légèrement élevé, insérer le pied de montage dans la fente du couvercle de phase.
5. Faire pivoter le disjoncteur vers le bas et à l’arrière jusqu’à ce que la(les) vis imperdable(s) s’aligne(nt) avec les trous taraudés dans les connecteurs du disjoncteur.
6. Insérer les vis dans les trous des connecteurs de dérivation et serrer aux valeurs de couple indiquées sur l’étiquette de câblage et de couple de l’intérieur.
7. Installer le fil de charge.
8. Réinstaller la garniture intérieure.

Démontage des disjoncteurs ECB, EDB, EGB et EJB

Pour les directives suivantes, consulter la figure 5.

1. Couper (O) toutes les alimentations du panneau de distribution.
2. Enlever la garniture intérieure.
3. Mettre le disjoncteur hors tension (O).
4. Retirer le fil de charge.
5. Desserrer la(les) vis du connecteur du disjoncteur et soulever le disjoncteur pour le retirer du panneau de distribution.
6. Réinstaller la garniture intérieure.

Figure 5 : Installation et démontage des disjoncteurs ECB, EDB, EGB et EJB



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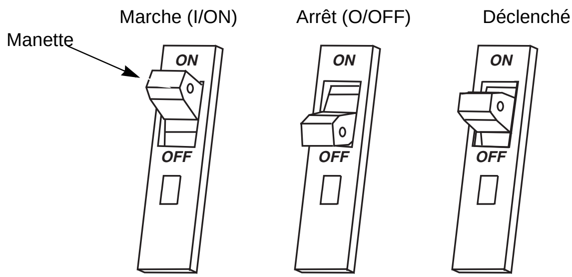
Directives de réarmement du disjoncteur

Si le disjoncteur est déclenché, la manette se trouvera en position moyenne entre marche (I/ON) et arrêt (O/OFF). Pour réarmer le disjoncteur, mettre la manette à la position d'arrêt (O), puis à la position de marche (I).

Figure 6 : Positions de la manette du disjoncteur



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Préparation de la garniture intérieure

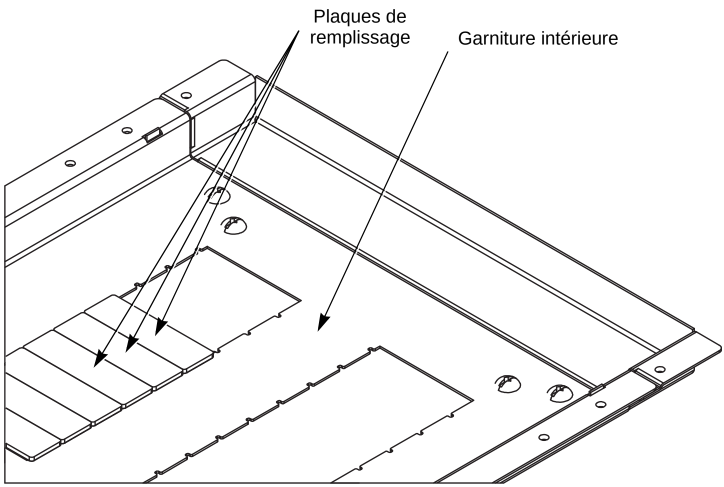
⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E, CSA Z462 ou NOM-029-STPS.
- Avant de mettre le panneau de distribution sous tension, tous les espaces inutilisés doivent être remplis avec des plaques de remplissage.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Figure 7 : Schéma de la garniture intérieure



REMARQUE : L’arrière de la garniture intérieure donne la liste des numéros de catalogue des plaques de remplissage compatibles correspondants.

Panneaux de distribution équipés d'opérateurs à moteur pour les disjoncteurs PowerPact à châssis H et J

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E, CSA Z462 ou NOM-029-STPS.
- L'installation et l'entretien de cet appareil ne doivent être effectués que par des électriciens qualifiés ayant reçu une formation appropriée conformément à OSHA 1910.331 à 1910.335.
- Coupez toutes les sources d'alimentation qui alimentent cet appareil et mettez hors tension les circuits primaires et secondaires avant de travailler sur ou à l'intérieur de cet appareil.
- Le verrouillage du fonctionnement manuel ou du couvercle du moteur ne déconnecte pas le circuit secondaire du moteur.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour vous assurer que l'appareil est hors tension.
- Observez toujours toutes les procédures d'interverrouillage et d’étiquetage selon la réglementation OSHA.
- Ne désactivez, retirez ni modifiez aucun interverrouillage mécanique ou électrique ni aucune fonction de sécurité.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

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Annexe 1 : Spécifications

Câblage typique

REMARQUE : Ne pas utiliser sur des systèmes en triangle triphasés à 3 fils de 600 V ou 480 V.

Tableau 1 : Câblage typique du panneau de distribution[1]

Tension ca	Panneaux de distribution monophasés		Panneaux de distribution triphasés	
	Phase	Fils	Phase	Fils
600Y/347	1	3	3	4
480Y/277	1	3	3	4
208Y/120	1	3	3	4
120/240	1	3	—	—
240[2]	1	2	3	3
240	1	3	—	—
240/120[3]	—	—	3	4, en triangle

[1] Des informations supplémentaires sont fournies sur le panneau de distribution. Voir la valeur nominale du disjoncteur principal, si utilisé.

[2] Pour ce système, le neutre n'est pas utilisé.

[3] Lorsqu'elles sont câblées pour un système en triangle, les phases « A » et « C » doivent être de 120 V au neutre, la phase « B » doit être de 208 V au neutre.

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Disjoncteur principal intégré ou de sous-alimentation
(FI, KI, H, J, LA, LC, LH, EDB, EGB, EJB)

Figure 8 : Schéma du panneau NF/NFOM de 125–250 A à cosses principales ou à disjoncteur principal

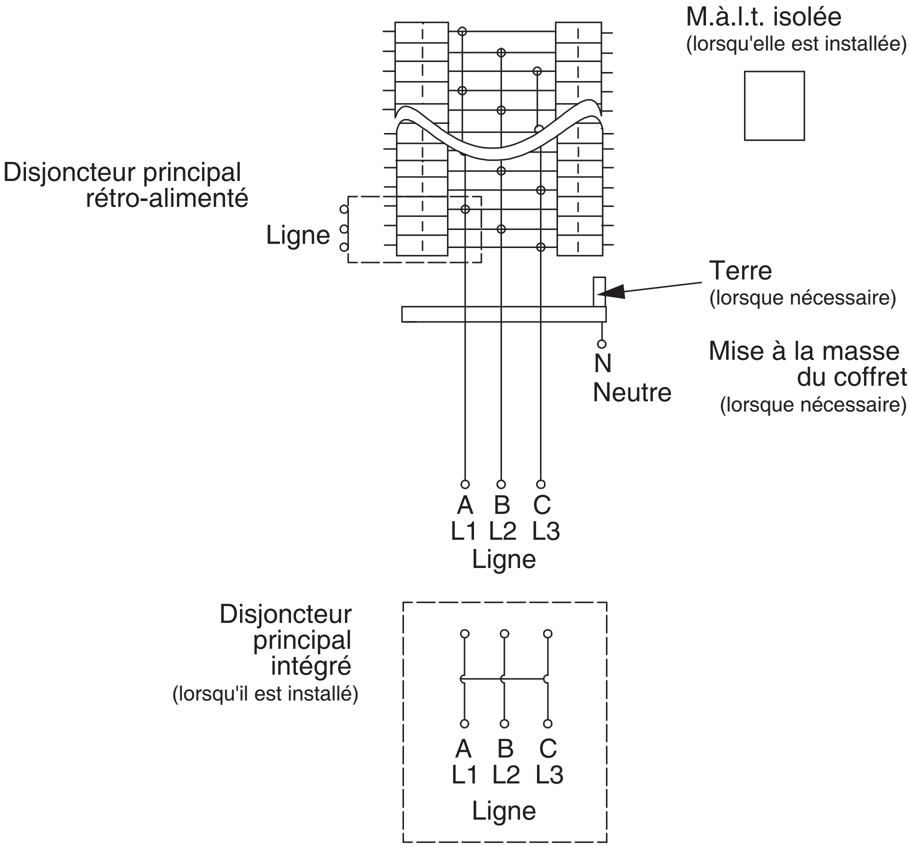

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Figure 9 : Schéma du panneau NF de 400 à 800 A à cosses principales ou à disjoncteur principal avec ou sans cosses de traversée

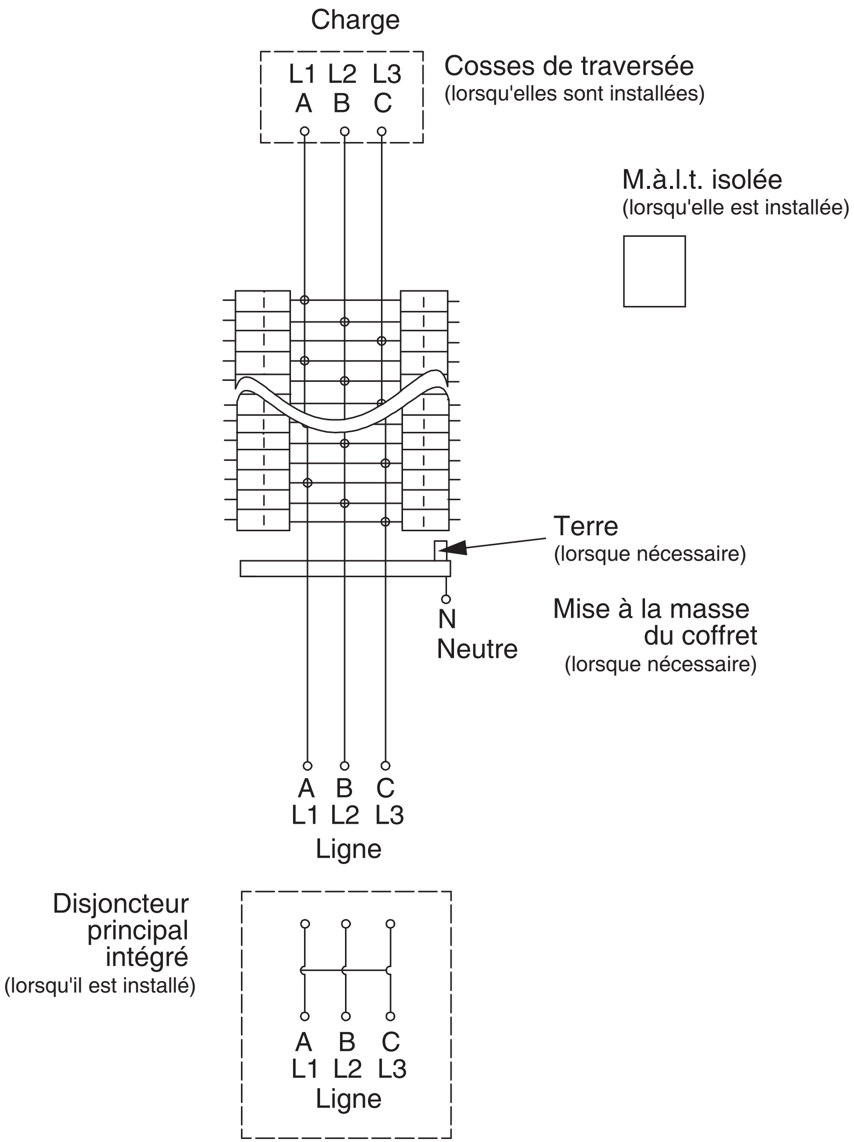

Figure 10 : Schéma du panneau NF de 400 à 800 A à disjoncteur principal avec cosses de traversée ou disjoncteurs de sous-alimentation

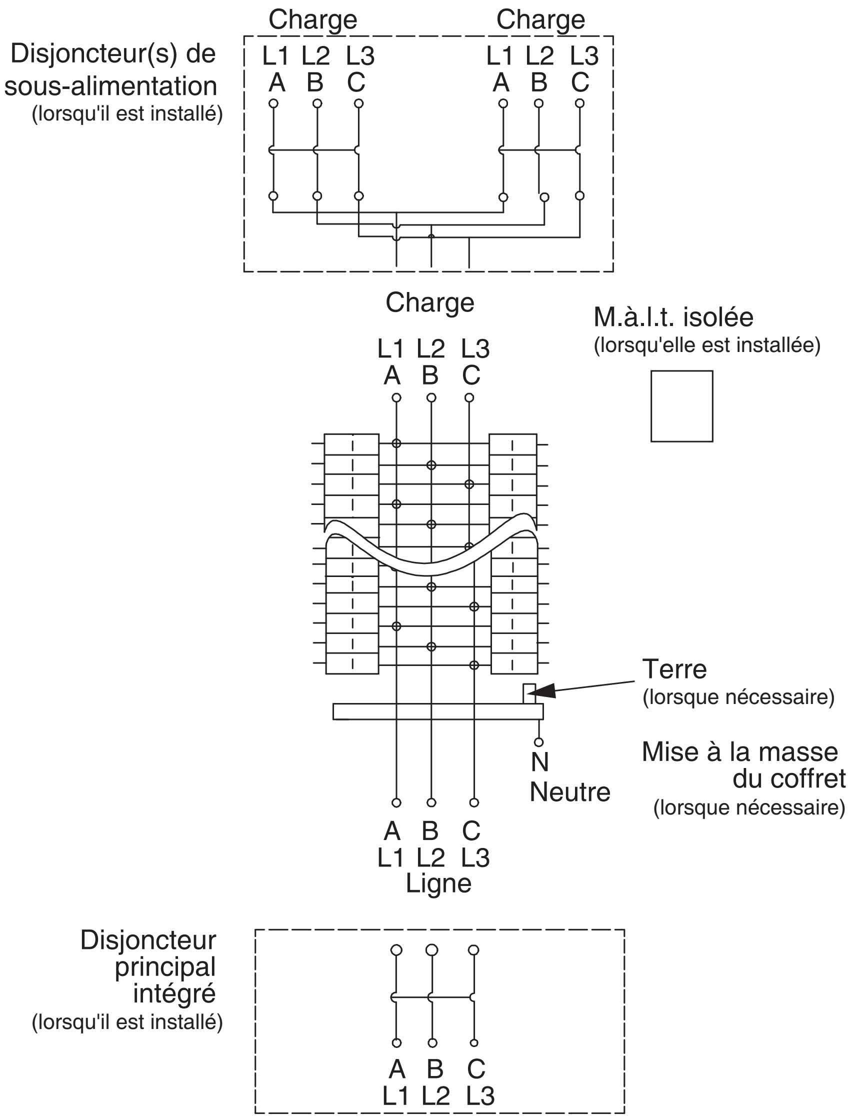

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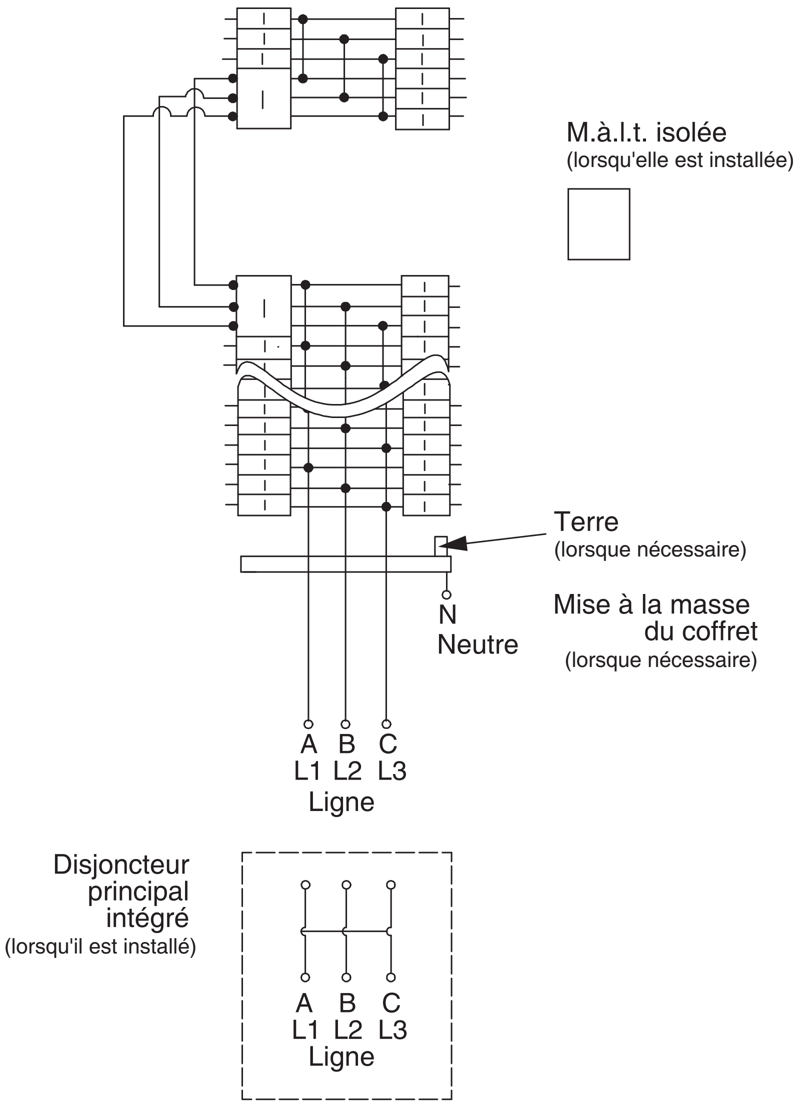
Figure 11 : Schéma du panneau de distribution NF typique avec barre-bus fendue



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Valeurs nominales du panneau de distribution

Se reporter au NEC (É.-U.) section 110-22, et au CCE règle 14-014 pour des informations supplémentaires. L’étiquette pour un système qualifié pour utilisation en série se trouve dans le sac de l'assortiment

REMARQUE : Les disjoncteurs de 125 A ED/EG/EJ sont de 480Y/277 Vca maximum seulement.

Tableau 2 : Valeurs nominales de disjoncteurs raccordés en série (rms symétriques)

Tension ca max. du système[1]	Courant nom. de court-circuit max.	Disjoncteurs principaux intégrés ou à distance et fusibles principaux à distance de la marque Square D[2]	Désignation du catalogue des disjoncteurs de dérivation de la marque Square D et gammes d’intensité admissibles
120 120/240 240	65 000	EG, FH, FG, KH, LH, MH, MX, HG, JG, DG	EDB, EDB-EPD
		LG	EDB
		EG	ECB-G3
	100 000	EJ, FC, FJ, KC, LC, LX, HJ, JJ	EDB, EDB-EPD, EGB
		DJ, LJ	EDB, EGB
		EJ, FC, KC, HJ, JJ	ECB-G3
	125 000	HL, JL	EDB, EDB-EPD, EGB, ECB-G3
	200 000	FI, KI, LI, LXI, HR, JR, LR	EDB, EDB-EPD, EGB, EJB
		FI, KI, HR, JR	ECB-G3
		Fusibles classe J ou T (600 V) de 200 A max.	ECB–G3
277 480Y/277	35 000	EG. FG, KH, LH, HG, JG, DG, LG	EDB, EDB-EPD
		EG, HG, JG	ECB-G3
	65 000	EJ, FC, FJ, KC, LC, LX, HJ, JJ, DJ	EDB, EDB-EPD, EGB
		EJ, FC, KC, HJ, JJ	ECB-G3
		LJ	EDB, EDB-EPD, EGB, EGB-EPD
		LL	EDB-EPD, EGB-EPD
	100 000	HL, JL	EDB, EDB-EPD, EGB, EJB
		DL, LL	EDB, EGB, EJB
		Fusibles de 400 A max.	EDB, EDB–EPD, EGB, EJB
	200 000	FI, KI, LI, LXI, HR, JR, LR	EDB, EDB–EPD, EGB, EJB
		FI, KI, HR, JR	ECB-G3
		Fusibles de 200 A max.	EDB, EDB–EPD, EGB, EJB, ECB–G3

Tableau 2 : Valeurs nominales de disjoncteurs raccordés en série (rms symétriques) *(suite)*

Tension ca max. du système[1]	Courant nom. de court-circuit max.	Disjoncteurs principaux intégrés ou à distance et fusibles principaux à distance de la marque Square D[2]	Désignation du catalogue des disjoncteurs de dérivation de la marque Square D et gammes d'intensité admissibles
600Y/347	18 000	HG, JG, MG	EDB
		LG	EDB (15–110 A)
	25 000	EJ, FI, KH, KI, LC, LE, LX, LI, LXI, HJ, JJ	EDB, EGB
		LJ	EDB (15–110 A), EGB (15–110 A)
		LH	EDB (15–70 A), EGB
	35 000	LC, LE, LX	EDB, EGB, EJB
	50 000	HL, JL	EDB, EGB, EJB
		LL	EDB (15–110 A), EGB (15–110 A), EJB (15–110 A)
	65 000	FI, KI, HR, JR	EDB, EGB, EJB
		LI, LXI, LR	EJB
	200 000	Fusibles classe J ou T (600 V) de 200 A max.	EDB, EGB, EJB

1 Les essais de courts-circuits sont effectués de 100 à 105 % de la tension nominale maximale du panneau de distribution.

2 Utiliser seulement un fil par phase pour les raccordements d'arrivée du disjoncteur quand le disjoncteur principal LH intégré est en amont des cosses de traversée

Tableau 3 : Sélectivité de disjoncteur critique pour panneau NF

SCCR maximum (RMS symétriques)	Disjoncteurs principaux intégrés ou à distance	Disjoncteurs de dérivation			
		Type[1]	Unipolaire	Bipolaire	Tripolaire
Valeur nominale en série et sélectif jusqu'à 18kA à 240 Vca	J-W, 250 A	ED, EG, EJ	15–70	15–125	15–125
Valeur nominale en série et sélectif jusqu'à 7kA à 480 Y/277 Vca	J-W, 250 A	ED, EG, EJ	15–70	70–125	70–125
Valeur nominale en série et sélectif jusqu'à 10kA à 480 Y/277 Vca	J-W, 250 A	ED, EG, EJ	15–60	15–60	15–60
Valeur nominale en série et sélectif jusqu'à 30kA à 480 Y/277 Vca ou à 240 Vca	L-W, 250 A L-W, 400 A L-W, 600 A	ED, EG, EJ	15–70	15–125	15–125

1 Y compris les disjoncteurs EPD

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Courant nominal de court-circuit pour intérieurs à cosses principales avec cosses de traversée ou de sous-alimentation

Les intérieurs à cosses principales munis de cosses de sous-alimentation ou de traversée, où le dispositif qui alimente l'intérieur n'est pas connu ou pas un dispositif Square D, sont classés pour 25 000 ampères rms symétriques à 600Y/347 Vca maximum pendant trois cycles. Utiliser un des disjoncteurs Square D de l'intensité nominale correcte, indiqués comme disjoncteurs principaux à la page 18, en avant de ces cosses aboutira à une valeur nominale égale à celle du disjoncteur.

Marquage CE

- Les intérieurs avec la marque CE sont conformes aux normes IEC 61439-1 et IEC 61439-2.
- Les intérieurs à cosses principales avec la marque CE ont été vérifiés pour supporter 10 000 A RMS symétriques pendant 30 cycles.
- Les intérieurs avec la marque CE doivent être utilisés avec des disjoncteurs ED qui ont été essayés selon les normes IEC. Cela limite les disjoncteurs utilisés au disjoncteur EDB à un seul pôle (voir le Digest pour les détails).
- Les intérieurs de disjoncteurs avec la marque CE sont limités à un court-circuit nominal maximum égal à la valeur nominale IEC du disjoncteur principal (voir le Digest pour les détails). Les disjoncteurs principaux doivent êtres homologués en série avec les disjoncteurs EDB à un seul pôle.

Annexe 2 : Accessoires

Un assortiment d'accessoires pouvant être installés sur place est disponible pour les panneaux de distribution NF :

- Kits de barre de m.à.l.t. de l'appareil, à la page 27
- Kits de cosses de sous-alimentation pour les panneaux de distribution de 125 à 400 A, à la page 27
- Kits de cosses principales
  - Kits de cosses mécaniques — Aluminum, à la page 28
  - Kits de cosses mécaniques — Cuivre, à la page 28
  - Kits de cosses à compression Versa-Crimp® — Aluminum, à la page 29
  - Kits de cosses à compression Versa-Crimp— Cuivre, à la page 29

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Kits de barre de m.à.l.t. de l'appareil

Les kits de barre de m.à.l.t. de l'appareil, convenant à du fil de cuivre ou d'aluminium, répondent aux besoins de m.à.l.t. des panneaux de distribution NF.

Tableau 4 : Spécifications du kit de barre de m.à.l.t. de l'appareil

Panneaux de distribution		Utiliser le numéro de catalogue du kit de barre de m.à.l.t.	
Circuit de dérivation	**Valeur nominale du secteur**	**Aluminium[1]**	**Cuivre[2]**
1–42	800 A maximum	(1) PK27GTA	(1) PK27GTACU
54–84		(2) PK27GTA	(2) PK27GTACU

[1] Barres en aluminium convenant à des conducteurs en cuivre ou aluminium de 60 °C ou 75 °C.

[2] Barres en cuivre convenant à des conducteurs en cuivre de 60 °C ou 75 °C.

Les emplacements de montage d'une barre de m.à.l.t. sont identifiés par le symbole de terre ⏚ estampé sur la paroi arrière du coffret.

Kits de cosses de sous-alimentation pour les panneaux de 125 à 400 A

Des cosses principales de sous-alimentation sont disponibles pour les applications de 125, 250 ou 400 A.

Tableau 5 : Kit de cosses de sous-alimentation pour applications de panneaux de 125 à 400 A

Intensité principale	Nº de catalogue du kit	Nombre max. de circuits
125	NF125SFL	18, 30
250	NF250SFL	30, 42, 54, 66, 84
400	NF400SFL	30, 42, 54, 66, 84

Kits de cosses principales

Tableau 6 : Kits de cosses mécaniques — Aluminum

Intensité du panneau de distribution	Nº de catalogue du kit	Calibre des fils
125	Standard	nº 6–350 kcmil 13,3–177,3 mm^2
250	Standard	
400	Standard	(1) 1/0–750 kcmil (2) 1/0–350 kcmil (1) 53,48–380 mm^2 (2) 53,48–177,3 mm^2
600	Standard	(2) 1/0–750 kcmil (2) 53,48–380 mm^2
800	Standard	(3) 1/0–750 kcmil (3) 53,48–380 mm^2

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Tableau 7 : Kits de cosses mécaniques — Cuivre

Intensité du panneau de distribution	Nº de catalogue du kit	Calibre des fils
125	NFCUM1	nº 6–350 kcmil 13,3–177,3 mm^2
250	NFCUM2	
400	NFCUM4	(1) 1/0–750 kcmil (2) 1/0–350 kcmil (1) 53,48–380 mm^2 (2) 53,48–177,3 mm^2
600	NFCUM6	(2) 1/0–750 kcmil (2) 53,48–380 mm^2

Tableau 8 : Kits de cosses à compression Versa-Crimp® — Aluminum

<table>
<tr><th>Intensité du panneau de distribution</th><th>Nº de catalogue du kit</th><th>Calibre des fils</th><th>Outil de sertissage</th></tr>
<tr><td>125</td><td>NFALV1</td><td>nº 4–300 kcmil
21,15–152 mm^2</td><td rowspan="4">VC6</td></tr>
<tr><td>250</td><td>NFALV2</td><td>250–350 kcmil
126,7–177,3 mm^2</td></tr>
<tr><td>400</td><td>NFALV4</td><td rowspan="2">(2) 2/0–500 kcmil
(2) 67,43–253,4 mm^2</td></tr>
<tr><td>600</td><td>NFALV6</td></tr>
</table>

Tableau 9 : Kits de cosses à compression Versa-Crimp— Cuivre

<table>
<tr><th>Intensité du panneau de distribution</th><th>Nº de catalogue du kit</th><th>Calibre des fils</th><th>Outil de sertissage</th></tr>
<tr><td>125</td><td>NFCUV1</td><td>nº 6–1/0 kcmil
13,30–53,48 mm^2</td><td>VC6-3</td></tr>
<tr><td>250</td><td>NFCUV2</td><td>(1) 2/0–300 kcmil
(1) 67,43–152 mm^2</td><td rowspan="2">VC6-FT,
VC7,
VC7-FT,
VC8</td></tr>
<tr><td>400</td><td>NFCUV4</td><td>(1) 400–750 kcmil
(1) 202,7–380 mm^2</td></tr>
<tr><td>600</td><td>NFCUV6</td><td>(2) 250–500 kcmil
(2) 126,7–253,4 mm^2</td><td>Série VC6</td></tr>
</table>

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Seul un personnel qualifié doit effectuer l’installation, l’utilisation, l’entretien et la maintenance du matériel électrique. Schneider Electric n’assume aucune responsabilité des conséquences éventuelles découlant de l’utilisation de cette documentation.

80043-741-03 Rev. 02, 06/2015
Remplace 80043-741-03 Rev. 01, 02/2015

Notes

Notes

NF/NFOM Panelboards Information Manual
Manual de información para tableros de alumbrado y distribución NF y NFOM
Directives d’utilisation pour panneaux de distribution NF/NFOM

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80043-741-03 Rev. 02
06/2015
Replaces 80043-741-03 Rev. 01, 02/2015

Importado en México por:
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80043-741-03 Rev. 02
06/2015
Reemplaza 80043-741-03 Rev. 01, 02/2015

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80043-741-03 Rev. 02
06/2015
Remplace 80043-741-03 Rev. 01, 02/2015

NQ/NQM Panelboards and QONQ Load Centers
Information Manual
Para los tableros de alumbrado NQ/NQM y centros de carga QONQ
Boletín de instrucciones
Pour panneaux de distribution NQ/NQM et centres de distribution QONQ
Directives d'utilisation

Instruction Bulletin
Boletín de instrucciones
Directives d'utilisation

80043-712-06 Rev. 02
11/2016

**Retain for future use. /
Conservar para uso futuro. /
À conserver pour usage ultérieur.**

SQUARE D by Schneider Electric

NQ/NQM Panelboards and QONQ Load Centers

Information Manual
Class 1640

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Instruction Bulletin

80043-712-06 Rev. 02
11/2016

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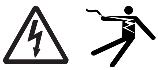
SQUARE D

by Schneider Electric

Hazard Categories and Special Symbols

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER
DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

WARNING
WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

CAUTION
CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

NOTICE
NOTICE is used to address practices not related to physical injury. The safety alert symbol is not used with this signal word.

NOTE: Provides additional information to clarify or simplify a procedure.

Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

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Introduction

This bulletin contains instructions for installing Square D™ brand NQ circuit breaker panelboards and QONQ load centers. These panelboards and load centers are Underwriters Laboratories (cULus) listed and accept QO™ and QOB branch circuit breakers.

For technical support on the installation of this panelboard, contact the Schneider Electric Customer Information Center at 1-888-778-2733.

See the labels on the equipment for rating and safety information. Additional equipment labels are provided with this document.

Safety Precautions

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462, or NOM-029-STPS.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn OFF all power supplying this equipment before working on or inside the equipment.
- Always use a properly rated voltage sensing device to confirm all power is OFF.
- Read and understand this entire instruction bulletin and the included NEMA PB 1.1 standards publication before installing, operating, or maintaining this equipment.
- Local codes vary, but are adopted and enforced to promote safe electrical installations. A permit may be needed to do electrical work, and some codes may require an inspection of the electrical work.
- Replace all devices, doors, and covers before turning ON power to this equipment.

Failure to follow these instructions will result in death or serious injury.

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Installation

This section provides instructions for the following NQ panelboard and QONQ load center procedures:

- “Interior Mounting for Square D Brand Enclosures” on page 6
- “Neutral Bonding Strap/Cable Installation” on page 9
- “QO and QOB Circuit Breaker Installation and Removal” on page 13
- “Circuit Breaker Reset Instructions” on page 16
- “Interior Trim Preparation” on page 17

Interior Mounting for Square D Brand Enclosures

A separate standards publication, titled “General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less” (NEMA PB1.1), has been provided with this equipment. Familiarize yourself with the content of this document before proceeding with any of the following procedures.

If you did not receive a copy of this document, or if you have any questions regarding this equipment, contact your local distributor or Schneider Electric representative.

NOTICE

HAZARD OF EQUIPMENT DAMAGE DUE TO LOOSE CONNECTIONS

- Ensure all connections are properly tightened.
- Refer to the torque information label provided on the panelboard before tightening the connections.

Failure to follow these instructions can result in equipment damage.

To properly mount and install the NQ panelboard or QONQ load center interior, please refer to the NEMA PB 1.1 standards publication, and follow the instructions below for either ““Surface Mounting (Enclosure Mounted on Wall)” on page 7” or ““Flush Mounting (Enclosure Recessed in Wall)” on page 7.”

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Surface Mounting (Enclosure Mounted on Wall)

1. Mount the enclosure as instructed in the NEMA PB 1.1 standards publication.
2. Remove the interior trim from the trim brackets.
3. Install the interior as described below:
    a. Set the interior on the enclosure studs. An elevating screw is not required (See Figure 1 on page 8).
    b. Tighten the Keps nuts against the interior side rails until the rails are against the back of the enclosure.
    c. Remount the interior trim after wiring.
4. If used as service entrance equipment, neutral bonding is required. See the “Neutral Bonding Strap/Cable Installation” instructions on page 9.
5. Apply equipment labels (located in the bag assembly) as directed by the instructions on the back of the equipment label sheet.

Flush Mounting (Enclosure Recessed in Wall)

1. Mount the enclosure as instructed in the NEMA PB 1.1 standards publication.
2. Remove the interior trim from the trim brackets.
3. Install the interior as described below:
    a. Thread the (4) 10-32 x 0.875 in. self-tapping, elevating screws provided with the flush trim into the side rails.
    b. Set the interior on the enclosure studs (see Figure 1 on page 8). Place the keps nuts onto the enclosure studs, but do not tighten.
    c. Adjust the screws so that the lip of the interior trim is approximately 0.25 inches (6.35 mm) from the wall line.
    d. Tighten the keps nuts against the side rails.
    e. Remount the interior trim after wiring.
4. If used as service entrance equipment, neutral bonding is required. See the “Neutral Bonding Strap/Cable Installation” instructions on page 9.
5. Apply equipment labels (located in the bag assembly) as directed by the instructions on the back of the equipment label sheet.

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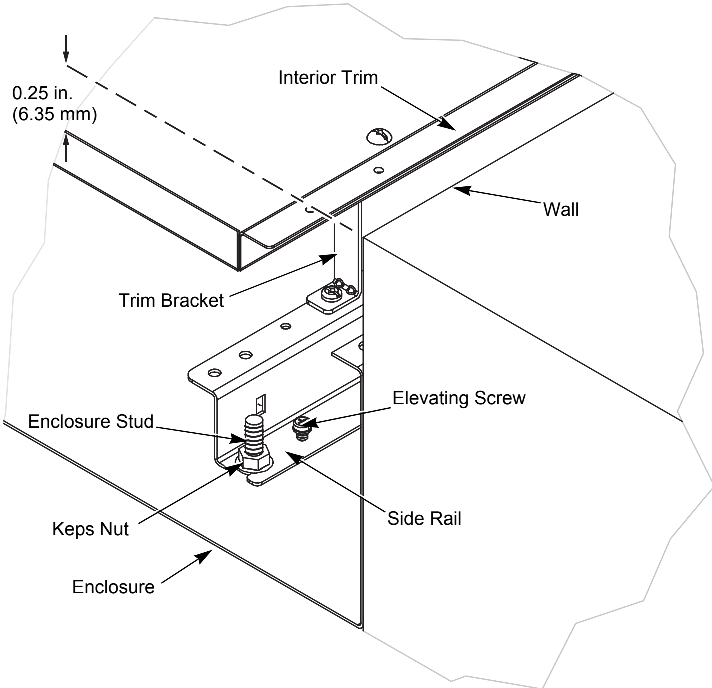
Figure 1: Interior Mounting of Square D Brand Enclosures



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Neutral Bonding Strap/Cable Installation

The neutral bonding strap/cable should be used only when the panelboard is **installed** as service entrance equipment.

To properly bond the neutral to the panelboard, follow the instructions for either “100 or 250 A Maximum NQ Panelboards” or “400 or 600 A Maximum NQ Panelboards and QONQ Load Centers” below and on page 11, respectively.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462, or NOM-029-STPS.
- Turn OFF all power supplying this equipment before working on or inside the equipment.
- The main bonding strap/cable should be used only when the panelboard is installed as service entrance equipment.
- Do not mix the mounting screws with the interior trim screws.

Failure to follow these instructions will result in death or serious injury.

NOTE: The bonding strap/cable parts are found in the bag assembly provided with the interior.

100 or 250 A Maximum NQ Panelboards

To install a neutral bonding strap on a 100 or 250 A maximum NQ panelboard, refer to Figure 2 and follow the instructions below.

1. Align the bonding strap on the side rail, as pictured.

   NOTE: For some applications, it may be necessary to remove the lug (not pictured) before installing the bonding strap.

2. Insert the two mounting screws, as pictured. Tighten the 10-32 screw to 10–12 lb-in (1.1–1.4 N•m) and the 1/4-20 to 25–30 lb-in (2.8–3.4 N•m).

   NOTE: If the lug was removed in Step 1 above, reinstall it on top of the bonding strap. Use the 1/4-20 screw x 11/16 in. lug mounting screw on applications with feed-through lug, sub-feed lug, sub-feed breaker, or 200% neutral applications. Use the 1/4-20 screw x 7/8 in lug mounting screw on 225 A applications with 200% neutrals and with feed-thru lugs, sub-feed lugs, or sub-feed circuit breakers. Lug mounting screws are provided in the bonding strap bag assembly.

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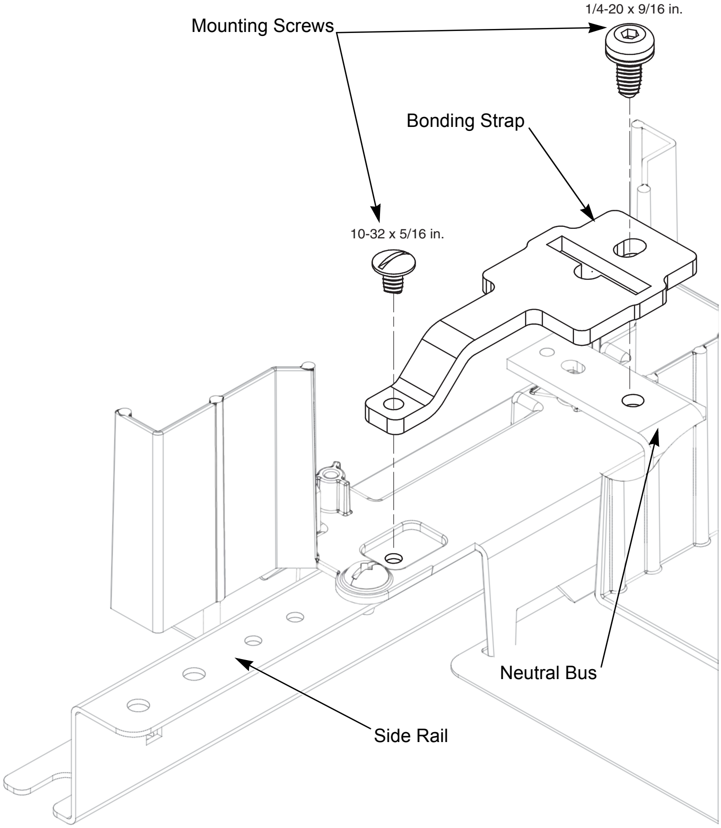
Figure 2: Bonding Strap Installation — 100 or 250 A Maximum NQ Panelboards



400 or 600 A Maximum NQ Panelboards and QONQ Load Centers

To install a neutral bonding cable on a 400 or 600 A maximum NQ panelboard and QONQ load center, refer to Figure 3 and follow the instructions below.

1. Align the lug on the side rail mounting hole, as pictured.
2. Tighten the lug mounting screw against the side rail to 10–12 lb-in (1.1–1.4 N•m).

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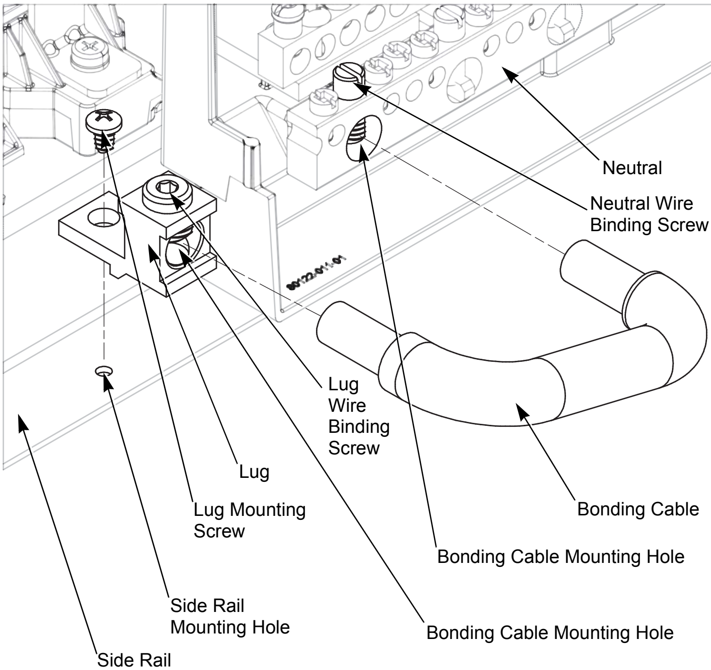
3. Align the bonding cable, as pictured, and insert it into the lug and neutral mounting holes.
4. Tighten both the lug wire binding screw and the neutral wire binding screw to 45–50 lb-in (5.1–5.6 N•m).

Figure 3: Bonding Cable Installation — 400 or 600 A Maximum NQ Panelboards and QONQ Load Centers



QO and QOB Circuit Breaker Installation and Removal

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462, or NOM-029-STPS.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn OFF all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm that all power is OFF.
- All unused spaces must be filled with blank fillers.
- Replace all devices, doors, and covers before turning ON power to this equipment.

Failure to follow these instructions will result in death or serious injury.

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QO and QOB Breaker Installation

Refer to Figure 4 on page 15 for the following instructions:

1. Turn OFF all power to the panelboard.
2. Turn the breaker OFF.
3. Remove the interior trim.
4. Snap the wire terminal end of the circuit breaker onto the mounting rail.
5. Engage the branch connector.

   For QO Circuit Breakers:

   a. Push inward until the plug-on jaws fully engage the branch connector.

   For QOB Circuit Breakers:

   a. Push inward until the breaker connector is centered on the branch connector mounting hole. Engage the screw into the branch connector hole and tighten it to the torque values shown on the interior wiring and torque diagram.

6. Install the load wire.
7. Reinstall the interior trim.

QO and QOB Breaker Removal

Refer to Figure 4 on page 15 for the following instructions:

1. Turn OFF all power to the panelboard.
2. Remove the interior trim.
3. Remove the load wire.
4. Disengage the branch connector.

   For QO Circuit Breakers:

   a. Pull outward until the plug-on jaws fully disengage the branch connector.

   For QOB Circuit Breakers:

   a. Loosen the screw in the breaker connector and pull the breaker off of the branch connector.

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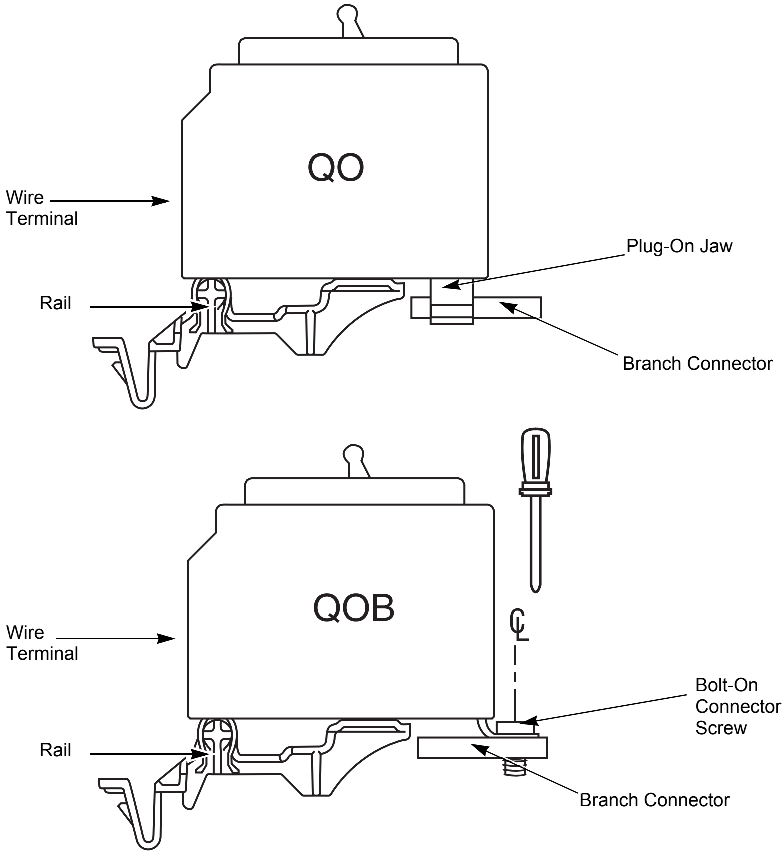
5. Snap the wire terminal end of the circuit breaker off of the mounting rail.
6. Reinstall the interior trim.

Figure 4: QO and QOB Circuit Breaker Installation and Removal



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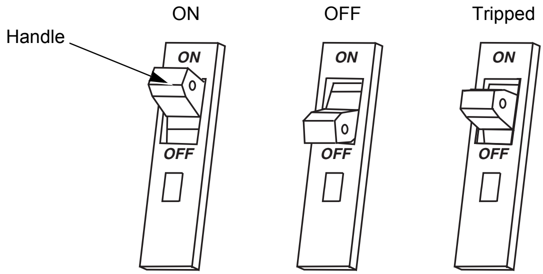
Circuit Breaker Reset Instructions

If the circuit breaker is tripped, the handle will be at the mid-position between ON and OFF. To reset the circuit breaker, push the handle to the OFF position, then to the ON position.

Figure 5: Circuit Breaker Handle Positions



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Interior Trim Preparation

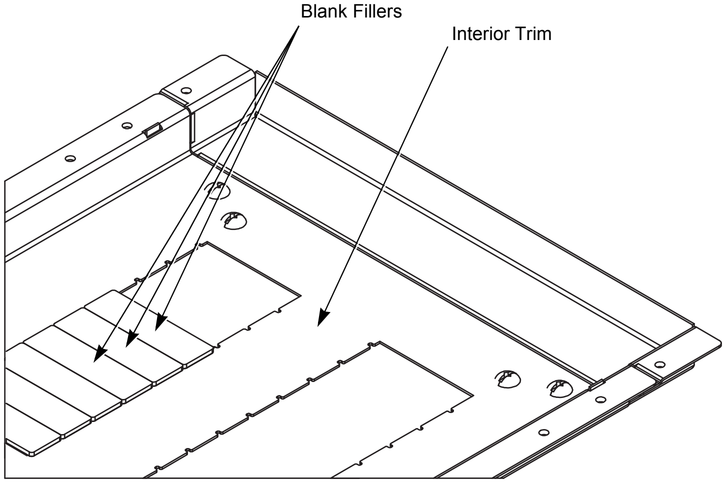
⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462, or NOM-029-STPS.
- Before energizing the panelboard, all unused spaces must be filled with blank fillers.
- Replace all devices, doors, and covers before energizing this equipment.

Failure to follow these instructions will result in death or serious injury.

Figure 6: Interior Trim Diagram



NOTE: The back of the interior trim lists the catalog number for its corresponding compatible blank fillers.

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Appendix 1: Specifications

Typical Wiring

Table 1: Panelboard Typical Wiring[1]

	1-Phase Panelboards		3-Phase Panelboards	
Voltage AC	**Phase**	**Wires**	**Phase**	**Wires**
208Y/120	—	—	3	4
120/240	1	3	—	—
240[2]	1	2	3	3
240[3]	1	3	—	—
240/120[4]	—	—	3	4 Delta

1 Additional information is provided on the panelboard. See the main circuit breaker rating, if used.

2 For this system, the neutral is not used and only circuit breakers rated 240 V AC minimum should be used. Do not use circuit breakers rated 120 V or 120/240 V AC.

3 For a grounded “B” phase system, only circuit breakers rated 240 V AC minimum should be used. Do not use circuit breakers rated 120 V or 120/240 V AC.

4 When wiring for a delta system, phases “A” and “C” must be 120 V to neutral, phase “B” 208 V to neutral. Connect only circuit breakers rated 240 V AC minimum. Do not use circuit breakers rated 120 V or 120/240 V to “B” phase.

Integral Main or Sub-Feed:
DJ, FI, KI, H, J, LA, LC, LH, QB, QD, QG, QJ, QO(B)VH

Figure 7: NQ/NQM 100–225 A Main Lugs or 100–250 A Main Breaker Diagram

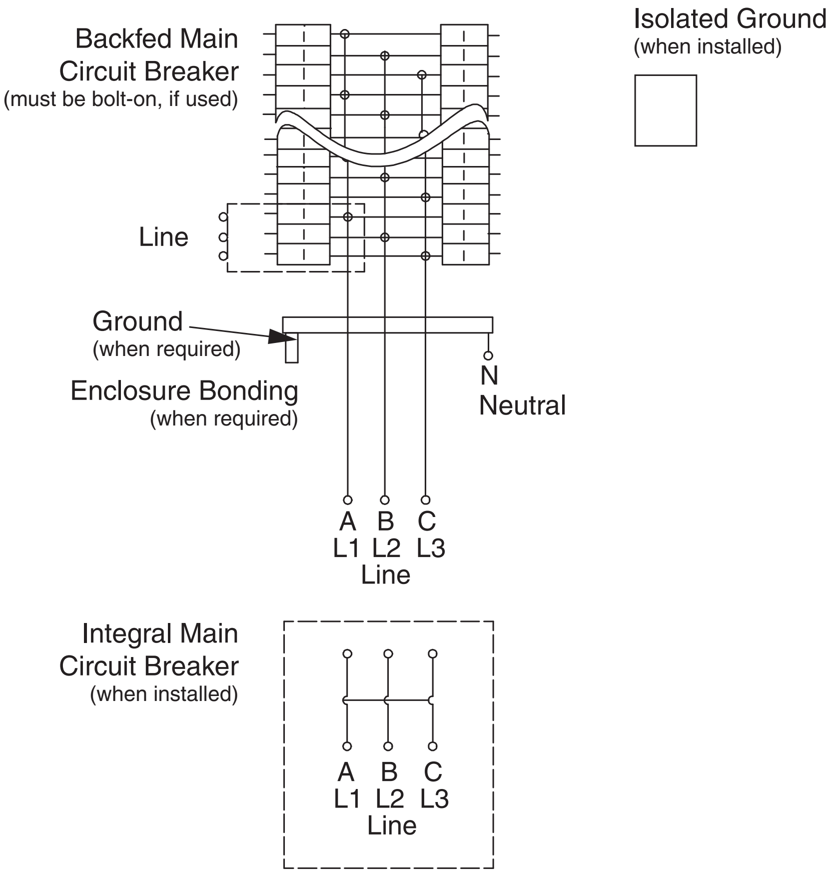

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Figure 8: NQ Panelboard or QONQ Load Center 400–600 A Main Lugs or Main Circuit Breaker with or without Feed-Through Lugs Diagram

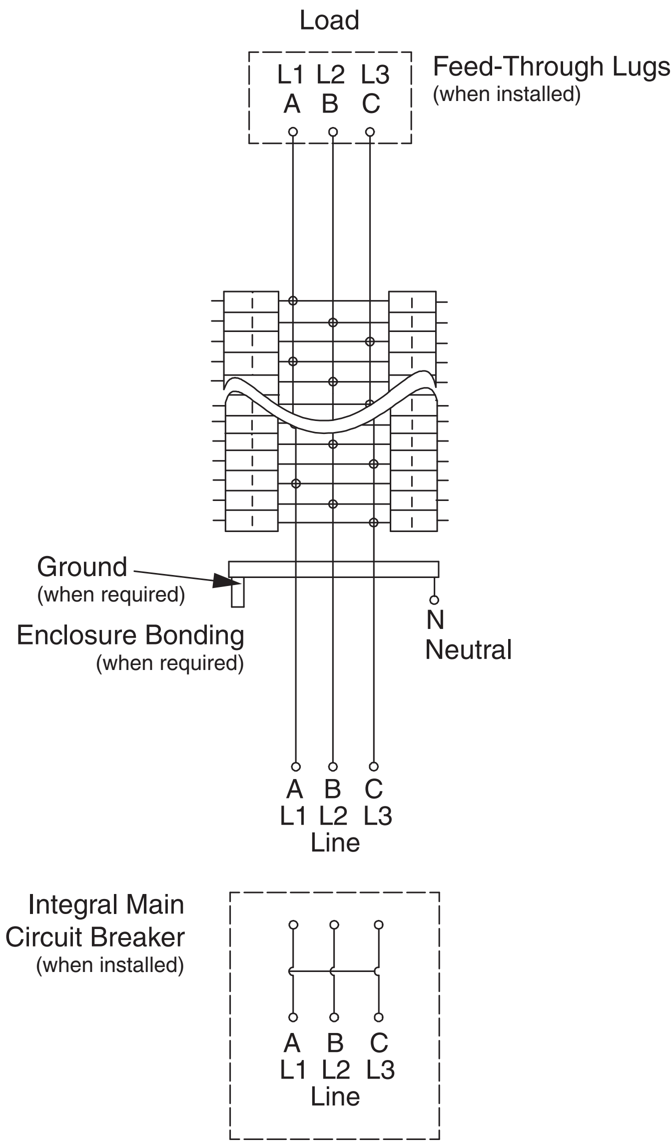

Figure 9: NQ Panelboard or QONQ Load Center 400–600 A Main Circuit Breaker with Feed-Through Lugs or Sub-Feed Circuit Breakers Diagram

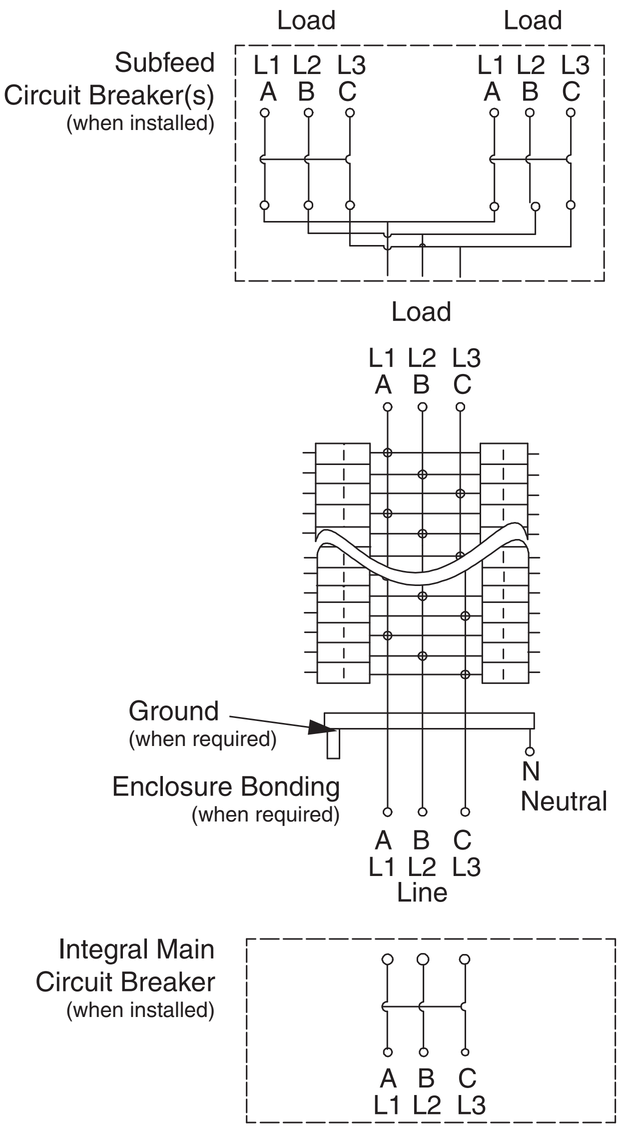

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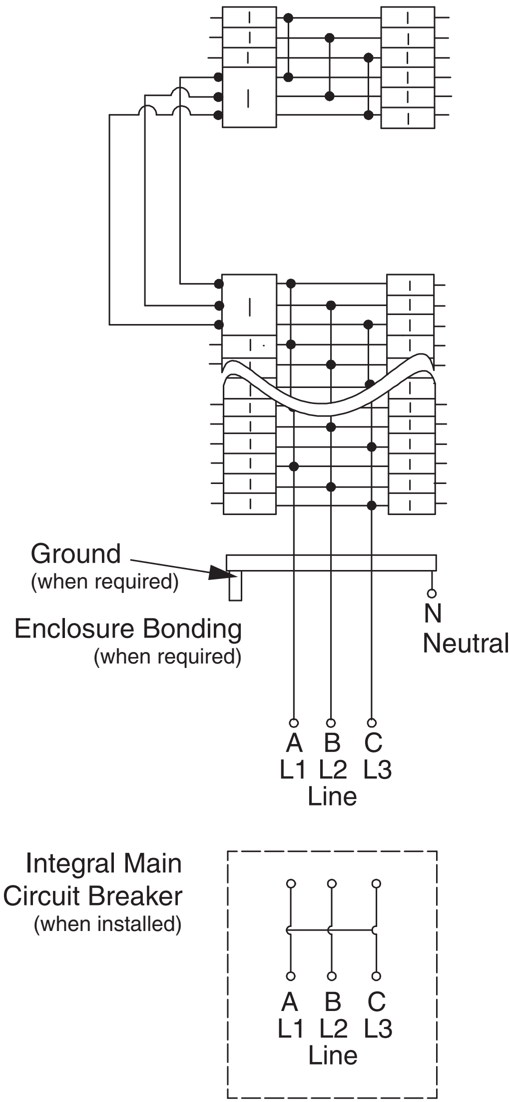
Figure 10: Typical NQ Panelboard with Split Bus Diagram



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Panelboard Ratings

Refer to NEC section 110-22 and CEC rule 14-014 for more information. The series rated system label is located in the bag assembly.

Table 2: Series Connected Breaker Ratings (RMS Symmetrical)

Max. System Voltage AC [1, 2]	Max. Short Circuit Current Rating	Square D Brand Integral or Remote Main Circuit Breakers and Remote Main Fuses	Square D Brand Branch Circuit Breaker Catalog Designation and Allowable Ampere Ranges [3, 4, 5, 6]			
			Type	1 Pole	2 Pole	3 Pole
120/240[7] 1P/3W	22,000	MG	QO (B)	15–30 A	—	—
	25,000	LD, HD, JD	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	—
			QO (B) PL	15–30 A	15–60 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
	65,000	HG, JG	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	—
			QO (B) PL	15–30 A	15–60 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
		LG	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
		LJ	QO (B) GFI	15–30 A	40–60 A	—
			QO (B) EPD	15–30 A	40–60 A	—

Continued on next page

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Table 2: Series Connected Breaker Ratings (RMS Symmetrical) *(continued)*

Max. System Voltage AC [1, 2]	Max. Short Circuit Current Rating	Square D Brand Integral or Remote Main Circuit Breakers and Remote Main Fuses	Square D Brand Branch Circuit Breaker Catalog Designation and Allowable Ampere Ranges [3, 4, 5, 6]			
			Type	1 Pole	2 Pole	3 Pole
120/240[7] 1P/3W	100,000	HJ, JJ	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	—
			QO (B) PL	15–30 A	15–60 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
		LJ	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	—
			QO (B) H	—	15–100 A	—
			QO (B) GFI	—	15–30 A	—
			QO (B) EPD	—	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
		DJ 400 A	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	—	150 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
		QJ	QO (B)	15–70 A	15–125 A	—
			QO (B) AS	15–30 A	15–30 A	—
			QO (B) VH	—	150 A	—
			QO (B) PL	15–30 A	15–60 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—

Continued on next page

Table 2: Series Connected Breaker Ratings (RMS Symmetrical) *(continued)*

Max. System Voltage AC [1, 2]	Max. Short Circuit Current Rating	Square D Brand Integral or Remote Main Circuit Breakers and Remote Main Fuses	Square D Brand Branch Circuit Breaker Catalog Designation and Allowable Ampere Ranges [3, 4, 5, 6]			
			Type	1 Pole	2 Pole	3 Pole
120/240[7] 1P/3W	125,000	HL, JL	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	—
			QO (B) PL	15–30 A	15–60 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
208Y/120 3P/4W	18,000	LA/LH (L) 34200MC	QO (B)	15–30 A	15–30 A	15–30 A
		LA/LH (L) 34225MC				
		LA/LH (L) 34250MC				
		LA/LH (L) 34400MC				
	25,000	LD	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–30 A	15–125 A	15–150 A
			QO (B) GFI	15–30 A	15–60 A	15–30 A
			QO (B) EPD	15–30 A	15–60 A	15–30 A
			QO (B) EPE	—	—	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
	30,000	DJ-W 150 A MC[8]	QO (B)	15–70 A	15–100 A	—
			QO (B) VH	—	15–125 A	15–150 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
		DJ-W 250 A MC[8]	QO (B)	15–70 A	15–100 A	—
			QO (B) VH	—	—	15–100 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—

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Table 2: Series Connected Breaker Ratings (RMS Symmetrical) *(continued)*

Max. System Voltage AC [1, 2]	Max. Short Circuit Current Rating	Square D Brand Integral or Remote Main Circuit Breakers and Remote Main Fuses	Square D Brand Branch Circuit Breaker Catalog Designation and Allowable Ampere Ranges [3, 4, 5, 6]			
			Type	1 Pole	2 Pole	3 Pole
208Y/120 3P/4W	30,000	DJ-W 600 A MC[8]	QO (B)	15–70 A	15–100 A	—
			QO (B) VH	—	—	15–150 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
	65,000	LG	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	15–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	15–30 A	15–60 A	15–30 A
			QO (B) EPD	15–30 A	15–60 A	15–30 A
			QO (B) EPE	—	—	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		LJ	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	15–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	15–30 A	15–60 A	15–30 A
			QO (B) EPD	15–30 A	15–60 A	15–30 A
			QO (B) EPE	—	—	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		LL	QO (B) GFI	—	—	15–30 A
			QO (B) EPD	—	—	15–30 A
			QO (B) EPE	—	—	15–30 A
	100,000	DJ 400 A	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	—	—	15–150 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—

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Table 2: Series Connected Breaker Ratings (RMS Symmetrical) *(continued)*

Max. System Voltage AC [1, 2]	Max. Short Circuit Current Rating	Square D Brand Integral or Remote Main Circuit Breakers and Remote Main Fuses	Square D Brand Branch Circuit Breaker Catalog Designation and Allowable Ampere Ranges [3, 4, 5, 6]			
			Type	1 Pole	2 Pole	3 Pole
208Y/120 3P/4W	100,000	QJ	QO (B)	15–70 A	15–125 A	15–30 A
			QO (B) VH	—	—	15–150 A
			QO (B) PL	15–30 A	15–60 A	15–30 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) EPE	15–30 A	15–60 A	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		LJ	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	15–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	—	15–30 A	—
			QO (B) EPD	—	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
240/120 3P/4W	22,000	QO (B) VH	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) EPE	—	—	15–50 A
			QO (B) PL	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—

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Table 2: Series Connected Breaker Ratings (RMS Symmetrical) *(continued)*

Max. System Voltage AC [1, 2]	Max. Short Circuit Current Rating	Square D Brand Integral or Remote Main Circuit Breakers and Remote Main Fuses	Square D Brand Branch Circuit Breaker Catalog Designation and Allowable Ampere Ranges [3, 4, 5, 6]			
			Type	1 Pole	2 Pole	3 Pole
240/120 3P/4W	25,000	QD	QO (B)	15–70 A	15–125 A	15–30 A
			QO (B) VH	—	—	35–150 A
			QO (B) PL	15–30 A	15–60 A	15–30 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) EPE	—	—	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		ED, FD	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		KD	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) AS	15–30 A	15–30 A	15–30 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
		HD, JD	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) VH	—	—	35–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) EPE	—	—	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—

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Table 2: Series Connected Breaker Ratings (RMS Symmetrical) *(continued)*

Max. System Voltage AC [1, 2]	Max. Short Circuit Current Rating	Square D Brand Integral or Remote Main Circuit Breakers and Remote Main Fuses	Square D Brand Branch Circuit Breaker Catalog Designation and Allowable Ampere Ranges [3, 4, 5, 6]			
			Type	1 Pole	2 Pole	3 Pole
240/120 3P/4W	25,000	LD	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–30 A	15–125 A	15–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	15–30 A	15–60 A	15–30 A
			QO (B) EPD	15–30 A	15–60 A	15–30 A
			QO (B) EPE	—	—	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
	42,000	LA, MA	Q2L-H	—	100–225 A	100–225 A
			QDL	—	70–225 A	70–225 A
		LC 400 A	QO (B)	15–70 A	15–70 A	—
			QO (B) VH	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		LC 600 A	QO (B) VH	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		MG	QO (B) VH	15–30 A	15–30 A	15–30 A
	65,000	LC 400 A	QO (B)	15–30 A	15–30 A	—
			QO (B) VH	15–30 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—

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Table 2: Series Connected Breaker Ratings (RMS Symmetrical) *(continued)*

Max. System Voltage AC [1, 2]	Max. Short Circuit Current Rating	Square D Brand Integral or Remote Main Circuit Breakers and Remote Main Fuses	Square D Brand Branch Circuit Breaker Catalog Designation and Allowable Ampere Ranges [3, 4, 5, 6] Type	1 Pole	2 Pole	3 Pole
240/120 3P/4W	65,000	LC 600 A	QO (B) VH	15–30 A	15–125 A	15–150 A
			QO (B) GFI	—	—	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		DJ 400 A	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	—	—	15–150 A
			QO (B) H	—	15–100 A	—
		DJ_W	QO (B)	15–70 A	15–150 A	—
			QO (B)-VH	—	110–125 A	15–150 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		DJ, DG, DL 150–600 A	QO (B) EPD	—	—	15–30 A
		EG, FG, KG	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		QG	QO (B)	15–70 A	15–125 A	15–30 A
			QO (B) VH	—	—	35–150 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) PL	15–30 A	15–60 A	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—

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Table 2: Series Connected Breaker Ratings (RMS Symmetrical) *(continued)*

Max. System Voltage AC [1, 2]	Max. Short Circuit Current Rating	Square D Brand Integral or Remote Main Circuit Breakers and Remote Main Fuses	Square D Brand Branch Circuit Breaker Catalog Designation and Allowable Ampere Ranges [3, 4, 5, 6]			
			Type	1 Pole	2 Pole	3 Pole
240/120 3P/4W	65,000	HG, JG	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) VH	—	—	35–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) EPE	—	—	15–50 A
			QO (B) PL	15–30 A	15–60 A	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		FC_ or KC_22___	QO (B)	15–70 A	15–100 A	15–100 A
		FC_ or KC_34___	QO (B) AS	15–30 A	15–30 A	15–30 A
		LG	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	15–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	15–30 A	15–60 A	15–30 A
			QO (B) EPD	15–30 A	15–60 A	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		LJ	QO (B)	15–70 A	15–125 A	—
			QO (B) GFI	15–30 A	40–60 A	—
			QO (B) EPD	15–30 A	40–60 A	15–30 A
			QO (B) EPE	—	—	15–30 A
		LL	QO (B) EPD	—	—	15–30 A
			QO (B) EPE	—	—	15–30 A
	100,000	FC_ or KC_22___	QO (B) GFI	15–30 A	15–30 A	—
		FC_ or KC_34___	QO (B) AFI	15–20 A	—	—

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Table 2: Series Connected Breaker Ratings (RMS Symmetrical) *(continued)*

Max. System Voltage AC [1, 2]	Max. Short Circuit Current Rating	Square D Brand Integral or Remote Main Circuit Breakers and Remote Main Fuses	Square D Brand Branch Circuit Breaker Catalog Designation and Allowable Ampere Ranges [3, 4, 5, 6]			
			Type	1 Pole	2 Pole	3 Pole
240/120 3P/4W	100,000	DJ 400 A	QO (B)	15–70 A	15–125 A	—
			QO (B) H	—	15–100 A	—
			QO (B) VH	—	—	15–150 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		EJ	QO (B)	15–70 A	15–125 A	15–100 A
		LJ	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	15–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	—	15–30 A	—
			QO (B) EPD	—	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		HJ, JJ	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) H	—	15–100 A	—
			QO (B) VH	—	—	35–150 A
			QO (B) PL	15–30 A	15–60 A	15–30 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—

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Table 2: Series Connected Breaker Ratings (RMS Symmetrical) *(continued)*

Max. System Voltage AC [1, 2]	Max. Short Circuit Current Rating	Square D Brand Integral or Remote Main Circuit Breakers and Remote Main Fuses	Square D Brand Branch Circuit Breaker Catalog Designation and Allowable Ampere Ranges [3, 4, 5, 6]			
			Type	1 Pole	2 Pole	3 Pole
240/120 3P/4W	125,000	HL, JL	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) H	—	15–100 A	—
			QO (B) VH	—	—	35–150 A
			QO (B) PL	15–30 A	15–60 A	15–30 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
	200,000	FI, KI, HR, JR	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
240 3P/3W or 240 1P/2W (two pole only)	22,000	QO (B) VH	QO (B)	—	—	15–100 A
			QO (B) GFI	—	—	15–50 A
			QO (B) PL	—	15–30 A	—
		Q2-H	QO (B)	—	—	15–30 A
	25,000	QD	QO (B)	—	—	15–30 A
			QO (B) VH	—	—	35–150 A
			QO (B) H	—	15–100 A	—
			QO (B) PL	—	15–60 A	15–30 A
			QO (B) EPD	—	—	15–50 A
			QO (B) EPE	—	—	15–50 A
			QO (B) GFI	—	—	15–50 A
		ED, FD	QO (B)	—	—	15–100 A
			QO (B) GFI	—	—	15–50 A
		KD	QO (B)	—	—	15–100 A
		HD, JD	QO (B)	—	—	15–100 A
			QO (B) VH	—	—	35–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	—	—	15–50 A

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Table 2: Series Connected Breaker Ratings (RMS Symmetrical) *(continued)*

Max. System Voltage AC [1, 2]	Max. Short Circuit Current Rating	Square D Brand Integral or Remote Main Circuit Breakers and Remote Main Fuses	Square D Brand Branch Circuit Breaker Catalog Designation and Allowable Ampere Ranges [3, 4, 5, 6]			
			Type	1 Pole	2 Pole	3 Pole
240 3P/3W or 240 1P/2W (two pole only)	25,000	LD	QO (B) VH	—	—	15–150 A
			QO (B) EPD	—	—	15–30 A
			QO (B) EPE	—	—	15–30 A
	42,000	LA, MA	QDL	—	70–225 A	70–225 A
		LC 400 A	QO (B) VH	—	—	15–100 A
		LC 600 A	QO (B) VH	—	—	15–100 A
		MG	QO (B) VH	—	—	150 A
	65,000	LC 400 A	QO (B) VH	—	—	15–100 A
		LC 600 A	QO (B) VH	—	—	15–30 A
		DJ 400 A	QO (B) VH	—	—	15–150 A
			QO (B) H	—	15–100 A	—
		DJ, DG, DL 150–600 A	QO (B) EPD	—	—	15–30 A
			QO (B) EPE	—	—	15–30 A
		EG, FG, KG	QO (B)	—	—	15–100 A
			QO (B) GFI	—	—	15–50 A
		QG	QO (B)	—	—	15–30 A
			QO (B) VH	—	—	35–150 A
			QO (B) H	—	15–100 A	—
		QG, HG, JG	QO (B) PL	—	—	15–30 A
		HG, JG	QO (B)	—	—	15–100 A
			QO (B) VH	—	—	35–150 A
			QO (B) H	—	15–100 A	—
		FC_ or KC_22___	QO (B)	—	—	15–100 A
		FC_ or KC_34___	QO (B) AS	—	15–30 A	15–30 A
		LG	QO (B) VH	—	—	15–150 A
			QO (B) H	—	15–100 A	—
			QO (B) EPD	—	—	15–30 A
			QO (B) EPE	—	—	15–30 A
		LJ	QO (B) EPD	—	—	15–30 A
			QO (B) EPE	—	—	15–30 A

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Table 2: Series Connected Breaker Ratings (RMS Symmetrical) *(continued)*

<table>
<tr><th rowspan="2">Max. System Voltage AC [1, 2]</th><th rowspan="2">Max. Short Circuit Current Rating</th><th rowspan="2">Square D Brand Integral or Remote Main Circuit Breakers and Remote Main Fuses</th><th colspan="4">Square D Brand Branch Circuit Breaker Catalog Designation and Allowable Ampere Ranges [3, 4, 5, 6]</th></tr>
<tr><th>Type</th><th>1 Pole</th><th>2 Pole</th><th>3 Pole</th></tr>
<tr><td rowspan="21">240 3P/3W or 240 1P/2W (two pole only)</td><td rowspan="2">65,000</td><td rowspan="2">LL</td><td>QO (B) EPD</td><td>—</td><td>—</td><td>15–30 A</td></tr>
<tr><td>QO (B) EPE</td><td>—</td><td>—</td><td>15–30 A</td></tr>
<tr><td rowspan="13">100,000</td><td>FC_ or KC_24___</td><td rowspan="2">QO (B) GFI</td><td rowspan="2">—</td><td rowspan="2">15–30 A</td><td rowspan="2">—</td></tr>
<tr><td>FC_ or KC_34___</td></tr>
<tr><td>DJ 400 A</td><td>QO (B) H</td><td>—</td><td>15–100 A</td><td>—</td></tr>
<tr><td>EJ, FJ</td><td>QO (B)</td><td>—</td><td>—</td><td>15–100 A</td></tr>
<tr><td rowspan="2">LJ</td><td>QO (B) VH</td><td>—</td><td>—</td><td>15–100 A</td></tr>
<tr><td>QO (B) H</td><td>—</td><td>15–100 A</td><td>—</td></tr>
<tr><td rowspan="5">HJ, JJ</td><td>QO (B)</td><td>—</td><td>—</td><td>15–100 A</td></tr>
<tr><td>QO (B) H</td><td>—</td><td>15–100 A</td><td>—</td></tr>
<tr><td>QO (B) VH</td><td>—</td><td>—</td><td>35–150 A</td></tr>
<tr><td>QO (B) EPD</td><td>—</td><td>—</td><td>15–30 A</td></tr>
<tr><td>QO (B) EPE</td><td>—</td><td>—</td><td>15–30 A</td></tr>
<tr><td rowspan="5">125,000</td><td rowspan="5">HL, JL</td><td>QO (B)</td><td>—</td><td>—</td><td>15–100 A</td></tr>
<tr><td>QO (B) H</td><td>—</td><td>15–100 A</td><td>—</td></tr>
<tr><td>QO (B) VH</td><td>—</td><td>—</td><td>35–150 A</td></tr>
<tr><td>QO (B) EPD</td><td>—</td><td>—</td><td>15–30 A</td></tr>
<tr><td>QO (B) EPE</td><td>—</td><td>—</td><td>15–30 A</td></tr>
<tr><td>200,000</td><td>FI, KI, HR, JR</td><td>QO (B)</td><td>—</td><td>—</td><td>15–100 A</td></tr>
<tr><td rowspan="9">120/240[7] 1P/3W</td><td>42,000</td><td>400 A Max. Class T3 Fuses</td><td>QO (B) VH</td><td>15–70 A</td><td>15–125 A</td><td>—</td></tr>
<tr><td rowspan="8">65,000</td><td rowspan="4">400 A Max. Class J Fuses</td><td>QO (B) VH</td><td>15–70 A</td><td>15–150 A</td><td>—</td></tr>
<tr><td>QO (B) AFI</td><td>15–20 A</td><td>—</td><td>—</td></tr>
<tr><td>QO (B) CAFI</td><td>15–20 A</td><td>15–20 A</td><td>—</td></tr>
<tr><td>QO (B) DF</td><td>15–20 A</td><td>—</td><td>—</td></tr>
<tr><td rowspan="4">400 A Max. Class T6 Fuses</td><td>QO (B) VH</td><td>15–70 A</td><td>15–150 A</td><td>—</td></tr>
<tr><td>QO (B) AFI</td><td>15–20 A</td><td>—</td><td>—</td></tr>
<tr><td>QO (B) CAFI</td><td>15–20 A</td><td>15–20 A</td><td>—</td></tr>
<tr><td>QO (B) DF</td><td>15–20 A</td><td>—</td><td>—</td></tr>
</table>

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Table 2: Series Connected Breaker Ratings (RMS Symmetrical) *(continued)*

Max. System Voltage AC [1, 2]	Max. Short Circuit Current Rating	Square D Brand Integral or Remote Main Circuit Breakers and Remote Main Fuses	Square D Brand Branch Circuit Breaker Catalog Designation and Allowable Ampere Ranges [3, 4, 5, 6]			
			Type	1 Pole	2 Pole	3 Pole
120/240[7] 1P/3W	100,000	200 A Max. Class T3 Fuses	QO (B)	15–70 A	15–125 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
	200,000	400 A Max. Class T3 Fuses	QO (B)	15–70 A	15–125 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
208Y/120 3P/4W	200,000	200 A Max. Class T6, J Fuses	QO (B)	15–70 A	15–125 A	—
			QO (B) GFI	—	—	15–50 A
			QO (B) EPD	—	—	15–50 A
		400 A Max. Class T3 Fuses	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) EPE	—	—	15–50 A
			QO (B) EPD	15–30 A	15–60 A	15–50 A
240/120 3P/4W	42,000	400 A Max. Class T3 Fuses	QO (B) VH	15–30 A	15–125 A	—
	50,000	400 A Max. Class T3 Fuses	QO (B) VH	—	—	15–30 A
	65,000	400 A Max. Class J Fuses	QO (B) VH	15–70 A	15–125 A	—
			QO (B) EPD	—	—	15–50 A
			QO (B) EPE	—	—	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		400 A Max. Class T6 Fuses	QO (B) VH	15–70 A	15–125 A	15–150 A
			QO (B) AFI	15–20 A	—	—

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Table 2: Series Connected Breaker Ratings (RMS Symmetrical) *(continued)*

Max. System Voltage AC [1, 2]	Max. Short Circuit Current Rating	Square D Brand Integral or Remote Main Circuit Breakers and Remote Main Fuses	Square D Brand Branch Circuit Breaker Catalog Designation and Allowable Ampere Ranges [3, 4, 5, 6]			
			Type	1 Pole	2 Pole	3 Pole
240/120 3P/4W	100,000	200 A Max. Class T3 Fuses	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) VH	—	—	15–30 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) EPE	—	—	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
			QOT	15–30 A	15–30 A	—
	200,000	200 A Max. Class J or T6 Fuses	QO (B) EPD	—	—	15–50 A
			QO (B) EPE	—	—	15–50 A
		400 A Max. Class T3 Fuses	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) EPE	—	—	15–50 A
240 3P/3W or 240 1P/2W (two pole only)	50,000	400 A Max. Class J or T6 Fuses	QO (B) VH	—	—	15–30 A
	65,000	400 A Max. Class J Fuses	QO (B) VH	—	—	15–30 A
			QO (B) EPD	—	—	15–50 A
			QO (B) EPE	—	—	15–50 A
		400 A Max. Class T6 Fuses	QO (B) VH	—	—	15–150 A
			QOB VH 1φ, 2W only	—	150 A	—
	100,000	200 A Max. Class T3 Fuses	QO (B)	—	—	15–100 A
			QO (B) VH	—	—	15–30 A
	200,000	200 A Max. Class J or T6 Fuses	QO (B) EPD	—	—	15–50 A
			QO (B) EPE	—	—	15–50 A
		400 A Max. Class T3 Fuses	QO (B)	—	—	15–100 A
			QO (B) EPD	—	—	15–50 A
			QO (B) EPE	—	—	15–50 A

1 For shown circuit breakers rated less than this maximum voltage, the indicated short circuit current rating also applies, but at the voltage rating of the circuit breaker.

2 Short circuit tests are conducted at 100–105% of the maximum rated voltage of the panelboard.

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[3] Suffixes HID, SWD, and SWN may also be applied to the applicable branch circuit breakers shown above. Suffix SWN may **not** be applied in combination with LC main breakers.

[4] Where QO (B) circuit breakers are shown above, QO (B) H, QO (B) VH, and QH (B) circuit breakers may also be used.

[5] Where QO (B) GFI circuit breakers are shown above, QO (B) EPD and/or QO (B) EPE circuit breakers may also be used. QO-EPE only comes in 3-pole construction.

[6] Where QO (B) AFI circuit breakers are shown above, QO (B) CAFI circuit breakers may also be used.

[7] Two-pole CAFI circuit breakers are only 120/240 Vac and may only be used on 120/240 VAC single phase 3 wire systems.

[8] To achieve selective coordination, the rating of the DJ main circuit breaker must be at least two times greater than the ampere rating of any branch circuit breaker.

Table 3: NQ Panel Mission Critical Breaker Selectivity

Maximum SCCR (RMS Symmetrical)	Integral or Remote Main Circuit Breakers	Branch Circuit Breakers			
		Type[1]	1-pole	2-pole	3-pole
Fully Rated and Selective to 10 kA at 208Y/120 Vac or at 240/120 Vac	J-W, 250 A L-W, 250 A	QO(B) QO(B)-H QO(B)-VH QH	10–70	10–125	10–125
Series Rated and Selective to 12 kA at 208Y/120 Vac or at 240/120 Vac	J-W, 250 A	QO(B) QO(B)-H QO(B)-VH QH	10–70	10–125	10–60
Series Rated and Selective to 15 kA at 208Y/120 Vac or at 240/120 Vac	J-W, 250 A	QO(B) QO(B)-H QO(B)-VH QH	10–60	10–60	10–30
Series Rated and Selective to 18 kA at 208Y/120 Vac or at 240/120 Vac	J-W, 250 A	QO(B) QO(B)-H QO(B)-VH QH	10–30	10–30	—
	L-W, 250 A	QO(B) QO(B)-H QO(B)-VH QH	10–60	10–60	10–60
Series Rated and Selective to 30 kA at 208Y/120 Vac or at 240/120 Vac	L-W, 400 A L-W, 600 A	QO(B) QO(B)-H QO(B)-VH QH	15–70	15–150	15–150

[1] Including AFI, CAFI, EPD and GFI Circuit Breakers

Table 4: Short Circuit Current Rating[1] for Main Lug Interiors with Sub-Feed or Feed-Through Lugs

<table>
<tr><th>Maximum System Voltage AC</th><th>Maximum Current Rating</th><th>Branch Circuits[2]</th><th>Application</th><th>Adder[3]</th><th>Maximum Short Circuit Current Rating[4]</th></tr>
<tr><td rowspan="11">240</td><td>100</td><td>18, 30</td><td>SFL and FTL</td><td>—</td><td rowspan="4">10,000</td></tr>
<tr><td rowspan="3">225</td><td>30, 42, 54, 72, 84, 96</td><td>SFL</td><td>6 inches (152.4 mm)</td></tr>
<tr><td>42</td><td rowspan="2">FTL</td><td>—</td></tr>
<tr><td>30, 54, 72, 84, 96</td><td>6 inches (152.4 mm)</td></tr>
<tr><td rowspan="5">400</td><td>30, 42, 54, 72, 84</td><td rowspan="2">SFL</td><td>—</td><td>25,000</td></tr>
<tr><td>96</td><td>—</td><td>10,000</td></tr>
<tr><td>30, 84</td><td rowspan="3">FTL</td><td>—</td><td>25,000</td></tr>
<tr><td>96</td><td>—</td><td>10,000</td></tr>
<tr><td>42, 54, 72</td><td>6 inches (152.4 mm)</td><td rowspan="2">25,000</td></tr>
<tr><td rowspan="2">600</td><td>30, 42, 54, 72, 84</td><td rowspan="2">FTL</td><td rowspan="2">12 inches (304.8 mm)</td></tr>
<tr><td>96</td><td>10,000</td></tr>
</table>

1 This rating applies to main lug interiors, equipped with sub-feed or feed-through lugs, where the device feeding the interior is unknown or not a Square D brand device. Use of a Square D brand main circuit breaker ahead of these lugs will result in a rating equal to the rating of the breaker. Short circuit tests are conducted at 100–105% of the maximum rated voltage of the panelboard.

2 96 circuits with SPD has 84 usable branch circuits.

3 The adder is the additional length of the enclosure.

4 RMS symmetrical amperes, for three cycles.

CE Marking

- Interiors with the "CE" mark meet the IEC 61439-1 and IEC 61439-2 standards.
- Main lug interiors with the "CE" mark have been tested to withstand 10,000 RMS symmetrical amperes for 30 cycles.
- Interiors with the "CE" mark are only approved for use with QOXD or QOBXD branch circuit breakers which carry the "CE" mark.

Appendix 2: Accessory Kits

An assortment of field-installable accessory kits are available for NQ panelboards:

- Equipment Ground Bar Kits
- Oversized Lug Kits for 100–250 A Panelboards
- Sub-Feed Lug Kits for 100–400 A Panelboards
- Main Lug Kits
  - — Mechanical Lug Kits—Aluminum
  - — Mechanical Lug Kits—Copper
  - — Versa-Crimp Compression Lug Kits—Aluminum
  - — Versa-Crimp Compression Lug Kits—Copper

Equipment Ground Bar Kits

Equipment ground bar kits, suitable for copper or aluminum wire, meet the grounding needs of NQ panelboards and QONQ load centers.

Table 5: Equipment Ground Bar Kits Specifications

Panelboard		Use Ground Bar Kit Catalog Number	
Branch Circuit	**Mains Rating**	**Aluminum[1]**	**Copper[2]**
1–42	600 A Maximum	(1) PK27GTA	(1) PK27GTACU
54–84		(2) PK27GTA	(2) PK27GTACU

[1] Aluminum bars suitable for 60° C or 75° C Copper or Aluminum conductors.

[2] Copper bars suitable for 60° C or 75° C Copper conductors.

NOTE: Ground bar mounting locations are identified by the ground symbol stamped into the back wall of the enclosure.

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Oversized Lug Kits for 100–250 A Panelboards

Oversized lug kits are available for applications where termination conductors of 3 AWG or larger are required for the neutral.

Table 6: Oversized Lug Kits for 100–250 A Panelboards Specifications

Circuit Breaker Rating	Kit Catalog Number	Wire Range
70 A	QO70AN	(1) 10–2 Al ([1] 5.76–33.6 mm^2) (1)14–4 Cu ([1] 2.08–21.1 mm^2)
80–125 A	Q1100AN	(1) 4–1/0 Al/Cu ([1] 42.4–53.5 mm^2)
125–150 A	Q1150AN	(1) 1–4/0 Al/Cu ([1] 42.4–107 mm^2)

Sub-Feed Lug Kits for 100–400 A Panelboards

Sub-feed main lugs are available for 100, 225, or 400 A applications.

Table 7: Sub-Feed Lug Kits for 100–400 A Panelboards Specifications

Main Amps	Kit Catalog Number	Maximum Circuits
100	NQSFL1	18, 30
225	NQSFL2	30[1], 42[1], 54[1], 72[1], 84[1]
400	NQSFL4	30, 42, 54, 72, 84

1 These panels require an additional 6 inches (152.4 mm) for the box and trim, for proper wire bending space.

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Main Lug Kits

Table 8: Mechanical Lug Kits — Aluminum

Panelboard Amps	Kit Catalog Number	Wire Range
100	Standard	#6–2/0 AWG (13.3–67.43 mm^2)
225	Standard	#6–350 kcmil (13.3–177.3 mm^2)
400	Standard	(1) 1/0–750 kcmil (2) 1/0–350 kcmil ([1] 53.48–380 mm^2) ([2] 53.48–177.3 mm^2)
600	Standard	(2) 1/0–750 kcmil ([2] 53.48–380 mm^2)
	NQALM6A	(3) #6–250 kcmil ([3] 13.3–127 mm^2)

Table 9: Mechanical Lug Kits — Copper

Panelboard Amps	Kit Catalog Number	Wire Range
100	NQCUM1	#6–2/0 AWG (13.3–67.43 mm^2)
225	NQCUM2	#6–250 kcmil (13.3–127 mm^2)
400	NQCUM4	(1) 1/0–750 kcmil (2) 1/0–350 kcmil ([1] 53.48–380 mm^2) ([2] 53.48–177.3 mm^2)
600	NQCUM6	

Table 10: Versa-Crimp® Compression Lug Kits — Aluminum

Panelboard Amps	Kit Catalog Number	Wire Range	Crimp Tool
100	NQALV1	#8–1/0 AWG (8.36–53.48 mm^2)	VC6 (All)
225	NQALV2	#4–300 kcmil (21.15–152 mm^2)	
400	NQALV4	(2) 2/0–500 kcmil ([2] 67.43–253.4 mm^2)	VC6-3, VC6-FT
600	NQALV6		

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Table 11: Versa-Crimp® Compression Lug Kits — Copper

Panelboard Amps	Kit Catalog Number	Wire Range	Crimp Tool
100	NQCUV1	#6–1/0 AWG (13.30–53.48 mm^2)	VC6 (All), VC7 (All)
225	NQCUV2	2/0–300 kcmil (67.43–152 mm^2)	VC6-3, VC7, VC6-FT, VC7-FT
400	NQCUV4	400–750 kcmil (202.7–380 mm^2)	VC6-FT, VC7-FT, VC8
600	NQCUV6	(2) 250–500 kcmil ([2] 126.7–253.4 mm^2)	VC6-3, VC7, VC6-FT, VC7-FT

Schneider Electric USA, Inc.
1415 S. Roselle Road
Palatine, IL 60067 USA
1-888-SquareD (1-888-778-2733)
www.us.SquareD.com

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

80043-712-06 Rev. 02, 11/2016
Replaces 80043-712-06 Rev. 02, 06/2015

Para los tableros de alumbrado NQ/NQM centros de carga QONQ

Boletín de instrucciones
Classe 1640

ESPAÑOL

Boletín de instrucciones

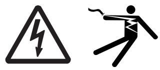
80043-712-06 Rev. 02
11/2016

Conservar para uso futuro.

by Schneider Electric

Categorías de riesgos y símbolos especiales

Asegúrese de leer detenidamente estas instrucciones y realice una inspección visual del equipo para familiarizarse con él antes de instalarlo, hacerlo funcionar o prestarle servicio de mantenimiento. Los siguientes mensajes especiales pueden aparecer en este boletín o en el equipo para advertirle sobre peligros potenciales o llamar su atención sobre cierta información que clarifica o simplifica un procedimiento.



La adición de cualquiera de estos símbolos a una etiqueta de seguridad de “Peligro” o “Advertencia” indica la existencia de un peligro eléctrico que podrá causar lesiones personales si no se observan las instrucciones.

Este es el símbolo de alerta de seguridad. Se usa para avisar sobre peligros potenciales de lesiones. Respete todos los mensajes de seguridad con este símbolo para evitar posibles lesiones o la muerte.

⚠ PELIGRO
PELIGRO indica una situación de peligro inminente que, si no se evita, **podrá** causar la muerte o lesiones serias.

⚠ ADVERTENCIA
ADVERTENCIA indica una situación potencialmente peligrosa que, si no se evita, **puede** causar la muerte o lesiones serias.

⚠ PRECAUCIÓN
PRECAUCIÓN indica una situación potencialmente peligrosa que, si no se evita, **puede** causar lesiones menores o moderadas.

AVISO
AVISO se usa para hacer notar prácticas no relacionadas con lesiones físicas. El símbolo de alerta de seguridad no se usa con esta palabra de indicación.

NOTA: Proporciona información adicional para clarificar o simplificar un procedimiento.

Observe que

Solamente el personal especializado deberá instalar, hacer funcionar y prestar servicios de mantenimiento al equipo eléctrico. Schneider Electric no asume responsabilidad alguna por las consecuencias emergentes de la utilización de este material.

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Introducción

Este boletín contiene las instrucciones de instalación de los centros de carga QONQ y de los tableros de alumbrado NQ de interruptores automáticos marca Square D™. Estos centros de carga y tableros de alumbrado han sido registrados con Underwriters Laboratories (cULus) y aceptan interruptores automáticos derivados QO™ y QOB.

Para obtener asistencia técnica sobre la instalación de este tablero de alumbrado, póngase en contacto con el centro de información al cliente de Schneider Electric llamando al 1-888-778-2733 (en EUA).

Consulte las etiquetas en el equipo para obtener información de seguridad y valores nominales. Con este documento se incluyen etiquetas adicionales del equipo.

Precauciones de seguridad

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía, consulte la norma 70E de NFPA, Z462 de CSA y NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice (O) el equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión adecuado para confirmar la desenergización del equipo.
- Asegúrese de leer y entender todo el contenido de este boletín de instrucciones así como la publicación de normas NEMA PB 1.1 (incluida) antes de instalar, hacer funcionar o prestar servicio de mantenimiento a este equipo.
- Las normas locales varían, se aceptan y hacen cumplir para fomentar la seguridad en instalaciones eléctricas. Es posible que necesite un permiso para realizar el trabajo eléctrico, y en algunos casos, algunos reglamentos pueden requerir una inspección del trabajo eléctrico efectuado.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de volver a energizar el equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

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Instalación

Esta sección proporciona instrucciones para los siguientes procedimientos de los tableros NQ y de los centros de carga QONQ:

- Montaje de interiores en gabinetes marca Square D
- “Instalación de la barra o cable de conexión del neutro” en la página 9
- “Instalación y desmontaje del interruptor automático QO y QOB” en la página 13
- “Instrucciones para restablecer el interruptor automático” en la página 16
- “Preparación del marco interior” en la página 17

Montaje de interiores en gabinetes marca Square D

Con este equipo, se ha incluido (por separado) la publicación de normas NEMA PB1.1 "Instrucciones generales apropiadas de instalación, funcionamiento y servicios de mantenimiento de tableros de alumbrado de 600 V o menos". Familiarícese con el contenido de este documento antes de continuar con los siguientes procedimientos.

Si no recibió una copia de esta publicación, o si tiene alguna pregunta con respecto al equipo, póngase en contacto con su distribuidor o representante local de Schneider Electric.

AVISO
PELIGRO DE DAÑO AL EQUIPO DEBIDO A CONEXIONES FLOJAS • Asegúrese de que todas las conexiones estén bien apretadas. • Consulte la etiqueta de información de par de apriete incluida con el tablero antes de apretar las conexiones. **El incumplimiento de estas instrucciones puede causar daño al equipo.**

Para montar e instalar correctamente el interior de un tablero NQ o centro de carga QONQ, consulte la publicación de normas NEMA PB 1.1, y siga las instrucciones a continuación para “Montaje de sobreponer (gabinete montado en la pared)” en la página 7 o “Montaje de empotrar (gabinete empotrado en la pared)” en la página 7.

Montaje de sobreponer (gabinete montado en la pared)

1. Monte el gabinete como se indica en la publicación de normas NEMA PB 1.1.
2. Retire el marco interior de sus soportes.
3. Instale el interior como se describe a continuación:
    a. Coloque el interior sobre los pernos del gabinete. No es necesario un tornillo elevador (vea la figura 1 en la página 8).
    b. Apriete las tuercas de seguridad en los rieles laterales del interior hasta que los rieles estén bien apoyados en la parte trasera del gabinete.
    c. Vuelva a montar el marco interior después de realizar el alambrado.
4. Si se utiliza como equipo de entrada de acometida, será necesaria una conexión del neutro. Consulte las instrucciones en "Instalación de la barra o cable de conexión del neutro" en la página 9.
5. Coloque las etiquetas del equipo (situadas en la bolsa de accesorios) siguiendo las instrucciones de la etiqueta colocada en la parte trasera del marco interior.

Montaje de empotrar (gabinete empotrado en la pared)

1. Monte el gabinete como se indica en la publicación de normas NEMA PB 1.1.
2. Retire el marco interior de sus soportes.
3. Instale el interior como se describe a continuación:
    a. Rosque los (4) tornillos elevadores autorroscantes de 10-32 x 0,875 pulg. (incluidos con el marco para empotrar) en los rieles laterales.
    b. Coloque el interior sobre los pernos del gabinete (vea la figura 1 en la página 8). Coloque las tuercas de seguridad sobre los pernos del gabinete, sin apretarlas.
    c. Ajuste los tornillos de manera que el reborde del marco interior se encuentre 0,25 pulg (6,35 mm) de la pared.
    d. Apriete las tuercas de seguridad en los rieles laterales.
    e. Vuelva a montar el marco interior después de realizar el alambrado.

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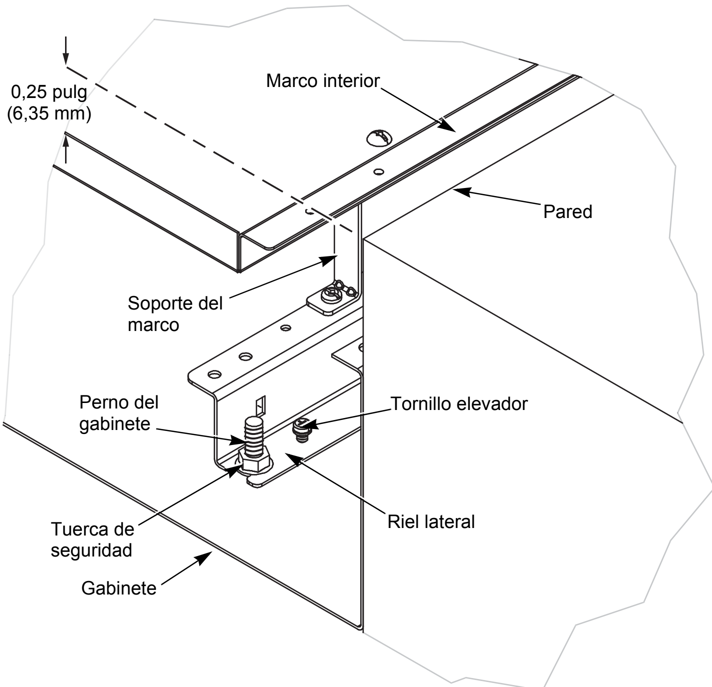
4. Si se utiliza como equipo de entrada de acometida, será necesaria una conexión del neutro. Consulte las instrucciones en “Instalación de la barra o cable de conexión del neutro” en la página 9.
5. Coloque las etiquetas del equipo (situadas en la bolsa de accesorios) siguiendo las instrucciones de la etiqueta colocada en la parte trasera del marco interior.

Figura 1: Montaje del interior en gabinetes marca Square D



Instalación de la barra o cable de conexión del neutro

La barra o el cable de conexión del neutro deberá usarse sólo cuando el tablero de alumbrado ha sido **instalado** como equipo de acometida.

Para conectar correctamente el neutro al tablero, siga las instrucciones para Tableros de alumbrado NQ de 100 ó 250 A como máximo o Centros de carga QONQ y tableros de alumbrado NQ de 400 ó 600 A como máximo en las páginas 9 y 11, respectivamente.

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⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía, consulte la norma 70E de NFPA, Z462 de CSA y NOM-029-STPS.
- Desenergice el equipo antes de realizar cualquier trabajo dentro o fuera de él.
- La barra/cable de conexión del neutro deberá usarse sólo cuando el tablero de alumbrado ha sido instalado como equipo de acometida.
- No mezcle los tornillos de montaje con los tornillos del marco interior.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

NOTA: Las piezas de la barra o cable de conexión del neutro se encuentran en la bolsa de accesorios incluida con el interior.

Tableros de alumbrado NQ de 100 ó 250 A como máximo

Para instalar la barra de conexión del neutro en un tablero NQ de 100 ó 250 A como máximo, consulte la figura 2 en la página 11 y siga las instrucciones a continuación.

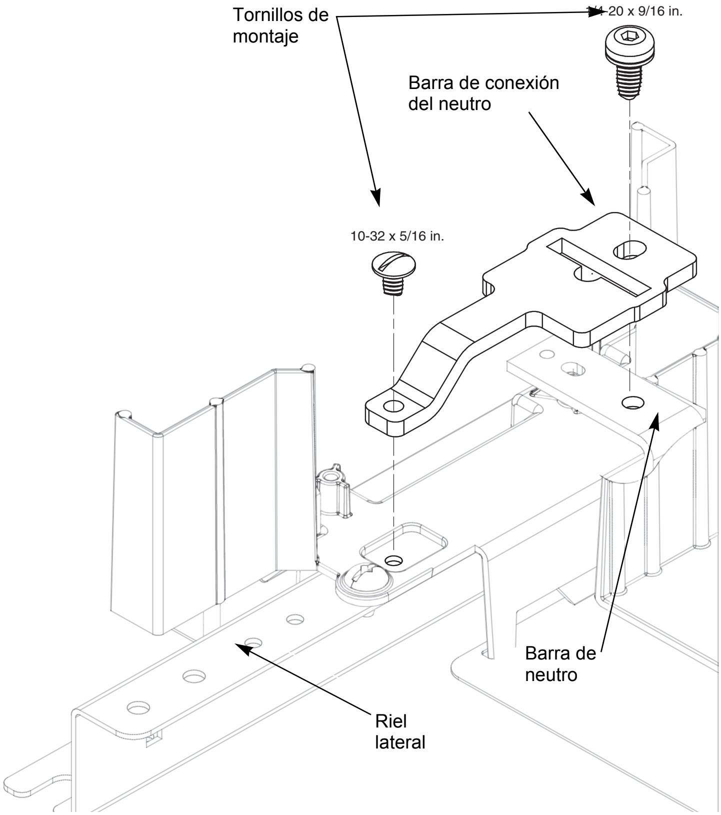
1. Alinee la barra en el riel lateral, como se ilustra.

   NOTA: En algunas aplicaciones, tal vez sea necesario retirar la zapata (no ilustrada) antes de instalar la barra de conexión del neutro.

2. Inserte los dos tornillos de montaje, como se ilustra. Apriete el tornillo de 10-32 de 1,1–1,4 N•m (10–12 lbs-pulg) y el tornillo de 1/4-20 de 2,8–3,4 N•m (25–30 lbs-pulg).

   NOTA: Si la zapata fue retirada en el paso 1 arriba, vuélvala a instalar encima de la barra de conexión del neutro. Utilice el tornillo de montaje de zapatas de 1/4-20 x 11/16 pulg. en aplicaciones con zapata de paso, zapata de subalimentación, interruptor automático de subalimentación, o bien, con aplicaciones de neutro al 200%. Utilice el tornillo de montaje de zapatas de 1/4-20 x 7/8 pulg. en aplicaciones de 225 A con el neutro al 200% y con zapatas de paso, zapatas de subalimentación o interruptores automáticos de subalimentación. Los tornillos de montaje de la zapata vienen incluidos en la bolsa de accesorios de la barra.

Figura 2: Instalación de la barra de conexión del neutro—Tableros de alumbrado NQ de 100 ó 250 A como máximo



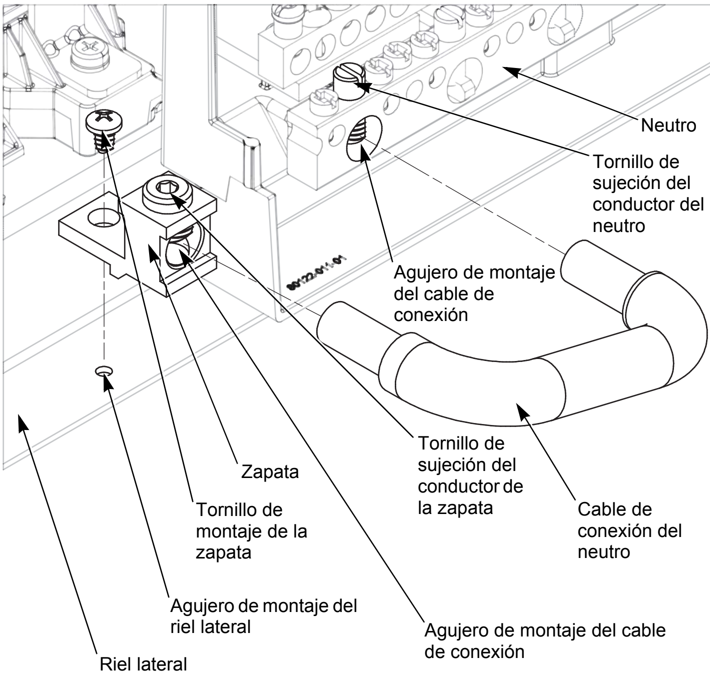
Centros de carga QONQ y tableros de alumbrado NQ de 400 ó 600 A como máximo

Para instalar un cable de conexión del neutro en un centro de carga QONQ y tablero NQ de 400 ó 600 A como máximo, consulte la figura 3 y siga las instrucciones a continuación.

1. Alinee la zapata en el agujero de montaje del riel lateral, como se ilustra.
2. Apriete el tornillo de montaje de la zapata en el riel lateral de 1,1 a 1,4 N•m (10 a 12 lbs-pulg).

3. Alinee el cable de conexión del neutro, como se ilustra, e insértelo en la zapata y agujeros de montaje del neutro.
4. Apriete ambos tornillos de sujeción del conductor del neutro y del conductor de la zapata de 5,1 a 5,6 N•m (45 a 50 lbs-pulg).

Figura 3: Instalación del cable de conexión del neutro—Centros de carga QONQ y tableros de alumbrado NQ de 400 ó 600 A como máximo



Instalación y desmontaje del interruptor automático QO y QOB

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía, consulte la norma 70E de NFPA, Z462 de CSA y NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo en él.
- Siempre utilice un dispositivo detector de tensión adecuado para confirmar la desenergización del equipo.
- Todos los espacios sin utilizar deben cubrirse con placas de relleno.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de volver a energizar el equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

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Instalación de los interruptores automáticos QO y QOB

Consulte la figura 4 en la página 15 para completar las siguientes instrucciones.

1. Desenergice (Off/O) el tablero.
2. Mueva la palanca del interruptor automático QO(B) a la posición de abierto (Off/O).
3. Retire el marco interior.
4. Encaje en el riel de montaje el extremo del interruptor automático correspondiente a la terminal de alambrado del lado de carga.
5. Enganche el conector del lado de línea.

   Para los interruptores automáticos QO:

   a. Empuje hacia dentro hasta que las mordazas enchufables se enganchen completamente en el conector del lado de línea.

   Para los interruptores automáticos QOB:

   a. Empuje hacia adentro hasta que el conector del interruptor automático esté centrado con el agujero de montaje del conector. Enganche el tornillo en el agujero del conector y apriételo en los valores de par de apriete especificados en los diagramas de alambrado del interior.

6. Instale el conductor de carga.
7. Vuelva a instalar el marco interior.

Desmontaje del interruptor automático QO y QOB

Consulte la figura 4 en la página 15 para completar las siguientes instrucciones.

1. Desenergice (Off/O) el tablero.
2. Retire el marco interior.
3. Retire el conductor de carga.
4. Desenganche el conector derivado.

   Para los interruptores automáticos QO:

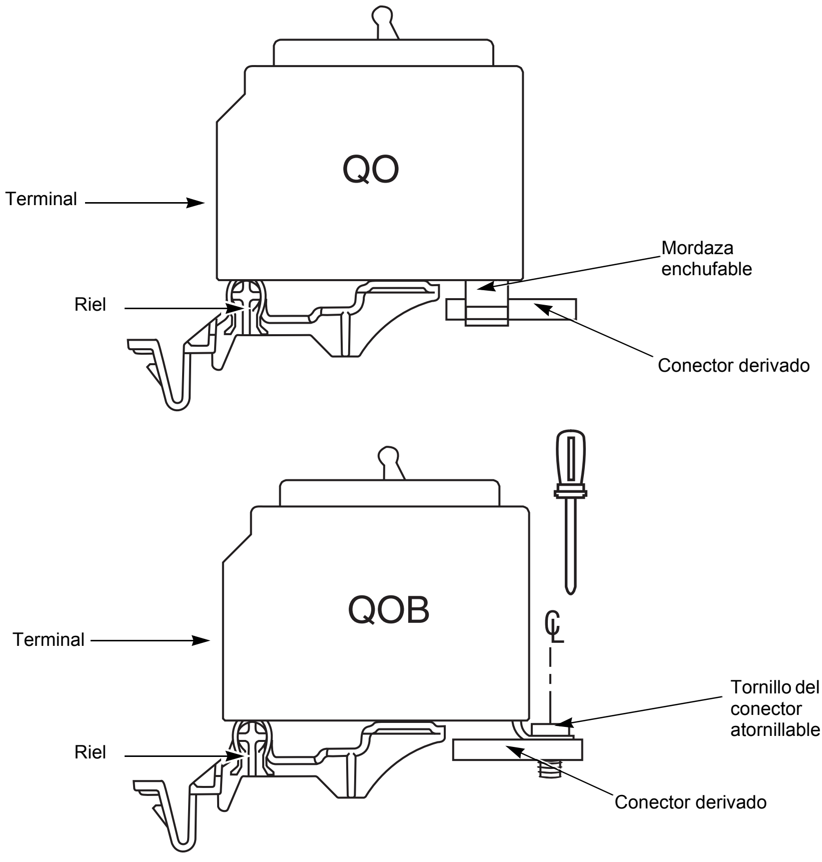
   a. Jale hacia fuera hasta que las mordazas enchufables se desenganchen completamente del conector del lado de línea.

   Para los interruptores automáticos QOB:

   a. Afloje el tornillo en el conector del interruptor automático y desengánchelo del conector del lado de línea.

5. Desenganche el extremo del interruptor automático correspondiente a la terminal del riel de montaje .
6. Vuelva a instalar el marco interior.

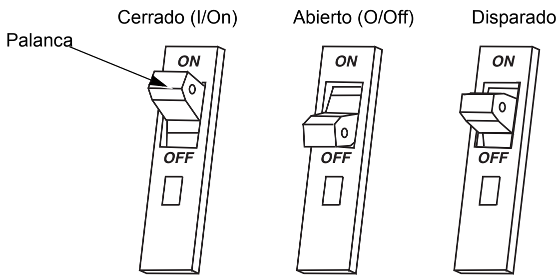
Figura 4: Instalación y desmontaje de los interruptores automáticos QO y QOB



Instrucciones para restablecer el interruptor automático

Si se dispara el interruptor automático, la palanca se encontrará en la posición intermedia entre la posición de abierto (O/Off) y cerrado (I/On). Para restablecer el interruptor automático, mueva la palanca a la posición de abierto (O/Off) y luego a la posición de cerrado (I/On).

Figura 5: Posiciones de la palanca del interruptor automático



Preparación del marco interior

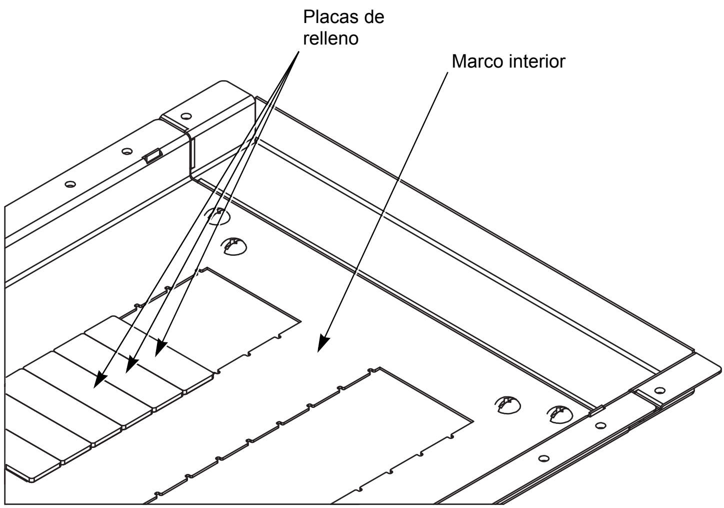
⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía, consulte la norma 70E de NFPA, Z462 de CSA y NOM-029-STPS.
- Antes de energizar el tablero de alumbrado, todos los espacios sin utilizar deben cubrirse con placas de relleno.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Figura 6: Diagrama del marco interior



NOTA: La parte posterior del marco interior contiene una lista de números de catálogo para las placas de relleno compatibles correspondientes.

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Anexo 1: Especificaciones

Alambrado típico

Tabla 1: Alambrado típico del tablero de alumbrado[1]

Tensión de ~ (c.a.)	Tableros de alumbrado de 1 fase		Tableros de alumbrado de 3 fases	
	Fase	Conductores	Fase	Conductores
208Y/120	—	—	3	4
120/240	1	3	—	—
240[2]	1	2	3	3
240[3]	1	3	—	—
240/120[4]	—	—	3	4, delta

1 El tablero de alumbrado incluye información adicional. Consulte el valor nominal del interruptor automático principal, si se usa.

2 Para este sistema no se utiliza el neutro y sólo se deben utilizar interruptores automáticos de 240 V~ (c.a.) como mínimo. No utilice interruptores automáticos de 120 ó 120/240 V~ (c.a.).

3 Para un sistema con fase "B" conectada a tierra, sólo se deben utilizar interruptores automáticos de 240 V~ (c.a.) como mínimo. No utilice interruptores automáticos de 120 ó 120/240 V~ (c.a.).

4 Cuando las conexiones son para un sistema delta, las fases "A" y "C" deben ser de 120 V a neutro, la fase "B" de 208 V a neutro. Conecte sólo interruptores automáticos de 240 V~ (c.a.) como mínimo. No utilice interruptores automáticos de 120 ó 120/240 V en la fase "B".

Interruptor automático principal o de subalimentación:
DJ, FI, KI, H, J, LA, LC, LH, QB, QD, QG, QJ, QO(B)VH

Figura 7: Diagrama del tablero con zapatas principales NQ/NQM de 100–225 A o interruptor automático principal de 100–250 A

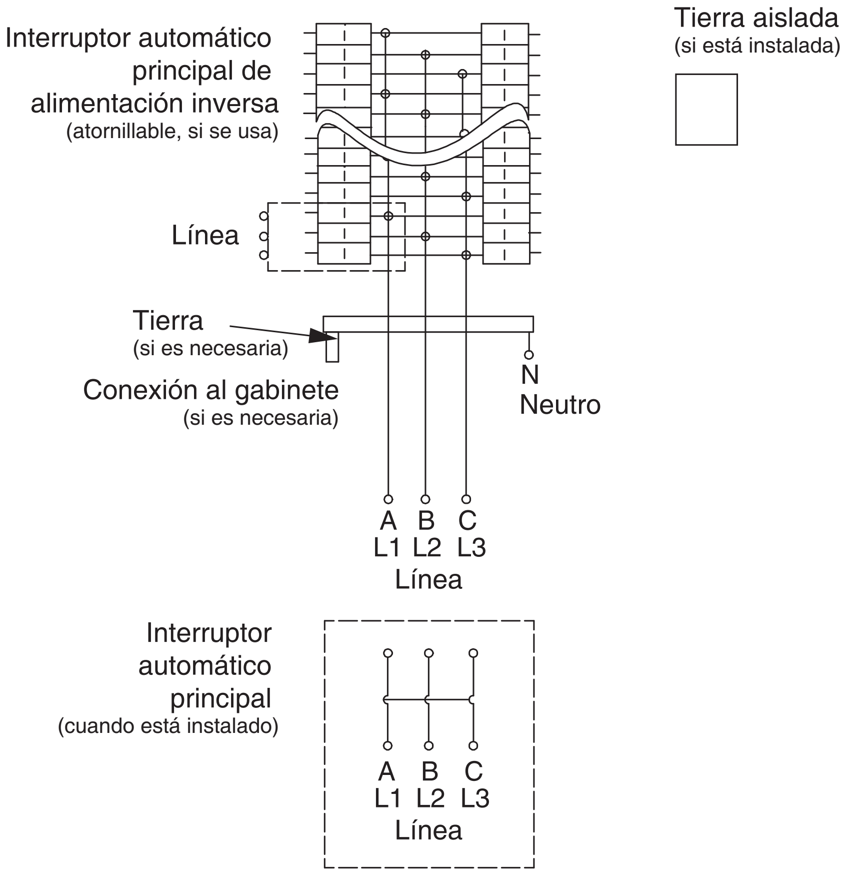

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Figura 8: Diagrama del tablero NQ o centro de carga QONQ con zapatas principales de 400–600 A o interruptor automático principal con o sin zapatas de paso

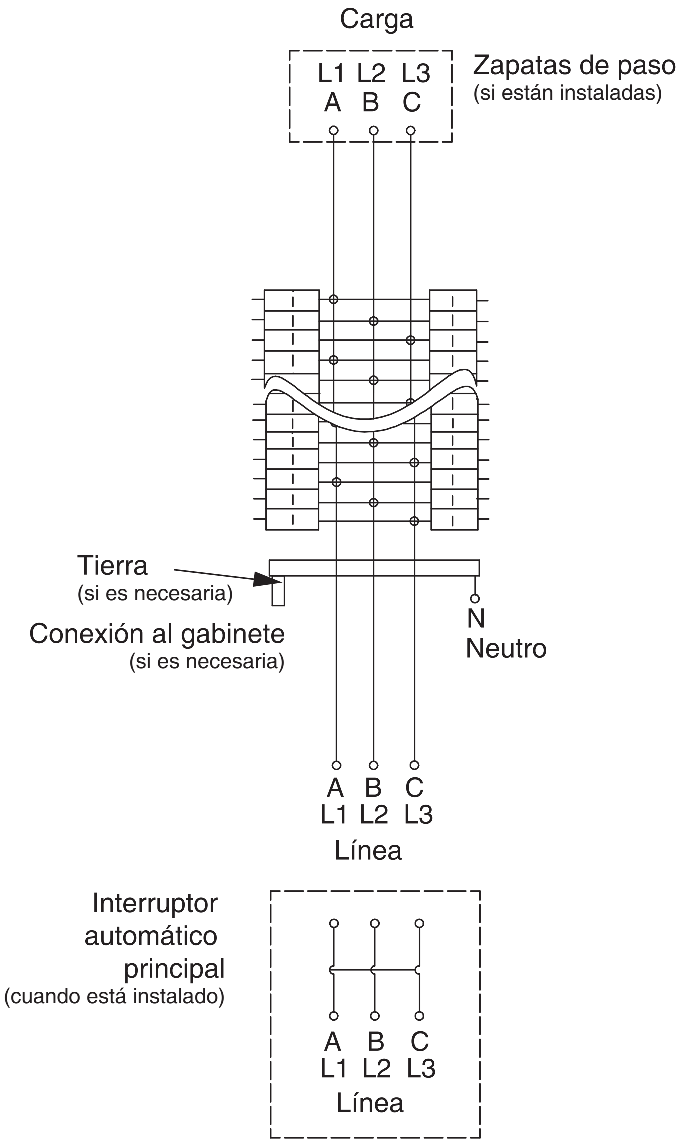


Figura 9: Diagrama del tablero NQ o centro de carga QONQ con interruptor automático principal de 400–600 A con zapatas de paso o interruptores automáticos de subalimentación

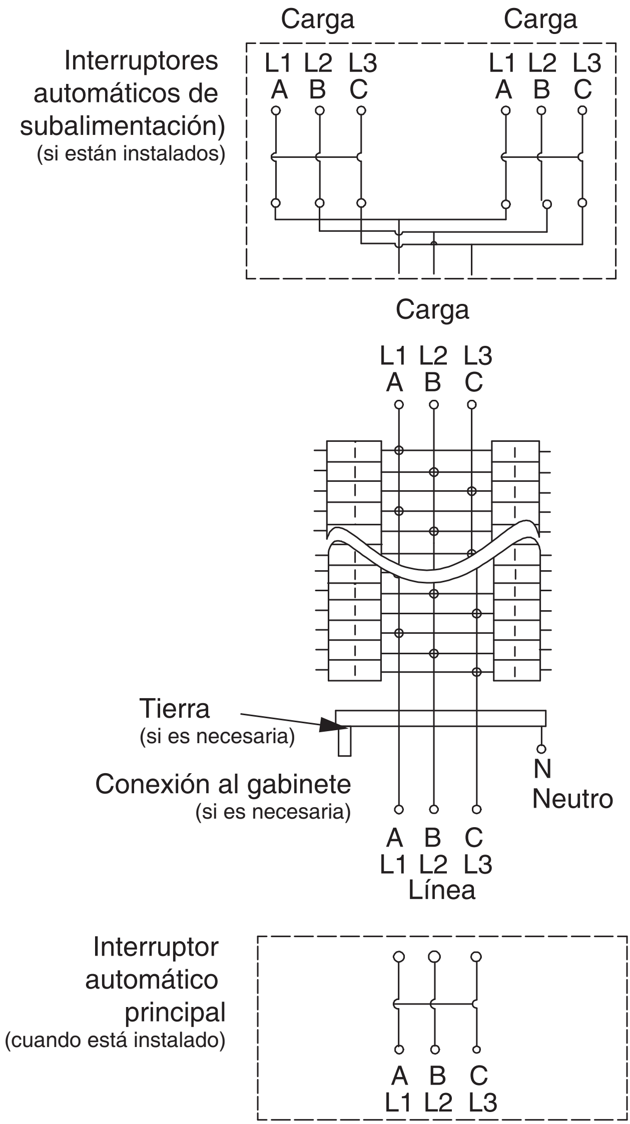
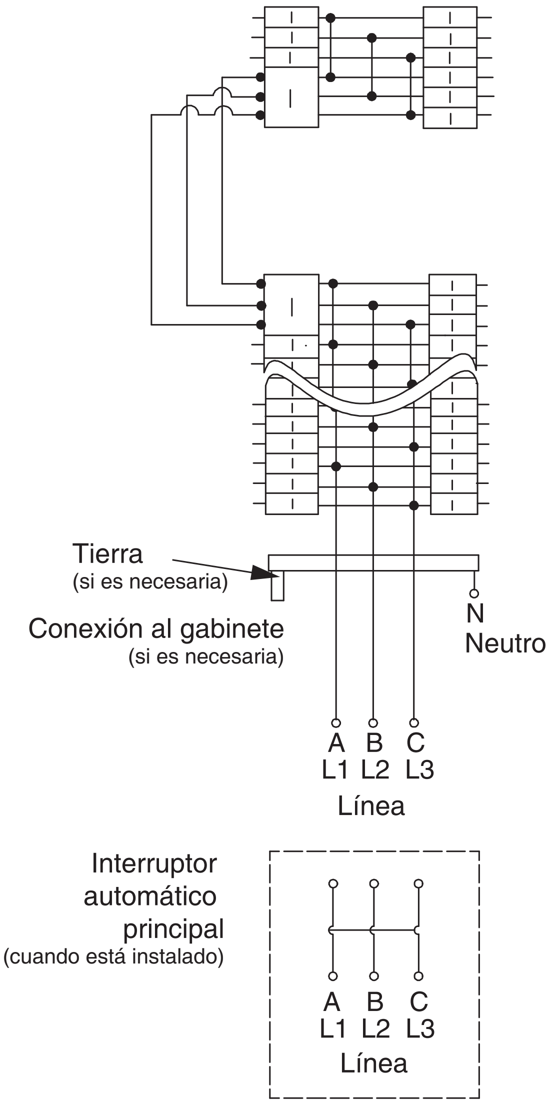


Figura 10: Diagrama del tablero de alumbrado NQ típico con barras divididas



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Valores nominales del tablero

Consulte la sección 110-22 del NEC y de la NOM-001-SEDE y la norma 14-014 de CEC para obtener más información. La etiqueta del sistema en serie se encuentra en la bolsa de accesorios.

Tabla 2: Valores nominales de los interruptores automáticos conectados en serie (simétrico rcm)

Tensión máxima del sistema de ~ [1, 2]	Corriente nominal máx. de corto-circuito	Interruptores automáticos principales integrales o remotos y fusibles principales remotos marca Square D	Designación de número de catálogo de los interruptores automáticos derivados marca Square D y gamas de corriente permitidas[3, 4, 5, 6]			
			Tipo	1 polo	2 polos	3 polos
120/240[7] 1F/3H	22 000	MG	QO (B)	15–30 A	—	—
	25 000	LD, HD, JD	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	—
			QO (B) PL	15–30 A	15–60 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
	65 000	HG, JG	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	—
			QO (B) PL	15–30 A	15–60 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
		LG	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
		LJ	QO (B) GFI	15–30 A	40–60 A	—
			QO (B) EPD	15–30 A	40–60 A	—

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Tabla 2: Valores nominales de los interruptores automáticos conectados en serie (simétrico rcm) *(continuación)*

Tensión máxima del sistema de ~ [1, 2]	Corriente nominal máx. de corto-circuito	Interruptores automáticos principales integrales o remotos y fusibles principales remotos marca Square D	Designación de número de catálogo de los interruptores automáticos derivados marca Square D y gamas de corriente permitidas[3, 4, 5, 6]			
			Tipo	1 polo	2 polos	3 polos
120/240[7] 1F/3H	100 000	HJ, JJ	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	—
			QO (B) PL	15–30 A	15–60 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
		LJ	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	—
			QO (B) H	—	15–100 A	—
			QO (B) GFI	—	15–30 A	—
			QO (B) EPD	—	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
		DJ 400 A	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	—	150 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
		QJ	QO (B)	15–70 A	15–125 A	—
			QO (B) AS	15–30 A	15–30 A	—
			QO (B) VH	—	150 A	—
			QO (B) PL	15–30 A	15–60 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—

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Tabla 2: Valores nominales de los interruptores automáticos conectados en serie (simétrico rcm) *(continuación)*

Tensión máxima del sistema de ~ [1, 2]	Corriente nominal máx. de corto-circuito	Interruptores automáticos principales integrales o remotos y fusibles principales remotos marca Square D	Designación de número de catálogo de los interruptores automáticos derivados marca Square D y gamas de corriente permitidas[3, 4, 5, 6]			
			Tipo	1 polo	2 polos	3 polos
120/240[7] 1F/3H	125 000	HL, JL	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	—
			QO (B) PL	15–30 A	15–60 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
208Y/120 3F/4H	18 000	LA/LH (L), 34200MC	QO (B)	15–30 A	15–30 A	15–30 A
		LA/LH (L), 34225MC				
		LA/LH (L), 34250MC				
		LA/LH (L), 34400MC				
208Y/120 3F/4H	25 000	LD	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–30 A	15–125 A	15–150 A
			QO (B) GFI	15–30 A	15–60 A	15–30 A
			QO (B) EPD	15–30 A	15–60 A	15–30 A
			QO (B) EPE	—	—	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
	30 000	DJ-W 150 A MC[8]	QO (B)	15–70 A	15–100 A	—
			QO (B) VH	—	15–125 A	15–150 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
		DJ-W 250 A MC[8]	QO (B)	15–70 A	15–100 A	—
			QO (B) VH	—	—	15–100 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
		DJ-W 600 A MC[8]	QO (B)	15–70 A	15–100 A	—
			QO (B) VH	—	—	15–150 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—

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Tabla 2: Valores nominales de los interruptores automáticos conectados en serie (simétrico rcm) *(continuación)*

Tensión máxima del sistema de ~ [1, 2]	Corriente nominal máx. de corto-circuito	Interruptores automáticos principales integrales o remotos y fusibles principales remotos marca Square D	Designación de número de catálogo de los interruptores automáticos derivados marca Square D y gamas de corriente permitidas[3, 4, 5, 6]			
			Tipo	1 polo	2 polos	3 polos
208Y/120 3F/4H	65 000	LG	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	15–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	15–30 A	15–60 A	15–30 A
			QO (B) EPD	15–30 A	15–60 A	15–30 A
			QO (B) EPE	—	—	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		LJ	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	15–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	15–30 A	15–60 A	15–30 A
			QO (B) EPD	15–30 A	15–60 A	15–30 A
			QO (B) EPE	—	—	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		LL	QO (B) GFI	—	—	15–30 A
			QO (B) EPD	—	—	15–30 A
			QO (B) EPE	—	—	15–30 A
	100 000	DJ 400 A	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	—	—	15–150 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—

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Tabla 2: Valores nominales de los interruptores automáticos conectados en serie (simétrico rcm) *(continuación)*

Tensión máxima del sistema de ~ [1, 2]	Corriente nominal máx. de corto-circuito	Interruptores automáticos principales integrales o remotos y fusibles principales remotos marca Square D	Designación de número de catálogo de los interruptores automáticos derivados marca Square D y gamas de corriente permitidas[3, 4, 5, 6]			
			Tipo	1 polo	2 polos	3 polos
208Y/120 3F/4H	100 000	QJ	QO (B)	15–70 A	15–125 A	15–30 A
			QO (B) VH	—	—	15–150 A
			QO (B) PL	15–30 A	15–60 A	15–30 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) EPE	15–30 A	15–60 A	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		LJ	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	15–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	—	15–30 A	—
			QO (B) EPD	—	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
240/120 3F/4H	22 000	QO (B) VH	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) EPE	—	—	15–50 A
			QO (B) PL	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—

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Tabla 2: Valores nominales de los interruptores automáticos conectados en serie (simétrico rcm) *(continuación)*

Tensión máxima del sistema de ~ [1, 2]	Corriente nominal máx. de corto-circuito	Interruptores automáticos principales integrales o remotos y fusibles principales remotos marca Square D	Designación de número de catálogo de los interruptores automáticos derivados marca Square D y gamas de corriente permitidas[3, 4, 5, 6]			
			Tipo	1 polo	2 polos	3 polos
240/120 3F/4H	25 000	QD	QO (B)	15–70 A	15–125 A	15–30 A
			QO (B) VH	—	—	35–150 A
			QO (B) PL	15–30 A	15–60 A	15–30 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) EPE	—	—	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		ED, FD	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		KD	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) AS	15–30 A	15–30 A	15–30 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
		HD, JD	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) VH	—	—	35–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) EPE	—	—	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—

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Tabla 2: Valores nominales de los interruptores automáticos conectados en serie (simétrico rcm) *(continuación)*

Tensión máxima del sistema de ~ [1, 2]	Corriente nominal máx. de corto-circuito	Interruptores automáticos principales integrales o remotos y fusibles principales remotos marca Square D	Designación de número de catálogo de los interruptores automáticos derivados marca Square D y gamas de corriente permitidas [3, 4, 5, 6]			
			Tipo	1 polo	2 polos	3 polos
240/120 3F/4H	25 000	LD	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–30 A	15–125 A	15–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	15–30 A	15–60 A	15–30 A
			QO (B) EPD	15–30 A	15–60 A	15–30 A
			QO (B) EPE	—	—	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
	42 000	LA, MA	Q2L-H	—	100–225 A	100–225 A
			QDL	—	70–225 A	70–225 A
		LC 400 A	QO (B)	15–70 A	15–70 A	—
			QO (B) VH	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		LC 600 A	QO (B) VH	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		MG	QO (B) VH	15–30 A	15–30 A	15–30 A
	65 000	LC 400 A	QO (B)	15–30 A	15–30 A	—
			QO (B) VH	15–30 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—

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Tabla 2: Valores nominales de los interruptores automáticos conectados en serie (simétrico rcm) *(continuación)*

Tensión máxima del sistema de ~ [1, 2]	Corriente nominal máx. de corto-circuito	Interruptores automáticos principales integrales o remotos y fusibles principales remotos marca Square D	Designación de número de catálogo de los interruptores automáticos derivados marca Square D y gamas de corriente permitidas[3, 4, 5, 6]			
			Tipo	1 polo	2 polos	3 polos
240/120 3F/4H	65 000	LC 600 A	QO (B) VH	15–30 A	15–125 A	15–150 A
			QO (B) GFI	—	—	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		DJ 400 A	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	—	—	15–150 A
			QO (B) H	—	15–100 A	—
		DJ_W	QO (B)	15–70 A	15–150 A	—
			QO (B)-VH	—	110–125 A	15–150 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		DJ, DG, DL 150–600 A	QO (B) EPD	—	—	15–30 A
		EG, FG, KG	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—

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Tabla 2: Valores nominales de los interruptores automáticos conectados en serie (simétrico rcm) *(continuación)*

Tensión máxima del sistema de ~ [1, 2]	Corriente nominal máx. de corto-circuito	Interruptores automáticos principales integrales o remotos y fusibles principales remotos marca Square D	Designación de número de catálogo de los interruptores automáticos derivados marca Square D y gamas de corriente permitidas[3, 4, 5, 6]			
			Tipo	1 polo	2 polos	3 polos
240/120 3F/4H	65 000	QG	QO (B)	15–70 A	15–125 A	15–30 A
			QO (B) VH	—	—	35–150 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) PL	15–30 A	15–60 A	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		HG, JG	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) VH	—	—	35–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) EPE	—	—	15–50 A
			QO (B) PL	15–30 A	15–60 A	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		FC_ o KC_22___	QO (B)	15–70 A	15–100 A	15–100 A
		FC_ o KC_34___	QO (B) AS	15–30 A	15–30 A	15–30 A
		LG	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	15–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	15–30 A	15–60 A	15–30 A
			QO (B) EPD	15–30 A	15–60 A	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		LJ	QO (B)	15–70 A	15–125 A	—
			QO (B) GFI	15–30 A	40–60 A	—
			QO (B) EPD	15–30 A	40–60 A	15–30 A
			QO (B) EPE	—	—	15–30 A

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Tabla 2: Valores nominales de los interruptores automáticos conectados en serie (simétrico rcm) *(continuación)*

Tensión máxima del sistema de ~ [1, 2]	Corriente nominal máx. de corto-circuito	Interruptores automáticos principales integrales o remotos y fusibles principales remotos marca Square D	Designación de número de catálogo de los interruptores automáticos derivados marca Square D y gamas de corriente permitidas[3, 4, 5, 6]			
			Tipo	1 polo	2 polos	3 polos
240/120 3F/4H	65 000	LL	QO (B) EPD	—	—	15–30 A
			QO (B) EPE	—	—	15–30 A
	100 000	FC_ o KC_22___	QO (B) GFI	15–30 A	15–30 A	—
		FC_ o KC_34___	QO (B) AFI	15–20 A	—	—
		DJ 400 A	QO (B)	15–70 A	15–125 A	—
			QO (B) H	—	15–100 A	—
			QO (B) VH	—	—	15–150 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		EJ	QO (B)	15–70 A	15–125 A	15–100 A
		LJ	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	15–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	—	15–30 A	—
			QO (B) EPD	—	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		HJ, JJ	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) H	—	15–100 A	—
			QO (B) VH	—	—	35–150 A
			QO (B) PL	15–30 A	15–60 A	15–30 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—

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Tabla 2: Valores nominales de los interruptores automáticos conectados en serie (simétrico rcm) *(continuación)*

Tensión máxima del sistema de ~ [1, 2]	Corriente nominal máx. de corto-circuito	Interruptores automáticos principales integrales o remotos y fusibles principales remotos marca Square D	Designación de número de catálogo de los interruptores automáticos derivados marca Square D y gamas de corriente permitidas[3, 4, 5, 6]			
			Tipo	1 polo	2 polos	3 polos
240/120 3F/4H	125 000	HL, JL	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) H	—	15–100 A	—
			QO (B) VH	—	—	35–150 A
			QO (B) PL	15–30 A	15–60 A	15–30 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
	200 000	FI, KI, HR, JR	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
240 3F/3H or 240 1F/2H (2 polos solamente)	22 000	QO (B) VH	QO (B)	—	—	15–100 A
			QO (B) GFI	—	—	15–50 A
			QO (B) PL	—	15–30 A	—
		Q2-H	QO (B)	—	—	15–30 A
	25 000	QD	QO (B)	—	—	15–30 A
			QO (B) VH	—	—	35–150 A
			QO (B) H	—	15–100 A	—
			QO (B) PL	—	15–60 A	15–30 A
			QO (B) EPD	—	—	15–50 A
			QO (B) EPE	—	—	15–50 A
			QO (B) GFI	—	—	15–50 A
		ED, FD	QO (B)	—	—	15–100 A
			QO (B) GFI	—	—	15–50 A
		KD	QO (B)	—	—	15–100 A
		HD, JD	QO (B)	—	—	15–100 A
			QO (B) VH	—	—	35–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	—	—	15–50 A

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Tabla 2: Valores nominales de los interruptores automáticos conectados en serie (simétrico rcm) *(continuación)*

Tensión máxima del sistema de ~ [1, 2]	Corriente nominal máx. de corto-circuito	Interruptores automáticos principales integrales o remotos y fusibles principales remotos marca Square D	Designación de número de catálogo de los interruptores automáticos derivados marca Square D y gamas de corriente permitidas[3, 4, 5, 6]			
			Tipo	1 polo	2 polos	3 polos
240 3F/3H o 240 1F/2H (2 polos solamente)	25 000	LD	QO (B) VH	—	—	15–150 A
			QO (B) EPD	—	—	15–30 A
			QO (B) EPE	—	—	15–30 A
	42 000	LA, MA	QDL	—	70–225 A	70–225 A
		LC 400 A	QO (B) VH	—	—	15–100 A
		LC 600 A	QO (B) VH	—	—	15–100 A
		MG	QO (B) VH	—	—	150 A
	65 000	LC 400 A	QO (B) VH	—	—	15–100 A
		LC 600 A	QO (B) VH	—	—	15–30 A
		DJ 400 A	QO (B) VH	—	—	15–150 A
			QO (B) H	—	15–100 A	—
		DJ, DG, DL 150–600 A	QO (B) EPD	—	—	15–30 A
			QO (B) EPE	—	—	15–30 A
		EG, FG, KG	QO (B)	—	—	15–100 A
			QO (B) GFI	—	—	15–50 A
		QG	QO (B)	—	—	15–30 A
			QO (B) VH	—	—	35–150 A
			QO (B) H	—	15–100 A	—
		QG, HG, JG	QO (B) PL	—	—	15–30 A
		HG, JG	QO (B)	—	—	15–100 A
			QO (B) VH	—	—	35–150 A
			QO (B) H	—	15–100 A	—
		FC_ o KC_22___	QO (B)	—	—	15–100 A
		FC_ o KC_34___	QO (B) AS	—	15–30 A	15–30 A
		LG	QO (B) VH	—	—	15–150 A
			QO (B) H	—	15–100 A	—
			QO (B) EPD	—	—	15–30 A
			QO (B) EPE	—	—	15–30 A
		LJ	QO (B) EPD	—	—	15–30 A
			QO (B) EPE	—	—	15–30 A
		LL	QO (B) EPD	—	—	15–30 A
			QO (B) EPE	—	—	15–30 A

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Tabla 2: Valores nominales de los interruptores automáticos conectados en serie (simétrico rcm) *(continuación)*

Tensión máxima del sistema de ~ [1, 2]	Corriente nominal máx. de corto-circuito	Interruptores automáticos principales integrales o remotos y fusibles principales remotos marca Square D	Designación de número de catálogo de los interruptores automáticos derivados marca Square D y gamas de corriente permitidas[3, 4, 5, 6]			
			Tipo	1 polo	2 polos	3 polos
240 3F/3H o 240 1F/2H (2 polos solamente)	100 000	FC_ o KC_24___ / FC_ o KC_34___	QO (B) GFI	—	15–30 A	—
		DJ 400 A	QO (B) H	—	15–100 A	—
		EJ, FJ	QO (B)	—	—	15–100 A
		LJ	QO (B) VH	—	—	15–100 A
			QO (B) H	—	15–100 A	—
		HJ, JJ	QO (B)	—	—	15–100 A
			QO (B) H	—	15–100 A	—
			QO (B) VH	—	—	35–150 A
			QO (B) EPD	—	—	15–30 A
			QO (B) EPE	—	—	15–30 A
	125 000	HL, JL	QO (B)	—	—	15–100 A
			QO (B) H	—	15–100 A	—
			QO (B) VH	—	—	35–150 A
			QO (B) EPD	—	—	15–30 A
			QO (B) EPE	—	—	15–30 A
	200 000	FI, KI, HR, JR	QO (B)	—	—	15–100 A
120/240[7] 1F/3H	42 000	Fusibles clase T3 de 400 A como máx.	QO (B) VH	15–70 A	15–125 A	—
	65 000	Fusibles clase J de 400 A como máx.	QO (B) VH	15–70 A	15–150 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
		Fusibles clase T6 de 400 A como máx.	QO (B) VH	15–70 A	15–150 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—

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Tabla 2: Valores nominales de los interruptores automáticos conectados en serie (simétrico rcm) *(continuación)*

Tensión máxima del sistema de ~ [1, 2]	Corriente nominal máx. de corto-circuito	Interruptores automáticos principales integrales o remotos y fusibles principales remotos marca Square D	Designación de número de catálogo de los interruptores automáticos derivados marca Square D y gamas de corriente permitidas[3, 4, 5, 6]			
			Tipo	**1 polo**	**2 polos**	**3 polos**
120/240[7] 1F/3H	100 000	Fusibles clase T3 de 200 A como máx.	QO (B)	15–70 A	15–125 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
	200 000	Fusibles clase T3 de 400 A como máx.	QO (B)	15–70 A	15–125 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
208Y/120 3F/4H	200 000	Fusibles clase T6 o J de 200 A como máx.	QO (B)	15–70 A	15–125 A	—
			QO (B) GFI	—	—	15–50 A
			QO (B) EPD	—	—	15–50 A
		Fusibles clase T3 de 400 A como máx.	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) EPE	—	—	15–50 A
			QO (B) EPD	15–30 A	15–60 A	15–50 A
240/120 3F/4H	42 000	Fusibles clase T3 de 400 A como máx.	QO (B) VH	15–30 A	15–125 A	—
	50 000	Fusibles clase T3 de 400 A como máx.	QO (B) VH	—	—	15–30 A
	65 000	Fusibles clase J de 400 A como máx.	QO (B) VH	15–70 A	15–125 A	—
			QO (B) EPD	—	—	15–50 A
			QO (B) EPE	—	—	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		Fusibles clase T6 de 400 A como máx.	QO (B) VH	15–70 A	15–125 A	15–150 A
			QO (B) AFI	15–20 A	—	—

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ESPAÑOL

Tabla 2: Valores nominales de los interruptores automáticos conectados en serie (simétrico rcm) *(continuación)*

Tensión máxima del sistema de ~ [1, 2]	Corriente nominal máx. de corto-circuito	Interruptores automáticos principales integrales o remotos y fusibles principales remotos marca Square D	Designación de número de catálogo de los interruptores automáticos derivados marca Square D y gamas de corriente permitidas[3, 4, 5, 6]			
			Tipo	1 polo	2 polos	3 polos
240/120 3F/4H	100 000	Fusibles clase T3 de 200 A como máx.	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) VH	—	—	15–30 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) EPE	—	—	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
			QOT	15–30 A	15–30 A	—
	200 000	Fusibles clase J o T6 de 200 A como máx.	QO (B) EPD	—	—	15–50 A
			QO (B) EPE	—	—	15–50 A
		Fusibles clase T3 de 400 A como máx.	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) EPE	—	—	15–50 A
240 3F/3H o 240 1F/2H (2 polos solamente)	50 000	Fusibles clase J o T6 de 400 A como máx.	QO (B) VH	—	—	15–30 A
	65 000	Fusibles clase J de 400 A como máx.	QO (B) VH	—	—	15–30 A
			QO (B) EPD	—	—	15–50 A
			QO (B) EPE	—	—	15–50 A
		Fusibles clase T6 de 400 A como máx.	QO (B) VH	—	—	15–150 A
			QOB VH 1φ, 2H solamente	—	150 A	—
	100 000	Fusibles clase T3 de 200 A como máx.	QO (B)	—	—	15–100 A
			QO (B) VH	—	—	15–30 A

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ESPAÑOL

Tabla 2: Valores nominales de los interruptores automáticos conectados en serie (simétrico rcm) *(continuación)*

<table>
<tr><th rowspan="2">Tensión máxima del sistema de ~ [1, 2]</th><th rowspan="2">Corriente nominal máx. de corto-circuito</th><th rowspan="2">Interruptores automáticos principales integrales o remotos y fusibles principales remotos marca Square D</th><th colspan="4">Designación de número de catálogo de los interruptores automáticos derivados marca Square D y gamas de corriente permitidas[3, 4, 5, 6]</th></tr>
<tr><th>Tipo</th><th>1 polo</th><th>2 polos</th><th>3 polos</th></tr>
<tr><td rowspan="5">240 3F/3H o 240 1F/2H (2 polos solamente)</td><td rowspan="5">200 000</td><td rowspan="2">Fusibles clase J o T6 de 200 A como máx.</td><td>QO (B) EPD</td><td>—</td><td>—</td><td>15–50 A</td></tr>
<tr><td>QO (B) EPE</td><td>—</td><td>—</td><td>15–50 A</td></tr>
<tr><td rowspan="3">Fusibles clase T3 de 400 A como máx.</td><td>QO (B)</td><td>—</td><td>—</td><td>15–100 A</td></tr>
<tr><td>QO (B) EPD</td><td>—</td><td>—</td><td>15–50 A</td></tr>
<tr><td>QO (B) EPE</td><td>—</td><td>—</td><td>15–50 A</td></tr>
</table>

1 Para los interruptores automáticos que figuran en esta tabla con una tensión máxima inferior a ésta, la corriente nominal de cortocircuito indicada también es aplicable pero en la tensión nominal del interruptor automático.

2 Las pruebas de cortocircuito son conducidas entre el 100 y 105% de la tensión nominal máxima del tablero combinado I-Line.

3 Los sufijos HID, SWD y SWN también pueden ser aplicables para los interruptores automáticos derivados que se muestran arriba. Es posible que el sufijo SWN **no** sea aplicable en combinación con los interruptores automáticos principales LC.

4 Es posible utilizar los interruptores automáticos QO (B) H, QO (B) VH y QH (B) donde se muestran los interruptores QO (B).

5 Es posible utilizar los interruptores automáticos QO (B) EPD y/o QO (B) EPE donde se muestran los interruptores QO (B) GFI.

6 Es posible utilizar los interruptores automáticos QO (B) CAFI donde se muestran los interruptores QO (B) AFI.

7 Los interruptores automáticos CAFI de dos polos son únicamente de 120/240 V~ y pueden ser utilizados en sistemas de una fase y 3 hilos de 120/240 V~ solamente.

8 Para lograr una coordinación selectiva, el valor nominal del interruptor automático principal DJ debe ser, por lo menos, dos veces mayor que el valor nominal en amperes de cualquier interruptor automático derivado.

Tabla 3: Selectividad de interruptores automáticos para aplicaciones críticas en tableros NQ

SCCR máxima (simétricos rcm)	Interruptores automáticos principales integral o remoto	Interruptores automáticos derivados			
		Tipo[1]	1-polo	2-polos	3-polos
Valor nominal total y selectivo hasta 10 kA en 208 Y/120 V~ o en 240/120 V~	J-W, 250 A L-W, 250 A	QO(B)	10–70	10–125	10–125
		QO(B)-H			
		QO(B)-VH			
		QH			
Valor nominal en serie y selectivo hasta 12 kA en 208Y/120 V~ o en 240/120 V~	J-W, 250 A	QO(B)	10–70	10–125	10–60
		QO(B)-H			
		QO(B)-VH			
		QH			
Valor nominal en serie y selectivo hasta 15 kA en 208Y/120 V~ o en 240/120 V~	J-W, 250 A	QO(B)	10–60	10–60	10–30
		QO(B)-H			
		QO(B)-VH			
		QH			
Valor nominal en serie y selectivo hasta 18 kA en 208Y/120 V~ o en 240/120 V~	J-W, 250 A	QO(B)	10–30	10–30	—
		QO(B)-H			
		QO(B)-VH			
		QH			
	L-W, 250 A	QO(B)	10–60	10–60	10–60
		QO(B)-H			
		QO(B)-VH			
		QH			
Valor nominal en serie y selectivo hasta 30 kA en 208Y/120 V~ o en 240/120 V~	L-W, 400 A L-W, 600 A	QO(B)	15–70	15–150	15–150
		QO(B)-H			
		QO(B)-VH			
		QH			

1 Incluyendo los interruptores automáticos AFI, CAFI, EPD y GFI.

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Tabla 4: Corriente nominal de cortocircuito para los interiores tipo zapatas principales equipados con zapatas de subalimentación o de paso[1]

<table>
<tr><th>Tensión máxima del sistema, ~ (c.a.)</th><th>Corriente nominal máxima</th><th>Circuitos derivados</th><th>Aplicación</th><th>Adicionador[2]</th><th>Corriente nominal máxima de cortocircuito [3]</th></tr>
<tr><td rowspan="11">240</td><td>100</td><td>18, 30</td><td>SFL and FTL</td><td>—</td><td rowspan="4">10,000</td></tr>
<tr><td rowspan="3">225</td><td>30, 42, 54, 72, 84, 96</td><td>SFL</td><td>6 pulgadas (152.4 mm)</td></tr>
<tr><td>42</td><td rowspan="2">FTL</td><td>—</td></tr>
<tr><td>30, 54, 72, 84, 96</td><td>6 pulgadas (152.4 mm)</td></tr>
<tr><td rowspan="5">400</td><td>30, 42, 54, 72, 84</td><td rowspan="2">SFL</td><td>—</td><td>25,000</td></tr>
<tr><td>96</td><td>—</td><td>10,000</td></tr>
<tr><td>30, 84</td><td rowspan="3">FTL</td><td>—</td><td>25,000</td></tr>
<tr><td>96</td><td>—</td><td>10,000</td></tr>
<tr><td>42, 54, 72</td><td>6 pulgadas (152.4 mm)</td><td rowspan="2">25,000</td></tr>
<tr><td rowspan="2">600</td><td>30, 42, 54, 72, 84</td><td rowspan="2">FTL</td><td rowspan="2">12 pulgadas (304.8 mm)</td></tr>
<tr><td>96</td><td>10,000</td></tr>
</table>

1 Estos valores nominales son aplicables para los interiores con zapatas principales, equipados con zapatas de subalimentación o de paso, donde el dispositivo que alimenta al interior es desconocido o no es de marca Square D. El uso de un interruptor automático principal marca Square D frente a estas zapatas producirá un valor nominal igual al del interruptor. Las pruebas de cortocircuito son conducidas entre el 100 y 105% de la tensión nominal máxima del tablero de alumbrado.

2 El adicionador es la longitud adicional del gabinete.

3 Amperes simétricos de rcm para tres ciclos.

Marcado CE

- Interiores con el marcado "CE" cumplen con las normas IEC 61439-1 e IEC 61439-2.
- Los interiores con zapatas principales y marcado "CE" han sido probados para soportar 10 000 amperes simétricos rcm durante 30 ciclos.
- Los interiores con el marcado "CE" sólo están aprobados para su uso con interruptores automáticos derivados QOXD o QOBXD que llevan el marcado "CE".

Anexo 2: Accesorios

Se encuentran disponibles una variedad de accesorios de instalación en campo para los tableros de alumbrado NQ:

- Kits de barra de tierra del equipo
- Kits de zapatas extra grande para los tableros de 100 a 250 A
- Kits de zapatas de subalimentación para los tableros de 100 a 400 A
- Kits de zapatas principales
  - — Kits de zapatas mecánicas — Aluminio
  - — Kits de zapatas mecánicas — Cobre
  - — Kits de zapatas de compresión Versa-Crimp®— Aluminio
  - — Kits de zapatas de compresión Versa-Crimp — Cobre

Kits de barra de tierra del equipo

Los kits de barra de tierra del equipo son adecuados para conductores de cobre o aluminio y cumplen con los requisitos de conexión a tierra de los tableros NQ y centros de carga QONQ.

Tabla 5: Especificaciones de los kits de barra de tierra del equipo

Tablero de alumbrado		Utilice el kit de barra de puesta a tierra con número de catálogo	
Número de circuitos	**Capacidad nominal**	**Aluminio[1]**	**Cobre[2]**
1–42	600 A máx.	(1) PK27GTA	(1) PK27GTACU
54–84		(2) PK27GTA	(2) PK27GTACU

1 Barras de aluminio adecuadas para conductores de Cu o Al para 60° C o 75° C

2 Barras de cobre adecuadas para conductores de Cu para 60° C o 75° C

NOTA: Las ubicaciones de montaje de la barra de puesta a tierra han sido identificadas por el símbolo de tierra ⏚ estampado en la pared trasera del gabinete.

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Kits de zapatas extra grande para los tableros de 100 a 250 A

Se encuentran disponibles kits de zapatas extra grande para aplicaciones donde el neutro requiere conductores de terminación de 3 AWG o de tamaño mayor.

Tabla 6: Especificaciones de los kits de zapatas extra grande para los tableros de 100 a 250 A

Valor nominal del interruptor automático	No. de catálogo del kit	Tamaño del conductor
70 A	QO70AN	(1) 10–2 Al (1) 5,76–33,6 mm^2 (1)14–4 Cu (1) 2,08–21,1 mm^2
80–125 A	Q1100AN	(1) 4–1/0 Al/Cu (1) 42,4–53,5 mm^2
125–150 A	Q1150AN	(1) 1–4/0 Al/Cu (1) 42,4–107 mm^2

Kits de zapatas de subalimentación para los tableros de 100 a 400 A

Se encuentran disponibles kits de zapatas principales de subalimentación para las aplicaciones de 100, 225 ó 400 A.

Tabla 7: Especificaciones de los kits de zapatas de subalimentación para los tableros de 100 a 400 A

Capacidad nominal de las barras (A)	No. de catálogo del kit	Cantidad máxima de circuitos
100	NQSFL1	18, 30
225	NQSFL2	30[1], 42[1], 54[1], 72[1], 84[1]
400	NQSFL4	30, 42, 54, 72, 84

1 Estos tableros requieren una longitud adicional de 152,4 mm (6 pulgadas) para el gabinete y marco para tener el espacio necesario para el doblez de los conductores.

Kits de zapatas principales

Tabla 8: Kits de zapatas mecánicas — Aluminio

Capacidad nominal del tablero (A)	No. de catálogo del kit	Tamaño del conductor
100	Estándar	#6–2/0 AWG 13,3–67,43 mm^2
225	Estándar	#6–350 kcmil 13,3–177,3 mm^2
400	Estándar	(1) 1/0–750 kcmil (2) 1/0–350 kcmil (1) 53,48–380 mm^2 (2) 53,48–177,3 mm^2
600	Estándar	(2) 1/0–750 kcmil (2) 53,48–380 mm^2
	NQALM6A	(3) #6–250 kcmil (3) 13,3–127 mm^2

Tabla 9: Kits de zapatas mecánicas — Cobre

Capacidad nominal del tablero (A)	No. de catálogo del kit	Tamaño del conductor
100	NQCUM1	#6–2/0 AWG 13,3–67,43 mm^2
225	NQCUM2	#6–250 kcmil 13,3–127 mm^2
400	NQCUM4	(1) 1/0–750 kcmil (2) 1/0–350 kcmil (1) 53,48–380 mm^2 (2) 53,48–177,3 mm^2
600	NQCUM6	

Tabla 10: Kits de zapatas de compresión Versa-Crimp® — Aluminio

Capacidad nominal del tablero (A)	No. de catálogo del kit	Tamaño del conductor	Herramienta de compresión
100	NQALV1	#8–1/0 AWG 8,36–53,48 mm^2	VC6 (todos)
225	NQALV2	#4–300 kcmil 21,15–152 mm^2	
400	NQALV4	(2) 2/0–500 kcmil (2) 67,43–253,4 mm^2	VC6-3, VC6-FT
600	NQALV6		

Tabla 11: Kits de zapatas de compresión Versa-Crimp — Cobre

Capacidad nominal del tablero (A)	No. de catálogo del kit	Tamaño del conductor	Herramienta de compresión
100	NQCUV1	#6–1/0 AWG 13,30–53,48 mm^2	VC6 (todos), VC7 (todos)
225	NQCUV2	2/0–300 kcmil 67,43–152 mm^2	VC6-3, VC7, VC6-FT, VC7-FT
400	NQCUV4	400–750 kcmil 202,7–380 mm^2	VC6-FT, VC7-FT, VC8
600	NQCUV6	(2) 250–500 kcmil (2) 126,7–253,4 mm^2	VC6-3, VC7, VC6-FT, VC7-FT

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Importado en México por:
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Solamente el personal especializado deberá instalar, hacer funcionar y prestar servicios de mantenimiento al equipo eléctrico. Schneider Electric no asume responsabilidad alguna por las consecuencias emergentes de la utilización de este material.

80043-712-06 Rev. 02, 11/2016
Reemplaza 80043-712-06 Rev. 02, 06/2015

Pour panneaux de distribution NQ/NQM et centres de distribution QONQ

Directives d’utilisation

Classe 1640

Directives d’utilisation

80043-712-06 Rev. 02
11/2016

À conserver pour usage ultérieur.

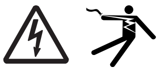
FRANÇAIS

SQUARE D™

by Schneider Electric

Catégories de dangers et symboles spéciaux

Lisez soigneusement ces directives et examinez l’appareillage afin de vous familiariser avec lui avant son installation, son fonctionnement ou son entretien. Les messages spéciaux qui suivent peuvent apparaître dans ce document ou sur l’appareillage. Ils vous avertissent de dangers potentiels ou attirent votre attention sur des renseignements pouvant éclaircir ou simplifier une procédure.



L’ajout de l’un ou l’autre des symboles à une étiquette de sécurité « Danger » ou « Avertissement » vous indique qu’un danger électrique existe et qu’il pourra y avoir des blessures corporelles si les directives ne sont pas suivies.

Ceci est le symbole d’une alerte de sécurité. Il sert à vous avertir d’un danger potentiel de blessures corporelles. Respectez toutes les consignes de sécurité accompagnant ce symbole pour éviter toute situation potentielle de blessure ou de mort.

⚠ DANGER
DANGER indique une situation de danger imminent qui, si elle n’est pas évitée, **entraînera** la mort ou des blessures graves.

⚠ AVERTISSEMENT
AVERTISSEMENT indique une situation de danger potentiel qui, si elle n’est pas évitée, **peut entraîner** la mort ou des blessures graves.

⚠ ATTENTION
ATTENTION indique une situation de danger potentiel qui, si elle n’est pas évitée, **peut entraîner** des blessures mineures ou modérées.

AVIS
AVIS est utilisé pour commenter des pratiques sans rapport avec les blessures physiques. Le symbole d'alerte de sécurité n'est pas employé avec ce mot de signalement.

REMARQUE : Fournit des renseignements complémentaires pour clarifier ou simplifier une procédure.

Veuillez noter

Seul un personnel qualifié doit effectuer l’installation, l’utilisation, l’entretien et la maintenance du matériel électrique. Schneider Electric n’assume aucune responsabilité des conséquences éventuelles découlant de l’utilisation de cette documentation.

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Introduction

Ce bulletin contient les directives pour l'installation des centres de distribution QONQ et des panneaux de distribution NQ à disjoncteurs de la marque Square D[MC]. Ces centres et panneaux de distribution sont inscrits UL (cULus) et acceptent les disjoncteurs de dérivation QO[MC] et QOB.

Pour obtenir une assistance technique sur l'installation de ce panneau de distribution, contacter le centre d'informations à la clientèle Schneider Electric au 1-888-778-2733 (É.-U.).

Consulter les étiquettes sur l'appareil pour les renseignements de capacité et de sécurité. Des étiquettes supplémentaires pour l'appareil sont fournies avec ce document.

Mesures de sécurité

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E, CSA Z462 ou NOM-029-STPS.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez l'alimentation de l'appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension ayant une valeur nominale appropriée pour s'assurer que l'alimentation est coupée.
- Lisez et comprenez entièrement ces directives d'utilisation et la publication des normes NEMA PB 1.1 incluse avant d'installer, d'utiliser ou d'assurer l'entretien de cet appareil.
- Les codes locaux varient mais sont adoptés et appliqués pour assurer des installations électriques sécuritaires. C'est peut-être nécessaire d'avoir un permis pour exécuter des travaux sur des circuits électriques et certains codes peuvent exiger que le travail électrique accompli soit inspecté.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Installation

Cette section fournit les directives pour les procédures suivantes concernant les panneaux de distribution NQ et les centres de distribution QONQ :

- « Montage de l’intérieur pour coffrets de la marque Square D » ci-après.
- « Installation du câble/tresse de mise à la masse du neutre » à la page 9
- « Installation et démontage des disjoncteurs QO et QOB » à la page 13
- « Directives de réarmement du disjoncteur » à la page 16
- « Préparation de la garniture intérieure » à la page 17

Montage de l’intérieur pour coffrets de la marque Square D

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Une publication séparée, intitulée « Directives générales pour l’installation, le fonctionnement et l’entretien des panneaux de distribution d’une valeur nominale de 600 V ou moins » (NEMA PB1.1) a été fournie avec cet appareil. Se familiariser avec le contenu de ce document avant d’entreprendre l’une quelconque des procédures ci-après.

Si un exemplaire de cette publication n’était pas joint, ou si des questions se posent concernant cet appareil, contacter le distributeur local ou un représentant de Schneider Electric.

AVIS
RISQUE DE DOMMAGES MATÉRIELS DUS À UN RACCORDEMENT DÉFAIT OU LÂCHE • Assurez-vous que tous les raccordements sont correctement serrés. • Reportez-vous à l’étiquette de renseignements sur les couples de serrage, placée sur le panneau de distribution, avant de serrer les raccordements. **Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.**

Pour monter et installer correctement l’intérieur du panneau de distribution NQ ou du centre de distribution QONQ, consulter la publication sur les normes NEMA PB 1.1 et observer les directives ci-après concernant « Montage en surface (coffret monté sur un mur) » ou « Montage encastré (coffret encastré dans le mur) ».

Montage en surface (coffret monté sur un mur)

1. Monter le coffret en suivant les directives de la publication des normes NEMA PB 1.1.
2. Enlever la garniture intérieure des supports de garniture.
3. Installer l’intérieur comme décrit ci-après :
   a. Placer l’intérieur sur les goujons du coffret. Une vis d’élévation n’est pas nécessaire (voir la figure 1 à la 8).
   b. Serrer les écrous Keps sur les rails latéraux de l’intérieur jusqu’à ce que les rails se trouvent contre l’arrière du coffret.
   c. Remonter la garniture intérieure une fois le câblage effectué.
4. Si l’appareil est utilisé comme appareil d’entrée de service, une fixation (mise à la masse) du neutre est nécessaire. Voir les directives dans la section « Installation du câble/tresse de mise à la masse du neutre » à la page 9.
5. Poser les étiquettes de l’appareil (fournies dans le sac de l’assortiment) comme indiqué aux directives, au dos de la feuille d’étiquettes de l’appareil.

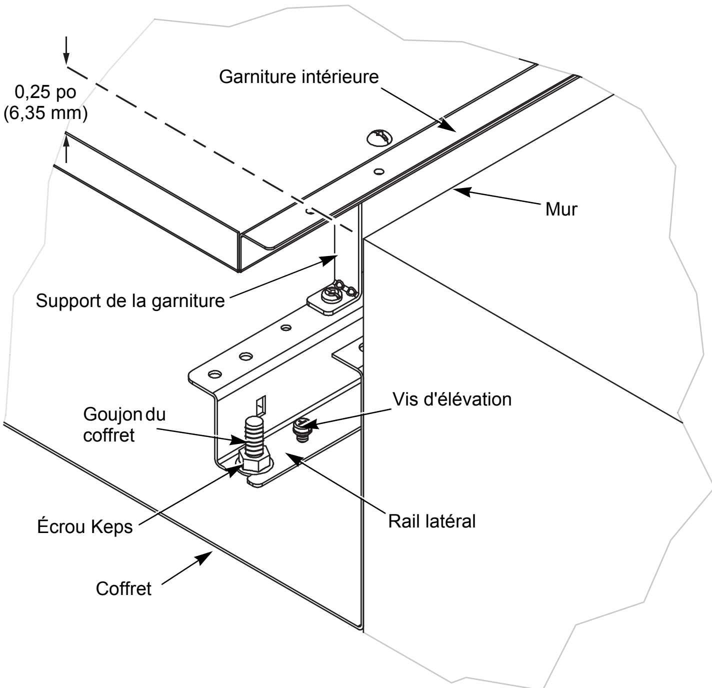
Montage encastré (coffret encastré dans le mur)

1. Monter le coffret comme indiqué dans la publication des normes NEMA PB 1.1.
2. Enlever la garniture intérieure des supports de garniture.
3. Installer l’intérieur comme décrit ci-après :
   a. Visser les (4) vis d'élévation auto-taraudeuses de 10-32 x 0,875 po fournies avec la garniture encastrée dans les rails latéraux.
   b. Placer l’intérieur sur les goujons du coffret (voir la figure 1 à la 8). Placer les écrous Keps sur les goujons du coffret, mais ne pas les serrer.
   c. Ajuster les vis de façon à ce que le rebord de la garniture intérieure soit à environ 0,25 po (6,35 mm) du mur.
   d. Serrer les écrous Keps sur les rails latéraux.
   e. Remonter la garniture intérieure une fois le câblage effectué.
4. Si l’appareil est utilisé comme appareil d’entrée de service, une fixation (mise à la masse) du neutre est nécessaire. Voir les directives dans la section « Installation du câble/tresse de mise à

la masse du neutre » à la page 9.

5. Poser les étiquettes de l'appareil (fournies dans le sac de l'assortiment) comme indiqué aux directives, au dos de la feuille d'étiquettes de l'appareil.

Figure 1 : Montage de l'intérieur des coffrets de la marque Square D



Installation du câble/tresse de mise à la masse du neutre

Le câble ou la tresse de mise à la masse du neutre ne doit être utilisé que lorsque le panneau de distribution est **installé** comme appareil de service.

Pour fixer correctement le neutre au panneau de distribution, suivre les directives pour « Panneaux de distribution NQ de 100 ou 250 A au maximum » ou pour « Centres de distribution QONQ et panneaux de distribution NQ de 400 ou 600 A au max. » aux pages 9 et 11, respectivement.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E, CSA Z462 ou NOM-029-STPS.
- Coupez l'alimentation de l'appareil avant d'y travailler.
- La tresse ou le câble de mise à la masse principal ne doit être utilisé que lorsque le panneau de distribution est installé comme appareil de service.
- Ne mélangez pas les vis de montage avec les vis de la garniture intérieure.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

REMARQUE : Les pièces de la tresse ou du câble de mise à la masse se trouvent dans le sac de l’assortiment fourni avec l’intérieur.

Panneaux de distribution NQ de 100 ou 250 A au maximum

Pour installer une tresse de mise à la masse du neutre sur un panneau de distribution NQ de 100 ou 250 A au maximum, se reporter à la figure 2, 11, et suivre les directives ci-dessous.

1. Aligner la tresse de mise à la masse sur le rail latéral, comme illustré.

   REMARQUE : Pour certaines applications, il peut être nécessaire de retirer la cosse (non représentée) avant d’installer la tresse.

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2. Insérer les deux vis de montage, comme illustré. Serrer la vis de 10-32 au couple de 1,1 à 1,4 N•m (10 à 12 lb-po) et la vis de 1/4-20 au couple de 2,86 à 3,4 N•m (25 à 30 lb-po).

   REMARQUE : Si la cosse a été retirée au point 1 ci-dessus, la réinstaller sur le dessus de la tresse de mise à la masse. Utiliser la vis de montage de 1/4-20 x 11/16 po avec les applications à cosse de traversée, cosse de sous-alimentation, disjoncteur de sous-alimentation ou neutre de 200 %. Utiliser la vis de montage de cosse de 1/4-20 x 7/8 po sur des applications de 225 A avec un neutre de 200 % et avec cosses de traversée, cosses de sous-alimentation ou disjoncteurs de sous-alimentation. Les vis de montage de cosses sont fournies dans le sac de l’assortiment de la tresse de mise à la masse.

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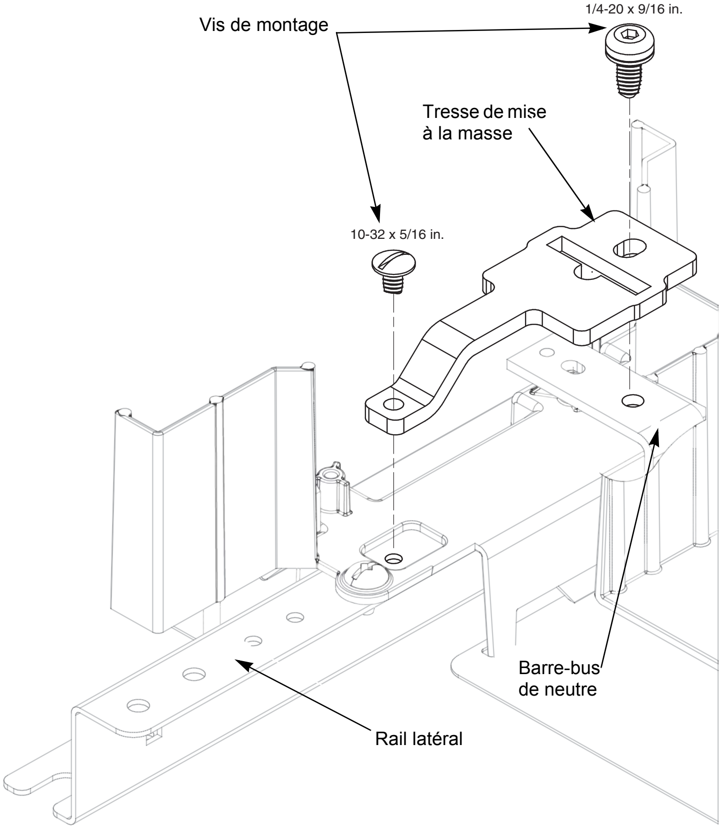
Figure 2 : Installation de la tresse de mise à la masse — Panneaux de distribution NQ de 100 ou 250 A au maximum



Centres de distribution QONQ et panneaux de distribution NQ de 400 ou 600 A au max.

Pour installer un câble de mise à la masse du neutre sur un panneau de distribution NQ de 400 ou 600 A maximum et un centre de distribution QONQ, se reporter à la figure 3 et suivre les directives ci-dessous.

1. Aligner la cosse sur le trou de montage du rail latéral, comme illustré.
2. Serrer la vis de montage de la cosse sur le rail latéral au couple de 1,1 à 1,4 N•m (10 à 12 lb-po).

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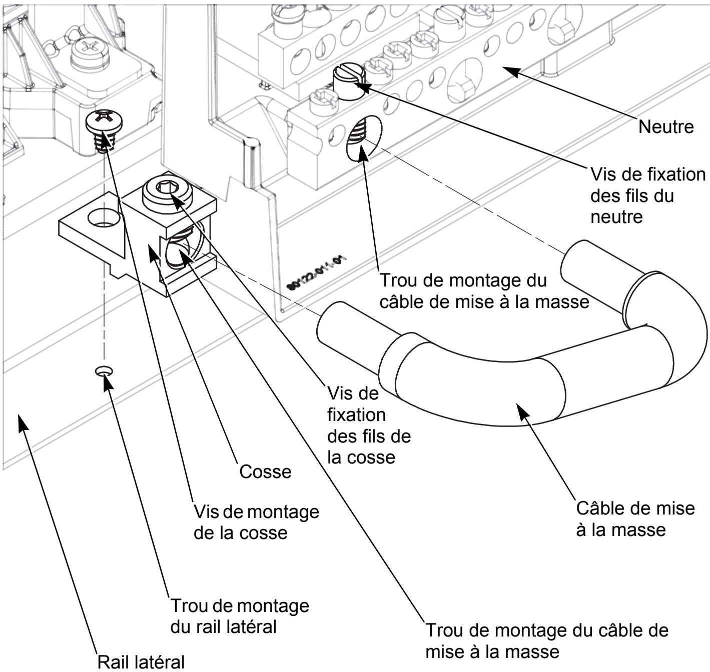
3. Aligner le câble de mise à la masse, comme illustré, et l’insérer dans la cosse et les trous de montage du neutre.
4. Serrer la vis de fixation des fils de la cosse et la vis de fixation des fils du neutre au couple de 5,1 à 5,6 N•m (45 à 50 lb-po).

Figure 3 : Installation du câble de mise à la masse — Centres de distribution QONQ et panneaux de distribution NQ de 400 ou 600 A au maximum



Installation et démontage des disjoncteurs QO et QOB

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E, CSA Z462 ou NOM-029-STPS.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez l'alimentation de l'appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension ayant une valeur nominale appropriée pour s'assurer que l'alimentation est coupée.
- Tous les espaces inutilisés doivent être remplis avec des plaques de remplissage.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

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Installation des disjoncteurs QO et QOB

Pour les directives suivantes, consulter la figure 4 à la 15.

1. Couper (O) toutes les alimentations du panneau de distribution.
2. Mettre le disjoncteur hors tension (O).
3. Enlever la garniture intérieure.
4. Emboîter l'extrémité de la borne de raccordement du disjoncteur sur le rail de montage.
5. Engager le connecteur de dérivation.

   Pour les disjoncteurs QO :

   a. pousser vers l'intérieur jusqu'à ce que les mâchoires enfichables s'engagent totalement dans le connecteur de dérivation.

   Pour les disjoncteurs QOB :

   a. pousser vers l'intérieur jusqu'à ce que le connecteur du disjoncteur soit centré sur le trou de montage du connecteur de dérivation. Engager la vis dans le trou du connecteur de dérivation et serrer aux valeurs de couple indiquées sur le schéma de câblage et de couple de l’intérieur.
6. Installer le fil de charge.
7. Réinstaller la garniture intérieure.

Démontage des disjoncteurs QO et QOB

Pour les directives suivantes, consulter la figure 4 à la 15.

1. Couper (O) toutes les alimentations du panneau de distribution.
2. Enlever la garniture intérieure.
3. Retirer le fil de charge.
4. Dégager le connecteur de dérivation.

   Pour les disjoncteurs QO :

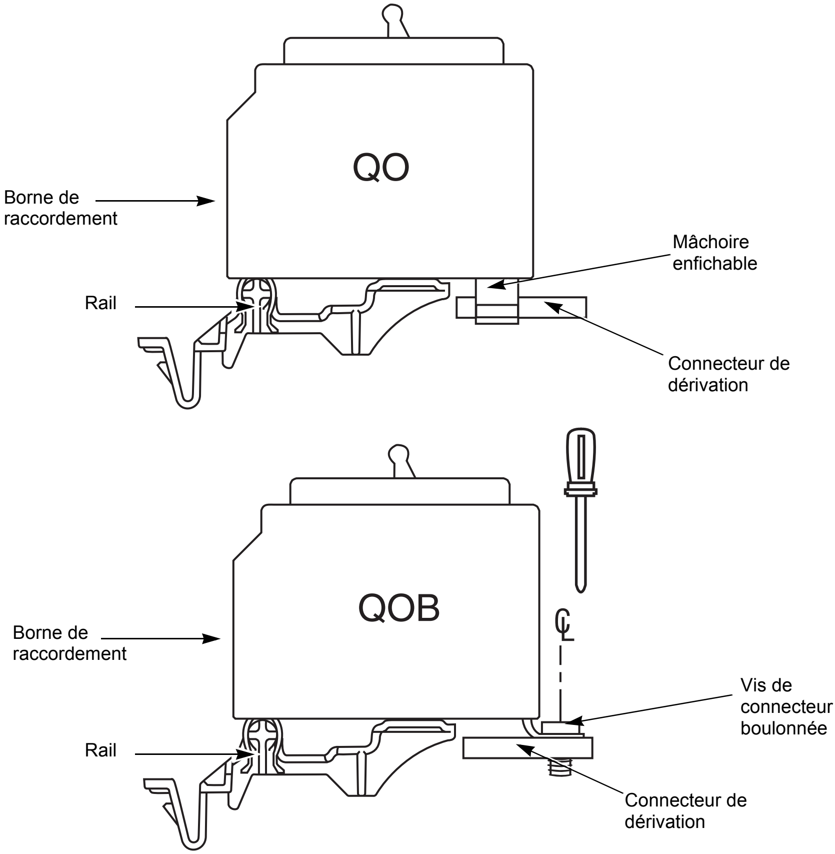
   a. Tirer vers l'extérieur jusqu'à ce que les mâchoires enfichables se dégagent totalement du connecteur de dérivation.

   Pour les disjoncteurs QOB :

   a. Desserrer la vis du connecteur du disjoncteur et séparer le disjoncteur du connecteur de dérivation.

5. Déboîter du rail de montage l'extrémité de la borne de raccordement du disjoncteur.
6. Réinstaller la garniture intérieure.

Figure 4 : Installation et démontage des disjoncteurs QO et QOB



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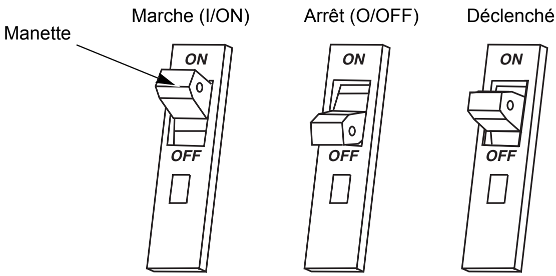
Directives de réarmement du disjoncteur

Si le disjoncteur est déclenché, la manette se trouvera en position moyenne entre marche (I/ON) et arrêt (O/OFF). Pour réarmer le disjoncteur, mettre la manette à la position d’arrêt, puis à la position de marche.

Figure 5 : Positions de la manette du disjoncteur



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Préparation de la garniture intérieure

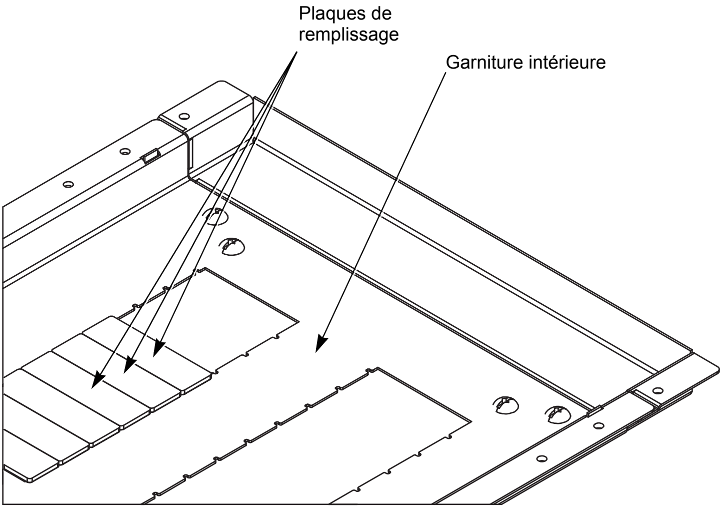
⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E, CSA Z462 ou NOM-029-STPS.
- Avant de mettre le panneau de distribution sous tension, tous les espaces inutilisés doivent être remplis avec des plaques de remplissage.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Figure 6 : Schéma de la garniture intérieure



REMARQUE : L’arrière de la garniture intérieure donne la liste des numéros de catalogue des plaques de remplissage compatibles correspondants.

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Annexe 1 : Spécifications

Câblage typique

Tableau 1 : Câblage typique du panneau de distribution[1]

Tension ca	Panneaux de distribution monophasés		Panneaux de distribution triphasés	
	Phase	Fils	Phase	Fils
208Y/120	—	—	3	4
120/240	1	3	—	—
240[2]	1	2	3	3
240[3]	1	3	—	—
240/120[4]	—	—	3	4, en triangle

[1] Des informations supplémentaires sont fournies sur le panneau de distribution. Voir la valeur nominale du disjoncteur principal, si utilisé.

[2] Pour ce système, le neutre n'est pas utilisé et seuls les disjoncteurs à tension nominale minimale de 240 Vca doivent être utilisés. Ne pas utiliser des disjoncteurs d'une tension nominale de 120 V ou de 120/240 Vca.

[3] Pour un système de phase « B » mis à la terre, seuls des disjoncteurs d'une tension nominale minimale de 240 Vca doivent être utilisés. Ne pas utiliser des disjoncteurs d'une tension nominale de 120 V ou de 120/240 Vca.

[4] Lorsqu'elles sont câblées pour un système en triangle, les phases « A » et « C » doivent être de 120 V au neutre, la phase « B » doit être de 208 V au neutre. Raccorder seulement des disjoncteurs d'une tension nominale minimale de 240 Vca. Ne pas utiliser des disjoncteurs d'une tension nominale de 120 V ou 120/240 V pour la phase « B ».

Disjoncteur principal intégré ou de sous-alimentation :
DJ, FI, KI, H, J, LA, LC, LH, QB, QD, QG, QJ, QO(B)VH

Figure 7 : Schéma de cosses principales NQ/NQM de 100 à 225 A ou disjoncteur principal de 100 à 250 A

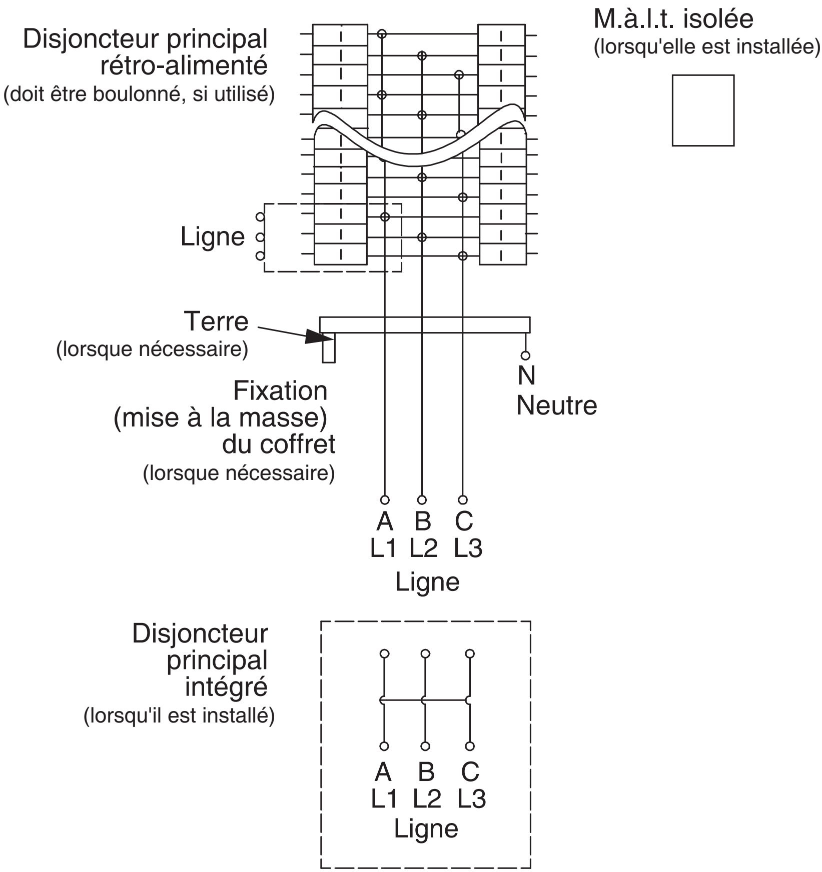

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Figure 8 : **Schéma de panneau NQ ou centre de distribution QONQ à cosses principales ou disjoncteur principal de 400 à 600 A avec ou sans cosses de traversée**

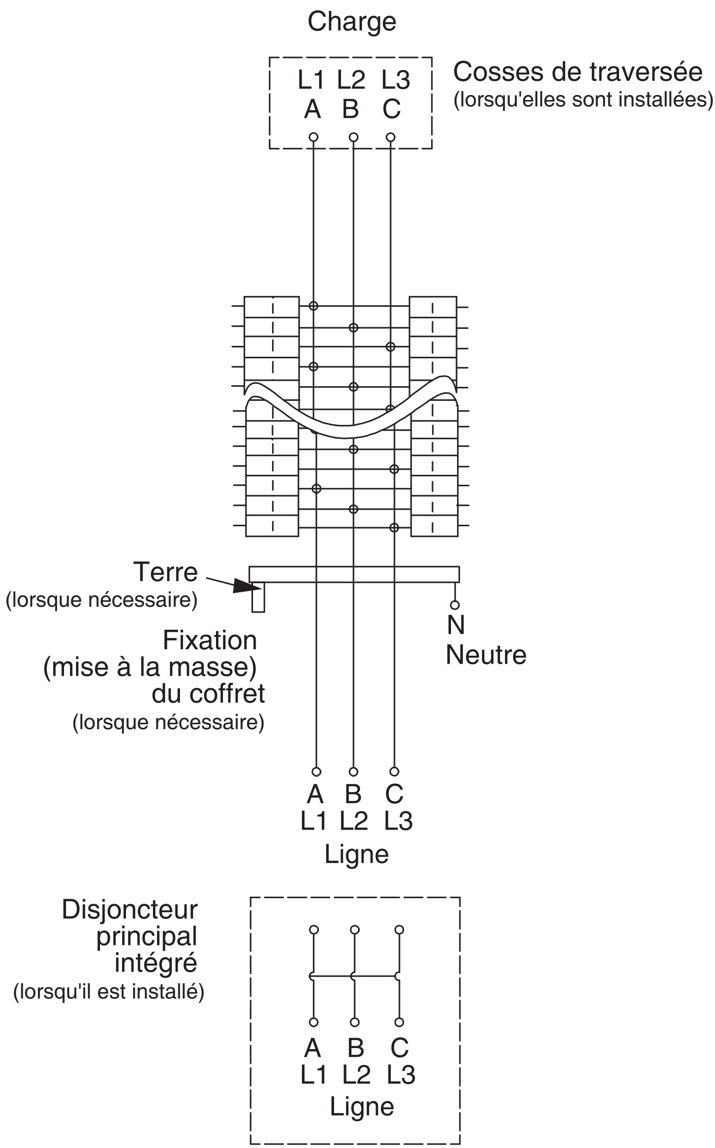

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Figure 9 : **Schéma de panneau NQ ou centre de distribution QONQ à disjoncteur principal de 400 à 600 A avec cosses de traversée ou de disjoncteurs de sous-alimentation**

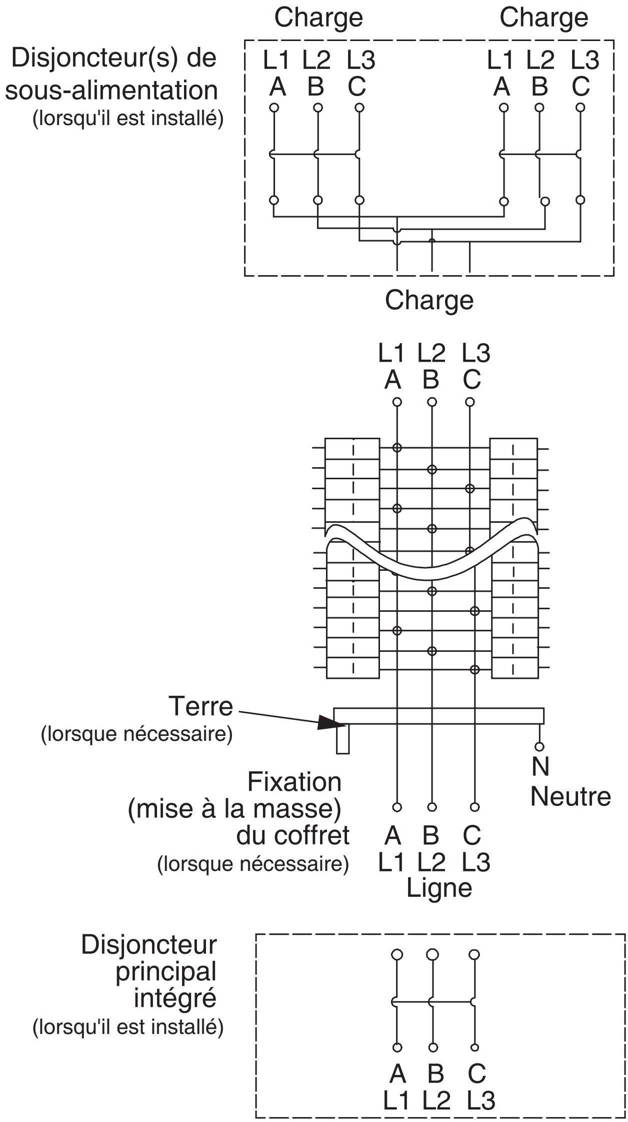

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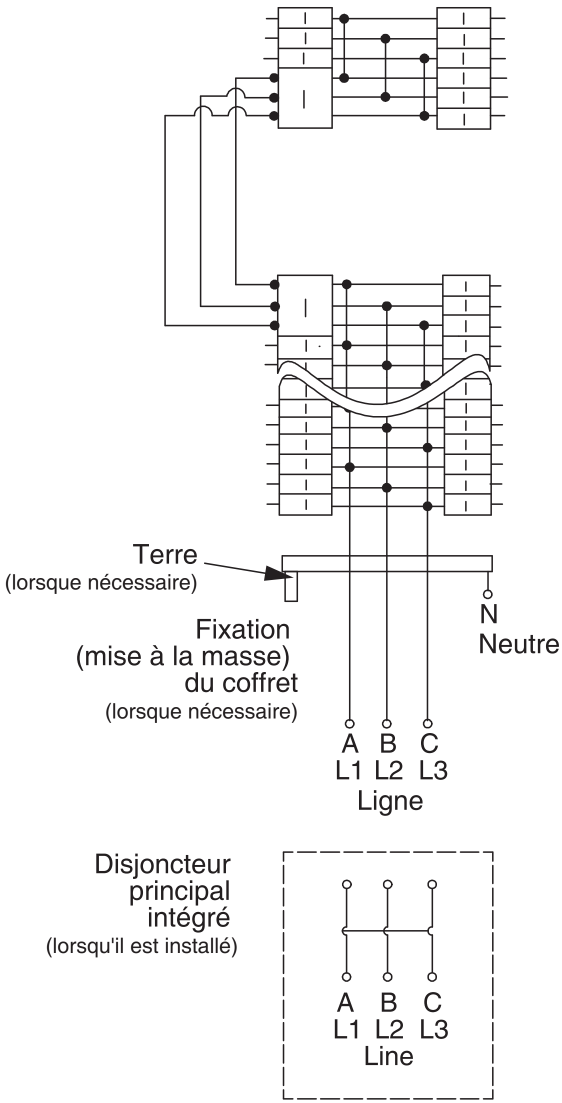
Figure 10 : Schéma de panneau de distribution NQ typique avec barre-bus fendue



Valeurs nominales du panneau de distribution

Se reporter au NEC (É.-U.) section 110-22, et au CCE règle 14-014 pour des informations supplémentaires. L'étiquette pour un système qualifié pour utilisation en série se trouve dans le sac de l'assortiment.

Tableau 2 : Val. nom. de disjoncteurs raccordés en série (RMS sym.)

Tension ca max. du système [1, 2]	Courant nominal de court-circuit max.	Disjoncteurs principaux intégrés ou à distance et fusibles principaux à distance de la marque Square D	Désignation du catalogue des disjoncteurs de dérivation de la marque Square D et gammes d'intensité admissibles [3, 4, 5, 6]			
			Type	1 pôle	2 pôles	3 pôles
120/240[7] 1P/3F	22 000	MG	QO (B)	15–30 A	—	—
	25 000	LD, HD, JD	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	—
			QO (B) PL	15–30 A	15–60 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
	65 000	HG, JG	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	—
			QO (B) PL	15–30 A	15–60 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
		LG	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
		LJ	QO (B) GFI	15–30 A	40–60 A	—
			QO (B) EPD	15–30 A	40–60 A	—

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Tableau 2 : Val. nom. de disjoncteurs raccordés en série (RMS sym.) *(suite)*

Tension ca max. du système [1, 2]	Courant nominal de court-circuit max.	Disjoncteurs principaux intégrés ou à distance et fusibles principaux à distance de la marque Square D	Désignation du catalogue des disjoncteurs de dérivation de la marque Square D et gammes d'intensité admissibles [3, 4, 5, 6]			
			Type	1 pôle	2 pôles	3 pôles
120/240[7] 1P/3F	100 000	HJ, JJ	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	—
			QO (B) PL	15–30 A	15–60 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
		LJ	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	—
			QO (B) H	—	15–100 A	—
			QO (B) GFI	—	15–30 A	—
			QO (B) EPD	—	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
		DJ 400 A	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	—	150 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
		QJ	QO (B)	15–70 A	15–125 A	—
			QO (B) AS	15–30 A	15–30 A	—
			QO (B) VH	—	150 A	—
			QO (B) PL	15–30 A	15–60 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—

Page suivante

Tableau 2 : Val. nom. de disjoncteurs raccordés en série (RMS sym.) *(suite)*

Tension ca max. du système [1, 2]	Courant nominal de court-circuit max.	Disjoncteurs principaux intégrés ou à distance et fusibles principaux à distance de la marque Square D	Désignation du catalogue des disjoncteurs de dérivation de la marque Square D et gammes d'intensité admissibles [3, 4, 5, 6]			
			Type	1 pôle	2 pôles	3 pôles
120/240[7] 1P/3F	125 000	HL, JL	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	—
			QO (B) PL	15–30 A	15–60 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
208Y/120 3P/4F	18 000	LA/LH (L), 34200MC LA/LH (L), 34225MC LA/LH (L), 34250MC LA/LH (L), 34400MC	QO (B)	15–30 A	15–30 A	15–30 A
208Y/120 3P/4F	25 000	LD	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–30 A	15–125 A	15–150 A
			QO (B) GFI	15–30 A	15–60 A	15–30 A
			QO (B) EPD	15–30 A	15–60 A	15–30 A
			QO (B) EPE	—	—	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
	30 000	DJ-W 150 A MC[8]	QO (B)	15–70 A	15–100 A	—
			QO (B) VH	—	15–125 A	15–150 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
		DJ-W 250 A MC[8]	QO (B)	15–70 A	15–100 A	—
			QO (B) VH	—	—	15–100 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
		DJ-W 600 A MC[8]	QO (B)	15–70 A	15–100 A	—
			QO (B) VH	—	—	15–150 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—

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Tableau 2 : Val. nom. de disjoncteurs raccordés en série (RMS sym.) *(suite)*

Tension ca max. du système [1, 2]	Courant nominal de court-circuit max.	Disjoncteurs principaux intégrés ou à distance et fusibles principaux à distance de la marque Square D	Désignation du catalogue des disjoncteurs de dérivation de la marque Square D et gammes d'intensité admissibles [3, 4, 5, 6]			
			Type	1 pôle	2 pôles	3 pôles
208Y/120 3P/4F	65 000	LG	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	15–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	15–30 A	15–60 A	15–30 A
			QO (B) EPD	15–30 A	15–60 A	15–30 A
			QO (B) EPE	—	—	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		LJ	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	15–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	15–30 A	15–60 A	15–30 A
			QO (B) EPD	15–30 A	15–60 A	15–30 A
			QO (B) EPE	—	—	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		LL	QO (B) GFI	—	—	15–30 A
			QO (B) EPD	—	—	15–30 A
			QO (B) EPE	—	—	15–30 A

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Tableau 2 : Val. nom. de disjoncteurs raccordés en série (RMS sym.) *(suite)*

Tension ca max. du système [1, 2]	Courant nominal de court-circuit max.	Disjoncteurs principaux intégrés ou à distance et fusibles principaux à distance de la marque Square D	Désignation du catalogue des disjoncteurs de dérivation de la marque Square D et gammes d'intensité admissibles [3, 4, 5, 6]			
			Type	1 pôle	2 pôles	3 pôles
208Y/120 3P/4F	100 000	DJ 400 A	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	—	—	15–150 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		QJ	QO (B)	15–70 A	15–125 A	15–30 A
			QO (B) VH	—	—	15–150 A
			QO (B) PL	15–30 A	15–60 A	15–30 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) EPE	15–30 A	15–60 A	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		LJ	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	15–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	—	15–30 A	—
			QO (B) EPD	—	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—

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Tableau 2 : Val. nom. de disjoncteurs raccordés en série (RMS sym.) *(suite)*

Tension ca max. du système [1, 2]	Courant nominal de court-circuit max.	Disjoncteurs principaux intégrés ou à distance et fusibles principaux à distance de la marque Square D	Désignation du catalogue des disjoncteurs de dérivation de la marque Square D et gammes d'intensité admissibles [3, 4, 5, 6]			
			Type	1 pôle	2 pôles	3 pôles
240/120 3P/4F	22 000	QO (B) VH	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) EPE	—	—	15–50 A
			QO (B) PL	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
	25 000	QD	QO (B)	15–70 A	15–125 A	15–30 A
			QO (B) VH	—	—	35–150 A
			QO (B) PL	15–30 A	15–60 A	15–30 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) EPE	—	—	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		ED, FD	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—

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Tableau 2 : Val. nom. de disjoncteurs raccordés en série (RMS sym.) *(suite)*

Tension ca max. du système [1, 2]	Courant nominal de court-circuit max.	Disjoncteurs principaux intégrés ou à distance et fusibles principaux à distance de la marque Square D	Désignation du catalogue des disjoncteurs de dérivation de la marque Square D et gammes d'intensité admissibles [3, 4, 5, 6]			
			Type	1 pôle	2 pôles	3 pôles
240/120 3P/4F	25 000	KD	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) AS	15–30 A	15–30 A	15–30 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
		HD, JD	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) VH	—	—	35–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) EPE	—	—	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		LD	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–30 A	15–125 A	15–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	15–30 A	15–60 A	15–30 A
			QO (B) EPD	15–30 A	15–60 A	15–30 A
			QO (B) EPE	—	—	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
	42 000	LA, MA	Q2L-H	—	100–225 A	100–225 A
			QDL	—	70–225 A	70–225 A
		LC 400 A	QO (B)	15–70 A	15–70 A	—
			QO (B) VH	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—

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Tableau 2 : Val. nom. de disjoncteurs raccordés en série (RMS sym.) *(suite)*

Tension ca max. du système [1, 2]	Courant nominal de court-circuit max.	Disjoncteurs principaux intégrés ou à distance et fusibles principaux à distance de la marque Square D	Désignation du catalogue des disjoncteurs de dérivation de la marque Square D et gammes d'intensité admissibles [3, 4, 5, 6]			
			Type	1 pôle	2 pôles	3 pôles
240/120 3P/4F	42 000	LC 600 A	QO (B) VH	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		MG	QO (B) VH	15–30 A	15–30 A	15–30 A
	65 000	LC 400 A	QO (B)	15–30 A	15–30 A	—
			QO (B) VH	15–30 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		LC 600 A	QO (B) VH	15–30 A	15–125 A	15–150 A
			QO (B) GFI	—	—	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		DJ 400 A	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	—	—	15–150 A
			QO (B) H	—	15–100 A	—
		DJ_W	QO (B)	15–70 A	15–150 A	—
			QO (B)-VH	—	110–125 A	15–150 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		DJ, DG, DL 150–600 A	QO (B) EPD	—	—	15–30 A
		EG, FG, KG	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—

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Tableau 2 : Val. nom. de disjoncteurs raccordés en série (RMS sym.) *(suite)*

Tension ca max. du système [1, 2]	Courant nominal de court-circuit max.	Disjoncteurs principaux intégrés ou à distance et fusibles principaux à distance de la marque Square D	Désignation du catalogue des disjoncteurs de dérivation de la marque Square D et gammes d'intensité admissibles [3, 4, 5, 6]			
			Type	1 pôle	2 pôles	3 pôles
240/120 3P/4F	65 000	QG	QO (B)	15–70 A	15–125 A	15–30 A
			QO (B) VH	—	—	35–150 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) PL	15–30 A	15–60 A	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		HG, JG	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) VH	—	—	35–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) EPE	—	—	15–50 A
			QO (B) PL	15–30 A	15–60 A	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		FC_ o KC_22___	QO (B)	15–70 A	15–100 A	15–100 A
		FC_ o KC_34___	QO (B) AS	15–30 A	15–30 A	15–30 A
		LG	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	15–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	15–30 A	15–60 A	15–30 A
			QO (B) EPD	15–30 A	15–60 A	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		LJ	QO (B)	15–70 A	15–125 A	—
			QO (B) GFI	15–30 A	40–60 A	—
			QO (B) EPD	15–30 A	40–60 A	15–30 A
			QO (B) EPE	—	—	15–30 A

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Tableau 2 : Val. nom. de disjoncteurs raccordés en série (RMS sym.) *(suite)*

Tension ca max. du système [1, 2]	Courant nominal de court-circuit max.	Disjoncteurs principaux intégrés ou à distance et fusibles principaux à distance de la marque Square D	Désignation du catalogue des disjoncteurs de dérivation de la marque Square D et gammes d'intensité admissibles [3, 4, 5, 6]			
			Type	1 pôle	2 pôles	3 pôles
240/120 3P/4F	65 000	LL	QO (B) EPD	—	—	15–30 A
			QO (B) EPE	—	—	15–30 A
	100 000	FC_ ou KC_22___	QO (B) GFI	15–30 A	15–30 A	—
		FC_ ou KC_34___	QO (B) AFI	15–20 A	—	—
		DJ 400 A	QO (B)	15–70 A	15–125 A	—
			QO (B) H	—	15–100 A	—
			QO (B) VH	—	—	15–150 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		EJ	QO (B)	15–70 A	15–125 A	15–100 A
		LJ	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	15–70 A	15–125 A	15–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	—	15–30 A	—
			QO (B) EPD	—	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		HJ, JJ	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) H	—	15–100 A	—
			QO (B) VH	—	—	35–150 A
			QO (B) PL	15–30 A	15–60 A	15–30 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—

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Tableau 2 : Val. nom. de disjoncteurs raccordés en série (RMS sym.) *(suite)*

Tension ca max. du système [1, 2]	Courant nominal de court-circuit max.	Disjoncteurs principaux intégrés ou à distance et fusibles principaux à distance de la marque Square D	Désignation du catalogue des disjoncteurs de dérivation de la marque Square D et gammes d'intensité admissibles [3, 4, 5, 6]			
			Type	1 pôle	2 pôles	3 pôles
240/120 3P/4F	125 000	HL, JL	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) H	—	15–100 A	—
			QO (B) VH	—	—	35–150 A
			QO (B) PL	15–30 A	15–60 A	15–30 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
	200 000	FI, KI, HR, JR	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
240 3P/3F ou 240 1P/2F (2 pôles uniquement)	22 000	QO (B) VH	QO (B)	—	—	15–100 A
			QO (B) GFI	—	—	15–50 A
			QO (B) PL	—	15–30 A	—
		Q2-H	QO (B)	—	—	15–30 A
	25 000	QD	QO (B)	—	—	15–30 A
			QO (B) VH	—	—	35–150 A
			QO (B) H	—	15–100 A	—
			QO (B) PL	—	15–60 A	15–30 A
			QO (B) EPD	—	—	15–50 A
			QO (B) EPE	—	—	15–50 A
			QO (B) GFI	—	—	15–50 A
		ED, FD	QO (B)	—	—	15–100 A
			QO (B) GFI	—	—	15–50 A
		KD	QO (B)	—	—	15–100 A
		HD, JD	QO (B)	—	—	15–100 A
			QO (B) VH	—	—	35–150 A
			QO (B) H	—	15–100 A	—
			QO (B) GFI	—	—	15–50 A

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Tableau 2 : Val. nom. de disjoncteurs raccordés en série (RMS sym.) *(suite)*

Tension ca max. du système [1, 2]	Courant nominal de court-circuit max.	Disjoncteurs principaux intégrés ou à distance et fusibles principaux à distance de la marque Square D	Désignation du catalogue des disjoncteurs de dérivation de la marque Square D et gammes d'intensité admissibles [3, 4, 5, 6]			
			Type	1 pôle	2 pôles	3 pôles
240 3P/3F ou 240 1P/2F (2 pôles uniquement)	25 000	LD	QO (B) VH	—	—	15–150 A
			QO (B) EPD	—	—	15–30 A
			QO (B) EPE	—	—	15–30 A
	42 000	LA, MA	QDL	—	70–225 A	70–225 A
		LC 400 A	QO (B) VH	—	—	15–100 A
		LC 600 A	QO (B) VH	—	—	15–100 A
		MG	QO (B) VH	—	—	150 A
	65 000	LC 400 A	QO (B) VH	—	—	15–100 A
		LC 600 A	QO (B) VH	—	—	15–30 A
		DJ 400 A	QO (B) VH	—	—	15–150 A
			QO (B) H	—	15–100 A	—
		DJ, DG, DL 150–600 A	QO (B) EPD	—	—	15–30 A
			QO (B) EPE	—	—	15–30 A
		EG, FG, KG	QO (B)	—	—	15–100 A
			QO (B) GFI	—	—	15–50 A
		QG	QO (B)	—	—	15–30 A
			QO (B) VH	—	—	35–150 A
			QO (B) H	—	15–100 A	—
		QG, HG, JG	QO (B) PL	—	—	15–30 A
		HG, JG	QO (B)	—	—	15–100 A
			QO (B) VH	—	—	35–150 A
			QO (B) H	—	15–100 A	—
		FC_ ou KC_22___	QO (B)	—	—	15–100 A
		FC_ ou KC_34___	QO (B) AS	—	15–30 A	15–30 A
		LG	QO (B) VH	—	—	15–150 A
			QO (B) H	—	15–100 A	—
			QO (B) EPD	—	—	15–30 A
			QO (B) EPE	—	—	15–30 A
		LJ	QO (B) EPD	—	—	15–30 A
			QO (B) EPE	—	—	15–30 A
		LL	QO (B) EPD	—	—	15–30 A
			QO (B) EPE	—	—	15–30 A

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Tableau 2 : Val. nom. de disjoncteurs raccordés en série (RMS sym.) *(suite)*

Tension ca max. du système [1, 2]	Courant nominal de court-circuit max.	Disjoncteurs principaux intégrés ou à distance et fusibles principaux à distance de la marque Square D	Désignation du catalogue des disjoncteurs de dérivation de la marque Square D et gammes d'intensité admissibles [3, 4, 5, 6]			
			Type	1 pôle	2 pôles	3 pôles
240 3P/3F ou 240 1P/2F (2 pôles uniquement)	100 000	FC_ ou KC_24___ / FC_ ou KC_34___	QO (B) GFI	—	15–30 A	—
		DJ 400 A	QO (B) H	—	15–100 A	—
		EJ, FJ	QO (B)	—	—	15–100 A
		LJ	QO (B) VH	—	—	15–100 A
			QO (B) H	—	15–100 A	—
		HJ, JJ	QO (B)	—	—	15–100 A
			QO (B) H	—	15–100 A	—
			QO (B) VH	—	—	35–150 A
			QO (B) EPD	—	—	15–30 A
			QO (B) EPE	—	—	15–30 A
	125 000	HL, JL	QO (B)	—	—	15–100 A
			QO (B) H	—	15–100 A	—
			QO (B) VH	—	—	35–150 A
			QO (B) EPD	—	—	15–30 A
			QO (B) EPE	—	—	15–30 A
	200 000	FI, KI, HR, JR	QO (B)	—	—	15–100 A
120/240[7] 1P/3F	42 000	400 A max. Fusibles classe T3	QO (B) VH	15–70 A	15–125 A	—
	65 000	400 A max. Fusibles classe J	QO (B) VH	15–70 A	15–150 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
		400 A max. Fusibles classe T6	QO (B) VH	15–70 A	15–150 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—

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Tableau 2 : Val. nom. de disjoncteurs raccordés en série (RMS sym.) *(suite)*

Tension ca max. du système [1, 2]	Courant nominal de court-circuit max.	Disjoncteurs principaux intégrés ou à distance et fusibles principaux à distance de la marque Square D	Désignation du catalogue des disjoncteurs de dérivation de la marque Square D et gammes d'intensité admissibles [3, 4, 5, 6]			
			Type	1 pôle	2 pôles	3 pôles
120/240[7] 1P/3F	100 000	200 A max. Fusibles classe T3	QO (B)	15–70 A	15–125 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	15–20 A	—
			QO (B) DF	15–20 A	—	—
	200 000	400 A max. Fusibles classe T3	QO (B)	15–70 A	15–125 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	—
208Y/120 3P/4F	200 000	200 A max. Fusibles classe T6 ou J	QO (B)	15–70 A	15–125 A	—
			QO (B) GFI	—	—	15–50 A
			QO (B) EPD	—	—	15–50 A
		400 A max. Fusibles classe T3	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) EPE	—	—	15–50 A
			QO (B) EPD	15–30 A	15–60 A	15–50 A
240/120 3P/4F	42 000	400 A max. Fusibles classe T3	QO (B) VH	15–30 A	15–125 A	—
	50 000	400 A max. Fusibles classe T3	QO (B) VH	—	—	15–30 A
	65 000	400 A max. Fusibles classe J	QO (B) VH	15–70 A	15–125 A	—
			QO (B) EPD	—	—	15–50 A
			QO (B) EPE	—	—	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
		400 A max. Fusibles classe T6	QO (B) VH	15–70 A	15–125 A	15–150 A
			QO (B) AFI	15–20 A	—	—

Page suivante

Tableau 2 : Val. nom. de disjoncteurs raccordés en série (RMS sym.) *(suite)*

Tension ca max. du système [1, 2]	Courant nominal de court-circuit max.	Disjoncteurs principaux intégrés ou à distance et fusibles principaux à distance de la marque Square D	Désignation du catalogue des disjoncteurs de dérivation de la marque Square D et gammes d'intensité admissibles [3, 4, 5, 6]			
			Type	1 pôle	2 pôles	3 pôles
240/120 3P/4F	100 000	200 A max. Fusibles classe T3	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) VH	—	—	15–30 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) EPE	—	—	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) CAFI	15–20 A	—	—
			QO (B) DF	15–20 A	—	—
			QOT	15–30 A	15–30 A	—
	200 000	200 A max. Fusibles classe J ou T6	QO (B) EPD	—	—	15–50 A
			QO (B) EPE	—	—	15–50 A
		400 A max. Fusibles classe T3	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) EPD	15–30 A	15–60 A	15–50 A
			QO (B) EPE	—	—	15–50 A
240 3P/3F ou 240 1P/2F (2 pôles uniquement)	50 000	400 A max. Fusibles classe J ou T6	QO (B) VH	—	—	15–30 A
	65 000	400 A max. Fusibles classe J	QO (B) VH	—	—	15–30 A
			QO (B) EPD	—	—	15–50 A
			QO (B) EPE	—	—	15–50 A
		400 A max. Fusibles classe T6	QO (B) VH	—	—	15–150 A
			QOB VH 1φ, 2F uniquement	—	150 A	—
	100 000	200 A max. Fusibles classe T3	QO (B)	—	—	15–100 A
			QO (B) VH	—	—	15–30 A

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Tableau 2 : Val. nom. de disjoncteurs raccordés en série (RMS sym.) *(suite)*

Tension ca max. du système [1, 2]	Courant nominal de court-circuit max.	Disjoncteurs principaux intégrés ou à distance et fusibles principaux à distance de la marque Square D	Désignation du catalogue des disjoncteurs de dérivation de la marque Square D et gammes d'intensité admissibles [3, 4, 5, 6]			
			Type	1 pôle	2 pôles	3 pôles
240 3P/3F ou 240 1P/2F (2 pôles uniquement)	200 000	200 A max. Fusibles classe J ou T6	QO (B) EPD	—	—	15–50 A
			QO (B) EPE	—	—	15–50 A
		400 A max. Fusibles classe T3	QO (B)	—	—	15–100 A
			QO (B) EPD	—	—	15–50 A
			QO (B) EPE	—	—	15–50 A

1 Pour les disjoncteurs montrés d'une tension nominale inférieure à cette tension maximale, le courant nominal de court-circuit indiqué s'applique également, mais à la tension nominale du disjoncteur.

2 Les essais de courts-circuits sont effectués de 100 à 105 % de la tension nominale maximale du panneau de commutation combiné I-Line.

3 Les suffixes HID, SWD et SWN peuvent être aussi appliqués aux disjoncteurs de dérivation qui conviennent et indiqués ci-dessus. Le suffixe SWN ne peut **pas** être appliqué en combinaison avec les disjoncteurs principaux LC.

4 Là où les disjoncteurs QO (B) sont indiqués ci-dessus, les disjoncteurs QO (B) H, QO (B) VH et QH (B) peuvent également être utilisés.

5 Là où les disjoncteurs QO (B) GFI sont indiqués ci-dessus, les disjoncteurs QO (B) EPD ou QO (B) EPE peuvent également être utilisés.

6 Là où les disjoncteurs QO (B) AFI sont indiqués ci-dessus, les disjoncteurs QO (B) CAFI peuvent également être utilisés.

7 **Les disjoncteurs bipolaires CAFI sont seulement de 120/240 Vca et ne peuvent être utilisés que sur des systèmes à 3 fils, monophasés, de 120/240 Vca.**

8 Pour obtenir une coordination sélective, la valeur nominale du disjoncteur principal DJ doit être au moins deux fois plus importante que l'intensité nominale de tout disjoncteur de dérivation.

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Tableau 3 : Sélectivité de disjoncteur critique pour panneau NQ

SCCR maximum (RMS symétriques)	Disjoncteurs principaux intégrés ou à distance	Disjoncteurs de dérivation			
		Type[1]	Unipolaire	Bipolaire	Tripolaire
Pleine valeur nominale et sélectif jusqu'à 10 kA à 208 Y/120 Vca ou à 240/120 Vca	J-W, 250 A L-W, 250 A	QO(B) QO(B)-H QO(B)-VH QH	10–70	10–125	10–125
Valeur nominale en série et sélectif jusqu'à 12kA à 208 Y/120 Vca ou à 240/120 Vca	J-W, 250 A	QO(B) QO(B)-H QO(B)-VH QH	10–70	10–125	10–60
Valeur nominale en série et sélectif jusqu'à 15kA à 208 Y/120 Vca ou à 240/120 Vca	J-W, 250 A	QO(B) QO(B)-H QO(B)-VH QH	10–60	10–60	10–30
Valeur nominale en série et sélectif jusqu'à 18kA à 208 Y/120 Vca ou à 240/120 Vca	J-W, 250 A	QO(B) QO(B)-H QO(B)-VH QH	10–30	10–30	—
	L-W, 250 A	QO(B) QO(B)-H QO(B)-VH QH	10–60	10–60	10–60
Valeur nominale en série et sélectif jusqu'à 30kA à 208 Y/120 Vca ou à 240/120 Vca	L-W, 400 A L-W, 600 A	QO(B) QO(B)-H QO(B)-VH QH	15–70	15–150	15–150

1 Y compris les disjoncteurs AFI, CAFI, EPD et GFI.

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Tableau 4 : Courant nominal de court-circuit[1] pour intérieurs à cosses principales avec cosses de traversée ou de sous-alimentation

<table>
<tr><th>Tension ca maximale du système</th><th>Courant nominal maximal</th><th>Circuits d'artère</th><th>Application</th><th>Addition[2]</th><th>Courant nominal de court-circuit max.[3]</th></tr>
<tr><td rowspan="11">240</td><td>100</td><td>18, 30</td><td>SFL and FTL</td><td>—</td><td rowspan="4">10,000</td></tr>
<tr><td rowspan="3">225</td><td>30, 42, 54, 72, 84, 96</td><td>SFL</td><td>6 pouces (152.4 mm)</td></tr>
<tr><td>42</td><td rowspan="2">FTL</td><td>—</td></tr>
<tr><td>30, 54, 72, 84, 96</td><td>6 pouces (152.4 mm)</td></tr>
<tr><td rowspan="5">400</td><td>30, 42, 54, 72, 84</td><td rowspan="2">SFL</td><td>—</td><td>25,000</td></tr>
<tr><td>96</td><td>—</td><td>10,000</td></tr>
<tr><td>30, 84</td><td rowspan="3">FTL</td><td>—</td><td>25,000</td></tr>
<tr><td>96</td><td>—</td><td>10,000</td></tr>
<tr><td>42, 54, 72</td><td>6 pouces (152.4 mm)</td><td rowspan="2">25,000</td></tr>
<tr><td rowspan="2">600</td><td>30, 42, 54, 72, 84</td><td rowspan="2">FTL</td><td rowspan="2">12 pouces (304.8 mm)</td></tr>
<tr><td>96</td><td>10,000</td></tr>
</table>

1 Ces valeurs nominales concernent les intérieurs à cosses principales, munis de cosses de sous alimentation ou de traversée, où le dispositif alimentant l'intérieur est inconnu ou autre qu'un dispositif de marque Square D. L'utilisation d'un disjoncteur principal de la marque Square D en amont de ces cosses aboutira à une valeur nominale égale à la valeur nominale du disjoncteur. Les essais de courts-circuits sont effectués de 100 à 105 % de la tension nominale maximale du panneau de distribution.

2 Addition est la longueur supplémentaire du coffret.

3 Ampères rms symétriques, pour trois cycles.

Marquage CE

- Les intérieurs avec la marque CE sont conformes aux normes IEC 61439-1 et IEC 61439-2.
- Les intérieurs à cosses principales avec la marque CE ont été vérifiés pour supporter 10 000 A RMS symétriques pendant 30 cycles.
- Les intérieurs avec la marque CE ne sont approuvés que pour une utilisation avec les disjoncteurs de dérivation QOXD ou QOBXD qui comportent la marque CE.

Annexe 2 : Accessoires

Un assortiment d'accessoires pouvant être installés sur place est disponible pour les panneaux de distribution NQ :

- Kits de barre de m.à.l.t. de l'appareil
- Kits de cosses surdimensionnées pour les panneaux de distribution de 100 à 250 A
- Kits de cosses de sous-alimentation pour les panneaux de distribution de 100 à 400 A
- Kit de cosse principale
  - — Kits de cosses mécaniques — Aluminum
  - — Kits de cosses mécaniques — Cuivre
  - — Kits de cosses à compression Versa-Crimp® — Aluminum
  - — Kits de cosses à compression Versa-Crimp — Cuivre

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Kits de barre de m.à.l.t. de l'appareil

Les kits de barre de m.à.l.t. de l'appareil, convenant à du fil de cuivre ou d'aluminium, répondent aux besoins de m.à.l.t. des panneaux de distribution NQ ou des centres de distribution QONQ.

Tableau 5 : Spécifications des kits de barre de m.à.l.t. de l'appareil

Panneaux de distribution		Utiliser le numéro de catalogue du kit de barre de m.à.l.t.	
Circuit d'artère	**Valeur nominale du secteur**	**Aluminium[1]**	**Cuivre[2]**
1–42	600 A maximum	(1) PK27GTA	(1) PK27GTACU
54–84		(2) PK27GTA	(2) PK27GTACU

1 Barres en aluminium convenant à des conducteurs en cuivre ou aluminium de 60 °C ou 75 °C.

2 Barres en cuivre convenant à des conducteurs en cuivre de 60 °C ou 75 °C.

REMARQUE : Les emplacements de montage d'une barre de m.à.l.t. sont identifiés par le symbole de terre ⏚ estampé sur la paroi arrière du coffret.

Kits de cosses surdimensionnées pour les panneaux de distribution de 100 à 250 A

Les kits de cosses surdimensionnées sont disponibles pour les applications dans lesquelles des conducteurs de terminaison d’un calibre de 3 AWG ou plus grand sont requis pour le neutre.

Tableau 6 : Spécifications du kit de cosses surdimensionnées pour les panneaux de distribution de 100 à 250 A

Valeur nominale du disjoncteur	Nº de catalogue du kit	Calibre des fils
70 A	QO70AN	(1) 10–2 Al (1) 5,76–33,6 mm^2 (1)14–4 Cu (1) 2,08–21,1 mm^2
80 à 125 A	Q1100AN	(1) 4–1/0 Al/Cu (1) 42,4–53,5 mm^2
125 à 150 A	Q1150AN	(1) 1–4/0 Al/Cu (1) 42,4–107 mm^2

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Kits de cosses de sous-alimentation pour les panneaux de distribution de 100 à 400 A

Des cosses principales de sous-alimentation sont disponibles pour les applications de 100, 225 ou 400 A.

Tableau 7 : Spécifications du kit de cosses de sous-alimentation pour les panneaux de distribution de 100 à 400 A

Intensité principale	Nº de catalogue du kit	Nombre max. de circuits
100	NQSFL1	18, 30
225	NQSFL2	30[1], 42[1], 54[1], 72[1], 84[1]
400	NQSFL4	30, 42, 54, 72, 84

1 Ces panneaux exigent 152,4 mm (6 pouces) supplémentaires pour le coffret et la garniture, afin d’avoir un espace de courbure des fils appropriés.

Kit de cosse principale

Tableau 8 : Kits de cosses mécaniques — Aluminum

Intensité du panneau de distribution	Nº de catalogue du kit	Calibre des fils
100	Standard	Nº 6–2/0 AWG 13,3–67,43 mm^2
225	Standard	Nº 6–350 kcmil 13,3–177,3 mm^2
400	Standard	(1) 1/0–750 kcmil (2) 1/0–350 kcmil (1) 53,48–380 mm^2 (2) 53,48–177,3 mm^2
600	Standard	(2) 1/0–750 kcmil (2) 53,48–380 mm^2
	NQALM6A	(3) #6–250 kcmil (3) 13,3–127 mm^2

Tableau 9 : Kits de cosses mécaniques — Cuivre

Intensité du panneau de distribution	Nº de catalogue du kit	Calibre des fils
100	NQCUM1	Nº 6–2/0 AWG 13,3–67,43 mm^2
225	NQCUM2	Nº 6 à 250 kcmil 13,3–127 mm^2
400	NQCUM4	(1) 1/0–750 kcmil (2) 1/0–350 kcmil (1) 53,48–380 mm^2 (2) 53,48–177,3 mm^2
600	NQCUM6	

Tableau 10 : Kits de cosses à compression Versa-Crimp® — Aluminum

Intensité du panneau de distribution	Nº de catalogue du kit	Calibre des fils	Outil de sertissage
100	NQALV1	Nº 8–1/0 AWG 8,36–53,48 mm^2	VC6 (tous)
225	NQALV2	Nº 4 à 300 kcmil 21,15–152 mm^2	
400	NQALV4	(2) 2/0–500 kcmil (2) 67,43–253,4 mm^2	VC6-3, VC6-FT
600	NQALV6		

Tableau 11 : Kits de cosses à compression Versa-Crimp — Cuivre

Intensité du panneau de distribution	Nº de catalogue du kit	Calibre des fils	Outil de sertissage
100	NQCUV1	Nº 6–1/0 AWG 13,30–53,48 mm^2	VC6 (tous) VC7 (tous)
225	NQCUV2	2/0 à 300 kcmil 67,43–152 mm^2	VC6-3, VC7, VC6-FT, VC7-FT
400	NQCUV4	400–750 kcmil 202,7–380 mm^2	VC6-FT, VC7-FT, VC8
600	NQCUV6	(2) 250–500 kcmil (2) 126,7–253,4 mm^2	VC6-3, VC7, VC6-FT, VC7-FT

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80043-712-06 Rev. 02, 11/2016
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Instruction Bulletin

Replaces 48049-148-05 Rev. 07, 10/2013

PowerPact™ P-Frame and NS630b–NS1600 Circuit Breakers

Retain for future use.

Necessary Tools

Screwdriver, Pozidriv® #2 or 3, or slotted

Socket Wrench, 7 mm internal hex

Screwdriver, long-shanked slotted

Torque Wrench, 5/16 in. or 8 mm

Additional Information

This bulletin provides installation instructions for PowerPact P-frame and NS630b–NS1600 circuit breakers. Tripping functions are controlled by the Micrologic™ electronic trip unit.

For additional information see the following user guides available on the Schneider Electric™ website:

- Catalog 0612CT0101: *PowerPact™ M, P, and R-frame Circuit Breaker*
- Bulletin 0613IB1313: *Modbus Communications System*
- Bulletin 0612IB1201: *PowerPact™ Circuit Breakers Dimensional Drawings*
- Bulletin 48049-136-05: *Micrologic 2.0A, 3.0A, 5.0A, and 6.0A Electronic Trip Units*
- Bulletin 48049-330-03: *Micrologic 5.0H and 6.0H Electronic Trip Units*
- Bulletin 48049-137-05: *Micrologic 5.0P and 6.0P Electronic Trip Unit*
- Bulletin 48049-207-05: *Micrologic 2.0, 3.0 and 5.0 Electronic Trip Units*
- Bulletins 5120108AA or 51201027 for rear connection instructions

To access the website go to:

http://www.schneider-electric.com

For application assistance, please call 1-888-778-2733.

Circuit Breaker Installation

1. Turn off all power supplying this equipment before working on or inside equipment.
2. Make sure circuit breaker is in tripped or OFF (O) position.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

ENGLISH

Individually-Mounted Circuit Breaker Installation

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Install circuit breaker so minimum clearance distance to grounded metal is maintained.

Failure to follow these instructions will result in death or serious injury.

3. Check clearances between circuit breaker and closest grounded metal (minimum enclosure dimensions are given in Table 4).

4. Prepare enclosure for circuit breaker (see Figure 23 on Page 16 for mounting hole and cover cutout dimensions).
   — Drill mounting holes in mounting surface. Tap holes for 10-32 threads.
   — Cut opening in cover for circuit breaker handle, handle escutcheon, accessory cover, or accessory cover escutcheon.

⚠ WARNING

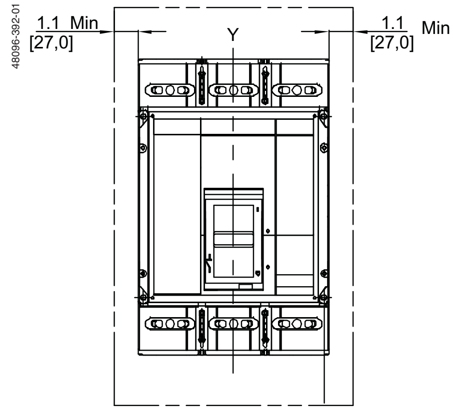
HAZARD OF ELECTRIC SHOCK, ARC FLASH OR EQUIPMENT DAMAGE

- Mount circuit breaker using only insulated mounting screws provided.
- All four washers (Figure 2, A) and mounting screws (B) must be installed and torqued to designated value.
- Electrically-operated circuit breakers must be grounded by installing insulated mounting screw in lower right mounting screw hole (C).

Failure to follow these instructions can result in serious injury or equipment damage.

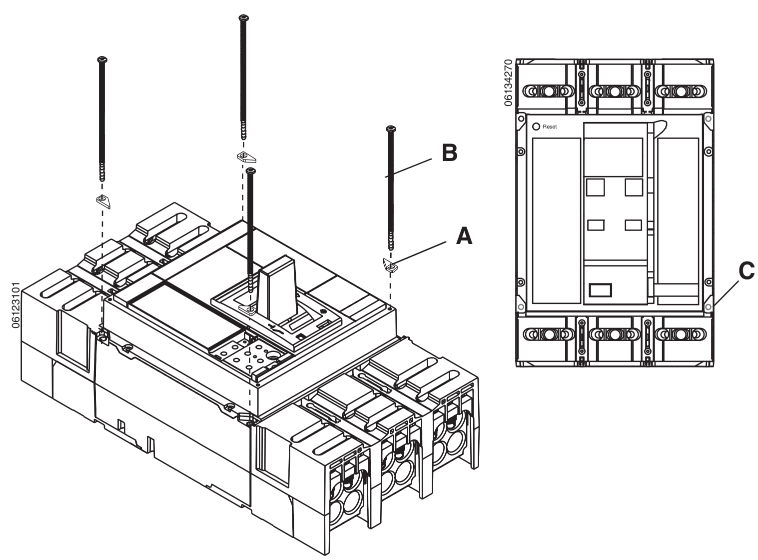
5. Mount circuit breaker using four washers (Figure 2, A, provided) and four insulated 10-32 x 4.5 in. screws (B, provided). Torque screws to 36 lb-in (4 N·m).

Figure 1: Minimum Clearance to Metal Requirement



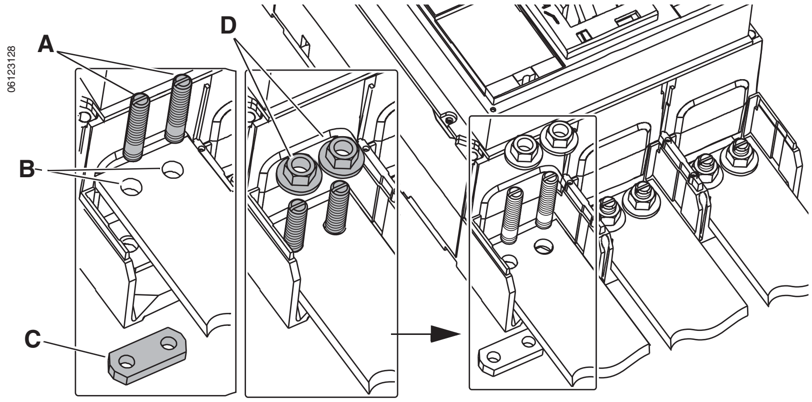
Dimensions: in. [mm]

Figure 2: Mount Circuit Breaker



6. For bus-connected circuit breakers, bolt bus to circuit breaker:
   a. Insert bolts (**Figure 3, A,** provided) through holes in bus (**B**) into circuit breaker nut plate (**C**). Using slotted screwdriver, torque bolts to 50 lb-in (5.65 N•m).
   b. Secure bus (**B**) with nuts (**D**, provided). Torque nuts to 250 in-lb (28 N•m).

Figure 3: Install Bus



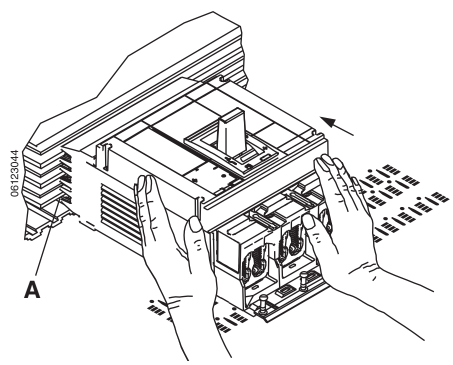
I-Line™ Circuit Breaker Installation

1. Place circuit breaker in the tripped or OFF (O) position.

NOTICE
HAZARD OF EQUIPMENT DAMAGE • Do not adjust jaws. • Do not remove joint compound. • If necessary, use Square D™ joint compound PJC7201. **Failure to follow these instructions can result in equipment damage.**

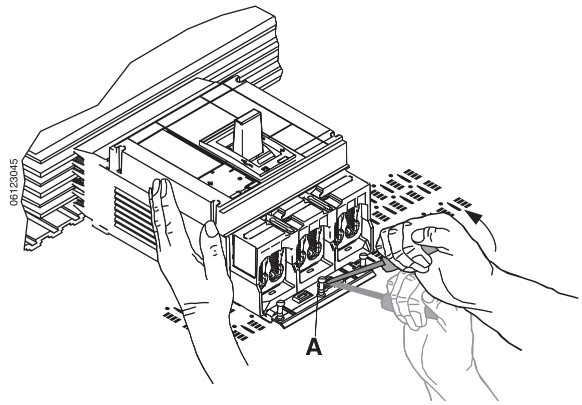
2. Place circuit breaker on I-Line pan with jaws (**Figure 4, A**) pushed against bus.

Figure 4: Place Circuit Breaker on Pan



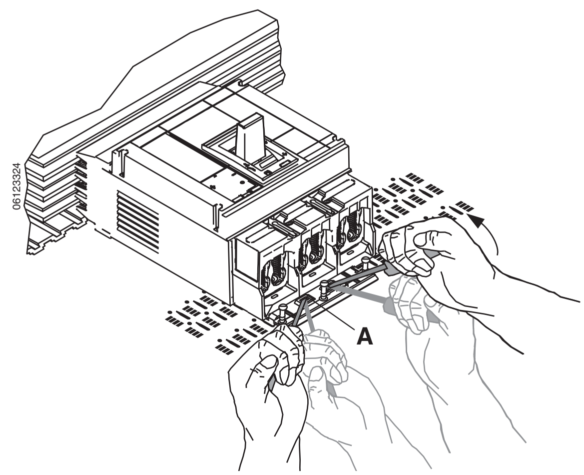
3. Insert long-shanked slotted screwdriver (**Figure 5, A**) into slot. Rack circuit breaker onto bus until circuit breaker jaws completely engage bus bars.

Figure 5: Start Racking Circuit Breaker onto Bus



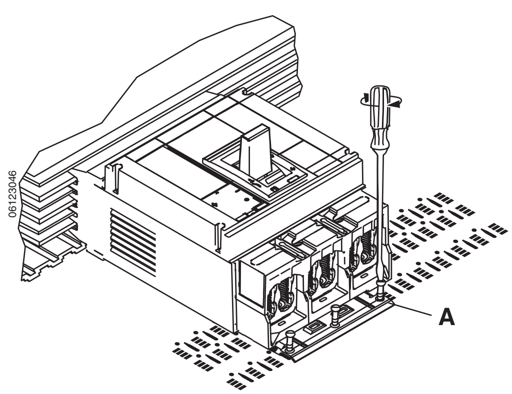
4. Insert second screwdriver (**Figure 6, A**) into bottom slot. Rack circuit breaker onto bus, using alternate screwdrivers until circuit breaker jaws completely engage bus bars.

Figure 6: Rack Circuit Breaker Completely onto Bus



5. Tighten three mounting bracket screws (**Figure 7, A**) firmly without bending mounting bracket.

Figure 7: Tighten Mounting Bracket Screws



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Cable Installation

Square conductor ends and preform conductors to final configuration. Using a proper insulation stripping tool, strip conductor ends as recommended in Table 1. Do not nick strands.

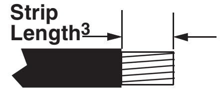
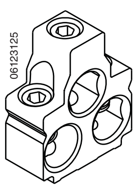
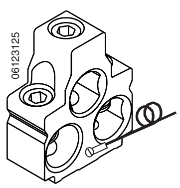
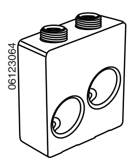
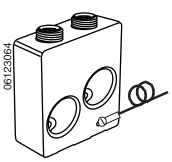
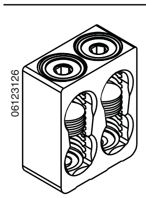
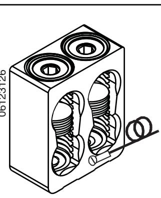
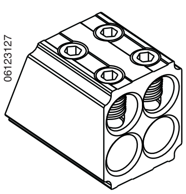
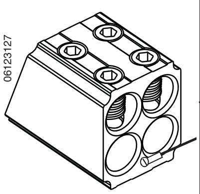
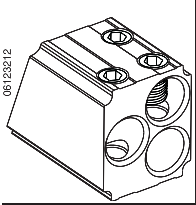
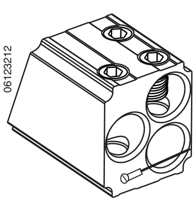
NOTICE

HAZARD OF FALSE TORQUE INDICATION

Do not allow conductor strands to interfere with threads of wire binding screw.

Failure to follow these instructions can result in equipment damage.

Table 1: Circuit Breaker Lug Information

Lug	Lug with Optional Control Wire Installed	Catalog Number	Conductor				Screw Torque	
			Type	Size	Qty.	Strip Length[3] 	Wire Binding Screw	Control WIre Screw
06123125 	06123125 	AL800M23K[1,2]	Al/Cu	3/0–500 kcmil (95–240 mm2)	3	1.0 in. (25 mm)	442.5 lb-in (50 N•m)	9–12 lb-in (1–1.3 N•m)
		CU800M23K[2]	Cu					
06123064 	06123064 	AL800P6K[1,2]	Al/Cu	3/0–600 kcmil (95–300 mm2)	2	1.2 in. (30 mm)	442.5 lb-in (50 N•m)	9–12 lb-in (1–1.3 N•m)
06123126 	06123126 	AL1200P24K[1,4]	Al/Cu	3/0–500 kcmil (95–240 mm2)	4	1.2 in. (30 mm)	442.5 lb-in (50 N•m)	9–12 lb-in (1–1.3 N•m)
		CU1200P24K[4]	Cu					
06123127 	06123127 	AL1200P25K[1,2,5]	Al/Cu	3/0–500 kcmil (95–240 mm2)	4	Top holes: 1.25 in. (30 mm) Bottom holes: 2.25 in. (57 mm)	442.5 lb-in (50 N•m)	9–12 lb-in (1–1.3 N•m)
		CU1200P25K[2,5]	Cu					
06123212 	06123212 	AL1200P6KU[1,2,5]	Al/Cu	350–600 kcmil (185–300 mm2)	3	Top and middle holes: 1.25 in. (30 mm) Bottom hole: 2.25 in. (57 mm)	442.5 lb-in (50 N•m)	9–12 lb-in (1–1.3 N•m)

1 For version with tapped hole for control wire add a T before the K to the catalog number (e.g. AL800M23**T**K).
2 Add suffix "4" for four-pole circuit breaker kits (e.g. AL800M23K4 or AL800M23TK4).
3 Conductors must be cut square for secure termination.
4 For load end (bottom) mounting only.
5 Not suitable for use on I-line circuit breakers.

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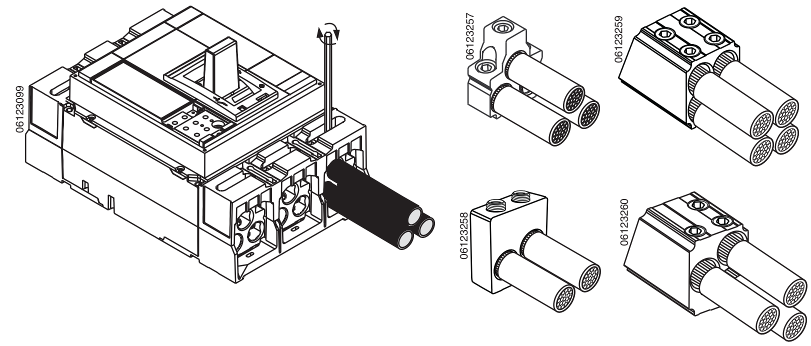
AL800M23K, CU800M23K, AL800P6K, AL1200P25K, CU1200P25K and AL1200P6KU Lug Kits

For factory-installed lugs, install cables in lug and torque wire binding screw as recommended on the faceplate.

For field-installable lug kits, see instruction bulletin shipped with the kit.

Figure 8: AL800M23K, Cu800M23K, AL800P6K, AL1200P25K, CU1200P25K and AL1200P6KU Lug Cable Installation



AL1200P24K and CU1200P24K Lug Kits

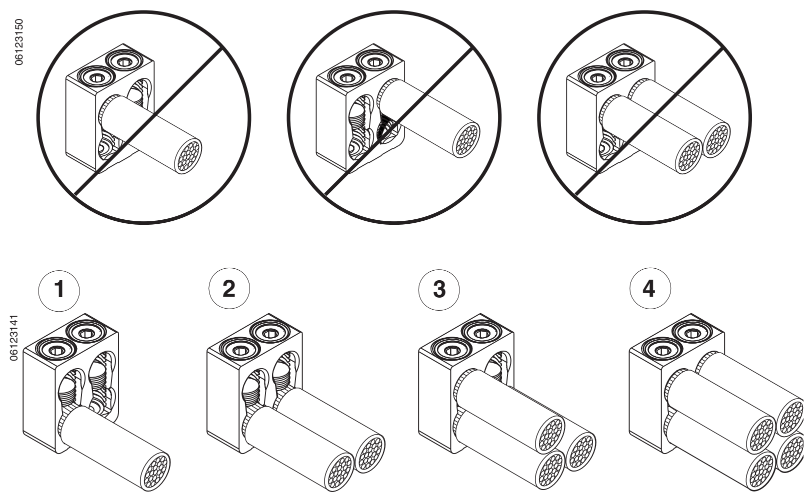
For factory-installed lugs, install cable in order listed and torque wire binding screw as recommended on the faceplate.

NOTE: Install bottom cables first. Bottom wire binding screws must be fully tightened before installing top cables. Remove foam spacer before installing cable.

1. Install left bottom cable and tighten wire binding screw.
2. Install right bottom cable and tighten wire binding screw.
3. Install left top cable and tighten wire binding screw.
4. Install right top cable and tighten wire binding screw.

For field-installable lug kits, see instruction bulletin shipped with the kit.

Figure 9: AL1200P24K and CU1200P24K Lug Cable Installation



Cable Restraint

NOTICE

HAZARD OF CONDUCTOR MOVEMENT UNDER SHORT-CIRCUIT CONDITIONS

Restrain circuit breaker conductors as required in Table 2.

Failure to follow these instructions can result in equipment damage.

Table 2: Cable Restraint Recommendations

Frame Size	Available Fault Current	Conductors Used	Unsupported Cable Length	Restraint Recommended
800 A	≤ 65 kA	Three 300 kcmil or larger	≤ 11 in. (279 mm)	No*
	All other cases			Yes
1200 A	≤ 65 kA	Four 350 kcmil or larger	≤ 14 in. (256 mm)	No*
	All other cases			Yes

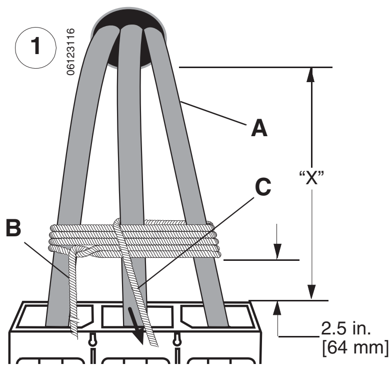
* All requirements must be met for restraint not to be required.

Restrain circuit breaker conductors as indicated in Table 2.

Wrap conductors using 30 ft. (9 m) of 3/8 in. (9.5 mm) sisal rope or equivalent.

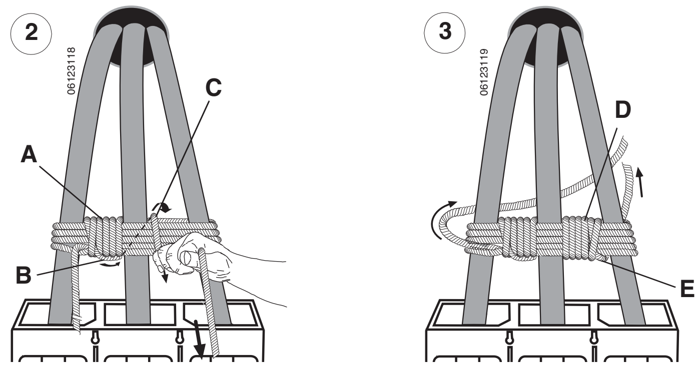
1. Begin wrapping conductors (**Figure 10, A**) 2.5 in. (64 mm) above circuit breaker. Wrap conductors five times, leaving 12 plus “X” ft. (4 + “X” m) of excess rope at the first end (**B**). Pull rope (**C**) taut.

Figure 10: Wrap Conductors



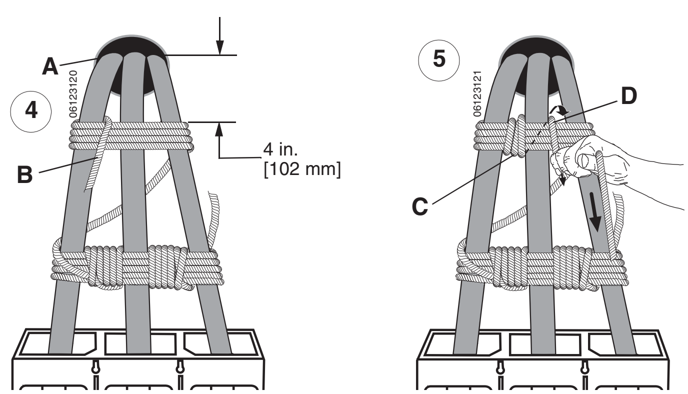
2. Wrap rope (**Figure 11, A**) several times until space between first two sets of conductors is completely filled. Weave final rope loop underneath previous loop (**B**). Bring rope (**C**) through right-hand space. Pull rope taut.
3. Wrap rope (**D**) several times until space between second and third set of conductors is completely filled. Weave final rope loop (**E**) underneath previous loop as shown. Pull rope taut.

Figure 11: Wrap Rope



4. Wrap rope four times around conductors 4 in. (102 mm) below where conductors exit enclosure (**Figure 12, A**). Pull rope (**B**) taut.
5. Wrap rope (**C**) several times until space between first two sets of conductors is completely filled. Bring rope (**D**) through right-hand space. Pull rope taut.

Figure 12: Wrap Conductors



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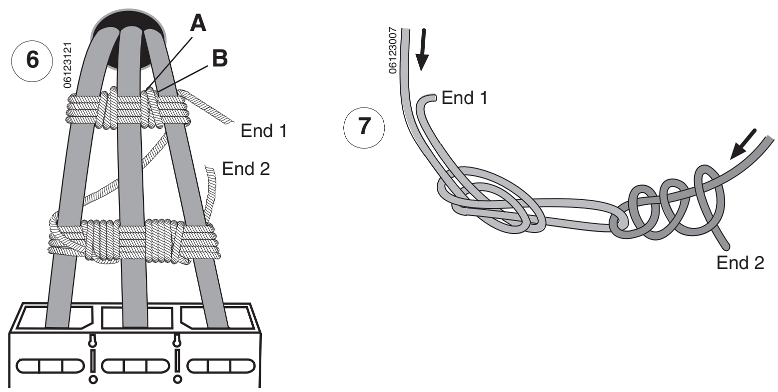
6. Wrap rope (**Figure 13, A**) several times until space between second and third set of conductors is completely filled. Weave final rope loop (**B**) underneath previous loop as shown. Pull rope taut.
7. Tie rope End 1 and End 2 together as shown. Rope must be taut. Cut off excess rope and tape ends to prevent fraying.

Figure 13: Wrap Rope



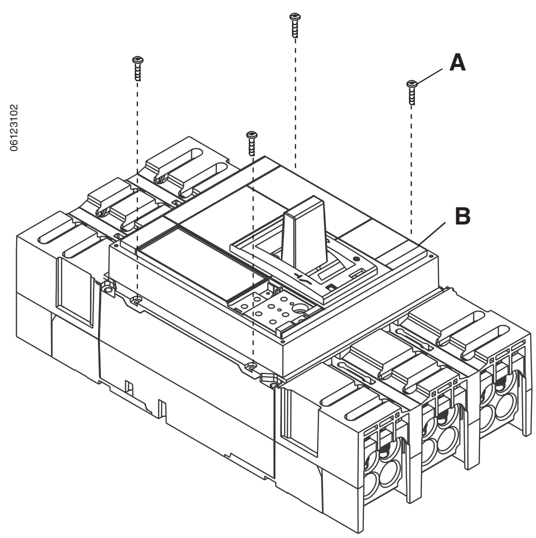
Installing Accessories

This subsection applies if circuit breaker has factory-installed or field-installed accessories.

Remove Accessory Cover

1. Make sure circuit breaker is in tripped or OFF (O) position.
2. Loosen four accessory cover screws (**Figure 14, A**) and remove accessory cover (**B**).

Figure 14: Remove Accessory Cover



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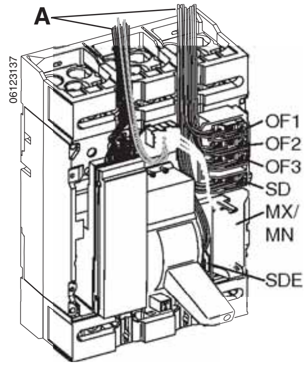
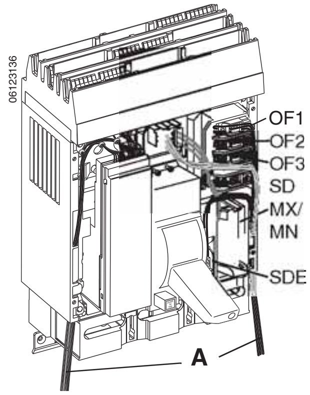
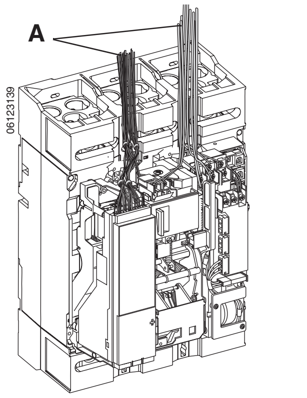
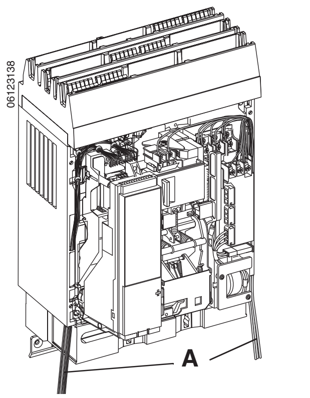
Install Accessories and Control Wiring

1. Install field-installable circuit breaker accessories as instructed in the instructions packed with each accessory.
2. Install control wiring (**Table 3, A**) to accessories. Torque terminal screws to 10 lb-in (1.2 N•m).

Table 3: Accessory Control Wiring

Type	Individually-Mounted Circuit Breaker	I-Line Circuit Breaker
	Wire Routing	**Wire Routing**
Manually Operated		
Electrically Operated		

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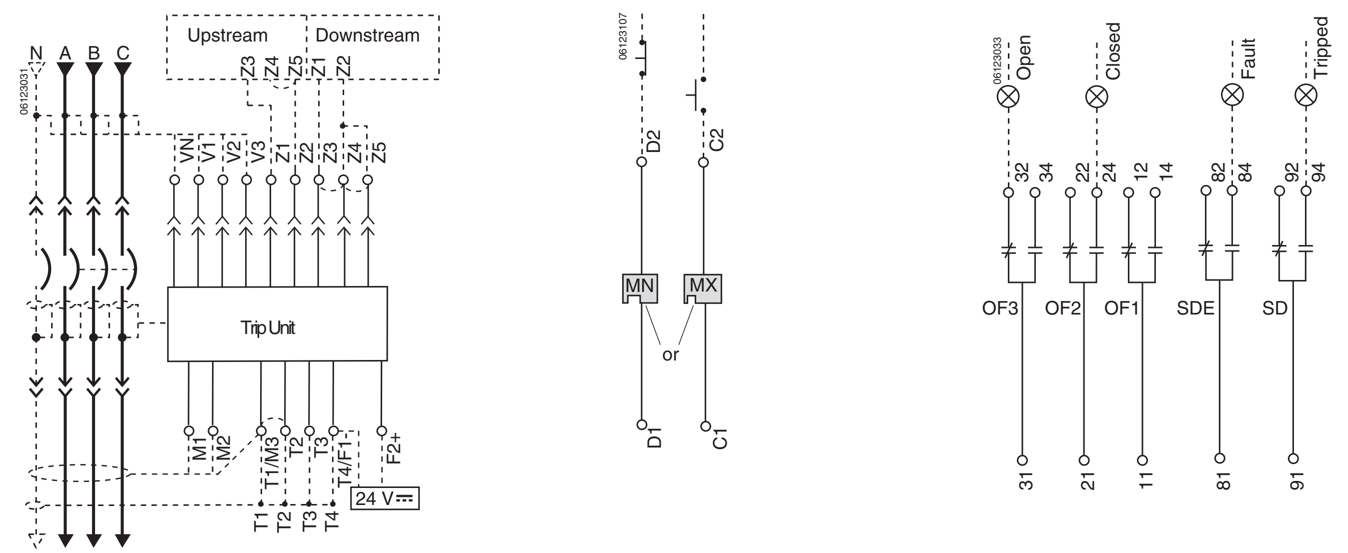
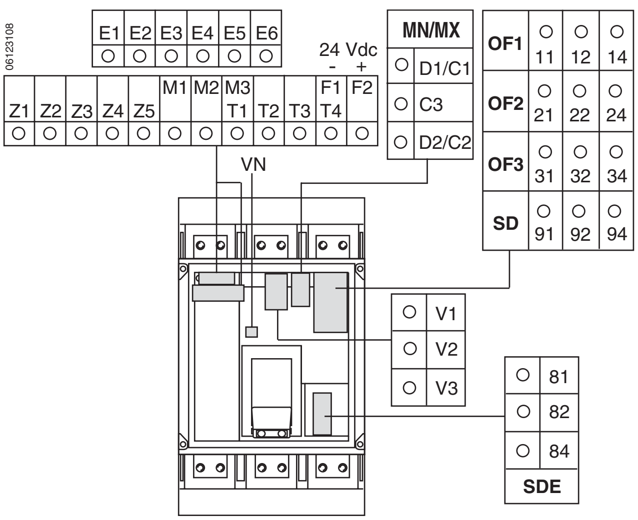
NOTE: All diagrams show circuit breaker in tripped position.

Figure 15: Accessory Control Wiring Diagrams for Manually-Operated Circuit Breakers

Power **Trip Unit[1]** **Remote Operation** **Alarm Contacts**





Connector	Recommended Wire Size
V1, V2, V3, Vn	22–16 AWG (0.3–1.5 mm^2)
E1–E2	22 AWG (0.3 mm^2) MIN shielded pair cable or twisted pair copper wires
T	22 AWG (0.3 mm^2) stranded shielded cable
E3–E6, Q1, Q2, Q3	22 AWG (0.3 mm^2) shielded twisted pairs with drain (Belden 8723 or equal)[3]
OF, SD, SDE	18–16 AWG (0.8–1.5 mm^2)
MN, MX	18–14 AWG (0.8–2.5 mm^2)
F	Size per aux. 24 Vdc power supply
Z1–Z5	22–18 AWG (0.3–0.8 mm^2)

Trip Unit Type					
Basic	A	P	H	Connector	Description
–	•	•	•	Com: E1-E6	Circuit breaker communication module E1 = +24 Vdc E2 = Common E3 = A/Tx- D0 E4 = B/Tx+ D1 E5 = A/Rx- D0 E6 = B/Rx+ D1
–	•	•	•	Z	Zone-selective interlocking (ZSI) Z1 = ZSI OUT signal Z2 = ZSI OUT Z3 = ZSI IN signal Z4 = ZSI IN short-time delay Z5 = ZSI IN ground fault
–	•	•	•	T	External neutral sensor
–	•	•	•	F	24 Vdc external power supply
–	–	•	•	Vn[2]	External neutral voltage takeoff
–	–	•	•	V1, V2, V3	External phase voltage takeoff
–	–	•	•	M6C[3]: Q1, Q2, Q3	6 programmable contacts 24 Vdc external power supply required

Function	Connector	Description
Auxiliary Contacts	OF	Open/Closed circuit breaker or switch position contacts
	SD	Bell alarm
	SDE	Electrical fault alarm contact
Remote Operation	MN	Undervoltage trip device
	MX	Shunt trip

[1]Remove factory jumpers between Z3, Z4 and Z5 if ZSI is connected. Remove factory jumper between T1 and T2 if neutral CT is connected.
[2]Neutral voltage supplied with flying leads.
[3]Optional M6C Programmable Contacts are supplied with flying leads.

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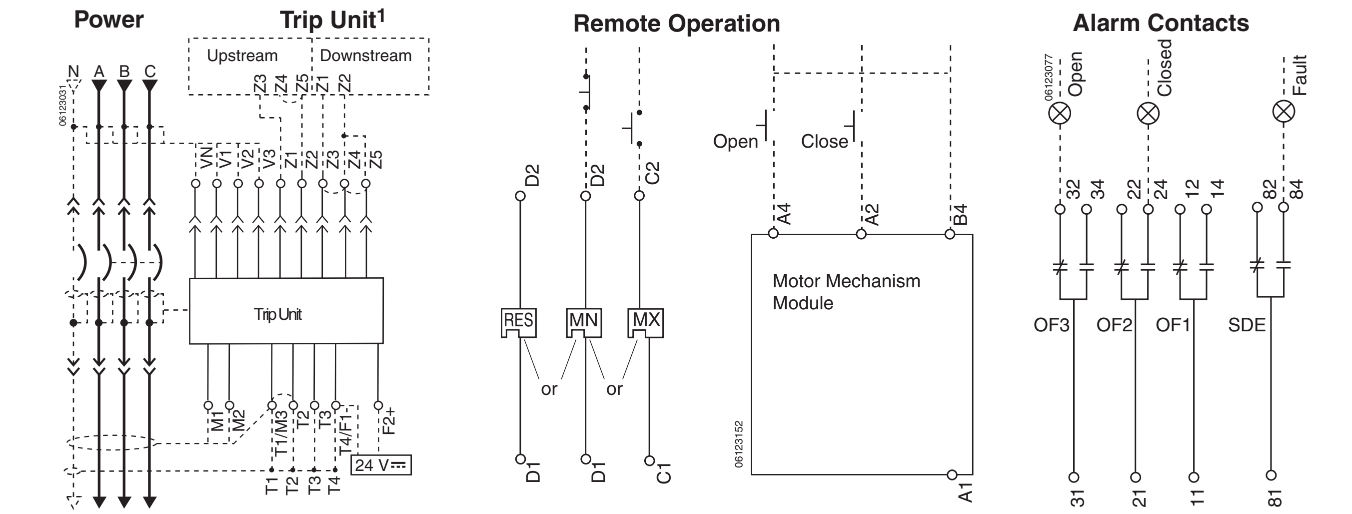
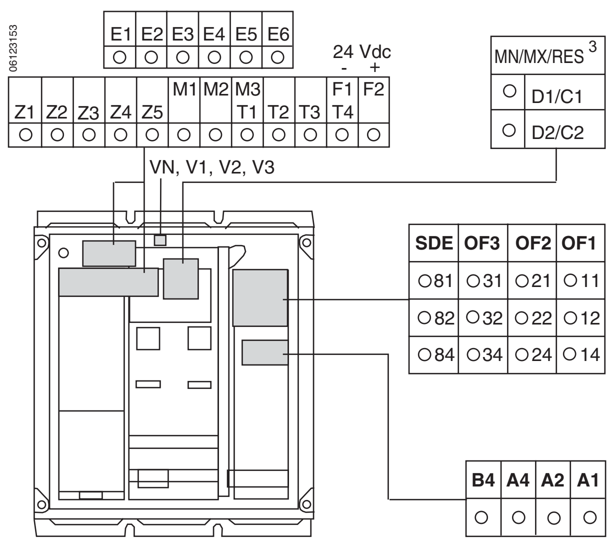
NOTE: All diagrams show circuit breaker in tripped position.

Figure 16: Accessory Control Wiring Diagrams for Electrically-Operated Circuit Breakers





Trip Unit Type Basic	A	P	H	Connector	Description
–	•	•	•	Com: E1-E6	Circuit breaker communication module E1 = +24 Vdc E2 = Common E3 = A/Tx- D0 E4 = B/Tx+ D1 E5 = A/Rx- D0 E6 = B/Rx+ D1
–	•	•	•	Z	Zone-selective Interlocking (ZSI) Z1 = ZSI OUT signal Z2 = ZSI OUT Z3 = ZSI IN signal Z4 = ZSI IN short-time delay Z5 = ZSI IN ground fault
–	•	•	•	T	External neutral sensor
–	•	•	•	F	24 Vdc external power supply
–	–	•	•	Vn	External voltage plug
–	–	•	•	V1, V2, V3[2]	External phase voltage takeoff
–	–	•	•	M6C[2]: Q1, Q2, Q3	6 programmable contacts 24 Vdc external power supply required

Connector	Recommended Wire Size
E1–E2	22 AWG (0.3 mm²) MIN shielded pair cable or twisted pair copper wires
V1, V2, V3, Vn	22–16 AWG (0.3–1.5 mm²)
T	22 AWG (0.3 mm²) stranded shielded cable
E3–E6, Q1, Q2, Q3	22 AWG (0.3 mm²) shielded twisted pairs with drain (Belden 8723 or equal)[2]
OF, SD, SDE	18–16 AWG (0.8–1.5 mm²)
MN, MX, RES	18–14 AWG (0.8–2.5 mm²)
F	Size per aux. 24 Vdc power supply
Z1–Z5	22–18 AWG (0.3–0.8 mm²)

Function	Connector	Description
Auxiliary Contacts	SDE	Electrical fault alarm contact
	OF	Open/Closed circuit breaker or switch position contacts
Remote Operation	MN	Undervoltage trip device
	MX	Shunt trip
	RES	Remote Reset
Motor Mech Module	A4	Electrical opening
	A2	Electrical closing
	B4, A1	Power supply for control devices and gear motor

[1] Remove factory jumpers between Z3, Z4 and Z5 if ZSI is connected. Remove factory jumper between T1 and T2 if neutral CT is connected.
[2] Optional M6C and external voltage takeoff are supplied with flying leads.
[3] Remote Reset (RES), Undervoltage Trip (MN), and Shunt Trip (MX) cannot be used together in any combination. Remote Reset is only for PowerPact P-frame electrically operated fixed circuit breakers.

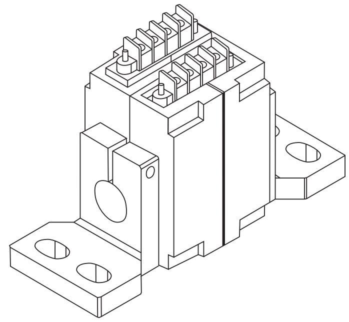
Ground-Fault Protection for Equipment

If circuit breaker does not have integral ground-fault tripping or alarm, skip this subsection.

A three-phase, four-wire circuit requires an external neutral current transformer (CT). Connect neutral CT to circuit breaker according to wiring diagrams in Figure 18.

NOTE: The equipment grounding connection must be upstream (line side) of the neutral CT and a neutral connection must exist from the supply transformer to the equipment.

Figure 17: Neutral Current Transformers



1. Feed Belden® cable from the neutral CT to the cradle terminals.
2. Connect the cable per the appropriate schematic.
3. Place Belden cable in plastic conduit.
4. Verify all wiring.
5. Verify that F1 and F2 are isolated from ground.

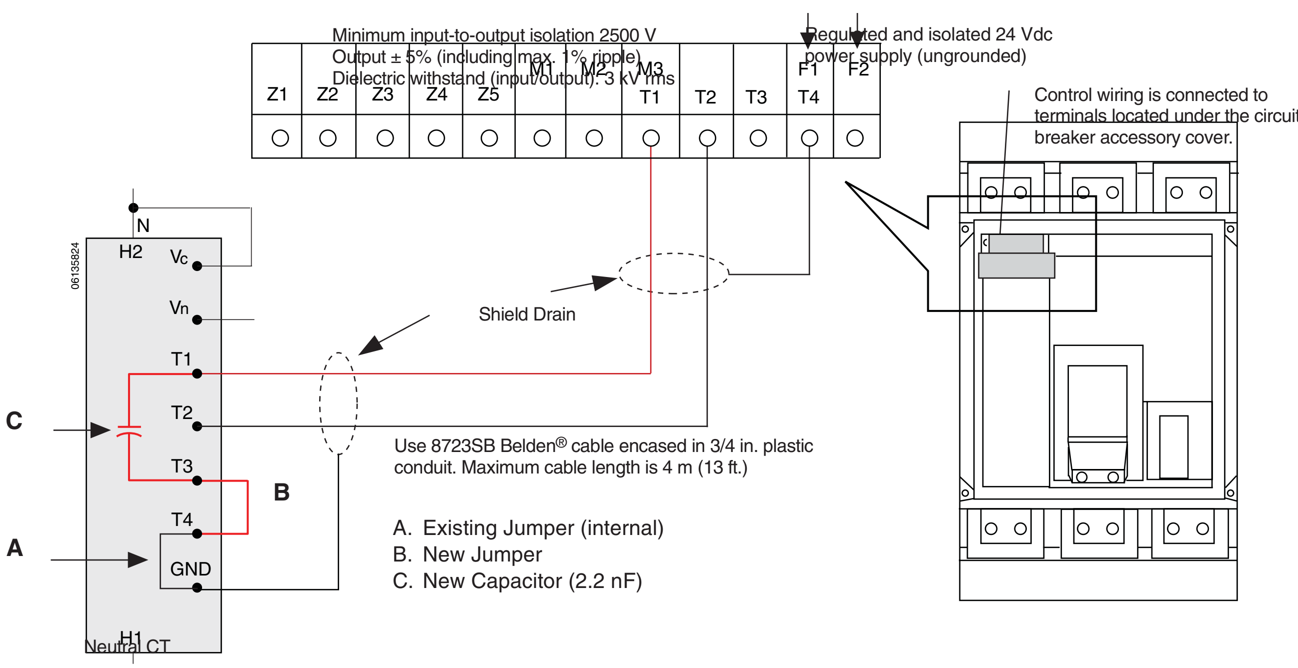
NOTICE

HAZARD OF IMPROPER TRIP SYSTEM OPERATION

F1 and F2 must be isolated from ground. Verify all wiring per the instructions in this bulletin.

Failure to follow this instruction can result in a nuisance trip during closing.

Figure 18: Wiring Schematic



Replace Accessory Cover

NOTICE

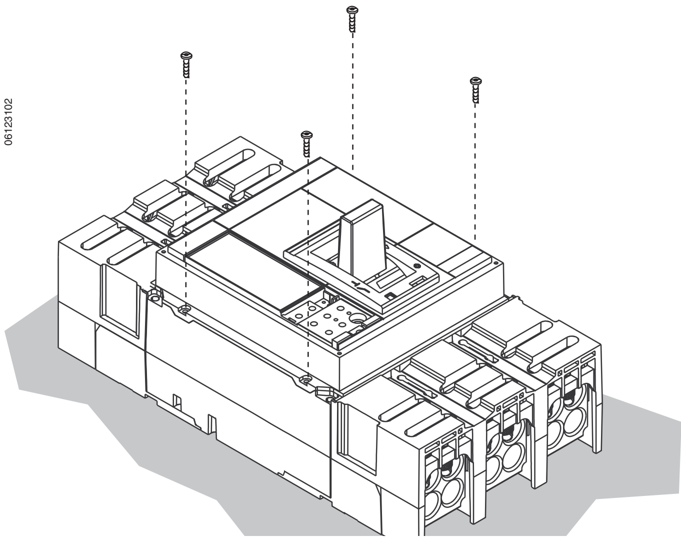
HAZARD OF EQUIPMENT DAMAGE

Accessory cover must be secured with all four screws tightened to stated torque. Do not overtorque screws. Do not use power equipment to torque screws.

Failure to follow these instructions can result in equipment damage.

Replace accessory cover. Replace all four accessory cover screws. Hand tighten screws to 11–13 lb-in (1.2–1.5 N•m). Do not exceed torque specification of screws.

Figure 19: Replace Accessory Cover



Circuit Breaker Removal

Turn off all power supplying this equipment before working on or inside equipment.

Remove circuit breaker in reverse order of installation.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

Operation

Manually-Operated Circuit Breakers:

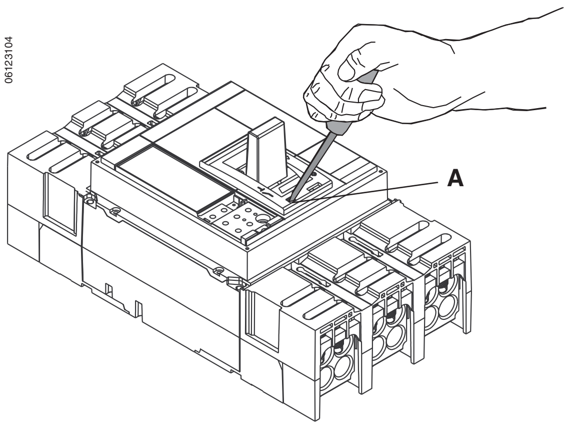
Press push-to-trip button (**Figure 20, A**) at installation to check operation. Repeat once a year to exercise circuit breaker.

NOTE: Push-to-trip button will not trip circuit breaker if it is in the OFF (O) position.

Electrically-Operated Circuit Breakers:

Charge circuit breaker with charging handle and press ON (I) and OFF (O) button at installation to check operation. Repeat once a year to exercise circuit breaker.

Figure 20: Press Push-to-Trip Button



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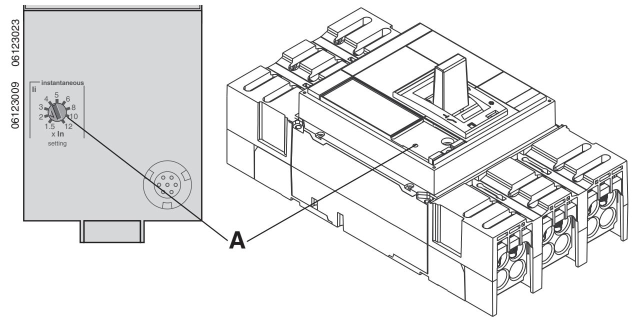
Trip Unit Adjustment

A. For ET1.0I and ET1.0M electronic trip units: Adjust instantaneous trip (Ii) by adjusting switch (**Figure 21, A**).
B. For Micrologic™ electronic trip units, refer to the trip unit user guide, which can be found on the Schneider Electric website (see Page 1).

Figure 21: Adjust Instantaneous Trip Switch

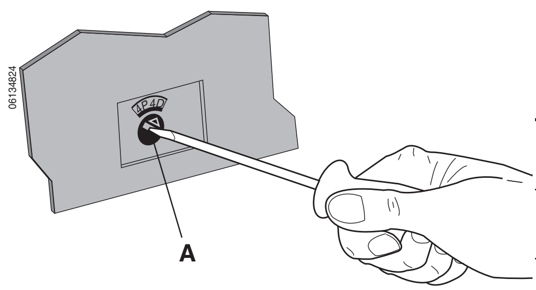


Neutral Protection Adjustment

NOTE: Applies to four-pole circuit breakers only.

A. For ET electronic trip units and Micrologic 2.0, 3.0, 5.0, 2.0A, 3.0A and 5.0A electronic trip units:
   — Remove fourth pole lens cover.
   — Use a slotted screwdriver to adjust neutral setting on circuit breaker (**Figure 22, A**).
   — Replace fourth pole lens cover. Torque screw to 5.3 in-lb (0.6 N•m).
B. For Micrologic 5.0P, 6.0P, 5.0H and 6.0H electronic trip units refer to the trip unit user guide, which can be found on the Schneider Electric website (see Page 1).

Figure 22: Adjust Circuit Breaker System Type Switch (on Four-Pole Circuit Breaker



Circuit Breaker Switch Setting	Neutral Protection
4P 3D	No neutral protection
3P N/2	1/2 neutral protection
4P 4D	Full neutral protection (factory default setting)

Testing

Circuit breaker trip unit operation can be tested using the Hand-held Test Kit or the Full-function Test Kit.

Troubleshooting

If problems occur during installation, refer to information below. If trouble persists, contact the field office.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Troubleshooting may require energizing auxiliary devices with a test power supply. Make sure that the power supply is off before connecting or disconnecting it to the auxiliary device.
- Do not touch the terminals of the device during the test.

Failure to follow these instructions will result in death or serious injury.

Condition	Possible Causes	Solution
Circuit breaker fails to stay closed.	1. Trip adjustment set too low. 2. Undervoltage trip not energized. 3. Shunt trip energized. 4. Short circuit or overload on system.	1. Adjust trip setting. 2. Energize undervoltage trip. 3. De-energize shunt trip. 4. Check system for short circuit or overload.
Circuit breaker trips, but no short circuit or overload is evident.	1. Trip adjustment set too low. 2. Voltage is below undervoltage trip setting.	1. Adjust trip setting. 2. Check system for low voltage.
Push-to-trip button will not trip circuit breaker.	Circuit breaker already tripped or OFF (O).	Move circuit breaker handle to reset, then to ON (I).
Circuit breaker cannot be opened manually.	Damage to current path.	Contact local field office.

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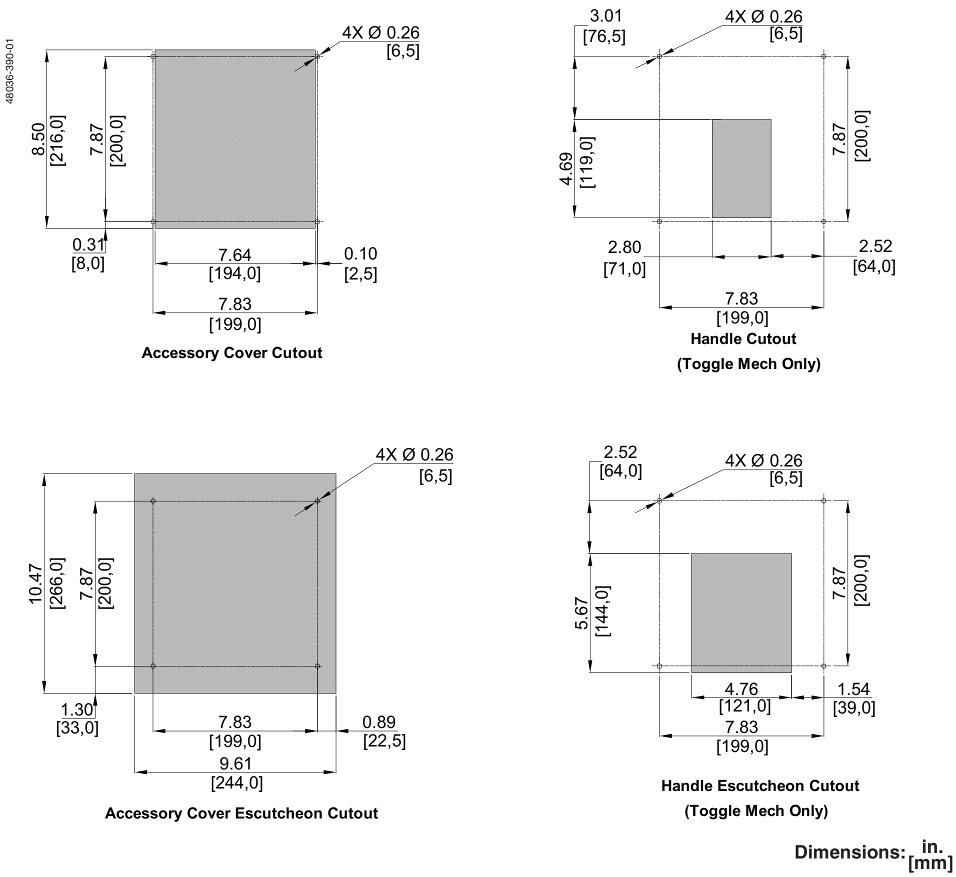
Dimensions

Enclosure Information

Table 4: Enclosure Dimensions

Circuit Breaker Rating	Circuit Breaker Enclosure Dimensions (H x W x D)		Ventilation Area			
	in.	mm	Top		Bottom	
≤ 800 A, 100% rated	51.9 x 20.25 x 7.75	1318.3 x 514.4 x 196.9	–	–	–	–
≤ 1200 A, standard rated	51.9 x 20.25 x 7.75	1318.3 x 514.4 x 196.9	–	–	–	–
> 800 A, 100% rated	62.25 x 23 x 14.75	1581.2 x 584.2 x 374.7	16.5 in.^{2}	10,645 mm^2	16.5 in.^{2}	10,645 mm^2

Figure 23: Enclosure Mounting Holes and Door Cutout Dimensions



Circuit Breaker Dimensions

For circuit breaker dimensions, refer to the circuit breaker dimensions on the Schneider Electric website (see Page 1).

Schneider Electric USA, Inc.
800 Federal Street
Andover, MA 01810 USA
888-778-2733
www.schneider-electric.us

Interruptores automáticos PowerPact™ con marco P y NS630b–NS1600

Conservar para uso futuro.

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Herramientas necesarias

Destornillador Pozidriv® no. 2 ó 3, o de punta plana

Llave de cubo, cavidad hexagonal interna de 7 mm

Destornillador de punta plana y cuerpo largo

Llave de apriete prefijado de 5/16 pulg

Información adicional

Este boletín proporciona las instrucciones de instalación de los interruptores automáticos PowerPact marco P y NS630b–NS1600. La unidad de disparo electrónico Micrologic™ controla las funciones de disparo.

Para obtener información adicional, consulte las siguientes guías del usuario disponibles en el sitio web de Schneider Electric™:

- Catálogo 0612CT0101: Interruptor automático *PowerPact™ marcos M, P y R*
- Boletín 0613IB1313: *Sistema de comunicaciones Modbus*
- Boletín 0613IB1205: *Dibujos dimensionales de los interruptores automáticos PowerPact™*
- Boletín 48049-136-05: *Unidades de disparo electrónico Micrologic 2.0A, 3.0A, 5.0A y 6.0A*
- Boletín 48049-330-03: *Unidades de disparo electrónico Micrologic 5.0H y 6.0H*
- Boletín 48049-137-05: *Unidades de disparo electrónico Micrologic 5.0P y 6.0P*
- Boletín 48049-207-05: *Unidades de disparo electrónico Micrologic 2.0, 3.0 y 5.0*
- Consulte el boletín 5120108AA o 51201027 para obtener las instrucciones de conexión trasera.

Para acceder a nuestro sitio web, vaya a:

http://www.schneider-electric.com

Para obtener asistencia sobre alguna aplicación, llame al 1-888-778-2733 en EUA y al 01800- 724634337 en México.

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Instalación del interruptor automático

1. Desenergice el equipo antes de realizar cualquier trabajo en él.
2. Asegúrese de que el interruptor automático esté en posición de disparado o abierto.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA o Z462 de CSA y NOM-029-STPS.
- Solamente el personal eléctrico especializado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo en él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de volver a energizar el equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Instalación del interruptor automático de montaje individual

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

Instale el interruptor automático de tal manera que se cumpla con los requisitos de espacio libre mínimo con piezas metálicas conectadas a tierra.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

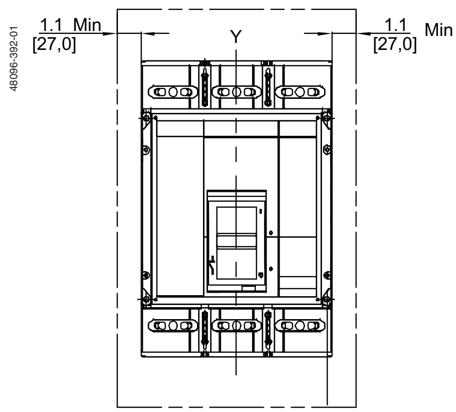
3. Verifique los espacios libres entre el interruptor automático y el metal conectado a tierra más cercano. (Consulte la tabla 4 para obtener las dimensiones mínimas del gabinete.)

4. Prepare el gabinete para instalar el interruptor automático (vea la figura 23 en la página 16 para obtener las dimensiones de los agujeros de montaje así como del corte en la cubierta.)

   — Perfore los agujeros de montaje en la superficie de montaje para roscas de 10-32.

   — Haga un corte en la cubierta para la palanca del interruptor automático, el escudo de la palanca, la cubierta de accesorios o el escudo de la cubierta de accesorios.

Figura 1: Requisitos de espacio libre mínimo con piezas de metal



Dimensiones: pulg [mm]

⚠ ADVERTENCIA

PELIGRO DE DESCARGA ELÉCTRICA, DESTELLO POR ARQUEO O DAÑO AL EQUIPO

- Utilice sólo los tornillos de montaje aislados, provistos para montar el interruptor automático.
- Todas las cuatro roldanas (figura 2, A) y los tornillos de montaje (B) deben estar instalados y apretados en el valor designado.
- Los interruptores automáticos accionados eléctricamente deben estar conectados a tierra mediante la instalación de un tornillo de montaje aislado en el agujero inferior derecho (C) del tornillo de montaje.

El incumplimiento de estas instrucciones puede causar lesiones serias o daño al equipo.

5. Instale el interruptor automático utilizando cuatro roldanas (figura 2, A, incluidas) y cuatro tornillos aislados de 10-32 x 4,5 pulg (B, incluidos). Apriete los tornillos en 4 N•m (36 lbs-pulg).

6. Para los interruptores automáticos conectados a las barras, atornille las barras al interruptor:
   a. Inserte los tornillos (figura 3, A, provistos) por los agujeros en la barra (B) y en la placa con tuercas (C) del interruptor. Utilizando un destornillador de punta plana, apriete los tornillos en 5,65 N•m (50 lb-pulg).
   b. Sujete las barras (**C**) con las tuercas (**D**, provistas). Apriete las tuercas en 28 N•m (250 lb-pulg).

Figura 2: Montaje del interruptor

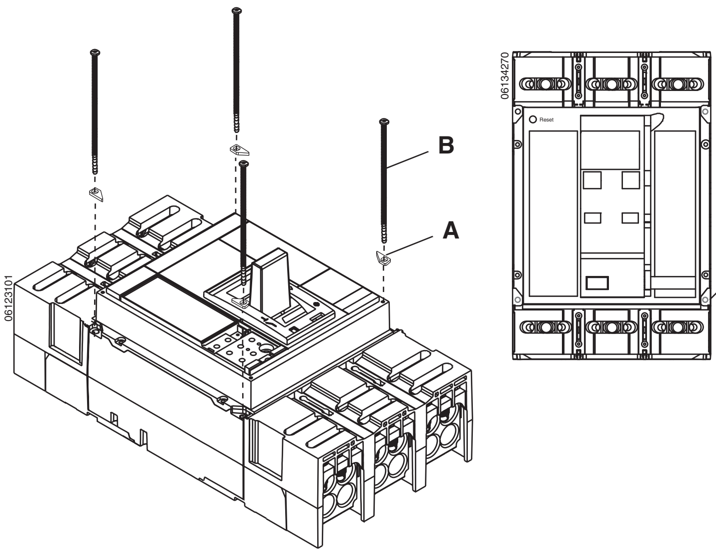
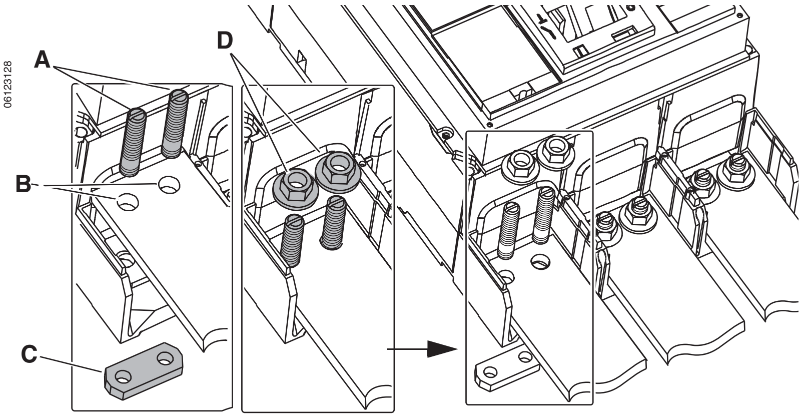


Figura 3: Instalación de las barras



ESPAÑOL

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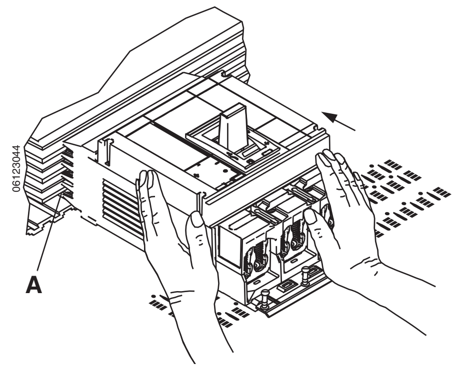
Instalación del interruptor automático I-Line™

> **AVISO**
>
> **PELIGRO DE DAÑO AL EQUIPO**
>
> - No ajuste las mordazas.
> - No retire el compuesto para juntas.
> - Si es necesario, utilice el compuesto para juntas PJC7201 de Square D™.
>
> **El incumplimiento de estas instrucciones puede causar daño al equipo.**

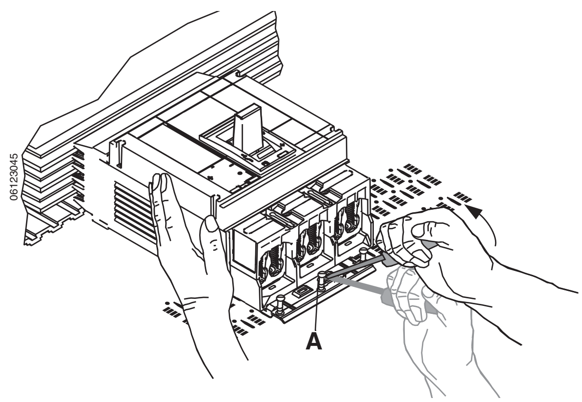
1. Coloque el interruptor automático en la posición de disparado o abierto (O/OFF).
2. Coloque el interruptor automático en la bandeja I-Line con las mordazas (**figura 4, A**) totalmente encajadas en las barras.

Figura 4: Colocación del interruptor automático sobre la bandeja



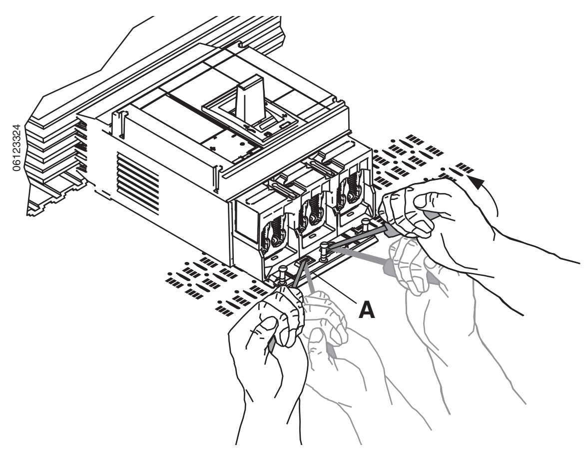
3. Inserte el destornillador de punta plana y cuerpo largo (**figura 5, A**) en la ranura. Monte el interruptor automático sobre la barra hasta que las mordazas enganchen completamente en las barras.

Figura 5: Inserción del interruptor automático en las barras



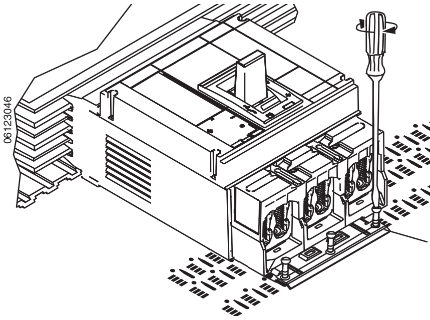
4. Inserte el segundo destornillador (**figura 6, A**) en la ranura inferior. Monte el interruptor automático sobre la barra utilizando los destornilladores alternadamente hasta que las mordazas enganchen completamente en las barras.

Figura 6: Enganche el interruptor automático completamente en las barras



5. Apriete firmemente los tres tornillos del soporte de montaje (**figura 7, A**) sin doblar el soporte de montaje.

Figura 7: Apriete de los tornillos del soporte de montaje



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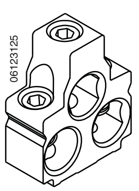
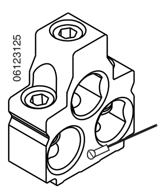
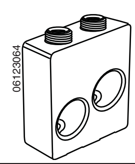
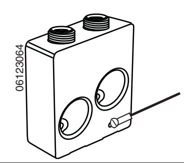
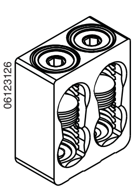
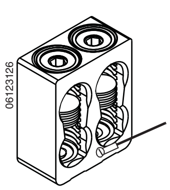
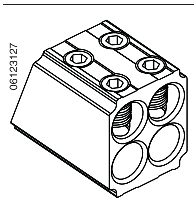
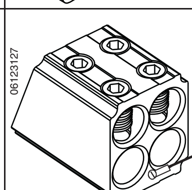
Instalación de cables

Corte las puntas de los conductores y prefórmelos en la configuración final. Con una herramienta para pelar cables adecuada, pele las puntas de los conductores según la tabla 1. No ranure los hilos.

> ***AVISO***
>
> **PELIGRO DE INDICACIÓN FALSA DEL PAR DE APRIETE**
>
> No permita que los hilos del conductor interfieran con las roscas del tornillo de sujeción del cable.
>
> **El incumplimiento de estas instrucciones puede causar daño al equipo.**

Tabla 1: Información de las zapatas del interruptor

Zapata	Zapata con cable de control opcional instalado	Número de catálogo	Conductores				Par de apriete	
			Tipo	Calibre	Cont.		Tornillo de sujeción de cables	Tornillo del cable de control
		AL800M23K[1,2]	Al/Cu	95–240 mm^2 (3/0–500 kcmil)	3	25 mm (1 pulg)	50 N•m (442,5 lb-pulg)	1–1,3 N•m (9–12 lb-pulg)
		CU800M23K[2]	Cu					
		AL800P6K[1,2]	Al/Cu	95–300 mm^2 (3/0–600 kcmil)	2	30 mm (1,2 pulg)	50 N•m (442,5 lb-pulg)	1–1,3 N•m (9–12 lb-pulg)
		AL1200P24K[1,4]	Al/Cu	95–240 mm^2 (3/0–500 kcmil)	4	30 mm (1,2 pulg)	50 N•m (442,5 lb-pulg)	1–1,3 N•m (9–12 lb-pulg)
		CU1200P24K[4]	Cu					
		AL1200P25K[1,2,5]	Al/Cu	95–240 mm^2 (3/0–500 kcmil)	4	Agujeros superiores: 30 mm (1,25 pulg) Agujeros inferiores: 57 mm (2,25 pulg)	50 N•m (442,5 lb-pulg)	1–1,3 N•m (9–12 lb-pulg)
		CU1200P25K[2,5]	Cu					

Continúa en la siguiente página

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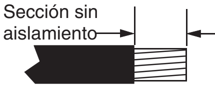
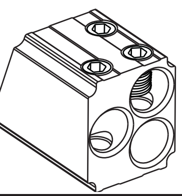
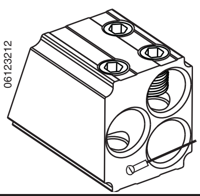
Tabla 1: Información de las zapatas del interruptor *(continuación)*

Zapata	Zapata con cable de control opcional instalado	Número de catálogo	Conductores				Par de apriete	
			Tipo	Calibre	Cont.	Sección sin aislamiento 	Tornillo de sujeción de cables	Tornillo del cable de control
 06123212	 06123212	AL1200P6KU[1,2,5]	Al/Cu	185–300 mm^2 (350–600 kcmil)	3	Agujeros superior e intermedio: 30 mm (1,25 pulg) Agujeros inferiores: 57 mm (2,25 pulg)	50 N•m (442,5 lb-pulg)	1–1,3 N•m (9–12 lb-pulg)

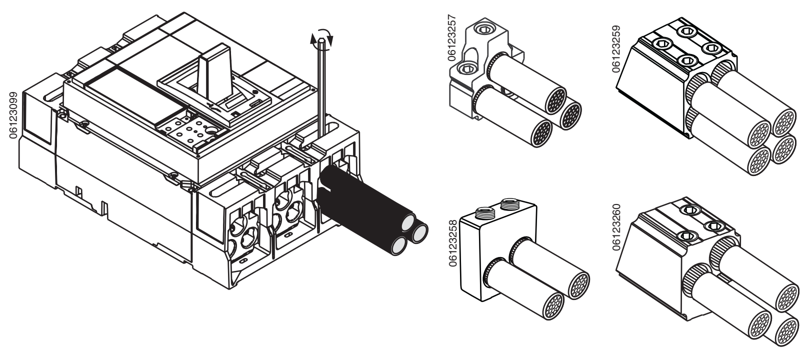
[1] En los modelos con agujero roscado para el cable de control, agregue una T antes de la K al número de catálogo (ej. AL800M23**T**K).
[2] Agregue el sufijo “4” al número de catálogo de los accesorios de interruptor automático de cuatro polos (por ejemplo AL800M23K4 o AL800M23TK4).
[3] Para obtener una conexión segura a las terminales, corte los conductores.
[4] Sólo para montaje por el extremo de carga (parte inferior).
[5] No es adecuado para interruptores automàticos I-Line.

Kits de las zapatas AL800M23K, CU800M23K, AL800P6K, AL1200P25K, CU1200P25K y AL1200P6KU

Para las zapatas instaladas en fábrica, instale los cables en la zapata y apriete el tornillo de sujeción del cable según la recomendación de la placa frontal.

Para los kits de zapatas instaladas en campo, consulte el boletín de instrucciones incluido con el kit.

Figura 8: Instalación de los cables en las zapatas AL800M23K, AL800P6K, AL1200P25K, CU800M23K, CU1200P25K y AL1200P6KU



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Kits de las zapatas AL1200P24K y CU1200P24K

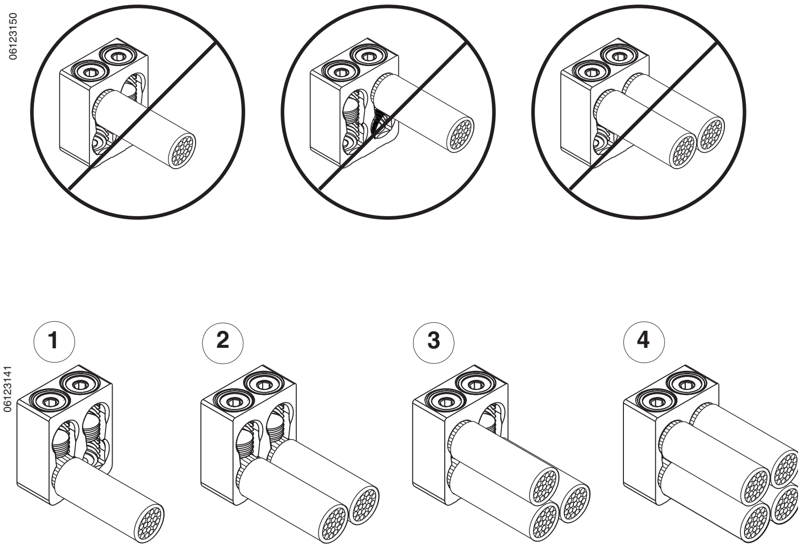
Para las zapatas instaladas en fábrica, instale el cable en el orden que aparece y apriete el tornillo de sujeción del cable según la recomendación de la placa frontal.

NOTA: Instale primero los cables inferiores. Los tornillos de sujeción de cables inferiores deben estar totalmente apretados antes de instalar los cables superiores. Retire el espaciador de espuma antes de la instalación del cable.

1. Instale el cable inferior izquierdo y apriete el tornillo de sujeción del cable.
2. Instale el cable inferior derecho y apriete el tornillo de sujeción del cable.
3. Instale el cable superior izquierdo y apriete el tornillo de sujeción del cable.
4. Instale el cable superior derecho y apriete el tornillo de sujeción del cable.

Para los kits de zapatas instaladas en campo, consulte el boletín instrucciones incluido con el kit.

Figura 9: Instalación de los cables en las zapatas AL1200P24K y CU1200P24K



Inmovilización de cables

> ## *AVISO*
>
> **PELIGRO DE MOVIMIENTO DE CONDUCTORES BAJO CONDICIONES DE CORTOCIRCUITO**
>
> Inmovilice los conductores del interruptor automático de acuerdo con las recomendaciones de la tabla 2.
>
> **El incumplimiento de estas instrucciones puede causar daño al equipo.**

Tabla 2: Recomendaciones de uso del inmovilizador de cables

Tamaño de marco	Corriente de falla disponible	Conductores utilizados	Longitud de cable no aceptable	Inmovilizador recomendado
800 A	≤ 65 kA	Tres de 300 kcmil o mayor	≤ 279 mm (11 pulg)	No*
	Todos los demás casos			Sí
1 200 A	≤ 65 kA	Cuatro de 350 kcmil o mayor	≤ 256 mm (14 pulg)	No*
	Todos los demás casos			Sí

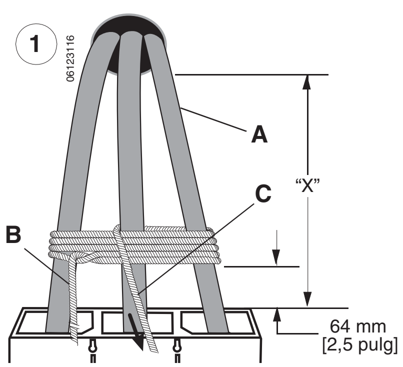
*Se deberá cumplir con todos los requisitos para que no se necesite un inmovilizador de cables.

Inmovilice los conductores del interruptor automático de acuerdo con las recomendaciones de la tabla 2.

Enrede los conductores con 9 m (30 pies) de cuerda de sisal de 9,5 mm (3/8 pulg) o equivalente.

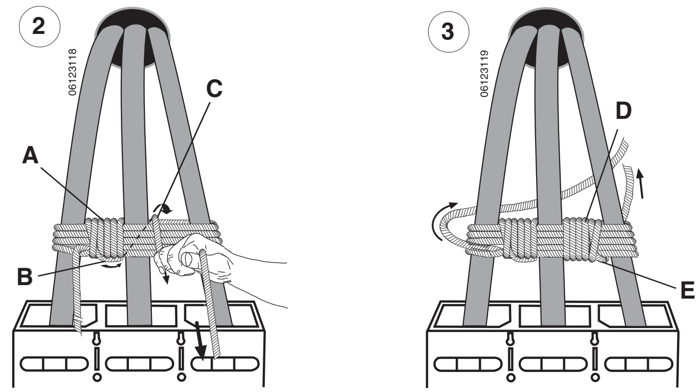
1. Comience a enredar los conductores (**figura 10, A**) 64 mm (2,5 pulg) por encima del interruptor automático. Enrede los conductores cinco veces, dejando 4 + “X” m (12 + “X” pies) de cuerda en el primer extremo (**B**). Jale la cuerda (**C**) hasta tensarla.

Figura 10: Amarre de los conductores



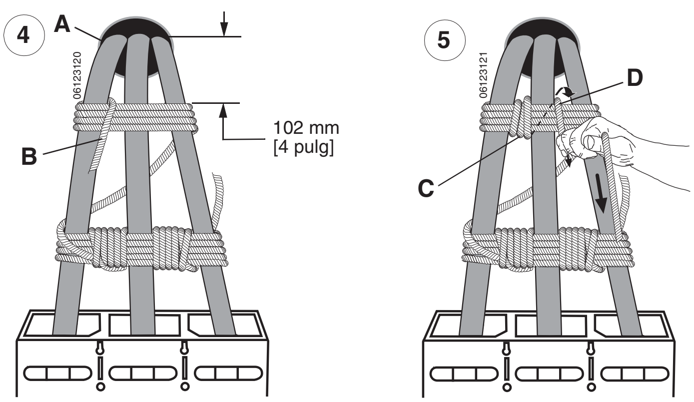
2. Enrede la cuerda (**figura 11, A**) varias veces hasta llenar completamente el espacio entre los primeros dos grupos de conductores. Amarre la vuelta final de la cuerda debajo de la vuelta anterior (**B**). Pase la cuerda (**C**) por el espacio del lado derecho. Jale la cuerda hasta tensarla.
3. Enrede la cuerda (**D**) varias veces hasta llenar completamente el espacio entre el segundo y tercer grupo de conductores. Enrede la última vuelta de la cuerda (**E**) debajo de la vuelta anterior, como se muestra. Jale la cuerda hasta tensarla.

Figura 11: Amarre de la cuerda



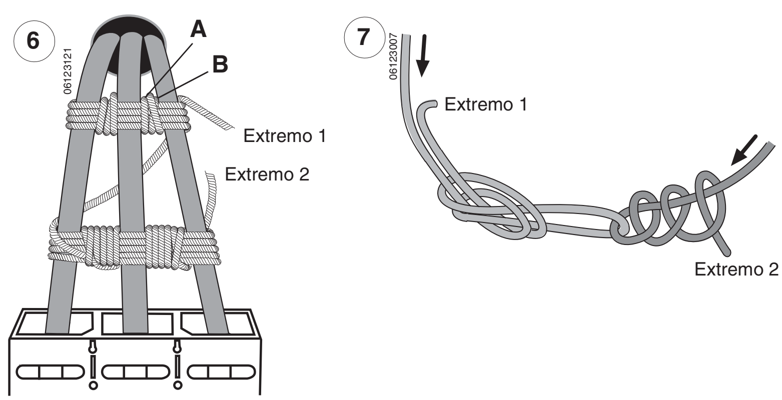
4. Enrede la cuerda cuatro veces alrededor de los conductores 102 mm (4 pulg) justo donde los conductores salen del gabinete (**figura 12, A**). Jale la cuerda (**B**) hasta tensarla.
5. Enrede la cuerda (**C**) varias veces hasta llenar completamente el espacio entre los primeros dos grupos de conductores. Pase la cuerda (**D**) por el espacio del lado derecho. Jale la cuerda hasta tensarla.

Figura 12: Amarre de los conductores



6. Enrede la cuerda (**figura 13, A**) varias veces hasta llenar completamente el espacio entre el segundo y tercer grupo de conductores. Enrede la última vuelta de la cuerda (**B**) debajo de la vuelta anterior, como se muestra. Jale la cuerda hasta tensarla.
7. Amarre los extremos 1 y 2 de la cuerda, como se muestra. La cuerda deberá estar tensa. Corte el resto de cuerda y ponga cinta de aislar en las puntas para evitar que se deshilache.

Figura 13: Amarre de la cuerda



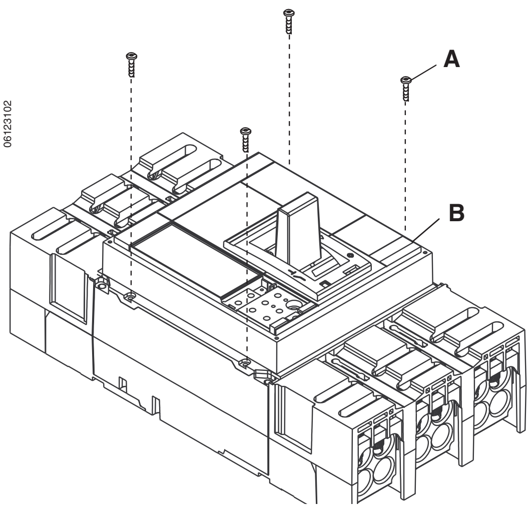
Instalación de los accesorios

Subsección aplicable para los interruptores automáticos con accesorios instalados en la fábrica o en campo.

Desmontaje de la cubierta de accesorios

1. Asegúrese de que el interruptor automático esté en posición de disparado o abierto.
2. Afloje los cuatro tornillos de la cubierta de accesorios (**figura 14, A**) y retírela (**B**).

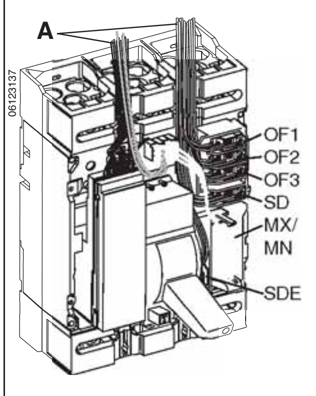
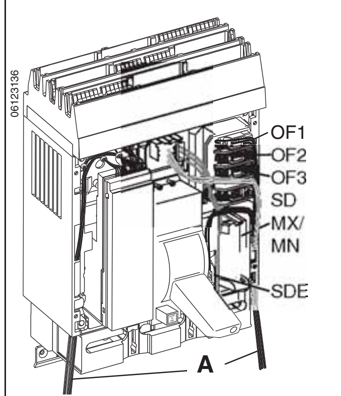
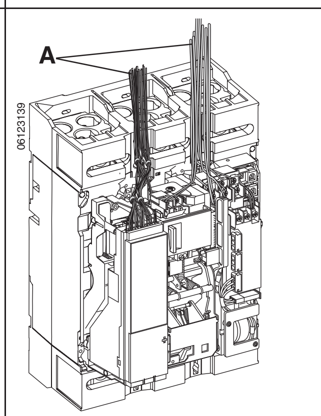
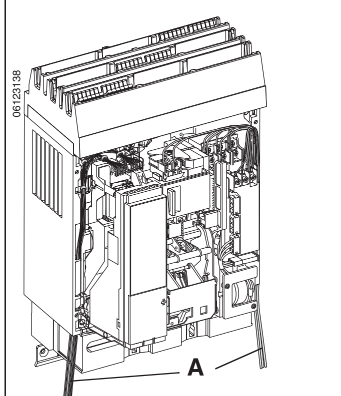
Figura 14: Desmontaje de la cubierta de accesorios



Instalación de los accesorios y cableado de control

1. Instale los accesorios del interruptor automático para instalarse en campo de acuerdo con las instrucciones provistas con cada accesorio.
2. Instale el cableado de control (**tabla 3, A**) en los accesorios. Apriete los tornillos de la terminal a 1,2 N•m (10 lbs-pulg).

Tabla 3: Cableado de control de los accesorios

Tipo	Interruptores automáticos de montaje individual	Interruptores automáticos I-Line
	Enrutamiento del cable	Enrutamiento del cable
Funcionamiento manual		
Funcionamiento eléctrico		

ESPAÑOL

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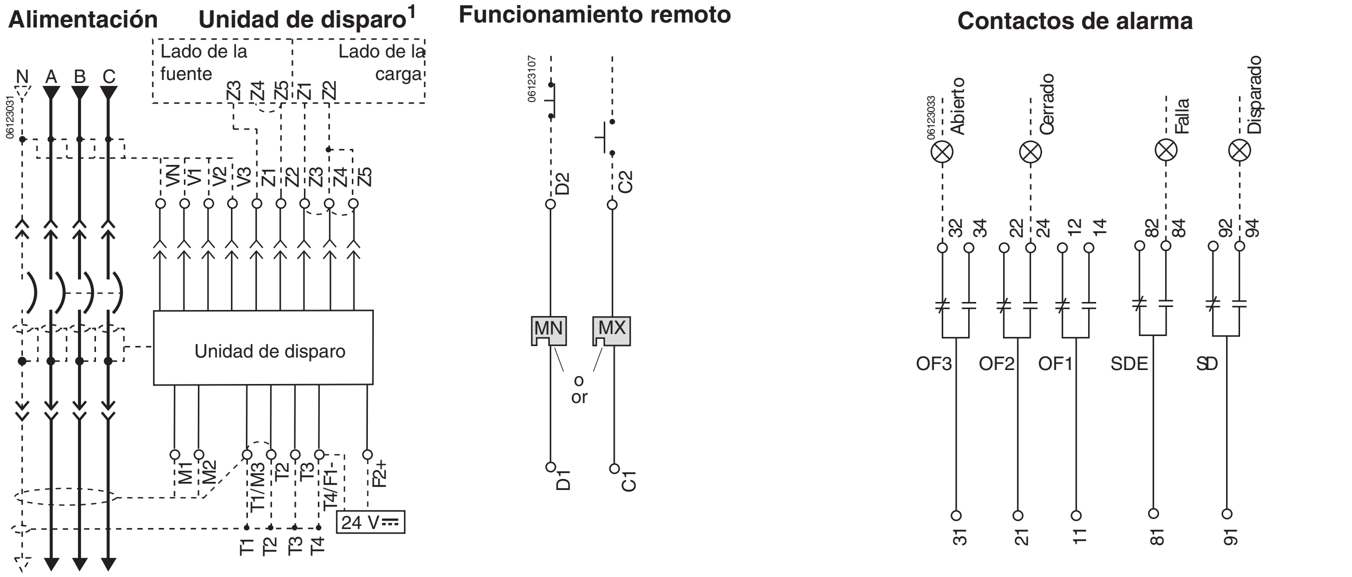
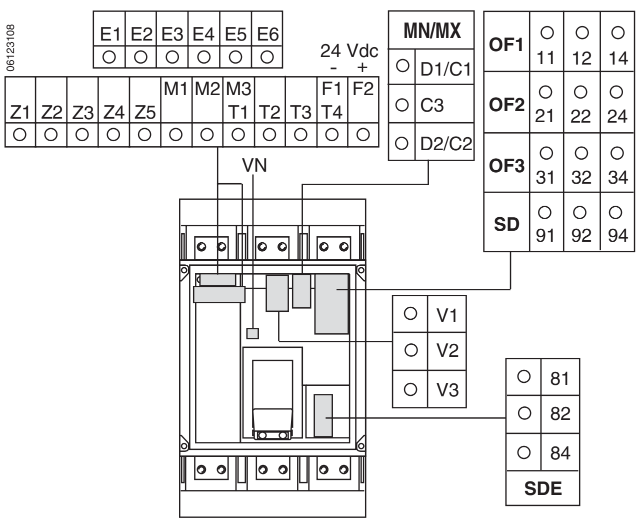
NOTA: Todos los diagramas muestran el interruptor automático en posición de disparado.

Figura 15: Diagramas del cableado de control de los accesorios para interruptores automáticos de funcionamiento manual





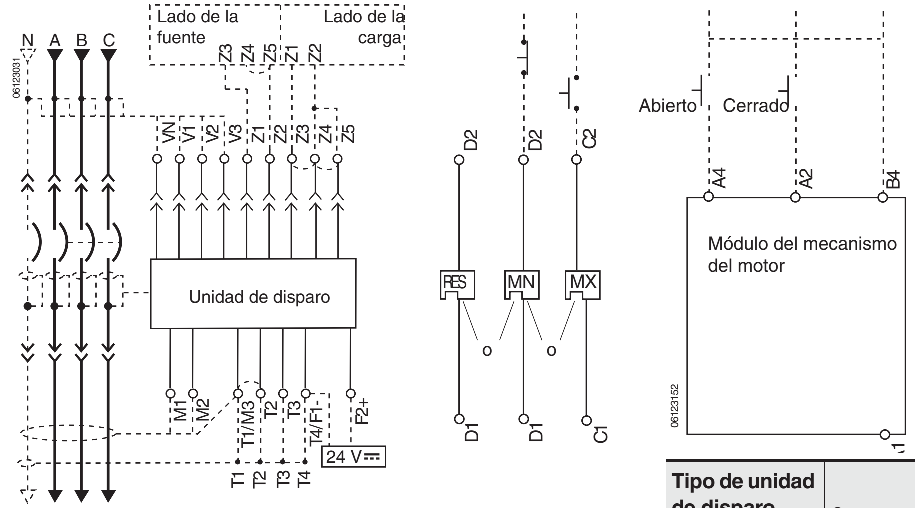
Conector	Calibre de cable recomendado
V1, V2, V3, Vn	0,3–1,5 mm^2 (22–16 AWG)
E1–E2	Conductores de cobre de pares trenzados o cable de pares blindados calibre 0,3 mm^2 (22 AWG) min
T	Cable blindado trenzado calibre 0,3 mm^2 (22 AWG)
E3–E6, Q1, Q2, Q3	Cable de pares blindados trenzados con hilo de drenaje, calibre 0,3 mm^2 (22 AWG), Belden 8723 o uno equivalente[3]
OF, SD, SDE	0,8–1,5 mm^2 (18–16 AWG)
MN, MX	0,8–2,5 mm^2 (18–14 AWG)
F	Tamaño según la fuente de alimentación auxiliar de 24 V (c.d.)
Z1–Z5	0,3–0,8 mm^2 (22–18 AWG)

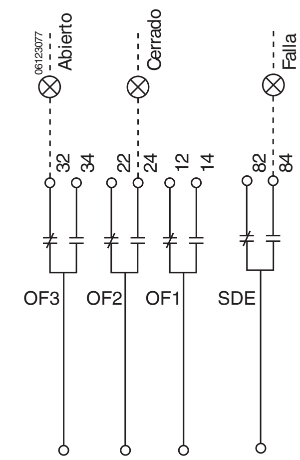
Tipo de unidad de disparo				Conector	Descripción
Básico	**A**	**P**	**H**		
–	•	•	•	Com: E1-E6	Módulo de comunicación del interruptor E1 = +24 Vdc E2 = Common E3 = A/Tx- D0 E4 = B/Tx+ D1 E5 = A/Rx- D0 E6 = B/Rx+ D1
–	•	•	•	Z	Enclavamiento selectivo de zona (ZSI) Z1= señal de salida del ZSI Z2= salida del ZSI Z3= señal de entrada del ZSI Z4= retardo de tiempo corto de entrada de ZSI Z5 = falla a tierra, entrada del ZSI
–	•	•	•	T	Sensor de neutro externo
–	•	•	•	F	Fuente de alimentación externa de 24 V⎓ (cd)
–	–	•	•	Vn[2]	Toma de tensión del neutro externa
–	–	•	•	V1, V2, V3	Toma de tensión de fase externa
–	–	•	•	M6C[3] (Q1, Q2, Q3)	6 contactos programables, se requiere una fuente de alimentación de 24 V⎓ (c.d.)
Función				**Conector**	**Descripción**
Contactos auxiliares				OF	Contactos del interruptor automático y de posición de abierto/cerrado
				SD	Timbre de alarma
				SDE	Contacto de alarma de falla eléctrica
Funcionamiento remoto				MN	Dispositivo de disparo por baja tensión
				MX	Disparo en derivación

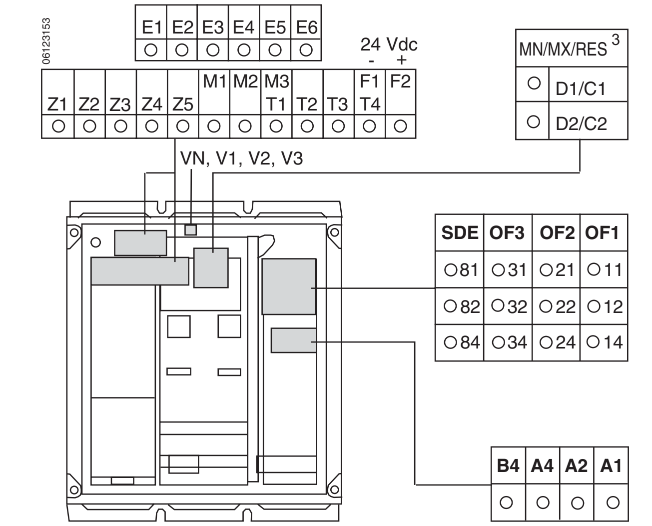
[1]Retire los cables de conexión en puente instalados en la fábrica entre Z3, Z4 y Z5 si está conectado el ZSI. Retire los cables de conexión en puente instalados en la fábrica entre T1 y T2 si está conectado el Tc al neutro.
[2]La conexión del neutro viene con conductores flexibles.
[3]Los contactos programables del módulo M6C opcional vienen provistos con conductores flexibles.

NOTA: Todos los diagramas muestran el interruptor automático en posición de disparado.

Figura 16: Diagramas del cableado de control de los accesorios para interruptores automáticos de funcionamiento eléctrico







Tipo de unidad de disparo				Conector	Descripción
Básico	A	P	H		
–	•	•	•	Com: E1-E6	Módulo de comunicación del interruptor E1 = +24 Vdc E2 = Common E3 = A/Tx- D0 E4 = B/Tx+ D1 E5 = A/Rx- D0 E6 = B/Rx+ D1
–	•	•	•	Z	Enclavamiento selectivo de zona (ZSI) Z1= señal de salida del ZSI Z2= salida del ZSI Z3= señal de entrada del ZSI Z4= retardo de tiempo corto de entrada de ZSI Z5 = falla a tierra, entrada del ZSI
–	•	•	•	T	Sensor de neutro externo
–	•	•	•	F	Fuente de alimentación externa de 24 V⎓ (cd)
–	–	•	•	Vn	Toma de tensión del neutro externa
–	–	•	•	V1, V2, V3[2]	Toma de tensión de fase externa
–	–	•	•	M6C[2] (Q1, Q2, Q3)	6 contactos programables, se requiere una fuente de alimentación de 24 V⎓ (c.d.)

Conector	Calibre de cable recomendado
E1–E2	Conductores de cobre de pares trenzados o cable de pares blindados calibre 0,3 mm^2 (22 AWG) min
V1, V2, V3, Vn	0,3–1,5 mm^2 (22–16 AWG)
T	Cable blindado trenzado calibre 0,3 mm^2 (22 AWG)
E3–E6, Q1, Q2, Q3	Cable de pares blindados trenzados con hilo de drenaje, calibre 0,3 mm^2 (22 AWG), Belden 8723 o uno equivalente[2]
OF, SD, SDE	0,8–1,5 mm^2 (18–16 AWG)
MN, MX, RES	0,8–2,5 mm^2 (18–14 AWG)
F	Tamaño según la fuente de alimentación auxiliar de 24 V (c.d.)
Z1–Z5	0,3–0,8 mm^2 (22–18 AWG)

Función	Conector	Descripción
Contactos auxiliares	SDE	Contacto de alarma de falla eléctrica
	OF	Contactos del interruptor y de posición de abierto/cerrado
Funcionamiento remoto	MN[3]	Dispositivo de disparo por baja tensión
	MX[3]	Disparo en derivación
	RES[3]	Restablecimiento remoto
Módulo del mecanismo del motor	A4	Apertura eléctrica
	A2	Cierre eléctrico
	B4, A1	Fuente de alimentación para los dispositivos de control y motor de engrane

[1]Retire los cables de conexión en puente, instalados en la fábrica, entre Z3, Z4 y Z5 si están conectados al enclavamiento selectivo de zona. Retire el cable de conexión en puente, instalado en la fábrica, entre T1 y T2 si está conectado el TC.
[2]El M6C opcional y la toma de tensión externa vienen con conductores en espiral.
[3]El restablecimiento remoto (RES), disparo por baja tensión (MN) y disparo en derivación (MX) no pueden ser usados juntos en ningún tipo de combinación. El restablecimiento remoto es sólo para interruptores automáticos fijos de funcionamiento eléctrico PowerPact marco P.

ESPAÑOL

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Protección contra fallas a tierra del equipo

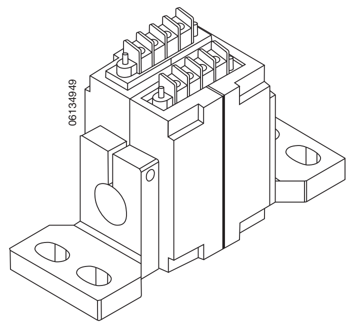
No es necesario leer esta subsección si su interruptor no dispone de disparo contra fallas a tierra o de alarma integral.

Un circuito de tres fases y cuatro hilos necesita un transformador de corriente al neutro (TC) externo. Conecte el TC al neutro al interruptor de acuerdo con los diagramas de cableado en la figura 18.

NOTA: La conexión a tierra del equipo se debe realizar en la corriente ascendente (en el lado de línea) del TC al neutro y debe contar con una conexión del neutro desde el transformador de alimentación hasta el equipo.

1. Pase el cable Belden® del TC al neutro a las terminales de la cuna.
2. Conecte el cable como se ilustra en el diagrama esquemático apropiado.
3. Coloque el cable Belden en el tubo conduit de plástico.
4. Revise todo el alambrado.
5. Asegúrese de que F1 y F2 estén aislados de tierra.

Figura 17: Transformadores de corriente al neutro



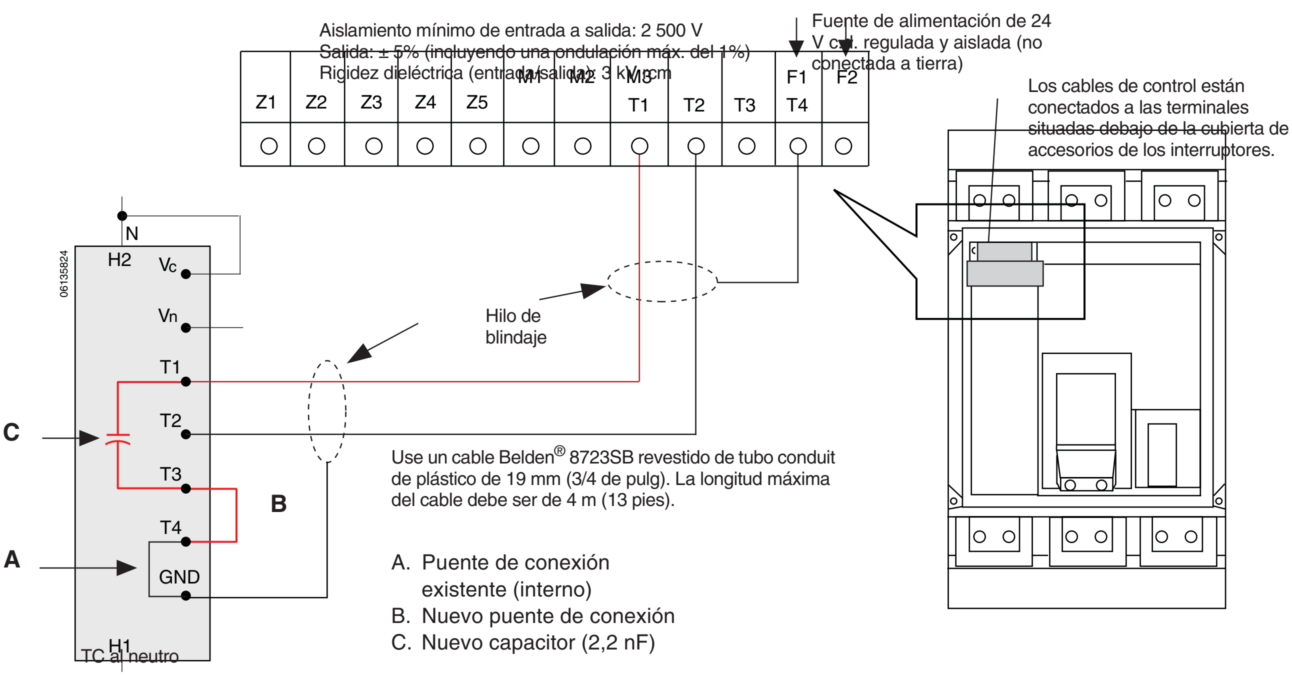
⚠ PELIGRO

PELIGRO DE FUNCIONAMIENTO INAPROPIADO DEL SISTEMA DE DISPARO

F1 y F2 deberán ser aislados de tierra. Asegúrese de que todo el alambrado haya sido instalado de acuerdo con las instrucciones de este boletín.

El incumplimiento de esta instrucción puede causar disparos incorrectos durante la operación de cierre.

Figura 18: Diagramas esquemáticos



A. Puente de conexión existente (interno)
B. Nuevo puente de conexión
C. Nuevo capacitor (2,2 nF)

Colocación de la cubierta de accesorios

AVISO

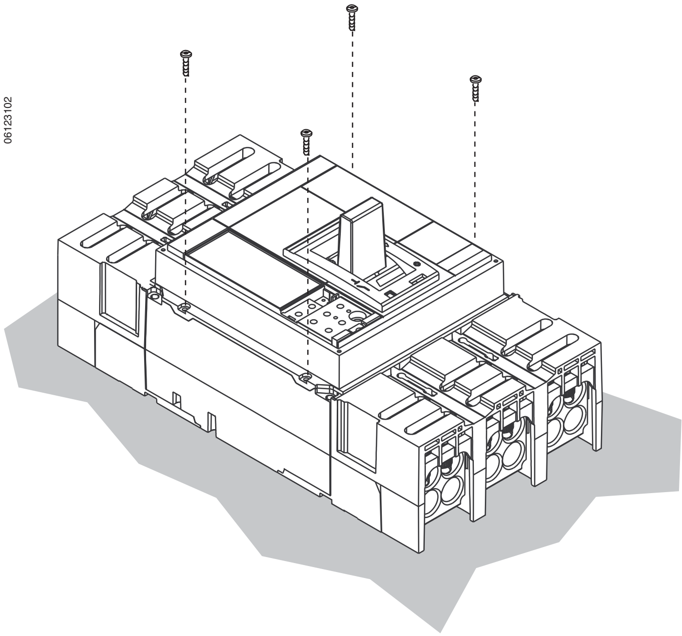
PELIGRO DE DAÑO AL EQUIPO

Apriete los cuatro tornillos según el valor indicado para sujetar la cubierta de accesorios. No apriete los tornillos en exceso. No utilice herramientas eléctricas para esto.

El incumplimiento de estas instrucciones puede causar daño al equipo.

Coloque la cubierta de accesorios. Vuelva a colocar los cuatro tornillos de la cubierta de accesorios. Apriete los tornillos con la mano de 1,2 a 1,5 N•m (11 a 13 lbs-pulg). No sobrepase los valores de par de apriete especificados para los tornillos.

Figura 19: Colocación de la cubierta de accesorios



Desmontaje del interruptor

Desenergice el equipo antes de realizar cualquier trabajo en él.

Desmonte el interruptor automático en el orden inverso al de su instalación

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA o Z462 de CSA y NOM-029-STPS.
- Solamente el personal eléctrico especializado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo en él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de volver a energizar el equipo.

El incumplimiento de esta instrucción podrá causar la muerte o lesiones serias.

ESPAÑOL

Funcionamiento

Interruptores automáticos de funcionamiento manual:

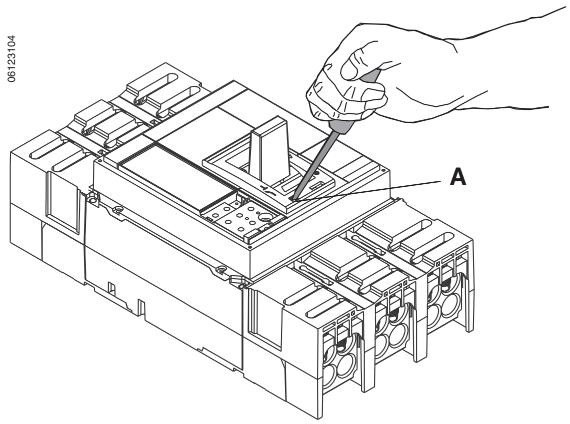
Pulse el botón de disparo (**figura 20, A**) durante la instalación para comprobar el funcionamiento. Repita la prueba una vez al año para volver a verificarlo.

NOTA: El botón de disparo no disparará el interruptor automático si se encuentra en la posición de abierto (O).

Interruptores automáticos de funcionamiento eléctrico:

Alimente el interruptor automático con la palanca de carga y presione el botón de conectado y desconectado durante la instalación para comprobar el funcionamiento. Repita la prueba una vez al año para volver a verificarlo.

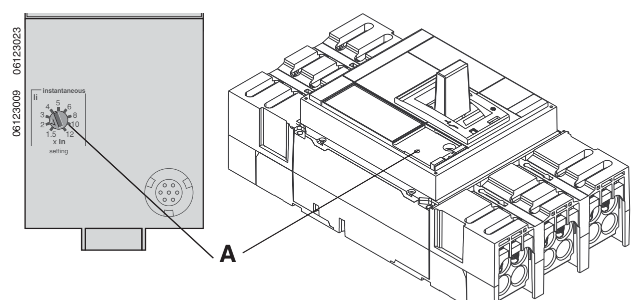
Figura 20: Presione el botón de disparo



Ajuste de la unidad de disparo

A. Para las unidades de disparo electrónico ET1.0I y ET1.0M: Ajuste el disparo instantáneo (Ii) ajustando el selector (**figura 21, A**).
B. Para las unidades de disparo electrónico Micrologic™, consulte la guía del usuario de la unidad de disparo, disponible en el sitio web de Schneider Electric (consulte la página 1).

Figura 21: Ajuste del selector de disparo instantáneo

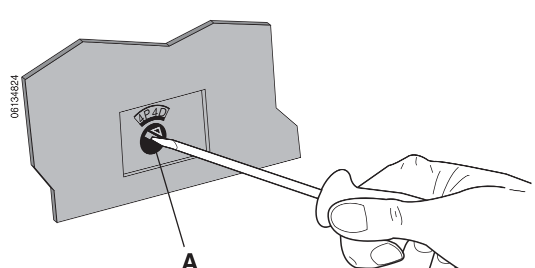


Ajuste de la protección del neutro

NOTA: Este procedimiento deberá realizarse sólo a los interruptores de cuatro polos.

A. Para las unidades de disparo electrónico ET y Micrologic 2.0, 3.0, 5.0, 2.0A, 3.0A y 5.0A:
   - — retire la tapa del lente del cuarto polo
   - — utilice un destornillador plano para ajustar los valores de configuración del neutro del interruptor automático (**figura 22, A**)
   - — vuelva a colocar la tapa del lente del cuarto polo. Apriete el tornillo a 0,6 N•m (5,3 lbs-pulg).
B. Para las unidades de disparo electrónico Micrologic 5.0P, 6.0P, 5.0H y 6.0H consulte la guía del usuario de la unidad de disparo, disponible en el sitio web de Schneider Electric (consulte la página 1).

Figura 22: Ajuste del selector tipo sistema del interruptor (en los interruptores de cuatro polos)



Ajuste de los selectores del interruptor	Protección neutra
4P 3D	Sin protección neutra
3P N/2	1/2 protección neutra
4P 4D	Protección neutra total (ajuste de fábrica [por omisión])

Pruebas

Utilice el equipo de pruebas portátil o el equipo de pruebas de amplias funciones para verificar el funcionamiento de la unidad de disparo del interruptor automático.

Diagnóstico de problemas

Si se presentan problemas durante la instalación, consulte la siguiente información. Si persiste el problema, póngase en contacto con su distribuidor más cercano.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA o Z462 de CSA y NOM-029-STPS.
- Solamente el personal eléctrico especializado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Al realizar el diagnóstico de problemas tal vez sea necesario energizar los dispositivos auxiliares con una fuente de alimentación de pruebas. Asegúrese de que ésta esté desenergizada antes conectarla o desconectarla al dispositivo auxiliar.
- No toque las terminales que se conectan al dispositivo durante las pruebas.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Condición	Causas posibles	Solución
El interruptor automático no permanece cerrado.	1. El ajuste de disparo está muy bajo. 2. El disparo por baja tensión no está energizado. 3. Disparo en derivación energizado. 4. Cortocircuito o sobrecarga en el sistema.	1. Ajuste el disparo. 2. Energice el disparo por baja tensión. 3. Desenergice el disparo en derivación. 4. Revise el sistema para ver si encuentra un cortocircuito o una sobrecarga.
El interruptor automático se dispara, pero no es evidente un cortocircuito o una sobrecarga.	1. El ajuste de disparo está muy bajo. 2. La tensión es inferior al valor de ajuste de disparo por baja tensión.	1. Ajuste el disparo. 2. Revise el sistema para ver si encuentra tensión baja.
El botón de disparo no dispara el interruptor.	El interruptor automático ya se encuentra en la posición de disparado o abierto (O).	Coloque la palanca del interruptor en la posición de restablecimiento, luego en la posición de cerrado (I).
El interruptor automático no se puede abrir manualmente.	Está dañada la ruta de corriente.	Póngase en contacto con su distribuidor más cercano.

ESPAÑOL

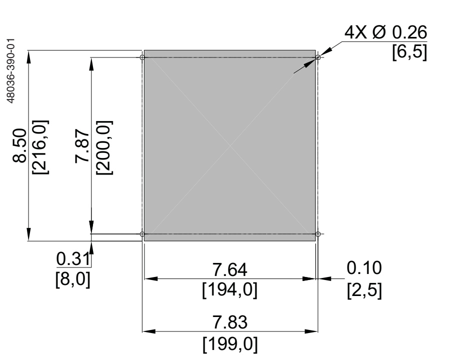
Dimensiones

Características del gabinete

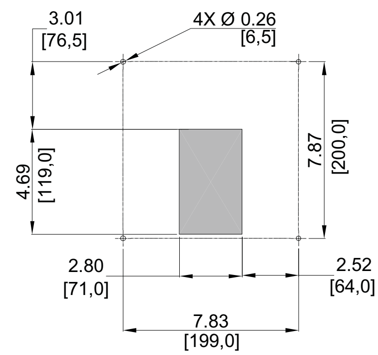
Tabla 4: Dimensiones del gabinete

Valor nominal del interruptor automático	Dimensiones del gabinete del interruptor automático (alto x ancho x profundidad)		Área de ventilación			
	pulg	mm	Superior		Inferior	
≤ 800 A, 100% nominales	51,9 x 20,25 x 7,75	1318,3 x 514,4 x 196,9	–	–	–	–
≤ 1 200 A, nominales estándar	51,9 x 20,25 x 7,75	1318,3 x 514,4 x 196,9	–	–	–	–
> 800 A, 100% nominales	62,25 x 23 x 14,75	1581,2 x 584,2 x 374,7	16,5 pulg^2	10,645 mm^2	16,5 pulg^2	10,645 mm^2

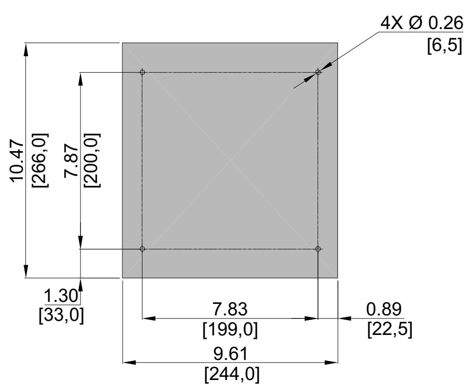
Figura 23: Dimensiones de los agujeros de montaje y corte de la cubierta del gabinete



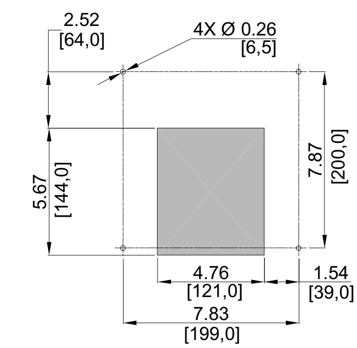
Corte de la cubierta de accesorios



Corte de la palanca (mecanismo articulado solamente)



Corte del escudo de la cubierta de accesorios



Corte del escudo de la palanca (mecanismo articulado solamente)

Dimensiones: pulg [mm]

Dimensiones de los interruptores automáticos

Para conocer las medidas del interruptor automático, consulte las dimensiones del interruptor disponible en el sitio web de Schneider Electric (consulte la página 1).

Importado en México por:
Schneider Electric México, S.A. de C.V.
Av. Ejercito Nacional No. 904
Col. Palmas, Polanco 11560 México, D.F.
55-5804-5000
www.schneider-electric.com.mx

Solamente el personal calificado deberá instalar, hacer funcionar y prestar servicios de mantenimiento al equipo eléctrico. Schneider Electric no asume responsabilidad alguna por las consecuencias emergentes de la utilización de este material.

Disjoncteurs PowerPact^{MC} à châssis P et NS630b–NS1600

À conserver pour usage ultérieur.

Outils nécessaires

Tournevis, Pozidriv® nº 2 ou nº 3 ou plat

Clé à douille, hex. interne de 7 mm

Tournevis, plat à longue tige

Clé dynamométrique, 5/16 po ou 8 mm

Renseignements supplémentaires

Ce bulletin contient les directives d'installation des disjoncteurs PowerPact à châssis P et NS630b–NS1600. Les fonctions de déclenchement sont commandées par le déclencheur électronique Micrologic^{MC}.

Pour obtenir des informations supplémentaires, consulter les guides de l’utilisateur suivants sur le site Web de Schneider Electric^{MC} :

- Catalogue 0612CT0101 : *Disjoncteurs PowerPact^{MC} à châssis M, P et R*
- Directives nº 0613IB1313 : *Système de communications Modbus*
- Directives nº 0613IB1205 : *Plans d'encombrement des disjoncteurs PowerPact^{MC}*
- Directives nº 48049-136-05 : *Déclencheurs électroniques Micrologic 2.0A, 3.0A, 5.0A et 6.0A*
- Directives nº 48049-330-03 : *Déclencheurs électroniques Micrologic 5.0H et 6.0H*
- Directives nº 48049-137-05 : *Déclencheurs électroniques Micrologic 5.0P et 6.0P*
- Directives no 48049-207-05 : *Déclencheurs électroniques Micrologic 2.0, 3.0 et 5.0*
- Consulter les directives d'utilisation 5120108AA ou 51201027 pour les directives de raccordement arrière.

Pour accéder à notre site Web aller à :

http://www.schneider-electric.com

Pour une assistance concernant les applications, appeler le 1-888-778-2733 (É.-U.).

FRANÇAIS

FRANÇAIS

Installation du disjoncteur

1. Couper l'alimentation de l'appareil avant d'y travailler.
2. S'assurer que le disjoncteur est en position de déclenché ou d'arrêt (O).

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E ou CSA Z462.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez l'alimentation de l'appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour s'assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Installation du disjoncteur monté individuellement

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

Installez le disjoncteur de sorte qu'une distance d'isolement minimale avec le métal mis à la terre soit maintenue.

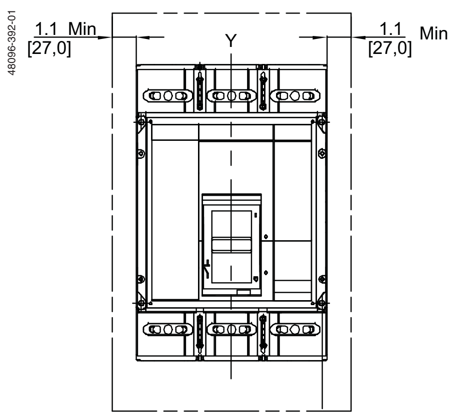
Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

1. Vérifier l'espace entre le disjoncteur et le métal mis à la terre le plus proche. (Se reporter au tableau 4 pour obtenir les dimensions minimales du coffret.)
2. Préparer le boîtier pour le disjoncteur (voir la figure 23 à la page 16 pour les dimensions des trous de montage et découpages de la porte).

   — Percer les trous de montage dans la surface de montage. Tarauder les trous pour filets de 10-32.

   — Découper une ouverture dans le couvercle pour la manette du disjoncteur, le plastron de la manette, le couvercle des accessoires ou le plastron du couvercle des accessoires.

Figure 1 : Exigence d'espace minimum avec du métal



Dimensions : po [mm]

⚠ AVERTISSEMENT

RISQUE D'ÉLECTROCUTION, D'ÉCLAIR D'ARC OU DE DOMMAGES MATÉRIELS

- Montez le disjoncteur en utilisant uniquement les vis de montage isolées fournies.
- Les quatre rondelles (figure 2, A) et vis de montage (B) doivent être installées et serrées aux valeurs de couple indiquées.
- Les disjoncteurs à commande électrique doivent être mis à la terre en installant une vis de montage isolée dans le trou de vis de montage inférieur droit (C).

Si ces directives ne sont pas respectées, cela peut entraîner des blessures ou des dommages matériels.

3. Monter le disjoncteur à l'aide des quatre rondelles (figure 2, A, fournies) et quatre vis isolées de 10-32 x 4,5 po (B, fournies). Serrer les vis au couple de 4 N·m (36 lb-po).

4. Pour les disjoncteurs raccordés par barre-bus, boulonner la barre-bus au disjoncteur :

   a. Insérer les boulons (**figure 3, A**, fournis) par les trous de la barre-bus (**B**) dans la plaque-écrou (**C**) du disjoncteur. À l'aide d'un tournevis plat, serrer les boulons au couple de serrage de 5,65 N•m (50 lb-po).

   b. Fixer la barre-bus (**C**) avec les écrous (**D**, fournis) Serrer les écrous au couple de serrage de 28 N•m (250 lb-po).

Figure 2 : Montage du disjoncteur

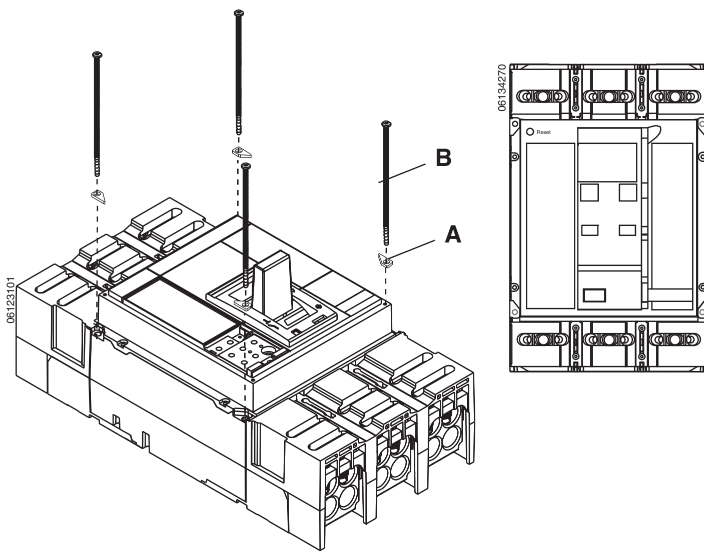
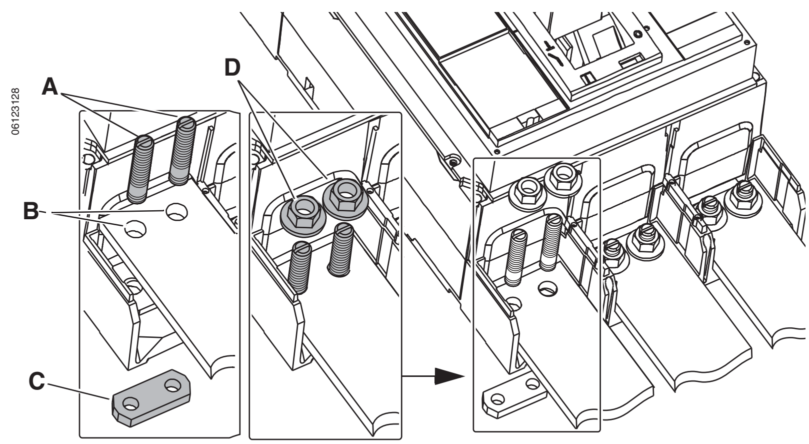


Figure 3 : Installation du bus



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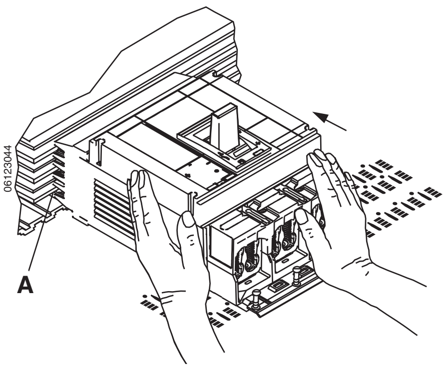
Installation du disjoncteur I-Line™

> **AVIS**
>
> **RISQUE DE DOMMAGES MATÉRIELS**
>
> - N'ajustez pas les mâchoires.
> - Ne retirez pas la pâte à joint.
> - Si nécessaire, utilisez la pâte à joint Square D^{MC} PJC7201.
>
> **Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.**

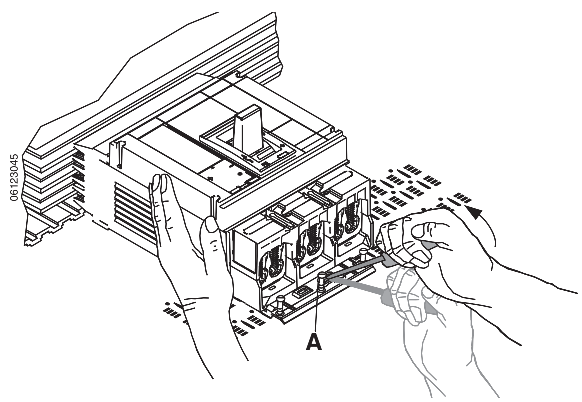
1. Placer le disjoncteur dans la position de déclenché ou d'arrêt (O).
2. Placer le disjoncteur sur la cuve I-Line avec les mâchoires (**figure 4, A**) contre les barres-bus

Figure 4 : Placer le disjoncteur sur la cuve



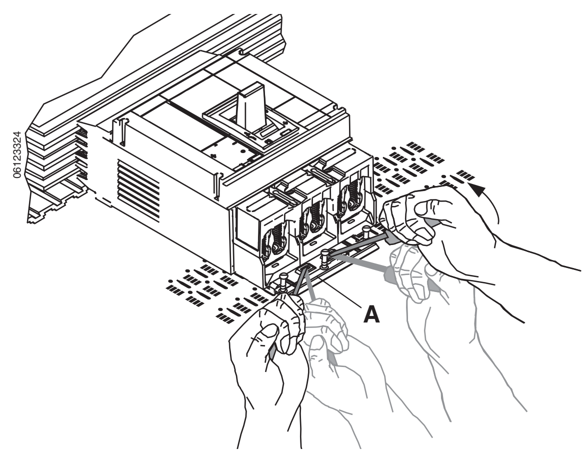
3. Insérer un tournevis à longue tige (**figure 5, A**) dans une fente. Embrocher le disjoncteur sur les barres-bus jusqu'à ce que les mâchoires du disjoncteur s'engagent complètement sur les barres-bus.

Figure 5 : Commencer à embrocher le disjoncteur sur les barres-bus



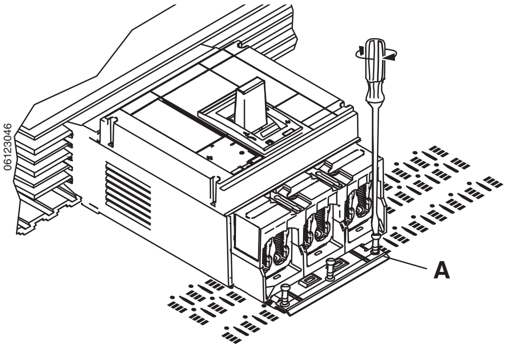
4. Insérer un deuxième tournevis (**figure 6, A**) dans une fente inférieure. Embrocher le disjoncteur sur les barres-bus en employant les tournevis alternativement jusqu'à ce que les mâchoires du disjoncteur s'engagent complètement sur les barres-bus.

Figure 6 : Embrocher le disjoncteur complètement sur les barres-bus



5. Serrer fermement les trois vis (**figure 7, A**) du support de montage sans tordre le support.

Figure 7 : Serrer les vis du support de montage



Installation des câbles

Couper les extrémités des conducteurs bien droit et leur donner leur configuration définitive. Au moyen d'un outil à dénuder l'isolation approprié, dénuder les extrémités des conducteurs comme recommandé au tableau 1. Ne pas entailler les torons.

AVIS

RISQUE D'INDICATION ERRONÉE DU COUPLE

Ne laissez pas les torons du conducteur s’engager dans le filetage de la vis de fixation.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

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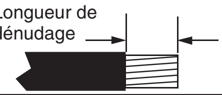
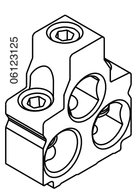
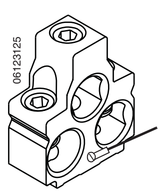
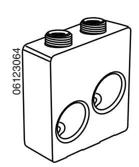
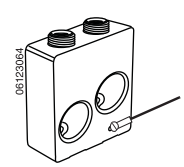
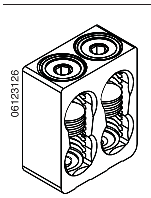
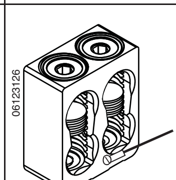
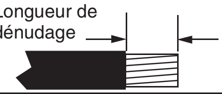
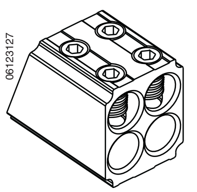
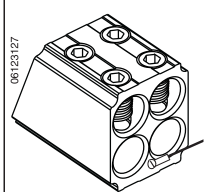
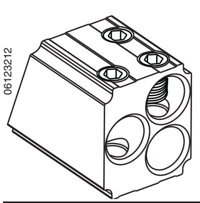
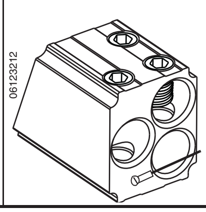
Tableau 1 : Information sur les cosses du disjoncteur

Cosse	Cosse avec le fil de contrôle optionnel installé	Nº de catalogue	Conducteurs				Couple de serrage	
			Type	Calibre	Qté	Longueur de dénudage 	Vis de fixation des fils	Vis du fil de contrôle
 06123125	 06123125	AL800M23K[1,2]	Al/Cu	95–240 mm^2 (3/0–500 kcmil)	3	25 mm (1 po)	50 N•m (442.5 lb-po)	1–1,3 N•m (1–12 lb-in)
		CU800M23K[2]	Cu			30 mm (1,2 po)		
 06123064	 06123064	AL800P6K[1,2]	Al/Cu	95–300 mm^2 (3/0–600 kcmil)	2	30 mm (1,2 po)	50 N•m (442.5 lb-po)	1–1,3 N•m (1–12 lb-in)
 06123126	 06123126	AL1200P24K[1,4]	Al/Cu	95–240 mm^2 (3/0–500 kcmil)	4	Trous supérieurs : 30 mm (1,25 po) Trous inférieurs : 57 mm (2,25 po)	50 N•m (442.5 lb-po)	1–1,3 N•m (1–12 lb-in)
		CU1200P24K[4]	Cu					

Page suivante

Tableau 1 : Information sur les cosses du disjoncteur *(suite)*

Cosse	Cosse avec le fil de contrôle optionnel installé	Nº de catalogue	Conducteurs				Couple de serrage	
			Type	Calibre	Qté	Longueur de dénudage 	Vis de fixation des fils	Vis du fil de contrôle
		AL1200P25K[1,2,5]	Al/Cu	95–240 mm^2 (3/0–500 kcmil)	4	25 mm (1 po)	50 N•m (442.5 lb-in)	1–1,3 N•m (1–12 lb-in)
		CU1200P25K[2,5]	Cu	95–300 mm^2 (3/0–600 kcmil)				
		AL1200P6KU[1,2,5]	Al/Cu	185–300 mm^2 (350–600 kcmil)	3	Trous supérieur et centre : 30 mm (1,25 po) Trous inférieurs : 57 mm (2,25 po)	50 N•m (442.5 lb-in)	1–1,3 N•m (1–12 lb-in)

1 Pour le modèle avec le trou taraudé pour le fil de contrôle ajouter un T devant le K au numéro de catalogue (AL800M23TK).
2 Ajouter le suffixe « 4 » au numéro de catalogue pour les kits de disjoncteurs quadripolaires (par exemple, AL800M23K4 ou AL800M23TK4).
3 Les conducteurs doivent être coupés droits pour assurer une terminaison sûre.
4 Monter uniquement par l'extrémité charge (partie inférieure).
5 Ne convient pas aux disjoncteurs I-Line.

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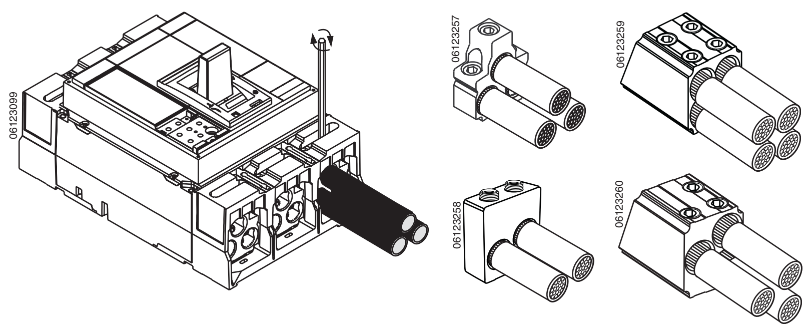
Kits des cosses AL800M23K, CU800M23K, AL800P6K, AL1200P25K, CU1200P25K et AL1200P6KU

Pour les cosses installées à l'usine, installer les câbles dans les cosses et serrer la vis de fixation de fils au couple recommandé sur la plaque avant.

Pour les kits de cosses à installer sur place, consulter les directives d'utilisation expédiées avec le kit.

Figure 8 : Installation des câbles des cosses AL800M23K, CU800M23K, AL800P6K, AL1200P25K, CU1200P25K et AL1200P6KU



Kits de cosses AL1200P24K et CU1200P24K

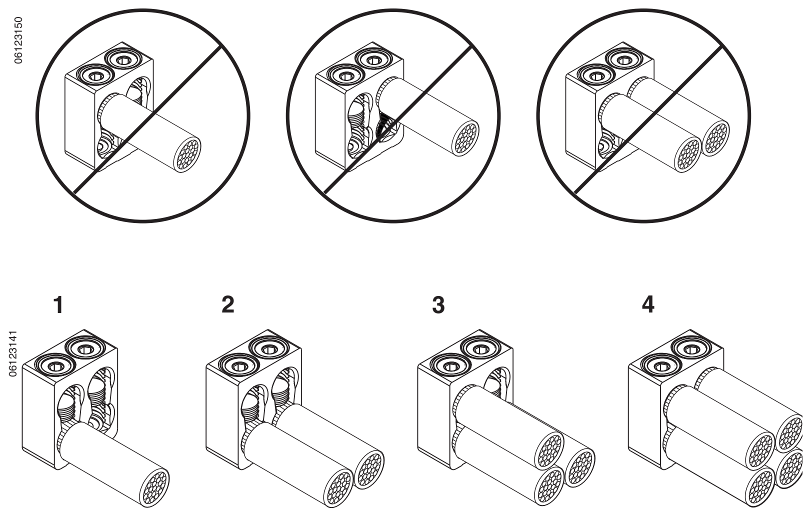
Pour les cosses installées à l'usine, installer le câble dans l'ordre indiqué et serrer la vis de fixation de fils au couple recommandé sur la plaque avant.

REMARQUE : Installer les câbles inférieurs d'abord. Les vis de fixation de fils inférieurs doivent être serrées à fond avant d'installer les câbles supérieurs. Retirer l'entretoise en mousse avant d'installer un câble.

1. Installer le câble inférieur gauche et serrer la vis de fixation de fils.
2. Installer le câble inférieur droit et serrer la vis de fixation de fils.
3. Installer le câble supérieur gauche et serrer la vis de fixation de fils.
4. Installer le câble supérieur droit et serrer la vis de fixation de fils.

Pour les kits de cosses à installer sur place, consulter les directives d'utilisation expédiées avec le kit.

Figure 9 : Installation des câbles des cosses AL1200P24K et CU1200P24K



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Entrave de câble

AVIS

RISQUE DE DÉPLACEMENT DES CONDUCTEURS DANS DES CONDITIONS DE COURT-CIRCUIT

Entravez les conducteurs du disjoncteur comme requis au tableau 2.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

Tableau 2 : Recommandations de l'entrave de câble

Capacité de châssis	Courant de défaut disponible	Conducteurs utilisés	Longueur de câble non soutenue	Entrave recommandée
800 A	≤ 65 kA	Trois de 300 kcmil ou plus gros	≤ 279 mm (11 po)	Non*
	Tous les autres cas			Oui
1 200 A	≤ 65 kA	Quatre de 350 kcmil ou plus gros	≤ 256 mm (14 po)	Non*
	Tous les autres cas			Oui

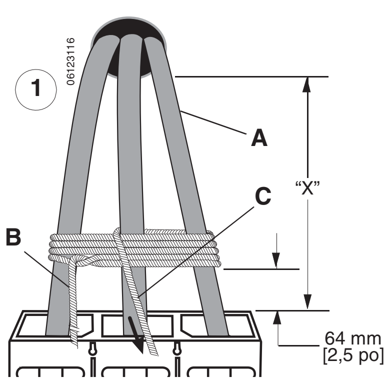
* Toutes les exigences doivent être satisfaites pour que l'entrave ne soit pas nécessaire.

Entraver les conducteurs du disjoncteur comme indiqué au tableau 2.

Entourer les conducteurs à l'aide de 9 m (30 pi) de corde en sisal de 9,5 mm (3/8 po) ou l'équivalent.

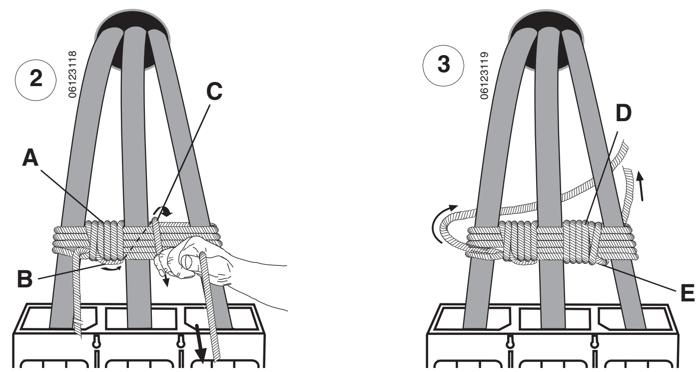
1. Commencer à entourer les conducteurs (**figure 10, A**) à 64 mm (2,5 po) au-dessus du disjoncteur. Entourer les conducteurs 5 fois, en laissant 4 + « X » m (12 + « X » pi) d'excès de corde à la première extrémité (**B**). Tirer sur la corde (**C**) et bien la tendre.

Figure 10 : Entourer les conducteurs



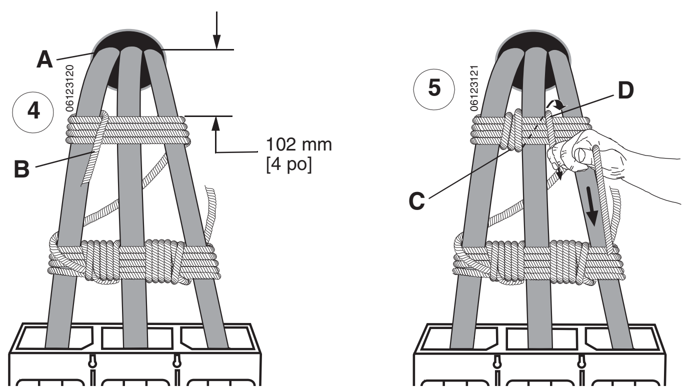
2. Faire plusieurs tours avec la corde (**figure 11, A**) jusqu'à ce qu'elle remplisse complètement l'espace entre les premiers deux jeux des conducteurs. Faire passer la dernière boucle de la corde sous la boucle précédente (**B**). Engager la corde (**C**) dans l'espace de droite. Tirer sur la corde et bien la tendre.
3. Faire plusieurs tours avec la corde (**D**) jusqu'à ce qu'elle remplisse complètement l'espace entre le deuxième et le troisième jeu des conducteurs. Faire passer la dernière boucle de la corde (**E**) sous la boucle précédente, comme indiqué. Tirer sur la corde et bien la tendre

Figure 11 : Entourer la corde



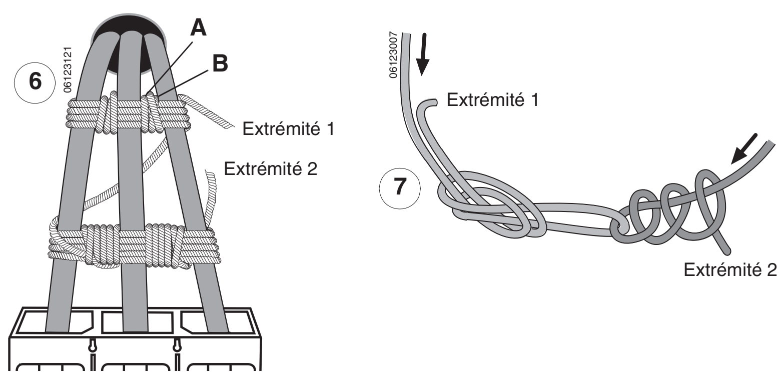
4. Faire quatre tours de corde autour des conducteurs de 102 mm (4 po) en dessous de l'endroit de sortie des fils du boîtier (**figure 12, A**). Tirer sur la corde (**B**) et bien la tendre.
5. Faire plusieurs tours avec la corde (**C**) jusqu'à ce qu'elle remplisse complètement l'espace entre les premiers deux jeux des conducteurs. Engager la corde (**D**) dans l'espace de droite. Tirer sur la corde et bien la tendre.

Figure 12 : Entourer les conducteurs



6. Faire plusieurs tours avec la corde (**figure 13, A**) jusqu'à ce qu'elle remplisse complètement l'espace entre le deuxième et le troisième jeu des conducteurs. Faire passer la dernière boucle de la corde (**B**) sous la boucle précédente, comme indiqué. Tirer sur la corde et bien la tendre.
7. Attacher ensemble les extrémités 1 et 2 comme indiqué. Tirer sur la corde et bien la tendre. Couper l'excès de corde et fixer les extrémités avec un ruban adhésif pour les empêcher de s'effilocher.

Figure 13 : Entourer la corde



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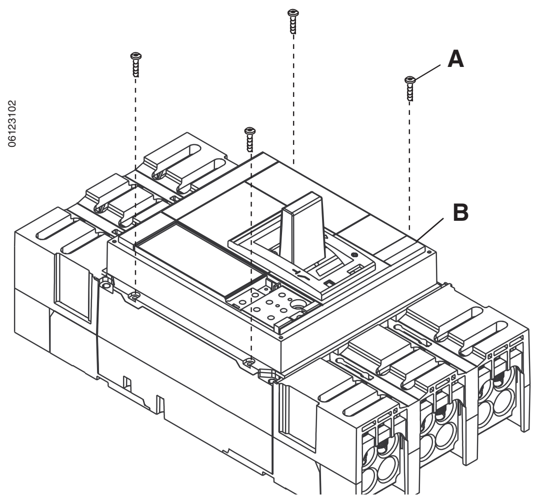
Installation des accessoires

Cette sous-section s'applique si le disjoncteur possède des accessoires installés à l'usine ou sur place.

Retrait du couvercle des accessoires

1. S'assurer que le disjoncteur est en position de déclenché ou d'arrêt.
2. Desserrer les quatre vis (**figure 14, A**) du couvercle des accessoires et retirer le couvercle (**B**).

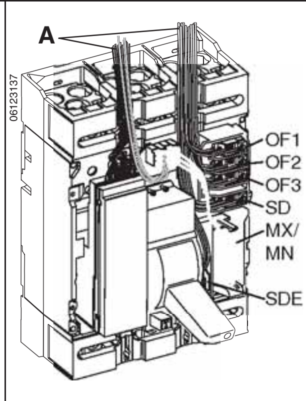
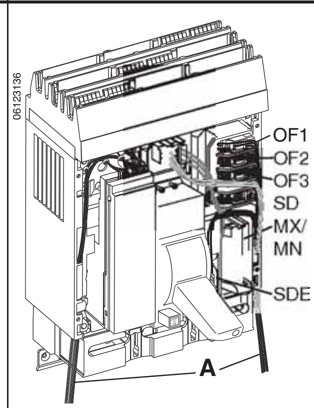
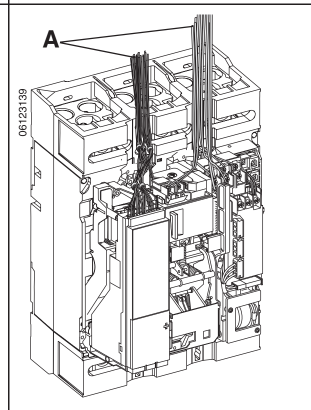
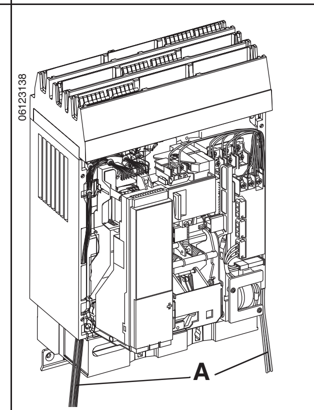
Figure 14 : Retrait du couvercle des accessoires



Installation des accessoires et du câblage de commande

1. Installer les accessoires installables sur place du disjoncteur comme indiqué dans les directives fournies avec chaque accessoire.
2. Installer le câblage de commande (**tableau 3, A**) aux accessoires. Serrer les vis de bornes à 1,2 N•m (10 lb-po).

Tableau 3 : Câblage de commande des accessoires

	Disjoncteurs montés individuellement	Disjoncteurs I-Line™
Type	**Acheminement des câbles**	**Acheminement des câbles**
à commande manuelle		
à commande électrique		

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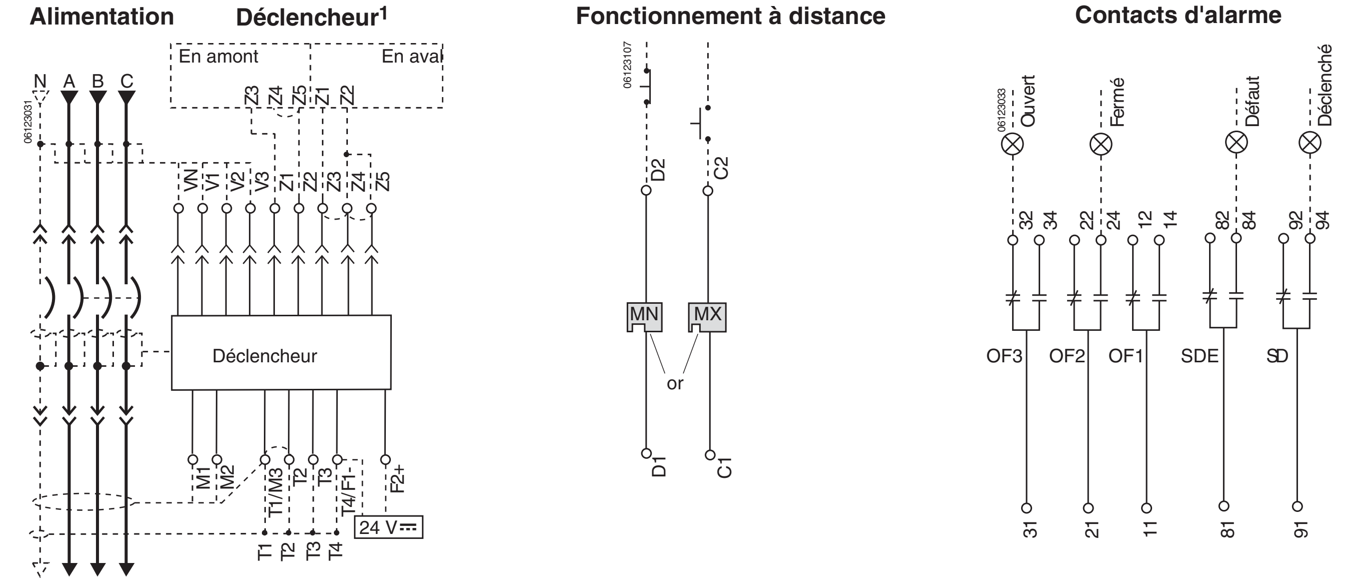
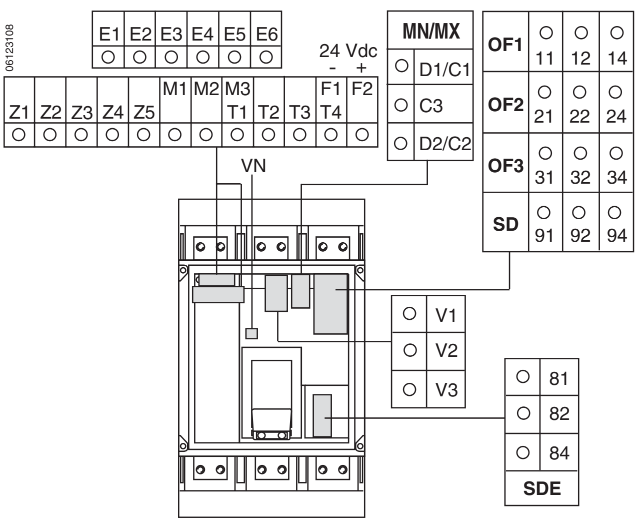
REMARQUE : Tous les schémas indiquent un disjoncteur dans la position déclenché.

Figure 15 : Schémas de câblage de commande des accessoires pour disjoncteurs à commande manuelle





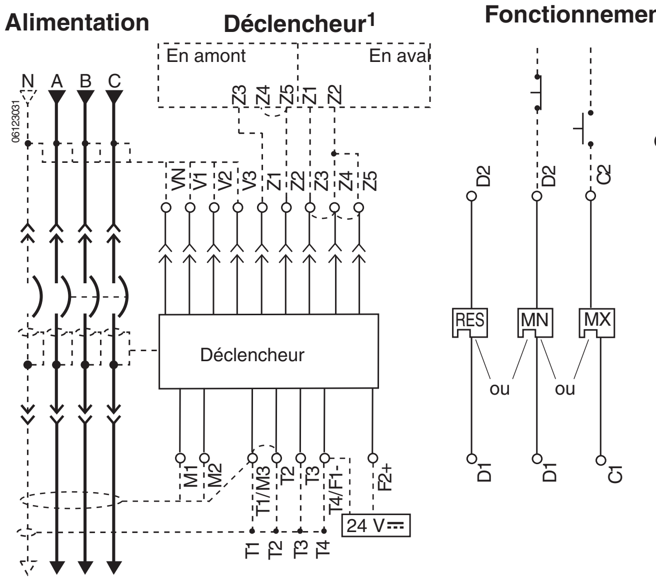
Connecteur	Calibre de fil recommandé
V1, V2, V3, Vn	22–16 AWG (0,3–1,5 mm^2)
E1–E2	Fils en cuivre à paire torsadée ou câble à paire blindée de calibre 22 AWG (0,3 mm^2) minimum
T	Câble blindé toronné de calibre 22 AWG (0,3 mm^2)
E3–E6, Q1, Q2, Q3	Paires torsadées blindées avec fil de drain, calibre 22 AWG (0,3 mm^2) (Belden 8723 ou équivalent)[3]
OF, SD, SDE	18–16 AWG (0,8–1,5 mm^2)
MN, MX	18–14 AWG (0,8–2,5 mm^2)
F	Choisir le calibre selon l'alimentation auxiliaire de 24 Vcc
Z1–Z5	22–18 AWG (0,3–0,8 mm^2)

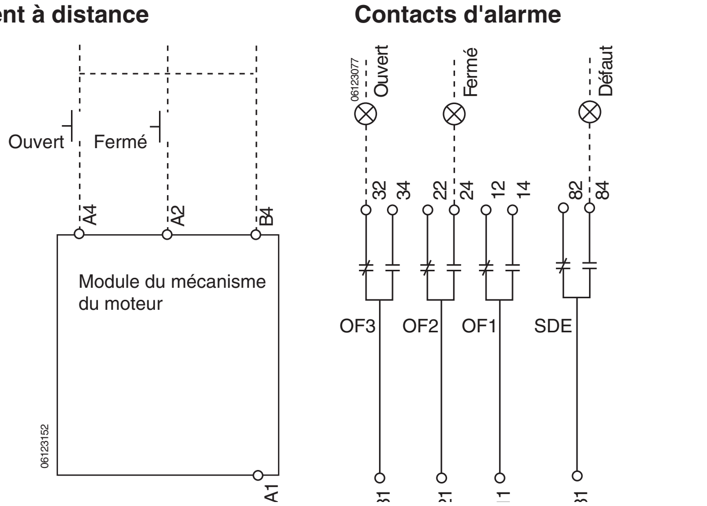
Type de déclencheur				Connecteur	Description
De base	A	P	H		
–	•	•	•	Com: E1-E6	Module de communication du disjoncteur E1 = +24 Vdc E2 = Common E3 = A/Tx- D0 E4 = B/Tx+ D1 E5 = A/Rx- D0 E6 = B/Rx+ D1
–	•	•	•	Z	Interverrouillage sélectif de zone (ZSI) Z1 = signal de sortie ZSI Z2 = sortie ZSI Z3 = signal d'entrée ZSI Z4 = court retard d'entrée ZSI Z5 = entrée de défaut à la terre ZSI
–	•	•	•	T	Capteur du neutre externe
–	•	•	•	F	Alimentation externe 24 Vcc
–	–	•	•	Vn[2]	Prise de tension de neutre externe
–	–	•	•	V1, V2, V3	Prise de tension de phase externe
–	–	•	•	M6C[3]: Q1, Q2, Q3	6 contacts programmables alimentation de 24 Vcc requise
Fonction				**Connecteur**	**Description**
Contacts auxiliaires				OF	Contacts de disjoncteur ou d'interrupteur en position ouvert/fermé
				SD	Alarme sonore
				SDE	Contact d'alarme de défaut électrique
Fonctionnement à distance				MN	Déclencheur sur baisse de tension
				MX	Déclencheur shunt

[1]Retirer les cavaliers d'usine entre Z3, Z4 et Z5 si ZSI est raccordée. Retirer le cavalier d'usine entre T1 et T2 si le TC de neutre est raccordé.
[2]Le raccordement du neutre est fourni avec câbles souples.
[3]Les contacts programmables M6C in option sont fournis avec câbles souples.

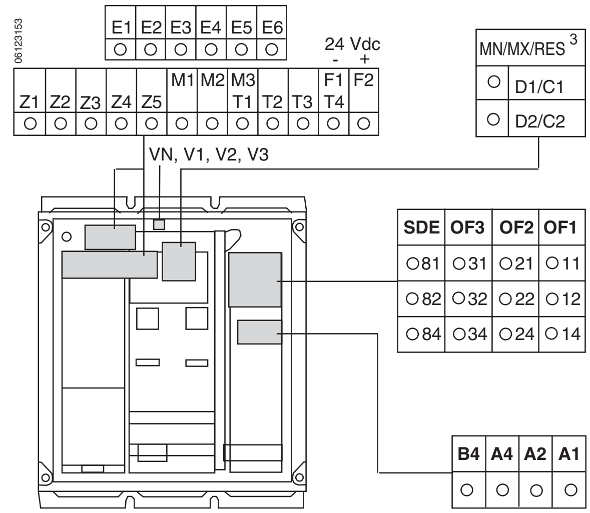
REMARQUE : Tous les schémas indiquent un disjoncteur dans la position déclenché.

Figure 16 : Schémas de câblage de commande des accessoires pour disjoncteurs à commande électrique





Type de déclencheur				Connecteur	Description
De base	A	P	H		
–	•	•	•	Com: E1-E6	Module de communication du disjoncteur E1 = +24 Vdc E2 = Common E3 = A/Tx- D0 E4 = B/Tx+ D1 E5 = A/Rx- D0 E6 = B/Rx+ D1
–	•	•	•	Z	Interverrouillage sélectif de zone (ZSI) Z1 = signal de sortie ZSI Z2 = sortie ZSI Z3 = signal d'entrée ZSI Z4 = court retard d'entrée ZSI Z5 = entrée de défaut à la terre ZSI
–	•	•	•	T	Capteur du neutre externe
–	•	•	•	F	Alimentation externe 24 Vcc
–	–	•	•	Vn	Prise de tension de neutre externe
–	–	•	•	V1, V2, V3[2]	Prise de tension de phase externe
–	–	•	•	M6C[2]: Q1, Q2, Q3	6 contacts programmables alimentation de 24 Vcc requise



Connecteur	Calibre de fil recommandé
E1–E2	Fils en cuivre à paire torsadée ou câble à paire blindée de calibre 22 AWG (0,3 mm²) minimum
V1, V2, V3, Vn	22–16 AWG (0,3–1,5 mm²)
T	Câble blindé toronné de calibre 22 AWG (0,3 mm²)
E3–E6, Q1, Q2, Q3	Paires torsadées blindées avec fil de drain, calibre 22 AWG (0,3 mm²) (Belden 8723 ou équivalent)[2]
OF, SD, SDE	18–16 AWG (0,8–1,5 mm²)
MN, MX, RES	18–14 AWG (0,8–2,5 mm²)
F	Choisir le calibre selon l'alimentation auxiliaire de 24 Vcc
Z1–Z5	22–18 AWG (0,3–0,8 mm²)

Fonction	Connecteur	Description
Contacts auxiliaires	SDE	Contact d'alarme de défaut électrique
	OF	Contacts de disjoncteur ou d'interrupteur en position ouvert/fermé
Fonctionnement à distance	MN[3]	Déclencheur sur baisse de tension
	MX[3]	Déclencheur shunt
	RES[3]	Réarmement à distance
Module de mécanisme du moteur	A4	Ouverture électrique
	A2	Fermeture électrique
	B4, A1	Alimentation pour appareils de commande et moteur à engrenages

[1]Retirer les cavaliers d'usine entre Z3, Z4 et Z5 si ZSI est connecté. Retirer le cavalier d'usine entre T1 et T2 si un TC de neutre est connecté.

[2]Le M6C et la prise de tension externe en option sont fournis avec des queues de cochon.

[3] La réinitialisation à distance (RES), le déclencheur sur baisse de tension (MN) et le déclencheur shunt (MX) ne peuvent pas être utilisés ensemble, quelle que soit la combinaison. La réinitialisation à distance est uniquement pour les disjoncteurs fixes à commande électrique PowerPact à châssis P.

FRANÇAIS

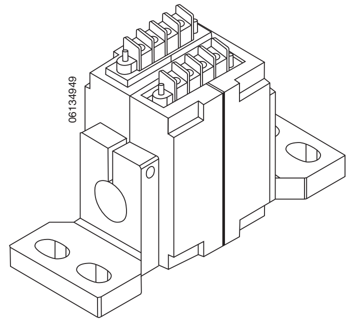
Protection des appareils contre les défauts à la terre

Si le disjoncteur ne possède pas un déclenchement ou une alarme intégrée sur défaut à la terre, sauter cette sous-section.

Un circuit triphasé à quatre fils nécessite l’emploi d’un transformateur de courant (TC) du neutre externe. Brancher le TC du neutre au disjoncteur selon les schémas de câblage à la figure 18.

REMARQUE : La connexion de mise à la terre de l'appareil doit être en amont (côté ligne) du TC du neutre et une connexion au neutre doit exister entre le transformateur d'alimentation et les appareils.

Figure 17 : Transformateurs de courant du neutre



1. Faire passer le câble Belden® du TC du neutre aux bornes du berceau.
2. Raccorder le câble selon le schéma approprié.
3. Placer le câble Belden dans un conduit en plastique.
4. Vérifier tout le câblage.
5. Vérifier si F1 et F2 sont isolées de la terre.

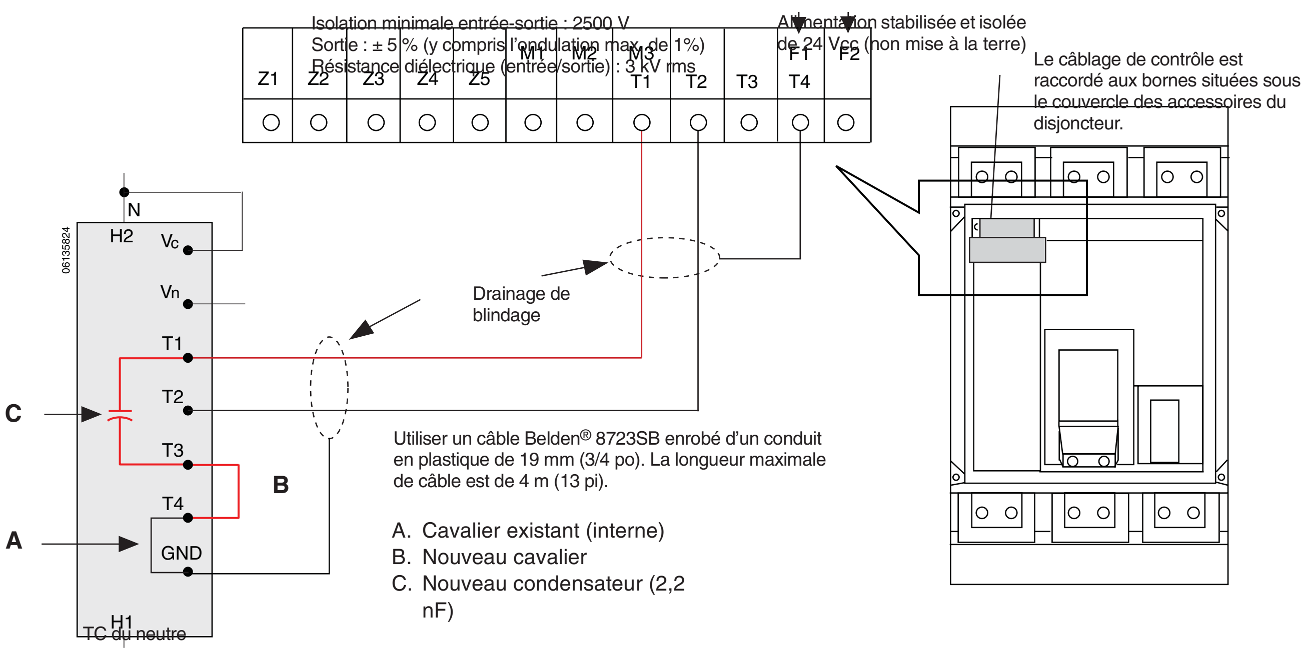
AVIS

RISQUE DE MAUVAIS FONCTIONNEMENT DU SYSTÈME DE DÉCLENCHEMENT

F1 et F2 doivent être isolées de la terre. Vérifiez tout le câblage en suivant les directives de ce bulletin.

Si cette précaution e sont pas observées, cela peut entraîner un déclenchement intempestif pendant la fermeture.

Figure 18 : Schéma de câblage



Remettre en place le couvercle des accessoires

AVIS

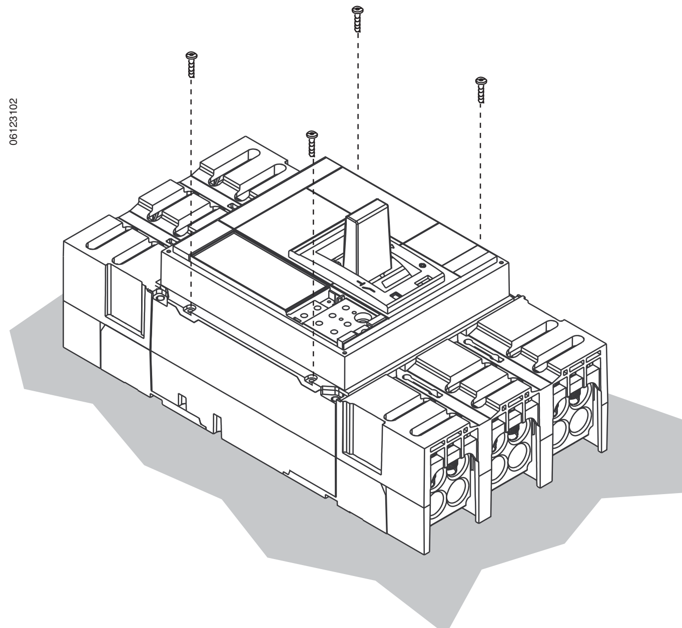
RISQUE DES DOMMAGES MATÉRIELS

Le couvercle des accessoires doit être fixé avec les quatre vis serrées au couple précisé. Ne serrez pas à un couple excessif. N'utilisez pas un outil électrique pour serrer les vis.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

Remettre en place le couvercle des accessoires. Replacer les quatre vis du couvercle des accessoires. Serrer à la main les vis à un couple entre 1,2 et 1,5 N•m (11 et 13 lb-po). Ne pas dépasser les spécifications de couple des vis.

Figure 19 : Remettre en place le couvercle des accessoires



Démontage du disjoncteur

Couper l'alimentation de l'appareil avant d'y travailler.

Retirer le disjoncteur dans l'ordre inverse de son installation.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E ou CSA Z462.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez l'alimentation de l'appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour s'assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

FRANÇAIS

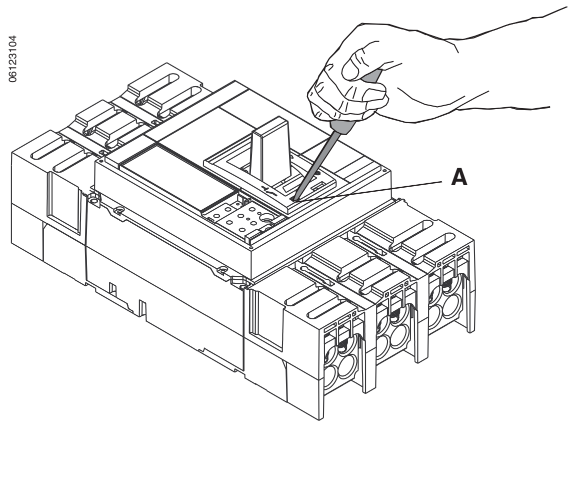
Fonctionnement

Disjoncteurs à commande manuelle :

Appuyer sur le bouton pousser-pour-déclencher (**figure 20, A**) au moment de l'installation afin de vérifier le fonctionnement. Répéter une fois par an simplement pour manœuvrer le disjoncteur.

REMARQUE : Le bouton pousser-pour-déclencher ne provoque pas le déclenchement du disjoncteur si ce dernier est en position d'arrêt (O).

Figure 20 : Appuyer sur le bouton pousser-pour-déclencher



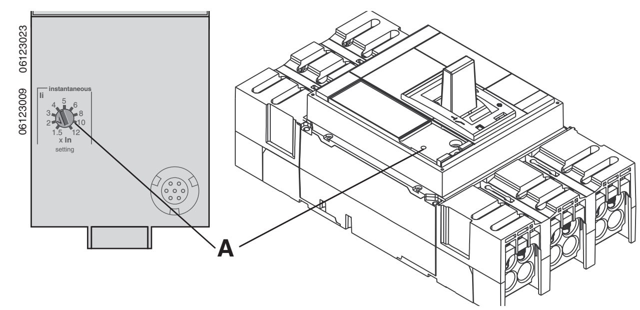
Disjoncteurs à commande électrique :

Armer le disjoncteur avec la manette d'armement et appuyer sur le bouton de marche et d'arrêt au moment de l'installation pour vérifier le fonctionnement. Répéter une fois par an simplement pour manœuvrer le disjoncteur.

Réglages du déclencheur

A. Pour les déclencheurs électroniques ET1.0I et ET1.0M : régler le déclenchement instantané (Ii) en ajustant le commutateur (**figure 21, A**).
B. Pour les déclencheurs électroniques Micrologic^MC, consulter le guide de l'utilisateur du déclencheur disponible sur le site Web de Schneider Electric (voir la page 1).

Figure 21 : Réglage du commutateur de déclenchement instantané

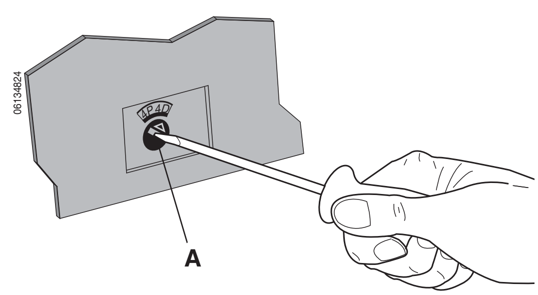


Réglages de la protection du neutre

REMARQUE : Pour disjoncteurs quadripolaire uniquement.

A. Pour les déclencheurs électroniques ET et Micrologic 2.0, 3.0, 5.0, 2.0A, 3.0A et 5.0A :
   — Enlever le couvercle de lentille du quatrième pôle.
   — Se servir d'un tournevis plat pour ajuster le réglage du neutre sur le disjoncteur (**figure 22, A**).
   — Replacer le couvercle de lentille du quatrième pôle. Serrer la vis au couple de 0,6 N•m (5,3 lb-po).
B. Pour les déclencheurs électroniques Micrologic 5.0P, 6.0P, 5.0H et 6.0H, consulter le guide de l'utilisateur du déclencheur disponible sur le site Web de Schneider Electric (voir la page 1).

Figure 22 : Réglage du sélecteur du système de type à disjoncteur (disjoncteur quadripolaire)



Réglage du sélecteur du disjoncteur	Protection du neutre
4P 3D	Neutre non protégé
3P N/2	Neutre moitié protégé
4P 4D	Neutre plein protégé (réglage d'usine par défaut)

Essais

Le fonctionnement du déclencheur de disjoncteur peut être vérifié à l'aide de la trousse d'essais portative ou de la trousse d'essai des fonctions complètes.

Dépannage

Si des problèmes surviennent pendant l'installation, se reporter aux consignes suivantes. Si les problèmes persistent, contacter le bureau de service local.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E ou CSA Z462.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Le dépannage peut nécessiter l'activation de dispositifs auxiliaires avec une alimentation d'essai. Assurez-vous que l'alimentation est désactivée avant tout branchement ou débranchement avec le dispositif auxiliaire.
- Ne touchez pas aux bornes du dispositif pendant l'essai.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Condition	Causes possibles	Solution
Le disjoncteur ne reste pas fermé.	1. Réglage de déclenchement trop bas. 2. Le déclencheur sur baisse de tension est hors tension. 3. Le déclencheur shunt est sous tension. 4. Un court-circuit ou surcharge est présent dans le système.	1. Ajuster le réglage de déclenchement. 2. Mettre le déclencheur sur baisse de tension sous tension. 3. Mettre le déclencheur shunt hors tension. 4. Rechercher un court-circuit ou une surcharge dans le système.
Le disjoncteur se déclenche, mais aucune évidence de court-circuit ni de surcharge.	1. Réglage de déclenchement trop bas. 2. La tension est inférieure au réglage du déclencheur sur baisse de tension.	1. Ajuster le réglage de déclenchement. 2. Vérifier si le système est en sous-tension.
Le bouton pousser-pour-déclencher ne déclenche pas le disjoncteur.	Le disjoncteur est déjà déclenché ou à l'arrêt (O).	Placer la manette du disjoncteur à réarmement, puis sur marche (I).
Le disjoncteur ne peut pas être ouvert manuellement.	Trajet de courant endommagé.	Contacter le bureau de service local.

FRANÇAIS

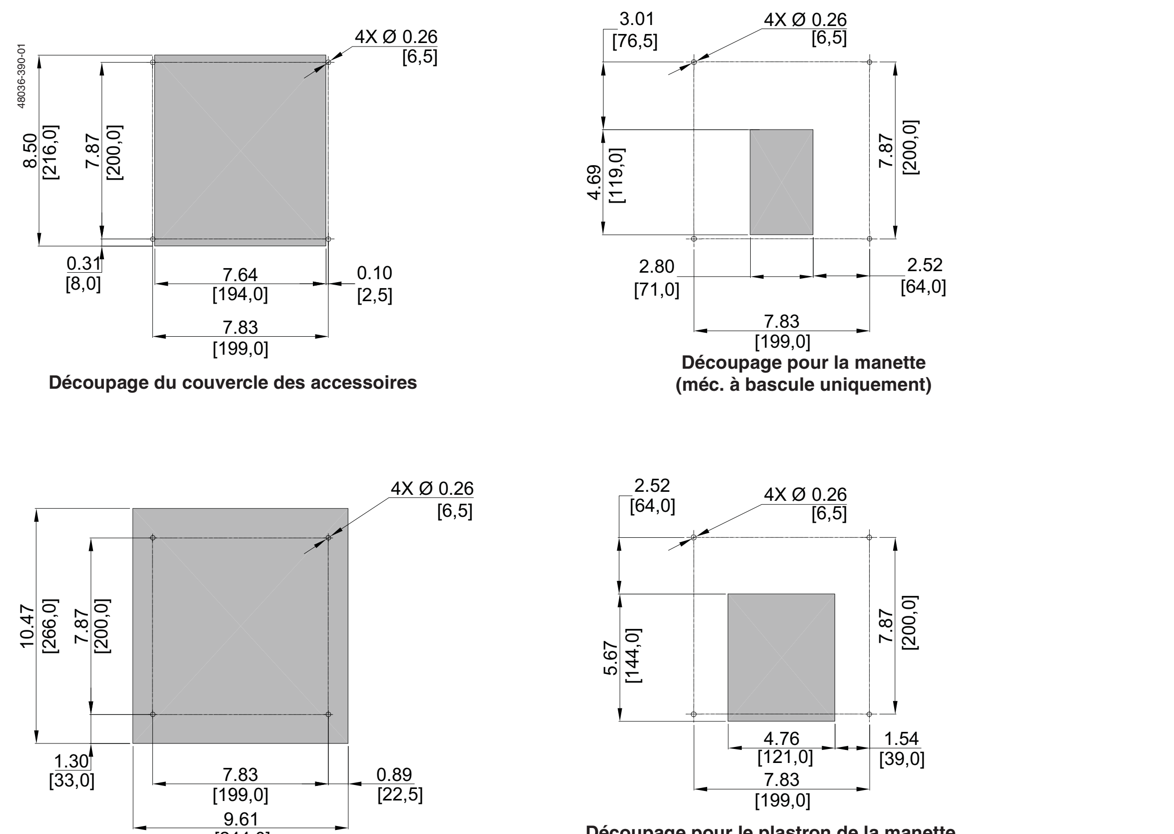
Dimensions

Informations sur les coffrets

Tableau 4 : Dimensions du coffret

Valeur nominale du disjoncteur	Dimensions du coffret du disjoncteur (haut. x larg. x épais.)		Zone d'aération			
	po	mm	Dessus		Fond	
≤ 800 A, classé à 100 %	51,9 x 20,25 x 7,75	1318,3 x 514,4 x 196,9	–	–	–	–
≤ 1 200 A, classé standard	51,9 x 20,25 x 7,75	1318,3 x 514,4 x 196,9	–	–	–	–
> 800 A, classé à 100 %	62,25 x 23 x 14,75	1581,2 x 584,2 x 374,7	16,5 po^2	10,645 mm^2	16,5 po^2	10,645 mm^2

Figure 23 : Dimensions des trous de montage et des découpages du couvercle du boîtier



Découpage du couvercle des accessoires

Découpage pour la manette (méc. à bascule uniquement)

Découpage pour le plastron du couvercle des accessoires

Découpage pour le plastron de la manette (méc. à bascule uniquement)

Dimensions des disjoncteurs

Pour les dimensions du disjoncteur, se reporter aux dimensions du disjoncteur disponibles sur le site Web de Schneider Electric (voir la page 1).

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800-565-6699
www.schneider-electric.ca

PLC Automatic Throwover Systems

Sistemas de transferencia automática con PLC

Systèmes de transfert automatique avec automate

Instruction Bulletin
Boletín de instrucciones
Directives d'utilisation

80330-001-04
07/2010

Retain for Future Use. /
Conservar para uso futuro. /
À conserver pour usage ultérieur.

by Schneider Electric

PLC Automatic Throwover Systems

Class 2700

Instruction Bulletin

80330-001-04
07/2010

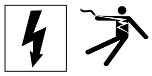
Retain for future use.

SQUARE D

by Schneider Electric

Hazard Categories and Special Symbols

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER
DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING
WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION
CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

CAUTION
CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in** property damage.

NOTE: Provides additional information to clarify or simplify a procedure.

Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

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Introduction

This instruction bulletin describes main-main, main-generator, and main-tie-main Square D® brand automatic throwover systems for low voltage switchboards/switchgear. It is for use by installers and specifiers and describes standard systems. For installations that deviate from these standards, this bulletin provides basic information only. Standard systems always include an uninterruptible power supply (UPS).

Options available are a preferred source selector switch, a retransfer switch, closed transition, and push-to-test lights. Refer to documentation supplied by the factory for any deviations to the standard system.

This bulletin also describes a standard sequence of operation for the programmable logic controller (PLC) system. The standard sequence follows one of the sections in “Operation” on page 24. The system is checked for proper sequence using one of the “Test Procedures” on page 30. Any changes to the standard sequence are documented in separate instructional materials provided by the factory.

Figure 1: PLC Shown on Power-Style® QED Switchboard

Square D brand automatic throwover systems from Schneider Electric are designed to meet Underwriters Laboratories (UL) 891 and to be applied on National Electrical Code® (NEC®) 702 Optional Standby Systems.

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Safety Precautions

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

⚠ CAUTION

HAZARD OF BODILY INJURY OR EQUIPMENT DAMAGE

- This manual contains general information about a standard design. It does not contain information about modifications to the standard design.
- Thoroughly review all documentation supplied by the factory for any deviations to the standard design.
- Contact your local Schneider Electric representative if you have any questions concerning the automatic throwover system.

Failure to follow these instructions can result in injury or equipment damage.

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Receiving, Handling, and Storage

The automatic throwover system is included as part of already-assembled equipment. Refer to the general equipment instruction bulletin for complete receiving, handling, and storage instructions for the equipment. Also refer to the programmable controller's user guide for additional environmental restrictions.

Applications and Specifications

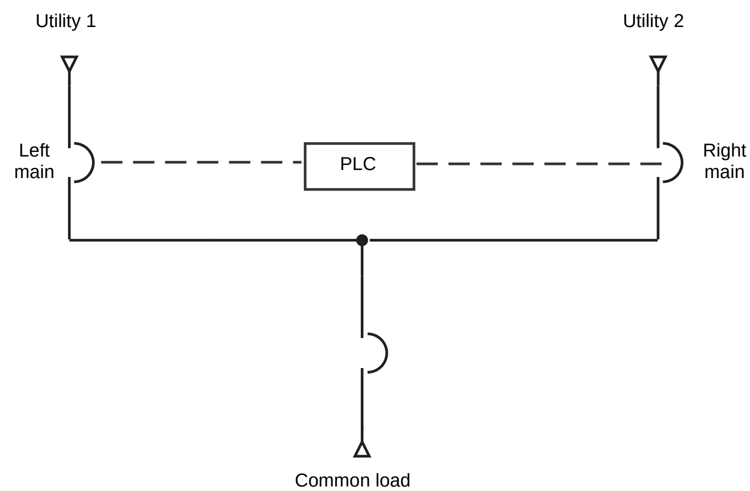
Automatic throwover (auto-throwover) systems minimize power interruption by transferring the load from the normal source to an alternate source when the normal source is temporarily unavailable. The system uses multiple connections to power sources (at least one of which is a utility) and a control system to achieve this transfer.

This auto-throwover system may be supplied with fixed-mounted or drawout circuit breakers, and is controlled by a Modicon® programmable logic controller. These systems also feature redundant supplies of control power. This manual applies to three types of Square D® brand auto-throwover systems: main-main, main-generator, and main-tie-main.

Main-Main

Each main circuit breaker connects to a utility source. Either supply may be the emergency or alternate source. When the normal source becomes unavailable, the system transfers to the alternate source. If the system is equipped with a PSS option, the system reverts to the preferred source automatically once it is available. Without the selector, automatic retransfer does not occur. See Figure 2.

Figure 2: Main-Main Configuration



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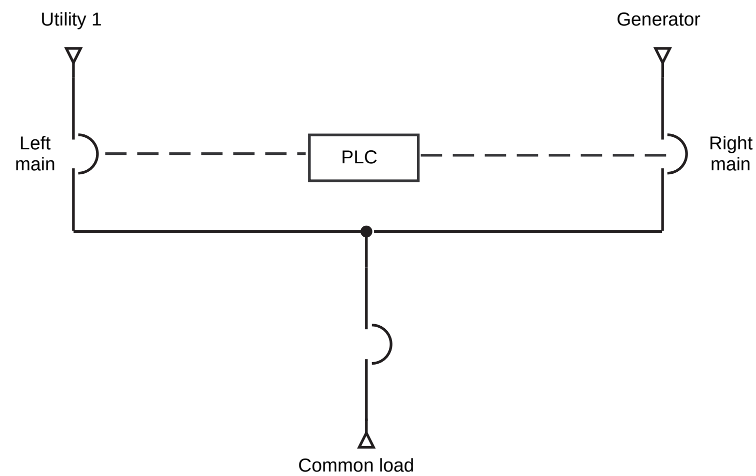
Main-Generator

One main circuit breaker connects to a utility source. The other main circuit breaker connects to a standby generator. Either main can be the emergency source. When power from the utility source is lost, the generator starts. Once both frequency and voltage stabilize, the system transfers to the generator. The system reverts to the utility source automatically when it becomes available, and the generator start signal is discontinued. See Figure 3.

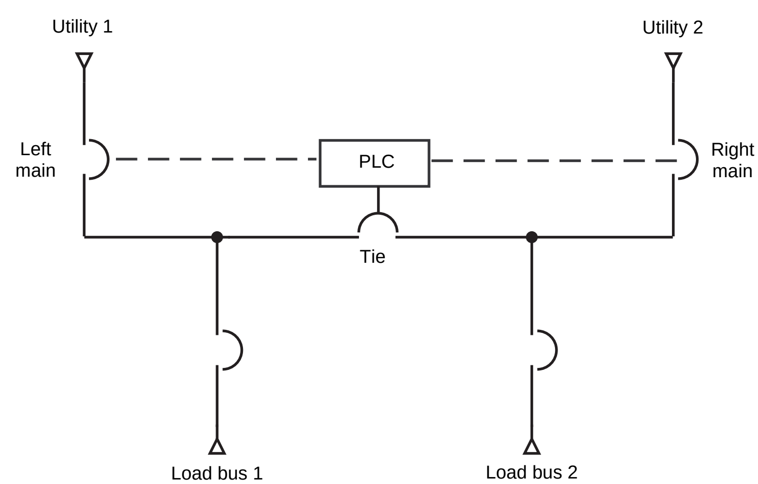
Figure 3: Main-Generator Configuration



Main-Tie-Main

Both main circuit breakers connect to a utility source and connect by means of a normally open tie circuit breaker. Each main circuit breaker feeds independent load buses. Various settings of the PSS and the retransfer on/off options determine which circuit breakers are closed during normal operating conditions. See Figure 4.

Figure 4: Main-Tie-Main Configuration



Operator Door Assembly

The operator door features indicating lights, pushbuttons, and keyed switches used to interface with the control system. See Figure 5 and Figure 6. The main-generator system features an additional generator switch. A main-tie-main system features additional illuminated pushbuttons for the tie circuit breaker. Except as noted, keys may be removed in any position. The location of the lights and switches may vary depending on the equipment type and the options included. The lights and switches will always be clearly labeled.

NOTE: LED bulbs are not replaceable. If an LED has power to it, but does not illuminate, you must replace the LED module. Before replacing an LED module, first turn off all power to the automatic throwover system. **Do not remove the wires connected to an LED module while the system is energized.** Disconnecting the LED module with the power ON may cause a closed circuit breaker to open.

Figure 5: Operator Door—Basic Main-Tie-Main Configuration

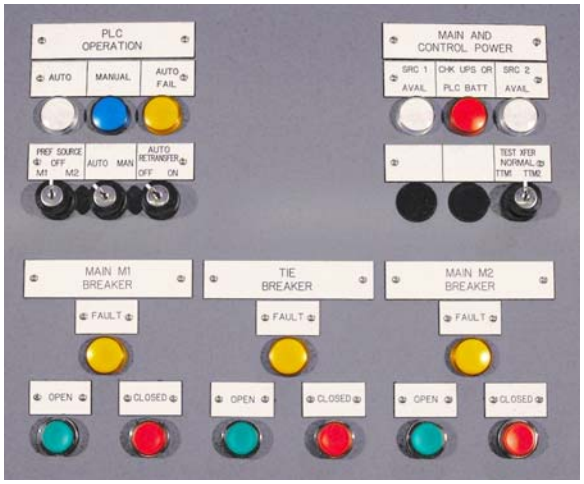
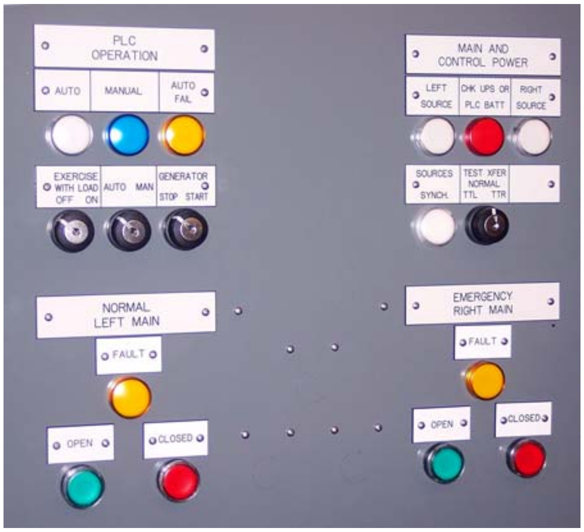


Figure 6: Operator Door—Basic Main-Generator Configuration



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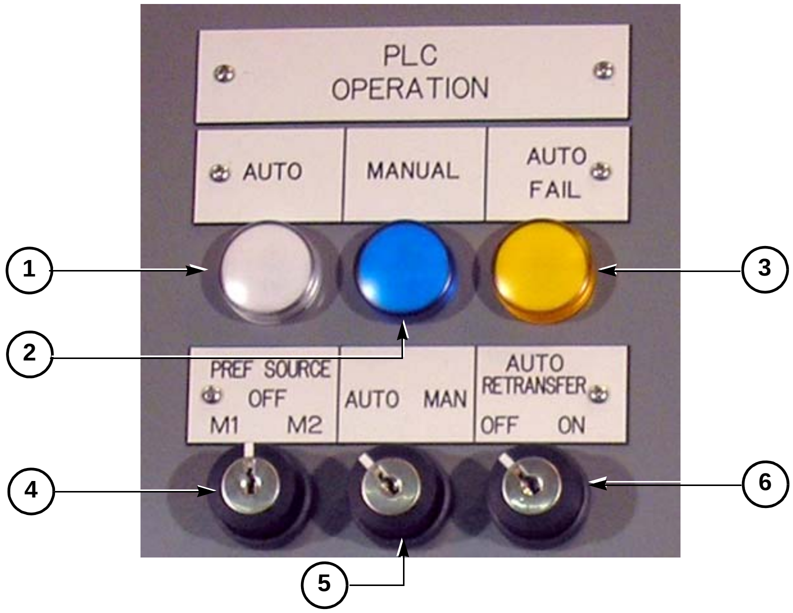
Operating Mode Group: Main-Main or Main-Tie-Main

The upper left-hand corner of the operator door features a two-position auto/manual keyed switch and three indicator lights. Two other optional keyed switches may be present.

Figure 7: Operating Mode Group: Main-Main or Main-Tie-Main

1. White Indicator Light
2. Blue Indicator Light
3. Amber Auto Mode Fail Light
4. PSS Switch (Optional)
5. Auto/Manual Keyed Switch
6. Auto Retransfer Switch (Optional)



Indicator Lights

The white light (Figure 7, 1) indicates the system is in Automatic mode. The blue light (Figure 7, 2) indicates the system is in Manual mode. The auto/manual keyed switch determines the operating mode.

The amber auto mode fail light (Figure 7, 3) indicates a system irregularity. The amber auto mode fail light illuminates under any of the following circumstances:

- Either drawout main or tie circuit breaker (but not all) has been racked to the test or disconnect positions.
- Either main or tie circuit breaker has tripped while the system was in Automatic mode for a reason (such as ground fault) that prevents transfer of source.
- A mechanical Open pushbutton has been pressed.
- The internal diagnostics have detected an error.

Preferred Source Selector (PSS) (Optional)

The optional PSS (Figure 7, 4) is a three-position keyed switch that determines whether the left or right source is the normal source. The center position is the Off position.

Auto/Manual Keyed Switch

The auto/manual keyed switch (Figure 7, 5) has two positions.
Turn the key to:

- “Auto” for automatic operation.
- “Man” (manual) to use the pushbuttons on the operator door to control the system manually.

Auto Retransfer (Optional)

The optional auto retransfer selector (Figure 7, 6) is a two-position keyed switch that determines the automatic retransfer mode. In the On position, retransfer occurs automatically after a source returns and becomes stable. In the Off position, the system remains in the transferred state after the source returns, allowing the user to manually initiate the retransfer at a more

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convenient time. Move the switch from the Off position to On to begin the transfer sequence. When transfer is complete, return the switch to the Off position if automatic transfers are not desired.

NOTE: If the auto retransfer switch is not supplied, all retransfers will be automatic.

Operating Mode Group: Main-Generator

The upper left-hand corner of the operator door features a two-position auto/manual keyed switch, a generator start/stop keyed switch, and three indicator lights. Optional keyed switches may be present.

Figure 8: Operating Mode Group: Main-Generator

1. White Indicator Light
2. Blue Indicator Light
3. Amber Auto Mode Fail Light
4. Exercise with Load Switch (Optional)
5. Auto/Manual Keyed Switch
6. Generator Stop/Start Switch

Indicator Lights

The white light (Figure 8, 1) indicates the system is in Automatic mode. The blue light (Figure 8, 2) indicates the system is in “manual mode”. The auto/manual keyed switch determines the operating mode.

The amber auto mode fail light (Figure 8, 3) indicates a system irregularity. The amber auto mode fail light illuminates under any of the following circumstances:

- Either drawout main or tie circuit breaker (but not all) has been racked to the test or disconnect positions.
- Either main or tie circuit breaker has tripped while the system was in Automatic mode for a reason (such as ground fault) that prevents transfer of source.
- A mechanical Open pushbutton has been pressed.
- The internal diagnostics have detected an error.

Exercise with Load (Optional)

The optional exercise with load selector (Figure 8, 4) is a two-position keyed switch that determines whether the generator exercise will occur with or without load.

Auto/Manual Keyed Switch

The auto/manual keyed switch (Figure 8, 5) has two positions. Turn the key to:

- “Auto” for automatic operation.
- “Man” (manual) to use the pushbuttons on the operator door to control the system manually.

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Generator Start/Stop

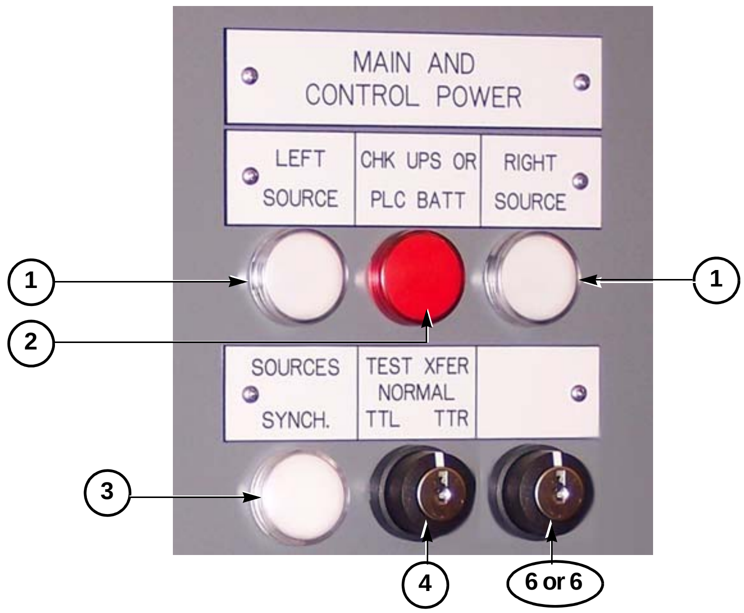
A generator start/stop switch (Figure 8, 6) may be used to start the generator when the auto/manual switch is set to manual mode. The switch has two positions, Stop and Start. In Manual mode, turn to the Start position to send a start signal to the generator. Turn to the Stop position to shut the generator down. In Auto mode, the generator start/stop switch is ignored.

Source and UPS Status Group

The source and uninterruptible power supply (UPS) status group, located in the upper right-hand section of the operator door, features a three-position keyed switch and three lights. Another keyed switch, an illuminated pushbutton, and/or an indicator light may also be present. See Figure 9.

Figure 9: Source and UPS Status Group

1. White Source Light
2. Red CHK UPS OR PLC BATT light
3. Sources Synchronized light (Optional)
4. Test Transfer Switch
5. Closed Transition Switch (Optional)
6. Push-to-Test Button (Optional)



Indicator Lights

Each white “Left Source” or “Right Source” light (Figure 9, 1) illuminates when the corresponding source is available. The red “CHK UPS OR PLC BATT” light (Figure 9, 2) indicates that either the PLC or UPS battery needs service. The “Sources Synched” light (Figure 9, 3) is supplied only on closed transition applications. When the two sources are sufficiently similar in phase angle, magnitude, and frequency, this light illuminates indicating synchronization.

Test Transfer Switch

The keyed test transfer switch (Figure 9, 4) has three positions:

- **TTL (Test Transfer Left)**—Simulates a left source power loss causing a transfer to the right source. During proper operation, the left source light is off and the right source light is on.
- **TTR (Test Transfer Right)**—Simulates a right source power loss causing a transfer to the left source. During proper operation, the right source light is off and the left source light is on.
- **Normal**—Standard operating mode. The switch is in the Normal position when NOT simulating a source power loss.

NOTE: The key can only be removed when it is in the Normal position.

Closed Transition Switch (Optional)

The optional closed transition switch selector (Figure 9, 5) is a two-position switch used to disable the closed transition function. It is only available for closed transition applications. When placed in the Off position, only open transition transfers are possible, even if the sync-check relay conditions are satisfied. When placed in the On position, closed transition transfers will occur if the sync-check relay conditions are satisfied.

NOTE: The closed transition switch cannot be present if the optional push-to-test button is supplied. In this case, all transfers will be closed transition and will occur only when the sync-check relay is satisfied.

Push-To-Test Button (Optional)

The optional push-to-test button (Figure 9, 6 (not shown)) tests the condition of the indicator lights, including illuminated pushbuttons. Press the button labeled “Push-To-Test.” Check all bulbs that do not illuminate. Replace bulbs as needed.

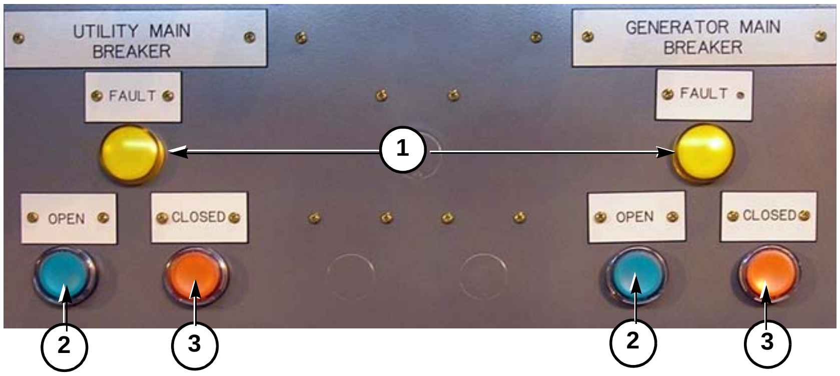
NOTE: The push-to-test button cannot be present if the optional closed transition switch is supplied.

Circuit Breaker Control and Status Group

The circuit breaker control and status group, located on the lower half of the operator door, features a light and two illuminated push buttons for each circuit breaker.

Figure 10: Circuit Breaker Control and Status Group

1. Amber Fault Indicator Light
2. Green Open Illuminated Pushbutton
3. Red Closed Illuminated Pushbutton



Indicator Lights

The amber “Fault” indicator light (Figure 10, 1) illuminates when the circuit breaker trips as a result of a fault condition (*e.g.,* long time, short time, instantaneous, or ground fault).

Pushbuttons

Each circuit breaker has two illuminated pushbuttons: the green open light (Figure 10, 2) and the red closed light (Figure 10, 3). In Manual mode, use these buttons to open or close the circuit breaker to which they correspond. In Automatic mode, the “Open” and “Close” pushbuttons will not control the circuit breakers. The left source group is on the bottom left, the right source group is on the bottom right, and the tie group (not shown) is in the bottom middle for a main-tie-main system.

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Control Power and Power Monitor Assembly

Each utility or generator source provides power to the control power system through a 1000 volt-ampere control power transformer. The disconnecting means for control power and the power quality monitor is located within each main circuit breaker instrument compartment.

Control Power Subassembly

The control power transformer (CPT) connects to source (line) side bussing of the main circuit breaker through a fused disconnect switch (Figure 11). To provide control power, the CPT transforms the line voltage to 120 volts, or, if the system is already 120 volts, isolates the control circuit. Control power is distributed from the secondary side of the transformer through DIN-rail mounted fuses.

Figure 11: Fused Control Power Disconnect

Power Quality Monitor Subassembly

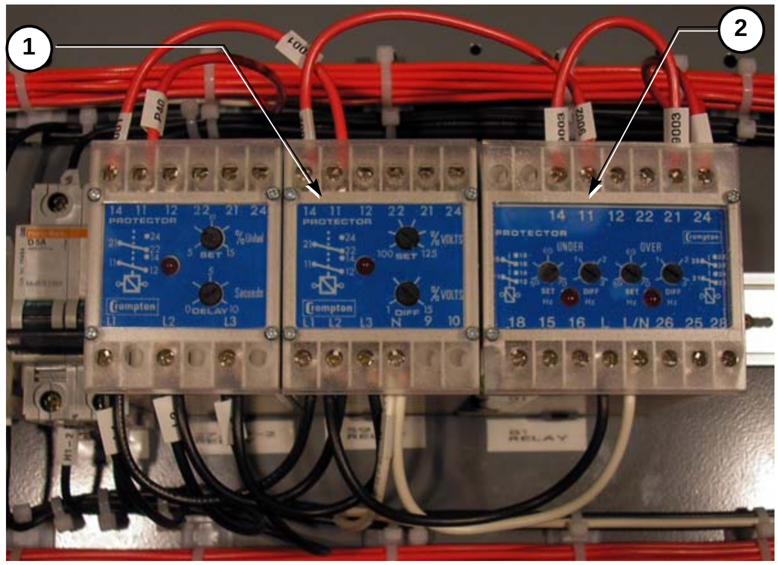
Each power quality monitor constantly evaluates the line voltage for an under-voltage, phase imbalance, phase loss, or phase reversal condition. When the power quality monitor senses an abnormal condition, a voltage input alerts the PLC.

Generator Relay Subassembly

This subassembly is present only when one of the main circuit breakers is connected to a generator instead of a utility source. The subassembly contains an overvoltage relay (Figure 12, 1) and an over/under frequency relay (Figure 12, 2). The relays' outputs are in series with the power quality monitor's outputs and indicate to the PLC that the generator source is available for use. The relays' settings are adjustable. Refer to the relay manuals for details.

Figure 12: Generator Relay Subassembly

1. Overvoltage Relay
2. Over/Under Frequency Relay



Sync-Check Relay Assembly

The sync-check relay assembly is located in each main circuit breaker section if the automatic throwover system is a closed transition system. The sync-check relay is shown in Figure 13. It compares "A" phase voltages from each source and closes a contact when both are sufficiently similar in phase angle, magnitude, and frequency. The closed contact provides a voltage input to the PLC to indicate that the power sources are "in phase." The sync-check relay is located in one section only.

Figure 13: Sync-Check Relay Assembly

UPS Assembly

The uninterruptible power supply (UPS) assembly consists of three main parts: the UPS, UPS bypass relay, and control power source contactor. Power flows from one control power subassembly through the control power source contactor, then through the UPS, and out to the control system. See Figure 14.

Figure 14: UPS Assembly

Control Power Source Contactor

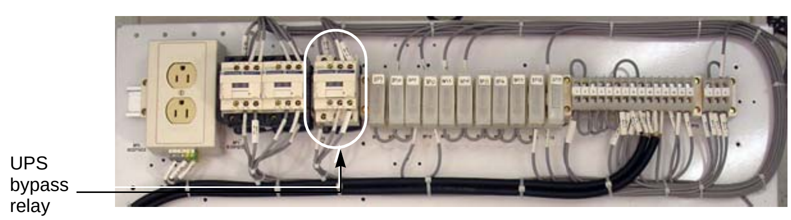
The line side of each main circuit breaker provides power to the control power transformers. The control power source contactor directs power to the UPS from an available utility or generator source. When two sources are available, either source may be the control power source. Mechanical interlocking of the contactor keeps the sources from paralleling through the control power circuit. See Figure 15.

Figure 15: Control Power Source Contactor

UPS Bypass Relay

The UPS bypass relay activates automatically to bypass the UPS to maintain the power flow to the control power system when the UPS is not functioning properly. See Figure 16.

Figure 16: UPS Bypass Relay



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UPS Unit

During normal operation, control power goes through the UPS, which acts as a voltage regulator for the control circuit. When neither the normal nor the alternate source are available, the UPS provides control power from its battery for a limited time. The UPS owner's manual provides details about its load capability.

The UPS battery will eventually require service. The "CHK UPS OR PLC BATT" light on the operator door will indicate when one of the batteries needs service. The "Low Batt" LED on the UPS will also illuminate when the UPS battery becomes inoperative. The "Low Batt" LED on the PLC will illuminate when the PLC battery needs to be replaced.

Figure 17: UPS Unit

Programmable Logic Controller (PLC) Assembly

The programmable logic controller assembly is located behind the operator door and contains the PLC central processing unit (CPU), PLC power supply, and input/output (I/O) modules. The interposing relays and some terminal blocks are located here, as well. See Figure 18.

Figure 18: PLC Assembly

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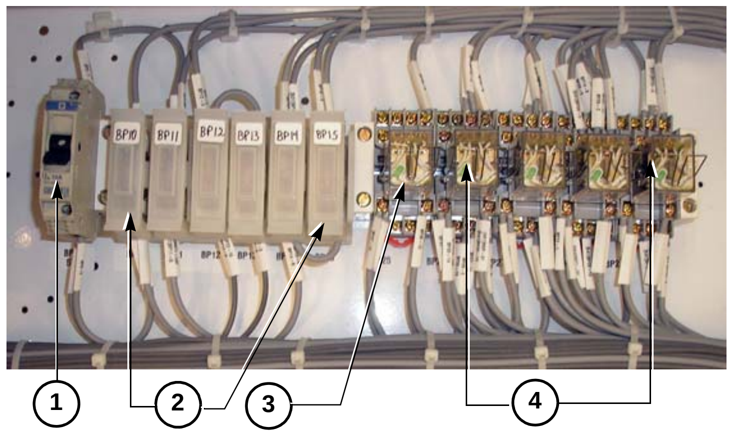
Circuit Breaker and Fuses

The circuit breaker (Figure 19, 1) provides a convenient method to “power down” the PLC for such things as program changes. Opening this circuit breaker removes power from the PLC, remote status interposing relay, generator start timer relay, and pushbuttons. The fuses (Figure 19, 2) are DIN-rail mounted devices and are equipped with indicating lights to signal a blown fuse.

Figure 19: Circuit Breaker, Fuses, Remote Status Relay, and Interposing Relays

1. Circuit breaker
2. Fuses
3. Remote status relay
4. Interposing relays



NOTE: Powering down the PLC will cause the generator start signal to be sent in a main-generator system. No transfer will take place, unless it is manually initiated.

Remote Status Relay Subassembly

This is an interposing relay on the PLC pan that closes a set of contacts when the PLC falls out of Automatic mode and enters Automatic-Fail mode (Figure 19, 3). The relay is wired to terminal blocks on the UPS assembly for customer connection points. Spare contacts, both normally open and normally closed, are provided at the relay.

Interposing Relays

The PLC outputs use Square D® brand, Type R interposing relays (Figure 19, 4) to open circuit breakers and to give an optional remote status contact. These relays are also used as part of an electrical interlock circuit which activates when the PLC is offline for any reason.

Generator Start Relay

Figure 20: Generator Start Relay

The generator start relay is an off-delay timer relay. See Figure 20. The relay is normally energized by an output from the PLC. When the generator source is required, the PLC output goes low to de-energize the relay and close the generator start contact. In the event of a total loss of control power (or if power to the PLC is disconnected), the relay will revert to its de-energized state to send a generator start signal via the same start contact.

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Touch Screen Control Option

General Information

The PLC control scheme can be equipped with an optional touch screen that replaces most of the door-mounted mechanical operators. The touch screen is available for the main-main, main-generator, and main-tie-main configurations. The auto/manual mode switch and generator start switch hardware will remain on the switchboard/switchgear to allow for manual control in the event that the touch screen does not work. These operators will allow the PLC to be switched to manual mode for generator starting and circuit breaker control via pushbuttons on the circuit breaker faceplates.

The touch screen provides the following features:

1. Personnel can set password-protected time delays from the touch screen. There will be no requirement for laptop computers, complicated online PLC program changes, specialized software, or cables.
2. Alarm conditions will contain specific information instead of being limited to a general summary alarm.
3. Optional event logging with time and date stamp is available. This feature allows personnel to track when and why transfers occurred.
4. Two levels of password protection are available to limit personnel access. This will ensure that only authorized personnel can access control buttons and switches for transfer operations. A second level of password protection will allow adjustment of time delays and password administration.
5. The display is backlit, which allows for manual operation in low ambient light conditions.

Touch Screens

The touch screens available are:

- Main
- Settings
- Programmable Logic Controller Input/Output (PLC I/O) Map
- Sequence of Operation
- Alarm Log (optional)
- Event Log (optional)

Main

The main screen contains system status indicators, circuit breaker control buttons, system control switches, password access button, date and time display, and screen access buttons. See Figure 21.

Figure 21: Main Screen

Settings

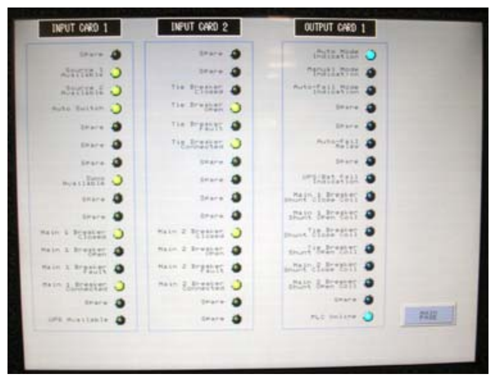
The settings screen contains touchpads for changing delay and timer settings, time and date settings, access to touch screen system configuration, and password administration. See Figure 22.

Figure 22: Settings Screen

PLC I/O Map

The PLC contains input/output (I/O) lists with indicators for status. See Figure 23.

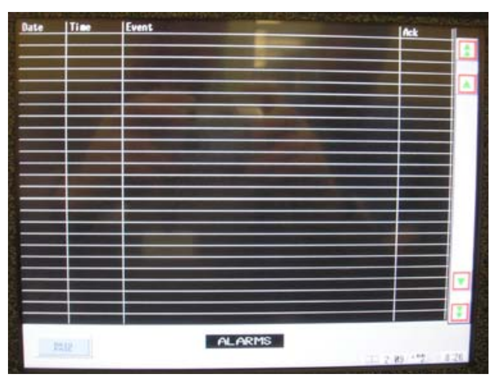
Figure 23: PLC I/O Map Screen



Alarm Log (Optional)

The alarm log contains a running list of alarms generated by system events (*i.e.*, circuit breaker faults, circuit breaker connection status, auto fail mode, etc.). See Figure 24.

Figure 24: Alarm Log Screen



Event Log (Optional)

The event log contains a running list of system events (i.e., switch activation, circuit breaker status, etc.). See Figure 25.

NOTE: When power is turned on, the touch screen will be illuminated before the PLC goes into “run mode” for about 10 sec.

Press the X in the lower right corner of the touch screen to close that window and allow visibility of all functions.

Figure 25: Event Log Screen

Password Access

The main screen displays the image of a closed padlock in the lower left corner. See Figure 26.

Figure 26: Password Access

1. Touch the padlock image to call up a touchpad for numeric data entry.
2. Enter the level 1 password (default 1234) to unlock access to the control switches and pushbuttons.
3. Use the required level 2 password (default 4321) to unlock the settings screen and to allow all level 1 functionality.
4. Touch the enter key to return to the main screen after entering the appropriate password.

   If the correct password was entered, the screen will display an unlocked padlock image with the active password level of 1 or 2.
5. Touch the push-to-lock touch pad to re-locked the system at any time.

The password access mode will eventually time out and automatically re-lock (as indicated by a return to the locked padlock image). The duration of the password security timer can be adjusted on the settings screen. Passwords also can be changed on this screen.

NOTE: If the password(s) is forgotten, a “back-door” access password (32767) can be entered for level 2 access.

1. Call up the settings screen, and a new button appears which allows a password override.
2. Touch the password override button to call up a screen that allows both the level 1 and level 2 passwords to be viewed and/or reset.

Control Operation

1. Enter the level 1 password to access control switches and pushbuttons on the main screen.
2. Touch a pushbutton to activate it.
3. Touch the switch to change a switch position. A popup window will appear, presenting additional touchpads for each switch position.
4. Touch the desired switch position. This closes the popup window and activates the switch.

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5. Access the help screen by touching the “?” touch pad on the switch popup screen. Help screens are available for each switch.
6. Close popup screens by: touching the red “X” in the upper right corner, touching the desired function, or touching an “OK” button.

NOTE: The auto/manual mode switch and generator start switch are not located on the touch screen, but are located on the equipment next to the touch screen.

Control Settings

1. Enter the level 2 password to access the settings screen.
2. Touch a time value to enter a new value on a popup numeric keypad.
3. Access help screens by touching the “?” touch pads near the setting in question.
4. Access time and date settings by touching the “PLC Time Set” or “PLC Date Set” button.
5. Adjust time and date settings by touching the up or down arrows that appear above and below the desired value.

NOTE: The touch screen has its own date/time function that will not control the PLC date/time. Consult the touch screen instructions for other functions not covered here, such as backlighting levels.

Alarm and Event Logs (Optional)

Enter the level 1 password to view these screens if supplied.

Events appear on a summary list with the most recent occurrences near the top.

Active events/alarms are displayed as red, acknowledged items appear yellow, and events/alarms that have returned to normal are displayed as green.

NOTE: Pressing the “acknowledge all events” button will change event status from red to yellow.

Operation

Main-Main System

This section describes the Automatic operation mode of the automatic throwover scheme for a main-main or two-utility system. Either the left or right main circuit breaker can be the normal or emergency source.

Initial (Default) Setting

The default setting is one main circuit breaker (designated “normal”) closed and one main circuit breaker (designated “alternate”) open. The left circuit breaker is the “normal” circuit breaker unless otherwise specified, either when initially ordered or by the PSS position.

Normal Source Lost

If the normal source is lost, the PLC automatically transfers the load to the alternate source. The normal circuit breaker opens after the open delay. After the close delay, the alternate circuit breaker closes.

Normal Source Returns—PSS Off/ No PSS Option

Without the PSS option, or if the PSS is Off, the system will remain in the transferred state, even after the normal source returns. The alternate circuit breaker will remain closed until manual intervention (or the alternate source is lost), allowing the user to schedule retransfer at a convenient time.

Normal Source Returns—PSS On

If the PSS is On:

- In an open-transition system, after the source stabilization delay, the alternate circuit breaker opens. After the close delay, the normal source closes.
- In a closed transition system, after the source stabilization delay, if the sync-check relay is satisfied, the normal circuit breaker closes. Two seconds later, the alternate circuit breaker opens. If the sync-check relay is not satisfied, retransfer will be delayed until the sources are synchronized.

Alternate Source Lost

If the alternate source is lost while the normal source is out, the alternate source circuit breaker will open. The circuit breaker associated with the first returning source will close after the source stabilization delay.

Auto Retransfer (Optional)

If equipped with the auto retransfer switch:

- With the switch in the Off position, the user controls the transfer manually.
- With the switch in the On position, the transfer will occur automatically.

Main-Generator System

This section describes the Automatic operation mode of the automatic throwover scheme for a system with one connection to a utility source and another to a generator.

Initial (Default) Setting

Under normal circumstances, the main circuit breaker connected to the utility is closed and the main circuit breaker attached to the generator is open. Unless otherwise specified, the utility source is the left circuit breaker and the generator breaker is on the right.

Normal Source Lost

The system automatically transfers the load to the alternate source. The Normal circuit breaker opens after the Open Delay, and the start signal goes out to the generator. The alternate circuit breaker closes 10 seconds after the automatic throwover system's generator relays are satisfied, indicating both voltage and frequency are within desirable limits.

Normal Source Returns—Open Transition

After the source stabilization delay has expired, the system will retransfer to the normal source in an open transition sequence. First, the generator circuit breaker opens. After the close time delay, the normal circuit breaker will close. The generator will run in an unloaded state for 15 minutes to allow for cool-down.

Normal Source Returns—Closed transition

After the source stabilization delay has expired, the system will retransfer to the normal source in a closed transition sequence. If the sync-check relay is satisfied, the normal circuit breaker closes, and after two seconds the generator circuit breaker opens. The generator will run in an unloaded state for 15 minutes to allow for cool-down. If the sources are not synchronized, retransfer will be delayed until the sources are synchronized.

Generator Source Lost While Normal Source Is Out

If the alternate (generator) source is lost while the normal source is out, the alternate source circuit breaker will open. If the alternate generator source is lost three times within 15 minutes, the system will go into "Auto Fail." When the normal source returns and stabilizes, the "Auto Fail" will reset and the normal breaker will close, returning the system to normal operating conditions.

Exercise Period

Every Sunday at 1:00 p.m., a start signal will be sent to the generator for 30 minutes. The exercise period may be loaded or unloaded if equipped with the optional exercise with load selector switch. If exercise with load is selected, a transfer to the generator source will occur during the exercise period.

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Main-Tie-Main System (No Options)

This section describes the Automatic operation mode of the PLC automatic throwover scheme for a two-utility source system with a tie circuit breaker when no options are included.

Initial (Default) Setting

Under normal circumstances (default conditions), both main circuit breakers are closed and the tie is open.

Normal Source Lost

After the open delay, the main circuit breaker whose source is lost will open. The tie circuit breaker closes after the close delay, reenergizing the lost load.

Normal Source Returns

After the source stabilization delay has expired, the tie circuit breaker opens. After the close delay, the main circuit breaker whose source has returned will close.

Both Sources Lost

If both utility sources are lost, then both main circuit breakers and the tie circuit breaker will open. When only one source returns, the system will change state to power both of the load buses from that source. When both sources return simultaneously, the main circuit breakers will close and the tie remains open.

Main-Tie-Main System (Options Included

This section describes the Automatic operation mode of the automatic throwover scheme provided for a two-utility source system with a tie circuit breaker when standard options are specified. The options include: PSS, closed transition, and retransfer on/off.

Initial (Default) Setting

The default condition varies with the PSS switch. Assuming both utility sources are available:

- If the switch position is Left, then the left main circuit breaker and tie are closed, while the right main circuit breaker is open.
- If the switch position is Right, then the right main circuit breaker and tie are closed, while the left main circuit breaker is open.
- If the PSS is Off (or not installed), then both main circuit breakers are closed and the tie circuit breaker is open.

Normal Source Lost

The associated normal source circuit breaker opens after the open delay. After the close delay, a previously open circuit breaker closes to restore power. The position of the PSS switch determines the exact order of operations as follows:

- With the PSS in the Left position: If the left source is lost, the left circuit breaker opens after the open delay. After the close delay, the right circuit breaker closes. The tie circuit breaker does not change state.
- With the PSS in the Right position: If the right source is lost, the right circuit breaker opens after the open delay. After the close delay, the left circuit breaker closes. The tie circuit breaker does not change state.
- With the PSS absent or in the Off position: The main circuit breaker whose source has been lost will open after the open delay. After the close delay, the tie circuit breaker will close, restoring power to the affected load.

Alternate Source Lost While Normal Source Available

With the PSS in the Right position, and the right circuit breaker closed: If the left source is lost, the system will not change state.

Similarly, with the PSS in the Left position, and the left circuit breaker closed: If the right source is lost, the system will not change state.

Both Sources Lost

If both utility sources are lost, the remaining source circuit breaker and the tie circuit breaker will open. When only one of the sources returns, the system will change state to power both the load buses from that source. When both return simultaneously, PSS and Retransfer On/Off switch positions determine which circuit breakers close.

Normal Source Returns—Retransfer Off

With Retransfer "Off," the system does not change state, with or without PSS. This allows the user to schedule retransfer at a convenient time.

Normal Source Returns—Retransfer On or Not Present

Without PSS, the system returns to normal state (that is, both mains closed and the tie open). With PSS, the system returns to normal state as determined by the position of the PSS:

1. Once the power quality monitor detects the return of the lost source, the stabilization delay begins to elapse.
2. After the delay elapses, the source is transferred. The transfer sequence is as follows:
   - In an open transition system, the normally open main circuit breaker opens, and the normally closed main circuit breaker closes after the close delay. (For example, if the PSS is in the Left position, the right main breaker opens. After the close delay, the left main closes.)
   - In a closed transition system, the normally closed circuit breaker closes, and two seconds later, the normally open circuit breaker opens. (For example, if the PSS is in the Right position, the right main breaker closes. Two seconds later, the left main breaker opens.)

Conditions That Prevent Transfer of Source

Downstream Fault

If a main circuit breaker trips as a result of a downstream fault, electrical interlocking does not allow either device to close. In Manual mode, the Close pushbuttons are locked out. In Automatic mode, closure is not allowed. A tripped circuit breaker also activates the amber "Auto Fail" light. Automatic transfer does not occur until the fault is cleared and the circuit breaker is reset. Refer to the circuit breaker literature for instructions on how to reset the auxiliary contacts. To reset the automatic throwover system, turn the "auto/manual" switch to Manual and then back to "Auto".

Other Conditions

Phase imbalance, phase reversal, or source voltage that exceeds limits (including total loss of voltage) will de-energize the power quality monitor, not allowing the associated main circuit breaker to close. A generator source is also monitored for over-voltage and proper frequency. If equipped with the optional auto retransfer switch and the switch is in the Off position, retransfer will be suspended until the switch is placed in the On position. This allows the user to wait for synchronization to occur (if closed transition application) or initiate the transfer at a more convenient time.

Main-generator systems are programmed to keep the alternate source circuit breaker from cycling. If the alternate source is being used to power the load, and the source voltage exceeds acceptable limits three times within 15 minutes, the system will default to Auto Fail, and the alternate circuit breaker will not be allowed to re-close. This condition is reset when the normal source returns, and the load is energized from the normal source.

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Installation

Preparation for Receiving Equipment

The automatic throwover system is contained in several switchboard or switchgear sections. Refer to the switchboard or switchgear manual for information pertinent to the equipment sections.

The Modicon PLC has environmental restrictions different from that of the equipment as a whole. These restrictions can be found in the Modicon PLC User's Guide. Be sure to store and install the equipment in accordance with the tighter restrictions. For example, if the Modicon central processing unit (CPU) has temperature limits of 32–140 °F (0–60 °C), and the equipment has limits of 32–167 °F (0–75 °C), then keep the equipment between 32–140 °F (0– 60 °C).

Location and Interconnection of Assemblies

The parts of the automatic throwover system are distributed among several switchboard or switchgear sections and must be wired together. Refer to the factory-supplied drawings shipped with the equipment for exact locations and subassembly interconnections.

Final Wiring Connections

As previously noted, the parts of the automatic throwover system are distributed among several equipment sections and must be wired together. Some terminal blocks may be near the bottom of the front or rear corner channels. Refer to the wiring diagrams furnished with the switchboard or switchgear to confirm all wiring connections.

Installing the Equipment

1. For a generator system, connect the external wiring on terminal blocks GEN 1 and GEN 2. The wiring must be run in conduit.
2. For remote status indication, connect the external wiring on terminal blocks AL 1 and AL 2 on the UPS assembly.
3. Complete all wiring between the sections for the control power and signals. The terminal blocks are typically located at the bottom of the front or rear corner channels of each section.

Checkout Before Energizing

The control power system has two or more fused disconnects, DIN-rail mounted circuit breakers, and numerous fuse assemblies. All of these must have the proper fuses installed, and the devices must be in the On position. Fuse sizes are specified on the wiring or schematic diagrams for the equipment. Use the following checklist for the correct initial startup device settings.

1. Use the mechanical Open button on each circuit breaker to open the mains.
2. Turn the “auto/manual” switch on the operator door to the Manual position.
3. Turn all load (distribution) devices off.
4. Turn all control power disconnects to the On position.
5. Close and secure all covers and doors.

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Performance Checkout

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- The control circuit and bus work are energized during the performance tests. Thoroughly review the equipment drawings, documentation, and design before starting any performance testing.

Failure to follow these instructions will result in death or serious injury.

Follow the checkout procedures in the “Installation” and “Maintenance” documentation for the equipment.

1. Energize the equipment.
2. Turn on the uninterruptible power supply (UPS) that is supplied with the equipment.
3. Complete the appropriate test of the Manual mode as described for the installed system in the “Test Procedures” section of this bulletin, beginning on page 30.
4. Complete the appropriate test of the Automatic mode as described for the installed system in the “Test Procedures” section of this bulletin, beginning on page 30.
5. Complete any steps for installed devices, including circuit breaker tests, ground fault tests, or metering circuit checkout as described in the appropriate documentation.

Placing Into Service

Place the automatic throwover system into service after satisfactory completion of the “Performance Checkout” on page 29 and all outlined tests.

1. Open or close the main circuit breakers to the desired initial condition using the automatic throwover system operator door switches.
2. Position all switches on the operator door to the desired positions.
3. Remove the keys from the keyed switches, and store in a secure but accessible location.

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Test Procedures

Before beginning any test procedure, complete the installation steps outlined in “Checkout Before Energizing” on page 28. Identify the system type (main-main, main-generator, or main-tie-main), and whether the system has options (pss, closed transfer, or retransfer on/off), to select the correct test procedure set. Complete the tests as outlined in “Performance Checkout” on page 29.

Perform the appropriate tests for Manual and Automatic modes quarterly. Record test dates and results in the“Maintenance Log” on page 47.

NOTE: This bulletin is for use by installers and specifiers and describes standard systems. For installations that deviate from these standards, this bulletin provides basic information only. Standard systems always include a UPS. Options available are a PSS switch, closed transition, exercise with load, auto retransfer, and a push-to-test lights pushbutton. Refer to the documentation supplied by the factory for any deviations to the standard system.

Additionally, this bulletin describes a standard sequence of operation for the system. The standard sequence follows one of the *“Operation”* sections beginning on *page 24* of this manual. The system is checked for proper sequence using one of the “Test Procedures” in the “Installation” section of this bulletin. Any changes to the standard sequence are documented in separate instructional materials that are provided by the factory.

Main-Main Base System

This section covers testing recommended for a two-utility system when no options are installed.

Manual Mode

With the switch in Manual mode, an operator can open and close each circuit breaker independently using the pushbuttons on the operator door. Only one main circuit breaker may be closed at a time, avoiding closed transition. A two-second delay occurs between opening one main and closing the other.

Table 1: Manual Mode Test Procedure for Basic Main-Main

1.	Complete the following:	Turn the auto/manual switch to the Manual position.
		Open both main circuit breakers with the mechanical Open button located on the circuit breakers.
		Turn the TTL/Normal/TTR switch to the Normal position.
2.	Verify that the following lights are on:	White Left Source light
		White Right Source light
		Green Left Main Open light
		Green Right Main Open light
		Blue Manual Mode light
3.	Verify that the following lights are off:	Amber Left Main Fault light
		Amber Right Main Fault light
		White Auto Mode light
4.	Press the red Left Main Close pushbutton on the operator door.	Green Left Main Open light will turn off
		Red Left Main Closed light will turn on
5.	Open the left main circuit breaker using the green Open pushbutton on the operator door.	Red Left Main Closed light will turn off
		Green Left Main Open light will turn on
6.	After two seconds, press the red Right Main Close pushbutton on the operator door.	Green Right Main Open light will turn off
		Red Right Main Closed light will turn on
7.	Open the right main circuit breaker using the green Open pushbutton on the operator door.	Red Right Main Closed light will turn off
		Green Right Main Open light will turn on
	NOTE: If the pushbutton to close one main circuit breaker is pressed while the other main circuit breaker is closed, the input is ignored.	

Automatic Mode

The operator door pushbuttons will not operate the circuit breakers in Automatic mode.

Table 2: Automatic Mode Test Procedure for Basic Main-Main

1.	Complete the following:	Turn the auto/manual switch to the Manual position.
		Open both main circuit breakers with the mechanical Open button located on the circuit breakers.
		Turn the TTL/Normal/TTR switch to the Normal position.
2.	Verify the following lights are off:	Amber Auto Fail light
		Amber Left Main Fault light
		Amber Right Main Fault light
3.	Verify the following lights are on:	White Left Source light
		White Right Source light
		Blue Manual Mode light
4.	Turn the auto/manual switch to Auto.	Normal source main circuit breaker will close
5.	Verify the following lights are on:	White Auto light
		Red Normal Closed light
		Green Alternate Open light
6.	Verify the following lights are off:	Amber Auto Fail light
		Amber Left Main Fault light
		Amber Right Main Fault light
7.	Simulate a loss of the normal source by turning the TTL/Normal/TTR switch to TTL (Test Transfer Left) or TTR (Test Transfer Right), whichever is the normal source. The normal main circuit breaker will open after the Open Delay. The Close Delay begins timing once the normal circuit breaker opens. After the Close Delay has timed out, the alternate source main circuit breaker will close.	
8.	Verify the following lights are on:	Green Normal Open light
		Red Alternate Closed light
		White Alternate Source light
	NOTE: The light for the normal source will be off.	
9.	Simulate normal source voltage return by turning the TTL/Normal/TTR switch back to the Normal position. The alternate main circuit breaker will continue to power the load, but the normal source light will be on.	
10.	Simulate a loss of the alternate source by turning the TTL/Normal/TTR switch to TTL (Test Transfer Left) or TTR (Test Transfer Right), whichever is the alternate source. The alternate main circuit breaker will open after the Open Delay. The Close Delay begins timing once the alternate circuit breaker opens. After the close delay has timed out, the normal source main circuit breaker will close.	
11.	Verify the following lights are on:	Green Alternate Open light
		Red Normal Closed light
		White Normal Source light
	NOTE: The source light for the alternate source will be off.	
12.	Simulate alternate source voltage return by turning the TTL/Normal/TTR switch back to the Normal position. The normal main circuit breaker will continue to power the load, but the alternate source light will be on.	

Main-Main Standard Options

This section covers testing recommended for a main-main system with standard options. These options include PSS, auto retransfer, and closed transition.

Manual Mode

With the switch in Manual mode, an operator can open and close each circuit breaker independently using the pushbuttons on the operator door. The PSS does not impact Manual mode.

Table 3: Manual Mode Test Procedure for Main-Main with Options

<table>
<tr><td rowspan="4">1.</td><td rowspan="4">Complete the following:</td><td>Turn the auto/manual switch to the Manual position.</td></tr>
<tr><td>Open both main circuit breakers with the mechanical Open button located on the circuit breakers.</td></tr>
<tr><td>Turn the TTL/Normal/TTR switch to the Normal position.</td></tr>
<tr><td>Turn the PSS switch to the Off position.</td></tr>
<tr><td rowspan="5">2.</td><td rowspan="5">Verify that the following lights are on:</td><td>White Left Source light</td></tr>
<tr><td>White Right Source light</td></tr>
<tr><td>Green Left Main Open light</td></tr>
<tr><td>Green Right Main Open light</td></tr>
<tr><td>Blue Manual Mode light</td></tr>
<tr><td rowspan="3">3.</td><td rowspan="3">Verify that the following lights are off:</td><td>Amber Left Main Fault light</td></tr>
<tr><td>Amber Right Main Fault light</td></tr>
<tr><td>White Auto Mode light</td></tr>
<tr><td rowspan="2">4.</td><td rowspan="2">Press the red Left Main Close pushbutton on the operator door.</td><td>Green Left Main Open light will turn off</td></tr>
<tr><td>Red Left Main Closed light will turn on</td></tr>
<tr><td rowspan="5">5.</td><td colspan="2">Move the PSS switch to the right position (prefer right source)</td></tr>
<tr><td rowspan="2">Press the Right Main Close pushbutton on the operator door. In a closed transition system with a satisfied sync-check relay.</td><td>Green Right Main Open light will turn off</td></tr>
<tr><td>Red Right Main Closed light will turn on</td></tr>
<tr><td colspan="2">After two seconds, the left main circuit breaker will open. The indicating lights for the left circuit breaker will change status.</td></tr>
<tr><td colspan="2">NOTE: If the synchronizing relay is not satisfied or is not installed, the command to close the right main will be ignored. Likewise, if the closed transition selector switch is in the Off position, the command to close the right main will be ignored.</td></tr>
<tr><td rowspan="5">6.</td><td colspan="2">Move the PSS switch to the left position (prefer left source)</td></tr>
<tr><td rowspan="2">Press the Left Main Close pushbutton on the operator door. In a closed transition system with a satisfied sync-check relay.</td><td>Green Left Main Open light will turn off</td></tr>
<tr><td>Red Left Main Closed light will turn on</td></tr>
<tr><td colspan="2">After two seconds, the right main circuit breaker will open. The indicating lights for the right circuit breaker will change status.</td></tr>
<tr><td colspan="2">NOTE: If the synchronizing relay is not satisfied or is not installed, the command to close the left main will be ignored. Likewise, if the closed transition selector switch is in the Off position, the command to close the left main will be ignored.</td></tr>
</table>

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Automatic Mode

The operator door pushbuttons will not operate the circuit breakers in Automatic mode.

Table 4: Automatic Mode Test Procedure for Main-Main with Options

1.	Complete the following:	Turn the auto/manual switch to the Manual position.
		Open both main circuit breakers with the mechanical Open button located on the circuit breakers.
		Turn the TTL/Normal/TTR switch to the Normal position.
		Turn the PSS switch to the Off position.
		Turn the Auto Retransfer Selector switch to the On position.
2.	Verify the following lights are on:	White Left Source light
		White Right Source light
		Blue Manual Mode light
3.	Verify the following lights are off:	Amber Auto Fail light
		Amber Left Main Fault light
		Amber Right Main Fault light
4.	Turn the auto/manual switch to Auto. The normal source main circuit breaker will close.	
5.	Verify the following lights are on:	White Auto light
		Red Normal Closed light
		Green Alternate Open light
6.	Verify the following lights are off:	Amber Auto Fail light
		Amber Left Main Fault light
		Amber Right Main Fault light
		Blue Manual Mode light
7.	Simulate a loss of the utility source by turning the TTL/Normal/TTR switch to TTL (Test Transfer Left) or TTR (Test Transfer Right), whichever is the normal source. The normal main circuit breaker will open after the Open Delay. The Close Delay begins timing once the normal circuit breaker opens. After the Close Delay has timed out, the alternate main will close.	
8.	Verify the following lights are on:	Green Normal Open light
		Red Alternate Closed light
		White Alternate Source light
	NOTE: The source light for the normal source will be off.	
9.	Simulate normal source voltage return by turning the TTL/Normal/TTR switch back to the Normal position.	
	With PSS and open transition, the system may retransfer to the normal circuit breaker. To allow the retransfer, set the PSS to the normal source position. To avoid retransfer, set the selector switch to the center/Off position. With the PSS set to the normal source position, the source stabilization delay begins timing once the normal source returns. After timing out, the alternate circuit breaker opens. After the Close Delay, the normal circuit breaker closes.	
	With PSS and closed transition, the source stabilization timer begins to time out once the normal voltage returns. With the PSS set to the normal source position, the normal circuit breaker closes. Two seconds later, the alternate circuit breaker opens.	
	NOTE: Without the PSS, the system does not retransfer. If the Auto Retransfer switch is set to the Off position, retransfer will be suspended until it is moved to the On position.	
10.	To simulate a loss of the utility alternate source, have the system set as follows:	Normal Main open
		Alternate Main closed
		PSS, if present, off
		Both Source lights on
11.	Simulate loss of alternate source by turning the TTL/Normal/TTR switch to the alternate source. The alternate circuit breaker will open after the Open Delay, and after the Close Delay the normal circuit breaker will close.	
12.	Simulate alternate source voltage return by turning the TTL/Normal/TTR switch back to the Normal position. The normal main circuit breaker will continue to power the load.	

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Main-Generator Base System

This section covers testing recommended for a utility-generator system with no options. The normal circuit breaker connects to the utility source, and the alternate circuit breaker connects to the generator.

Manual Mode

With the switch in Manual mode, an operator can open and close each circuit breaker independently using the pushbuttons on the operator door. Only one main circuit breaker may be closed at a time, avoiding closed transition. A two-second delay occurs between opening one main and closing the other.

Table 5: Manual Mode Test Procedure for Basic Main-Generator

1.	Complete the following:	Turn the auto/manual switch to the Manual position.
		Open both main circuit breakers with the mechanical Open button located on the circuit breakers.
		Turn the TTL/Normal/TTR switch to the Normal position.
		Turn the Generator Start switch to the Stop position.
2.	Verify that the following lights are on:	White Normal Source light
		Green Normal Main Open light
		Green Alternate Main Open light
		Blue Manual Mode light
3.	Verify that the following lights are off:	White Alternate Source light
		Amber Normal Main Fault light
		Amber Alternate Main Fault light
		White Auto Mode light
4.	Start the generator by turning the Generator Start switch to the Start position. Proceed with this test when the source available light for the generator is on.	
5.	Press the red Normal Main Close pushbutton on the operator door.	Green Normal Main Open light will turn off
		Red Normal Main Closed light will turn on
6.	Open the normal main circuit breaker using the green Open pushbutton on the operator door.	Red Normal Main Closed light will turn off
		Green Normal Main Open light will turn on
7.	After two seconds, press the red Alternate Main Close pushbutton on the operator door.	Green Alternate Main Open light will turn off
		Red Alternate Main Closed light will turn on
8.	Open the alternate main circuit breaker using the green Open pushbutton on the operator door.	Red Alternate Main Closed light will turn off
		Green Alternate Main Open light will turn on
9.	Turn the Generator Start switch to the Stop position. Generator will continue to run until the cool-down period has expired.	
	NOTE: If the Normal Main Close pushbutton is depressed while the Generator (Alternate Main) Breaker is closed and the sync-check relay conditions are satisfied, a transfer to the Utility (Normal Main) Source will occur, since it is preferred by default.	

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Automatic Mode

The operator door pushbuttons will not operate the circuit breakers in Automatic mode. The position of the Generator Start switch does not affect operation of the PLC system while in Automatic mode.

Table 6: Automatic Mode Test Procedure for Basic Main-Generator

1.	Complete the following:	Turn the auto/manual switch to the Manual position.
		Open both main circuit breakers with the mechanical Open button located on the circuit breakers.
		Turn the TTL/Normal/TTR switch to the Normal position.
		Turn the Generator Start switch to the Stop position.
2.	Verify that the following lights are on:	White Normal Source light
		Green Normal Main Open light
		Green Alternate Main Open light
		Blue Manual Mode light
3.	Verify that the following lights are off:	White Alternate Source light
		Amber Normal Main Fault light
		Amber Alternate Main Fault light
		White Auto Mode light
4.	Turn the auto/manual switch to Auto. The normal main circuit breaker will close.	
5.	Verify the following lights are on:	White Auto light
		Red Normal Closed light
		Green Alternate Open light
6.	Verify the following lights are off:	Amber Auto Fail light
		Amber Normal Main Fault light
		Amber Alternate Main Fault light
		Blue Manual Mode light
7.	Simulate a loss of the normal source by turning the TTL/Normal/TTR switch to TTL (Test Transfer Left) or TTR (Test Transfer Right), whichever is the normal source. The normal main circuit breaker will open after the Open Delay. The start signal will be sent to the generator. After the generator source has stabilized, the generator circuit breaker will close.	
8.	Verify the following lights are on:	Green Normal Open light
		Red Alternate Closed light
		White Alternate Source light
	NOTE: The white normal Source light will be off.	
9.	Simulate normal source voltage return by turning the TTL/Normal/TTR switch back to the Normal position. Retransfer to the utility source will occur. After the stabilization delay, the generator circuit breaker will open. After the Close Delay, the normal circuit breaker will close and the generator will continue to run until the cool-down period has expired.	

Main-Generator Standard Options

This section covers testing recommended for a main-generator system with standard options. These options include having closed transition, exercise with load, and auto retransfer switches.

Manual Mode

With the switch in Manual mode, an operator can open and close each circuit breaker independently using the pushbuttons on the operator door.

Table 7: Manual Mode Test Procedure for Main-Generator with Options

1.	Complete the following:	Turn the auto/manual switch to the Manual position.
		Open both main circuit breakers with the mechanical Open button located on the circuit breakers.
		Turn the TTL/Normal/TTR switch to the Normal position.
		Turn the Generator Start switch to the Stop position.
2.	Verify that the following lights are on:	White Normal Source light
		Green Normal Main Open light
		Green Alternate Main Open light
		Blue Manual Mode light
3.	Verify that the following lights are off:	White Alternate Source light
		Amber Normal Main Fault light
		Amber Alternate Main Fault light
		White Auto Mode light
4.	Start the generator by turning the Generator Start switch to the Start position. Proceed with this test when the source available light for the generator is on.	
5.	Press the red normal Main Close pushbutton on the operator door.	Green Normal Main Open light will turn off
		Red Normal Main Closed light will turn on
6.	Press the alternate Main Close pushbutton on the operator door. In a closed transition system with a satisfied sync-check relay:	Green Alternate Main Open light will turn off
		Red Alternate Main Closed light will turn on
	After two seconds, the normal Main circuit breaker will open. The indicating lights for the normal circuit breaker will change status.	
	NOTE: If the synchronizing relay is not satisfied or is not installed, the command to close the alternate main breaker will be ignored.	
7.	Press the normal Main Close pushbutton on the operator door. In a closed transition system with a satisfied sync-check relay:	Green Normal Main Open light will turn off
		Red Normal Main Closed light will turn on
	After two seconds, the alternate main circuit breaker will open. The indicating lights for the alternate circuit breaker will change status.	
	NOTE: If the synchronizing relay is not satisfied or is not installed, the command to close the normal main breaker will be ignored.	
8.	Turn the Generator Start switch to the Stop position. Generator will continue to run until the cool-down period has expired.	

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Automatic Mode

The operator door pushbuttons will not operate the circuit breakers in Automatic mode. The position of the Generator Start switch does not affect operation of the PLC system while in Automatic mode.

Table 8: Automatic Mode Test Procedure for Main-Generator with Options

1.	Complete the following:	Turn the auto/manual switch to the Manual position.
		Open both main circuit breakers with the mechanical Open button located on the circuit breakers.
		Turn the TTL/Normal/TTR switch to the Normal position.
		Turn the Generator Start switch to the Stop position.
2.	Verify that the following lights are on:	White Normal Source light
		Green Normal Main Open light
		Green Alternate Main Open light
		Blue Manual Mode light
3.	Verify that the following lights are off:	White Alternate Source light
		Amber Normal Main Fault light
		Amber Alternate Main Fault light
		Amber Auto Fail light
4.	Turn the auto/manual switch to Auto. The normal source main circuit breaker will close.	
5.	Verify the following lights are on:	White Auto light
		Red Normal Closed light
		Green Alternate Open light
6.	Verify the following lights are off:	Amber Auto Fail light
		Amber Normal Main Fault light
		Amber Alternate Main Fault light
		Blue Manual Mode light
7.	Simulate a loss of the utility source by turning the TTL/Normal/TTR switch to TTL (Test Transfer Left) or TTR (Test Transfer Right), whichever is the normal source. The normal main circuit breaker will open after the Open Delay.	
	The start signal will be sent to the generator. After the generator source has stabilized, the generator circuit breaker will close.	
8.	Verify the following lights are on:	Green Normal Open light
		Red Alternate Closed light
		White Alternate Source light
	NOTE: The white Normal Source light will be off.	
9.	Simulate normal source voltage return by turning the TTL/Normal/TTR switch back to the Normal position. Retransfer to the utility source will occur after the stabilization delay has expired for the utility source. If the optional Auto-Retransfer switch is in the Off position, retransfer will be suspended until it is moved to the On position.	
	With open transition, the generator circuit breaker opens. After the Close Delay, the normal circuit breaker closes.	
	With closed transition, the normal circuit breaker closes. Two seconds later, the generator circuit breaker opens.	
	The generator will continue to run until the cool-down period has expired.	

Main-Tie-Main Base System

This section covers testing recommended for a two-utility system with a tie circuit breaker when no options are installed. Normal power supply is through the left and right main circuit breakers to individual load buses with the tie circuit breaker open.

Manual Mode

With the switch in Manual mode, an operator can open and close each circuit breaker independently using the pushbuttons on the operator door. Only two circuit breakers may be closed at a time, avoiding closed transition. After any circuit breaker is opened, a two-second delay occurs before any circuit breaker may be closed.

Table 9: Manual Mode Test Procedure for Basic Main-Tie-Main

1.	Complete the following:	Turn the auto/manual switch to the Manual position.
		Open both main circuit breakers and the tie circuit breaker with the mechanical Open button located on the circuit breakers.
		Turn the TTL/Normal/TTR switch to the Normal position.
2.	Verify that the following lights are on:	White Left Source light
		White Right Source light
		Green Left Main Open light
		Green Right Main Open light
		Green Tie Open light
		Blue Manual Mode light
3.	Verify that the following lights are off:	Amber Left Main Fault light
		Amber Right Main Fault light
		Amber Tie Fault light
		White Auto Mode light
4.	Press the red Left Main Close pushbutton on the operator door.	Green Left Main Open light will turn off
		Red Left Main Closed light will turn on
5.	Press the red Right Main Close pushbutton on the operator door.	Green Right Main Open light will turn off
		Red Right Main Closed light will turn on
6.	Open the left main circuit breaker using the green Open pushbutton on the operator door. The status lights for the left main will change from red to green.	
	After two seconds, press the Tie Close pushbutton on the operator door.	Green Tie Open light will turn off
		Red Tie Closed light will turn on
7.	Open the right main circuit breaker using the green Open pushbutton on the operator door. The status lights for the right main will change from red to green. After two seconds, close the left main circuit breaker. The status lights for the left main will change from green to red.	
8.	Open the tie circuit breaker using the green Open pushbutton on the operator door. The status lights for the tie will change from red to green.	
9.	Open the left main circuit breaker using the green Open pushbutton on the operator door. The status lights for the left main will change from red to green.	

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Automatic Mode

The operator door pushbuttons will not operate the circuit breakers in Automatic mode.

Table 10: Automatic Mode Test Procedure for Basic Main-Tie-Main

1.	Complete the following:	Turn the auto/manual switch to the Manual position.
		Open both main circuit breakers and the tie circuit breaker with the mechanical Open button located on the circuit breakers.
		Turn the TTL/Normal/TTR switch to the Normal position.
2.	Verify the following lights are on:	White Left Source light
		White Right Source light
		Green Left Main Open light
		Green Right Main Open light
		Green Tie Open light
		Blue Manual Mode light
3.	Verify the following lights are off:	Amber Left Main Fault light
		Amber Right Main Fault light
		Amber Tie Fault light
		White Auto Mode light
4.	Turn the auto/manual switch to Auto.	Right and Left main circuit breakers will close
5.	Verify the following lights are on:	White Auto light
		Red Left Main Closed light
		Green Tie Open light
		Red Right Main Closed light
6.	Verify the following lights are off:	Amber Auto Fail light
		Amber Left Main Fault light
		Amber Tie Fault light
		Amber Right Main Fault light
		Blue Manual Mode light
7.	Simulate a loss of the left source by turning the TTL/Normal/TTR switch to TTL (Test Transfer Left). The left main circuit breaker will open after the Open Delay. The Close Delay begins timing once the left main circuit breaker opens. After the Close Delay has timed out, the tie circuit breaker will close.	
8.	Simulate left source voltage return by turning the TTL/Normal/TTR switch back to the Normal position. After the stabilization delay, the tie circuit breaker will open. After the Close Delay, the left main circuit breaker will close.	
9.	Simulate a loss of the right source by turning the TTL/Normal/TTR switch to TTR (Test Transfer Right). The right main circuit breaker will open after the Open Delay. The Close Delay begins timing once the right main circuit breaker opens. After the Close Delay has timed out, the tie circuit breaker will close.	
10.	Simulate right source voltage return by turning the TTL/Normal/TTR switch back to the Normal position. After the stabilization delay, the tie circuit breaker will open. After the Close Delay, the right main circuit breaker will close.	

Main-Tie-Main Standard Options

This section covers testing recommended for a main-tie-main system with standard options. These options include PSS, auto retransfer, and closed transition.

Steps 6, 7, and 8 apply only to systems with the closed transition option. If the installed system does not have this option, perform the manual mode test for main-tie-main, base system, beginning on page 38.

Manual Mode

With the switch in Manual mode, an operator can open and close each circuit breaker independently using the pushbuttons on the operator door. The PSS does not impact Manual mode.

Table 11: Manual Mode Test Procedure for Main-Tie-Main with Options

1.	Complete the following:	Turn the auto/manual switch to the Manual position.
		Open both main circuit breakers and the tie circuit breaker with the mechanical Open button located on the circuit breakers.
		Turn the TTL/Normal/TTR switch to the Normal position.
		Turn the PSS switch to the Off position.
		Turn the Retransfer switch to the Off position.
2.	Verify that the following lights are on:	White Left Source light
		White Right Source light
		Green Left Main Open light
		Green Right Main Open light
		Green Tie Open light
		Blue Manual Mode light
3.	Verify that the following lights are off:	Amber Left Main Fault light
		Amber Right Main Fault light
		Amber Tie Fault light
		White Auto Mode light
4.	Press the red Left Main Close pushbutton on the operator door.	Green Left Main Open light will turn off
		Red Left Main Closed light will turn on
5.	Press the red Right Main Close pushbutton on the operator door.	Green Right Main Open light will turn off
		Red Right Main Closed light will turn on
6.	Press the Tie Close pushbutton on the operator door. In a closed transition system with a satisfied sync-check relay:	Green Tie Open light will turn off
		Red Tie Closed light will turn on
	NOTE: If the synchronizing relay is not satisfied or is not installed, the command to close the tie circuit breaker will be ignored. Likewise, if the closed transition selector switch is in the Off position, the command to close the tie will be ignored.	
	Within two seconds, press the Open button for the left main circuit breaker.	Red Left Main Closed light will turn off
		Green Left Main Open light will turn on
	NOTE: If you do not press the Open button within two seconds, the tie circuit breaker will open.	
7.	Press the Left Main Close pushbutton on the operator door. In a closed transition system with a satisfied sync-check relay:	Green Left Main Open light will turn off
		Red Left Main Closed light will turn on
	NOTE: If the synchronizing relay is not satisfied or is not installed, the command to close the left main circuit breaker will be ignored. Likewise, if the closed transition selector switch is in the Off position, the command to close the left main will be ignored.	
	Within two seconds, press the Open button for the right main circuit breaker.	Red Right Main Closed light will turn off
		Green Right Main Open light will turn on
	NOTE: If you do not press the Open button within two seconds, the tie circuit breaker will open.	
8.	Press the Right Main Close pushbutton on the operator door. In a closed transition system with a satisfied sync-check relay:	Green Right Main Open light will turn off
		Red Right Main Closed light will turn on
	Wait two seconds and the tie will open, or open the tie circuit breaker using the operator door pushbutton.	

Automatic Mode

The operator door pushbuttons will not operate the circuit breakers in Automatic mode.

Table 12: Automatic Mode Test Procedure for Main-Tie-Main with Options

<table>
<tr><td rowspan="5">1.</td><td colspan="2" rowspan="5">Complete the following:</td><td colspan="2">Turn the auto/manual switch to the Manual position.</td></tr>
<tr><td colspan="2">Open both main circuit breakers and the tie circuit breaker with the mechanical Open button located on the circuit breakers.</td></tr>
<tr><td colspan="2">Turn the TTL/Normal/TTR switch to the Normal position.</td></tr>
<tr><td colspan="2">Turn the PSS switch to the Off position.</td></tr>
<tr><td colspan="2">Turn the Auto Retransfer Selector switch to the Off position.</td></tr>
<tr><td rowspan="6">2.</td><td colspan="2" rowspan="6">Verify the following lights are on:</td><td colspan="2">White Left Source light</td></tr>
<tr><td colspan="2">White Right Source light</td></tr>
<tr><td colspan="2">Green Left Main Open light</td></tr>
<tr><td colspan="2">Green Right Main Open light</td></tr>
<tr><td colspan="2">Green Tie Open light</td></tr>
<tr><td colspan="2">Blue Manual Mode light</td></tr>
<tr><td rowspan="4">3.</td><td colspan="2" rowspan="4">Verify the following lights are off:</td><td colspan="2">Amber Left Main Fault light</td></tr>
<tr><td colspan="2">Amber Right Main Fault light</td></tr>
<tr><td colspan="2">Amber Tie Fault light</td></tr>
<tr><td colspan="2">White Auto Mode light</td></tr>
<tr><td rowspan="6">4.</td><td colspan="4">Turn the auto/manual switch to Auto. Two circuit breakers will close, depending on installed options and settings. The normal condition varies with the PSS. The chart below lists the alternative normal conditions.</td></tr>
<tr><td colspan="2">PSS Switch Position</td><td colspan="2">Circuit Breaker Conditions</td></tr>
<tr><td colspan="2">Left</td><td colspan="2">Left Main circuit breaker closed, the Tie closed,
Right Main circuit breaker open</td></tr>
<tr><td colspan="2">Right</td><td colspan="2">Right Main circuit breaker closed, the Tie closed,
Left Main circuit breaker open</td></tr>
<tr><td colspan="2">Off</td><td colspan="2">Left and Right Main circuit breakers closed, Tie circuit breaker open</td></tr>
<tr><td colspan="2">Not Installed</td><td colspan="2">Left and Right Main circuit breakers closed, Tie circuit breaker open</td></tr>
<tr><td>5.</td><td colspan="4">Turn the PSS switch, if present, to the Off position. At this point, the main circuit breakers should be closed (red lights) and the tie circuit breaker open (green light).</td></tr>
<tr><td>6.</td><td colspan="4">Simulate a loss of the left source by turning the TTL/Normal/TTR switch to TTL (Test Transfer Left). The left main will open (green light) after the Open Delay. The tie will close (red light) after the Close Delay.</td></tr>
<tr><td rowspan="5">7.</td><td colspan="4">Simulate a return of the left source by turning the TTL/Normal/TTR switch to Normal. What happens next depends on the options installed and their settings. Refer to the following table.</td></tr>
<tr><td>PSS Switch Position</td><td>Retransfer On/Off</td><td>Transfer Type</td><td>Sequence</td></tr>
<tr><td>Off or not installed</td><td>Off</td><td>Open or Closed</td><td>System does not change state</td></tr>
<tr><td>Off or not installed</td><td>On or not installed</td><td>Open</td><td>After the stabilization delay, the tie circuit breaker opens. After the Close Delay, the left main circuit breaker closes.</td></tr>
<tr><td>Off or not installed</td><td>On or not installed</td><td>Closed</td><td>After the stabilization delay, the left main circuit breaker closes. Two seconds later, the tie circuit breaker opens.</td></tr>
<tr><td>8.</td><td colspan="4">Simulate a loss of the right source by turning the TTL/Normal/TTR switch to TTR (Test Transfer Right). The right main circuit breaker will open after the Open Delay. The Close Delay begins timing once the normal circuit breaker opens. After the Close Delay has timed out, the tie or left, whichever was open, will close.</td></tr>
<tr><td rowspan="5">9.</td><td colspan="4">Simulate a return of the right source by turning the TTL/Normal/TTR switch to Normal. What happens next depends on the options installed and their settings. Refer to the following table.</td></tr>
<tr><td>PSS Switch Position</td><td>Retransfer On/Off</td><td>Transfer Type</td><td>Sequence</td></tr>
<tr><td>Off or not installed</td><td>Off</td><td>Open or Closed</td><td>System does not change state</td></tr>
<tr><td>Off or not installed</td><td>On or not installed</td><td>Open</td><td>After the stabilization delay, the tie circuit breaker opens. After the Close Delay, the right main circuit breaker closes.</td></tr>
<tr><td>Off or not installed</td><td>On or not installed</td><td>Closed</td><td>After the stabilization delay, the right main circuit breaker closes. Two seconds later, the tie circuit breaker opens.</td></tr>
<tr><td>10.</td><td colspan="4">Turn the PSS, if present, to left. The system will change state, if necessary, to become configured correctly—with the left and tie circuit breakers closed and the right circuit breaker open.</td></tr>
<tr><td>11.</td><td colspan="4">Simulate a loss of the left source by turning the TTL/Normal/TTR switch to TTL. The left main will open (green light) after the Open Delay. The right circuit breaker will close (red light) after the Close Delay. The tie circuit breaker will stay closed.</td></tr>
</table>

Table 12: Automatic Mode Test Procedure for Main-Tie-Main with Options

12.	Simulate a return of the left source by turning the TTL/Normal/TTR switch to Normal. What happens next depends on the options installed and their settings. Refer to the following table.			
	PSS Switch Position	Retransfer On/Off	Transfer Type	Sequence
	Left	Off	Open or Closed	System does not change state
	Left	On or not installed	Open	After the stabilization delay, the right main circuit breaker opens. After the Close Delay, the left main circuit breaker closes.
	Left	On or not installed	Closed	After the stabilization delay, the left main circuit breaker closes. Two seconds later, the right main circuit breaker opens.
13.	Turn the PSS, if present, to right. The system will change state, if necessary, to become configured correctly—with the right and tie circuit breakers closed and the left circuit breaker open. The tie circuit breaker will stay closed.			
14.	Simulate a loss of the right source by turning the TTL/Normal/TTR switch to TTR. The right main will open (green light) after the Open Delay. The left circuit breaker will close (red light) after the Close Delay. The tie circuit breaker will stay closed.			
15.	Simulate a return of the right source by turning the TTL/Normal/TTR switch to Normal. What happens next depends on the options installed and their settings. Refer to the following table.			
	PSS Switch Position	Retransfer On/Off	Transfer Type	Sequence
	Right	Off	Open or Closed	System does not change state
	Right	On or not installed	Open	After the stabilization delay, the left main circuit breaker opens. After the Close Delay, the right main circuit breaker closes.
	Right	On or not installed	Closed	After the stabilization delay, the right main circuit breaker closes. Two seconds later, the left main circuit breaker opens.

ENGLISH

Troubleshooting and Maintenance

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Disconnect all sources of electric power before beginning visual inspections, tests, or maintenance.
- Assume all circuits are live until completely deenergized, tested, grounded, and tagged.
- Use a properly rated voltage sensing device to confirm that the power is off.
- Check all power sources, including possible backfeeding.

Failure to follow these precautions will result in death, severe personal injury, or equipment damage.

Changing Fuses

The control power system is fed from multiple sources, including an uninterruptible power supply (UPS). Turn off all control power disconnect switches and the UPS before removing fuses. Verify that the power is off with a properly rated voltage sensing device. Fuses are located in the control power disconnect switches and in DIN-rail mounted fuse blocks with illuminated blown fuse indicators. Replace fuses with identical type and amperage ratings.

Checking Light Bulbs

Without Push-To-Test Option

All lights are long-life, protected LEDs. If an LED does not illuminate, replace the LED module with one of the same type.

NOTE: LED bulbs are not replaceable. If an LED has power to it, but does not illuminate, you must replace the LED module. Before replacing an LED module, first turn off all power to the automatic throwover system. **Do not remove the wires connected to an LED module while the system is energized.** Disconnecting the LED module with the power ON may cause a closed circuit breaker to open.

With Push-To-Test Option

1. Press the Push-To-Test pushbutton. All of the bulbs on the operator door should illuminate.
2. Replace any bulbs that do not illuminate.

Troubleshooting Chart

All work should be completed by qualified electrical personnel.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Check all power sources, including possible backfeeding.

Failure to follow these instructions will result in death or serious injury.

Table 13: Troubleshooting

Condition	Possible Cause	Suggested Action
Control Power Loss	Inoperative fuse(s)	Identify and correct cause of overload or fault. Replace fuse(s).
	Circuit breaker CB1 off	Check the DIN-rail mounted circuit breaker on the PLC assembly pan. If off, turn on. If tripped, identify and correct cause of overload or fault. Reset the circuit breaker.
CHK UPS OR PLC BATT light on	PLC battery low	f the battery light on the front of the PLC is lit, follow instructions in the Modicon PLC User's Guide to change the battery in the PLC.
	UPS battery low	Check the UPS status indicators to determine if the UPS battery has caused the alarm.
Circuit breaker springs not charged	Input fuse inoperative	Identify and correct cause of overload or fault. Replace fuse(s).
Red or Green circuit breaker status light not on	Light bulb inoperative	Check light bulb or LED module, replace as necessary. (Use Push-to-Test button when available.)
	Control power not available	See Control Power Loss
White source light not on, but source is available	Light bulb inoperative	Check light bulb or LED module, replace as necessary. (Use Push-to-Test button when available.)
	Fuse inoperative	The light may be out if any of the fuses in the power quality monitor disconnects (designated VDS) are inoperative. See Control Power Loss.
	TTL/Normal/TTR switch not in Normal position	Return the switch to the normal position.
	Power quality monitors not satisfied	Refer to other meters or voltage monitors to determine if voltage is within the limits of the voltage and frequency relays, including proper phase rotation.
Normal source lost, but transfer did not occur	Main circuit breaker tripped because of fault	The trip indicator on each circuit breaker will note the type of fault that occurred. Identify and correct cause of overload or fault. Reset circuit breaker.
	System not in Automatic mode	Verify the auto/manual switch is turned to Auto, and white Auto light is on.
	Alternate not available	System will not transfer to an unavailable source. Check utility availability or generator functionality.
Amber Auto Fail light is on	Mechanical open or close button was depressed	Turn the auto/manual switch to Manual and then to Auto to reset system. **NOTE:** Circuit breakers may change state to return to normal status.
	Circuit breaker racked out	System will remain inoperative until all main circuit breakers are in the same position, either connected or test. Turn the auto/manual switch to Manual and back to Auto to reset.
	Main circuit breaker tripped	Identify and correct cause of overload or fault. Reset circuit breaker. Turn the auto/manual switch to Manual and back to Auto to reset system from Auto mode fail.
	PLC has determined an error in the PLC internal program	An error internal to the PLC CPU will be indicated by the LED on the CPU. Refer to the Modicon PLC User's Guide for more information.
Source transferred “without reason”	Temporary voltage loss or sag	If recording voltage meters are not installed, consult with the utility to find out if a momentary outage occurred. A voltage dip below the set point of the power monitor may result in transfer operation.

Table 13: Troubleshooting

Generator did not start	Signal not sent	Go through manual test. Watch for the PLC output light 6 on Output Module 1. It should normally be illuminated and will go out when the generator start command should be sent. If it does not go out, contact Square D Field Services.
	Signal not received	Verify wiring connections between the time delay relay and the generator set.
	Signal received, generator would not start	Refer to the generator system documentation.
Closed transition system followed open sequence	Sync-check relay not satisfied	Input fuses to the sync-check relay inoperative. Identify and correct cause of overload or fault. Replace fuse.
		Sources are not synchronized. Consult with power supplier.

List of Standard Values and Arrangements

This list contains the standard factory installed settings, including programmed options. If these values do not apply to your equipment, note those differences in this bulletin.

All Systems

Table 14: System Settings

Open Delay	3 seconds. Timing begins after power quality monitor deenergizes.
Close Delay	2 seconds. Timing begins after a circuit breaker opens.
Transfer Delay—Open Transition	Open delay plus close delay.
Transfer Delay—closed transition	2 seconds maximum when sources are synchronized
Sync-Check Relay[1]	10–30% nominal voltage
	6–20% phase angle
	NOTE: Both voltage and phase angle are changed by one potentiometer.
Source Stabilization Timer	10 seconds to retransfer to Preferred Source.
Power Quality Monitor[1]	15% Undervoltage (fixed)
	5–15% Phase Imbalance
	0–10 second time delay

1 Settings are field adjustable.

Table 15: System Configuration

System	Normal Source	Alternate Source
Main-Main, Main-Generator	Left main circuit breaker	Right main circuit breaker
Main-Tie-Main	Both left and right main circuit breakers, with tie circuit breaker open	Left or Right main circuit breaker, with tie circuit breaker closed

Generator Systems

Table 16: Generator System Settings

81 Relay[1]	50–70 Hz over-frequency .1–3 Hz differential
	50–70 Hz under-frequency .1–3 Hz differential
59 Relay[1]	100–125% over-voltage 1–15% differential
Generator Options (not field adjustable, except with optional touch screen)	Cool-down period: 15 minutes (unloaded)
	Exercise period: 30 minutes per week (loaded or unloaded) Will start Sunday at 1 p.m.

1 Settings are field adjustable.

Connection to Circuit Breakers

Connection to Circuit Breakers

Factory-installed wiring to circuit breakers includes open and close coils, circuit breaker status contacts, and fault-indicating contacts, along with other specified accessories. For field changes, refer to the appropriate circuit breaker manual. For information specific to each of the circuit breakers, refer to their respective instruction bulletins.

References

The approval drawings show details of wiring interconnections, including installed options, unique to each automatic throwover system installation. Schneider Electric provided one set of drawings with the equipment.

Contact Square D Services or the Customer Information Center at 1-888-SquareD (1-888-778-2733) for start-up service or general questions about a specific installation.

Most instruction bulletins and other literature can be obtained from the Online Literature Fulfillment (OLF) Center and from the Schneider Electric Technical Library at www.us.SquareD.com.

ENGLISH

Maintenance Log

Table 17: Maintenance Log

Date	Description

Schneider Electric USA, Inc.
8821 Garners Ferry Road
Hopkins, SC 29061 USA
1-888-SquareD
(1-888-778-2733)
www.schneider-electric.us

80330-001-04 07/2010
Replaces 80330-001-03, 07/2007

Sistemas de transferencia automática con PLC

Clase 2700

Boletín de instrucciones

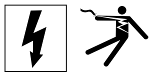
80330-001-04
07/2010

Conservar para uso futuro.

by Schneider Electric

Categorías de peligros y símbolos especiales

Asegúrese de leer detenidamente estas instrucciones y realice una inspección visual del equipo para familiarizarse con él antes de instalarlo, hacerlo funcionar o prestarle servicio de mantenimiento. Los siguientes mensajes especiales pueden aparecer en este boletín o en el equipo para advertirle sobre peligros potenciales o llamar su atención sobre cierta información que clarifica o simplifica un procedimiento.



La adición de cualquiera de los dos símbolos a una etiqueta de seguridad de “Peligro” o “Advertencia” indica que existe un peligro eléctrico que causará lesiones si no se siguen las instrucciones.

Este es el símbolo de alerta de seguridad. Se usa para avisar sobre peligros potenciales de lesiones. Respete todos los mensajes de seguridad con este símbolo para evitar posibles lesiones o la muerte.

⚠ PELIGRO

PELIGRO indica una situación de peligro inminente que, si no se evita, **causará** la muerte o lesiones serias.

⚠ ADVERTENCIA

ADVERTENCIA indica una situación potencialmente peligrosa que, si no se evita, **puede causar** la muerte o lesiones serias.

⚠ PRECAUCIÓN

PRECAUCIÓN indica una situación potencialmente peligrosa que, si no se evita, **puede causar** lesiones menores o moderadas.

PRECAUCIÓN

PRECAUCIÓN, cuando se usa sin el símbolo de alerta de seguridad, indica una situación potencialmente peligrosa que, si no se evita, **puede causar** daños a la propiedad.

NOTA: Proporciona información adicional para clarificar o simplificar un procedimiento.

Observe que

Solamente el personal especializado deberá instalar, hacer funcionar y prestar servicios de mantenimiento al equipo eléctrico. Schneider Electric no asume responsabilidad alguna por las consecuencias emergentes de la utilización de este material.

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Introducción

Este boletín de instrucciones describe los sistemas de transferencia automática principal-principal, principal-generador y principal-cierre manual-principal marca Square D® para los tableros de fuerza / tableros de distribución tipo autosoportado en baja tensión. Asimismo, se proporciona información sobre los sistemas estándar la cual será utilizada por los responsables de la instalación y las especificaciones. En este boletín se proporciona información básica solamente insuficiente para instalaciones que no son estándar. Los sistemas estándar siempre incluyen un sistema de alimentación ininterrumpida (UPS).

Las opciones disponibles son un interruptor selector de fuente preferida, un interruptor de retransferencia, sistema de transición cerrada y lámparas de prueba. Consulte los documentos provistos por la fábrica para conocer cualquier desviación en el sistema estándar.

Este boletín también describe una secuencia de funcionamiento estándar para el sistema del controlador lógico programable (PLC). La secuencia estándar sigue uno de los temas delineado en la sección “Funcionamiento” en la página 26 de este manual. El sistema es verificado para cerciorarse de que usa la secuencia apropiada siguiendo uno de los “Procedimientos de prueba” en la página 32. Cualquier cambio a la secuencia estándar se describe en documentos de instrucción independientes provistos por la fábrica.

Figura 1: PLC mostrado en un tablero de distribución tipo autosoportado Power-Style® QED

Los sistemas de transferencia automática marca Square D de Schneider Electric han sido diseñados para cumplir con la norma UL® 891 de Underwriters Laboratories® y para ser usados en sistemas de reserva opcionales según la norma NEC® 702 del Código nacional eléctrico de EUA (NEC ®), NOM-001-SEDE.

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Precauciones de seguridad

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía, consulte la norma 70E de NFPA.
- Solamente el personal eléctrico especializado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de volver a energizar el equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

⚠ PRECAUCIÓN

RIESGO DE LESIONES CORPORALES O DAÑO AL EQUIPO

- Este manual contiene información general acerca de un diseño estándar. No contiene información acerca de las modificaciones al diseño estándar.
- Revise completamente los documentos provistos por la fábrica para conocer cualquier desviación en el diseño estándar.
- Póngase en contacto con su representante local de Schneider Electric si tiene preguntas relacionadas con el sistema de transferencia automática.

El incumplimiento de estas instrucciones puede causar lesiones personales o daño al equipo.

Recibo, manejo y almacenamiento

El sistema de transferencia automática viene incluido como parte del equipo ya ensamblado. Consulte el boletín de instrucciones generales del equipo para obtener instrucciones completas sobre su recibo, manejo y almacenamiento. Consulte también la guía del usuario del controlador programable para conocer restricciones adicionales ambientales.

Aplicaciones y especificaciones

Los sistemas de transferencia automática minimizan la interrupción de corriente eléctrica al transferir la carga de la fuente normal a una fuente alternativa cuando la fuente normal está temporalmente fuera de servicio. El sistema emplea conexiones múltiples a fuentes de alimentación (de las cuales por lo menos una es del servicio de acometida) y un sistema de control para lograr esta transferencia.

Este sistema de transferencia automática puede incluir interruptores automáticos fijos o removibles, y deberá ser controlado por un controlador lógico programable marca Modicon®. Estos sistemas también contienen fuentes redundantes de alimentación de control. Este manual contiene información aplicable para tres tipos de sistemas de transferencia automática marca Square D®: principal-principal, principal-generador y principal-cierre manual-principal.

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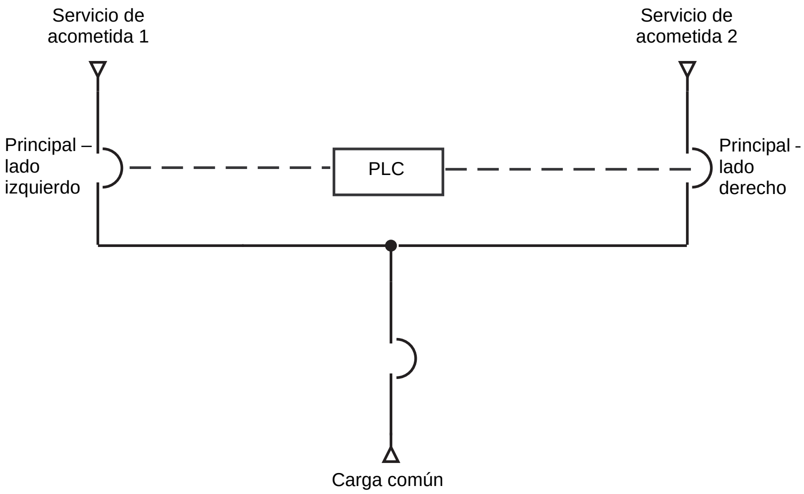
Principal-principal

Cada interruptor automático principal se conecta a una fuente de acometida. Cualquiera de las fuentes puede servir como la fuente de emergencia o alternativa. Cuando la fuente normal no está disponible, el sistema transfiere la carga a la fuente alternativa. Si el sistema está equipado con un selector de fuente preferida (PSS, por sus siglas en inglés), el sistema regresa automáticamente a la fuente preferida una vez que ésta se encuentra disponible. Si el sistema no está equipado con este selector, la re-transferencia automática no se lleva a cabo. Vea la figura 2.

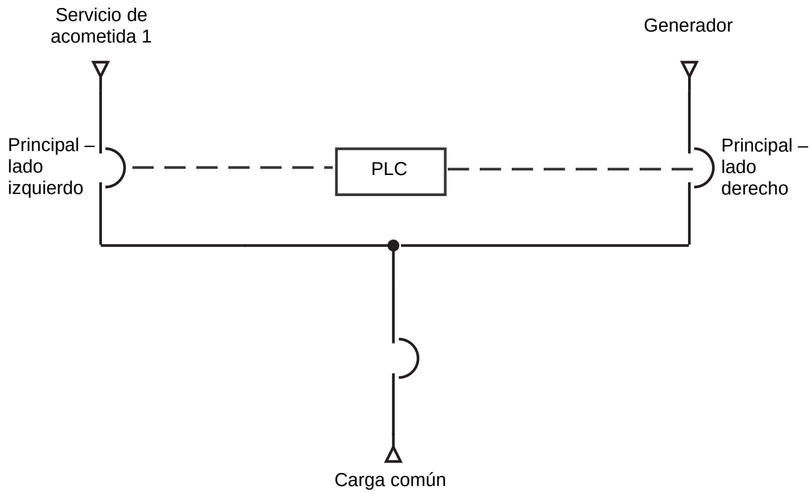
Figura 2: Configuración “Principal-Principal”



Principal-Generador

Un interruptor automático principal se conecta a una fuente de acometida. El otro interruptor automático principal se conecta a un generador de reserva. Cualquiera de los interruptores principales puede servir como la fuente de emergencia. En caso de una pérdida de alimentación en la fuente de acometida, el generador se arranca. Una vez que la frecuencia y la tensión se estabilizan, el sistema se transfiere al generador. El sistema regresa automáticamente a la fuente de acometida en cuanto se encuentra disponible y la señal de arranque del generador es descontinuada. Vea la figura 3.

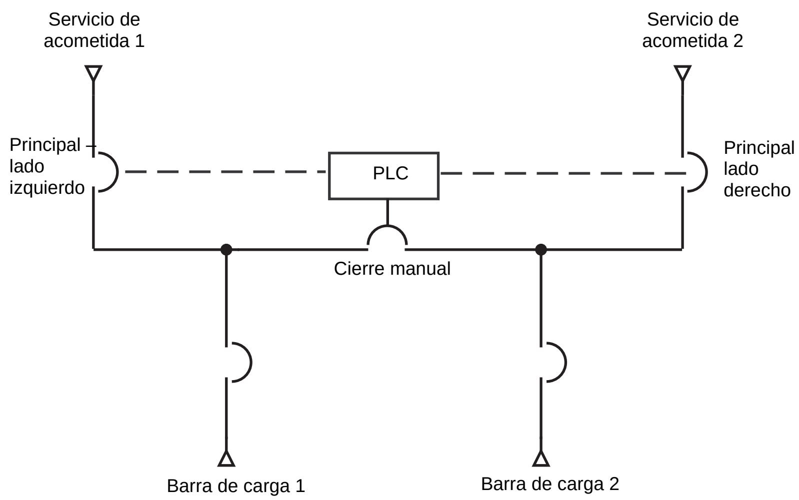
Figura 3: Configuración "Principal-Generador"



Principal-cierre manual-principal

Ambos interruptores automáticos principales se conectan a una fuente de acometida a través de un interruptor automático de cierre manual normalmente abierto. Cada interruptor automático alimenta barras de carga independientes. Varios ajustes del PSS y las opciones de conexión/desconexión de re-transferencia determinan qué interruptores automáticos están cerrados durante condiciones normales de funcionamiento. Vea la figura 4.

Figura 4: Configuración principal-cierre manual-principal



Ensamble de la puerta de operador

La puerta de operador contiene las luces indicadoras, botones pulsadores e interruptores de llave que se utilizan para comunicarse con el sistema de control. Vea las figuras 5 y 6. El sistema "principal-generador" contiene un interruptor selector de generador adicional. Un sistema principal-cierre manual-principal contiene botones pulsadores iluminados adicionales para el interruptor automático de cierre manual. Las llaves pueden ser retiradas en cualquier posición, a no ser que se indique lo contrario. La ubicación de las luces indicadoras e interruptores puede variar según el tipo de equipo y las opciones incluidas. Las luces e interruptores siempre estarán claramente etiquetados.

NOTA: Los bulbos de los LED no se pueden sustituir. Si un LED está energizado y no se ilumina, debe sustituir el módulo de LED. Antes de sustituir un módulo de LED, desconecte (O/OFF) toda la alimentación al sistema de transferencia automática. **No desconecte los cables conectados a un módulo de LED mientras el sistema está energizado.** Si se desconecta el módulo de LED con la alimentación conectada (I/ON) puede provocar la apertura de un interruptor automático cerrado.

Figura 5: Puerta de operador—Configuración básica “Principal-cierre manual-principal”

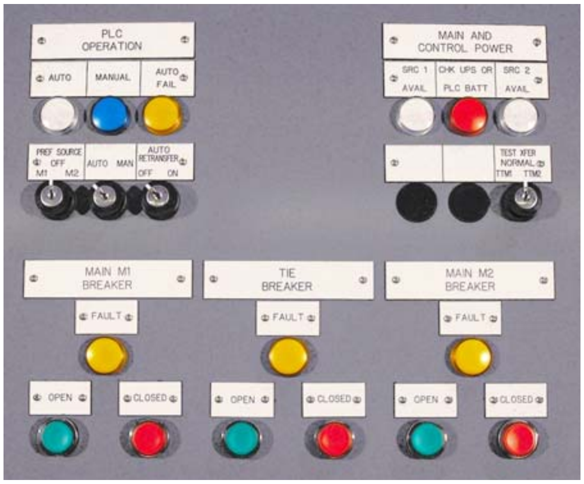
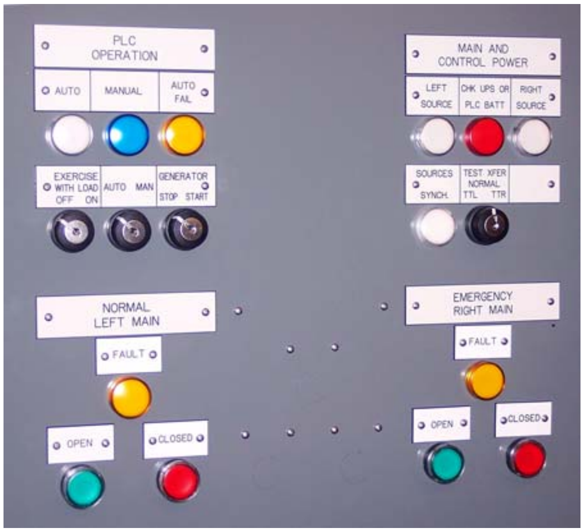


Figura 6: Puerta de operador—Configuración básica “Principal-Generador”



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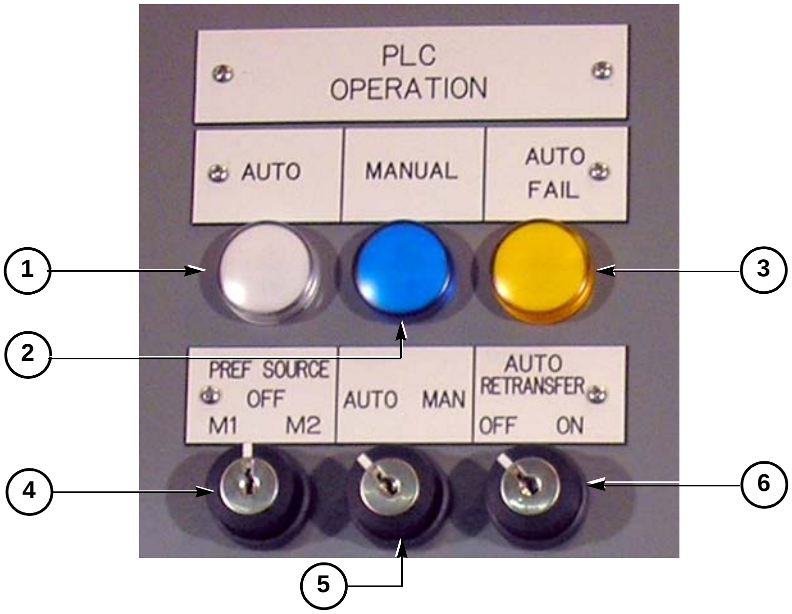
Grupo de modo de funcionamiento: Principal-principal o principal-cierre manual-principal

La esquina superior izquierda de la puerta de operador contiene un interruptor selector de llave de dos posiciones "AUTO/MANUAL" y tres luces indicadoras. Es posible que haya otros dos interruptores de llave opcionales.

Figura 7: Grupo de modo de funcionamiento: Principal-principal o principal-cierre manual-principal

1. Luz indicadora blanca
2. Luz indicadora azul
3. Luz ámbar indicadora de falla de modo auto
4. Interruptor selector PSS (opcional)
5. Interruptor selector de llave Auto/Manual
6. Interruptor selector de retransferencia automática (AUTO RETRANSFER), opcional



Luces indicadoras

La luz blanca (figura 7, 1) indica si el sistema está en modo automático. La luz azul (figura 7, 2) indica si el sistema está en modo manual. El interruptor selector de llave auto/manual determina el modo de funcionamiento.

La luz ámbar indicadora de falla de modo auto (figura 7, 3) indica una irregularidad en el sistema. La luz ámbar indicadora de falla de modo auto se ilumina bajo las siguientes circunstancias:

- Cualquiera de los interruptores automáticos principales removibles o de cierre manual (pero no todos) ha sido extraído a las posiciones de prueba o desconectado.
- Uno de los interruptores automáticos principales o de cierre manual se ha disparado mientras el sistema se encontraba en modo automático por alguna razón; tal como una falla a tierra, que evita la transferencia de la fuente.
- Se ha oprimido un botón de apertura mecánico.
- El diagnóstico interno ha detectado un error.

Selector de fuente preferida (PSS), opcional

El PSS opcional (figura 7, 4) es un interruptor selector de llave de tres posiciones que determina si la fuente normal es la fuente izquierda o derecha. La posición intermedia es la posición de desconectado (Off).

Interruptor selector de llave Auto/Manual

El interruptor selector de llave Auto/Manual (figura 7, 5) tiene dos posiciones. Gire la llave hacia:

- AUTO para un funcionamiento automático.
- MAN para utilizar los botones pulsadores en la puerta de operador para controlar el sistema manualmente.

Retransferencia auto (opcional)

El selector de retransferencia auto opcional (figura 7, 6) es un interruptor selector de llave de dos posiciones que determina el modo de retransferencia automática. En la posición de conectado (On), la retransferencia se realiza automáticamente después de que una fuente regresa y se vuelve estable. En la posición de desconectado (Off), el sistema permanece en estado transferido después de que la fuente regresa, permitiendo al usuario iniciar manualmente la retransferencia a una hora más conveniente. Mueva el interruptor selector de la posición de desconectado (Off) a conectado (On) para comenzar la secuencia de transferencia. Cuando se haya completado la transferencia, regrese el interruptor selector a la posición de desconectado (Off), si no desea que se realicen transferencias automáticas.

Si el interruptor selector de retransferencia auto no fue provisto, todas las retransferencias serán automáticas.

Grupo de modo de funcionamiento: Principal-Generador

La esquina superior izquierda de la puerta de operador contiene un interruptor selector de llave de dos posiciones "auto/manual", un interruptor selector de llave del generador "arranque/paro" y tres luces indicadoras. Es posible que haya interruptores de llave opcionales.

Figura 8: Grupo de modo de funcionamiento: Principal-Generador

1. Luz indicadora blanca
2. Luz indicadora azul
3. Luz ámbar indicadora de falla de modo auto
4. Interruptor selector de prueba con carga (opcional)
5. Interruptor selector de llave Auto/Manual
6. Interruptor selector de arranque/paro del generador

Luces indicadoras

La luz blanca (figura 8, 1) indica si el sistema está en modo automático. La luz azul (figura 8, 2) indica si el sistema está en modo manual. El interruptor selector de llave auto/manual determina el modo de funcionamiento.

La luz ámbar indicadora de falla de modo auto (figura 8, 3) indica una irregularidad en el sistema. La luz ámbar indicadora de falla de modo auto se ilumina bajo las siguientes circunstancias:

- Cualquiera de los interruptores automáticos principales removibles o de cierre manual (pero no todos) ha sido extraído a las posiciones de prueba o desconectado.
- Uno de los interruptores automáticos principales o de cierre manual se ha disparado mientras el sistema se encontraba en modo automático por alguna razón; tal como una falla a tierra, que evita la transferencia de la fuente.
- Se ha oprimido un botón de apertura mecánico.
- El diagnóstico interno ha detectado un error.

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Prueba con carga (opcional)

El selector de prueba con carga opcional (figura 8, 4) es un interruptor selector de llave de dos posiciones que determina si se realizará la prueba del generador con o sin carga.

Interruptor selector de llave Auto/Manual

El interruptor selector de llave auto/manual (figura 8, 5) tiene dos posiciones. Gire la llave hacia:

- AUTO para un funcionamiento automático.
- MAN para utilizar los botones pulsadores en la puerta de operador para controlar el sistema manualmente.

Arranque/paro del generador

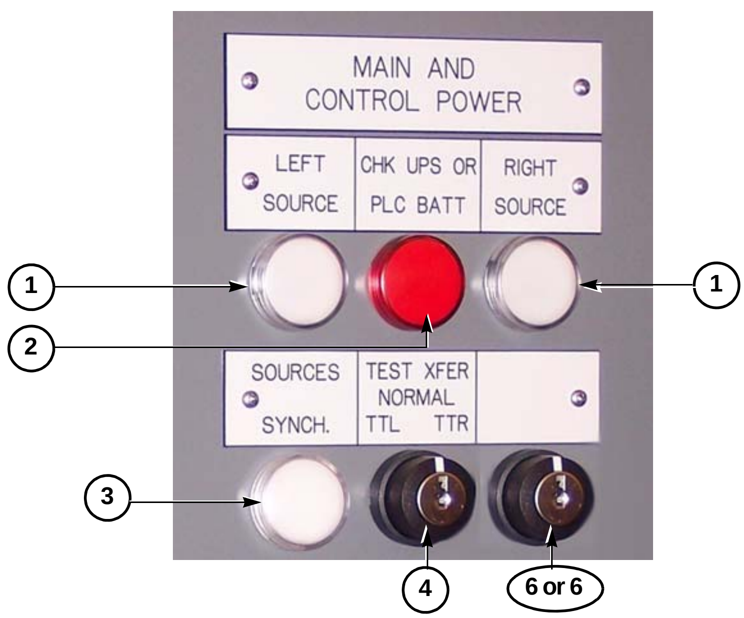
Es posible usar un interruptor selector de arranque/paro del generador (figura 8, 6) para arrancar el generador cuando el interruptor selector auto/manual se ajusta en modo manual. El interruptor selector tiene dos posiciones: paro y arranque. En el modo manual, gire a la posición de arranque para enviar una señal de arranque al generador. Gire a la posición de paro para desconectar el servicio del generador. En modo automático, el interruptor selector de arranque/paro del generador es ignorado.

Fuente y grupo de estado del sistema de alimentación ininterrumpida (UPS)

La fuente y grupo de estado del sistema de alimentación ininterrumpida (UPS), situados en la sección superior derecha de la puerta de operador, contiene un interruptor selector de llave de tres posiciones y tres luces. Otro interruptor selector de llave, un botón pulsador iluminado, y/o una luz indicadora pueden también estar presentes. Vea la figura 9.

Figura 9: Fuente y grupo de estado del sistema de alimentación ininterrumpida

1. Luz blanca indicadora de fuente
2. Luz roja indicadora de verificación de batería del UPS o PLC (CHK UPS OR PLC BATT)
3. Luz indicadora de fuentes sincronizadas (opcional)
4. Interruptor selector de transferencia de prueba
5. Interruptor de transición cerrada (opcional)
6. Botón de prueba (opcional)



Luces indicadoras

Cada luz blanca “Left Source” (fuente izquierda) o “Right Source” (fuente derecha), figura 9, 1 se ilumina cuando la fuente correspondiente está disponible. La luz roja indicadora “CHK UPS OR PLC BATT” (verificación de batería del UPS o PLC), figura 9, 2 indica que la batería de cualquiera el PLC o UPS necesita servicio. La luz indicadora “Sources Synch.” (fuentes sincronizadas), figura 9, 3 es provista sólo en los sistemas de transición cerrada. Cuando las dos fuentes son lo suficientemente similares en ángulo de fase, magnitud y frecuencia, esta luz se ilumina para indicar su sincronización.

Interruptor selector de transferencia de prueba

Este selector (figura 9, 4) tiene tres posiciones:

- **TTL (prueba de transferencia - fuente izquierda)**—Simula una pérdida de alimentación en la fuente izquierda la cual causa una transferencia a la fuente derecha. Durante un funcionamiento correcto, la luz de la fuente izquierda se encuentra apagada y la luz de la fuente derecha encendida.
- **TTL (prueba de transferencia - fuente derecha)**—Simula una pérdida de alimentación en la fuente derecha la cual causa una transferencia a la fuente izquierda. Durante un funcionamiento correcto, la luz de la fuente derecha se encuentra apagada y la luz de la fuente izquierda encendida.
- **Normal**—Modo de funcionamiento estándar. El interruptor selector se encuentra en posición Normal cuando NO está simulando una pérdida de alimentación en la fuente.

La llave puede ser retirada sólo cuando está en la posición Normal.

Interruptor selector de transición cerrada (opcional)

El interruptor selector de transición cerrada opcional (figura 9, 5) es un interruptor selector de dos posiciones que desactiva la función de transición cerrada. Éste se encuentra disponible sólo para las aplicaciones de transición cerrada. Cuando se coloca en la posición de desconectado (Off), únicamente se pueden realizar transferencias de transición abierta, aun cuando se cumplen las condiciones del relevador de comprobación de sincronización. Cuando se coloca en la posición de conectado (On), se pueden realizar transferencias de transición cerrada si se cumplen las condiciones del relevador de comprobación de sincronización.

El interruptor selector de transición cerrada no puede estar presente si el botón de prueba opcional está instalado. En este caso, todas las transferencias serán transiciones cerradas y sucederán sólo cuando se satisfacen las condiciones del relevador de comprobación de sincronización.

Botón de prueba (opcional)

El botón de prueba opcional [figura 9, 6 (no mostrado)] prueba la condición de las luces indicadoras, incluyendo los botones iluminados. Presione el botón marcado "Prueba" Revise todos los focos que no se iluminan. Sustituya los focos a medida que sea necesario.

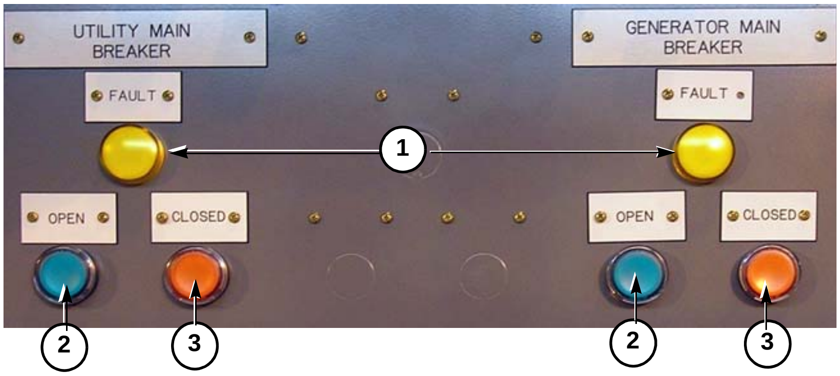
El botón de prueba no puede estar presente si el interruptor selector de transición cerrada opcional está instalado.

Grupo de estado y control de los interruptores automáticos

El grupo de estado y control de los interruptores automáticos, situado en la mitad inferior en la puerta de operador, contiene una luz indicadora y dos botones pulsadores iluminados para cada interruptor automático.

Figura 10: Grupo de estado y control de los interruptores automáticos

1. Luz ámbar indicadora de falla (Fault)
2. Botón de apertura (Open) iluminado verde
3. Botón de cierre (Closed) iluminado rojo



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Luces indicadoras

La luz ámbar indicadora de falla (figura 10, 1) se iluminará cuando el interruptor automático se dispara a causa de una falla (*p.ej.,* tiempo largo, tiempo corto, instantánea o falla a tierra).

Botones pulsadores

Cada interruptor automático tiene dos botones iluminados: la luz verde de apertura, figura 10, 2) y la luz de cierre roja (figura 10, 3). En el modo Manual, emplee estos botones para abrir o cerrar el interruptor automático correspondiente. En modo Automático, los botones de cierre y apertura no controlarán los interruptores automáticos. El grupo de la fuente izquierda se encuentra en la parte inferior izquierda, el grupo de la fuente derecha en la parte inferior derecha, y el grupo de cierre manual (no mostrado) en la mitad inferior para un sistema principal-cierre manual-principal.

Ensamble de supervisión de alimentación y alimentación de control

Cada fuente de acometida o generador proporciona alimentación al sistema de alimentación de control a través de un transformador de alimentación de control de 1 000 volt-amperes. El dispositivo de desconexión para la alimentación de control y la supervisión de la calidad de la alimentación se encuentra dentro del compartimiento de instrumentos de cada interruptor automático principal.

Sub-ensamble de la alimentación de control

Figura 11: Seccionador desconectador de la alimentación de control fusible

El transformador de alimentación de control (TAC) conecta las barras del lado de línea de la fuente del interruptor automático principal a través de un desconectador seccionador fusible (vea la figura 11). Para proporcionar alimentación de control, el TAC transforma la tensión en línea en 120 V, o bien, si el sistema ya es de 120 V, aísla el circuito de control. La alimentación de control es distribuida desde el lado secundario del transformador a través de fusibles montados en riel DIN.

Sub-ensamble de supervisión de la calidad de la alimentación

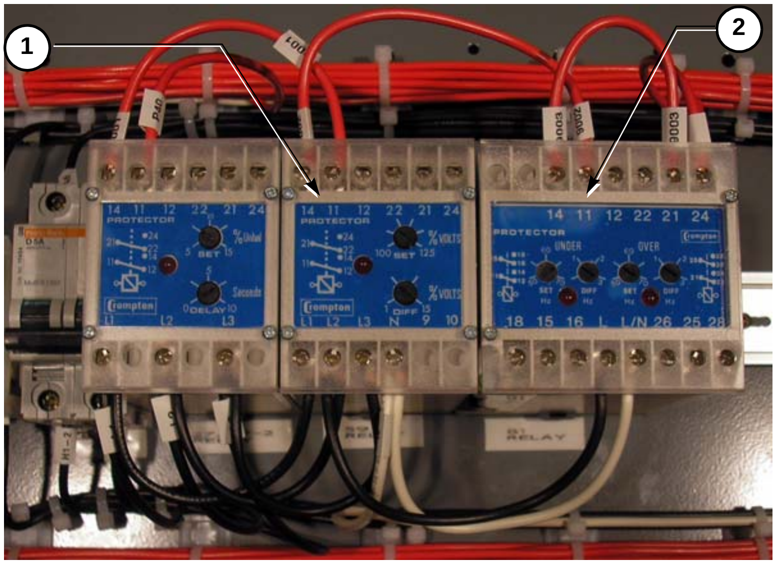
Cada dispositivo de supervisión de calidad de la alimentación evalúa constantemente la tensión de línea para determinar si hay una baja tensión, desequilibrio de fase, pérdida de fase o inversión de fase. Cuando el dispositivo de supervisión de calidad de la alimentación detecta una condición anormal, una señal de entrada de tensión alerta al PLC.

Sub-ensamble del relevador del generador

Este sub-ensamble está presente sólo cuando uno de los interruptores automáticos principales está conectado a un generador en lugar de a una fuente de acometida. El sub-ensamble contiene un relevador de sobretensión (figura 12, 1) y un relevador de sobre/baja frecuencia (figura 12, 2). Las salidas de los relevadores se encuentran en serie con las salidas del dispositivo de supervisión de calidad de la alimentación e indican al PLC que la fuente del generador está disponible para usarse. Los ajustes del relevador son configurables. Consulte los manuales del relevador para obtener más detalles.

Figura 12: Sub-ensamble de relevadores de generador

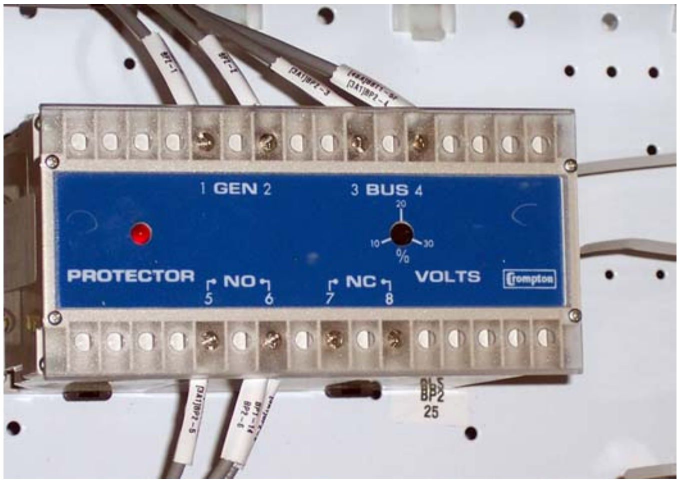
1. Relevador de sobretensión
2. Relevador de sobre o baja frecuencia



Ensamble de relevador de comprobación de sincronización

El ensamble de relevador de comprobación de sincronización se encuentra situado en cada sección del interruptor automático principal si el sistema de transferencia automática es un sistema de transición cerrada. El relevador de comprobación de sincronización se muestra en la figura 13. Éste compara las tensiones de fase "A" de cada fuente y cierra un contacto cuando ambos son lo suficientemente similares en ángulo de fase, magnitud y frecuencia. El contacto cerrado proporciona una entrada de tensión al PLC para indicar que las fuentes de alimentación están "en fase". El relevador de comprobación de sincronización se encuentra situado en una sección solamente.

Figura 13: Ensamble de relevador de comprobación de sincronización



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Ensamble del sistema de alimentación ininterrumpida (UPS)

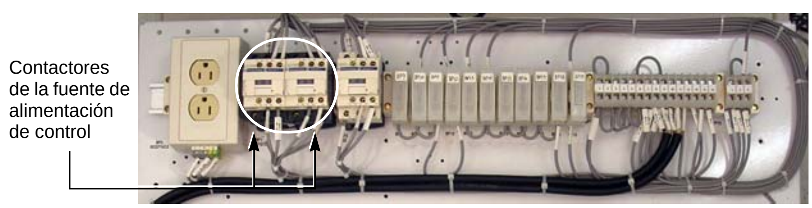
El ensamble del sistema de alimentación ininterrumpida (UPS) consta de tres partes principales: El UPS, el relevador de derivación del UPS y el contactor de la fuente de alimentación de control. La alimentación circula desde un sub-ensamble de alimentación de control a través del contactor de la fuente de alimentación de control, luego por el UPS y hacia el sistema de control. Vea la figura 14.

Figura 14: Ensamble del sistema de alimentación ininterrumpida (UPS)

Contactor de la fuente de alimentación de control

El lado de línea de cada interruptor automático principal proporciona alimentación a los transformadores de alimentación de control. El contactor de la fuente de alimentación de control dirige la alimentación al UPS desde una fuente de acometida o generador disponible. Cuando las dos fuentes están disponibles, cualquiera de ellas puede ser la fuente de alimentación de control. El enclavamiento mecánico del contactor evita que ambas se activen al mismo tiempo a través del circuito de alimentación de control. Vea la figura 15.

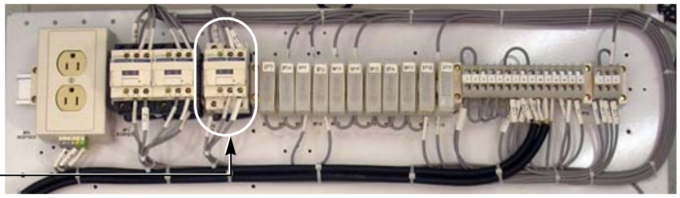
Figura 15: Contactor de la fuente de alimentación de control



Relevador de derivación del UPS

El relevador de derivación del UPS se activa automáticamente para ignorar el UPS y mantener la circulación de la alimentación en el sistema de alimentación de control cuando el UPS no está funcionando correctamente. Vea la figura 16.

Figura 16: Relevador de derivación del UPS



Sistema de alimentación ininterrumpida (UPS)

Durante un funcionamiento normal, la alimentación de control pasa por el UPS, que actúa como un regulador de tensión para el circuito de control. Cuando la fuente normal o alternativa no está disponible, el UPS proporciona alimentación de control de su batería durante un tiempo limitado. El manual de usuario del UPS proporciona detalles acerca de su capacidad de carga.

La batería del UPS necesitará servicio eventualmente. La luz indicadora de verificación de la batería de UPS o PLC “CHK UPS OR PLC BATT” indicará si una de las baterías necesita servicio. El LED “Low Batt” (batería baja) en el UPS también se iluminará cuando la batería del UPS no está funcionando. El LED “Low Batt” (batería baja) en el PLC se iluminará cuando la batería del PLC necesita sustituirse.

Figura 17: Sistema de alimentación ininterrumpida (UPS)

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Ensamble del controlador lógico programable (PLC)

El ensamble del controlador lógico programable se encuentra ubicado detrás de la puerta del operador y contiene la unidad central de procesamiento (CPU), la fuente de alimentación del PLC y los módulos de entradas/salidas (E/S). Los relevadores de interposición y algunos bloques de terminales también se encuentran situados aquí. Vea la figura 18.

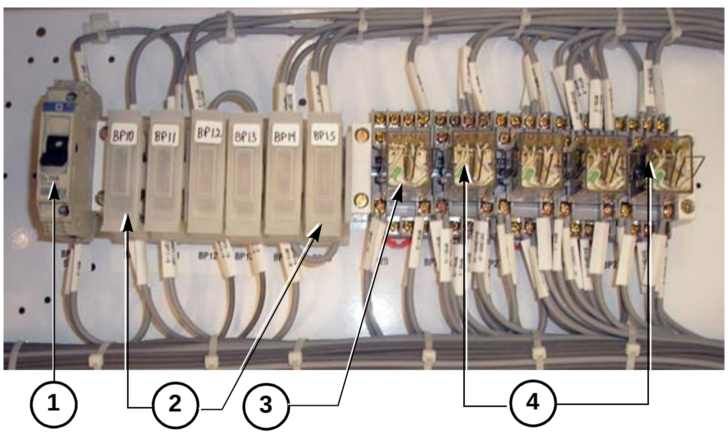
Figura 18: Ensamble del PLC

Interruptor automático y fusibles

El interruptor automático (figura 19, 1) proporciona un método conveniente para "desenergizar" el PLC, por ejemplo, cualquier modificación al programa. Al abrir este interruptor automático se desconecta la alimentación del PLC, relevador de interposición de estado remoto, relevador de temporización de arranque del generador y botones pulsadores. Los fusibles (figura 19, 2) son dispositivos montados en riel DIN y vienen equipados con luces indicadoras para indicar si hay un fusible quemado.

Figura 19: Interruptor automático, fusibles, relevador de estado remoto y relevadores de interposición

1. Interruptor
2. Fusibles
3. Relevador de estado remoto
4. Relevadores de interposición



Si se desenergiza el PLC se producirá una señal de arranque del generador la cual será enviada a un sistema principal-generador. No se llevará a cabo ninguna transferencia a no ser que sea iniciada manualmente.

Sub-ensamble del relevador de estado remoto

Este es un relevador de interposición en la bandeja del PLC que cierra un grupo de contactos cuando el PLC se sale del modo automático y entra al modo automático-falla (figura 19, 3). El relevador está conectado a los bloques de terminales en el ensamble del UPS para facilitar las conexiones por el cliente. Los contactos de repuesto, normalmente abiertos y normalmente cerrados, vienen incluidos en el relevador.

Relevadores de interposición

Las salidas del PLC emplean relevadores de interposición tipo R marca Square D® (figura 19, 4) para abrir los interruptores automáticos y proporcionar un contacto de estado remoto opcional. Estos relevadores se usan también como parte de un circuito de enclavamiento eléctrico que se activa cuando el PLC está fuera de línea por cualquier motivo.

Relevador de arranque del generador

Figura 20: Relevador de arranque del generador

El relevador de arranque del generador es un relevador temporizador de desconexión con retardo. Vea la figura 20. El relevador es normalmente energizado por una salida desde el PLC. Cuando es necesaria la fuente del generador, la salida del PLC disminuye para desenergizar el relevador y cerrar el contacto de arranque del generador. En caso de una pérdida total de la alimentación de control (o si la alimentación al PLC es desconectada), el relevador regresará a su estado desenergizado para enviar una señal de arranque del generador a través del mismo contacto de arranque.

Opción de control en la pantalla de toque

Información general

El esquema de control del PLC puede ser equipado con una pantalla de toque opcional que se pueden usar en lugar de la mayoría de los operadores mecánicos montados en la puerta. La pantalla de toque está disponible para las configuraciones "principal-principal", "principal-generador" y "principal-cierre manual-principal". Los interruptores selectores de modo auto/manual y de arranque del generador permanecerán en el tablero de distribución tipo autosoportado / tablero de fuerza para permitir el control manual en caso de que la pantalla de toque no funcione. Estos selectores permitirán cambiar el PLC al modo manual para arrancar el generador y controlar los interruptores automáticos a través de botones pulsadores en las placas frontales de los interruptores.

La pantalla de toque incluye las siguientes funciones:

1. El personal "autorizado" puede configurar retardos de tiempo protegidos por contraseña desde la pantalla de toque. No habrá requisitos especiales para computadoras laptop, modificaciones complicadas al programa del PLC en línea, software especializado o cables.
2. Las condiciones de alarma contendrán información específica, en lugar de estar limitado a una alarma de resumen general.

3. Estará disponible un registro cronológico de eventos opcional que incluirá fecha y hora. Esta función permitirá al personal "autorizado" seguir pista a las transferencias realizadas.
4. Están disponibles dos niveles de protección con contraseña para limitar el acceso al personal. Esto asegurará que sólo el personal autorizado tenga acceso a los interruptores y botones de control para realizar operaciones de transferencia. Un segundo nivel de protección con contraseña permitirá realizar ajustes de retardos de tiempo y administración de contraseñas.
5. El módulo de visualización incluye contraluz, lo cual permite realizar operaciones manuales bajo condiciones ambientales de luz baja.

Pantallas de toque

Las pantallas de toque disponibles son:

- Principal
- Ajustes
- Mapa de entradas/salidas del controlador lógico programable (E/S del PLC)
- Secuencia de operaciones
- Registro cronológico de alarmas (opcional)
- Registro cronológico de eventos (opcional)

Principal

La pantalla principal contiene los indicadores de estado del sistema, botones de control de interruptores automáticos, interruptores de control del sistema, botón de acceso con contraseña, visualización de fecha y hora y botones de acceso a pantallas. Vea la figura 21.

Figura 21: Pantalla principal

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Ajustes

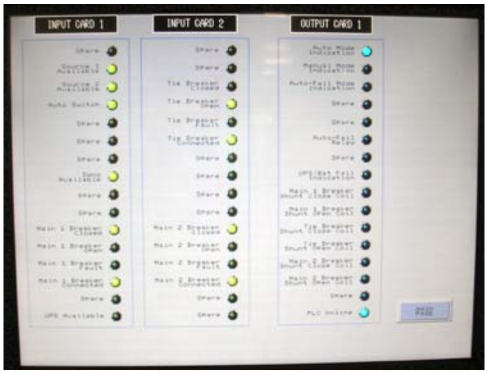
La pantalla de ajustes contiene los teclados de toque para cambiar los ajustes de temporizador y retardo, ajustes de hora y fecha, acceso a las configuraciones del sistema de pantallas de toque y administración de contraseñas. Vea la figura 22.

Figura 22: Pantalla de ajustes

Mapa de E/S del PLC

El PLC contiene listas de entradas/salidas (E/S) con indicadores de estado. Vea la figura 23.

Figura 23: Pantalla de mapa de E/S del PLC



Registro cronológico de alarmas (opcional)

El registro cronológico de alarmas contiene una lista continua de alarmas generadas por eventos del sistema (*p.ej.*, fallas de interruptores automáticos, estado de la conexión de interruptores automáticos, modo de auto falla, etc.). Vea la figura 24.

Figura 24: Pantalla de registro cronológico de alarmas

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Registro cronológico de eventos (opcional)

El registro cronológico de eventos contiene una lista continua de eventos del sistema (p.ej., activación de interruptores, estado de interruptores automáticos, etc.). Vea la figura 25.

Cuando se conecta la alimentación, la pantalla de toque se iluminará antes de que el PLC pase al "modo de marcha" durante 10 segundos aproximadamente.

Presione la "X" en la esquina inferior derecha de la pantalla de toque para cerrar esa ventana y permitir la visibilidad de todas las funciones.

Figura 25: Pantalla de registro cronológico de eventos

Acceso con contraseña

La pantalla principal muestra la imagen de un candado cerrado en la esquina inferior izquierda. Vea la figura 26.

Figura 26: Acceso con contraseña

1. Toque la imagen de candado para invocar un teclado de toque para ingresar datos numéricos.
2. Ingrese la contraseña de nivel 1 (por omisión 1234) para desbloquear el acceso a los botones pulsadores e interruptores de control.
3. Emplee la contraseña de nivel 2 requerida (por omisión 4321) para desbloquear la pantalla de ajustes y permitir todas las funciones de nivel 1.
4. Toque la tecla "Enter" para regresar a la pantalla principal después de ingresar la contraseña apropiada.

   Si se ingresó la contraseña correcta, la pantalla mostrará una imagen de candado desbloqueado con la contraseña activa de nivel 1 ó 2.
5. Toque "push-to-lock" (bloquear) para volver a bloquear el sistema en cualquier momento.

El modo de acceso con contraseña expirará eventualmente y volverá a bloquearse automáticamente (esto será indicado por la imagen de candado bloqueado). La duración del temporizador de seguridad de contraseña puede ser configurado en la pantalla de ajustes. Las contraseñas también pueden ser modificadas en esta pantalla.

Si llegan a olvidarse las contraseñas, es posible ingresar una contraseña (32767) por la "puerta trasera" para alcanzar un acceso de nivel 2.

1. Invoque la pantalla de ajustes y aparecerá un nuevo botón que permite anular una contraseña.
2. Toque el botón de anulación de contraseña para invocar una pantalla que permitirá visualizar y/o restablecer ambas contraseñas de los niveles 1 y 2.

Operación de control

1. Ingrese la contraseña de nivel 1 para obtener acceso a los interruptores y botones pulsadores de control en la pantalla principal.
2. Toque un botón pulsador para activarlo.
3. Para cambiar una posición de interruptor selector, toque el interruptor selector deseado. Aparecerá una ventana automática que presenta teclados de toque adicionales para cada posición de interruptor.
4. Toque la posición de interruptor selector deseada. Esto cierra la ventana automática y desactiva el interruptor selector.
5. La pantalla de ayuda se accede tocando "?" en el teclado en la pantalla automática del interruptor. Se encuentran disponibles pantallas de ayuda para cada interruptor.
6. Cierre las pantallas automáticas: tocando la "X" roja en la esquina superior derecha, la función deseada o el botón "OK".

El interruptor selector de modo auto/manual y el interruptor selector de arranque del generador no se encuentran en la pantalla de toque, sino en el equipo junto a la pantalla.

Ajustes de control

1. Ingrese la contraseña de nivel 2 para acceder a la pantalla de ajustes.
2. Toque un valor de tiempo para ingresar un nuevo valor en un teclado numérico automático.
3. La pantalla de ayuda se accede tocando "?" en el teclado junto al ajuste en cuestión.
4. Acceda a los ajustes de tiempo y fecha tocando el botón “PLC Time Set” (ajuste de tiempo del PLC) o “PLC Date Set” (ajuste de fecha del PLC).
5. Ajuste la hora y fecha tocando las fechas arriba o abajo que aparecen arriba y abajo del valor deseado.

La pantalla de toque tiene sus propias funciones de fecha/hora que no controlarán la fecha/hora del PLC. Consulte las instrucciones de la pantalla de toque para conocer otras funciones que no se tratan aquí; por ejemplo, los niveles de contraluz.

Registros cronológicos de alarmas y eventos (opcional)

Ingrese la contraseña de nivel 1 para visualizar estas pantallas, si fueron provistas.

Los eventos aparecen en una lista en resumen con las incidencias más recientes primero en la lista.

Los eventos/alarmas activas se visualizarán en rojo, los elementos confirmados aparecerán en amarillo y los eventos/alarmas que han regresado a su estado normal aparecerán en verde.

Al presionar el botón “acknowledge all events” (confirmar todos los eventos) cambiará el estado de los eventos de rojo a amarillo.

Funcionamiento

Sistema principal-principal

Esta sección describe el modo de funcionamiento automático del esquema de transferencia automática para un sistema "principal-principal" o de "dos acometidas". Cualquiera de los interruptores automáticos principales, derecho o izquierdo, puede ser la fuente normal o de emergencia.

Ajuste inicial (por omisión)

El ajuste por omisión es un interruptor automático principal (designado "normal") cerrado y el otro (designado "alternativo") abierto. El interruptor automático izquierdo es el designado "normal" a no ser que se especifique lo contrario, ya sea cuando se solicita originalmente o por la posición del PSS.

Fuente normal fuera de servicio

Si la fuente normal no funciona, el PLC transfiere la carga automáticamente a la fuente alternativa. El interruptor automático normal se abre después de que expira el retardo de apertura. Una vez que expira el retardo de cierre, el interruptor automático de la fuente alternativa se cierra.

Retorno de la fuente normal—PSS desonectado/Sin opción de PSS

Sin la opción de PSS, o si el PSS está desconectado, el sistema permanecerá en el estado transferido, aun después de que la fuente normal regresa. El interruptor automático de la fuente alternativa permanecerá cerrado hasta que se lleva a cabo una intervención manual (o la fuente alternativa se pierde), permitiendo al usuario programar la retransferencia a una hora conveniente.

Retorno de la fuente normal —PSS encendido

Si el PSS está encendido:

- En un sistema de transición abierta, después de que expira el retardo de estabilización de la fuente, el interruptor automático de la fuente alternativa se abrirá. Una vez que expira el retardo de cierre, la fuente normal se cierra.
- En un sistema de transición cerrada, después de que expira el retardo de estabilización de la fuente, si se cumplen las condiciones del relevador de comprobación de sincronización, el interruptor automático normal se cierra. Dos segundos después, el interruptor automático de la fuente alternativa se abrirá. Si no se cumplen las condiciones del relevador de comprobación de sincronización, la retransferencia será retrasada hasta que se sincronizan las fuentes.

Fuente alternativa fuera de servicio

Si la fuente alternativa no funciona mientras la fuente normal está fuera de servicio, el interruptor automático de la fuente alternativa se abrirá. El interruptor automático asociado con la primera fuente de retorno se cerrará después de que expira el retardo de estabilización de la fuente.

Retransferencia auto (opcional)

Si viene equipado con el interruptor selector de retransferencia auto:

- Con el interruptor selector en la posición de desconectado (Off), el usuario controla la transferencia manualmente.
- Con el interruptor selector en la posición de conectado (On), la transferencia se llevará a cabo automáticamente.

Sistema Principal-Generador

Esta sección describe el modo de funcionamiento automático del esquema de transferencia automática para un sistema con una conexión a una fuente de acometida y otro a un generador.

Ajuste inicial (por omisión)

Bajo circunstancias normales, el interruptor automático principal conectado a la acometida está cerrado y el interruptor automático principal conectado al generador está abierto. A no ser que se especifique lo contrario, la fuente de acometida es el interruptor automático izquierdo y el interruptor selector del generador se encuentra a la derecha.

Fuente normal fuera de servicio

El sistema transfiere automáticamente la carga a la fuente alternativa. El interruptor automático normal se abrirá después de que expira el retardo de apertura, y la señal de arranque se envía al generador. El interruptor automático de la fuente alternativa se cierra 10 segundos después de que se cumplen las condiciones de los relevadores del generador del sistema de transferencia, indicando que ambos la tensión y frecuencia se encuentran dentro de los límites deseables.

Retorno de la fuente normal —Sistema de transición abierta

Después de que expira el retardo de estabilización de la fuente, el sistema se retransferirá a la fuente normal en una secuencia del sistema de transición abierta. Primero, el interruptor automático del generador se abre. Una vez que expira el retardo de cierre, el interruptor automático normal se cerrará. El generador funcionará en un estado sin carga durante 15 minutos para permitir que se enfríe.

Retorno de la fuente normal —Sistema de transición cerrada

Después de que expira el retardo de estabilización de la fuente, el sistema se retransferirá a la fuente normal en una secuencia del sistema de transición cerrada. Si se cumplen las condiciones del relevador de comprobación de sincronización, el interruptor automático normal se cierra, y después de dos segundos el interruptor automático del generador se abre. El generador funcionará en un estado sin carga durante 15 minutos para permitir que se enfríe. Si las fuentes no están sincronizadas, la retransferencia será retrasada hasta que se sincronizan las fuentes.

Fuente del generador fuera de servicio mientras la fuente normal está desconectada

Si la fuente alternativa (generador) está fuera de servicio mientras la fuente normal está fuera de servicio, el interruptor automático de la fuente alternativa se abrirá. Si la fuente alternativa del generador se desconecta tres veces dentro de 15 minutos, el sistema pasará al modo "Auto Fail" (falla de modo automático). Cuando la fuente normal regresa y se estabiliza, el modo "Auto Fail" se restablecerá y el interruptor automático de la fuente normal se cerrará, regresando el sistema a las condiciones normales de funcionamiento.

Período de prueba

Cada domingo a las 13:00 horas, una señal de arranque será enviada al generador durante 30 minutos. El período de prueba puede o no tener carga si viene equipado con el interruptor selector de prueba con carga opcional. Si se selecciona la prueba con carga, una transferencia a la fuente del generador se realizará durante el período de prueba.

Sistema principal-cierre manual-principal (sin opciones)

Esta sección describe el modo de funcionamiento automático del esquema de transferencia automática del PLC para un sistema con dos fuentes de acometida con un interruptor automático de cierre manual cuando no viene incluida ninguna opción.

Ajuste inicial (por omisión)

Bajo circunstancias normales (por omisión), ambos interruptores automáticos principales están cerrados y el de cierre manual está abierto.

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Fuente normal fuera de servicio

Una vez que expira el retardo de apertura, el interruptor automático principal, cuya fuente está desconectada, se abrirá. El interruptor automático de cierre manual se cierra después de que expira el retardo de cierre y vuelve a energizar la carga desconectada.

Fuente normal en servicio

Después de que expira el retardo de estabilización de la fuente, el interruptor automático de cierre manual se abrirá. Una vez que expira el retardo de cierre, el interruptor automático principal, cuya fuente se ha vuelto a poner en servicio, se cerrará.

Ambas fuente fuera de servicio

Si ambas fuentes de acometida están fuera de servicio, entonces ambos interruptores automáticos principales y el interruptor automático de cierre manual se abrirán. Cuando sólo una de las fuentes se vuelve a conectar, el sistema cambiará de estado para energizar ambas barras de carga de esa fuente. Cuando ambas fuentes se vuelven a conectar simultáneamente, los interruptores automáticos principales se cerrarán y el de cierre manual permanece abierto.

Sistema principal-cierre manual-principal (con opciones)

Esta sección describe el modo de funcionamiento automático del esquema de transferencia automática provisto para un sistema con dos fuentes de acometida con un interruptor automático de cierre manual cuando opciones estándar son especificadas. Las opciones incluyen: PSS, transición cerrada y conexión/desconexión de retransferencia.

Ajuste inicial (por omisión)

La condición por omisión varía con el interruptor selector PSS. Si se supone que ambas fuentes de acometida están disponibles:

- la posición del interruptor selector está a la izquierda, entonces el interruptor automático principal del lado izquierdo y el de cierre manual están cerrados, mientras que el interruptor automático principal del lado derecho está abierto.
- la posición del interruptor selector está a la derecha, entonces el interruptor automático principal del lado derecho y el de cierre manual están cerrados, mientras que el interruptor automático principal del lado izquierdo está abierto.
- el PSS está desconectado (Off), o no está instalado, entonces ambos interruptores automáticos principales están cerrados y el de cierre manual está abierto.

Fuente normal fuera de servicio

El interruptor automático asociado con la fuente normal se abrirá después de que expira el retardo de apertura. Una vez que expira el retardo de cierre, un interruptor automático anteriormente abierto se cierra para restaurar la alimentación. La posición del interruptor selector PSS determina el orden exacto de funcionamiento de la siguiente manera:

- Con el PSS en la posición de la izquierda: Si la fuente izquierda está fuera de servicio, el interruptor automático del lado izquierdo se abrirá después de que expira el retardo de apertura. Una vez que expira el retardo de cierre, el interruptor automático del lado izquierdo se cierra. El interruptor automático de cierre manual no cambia de estado.
- Con el PSS en la posición de la derecha: Si la fuente derecha está fuera de servicio, el interruptor automático del lado derecho se abrirá después de que expira el retardo de apertura. Una vez que expira el retardo de cierre, el interruptor automático del lado izquierdo se cierra. El interruptor automático de cierre manual no cambia de estado.
- Sin el PSS o en la posición de desconectado (Off): El interruptor automático principal, cuya fuente está desconectada, se abrirá una vez que expira el retardo de apertura. Una vez que expira el retardo de

cierre, el interruptor automático de cierre manual se cerrará para restaurar la alimentación a la carga afectada.

Fuente alternativa fuera de servicio mientras la fuente normal está disponible

Con el PSS en la posición de la derecha y el interruptor automático del lado derecho cerrado. Si la fuente izquierda está fuera de servicio, el sistema no cambiará de estado.

De la misma manera, con el PSS en la posición de la izquierda y el interruptor automático del lado izquierdo cerrado: Si la fuente derecha está fuera de servicio, el sistema no cambiará de estado.

Ambas fuentes fuera de servicio

Si ambas fuentes de acometida están fuera de servicio, el interruptor automático de la fuente restante y el interruptor automático de cierre manual se abrirán. Cuando sólo una de las fuentes se vuelve a conectar, el sistema cambiará de estado para energizar ambas barras de carga de esa fuente. Cuando ambas se vuelven a conectar simultáneamente, las posiciones del PSS y el interruptor selector de conexión/desconexión de retransferencia determinan qué interruptores automáticos se cierran.

Retorno de la fuente normal — Retransferencia desconectada

Con la retransferencia desconectada (Off), el sistema no cambia de estado, con o sin PSS. Esto permite al usuario programar la retransferencia a una hora conveniente.

Retorno de la fuente normal — Retransferencia conectada o no presente

Sin un PSS, el sistema regresa al estado normal (esto es, ambos interruptores automáticos principales cerrados y el de cierre manual abierto). Con un PSS, el sistema regresa al estado normal como se puede ver según la posición del PSS:

1. Una vez que el dispositivo de supervisión de calidad de la alimentación detecta la reconexión de la fuente que estaba fuera de servicio, el retardo de estabilización comienza a contar el tiempo transcurrido.
2. Una vez que el retardo ha transcurrido, la fuente es transferida. La secuencia de transferencia es como sigue:
   - En un sistema de transición abierta, el interruptor automático normalmento abierto se abre y el normalmente cerrado se cierra después de expirar el retardo de cierre. (por ejemplo, si el PSS se encuentra en la posición de la izquierda, el interruptor automático principal del lado derecho se abre. Una vez que expira el retardo de cierre, el interruptor automático principal del lado izquierdo se cierra).
   - En un sistema de transición cerrada, el interruptor automático normalmente cerrado se cierra, y dos segundos después, el interruptor automático normalmente abierto se abre. Por ejemplo, si el PSS se encuentra en la posición de la derecha, el interruptor automático principal del lado derecho se cierra. Dos segundos después, el interruptor automático del lado izquierdo se abre.

Condiciones que evitan la transferencia de la fuente

Falla de corriente descendente

Si un interruptor automático principal se dispara como resultado de una falla de corriente descendente, el enclavamiento eléctrico no permite que se cierre ningún dispositivo. En modo manual, los botones de cierre están bloqueados. En modo automático, no se permite un cierre. Un interruptor automático disparado también activa la luz ámbar "Auto Fail" (falla de modo automático). La transferencia automática no se realiza sino hasta que la falla se restablece y el interruptor automático es restablecido. Consulte la documentación del interruptor automático para obtener instrucciones sobre cómo restablecer los contactos auxiliares. Para restablecer el sistema de transferencia automática, coloque el interruptor selector "auto/manual" en Manual y de regreso a Auto.

Otras condiciones

Un desequilibrio de fase, inversión de fase o tensión de la fuente que excede los límites (incluyendo la pérdida total de tensión) desenergizará el dispositivo de supervisión de calidad de la alimentación, sin dejar que se cierre el interruptor automático principal asociado. Una fuente de generador también es supervisada para determinar si hay sobretensión y frecuencia apropiada. Si viene equipado con el interruptor selector de retransferencia automática opcional y éste se encuentra en la posición de desconectado (Off), la retransferencia será suspendida hasta que el interruptor selector se cambia a la posición de conectado (On). Esto permite al usuario esperar a que se realice la sincronización (en una aplicación de transición cerrada) o iniciar la transferencia a una hora más conveniente.

Los sistemas "principal-generador" están programados para evitar que se conecte y desconecte el interruptor automático de la fuente alternativa. Si la fuente alternativa está siendo usada para energizar la carga, y la tensión de la fuente excede los límites aceptables tres veces dentro de 15 minutos, el sistema pasará al modo de falla automática (Auto Fail) y el interruptor automático de la fuente alternativa no podrá volver a cerrarse. Esta condición se restablece cuando la fuente normal regresa y la carga es energizada de la fuente normal.

Instalación

Preparación para el recibo del equipo

El sistema de transferencia automática se encuentra dentro de varias secciones del tablero de distribución tipo autosoportado o tablero de fuerza. Consulte el manual del tablero de distribución tipo autosoportado o tablero de fuerza para obtener información pertinente a las secciones del equipo.

El PLC Modicon® tiene restricciones ambientales diferentes a las del equipo entero. Encontrará la información pertinente a estas restricciones en la Guía del usuario del PLC Modicon. Asegúrese de almacenar e instalar el equipo de acuerdo con las restricciones más estrictas. Por ejemplo, si la unidad central de procesamiento (CPU) Modicon tiene límites de temperatura entre 0 y 60 °C (32 y 140 °F), y el equipo tiene límites entre 0 y 75 °C (32 y 167 °F), entonces mantenga el equipo a una temperatura entre 0 y 60 °C (32 y 140 °F).

Ubicación e interconexión de ensambles

Las partes del sistema de transferencia automática se encuentran distribuidas entre varias secciones del tablero de distribución tipo autosoportado o tablero de fuerza y deberán conectarse juntas. Consulte los dibujos provistos por la fábrica los cuales fueron enviados con el equipo para conocer las ubicaciones exactas e interconexiones de los sub-ensambles.

Conexiones finales de los cables

Como se indicó anteriormente, las partes del sistema de transferencia automática se encuentran distribuidas entre varias secciones del equipo y deberán conectarse juntas. Es posible que algunos bloques de terminales se encuentren junto a la parte inferior de los canales de las esquinas frontales o traseros. Consulte los diagramas de alambrado provistos con el tablero de distribución o tablero de fuerza y asegúrese de que todas las conexiones se hayan realizado correctamente.

Instalación del equipo

1. En un sistema de generador, conecte los cables externos en los bloques de terminales GEN 1 y GEN 2. El alambrado deberá ser tendido en tubo conduit.
2. Para los indicadores de estado remotos, conecte los cables externos en los bloques de terminales AL 1 y AL 2 en el ensamble del UPS.
3. Complete todo el alambrado entre las secciones para la alimentación de control y señales. Los bloques de terminales se encuentren típicamente en la parte inferior de los canales de las esquinas frontales o traseros de cada sección.

Revisión antes de la energización

El sistema de alimentación de control tiene dos o más unidades de desconexión fusible, interruptores automáticos montados en riel DIN y varios ensambles de fusible. Todos estos deben tener los fusibles correctos instalados y los dispositivos deben estar en la posición de conectado (On). Los tamaños de fusible son especificados en los diagramas esquemáticos o de alambrado para el equipo. Emplee la siguiente lista de verificación para obtener los ajustes iniciales correctos de arranque de los dispositivos.

1. Utilice el botón de apertura en cada interruptor automático para abrir los dispositivos principales.
2. Coloque el interruptor selector "auto/manual" en la puerta de operador en la posición Manual.
3. Desconecte todos los dispositivos de (distribución) carga.
4. Todos los dispositivos de desconexión de la alimentación de control deberán estar en la posición de conectado (ON).
5. Cierre y asegure todas las cubiertas y puertas.

Verificación de funcionamiento

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía, consulte la norma 70E de NFPA.
- Solamente el personal eléctrico especializado deberá instalar y prestar servicio de mantenimiento a este equipo.
- El circuito de control y barra están energizados durante las pruebas de funcionamiento. Revise minuciosamente los dibujos, la documentación y el diseño del equipo antes de realizar cualquier prueba de funcionamiento.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Siga los procedimientos de verificación delineados en la documentación del equipo bajo "Instalación" y "Servicios de mantenimiento".

1. Energice el equipo.
2. Conecte el sistema de alimentación ininterrumpida (UPS) provisto con el equipo.
3. Realice la prueba apropiada del modo manual para el sistema instalado como se describe en la sección “Procedimientos de prueba” de este boletín, comenzando en la página 32.

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4. Complete la prueba apropiada del modo automático para el sistema instalado como se describe en la sección “Procedimientos de prueba” de este boletín, comenzando en la página 32.
5. Realice los pasos necesarios para los dispositivos instalados, incluyendo las pruebas del interruptor automático, las pruebas de falla a tierra o la verificación de los circuitos de medición, tal como se describe en la documentación correspondiente.

Puesta en servicio

Ponga en servicio el sistema de transferencia automática después de realizar satisfactoriamente el procedimiento en “Verificación de funcionamiento” en la página 31 y todas las pruebas descritas.

1. Abra o cierre los interruptores automáticos principales en la condición inicial deseada utilizando los interruptores selectores en la puerta de operador del sistema de transferencia automática.
2. Coloque todos los interruptores selectores en la puerta de operador en la posición deseada.
3. Retire las llaves de los interruptores de llave y guárdelas en un lugar seguro y accesible.

Procedimientos de prueba

Antes de comenzar cualquier procedimiento de prueba, realice los pasos de instalación delineados en “Revisión antes de la energización” en la página 31. Identifique el tipo de sistema (principal-principal, principal-generador o principal-cierre manual-principal), y si el sistema tiene opciones (PSS o transferencia cerrada o retransferencia conexión/desconexión), para seleccionar el grupo apropiado de procedimientos de prueba. Realice las pruebas delineadas en “Verificación de funcionamiento” en la página 31.

Realice las pruebas apropiadas para los modos manual y automático trimestralmente. Anote las fechas y resultados de las pruebas en el “Registro cronológico de servicios de mantenimiento” en la página 50.

En este boletín se proporciona información sobre los sistemas estándar la cual será utilizada por los responsables de la instalación y las especificaciones. En este boletín se proporciona información básica solamente insuficiente para instalaciones que no son estándar. Los sistemas estándar siempre incluyen un sistema de alimentación ininterrumpida (UPS). Las opciones disponibles son interruptores selectores de fuente preferida (PSS), de prueba con carga, de auto-retransferencia y botón de luces de prueba. Consulte los documentos provistos por la fábrica para conocer cualquier desviación en el sistema estándar.

Asimismo, este boletín describe una secuencia de funcionamiento estándar para el sistema. La secuencia estándar sigue una de las secciones delineadas en *“Funcionamiento”* que comienza en la *página 26* de este manual. El sistema es verificado para cerciorarse de que usa la secuencia apropiada siguiendo uno de los “Procedimientos de prueba” delineados en la sección “Instalación” de este boletín. Cualquier cambio a la secuencia estándar se describe en los documentos de instrucción independientes provistos por la fábrica.

Sistema base principal-principal

Esta sección trata sobre las pruebas recomendadas para un sistema de dos acometidas cuando no hay ninguna opción instalada.

Modo Manual

Con el interruptor selector en modo Manual, un operador puede abrir y cerrar cada interruptor automático independientemente usando los botones pulsadores en la puerta de operador. Únicamente un interruptor automático principal puede cerrarse en un determinado momento, evitando un sistema de transición cerrada. Se produce un retardo de dos segundos entre la apertura de un interruptor automático principal y el cierre de otro.

Tabla 1: Procedimientos de prueba del modo manual para una configuración básica "principal-principal"

1.	Realice lo siguiente:	Coloque el interruptor selector auto/manual en la posición Manual.
		Abra ambos interruptores automáticos principales utilizando el botón de apertura situado en los interruptores.
		Coloque el interruptor selector TTL/Normal/TTR en la posición Normal.
2.	Asegúrese de que las luces indicadoras estén encendidas:	Luz blanca indicadora de fuente izquierda
		Luz blanca indicadora de fuente derecha
		Luz verde indicadora de apertura del interruptor automático principal izquierdo
		Luz verde indicadora de apertura del interruptor automático principal derecho
		Luz azul indicadora de modo manual
3.	Asegúrese de que las luces indicadoras estén apagadas:	Luz ámbar indicadora de falla del interruptor automático principal izquierdo
		Luz ámbar indicadora de falla del interruptor automático principal derecho
		Luz blanca indicadora de modo Auto
4.	Oprima el botón de cierre rojo del interruptor automático principal izquierdo, en la puerta de operador.	La luz verde indicadora de apertura del interruptor automático principal izquierdo se apagará
		La luz roja indicadora de cierre del interruptor automático principal izquierdo se encenderá
5.	Abra el interruptor automático principal izquierdo utilizando el botón de apertura verde, en la puerta de operador.	La luz roja indicadora de cierre del interruptor automático principal izquierdo se apagará
		La luz verde indicadora de apertura del interruptor automático principal izquierdo se encenderá
6.	Después de dos segundos, oprima el botón de cierre rojo del interruptor automático principal derecho, en la puerta de operador.	La luz verde indicadora de apertura del interruptor automático principal derecho se apagará
		La luz roja indicadora de cierre del interruptor automático principal derecho se encenderá
7.	Abra el interruptor automático principal derecho utilizando el botón de apertura verde, en la puerta de operador.	La luz roja indicadora de cierre del interruptor automático principal derecho se apagará
		La luz verde indicadora de apertura del interruptor automático principal derecho se encenderá
	NOTA: Si se oprime el botón de cierre de uno de los interruptores automáticos principales mientras el otro está cerrado, la señal de entrada será ignorada.	

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Modo automático

Los botones pulsadores de la puerta de operador no harán funcionar los interruptores automáticos en modo automático.

Tabla 2: Procedimientos de prueba del modo automático para una configuración básica "principal-principal"

1.	Realice lo siguiente:	Coloque el interruptor selector auto/manual en la posición Manual.
		Abra ambos interruptores automáticos principales utilizando el botón de apertura situado en los interruptores.
		Coloque el interruptor selector TTL/Normal/TTR en la posición Normal.
2.	Asegúrese de que las luces indicadoras estén apagadas:	Luz ámbar indicadora de falla de modo automático
		Luz ámbar indicadora de falla del interruptor automático principal izquierdo
		Luz ámbar indicadora de falla del interruptor automático principal derecho
3.	Asegúrese de que las luces indicadoras estén encendidas:	Luz blanca indicadora de fuente izquierda
		Luz blanca indicadora de fuente derecha
		Luz azul indicadora de modo manual
4.	Coloque el interruptor selector auto/manual en la posición Auto.	El interruptor automático principal de la fuente normal se cerrará
5.	Asegúrese de que las luces indicadoras estén encendidas:	Luz blanca indicadora de modo Auto
		Luz roja indicadora de cierre del interruptor automático principal de la fuente normal
		Luz verde indicadora de apertura del interruptor automático principal de la fuente alternativa
6.	Asegúrese de que las luces indicadoras estén apagadas:	Luz ámbar indicadora de falla de modo automático
		Luz ámbar indicadora de falla del interruptor automático principal izquierdo
		Luz ámbar indicadora de falla del interruptor automático principal derecho
7.	Simula una pérdida de la fuente normal colocando el interruptor selector TTL/Normal/TTR en TTL (prueba de transferencia a la fuente izquierda) o TTR (prueba de transferencia a la fuente derecha), cualquiera que sea la fuente normal. El interruptor automático principal de la fuente normal se abrirá después de que expira el retardo de apertura. Una vez que el interruptor automático de la fuente normal se abre, el retardo de cierre comienza a contar el tiempo. Una vez que expira el retardo de cierre, el interruptor automático principal de la fuente alternativa se cerrará.	
8.	Asegúrese de que las luces indicadoras estén encendidas:	Luz verde indicadora de apertura del interruptor automático principal de la fuente normal
		Luz roja indicadora de cierre del interruptor automático principal de la fuente alternativa
		Luz blanca indicadora de fuente alternativa
	NOTA: La luz indicadora de la fuente normal estará apagada.	
9.	Simula el retorno de tensión a la fuente normal colocando el interruptor selector TTL/Normal/TTR de regreso a la posición Normal. El interruptor automático principal de la fuente alternativa continuará alimentando la carga, sin embargo, la luz indicadora de la fuente normal estará encendida.	
10.	Simula una pérdida de la fuente alternativa colocando el interruptor selector TTL/Normal/TTR en TTL (prueba de transferencia a la fuente izquierda) o TTR (prueba de transferencia a la fuente derecha), cualquiera que sea la fuente alternativa. El interruptor automático principal de la fuente alternativa se abrirá después de que expira el retardo de apertura. Una vez que el interruptor automático de la fuente alternativa se abre, el retardo de cierre comienza a contar el tiempo. Una vez que expira el retardo de cierre, el interruptor automático principal de la fuente normal se cerrará.	
11.	Asegúrese de que las luces indicadoras estén encendidas:	Luz verde indicadora de apertura del interruptor automático principal de la fuente alternativa
		Luz roja indicadora de cierre del interruptor automático principal de la fuente normal
		Luz blanca indicadora de fuente normal
	NOTA: La luz indicadora de la fuente alternativa estará apagada.	
12.	Simula el retorno de tensión a la fuente alternativa colocando el interruptor TTL/Normal/TTR de regreso en la posición Normal. El interruptor automático principal de la fuente normal continuará alimentando la carga, sin embargo, la luz indicadora de la fuente alternativa estará encendida.	

Opciones estándar del sistema "principal-principal"

Esta sección trata sobre las pruebas recomendadas para un sistema "principal-principal" con opciones estándar. Estas opciones incluyen el PSS, auto-retransferencia y transición cerrada.

Modo Manual

Con el interruptor selector en modo Manual, un operador puede abrir y cerrar cada interruptor automático independientemente usando los botones pulsadores en la puerta de operador. El PSS no tiene ningún impacto sobre el modo Manual.

Tabla 3: Procedimientos de prueba del modo manual para un sistema "principal-principal" con opciones

<table>
<tr><td rowspan="4">1.</td><td rowspan="4">Realice lo siguiente:</td><td>Coloque el interruptor selector auto/manual en la posición Manual.</td></tr>
<tr><td>Abra ambos interruptores automáticos principales utilizando el botón de apertura situado en los interruptores.</td></tr>
<tr><td>Coloque el interruptor selector TTL/Normal/TTR en la posición Normal.</td></tr>
<tr><td>Coloque el interruptor selector PSS en la posición de desconectado (Off).</td></tr>
<tr><td rowspan="5">2.</td><td rowspan="5">Asegúrese de que las luces indicadoras estén encendidas:</td><td>Luz blanca indicadora de fuente izquierda</td></tr>
<tr><td>Luz blanca indicadora de fuente derecha</td></tr>
<tr><td>Luz verde indicadora de apertura del interruptor automático principal izquierdo</td></tr>
<tr><td>Luz verde indicadora de apertura del interruptor automático principal derecho</td></tr>
<tr><td>Luz azul indicadora de modo Manual</td></tr>
<tr><td rowspan="3">3.</td><td rowspan="3">Asegúrese de que las luces indicadoras estén apagadas:</td><td>Luz ámbar indicadora de falla del interruptor automático principal izquierdo</td></tr>
<tr><td>Luz ámbar indicadora de falla del interruptor automático principal derecho</td></tr>
<tr><td>Luz blanca indicadora de modo Auto</td></tr>
<tr><td rowspan="2">4.</td><td rowspan="2">Oprima el botón de cierre rojo del interruptor automático principal izquierdo, en la puerta de operador.</td><td>La luz verde indicadora de apertura del interruptor automático principal izquierdo se apagará</td></tr>
<tr><td>La luz roja indicadora de cierre del interruptor automático principal izquierdo se encenderá</td></tr>
<tr><td rowspan="5">5.</td><td colspan="2">Mueva el interruptor selector PSS a la posición derecha (fuente derecha preferida)</td></tr>
<tr><td rowspan="2">Oprima el botón de cierre del interruptor automático principal derecho, en la puerta de operador. En un sistema de transición cerrada que cumple con las condiciones del relevador de comprobación de sincronización.</td><td>La luz verde indicadora de apertura del interruptor automático principal derecho se apagará</td></tr>
<tr><td>La luz roja indicadora de cierre del interruptor automático principal derecho se encenderá</td></tr>
<tr><td colspan="2">Dos segundos después, el interruptor automático principal izquierdo se abrirá. Las luces indicadoras para el interruptor automático de la fuente izquierda cambiarán de estado.</td></tr>
<tr><td colspan="2">NOTA: Si las condiciones del relevador de sincronización no se cumplen o éste no es instalado, el comando para cerrar el interruptor automático principal derecho será ignorado. De la misma manera, si el interruptor selector del sistema de transición cerrada está en la posición de desconectado (Off), el comando para cerrar el interruptor automático principal derecho será ignorado.</td></tr>
<tr><td rowspan="5">6.</td><td colspan="2">Mueva el interruptor selector PSS a la posición derecha (fuente derecha preferida)</td></tr>
<tr><td rowspan="2">Oprima el botón de cierre del interruptor automático principal izquierdo, en la puerta de operador. En un sistema de transición cerrada que cumple con las condiciones del relevador de comprobación de sincronización.</td><td>La luz verde indicadora de apertura del interruptor automático principal izquierdo se apagará</td></tr>
<tr><td>La luz roja indicadora de cierre del interruptor automático principal izquierdo se encenderá</td></tr>
<tr><td colspan="2">Dos segundos después, el interruptor automático principal derecho se abrirá. Las luces indicadoras para el interruptor automático de la fuente izquierda cambiarán de estado.</td></tr>
<tr><td colspan="2">NOTA: Si las condiciones del relevador de sincronización no se cumplen o éste no es instalado, el comando para cerrar el interruptor automático principal izquierdo será ignorado. De la misma manera, si el interruptor selector del sistema de transición cerrada está en la posición de desconectado (Off), el comando para cerrar el interruptor automático principal izquierdo será ignorado.</td></tr>
</table>

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Modo automático

Los botones pulsadores de la puerta de operador no harán funcionar los interruptores automáticos en modo automático.

Tabla 4: Procedimientos de prueba del modo automático para un sistema "principal-principal" con opciones

1.	Realice lo siguiente:	Coloque el interruptor selector auto/manual en la posición Manual.
		Abra ambos interruptores automáticos principales utilizando el botón de apertura situado en los interruptores.
		Coloque el interruptor selector TTL/Normal/TTR en la posición Normal.
		Coloque el interruptor selector PSS en la posición de desconectado (Off).
		Coloque el interruptor selector de auto-retransferencia en la posición de conectado (On).
2.	Asegúrese de que las luces indicadoras estén encendidas:	Luz blanca indicadora de fuente izquierda
		Luz blanca indicadora de fuente derecha
		Luz azul indicadora de modo Manual
3.	Asegúrese de que las luces indicadoras estén apagadas:	Luz ámbar indicadora de falla de modo automático
		Luz ámbar indicadora de falla del interruptor automático principal izquierdo
		Luz ámbar indicadora de falla del interruptor automático principal derecho
4.	Coloque el interruptor selector auto/manual en la posición Auto. El interruptor automático principal de la fuente normal se cerrará	
5.	Asegúrese de que las luces indicadoras estén encendidas:	Luz blanca indicadora de modo Auto
		Luz roja indicadora de cierre del interruptor automático principal de la fuente normal
		Luz verde indicadora de apertura del interruptor automático principal de la fuente alternativa
6.	Asegúrese de que las luces indicadoras estén apagadas:	Luz ámbar indicadora de falla de modo automático
		Luz ámbar indicadora de falla del interruptor automático principal izquierdo
		Luz ámbar indicadora de falla del interruptor automático principal derecho
		Luz azul indicadora de modo Manual
7.	Simula una pérdida de la fuente de acometida colocando el interruptor selector TTL/Normal/TTR en TTL (prueba de transferencia a la fuente izquierda) o TTR (prueba de transferencia a la fuente derecha), cualquiera que sea la fuente normal. El interruptor automático principal de la fuente normal se abrirá después de que expira el retardo de apertura. Una vez que el interruptor automático de la fuente normal se abre, el retardo de cierre comienza a contar el tiempo. Una vez que expira el retardo de cierre, el interruptor automático principal de la fuente alternativa se cerrará.	
8.	Asegúrese de que las luces indicadoras estén encendidas:	Luz verde indicadora de apertura del interruptor automático principal de la fuente normal
		Luz roja indicadora de cierre del interruptor automático principal de la fuente alternativa
		Luz blanca indicadora de fuente alternativa
	NOTA: La luz indicadora de la fuente normal estará apagada.	
9.	Simula el retorno de tensión a la fuente normal colocando el interruptor selector TTL/Normal/TTR de regreso a la posición Normal.	
	Con el PSS y un sistema de transición abierta, el sistema puede retransferir al interruptor automático de la fuente normal. Para permitir la retransferencia, ajuste el PSS en la posición de la fuente normal. Para evitar la retransferencia, ajuste el interruptor selector en la posición intermedia/desconectado (Off). Con el PSS ajustado en la posición de la fuente normal, el retardo de estabilización de la fuente comienza a contar el tiempo una vez que la fuente normal regresa. Una vez que expira el tiempo, el interruptor automático de la fuente alternativa se abre. Una vez que expira el retardo de cierre, el interruptor automático de la fuente normal se cierra.	
	Con el PSS y un sistema de transición cerrada, el temporizador de estabilización de la fuente comienza a expirar una vez que regresa la tensión normal. Con el PSS ajustado en la posición de la fuente normal, el interruptor automático de la fuente normal se cierra. Dos segundos después, el interruptor automático de la fuente alternativa se abre.	
	NOTA: Sin el PSS, el sistema no realiza una retransferencia. Si el interruptor selector de retransferencia automática se ajusta en la posición de desconectado (Off), la retransferencia será suspendida hasta que se cambia a la posición de conectado (On).	
10.	Para simular una pérdida de la fuente alternativa de acometida, ajuste el sistema de la siguiente manera:	Interruptor automático de la fuente normal abierto
		Interruptor automático principal de la fuente alternativa cerrado
		PSS desconectado (off), si está presente
		Ambas luces indicadoras de fuente están encendidas
11.	Simula la pérdida de la fuente alternativa colocando el interruptor selector TTL/Normal/TTR en la posición de la fuente alternativa. El interruptor automático de la fuente alternativa se abrirá después de que expira el retardo de apertura y después de que expira el retardo de cierre, el interruptor automático de la fuente normal se cerrará.	
12.	Simula el retorno de tensión a la fuente alternativa colocando el interruptor TTL/Normal/TTR de regreso en la posición Normal. El interruptor automático principal de la fuente normal continuará alimentando la carga.	

Sistema base Principal-Generador

Esta sección trata sobre las pruebas recomendadas para un sistema "acometida-generador" sin opciones. El interruptor automático de la fuente normal se conecta a la fuente de acometida y el interruptor automático de la fuente alternativa se conecta al generador.

Modo Manual

Con el interruptor selector en modo Manual, un operador puede abrir y cerrar cada interruptor automático independientemente usando los botones pulsadores en la puerta de operador. Únicamente un interruptor automático principal puede cerrarse en un determinado momento, evitando un sistema de transición cerrada. Se produce un retardo de dos segundos entre la apertura de un interruptor automático principal y el cierre de otro.

Tabla 5: Procedimientos de prueba del modo manual para un sistema básico "principal-generador"

1.	Realice lo siguiente:	Coloque el interruptor selector auto/manual en la posición Manual.
		Abra ambos interruptores automáticos principales utilizando el botón de apertura situado en los interruptores.
		Coloque el interruptor selector TTL/Normal/TTR en la posición Normal.
		Coloque el interruptor selector de arranque del generador en la posición de paro
2.	Asegúrese de que las luces indicadoras estén encendidas:	Luz blanca indicadora de fuente normal
		Luz verde indicadora de apertura del interruptor automático principal de la fuente normal
		Luz verde indicadora de apertura del interruptor automático principal de la fuente alternativa
		Luz azul indicadora de modo Manual
3.	Asegúrese de que las luces indicadoras estén apagadas:	Luz blanca indicadora de fuente alternativa
		Luz ámbar indicadora de falla del interruptor automático principal de la fuente normal
		Luz ámbar indicadora de falla del interruptor automático principal de la fuente alternativa
		Luz blanca indicadora de modo Auto
4.	Arranque el generador colocando el interruptor selector de arranque del generador en la posición de arranque Continúe con esta prueba cuando la luz indicadora de la fuente disponible para el generador esté encendida.	
5.	Oprima el botón de cierre rojo del interruptor automático principal de la fuente normal, en la puerta de operador.	La luz verde indicadora de apertura del interruptor automático principal de la fuente normal se apagará
		La luz roja indicadora de cierre del interruptor automático principal de la fuente normal se encenderá
6.	Abra el interruptor automático principal normal utilizando el botón de apertura verde, en la puerta de operador.	La luz roja indicadora de cierre del interruptor automático principal de la fuente normal se apagará
		La luz verde indicadora de apertura del interruptor automático principal de la fuente normal se encenderá
7.	Después de dos segundos, oprima el botón de cierre rojo del interruptor automático principal de la fuente alternativa, en la puerta de operador.	La luz verde indicadora de apertura del interruptor automático principal de la fuente alternativa se apagará
		La luz roja indicadora de cierre del interruptor automático principal de la fuente alternativa se encenderá
8.	Abra el interruptor automático principal alternativo utilizando el botón de apertura verde, en la puerta de operador.	La luz roja indicadora de cierre del interruptor automático principal de la fuente alternativa se apagará
		La luz verde indicadora de apertura del interruptor automático principal de la fuente alternativa se encenderá
9.	Coloque el interruptor selector de arranque del generador en la posición de paro El generador continuará funcionando hasta que expira el período de enfriamiento.	
	NOTA: Si se oprime el botón de cierre del interruptor automático principal de la fuente normal mientras el interruptor automático principal del generador (de la fuente alternativa) está cerrado y se cumplen las condiciones del relevador de comprobación de sincronización, se realizará una transferencia a la fuente del interruptor automático principal de la fuente normal de acometida, puesto que ésta es la preferida por omisión.	

ESPAÑOL

Modo automático

Los botones pulsadores de la puerta de operador no harán funcionar los interruptores automáticos en modo automático. La posición del interruptor selector de arranque del generador no afecta el funcionamiento del sistema del PLC mientras se encuentra en estado automático.

Tabla 6: Procedimientos de prueba del modo automático para un sistema básico "principal-generador"

1.	Realice lo siguiente:	Coloque el interruptor selector auto/manual en la posición Manual.
		Abra ambos interruptores automáticos principales utilizando el botón de apertura situado en los interruptores.
		Coloque el interruptor selector TTL/Normal/TTR en la posición Normal.
		Coloque el interruptor selector de arranque del generador en la posición de paro
2.	Asegúrese de que las luces indicadoras estén encendidas:	Luz blanca indicadora de fuente normal
		Luz verde indicadora de apertura del interruptor automático principal de la fuente normal
		Luz verde indicadora de apertura del interruptor automático principal de la fuente alternativa
		Luz azul indicadora de modo Manual
3.	Asegúrese de que las luces indicadoras estén apagadas:	Luz blanca indicadora de fuente alternativa
		Luz ámbar indicadora de falla del interruptor automático principal de la fuente normal
		Luz ámbar indicadora de falla del interruptor automático principal de la fuente alternativa
		Luz blanca indicadora de modo Auto
4.	Coloque el interruptor selector auto/manual en la posición Auto. El interruptor automático principal de la fuente normal se cerrará.	
5.	Asegúrese de que las luces indicadoras estén encendidas:	Luz blanca indicadora de modo Auto
		Luz roja indicadora de cierre del interruptor automático principal de la fuente normal
		Luz verde indicadora de apertura del interruptor automático principal de la fuente alternativa
6.	Asegúrese de que las luces indicadoras estén apagadas:	Luz ámbar indicadora de falla de modo automático
		Luz ámbar indicadora de falla del interruptor automático principal de la fuente normal
		Luz ámbar indicadora de falla del interruptor automático principal de la fuente alternativa
		Luz azul indicadora de modo Manual
7.	Simula una pérdida de la fuente normal colocando el interruptor selector TTL/Normal/TTR en TTL (prueba de transferencia a la fuente izquierda) o TTR (prueba de transferencia a la fuente derecha), cualquiera que sea la fuente normal. El interruptor automático principal de la fuente normal se abrirá después de que expira el retardo de apertura. La señal de arranque será enviada al generador. Una vez que la fuente del generador se ha estabilizado, el interruptor automático del generador se cerrará.	
8.	Asegúrese de que las luces indicadoras estén encendidas:	Luz verde indicadora de apertura del interruptor automático principal de la fuente normal
		Luz roja indicadora de cierre del interruptor automático principal de la fuente alternativa
		Luz blanca indicadora de fuente alternativa
	NOTA: La luz blanca indicadora de la fuente normal estará apagada.	
9.	Simula el retorno de tensión a la fuente normal colocando el interruptor selector TTL/Normal/TTR de regreso a la posición Normal. La retransferencia a la fuente de acometida se realizará. Después de que expira el retardo de estabilización, el interruptor automático del generador se abrirá. Después de que expira el retardo de cierre, el interruptor automático de la fuente normal se cerrará y el generador continuará funcionando hasta que expira el período de enfriamiento.	

Opciones estándar de un sistema "principal-generador"

Esta sección trata sobre las pruebas recomendadas para un sistema "principal-generador" con opciones estándar. Estas opciones incluyen la selección de un sistema de transición cerrada y prueba con carga e interruptores selectores de retransferencia automática.

Modo Manual

Con el interruptor selector en modo Manual, un operador puede abrir y cerrar cada interruptor automático independientemente usando los botones pulsadores en la puerta de operador.

Tabla 7: Procedimientos de prueba del modo manual para un sistema "principal-generador" con opciones

<table>
<tr><td rowspan="4">1.</td><td rowspan="4">Realice lo siguiente:</td><td>Coloque el interruptor selector auto/manual en la posición Manual.</td></tr>
<tr><td>Abra ambos interruptores automáticos principales utilizando el botón de apertura situado en los interruptores.</td></tr>
<tr><td>Coloque el interruptor selector TTL/Normal/TTR en la posición Normal.</td></tr>
<tr><td>Coloque el interruptor selector de arranque del generador en la posición de paro</td></tr>
<tr><td rowspan="4">2.</td><td rowspan="4">Asegúrese de que las luces indicadoras estén encendidas:</td><td>Luz blanca indicadora de fuente normal</td></tr>
<tr><td>Luz verde indicadora de apertura del interruptor automático principal de la fuente normal</td></tr>
<tr><td>Luz verde indicadora de apertura del interruptor automático principal de la fuente alternativa</td></tr>
<tr><td>Luz azul indicadora de modo Manual</td></tr>
<tr><td rowspan="4">3.</td><td rowspan="4">Asegúrese de que las luces indicadoras estén apagadas:</td><td>Luz blanca indicadora de fuente alternativa</td></tr>
<tr><td>Luz ámbar indicadora de falla del interruptor automático principal de la fuente normal</td></tr>
<tr><td>Luz ámbar indicadora de falla del interruptor automático principal de la fuente alternativa</td></tr>
<tr><td>Luz blanca indicadora de modo Auto</td></tr>
<tr><td>4.</td><td colspan="2">Arranque el generador colocando el interruptor selector de arranque del generador en la posición de arranque Continúe con esta prueba cuando la luz indicadora de la fuente disponible para el generador esté encendida.</td></tr>
<tr><td rowspan="2">5.</td><td rowspan="2">Oprima el botón de cierre rojo del interruptor automático principal de la fuente normal, en la puerta de operador.</td><td>La luz verde indicadora de apertura del interruptor automático principal de la fuente normal se apagará</td></tr>
<tr><td>La luz roja indicadora de cierre del interruptor automático principal de la fuente normal se encenderá</td></tr>
<tr><td rowspan="4">6.</td><td rowspan="2">Oprima el botón de cierre del interruptor automático principal de la fuente alternativa, en la puerta de operador. En un sistema de transición cerrada con un relevador de comprobación de sincronización:</td><td>La luz verde indicadora de apertura del interruptor automático principal de la fuente alternativa se apagará</td></tr>
<tr><td>La luz roja indicadora de cierre del interruptor automático principal de la fuente alternativa se encenderá</td></tr>
<tr><td colspan="2">Dos segundos después, el interruptor automático principal de la fuente normal se abrirá. Las luces indicadoras para el interruptor automático de la fuente normal cambiarán de estado.</td></tr>
<tr><td colspan="2">NOTA: Si las condiciones del relevador de sincronización no se cumplen o éste no es instalado, el comando para cerrar el interruptor automático principal de la fuente alternativa será ignorado.</td></tr>
<tr><td rowspan="4">7.</td><td rowspan="2">Oprima el botón de cierre del interruptor automático principal de la fuente normal, en la puerta de operador. En un sistema de transición cerrada con un relevador de comprobación de sincronización:</td><td>La luz verde indicadora de apertura del interruptor automático principal de la fuente normal se apagará</td></tr>
<tr><td>La luz roja indicadora de cierre del interruptor automático principal de la fuente normal se encenderá</td></tr>
<tr><td colspan="2">Dos segundos después, el interruptor automático principal de la fuente alternativa se abrirá. Las luces indicadoras para el interruptor automático de la fuente alternativa cambiarán de estado.</td></tr>
<tr><td colspan="2">NOTA: Si las condiciones del relevador de sincronización no se cumplen o éste no es instalado, el comando para cerrar el interruptor automático principal de la fuente normal será ignorado.</td></tr>
<tr><td>8.</td><td colspan="2">Coloque el interruptor selector de arranque del generador en la posición de paro El generador continuará funcionando hasta que expira el período de enfriamiento.</td></tr>
</table>

Modo automático

Los botones pulsadores de la puerta de operador no harán funcionar los interruptores automáticos en modo automático. La posición del interruptor selector de arranque del generador no afecta el funcionamiento del sistema del PLC mientras se encuentra en estado automático.

Tabla 8: Procedimientos de prueba del modo automático para un sistema "principal-generador" con opciones

1.	Realice lo siguiente:	Coloque el interruptor selector auto/manual en la posición Manual.
		Abra ambos interruptores automáticos principales utilizando el botón de apertura situado en los interruptores.
		Coloque el interruptor selector TTL/Normal/TTR en la posición Normal.
		Coloque el interruptor selector de arranque del generador en la posición de paro
2.	Asegúrese de que las luces indicadoras estén encendidas:	Luz blanca indicadora de fuente normal
		Luz verde indicadora de apertura del interruptor automático principal de la fuente normal
		Luz verde indicadora de apertura del interruptor automático principal de la fuente alternativa
		Luz azul indicadora de modo Manual
3.	Asegúrese de que las luces indicadoras estén apagadas:	Luz blanca indicadora de fuente alternativa
		Luz ámbar indicadora de falla del interruptor automático principal de la fuente normal
		Luz ámbar indicadora de falla del interruptor automático principal de la fuente alternativa
		Luz ámbar indicadora de falla de modo automático
4.	Coloque el interruptor selector auto/manual en la posición Auto. El interruptor automático principal de la fuente normal se cerrará	
5.	Asegúrese de que las luces indicadoras estén encendidas:	Luz blanca indicadora de modo Auto
		Luz roja indicadora de cierre del interruptor automático principal de la fuente normal
		Luz verde indicadora de apertura del interruptor automático principal de la fuente alternativa
6.	Asegúrese de que las luces indicadoras estén apagadas:	Luz ámbar indicadora de falla de modo automático
		Luz ámbar indicadora de falla del interruptor automático principal de la fuente normal
		Luz ámbar indicadora de falla del interruptor automático principal de la fuente alternativa
		Luz azul indicadora de modo Manual
7.	Simula una pérdida de la fuente de acometida colocando el interruptor selector TTL/Normal/TTR en TTL (prueba de transferencia a la fuente izquierda) o TTR (prueba de transferencia a la fuente derecha), cualquiera que sea la fuente normal. El interruptor automático principal de la fuente normal se abrirá después de que expira el retardo de apertura.	
	La señal de arranque será enviada al generador. Una vez que la fuente del generador se ha estabilizado, el interruptor automático del generador se cerrará.	
8.	Asegúrese de que las luces indicadoras estén encendidas:	Luz verde indicadora de apertura del interruptor automático principal de la fuente normal
		Luz roja indicadora de cierre del interruptor automático principal de la fuente alternativa
		Luz blanca indicadora de fuente alternativa
	NOTA: La luz blanca indicadora de la fuente normal estará apagada.	
9.	Simula el retorno de tensión a la fuente normal colocando el interruptor selector TTL/Normal/TTR de regreso a la posición Normal. La retransferencia a la fuente de acometida se realizará después de que expira el retardo de estabilización para la fuente de acometida. Si el interruptor selector de retransferencia automática opcional se encuentra en la posición de desconectado (Off), la retransferencia será suspendida hasta que se cambia a la posición de conectado (On).	
	Con el sistema de transición abierta, el interruptor automático del generador se abre. Una vez que expira el retardo de cierre, el interruptor automático de la fuente normal se cierra.	
	Con el sistema de transición cerrada, el interruptor automático de la fuente normal se cierra. Dos segundos después, el interruptor automático del generador se abre.	
	El generador continuará funcionando hasta que expira el período de enfriamiento.	

Sistema base principal-cierre manual-principal

Esta sección trata sobre las pruebas recomendadas para un sistema de dos acometidas con un interruptor automático de cierre manual cuando no hay ninguna opción instalada. El suministro de la alimentación normal es a través de los interruptores automáticos principales izquierdo y derecho hacia las barras de carga individuales con el interruptor automático de cierre manual abierto.

Modo Manual

Con el interruptor selector en modo Manual, un operador puede abrir y cerrar cada interruptor automático independientemente usando los botones pulsadores en la puerta de operador. Únicamente dos interruptores automáticos pueden cerrarse en un determinado momento, evitando un sistema de transición cerrada. Después de que uno de los interruptores automáticos se abre, se produce un retardo de dos segundos antes de que un interruptor automático pueda cerrarse.

ESPAÑOL

Tabla 9: Procedimientos de prueba del modo manual para una configuración básica "principal-cierre manual-principal"

1.	Realice lo siguiente:	Coloque el interruptor selector auto/manual en la posición Manual.
		Abra ambos interruptores automáticos principales y el interruptor automático de cierre manual utilizando el botón de apertura.
		Coloque el interruptor selector TTL/Normal/TTR en la posición Normal.
2.	Asegúrese de que las luces indicadoras estén encendidas:	Luz blanca indicadora de fuente izquierda
		Luz blanca indicadora de fuente derecha
		Luz verde indicadora de apertura del interruptor automático principal izquierdo
		Luz verde indicadora de apertura del interruptor automático principal derecho
		Luz verde indicadora de apertura del interruptor automático de cierre manual
		Luz azul indicadora de modo Manual
3.	Asegúrese de que las luces indicadoras estén apagadas:	Luz ámbar indicadora de falla del interruptor automático principal izquierdo
		Luz ámbar indicadora de falla del interruptor automático principal derecho
		Luz ámbar indicadora de falla del interruptor automático de cierre manual
		Luz blanca indicadora de modo Auto
4.	Oprima el botón de cierre rojo del interruptor automático principal izquierdo, en la puerta de operador.	La luz verde indicadora de apertura del interruptor automático principal izquierdo se apagará
		La luz roja indicadora de cierre del interruptor automático principal izquierdo se encenderá
5.	Oprima el botón de cierre rojo del interruptor automático principal derecho, en la puerta de operador.	La luz verde indicadora de apertura del interruptor automático principal derecho se apagará
		La luz roja indicadora de cierre del interruptor automático principal derecho se encenderá
6.	Abra el interruptor automático principal izquierdo utilizando el botón de apertura verde, en la puerta de operador. Las luces de estado para el interruptor automático principal izquierdo cambiarán de rojo a verde.	
	Después de dos segundos, oprima el botón de cierre del interruptor automático de cierre manual, en la puerta de operador.	La luz verde indicadora de apertura del interruptor automático de cierre manual se apagará
		La luz roja indicadora de cierre del interruptor automático de cierre manual se encenderá
7.	Abra el interruptor automático principal derecho utilizando el botón de apertura verde, en la puerta de operador. Las luces de estado para el interruptor automático principal derecho cambiarán de rojo a verde. Dos segundos después, cierre el interruptor automático principal izquierdo. Las luces de estado para el interruptor automático principal izquierdo cambiarán de verde a rojo.	
8.	Abra el interruptor automático de cierre manual utilizando el botón de apertura verde, en la puerta de operador. Las luces de estado para el interruptor automático de cierre manual cambiarán de rojo a verde.	
9.	Abra el interruptor automático principal izquierdo utilizando el botón de apertura verde, en la puerta de operador. Las luces de estado para el interruptor automático principal izquierdo cambiarán de rojo a verde.	

Modo automático

Los botones pulsadores de la puerta de operador no harán funcionar los interruptores automáticos en modo automático.

Tabla 10: Procedimientos de prueba del modo automático para una configuración básica "principal-cierre manual-principal"

1.	Realice lo siguiente:	Coloque el interruptor selector auto/manual en la posición Manual.
		Abra ambos interruptores automáticos principales y el interruptor automático de cierre manual utilizando el botón de apertura.
		Coloque el interruptor selector TTL/Normal/TTR en la posición Normal.
2.	Asegúrese de que las luces indicadoras estén encendidas:	Luz blanca indicadora de fuente izquierda
		Luz blanca indicadora de fuente derecha
		Luz verde indicadora de apertura del interruptor automático principal izquierdo
		Luz verde indicadora de apertura del interruptor automático principal derecho
		Luz verde indicadora de apertura del interruptor automático de cierre manual
		Luz azul indicadora de modo Manual
3.	Asegúrese de que las luces indicadoras estén apagadas:	Luz ámbar indicadora de falla del interruptor automático principal izquierdo
		Luz ámbar indicadora de falla del interruptor automático principal derecho
		Luz ámbar indicadora de falla del interruptor automático de cierre manual
		Luz blanca indicadora de modo Auto
4.	Coloque el interruptor selector auto/manual en la posición Auto.	Los interruptores automáticos principales derecho e izquierdo se cerrarán
5.	Asegúrese de que las luces indicadoras estén encendidas:	Luz blanca indicadora de modo Auto
		Luz roja indicadora de cierre del interruptor automático principal izquierdo
		Luz verde indicadora de apertura del interruptor automático de cierre manual
		Luz roja indicadora de cierre del interruptor automático principal derecho
6.	Asegúrese de que las luces indicadoras estén apagadas:	Luz ámbar indicadora de falla de modo automático
		Luz ámbar indicadora de falla del interruptor automático principal izquierdo
		Luz ámbar indicadora de falla del interruptor automático de cierre manual
		Luz ámbar indicadora de falla del interruptor automático principal derecho
		Luz azul indicadora de modo Manual
7.	Simule una pérdida de la fuente izquierda colocando el interruptor selector TTL/Normal/TTR en la posición TTL (prueba de la transferencia a la fuente izquierda). El interruptor automático principal de la fuente izquierda se abrirá después de que expira el retardo de apertura. Una vez que el interruptor automático principal izquierdo se abre, el retardo de cierre comienza a contar el tiempo. Una vez que expira el retardo de cierre, el interruptor automático de cierre manual se cerrará.	
8.	Simule el retorno de tensión a la fuente izquierda colocando el interruptor selector TTL/Normal/TTR de regreso a la posición Normal. Después de que expira el retardo de estabilización, el interruptor automático de cierre manual se abrirá. Una vez que expira el retardo de cierre, el interruptor automático principal de la fuente izquierda se cerrará.	
9.	Simule una pérdida de la fuente derecha colocando el interruptor selector TTL/Normal/TTR en la posición TTR (prueba de la transferencia a la fuente derecha). El interruptor automático principal de la fuente derecha se abrirá después de que expira el retardo de apertura. Una vez que el interruptor automático principal derecho se abre, el retardo de cierre comienza a contar el tiempo. Una vez que expira el retardo de cierre, el interruptor automático de cierre manual se cerrará.	
10.	Simule el retorno de tensión a la fuente derecha colocando el interruptor TTL/Normal/TTR de regreso en la posición Normal. Después de que expira el retardo de estabilización, el interruptor automático de cierre manual se abrirá. Una vez que expira el retardo de cierre, el interruptor automático principal de la fuente derecha se cerrará.	

Opciones estándar del sistema "principal-cierre manual-principal"

Esta sección trata sobre las pruebas recomendadas para un sistema "principal-cierre manual-principal" con opciones estándar. Estas opciones incluyen el PSS, auto-retransferencia y transición cerrada.

Los pasos 6, 7 y 8 son aplicables únicamente para los sistemas con la opción de transición cerrada. Si el sistema instalado no cuenta con esta opción, realice la prueba de modo manual para el sistema base "principal-cierre manual-principal" que comienza en la página 41.

Modo Manual

Con el interruptor selector en modo Manual, un operador puede abrir y cerrar cada interruptor automático independientemente usando los botones pulsadores en la puerta de operador. El PSS no tiene ningún impacto sobre el modo Manual.

Tabla 11: Procedimientos de prueba del modo manual para una configuración "principal-cierre manual-principal" con opciones

1.	Realice lo siguiente:	Coloque el interruptor selector auto/manual en la posición Manual.
		Abra ambos interruptores automáticos principales y el interruptor automático de cierre manual utilizando el botón de apertura.
		Coloque el interruptor selector TTL/Normal/TTR en la posición Normal.
		Coloque el interruptor selector PSS en la posición de desconectado (Off).
		Coloque el interruptor selector de retransferencia en la posición de desconectado (Off).
2.	Asegúrese de que las luces indicadoras estén encendidas:	Luz blanca indicadora de fuente izquierda
		Luz blanca indicadora de fuente derecha
		Luz verde indicadora de apertura del interruptor automático principal izquierdo
		Luz verde indicadora de apertura del interruptor automático principal derecho
		Luz verde indicadora de apertura del interruptor automático de cierre manual
		Luz azul indicadora de modo Manual
3.	Asegúrese de que las luces indicadoras estén apagadas:	Luz ámbar indicadora de falla del interruptor automático principal izquierdo
		Luz ámbar indicadora de falla del interruptor automático principal derecho
		Luz ámbar indicadora de falla del interruptor automático de cierre manual
		Luz blanca indicadora de modo Auto
4.	Oprima el botón de cierre rojo del interruptor automático principal izquierdo, en la puerta de operador.	La luz verde indicadora de apertura del interruptor automático principal izquierdo se apagará
		La luz roja indicadora de cierre del interruptor automático principal izquierdo se encenderá
5.	Oprima el botón de cierre rojo del interruptor automático principal derecho, en la puerta de operador.	La luz verde indicadora de apertura del interruptor automático principal derecho se apagará
		La luz roja indicadora de cierre del interruptor automático principal derecho se encenderá
6.	Oprima el botón de cierre del interruptor automático de cierre manual, en la puerta de operador. En un sistema de transición cerrada con un relevador de comprobación de sincronización:	La luz verde indicadora de apertura del interruptor automático de cierre manual se apagará
		La luz roja indicadora de cierre del interruptor automático de cierre manual se encenderá
	NOTA: Si las condiciones del relevador de sincronización no se cumplen o éste no es instalado, el comando para cerrar el interruptor automático de cierre manual será ignorado. De la misma manera, si el interruptor selector del sistema de transición cerrada está en la posición de desconectado (Off), el comando para cerrar el interruptor automático de cierre manual será ignorado.	
	Dentro de dos segundos, oprima el botón de apertura para el interruptor automático principal izquierdo.	La luz roja indicadora de cierre del interruptor automático principal izquierdo se apagará
		La luz verde indicadora de apertura del interruptor automático principal izquierdo se encenderá
	NOTA: Si no oprime el botón de apertura dentro de dos segundos, el interruptor automático de cierre manual se abrirá.	
7.	Oprima el botón de cierre del interruptor automático principal izquierdo, en la puerta de operador. En un sistema de transición cerrada con un relevador de comprobación de sincronización:	La luz verde indicadora de apertura del interruptor automático principal izquierdo se apagará
		La luz roja indicadora de cierre del interruptor automático principal izquierdo se encenderá
	NOTA: Si las condiciones del relevador de sincronización no se cumplen o éste no es instalado, el comando para cerrar el interruptor automático principal izquierdo será ignorado. De la misma manera, si el interruptor selector del sistema de transición cerrada está en la posición de desconectado (Off), el comando para cerrar el interruptor automático principal izquierdo será ignorado.	
	Dentro de dos segundos, oprima el botón de apertura para el interruptor automático principal derecho.	La luz roja indicadora de cierre del interruptor automático principal derecho se apagará
		La luz verde indicadora de apertura del interruptor automático principal derecho se encenderá
	NOTA: Si no oprime el botón de apertura dentro de dos segundos, el interruptor automático de cierre manual se abrirá.	
8.	Oprima el botón de cierre del interruptor automático principal derecho, en la puerta de operador. En un sistema de transición cerrada con un relevador de comprobación de sincronización:	La luz verde indicadora de apertura del interruptor automático principal derecho se apagará
		La luz roja indicadora de cierre del interruptor automático principal derecho se encenderá
	Espere dos segundos y el interruptor automático de cierre manual se abrirá, o abra el interruptor automático de cierre manual usando el botón de la puerta de operador.	

Modo automático

Los botones pulsadores de la puerta de operador no harán funcionar los interruptores automáticos en modo automático.

Tabla 12: Procedimientos de prueba del modo automático para una configuración "principal-cierre manual-principal" con opciones

<table>
<tr><td rowspan="5">1.</td><td rowspan="5" colspan="2">Realice lo siguiente:</td><td colspan="2">Coloque el interruptor selector auto/manual en la posición Manual.</td></tr>
<tr><td colspan="2">Abra ambos interruptores automáticos principales y el interruptor automático de cierre manual utilizando el botón de apertura.</td></tr>
<tr><td colspan="2">Coloque el interruptor selector TTL/Normal/TTR en la posición Normal.</td></tr>
<tr><td colspan="2">Coloque el interruptor selector PSS en la posición de desconectado (Off).</td></tr>
<tr><td colspan="2">Coloque el interruptor selector de auto-retransferencia en la posición de desconectado (Off).</td></tr>
<tr><td rowspan="6">2.</td><td rowspan="6" colspan="2">Asegúrese de que las luces indicadoras estén encendidas:</td><td colspan="2">Luz blanca indicadora de fuente izquierda</td></tr>
<tr><td colspan="2">Luz blanca indicadora de fuente derecha</td></tr>
<tr><td colspan="2">Luz verde indicadora de apertura del interruptor automático principal izquierdo</td></tr>
<tr><td colspan="2">Luz verde indicadora de apertura del interruptor automático principal derecho</td></tr>
<tr><td colspan="2">Luz verde indicadora de apertura del interruptor automático de cierre manual</td></tr>
<tr><td colspan="2">Luz azul indicadora de modo Manual</td></tr>
<tr><td rowspan="4">3.</td><td rowspan="4" colspan="2">Asegúrese de que las luces indicadoras estén apagadas:</td><td colspan="2">Luz ámbar indicadora de falla del interruptor automático principal izquierdo</td></tr>
<tr><td colspan="2">Luz ámbar indicadora de falla del interruptor automático principal derecho</td></tr>
<tr><td colspan="2">Luz ámbar indicadora de falla del interruptor automático de cierre manual</td></tr>
<tr><td colspan="2">Luz blanca indicadora de modo Auto</td></tr>
<tr><td rowspan="6">4.</td><td colspan="4">Coloque el interruptor selector auto/manual en la posición Auto. Dos interruptores automáticos se cerrarán, según los ajustes y opciones instaladas. Las condiciones normales varían con el interruptor selector PSS. La tabla a continuación describe las condiciones normales de la fuente alternativa.</td></tr>
<tr><td colspan="2">Posición del interruptor selector PSS</td><td colspan="2">Condiciones del interruptor automático</td></tr>
<tr><td colspan="2">Izquierda</td><td colspan="2">Interruptor automático principal izquierdo cerrado, el interruptor automático de cierre manual cerrado
Interruptor automático principal derecho abierto</td></tr>
<tr><td colspan="2">Derecha</td><td colspan="2">Interruptor automático principal derecho cerrado, interruptor automático de cierre manual cerrado
Interruptor automático principal izquierdo abierto</td></tr>
<tr><td colspan="2">Desconectado (Off)</td><td colspan="2">Interruptores automáticos principales izquierdo y derecho cerrados, interruptor automático de cierre manual abierto</td></tr>
<tr><td colspan="2">No instalado</td><td colspan="2">Interruptores automáticos principales izquierdo y derecho cerrados, interruptor automático de cierre manual abierto</td></tr>
<tr><td>5.</td><td colspan="4">Coloque el interruptor selector PSS (si está presente) en la posición de desconectado (Off). En este punto, los interruptores automáticos principales deberán estar cerrados (luces indicadoras rojas) y el interruptor automático de cierre manual abierto (luz indicadora verde).</td></tr>
<tr><td>6.</td><td colspan="4">Simule una pérdida de la fuente izquierda colocando el interruptor selector TTL/Normal/TTR en la posición TTL (prueba de la transferencia a la fuente izquierda). El interruptor automático principal izquierdo se abrirá (luz indicadora verde) después de que expira el retardo de apertura. El interruptor automático de cierre manual se cerrará (luz indicadora roja) después de que expira el retardo de cierre.</td></tr>
<tr><td rowspan="5">7.</td><td colspan="4">Simule el retorno de la fuente izquierda colocando el interruptor selector TTL/Normal/TTR en la posición Normal. Los siguientes eventos dependen de las opciones instaladas y sus ajustes. Consulte la siguiente tabla.</td></tr>
<tr><td>Posición del interruptor selector PSS</td><td>Retransferencia conexión/desconexión</td><td>Tipo de transición</td><td>Secuencia</td></tr>
<tr><td>Desconectado (Off) o no instalada</td><td>Abierta</td><td>Abierta o cerrada</td><td>El sistema no cambia de estado</td></tr>
<tr><td>Desconectado (Off) o no instalada</td><td>Conectada o no instalada</td><td>Abierta</td><td>Después de que expira el retardo de estabilización, el interruptor automático de cierre manual se abrirá. Una vez que expira el retardo de cierre, el interruptor automático principal de la fuente izquierda se cerrará.</td></tr>
<tr><td>Desconectado (Off) o no instalada</td><td>Conectada o no instalada</td><td>Cerrada</td><td>Una vez que expira el retardo de estabilización, el interruptor automático principal de la fuente izquierda se cerrará. Dos segundos después, el interruptor automático de cierre manual se abrirá.</td></tr>
<tr><td>8.</td><td colspan="4">Simule una pérdida de la fuente derecha colocando el interruptor selector TTL/Normal/TTR en la posición TTR (prueba de la transferencia a la fuente derecha). El interruptor automático principal de la fuente derecha se abrirá después de que expira el retardo de apertura. Una vez que el interruptor automático de la fuente normal se abre, el retardo de cierre comienza a contar el tiempo. Una vez que expira el retardo de cierre, el interruptor automático de cierre manual o izquierdo (cualquiera que se encontraba abierto) se cerrará.</td></tr>
</table>

Tabla 12: Procedimientos de prueba del modo automático para una configuración "principal-cierre manual-principal" con opciones *(continuación)*

<table>
<tr><td rowspan="5">9.</td><td colspan="4">Simula el retorno de la fuente derecha colocando el interruptor selector TTL/Normal/TTR en la posición Normal. Los siguientes eventos dependen de las opciones instaladas y sus ajustes. Consulte la siguiente tabla.</td></tr>
<tr><td>Posición del interruptor selector PSS</td><td>Retransferencia conexión/desconexión</td><td>Tipo de transición</td><td>Secuencia</td></tr>
<tr><td>Desconectado (Off) o no instalada</td><td>Abierta</td><td>Abierta o cerrada</td><td>El sistema no cambia de estado</td></tr>
<tr><td>Desconectado (Off) o no instalada</td><td>Conectada o no instalada</td><td>Abierta</td><td>Después de que expira el retardo de estabilización, el interruptor automático de cierre manual se abrirá. Una vez que expira el retardo de cierre, el interruptor automático principal de la fuente derecha se cerrará.</td></tr>
<tr><td>Desconectado (Off) o no instalada</td><td>Conectada o no instalada</td><td>Cerrada</td><td>Una vez que expira el retardo de estabilización, el interruptor automático principal de la fuente derecha se cerrará. Dos segundos después, el interruptor automático de cierre manual se abrirá.</td></tr>
<tr><td>10.</td><td colspan="4">Coloque el interruptor selector PSS (si está presente) en la posición del lado izquierdo. El sistema cambiará de estado, si fuese necesario, para que sea configurado correctamente —con los interruptores automáticos izquierdo y de cierre manual cerrados y el interruptor automático derecho abierto.</td></tr>
<tr><td>11.</td><td colspan="4">Simule la pérdida de la fuente izquierda colocando el interruptor selector TTL/Normal/TTR en la posición TTL. El interruptor automático principal izquierdo se abrirá (luz indicadora verde) después de que expira el retardo de apertura. El interruptor automático derecho se cerrará (luz indicadora roja) después de que expira el retardo de cierre. El interruptor automático de cierre manual permanecerá cerrado.</td></tr>
<tr><td rowspan="5">12.</td><td colspan="4">Simule el retorno de la fuente izquierda colocando el interruptor selector TTL/Normal/TTR en la posición Normal. Los siguientes eventos dependen de las opciones instaladas y sus ajustes. Consulte la siguiente tabla.</td></tr>
<tr><td>Posición del interruptor selector PSS</td><td>Retransferencia conexión/desconexión</td><td>Tipo de transición</td><td>Secuencia</td></tr>
<tr><td>Izquierda</td><td>Abierta</td><td>Abierta o cerrada</td><td>El sistema no cambia de estado</td></tr>
<tr><td>Izquierda</td><td>Conectada o no instalada</td><td>Abierta</td><td>Una vez que expira el retardo de estabilización, el interruptor automático principal de la fuente derecha se abrirá. Una vez que expira el retardo de cierre, el interruptor automático principal de la fuente izquierda se cerrará.</td></tr>
<tr><td>Izquierda</td><td>Conectada o no instalada</td><td>Cerrada</td><td>Una vez que expira el retardo de estabilización, el interruptor automático principal de la fuente izquierda se cerrará. Dos segundos después, el interruptor automático principal derecho se abre.</td></tr>
<tr><td>13.</td><td colspan="4">Coloque el interruptor selector PSS (si está presente) en la posición del lado derecho. El sistema cambiará de estado, si fuese necesario, para que sea configurado correctamente —con los interruptores automáticos derecho y de cierre manual cerrados y el interruptor automático izquierdo abierto.</td></tr>
<tr><td>14.</td><td colspan="4">Simule la pérdida de la fuente derecha colocando el interruptor selector TTL/Normal/TTR en la posición TTR. El interruptor automático principal derecho se abrirá (luz indicadora verde) después de que expira el retardo de apertura. El interruptor automático izquierdo se cerrará (luz indicadora roja) después de que expira el retardo de cierre. El interruptor automático de cierre manual permanecerá cerrado.</td></tr>
<tr><td rowspan="5">15.</td><td colspan="4">Simule el retorno de la fuente derecha colocando el interruptor selector TTL/Normal/TTR en la posición Normal. Los siguientes eventos dependen de las opciones instaladas y sus ajustes. Consulte la siguiente tabla.</td></tr>
<tr><td>Posición del interruptor selector PSS</td><td>Retransferencia conexión/desconexión</td><td>Tipo de transición</td><td>Secuencia</td></tr>
<tr><td>Derecha</td><td>Abierta</td><td>Abierta o cerrada</td><td>El sistema no cambia de estado</td></tr>
<tr><td>Derecha</td><td>Conectada o no instalada</td><td>Abierta</td><td>Una vez que expira el retardo de estabilización, el interruptor automático principal de la fuente izquierda se abrirá. Una vez que expira el retardo de cierre, el interruptor automático principal de la fuente derecha se cerrará.</td></tr>
<tr><td>Derecha</td><td>Conectada o no instalada</td><td>Cerrada</td><td>Una vez que expira el retardo de estabilización, el interruptor automático principal de la fuente derecha se cerrará. Dos segundos después, el interruptor automático principal izquierdo se abre.</td></tr>
</table>

ESPAÑOL

Diagnóstico de problemas y servicio de mantenimiento

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía, consulte la norma 70E de NFPA.
- Solamente el personal eléctrico especializado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desconecte todas las fuentes de alimentación eléctrica antes de realizar una inspección visual, pruebas o servicios de mantenimiento al equipo.
- Suponga que todos los circuitos están “vivos” hasta que hayan sido completamente desenergizados, probados, puestos a tierra y etiquetados.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Revise todas las fuentes de alimentación, incluyendo la posibilidad de retroalimentación.

El incumplimiento de estas precauciones podrá causar la muerte, lesiones personales serias o daño al equipo.

Cambio de fusibles

El sistema de alimentación de control se alimenta de fuentes múltiples, incluyendo una fuente de alimentación ininterrumpida (UPS). Desconecte todos los seccionadores desconectadores de la alimentación de control y el UPS antes de extraer los fusibles. Verifique la desenergización del equipo utilizando un dispositivo detector de tensión nominal adecuado. Los fusibles se encuentran en los seccionadores desconectadores de la alimentación de control y en los bloques de fusibles montados en riel DIN con indicadores iluminados de fusible quemado. Sustituya los fusibles con unos del mismo tipo y valor nominal en amperes.

Revisión de los focos de las luces indicadoras

Sin opción de botón de prueba

Todas las luces indicadoras son LED protegidos de larga duración. Si un LED no se ilumina, sustitúya el módulo de LED por uno del mismo tipo.

NOTA: Los bulbos de los LED no se pueden sustituir. Si un LED está energizado y no se ilumina, debe sustituir el módulo de LED. Antes de sustituir un módulo de LED, desconecte (O/OFF) toda la alimentación al sistema de transferencia automática. **No desconecte los cables conectados a un módulo de LED mientras el sistema está energizado.** Si se desconecta el módulo de LED con la alimentación conectada (I/ON) puede provocar la apertura de un interruptor automático cerrado.

Con opción de botón de prueba

1. Presione el botón de prueba. Todos los focos en la puerta de operador deberán iluminarse.
2. Sustituya los focos que no se iluminan.

Diagnóstico de problemas

Todo el trabajo deberá ser completado sólo por personal eléctrico especializado.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía, consulte la norma 70E de NFPA.
- Solamente el personal eléctrico especializado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Revise todas las fuentes de alimentación, incluyendo la posibilidad de retroalimentación.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Tabla 13: Diagnóstico de problemas

Condición	Causa posible	Acción sugerida
Pérdida de la alimentación de control	Fusibles dañados	Identifique y corrija la causa de la sobrecarga o falla. Sustituya los fusibles.
	Interruptor automático CB1 abierto	Verifique el interruptor automático montado en riel DIN en la bandeja de montaje del PLC. Si está abierto, ciérrelo. Si está disparado, identifique y corrija la causa de la sobrecarga o falla. Restablezca el interruptor automático.
La luz indicadora de verificación de batería del UPS o PLC (CHK UPS OR PLC BATT) está encendida.	La batería del PLC está baja	Si la luz de la batería en frente del PLC está iluminada, siga las instrucciones en la Guía del usuario del PLC Modicon® para cambiar la batería.
	Batería del UPS baja	Revise los indicadores de estado del UPS para determinar si la batería del UPS ha producido la alarma.
Resortes del interruptor automático descomprimidos (no cargados)	Fusible de entrada dañado	Identifique y corrija la causa de la sobrecarga o falla. Sustituya los fusibles.
La luz roja o verde indicadora de estado del interruptor automático no se ilumina	El foco de la luz no sirve	Revise el foco de la luz o el módulo de LED, sustitúyalo si es necesario. (Utilice el botón de prueba si está disponible).
	Alimentación de control no disponible	Vaya a "Pérdida de la alimentación de control"
La luz blanca de la fuente no se ilumina, sin embargo la fuente está disponible	El foco de la luz no sirve	Revise el foco de la luz o el módulo de LED, sustitúyalo si es necesario. (Utilice el botón de prueba si está disponible).
	Fusible dañado	La luz indicadora puede estar apagada si alguno de estos fusibles en los dispositivos de desconexión de la unidad de supervisión de calidad de la alimentación (designados VDS) están dañados. Vaya a "Pérdida de la alimentación de control".
	El interruptor selector TTL/Normal/TTR no se encuentra en la posición Normal	Regrese el interruptor selector a la posición Normal.
	Los dispositivos de supervisión de calidad de la alimentación no cumplen con las condiciones	Consulte los datos de otros medidores o dispositivos de supervisión de tensión para determinar si la tensión se encuentra dentro de los límites de los relevadores de tensión y frecuencia, incluyendo la rotación de fase apropiada.
Fuente normal fuera de servicio, por consiguiente la transferencia no se realizó	El interruptor automático principal se disparó debido a una falla	El indicador de disparo en cada interruptor automático indicará el tipo de falla que se ha producido. Identifique y corrija la causa de la sobrecarga o falla. Restablezca el interruptor automático.
	El sistema no se encuentra en modo automático	Asegúrese de que el interruptor selector auto/manual se encuentre en la posición Auto y que la luz Auto esté encendida.
	Fuente alternativa no disponible	El sistema no realizará una transferencia a una fuente no disponible. Revise la disponibilidad de acometida o la funcionalidad del generador.

ESPAÑOL

Tabla 13: Diagnóstico de problemas *(continuación)*

La luz ámbar indicadora de falla de modo automático está encendida	El botón de cierre o apertura ha sido oprimido	Coloque el interruptor selector auto/manual en la posición Manual y luego en Auto para restablecer el sistema. **NOTA:** Los interruptores automáticos pueden cambiar de estado para regresar al estado normal.
	El interruptor automático ha sido extraído	El sistema permanecerá en estado inoperante hasta que todos los interruptores automáticos principales se encuentren en la misma posición, ya sea conectados o en prueba. Coloque el interruptor selector auto/manual en la posición Manual y luego en Auto para restablecer el sistema.
	Interruptor automático principal disparado	Identifique y corrija la causa de la sobrecarga o falla. Restablezca el interruptor automático. Coloque el interruptor selector auto/manual en la posición Manual y luego en Auto para restablecer el sistema de una falla en modo Auto.
	El PLC ha determinado un error en el programa interno del PLC	Un error interno a la CPU del PLC será indicada por el LED en la CPU. Consulte la Guía de usuario del PLC Modicon® para obtener más información.
Fuente transferida sin ningún motivo	Pérdida o caída de tensión temporal	Si no están instalados medidores de tensión con registro, póngase en contacto con la compañía de electricidad para averiguar si se ha producido una interrupción momentánea del servicio. Una caída de tensión por debajo del punto de ajuste del dispositivo de supervisión de la alimentación puede resultar en una transferencia.
El generador no arrancó	No se envió la señal	Realice la prueba manual. Observe la salida del PLC (luz 6) en el módulo de salidas 1. Normalmente, ésta debe estar iluminada y se apagará cuando se envía el comando de arranque del generador. Si no se apaga, póngase en contacto con el Centro de servicios en campo Square D.
	No se recibió una señal	Revise las conexiones de los cables entre el relevador de retardo de tiempo y el equipo del generador.
	Se recibió una señal, sin embargo, el generador no arranca	Consulte la documentación del sistema del generador.
El sistema de transición cerrada sigue la secuencia del sistema abierto	No se cumplieron las condiciones del relevador de comprobación de sincronización	Los fusibles de entrada para el relevador de comprobación de sincronización están dañados. Identifique y corrija la causa de la sobrecarga o falla. Sustituya los fusibles.
		Las fuentes no están sincronizadas. Póngase en contacto con el proveedor de la alimentación.

Lista de valores estándar y arreglos

Esta lista contiene los ajustes estándar instalados en la fábrica, incluyendo las opciones programadas. Si estos valores no son aplicables para su equipo, observe esas diferencias en este boletín.

Todos los sistemas

Tabla 14: Ajustes del sistema

Retardo de apertura	3 segundos. La temporización comienza una vez que el dispositivo de supervisión de calidad de la alimentación se desenergiza.
Retardo de cierre	2 segundos. La temporización comienza una vez que se abre un interruptor automático.
Retardo de transferencia—Sistema de transición abierta	Retardo de apertura y retardo de cierre.
Retardo de transferencia—Sistema de transición cerrada	2 segundos como máximo cuando las fuentes están sincronizadas
Relevador de comprobación de sincronización[1]	10–30% de tensión nominal
	6–20% de ángulo de fase
	NOTA: Ambos el ángulo de fase y tensión son modificados por un potenciómetro.
Temporizador de estabilización de fuente	10 segundos para retransferir a la fuente preferida.
Dispositivo de supervisión de la calidad de la alimentación[1]	15% de baja tensión (fijo)
	5–15% de desequilibrio de fase
	0–10 segundos, retardo de tiempo

[1] Los ajustes se pueden modificar en campo.

Tabla 15: Configuración del sistema

Sistema	Fuente normal	Fuente alternativa
Principal-principal, principal-generador	Interruptor automático principal izquierdo	Interruptor automático principal derecho
Principal-cierre manual-principal	Ambos interruptores automáticos principales izquierdo y derecho cerrados con el interruptor automático de cierre manual abierto	Interruptor automático principal izquierdo o derecho con el interruptor automático de cierre manual cerrado

Sistemas del generador

Tabla 16: Ajustes del sistema del generador

Relevador 81[1]	50–70 Hz de sobrefrecuencia 0,1–3 Hz, diferencial
	50–70 Hz de baja frecuencia 0,1–3 Hz, diferencial
Relevador 59[1]	100–125% de sobretensión 1–15%, diferencial
Opciones del generador (no se pueden ajustar en campo, excepto con una pantalla de toque opcional)	Período de enfriamiento: 15 minutos (sin carga)
	Período de prueba: 30 minutos por semana (con o sin carga) comenzará en domingo a las 13:00 horas.

[1] Los ajustes se pueden modificar en campo.

ESPAÑOL

Conexión a los interruptores automáticos

Conexión a los interruptores automáticos

El alambrado instalado en la fábrica en los interruptores automáticos incluye bobinas de cierre y apertura, contactos de estado de los interruptores automáticos y contactos indicadores de falla, junto con otros accesorios especificados. Al realizar modificaciones en campo, consulte el manual del interruptor automático apropiado. Para obtener información específica sobre cada uno de los interruptores automáticos, consulte los boletines de instrucciones respectivos.

Referencias

Los dibujos de aprobación muestran detalles de las interconexiones de los cables, incluyendo las opciones instaladas, exclusivas para la instalación de cada sistema de transferencia automática. Schneider Electric incluye un juego de dibujos con el equipo.

Póngase en contacto con el Centro de servicios o información al cliente llamando al 1-888-778-2733 (en EUA) o al x-xxx-xxxx (en México) con preguntas relacionadas con el arranque u otras preguntas en general acerca de una instalación en particular.

La mayoría de los boletines de instrucciones y demás documentación se puede obtener del Centro de distribución de literatura (OLF) en línea y de la biblioteca técnica de Schneider Electric en el sitio web www.us.SquareD.com.

ESPAÑOL

Registro cronológico de servicios de mantenimiento

Tabla 17: Registro cronológico de servicios de mantenimiento

Fecha	Descripción

Sistemas de transferencia automática con PLC
Boletín de instrucciones

Importado en México por:
Schneider Electric México, S.A. de C.V.
Calz. J. Rojo Gómez 1121-A
Col. Gpe. del Moral 09300 México, D.F.
Tel. Tel. 55-5804-5000
www.schneider-electric.com.mx

80330-001-04 07/2010
Reemplaza 80330-001-03, 07/2007

Systèmes de transfert automatique avec automate

Classe 2700

Directives d'utilisation

80330-001-04
07/2010

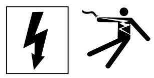
À conserver pour usage ultérieur.

SQUARE D

by Schneider Electric

Catégories de dangers et symboles spéciaux

Lisez soigneusement ces directives et examinez l'appareillage afin de vous familiariser avec lui avant son installation, son fonctionnement ou son entretien. Les messages spéciaux qui suivent peuvent apparaître dans ce document ou sur l'appareillage. Ils vous avertissent de dangers potentiels ou attirent votre attention sur des renseignements pouvant éclaircir ou simplifier une procédure.



L'ajout de l'un ou l'autre des symboles à une étiquette de sécurité “ Danger ” ou “ Avertissement ” vous indique qu'un danger électrique existe et qu'il pourra y avoir des blessures corporelles si les directives ne sont pas suivies.

Ceci est le symbole d'une alerte de sécurité. Il sert à vous avertir d'un danger potentiel de blessures corporelles. Respectez toutes les consignes de sécurité accompagnant ce symbole pour éviter toute situation potentielle de blessure ou de mort.

⚠ DANGER
DANGER indique une situation de danger imminent qui, si elle n'est pas évitée, **entraînera** la mort ou des blessures graves.

⚠ AVERTISSEMENT
AVERTISSEMENT indique une situation de danger potentiel qui, si elle n'est pas évitée, **peut entraîner** la mort ou des blessures graves.

⚠ ATTENTION
ATTENTION indique une situation de danger potentiel qui, si elle n'est pas évitée, **peut entraîner** des blessures mineures ou modérées.

ATTENTION
ATTENTION, utilisé sans le symbole d'alerte de sécurité, indique une situation de danger potentiel qui, si elle n'est pas évitée, **peut entraîner** des dommages matériels.

REMARQUE : Fournit des renseignements complémentaires pour clarifier ou simplifier une procédure.

Veuillez noter

Seul un personnel qualifié doit effectuer l'installation, l'utilisation, l'entretien et la maintenance du matériel électrique. Schneider Electric n'assume aucune responsabilité des conséquences éventuelles découlant de l'utilisation de cette documentation.

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Introduction

Ces directives d'utilisation décrivent les systèmes de transfert automatique, principal à principal, principal à génératrice et principal-couplage-principal, de la marque Square D® pour les panneaux/appareillages de commutation à basse tension. Elles sont à utiliser par des installateurs et spécificateurs et décrivent les systèmes standard. Pour des installations qui ne suivent pas ces standards, ces directives d'utilisation fournissent seulement des informations de base. Les systèmes standard comprennent toujours un système d'alimentation sans coupure (UPS).

Les options disponibles sont un sélecteur de source préférée (SSP), un sélecteur de retransfert automatique et des voyants pousser-pour-vérifier. Se reporter à la documentation fournie par l'usine pour toute déviation par rapport au système standard.

Ces directives d'utilisation décrivent également une séquence standard de fonctionnement pour le système d'automate (PLC). La séquence standard suit l'une des sections dans « Fonctionnement » à la page 26. La séquence appropriée du système est vérifiée à l'aide d'une des « Procédures d'essai » à la page 32. Les changements par rapport à la séquence standard sont détaillés dans de la documentation instructive séparée fournie par l'usine.

Figure 1 : Automate installé sur un panneau de commutation QED Power-Style®

Les systèmes de transfert automatique Square D de Schneider Electric sont conçus conformes à la norme Underwriters Laboratories® (UL®) 891 et répondent à la norme du National Electrical Code® (NEC®, É.-U.) 702, Systèmes de secours optionnels.

FRANÇAIS

Mesures de sécurité

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez l'alimentation de l'appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension ayant une valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

⚠ ATTENTION

RISQUE DE BLESSURES OU DE DOMMAGES MATÉRIELS

- Ce manuel contient les informations générales sur une conception standard. Il ne contient pas d’informations sur des modifications apportées à la conception standard.
- Examinez attentivement toute la documentation fournie par l’usine concernant toute déviation par rapport à la conception standard.
- Contactez le représentant Schneider Electric local en cas de questions à poser concernant le système de transfert automatique.

Si ces directives ne sont pas respectées, cela peut entraîner des blessures ou des dommages matériels.

FRANÇAIS

Réception, manutention et entreposage

Le système de transfert automatique est inclus comme partie de l’appareil déjà assemblé. Se reporter aux directives d’utilisation générales de l’appareil pour les directives complètes de réception, de manutention et d’entreposage de l’appareil. Consulter également le guide de l’utilisateur de l’automate pour connaître les restrictions supplémentaires concernant l’environnement.

Applications et spécifications

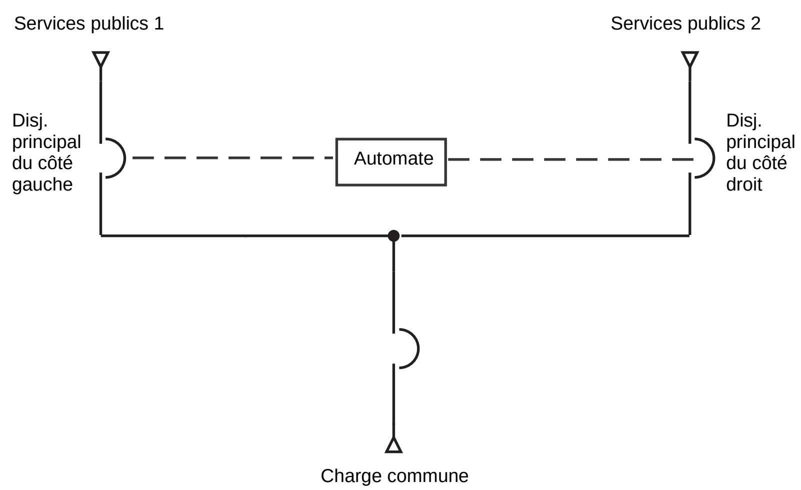
Les systèmes de transfert automatique (auto-transfert) minimisent l’interruption d’alimentation en transférant la charge de la source normale vers une autre source quand la source normale est temporairement indisponible. Le système utilise des raccordements multiples aux sources d’alimentation (dont un au moins est un service public) et un système de contrôle pour exécuter le transfert.

Ce système de auto-transfert peut être fourni avec des disjoncteurs fixes ou débrochables et est contrôlé par un automate programmable Modicon®. Ces systèmes comportent également des alimentations redondantes de puissance de contrôle. Ce manuel concerne trois types de systèmes de transfert automatique Square D® : principal à principal, principal à génératrice et principal-couplage-principal.

Principal à principal

Chaque disjoncteur principal est connecté à une source de service public. N’importe laquelle de ces alimentations peut être la source d’urgence ou alternative. Quand la source normale devient indisponible, le système transfère vers la source alternative. Si le système est muni d’une option de sélecteur de source préférée (SSP), le système revient automatiquement à la source préférée dès qu’elle est de nouveau disponible. Sans ce sélecteur, le retransfert automatique ne se produit pas. Voir la figure 2.

Figure 2 : Configuration principal à principal



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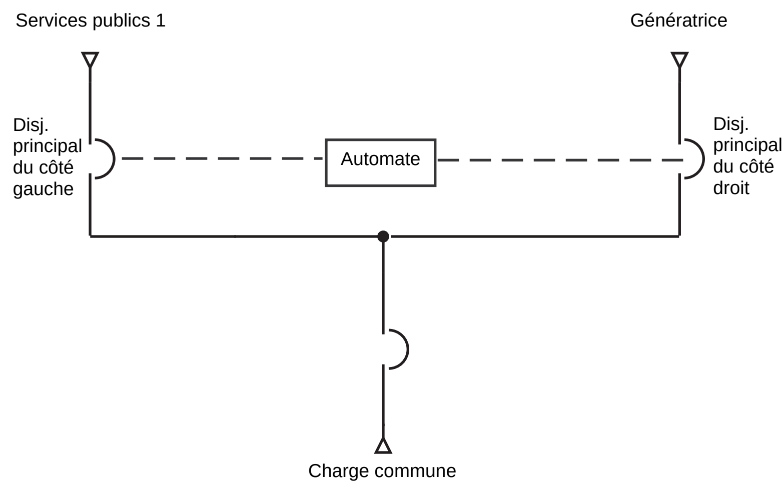
Principal à génératrice

Un disjoncteur principal est connecté à une source de service public. L'autre disjoncteur principal est connecté à une génératrice de secours. N'importe lequel des disjoncteurs peut être la source d'urgence. Quand l'alimentation provenant de la source de service public est perdue, la génératrice démarre. Dès que la fréquence et la tension sont stabilisées, le système transfère vers la génératrice. Le système revient automatiquement à la source de service public quand elle devient de nouveau disponible et le signal de démarrage de la génératrice interrompu. Voir figure 3.

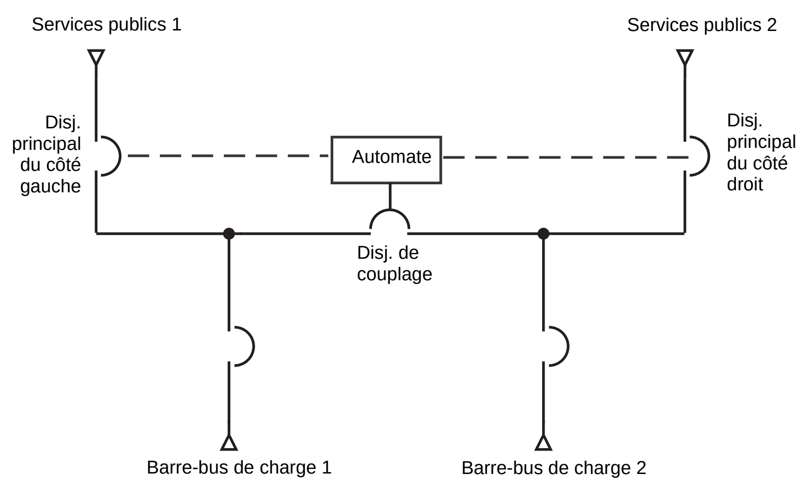
Figure 3 : Configuration principal à génératrice



Principal-couplage-principal

Les deux disjoncteurs principaux se raccordent à une source de services publics au moyen d'un disjoncteur de couplage normalement ouvert. Chaque disjoncteur principal alimente des barres-bus de charge indépendantes. Les divers réglages du sélecteur de source préférée (SSP) et les options marche/arrêt de retransfert déterminent quels disjoncteurs sont fermés pendant les conditions normales de fonctionnement. Voir la figure 4.

Figure 4 : Configuration principal-couplage-principal



Assemblage de la porte des opérateurs

La porte des opérateurs comporte des voyants lumineux, des boutons-poussoirs et des sélecteurs à clé utilisés pour servir d'interface avec le système de contrôle. Voir les figures 5 et 6. Le système principal à génératrice comporte un sélecteur de génératrice supplémentaire. Un système principal-couplage-principal comporte des boutons-poussoirs lumineux supplémentaires pour le disjoncteur de couplage. Sauf dans les cas indiqués, les clés peuvent être enlevées dans n'importe quelle position. L'emplacement des voyants et sélecteurs peut varier selon le type d'appareil et les options incluses. Les voyants et sélecteurs seront toujours étiquetés clairement.

REMARQUE : Les ampoules à diodes électroluminescentes (DÉL) ne sont pas remplaçables. Si une DÉL est sous tension mais ne s'allume pas, il faut remplacer le module de la DÉL. Avant de faire ce remplacement, mettre tout le système de transfert automatique hors tension. **Ne pas retirer les fils raccordés à un module à DÉL tant que le système est sous tension.** Le fait de déconnecter le module d'une DÉL alors que le système est sous tension peut entraîner l'ouverture d'un disjoncteur fermé.

Figure 5 : Portes des opérateurs—configuration principal-couplage-principal

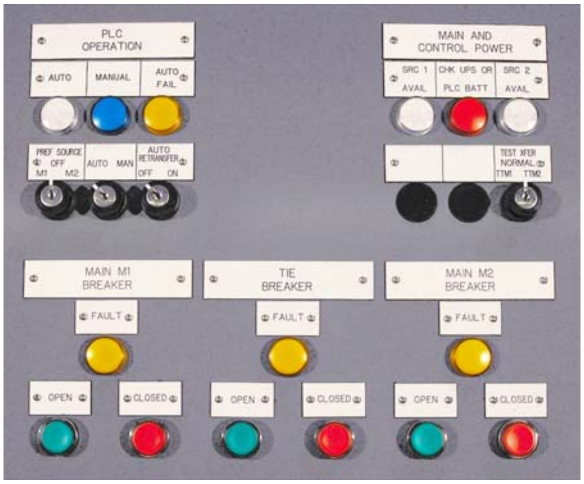
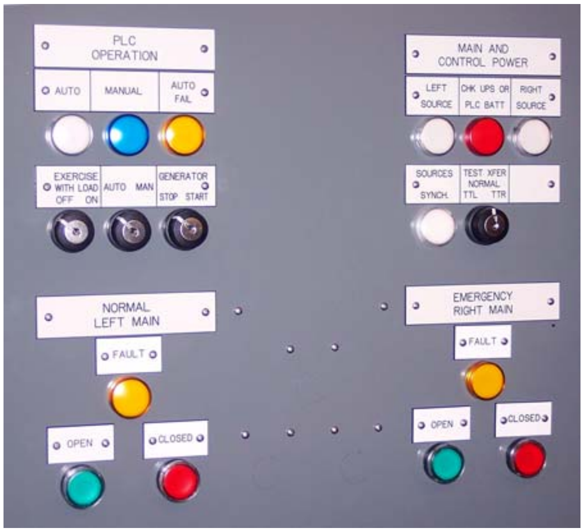


Figure 6 : Porte des opérateurs—configuration principal à génératrice de base

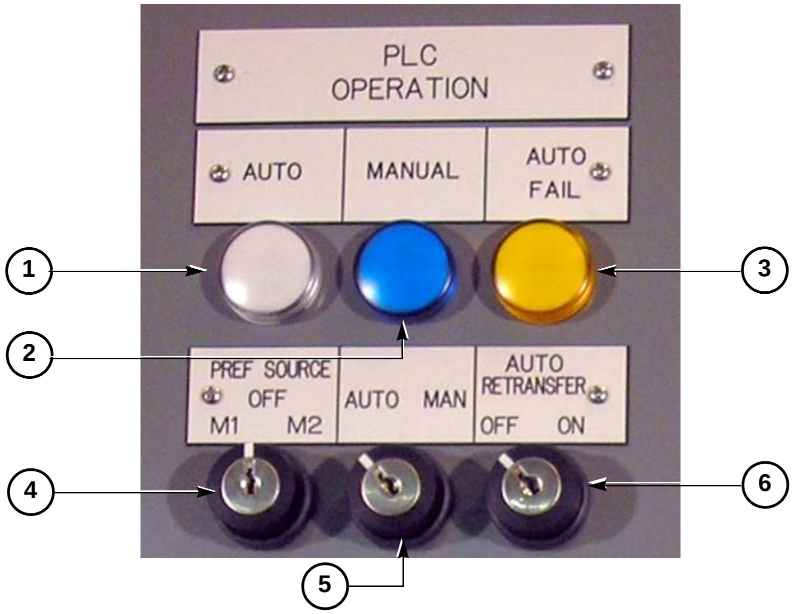


Groupe de mode de fonctionnement : principal à principal ou principal-couplage-principal

L'angle supérieur gauche de la porte des opérateurs comporte un sélecteur à clé auto / manuel à deux positions et trois voyants lumineux. Deux autres sélecteurs à clé en option peuvent être présents.

Figure 7 : Groupe de mode de fonctionnement : principal à principal ou principal-couplage-principal

1. Voyant blanc
2. Voyant bleu
3. Voyant lumineux orange d'échec de mode automatique (AUTO FAIL)
4. Sélecteur de source préférée (SSP) (PREF SOURCE) (en option)
5. Sélecteur à clé auto / manuel (AUTO/MAN)
6. Sélecteur de retransfert automatique (AUTO RETRANSFER) (en option)



Voyants

Le voyant blanc (figure 7, 1) indique que le système est en mode de fonctionnement automatique. Le voyant bleu (figure 7, 2) indique que le système est en mode de fonctionnement manuel. Le sélecteur à clé auto / manuel détermine le mode de fonctionnement.

Le voyant orange d'échec du mode automatique (figure 7, 3) indique une irrégularité du système. Le voyant orange d'échec du mode automatique s'allume dans l'une ou l'autre des circonstances suivantes :

- L'un des disjoncteurs débrochables principaux ou le disjoncteur de couplage (mais pas tous) a été placé dans la position d'essai ou de déconnexion.
- L'un des disjoncteurs principaux ou le disjoncteur de couplage s'est déclenché alors que le système était en mode automatique pour une raison (telle qu'un défaut à la terre) qui empêche le transfert de source.
- Un bouton-poussoir mécanique d'ouverture a été enfoncé.
- Les diagnostics internes ont détecté une erreur.

Sélecteur de source préférée (SSP) (en option)

Le SSP en option (figure 7, 4) est un sélecteur à clé à trois positions qui détermine si la source de gauche ou la source de droite est la source normale. La position centrale est la position d'arrêt (OFF).

Sélecteur à clé auto / manuel

Le sélecteur à clé auto / manuel (figure 7, 5) a deux positions.
Tourner la clé sur :

- « AUTO » pour un fonctionnement automatique.
- « MAN » pour utiliser les boutons-poussoirs sur la porte des opérateurs pour contrôler le système manuellement.

Retransfert automatique (en option)

Le sélecteur de retransfert automatique en option (figure 7, 6) est un sélecteur à clé à deux positions qui détermine le mode de retransfert automatique. En position de marche (ON), le retransfert se produit automatiquement après le retour d’une source qui devient stable. En position d’arrêt (OFF), le système reste à l’état transféré après le retour de la source, permettant à l’utilisateur de lancer manuellement le retransfert à un moment qui convient mieux. Faire passer le sélecteur de la position d’arrêt à la position de marche (ON) pour commencer la séquence de transfert. Lorsque le transfert est terminé, remettre le sélecteur à la position d’arrêt si des transferts automatiques ne sont pas désirés.

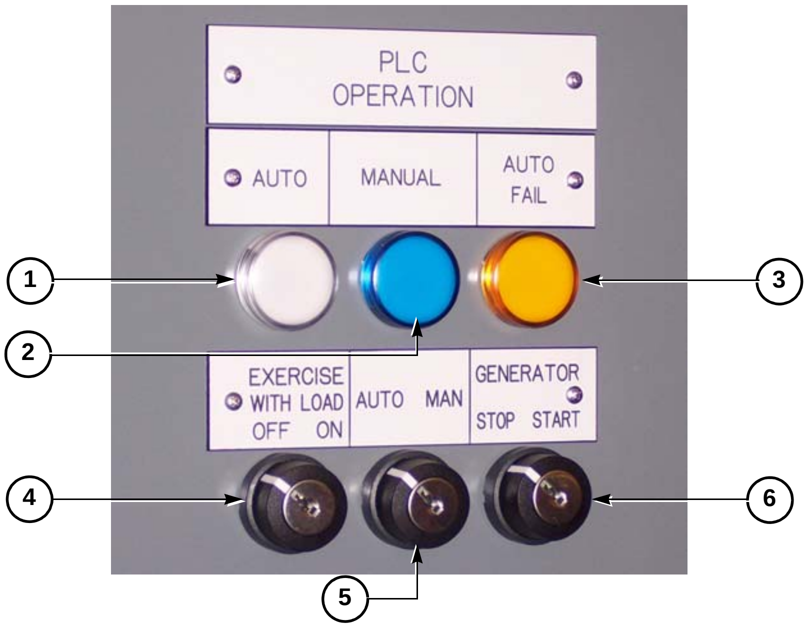
Si le sélecteur de retransfert automatique n’est pas fourni, tous les retransferts seront automatiques.

Groupe de mode de fonctionnement : Principal à génératrice

L’angle gauche supérieur de la porte des opérateurs comporte un sélecteur à clé automatique/manuel à deux positions, un sélecteur à clé marche/arrêt pour la génératrice et trois voyants lumineux. Des sélecteurs à clé en option peuvent être présents.

Figure 8 : Groupe de mode de fonctionnement : Principal à génératrice

1. Voyant blanc
2. Voyant bleu
3. Voyant lumineux orange d’échec de mode automatique (AUTO FAIL)
4. Sélecteur de vérification avec charge (EXERCISE WITH LOAD) (en option)
5. Sélecteur à clé auto / manuel (AUTO/MAN)
6. Sélecteur marche/arrêt de la génératrice (GENERATOR START STOP)



Voyants

Le voyant blanc (figure 8, 1) indique que le système est en mode de fonctionnement automatique. Le voyant bleu (figure 8, 2) indique que le système est en mode de fonctionnement manuel. Le sélecteur à clé auto / manuel détermine le mode de fonctionnement

Le voyant orange d’échec du mode automatique (figure 8, 3) indique une irrégularité du système. Le voyant orange d’échec du mode automatique s’allume dans l’une ou l’autre des circonstances suivantes :

- L’un des disjoncteurs débrochables principaux ou le disjoncteur de couplage (mais pas tous) a été placé dans la position d’essai ou de déconnexion.
- L’un des disjoncteurs principaux ou le disjoncteur de couplage s’est déclenché alors que le système était en mode automatique pour une raison (telle qu’un défaut à la terre) qui empêche le transfert de source.
- Un bouton-poussoir mécanique d’ouverture a été enfoncé.
- Les diagnostics internes ont détecté une erreur.

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Vérification avec une charge (en option)

Le sélecteur de vérification avec charge en option (figure 8, 4) est un sélecteur à clé à deux positions qui détermine si la vérification de la génératrice peut se faire avec ou sans charge.

Sélecteur à clé auto / manuel

Le sélecteur à clé auto / manuel (figure 8, 5) a deux positions. Tourner la clé sur :

- « AUTO » pour un fonctionnement automatique.
- « MAN » pour utiliser les boutons-poussoirs sur la porte des opérateurs pour contrôler le système manuellement.

Marche/arrêt de la génératrice

Un sélecteur de marche/arrêt de génératrice (figure 8, 6) peut être utilisé pour démarrer la génératrice lorsque le sélecteur de mode automatique/manuel est réglé en mode manuel. Le sélecteur possède deux positions, arrêt et marche. En mode manuel, mettre à la position de marche pour envoyer un signal de démarrage à la génératrice. Mettre à la position d'arrêt pour arrêter la génératrice. En mode automatique, le sélecteur de marche/arrêt de la génératrice est ignoré.

Groupe d'état de source et d'UPS

Le groupe d'état de source et du système d'alimentation sans coupure (UPS), situé dans la section supérieure de droite de la porte des opérateurs, comporte un sélecteur à clé à trois positions et trois voyants. Un autre sélecteur à clé, un bouton-poussoir lumineux ou un voyant peut être également présent. Voir la figure 9.

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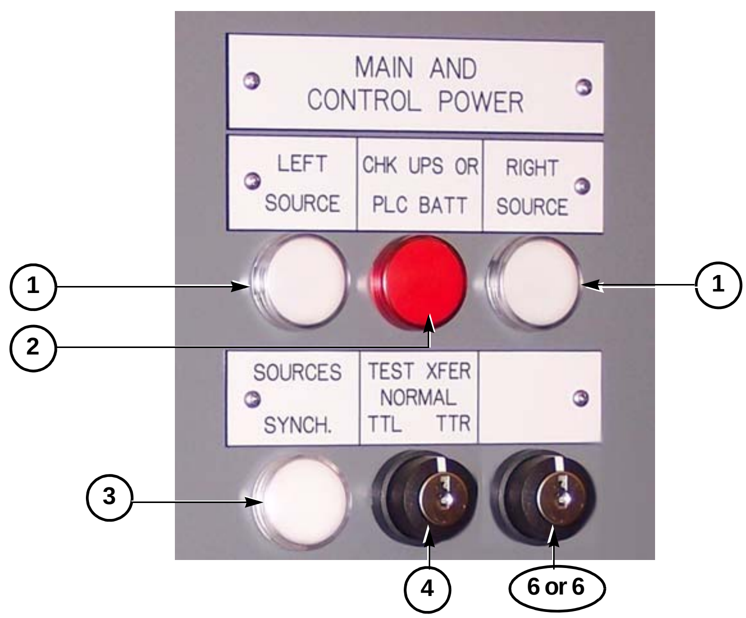
Figure 9 : Groupe d'état de source et d'UPS

1. Voyant blanc de source
2. Voyant rouge de vérification de la pile de l'UPS ou de l'automate (CHK UPS OR PLC BATT)
3. Voyant de sources synchronisées (SOURCES SYNCH.) (en option)
4. Sélecteur d'essai de transfert (TEST XFER)
5. Sélecteur de transition fermée (en option)
6. Bouton pousser-pour-vérifier (en option)



Voyants

Chaque voyant « Left Source » (Source de gauche) ou « Right Source » (Source de droite) (figure 9, 1) s'allume lorsque la source correspondante est disponible. Le voyant rouge de vérification de la pile (figure 9, 2) indique que la pile de l'automate ou celle de l'UPS a besoin de service. Le voyant de sources synchronisées (figure 9, 3) est fourni seulement sur les systèmes à transition fermée. Lorsque deux sources sont suffisamment similaires en angle de phase, magnitude et fréquence, ce voyant s'allume indiquant la synchronisation.

Sélecteur d'essai de transfert

Le sélecteur à clé d'essai de transfert (figure 9, 4) a trois positions :

- **TTL (Essai de transfert de gauche)**—Simule une perte d'alimentation de la source de gauche entraînant un transfert à la source de droite. En cours de fonctionnement normal, le voyant de la source de gauche est éteint et le voyant de la source de droite est allumé.
- **TTR (Essai de transfert de droite)**—Simule une perte d'alimentation de la source de droite entraînant un transfert à la source de gauche. En cours de fonctionnement normal, le voyant de la source de droite est éteint et le voyant de la source de gauche est allumé.
- **Normal**—Mode de fonctionnement standard. Le sélecteur est à la position « Normal » quand il n'y a PAS de simulation de perte d'alimentation d'une source.

La clé ne peut être enlevée qu'en position « Normal ».

Sélecteur de transition fermée (en option)

Le sélecteur de transition fermée en option (figure 9, 5) est un sélecteur à deux positions utilisé pour désactiver la fonction de transition fermée. Il n'est disponible que pour les applications de transition fermée. Lorsqu'il est mis à la position d'arrêt, seuls les transferts de transition ouverte sont possibles, même si les conditions du relais de vérification de synchronisation sont satisfaites. Lorsqu'il est mis à la position de marche, les transferts de transition fermée se produiront si les conditions du relais de vérification de la synchronisation sont satisfaites.

Le sélecteur de transition fermée ne peut pas être présent si le bouton pousser-pour-vérifier en option est installé. Dans ce cas, tous les transferts seront en transition fermée et se produiront uniquement quand le relais de vérification de synchronisation est satisfait.

Bouton pousser-pour-vérifier (en option)

Le bouton pousser-pour-vérifier en option (figure 9, 6 [non représenté]) essaie la condition des voyants, y compris les boutons-poussoirs lumineux. Appuyer sur le bouton marqué « Push-To-Test » (Pousser-pour-vérifier) Vérifier toutes les ampoules qui ne s'allument pas. Remplacer les ampoules au besoin.

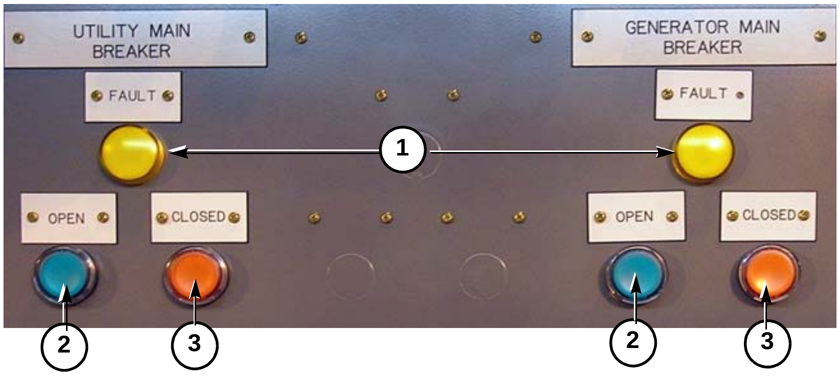
Le bouton pousser-pour-vérifier ne peut pas être présent si le sélecteur de transition fermée en option est installé.

Groupe de contrôle et d'état des disjoncteurs

Le groupe de contrôle et d'état des disjoncteurs, situé sur la moitié inférieure de la porte des opérateurs, comporte un voyant et deux boutons-poussoirs lumineux pour chaque disjoncteur.

Figure 10 : Groupe de contrôle et d'état des disjoncteurs

1. Voyant de défaut (FAULT) orange
2. Bouton-poussoir lumineux d'ouverture (OPEN) vert
3. Bouton-poussoir lumineux de fermeture (CLOSED) rouge



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Voyants

Le voyant orange de défaut (figure 10, 1) s’allume quand le disjoncteur se déclenche par suite d’une condition de défaut (*par ex.,* défaut de longue durée, défaut de courte durée, défaut instantané ou défaut à la terre).

Boutons-poussoirs

Chaque disjoncteur possède deux boutons-poussoirs lumineux : le voyant vert d’ouverture (figure 10, 2) et le voyant rouge de fermeture (figure 10, 3). En mode manuel, utiliser ces boutons pour ouvrir ou fermer le disjoncteur auquel ils correspondent. En mode automatique, les boutons-poussoirs d’ouverture et de fermeture ne contrôlent pas les disjoncteurs. Le groupe de la source de gauche se trouve au bas et à gauche, le groupe de la source de droite se trouve au bas et à droite, et le groupe de couplage (non représenté) se trouve au bas et au milieu pour un système principal-couplage-principal.

Ensemble de l’alimentation de contrôle et de surveillance de l’alimentation

Chaque source de services publics ou de génératrice fournit l’alimentation au système d’alimentation de contrôle par l’intermédiaire d’un transformateur de l’alimentation de contrôle de 1 000 volts-ampères. Les moyens de déconnexion pour l’alimentation de contrôle et la surveillance de la qualité de l’alimentation se trouvent à l’intérieur de chaque compartiment d’instrumentation de disjoncteur principal.

Sous-ensemble de l’alimentation de contrôle

Le transformateur d’alimentation de contrôle (TAC) se raccorde à la connexion à barre-bus du côté source (ligne) du disjoncteur principal par l’intermédiaire d’un sectionneur à fusible (figure 11). Pour fournir une alimentation de contrôle, le TAC transforme la tension de ligne à 120 V ou, si le système est déjà à 120 V, il isole le circuit de contrôle. L’alimentation de contrôle est distribuée à partir du côté secondaire du transformateur par l’intermédiaire de fusibles montés sur rail DIN.

Figure 11 : Sectionneur d'alimentation de contrôle à fusible

Sous-ensemble de surveillance de la qualité de l’alimentation

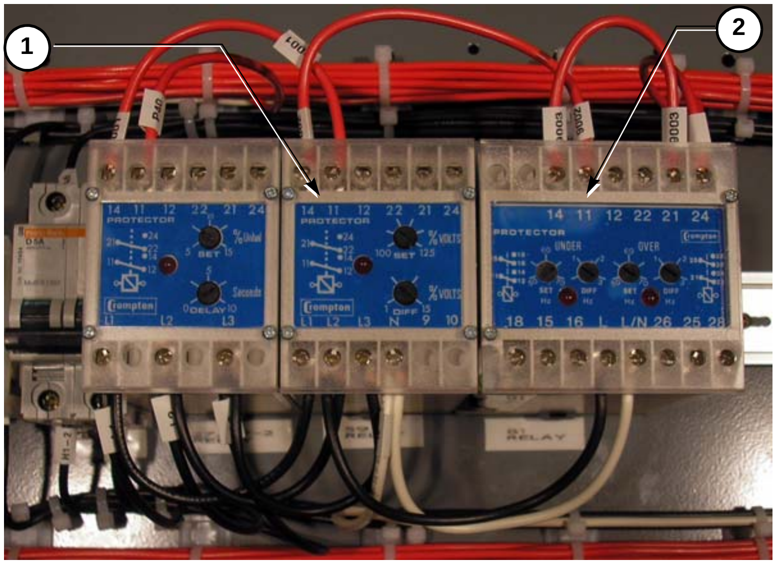
Chaque dispositif de surveillance ou moniteur de la qualité de l’alimentation évalue constamment la tension de ligne afin de détecter une sous-tension éventuelle, un déséquilibre de phase, une perte de phase ou une condition d’inversion de phase. Lorsque le moniteur de la qualité de l’alimentation détecte une condition anormale, une entrée de tension alerte l’automate.

Sous-ensemble de relais de la génératrice

Ce sous-ensemble est uniquement présent quand un des disjoncteurs principaux est raccordé à une source de génératrice au lieu d’une source de services publics. Le sous-ensemble contient un relais de surtension (figure 12, 1) et un relais de sur/sous-fréquence (figure 12, 2). Les sorties des relais sont en série avec les sorties du moniteur de la qualité de l’alimentation et indiquent à l’automate que la source de génératrice est disponible à l'utilisation. Les réglages des relais peuvent être ajustés. Se reporter aux manuels des relais pour les détails.

Figure 12 : Sous-ensemble de relais de génératrice

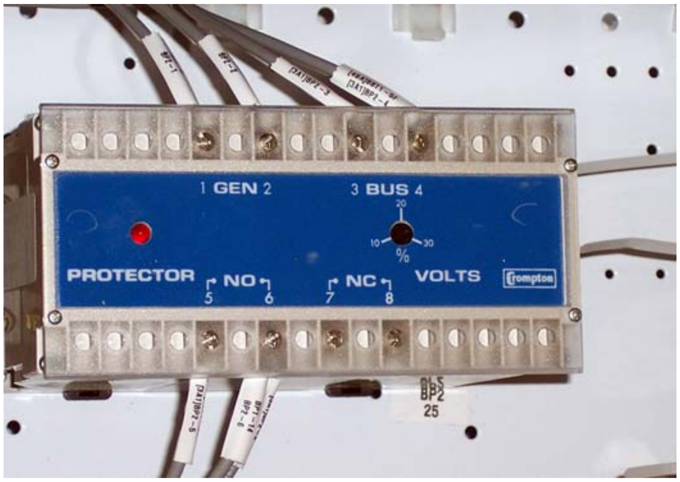
1. Relais de surtension
2. Relais de sur/sous-fréquence



Ensemble de relais de vérification de la synchronisation

L'ensemble de relais de vérification de la synchronisation est situé dans la section de chaque disjoncteur principal si le système de transfert automatique est un système à transition fermée. Le relais de vérification de la synchronisation est représenté à la figure 13. Il compare les tensions de la phase « A » en provenance de chaque source et ferme un contact lorsque les deux sont suffisamment similaires en angle de phase, magnitude et fréquence. Le contact fermé fournit une entrée de tension à l'automate pour indiquer que les sources d'alimentation sont « en phase ». Le relais de vérification de la synchronisation est situé dans une section seulement.

Figure 13 : Ensemble de relais de vérification de la synchronisation



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Ensemble de l’UPS

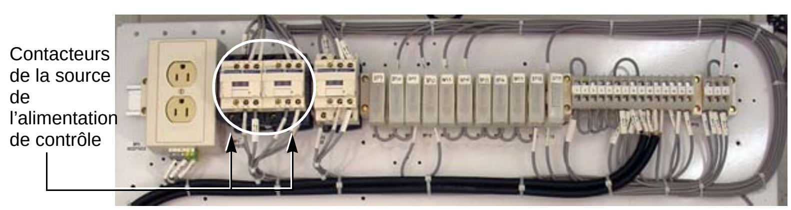
L’ensemble de systèmes d’alimentation sans coupure (UPS) comprend trois parties principales : L’UPS, le relais de contournement de l’UPS et le contacteur de la source de l’alimentation de contrôle. L’alimentation provient d’un sous-ensemble d’alimentation de contrôle, passe par le contacteur de la source de l’alimentation de contrôle puis par l’UPS et sort vers le système de contrôle. Voir la figure 14.

Figure 14 : Ensemble de l’UPS

Contacteur de la source de l’alimentation de contrôle

Le côté ligne de chaque disjoncteur principal fournit l’alimentation aux transformateurs de l’alimentation de contrôle. Le contacteur de la source de l’alimentation de contrôle dirige l’alimentation vers l’UPS à partir d’une source de service public disponible ou d’une source de génératrice. Quand les deux sources sont disponibles, l’une ou l’autre source peut être la source de l’alimentation de contrôle. L’interverrouillage mécanique du contacteur empêche les sources de se mettre en parallèle par l’intermédiaire du circuit de l’alimentation de contrôle. Voir la figure 15.

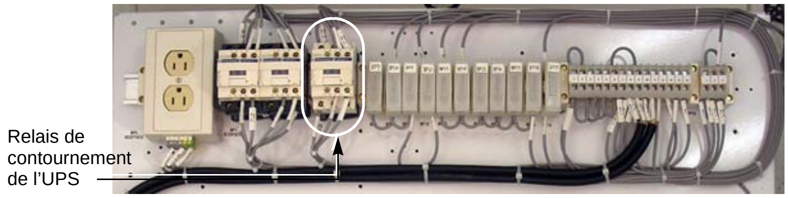
Figure 15 : Contacteur de la source de l’alimentation de contrôle



Relais de contournement de l’UPS

Le relais de contournement de l’UPS s’active automatiquement pour contourner l’UPS afin de maintenir le débit de l’alimentation vers le système de contrôle de l’alimentation quand l’UPS ne fonctionne pas correctement. Voir la figure 16.

Figure 16 : Relais de contournement de l’UPS



Système d’alimentation sans coupure (UPS)

En fonctionnement normal, l’alimentation de contrôle passe par l’UPS, lequel agit comme régulateur de tension pour le circuit de contrôle. Lorsque ni la source normale ni la source de remplacement ne sont disponibles, l’UPS procure une alimentation de contrôle à partir de sa pile pendant une durée limitée. Le manuel du propriétaire de l’UPS donne les détails sur sa capacité de charge.

La pile de l’UPS aura éventuellement besoin de service. Le voyant de vérification de la pile (CHK UPS OR PLC BATT) sur la porte des opérateurs indiquera quand une des piles aura besoin de service. La DÉL « Low Batt » (Pile déchargée) placée sur l’UPS s’allumera également lorsque la pile de l’UPS cessera de fonctionner. La DÉL « Low Batt » placée sur l’automate s’allumera lorsque la pile de l’automate devra être remplacée.

Figure 17 : Système d’alimentation sans coupure (UPS)

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Assemblage d'automate programmable

L'assemblage d'automate programmable est situé derrière la porte des opérateurs et contient l'unité centrale (UC) de l'automate, le bloc d'alimentation de l'automate et des modules d'entrées/sorties (E/S). Les relais d'interposition et quelques borniers se trouvent également là. Voir la figure 18.

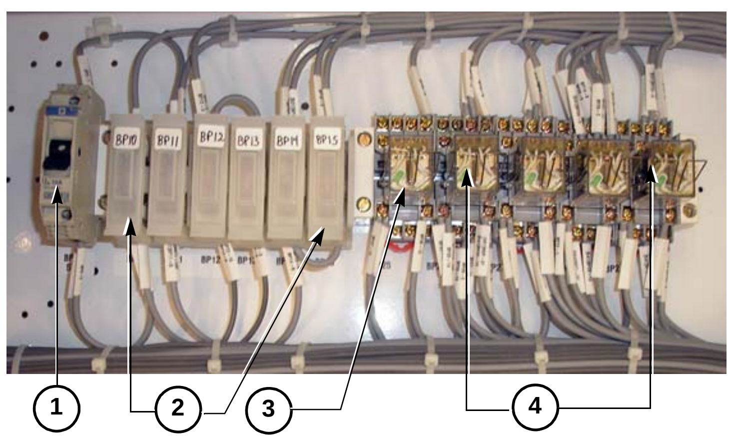
Figure 18 : Assemblage de l'automate

Disjoncteur et fusibles

Le disjoncteur (figure 19, 1) fournit une méthode pratique de coupure de l'alimentation de l'automate pour des choses telles que des changements de programme. L'ouverture de ce disjoncteur coupe l'alimentation de l'automate, du relais d'interposition d'état à distance, du relais du temporisateur de démarrage de la génératrice et des boutons-poussoirs. Les fusibles (figure 19, 2) sont des dispositifs montés sur rail DIN et munis de voyants indicateurs pour signaler un fusible fondu.

Figure 19 : Disjoncteur, fusibles, relais d'état à distance et relais d'interposition

1. Disjoncteur
2. Fusibles
3. Relais d'état à distance
4. Relais d'interposition



Le fait de couper l'alimentation de l'automate provoquera l'envoi du signal de démarrage de la génératrice dans le système principal à génératrice. Aucun transfert ne s'effectuera, à moins d'être lancé manuellement.

Sous-ensemble de relais d’état à distance

Il s’agit d’un relais d’interposition sur la cuve de l’automate qui ferme un jeu de contacts quand l’automate quitte le mode automatique et passe en mode d’échec du mode automatique (figure 19, 3). Le relais est câblé aux borniers de l’ensemble UPS, offrant des points de raccordement au client. Des contacts alternatifs, normalement ouverts ainsi que normalement fermés, sont fournis au relais.

Relais d’interposition

Les sorties de l’automate utilisent des relais d’interposition Square D® de type R (figure 19, 4) pour ouvrir les disjoncteurs et donner un contact d’état à distance optionnel. Ces relais sont également utilisés comme partie d’un circuit d’interverrouillage électrique qui s’active lorsque l’automate est hors ligne pour une raison quelconque.

Relais de démarrage de la génératrice

Figure 20 : Relais de démarrage de la génératrice

Le relais de démarrage de la génératrice est un relais temporisateur à retard de désactivation. Voir la figure 20. Le relais est normalement alimenté par une sortie de l’automate. Lorsque la source de la génératrice est requise, la sortie de l’automate s’affaiblit afin de désactiver le relais et fermer le contact de démarrage de la génératrice. En cas de perte totale de l’alimentation de contrôle (ou si l’alimentation de l’automate est déconnectée), le relais repasse à son état désactivé afin d’envoyer un signal de démarrage de la génératrice au moyen du même contact de démarrage.

Option de contrôle par écran tactile

Généralités

Le schéma de contrôle de l’automate peut être muni d’un écran tactile en option qui remplace la plupart des opérateurs mécaniques montés sur la porte. L’écran tactile est disponible pour les configurations principal à principal, principal à génératrice et principal-couplage-principal. Les sélecteurs à clé de mode auto/manuel et de démarrage de la génératrice restent sur le panneau/l’appareillage de commutation pour permettre le contrôle manuel au cas où l’écran tactile ne fonctionnerait pas. Ces sélecteurs permettront à l’automate d’être commuté au mode manuel pour le démarrage de la génératrice et le contrôle des disjoncteurs par l’intermédiaire des boutons-poussoirs situés sur les plaques avant des disjoncteurs.

L’écran tactile offre les fonctions suivantes :

1. Le personnel peut régler des temporisations protégées par mot de passe à partir de l’écran tactile. Il n’y aura aucune exigence pour les ordinateurs portables, les changements compliqués de programmes d’automate en ligne, les logiciels spécialisés ou les câbles.
2. Les conditions d’alarme contiendront des informations spécifiques au lieu de se limiter à une alarme sommaire générale.

3. L'enregistrement des événements avec indication de l'heure et de la date est disponible. Cette fonction permet au personnel de s'informer quand et pourquoi des transferts se produisent.
4. Deux niveaux de protection par mot de passe sont disponibles afin de limiter l'accès de personnel. Cela assure que seul le personnel autorisé peut accéder aux boutons et sélecteurs de contrôle pour les opérations de transfert. Un deuxième niveau de protection par mot de passe permettra de régler l'administration des temporisations et mots de passe.
5. L'afficheur est rétro-éclairé, ce qui permet une utilisation manuelle dans des conditions de faible éclairage ambiant.

Écrans tactiles

Les écrans tactiles disponibles sont les suivants :

- Principal
- Réglages
- Carte des entrées sorties (E/S) de l'automate
- Séquence de manœuvres
- Journal des alarmes (en option)
- Journal des événements (en option)

Principal

L'écran principal contient les indicateurs d'état du système, les boutons de contrôle des disjoncteurs, les sélecteurs de contrôle du système, le bouton d'accès par mot de passe, l'affichage de la date et de l'heure et les boutons de saisie des écrans. Voir la figure 21.

Figure 21 : Écran principal

Réglages

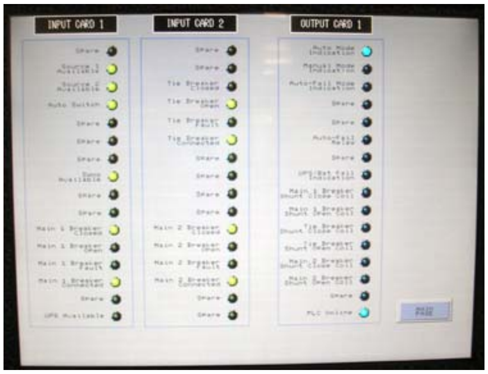
L’écran de réglages contient les touches à effleurement permettant de modifier les réglages de retard et de temporisateur, les réglages de l’heure et de la date, l’accès à la configuration du système d’écrans tactiles et l’administration des mots de passe. Voir la figure 22.

Figure 22 : Écran de réglages

Carte des E/S de l’automate

L’automate contient des listes d’entrées/sorties (E/S) avec des indicateurs pour l’état. Voir la figure 23.

Figure 23 : Écran de carte des E/S de l’automate



Journal des alarmes (en option)

Le journal des alarmes contient une liste déroulante des alarmes générées par les évènements du système (*i.e.*, les défauts des disjoncteurs, l’état des raccordements des disjoncteurs, le mode d’échec en automatique, etc.). Voir la figure 24.

Figure 24 : Écran du journal des alarmes

Journal des évènements (en option)

Le journal des évènements contient une liste déroulante des évènements du système (c’est-à-dire, activation des sélecteurs, état des disjoncteurs, etc.). Voir la figure 25.

À la mise sous tension, l’écran tactile s’allumera avant que l’automate ne passe en mode de marche pendant environ 10 secondes.

Appuyer sur le X dans l’angle inférieur droit de l’écran tactile pour fermer cette fenêtre et permettre la visibilité de toutes les fonctions.

Figure 25 : Écran du journal des événements

Accès par mot de passe

L’écran principal affiche l’image d’un cadenas fermé dans l’angle inférieur gauche. Voir la figure 26.

Figure 26 : Accès par mot de passe

1. Toucher l’image du cadenas afin d’appeler une touche à effleurement pour l’entrée de données numériques.
2. Entrer le mot de passe du niveau 1 (par défaut : 1234) pour déverrouiller l’accès aux boutons-poussoirs et sélecteurs de contrôle.
3. Utiliser le mot de passe du niveau 2 requis (par défaut : 4321) pour déverrouiller l’écran de réglages et permettre la fonctionnalité totale du niveau 1.
4. Toucher la touche d’entrée (ENTER) pour retourner à l’écran principal après avoir entré le mot de passe approprié.

   Si le mot de passe correct a été entré, l’écran affichera une image de cadenas déverrouillé avec le niveau de mot de passe actif 1 ou 2.
5. Toucher la touche à effleurement pousser-pour-verrouiller (push-to-lock) afin de verrouiller à nouveau le système à tout moment.

Le mode d’accès par mot de passe arrivera finalement au bout de son délai et se reverrouillera automatiquement (comme indiqué par un retour à l’image du cadenas verrouillé). La durée du temporisateur de sécurité du mot de passe peut être réglée sur l’écran de réglages. Les mots de passe peuvent être également modifiés sur cet écran.

Si les mots de passe sont oubliés, un mot de passe d’accès de secours, 32767, peut être employé pour l’accès de niveau 2.

1. Appeler l’écran de réglages et un nouveau bouton apparaît, qui permet de supplanter ou forcer un mot de passe.
2. Toucher le bouton de forçage de mot de passe pour appeler un écran qui permet de visualiser ou de modifier les 2 mots de passe, niveaux 1 et 2.

Opération de contrôle

1. Entrer le mot de passe du niveau 1 pour accéder aux boutons-poussoirs et sélecteurs de contrôle sur le menu principal.
2. Toucher un bouton-poussoir pour l'activer.
3. Toucher l'interrupteur pour changer la position de l'interrupteur. Une fenêtre contextuelle apparaîtra, présentant des touches à effleurement supplémentaires pour chaque position de l'interrupteur.
4. Toucher la position de l'interrupteur désirée. Ceci ferme la fenêtre contextuelle et active l'interrupteur
5. Saisir l'écran d'aide en touchant la touche à effleurement « ? » sur l'écran contextuel de l'interrupteur. Des écrans d'aide sont disponibles pour chaque interrupteur.
6. Fermer les écrans contextuels en touchant le « X » rouge dans l'angle supérieur droit, en touchant la fonction désirée ou en touchant un bouton « OK ».

Les sélecteurs à clé du mode auto/manuel et de démarrage de la génératrice ne se trouvent pas sur l'écran tactile, mais sur l'appareil à côté de l'écran tactile.

Réglages de contrôle

1. Entrer le mot de passe du niveau 2 pour saisir l'écran de réglages.
2. Toucher une valeur d'heure pour entrer une nouvelle valeur sur le clavier numérique contextuel.
3. Saisir les écrans d'aide en touchant les touches à effleurement « ? » près du réglage en question.
4. Accéder aux réglages de l'heure et de la date en touchant le bouton « PLC Time Set » (Réglage de l'heure de l'automate) ou au bouton « PLC Date Set » (Réglage de la date de l'automate).
5. Ajuster l'heure et de la date en touchant les flèches vers le haut ou vers le bas, qui paraissent au-dessus ou en dessous de la valeur désirée.

L'écran tactile possède sa propre fonction de date/heure qui ne contrôlera pas la date/heure de l'automate. Consulter les directives de l'écran tactile pour les fonctions qui ne sont pas décrites ici, telles que les niveaux de rétro-éclairage.

Journaux des alarmes et évènements (en option)

Entrer le mot de passe du niveau 1 pour visualiser ces écrans si fournis.

Les évènements apparaissent sur une liste de synthèse, ceux les plus récents étant près du haut.

Les évènements/alarmes actifs sont affichés en rouge, les articles reconnus apparaissent en jaune et les évènements/alarmes qui sont retournés à leur condition normale sont affichés en vert.

Un appui sur le bouton « acknowledge all events » (reconnaître tous les évènements) modifiera l'état de l'évènement de rouge à jaune.

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Fonctionnement

Système principal à principal

Cette section décrit le mode de fonctionnement automatique du schéma de transfert automatique fourni pour un système principal à principal ou à deux services publics. Soit le disjoncteur principal de gauche, soit celui de droite peut être la source normale ou d'urgence.

Réglage initial (par défaut)

Le réglage par défaut est un disjoncteur principal fermé (désigné normal) et un disjoncteur principal ouvert (désigné alternatif). Le disjoncteur de gauche est le disjoncteur de la source normale sauf autre indication, soit lors de la commande initiale, soit par la position du SSP (sélecteur de source préférée).

Source normale perdue

Si la source normale est perdue, l'automate transfère automatiquement la charge vers la source alternative. Le disjoncteur de la source normale s'ouvre après le délai d'ouverture. Après le délai de fermeture, le disjoncteur de la source alternative se ferme.

Source normale revient—option SSP désactivé/pas de SSP

Sans l'option du SSP, ou s'il est désactivé, le système restera à l'état transféré, même après le retour de la source normale. Le disjoncteur de la source alternative restera fermé jusqu'à une intervention manuelle (ou la perte de la source alternative), permettant à l'utilisateur de programmer un retransfert à un moment convenable.

Source normale revient—SSP activé

Si le SSP est activé :

- Dans un système de transition ouverte, après le délai de stabilisation de la source, le disjoncteur de la source alternative s'ouvre. Après le délai de fermeture, la source normale se ferme.
- Dans un système de transition fermée, après le délai de stabilisation de la source, si le relais de vérification de la synchronisation est satisfait, le disjoncteur de la source normale se ferme. Deux secondes plus tard, le disjoncteur de la source alternative s'ouvre. Si le relais de vérification de la synchronisation n'est pas satisfait, le retransfert sera retardé jusqu'à ce que les sources soient synchronisées.

Source alternative perdue

Si la source alternative est perdue alors que la source normale est hors service, le disjoncteur de la source alternative s'ouvrira. Le disjoncteur associé à la source qui se rétablit en premier se fermera après le délai de stabilisation de la source.

Retransfert automatique (en option)

Si muni d'un sélecteur de retransfert automatique :

- Le sélecteur étant à la position d'arrêt, l'utilisateur contrôle le transfert manuellement.
- Le sélecteur étant à la position de marche, le transfert s'effectuera automatiquement.

Système principal à génératrice

Cette section décrit le mode de fonctionnement automatique du schéma de transfert automatique pour un système possédant un raccordement à une source de service public et un autre à une génératrice.

Réglage initial (par défaut)

Dans des circonstances normales, le disjoncteur principal raccordé au service public est fermé et le disjoncteur raccordé à la génératrice est ouvert. Sauf spécification différente, la source de service public est le disjoncteur de gauche et le disjoncteur de la génératrice est sur la droite.

Source normale perdue

Le système transfère automatiquement la charge à la source alternative. Le disjoncteur de la source normale s'ouvre après le délai d'ouverture, et le signal de démarrage est envoyé à la génératrice. Le disjoncteur de la source alternative se ferme 10 secondes après que les relais de la génératrice du système de transfert automatique auront été satisfaits, indiquant que la tension ainsi que la fréquence se trouvent dans les limites désirables.

Source normale revient—transition ouverte

Après l'expiration du délai de stabilisation de la source, le système retransfère vers la source normale en une séquence de transition ouverte. Tout d'abord, le disjoncteur de la génératrice s'ouvre. Après le délai du temps de fermeture, le disjoncteur de la source normale se ferme. La génératrice fonctionnera en un état déchargé pendant 15 minutes pour lui permettre de se refroidir.

Source normale revient—transition fermée

Après l'expiration du délai de stabilisation de la source, le système retransfère vers la source normale en une séquence de transition fermée. Si le relais de vérification de la synchronisation est satisfait, le disjoncteur de la source normale se ferme et, après deux secondes, le disjoncteur de la génératrice s'ouvre. La génératrice fonctionnera en un état déchargé pendant 15 minutes pour lui permettre de se refroidir. Si les sources ne sont pas synchronisées, le retransfert sera retardé jusqu'à ce qu'elles soient synchronisées.

Source de la génératrice perdue alors que la source normale est hors service

Si la source alternative (génératrice) est perdue alors que la source normale est hors service, le disjoncteur de la source alternative s'ouvrira. Si la source alternative, la génératrice, est perdue trois fois en 15 minutes, le système passera en mode « Auto Fail » (Échec du mode automatique). Quand la source normale se rétablit et se stabilise, le mode « Auto Fail » se remet à zéro et le disjoncteur de la source normale se ferme, rétablissant les conditions normales de fonctionnement du système.

Période de vérification

Chaque dimanche à 13 h., un signal de démarrage sera envoyé à la génératrice pendant 30 minutes. La période de vérification peut être avec ou sans charge si muni d'un sélecteur de vérification avec charge en option. Si une vérification avec charge est choisie, un transfert à la source de génératrice se produira pendant la période de vérification.

Système principal-couplage-principal (sans options)

Cette section décrit le mode de fonctionnement automatique du schéma de transfert automatique de l'automate pour un système avec deux sources de services publics, muni d'un disjoncteur de couplage quand aucune option n'est incluse.

Réglage initial (par défaut)

En circonstances normales (conditions par défaut), les deux disjoncteurs principaux sont fermés et le disjoncteur de couplage est ouvert.

Source normale perdue

Après le délai d'ouverture, le disjoncteur principal dont la source est perdue s'ouvrira. Le disjoncteur de couplage se ferme après le délai de fermeture, réactivant la charge perdue.

Retour de la source normale

Après l'expiration du délai de stabilisation de la source, le disjoncteur de couplage s'ouvre. Après le délai de fermeture, le disjoncteur principal dont la source est rétablie se fermera.

Perte des deux sources

Si les deux sources de services publics sont perdues, les deux disjoncteurs principaux et le disjoncteur de couplage s'ouvriront. Quand une seule source est rétablie, le système change d'état afin d'alimenter les deux barres-bus de charge à partir de cette source. Lorsque les deux sources se

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rétablissent simultanément, les disjoncteurs principaux se fermeront et le disjoncteur de couplage restera ouvert.

Système principal-couplage-principal (avec options)

Cette section décrit le mode de fonctionnement automatique du schéma de transfert automatique fourni pour un système avec deux sources de services publics, muni d'un disjoncteur de couplage lorsque des options standard sont spécifiées. Les options comprennent : SSP, transition fermée et marche/arrêt de retransfert.

Réglage initial (par défaut)

La condition par défaut varie en fonction du sélecteur SSP. En supposant que les deux sources de services publics sont disponibles :

- Si la position du sélecteur est celle de gauche, dans ce cas le disjoncteur principal de gauche et le disjoncteur de couplage sont fermés, tandis que le disjoncteur principal de droite est ouvert.
- Si la position du sélecteur est celle de droite, dans ce cas le disjoncteur principal de droite et le disjoncteur de couplage sont fermés, tandis que le disjoncteur principal de gauche est ouvert.
- Si le SSP est à l'arrêt (OFF) (ou pas installé), les deux disjoncteurs principaux sont alors fermés et le disjoncteur de couplage est ouvert.

Source normale perdue

Le disjoncteur associé à la source normale s'ouvre après le délai d'ouverture. Après le délai de fermeture, un disjoncteur précédemment ouvert se ferme afin de rétablir l'alimentation. La position du sélecteur SSP détermine l'ordre exact des opérations de la manière suivante :

- Avec le SSP à la position de gauche : Si la source de gauche est perdue, le disjoncteur de gauche s'ouvre après le délai d'ouverture. Après le délai de fermeture, le disjoncteur de droite se ferme. Le disjoncteur de couplage ne change pas d'état.
- Avec le SSP à la position de droite : Si la source de droite est perdue, le disjoncteur de droite s'ouvre après le délai d'ouverture. Après le délai de fermeture, le disjoncteur de gauche se ferme. Le disjoncteur de couplage ne change pas d'état.
- Avec le SSP absent ou à la position d'arrêt (OFF) : Le disjoncteur principal dont la source a été perdue s'ouvrira après le délai d'ouverture. Après le délai de fermeture, le disjoncteur de couplage se fermera, rétablissant l'alimentation de la charge affectée.

Source alternative perdue alors que la source normale est disponible

Avec le SSP à la position de droite et le disjoncteur de droite fermé : si la source de gauche est perdue, le système ne changera pas d'état.

De même, avec le SSP à la position de gauche et le disjoncteur de gauche fermé : si la source de droite est perdue, le système ne changera pas d'état.

Perte des deux sources

Si les deux sources de services publics sont perdues, le disjoncteur de la source subsistante et le disjoncteur de couplage s'ouvriront. Lorsqu'une seule des sources se rétablit, le système changera d'état afin d'alimenter les deux barres-bus de charge à partir de cette source. Quand les deux sources se rétablissent simultanément, les positions du SSP et du sélecteur de marche/arrêt de retransfert déterminent quels disjoncteurs se ferment.

Retour de la source normale—Retransfert à l'arrêt

Avec le retransfert à l'arrêt, le système ne change pas d'état, avec ou sans SSP. Cela permet à l'utilisateur de programmer un retransfert à un moment commode.

Retour de la source normale—Retransfert en marche ou non présent

Sans SSP, le système retourne à l'état normal (c'est à dire, les deux disjoncteurs principaux fermés et le disjoncteur de couplage ouvert). Avec un SSP, le système retourne à l'état normal tel que déterminé par la position du SSP :

1. Après que le moniteur de la qualité de l'alimentation aura détecté le retour de la source perdue, le délai de stabilisation commencera à s'écouler.
2. Après le délai écoulé, la source est transférée. La séquence de transfert se déroule ainsi :
   — Dans un système de transition ouverte, le disjoncteur principal normalement ouvert s'ouvre et le disjoncteur principal normalement fermé se ferme après le délai de fermeture. (Par exemple, si le SSP est à la position de gauche, le disjoncteur principal de droite s'ouvre. Après le délai de fermeture, le disjoncteur principal de gauche se ferme.)

   — Dans un système de transition fermée, le disjoncteur normalement fermé se ferme et, deux secondes plus tard, le disjoncteur normalement ouvert s'ouvre. (Par exemple, si le SSP est à la position de droite, le disjoncteur principal de droite se ferme. Deux secondes plus tard, le disjoncteur principal de gauche s'ouvre.)

Conditions qui empêchent le transfert de source

Défaut en aval

Si un disjoncteur principal se déclenche par suite d'un défaut en aval, l'interverrouillage électrique ne permet à aucun dispositif de se fermer. En mode manuel, les boutons-poussoirs de fermeture sont verrouillés. En mode automatique, la fermeture n'est pas autorisée. Un disjoncteur déclenché active aussi le voyant orange d'échec du mode automatique (Auto Fail). Le transfert automatique ne se produit pas tant que le défaut n'est pas corrigé et que le disjoncteur n'est pas réarmé. Se reporter à la documentation sur les disjoncteurs pour les directives de réarmement des contacts auxiliaires. Pour réarmer le système de transfert automatique, mettre le sélecteur auto / manuel à la position Manuel et le remettre à la position Auto.

Autres conditions

Un déséquilibre de phase, une inversion de phase ou une tension de source qui dépasse les limites (y compris la perte totale de tension) désactivera le moniteur de la qualité de l'alimentation, ne permettant pas au disjoncteur associé de se fermer. Une source de génératrice est également surveillée pour une surtension et une fréquence correcte. Si le système est muni d'un sélecteur de retransfert automatique en option et si le sélecteur est à la position d'arrêt (OFF), le retransfert sera suspendu jusqu'à ce que le sélecteur soit mis à la position de marche. Cela permet à l'utilisateur d'attendre qu'une synchronisation se produise (s'il s'agit d'une application de transition fermée), ou de lancer le transfert à un moment plus commode.

Les systèmes principal à génératrice sont programmés de sorte à empêcher le disjoncteur de la source alternative de s'ouvrir et de se refermer. Si la source alternative est utilisée pour alimenter la charge, et si la tension de la source dépasse les limites acceptables trois fois en 15 minutes, le système passera par défaut en mode d'échec du mode automatique (Auto Fail) et le disjoncteur de la source alternative ne sera pas autorisé à se refermer. Cette condition est rétablie au retour de la source normale, et la charge est alimentée à partir de la source normale.

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Installation

Préparation à la réception de l’appareil

Le système de transfert automatique est contenu dans plusieurs sections de panneau de commutation ou d’appareillage de commutation. Consulter le manuel du panneau ou de l’appareillage de commutation pour obtenir des informations générales se rapportant aux sections de l’appareil.

L’automate Modicon® a des restrictions environnementales qui diffèrent de celles de l’appareil en son entier. Ces restrictions peuvent être trouvées dans le guide de l’utilisateur de l’automate Modicon. S’assurer d’entreposer et d’installer l’appareil conformément aux restrictions plus serrées. Par exemple, si l’unité centrale (UC) Modicon a des limites de température de 0 à 60 °C (32 à 140 °F) et si l’appareil a des limites de 0 à 75 °C (32 à 167 °F), maintenir alors l’appareil entre 0 et 60 °C (32 et 140 °F).

Emplacement et interconnexion des ensembles

Les pièces du système de transfert automatique sont réparties dans plusieurs sections du panneau de commutation ou de l’appareillage de commutation et doivent être câblées ensemble. Se reporter aux plans fournis par l’usine avec l’appareil pour les emplacements exacts et les interconnexions des sous-ensembles.

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Raccordements de câblage définitifs

Comme précédemment noté, les pièces du système de transfert automatique sont réparties dans plusieurs sections de l’appareil et doivent être câblées ensemble. Certains borniers peuvent être près du bas des profilés d’angle avant ou arrière. Se reporter aux schémas de câblage fournis avec le panneau ou l’appareillage de commutation pour confirmer les raccordements de câblage.

Installation de l'appareil

1. Pour un système à génératrice, raccorder le câblage externe aux borniers GEN 1 et GEN 2. Le câblage doit être acheminé dans un conduit.
2. Pour une indication d’état à distance, raccorder le câblage externe aux borniers AL 1 et AL 2 de l’ensemble de l’UPS.
3. Compléter tout le câblage entre les sections pour l’alimentation de contrôle et les signaux. Les borniers sont typiquement situés au bas des profilés d’angle avant ou arrière de chaque section.

Vérification avant la mise sous tension

Le système de l’alimentation de contrôle possède deux ou plusieurs sectionneurs à fusible, des disjoncteurs montés sur rail DIN et de nombreux assemblages de fusibles. Tous ces dispositifs doivent avoir les fusibles appropriés installés et être à la position de marche. Les tailles de fusibles sont spécifiées sur les schémas de principe ou de câblage de l’appareil. Utiliser la liste de contrôle suivante pour les réglages corrects du dispositif de mise en service initiale.

1. Utiliser le bouton d’ouverture (OPEN) sur chaque disjoncteur pour ouvrir le disjoncteur principal.
2. Mettre le sélecteur « auto/manual » situé sur la porte des opérateurs à la position Manuel.
3. Mettre tous les dispositifs de charge (distribution) à l’arrêt ou en position ouverte.
4. Mettre tous les sectionneurs d’alimentation de contrôle à la position de marche (I), fermée.
5. Fermer et verrouiller tous les portes et les couvercles.

Vérification de la performance

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Le circuit de contrôle et le système des barres-bus sont mis sous tension durant les essais de performance. Étudiez à fond les plans, la documentation et la conception de l'appareil avant d'entreprendre un essai de performance.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Observer les procédures de vérification contenues dans la documentation d'installation et d'entretien de l'appareil.

1. Mettre l'appareil sous tension.
2. Mettre sous tension le système d'alimentation sans coupure (UPS) fourni avec l'appareil.
3. Effectuer l'essai approprié du mode manuel comme décrit pour le système installé dans la section « Procédures d'essai » de ces directives d'utilisation, à partir de la page 32.
4. Effectuer l'essai approprié du mode automatique comme décrit pour le système installé dans la section « Procédures d'essai » de ces directives d'utilisation, commençant à la page 32.
5. Effecteur tous les essais pour les dispositifs installés, notamment les essais de disjoncteurs, essais de défaut de mise à la terre ou vérification des circuits de mesure comme décrit dans la documentation appropriée.

Mise en service

Mettre le système de transfert automatique en service après avoir terminé de façon satisfaisante la « Vérification de la performance » à la page 31 et tous les essais indiqués.

1. Ouvrir ou fermer les disjoncteurs principaux selon la condition initiale désirée à l'aide des boutons-poussoirs de la porte des opérateurs.
2. Mettre tous les sélecteurs sur la porte des opérateurs aux positions désirées.
3. Retirer les clés des sélecteurs à clé et entreposez-les dans un endroit sûr mais accessible.

Procédures d’essai

Avant d’entreprendre une procédure d’essai, effectuer les points d’installation décrits dans la section « Vérification avant la mise sous tension » à la page 30. Identifier le type de système (principal à principal, principal à génératrice ou principal-couplage-principal) et si le système a des options (sélecteur de source préférée [SSP] ou transition fermée), afin de choisir les procédures d’essai correctes. Effectuer les essais comme expliqué dans « Vérification de la performance » à la page 31.

Effectuer les essais appropriés pour les modes manuel et automatique tous les trimestres. Enregistrer les dates et résultats dans le « Journal d’entretien » à la page 50.

Ces directives sont à utiliser par des installateurs et spécificateurs et décrivent les systèmes standard. Pour des installations qui ne suivent pas ces standards, ces directives d’utilisation fournissent seulement des informations de base. Les systèmes standard comportent toujours un système d’alimentation sans coupure (UPS). Les options disponibles consistent en un sélecteur de source préférée, transition fermée, vérification avec charge, retransfert automatique et un bouton-poussoir pour vérifier les voyants. Se reporter à la documentation fournie par l’usine pour toutes déviations par rapport au système standard.

De plus, ces directives d’utilisation décrivent une séquence de fonctionnement standard pour le système. La séquence standard suit l’une des sections dans *« Fonctionnement »* commençant à la *page 26* de ce manuel. Le système est vérifié concernant la séquence appropriée à l’aide d’une des « Procédures d’essai » de la section « Installation » de ces directives d’utilisation. Tous les changements dans la séquence standard sont documentés dans des documents séparés qui sont fournis par l’usine.

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Système principal à principal de base

Cette section couvre les essais recommandés pour un système à deux services publics quand aucune option n'est installée.

Mode manuel

Avec le sélecteur en mode manuel, un opérateur peut ouvrir et fermer chaque disjoncteur indépendamment à l'aide des boutons-poussoirs sur la porte des opérateurs. Un seul disjoncteur principal peut être fermé à la fois, évitant une transition fermée. Un délai de deux secondes s'écoule entre l'ouverture d'un disjoncteur principal et la fermeture de l'autre.

Tableau 1 : Procédure d'essai en mode manuel pour un système principal à principal de base

1.	Effectuer les points suivants :	Mettre le sélecteur auto/manuel à la position manuel.
		Ouvrir les deux disjoncteurs avec le bouton d'ouverture situé sur les disjoncteurs.
		Mettre le sélecteur TTL/Normal/TTR à la position Normal.
2.	Vérifier si les voyants suivants sont allumés :	Voyant blanc, source de côté gauche
		Voyant blanc, source de côté droit
		Voyant vert, ouverture du disjoncteur principal de gauche
		Voyant vert, ouverture du disjoncteur principal de droite
		Voyant bleu, mode manuel
3.	Vérifier si les voyants suivants sont éteints :	Voyant orange, défaut du disjoncteur principal de gauche
		Voyant orange, défaut du disjoncteur principal de droite
		Voyant blanc, mode automatique
4.	Appuyer sur le bouton-poussoir rouge de fermeture du disjoncteur principal de gauche sur la porte des opérateurs.	Le voyant vert d'ouverture du disjoncteur principal de gauche s'éteindra
		Le voyant rouge de fermeture du disjoncteur principal de gauche s'allumera
5.	Ouvrir le disjoncteur principal de gauche à l'aide du bouton-poussoir vert d'ouverture sur la porte des opérateurs.	Le voyant rouge de fermeture du disjoncteur principal de gauche s'éteindra
		Le voyant vert d'ouverture du disjoncteur principal de gauche s'allumera
6.	Après deux secondes, appuyer sur le bouton-poussoir rouge de fermeture du disjoncteur principal de droite sur la porte des opérateurs.	Le voyant vert d'ouverture du disjoncteur principal de droite s'éteindra
		Le voyant rouge de fermeture du disjoncteur principal de droite s'allumera
7.	Ouvrir le disjoncteur principal de droite à l'aide du bouton-poussoir vert d'ouverture sur la porte des opérateurs.	Le voyant de fermeture du disjoncteur principal de droite s'éteindra
		Le voyant vert d'ouverture du disjoncteur principal de droite s'allumera
	REMARQUE : Si le bouton-poussoir de fermeture d'un disjoncteur principal est enfoncé alors que l'autre disjoncteur principal est fermé, le signal d'entrée est ignoré.	

Mode automatique

Les boutons-poussoirs de la porte des opérateurs ne feront pas fonctionner les disjoncteurs en mode automatique.

Tableau 2 : Procédure d’essai en mode automatique pour un système principal à principal de base

1.	Effectuer les points suivants :	Mettre le sélecteur auto/manuel à la position manuel.
		Ouvrir les deux disjoncteurs avec le bouton d’ouverture situé sur les disjoncteurs.
		Mettre le sélecteur TTL/Normal/TTR à la position Normal.
2.	Vérifier si les voyants suivants sont éteints :	Voyant orange, échec du mode automatique
		Voyant orange, défaut du disjoncteur principal de gauche
		Voyant orange, défaut du disjoncteur principal de droite
3.	Vérifier si les voyants suivants sont allumés :	Voyant blanc, source de côté gauche
		Voyant blanc, source de côté droit
		Voyant bleu, mode manuel
4.	Mettre le sélecteur auto/manuel à la position auto.	Le disjoncteur principal de la source normale se fermera
5.	Vérifier si les voyants suivants sont allumés :	Voyant blanc, mode automatique
		Voyant rouge, fermeture du disjoncteur principal de la source normale
		Voyant vert, ouverture du disjoncteur principal de la source alternative
6.	Vérifier si les voyants suivants sont éteints :	Voyant orange, échec du mode automatique
		Voyant orange, défaut du disjoncteur principal de gauche
		Voyant orange, défaut du disjoncteur principal de droite
7.	Simuler une perte de la source normale en mettant le sélecteur TTL/Normal/TTR à la position TTL (Essai de transfert de la source de gauche) ou TTR (Essai de transfert de la source de droite), selon ce qui est la source normale. Le disjoncteur principal de la source normale s’ouvrira après le délai d’ouverture. Le délai de fermeture commence à temporiser une fois que le disjoncteur de la source normale s’ouvre. Une fois le délai de fermeture terminé, le disjoncteur principal de la source alternative se fermera.	
8.	Vérifier si les voyants suivants sont allumés :	Voyant vert, ouverture du disjoncteur principal de la source normale
		Voyant rouge, fermeture du disjoncteur principal de la source alternative
		Voyant blanc, source alternative
	REMARQUE : Le voyant pour la source normale sera éteint.	
9.	Simuler un retour de tension de la source normale en remettant le sélecteur TTL/Normal/TTR à la position Normal. Le disjoncteur de la source alternative continuera à alimenter la charge, mais le voyant de la source normale sera allumé.	
10.	Simuler une perte de source alternative en mettant le sélecteur TTL/Normal/TTR à la position TTL (Essai de transfert de la source de gauche) ou TTR (Essai de transfert de la source de droite), selon ce qui est la source alternative. Le disjoncteur de la source alternative s’ouvrira après le délai d’ouverture. Le délai de fermeture commence à temporiser une fois que le disjoncteur de la source alternative s’ouvre. Une fois le délai de fermeture terminé, le disjoncteur principal de la source normale se fermera.	
11.	Vérifier si les voyants suivants sont allumés :	Voyant vert, ouverture du disjoncteur principal de la source alternative
		Voyant rouge, fermeture du disjoncteur principal de la source normale
		Voyant blanc, source normale
	REMARQUE : Le voyant pour la source alternative sera éteint.	
12.	Simuler un retour de tension de la source alternative en remettant le sélecteur TTL/Normal/TTR à la position Normal. Le disjoncteur principal de la source normale continuera à alimenter la charge, mais le voyant de la source alternative sera allumé.	

Système principal à principal avec options standard

Cette section couvre les essais recommandés pour un système principal à principal avec des options standard. Ces options comprennent un SSP, le retransfert automatique et la transition fermée.

Mode manuel

Avec le sélecteur en mode manuel, un opérateur peut ouvrir et fermer chaque disjoncteur indépendamment à l’aide des boutons-poussoirs sur la porte des opérateurs. Le sélecteur SSP n’a pas d’impact sur le mode manuel.

Tableau 3 : Procédure d’essai en mode manuel pour un système principal à principal avec des options

1.	Effectuer les points suivants :	Mettre le sélecteur auto/manuel à la position manuel.
		Ouvrir les deux disjoncteurs avec le bouton d’ouverture situé sur les disjoncteurs.
		Mettre le sélecteur TTL/Normal/TTR à la position Normal.
		Mettre le sélecteur (SSP) à la position d’arrêt (STOP).
2.	Vérifier si les voyants suivants sont allumés :	Voyant blanc, source de côté gauche
		Voyant blanc, source de côté droit
		Voyant vert, ouverture du disjoncteur principal de gauche
		Voyant vert, ouverture du disjoncteur principal de droite
		Voyant bleu, mode manuel
3.	Vérifier si les voyants suivants sont éteints :	Voyant orange, défaut du disjoncteur principal de gauche
		Voyant orange, défaut du disjoncteur principal de droite
		Voyant blanc, mode automatique
4.	Appuyer sur le bouton-poussoir rouge de fermeture du disjoncteur principal de gauche sur la porte des opérateurs.	Le voyant vert d’ouverture du disjoncteur principal de gauche s’éteindra
		Le voyant rouge de fermeture du disjoncteur principal de gauche s’allumera
5.	Mettre le sélecteur SSP à la position de droite (source de droite préférée)	
	Appuyer sur le bouton-poussoir de fermeture du disjoncteur principal de droite sur la porte des opérateurs. Dans un système de transition fermée avec un relais de vérification de synchronisation satisfait.	Le voyant vert d’ouverture du disjoncteur principal de droite s’éteindra
		Le voyant rouge de fermeture du disjoncteur principal de droite s’allumera
	Après deux secondes, le disjoncteur principal de gauche s’ouvrira. Les voyants indicateurs pour le disjoncteur de gauche changeront d’état.	
	REMARQUE : Si le relais de synchronisation n’est pas satisfait ou n’est pas installé, la commande de fermeture du disjoncteur principal de droite sera ignorée. De même, si le sélecteur de transition fermée est à la position d’arrêt, la commande de fermeture du disjoncteur principal de droite sera ignorée.	
6.	Mettre le sélecteur SSP à la position de gauche (source de gauche préférée)	
	Appuyer sur le bouton-poussoir de fermeture du disjoncteur principal de gauche sur la porte des opérateurs. Dans un système de transition fermée avec un relais de vérification de synchronisation satisfait.	Le voyant vert d’ouverture du disjoncteur principal de gauche s’éteindra
		Le voyant rouge de fermeture du disjoncteur principal de gauche s’allumera
	Après deux secondes, le disjoncteur principal de droite s’ouvrira. Les voyants indicateurs pour le disjoncteur de droite changeront d’état.	
	REMARQUE : Si le relais de synchronisation n’est pas satisfait ou n’est pas installé, la commande de fermeture du disjoncteur principal de gauche sera ignorée. De même, si le sélecteur de transition fermée est à la position d’arrêt, la commande de fermeture du disjoncteur principal de gauche sera ignorée.	

Mode automatique

Les boutons-poussoirs de la porte des opérateurs ne feront pas fonctionner les disjoncteurs en mode automatique.

Tableau 4 : Procédure d’essai en mode automatique pour un système principal à principal avec des options

1.	Effectuer les points suivants :	Mettre le sélecteur auto/manuel à la position manuel.
		Ouvrir les deux disjoncteurs avec le bouton d’ouverture situé sur les disjoncteurs.
		Mettre le sélecteur TTL/Normal/TTR à la position Normal.
		Mettre le sélecteur (SSP) à la position d’arrêt (STOP).
		Mettre le sélecteur de retransfert automatique à la position de marche.
2.	Vérifier si les voyants suivants sont allumés :	Voyant blanc, source de côté gauche
		Voyant blanc, source de côté droit
		Voyant bleu, mode manuel
3.	Vérifier si les voyants suivants sont éteints :	Voyant orange, échec du mode automatique
		Voyant orange, défaut du disjoncteur principal de gauche
		Voyant orange, défaut du disjoncteur principal de droite
4.	Mettre le sélecteur auto/manuel à la position auto. Le disjoncteur principal de la source normale se fermera.	
5.	Vérifier si les voyants suivants sont allumés :	Voyant blanc, mode automatique
		Voyant rouge, fermeture du disjoncteur principal de la source normale
		Voyant vert, ouverture du disjoncteur principal de la source alternative
6.	Vérifier si les voyants suivants sont éteints :	Voyant orange, échec du mode automatique
		Voyant orange, défaut du disjoncteur principal de gauche
		Voyant orange, défaut du disjoncteur principal de droite
		Voyant bleu, mode manuel
7.	Simuler une perte de la source de service public en mettant le sélecteur TTL/Normal/TTR à la position TTL (Essai de transfert de la source de gauche) ou TTR (Essai de transfert de la source de droite), selon ce qui est la source normale. Le disjoncteur principal de la source normale s’ouvrira après le délai d’ouverture. Le délai de fermeture commence à temporiser une fois que le disjoncteur de la source normale s’ouvre. Une fois le délai de fermeture terminé, le disjoncteur principal de la source alternative se fermera.	
8.	Vérifier si les voyants suivants sont allumés :	Voyant vert, ouverture du disjoncteur principal de la source normale
		Voyant rouge, fermeture du disjoncteur principal de la source alternative
		Voyant blanc, source alternative
	REMARQUE : Le voyant pour la source normale sera éteint.	
9.	Simuler un retour de tension de la source normale en remettant le sélecteur TTL/Normal/TTR à la position Normal.	
	Avec le sélecteur SSP et la transition ouverte, le système peut retransférer vers le disjoncteur de la source normale. Pour permettre le retransfert, mettre le SSP à la position de source normale. Pour empêcher le retransfert, mettre le sélecteur à la position centrale/d’arrêt. Avec le SSP mis à la position de source normale, le délai de stabilisation de la source commence à temporiser après le retour de la source normale. Après l’arrivée au bout de son délai, le disjoncteur de la source alternative s’ouvre. Après le délai de fermeture, le disjoncteur de la source normale se ferme.	
	Avec le SSP et la transition fermée, le temporisateur de stabilisation de la source commence à arriver au bout de son délai après le retour de la tension normale. Avec le SSP mis à la position de source normale, le disjoncteur de la source normale se ferme. Deux secondes plus tard, le disjoncteur de la source alternative s’ouvre.	
	REMARQUE : Sans le SSP, le système ne retransfère pas. Si le sélecteur de retransfert automatique est mis à la position d’arrêt, le retransfert sera suspendu jusqu’à ce qu’il soit mis à la position de marche.	
10.	Pour simuler une perte de source alternative de service public, le système doit être réglé de la façon suivante :	Disjoncteur principal de la source normale ouvert
		Disjoncteur principal de la source alternative fermé
		SSP à l’arrêt (STOP), si présent
		Les deux voyants de source allumés
11.	Simuler une perte de source alternative en mettant le sélecteur TTL/Normal/TTR à la position de source alternative. Le disjoncteur de la source alternative s’ouvrira après le délai d’ouverture, et après le délai de fermeture le disjoncteur de la source normale se fermera.	
12.	Simuler un retour de tension de la source alternative en remettant le sélecteur TTL/Normal/TTR à la position Normal. Le disjoncteur principal de la source normale continuera à alimenter la charge.	

Système principal à génératrice de base

Cette section couvre les essais recommandés pour un système à service public-génératrice sans options. Le disjoncteur de la source normale est raccordé à la source de service public et le disjoncteur de la source alternative est raccordé à la génératrice.

Mode manuel

Avec le sélecteur en mode manuel, un opérateur peut ouvrir et fermer chaque disjoncteur indépendamment à l’aide des boutons-poussoirs sur la porte des opérateurs. Un seul disjoncteur principal peut être fermé à la fois, évitant une transition fermée. Un délai de deux secondes s’écoule entre l’ouverture d’un disjoncteur principal et la fermeture de l’autre.

Tableau 5 : Procédure d’essai en mode manuel pour un système principal à génératrice de base

1.	Effectuer les points suivants :	Mettre le sélecteur auto/manuel à la position manuel.
		Ouvrir les deux disjoncteurs avec le bouton d’ouverture situé sur les disjoncteurs.
		Mettre le sélecteur TTL/Normal/TTR à la position Normal.
		Mettre le sélecteur de démarrage de la génératrice à la position d’arrêt (STOP).
2.	Vérifier si les voyants suivants sont allumés :	Voyant blanc, source normale
		Voyant vert, ouverture du disjoncteur principal de la source normale
		Voyant vert, ouverture du disjoncteur principal de la source alternative
		Voyant bleu, mode manuel
3.	Vérifier si les voyants suivants sont éteints :	Voyant blanc, source alternative
		Voyant orange, défaut du disjoncteur principal de la source normale
		Voyant orange, défaut du disjoncteur principal de la source alternative
		Voyant blanc, mode automatique
4.	Démarrer la génératrice en mettant le sélecteur de démarrage de la génératrice à la position de marche (START). Effectuer cet essai quand le voyant de la source disponible pour la génératrice est allumé.	
5.	Appuyer sur le bouton-poussoir rouge de fermeture du disjoncteur principal de la source normale sur la porte des opérateurs.	Le voyant vert d’ouverture du disjoncteur principal de la source normale s’éteindra
		Le voyant rouge de fermeture du disjoncteur principal de la source normale s’allumera
6.	Ouvrir le disjoncteur principal de la source normale à l’aide du bouton-poussoir vert d’ouverture sur la porte des opérateurs.	Le voyant rouge de fermeture du disjoncteur principal de la source normale s’éteindra
		Le voyant vert d’ouverture du disjoncteur principal de la source normale s’allumera
7.	Après deux secondes, appuyer sur le bouton-poussoir rouge de fermeture du disjoncteur principal de la source alternative sur la porte des opérateurs.	Le voyant vert d’ouverture du disjoncteur principal de la source alternative s’éteindra
		Le voyant rouge de fermeture du disjoncteur principal de la source alternative s’allumera
8.	Ouvrir le disjoncteur principal de la source alternative à l’aide du bouton-poussoir vert d’ouverture sur la porte des opérateurs.	Le voyant rouge de fermeture du disjoncteur principal de la source alternative s’éteindra
		Le voyant vert d’ouverture du disjoncteur principal de la source alternative s’allumera
9.	Mettre le sélecteur de démarrage de la génératrice à la position d’arrêt (STOP). La génératrice continuera à fonctionner jusqu’à l’expiration de la période de refroidissement.	
	REMARQUE : Si le bouton-poussoir de fermeture du disjoncteur principal de la source normale est enfoncé alors que le disjoncteur principal de la génératrice (source alternative) est fermé et que les conditions du relais de vérification de la synchronisation sont satisfaites, un transfert vers la source principal de service public (source normale) se produira, puisque c’est la préférence par défaut.	

Mode automatique

Les boutons-poussoirs de la porte des opérateurs ne feront pas fonctionner les disjoncteurs en mode automatique. La position du sélecteur de démarrage de la génératrice n’affecte pas le fonctionnement du système de l’automate en mode automatique.

Tableau 6 : Procédure d’essai en mode automatique pour un système principal à génératrice de base

1.	Effectuer les points suivants :	Mettre le sélecteur auto/manuel à la position manuel.
		Ouvrir les deux disjoncteurs avec le bouton d’ouverture situé sur les disjoncteurs.
		Mettre le sélecteur TTL/Normal/TTR à la position Normal.
		Mettre le sélecteur de démarrage de la génératrice à la position d’arrêt (STOP).
2.	Vérifier si les voyants suivants sont allumés :	Voyant blanc, source normale
		Voyant vert, ouverture du disjoncteur principal de la source normale
		Voyant vert, ouverture du disjoncteur principal de la source alternative
		Voyant bleu, mode manuel
3.	Vérifier si les voyants suivants sont éteints :	Voyant blanc, source alternative
		Voyant orange, défaut du disjoncteur principal de la source normale
		Voyant orange, défaut du disjoncteur principal de la source alternative
		Voyant blanc, mode automatique
4.	Mettre le sélecteur auto/manuel à la position auto. Le disjoncteur principal de la source normale se fermera.	
5.	Vérifier si les voyants suivants sont allumés :	Voyant blanc, mode automatique
		Voyant rouge, fermeture du disjoncteur principal de la source normale
		Voyant vert, ouverture du disjoncteur principal de la source alternative
6.	Vérifier si les voyants suivants sont éteints :	Voyant orange, échec du mode automatique
		Voyant orange, défaut du disjoncteur principal de la source normale
		Voyant orange, défaut du disjoncteur principal de la source alternative
		Voyant bleu, mode manuel
7.	Simuler une perte de la source normale en mettant le sélecteur TTL/Normal/TTR à la position TTL (Essai de transfert de la source de gauche) ou TTR (Essai de transfert de la source de droite), selon ce qui est la source normale. Le disjoncteur principal de la source normale s’ouvrira après le délai d’ouverture. Le signal de démarrage sera envoyé à la génératrice. Une fois la source de la géréatrice stabilisée, le disjoncteur de la génératrice se fermera.	
8.	Vérifier si les voyants suivants sont allumés :	Voyant vert, ouverture du disjoncteur principal de la source normale
		Voyant rouge, fermeture du disjoncteur principal de la source alternative
		Voyant blanc, source alternative
	REMARQUE : Le voyant blanc de la source normale sera éteint.	
9.	Simuler un retour de tension de la source normale en remettant le sélecteur TTL/Normal/TTR à la position Normal. Un retransfert à la source de service public va se produire. Après le délai de stabilisation, le disjoncteur de la génératrice s’ouvrira. Après le délai de fermeture, le disjoncteur de la source normale se fermera et la génératrice continuera à fonctionner jusqu’à l’expiration de la période de refroidissement.	

FRANÇAIS

Système principal à génératrice avec options standard

Cette section couvre les essais recommandés pour un système principal à génératrice avec des options standard. Ces options comprennent les sélecteurs de la transition fermée, de la vérification avec une charge et du retransfert automatique.

Mode manuel

Avec le sélecteur en mode manuel, un opérateur peut ouvrir et fermer chaque disjoncteur indépendamment à l'aide des boutons-poussoirs sur la porte des opérateurs.

Tableau 7 : Procédure d'essai en mode manuel pour un système principal à génératrice avec des options

1.	Effectuer les points suivants :	Mettre le sélecteur auto/manuel à la position manuel.
		Ouvrir les deux disjoncteurs avec le bouton d'ouverture situé sur les disjoncteurs.
		Mettre le sélecteur TTL/Normal/TTR à la position Normal.
		Mettre le sélecteur de démarrage de la génératrice à la position d'arrêt (STOP).
2.	Vérifier si les voyants suivants sont allumés :	Voyant blanc, source normale
		Voyant vert, ouverture du disjoncteur principal de la source normale
		Voyant vert, ouverture du disjoncteur principal de la source alternative
		Voyant bleu, mode manuel
3.	Vérifier si les voyants suivants sont éteints :	Voyant blanc, source alternative
		Voyant orange, défaut du disjoncteur principal de la source normale
		Voyant orange, défaut du disjoncteur principal de la source alternative
		Voyant blanc, mode automatique
4.	Démarrer la génératrice en mettant le sélecteur de démarrage de la génératrice à la position de marche (START). Effectuer cet essai quand le voyant de la source disponible pour la génératrice est allumé.	
5.	Appuyer sur le bouton-poussoir rouge de fermeture du disjoncteur principal de la source normale sur la porte des opérateurs.	Le voyant vert d'ouverture du disjoncteur principal de la source normale s'éteindra
		Le voyant rouge de fermeture du disjoncteur principal de la source normale s'allumera
6.	Appuyer sur le bouton-poussoir de fermeture du disjoncteur principal de la source alternative sur la porte des opérateurs. Dans un système de transition fermée avec un relais de vérification de synchronisation satisfait :	Le voyant vert d'ouverture du disjoncteur principal de la source alternative s'éteindra
		Le voyant rouge de fermeture du disjoncteur principal de la source alternative s'allumera
	Après deux secondes, le disjoncteur principal de la source normale s'ouvrira. Les voyants indicateurs pour le disjoncteur de la source normale changeront d'état.	
	REMARQUE : Si le relais de synchronisation n'est pas satisfait ou n'est pas installé, la commande de fermeture du disjoncteur principal de la source alternative sera ignorée.	
7.	Appuyer sur le bouton-poussoir de fermeture du disjoncteur principal de la source normale sur la porte des opérateurs. Dans un système de transition fermée avec un relais de vérification de synchronisation satisfait :	Le voyant vert d'ouverture du disjoncteur principal de la source normale s'éteindra
		Le voyant rouge de fermeture du disjoncteur principal de la source normale s'allumera
	Après deux secondes, le disjoncteur principal de la source alternative s'ouvrira. Les voyants indicateurs pour le disjoncteur de la source alternative changeront d'état.	
	REMARQUE : Si le relais de synchronisation n'est pas satisfait ou n'est pas installé, la commande de fermeture du disjoncteur principal de la source normale sera ignorée.	
8.	Mettre le sélecteur de démarrage de la génératrice à la position d'arrêt (STOP). La génératrice continuera à fonctionner jusqu'à l'expiration de la période de refroidissement.	

Mode automatique

Les boutons-poussoirs de la porte des opérateurs ne feront pas fonctionner les disjoncteurs en mode automatique. La position du sélecteur de démarrage de la génératrice n’affecte pas le fonctionnement du système de l’automate en mode automatique.

Tableau 8 : Procédure d’essai en mode automatique pour un système principal à génératrice avec des options

1.	Effectuer les points suivants :	Mettre le sélecteur auto/manuel à la position manuel.
		Ouvrir les deux disjoncteurs avec le bouton d’ouverture situé sur les disjoncteurs.
		Mettre le sélecteur TTL/Normal/TTR à la position Normal.
		Mettre le sélecteur de démarrage de la génératrice à la position d’arrêt (STOP).
2.	Vérifier si les voyants suivants sont allumés :	Voyant blanc, source normale
		Voyant vert, ouverture du disjoncteur principal de la source normale
		Voyant vert, ouverture du disjoncteur principal de la source alternative
		Voyant bleu, mode manuel
3.	Vérifier si les voyants suivants sont éteints :	Voyant blanc, source alternative
		Voyant orange, défaut du disjoncteur principal de la source normale
		Voyant orange, défaut du disjoncteur principal de la source alternative
		Voyant orange, échec du mode automatique
4.	Mettre le sélecteur auto/manuel à la position auto. Le disjoncteur principal de la source normale se fermera.	
5.	Vérifier si les voyants suivants sont allumés :	Voyant blanc, mode automatique
		Voyant rouge, fermeture du disjoncteur principal de la source normale
		Voyant vert, ouverture du disjoncteur principal de la source alternative
6.	Vérifier si les voyants suivants sont éteints :	Voyant orange, échec du mode automatique
		Voyant orange, défaut du disjoncteur principal de la source normale
		Voyant orange, défaut du disjoncteur principal de la source alternative
		Voyant bleu, mode manuel
7.	Simuler une perte de la source de service public en mettant le sélecteur TTL/Normal/TTR à la position TTL (Essai de transfert de la source de gauche) ou TTR (Essai de transfert de la source de droite), selon ce qui est la source normale. Le disjoncteur principal de la source normale s’ouvrira après le délai d’ouverture.	
	Le signal de démarrage sera envoyé à la génératrice. Une fois la source de la génératrice stabilisée, le disjoncteur de la génératrice se fermera.	
8.	Vérifier si les voyants suivants sont allumés :	Voyant vert, ouverture du disjoncteur principal de la source normale
		Voyant rouge, fermeture du disjoncteur principal de la source alternative
		Voyant blanc, source alternative
	REMARQUE : Le voyant blanc de la source normale sera éteint.	
9.	Simuler un retour de tension de la source normale en remettant le sélecteur TTL/Normal/TTR à la position Normal. Le retransfert à la source de service public se produira après l’expiration du délai de stabilisation pour la source de service public. Si le sélecteur de retransfert automatique en option est mis à la position d’arrêt, le retransfert sera suspendu jusqu’à ce qu’il soit mis à la position de marche.	
	Avec la transition ouverte, le disjoncteur de la génératrice s’ouvre. Après le délai de fermeture, le disjoncteur de la source normale se ferme.	
	Avec la transition fermée, le disjoncteur de la source normale se ferme. Deux secondes plus tard, le disjoncteur de la génératrice s’ouvre.	
	La génératrice continuera à fonctionner jusqu’à l’expiration de la période de refroidissement.	

Système principal-couplage-principal de base

Cette section couvre les essais recommandés pour un système à deux services publics avec un disjoncteur de couplage quand aucune option n'est installée. La fourniture de l'alimentation normale se fait par l'intermédiaire des disjoncteurs principaux de gauche et de droite vers des barres-bus de charge individuelles, avec le disjoncteur de couplage ouvert.

Mode manuel

Avec le sélecteur en mode manuel, un opérateur peut ouvrir et fermer chaque disjoncteur indépendamment à l'aide des boutons-poussoirs sur la porte des opérateurs. Seuls deux disjoncteurs peuvent être fermés en même temps, évitant ainsi une transition fermée. Après l'ouverture de n'importe lequel des disjoncteurs, un délai de deux secondes se produit avant qu'un disjoncteur puisse être fermé.

Tableau 9 : Procédure d'essai en mode manuel pour un système principal-couplage-principal de base

1.	Effectuer les points suivants :	Mettre le sélecteur auto/manuel à la position manuel.
		Ouvrir les deux disjoncteurs principaux et le disjoncteur de couplage avec le bouton d'ouverture situé sur les disjoncteurs.
		Mettre le sélecteur TTL/Normal/TTR à la position Normal.
2.	Vérifier si les voyants suivants sont allumés :	Voyant blanc, source de côté gauche
		Voyant blanc, source de côté droit
		Voyant vert, ouverture du disjoncteur principal de gauche
		Voyant vert, ouverture du disjoncteur principal de droite
		Voyant vert, ouverture du disjoncteur de couplage
		Voyant bleu, mode manuel
3.	Vérifier si les voyants suivants sont éteints :	Voyant orange, défaut du disjoncteur principal de gauche
		Voyant orange, défaut du disjoncteur principal de droite
		Voyant orange, défaut du disjoncteur de couplage
		Voyant blanc, mode automatique
4.	Appuyer sur le bouton-poussoir rouge de fermeture du disjoncteur principal de gauche sur la porte des opérateurs.	Le voyant vert d'ouverture du disjoncteur principal de gauche s'éteindra
		Le voyant rouge de fermeture du disjoncteur principal de gauche s'allumera
5.	Appuyer sur le bouton-poussoir rouge de fermeture du disjoncteur principal de droite sur la porte des opérateurs.	Le voyant vert d'ouverture du disjoncteur principal de droite s'éteindra
		Le voyant rouge de fermeture du disjoncteur principal de droite s'allumera
6.	Ouvrir le disjoncteur principal de gauche à l'aide du bouton-poussoir vert d'ouverture sur la porte des opérateurs. Les voyants d'état pour le disjoncteur principal de gauche passeront de rouge au vert.	
	Après deux secondes, appuyer sur le bouton-poussoir de fermeture du disjoncteur de couplage sur la porte des opérateurs.	Le voyant vert d'ouverture du disjoncteur de couplage s'éteindra
		Le voyant rouge de fermeture du disjoncteur de couplage s'allumera
7.	Ouvrir le disjoncteur principal de droite à l'aide du bouton-poussoir vert d'ouverture sur la porte des opérateurs. Les voyants d'état pour le disjoncteur principal de droite passeront du rouge au vert. Après deux secondes, fermer le disjoncteur principal de gauche. Les voyants d'état pour le disjoncteur principal de gauche passeront du vert au rouge.	
8.	Ouvrir le disjoncteur de couplage à l'aide du bouton-poussoir vert d'ouverture sur la porte des opérateurs. Les voyants d'état pour le disjoncteur de couplage passeront du rouge au vert.	
9.	Ouvrir le disjoncteur principal de gauche à l'aide du bouton-poussoir vert d'ouverture sur la porte des opérateurs. Les voyants d'état pour le disjoncteur principal de gauche passeront du rouge au vert.	

Mode automatique

Les boutons-poussoirs de la porte des opérateurs ne feront pas fonctionner les disjoncteurs en mode automatique.

Tableau 10 : Procédure d’essai en mode automatique pour un système principal-couplage-principal de base

1.	Effectuer les points suivants :	Mettre le sélecteur auto/manuel à la position manuel.
		Ouvrir les deux disjoncteurs principaux et le disjoncteur de couplage avec le bouton d’ouverture situé sur les disjoncteurs.
		Mettre le sélecteur TTL/Normal/TTR à la position Normal.
2.	Vérifier si les voyants suivants sont allumés :	Voyant blanc, source de côté gauche
		Voyant blanc, source de côté droit
		Voyant vert, ouverture du disjoncteur principal de gauche
		Voyant vert, ouverture du disjoncteur principal de droite
		Voyant vert, ouverture du disjoncteur de couplage
		Voyant bleu, mode manuel
3.	Vérifier si les voyants suivants sont éteints :	Voyant orange, défaut du disjoncteur principal de gauche
		Voyant orange, défaut du disjoncteur principal de droite
		Voyant orange, défaut du disjoncteur de couplage
		Voyant blanc, mode automatique
4.	Mettre le sélecteur auto/manuel à la position auto.	Les disjoncteurs principaux de droite et de gauche se fermeront
5.	Vérifier si les voyants suivants sont allumés :	Voyant blanc, mode automatique
		Voyant rouge, fermeture du disjoncteur principal de gauche
		Voyant vert, ouverture du disjoncteur de couplage
		Voyant rouge, fermeture du disjoncteur principal de droite
6.	Vérifier si les voyants suivants sont éteints :	Voyant orange, échec du mode automatique
		Voyant orange, défaut du disjoncteur principal de gauche
		Voyant orange, défaut du disjoncteur de couplage
		Voyant orange, défaut du disjoncteur principal de droite
		Voyant bleu, mode manuel
7.	Simuler une perte de la source de gauche en mettant le sélecteur TTL/Normal/TTR à la position de TTL (Essai de transfert de la source de gauche). Le disjoncteur principal de gauche s’ouvrira après le délai d’ouverture. Le délai de fermeture commence à temporiser une fois que le disjoncteur principal de gauche s’ouvre. Une fois le délai de fermeture terminé, le disjoncteur de couplage se fermera.	
8.	Simuler un retour de tension de la source de gauche en remettant le sélecteur TTL/Normal/TTR à la position Normal. Après le délai de stabilisation, le disjoncteur de couplage s’ouvrira. Après le délai de fermeture, le disjoncteur principal de gauche se fermera.	
9.	Simuler une perte de la source de droite en mettant le sélecteur TTL/Normal/TTR à la position de TTR (Essai de transfert de la source de droite). Le disjoncteur principal de droite s’ouvrira après le délai d’ouverture. Le délai de fermeture commence à temporiser une fois que le disjoncteur principal de droite s’ouvre. Une fois le délai de fermeture terminé, le disjoncteur de couplage se fermera.	
10.	Simuler un retour de tension de la source de droite en remettant le sélecteur TTL/Normal/TTR à la position Normal. Après le délai de stabilisation, le disjoncteur de couplage s’ouvrira. Après le délai de fermeture, le disjoncteur principal de droite se fermera	

Système principal-couplage-principal avec options standard

Cette section couvre les essais recommandés pour un système principal-couplage-principal avec des options standard. Ces options comprennent un SSP, le retransfert automatique et la transition fermée.

Les points 6, 7 et 8 ne concernent que les systèmes avec l’option de transition fermée. Si le système installé ne possède pas cette option, effectuer l’essai en mode manuel pour un système principal-couplage-principal de base, commençant à la page 41.

Mode manuel

Avec le sélecteur en mode manuel, un opérateur peut ouvrir et fermer chaque disjoncteur indépendamment à l’aide des boutons-poussoirs sur la porte des opérateurs. Le sélecteur SSP n’a pas d’impact sur le mode manuel.

Tableau 11 : Procédure d’essai en mode manuel pour un système principal-couplage-principal avec des options

1.	Effectuer les points suivants :	Mettre le sélecteur auto/manuel à la position manuel.
		Ouvrir les deux disjoncteurs principaux et le disjoncteur de couplage avec le bouton d’ouverture situé sur les disjoncteurs.
		Mettre le sélecteur TTL/Normal/TTR à la position Normal.
		Mettre le sélecteur (SSP) à la position d’arrêt (OFF).
		Mettre le sélecteur de retransfert à la position d’arrêt (OFF).
2.	Vérifier si les voyants suivants sont allumés :	Voyant blanc, source de côté gauche
		Voyant blanc, source de côté droit
		Voyant vert, ouverture du disjoncteur principal de gauche
		Voyant vert, ouverture du disjoncteur principal de droite
		Voyant vert, ouverture du disjoncteur de couplage
		Voyant bleu, mode manuel
3.	Vérifier si les voyants suivants sont éteints :	Voyant orange, défaut du disjoncteur principal de gauche
		Voyant orange, défaut du disjoncteur principal de droite
		Voyant orange, défaut du disjoncteur de couplage
		Voyant blanc, mode automatique
4.	Appuyer sur le bouton-poussoir rouge de fermeture du disjoncteur principal de gauche sur la porte des opérateurs.	Le voyant vert d’ouverture du disjoncteur principal de gauche s’éteindra
		Le voyant rouge de fermeture du disjoncteur principal de gauche s’allumera
5.	Appuyer sur le bouton-poussoir rouge de fermeture du disjoncteur principal de droite sur la porte des opérateurs.	Le voyant vert d’ouverture du disjoncteur principal de droite s’éteindra
		Le voyant rouge de fermeture du disjoncteur principal de droite s’allumera
6.	Appuyer sur le bouton-poussoir de fermeture du disjoncteur de couplage sur la porte des opérateurs. Dans un système de transition fermée avec un relais de vérification de synchronisation satisfait :	Le voyant vert d’ouverture du disjoncteur de couplage s’éteindra
		Le voyant rouge de fermeture du disjoncteur de couplage s’allumera
	REMARQUE : Si le relais de synchronisation n’est pas satisfait ou n’est pas installé, la commande de fermeture du disjoncteur de couplage sera ignorée. De même, si le sélecteur de transition fermée est à la position d’arrêt, la commande de fermeture du disjoncteur de couplage sera ignorée.	
	Dans les deux secondes, appuyer sur le bouton d’ouverture pour le disjoncteur principal de gauche.	Le voyant rouge de fermeture du disjoncteur principal de gauche s’éteindra
		Le voyant vert d’ouverture du disjoncteur principal de gauche s’allumera
	REMARQUE : À défaut d’avoir appuyé sur le bouton d’ouverture dans les deux secondes, le disjoncteur de couplage s’ouvrira.	
7.	Appuyer sur le bouton-poussoir de fermeture du disjoncteur principal de gauche sur la porte des opérateurs. Dans un système de transition fermée avec un relais de vérification de synchronisation satisfait :	Le voyant vert d’ouverture du disjoncteur principal de gauche s’éteindra
		Le voyant rouge de fermeture du disjoncteur principal de gauche s’allumera
	REMARQUE : Si le relais de synchronisation n’est pas satisfait ou n’est pas installé, la commande de fermeture du disjoncteur principal de gauche sera ignorée. De même, si le sélecteur de transition fermée est à la position d’arrêt, la commande de fermeture du disjoncteur principal de gauche sera ignorée.	
	Dans les deux secondes, appuyer sur le bouton d’ouverture pour le disjoncteur principal de droite.	Le voyant rouge de fermeture du disjoncteur principal de droite s’éteindra
		Le voyant vert d’ouverture du disjoncteur principal de droite s’allumera
	REMARQUE : À défaut d’avoir appuyé sur le bouton d’ouverture dans les deux secondes, le disjoncteur de couplage s’ouvrira.	
8.	Appuyer sur le bouton-poussoir rouge de fermeture du disjoncteur principal de droite sur la porte des opérateurs. Dans un système de transition fermée avec un relais de vérification de synchronisation satisfait :	Le voyant vert d’ouverture du disjoncteur principal de droite s’éteindra
		Le voyant rouge de fermeture du disjoncteur principal de droite s’allumera
	Attendre deux secondes et le disjoncteur de couplage s’ouvrira, ou ouvrir le disjoncteur de couplage à l’aide du bouton-poussoir sur la porte des opérateurs.	

Mode automatique

Les boutons-poussoirs de la porte des opérateurs ne feront pas fonctionner les disjoncteurs principaux en mode automatique.

Tableau 12 : Procédure d’essai en mode automatique pour un système principal-couplage-principal avec des options

<table>
<tr><td rowspan="5">1.</td><td colspan="2" rowspan="5">Effectuer les points suivants :</td><td colspan="3">Mettre le sélecteur auto/manuel à la position manuel.</td></tr>
<tr><td colspan="3">Ouvrir les deux disjoncteurs principaux et le disjoncteur de couplage avec le bouton d’ouverture situé sur les disjoncteurs.</td></tr>
<tr><td colspan="3">Mettre le sélecteur TTL/Normal/TTR à la position Normal.</td></tr>
<tr><td colspan="3">Mettre le sélecteur (SSP) à la position d’arrêt (OFF).</td></tr>
<tr><td colspan="3">Mettre le sélecteur de retransfert automatique à la position d’arrêt (OFF).</td></tr>
<tr><td rowspan="6">2.</td><td colspan="2" rowspan="6">Vérifier si les voyants suivants sont allumés :</td><td colspan="3">Voyant blanc, source de côté gauche</td></tr>
<tr><td colspan="3">Voyant blanc, source de côté droit</td></tr>
<tr><td colspan="3">Voyant vert, ouverture du disjoncteur principal de gauche</td></tr>
<tr><td colspan="3">Voyant vert, ouverture du disjoncteur principal de droite</td></tr>
<tr><td colspan="3">Voyant vert, ouverture du disjoncteur de couplage</td></tr>
<tr><td colspan="3">Voyant bleu, mode manuel</td></tr>
<tr><td rowspan="4">3.</td><td colspan="2" rowspan="4">Vérifier si les voyants suivants sont éteints :</td><td colspan="3">Voyant orange, défaut du disjoncteur principal de gauche</td></tr>
<tr><td colspan="3">Voyant orange, défaut du disjoncteur principal de droite</td></tr>
<tr><td colspan="3">Voyant orange, défaut du disjoncteur de couplage</td></tr>
<tr><td colspan="3">Voyant blanc, mode automatique</td></tr>
<tr><td rowspan="6">4.</td><td colspan="5">Mettre le sélecteur auto/manuel à la position auto. Deux disjoncteurs se fermeront, selon les options installées et les réglages. Les conditions normales varient avec le SSP. Le tableau ci-dessous énumère les conditions normales.</td></tr>
<tr><td colspan="2">Position du sélecteur de source préférée</td><td colspan="3">Conditions des disjoncteurs</td></tr>
<tr><td colspan="2">Gauche</td><td colspan="3">Disjoncteur principal de gauche fermé, disjoncteur de couplage fermé,
Disjoncteur principal de droite ouvert</td></tr>
<tr><td colspan="2">Droite</td><td colspan="3">Disjoncteur principal de droite fermé, disjoncteur de couplage fermé,
Disjoncteur principal de gauche ouvert</td></tr>
<tr><td colspan="2">Arrêt</td><td colspan="3">Disjoncteurs principaux de gauche et de droite fermés, disjoncteur de couplage ouvert</td></tr>
<tr><td colspan="2">Non installé</td><td colspan="3">Disjoncteurs principaux de gauche et de droite fermés, disjoncteur de couplage ouvert</td></tr>
<tr><td>5.</td><td colspan="5">Mettre le sélecteur (SSP) à la position d’arrêt (OFF), si présent. À ce stade, les disjoncteurs principaux devraient être fermés (voyants rouges) et le disjoncteur de couplage devrait être ouvert (voyant vert).</td></tr>
<tr><td>6.</td><td colspan="5">Simuler une perte de la source de gauche en mettant le sélecteur TTL/Normal/TTR à la position de TTL (Essai de transfert de la source de gauche). Le disjoncteur principal de gauche s’ouvrira (voyant vert) après le délai d’ouverture. Le disjoncteur de couplage se fermera (voyant rouge) après le délai de fermeture.</td></tr>
<tr><td rowspan="5">7.</td><td colspan="5">Simuler un retour de la source de gauche en mettant le sélecteur TTL/Normal/TTR à la position de Normal. Ce qui se produit ensuite dépend des options installées et de leurs réglages. Se reporter au tableau suivant.</td></tr>
<tr><td>Position du SSP</td><td>Retransfert en marche/à l’arrêt</td><td>Type de transition</td><td colspan="2">Séquence</td></tr>
<tr><td>À l’arrêt ou non installé</td><td>Arrêt</td><td>Ouverte ou fermée</td><td colspan="2">Le système ne change pas d’état</td></tr>
<tr><td>À l’arrêt ou non installé</td><td>En marche ou non installé</td><td>Ouverte</td><td colspan="2">Après le délai de stabilisation, le disjoncteur de couplage s’ouvre. Après le délai de fermeture, le disjoncteur principal de gauche se ferme.</td></tr>
<tr><td>À l’arrêt ou non installé</td><td>En marche ou non installé</td><td>Fermée</td><td colspan="2">Après le délai de stabilisation, le disjoncteur principal de gauche se ferme. Deux secondes plus tard, le disjoncteur de couplage s’ouvre.</td></tr>
<tr><td>8.</td><td colspan="5">Simuler une perte de la source de droite en mettant le sélecteur TTL/Normal/TTR à la position de TTR (Essai de transfert de la source de droite). Le disjoncteur principal de droite s’ouvrira après le délai d’ouverture. Le délai de fermeture commence à temporiser une fois que le disjoncteur de la source normale s’ouvre. Après que le délai de fermeture s’est écoulé, le disjoncteur de couplage ou celui de gauche, selon celui qui était ouvert, se fermera.</td></tr>
<tr><td rowspan="5">9.</td><td colspan="5">Simuler un retour de la source de droite en mettant le sélecteur TTL/Normal/TTR à la position de Normal. Ce qui se produit ensuite dépend des options installées et de leurs réglages. Se reporter au tableau suivant.</td></tr>
<tr><td>Position du SSP</td><td>Retransfert en marche / à l’arrêt</td><td>Type de transition</td><td colspan="2">Séquence</td></tr>
<tr><td>À l’arrêt ou non installé</td><td>Arrêt</td><td>Ouverte ou fermée</td><td colspan="2">Le système ne change pas d’état</td></tr>
<tr><td>À l’arrêt ou non installé</td><td>En marche ou non installé</td><td>Ouverte</td><td colspan="2">Après le délai de stabilisation, le disjoncteur de couplage s’ouvre. Après le délai de fermeture, le disjoncteur principal de droite se ferme.</td></tr>
<tr><td>À l’arrêt ou non installé</td><td>En marche ou non installé</td><td>Fermée</td><td colspan="2">Après le délai de stabilisation, le disjoncteur principal de droite se ferme. Deux secondes plus tard, le disjoncteur de couplage s’ouvre.</td></tr>
</table>

Tableau 12 : Procédure d’essai en mode automatique pour un système principal-couplage-principal avec des options *(suite)*

<table>
<tr><td>10.</td><td colspan="4">Mettre le SSP à la position de gauche, si présent. Le système changera d’état, si nécessaire, pour avoir la configuration correcte—avec les disjoncteurs de gauche et de couplage fermés et le disjoncteur de droite ouvert.</td></tr>
<tr><td>11.</td><td colspan="4">Simuler une perte de la source de gauche en mettant le sélecteur TTL/Normal/TTR à la position de TTL. Le disjoncteur principal de gauche s’ouvrira (voyant vert) après le délai d’ouverture. Le disjoncteur principal de droite se fermera (voyant rouge) après le délai de fermeture. Le disjoncteur de couplage restera fermé.</td></tr>
<tr><td rowspan="5">12.</td><td colspan="4">Simuler un retour de la source de gauche en mettant le sélecteur TTL/Normal/TTR à la position de Normal. Ce qui se produit ensuite dépend des options installées et de leurs réglages. Se reporter au tableau suivant.</td></tr>
<tr><td>Position du SSP</td><td>Retransfert en marche / à l’arrêt</td><td>Type de transition</td><td>Séquence</td></tr>
<tr><td>Gauche</td><td>Arrêt</td><td>Ouverte ou fermée</td><td>Le système ne change pas d’état</td></tr>
<tr><td>Gauche</td><td>En marche ou non installé</td><td>Ouverte</td><td>Après le délai de stabilisation, le disjoncteur principal de droite s’ouvre. Après le délai de fermeture, le disjoncteur principal de gauche se ferme.</td></tr>
<tr><td>Gauche</td><td>En marche ou non installé</td><td>Fermée</td><td>Après le délai de stabilisation, le disjoncteur principal de gauche se ferme. Deux secondes plus tard, le disjoncteur principal de droite s’ouvre.</td></tr>
<tr><td>13.</td><td colspan="4">Mettre le SSP à la position de droite, si présent. Le système changera d’état, si nécessaire, pour avoir une configuration correcte—avec les disjoncteurs de droite et de couplage fermés et le disjoncteur de gauche ouvert. Le disjoncteur de couplage restera fermé.</td></tr>
<tr><td>14.</td><td colspan="4">Simuler une perte de la source de droite en mettant le sélecteur TTL/Normal/TTR à la position de TTR. Le disjoncteur principal de droite s’ouvrira (voyant vert) après le délai d’ouverture. Le disjoncteur principal de gauche se fermera (voyant rouge) après le délai de fermeture. Le disjoncteur de couplage restera fermé.</td></tr>
<tr><td rowspan="5">15.</td><td colspan="4">Simuler un retour de la source de droite en mettant le sélecteur TTL/Normal/TTR à la position de Normal. Ce qui se produit ensuite dépend des options installées et de leurs réglages. Se reporter au tableau suivant.</td></tr>
<tr><td>Position du SSP</td><td>Retransfert en marche / à l’arrêt</td><td>Type de transition</td><td>Séquence</td></tr>
<tr><td>Droit</td><td>Arrêt</td><td>Ouverte ou fermée</td><td>Le système ne change pas d’état</td></tr>
<tr><td>Droit</td><td>En marche ou non installé</td><td>Ouverte</td><td>Après le délai de stabilisation, le disjoncteur principal de gauche s’ouvre Après le délai de fermeture, le disjoncteur principal de droite se ferme.</td></tr>
<tr><td>Droit</td><td>En marche ou non installé</td><td>Fermée</td><td>Après le délai de stabilisation, le disjoncteur principal de droite se ferme Deux secondes plus tard, le disjoncteur principal de gauche s’ouvre.</td></tr>
</table>

FRANÇAIS

Dépannage et entretien

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Déconnectez toutes les sources d'alimentation avant d'effectuer des inspections visuelles, des essais ou des procédures d'entretien.
- Présumez que tous les circuits sont sous tension tant qu'ils n'ont pas été complètement mis hors tension, vérifiés, mis à la terre et étiquetés.
- Utilisez un dispositif de détection de tension ayant une valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Vérifiez toutes les sources d'alimentation, y compris la possibilité de rétro-alimentation.

Si ces directives ne sont pas respectées, cela entraînera la mort, des blessures graves ou des dommages matériels.

Remplacement des fusibles

Le système de l'alimentation de contrôle est alimenté à partir de sources multiples, y compris un système d'alimentation sans coupure (UPS). Mettre hors tension tous les sectionneurs de l'alimentation de contrôle et l'UPS avant de retirer les fusibles. Vérifier que toute l'alimentation est coupée à l'aide d'un dispositif de détection de tension ayant une valeur nominale appropriée. Les fusibles sont situés dans les sectionneurs de l'alimentation de contrôle et dans les blocs de fusibles montés sur rail DIN munis d'indicateurs lumineux de fusibles fondus. Remplacer les fusibles par des fusibles de type et d'intensité nominale identiques.

Vérification des ampoules

Sans l'option pousser-pour-vérifier

Tous les voyants sont des DÉL protégées, à longue durée de vie. Si une DÉL ne s'allume pas, remplacez le module de la DÉL par un du même type.

REMARQUE : Les ampoules à diodes électroluminescentes (DÉL) ne sont pas remplaçables. Si une DÉL est sous tension mais ne s'allume pas, il faut remplacer le module de la DÉL. Avant de faire ce remplacement, mettre tout le système de transfert automatique hors tension. **Ne pas retirer les fils raccordés à un module à DÉL tant que le système est sous tension.** Le fait de déconnecter le module d'une DÉL alors que le système est sous tension peut entraîner l'ouverture d'un disjoncteur fermé.

Avec l'option pousser-pour-vérifier

1. Appuyer sur le bouton-poussoir pousser-pour-vérifier. Toutes les ampoules sur la porte des opérateurs devraient s'allumer.
2. Remplacer les ampoules qui ne s'allument pas.

Tableau de dépannage

Tout travail doit être accompli par des électriciens qualifiés.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez l'alimentation de l'appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension ayant une valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Vérifiez toutes les sources d'alimentation, y compris la possibilité de rétro-alimentation.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Tableau 13 : Dépannage

Condition	Cause possible	Action suggérée
Perte d'alimentation de contrôle	Fusible(s) défectueux	Identifer et corriger la cause de surcharge ou de défaut. Remplacer les fusibles.
	Disjoncteur CB1 hors tension	Vérifier le disjoncteur monté sur rail DIN sur la cuve d'assemblage de l'automate. S'il est hors tension, le mettre sous tension. S'il est déclenché, identifier et corriger la cause de surcharge ou du défaut. Réarmer le disjoncteur.
Voyant de vérification la pile de l'UPS ou de l'automate (CHK UPS OR PLC BATT) allumé	Pile de l'automate déchargée	Si le voyant de la pile sur la face avant de l'automate est allumé, suivre les directives du guide de l'utilisateur de l'automate Modicon® pour remplacer la pile.
	Pile de l'UPS déchargée	Vérifier les indicateurs d'état de l'UPS afin de déterminer si la pile de l'UPS a déclenché l'alarme.
Ressorts du disjoncteur non armés	Fusible d'entrée défectueux	Identifer et corriger la cause de surcharge ou de défaut. Remplacer les fusibles.
Le voyant rouge ou vert d'état des disjoncteurs n'est pas allumé	Ampoule défectueuse	Vérifier l'ampoule ou le module à DÉL, remplacer si nécessaire. (Utiliser le bouton pousser-pour-vérifier lorsque disponible.)
	Alimentation de contrôle non disponible	Voir Perte d'alimentation de contrôle
Le voyant blanc de source n'est pas allumé, mais la source est disponible	Ampoule défectueuse	Vérifier l'ampoule ou le module à DÉL, remplacer si nécessaire. (Utiliser le bouton pousser-pour-vérifier lorsque disponible.)
	Fusible défectueux	Le voyant peut être éteint si un ou des fusibles des sectionneurs du moniteur de la qualité de l'alimentation (système de détection de tension [VDS] désigné) sont défectueux. Voir Perte d'alimentation de contrôle.
	Le sélecteur TTL/Normal/TTR n'est pas à la position Normal	Remettre le sélecteur à la position Normal.
	Les moniteurs de la qualité de l'alimentation ne sont pas satisfaits	Consulter d'autres compteurs ou moniteurs de tension afin de déterminer si la tension se trouve dans les limites des relais de tension et de fréquence, y compris la rotation appropriée des phases.
La source normale est perdue, mais le transfert ne s'est pas produit	Le disjoncteur principal s'est déclenché à cause d'un défaut	L'indicateur de déclenchement sur chaque disjoncteur notera le type de défaut qui s'est produit. Identifer et corriger la cause de surcharge ou de défaut. Réarmer le disjoncteur.
	Le système n'est pas en mode automatique	Vérifier si le sélecteur auto/manuel est à la position auto et si le voyant blanc auto est allumé.
	La source alternative n'est pas disponible	Le système n'effectuera pas de transfert à une source non disponible. Vérifier la disponibilité du service public ou la fonctionnalité de la génératrice.

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Tableau 13 : Dépannage *(suite)*

Le voyant orange d'échec du mode automatique (Auto Fail) est allumé	Il a été appuyé sur le bouton d'ouverture ou de fermeture	Mettre le sélecteur auto/manuel à la position manuel puis à la position auto pour réarmer le système. **REMARQUE :** Les disjoncteurs peuvent changer d'état pour retourner à l'état normal.
	Disjoncteur débroché	Le système restera hors service jusqu'à ce que tous les disjoncteurs principaux soient à la même position, raccordés ou à l'essai. Mettre le sélecteur auto/manuel à la position manuel puis le remettre à la position auto pour réarmer.
	Disjoncteur principal déclenché	Identifer et corriger la cause de surcharge ou de défaut. Réarmer le disjoncteur. Mettre le sélecteur auto/manuel à la position manuel et le remettre à la position auto pour réarmer le système d'échec du mode automatique.
	L'automate a déterminé une erreur dans le programme interne de l'automate	Une erreur interne de l'automate ou de l'UC sera indiquée par la DÉL sur l'UC. Consulter le guide de l'utilisateur de l'automate Modicon pour plus d'informations.
Source transférée sans raison	Perte ou creux de tension temporaire	Si des voltmètres enregistreurs ne sont pas installés, s'adresser aux services publics afin de savoir si une coupure momentanée s'est produite. Une tension très en dessous du point de consigne du moniteur d'alimentation peut entraîner un opération de transfert.
La génératrice n'a pas démarré	Signal non envoyé	Effectuer l'essai manuel. Surveiller le voyant 6 de sortie de l'automate sur le module 1 de sorties. Il devrait normalement être allumé et il s'éteindra au moment de l'envoi de la commande de démarrage de la génératrice. S'il ne s'éteint pas, contacter les services de maintenance Square D.
	Signal non reçu	Vérifier les raccordements de câblage entre le relais de temporisation et l'ensemble génératrice.
	Signal reçu, la génératrice ne démarre pas	Se reporter à la documentation du système de la génératrice.
Un système de transition fermée a suivi une séquence d'ouverture	Relais de vérification de la synchronisation non satisfait	Fusibles d'entrée du relais de vérification de la synchronisation défectueux. Identifer et corriger la cause de surcharge ou de défaut. Remplacer le fusible.
		Les sources ne sont pas synchronisées. Consulter le fournisseur de l'alimentation.

FRANÇAIS

Liste des valeurs et arrangements standard

Cette liste contient les réglages standard installés à l'usine, y compris les options programmées. Si ces valeurs ne concernent pas votre appareil, noter les différences dans ces directives d'utilisation.

Tous les systèmes

Tableau 14 : Réglages du système

Retard d'ouverture	3 secondes La temporisation commence après la mise hors tension du moniteur de la qualité de l'alimentation.
Retard de fermeture	2 secondes La temporisation commence après l'ouverture d'un disjoncteur.
Délai de transfert—Transition ouverte	Délai d'ouverture plus délai de fermeture.
Délai de transfert—Transition fermée	2 secondes maximum quand les sources sont synchronisées
Relais de vérification de la synchronisation[1]	10 à 30 % de la tension nominale
	6 à 20 % de l'angle de phase
	REMARQUE : La tension ainsi que l'angle de phase sont modifiés par un potentiomètre.
Temporisateur de stabilisation des sources	10 secondes pour retransférer à la source préférée.
Moniteur de la qualité de l'alimentation[1]	Sous-tension de 15 % (fixe)
	Déséquilibre de phase de 5 à 15 %
	Retard de 0 à 10 secondes

[1] Les réglages peuvent être ajustés sur place.

Tableau 15 : Configuration du système

Système	Source normale	Source alternative
Principal à principal, principal à génératrice	Disjoncteur principal de gauche	Disjoncteur principal de droite
Principal-couplage-principal	Les deux disjoncteurs principaux de gauche et de droite, avec le disjoncteur de couplage ouvert	Disjoncteur principal de gauche ou de droite, avec le disjoncteur de couplage fermé

Systèmes à génératrice

Tableau 16 : Réglages du système à génératrice

Relais 81[1]	Surfréquence de 50 à 70 Hz Différentiel de 0,1 à 3 Hz
	Surfréquence de 50 à 70 Hz Différentiel de 0,1 à 3 Hz
Relais 59[1]	Surtension de 100 à 125 % Différentiel de 1 à 15 %
Options de la génératrice (non réglables sur place, sauf avec un écran tactile en option)	Période de refroidissement : 15 minutes (sans charge)
	Période de vérification : 30 minutes par semaine (avec ou sans charge). Commence le dimanche à 13 h.

[1] Les réglages peuvent être ajustés sur place.

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Raccordement aux disjoncteurs

Raccordement aux disjoncteurs

Le câblage vers les disjoncteurs installé à l’usine comprend des bobines d’ouverture et de fermeture, des contacts d’état des disjoncteurs et des contacts d’indication de défauts, ainsi que d’autres accessoires spécifiés. Pour les modifications sur place, se reporter au manuel du disjoncteur approprié. Pour des informations spécifiques sur chacun des disjoncteurs, se reporter aux directives d’utilisation respectives.

Références

Les plans d’approbation donnent les détails des interconnexions de câblage, y compris les options installées, uniques à chaque installation de système de transfert de source automatique. Schneider Electric a fourni un jeu de plans avec l’appareil.

Contacter les services Square D ou le centre d’informations de la clientèle au 1-888-778-2733 (É.-U.) pour de l’aide à la mise en service ou des questions générales au sujet d’une installation spécifique.

La plupart des directives d’utilisation et autres documents peuvent être obtenus du centre d’obtention de documentation en ligne et de la bibliothèque technique de Schneider Electric à www.us.SquareD.com.

Journal d’entretien

Tableau 17 : Journal d’entretien

Date	Description

Modicon®, Power-Style® et Square D® sont marques déposées de Schneider Electric. Toutes autres marques commerciales utilisées dans ce document sont la propriété de leurs propriétaires respectifs.

Seul un personnel qualifié doit effectuer l'installation, l'utilisation, l'entretien et la maintenance du matériel électrique. Schneider Electric n'assume aucune responsabilité des conséquences éventuelles découlant de l'utilisation de cette documentation.

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Sistemas de transferencia automática con PLC
Systèmes de transfert automatique avec automate

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80330-001-04 07/2010
Replaces 80330-001-03 07/2007

Importado en México por:
Schneider Electric México, S.A. de C.V.
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80330-001-04 07/2010
Reemplaza 80330-001-03 07/2007

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Power-Style™

QED-2 Switchboards / Tableros de distribución tipo autosoportado QED-2 / Panneaux de commutation QED-2

Instruction Bulletin / Boletín de instrucciones / Directives d'utilisation

80043-055-12
05/2015

Retain for future use. / Conservar para uso futuro. / À conserver pour usage ultérieur.

by Schneider Electric

Power-Style™ QED-2 Switchboards

Class 2700

Instruction Bulletin

80043-055-12
05/2015

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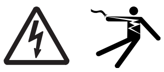
Retain for future use.

SQUARE D™
by Schneider Electric

Hazard Categories and Special Symbols

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER
DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING
WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION
CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE
NOTICE is used to address practices not related to physical injury. The safety alert symbol is not used with this signal word.

NOTE: Provides additional information to clarify or simplify a procedure.

Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

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Section 1—Introduction

This manual contains instructions for the proper installation, operation, and maintenance of Power-Style™ QED-2 switchboard equipment manufactured by Schneider Electric. Engineering, installation, and operating staff supervisors should familiarize themselves with this manual and become acquainted with the appearance and characteristics of each piece of equipment mounted or contained in the switchboard.

These instructions and procedures apply to Power-Style QED-2 switchboard installations by Schneider Electric. When special features or non-standard components are incorporated in the switchboard, detailed instructions for these components are included in the instruction material holder.

NOTE: There are references to Series 2 switchboards in several places in this instruction bulletin. To determine if the QED-2 switchboard is a Series 2 model, check the rating nameplate located on the front cover. If the switchboard is a Series 2 model, the nameplate indicates that. If it is not a Series 2 model, there is not a Series designation.

Inspection and Packaging

Every Power-Style QED-2 switchboard is carefully inspected and packaged at the assembly plant. Construction of the switchboard is checked, both structurally and electrically, for compliance with all specifications, codes, and standards. After a complete inspection, the switchboard is prepared for shipment. Each section is shipped separately for easier handling before installation. The factory order number, an identification number, and the shipping weights are plainly marked on each shipping section.

Document Replacement

Contact your local Schneider Electric representative to replace lost or damaged wiring diagrams and instruction sheets. Use the factory order number as a reference.

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Section 2—Safety Precautions

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must be installed and serviced only by qualified personnel.
- Perform such work only after reading and understanding all of the instructions contained in this bulletin.
- Turn off all power supplying this equipment before working on or inside equipment.
- Before performing visual inspections, tests, or maintenance on this equipment, disconnect all sources of electric power. Assume all circuits are live until they are de-energized, tested, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Always use a properly rated voltage sensing device to confirm power is off.
- Practice lock-out/tag-out procedures according to OSHA requirements.
- Handle this equipment carefully and install, operate, and maintain it correctly in order for it to function properly. Neglecting fundamental installation and maintenance requirements may lead to personal injury, as well as damage to equipment or other property.
- Carefully inspect your work area and remove any tools and objects left inside the equipment.
- Replace all devices, doors, and covers before turning on power to this equipment.
- All instructions in this manual assume that the customer has taken these measures before performing maintenance or testing.

Failure to follow these instructions will result in death or serious injury.

Section 3—Receiving, Handling, and Storing

Receiving

Upon receipt, check the packing list against the equipment received to ensure the order and shipment are complete. Also upon receipt, immediately inspect switchboard sections for any damage that occurred in transit. If damage is found or suspected, file a claim with the carrier immediately and notify the nearest Schneider Electric representative.

Handling

⚠ WARNING

SPECIAL HANDLING REQUIREMENTS

- Do not lay the equipment on its front or sides.
- Lay equipment only on its back when special handling is required.
- Do not ship the equipment lying down.

Failure to follow these instructions can result in serious injury or equipment damage.

Ensure that proper equipment, such as an overhead crane, is available at the installation site to handle the switchboard. This equipment helps avoid injury to personnel and damage to the switchboard.

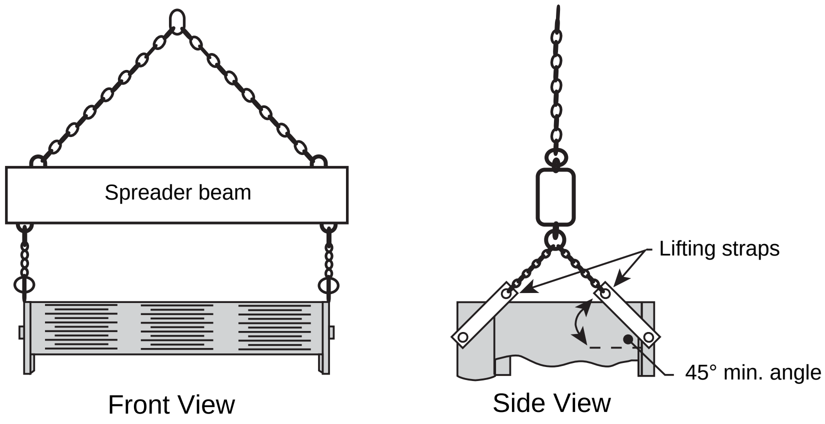
The shipping weight of each shipping section is marked on the packing list. Verify the lifting capacity of the equipment being used to handle the switchboard in accordance with the shipping weight of each shipping section. Keep the switchboard upright during handling.

Schneider Electric recommends using an overhead crane, lifting straps, and cables or chains to handle the switchboard. This method and alternative handling methods are discussed in this section.

Handling with Lifting Straps

Schneider Electric provides lifting straps as standard equipment for NEMA Type 1 switchboard shipping sections rated 3,000 A or less. Instruction labels on each shipping section include drawings and written instructions outlining the proper use of the lifting straps (Figure 1). Use rigid spreaders or a spanner bar to provide vertical lift on the lifting straps. This helps avoid damage to the frame or finish.

Figure 1 – Lifting with an Overhead Crane, Lifting Straps, and Cables or Chains



Follow these instructions to handle the switchboard:

1. Use load-rated cables or chains with safety hooks or shackles. Do not pass cables or chains through holes in lifting straps.
2. Use a load-rated spreader beam to prevent structure damage. Rig so that the minimum angle between the lifting cables or chains and equipment top is 45 degrees.

Follow these instructions for laying equipment on its back:

1. Remove shipping skid and equipment back covers.
2. Use overhead cranes, lifting straps, and cables or chains for laying equipment on its back.
3. Rate of drop or pickup for laying equipment on its back is four feet per minute or less.
4. Reverse the procedure to stand the equipment in its upright position.
5. Reinstall back covers.

The warning label (Figure 2) is attached to both the front and rear of the switchboard.

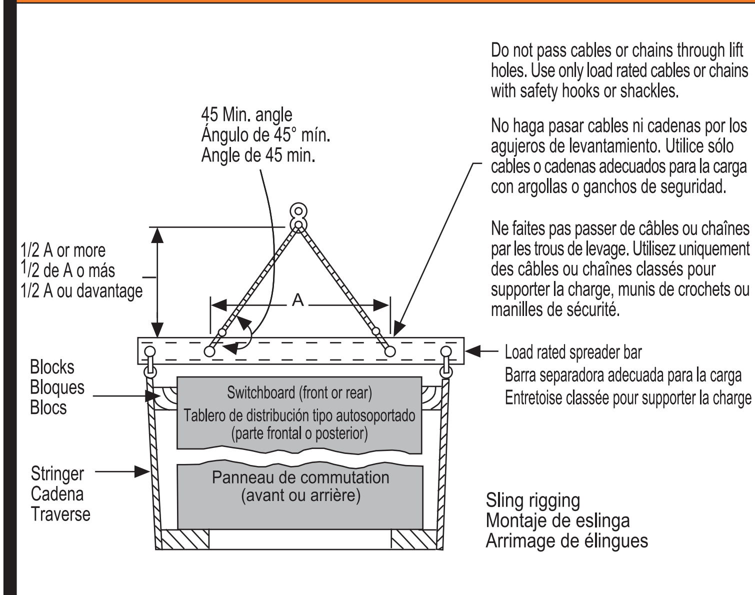
Figure 2 – Warning Label, Rainproof Switchboards

Handling without Lifting Straps

Lifting straps are not furnished on shipping sections rated more than 3,000 A, or on rainproof switchboards. Use rollers, slings, or other means to handle the shipping sections. The handling label (Figure 3) is affixed to each of these sections.

Figure 3 – Handling Instruction Label, Switchboards without Lifting Straps

WARNING / ADVERTENCIA / AVERTISSEMENT



TOP HEAVY LOAD HAZARD OF TIPPING

- This equipment must be moved by a sling, chain or rollers.
- Stabilize the shipping section to prevent tipping.
- Do not work under, around or on this equipment while elevated or moving.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

CARGA PESADA EN LA PARTE SUPERIOR PELIGRO DE QUE SE CAIGA LA CARGA

- Este equipo debe moverse con una eslinga, cadena o rodillos.
- Estabilice la sección de embarque para evitar voltearla.
- No trabaje debajo, alrededor o sobre el equipo mientras se está elevando o moviendo.

El incumplimiento de estas instrucciones puede causar la muerte, lesiones serias o daño al equipo.

CHARGE INSTABLE RISQUE DE RENVERSEMENT DE CHARGE

- Cet appareil doit être déplacé à l'aide d'une élingue, d'une chaîne ou de roulettes.
- Stabilisez la section de transport afin d'éviter qu'il ne bascule.
- Ne travaillez pas en dessous, autour ou sur cet appareil pendant qu'il est soulevé ou déplacé.

Si ces directives ne sont pas respectées, cela peut entraîner la mort, des blessures graves ou des dommages matériels.

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⚠ WARNING

TOP HEAVY LOAD—HAZARD OF TIPPING

- Stabilize the shipping section to reduce the possibility of tipping.
- Consult with a certified rigging and lifting expert for any situation not covered in these instructions.

Failure to follow these instructions can result in death or serious injury.

When elevating a shipping section not equipped with lifting straps, use an overhead crane equipped with either of the following:

- A chain coupled to a sling rigging
- A wire cable with safety hooks and shackles

Wrap the sling completely around the switchboard and shipping stringers.

NOTE: A forklift is an alternative method of handling the switchboard. Always check the fork lengths to ensure that the forks extend under the entire switchboard. Carefully balance the load, and always use a safety strap when handling or moving a switchboard with a forklift (Figure 4 on page 15).

Storing

When storing the switchboard before installation, cover the top and openings of the equipment during the construction period to protect the switchboard from dust and debris.

If a switchboard is not installed and energized immediately, store it in a clean, dry space with a consistent temperature to prevent condensation. Store the switchboard indoors, if possible. Preferably, store it in a heated building with adequate air circulation and protect it from dirt, fumes, water, and physical damage. Storing the switchboard outdoors can cause harmful condensation inside the switchboard.

NOTE: Install portable electric heaters of approximately 250 watts per vertical section in both indoor-type and rainproof-type switchboard enclosures for adequate protection during storage.

Before energizing the space heaters, remove all loose packing or flammable materials inside the switchboard. Outdoor switchboards are not weather-resistant until completely and properly installed; treat them the same as indoor switchboards until after installation.

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Figure 4 – Forklift Safety Label

⚠ WARNING

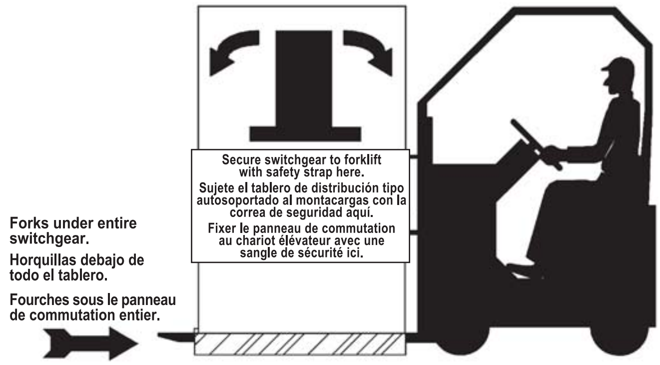
HAZARD OF EQUIPMENT DAMAGE
• Secure to forklift with safety strap.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ ADVERTENCIA

PELIGRO DE DAÑO AL EQUIPO
• Sujete al montacargas con la correa de seguridad.
El incumplimiento de estas instrucciones puede causar la muerte, lesiones serias o daño al equipo.

⚠ AVERTISSEMENT

RISQUE DE BLESSURES OU DE DOMMAGES MATÉRIELS
• Fixer au chariot élévateur avec une sangle de sécurité.
Si ces directives ne sont pas respectées, cela peut entrainer la mort ou des blessures graves ou des dommages matériels.



Remove label after installation.
Retire la etiqueta después de la instalación.
Enlever l'étiquette après l'installation.

Special Handling Requirements
Do not lay the equipment on its front or sides. Doing so will damage unit.
Lay equipment only on its back when special handling is required.
See Instruction Bulletin for special handling instructions for laying equipment on its back.
Equipment is NOT to be shipped lying down.
Failure to follow these instructions can result in death, serious injury or equipment damage.

Requisitos especiales de manejo
No coloque el equipo sobre su frente o lados ya que podría dañarse la unidad.
Coloque el equipo sobre su parte posterior solamente cuando sea necesario manejarlo de manera especial.
Consulte el boletín para obtener las instrucciones especiales de manejo para colocar el equipo sobre su parte posterior.
El equipo NO deberá transportarse acostado.
El incumplimiento de estas instrucciónes puede causar la muerte, lesiones serias o daño al equipo.

Exigences de manutention spéciales
Ne couchez pas l'appareil sur sa face avant ou sur las côtés. Faire ainsi l'endommagerait.
Couchez l'appareil sur le dos uniquement lorsqu'une manutention spéciale est nécessaire.
Consultez les directives d'utilisation pour les instructions de manutention spéciales pour coucher l'appareil sur le dos.
N'expédiez PAS l'appareil sur son dos.
Si ces directives ne sont pas respectées, cela peut entrainer la mort ou des blessures graves ou des dommages matériels.

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Section 4—Installation

Correct installation of Power-Style QED-2 switchboards is essential for proper operation of all switchboard components. Study the associated instruction books and all drawings carefully. In most cases, all drawings are sent to the purchaser before a switchboard is shipped to enable adequate planning.

NOTE: The top of the switchboard will not support the weight of the installer.

Location

Find the designated area on the building floor plan where the switchboard will be installed. The location chosen for installation should provide working clearances complying with Section 110-26 of the National Electrical Code® (NEC®) or Section 2-308 of the Canadian Electrical Code (CEC) Part 1.

- Front-accessible switchboards require field connections, including mains, branches, ground bus, and neutral bus, to be accessible and maintainable from the front.
- For switchboards having rear ventilation, allow a minimum 1/2-in. (13 mm) clearance between the rear of the switchboard and the wall for proper ventilation. Equipment drawings identify switchboards requiring rear or side access.
- Switchboards that require rear access for installation, field connections, or maintenance (such as filter replacement), require 30 in. (762 mm) of working space per NEC 110-26.
- If the switchboard is in a wet location or outside of the building, enclose it in an outdoor enclosure or equipment to prevent moisture or water from entering and accumulating within the enclosure. Outdoor-rated switchboards drain to the rear, so there must be at least a 1/2-in. (13 mm) clearance between the rear of the switchboard and a wall or other obstruction for proper drainage.

Foundation Preparation

The floor or foundation must be strong enough to support the weight of the switchboard without sagging. The surrounding floor area should gently slope toward a drain.

NOTE: For seismic qualifications, read the section “Anchoring for Seismic Qualifications” on page 20 before pouring the floor or foundation.

Power-Style QED-2 switchboards are assembled on true and level floors at the assembly plant. To ensure correct bus bar alignment, the mounting pad or final installation site must be smooth and level. If parallel steel floor channels are imbedded for mounting the switchboard, take extra care to ensure the floor channels are level over their entire length to avoid distortion of the switchboard structure. Each channel should be level with the finished floor.

When pouring the foundation, make provisions for conduits entering the switchboard from below and carrying the incoming and/or outgoing cables, control wiring, and ground cable. The bottom view in the equipment drawing shows the available conduit area for correct layout.

Conduits should project above the finished floor by about 2 in. (51 mm). However, to simplify moving the shipping sections into place, install the conduits flush with the concrete and, after the sections are in their final position, add the appropriate extension sleeves. Otherwise, raising the shipping section on timbers or lifting it by a crane to clear the conduit hubs will be necessary. Before pouring the foundation, consider installing additional conduits for future circuits.

Switchboard Preparation

Remove dirt and debris from the foundation and surrounding area before moving the switchboard into final position.

After the switchboard has been moved to its final installation site, take each shipping section off its shipping stringers. For switchboards greater than 24 in. (610 mm) deep, the center base channel can be removed.

Remove all packing materials. If the switchboard is equipped with a bottom closure plate in each vertical section, remove and retain the plates for reuse. When bottom closure plates are furnished, the customer must make any holes necessary for conduit entering the bottom of the switchboard. After making the holes, reinstall the closure plate.

General Installation

NOTICE
HAZARD OF EQUIPMENT DAMAGE Level and align adjacent shipping sections with one another. Ensure proper alignment of horizontal main through bus and proper splice bus connections. **Failure to follow these instructions can result in equipment damage.**

Install the switchboard into its final position by leveling progressively each section and bolting the frames together, if separated. Position shipping sections as follows:

1. Maneuver each shipping section into the desired position using the procedures under “Handling” on page 11.
2. Carefully lower the section over the conduit stubs to comply with the “available conduit area” as shown in the bottom view of the equipment drawings. Otherwise, there might not be sufficient cable bending space.
3. Level the shipping section.
4. After installation of each section is complete, make the through bus splice connection to the preceding section before installing the next section.

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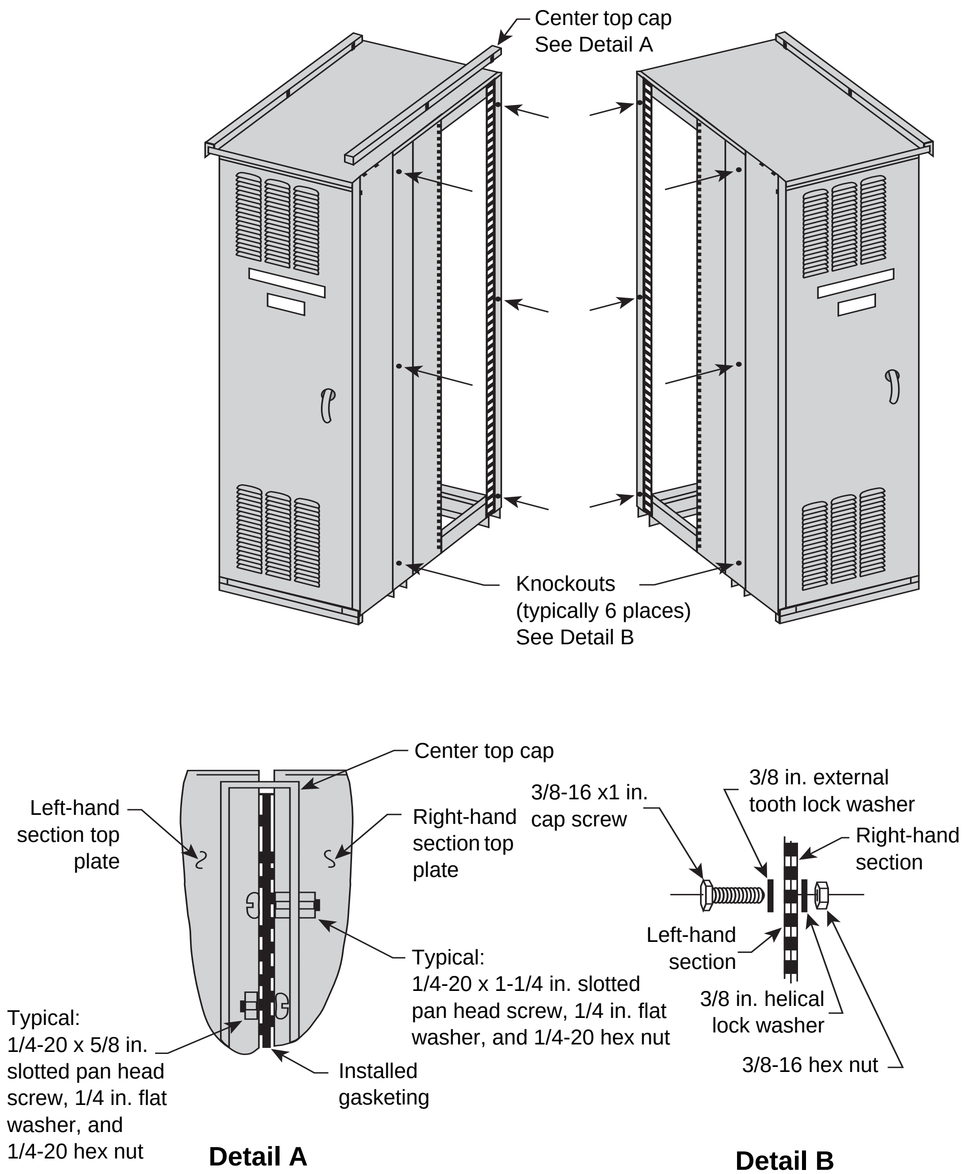
Joining Shipping Sections—Outdoor Switchboards

1. Remove the center top cap (Figure 5) from the left-hand section, and retain all hardware for reuse.

Figure 5 – Joining Adjacent Sections—Outdoor Switchboards



2. When possible, open or remove the front and rear doors and panels, providing access to bolt adjacent shipping sections together.
3. Remove three 0.5-in. (13 mm) diameter knockouts from the front vertical corner channel and three from the rear vertical corner channel (a total of six per frame side) as indicated by the arrows in Figure 5.
4. Position each adjacent section, carefully leveling it and aligning it with the previous section. If lifting straps are provided, completely remove them from

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the sides being bolted together so the sections can be joined flush. The only gasket required between sections is provided on the roof flange.

NOTE: If lifting strap removal is not required to join sections, leave the lifting strap on the switchboard. Verify that the bolt is tight to maintain NEMA Type 3R integrity.

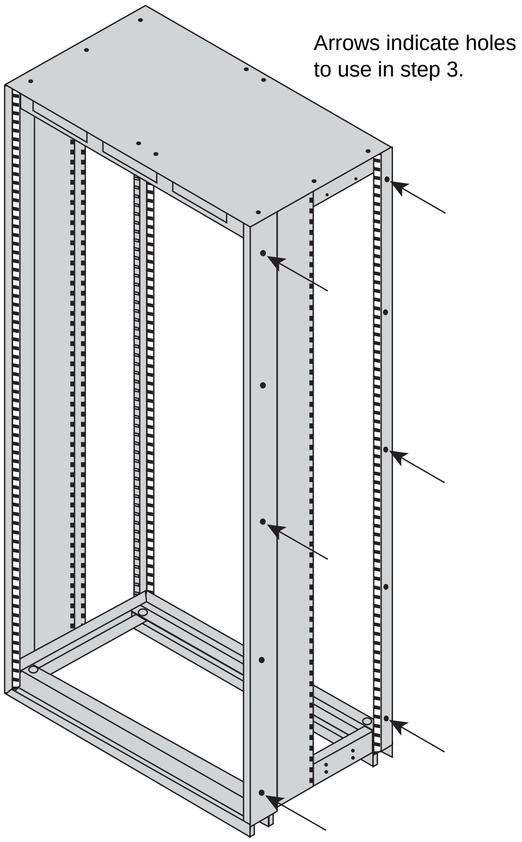
5. Six bolts (3/8-16 x 1 in.) are provided. Place them through the holes created in step 3 to join adjacent sections.
6. Make the through bus splice connections to the preceding section.
7. Replace the center top cap removed in step 1.
8. Replace and secure the front and rear doors and panels removed in step 2.

Joining Shipping Sections—Indoor Switchboards

1. Position each adjacent section, carefully leveling and aligning it with the previous section. If lifting straps are provided, completely remove them from the sides being bolted together so the sections can be joined flush.

   NOTE: Leave the other lifting straps on the switchboard if their removal is not required to join adjacent sections flush.

   Figure 6 – Indoor Switchboards



2. Open or remove the front and rear doors and panels, providing access to bolt adjacent shipping sections together.
3. Six bolts (3/8-16 x 1 in.) are provided. Place the bolts through the existing holes in the front and rear vertical corner channels to join adjacent sections (Figure 6).
4. Make the through bus splice connections to the preceding section.
5. Replace and secure all front and rear doors and panels removed in step 2.

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Anchoring for Seismic Qualifications

QED-2 equipment that is seismically certified has been qualified to the site-specific seismic requirements of the listed model building codes and/or standards. Optional construction features may be required, depending on the location of the installation and the particular code and/or standard of interest. Seismic certificates of compliance are provided with all seismically certified QED-2 equipment. To maintain the validity of this certification, the installation instructions provided in this bulletin must be followed.

Responsibility for Mitigation of Seismic Damage

For the purposes of the model building codes, QED-2 equipment are considered nonstructural building components. Equipment capacity was determined from triaxial seismic shake table test results as defined in the International Code Counsel Evaluation Service (ICCES) Acceptance Criteria for Seismic Qualification Testing of Nonstructural Components (AC156). Unless otherwise indicated, an equipment importance factor of 1.5 (Ip = 1.5) was used, indicating that equipment functionality was verified before and after shaker table seismic simulation testing. This importance factor is indicative of critical facilities where maximizing the probability of post event functionality is a priority. The Building Seismic Safety Council (BSSC) recognizes AC 156 as an appropriate methodology in the 2003 National Earthquake Hazard Reduction Program (NEHRP) Commentary (FEMA 450 Part 2). The National Institute of Building Sciences established the BSSC in 1979 to develop and promote regulatory provisions for earthquake risk mitigation at the national level.

Incoming and outgoing cable and conduit must also be considered as related but independent systems. They must be designed and restrained to withstand the forces generated by the seismic event without increasing the load transferred to the equipment. For applications where seismic hazard exists, bottom entry and/or exit of cable and conduit is preferred. This system must be able to transfer the loads created by a seismic event to the load-bearing path of the building structural system.

Maintaining Seismic Certification

Seismic qualification of nonstructural components by Schneider Electric is just one link in the total chain of responsibility required to maximize the probability that the equipment will be intact and functional after a seismic event. During a seismic event, the equipment must be able to transfer the loads that are created through the mounting pad and anchorage to the load-bearing path of the building structural system. The structural civil engineer or design engineer of record is responsible for detailing the equipment connection and anchorage requirements for the given installation. The installer and manufacturers of the anchorage restraint system are responsible for assuring that the mounting requirements are met. Schneider Electric is not responsible for the specification and performance of these systems.

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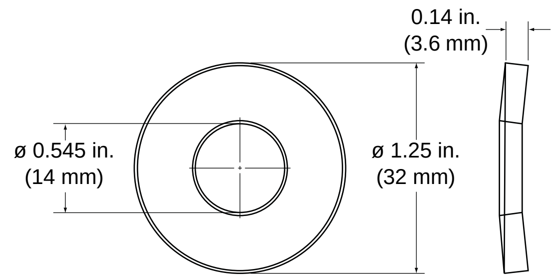
Anchoring QED-2 Equipment for Seismic Applications

Figure 7 – Belleville Washer



Formed base channels run the width of the section. The channels and connecting braces provide a minimum 0.75-in. (19 mm) diameter hole for fastening the section to the floor. To anchor the QED-2 switchboard to the floor properly, use all four mounting locations for NEMA Type 1 enclosures less than 36 in. deep, all six mounting locations for 36–70 in. deep enclosures, and six of the eight mounting locations for enclosures greater than 70-in. deep (see Figure 8 on page 23).

Use 0.5 in. (13 mm) diameter anchor bolts (Grade 5 minimum, provided by others) for the installation of equipment. Use one 1.25 in. (32 mm) outer diameter Grade 5 Belleville washer (provided by others; see Figure 7) under the head of each bolt or anchor nut. To develop the full strength of the anchor, torque the hardware to the value specified by the anchor manufacturer, or as recommended in the seismic restraint detailing supplied by the Structural Civil Engineer of record for the project (see Figure 9 on page 24).

Additionally, each NEMA Type 1 enclosed section includes four top-located hard points for attaching two upper lateral braces (braces and hardware supplied by others) to the QED-2 structure for top structural restraint (see Figures 10 and 11 on page 25).

Top structural restraint is required for all QED-2 equipment installed:

- where the site-specific 0.2 second spectral ground motion exceeds 2.67 g (as determined from the code-referenced ground motion maps or the site-specific seismic hazard engineering study), or
- when displacement at the top of the equipment cannot be tolerated, or
- for all QED-2 corner sections used for seismic applications.

To develop the full strength of the upper structural anchor, install and torque the hardware as specified by the anchor manufacturer or the seismic restraint detailing supplied by the Structural Civil Engineer of record for the project.

NOTE: Anchoring hardware is not furnished with the QED-2 equipment.

After the QED-2 switchboard and adjacent equipment are properly joined and the entire structure is bolted to the floor, install the incoming service conductors and load side cables. During an earthquake, the top of the QED-2 switchboard can move in any direction. Any top incoming cables must accommodate this motion. Do not use the QED-2 enclosure (particularly the top) to mount exterior equipment.

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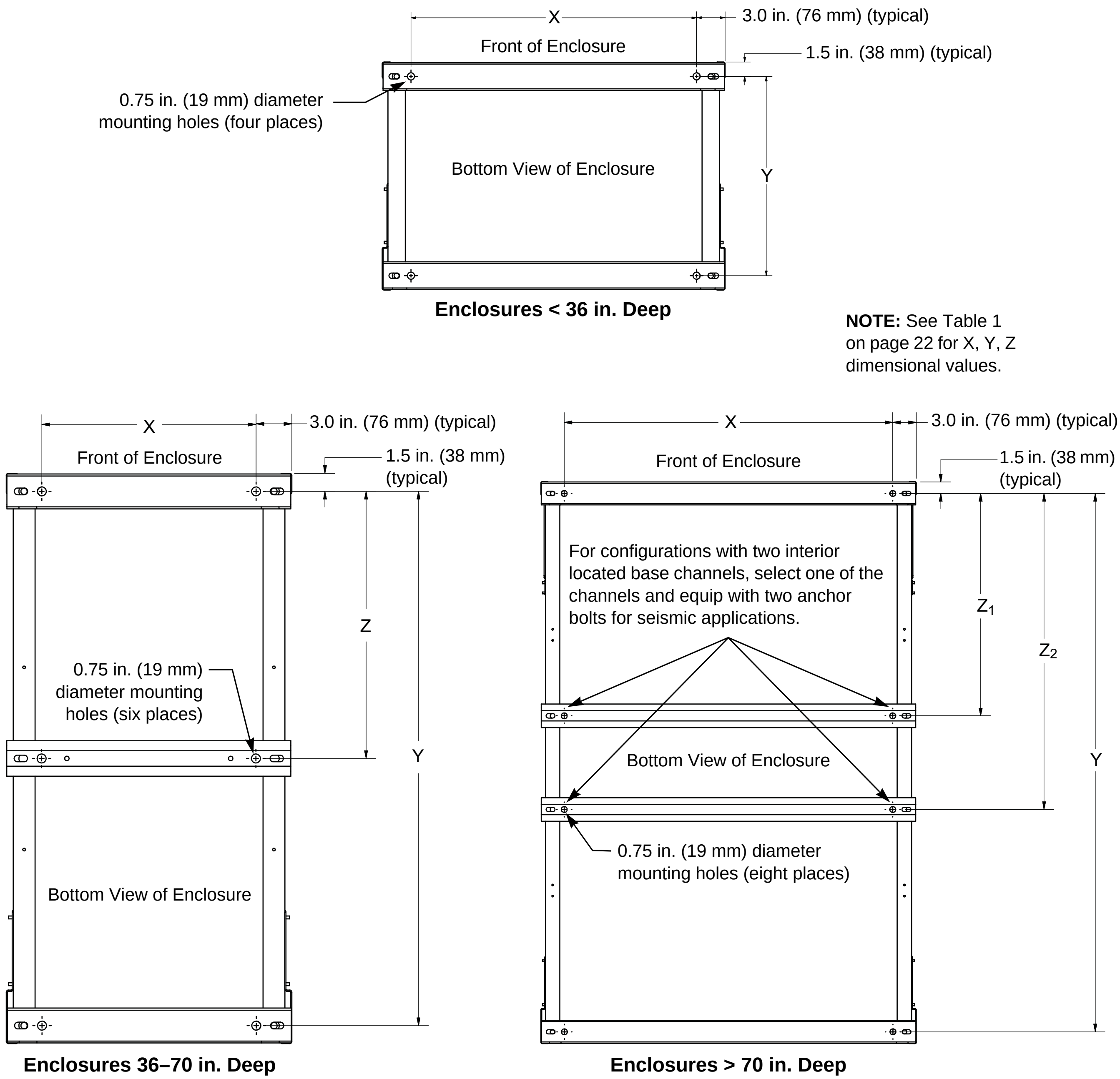
Base Anchoring

1. To anchor the switchboard to the floor properly, use all of the designated 0.75 in. (19 mm) diameter mounting hole locations as illustrated in Figure 8 on page 23. The enclosure dimensions corresponding to Figure 8 are listed in Table 1.

Table 1 – Enclosure X,Y, Z Dimensions in Inches (mm)

Enclosure Width → / Enclosure Depth ↓	12 in. (305 mm)	24 in. (610 mm)	30 in. (762 mm)	36 in. (914 mm)	42 in. (1067 mm)	48 in. (1219 mm)	54 in. (1372 mm)
24 in. (610 mm)	X = 6 (152) Y = 21 (533)	X = 18 (457) Y = 21 (533)	X = 24 (610) Y = 21 (533)	X = 30 (762) Y = 21 (533)	X = 36 (914) Y = 21 (533)	X = 42 (1067) Y = 21 (533)	X = 48 (1219) Y = 21 (533)
36 in. (914 mm)	X = 6 (152) Z = 16.5 (419) Y = 33 (838)	X = 18 (457) Z = 16.5 (419) Y = 33 (838)	X = 24 (610) Z = 16.5 (419) Y = 33 (838)	X = 30 (762) Z = 16.5 (419) Y = 33 (838)	X = 36 (914) Z = 16.5 (419) Y = 33 (838)	X = 42 (1067) Z = 16.5 (419) Y = 33 (838)	X = 48 (1219) Z = 16.5 (419) Y = 33 (838)
48 in. (1219 mm)	X = 6 (152) Z = 22.5 (572) Y = 45 (1143)	X = 18 (457) Z = 22.5 (572) Y = 45 (1143)	X = 24 (610) Z = 22.5 (572) Y = 45 (1143)	X = 30 (762) Z = 22.5 (572) Y = 45 (1143)	X = 36 (914) Z = 22.5 (572) Y = 45 (1143)	X = 42 (1067) Z = 22.5 (572) Y = 45 (1143)	X = 48 (1219) Z = 22.5 (572) Y = 45 (1143)
54 in. (1372 mm)	X = 6 (152) Z = 25.5 (648) Y = 51 (1295)	X = 18 (457) Z = 25.5 (648) Y = 51 (1295)	X = 24 (610) Z = 25.5 (648) Y = 51 (1295)	X = 30 (762) Z = 25.5 (648) Y = 51 (1295)	X = 36 (914) Z = 25.5 (648) Y = 51 (1295)	X = 42 (1067) Z = 25.5 (648) Y = 51 (1295)	X = 48 (1219) Z = 25.5 (648) Y = 51 (1295)
60 in. (1524 mm)	X = 6 (152) Z = 28.5 (724) Y = 57 (1448)	X = 18 (457) Z = 28.5 (724) Y = 57 (1448)	X = 24 (610) Z = 28.5 (724) Y = 57 (1448)	X = 30 (762) Z = 28.5 (724) Y = 57 (1448)	X = 36 (914) Z = 28.5 (724) Y = 57 (1448)	X = 42 (1067) Z = 28.5 (724) Y = 57 (1448)	X = 48 (1219) Z = 28.5 (724) Y = 57 (1448)
72 in. (1829 mm)	X = 6 (152) Z_1 = 28.5 Z_2 = 40.5 (1029) Y = 69 (1753)	X = 18 (457) Z_1 = 28.5 (724) Z_2 = 40.5 (1029) Y = 69 (1753)	X = 24 (610) Z_1 = 28.5 (724) Z_2 = 40.5 (1029) Y = 69 (1753)	X = 30 (762) Z_1 = 28.5 (724) Z_2 = 40.5 (1029) Y = 69 (1753)	X = 36 (914) Z_1 = 28.5 (724) Z_2 = 40.5 (1029) Y = 69 (1753)	X = 42 (1067) Z_1 = 28.5 (724) Z_2 = 40.5 (1029) Y = 69 (1753)	X = 48 (1219) Z_1 = 28.5 (724) Z_2 = 40.5 (1029) Y = 69 (1753)

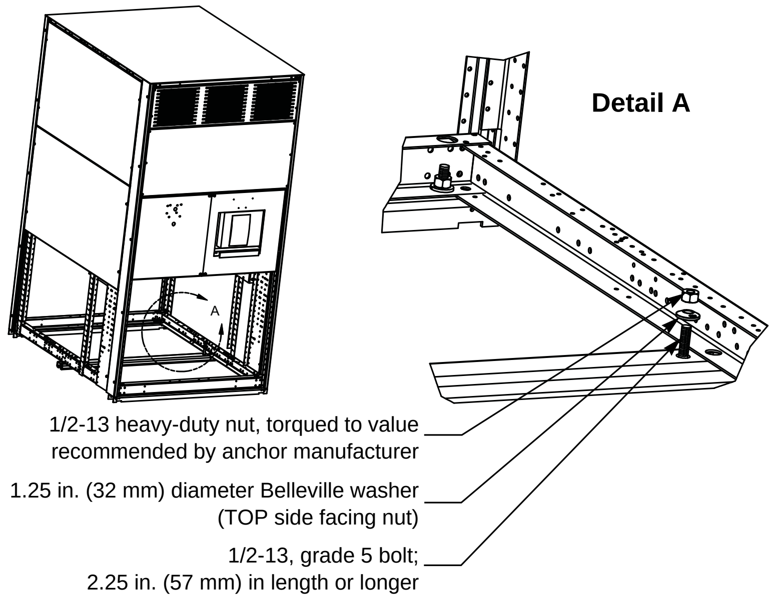
Figure 8 – Base Channel Floor Anchor Bolt Locations



NOTE: See Table 1 on page 22 for X, Y, Z dimensional values.

2. Depending on the frame size (see Figure 8 on page 23), use either four or six 1/2-13 Grade 5 bolts in the locations shown in Figure 9.

Figure 9 – Base Channel Mounting Hardware



NOTE: Base channel mounting hardware detail shown for reference purposes only. Anchoring hardware is not furnished with the switchboard. Covers and internal hardware shown removed for illustration purposes.

3. Once the switchboard is in place, secure the base channels to each bolt using a 1.25 in. (32 mm) diameter Belleville washer between a 1/2-13 hardened nut and the switchboard frame as illustrated in Figure 9.

   NOTE: The “TOP” side of the Belleville washer must be facing the nut.

4. Torque each nut to the value recommended by the anchor manufacturer to develop the full strength of the anchor.

Top Anchoring/Restraint

For installation at locations with an Ss greater than 2.67 g (as determined from the current version of the International Building Code), or where displacement cannot be tolerated at the top of the switchboard during a seismic event, use top restraints attached to the equipment hard points.

NOTE: Anchoring hardware is not furnished with the switchboard.

1. The four 0.88-in. (22 mm) diameter mechanical knock-outs shown in Figure 10 on page 25 serve as hard points for application of a top restraint system.

   NOTE: By code, it is the responsibility of the Building Design Professional to determine the top restraint methodology for the intended building application.

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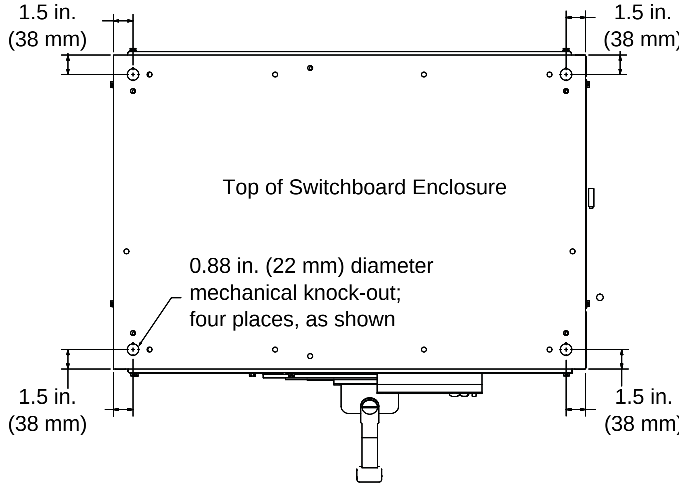
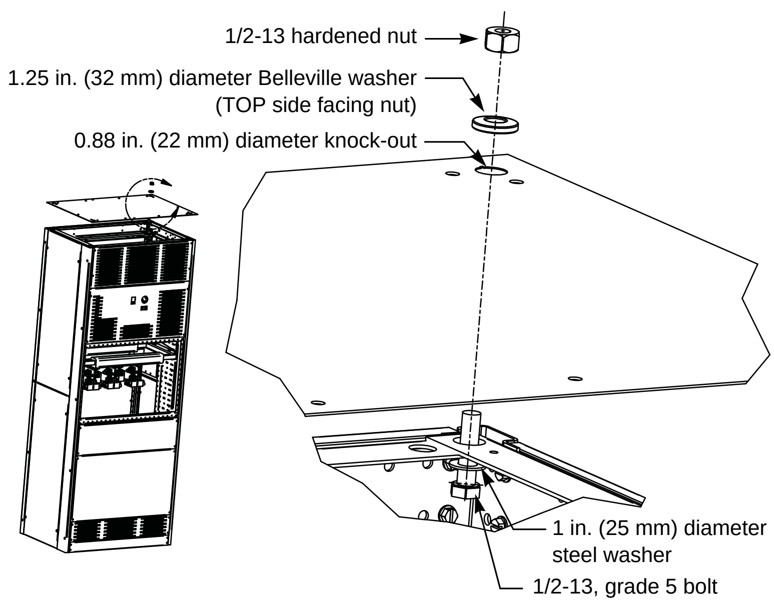
Figure 10 – Top Anchor Hard-Point Locations



2. Detach the top plate from the main switchboard enclosure. Retain the screws.
3. Remove the four 0.88 in. (22 mm) diameter mechanical knock-outs as directed by the Building Design Professional.
4. With the knock-outs removed, reattach and re-secure the top plate to the enclosure using the screws removed in Step 2.
5. Attach the top restraint system using a 1/2-13, Grade 5 bolt, a 1 in. (25 mm) diameter steel washer, a 1.25 in. (32 mm) diameter Belleville washer, and a hardened 1/2-13 nut as shown in Figure 11.

Figure 11 – Top Anchor Mounting Hardware



6. After all switchboard sections are properly joined and the entire structure is properly anchored, install the incoming service conductors and load side cables.
7. Do not use the switchboard enclosure (particularly the top) to mount exterior equipment, except for conduit.

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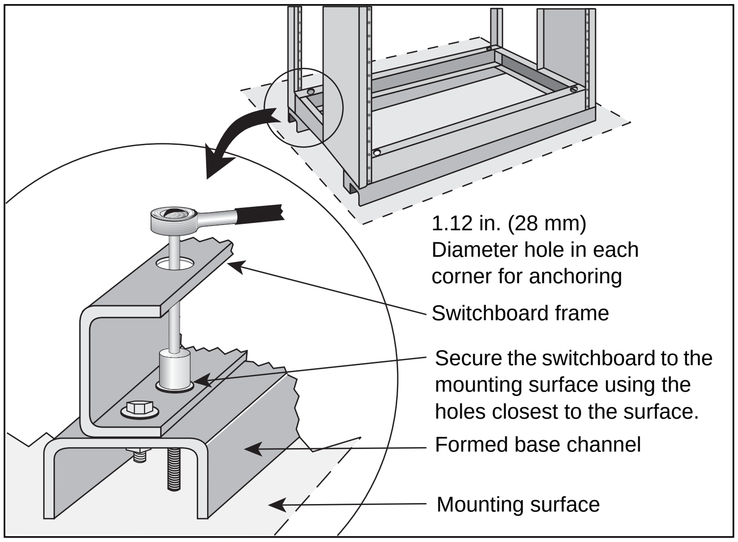
Anchoring the Switchboard

Although sections are freestanding, a hard bump or shifting movement can result in damage to the splice joints between sections and conduit hubs connected to the sections. Therefore, each vertical section must be anchored to the floor.

Formed base channels run the width of the shipping section. The channels have 1.12-in. (28 mm) diameter holes for fastening the section to the floor (Figure 12). Anchor each section to the floor with 1/2-in. (Grade 2 minimum) bolts with flat washers and anchors suitable for installation of electrical equipment (not furnished).

Figure 12 – Switchboard Base Channels



After all switchboard sections are properly joined and the entire structure is bolted to the floor, install the incoming service conductors and load side cables.

NOTE: If the switchboard consists of only one shipping section, proceed to “Grounding and Bonding” on page 28.

Through Bus Splice Connections

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Do not install through bus splice connectors with the switchboard energized.

Failure to follow these instructions will result in death or serious injury.

Through bus splice connectors and/or hardware, along with installation instructions, are provided with each shipping split. Follow the installation instructions, and torque splice bolts to the value given in “Section 9— Torque Values for Electrical Connections” on page 53.

If through bus bars are wrapped with an insulative material, cover the splice connections with the material provided.

For splice connections with bus on the front and rear of an insulating tube, ensure the U-shaped, copper connector is centered around the tube. Figure 13 on page 27 shows the proper orientation of the connector.

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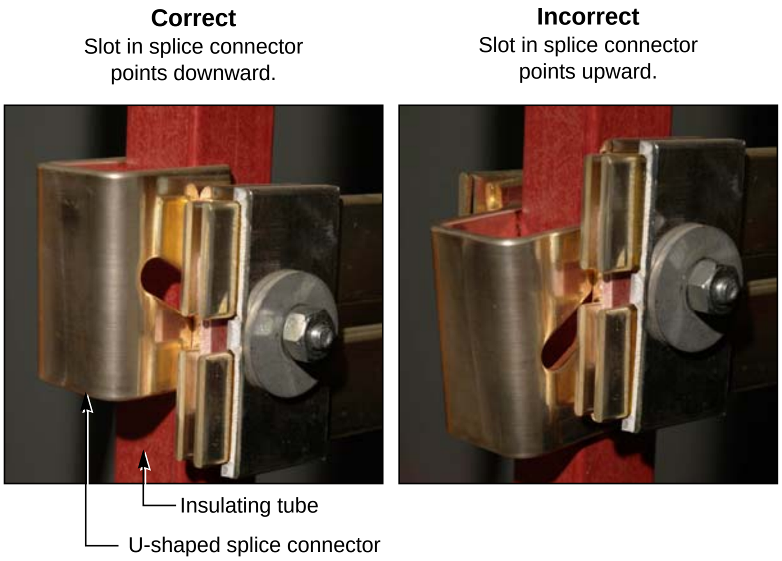
NOTE: The U-shaped connector will fit snugly against the insulating tube when installed correctly. It is pulled away from the insulating tube in Figure 13 to show the orientation of the connector slot.

Figure 13 – Proper Orientation of U-shaped Splice Connector



Ground Bus Splice Connections

Align and secure the ground bus splice connection between shipping sections. Torque connections to 100 lb-in (11 N•m) (Figure 14 or 15).

NOTE: Proper installation is essential for equipment ground-fault systems.

Figure 14 – Ground Bus Splice Connection

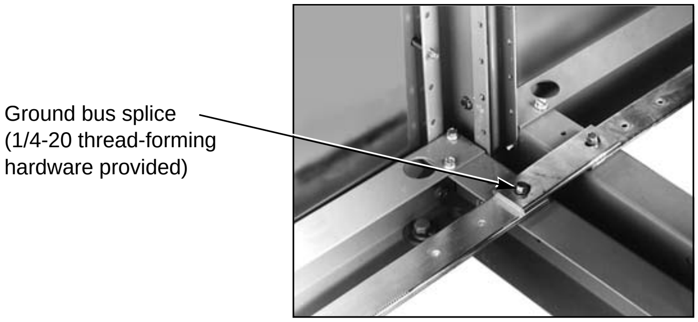


Figure 15 – Series 2 Ground Bus Splice Connection

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Grounding and Bonding

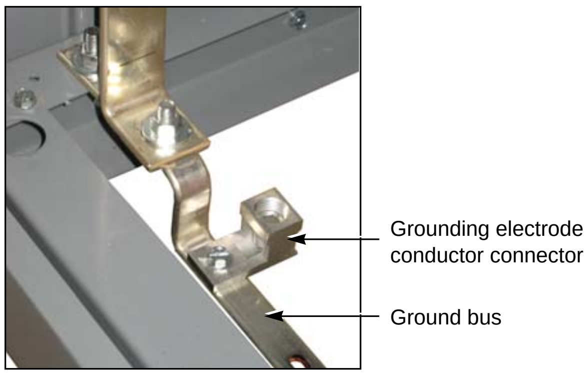
NOTE: A system is “grounded” if it is grounded at any point ahead of the switchboard, whether the grounded conductor (neutral) is carried through to the loads, or not.

Service Equipment—Grounded System

For solidly *grounded* systems used as either service equipment or as a main switchboard on a separately derived system:

1. Run a grounding electrode conductor from the grounding electrode at the installation site to the grounding electrode conductor connector (ground lug) located on the switchboard ground bus (or on the neutral bus, if so indicated on the equipment drawing) (Figure 16). Select the material and size of this grounding electrode conductor to comply with Sections 250-62 and 250-66 of the NEC or Sections 10-204 and 10-206 of the 1998 CEC, and install it as specified in Section 250-64 of the NEC or Section 10-908 of the 1998 CEC.

Figure 16 – Grounding Electrode Connector



2. Install the main bonding jumper between the neutral bus and the ground bus (Figure 17 or 18 on 29). For torque values, refer to “Section 9—Torque Values for Electrical Connections” on page 53.

   NOTE: If the switchboard is fed from multiple sources (for example, double-ended systems), there may be two or more main bonding jumpers to install.

Figure 17 – Main Bonding Jumper

Figure 18 – Series 2 Main Bonding Jumper

In Canada, a main bonding jumper bus or cable is provided between the neutral bus and ground bus. When the bonding jumper must be disconnected (for example, for a Megger® test), remove the main bonding jumper bus or cable lug with cable from the neutral bus. This is normally located near the line neutral lugs. Secure the main bonding jumper bus or cable and lug to maintain the required distance from phases and neutral.

NOTE: If the switchboard is fed from multiple sources (for example, a double-ended system like a main-tie-main), there may be two or more main bonding jumpers installed.

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Service Equipment—Ungrounded System

For *ungrounded* systems used as either service equipment, or as a main switchboard on a separately derived system:

1. Run a grounding electrode conductor from the grounding electrode at the installation site to the grounding electrode conductor connector (ground lug) located on the switchboard ground bus (Figure 16 on page 28).
2. Select the material and size of this grounding electrode conductor to comply with Sections 250-62 and 250-66 of the NEC or Sections 10-700 and 10-702 of the 1998 CEC, and install it as specified in Section 250-64 of the NEC or Section 10-204 of the 1998 CEC.

Not Service Equipment

For either *grounded or ungrounded* systems, when a switchboard is not used as service equipment nor as a main switchboard on a separately derived system:

Use equipment grounding conductors sized according to Section 250-122 of the NEC or Section 10-206 of the 1998 CEC to connect the switchboard frame and ground bus to the service ground.

High-Impedance Grounded Neutral Systems

For high-impedance grounded neutral systems:

Ground the system following the instructions provided with the system grounding equipment and in compliance with Section 250-36 of the NEC. Confirm that the switchboard frame and ground bus are bonded in accordance with Section 250-102 of the NEC.

Busway Connections

Schneider Electric switchboards are manufactured with two different styles of busway connections. Qwik Flange™ is used on indoor switchboards only.

The other type of busway connection is the “dummy” flanged end. This type is used on some indoor switchboards, but primarily on outdoor units. The dummy flanged end must be removed to allow actual busway flanged end installation. Either the dummy or actual busway flanged end must be in place before energizing the switchboard.

NOTE: Do not use the switchboard to support the weight of the busway connection. Support busway independently. When busway is installed, make sure no areas of the roof are bowed downward. This will help prevent pooling of water.

Busway Connection—NEMA Type 1 (Indoor) Only (Qwik Flange™)

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Turn off all power supplying the switchboard and busway before installing connections.

Failure to follow these instructions will result in death or serious injury

Follow the instructions in this section to make Qwik Flange busway connections (see Figures 19 and 20 on page 31):

1. Remove any protective covering from the opening in the switchboard.
2. Slip the busway joint into the switchboard connectors.
3. Check the joint bolt alignment; the center line (C/L) of the joint bolt to the switchboard surface should be 0.95 in. (24 mm) (Figure 19 on page 31).
4. Attach the side closing plates using two 5/16-in. bolts (provided). When installed properly, the holes in the side closing plates align with the holes in both the switchboard and busway.

Figure 19 – Qwik Flange Installation

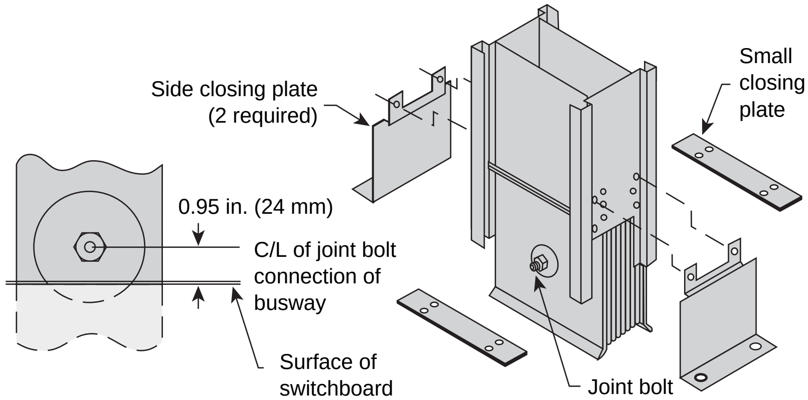
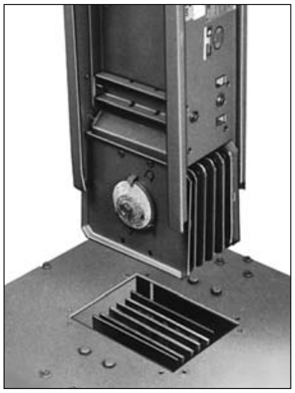
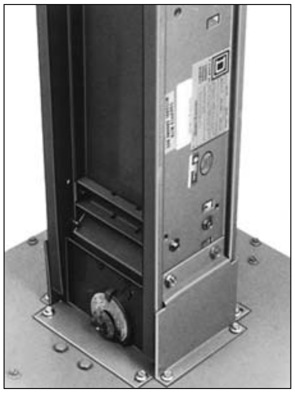


Figure 20 – Qwik Flange





5. Use an 18-in. (457 mm) or longer wrench to torque the joint bolt until the outer break-away head twists off. Do not allow the break-away bolt head or red warning disc to drop into the switchboard.
6. Slip the remaining two small closing plates into position by aligning with the holes in the switchboard. Use the four 1/4-20 screws provided to secure the equipment.
7. Confirm proper phasing of the installed busway before energizing.

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Busway Connections—NEMA Type 1 (Non-Qwik Flange) and NEMA Type 3R

If this style of connection for busway is furnished, the busway "dummy" flanged end must be removed before installing busway (Figure 21 on page 32).

⚠ DANGER

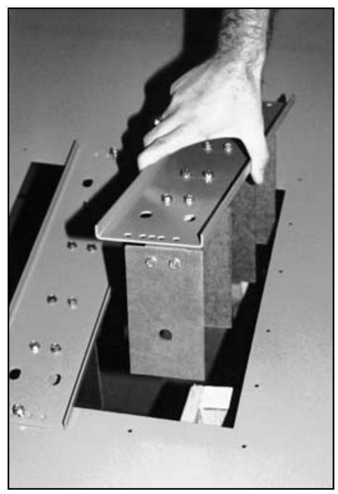
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Turn off all power supplying the switchboard and busway before installing connections.

Failure to follow these instructions will result in death or serious injury.

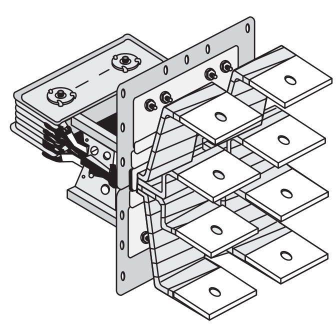
1. From inside the switchboard, remove the 1/2-in. bolts that fasten the switchboard bus to the busway dummy nonmetallic flanges. Retain all hardware for reuse.
2. Remove all screws securing the busway dummy flanged end to the switchboard enclosure.
3. Remove the busway dummy flanged end (Figure 21).

Figure 21 – Removing the Busway Dummy Flanged End



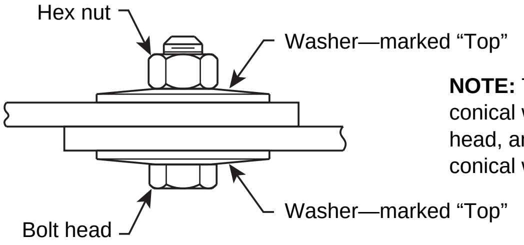
4. Install the actual busway flanged end to the switchboard bus connectors provided in the switchboard (Figure 22). Insert the flanges between the switchboard bus connectors so that the mounting holes in the collar of the flanged end align with the pre-drilled holes in the switchboard enclosure.

Figure 22 – Flanged-End Connections



5. Line up the holes in the bus bar flanges, and reinstall the 1/2-in. (13 mm) hardware that was removed in step 1 on page 32 and as shown in Figure 23.

Figure 23 – Reinstalling the 1/2-In. (13 mm) Hardware



NOTE: The convex side (marked “Top”) of one conical washer should be against the bolt head, and the convex side of the second conical washer should be against the hex nut.

6. Torque the bolts inserted in step 5 as indicated in “Section 9—Torque Values for Electrical Connections” on page 53.
7. Assemble the busway collar to the switchboard enclosure with the screws provided.
8. Ensure that the busway integral ground is connected to the switchboard ground bus.
9. Confirm busway phasing before energizing.

Conduit Area

1. Locate and terminate all conduit in the switchboard enclosure in the “available conduit area” designated on the equipment drawing.

   NOTE: On switchboards greater than 24 in. (610 mm) deep, the center base channel can be removed for additional conduit area. **Exception:** Do not remove any base channels when seismic restraint is required.
2. Install the conduit properly. Use hubs, locknuts, and bushings to protect the cables and prevent condensation on the conduit from entering the switchboard.

   NOTE: If top entry, do not use the top of the switchboard to support the weight of the conduit. Support the conduit independently. When conduit is installed, make sure no areas of the roof are bowed downward. This will help prevent pooling of water.

   If bottom closure plates are furnished, the customer must remove the plates, make holes in them for any conduit entering the bottom of the switchboard, and then reinstall the plates.

   Under seismic conditions, consider using top restraints if movement of the top of the switchboard is an issue.
3. Bond all conduit hubs to the switchboard enclosure with approved electrical connections.

ENGLISH

Cable Pulling

Power-Style QED-2 switchboards are constructed to customer specifications for the cable entrance arrangement (for example, top or bottom feed). Switchboard components are arranged to give proper cable clearance and bending space for cables entering or exiting the switchboard as specified on the equipment drawing.

1. Use only cable sizes suitable for a proper fit with the corresponding lugs.
2. Pull the proper number of line side and load side cables according to the load served and the NEC or CEC.
3. Position the cables inside the switchboard so that they are not subject to physical damage.
4. Maintain the largest possible bending radii and proper clearance to bus bars and grounded parts. If any cables are lying or bearing on structural members, support them to relieve this condition or place suitable protective material at the bearing point to protect the cable insulation.
5. Be certain to run all phase conductors, including the neutral, through the same opening where cables enter or leave the switchboard, or pass through any metal that has magnetic properties. Otherwise, overheating can result. See Section 300-20(a) of NEC.
6. When instructed, brace or cable-lace the conductors.

Cable Terminations

1. Use a proper insulation stripping tool to strip a length of insulation from the end of the cable sufficient to fit into the full length of the lug barrel. Be careful not to nick or ring the strands.
2. Thoroughly clean aluminum cable contact surfaces with a wire brush, or scrub them with an abrasive cloth to remove oxides and foreign matter.
3. Immediately apply an acceptable joint compound to the bare aluminum surfaces.
4. If compression-type lugs are furnished on any switch or circuit breaker, or as the main incoming power lugs, unbolt and remove them to create sufficient room for crimping the lugs to the cables with the crimping tool.
   a. Insert the cable into the lug barrel and, using the crimping tool, make the specified number of crimps per the recommendations of the manufacturer.
   b. Wipe excess joint compound from the connector and insulation.
   c. With the cables connected, remount the lugs onto the bus bars, switches, or circuit breakers. Torque the bolts to the values given in “Section 9—Torque Values for Electrical Connections” on page 53.
5. Set screw-type lugs may be furnished as main incoming lugs and are standard on molded case circuit breakers and QMB/QMJ/QMQB[1] fusible switches. Torque these lugs to, **but do not exceed**, the specified values. Torque values for circuit breaker and switch lugs are marked on these units. Torque values for other switchboard lugs are marked on the switchboard (Table 7 on page 53).

[1] QMQB switches are available in Canada only.

ENGLISH

Cable Restraint for Short-Circuit Current Rating (SCCR)

Cable restraint is recommended for lugs mounted on bus when the following conditions are met:

- Unsupported cable lengths are greater than 3.5 ft. (1 m) [1]

  AND

- Cables meet the **Yes** criteria shown in Table 2.

Table 2 – Cable Restraint Criteria

Cable Ampacity	Available Short Circuit Fault Current (RMS)			
	< 65 kA	65 to < 85 kA	85 to < 150 kA	150 to 200 kA
≤ 800 A	No	Yes	Yes	Yes
1200 A	No	No	Yes	Yes
1600 A	No	No	Yes	Yes
2000 A	No	No	Yes	Yes
2500 A	No	No	No	Yes
3000 A	No	No	No	Yes
≥ 4000 A	No	No	No	No

OR

- When otherwise specified.

NOTE: For I-Line™ circuit breakers, or if the lugs are in the circuit breaker, refer to the instruction bulletin for the specific circuit breaker.

Figure 24 – Cable Restraint Example

[1] Cable length is measured from the end of the lug to the conduit fitting through which the cable exits.

ENGLISH

NOTICE

HAZARD OF CABLE MOVEMENT UNDER SHORT-CIRCUIT CONDITIONS

Restrain all cables, including neutral cables, in the switchboard installation when the conditions stated on page 35 are met.

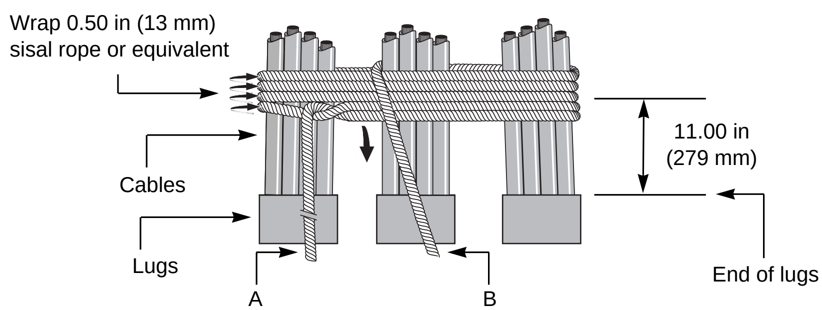
Failure to follow these instructions can result in equipment damage.

When cable restraints are required, perform the following steps.

NOTE: Wrap cables using 1/2-in. (13 mm) diameter sisal rope, 3/8-in. (9.5 mm) diameter nylon rope, or equivalent.

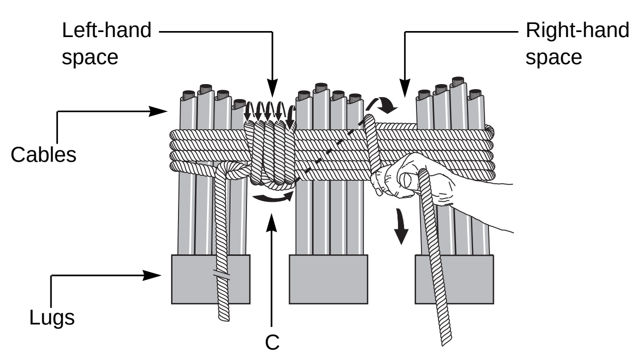
1. Begin wrapping the cables (Figure 25) a maximum distance of 11 in. (279 mm) from the end of the lugs. Continue to wrap the cables on 11-in. (279 mm) center(s) up to the point where the cables leave the enclosure.
   a. Wrap the cables four (4) times as shown, leaving 3 ft. (1 m) of excess rope at the first end (A).
   b. Pull the rope (B) taut.

Figure 25 – Wrapping Cables (neutral cables not shown)



2. Wrap the rope several times (Figure 26) until the space between the cables is completely filled.
   a. Weave the final rope loop underneath the previous loop (C).
   b. Bring the rope through the right-hand space.
   c. Pull the rope taut.

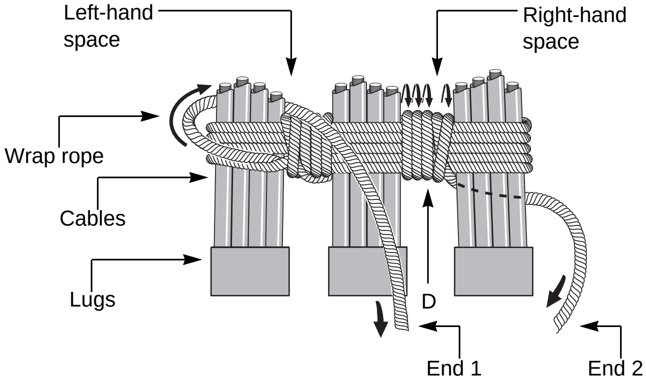
Figure 26 – Wrapping the Space Between Cables



ENGLISH

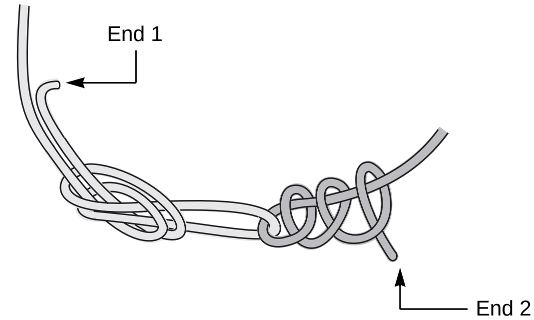
3. Wrap the rope several times until the space between the cables (Figure 27) is completely filled.
   a. Weave the final rope loop underneath the previous rope loop (D).
   b. Pull the rope taut.

Figure 27 – Finish Wrapping the Space Between Cables



4. Tie the rope ends (1) and (2) together (Figure 28) until they are taut. Cut off excess rope, and tape ends to prevent fraying.

Figure 28 – Tying Rope Ends Together



5. Recheck torques of wire binding screws after securing the cables.

   NOTE: Refer to the torque label supplied with the switchboard for torque values.

ENGLISH

Section 5—Pre-energizing Checkout Procedure

Conduct a complete inspection **before** the switchboard is energized to ensure that all components function and operate properly. **Complete every step of the checkout procedure listed before energizing the switchboard.**

1. Check all field-installed bus bar connections. Torque values are listed in “Section 9—Torque Values for Electrical Connections” on page 53.
2. Check all accessible connections for tightness.
3. Check all factory- and field-installed lug terminations for tightness.
4. Check the rigidity of all bus bar supports.
5. Check the switchboard enclosure for dents or other damage that reduces electrical clearances inside the switchboard.
6. Remove all foam blocks, or other temporary cushioning or retaining material, from the electrical devices.
7. Manually open and close all switches, circuit breakers, and other operating mechanisms, checking for correct alignment and free operation.
8. Operate all electrically operated switches, circuit breakers, and other devices equipped with remote operators (not under load). An auxiliary source of control power may be necessary to accomplish this.
9. Check all relays, meters, and instrumentation to verify that all field- installed wiring connections are made properly and that the devices function properly.
10. Current transformers (CTs) supplied for customer use require connection to a metering device load before energizing. Verify that the metering device load is properly connected, including main switchboard connections to remote equipment.
11. All CT circuits supplied by Schneider Electric for customer metering use are shorted for shipment. Remove shorting terminal screws on shorting terminal blocks or jumpers and store in the block.
12. Factory-installed circuit breakers may have an adjustable magnetic or electronic trip which is factory set to the lowest setting. To provide coordinated operation during a fault, adjust the trip as outlined in the instruction manual provided with the circuit breaker. All poles are adjusted simultaneously, using a screwdriver, by the single setting.
13. If ground-fault protection is furnished on type BP switch, adjust the relay to the desired ground current pickup setting. The relay is shipped from the factory at the lowest setting of 120 A for the relay. Relay pickup range is from 120–1,200 A for the relay.

    NOTE: For molded case circuit breakers, refer to “Section 11—Reference Publications” on page 56 for circuit breaker information.
14. Check the torque on all bolts of the fuses mounted in Bolt-Loc™ switches, 21–30 lb-ft (28–41 N•m), and in QMB/QMJ/QMQB[1] switches (as marked on the device).

[1] QMQB switches are available in Canada only.

NOTICE

HAZARD OF EQUIPMENT DAMAGE

Do not pry open or spread the fuse mounting clips. Doing so can cause a loose connection, resulting in overheating.

Failure to follow these instructions can result in equipment damage.

15. Examine fuse clip contact pressure and contact means (QMB/QMJ/QMQB[1] fusible switches). If there is any sign of looseness, contact Schneider Electric Services at 1-888-778-2733 (US) or 1-800-565-6699 (Canada). Loose fuse clips can result in overheating.
16. Check all QMB/QMJ/QMQB[1] fusible switches, verifying that the proper fuses with the required interrupting rating and continuous current rating are installed. Do not use renewable link fuses in Square D™ brand fusible switches.
17. Verify that all grounding connections are correctly made. If the switchboard is used as a service entrance, double check to see that the main bonding jumper is connected (Figure 17 on page 29).

⚠ CAUTION

HAZARD OF EQUIPMENT DAMAGE OR INJURY

- Remove the long-time rating plug before electrical insulation testing a circuit breaker that has a label stating “Warning: Disconnect Plug Before Dielectric Test.”
- Some Micrologic™ trip units are not rated for voltages that would occur during electrical resistance insulation testing.
- Open all control and metering disconnects from the control circuits.

Failure to follow these instructions can result in injury or equipment damage.

18. Conduct an electrical insulation resistance (Megger®) test to ensure that the switchboard is free from short circuits and undesirable grounds.
    a. Open all control power and metering disconnects or remove the fuses from the control circuits.
    b. Disconnect the neutral connection at any surge protective device or other electronic device before performing the electrical insulation resistance test; reconnect to the device after the test.
    c. With the neutral isolated from the ground and the power switches and circuit breakers open, conduct electrical insulation tests from phase-to-phase, phase-to-ground, phase-to-neutral, and neutral-to-ground.
    d. If the resistance reads less than one megohm while testing with the branch circuit devices in the open position, the system may be unsafe and should be investigated.
    e. Consult Schneider Electric Services at 1-888-778-2733 (US) or 1-800-565-6699 (Canada) to help correct any problems.
19. After completing the electrical insulation resistance test, replace all control power fuses that were removed and close power disconnects that were opened.
20. Check all field-installed wiring. Make certain it is clear of all live parts, and when instructed, secured to withstand fault currents.

ENGLISH

21. Verify that all control wiring between sections is connected.
22. Vacuum to remove any dust, scrap wire, or other debris.

NOTICE

HAZARD OF EQUIPMENT DAMAGE

Do not use an air hose to blow out the switchboard. Dust can settle inside relays and overcurrent devices, causing overheating and improper operation.

Failure to follow these instructions can result in equipment damage.

23. Replace all covers and barriers; check for any pinched wires, and close doors. Make certain all enclosure parts are aligned properly and securely fastened.

Ground Fault Protection Systems

Paragraph 230-95(c) of the National Electrical Code requires that all equipment ground-fault protection systems be tested when first installed. If the circuit breaker has equipment ground-fault protection installed, test it at this time.

1. Make sure the trip unit is powered. The trip unit is powered if:
   — The circuit breaker is closed or bottom fed and has more than 100 V of load voltage on two phases (P or H trip unit only).
   — The full-function or hand-held test kit is connected and on.
   — The 24 Vdc external power supply is connected.
   — An external voltage tap is installed and voltage of more than 100 V is present on two phases (P or H trip unit only).
2. If the system is a radial (single-ended) system, press the ground-fault Push-to-Test button. The circuit breaker trips, and the trip unit ground-fault indicator light comes on.
3. Record results on the ground fault system test log.

NOTE: If a complete check of the ground-fault system is necessary, use primary injection testing. If the system is multiple source and/or requires field connections at the job site, use primary injection testing.

NOTE: Some ground fault systems require field connections at the job site. Consult the switchboard interconnection wiring drawing for details.

ENGLISH

Section 6—Energizing the Switchboard

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Correct short-circuit conditions detected during the checkout procedures described in “Section 5—Pre-energizing Checkout Procedure” beginning on page 38.
- Qualified electrical personnel must be present when energizing this equipment for the first time.
- Follow the instructions in this section to energize the switchboard properly.

Failure to follow these instructions will result in death or serious injury.

1. Make sure there is not a load on the switchboard when it is energized. Turn off all downstream loads.
2. Energize the switchboard in the following sequence:
   a. Turn on all control power disconnects before energizing the switchboard. Refer to the record drawings supplied with equipment to see if control power disconnects are supplied.
   b. Close any open doors and/or covers.
   c. Close all main devices.
   d. Close each branch circuit breaker or branch fusible switch.
   e. Proceed to each panelboard and other downstream load.
3. After all overcurrent protective devices are closed, turn on all loads (for example, lighting circuits, contactors, heaters, and motors).

ENGLISH

Section 7—Maintaining the Switchboard

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Inspect and perform preventive maintenance only on switchboards and equipment that has been de-energized and electrically isolated (unless otherwise specified). This helps ensure that accidental contact cannot be made with energized parts.
- Follow safety-related work practices as described in NFPA 70E, Part II at all times.

Failure to follow these instructions will result in death or serious injury.

Periodic maintenance of the switchboard includes cleaning, lubrication, and exercising component parts. The interval between maintenance checks can vary depending upon the amount of usage and environmental conditions of each installation. The maximum recommended inspection interval is one year. This definition for periodic maintenance applies throughout this manual, unless otherwise noted.

Always inspect the switchboard after a fault. (Refer to “Section 8—Adverse Circumstances”, beginning on page 50). Service bulletins for the various disconnecting and overcurrent devices mounted in the switchboard are available through your local Schneider Electric representative.

General Inspection and Cleaning

1. Vacuum the switchboard interior to remove any dirt or dust deposits. Wipe all bus bars, insulators, cables, etc., with a clean, dry, lint-free cloth.
2. Check the switchboard interior carefully for moisture, condensation build-up, or signs of any previous wetness. Moisture can cause insulation failures and rapid oxidation of current-carrying parts. Inspect all conduit entrances and cracks between the enclosure panels for dripping leaks. Condensation in conduits can be a source of moisture and must not be allowed to drip onto live parts or insulating material. Take the necessary steps to eliminate the moisture and seal off all leaks.

NOTICE

HAZARD OF EQUIPMENT DAMAGE

- Do not use an air hose to blow out the switchboard. Dust can settle inside relays and overcurrent devices, causing overheating and improper operation.
- Do not allow paint, chemicals, or petroleum-based solvents to contact plastics or insulating materials.

Failure to follow these instructions can result in equipment damage.

3. Inspect the switchboard for any signs of overheating. Discoloration and flaking of insulation or metal parts are indications of overheating.

   NOTE: If overheating occurs, be sure that all conditions that caused the overheating have been corrected. Loose or contaminated connections can cause overheating.

4. Check for signs of rodent nesting in the switchboard. If required, use a good exterminating technique in the general area of the switchboard.

   NOTE: Do not place or use exterminating substances and chemicals inside the switchboard. Some products attract rodents.
5. Carefully inspect all devices for any visibly worn-out, cracked, or missing parts.
6. Manually open and close switches and circuit breakers several times to verify they are working properly.
7. Verify that all key interlocks and door interlocking provisions are working properly.

Bus Bar Joints, Lug Terminations, and Insulating Materials

1. Bus bar joints are maintenance-free. Do not retighten them after the pre-energizing checkout procedure is complete.

NOTICE

HAZARD OF EQUIPMENT DAMAGE

- Do not sand or remove plating on any bus bar, splice bar, or terminal lug.
- Damage to plating can result in overheating. Replace damaged part. Contact Schneider Electric Services at 1-888-778-2733 (US) or 1-800-565-6699 (Canada).

Failure to follow these instructions can result in equipment damage.

2. Check all bus bar joints and terminal lugs for any pitting, corrosion, or discoloration resulting from high temperatures or subjection to high fault conditions. If any damage has occurred, replace the bus bars or lugs. If cleaning is required, use Lectra-Clean®, made by CRC.
3. Inspect all insulating materials. Before re-energizing the switchboard, replace insulators with any visible damage (such as cracks).

General Lubrication Information

For field maintenance re-lubrication of blade/jaw components in switches 600 V and below, use BG20 High Performance Synthetic Grease from Dow Corning (Schneider Electric catalog number SWLUB). This grease is applicable for the following switches:

- Bolt-Loc
- QMB Main and Branch
- QMJ Branch
- QMQB[1] Main and Branch

For bus/plug-on connections, use electric joint compound, Schneider Electric catalog number PJC7201.

For Masterpact™ NW drawout connections, use only Schneider Electric catalog number S48899 Electric Joint Compound.

Automatic Transfer Switches

Consult the documentation provided by the manufacturer for all installation, operation, and maintenance instructions for these devices.

[1] QMQB switches are available in Canada only.

Bolt-Loc Bolted Pressure Contact Switch Maintenance (800–4,000 A)

Refer to the Bolt-Loc switch installation and maintenance manual for complete information (manual is shipped with the switchboard). If the manual is not available, refer to “Section 11—Reference Publications” on page 56, and contact your local Schneider Electric representative to obtain the appropriate manuals.

1. Exercise the operating mechanism at least once a year to ensure proper operation.
2. The Bolt-Loc switch is shipped from the factory properly lubricated. Periodic cleaning and lubrication of the switch is required. The maintenance interval between lubrications depends on factors such as usage and ambient conditions. The maximum recommended maintenance interval is one year for current-carrying parts and five years for operating mechanisms.

⚠ DANGER

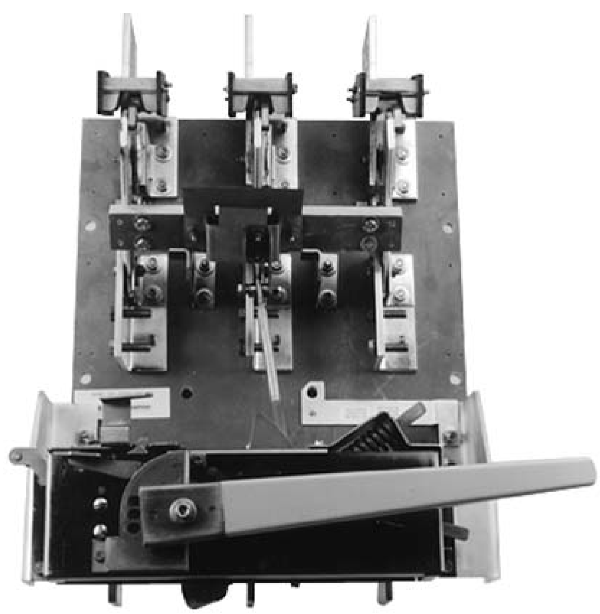
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Always check line and load ends of the fuses for voltage before starting the replacement procedure. The Bolt-Loc switch can be part of a multiple source system in which the fuses can be energized when the Bolt-Loc switch is in the “open” position.

Failure to follow these instructions will result in death or serious injury.

3. To replace the fuse:
   a. Open the switch before opening the fuse door.

Figure 29 – Type BP Bolt-Loc Fusible Switch



   b. Open the fuse door, releasing the interlock as described in the instructions on the door.
   c. Observe the switch blades to confirm the switch is “open.”
   d. Check the line and load ends of fuses for voltage using a properly rated voltage sensing device. No voltage should be present.

e. Remove all fuses. Retain the hardware for reuse.
f. Using a non-abrasive cleaner such as Lectra-Clean, made by CRC, wipe clean the fuse mounting pads on the switch and the terminals of each new fuse. Check the alignment of fuse terminals before installing new fuses.
g. Install new fuses using the same hardware removed in Step e. Tighten to 21–30 lb-ft (28–41 N•m).

4. Close the fuse door, and check the fuse door interlock with the switch in the ON position. The fuse doors should not open using normal hand force.

Circuit Breakers

Schneider Electric circuit breakers are designed and manufactured as sealed units requiring minimal periodic maintenance.

Exercise circuit breakers at least once a year to ensure proper operation. For general maintenance:

1. Trip the circuit breaker by pushing the Push-To-Trip or “Open” button located on the face of the circuit breaker. Refer to the appropriate circuit breaker manual for the specific location of this button.
2. Manually open and close the circuit breaker two to three times.

Figure 30 – PowerPact™ R-Frame Circuit Breaker

NOTE: Schneider Electric instruction bulletin 48049-900-0x, *Field Testing and Maintenance Guide for Thermal-Magnetic and Micrologic™ Electronic Trip Molded Case Circuit Breakers*, provides more in-depth information.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- If adjusting circuit breaker settings, do not set the long-time trip rating at a higher ampacity than the rating of the bus bar or load cables it supplies; overheating can occur.
- Before energizing the switchboard, fill all unused I-Line circuit breaker mounting spaces with blank fillers and/or extensions as listed in Table 3.

Failure to follow these instructions will result in death or serious injury.

Refer to individual circuit breaker instruction manuals shipped with the switchboard for additional maintenance information, such as changing rating plugs, sensor plugs, or adjustable settings and removing circuit breakers. If the instruction manual is not available, refer to “Section 11—Reference Publications” on page 56 for the appropriate number, or contact your local Schneider Electric representative.

Table 3 – I-Line™ Blank Fillers and Extensions

Item	Height	Catalog No.	Branch Circuit Side	Circuit Breaker Frame
Blank Fillers	1.50 in. (38 mm)	HNM1BL	Both Sides	Not applicable
	4.50 in. (114 mm)	HNM4BL	Both Sides	
Blank Extensions	1.50 in. (38 mm)	HLW1BL	Wide Side	All applications except PowerPact H/J circuit breakers with Micrologic trip unit 5/6.
	4.50 in. (114 mm)	HLW4BL	Wide Side	
	1.50 in. (38 mm)	HLN1BL	Narrow Side	
	4.50 in. (114 mm)	HLN4BL	Narrow Side	
	4.50 in. (114 mm)	HLN4EBL	Narrow Side	Only PowerPact H/J circuit breakers with Micrologic trip unit 5/6.
	4.50 in. (114 mm)	HLW4EBL	Wide Side	

NOTICE

HAZARD OF EQUIPMENT DAMAGE

- Do not remove the protective lubricant on the plug-on connectors.
- If additional lubrication is required, apply a coating of electrical joint compound, catalog number PJC7201, to the contact surfaces of the plug-on connector.

Failure to follow these instructions can result in equipment damage.

3. The universal test set, catalog number UTS3, is available to test Schneider Electric Powerpact P and R circuit breakers equipped with Micrologic trip units. It runs trip unit tests automatically, with prompts to the user for initial information. Test modules for each circuit breaker frame are used to store data necessary for automatic tests. Series B Micrologic trip units require test module CBTMB, which is included in UTS3.

   A pocket tester, catalog number S434206, or UTA tester, catalog number STRV00910, are available for Schneider Electric Powerpact H, J, and L circuit breakers with Micrologic trip units. These testers supply power to the Micrologic trip units and allow for settings to be adjusted through the keypad located on the circuit breaker or through a PC using the USB interface.

Masterpact NW trip units require the full-function test set, catalog number S33595, or the hand-held test set, catalog number S33594.

NOTE: Tests can be conducted with a circuit breaker installed in the switchboard; circuit breaker removal is not required. **The switchboard must be de-energized.**

QMB/QMJ/QMQB[1] Fusible Switches

Refer to the QMB/QMJ/QMQB[1] instruction manual for complete maintenance information. If the instruction manual is not available, refer to "Section 11—Reference Publications" on page 56 of this manual for the appropriate number. Contact your local Schneider Electric representative to obtain the manual.

Switch Maintenance

1. Periodically exercise the switch to ensure proper operation. This period should not exceed one year.
2. Check the cover interlock with the switch in the ON position. The cover should not open using normal hand force.
3. Inspect the switch interior for any damaged or cracked parts, and replace as necessary.
4. For fusible switch units, check the fuse mounting clips or bolted contact area for corrosion or discoloration (indicating overheating). Replace them if necessary.
5. For additional maintenance instructions, see the label on the inside of the door.

Fuse Replacement (Fusible Switches Only)

1. Turn the switch to the OFF position before opening the door.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Always check line and load ends of the fuses for voltage before starting the fuse replacement procedure with a properly rated voltage sensing device.

Failure to follow these instructions will result in death or serious injury.

2. Observe the switch blades to confirm that the switch is in the OFF position.
3. Using a properly rated voltage sensing device, verify that line and load ends of the fuse are not energized.
4. Observe all warning labels specifying the type of fuse to use. Do not substitute a non-current limiting fuse, or attempt in any way to defeat the rejection feature of the fuse clips furnished with the switch. Do not use renewable link fuses in Schneider Electric fusible switches.

NOTICE

HAZARD OF EQUIPMENT DAMAGE

Do not pry open or spread the fuse mounting clips. Doing so can cause a loose connection, resulting in overheating and nuisance fuse blowing.

Failure to follow these instructions can result in equipment damage.

[1] QMQB switches are available in Canada only.

ENGLISH

Installing QMB/QMJ/QMQB[1] Fusible Switches

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Remove power for these sections before installing or removing QMB/QMJ/QMQB[1] switches.
- Do not use a main as a branch unit or a branch as a main.
- All unused spaces must be filled with blank fillers before energizing the switchboard. Refer to Tables 4 and 5 for sizes and catalog numbers.

Failure to follow these instructions will result in death or serious injury.

Table 4 – QMB/QMJ Fusible Switch Blank Fillers

Height	Catalog No.
1.50 in. (38 mm)	QMB1BLW
3.00 in. (76 mm)	QMB3BLW
6.00 in. (152 mm)	QMB6BLW
15.00 in. (381 mm)	QMB15BLW

Table 5 – QMQB[1] Fusible Switch Blank Fillers

Height	Catalog No.
2x: 1.375 in. (35 mm)	QFS1
8x: 5.50 in. (140 mm)	QFS5
10x: 6.875 in. (175 mm)	QFS6
14x: 9.625 in. (244 mm)	QFS9
24x: 16.50 in. (419 mm)	QFS16

NOTICE

HAZARD OF EQUIPMENT DAMAGE

Do not remove the protective lubricant on the plug-on connectors.

Failure to follow these instructions can result in equipment damage.

1. Turn off the main power.
2. Turn the switch handle(s) to the OFF position. Align switch plug-on connectors with QMB panel vertical bus, and plug switch onto panel.
3. Place and partially tighten all unit mounting screws that mount to the QMB panel mounting rails.
4. Tighten all screws evenly. The unit mounting flange and plug-on connectors must be seated securely.

ENGLISH

Removing QMB/QMJ/QMQB[1] Fusible Switches

1. Turn off the main power.
2. Turn switch handle(s) to the OFF position.
3. Disconnect the load wires.
4. For QMB and QMJ switches, remove mounting screws holding the switch to the mounting rail. For QMQB[1] switches, remove the bolts holding the switch to the line terminal.
5. Unplug the switch.

Ground-Fault Protection Systems

Check the terminal connections on the ground-fault protection system at least once a year for tightness and corrosion. If the system can be tested without tripping the main or branch device, directions for testing the system are in the device manual. Otherwise, testing the ground-fault protection system will trip the main or branch device to which it is connected. If the ground-fault sensor or relay is physically or electrically damaged, replace it.

If the ground-fault protection system does not operate properly and additional equipment has been connected to the installation since the last maintenance test/check, de-energize the entire system, and check for grounds on the neutral downstream from the main bonding jumper. If no downstream grounds are detected and the ground fault system is not operating properly, contact Schneider Electric Services at 1-888-778-2733 (US) or 1-800-565-6699 (Canada).

If no additions have been made to the installation and the ground-fault protection system does not operate properly, contact Schneider Electric Services at 1-888-778-2733 (US) or 1-800-565-6699 (Canada).

Refer to the ground-fault field test instruction manual for additional testing information. If the manual is not available, refer to “Section 11—Reference Publications” on page 56 of this manual to obtain the appropriate number. Contact your local Schneider Electric representative to obtain this manual.

[1] QMQB switches are available in Canada only.

ENGLISH

Section 8—Adverse Circumstances

This section includes, but is not limited to, all electrical components of the switchboard.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Turn off all power supplying the switchboard before cleaning.
- Always use a properly rated voltage sensing device to confirm all power is off.
- Before energizing the switchboard, all unused circuit breaker mounting spaces must be filled.

Failure to follow these instructions will result in death or serious injury.

NOTE: Before attempting to re-energize the switchboard following adverse circumstances, contact Schneider Electric Services at 1-888-778-2733 (US) or 1-800-565-6699 (Canada) for special instructions.

Inspection Following a Short Circuit

If a short circuit occurs, make a thorough inspection of the entire system, and verify that no damage to conductors or insulation has occurred. High mechanical and thermal stresses developed by short-circuit currents can damage conductors and insulation. Check the overcurrent-protection device that interrupted the short-circuit current for possible arcing damage.

Do not open sealed devices, such as molded case circuit breakers. Replace these devices if they are damaged. Before energizing the switchboard, all unused circuit breaker mounting spaces must be filled. For more information about these devices, refer to the appropriate instruction manual listed in “Section 11—Reference Publications” on page 56.

Clean-up Following a Short Circuit

The insulating properties of some organic insulating materials can deteriorate during an electrical arc. If so:

1. Remove any soot or debris.
2. Replace carbon-tracked insulation.

Water-Soaked Switchboards

Do not clean or repair a switchboard that has been exposed to large volumes of water or submerged at any time. Current-carrying parts, insulation systems, and electrical components may be damaged beyond repair. **Do not energize the switchboard.** Contact Schneider Electric Services at 1-888-778-2733 (US) or 1-800-565-6699 (Canada).

ENGLISH

Water-Sprayed or Splashed Switchboards (Clean Water Only)

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Turn off all power supplying this equipment before working on it.

Failure to follow these instructions will result in death or serious injury.

If the switchboard has been sprayed or splashed with small amounts of clean water, make a thorough inspection of the entire system, and verify that no damage to conductors or insulation has occurred. Do not open sealed devices such as molded case circuit breakers or fuses. Replace these devices if they are damaged. For more information about these devices, refer to the appropriate instruction manual listed in “Section 11—Reference Publications”.

Inspection and Clean-up of Clean Water Sprayed or Splashed Switchboards

Follow steps 1–10 only if:

- No signs of physical damage to the equipment are present.
- The switchboard has not been submerged or exposed to water for long periods of time.
- The water that has been in contact with the switchboard has not been contaminated with sewage, chemicals, or other substances that can negatively affect the integrity of the electrical equipment.
- The water that has been in contact with the switchboard has not entered any area of the enclosure that may contain wiring installed as intended and located above any live part. Specifically, inspect for water entering through conduits located above live parts.

If any one or more of these conditions have not been met, contact Schneider Electric Services at 1-888-778-2733 (US) or 1-800-565-6699 (Canada).

If **ALL** of the conditions listed have been met, proceed as follows:

1. Turn off all power supplying this equipment before working on or inside the equipment.
2. Always use a properly rated voltage sensing device to confirm all power is off.
3. Disconnect and electrically isolate the switchboard so that no contact can be made with energized parts.
4. Wipe off all moisture from the bus bars, insulators, and insulating material with a clean, dry, lint-free cloth. Do **not** use cleaning agents or water displacement sprays.
5. Prepare the switchboard for insulation resistance (Megger®) testing by disconnecting all line side supply connections and all load side cable connections to isolate the switchboard from the wiring system.

ENGLISH

⚠ CAUTION

HAZARD OF EQUIPMENT DAMAGE OR INJURY

- Remove the long-time rating plug before electrical insulation testing a circuit breaker that has a label stating “Warning: Disconnect Plug Before Dielectric Test.”
- Some Micrologic trip units are not rated for voltages that would occur during electrical resistance insulation testing.
- Open all control and metering disconnects from the control circuits.

Failure to follow these instructions can result in injury or equipment damage.

6. Turn all circuit breakers or switches to their ON position. The switchboard must remain de-energized.
7. Use a megohmmeter with a capacity of 500–1,000 Vdc and apply voltage from:
   a. Each phase-to-ground with circuit breaker on.
   b. Phase-to-phase with circuit breaker on.
8. Record resistance values. Refer to “Section 10—Switchboard Insulation Resistance Chart” on page 55.
9. If resistance measurements are less than 0.5 megohm, call Schneider Electric Services at 1-888-778-2733 (US) or 1-800-565-6699 (Canada) for recommendations.
10. If resistance measurements are greater than 0.5 megohm, the equipment can be energized using the procedures listed in “Section 6—Energizing the Switchboard” on page 41.

ENGLISH

Section 9—Torque Values for Electrical Connections

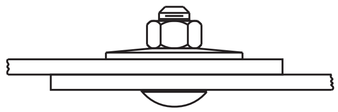
Table 6 – Incoming, Branch, and Neutral Lug

Socket Size Across Flats	Torque Value
1/4 in.	180 lb-in (20 N•m)
5/16 in.	250 lb-in (28 N•m)
3/8 in.	340 lb-in (38 N•m)
1/2 in. ★	450 lb-in (51 N•m)

★ Certain lugs require 620 lb-in (70 N•m) and are marked as such.

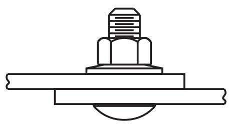
Table 7 – Multiple Conductor Neutral and/or Ground Bar

Screw Type	Lug Wire Range	Conductor Size	Torque Value
Slotted Head	14–4	14-10 Cu, 12-10 Al	20 lb-in (2 N•m)
		8 Cu-Al	25 lb-in (3 N•m)
		6-4 Cu-Al	35 lb-in (4 N•m)
	14–1/0	14-8 Cu-Al	36 lb-in (4 N•m)
		6-1/0 Cu-Al	45 lb-in (5 N•m)
Socket Head	14–1/0	All	100 lb-in (11 N•m)
	6–300 kcmil	All	275 lb-in (31 N•m)

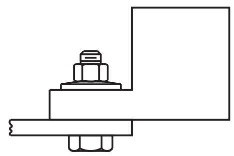


Carriage bolt
Hex nut
Conical washer

Hardware Description	Torque Value
1/2 in.	720–840 lb-in (81–95 N•m)

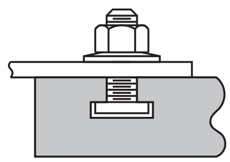


Carriage bolt
Conical washer assembly
Keps nut



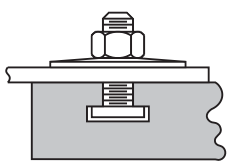
Hex head bolt
Conical washer assembly
Keps nut

Hardware Description	Torque Value
1/4 in.	50–75 lb-in (6–8 N•m)
5/16 in.	80–125 lb-in (9–14 N•m)
3/8 in.	175–225 lb-in (20–25 N•m)
1/2 in.	250–350 lb-in (28–40 N•m)



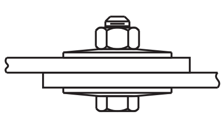
Square head (Tee) bolt
Conical washer assembly
Keps nut

Hardware Description	Torque Value
1/4 in.	50–75 lb-in (6–8 N•m)
3/8 in.	175–225 lb-in (20–25 N•m)
1/2 in.	250–350 lb-in (28–40 N•m)



Square head (Tee) bolt
Conical washer

Hardware Description	Torque Value	
	Conical Washer OD	Square Head (Tee) Bolt Conical Washer
3/8 in.	0.87 in. (22 mm)	250–280 lb-in (28–32 N•m)
	1.00 in. (25 mm)	130–150 lb-in (15–17 N•m)
1/2 in.	1.25 in. (32 mm) 2.25 in. (57 mm)	450–550 lb-in (51–62 N•m)



Hex head bolt
(2) Conical washers

Hardware Description	Torque Value	
	Conical Washer OD	Hex Head Bolt (2) Conical Washers
5/16 in.	0.90 in. (23 mm)	145–160 lb-in (16–18 N•m)
3/8 in.	0.87 in. (22 mm)	250–280 lb-in (28–32 N•m)
	1.00 in. (25 mm)	130–150 lb-in (15–17 N•m)
1/2 in.	1.25 in. (32 mm) 2.25 in. (57 mm) 3.00 in. (76 mm)	720–840 lb-in (81–95 N•m)

ENGLISH

Section 10—Switchboard Insulation Resistance Chart

Always use a 500 or 1,000 Vdc megohmmeter when testing insulation resistance.

NOTE: The Neutral–Ground column is provided to record the results of the pre-energizing checkout procedure only.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Turn off all power to the switchboard before testing.
- Always use a properly rated voltage sensing device to confirm power is off.

Failure to follow these instructions will result in death or serious injury.

Date	Phase–Phase			Phase–Ground			Neutral–Ground
	All Disconnects Open						
	a-b	b-c	c-a	a-ground	b-ground	c-ground	Neutral–Ground
Date	All Disconnects Closed						
	a-b	b-c	c-a	a-ground	b-ground	c-ground	Neutral–Ground

ENGLISH

Section 11—Reference Publications

Schneider Electric publications are available through your local Schneider Electric representative. These publications include device replacement procedures and listings of spare parts to make ordering and servicing of replacement parts quick and convenient. Any maintenance procedure or device not listed, such as an I-Line interior, is not customer serviceable.

Contact your local Schneider Electric representative for information at 1-888-778-2733 in the US, or at 1-800-565-6699 in Canada. Or, refer to the Technical Library at http://www.schneider-electric.us/ to obtain the appropriate publications.

For information about obtaining NEMA documents, write to:

National Electrical Manufacturers Association (NEMA)
Attention: Customer Service
1300 North 17th Street
Suite 1847
Rosslyn, VA 22209

Other Reference Publications	Publication Number
General Instructions for Proper Installation, Operation, and Maintenance of Switchboards Rated 600 V or Less	NEMA Publication PB2.1
Application Guide for Ground Fault Protective Devices for Equipment	NEMA Publication PB2.2
Circuit Breakers	NEMA Publication AB-4
Enclosed and Miscellaneous Distribution Switches	NEMA Publication KS-1
Electrical Equipment Maintenance	NFPA 70B-1999

Section 12—Installation and Maintenance Log

Date	Initials	Maintenance Performed

ENGLISH

Date	Initials	Maintenance Performed

ENGLISH

Schneider Electric USA, Inc.
800 Federal Street
Andover, MA 01810 USA
888-778-2733
www.schneider-electric.us

Standards, specifications, and designs may change, so please ask for confirmation that the information in this publication is current.

80043-055-12, 05/2015
Replaces 80043-055-11, 04/2014

Power-Style™

Tableros de distribución tipo autosoportado QED-2

Clase 2700

Boletín de instrucciones

80043-055-12
05/2015

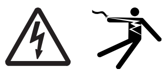
Conservar para uso futuro.

ESPAÑOL

SQUARE D™
by Schneider Electric

Categorías de riesgos y símbolos especiales

Asegúrese de leer detenidamente estas instrucciones y realice una inspección visual del equipo para familiarizarse con él antes de instalarlo, hacerlo funcionar o prestarle servicio de mantenimiento. Los siguientes mensajes especiales pueden aparecer en este boletín o en el equipo para advertirle sobre peligros potenciales o llamar su atención sobre cierta información que clarifica o simplifica un procedimiento.



La adición de cualquiera de estos símbolos a una etiqueta de seguridad de “Peligro” o “Advertencia” indica la existencia de un peligro eléctrico que podrá causar lesiones personales si no se observan las instrucciones.

Este es el símbolo de alerta de seguridad. Se usa para avisar sobre peligros potenciales de lesiones. Respete todos los mensajes de seguridad con este símbolo para evitar posibles lesiones o la muerte.

⚠ PELIGRO
PELIGRO indica una situación de peligro inminente que, si no se evita, **podrá** causar la muerte o lesiones serias.

⚠ ADVERTENCIA
ADVERTENCIA indica una situación potencialmente peligrosa que, si no se evita, **puede** causar la muerte o lesiones serias.

⚠ PRECAUCIÓN
PRECAUCIÓN indica una situación potencialmente peligrosa que, si no se evita, **puede** causar lesiones menores o moderadas.

AVISO
AVISO se usa para hacer notar prácticas no relacionadas con lesiones físicas. El símbolo de alerta de seguridad no se usa con esta palabra de indicación.

NOTA: Proporciona información adicional para clarificar o simplificar un procedimiento.

Observe que

Solamente el personal especializado deberá instalar, hacer funcionar y prestar servicios de mantenimiento al equipo eléctrico. Schneider Electric no asume responsabilidad alguna por las consecuencias emergentes de la utilización de este material.

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ESPAÑOL

Sección 1—Introducción

Este boletín proporciona las instrucciones de instalación, funcionamiento y servicio de mantenimiento de los tableros de distribución tipo autosoportado Power-Style™ QED-2 fabricados por Schneider Electric. Tanto los ingenieros como el personal de supervisión de funcionamiento e instalación del equipo deberán familiarizarse con este manual así como con el aspecto y las características de los componentes instalados o contenidos en el tablero de distribución tipo autosoportado.

Estas instrucciones y procedimientos son aplicables para instalar los tableros de distribución tipo autosoportado Power-Style QED-2 fabricados por Schneider Electric. Cuando han sido instaladas funciones especiales o componentes no comunes en el tablero de distribución tipo autosoportado, encontrará instrucciones detalladas para estos componentes en la documentación adjunta con este equipo.

NOTA: Se hace referencia a los tableros de distribución de la serie 2 en varias partes de este boletín de instrucciones. Para determinar si un tablero de distribución QED-2 es un modelo de la serie 2, consulte la placa de datos situada en la cubierta frontal. Si el tablero de distribución es un modelo de la serie 2, la placa de datos lo indicará. Si el tablero no es un modelo de la serie 2, no habrá una designación de serie.

Inspección y empaque

Cada tablero de distribución tipo autosoportado Power-Style QED-2 se inspecciona y empaca minuciosamente en la planta de montaje. La construcción de la estructura y conexiones eléctricas del tablero de distribución tipo autosoportado son verificadas para cerciorarse de que cumple con todas las especificaciones, códigos y normas. Después de inspeccionarlo completamente, se prepara para su envío. Las secciones se envían por separado para facilitar su manejo antes de la instalación. El número de orden de la fábrica, el número de identificación y el peso de cada sección de transporte está claramente especificado en cada envase.

Reemplazo de documentos

Póngase en contacto con su representante local de Schneider Electric para solicitar la sustitución de hojas de instrucciones y diagramas de alambrado perdidos o dañados. Utilice el número de orden de fábrica como referencia.

Sección 2—Instrucciones de seguridad

ESPAÑOL

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía, consulte la norma 70E de NFPA y NOM-029-STPS.
- Solamente el personal calificado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Asegúrese de leer y entender todas las instrucciones de este boletín antes de realizar cualquier trabajo en este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo en él.
- Antes de realizar una inspección visual, pruebas o servicio de mantenimiento al equipo, desconecte todas las fuentes de alimentación eléctrica. Suponga que todos los circuitos están “vivos” hasta que hayan sido completamente desenergizados, probados y etiquetados. Preste particular atención al diseño del sistema de alimentación. Tome en consideración todas las fuentes de alimentación, incluyendo la posibilidad de retroalimentación.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Siga los procedimientos de bloqueo y etiquetado de acuerdo con los requisitos de OSHA.
- Maneje el equipo con cuidado; instale, haga funcionar y realice servicios de mantenimiento adecuadamente para que funcione como es debido. El incumplimiento de los requisitos fundamentales de instalación y servicios de mantenimiento puede causar lesiones personales así como daño al equipo u otros bienes.
- Inspeccione detenidamente el área de trabajo y retire las herramientas u objetos que hayan quedado dentro del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.
- Todas las instrucciones de este manual fueron escritas suponiendo que el cliente ha adoptado estas medidas de precaución antes de prestar servicios de mantenimiento o realizar una prueba.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Sección 3—Recibo, manejo y almacenamiento

Recibo

Al recibir el equipo, revise la lista de embalaje y compárela con el equipo recibido para asegurarse de que no haya faltantes según la orden de compra y el envío. Además, realice una inspección visual de las secciones del tablero de distribución tipo autosoportado para ver si encuentra algún daño que pudo haber sucedido durante su transporte. Si encuentra algún daño o tiene alguna sospecha de daño, de inmediato presente una reclamación a la compañía de transporte y notifique a su representante de ventas local de Schneider Electric.

Manejo

ESPAÑOL

⚠ ADVERTENCIA

REQUISITOS ESPECIALES DE MANEJO

- No coloque el equipo sobre su frente o lados ya que podría dañarse la unidad.
- Coloque el equipo sobre su parte posterior solamente cuando sea necesario manejarlo de manera especial.
- El equipo no deberá transportarse acostado.

El incumplimiento de estas instrucciones puede causar lesiones serias o daño al equipo.

Asegúrese de tener disponible, en el sitio de instalación, equipo apropiado (por ejemplo, una grúa aérea) para manipular el tablero de distribución tipo autosoportado. El uso de equipo apropiado ayudará a evitar lesiones personales y daño al tablero de distribución tipo autosoportado.

El peso de cada sección de transporte está claramente marcado en la lista de embalaje. Verifique la capacidad de carga del equipo de levantamiento que utiliza para manipular el tablero de distribución tipo autosoportado, asegúrese que sea adecuado para el peso especificado en cada sección de transporte. Mantenga el tablero en posición vertical mientras es manipulado.

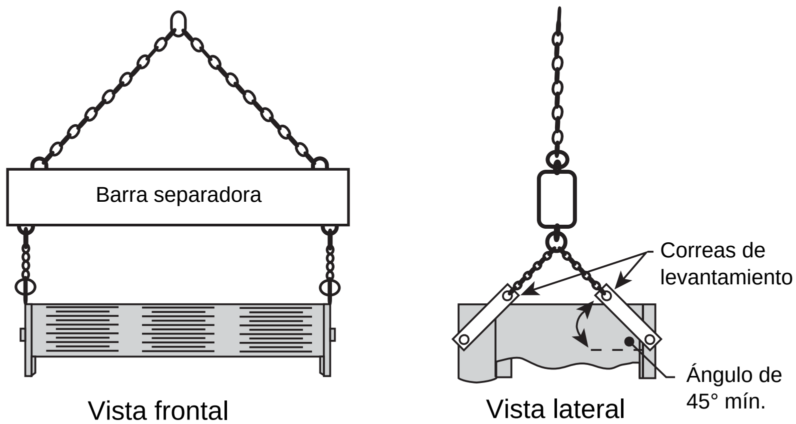
Schneider Electric recomienda el uso de una grúa aérea, correas de levantamiento y cables o cadenas para manipular el tablero. En esta sección se tratan este método así como otros métodos de manipulación alternativos.

ESPAÑOL

Manipulación con correas de levantamiento

Schneider Electric incluye las correas de levantamiento necesarias para manipular las secciones de transporte de los tableros de distribución tipo autosoportado NEMA tipo 1 de 3 000 A o de menor tamaño. Las etiquetas de instrucciones en cada sección de transporte contienen los dibujos e instrucciones escritas que detallan el uso correcto de las correas de levantamiento (vea la figura 1). Emplee barras separadoras rígidas o una barra de extensión para facilitar el levantamiento vertical con las correas de levantamiento. Esto ayuda a evitar daños al marco o acabado.

Figura 1 – Levantamiento con una grúa aérea, correas de levantamiento y cables o cadenas



Siga estas instrucciones al manipular el tablero de distribución tipo autosoportado:

1. Utilice cables o cadenas adecuados para la carga con ganchos de seguridad o grilletes. No pase los cables ni las cadenas por los agujeros en las correas de levantamiento.
2. Emplee una barra separadora adecuada para la carga para evitar daños a la estructura. Nivélela de manera que el ángulo mínimo entre los cables o cadenas de levantamiento y la parte superior del equipo sea de 45°.

Siga estas instrucciones para colocar el equipo sobre su parte posterior:

1. Retire el patín de transporte y las cubiertas posteriores del equipo.
2. Emplee grúas aéreas, correas de levantamiento y cables o cadenas para colocar el equipo sobre su parte posterior.
3. La variación de caída o elevación para colocar el quipo en su parte posterior es de 1,22 m (4 pies) por minuto o menos.
4. Realice este procedimiento de manera inversa para colocar el equipo en posición vertical.
5. Vuelva a instalar las cubiertas posteriores.

La etiqueta de advertencia (figura 2) está adherida en ambos lados, en el frente y detrás del tablero de distribución tipo autosoportado.

Figura 2 – Etiqueta de advertencia – Tableros de distribución tipo autosoportado a prueba de lluvia

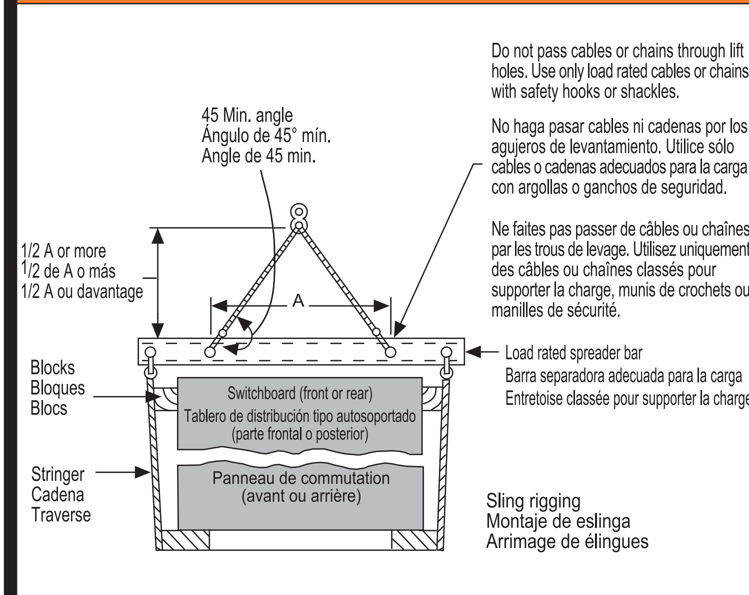
ESPAÑOL

Manipulación sin correas de levantamiento

Las correas de levantamiento no vienen incluidas con las secciones de transporte de más de 3 000 A o con los tableros de distribución tipo autosoportado a prueba de lluvia. Emplee rodillos, eslingas u otro equipo para manipular estas secciones de transporte. La etiqueta de manipulación (figura 3) viene adherida a cada sección de transporte.

Figura 3 – Etiqueta de instrucciones sobre la manipulación de los tableros de distribución sin correas de levantamiento

⚠ WARNING / ADVERTENCIA / AVERTISSEMENT



TOP HEAVY LOAD HAZARD OF TIPPING

- This equipment must be moved by a sling, chain or rollers.
- Stabilize the shipping section to prevent tipping.
- Do not work under, around or on this equipment while elevated or moving.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

CARGA PESADA EN LA PARTE SUPERIOR PELIGRO DE QUE SE CAIGA LA CARGA

- Este equipo debe moverse con una eslinga, cadena o rodillos.
- Estabilice la sección de embarque para evitar voltearla.
- No trabaje debajo, alrededor o sobre el equipo mientras se está elevando o moviendo.

El incumplimiento de estas instrucciones puede causar la muerte, lesiones serias o daño al equipo.

CHARGE INSTABLE RISQUE DE RENVERSEMENT DE CHARGE

- Cet appareil doit être déplacé à l'aide d'une élingue, d'une chaîne ou de roulettes.
- Stabilisez la section de transport afin d'éviter qu'il ne bascule.
- Ne travaillez pas en dessous, autour ou sur cet appareil pendant qu'il est soulevé ou déplacé.

Si ces directives ne sont pas respectées, cela peut entraîner la mort, des blessures graves ou des dommages matériels.

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⚠ ADVERTENCIA

CARGA PESADA EN LA PARTE SUPERIOR—PELIGRO DE QUE SE CAIGA LA CARGA

- Estabilice la sección de transporte para minimizar la posibilidad de que se voltee la carga.
- Consulte con un experto certificado en elevación y montaje para cualquier situación que no se incluye en estas instrucciones.

El incumplimiento de estas instrucciones puede causar la muerte o lesiones serias.

Es posible utilizar una grúa aérea junto con uno de los siguientes dispositivos para levantar una sección de transporte no equipada con correas de levantamiento:

- una cadena unida a un montaje de eslinga
- un cable de alambre con ganchos de seguridad o grilletes

Enrede la eslinga completamente alrededor del tablero de distribución tipo autosoportado y reforzador de transporte (figura 4 en la página 74).

NOTA: El uso de un montacargas es un método alternativo para manipular el tablero de distribución tipo autosoportado. Siempre verifique las longitudes de las horquillas para asegurarse de que éstas se extiendan por debajo de todo el tablero de distribución tipo autosoportado. Equilibre cuidadosamente la carga y siempre utilice una correa de seguridad al manipular o mover un tablero de distribución tipo autosoportado con un montacargas (figura 4 en la página 74).

Almacenamiento

Si va a almacenar el tablero de distribución tipo autosoportado antes de instalarlo cubra la parte superior y sus aberturas (durante el período de construcción) para protegerlo del polvo y basura.

Si no se instala o energiza el tablero de inmediato, almacénelo en un lugar limpio y seco con temperatura uniforme para evitar la formación de condensación. Si es posible, almacene el tablero de distribución tipo autosoportado en el interior. Si es posible, deberá guardarse en un edificio con calefacción y circulación de aire adecuada, y protegerlo de suciedad, humos, agua y cualquier daño físico. Si se almacena el tablero en el exterior podría formarse condensación peligrosa dentro de él.

NOTA: Instale calefactores eléctricos portátiles de aproximadamente 250 W por sección vertical, en ambos gabinetes para los tableros de distribución tipo autosoportado, para interiores y aquellos a prueba de lluvia, para protegerlos adecuadamente durante su almacenamiento.

Antes de energizar los calefactores, retire el empaque suelto o material inflamable dentro del tablero de distribución tipo autosoportado. Los tableros de distribución tipo autosoportado para exteriores no son a prueba de intemperie sino hasta que han sido completa y apropiadamente instalados; trátelos como equipo para interiores antes de su instalación.

Figura 4 – Etiqueta de seguridad del montacargas

⚠ WARNING

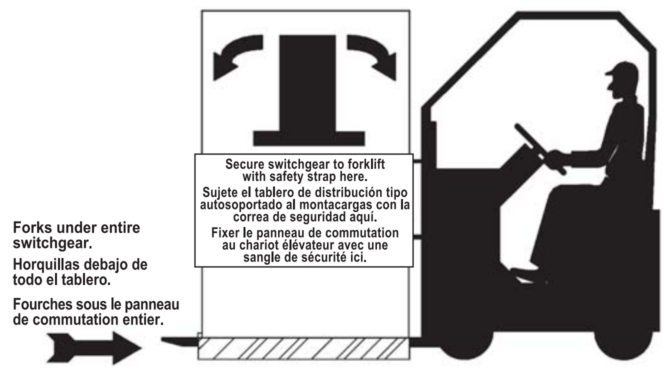
HAZARD OF EQUIPMENT DAMAGE
• Secure to forklift with safety strap.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ ADVERTENCIA

PELIGRO DE DAÑO AL EQUIPO
• Sujete al montacargas con la correa de seguridad.
El incumplimiento de estas instrucciones puede causar la muerte, lesiones serias o daño al equipo.

⚠ AVERTISSEMENT

RISQUE DE BLESSURES OU DE DOMMAGES MATÉRIELS
• Fixer au chariot élévateur avec une sangle de sécurité.
Si ces directives ne sont pas respectées, cela peut entrainer la mort ou des blessures graves ou des dommages matériels.



Remove label after installation.
Retire la etiqueta después de la instalación.
Enlever l'étiquette après l'installation.

Special Handling Requirements
Do not lay the equipment on its front or sides. Doing so will damage unit.
Lay equipment only on its back when special handling is required.
See Instruction Bulletin for special handling instructions for laying equipment on its back.
Equipment is NOT to be shipped lying down.
Failure to follow these instructions can result in death, serious injury or equipment damage.

Requisitos especiales de manejo
No coloque el equipo sobre su frente o lados ya que podría dañarse la unidad.
Coloque el equipo sobre su parte posterior solamente cuando sea necesario manejarlo de manera especial.
Consulte el boletín para obtener las instrucciones especiales de manejo para colocar el equipo sobre su parte posterior.
El equipo NO deberá transportarse acostado.
El incumplimiento de estas instrucciónes puede causar la muerte, lesiones serias o daño al equipo.

Exigences de manutention spéciales
Ne couchez pas l’appareil sur sa face avant ou sur las côtés. Faire ainsi l’endommagerait.
Couchez l’appareil sur le dos uniquement lorsqu’une manutention spéciale est nécessaire.
Consultez les directives d’utilisation pour les instructions de manutention spéciales pour coucher l’appareil sur le dos.
N’expédiez PAS l’appareil sur son dos.
Si ces directives ne sont pas respectées, cela peut entrainer la mort ou des blessures graves ou des dommages matériels.

ESPAÑOL

Sección 4—Instalación

Es importante instalar correctamente los tableros de distribución tipo autosoportado Power-Style QED-2 para que sus componentes funcionen como es debido. Lea cuidadosamente los folletos de instrucciones relacionados y observe los dibujos. Por lo general, los dibujos son enviados al comprador con anterioridad al envío del tablero de distribución tipo autosoportado para permitir la planificación adecuada.

NOTA: La parte superior del tablero de distribución no soportará el peso del instalador.

Ubicación

ESPAÑOL

Localice el área designada en el plano de construcción en donde se instalará el tablero de distribución tipo autosoportado. La ubicación seleccionada para la instalación deberá contar con el espacio libre suficiente para realizar las tareas necesarias según lo establecido en la sección 110-26 del National Electrical Code® (NEC®) o NOM-001-SEDE, o la sección 2-308 del Código eléctrico canadiense (CEC) parte 1.

- Los tableros de distribución tipo autosoportado con facilidad de acceso por su parte frontal requieren que las conexiones en campo; de la línea principal, derivaciones, barra de puesta a tierra y barra de neutro, estén accesibles por la parte frontal del tablero para facilitar su mantenimiento.
- En los tableros de distribución tipo autosoportado con ventilación en su parte posterior, deberá existir un espacio libre mínimo de 13 mm (1/2 pulg) entre la parte posterior del tablero y la pared para obtener ventilación apropiada. Los dibujos del equipo especifican los tableros de distribución tipo autosoportado que requieren acceso por atrás o por el costado.
- Los tableros de distribución tipo autosoportado que requieren acceso por la parte posterior para la instalación, las conexiones de campo o servicios de mantenimiento (como el cambio de filtros), requieren de un espacio de trabajo de 762 mm (30 pulgadas) según el NEC 110-26, NOM-001-SEDE.
- Si el tablero de distribución tipo autosoportado se encuentra en un lugar húmedo o afuera de un edificio, protéjalo colocándolo en un gabinete para exteriores o utilice equipo apropiado para evitar la penetración y acumulación de agua o humedad dentro del gabinete. Los tableros de distribución para exteriores se desaguan por la parte posterior, así que debe haber por lo menos un espacio libre de 13 mm (1/2 pulgada) entre la parte posterior del tablero y una pared u otro obstáculo para un drenaje adecuado.

Preparación de los cimientos

El piso o los cimientos deben ser apropiados para soportar el peso del tablero de distribución tipo autosoportado sin que se hunda. El área alrededor del piso deberá tener una ligera pendiente hacia un desagüe.

NOTA: Consulte la sección en la página 79 para obtener detalles sobre la clasificación sísmica antes de verter la mezcla de concreto para el piso o los cimientos.

Los tableros de distribución tipo autosoportado Power-Style QED-2 son ensamblados en pisos nivelados reales en la planta de montaje. Para garantizar una alineación correcta de las barras de distribución, la plataforma de montaje o el lugar de la instalación final debe estar liso y nivelado. Si los canales de acero en paralelo están incrustados en el piso para montar el tablero, proceda con mucho cuidado y asegúrese de que los canales estén nivelados a todo su largo para evitar deformaciones de la estructura del tablero. Cada uno de los canales debe estar nivelado con el piso terminado.

Antes de verter la mezcla de concreto para los cimientos, asegúrese de realizar las provisiones para tubo conduit que entrarán al tablero desde abajo y que llevarán los cables entrantes o salientes, el alambrado de control y el cable de puesta a tierra. La vista inferior en el dibujo del equipo muestra el área disponible para tubo conduit lo que le permite obtener una configuración correcta.

Los tubos conduit deberán salir del piso terminado aproximadamente 51 mm (2 pulgadas). Sin embargo, para facilitar el desplazamiento de las secciones de transporte a su ubicación final, instale el tubo conduit de manera que quede a ras con el concreto y, una vez que las secciones se encuentren en su posición final, agregue manguitos de extensión apropiados. De lo contrario, será necesario utilizar una grúa para levantar la sección de transporte y librar los receptáculos para tubo conduit. Antes de verter los cimientos, considere instalar tubo conduit adicional para agregar circuitos en el futuro.

Preparación del tablero de distribución tipo autosoportado

Retire la suciedad y material extraño de los cimientos y el área circundante antes de desplazar el tablero de distribución tipo autosoportado a su posición final.

Una vez que el tablero se encuentra instalado en su ubicación final, retire los refuerzos de cada sección de transporte. En los tableros de distribución tipo autosoportado mayores que 610 mm (24 pulgadas) de profundidad, es posible retirar el canal de montaje intermedio.

Retire todo el material de embalaje. Si el tablero de distribución tipo autosoportado viene equipado con una placa de cierre en la parte inferior, en cada sección vertical, retire y conserve las placas para volverlas a usar. Cuando viene equipado con placas de cierre en la parte inferior, el cliente es responsable de hacer los agujeros necesarios para la entrada de tubo conduit por la parte inferior del tablero de fuerza. Una vez que haya perforado los agujeros, vuelva a instalar las placas de cierre.

Generalidades sobre la instalación

AVISO

PELIGRO DE DAÑO AL EQUIPO

Nivele y alinee las secciones de transporte adyacentes una con otra. Asegúrese de que estén correctamente alineadas las barras de paso horizontales principales y las conexiones de las barras de empalme correspondientes.

El incumplimiento de estas instrucciones puede causar daño al equipo.

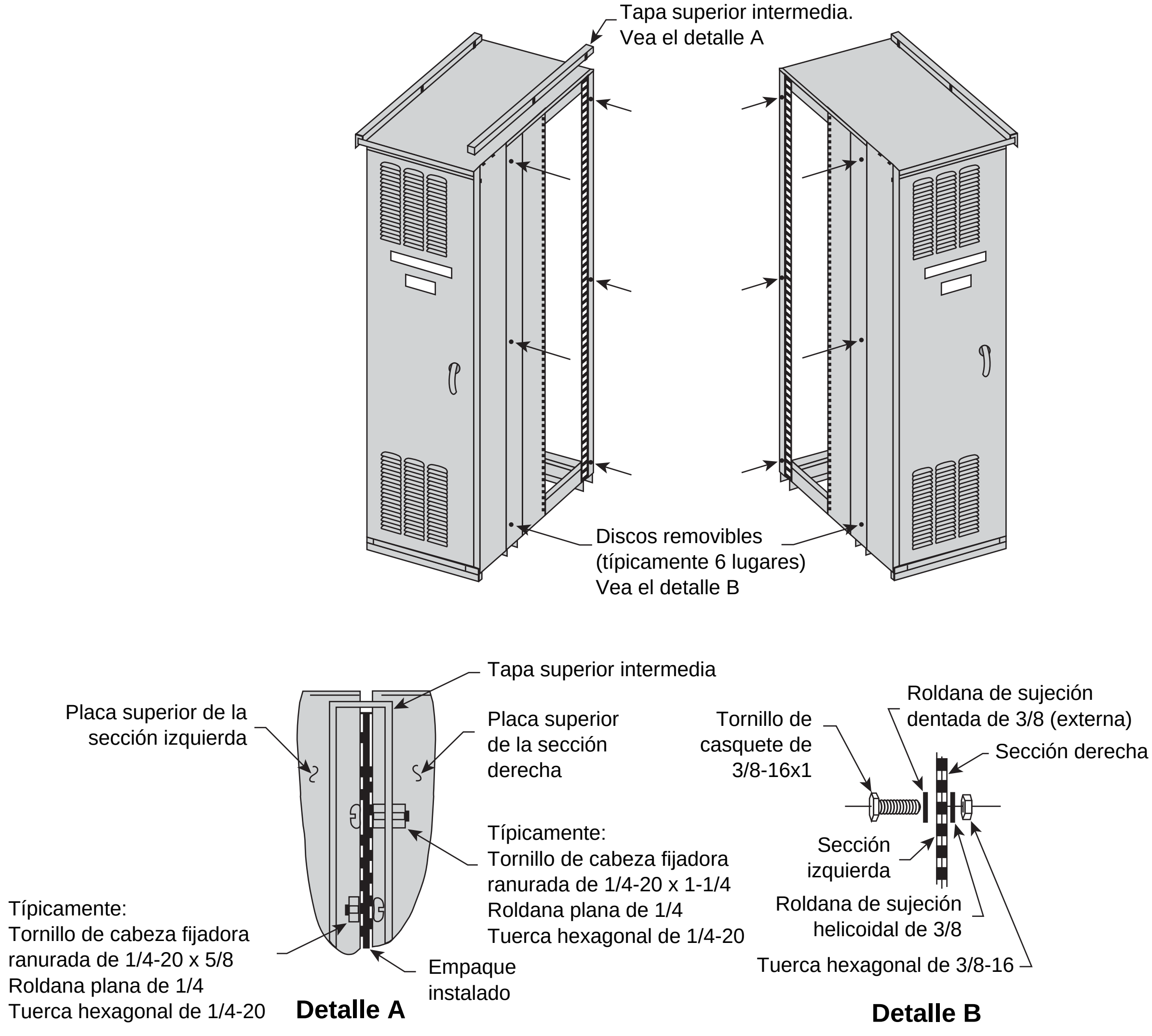
Instale el tablero de distribución tipo autosoportado en su posición final nivelando progresivamente cada sección y atornillando los marcos, si vienen separados. Coloque las secciones de transporte de la siguiente manera:

1. Maneje cada sección de transporte siguiendo los procedimientos delineados en “Manejo” en la página 69 hasta colocarlas en la posición deseada.
2. Cuidadosamente baje la sección hasta colocarla sobre los manguitos de extensión del tubo conduit asegurándose de utilizar el área disponible de tubo conduit mostrada en la vista inferior en los dibujos del equipo. De lo contrario, el espacio puede no ser suficiente para el doblez de los cables.
3. Nivele la sección de transporte.
4. Una vez completada la instalación de cada sección, realice las conexiones de empalme de las barras de paso en la sección anterior antes de instalar la siguiente.

Unión de las secciones de transporte—Tableros de distribución tipo autosoportado para exteriores

1. Retire la tapa superior intermedia (figura 5) de la sección izquierda y conserve los herrajes para volverlos a usar.

Figura 5 – Unión de las secciones adyacentes—Tableros de distribución tipo autosoportado para exteriores



2. Si es posible, abra y retire los paneles y puertas frontal y posterior para obtener acceso para atornillar las secciones de embarque adyacentes.
3. Retire tres discos removibles de 13 mm (0,5 pulg) del canal vertical frontal y tres del canal vertical posterior (un total de seis discos en cada lado del marco) indicados por la flechas en la figura 5.
4. Coloque cuidadosamente cada sección adyacente, nivelando y alineándola con la sección anterior. Si el equipo viene con correas de levantamiento, retírelas completamente de los lados que van a ser atornillados de manera que al unir las secciones queden a ras. El único empaque requerido entre secciones se proporciona en la brida del techo.

ESPAÑOL

NOTA: Si no es necesario retirar las correas de levantamiento para unir las secciones, déjelas en el tablero de distribución tipo autosoportado. Verifique que el tornillo esté bien apretado para mantener la integridad NEMA 3R.

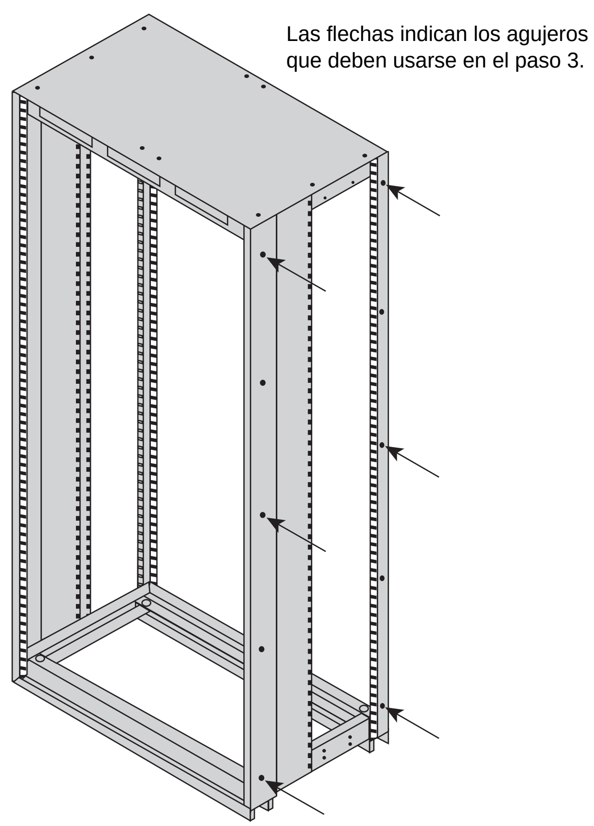
5. Coloque los seis (6) tornillos de 3/8-16 x 1 (incluidos) en los agujeros de los discos retirados en el paso 3 para unir las secciones adyacentes.
6. Realice las conexiones de empalme de las barras de paso en la sección anterior.
7. Vuelva a colocar la tapa superior intermedia que retiró en el paso 1.
8. Vuelva a colocar y sujete las puertas frontal y posterior, y paneles que retiró en el paso 2.

Unión de las secciones de transporte—Tableros de distribución tipo autosoportado para interiores

1. Coloque cuidadosamente cada sección adyacente, nivelando y alineándola con la sección anterior. Si el equipo viene con correas de levantamiento, retírelas completamente de los lados que van a ser atornillados de manera que al unir las secciones queden a ras.

   NOTA: Deje las otras correas de levantamiento en el tablero de distribución tipo autosoportado si no es necesario retirarlas para unir las secciones adyacentes de manera que queden a ras.

Figura 6 – Tableros de distribución tipo autosoportado para interiores



2. Abra y retire los paneles y puertas frontal y posterior para obtener acceso para atornillar las secciones de embarque adyacentes.
3. Coloque los seis (6) tornillos de 3/8-16x1 (incluidos) en los agujeros existentes en los canales verticales de la esquina frontal y posterior para unir las secciones adyacentes, vea la figura 6.

4. Realice las conexiones de empalme de las barras de paso en la sección anterior.
5. Vuelva a colocar y sujete las puertas frontal y posterior, y paneles que retiró en el paso 2.

Sujeción para obtener una clasificación sísmica

El equipo QED-2, certificado a prueba de actividad sísmica, cumple con los requisitos a prueba de actividad sísmica particulares para el sitio, que figuran en los códigos y/o normas de construcción. Es posible que estos modelos requieran características de construcción opcionales, depende de la ubicación de instalación y el código o norma particular. El equipo QED-2 viene acompañado de un certificado de cumplimiento con los requisitos a prueba de actividad sísmica. Para mantener la validez de esta certificación, se deberán seguir las instrucciones de instalación delineadas en este boletín.

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Responsabilidad con respecto a la reducción de daños por actividad sísmica

Para los fines de los códigos de construcción de este modelo, el equipo QED-2 se considera como un componente no estructural de construcción. La capacidad del equipo fue resuelta en base a los resultados de las pruebas detallados en las tablas de actividad sísmica triaxial como lo define el International Code Counsel Evaluation Service (ICCES) (Servicio de evaluación del consejo de normas internacionales) en los criterios de aceptación y requisitos de la prueba de actividad sísmica de componentes no estructurales (AC156). A no ser que se indique lo contrario, se ha utilizado un factor de importancia del equipo de 1,5 (Ip = 1,5); lo que indica que la funcionalidad del equipo fue verificada antes y después de realizar la prueba de simulación sísmica detallada en la tabla de actividad sísmica. Este factor de importancia indica las instalaciones críticas a las cuales deberá darse prioridad para maximizar su funcionalidad después de un evento sísmico. El Building Seismic Safety Council [(BSSC), Consejo de seguridad sísmica en edificios] reconoce el criterio AC156 como un método apropiado en las crónicas del Programa nacional de reducción de riesgos durante terremotos (NEHRP) del 2003 (FEMA 450 parte 2). El Instituto nacional de ciencias de edificios fundó el BSSC en 1979 para desarrollar y promover provisiones normativas de mitigación de riesgos durante terremotos a un nivel nacional.

El tubo conduit así como los cables entrantes y salientes también deben considerarse como sistemas relacionados e independientes, los cuales deberán ser diseñados y contenidos para soportar las fuerzas generadas por el evento sísmico sin aumentar la carga transferida al equipo. En las aplicaciones en las que existen riesgos sísmicos, es preferible introducir y/o sacar los cables y tubo conduit por la parte inferior. Este sistema debe ser capaz de transferir las cargas creadas por un evento sísmico a los muros de carga del sistema estructural del edificio.

Cómo mantener la certificación sísmica

El equipo de Schneider Electric cumple con los requisitos de actividad sísmica en componentes no estructurales los cuales son simplemente un eslabón necesario en toda la cadena de responsabilidades para maximizar la probabilidad de que el equipo esté intacto y que funcione después de un evento sísmico. Durante un evento sísmico, el equipo debe ser capaz de transferir las cargas producidas por la plataforma de montaje y el anclaje a los muros de carga del sistema estructural del edificio. El ingeniero civil o ingeniero de diseño oficial de la estructura es responsable de detallar los requisitos de conexión al equipo y su sujeción para la instalación. El encargado de la instalación y los fabricantes del sistema de restricción de sujeción son responsables de garantizar el cumplimiento con los requisitos de montaje. Schneider Electric no asume responsabilidad por las especificaciones ni el funcionamiento de estos sistemas.

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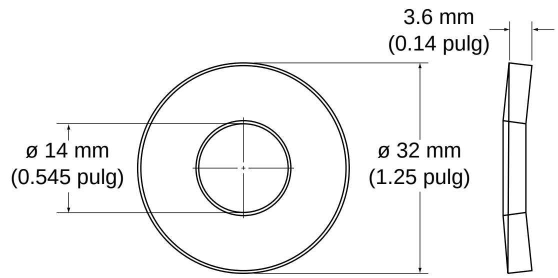
Sujeción del equipo QED-2 para aplicaciones sísmicas

Figura 7 – Roldana Belleville



Los canales de montaje son del ancho de la sección. Los canales y soportes de conexión tienen un agujero de 19 mm (0,75 pulg) de diámetro como mínimo para sujetar la sección al piso. Para sujetar correctamente el tablero QED-2 al piso, emplee todas las cuatro ubicaciones de montaje para los gabinetes NEMA tipo 1 menores de 914 mm (36 pulg) de profundidad, todas las seis ubicaciones de montaje para los gabinetes de 914 mm (36 pulg) a 1 778 mm (70 pulg) de profundidad, y seis de las ocho ubicaciones de montaje para los gabinetes mayores que 1 778 mm (70 pulg) de profundidad (vea la figura 8 en la página 82).

Utilice tornillos de sujeción de 13 mm (1/2 pulg) de diámetro, grado 5 como mínimo, no incluidos con el equipo, para instalar el equipo. Utilice una roldana Belleville de 32 mm (1,25 pulg) de diámetro exterior, grado 5 (no incluida con el equipo, vea la figura 7) debajo de la cabeza de cada tornillo o tuerca de sujeción. Para obtener la fuerza completa de sujeción, apriete los herrajes en el valor especificado por el fabricante del dispositivo de sujeción o bien, según lo recomendado por el ingeniero civil de la estructura oficial del proyecto (vea la figura 9 en la página 83).

Además, cada sección en gabinete NEMA tipo 1 incluye puntos de refuerzo situados en la parte trasera superior para instalar dos soportes de refuerzo laterales (los soportes de refuerzo y herrajes no vienen incluidos con el equipo) en la parte superior de la estructura QED-2 para restringir su movimiento (vea las figuras 10 y 11 en la página 84).

El refuerzo estructural en la parte superior es necesario para todo el equipo QED-2 instalado:

- donde el movimiento de tierra espectral de 0,2 segundos, específico del sitio, excede 2,67 g (según lo determinado en los mapas de movimiento de tierra de referencia por código o el estudio de diseño de riesgo sísmico específico del sitio), o
- donde el desplazamiento en la parte superior del equipo no puede ser tolerado, o bien
- para todas las secciones QED-2 en las esquinas que se usan para aplicaciones de actividad sísmica.

Para obtener la fuerza completa de sujeción en la estructura superior, instale y apriete los herrajes en el valor especificado por el fabricante del dispositivo de sujeción o refuerzo sísmico provisto por el ingeniero civil de la estructura oficial del proyecto.

NOTA: Los herrajes de sujeción no vienen incluidos con el equipo QED-2.

Una vez que se hayan unido correctamente el tablero QED-2 y el equipo adyacente, y toda la estructura haya sido atornillada al piso, instale los conductores de la acometida entrante y los cables del lado de carga. Durante un terremoto, la parte superior del tablero QED-2 puede moverse en cualquier dirección. Los cables que entran por la parte superior deberán ser adecuados para este movimiento. El gabinete del QED-2 (en particular la parte superior) no deberá usarse para montar equipo en su exterior.

Sujeción de la base de montaje

1. Para sujetar correctamente el tablero de alumbrado y distribución al piso, emplee todos los agujeros de montaje de 19 mm (0,75 pulg) de diámetro como se ilustra en la figura 8 en la página 82. Las dimensiones del gabinete en la figura 9 se indican en la tabla 1.

Tabla 1 – Gabinetes–Dimensiones X, Y, Z en pulgadas (mm)

Ancho del gabinete Profundidad del gabinete	12 pulg (305 mm)	24 pulg (610 mm)	30 pulg (762 mm)	36 pulg (914 mm)	42 pulg (1 067 mm)	48 pulg (1 219 mm)	54 pulg (1 372 mm)
24 pulg (610 mm)	X = 6 (152) Y = 21 (533)	X = 18 (457) Y = 21 (533)	X = 24 (610) Y = 21 (533)	X = 30 (762) Y = 21 (533)	X = 36 (914) Y = 21 (533)	X = 42 (1067) Y = 21 (533)	X = 48 (1219) Y = 21 (533)
36 pulg (914 mm)	X = 6 (152) Z = 16,5 (419) Y = 33 (838)	X = 18 (457) Z = 16,5 (419) Y = 33 (838)	X = 24 (610) Z = 16,5 (419) Y = 33 (838)	X = 30 (762) Z = 16,5 (419) Y = 33 (838)	X = 36 (914) Z = 16,5 (419) Y = 33 (838)	X = 42 (1067) Z = 16,5 (419) Y = 33 (838)	X = 48 (1219) Z = 16,5 (419) Y = 33 (838)
48 pulg (1 219 mm)	X = 6 (152) Z = 22,5 (572) Y = 45 (1143)	X = 18 (457) Z = 22,5 (572) Y = 45 (1143)	X = 24 (610) Z = 22,5 (572) Y = 45 (1143)	X = 30 (762) Z = 22,5 (572) Y = 45 (1143)	X = 36 (914) Z = 22,5 (572) Y = 45 (1143)	X = 42 (1067) Z = 22,5 (572) Y = 45 (1143)	X = 48 (1219) Z = 22,5 (572) Y = 45 (1143)
54 pulg (1 372 mm)	X = 6 (152) Z = 25,5 (648) Y = 51 (1295)	X = 18 (457) Z = 25,5 (648) Y = 51 (1295)	X = 24 (610) Z = 25,5 (648) Y = 51 (1295)	X = 30 (762) Z = 25,5 (648) Y = 51 (1295)	X = 36 (914) Z = 25,5 (648) Y = 51 (1295)	X = 42 (1067) Z = 25,5 (648) Y = 51 (1295)	X = 48 (1219) Z = 25,5 (648) Y = 51 (1295)
60 pulg (1 524 mm)	X = 6 (152) Z = 28,5 (724) Y = 57 (1448)	X = 18 (457) Z = 28,5 (724) Y = 57 (1448)	X = 24 (610) Z = 28,5 (724) Y = 57 (1448)	X = 30 (762) Z = 28,5 (724) Y = 57 (1448)	X = 36 (914) Z = 28,5 (724) Y = 57 (1448)	X = 42 (1067) Z = 28,5 (724) Y = 57 (1448)	X = 48 (1219) Z = 28,5 (724) Y = 57 (1448)
72 pulg (1 829 mm)	X = 6 (152) Z_1 = 28,5 Z_2 = 40,5 (1029) Y = 69 (1753)	X = 18 (457) Z_1 = 28,5 (724) Z_2 = 40,5 (1029) Y = 69 (1753)	X = 24 (610) Z_1 = 28,5 (724) Z_2 = 40,5 (1029) Y = 69 (1753)	X = 30 (762) Z_1 = 28,5 (724) Z_2 = 40,5 (1029) Y = 69 (1753)	X = 36 (914) Z_1 = 28,5 (724) Z_2 = 40,5 (1029) Y = 69 (1753)	X = 42 (1067) Z_1 = 28,5 (724) Z_2 = 40,5 (1029) Y = 69 (1753)	X = 48 (1219) Z_1 = 28,5 (724) Z_2 = 40,5 (1029) Y = 69 (1753)

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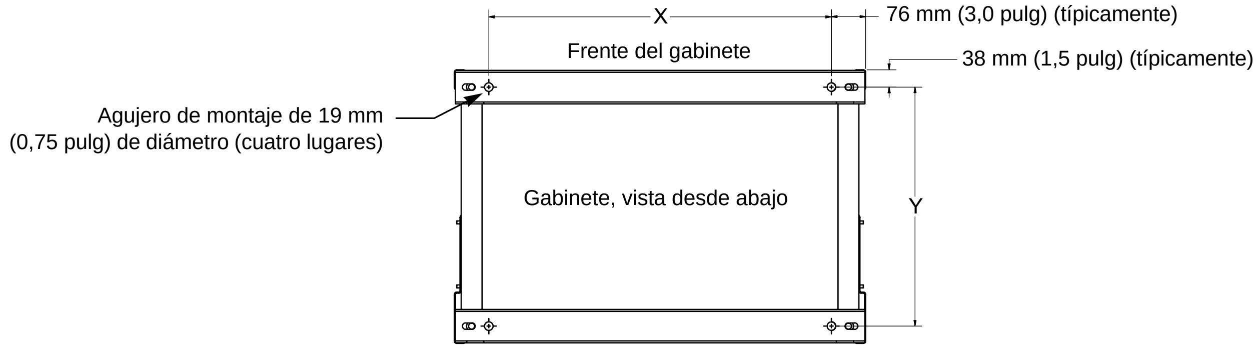
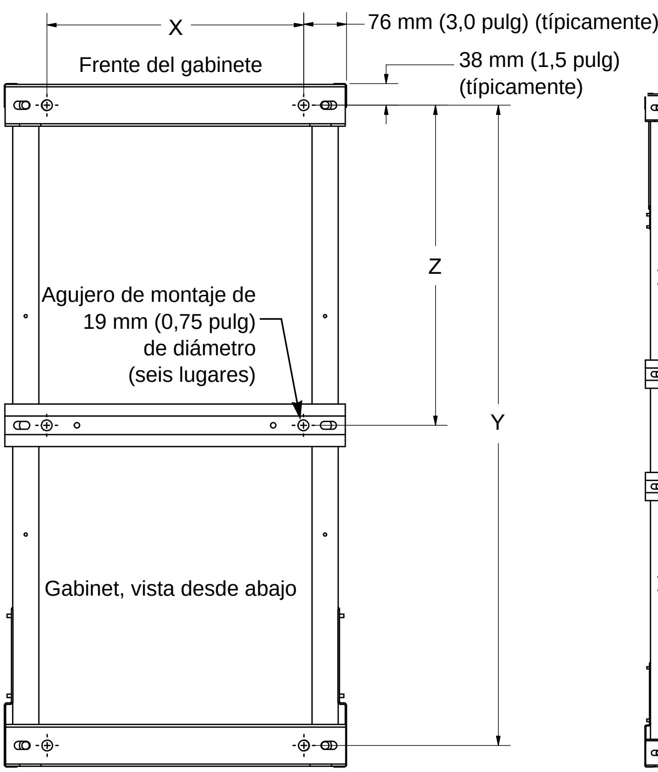
Figura 8 – Ubicación de los tornillos de sujeción al piso de los canales de montaje

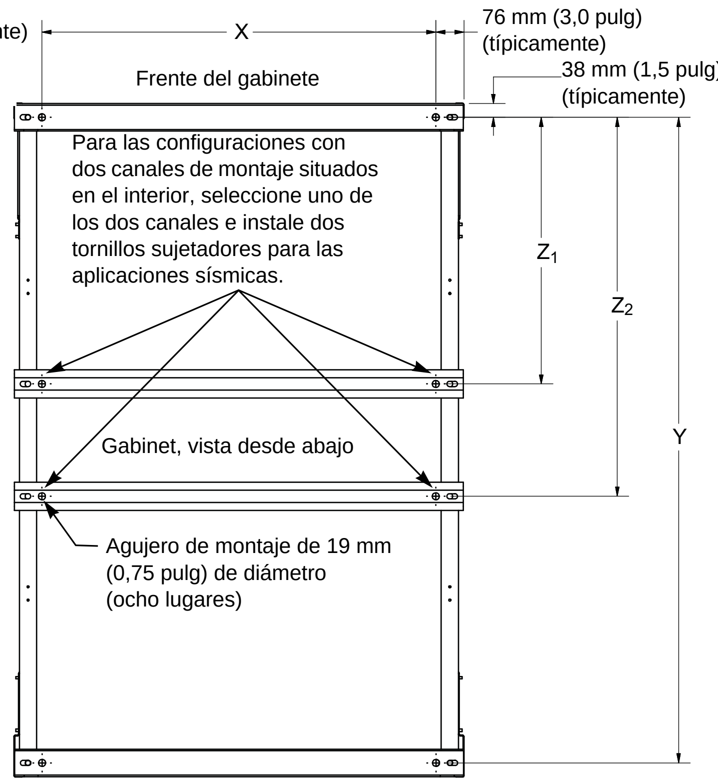


Gabinetes < 914 mm (36 pulg) de profundidad

NOTA: Consulte la tabla 1 en la página 81 para los valores de las medidas X / Y / Z.



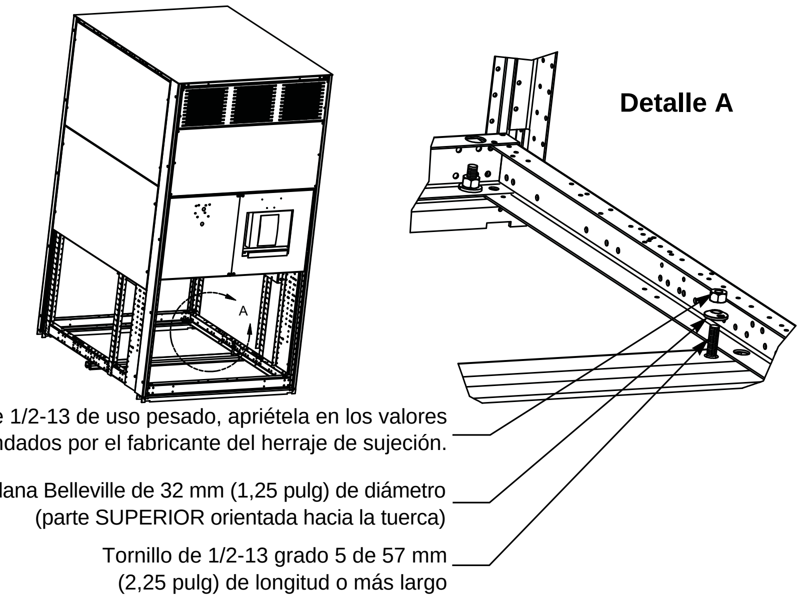
Gabinetes de 914 a 1 778 mm (36 a 70 pulg) de profundidad



Gabinetes > 1 778 mm (70 pulg) de profundidad

2. Según el tamaño de marco (figura 8 en la página 82), se usan cuatro o seis tornillos de ½-13 grado 5, en las ubicaciones que se muestran en la figura 9.

Figura 9 – Herrajes para el canal de montaje



NOTA: Los herrajes del canal de montaje se muestran en detalle para usarse como referencia solamente. Los herrajes de sujeción no vienen incluidos con el equipo. Las cubiertas y herrajes interiores no se muestran para facilitar su ilustración.

3. Una vez que el tablero de alumbrado y distribución ha sido colocado en su lugar, sujete los canales de montaje en cada tornillo empleando una roldana Belleville de 31,75 mm (1,25 pulg) de diámetro entre una tuerca de acero endurecido de 1/2-13 y el marco del tablero como se ilustra en la figura 9.

   NOTA: El lado "SUPERIOR" de la roldana Bellevile deberá estar orientada hacia la tuerca.

4. Apriete cada tuerca en el valor recomendado por el fabricante del herraje de sujeción para adquirir la fuerza total del herraje de sujeción.

Restricción / sujeción en la parte superior

En las instalaciones con un Ss mayor que 2,67 g (según lo determina la versión actual del código de construcción internacional) o bien, donde el desplazamiento no puede ser tolerado en la parte superior del tablero de distribución durante actividad sísmica, emplee los refuerzos instalados en la parte superior del equipo.

NOTA: Los herrajes de sujeción no vienen incluidos con el equipo.

1. Los cuatro agujeros preperforados de 22 mm (0,88 pulg) de diámetro (que se muestran en figura 10 en la página 84) sirven como puntos de refuerzo para un sistema de restricción por la parte superior.

   NOTA: De acuerdo con el código, es responsabilidad del profesional de diseño del edificio determinar el método de restricción apropiado en la parte superior según el uso de aplicación.

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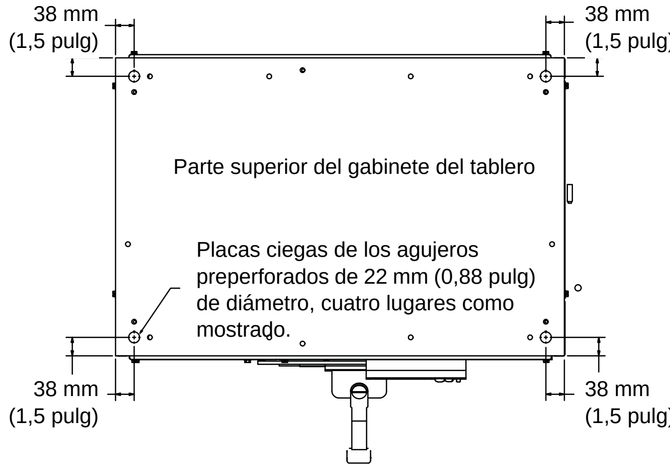
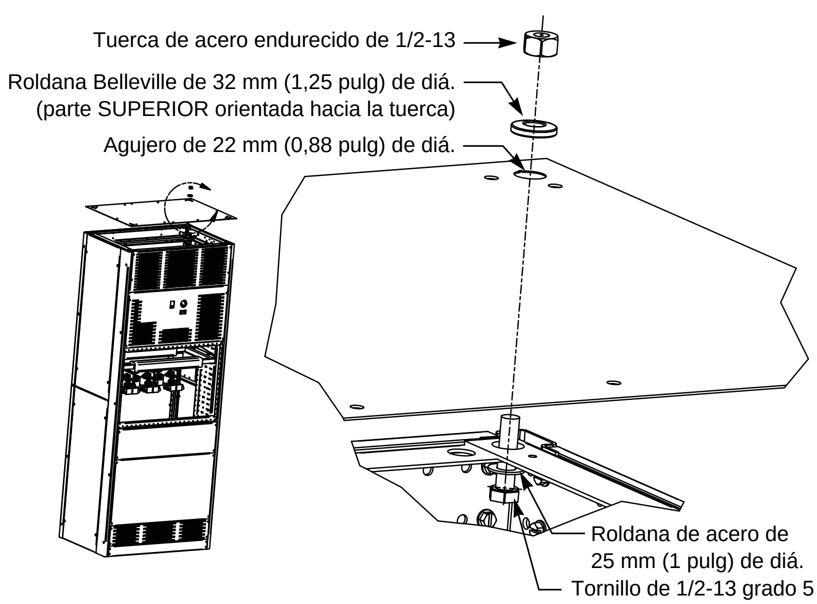
Figura 10 – Ubicación de los puntos de refuerzo para sujeción en la parte superior



2. Desmonte la placa superior del gabinete del tablero principal. Conserve los tornillos.
3. Desprenda las quatro placas ciegas de los agujeros preperforados de 22 mm (0,88 pulg) de diámetro según las indicaciones del profesional de diseño del edificio.
4. Con los discos removibles retirados, vuelva a instalar y vuelva a sujetar la placa superior al gabinete empleando los tornillos que retiró del paso 2.
5. Instale el sistema de refuerzo de la parte superior empleando un tornillo de 1/2-13, grado 5, una roldana de acero de 25 mm (1 pulg) de diá, una roldana Belleville de 32 mm (1,25 pulg) y una tuerca de acero endurecido de 1/2-13 como se muestra en la figura 11.

Figura 11 – Herrajes de montaje para sujeción en la parte superior



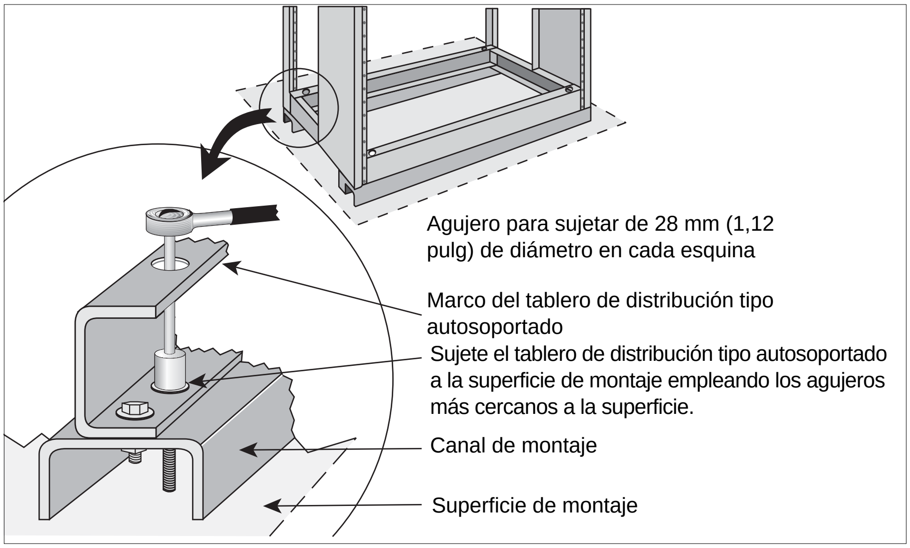
6. Una vez que se hayan unido correctamente las secciones del tablero y toda la estructura haya sido sujetada correctamente, instale los conductores de la alimentación entrante de acometida y los cables del lado de carga.
7. No utilice el gabinete del tablero (en particular la parte superior) para montar equipo en su exterior, con la excepción del tubo conduit.

Sujeción del tablero de distribución tipo autosoportado

Aunque las secciones son independientes, un golpe duro o movimiento brusco puede dañar las uniones de empalme entre las secciones y los receptáculos de tubo conduit conectados a ellas. Por lo tanto, cada sección vertical debe ser sujetada al piso.

Los canales de montaje son del ancho de la sección de transporte. Los canales tienen un agujero de 28 mm (1,12 pulg) de diámetro para sujetar la sección al piso (vea la figura 12). Sujete cada sección al piso utilizando tornillos de 13 mm (1/2 pulg), grado 2 como mínimo, con roldanas planas y anclajes adecuados para la instalación del equipo eléctrico (no incluidos).

Figura 12 – Canales de montaje del tablero de distribución tipo autosoportado



Una vez que se hayan unido correctamente las secciones del tablero de distribución tipo autosoportado y toda la estructura haya sido atornillada al piso, instale los conductores de la acometida entrante y los cables del lado de carga.

NOTA: Si el tablero de distribución tipo autosoportado consiste en una sola sección, vaya al paso “Unión y puesta a tierra” en la página 88.

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Conexiones de empalme de las barras de paso

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No instale los conectores de empalme de las barras de paso mientras el tablero de distribución tipo autosoportado está energizado.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Los herrajes y/o conectores de empalme de las barras de paso, junto con las hojas de instrucciones para su instalación, vienen incluidos con cada sección de transporte. Siga las instrucciones de instalación y apriete los tornillos de empalme en los valores especificados en la “Sección 9—Valores de par de apriete para las conexiones eléctricas” en la página 117.

Si las barras de paso vienen envueltas en material aislante, utilice este material para cubrir las conexiones de empalme.

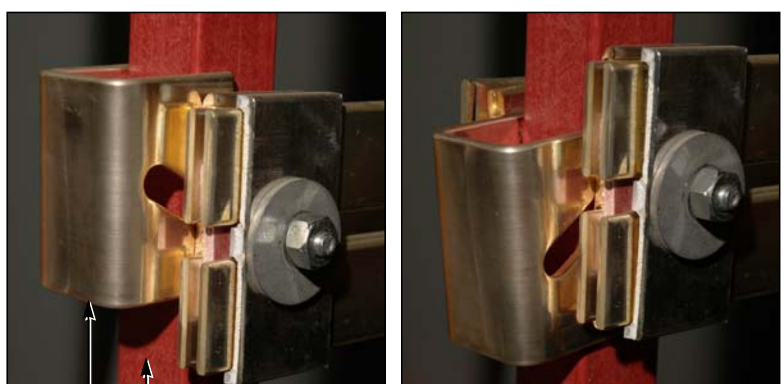
En las conexiones de empalme con barra al frente y atrás de un tubo de aislamiento, asegúrese de que el conector de cobre en forma de U esté centrado alrededor del tubo. La figura 13 en la página 86 muestra la orientación correcta del conector.

NOTA: El conector en forma de U encajará firmemente en el tubo aislador cuando ha sido instalado correctamente. Para mostrar la orientación de la ranura del conector, éste se muestra separado del tubo aislador (vea la figura 13).

Figura 13 – Orientación correcta del conector de empalme en forma de U

Correcta
La ranura del conector de empalme deberá estar orientada hacia abajo.

Incorrecta
La ranura del conector de empalme está orientada hacia arriba.



Conexiones de empalme de la barra de puesta a tierra

Alinee y sujete las conexiones de empalme de la barra de puesta a tierra, en cada sección de transporte. Apriete las conexiones en 11 N•m (100 lbs-pulg), vea la figura 14 o 15.

NOTA: Es muy importante realizar la instalación correcta de los sistemas de falla a tierra del equipo.

Figura 14 – Conexión de empalme de la barra de puesta a tierra

Empalme de la barra de puesta a tierra (incluye el herraje formador de roscas de 1/4-20)

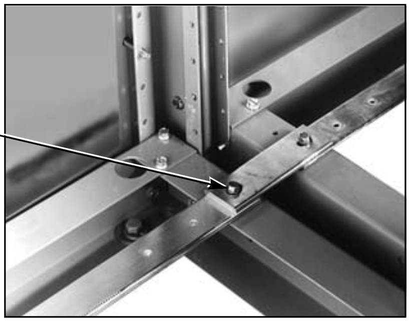


Figura 15 – Conexión de empalme de la barra de puesta a tierra de la serie 2

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Unión y puesta a tierra

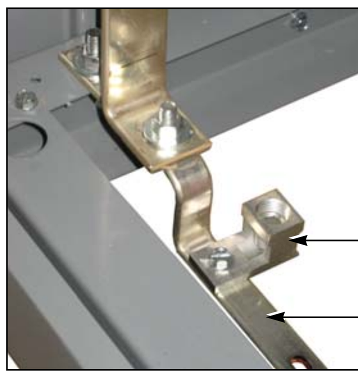
NOTA: Un sistema está “puesto a tierra” si está conectado a tierra en cualquier punto adelante del tablero de distribución tipo autosoportado, independientemente de que el conductor (neutro) de puesta a tierra haya o no sido llevado con las cargas.

Equipo de acometida—Sistema puesto a tierra

En los sistemas sólidamente *puestos a tierra* utilizados como equipo de acometida o como un tablero principal en un sistema derivado independiente:

1. Tienda un conductor (del electrodo de puesta a tierra) desde el electrodo en el sitio de instalación al conector (zapata de tierra) del conductor del electrodo, situado en la barra de puesta a tierra del tablero (o en la barra de neutro, si así lo indican los dibujos del equipo), vea la figura 16. Seleccione el material y tamaño del conductor del electrodo de puesta a tierra apropiado para cumplir con los requisitos de las secciones 250-62 y 250-66 del NEC, NOM-001-SEDE o las secciones 10-204 y 10-206 del Código canadiense CEC de 1998 e instálelo según las especificaciones de la sección 250-64 del NEC, NOM-001-SEDE o la sección 10-908 del CEC de 1998.

Figura 16 – Conector del electrodo de puesta a tierra



2. Instale el puente de unión principal entre la barra de neutro y la barra de puesta a tierra (vea la figura 17 o 18). Obtenga los valores de par de apriete de la “Sección 9—Valores de par de apriete para las conexiones eléctricas” en la página 117.

   NOTA: Si el tablero de distribución tipo autosoportado es alimentado de múltiples fuentes (por ejemplo, sistemas de dos extremos), habrá que instalar dos o más puentes de unión principales.

Figura 17 – Puente de unión principal

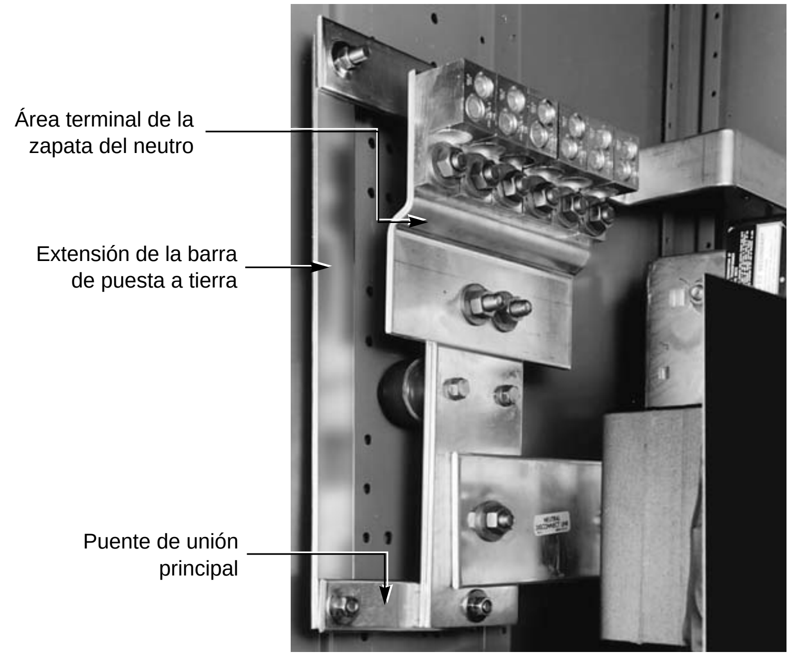


Figura 18 – Puente de unión principal de la serie 2

El equipo vendido en Canadá incluye un puente de unión principal (barra o cable) entre la barra de neutro y la barra de puesta a tierra. Cuando es necesario desconectar este puente (por ejemplo, para la prueba con un Megger®), retire la barra de puente de unión principal o la zapata con cable de la barra de neutro; éste se encuentra normalmente junto a las zapatas de neutro de línea. Sujete la barra o cable de puente de unión principal y la zapata para mantener la distancia requerida entre las fases y el neutro.

NOTA: Si el tablero de distribución tipo autosoportado es alimentado de múltiples fuentes (por ejemplo, un sistema de dos extremos como un principal-interconexión-principal), habrá dos o más puentes de unión principales instalados.

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Equipo de acometida—Sistema no puesto a tierra

En los sistemas *no puestos a tierra* utilizados como equipo de acometida o como un tablero principal en un sistema derivado independiente:

1. Tienda un conductor (del electrodo de puesta a tierra) desde el electrodo en el sitio de instalación al conector (zapata de tierra) del conductor del electrodo, situado en la barra de puesta a tierra del tablero, vea la figura 16.
2. Seleccione el material y tamaño del conductor del electrodo de puesta a tierra apropiado para cumplir con los requisitos de las secciones 250-62 y 250-66 del NEC, NOM-001-SEDE o las secciones 10-700 y 10-702 del Código canadiense CEC de 1998 e instálelo según las especificaciones de la sección 250-64 del NEC, NOM-001-SEDE o la sección 10-204 del CEC de 1998.

Equipo no de acometida

En los sistemas *puestos o no puestos a tierra* en los que el tablero de distribución tipo autosoportado no es utilizado como equipo de acometida ni tampoco como un tablero principal en un sistema derivado independiente:

Utilice conductores de puesta a tierra del equipo del tamaño especificado en la sección 250-122 del NEC, NOM-001-SEDE o la sección 10-206 del código canadiense CEC de 1998 para conectar el marco del tablero de distribución tipo autosoportado y la barra de puesta a tierra a la tierra de acometida.

Sistemas de alta impedancia con neutro puesto a tierra

Sistemas de alta impedancia con neutro puesto a tierra:

Conecte el sistema a tierra de acuerdo con las instrucciones incluidas con el sistema de puesta a tierra del equipo y de acuerdo con las especificaciones de la sección 250-36 del NEC, NOM-001-SEDE. Asegúrese de que el marco del tablero de distribución tipo autosoportado y la barra de puesta a tierra estén conectadas de acuerdo con las especificaciones de la sección 250-102 del NEC, NOM-001-SEDE.

Conexiones del electroducto

Los tableros de distribución tipo autosoportado de Schneider Electric se fabrican en dos estilos diferentes de conexiones de electroducto. La brida Qwik Flange™ se utiliza sólo en los tableros de distribución tipo autosoportado para interiores.

El otro tipo de conexión de electroducto es el extremo con brida “falsa”. Este tipo de conexión es utilizada principalmente en los tableros de distribución tipo autosoportado para exteriores; sin embargo, también se usa en algunos tableros para interiores. El extremo con brida falsa debe ser desmontado para permitir la instalación del extremo con brida real del electroducto. De cualquier modo, el extremo con brida falsa o el extremo con brida real del electroducto deberá estar en su lugar antes de energizar el tablero de distribución tipo autosoportado.

NOTA: No use el tablero de distribución tipo autosoportado para soportar el peso de la conexión del electroducto. Soporte el electroducto en forma independiente. Cuando se instala el electroducto, asegúrese de que no hay áreas del techo inclinadas hacia abajo. Esto ayudará a prevenir la acumulación de agua.

Conexión del electroducto—NEMA 1 (para interiores) solamente (con brida Qwik Flange™)

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

Desenergice el tablero de distribución tipo autosoportado y el electroducto antes de realizar las conexiones.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Siga las instrucciones descritas en esta sección para realizar las conexiones del electroducto con brida Qwik Flange (vea las figuras 19 y 20 en la página 91).

1. Quite las cubiertas protectoras de la abertura en el tablero de distribución tipo autosoportado.
2. Deslice la junta del electroducto en los conectores del tablero de distribución tipo autosoportado.
3. Verifique la alineación del tornillo de unión; la distancia entre la línea central (C/L) del tornillo de unión y la superficie del tablero de distribución tipo autosoportado deberá ser de 24 mm (0,95 pulg), vea la figura 19.
4. Instale las placas de cierre laterales utilizando dos tornillos de 5/16, incluidos. Si la instalación se realizó correctamente, los agujeros en las placas de cierre laterales estarán alineados con los agujeros en ambos, el tablero de distribución tipo autosoportado y el electroducto.

Figura 19 – Instalación de la brida Qwik Flange

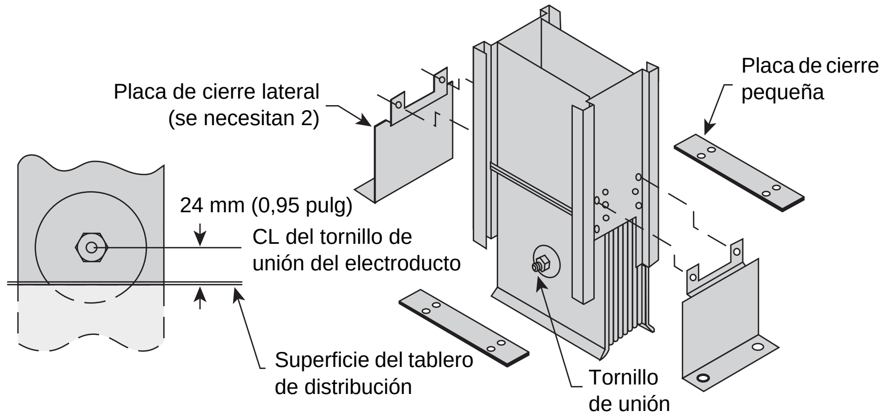
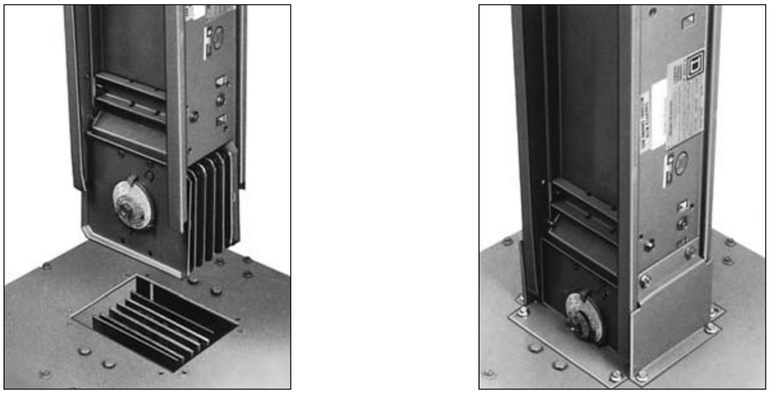


Figura 20 – Brida Qwik Flange



5. Utilice una llave con una palanca de 457 mm (18 pulg) o más larga para apretar el tornillo de unión hasta romper la cabeza exterior. No deje que caigan la cabeza del tornillo ni el disco rojo de advertencia dentro del tablero de distribución tipo autosoportado.

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6. Utilice los cuatro tornillos de 1/4-20 para colocar las dos placas de cierre pequeñas restantes en su lugar alineándolas con los agujeros en el tablero de distribución tipo autosoportado.
7. Asegúrese que las fases del electroducto instalado estén en la posición correcta, antes de energizarlo.

Conexión del electroducto—NEMA 1 (sin brida Qwik Flange) y NEMA 3R

Si el tablero viene con este estilo de conexión, se deberá retirar la brida falsa antes de instalar el electroducto, vea la figura 21.

⚠ PELIGRO

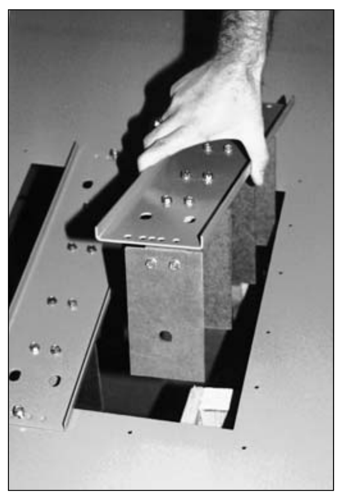
PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

Desenergice el tablero de distribución tipo autosoportado y el electroducto antes de realizar las conexiones.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

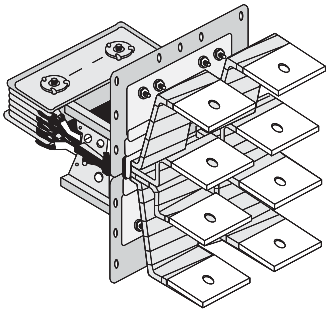
1. Desde el interior del tablero de distribución tipo autosoportado, extraiga los tornillos de 13 mm (1/2 pulg) que sujetan las barras del tablero a las bridas falsas no metálicas. Conserve los herrajes para volverlos a utilizar.
2. Retire los tornillos que sujetan la brida falsa al gabinete del tablero de distribución tipo autosoportado.
3. Retire la brida falsa, vea la figura 21.

Figura 21 – Desmontaje de la brida falsa



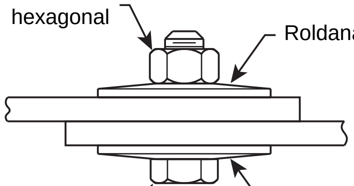
4. Instale la brida real sobre los conectores de las barras del tablero de distribución tipo autosoportado incluidos, vea la figura 22. Instale las lengüetas de conexión entre los conectores de las barras del tablero de distribución de manera que los agujeros de montaje, en el collarín de la brida, se alineen con los agujeros previamente perforados en el gabinete del tablero.

Figura 22 – Conexiones de la brida



5. Alinee los agujeros en las lengüetas de conexión de las barras de distribución y vuelva a instalar los herrajes de 13 mm (1/2 pulg) que retiró en el paso 1, en la página 92, vea la figura 23.

Figura 23 – Reinstalación de los herrajes de 13 mm (1/2 pulg)



NOTA: El lado convexo (marcado “Top”) de una roldana cónica deberá estar apoyado contra la cabeza del tornillo y el lado convexo de la segunda roldana cónica deberá estar apoyado contra la tuerca hexagonal.

6. Apriete los tornillos instalados en el paso 5 como se indica en la “Sección 9—Valores de par de apriete para las conexiones eléctricas” en la página 117.
7. Ensamble el collarín del electroducto al gabinete del tablero de distribución tipo autosoportado utilizando los tornillos provistos.
8. Asegúrese de que la tierra integral del electroducto esté conectada a la barra de puesta a tierra del tablero de distribución tipo autosoportado.
9. Confirme la posición de las fases del electroducto antes de energizarlo.

Área reservada para el tubo conduit

1. Ubique y haga que todo el tubo conduit termine en el gabinete del tablero de distribución tipo autosoportado, en el “área disponible para el tubo conduit” designada en el dibujo del equipo.

   NOTA: En los tableros de distribución tipo autosoportado mayores que 610 mm (24 pulgadas) de profundidad, es posible retirar el canal de montaje intermedio para obtener espacio adicional para el tubo conduit. **Excepción:** Cuando se require un refuerzo sísmico no retire ningún canal de montaje.
2. Instale el tubo conduit correctamente. Utilice receptáculos, tuercas de sujeción y cojinetes para proteger los cables y evitar que se forme condensación en el tubo conduit y que entre al tablero de distribución tipo autosoportado.

   NOTA: Si el tubo conduit entra por la parte superior, no use la parte superior del tablero de distribución tipo autosoportado para soportar su peso. Soporte el tubo conduit en forma independiente. Cuando se instala el tubo conduit, asegúrese de que no hay áreas del techo inclinadas hacia abajo. Esto ayudará a prevenir la acumulación de agua.

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Si viene equipado con placas de cierre en la parte inferior, el cliente deberá desmontar las placas, hacer los agujeros necesarios para el tubo conduit que entra por la parte inferior del tablero de distribución, y luego volver a instalar las placas.

Bajo condiciones sísmicas, considere el uso de refuerzos en la parte superior del equipo para restringir su movimiento.

3. Conecte todos receptáculos de tubo conduit al gabinete del tablero de distribución tipo autosoportado con conexiones eléctricas aprobadas.

Extracción de cables

Los tableros de distribución tipo autosoportado Power-Style QED-2 se fabrican según las especificaciones del cliente; por ejemplo, la configuración de entrada de los cables puede ser por la parte superior o por la parte inferior. Los componentes del tablero de distribución tipo autosoportado se arreglan de manera tal para obtener el espacio libre necesario para el doblez de los cables que entran y salen del tablero como se especifica en los dibujos del equipo.

1. Utilice sólo cable de calibre adecuado para obtener una buena conexión con las zapatas correspondientes.
2. Extraiga la cantidad correcta de cables para los lados de línea y carga según la carga a servir así como los requisitos del NEC, NOM-001-SEDE y CEC.
3. Coloque los cables dentro del tablero de distribución tipo autosoportado de manera que no estén sujetos al daño físico.
4. Mantenga los radios máximos posibles para el doblez y un espacio libre adecuado entre los cables y las barras de distribución y las partes conectadas a tierra. Los cables tendidos o que soportan miembros estructurales deben ser sujetados correctamente o coloque material de protección adecuado en el punto de aguante para proteger el aislamiento de los cables.
5. En los lugares donde los cables entran o salen del tablero de distribución tipo autosoportado, o pasan a través de cualquier metal que tenga propiedades magnéticas, asegúrese de hacer pasar todos los conductores de fase, incluyendo el neutro, por la misma abertura. De lo contrario, puede haber sobrecalentamiento. Consulte la sección 300-20(a) del NEC y NOM-001-SEDE.
6. Cuando se le indique, soporte o sujete con cables los conductores.

Terminaciones de cable

1. Con una herramienta de desforramiento apropiada, pele una sección de aislamiento de un extremo del cable suficiente para encajar en la longitud completa del cuerpo de la zapata. Tenga cuidado de no dañar los hilos.
2. Utilice un cepillo para limpiar completamente las superficies de contacto de los cables de aluminio o friegue con un trapo abrasivo para remover el óxido y material extraño.
3. De inmediato aplique un compuesto para juntas aceptable a las superficies de aluminio al descubierto.
4. Desatornille y retire las zapatas de compresión si fueron provistas con los seccionadores o interruptores automáticos, o las zapatas de alimentación entrante principales, para crear espacio suficiente para plegar las zapatas en los cables con una herramienta opresora.
   a. Inserte el cable en el cuerpo de la zapata y, con una herramienta opresora, realice la cantidad de pliegues especificada por el fabricante.
   b. Limpie el sobrante de compuesto para juntas del conector y aislamiento.
   c. Con los cables conectados, vuelva a montar las zapatas sobre las barras de distribución, desconectadores o interruptores automáticos. Apriete los tornillos en los valores especificados en la “Sección 9—Valores de par de apriete para las conexiones eléctricas” en la página 117.
5. Las zapatas tipo tornillo se pueden proporcionar como zapatas principales de entrada y son estándares en los interruptores automáticos en caja moldeada e interruptores fusibles QMB/QMJ/QMQB[1]. Apriete estas zapatas en, **pero no exceda**, los valores especificados. Los valores de par de apriete para las zapatas del interruptor automático así como de desconectadores vienen marcados en estas unidades. Los valores de par de apriete para otras zapatas vienen especificadas en el tablero de distribución tipo autosoportado (consulte la tabla 7 en la página 117).

[1] Los interruptores fusibles QMQB se encuentran disponibles solamente en Canadá.

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Sujetadores de cables para la corriente nominal de cortocircuito (SCCR)

El sujetador de cables se recomienda para las zapatas montadas en barras cuando se cumplen las siguientes condiciones:

- Las longitudes de cable sin soporte son superiores a 1 m (3,5 pies) [1]

Y

- Los cables cumplen con los criterios **Sí** que se muestran en la tabla 2.

Tabla 2 – Criterios para el uso de sujetadores de cables

Intensidad de corriente de los cables	Corriente de falla de cortocircuito disponible (RMS)			
	< 65 kA	65 a < 85 kA	85 a < 150 kA	150 a 200 kA
≤ 800 A	No	Sí	Sí	Sí
1200 A	No	No	Sí	Sí
1600 A	No	No	Sí	Sí
2000 A	No	No	Sí	Sí
2500 A	No	No	No	Sí
3000 A	No	No	No	Sí
≥ 4 000 A	No	No	No	No

O

- Cuando se especifique lo contrario.

NOTA: Para los interruptores automáticos I-Line™, o si las zapatas se encuentran en el interruptor, consulte el boletín de instrucciones correspondiente.

Figura 24 – Ejemplo de sujetador de cables

[1] La longitud del cable se mide desde el extremo de la zapata al conector de tubo conduit por donde sale el cable.

AVISO

PELIGRO DE MOVIMIENTO DE CABLES BAJO UN CORTOCIRCUITO

Sujste todos los cables, incluyendo los cables de neutro, en la instalación del tablero de distribución cuando las condiciones especificadas en la página 96 se cumplan.

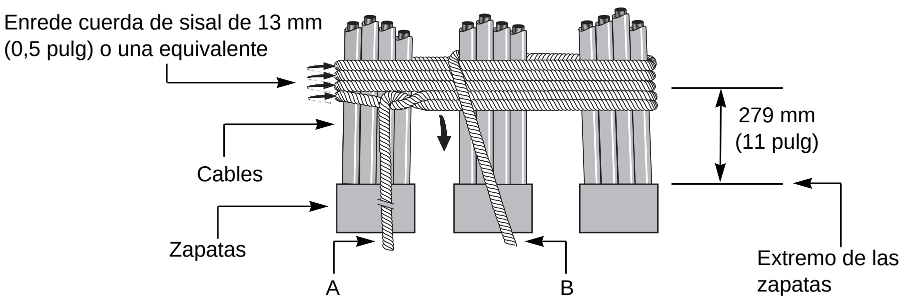
El incumplimiento de estas instrucciones puede causar daño al equipo.

Cuando son necesarios los sujetadores de cables, realice los siguientes pasos.

NOTA: Enrede los cables con cuerda de sisal de 13 mm (1/2 pulgada) de diámetro, cuerda de nylon de 9,5 mm (3/8 pulgada) de diámetro o su equivalente.

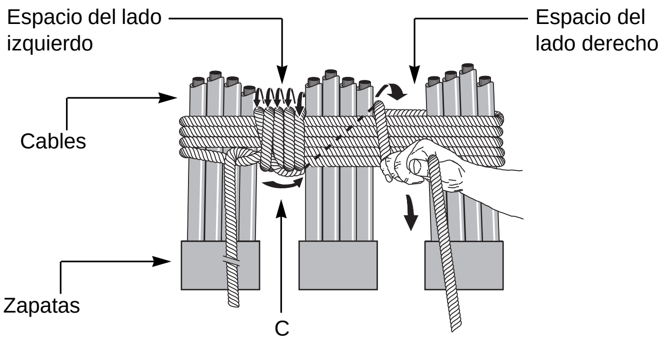
1. Comience a enredar los cables (figura 25) a una distancia de no más de 279 mm (11 pulg) desde el extremo de las zapatas. Continúe enredando los cables cada 279 mm (11 pulg), hasta el punto donde los cables salen del gabinete.
   a. Enrede los cables cuatro (4) veces, como se muestra en la figura, dejando 1 m (3 pies) de cuerda en el primer extremo (A).
   b. Jale la cuerda (B) hasta tensarla.

Figura 25 – Cómo enredar los cables (los cables de neutro no se muestra)



2. Enrede la cuerda varias veces (figura 26) hasta llenar completamente el espacio entre los cables.
   a. Entrelace el bucle final de la cuerda por debajo del bucle anterior (C).
   b. Pase la cuerda por el espacio del lado derecho.
   c. Jale la cuerda hasta tensarla.

Figura 26 – Cómo enredar la cuerda en el espacio entre los cables



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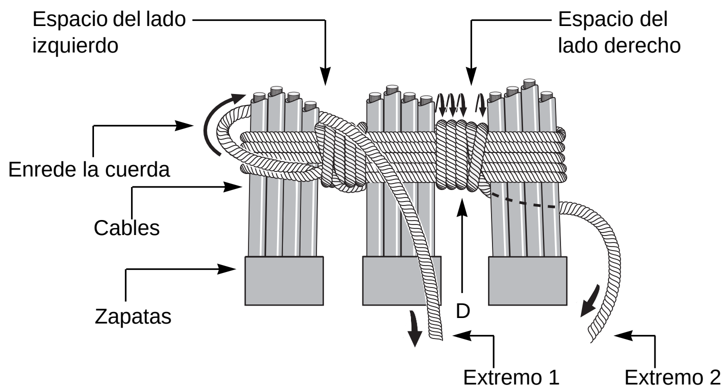
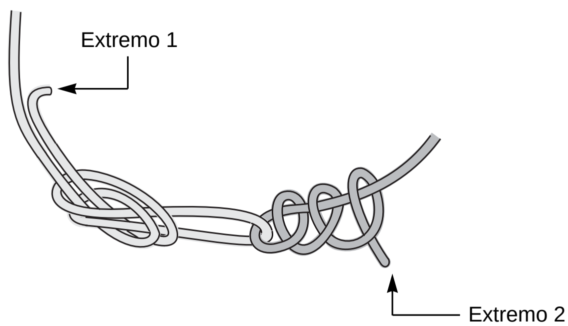
3. Enrede la cuerda varias veces hasta llenar completamente el espacio entre los cables (figura 27).
   a. Entrelace el bucle final de la cuerda por debajo del bucle anterior (D) de la cuerda.
   b. Jale la cuerda hasta tensarla.

Figura 27 – Cómo terminar de enredar la cuerda en el espacio entre los cables



4. Amarre los extremos (1) y (2) de la cuerda (figura 28) hasta tensarlos. Corte el exceso de cuerda y ponga cinta de aislar en las puntas para evitar que se deshilachen.

Figura 28 – Cómo amarrar los extremos de la cuerda



5. Vuelva a comprobar los valores de par de apriete de los tornillos de sujeción de los cables después de sujetarlos.

   NOTA: Consulte la etiqueta incluida con el tablero de distribución para obtener los valores de par de apriete.

Sección 5—Procedimiento de verificación de pre-energización

Realice una inspección completa **antes** de que el tablero de distribución tipo autosoportado sea energizado y asegúrese de que todos los componentes funcionen correctamente. **Realice cada uno de los siguientes pasos del procedimiento de verificación antes de energizar el tablero de distribución.**

1. Verifique todas las conexiones de las barras de distribución instaladas en campo. Los valores de par de apriete figuran en la sección 9 en la página 117.
2. Revise todas las conexiones accesibles y asegúrese de que estén bien apretadas.
3. Revise las terminaciones de todas las zapatas instaladas en la fábrica y en campo y asegúrese de que estén bien apretadas.
4. Verifique la rigidez de todos los soportes de las barras de distribución.
5. Revise el gabinete del tablero de distribución tipo autosoportado y asegúrese de que no haya abolladuras u otros daños que puedan reducir el espacio libre para los cables eléctricos dentro del tablero.
6. Retire todos los bloques de espuma o cualquier otro material almohadillado o de sujeción temporal de los dispositivos eléctricos.
7. Abra y cierre manualmente todos los desconectadores, interruptores automáticos y demás mecanismos de funcionamiento; asegúrese de que estén bien alineados y que no haya obstrucciones que impidan su funcionamiento.
8. Haga funcionar todos los desconectadores e interruptores automáticos de funcionamiento eléctrico, así como los demás dispositivos con operadores remotos (que no estén bajo carga). Se puede necesitar una fuente de alimentación de control auxiliar para realizar este procedimiento.
9. Revise todos los relevadores, medidores e instrumentación y asegúrese de que todas las conexiones de alambrado, instaladas en campo, se hayan realizado correctamente y que los dispositivos funcionen.
10. Los transformadores de corriente (TC) que se entregan para uso del cliente requieren una conexión a una carga del dispositivo de medición antes de ser energizados. Verifique que la carga del dispositivo de medición esté correctamente conectada, incluyendo las conexiones principales del tablero de distribución tipo autosoportado al equipo remoto.
11. Todos los circuitos del TC suministrados por Schneider Electric, utilizados para medición por el cliente, han sido cortocircuitados para su transporte. Retire los tornillos de las terminales cortocircuitadoras en los puentes o bloques de terminales cortocircuitadores y guárdelos en el bloque.
12. Los interruptores automáticos instalados en la fábrica pueden tener un disparo magnético o electrónico ajustable el cual es configurado en la fábrica en el ajuste más bajo. Para permitir la operación coordinada durante una falla, ajuste el disparo como se indica en el manual de instrucciones suministrado con el interruptor. Todos los polos se ajustan simultáneamente, usando un destornillador, en un solo ajuste.
13. Si el interruptor tipo BP viene con protección contra fallas a tierra, ajuste el relevador en el valor deseado de activación de la corriente de puesta a tierra. El relevador viene de fábrica en su ajuste más bajo de 120 A. La gama de activación del relevador es de 120 a 1 200 A.

   NOTA: .Para los interruptores automáticos en caja moldeada, consultela “Sección 11—Publicaciones de referencia” en la página 120, para obtener información.

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14. Asegúrese que todos los tornillos de los fusibles montados en los interruptores Bolt-Loc™, estén apretados de 28 a 41 N•m (21 a 30 lb-pies), y en los interruptores fusibles QMB/QMJ/QMQB[1] como se indica en el dispositivo.

AVISO

PELIGRO DE DAÑO AL EQUIPO

No abra ni extienda los clips para fusibles. Esto puede aflojar las conexiones lo cual podría causar sobrecalentamiento.

El incumplimiento de estas instrucciones puede causar daño al equipo.

15. Examine la presión de contacto del clip para fusibles y el dispositivo de contacto (interruptores fusibles QMB/QMJ/QMQB[1]). Si hay alguna indicación de aflojamiento, póngase en contacto con el Centro de Servicios Schneider Electric llamando al 1-888-778-2733 (en EUA) o al 01 800 724 63 43 37 (en México). Los clips para fusibles incorrectamente ajustados pueden causar sobrecalentamiento.
16. Revise todos los interruptores fusibles QMB/QMJ/QMQB[1], y asegúrese de que estén instalados los fusibles necesarios con la corriente nominal continua y de interrupción correcta. No use fusibles renovables en los interruptores fusibles marca Square D™.
17. Asegúrese de que todas las conexiones de puesta a tierra hayan sido realizadas correctamente. Si el tablero de distribución tipo autosoportado se usa como equipo de entrada de acometida, asegúrese de que el puente de conexión principal esté conectado (vea la figura 17 en la página 89).

⚠ PRECAUCIÓN

PELIGRO DE DAÑO AL EQUIPO O LESIONES PERSONALES

- Retire el calibrador de tiempo largo antes de realizar la prueba de aislamiento eléctrico a un interruptor automático con la siguiente etiqueta “Advertencia: desconecte el calibrador antes de realizar la prueba de rigidez dieléctrica”.
- Algunas unidades de disparo Micrologic™ no son adecuadas para las tensiones producidas durante la prueba de resistencia del aislamiento eléctrico.
- Abra todos los dispositivos de control y medición de los circuitos de control.

El incumplimiento de estas instrucciones pueden causar lesiones personales o daño al equipo.

18. Realice una prueba de resistencia de aislamiento eléctrico (con un megóhmetro) para asegurarse de que no haya cortocircuitos o conexiones a tierra no deseadas en el tablero de distribución tipo autosoportado.
    a. Abra todos los desconectadores de alimentación de control y de medición o retire los fusibles de los circuitos de control.
    b. Desconecte las conexiones de neutro en cualquier dispositivo de protección contra sobretensiones transitorias u otro dispositivo electrónico antes de realizar la prueba de resistencia de aislamiento eléctrico; vuelva a conectar al dispositivo después de la prueba.

[1] Los interruptores fusibles QMQB se encuentran disponibles solamente en Canadá.

c. Con el neutro aislado de la tierra y los desconectadores de alimentación e interruptores automáticos abiertos, realice pruebas eléctricas al aislamiento de fase a fase, fase a tierra, fase a neutro y neutro a tierra.

d. Si la resistencia indica menos que un megohm durante la prueba, con los dispositivos del circuito derivado en la posición de abierto, el sistema puede ser peligroso y se debe investigar.

e. Póngase en contacto con el Centro de servicios Schneider Electric llamando al 1-888-778-2733 (en EUA) o al 01 800 724 63 43 37 (en México) para que lo ayuden a corregir cualquier problema que tenga.

19. Después de completar la prueba de resistencia de aislamiento eléctrico, vuelva a colocar todos los fusibles de la alimentación de control que hayan sido retirados y cierre los desconectadores de alimentación que hayan sido abiertos.
20. Verifique el alambrado realizado en campo. Asegúrese de que no toque ninguna pieza energizada, y cuando se indique, que aguante las corrientes de falla.
21. Verifique que todo el alambrado de control entre las secciones esté conectado.
22. Pase una aspiradora para retirar el polvo, restos de cable u otros tipos de residuos.

AVISO

PELIGRO DE DAÑO AL EQUIPO

No utilice una manguera de aire comprimido para soplar aire en el tablero de distribución tipo autosoportado. El polvo se puede depositar dentro de los relevadores y dispositivos de sobrecorriente, haciendo que se sobrecalienten y que funcionen en forma incorrecta.

El incumplimiento de estas instrucciones puede causar daño al equipo.

23. Vuelva a colocar todas las cubiertas y barreras, asegúrese de no pellizcar ningún cable, y cierre las puertas. Asegúrese de que todas las piezas del gabinete estén bien alineadas y sujetadas.

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Sistemas de protección contra fallas a tierra

El inciso 230-95(c) del Código nacional eléctrico de EUA (NEC) y la NOM-001-SEDE requiere pruebas de los sistemas de protección contra fallas a tierra cuando se instalan por primera vez. Si el interruptor automático dispone de esta protección, pruebe el sistema de protección contra fallas a tierra en este momento.

1. Asegúrese de que la unidad de disparo esté energizada. La unidad de disparo está energizada si:
   - — el interruptor automático está cerrado o recibe alimentación por la parte inferior y tiene más de 100 V de tensión de carga en dos fases (en las unidades de disparo P o H solamente).
   - — el equipo de pruebas de plenas funciones o portátil está conectado y energizado.
   - — la fuente de alimentación externa de 24 V ⎓ (c.d.) está conectada.
   - — una toma de tensión externa está instalada y hay más de 100 V ~ (c.a.) en dos fases (en las unidades de disparo P o H solamente).
2. Si el sistema es radial (de un solo extremo), oprima el botón de disparo por falla a tierra. El interruptor automático se disparará y el indicador de falla a tierra de la unidad de disparo se iluminará.
3. Anote los resultados en el registro cronológico de pruebas del sistema de falla a tierra.

NOTA: Si es necesario realizar una prueba completa al sistema de falla a tierra, realice una prueba de inyección primaria. Si el sistema tiene múltiples fuentes y/o se requiere conectarlo en campo, utilice una prueba de inyección primaria.

NOTA: Algunos sistemas de falla a tierra requieren conexiones en el sitio de trabajo. Consulte el diagrama de alambrado de interconexiones del tablero de distribución tipo autosoportado para obtener detalles.

Sección 6—Energización del tablero de distribución tipo autosoportado

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Corrija las condiciones de cortocircuito detectadas durante los procedimientos de verificación descritos en la “Sección 5—Procedimiento de verificación de pre-energización”, y que comienzan en la página 99.
- Electricistas calificados deben estar presente cuando se energiza este equipo por primera vez.
- Siga las instrucciones en esta sección para energizar correctamente el tablero de distribución tipo autosoportado.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

1. Asegúrese de que no haya alguna carga en el tablero de distribución tipo autosoportado cuando se energiza. Desconecte todas las cargas descendentes.
2. Energice el tablero de distribución tipo autosoportado en la siguiente secuencia:
   a. Conecte todos los desconectadores de alimentación de control antes de energizar el tablero de distribución tipo autosoportado. Consulte los dibujos incluidos con el equipo para determinar si han sido provistos desconectadores de alimentación de control.
   b. Cierre las puertas y/o cubiertas abiertas.
   c. Cierre todos los dispositivos principales.
   d. Cierre cada uno de los interruptores automáticos o interruptores fusibles derivados.
   e. Proceda con cada tablero y demás cargas de corriente descendente.
3. Una vez que todos los dispositivos de protección contra sobrecorrientes estén cerrados, energice todas las cargas (por ejemplo, los circuitos de alumbrado, contactores, calefactores y motores).

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Sección 7—Servicio de mantenimiento

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Inspeccione y realice servicio de mantenimiento preventivo sólo a los tableros de distribución tipo autosoportado y equipo que estén desenergizados y eléctricamente aislados (a no ser que se especifique lo contrario). Con esto se evitará el contacto accidental con piezas o partes energizadas del equipo.
- Siempre siga las prácticas de seguridad relacionadas con el trabajo involucrado como se describe en la norma 70E de NFPA, Parte II y NOM-029-STPS.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

ESPAÑOL

Los servicios de mantenimiento periódicos del tablero de distribución tipo autosoportado deben incluir limpieza, lubricación y pruebas de todos los componentes. El intervalo entre cada servicio de mantenimiento puede variar dependiendo del uso y las condiciones ambientales de cada instalación. Se recomienda realizar una inspección, por lo menos una vez al año. Esta definición de servicio de mantenimiento periódico es aplicable en todo este manual, a no ser que se observe lo contrario.

Siempre inspeccione el tablero de distribución tipo autosoportado después de una falla. (Consulte la “Sección 8—Circunstancias adversas”, que comienza en la página 114). Se encuentran disponibles a través de su representante local de Schneider Electric, boletines de servicio para los varios dispositivos de desconexión y sobrecorriente montados en el tablero de distribución tipo autosoportado.

Inspección general y limpieza

1. Aspire el interior del tablero de distribución tipo autosoportado para retirar cualquier depósito de suciedad o polvo. Limpie todas las barras de distribución, aisladores, cables, etc. con un trapo limpio y sin pelusas.

AVISO

PELIGRO DE DAÑO AL EQUIPO

- No utilice una manguera de aire comprimido para soplar aire en el tablero de distribución tipo autosoportado. El polvo se puede depositar dentro de los relevadores y dispositivos de sobrecorriente, haciendo que se sobrecalienten y que funcionen en forma incorrecta.
- No permita que la pintura, sustancias químicas o solventes a base de petróleo entren en contacto con material plástico o aislante.

El incumplimiento de estas instrucciones puede causar daño al equipo.

2. Verifique que en el interior del tablero de distribución tipo autosoportado no haya humedad, acumulación de condensación, o indicaciones de haber estado mojado. La humedad puede causar fallas de aislamiento y la oxidación rápida de las piezas conductoras de corriente. Inspeccione todas las entradas del tubo conduit y cuarteaduras entre los tableros del gabinete para asegurarse de que no haya fugas con goteo. La condensación en los tubos conduit puede ser la fuente de humedad y no se debe permitir que gotee sobre partes vivas o

material de aislamiento. Tome todas las medidas necesarias para eliminar la humedad y sellar todas las fugas.

3. Inspeccione el tablero de distribución tipo autosoportado y asegúrese de que no haya indicaciones de sobrecalentamiento. La decoloración y el descascaramiento del aislamiento o piezas de metal son indicios de sobrecalentamiento.

   NOTA: Si hay sobrecalentamiento, asegúrese de que todas las condiciones que lo causaron se hayan corregido. Las conexiones sueltas o contaminadas pueden causar el sobrecalentamiento.

4. Asegúrese de que no haya indicaciones de nidos de roedores en el tablero de distribución tipo autosoportado. Si es necesario, use una técnica de exterminación buena en toda el área del tablero de distribución tipo autosoportado.

   NOTA: No ponga ni use sustancias químicas para exterminar dentro del tablero de distribución tipo autosoportado. Algunos de estos productos atraen a los roedores.

5. Inspeccione cuidadosamente todos los dispositivos para asegurarse de que no haya piezas gastadas, quebradas o que falten.
6. Manualmente, abra y cierre los desconectadores e interruptores automáticos varias veces para verificar que funcionen correctamente.
7. Verifique que todos los bloqueos de llave y provisiones de bloqueo de puertas funcionen correctamente.

ESPAÑOL

Juntas de las barras de distribución, zapatas de terminal y material de aislamiento

1. Las juntas de las barras de distribución no necesitan matenimiento. No las vuelva a apretar después de haber completado el procedimiento de verificación de pre-energización.

AVISO

PELIGRO DE DAÑO AL EQUIPO

- No pula ni retire el revestimiento metálico en las barras de distribución, barras de empalme o zapatas de terminal.
- Si se llega a dañar el revestimiento metálico se puede producir sobrecalentamiento. Sustituya las piezas dañadas. Póngase en contacto con el Centro de servicios Schneider Electric llamando al 1-888-778-2733 (en EUA) o al 01 800 724 63 43 37 (en México) para que lo ayuden a corregir cualquier problema que tenga.

El incumplimiento de estas instrucciones puede causar daño al equipo.

2. Revise todas las juntas de las barras de distribución y zapatas de terminal para ver si encuentra picaduras, corrosión o decoloración que pudo haber ocurrido a causa de temperaturas elevadas o sometimiento a condiciones de fallas mayores. Si se ha producido algún daño, sustituya las barras de distribución o zapatas. Si es necesario efectuar limpieza, use limpiador Lectra-Clean®, hecho por CRC.
3. Inspeccione todo el material de aislamiento. Antes de volver a energizar el tablero de distribución tipo autosoportado, sustituya los aisladores que tengan daños visibles (por ejemplo, cuarteaduras).

ESPAÑOL

Información general sobre la lubricación

Para volver a lubricar los componentes de la cuchilla/mordaza de los interruptores de 600 V e inferiores, durante un mantenimiento en campo, utilice grasa sintética de alto rendimiento BG20 de Dow Corning (número de catálogo SWLUB de Schneider Electric). Utilice esta grasa en los siguientes desconectadores:

- Bolt-Loc
- QMB principal y derivado
- QMJ derivado
- QMQB principal y derivado[1]

Para las conexiones enchufables y de barra, utilice compuesto para juntas eléctricas, número de catálogo PJC7201 Schneider Electric.

Para las conexiones de los interruptores automáticos SED y NED removibles, **utilice** compuesto para juntas eléctricas, número de catálogo PJC8311 Schneider Electric.

Para las conexiones de los interruptores de potencia Masterpact™ NW removibles, utilice sólo el compuesto para juntas eléctricas, número de catálogo S48899 Schneider Electric.

Interruptores de transferencia automática

Consulte la documentación del fabricante para obtener instrucciones sobre la instalación, funcionamiento y servicios de mantenimiento de estos dispositivos.

[1] Los interruptores fusibles QMQB se encuentran disponibles solamente en Canadá.

Mantenimiento de los desconectadores de contacto a presión Bolt-Loc (de 800 a 4 000 A)

Consulte el manual de instalación y servicios de mantenimiento del desconectador Bolt-Loc para obtener información completa (el manual viene incluido con el tablero de distribución tipo autosoportado). Si el manual no está disponible, consulte la “Sección 11—Publicaciones de referencia” en la página 120 y póngase en contacto con su representante local de Schneider Electric para obtener los manual correspondientes.

1. Realice pruebas al mecanismo de funcionamiento por lo menos una vez al año y asegúrese de que funciona correctamente.
2. El desconectador Bolt-Loc viene de fábrica correctamente lubricado. Sin embargo, es necesario realizarle limpieza y lubricación en intervalos regulares. El intervalo de mantenimiento entre lubricaciones depende de su uso y de las condiciones del medio ambiente. El intervalo máximo de mantenimiento recomendado es un año para las piezas conductoras de corriente y cinco años para los mecanismos de funcionamiento.

⚠ PELIGRO

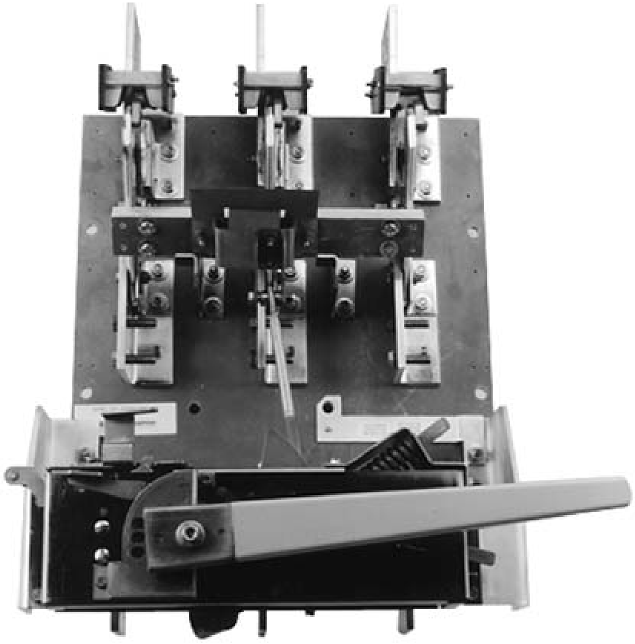
PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

Verifique siempre los extremos de línea y carga de los fusibles para determinar si hay tensión antes de comenzar el procedimiento de repuesto. El desconectador Bolt-Loc puede ser parte de un sistema de fuentes múltiples en el que los fusibles pueden ser energizados cuando este desconectador se encuentra en la posición de abierto (O).

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

3. Para sustituir el fusible:
   a. Abra el desconectador antes de abrir la puerta de los fusibles.

Figura 29 – Desconectador fusible Bolt-Loc tipo BP



ESPAÑOL

b. Abra la puerta de los fusibles, soltando el bloqueo como se describe en las instrucciones en la puerta.

c. Observe las cuchillas del desconectador y asegúrese que éste se encuentre en la posición de abierto (O).

d. Con un dispositivo detector de tensión nominal adecuado verifique los extremos de línea y carga de los fusibles para determinar si hay tensión. No deberá haber tensión presente.

e. Retire todos los fusibles. Conserve los herrajes para su uso posterior.

f. Con un limpiador no abrasivo, tal como Lectra-Clean fabricado por CRC, limpie las áreas de montaje de los fusibles en el desconectador y las terminales de cada fusible nuevo. Compruebe la alineación de las terminales de los fusibles antes de instalar los nuevos fusibles.

g. Instale los nuevos fusibles, utilizando los mismos herrajes que retiró en el paso “e” y apriételos de 28 a 41 N•m (21 a 30 lbs-pie).

4. Cierre la puerta de los fusibles y asegúrese de que esté bloqueada con el desconectador en la posición de cerrado (I). La puerta de los fusibles no deberá abrirse aplicando fuerza normal con las manos.

Interruptores automáticos

Los interruptores automáticos de Schneider Electric están diseñados y fabricados como unidades totalmente selladas que requieren un mínimo de mantenimiento periódico.

Realice pruebas a los interruptores automáticos por lo menos una vez al año y asegúrese de que funcionan correctamente. Durante los servicios de mantenimiento generales:

1. Dispare el interruptor automático oprimiendo el botón de disparo o botón de apertura en la parte frontal. Consulte el manual correspondiente del interruptor automático para conocer la ubicación específica de este botón.
2. Manualmente, abra y cierre el interruptor automático de dos a tres veces.

Figura 30 – Interruptor automático PowerPact™ marco R

NOTA: El boletín de instrucciones 48049-900-0x Schneider Electric, "*Guía de servicio de mantenimiento y pruebas en campo para los interruptores automáticos en caja moldeada termomagnéticos y de disparo electrónico Micrologic™*", proporciona información más detallada.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Si se cambian los ajustes del interruptor automático, no ajuste el valor de disparo de tiempo largo en un valor de capacidad de la corriente más alto que la capacidad de la barra de distribución o de los cables de carga que alimenta; esto puede causar sobrecalentamiento.
- Antes de energizar el tablero de distribución tipo autosoportado, todos los espacios de montaje del interruptor automático I-Line, que no se hayan usado, deberán cubrirse con placas y/o extensiones de relleno, consulte la tabla 3.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Para obtener información adicional de servicio de mantenimiento, por ejemplo, instrucciones sobre cómo cambiar los calibradores, enchufes sensores o ajustes, y retirar interruptores automáticos, consulte los manuales de instrucciones individuales de los interruptores automáticos que se enviaron con el tablero de distribución. Si no está disponible el manual de instrucciones, consulte la "Sección 11—Publicaciones de referencia" en la página 120 para obtener el número de referencia apropiado, o póngase en contacto con su representante local de Schneider Electric.

Tabla 3 – Placas y extensiones de relleno I-Line™

Artículo	Altura	No. de catálogo	Lado del circuito derivado	Marco del interruptor automático
Placas de relleno	38 mm (1,50 pulg)	HNM1BL	Ambos lados	No aplicable
	114 mm (4,50 pulg)	HNM4BL	Ambos lados	
Extensiones de relleno	38 mm (1,50 pulg)	HLW1BL	Lado ancho	Todas las aplicaciones excepto los interruptores automáticos PowerPact marcos H/J con unidades de disparo Micrologic 5/6.
	114 mm (4,50 pulg)	HLW4BL	Lado ancho	
	38 mm (1,50 pulg)	HLN1BL	Lado angosto	
	114 mm (4,50 pulg)	HLN4BL	Lado angosto	
	38 mm (1,50 pulg)	HLN4EBL	Lado angosto	Únicamente interruptores automáticos PowerPact marcos H/J con unidades de disparo Micrologic 5/6.
	114 mm (4,50 pulg)	HLW4EBL	Lado ancho	

ESPAÑOL

AVISO

PELIGRO DE DAÑO AL EQUIPO

- No retire el lubricante protector de los conectores enchufables.
- Si necesita más lubricante, aplique una capa de compuesto para juntas eléctricas, número de catálogo PJC7201, a las superficies de contacto de los conectores enchufables.

El incumplimiento de estas instrucciones puede causar daño al equipo.

3. Está disponible un equipo de pruebas universal, número de catálogo UTS3, para probar los interruptores automáticos PowerPact marcos P y R de Schneider Electric equipados con unidades de disparo Micrologic. Este equipo automáticamente ejecuta pruebas a las unidades de disparo mostrando mensajes al usuario para obtener la información inicial. Se utilizan módulos de prueba para cada marco de interruptor automático los cuales almacenan los datos necesarios para las pruebas automáticas. Las unidades de disparo Micrologic serie B requieren un módulo de prueba CBTMB, el cual viene incluido con el equipo UTS3.

   Se encuentra disponible un probador de bolsillo, número de catálogo S434206, o un probador UTA, número de catálogo STRV00910, para los interruptores automáticos PowerPact marcos H, J y L de Schneider Electric con unidades de disparo Micrologic. Estos probadores suministran alimentación a las unidades de disparo Micrologic y permiten ajustar las configuraciones a través de la terminal de programación y ajustes situada en el interruptor automático o a través de una PC empleando una interfaz USB.

   Los interruptores de potencia Masterpact NW con unidades de disparo requieren el equipo de pruebas de amplias funciones, número de catálogo S33595, o el equipo de pruebas portátil, número de catálogo S33594.

NOTA: Las pruebas se pueden realizar con el interruptor automático instalado en el tablero de distribución tipo autosoportado; no es necesario desmontarlo.
El tablero de distribución tipo autosoportado debe estar desenergizado.

Interruptores fusibles QMB/QMJ/QMQB[1]

Consulte el manual de instrucciones de los interruptores fusibles QMB/QMJ/QMQB[1] para obtener información completa sobre los servicios de mantenimiento. Si no está disponible el manual de instrucciones, consulte la “Sección 11—Publicaciones de referencia” en la página 120 de este manual para obtener el número de referencia apropiado. Póngase en contacto con su representante local de Schneider Electric para obtener este manual.

Servicio de mantenimiento del interruptor

1. Pruebe periódicamente el interruptor y asegúrese de que funciona correctamente. El intervalo de prueba no deberá exceder un año.
2. Compruebe el bloqueo de la cubierta con el interruptor en la posición de cerrado (I). La cubierta no deberá abrirse aplicando fuerza normal con las manos.
3. Realice una inspección visual al interior del interruptor para determinar si se ha producido algún daño o si hay partes quebradas, si es necesario sustitúyalas.
4. En los interruptores fusibles, revise los clips para fusibles o el área de contacto con tornillos en busca de corrosión o decoloración (que pueden indicar sobrecalentamiento). Si es necesario, sustitúyalos.
5. Para obtener instrucciones adicionales de mantenimiento, consulte la etiqueta que se encuentra dentro de la puerta.

Sustitución de fusibles (interruptores fusibles solamente)

1. Coloque el interruptor en la posición de abierto (O) antes de abrir la puerta.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

Con un dispositivo detector de tensión nominal adecuado, verifique siempre los extremos de línea y carga de los fusibles para determinar si hay tensión antes de comenzar el procedimiento de sustitución de fusibles.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

2. Observe las cuchillas del interruptor y asegúrese de que estén en la posición de abierto (O).
3. Con un dispositivo detector de tensión nominal adecuado, verifique los extremos de línea y carga de los fusibles y asegúrese que no estén energizados.
4. Observe todas las etiquetas de advertencia que especifican el tipo de fusible que debe usar. No sustituya un fusible que no sea limitador de corriente, o intente de alguna forma invalidar la función de rechazo de los clips para fusibles provistos con el interruptor. No use fusibles renovables en los interruptores fusibles Schneider Electric.

AVISO

PELIGRO DE DAÑO AL EQUIPO

No abra ni extienda los clips para fusibles. Esto puede aflojar las conexiones lo cual podría causar sobrecalentamiento y quemar los fusibles.

El incumplimiento de estas instrucciones puede causar daño al equipo.

[1] Los interruptores fusibles QMQB se encuentran disponibles solamente en Canadá.

ESPAÑOL

Instalación de los interruptores fusibles QMB/QMJ/QMQB[1]

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Retire la alimentación de estas secciones antes de instalar o retirar los interruptores QMB/QMJ/QMQB[1].
- No utilice un dispositivo principal como derivado ni un derivado como principal.
- Todos los espacios sin utilizar deben cubrirse con placas de relleno antes de energizar el tablero de distribución tipo autosoportado. Consulte las tablas 4 y 5 para obtener los tamaños y números de catálogo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Tabla 4 – Placas de relleno para los interruptores fusibles QMB/QMJ

Altura	No. de catálogo
38 mm (1,50 pulg)	QMB1BLW
76 mm (3 pulg)	QMB3BLW
152 mm (6 pulg)	QMB6BLW
381 mm (15 pulg)	QMB15BLW

Tabla 5 – Placas de relleno para los interruptores fusibles QMQB[1]

Altura	No. de catálogo
2x: 35 mm (1,375 pulg)	QFS1
8x: 140 mm (5,5 pulg)	QFS5
10x: 175 mm (6,875 pulg)	QFS6
14x: 244 mm (9,625 pulg)	QFS9
24x: 419 mm (16,5 pulg)	QFS16

AVISO

PELIGRO DE DAÑO AL EQUIPO

No retire el lubricante protector de los conectores enchufables.

El incumplimiento de estas instrucciones puede causar daño al equipo.

1. Desconecte la alimentación principal.
2. Coloque la(s) palanca(s) del(de los) interruptor(es) en la posición de abierto (O). Alinee los conectores enchufables del interruptor con las barras verticales del tablero QMB, y enchufe el interruptor al tablero.
3. Coloque y apriete parcialmente todos los tornillos de montaje de las unidades que se montan en los rieles de montaje del tablero QMB.
4. Apriete todos los tornillos uniformemente. La brida de montaje de la unidad y los conectores enchufables deben estar apoyados firmemente.

[1] Los interruptores fusibles QMQB se encuentran disponibles solamente en Canadá.

Desmontaje de los interruptores fusibles QMB/QMJ/QMQB[1]

1. Desconecte la alimentación principal.
2. Coloque la(s) palanca(s) del(de los) interruptor(es) en la posición de abierto (O).
3. Desconecte los cables de carga.
4. En los interruptores QMB y QMJ, extraiga los tornillos de montaje que sostienen el interruptor al riel de montaje. En los interruptores QMQB[1], extraiga los tornillos que sostienen el interruptor a la terminal de línea.
5. Desenchufe el interruptor.

Sistemas de protección contra fallas a tierra

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Revise las conexiones de las terminales en el sistema de protección contra fallas a tierra por lo menos una vez al año y asegúrese de que estén bien apretadas y que no estén corroídas. Consulte las instrucciones en el manual del dispositivo para ver si es posible probar el sistema sin disparar el dispositivo principal o derivado. De lo contrario, al realizar las pruebas el sistema de protección contra fallas a tierra disparará el dispositivo principal o derivado al que está conectado. Si estuviese dañado física o eléctricamente el sensor o relevador de falla a tierra, sustitúyalo.

Si el sistema de protección contra fallas a tierra no funciona correctamente y se ha conectado equipo adicional a la instalación desde la última prueba o revisión de servicio de mantenimiento, desenergice todo el sistema. Revise el sistema para ver si encuentra tierras en la corriente descendente del neutro proveniente del puente de conexión principal. Si no se detectan tierras en la corriente descendente y el sistema de protección contra fallas a tierra no está funcionando como es debido, póngase en contacto con el Centro de Servicios Schneider Electric llamando al 1-888-778-2733 (en EUA) o al 01 800 724 63 43 37 (en México).

Si no se han hecho adiciones a la instalación y el sistema de protección contra fallas a tierra no está funcionando como es debido, póngase en contacto con el Centro de Servicios Schneider Electric llamando al 1-888-778-2733 (en EUA) o al 01 800 724 63 43 37 (en México).

Consulte el manual de instrucciones, de pruebas en campo de falla a tierra, para obtener información adicional sobre las pruebas. Si el manual no está disponible, consulte la “Sección 11—Publicaciones de referencia” en la página 120, de este manual para obtener el número de referencia correspondiente. Póngase en contacto con su representante local de Schneider Electric para obtener este manual.

Sección 8—Circunstancias adversas

Esta sección incluye, pero no se limita a, todos los componentes eléctricos del tablero de distribución tipo autosoportado.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Desenergice el tablero de distribución tipo autosoportado antes de limpiarlo.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Antes de energizar el tablero de distribución tipo autosoportado, deberán cubrirse todos los espacios de montaje para los interruptores automáticos sin utilizar.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

NOTA: Antes de intentar re-energizar el tablero de distribución tipo autosoportado y después de encontrarse bajo circunstancias adversas, póngase en contacto con el Centro de servicios Schneider Electric, llamando al 1-888-778-2733 (en EUA) o al 01 800 724 63 43 37 (en México) para obtener instrucciones especiales.

Inspección después de un cortocircuito

Si se produce un cortocircuito, realice una inspección completa a todo el sistema, asegúrese de que no se hayan dañado los conductores o el aislamiento. Los altos esfuerzos mecánicos y térmicos producidos por las corrientes de cortocircuito pueden dañar los conductores y el aislamiento. Revise el dispositivo de protección contra sobrecorrientes que interrumpió la corriente de cortocircuito para ver si encuentra daños a causa de la formación de arcos.

No abra los dispositivos sellados, tales como los interruptores automáticos en caja moldeada. Si están dañados, estos dispositivos se deben sustituir. Antes de energizar el tablero de distribución tipo autosoportado, deberán cubrirse todos los espacios de montaje para los interruptores automáticos sin utilizar. Si necesita más información sobre estos dispositivos, consulte el manual de instrucciones correspondiente que figura en la “Sección 11—Publicaciones de referencia” en la página 120.

Limpieza después de un cortocircuito

Las propiedades de aislamiento de algunos materiales de aislamiento orgánicos pueden deteriorarse al formarse un arco eléctrico. En caso de que esto suceda:

1. Retire el hollín o residuos.
2. Sustituya el aislamiento con marcas de carbono.

Tableros de distribución tipo autosoportado inmersos en agua

No limpie ni repare un tablero de distribución tipo autosoportado que ha sido expuesto a grandes volúmenes de agua o que haya sido sumergido. Es posible que las piezas conductoras de corriente; sistemas de aislamiento y componentes eléctricos se dañen y no puedan repararse. **No energice el tablero de distribución tipo autosoportado.** Comuníquese con el Centro de servicios Schneider Electric al 1-888-778-2733 (en EUA) o al 01 800 724 63 43 37 (en México).

Tableros de distribución tipo autosoportado rociados o salpicados con agua (sólo agua limpia)

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

Desenergice el equipo antes de realizar cualquier trabajo en él.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

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Si el tablero de distribución tipo autosoportado ha sido rociado o salpicado con cantidades pequeñas de agua limpia, realice una inspección completa a todo el sistema; asegúrese de que no se hayan dañado los conductores o el aislamiento. No abra los dispositivos cerrados herméticamente, por ejemplo los interruptores automáticos en caja moldeada o fusibles. Si están dañados, estos dispositivos se deben sustituir. Si necesita más información sobre estos dispositivos, consulte el manual de instrucciones correspondiente que figura en la “Sección 11—Publicaciones de referencia”.

Inspección y limpieza del tablero de distribución tipo autosoportado rociado o salpicado con agua limpia

Realice los pasos 1 a 10 solamente si:

- No hay indicaciones de daño físico al equipo.
- El tablero de distribución tipo autosoportado no ha sido sumergido o expuesto al agua durante largos períodos de tiempo.
- El agua en contacto con el tablero de distribución tipo autosoportado no ha sido contaminada con aguas residuales, productos químicos u otras substancias que puedan afectar negativamente la integridad del equipo eléctrico.
- El agua que ha estado en contacto con el tablero de distribución tipo autosoportado no ha penetrado a ninguna área del gabinete con los cables conectados y ubicados por encima de piezas energizadas. Específicamente, realice una inspección visual para ver si encuentra agua que pudiese haber entrado por los tubos conduit ubicados por encima de las partes vivas.

Si no se cumple ninguna de estas condiciones, póngase en contacto con el Centro de Servicios Schneider Electric llamando al 1-888-778-2733 (en EUA) o al 555-227-7979 (en México).

Si se cumplen **TODAS** estas condiciones proceda con los siguientes pasos:

1. Desenergice el equipo antes de realizar cualquier trabajo en él.
2. Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
3. Desconecte y aísle eléctricamente el tablero de distribución tipo autosoportado de manera que no haya contacto con las piezas energizadas.
4. Limpie la humedad de las barras de distribución, aisladores y material de aislamiento con un trapo limpio y seco sin pelusa. **No** use limpiadores o rociadores de agua.
5. Prepare el tablero de distribución tipo autosoportado para las pruebas de resistencia de aislamiento (con megóhmetro). Desconecte todos los cables de alimentación del lado de línea y las conexiones del lado de carga para aislar el tablero del sistema de alambrado.

ESPAÑOL

⚠ PRECAUCIÓN

PELIGRO DE DAÑO AL EQUIPO O LESIONES PERSONALES

- Retire el calibrador de tiempo largo antes de realizar la prueba de aislamiento eléctrico a un interruptor automático con la siguiente etiqueta “Advertencia: desconecte el calibrador antes de realizar la prueba de rigidez dieléctrica”.
- Algunas unidades de disparo Micrologic no son adecuadas para las tensiones producidas durante la prueba de resistencia del aislamiento eléctrico.
- Abra todos los dispositivos de control y medición de los circuitos de control.

El incumplimiento de estas instrucciones pueden causar lesiones personales o daño al equipo.

6. Coloque los interruptores automáticos o desconectadores en la posición de cerrado (I). El tablero de distribución tipo autosoportado debe permanecer desenergizado.
7. Utilice un megóhmetro con capacidad de 500 a 1 000 V ⎓ (c.d.) y aplique tensión de:
   a. cada fase a tierra con el interruptor automático en la posición de cerrado (I).
   b. fase a fase con el interruptor automático en la posición de cerrado (I).
8. Anote los valores de resistencia. Consulte la “Sección 10—Tabla de resistencia del aislamiento” en la página 119.
9. Si las mediciones de resistencia son menores que 0,5 megohm, póngase en contacto con el Centro de Servicios Schneider Electric llamando al 1-888-778-2733 (en EUA) o al 01 800 724 63 43 37 (en México).
10. Si las mediciones de resistencia son mayores que 0,5 megohm, es posible energizar el equipo utilizando los procedimientos detallados en la “Sección 6—Energización del tablero de distribución tipo autosoportado” en la página 103.

Sección 9—Valores de par de apriete para las conexiones eléctricas

Tabla 6 – Zapata de entrada, de derivación y de neutro

Tamaño de la cabeza hexagonal del tornillo	Valor de par de apriete
1/4 pulg	20 N•m (180 lbs-pulg)
5/16 pulg	28 N•m (250 lbs-pulg)
3/8 pulg	38 N•m (340 lbs-pulg)
1/2 pulg ★	51 N•m (450 lbs-pulg)

★ Las zapatas que requieren un par de apriete de 70 N•m (620 lbs-pulg) han sido marcadas.

Tabla 7 – Barra de neutro de conductores múltiples y/o de puesta a tierra

Tipo de tornillo	Tamaño de conductor para la zapata	Tamaño de conductor	Valor de par de apriete
Cabeza ranurada	14–4	14-10 Cu, 12-10 Al	2 N•m (20 lbs-pulg)
		8 Cu-Al	3 N•m (25 lbs-pulg)
		6-4 Cu-Al	4 N•m (35 lbs-pulg)
	14–1/0	14-8 Cu-Al	4 N•m (36 lbs-pulg)
		6-1/0 Cu-Al	5 N•m (45 lbs-pulg)
Cabeza hueca	14–1/0	Todos	11 N•m (100 lbs-pulg)
	6–300 kcmil	Todos	31 N•m (275 lbs-pulg)

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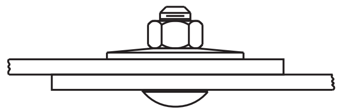
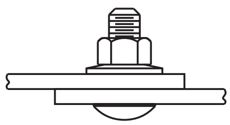
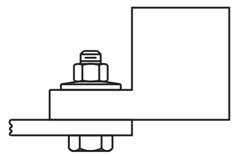


Tornillo de carro
Tuerca hexagonal
Roldana cónica

Herraje	Valor de par de apriete
1/2 pulg	720–840 lbs-pulg (81–95 N•m)



Tornillo de carro
Ensamble de roldana cónica
Tuercas de seguridad



Tornillo de cabeza hexagonal
Ensamble de roldana cónica
Tuercas de seguridad

Herraje	Valor de par de apriete
1/4 pulg	50–75 lbs-pulg (6–8 N•m)
5/16 pulg	80–125 lbs-pulg (9–14 N•m)
3/8 pulg	175–225 lbs-pulg (20–25 N•m)
1/2 pulg	250–350 lbs-pulg (28–40 N•m)

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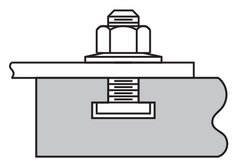
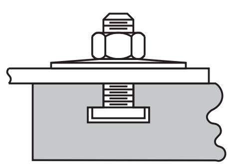


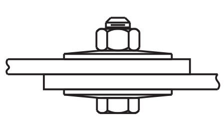
Tornillo (en "T") de cabeza cuadrada
Ensamble de roldana cónica
Tuercas de seguridad

Herraje	Valor de par de apriete
1/4 pulg	50–75 lbs-pulg (6–8 N•m)
3/8 pulg	175–225 lbs-pulg (20–25 N•m)
1/2 pulg	250–350 lbs-pulg (28–40 N•m)



Tornillo (en "T") de cabeza cuadrada
Roldana cónica

Herraje	Valor de par de apriete	
	Diá. ext. de la roldana cónica	Tornillo (en "T") de cabeza cuadrada Roldana cónica
3/8 pulg	22 mm (0.87 pulg)	250–280 lbs-pulg (28–32 N•m)
	25 mm (1.00 pulg)	130–150 lbs-pulg (15–17 N•m)
1/2 pulg	32 mm (1.25 pulg) 57 mm (2.25 pulg)	450–550 lbs-pulg (51–62 N•m)



Tornillo de cabeza hexagonal
(2) roldanas cónicas

Herraje	Valor de par de apriete	
	Diá. ext. de la roldana cónica	Tornillo de cabeza hexagonal (2) Roldanas cónicas
5/16 pulg	23 mm (0.90 pulg)	145–160 lbs-pulg (16–18 N•m)
3/8 pulg	22 mm (0.87 pulg)	250–280 lbs-pulg (28–32 N•m)
	25 mm (1.00 pulg)	130–150 lbs-pulg (15–17 N•m)
1/2 pulg	32 mm (1.25 pulg) 57 mm (2.25 pulg) 76 mm (3.00 pulg)	720–840 lbs-pulg (81–95 N•m)

Sección 10—Tabla de resistencia del aislamiento

Siempre utilice un megóhmetro de 500 ó 1 000 V ⎓ (c.d.) para la prueba de resistencia del aislamiento.

NOTA: En la columna de “neutro a tierra” anote sólo los resultados del procedimiento de verificación de pre-energización.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Desenergice el tablero de distribución tipo autosoportado antes de realizar la prueba.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Fecha	Fase a Fase			Fase a Tierra			Neutro a tierra
	Todos los dispositivos de desconexión abiertos						
	a-b	b-c	c-a	a-tierra	b-tierra	c-tierra	Neutro a tierra

Fecha	Todos los dispositivos de desconexión cerrados						
	a-b	b-c	c-a	a-tierra	b-tierra	c-tierra	Neutro a tierra

Sección 11—Publicaciones de referencia

Las publicaciones de Schneider Electric se encuentran disponibles de su representante local de campo. Estas incluyen los procedimientos de repuesto de los dispositivos así como las listas de piezas de repuesto para facilitar su pedido y servicio de mantenimiento. Cualquier procedimiento de servicio de mantenimiento o dispositivo que no esté en la lista, tal como un interior de tablero I-Line™, no puede ser reparado por el cliente.

Póngase en contacto con su representante local de Schneider Electric para obtener información llamando al 1-888-778-2733 (en EUA) o al 01 800 724 63 43 37 (en México). O bien, consulte la Biblioteca técnica en línea del sitio web http://www.schneider-electric.us/ para obtener las publicaciones apropiadas.

Si desea obtener documentos de NEMA, solicítelos por escrito a la siguiente dirección:

National Electrical Manufacturers Association (NEMA)
Attention: Customer Service
1300 North 17th Street
Suite 1847
Rosslyn, VA 22209

Otras publicaciones de referencia	Número de publicación
Instrucciones generales para la instalación, funcionamiento, y servicio de mantenimiento adecuados de los tableros de distribución de 600 V~ o menos	Publicación NEMA PB2.1
Guía de aplicación para los dispositivos de protección contra fallas a tierra del equipo	Publicación PB2.2 de NEMA
Interruptores automáticos	Publicación AB-4 de NEMA
Interruptores de distribución en gabinete y misceláneos	Publicación KS-1 de NEMA
Servicio de mantenimiento del equipo eléctrico	NFPA 70B-1999

Sección 12—Registro cronológico de instalación y servicios de mantenimiento

Fecha	Iniciales	Servicio de mantenimiento realizado

Fecha	Iniciales	Servicio de mantenimiento realizado

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Importado en México por:
Schneider Electric México, S.A. de C.V.
Av. Ejercito Nacional No. 904
Col. Palmas, Polanco 11560 México, D.F.
55-5804-5000
www.schneider-electric.com.mx

Normas, especificaciones y diseños pueden cambiar, por lo tanto pida confirmación de que la información de esta publicación está actualizada.

80043-055-12, 05/2015
Reemplaza 80043-055-11, 04/2014

Power-Style^{MC}

Panneaux de commutation QED-2

Classe 2700

Directives d'utilisation

80043-055-12
05/2015

À conserver pour usage ultérieur.

FRANÇAIS

Catégories de dangers et symboles spéciaux

Lisez attentivement ces directives et examinez l'appareillage pour vous familiariser avec son fonctionnement avant de faire son installation ou son entretien. Les messages spéciaux suivants peuvent apparaître dans les présentes directives ou sur l'appareil pour avertir l'utilisateur de dangers potentiels ou pour attirer l'attention sur des informations qui clarifient ou simplifient une procédure.

L'ajout d'un de ces deux symboles à une étiquette de sécurité de « Danger » ou d'« Avertissement » indique qu'un danger électrique existe et qu'il peut entraîner des blessures corporelles si les directives ne sont pas respectées.

Ceci est le symbole d'alerte de sécurité. Il est utilisé pour vous alerter de dangers de blessures corporelles potentielles. Veuillez vous conformer à tous les messages de sécurité qui suivent ce symbole pour éviter une blessure ou la mort.

DANGER
DANGER indique une situation de danger imminent qui, si elle n'est pas évitée **entraînera** la mort ou des blessures graves.

AVERTISSEMENT
AVERTISSEMENT indique une situation de danger potentiel qui, si elle n'est pas évitée, **peut entraîner** la mort ou des blessures graves.

ATTENTION
ATTENTION indique une situation de danger potentiel qui, si elle n'est pas évitée, **peut entraîner** des blessures mineures ou modérées.

AVIS
AVIS est utilisé pour commenter des pratiques sans rapport avec les blessures physiques. Le symbole d'alerte de sécurité n'est pas employé avec ce mot de signalement.

REMARQUE : Fournit des renseignements complémentaires pour clarifier ou simplifier une procédure.

Veuillez noter

Seul un personnel qualifié doit effectuer l'installation, l'utilisation, l'entretien et la maintenance du matériel électrique. Schneider Electric n'assume aucune responsabilité des conséquences éventuelles découlant de l'utilisation de cette documentation.

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Chapitre 1—Introduction

Ce bulletin contient les directives d'installation, de fonctionnement et d'entretien du panneau de commutation Power-Style^MC QED-2 fabriqué par Schneider Electric. Le personnel de supervision des services d'ingénierie, d'installation et d'utilisation doit prendre connaissance de ce bulletin et devenir familier avec l'apparence et les caractéristiques de chaque appareil installé ou compris dans le panneau de commutation.

Ces directives et procédures s'appliquent aux installations des panneaux de commutation Power-Style QED-2 fabriqués par Schneider Electric. Lorsque des caractéristiques spéciales ou des composants non standard sont incorporés dans le panneau de commutation, des directives détaillées pour ces composants sont incluses dans le porte document fourni avec cet équipement.

REMARQUE : Il y a des références aux panneaux de commutation de la série 2 en plusieurs endroits de ces directives d'utilisation. Pour déterminer si le panneau de commutation QED-2 est un modèle de la série 2, consulter la plaque signalétique située sur le couvercle avant. Si le panneau de commutation est un modèle de la série 2, la plaque signalétique l'indique. Si ce n'est pas un modèle de la série 2, il n'y a pas d'indication de série.

Inspection et emballage

Chaque panneau de commutation Power-Style QED-2 est soigneusement inspecté et emballé à l'usine. La construction du panneau de commutation est contrôlée tant au niveau structurel qu'au niveau électrique, pour assurer sa conformité avec tous les codes, spécifications et normes. Après une inspection complète, le panneau de commutation est préparé pour son transport. Chaque section est expédiée séparément afin de faciliter la manutention avant l'installation. Le numéro de commande de l'usine, le numéro d'identification et le poids à l'expédition sont marqués sur chaque section de transport.

Remplacement de documents

Contacter le bureau de ventes Schneider Electric le plus proche pour remplacer des schémas de câblage et fiches de directives perdus ou endommagés. Utiliser le numéro de commande de l'usine comme référence.

Chapitre 2—Mesures de sécurité

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E ou CSA Z462.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- N'entreprenez ce travail qu'après avoir lu et compris toutes les explications contenues dans ces directives.
- Coupez toutes les alimentations à cet appareil avant d'y travailler.
- Avant d'effectuer des inspections visuelles, des essais ou des procédures d'entretien sur cet appareil, déconnectez toutes les sources d'alimentation. Présumez que tous les circuits sont sous tension tant qu'ils n'ont pas été complètement mis hors tension, vérifiés et étiquetés. Faites particulièrement attention à l'agencement du système d'alimentation. Considérez toutes les sources d'alimentation, y compris la possibilité de rétro-alimentation.
- Utilisez toujours un dispositif de détection de tension ayant une valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Observez toutes les procédures d'interverrouillage et d'étiquetage selon la réglementation OSHA.
- Traitez cet appareil avec soin et installez-le, utilisez-le et entretenez-le correctement pour assurer son bon fonctionnement. Le non-respect des exigences fondamentales d'installation et d'entretien peut entraîner des blessures, ainsi que des dommages à l'appareil ou autres biens.
- Inspectez soigneusement la zone de travail et enlevez tous les outils et objets laissés à l'intérieur de l'appareil.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.
- Les explications données dans ces directives présument que le client a pris ces mesures avant d'effectuer un entretien ou des essais.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

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Chapitre 3—Réception, manutention et entreposage

Réception

À la réception, comparer le bordereau d'envoi avec l'appareil reçu afin de vérifier si la commande et l'envoi sont complets. Également à la réception, inspecter immédiatement les sections du panneau de commutation afin d'y détecter tous dommages éventuels ayant pu survenir au cours du transport. Si des dommages sont découverts ou soupçonnés, faire une réclamation à remettre immédiatement au transporteur et en informer le représentant de Schneider Electric le plus proche.

Manutention

⚠ AVERTISSEMENT

EXIGENCES DE MANUTENTION SPÉCIALES

- Ne couchez pas l'appareil sur sa face avant ou sur les côtés. Faire ainsi l'endommagerait.
- Couchez l'appareil sur le dos uniquement lorsqu'une manutention spéciale est nécessaire.
- N'expédiez pas l'appareil sur son dos.

Si ces directives ne sont pas respectées, cela peut entraîner des blessures graves ou des dommages matériels.

S'assurer qu'un équipement approprié, tel qu'une grue mobile, est disponible au site d'installation pour la manutention du panneau de commutation. Cet équipement contribuera à éviter des blessures du personnel et des dommages au panneau de commutation.

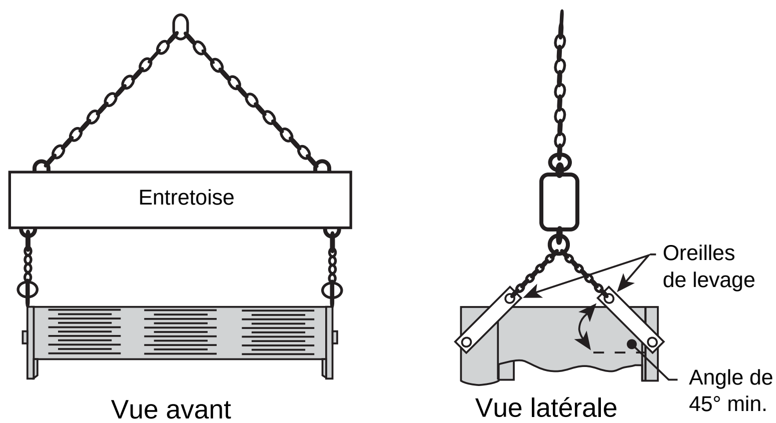
Le poids à l'expédition de chaque section de transport est marqué sur le bordereau d'envoi. Vérifier la capacité de levage de l'équipement employé pour manipuler le panneau de commutation conformément au poids à l'expédition de chaque section de transport. Maintenir le panneau de commutation en position verticale pendant sa manutention.

Schneider Electric recommande l'utilisation d'une grue mobile, des oreilles de levage et câbles ou chaînes pour la manutention du panneau de commutation. Cette méthode et des méthodes alternatives de manutention sont indiquées dans cette section.

Manutention avec oreilles de levage

Schneider Electric fournit les oreilles de levage à titre d'équipement standard pour les sections de transport des panneaux de commutation NEMA type 1 de valeur nominale jusqu'à 3000 A. Les étiquettes de directives placées sur chaque section de transport contiennent des dessins et des directives écrites précisant l'usage approprié des oreilles de levage (figure 1). Utiliser des entretoises rigides ou une barre d'écartement et oreilles de levage pour procurer un levage vertical. Cela aidera à éviter d'endommager le châssis ou le fini.

Figure 1 – Levage à l'aide d'une grue mobile, des oreilles de levage et de câbles ou de chaînes



Suivre ces directives pendant la manipulation du panneau :

1. Utiliser des câbles ou chaînes classés pour supporter la charge, munis de crochets ou manilles de sécurité. Ne faites pas passer de câbles ou chaînes par les trous des oreilles de levage.
2. Utiliser une entretoise classée pour supporter la charge afin d'éviter tout dommage de structure. L'angle minimum entre les câbles ou chaînes de levage et la partie supérieure de l'appareil doit être de 45 degrés.

Suivre ces directives pour coucher l’appareil sur le dos :

1. Retirer la palette de transport et les couvercles de protection arrière de l’appareil.
2. Utiliser des grues mobiles, sangles de levage et câbles ou chaînes pour coucher l’appareil sur le dos.
3. La vitesse de descente ou de levée pour coucher un appareil sur le dos est de 1,22 mètre (4 pieds) par minutes ou moins.
4. Inverser la procédure pour mettre l’appareil en position verticale.
5. Remettre les couvercles de protection arrière en place.

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L'étiquette d'avertissement (figure 2) est fixée sur le devant et sur l'arrière du panneau de commutation.

Figure 2 – Étiquette d'avertissement, panneaux de commutation à l'épreuve de la pluie

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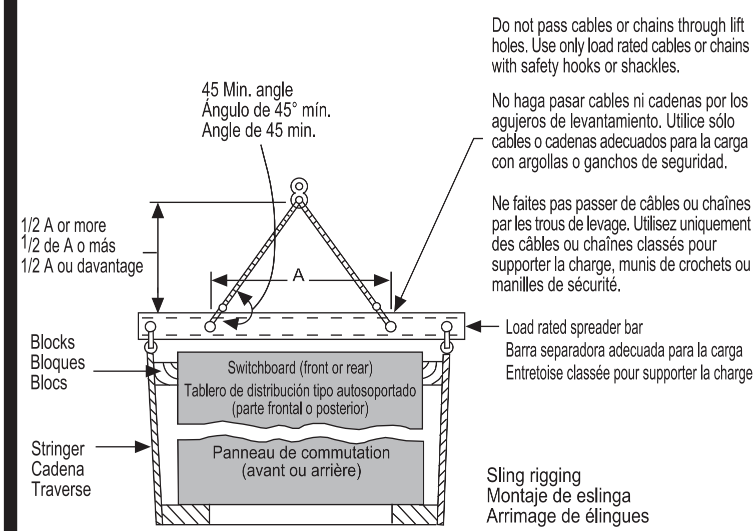
Manutention sans oreilles de levage

Les oreilles de levage ne sont pas fournies sur les sections de transport d'une valeur nominale supérieure à 3000 A ou sur un panneau à l'épreuve de la pluie. Des rouleaux, élingues ou autres moyens doivent être employés pour la manutention des sections de transport. L'étiquette de manutention (figure 3) est placée sur chacune de ces sections.

Figure 3 – Étiquette de manutention, panneaux de commutation sans oreilles de levage

WARNING / ADVERTENCIA / AVERTISSEMENT



TOP HEAVY LOAD HAZARD OF TIPPING

- This equipment must be moved by a sling, chain or rollers.
- Stabilize the shipping section to prevent tipping.
- Do not work under, around or on this equipment while elevated or moving.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

CARGA PESADA EN LA PARTE SUPERIOR PELIGRO DE QUE SE CAIGA LA CARGA

- Este equipo debe moverse con una eslinga, cadena o rodillos.
- Estabilice la sección de embarque para evitar voltearla.
- No trabaje debajo, alrededor o sobre el equipo mientras se está elevando o moviendo.

El incumplimiento de estas instrucciones puede causar la muerte, lesiones serias o daño al equipo.

CHARGE INSTABLE RISQUE DE RENVERSEMENT DE CHARGE

- Cet appareil doit être déplacé à l'aide d'une élingue, d'une chaîne ou de roulettes.
- Stabilisez la section de transport afin d'éviter qu'il ne bascule.
- Ne travaillez pas en dessous, autour ou sur cet appareil pendant qu'il est soulevé ou déplacé.

Si ces directives ne sont pas respectées, cela peut entraîner la mort, des blessures graves ou des dommages matériels.

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⚠ AVERTISSEMENT

CHARGE INSTABLE—RISQUE DE RENVERSEMENT DE CHARGE

- Équilibrez la section de transport et fixez-la convenablement afin de réduire les risques de basculement.
- Consulter un spécialiste de l'arrimage et du levage pour toute situation non couverte dans ces directives.

Si ces directives ne sont pas respectées, cela peut entraîner la mort ou des blessures graves.

Lors du levage d'une section de transport non munie d'oreilles de levage, utiliser une grue mobile équipée de l'un des éléments suivants :

- Une chaîne couplée à un accrochage par élingues
- Un câble métallique muni de crochets et manilles de sécurité

Enrouler l'élingue complètement autour du panneau de commutation et des longerons de transport (figure 4 à la page 138).

REMARQUE : Un chariot élévateur est une méthode alternative de manutention du panneau de commutation. Toujours vérifier la longueur des fourches afin de s'assurer qu'elles s'étendent entièrement sous le panneau de commutation. Équilibrer soigneusement la charge et toujours utiliser une sangle de sécurité lors de la manutention ou du déplacement d'un panneau de commutation avec un chariot élévateur (figure 4 à la page 138).

Entreposage

Lors de l'entreposage du panneau de commutation avant son installation, couvrir le dessus et les ouvertures, pendant la période de construction, pour le protéger de la poussière et des débris.

Si le panneau de commutation n’est pas immédiatement installé et mis sous tension, l’entreposer dans un endroit propre et sec ayant une température constante pour éviter toute condensation. Si possible, entreposer le panneau de commutation à l'intérieur. Il est préférable de l'entreposer dans un bâtiment chauffé muni d'une circulation d'air adéquate et de le protéger de la saleté, de la fumée, de l'eau et de tout endommagement physique. L’entreposage du panneau de commutation à l’extérieur risque de causer une condensation nuisible à l’intérieur du panneau.

REMARQUE : Installer des appareils de chauffage électriques portables de 250 W environ par section verticale dans les deux types d'armoires de panneau de commutation, pour usage à l'intérieur et à l'épreuve de la pluie, pour assurer une protection adéquate durant l'entreposage.

Avant de mettre les appareils de chauffage en marche, enlever tous les matériaux d'emballage ou inflammables se trouvant à l'intérieur du panneau de commutation. Les panneaux de commutation pour usage à l'extérieur, ne résistent pas aux intempéries tant qu'ils ne sont pas complètement et correctement installés et doivent être traités exactement de la même manière qu'un panneau de commutation pour usage à l’intérieur jusqu'après son installation.

Figure 4 – Étiquette de sécurité pour chariot élévateur

⚠ WARNING

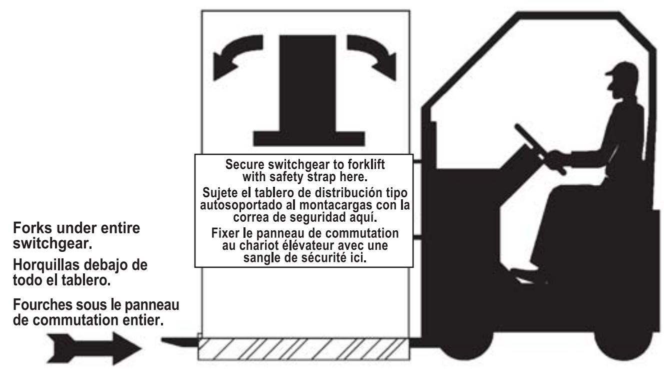
HAZARD OF EQUIPMENT DAMAGE
• Secure to forklift with safety strap.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ ADVERTENCIA

PELIGRO DE DAÑO AL EQUIPO
• Sujete al montacargas con la correa de seguridad.
El incumplimiento de estas instrucciones puede causar la muerte, lesiones serias o daño al equipo.

⚠ AVERTISSEMENT

RISQUE DE BLESSURES OU DE DOMMAGES MATÉRIELS
• Fixer au chariot élévateur avec une sangle de sécurité.
Si ces directives ne sont pas respectées, cela peut entrainer la mort ou des blessures graves ou des dommages matériels.



Remove label after installation.
Retire la etiqueta después de la instalación.
Enlever l'étiquette après l'installation.

Special Handling Requirements
Do not lay the equipment on its front or sides. Doing so will damage unit.
Lay equipment only on its back when special handling is required.
See Instruction Bulletin for special handling instructions for laying equipment on its back.
Equipment is NOT to be shipped lying down.
Failure to follow these instructions can result in death, serious injury or equipment damage.

Requisitos especiales de manejo
No coloque el equipo sobre su frente o lados ya que podría dañarse la unidad.
Coloque el equipo sobre su parte posterior solamente cuando sea necesario manejarlo de manera especial.
Consulte el boletín para obtener las instrucciones especiales de manejo para colocar el equipo sobre su parte posterior.
El equipo NO deberá transportarse acostado.
El incumplimiento de estas instrucciónes puede causar la muerte, lesiones serias o daño al equipo.

Exigences de manutention spéciales
Ne couchez pas l'appareil sur sa face avant ou sur las côtés. Faire ainsi l'endommagerait.
Couchez l'appareil sur le dos uniquement lorsqu'une manutention spéciale est nécessaire.
Consultez les directives d'utilisation pour les instructions de manutention spéciales pour coucher l'appareil sur le dos.
N'expédiez PAS l'appareil sur son dos.
Si ces directives ne sont pas respectées, cela peut entrainer la mort ou des blessures graves ou des dommages matériels.

Chapitre 4—Installation

Une installation correcte du panneau de commutation Power-Style QED-2 est essentielle pour le bon fonctionnement de tous les composants du panneau. Étudier soigneusement les directives d'utilisation et tous les dessins et plans associés. Typiquement, les dessins et plans sont envoyés à l'acheteur avant l'expédition du panneau de commutation afin de permettre une planification adéquate.

REMARQUE : Le dessus du panneau de commutation ne supportera pas le poids de l'installateur.

Emplacement

Trouver l'endroit désigné sur le plan du bâtiment pour l'installation du panneau de commutation. L'emplacement choisi pour l'installation doit offrir des dégagements de travail conformes à la section 110-26 du National Electrical Code® (NEC®), ou à la section 2-308 du Code canadien de l'électricité (CCE), partie 1.

- Les panneaux de commutation accessibles par l'avant nécessitent que l'accès et l'entretien des raccordements sur place, notamment au secteur, aux dérivations, à la barre-bus de m.à.l.t. et à la barre-bus du neutre, puissent se faire par l'avant.
- Pour les panneaux de commutation munis d'une aération arrière, laisser un dégagement minimum de 13 mm (1/2 po) entre l'arrière du panneau de distribution et le mur afin d'obtenir une aération satisfaisante. Les plans de l'appareil identifient les panneaux de commutation qui demandent un accès arrière ou latéral.
- Les panneaux de commutation qui nécessitent un accès arrière pour l'installation, les raccordements sur place ou l'entretien (remplacement d'un filtre, par exemple), exigent 762 mm (30 po) d'espace de travail selon le Code national de l'électricité (É.-U.) 110-26.
- Si le panneau de commutation est placé dans un endroit humide ou en dehors du bâtiment, l'enfermer dans une armoire ou un équipement pour usage à l'extérieur afin d'empêcher l'humidité ou l'eau d'entrer et de s'accumuler à l'intérieur de l'armoire. L'écoulement des panneaux de commutation classés pour usage à l'extérieur est à l'arrière, il faut donc un dégagement d'au moins 13 mm (1/2 po) entre l'arrière du panneau de commutation et un mur ou autre obstruction pour avoir un écoulement correct.

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Préparation de la fondation

Le sol ou la fondation doit être suffisamment solide pour soutenir le poids du panneau de commutation sans s'affaisser. Le sol environnant doit avoir une légère pente vers un écoulement.

REMARQUE : Pour les qualifications sismiques, lire la section à la page 143 avant de couler le sol ou la fondation.

Les panneaux de commutation Power-Style QED-2 sont assemblés sur des sols plans et de niveau à l'usine d'assemblage. Pour assurer un alignement correct des barres-bus, le socle de montage ou le site d'installation définitif doit être lisse et de niveau. Si des profilés en acier parallèles sont intégrés dans le sol pour le montage du panneau de distribution, prendre des précautions supplémentaires pour assurer que les profilés sont de niveau sur toute la longueur afin d'éviter toute déformation de la structure du panneau de distribution. Chaque profilé doit être de niveau avec le sol fini.

Lors du coulage de la fondation, prendre les dispositions nécessaires pour les conduits entrant dans le panneau de distribution par le dessous qui assurent le passage des câbles d'arrivée ou de sortie, du câblage de contrôle et du câble de m.à.l.t. La vue de dessous sur le plan de l'appareil indique la zone disponible pour les conduits, qui permet un arrangement correct.

Les conduits doivent faire saillie au-dessus du sol fini d'environ 51 mm (2 po). Toutefois, pour simplifier la mise en place des sections de transport, installer les conduits au niveau du béton et, une fois les sections à leur emplacement définitif, ajouter des manchons d'extension appropriés. Autrement, il sera nécessaire de placer la section de transport sur des longerons ou de la soulever à l'aide d'une grue pour dégager les manchons des conduits. Avant de couler la fondation, considérer l'installation de conduits supplémentaires pour des circuits futurs.

Préparation du panneau de commutation

Nettoyer la fondation et la zone environnante de toute saleté et de tous débris avant de déplacer le panneau de commutation vers son emplacement définitif.

Après avoir placé le panneau de commutation à son site définitif, enlever les longerons de chaque section de transport. Pour les panneaux de commutation d'une profondeur supérieure à 610 mm (24 po), le profilé de base du milieu peut être enlevé.

Enlever tous les matériaux d'emballage. Si le panneau de commutation est muni d'une plaque de fermeture de fond dans chaque section verticale, retirer ces plaques et les mettre de côté pour une utilisation ultérieure. Lorsque des plaques de fermeture de fond sont fournies, le client doit y découper les trous nécessaires pour l'entrée de conduits par le bas du panneau de commutation. Après avoir découpé les trous, réinstaller les plaques de fermeture.

Installation générale

AVIS

RISQUE DE DOMMAGES MATÉRIELS

Mettez de niveau et alignez les sections de transport adjacentes les unes avec les autres. Assurez un alignement correct des barres-bus de traversée horizontales principales et des raccordements corrects des barres-bus de jonction.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

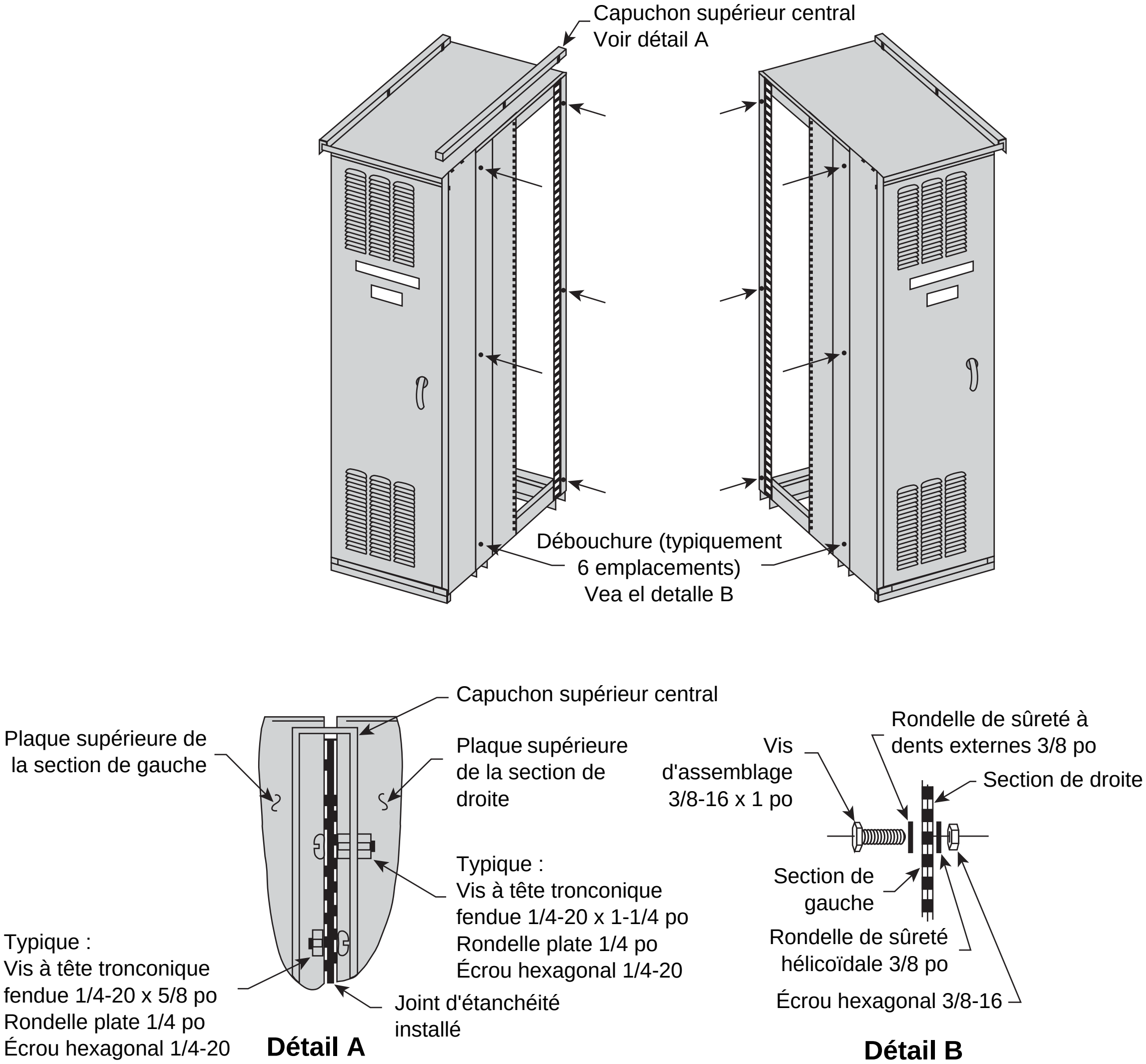
Installer le panneau de commutation à son emplacement définitif en mettant de niveau progressivement chaque section et en boulonnant les châssis ensemble, s'ils sont séparés. Placer les sections de transport de la manière suivante :

1. Placer chaque section de transport à son emplacement voulu en observant les procédures décrites dans la section « Manutention » à la page 133.
2. Abaisser soigneusement la section sur les manchons des conduits pour la faire correspondre à la « zone de conduits disponible » comme indiqué sur la vue de dessous des dessins de l'appareil. Autrement, il se pourrait qu'il n'y ait pas suffisamment d'espace de courbure des câbles.
3. Mettre la section de transport de niveau.
4. Après avoir terminé l'installation de chaque section, effectuer le raccordement de jonction des barres-bus de traversée avec la section précédente avant d'installer la section suivante.

Jonction des sections de transport—Panneaux de commutation pour usage à l'extérieur

1. Retirer le capuchon supérieur central (figure 5) de la section de gauche et mettre de côté toute la quincaillerie pour pouvoir la réutiliser.

Figure 5 – Jonction des sections adjacentes—Panneaux de commutation pour usage à l'extérieur



2. Lorsque c'est possible, ouvrir et retirer les portes avant et arrière et les panneaux afin d'avoir un accès pour boulonner les sections de transports adjacentes.
3. Retirer trois débouchures d'un diamètre de 13 mm (0,5 po) du profilé d'angle vertical avant et trois du profilé d'angle vertical arrière (soit un total de six par côté de châssis), comme indiqué par les flèches de la figure 5.
4. Placer chaque section adjacente, en la mettant de niveau avec soin et en l'alignant avec la section précédente. Si des oreilles de levage sont fournies, les enlever complètement des côtés qui vont être boulonnés ensemble de sorte que les sections soient bien jointes. Le seul joint d'étanchéité requis entre les sections est fourni sur la flasque du toit.

   REMARQUE : Si le retrait des oreilles de levage n'est pas nécessaire pour joindre les sections, les laisser sur le panneau de commutation. Vérifier si le boulon est serré pour maintenir l'intégrité NEMA 3R.

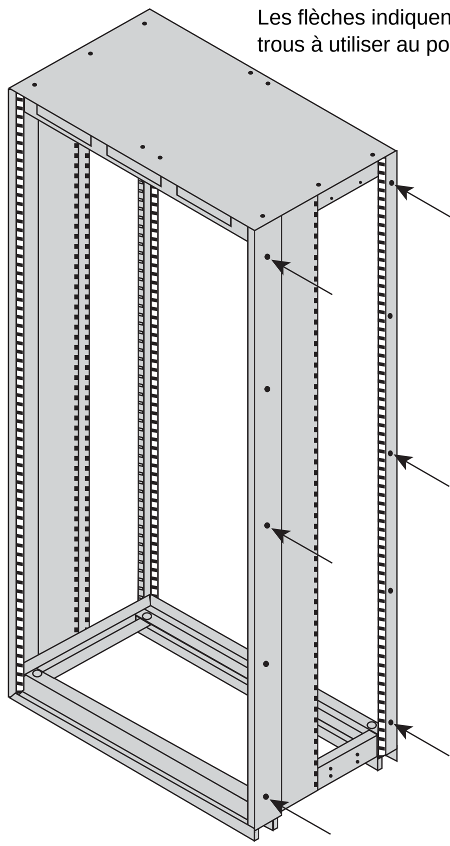
5. Placer six boulons (3/8-16 x 1 po) dans les trous créés au point 3 pour joindre les sections adjacentes.
6. Faire les raccordements de jonction des barres-bus de traversée à la section précédente.
7. Replacer le capuchon supérieur central retiré au point 1.
8. Replacer et fixer les portes avant et arrière et les panneaux retirés au point 2.

Jonction des sections de transport—Panneaux de commutation pour usage à l'intérieur

1. Placer chaque section adjacente, en la mettant de niveau avec soin et en l'alignant avec la section précédente. Si des oreilles de levage sont fournies, les enlever complètement des côtés qui vont être boulonnés ensemble de sorte que les sections soient bien jointes.

   REMARQUE : Laisser les autres oreilles de levage sur le panneau de commutation si leur retrait n'est pas nécessaire pour bien joindre les sections adjacentes.

Figure 6 – Panneaux de commutation pour usage à l'intérieur



2. Ouvrir et retirer les portes avant et arrière et les panneaux afin d'avoir un accès pour boulonner les sections de transports adjacentes.
3. Placer six boulons (3/8-16 x 1 po) dans les trous existants sur les profilés d'angle verticaux avant et arrière pour joindre les sections adjacentes (figure 6).
4. Faire les raccordements de jonction des barres-bus de traversée à la section précédente.
5. Replacer et fixer toutes les portes avant et arrière et les panneaux retirés au point 2.

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Ancrage pour qualifications sismiques

L'appareil QED-2 certifié comme étant capable de résister à des séismes a reçu la qualification de conformité aux exigences sismiques spécifiques pour le site selon les codes ou normes des immeubles pour les modèles répertoriés. Des caractéristiques de construction optionnelles peuvent être exigées, en fonction de l'emplacement de l'installation ainsi que des codes ou des normes répondant à des demandes spécifiques. Des certificats de conformité sont fournis avec tous les appareils QED-2 certifiés comme étant capables de résister à des séismes. Pour maintenir la validité de cette certification, les directives d'installation fournies dans ce bulletin doivent être suivies.

Responsabilité concernant la réduction des dommages sismiques

Pour les codes des immeubles modèles, les appareils QED-2 sont considérés des composants non structuraux des bâtiments. La capacité du matériel a été déterminée à partir de résultats d'essais sur table de secousses sismiques à trois axes, comme définie, par l'International Code Council - Evaluation Service (ICCES) (Conseil international des codes [du bâtiment]), dans les critères d'acceptation des essais de qualification sismique des composants non structuraux (AC156). Sauf indication contraire, un facteur d'importance du matériel de 1,5 (Ip = 1,5) a été utilisé, indiquant que le fonctionnement du matériel a été vérifié avant et après l'essai de simulation sismique avec la table de secousses. Ce facteur d'importance est une indication pour les aménagements cruciaux où la maximisation de la probabilité de fonctionnement après un évènement sismique est une priorité. La norme AC156 a été reconnue par le Conseil de sécurité sismique des immeubles (BSSC) en tant que méthodologie appropriée dans les commentaires sur le programme national 2003 de réduction des risques causés par les tremblements de terre (NEHRP) (FEMA 450 Partie 2). Le National Institute of Building Sciences (Institut national des sciences de la construction) a établi le BSSC en 1979 afin de développer et promouvoir des dispositions réglementaires pour la réduction des dangers dus aux tremblements de terre au niveau national.

Les câbles et conduits d'arrivée et de sortie doivent être également considérés comme des systèmes connexes mais indépendants. Ils doivent être conçus et retenus de manière à résister aux forces générées par l'évènement sismique sans augmenter la charge transférée au matériel. Pour les applications où un risque sismique existe, une entrée ou sortie de câble ou conduit par la partie inférieure est préférable. Ce système doit être capable de transférer les charges créées par un séisme à l'ossature du système structural de l'immeuble.

Maintien de la certification sismique

La qualification sismique des composants non structuraux fournis par Schneider Electric n'est qu'un maillon de la chaîne totale des responsabilités requises pour maximiser la probabilité qu'un matériel soit intact et en état de fonctionnement après un séisme. Pendant un évènement sismique, le matériel doit pouvoir transférer les charges qui sont créées, via son bloc de montage et son ancrage, à l'ossature du système structural de l'immeuble. L'ingénieur civil de structure ou l'ingénieur de conception en charge du projet a la responsabilité de détailler le raccordement du matériel et les exigences d'ancrage pour une installation donnée. L'installateur et les fabricants des systèmes d'ancrage ont la responsabilité d'assurer que les exigences de montage soient respectées. Schneider Electric n'est pas responsable des caractéristiques et performances de ces systèmes.

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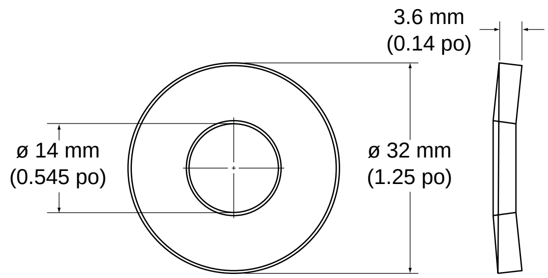
Ancrage de l’appareil QED-2 pour les applications sismiques

Figure 7 – Rondelle Belleville



Les profilés de base sont de la largeur de la section. Les profilés et attaches de raccordement procurent un trou de 19 mm (0,75 po) de diamètre minimum pour attacher la section au sol. Pour ancrer correctement le panneau QED-2 au sol, utiliser les quatre emplacements de montage pour les armoires NEMA type 1 d’une profondeur inférieure à 914 mm (36 po), les six emplacements de montage pour les armoires d’une profondeur de 914 à 1778 mm (36 à 70 po), et six des huit emplacements de montage pour les armoires d’une profondeur supérieure à 1778 mm (70 po) (voir la figure 8 à la page 146).

Utiliser des boulons d’ancrage de 13 mm (0,5 po) de diamètre (qualité 5 minimum, fournis par autres) pour l’installation de l’appareil. Utiliser une rondelle Belleville de qualité 5 de 32 mm (1,25 po) de diamètre extérieur (fournis par autres; voir la figure 7) sous la tête de chaque boulon ou écrou d’ancre. Pour exploiter la résistance de l’ancre, serrer la quincaillerie à la valeur de couple spécifiée par le fabricant des ancres ou comme recommandé dans les instructions anti-séisme détaillées fournies par l’ingénieur civil en charge du projet (voir la figure 9 à la page 147).

En outre, chaque section fermée NEMA type 1 comprend points rigides, situés sur la partie supérieure arrière, pour attacher deux tirants supérieurs latéraux (les tirants et la quincaillerie sont fournis par d’autres) à la structure du QED-2 pour fournir une entrave structurelle au dessus de l’appareil (voir les figures 10 et 11 à la page 148).

L’entrave structurelle est requise pour tout appareil QED-2 installé :

- lorsque le mouvement spectral du sol de 0,2 seconde spécifique au site dépasse 2,67 g (comme déterminé à partir des cartes de mouvement du sol indiquées au code ou l’étude par des ingénieurs des risques sismiques spécifiques au site), ou
- lorsqu’aucun déplacement du dessus de l’appareil ne peut être toléré, ou
- pour toutes les sections QED-2 d’angle utilisées dans les applications sismiques.

Pour exploiter la résistance totale de l’ancre structurelle supérieure, installer et serrer la quincaillerie au couple spécifié par le fabricant des ancres ou les instructions anti-séisme détaillées fournies par l’ingénieur civil en charge du projet.

REMARQUE : La quincaillerie d'ancrage n'est pas fournie avec l’appareil QED-2.

Après avoir correctement effectué la jonction du panneau QED-2 et de l’appareil adjacent et avoir boulonné la structure au sol, installer les conducteurs de service d’arrivée et les câbles du côté charge. Pendant un tremblement de terre, le dessus du panneau QED-2 peut se déplacer dans n'importe quelle direction. Tous les câbles entrant par le haut doivent pouvoir s'accommoder de ce mouvement. L'armoire de l’appareil QED-2 (en particulier le dessus) ne doit pas être employée pour monter de l'équipement extérieur.

Ancrage de la base

1. Pour ancrer correctement le panneau de commutation au sol, utiliser tous les trous de montage de 19 mm (0,75 po) de diamètre, comme illustré à la figure 8 à la page 146. Les dimensions de l’armoire dans la figure 9 sont indiquées dans le tableau 1.

Tableau 1 – Dimensions X, Y, Z de l’armoire en po (mm)

Largeur de l’armoire → / Profondeur de l’armoire ↓	12 po (305 mm)	24 po (610 mm)	30 po (762 mm)	36 po (914 mm)	42 po (1 067 mm)	48 po (1 219 mm)	54 po (1 372 mm)
24 po (610 mm)	X = 6 (152) Y = 21 (533)	X = 18 (457) Y = 21 (533)	X = 24 (610) Y = 21 (533)	X = 30 (762) Y = 21 (533)	X = 36 (914) Y = 21 (533)	X = 42 (1067) Y = 21 (533)	X = 48 (1219) Y = 21 (533)
36 po (914 mm)	X = 6 (152) Z = 16,5 (419) Y = 33 (838)	X = 18 (457) Z = 16,5 (419) Y = 33 (838)	X = 24 (610) Z = 16,5 (419) Y = 33 (838)	X = 30 (762) Z = 16,5 (419) Y = 33 (838)	X = 36 (914) Z = 16,5 (419) Y = 33 (838)	X = 42 (1067) Z = 16,5 (419) Y = 33 (838)	X = 48 (1219) Z = 16,5 (419) Y = 33 (838)
48 po (1 219 mm)	X = 6 (152) Z = 22,5 (572) Y = 45 (1143)	X = 18 (457) Z = 22,5 (572) Y = 45 (1143)	X = 24 (610) Z = 22,5 (572) Y = 45 (1143)	X = 30 (762) Z = 22,5 (572) Y = 45 (1143)	X = 36 (914) Z = 22,5 (572) Y = 45 (1143)	X = 42 (1067) Z = 22,5 (572) Y = 45 (1143)	X = 48 (1219) Z = 22,5 (572) Y = 45 (1143)
54 po (1 372 mm)	X = 6 (152) Z = 25,5 (648) Y = 51 (1295)	X = 18 (457) Z = 25,5 (648) Y = 51 (1295)	X = 24 (610) Z = 25,5 (648) Y = 51 (1295)	X = 30 (762) Z = 25,5 (648) Y = 51 (1295)	X = 36 (914) Z = 25,5 (648) Y = 51 (1295)	X = 42 (1067) Z = 25,5 (648) Y = 51 (1295)	X = 48 (1219) Z = 25,5 (648) Y = 51 (1295)
60 po (1 524 mm)	X = 6 (152) Z = 28,5 (724) Y = 57 (1448)	X = 18 (457) Z = 28,5 (724) Y = 57 (1448)	X = 24 (610) Z = 28,5 (724) Y = 57 (1448)	X = 30 (762) Z = 28,5 (724) Y = 57 (1448)	X = 36 (914) Z = 28,5 (724) Y = 57 (1448)	X = 42 (1067) Z = 28,5 (724) Y = 57 (1448)	X = 48 (1219) Z = 28,5 (724) Y = 57 (1448)
72 po (1 829 mm)	X = 6 (152) Z_1 = 28,5 Z_2 = 40,5 (1029) Y = 69 (1753)	X = 18 (457) Z_1 = 28,5 (724) Z_2 = 40,5 (1029) Y = 69 (1753)	X = 24 (610) Z_1 = 28,5 (724) Z_2 = 40,5 (1029) Y = 69 (1753)	X = 30 (762) Z_1 = 28,5 (724) Z_2 = 40,5 (1029) Y = 69 (1753)	X = 36 (914) Z_1 = 28,5 (724) Z_2 = 40,5 (1029) Y = 69 (1753)	X = 42 (1067) Z_1 = 28,5 (724) Z_2 = 40,5 (1029) Y = 69 (1753)	X = 48 (1219) Z_1 = 28,5 (724) Z_2 = 40,5 (1029) Y = 69 (1753)

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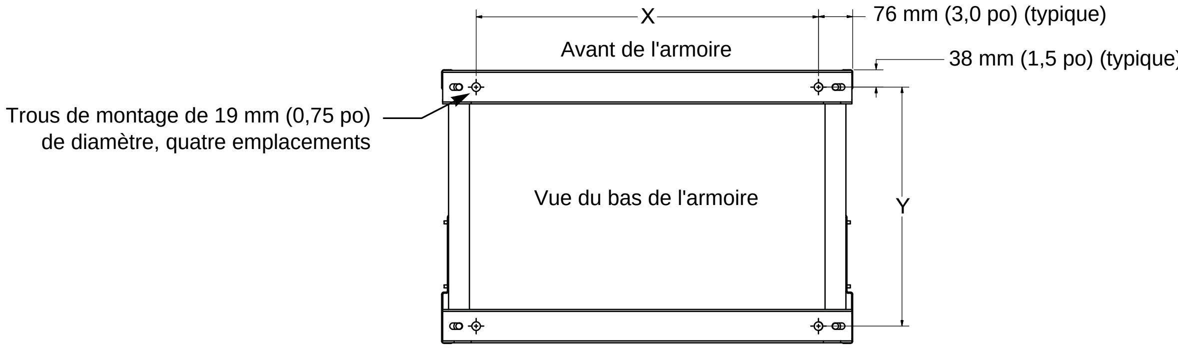
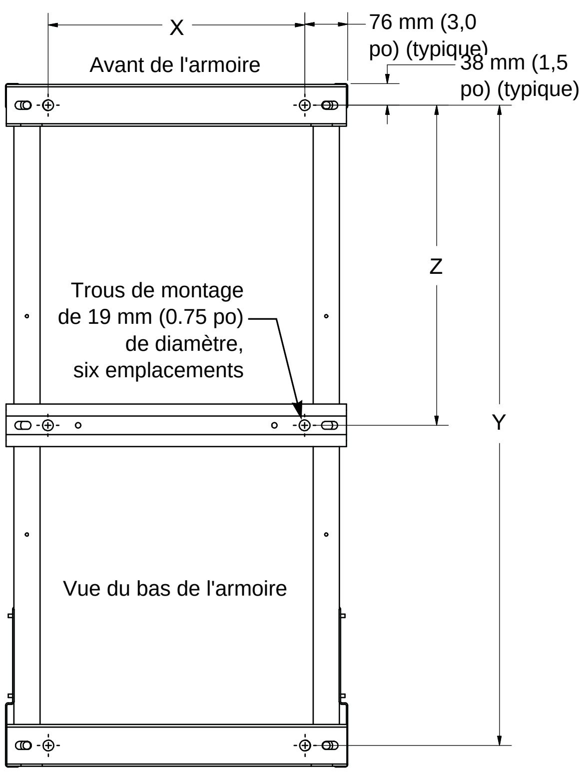
Figure 8 – Emplacements des boulons de fixation au sol du profilé de base

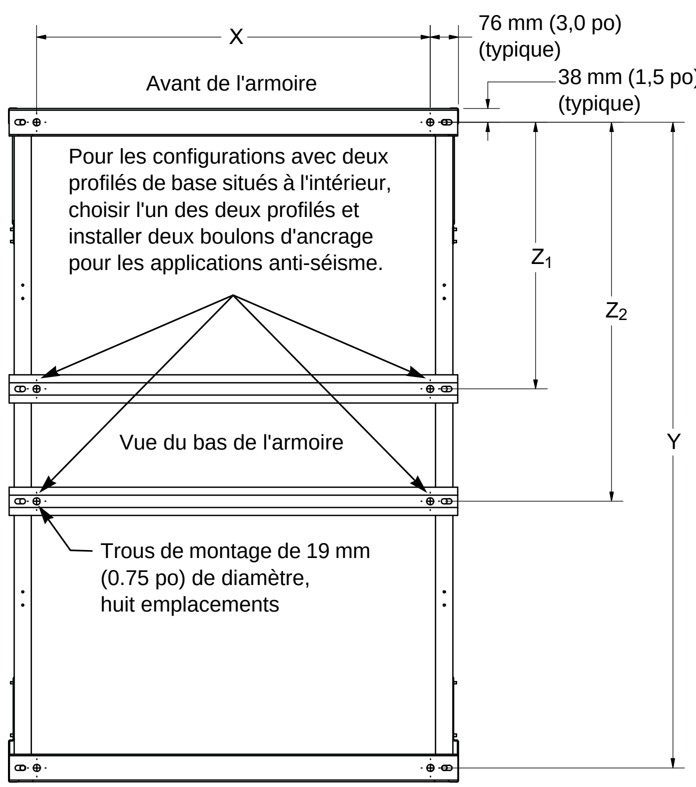


Armoires d'une profondeur < à 914 mm (36 po)

REMARQUE : Voir le tableau 1 à la page 145 pour les valeurs des dimensions X / Y / Z.



Armoires d'une profondeur de 914 à 1778 mm (36 à 70 po)



Armoires d'une profondeur > à 1778 mm (70 po)

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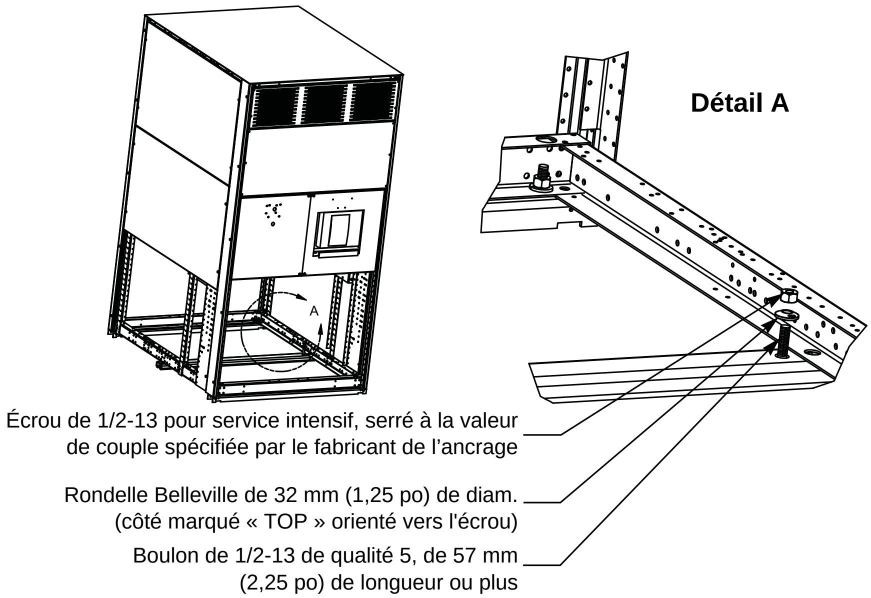
2. Selon la taille de châssis (voir la figure 9 à la page 15), utiliser quatre ou six boulons de qualité 5, de ½ po-13 dans les emplacements indiqués à la figure 9.

Figure 9 – Quincaillerie de montage de profilés de base



REMARQUE : Détail de la quincaillerie de montage du profilé de base représenté à titre de référence uniquement. La quincaillerie d'ancrage n'est pas fournie avec le panneau de commutation. Les couvercles et la quincaillerie interne ne sont pas représentés aux fins d'illustration seulement.

3. Après la mise en place du panneau de commutation, fixer les profilés de base à chaque boulon à l'aide d'une rondelle Belleville de 31,75 mm (1,25 po) de diamètre entre un écrou trempé de 1/2-13 et le châssis du panneau de commutation comme illustré à la figure 9.

   REMARQUE : le dessus [TOP] de la rondelle Belleville doit faire face à l'écrou.

4. Serrer chaque écrou à la valeur de couple spécifiée par le fabricant de l'ancrage pour développer la résistance totale de l'ancrage.

Ancrage / entrave supérieure

Pour une installation à des emplacements ayant un Ss supérieur à 2,67 g (comme déterminé à partir de la version courante du code de construction international) ou là où un déplacement ne peut pas être toléré au haut du panneau de commutation pendant un évènement sismique, utiliser des entraves supérieures fixées aux emplacements de points renforcés.

REMARQUE : La quincaillerie d'ancrage n'est pas fournie avec le panneau de commutation.

1. Les quatre débouchures de 22 mm (0,88 po) de diamètre indiqués à la figure 10 à la page 148 servent de points renforcés pour l'application d'un système d'entraves supérieures.

   REMARQUE : Selon le code, il relève de la responsabilité du professionnel de la conception de construction de déterminer la méthodologie des entraves supérieures pour l'application envisagée.

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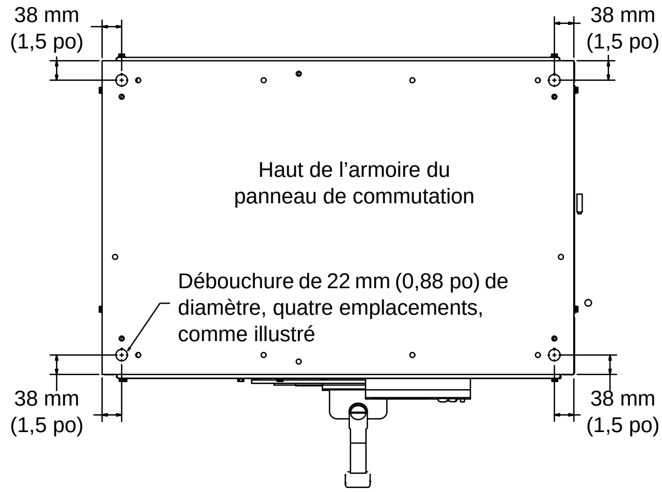
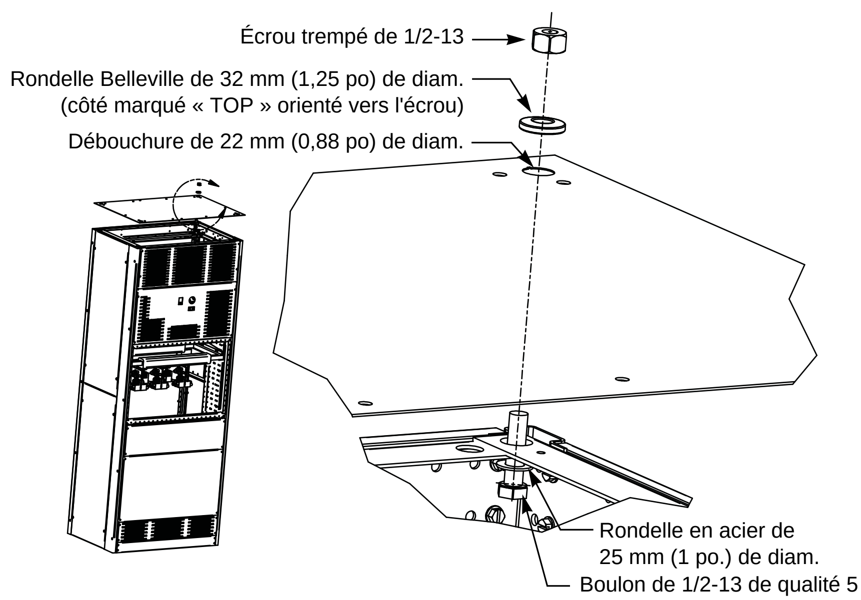
Figure 10 – Emplacements des points renforcés pour l’ancrage supérieur



2. Détacher la plaque supérieure de l’armoire du panneau de commutation principal. Mettre les vis de côté.
3. Retirer les quatre (4) débouchures de 22 mm (0,88 po) de diamètre comme indiqué par le professionnel de la conception de l'immeuble.
4. Les débouchures ayant été enlevées, réattacher et fixer la plaque supérieure au coffret à l’aide des vis retirées au point 2.
5. Attacher le système d’entrave supérieure à l’aide d’un boulon de 1/2-13 de qualité 5, d'une rondelle en acier de 25 mm (1 po) de diamètre, d'une rondelle Belleville de 1-1/4 et d'un écrou trempé de 1/2-13 comme indiqué à la figure 11.

Figure 11 – Quincaillerie de montage d’ancrage supérieure



6. Après avoir assemblé ensemble correctement toutes les sections du panneau de commutation et ancré la structure entière, installer les conducteurs d'alimentation d'arrivée et les câbles du côté charge.
7. Ne pas utiliser l’armoire du panneau de commutation (en particulier le dessus) pour monter un appareil extérieur, sauf un conduit.

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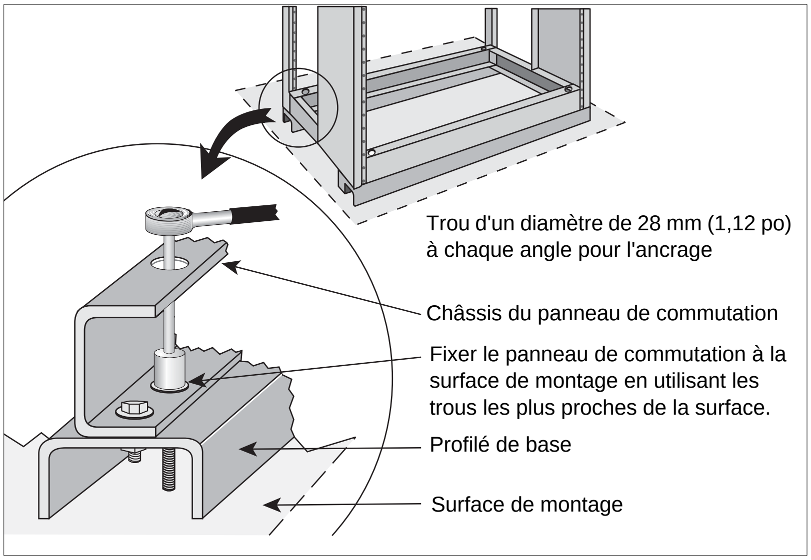
Ancrage du panneau de commutation

Bien que les sections soient autonomes, un coup ou mouvement de déplacement brutal peut entraîner des dommages aux raccordements de jonction entre les sections et aux manchons de conduits raccordés aux sections. Il faut donc ancrer chaque section verticale au sol.

Les profilés de base sont de la largeur de la section de transport. Ces profilés sont munis de trous de 28 mm (1,12 po) de diamètre permettant d'attacher la section au sol (figure 12 à la page 149). Ancrer chaque section au sol avec des boulons de 13 mm (1/2 po) de calibre 2 minimum, rondelles plates et chevilles (non fournies) convenant à une installation d'appareil électrique.

Figure 12 – Profilés de base du panneau de commutation



Après avoir assemblé ensemble correctement toutes les sections du panneau de commutation et boulonné la structure entière au sol, installer les conducteurs d'alimentation d'arrivée et les câbles du côté charge.

REMARQUE : Si le panneau de commutation ne comprend qu'une seule section de transport, passer à « Mise à la terre et à la masse » à la page 152.

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Raccordements de jonction des barres-bus de traversée

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

N'installez pas de connecteurs de jonction de barre-bus de traversée alors que le panneau de commutation est sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

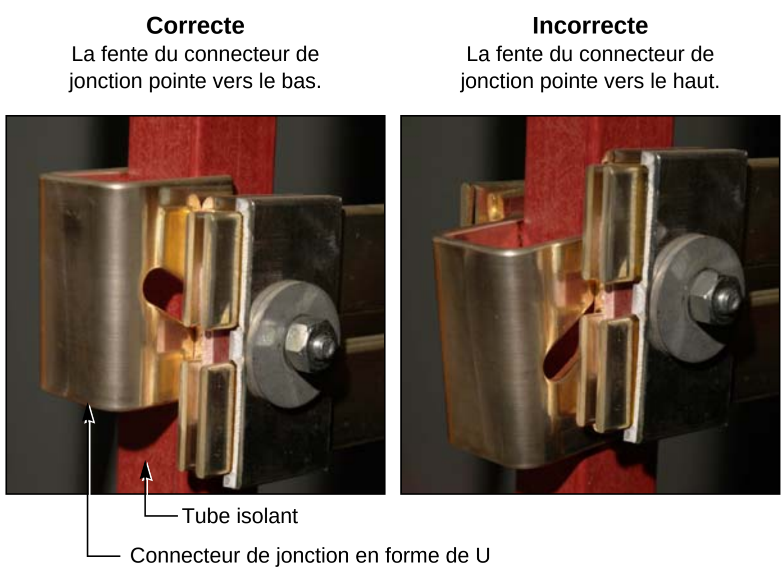
De la quincaillerie ou des connecteurs de jonction des barres-bus de traversée avec directives d'installation sont fournis avec chaque section de transport. Suivre les directives d'installation et serrer les boulons de jonction à la valeur de couple de serrage donnée dans le « Chapitre 9—Valeurs des couples de serrage pour les connexions électriques » à la page 179.

Si les barres-bus de traversée sont enveloppées dans un matériau isolant, couvrir les raccordements de jonction avec le matériau fourni.

Pour les raccordements de jonction avec barre-bus à l'avant et à l'arrière d'un tube isolant, s'assurer que le connecteur en cuivre, en forme de U, soit centré autour du tube. La figure 13 à la page 150 montre l'orientation correcte du connecteur.

REMARQUE : Le connecteur en forme de U s'adapte parfaitement au tube isolant lorsqu'il est installé correctement. Le connecteur est écarté du tube isolant dans la figure 13 pour montrer l'orientation de la fente.

Figure 13 – Orientation correcte du connecteur de jonction en forme de U



Raccordements de jonction de la barre-bus de m.à.l.t.

Aligner et fixer les raccordements de jonction de la barre-bus de m.à.l.t. entre les sections de transport. Serrer les raccordements au couple de 11 N•m (100 lb-po) (figure 14 ou 15).

REMARQUE : Une installation correcte est essentielle pour les systèmes de défaut à la terre du matériel.

Figure 14 – Raccordement de jonction de la barre-bus de m.à.l.t.

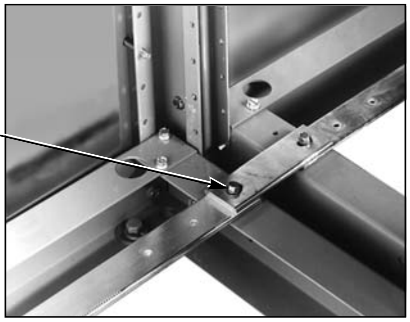


Figure 15 – Raccordement de jonction de la barre-bus de m.à.l.t. de la série 2

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Mise à la terre et à la masse

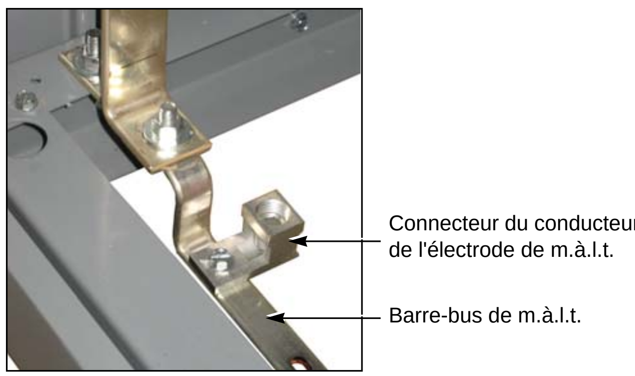
REMARQUE : Un système est « mis à la terre » s'il est mis à la terre à n'importe quel point en amont du panneau de commutation, que le conducteur mis à la terre (neutre) soit amené fin vers les charges, ou non.

Appareil de service—Système mis à la terre

Pour les systèmes *solidement mis à la terre* utilisés soit comme appareil de service, soit comme panneau de commutation principal sur un système dérivé séparément :

1. Installer le conducteur de l'électrode de mise à la terre depuis l'électrode du site d'installation jusqu'au connecteur (cosse de m.à.l.t.) du conducteur de l'électrode situé sur la barre-bus de m.à.l.t. du panneau de commutation (ou sur la barre-bus de neutre, si indiqué ainsi sur le dessin du matériel) (figure 16). Sélectionner le matériau et le calibre du conducteur de cette électrode de m.à.l.t. pour être conforme aux sections 250-62 et 250-66 du NEC (É.-U.) ou aux sections 10-204 et 10-206 du CCE de 1998, et l'installer comme spécifié à la section 250-64 du NEC (É.-U.) ou à la section 10-908 du CCE de 1998.

Figure 16 – Connecteur de l'électrode de mise à la terre



2. Installer le cavalier de mise à la masse principal entre la barre-bus de neutre et la barre-bus de m.à.l.t. (figure 17 ou 18). Pour obtenir les valeurs de couple de serrage, vous reporter au « Chapitre 9—Valeurs des couples de serrage pour les connexions électriques » à la page 179.

   REMARQUE : Si le panneau de commutation est alimenté par des sources multiples (par exemple, systèmes à deux extrémités [sources]), l'installation de deux cavaliers de mise à la masse principaux ou davantage peut être nécessaire.

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Figure 17 – Cavalier de mise à la masse principal

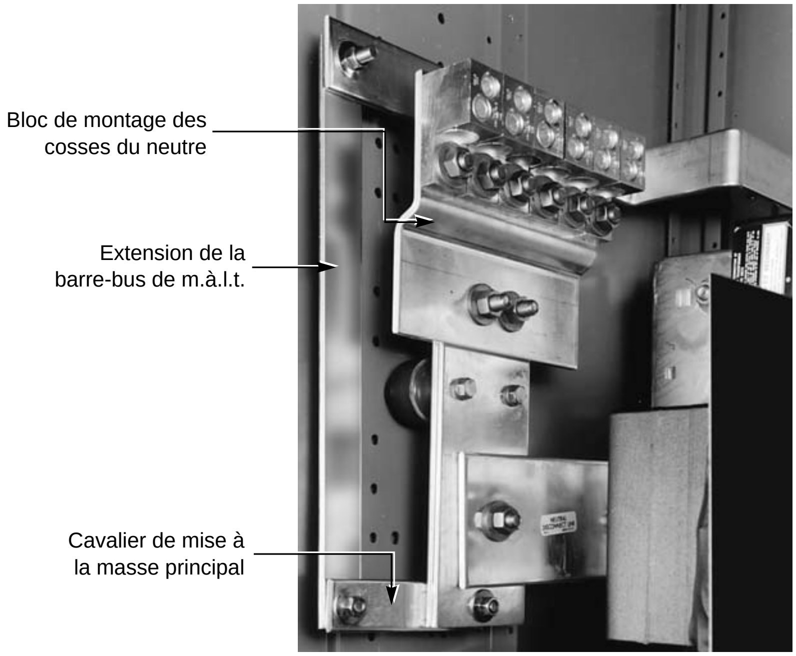
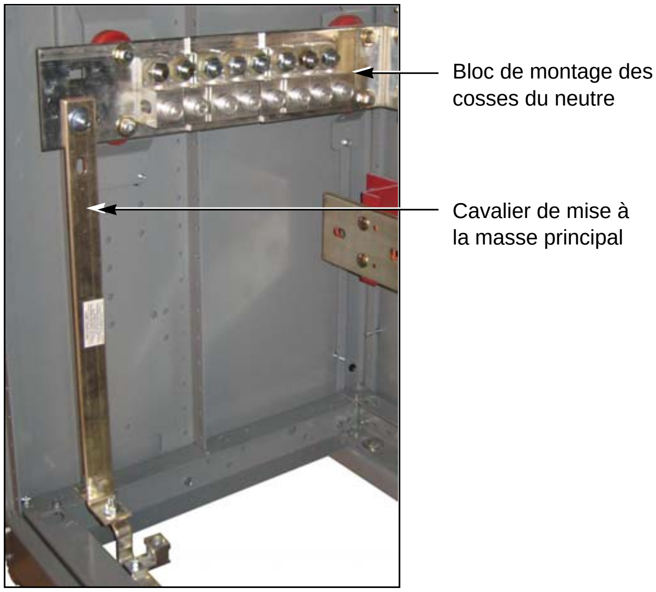


Figure 18 – Cavalier de mise à la masse principal de la série 2



Au Canada, une barre ou câble cavalier de mise à la masse principal est fourni entre la barre-bus du neutre et la barre-bus de m.à.l.t. Lorsque le cavalier doit être déconnecté (par exemple, pour un essai Megger®), détacher la cosse du câble ou de la barre de mise à la masse principale avec son câble de la barre-bus du neutre. Celle-ci se trouve normalement près des cosses de neutre de ligne. Attacher la barre ou le câble cavalier de mise à la masse principale et la cosse pour maintenir la distance requise des phases et du neutre.

REMARQUE : Si le panneau de commutation est alimenté par des sources multiples (par exemple, systèmes à deux extrémités, principal-couplage-principal), l'installation de deux cavaliers principaux ou davantage peut-être nécessaire.

Appareil de service—Système flottant

Pour les systèmes flottants utilisés soit comme appareil de service, soit comme panneau de commutation principal sur un système dérivé séparément :

1. Installer le conducteur de l'électrode de mise à la terre depuis l'électrode du site d'installation jusqu'au connecteur (cosse de m.à.l.t.) du conducteur de l'électrode situé sur la barre-bus de m.à.l.t. du panneau de commutation (figure 16).
2. Sélectionner le matériau et le calibre du conducteur de cette électrode de m.à.l.t. pour être conforme aux sections 250-62 et 250-66 du NEC (É.-U.) ou aux sections 10-700 et 10-702 du CCE de 1998, et l'installer comme spécifié à la section 250-64 du NEC (É.-U.) ou à la section 10-204 du CCE de 1998.

Appareil non de service

Pour les systèmes *mis ou non mis à la terre*, lorsqu'un panneau de commutation est utilisé ni comme un appareil de service, ni comme un panneau de commutation principal sur un système dérivé séparément :

Utiliser des conducteurs de m.à.l.t. de l'appareil qui sont calibrés conformément à la section 250-122 du NEC (É.-U.) ou à la section 10-206 du CCE de 1998 pour raccorder le châssis du panneau de commutation et la barre-bus de m.à.l.t. à la terre de service.

Systèmes de neutre mis à la terre à impédance élevée

Pour les systèmes de neutre mis à la terre à impédance élevée :

Mettre le système à la terre en suivant les directives fournies avec l'équipement de m.à.l.t. du système et conformément à la section 250-36 du NEC (É.-U.). S'assurer que le châssis du panneau de commutation et la barre-bus de m.à.l.t. sont fixés conformément à la section 250-102 du NEC (É.-U.).

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Raccordement à une canalisation préfabriquée

Les panneaux de commutation Schneider Electric sont fabriqués avec deux types différents de raccordements pour les canalisations préfabriquées. Le type avec Qwik Flange[MC] est uniquement employé sur les panneaux de commutation pour usage à l'intérieur.

L'autre type de raccordement de canalisation préfabriquée est avec collerette de fixation « factice ». Ce type est employé sur certains panneaux de commutation pour usage à l'intérieur, mais principalement sur les unités pour usage à l'extérieur. La collerette de fixation factice doit être retirée pour permettre l'installation de la collerette de fixation réelle. La collerette de fixation, factice ou réelle, doit être en place avant de mettre le panneau de commutation sous tension.

REMARQUE : Ne pas se servir du panneau commutation pour soutenir le poids du raccordement de la canalisation préfabriquée. Soutenir la canalisation préfabriquée de façon indépendante. Lorsqu'une canalisation préfabriquée est installée, s'assurer qu'aucune partie du toit ne s'affaisse. Cela aidera à empêcher la formation de flaques d'eau.

Raccordement à la canalisation préfabriquée—NEMA 1 (pour usage à l'intérieur) seulement (Qwik Flange[MC])

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

Coupez l’alimentation du panneau de commutation et de la canalisation préfabriquée avant de faire les raccordements.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Suivre les directives de cette section pour effectuer les raccordements de canalisations préfabriquées avec Qwik Flange (voir les figures 19 et 20 à la page 155):

1. Retirer toute couverture de protection de l'ouverture du panneau de commutation.
2. Introduire la jonction de la canalisation préfabriquée dans les connecteurs du panneau de commutation.
3. Vérifier l'alignement du boulon d'assemblage; la distance entre la ligne centrale (L.C.) du boulon d'assemblage à la surface du panneau de commutation doit être de 24 mm (0,95 po) (figure 19).
4. Fixer les plaques de fermeture latérales à l'aide de deux boulons de 5/16 po (fournis). Si l'installation est correcte, les trous dans les plaques de fermeture latérales sont alignés avec les trous du panneau de commutation et de la canalisation préfabriquée.

Figure 19 – Installation du Qwik Flange

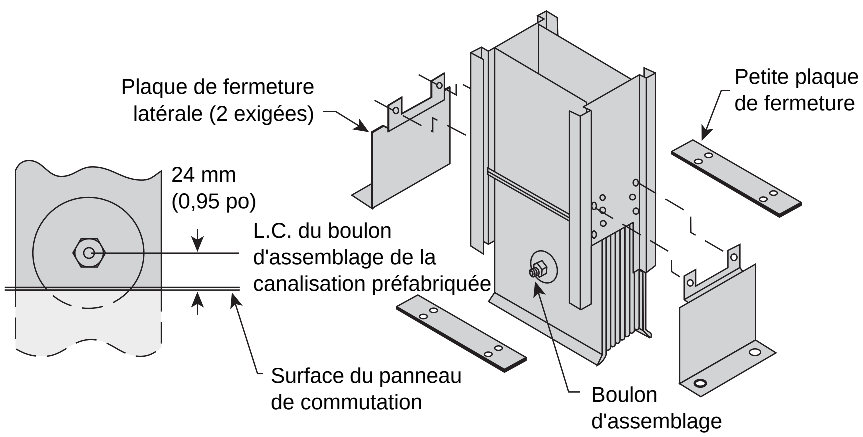
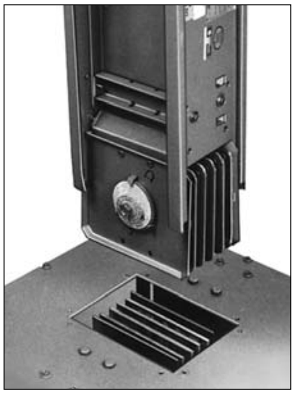
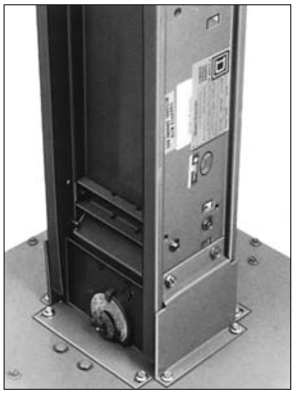


Figure 20 – Qwik Flange





5. Utiliser une clé de 457 mm (18 po) ou plus longue pour serrer le boulon d'assemblage jusqu'à ce que la tête extérieure détachable se sépare. Ne pas laisser la tête de boulon ou le disque d'avertissement rouge tomber dans le panneau de commutation.
6. Utiliser les quatre vis de 1/4-20 fournies pour installer les deux petites plaques de fermeture restantes en place en les alignant avec les trous du panneau de commutation.
7. Vérifier la séquence des phases de la canalisation préfabriquée installée avant de mettre sous tension.

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Raccordement à la canalisation préfabriquée—NEMA 1 (sans Qwik Flange) et NEMA 3R

Si ce type de raccordement pour canalisation préfabriquée est fourni, la collerette de fixation « factice » doit être retirée avant d'installer la canalisation préfabriquée (figure 21).

⚠ DANGER

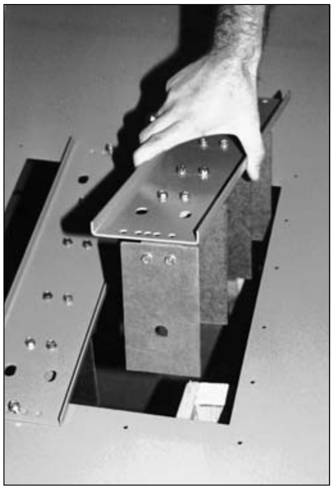
RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

Coupez l'alimentation du panneau de commutation et de la canalisation préfabriquée avant de faire les raccordements.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

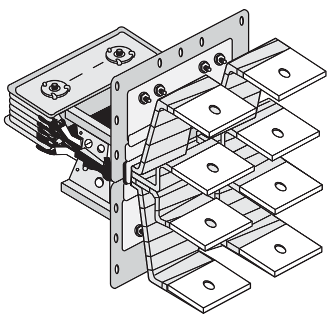
1. De l'intérieur du panneau de commutation, retirer les boulons de 13 mm (1/2 po) qui attachent les barres-bus du panneau de commutation aux collerettes non métalliques factices. Mettre de côté toute la quincaillerie pour pouvoir la réutiliser.
2. Retirer toutes les vis fixant la collerette factice à l'armoire du panneau de commutation.
3. Retirer la collerette factice (figure 21).

Figure 21 – Retrait de la collerette factice



4. Installer la collerette réelle sur les connecteurs des barres-bus du panneau de commutation fournis (figure 22). Installer les lames de fixation entre les connecteurs des barres-bus du panneau de commutation de sorte que les trous de montage de la collerette sont alignés avec les trous pré-percés dans l'armoire du panneau.

Figure 22 – Raccordements de la collerette réelle



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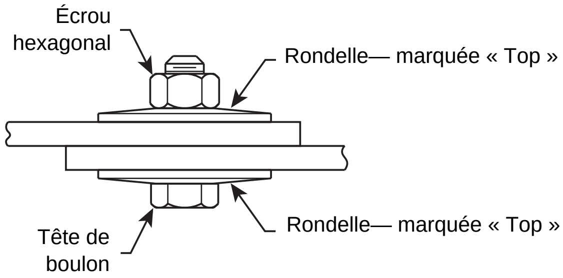
5. Aligner les trous des lames de fixation des barres-bus et réinstaller la quincaillerie de 13 mm (1/2 po) retirée au point 1 à la page 156 et comme indiqué ci-dessous (figure 23).

Figure 23 – Réinstallation de la quincaillerie de 13 mm (1/2 po)



REMARQUE : Le côté convexe (marqué « Top » [Dessus]) d'une rondelle conique doit se trouver contre la tête du boulon, et le côté convexe de la deuxième rondelle conique doit se trouver contre l'écrou hexagonal.

6. Serrer les boulons installés au point 5 au couple indiqué dans le « Chapitre 9—Valeurs des couples de serrage pour les connexions électriques » à la page 179.
7. Assembler la collerette de la canalisation préfabriquée à l'armoire du panneau de commutation à l'aide des vis fournies.
8. S'assurer que la terre intégrée à la canalisation préfabriquée est raccordée à la barre-bus de mise à la terre du panneau.
9. Vérifier la séquence des phases de la canalisation préfabriquée avant de mettre sous tension.

FRANÇAIS

Zone réservée aux conduits

1. Localiser et terminer tout conduit dans la « zone disponible pour les conduits » de l'armoire du panneau, indiqué sur le plan de l'appareil.

   REMARQUE : Sur les panneaux de commutation d'une profondeur supérieure à 610 mm (24 po), le profilé de base central peut être retiré pour obtenir une zone disponible supplémentaire pour les conduits. **Exception :** Si un système d'entrave sismique est requis ne retirer aucun profilé de base.

2. Installer le conduit correctement. Utiliser des manchons, contre-écrous et traversées pour protéger les câbles et empêcher la condensation sur les conduits de pénétrer dans le panneau.

   REMARQUE : Si l'entrée se fait par le haut, ne pas utiliser le dessus du panneau pour supporter le poids des conduits. Fournir aux conduits un support indépendant. Lorsqu'un conduit est installé, s'assurer qu'aucune partie du toit ne s'affaisse. Cela aidera à empêcher la formation de flaques d'eau.

   Si des plaques de fermeture inférieures sont fournies, le client doit les retirer, y percer des trous pour toute entrée de conduit entrant par le bas du panneau de commutation, puis les réinstaller.

   Dans des conditions sismiques, considérer l'utilisation d'entraves supérieures si le mouvement de la partie supérieure du panneau de commutation est un problème.

3. Relier tous les manchons des conduits à l'armoire du panneau avec des connexions électriques approuvées.

Tirage des câbles

Les panneaux de commutation Power-Style QED-2 sont construits aux spécifications du client concernant la disposition des entrées de câbles (par exemple, par le dessus ou par le bas). Les composants des panneaux de commutation sont disposés de façon à donner un dégagement et un espace de courbure appropriés aux câbles qui entrent ou sortent du panneau de commutation comme spécifié sur le plan de l'appareil.

1. N'utiliser que des calibres de câbles qui conviennent aux cosses correspondantes.
2. Tirer le nombre approprié de câbles côté ligne et côté charge en fonction de la charge servie et en accord avec le NEC (É.-U.) ou le CCE.
3. Positionner les câbles à l'intérieur du panneau pour qu'ils ne puissent pas être endommagés.
4. Le rayon de courbure doit être le plus grand possible et les barres-bus ainsi que les parties mises à la terre doivent avoir un dégagement adéquat. Si des câbles reposent sur des éléments structurels ou sont supportés par ces éléments, les soutenir pour atténuer cette condition ou placer un matériau de protection convenable au point de support pour protéger l'isolation des câbles.
5. Aux endroits où les câbles entrent ou sortent du panneau de commutation et où ils traversent des cloisons métalliques ayant des propriétés magnétiques, faire passer tous les conducteurs de phase, y compris le neutre, par la même ouverture pour éviter une surchauffe. Voir la section 300-20(a) du NEC (É.-U.).
6. Renforcer ou entrelacer les conducteurs si indiqué.

FRANÇAIS

Terminaisons des câbles

1. Se servir d'un outil de dénudage d'isolation approprié pour dénuder une longueur d'isolation à partir de l'extrémité du câble, suffisante pour qu'elle s'engage dans toute la longueur du corps de la cosse. Faire attention de ne pas entailler ou cercler les torons.
2. Nettoyer soigneusement les surfaces de contact des câbles en aluminium avec une brosse métallique ou les frotter avec un chiffon abrasif pour enlever les oxydes et autres matières étrangères.
3. Appliquer immédiatement une pâte à joint acceptable sur les surfaces nues d'aluminium.
4. Si des cosses à compression sont fournies sur un interrupteur ou disjoncteur, ou comme cosses de l'alimentation d'arrivée principale, les déboulonner et les enlever pour avoir assez de place pour sertir les cosses sur les câbles avec un outil de sertissage.
   a. Insérer le câble dans le corps de la cosse et, à l'aide de l'outil de sertissage, faire le nombre de sertissages recommandé par le fabricant.
   b. Enlever l'excès de pâte à joint du connecteur et de l'isolation.
   c. Avec les câbles sertis, remonter les cosses sur les barres-bus, interrupteurs ou disjoncteurs. Serrer les boulons aux valeurs de couple de serrage données dans le chapitre 9 à la page 179.
5. Des cosses à vis peuvent être fournies comme cosses d'alimentation principale et sont standard sur les disjoncteurs à boîtier moulé et sur les interrupteurs à fusibles QMB/QMJ/QMQB[1]. Serrer ces cosses aux valeurs spécifiées**, mais ne pas les dépasser**. Les valeurs des couples de serrage pour les cosses de disjoncteurs et interrupteurs sont marquées sur ces unités. Les valeurs des couples de serrage des autres cosses du panneau sont indiquées sur le panneau (tableau 7 à la page 179).

[1] Les interrupteurs QMQB sont disponibles uniquement au Canada.

Entrave des câbles pour le courant nominal de court-circuit (SCCR)

L'entrave des câbles est recommandée pour les cosses montées sur barres-bus dans les conditions suivantes :

- Les longueurs de câbles non soutenues dépassent 1 m (3,5 pieds) [1]

  ET

- Les câbles répondent au critère **Oui** indiqué au tableau 1.

Tableau 2 – Critères de l'entrave de câble

Courant admissible du câble	Courant de défaut de court-circuit disponible (RMS)			
	< 65 kA	**65 à < 85 kA**	**85 à < 150 kA**	**150 à 200 kA**
≤ 800 A	Non	Oui	Oui	Oui
1 200 A	Non	Non	Oui	Oui
1 600 A	Non	Non	Oui	Oui
2 000 A	Non	Non	Oui	Oui
2 500 A	Non	Non	Non	Oui
3 000 A	Non	Non	Non	Oui
≥4000 A	Non	Non	Non	Non

OU

- Quand il est autrement spécifié.

REMARQUE : Pour les disjoncteurs I-Line[MC], ou si les cosses sont dans le disjoncteur, se reporter aux directives d'utilisation pour le disjoncteur spécifique.

Figure 24 – Exemple de l'entrave de câble

[1] La longueur d'un câble est mesurée de l'extrémité de la cosse au raccord du conduit par lequel le câble sort.

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RISQUE DE DÉPLACEMENT DES CÂBLES DANS DES CONDITIONS DE COURT-CIRCUIT

Entravez tous les câbles, y compris les câbles de neutre, dans l'installation du panneau de commutation lorsque les conditions indiquées à la page 159 sont satisfaites.

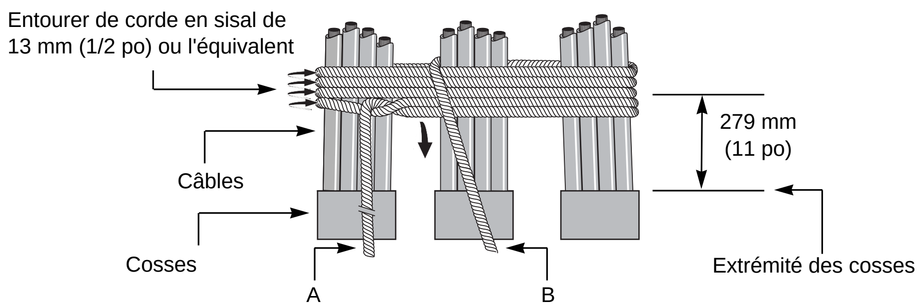
Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

Lorsque des entraves de câbles sont requises, faire comme suit.

REMARQUE : Entourer les câbles à l'aide d'une corde en sisal de 13 mm (1/2 po) de diamètre, une corde en nylon de 9,5 mm (3/8 po) de diamètre ou l'équivalent.

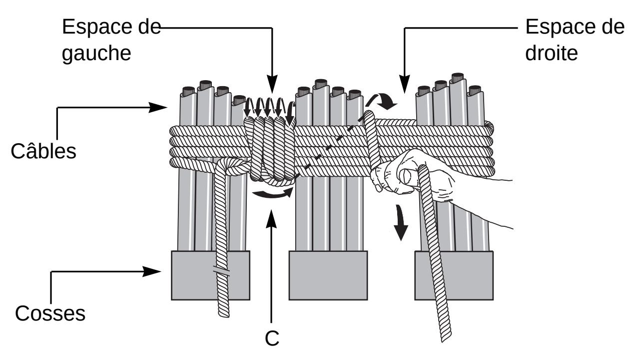
1. Commencer à entourer les câbles (figure 25) à une distance maximale de 279 mm (11 po) de l'extrémité des cosses. Continuer à entourer les câbles chaque 279 mm (11 po), jusqu'au point où les câbles sortent du coffret.
   a. Entourer les câbles quatre (4) fois comme illustré, en laissant 1 m (3 pi) d'excès de corde à la première extrémité (A).
   b. Tirer sur la corde (B) et bien la tendre.

Figure 25 – Entourage des câbles (câbles de neutre non représentés)



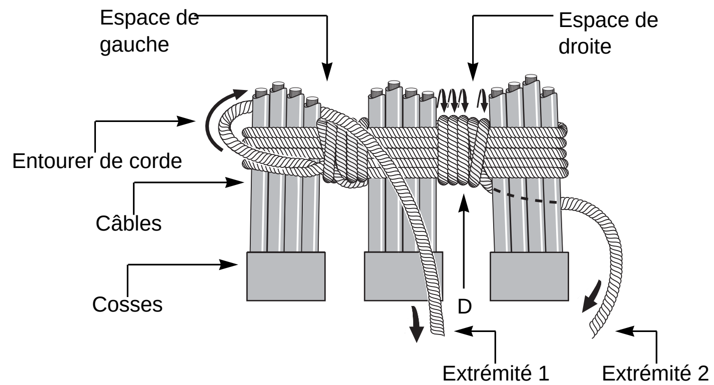
2. Faire plusieurs tours avec la corde (figure 26) jusqu'à ce qu'elle remplisse complètement l'espace entre les câbles.
   a. Faire passer la dernière boucle de la corde sous la boucle précédente (C).
   b. Engager la corde dans l'espace de droite.
   c. Tirer sur la corde et bien la tendre.

Figure 26 – Entourage de l'espace entre les câbles



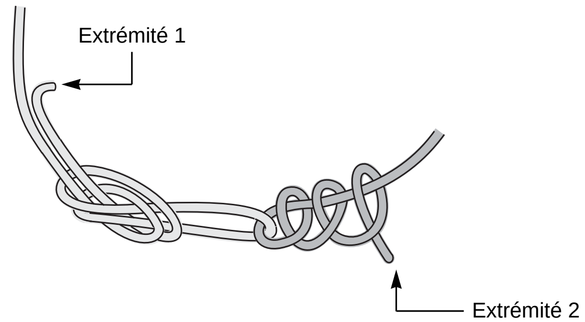
3. Faire plusieurs tours avec la corde jusqu'à ce qu'elle remplisse complètement l'espace entre les câbles (figure 27).
   a. Faire passer la dernière boucle de la corde sous la boucle (D) précédente.
   b. Tirer sur la corde et bien la tendre.

Figure 27 – Finition de l'entourage de corde dans l'espace entre les câbles



4. Attacher ensemble les extrémités (1) et (2) (figure 28) jusqu'à ce qu'elles soient tendues. Couper l'excès de corde et entourer les extrémités avec un ruban adhésif pour les empêcher de s'effilocher.

Figure 28 – Attacher ensemble les extrémités de la corde



5. Vérifier de nouveau les couples des vis de fixation des fils après avoir fixé les câbles.

   NOTE: Se reporter à l'étiquette des couples fournie avec le panneau de commutation pour trouver les valeurs de couple.

FRANÇAIS

Chapitre 5—Procédure préliminaire de mise sous tension

Effectuer une inspection complète **avant** de mettre le panneau de commutation sous tension pour s'assurer que tous les composants fonctionnent correctement. **Accomplir chaque étape de la procédure préliminaire indiquée ci-dessous avant de mettre le panneau de commutation sous tension.**

1. Vérifier toutes les connexions des barres-bus installées sur place. Les valeurs des couples sont indiquées au chapitre 9 à la page 179.
2. Vérifier si tous les raccordements accessibles sont bien serrés.
3. Vérifier si toutes les terminaisons de cosses installées à l'usine et sur place sont bien serrées.
4. Vérifier la rigidité de tous les supports des barres-bus.
5. Vérifier si l'armoire du panneau de commutation n'a pas reçu des coups ou subi d'autres dommages qui réduisent les distances d'isolation électrique à l'intérieur du panneau.
6. Retirer des dispositifs électriques tous les blocs de mousse ou autres matériaux de rembourrage ou de maintien temporaires.
7. Ouvrir et fermer manuellement tous les interrupteurs, disjoncteurs et autres mécanismes de fonctionnement, en vérifiant leur alignement et bon fonctionnement.
8. Faire fonctionner tous les disjoncteurs, les interrupteurs à commande électrique et autres dispositifs munis d'opérateurs à distance (non sous charge). Il sera peut-être nécessaire d'utiliser une source auxiliaire d'alimentation de contrôle pour effectuer ces vérifications.
9. Vérifier tous les relais, appareils de mesure et instruments afin de s'assurer que tous les raccordements de câbles installés sur place sont corrects et que les appareils fonctionnement correctement.
10. Les transformateurs de courant (TC) fournis pour être utilisés par le client doivent être raccordés à un appareil de mesure avant d'être mis sous tension. S'assurer que la charge de l'appareil de mesure est connectée correctement, y compris les connexions principales du panneau de commutation à un appareil distant.
11. Tous les circuits de TC fournis par Schneider Electric pour l'utilisation de mesure par le client sont court-circuités pour leur expédition. Retirer les vis des bornes de court-circuitage sur les borniers de court-circuitage, ou les cavaliers, et les garder dans le bornier.
12. Les disjoncteurs installés à l'usine sont munis d'un déclenchement magnétique ou électronique réglable configuré à l'usine au réglage le plus bas. Pour fournir un fonctionnement coordonné pendant un défaut, régler le déclenchement magnétique comme indiqué dans le manuel de directives fourni avec le disjoncteur. Tous les pôles sont réglés simultanément, en utilisant un tournevis, par ce seul réglage.
13. Si une protection contre les défauts à la terre est fournie sur un interrupteur de type BP, régler le relais à la valeur désirée d'enclenchement de courant de terre. Le relais est expédié de l'usine au réglage le plus bas de 120 A. La gamme d'enclenchement du relais s'étend de 120 à 1200 A.

    REMARQUE : Pour les disjoncteurs à boîtier moulé, consulter le « Chapitre 11—Publications de référence » à la page 182 pour avoir des informations sur ceux-ci.
14. Vérifier le couple sur tous les boulons des fusibles montés dans des interrupteurs Bolt-Loc[MC], soit 28 à 41 N•m (21 à 30 lb-pi), et dans les interrupteurs QMB/QMJ/QMQB[1] (comme marqué sur le dispositif).

AVIS

RISQUE DE DOMMAGES MATÉRIELS

Ne forcez pas ouvert ou n'écartez pas les pinces des porte-fusibles. Cela pourrait desserrer une connexion et provoquer une surchauffe.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

15. Examiner la pression de contact des pinces à fusibles et les moyens de contact (interrupteurs à fusibles QMB/QMJ/QMQB[1]). S'il existe le moindre signe de desserrage, contacter les services de Schneider Electric au 1-888-778-2733 (É.-U.) ou au 1-800-265-3374 (Canada). Des pinces à fusibles lâches peuvent entraîner une surchauffe.
16. Vérifier tous les interrupteurs à fusibles QMB/QMJ/QMQB[1] en s'assurant que les fusibles appropriés avec la valeur nominale d'interruption et la valeur continue nominale du courant requises sont installés. Ne pas utiliser de fusibles à éléments renouvelables dans les interrupteurs à fusibles de la marque Square D^{MC}.

⚠ ATTENTION

RISQUE DE DOMMAGES MATÉRIELS OU DES BLESSURES

- Retirez la fiche de valeur nominale de longue durée avant de vérifier l'isolation électrique d'un disjoncteur muni d'une étiquette indiquant « Avertissement : déconnecter la fiche avant de faire un essai diélectrique ».
- Certains déclencheurs Micrologic^{MC} ne sont pas classés pour des tensions qui surviendraient pendant un essai de résistance d'isolation électrique.
- Ouvrir tous les sectionneurs de contrôle et de mesure des circuits de contrôle.

Si ces directives ne sont pas respectées, cela peut entraîner des blessures ou des dommages matériels.

17. Vérifier si toutes les connexions de m.à.l.t. sont faites correctement. Si le panneau de commutation est utilisé comme entrée de service, vérifier une seconde fois pour voir si le cavalier de raccordement principal est connecté (figure 17 à la page 153).
18. Effectuer un test de résistance d’isolation (avec un appareil Megger®) pour s’assurer que le panneau de commutation est exempt de courts-circuits et de mises à la terre indésirables. Ouvrir tous les sectionneurs de l'alimentation de contrôle et de mesure ou enlever les fusibles des circuits de contrôle. Déconnecter le raccordement du neutre à tout dispositif de protection contre les surtensions transitoires ou autre dispositif électronique avant d'effectuer l'essai de résistance d'isolation électrique; reconnecter au dispositif après l'essai. Avec le neutre isolé de la terre et les interrupteurs d'alimentation et disjoncteurs ouverts, effectuer des essais d’isolation électrique de phase-à-phase, phase-à-terre, phase-à-neutre et neutre-à-terre. Si la résistance est inférieure à un mégohm en vérifiant avec les dispositifs de circuit de dérivation en position ouverte, le système peut être dangereux et doit être examiné. Contacter les Services Schneider Electric au 1-888-778-2733 (É.-U.), ou au 1-800-265-3374 (Canada) pour corriger les problèmes.

[1] Les interrupteurs QMQB sont disponibles uniquement au Canada.

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19. Après avoir effectué l'essai de résistance d'isolation électrique, replacer tous les fusibles de l'alimentation de contrôle qui ont été retirés et fermer les sectionneurs d'alimentation qui ont été ouverts.
20. Vérifier tout le câblage installé sur place. S'assurer qu'il n'est en contact avec aucune pièce sous tension et, lorsque c'est demandé, qu'il est fixé pour soutenir les courants de défaut.
21. Vérifier si tout le câblage de contrôle entre les sections est connecté.
22. Utiliser un aspirateur pour retirer la poussière, les déchets de fil et autres débris.

AVIS

RISQUE DE DOMMAGES MATÉRIELS

N'utilisez pas de l'air sous pression pour souffler la poussière hors du panneau de commutation. La poussière peut se déposer à l'intérieur des relais et des dispositifs de surintensité et provoquer une surchauffe et un fonctionnement défectueux.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

23. Replacer tous les couvercles et les cloisons; prendre soin de ne pincer aucun fil et fermer les portes. S'assurer que toutes les parties de l'armoire sont alignées correctement et attachées solidement.

FRANÇAIS

Systèmes de protection contre les défauts à la terre

Le paragraphe 230-95(c) du Code national de l'électricité (NEC; É.-U.) requiert que tous les systèmes de protection d'appareils contre les défauts à la terre soient vérifiés quand ils sont installés la première fois. Si le disjoncteur possède des équipements de protection contre les défauts à la terre, vérifier le système de protection à ce moment-là.

1. S'assurer que le déclencheur est sous tension. Celui-ci est sous tension si :
   — le disjoncteur est fermé ou alimenté par le bas et a une tension de charge de plus de 100 V sur deux phases (déclencheurs P ou H uniquement).
   — la trousse d'essais des fonctions complètes ou portative est raccordée et sous tension.
   — l'alimentation externe de 24 V cc est raccordée.
   — un dérivateur de tension externe est installé et une tension de plus de 100 V est présente sur deux phases (déclencheurs P ou H uniquement).
2. S'il s'agit d'un système radial (à une seule extrémité), appuyer sur le bouton pousser-pour-vérifier de défaut à la terre. Le disjoncteur se déclenche et le voyant lumineux de défaut à la terre du déclencheur s'allume.
3. Enregistrer les résultats dans le journal d'essais du système de défaut à la terre.

REMARQUE : Si une vérification complète du système de défaut à la terre est nécessaire, faire un essai d'injection primaire. Si le système est à sources multiples ou nécessite des raccordements sur place au site de travail, faire un essai d'injection primaire.

REMARQUE : Certains systèmes de défaut à la terre exigent des raccordements sur place au site de travail. Consulter le schéma de câblage d'interconnexion du panneau de commutation pour les détails.

Chapitre 6—Mise sous tension du panneau de commutation

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Corrigez les conditions de court-circuit détectées pendant les procédures de vérification décrites dans le « Chapitre 5—Procédure préliminaire de mise sous tension », commençant à la page 162.
- Un électricien qualifié doit être présent lors de la mise sous tension de l’appareil pour la première fois.
- Suivez les directives de ce chapitre pour mettre le panneau de commutation sous tension correctement.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

1. S’assurer qu’aucune charge est connectée au panneau de commutation au moment de sa mise sous tension. Mettre hors tension toutes les charges en aval.
2. Mettre le panneau de commutation sous tension en suivant la séquence ci-après :
   a. Activer tous les sectionneurs d'alimentation de contrôle avant de mettre le panneau de commutation sous tension. Consulter les schémas fournis avec l'appareil pour voir si des sectionneurs d'alimentation de contrôle sont fournis.
   b. Fermer toutes les portes et tous les couvercles qui pourraient être ouverts.
   c. Fermer tous les dispositifs principaux.
   d. Fermer chaque disjoncteur de dérivation ou interrupteur à fusibles de dérivation.
   e. Continuer de même pour chaque panneau de distribution et tous les autres dispositifs en aval.
3. Après avoir fermé tous les dispositifs de protection contre les surintensités, activer toutes les charges une par une (par exemple, circuits d'éclairage, contacteurs, appareils de chauffage et moteurs).

FRANÇAIS

Chapitre 7—Entretien du panneau de commutation

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Inspectez et procédez à un entretien préventif seulement sur un panneau de commutation et un appareil qui a été déconnecté et isolé électriquement (sauf indication contraire). Cela contribue à assurer qu'aucun contact accidentel ne se produise avec des pièces sous tension.
- Observez à tous moments des pratiques de travail avec respect de la sécurité telles que décrites dans NFPA 70E, partie II.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

L'entretien périodique du panneau de commutation comprend le nettoyage, la lubrification et la manœuvre des équipements le composant. L'intervalle entre les contrôles d'entretien peut varier en fonction de l'usage et des conditions environnementales de chaque installation. L'intervalle maximum recommandé entre les inspections est d'un an. Cette définition d'entretien périodique s'applique tout au long de ce manuel, sauf indication contraire.

Toujours inspecter le panneau de commutation après un défaut. (Se reporter au « Chapitre 8—Circonstances indésirables » commençant à la page 176). Des bulletins de service sur les divers dispositifs de déconnexion et de surintensité montés dans le panneau de commutation sont disponibles votre représentant local de Schneider Electric.

FRANÇAIS

Inspection générale et nettoyage

1. Passer l'aspirateur à l'intérieur du panneau de commutation pour enlever la saleté ou la poussière. Essuyer toutes les barres-bus, les isolateurs, les câbles et les autres éléments avec un chiffon non pelucheux, propre et sec.

AVIS

RISQUE DE DOMMAGES MATÉRIELS

- N'utilisez pas de l'air sous pression pour souffler la poussière hors du panneau de commutation. La poussière peut se déposer à l'intérieur des relais et des dispositifs de surintensité et provoquer une surchauffe et un fonctionnement défectueux.
- Ne permettez pas de la peinture, des produits chimiques ou des dissolvants à base de pétrole d'entrer en contact avec des plastiques ou des matériaux d'isolation.

Si ces précautions ne sont pas respectées, cela peut entraîner des dommages matériels.

2. Vérifier soigneusement l'intérieur du panneau de commutation pour y détecter toute accumulation éventuelle d'humidité ou de condensation, ou des signes d'humidité ancienne. L'humidité peut provoquer des pannes d'isolation et une oxydation rapide des éléments porteurs de courant. Inspecter toutes les entrées de conduit et les fentes entre les panneaux de l'armoire pour voir s'il y a des gouttes provenant de fuites. La condensation dans les conduits peut être

une source d'humidité et ne doit pas pouvoir s'écouler en gouttes sur les parties sous tension ou les matériaux d'isolation. Prendre les mesures nécessaires pour éliminer l'humidité et étancher tous les endroits qui fuient.

3. Inspecter le panneau de commutation pour y déceler tous signes de surchauffe. Une décoloration et l'écaillure de l'isolation ou de pièces métalliques sont des indications de surchauffe.

   REMARQUE : En cas de surchauffe, corriger toutes les conditions qui ont provoqué la surchauffe. Des connexions lâches ou polluées peuvent provoquer une surchauffe.
4. Rechercher s'il y a des signes de nids de rats ou de souris dans le panneau de commutation. Au besoin, procéder à une extermination dans la zone générale du panneau.

   REMARQUE : Ne pas mettre ou utiliser de substances exterminatrices et de produits chimiques à l'intérieur du panneau. Certains de ces produits attirent les rongeurs.
5. Inspecter avec soin tous les dispositifs pour rechercher s'il y a des parties usées, fendues ou manquantes.
6. Ouvrir et fermer manuellement les interrupteurs et disjoncteurs plusieurs fois pour vérifier s'ils fonctionnent correctement.
7. Vérifier si tous les interverrouillages à clé et les interverrouillages de porte fonctionnent correctement.

FRANÇAIS

Joints de barres-bus, cosses des bornes et matériaux d'isolation

1. Les joints de barres-bus ne demandent aucun entretien. Ne pas les resserrer après avoir terminé la procédure préliminaire de mise sous tension.

AVIS

RISQUE DE DOMMAGES MATÉRIELS

- Ne poncez pas et ne retirez pas le plaquage des barres-bus, barres de raccordement ou cosses de bornes.
- L'endommagement du plaquage peut entraîner une surchauffe. Remplacez toute pièce endommagée. Contacter les Services Schneider Electric au 1-888-778-2733 (É.-U.), ou au 1-800-265-3374 (Canada).

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

2. Vérifier si les joints des barres-bus et cosses des bornes montrent des signes de crevasse ou piqure, de corrosion ou de décoloration résultant de hautes températures ou de soumission à des conditions de défaut importantes. En cas d'endommagement, remplacer les barres-bus ou les cosses. Si un nettoyage est nécessaire, utiliser Lectra-Clean®, fabriqué par CRC.
3. Inspecter tous les matériaux d'isolation. Avant de remettre le panneau de commutation sous tension, remplacer les isolateurs montrant des signes visibles de dommages (des fissures, par exemple).

Informations générales de lubrification

Pour une nouvelle lubrification d'entretien sur place des composants de lames/mâchoires dans les interrupteurs de 600 V et moins, utiliser la graisse synthétique très performante BG20 de Dow Corning (nombre de catalogue SWLUB de Schneider Electric). Cette graisse convient aux interrupteurs suivants :

- Bolt-Loc
- QMB, principal et de dérivation
- QMJ, de dérivation
- QMQB[1], principal et de dérivation

Pour les raccordements enfichables des barres-bus, utiliser la pâte à joint électrique Schneider Electric, numéro de catalogue PJC7201.

Pour les raccordements des disjoncteurs SED et NED débrochables, la pâte à joint électrique de Schneider Electric, numéro de catalogue PJC8311, **doit** être utilisée.

Pour les raccordements des disjoncteurs Masterpact^MC NW débrochables, utiliser uniquement la pâte à joint électrique de Schneider Electric, numéro de catalogue S48899.

Interrupteurs automatiques de transfert

Consulter le bulletin du fabricant concernant ces dispositifs pour toutes les directives d'installation, de fonctionnement et d'entretien.

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[1] Les interrupteurs QMQB sont disponibles uniquement au Canada.

Entretien des interrupteurs à contact par pression Bolt-Loc (800 à 4000 A)

Consulter le manuel d'installation et d'entretien des interrupteurs Bolt-Loc pour des informations complètes (le manuel est expédié avec le panneau de commutation). Si le manuel n'est pas disponible, vous reporter au « Chapitre 11—Publications de référence », page 182, et contacter votre représentant local de Schneider Electric pour obtenir les manuels appropriés.

1. Actionner le mécanisme de fonctionnement au moins une fois par an pour s'assurer de son bon fonctionnement.
2. L'interrupteur Bolt-Loc est expédié de l'usine correctement lubrifié. Un nettoyage et une lubrification périodiques de l'interrupteur sont nécessaires. L'intervalle d'entretien entre les lubrifications dépend de facteurs tels que les conditions d'usage et d'environnement. L'intervalle d'entretien maximum recommandé est d'un an pour les pièces porteuses de courant et de cinq ans pour les mécanismes de fonctionnement.

⚠ DANGER

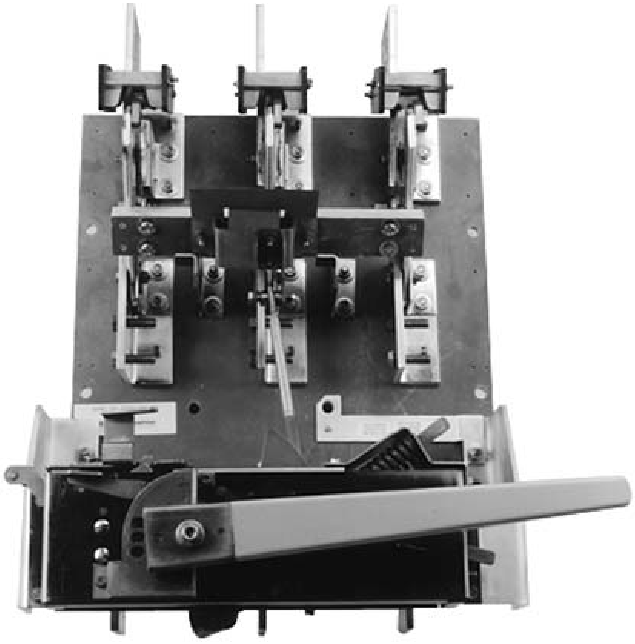
RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

Vérifiez toujours la tension des extrémités ligne et charge des fusibles avant d'entreprendre la procédure de remplacement. L'interrupteur Bolt-Loc peut faire partie d'un système à sources multiples dans lequel des fusibles peuvent être sous tension lorsque l'interrupteur Bolt-Loc est en position « ouverte ».

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

3. Pour remplacer le fusible :
   a. Ouvrir l'interrupteur avant d'ouvrir la porte des fusibles.

Figure 29 – Interrupteur à fusibles Bolt-Loc type BP



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b. Ouvrir la porte des fusibles, en désengageant l'interverrouillage comme décrit dans les directives placées sur la porte.
c. Observer les lames de l'interrupteur pour avoir confirmation que l'interrupteur est « ouvert ».
d. Vérifier la tension aux extrémités ligne et charge des fusibles en utilisant un dispositif de détection d'une tension nominale appropriée. Aucune tension ne doit être présente.
e. Enlever tous les fusibles. Mettre de côté la quincaillerie pour pouvoir la réutiliser.
f. À l'aide d'un nettoyant non abrasif, tel que Lectra-Clean fabriqué par CRC, essuyer les blocs de montage des fusibles de l'interrupteur et les lames de chaque fusible neuf. Vérifier l'alignement des blocs de montage des fusibles avant d'installer des fusibles neufs.
g. Installer les nouveaux fusibles à l'aide de la même quincaillerie retirée au point « e », et serrer au couple de 28 à 41 N•m (21 à 30 lb-pi).

4. Fermer la porte des fusibles et vérifier son interverrouillage avec l'interrupteur en position de marche (ON). La porte des fusibles ne doit pas pouvoir s'ouvrir quand on exerce une force manuelle normale.

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Disjoncteurs

Les disjoncteurs Schneider Electric sont conçus et fabriqués en tant qu'unités totalement hermétiques n'exigeant qu'un minimum d'entretien périodique.

Actionner les disjoncteurs au moins une fois par an pour s'assurer de leur bon fonctionnement. Pour l'entretien général :

1. Déclencher le disjoncteur en appuyant sur le bouton pousser-pour-déclencher ou le bouton d'ouverture (open) situé sur la face avant du disjoncteur. Se reporter au manuel du disjoncteur approprié pour l'emplacement spécifique de ce bouton.
2. Ouvrir et fermer manuellement le disjoncteur deux ou trois fois.

Figure 30 – Disjoncteur PowerPact^{MC} à châssis R

REMARQUE : Les directives d'utilisation Schneider Electric 48049-900-0x « Field Testing and Maintenance Guide for Thermal-Magnetic and Micrologic™ Electronic-Trip Molded Case Circuit Breakers » (Guide d'essai sur place et d'entretien pour disjoncteurs à boîtier moulé thermomagnétiques et à déclenchement électronique Micrologic^MC) fournissent des informations plus approfondies.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Si les réglages du disjoncteur sont modifiés, ne réglez pas le courant de déclenchement à longue durée à un courant admissible plus élevé que le courant nominal des barres-bus ou des câbles de charge qu'il alimente; une surchauffe pourrait se produire.
- Avant de mettre le panneau de commutation sous tension, tous les espaces de montage pour disjoncteurs I-Line inutilisés doivent être remplis avec des plaques de remplissage ou des extensions comme indiqué au tableau 3.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Consulter les manuels d'instructions des divers disjoncteurs expédiés avec le panneau de commutation pour tous renseignements d'entretien supplémentaires, tels que le changement de fiches de valeur nominale, capteurs enfichables ou des réglages et le retrait des disjoncteurs. Si le manuel d'instructions n'est pas disponible, vous reporter au « Chapitre 11—Publications de référence » à la page 182 pour le numéro approprié, ou contacter le représentant des ventes local de Schneider Electric.

Tableau 3 – Plaques et prolongateurs de remplissage I-Line^MC

Article	Hauteur	N^o de catalogue	Côté du disjoncteur de dérivation	Châssis du disjoncteur
Plaques de remplissage	38 mm (1,50 po)	HNM1BL	Les deux côtés	Non applicable
	114 mm (4,50 po)	HNM4BL	Les deux côtés	
Prolongateurs de remplissage	38 mm (1,50 po)	HLW1BL	Côté large	Toutes les applications sauf PowerPact H/J avec déclencheur Micrologic 5/6.
	114 mm (4,50 po)	HLW4BL	Côté large	
	38 mm (1,50 po)	HLN1BL	Côté étroit	
	114 mm (4,50 po)	HLN4BL	Côté étroit	
	38 mm (1,50 po)	HLN4EBL	Côté étroit	Únicamente interruptores automáticos PowerPact marcos H/J con unidades de disparo Micrologic 5/6.
	114 mm (4,50 po)	HLW4EBL	Côté large	

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AVIS

RISQUE DE DOMMAGES MATÉRIELS

- N'enlevez pas le lubrifiant protecteur des connecteurs enfichables.
- Si une lubrification supplémentaire est requise, appliquer une couche de pâte à joint électrique, numéro de catalogue PJC7201, sur les surfaces de contact du connecteur enfichable.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

3. La trousse d'essai universelle, numéro de catalogue UTS3, est disponible pour procéder à l'essai des disjoncteurs Powerpact à châssis P et R de Schneider Electric munis de déclencheurs Micrologic. Elle exécute les essais des déclencheurs automatiquement, avec des invites à l'utilisateur pour l'obtention des informations initiales. Des modules d'essai pour chaque châssis de disjoncteur sont utilisés pour entreposer les données nécessaires aux essais automatiques. Les déclencheurs Micrologic série B nécessitent le module d'essai CBTMB, inclus dans la trousse UTS3.

   Un vérificateur de poche, numéro de catalogue S434206, ou un module de maintenance, numéro de catalogue STRV00910, est disponible pour les disjoncteurs PowerPact à châssis H, J et L de Schneider Electric munis de déclencheurs Micrologic. Ces vérificateurs fournissent l'alimentation aux déclencheurs Micrologic et permettent d'ajuster les réglages au moyen du clavier numérique situé sur le disjoncteur ou à l'aide d'un PC avec une interface USB.

   Les disjoncteurs Masterpact NW avec déclencheurs nécessitent la trousse d'essai des fonctions complètes, numéro de catalogue S33595, ou la trousse d'essais portative, numéro de catalogue S33594.

REMARQUE : Les essais peuvent être accomplis avec un disjoncteur installé dans le panneau de commutation; le retrait du disjoncteur n'est pas nécessaire. **Le panneau doit être mis hors tension.**

Interrupteurs à fusible QMB/QMJ/QMQB[1]

Consulter le manuel de directives des interrupteurs QMB/QMJ/QMQB[1] pour les informations d'entretien complètes. Si ce manuel n'est pas disponible, vous reporter au « Chapitre 11—Publications de référence » à la page 182 de ce manuel pour le numéro approprié. S'adresser votre représentant local de Schneider Electric pour obtenir ce manuel.

Entretien de l'interrupteur

1. Manœuvrer périodiquement l'interrupteur pour s'assurer de son bon fonctionnement. Cette période ne doit pas dépasser un an.
2. Vérifier l'interverrouillage du couvercle avec l'interrupteur en position de marche (ON). Le couvercle ne doit pas pouvoir s'ouvrir quand on exerce une force manuelle normale.
3. Inspecter l'intérieur de l'interrupteur pour détecter toutes pièces éventuellement endommagées ou fendues et les remplacer si nécessaire.
4. Pour les interrupteurs à fusibles, vérifier les pinces des porte-fusibles ou la zone de contact boulonnée afin de s'assurer de l'absence de toute corrosion ou décoloration (signe de surchauffe). Remplacer si nécessaire.
5. Pour des directives d'entretien supplémentaires, consulter l'étiquette qui se trouve sur la surface intérieure de la porte.

Remplacement des fusibles (interrupteurs à fusibles uniquement)

1. Mettre l'interrupteur en position d'arrêt (OFF) avant d'ouvrir la porte.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

Vérifiez toujours la tension des extrémités ligne et charge des fusibles avant d'entreprendre la procédure de remplacement des fusibles, à l'aide d'un dispositif de détection d'une tension nominale appropriée.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

2. Observer les lames de l'interrupteur afin d'avoir confirmation que l'interrupteur est à la position d'arrêt (OFF).
3. À l'aide d'un dispositif de détection d'une tension nominale appropriée, s'assurer que les extrémités ligne et charge des fusibles ne sont pas sous tension.
4. Observer toutes les étiquettes d'avertissement spécifiant le type de fusible à employer. Ne pas remplacer par un fusible sans limitation de courant, et n'essayer en aucune façon de neutraliser le dispositif de rejet des porte-fusibles fourni avec l'interrupteur. Ne pas utiliser de fusibles à éléments renouvelables dans les interrupteurs à fusibles Schneider Electric.

FRANÇAIS

[1] Les interrupteurs QMQB sont disponibles uniquement au Canada.

AVIS

RISQUE DE DOMMAGES MATÉRIELS

Ne forcez pas ouvert ou n'écartez pas les pinces des porte-fusibles. Cela pourrait desserrer une connexion et provoquer une surchauffe et des ouvertures intempestives des fusibles.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

Installation des interrupteurs à fusibles QMB/QMJ/QMQB[1]

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Mettez les sections hors tension avant d'installer ou de retirer des interrupteurs QMB/QMJ/QMQB[1].
- N'utilisez pas un dispositif principal comme dispositif de dérivation ni un dispositif de dérivation comme dispositif principal.
- Avant de mettre le panneau de distribution sous tension, tous les espaces inutilisés doivent être remplis avec des plaques de remplissage. Vous reporter aux tableaux 4 et 5 pour les tailles et les numéros de catalogue.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Tableau 4 – Plaques de remplissage pour les interrupteurs à fusibles QMB/QMJ

Hauteur	N^{o} de catalogue
38 mm (1,50 po)	QMB1BLW
76 mm (3,00 po)	QMB3BLW
152 mm (6,00 po)	QMB6BLW
381 mm (15,00 po)	QMB15BLW

Tableau 5 – Plaques de remplissage pour les interrupteurs à fusibles QMQB[1]

Hauteur	N^{o} de catalogue
2x : 35 mm (1,375 po)	QFS1
8x : 140 mm (5,50 po)	QFS5
10x : 175 mm (6,875 po)	QFS6
14x : 244 mm (9,625 po)	QFS9
24x : 419 mm (16,50 po)	QFS16

[1] Les interrupteurs QMQB sont disponibles uniquement au Canada.

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AVIS

RISQUE DE DOMMAGES MATÉRIELS

N'enlevez pas le lubrifiant protecteur des connecteurs enfichables.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

1. Couper l'alimentation principale.
2. Amener la manette des interrupteurs à la position d'arrêt (OFF). Aligner les connecteurs enfichables de l'interrupteur avec les barres-bus verticales du panneau QMB et brancher l'interrupteur sur le panneau.
3. Placer et serrer partiellement toutes les vis de montage de l'unité qui se montent sur les rails de montage du panneau QMB.
4. Serrer toutes les vis de façon égale. La bride de montage de l'unité et les connecteurs enfichables doivent être bien mis en place.

Retrait des interrupteurs à fusibles QMB/QMJ/QMQB[1]

1. Couper l'alimentation principale.
2. Amener la manette des interrupteurs à la position d'arrêt (OFF).
3. Débrancher les fils de charge.
4. Pour les interrupteurs QMB et QMJ, retirer les vis de montage qui retiennent l'interrupteur au rail de montage. Pour les interrupteurs QMQB[1], retirer les boulons qui maintiennent l'interrupteur à la borne de ligne.
5. Débrancher l'interrupteur.

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Systèmes de protection contre les défauts à la terre

Vérifier le serrage et la corrosion des connexions des bornes sur le système de protection contre les défauts à la terre au moins une fois par an. Si l'essai du système peut être effectué sans déclencher le dispositif principal ou de dérivation, consulter les directives d'essai dans le manuel du dispositif. Autrement, l'essai du système de protection contre les défauts à la terre déclenchera le dispositif principal ou de dérivation auquel il est raccordé. Si le capteur ou relais de défaut à la terre est physiquement ou électriquement endommagé, le remplacer.

Si le système de protection contre les défauts à la terre ne fonctionne pas correctement et si un appareil supplémentaire a été raccordé à l'installation depuis le dernier essai ou la dernière vérification d'entretien, mettre le système entier hors tension et vérifier s'il existe des mises à la terre sur le neutre en aval du cavalier de raccordement principal. Si aucune mise à la terre en aval n'est détectée et si le système de protection contre les défauts à la terre ne fonctionne pas correctement, contacter aux Services Schneider Electric au 1-888-778-2733 (É.-U.) ou au 1-800-265-3374 (Canada).

Si rien n'a été ajouté à l'installation et si le système de protection contre les défauts à la terre ne fonctionne pas correctement, contacter aux Services Schneider Electric au 1-888-778-2733 (É.-U.) ou au 1-800-265-3374 (Canada).

Consulter le manuel d'instructions des essais sur place concernant les défauts de m.à.l.t. pour des renseignements supplémentaires sur les essais. Si le manuel n'est pas disponible, se référer au « Chapitre 11—Publications de référence » à la page 182, de ce manuel pour obtenir le numéro. S'adresser votre représentant local de Schneider Electric pour obtenir ce manuel.

[1] Les interrupteurs QMQB sont disponibles uniquement au Canada.

Chapitre 8—Circonstances indésirables

Ce chapitre contient, mais sans s'y limiter, sur tous les composants électriques du panneau de commutation.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Coupez toute alimentation du panneau de commutation avant de le nettoyer.
- Utilisez toujours un dispositif de détection de tension ayant une valeur nominale appropriée pour s'assurer que l'alimentation est coupée.
- Avant de mettre le panneau de commutation sous tension, tous les espaces de montage de disjoncteurs inutilisés doivent être remplis.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

REMARQUE : Avant de remettre le panneau de commutation sous tension, à la suite de circonstances indésirables, s’adresser aux Services Schneider Electric au 1-888-778-2733 (É.-U.) ou au 1-800-265-3374 (Canada) pour obtenir des instructions spéciales.

Inspection après un court-circuit

Si un court-circuit se produit, effectuer une inspection minutieuse du système entier et s'assurer qu'aucun dommage aux conducteurs ou à l'isolation ne s'est produit. Les fortes contraintes mécaniques et thermiques provoquées par les courants de court-circuit peuvent endommager les conducteurs et l’isolation. Vérifier le dispositif de protection contre les surintensités qui a interrompu le courant de court-circuit pour voir s’il y a eu des dommages provoqués par un arc électrique.

Ne pas ouvrir les dispositifs scellés, tels que les disjoncteurs à boîtiers moulés. Ces dispositifs doivent être remplacés s’ils sont endommagés. Avant de mettre le panneau de commutation sous tension, tous les espaces de montage de disjoncteurs inutilisés doivent être remplis. Pour obtenir davantage d'informations au sujet de ces dispositifs, consulter le manuel approprié indiqué au « Chapitre 11—Publications de référence » à la page 182.

Nettoyage à la suite d’un court-circuit

Les propriétés isolantes de certains matériaux organiques peuvent se détériorer au cours d’un arc électrique. Si c'est le cas :

1. Retirer la suie ou les débris éventuels.
2. Remplacer les isolants carbonisés.

Panneau de commutation imbibé d’eau

Ne pas nettoyer ni réparer un panneau de commutation qui a été mouillé ou inondé. Les pièces porteuses de courant, systèmes d'isolation et composants électriques peuvent être endommagés au-delà de toute réparation. **Ne pas mettre le panneau de commutation sous tension.** S’adresser aux Services Schneider Electric au 1-888-778-2733 (É.-U.) ou au 1-800-265-3374 (Canada).

Panneaux de commutation aspergés ou éclaboussés d’eau (eau propre uniquement)

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

Coupez toutes les alimentations à cet appareil avant d’y travailler.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Si un panneau de commutation a été aspergé ou éclaboussé avec de petites quantités d’eau propre, faire une inspection complète du système entier et vérifier si les conducteurs et les isolants n’ont pas été endommagés. Ne pas ouvrir des dispositifs scellés tels que des disjoncteurs à boîtier moulé ou fusibles. Ces dispositifs doivent être remplacés s’ils sont endommagés. Pour obtenir davantage d'informations au sujet de ces dispositifs, consulter le manuel approprié indiqué au « Chapitre 11—Publications de référence ».

Inspection et nettoyage de panneaux de commutation ayant été aspergés ou éclaboussés avec de l’eau propre

Suivre les points 1 à 10 ci-dessous seulement si :

- L’appareil ne présente aucun signe de dommage physique.
- Le panneau de commutation n’a pas été immergé ni exposé à l’eau pendant une longue durée.
- L’eau qui a été en contact avec le panneau n’a pas été polluée par l’eau des égouts, des agents chimiques ou d’autres substances qui pourraient affecter l’intégrité de l’appareil électrique.
- L’eau qui a été en contact avec le panneau n’est pas entrée dans une zone de l’armoire contenant des câbles installés comme prévus et situés au-dessus des pièces sous tension. Examiner en particulier si de l’eau est entrée dans les conduits situés au-dessus des pièces sous tension.

Si une ou plusieurs de ces conditions n'ont pas été rencontrées, contacter aux Services Schneider Electric au 1-888-778-2733 (É.-U.) ou au 1-800-265-3374 (Canada).

Si **TOUTES** les conditions indiquées ci-dessus ont été rencontrées, procéder comme suit :

1. Couper l'alimentation de l'appareil avant d'y travailler.
2. Toujours utiliser un dispositif de détection de tension ayant une valeur nominale appropriée pour s'assurer que l'alimentation est coupée.
3. Déconnecter et isoler électriquement le panneau de commutation de façon à ce qu'aucun contact ne puisse se faire avec des pièces sous tension.
4. Essuyer toute humidité des barres-bus, isolateurs et matériaux d'isolation avec un chiffon propre, sec et non pelucheux. Ne **pas** utiliser d’agents de nettoyage ni des produits pour déplacer l’eau.
5. Préparer le panneau de commutation pour les essais de résistance d’isolation (appareil Megger®) en déconnectant toutes les connexions d’alimentation du côté ligne et toutes les connexions de câbles de côté charge pour isoler le panneau du système de câblage.

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⚠ ATTENTION

RISQUE DE DOMMAGES MATÉRIELS OU DES BLESSURES

- Retirez la fiche de valeur nominale de longue durée avant de vérifier l'isolation électrique d'un disjoncteur muni d'une étiquette indiquant « Avertissement : déconnecter la fiche avant de faire un essai diélectrique ».
- Certains déclencheurs Micrologic ne sont pas classés pour des tensions qui surviendraient pendant un essai de résistance d'isolation électrique.
- Ouvrir tous les sectionneurs de contrôle et de mesure des circuits de contrôle.

Si ces directives ne sont pas respectées, cela peut entraîner des blessures ou des dommages matériels.

6. Placer tous les disjoncteurs ou interrupteurs en position de marche (ON). Le panneau de commutation doit rester désactivé.
7. Utiliser un mégohmmètre avec une capacité de 500 à 1000 Vcc et appliquer la tension entre :
   a. Chaque phase vers la terre avec le disjoncteur en position de marche (ON).
   b. Phase à phase avec le disjoncteur en position de marche (ON).
8. Noter les valeurs de résistance. Vous reporter au « Chapitre 10—Registre des résistances d'isolation du panneau de commutation » à la page 181.
9. Si les mesures de résistance sont inférieures à 0,5 mégohm, contacter aux Services Schneider Electric au 1-888-778-2733 (É.-U.) ou au 1-800-265-3374 (Canada) pour obtenir des recommandations.
10. Si les mesures de résistance sont supérieures à 0,5 mégohm, l'appareil peut être mis sous tension en utilisant les procédures indiquées au « Chapitre 6—Mise sous tension du panneau de commutation » à la page 165.

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Chapitre 9—Valeurs des couples de serrage pour les connexions électriques

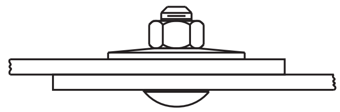
Tableau 6 – Cosse d’arrivée, de dérivation et de neutre

Taille des douilles au travers des plans plats	Valeur du couple de serrage
1/4 po	20 N•m (180 lb-po)
5/16 po	28 N•m (250 lb-po)
3/8 po	38 N•m (340 lb-po)
1/2 po ★	51 N•m (450 lb-po)

★ Certaines cosses exigent un couple de serrage de 70 N•m (620 lb-po) et sont marquées ainsi.

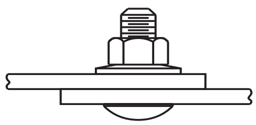
Tableau 7 – Barre de neutre à conducteurs multiples ou de m.à.l.t.

<table>
<tr><th>Type de vis</th><th>Gamme des fils de cosses</th><th>Calibre de conducteur</th><th>Valeur du couple de serrage</th></tr>
<tr><td rowspan="5">Tête fendue</td><td rowspan="3">14 à 4</td><td>14 à 10 Cu, 12 à 10 Al</td><td>2 N•m (20 lb-po)</td></tr>
<tr><td>8 Cu-Al</td><td>3 N•m (25 lb-po)</td></tr>
<tr><td>6 à 4 Cu-Al</td><td>4 N•m (35 lb-po)</td></tr>
<tr><td rowspan="2">14 à 1/0</td><td>14 à 8 Cu-Al</td><td>4 N•m (36 lb-po)</td></tr>
<tr><td>6 à 1/0 Cu-Al</td><td>5 N•m (45 lb-po)</td></tr>
<tr><td rowspan="2">Tête creuse</td><td>14 à 1/0</td><td>Toutes</td><td>11 N•m (100 lb-po)</td></tr>
<tr><td>6 à 300 kcmil</td><td>Toutes</td><td>31 N•m (275 lb-po)</td></tr>
</table>

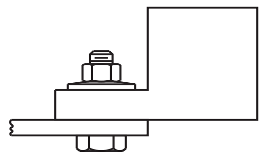


Boulon de carrosserie
Écrou hexagonal
Rondelle conique

Description de la quincaillerie	Valeur du couple de serrage
1/2 po	81 à 95 N•m (720 à 840 lb-po)

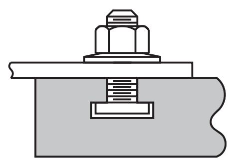


Boulon de carrosserie
Assemblage de rondelle conique
Écrous keps



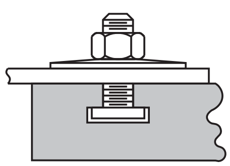
Boulon à tête hexagonale
Assemblage de rondelle conique
Écrous keps

Description de la quincaillerie	Valeur du couple de serrage
1/4 po	6 à 8 N•m (50 à 75 lb-po)
5/16 po	9 à 14 N•m (80 à 125 lb-po)
3/8 po	20 à 25 N•m (175 à 225 lb-po)
1/2 po	28 à 40 N•m (250 à 350 lb-po)



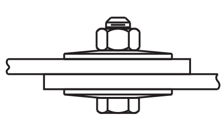
Boulon à tête carré (té)
Assemblage de rondelle conique
Écrous keps

Description de la quincaillerie	Valeur du couple de serrage
1/4 po	6 à 8 N•m (50 à 75 lb-po)
3/8 po	20 à 25 N•m (175 à 225 lb-po)
1/2 po	28 à 40 N•m (250 à 350 lb-po)



Boulon à tête carré (té)
Rondelle conique

Description de la quincaillerie	Valeur du couple de serrage	
	Diamètre extérieur de la rondelle conique	Boulon à tête carré (té) Rondelle conique
3/8 po	22 mm (0,87 po)	28 à 32 N•m (250 à 280 lb-po)
	25 mm (1,00 po)	15 à 17 N•m (130 à 150 lb-po)
1/2 po	32 mm (1,25 po)	51 à 62 N•m (450 à 550 lb-po)
	57 mm (2,25 po)	



Boulon à tête hexagonale
(2) rondelles coniques

Description de la quincaillerie	Valeur du couple de serrage	
	Diamètre extérieur de la rondelle conique	Boulon à tête hexagonale (2) Rondelles coniques
5/16 po	23 mm (0,90 po)	16 à 18 N•m (145 à 160 lb-po)
3/8 po	22 mm (0,87 po)	28 à 32 N•m (250 à 280 lb-po)
	25 mm (1,00 po)	15 à 17 N•m (130 à 150 lb-po)
1/2 po	32 mm (1,25 po)	81 à 95 N•m (720 à 840 lb-po)
	57 mm (2,25 po)	
	76 mm (3,00 po)	

Chapitre 10—Registre des résistances d'isolation du panneau de commutation

Toujours utiliser un mégohmmètre de 500 à 1000 Vcc lors d'un essai de résistance d'isolation.

REMARQUE : La colonne Neutre à Terre est fournie pour noter les résultats de la procédure préliminaire de mise sous tension uniquement.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Coupez toute alimentation du panneau de commutation avant d'effectuer un essai.
- Utilisez toujours un dispositif de détection de tension ayant une valeur nominale appropriée pour vous assurer que l'alimentation est coupée.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Date	Phase à Phase			Phase à Terre			Neutre à Terre
	Tous sectionneurs ouverts						
	a-b	b-c	c-a	a-terre	b-terre	c-terre	Neutre à Terre
Date	Tous sectionneurs fermés						
	a-b	b-c	c-a	a-terre	b-terre	c-terre	Neutre à Terre

Chapitre 11—Publications de référence

Les publications de Schneider Electric sont disponibles chez votre représentant local de Schneider Electric. Ces publications comprennent les procédures de remplacement d’un dispositif et les listes de pièces de rechange pour faciliter et accélérer les commandes et le remplacement des pièces. Toute procédure d'entretien ou tout dispositif non compris dans les listes, tel qu'un intérieur I-Line[MC], n'est pas réparable par l'utilisateur.

Contacter votre représentant local de Schneider Electric le plus proche pour obtenir des informations au 1-888-778-2733 aux É.-U., ou au 1-800-265-3374 au Canada. Ou consulter la bibliothèque technique à http://www.schneider-electric.us/ pour obtenir les publications appropriées.

Pour tout renseignement sur l’obtention de documents NEMA, écrire à :

National Electrical Manufacturers Association (NEMA)
Attention: Customer Service
1300 North 17th Street
Suite 1847
Rosslyn, VA 22209

Autres publications de référence	Numéro de publication
Directives générales pour l’installation, le fonctionnement et l’entretien des panneaux de commutation de 600 V ou moins	Publication PB2.1 NEMA
Guide d’application pour les dispositifs de protection d’appareil contre les défauts à la terre	Publication NEMA PB2.2
Disjoncteurs	Publication NEMA AB-4
Interrupteurs de distribution sous coffret et autres	Publication NEMA KS-1
Entretien de l’appareillage électrique	NFPA 70B-1999

Chapitre 12—Journal d'installation et d'entretien

Date	Initiales	Entretien effectué

Date	**Initiales**	**Entretien effectué**

FRANÇAIS

FRANÇAIS

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Du fait que les normes, caractéristiques et conceptions peuvent changer, demander confirmation que l'information contenue dans cette publication est à jour.

80043-055-12, 05/2015
Remplace Remplace 80043-055-11, daté 04/2014

Schneider Electric USA, Inc.
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www.schneider-electric.us

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80043-055-12, 05/2015
Replaces 80043-055-11, 04/2014

Importado en México por:
Schneider Electric México, S.A. de C.V.
Av. Ejercito Nacional No. 904
Col. Palmas, Polanco 11560 México, D.F.
55-5804-5000
www.schneider-electric.com.mx

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80043-055-12, 05/2015
Reemplaza 80043-055-11, 04/2014

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80043-055-12, 05/2015
Remplace 80043-055-11, 04/2014

Power-Zone™ 4

Low Voltage, Metal-Enclosed Drawout Switchgear with Masterpact™ Low Voltage Power Circuit Breakers / Tablero de fuerza removible en gabinete de metal de baja tensión con interruptores de potencia Masterpact™ de baja tensión / Appareillage de commutation débrochable à basse tension sous coffret métallique avec disjoncteur de puissance à basse tension MasterpactMC

Instruction Bulletin / Boletín de instrucciones / Directives d’utilisation

80298-002-07
06/2015

Retain for future use. / Conservar para uso futuro. / À conserver pour usage ultérieur.

by Schneider Electric

Power-Zone™ 4

ENGLISH

Low Voltage, Metal-Enclosed Drawout Switchgear with Masterpact™ Low Voltage Power Circuit Breakers

Class 6037

Instruction Bulletin

80298-002-07
06/2015

Retain for future use.

SQUARE D™

by Schneider Electric

Hazard Categories and Special Symbols

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER
DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

WARNING
WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

CAUTION
CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE
NOTICE is used to address practices not related to physical injury. The safety alert symbol is not used with this signal word.

NOTE: Provides additional information to clarify or simplify a procedure.

Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

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Section 1—Introduction

This manual contains instructions for the proper installation, operation, and maintenance of Square D™ brand Power-Zone™ 4 switchgear equipment from Schneider Electric.

The purchaser's engineering, installation, and operating staff supervisors should familiarize themselves with this manual and become acquainted with the appearance and characteristics of each piece of equipment mounted or contained in the switchgear.

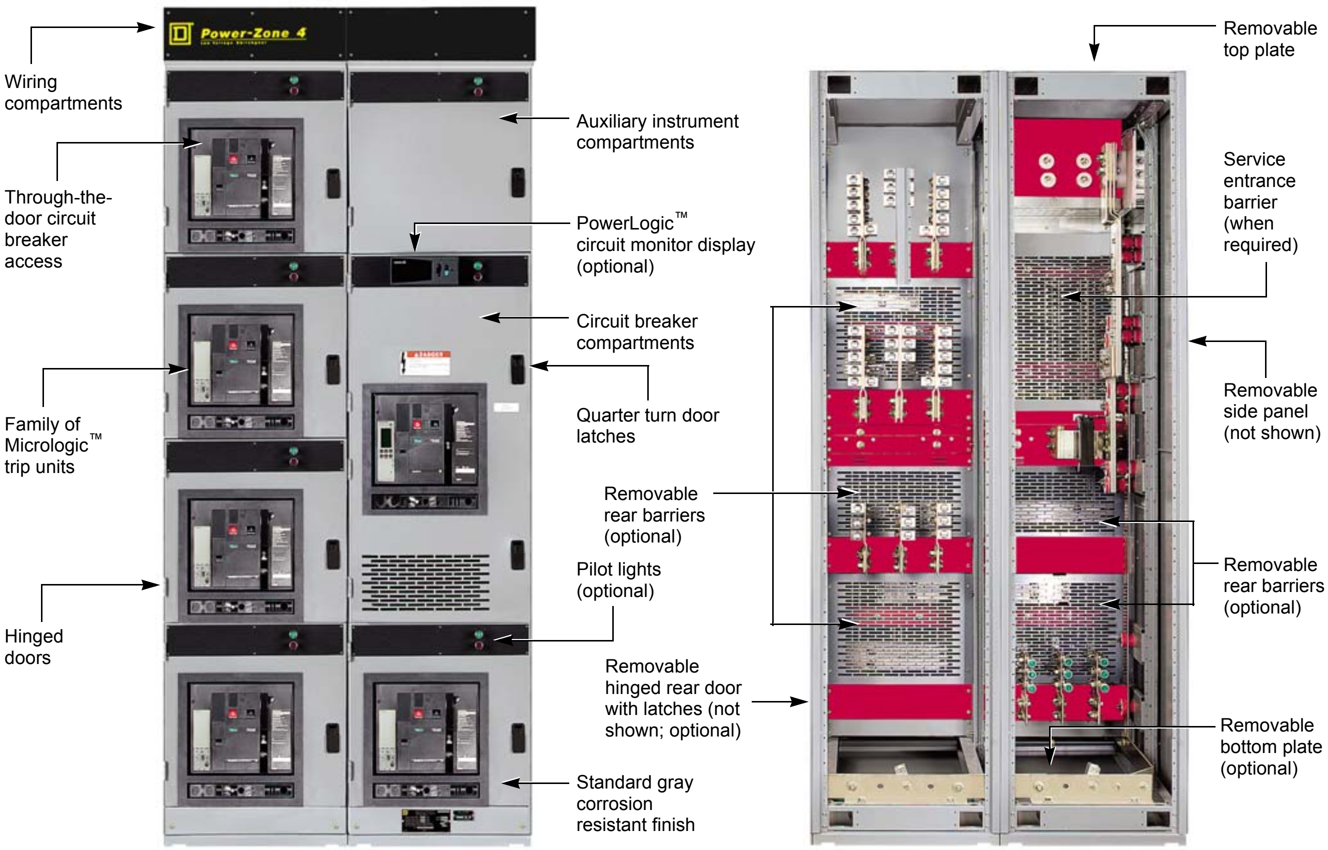
These instructions and procedures apply to Square D brand Power-Zone 4 switchgear installations. When special features or non-standard components are incorporated in the switchgear, detailed instructions for these components are included in the instruction material holder.

General Description

Square D brand Power-Zone 4 switchgear is manufactured with rugged 12-gauge steel and electrodeposition coated with gray paint to stand up to normal industrial environments. The switchgear is compartmentally designed to enclose all electrical parts. Power-Zone 4 switchgear is Underwriters Laboratories® (UL®) Listed to UL 1558 and is designed, manufactured, and tested in accordance with ANSI/IEEE C37.20.1 and C37.51.

A typical assembly is shown in Figure .

Typical Power-Zone 4 Switchgear



Front View

Rear View

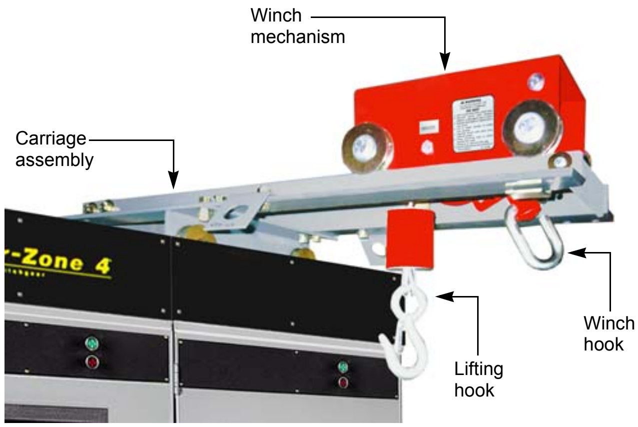
ENGLISH

Power-Zone 4 switchgear with Masterpact™ circuit breakers provide overload, short-circuit, and equipment ground-fault protection for circuits up to 600 volts. The switchgear is a stationary structure, which includes one or more free-standing vertical sections mechanically and electrically joined to make a single coordinated installation.

Each vertical section consists of three separate areas: front compartment (including secondary wireways), bus compartment, and rear cable compartment. One or more of the sections within the front area can be used as an auxiliary instrument compartment containing potential transformers, meters, relays, and control devices.

When specified, a rail-mounted traveling lifter assembly is included with indoor Power-Zone 4 switchgear. The lifting device is available in both manual crank and electrical operation. The manual lifting device is available on enclosures without drip hoods and is capable of lifting Masterpact circuit breakers into and out of any compartment. The circuit breaker is raised or lowered by cranking the winch mechanism.

Rail-Mounted Traveling Lifter



Extra features and special control options are often incorporated when specified by the purchaser's order. The special features are shown on the drawings and diagrams for the specific switchgear assembly. Instructions for relays, instruments, control switches, and circuit breakers are included in the order documents shipped with the switchgear.

In addition to this manual, other printed documentation is supplied for the switchgear components. Read and understand all applicable documentation before beginning the installation of the switchgear.

Section 2—Safety Precautions

This section contains important safety precautions that must be followed before attempting to lift, move, install, use, or maintain Power-Zone 4 switchgear and associated components.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Perform such work only after reading and understanding all of the instructions contained in this bulletin.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Before performing visual inspections, tests, or maintenance on this equipment, disconnect all sources of electric power. Assume all circuits are live until they are completely de-energized, tested, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Always practice lock-out/tag-out procedures according to OSHA requirements.
- Circuit breaker and switch contacts must be open and all springs discharged before performing maintenance work, disconnection, or removal of a circuit breaker.
- Conduct electrical testing to confirm no short-circuits were created during installation, maintenance, or inspection.
- Never insert a circuit breaker into a circuit breaker compartment that is not complete and functional.
- Be aware of potential hazards; wear personal protective equipment, and take adequate safety precautions.
- Carefully inspect your work area, and remove any tools and objects left inside the equipment.
- Replace all devices, doors, and covers before turning on power to this equipment.
- All instructions in this manual are written with the assumption that the customer has taken these measures before performing maintenance or testing.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

When the insulated bus feature is provided, all safety mechanisms, procedures, and practices as specified in this manual shall still apply and must be followed.

Failure to follow this instruction will result in death or serious injury.

ENGLISH

Section 3—Receiving, Handling, and Storage

Power-Zone 4 switchgear is shipped assembled in one or several shipping sections, depending on the size of the lineup and the handling facilities at the installation site.

Indoor shipping sections are mounted on wooden skids and enclosed in a covering to protect them from atmospheric conditions.

For instructions regarding the various components, refer to the manual associated with each product.

Receiving

Upon receipt, check the packing list against the equipment received to ensure the order and shipment are complete. Also upon receipt, immediately inspect switchgear sections for any damage that may have occurred in transit. If damage is found or suspected, file a claim with the carrier immediately, and notify Schneider Electric Services at 1-888-778-2733.

Identification

The rating nameplate is on the front cover of each structure. Included on the nameplate is the following information:

1. Factory order number
2. Rated maximum voltage
3. Frequency
4. Bus current ratings
5. Short-circuit current ratings

NOTE: All ratings are the maximum limits of the equipment.

Handling

Ensure that proper equipment, such as an overhead crane, is available at the installation site to handle the switchgear. This equipment will help avoid injury to personnel and damage to the switchgear.

NOTICE

EQUIPMENT HANDLE HAZARD

Do not lay the equipment on its back, front, or sides without specific instructions from Schneider Electric.

Failure to follow this instruction can result in equipment damage.

For ease of handling by a crane, all shipping sections are equipped with lifting straps at each corner of the section. This equipment is shipped up to a maximum of 72 inches (1,829 mm) wide. The lifting strap has a 1.38-inch (35 mm) diameter hole for acceptance of crane hooks as shown in Figure 1 on page 11. Use a suitable spreader beam to maintain the integrity of the lifting straps. Variations in the center of gravity may cause the equipment to tilt to one side or the other.

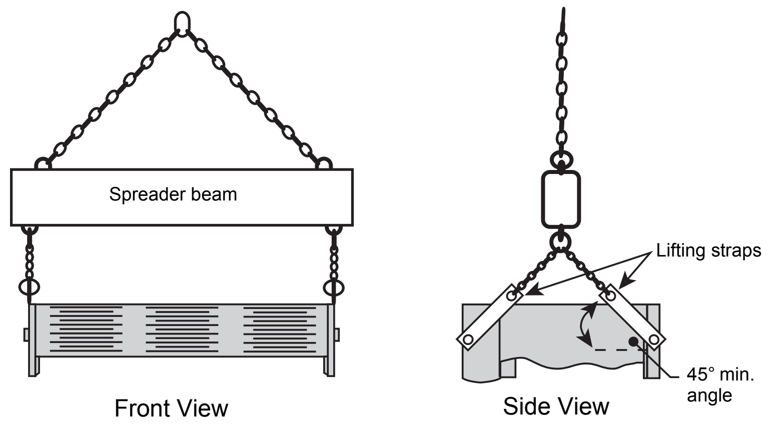
Schneider Electric recommends using an overhead crane, lifting straps, and cables or chains to handle the switchgear. This method and alternative handling methods are discussed in this section.

Handling with Lifting Straps

Schneider Electric provides lifting straps as standard equipment for switchgear shipping sections that are 72 inches (1,829 mm) wide or less. Instruction labels on each shipping section include drawings and written instructions outlining the proper use of the lifting straps (Figure 1 on page 11). Use rigid spreaders or a spanner bar to provide vertical lift on the lifting straps. This will help to avoid damaging the frame or finish.

ENGLISH

Figure 1: Lifting with an Overhead Crane, Lifting Straps, and Cables or Chains



Follow these instructions to handle the switchgear.

1. Use load-rated cables or chains with safety hooks or shackles. Do not pass cables or chains through holes in lifting straps.
2. Use a load-rated spreader beam to prevent structure damage. Rig so that the minimum angle between the lifting cables or chains and equipment top is 45 degrees.

Handling without Lifting Straps

Lifting straps are not furnished on shipping sections longer than 72 inches (1,829 mm) or on rainproof switchgear. Rollers, slings, or other means must be used to handle the shipping section. The handling label (Figure 2) is affixed to each of these sections.

Figure 2: Handling Instruction Label, Switchgear without Lifting Straps

HANDLING

THIS EQUIPMENT MUST BE HANDLED
EITHER BY A SLING OR BY ROLLERS.
"LIFTING MEANS NOT PROVIDED"

When elevating a shipping section not equipped with lifting straps, an overhead crane equipped with either of the following may be used:

- A chain coupled to a sling rigging
- A wire cable with safety hooks and shackles

Wrap the sling completely around the switchgear and shipping stringers (Figure 3 on page 12).

ENGLISH

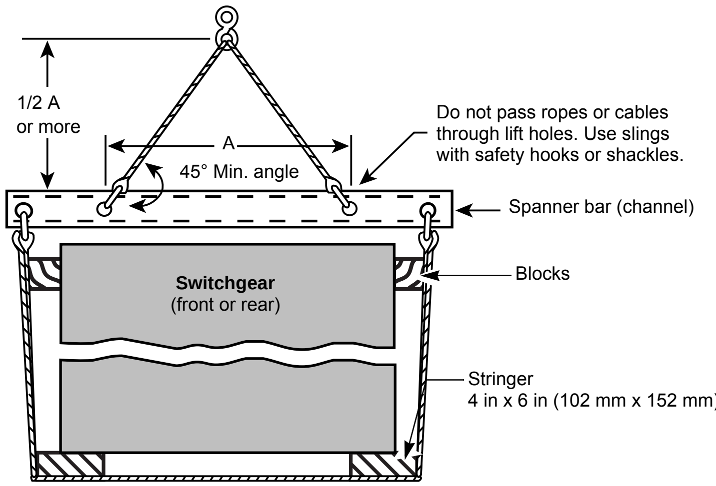
⚠ WARNING

TOP HEAVY LOAD

Stabilize the shipping section to reduce the possibility of tipping.

Failure to follow this instruction can result in death or serious injury.

Figure 3: Switchgear in Sling Rigging



A forklift is an alternative method of handling the switchgear.

NOTE: Always check the fork lengths to ensure that the forks extend under the entire switchgear. Carefully balance the load and always use a safety strap when handling or moving a switchgear with a forklift (Figure 4).

Figure 4: Forklift Safety Strap

Circuit Breakers

Use care when uncrating, rolling, hoisting, or handling Masterpact circuit breakers. (See page 48 for additional instructions.) Use care not to remove or damage the warning labels on the circuit breaker.

Circuit Breaker Lifter Bars (if furnished)

Use care when uncrating or handling the circuit breaker lifter bars.

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Traveling Lifter (if furnished)

Use care when uncrating, rolling, hoisting, or handling the traveling lifter assembly. The traveling lifter assembly weighs 65 lb (29 kg). Use suitable mechanical aids when handling the assembly.

See page 38 for further instructions. Use care not to remove or damage the warning labels on the traveling lifter assembly.

Floor Crane (if furnished)

Use care when unpacking and handling the optional floor crane. Refer to the manufacturer’s instructions for proper usage and handling.

Storage

If the Power-Zone 4 switchgear assembly is to be stored before being placed into service, perform the steps listed below.

1. Unpack the equipment to check for completeness and condition.
2. Reseal the equipment in its packing for protection until installation.

When storing the equipment:

- Keep the equipment in a clean, dry place that is free from corrosive elements and mechanical abuse.

  NOTE: Indoor equipment should be stored in an atmospherically controlled building until installation. Keep the equipment clean and dry, with a humidity less than 80% and temperature between 32 °F (0 °C) and 104 °F (40 °C). Avoid moisture, changes in temperature, cement dust, and corrosive atmospheres.
- Covering the equipment with a tarpaulin may be necessary to protect it from contaminants or moisture.
- Do not store indoor units outdoors.
- If it is necessary to store the equipment outdoors, make special arrangements to keep the equipment clean, dry, and within the temperature and humidity limits stated above.
  - It may be necessary to cover the equipment and install temporary heating units.
  - Place the shipping sections on level surfaces for storage to maintain structural integrity.
- In areas of high humidity, such as installations near oceans or rivers, monitor the switchgear equipment closely.
  - If necessary, use additional heat to keep the switchgear dry.
  - Contact Schneider Electric Services at 1-888-778-2733 if the internal heaters are not adequate for your location.
- If the optional traveling lifter assembly is to be stored, do not remove it from its packing until installation.
- If optional internal heaters are supplied with the switchgear, connect them to an external power source. Energize the heaters inside the switchgear, or add heat from a separate source, such as a light bulb or blower. Use a minimum of 250 watts of heat per vertical section to keep the equipment dry during storage.

ENGLISH

Section 4—Installation

Before installing Power-Zone 4 switchgear, read and understand:

- All precautions in this manual.
- All manuals for associated components.
- All drawings and diagrams included with the equipment.

Assemble the Shipping Sections

When correctly installed, indoor switchgear conforms to the following requirements.

- Front panels form a straight, true line; and when transformers and/or other gear are included, the front panels line up or form parallel lines.
- Units are spaced correctly from center-to-center and perpendicular to the mounting surface.
- The switchgear is fastened securely to the floor channels or base pad.
- The shipping sections are bolted together securely.
- Bus and control wiring connections are connected properly.

Prepare the Site

Before positioning the equipment, check these items to ensure that the site is ready for final installation.

- Compare the site plans and specifications with the equipment drawings to be sure no discrepancies exist.
- Check the site to confirm switchgear will fit properly.
- Provide area ventilation at all times to maintain the ambient temperature around the equipment between 32 °F (0 °C) and 104 °F (40 °C).
- Provide adequate permanent lighting and convenience outlets near the equipment.
- Route sewer, water, and steam lines away from the equipment.
- Provide floor drains near the equipment.
- When installing the equipment, consider the aisle space required at the front and rear of the equipment, as well as space at the ends of the lineup.

  NOTE: Required minimum clearances around switchgear are given in Article 110.26 of the National Electrical Code® (NEC®) or Rule 2-308 of the Canadian Electrical Code (CEC). These clearances are only a minimum. Additional space may be required for insertion and withdrawal of circuit breakers and to transfer to other compartments with a hoist or floor crane.

Prepare the Foundation

- Confirm that the floor or foundation is strong enough to support the equipment without distortion or sagging.

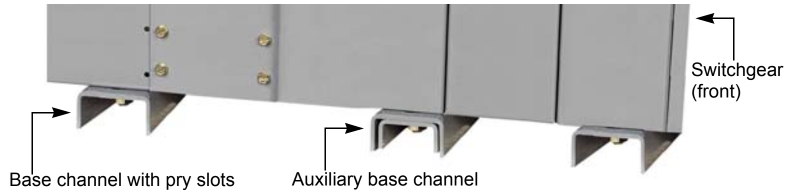
  NOTE: Refer to the shipping documents for actual weights of the equipment.

- Confirm that the concrete and channels are level left-to-right and front-to-rear within 1/8-inch per square yard (3 mm per square meter).
- Install equipment on a smooth, level base to keep tolerances and adjustments to a minimum.
- Confirm that the steel channels are level with the finished base and that the surrounding base gently slopes toward a drain.

Position the Switchgear

1. Pry the switchgear by inserting a crowbar or pry bar into a base channel slot.
2. Carefully move the switchgear into position until the front panels form a straight, true line.
3. Confirm that the vertical section front(s) line up or form parallel lines.

Figure 5: Final Positioning of the Switchgear (Side View)



Align the Vertical Sections

1. Establish a base line a few inches in front of the switchgear and parallel to the installation location.
2. Equalize the distances from the front of the switchgear to the base line, making the face of the section parallel to the base line.
3. After the first shipping section has been placed, move the second section into position and similarly check it.
4. Fasten the vertical sections together.
5. Repeat steps 3 and 4 until the installation is complete.
6. Check the traveling lifter front and rear rails for proper alignment. If the rails are misaligned, adjust for front and rear alignment of equipment. See “Align the Sections and Rails” on page 39.

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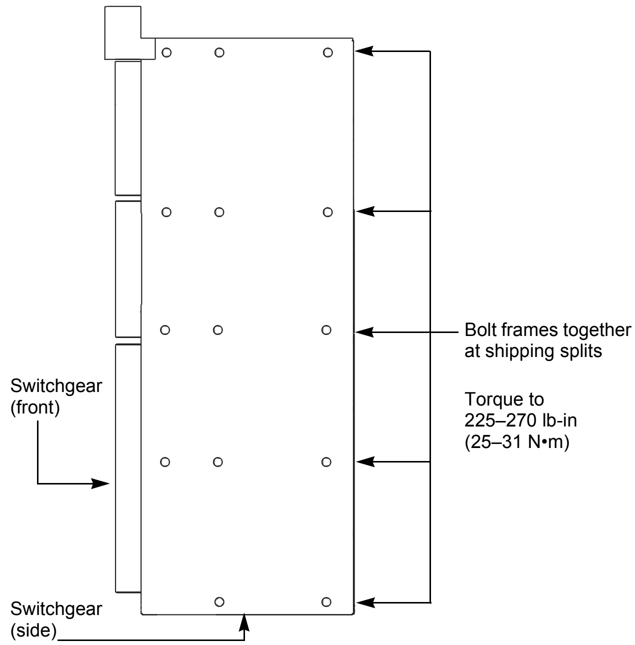
Join the Shipping Splits

1. Obtain the 3/8-16-inch shipping split hardware located inside the equipment.
2. Bolt the frames together (Figure 6) with the shipping split hardware. Torque the hardware to 225–270 lb-in (25–31 N•m).

Figure 6: Joining the Shipping Splits (Side View)



Join the Wiring Compartments

1. After the frames of the shipping splits have been bolted together, remove the wiring compartment covers (Figure 7) at the split.

Figure 7: Removing the Wiring Compartment Covers

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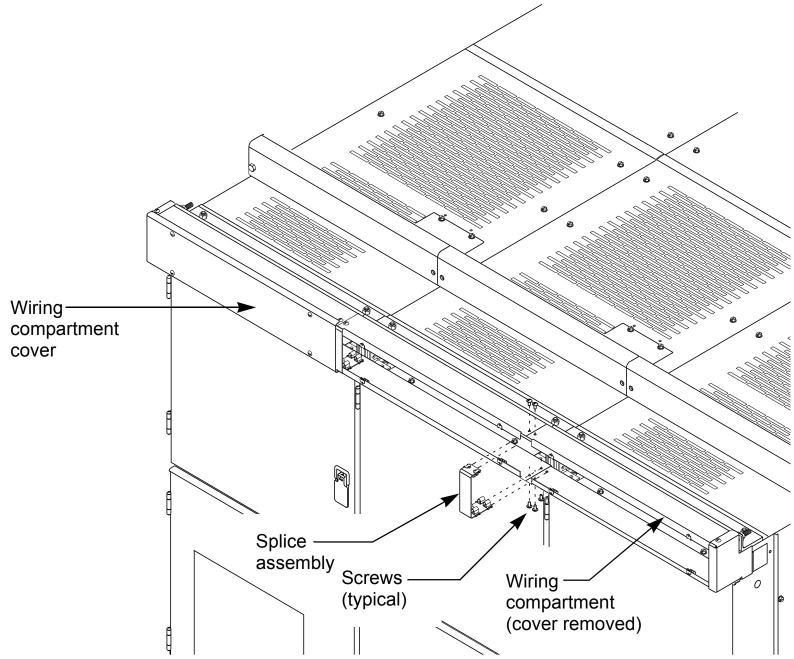
2. Remove the splice assembly (Figure 8) in the wiring compartments toward the left of the split.

Figure 8: Joining the Wiring Compartments



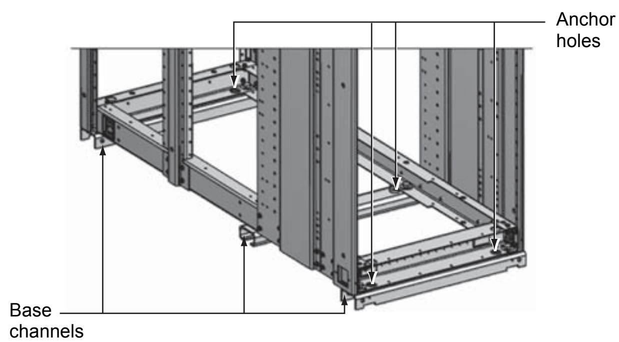
3. Remove the screws from the splice assembly. Retain the screws for reuse.
4. Install the splice assembly (Figure 8) using the screws removed in step 3.

Anchor the Switchgear (Non-seismic)

Although sections are freestanding, a hard bump or shifting movement can result in damage to the splice joints between sections and conduit hubs connected to the sections. Therefore, anchor the base channels to the floor. Formed base channels run the width of the shipping section. The channels have 3/4-inch (19 mm) diameter holes for fastening the section to the floor.

1. Anchor each section to the floor (Figure 9) with four 1/2-inch (13 mm) Grade 2 (minimum) bolts, flat washers, and anchors (not furnished).

Figure 9: Anchoring Using Base Channels



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2. After all shipping sections are joined together, and the entire structure is bolted to the floor, install the incoming service conductors and load side cables. Refer to the floor plan examples in Figures 10 and 11.

Figure 10: Typical Floor Plan (Bottom View)—Non-Seismic

Unit Width	Dimension B
22.0 in (559 mm)	8.0 in (203 mm)
30.0 in (762 mm)	12.0 in (305 mm)
36.0 in (916 mm)	15.0 in (381 mm)

NOTE: The dimensions shown are tie-down locations within individual Power-Zone 4 sections. Refer to factory-supplied drawings to determine appropriate anchor locations for the equipment pad.

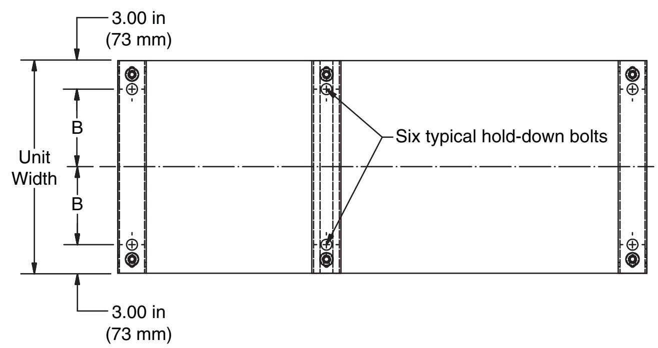
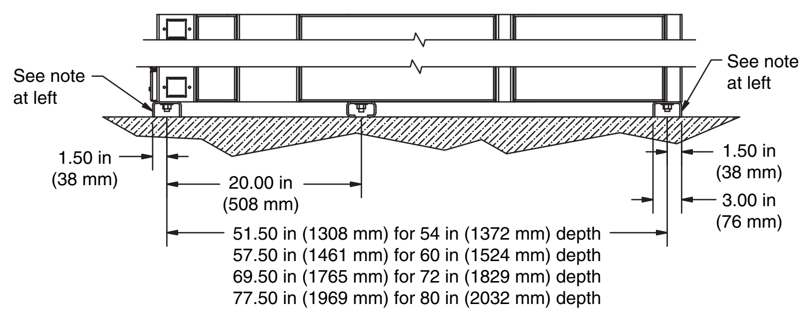


Figure 11: Typical Floor Plan (Side View)—Non-Seismic

NOTE: Concrete and channels should be level left to right and front to rear within 1/8-inch per square yard (3 mm per square meter).



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Seismic Certification

Power-Zone 4 switchgear that are seismically certified have been qualified to the site-specific seismic requirements of the listed model building codes and/or standards. Optional construction features may be required, depending on the location of the installation and the particular code and/or standard of interest. Seismic certificates of compliance and equipment labels are provided with all seismically certified switchgear. To maintain the validity of this certification, the installation instructions provided in this section must be followed.

Responsibility for Mitigation of Seismic Damage

For the purposes of the model building codes, Power-Zone 4 switchgear are considered nonstructural building components. Equipment capacity was determined from tri-axial seismic shake table test results as defined in the International Code Counsel Evaluation Service (ICC ES) Acceptance Criteria for Seismic Qualification Testing of Nonstructural Components (AC156).

Unless otherwise indicated, an equipment importance factor of 1.5 (IP = 1.5) was used, indicating that equipment functionality was verified before and after shaker table seismic simulation testing. This importance factor is indicative of critical facilities where maximizing the probability of post event functionality is a priority.

AC156 is published by the ICC ES and has been recognized by the Building Seismic Safety Council (BSSC) as an appropriate methodology in the 2003 National Earthquake Hazard Reduction Program (NEHRP) commentary. The National Institute of Building Sciences established the BSSC in1979 to develop and promote regulatory provisions for earthquake risk mitigation at the national level.

Incoming and outgoing cable and conduit must also be considered as related but independent systems. They must be designed and restrained to withstand the forces generated by the seismic event without increasing the load transferred to the equipment. For applications where seismic hazard exists, bottom entry and/or exit of cable and conduit is preferred.

A lateral restraint system is also required in situations where horizontal motion at the top of the Power-Zone 4 switchgear is not desirable (such as applications where top entry and/or exit of conduit are used). This system must be capable of transferring the loads created to the load-bearing path of the building structural system.

Seismic qualification of nonstructural components by Schneider Electric is just one link in the total chain of responsibility required to maximize the probability that the equipment will be intact and functional after a seismic event. During a seismic event, the equipment must be able to transfer the loads that are created through the mounting pad and anchorage to the load-bearing path of the building structural system.

The structural civil engineer or design engineer of record is responsible for detailing the equipment connection and anchorage requirements (including the lateral restraint system if appropriate) for the given installation. The installer and manufacturers of the anchorage and lateral restraint system are responsible for assuring that the mounting requirements are met. Schneider Electric is not responsible for the specification and performance of these systems.

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Anchor the Switchgear (Seismic)

Formed base channels run the width of the shipping section. The channels have 1.13-inch (29 mm) diameter holes for fastening the section to the floor. Use all six mounts to anchor the switchgear to the floor properly.

During an earthquake, the top of the switchgear can move in any direction. Any top incoming cables must accommodate this motion. The switchgear enclosure (particularly the top) should not be used to mount exterior equipment.

When anchoring to a concrete pad:

- Use 1/2-inch (13 mm) diameter Grade 5 (minimum) concrete anchor bolts or sleeve anchors suitable for installation of electrical equipment.
- Use a 1/2-inch (13 mm) hardened washer (approximately 1.5-inch (38 mm) OD) and lock washer under the head of each bolt or anchor nut, and torque to the value specified by the manufacturer of the anchor to develop the full strength of the anchor.
- Stud anchors, sleeve anchors, or concrete anchor bolts are recommended (follow manufacturer’s instructions for recommended hole size). Do not use expansion shields, such as “lag screw shields”. The concrete pad should be constructed from 3000 psi (minimum) strength concrete mix.

1. Anchor each section to the concrete pad with six 1/2-inch (13 mm) Grade 5 (minimum) bolts, hardened washers, and anchors (not furnished).
2. After all shipping sections are joined together, and the entire structure is bolted to the concrete pad, install the incoming service conductors and load side cables. Refer to the floor plan examples in Figures 12 and 13 on page 21.

When anchoring sections to a floor other than concrete:

- Use six 1/2-inch (13 mm) Grade 5 (minimum) bolts or studs through the holes in the base channels.
- Secure bolts or studs to the floor with anchors or other means to achieve the full strength of the seismic restraint system.
- Use a 1/2-inch (13 mm) hardened washer (approximately 1.5-inch (38 mm) OD) and lock washer under the head of each bolt or anchor nut, and torque to the value specified by the manufacturer of the anchor to develop the full strength of the anchor.

1. Anchor each section to the floor with six 1/2-inch (13 mm) Grade 5 (minimum) bolts, hardened washers, and anchors (not furnished).
2. After all shipping sections are joined together, and the entire structure is bolted to the floor, install the incoming service conductors and load side cables. Refer to the floor plan examples in Figures 12 and 13 on page 21.

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Securing Structures to Floor—Seismic Hazard [1] Designated Locations

Each section must be anchored to the load-bearing path of the building structural system per the details supplied by the engineer of record. The floor mounting locations for NEMA 1 enclosures are shown below.

Use 0.50 in. or 0.75 in. grade 5 or higher bolts (furnished by others) and hardened washers. Torque bolts to the value specified by the manufacturer of the anchor.

Figure 12: Typical Floor Plan (Bottom View)—Seismic

Unit Width	Dimension B
22.0 in (559 mm)	8.0 in (203 mm)
30.0 in (762 mm)	12.0 in (305 mm)
36.0 in (916 mm)	15.0 in (381 mm)

NOTE: The dimensions shown are tie-down locations within individual Power-Zone 4 sections. Refer to factory-supplied drawings to determine appropriate anchor locations for the equipment pad.

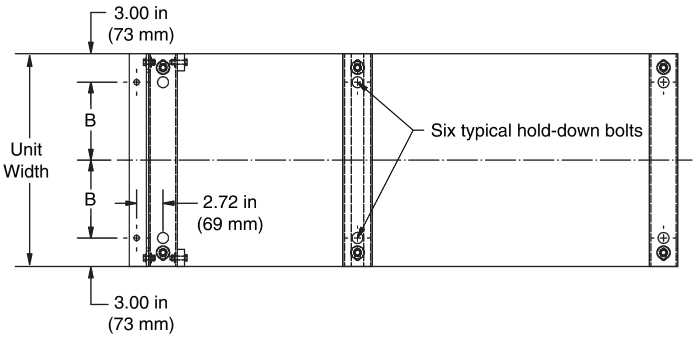
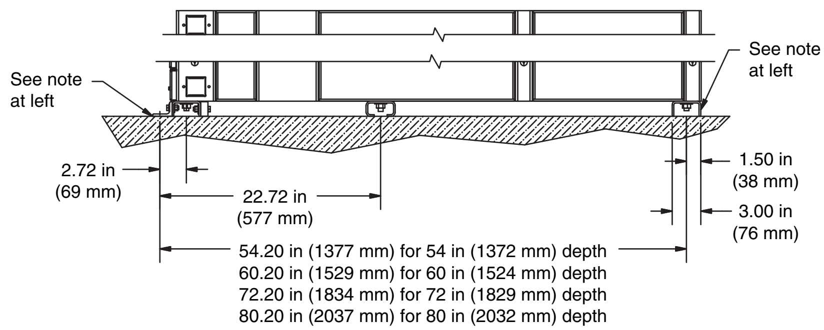


Figure 13: Typical Floor Plan (Side View)—Seismic

NOTE: Concrete and channels should be level left to right and front to rear within 1/8-inch per square yard (3 mm per square meter).



Connect the Bus

All connections for the main, neutral, and ground bus between sections are made by means of bolted splice plates (plated).

Prepare the Bus Joints

NOTICE

POOR BUSBAR CONNECTIONS

Do not use abrasive cleaners on the bus joints. This may cause high resistance connections.

Failure to follow this instruction can result in equipment damage.

All bus joints are plated to provide a reliable electrical connection.

1. Remove any dirt, grease, and other foreign material from bus joint surfaces before they are joined.
2. Wipe surfaces clean with a lint-free cloth and denatured alcohol.
3. Wipe the joint dry with a clean, lint-free cloth.

[1] Seismic hazard for site specific locations as defined by the current edition of the International Building Code or NFPA 5000 or relevant local building code or consulting engineer of record.

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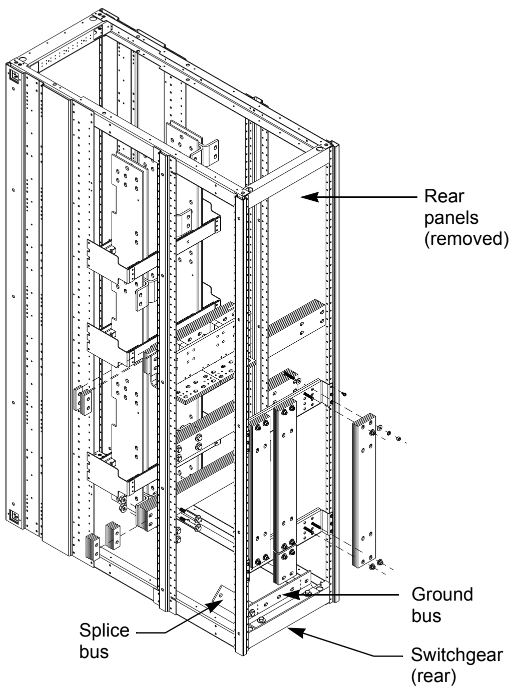
Splice the Ground Bus

The ground splice bus (Figure 14) is shipped in an upright position at the bottom rear of the switchgear section. See Figures 14 and 15 for steps 1 through 5.

Figure 14: Splicing the Ground Bus



1. Remove the rear panels from the switchgear.
2. Remove the 1/2-13-inch hardware securing the splice bus to the ground bus. Retain this hardware for reuse.
3. Remove the 1/2-13-inch hardware from the other end of the splice bus. Retain this hardware for reuse.
4. Align the splice bus with the adjacent ground bus.
5. Install the 1/2-13-inch hardware retained in steps 2 and 3.
6. Torque all 1/2-13-inch hardware to 60–70 lb-ft (81–95 N•m). See Figure 16.

   NOTE: The convex side (marked "Top") of one conical washer should be against the bolt head and the convex side of the second conical washer should be against the hex nut.

Figure 15: Ground Bus Connected

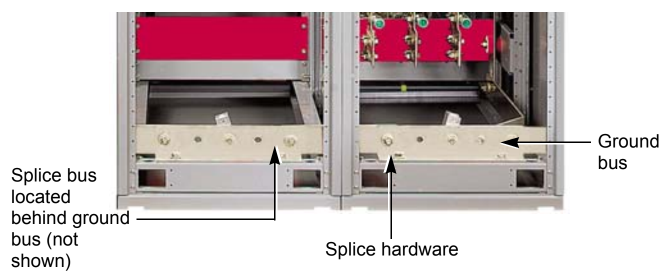
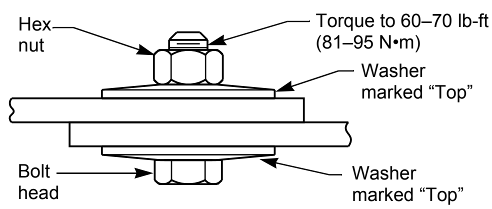


Figure 16: Installing Conical Washers



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Splice the Neutral Bus

Neutral splice bus (Figure 17) is shipped mounted to brackets at the rear of the switchgear section. See Figure 17 for steps 1 through 5.

1. Remove the two 3/8-16-inch hardware securing the splice bus and discard.
2. Remove the splice bus. Retain for reuse.
3. If rear barriers are provided (Figure 18 on page 23), remove them to gain access to the neutral splice bus area. Retain for reuse.
4. Remove the 1/2-13-inch splice hardware in the sections to be spliced. Retain for reuse.
5. Remove the red glass polyester spacers and discard.

Figure 17: Splicing the Neutral Bus

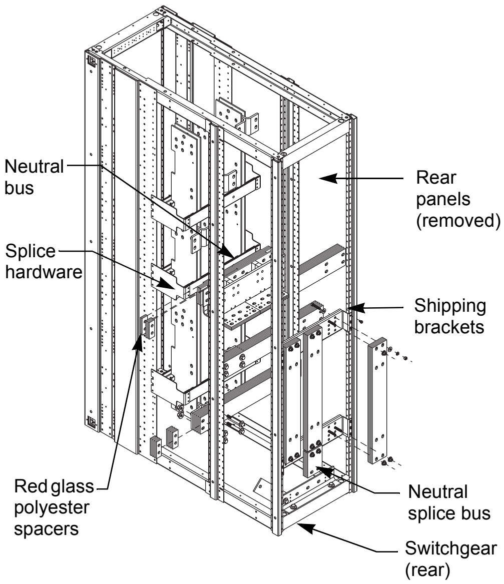
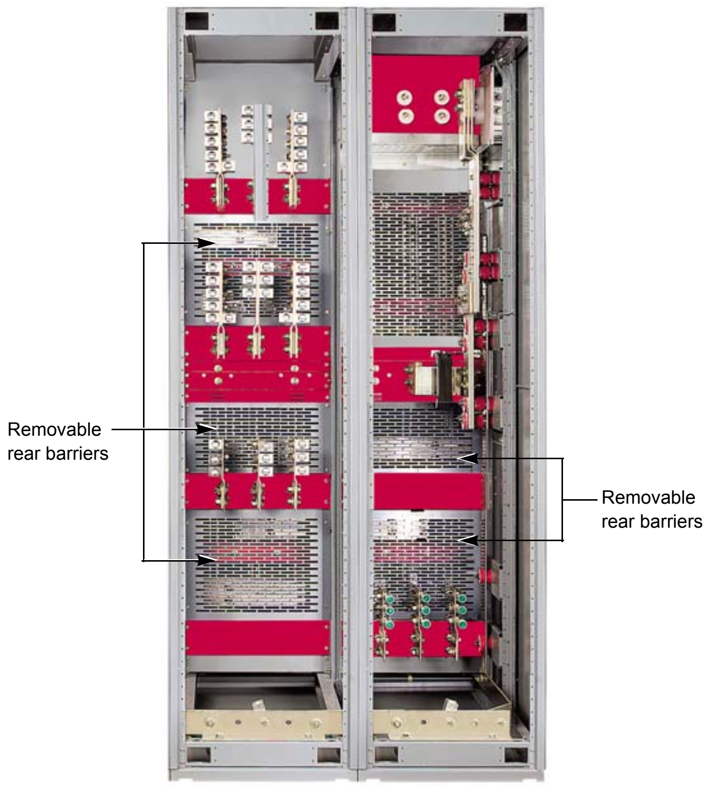


Figure 18: Removing Rear Barriers (If Provided)



Bus Compartment (rear view)

6. Position and install the neutral splice bus (Figure 19). Also see Figure 17 on page 23.
7. Install the 1/2-13-inch splice hardware removed in step 4 on page 23. Note the orientation of the splice hardware in Figure 19.
8. Torque all 1/2-13-inch hardware (Figure 16) to 60–70 lb-ft (81–95 N•m).

   NOTE: The convex side (marked “Top”) of one conical washer should be against the bolt head and the convex side of the second conical washer should be against the hex nut.

9. If supplied, install the rear barriers (Figure 18 on page 23) removed in step 3 on page 23.

Figure 19: Neutral Bus Laminations

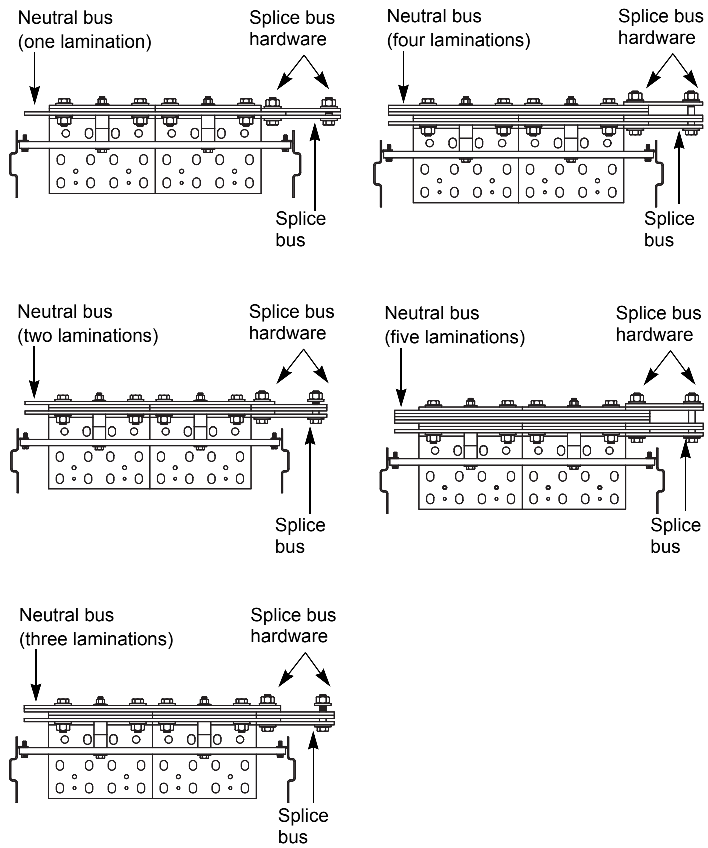
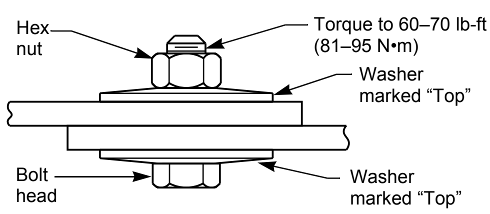


Figure 20: Installing Conical Washers



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Splice the Main Through-Bus

Main through-bus splice bars (Figure 22) are shipped mounted to brackets at the rear of the switchgear section. See Figure 22 for steps 1 through 8.

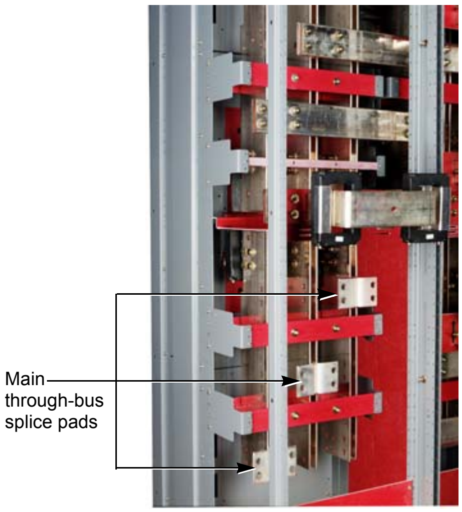
1. Remove the twelve 3/8-16-inch hardware securing the splice bus and discard.
2. Remove the splice bus, keeping each set together as shipped. Retain for reuse.
3. Discard the shipping brackets and bracket mounting hardware.
4. If rear barriers are provided (Figure 18 on page 23), remove them to gain access to the main through-bus splice area. Retain for reuse.
5. If bus boots are installed over the main through-bus splice pads, use a pair or wire cutters to snip off just enough wire ties to gain access to the main through-bus splice pads. Do not completely remove the boots.
6. Remove the 1/2-13-inch hardware supplied with the equipment at the splice pads. Retain for reuse.

   NOTE: Splice pads may be in the top or bottom half of the switchgear section. Splice pads in the bottom location are shown in Figures 21, 22, and 23 (on page 26).
7. Remove the red glass polyester spacers and discard.

   NOTE: Note the location of these spacers as they are being removed. The splice bus will be installed in their place.
8. Determine individual phase placement by matching the hole pattern and hole spacing in the splice bars with the hole pattern and hole spacing in the splice pads in the sections to be spliced.

   See Table 1 on page 26 to determine the number of laminations required per phase.

Figure 21: Typical Main Through-Bus Splice Pads



Bus Compartment (rear view)

Figure 22: Splicing the Main Through-Bus

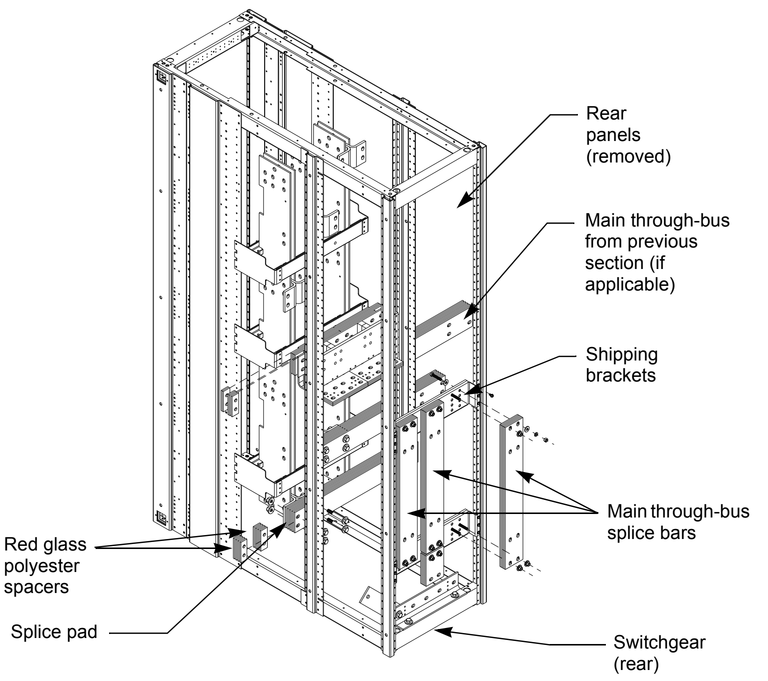


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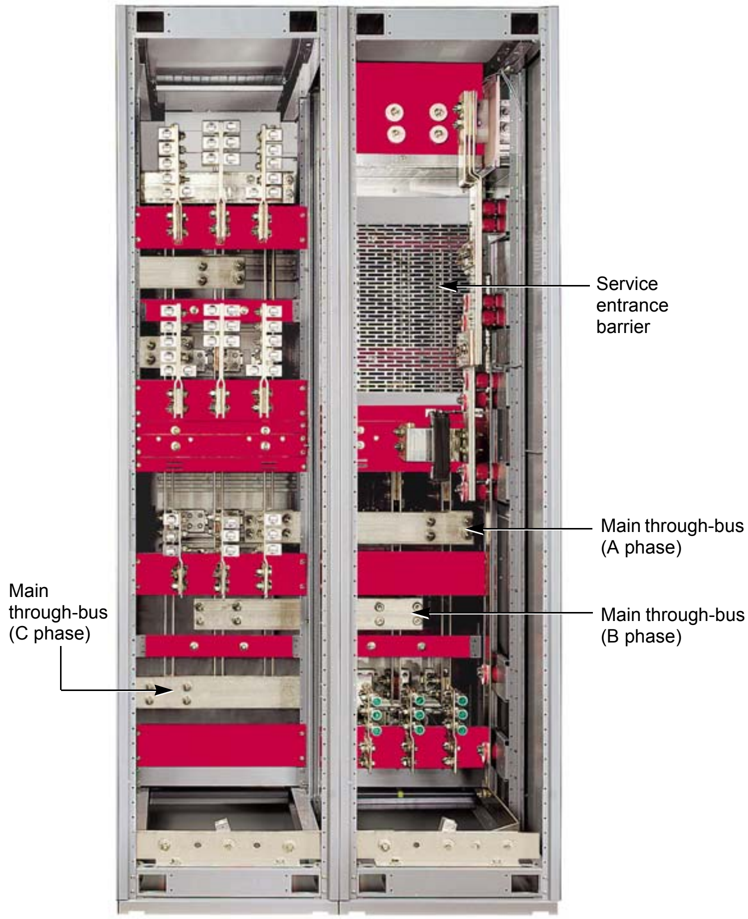
Table 1: Number of Laminations Required Per Phase

Main Through-Bus Ampacity	Standard Rating	Optional Rating
Without Insulated Bus Option		
1600 A ≤ 100 kA SCCR	1	2
1600 A > 100 kA SCCR	2	2
2000 A ≤ 100 kA SCCR	1	2
2000 A > 100 kA SCCR	2	2
3200 A (all SCCR)	2	4
4000 A (all SCCR)	3	4
5000 A (all SCCR)	4	5
With Insulated Bus Option		
1600 A ≤ 65 kA SCCR	1	2
1600 A > 65 kA SCCR	2	2
2000 A ≤ 65 kA SCCR	1	2
2000 A > 65 kA SCCR	2	2
3200 A (all SCCR)	2	4
4000 A (all SCCR)	3	4
5000 A (all SCCR)	4	5

NOTE: All laminations are 1/4-inch x 4-inch (6 mm x 102 mm) copper bus.

Figure 23: Typical Main Through-Bus (A, B, and C Phases)



Bus Compartment (rear view)

9. Replace each polyester spacer removed in step 7 on page 25 with a main through-bus splice bar. See Figure 22 on page 25.
10. Install the 1/2-13-inch splice hardware removed in step 6 on page 25. See Figure 22 on page 25.
11. Torque all 1/2-13-inch hardware to 60–70 lb-ft (81–95 N•m). See Figure 16.

    NOTE: The convex side (marked “Top”) of one conical washer should be against the bolt head and the convex side of the second conical washer should be against the hex nut.

12. If supplied, close the bus boots by inserting new wire ties into the attachment holes. Use the wire ties provided (Schneider Electric part number 25901-24485).
13. If supplied, install the rear barriers (Figure 18 on page 23), removed in step 4 on page 25.

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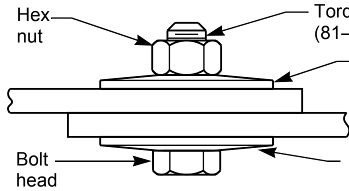
Figure 24: Installing Conical Washers



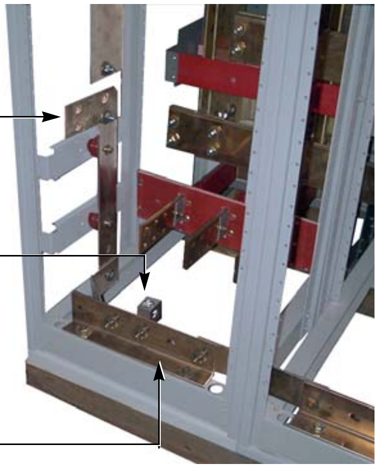
Grounding and Bonding

NOTE: For purposes of making the determinations below, a system is "grounded" if it is grounded at any point ahead of the switchgear, whether the grounded conductor (neutral) is carried through to the loads, or not.

Service Equipment (Solidly Grounded Systems)

For *solidly grounded* systems used as either service equipment or as the main switchgear on a separately derived system:

Figure 25: Main Bonding Jumper and Grounding Electrode Conductor Connector (Grounded Systems)



1. Install the grounding electrode conductor from the grounding electrode at the installation site to the grounding electrode conductor connector (ground lug) located on the switchgear ground bus (or on the neutral bus, if so indicated on the equipment drawing) (Figure 25). Select the proper material and size of the grounding electrode conductor to comply with Sections 250.62 and 250.66 of the NEC. Install the grounding electrode conductor as specified in Section 250.64 of the NEC.
2. Install the main bonding jumper between the neutral bus and the ground bus (Figure 25). Refer to Tables 2 and 3 for torque values.

   NOTE: If the switchgear is fed from multiple sources (for example, double-ended systems), there may be two or more main bonding jumpers to install.

Table 2: Incoming, Branch, Neutral and Ground Lugs

Socket Size Across Flats	Torque Value
1/4 in (6 mm)	180 lb-in (20 N•m)
5/16 in (8 mm)	250 lb-in (28 N•m)
3/8 in (10 mm)	340 lb-in (38 N•m)
1/2 in (13 mm) See exception on next line	450 lb-in (51 N•m)
1/2 in (13 mm) 3/0-750 kcmil	620 lb-in (70 N•m)

Table 3: Multiple Conductor Neutral and/or Ground Bus

Screw Type	Lug Wire Range	Conductor Size	Torque Value
Slotted head	14–4	14-10 Cu, 12-10 Al	20 lb-in (2 N•m)
		8 Cu-Al	25 lb-in (3 N•m)
		6-4 Cu-Al	35 lb-in (4 N•m)
	14–1/0	14-8 Cu-Al	36 lb-in (4 N•m)
		6-1/0 Cu-Al	45 lb-in (5 N•m)
Socket head	14–1/0	All	100 lb-in (11 N•m)
	6-300 kcmil	All	275 lb-in (31 N•m)

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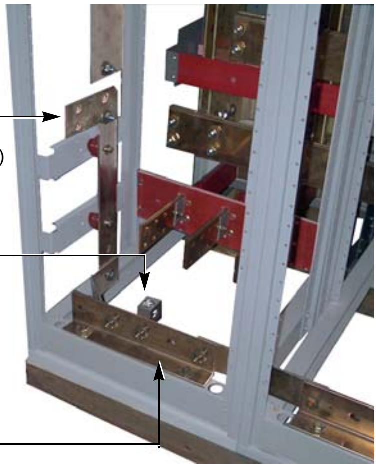
Service Equipment (Ungrounded Systems)

For *ungrounded* systems used as either service equipment, or as the main switchgear on a separately derived system:

1. Install the grounding electrode conductor from the grounding electrode at the installation site to the grounding electrode conductor connector (ground lug) located on the switchgear ground bus (Figure 26).
2. Select the proper material and size of the grounding electrode conductor to comply with Sections 250.62 and 250.66 of the NEC. Install the grounding electrode conductor as specified in Section 250.64 of the NEC.

Figure 26: Main Bonding Jumper and Grounding Electrode Conductor Connector (Ungrounded Systems)



Not Service Equipment

To connect the switchgear frame and ground bus to the service ground for *grounded* or *ungrounded* systems, when switchgear is used neither as service equipment, nor as the main switchgear on a separately derived system, use equipment grounding conductors sized according to Section 250.122 of the NEC.

High-Impedance Grounded Neutral Systems

For *high-impedance grounded neutral systems*, ground the system following instructions provided with the system grounding equipment and in compliance with Section 250.36 of the NEC.

Confirm that the switchgear frame and ground bus are bonded in accordance with Section 250.102 of the NEC.

Connect the Power Cables, Controls, and Wiring

Connect the Power Cables

NOTICE

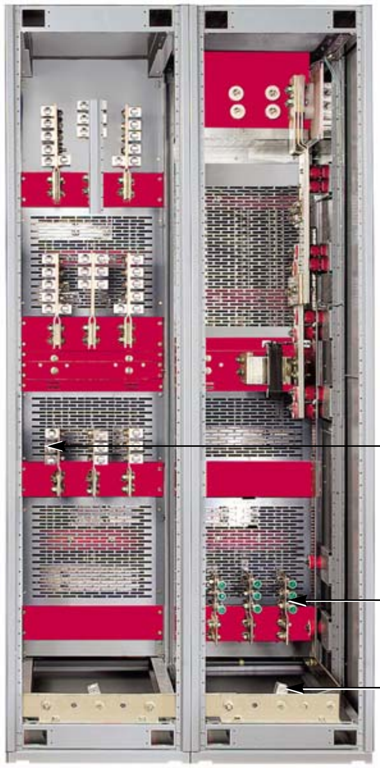
LOSS OF EQUIPMENT GROUND-FAULT PROTECTION

Do not connect grounding conductors to any load neutral terminal(s).

Failure to follow this instruction can result in equipment damage.

NOTE: When connecting power cables, use 90 °C insulated conductors based on the ampacity of 75 °C conductors unless otherwise indicated by supplemental instructions.

Figure 27: Connecting the Cables



Cable compartment (rear view)

Power-Zone 4 switchgear is provided with compression or mechanical type lugs (Figure 27) for terminating the main power cables.

1. Determine the phase of each cable before making the connection.

   NOTE: Viewing the switchgear from the front, the bus sequence is phased A-B-C top-to-bottom, front-to-rear, or left-to-right.

   Non-standard arrangements may be necessary to meet specific requirements. If so, the bus is marked A, B, and C in the order specified by the customer.

   If an optional neutral is provided, all the connections for the neutral are labeled.

2. Avoid sharp turns, corners, and edges when forming cables for termination within the switchgear. This reduces the risk of damage to equipment or weakening of the cable insulation. The cable manufacturer’s instructions should be followed in determining the minimum bending radii of the cables. This will vary with the type and size of cable involved. Refer to the NEC requirements for more information regarding minimum bending radii of cables.
3. Securely lace and support the line and load cables as directed in “Conductor Restraint for Short-Circuit Current Rating (SCCR)” on page 30.

   NOTE: This helps avoid strain or load on the terminals.

4. Once all appropriate cables are connected, reinstall the rear panels removed in step 1 under “Splice the Ground Bus” on page 22.

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Conductor Restraint for Short-Circuit Current Rating (SCCR)

NOTICE

HAZARD OF CONDUCTOR MOVEMENT UNDER SHORT-CIRCUIT CONDITIONS

Restrain conductors (including the neutral conductors) in switchgear installation based on Table 4.

Failure to follow this instruction can result in equipment damage.

Table 4: Conductor Restraint Requirements

Ampacity	Available Short Circuit Fault Current (RMS)			
	≤ 85 kA	> 85 to ≤ 100 kA	> 100 to ≤ 130 kA	> 130 to ≤ 200 kA
Supply Cables NOT entering Service Entrance Barriered Compartment				
≤ 2000 A	No	No	Yes	Yes
2001–3200 A	No	No	Yes	Yes
3201–4000 A	No	No	No	No
4001–5000 A	No	No	No	No
Masterpact NT Circuit Breaker Load Cables				
≤ 800 A	No	Yes	Yes	Yes
Masterpact NW Circuit Breaker Load Cables				
≤ 2000 A	Yes	Yes	Yes	Yes
801–1600 A	Yes	Yes	Yes	Yes
1601–2000 A	Yes	Yes	Yes	Yes
2001–3200 A	No	No	Yes	Yes
3201–4000 A	No	No	No	No

Cable restraint is recommended for lugs mounted on bus when the following conditions are met:

- Unsupported cable lengths are greater than 3.5 ft. (1 m) as measured from the end of the lug to the conduit fitting through which the cable exits.

  AND

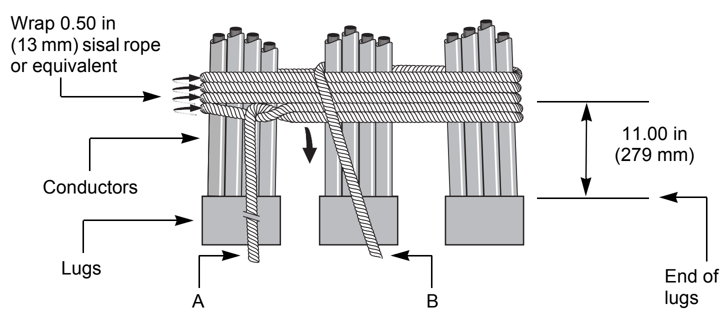
- Cables meet the Yes criteria shown in Table 4.

If restraints are required, perform the following steps.

NOTE: Wrap conductors using 1/2-inch (13 mm) diameter sisal rope or equivalent.

1. Begin wrapping the conductors (Figure 28) a maximum distance of 11 in. (279 mm) from the end of the lugs. Continue to wrap the conductors on 11-in. (279 mm) center(s) up to the point where the conductors leave the enclosure.
   a. Wrap the conductors four (4) times as shown, leaving 3 ft. (1 m) of excess rope at the first end (A).
   b. Pull the rope (B) taut.

Figure 28: Wrapping Conductors (neutral conductors not shown)[a]



[a] Secure neutral cables to phase cables from enclosure entry until terminated on the lug pad. In the situation where the neutral lug pad is remote from the phase lug pads, secure neutral cables to the frame.

2. Wrap the rope several times (Figure 29) until the space between the conductors is completely filled.
   a. Weave the final rope loop underneath the previous loop (C).
   b. Bring the rope through the right-hand space.
   c. Pull the rope taut.

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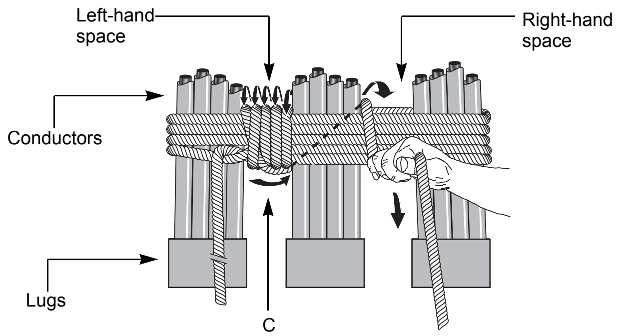
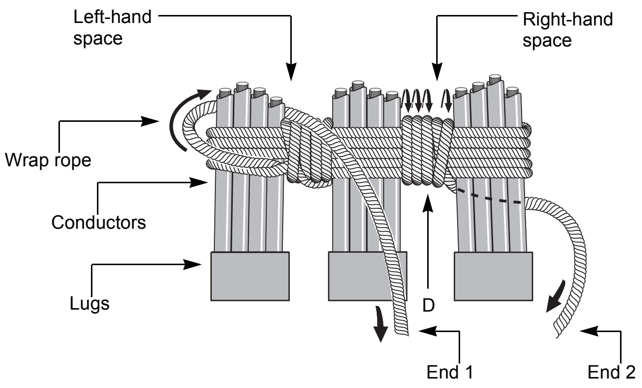
Figure 29: Wrapping the Space Between Conductors



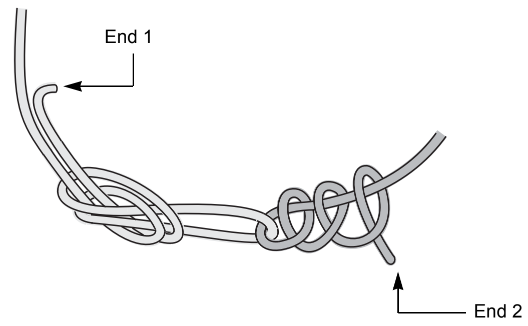
3. Wrap the rope several times until the space between the conductors (Figure 30) is completely filled.
   a. Weave the final rope loop underneath the previous rope loop (D).
   b. Pull the rope taut.

Figure 30: Finish Wrapping the Space Between Conductors



4. Tie the rope ends (1) and (2) together (Figure 31) until they are taut. Cut off excess rope, and tape ends to prevent fraying.

Figure 31: Tying Rope Ends Together



5. Recheck torques of wire binding screws after securing the conductors.

   NOTE: Refer to the torque label supplied with the switchgear for torque values.

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Connect the Controls and Wiring

1. Locate and remove the wiring compartment covers (Figure 32) at the split from the front of the switchgear.

Figure 32: Removing the Wiring Compartment Covers

2. Connect all pull-apart terminal blocks that cross a shipping split to their correct plugs provided for this purpose.

   NOTE: The terminal blocks have been labeled at the factory and are shown on the connection diagrams for the installation.

3. Connect any controls for remote mounted relays, control switches, and instruments to a set of terminal blocks located on either the rear frame of the vertical section or in the instrument compartment. Refer to the customer “connection diagram” drawings.
4. Check control wiring with the connection diagram to confirm all connections have been made properly, current transformer circuits completed, and loose connections tightened properly.

   NOTE: If the control power source is other than an internal control power transformer, the wires from the source to the switchgear must be of adequate size to avoid excessive voltage drop during operation.

Connect Communications Cables—Modbus RS485 or Ethernet (Modbus TCP)

Equipment provided with Communication Components (I/O Modules, IFE or IFM) enables customer networks to communicate with circuit breakers and electronic meters to provide status and energy monitoring. If so equipped, the customer drawings will indicate network cable connections within the

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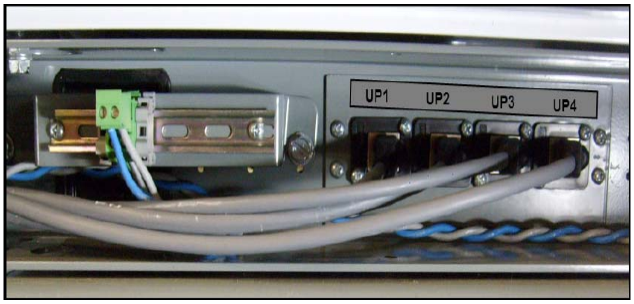
equipment and customer connection point(s). Follow the steps below to complete necessary connections of network cables across shipping splits.

1. Locate network communication cables stored for shipment in the bottom front wireway of each section. See Figure 33 for example of stored cables.

Figure 33: Example of Communication Cables Temporarily Stored in Wireway for Shipment

2. Refer to the Communication System Schematic drawings shipped with the equipment and identify cables to be connected between shipping splits as listed in a., b. or c. below. Cables have labels corresponding to Wiring Diagrams and the destination ends (e.g. UP1L means UP port #1 in the Left adjacent section. UP3R means UP port #3 in the Right adjacent section).
   a. Universal Logic Plug (ULP)-type cables (see Figure 34). ULP cables connect individual circuit breakers to a network interface (Modbus RS485 via "IFM" component or Ethernet Modbus TCP via "IFE" component). The cables are gray and communicate over the Universal Logic Plug (ULP) system between communication components (such as I/O module, Front Display Module, IFE or IFM).
   b. Modbus RS485-type cables (see Figure 38).
   a. Ethernet (Modbus TCP)-type cables (see Figure 40).

Figure 34: Example of Gray ULP Cables Connected to ULP Ports



Note: In the photo the ULP ports are labeled as "UP1", UP2", UP3" and "UP4"

3. Reference Figure 35, 36, and 37. to connect ULP cables between shipping splits by identifying “UP” plug port in adjacent section with the corresponding “UP” port number on the wire label.

   NOTE: ULP Plug port may be located in the section to the right or left and is mounted on a gray (connector) plate with RJ45 female connectors mounted on it. ULP Ports are typically identified as "UPx" where x = 1, 2, 3, 4, 5, 6, 7 or 8.

4. Route ULP cable from originating section through the right and/or left side grommet(s) of the bottom front wireway and to the destination section where the ULP port is located.

Figure 35: Gray ULP multi-conductor cables in bottom front wireway shown with 24V cable bundles (red and gray)

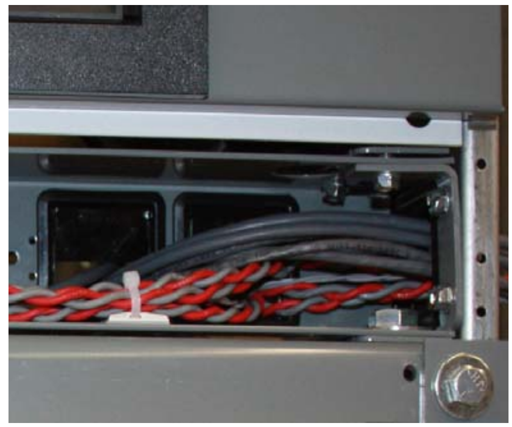


Figure 36: ULP and 24V cables brought through side openings of bottom front wireway

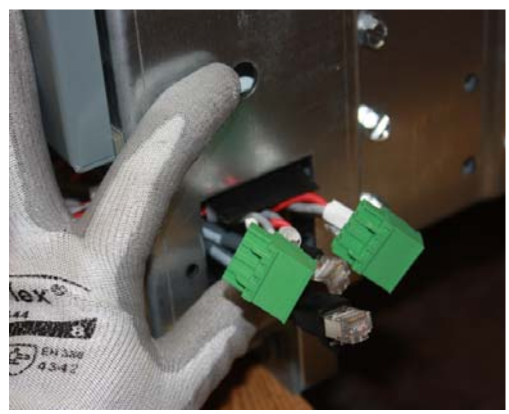


Figure 37: ULP Cables routed and connected to labeled ULP ports in adjacent section wireway

5. If you have a Modbus RS485 network with IFM's within your equipment (see Figure 38 on page 35), follow steps 6-8 below. If you have an

Ethernet Modbus TCP network with IFE's within your equipment (see Figure 40 on page 36), follow steps 9-11 below.

6. Modbus RS485 cables are gray, multi-conductor shielded cables with a 4-point green plug on the end (see Figure 38: on page 35). At each shipping split bottom front wireway a green, 4-point plug will be rolled back for connection to the stationary connector in the section to the right.

   NOTE: The terminal blocks have been labeled at the factory and are shown in the Wiring Diagrams for the sections and Communication System Schematic diagrams for the lineup.

Figure 38: Example of Modbus RS485 4-pin Plug

7. Route the green plug from the originating section through the right side grommet of the bottom front wireway and to the destination section at right.
8. Connect the plug to the green stationary connector on the left side of the bottom front wireway (see Figure 39). Modbus RS485 network interconnection is now complete.

Figure 39: Modbus RS485 Stationary Connector in Left Side of Bottom Front Wireway

9. Ethernet Modbus TCP cables are blue with an RJ45 connector on each end. Ethernet cables are to be connected to destination ports between shipping splits and are temporarily bundled for shipment in the bottom front wireway of the sections. The destination ports are RJ45 female connectors mounted on blue (connector) plates in the bottom front

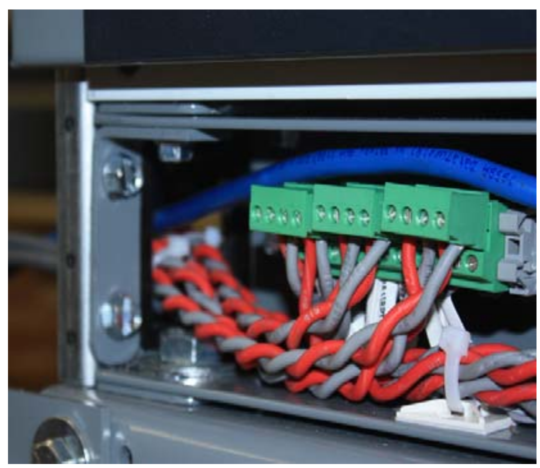
wireway of some sections (refer to factory Wiring Diagrams drawings for sections with Ethernet ports).

NOTE: The cables are labeled with port numbers corresponding to the destination port. Cables have labels corresponding to drawings and the destination ends (e.g. EP2 means Ethernet Port 2 in an adjacent section) (see Figure 40).

Figure 40: Example of Ethernet Modbus TCP Cable (Blue) Connection to Labeled Ethernet Port

10. Route the Ethernet cables between shipping splits as shown on the factory drawings through the bottom front wireway and through the side grommet on each section (see Figure 41).

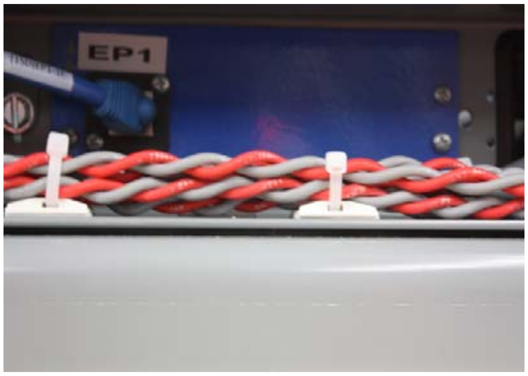
Figure 41: Ethernet Through-side Opening



11. Connect the male RJ45 plug of the Ethernet cable into the corresponding labeled RJ45 female port on the **blue (connector) plate** (see Figure 42).

    NOTE: Do not connect the blue Ethernet cables into the RJ45 ports on the gray (connector) plates. The RJ45 ports on the gray (connector) plates are for ULP connections from steps 3-4 above.

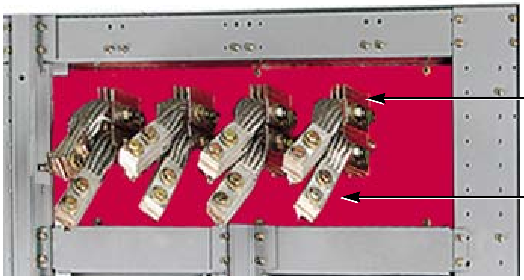
Figure 42: Example of Blue Ethernet Port & Label with Connected Ethernet Cable



Mount the Flex Connectors

This section contains instructions on how to mount flex connections on Power-Zone 4 switchgear transformer stabs or adapter bus.

Figure 43: Typical Flex Connections



Switchgear (side)

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Turn off all power supplying the transformer before installing the transformer flex connectors.
- Always use a properly rated voltage sensing device to confirm power is off.

Failure to follow these instructions will result in death or serious injury.

NOTE: Mount flex connectors in the top holes of the transformer bus on half neutral bus ratings.

1. Turn off all power supplying the transformer before installing the transformer flex connectors. Use a properly rated voltage sensing device to confirm all power is off.
2. Attach the appropriate flex connector (Figure 44 on page 38) to the transformer stabs or adapter bus.
3. Attach the accompanying 1/2-inch (13 mm) bolts and nuts to each flex connector, and torque to 60–70 lb-ft (81–95 N•m).

   Figure 44 on page 38 shows a typical transformer connection situated on the right side of the Power-Zone 4 switchgear.

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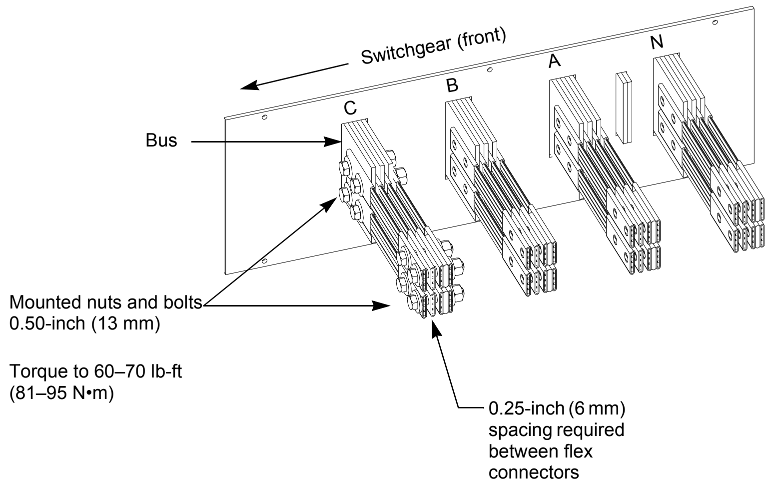
Figure 44: Typical Transformer Connection on Right Side of Switchgear



Install the Traveling Lifter

⚠ DANGER

HAZARD OF FALLING OBJECTS OR EQUIPMENT

- Do not install or operate the traveling lifter assembly unless two or more qualified personnel are present.
- Do not change the mechanics or design of the traveling lifter.
- Always keep the gears on the traveling lifter well lubricated. Never allow the gears to run dry.
- Never operate the traveling lifter with broken or distorted teeth, a bent handle, cable deterioration, or other obvious distortions.
- Do not overload, snarl, kink, or knot the cable.
- Never let the traveling lifter drum unwrap completely so the load is supported completely and only by the anchor.
- Do not load the traveling lifter beyond its rated load capacity of 300 lb (135 kg).
- Do not move the traveling lifter by pulling on a suspended circuit breaker.
- Do not walk or stand under suspended loads or the traveling lifter assembly.

Failure to follow these instructions will result in death or serious injury.

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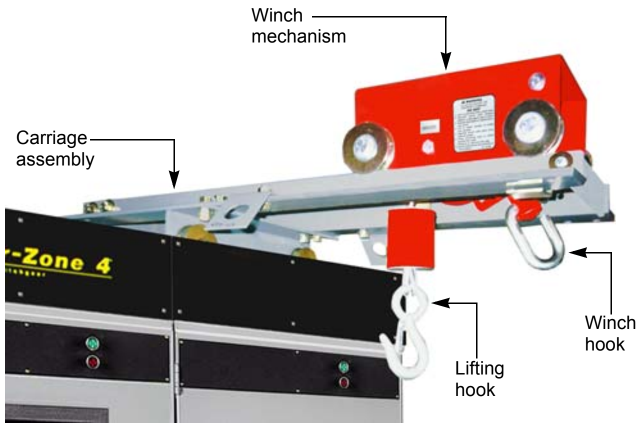
Figure 45: Typical Traveling Lifter Assembly



Align the Sections and Rails

> **NOTICE**
>
> **HAZARD OF ROOF DEFLECTION**
>
> Do not climb on the roof of the switchgear sections. The switchgear is not designed to support additional weight.
>
> **Failure to follow this instruction can result in equipment damage.**

After the switchgear has been moved to its final location, check for proper rail alignment before installing the traveling lifter assembly.

Both front and rear rails must be aligned to provide proper operation of the traveling lifter assembly. Alignment is particularly critical between vertical sections that are split for shipping purposes.

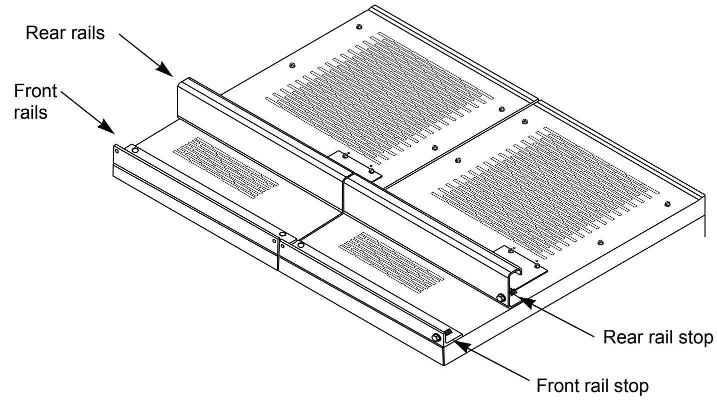
If the vertical sections were assembled at the factory, the rails and section(s) should already be aligned. However, this procedure is important to confirm alignment of the vertical sections and rails.

NOTE: A minimum of 16 inches (406 mm) of unrestricted workspace is required from one side of the switchgear lineup in order to install the carriage assembly. If this is NOT possible after final placement of the switchgear, install the traveling lifter assembly before moving the switchgear to its final location. Do not move the carriage assembly when placing the switchgear.

1. After the switchgear is placed in its final location, align the sections (Figure 46) so that the front and rear rails line up in all directions.

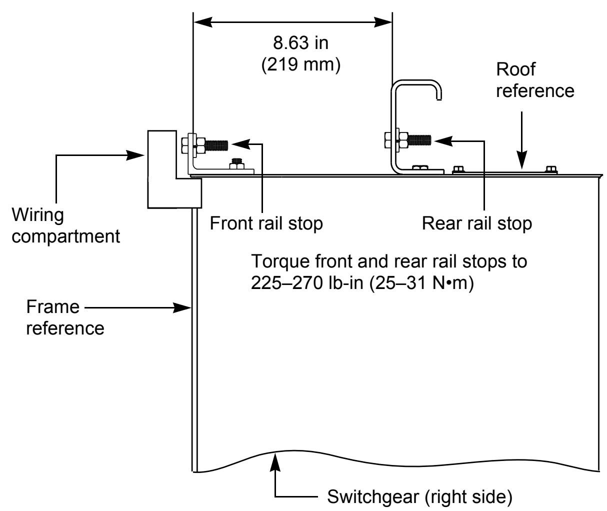
   NOTE: In Figure 46, the wiring compartment is removed from the front of the switchgear for clarity.

Figure 46: Aligning the Vertical Sections



2. Align the front and rear rails (Figure 47 on page 40) to within 1/16-inch (2 mm) for proper operation of the traveling lifter. This is critical for ease of movement transversely along the width of the switchgear.

Figure 47: Aligning the Front and Rear Rails



Rail Alignment Troubleshooting Steps

a. Place shims under the equipment sections to achieve proper vertical alignment.
b. Loosen the rail bolts to realign the front and rear rails; then tighten bolts, and torque to 225–270 lb-in (25–31 N•m).

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Install the Carriage Assembly

⚠ DANGER

HAZARD OF FALLING EQUIPMENT OR LOAD

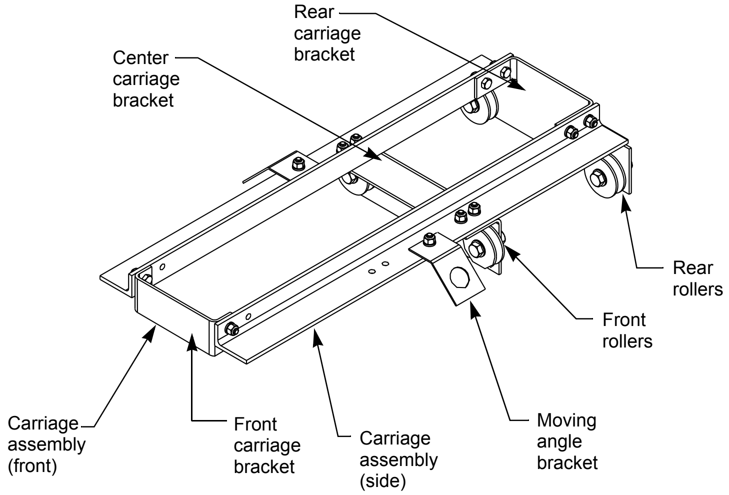
- Do not remove the front rail stops after the carriage assembly is installed.
- The front rail stops (bolts) must be assembled on the front rails to prevent the lifter from rolling off the end of the switchgear lineup.

Failure to follow these instructions will result in death or serious injury.

NOTE: The carriage assembly is packed separately from the switchgear.

1. Remove the front and rear rail stops (Figure 47) from the end section of the switchgear on which the carriage assembly will be installed. Retain the front and rear rail stops and hardware.
2. Remove the shipping banding securing the carriage assembly to the pallet.
3. Position the lifting equipment under or around the carriage assembly.
4. Confirm that support is adequate and that the carriage assembly is held securely.
5. Before raising the carriage assembly (Figure 48), orient it so that the front of the carriage assembly lines up with the front of the switchgear.

Figure 48: Carriage Assembly (Front and Side View)



6. Carefully raise the carriage assembly (this requires two qualified personnel), and move it into place on the front and rear traveling lifter rails as shown in Figure 49.

   NOTE: In Figure 49, the wiring compartment is removed from the front of the switchgear for clarity.

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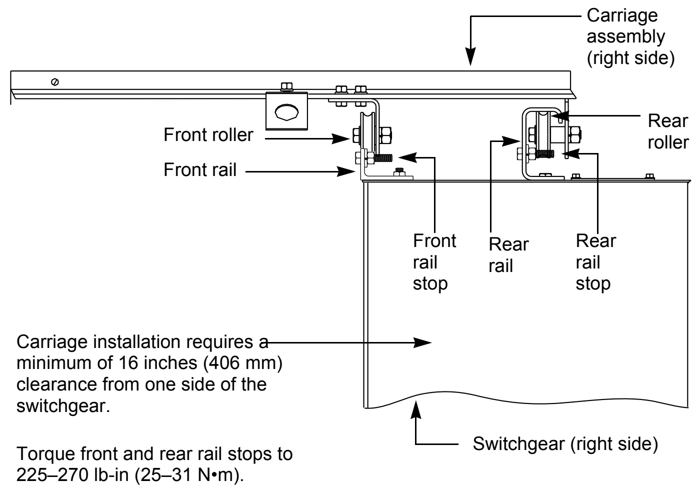
Figure 49: Installing the Carriage Assembly



7. Position the front rollers on top of the front rails and the rear rollers underneath the rear rails.
8. Slide the carriage along rails until it clears the front lifter stop position.
9. After the carriage assembly is in place, reinstall the front and rear rail stops (Figure 49) removed in step 1, and torque to 225–270 lb-in (25–31 N•m).

Install the Winch Mechanism

⚠ WARNING

HAZARD OF FALLING EQUIPMENT OR LOAD

- Always keep 4 to 5 wraps of cable on the winch mechanism drum.
- Never let the drum unwrap completely, so that the load is supported only by the anchor.

Failure to follow these instructions can result in serious injury or equipment damage.

Perform the following steps to install the winch mechanism on top of the carriage assembly.

NOTE: The winch mechanism is packed separately from the switchgear.

1. Remove the front carriage bracket (Figure 50) from the carriage assembly. Retain the bracket and hardware.

   NOTE: In Figure 50, the wiring compartment is removed from the front of the switchgear for clarity.

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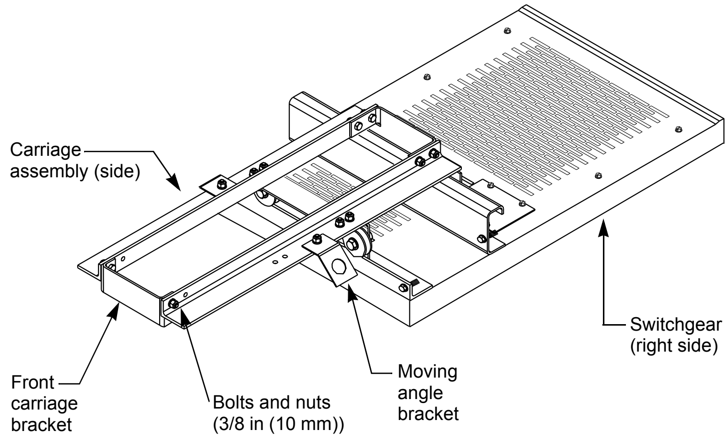
Figure 50: Removing the Front Carriage Bracket



2. Unpack the winch mechanism shipping carton contents near the switchgear.
3. If needed, lubricate the winch gears with heavy gear lubricant.

   NOTE: For best results, keep the gears lubricated. In normal operating conditions, use a heavy gear lubricant. In dirty or gritty conditions, use a dry lubricant, such as dry graphite.
4. Confirm that the cable is wrapped firmly around the drum. Never allow fewer than 4 to 5 cable wraps around the drum.
5. Before raising the winch mechanism, orient it (Figure 51) so that the front of the winch mechanism lines up with the front of the switchgear.
6. Install the winch mechanism (Figure 52) to the carriage assembly by rolling the winch wheels onto the carriage rails.

   NOTE: Confirm that the winch stop brackets are under the carriage rails.

   In Figure 52, the wiring compartment is removed from the front of the switchgear for clarity.

Figure 51: Winch Mechanism (Front View)

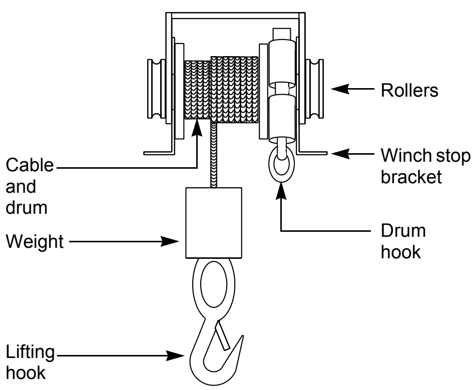
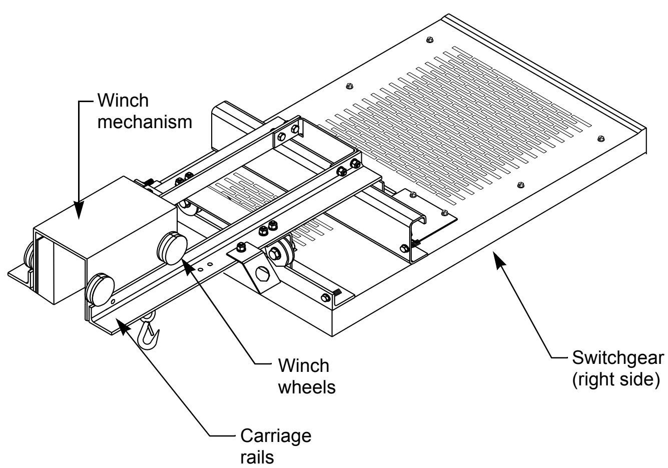


Figure 52: Installing the Winch Mechanism



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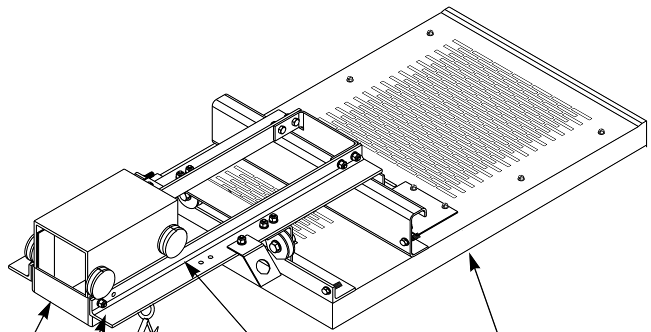
7. After the winch mechanism is in place, reinstall the front carriage bracket (Figure 53) removed in step 1 on page 42, and torque to 225–270 lb-in (25–31 N•m).

   NOTE: Confirm that the winch stop brackets are behind the front carriage bracket and under the carriage rails before tightening the carriage bracket and hardware.

   In Figure 53, the wiring compartment is removed from the front of the switchgear for clarity.

Figure 53: Installing the Front Carriage Bracket



Inspect and Test Before Operation

Once the traveling lifter is installed completely, visually inspect it (Figure 54) for any distortion.

- Confirm that the rails and sections are aligned.
- Confirm that the front and rear rails stops have been installed correctly.
- Confirm that the carriage and winch mechanism have been installed correctly.
- Confirm that the cable has been fastened securely around the winch drum.
- Confirm that the winch gears are well lubricated.

  NOTE: For normal operation, use a heavy gear lubricant. In very dirty or gritty conditions, use a dry lubricant, such as dry graphite, to lubricate the gears. Never allow the gears to run dry.

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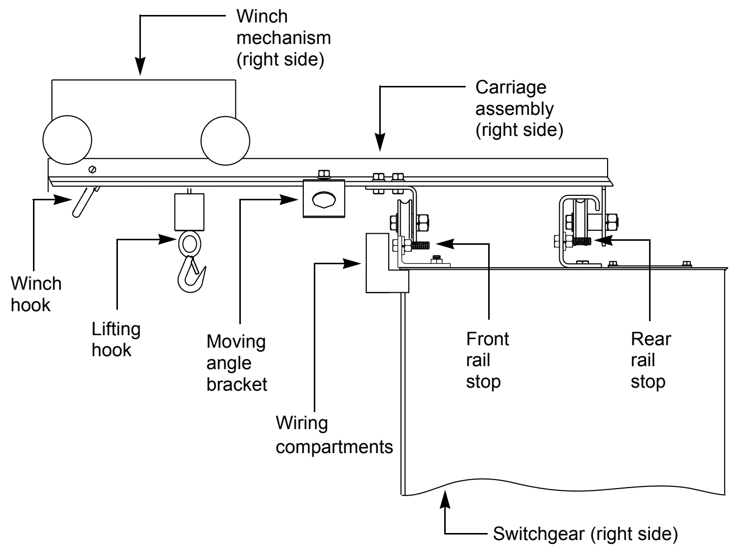
- If applicable, remove handling means and any obstructions on top of the unit that could inhibit operation of the traveling lifter.

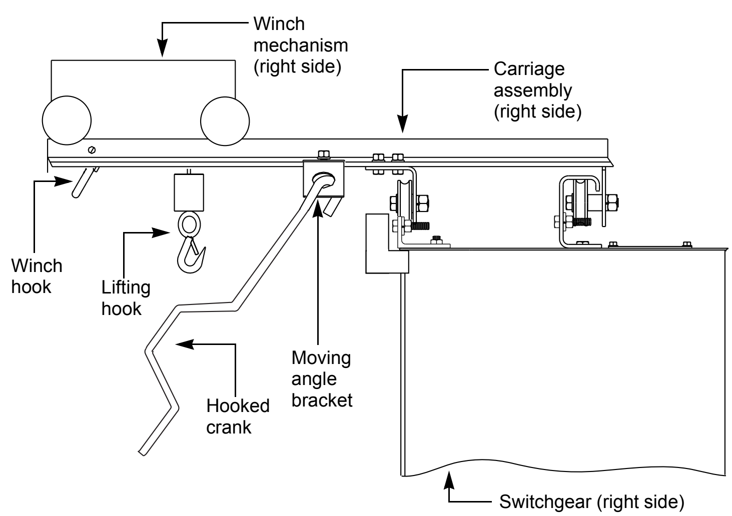
Figure 54: Visually Inspecting the Traveling Lifter



Use the traveling lifter hooked crank to move the carriage assembly from side-to-side along the top of the vertical sections to confirm that the traveling lifter operates properly.

1. Locate the hooked crank, and insert the hooked end through the moving angle bracket as shown in Figure 55.

Figure 55: Testing the Carriage Assembly



2. Pull the hooked crank so that the carriage assembly rolls smoothly along the rails.

   NOTE: If the carriage assembly does not roll smoothly, reinspect the top of the unit for obstructions or for front and rear rail misalignment.

3. Insert the hooked end of the traveling lifter hooked crank through the winch hook as shown in Figure 56.

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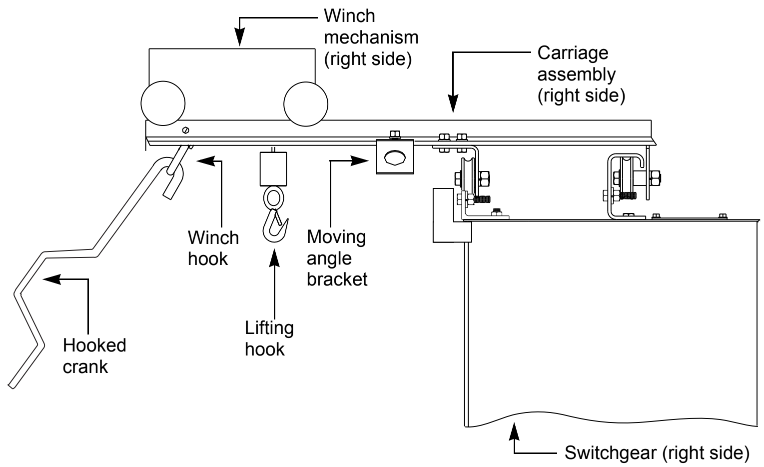
Figure 56: Testing the Winch Mechanism



4. To operate the traveling lifter:
    a. Turn the crank counterclockwise to lower the lifting hook.
    b. Turn the crank clockwise to raise the lifting hook just below the winch hook.

    NOTE: If the winch mechanism does not raise or lower the lifting hook, reinspect the unit for obstructions or adequate gear lubrication.

Assemble the Circuit Breaker Lifter Bars

Table 5: Circuit Breaker Lifter Bar Assembly

Circuit Breaker Type	Amperes	Circuit Breaker Frame Width
NT08 (N1, H1, L1F)	800 A	T-frame 9.50 in (241 mm)
NW08, NW16, NW20, NW32 (N1, H1, H2)	800–3200 A	W-frame 15.75 in (400 mm)
NW08, NW16 (L1, L1F)	800–1600 A	W-frame 15.75 in (400 mm)
NW20 (L1–Feeder, L1F-Feeder)	2000 A	W-frame 15.75 in (400 mm)
NW40, NW50 (H2, L1)	4000–5000 A	Y-frame 31.00 in (787 mm)
NW20, NW32 (L1)	2000–3200 A	Y-frame 31.00 in (787 mm)

⚠ DANGER

HAZARD OF FALLING EQUIPMENT OR LOAD

- Do not change the mechanics or design of the circuit breaker lifter bar.
- Use the circuit breaker lifter bar (furnished with each switchgear order) in conjunction with the traveling lifter assembly or floor crane to lift the circuit breaker.

Failure to follow these instructions will result in death or serious injury.

The T-frame circuit breaker lifter bar is used to lift and lower Masterpact NT circuit breakers. The W-frame and Y-frame circuit breaker lifter bars are used to lift and lower Masterpact NW circuit breakers. The size of the circuit breaker determines if the W-frame (standard width) or Y-frame (double width) circuit breaker lifter bar will be used.

Refer to Table 5 to determine which circuit breaker lifter bar to use for assembly.

ENGLISH

Figure 57: T-Frame Circuit Breaker Lifter Bar

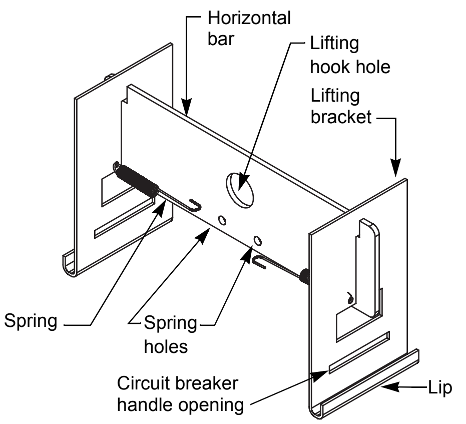
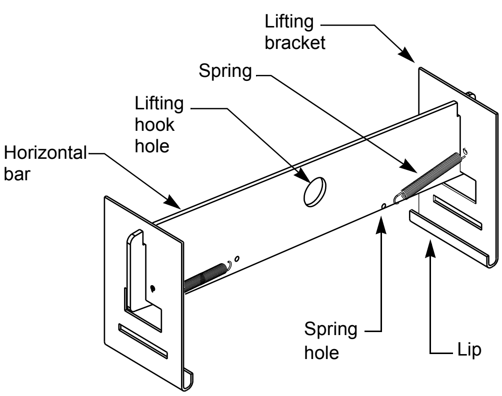


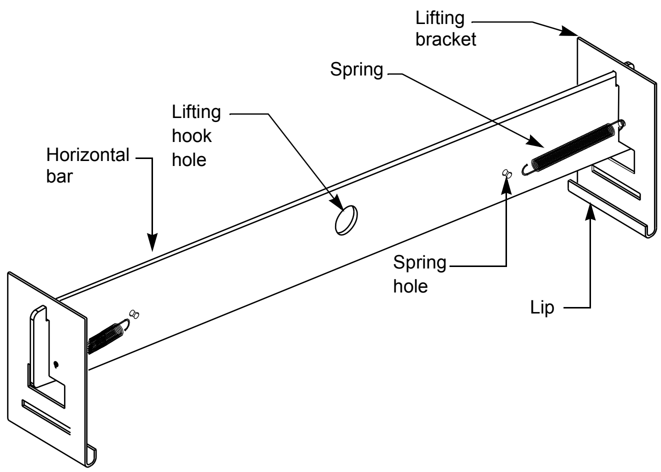
Figure 58: W-Frame Circuit Breaker Lifter Bar



Perform these steps to assemble the T-frame, W-frame, and Y-frame circuit breaker lifter bars (Figures 57, 58, and 59).

1. Position the horizontal bar with the lifting hook hole right-side up.
2. Note the direction of the lip. Slide the lifting brackets into the grooves on the horizontal bar.
3. Attach the springs from the lifting bracket to the spring holes as shown in Figures 57, 58, and 59.

Figure 59: Y-Frame Circuit Breaker Lifter Bar



ENGLISH

Prepare and Install the Circuit Breakers

⚠ DANGER

HAZARD OF FALLING EQUIPMENT OR TIPPING LOAD

- Never stand under a suspended circuit breaker.
- Use the traveling lifting hook (or other suitable lifting hook) in combination with the circuit breaker lifter bar (supplied with the switchgear) to move the circuit breaker.
- Confirm that the safety catch is properly closed on the lifting hook.

Failure to follow these instructions will result in death or serious injury.

Before proceeding further, refer to the job drawings and Masterpact circuit breaker manual. Follow all of the safety precaution instructions detailed in the circuit breaker manual.

NOTE: The circuit breakers may be packed separately from Power-Zone 4 switchgear.

Lift and Move the Circuit Breakers

Follow these instructions to move the circuit breaker to the installation site.

1. Unpack the circuit breakers, if necessary, according to the Masterpact circuit breaker manual.
2. Firmly attach the circuit breaker lifter bar into the slots on both sides of the circuit breaker (Figure 60). For a T-frame circuit breaker, extend the circuit breaker handles and place them through the handle slots of the circuit breaker lifter bar (Figure 57 on page 47 and Figure 61 on page 49).

Figure 60: Attaching the Lifter Bar to the Circuit Breaker

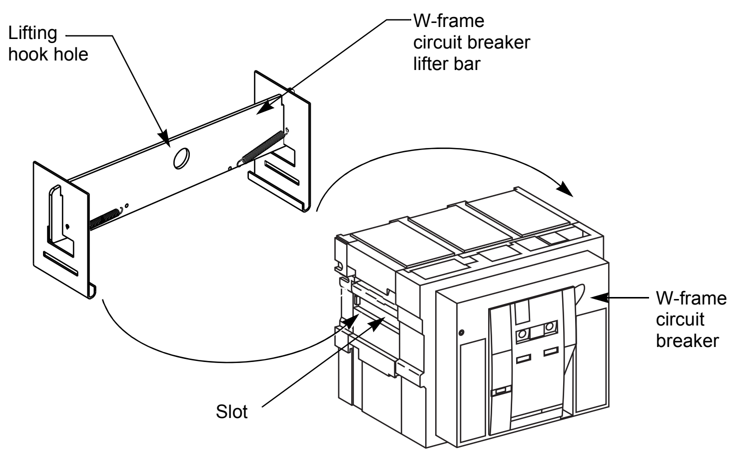
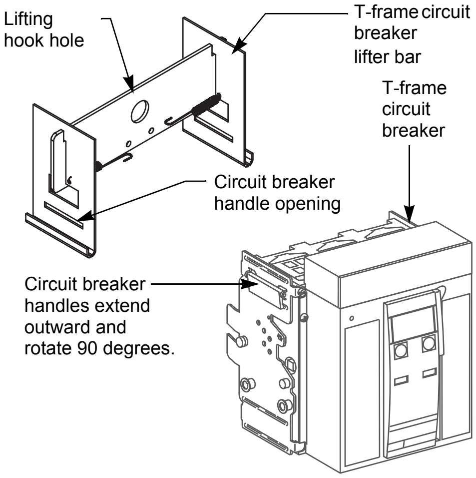
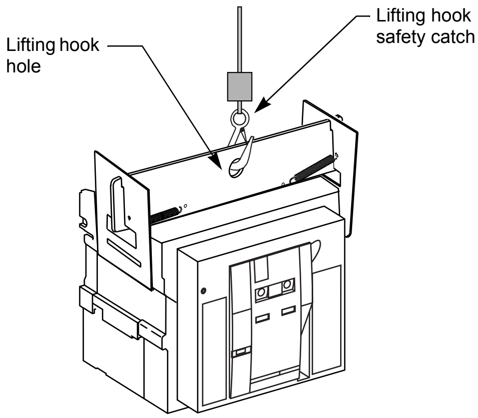


Figure 61: Attaching the T-Frame Lifter Bar to the Circuit Breaker



3. Attach the traveling lifter or floor crane lifting hook in the lifting hook hole (Figure 62). Make certain the safety catch is closed on the lifting hook before raising or lowering the circuit breaker.

Figure 62: Lifting and Moving the Circuit Breaker



4. Use the traveling lifter or floor crane to lift and move the circuit breaker.
5. Install the circuit breaker per the circuit breaker manual.

ENGLISH

Switchgear Inspection and Testing Before Operation

After Power-Zone 4 switchgear and components have been installed, and all control and primary connections made, perform a final inspection and test before placing the switchgear into service.

When installed correctly, the indoor switchgear conforms to the following requirements:

- Front panels form a straight, true line; and when transformers and/or other gear are included, the front panels line up or form parallel lines.
- Units are spaced correctly from center-to-center and perpendicular to the mounting surface.
- The switchgear is fastened securely to the floor channels or base pad.
- The shipping sections are bolted together securely.
- Bus and control wiring connections are connected properly.

Directions for testing relays, instruments, meters, circuit breakers, and other electronic devices that are included in the assembly are given in the manual for each individual device.

Settings for protective devices are determined from a coordination study performed by the purchaser, consultant, or the Schneider Electric coordination group. Factory settings are used for production testing and may not reflect specific site requirements.

Selection of test equipment depends on the rating and type of installation. A multimeter is necessary to check the continuity of control circuits. A megohmmeter is also needed for testing.

Check the Power Circuit Connections

Perform the following steps to check power circuits.

1. Check wire connections and bolted bus connections to confirm that no loosening or damage occurred during shipment or installation. Immediately replace any covers or barriers that were removed to check connections.

   NOTE: Correct torque values are listed on labels located in the cable compartment.

2. If the bus is equipped with insulation:
   a. Partially remove the insulating bus boots to check bolted bus connections by snipping just enough wire ties to gain access to the connection hardware.
   b. Reinstall the insulated bus boots immediately after inspection by inserting new wire ties into the attachment holes. Use the wire ties provided (Schneider Electric part number 25901-24485).

Check the External Equipment

Perform continuity checks for the connections to external equipment, such as remote controls, interlock circuits, and auxiliary switches. Refer to the appropriate procedures in the manual for each individual device being tested.

Check the Auxiliary Equipment

Relays included on or in the instrument panels are set for manufacturing testing levels when shipped.

1. Determine the final relay settings from a coordination study performed by the purchaser, consultant, or Schneider Electric coordination group.
2. Make necessary modifications to the relay settings according to the manual for that particular relay.

Circuit monitors and power meters included on the front of the switchgear may or may not be properly configured. The final configuration of these devices must be set by the purchaser or consultant. Refer to the circuit monitor and power meter manuals when setting these devices.

Check the Equipment Ground-Fault Systems

Paragraph 230-95(c) of the National Electrical Code requires that all equipment ground-fault protection systems be tested when first installed. If the circuit breaker has integral equipment ground-fault protection installed, test it at this time.

Make sure trip unit is powered. The trip unit is powered if:

- The circuit breaker is closed or bottom-fed and has more than 100 V of load voltage on two phases (P or H trip unit only).
- The full-function or hand-held test kit is connected and on.
- The 24 Vdc external power supply is connected.
- An external voltage tap is installed and voltage of more than 100 V is present on two phases (P or H trip unit only).

If this is a radial (single-ended) system, press the ground-fault Push-to-Test button. The circuit breaker will trip, and the trip unit ground-fault indicator light will come on.

Ground-fault protection also may be provided by a means not integral to the circuit breaker, such as an external relay. Follow the manufacturer's instructions for this system, and test it at this time.

Record results on the ground fault system test log.

NOTE: If a complete check of the ground-fault system is necessary, use primary injection testing. If the system is multiple source and/or requires field connections at the job site, use primary injection testing.

NOTE: Some ground fault systems require field connections at the job site. Consult the switchgear interconnection wiring drawing for details.

Conduct the Electrical Insulation Resistance Test

⚠CAUTION

TEST VOLTAGE HAZARD

- Remove the long-time rating plug before electrical insulation testing a circuit breaker that has a label stating "Warning: Disconnect Plug Before Dielectric Test".
- Some Micrologic™ trip units are not rated for voltages that would occur during electrical resistance insulation testing.
- Open all control and metering disconnects from the control circuits.

Failure to follow these instructions can result in personal injury or equipment damage.

Power-Zone 4 switchgear and Masterpact circuit breakers are factory-tested for dielectric insulation strength.

Conduct dielectric testing once the switchgear is installed. This testing will help identify short-circuits and undesirable grounds in the switchgear and help identify any potential damage to the insulation during transport and installation.

1. Refer to ANSI/IEEE C37.20.1 for information regarding field dielectric testing.
2. Open all control power and metering disconnects, or remove the fuses from the control circuits. Disconnect the neutral connection at any transient voltage surge suppressor (TVSS) or other electronic device prior to performing the electrical insulation resistance test, then reconnect after the test.
3. With the neutral isolated from the ground and the power switches and circuit breakers open, conduct electrical insulation tests from phase-to-phase, phase-to-ground, phase-to-neutral, and neutral-to-ground.

   NOTE: If the resistance reads less than one megohm while testing with the branch circuit devices in the Open position, the system may be unsafe and should be investigated. Consult Schneider Electric Services at 1-888-778-2733 to help you correct any problems.
4. After completing the electrical insulation test, replace all control power fuses that may have been removed and close power disconnects that have been opened. Energize supplies as desired.

ENGLISH

Section 5—Pre-Energizing Checkout Procedure

Conduct a complete inspection **before** the switchgear is energized to ensure that all components function and operate properly. **Complete every step of the checkout procedure listed before energizing the switchgear.**

NOTICE

LOOSE FUSE CLIPS

Do not pry open or spread the fuse mounting clips. This can cause a loose connection, resulting in overheating.

Failure to follow this instruction can result in equipment damage.

1. Check all field-installed bus bar connections.
2. Check all accessible connections for tightness.
3. Check all factory and field-installed lug terminations for tightness.
4. Check the rigidity of all bus bar supports.
5. Check the switchgear enclosure for dents or other damage that reduces electrical clearances inside the switchgear.
6. Remove all foam blocks, or other temporary cushioning or retaining material, from the electrical devices.
7. Open and close all circuit breakers and other operating mechanisms, checking for correct alignment and free operation.
8. Operate all electrically operated switches, circuit breakers, and other devices equipped with remote operators (not under load). An auxiliary source of control power may be necessary to accomplish this.
9. Check all relays, meters, and instrumentation to verify that all field installed wiring connections are made properly and that the devices function properly.
10. Current transformers (CTs) supplied for customer use require connection to a metering device load before energizing. Verify that the metering device load is properly connected, including main switchgear connections to remote equipment.
11. All CT circuits supplied by Schneider Electric for customer metering use are shorted for shipment. Remove shorting terminal screws on shorting terminal blocks or jumpers and store in the block.
12. On switchgear containing an electronic trip circuit breaker, set the tripping characteristic curve of the adjustable electronic trip unit per the job requirements, or as outlined in the respective instruction manual.
13. Verify that all grounding connections are correctly made. If the switchgear is used as a service entrance, double check to see that the main bonding jumper is connected.
14. Check all field-installed wiring. Make certain it is clear of all live parts, and when instructed, secured to withstand fault currents.
15. Verify that all control wiring between sections is connected.
16. Vacuum to remove any dust, scrap wire, or other debris.
17. Replace all covers; check for any pinched wires, and close doors. Make certain all enclosure parts are properly aligned and fastened securely.

NOTICE

CONTAMINATION HAZARD

Do not use an air hose to blow out the switchgear. The dust may settle inside relays and overcurrent devices, causing overheating and improper operation.

Failure to follow this instruction can result in equipment damage.

ENGLISH

Section 6—Energizing the Switchgear

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Correct short circuit conditions detected during the checkout procedures described in “Section 5—Pre-Energizing Checkout Procedure”, beginning on page 52.
- Qualified electrical personnel must be present when energizing this equipment for the first time.
- Follow the instructions in this section to properly energize the switchgear.

Failure to follow these instructions will result in death or serious injury.

1. No load should be on the switchgear when it is energized. Turn off all downstream loads.
2. Energize the switchgear in the following sequence:
   a. Turn on all control power disconnects before energizing the switchgear. Refer to the record drawings supplied with equipment to see if control power disconnects are supplied.
   b. Close any open doors and/or covers.
   c. Close the main device(s).
   d. Close each branch circuit breaker.
   e. Proceed to each panelboard and other downstream load.

After all overcurrent protective devices are closed, turn on all loads (for example, lighting circuits, contactors, heaters, and motors).

ENGLISH

Section 7—Maintaining the Switchgear

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Inspect and perform preventive maintenance only on switchgear and equipment to which power has been turned to the OFF position, disconnected, and electrically isolated (unless otherwise specified) so that no accidental contact can be made with energized parts.
- Follow safety related work practices as described in NFPA 70E - Standard for Electrical Safety Requirements for Employee Workplaces and OSHA Standards - 29 CFR Part 1910 Subpart S - Electrical.

Failure to follow these instructions will result in death or serious injury.

Periodic maintenance on the switchgear includes cleaning, lubrication, and exercising component parts. The interval between maintenance checks can vary depending upon the amount of usage and environmental conditions of each installation. The maximum recommended inspection interval is one year. This definition for periodic maintenance applies throughout this manual, unless otherwise noted.

Always inspect the switchgear after a fault. (Refer to “Section 8—Adverse Circumstances”, beginning on page 59). Service manuals for the various disconnecting and overcurrent devices mounted in the switchgear are available through Schneider Electric Services at 1-888-778-2733.

Switchgear Inspection Guidelines

In general, the following guidelines may be followed. However, as conditions vary, the maintenance program must also be adapted to provide a long life for the equipment and the electrical system.

Periodic inspection of the equipment will be necessary to establish the conditions to which the switchgear are subjected (see “Ideal Operating Conditions” below, and “Normal Operating Conditions” and “Harsh Operating Conditions” on page 55). Perform inspections and maintenance according to these conditions.

Inspect the equipment immediately after abnormal or stressful operating conditions occur or after the equipment experiences a fault current.

These inspection and maintenance guidelines cover only Schneider Electric brand Power-Zone 4 switchgear. If conditions cannot be established and documented, then the harsh operating condition must be assumed.

These inspection and maintenance guidelines do not warrant any field connections, field modifications, or supersede any maintenance procedures or schedules recommended by component manufacturers. For more information regarding the warranty of this product, refer to “Schneider Electric Conditions of Sale.”

Ideal Operating Conditions

When the equipment is operating under the “ideal operating conditions” outlined below, it should be able to operate without maintenance for a period of five years.

Environmental

- Ambient room temperature range is 50 °F (10 °C) to 104 °F (40 °C).
- Altitude is less than 6600 ft (2012 m).
- Equipment is located indoors in a climate controlled room (heat/AC).
- Absence of dust or debris either airborne or settled.
- Relative humidity averaging less than 70%.

- Absence of vibrations or seismic activity.

Circuit Loading

- Continuous loading (with 100% rated devices) is between 20–80% of the equipment ratings.
- Average loading not exceeding 70% of the equipment rating.
- Only resistive or continuous motor loads, no welding or jogging loads.
- Circuit breaker switching less than 15 cycles annually.
- Maximum of two circuit breaker trips due to overload or fault annually.

Equipment Installation

- Torque all busbar joints, lugs, and bolts to their appropriate tightness at installation.
- Securely tighten all control and communications wiring at installation.
- Follow pre-energizing checkout rigorously.

Normal Operating Conditions

When the equipment is operating under the “normal operating conditions” outlined below, it should be inspected and maintained every 1–3 years, or more frequently, based on the user’s experience.

Environmental

- Ambient room temperature is between -22 °F (-30 °C) and 104 °F (40 °C).
- Altitude is less than 6600 ft (2012 m).
- The effect of solar radiation is not significant.

  NOTE: Refer to the principles outlined in IEEE Standard C37.24-1986 for additional information.

Circuit Loading

- Circuit breaker switching is no more than 200 cycles annually.
- Welding or jogging loads represents less than 15% of a circuit and/or equipment loading.

Equipment Installation

- Torque all busbar joints, lugs, and bolts to their appropriate tightness at installation.
- Securely tighten all control and communications wiring at installation.
- Follow pre-energizing checkout rigorously.

Harsh Operating Conditions

When the equipment is operating under the “harsh operating conditions” outlined below, it should be inspected and maintained every 6 months, or more frequently, based on the user’s experience.

Environmental

- Ambient room temperature is less than -22 °F (-30 °C) or greater than 104 °F (40 °C).
- Altitude exceeds 6600 ft (2012 m).
- The effect of solar radiation is significant.
- The equipment is exposed to hot and/or humid climate.
- The equipment is exposed to damaging fumes, vapors, steam, salt air, and/or oil vapors.
- The equipment is exposed to seismic shock or abnormal vibrations or tilting.

ENGLISH

Circuit Loading

- The circuit breaker trips frequently due to overloading or fault.
- Circuit breaker switching exceeds 200 times annually.
- Welding loads or jogging loads represent greater than 15% of a circuit's load.

Equipment Installation

- Torque all busbar joints, lugs, and bolts to their appropriate tightness at installation.
- Securely tighten all control and communications wiring at installation.
- Follow pre-energizing checkout rigorously.

General Inspection and Cleaning

NOTICE

CONTAMINATION HAZARD

- Do not use an air hose to blow out the switchgear. The dust may settle inside relays and overcurrent devices, causing overheating and improper operation.
- Do not allow paint, chemicals, or petroleum-based solvents to contact plastics or insulating materials.

Failure to follow these instructions can result in equipment damage.

1. Vacuum the switchgear interior to remove any dirt or dust deposits. Wipe all bus bars, insulators, cables, and so forth, with a clean, dry, lint-free cloth.
2. Check the switchgear interior carefully for moisture, condensation build-up, or signs of any previous wetness. Moisture can cause insulation breakdown and rapid oxidation of current carrying parts. Inspect all conduit entrances and cracks between the enclosure panels for dripping leaks. Condensation in conduits may be a source of moisture and must not be allowed to drip onto live parts or insulating material. Take the necessary steps to eliminate the moisture and seal off all leaks.
3. Inspect the switchgear for any signs of overheating. Discoloration and flaking of insulation or metal parts are indications of overheating.

   NOTE: If overheating occurs, be sure that all conditions that caused the overheating have been corrected. Loose or contaminated connections can cause overheating.
4. Check for signs of rodent nesting in the switchgear. If required, use a good exterminating technique in the general area of the switchgear.

   NOTE: Do not place or use exterminating substances and chemicals inside the switchgear. Some of these products attract rodents.
5. Carefully inspect all devices for any visibly worn-out, cracked, or missing parts.
6. Open and close circuit breakers several times to verify they are working properly.
7. Verify that all key interlocks and door interlocking provisions are working properly.

Bus Bar Joints, Lug Terminations, and Insulating Materials

NOTICE

PLATING DAMAGE HAZARD

- Do not sand or remove plating on any bus bar, splice bar, or terminal lug.
- Damage to plating can result in overheating. Replace damaged part. Contact Square D Services at 1-888-778-2733.

Failure to follow these instructions can result in equipment damage.

1. Bus bar joints are maintenance-free. Do not retighten them after the pre-energizing checkout procedure is complete.
2. Check all bus bar joints and terminal lugs for any pitting, corrosion, or discoloration resulting from high temperatures or subjection to high fault conditions. If any damage has occurred, replace the bus bars or lugs. If cleaning is required, use Lectra-Clean®, made by CRC.
3. Inspect all insulating materials. Before re-energizing the switchgear, replace insulators having any visible damage (such as cracks).

ENGLISH

Traveling Lifter Inspection and Maintenance Procedures

Inspect the traveling lifter for wear. These units were developed as quality products for intermittent use, not for continuous use. Frequent use increases lifter wear, but proper lubrication can extend service life.

Lubrication

Perform the following steps to lubricate the traveling lifter assembly.

1. Make sure a good film of lubrication is always present in appropriate places.
2. All wheels and rollers must be lubricated properly with a multi-purpose grease. Brush a high-quality, multi-purpose grease onto the worm gear assembly. Repeat this procedure, as necessary, to maintain a continuous film of grease over the face of these gears.
3. Never operate the winch with the worm gear assembly dry.
4. Lubricate all other points of friction as needed with a high-quality, medium-weight oil. Avoid over saturation that produces oil dripping.

Inspection and Maintenance

After the equipment has been lubricated, perform the following steps.

- Inspect all components for cracks, loose parts, and weather or chemical damage.
- If cracks or strain damage are suspected, remove the unit from service. If cracked components are detected, replace them before returning unit to use.
- Periodically check for distortion of the traveling lifter. If distortion is found:
  - Verify that the rails and sections are aligned.
  - Verify that the carriage and winch mechanism have been installed correctly.
  - Verify that the cable has been fastened securely to the winch drum.
  - Verify that the gears are well lubricated.

    NOTE: For normal operation, use a heavy gear lubricant. In very dirty or gritty conditions, it is advisable to use a dry lubricant such as dry graphite to lubricate the gears. Never allow the gears to run dry.
- If applicable, remove handling means and any obstructions from the top of the unit that could inhibit operation of the traveling lifter.
- Thoroughly inspect the traveling lifter wire cable. Pay close attention to cable sections, such as parts passing over sheaves or wound on the drum, which are normally hidden during inspection or maintenance procedures.

  Contact Schneider Electric Services at 1-888-778-2733 if the cable shows any of the following signs of deterioration:
  - Kinking, crushing, cutting, or unstranding
  - Corroded, cracked, bent, or broken wires
  - Worn end connections
- Always keep the exterior finish in good condition to protect against corrosive damage. When damage is noticed, remove the finish to bare metal and refinish using a high-quality primer and finish coat.
- Be certain that all the warning labels are still in place and readable. If the warning labels become unreadable or are destroyed, contact your local Schneider Electric sales office.
- Do not repair any parts that are worn, cracked, deformed, misaligned, or severely corroded. Repairing parts does not ensure satisfactory or safe performance. Do not substitute other manufacturers' parts.
- Record all inspections and maintenance performed on the traveling lifter in a maintenance log. See "Section 10—Maintenance Log" on page 62.

ENGLISH

Circuit Breaker Inspection Schedule

The inspection schedule for circuit breakers and trip units should be based on recommendations contained in the circuit breaker and trip units manuals.

ENGLISH

Section 8—Adverse Circumstances

This section includes, but is not limited to, all electrical components of the switchgear.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Turn off all power supplying the switchgear before cleaning.
- Always use a properly rated voltage sensing device to confirm power is off.
- Before energizing the switchgear, all unused circuit breaker mounting spaces must be filled.

Failure to follow these instructions will result in death or serious injury.

NOTE: Before attempting to re-energize the switchgear following adverse circumstances, contact Square D Services at 1-888-778-2733 for special instructions.

Inspection Following a Short Circuit

If a short circuit occurs, make a thorough inspection of the entire system, and verify that no damage to conductors or insulation has occurred. High mechanical and thermal stresses developed by short-circuit currents may damage conductors and insulation. Check the overcurrent protection device that interrupted the short-circuit current for possible arcing damage.

Do not open sealed devices, such as molded case circuit breakers. These devices should be replaced if damaged. Before energizing the switchgear, all unused circuit breaker mounting spaces must be filled.

Clean-up Following a Short Circuit

The insulating properties of some organic insulating materials may deteriorate during an electrical arc. If so:

1. Remove any soot or debris.
2. Replace carbon-tracked insulation.

Water-Soaked Switchgear

Do not clean or repair a switchgear that has been exposed to large volumes of water or submerged at any time. Current-carrying parts, insulation systems, and electrical components may be damaged beyond repair. **Do not energize the switchgear.** Contact Square D Field Services.

Water-Sprayed or Splashed Switchgear (Clean Water Only)

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Turn off all power supplying the switchgear before cleaning.
- Always use a properly rated voltage sensing device to confirm power is off.
- Before energizing the switchgear, all unused circuit breaker mounting spaces must be filled.

Failure to follow these instructions will result in death or serious injury.

If the switchgear has been sprayed or splashed with small amounts of clean water, make a thorough inspection of the entire system, and verify that no damage to conductors or insulation has occurred. Do not open sealed devices such as molded case circuit breakers or fuses. These devices should be replaced if damaged.

ENGLISH

Inspection and Clean-up of Clean Water Sprayed or Splashed Switchgear

Follow steps 1–10 below only if:

- No signs of physical damage to the equipment are present.
- The switchgear has not been submerged or exposed to water for long periods of time.
- The water that has been in contact with the switchgear has not been contaminated with sewage, chemicals, or other substances that can negatively affect the integrity of the electrical equipment.
- The water that has been in contact with the switchgear has not entered any area of the enclosure that may contain wiring installed as intended and located above any live part. Specifically, inspect for water entering through conduits located above live parts.

If any one or more of these conditions have not been met, contact Square D Services at 1-888-778-2733.

If **ALL** of the conditions listed above have been met, proceed as follows:

1. Turn off all power supplying this equipment before working on or inside the equipment.
2. Always use a properly rated voltage sensing device to confirm power is off.
3. Disconnect and electrically isolate the switchgear so that no contact can be made with energized parts.
4. Wipe off all moisture from the bus bars, insulators, and insulating material with a clean, dry, lint-free cloth. Do **not** use cleaning agents or water displacement sprays.
5. Prepare the switchgear for insulation resistance (megger) testing by disconnecting all line side supply connections and all load side cable connections to isolate the switchgear from the wiring system.
6. Turn all circuit breakers or switches to their ON position. The switchgear must remain completely de-energized.
7. Use a megohmeter with a capacity of 500–1000 Vdc and apply voltage from:
   a. Each phase-to-ground with circuit breaker on.
   b. Phase-to-phase with circuit breaker on.
8. Record resistance values. Refer to “Section 9—Switchgear Insulation Resistance Chart” on page 61.
9. If resistance measurements are less than 0.5 megohm, call Square D Services at 1-888-778-2733 for recommendations.
10. If resistance measurements are greater than 0.5 megohm, the equipment can be energized using the procedures listed in “Section 6—Energizing the Switchgear” on page 53.

⚠ CAUTION

TEST VOLTAGE HAZARD

- Remove the adjustable rating plug before electrical insulation testing a circuit breaker that has a label stating "Warning: Disconnect Plug Before Dielectric Test".
- Some Micrologic trip units are not rated for voltages that would occur during electrical resistance insulation testing.
- Open all control and metering disconnects from the control circuits.

Failure to follow these instructions can result in injury or equipment damage.

ENGLISH

Section 9—Switchgear Insulation Resistance Chart

Always use a 500 or 1000 Vdc megohmeter when testing insulation resistance.

NOTE: The Neutral–Ground column is provided to record the results of the pre-energizing checkout procedure only.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Turn off all power to the switchgear before testing.
- Always use a properly rated voltage sensing device to confirm power is off.

Failure to follow these instructions will result in death or serious injury.

Date	Phase–Phase			Phase–Ground			Neutral–Ground
	All Disconnects Open						
	a-b	b-c	c-a	a-ground	b-ground	c-ground	Neutral–Ground
Date	All Disconnects Closed						
	a-b	b-c	c-a	a-ground	b-ground	c-ground	Neutral–Ground

Section 10—Maintenance Log

Date	Description

Date	Description

Schneider Electric USA, Inc.
800 Federal Street
Andover, MA 01810 USA
888-778-2733
www.schneider-electric.us

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80298-002-07, 06/2015
Replaces 80298-002-06, 06/2007

Power-Zone™ 4

Tablero de fuerza removible en gabinete de metal de baja tensión con interruptores de potencia Masterpact™ de baja tensión

Clase 6037

Boletín de instrucciones

80298-002-07
06/2015

Conservar para uso futuro.

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SQUARE D™
by Schneider Electric

Categorías de riesgos y símbolos especiales

Asegúrese de leer detenidamente estas instrucciones y realice una inspección visual del equipo para familiarizarse con él antes de instalarlo, hacerlo funcionar o prestarle servicio de mantenimiento. Los siguientes mensajes especiales pueden aparecer en este boletín o en el equipo para advertirle sobre peligros potenciales o llamar su atención sobre cierta información que clarifica o simplifica un procedimiento.

La adición de cualquiera de estos símbolos a una etiqueta de seguridad de “Peligro” o “Advertencia” indica la existencia de un peligro eléctrico que podrá causar lesiones personales si no se observan las instrucciones.

Este es el símbolo de alerta de seguridad. Se usa para avisar sobre peligros potenciales de lesiones. Respete todos los mensajes de seguridad con este símbolo para evitar posibles lesiones o la muerte.

PELIGRO

PELIGRO indica una situación de peligro inminente que, si no se evita, **podrá** causar la muerte o lesiones serias.

ADVERTENCIA

ADVERTENCIA indica una situación potencialmente peligrosa que, si no se evita, **puede** causar la muerte o lesiones serias.

PRECAUCIÓN

PRECAUCIÓN indica una situación potencialmente peligrosa que, si no se evita, **puede** causar lesiones menores o moderadas.

AVISO

AVISO se usa para hacer notar prácticas no relacionadas con lesiones físicas. El símbolo de alerta de seguridad no se usa con esta palabra de indicación.

NOTA: Proporciona información adicional para clarificar o simplificar un procedimiento.

Observe que

Solamente el personal calificado deberá instalar, hacer funcionar y prestar servicios de mantenimiento al equipo eléctrico. Schneider Electric no asume responsabilidad alguna por las consecuencias emergentes de la utilización de este material.

Una persona calificada es aquella que tiene destreza y conocimiento técnico relacionado con la construcción, instalación y funcionamiento del equipo eléctrico; asimismo, esta persona ha recibido capacitación sobre seguridad con la cual puede reconocer y evitar los riesgos involucrados.

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Sección 1—Introducción

Este boletín proporciona las instrucciones de instalación, funcionamiento y servicio de mantenimiento del tablero de fuerza Power-Zone™ 4, marca Square D fabricado por Schneider Electric.

Los supervisores del personal de diseño, instalación y funcionamiento por parte del comprador deberán familiarizarse con este manual así como de la apariencia y características de cada pieza del equipo montada o contenida en el tablero de fuerza.

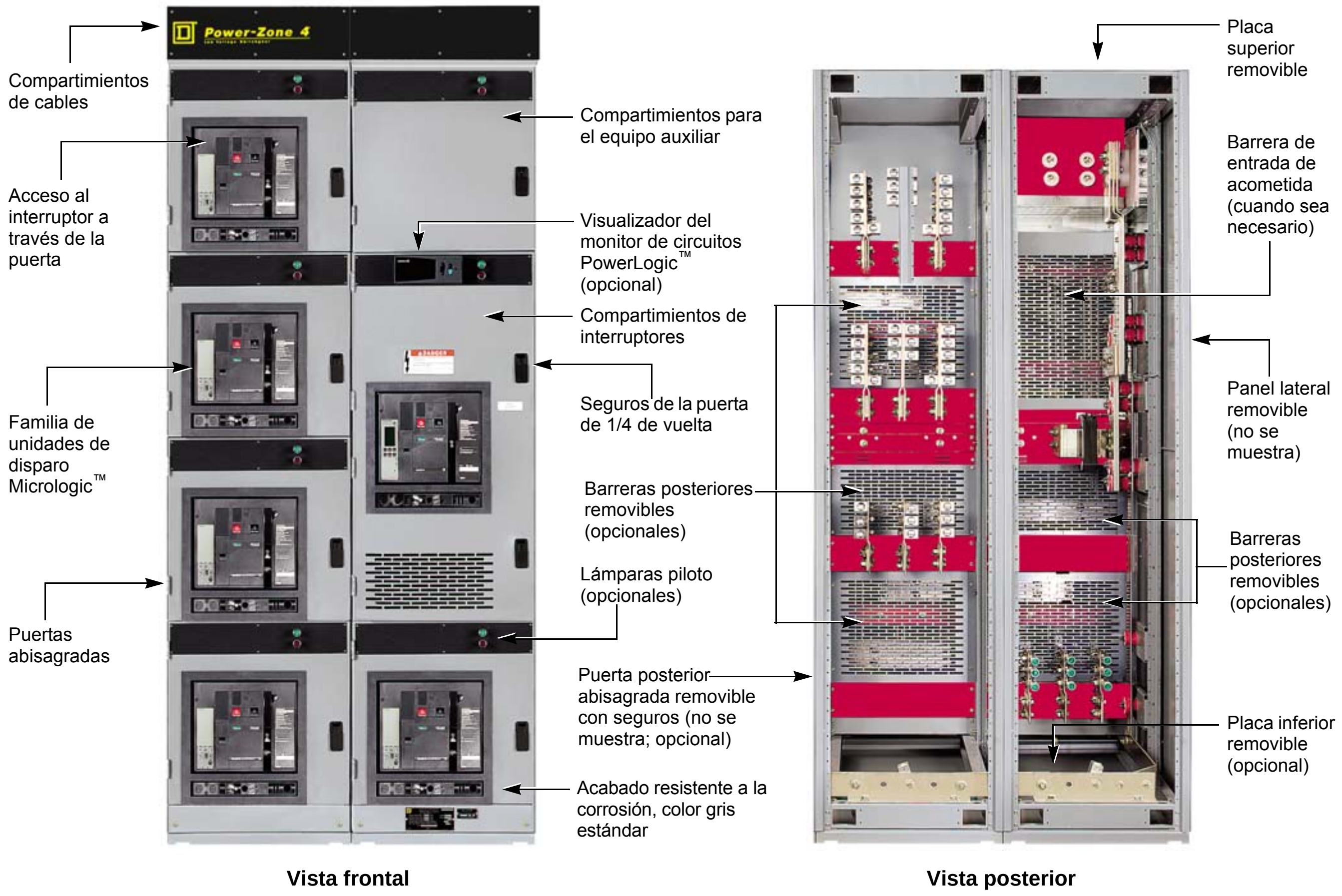
Estas instrucciones y procedimientos son aplicables para la instalación de los tableros de fuerza Power-Zone 4 marca Square D. Cuando se incorporan características especiales o componentes no estándar al tablero de fuerza, se incluyen instrucciones detalladas para estos componentes en la funda para material de instrucciones.

Descripción general

El tablero de fuerza Power-Zone 4 marca Square D ha sido fabricado con acero robusto calibre 12 y un revestimiento de deposición electrolítica con pintura gris para soportar entornos industriales normales. El tablero de fuerza ha sido diseñado con compartimientos para albergar todos los componentes eléctricos. El tablero de fuerza Power-Zone 4 ha sido diseñado, fabricado y probado según las normas C37.20.1 y C37.51 de ANSI/IEEE.

En la figura 1 se muestra un ensamble típico.

Figura 1: Tablero de fuerza



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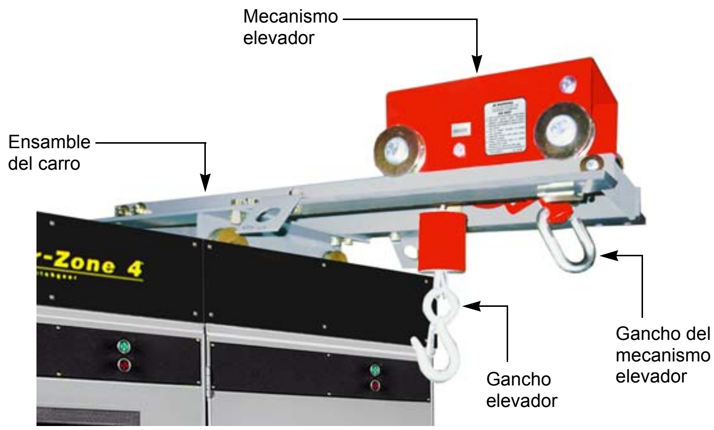
El tablero de fuerza Power-Zone 4 (registrados bajo la norma 1558 de UL) con los interruptores de potencia Masterpact™ protege los circuitos de hasta 600 V contra sobrecargas, cortocircuitos y fallas a tierra. El tablero de fuerza es una estructura fija, que incluye una o más secciones verticales independientes que están conectadas por medios mecánicos y eléctricos para formar una sola instalación coordinada.

Cada sección vertical consiste de tres áreas diferentes: el compartimiento frontal (incluyendo los conductos de cables secundarios), el compartimiento de barras y el compartimiento de cables posterior. Una o más de las secciones del área frontal puede ser utilizada como un compartimiento para equipo auxiliar, tal como transformadores de potencial, medidores, relevadores y dispositivos de control.

Cuando así se especifique, el tablero de fuerza para interiores Power-Zone 4 lleva un ensamble de horquilla móvil montado sobre rieles. El dispositivo de levantamiento está disponible con una manivela manual o funcionamiento eléctrico. El dispositivo de levantamiento manual está disponible en gabinetes sin cubiertas de escurrimiento y es capaz de levantar interruptores de potencia Masterpact para introducirlos y sacarlos de su compartimiento. El interruptor se sube o se baja utilizando la manivela del mecanismo elevador.

Figura 2: Horquilla móvil sobre rieles



A menudo se pueden incorporar funciones adicionales y opciones de control especiales si así se especifica en la orden de compra. Las funciones especiales se muestran en los dibujos y diagramas del ensamble del tablero de fuerza específico. Las instrucciones para los relevadores, el equipo, los desconectadores de control y los interruptores de potencia están incluidas con los documentos que se envían con el tablero de fuerza.

Además del boletín de instrucciones, recibirá otros documentos impresos referentes a los componentes del tablero de fuerza. Asegúrese de leer y entender todos los documentos aplicables antes de comenzar a instalar el tablero de fuerza.

Sección 2—Precauciones de seguridad

Esta sección contiene precauciones de seguridad importantes que se deben respetar antes de levantar, mover, instalar, usar o prestar servicio de mantenimiento al tablero de fuerza Power-Zone 4 y sus componentes.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la la norma 70E de NFPA, NOM-029-STPS o Z462 de CSA.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicios de mantenimiento a este equipo.
- Realice estas tareas sólo después de haber leído y entendido todas las instrucciones de este boletín.
- Desenergice el equipo antes de realizar cualquier trabajo en él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Antes de realizar inspecciones visuales, pruebas y servicio de mantenimiento al equipo, desconecte TODAS las fuentes de alimentación eléctrica. Asuma que todos los circuitos están energizados hasta que hayan sido totalmente desenergizados, probados y etiquetados. Preste atención especial al diseño de la red eléctrica. Considere todas las fuentes de alimentación, incluida la posibilidad de retroalimentación.
- Practique siempre los procedimientos de bloqueo y etiquetado establecidos por los requisitos de OSHA.
- Los contactos del interruptor y del desconectador deben estar abiertos y todos los resortes descargados antes de realizar tareas de mantenimiento, desconexión o desmontaje de un interruptor.
- Realice pruebas eléctricas y asegúrese de que no se haya producido ningún cortocircuito durante la instalación, servicio de mantenimiento o inspección.
- Nunca inserte un interruptor en un compartimiento para interruptores que no esté completo y funcional.
- Esté consciente de los riesgos potenciales, utilice equipo protector personal y tome medidas de seguridad adecuadas.
- Inspeccione detenidamente el área de trabajo para asegurarse de que no hayan quedado herramientas ni objetos extraños dentro del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.
- Todas las instrucciones de este boletín fueron escritas suponiendo que el cliente ha tomado todas las medidas descritas antes de realizar servicios de mantenimiento o pruebas.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

Cuando se proporciona la opción de barra aislada, todos los mecanismos, procedimientos y prácticas de seguridad especificados en este documento se deberán seguir y emplear.

El incumplimiento de esta precaución podrá causar la muerte o lesiones serias.

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Sección 3—Recibo, manejo y almacenamiento

El tablero de fuerza Power-Zone 4 se envía de fábrica ya ensamblado en una o varias secciones, dependiendo del tamaño de la formación y de las instalaciones de manejo que existen en el lugar en el que se va a instalar.

Las secciones para interiores vienen montadas sobre patines de madera y guardadas en una caja para protegerlas de las condiciones atmosféricas.

Si necesita instrucciones para los diferentes componentes, consulte la documentación asociada con cada producto.

Recibo

Revise la lista de contenido y compárela con el equipo recibido para verificar que la orden y el envío estén completos. Al recibir el equipo, de inmediato realice una inspección visual a las secciones del tablero de fuerza para asegurarse de que no se haya producido ningún daño durante el transporte. Si descubre o se sospecha algún daño, de inmediato presente una reclamación ante la compañía de transporte y notifique al representante más cercano de Schneider Electric.

Identificación

Encontrará la placa de datos con los valores nominales en la cubierta frontal de cada estructura. En la placa de datos se incluye la siguiente información:

1. Número de orden de fábrica
2. Tensión nominal máxima
3. Frecuencia
4. Corriente nominal de la barra
5. Valor nominal de la corriente de cortocircuito

NOTA: Todos los valores son los límites máximos del equipo.

Manejo

AVISO

RIESGO DURANTE EL MANEJO DEL EQUIPO

No deje que el equipo se apoye sobre su parte posterior, frente o lados sin antes haber recibido instrucciones específicas de Schneider Electric.

El incumplimiento de esta instrucción puede causar daño al equipo.

Asegúrese de tener disponible equipo adecuado (por ejemplo, grúas aéreas) en el sitio de instalación para manejar el tablero de fuerza. Este equipo le ayudará a evitar lesiones al personal y daño al tablero.

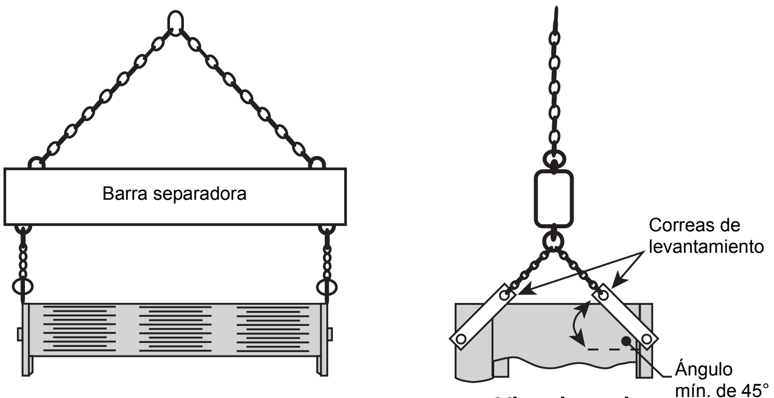
Para que sea más fácil manejarlas con una grúa, todas las secciones llevan correas de levantamiento en las esquinas. La anchura máxima del equipo embarcado es de 183 cm (72 pulg). La correa de levantamiento tiene un agujero de 35 mm (1,38 pulg) de diámetro para enganchar los ganchos de la grúa como se muestra en la figura 3 en la página 11. Use una viga esparcidora para mantener la integridad de las correas de levantamiento. Si se producen variaciones en el centro de gravedad, el equipo puede inclinarse hacia un lado.

Schneider Electric recomienda el uso de grúas aéreas, correas de levantamiento y cables o cadenas para manejar el tablero de fuerza. La siguiente sección trata sobre este método así como métodos de manejo alternativos.

Manejo con correas de levantamiento

Schneider Electric incluye las correas de levantamiento para las secciones de transporte del tablero de fuerza de 183 cm (72 pulg) de ancho o menores. Las etiquetas de instrucciones en cada sección incluyen los dibujos e instrucciones escritas que describen el uso adecuado de estas correas (figura 3 en la página 11). Utilice barras separadoras rígidas o una barra de extensión para proporcionar el levantamiento vertical sobre las correas de levantamiento. Esto evitará dañar el marco o su acabado.

Figura 3: Levantamiento con una grúa aérea, correas de levantamiento y cables o cadenas



Siga estas instrucciones para manejar el tablero de fuerza:

1. Utilice cables o cadenas adecuados para la carga con ganchos de seguridad o grilletes. No haga pasar los cables ni las cadenas por los agujeros en las correas de levantamiento.
2. Utilice una barra separadora adecuada para la carga para evitar daños a la estructura. Apareje de manera que el ángulo mínimo entre los cables o cadenas de levantamiento y la parte superior del equipo sea de 45 grados.

Manejo sin correas de levantamiento

Las correas de levantamiento no vienen incluidas con las secciones de transporte de más de 183 cm (72 pulg) o en los tableros de fuerza a prueba de lluvia. Deberá utilizar rodillos, eslingas u otros medios para manejar las secciones. La etiqueta de manejo (figura 4) está adherida a cada una de estas secciones.

Figura 4: Etiqueta de instrucciones de manejo, tablero de fuerza sin correas de levantamiento

MANEJO

ESTE EQUIPO DEBERÁ MANEJARSE
CON UNA ESLINGA O RODILLOS.
“LOS MEDIOS DE LEVANTAMIENTO NO VIENEN INCLUIDOS”

Al elevar una sección de transporte no equipada con correas de levantamiento, es posible utilizar una grúa aérea equipada con lo siguiente:

- Una cadena enganchada a un mecanismo de maniobra con eslinga, o
- Un cable de alambre con ganchos de seguridad y grilletes

Enrede la eslinga completamente alrededor del tablero de fuerza y reforzadores de transporte (figura 5 en la página 12).

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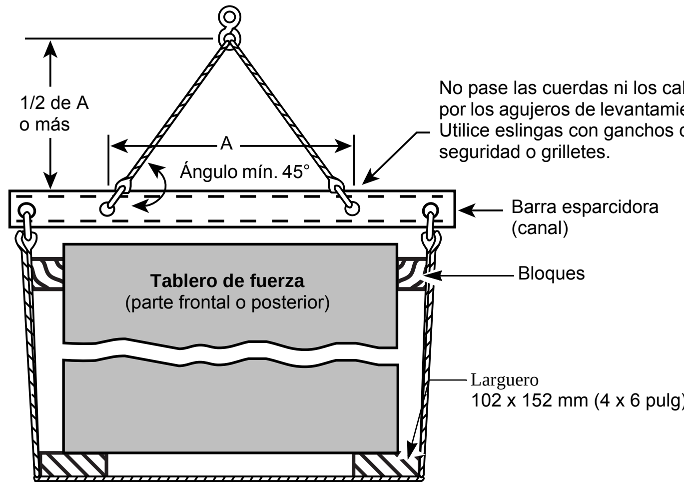
⚠ ADVERTENCIA

CARGA PESADA EN LA PARTE SUPERIOR

Estabilice la sección de transporte para minimizar la posibilidad de que se voltee la carga.

El incumplimiento de esta instrucción puede causar la muerte o lesiones serias.

Figura 5: Tablero de fuerza en mecanismo de maniobra con eslinga



El uso de un montacargas es un método alternativo para manejar el tablero de fuerza.

NOTA: Siempre verifique las longitudes de las horquillas para asegurarse de que éstas se extiendan por abajo de todo el tablero de fuerza. Equilibre cuidadosamente la carga y siempre utilice una correa de seguridad al manejar o mover un tablero de fuerza con un montacargas (figura 6).

Figura 6: Correa de seguridad del montacargas

Interruptores

Tenga cuidado cuando saque los interruptores de potencia Masterpact de su caja, así como cuando los haga rodar, los eleve o los maneje. Tenga cuidado de no retirar ni dañar las etiquetas de advertencia del interruptor. Consulte la página 47 si necesita instrucciones adicionales.

Barras de levantamiento del interruptor (si vienen incluidas)

Sea cuidadoso cuando saque de la caja o maneje las barras de levantamiento del interruptor.

Horquilla móvil (si viene incluida)

Tenga cuidado cuando saque el ensamble de la horquilla móvil de su caja, así como cuando lo haga rodar, lo eleve o lo maneje. El ensamble de la horquilla móvil pesa 29 kg (65 lbs), asegúrese de usar los medios mecánicos necesarios para manejar este ensamble.

Consulte la página 38 si necesita instrucciones adicionales. Tenga cuidado de no retirar ni dañar las etiquetas de advertencia del ensamble de la horquilla móvil.

Grúa de piso (si viene incluida)

Tenga cuidado cuando saque de su caja la grúa de piso opcional y al manejarla. Consulte las instrucciones de los fabricantes para informarse del uso y manejo apropiados.

Almacenamiento

Si el ensamble del tablero de fuerza Power-Zone 4 va a ser almacenado antes de su puesta en servicio, siga este procedimiento.

1. Desempaque el equipo para asegurarse de que esté completo y en buenas condiciones.
2. Vuelva a proteger el equipo en su embalaje original hasta que lo instale para que esté protegido.

Cuando almacene el equipo:

- Guárdelo en un lugar limpio y seco en el que no haya elementos que provoquen corrosión ni esté sujeto a abuso mecánico.

  NOTA: El equipo para interiores se debe almacenar en un edificio con control atmosférico hasta su instalación. Mantenga el equipo limpio y seco, con una humedad inferior al 80% y una temperatura de entre 0 y 40 °C (32 y 104 °F). Evite la humedad, los cambios de temperatura, el polvo de cemento y las atmósferas corrosivas.
- Puede que sea necesario cubrir el equipo con una lona para protegerlo de elementos contaminantes y de la humedad.
- No almacene al aire libre las unidades para interiores.
- Si se ve obligado a almacenar el equipo al aire libre, tome todas las precauciones necesarias para conservarlo limpio y seco, y dentro de los límites de temperatura y humedad recomendados anteriormente.
  - — Es posible que necesite cubrir el equipo e instalar calefactores provisionales.
  - — Cuando las almacene, coloque las secciones en superficies niveladas para mantener la integridad de su estructura.
- En zonas donde haya mucha humedad, por ejemplo instalaciones al lado del mar o de un río, vigile constantemente el equipo del tablero de fuerza.
  - — Si es necesario, use unidades de calefacción adicionales para mantener el tablero de fuerza seco.
  - — Diríjase al representante de Schneider Electric si los calefactores internos no son adecuados para su zona.
- Si va a almacenar el ensamble de la horquilla móvil, no lo desempaque hasta que vaya a realizar la instalación.
- Si el tablero de fuerza viene con calefactores internos opcionales, conéctelos a una fuente de alimentación externa. Energice los calefactores internos del tablero de fuerza o agregue calor de otra fuente, como puede ser un foco o ventilador. Use una fuente de calor de 250 watts por sección vertical como mínimo para que el equipo permanezca seco durante su almacenamiento.

ESPAÑOL

Sección 4—Instalación

Antes de instalar el tablero de fuerza Power-Zone 4, asegúrese de leer y entender:

- Todas las precauciones descritas en este boletín.
- Toda la documentación de los componentes asociados.
- Todos los dibujos y diagramas que acompañan al equipo.

Ensamble de las secciones

Cuando ha sido instalado correctamente, el tablero de fuerza para interiores cumple con los siguientes requisitos.

- Los paneles frontales forman una línea recta y cuando se incluyen transformadores u otro tipo de equipo, los paneles frontales quedan alineados o forman líneas paralelas.
- Las unidades están espaciadas correctamente de centro a centro y en línea perpendicular a la superficie de montaje.
- El tablero de fuerza está bien sujeto a los canales del piso o a la base de montaje.
- Las secciones están bien atornilladas entre sí.
- Los cables de control y de la barra están conectados correctamente.

Preparación del sitio de la instalación

Antes de colocar el equipo, verifique lo siguiente para asegurarse que el sitio está listo para la instalación final.

- Compare los planos y especificaciones del sitio con los dibujos del equipo para asegurarse de que no exista ninguna discrepancia.
- Revise el sitio para confirmar que hay suficiente espacio para el tablero de fuerza.
- Asegúrese de que haya suficiente ventilación en el área, en todo momento, para mantener la temperatura ambiente alrededor del equipo entre 0 °C y 40 °C (32 °F y 104 °F).
- Asegúrese de que haya suficiente iluminación permanente y enchufes convenientes cerca del equipo.
- Dirija el alcantarillado, y las tuberías de agua y vapor lejos del equipo.
- Instale un desagüe en el piso cerca del equipo.
- Cuando instale el equipo, tenga en cuenta el espacio libre que se necesita en la parte frontal y en la parte posterior del equipo, así como en los extremos.

  NOTA: El espacio libre necesario para efectuar el trabajo alrededor del tablero de fuerza está especificado en la sección 110–26 del National Electrical Code® (código eléctrico nacional de los EUA), o en la sección 110-16 de NOM-001-SEDE o la sección 2-308 del Código eléctrico canadiense (CEC®). Estos espacios son sólo la recomendación mínima. Es posible que necesite espacio adicional para introducir y extraer los interruptores y para transferirlos a otros compartimientos con un elevador o grúa de piso.

Preparación de la cimentación

- Confirme que el piso o la cimentación elegido sea lo suficientemente fuerte como para soportar el equipo sin distorsiones ni hundimientos.

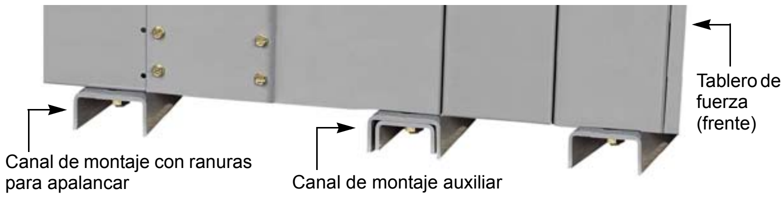
  NOTA: Consulte los documentos de transporte para informarse del peso del equipo.

- Confirme que el concreto y los canales estén bien nivelados de izquierda a derecha y de adelante hacia atrás con una variación permitida de 3 mm por metro cuadrado (1/8 de pulgada por yarda cuadrada).
- Instale el equipo sobre una base uniforme y nivelada para mantener las tolerancias y los ajustes al mínimo.
- Confirme que los canales de acero estén a nivel con la base terminada y que la base de alrededor se incline ligeramente hacia un desagüe.

Colocación del tablero de fuerza

1. Para abrir el tablero de fuerza, inserte una palanca o barreta en la ranura de uno de los canales de montaje.
2. Empiece a mover con cuidado el tablero de fuerza para colocarlo en el lugar deseado hasta que los paneles frontales formen una línea recta.
3. Confirme que las partes frontales de las secciones verticales estén alineadas o formen líneas paralelas.

Figura 7: Posición final del tablero de fuerza (vista lateral)



Alineación de las secciones verticales

1. Establezca una línea base unas cuantas pulgadas al frente del tablero de fuerza y paralela al lugar de la instalación.
2. Iguale las distancias desde el frente del tablero de fuerza hasta la línea base, haciendo que la cara de la sección esté paralela con la línea base.
3. Cuando haya colocado la primera sección, ponga la segunda sección en su posición y revísela de la misma forma.
4. Sujete entre sí las secciones verticales.
5. Repita los pasos 3 y 4 hasta completar la instalación.
6. Revise los rieles traseros y delanteros de la horquilla móvil para asegurarse de que estén bien alineados. Si los rieles están mal alineados, ajústelos de forma que el equipo quede alineado por delante y por detrás. Consulte “Alineación de las secciones y de los rieles” en la página 39.

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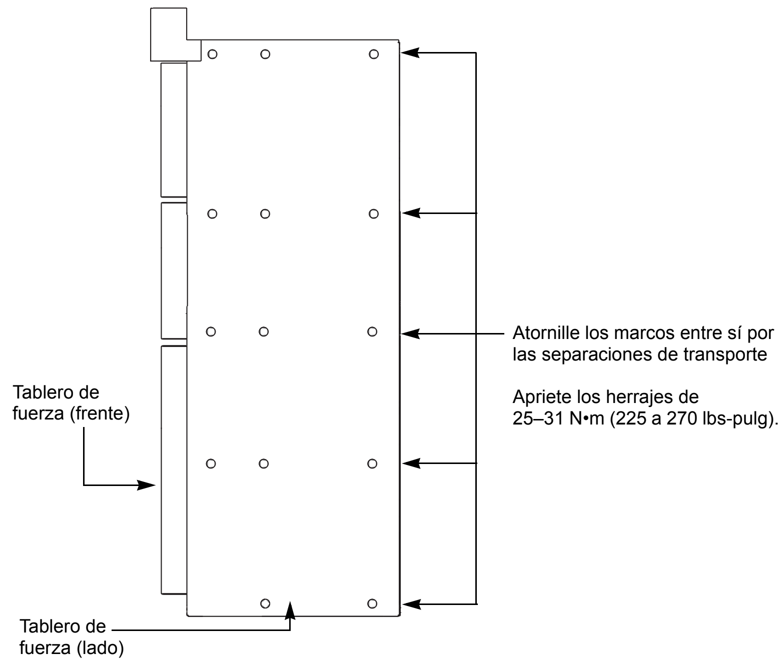
Unión de las separaciones de transporte

1. Obtenga los herrajes de 3/8-16 para separaciones de transporte ubicados dentro del equipo.
2. Atornille los marcos entre sí (figura 8) con los herrajes para separaciones de transporte. Apriete los herrajes de 25 a 31 N•m (225 a 270 lbs-pulg).

Figura 8: Unión de las separaciones de transporte (vista lateral)



Unión de los compartimientos de cables

1. Cuando los marcos de las separaciones de transporte hayan sido atornillados entre sí, retire las cubiertas de los compartimientos de cables (figura 9) en el punto de separación.

Figura 9: Desmontaje de las cubiertas de los compartimientos de cables

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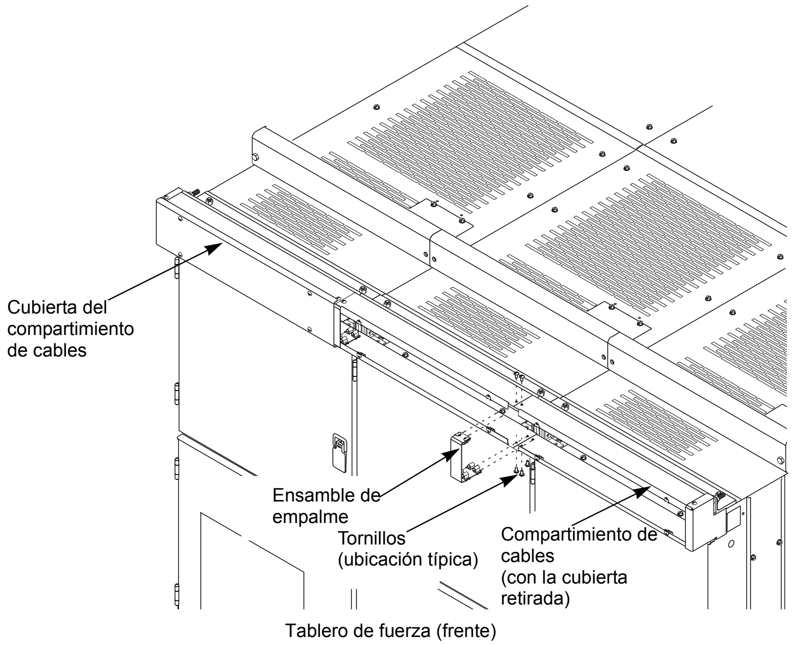
2. Retire el ensamble de empalme (figura 10) en los compartimientos de cables a la izquierda de la separación.

Figura 10: Unión de los compartimientos de cables



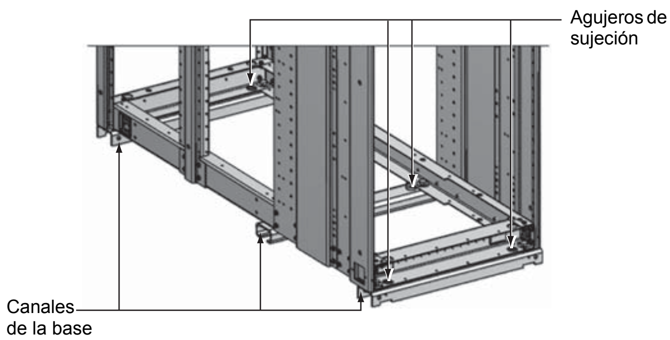
3. Retire los tornillos del ensamble de empalme. Guarde los tornillos para volver a usarlos.
4. Instale el ensamble de empalme (figura 10) con los tornillos que retiró en el paso 3.

Fijación del tablero de fuerza al piso (no sísmico)

Aunque las secciones se mantienen en pie por sí solas, un empujón fuerte o un movimiento puede dañar las uniones de empalme entre las secciones y los receptáculos para tubo conduit conectados a ellas. Por consiguiente, sujete los canales de la base al piso. Los canales de montaje formados recorren todo el ancho de cada sección. Los canales tienen agujeros de 19 mm (3/4 pulg) de diámetro para poder fijar la sección al piso.

1. Fije cada sección al piso (figura 11) con cuatro tornillos de 1/2 pulg (13 mm) grado 2 como mínimo, roldanas planas y fijadoras (no incluidas).

Figura 11: Fijación mediante los canales de montaje



2. Cuando todas las secciones hayan sido conectadas entre sí y toda la estructura haya sido atornillada al piso, instale los conductores de acometida y los cables del lado de carga. Consulte los ejemplos de los planos en las figuras 12 y 13 en la página 18.

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Figura 12: Plano típico (vista inferior)—no sísmico

Ancho de la unidad	Dimensión B
559 mm (22,00 pulg)	203 mm (8,00 pulg)
762 mm (30,00 pulg)	305 mm (12,00 pulg)
914 mm (36,00 pulg)	381 mm (15,00 pulg)

NOTA: Las dimensiones mostradas son ubicaciones de sujeción dentro de las secciones individuales del equipo Power-Zone 4. Consulte los dibujos de fábrica incluidos para determinar las ubicaciones de sujeción apropiadas para la plataforma del equipo.

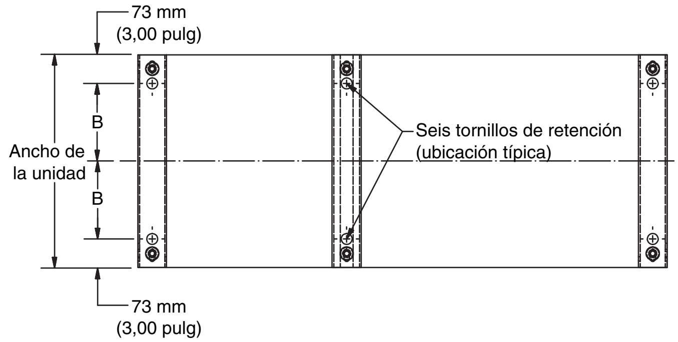
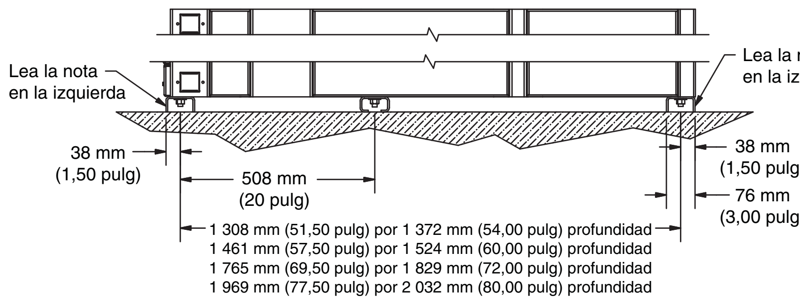


Figura 13: Plano típico (vista lateral)—no sísmico

NOTA: El concreto y los canales deben estar bien nivelados de izquierda a derecha y de adelante hacia atrás con una variación permitida de 3 mm por metro cuadrado (1/8 pulg por yarda cuadrada).



Certificación sísmica

Los tableros de fuerza Power-Zone 4, certificados a prueba de actividad sísmica, cumplen con los requisitos de actividad sísmica particulares para el sitio, que figuran en los códigos y/o normas de construcción. Es posible que estos modelos requieran características de construcción opcionales, depende de la ubicación de instalación y el código o norma particular. Todos los tableros de fuerza vienen acompañados de un certificado de cumplimiento con los requisitos a prueba de actividad sísmica y etiquetas correspondientes. Para mantener la validez de esta certificación, se deberán seguir las instrucciones de instalación delineadas en esta sección.

Responsabilidad con respecto a la reducción de daños por actividad sísmica

Para los fines de los códigos de construcción de este modelo, los tableros de fuerza Power-Zone 4 se consideran componentes no estructurales de construcción. La capacidad del equipo fue resuelta en base a los resultados de las pruebas en mesa sacudidora sísmica triaxial como lo define el International Code Counsel Evaluation Service (ICC-ES) (Servicio de evaluación del consejo de normas internacionales) en los criterios de aceptación y requisitos de la prueba de actividad sísmica de componentes no estructurales (AC156).

A no ser que se indique lo contrario, se ha utilizado un factor de importancia del equipo de 1,5 (IP = 1,5); lo que indica que la funcionalidad del equipo fue verificada antes y después de realizar la prueba de simulación sísmica en mesa sacudidora. Este factor de importancia indica las instalaciones críticas a las cuales deberá darse prioridad para maximizar su funcionalidad después de un evento sísmico.

El criterio AC156 lo publica el ICC ES y ha sido reconocido por el Building Sismic Safety Council [(BSSC), Consejo de seguridad sísmica en edificios] como un método apropiado en las crónicas del Programa nacional de reducción de riesgos durante terremotos (NEHRP) del 2003. El Instituto nacional de ciencias de edificios fundó el BSSC en 1979 para desarrollar y promover provisiones normativas de mitigación de riesgos durante terremotos a un nivel nacional.

El tubo conduit así como los cables entrantes y salientes también deben considerarse como sistemas relacionados e independientes, los cuales deberán ser diseñados y contenidos para soportar las fuerzas generadas por el evento sísmico sin aumentar la carga transferida al equipo. En las aplicaciones en las que existen riesgos sísmicos, es preferible introducir y/o sacar los cables y tubo conduit por la parte inferior.

Un sistema de restricción lateral también es necesario cuando no se desea movimiento horizontal en la parte superior del tablero de fuerza Power-Zone 4 (por ejemplo, en las aplicaciones con entrada y/o salida de tubo conduit en la parte superior). Este sistema debe ser capaz de transferir las cargas creadas a los muros de carga del sistema estructural del edificio.

El equipo de Schneider Electric cumple con los requisitos de actividad sísmica en componentes no estructurales los cuales son simplemente un eslabón necesario en toda la cadena de responsabilidades para maximizar la probabilidad de que el equipo esté intacto y que funcione después de un evento sísmico. Durante un evento sísmico, el equipo debe ser capaz de transferir las cargas producidas por la plataforma de montaje y el anclaje a los muros de carga del sistema estructural del edificio.

El ingeniero civil o ingeniero de diseño oficial de la estructura es responsable de detallar los requisitos de conexión al equipo y su anclaje (incluyendo el sistema de restricción lateral, si es apropiado) para la instalación. El encargado de la instalación y los fabricantes del sistema de anclaje y restricción lateral son responsables de garantizar el cumplimiento con los requisitos de montaje. Schneider Electric no asume responsabilidad por las especificaciones ni el funcionamiento de estos sistemas.

Fijación del tablero de fuerza al piso (sísmico)

Los canales de montaje formados recorren todo el ancho de cada sección. Los canales tienen agujeros de 29 mm (1,13 pulg) de diámetro para poder sujetar la sección al piso. Use los seis soportes para fijar adecuadamente el tablero de fuerza al piso.

Durante un terremoto, es posible que se mueva la parte superior del tablero en cualquier dirección. Los cables que entran por la parte superior deberán ser adaptados para este movimiento. El gabinete del tablero (en particular la parte superior) no deberá ser utilizado para montar equipo en su exterior.

Cuando vaya a fijar la unidad a un piso de concreto:

- Use tornillos de fijación al concreto de 1/2 pulg (13 mm) de diámetro grado 5 (como mínimo) o fijadores de casquillo adecuados para la instalación del equipo eléctrico.
- Utilice una roldana de acero endurecido de 1/2 pulg (13 mm) con un diámetro exterior de aproximadamente 1,5 pulg (38 mm) y una roldana de sujeción, debajo de la cabeza de cada tornillo o tuerca de sujeción; apriételos en los valores especificados por el fabricante del herraje de sujeción para obtener la resistencia necesaria.
- Se recomienda el uso de sujetadores de tornillo, fijadores de casquillo o tornillos de fijación al concreto (en las instrucciones del fabricante encontrará el tamaño de agujero recomendado). No use blindajes de expansión tales como “blindajes para tirafondos”. La base de concreto se debe construir con una resistencia de 210,9 kg/cm^2 (3 000 psi) (como mínimo).

1. Fije cada sección a la base de concreto con seis tornillos de 1/2 pulg (13 mm) grado 5 como mínimo, roldanas de acero endurecido y fijadores (no incluidos).
2. Cuando todas las secciones hayan sido conectadas entre sí y toda la estructura haya sido atornillada a la base de concreto, instale los conductores de acometida y los cables del lado de carga. Consulte los ejemplos de los planos en las figuras 14 y 15 en la página 20.

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Cuando fije las secciones a un piso que no sea de concreto:

- Use tornillos de 1/2 pulg (13 mm) grado 5 (como mínimo) a través de los agujeros de los canales de montaje.
- Los tornillos o pernos deben ser sujetados al piso con anclajes u otros herrajes de sujeción apropiados para obtener la resistencia necesaria del sistema de restricción sísmica.
- Utilice una roldana de acero endurecido de 1/2 pulg (13 mm) con un diámetro exterior de aproximadamente 1,5 pulg (38 mm) y una roldana de sujeción, debajo de la cabeza de cada tornillo o tuerca de sujeción; apriételos en los valores especificados por el fabricante del herraje de sujeción para obtener la resistencia necesaria.

1. Fije cada sección al piso con seis tornillos de 1/2 pulg (13 mm) grado 5 como mínimo, roldanas de acero endurecido y fijadores (no incluidas).
2. Cuando todas las secciones hayan sido conectadas entre sí y toda la estructura haya sido atornillada al piso, instale los conductores de acometida y los cables del lado de carga. Consulte los ejemplos de los planos en las figuras 14 y 15.

Sujeción de estructuras al piso —Ubicaciones designadas como de riesgo sísmico[1]

Cada sección debe ser sujetada a los muros de carga del sistema estructural del edificio, según los detalles provistos por el ingeniero oficial. A continuación se muestran las ubicaciones de montaje en el piso para los gabinetes NEMA 1.

Utilice tornillos de 1/2 pulg (13 mm) o 0,75 pulg (19 mm) grado 5 o mayor (no incluidos con el equipo) y roldanas de acero endurecido. Apriete los tornillos en el valor especificado por el fabricante de los herrajes de sujeción.

Figura 14: Plano típico (vista inferior)—sísmico

Ancho de la unidad	Dimensión B
559 mm (22,00 pulg)	203 mm (8,00 pulg)
762 mm (30,00 pulg)	305 mm (12,00 pulg)
914 mm (36,00 pulg)	381 mm (15,00 pulg)

NOTA: Las dimensiones mostradas son ubicaciones de sujeción dentro de las secciones individuales del equipo Power-Zone 4. Consulte los dibujos de fábrica incluidos para determinar las ubicaciones de sujeción apropiadas para la plataforma del equipo.

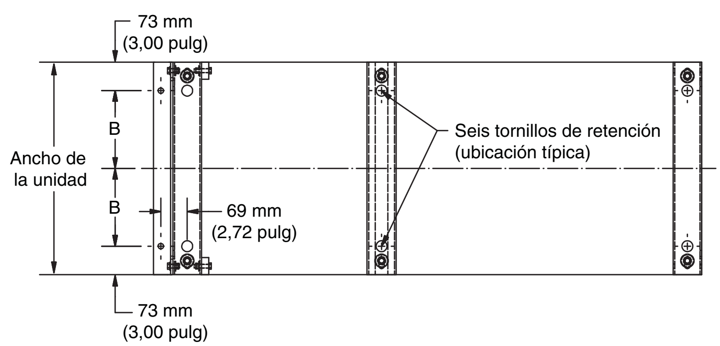
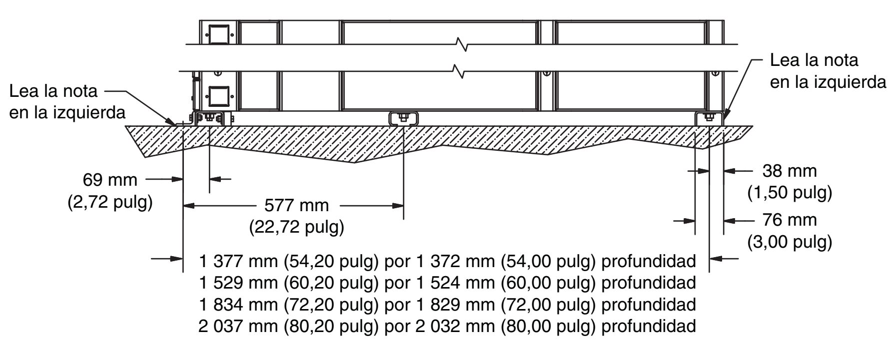


Figura 15: Plano típico (vista lateral)—sísmico

NOTA: El concreto y los canales deben estar bien nivelados de izquierda a derecha y de adelante hacia atrás con una variación permitida de 3 mm por metro cuadrado (1/8 pulg por yarda cuadrada).



1 Riesgo sísmico para las ubicaciones específicas del sitio como lo define el código de construcción internacional más reciente o la norma NFPA 5000 o el código de construcción local relevante o el ingeniero oficial de asesoría.

Conexión de las barras

Todas las conexiones entre las secciones de barra principal, neutra y de tierra se hacen con placas de empalme atornilladas (enchapadas).

Preparación de las juntas de las barras

> **AVISO**
>
> **CONEXIÓN INCORRECTA DE LAS BARRAS DE DISTRIBUCIÓN**
>
> No use limpiadores abrasivos para limpiar las juntas de barras. Esto puede producir conexiones de alta resistencia.
>
> **El incumplimiento de esta instrucción puede causar daño al equipo.**

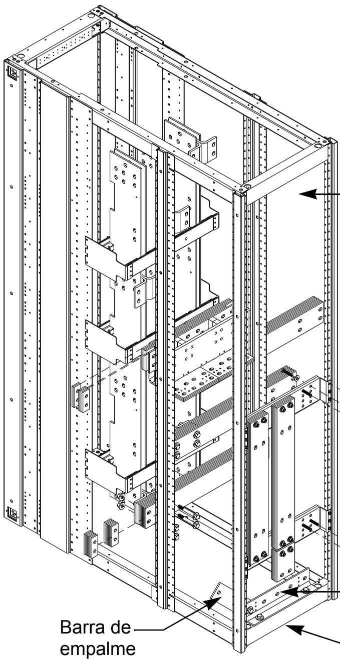
Todas las juntas de barras están enchapadas para asegurar una conexión eléctrica confiable.

1. Remueva la suciedad, la grasa y cualquier otra materia extraña que haya en la superficie de la junta de barras antes de unirlas.
2. Limpie las superficies con un paño que no deje pelusas y alcohol desnaturalizado.
3. Seque la junta con un paño limpio que no deje pelusas.

Empalme de la barra de tierra

La barra de empalme a tierra (figura 16) viene de fábrica en posición vertical en la parte inferior trasera de la sección del tablero de fuerza. Vea las figuras 16 y 17 al realizar los pasos 1 a 5.

Figura 16: Empalme de la barra de tierra



1. Retire los paneles posteriores del tablero de fuerza.
2. Retire los herrajes de 1/2-13 que sujetan la barra de empalme a la barra de tierra. Guarde los herrajes para volverlos a instalar.
3. Retire los herrajes de 1/2-13 del otro extremo de la barra de empalme. Guarde los herrajes para volverlos a instalar.
4. Alinee la barra de empalme con la barra de tierra adyacente.
5. Instale los herrajes de 1/2-13 que guardó en los pasos 2 y 3.
6. Apriete todos los herrajes de 1/2-13 de 81 a 95 N•m (60 a 70 lbs-pie). Vea la figura 18 en la página 22.

NOTA: El lado convexo (marcado “Top”) de una roldana cónica deberá apoyarse contra la cabeza del tornillo y el lado convexo de la segunda roldana cónica deberá apoyarse contra la tuerca hexagonal.

Figura 17: Barra de puesta a tierra conectada

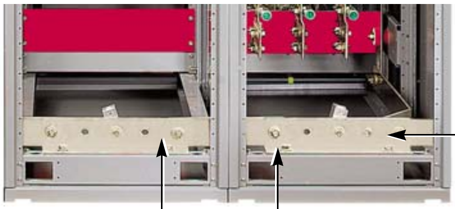


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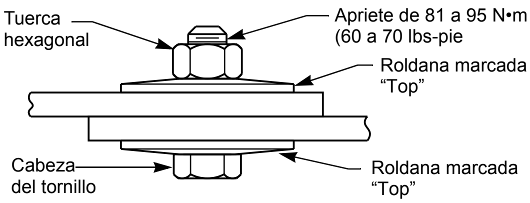
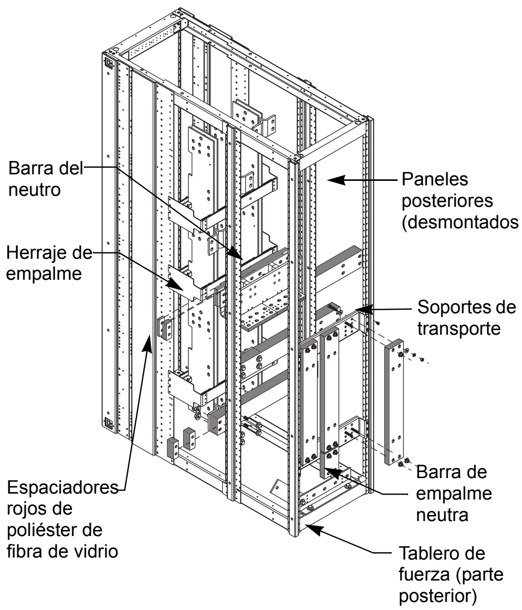
Figura 18: Instalación de las roldanas cónicas



Empalme de la barra del neutro

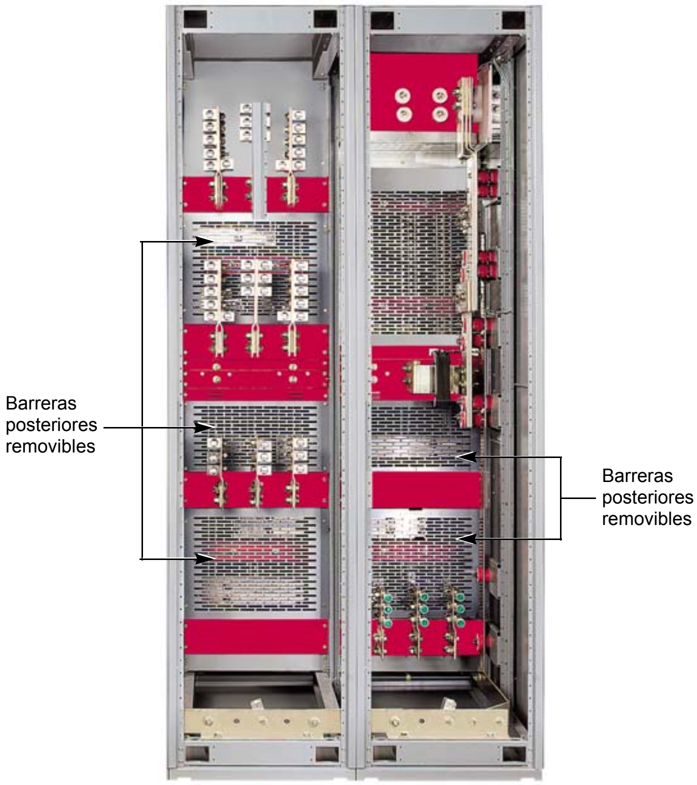
La barra de empalme neutra (figura 19) viene montada sobre soportes en la parte trasera de la sección del tablero de fuerza. Vea la figura 19 al realizar los pasos del 1 al 5.

Figura 19: Empalme de la barra del neutro



1. Retire los dos herrajes de 3/8-16 que sujetan la barra de empalme y deséchelos.
2. Retire la barra de empalme. Guárdela para volverla a instalar.
3. Si vienen incluidas las barreras posteriores (figura 20), retírelas para poder acceder al área de empalme de la barra del neutro. Guárdelas para volver a instalarlas.
4. Retire los herrajes de empalme de 1/2-13 en las secciones que vaya a empalmar. Guárdelos para volverlos a usar.
5. Retire los espaciadores rojos de poliéster de fibra de vidrio y deséchelos.

Figura 20: Desmontaje de las barreras posteriores (si vienen incluidas)



Compartimiento de las barras (vista posterior)

6. Coloque e instale la barra de empalme neutra (figura 21). Vea también la figura 19 en la página 22.
7. Instale los herrajes de empalme de 1/2-13 que guardó en el paso 4 en la página 22. Observe la orientación de los herrajes de empalme en la figura 21.
8. Apriete todos los herrajes de 1/2-13 (figura 22) de 81 a 95 N•m (60 a 70 lbs-pie).

   NOTA: El lado convexo (marcado "Top") de una roldana cónica deberá apoyarse contra la cabeza del tornillo y el lado convexo de la segunda roldana cónica deberá apoyarse contra la tuerca hexagonal.
9. Si vienen incluidas, instale las barreras posteriores (figura 20 en la página 22) que desmontó en el paso 3 en la página 22.

Figura 21: Laminaciones de la barra del neutro

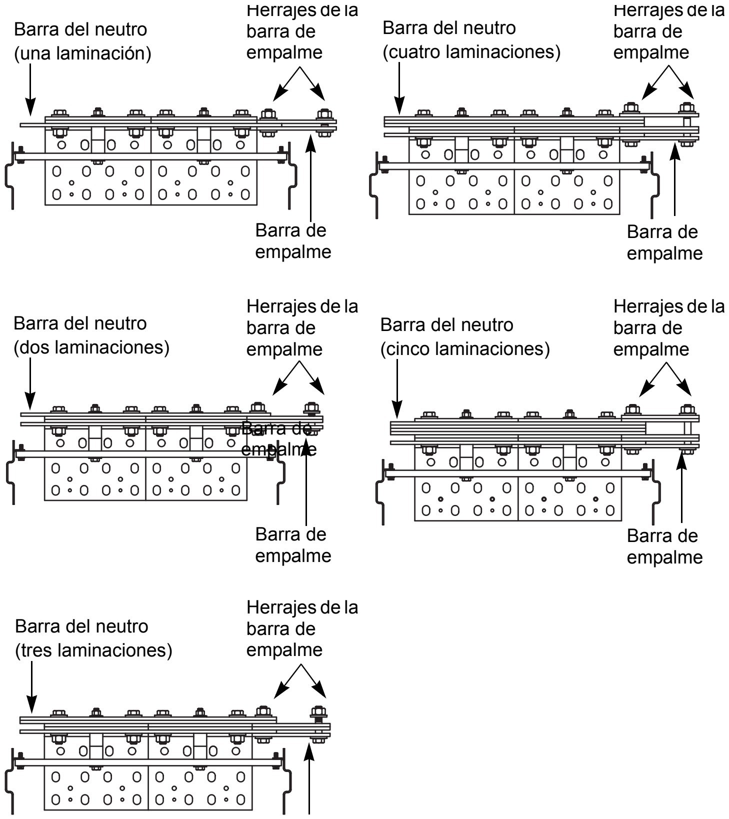
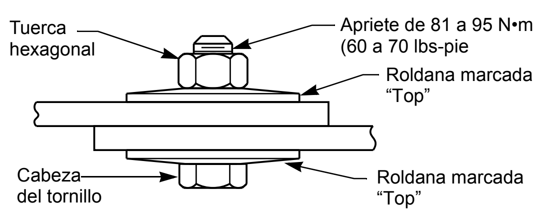


Figura 22: Instalación de las roldanas cónicas



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Empalme de la barra directa principal

Las barras de empalme directas principales (figura 24) vienen montadas sobre soportes en la parte posterior de la sección del tablero de fuerza. Vea la figura 24 para informarse de los pasos del 1 al 8.

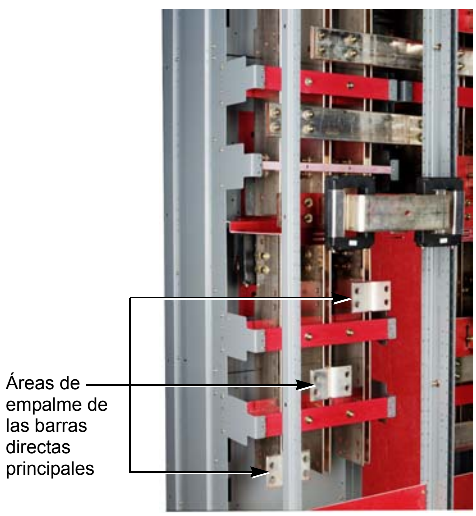
1. Retire los doce herrajes de 3/8-16 que sujetan la barra de empalme y deséchelos.
2. Retire la barra de empalme y mantenga cada grupo unido tal como le fue enviado. Guárdela para volver a instalarla.
3. Deseche los soportes de transporte y los herrajes de montaje.
4. Si vienen incluidas las barreras posteriores (figura 20 en la página 22), retírelas para poder acceder al área de empalme de las barras directas principales. Guárdelas para volver a instalarlas.
5. Si se instalan manguitos protectores para barra sobre las áreas de empalme de la barra directa principal, utilice unas tijeras cortadoras de alambre para cortar los amarres de cable necesarios para tener acceso a las áreas de empalme de la barra. No retire los protectores completamente.
6. Retire los herrajes de 1/2-13 que vienen con el equipo en las áreas de empalme. Guárdelos para volver a utilizarlos.

   NOTA: Las áreas de empalme pueden estar en la mitad superior o inferior de la sección del tablero de fuerza. Las figuras 24, 23 y 25 muestran las áreas de empalme en la parte inferior.
7. Retire los espaciadores rojos de poliéster de fibra de vidrio y deséchelos.

   NOTA: Recuerde la posición de estos espaciadores que está retirando. En su lugar va a instalar la barra de empalme.
8. Para determinar la posición de cada fase individual, haga corresponder los agujeros y los espacios en las barras de empalme con los agujeros y los espacios en las áreas de empalme de las secciones que va a empalmar.

   Consulte la tabla 1 en la página 25 para determinar el número de laminaciones por fase que se requieren.

Figura 23: Áreas de empalme típicas de las barras directas principales



Compartimiento de las barras (vista posterior)

Figura 24: Empalme de la barra directa principal

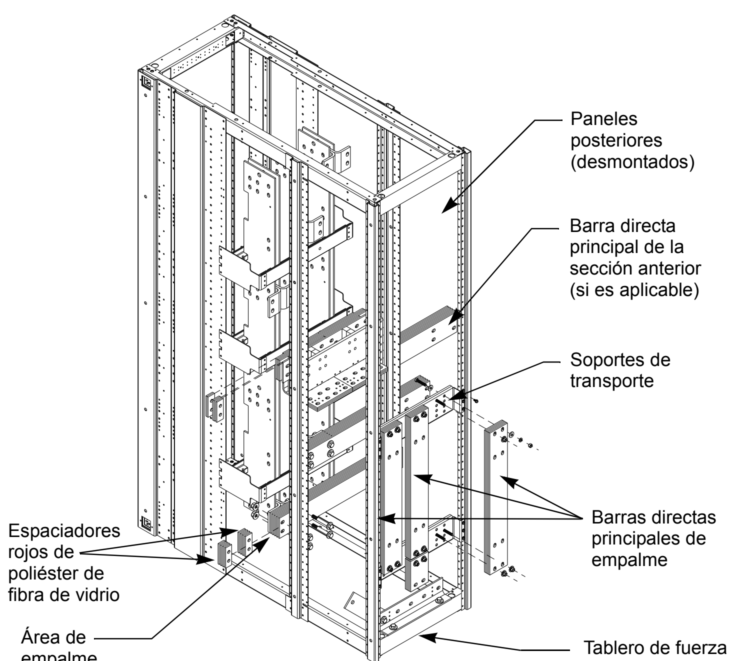


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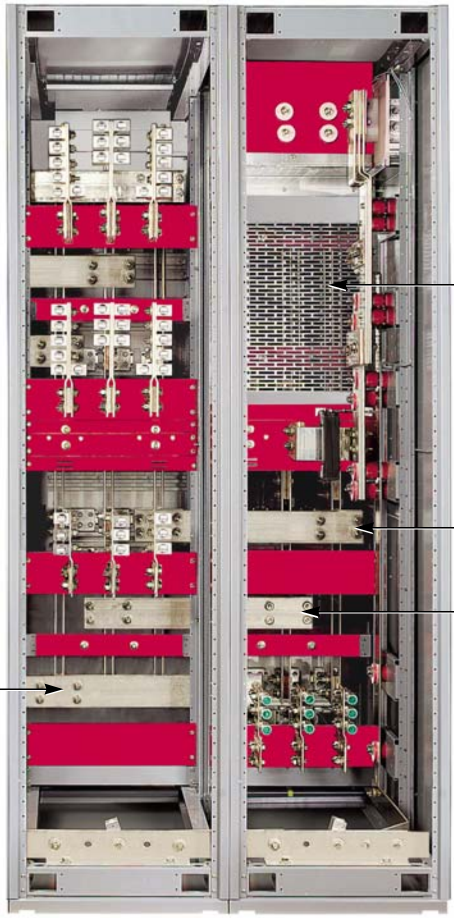
Tabla 1: Cantidad de laminaciones requeridas por fase

Capacidad de corriente de las barras directas principales	Estándar	Opcional
Sin opción de barra aislada		
1600 A ≤ 100 kA SCCR	1	2
1600 A > 100 kA SCCR	2	2
2000 A ≤ 100 kA SCCR	1	2
2000 A > 100 kA SCCR	2	2
3200 A (todo SCCR)	2	4
4000 A (todo SCCR)	3	4
5000 A (todo SCCR)	4	5
Con opción de barra aislada		
1600 A ≤ 65 kA SCCR	1	2
1600 A > 65 kA SCCR	2	2
2000 A ≤ 65 kA SCCR	1	2
2000 A > 65 kA SCCR	2	2
3200 A (todo SCCR)	2	4
4000 A (todo SCCR)	3	4
5000 A (todo SCCR)	4	5

NOTA: Todas las laminaciones son barras de cobre de 6 mm (1/4 pulg) x 102 mm (4 pulg).

Figura 25: Barra directa principal típica (fases A, B y C)

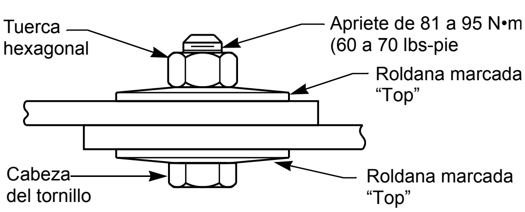


Compartimiento de las barras (vista posterior)

9. Sustituya los espaciadores de poliéster que retiró en el paso 7 en la página 24 con barras directas principales de empalme. Vea la figura 24 en la página 24.
10. Instale los herrajes de empalme de 1/2-13 que guardó en el paso 6 en la página 24. Vea la figura 24 en la página 24.
11. Apriete todos los herrajes de 1/2-13 de 81 a 95 N•m (60 a 70 lbs-pie). Vea la figura 26.

    NOTA: El lado convexo (marcado “Top”) de una roldana cónica deberá apoyarse contra la cabeza del tornillo y el lado convexo de la segunda roldana cónica deberá apoyarse contra la tuerca hexagonal.
12. Si viene con manguitos protectores para barra inserte los nuevos amarres de alambre en los agujeros de fijación. Utilice los amarres de alambre provistos (número de pieza 25901-24485 de Schneider Electric).
13. Si vienen incluidas, instale las barreras posteriores (figura 20 en la página 22) retiradas en el paso 4 en la página 24.

Figura 26: Instalación de las roldanas cónicas



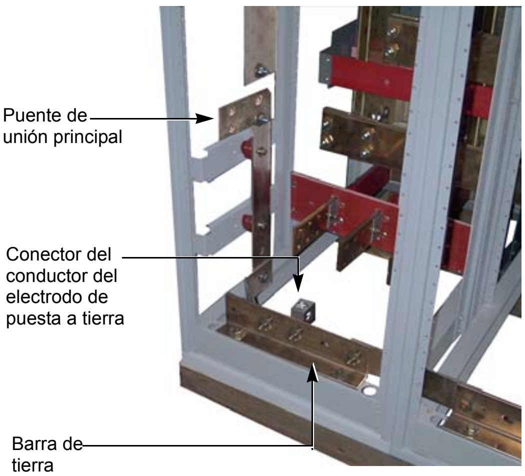
Puesta a tierra y unión

NOTA: Para determinar lo siguiente, un sistema está conectado a tierra si está puesto a tierra en cualquier punto adelante del tablero de fuerza, independientemente que el conductor (neutro) conectado a tierra sea llevado a las cargas o no.

Equipo de acometida (sistemas conectados directamente a tierra)

Para sistemas *conectados directamente a tierra* utilizados como equipo de acometida o como tablero de fuerza principal en un sistema con derivación independiente:

Figura 27: Puente de unión principal y conector del conductor del electrodo de puesta a tierra (sistemas conectados a tierra)



1. Instale el conductor del electrodo de puesta a tierra desde el electrodo de puesta a tierra del lugar de la instalación hasta el conector del conductor del electrodo de puesta a tierra (zapata de tierra) situado en la barra de tierra del tablero de fuerza (o en la barra del neutro si así lo indica el dibujo del equipo) (figura 27). Seleccione el material y el tamaño apropiados para que el conductor del electrodo de puesta a tierra cumpla con lo establecido en las secciones 250-91(a) y 250-94 de la NOM-001-SEDE. Instale el conductor del electrodo de puesta a tierra según lo especificado en la sección 250-92 de la NOM-001-SEDE.
2. Instale el puente de unión principal entre la barra del neutro y la barra de tierra (figura 27). Consulte las tablas 2 y 3 para informarse de los valores de par de apriete.

   NOTA: Si el tablero de fuerza se alimenta de varias fuentes (por ejemplo en el caso de sistemas de extremos iguales), es posible que tenga que instalar dos o más puentes de unión principales.

Tabla 2: Zapatas de entrada, de derivación, de neutro y de tierra

Tamaño del receptáculo hembra entre caras	Valor de par de apriete
1/4 pulg (6 mm)	20 N•m (180 lbs-pulg)
5/16 pulg (8 mm)	28 N•m (250 lbs-pulg)
3/8 pulg (10 mm)	38 N•m (340 lbs-pulg)
1/2 pulg (13 mm) Observe las excepciones en la siguiente línea	51 N•m (450 lbs-pulg)
1/2 pulg (13 mm) 3/0-750 kcmil	70 N•m (620 lbs-pulg)

Tabla 3: Barra de tierra y/o de neutro del conductor múltiple

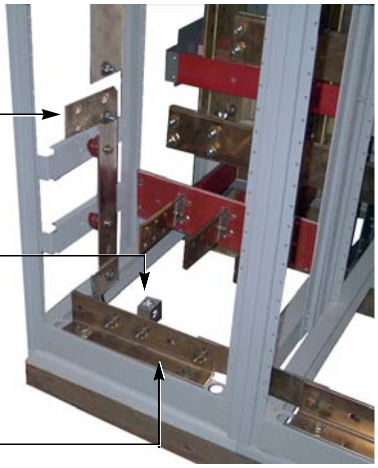
Tipo de tornillo	Calibre del conductor de zapata	Tamaño del conductor	Valor de par de apriete
Cabeza ranurada	2,082 a 21,15 mm^2 (14 a 4)	2,082 a 5,26 mm^2 (14-10) Cu, 3,307 a 5,26 mm^2 (12-10) Al	2 N•m (20 lbs-pulg)
		8,367 mm^2 (8) Cu-Al	3 N•m (25 lbs-pulg)
		13,30 a 21,15 mm^2(6-4) Cu-Al	4 N•m (35 lbs-pulg)
	2,082 a 53,48 mm^2 (14 a 1/0)	2,082 a 8,367 mm^2 (14-8) Cu-Al	4 N•m (36 lbs-pulg)
		13,30 a 53,48 mm^2 (6-1/0) Cu-Al	5 N•m (45 lbs-pulg)
Cabeza hueca	2,082 a 53,48 mm^2 (14 a 1/0)	Todos	11 N•m (100 lbs-pulg)
	13,30 a 152 mm^2 (6-300 kcmil)	Todos	31 N•m (275 lbs-pulg)

Equipo de acometida (sistemas no conectados a tierra)

Para sistemas *no conectados a tierra* utilizados como equipo de acometida o como tablero de fuerza principal en un sistema con derivación independiente:

1. Instale el conductor del electrodo de puesta a tierra desde el electrodo de puesta a tierra del lugar de la instalación hasta el conector del conductor del electrodo de puesta a tierra (zapata de tierra) situado en la barra de tierra del tablero de fuerza (figura 28).
2. Seleccione el material y el tamaño apropiados para que el conductor del electrodo de puesta a tierra cumpla con lo establecido en las secciones 250-91(a) y 250-94 de la NOM-001-SEDE. Instale el conductor del electrodo de puesta a tierra según lo especificado en la sección 250-92 de la NOM-001-SEDE.

Figura 28: Puente de unión principal y conector del conductor del electrodo de puesta a tierra (sistemas no conectados a tierra)



Equipo que no es de acometida

Para conectar el marco del tablero de fuerza y la barra de tierra a la tierra de la acometida en sistemas *conectados o no conectados a tierra*, cuando el tablero de fuerza no se utiliza como equipo de acometida ni como tablero de fuerza principal en un sistema con derivación independiente, use los conductores de puesta a tierra del equipo del tamaño especificado en la sección 250-95 de la NOM-001-SEDE.

Sistemas de neutro puestos a tierra con alta impedancia

En el caso de *sistemas de neutro puestos a tierra con alta impedancia*, ponga el sistema a tierra según las instrucciones que lo acompañan y de acuerdo con lo especificado en la sección 250-5(b) excep. 5 y 250-27 de la NOM-001-SEDE.

Confirme que el marco del tablero de fuerza y la barra de tierra estén conectados según lo especificado en la sección 250-79 de la NOM-001-SEDE.

Conexión de los cables de alimentación, los controles y el alambrado

Conexión de los cables de alimentación

AVISO

PÉRDIDA DE LA PROTECCIÓN DE FALLA DE PUESTA A TIERRA DEL EQUIPO

No conecte los conductores de puesta a tierra a ninguna terminal del neutro de carga.

El incumplimiento de esta instrucción puede causar daño al equipo.

NOTA: Al conectar los cables de alimentación, utilice conductores aislados para 90°C en base a la capacidad de conducción de la corriente de los conductores de 75°C a no ser que se indique lo contrario en las instrucciones suplementarias.

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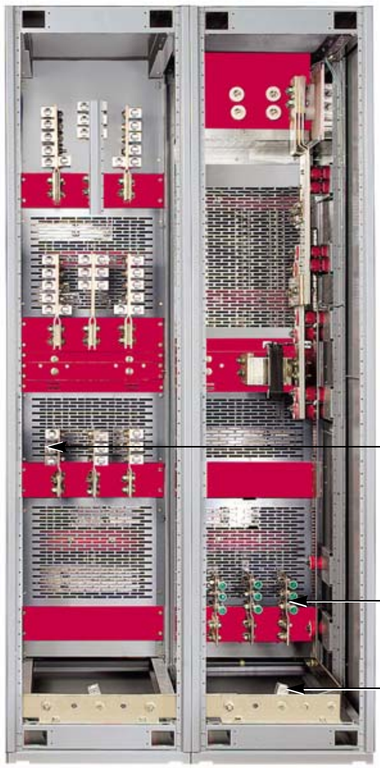
Figura 29: Conexión de los cables



Compartimiento de cables (vista posterior)

El tablero de fuerza Power-Zone 4 lleva zapatas de compresión o mecánicas (figura 29) para conectar a las terminales los cables de alimentación principal.

1. Determine la fase de cada cable antes de establecer la conexión.

   NOTA: Si se mira el tablero de fuerza desde el frente, la secuencia de las fases de las barras es A-B-C de arriba a abajo, de adelante hacia atrás o de izquierda a derecha.

   Es posible que el tablero esté organizado de otra manera para cubrir sus necesidades específicas. Si este es el caso, la barra irá marcada A, B y C en el orden especificado por el cliente.

   Si se incluye un neutro opcional, todas sus conexiones vendrán etiquetadas.

2. Evite los dobleces agudos en las esquinas y bordes filosos cuando forme los cables para conectarlos a las terminales en el tablero de fuerza. Esto ayudará a reducir el riesgo de daño al equipo y el debilitamiento del aislamiento de los cables. Consulte las instrucciones del fabricante para determinar el radio mínimo de doblez de los cables. Este radio variará dependiendo del tipo y tamaño del cable. Consulte los requisitos de la NOM-001-SEDE para informarse de los radios de doblez mínimos de los diferentes cables.

3. Amarre y soporte bien los cables de línea y de carga como se indica en “Limitador del conductor para valores nominales de la corriente de cortocircuito (SCCR)” en la página 29.

   NOTA: Esto evita que las terminales se tensen o soporten demasiado peso.

4. Una vez que los cables apropiados hayan sido conectados; instale los paneles posteriores retirados en el paso 1 en la página 21.

Limitador del conductor para valores nominales de la corriente de cortocircuito (SCCR)

Tabla 4: Requisitos de restricción de los conductores

Intensidad de corriente	Corriente de falla de cortocircuito disponible (rcm)			
	≤ 85 kA	**> 85 a ≤ 100 kA**	**> 100 a ≤ 130 kA**	**> 130 a ≤ 200 kA**
Los cables de suministro NO entran al compartimiento de entrada de acometida protegido con barreras				
≤ 2 000 A	No	No	Sí	Sí
2 001 – 3 200 A	No	No	Sí	Sí
3 201 – 4 000 A	No	No	No	No
4 001 – 5 000 A	No	No	No	No
Cables de carga del interruptor de potencia Masterpact NT				
≤ 1 200 A	No	Sí	Sí	Sí
Cables de carga del interruptor de potencia Masterpact NW				
≤ 2 000 A	Sí	Sí	Sí	Sí
801 – 1 600 A	Sí	Sí	Sí	Sí
1 601 – 2 000 A	Sí	Sí	Sí	Sí
2 001 – 3 200 A	No	No	Sí	Sí
3 201 – 4 000 A	No	No	No	No

AVISO

PELIGRO DE MOVIMIENTO DE CONDUCTORES BAJO CONDICIONES DE CORTOCIRCUITO

Restrinja los conductores (incluyendo los conductores de neutro) durante la instalación del tablero de distribución según los requisitos de la tabla 4.

El incumplimiento de esta instrucción puede causar daño al equipo.

El sujetador de cables se recomienda para las zapatas montadas en barras cuando se cumplen las siguientes condiciones:

- Las longitudes de cable sin soporte son mayores que 1 m (3,5 pies) medidas desde el extremo de la zapata al conector de tubo conduit por donde sale el cable.

  Y

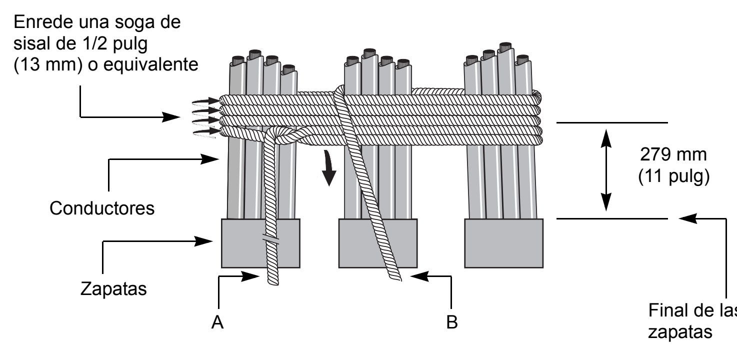
- Los cables cumplen con los criterios Sí que se muestran en la tabla 4.

Si se necesitan los sujetadores, realice los siguientes pasos.

NOTA: Enrede los conductores con soga de sisal de 1/2 pulg (13 mm) o equivalente.

1. Empiece a enredar los conductores (figura 30 en la página 29) a distancias máximas de 279 mm (11 pulg) desde el final de las zapatas. Continúe enredando los conductores a distancias equidistantes de 279 mm (11 pulg) hasta el punto donde los conductores salen del gabinete.
   a. Enrede los conductores 4 veces tal como se muestra y deje 1 m (3 pies) de exceso de soga en el primer extremo (A).
   b. Jale la soga (B) hasta tensarla.

Figura 30: Cómo enredar los conductores (los conductores de neutro no se muestran)[1]

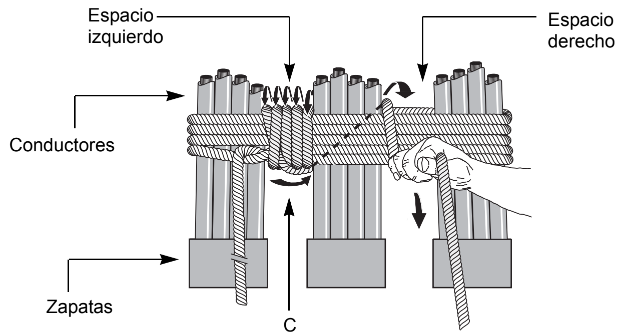


[1] Sujete los cables de neutro a los cables de fase desde la entrada del gabinete hasta el área terminal de las zapatas. En casos en que el área terminal de las zapatas de neutro se encuentra alejada del área terminal de las zapatas de fase, sujete los cables de neutro al marco.

2. Enrede la soga varias veces (figura 31) hasta que no haya espacio entre los conductores.
   a. Pase el último tramo de la soga bajo el bucle anterior (C).
   b. Pase la soga por el espacio derecho.

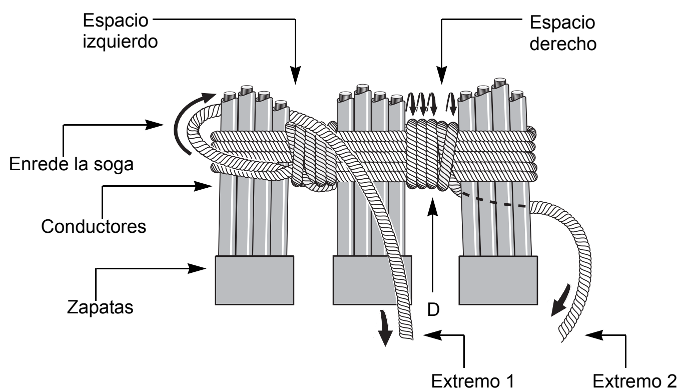
c. Jale la soga hasta tensarla.

Figura 31: **Cómo enredar la soga en el espacio entre los conductores**



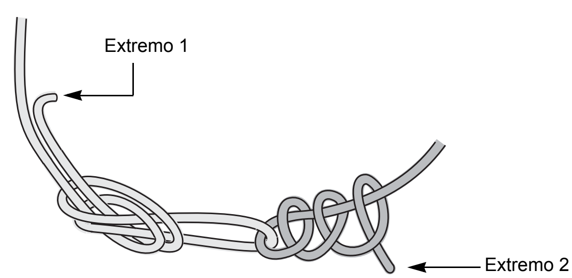
3. Enrede la soga varias veces hasta que no haya espacio entre los conductores (Figure 32).
   a. Pase el último tramo de la soga bajo el bucle anterior (D).
   b. Jale la soga hasta tensarla.

Figura 32: **Removing the Wiring Compartment Covers**



4. Enrede los extremos (1) y (2) (Figure 33) hasta que queden tensos. Recorte el exceso de soga y forre con cinta los extremos para evitar que se deshilachen.

Figura 33: **Cómo amarrar los extremos de la soga**



5. Vuelva a verificar el par de apriete de los tornillos de sujeción de los cables después de haber asegurado los conductores.

   NOTA: Consulte la etiqueta que viene con el tablero de fuerza para obtener los valores de par de apriete.

Conexión de los controles y el alambrado

1. Localice y retire las cubiertas de los compartimientos de cables (figura 34) en la división que hay en la parte frontal del tablero de fuerza.

Figura 34: Desmontaje de las cubiertas de los compartimientos de cables

2. Conecte todos los bloques de terminales desprendibles que cruzan una sección de transporte en los enchufes correspondientes provistos para este propósito.

   NOTA: Los bloques de terminales han sido etiquetados en la fábrica y se muestran en los diagramas de conexiones de la instalación.

3. Conecte todos los controles de relevadores, interruptores de control y otro equipo montados en otra ubicación a un grupo de bloques de terminales que se encuentre en el marco posterior de la sección vertical o en el compartimiento de equipo. Consulte los dibujos del “diagrama de conexiones” del cliente.
4. Compare los cables de control con el diagrama de conexiones para confirmar que todas las conexiones sean correctas, que los circuitos del transformador de corriente hayan sido completados y que ninguna conexión esté suelta.

   NOTA: Si la fuente de alimentación de control no es un transformador de alimentación de control interno, los cables que van de la fuente al tablero de fuerza deberán ser del tamaño adecuado para evitar que la tensión baje en exceso durante el funcionamiento.

Conexión de los cables de comunicaciones —Modbus RS485 o Ethernet (Modbus TCP)

El equipo que viene con componentes de comunicación (módulos de E/S, módulos IFE o IFM) permite la comunicación entre las redes del cliente con interruptores automáticos y medidores electrónicos para proporcionar supervisión de energía y estado. Si así está equipado, los dibujos del cliente indicarán las conexiones de los cables de red dentro de los puntos de conexión del equipo y del cliente. Siga los pasos siguientes para completar las conexiones necesarias de los cables de red en las separaciones de transporte.

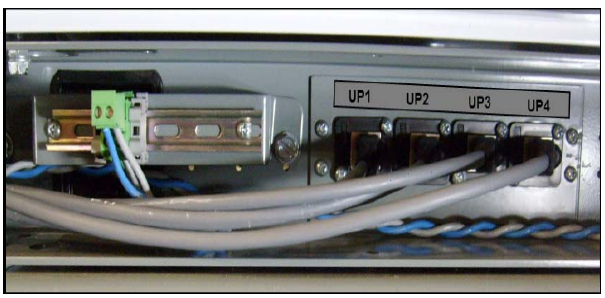
ESPAÑOL

1. Localice los cables de comunicación de red (almacenados para el envío) en el ducto para cables frontal inferior de cada sección. Consulte la figura 35 donde se ilustra un ejemplo de los cables almacenados.

Figura 35: Ejemplo de cables de comunicación temporalmente almacenados en el ducto para cables para su envío

2. Consulte los dibujos esquemático del sistema de comunicaciones enviados con el equipo e identifique los cables que deben conectarse entre las separaciones de transporte como se indica en a., b. o c. a continuación. Los cables tienen etiquetas correspondientes a los diagramas de alambrado y los extremos de destino (por ejemplo, UP1L significa puerto UP no. 1 en la sección izquierda adyacente. UP3R significa puerto UP no. 3 en la sección derecha adyacente).
   a. Cables tipo ULP (conector lógico universal), vea la figura 36. Los cables ULP conectan interruptores automáticos individuales a una interfaz de red (Modbus RS485 a través del componente "IFM", o bien, Ethernet Modbus TCP a través del componente "IFE"). Los cables son grises y se comunican a través del sistema ULP (conector lógico universal) entre los componentes de comunicación (como el módulo de E/S, módulo de visualización frontal, módulo IFE o IFM).
   b. Cables RS485 de Modbus (vea la figura 40).
   c. Cables Ethernet (Modbus TCP) (vea la figura 42).

Figura 36: Ejemplo de cables ULP grises conectados a los puertos ULP



Nota: En la foto los puertos ULP están etiquetados como "UP1", "UP2", "UP3" y "UP4"

3. Consulte las figuras 37, 38 y 39 para conectar los cables ULP entre las separaciones de transporte identificando el puerto del conector "UP" en la sección adyacente con el número de puerto "UP" correspondiente en la etiqueta del cable.

   NOTA: El puerto del conector ULP puede encontrarse en la sección a la derecha o A la izquierda y está montado sobre una placa (conector) gris con conectores hembra RJ45 montados en ella. Los puertos ULP normalmente se identifican como "UPx" donde x = 1, 2, 3, 4, 5, 6, 7 u 8.

4. Dirija el cable ULP de la sección de origen a través de las aberturas del lado derecho o izquierdo del ducto para cables frontal inferior y hasta la sección de destino donde se encuentra el puerto ULP.

Figura 37: Se ilustran los cables multiconductores ULP grises en el ducto para cables frontal inferior con mazos de cables de 24 V (rojos y grises)

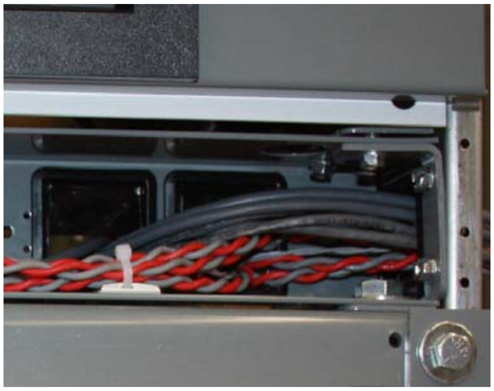


Figura 38: Cables ULP y de 24 V a través de las aberturas laterales del ducto para cables frontal inferior

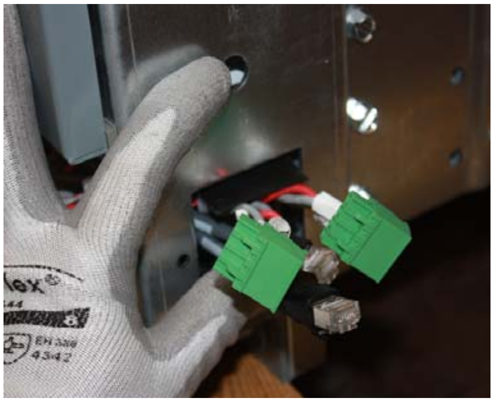


Figura 39: Cables ULP dirijidos y conectados a los puertos ULP etiquetados en el ducto para cables de la sección adyacente

5. Si tiene una red Modbus RS485 con módulos IFM dentro de su equipo (consulte la figura 40), siga los pasos 6 a 8 a continuación. Si tiene una red Ethernet Modbus TCP con módulos IFE dentro de su equipo (consulte la figura 42 en la página 35), siga los pasos 9 a 11 a continuación.
6. Los cables Modbus RS485 son cables blindados multi-conductores grises con un conector verde de 4 puntos en el extremo (vea la figura 40). En cada ducto para cables frontal inferior de las separaciones de transporte, un conector verde de 4 puntos será enrollado para la conexión al conector fijo en la sección a la derecha.

   NOTA: Los bloques de terminales han sido etiquetados de fábrica y se muestran en los diagramas de alambrado para las secciones y diagramas esquemáticos del sistema de comunicaciones para la formación.

Figura 40: Ejemplo de conector Modbus RS485 de 4 pines

7. Dirija el conector verde de la sección de origen por la abertura del lado derecho del ducto para cables frontal inferior y hacia la sección de destino a la derecha.
8. Conecte el conector al conector verde fijo en el lado izquierdo del ducto para cables frontal inferior (vea la figura 41). La interconexión de redes Modbus RS485 ya está completa.

Figura 41: Conector fijo Modbus RS485 en el lado izquierdo del ducto para cables frontal inferior

9. Los cables Ethernet Modbus TCP son azules con un conector RJ45 en cada extremo. Los cables Ethernet deben conectarse a los puertos de destino entre las separaciones de transporte y son agrupados temporalmente para su envío en el ducto para cables frontal inferior de las secciones. Los puertos de destino son conectores hembra RJ45

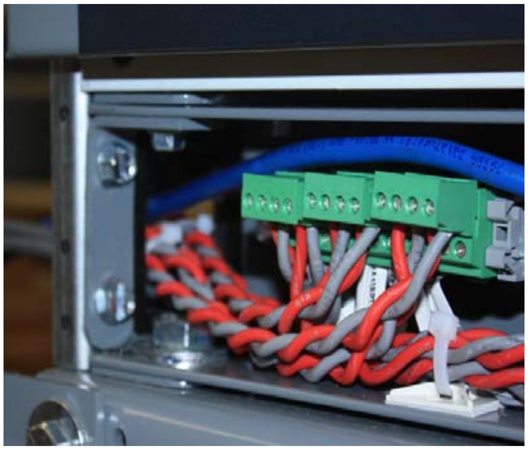
montados en las placas (conectores) azules en el ducto para cables frontal inferior de algunas secciones (consulte los dibujos en los diagramas de alambrado de fábrica para las secciones con puertos Ethernet).

NOTA: Los cables están etiquetados con los números de puerto correspondientes al puerto de destino. Los cables tienen etiquetas correspondientes a los dibujos y los extremos de destino (por ejemplo, EP2 significa puerto Ethernet no. 2 en la sección adyacente), vea la figura 42.

Figura 42: Ejemplo de la conexión del cable Ethernet Modbus TCP (azul) al puerto Ethernet etiquetado

10. Pase los cables Ethernet entre las separaciones de transporte, como se muestra en los dibujos de fábrica por el ducto para cables frontal inferior y por la abertura lateral en cada sección (consulte la figura 43).

Figura 43: Abertura lateral de paso del cable Ethernet



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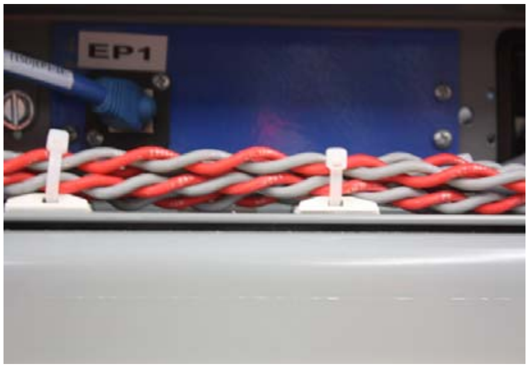
11. Conecte el conector macho RJ45 del cable Ethernet en el puerto hembra RJ45 correspondiente etiquetado en la **placa (conector) azul (**vea la figura 44).

    NOTA: No conecte los cables Ethernet azules en los puertos RJ45 en las placas (conectores) grises. Los puertos RJ45 en las placas (conectores) grises son para las conexiones ULP de los pasos 3 y 4 arriba.

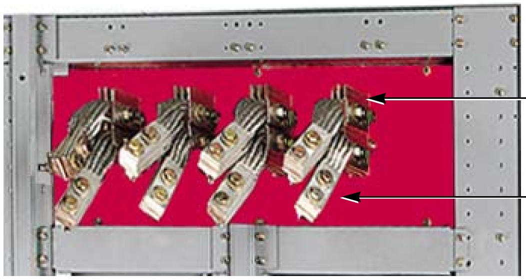
Figura 44: Ejemplo de etiqueta y puerto Ethernet azul con cable Ethernet conectado



Montaje de los conectores flexibles

Esta sección contiene instrucciones para montar conexiones flexibles en las perforaciones o en la barra adaptadora del transformador del tablero de fuerza Power-Zone 4.

Figura 45: Conexiones flexibles típicas



⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Desenergice el transformador antes de instalar los conectores flexibles.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.

El incumplimiento de estas instrucciones puede causar la muerte o lesiones serias.

NOTA: Monte los conectores flexibles en los agujeros superiores de la barra del transformador sobre la barra del neutro de ampacidad media.

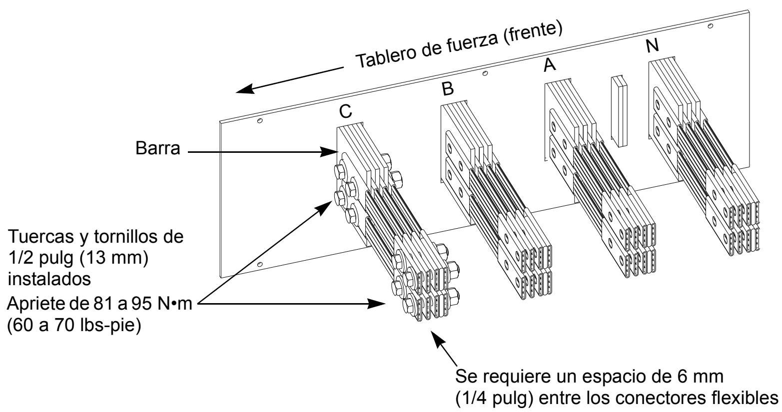
1. Desenergice el transformador antes de instalar los conectores flexibles. Utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
2. Conecte el conector flexible adecuado (figura 46) a las perforaciones o barra adaptadora del transformador.
3. Inserte los tornillos de 1/2 pulg (13 mm) y tuercas incluidos con cada conector flexible y apriételos de 81 a 95 N•m (60 a 70 lbs-pie).

   El diagrama siguiente muestra una conexión típica del transformador en el lado derecho del tablero de fuerza Power-Zone 4.

Tabla 5: Conexiones flexibles del transformador

Valor nominal	Tipo de barra	Cantidad (fase o neutro)
1 600 A	Barra de fase	5
	Barra del neutro completa	5
	Barra del neutro media	3
2 000 A	Barra de fase	6
	Barra del neutro completa	6
	Barra del neutro media	3
3 200 A	Barra de fase	8
	Barra del neutro completa	8
	Barra del neutro media	4
4 000 A	Barra de fase	10
	Barra del neutro completa	10
	Barra del neutro media	5
5 000 A	Barra de fase	13
	Barra del neutro completa	13
	Barra del neutro media	7

Figura 46: Conexión típica del transformador en el lado derecho del tablero de fuerza



La cantidad y el tamaño de las perforaciones variarán según el valor nominal del transformador.

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Instalación de la horquilla móvil

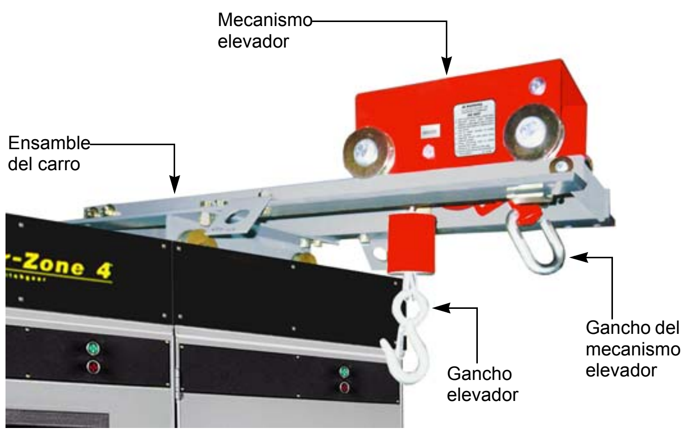
⚠ PELIGRO

PELIGRO DE QUE SE CAIGAN OBJETOS O EL EQUIPO

- No instale ni haga funcionar el ensamble de la horquilla móvil a no ser que estén presentes dos o más personas calificadas.
- No cambie la mecánica ni el diseño de la horquilla móvil.
- Siempre mantenga la rueda de engranaje de la horquilla móvil bien lubricada. No permita que el engranaje funcione sin estar engrasado.
- Nunca haga funcionar la horquilla móvil con dientes rotos o dañados, una palanca doblada, cables dañados u otras distorsiones obvias.
- No sobrecargue, enrede, retuerza ni ate el cable.
- No deje que el tambor de la horquilla móvil se desenrolle completamente ya que en ese caso la carga estará siendo soportada sólo por el ancla.
- No cargue la horquilla móvil por encima de su capacidad nominal de carga de 135 kg.
- No jale un interruptor suspendido para mover la horquilla móvil.
- No camine ni se pare debajo de cargas suspendidas ni del ensamble de la horquilla.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Figura 47: Ensamble típico de una horquilla móvil



Alineación de las secciones y de los rieles

AVISO

PELIGRO DE HUNDIMIENTO DEL TECHO

No se suba al techo de las secciones del tablero de fuerza. El tablero de fuerza no ha sido diseñado para soportar peso adicional.

El incumplimiento de esta instrucción puede causar daño al equipo.

Cuando haya trasladado el tablero de fuerza a su lugar de instalación final, compruebe que los rieles estén correctamente alineados antes de instalar el ensamble de la horquilla móvil.

El riel frontal y el riel posterior deben estar alineados para que el ensamble de la horquilla móvil funcione correctamente. La alineación es especialmente importante entre las secciones verticales que son divididas para su transporte.

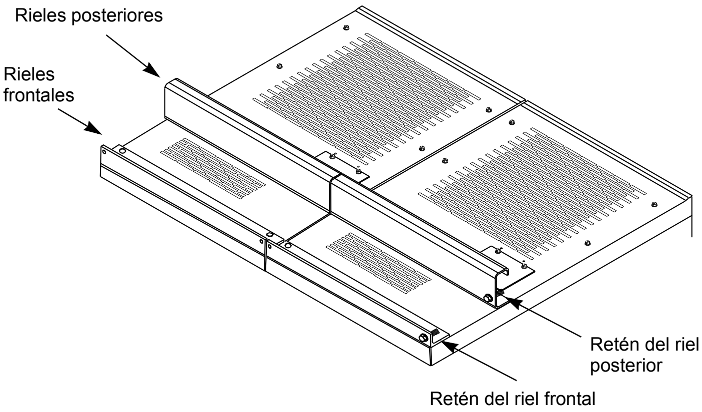
Si las secciones verticales vienen ensambladas de fábrica, los rieles y la sección o secciones ya vendrán alineadas. Sin embargo, es importante seguir el procedimiento para confirmar la alineación de las secciones verticales y de los rieles.

NOTA: Se requiere un espacio de trabajo mínimo de 406 mm (16 pulg) en uno de los lados de la formación del tablero de fuerza para poder instalar el ensamble del carro. Si NO va a poder disponer del espacio necesario después de la instalación final del tablero de fuerza, instale el ensamble de la horquilla móvil antes de poner el tablero en su lugar permanente. No mueva el ensamble del carro cuando instale el tablero de fuerza.

1. Cuando el tablero de fuerza haya sido instalado en su lugar permanente, alinee las secciones (figura 48) para que los rieles frontales y posteriores estén alineados en todas las direcciones.

   NOTA: En la figura 48, el compartimiento de cables ha sido retirado de la parte frontal del tablero para mayor claridad.

Figura 48: Alineación de las secciones verticales



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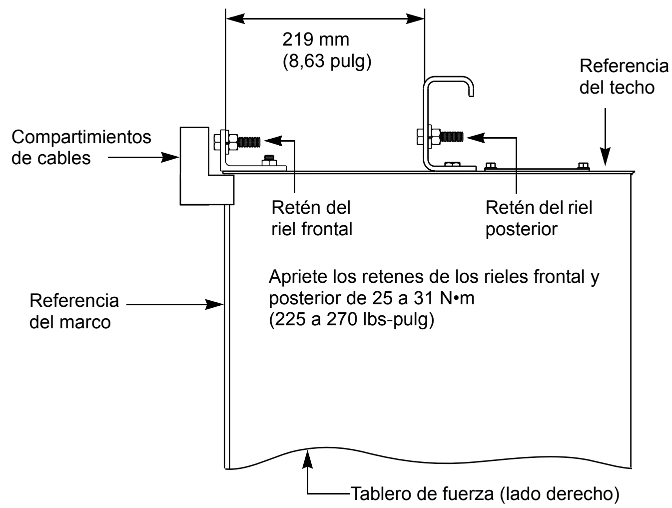
2. Alinee el riel frontal y el posterior (figura 49) con una desviación máxima de 1,6 mm (1/16 pulg) para que la horquilla móvil funcione correctamente. Esto es de vital importancia para facilitar el desplazamiento transversal por el tablero de fuerza.

Figura 49: Alineación del riel frontal y del posterior



Diagnóstico de problemas de alineación de los rieles

a. Introduzca el elemento de compensación bajo las secciones del equipo para que la alineación vertical sea la correcta.
b. Afloje los tornillos de los rieles para volver a alinear el riel frontal y el posterior, luego atornille los tornillos y apriételos de 25 a 31 N•m (225 a 270 lbs-pulg).

Instalación del ensamble del carro

⚠ PELIGRO

PELIGRO DE QUE SE CAIGA EL EQUIPO O LA CARGA

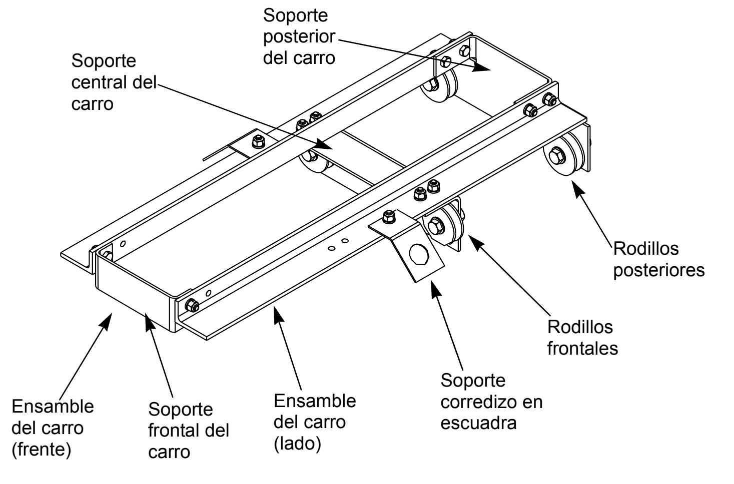
- No retire los retenes del riel frontal una vez que el ensamble del carro haya sido instalado.
- Los retenes del riel frontal (tornillos) se deben instalar en los rieles frontales para evitar que se caiga el mecanismo elevador de la formación del tablero de fuerza.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

NOTA: El ensamble del carro viene de fábrica empacado por separado del tablero de fuerza.

1. Retire los retenes de los rieles frontal y posterior (figura 49 en la página 40) de la sección final del tablero de fuerza en la cual el ensamble del carro será instalada. Guarde los retenes de los rieles frontal y posterior y sus herrajes.
2. Retire las correas de transporte que sujetan el ensamble del carro a la plataforma.
3. Coloque el equipo elevador debajo del ensamble del carro o alrededor de él.

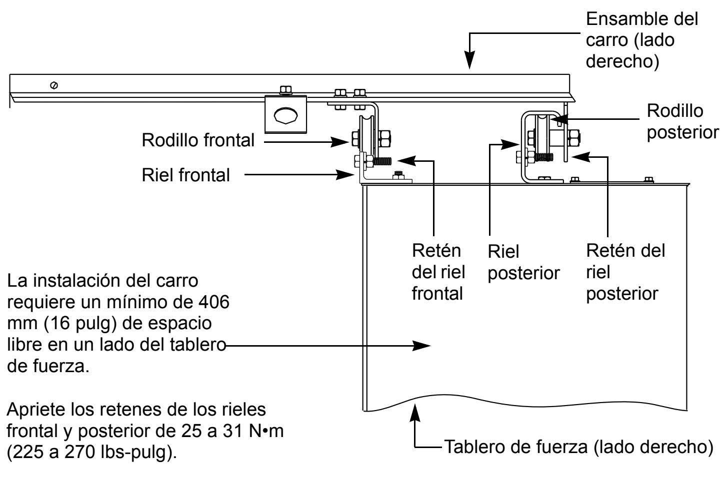
Figura 50: Ensamble del carro (vista frontal y vista lateral)



4. Confirme que el soporte sea adecuado y que el ensamble del carro esté bien sujeto.
5. Antes de levantar el ensamble del carro (figura 50), oriente su frente para alinearlo con la parte frontal del tablero de fuerza.
6. Levante con cuidado el ensamble del carro (necesitará dos personas calificadas) y póngalo en su lugar en los rieles frontal y posterior de la horquilla móvil como se muestra en la figura 51.

   NOTA: En la figura 51, el compartimiento de cables ha sido retirado de la parte frontal del tablero de fuerza para mayor claridad.
7. Coloque los rodillos frontales encima de los rieles frontales y los rodillos posteriores debajo de los rieles posteriores.
8. Deslice el carro a lo largo de los rieles hasta que pase la posición del retén frontal.
9. Una vez que el ensamble del carro esté instalado, vuelva a instalar los retenes de los rieles frontal y posterior (figura 51) que retiró en el paso 1 y apriételos de 25 a 31 N•m (225 a 270 lbs-pulg).

Figura 51: Instalación del ensamble del carro



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Instalación del mecanismo elevador

⚠ ADVERTENCIA

PELIGRO DE QUE SE CAIGA EL EQUIPO O LA CARGA

- Siempre debe haber de 4 a 5 vueltas de cable en el tambor del mecanismo elevador.
- No deje que el tambor se desenrolle completamente ya que en ese caso la carga estará siendo soportada sólo por el ancla.

El incumplimiento de estas instrucciones puede causar lesiones serias o daño al equipo.

Realice el siguiente procedimiento para instalar el mecanismo elevador encima del ensamble del carro.

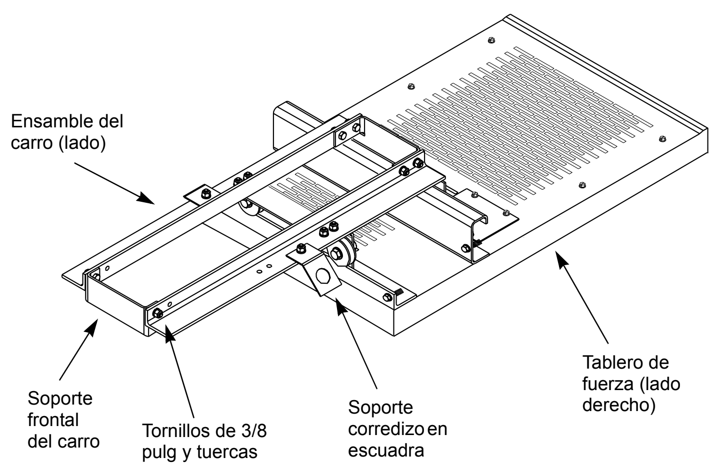
NOTA: El mecanismo elevador viene de fábrica empacado por separado del tablero de fuerza.

1. Retire el soporte frontal del carro (figura 52) del ensamble del carro. Guarde el soporte y sus herrajes.

   NOTA: En la figura 52, el compartimiento de cables ha sido retirado de la parte frontal del tablero de fuerza para mayor claridad.

2. Desempaque el contenido del cartón del mecanismo elevador cerca del tablero de fuerza.

Figura 52: Desmontaje del soporte frontal del carro

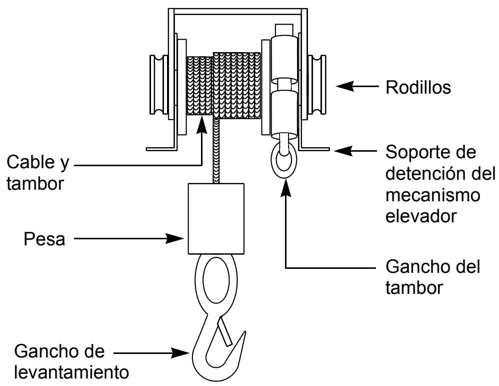


3. Si es necesario, lubrique los engranajes del mecanismo elevador con lubricante consistente para engranajes.

   NOTA: Obtendrá los mejores resultados si mantiene los engranajes lubricados. En condiciones normales de funcionamiento, use un lubricante consistente para engranajes. Si existen condiciones de exceso de suciedad o arenilla, use un lubricante seco, por ejemplo grafito seco.

4. Confirme que el cable esté tenso alrededor del tambor. Nunca deberá haber menos de 4 a 5 vueltas alrededor del tambor.

Figura 53: Mecanismo elevador (vista frontal)

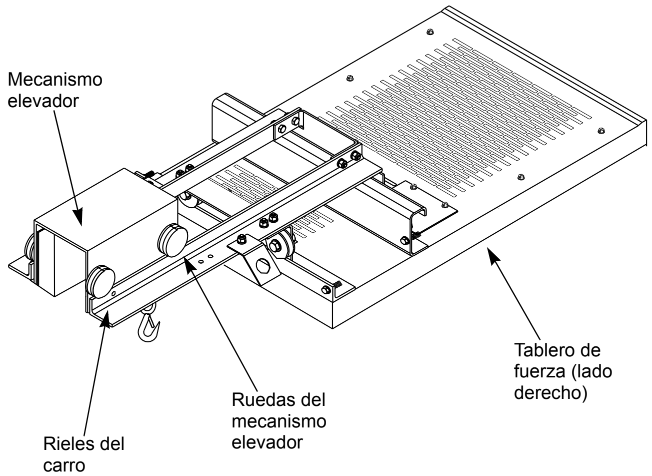


5. Antes de levantar el mecanismo elevador (figura 53) oriente su frente para alinearlo con la parte frontal del tablero de fuerza.
6. Instale el mecanismo elevador (figura 54) en el ensamble del carro; para esto, haga rodar las ruedas del mecanismo elevador por los rieles del carro.

   NOTA: Confirme que los soportes de detención del mecanismo elevador estén debajo de los rieles del carro.

   En la figura 54, el compartimiento de cables ha sido retirada de la parte frontal del tablero de fuerza para mayor claridad.

Figura 54: Instalación del mecanismo elevador

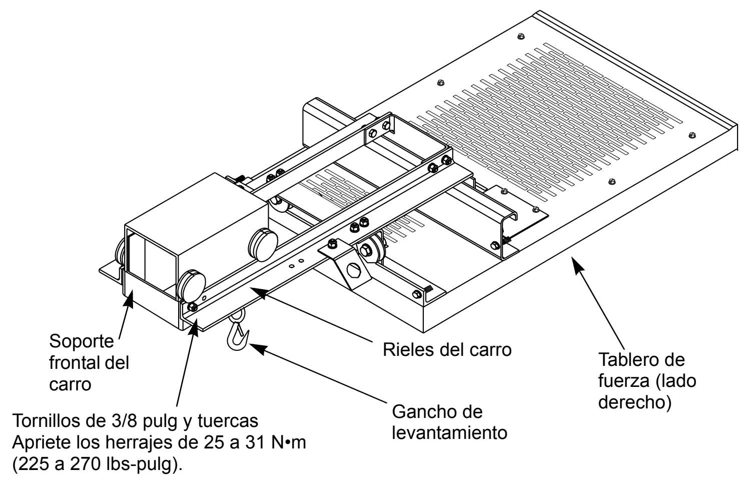


7. Cuando el ensamble del carro esté instalado, vuelva a instalar el soporte frontal del carro (figura 55) que retiró en el el paso 1 en la página 42 y apriete de 25 a 31 N•m (225 a 270 lbs-pulg).

   NOTA: Confirme que los soportes de detención del mecanismo elevador estén detrás del soporte frontal del carro y bajo los rieles del carro antes de apretar el soporte del carro y sus herrajes.

   En la figura 55, el compartimiento de cables ha sido retirado de la parte frontal del tablero de fuerza para mayor claridad.

Figura 55: Instalación del soporte frontal del carro



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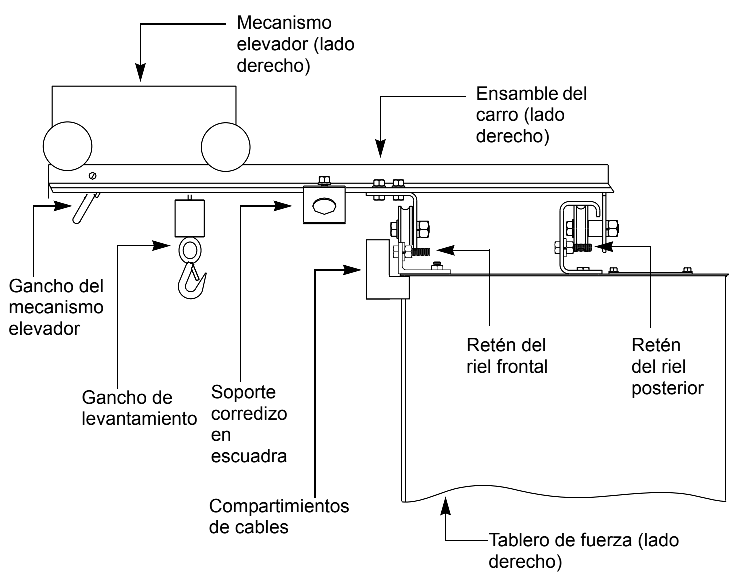
Inspección y pruebas antes de la puesta en funcionamiento

Una vez que la horquilla móvil haya sido completamente instalada, inspecciónela visualmente (figura 56) para comprobar si existe alguna distorsión.

- Confirme que los rieles y las secciones estén alineados.
- Confirme que los retenes del riel frontal y del posterior hayan sido instalados correctamente.
- Confirme que el carro y el mecanismo elevador hayan sido instalados correctamente.
- Confirme que el cable esté bien sujeto alrededor del tambor del mecanismo elevador.
- Confirme que los engranajes del mecanismo elevador estén bien lubricados.

  NOTA: En condiciones normales de funcionamiento, use un lubricante consistente para engranajes. Si existen condiciones de exceso de suciedad o arenilla, use un lubricante seco, por ejemplo grafito seco, para lubricar los engranajes. No permita que el engranaje funcione sin estar engrasado.
- Si fuera aplicable, retire de la parte superior de la unidad cualquier equipo que haya usado para manejarla y todas las obstrucciones que puedan estorbar el funcionamiento de la horquilla móvil.

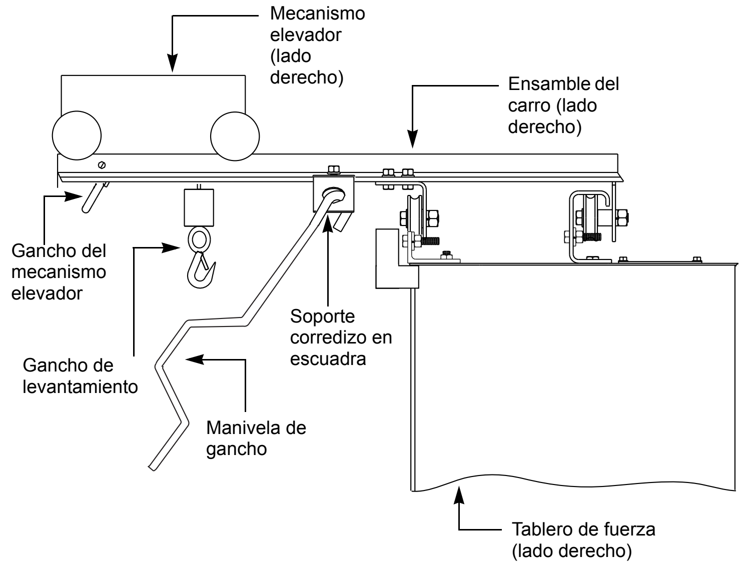
Figura 56: Inspección visual de la horquilla móvil



Use la manivela de gancho de la horquilla móvil para mover el ensamble del carro de un lado a otro a lo largo de las secciones verticales y confirmar con ello que la horquilla móvil funciona correctamente.

1. Localice la manivela de gancho e inserte el gancho en el soporte corredizo en escuadra como se muestra en la figura 57.

Figura 57: Pruebas del ensamble del carro

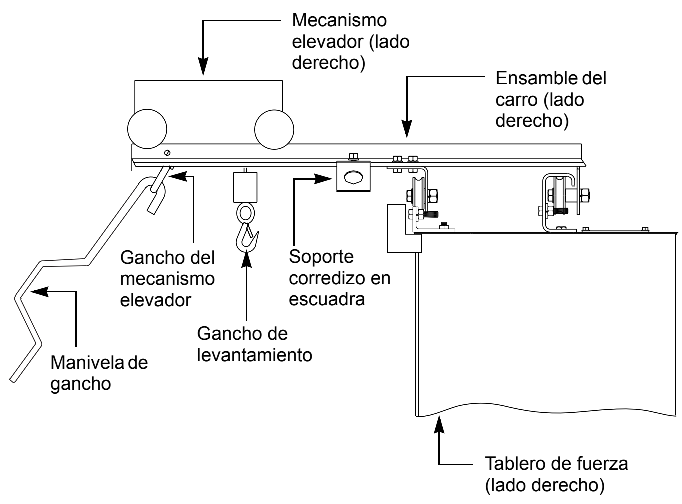


2. Jale la manivela de gancho para que el ensamble del carro ruede sin problemas por los rieles.

   NOTA: Si el ensamble del carro no rueda bien, asegúrese de que no haya ninguna obstrucción en la parte superior de la unidad y de que el riel frontal y el posterior estén bien alineados.

3. Inserte el gancho de la manivela de la horquilla móvil en el gancho del mecanismo elevador como se muestra en la figura 58.

Figura 58: Pruebas del mecanismo elevador



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4. Para hacer funcionar la horquilla móvil:
   a. Gire la manivela en sentido contrario al de las manecillas del reloj para bajar el gancho de levantamiento.
   b. Gire la manivela en el sentido de las manecillas del reloj para levantar el gancho de levantamiento hasta que llegue justo debajo del gancho del mecanismo elevador.

      NOTA: Si el mecanismo elevador no levanta ni baja el gancho de levantamiento, vuelva a inspeccionar la unidad para asegurarse de que no haya ninguna obstrucción y de que los engranajes estén bien lubricados.

Ensamble de las barras de levantamiento del interruptor

Tabla 6: Ensamble de las barras de levantamiento de interruptor

Tipo de interruptor	Corriente (A)	Ancho del marco del interruptor
NT08 (N1, H1, L1F)	800 A	marco T 241 cm (9,50 pulg)
NW08, NW16, NW20, NW32 (N1, H1, H2)	800 a 3 200 A	marco W 400 mm (15,75 pulg)
NW08, NW16 (L1, L1F)	800 a 1 600 A	marco W 400 mm (15,75 pulg)
NW20 (L1-alimentador, L1F–alimentador)	2 000 A	marco W 400 mm (15,75 pulg)
NW40, NW50 (H2, L1)	4 000 a 5 000 A	marco Y 787 mm (31,00 pulg)
NW20, NW32 (L1)	2 000 a 3 200 A	marco Y 787 mm (31,00 pulg)

⚠ PELIGRO

PELIGRO DE QUE SE CAIGA EL EQUIPO O LA CARGA

- No cambie la mecánica ni el diseño de las barras de levantamiento del interruptor.
- Use la barra de levantamiento del interruptor (incluida con todos los pedidos de tableros de fuerza) junto con el ensamble de la horquilla móvil o grúa de piso para levantar el interruptor.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

La barra de levantamiento de los interruptores con marco T se usa para levantar y bajar los interruptores de potencia Masterpact NT. Las barras de levantamiento de los interruptores marco W y marco Y se usan para levantar y bajar los interruptores de potencia Masterpact NW. El tamaño del interruptor determina si se usará una barra de levantamiento para marco W (ancho estándar) o marco Y (ancho doble).

Consulte la tabla 6 para determinar qué barra de levantamiento de interruptor utilizar en el ensamble.

Figura 59: Barra de levantamiento del interruptor marco T

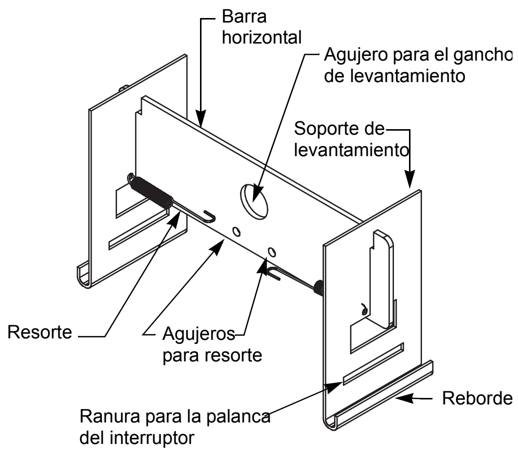
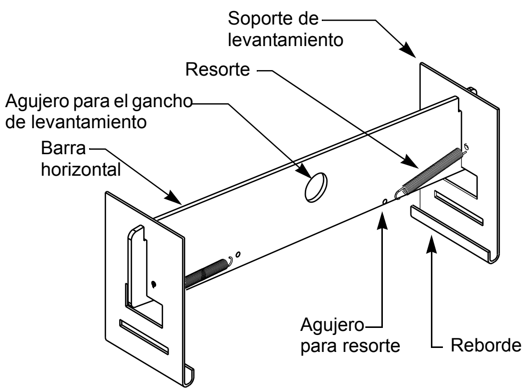


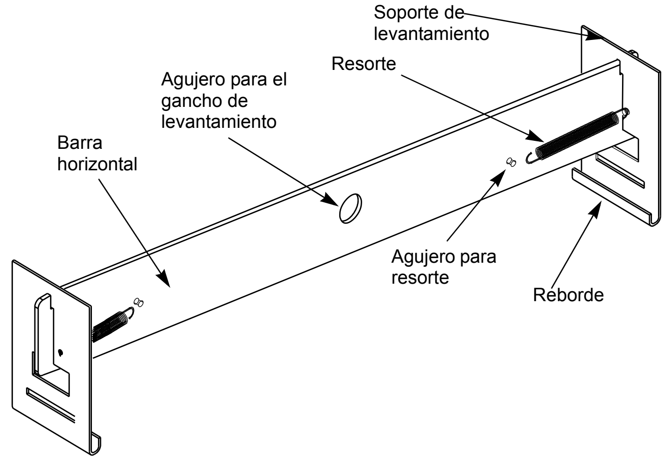
Figura 60: Barra del interruptor marco W



Realice el siguiente procedimiento para ensamblar las barras de levantamiento de los interruptores marco T, W, y Y (figuras 59, 60 y 61).

1. Coloque la barra horizontal con el agujero del gancho de levantamiento hacia arriba.
2. Observe la orientación del reborde. Deslice los soportes por los canales de la barra horizontal.
3. Introduzca los resortes de los soportes de levantamiento en los agujeros para resortes como se muestra en las figuras 59, 60 y 61.

Figura 61: Barra de levantamiento del interruptor marco Y



Preparación e instalación de los interruptores

⚠ PELIGRO

PELIGRO DE QUE SE CAIGA EL EQUIPO O LA CARGA

- Nunca se pare debajo de un interruptor suspendido en el aire.
- Use el gancho de la horquilla móvil (u otro gancho de levantamiento adecuado) en combinación con la barra de levantamiento (incluida con el tablero de fuerza) para mover el interruptor.
- Confirme que el fiador de seguridad esté bien cerrado en el gancho de levantamiento.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Antes de continuar, consulte los dibujos de la obra y el manual del interruptor de potencia Masterpact. Siga todas las instrucciones relacionadas con la seguridad detalladas en el manual del interruptor.

NOTA: Es posible que los interruptores vengan de fábrica empacados por separado del tablero de fuerza Power-Zone 4.

ESPAÑOL

Levantamiento y manejo de los interruptores

Siga estas instrucciones para trasladar el interruptor al lugar de instalación.

1. Desempaque los interruptores de potencia Masterpact según las instrucciones del manual.
2. Conecte firmemente la barra de levantamiento del interruptor en las ranuras a los lados de dicho interruptor (figura 62). En los interruptores marco T, extienda la palanca del interruptor y hágala pasar por las ranuras de la barra de levantamiento del interruptor (figura 59 en la página 47 y figura 63 en la página 48).

Figura 62: Conexión de la barra de levantamiento al interruptor

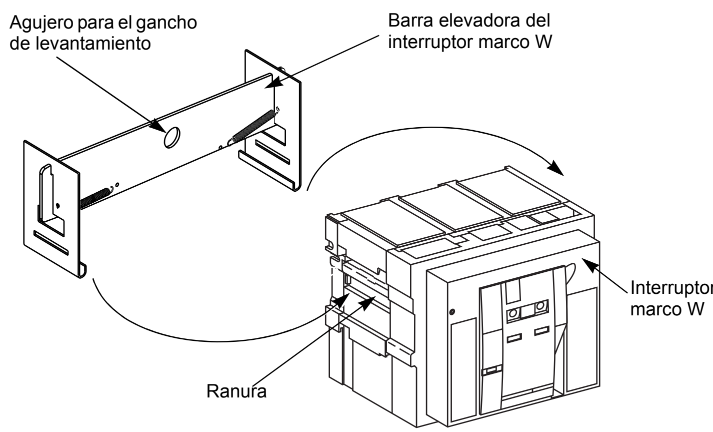
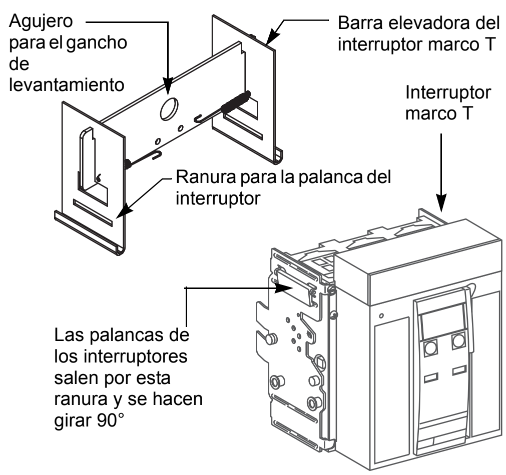


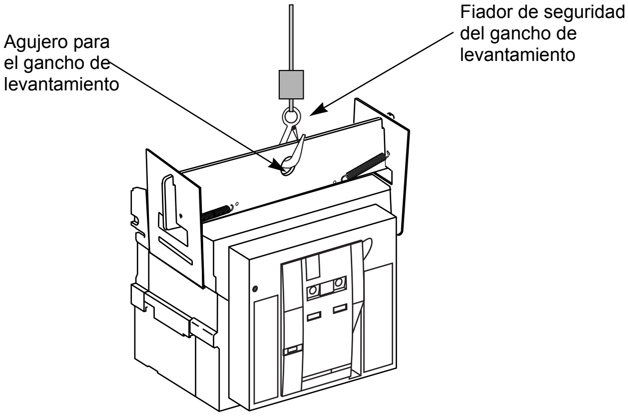
Figura 63: Instalación de la barra de levantamiento en el interruptor marco T



ESPAÑOL

3. Introduzca la horquilla móvil o el gancho de levantamiento de la grúa de piso en el agujero correspondiente (figura 64). Asegúrese de que el fiador de seguridad esté cerrado en el gancho de levantamiento antes de levantar o bajar el interruptor.

Figura 64: Modo de elevar y mover el interruptor



4. Use la horquilla móvil o la grúa de piso para levantar y mover el interruptor.
5. Instale el interruptor de acuerdo con las instrucciones del manual.

ESPAÑOL

Inspección y prueba del tablero de fuerza antes de hacerlo funcionar

Cuando el tablero de fuerza Power-Zone 4 y sus componentes hayan sido instalados y todas las conexiones primarias y de control estén establecidas, realice la inspección y prueba finales antes de poner el tablero de fuerza en servicio.

Si fue instalado correctamente, el tablero de fuerza para interiores cumple con los siguientes requisitos:

- Los paneles frontales forman una línea recta; y cuando se incluyen transformadores y/u otros mecanismos, los paneles frontales se alinean o forman líneas paralelas.
- Las unidades están correctamente espaciadas de centro a centro y perpendiculares a la superficie de montaje.
- El tablero de fuerza está bien sujeto a los canales del piso o plataforma base.
- Las secciones de embarque están bien atornilladas y fijas.
- Las conexiones de la barra y de los cables de control están correctamente conectadas.

En el manual encontrará instrucciones para probar los relevadores, instrumentos, medidores, interruptores y demás dispositivos eléctricos individualmente.

Los ajustes de los dispositivos protectores han sido determinados con anterioridad por un estudio de coordinación realizado por el comprador, un asesor o el grupo de coordinación de Schneider Electric. Los ajustes de fábrica se establecen mediante pruebas de producción y pueden no reflejar los requisitos específicos de cada instalación.

La selección del equipo de prueba depende del valor nominal y del tipo de instalación. Se necesitará un medidor múltiple para comprobar la continuidad de los circuitos de control. Se necesitará un megóhmetro para realizar las pruebas.

Comprobación de las conexiones de los circuitos de alimentación

Realice los siguientes pasos para probar los circuitos de alimentación.

1. Revise las conexiones de los cables y las conexiones de las barras atornilladas para confirmar que no se hayan aflojado ni hayan resultado dañadas durante el transporte o la instalación. Vuelva a instalar inmediatamente las cubiertas o las barreras que retiró para comprobar las conexiones.

   NOTA: Los valores de par de apriete correctos los encontrará en las etiquetas del compartimiento de cables.

2. Si la barra fue enviada con aislamiento:

   a. Retire parcialmente los manguitos aislantes para comprobar las conexiones de las barras atornilladas cortando suficientes amarres de alambre para tener acceso a los herrajes de las conexiones.

   b. Vuelva a instalar los manguitos de aislamiento inmediatamente después de la inspección e inserte los nuevos amarres de alambre en los agujeros de fijación. Utilice los amarres de alambre provistos (número de pieza 25901-24485 de Schneider Electric).

Comprobación del equipo externo

Realice pruebas de continuidad en las conexiones del equipo externo, es decir los controles remotos, los circuitos de bloqueo y los contactos auxiliares. Consulte los procedimientos adecuados del manual para cada dispositivo que vaya a comprobar.

ESPAÑOL

Comprobación del equipo auxiliar

Los relevadores incluidos encima o dentro de los paneles de instrumentos han sido enviados con los ajustes de los niveles de prueba del fabricante.

1. Determine los ajustes finales de los relevadores según el estudio de coordinación realizado por el comprador, un asesor o el grupo de coordinación de Schneider Electric.
2. Haga las modificaciones necesarias en los ajustes del relevador según el manual de ese relevador en particular.

Es posible que los monitores de circuitos y los medidores de alimentación incluidos en la parte frontal del tablero de fuerza no estén bien configurados. El comprador o asesor deberá establecer la configuración final de este dispositivo. Consulte los manuales del monitor de circuitos y del medidor de alimentación para ajustar estos dispositivos.

Comprobación de los sistemas de falla a tierra del equipo

La norma NOM-001-SEDE requiere que se realicen pruebas a los sistemas de protección contra fallas a tierra del equipo cuando se instalan por primera vez. Si el interruptor dispone de esta protección, pruebe el sistema integral de protección contra fallas a tierra en este momento.

Asegúrese de que la unidad de disparo esté energizada. La unidad de disparo está energizada si:

- El interruptor está cerrado o recibe alimentación por la parte inferior y tiene más de 100 V de tensión de carga en dos fases (en las unidades de disparo P o H solamente).
- El equipo de pruebas de plenas funciones o portátil está conectado y energizado.
- La fuente de alimentación externa de 24 V⎓ (c.d.) está conectada.
- La derivación de tensión externa está instalada y hay más de 100 V en dos fases (unidades de disparo P o H solamente). Si éste es un sistema radial (asimétrico), pulse el botón de prueba de falla a tierra. El interruptor se disparará y el indicador de falla a tierra de la unidad de disparo encenderá la luz.

Asimismo, es posible proporcionar protección contra fallas a tierra a través de un dispositivo que no esté integrado al interruptor, por ejemplo un relevador externo. Siga las instrucciones del fabricante del sistema y realice una prueba en este momento.

Anote los resultados en el registro cronológico de pruebas del sistema de falla a tierra.

NOTA: Si es necesario realizar una prueba completa al sistema de protección contra fallas a tierra, realice una prueba de inyección primaria. Si el sistema tiene múltiples fuentes y/o se requieren conexiones en campo, utilice una prueba de inyección primaria.

NOTA: Algunos sistemas de protección contra fallas a tierra necesitan conexiones en campo en el sitio de trabajo. Consulte el diagrama de interconexión de cables del tablero de fuerza para obtener detalles.

ESPAÑOL

Realización de la prueba de resistencia del aislamiento eléctrico

Ya se comprobó en la fábrica la resistencia del aislamiento dieléctrico del tablero de fuerza Power-Zone 4 y los interruptores de potencia Masterpact.

⚠ PRECAUCIÓN

PELIGRO DE TENSIÓN DE PRUEBA

- Retire el calibrador de tiempo largo antes de probar el aislamiento eléctrico de un interruptor que tenga adherida la siguiente etiqueta “Advertencia: Desconecte el calibrador antes de realizar la prueba de rigidez dieléctrica”.
- Algunas unidades de disparo Micrologic no tienen el valor nominal necesario para resistir la tensión que se produce durante las pruebas de resistencia del aislamiento eléctrico.
- Abra todos los dispositivos de desconexión de control y de medición en los circuitos de control.

El incumplimiento de estas instrucciones puede causar lesiones personales o daño al equipo.

Realice una prueba de rigidez dieléctrica una vez que el tablero de fuerza haya sido instalado. Esta prueba ayudará a descubrir cortocircuitos y puestas a tierra no deseados, además de daños que pudieron haberse producido durante su transporte e instalación.

1. Si desea más información sobre las pruebas de rigidez dieléctrica en campo, consulte la norma C37.20.1 de ANSI/IEEE.
2. Abra todos los dispositivos de desconexión de alimentación de control y de medición o extraiga los fusibles de los circuitos de control. Desconecte las conexiones de neutro en cualquier supresor de sobretensiones transitorias (TVSS) u otro dispositivo electrónico antes de realizar la prueba de resistencia de aislamiento eléctrico; vuelva a conectar al dispositivo después de la prueba.
3. Con el neutro aislado de la tierra y los desconectadores e interruptores abiertos, realice las pruebas de aislamiento eléctrico de fase a fase, fase a tierra, fase a neutro y neutro a tierra.

   NOTA: Si la resistencia proporciona un valor inferior que un megaohm mientras realiza las pruebas con los dispositivos de circuito derivado en la posición de abierto, es posible que el sistema produzca condiciones peligrosas las cuales tendrán que ser investigadas. Consulte con Schneider Electric México llamando al 55-5804-5000 para obtener asistencia acerca de cómo corregir cualquier problema.
4. Después de completar la prueba de aislamiento eléctrico, vuelva a colocar todos los fusibles de la alimentación de control que haya extraído y cierre los dispositivos de desconexión de alimentación que hayan sido abiertos. Energice las fuentes de alimentación a medida que sea necesario.

Sección 5—Procedimiento de verificación de pre-energización

Realice una inspección completa **antes** de energizar el tablero de fuerza para asegurarse que todos los componentes funcionan correctamente. **Realice cada uno de los siguientes pasos del procedimiento de verificación antes de energizar el tablero de fuerza.**

AVISO

CLIPS PARA FUSIBLES INCORRECTAMENTE AJUSTADOS

No abra haciendo palanca ni extienda los clips de montaje para fusibles; ya que pueden aflojarse las conexiones y crear sobrecalentamiento.

El incumplimiento de esta instrucción puede causar daño al equipo.

1. Revise todas las conexiones de la barra de distribución realizadas en campo.
2. Revise todas las conexiones a las que pueda acceder y asegúrese de que estén bien apretadas.
3. Revise todas las terminaciones de zapatas instaladas en la fábrica y en campo, y asegúrese de que estén bien apretadas.
4. Verifique la rigidez de todos los soportes de la barra de distribución.
5. Revise el gabinete del tablero de fuerza y asegúrese de que no haya abolladuras u otros daños que puedan reducir el espacio libre para los cables eléctricos dentro del tablero.
6. Retire los bloques de espuma y demás material de sujeción o de protección utilizado para transportar los dispositivos eléctricos.
7. Abra y cierre todos los interruptores y demás mecanismos de funcionamiento, asegúrese de que estén correctamente alineados y que funcionen sin obstrucción.
8. Haga funcionar todos los desconectadores de funcionamiento eléctrico, interruptores y demás dispositivos equipados con operadores remotos (que no contengan carga). Es posible que se necesite una fuente auxiliar de alimentación de control para realizar este procedimiento.
9. Revise todos los relevadores, medidores e instrumentación para verificar que las conexiones de los cables realizadas en campo se hayan hecho correctamente y que los dispositivos también funcionen correctamente.
10. Los transformadores de corriente (TC) provistos para uso del cliente requieren conexión a la carga de un dispositivo de medición antes de energizarlos. Verifique que la carga del dispositivo de medición esté correctamente conectada, incluyendo las conexiones principales del tablero de fuerza al equipo remoto.
11. Todos los circuitos del TC suministrados por Schneider Electric, utilizados para medición por el cliente, han sido cortocircuitados para su transporte. Retire las terminales de tornillo cortocircuitadoras situadas en los bloques de terminales o puentes de conexión cortocircuitadores y guárdelas en el bloque.

AVISO

PELIGRO DE CONTAMINACIÓN

No utilice una manguera de aire comprimido para soplar aire en el tablero de fuerza. Es posible que el polvo se asiente dentro de los relevadores y dispositivos de protección contra sobrecorrientes lo cual podría causar sobrecalentamiento y un funcionamiento inadecuado.

El incumplimiento de esta instrucción puede causar daño al equipo.

12. En el tablero de fuerza con interruptor de disparo electrónico integrado, ajuste la curva característica de disparo de la unidad de disparo electrónico ajustable según los requisitos del trabajo o como se describe en el manual de instrucciones respectivo.
13. Asegúrese de que las conexiones a tierra se hayan realizado correctamente. Si el tablero de fuerza se usa como equipo de entrada de acometida, asegúrese de que el puente de conexión principal esté conectado.
14. Revise todo el alambrado realizado en campo. Asegúrese de que no toque ninguna pieza energizada, y cuando se indique, cerciórese de que aguante las corrientes de falla.
15. Verifique que todos los cables de control entre las secciones estén conectados.
16. Aspire para retirar el polvo, los pedazos de alambre u otros residuos.
17. Vuelva a colocar todas las cubiertas, asegúrese de no pellizcar ningún cable, y cierre las puertas. Asegúrese de que todas las piezas del gabinete estén correctamente alineadas y bien fijas.

ESPAÑOL

Sección 6—Energización del tablero de fuerza

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Corrija las condiciones de cortocircuito detectadas durante los procedimientos de verificación descritos en la “Sección 5—Procedimiento de verificación de pre-energización”, que comienza en la página 53.
- Deberá estar presente personal eléctrico calificado al energizar el equipo por primera vez.
- Siga las instrucciones de esta sección para energizar correctamente el tablero de fuerza.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

1. Asegúrese de que no haya carga en el tablero de fuerza cuando se energiza. Desconecte todas las cargas descendentes.
2. Energice el tablero de fuerza en la siguiente secuencia:

   a. Conecte todos los dispositivos de desconexión de alimentación de control antes de energizar el tablero de fuerza. Consulte los dibujos del registro que acompañan al equipo para ver si viene con dispositivos de desconexión de alimentación de control.
   b. Cierre las puertas o cubiertas que estén abiertas.
   c. Cierre todos los dispositivos principales.
   d. Cierre los interruptores derivados.
   e. Proceda con cada uno de los tableros de alumbrado/distribución y demás dispositivos de carga descendente.

Cuando todos los dispositivos protectores contra sobrecorrientes hayan sido cerrados, encienda todas las cargas; por ejemplo, circuitos de alumbrado, contactores, calefactores y motores.

Sección 7—Servicio de mantenimiento del tablero de fuerza

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Inspeccione y realice servicio de mantenimiento preventivo solamente al tablero de fuerza y al equipo que se encuentre en la posición de abierto (O), desconectado y aislado eléctricamente (a no ser que se especifique lo contrario) para que no haya contacto accidental con piezas energizadas.
- Siga las prácticas de seguridad en el trabajo descritas en la norma 70E de NFPA para cumplir con los requisitos de seguridad para los empleados y la norma 29 CFR Parte 1910 Subparte S de OSHA relacionadas con las instalaciones eléctricas.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

El servicio de mantenimiento periódico del tablero de fuerza incluye la limpieza, lubricación y pruebas de funcionamiento de los componentes principales. El intervalo de tiempo entre servicios de mantenimiento puede variar dependiendo de la cantidad de uso y condiciones ambientales de cada instalación. Se recomienda un intervalo de inspección de un año como máximo. Esta definición de servicio de mantenimiento periódico es aplicable en todo el manual, a no ser que se indique lo contrario.

Siempre inspeccione el tablero de fuerza después de una falla (consulte la sección 8 “Sección 8—Circunstancias adversas”, que comienza en la página 60). Se encuentran disponibles, de su oficina local de campo de Schneider Electric, manuales de servicio para los diferentes dispositivos de desconexión y protección contra sobrecorrientes montados en el tablero de fuerza.

ESPAÑOL

Procedimientos para la inspección del tablero de fuerza

Por lo general, se deben seguir los siguientes procedimientos, sin embargo, cuando cambien las condiciones también debe cambiar el programa de servicio de mantenimiento para asegurar la máxima duración del equipo y del sistema eléctrico.

Será necesario inspeccionar periódicamente el equipo para establecer las condiciones a las que está sujeto el tablero de fuerza (lea “Condiciones ideales de funcionamiento”, “Condiciones normales de funcionamiento” y “Condiciones difíciles de funcionamiento” en la página 57). Realice las inspecciones y los servicios de mantenimiento según estas condiciones.

Inspeccione el equipo inmediatamente después de que se presenten condiciones de funcionamiento anormales o difíciles o cuando el equipo experimente una corriente de falla.

Estos procedimientos de inspección y servicio de mantenimiento sólo son aplicables para el tablero de fuerza Power-Zone 4 fabricado por Schneider Electric. Si no se pueden establecer y documentar las condiciones de funcionamiento, entonces se deberán asumir condiciones difíciles de funcionamiento.

Estos procedimientos de inspección y servicio de mantenimiento no exigen conexiones o modificaciones de campo, ni reemplazan los procedimientos ni programas de servicio de mantenimiento recomendados por los fabricantes de los componentes. Si desea obtener más información sobre la garantía de este producto, consulte las cláusulas de “Condiciones de venta de Schneider Electric”.

ESPAÑOL

Condiciones ideales de funcionamiento

Cuando el equipo funciona bajo “condiciones ideales” descritas a continuación, debería funcionar sin necesidad de servicio de mantenimiento durante 5 años.

Ambientales

- La temperatura ambiente de la sala deberá ser entre 10 y 40 °C (50 y 104 °F).
- La altitud es inferior a 2 012 m (6 600 pies).
- El equipo está instalado en el interior en una sala climatizada (calefacción/aire acondicionado).
- No existe polvo ni suciedad, ni en el aire ni en las superficies.
- La humedad relativa promedia es aprox. del 70%.
- No existen vibraciones ni actividad sísmica.

Carga de los circuitos

- La carga continua (con dispositivos con un valor nominal del 100%) está entre el 20 y el 80% de los valores nominales del equipo.
- La carga media no excede el 70% del valor nominal del equipo.
- Sólo existen cargas del motor resistivas o continuas, no cargas de soldadura ni intermitentes.
- El interruptor conmuta menos de 15 ciclos al año.
- Se produce anualmente un máximo de dos disparos en el interruptor debido a sobrecargas o fallas.

Instalación del equipo

- Apriete las juntas, zapatas y tornillos de las barras en el valor de par de apriete apropiado durante la instalación.
- Apriete bien todos los cables de control y comunicaciones durante la instalación.
- Siga el procedimiento de pre-energización rigurosamente.

Condiciones normales de funcionamiento

Cuando el equipo funciona bajo “condiciones normales” descritas a continuación, se deberán realizar inspecciones visuales y servicios de mantenimiento de 1 a 3 años, o con más frecuencia, dependiendo de la experiencia del usuario.

Ambientales

- La temperatura ambiente de la sala deberá ser entre -30 °C y 40 °C (-22 °F y 104 °F).
- La altitud es inferior a 2 012 m (6 600 pies).
- El efecto de la radiación solar no es importante.

  NOTA: Consulte los principios descritos en la norma C37.24-1986 de IEEE si desea información adicional.

Carga de los circuitos

- El interruptor conmuta menos de 200 ciclos al año.
- Las cargas de soldadura o intermitentes representan menos del 15% de la carga de un circuito o equipo.

Instalación del equipo

- Apriete las juntas, zapatas y tornillos de las barras en el valor de par de apriete apropiado durante la instalación.
- Apriete bien todos los cables de control y comunicaciones durante la instalación.
- Siga el procedimiento de pre-energización rigurosamente.

ESPAÑOL

Condiciones difíciles de funcionamiento

Cuando el equipo funciona bajo “condiciones difíciles” descritas a continuación, se deberá realizar inspecciones visuales y servicios de mantenimiento cada 6 meses, o con más frecuencia, dependiendo de la experiencia del usuario.

Ambientales

- La temperatura ambiente de la sala es inferior a -30 °C (-22 °F) o superior a 40 °C (104 °F).
- La altitud es superior a 2 012 m (6 600 pies).
- El efecto de la radiación solar es importante.
- El equipo está expuesto a un clima excesivamente cálido o húmedo.
- El equipo está expuesto a humos dañinos, vapores, vapor de agua, aire salino y/o vapores de aceites.
- El equipo está expuesto a movimientos sísmicos, vibraciones anormales o inclinaciones.

Carga de los circuitos

- El interruptor se dispara con frecuencia debido a sobrecargas o fallas.
- El interruptor conmuta más de 200 veces al año.
- Las cargas de soldadura o intermitentes representan más del 15% de la carga de un circuito.

Instalación del equipo

- Apriete las juntas, zapatas y tornillo de las barras en el valor de par de apriete apropiado durante la instalación.
- Apriete bien todos los cables de control y comunicaciones durante la instalación.
- Siga el procedimiento de pre-energización rigurosamente.

Inspección general y limpieza

AVISO

PELIGRO DE CONTAMINACIÓN

- No utilice una manguera de aire comprimido para soplar aire en el tablero de fuerza. Es posible que el polvo se asiente dentro de los relevadores y dispositivos de protección contra sobrecorrientes lo cual podría causar sobrecalentamiento y un funcionamiento inadecuado.
- No permita que plásticos o material de aislamiento entre en contacto con pintura, productos químicos o solventes basados en derivados del petróleo.

El incumplimiento de estas instrucciones puede causar daño al equipo.

1. Aspire el interior del tablero de fuerza para quitar la suciedad o depósitos de polvo. Limpie todas las barras de distribución, aisladores, cables, etc. con un trapo limpio y seco sin pelusas.
2. Revise cuidadosamente el interior del tablero de fuerza para ver si encuentra humedad, acumulación, condensación o indicaciones de humedad previa. La humedad puede romper el aislamiento y causar la oxidación rápida de las piezas conductoras de corriente. Inspeccione todas las entradas de tubo conduit y cuarteaduras entre los paneles del gabinete para ver si encuentra fugas líquidas. La condensación en los tubos conduit puede ser una fuente de humedad y deberá evitar que gotee en las piezas energizadas o material de aislamiento. Tome las medidas necesarias para eliminar la humedad y sellar las fugas.
3. Inspeccione el tablero de fuerza para ver si encuentra alguna indicación de sobrecalentamiento. La decoloración y descascaramiento del aislamiento o piezas de metal son indicaciones de sobrecalentamiento.

   NOTA: Si se produce sobrecalentamiento, asegúrese de haber corregido todas las condiciones que lo causaron. Las conexiones sueltas o contaminadas pueden causar sobrecalentamiento.
4. Revise el tablero de fuerza para ver si encuentra nidos de roedores. En caso de ser necesario, utilice una buena técnica de exterminación en el área general del tablero.

   NOTA: No coloque o utilice substancias ni productos químicos para exterminar dentro del tablero de fuerza ya que algunos de ellos pueden atraer roedores.
5. Inspeccione cuidadosamente todos los dispositvos para ver si encuentra desgaste, cuarteaduras o piezas faltantes.

6. Abra y cierre los interruptores automáticos varias veces y asegúrese de que estén funcionando correctamente.
7. Asegúrese de que todos los bloqueos de llave y provisiones de bloqueo de puerta estén funcionando correctamente.

Juntas de las barras de distribución, terminaciones de zapatas y material de aislamiento

AVISO

PELIGRO DE DAÑO AL REVESTIMIENTO

- No lije ni remueva el revestimiento metálico de las barras de distribución, barras de empalme o zapatas de terminal.
- El daño al revestimiento metálico puede causar sobrecalentamiento. Sustituya las piezas dañadas. Póngase en contacto con Schneider Electric México llamando al 55-5804-5000.

El incumplimiento de estas instrucciones puede causar daño al equipo.

1. No es necesario realizar servicio de mantenimiento a las juntas de las barras. No las vuelva a apretar una vez de haber completado el procedimiento de verificación de pre-energización.
2. Revise todas las juntas de las barras de distribución y las zapatas de terminales para ver si encuentra picaduras, corrosión o decoloración a consecuencia de temperaturas altas o muchas fallas. Si se ha producido algún daño, sustituya las barras o zapatas. Si es necesario limpiarlas, utilice el producto Lectra-Clean®, fabricado por CRC.
3. Inspeccione el material de aislamiento. Antes de volver a energizar el tablero de fuerza, sustituya los aisladores que tengan daños visibles; por ejemplo, cuarteaduras.

Procedimientos de inspección y servicio de mantenimiento de la horquilla móvil

Inspeccione la horquilla móvil en busca de signos de desgaste. Estas unidades han sido desarrolladas como productos de calidad para su uso ocasional, no continuo. Si se usa con frecuencia, la horquilla se desgastará más, aunque si se mantiene adecuadamente lubricada se extenderá su vida útil.

Lubricación

Realice los siguientes pasos para lubricar el ensamble de la horquilla móvil.

1. Asegúrese de que puntos apropiados de la horquilla estén siempre bien lubricados.
2. Todas las ruedas y los rodillos deben estar bien lubricados con una grasa multiuso. Aplique una grasa multiuso de gran calidad al ensamble del engranaje sin fin. Repita este procedimiento, siempre que sea necesario, para mantener una capa continua de grasa sobre la superficie de los engranajes.
3. Nunca haga funcionar el mecanismo elevador con el ensamble del engranaje sin fin seco.
4. Lubrique todos los puntos de fricción según se necesite con un aceite de densidad media de gran calidad. Evite saturarlo en exceso, ya que esto hará que el aceite gotee.

Inspección y servicio de mantenimiento

Cuando el equipo haya sido lubricado, realice el siguiente procedimiento de inspección.

- Inspeccione todos los componentes en busca de cuarteamientos, piezas sueltas y desperfectos provocados por los elementos climáticos o por productos químicos.
- Si se sospecha que existen cuarteamientos o desperfectos debido al esfuerzo, ponga la unidad fuera de servicio. Si detecta algún componente cuarteado, sustitúyalo antes de volver a poner la unidad en servicio.

- Revise la horquilla móvil periódicamente para asegurarse de que no haya ninguna distorsión. Si encuentra alguna distorsión:
  - — Asegúrese de que los rieles y las secciones estén alineados.
  - — Asegúrese de que el carro y el mecanismo elevador hayan sido instalados correctamente.
  - — Asegúrese de que el cable esté bien sujeto al tambor del mecanismo elevador.
  - — Asegúrese de que los engranajes estén bien lubricados.

    NOTA: En condiciones normales de funcionamiento, use un lubricante consistente para engranajes. Si existen condiciones de exceso de suciedad o arenilla, use un lubricante seco, por ejemplo grafito seco, para lubricar los engranajes. Nunca permita que los engranajes funcionen sin estar engrasados.
- Si fuera aplicable, retire de la parte superior de la unidad los dispositivos de levantamiento y cualquier obstrucción que pudiera impedir el funcionamiento de la horquilla móvil.
- Inspeccione a conciencia el cable de la horquilla móvil. Preste especial atención a las secciones del cable, es decir las partes que pasan por encima de las poleas o que se enrollan alrededor del tambor, ya que normalmente no están visibles durante la inspección o servicio de mantenimiento.
- Comuníquese con Schneider Electric México llamando al 55-5804-5000 si el cable muestra señales de deterioro:
  - — Retorcimientos, aplastamientos, cortes o destrenzados.
  - — Cables corroídos, cuarteados, doblados o rotos.
  - — Conexiones finales desgastadas.
- Mantenga siempre el acabado exterior en buenas condiciones para proteger el interior contra la corrosión. Si nota algún desperfecto, remueva el acabado hasta dejar al descubierto el metal desnudo y vuélvalo a cubrir con imprimación de gran calidad y una capa de acabado final.
- Asegúrese de que todas las etiquetas de advertencia estén en su sitio y que se puedan leer. Si las etiquetas de advertencia dejan de ser legibles o son destruidas, comuníquese con su oficina local de ventas de Schneider Electric.
- No repare ninguna pieza que esté desgastada, cuarteada, deformada, desalineada o excesivamente corroída. Las piezas reparadas no garantizan un rendimiento satisfactorio y seguro. No use piezas de otros fabricantes.
- Anote en el registro cronológico de servicio de mantenimiento todas las inspecciones y servicios de mantenimiento que realice a la horquilla móvil. Consulte “Sección 10—Registro cronológico de servicios de mantenimiento” en la página 64.

Programa de inspección de los interruptores

El programa de inspección de los interruptores y de las unidades de disparo se deberá basar en los boletines de instrucciones de cada interruptor y de las unidades de disparo.

ESPAÑOL

Sección 8—Circunstancias adversas

Esta sección incluye, pero no se limita a, todos los componentes eléctricos del tablero de fuerza.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Desenergice el tablero de fuerza antes de limpiarlo.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Antes de energizar el tablero de fuerza, deberán cubrirse todos los espacios de montaje sin utilizar de los interruptores.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

NOTA: Antes de volver a energizar el tablero de fuerza y bajo las siguientes circunstancias adversas, póngase en contacto con Schneider Electric México llamando al 55-5804-5000 para obtener instrucciones especiales.

Inspección después de un cortocircuito

Si se produce un cortocircuito, realice una inspección completa a todo el sistema, asegúrese de que no se hayan dañado los conductores ni el aislamiento. Los altos esfuerzos mecánicos y térmicos producidos por las corrientes de cortocircuito pueden dañar los conductores y el aislamiento. Revise el dispositivo de protección contra sobrecorrientes que interrumpió la corriente de cortocircuito para ver si encuentra daños a causa de la formación de arcos.

No abra los dispositivos cerrados herméticamente, por ejemplo los interruptores automáticos en caja moldeada. Estos dispositivos deberán sustituirse en caso de haberse dañado. Antes de energizar el tablero de fuerza, deberán cubrirse todos los espacios de montaje sin utilizar de los interruptores.

Limpieza después de un cortocircuito

Es posible que las propiedades aislantes de algunos materiales de aislamiento orgánicos se deterioren durante un arco eléctrico. En caso de que esto suceda:

1. Retire el hollín o residuos.
2. Sustituya el aislamiento con marcas de carbono.

Tablero de fuerza inmerso en agua

No limpie ni repare un tablero de fuerza que ha sido expuesto a grandes volúmenes de agua o que haya sido sumergido. Es posible que las piezas conductoras de corriente; sistemas de aislamiento y componentes eléctricos se dañen y no puedan repararse. **No energice el tablero de fuerza.** Póngase en contacto con el Centro de servicios en campo de Schneider Electric.

Tablero de fuerza rociado o salpicado de agua (con agua limpia solamente)

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Desenergice el tablero de fuerza antes de limpiarlo.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Antes de energizar el tablero de fuerza, deberán cubrirse todos los espacios de montaje sin utilizar de los interruptores.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Si el tablero de fuerza ha sido rociado o salpicado con cantidades pequeñas de agua limpia, realice una inspección completa a todo el sistema; asegúrese de que no se hayan dañado los conductores ni el aislamiento. No abra los dispositivos cerrados herméticamente, por ejemplo los interruptores automáticos en caja moldeada o fusibles. Estos dispositivos deberán sustituirse en caso de haberse dañado.

Inspección y limpieza del tablero de fuerza rociado o salpicado de agua limpia

Realice los pasos 1 a 10 solamente si:

- no se encuentran señas de daño físico al equipo.
- el tablero de fuerza no ha sido sumergido ni expuesto al agua durante largos períodos de tiempo.
- el agua en contacto con el tablero de fuerza no ha sido contaminada con aguas residuales, productos químicos u otras substancias que puedan afectar negativamente la integridad del equipo eléctrico.
- el agua que ha estado en contacto con el tablero de fuerza no ha penetrado a ninguna área del gabinete con los cables conectado y ubicado por encima de piezas energizadas. En particular, inspeccione el tubo conduit situado por encima de piezas energizadas para ver si ha penetrado agua.

Si no se cumple ninguna de estas condiciones, póngase en contacto con Schneider Electric México llamando al 55-5804-5000.

Si se cumplen **TODAS** estas condiciones proceda con los siguientes pasos:

1. Desenergice el equipo antes de realizar cualquier trabajo en él.
2. Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
3. Desconecte y aísle eléctricamente el tablero de fuerza de manera que no haya contacto con las piezas energizadas.
4. Limpie la humedad de las barras de distribución, aisladores y material de aislamiento con un trapo limpio y seco que no deje pelusas. **No** use limpiadores ni rociadores de agua.
5. Prepare el tablero de fuerza para realizar las pruebas de resistencia de aislamiento (con un megóhmetro). Desconecte la alimentación del lado de línea y los cables del lado de carga para aislar el tablero del sistema de alambrado.

ESPAÑOL

AVISO

PELIGRO DE TENSIÓN DE PRUEBA

- Retire el calibrador ajustable antes de realizar la prueba de aislamiento eléctrico a un interruptor con la siguiente etiqueta “Advertencia: desconecte el calibrador antes de realizar la prueba de rigidez dieléctrica”.
- Algunas unidades de disparo Micrologic no son adecuadas para las tensiones producidas durante la prueba de resistencia del aislamiento eléctrico.
- Abra todos los dispositivos de desconexión de control y de medición en los circuitos de control.

El incumplimiento de estas instrucciones puede causar lesiones o daño al equipo.

6. Ponga la palanca de los interruptores o desconectadores en la posición de cerrado (I). El tablero de fuerza deberá permanecer completamente desenergizado.
7. Utilice un megóhmetro con capacidad de 500 a 1 000 V⎓ (c.d.) y aplique tensión de:
   a. cada fase a tierra con el interruptor energizado.
   b. fase a fase con el interruptor energizado.
8. Anote los valores de resistencia. Consulte la “Sección 9—Tabla de resistencia del aislamiento del tablero de fuerza” en la página 63.
9. Si las mediciones de resistencia son menores que 0,5 megohm, póngase en contacto con Schneider Electric México llamando al 55-5804-5000 para obtener recomendaciones.
10. Si las mediciones de resistencia son mayores que 0,5 megohm, el equipo puede ser energizado siguiendo los procedimientos que figuran en la sección 6, “Sección 6—Energización del tablero de fuerza” en la página 54.

ESPAÑOL

Sección 9—Tabla de resistencia del aislamiento del tablero de fuerza

Siempre utilice un megóhmetro de 500 ó 1 000 V⎓ (c.d.) para la prueba de resistencia del aislamiento.

NOTA: En la columna de neutro–tierra anote sólo los resultados del procedimiento de verificación de pre-energización.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Desenergice el tablero de fuerza antes de realizar la prueba.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

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Fecha	Fase–Fase			Fase–Tierra			Neutro–Tierra
	Todos los dispositivos de desconexión abiertos						
	a-b	b-c	c-a	a-tierra	b-tierra	c-tierra	Neutro–Tierra
Fecha	Todos los dispositivos de desconexión cerrados						
	a-b	b-c	c-a	a-tierra	b-tierra	c-tierra	Neutro–Tierra

ESPAÑOL

Sección 10—Registro cronológico de servicios de mantenimiento

Fecha	Descripción

Fecha	Descripción

Importado en México por:
Schneider Electric México, S.A. de C.V.
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55-5804-5000
www.schneider-electric.com.mx

Normas, especificaciones y diseños pueden cambiar, por lo tanto pida confirmación de que la información de esta publicación está actualizada.

80298-002-07, 06/2015
Reemplaza 80298-002-07, 06/2007

Power-Zone^{MC}4

Appareillage de commutation débrochable à basse tension sous coffret métallique avec disjoncteur de puissance à basse tension Masterpact^{MC}

Classe 6037

Directives d'utilisation

80298-002-06
06/2015

À conserver pour usage ultérieur.

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SQUARE D

by Schneider Electric

Catégories de dangers et symboles spéciaux

Lisez attentivement ces directives et examinez l'appareillage pour vous familiariser avec son fonctionnement avant de faire son installation ou son entretien. Les messages spéciaux suivants peuvent apparaître dans les présentes directives ou sur l'appareil pour avertir l'utilisateur de dangers potentiels ou pour attirer l'attention sur des informations qui clarifient ou simplifient une procédure.

L'ajout d'un de ces deux symboles à une étiquette de sécurité de « Danger » ou d'« Avertissement » indique qu'un danger électrique existe et qu'il peut entraîner des blessures corporelles si les directives ne sont pas respectées.

Ceci est le symbole d'alerte de sécurité. Il est utilisé pour vous alerter de dangers de blessures corporelles potentielles. Veuillez vous conformer à tous les messages de sécurité qui suivent ce symbole pour éviter une blessure ou la mort.

DANGER

DANGER indique une situation de danger imminent qui, si elle n'est pas évitée **entraînera** la mort ou des blessures graves.

AVERTISSEMENT

AVERTISSEMENT indique une situation de danger potentiel qui, si elle n'est pas évitée, **peut entraîner** la mort ou des blessures graves.

ATTENTION

ATTENTION indique une situation de danger potentiel qui, si elle n'est pas évitée, **peut entraîner** des blessures mineures ou modérées.

AVIS

AVIS est utilisé pour commenter des pratiques sans rapport avec les blessures physiques. Le symbole d'alerte de sécurité n'est pas employé avec ce mot de signalement.

REMARQUE : Fournit des renseignements complémentaires pour clarifier ou simplifier une procédure.

Veuillez noter

Seul un personnel qualifié doit effectuer l'installation, l'utilisation, l'entretien et la maintenance du matériel électrique. Schneider Electric n'assume aucune responsabilité des conséquences éventuelles découlant de l'utilisation de cette documentation.

Une personne qualifiée est une personne disposant de compétences et de connaissances dans le domaine de la construction et du fonctionnement des équipements électriques et installations et ayant bénéficié d'une formation de sécurité afin de reconnaître et d'éviter les risques encourus.

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Chapitre 1—Introduction

Ce bulletin contient les directives d'installation, de fonctionnement et d'entretien de l'appareillage de commutation Power-Zone^{MC} 4 de la marque Square D fabriqué par Schneider Electric.

Le personnel de supervision des Services d'ingénierie, d'installation et d'utilisation de l'acheteur doivent prendre connaissance de ce manuel et devenir familier avec l'apparence et les caractéristiques de chaque pièce de l'appareil monté ou contenu dans l'appareillage de commutation.

Ces directives et procédures s'appliquent aux installations d'appareillage de commutation Power-Zone 4 de la marque Square D. Lorsque des caractéristiques spéciales ou des composants non standard sont incorporés dans l'appareillage de commutation, des directives détaillées pour ces composants sont incluses dans le porte document contenant les directives.

Description générale

L'appareillage de commutation Power-Zone 4 de la marque Square D est fabriqué avec de l'acier résistant de calibre 12 et revêtu d'une peinture grise par électrodéposition pour s'adapter à l'environnement industriel normal. Il comprend divers compartiments destinés à renfermer toutes les pièces électriques. L'appareillage de commutation Power-Zone 4 est conçu, fabriqué et vérifié conformément à ANSI/IEEE C37.20.1 C37.51 et CAN/CSA C22.2, spéc. 31-M89.

Un assemblage typique est représenté dans les figures 1 et 2.

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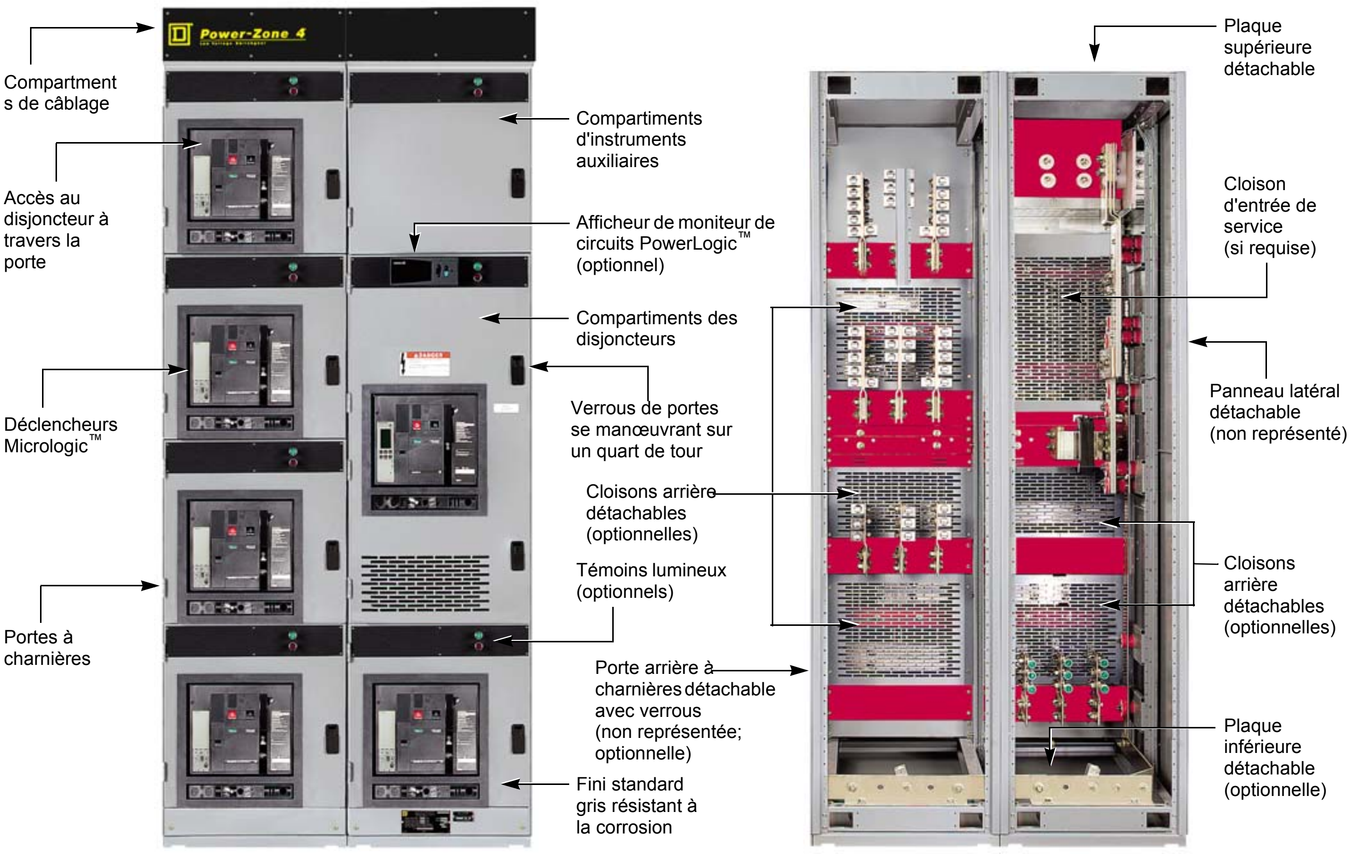
Figure 1 : Appareillage de commutation



Vue avant

Vue arrière

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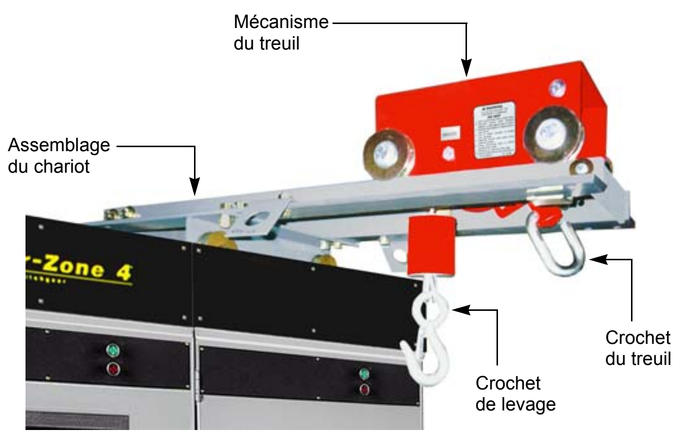
L'appareillage de commutation Power-Zone 4 avec les disjoncteurs Masterpact^MC protège contre les surcharges, les courts-circuits et les défauts à la terre pour les circuits jusqu'à 600 volts. C'est une structure fixe, composée d'une ou plusieurs sections verticales autonomes et reliées électriquement afin de constituer une seule installation coordonnée.

Chaque section verticale comprend trois parties distinctes : le compartiment avant (y compris les caniveaux secondaires), le compartiment des barres-bus et le compartiment arrière des câbles. Une ou plusieurs sections de la partie avant peuvent être utilisées comme compartiments d'instruments auxiliaires renfermant des transformateurs de tension, compteurs, relais et dispositifs de contrôle.

Lorsque cela est spécifié, un ensemble de levage mobile monté sur rails est inclus avec l'appareillage de commutation Power-Zone 4 intérieur. Le système de levage est disponible en fonctionnement manuel par manivelle ainsi qu'en fonctionnement électrique. Le système de levage manuel est disponible sur des armoires sans hotte anti-égouttement et il peut soulever les disjoncteurs Masterpact pour les placer dans et les sortir de tout compartiment. Le disjoncteur est soulevé ou abaissé par un système de manivelle qui commande le mécanisme du treuil.

Figure 2 : Système de levage mobile monté sur rails



Des caractéristiques supplémentaires et des options de commande spéciales sont souvent incorporées lorsqu'elles sont spécifiées par la commande de l'acheteur. Les caractéristiques spéciales sont indiquées sur les dessins et schémas de l'assemblage de l'appareillage de commutation spécifique. Les directives concernant les relais, instruments, interrupteurs de contrôle et disjoncteurs sont comprises dans la documentation de la commande expédiée avec l'appareillage de commutation.

En plus de ces directives d'utilisation, une autre documentation imprimée est fournie pour les composants de l'appareillage de commutation. Lire et comprendre toute la documentation avant de commencer l'installation de l'appareillage de commutation.

Chapitre 2—Mesures de sécurité

Ce chapitre contient des mesures de sécurité importantes qui doivent être observées avant de soulever, de déplacer, d'installer, d'utiliser ou d'assurer l'entretien de l'appareillage de commutation Power-Zone 4 et de ses composants.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Portez un équipement de protection personnel (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E ou CSA Z462.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- N'entreprenez ce travail qu'après avoir lu et compris toutes les explications contenues dans ces directives.
- Coupez l'alimentation de l'appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour s'assurer que l'alimentation est coupée.
- Avant d'effectuer des inspections visuelles, des essais ou un entretien de l'appareil, débranchez toutes les sources d'alimentation électrique. Présumez que tous les circuits sont sous tension tant qu'ils n'ont pas été complètement mis hors tension, vérifiés et étiquetés. Faites particulièrement attention à l'agencement du système d'alimentation. Tenez compte de toutes les sources d'alimentation, y compris la possibilité de rétro-alimentation.
- Observez toujours les procédures de verrouillage et d'étiquetage selon les exigences OSHA.
- Les contacts des disjoncteurs et des interrupteurs doivent être ouverts et tous les ressorts détendus avant d'effectuer un travail d'entretien, un débranchement ou le retrait d'un disjoncteur.
- Effectuez un essai électrique pour confirmer qu'aucun court-circuit n'a été créé pendant l'installation, l'entretien ou l'inspection.
- N'insérez jamais un disjoncteur dans un compartiment de disjoncteur qui n'est ni complet ni fonctionnel.
- Méfiez-vous des risques éventuels, portez un équipement personnel de protection et prenez les précautions de sécurité adéquates.
- Inspectez soigneusement la zone de travail pour vous assurer qu'aucun outil ou objet n'a été oublié à l'intérieur
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.
- Les explications données dans ces directives présument que le client a pris ces mesures avant d'effectuer un entretien ou des essais.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

Lorsque la fonction de barre-bus isolée est fournie, toutes les mesures, procédures et méthodes de sécurité spécifiées dans ce manuel s'appliquent toujours et doivent être suivies.

Si cette directive n'est pas respectée, cela entraînera la mort ou des blessures graves.

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Chapitre 3—Réception, manutention et entreposage

L'appareillage de commutation Power-Zone 4 est expédié assemblé en une ou plusieurs sections, en fonction de la taille de la configuration et des installations de manutention au site d'installation.

Les sections intérieures sont expédiées montées sur des palettes en bois et enveloppées de façon à les protéger des intempéries.

Pour les instructions sur les divers composants, se reporter aux directives associées à chaque produit.

Réception

Dès la réception, vérifier la liste des pièces indiquée sur le bordereau d'envoi par rapport à l'appareil reçu afin de s'assurer qu'il ne manque aucune pièce. Dès la réception également, inspecter immédiatement les sections de l'appareillage de commutation afin de voir si elles ont subi des dommages pendant le transport. En cas de découverte ou de soupçon de dommage, remettre immédiatement une réclamation au transporteur et avertir votre représentant Schneider Electric le plus proche.

Identification

La plaque signalétique des valeurs nominales se trouve sur le couvercle avant de chaque structure. Les informations suivantes sont indiquées sur la plaque signalétique :

1. Numéro de commande de l'usine
2. Tension nominale maximale
3. Fréquence
4. Valeur nominale des courants des barres-bus
5. Valeur nominale des courants de court-circuit

REMARQUE : Toutes les valeurs nominales représentent les limites maximales de l'appareil.

Manutention

S'assurer qu'un équipement approprié, tel qu'une grue mobile, est disponible au site d'installation pour la manutention de l'appareillage de commutation. Cet équipement contribuera à éviter des blessures de personnel et des dommages à l'appareillage de commutation.

AVIS

RISQUE EN COURS DE MANUTENTION

Ne posez pas l'appareil sur le dos, la face avant ou les côtés sans directives spécifiques de Schneider electric.

Si cette directive n'est pas respectée, cela peut entraîner des dommages matériels.

Pour faciliter la manutention par une grue, toutes les sections de transport sont équipées de sangles de levage à chaque coin. Cet appareil est expédié jusqu'à une largeur maximale de 183 cm (72 po). La sangle de levage est munie d'un trou de 35 mm (1,38 po) de diamètre pouvant recevoir les crochets d'une grue comme indiqué à la figure 3 à la page 11. Utiliser une barre d'expansion adéquate pour maintenir l'intégrité des sangles de levage. Des variations du centre de gravité peuvent entraîner le basculement de l'appareil d'un côté ou de l'autre.

Schneider Electric recommande l'utilisation d'une grue mobile, des sangles de levage et câbles ou chaînes pour la manutention de l'appareillage de commutation. Cette mèthode et des mèthodes alternatives de manutention sont indiquées dans cette section.

Manutention avec sangles de levage

Schneider Electric fournit les sangles de levage à titre d'équipement standard pour les sections de transport d'appareillage de commutation d'une largeur de 183 cm (72 po) ou moins. Les étiquettes de directives placées sur chaque section de transport contiennent des dessins et des directives écrites précisant l'usage approprié des sangles de levage (figure 3 à la page 11). Utiliser des barres d'expansion rigides ou une barre de tension pour fournir un levage vertical des sangles. Cela aidera à éviter d'endommager le châssis ou le fini.

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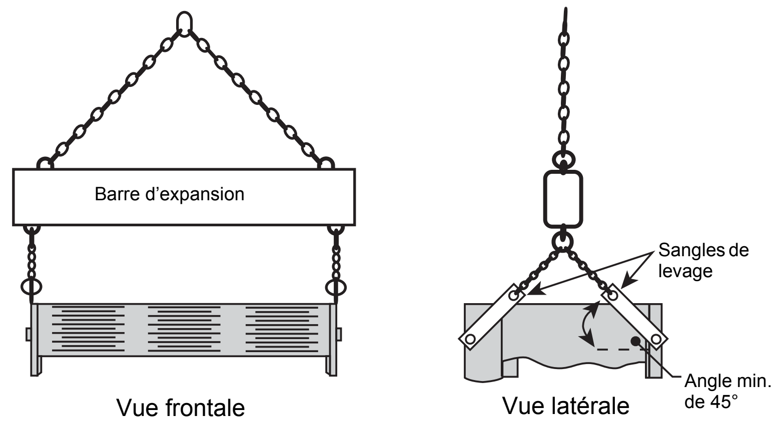
Figure 3 : Levage à l'aide d'une grue mobile, de sangles de levage et de câbles ou de chaines



Suivre ces directives pendant la manipulation de l’appareillage :

1. Utiliser des câbles ou chaînes à la valeur nominale de la charge avec des crochets ou manilles de sécurité. Ne pas faire passer les câbles ou les chaînes par les trous des sangles de levage.
2. Utiliser une barre d'expansion à la valeur nominale de la charge afin d'éviter d'endommager la structure. L’angle minimum entre les câbles ou les chaînes de levage et le dessus de l’appareillage doit être de 45 degrés.

Manutention sans sangles de levage

Les sangles de levage ne sont pas fournies sur les sections de transport d'une longueur supérieure à 183 cm (72 po) ou sur un appareillage de commutation à l'épreuve de la pluie. Des rouleaux, courroies ou autres moyens doivent être employés pour la manutention de la section de transport. L'étiquette de manutention (figure 4) est placée sur chacune de ces sections.

Figure 4 : Étiquette de directives de manutention, appareillage de commutation sans sangle de levage

MANUTENTION

CET APPAREIL DOIT ÊTRE MANIPULÉ
À L'AIDE D'UNE COURROIE OU DE ROULEAUX.
« MOYENS DE LEVAGE NON FOURNIS »

Lors du levage d'une section de transport non munie de sangles de levage, une grue mobile équipée de l'un des éléments suivants doit être employée :

- Une chaine couplée d'un accrochage par courroies
- Un câble métallique muni de crochets et manilles de sécurité

Enrouler la courroie complètement autour de l'appareillage de commutation et des cordes de transport (figure 5 à la page 12).

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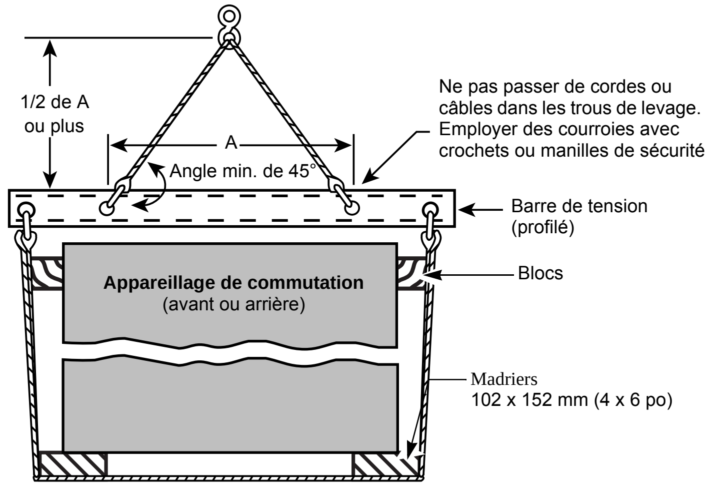
⚠ AVERTISSEMENT

HAUT CHARGÉ PLUS LOURDEMENT

Stabilisez la section de transport pour qu’elle ne se renverse pas.

Si cette directive n'est pas respectée, cela peut entraîner la mort ou des blessures graves.

Figure 5 : Appareillage de commutation avec accrochage par courroies



Un chariot élévateur est une méthode alternative de manutention de l'appareillage de commutation.

REMARQUE : Toujours vérifier la longueur des fourches afin de s'assurer qu'elles s'étendend sous l'appareillage de commutation entier. Équilibrer soigneusement la charge et toujours utiliser une sangle de sécurité lors de la manutention ou du déplacement d'un appareillage de commutation avec un chariot élévateur (figure 6).

Figure 6 : Sangle de sécurité de chariot élévateur

Disjoncteurs

Faire attention lors du déballage, du déplacement, du levage ou de la manutention des disjoncteurs Masterpact. (Voir les instructions supplémentaires à la page 50.) Prendre soin de ne pas retirer et de ne pas abîmer les étiquettes d'avertissement sur le disjoncteur.

Barres de levage des disjoncteurs (si founies)	Faire attention lors du déballage ou de la manutention des barres de levage des disjoncteurs.
Système de levage mobile (si fourni)	Faire attention lors du déballage, du déplacement, du levage ou de la manutention de l’assemblage de système de levage mobile. L’assemblage de système de levage mobile pèse 29 kg (65 lb). Utiliser des aides mécaniques adéquats pour la manutention. Se reporter à la page 40 pour de plus amples instructions. Prendre soin de ne pas retirer et de ne pas abîmer les étiquettes d'avertissement sur l'assemblage du système de levage mobile.
Grue d’atelier (si fourni)	Faire attention lors du déballage et de la manutention de la grue d'atelier optionnelle. Consulter les instructions des fabricants concernant l'usage et la manutention.

Entreposage

Si l'appareillage de commutation Power-Zone 4 doit être entreposé avant d'être mis en service, effectuer les étapes suivantes.

1. Déballer le matériel afin de vérifier s'il est complet et en bon état.
2. Replacer le matériel dans son emballage étanche pour le protéger jusqu'à son installation.

Lors de l'entreposage du matériel :

- Le garder dans un lieu propre et sec, à l'abri d'éléments corrosifs et d'abus mécaniques.

  REMARQUE : Le matériel intérieur doit être entreposé dans un bâtiment doté d'un contrôle atmosphérique jusqu'à son installation. Le garder propre et sec, avec une humidité inférieure à 80 % et à une température entre 0 et 40 °C (32 et 104 °F). Éviter l'humidité, les changements de température, la poussière de béton et les atmosphères corrosives.
- Couvrir le matériel avec une bâche peut être nécessaire pour le protéger des polluants ou de l'humidité.
- Ne pas entreposer les ensembles pour installation à l'intérieur à l'extérieur.
- S'il est nécessaire d'entreposer le matériel à l'extérieur, prendre des dispositions spéciales pour le maintenir propre et sec et dans les conditions de température et d'humidité indiquées ci-dessus.
  - — Il peut être nécessaire de couvrir le matériel et d'installer des appareils de chauffage temporaires.
  - — Placer les sections de transport sur des surfaces de niveau pour leur entreposage afin de maintenir leur intégrité struturelle.
- Dans les endroits très humides, telles que les installations proches d'océans ou de rivières, surveiller l'appareillage de commutation de près.
  - — Si nécessaire, utiliser un chauffage supplémentaire pour tenir l'appareillage de communication au sec.
  - — Contacter le représentant Schneider Electric si les appareils de chauffage internes ne sont pas adéquats pour l’emplacement.
- Si l'assemblage du système de levage mobile ne doit pas être entreposé, ne pas le sortir de son emballage avant l'installation.
- Si des appareils de chauffage optionnels sont fournis avec l'appareillage de commutation, les raccorder à une source d'alimentation externe. Mettre sous tension les appareils de chauffage à l'intérieur de l'appareillage de commutation ou ajouter du chauffage à partir d'une source séparée, telle qu'une ampoule ou un ventilateur. Utiliser un chauffage de 250 W minimum par section verticale pour maintenir l'équipement sec pendant l'entreposage.

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Chapitre 4—Installation

Avant d'installer l'appareillage de commutation Power-Zone 4, lire et comprendre :

- Toutes les précautions de ces directives.
- Toutes les directives d'utilisation des composants connexes.
- Tous les dessins et schémas inclus avec l'appareil.

Assemblage des sections de transport

Lorsqu'il est correctement installé, l'appareillage de commutation est conforme aux exigences suivantes.

- Les panneaux avant forment une ligne droite, exacte; lorsque des transformateurs ou autres appareils sont inclus, les panneaux avant s'alignent ou forment des lignes parallèles.
- Les éléments sont espacées correctement de centre à centre et perpendiculaires à la surface de montage.
- L'appareillage de commutation est solidement fixé à des profilés en U ou à un socle.
- Les sections de transport sont fermement boulonnées ensemble.
- Les connexions de la barre-bus et du câblage de contrôle sont correctement raccordées.

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Préparation du site

Avant de mettre l’appareillage en place, procéder à ces vérifications afin d’être sûr que le site est prêt pour une installation définitive.

- Comparer les plans et les spécifications du site aux dessins de l'appareil pour s'assurer qu'il n'existe aucune discordance.
- Examiner le site afin de confirmer que l'appareillage de commutation s'y intégrera correctement.
- Fournir une aération constante au lieu d'installation afin de maintenir la température ambiante autour de l'appareil entre 0 et 40 °C (32 et 104 °F).
- Fournir un age permanent adéquat et des prises de courant commodes près de l'appareil.
- Acheminer les lignes d'égout, d'eau et de vapeur loin de l'appareil.
- Fournir des écoulements de sol à proximité de l'appareil.
- Lors de l'installation de l'appareil, tenir compte d'un espace pour l'allée nécessaire à l'avant et à l'arrière de l'appareil de même qu'un espace aux extrémités de l'alignement.

  REMARQUE : Les dégagements minimaux requis autour du panneau de commutation sont indiqués dans l’article 110–26 du National Electrical Code® (code national d’électricité, É.-U.) ou à la section 2-308 du Code canadien de l'électricité (CEC®). Ces dégagements sont seulement un minimum. Un espace supplémentaire peut être nécessaire pour l'insertion ou le retrait de disjoncteurs et pour le transfert d'autres appareils à l'aide d'un palan ou d'une grue d'atelier.

Préparation de la fondation

- Confirmer que le sol ou la fondation de la station est suffisamment solide pour supporter l'appareil sans déformation ni affaissement.

  REMARQUE : Consulter les documents de transport pour connaître le poids réel de l'appareil.
- S'assurer que le béton et les profilés sont de niveau de gauche à droite et d'avant en arrière avec une tolérance de 3 mm par mètre carré (1/8 po par verge carrée).
- Installer l'appareil sur une base lisse, de niveau pour garder les tolérances et les ajustements au minimum.

- Confirmer que les profilés en acier sont de niveau avec la base finie et que la base environnante forme des pentes douces en direction d'un écoulement.

Positionnenement de l'appareillage de commutation

1. Soulever l'appareillage de commutation en insérant un levier ou une barre dans une fente d'un profilé de la base.
2. Mettre l'appareillage de commutation en place avec soin jusqu'à ce que les panneaux avant soient en ligne droite.
3. S'assurer que les parties avant des sections verticales sont alignées ou forment des lignes parallèles.

Figure 7 : Positionnement définitif de l'appareillage de commutation (vue latérale)

Alignement des sections verticales

1. Établir une ligne de base à quelques pouces à l'avant de l'appareillage de commutation et parallèle à l'emplacement d'installation.
2. Égaliser les distances de l'avant de l'appareillage de commutation à la ligne de base, la face de la section devant être parallèle à la ligne de base.
3. Après la mise en place de la première section de transport, mettre la deuxième section en place et procéder au même contrôle.
4. Attacher ensemble les sections verticales.
5. Répéter les étapes 3 et 4 jusqu'à ce que l'installation soit complète.
6. Vérifier si l'alignement des rails avant et arrière du système de levage mobile est correct. Si les rails sont mal alignés, régler l'alignement avant et arrière de l'appareil. Voir « Alignement des sections et les rails » à la page 41.

Joindre les joints de transport

1. Obtenir la quincaillerie de 3/8-16 po du joint de transport située à l’intérieur de l’appareil.
2. Boulonner les châssis (figure 8) avec la quincailerie du joint de transport. Serrer au couple de 25 à 31 N•m (225 à 270 lb-po).

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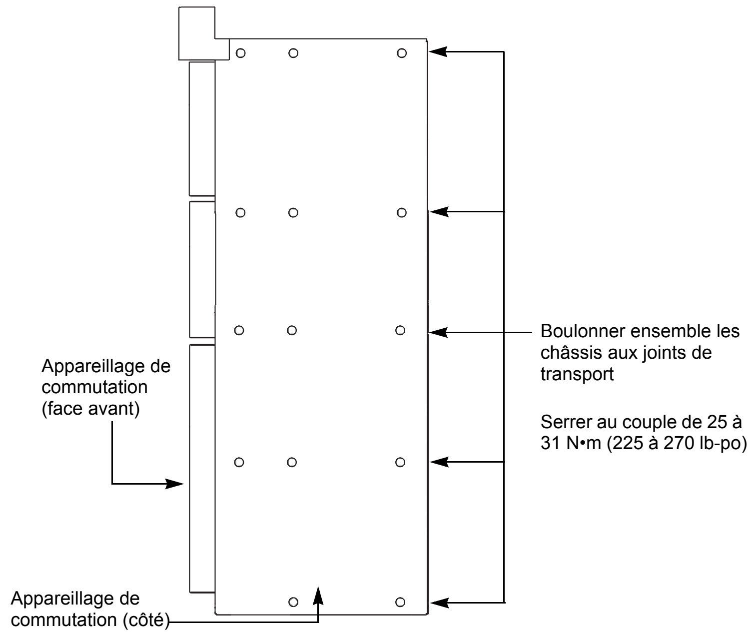
Figure 8 : Jonction des joints de transport (vue latérale)



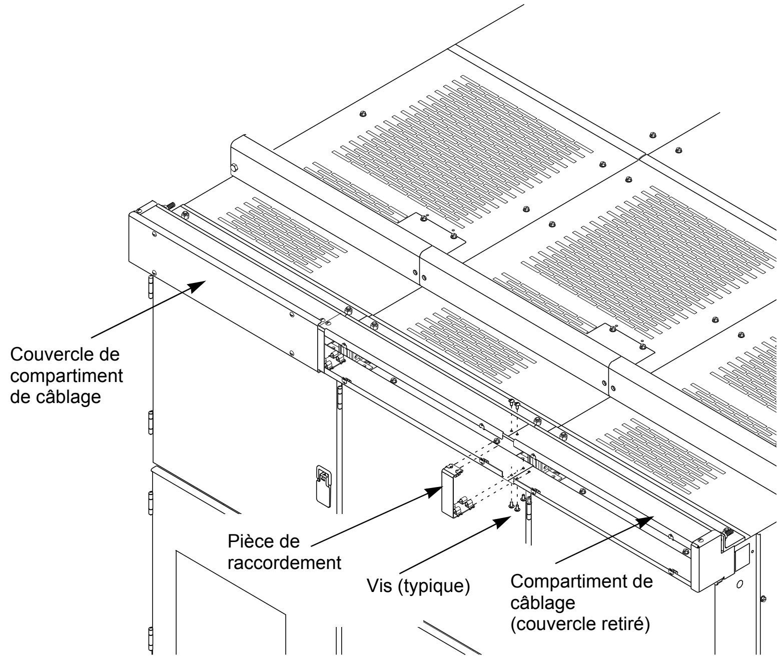
Joindre les compartiments de câblage

1. Après avoir boulonné les châssis aux joints de transport, retirer les couvercles des compartiments de câblage (figure 9) au niveau du joint.

Figure 9 : Retrait des couvercles des compartiments de câblage

2. Retirer la pièce de raccordement (figure 10) des compartiments de câblage vers la gauche du joint.

Figure 10 : Jonction des compartiments de câblage



Appareillage de commutation (face avant)

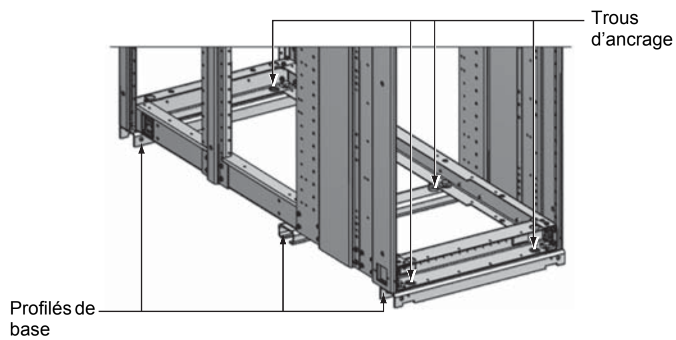
3. Retirer les vis de la pièce de raccordement. Les mettre de côté pour un usage ultérieur.
4. Installer la pièce de raccordement (figure 10) à l'aide des vis retirées à l'étape 3.

Ancrage de l'appareillage de commutation (non anti-sismique)

Bien que les sections soient autonomes, un coup ou mouvement de déplacement brutal peut endommager les joints de raccordement entre les sections et les manchons de conduits raccordés aux sections. Il faut donc ancrer les profilés de base au sol. Les profilés de la base courent sur la largeur de la section de transport. Ces profilés sont munis de trous de 19 mm (3/4 po) de diamètre permettant d'attacher la section au sol.

1. Ancrer chaque section au sol (figure 11) avec quatre boulons de 1/2 po (13 mm) de qualité 2 min., rondelles plates et chevilles.

Figure 11 : Ancrage à l'aide de profilés de base



2. Après avoir assemblé ensemble toutes les sections de transport et boulonné la structure entière au sol, installer les conducteurs d'alimentation d'arrivée et les câbles du côté charge. Se reporter aux exemples de plans des figures 12 et 13.

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Figure 12 : Plan typique (vue inférieure)—non anti-sismique

Largeur d'une unité	Dimension B
559 mm (22,00 po)	203 mm (8,00 po)
762 mm (30,00 po)	305 mm (12,00 po)
914 mm (36,00 po)	381 mm (15,00 po)

REMARQUE : Les dimensions indiquées concernent les emplacements des points d'ancrage dans les sections de l'appareillage Power-Zone 4 individuelles. Consulter les plans fournis par l'usine pour déterminer des points d'ancrage adéquats du bloc de montage du matériel.

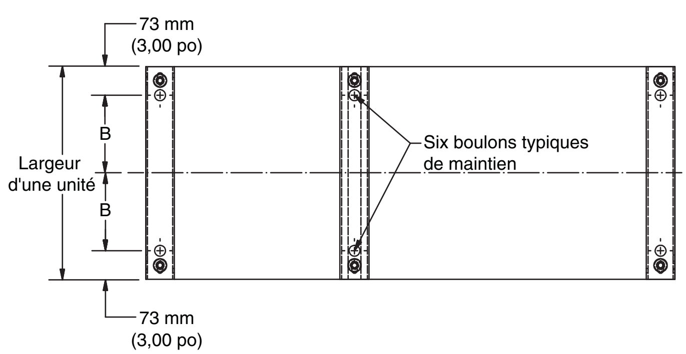
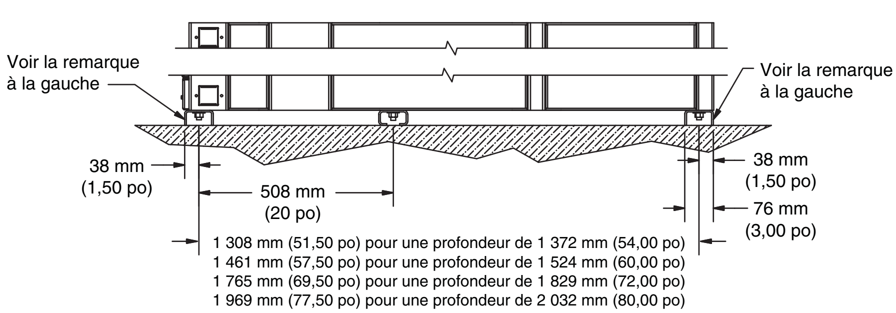


Figure 13 : Plan typique (vue latérale)—non anti-sismique

REMARQUE : Le béton et les profilés doivent être de niveau de gauche à droite et d'avant en arrière avec une tolérance de 3 mm par mètre carré (1/8 po par verge carrée).



Certification sismique

Les appareillages de commutation Power-Zone 4 certifiés comme étant capables de résister à des séismes ont reçu la qualification de conformité aux exigences sismiques spécifiques pour le site selon les codes ou normes des immeubles pour les modèles répertoriés. Des caractéristiques de construction optionnelles peuvent être exigées, en fonction de l'emplacement de l'installation ainsi que des codes ou des normes répondant à des demandes spécifiques. Des certificats de conformité et étiquettes de matériel sont fournis avec tous les appareillages de commutation certifiés comme étant capables de résister à des séismes. Pour maintenir la validité de cette certification, les directives d'installation fournies dans cette section doivent être suivies.

Responsabilité concernant la réduction des dommages sismiques

Pour les codes des immeubles modèles, les appareillages de commutation Power-Zone 4 sont considérés des composants non structuraux des bâtiments. La capacité du matériel a été déterminée à partir de résultats d'essais sur table à vibrations sismiques à trois axes, comme définie, par l'International Code Council - Evaluation Service (ICC-ES) (Conseil international des codes [du bâtiment]), dans les critères d'acceptation des essais de qualification sismique des composants non structuraux (AC156).

Sauf indication contraire, un facteur d'importance du matériel de 1,5 (IP = 1,5) a été utilisé, indiquant que le fonctionnement du matériel a été vérifié avant et après l'essai de simulation sismique avec la table à vibrations. Ce facteur d'importance est une indication pour les aménagements cruciaux où la maximisation de la probabilité de fonctionnement après un évènement sismique est une priorité.

La norme AC156 est publiée par l'ICC-ES et a été reconnue par le Building Seismic Safety Council (BSSC) (Conseil de sécurité sismique des immeubles) en tant que méthodologie appropriée dans les commentaires sur le programme national 2003 de réduction des risques causés par les tremblements de terre (NEHRP «National Earthquake Hazard Reduction Program»). Le National Institute of Building Sciences (Institut national des sciences de la construction) a établi le BSSC en 1979 afin de développer et promouvoir des dispositions réglementaires pour la réduction des dangers dus aux tremblements de terre au niveau national.

Les câbles et conduits d'arrivée et de sortie doivent être également considérés comme des systèmes connexes mais indépendants. Ils doivent être conçus et retenus de manière à résister aux forces générées par l'évènement sismique sans augmenter la charge transférée au matériel. Pour les applications où un risque sismique existe, une entrée ou sortie de câble ou conduit par la partie inférieure est préférable.

Un système d'entraves latérales est également requis dans les situations où un mouvement horizontal de la partie supérieure de l'appareillage Power-Zone 4 n'est pas désirable (telles que les applications dans lesquelles une entrée ou sortie de conduit par la partie supérieure est utilisée). Ce système doit être capable de transférer les charges créées à l'ossature du système structural de l'immeuble.

La qualification sismique des composants non structuraux fournis par Schneider Electric n'est qu'un maillon de la chaîne totale des responsabilités requises pour maximiser la probabilité qu'un matériel soit intact et en état de fonctionnement après un séisme. Pendant un évènement sismique, le matériel doit pouvoir transférer les charges qui sont créées, via son bloc de montage et son ancrage, à l'ossature du système structural de l'immeuble.

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L'ingénieur civil de structure ou l'ingénieur de conception en charge du projet a la responsabilité de détailler le raccordement du matériel et les exigences d'ancrage (notamment le système d'entraves latérales si nécessaire) pour une installation donnée. L'installateur et les fabricants des systèmes d'ancrage et d'entraves latérales ont la responsabilité d'assurer que les exigences de montage soient respectées. Schneider Electric n'est pas responsable des caractéristiques et performances de ces systèmes.

Ancrage de l'appareillage de commutation (anti-sismique)

Les profilés de la base courent sur la largeur de la section de transport. Ces profilés sont munis de trous de 19 mm (3/4 po) de diamètre permettant d'attacher la section au sol. Utiliser les six emplacements de fixation pour ancrer correctement l'appareillage de commutation au sol.

Pendant un tremblement de terre, le haut de l'appareillage de commutation peut bouger dans n'importe quel sens. Les câbles d'arrivée par le haut doivent s'accommoder de ce mouvement. L'armoire de l'appareillage (le haut en particulier) ne doit pas être employée pour le montage d'appareils extérieurs.

Lors d'un ancrage à un bloc de béton :

- Utiliser des boulons d'ancrage pour béton de 1/2 po (13 mm) de qualité 5 (minimum) ou des chevilles à manchon convenant à une installation d'appareil électrique.
- Utiliser une rondelle trempée de 1/2 po (13 mm) (environ 1,5 po [38 mm] de diamètre extérieur) et une rondelle de sûreté sous la tête de chaque boulon ou écrou d’ancrage, et serrer à la valeur de couple de serrage spécifiée par le fabricant de l’ancrage pour développer la résistance totale de l’ancrage.
- Des ancres filetées, chevilles à manchon ou boulons d'ancrage pour béton sont recommandés (suivre les instructions du fabricant pour la taille de trou recommandée). Ne pas employer de protections à expansion telles que des « protections pour vis de coffrage ». Le bloc de béton doit être construit à partir d'un mélange de béton d'une robustesse de 210,9 kg/cm^2 (3 000 psi) (minimum).

1. Ancrer chaque section au bloc de béton avec six boulons de 13 mm (1/2 po) de qualité 5 (minimum), rondelles trempées et chevilles.
2. Après avoir assemblé ensemble toutes les sections de transport et boulonné la structure entière au bloc de béton, installer les conducteurs d'alimentation d'arrivée et les câbles du côté charge. Se reporter aux exemples de plans des figures 14 et 15 à la page 21.

Lors de l'ancrage des sections à un sol qui n’est pas en béton :

- Utiliser six boulons de 1/2 po (13 mm) de qualité 5 (minimum) ou des goujons passant par les trous des profilés de base.
- Sécuriser les boulons ou goujons au sol avec des ancres ou autres moyens afin d’obtenir la résistance absolue du système d’entrave sismique.
- Utiliser une rondelle trempée de 1/2 po (13 mm) (environ 1,5 po [38 mm] de diamètre extérieur) et une rondelle de sûreté sous la tête de chaque boulon ou écrou d’ancrage, et serrer à la valeur de couple de serrage spécifiée par le fabricant de l’ancrage pour développer la résistance totale de l’ancrage.

1. Ancrer chaque section au sol avec six boulons de 1/2 po (13 mm) de qualité 5 (minimum), rondelles trempées et chevilles.
2. Après avoir assemblé ensemble toutes les sections de transport et boulonné la structure entière au sol, installer les conducteurs d'alimentation d'arrivée et les câbles du côté charge. Se reporter aux exemples de plans comme indiqué aux figures 14 et 15 à la page 21.

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Fixation des structures au sol—Emplacements à risque sismique[1]

Chaque section doit être ancrée à l'ossature du système structural de l'immeuble en suivant les détails fournis par l'ingénieur en charge du projet. Les emplacements de fixation au sol pour les armoires NEMA 1 sont indiqués ci-dessous.

Utiliser des boulons de 1/2 po (13 mm) de qualité 5 (minimum) et des rondelles trempées Serrer les boulons à la valeur de couple de serrage spécifiée par le fabricant du système d'ancrage.

Figure 14 : Plan typique (vue inférieure)—anti-sismique

Largeur d'une unité	Dimension B
559 mm (22,00 po)	203 mm (8,00 po)
762 mm (30,00 po)	305 mm (12,00 po)
914 mm (36,00 po)	381 mm (15,00 po)

REMARQUE : Les dimensions indiquées concernent les emplacements des points d'ancrage dans les sections de l'appareillage Power-Zone 4 individuelles. Consulter les plans fournis par l'usine pour déterminer des points d'ancrage adéquats du bloc de montage du matériel.

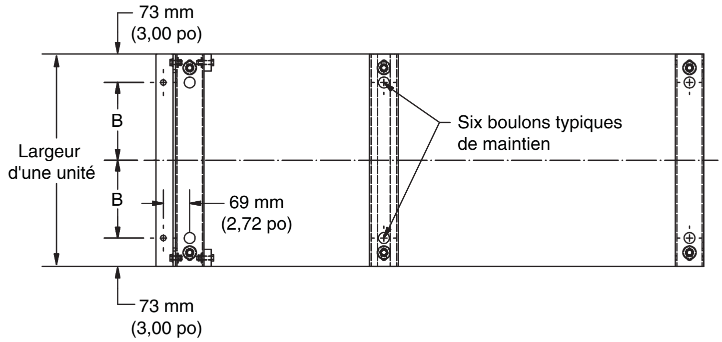
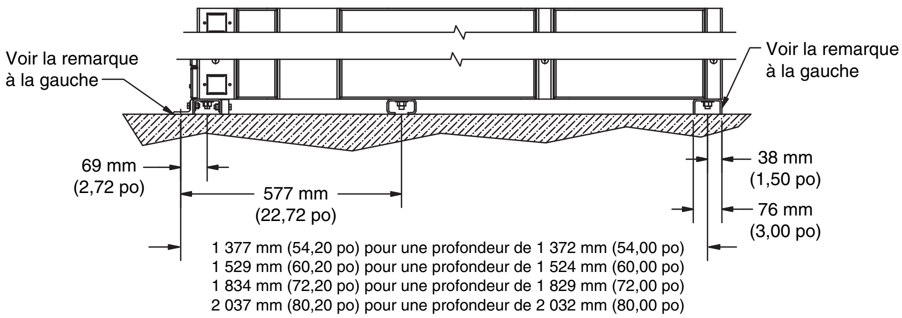


Figure 15 : Plan typique (vue latérale)—anti-sismique

REMARQUE : Le béton et les profilés doivent être de niveau de gauche à droite et d'avant en arrière avec une tolérance de 3 mm par mètre carré (1/8 po par verge carrée).



Raccordement de la barre-bus

Tous les raccordements pour les barres-bus principale, de neutre et de mise à la terre entre les sections sont effectués au moyen de plaques de raccordement boulonnées (plaquées).

Préparation des joints de la barre-bus

AVIS

RACCORDEMENTS MÉDIOCRES DES BARRES-BUS

N'employez pas de nettoyants abrasifs sur les joints des barres-bus, cela peut entraîner des raccordements à haute résistance.

Si cette directive n'est pas respectée, cela peut entraîner des dommages matériels.

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[1] Risque sismique pour des emplacements de sites spécifiques selon la définition de l'édition en vigueur du code de construction international ou NFPA 5000, ou de tout code de construction local approprié ou de l'ingénieur consultant en charge du projet.

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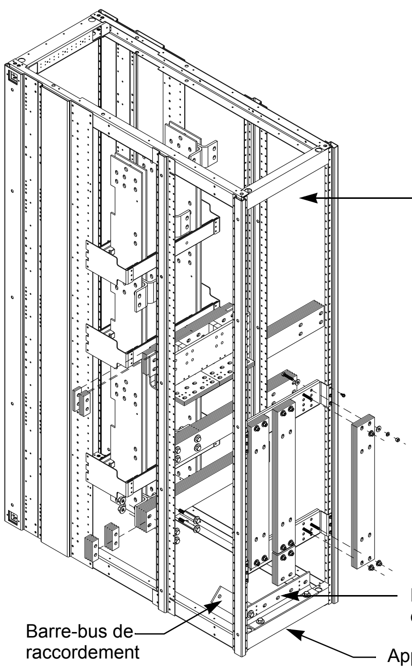
Tous les joints de la barre-bus sont plaqués pour procurer une connexion électrique fiable.

1. Retirer la saleté, la graisse et les corps étrangers de la surface des joints de la barre-bus avant de les joindre.
2. Nettoyer les surfaces à l'aide d'un chiffon non pelucheux et d'alcool dénaturé.
3. Sécher le joint à l'aide d'un chiffon propre et non pelucheux.

Raccordement de la barre-bus de m.à.l.t.

La barre-bus de raccordement à la terre (figure 16) est expédiée en position verticale à la section arrière inférieure de l'appareillage de commutation. Voir les figures 16 et 17 pour les étapes 1 à 5.

Figure 16 : Raccordement de la barre-bus de m.à.l.t.



1. Retirer les panneaux arrière de l'appareillage de commutation.
2. Retirer la quincaillerie de 1/2-13 po fixant la barre-bus de raccordement à la barre-bus de m.à.l.t. Mettre cette quincaillerie de côté pour pouvoir la réutiliser.
3. Retirer la quincaillerie de 1/2-13 po de l'autre extrémité de la barre-bus de raccordement. Mettre cette quincaillerie de côté pour pouvoir la réutiliser.
4. Aligner la barre-bus de raccordement avec la barre-bus de m.à.l.t. adjacent.
5. Installer la quincaillerie de 1/2-13 po mise de côté aux étapes 2 et 3.
6. Serrer toute la quincaillerie de 1/2-13 po à un couple de 81 à 95 N•m (60 à 70 lb-pi). Voir la figure 18.

   REMARQUE : Le côté convexe (marqué « Top ») d'une rondelle conique doit se trouver contre la tête du boulon et le côté convexe de la deuxième rondelle doit se trouver contre l'écrou hexagonal.

Figure 17 : Barre-bus de m.à.l.t. raccordée

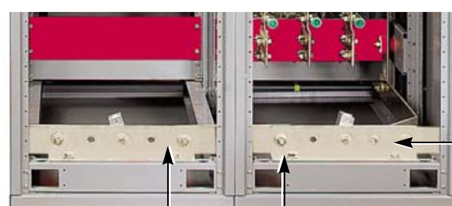
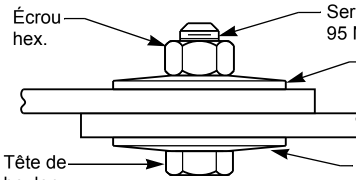


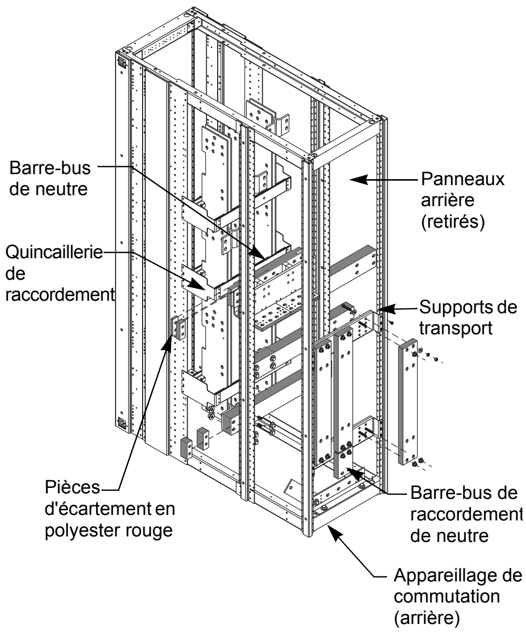
Figure 18 : Installation des rondelles coniques



Raccordement de la barre-bus de neutre

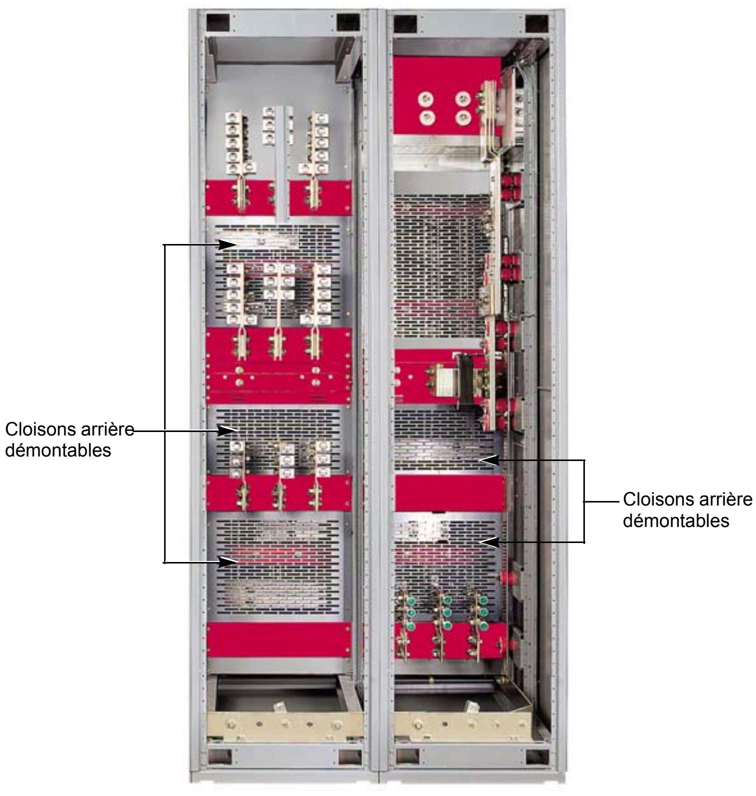
La barre-bus de raccordement de neutre (figure 19) est expédiée montée aux supports à la section arrière de l'appareillage de commutation. Voir la figure 19 pour les étapes 1 à 5.

Figure 19 : Raccordement de la barre-bus de neutre



1. Retirer les deux vis de 3/8-16 po fixant la barre-bus de raccordement et les jeter.
2. Retirer la barre-bus de raccordement. La mettre de côté pour le réutiliser ultérieurement.
3. Si des cloisons arrière sont fournies (figure 20), les retirer pour avoir accès au secteur de la barre-bus de raccordement de neutre. Les mettre de côté pour les réutiliser ultérieurement.
4. Retirer la quincaillerie de raccordement de 1/2-13 po des sections à raccorder. Les mettre de côté pour les réutiliser ultérieurement.
5. Retirer les pièces d'écartement en polyester rouge et les jeter.

Figure 20 : Retrait des cloisons arrière (le cas échéant)



Compartiment de la barre-bus (vue arrière)

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6. Positionner et installer la barre-bus de raccordement de neutre (figure 21). Voir également la figure 19 à la page 23.
7. Installer la quincaillerie de raccordement de 1/2-13 po retirée à l'étape 4 à la page 23. Noter l'orientation de la quincaillerie de raccordement à la figure 21.
8. Serrer toute la quincaillerie (figure 22) de 1/2-13 po à un couple de 81 à 95 N•m (60 à 70 lb-pi).

   REMARQUE : Le côté convexe (marqué « Top ») d'une rondelle conique doit se trouver contre la tête du boulon et le côté convexe de la deuxième rondelle doit se trouver contre l'écrou hexagonal.
9. Si elles ont été fournies, installer les cloisons arrière (figure 20 à la page 23) retirées à l'étape 3 à la page 23.

Figure 21 : Lamelles de la barre-bus de neutre

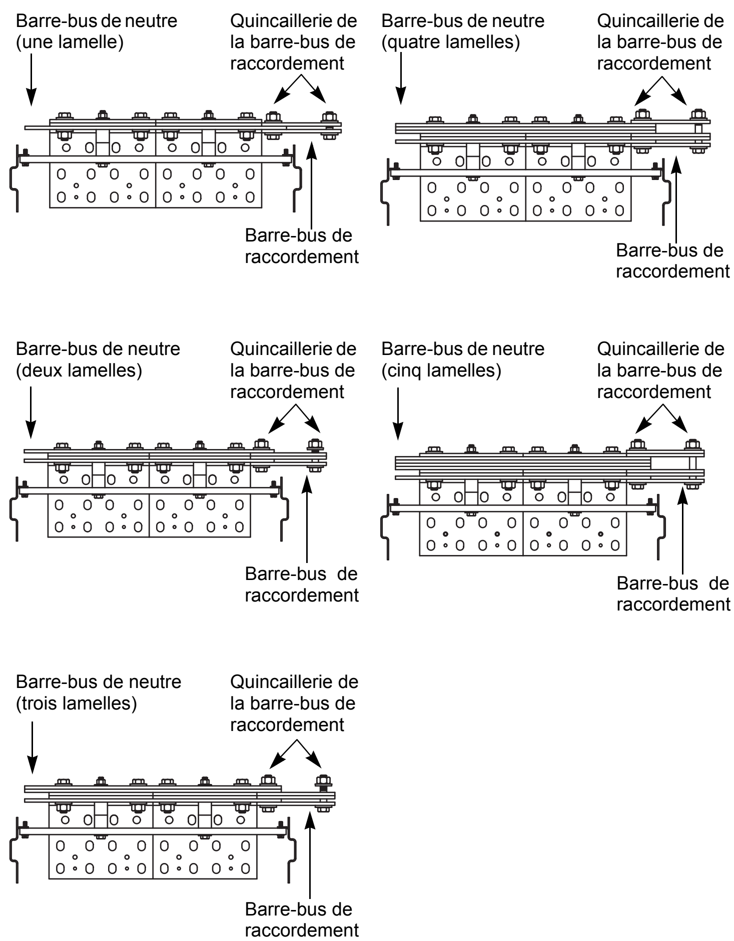
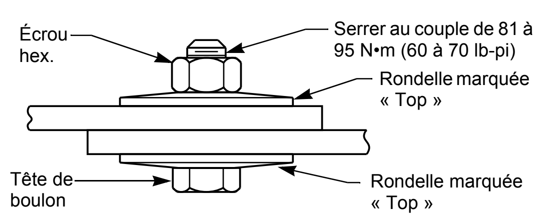


Figure 22 : Installation des rondelles coniques



Raccordement de la barre-bus de passage principale

Les barres-bus de raccordement de la barre-bus de passage principale (figure 24) sont expédiées montées aux supports à la section arrière de l'appareillage de commutation. Voir la figure 24 pour les étapes 1 à 8.

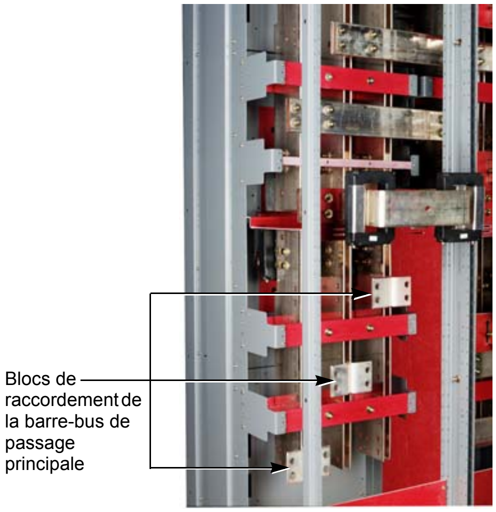
1. Retirer les douze quincailleries de 3/8-16 po fixant les barres-bus de raccordement et les jeter.
2. Retirer les barres-bus de raccordement, en gardant chaque jeu ensemble tel qu'expédié. Les mettre de côté pour les réutiliser ultérieurement.
3. Jeter les supports de transport et la quincaillerie de montage des supports.
4. Si des cloisons arrières sont fournies (figure 20 à la page 23), les retirer pour avoir accès au secteur de la barre-bus de raccordement de neutre. Les mettre de côté pour les réutiliser ultérieurement.
5. Si les gaines de la barre-bus sont installées sur les blocs de raccordement de la barre-bus de passage principale, utiliser une paire de cisailles coupe-fil pour couper juste assez d'attache-fils pour avoir accès aux blocs de raccordement de la barre-bus de passage principale. Ne pas enlever complètement les gaines.
6. Retirer la quincaillerie de 1/2-13 po, des blocs de raccordement, fournie avec le matériel. Les mettre de côté pour les réutiliser ultérieurement.

   REMARQUE : Les blocs de raccordement peuvent se trouver dans la moitié supérieure ou inférieure de la section de l'appareillage de commutation. Les blocs de raccordement placés dans la partie inférieure sont représentés aux figures 24, 23 et 25 (à la page 27).
7. Retirer les pièces d'écartement en polyester rouge et les jeter.

   REMARQUE : Noter l'emplacement de ces pièces d'écartement lors de leur retrait. La barre-bus de raccordement sera installée à leur place.
8. Déterminer la mise en place des phases individuelles en faisant correspondre la configuration des trous et l'espacement des trous des barres de raccordement avec la configuration des trous et l'espacement des trous des blocs de raccordement des sections à raccorder.

   Se référer au tableau 1 à la page 27 pour déterminer le nombre de lamelles requis par phase.

Figure 23 : Blocs typiques de raccordement de la barre-bus de passage principale



Compartiment de la barre-bus (vue arrière)

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Figure 24 : Raccordement de la barre-bus de passage principale

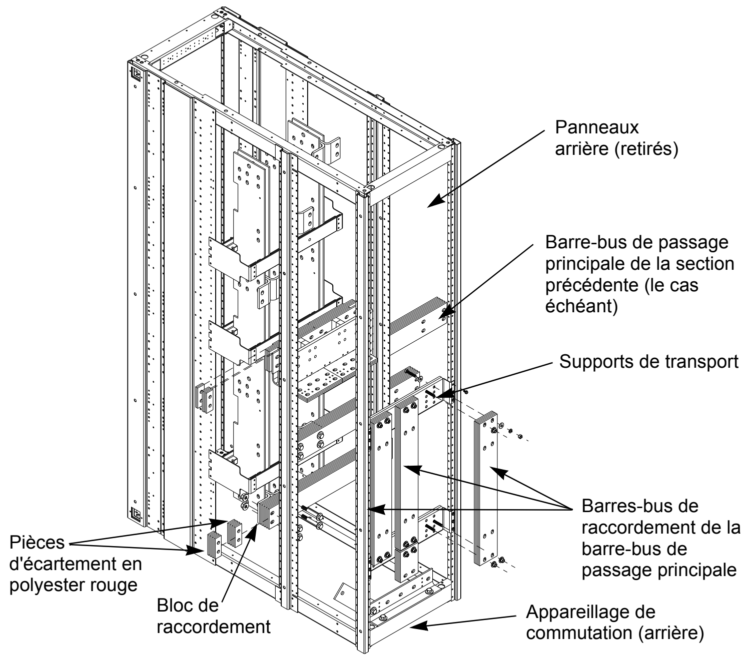
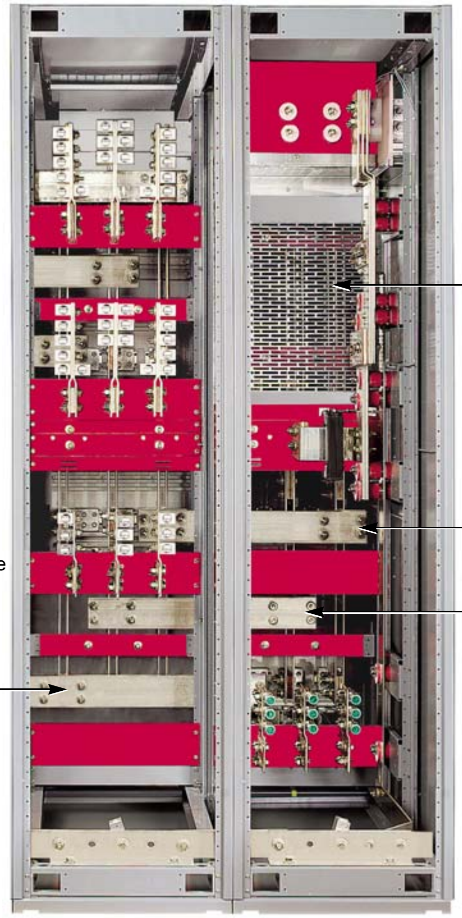


Tableau 1 : Nombre de lamelles requis par phase

Courant admissible de la barre-bus de passage principale	Standard	Optionel
Sans l'option de barre-bus isolée		
1600 A ≤ 100 kA SCCR	1	2
1600 A > 100 kA SCCR	2	2
2000 A ≤ 100 kA SCCR	1	2
2000 A > 100 kA SCCR	2	2
3200 A (tout SCCR)	2	4
4000 A (tout SCCR)	3	4
5000 A (tout SCCR)	4	5
Avec l'option de barre-bus isolée		
1600 A ≤ 65 kA SCCR	1	2
1600 A > 65 kA SCCR	2	2
2000 A ≤ 65 kA SCCR	1	2
2000 A > 65 kA SCCR	2	2
3200 A (tout SCCR)	2	4
4000 A (tout SCCR)	3	4
5000 A (tout SCCR)	4	5

REMARQUE : Toutes les lamelles sont des barres-bus de cuivre de 6 x 102 mm (1/4 x 4 po)

Figure 25 : Barre-bus de passage principale typique (phases A, B et C)

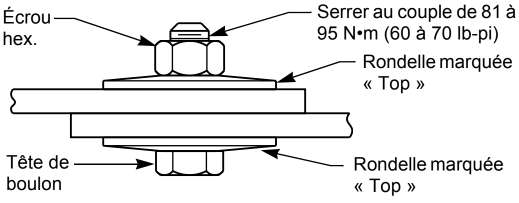


Compartiment de barre-bus (vue arrière)

9. Remplacer chaque pièce d'écartement retirée à l'étape 7 à la page 25 par une barre de raccordement de la barre-bus de passage principale. Voir la figure 24 à la page 26 .
10. Installer la quincaillerie de raccordement de 1/2-13 po retirée à l'étape 6 à la page 24. Voir la figure 24 à la page 26 .
11. Serrer toute la quincaillerie de 1/2-13 po à un couple de 81 à 95 N•m (60 à 70 lb-pi). Voir la figure 26.

    REMARQUE : Le côté convexe (marqué «Top») d'une rondelle conique doit se trouver contre la tête du boulon et le côté convexe de la deuxième rondelle doit se trouver contre l'écrou hexagonal.
12. Si elles sont fournies, fermer les gaines de la barre-bus en insérant de nouveaux attache-fils dans les trous de fixation. Utiliser les attache-fils fournis (Schneider Electric, pièce numéro 25901-24485).
13. Si elles ont été fournies, installer les cloisons arrière (figure 20 à la page 23) retirées à l'étape 4 à la page 23.

Figure 26 : Installation des rondelles coniques



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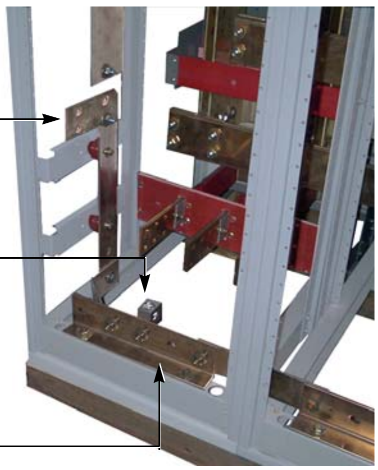
Mise à la terre et fixation

REMARQUE : Dans le but de faire les déterminations ci-dessous : un système est « mis à la terre » s'il est mis à la terre à n'importe quel point en amont de l'appareillage de commutation, que le conducteur mis à la terre (neutre) passe par les charges, ou non.

Appareil de service (systèmes solidement mis à la terre)

Pour les systèmes *solidement mis à la terre* utilisés soit comme appareil de service, soit comme appareillage de commutation principal sur un système dérivé séparément :

Figure 27 : Cavalier de fixation principal et connecteur du conducteur d'électrode de m.à.l.t. (systèmes mis à la terre)



1. Installer le conducteur de l'électrode de mise à la terre depuis l'électrode de mise à la terre au site d'installation jusqu'au connecteur du conducteur de l'électrode de m.à.l.t. (cosse de m.à.l.t.) située sur la barre-bus de m.à.l.t. de l'appareillage de commutation (ou sur la barre-bus de neutre, si indiqué ainsi sur l'illustration du matériel) (figure 27). Sélectionner le matériau et le calibre appropriés pour le conducteur de l'électrode de m.à.l.t. afin de se conformer à la section 10 du Code canadien de l'électricité (CCE). Installer le conducteur de l'électrode de m.à.l.t. comme spécifié dans la section 10 du CCE.
2. Installer le cavalier de fixation principal entre la barre-bus de neutre et la barre-bus de m.à.l.t. (figure 27). Se reporter aux tableaux 2 et 3 pour les valeurs de couple.

   REMARQUE : Si l'appareillage de commutation est alimenté par des sources multiples (par exemple, systèmes à deux extrémités), l'installation de deux cavaliers de fixation ou davantage peut être nécessaire.

Tableau 2 : Cosses d'arrivée, de dérivation, de neutre et de m.à.l.t.

Taille des douilles au travers des plans plats	Valeur de couple
1/4 po (6 mm)	20 N•m (180 lb-po)
5/16 po (8 mm)	28 N•m (250 lb-po)
3/8 po (10 mm)	38 N•m (340 lb-po)
1/2 po (13 mm) Voir l'exception à la ligne suivante	51 N•m (450 lb-po)
1/2 po (13 mm) 3/0-750 kcmil	70 N•m (620 lb-po)

Tableau 3 : Barre-bus de neutre à conducteurs multiples ou de m.à.l.t.

Type de vis	Gamme des fils de cosses	Calibre de conducteur	Valeur de couple
Tête fendue	14 à 4	14 à 10 Cu, 12 à 10 Al	2 N•m (20 lb-po)
		8 Cu-Al	3 N•m (25 lb-po)
		6 à 4 Cu-Al	4 N•m (35 lb-po)
	14 à 1/0	14 à 4 Cu-Al	4 N•m (36 lb-po)
		6 à 1/0 Cu-Al	5 N•m (45 lb-po)
Tête creuse	14 à 1/0	Tout	11 N•m (100 lb-po)
	6 à 300 kcmil	Tout	31 N•m (275 lb-po)

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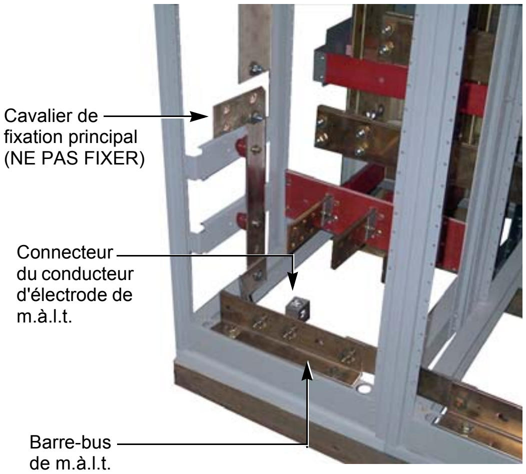
Appareil de service (systèmes non mis à la terre)

Pour les systèmes *non mis à la terre* utilisés soit comme appareil de service, soit comme appareillage de commutation principal sur un système dérivé séparément :

1. Installer le conducteur d'électrode de m.à.l.t. depuis l'électrode de m.à.l.t. au site d'installation jusqu'au connecteur du conducteur de l'électrode de m.à.l.t. (cosse de m.à.l.t.) situé sur la barre-bus de m.à.l.t. de l'appareillage de commutation (figure 28).
2. Sélectionner le matériau et le calibre appropriés pour le conducteur de l'électrode de m.à.l.t. afin de se conformer à la section 10 du CCE. Installer le conducteur de l'électrode de m.à.l.t. comme spécifié dans la section 10 du CCE.

Figure 28 : Cavalier de fixation principal et connecteur du conducteur d'électrode de m.à.l.t. (systèmes mis à la terre)



Appareil non de service

Pour raccorder le châssis de l'appareillage de commutation et la barre-bus de m.à.l.t. à la m.à.l.t. de service pour les systèmes *mis à la terre ou non mis à la terre,* lorsque l'appareillage de commutation n'est utilisé ni comme appareil de service, ni comme appareillage de commutation principal sur un système dérivé séparément, utiliser des conducteurs de m.à.l.t. de calibre conforme à la section 10 du CCE.

Systèmes de neutre mis à la terre à impédance élevée

Pour les *systèmes de neutre mis à la terre à impédance élevée*, mettre le système à la terre en suivant les instructions fournies avec le matériel de mise à la terre des systèmes et conformément à la section 10 du CCE.

S'assurer que le châssis de l'appareillage de commutation et la barre-bus de m.à.l.t. sont fixés conformément à la section 10 du CCE.

Raccordement des câbles d'alimentation, des contrôles et du câblage

Raccordement des câbles d'alimentation

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PERTE DE LA PROTECTION CONTRE LES DÉFAUTS À LA TERRE DE L'APPAREIL Ne raccordez pas les conducteurs de m.à.l.t. à n'importe quelles bornes de charge. **Si cette directive n'est pas respectée, cela peut entraîner des dommages matériels.**

REMARQUE : Pour le raccordement des câbles d'alimentation, utiliser des conducteurs isolés à 90 °C basés sur l'ampacité de conducteurs à 75 °C sauf indication contraire par des explications supplémentaires.

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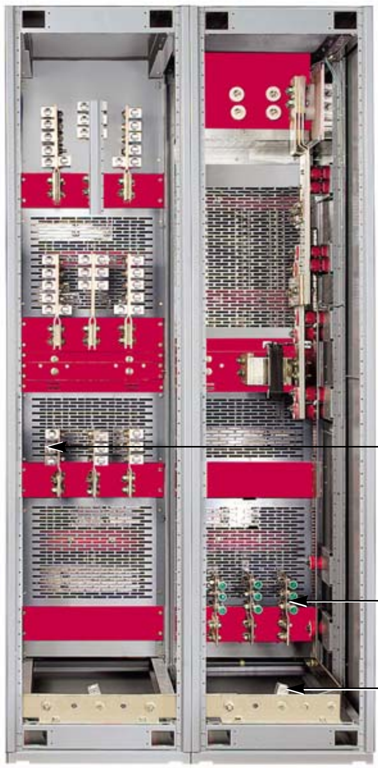
Figure 29 : **Raccordement des câbles**



Compartiment des câbles (vue arrière)

L'appareillage de commutation Power-Zone 4 est fourni avec des cosses de type à compression ou mécaniques (figure 29) pour terminer les câbles d'alimentation principale.

1. Déterminer la phase de chaque câble avant d'effectuer le raccordement.

   REMARQUE : En regardant l'appareillage de commutation par l'avant, la séquence des phases est A-B-C de haut en bas, d'avant en arrière ou de gauche à droite.

   Des arrangements non standard peuvent être nécessaires pour satisfaire des exigences spécifiques. En pareil cas, la barre-bus est marquée A, B et C dans l'ordre spécifié par le client.

   Si un neutre optionnel est fourni, tous les raccordements pour le neutre sont étiquetés.

2. Éviter les courbures prononcées, les coins et les bords lors de la formation des câbles pour une terminaison dans l'appareillage de commutation. Cela réduit le risque d'endommagement du matériel ou l'affaiblissement de l'isolation des câbles. Les instructions du fabricant de câbles doivent être observées pour déterminer le rayon minimum de courbure des câbles. Cela varie avec le type et le calibre du câble impliqué. Consulter les exigences du CCE pour avoir plus de détails sur le rayon minimum de courbure des câbles.
3. Acheminer et soutenir fermement les câbles de ligne et de charge selon les instructions figurant dans « Entrave des conducteurs pour le courant nominal de court-circuit (SCCR) » à la page 31.

   REMARQUE : Ceci contribue à éviter un effort ou une charge sur les bornes.

4. Une fois tous les câbles appropriés sont raccordés, installer les panneaux arrière retirés à l'étape 1 à la page 22.

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Entrave des conducteurs pour le courant nominal de court-circuit (SCCR)

AVIS

RISQUE DE DÉPLACEMENT DES CONDUCTEURS DANS DES CONDITIONS DE COURT-CIRCUIT

Entraver les conducteurs (y compris les conducteurs de neutre) dans l'installation du panneau de commutation selon le tableau 4.

Si cette directive n'est pas respectée, cela peut entraîner des dommages matériels.

Tableau 4 : Exigences d'entrave des conducteurs

Courant admissible	Courant de défaut de court-circuit disponible (RMS)			
	≤ 85 kA	> 85 à ≤ 100 kA	> 100 à ≤ 130 kA	> 130 à ≤ 200 kA
Câbles d'alimentation N'entrant PAS dans le compartiment d'entrée de service avec cloison				
≤ 2000 A	Non	Non	Oui	Oui
2001 à 3200 A	Non	Non	Oui	Oui
3201 à 4000 A	Non	Non	Non	Non
4001 à 5000 A	Non	Non	Non	Non
Câbles de charge de disjoncteur Masterpact NT				
≤ 1200 A	Non	Oui	Oui	Oui
Câbles de charge de disjoncteur Masterpact NW				
≤ 2000 A	Oui	Oui	Oui	Oui
801 à 1600 A	Oui	Oui	Oui	Oui
1601 à 2000 A	Oui	Oui	Oui	Oui
2001 à 3200 A	Non	Non	Oui	Oui
3201 à 4000 A	Non	Non	Non	Non

L'entrave des câbles est recommandée pour les cosses montées sur barres-bus dans les conditions suivantes :

- Les longueurs de câbles non supportées sont supérieures à 1 m (3,5 pi), telles que mesurées depuis l'extrémité de la cosse jusqu'au raccord du conduit par où sort le câble.

  ET

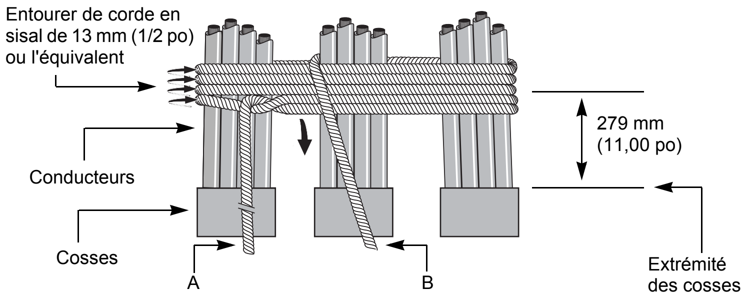
- Les câbles répondent au critère Oui indiqué au tableau 4.

Si des entraves sont nécessaires, procéder selon les points suivant.

REMARQUE : Entourer les conducteurs d'une corde en sisal de 13 mm (1/2 po) de diamètre ou l'équivalent.

1. Commencer à entourer les conducteurs (figure 30) à une distance maximale de 279 mm (11 po) de l'extrémité des cosses. Continuer à les entourer en comptant 279 mm (11 po) entre le centre des boucles de corde et le point où les conducteurs sortent de l'armoire.
   a. Entourer les conducteurs quatre (4) fois comme illustré, en laissant 1 m (3 pi) d'excès de corde à la première extrémité (A).
   b. Tirer sur la corde (B) et bien la tendre.

Figure 30 : Entourage des conducteurs (les conducteurs de neutre ne sont pas représentés)[1]



1 Fixer les câbles de neutre aux câbles de phases provenant de l'entrée de l'armoire jusqu'à ce qu'ils atteignent le bloc de cosses. Dans une situation où le bloc de cosses du neutre est éloigné des blocs de cosses des phases, fixer les câbles de neutre au châssis.

2. Faire plusieurs tours avec la corde (figure 31) jusqu'à ce qu'elle remplisse complètement l'espace entre les conducteurs.
   a. Faire passer la dernière boucle de la corde sous la boucle précédente (C).
   b. Engager la corde dans l'espace de droite.
   c. Tirer sur la corde et bien la tendre.

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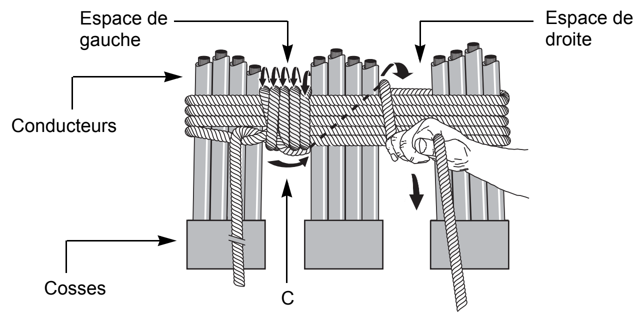
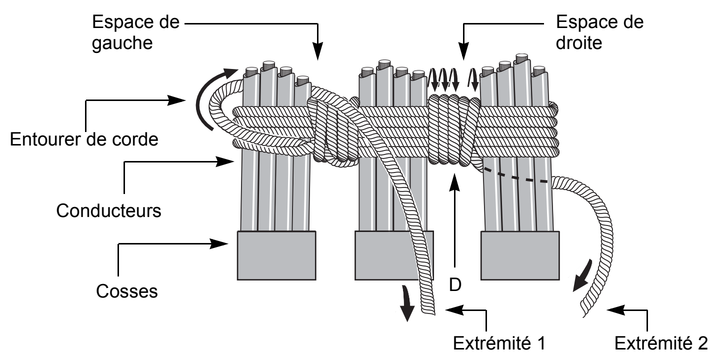
Figure 31 : Entourage de l'espace entre les conducteurs



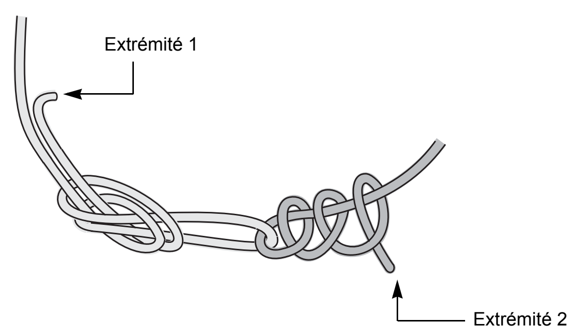
3. Faire plusieurs tours avec la corde (figure 32) jusqu'à ce qu'elle remplisse complètement l'espace entre les conducteurs.
   a. Faire passer la dernière boucle de la corde sous la boucle précédente (D).
   b. Tirer sur la corde et bien la tendre.

Figure 32 : Removing the Wiring Compartment Covers



4. Attacher ensemble les extrémités (1) et (2) (figure 33) jusqu'à ce qu'elles soient tendues. Couper l'excès de corde et entourer les extrémités avec un ruban adhésif pour les empêcher de s'effilocher.

Figure 33 : Attacher ensemble les extrémités de la corde



5. Vérifier de nouveau les couples des vis de fixation des fils après avoir fixé les conducteurs.

   REMARQUE : Se reporter à l'étiquette des couples fournie avec l'appareillage de commutation pour trouver les valeurs de couple.

Raccordement des câbles d'alimentation, des contrôles et du câblage

Raccordement des contrôles et du câblage

1. Situer et enlever les couvercles des compartiments de câblage (figure 34) à la division de la face avant de l'appareillage de commutation.

Figure 34 : Retrait des couvercles des compartiments de câblage

2. Raccorder tous les borniers antérieurement séparés qui traversent les sections de transport, à leurs fiches respectives et fournies à cette fin.

   REMARQUE : Les borniers ont été étiquetés à l'usine et leur installation est indiquée sur les schémas de raccordement.

3. Raccorder les contrôles des relais montés à distance, des interrupteurs de contrôle et des instruments à un ensemble de borniers situé soit sur le châssis arrière de la section verticale, soit dans le compartiment des instruments. Consulter les dessins « schéma des raccordements » du client.
4. Vérifier le câblage de contrôle avec le schéma des raccordements pour s'assurer que tous les raccordements ont été effectués correctement, que les circuits du transformateur sont complets et que les raccordements desserrés ont été bien serrés.

   REMARQUE : Si la source d'alimentation de contrôle est autre qu'un transformateur interne d'alimentation des contrôle, les fils provenant de la source allant vers l'appareillage de commutation doivent être du calibre adéquat pour éviter une chute de tension excessive en cours de fonctionnement.

Raccorder les câbles de communication—Modbus RS485 ou Ethernet (Modbus TCP)

L'appareillage fourni avec les composants de communication (Modules E/S, IFE ou IFM) permet aux réseaux du client de communiquer avec les disjoncteurs et compteurs électroniques afin d'offrir une surveillance d'état et d'énergie. À défaut d'un tel équipement, les plans du client indiqueront les raccordements des câbles des réseaux dans l'appareil et les points de raccordements du client. Procéder selon les points ci-dessous pour

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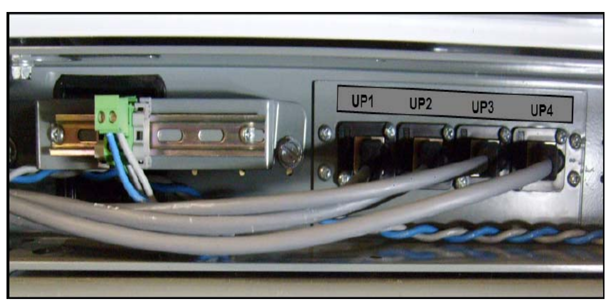
compléter les raccordements nécessaires des câbles des réseaux parmi les unités de transport.

1. Trouver les câbles de communication entreposés pour l'expédition dans le caniveau avant inférieur de chaque section. Voir la figure 35 pour un exemple d'entreposage de câbles.

Figure 35 : Exemple de câbles de communication temporairement entreposés dans un caniveau pour leur expédition

2. Se reporter aux schémas de principe du système de communication expédiés avec l'appareil et identifier les câbles à raccorder entre les unités de transport indiquées à a, b ou c ci-dessous. Les câbles sont munis d'étiquettes qui correspondent aux schémas de câblage et aux extrémités de destination (par exemple, UP1L signifie port UP n° 1 de la section adjacente de gauche. UP3R signifie le port UP n° 3 de la section adjacente de droite).
   a. Câbles de type à fiche logique universelle (ULP) (voir la figure 36). Les câbles ULP raccordent les disjoncteurs individuels à une interface de réseau (Modbus RS485 via un composant « IFM » ou Ethernet Modbus TCP via un composant « IFE »). Les câbles sont gris et communiquent au moyen du système à fiche logique universelle (ULP) entre les composants de communication (tels que module E/S, afficheur de tableau, IFE ou IFM).
   b. Câbles de type Modbus RS485 (voir la figure 40).
   c. Câbles de type Ethernet (Modbus TCP) (voir la figure 42).

Figure 36 : Exemple de câbles gris ULP raccordés à des ports ULP



Remarque : Dans la photo, les ports ULP sont étiquetés « UP1 », « UP2 », « UP3 » et « UP4 »

3. Consulter les figures 37, 38 et 39 pour raccorder les câbles ULP entre les unités de transport en identifiant le port de la fiche « UP » de la section adjacente avec le numéro de port « UP » correspondant sur l'étiquette du fil.

REMARQUE : Le port de la fiche ULP peut se trouver dans la section de droite ou de gauche et monté sur une plaque grise (un connecteur) avec les connecteurs femelles RJ45 montés dessus. Les ports ULP sont typiquement identifiés comme « UPx » où x = 1, 2, 3, 4, 5, 6, 7 ou 8.

4. Acheminer un câble ULP, à partir de sa section d'origine, par les œillets du côté droit ou du côté gauche du caniveau avant inférieur et vers la section de destination où se trouve situé le port ULP.

Figure 37 : Câbles gris ULP à conducteurs multiples dans le caniveau avant inférieur, représentés avec des faisceaux de câbles de 24 V (rouges et gris)

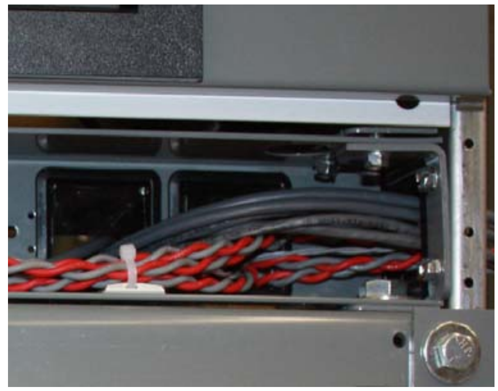


Figure 38 : Câbles ULP et de 24 V amenés par les ouvertures latérales du caniveau avant inférieur

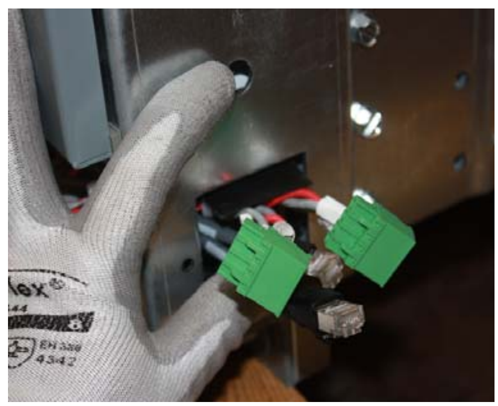


Figure 39 : Câbles ULP acheminés et raccordés aux ports étiquetés ULP du caniveau de la section adjacente

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5. En cas de réseau Modbus RS485 avec un module IFM dans l'appareil (voir la figure 40), suivre les points 6 à 8 ci-dessous. En cas de réseau Ethernet Modbus TCP avec un module IFE dans l'appareil (voir la figure 42 à la page 37), suivre les points 9 à 11 ci-dessous.
6. Les câbles Modbus RS485 sont gris, des câbles blindés à conducteurs multiples avec une fiche verte à 4 points de raccordement à l'extrémité (voir figure 40). À chaque caniveau avant inférieur d'une unité de transport, une fiche verte à 4 broches sera enroulée pour son raccordement à un connecteur fixe de la section sur la droite.

   REMARQUE : Les borniers ont été étiquetés à l'usine et sont montrés dans le schéma de câblage des sections et schémas de principe du système de communication en vue de l'alignement.

Figure 40 : Exemple de fiche Modbus RS485 à 4 broches

7. Acheminer la fiche verte, provenant de sa section d'origine, par l'œillet du côté droit du caniveau avant inférieur et vers la section de destination à droite.
8. Raccorder la fiche au connecteur fixe vert sur le côté gauche du caniveau avant inférieur (voir la figure 41). L'interconnexion du réseau Modbus RS485 est maintenant complète.

Figure 41 : Connecteur fixe Modbus RS485 du côté gauche du caniveau avant inférieur

9. Les câbles Ethernet Modbus TCP sont bleus avec un connecteur RJ45 à chaque extrémité. Les câbles Ethernet doivent être raccordés aux ports de destination entre les unités de transport et sont temporairement groupés pour leur expédition dans le caniveau avant inférieur des sections. Les ports de destination sont des connecteurs femelles RJ45 montés sur des plaques (connecteurs) bleues dans le caniveau avant

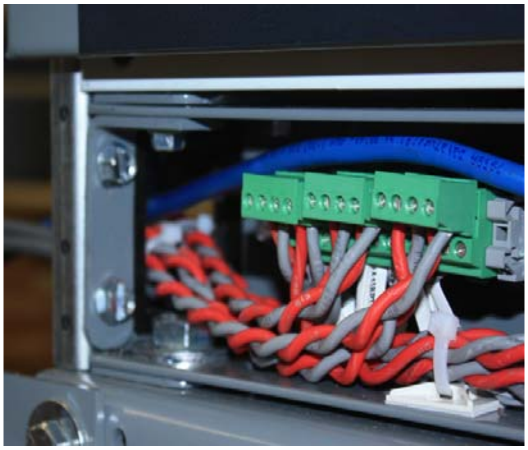
inférieur de certaines sections (se reporter aux plans des schémas de câblage pour les sections munies de ports Ethernet).

REMARQUE : Les câbles sont étiquetés avec des numéros de ports correspondant aux ports de destination. Les câbles sont munis d'étiquettes correspondant aux plans et aux extrémités de destination (par exemple, EP2 signifie Port Ethernet 2 de la section adjacente) (voir la figure 42).

Figure 42 : Exemple de raccordement de câble Ethernet Modbus TCP (bleu) au port étiqueté Ethernet

10. Acheminer les câbles Ethernet entre les unités de transport, comme montré sur les plans d'usine, par le caniveau avant inférieur et l'œillet latéral sur chaque section (voir la figure 43).

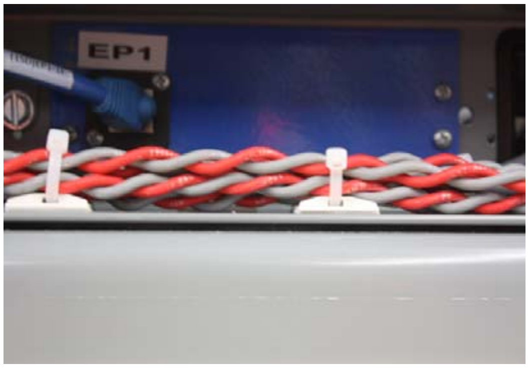
Figure 43 : Ouverture latérale pour le câble Ethernet



11. Raccorder la fiche mâle RJ45 du câble Ethernet au port femelle correspondant étiqueté RJ45 sur la **plaque (connecteur) bleue** (voir la figure 44 à la page 38).

    REMARQUE : Ne pas raccorder les câbles Ethernet bleus aux ports RJ45 sur les plaques (connecteurs) grises. Les ports RJ45 sur les plaques (connecteurs) grises sont destinés aux raccordements ULP des points 3 et 4 ci-dessus.

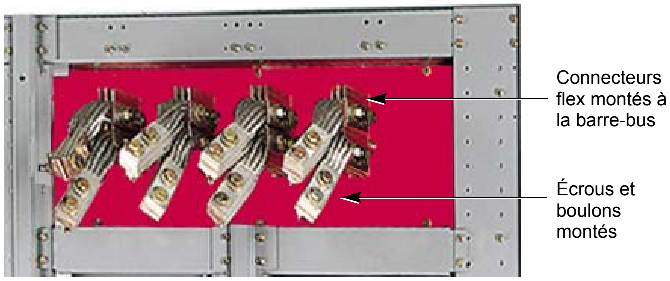
Figure 44 : Exemple de port Ethernet bleu et d'étiquette avec câble Ethernet raccordé



Montage des connecteurs Flex

Cette section contient les instructions de montage de raccordements flex sur les lames de fixation (cosses) du transformateur de l'appareillage de commutation Power-Zone 4 ou sur la barre-bus adaptatrice.

Figure 45 : Raccordements Flex typiques



Appareillage de commutation (côté)

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ARC ÉLECTRIQUE

- Coupez toute alimentation du transformateur avant d'y installer les connecteurs flex.
- Utilisez toujours un dispositif de détection de tension ayant une valeur nominale appropriée pour s'assurer que l'alimentation est coupée.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

REMARQUE : Monter les connecteurs flex dans les trous supérieurs de la barre-bus du transformateur sur les valeurs nominales demi-neutres de la barre-bus.

1. Couper toute alimentation du transformateur avant d'y installer les connecteurs flex.

   Utiliser toujours un dispositif de détection de tension ayant une valeur nominale appropriée pour s'assurer que l'alimentation est coupée.

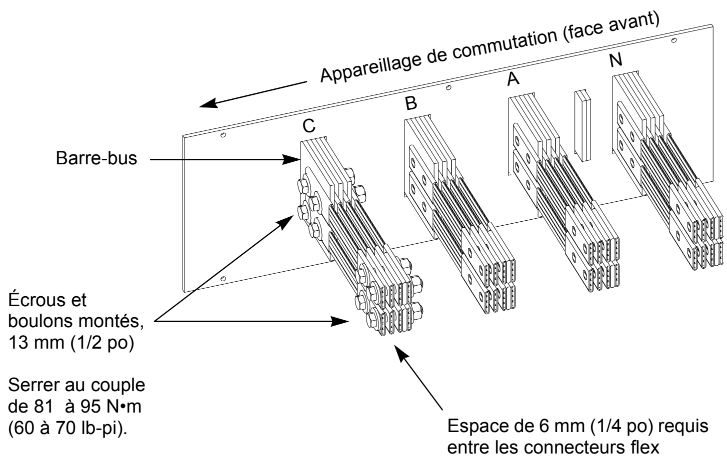
2. Fixer le connecteur flex approprié (figure 46) aux lames de fixation du transformateur ou à la barre-bus adaptatrice.
3. Fixer les boulons et écrous fournis, de 1/2 po (13 mm), à chaque connecteur flex et serrer à un couple de 81 à 95 N•m (60 à 70 lb-pi).

   Le schéma ci-dessous représente un raccordement typique de transformateur situé sur le côté droit de l'appareillage de commutation Power-Zone 4.

Tableau 5 : Raccordements flex du transformateur

Val. nom.	Type de barre-bus	Quantité (phase ou neutre)
1 600 A	Barre-bus de phase	5
	Barre-bus de neutre total	5
	Barre-bus de demi-neutre	3
2 000 A	Barre-bus de phase	6
	Barre-bus de neutre total	6
	Barre-bus de demi-neutre	3
3 200 A	Barre-bus de phase	8
	Barre-bus de neutre total	8
	Barre-bus de demi-neutre	4
4 000 A	Barre-bus de phase	10
	Barre-bus de neutre total	10
	Barre-bus de demi-neutre	5
5 000 A	Barre-bus de phase	13
	Barre-bus de neutre total	13
	Barre-bus de demi-neutre	7

Figure 46 : Raccordement typique de transformateur sur le côté droit de l'appareillage de commutation



Le nombre et la taille des lames de fixation du transformateur peuvent varier en fonction de la valeur nominale de celui-ci.

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Installation du système de levage mobile

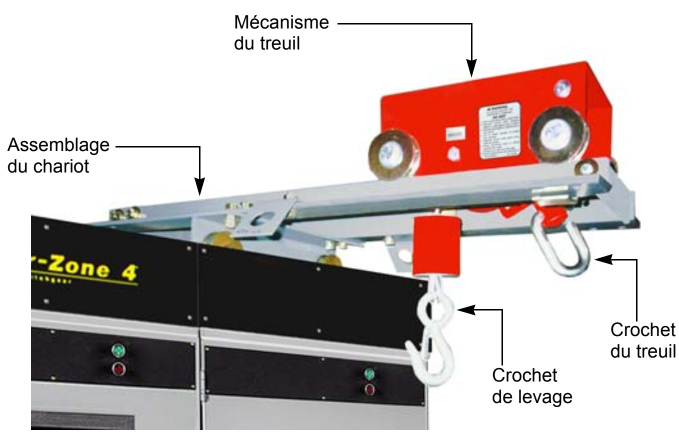
⚠ DANGER

RISQUE DE CHUTE D'OBJETS OU DE L'APPAREIL

- N'installez pas ou n'utilisez pas l'assemblage du système de levage mobile à moins que deux ou plusieurs personnes qualifiées ne soient présentes.
- Ne modifiez pas le mécanisme ou l'agencement du système de levage mobile.
- Gardez toujours les engrenages du système de levage mobile bien lubrifiés. Ne laissez jamais les engrenages fonctionner à sec.
- N'utilisez jamais le système de levage mobile avec des dents cassées ou tordues, une poignée déformée, un câble détérioré ou d'autres déformations évidentes.
- Ne surchargez pas, ne vrillez pas, ne tortillez pas et ne nouez pas le câble.
- Ne laissez jamais le tambour du système de levage mobile avec un câble complètement déroulé si bien que la charge serait totalement et uniquement supportée par la pièce d'ancrage.
- Ne chargez pas le système de levage mobile au-delà de sa capacité nominale de charge de 135 kg (300 lb).
- Ne déplacez pas le système de levage mobile en le tirant par un disjoncteur suspendu.
- Ne passez pas et ne restez pas sous des charges suspendues ou sous l'assemblage du système de levage mobile.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Figure 47 : Système de levage mobile typique



Alignement des sections et les rails

AVIS

RISQUE DE FLÉCHISSEMENT DU TOIT

Ne grimpez pas sur le toit des sections de l'appareillage de commutation. Il n'est pas prévu pour supporter un poids supplémentaire.

Si cette directive n'est pas respectée, cela peut entraîner des dommages matériels.

Après avoir placé l'appareillage de commutation à son emplacement définitif, vérifier le bon alignement des rails avant d'installer l'assemblage du système de levage mobile.

Les deux rails, avant et arrière, doivent être alignés pour assurer un bon fonctionnement de l'assemblage du système de levage mobile. L'alignement est particulièrement critique entre les sections verticales qui sont divisées pour les besoins du transport.

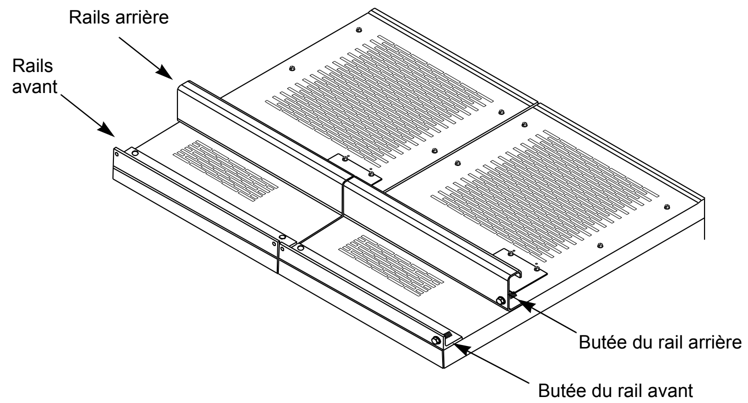
Si les sections verticales ont été assemblées à l'usine, les rails et la ou les sections doivent être déjà alignés. Toutefois, cette procédure est importante afin de s'assurer du bon alignement des sections verticales et des rails.

REMARQUE : Un espace de travail minimum non encombré de 406 mm (16 po) est nécessaire d'un côté de l'alignement de l'appareillage de commutation de façon à pouvoir installer l'assemblage de chariot. Si cela N'est PAS possible après la mise en place définitive de l'appareillage de commutation, installer l'assemblage du système de levage mobile avant de mettre l'appareillage de commutation à son emplacement définitif. Ne pas déplacer l'assemblage de chariot lors de la mise en place de l'appareillage de commutation.

1. Après avoir placé l'appareillage de commutation à son emplacement définitif, aligner les sections (figure 48) de façon à ce que les rails avant et arrière soient alignés dans tous les sens.

   REMARQUE : Sur la figure 48, le compartiment de câblage est retiré de la face avant de l'appareillage de commutation aux fins de clarté.

Figure 48 : Alignement des sections verticales



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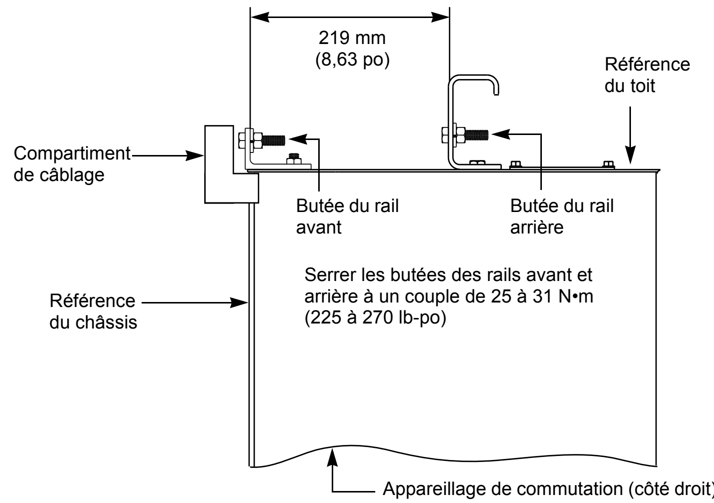
2. Aligner les rails avant et arrière (figure 49) à 1,6 mm (1/16 po) près pour permettre le bon fonctionnement du système de levage mobile. Cela est essentiel pour faciliter le mouvement transversal le long de la largeur de l'appareillage de commutation.

Figure 49 : Alignement des rails avant et arrière



Étapes de dépannage de l'alignement des rails

a. Placer des cales sous les sections du matériel afin d'obtenir un alignement vertical correct.
b. Desserrer les boulons des rails afin de réaligner les rails avant et arrière, puis resserrer les boulons à un couple de 25 à 31 N•m (225 à 270 lb-po).

Installation de l'assemblage de chariot

⚠ DANGER

RISQUE DE CHUTE DE L'APPAREIL OU DE CHARGE

- Ne retirez pas les butées des rails avant une fois que l'assemblage de chariot est installé.
- Les butées (boulons) des rails avant doivent être assemblées sur les rails avant afin d'éviter au système de levage de rouler au-delà de l'extrémité de l'alignement de l'appareillage de commutation.

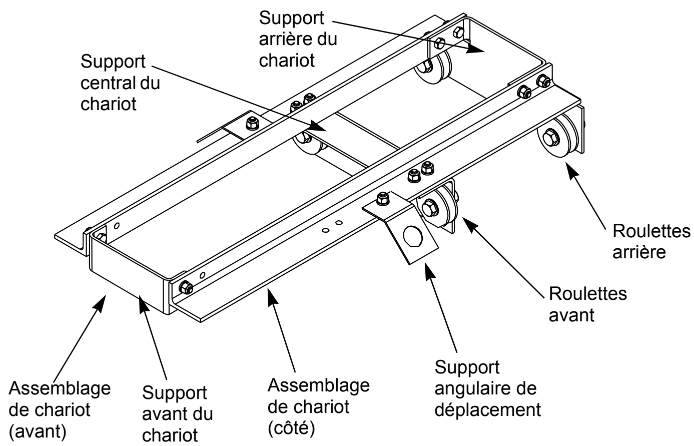
Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

REMARQUE : L'assemblage de chariot est emballé séparément de l'appareillage de commutation.

1. Retirer les butées des rails avant et arrière (figure 49 à la page 42) de la section d'extrémité de l'appareillage de commutation sur laquelle l'assemblage de chariot sera installé. Conserver les butées et la quincaillerie des rails avant et arrière.
2. Retirer la bande de transport qui retient l'assemblage de chariot sur la palette.
3. Placer le matériel de levage sous et autour de l'assemblage de chariot.
4. S'assurer que le support est adéquat et que l'assemblage de chariot est solidement maintenu.

5. Avant de soulever l'assemblage de chariot (figure 50), l'orienter de façon à ce que sa face avant s'aligne avec l'avant de l'appareillage de commutation.

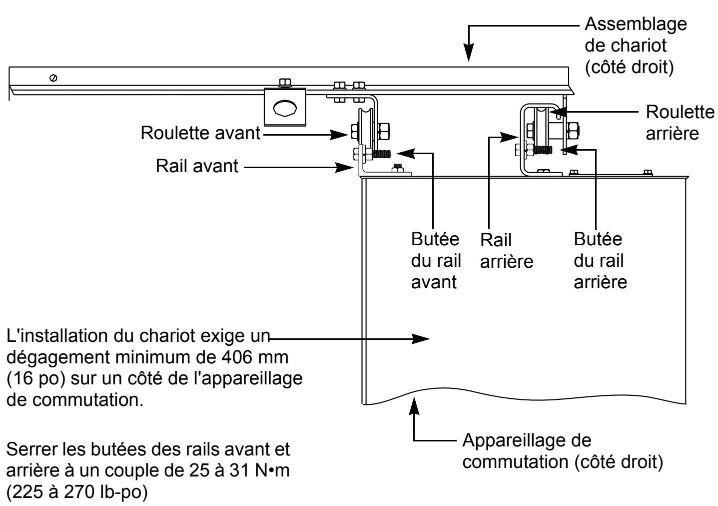
Figure 50 : Assemblage de chariot (vues frontale et latérale)



6. Soulever soigneusement l'assemblage de chariot (cela demande deux personnes qualifiées) et le mettre en place sur les rails avant et arrière du système de levage mobile comme indiqué à la figure 51.

   REMARQUE : Sur la figure 51, le compartiment de câblage est retiré de la face avant de l'appareillage de commutation aux fins de clarté.

Figure 51 : Installation de l'assemblage de chariot



7. Placer les roulettes avant sur les rails avant et les roulettes arrière sous les rails arrière.
8. Faire glisser le chariot le long des rails jusqu'à ce qu'il dégage l'emplacement de la butée avant du système de levage.
9. Après la mise en place de l'assemblage de chariot, réinstaller les butées des rails avant et arrière (figure 51) retirées à l'étape 1 et serrer à un couple de 25 à 31 N•m (225 à 270 lb-po).

FRANÇAIS

FRANÇAIS

Installation du mécanisme du treuil

⚠ AVERTISSEMENT

RISQUE DE CHUTE DE L'APPAREIL OU DE CHARGE

- Laissez toujours 4 à 5 enroulements de câble sur le tambour du mécanisme du treuil.
- Ne laissez jamais le tambour avec un câble complètement déroulé si bien que la charge serait uniquement supportée par la pièce d'ancrage.

Si ces directives ne sont pas respectées, cela peut entraîner la mort ou des dommages matériels.

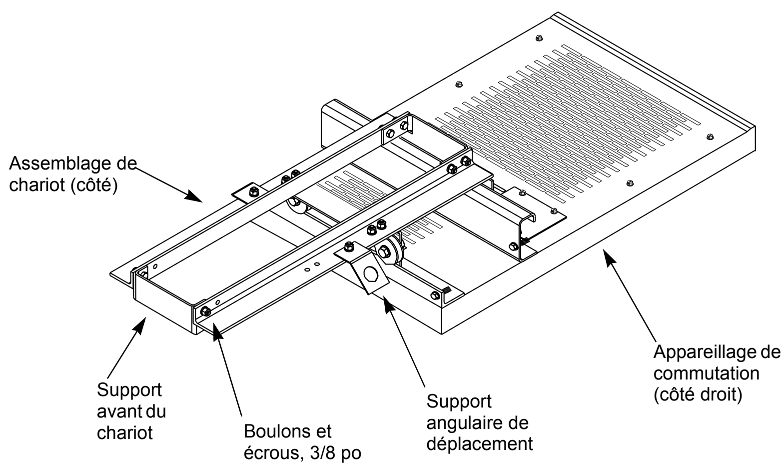
Effectuer les étapes suivantes pour installer le mécanisme du treuil sur le dessus de l'assemblage de chariot.

REMARQUE : Le mécanisme du treuil est emballé séparément de l'appareillage de commutation.

1. Retirer le support avant du chariot (figure 52) de l'assemblage de chariot. Mettre de côté le support et la quincaillerie.

   REMARQUE : Sur la figure 52, le compartiment de câblage est retiré de la face avant de l'appareillage de commutation aux fins de clarté.

Figure 52 : Retrait du support avant du chariot

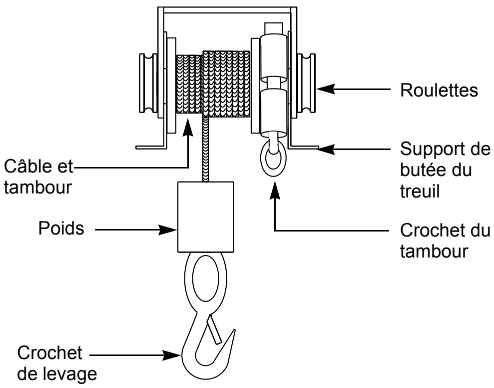


2. Déballer le contenu du carton d'expédition du mécanisme du treuil à proximité de l'appareillage de commutation.
3. Au besoin, lubrifier les engrenages du treuil avec un lubrifiant d'engrenages épais.

   REMARQUE : Pour obtenir les meilleurs résultats, les engrenages doivent être toujours lubrifiés. En conditions normales de fonctionnement, utiliser un lubrifiant d'engrenages épais. Dans des conditions de saleté ou de sable utiliser un lubrifiant sec tel que le graphite sec.

4. S'assurer que le câble est fermement enroulé autour du tambour. Ne jamais laisser le tambour sans moins de 4 à 5 enroulements de câble.

Figure 53 : Mécanisme du treuil (vue frontale)

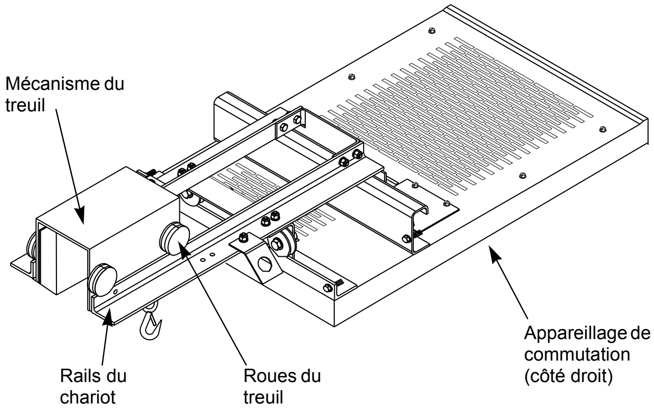


5. Avant de soulever le mécanisme du treuil, l'orienter (figure 53) de sorte que la partie avant du mécanisme s'aligne avec la face avant de l'appareillage de commutation.
6. Installer le mécanisme du treuil (figure 54) sur l'assemblage de chariot en faisant rouler les roues du treuil sur les rails du chariot.

   REMARQUE : S'assurer que les supports de butée du treuil se trouvent sous les rails du chariot.

   Sur la figure 54, le compartiment de câblage est retiré de la face avant de l'appareillage de commutation aux fins de clarté.

Figure 54 : Installation du mécanisme du treuil

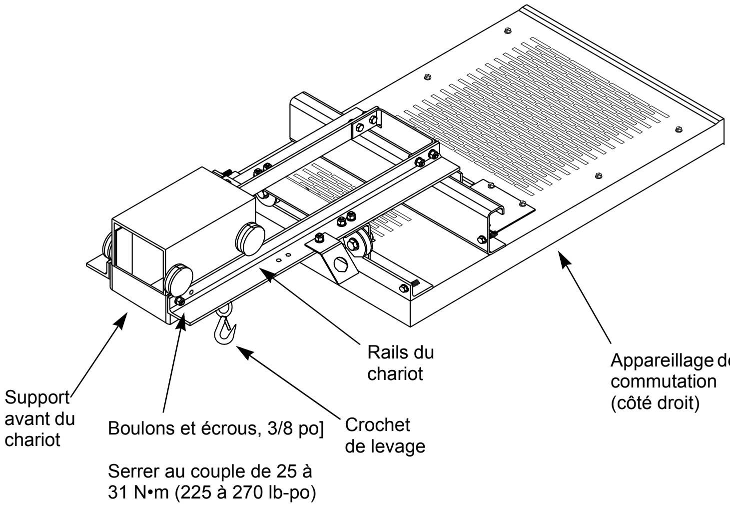


7. Après avoir mis en place le mécanisme du treuil, réinstaller le support avant du chariot (figure 55) retiré à l'étape 1 à la page 44 et serrer à un couple de 25 à 31 N•m (225 à 270 lb-po).

   REMARQUE : S'assurer que les supports de butée du treuil se trouvent derrière le support avant du chariot et sous les rails de ce dernier avant de serrer le support et la quincaillerie du chariot.

   Sur la figure 55, le compartiment de câblage est retiré de la face avant de l'appareillage de commutation aux fins de clarté.

Figure 55 : Installation du support avant du chariot



FRANÇAIS

Inspection et essais avant l'utilisation

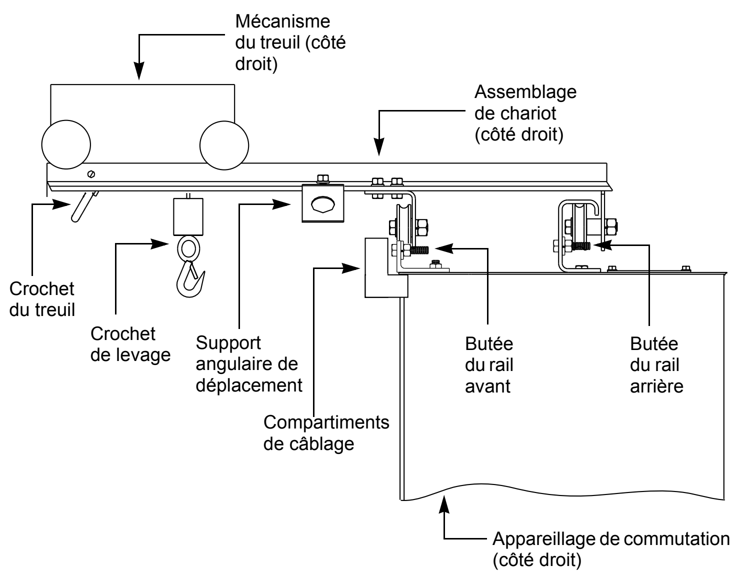
Une fois le système de levage mobile est complètement installé, l'inspecter visuellement (figure 56) pour détecter toute déformation.

- S'assurer que les rails et les sections sont alignés.
- S'assurer que les butées des rails avant et arrière ont été installées correctement.
- S'assurer que le chariot et le mécanisme du treuil ont été installés correctement.
- S'assurer que le câble a été solidement attaché autour du tambour du treuil.
- S'assurer que les engrenages du treuil sont bien lubrifiés.

  REMARQUE : Pour obtenir un fonctionnement normal, utiliser un lubrifiant d'engrenages épais. Dans des conditions de saleté ou de graviers, utiliser un lubrifiant sec tel que le graphite sec pour lubrifier les engrenages. Ne jamais laisser les engrenages fonctionner à sec.

- Le cas échéant, retirer les moyens de manutention et toutes obstructions sur le dessus de l'appareil susceptibles de gêner le fonctionnement du système de levage mobile.

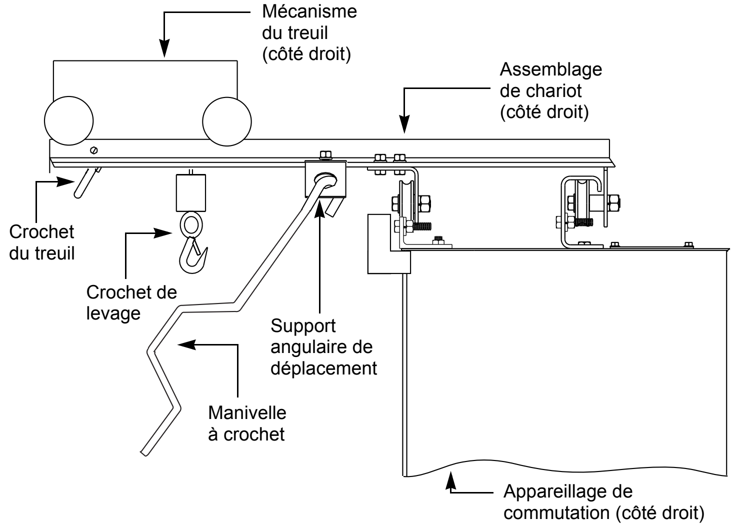
Figure 56 : Inspection visuelle du système de levage mobile



Utiliser la manivelle à crochet du système de levage mobile pour déplacer l'assemblage de chariot d'un côté à l'autre le long du dessus des sections verticales afin de s'assurer du bon fonctionnement du système de levage mobile.

1. Trouver la manivelle à crochet et insérer l'extrémité muni du crochet dans le support angulaire de déplacement comme indiqué à la figure 57.

Figure 57 : Essai de l'assemblage de chariot

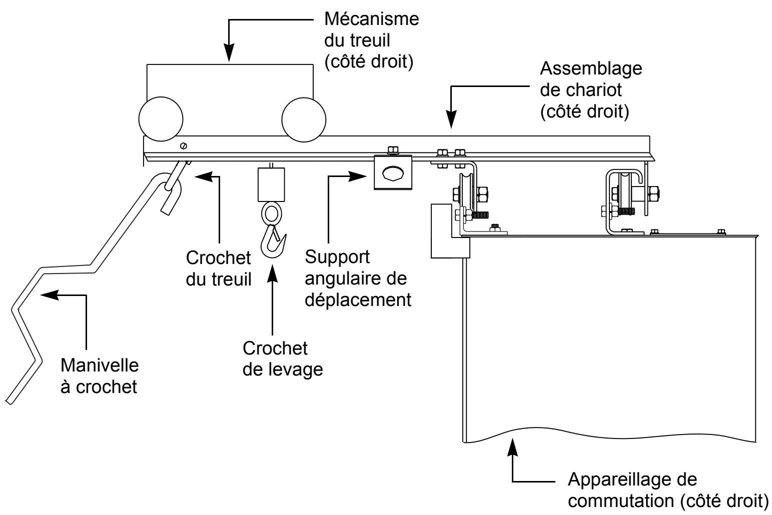


2. Tirer sur la manivelle à crochet de façon à faire rouler l'assemblage de chariot en douceur le long des rails.

   REMARQUE : Si l'assemblage de chariot ne se déplace pas en douceur, réinspecter le dessus de l'appareil afin de voir s'il existe des obstructions ou un mauvais alignement des rails avant et arrière.

3. Insérer l'extrémité munie d'un crochet de la manivelle à crochet du système de levage mobile dans le crochet du treuil comme indiqué figure 58.

Figure 58 : Essai du mécanisme du treuil



FRANÇAIS

4. Pour manœuvrer le système de levage mobile :
   a. Tourner la manivelle dans le sens anti-horaire pour abaisser le crochet de levage.
   b. Tourner la manivelle dans le sens horaire pour relever le crochet de levage juste en dessous du crochet du treuil.

   REMARQUE : Si le mécanisme du treuil ne relève pas ou n'abaisse pas le crochet de levage, réinspecter l'appareil pour voir s'il existe des obstructions ou si les engrenages manquent de lubrification.

Assemblage des barres de levage du disjoncteur

Tableau 6 : Assemblage de barres de levage du disjoncteur

Type de disjoncteur	Ampères	Largeur du châssis du disjoncteur
NT08 (N1, H1, L1F)	800 A	Châssis T 241 mm (9,5 po)
NW08, NW16, NW20, NW32 (N1, H1, H2)	800 à 3 200 A	Châssis W 400 mm (15,75 po)
NW08, NW16 (L1, L1F)	800 à 1 600 A	Châssis W 400 mm (15,75 po)
NW20 (L1, alimentation; L1F alimentation)	2 000 A	Châssis W 400 mm (15,75 po)
NW40, NW50 (H2, L1)	4 000 à 5 000 A	Châssis Y 787 mm (31,00 po)
NW20, NW32 (L1)	2 000 à 3 200 A	Châssis Y 787 mm (31,00 po)

Figure 59 : Barre de levage du disjoncteur à châssis T

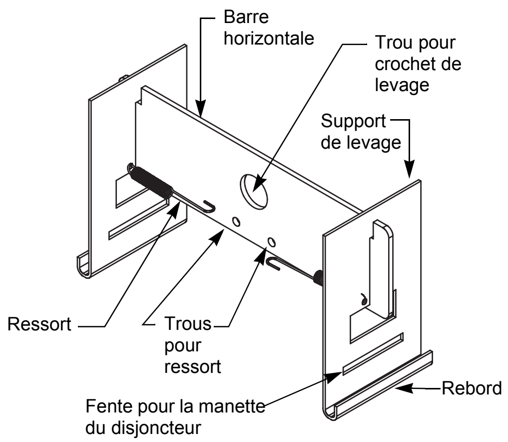
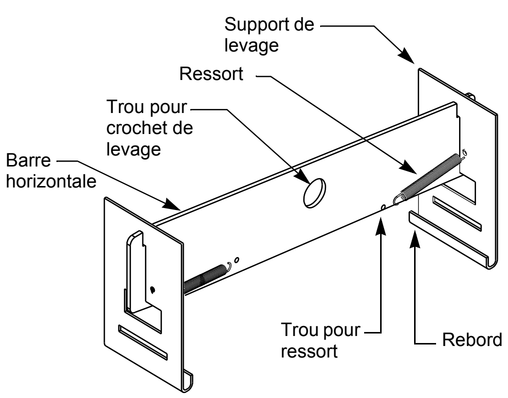


Figure 60 : Barre de levage du disjoncteur à châssis W



⚠ DANGER

RISQUE DE CHUTE DE L'APPAREIL OU DE CHARGE

- Ne modifiez pas le mécanisme ni l'agencement de la barre de levage du disjoncteur.
- Utilisez la barre de levage du disjoncteur (fournie avec chaque commande d'appareillage de commutation) conjointement avec l'assemblage de levage mobile ou une grue d'atelier pour soulever le disjoncteur.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

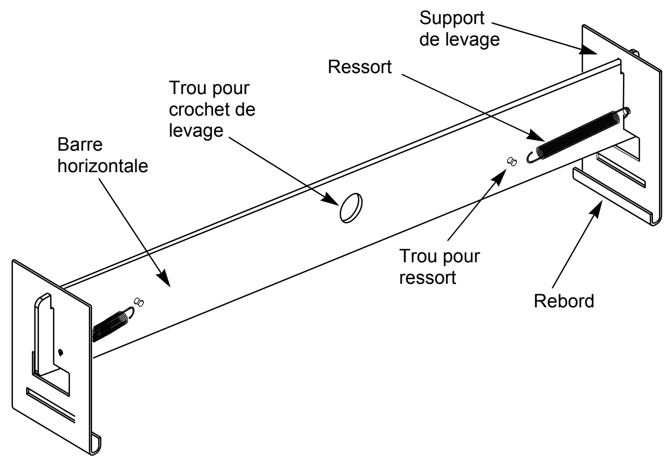
La barre de levage du disjoncteur à châssis T est utilisée pour soulever et abaisser les disjoncteurs Masterpact NT. Les barres de levage du disjoncteur à châssis W et à châssis Y sont utilisées pour soulever et abaisser les disjoncteurs Masterpact NW. La taille du disjoncteur détermine si la barre de levage du disjoncteur à châssis W (largeur normale) ou à châssis Y (largeur double) sera utilisée.

Consulter le tableau 6 pour déterminer quelle barres de levage du disjoncteur utiliser pour l'assemblage.

Effectuer les étapes suivantes pour assembler les barres de levage du disjoncteur à châssis T, à châssis W et à châssis Y (figures 59, 60, et 61).

1. Placer la barre horizontale avec le trou pour crochet de levage vers le haut.
2. Noter la direction du rebord. Glisser les supports de levage dans les rainures de la barre horizontale.
3. Attacher les ressorts des supports de levage aux trous pour ressort comme indiqué aux figures 59, 60, et 61.

Figure 61 : Barre de levage du disjoncteur à châssis Y



FRANÇAIS

FRANÇAIS

Préparation et installation des disjoncteurs

⚠ DANGER

RISQUE DE CHUTE DE L'APPAREIL OU RENVERSEMENT DE CHARGE

- Ne restez jamais sous un disjoncteur suspendu.
- Utilisez le crochet de levage mobile (ou tout autre crochet de levage adéquat) conjointement avec la barre de levage du disjoncteur (fournie avec l'appareillage de commutation) pour déplacer le disjoncteur.
- Assurez-vous que la cliquet de sûreté est bien fermé sur le crochet de levage.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Avant de continuer, se reporter aux dessins et aux directives d'utilisation des disjoncteurs Masterpact. Observer toutes les mesures de sécurité détaillées dans les directives d'utilisation du disjoncteur.

REMARQUE : Les disjoncteurs sont emballés séparéments de l'appareillage de commutation Power-Zone 4.

Manutention des disjoncteurs

Déplacer le disjoncteur vers le site d'installation de la manière suivante :

1. Déballer les disjoncteurs, si nécessaires, selon les directives d'utilisation des disjoncteurs Masterpact.
2. Fixer fermement la barre de levage du disjoncteur dans les fentes des deux côtés du disjoncteur (figure 62). Pour un disjoncteur à châssis T, étendre les manettes du disjoncteur et les placer dans les fentes pour manettes de la barre de levage du disjoncteur (figure 59 à la page 49 et figure 63 à la page 51).

Figure 62 : Fixation de la barre de levage au disjoncteur

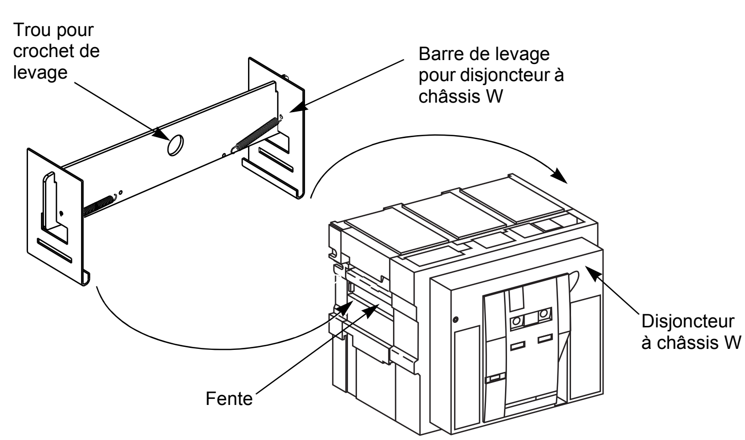
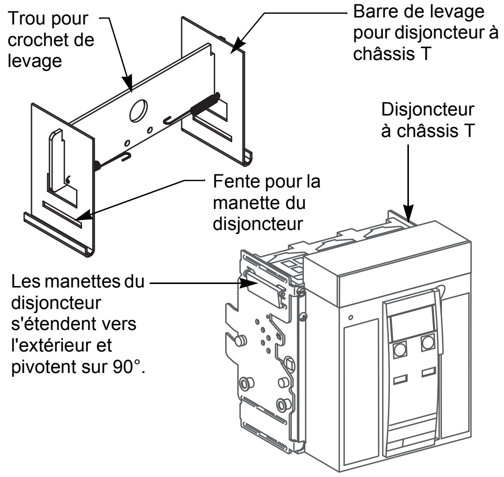
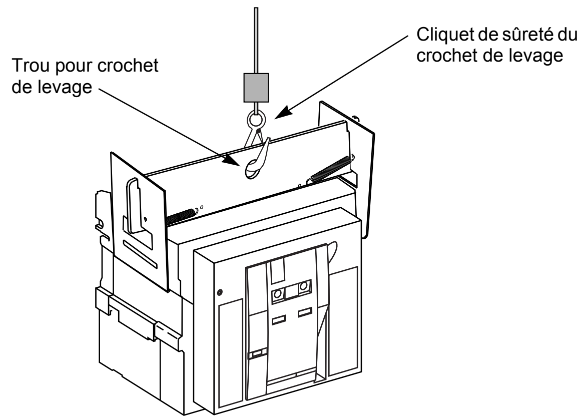


Figure 63 : Fixation de la barre de levage au disjoncteur à châssis T



3. Accrocher le crochet de levage du système de levage mobile ou de la grue d'atelier au trou pour crochet de levage (figure 64). S'assurer que le cliquet de sûreté est fermé sur le crochet de levage avant de soulever ou d'abaisser le disjoncteur.

Figure 64 : Levage et déplacement du disjoncteur



4. Utiliser le système de levage mobile ou la grue d'atelier pour soulever et déplacer le disjoncteur.
5. Installer le disjoncteur selon les directives d’utilisation qui l'accompagnent.

FRANÇAIS

Inspection et essai de l'appareillage de commutation avant son utilisation

Après avoir installé l'appareillage de commutation Power-Zone 4 et ses composants et avoir effectué tous les raccordements primaires et de contrôle, effectuer une inspection finale et procéder à un essai avant de mettre l'appareillage de commutation en service.

Lorsqu'il est correctement installé, l'appareillage de commutation est conforme aux exigences suivantes :

- Les panneaux avant forment une ligne droite, exacte; lorsque des transformateurs et/ou autres sont inclus, les panneaux avant s'alignent ou forment des lignes parallèles.
- Les éléments sont espacées correctement de centre à centre et perpendiculaires à la surface de montage.
- L'appareillage de commutation est solidement fixé à des profilés en U ou à un socle.
- Les sections de transport sont fermement boulonnées ensemble.
- Les connexions de la barre-bus et du câblage de contrôle sont correctement raccordées.

Les instructions d'essai des relais, instruments, compteurs, disjoncteurs et autres dispositifs électroniques compris dans l'assemblage sont données dans les directives d'utilisation de chaque dispositif individuel.

Les réglages des dispositifs de protection sont déterminés à partir d'une étude de coordination effectuée par l'acheteur ou le groupe de coordination Schneider Electric. Les réglages de l'usine sont utilisés pour la production d'essais et peuvent ne pas inclure les exigences spécifiques du site.

La sélection d'un matériel d'essai dépend de la valeur nominale et du type de l'installation. Un multimètre est nécessaire pour contrôler la continuité des circuits de contrôle. Un mégohmmètre ou vérificateur à tension élevée est également nécessaire pour les essais.

Vérification des raccordements du circuit d'alimentation

Effectuer les étapes suivantes pour vérifier les circuits d'alimentation.

1. Vérifier les raccordements des fils et les raccordements boulonnés de la barre-bus pour s'assurer qu'aucun relâchement ou dommage ne s'est produit pendant le transport ou l'installation. Remplacer immédiatement les couvercles ou cloisons qui ont été retirés pour vérifer les raccordements ; cela permet d'établir qu'il ne s'est produit aucune perte de matériel.

   REMARQUE : Les valeurs de couple correctes sont indiquées sur les étiquettes situées dans le compartiment des câbles.

2. Si la barre-bus est équipée d'une isolation :

   a. Retirer partiellement les gaines d'isolation de la barre-bus pour vérifier les raccordements boulonnés de la barre-bus en coupant juste assez d'attache-fils pour avoir accès à la quincaillerie de raccordement.

   b. Réinstaller les gaines d'isolation de la barre-bus immédiatement après inspection en insérant de nouveaux attache-fils dans les trous de fixation. Utiliser les attache-fils fournis (Schneider Electric, pièce numéro 25901-24485).

Vérification du matériel externe

Effectuer des contrôles de continuité pour les raccordements au matériel externe tels que les contrôles à distance, les circuits d'interverrouillage et les interrupteurs auxiliaires. Se reporter aux procédures appropriées dans les directives d'utilisation de chaque dispositif individuel soumis à des essais.

Vérification du matériel auxiliaire

Les relais inclus sur ou dans les panneaux d'instruments sont réglés pour des niveaux d'essais de fabrication lorsqu'ils sont expédiés.

1. Déterminer les réglages définitifs des relais à partir de l'étude de coordination effectuée par le client, un consultant ou le groupe de coordination Schneider Electric.
2. Procéder aux modifications nécessaires des réglages des relais conformément aux directives d'utilisation pour ce relais particulier.

Les moniteurs de circuits et indicateurs de puissance compris sur la face avant de l'appareillage de commutation peuvent être ou ne pas être correctement configurés. La configuration définitive de ces dispositifs doit être établie par l'acheteur ou un consultant. Consulter les directives d'utilisation des moniteurs de circuits et indicateurs de puissance lors du réglage de ces dispositifs.

Vérification des systèmes de défaut à la terre de l'appareil

Le CCÉ exige que tous les systèmes de protection contre les défauts à la terre de l'appareil soient essayés lors de leur installation initiale. Si le disjoncteur possède la protection d'appareils contre les défauts à la terre, vérifier le système de protection à ce moment-là.

S'assurer que le déclencheur est sous tension. Le déclencheur est sous tension si :

- le disjoncteur est fermé ou alimenté par le bas et a une tension de charge de plus de 100 V sur deux phases (déclencheurs P ou H uniquement).
- la trousse d'essais des fonctions complètes ou portative est raccordée et sous tension.
- l'alimentation externe de 24 V cc est raccordée.
- un dérivateur de tension externe est installé et si une tension de plus de 100 V est présente sur deux phases (déclencheurs P ou H uniquement).

S'il s'agit d'un système radial (à une seule extrémité), appuyer sur le bouton pousser-pour-vérifier de défaut à la terre. Le disjoncteur se déclenchera et le voyant lumineux de défaut à la terre du déclencheur s'allumera.

La protection contre les défauts à la terre peut être également fournie d'une façon non intégrée au disjoncteur, comme un relais externe. Suivre les directives du fabricant pour ce système, et l'essayer à ce moment-là.

Enregistrer les résultats au journal d'essais du système de défaut à la terre.

REMARQUE : Si une vérification complète du système de défaut à la terre est nécessaire, faire un essai d'injection primaire. Si le système est à sources multiples ou nécessite des raccordements sur place au site de travail, faire un essai d'injection primaire.

REMARQUE : Certains systèmes de défaut à la terre exigent des raccordements sur place au site de travail. Se reporter au schéma de câblage d'interconnexion de l'appareillage de commutation pour les détails.

Effectuer des essais de résistance d'isolation électrique

La résistance de l'isolation diélectrique de l'appareillage de commutation Power-Zone 4 et des disjoncteurs Masterpact est vérifiée à l'usine.

⚠ATTENTION

RISQUE DE TENSION D'ESSAI

- Retirez la fiche de valeur nominale de longue durée avant de vérifier l'isolation électrique d'un disjoncteur muni d'une étiquette indiquant « Avertissement : déconnecter la fiche avant de faire un essai diélectrique ».
- Certains déclencheurs Micrologic ne sont pas homologués pour des tensions survenant pendant un essai de résistance d'isolation électrique.
- Ouvrir tous les sectionneurs de contrôle et de mesure des circuits de contrôle.

Si ces directives ne sont pas respectées, cela peut entraîner des blessures ou des dommages matériels.

Effectuer des essais diélectriques une fois l'appareillage de commutation installé. Ces essais aideront à identifier les courts-circuits et mises à la terre indésirables dans l'appareillage de commutation ainsi que tout dommage potentiel occasionné à l'isolation pendant le transport depuis l'usine.

1. Se reporter à ANSI/IEEE C37.20.1 pour obtenir d'informations concernant les essais diélectriques sur place,
2. Ouvrir tous les sectionneurs de mesure et d'alimentation de contrôle, ou enlever les fusibles des circuits de contrôle. Déconnecter le raccordement du neutre à tout suppresseur de surtensions transitoires (SST) ou autre dispositif électronique avant d'effectuer l'essai de résistance d'isolation électrique puis raccorder de nouveau après l'essai.
3. Avec le neutre isolé de la terre et les interruteurs d'alimentation et disjoncteurs ouverts, effectuer des essais d'isolation électrique entre phases, de phase à la terre, de phase au neutre et du neutre à la terre.

   REMARQUE : Si la résistance indique moins de un mégohm pendant un essai avec les dispositifs de circuits de dérivation en position ouverte, le système peut manquer de sécurité et doit être examiné. Consulter la Division des services de Schneider Electric Canada (1-800-265-3374) pour aider à corriger les problèmes.

4. Après avoir terminé l'essai d'isolation électrique, replacer tous les fusibles de l'alimentation de contrôle qui ont été enlevés et fermer les sectionneurs d'alimentation qui ont été ouverts. Mettre sous tension selon les besoins.

Chapitre 5—Procédure de contrôle avant la mise sous tension

Procéder à une inspection complète **avant** de mettre l'appareillage de commutation sous tension afin de s'assurer que tous les composants fonctionnent et marchent correctement. **Accomplir chaque étape de la procédure de contrôle indiquée avant de mettre l'appareillage de commutation sous tension.**

AVIS

PINCES DES PORTE-FUSIBLES LÂCHES

Ne forcez pas ouvert et n'écartez pas les pinces des porte-fusibles. Cela pourrait entraîner un mauvais contact aboutissant à une surchauffe.

Si cette directive n'est pas respectée, cela peut entraîner des dommages matériels.

1. Vérifier tous les raccordements de barres-bus installés sur place.
2. Vérifier si tous les raccordements accessibles sont bien serrés.
3. Vérifier si toutes les terminaisons de cosses installées à l'usine ou sur place sont bien serrées.
4. Vérifier la rigidité de tous les supports de barres-bus.
5. Vérifier si l'armoire de l'appareillage de commutation n'a pas reçu de coups ou subi d'autres dommages qui réduisent les distances d'isolation électrique à l'intérieur de l'appareillage.
6. Retirer des dispositifs électriques tous les blocs de mousse ou autres matériaux de rembourrage ou de retenue.
7. Ouvrir et fermer tous les disjoncteurs et autres mécanismes de fonctionnement, en vérifiant si leur alignement est correct et s'ils se manœuvrent librement.
8. Manœuvrer (mais non sous charge) tous les interrupteurs , disjoncteurs et autres dispositifs à fonctionnement électrique munis d'opérateurs à distance. Pour ce faire, une source auxiliaire d'alimentation de contrôle peut être nécessaire.
9. Vérifier tous les relais, compteurs et instruments afin de s'assurer que tous les raccordements de câblage installés sur place sont faits correctement et que les dispositifs fonctionnent correctement.
10. Les transformateurs de courant (TC) fournis pour l'utilisation par le client nécessitent un raccordement à une charge de dispositif de mesure avant la mise sous tension. Vérifier si la charge du dispositif de mesure est bien raccordée, y compris les raccordements principaux de l'appareillage de commutation à tout appareil distant.
11. Tous les circuits de TC fournis par Schneider Electric pour l'utilisation de mesure par le client sont court-circuités pour leur expédition. Enlever les vis de bornes de court-circuit sur les borniers ou cavaliers de court-circuitage et ranger dans le bloc.
12. Sur un appareillage de commutation contenant un disjoncteur à déclenchement électronique, régler la courbe des caractéristiques de déclenchement du déclencheur électronique réglable en fonction des exigences du travail, ou comme précisé dans le manuel d'utilisation respectif.

AVIS

RISQUE DE CONTAMINATION

N'utilisez pas un conduit d'air pour souffler la poussière de l'appareillage de commutation. La poussière pourrait s'infiltrer à l'intérieur des relais et des dispositifs de surintensité, entraînant une surchauffe et un mauvais fonctionnement.

Si cette directive n'est pas respectée, cela peut entraîner des dommages matériels.

13. Vérifier si les raccordements de mise à la terre sont correctement effectués. Si l'appareillage de commutation est utilisé comme entrée de service, vérifier une seconde fois pour voir si le cavalier de raccordement principal est connecté.
14. Vérifier tout câblage installé sur place. S'assurer qu'il n'est en contact avec aucune pièce sous tension et, lorsque c'est demandé, qu'il est fixé pour soutenir les courants de défaut.
15. S'assurer que tout câblage de contrôle entre les sections est raccordé.
16. Passer l'aspirateur pour enlever la poussière, les bouts de fils ou autres débris.
17. Replacer tous les couvercles; prendre soin de ne pincer aucun fil et fermer les portes. S'assurer que toutes les pièces des armoires sont correctement alignées et bien attachées.

Chapitre 6—Mise sous tension de l’appareillage de commutation

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ARC ÉLECTRIQUE

- Corrigez les conditions de court-circuit détectées au cours des procédures de contrôle décrites dans le « Chapitre 5—Procédure de contrôle avant la mise sous tension », commençant à la page 55.
- Des électriciens qualifiés doivent être présents lors de la mise sous tension de cet appareil pour la première fois.
- Suivez les directives de ce chapitre pour mettre l'appareillage de commutation sous tension correctement.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

1. Aucune charge ne doit être sur l'appareillage de commutation au moment de sa mise sous tension. Mettre hors tension toutes les charges en aval.
2. Mettre l'appareillage de commutation sous tension en suivant la séquence ci-après :
   a. Activer tous les sectionneurs d’alimentation de contrôle avant de mettre l'appareillage de commutation sous tension. Consulter les schémas fournis avec le matériel pour voir si les sectionneurs d’alimentation de contrôle sont fournis.
   b. Fermer toutes les portes et tous les couvercles.
   c. Fermer le ou les dispositifs principaux.
   d. Fermer chaque disjoncteur de dérivation.
   e. Continuer de même pour chaque panneau de distribution et tous les autres dispositifs en aval.

Après avoir fermé tous les dispositifs de protection contre les surintensités, activer toutes les charges une par une (par exemple, circuits d'age, contacteurs, appareils de chauffage et moteurs).

FRANÇAIS

Chapitre 7—Entretien de l'appareillage de commutation

L'entretien périodique de l'appareillage de commutation comprend le nettoyage, la lubrification et la manœuvre des pièces des composants. L'intervalle entre les contrôles d'entretien peut varier en fonction de l'usage et des conditions environnementales de chaque installation. L'intervalle maximum recommandé entre les inspections est d'un an. Cette définition d'entretien périodique s'applique tout au long de ce manuel, sauf indication contraire.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ARC ÉLECTRIQUE

- Inspectez et procédez à un entretien préventif seulement sur un appareillage de commutation et un appareil dont l'alimentation a été placée sur la position OFF, déconnectée et isolée électriquement (sauf indication contraire), de façon à ce qu'aucun contact accidentel ne se produise avec des pièces sous tension.
- Observez les pratiques de sécurité en rapport avec le travail telles que décrites dans NFPA 70E - Norme des exigences de sécurité électrique pour les postes de travail des employés et normes OSHA - 29 CFR Partie 1910, sous-partie S - Appareillage électrique.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Toujours inspecter l'appareillage de commutation après un défaut. (Se reporter au « Chapitre 8—Circonstances indésirables» commençant à la page 62). Des bulletins de service sur les divers dispositifs de déconnexion et de surintensité montés dans l'appareillage de commutation sont disponibles au bureau local d'intervention sur place Schneider Electric.

FRANÇAIS

Directives d'inspection de l'appareillage de commutation

En général, les directives suivantes peuvent être suivies; toutefois, le programme d'entretien doit s'adapter aux conditions pour assurer une longue durée au matériel et au système électrique.

Un inspection périodique du matériel est nécessaire pour établir les conditions auxquelles l'appareillage de commutation est soumis (voir « Conditions idéales de fonctionnement » et « Conditions normales de fonctionnement » à la page 58 et « Conditions de fonctionnement contraignantes » à la page 59). Effectuer les inspections et l'entretien en fonction de ces conditions.

Inspecter le matériel immédiatement après l'apparition de conditions de fonctionnement anormales ou contraignantes ou après une défaillance ou panne de courant.

Ces directives d'inspection et d'entretien ne concernent que l'appareillage de commutation Power-Zone 4 fabriqué par Schneider Electric. Si des conditions ne peuvent pas être établies et documentées, la condition contraignante de fonctionnement doit alors être assumée.

Ces directives d'inspection et d'entretien ne garantissent aucun raccordement sur place ni aucune modification sur place et ne remplacent pas les procédures d'entretien ou les programmes recommandés par les fabricants de composants. Pour obtenir davantage d'informations concernant la garantie de ce produit, consulter les « Conditions de vente de Schneider Electric ».

Conditions idéales de fonctionnement

Lorsque le matériel fonctionne sous les «conditions idéales de fonctionnement» précisées ci-après, il doit être capable de fonctionner sans entretien pendant une période de cinq ans.

Environnement

- La gamme de température ambiante de la pièce est entre 10 et 40 °C (50 et 104 °F).
- L'altitude est inférieure à 2 012 m (6 600 pi).
- Le matériel se trouve à l'intérieur dans une pièce à climatisation contrôlée (chauffage/climatiseur).
- Absence de poussière ou débris soit dans l'air soit stabilisés.
- Humidité relative moyenne inférieure à 70%.
- Absence de vibrations ou d'activité sismique.

Chargement de circuit

- Chargement continu (avec des dispositifs à valeur nominale de 100 %) entre 20 et 80% de la valeur nominale du matériel.
- Chargement moyen ne dépassant pas 70 % de la valeur nominale du matériel.
- Charges de moteurs résistives ou continues seulement, aucune charge de soudure ou de marche pas à pas.
- Commutation des disjoncteurs inférieure à 15 cycles par an.
- Maximum de deux déclenchements de disjoncteur par an à la suite de surcharge ou de défaillance.

Installation du matériel

- Lors de l'installation, serrer tous les joints, cosses et boulons de barre-bus au couple approprié.
- Serrer fermement le câblage de toutes les contrôles et communications à l'installation.
- Observer rigoureusement toute vérification préalable à la mise sous tension.

Conditions normales de fonctionnement

Lorsque le matériel fonctionne dans les «conditions normales de fonctionnement» décrites ci-après, il doit être inspecté et entretenu toutes les périodes de un à trois ans, ou plus fréquemment, selon l'expérience de l'utilisateur.

Environnement

- La température ambiante de la pièce est entre -30 et 40 °C (-22 et 104 °F).
- L'altitude est inférieure à 2 012 m (6 600 pi).
- L'effet des radiations solaires est insignifiant.

  REMARQUE : Se reporter aux principes indiqués dans la norme C37.24-1986 de l'IEEE pour de plus amples informations.

Chargement de circuit

- La commutation du disjoncteur ne dépasse pas 200 cycles par an.
- Les charges de soudure et de marche pas à pas représentent moins de 15 % du chargement d'un circuit ou d'un appareil.

Installation du matériel

- Lors de l'installation, serrer tous les joints, cosses et boulons de barre-bus au couple approprié.
- Serrer fermement le câblage de toutes les commandes et communications à l'installation.
- Observer rigoureusement toute vérification préalable à la mise sous tension.

Conditions de fonctionnement contraignantes

Lorsque le matériel fonctionne dans les «conditions de fonctionnement contraignantes» indiquées ci-après, il faut l'inspecter et l'entretenir tous les 6 mois, ou plus souvent, en fonction de l'expérience de l'utilisateur.

Environnement

- La température ambiante de la pièce est inférieure à -30 °C (-22 °F) ou supérieure à 40 °C (104 °F).
- L'altitude dépasse 2 012 m (6 600 pi).
- L'effet des radiations solaires est significatif.
- Le matériel est exposé à un climet chaud ou humide.
- Le matériel est exposé à des fumées, des vapeurs, de l'air salé ou des vapeurs d'huile.
- Le matériel est exposé à des chocs sismiques ou des vibrations ou inclinaisons anormales.

Chargement de circuit

- Le disjoncteur se déclenche souvent par suite d'une surcharge ou d'un défaut.
- La commutation du disjoncteur dépasse 200 fois par an.
- Les charges de soudure ou la marche pas à pas représente plus de 15% de la charge du circuit.

Installation de l'équipement

- Lors de l'installation, serrer tous les joints, cosses et boulons de barre-bus au couple approprié.
- Serrer fermement le câblage de toutes les contrôles et communications à l'installation.
- Observer rigoureusement toute vérification préalable à la mise sous tension.

Inspection générale et nettoyage

1. Passer l'aspirateur à l'intérieur de l'appareillage de commutation pour enlever les dépôts de saleté ou de poussière. Essuyer les barres-bus, isolateurs, câbles et autres avec un chiffon propre, sec et non pelucheux.
2. Vérifier soigneusement l'intérieur de l'appareillage de commutation pour y détecter toute accumulation éventuelle d'humidité ou de condensation, ou des signes d'humidité ancienne. L'humidité peut entraîner une rupture d'isolation et une oxydation rapide des pièces porteuses de courant. Inspecter toutes les entrées de conduits et les fissures entre les panneaux de l'armoire pouvant permettre des fuites par égouttement. La condensation dans les conduits peut être une source d'humidité et ne doit pas être autorisée à s'égoutter sur des pièces sous tension ou du matériau d'isolation. Prendre les précautions nécessaires pour éliminer l'humidité et boucher toutes les fuites.
3. Inspecter l'appareillage de commutation pour y déceler tous signes de surchauffe. Une décoloration et l'écaillure de l'isolation ou de pièces métalliques sont des indications de surchauffe.

   REMARQUE : Si une surchauffe se produit, s'assurer que toutes les conditions qui ont causé la surchauffe ont été corrigées. Des connexions défaites, lâches ou contaminées peuvent entraîner une surchauffe.
4. Vérifier s'il existe des signes de nids de rongeurs dans l'appareillage de commutation. Si nécessaire, utiliser une bonne technique d'extermination dans le secteur de l'appareillage de commutation.

   REMARQUE : Ne pas placer ou ne pas utiliser de substances et de produits chimiques d'extermination à l'intérieur de l'appareillage de commutation. Certains de ces produits attirent les rongeurs.

AVIS

RISQUE DE CONTAMINATION

- N'utilisez pas un conduit d'air pour souffler la poussière de l'appareillage de commutation. La poussière pourrait s'infiltrer à l'intérieur des relais et des dispositifs de surintensité, entraînant une surchauffe et un mauvais fonctionnement.
- Ne permettez pas à de la peinture, des produits chimiques ou des dissolvants à base de pétrole d'entrer en contact avec des plastiques ou des matériaux d'isolation.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

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5. Inspecter soigneusement tous les dispositifs afin d'y déceler la présence visible éventuelle d'usure, de fissures ou afin de voir si des pièces manquent.
6. Ouvrir et fermer les disjoncteurs plusieurs fois pour s'assurer qu'ils fonctionnent correctement.
7. Vérifier si toutes les serrures à clé d'interverrouillage et tous les dispositifs d'interverrouillage de la porte fonctionnent correctement.

Joints de barres-bus, terminaisons de cosses et matériaux d'isolation

AVIS

RISQUE DE DOMMAGES AU PLAQUAGE

- Ne poncez pas et ne retirez pas le plaquage des barres-bus, barres de raccordement ou cosses de bornes.
- L'endommagement du plaquage peut entraîner une surchauffe. Remplacez toute pièce endommagée. Contactez la Division des services de Schneider Electric Canada au 1-800-265-3374.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

1. Les joints de barres-bus ne demandent aucun entretien. Ne pas les resserrer après avoir terminé la procédure de contrôle avant la mise sous tension.
2. Vérifier si les joints des barres-bus et cosses des bornes montrent des signes d'égratignure, de corrosion ou de décoloration résultant de hautes températures ou de soumission à des conditions de défaut importantes. Si des dommages se sont produits, remplacer les barres-bus ou les cosses. Si un nettoyage est nécessaire, utiliser Lectra-Clean®, fabriqué par CRC.
3. Inspecter tous les matériaux d'isolation. Avant de remettre l'appareillage de commutation sous tension, remplacer les isolateurs montrant des signes visibles de dommages (des fissures, par exemple).

Procédures d'inspection et d'entretien du système de levage mobile

Examiner si le système de levage mobile montre des signes d'usure. Ces appareils ont été construits comme produits de qualité pour un usage intermittent, non pour un usage continu. L'usage fréquent augmente l'usure du système de levage, mais une lubrification appropriée peut augmenter sa durée utile.

Lubrification

Effectuer les étapes ci-après pour lubrifier l'assemblage du système de levage mobile.

1. S'assurer qu’une couche de graisse est toujours présente aux emplacements appropriés.
2. Toutes les roues et tous les galets doivent est bien lubrifiés avec une graisse polyvalente. Étaler une couche de graisse polyvalente de haute qualité sur l'assemblage des engrenages à vis sans fin. Répéter cette procédure, autant que nécessaire, pour maintenir un film continu de graisse sur la face de ces engrenages.
3. Ne jamais utiliser le treuil avec l'assemblage d'engrenages à vis sans fin sec.
4. Lubrifier tous les autres points de friction autant que nécessaire avec une huile de poids moyen, de haute qualité. Éviter une saturation excessive qui provoque l'égouttement de l'huile.

Inspection et entretien

Après avoir lubrifié le matériel, effectuer les étapes d'inspection suivantes.

- Examiner s'il existe des fissures, des pièces desserrées et des dommages causés par le temps ou des produits chimiques sur les composants.
- Si l'on soupçonne la présence de fissures ou de ruptures, mettre l'appareil hors service. En cas de détection de composants fendus, les remplacer avant de remettre l'appareil en service.
- Vérifier périodiquement s'il se produit des distorsions sur le système de levage mobile. En cas de distortion :
  - S'assurer que les rails et sections sont alignés.
  - S'assurer que le chariot et le mécanisme de treuil ont été correctement installés.
  - S'assurer que le câble a été bien attaché au tambour du treuil.
  - S'assurer que tous les engrenages sont bien lubrifiés.

  REMARQUE : Pour une utilisation normale, utiliser un lubrifiant d'engrenage épais. Dans des conditions très sales ou avec des graviers, il est conseillé d'employer un lubrifiant sec tel que le graphite sec pour lubrifier les engrenages. Ne jamais laisser les engrenages fonctionner à sec.
- S'il est possible, retirer les accessoires de manutention et toutes obstructions du dessus de l'appareil susceptibles de bloquer le fonctionnement du système de levage mobile.
- Inspecter attentivement le câble métallique du système de levage mobile. Faire particulièrement attention aux sections de câble, telles que les parties passant sur des poulies ou enroulements sur le tambour, qui sont normalement masquées pendant les procédures d'inspection ou d'entretien.

S'adresser à la Division des services de Schneider Electric pour le Canada si le câble montre l'un quelconque des signes suivants de détérioration :

- Nœuds, écrasements, coupures ou brins se détachant
- Fils corrodés, fendus, pliés ou cassés
- Raccordements d'extrémités usés

- Toujours maintenir le fini extérieur en bonne condition pour la protection contre les dommages de la corrosion. En cas de dommage, enlever le fini jusqu'au métal nu et refaire le fini en utilisant une couche d'apprêt et un fini de haute qualité.
- S'assurer que toutes les étiquettes d'avertissement sont toujours en place et lisibles. Si des étiquettes d'avertissement deviennent illisibles ou disparaissent, s'adresser au bureau de vente local de Schneider Electric.
- Ne réparer aucune pièce usée, fissurée, déformée, mal alignée ou fortement corrodée. La réparation de pièces n'assure pas des performances satisfaisantes ou sans danger. Ne pas employer de pièces provenant d'autres fabricants.
- Enregistrer toutes les inspections et tout l'entretien effectués sur le système de levage mobile dans un journal d'entretien. Voir « Chapitre 10—Journal d'entretien » à la page 66.

Programme d'inspection du disjoncteur

Le programme d'inspection des disjoncteurs et déclencheurs doit tenir compte des recommandations contenues dans les directives d'utilisation des disjoncteurs et déclencheurs.

Chapitre 8—Circonstances indésirables

Ce chapitre porte, mais sans s'y limiter, sur tous les composants électriques de l'appareillage de commutation.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ARC ÉLECTRIQUE

- Coupez toute alimentation de l'appareillage de commutation avant de le nettoyer.
- Utilisez toujours un dispositif de détection de tension ayant une valeur nominale appropriée pour s'assurer que l'alimentation est coupée.
- Avant de mettre l'appareillage de commutation sous tension, tous les espaces de montage de disjoncteurs non utilisés doivent être obturés.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

REMARQUE : Avant d'essayer de remettre l'appareillage de commutation sous tension à la suite de circonstances indésirables, contacter la Division des services de Schneider Electric Canada au 1-800-265-3374 pour obtenir des directives spéciales.

Inspection après un court-circuit

Si un court-circuit se produit, effectuer une inspection minutieuse du système entier et s'assurer qu'aucun dommage aux conducteurs ou à l'isolation ne s'est produit. Les contraintes mécaniques et thermiques élevées développées par les courants de court-circuit peuvent endommager les conducteurs et l'isolation. Vérifier le dispositif de protection contre les surintensités qui a interrompu le courant de court-circuit afin de voir s'il n'a pas subi des dommages par formation d'arc.

Ne pas ouvrir les dispositifs scellés, tels que les disjoncteurs à boîtier moulé. Ces dispositifs doivent être remplacés s'ils sont endommagés. Avant de mettre l'appareillage de commutation sous tension, tous les espaces de disjoncteurs non utilisés doivent être obturés.

Nettoyage après un court-circuit

Les propriétés d'isolation de certains matériaux d'isolation organiques peuvent se détériorer durant un arc électrique. Si c'est le cas :

1. Retirer la suie ou les débris éventuels.
2. Remplacer l'isolation montrant des traces de carbonisation.

Appareillage de commutation trempé d'eau

Ne pas nettoyer ni réparer un appareillage de commutation qui a été exposé à de grands volumes d'eau ou immergé à un moment quelconque. Les pièces porteuses de courant, systèmes d'isolation et composants électriques peuvent être endommagés au-delà de toute réparation. **Ne pas mettre l'appareillage de commutation sous tension.** Contacter les services d'intervention sur place de Schneider Electric.

Appareillage de commutation vaporisé ou rincé à l'eau (eau propre uniquement)

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ARC ÉLECTRIQUE

- Coupez toute alimentation de l'appareillage de commutation avant de le nettoyer.
- Utilisez toujours un dispositif de détection de tension ayant une valeur nominale appropriée pour s'assurer que l'alimentation est coupée.
- Avant de mettre l'appareillage de commutation sous tension, tous les espaces de montage de disjoncteurs non utilisés doivent être obturés.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Si l'appareillage de commutation a été vaporisé ou rincé avec des petites quantités d'eau propre, procéder à une inspection minutieuse du système entier et s'assurer qu'aucun dommage aux conducteurs ou à l'isolation ne s'est produit. Ne pas ouvrir des dispositifs scellés tels que des disjoncteurs à boîtier moulé ou fusibles. Ces dispositifs doivent être remplacés s'ils sont endommagés.

Inspection et nettoyage d'un appareillage de commutation vaporisé ou rincé à l'eau propre

Suivre les étapes 1 à 10 ci-dessous seulement si :

- Aucun signe de dommage physique à l'appareil n'est présent.
- L'appareillage de commutation n'a pas été immergé ni exposé à l'eau pendant de longues périodes.
- L'eau qui s'est trouvée en contact avec l'appareillage de commutation n'a pas été contaminée par des égouts, des produits chimiques ou autres substances pouvant négativement affecter l'intégrité du matériel électrique.
- L'eau qui s'est trouvée en contact avec l'appareillage de commutation n'a pas pénétré un secteur quelconque de l'armoire pouvant contenir des câbles installés comme prévu et situés au-dessus de pièces sous tension. Plus particulièrement, inspecter si de l'eau est entrée par les conduits situés au-dessus de pièces sous tension.

Si une ou plusieurs de ces conditions n'ont pas été rencontrées, contacter la Division des services de Schneider Electric Canada au 1-800-265-3374.

Si **TOUTES** les conditions indiquées ci-dessus ont été rencontrées, procéder comme suit :

1. Couper l'alimentation de l'appareil avant d'y travailler.
2. Toujours utiliser un dispositif de détection de tension à valeur nominale appropriée pour s'assurer que l'alimentation est coupée.
3. Déconnecter et isoler électriquement l'appareillage de commutation de façon à ce qu'aucun contact ne puisse se faire avec des pièces sous tension.
4. Essuyer toute humidité des barres-bus, isolateurs et matériaux d'isolation avec un chiffon propre, sec et non pelucheux. Ne **pas** utiliser d'agents de nettoyage ni de vaporisateurs à déplacement d'eau.
5. Préparer l'appareillage de commutation à un essai de résistance d'isolation (mégohmmètre) en déconnectant tous les raccordements d'alimentation du côté secteur et tous les raccordements de câbles du côté charge afin d'isoler l'appareillage de commutation du système de câblage.

⚠ ATTENTION

RISQUE DE TENSION D'ESSAI

- Retirez la fiche de valeur nominale de longue durée avant de vérifier l'isolation électrique d'un disjoncteur muni d'une étiquette indiquant «Avertissement : déconnecter la fiche avant de faire un essai diélectrique».
- Certains déclencheurs Micrologic ne sont pas homologués pour des tensions survenant pendant un essai de résistance d'isolation électrique.
- Ouvrir tous les sectionneurs de contrôle et de mesure des circuits de contrôle.

Si ces directives ne sont pas respectées, cela peut entraîner des blessures ou des dommages matériels.

6. Placer tous les disjoncteurs ou interrupteurs en position ON (marche). L'appareillage de commutation doit rester complètement désactivé.
7. Utiliser un mégohmètre d'une capacité de 500 à 1 000 Vcc et appliquer la tension à partir de :
   a. Chaque phase vers la terre avec le disjoncteur activé.
   b. Phase à phase avec le disjoncteur activé.
8. Noter les valeurs de résistance. Se reporter au « Chapitre 9—Registre des résistances d'isolation de l'appareillage » à la page 65.
9. Si les mesures de résistance sont inférieures à 0,5 mégohm, appeler la Division des services de Schneider Electric Canada au 1-800-265-3374 pour obtenir des recommandations.
10. Si les mesures de résistance sont supérieures à 0,5 mégohm, l'appareil peut être mis sous tension en utilisant les procédures indiquées au « Chapitre 6—Mise sous tension de l'appareillage de commutation » à la page 56.

FRANÇAIS

Chapitre 9—Registre des résistances d’isolation de l’appareillage

Toujours utiliser un mégohmètre de 500 ou 1 000 Vcc lors d'un essai de résistance d'isolation.

REMARQUE : La colonne Neutre-Terre est fournie pour noter les résultats de la procédure de contrôle avant la mise sous tension uniquement.

⚠ DANGER

RRISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ARC ÉLECTRIQUE

- Coupez toute alimentation de l'appareillage de commutation avant de faire un essai.
- Utilisez toujours un dispositif de détection de tension ayant une valeur nominale appropriée pour s'assurer que l'alimentation est coupée.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Date	Phase–Phase			Phase–Terre			Neutre–Terre
	Tous sectionneurs ouverts						
	a-b	b-c	c-a	a-terre	b-terre	c-terre	Neutre–Terre

Date	Tous sectionneurs fermés						
	a-b	b-c	c-a	a-terre	b-terre	c-terre	Neutre–Terre

FRANÇAIS

Chapitre 10—Journal d’entretien

Date	Description

Date	Description

Schneider Electric Canada, Inc.
5985 McLaughlin Road
Mississauga, ON L5R 1B8 Canada
800-565-6699
www.schneider-electric.ca

Du fait que les normes, caractéristiques et conceptions peuvent changer, demander confirmation que l'information contenue dans cette publication est à jour.

80298-002-07, 06/2015
Remplace 80298-002-06, 06/2007

Schneider Electric USA, Inc.
800 Federal Street
Andover, MA 01810 USA
888-778-2733
www.schneider-electric.us

Standards, specifications, and designs may change, so please ask for confirmation that the information in this publication is current.

80298-002-07, 06/2015
Replaces 80298-002-06, 06/2007

Importado en México por:
Schneider Electric México, S.A. de C.V.
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55-5804-5000
www.schneider-electric.com.mx

Normas, especificaciones y diseños pueden cambiar, por lo tanto pida confirmación de que la información de esta publicación está actualizada.

80298-002-07, 06/2015
Reemplaza 80298-002-06, 06/2007

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80298-002-07, 06/2015
Remplace 80298-002-06, 06/2007

Surgelogic™
Internal Modular Assembly (IMA)
Surge Protective Device (SPD)

Dispositivo de protección contra sobretensiones transitorias (SPD) tipo ensamble modular interno (IMA)

Dispositif de protection contre les surtensions transitoires (SPD) de type assemblage modulaire interne (IMA)

ENGLISH

Instruction Bulletin

8222-0050, Rev. 01 06/2016

Retain for future use.

SQUARE D™

by Schneider Electric

ENGLISH

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For troubleshooting, call the Surgelogic Technical Assistance Group at 1-800-577-7353.

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Precautions

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.
- This equipment must be effectively grounded per all applicable codes. Use an equipment-grounding conductor to connect this equipment to the power system ground.

Failure to follow these instructions will result in death or serious injury.

⚠ CAUTION

LOSS OF BRANCH CIRCUIT POWER/LOSS OF SURGE SUPPRESSION

- Perform periodic inspection of the Surge Protective Device status indicator lights as part of the preventative maintenance schedule.
- Promptly service the Surge Protective Device when an alarm state exists.
- Use dry contacts to signal an alarm state to the central supervisory system for unmanned, inaccessible, or critical installations.
- Use multiple Surge Protective Devices to achieve redundancy for critical applications.

Failure to follow these instructions can result in injury or equipment damage.

At end-of-life conditions, Surge Protective Devices (SPDs) can lose their ability to block power system voltage and attempt to draw excessive current from the line. This SPD is equipped with overcurrent and overtemperature components that disconnect the surge suppression elements from the electrical supply should the surge suppression elements reach end of life. Tripping of the branch circuit breaker or fuse feeding the SPD can occur when the surge suppression elements reach end of life.

ENGLISH

⚠ CAUTION

LOSS OF SURGE SUPPRESSION

- Do not energize the Surge Protective Devices until the electrical system is completely installed, inspected, tested, and all conductors have been connected and functional, including the neutral.
- Verify the voltage rating of the device and system before energizing the Surge Protective Device.
- Perform high-potential insulation testing, or any other tests where Surge Protective Device components will be subjected to voltages higher than their rated turn-on voltage, with the neutral and Surge Protective Device disconnected from the power source.

Failure to follow these instructions can result in injury or equipment damage.

Introduction

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.
- This equipment must be effectively grounded per all applicable codes. Use an equipment-grounding conductor to connect this equipment to the power system ground.

Failure to follow these instructions will result in death or serious injury.

Note: For troubleshooting, call the Surgelogic Technical Assistance Group at 1-800-577-7353.

Proper installation is imperative to maximize the IMA SPD's effectiveness and performance. Follow the steps outlined in this instruction bulletin to ensure proper installation. Read the entire instruction bulletin before beginning the installation. These instructions are not intended to replace national or local electrical codes. Check all applicable electrical codes to verify compliance. Installation of IMA surge suppressors should only be performed by qualified electrical personnel.

Unpacking and Preliminary Inspection

Inspect the entire shipping container for damage or signs of mishandling before unpacking the device. Remove the packing material and further inspect the device for any obvious shipping damage. If any damage is found and is a result of shipping or handling, immediately file a claim with the shipping company.

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Storage

The device should be stored in a clean, dry environment. Storage temperature is -40 °F to +149 °F (-40°C to +65°C). All of the packaging materials should be left intact until the device is ready for installation.

Safety Labels

English, Spanish, and French versions of all safety labels (Danger, Warning, and Caution) are provided.

Location Considerations

Environment

The device is designed to operate in an ambient temperature range of -4 °F to +149 °F (-20°C to +65°C) with a relative humidity of 0 to 95% non-condensing. The operating temperature of the LCD on the diagnostic display panel is +14 °F to +140 °F (-10°C to +60°C). Refer to the product catalog for further details on enclosures. All IMA devices operate normally without reduction in performance when subjected to shock and vibrations described in IEC 60721-3-3, Class 3M4.

Audible Noise

The device background noise is negligible and does not restrict the location of the installation.

Mounting

Refer to page 13 for typical mounting dimensions.

Service Clearance

The service clearance should meet all applicable code requirements.

Equipment Performance

To obtain the maximum system performance, locate the device as close to the circuit being addressed as possible, to minimize the interconnecting wiring length. For every foot of wire length, approximately 160 Volts (6 kV / 3 kA, 8/20 microsecond) is added to the suppressed voltage. The Voltage Protection Rating (VPR) is located on the device nameplate and is measured six inches from the enclosure sidewall, according to UL® 1449.

Electrical

Voltage Rating

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Confirm the Surge Protective Device voltage rating on the module or nameplate label is the same as the operating voltage.

Failure to follow these instructions will result in death or serious injury.

Prior to mounting the SPD, verify that the device has the same voltage rating as the power distribution system in which it is installed. Compare the nameplate voltage on the SPD with the nameplate voltage of the electrical distribution equipment.

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The specifier or user of the device must be familiar with the configuration and arrangement of the power distribution system in which any SPD is to be installed. The system configuration of any power distribution system is based strictly on how the secondary windings of the transformer supplying the service entrance main or load are configured. This includes whether or not the transformer windings are referenced to earth via a grounding conductor. The system configuration is not based on how any specific load or equipment is connected to a particular power distribution system. See Table 1 for the service voltage of each SPD.

Table 1: Voltage Rating

Service Voltage	Peak Surge Current Rating Per Phase	Catalog Numbers [1]
120/240 V, 1-phase, 3-wire + ground	120	TVS1IMA12_
	160	TVS1IMA16_
	240	TVS1IMA24_
	320	TVS1IMA32_
	480	TVS1IMA48_
208Y/120 V, 3-phase, 4-wire +ground Wye [2]	120	TVS2IMA12_
	160	TVS2IMA16_
	240	TVS2IMA24_
	320	TVS2IMA32_
	480	TVS2IMA48_
240/120 V, 3-phase, 4-wire + ground High-Leg Delta	120	TVS3IMA12_
	160	TVS3IMA16_
	240	TVS3IMA24_
	320	TVS3IMA32_
	480	TVS3IMA48_
480Y/277 V, 3-phase, 4-wire + ground Wye [3]	120	TVS4IMA12_
	160	TVS4IMA16_
	240	TVS4IMA24_
	320	TVS4IMA32_
	480	TVS4IMA48_
480 V, 3-phase, 3-wire + ground Delta [4]	100	TVS5IMA10_
	120	TVS5IMA12_
	160	TVS5IMA16_
	200	TVS5IMA20_
	240	TVS5IMA24_
	320	TVS5IMA32_
	480	TVS5IMA48_
240 V, 3-phase, 3-wire + ground Delta	100	TVS6IMA10_
	120	TVS6IMA12_
	160	TVS6IMA16_
	200	TVS6IMA20_
	240	TVS6IMA24_
	320	TVS6IMA32_
	480	TVS6IMA48_
600/347 V, 3-phase, 4-wire + ground Wye	120	TVS8IMA12_
	160	TVS8IMA16_
	240	TVS8IMA24_
	320	TVS8IMA32_
	480	TVS8IMA48_

Continued–

ENGLISH

Table 1: Voltage Rating

600 V, 3-phase, 3-wire + ground Delta [5]	100	TVS9IMA10_
	120	TVS9IMA12_
	160	TVS9IMA16_
	180	TVS9IMA18_
	200	TVS9IMA20_
	240	TVS9IMA24_
	320	TVS9IMA32_

1 Catalog numbers are representational. Actual catalog numbers require a suffix to indicate UL Type.

2 208Y/120 series also applies to the following voltage 220Y/127.

3 480Y/277 series applies to the following voltages 380Y/220, 400Y/230 and 415Y/240.

4 480 V Delta series also applies to the following voltages: 480Y/277V HRG.

5 600 V Delta series also applies to the following voltages: 600Y/347V HRG.

Terminals, Wire Size, and Installation Torque

Terminals are provided for phase (line), neutral, and equipment ground connections. The IMA terminals accept a range of 12 AWG to 2 AWG copper wire for phase, neutral, and ground connectors.

Table 2: Terminal Torque

Power Connection	Torque
AØ, BØ, CØ and N	35 lb-in. (4 N•m)
Ground	

Branch Circuit Overcurrent Protection

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Use conductors rated for the Overcurrent Protection Device (OCPD) per applicable codes.
- Use conductors rated for the application per applicable codes.

Failure to follow these instructions will result in death or serious injury.

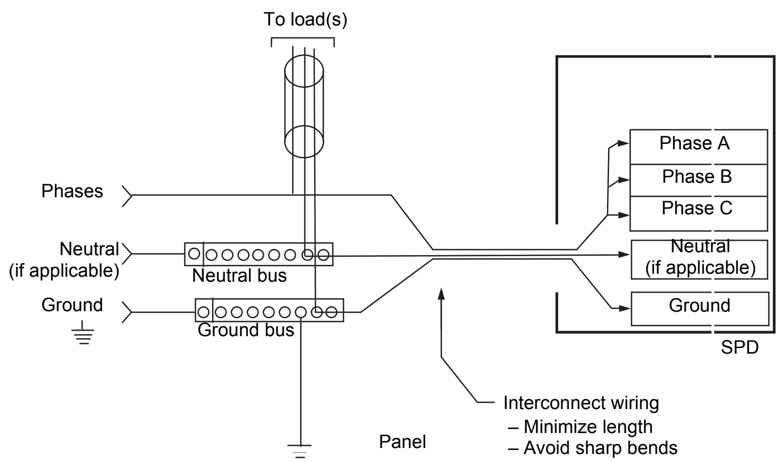
UL 1449 Type 1 SPDs have been designed and approved for line side applications prior to the main service disconnect without supplemental overcurrent protection. Type 2 SPDs must be installed on the load side of the main Overcurrent Protection Device (OCPD). All installations should either provide or include a disconnecting means.

ENGLISH

Location of Surge Protective Device (SPD)

Locate the SPD as close as possible to the circuit being addressed to minimize the wire length and optimize SPD performance. Avoid long wire runs so that the device will perform as intended. To reduce the impedance that the wire displays to surge currents, the phase, neutral, and ground conductors must be routed within the same conduit and tightly bundled or twisted together to optimize device performance. Avoid sharp bends in the conductors. See Figure 1.

Figure 1: Surge Protective Device Wiring Practice



Grounding

⚠ WARNING

HAZARDOUS TOUCH VOLTAGE

- Connect the Surge Protective Device ground terminal to the building grounding grid structure.
- Use an appropriately sized equipment grounding conductor.
- When using metallic raceway or conduit:
  - — Do not use isolation bushings to interrupt the metallic raceway or conduit.
  - — Maintain electrical continuity at all raceway and conduit connections using appropriate bonding devices.
- Do not use a separate isolated ground for the Internal Modular Assembly device.
- Verify proper equipment connection to the grounding system.
- Verify ground grid continuity by performing regularly scheduled inspections and testing as part of a comprehensive electrical maintenance program.

Failure to follow these instructions can result in death or serious injury.

ENGLISH

General

The IMA has SPD elements connected from phase to ground. It is critical that there be a robust and effective connection to the building grounding structure. The grounding connection must utilize an equipment grounding conductor run with the phase and neutral connection of the power system. Do not connect the SPD to a separate isolated ground.

For best overvoltage suppression by the IMA SPD, use a single-point ground system where the service entrance grounding electrode system is connected to, and bonded to, all other available electrodes, building steel, metal water pipes, driven rods, etc. (for reference, see NEC Art 250). The ground impedance measurement of the electrical system should be as low as possible and in compliance with all applicable codes.

Power System Grounding

In addition to the power system configuration and voltage, the power system grounding method must be considered when selecting the appropriate IMA device. Refer to the following chart for information concerning the suitability of IMA device to specific power system grounding method.

Table 3: Grounding Methods

IMA Device Catalog Number	Power System Grounding Method
TVS1IMA__	Solidly-Grounded
TVS2IMA__	
TVS3IMA__	
TVS4IMA__	
TVS8IMA__	
TVS5IMA__	Ungrounded / HRG
TVS6IMA__	
TVS9IMA__	

Solidly-Grounded Power Systems

⚠ CAUTION

SURGE PROTECTIVE DEVICE DAMAGE AND POWER SYSTEM OVERVOLTAGE

- Do not connect devices rated for use on solidly-grounded power systems to resistance-grounded (for example, High Resistance Ground) or ungrounded power systems.
- Verify that the service entrance equipment is bonded to ground in accordance with all applicable codes.
- Verify that the neutral terminal of the power system transformer feeding the device is bonded to system ground in accordance with all applicable codes.

Failure to follow these instructions can result in equipment damage.

SPDs rated for use on solidly-grounded power systems must not be connected to resistance-grounded or ungrounded power systems. Such a connection can result in damage to the SPD.

Always verify the power system grounding configuration prior to application of power to the device. Confirm that all ground bonds are installed at both the service entrance equipment and power system transformer prior to application of power.

ENGLISH

Delta and Resistance-Grounded Power Systems

⚠ CAUTION

SURGE PROTECTIVE DEVICE DAMAGE AND POWER SYSTEM OVERVOLTAGE

- Ungrounded power systems are inherently unstable and can produce excessively high line-to-ground voltages during certain fault conditions. During these fault conditions any electrical equipment, including an SPD, may be subjected to voltages which exceed their designed ratings. This information is being provided to the user so that an informed decision can be made before installing any electrical equipment on an ungrounded power system.
- Resistance-grounded power systems must be maintained in an over-damped state to limit voltage overshoot and duration during operation.
- Verification and adjustment of correct power system damping should be done:
  - — Periodically as part of normal system maintenance.
  - — Following power system modifications.

Failure to follow these instructions can result in equipment damage.

The IMA product is intended for use on resistance-grounded power systems where the power system has been set for, and is maintained in, an over-damped state. For the power system to be over-damped, the current through the grounding resistor during a bolted phase-to-ground fault must be significantly greater than the total charging current of the system.

Periodic engineering evaluation of the power system is required to determine the worst-case charging current of the system and to adjust the grounding resistance accordingly. As the power system is modified, the value of the grounding resistor must be evaluated and adjusted to maintain the system in the over-damped state.

Installation

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.
- This equipment must be effectively grounded per all applicable codes. Use an equipment-grounding conductor to connect this equipment to the power system ground.

Failure to follow these instructions will result in death or serious injury.

ENGLISH

UL Conditions of Acceptability

For use only in equipment where the acceptability of the combination is determined by Underwriters Laboratories®. When installed in the end-use equipment, the following are among the considerations to be made:

1. A suitable electrical enclosure shall be provided in the end-use product.
2. The device is intended for factory wiring only with the suitability of the connections (including spacings between factory connectors) determined in the end-use application.
3. Voltage Protection Rating (VPR) shall be determined in the end-product where applicable.
4. The SPD unit has been subjected to the following tests of UL1449:
   a. Surge Testing (VPR)
   b. Nominal Discharge Test (20 kA)
   c. Operational Voltage Test
   d. Dielectric Voltage Withstand
   e. Current Tests (Short Circuit Current, Intermediate Currents, Limited Currents)
5. The component SPD has been evaluated to Short Circuit Rating tests (SCCR), per UL 1449) at 200 kA rms available fault current, without external Overcurrent Protective Devices (OCPD) or external enclosures.

Wiring

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.
- This equipment must be effectively grounded per all applicable codes. Use an equipment-grounding conductor to connect this equipment to the power system ground.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Confirm the Surge Protective Device voltage rating on the module or nameplate label is the same as the operating voltage.

Failure to follow these instructions will result in death or serious injury.

Follow the steps listed below when making wiring connections:

1. Turn off all power supplying this equipment before working on or inside any enclosure containing this equipment.
2. Confirm the SPD voltage rating and configuration is the same as the system voltage and power system configuration to which it will be connected.
3. Identify proper location for surge protective device. Locate as close as possible to the panel being addressed so the wires are as short as possible. Mount unit securely.

   Note: The surge protective device must be installed in an accessible location as described in the NEC.

4. Install in accordance with national and local electrical codes for overcurrent protection recommendations and wire ampacity considerations.

   Note: The neutral connection is not present on three-wire, three-phase wye ground or two-wire single-phase mid-point ground power systems. For these systems, bond the neutral and ground lugs together in the SPD. For a High Resistance Ground (HRG) or Delta SPD, no neutral connection exists. For installation wiring see Figures 6 and 7.

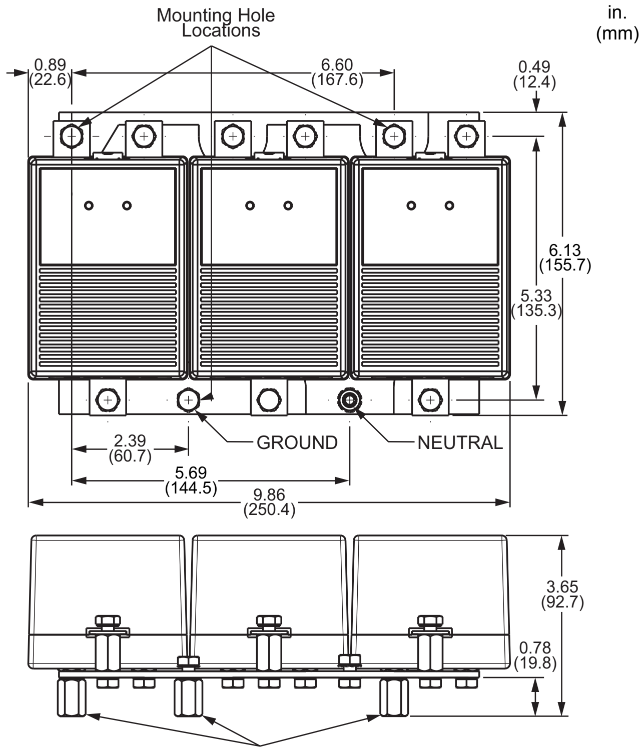
   Note: See Terminals, Wire Size, and Installation Torque and Table 2 on page 7 for acceptable wire size and installation torque.

5. Twist conductors ½ turn or more for every twelve inches of length. Do not loop or coil wires. Be sure to maintain adequate wire bending space per NEC.
6. If the remote signaling contacts of the diagnostic display panel are to be used, refer to the section, “Dry Contacts”, on page 18 for wiring instructions.
7. On a High-Leg Delta installation, note the high leg connection per wiring diagram. See Figure 5.
8. Replace all devices, doors and covers before turning on power to the equipment. If the SPD is properly installed and functioning, the green LED indicators on the display will be lit.

For questions pertaining to the installation of this device, contact the Surgelogic Technical Assistance Group at 1-800-577-7353.

ENGLISH

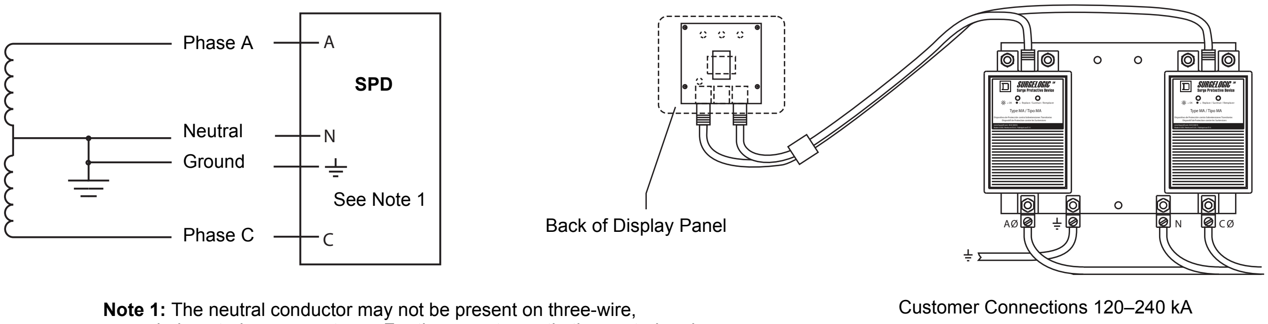
Figure 2: Dimensions and Mounting



Note: The neutral connection will not be present on Delta and HRG configurations.

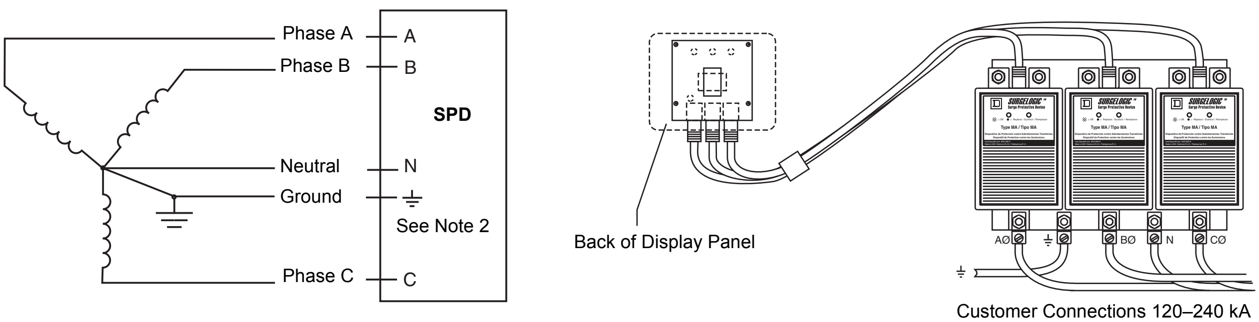
Wiring Diagrams

Figure 3: Single-Phase, Three-Wire, Grounded Installation Integral Switch



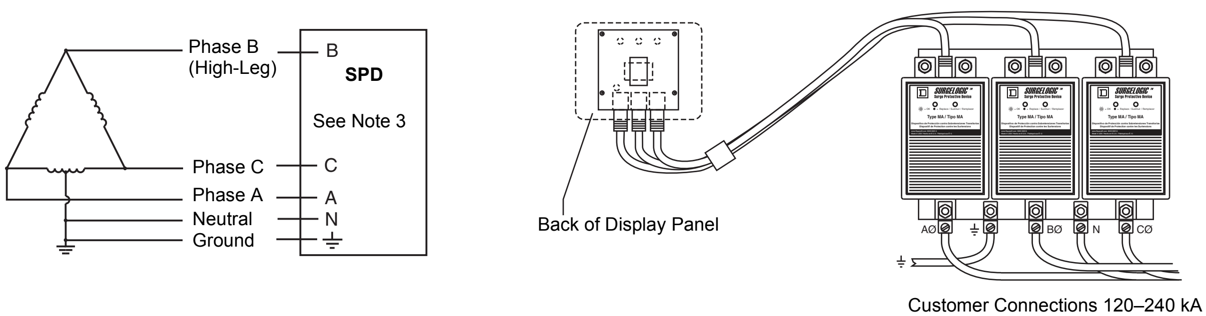
Note 1: The neutral conductor may not be present on three-wire, grounded neutral power systems. For these systems, tie the neutral and ground lugs on the SPD together.

Figure 4: Three-Phase, Three- or Four-Wire, Grounded Wye Installation



Note 2: The neutral conductor is not present on three-wire, grounded neutral power systems. For these systems tie the neutral and ground lugs of the SPD together.

Figure 5: Three-Phase, Three- or Four-Wire, High-Leg Delta Installation

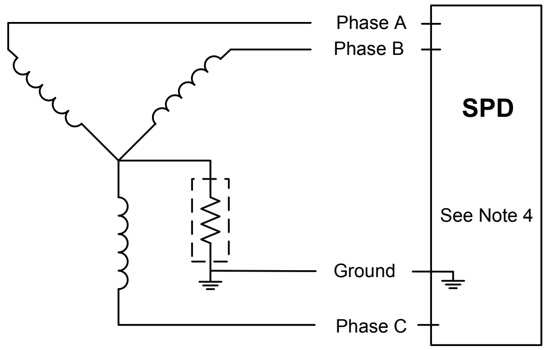


Note 3: The high-leg of the power system must connect to phase B of the SPD. The neutral conductor is not present on three-wire, grounded neutral power systems. For these systems tie the neutral and ground lugs on the SPD together.

Wiring Diagrams for HRG and Delta Systems

Figure 6: High Resistance Ground (HRG) Wye Installation

Note 4: The neutral conductor is not present on HRG wye grounded power systems.



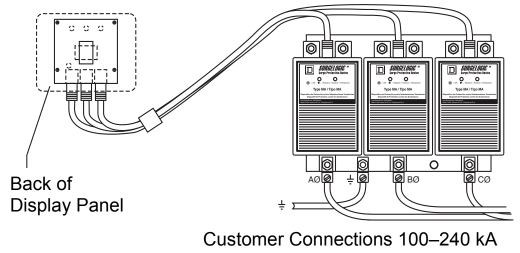
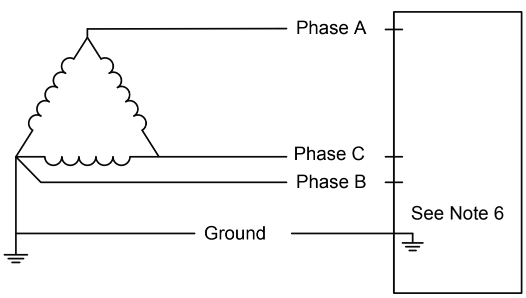


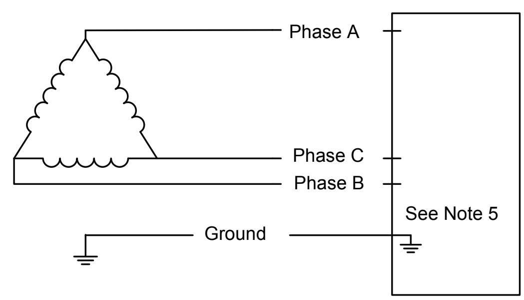
Figure 7: Three-Phase Three-Wire + Ground, Delta Installation

Note 5: The ground connection of the Delta SPD shall be connected to the system ground conductor. The neutral conductor is not present on Delta systems.

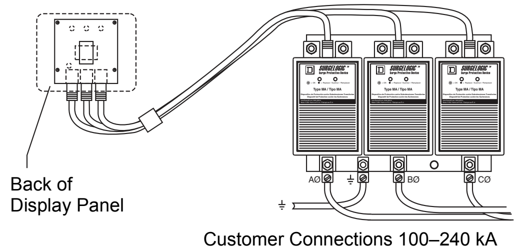
Corner Grounded Delta



Ungrounded Delta



Note 6: The ground connection of the Delta SPD shall be connected to the system ground conductor. The neutral conductor is not present on Delta systems. Phase B of the electrical system is typically the grounded phase.



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Operation

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.
- This equipment must be effectively grounded per all applicable codes. Use an equipment-grounding conductor to connect this equipment to the power system ground.

Failure to follow these instructions will result in death or serious injury.

LED Status Indicators

The SPD diagnostic display panel shows the status of each MA module with diagnostically controlled green/red LEDs (see Figure 8). If a unit is operating correctly, all of the phase LEDs will be illuminated green. To test the integrity of the diagnostics for each phase, push the button below the phase LEDs on the diagnostic display panel. The green LED will turn red and the alarm will sound, if the alarm is enabled. Releasing the test button will complete the test; the red LED will turn green and the alarm will shut off.

If an inoperable condition occurs on any phase, the audible alarm sounds and the corresponding phase LED on the diagnostic display panel is illuminated red. This indicates that the device needs service by qualified electrical personnel. The audible alarm can be silenced, until a qualified person is able to evaluate and service the SPD, by pressing the alarm enable/disable button. The alarm will silence and the green alarm LED will not be lit. The red phase LED will continue to be illuminated until the inoperative condition had been cleared.

On an MA module (see Figure 8), if either LED is not lit, the module should be replaced. If both green LEDs are not lit and the diagnostic display panel has power, then power has been lost to that phase or the module should be replaced (refer to Table 2 on page 7). Refer to the final equipment instruction bulletin for MA module disconnection and access instructions.

When power is applied to the SPD and one or more of the diagnostic display panel LEDs are red, and one or more MA module LEDs are out, the appropriate MA module should be replaced. Refer to “Maintenance and Troubleshooting” on page 21 for proper troubleshooting procedures and Table 5 for replacement modules. If the module LEDs are green and the diagnostic display LEDs are red, please call the Surgelogic Technical Assistance Group at 1-800-577-7353.

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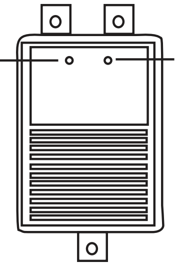
Figure 8: MA Module LEDs



Replacement Modules

Table 4: IMA Replacement Modules

System Voltage	Peak Surge Current Rating (kA)	Catalog Numbers[1]		
		Phase A	Phase B	Phase C
120/240 V, 1-phase, 3-wire + ground	120 160 240	MA1IMA12_ MA1IMA16_ MA1IMA24_	— — —	MA1IMA12_ MA1IMA16_ MA1IMA24_
208Y/120 V, 3-phase, 4-wire + ground Wye [2]	120 160 240	MA1IMA12_ MA1IMA16_ MA1IMA24_	MA1IMA12_ MA1IMA16_ MA1IMA24_	MA1IMA12_ MA1IMA16_ MA1IMA24_
120/240 V, 3-phase, 4-wire + ground High-Leg Delta [3]	120 160 240	MA1IMA12_ MA1IMA16_ MA1IMA24_	MA3IMA12_ MA3IMA16_ MA3IMA24_	MA1IMA12_ MA1IMA16_ MA1IMA24_
240 V, 3-phase, 3-wire + ground Delta	120 160 240	MA6IMA12_ MA6IMA16_ MA6IMA24_	MA6IMA12_ MA6IMA16_ MA6IMA24_	MA6IMA12_ MA6IMA16_ MA6IMA24_
480Y/277 V, 3-phase, 4-wire + ground Wye [4]	120 160 240	MA4IMA12_ MA4IMA16_ MA4IMA24_	MA4IMA12_ MA4IMA16_ MA4IMA24_	MA4IMA12_ MA4IMA16_ MA4IMA24_
480 V, 3-phase, 3-wire + ground Delta [5]	120 160 240	MA5IMA12_ MA5IMA16_ MA5IMA24_	MA5IMA12_ MA5IMA16_ MA5IMA24_	MA5IMA12_ MA5IMA16_ MA5IMA24_
600Y/347 V, 3-phase, 4-wire + ground Wye	120 160 240	MA8IMA12_ MA8IMA16_ MA8IMA24_	MA8IMA12_ MA8IMA16_ MA8IMA24_	MA8IMA12_ MA8IMA16_ MA8IMA24_
600 V, 3-phase, 3-wire + ground Delta [6]	120 160 180	MA9IMA12_ MA9IMA16_ MA9IMA18_	MA9IMA12_ MA9IMA16_ MA9IMA18_	MA9IMA12_ MA9IMA16_ MA9IMA18_

1 Catalog numbers are representational. Actual catalog numbers require a suffix to indicate UL Type.

2 208Y/120 series also applies to the following voltage 220Y/127.

3 High-Leg Delta (Phase B modules are different than Phase A and Phase C modules).

4 480Y/277 series applies to the following voltages 380Y/220, 400Y/230 and 415Y/240.

5 480 V Delta series also applies to the following voltages: 480Y/277V HRG.

6 600 V Delta series also applies to the following voltages: 600Y/347V HRG.

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Table 5: Replacement Diagnostic Cables

TVS19PCK	Three 19 in. (48.3 cm) cables
TVS36PCK	Three 36 in. (91.4 cm) cables
TVS60PCK	Three 60 in. (152.4 cm) cables
TVS192PCK	Three 192 in. (487.7 cm) cables

Audible Alarm

Push the alarm enable/disable button to enable or disable the alarm (see Figure 9). If the green alarm LED is lit the alarm is enabled. If the green alarm LED is not lit the alarm is disabled.

Surge Counter

The surge counter displays the number of transient voltage surges since the counter was last reset. The counter is battery powered to retain memory in the event of a power loss to the IMA module. To reset the surge counter, remove all power and press the small switch located inside the unit on the underside of the diagnostic circuit board near the diagnostic display connectors (also refer to Figure 10). This will reset the counter to zero.

Dry Contacts

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Use 600 V ac rated dry contact wiring.
- Dry contact wiring must have less than 1/16 in. (1.6 mm) exposed wire from the dry contact block.
- Maintain at least 1.0 in. (25 mm) separation between dry contact wiring and the power wiring in the enclosure.

Failure to follow these instructions will result in death or serious injury.

The IMA series SPD is provided with dry contacts. The connection for the dry contacts is located on the back of the diagnostic display panel, (lower right corner, refer to Figure 10), and will accept 22 AWG (0.33 mm^2) to 14 AWG (2.1 mm^2) stranded or solid wire. The dry contacts are three-position, Form “C” type with Normally Open, Normally Closed, and Common connections.

In the unpowered state the contact is closed between terminals NC and COM. This is also the alarm condition. The opposite state, closed between terminals NO and COM, indicates that power is on to the unit and that no alarm condition exists (See Table 6).

These contacts can be used for remote indication of the SPD’s operating status to a computer interface board or emergency management system. Also, these contacts are designed to work with the SPD remote monitor option described in the next section.

Table 6: Dry Contact Configuration

Alarm Contact Terminals	Contact State with Power Applied
NO to COM	Closed
NC to COM	Open

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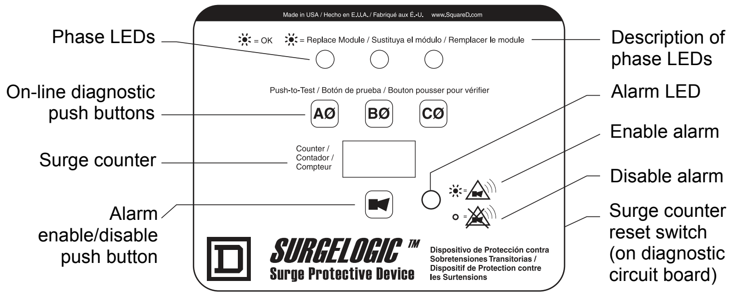
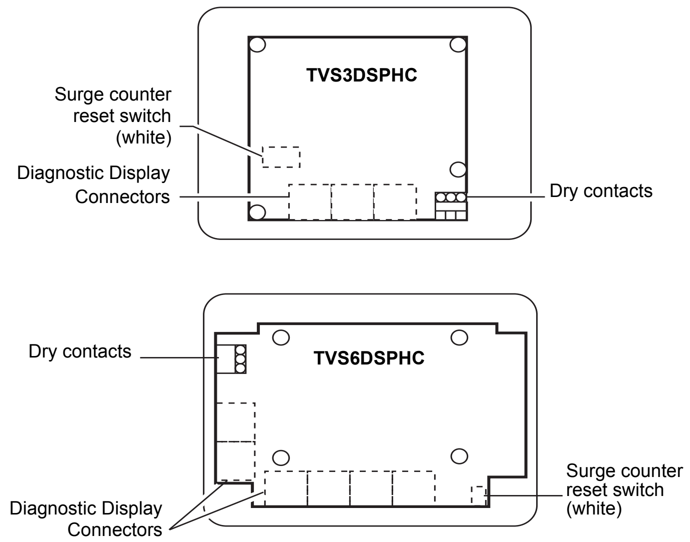
Figure 9: Three-Phase Diagnostic Display Panel with Surge Counter



Note: Phase B is not present on single-phase applications.

Figure 10: Rear of Diagnostic Circuit Board



Care must be taken when installing the dry contact wiring because the terminals are on a moving door. Avoid the door hinge, any switches, and the high voltage areas of the enclosure when routing the wiring. To avoid the door hinge, tie wrap any dry contact wiring to the existing cable harness which crosses the hinge. Once the dry contact wiring is secured on a non-moving point of the enclosure, it is the user's responsibility to maintain at least 1.0 in. (25 mm) separation between 600 V ac rated dry contact wiring and the power wiring in the enclosure.

The dry contacts are designed for a maximum voltage of 24 V dc / 24 V ac and a maximum current of 2 A. Higher energy applications may require additional relay implementation outside the SPD. Damage to the SPD relay caused by use with energy levels in excess of those discussed in this instruction bulletin are not covered by warranty. For application questions, contact the Surgelogic Technical Assistance Group at 1-800-577-7353.

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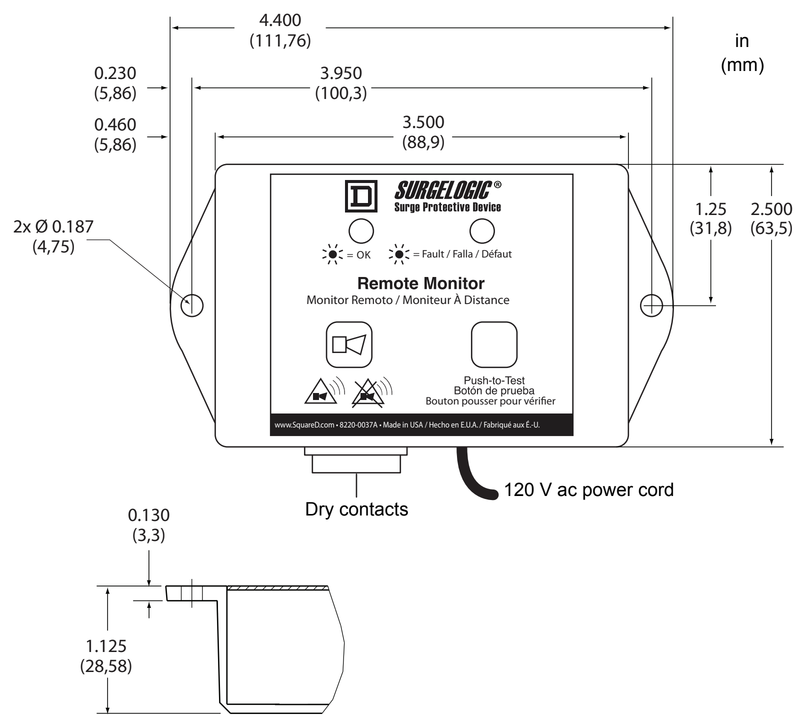
Remote Monitor Option

The remote monitor option has two LEDs, one red and one green, and an audible alarm with an enable/disable switch. Normal status is a lit green LED, and no audible alarm. To test the integrity of the remote monitor, press the push-to-test switch. If the alarm is enabled, the green LED will turn off, the red LED will turn on, and the alarm will sound. Releasing the switch will complete the test; the red LED will turn off, the green LED will turn on and the alarm will shut off.

If suppression on any phase is lost, the green LED will turn off, the red LED will turn on and an alarm will sound. The audible alarm can be silenced by pushing the alarm enable/disable button. The alarm will silence and the green alarm LED will not be lit. The red LED will continue to be illuminated until the inoperative condition has been cleared.

The remote monitor includes a 120 V ac to 12 V dc adapter with a six-foot power cord. Connections are made to the SPD diagnostic panel with Form “C”, three-position dry contacts (provided) and the appropriate length of solid or stranded 22 AWG (0.33 mm^2) to 14 AWG (2.1 mm^2) not provided.

Figure 11: Remote Monitor Option (TVS12RMU)



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Maintenance and Troubleshooting

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.
- This equipment must be effectively grounded per all applicable codes. Use an equipment-grounding conductor to connect this equipment to the power system ground.

Failure to follow these instructions will result in death or serious injury.

Preventative Maintenance

Inspect the SPD periodically to maintain reliable system performance and continued transient voltage surge suppression. Periodically check the state of the diagnostic display panel LED status indicators. Routinely use the built-in diagnostics to inspect for inoperative modules.

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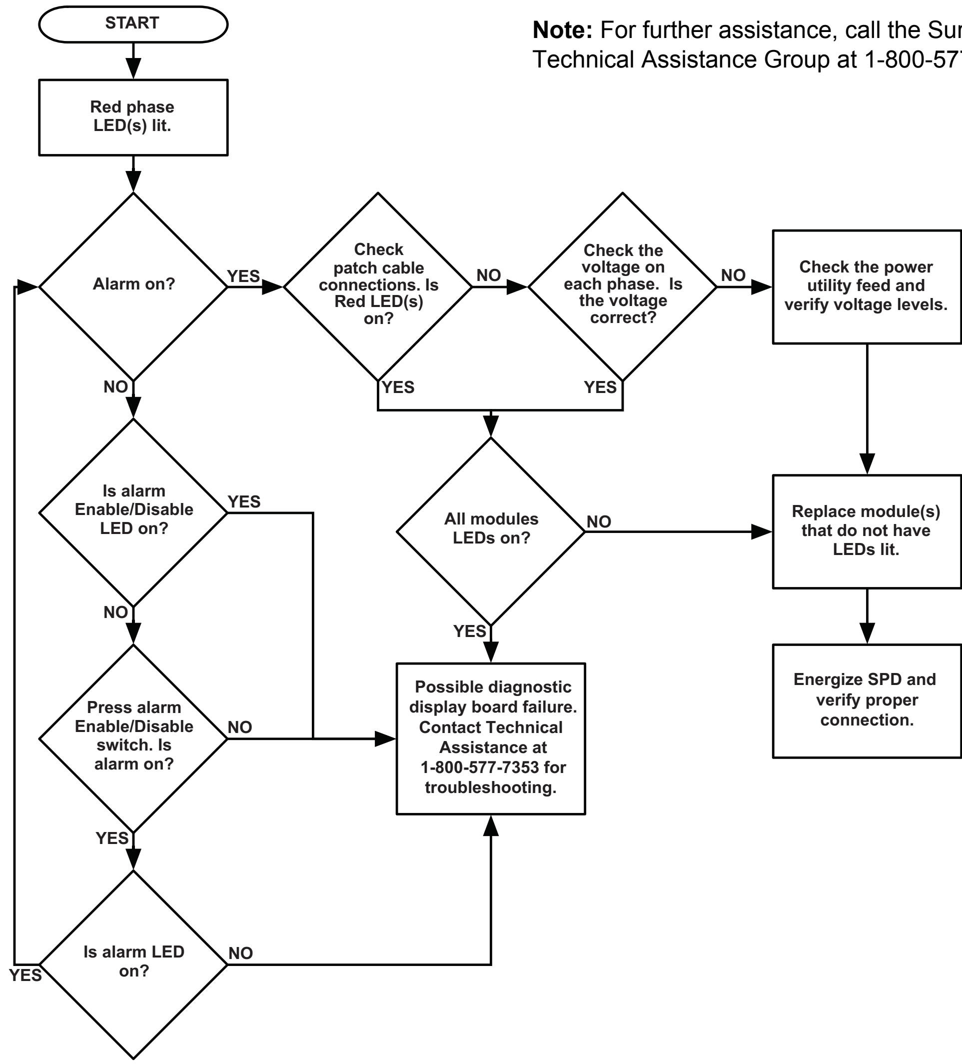
Troubleshooting

If a module shows two green indicator lights and the display panel shows a red phase indicator light, follow the Troubleshooting Flow Chart in Figure 12 below.

Figure 12: Troubleshooting Flow Chart

Note: For further assistance, call the Surgelogic Technical Assistance Group at 1-800-577-7353.



Replacement Parts

The following replacement parts are available. For ordering information please contact your local distributor or refer to the product catalog.

- MA modules. Replacement instructions are included with the replacement parts.
- Diagnostic display panel assemblies. Replacement instructions are included with the replacement parts.

Surgelogic™ Internal Modular Assembly (IMA)
Instruction Bulletin

Schneider Electric USA, Inc.
800 Federal Street
Andover, MA 01810 USA
888-778-2733
www.schneider-electric.us

8222-0050 Rev. 01, 06/2016
Replaces 8222-0050 Rev. G, 06/2013

Surgelogic™
Ensamble modular interno (IMA)
Dispositivo de protección contra sobretensiones transitorias (SPD)

ESPAÑOL

Boletín de instrucciones

8222-0050, Rev. 01, 06/2016

Conservar para uso futuro.

SQUARE D

by Schneider Electric

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Precauciones

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA/Z462 de CSA y NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desconecte todas las fuentes de alimentación del equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de volver a energizar el equipo.
- Este equipo deberá estar correctamente conectado a tierra de acuerdo con los códigos aplicables. Utilice un conductor de conexión a tierra del equipo para conectar este último a la tierra del sistema de alimentación.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

⚠ PRECAUCIÓN

PÉRDIDA DE ALIMENTACIÓN DEL CIRCUITO DERIVADO/PÉRDIDA DE SUPRESIÓN DE SOBRETENSIONES TRANSITORIAS

- Realice inspecciones periódicas a las luces indicadoras de estado del SPD como parte del programa de mantenimiento preventivo.
- Deberá prestarse servicio de inmediato al SPD cuando se activa una alarma.
- Utilice contactos secos para emitir una señal de alarma al sistema de supervisión central en las instalaciones críticas o difíciles de acceder y no supervisadas por personal.
- Emplee múltiples SPD para obtener redundancia para las aplicaciones críticas.

El incumplimiento de estas instrucciones puede causar lesiones personales o daño al equipo.

Cuando llegan al fin de su vida útil, los dispositivos de protección contra sobretensiones transitorias (SPD) pueden perder su habilidad de bloquear la tensión del sistema de alimentación e intentar extraer corriente excesiva de la línea. El SPD está equipado con componentes de sobrecorriente y sobrecalentamiento que desconectan los elementos de supresión de sobretensiones transitorias de la fuente de alimentación eléctrica en caso de que estos elementos alcancen su fin de vida útil. Es posible que el fusible o interruptor automático derivado que alimenta al SPD se dispare cuando los elementos de supresión de sobretensiones transitorias llegan al fin de su vida útil.

⚠ PRECAUCIÓN

PÉRDIDA DE SUPRESIÓN DE SOBRETENSIONES TRANSITORIAS

- No energice los SPD sino hasta que el sistema eléctrico haya sido completamente instalado, inspeccionado, probado y todos los conductores estén conectados y funcionando, incluyendo el neutro.
- Verifique la tensión nominal del dispositivo y del sistema antes de energizar el SPD.
- Realice las pruebas de rigidez dieléctrica al aislamiento, o cualquier otra prueba donde los componentes del SPD sean sometidos a tensiones más altas que la tensión de conexión, con el neutro y el SPD desconectados de la fuente de alimentación.

El incumplimiento de estas instrucciones puede causar lesiones personales o daño al equipo.

Introducción

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA/Z462 de CSA y NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desconecte toda la alimentación del equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.
- Este equipo deberá estar correctamente conectado a tierra de acuerdo con los códigos aplicables. Utilice un conductor de conexión a tierra del equipo para conectar este último a la tierra del sistema de alimentación.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

NOTA: Para obtener asistencia de diagnóstico de problemas, póngase en contacto con el grupo de asistencia técnica Surgelogic llamando al 1-800-577-7353 (en EUA) o bien al 01-800 72 463 4337 (en México).

La instalación adecuada es fundamental para maximizar la eficacia y el rendimiento del dispositivo de protección contra sobretensiones transitorias tipo IMA. Siga los pasos descritos en este boletín de instrucciones para asegurarse de obtener una instalación correcta. Lea todas las instrucciones de este boletín antes de comenzar la instalación. Estas instrucciones no deberán utilizarse como un sustituto del código nacional eléctrico de los EUA (NEC), NOM-001-SEDE ni de los códigos locales. Revise todos los códigos eléctricos correspondientes y asegúrese de que cumple con ellos. La instalación de los dispositivos de protección contra sobretensiones transitorias modulares deberá realizarla solamente personal eléctrico calificado.

Desempaque e inspección preliminar

Realice una inspección visual de la caja de embalaje para ver si encuentra daños o indicaciones de un manejo inadecuado del equipo antes de desempacarlo. Retire el material de embalaje y revise el equipo para ver si encuentra daños obvios causados durante el envío. Si encuentra algún daño causado durante el envío o debido al manejo inadecuado, notifique de inmediato a la compañía de transporte.

Almacenamiento

Almacene el equipo en un lugar seco y limpio a una temperatura ambiente de -40 °C a +65 °C (-40 °F a 149 °F). No deseche el material de embalaje sino hasta después de haber instalado el equipo.

Etiquetas de seguridad

Se incluyen versiones en inglés, español y francés de todas las etiquetas de seguridad (peligro, advertencia y precaución).

Consideraciones para la ubicación

Medio ambiente

Este dispositivo ha sido diseñado para funcionar en temperaturas ambientales de -20 °F a +65 °C (-4 °C a +149 °F), con humedad relativa de 0 a 95% sin condensación. La temperatura de funcionamiento de la pantalla de cristal líquido de diagnóstico es de -10 °C a +60 °C (+14 °F a +140 °F). Consulte el catálogo de productos para obtener más detalles sobre los gabinetes. Todos los dispositivos IMA funcionan normalmente sin reducir su rendimiento cuando se les somete a choques o vibraciones, como se describe en la norma IEC 60721-3-3, clase 3M4.

Ruido audible

El ruido de fondo del dispositivo es insignificante y no es un elemento limitante de la ubicación de instalación.

Montaje

Consulte la página 13 para conocer las dimensiones de montaje típico.

Espacio libre necesario para realizar servicios de mantenimiento

El espacio libre necesario para realizar servicios de mantenimiento debe cumplir con todos los requisitos de los códigos correspondientes.

Rendimiento del equipo

Para obtener un rendimiento máximo del sistema, coloque el dispositivo lo más cerca posible del circuito que se está protegiendo para minimizar la longitud del alambrado de interconexión. Para cada 1 pie (30 cm) de longitud de cable, se agregan aproximadamente 160 V (6kV / 3kA, 8/20 microsegundos) a la tensión suprimida. El nivel de protección de tensión (VPR) está especificado en la placa de datos del dispositivo y debe medir 152 mm (6 pulgadas) desde las terminales del dispositivo, según la norma UL® 1449.

Especificaciones eléctricas

Tensión nominal

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

Asegúrese de que la tensión nominal del SPD en el módulo o especificada en la placa de datos sea la misma que la tensión de funcionamiento.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Antes de montar el SPD, asegúrese de que el dispositivo tenga la misma tensión nominal que la red de distribución eléctrica en que esté instalado. Compare la tensión de la placa de datos en el SPD con la tensión de la placa de datos del equipo de distribución eléctrica.

La persona encargada de proporcionar las especificaciones o el usuario del dispositivo deberá estar familiarizado con la configuración y la disposición de la red de energía en la que se instalará el SPD. La configuración del sistema de cualquier red de distribución eléctrica está basada rigurosamente en la configuración de los devanados secundarios del transformador que suministran a la carga o entrada principal de acometida. Inclusive si los devanados del transformador están conectados o no a tierra a través de un conductor de puesta a tierra. Sin embargo, la configuración de la red no está basada en la conexión de ninguna carga o equipo específico de una red de distribución eléctrica particular. Consulte la tabla 1 para conocer la tensión de acometida de cada SPD.

Tabla 1: Tensión nominal

Tensión de acometida	Corriente transitoria máxima por fase	Números de catálogo[1]
120/240 V, 1 fase, 3 hilos + tierra	120	TVS1IMA12_
	160	TVS1IMA16_
	240	TVS1IMA24_
	320	TVS1IMA32_
	480	TVS1IMA48_
208Y/120 V, 3 fases, 4 hilos + tierra (en estrella) [2]	120	TVS2IMA12_
	160	TVS2IMA16_
	240	TVS2IMA24_
	320	TVS2IMA32_
	480	TVS2IMA48_
240/120 V, 3 fases, 4 hilos + tierra (instalación en delta con extremo alto [High Leg Delta])	120	TVS3IMA12_
	160	TVS3IMA16_
	240	TVS3IMA24_
	320	TVS3IMA32_
	480	TVS3IMA48_
480Y/277 V, 3 fases, 4 hilos + tierra (en estrella) [3]	120	TVS4IMA12_
	160	TVS4IMA16_
	240	TVS4IMA24_
	320	TVS4IMA32_
	480	TVS4IMA48_

Continúa–

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Tabla 1: Tensión nominal

Tensión de acometida	Corriente transitoria máxima por fase	Números de catálogo[1]
480 V, 3 fase, 3 hilos + tierra (en delta) [4]	100	TVS5IMA10_
	120	TVS5IMA12_
	160	TVS5IMA16_
	200	TVS5IMA20_
	240	TVS5IMA24_
	320	TVS5IMA32_
	480	TVS5IMA48_
240 V, 3 fase, 3 hilos + tierra (en delta)	100	TVS6IMA10_
	120	TVS6IMA12_
	160	TVS6IMA16_
	200	TVS6IMA20_
	240	TVS6IMA24_
	320	TVS6IMA32_
	480	TVS6IMA48_
600Y/347 V, 3 fases, 4 hilos + tierra (en estrella)	120	TVS8IMA12_
	160	TVS8IMA16_
	240	TVS8IMA24_
	320	TVS8IMA32_
	480	TVS8IMA48_
600 V, 3 fase, 3 hilos + tierra (en delta) [5]	100	TVS9IMA10_
	120	TVS9IMA12_
	160	TVS9IMA16_
	180	TVS9IMA18_
	200	TVS9IMA20_
	240	TVS9IMA24_
	320	TVS9IMA32_

1 Los números de catálogo son de ejemplo. Los números de catálogo reales requieren un sufijo para indicar el tipo UL.

2 208Y/120 también es aplicable para la tensión de 220Y/127.

3 480Y/277 es aplicable para las siguientes tensiones 380Y/220, 400Y/230 y 415Y/240.

4 480 V en delta es también aplicable para las siguientes tensiones: 480Y/277V HRG.

5 600 V en delta es también aplicable para las siguientes tensiones: 600Y/347V HRG.

Terminales, tamaño de cable y par de apriete de la instalación

Se proporcionan terminales para las conexiones de fase (línea), neutro y tierra del equipo. Las terminales IMA aceptan una gama de tamaños de conductor de cobre de 12 AWG a 2 AWG para los conectores de fase, neutro y conexión a tierra.

Tabla 2: Par de apriete de las terminales

Conexiones de la alimentación	Par de apriete
AØ, BØ, CØ y N	35 lbs-pulg (4 N•m)
Tierra	

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Protección contra sobrecorrientes del circuito derivado

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice conductores apropiados para el dispositivo de protección contra sobrecorrientes (DPCS) según los códigos correspondientes.
- Utilice conductores apropiados para la aplicación según los códigos correspondientes.

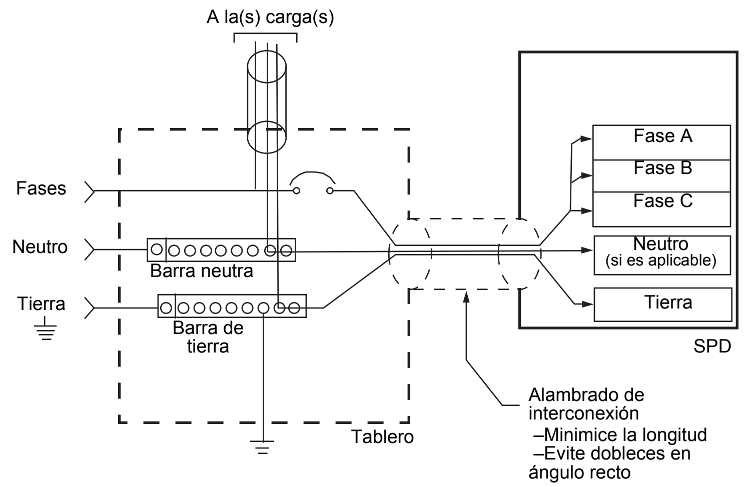
El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Los SPD UL 1449 tipo 1 han sido diseñados y aprobados para aplicaciones del lado de línea adelante de la desconexión de acometida principal sin protección contra sobrecorriente adicional. Los SPD tipo 2 deben ser instalados en el lado de carga del dispositivo de protección contra sobrecorriente principal (DPCS). Todas las instalaciones deben proporcionar o incluir un medio de desconexión.

Ubicación del SPD

Coloque el SPD lo más cerca posible del circuito que se está protegiendo para minimizar la longitud del cable y optimizar el funcionamiento del SPD. Evite tendidos largos de cable para que el equipo funcione correctamente. Para reducir la impedancia que el cable ofrece a las corrientes transitorias, los conductores de fase, neutro y puesta a tierra deberán ser enrutados dentro del mismo tubo conduit y amarrarse fuertemente para optimizar el funcionamiento del dispositivo. Evite doblar los conductores en ángulo recto. Vea la figura 1.

Figura 1: Prácticas de alambrado del dispositivo de protección contra sobretensiones transitorias



Conexión a tierra

⚠ ADVERTENCIA

TENSIÓN PELIGROSA AL TOQUE

- Conecte la terminal de tierra del SPD a la estructura de la red de puesta a tierra del edificio.
- Utilice un conductor de puesta a tierra del equipo de tamaño apropiado.
- Cuando se usa tubo conduit o canalización metálica:
  - — No utilice pasamuros de aislamiento para interrumpir el tubo conduit o canalización metálica.
  - — Mantenga continuidad eléctrica en todas las conexiones de la canalización y tubo conduit empleando dispositivos de unión apropiados.
- No utilice una conexión a tierra aislada independiente para el dispositivo tipo ensamble modular interno (IMA).
- Revise las conexiones al equipo y asegúrese de que esté correctamente conectado al sistema de puesta a tierra.
- Verifique la continuidad de la red de puesta a tierra realizando inspecciones y pruebas como parte de un programa completo de servicio de MANTENIMIENTO eléctrico.

El incumplimiento de estas instrucciones puede causar la muerte o lesiones serias.

General

El dispositivo IMA tiene elementos del SPD conectados de fase a tierra. Es muy importante que exista una conexión robusta y efectiva en la estructura de puesta a tierra del edificio. La conexión de puesta a tierra debe utilizar un conductor de puesta a tierra del equipo tendido con la conexión de fase y neutro del sistema de alimentación. No conecte el SPD a una tierra aislada separada.

Para obtener una mejor supresión de sobretensión del SPD tipo IMA, utilice un sistema de conexión a tierra de un solo punto en el que el sistema de electrodos de puesta a tierra de acometida esté conectado y unido a todos los demás electrodos disponibles, a un elemento de acero del edificio, tubería de agua de metal, varillas de accionamiento, etc. (consulte el artículo 250 del código eléctrico nacional [NEC de EUA] para obtener referencias). La medición de impedancia de conexión a tierra del sistema eléctrico deberá ser lo más baja posible y deberá cumplir con todos los códigos aplicables apropiados.

Puesta a tierra del sistema de alimentación

Además de la configuración y tensión del sistema de alimentación, el método de puesta a tierra del sistema debe considerarse al seleccionar el dispositivo IMA apropiado. Consulte la siguiente tabla para obtener información al seleccionar el dispositivo IMA apropiado para la puesta a tierra específica del sistema de alimentación.

Tabla 3: Métodos de puesta a tierra

Número de catálogo del dispositivo IMA	Método de puesta de tierra del sistema de alimentación
TVS1IMA__	Sólidamente puesto a tierra
TVS2IMA__	
TVS3IMA__	
TVS4IMA__	
TVS8IMA__	
TVS5IMA__	No puesto a tierra / puesto a tierra con alta resistencia (HRG)
TVS6IMA__	
TVS9IMA__	

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Sistemas de alimentación sólidamente puestos a tierra

⚠PRECAUCIÓN

DAÑO AL SPD Y SOBRETENSIÓN EN EL SISTEMA DE ALIMENTACIÓN

- No conecte los dispositivos diseñados para usarse en sistemas de alimentación sólidamente puestos a tierra en sistemas de alimentación no puestos a tierra o puestos a tierra con resistencia (por ejemplo, HRG).
- Asegúrese de que el equipo de acometida esté unido a tierra de acuerdo con todos los códigos y normas correspondientes.
- Asegúrese de que la terminal de neutro del transformador del sistema de alimentación que alimenta al dispositivo esté unida a la tierra del sistema de acuerdo con todos los códigos y normas correspondientes.

El incumplimiento de estas instrucciones puede causar daño al equipo.

Los dispositivos SPD diseñados para usarse en sistemas de alimentación sólidamente puestos a tierra no deben ser conectados a sistemas de alimentación no puestos a tierra o con resistencia a tierra. Dicha conexión puede causar daño al SPD.

Siempre verifique la configuración de puesta a tierra del sistema de alimentación antes de energizar el dispositivo. Asegúrese de que todas las conexiones a tierra hayan sido instaladas en ambos, el equipo de entrada de acometida y el transformador del sistema de alimentación, antes de energizar.

Sistemas de alimentación puestos a tierra con resistencia y en delta

⚠PRECAUCIÓN

DAÑO AL SPD Y SOBRETENSIÓN EN EL SISTEMA DE ALIMENTACIÓN

- Los sistemas de alimentación sin conexión a tierra son intrínsecamente inestables y pueden producir tensiones de línea a tierra demasiado altas durante ciertas condiciones de falla. Durante estas condiciones de falla cualquier equipo eléctrico, incluyendo un SPD, puede someterse a tensiones que excedan sus valores nominales designados. Esta información es suministrada al usuario para que tome una decisión informada antes de instalar cualquier equipo eléctrico en un sistema de alimentación sin conexión a tierra.
- Los sistemas de alimentación puestos a tierra con resistencia deben mantenerse en un estado de sobreamortiguación para limitar la duración y el exceso de tensión durante el funcionamiento.
- Es necesario realizar la verificación y ajuste correcto de amortiguación del sistema de alimentación:
  - Periódicamente y como parte de un servicio de mantenimiento normal.
  - Después de realizar modificaciones al sistema de alimentación.

El incumplimiento de estas instrucciones puede causar daño al equipo.

El dispositivo IMA se usa en sistemas de alimentación puestos a tierra con resistencia donde el sistema ha sido ajustado para, y mantenido en, un estado de sobreamortiguación. Para que el sistema de alimentación se encuentre en sobreamortiguación, la corriente en la resistencia de puesta a tierra (durante una falla franca de fase a tierra) debe ser significativamente mayor que la corriente total de carga del sistema.

ESPAÑOL

La evaluación periódica del diseño del sistema de alimentación es necesaria para determinar la corriente de carga (en el peor de los casos) del sistema y ajustar la resistencia de puesta a tierra conforme sea necesario. A medida que se modifica el sistema de alimentación, el valor de la resistencia de puesta a tierra debe ser evaluado y ajustado para mantener el sistema en estado de sobreamortiguación.

Instalación

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA/Z462 de CSA y NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desconecte toda la alimentación del equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.
- Este equipo deberá estar correctamente conectado a tierra de acuerdo con los códigos aplicables. Utilice un conductor de conexión a tierra del equipo para conectar este último a la tierra del sistema de alimentación.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Condiciones de aceptación de UL

Para su uso solamente en equipo en el que Underwriters Laboratories® ha aceptado su combinación. Cuando se instala en el equipo de uso final, he aquí una lista de puntos importantes que deberán ser considerados:

1. Deberá proporcionarse un gabinete eléctrico apropiado en el producto de uso final.
2. En la fábrica, se realizará únicamente las conexiones (incluyendo los espacios entre los conectores) al dispositivo que sean adecuadas según la aplicación de uso final.
3. El nivel de protección de tensión (VPR) será determinado en el dispositivo final según sea aplicable.
4. El SPD ha sido sometido a las siguientes pruebas según la norma UL 1449:
   a. Pruebas de sobretensiones transitorias (VPR)
   b. Prueba de descarga nominal (20 kA)
   c. Prueba de tensión de funcionamiento
   d. Tensión de rigidez dieléctrica
   e. Pruebas de corriente (cortocircuito, intermedia, limitada)
5. Los componentes del SPD han sido evaluados para las pruebas de corriente nominal de cortocircuito (SCCR), según la norma UL 1449, con una corriente de falla disponible de 200 kA rcm, sin dispositivos de protección contra sobrecorriente (DPCS) externos o gabinetes externos.

Alambrado

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA y NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desconecte toda la alimentación del equipo antes de realizar cualquier trabajo en él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de volver a energizar el equipo.
- Este equipo deberá estar correctamente puesto a tierra de acuerdo con los códigos aplicables. Utilice un conductor de conexión a tierra del equipo para conectar este último a la tierra del sistema de alimentación.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

Asegúrese de que la tensión nominal del SPD en el módulo o especificada en la placa de datos sea la misma que la tensión de funcionamiento.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Siga los siguientes pasos al realizar las conexiones de los cables:

1. Desenergice el equipo antes de realizar cualquier trabajo dentro o fuera del gabinete que contiene este equipo.
2. Asegúrese de que la tensión nominal y configuración del SPD sean las mismas que la del sistema de alimentación al que será conectado.
3. Identifique la ubicación apropiada para el dispositivo de protección contra sobretensiones transitorias. Colóquelo lo más cerca posible al tablero para que los cables sean de una longitud lo más corta posible. Sujete la unidad firmemente.

   NOTA: El dispositivo de protección contra sobretensiones transitorias (SPD) debe ser instalado en una ubicación accesible como se describe en el NEC o NOM-001-SEDE.

4. Instálelo según las normas locales y nacionales (NEC o NOM-001-SEDE) para obtener las recomendaciones de protección contra sobrecorriente e información relevante sobre la capacidad de corriente de los conductores.

   NOTA: Los sistemas de alimentación de 3 hilos, 3 fases con conexión a tierra en estrella, o de 2 hilos, 1 fase con punto intermedio de conexión a tierra no tienen conexión para neutro. En estos sistemas, una (bond) el

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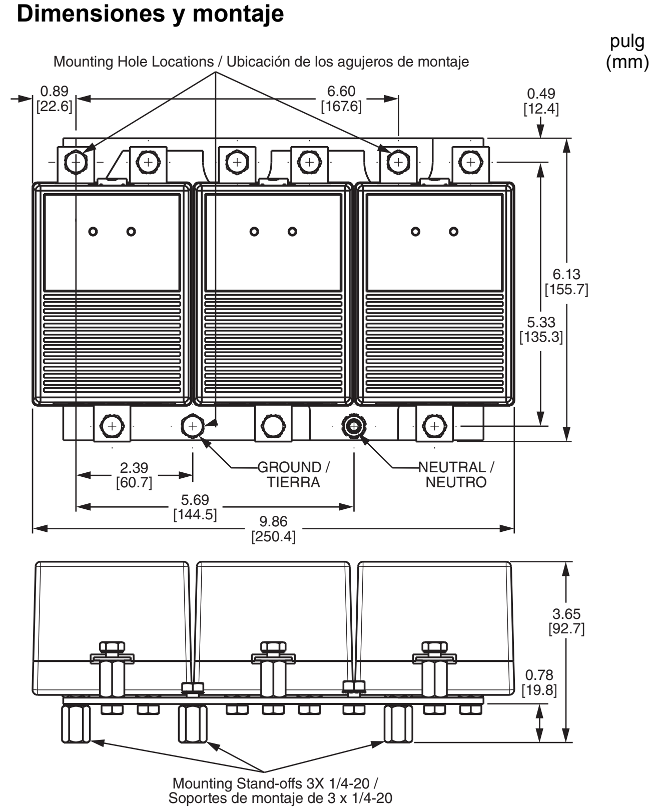
neutro y las zapatas de tierra en el SPD. Los SPD con conexión en delta o puestos a tierra con alta resistencia, no tienen conexión para neutro. Para instalar los cables consulte las figuras 3 a 6.

NOTA: Consulte Terminales, tamaño de cable y par de apriete de la instalación y la tabla 2 en la página 7, para obtener el tamaño de cable y par de apriete aceptables para la instalación.

5. Tuerza los conductores ½ vuelta o más por cada 305 mm (12 pulgadas) de longitud. No haga bucles ni enrolle los cables. Asegúrese de mantener un espacio adecuado para el doblez de los cables según las especificaciones del NEC y NOM-001-SEDE.
6. Si se van a usar los contactos de señalización remota de la pantalla de diagnóstico, consulte la sección “Contacto seco” en la página 20 para obtener las instrucciones de alambrado.
7. En una instalación delta de extremo alto, observe la conexión del extremo alto según el diagrama de alambrado. Consulte la figure 5.
8. Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo. Si el SPD está correctamente instalado y funcionando, los indicadores LED verdes se encenderán en la pantalla.

Si tiene alguna pregunta con respecto a la instalación del dispositivo, póngase en contacto con el grupo de asistencia técnica Surgelogic llamando al 01-800-724-634-337 en México (o bien al 1-800-577-7353 en EUA).

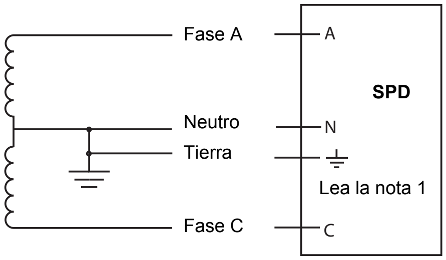
Figura 2: Dimensiones y montaje

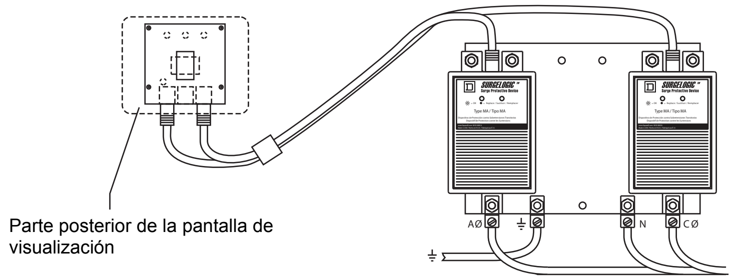


NOTA: La conexión del neutro no estará presente en las configuraciones en delta y HRG.

Diagramas de alambrado

Figura 3: Instalación con conexión a tierra, de una fase, tres hilos con desconectador integral

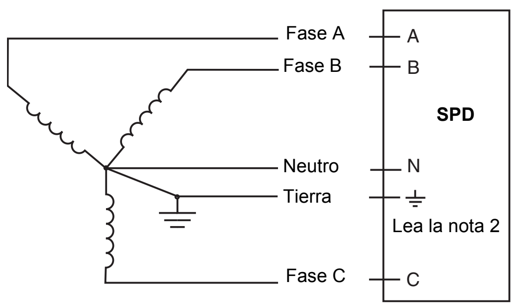


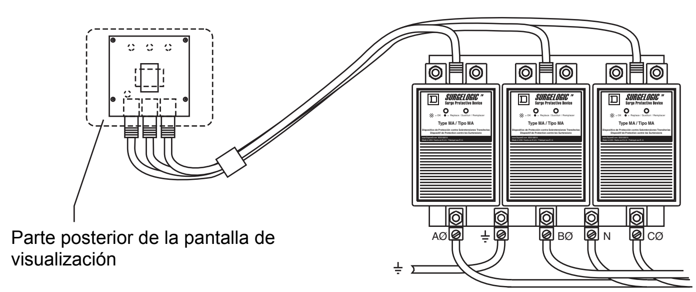


Conexiones del cliente de 120–240 kA

NOTA 1: Es posible que en los sistemas de alimentación con neutro a tierra de tres hilos no exista un conductor neutro. En estos sistemas una las zapatas de tierra y neutro del SPD.

Figura 4: Instalación en estrella con conexión a tierra, de tres fases, 3 ó 4 hilos

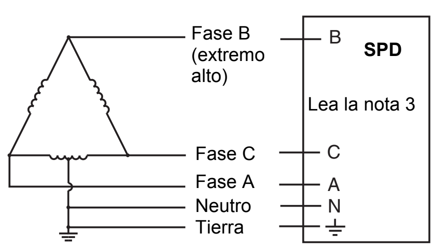


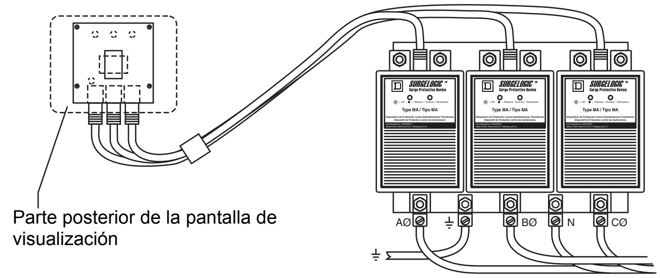


Conexiones del cliente de 120–240 kA

NOTA 2: Los sistemas de alimentación con neutro a tierra de tres hilos no tienen conductor de neutro. En estos sistemas una las zapatas de tierra y neutro del SPD.

Figura 5: Instalación en delta con extremo alto de 3 fases, 3 ó 4 hilos





Conexiones del cliente de 120–240 kA

NOTA 3: El extremo alto del sistema de alimentación debe conectarse a la fase B del SPD. Los sistemas de alimentación con neutro a tierra de tres hilos no tienen conductor neutro. En estos sistemas una las zapatas de tierra y neutro del SPD.

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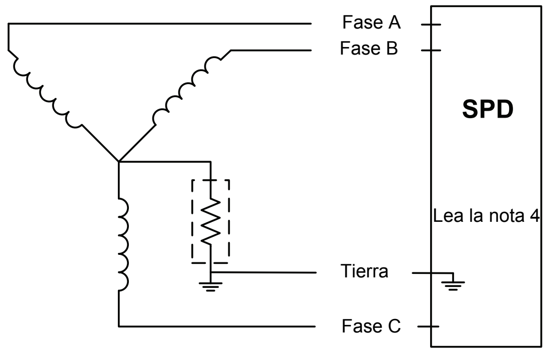
Diagramas de alambrado para los sistemas de HRG y en delta

Figura 6: Instalación en estrella con alta resistencia a tierra (HRG)

NOTA 4: Los sistemas de alimentación en estrella puestos a tierra con alta resistencia no tienen conductor neutro.



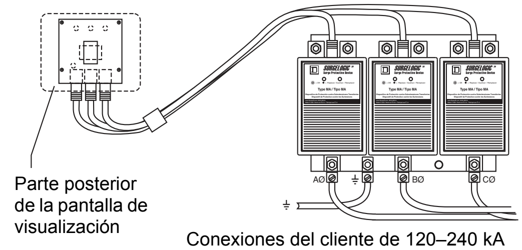
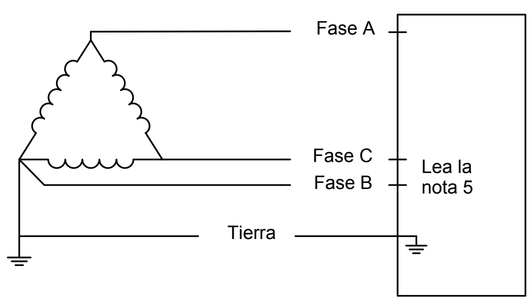


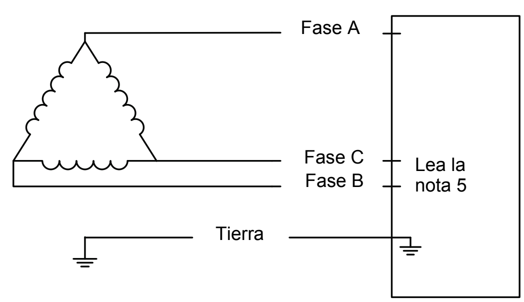
Figura 7: Instalación en delta de tres fases, tres hilos + tierra

NOTA 5: La conexión a tierra del SPD con conexión en delta deberá conectarse al conductor de tierra del sistema. Los sistemas de conexión en delta no tienen conductor de neutro.

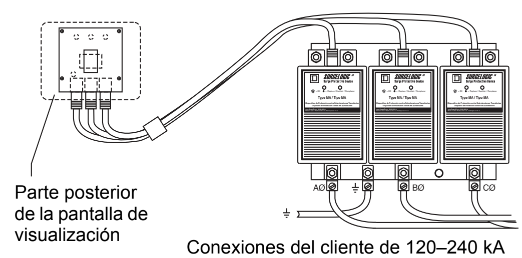
Delta con puesta a tierra de una fase (en esquina)



Delta sin puesta a tierra



NOTA 6: La conexión a tierra del SPD con conexión en delta deberá conectarse al conductor de tierra del sistema. Los sistemas de conexión en delta no tienen conductor de neutro. La fase B del sistema eléctrico es típicamente la fase de puesta a tierra.



Funcionamiento

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA/Z462 de CSA y NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desconecte toda la alimentación del equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.
- Este equipo deberá estar correctamente conectado a tierra de acuerdo con los códigos aplicables. Utilice un conductor de conexión a tierra del equipo para conectar este último a la tierra del sistema de alimentación.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Indicadores de estado LED

La pantalla de visualización de diagnóstico del SPD muestra el estado de cada módulo MA a través de los LED de diagnóstico verde/rojo (vea la figura 8). Si la unidad está funcionando correctamente, todos los LED de las fases se iluminarán en verde. Para probar la integridad del diagnóstico de cada fase, oprima el botón situado debajo de los LED de fase en la pantalla de visualización de diagnóstico. El LED verde cambiará de color a rojo y sonará una alarma, si ésta está activada. Al soltar el botón de prueba terminará la prueba; el LED rojo cambiará de color a verde y la alarma se apagará.

Si alguna de las fases no funciona, la alarma audible sonará y el LED de la fase correspondiente, en la pantalla de visualización de diagnóstico, se iluminará en rojo. Esto es una indicación para el personal eléctrico calificado de la necesidad de realizar un servicio de mantenimiento. Es posible desactivar la alarma audible mientras se espera a que un técnico calificado evalúe y preste servicio de mantenimiento al SPD, pulsando el botón de activación/desactivación. La alarma dejará de sonar y el LED verde designado para la alarma no se iluminará. El LED rojo de la fase continuará iluminado hasta que se restablezca la condición de inoperabilidad.

En un módulo MA (figura 8), si cualquiera de los LED no está iluminado, el módulo deberá sustituirse. Cuando ambos LED verdes no están iluminados y está energizada la pantalla de diagnóstico, entonces es posible que no esté recibiendo alimentación esa fase o el módulo se ha dañado y debe sustituirse (consulte la tabla 1 en la página 6). Consulte el boletín de instrucciones del equipo para obtener instrucciones sobre la desconexión y el acceso al módulo MA.

Cuando se aplica alimentación al SPD y uno o más de los LED en la pantalla de diagnóstico están iluminados en rojo, y uno o más LED del módulo MA no están iluminados, deberá sustituirse el módulo MA apropiado. Consulte “Servicio de mantenimiento y diagnóstico de problemas” en la página 21 para conocer los procedimientos apropiados de diagnóstico de problemas y la tabla 4 para obtener información sobre los módulos de repuesto. Si los LED del módulo se iluminan en verde y los LED

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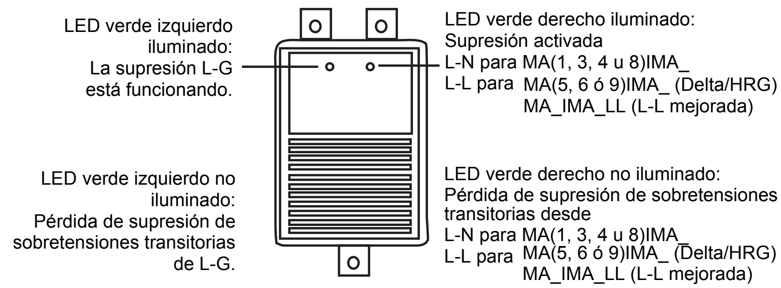
de la pantalla de diagnóstico se iluminan en rojo, póngase en contacto con el grupo de asistencia técnica Surgelogic llamando al 1-800-577-7353 (EUA).

Figura 8: LED del módulo MA



Módulos de repuesto

Tabla 4: Módulos de repuesto IMA

Tensión del sistema	Corriente transitoria máxima (kA) (kA)	Números de catálogo[1]		
		Fase A	Fase B	Fase C
120/240 V, 1 fase, 3 hilos + tierra	120 160 240	MA1IMA12_ MA1IMA16_ MA1IMA24_	— — —	MA1IMA12_ MA1IMA16_ MA1IMA24_
208Y/120 V, 3 fases, 4 hilos + tierra [2] (en estrella)	120 160 240	MA1IMA12_ MA1IMA16_ MA1IMA24_	MA1IMA12_ MA1IMA16_ MA1IMA24_	MA1IMA12_ MA1IMA16_ MA1IMA24_
120/240 V, 3 fase, 4 hilos + tierra [3] (conexión en delta con extremo alto)	120 160 240	MA1IMA12_ MA1IMA16_ MA1IMA24_	MA3IMA12_ MA3IMA16_ MA3IMA24_	MA1IMA12_ MA1IMA16_ MA1IMA24_
240 V, 3 fases, 3 hilos + tierra (en delta)	120 160 240	MA6IMA12_ MA6IMA16_ MA6IMA24_	MA6IMA12_ MA6IMA16_ MA6IMA24_	MA6IMA12_ MA6IMA16_ MA6IMA24_
480Y/277 V, 3 fases, 4 hilos + tierra [4] (en estrella)	120 160 240	MA4IMA12_ MA4IMA16_ MA4IMA24_	MA4IMA12_ MA4IMA16_ MA4IMA24_	MA4IMA12_ MA4IMA16_ MA4IMA24_
480 V, 3 fases, 3 hilos + tierra (en delta) [5]	120 160 240	MA5IMA12_ MA5IMA16_ MA5IMA24_	MA5IMA12_ MA5IMA16_ MA5IMA24_	MA5IMA12_ MA5IMA16_ MA5IMA24_
600Y/347 V, 3 fases, 4 hilos + tierra (en estrella)	120 160 240	MA8IMA12_ MA8IMA16_ MA8IMA24_	MA8IMA12_ MA8IMA16_ MA8IMA24_	MA8IMA12_ MA8IMA16_ MA8IMA24_
600 V, 3 fases, 3 hilos + tierra (en delta) [6]	120 160 180	MA9IMA12_ MA9IMA16_ MA9IMA18_	MA9IMA12_ MA9IMA16_ MA9IMA18_	MA9IMA12_ MA9IMA16_ MA9IMA18_

1 Los números de catálogo son de ejemplo. Los números de catálogo reales requieren un sufijo para indicar el tipo UL.

2 208Y/120 también es aplicable para la tensión de 220Y/127.

3 Conexión en delta con extremo alto (los módulos para la fase B son diferentes que los módulos para las fases A y C).

4 480Y/277 es aplicable para las siguientes tensiones 380Y/220, 400Y/230 y 415Y/240.

5 480 V en delta es también aplicable para las siguientes tensiones: 480Y/277V HRG.

6 600 V en delta es también aplicable para las siguientes tensiones: 600Y/347V HRG.

Tabla 5: Cables de repuesto para la pantalla de visualización de diagnóstico

TVS19PCK	Tres cables de 48,3 cm (19 pulg)
TVS36PCK	Tres cables de 91,4 cm (36 pulg)
TVS60PCK	Tres cables de 152,4 cm (60 pulg)
TVS192PCK	Tres cables de 487,7 cm (192 pulg)

Alarma audible

Pulse el botón de activación/desactivación de la alarma para activarla o desactivarla (vea la figura 9). Cuando el LED verde designado para la alarma está iluminado, la alarma está activada. Cuando el LED verde designado para la alarma no está iluminado, la alarma está desactivada.

Contador de sobretensiones transitorias

El contador de sobretensiones transitorias muestra la cantidad de sobretensiones transitorias que ocurrieron desde la última vez que se puso el contador en ceros. El contador está equipado con pilas para retener la memoria en caso de una pérdida de alimentación en el módulo IMA. Para poner el contador de sobretensiones transitorias en ceros, primero desconecte todas las fuentes de alimentación y luego presione el conmutador pequeño ubicado dentro de la unidad debajo de la tarjeta de circuitos de diagnóstico junto a los conectores de la pantalla de diagnóstico (consulte también la figura 10). Esto pondrá el contador en ceros.

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Contactos secos

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Emplee el alambrado para contactos secos de 600 V~ nominales.
- El alambrado para contactos secos deberá tener una sección de cable desnudo de menos de 1,6 mm (1/16 pulg) desde el bloque de contactos secos.
- Mantenga una separación de por lo menos 25,4 mm (1 pulg) entre el alambrado de los contactos secos y el alambrado de la alimentación en el gabinete.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

El SPD serie IMA viene con contactos secos. La conexión para los contactos secos se encuentra en la parte posterior de la pantalla de visualización de diagnóstico (esquina inferior derecha, consulte la figura 10) y aceptará cables trenzados o alambre sencillo de tamaño 22 a 14 AWG. Los contactos secos forma C son de tres posiciones: normalmente abierto, normalmente cerrado y común.

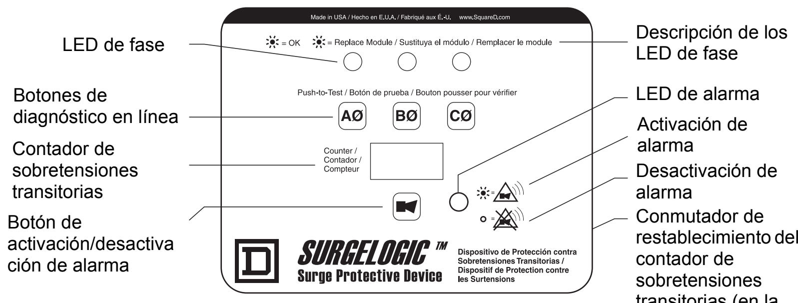
En el estado desenergizado el contacto está cerrado entre las terminales NC y COM. Esto es también la condición de alarma. El estado opuesto, cerrado entre las terminales NA y COM, indica que la unidad está energizada y que no existe ninguna condición de alarma (consulte la tabla 6).

Estos contactos se utilizan para proporcionar información remota sobre el estado de funcionamiento del SPD a una tarjeta de interfaz con la computadora o a un sistema de gestión de emergencia. Asimismo, estos contactos han sido diseñados para funcionar con la opción de monitor remoto del SPD, descrita en la siguiente sección.

Tabla 6: Configuración de los contactos secos

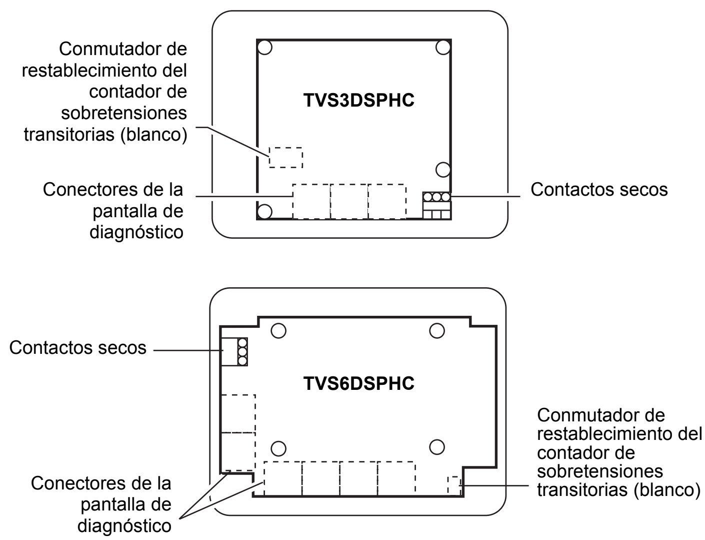
Terminales de los contactos de alarma	Estado de los contactos energizados
NA a COM	Cerrado
NC a COM	Abierto

Figura 9: Pantalla de diagnóstico de tres fases con contador de sobretensiones transitorias



NOTA: La fase B no está presente en las aplicaciones monofásicas.

Figura 10: Parte posterior de la tarjeta de circuitos de diagnóstico



Deberá proceder con cuidado al instalar los cables de los contactos secos ya que las terminales se encuentran ubicadas en una puerta móvil. Evite la bisagra de la puerta, los interruptores/conmutadores y áreas de alta tensión del gabinete al dirigir los cables. Para evitar la bisagra de la puerta, amarre y enrede los cables de los contactos secos en el arnés para cables existente que cruza la bisagra. Una vez que los cables de los contactos secos están bien sujetos en un punto sin movimiento del gabinete, es responsabilidad del usuario mantener una separación de por lo menos 25,4 mm (1 pulgada) entre el alambrado de los contactos secos de 600 V~ nominales y el alambrado de alimentación en el gabinete.

Estos contactos secos han sido diseñados para una tensión máxima de 24 V⎓/ 24 V~ y una corriente máxima de 2 A. Es posible que las aplicaciones que necesiten mayor energía tengan que agregar un relevador adicional fuera del SPD. Daños al relevador del SPD causados por niveles de energía mayores que los valores sugeridos en este boletín de instrucciones no están cubiertos por la garantía. Si tiene alguna pregunta con respecto a la aplicación, póngase en contacto con el grupo de asistencia técnica Surgelogic llamando al 01-800 724 634 337 en México (o bien al 1-800-577-7353 en EUA).

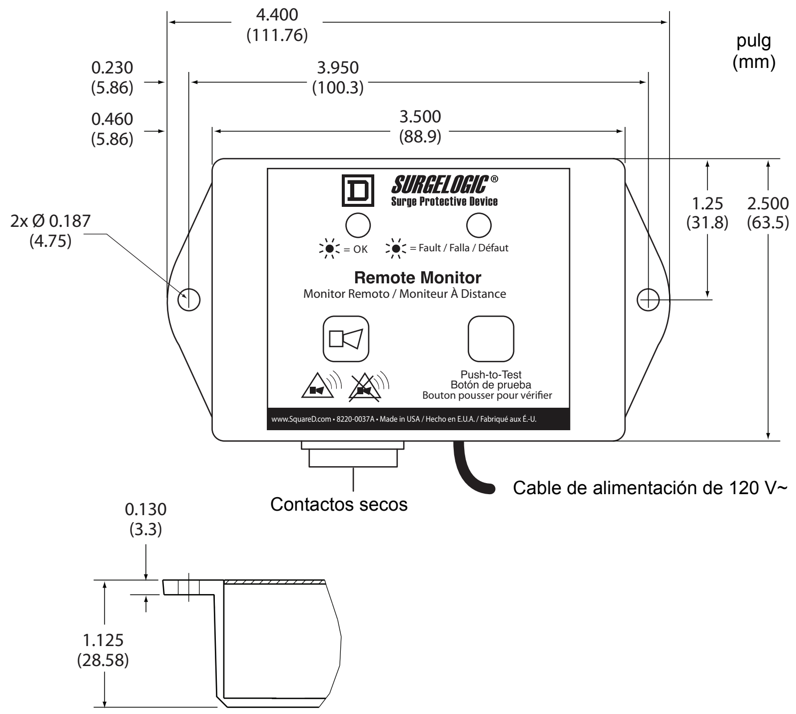
Monitor remoto opcional

La opción de monitor remoto tiene dos LED, uno rojo y el otro verde, así como una alarma audible con un conmutador de activación/desactivación. Durante un estado normal, el LED verde estará iluminado y no sonará la alarma. Para probar la integridad del monitor remoto, presione el botón de prueba. Si la alarma está activada, el LED verde se apagará, el LED rojo se iluminará y la alarma sonará. Al soltar el botón de prueba terminará la prueba; el LED rojo se apagará, el LED verde se iluminará y la alarma se apagará.

Si se llegase a perder la supresión de alguna fase; el LED verde se apagará, el LED rojo se iluminará y la alarma sonará. La alarma audible se puede apagar presionando el botón de activación/desactivación. La alarma dejará de sonar y el LED verde designado para la alarma no se iluminará. El LED rojo continuará iluminado hasta que se restablezca la condición de inoperabilidad.

El monitor remoto incluye un adaptador de 120 V~ a 12 V c.d. con un cable de alimentación de 1,83 m (6 pies). Las conexiones a la pantalla de diagnóstico del SPD se realizan con los contactos secos forma C de tres posiciones (incluidos) y un conductor de 0,33 a 2,1 mm^2 (22 a 14 AWG), alambre sencillo o cable trenzado de longitud apropiada de 305 m (1 000 pies), no incluido.

Figura 11: Monitor remoto opcional (TVS12RMU)



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Servicio de mantenimiento y diagnóstico de problemas

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA/Z462 de CSA y NOM-029-STPS.
- Solamente el personal eléctrico calificado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desconecte toda la alimentación del equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.
- Este equipo deberá estar correctamente conectado a tierra de acuerdo con los códigos aplicables. Utilice un conductor de conexión a tierra del equipo para conectar este último a la tierra del sistema de alimentación.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

Servicio de mantenimiento preventivo

Realice una inspección visual periódica al SPD para mantener un funcionamiento confiable del sistema y una supresión continua de sobretensiones transitorias. También, revise periódicamente el estado de los indicadores LED de la pantalla de diagnóstico. Rutinariamente, utilice los indicadores de diagnóstico incorporados para detectar los módulos inoperantes.

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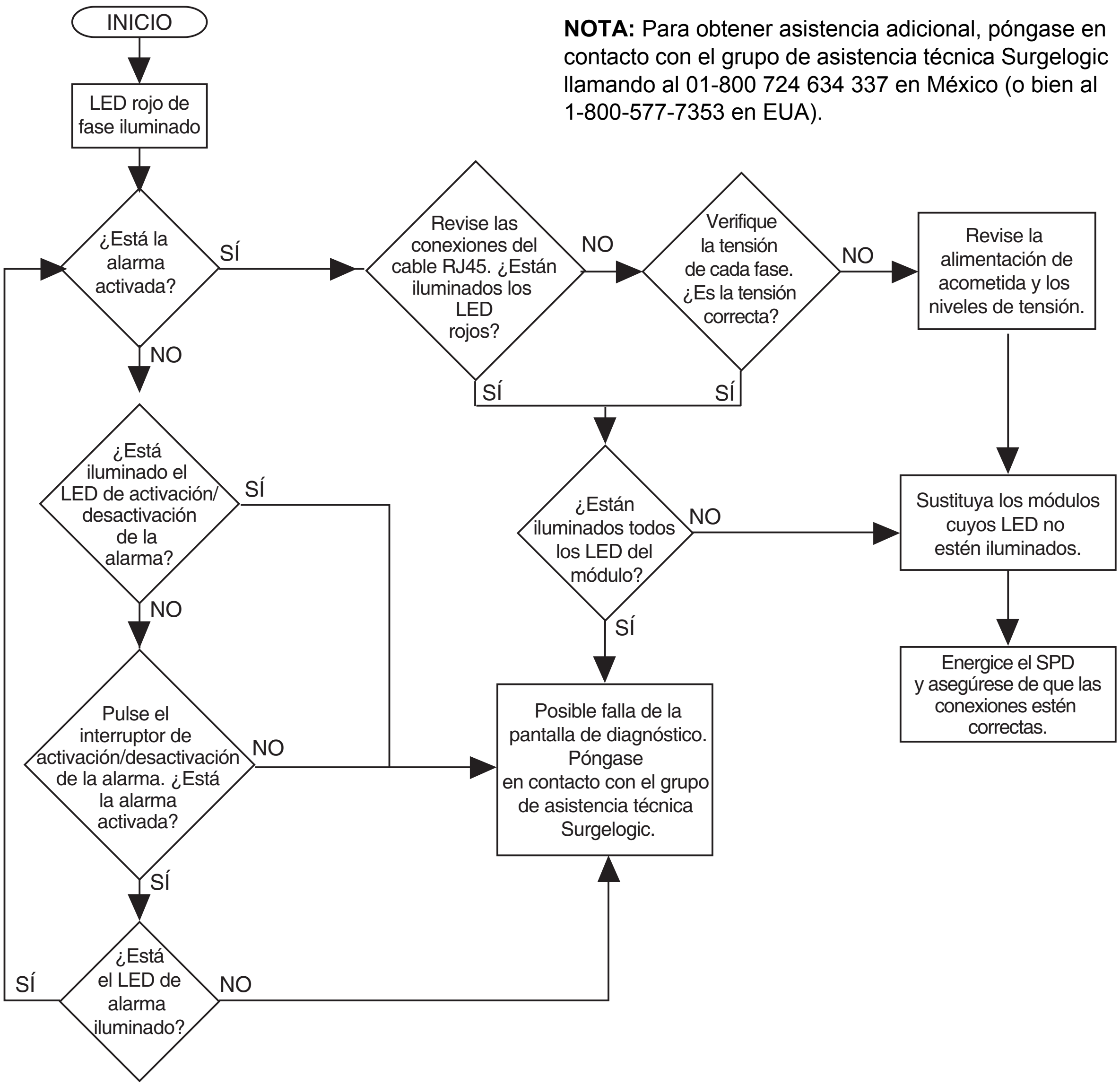
Diagnóstico de problemas

Si un módulo muestra dos luces indicadoras en verde y la pantalla muestra una luz indicadora de fase en rojo, consulte el cuadro de flujo de diagnóstico de problemas en la figura 12.

Figura 12: Cuadro de flujo de diagnóstico de problemas

NOTA: Para obtener asistencia adicional, póngase en contacto con el grupo de asistencia técnica Surgelogic llamando al 01-800 724 634 337 en México (o bien al 1-800-577-7353 en EUA).



Piezas de repuesto

Las siguientes piezas de repuesto se encuentran disponibles. Para obtener información sobre pedidos, póngase en contacto con su distribuidor local, o bien consulte el catálogo de productos.

- Módulos MA. Se incluyen las instrucciones de sustitución con las piezas de repuesto.
- Ensambles de la pantalla de diagnóstico. Se incluyen las instrucciones de sustitución con las piezas de repuesto.

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55-5804-5000
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Normas, especificaciones y diseños pueden cambiar, por lo tanto pida confirmación de que la información de esta publicación está actualizada.

8222-0050, Rev. 01, 06/2016
Reemplaza 8222-0050G, 05/2013

Surgelogic^{MC}
Assemblage modulaire interne (IMA)
Dispositif de protection contre les surtensions transitoires (SPD)

Directives d'utilisation

8222-0050, Rév. 01, 06/2016

À conserver pour usage ultérieur.

FRANÇAIS

SQUARE D

by Schneider Electric

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Précautions

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E ou CSA Z462.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez toutes les alimentations à cet appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.
- Cet appareil doit être effectivement mis à la terre selon tous les codes en vigueur. Utilisez un conducteur de m.à.l.t. d'appareil pour raccorder celui-ci à la terre du système d'alimentation.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

⚠ ATTENTION

PERTE D'ALIMENTATION DU CIRCUIT DE DÉRIVATION/PERTE DE SUPPRESSION DES SURTENSIONS TRANSITOIRES

- Effectuez une inspection périodique des voyants d'état du SPD comme partie du programme d'entretien préventif.
- Réparez promptement le SPD en présence d'un état d'alarme.
- Utilisez des contacts secs pour signaler un état d'alarme au système de surveillance central pour les installations sans intervention humaine, inaccessibles ou critiques.
- Utilisez plusieurs SPD pour obtenir une redondance pour les applications critiques.

Si ces directives ne sont pas respectées, cela peut entraîner des blessures ou des dommages matériels.

Dans les conditions de fin de vie utile, les dispositifs de protection contre les surtensions transitoires (SPD) peuvent perdre la capacité de blocage de la tension du système d'alimentation et essayer de consommer un courant de ligne excessif. Ce SPD est muni des composants de surintensité et surchauffe qui déconnectent de l'alimentation électrique les éléments de suppression de surtensions transitoires si ces éléments atteignent la fin de leur vie utile. Un déclenchement du fusible ou disjoncteur de dérivation alimentant le SPD peut se produire lorsque les éléments de suppression de surtensions transitoires atteignent la fin de leur vie utile.

⚠ ATTENTION

PERTE DE SUPPRESSION DES SURTENSIONS TRANSITOIRES

- Ne mettez pas les dispositifs de protection contre les surtensions transitoires sous tension avant que le système électrique soit complètement installé, inspecté, essayé et que tous les conducteurs soient raccordés et fonctionnels, y compris le neutre.
- Vérifiez la tension nominale du dispositif et du système avant de mettre sous tension le dispositif de protection contre les surtensions transitoires.
- Effectuez un essai d'isolation à potentiel élevé ou tous autres essais où des composants du dispositif de protection contre les surtensions transitoires seront soumis à des tensions supérieures à leur tension nominale de mise sous tension, avec le neutre et le SPD déconnectés de la source d'alimentation.

Si ces directives ne sont pas respectées, cela peut entraîner des blessures ou des dommages matériels.

Introduction

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E ou CSA Z462.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez toutes les alimentations à cet appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.
- Cet appareil doit être effectivement mis à la terre selon tous les codes en vigueur. Utilisez un conducteur de m.à.l.t. d'appareil pour raccorder celui-ci à la terre du système d'alimentation.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

REMARQUE : Pour les besoins de dépannage, appeler le groupe d'assistance technique Surgelogic au 1-800-577-7353 (É.-U.).

Une bonne installation est impérative pour obtenir l'efficacité et le rendement maximaux du SPD type IMA. Suivre les points indiqués dans ces directives d'utilisation afin d'assurer une installation correcte. Lire les directives d'utilisation en entier avant de commencer l'installation. Ces directives ne sont pas destinées à remplacer les codes d'électricité nationaux ou locaux. Consulter tous les codes d'électricité en vigueur pour vérifier la conformité. L'installation des dispositifs modulaires de protection contre les surtensions transitoires ne doit être effectuée que par des électriciens qualifiés.

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Déballage et inspection préliminaire

Inspecter entièrement l'emballage d'expédition pour détecter d'éventuels dommages ou signes de mauvaise manutention avant de déballer le dispositif. Retirer les matériaux d'emballage et inspecter encore le dispositif afin de s'assurer qu'il n'a subi aucune détérioration au cours du transport. En cas de dommages résultant du transport ou de la manutention, remplir immédiatement un bordereau de réclamation destiné à l'entreprise de transport.

Entreposage

Le dispositif doit être entreposé dans un endroit propre et sec. La température d'entreposage est de -40 à +65 °C (-40 à +149 °F). Tous les matériaux d'emballage doivent être conservés intacts jusqu'à ce que le dispositif soit prêt à être installé.

Étiquettes de sécurité

Les versions en anglais/espagnol/français de toutes les étiquettes de sécurité (danger, avertissement et attention) sont fournies.

Considérations sur l'emplacement

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Environnement

Le dispositif est conçu pour fonctionner dans une gamme de températures ambiantes de -20 à +65 °C (-4 à +149 °F) avec une humidité relative de 0 à 95 % sans condensation. La température de fonctionnement de l’affichage à cristaux liquides (ACL) sur le panneau de surveillance des diagnostics est de -10 à +60 °C (+14 à +140 °F). Se reporter au catalogue des produits pour plus de détails sur les coffrets. Tous les dispositifs IMA fonctionnent normalement sans réduction de rendement lorsqu'ils subissent des chocs ou vibrations décrits dans IEC 60721-3-3, Classe 3M4.

Bruit audible

Le bruit de fond du dispositif est négligeable et ne limite pas l'emplacement d'installation.

Montage

Se reporter à la page 14 pour les dimensions de montage typiques.

Dégagement pour l'entretien

Le dégagement pour l'entretien doit répondre à toutes les exigences des codes en vigueur.

Rendement de l'appareil

Pour obtenir le rendement maximum du système, placer le dispositif aussi près que possible du circuit concerné afin de réduire au minimum la longueur du câblage d'interconnexion. Pour chaque pied (30 cm) de longueur de fil, environ 160 V (6kV/3kA, 8/20 microsecondes) sont ajoutés à la tension supprimée. Le niveau de protection en tension (VPR) est indiqué sur la plaque signalétique du dispositif et est mesuré à 152 mm (6 po) à partir des bornes du dispositif, selon UL® 1449.

Caractéristiques électriques

Tension nominale

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC

Assurez-vous que la tension nominale du SPD sur le module ou la plaque signalétique est la même que la tension de fonctionnement.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Avant de monter le SPD, vérifier s'il possède la même tension nominale que le système de distribution d'alimentation dans lequel il est installé. Comparer la tension de la plaque signalétique sur le SPD avec la tension de la plaque signalétique de l'appareil de distribution électrique.

Le spécificateur ou utilisateur du dispositif doit être familier avec la configuration et l'agencement du système de distribution d'alimentation dans lequel un SPD doit être installé. La configuration d'un système de distribution d'alimentation est strictement basée sur la façon dont les bobinages secondaires du transformateur assurant l'alimentation du secteur ou de la charge d'entrée de service sont configurés. Ceci oblige à déterminer si les bobinages du transformateur sont ou non reliés à la terre par un conducteur de m.à.l.t. La configuration du système n'est pas basée sur la façon dont une charge ou un appareil spécifique est raccordé à un système de distribution d'alimentation particulier. Voir le tableau 1 pour la tension de service de chaque SPD.

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Tableau 1 : Tension nominale

Tension de service	Courant nominal de surtension de crête par phase	Numéros de catalogue[1]
120/240 V, monophasée, 3 fils + terre	120	TVS1IMA12_
	160	TVS1IMA16_
	240	TVS1IMA24_
	320	TVS1IMA32_
	480	TVS1IMA48_
208Y/120 V, triphasée, 4 fils + terre[2], étoile	120	TVS2IMA12_
	160	TVS2IMA16_
	240	TVS2IMA24_
	320	TVS2IMA32_
	480	TVS2IMA48_
240/120 V, triphasée, 4 fils + terre, sommet du triangle (High Leg Delta)	120	TVS3IMA12_
	160	TVS3IMA16_
	240	TVS3IMA24_
	320	TVS3IMA32_
	480	TVS3IMA48_
480Y/277 V, triphasée, 4 fils + terre[3], étoile	120	TVS4IMA12_
	160	TVS4IMA16_
	240	TVS4IMA24_
	320	TVS4IMA32_
	480	TVS4IMA48_

Suite–

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Tableau 1 : Tension nominale

Tension de service	Courant nominal de surtension de crête par phase	Numéros de catalogue[1]
480 V, triphasée, 3 fils + terre Triangle [4]	100	TVS5IMA10_
	120	TVS5IMA12_
	160	TVS5IMA16_
	200	TVS5IMA20_
	240	TVS5IMA24_
	320	TVS5IMA32_
	480	TVS5IMA48_
240 V, triphasée, 3 fils + terre Triangle	100	TVS6IMA10_
	120	TVS6IMA12_
	160	TVS6IMA16_
	200	TVS6IMA20_
	240	TVS6IMA24_
	320	TVS6IMA32_
	480	TVS6IMA48_
600Y/347 V, triphasée, 4 fils + terre, étoile	120	TVS8IMA12_
	160	TVS8IMA16_
	240	TVS8IMA24_
	320	TVS8IMA32_
	480	TVS8IMA48_
600 V, triphasée, 3 fils + terre Triangle [5]	100	TVS9IMA10_
	120	TVS9IMA12_
	160	TVS9IMA16_
	180	TVS9IMA18_
	200	TVS9IMA20_
	240	TVS9IMA24_
	320	TVS9IMA32_

1 Les numéros de catalogue sont représentatifs. Les numéros de catalogue réels exigent un suffixe pour indiquer le type UL.

2 208Y/120 V s'applique aussi à la tension 220Y/127.

3 480Y/277 s'applique aux tensions suivantes : 380Y/220, 400Y/230, 415Y/240.

4 480 V en triangle s'applique également aux tensions suivantes : 480Y/277V HRG

5 600 V en triangle s'applique également aux tensions suivantes : 600Y/347V HRG

Couple de serrage des bornes et calibre du fil

Des bornes sont fournies pour les raccordements de phase (ligne), du neutre et de mise à la terre de l'appareil. Les bornes IMA acceptent des fils en cuivre d'un calibre allant de 12 AWG à 2 AWG pour les connecteurs des phases, du neutre et de m.à.l.t.

Tableau 2 : Couple de serrage de bornes

Raccordements d'alimentation	Couple de serrage
AØ, BØ, CØ et N	35 lb-po (4 N•m)
Terre	

Protection contre les surintensités du circuit de dérivation

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC

- Utilisez des conducteurs de valeur nominale adéquate pour le dispositif de protection contre les surintensités (OCPD) selon les codes en vigueur.
- Utilisez des conducteurs de valeur nominale adéquate pour l'application selon les codes en vigueur.

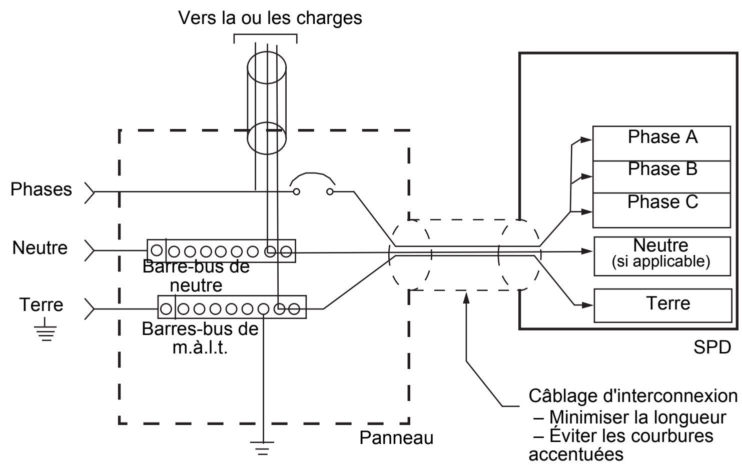
Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Les SPD, UL 1449 type 1, ont été conçus et approuvés pour les applications côté ligne avant le sectionneur de service principal sans protection supplémentaire contre les surintensités. Les SPD type 2 doivent être installés sur le côté charge du dispositif de protection contre les surintensités (OCPD) principal. Toutes les installations doivent fournir ou comprendre un moyen de déconnexion.

Emplacement du SPD

Placer le SPD aussi près que possible du circuit concerné afin de minimiser la longueur de fil et de maximiser le rendement du SPD. Éviter les longs cheminements de fils de façon à ce que le dispositif fonctionne comme prévu. Pour réduire l'impédance que le fil affiche aux courants de surtension, les conducteurs des phases, du neutre et de m.à.l.t. doivent être acheminés dans le même conduit et groupés ou torsadés ensemble de façon serrée pour optimiser le rendement du dispositif. Éviter les courbures accentuées sur les conducteurs. Voir la figure 1.

Figure 1 : Méthode de câblage du dispositif de protection contre les surtensions transitoires



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Mise à la terre

⚠ AVERTISSEMENT

TENSION DANGEREUSE AU CONTACT

- Raccordez la borne de m.à.l.t. du SPD à la structure de la grille de m.à.l.t. de l'immeuble.
- Utilisez un conducteur de m.à.l.t. de calibre approprié pour l'appareil.
- En cas d'utilisation d'une canalisation ou d'un conduit métallique :
  - — N'employez pas de manchons d'isolation pour interrompre l'acheminement d'une canalisation ou conduit métallique.
  - — Maintenez une continuité électrique à tous les raccordements de la canalisation et du conduit en utilisant les dispositifs de raccordement appropriés.
- N'utilisez pas une m.à.l.t. isolée séparée pour le dispositif de type assemblage modulaire interne (IMA).
- Vérifiez si le raccordement du matériel au système de m.à.l.t. est adéquat.
- Vérifiez la continuité de la grille de m.à.l.t. en effectuant régulièrement les inspections programmées et en faisant des essais comme partie du programme complet d'entretien électrique.

Si ces directives ne sont pas respectées, cela peut entraîner la mort ou des blessures graves.

Généralités

Le type IMA possède des éléments du SPD raccordés de la phase à la terre. Il est essentiel qu'il existe un raccordement robuste et efficace à la structure de m.à.l.t. de l'immeuble. Le raccordement de m.à.l.t. doit utiliser un conducteur de m.à.l.t. d'appareil acheminé avec le raccordement de phase et de neutre du système d'alimentation. Ne pas raccorder le SPD à une terre isolée séparée.

Pour assurer la meilleure suppression des surtensions par le SPD type IMA, utiliser un système de m.à.l.t. à un seul point, où le système d'électrode de m.à.l.t. de l'entrée de service est raccordé et fixé à toutes les autres électrodes disponibles, à l'acier de l'immeuble, aux tuyaux métalliques d'eau, aux tiges guidées, etc. (pour référence, voir le Code national de l'électricité [NEC, É.-U.], article 250). La mesure de l'impédance de la m.à.l.t. du système électrique doit être aussi faible que possible et conforme à tous les codes en vigueur.

Mise à la terre du système d'alimentation

En plus de la configuration et de la tension du système d'alimentation, la méthode de m.à.l.t. du système d'alimentation doit être considérée lors de la sélection du dispositif IMA approprié. Se reporter au tableau suivant pour avoir des renseignements concernant la convenance du dispositif IMA sur la méthode de m.à.l.t. spécifique au système d'alimentation.

Tableau 3 : Méthodes de mise à la terre

Nº de catalogue du dispositif IMA	Méthode de m.à.l.t. du système d'alimentation
TVS1IMA__	Mise à la terre directe
TVS2IMA__	
TVS3IMA__	
TVS4IMA__	
TVS8IMA__	
TVS5IMA__	Flottant / mise à la terre à résistance élevée (HRG)
TVS6IMA__	
TVS9IMA__	

Système d'alimentation avec mise à la terre directe

⚠ ATTENTION

ENDOMMAGEMENT DU SPD ET SURTENSION DU SYSTÈME D'ALIMENTATION

- Ne raccordez pas les dispositifs classés pour une utilisation sur des systèmes d'alimentation avec mise à la terre directe à des systèmes d'alimentation avec mise à la terre à résistance (par exemple, HRG) ou non mis à la terre!
- Vérifiez si l'appareil d'entrée de service est relié à la terre conformément à tous les codes en vigueur.
- Vérifiez si la borne du neutre du transformateur du système d'alimentation qui alimente le dispositif est reliée à la terre du système conformément à tous les codes en vigueur.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

Les dispositifs SPD classés pour une utilisation sur des systèmes d'alimentation avec mise à la terre directe ne doivent pas être raccordés à des systèmes d'alimentation avec mise à la terre à résistance ou non mis à la terre. Un tel raccordement peut entraîner l'endommagement du SPD.

Toujours vérifier la configuration de la m.à.l.t. du système d'alimentation avant de mettre le dispositif sous tension. S'assurer que tous les raccordements à la terre sont installés sur l'appareil d'entrée de service ainsi que sur le transformateur du système d'alimentation avant de mettre sous tension.

Systèmes d'alimentation mise à la terre à résistance et en triangle

⚠ ATTENTION

ENDOMMAGEMENT DU SPD ET SURTENSION DU SYSTÈME D'ALIMENTATION

- Les systèmes d'alimentation sans mise à la terre (systèmes flottants) sont, par inhérence, instables et peuvent produire des tensions phase-terre excessivement hautes pendant certaines conditions de défaut. Pendant ces conditions de défaut, tout appareillage électrique, y compris un dispositif de protection contre les surtensions (SPD), peut être soumis à des tensions qui dépassent ses capacités nominales. Ces informations sont fournies à l'utilisateur de sorte qu'une décision fondée puisse être prise avant d'installer un appareillage électrique sur un système d'alimentation non mis à la terre (systèmes flottants).
- Les systèmes d'alimentation avec mise à la terre à résistance doivent être maintenus dans un état suramorti afin de limiter le dépassement et la durée de la tension pendant le fonctionnement.
- La vérification et l'ajustement de l'amortissement du système d'alimentation doivent être effectués:
  - — Périodiquement comme partie de l'entretien normal du système.
  - — En observant les modifications du système d'alimentation.

Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.

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Le dispositif IMA avec est destiné à une utilisation sur des systèmes d’alimentation avec mise à la terre à résistance où le système d’alimentation a été réglé pour et maintenu dans un état suramorti. Pour que le système d’alimentation soit suramorti, le courant traversant la résistance de m.à.l.t. pendant un défaut phase-terre franc doit être notablement plus important que le courant de chargement total du système.

Une évaluation périodique d’ingénierie du système d’alimentation est requise pour déterminer le courant de chargement du pire cas du système et pour ajuster la résistance de m.à.l.t. en conséquence. Quand le système d’alimentation est modifié, la valeur de la résistance de m.à.l.t. doit être évaluée et réglée afin de maintenir le système en état suramorti.

Installation

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E ou CSA Z462.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez toutes les alimentations à cet appareil avant d’y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.
- Cet appareil doit être effectivement mis à la terre selon tous les codes en vigueur. Utilisez un conducteur de m.à.l.t. d'appareil pour raccorder celui-ci à la terre du système d'alimentation.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Conditions d’acceptabilité de UL

Pour une utilisation seulement avec un appareil pour lequel l’acceptabilité de la combinaison est déterminée par UL (Underwriters Laboratories®). En cas d’installation dans un appareil utilisé par un particulier, les considérations qui suivent sont parmi celles qui doivent être prises en compte :

1. Un coffret électrique adéquat sera fourni dans le produit de l’utilisateur particulier.
2. Le dispositif est prévu pour un câblage d’usine uniquement avec des raccordements adéquats (incluant les espaces entre les connecteurs d’usine) déterminés dans l’application de l’utilisateur.
3. Le niveau de protection en tension (VPR) sera déterminé dans le produit final où elle s’applique.
4. Le SPD a subi les essais suivants de UL1449:
   a. Essai de surtensions transitoires (VPR)
   b. Essai de décharge nominale (20 kA)
   c. Essai de tension de fonctionnement
   d. Résistance de tension diélectrique
   e. Essais de courant (courant de court-circuit, courants intermédiaires, courants limités)

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5. Les composants du SPD ont été évalués pour les essais de courant nominal de court-circuit (SCCR), selon UL 1449, à un courant de défaut disponible de 200 kA RMS, sans dispositif de protection contre les surintensités (OCPD) ni de coffrets externes.

Câblage

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez toutes les alimentations à cet appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.
- Cet appareil doit être effectivement mis à la terre selon tous les codes en vigueur. Utilisez un conducteur de m.à.l.t. d'appareil pour raccorder celui-ci à la terre du système d'alimentation.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC

Assurez-vous que la tension nominale du SPD sur le module ou la plaque signalétique est la même que la tension de fonctionnement.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Suivre les points ci-dessous lors des raccordements de câblage :

1. Couper toute alimentation vers cet appareil avant de travailler sur ou à l'intérieur du coffret contenant cet appareil.
2. S'assurer que la tension nominale et la configuration du SPD sont les mêmes que la tension et la configuration du système d'alimentation auquel il sera raccordé.
3. Identifier l'emplacement approprié pour le dispositif de protection contre les surtensions transitoires. Le placer aussi près que possible du panneau concerné de façon à ce que les fils soient aussi courts que possible. Monter l'unité en toute sécurité.

   REMARQUE : Le dispositif de protection contre les surtensions transitoires doit être installé dans un endroit accessible comme décrit dans le NEC (É.-U).

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4. Installer conformément aux codes nationaux et locaux concernant les recommandations de protection contre les surintensités et les considérations de courant admissible des fils.

   REMARQUE : Le raccordement du neutre n'est pas présent sur les systèmes d'alimentation mise à la terre à 2 fils monophasée ou en étoile mise à la terre à 3 fils triphasée. Pour ces systèmes, relier les cosses de neutre et de terre ensemble dans le SPD. Pour un SPD à système de m.à.l.t à résistance élevée (HRG) ou en triangle, aucun raccordement de neutre n'existe. Pour le câblage d'installation, voir les figures 3 à 6.

   REMARQUE : Se reporter au tableau 2 et à la section « Couple de serrage des bornes et calibre du fil » à la page 7 pour obtenir le calibre de fil et le couple d'installation recommandés.

5. Torsader les conducteurs de 1/2 tour ou plus par 305 mm (12 po) de longueur. Ne pas faire de boucles et ne pas enrouler les fils. Prendre soin de maintenir l'espace de courbure des fils adéquat selon le NEC.
6. Si les contacts de signalisation à distance du panneau de surveillance des diagnostics doivent être utilisés, se reporter à la section « Contacts secs » à la page 19 pour les directives de câblage.
7. Sur une installation en sommet de triangle, noter le raccordement en sommet selon le schéma de câblage. Voir la figure 5.
8. Replacer tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension. Si le SPD est correctement installé et fonctionne, les voyants DÉL verts du panneau de surveillance s'allument.

Pour toutes questions concernant l'installation de ce dispositif, appeler le groupe d'assistance technique Surgelogic au 1-800-577-7353 (É.-U.).

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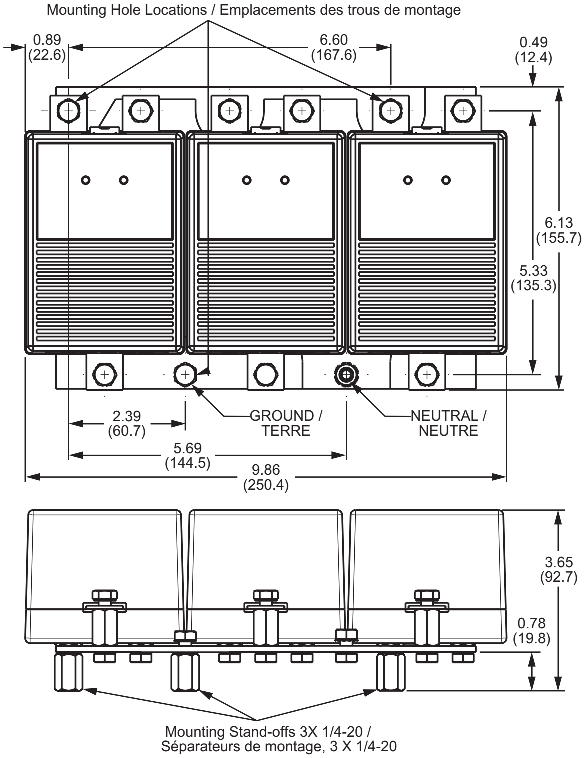
Figure 2 : Dimensions et montage

po
(mm)



REMARQUE : Le raccordement du neutre ne sera pas présent sur des configurations en triangle et à m.à.l.t. de haute résistance (HRG).

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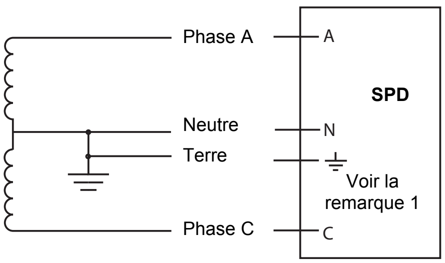
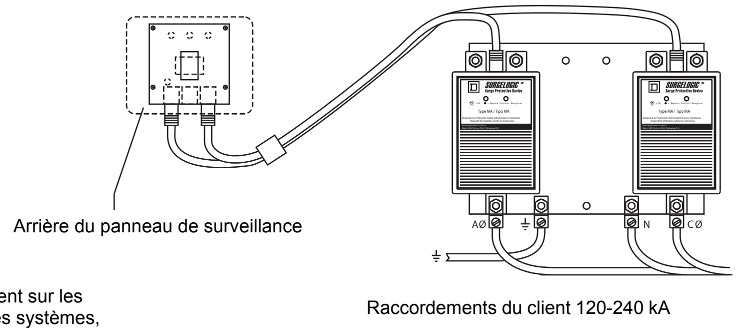
Schémas de câblage

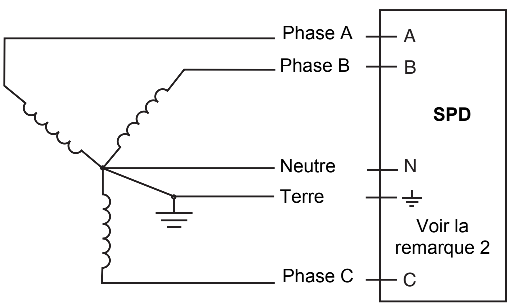
Figure 3 : Installation mise à la terre, monophasée à 3 fils avec interrupteur intégré

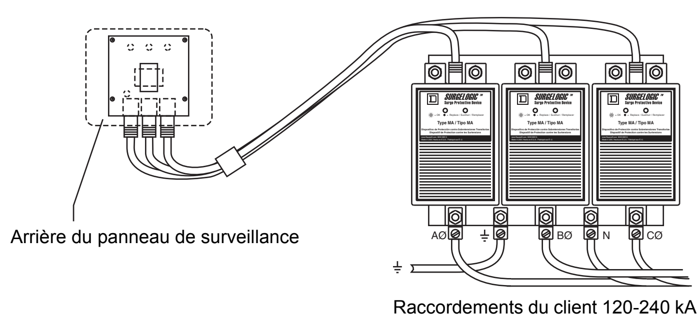




REMARQUE 1 : Le conducteur de neutre peut ne pas être présent sur les systèmes d'alimentation de neutre mis à la terre à 3 fils. Pour ces systèmes, attacher les cosses de neutre et de m.à.l.t. du SPD ensemble.

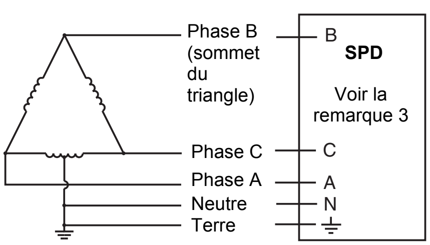
Figure 4 : Installation en étoile mise à la terre, triphasée à 3 ou 4 fils

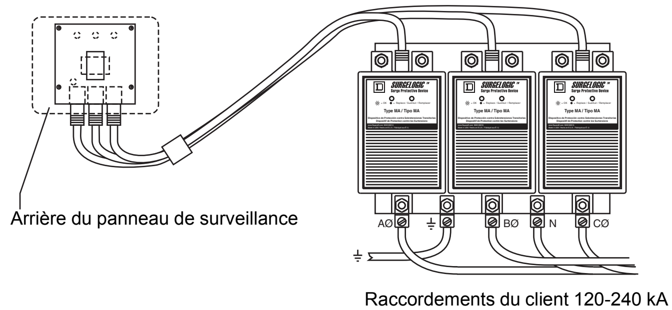




REMARQUE 2 : Le conducteur de neutre n'est pas présent sur les systèmes d'alimentation de neutre mis à la terre à 3 fils. Pour ces systèmes, attacher les cosses de neutre et de m.à.l.t. du SPD ensemble.

Figure 5 : Installation en sommet de triangle triphasée, à 3 ou 4 fils





REMARQUE 3 : Le sommet du triangle du système d'alimentation doit se raccorder à la phase B du SPD. Le conducteur de neutre n'est pas présent sur les systèmes d'alimentation de neutre mis à la terre à 3 fils. Pour ces systèmes, attacher les cosses de neutre et de m.à.l.t. du SPD ensemble.

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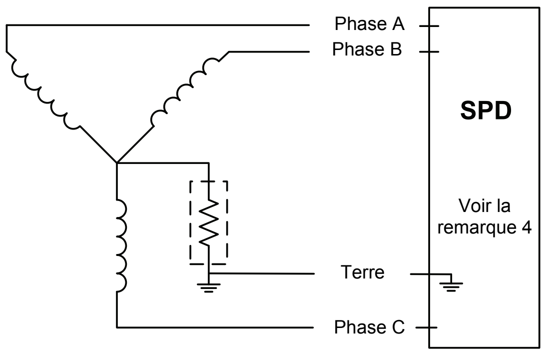
Schémas de câblage pour systèmes de m.à.l.t à résistance élevée (HRG) et en triangle

Figure 6 : Installation en étoile d'un système de m.à.l.t. de haute résistance (HRG)

REMARQUE 4 : Le conducteur de neutre n'est pas présent sur les systèmes d'alimentation mis à la terre en étoile HRG.



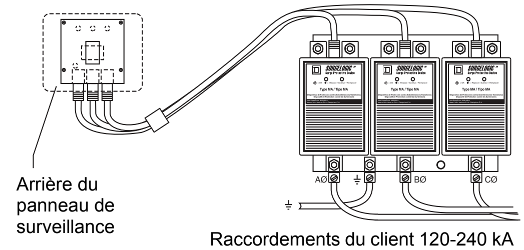
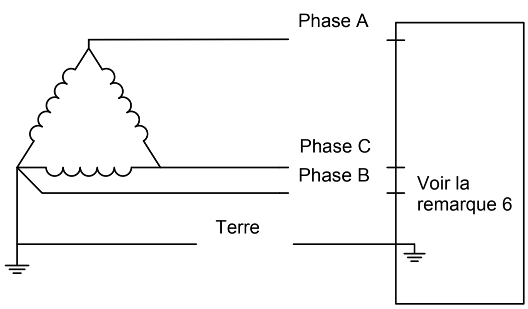


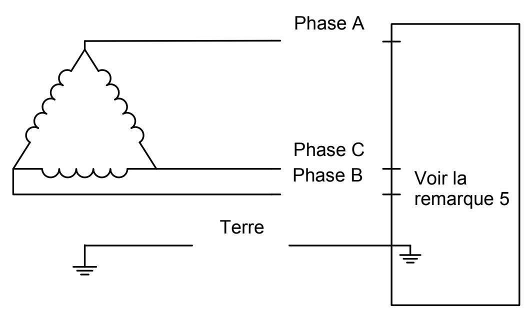
Figure 7 : Installation en triangle, triphasée à 3 fils + terre

REMARQUE 5 : Le raccordement à la terre d'un SPD en triangle sera raccordé au conducteur de m.à.l.t. du système. Le conducteur du neutre n'est pas présent sur les systèmes en triangle.

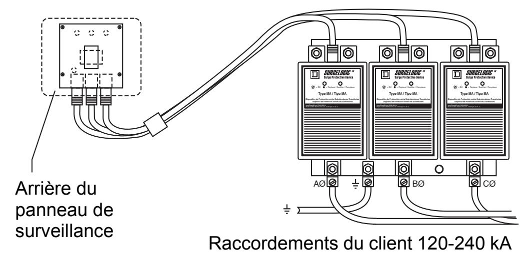
Système en triangle m.à.l.t. par le coin



Système en triangle flottant



REMARQUE 6 : Le raccordement à la terre d'un SPD en triangle sera raccordé au conducteur de m.à.l.t. du système. Le conducteur du neutre n'est pas présent sur les systèmes en triangle. La phase B du système électrique est typiquement la phase mise à la terre.



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Fonctionnement

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E ou CSA Z462.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez toutes les alimentations à cet appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.
- Cet appareil doit être effectivement mis à la terre selon tous les codes en vigueur. Utilisez un conducteur de m.à.l.t. d'appareil pour raccorder celui-ci à la terre du système d'alimentation.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Indicateurs d'état DÉL

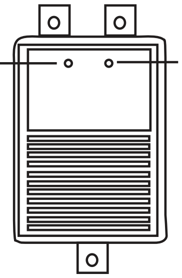
Le panneau de surveillance de diagnostics du SPD indique l'état de chaque module MA à l'aide de DÉL vertes/rouges contrôlées de façon diagnostique (voir la figure 8). Si un appareil fonctionne correctement, toutes les DÉL de phases s'allumeront en vert. Pour essayer l'intégrité des diagnostics pour chaque phase, appuyer sur le bouton sous les DÉL de phases sur le panneau de surveillance des diagnostics. La DÉL verte passe au rouge et l'alarme se fait entendre, si elle est activée. Relâcher le bouton d'essai termine l'essai; la DÉL rouge passe au vert et l'alarme s'arrête.

Si une condition de non fonctionnement se présente sur une phase, l'alarme sonore se déclenche et la DÉL de phase correspondante sur le panneau de surveillance des diagnostics s'allume au rouge. Cela indique que le dispositif a besoin d'être réparé par un personnel qualifié. L'alarme sonore peut être mise au silence, jusqu'à ce qu'une personne qualifiée soit capable d'évaluer et de réparer le SPD, en appuyant sur le bouton d'activation/désactivation de l'alarme. L'alarme s'arrêtera et la DÉL verte d'alarme ne s'allumera pas. La DÉL rouge de phase reste allumée jusqu'à ce que la condition de non fonctionnement soit corrigée.

Sur un module MA (voir la figure 8), si une DÉL n'est pas allumée, le module doit être remplacé. Si les deux DÉL vertes ne sont pas allumées et si le panneau de surveillance des diagnostics est sous tension, l'alimentation a été perdue pour cette phase ou le module doit être remplacé (se reporter au tableau 1 à la page 6). Se reporter aux directives d'utilisation de l'appareil pour la déconnexion du module MA et les directives d'accès.

Lorsqu'un SPD est mis sous tension et qu'une ou plusieurs DÉL du panneau de surveillance des diagnostics sont rouges, et qu'une ou plusieurs DÉL du module MA sont éteintes, le module MA approprié doit être remplacé. Se reporter à la section « Entretien et dépannage » à la page 22 pour connaître les procédures de dépannage appropriées et au tableau 4 pour les modules de rechange. Si les DÉL du module sont vertes et si les DÉL du panneau de surveillance de diagnostics sont rouges, appeler le groupe d'assistance technique Surgelogic au 1-800-577-7353 (É.-U.).

Figure 8 : DÉL du module MA



Modules de rechange

Tableau 4 : Modules IMA de rechange

Tension du système	Courant nominal de surtension de crête (kA)	Numéros de catalogue[1]		
		Phase A	Phase B	Phase C
120 V/240 V, monophasée, 3 fils + terre	120 160 240	MA1IMA12_ MA1IMA16_ MA1IMA24_	— — —	MA1IMA12_ MA1IMA16_ MA1IMA24_
208Y/120 V, triphasée, 4 fils + terre [2] en étoile	120 160 240	MA1IMA12_ MA1IMA16_ MA1IMA24_	MA1IMA12_ MA1IMA16_ MA1IMA24_	MA1IMA12_ MA1IMA16_ MA1IMA24_
120 V/240 V, triphasée, 4 fils + terre [3] sommet du triangle	120 160 240	MA1IMA12_ MA1IMA16_ MA1IMA24_	MA3IMA12_ MA3IMA16_ MA3IMA24_	MA1IMA12_ MA1IMA16_ MA1IMA24_
240 V, triphasée, 3 fils + terre en triangle	120 160 240	MA6IMA12_ MA6IMA16_ MA6IMA24_	MA6IMA12_ MA6IMA16_ MA6IMA24_	MA6IMA12_ MA6IMA16_ MA6IMA24_
480Y/277 V, triphasée, 4 fils + terre [4] en étoile	120 160 240	MA4IMA12_ MA4IMA16_ MA4IMA24_	MA4IMA12_ MA4IMA16_ MA4IMA24_	MA4IMA12_ MA4IMA16_ MA4IMA24_
480 V, triphasée, 3 fils + terre en triangle [5]	120 160 240	MA5IMA12_ MA5IMA16_ MA5IMA24_	MA5IMA12_ MA5IMA16_ MA5IMA24_	MA5IMA12_ MA5IMA16_ MA5IMA24_
600Y/347 V, triphasée, 4 fils + terre en étoile	120 160 240	MA8IMA12_ MA8IMA16_ MA8IMA24_	MA8IMA12_ MA8IMA16_ MA8IMA24_	MA8IMA12_ MA8IMA16_ MA8IMA24_
600 V, triphasée, 3 fils + terre en triangle [6]	120 160 180	MA9IMA12_ MA9IMA16_ MA9IMA18_	MA9IMA12_ MA9IMA16_ MA9IMA18_	MA9IMA12_ MA9IMA16_ MA9IMA18_

[1] Les numéros de catalogue sont représentatifs. Les numéros de catalogue réels exigent un suffixe pour indiquer le type UL.

[2] 208Y/120 s'applique aussi à la tension 220Y/127.

[3] Sommet du triangle (les modules de phase B sont différents des modules de phases A et C).

[4] 480Y/277 s'applique aux tensions suivantes : 380Y/220, 400Y/230, 415Y/240.

[5] 480 V en triangle s'applique également aux tensions suivantes : 480Y/277V HRG

[6] 600 V en triangle s'applique également aux tensions suivantes : 600Y/347V HRG

Tableau 5 : Câbles de rechange pour le panneau de surveillance des diagnostics

TVS19PCK	Trois câbles de 48,3 cm (19 po)
TVS36PCK	Trois câbles de 91,4 cm (36 po)
TVS60PCK	Trois câbles de 152,4 cm (60 po)
TVS192PCK	Trois câbles de 487,7 cm (192 po)

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Alarme sonore

Appuyer sur le bouton d'activation/désactivation de l'alarme pour activer ou désactiver celle-ci (voir la figure 9). Si la DÉL verte d'alarme est allumée, l'alarme est activée. Si la DÉL verte d'alarme est éteinte, l'alarme est désactivée.

Compteur de surtensions

Le compteur de surtensions affiche le nombre de surtensions transitoires depuis la dernière remise à zéro du compteur. Le compteur est alimenté par une pile qui permet de conserver les valeurs en mémoire en cas de perte d'alimentation du module IMA. Pour remettre à zéro le compteur de surtensions, couper l'alimentation et appuyer sur le petit interrupteur situé à l'intérieur de l'appareil, sur le dessous de la carte de circuits des diagnostics près des connecteurs du panneau de surveillance de diagnostics (consulter également la figure 10). Cela remet le compteur à zéro.

Contacts secs

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC

- Utilisez un câblage de contacts secs d'une tension nominale de 600 Vca.
- Un câblage de contacts secs doit avoir moins de 1,6 mm (1/16 po) de fil exposé depuis le bloc des contacts secs.
- Maintenez au moins 25,4 mm (1,0 po) de séparation entre le câblage de contacts secs et le câblage d'alimentation dans le coffret.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

Le SPD de la série IMA est fourni avec des contacts secs. Le raccordement pour les contacts secs se trouve à l'arrière du panneau de surveillance de diagnostics (coin inférieur droit, voir la figure 10) et acceptera un câble rigide ou toronné de calibre n^{o} 22 à n^{o} 14 AWG. Les contacts secs sont du type à 3 positions, de forme « C », avec des connexions normalement ouverte, normalement fermée et commune.

Dans l'état hors tension le contact est fermé entre les bornes NF et COM. Ceci est également la condition d'alarme. L'état opposé, fermé entre les bornes NO et COM, indique que l'appareil est sous tension et qu'il n'existe aucune condition d'alarme (voir le tableau 3).

Ces contacts peuvent être utilisés pour l'indication à distance de l'état de fonctionnement du SPD à une carte d'interface d'ordinateur ou à un système de gestion des urgences. En outre, ces contacts sont conçus pour fonctionner avec l'option de moniteur à distance du SPD décrite dans la section suivante.

Tableau 6 : Configuration des contacts secs

Bornes du contact d'alarme	État du contact hors tension
NO à COM	Fermé
NF à COM	Ouvert

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Figure 9 : Panneau de surveillance des diagnostics triphasé avec compteur de surtensions

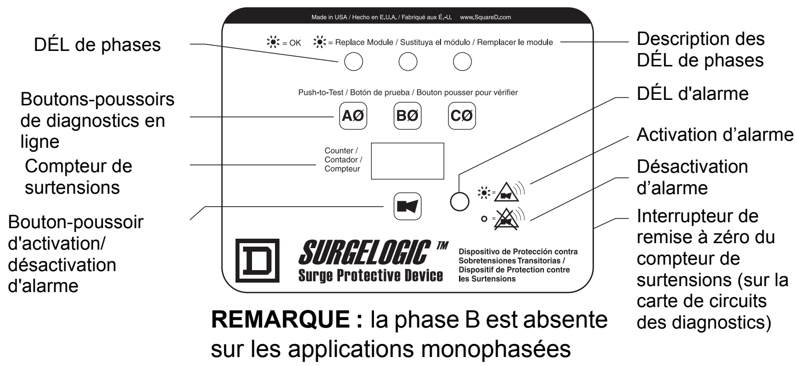
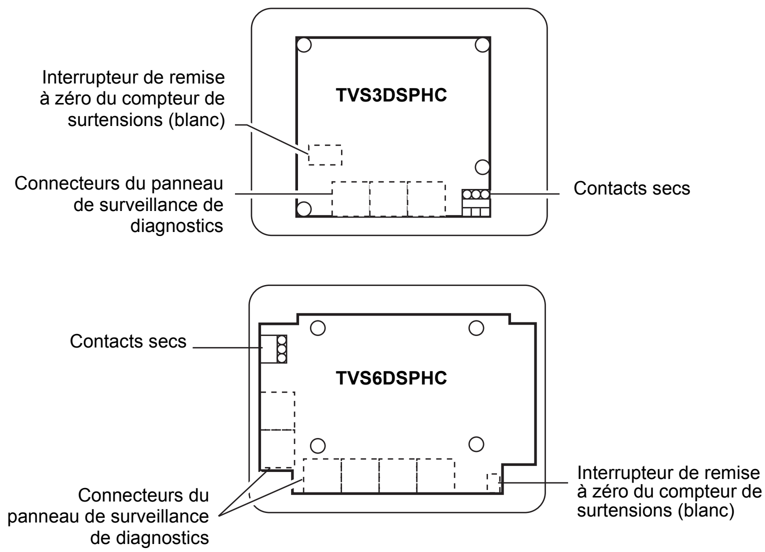


Figure 10 : Arrière de la carte de circuits des diagnostics



Des précautions doivent être prises en installant le câblage de contacts secs parce que les bornes se trouvent sur une porte mobile. Éviter la charnière de porte, les interrupteurs et les zones de haute tension du coffret lors de l'acheminement du câblage. Pour éviter la charnière de porte, attacher tout câblage de contacts secs au faisceau de câbles existant qui traverse la charnière. Une fois le câblage de contacts secs fixé sur un point fixe du coffret, l'utilisateur a la responsabilité de maintenir au moins 25,4 mm (1,0 po) de séparation entre le câblage de contacts secs de 600 Vca de tension nominale et le câblage d'alimentation dans le coffret.

Les contacts sont conçus pour une tension maximale de 24 Vcc ou 24 Vca et un courant maximum de 2 A. Les applications d'une énergie plus élevée peuvent exiger l'incorporation de relais supplémentaires à l'extérieur du SPD. Les dommages occasionnés au relais du SPD par l'utilisation de niveaux d'énergie qui dépassent ceux indiqués dans ces directives d'utilisation ne sont pas couverts par la garantie. Pour les questions d'application, appeler le groupe d'assistance technique Surgelogic au 1-800-577-7353 (É.-U.).

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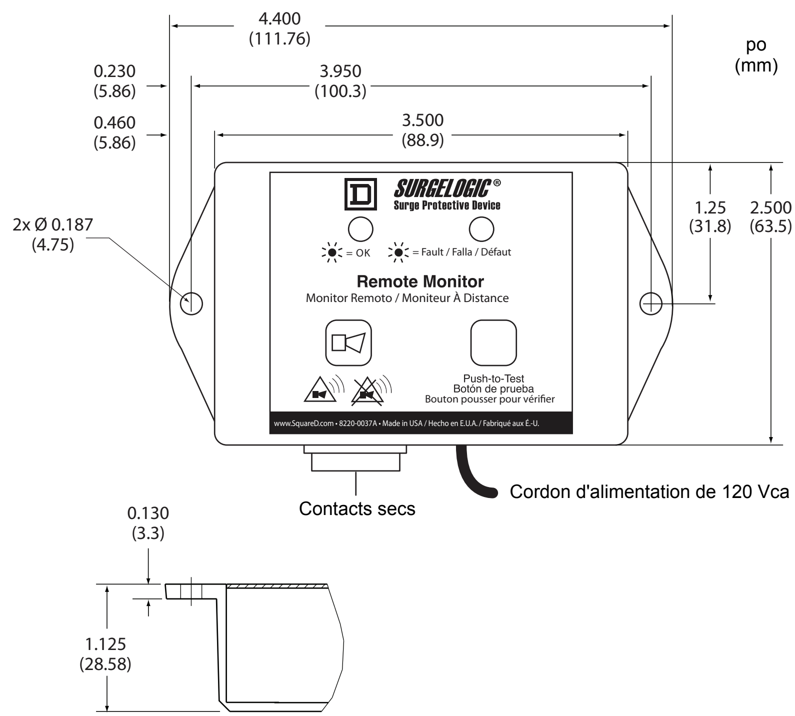
Option de moniteur à distance

L'option de moniteur à distance possède deux DÉL, une rouge et une verte, et une alarme sonore munie d'un interrupteur d'activation/désactivation. L'état normal est une DÉL verte allumée et pas d'alarme sonore. Pour essayer l'intégrité du moniteur à distance, appuyer sur le bouton pousser-pour-vérifier. Si l'alarme est activée, la DÉL verte s'éteint, la DÉL rouge s'allume et l'alarme retentit Relâcher le bouton termine l'essai; la DÉL rouge s'éteindra, la DÉL verte s'allumera et l'alarme s'arrêtera.

Si la suppression sur n'importe quelle phase est perdue, la DÉL verte s'éteindra, la DÉL rouge s'allumera et une alarme retentira. L'alarme sonore peut être mise au silence en appuyant sur le bouton d'activation/désactivation d'alarme. L'alarme s'arrêtera et la DÉL verte d'alarme ne s'allumera pas. La DÉL rouge reste allumée jusqu'à ce que la condition de non fonctionnement soit corrigée.

Le moniteur à distance comprend un adaptateur de 120 V~ à 12 Va avec un cordon d'alimentation de 1,83 m (6 pi). Les raccordements sont faits au panneau de diagnostics du SPD à l'aide des contacts secs de forme « C » à 3 positions (fournis) et de la longueur appropriée, jusqu'à 305 m (1000 pi) de câble rigide ou toronné de calibre n^{o} 22 à n^{o} 14 AWG (0,33 à 2,1 mm^2), (non fourni).

Figure 11 :   Option de moniteur à distance (TVS12RMU)



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Entretien et dépannage

⚠ DANGER

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU ÉCLAIR D'ARC ÉLECTRIQUE

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E ou CSA Z462.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez toutes les alimentations à cet appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.
- Cet appareil doit être effectivement mis à la terre selon tous les codes en vigueur. Utilisez un conducteur de m.à.l.t. d'appareil pour raccorder celui-ci à la terre du système d'alimentation.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

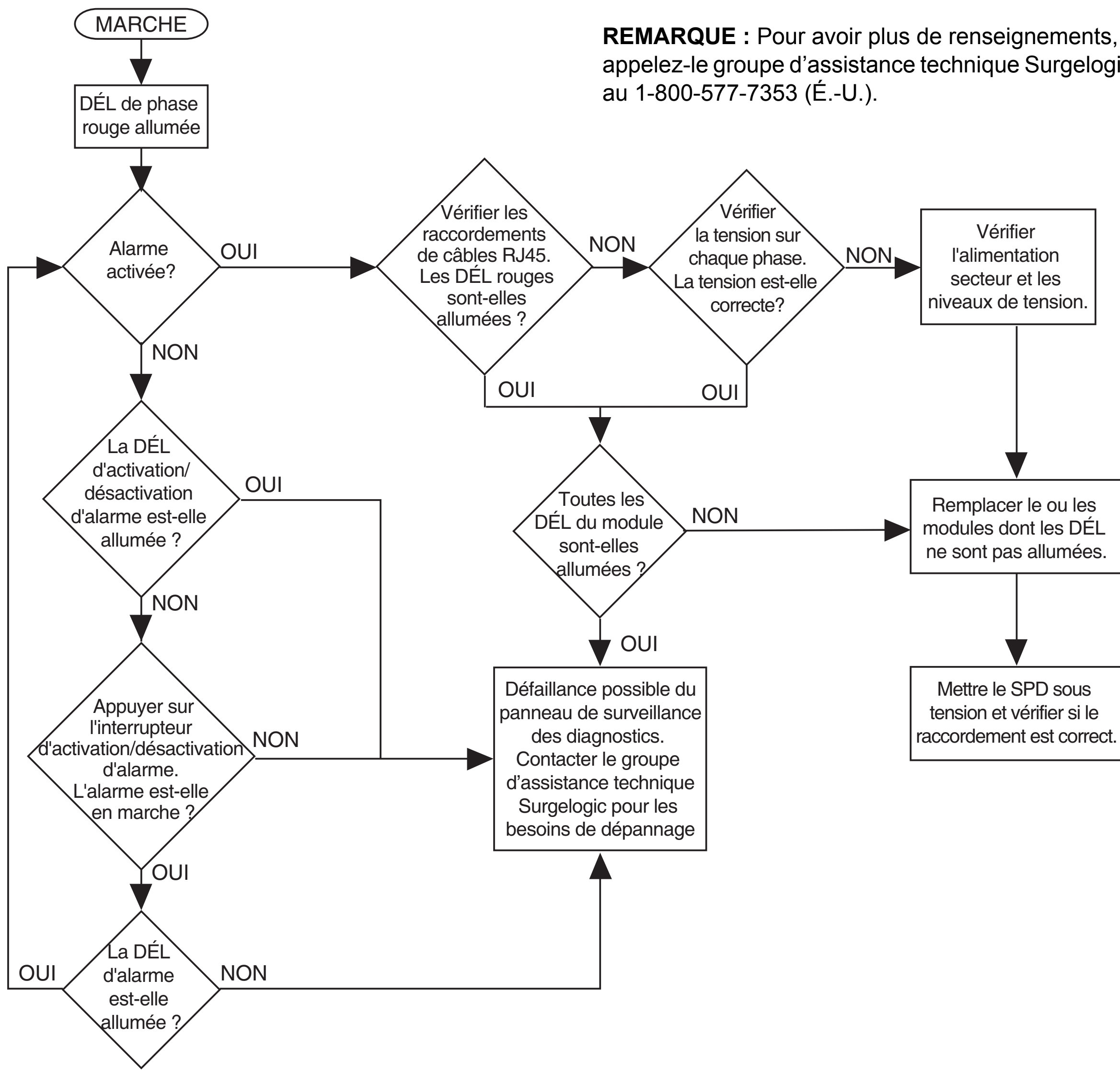
Entretien préventif

Inspecter le SPD périodiquement pour que le rendement du système reste fiable et assure la suppression continue des surtensions transitoires. Vérifier périodiquement l'état des indicateurs DÉL du panneau de surveillance des diagnostics. Utiliser de façon routinière les diagnostics intégrés pour détecter les modules ne fonctionnant pas.

Dépannage

Si un module montre deux voyants verts et si le panneau de surveillance des diagnostics montre un voyant de phase rouge, suivre l'organigramme de dépannage (figure 12).

Figure 12 : Organigramme de dépannage



REMARQUE : Pour avoir plus de renseignements, appelez-le groupe d'assistance technique Surgelogic au 1-800-577-7353 (É.-U.).

Pièces de rechange

Les pièces de rechange suivantes sont disponibles. Pour les informations de commande, contacter le distributeur local ou consulter le catalogue de produits.

- Modules MA. Les instructions de rechange sont comprises avec les pièces de rechange.
- Assemblages de panneau de surveillance des diagnostics. Les instructions de rechange sont comprises avec les pièces de rechange.

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Du fait que les normes, caractéristiques et conceptions peuvent changer, demander confirmation que l'information contenue dans cette publication est à jour.

8222-0050, Rév. 01, 06/2016
Remplace 8222-0050G, 05/2013