HVL/cc Medium Voltage, Metal-Enclosed Switchgear

2.4 to 38 kV, 60 to 150 kV BIL, 25 kA Short-time, Indoor or Outdoor

Instruction Bulletin

Class 6045

05/2024

6045–1

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Schneider Electric

Legal Information

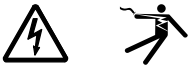
The information provided in this document contains general descriptions, technical characteristics and/or recommendations related to products/solutions.

This document is not intended as a substitute for a detailed study or operational and site-specific development or schematic plan. It is not to be used for determining suitability or reliability of the products/solutions for specific user applications. It is the duty of any such user to perform or have any professional expert of its choice (integrator, specifier or the like) perform the appropriate and comprehensive risk analysis, evaluation and testing of the products/solutions with respect to the relevant specific application or use thereof.

Table of Contents

Safety Information

Read these instructions carefully and examine the equipment to become familiar with the device before attempting to install, operate, service, or maintain it. The following special messages may appear throughout this user guide 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.

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.

Electrical equipment should be transported, stored, installed, and operated only in the environment for which it is designed.

Introduction

This bulletin contains instructions for the proper installation, operation, and maintenance of HVL/cc™ Metal-Enclosed Switchgear manufactured by Schneider Electric™. This product offers switching, metering, and interrupting capabilities for medium voltage systems ranging from 2.4 kV to 38 kV, 60 kV BIL to 150 kV BIL. The equipment is available in a variety of arrangements and in enclosures designed and constructed for indoor (NEMA 1) and outdoor (NEMA 3R) use.

Before You Begin

Read and understand:

- this bulletin before performing the installation, operation, and maintenance steps described in this bulletin.
- the HVL/cc Grounding Switch Application section of the Medium Voltage, Metal-Enclosed Switchgear User Guide (6045IB2401).

  NOTE: If more information on the grounding switch application for this equipment is needed, contact your Schneider Electric representative. In accordance with national and local electrical codes, electrical equipment must be installed, operated, serviced, and maintained only by qualified personnel.

General Description

HVL/cc switchgear is made up of modular units containing fixed mounted interrupters with or without replaceable E-rated fuses. It is a compact design with optional front-only accessibility. Equipment is available in single or multiple bay units. Sections are shipped assembled for ease of handling and installation. HVL/cc metal-enclosed switchgear from Schneider Electric is designed, manufactured, and tested in accordance with ANSI standards C37.20.3, C37.20.4, C37.57, C37.58, Canadian standards CSA 22.2 no. 31, CSA 22.2 no. 193, and NEMA SG5 where applicable.

Enclosures

HVL/cc Metal-Enclosed Switchgear is available in indoor and outdoor enclosures.

Indoor switchgear enclosures (see Indoor Switchgear (NEMA1 construction), page 7) include these standard features:

Figure 1 - Indoor Switchgear (NEMA1 construction)

- Lifting angles on the top of each shipping section.
- Provisions for future expansion (when using main cross bus).
- Clear acrylic viewing ports for inspection of switch blade position.
- Steel enclosure per ANSI C37.20.3, NEMA 1.
- Full-length ground bus in multiple bay enclosures.
- Interlock which inhibits removing the load-side panel while the switch or circuit interrupter is closed and/or ground switch is open.
- Switch or circuit interrupter interlock (electrical and/or mechanical) which inhibits operating the switches main contacts while the load-side door is removed.
- Provisions for padlocking the load-side panel.
- Key interlocking is optional.

Outdoor switchgear enclosures (see Outdoor Switchgear (NEMA 3R construction) , page 8), are designed and manufactured with the following standard features:

Figure 2 - Outdoor Switchgear (NEMA 3R construction)

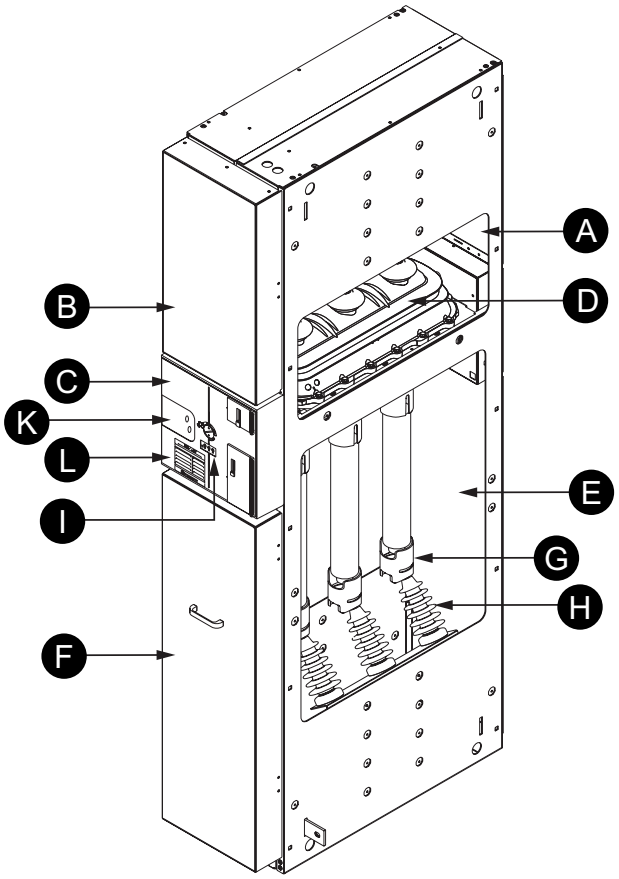
- Roof sloped to rear for precipitation runoff.
- Operating handles are enclosed.
- Formed steel base.
- Full height gasketed front doors.
- Steel enclosure per ANSI C37.20.3, NEMA 3R.
- Split rear panels with tamper-resistant bolts.
- Strip heaters in each switch bay.
- Stay rods to hold outer-hinged doors in open position.

Compartments

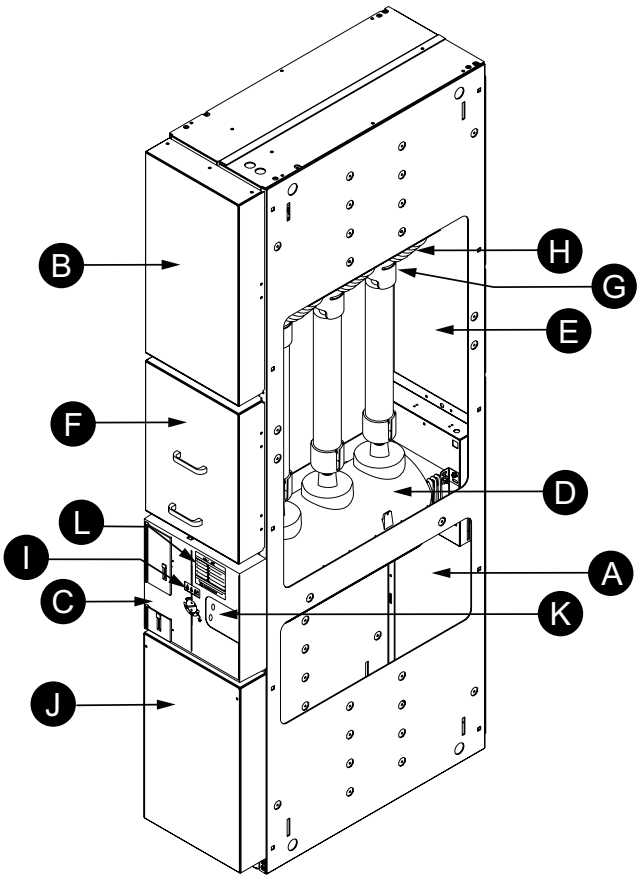
The information contained in this section describes the compartments of HVL/cc Switchgear (see Switch Cubicle, page 9).

Figure 3 - Switch Cubicle

Square D™ brand DIN-E style fuses shown as a reference.



Application A (Load side–Bottom)



Application B (Load side–Top)

A	Busbar compartment	**D**	Interrupter switch or disconnector	**G**	Cable termination	**J**	Bolted front panel (app. B only)
B	Upper panel or LV compartment	**E**	Fuse or load-side compartment	**H**	Capacitive divider	**K**	Viewing ports
C	Mechanism compartment	**F**	Load-side access panel	**I**	Live line indicators (LLIs)	**L**	Rating nameplate

Bus-bar Compartment

The bus-bar compartment is isolated from the other compartments of the equipment by the epoxy body of the interrupter or 11–gauge steel barriers. The bus bars extend continuously through the length of the switchgear and may transition from application A to application B bus compartments and vice versa. Two main bus positions allow future extensions and connections to existing equipment. HVL/cc bus has been tested to 25 kA for two seconds with 68 kA peak (40 kA momentary) current levels. It has been further tested to the full-integrated level of 63 kA using a four-frame run of bus, including a 29.5 in. (750 mm) compartment. The bus bar is 1/4 x 2 in. (6 x 51 mm) tin-plated copper for 600 A or two 1/4 x 2 in. (6 x 51 mm) for 1200 A.

Upper Panel/Low-voltage Compartment

The upper panel/low voltage compartment has a bolted panel when there are no controls or relays present in this vertical section. When any of these devices are present, the low-voltage compartment has a hinged panel. The low-voltage compartment houses terminal blocks and supports a relay or monitoring device that may be supplied with the switchgear line-up. All auxiliary contacts for the control of the mechanism are wired to terminal blocks for customer access and are in this compartment. An optional thermal scanning window is available in this panel.

Fuse/Load-side Compartment

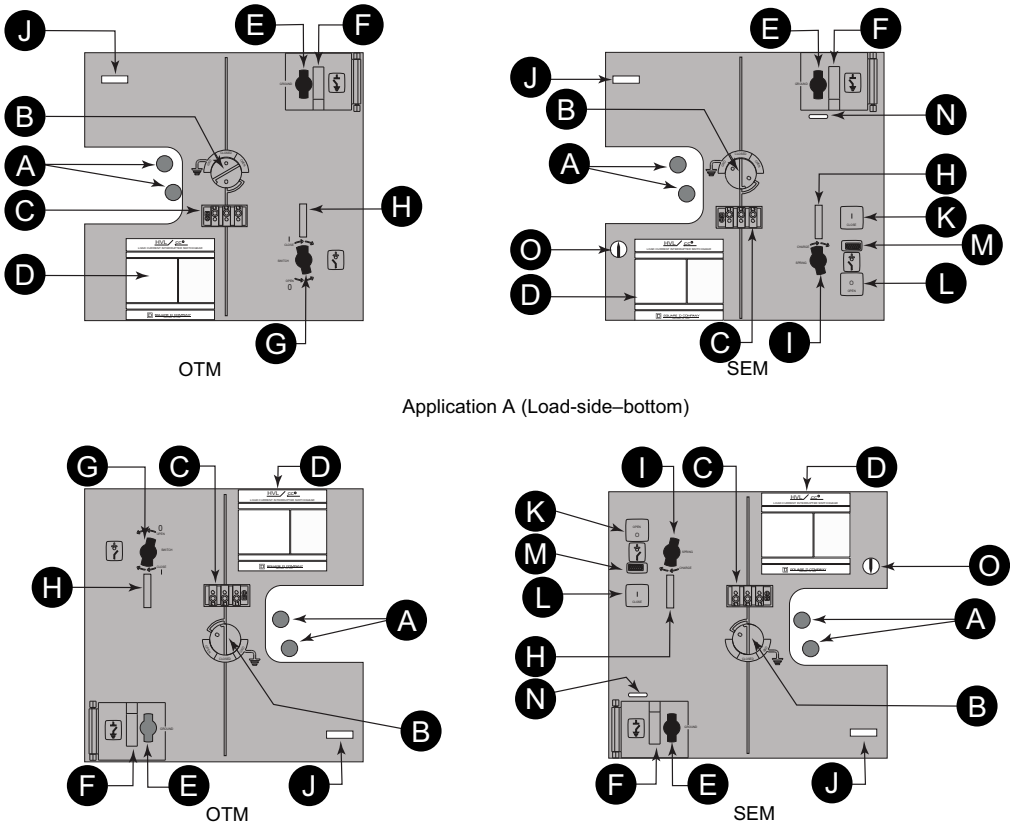
The fuse/load-side compartment houses fuses, voltage transformers (VT), the control power transformer (CPT), or bus connections. The panel is interlocked with the switch and can be padlocked by several methods (see Panel Interlock Provisions, page 17).

Mechanism Compartment

The HVL/cc can be equipped with either an over toggle mechanism (OTM) or a stored energy mechanism (SEM).

The mechanism compartment has a black polycarbonate and steel cover that encloses the mechanism. It is etched with instructions for operating the mechanism. The cover also has a mimic bus that shows the position of the switch and contains nameplate information for the interrupter. Two ports for viewing the position of the main blades are located within the mechanism cover. The load-side Live Line Indicators (LLIs) are also positioned on the cover.

Figure 4 - Mechanism Covers



A	Viewing ports	**F**	Ground switch padlock provision	**K**	Close push button (SEM)
B	Mimic bus	**G**	Switch operating port (OTM)	**L**	Open push button (SEM)
C	Live line indicators	**H**	Padlock provision	**M**	Spring charge indicator (SEM)
D	Rating nameplate	**I**	Spring charging port (SEM)	**N**	Mechanical interlock opening lever (SEM only if equipped)
E	Ground switch operating port (OTM/ SEM if equipped)	**J**	Switch operating counter (if equipped)	**O**	Motor cut-off switch (SEM only-if equipped)

Mechanisms

The mechanism compartment cover comes with optional padlock provisions for blocking access to the control functions of the interrupter. The covers **do not block** electrical operation of either the mechanism or the FuseLogic™ function from tripping the interrupter.

Optional electrical mechanical, and/or keyed interlocks can be supplied to block the switch operations outlined in this bulletin.

The HVL/cc Switchgear Mechanism Compartment contains the operators for both the main switch and the grounding switch. Available mechanisms include:

- Manually operated Over Toggle Mechanism (Type OTM).
- Motor operated Over Toggle Mechanism (Type OTM).
- Manually operated Stored Energy Mechanism (Type SEM) with optional FuseLogic system.
- Motor operated Stored Energy Mechanism (Type SEM) with open and close coils, and optional FuseLogic system.

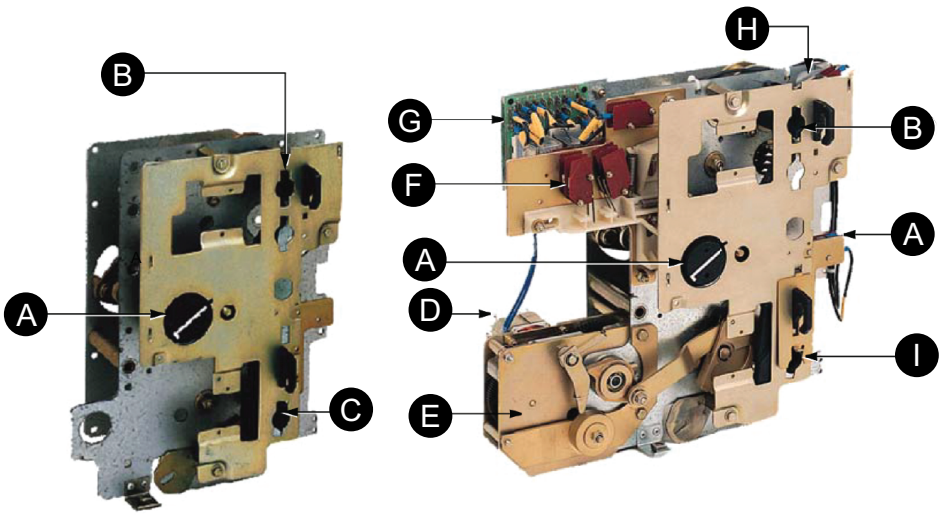
NOTE: Only manually operated OTM and SEM are available in Class 1, Division 2 applications.

Over-toggle Mechanism (OTM)

The OTM is the standard mechanism supplied with the HVL/cc switchgear. The mechanism requires the springs be compressed into an over-toggle position where they release their energy for closing and opening the device. The speed of the blades is independent of the user. The OTM is available with a motor for remote electrical operation and is available with auxiliary contacts, with or without the motor (see Over-Toggle Mechanism (OTM), page 12).

The grounding switch actuator is optional on the OTM mechanism. It is an over-toggle actuator and has a fault close rating equal to that of the switch. It can be blocked if required for application. Motor operation is not available for the grounding switch.

Figure 5 - Over-Toggle Mechanism (OTM)



A	Viewing ports	**F**	Auxiliary contacts
B	Ground switch port (if equipped)	**G**	Motor control circuit board

C	Over-toggle port	**H**	Ground switch port (if equipped)
D	Motor	**I**	Main interrupter cut-off microswitch
E	Motor gear box		

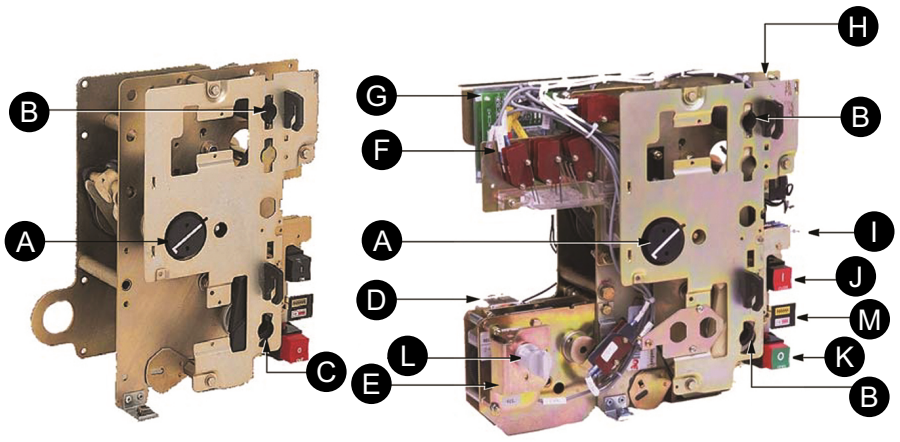
Stored Energy Mechanism (SEM)

The SEM is the optional mechanism for HVL/cc. It is supplied when remote trip or close is required.

The SEM requires a single action to charge both opening and closing springs. The opening spring is charged first; therefore, the switch is immediately ready to trip after the switch has been closed. The SEM is provided when direct tripping for the FuseLogic system is ordered. The SEM is available with a motor for remote electrical operation and is available with auxiliary contacts, with or without the motor. It can come with only an opening coil. When a motor is supplied, the opening and closing coils are also included. An under-voltage release is available with the mechanism. This mechanism is also used in all transfer schemes.

The grounding switch actuator is optional on the SEM mechanism. It is an over-toggle actuator as on the OTM and has a fault close rating equal to that of the switch. Motor operation is not available for the grounding switch.

Figure 6 - Stored Energy Mechanism (SEM)



A	Open/close and ground position indicator	**H**	Ground switch cut-off microswitch
B	Ground switch port (if equipped)	**I**	Main interrupter cut-off microswitch
C	Spring charge port	**J**	Close push button
D	Motor	**K**	Open push button
E	Motor gear box	**L**	Motor cut-off microswitch
F	Auxiliary contacts	**M**	Spring charge indicator
G	Motor control circuit board		

Interrupter Switch

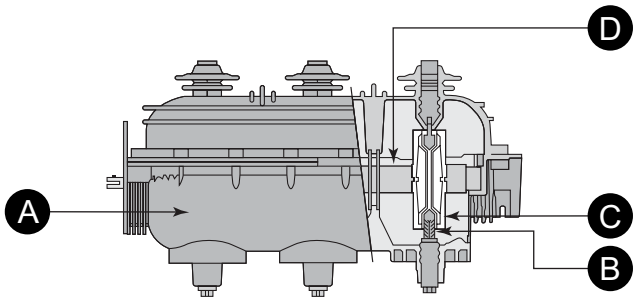
The interrupter housing is an epoxy enclosure that is non-refillable and contains SF6 gas. The SF6 gas helps extinguish the electrical arc. This low-pressure enclosure sheilds the main contacts from the environment. It contains interruption by-products, including the arc, allowing for use of this interrupter in environments where air switches are not suitable.

Table 1 - SF6 Gas

Switchgear	Pressure	Interrupter Weight
Up to 17.5 kV	5.8 psi gauge (0.4 bar)	0.210 kg = 210 grams
25.8–38 kV	14.5 psi gauge (1.0 bar)	0.591 kg = 591 grams

NOTE: L1, L2, and L3 labeling on the switch housing is not representative of phase sequence A, B, C.

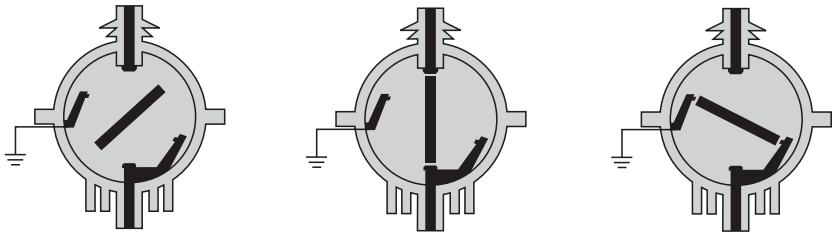
Figure 7 - Cross-section of the Interrupter Switch/Disconnector



A	Viewing ports	**C**	Switch blades
B	Fixed contact	**D**	Operating shaft

Three rotating blades are sealed in the enclosure and have only one external rotating seal. Contact Blade Positions, page 14 shows the three positions of the rotating blades.

Figure 8 - Contact Blade Positions



The distance between the fixed and moving contacts is sufficient to withstand the normal recovery voltage and system-imposed transient recovery voltages (TRVs). The distance is great enough to also withstand 110% of the rated BIL and sixty-cycle withstand voltages.

Optional Grounding Switch

The interrupter switch has an optional feature that enables grounding the switch. For more information on units with grounding switches, refer to the HVL/cc Grounding

Switch Application section of the Metal Enclosed Load Interrupter Switchgear with HVL/cc Switches catalog (6045IB2401) or call your local Schneider Electric representative.

Load-side Access Panel

The load-side access panel is mechanically interlocked with the switch. It comes with locating and latching hooks and a “Tee” slot for the switch interlock (see Panel Interlock Provisions, page 17). When the optional load-side discharge assembly (LDA) is supplied, a view port is provided for identifying the position of the LDA. An optional thermal scanning window is also available in this panel.

Cable Termination

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK EXPLOSION OR ARC FLASH

Only use lugs provided by Schneider Electric in order to maintain dielectric clearances.

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

Lugs are provided for HVL/cc. **DO NOT USE OTHER MANUFACTURERS LUGS** for the medium voltage cable unless authorized by Schneider Electric. The lugs are mounted inside the field shapers and accommodate one or two cables.

FuseLogic System Components

The FuseLogic system inhibits inadvertent switching until fuses are installed or replaced. The system is provided as an option on HVL/cc Metal-Enclosed Switchgear. It is available with the SEM mechanism and Square D brand DIN-E (or Bussmann equivalent) style fuses only. This system is not available with Mersen™ CS-3 fuses.

The FuseLogic system uses Square D brand medium voltage fuses with a special blown fuse indicator pin. This blown fuse indicator works in conjunction with the switch to form a simple lockout mechanism. The FuseLogic system functions without auxiliary power in most cases.

Blown Fuse Indicator (BFI)

The optional BFI is available with either the OTM or SEM mechanisms. The assembly is located on the line side of the fuse. It operates a flag that is seen through a hole in the mechanism cover. The BFI drives a direct acting trip or a time delayed trip when supplied with FuseLogic system schemes.

Live-line Indicators (LLI)/Capacitive Divider (CD)

The LLIs are equipped with neon lamps that indicate the presence of voltage. They are visible on the front of the mechanism cover. They are wired to the CD located on the load side of the switch. Optional CDs are installed on the main bus or line side of the switch with the LLI mounted on the front panel.

Test ports on the LLIs are suitable for testing voltage with a properly rated voltage sensing device (see Phase Sequence Testing, page 57). LLIs are not an indicator of the absence of voltage. Use properly rated test equipment to help ensure no voltage is present before performing any maintenance procedures.

The CD is a standoff support insulator with the capacitor permanently bonded inside. The power from this capacitor provides the energy required for the neon lamps of the LLIs. The energy can also be used to activate optional features such as an auto-transfer scheme.

Load-side Discharge Assembly (LDA)

⚠⚠DANGER

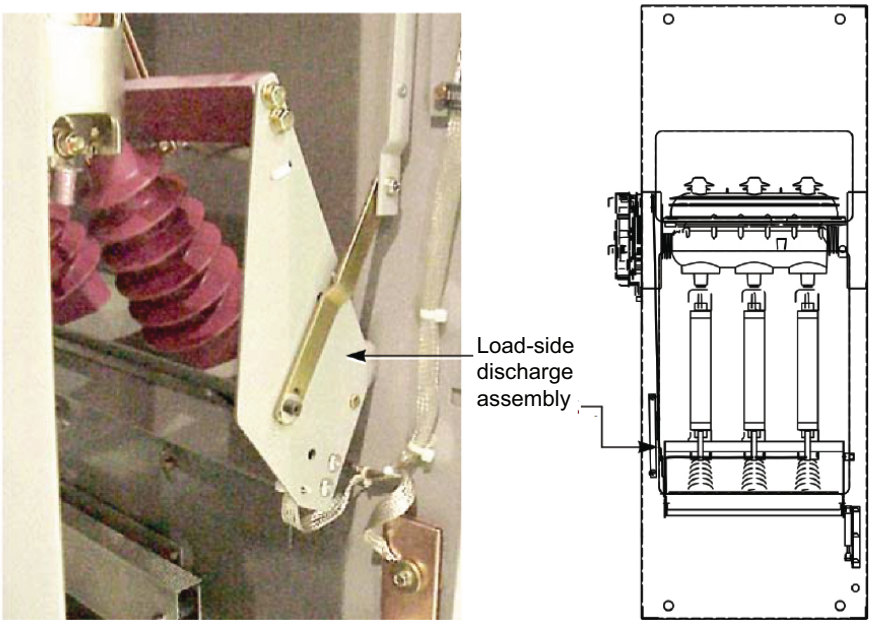
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, NOM-029-STPS-2011, or CSA Z462.
- Load-side discharge assembly does not have fault-making capability.
- Use the load-side discharge assembly only where there is no possibility of load-side back-feed from alternate power sources such as commercial power, down-stream generator, and/or charged capacitor bank.

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

The LDA is a device used to discharge to ground any residual voltage on the load side of the fuses after the grounding switch has closed. The device operates in conjunction with the grounding switch and is available only on fused units equipped with an optional grounding switch. This option is available in units with Square D brand DIN-E style fuses only. This option is not available with Mersen CS-3 fuses.

Figure 9 - Load-side Discharge Assembly Location



Front View **Side View (enclosure)**

For more information on units with grounding switches refer to the “HVL/cc Grounding Switch Application” section of the “Metal Enclosed Load Interrupter Switchgear with

HVL/cc Switches" catalog (6045IB2401) or call your local Schneider Electric representative.

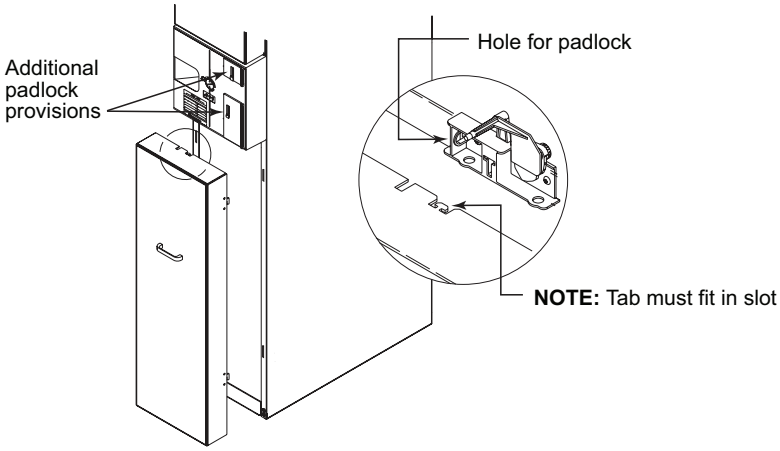
Panel Interlocks

The HVL/cc is equipped with mechanical interlocks as a standard feature. The switch interlock inhibits removing the load-side panel while the load-interrupter switch is closed (also open and ungrounded, if so equipped). Padlock provisions are also available for the load-side panel.

Additional padlocking provisions are available for both or either the motor cut-off switch and/or the ground switch. The load switch can be padlocked using an optional padlocking provision located on the mechanism cover polycarbonate hinge covers.

Key interlocks are optional equipment. They are often supplied in conjunction with metal-enclosed switchgear to direct proper operation and coordination of the equipment. The key interlock schemes are usually described on the switchgear assembly drawings supplied with the equipment.

Figure 10 - Panel Interlock Provisions



Class 1, Division 2 Certification

The Class 1, Division 2 switchgear is used in hazardous areas, as defined by National Electrical Code® (NEC®), and is self-certified for use in T3B locations with heaters and T5 locations without heaters. The Class 1, Division 2 switchgear is maintained in the same manner as the standard switchgear with the exceptions noted throughout this bulletin. Special features of Class 1, Division 2 rated equipment are:

- Explosion-proof T3B rated heaters.
- Uses only non-indicating fuses (see Fuse Characteristics and Striker Pin Directions (Application A position shown), page 46).
- Uses only manually operated switch mechanisms (OTM or SEM).
- Test ports on the LLI heads are factory-plugged.

Moisture Contamination Avoidance and Mitigation

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Store the equipment in a clean, dry (including no condensation), well-ventilated area with an ambient temperature of approximately 70°F (21°C).
- If heaters are furnished in the assembly, energize them from an external source. When energizing heaters from an external source, remove the primary and secondary overcurrent protective devices from the control power transformer.
- If heaters are not installed in the assembly, and the area is cold and damp, use a temporary heating source within the assembly. A minimum of 125 W of heat per section is recommended.
- Avoid greasy, smoky heaters that can deposit carbon on insulation, which could lead to tracking and insulation breakdown.
- If moisture, condensation, or chemical ingress is observed, do not energize the equipment. If the equipment is already energized, de-energize it immediately.

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

⚠WARNING

FIRE HAZARD

Remove all flammable material in the vicinity of the heaters, such as packaging, accessories in boxes, and documentation, before energizing the heaters.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Shipping, Receiving, and Storage Requirements

This equipment does not achieve its ratings until it is installed per record/as-built drawings, installed per the instructions contained in this document, and has operational environmental controls with appropriate settings to help mitigate environmental influences. This equipment can be stored in a climate controlled area that uses both heating and cooling to maintain acceptable environmental conditions. Indoor and outdoor rated equipment is not suitable for outdoor storage.

- The equipment should be treated as if it is in storage until it is installed and operational. The storage area should be clean, dry (75% or less relative humidity), and climate controlled with proper ventilation.
- To keep the equipment dry, the use of heaters is required in some cases (for example, during seasonal or low periods of electrical loading and equipment de-energization):
  - Consult the engineer of record for the appropriate environmental control settings or means to mitigate environmental influences.
  - If so equipped, ensure that the thermostats and/or humidistats are set to mitigate condensation. A minimum of 125 W of heat per section is suggested.
  - If heaters are used with the equipment that were not included in the equipment by Schneider Electric, they must be clean and free of debris and grease. Greasy and/or smoky heaters can contaminate electrical insulation and lead to dielectric breakdown and/or tracking.
- Shipping packaging is not suitable for and cannot be used by itself for equipment storage unless otherwise indicated on the shipping packaging labeling.

- When receiving equipment, the equipment may be at a lower temperature than the ambient air temperature. Allow time for the equipment temperature, including the temperature of internal components, to rise to the ambient air temperature before making openings in or otherwise disturbing the packaging. Condensation can occur on and inside the equipment if warm air contacts cold surfaces of the equipment. Moisture damage can occur, destroying the dielectric capabilities of the equipment and rendering it unusable.
- The factory shipping wrap around the equipment on shipping pallets is not suitable for non-enclosed over-the-road transportation that risks exposing the equipment to the elements. The factory shipping wrap around the equipment should remain on the equipment until the equipment is ready to be inspected and stored or inspected and installed. After receiving the equipment and allowing it to acclimate to the environment, remove the packaging and inspect the equipment for damage that may have occurred in transit. If damage is found or suspected, immediately file a claim with the carrier and notify your Schneider Electric representative.
- Follow these guidelines every time the equipment is moved to a new storage location or to its final destination.

Installation, Operation, and Maintenance Requirements

This equipment does not achieve its ratings until it is installed per record/as-built drawings, installed per the instructions contained in this document, and has operational environmental controls with appropriate settings to help mitigate environmental influences. This equipment can also be operated in a climate controlled area that uses both heating and cooling to maintain acceptable environmental conditions. Indoor and outdoor rated equipment is not suitable for outdoor storage.

In some cases (such as seasonal electrical loading, de-energized equipment, and standby/alternate power sources), the heat generated by equipment loading is insufficient to prevent condensation and alternate heat sources are required. If environmental controls such as a thermostat or humidistat are used, ensure their settings are sufficient to mitigate condensation and remain operational at all times. Consult the Engineer of Record for the appropriate environmental control settings.

Exposure to Moisture, Chemicals, and Condensation

If liquids such as moisture, chemicals, and condensation contact the electronics, circuit breaker, fuses, bussing, or other electrical components, do not attempt to clean or repair the equipment as this may lead to unrepairable damage. If the equipment is energized, de-energize it. If equipment is not energized, do not energize it. Contact the Schneider Electric Customer Care Center at 888-778-2733.

Equipment Installation for Seismic Applications

Introduction

Seismic certification is an optional feature on the HVLcc product line and provides seismic conformance options to any of the North American and International building codes and seismic design standards identified in List of supported regional building codes and seismic design standards, page 20. HVLcc that is seismically certified has been certified to the seismic requirements of the listed code per the manufacturer's certificate of compliance (CoC). Equipment compliance labels and CoC's are provided with all seismically certified HVLcc. Refer to the equipment CoC for certification details and applicable seismic parameters. To maintain the validity of this certification, the installation instructions provided in this section must be followed.

Table 2 - List of supported regional building codes and seismic design standards

Country / Region	Code Reference ID	Code Name
Argentina	INPRES-CIRSOC103	Argentinean Standards for Earthquake Resistant Constructions
Australia	AS 1170.4-2007 (R2018)	Structural design actions, Part 4: Earthquake actions in Australia
Canada	NBCC	National Building Code of Canada
Chile	NCh 433.Of1996	Earthquake resistant design of buildings
China	GB 50011-2010 (2016)	Code for Seismic Design of Buildings
Colombia	NSR-10 Título A	Colombian Regulation of Earthquake Resistant Construction
Europe	Eurocode 8 EN1998-1	Design of structures for earthquake resistance – Part 1: General rules, seismic actions and rules for buildings
India	IS 1893 (Part 1) : 2016	Criteria for Earthquake Resistant Design of Structures Part 1 General Provisions and Buildings
Indonesia	SNI 1726:2019	Earthquake Resistance Planning Procedures for Building and Non-building Structures
Japan	Building Standard Law	The Building Standard Law of Japan
Mexico	CFE MDOC-15	Civil Works Design Manual, Earthquake Design
New Zealand	NZS 1170.5:2004+A1	Structural design actions, Part 5: Earthquake actions – New Zealand
Peru	N.T.E. - E.030	National Building Code, Earthquake-Resistant Design
Russia	СП 14.13330.2018	Building norms and regulations: Construction in seismic regions
Saudi Arabia	SBC 301	Saudi Building Code, Loads & Forces Requirements
Taiwan	CPA 2011	Seismic Design Code and Commentary for Buildings
Turkey	TBEC-2018	Turkey Buildings Earthquake Standard
United States	IBC per ASCE 7	International Building Code—IBC
	CBC per ASCE 7	California Building Code—CBC
	UFC per DoD	Uniform Facilities Criteria—UFC

Responsibility for Mitigation of Seismic Damage

The HVLcc equipment is considered a nonstructural building component as defined by regional building codes and seismic design standards. Equipment capacity was determined from tri-axial seismic shake-table test results in accordance with the International Code Counsel Evaluation Service (ICC ES) Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components (ICC-ES AC156).

An equipment importance factor, I_p, that is greater than one ($I_p > 1.0$) is assumed and indicates that equipment functionality is required after a seismic event and after seismic simulation testing. This importance factor is applicable for designated seismic systems (i.e., special certification) servicing critical infrastructure and essential buildings where post-earthquake equipment functionality is a requirement.

Seismic certification of nonstructural components and equipment 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 inertial loads that are created and reacted through the equipment's force resisting system and anchorage to the load-bearing path of the building structural system or foundation.

Anchorage of equipment (i.e., nonstructural supports and attachments) to the primary building structure or foundation is required to validate seismic conformance. The construction site structural engineer or engineer of record (EOR) or the registered

design professional (RDP) is responsible for detailing the equipment anchorage requirements for the given installation. The installer and manufacturers of the anchorage system are responsible for assuring that the mounting requirements are met. Schneider Electric is not responsible for the specification and performance of equipment anchorage systems.

Tie-down Points for Rigid Floor Mounted Equipment

The equipment enclosure provides anchorage tie-down points to accept anchor attachments to the building structure or foundation. Indoor and outdoor enclosures provide enclosure base frame clearance holes for bolted anchorage attachments as shown in job drawings.

Equipment installations of single, stand-alone sections must be anchored using all enclosure tie-down points as shown in job drawings for indoor and outdoor applications respectively. Equipment installations of multiple-section lineups (2 or more HVLcc units bolted together) require every tie-down point to be used and specifics will be shown in the job drawings.

Equipment installations using welded supports and attachments in lieu of bolted supports and attachments must ensure the weld locations are distributed similarly to the locations of enclosure anchorage clearance holes. Welded supports and attachments must be properly sized to ensure the weldment withstand capacity exceeds the earthquake demand at location of equipment installation. Precautions shall be made to properly vent and shield the equipment enclosure during the field welding process. Schneider Electric is not responsible for equipment damage caused by field welded supports and attachments.

Anchorage Assembly Instructions

The bolted anchor assembly view depicted in job drawings illustrates the equipment's as-tested attachment to the seismic shake-table test fixture. The equipment seismic rated capacity, as stated on the Schneider Electric CoC, was achieved with the identified size and grade attachment hardware. For bolted attachments, the use of factory supplied Belleville conical spring washers, where specified in job drawings, are required to maintain seismic conformance. Field installed equipment attachment and support detailing shall be in accordance with the anchorage system requirements as defined by the construction site EOR or RDP.

Safety Precautions

Carefully read and follow to the safety precautions outlined below before attempting to lift, move, install, use, or maintain HVL/cc Metal-Enclosed Switchgear and its 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, NOM-029-STPS-2011, or CSA Z462.
- Only qualified electrical personnel familiar with medium voltage circuits should perform the instructions in this bulletin. Personnel must understand the hazards involved in working with or near medium voltage equipment.
- Qualified electrical personnel must perform work in accordance with national and local electric codes.
- 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.
- The Live Line Indicator is not an indicator of the absence of voltage.
- Always use a properly rated voltage sensing device to confirm power is off.
- Before performing visual inspections, tests, or maintenance on the equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, grounded, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Before making any electrical connection, ensure that all leads to be connected are de-energized with proper safety grounds applied.
- Metal-enclosed switchgear have interlocks designed to minimize hazards to the user. It is not possible to eliminate every hazard with interlocks. The user of this device is responsible for recognizing the potential hazards, for wearing protective safety equipment, and for taking adequate safety precautions.
- Do not make any adjustments to the equipment or operate the system with safety features removed. Contact your local Schneider Electric representative for additional instructions if the device does not function as described in this manual.
- Handle this equipment carefully and install, operate and maintain it correctly in order for it to function properly.
- Carefully inspect your work area and remove any tools and objects left inside the equipment.
- Replace all devices, doors, and covers before turning on the power to this equipment.
- All instructions in this manual are written with the assumption that the customer has taken all these measures before performing maintenance or testing.

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

⚠ **WARNING:** This product can expose you to chemicals including Nickel compounds, which are known to the State of California to cause cancer, and Bisphenol A (BPA), which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Moisture Contamination Avoidance and Mitigation

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Store the equipment in a clean, dry (including no condensation), well-ventilated area with an ambient temperature of approximately 70°F (21°C).
- If heaters are furnished in the assembly, energize them from an external source. When energizing heaters from an external source, remove the primary and secondary overcurrent protective devices from the control power transformer.
- If heaters are not installed in the assembly, and the area is cold and damp, use a temporary heating source within the assembly. A minimum of 125 W of heat per section is recommended.
- Avoid greasy, smoky heaters that can deposit carbon on insulation, which could lead to tracking and insulation breakdown.
- If moisture, condensation, or chemical ingress is observed, do not energize the equipment. If the equipment is already energized, de-energize it immediately.

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

⚠WARNING

FIRE HAZARD

Remove all flammable material in the vicinity of the heaters, such as packaging, accessories in boxes, and documentation, before energizing the heaters.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Receiving, Handling, and Storage

This chapter contains information regarding the receiving, handling, and storage of HVL/cc Metal-Enclosed Switchgear.

Receiving

Metal-enclosed switchgear is shipped on skids with protective wrapping to help prevent damage during normal transit. Check the packing list against the equipment received to ensure the order and shipments are complete. Claims for shortages or other errors must be made in writing to Schneider Electric within 30 days after receipt of shipment. Failure to do so constitutes unqualified acceptance and a waiver of all such claims by the purchaser.

Upon receipt, immediately inspect the switchgear for damage that may have occurred during transit. If damage is found or suspected, immediately file a claim with the carrier and notify Schneider Electric.

Identification

The rating nameplate is located on the front cover of the operating mechanism. Included on the nameplate is the following information:

- Factory order number
- Manufacture date
- Rated maximum voltage
- Impulse BIL (kV)
- Power frequency withstand (kV)
- Frequency
- Switch continuous current (A)
- Main bus ratings
- Momentary current (kA)
- Short time current (kA)
- Fault closing current (kA)
- Fuse information

NOTE: All ratings are the MAXIMUM limits of the equipment.

Handling

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Switchgear should be in an upright position prior to fuse installation.
- Fuses need to be taken out prior to the equipment being laid down and then replaced after the equipment is brought back to an upright position.

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

Switchgear is normally shipped in an upright position. However, single frames may be shipped laying down.

Use care when uncrating, rolling, hoisting, or handling the switchgear.

⚠WARNING

EQUIPMENT DISTORTION

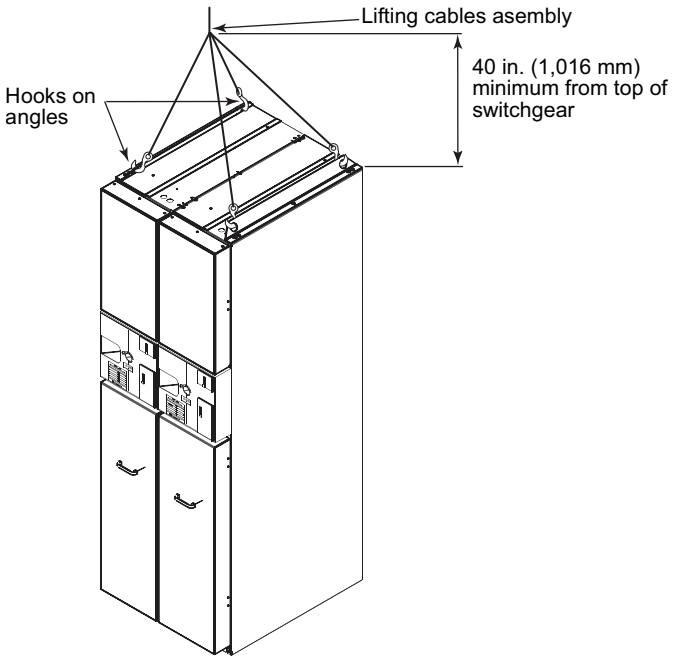
- Do not remove the skids until the shipping sections are at the final location.
- Consult with a certified rigging and lifting expert for any situation not covered in these instructions.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Lifting Provision-Indoor

Removable lifting angles are provided for inserting hooks to lift each section. Use hooks on angles (see Lifting Provision–Indoor, page 26) to properly lift and move indoor metal enclosed switchgear. A minimum of 40 in. (1,016 mm) between the lifting cables assembly and the top of the switchgear is required.

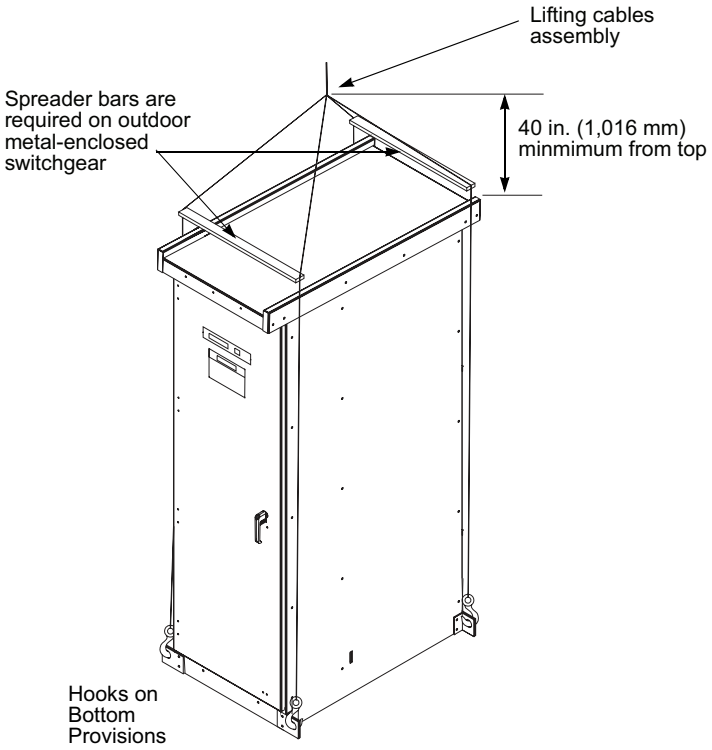
Figure 11 - Lifting Provision–Indoor



Lifting Provision-Outdoor

Lifting angles are provided for inserting hooks to lift each shipping section. Retain these angles and hardware for use in anchoring outdoor shipping sections (see Anchoring and Joining the Shipping Split Frames, page 38 and Anchoring Subsequent Indoor Shipping Splits, page 40). A minimum of 40 in. (1,016 mm) between the lifting cables assembly and the top of the switchgear is required. Use spreader bars and a hook to the bottom provisions (see Figure 12) to properly lift and move outdoor metal-enclosed switchgear.

Figure 12 - Lifting Provision–Outdoor



Using a Forklift

Use only equipment of proper load range for lifting the switchgear. Review the shipping documentation for the actual weight of the equipment. When an overhead crane is not available, rollers or pipes may be used for moving the switchgear to its location. Forklifts of proper load range may be used (see Handling Using a Forklift, page 28). This equipment is shipped up to a maximum of five vertical units or to 75 in. (1,905 mm) wide.

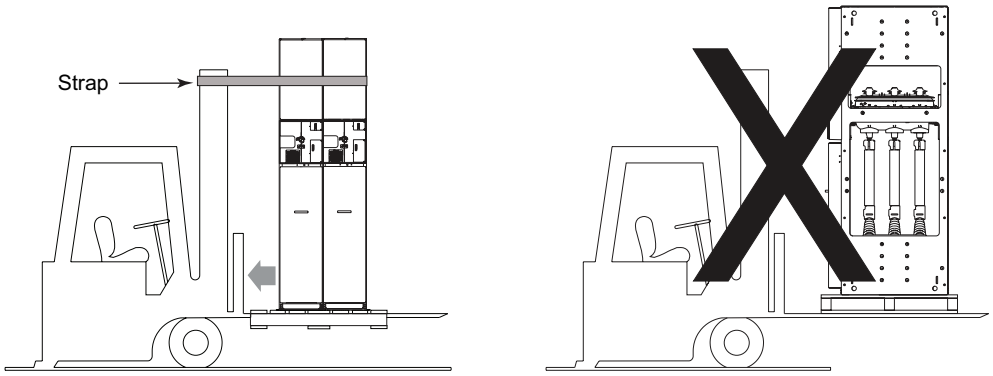
⚠WARNING

TOP HEAVY LOAD

If lifting the switchgear by forklift, stabilize the shipping section with a safety strap to reduce the possibility of tipping.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Figure 13 - Handling Using a Forklift



Storage

If the switchgear is stored before being placed into service, keep it in a clean, dry place that is free from condensing conditions, corrosive elements, and mechanical abuse. Energize the heaters inside the switchgear, or add heat from a separate source, such as a light bulb or blower. Use a minimum of 125 W of heat per vertical section to keep the equipment dry during storage.

Covering the equipment with a tarpaulin may be necessary to help protect it from contaminants or moisture. Do not store indoor units outdoors.

In areas of high humidity, such as installations near oceans or large bodies of water, monitor the equipment closely. If necessary, use additional heat to keep the switchgear dry. Contact the factory if the internal heaters do not adequately prevent condensation for your location or environmental condition.

The drawings below are examples of a typical Application A Indoor and Outdoor Metal-enclosed Switchgear.

Refer to the customer drawings for the actual weights, dimensions, and conduit entry locations. The weights given below are approximate and are not correct for all combinations of gear.

Table 3 - Storage Weights

	Frame Width (X)		
	14.75 in. (375 mm)	**20.00 in. (508 mm)**	**29.50 in. (750 mm)**
Bolt Center (Y)	13.50 in. (343 mm)	18.75 in. (476 mm)	28.25 in. (717 mm)
Unfused Switch	445 lb. (200 kg)	485 lb. (218 kg)	545 lb. (245 kg)
Fused Switch	480 lb. (216 kg)	520 lb. (234 kg)	580 lb. (261 kg)
Transition/Auxiliary Unit	210 lb. (95 kg)	250 lb. (160 kg)	—
VT Compartment	—	820 lb. (369 kg)	875 lb. (394 kg)
CT Compartment	—	—	835 lb. (376 kg)

2.4–15 kV Switchgear Indoor (NEMA 1 Construction)

Figure 14 - Side, Front, and Plan Drawings-Indoor (Application A)

Square D brand DIN-E style fuses shown as a reference.

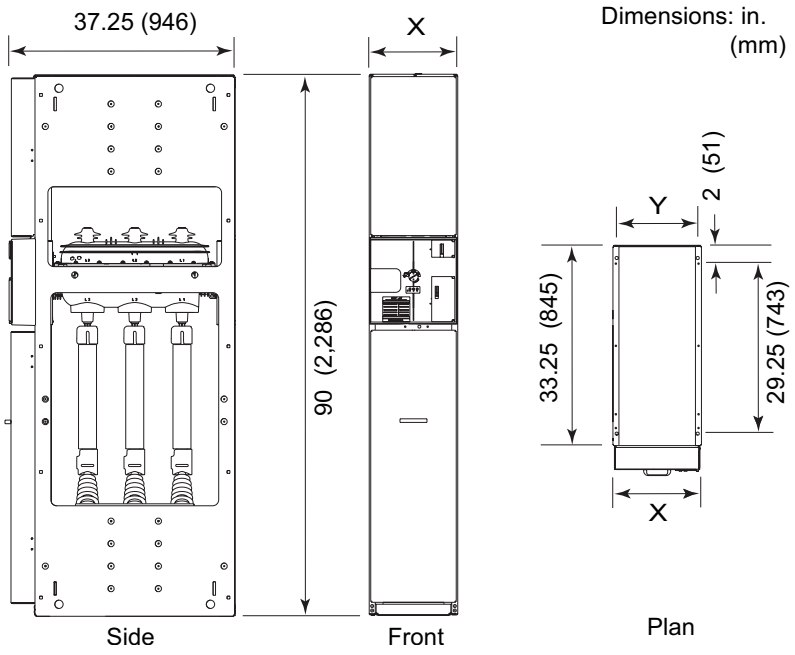


Table 4 - Approximate Dimensions and Weights 2.4–15 kV-Indoor

	Frame Width (X)		
	14.75 in. (375 mm)	**20.00 in. (508 mm)**	**29.50 in. (750 mm)**
Bolt Center (Y)	13.50 in. (343 mm)	18.75 in. (476 mm)	28.25 in. (717 mm)
Unfused Switch	445 lb (200 kg)	485 lb (218 kg)	545 lb (245 kg)
Fused Switch	480 lb (216 kg)	520 lb (234 kg)	580 lb (261 kg)
Transition/Auxiliary Unit	210 lb (95 kg)	250 lb (160 kg)	—
VT Compartment	—	820 lb (369 kg)	875 lb (394 kg)
CT Compartment	—	—	835 lb (376 kg)

2.4–15 kV Switchgear Outdoor (NEMA 3R Construction)

Figure 15 - Side and Plan Drawing—Outdoor (Application A)

Square D brand DIN-E style fuses shown as a reference.

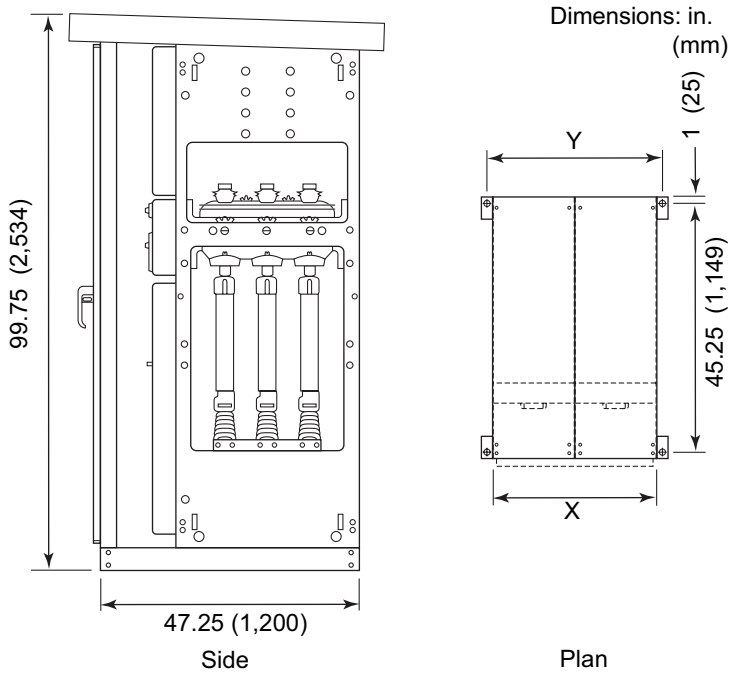


Table 5 - Approximate Dimensions and Weights 2.4–15 kV-Outdoor

	Frame Width (X)		
	14.75 in. (375 mm)	**20.00 in. (508 mm)**	**29.50 in. (750 mm)**
Bolt Center (Y)	Add 2.25 in. (57 mm) to the total length of the switchgear lineup		
Unfused Switch	585 lb. (263 kg)	655 lb. (295 kg)	785 lb. (353 kg)
Fused Switch	629 lb. (278 kg)	685 lb. (308 kg)	820 lb. (370 kg)
Transition/Auxiliary Unit	440 lb. (200 kg)	450 lb. (205 kg)	—
VT Compartment	—	985 lb. (443 kg)	1115 lb. (502 kg)
CT Compartment	—	—	1075 lb. (484 kg)
End Panel	End panels add 90 lb. (40.5 kg) per end unit		

25.8–38 kV Switchgear Indoor (NEMA 1 Construction)

Figure 16 - Side, Front, and Plan Drawings—Indoor (Application A)

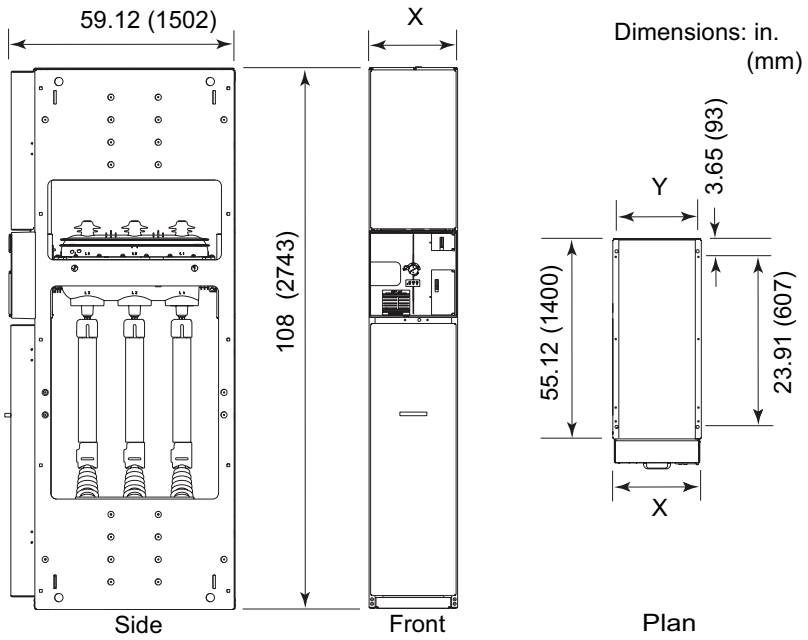


Table 6 - Approximate Dimensions and Weights 25.8–38 kV-Indoor

	Frame Width (X)	
	29.50 in. (750 mm)	**39.37 in. (1000 mm)**
Bolt Center (Y)	25.76 in. (654 mm)	35.63 in. (905 mm)
Unfused Switch	760 lb. (345 kg)	877 lb. (400 kg)
Fused Switch	795 lb. (360 kg)	915 lb. (420 kg)
Transition/Auxiliary Unit	510 lb. (230 kg)	625 lb. (280 kg)
VT Compartment	1090 lb. (495 kg)	1200 lb. (545 kg
CT Compartment	1050 lb. (475 kg)	1160 lb. (525 kg)

25.8–38 kV Switchgear Outdoor (NEMA 3R Construction)

Figure 17 - Side and Plan Drawing-Outdoor (Application A)

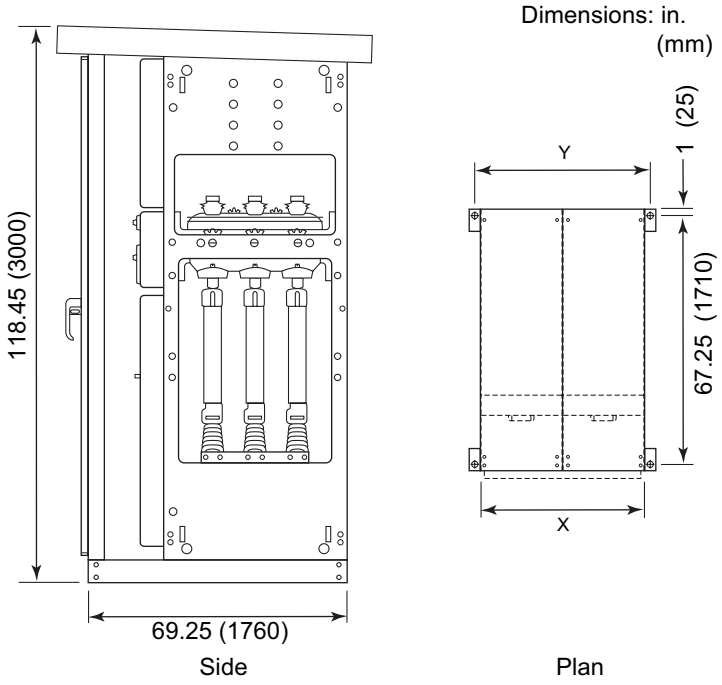


Table 7 - Approximate Dimensions and Weights 25.8–38 kV-Outdoor

	Frame Width (X)	
	29.50 in. (750 mm)	**39.37 in. (1000 mm)**
Bolt Center (Y)	Add 2.25 in. (57 mm) to the total length of the switchgear lineup	
Unfused Switch	1010 lb. (460 kg)	1165 lb. (530 kg)
Fused Switch	1060 lb. (480 kg)	1220 lb. (553 kg)
Transition/Auxiliary Unit	680 lb. (310 kg)	830 lb. (375 kg)
VT Compartment	1450 lb. (650 kg)	1600 lb. (725 kg)
CT Compartment	1400 lb. (634 kg)	1545 lb. (700 kg)

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, NOM-029-STPS-2011, or CSA Z462.
- Turn off the power supply to the switchgear.
- Turn off the switchgear before removing or installing fuses or making load-side connections.
- Always use a properly rated voltage sensing device at all line and load-side fuse clips to confirm that the switchgear is off.
- Never operate the switchgear with the access panels open.

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

This chapter contains instructions for the installation of the equipment. Perform the installation in the following sequence:

1. Site Preparation, page 33
2. Switch Operation
3. Access Panel Removal
4. Field Assembly, page 38
5. Cable Connections, page 41
6. Fuse Inspection/Fuse Replacement, page 44 (if necessary)
7. Hi-pot Testing, page 52

Site Preparation

Good site preparation is necessary to avoid installation problems and help ensure proper switchgear operation. Compare the site plans and specifications with the switchgear drawings to be sure there are no discrepancies. Check the site to ensure that the equipment fits properly (see Approximate Dimensions and Weights 2.4–15 kV-Indoor, page 29, Approximate Dimensions and Weights 2.4–15 kV-Outdoor, page 30, and Approximate Dimensions and Weights 25.8–38 kV-Indoor, page 31).

The floor must be flat and level within 1/16 in. per ft. (2 mm per 305 mm), or a maximum of 1/4 in. (6 mm) within the area of the switchgear, to help prevent distortion of the enclosures.

The equipment is available with front-access only as an option.

Schneider Electric recommends placing the rear of indoor equipment a minimum of 4–6 in. from the wall. Allow five ft. (1,524 mm) of clearance on the front. However, minimum clearances must meet all local and national requirements.

On outdoor switchgear, five ft. of clearance (on the front and back only) is recommended.

Provide area ventilation at all times to maintain the ambient temperature around the equipment between 32° F and 104 °F (0 °C and 40 °C) (see Preventive Maintenance, page 59).

Adequate lighting and convenience outlets must be available near the switchgear. Route sewer, water, and steam lines away from the equipment. Provide floor drains to minimize water buildup.

Operating the Switches

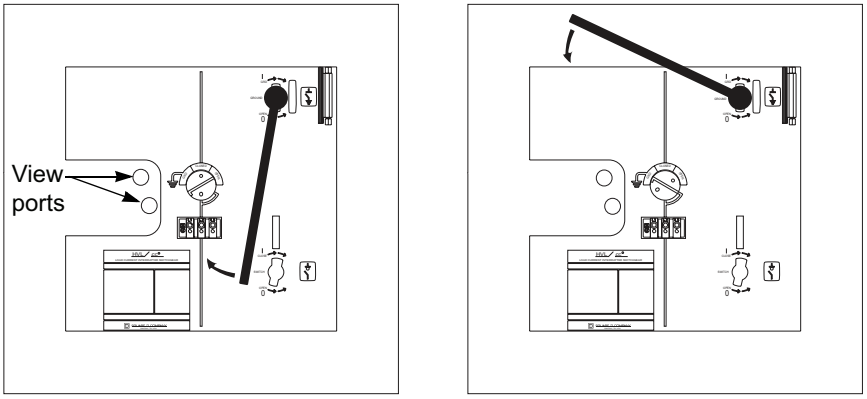
Switches are shipped in the closed position. Switches must be opened or grounded (if equipped) to gain access into the load-side compartment (see Operating the Ground Switch (if equipped), page 34, Switchgear Operation (OTM), page 35, and Switchgear Operation (SEM), page 36and Switchgear Operation (SEM), page 36). The position of the switch blades may be obvious from the position indicator on the mimic bus, however, always look through the viewing ports to verify the blades actual position. A flashlight is helpful.

NOTE: Never leave the operating handle in the switch port. The motor will not operate.

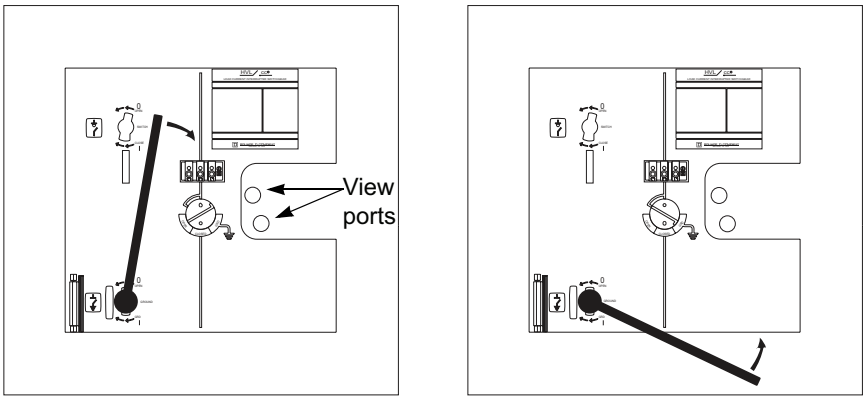
Operating the Ground Switch (if equipped)

To operate the ground switch (see Operating the Ground Switch (if equipped), page 34).

Figure 18 - Operating the Ground Switch (if equipped)



Closing the Ground Switch (Gounded) Opening the Ground Switch (Ungounded)
Application A



Closing the Ground Switch (Gounded) Opening the Ground Switch (Ungounded)
Application B

1. To **GROUND** the switch, insert the mechanism handle into the ground port located on the front of the mechanism compartment cover.
2. Rotate the handle clockwise, charging the ground mechanism spring, until the ground mechanism advances past over-toggle. Once the mechanism moves past over-toggle, the ground mechanism springs release their energy. This causes the switch blades to rotate at speeds independent of the user into the **GROUNDED** position.

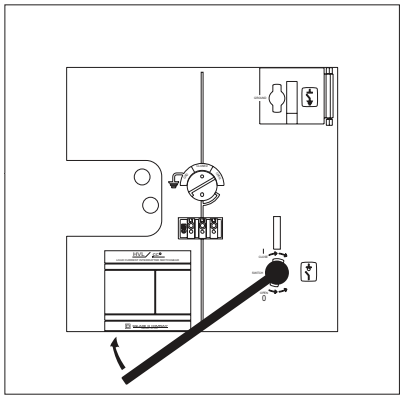
3. Remove the mechanism handle.

To **UNGROUND** the switch, follow the steps previously outlined in this section except rotate the handle counterclockwise.

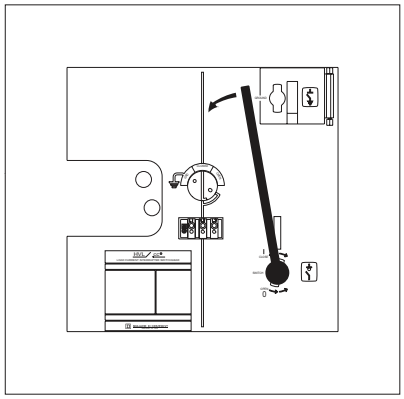
Operating Switchgear Equipped With an OTM

To operate switches equipped with an OTM (see Switchgear Operation (OTM), page 35).

Figure 19 - Switchgear Operation (OTM)

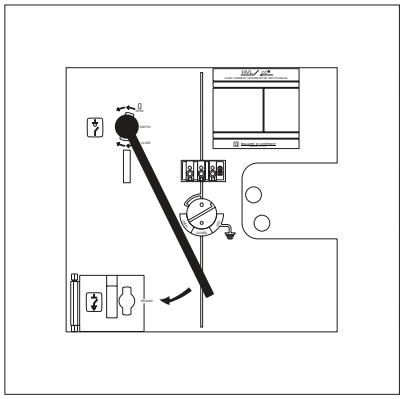


Closing the Switch (OTM)

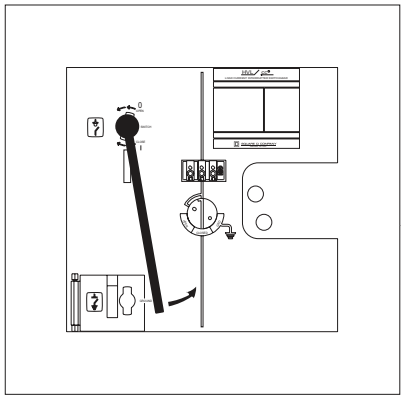


Opening the Switch (OTM)

Application A



Closing the Switch with an OTM mechanism



Opening the Switch with an OTM mechanism

Application B

1. To **OPEN (O)** the switch, insert the mechanism handle into the switch operating port located on the front of the mechanism compartment cover.
2. Rotate the handle counterclockwise, until the operating mechanism advances beyond over-toggle.

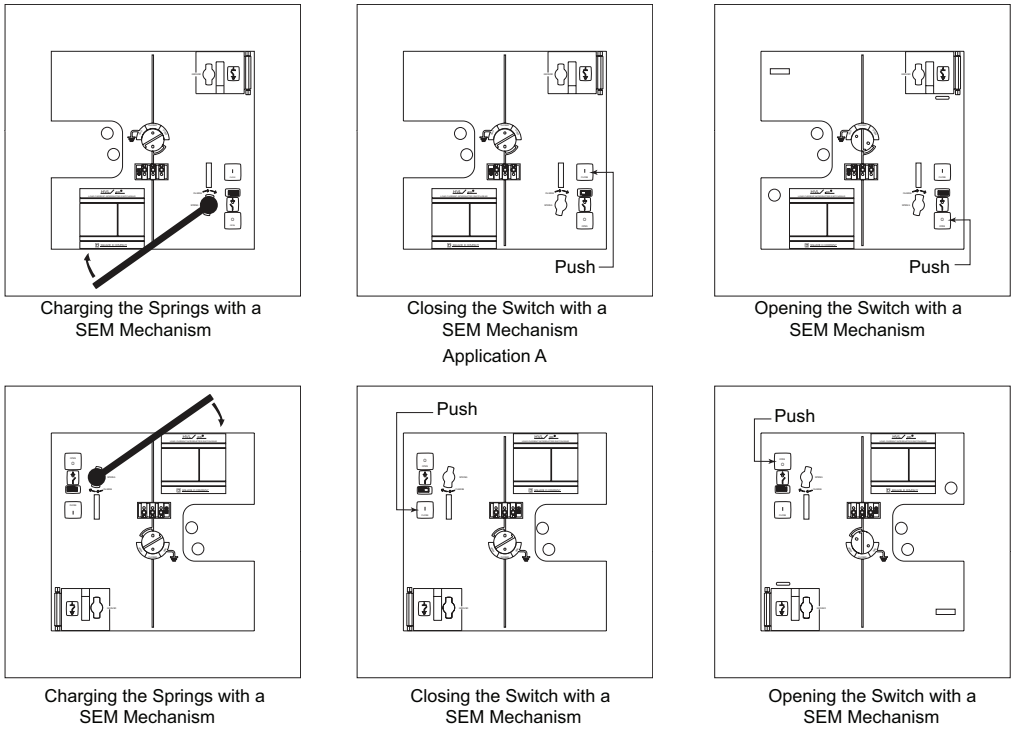
   NOTE: Rotating the handle charges the open/close springs of the operating mechanism. Once the mechanism moves beyond over-toggle, the operating mechanism springs release their energy. This causes the switch blades to rotate at speeds independent of the user into the **OPEN** position.
3. Remove the mechanism handle.

To **CLOSE (I)** the switch, follow the steps previously outlined in this section except rotate the handle clockwise.

Operating Switchgear Equipped With an SEM

To operate switches equipped with an SEM (see Switchgear Operation (SEM), page 36).

Figure 20 - Switchgear Operation (SEM)



Charging the Springs with a SEM Mechanism | Closing the Switch with a SEM Mechanism | Opening the Switch with a SEM Mechanism

Application A

Charging the Springs with a SEM Mechanism | Closing the Switch with a SEM Mechanism | Opening the Switch with a SEM Mechanism

Application B

1. Press the **OPEN (O)** push button. The operating mechanism springs release their energy, causing the switch blades to rotate into the **OPEN** position.
2. **CLOSE (I)** the switch by inserting the mechanism handle into the spring charging port located on the front of the mechanism compartment cover.
3. Rotate the handle clockwise to charge the open/close springs of the operating mechanism.
4. Continue to rotate the handle until the spring charge indicator shows that the springs are fully charged. Both the open and close springs are now charged.
5. Remove the mechanism handle.
6. Press the **CLOSE (I)** push button. The operating mechanism springs release their energy, causing the switch blades to rotate into the **CLOSE** position (the opening springs remain charged).

Access Panel Removal

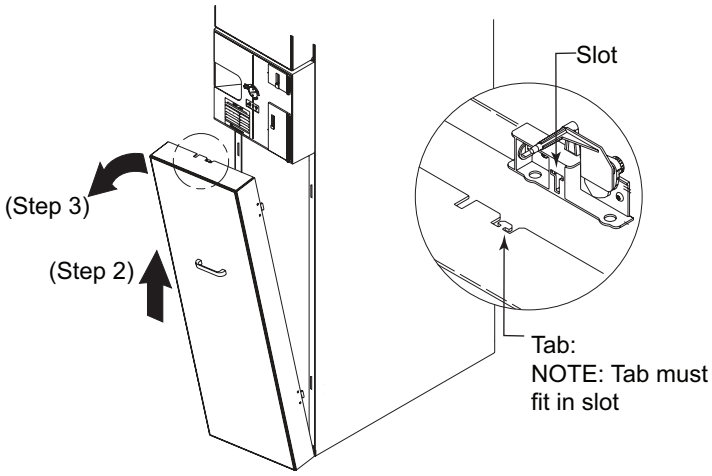
After the switch is placed in the **OPEN** or **GROUNDED** (if equipped) position, remove all appropriate access panels. Removal of these panels allows access to the necessary compartments to anchor and join shipping split frames, make bus and cable connections, install and/or remove fuses, and perform Hi-pot (dielectric) tests and pre-energization inspections.

Instructions for removing the load-side access panel are listed below. All other panels are bolted. The instrument compartment panel cannot be removed.

Removing the Load-side Access Panels

To remove the load-side access panels for Application A indoor or outdoor switchgear (see Removing the Load-side Access Panel-Application A, page 37):

Figure 21 - Removing the Load-side Access Panel-Application A

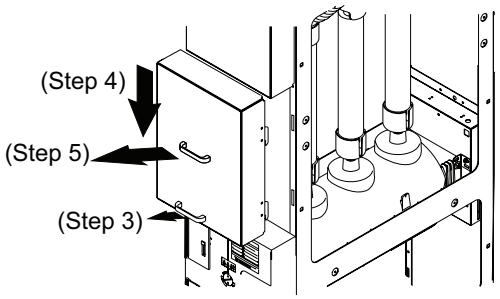


1. Verify that the switch is in the **OPEN** or **GROUNDED** (if equipped) position.

   NOTE: If the switchgear is equipped with a grounding switch, the switch must be in the **GROUNDED** position.
2. Grasp the handle on the front of the access panel firmly and lift the access panel until the interlock tab clears the interlock slot.
3. Tilt (pull) the panel out until it clears the front of the switchgear.

Follow the instructions listed below for removing the load-side access panels for **Application B** indoor or outdoor switchgear (see Removing the Load-side Access Panel-Application B, page 37):

Figure 22 - Removing the Load-side Access Panel-Application B



1. Verify that the switch is in the **OPEN (O)** or **GROUNDED** (if equipped) position.

   NOTE: If the switchgear is equipped with a grounding switch, then the switch must be in the **GROUNDED** position.
2. Grasp both the top and bottom handles on the front of the load-side access panel.

   NOTE: Be sure to support the panel by grasping the **TOP** handle firmly.
3. Pull the lower handle to release the latch retaining the access panel.
4. While supporting the panel allow it to slide down gently.
5. Pull out the panel to remove it.

Field Assembly

After proper site preparation, field assembly of shipping splits is required.

Field assembly includes:

1. Anchoring and joining shipping split assemblies, page 38
2. Bus connections, page 40
3. Control wiring connections, page 41

⚠CAUTION

IMPROPER BUS ALIGNMENT

Install the shipping split bus connectors only after the shipping sections are fastened in place and no additional movement will be made to the assembly.

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

Anchoring and Joining the Shipping Split Frames

To join and anchor shipping split frames:

1. Review the assembly drawings so that the switchgear sections are assembled in the correct order.

   NOTE: If the switchgear is to connect to an existing lineup, mount the connecting sections first.

2. Locate and anchor the first shipping split.

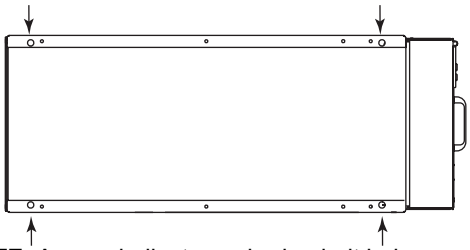
   NOTE: Be sure to mount all shipping splits on the same plane and level to achieve proper connection.

Follow the instructions for anchoring indoor, page 38 or outdoor, page 39 shipping split units.

Indoor Shipping Splits

To anchor indoor shipping split frames to the floor, place the 3/8 in. anchoring bolts (supplied by customer) through the anchoring holes located in the flanges at the bottom of each enclosure (see Bolt Hole Locations for Indoor Enclosures, page 38).

Figure 23 - Bolt Hole Locations for Indoor Enclosures

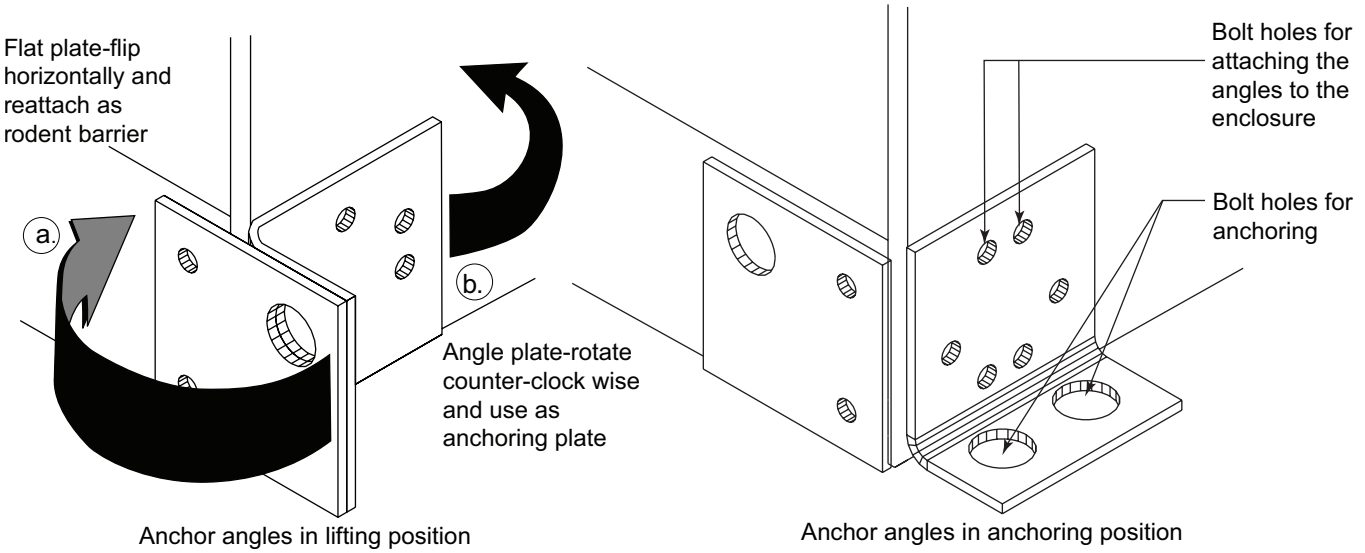


NOTE: Arrows indicate anchoring bolt holes positions.

Outdoor Shipping Splits

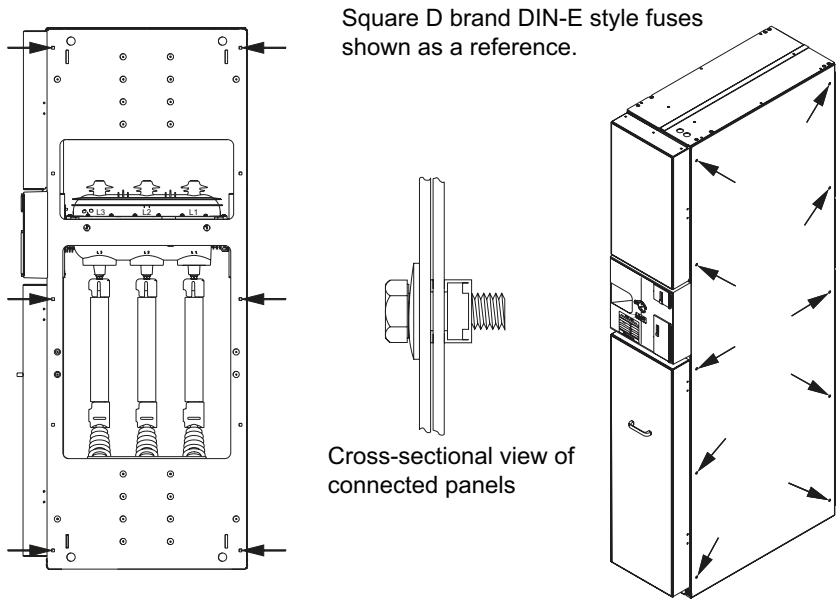
1. Remove the lifting angle assemblies. Retain the hardware and lifting angle assembly parts for future use. The angle is used for anchoring the shipping split. The flat plate is used as a rodent barrier.
2. Rotate the angle and attach it to the side of the shipping split using the hardware retained in step 1.
3. Anchor the enclosure to the foundation by placing the 3/4 in. anchoring bolts through the holes in the anchoring angles (see Anchoring Assemblies for Outdoor Enclosures, page 39).

Figure 24 - Anchoring Assemblies for Outdoor Enclosures



4. Locate the next shipping split according to the assembly drawing.
5. Level the shipping split and join it to the previously installed shipping split. Use 3/8-16, Grade 5 hardware to join shipping splits. Refer to Joining the Shipping Splits and Installing the End Panels, page 39 for bolt hole locations.

Figure 25 - Joining the Shipping Splits and Installing the End Panels

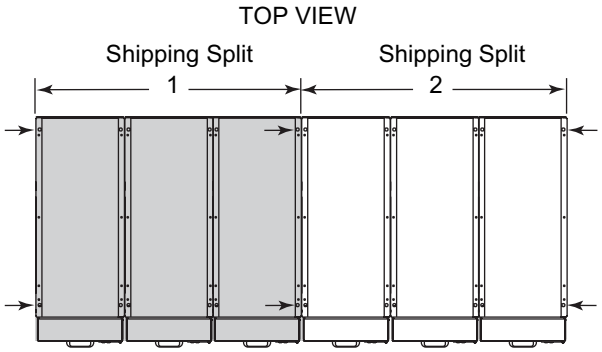


NOTE: Arrows indicate shipping split and end panel bolt locations.

6. Anchor the shipping split.

   For indoor units, place the 3/8 in. anchoring bolts (supplied by customer) through the anchoring holes located in the flanges at the bottom of the enclosure (see Anchoring Subsequent Indoor Shipping Splits, page 40). See Torque Values, page 41.

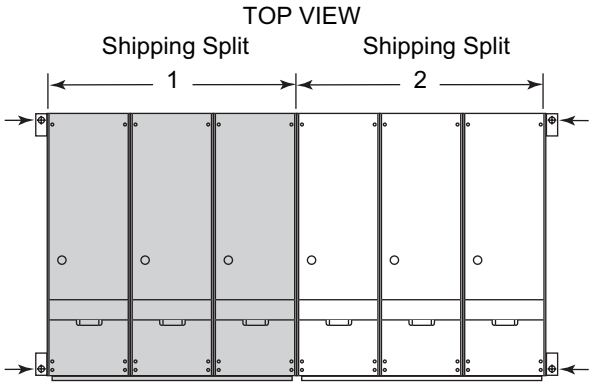
Figure 26 - Anchoring Subsequent Indoor Shipping Splits



NOTE: Arrows indicate anchoring bolt holes.

For outdoor units, place 3/4 in. anchoring bolts through the holes located in the anchoring angles. Attach anchoring angles to the end units only of outdoor switchgear lineups (see Anchoring Subsequent Outdoor Shipping Sections, page 40). See Torque Values, page 41.

Figure 27 - Anchoring Subsequent Outdoor Shipping Sections



NOTE: Arrows indicate anchoring bolt holes.

7. Repeat steps 4 through 6 for each additional shipping split
8. For outdoor units, rotate and reattach the flat plates (part of the lifting angle assembly) over the bolt holes left during removal of the lifting angle assemblies to help minimize rodent entry (see Anchoring Assemblies for Outdoor Enclosures, page 39).

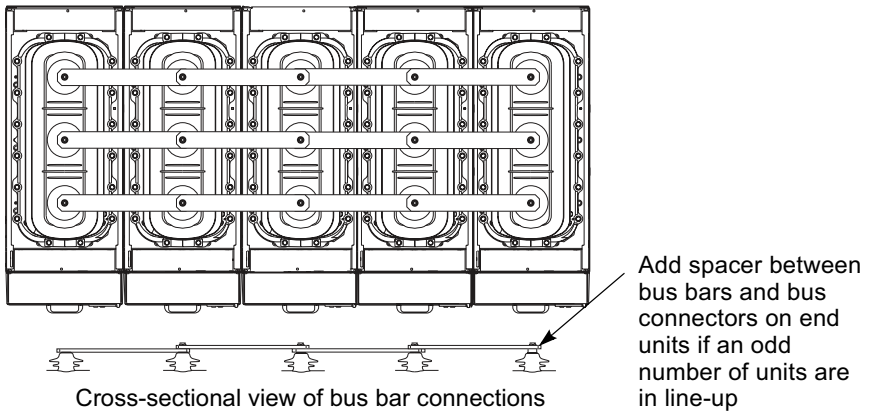
Bus Connections

To make bus connections:

1. Make sure the bus connector contact surfaces are clean. When necessary, clean the bus bars with a mild, non-abrasive cleaning agent such as ScotchBrite®. Be careful not to remove the bus bar's silver-plating during cleaning.
2. Install the bus connectors one phase at a time. Loosely bolt the bus joints. The bus connector hardware is provided and can be found in the carton packing. Use M-8 (8 mm) hardware for line side bus connections and M-10 (10 mm) for the load-side bus connections.

3. After all three bus bars are in place and properly aligned, tighten the bolts using a torque wrench. See Torque Values, page 41 for torque values.

Figure 28 - Bus Bar Connections



4. Connect the ground bus at each shipping split, remove and retain the existing hardware. Position the unit, then re-install and tighten the hardware per Torque Values, page 41.

Table 8 - Torque Values

Bolt Size (SAE #2 Steel Bolts)	Torque Values	
	Sheet Metal Joints	Electrical Connections
1/4-20	7 lb-ft. (9.5 N•m)	10 lb-ft. (13.5 N•m)
5/16-8	14 lb-ft. (19 N•m)	20 lb-ft. (27 N•m)
3/8-6	21 lb-ft. (28.5 N•m)	35 lb-ft. (47.5 N•m)
1/2-3	42 lb-ft. (57 N•m)	70 lb-ft. (95 N•m)
M8 (8 mm)	15 lb-ft. (20.5 N•m)	21 lb-ft. (28.5 N•m)
M10 (10 mm)	22 lb-ft. (30 N•m)	36 lb-ft. (49 N•m)

Control Wiring Connections

To make control-wiring connections:

1. Consult the customer wiring diagrams for re-connection of control wiring at the shipping splits, when applicable. Each wire has been identified and previously connected during assembly when tested at the factory.
2. Make all outgoing control connections according to the wiring diagrams. After wiring is complete, check all connections to verify they are properly completed and in their proper location.

Cable Connections

Before making the cable connections, determine the phase identity of each cable. Viewing the switchgear from the front, standard bus sequence is normally phased A-B-C front to rear, unless labeled otherwise.

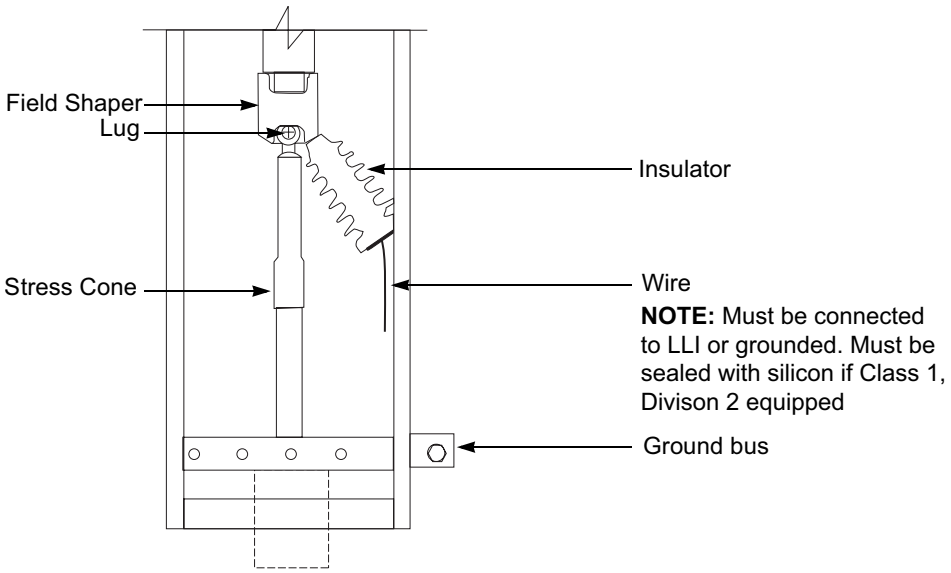
⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK EXPLOSION OR ARC FLASH

- All cables must be terminated inside the field shapers with lugs supplied by Schneider Electric (see Example of a Typical Cable Connection, page 42).
- Properly support cables so that landing pads are not bearing the weight of the cables.

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

Figure 29 - Example of a Typical Cable Connection



When cable terminations are made, follow the cable manufacturer's instructions in stripping the shield and cleaning the unshielded portion of the cable. Install the appropriate stress cone in accordance with the stress cone manufacturer's instructions. Cables should be securely fastened or braced to withstand short circuit forces and to minimize strain on the terminals.

Forming the Cables

When forming cables for termination within switchgear, avoid sharp turns, corners, and edges which could damage or weaken the cable insulation. Follow the cable manufacturer's instructions carefully in determining the minimum bending radius of cables.

Shielded Cables Through Window-Type Current Transformers

When routing shielded cable through window-type current transformers or ground sensor current transformers, the shield-ground connection wire is normally routed back through the current transformer and solidly grounded.

Unshielded Cable Connections

⚠⚠DANGER

HAZARD OF ELECTRICAL SHOCK, EXPLOSION, OR ARC FLASH

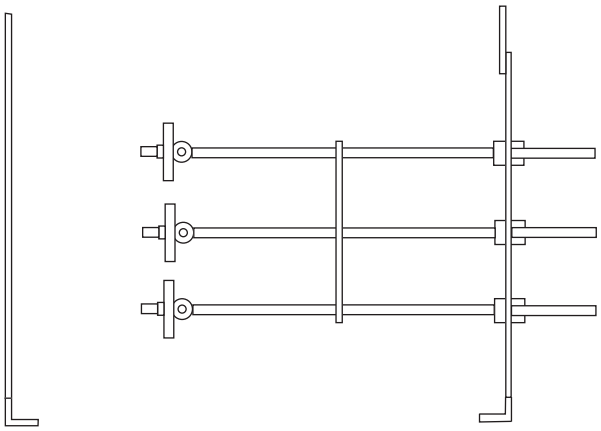
Maintain a minimum clearance of four in. (102 mm) between insulated cable and grounded metal parts or other phases.

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

To meet switchgear requirements, follow the cable manufacturer's instructions for proper clearance of cables, conduits, and bus. These items must be securely fastened or braced to withstand short circuit forces and to minimize strain on the terminals.

NOTE: Maximum length of unsupported cable is 18 inches (457 mm).

Figure 30 - Example of Unshielded Cable Support



Fuse Replacement

Proper fuse replacement for this equipment is very important. If FuseLogic fuse trip system is installed, the correct removal and installation allows for proper function of the system. To maintain system coordination, always replace all three fuses even if only one has blown. Lubricate the fuse clips with Mobil® 28 red grease if needed.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, NOM-029-STPS-2011, 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.
- The Live Line Indicator is not an indicator of the absence of voltage.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on the power to this equipment.
- The body of a fuse that has blown or carried load current can be **EXTREMELY HOT** and burn unprotected hands.
- Never try to insert or remove both ends of the fuse at once. The fuse body is made of FRAGILE PORCELAIN (glass-like) and can shatter if handled incorrectly (see Fuse Removal (Application A shown), page 45 and Fuse Installation (Application A shown), page 46).
- When removing Square D (or Bussman equivalent) DIN-E style fuses, always remove the end opposite the switch first. This avoids damaging the Fuselogic system assembly and fuse (see Fuse Removal (Application A shown), page 45). Never attempt to remove both ends at once.
- When installing Square D (or Bussman equivalent) DIN-E style fuses, always install the end of the fuse nearest the switch first; then install the opposite end. Always push on the ferrule being inserted (see Fuse Installation (Application A shown), page 46). Never attempt to install both ends at once.
- While removing Mersen CS-3 style fuses, always remove the end nearest the switch first (see Removal of Mersen Fuses, page 47, Application A). Never attempt to remove both ends at once.
- While installing Mersen CS-3 style fuses, always install the end opposite the switch first (see Installation of Mersen Fuses, page 48, Application A shown). Never attempt to install both ends at once.
- Only use the fuse insertion and removal tools specified or provided by Schneider Electric to avoid damaging the fuse holders.
- Do not use a metallic prybar/tool to pry the fuses out of the fuse clip. This can damage the fuse holders. Only use a non-marking, non-sparking and nonmetallic pry tool specified or provided by Schneider Electric.
- Do not pry or support any tool on any part of the aluminum deflectors for fuse removal or insertion. This can damage the surface of the aluminum deflectors and degrade dielectric performance.

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

If the HVLcc unit experiences a trip current, blown fuse, or other stressful condition, inspect the switch at the first opportunity:

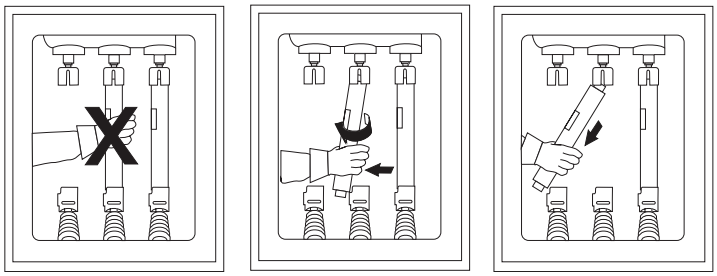
1. Make any necessary repairs.
2. Inspect the fuse clips (both top and bottom) on each phase carefully for any form of damage like (but not limited to) arcing or burn marks.
3. Contact your local Schneider Electric representative to replace parts if any erosion on the fuse clips exists.
4. Perform a hi-pot test before placing the equipment back into service.

Fuse Removal Square D (or Bussman™ Equivalent) DIN-E Style Fuses

1. Place the switch in the **OPEN** or **GROUNDED** position to access the load-side compartment (see Removing the Load-side Access Panels, page 37)
2. Use a properly rated voltage sensing device to verify that power is off. The Live Line Indicator is not an indicator of the absence of voltage.
3. Grasp the fuse by the end opposite the switch first. While gently pulling the fuse ferrule, rotate the fuse body slightly to help ease the fuse ferrule out of the fuse clip.
4. After the fuse is removed from the fuse clip opposite the switch, pull the fuse down to remove the fuse from the remaining fuse clip.

   NOTE: To maintain system coordination, always replace all three fuses even if only one has blown.

Figure 31 - Fuse Removal (Application A shown)



Fuse Installation of Square D (or Bussmann equivalent) DIN-E Style Fuses

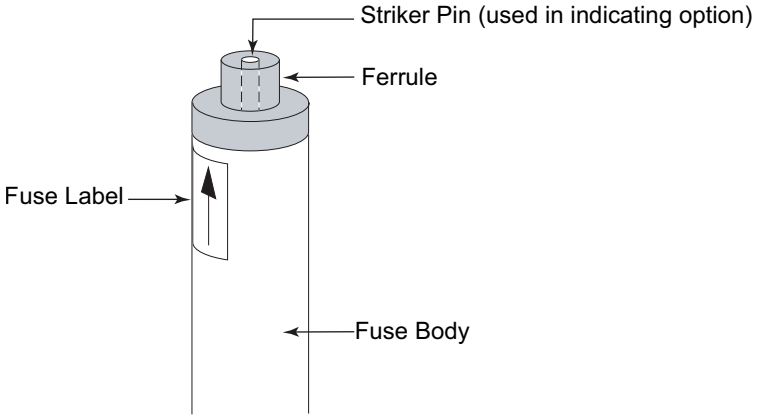
To install fuses:

1. Using a properly rated voltage sensing device verify that power is off.

2. Insert the fuse ferrule into the fuse clip that is nearest the switch (Top on Application A, Bottom on Application B). Be sure to orient the striker pin properly (see Fuse Characteristics and Striker Pin Directions (Application A position shown), page 46).

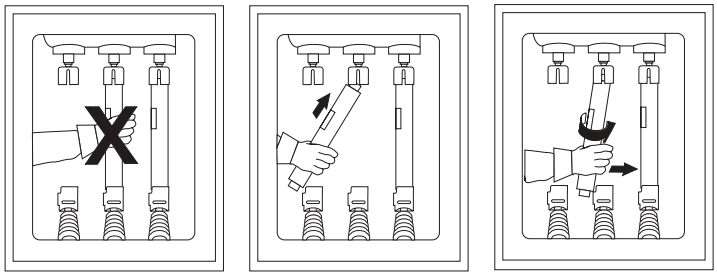
   NOTE: The striker pin assembly must always point toward the switch. For Application A the pin is at the top of the fuse. On Application B the pin must be at the bottom. The fuse characteristics and striker pin directions are printed on the fuse label. Always turn the fuse so that the label is in the front and the arrow is pointed toward the switch (up-Application A, down-Application B).

Figure 32 - Fuse Characteristics and Striker Pin Directions (Application A position shown)



3. Insert the remaining end of the fuse into the fuse clip opposite the switch. Gently push while rotating the fuse body to help ease the fuse ferrule into the fuse clip.

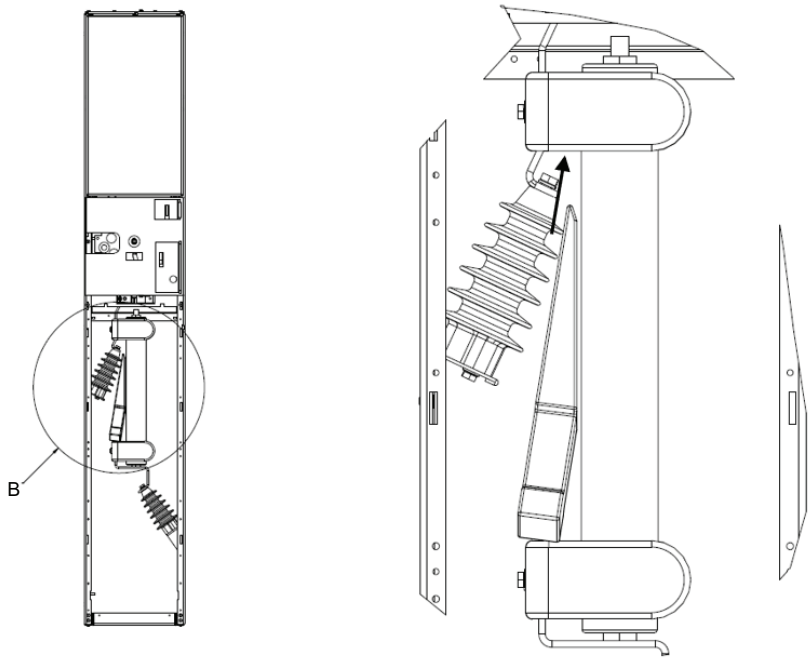
Figure 33 - Fuse Installation (Application A shown)



Removal of Mersen Fuses

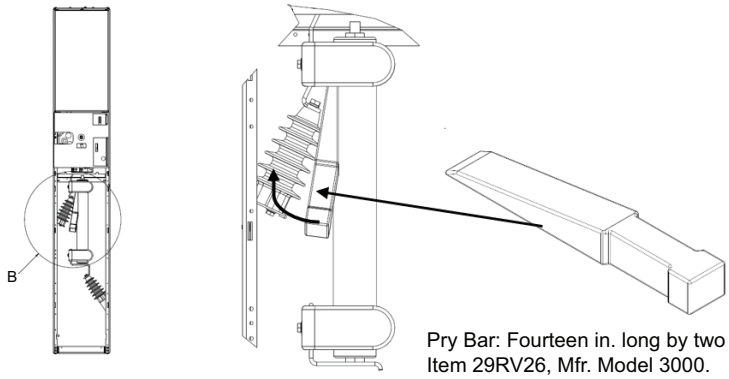
1. Place the switch in the **OPEN** or **GROUNDED** position to access the load-side compartment (see Removing the Load-side Access Panels, page 37) .
2. Use a properly rated voltage sensing device to verify that power is off.
3. Insert nonmetallic pry tool/wedge inside the field shaper between fuse ferrule or body and fuse holder assembly in the end nearest the switch as shown in Pry Tool/Wedge Inside the Field Shaper , page 47 (15 kV Single fuse shown for reference).

Figure 34 - Pry Tool/Wedge Inside the Field Shaper

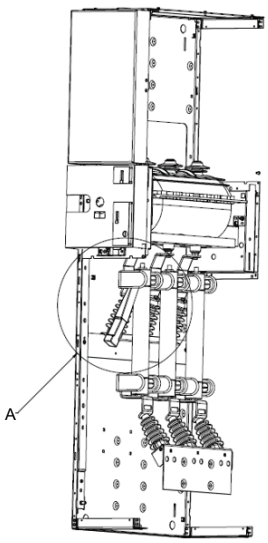


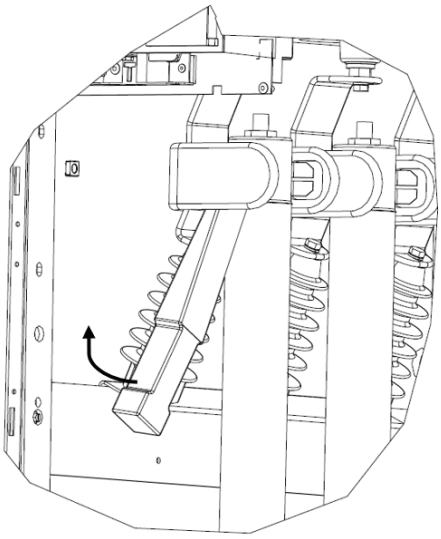
4. Gently pry fuse out of fuse clip and remove fuse from the end nearest the switch (see Pry Fuse Out and Remove, page 47).

Figure 35 - Pry Fuse Out and Remove



Pry Bar: Fourteen in. long by two in. wide, ABS Item 29RV26, Mfr. Model 3000.





5. After the fuse is removed from the fuse clip nearest the switch, pull the fuse to remove the fuse from the remaining fuse clip.

   NOTE: To maintain system coordination, always replace all three fuses even if only one has blown.

Installation of Mersen Fuses

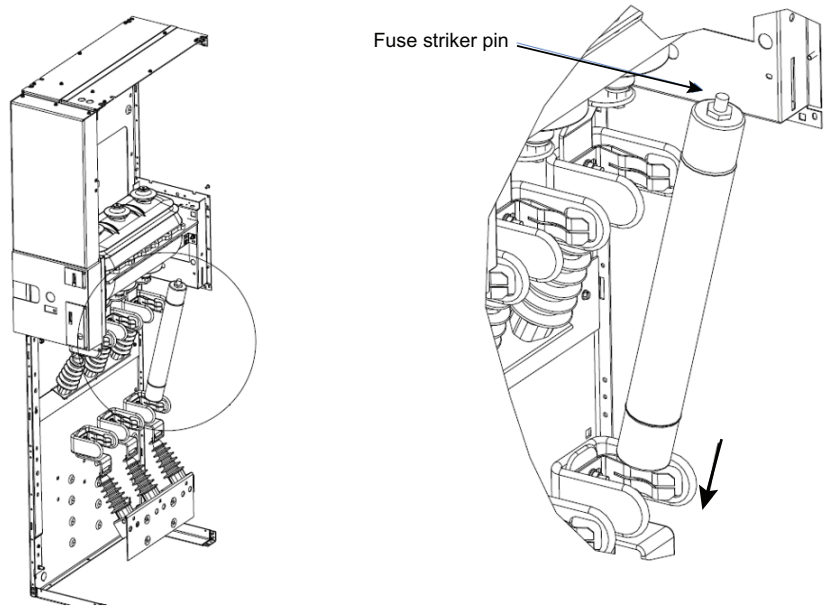
Always install the end of the fuse opposite the switch first; then install the near end.

1. Use a properly rated voltage sensing device verify that power is off.

2. Insert the fuse ferrule vertically into the round portion of the fuse clip that is opposite the switch (Bottom on Application A, Top on Application B). Start with the phase farthest away from the opening being accessed (C Phase if accessing from the front and A Phase if accessing from the back. Phase C is shown for reference in Striker Pin Orientation, page 49). Push and twist fuse to help with installation.

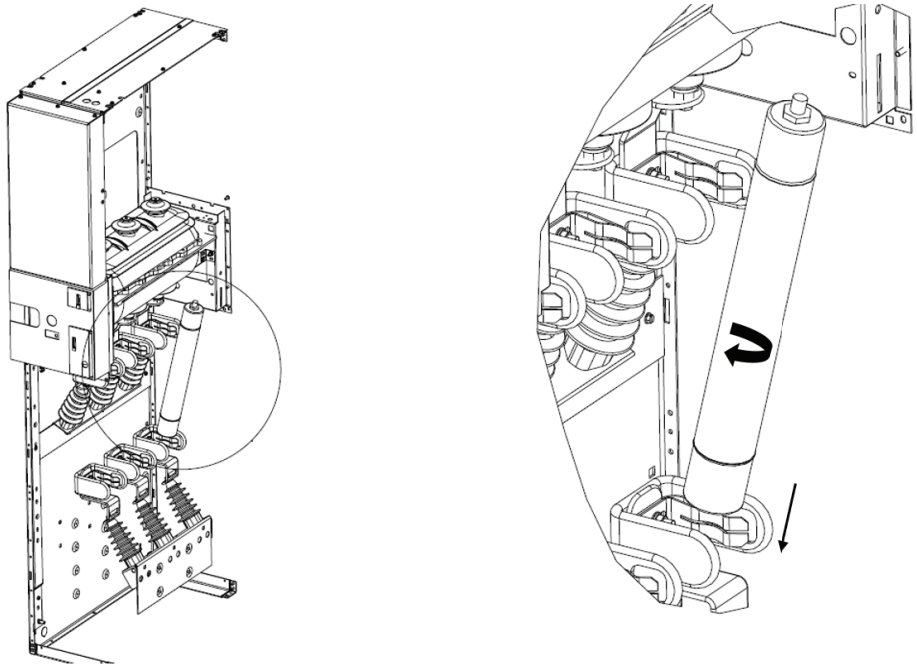
   NOTE: The fuse striker pin assembly must always point toward the switch. For Application A the pin is at the top of the fuse. For Application B the pin must be at the bottom. The fuse characteristics are printed on the fuse label. Always turn the fuse so that the label is in the front (up-Application A, down-Application B).

Figure 36 - Striker Pin Orientation



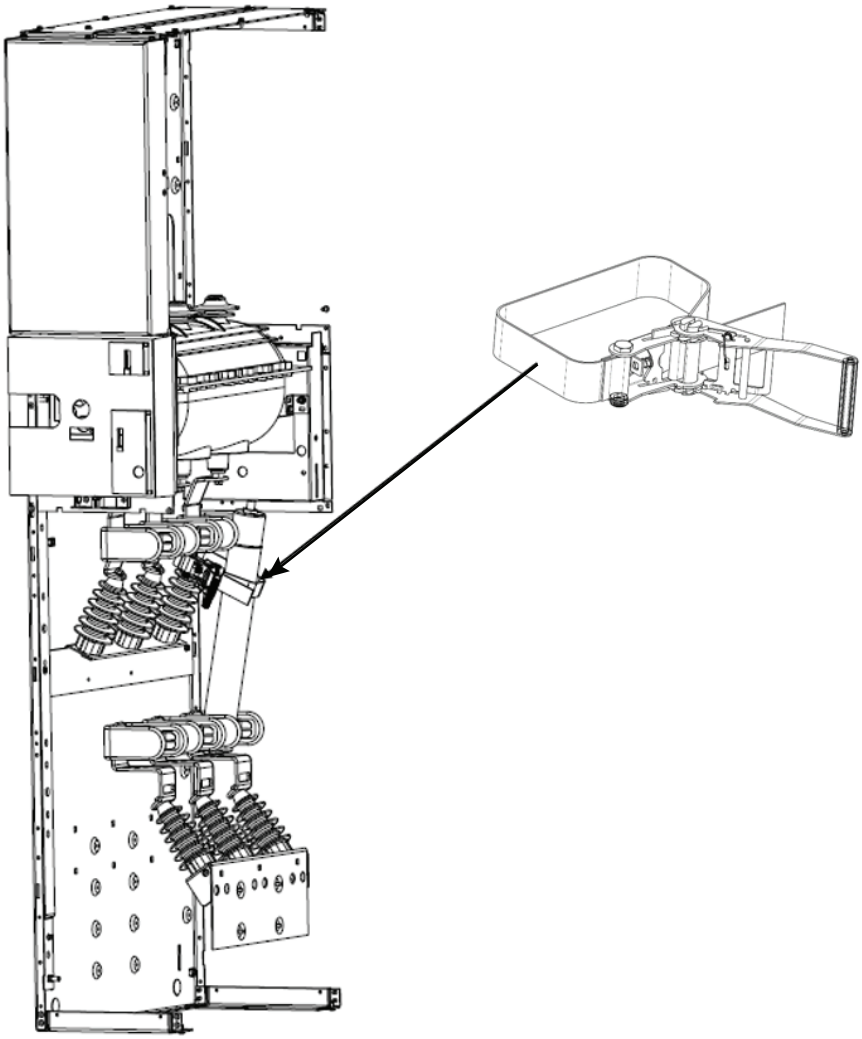
3. Push and twist fuse to help with installation (see Fuse Installation, page 50).

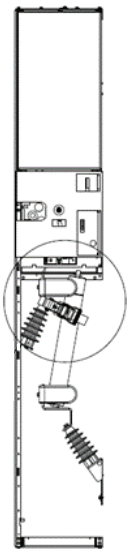
Figure 37 - Fuse Installation

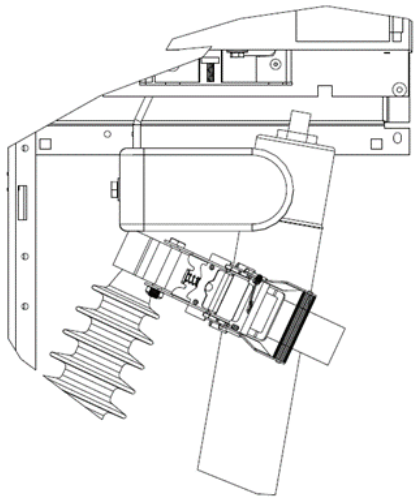


4. Attach a ratchet strap around the end of the fuse nearest the switch, and around the fuse holder assembly as shown in Strap Positioning, page 51. Gently ratchet the fuse body into the fuse clip and insert the remaining end of the fuse into the fuse clip nearest the switch.

Figure 38 - Strap Positioning







5. Remove ratchet strap.

Hi-Pot (Dielectric) Testing

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, NOM-029-STPS-2011, or CSA Z462.
- Only qualified electrical personnel should perform this testing.
- During testing maintain a minimum clearance of six ft. (1.8 m) from equipment.

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

1. Perform a standard sixty-cycle hi-pot (dielectric) test to measure insulation integrity. See Hi-Pot Test Values, page 53 for hi-pot test values. In performing the hi-pot (dielectric) test, take the following minimum actions to help ensure the safety of personnel and equipment:
   - Restrict entry into the area to help prevent any unauthorized personnel from approaching the gear during testing.
   - Notify all persons that the test is going to be conducted.
   - Follow all local lockout and tag-out procedures.
   - Remove all fuses both low voltage and medium voltage.
   - Disconnect all potential transformer secondary connections.
   - Disconnect Surge (Lightning) arrestors (SAs or LAs) (if supplied)
   - Short all current transformer circuits at shorting block.
   - Capacitive dividers supplied with the equipment must be properly connected or grounded.
   - All ground connections must be properly made and tightened according to Torque Values, page 41. Refer to Bus Connections, page 40, Example of a Typical Cable Connection, page 42(“Installation Note”), and the “HVL/cc Grounding Switch Application” section of the “Metal Enclosed Load Interrupter Switchgear with HVL/cc Switches” catalog (6045CT9801).

Table 9 - Hi-Pot Test Values

Equipment Rating	Field Test Voltages	
	(AC)	(DC)
4.76 kV	14 kV	20 kV
15 kV	27 kV	38 kV
17.5 kV	28.5 kV	40 kV
27 kV	45 kV	63 kV
38 kV	60 kV	85 kV

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

When using a DC voltage source, the load-side of the capacitive dividers must be grounded after the high-pot test is completed to discharge trapped charges.

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

2. Apply the voltage to each phase individually for one minute with the other two phases and the enclosure grounded.

If the test is unsuccessful, inspect the insulators for leakage paths. If necessary, clean the surface of the insulator(s) and re-test. If problems persist, **DO NOT ENERGIZE THE SWITCHGEAR**. Contact your local Schneider Electric field sales office or your distributor.

After a successful test, restore the equipment by reversing any changes made for the hi-pot test (such as replacing fuses, disconnecting wires, etc.).

Final Inspection

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, NOM-029-STPS-2011, or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Always assume that all circuits are live until they have been completely de-energized, tested, grounded, and tagged.
- Exercise extreme care to so that the equipment is not energized while conducting the preliminary tests. If disconnect switches cannot be opened, disconnect the line leads.

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

After the switchgear is installed and all interconnections are made, follow the steps listed below to test the equipment and perform a final inspection before placing it in service.

1. Verify that a sixty-cycle hi-pot test has been preformed recently on the equipment. See Hi-Pot Test Values, page 53 for test values and additional information.
2. Check all control wiring with the wiring diagrams. Verify that all connections are properly made and tightened to the proper torque value (see Torque Values, page 41), all fuses are installed, current transformer circuits are complete, and all fault detection devices have been properly connected.
3. Verify all insulating surfaces, including the primary support insulators and isolation barriers, are clean and dry.
4. Verify all fuses are installed properly and do not exceed the nameplate rating.
5. Before energizing any electric power source, make a final check of the equipment. Inspect every compartment for loose parts, tools, litter, and miscellaneous construction items.
6. Review key interlock schemes carefully (if used). Insert only the proper keys in the locks. Remove all extra keys and store them where only authorized personnel can access them.
7. Verify that all barriers and covers are properly secured.

Final Preparation and Energization

This chapter contains information on how to operate HVL/cc Metal-Enclosed Switchgear.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, NOM-029-STPS-2011, or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Only qualified electrical personnel familiar with medium voltage circuits should perform the instructions in this bulletin. Personnel must understand the hazards involved in working with or near medium voltage equipment.
- Qualified electrical personnel must perform work in accordance with national and local electric codes.
- 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.
- The Live Line Indicator is not an indicator of the absence of voltage.
- Always use a properly rated voltage sensing device to confirm power is off.
- Before performing visual inspections, tests, or maintenance on the equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, grounded, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Before making any electrical connection, ensure that all leads to be connected are de-energized with proper safety grounds applied.
- Metal-enclosed switchgear have interlocks designed to minimize hazards to the user. It is not possible to eliminate every hazard with interlocks. The user of this device is responsible for recognizing the potential hazards, for wearing protective safety equipment, and for taking adequate safety precautions.
- Do not make any adjustments to the equipment or operate the system with safety features removed. Contact your local Schneider Electric representative for additional instructions if the device does not function as described in this manual.
- Handle this equipment carefully and install, operate and maintain it correctly in order for it to function properly.
- Carefully inspect your work area and remove any tools and objects left inside the equipment.
- Replace all devices, doors, and covers before turning on the 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.

Final Operating Checks

Perform the following minimum list of operating tests that before energization:

NOTE: If any of the operating tests provide unacceptable results, **DO NOT ENERGIZE THE SWITCHGEAR.** Contact your local Schneider Electric field sales office or distributor.

With all power off, perform the following checks:

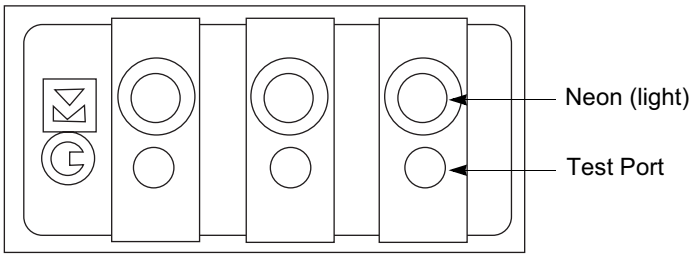
1. Operate the grounding switch (if equipped) a minimum of five times and verify that the LDA (if equipped) is functioning properly. (All contact fingers must touch the field shapers when the main switch is in the grounded position.)
2. Operate the load switch a minimum of five times.
3. With the switch in the **CLOSE** position, verify that the load-side panel cannot be removed (see Removing the Load-side Access Panels, page 37).
4. When mechanical interlocks are present for automatic transfer or duplex switching, verify that only one switch will operate at a time.
5. Verify that the CT circuits are not shorted at the terminal block.
6. Replace all devices, doors, and covers before turning on the power to the equipment.

Energization

After the proper testing is complete on the incoming service cables and before the switch is energized, perform the following operations.

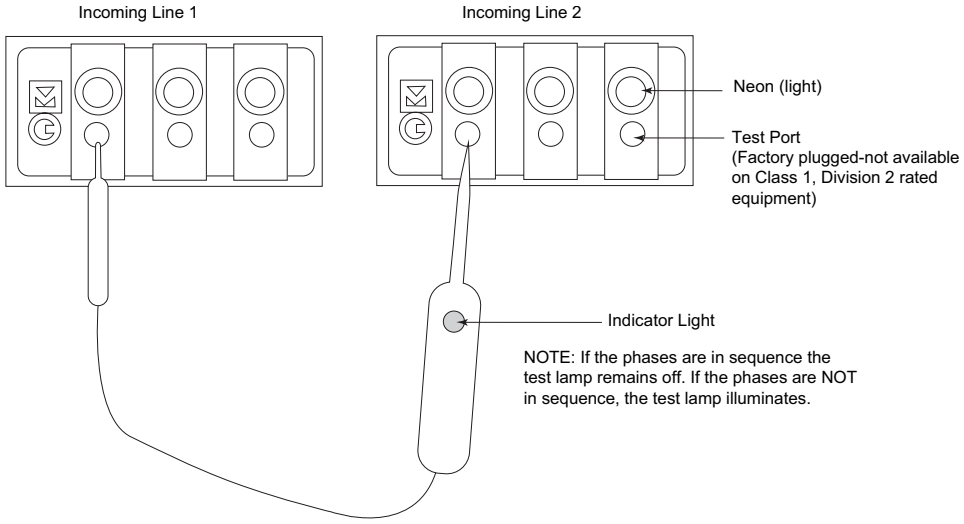
1. Open the incoming main switch.
2. Energize the incoming cables.
3. The Live Line Indicators (LLIs) are located on the main source side of the line-up as in Using Live Line Indicators, page 56. The LLI is not an indicator of the absence of voltage. As soon as the circuits are energized, the voltage indicator lamps should illuminate.

Figure 39 - Using Live Line Indicators



4. Perform phase sequence tests on equipment with multiple incoming lines. Phase sequence tests can be performed through the test ports on the optional LLIs (see Phase Sequence Testing, page 57).

Figure 40 - Phase Sequence Testing



NOTE: Test ports will have a potential of 17–60 V (L-G) depending on version of light head module.

5. Close the switch, and the load-side indicators should illuminate.
6. Close the load and feeder circuits, if provided in the line-up, one at a time.

Inspection, Maintenance, and Troubleshooting

This chapter contains the following sections:

Inspection/Preventative Maintenance Guidelines

This section contains information on inspecting and performing preventive maintenance on HVL/cc Metal-Enclosed Switchgear.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, NOM-029-STPS-2011, 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.
- The Live Line Indicator is not an indicator of the absence of voltage.
- Always use a properly rated voltage sensing device to confirm power is off.
- Before performing visual inspections, tests, or maintenance on the equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, grounded, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Replace all devices, doors, and covers before turning on the power to this equipment.

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

Inspection

Follow the guidelines and procedures outlined in this section when performing periodic inspections on the equipment.

Recommended Inspection Interval

Periodic inspection of the equipment is necessary to establish the conditions to which the units are subjected (see Recommended Maintenance Guidelines, page 60). The maximum recommended inspection interval is one year.

Inspection Procedure

The following is a minimal list of inspection procedures to perform to help ensure proper maintenance.

1. Bus and Connections. De-energize the primary and secondary circuits. Perform a standard sixty-cycle hi-pot test to measure bus insulation integrity (see Hi-Pot (Dielectric) Testing, page 52).
2. Inspect the connections for symptoms which indicate overheating or weakened insulation. Remove dust from the surfaces of the bus bars, connections, supports, and enclosures. Wipe clean with a solvent such as denatured alcohol. Only apply denatured alcohol with lint free cloths and take care to only use it on the surfaces of bus bars, connections, supports, and enclosures. Vacuum the equipment. Do not use compressed air to blow dust from the surfaces inside the switchgear.
3. Maintain the instruments, relays, and other devices according to the specific instructions supplied. Inspect the devices and their contacts for dust or dirt; wipe clean with a clean, lint free cloth as necessary. The maintenance schedule for individual devices, such as meters and relays, are based upon recommendations contained in the individual instruction manual for each device. Coordinate the various schedules with the overall maintenance program.
4. Inspect control wiring connections for tightness and damage.
5. Manually operate mechanical moving parts such as switch assemblies, interlocks, and doors.
6. Make sure all bus areas are well ventilated. Inspect grille work and air passages on indoor and outdoor switchgear to make sure they are free from obstruction and dirt accumulation. Clean aluminum filters on outdoor switchgear by removing and thoroughly back-flushing with soap and water. Replace the filters only after they are clean and dry.

Preventive Maintenance

Follow the guidelines and procedures in this section when performing preventative maintenance.

Maintenance Log

Keep a maintenance log (see Troubleshooting, page 71) for this equipment. List all inspection, service, and maintenance calls with dates as well as any corrective and preventive actions taken.

Preventative Maintenance Intervals

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. This definition for periodic maintenance applies throughout this manual, unless otherwise noted.

Inspect the equipment immediately after abnormal or stressful operating conditions occur or after the equipment experiences a trip current.

Table 10 - Recommended Maintenance Guidelines

Component	Ideal Conditions[1]	Standard Conditions[1]	Aggressive Conditions[1]
Epoxy Switch Housing	Every ten years	Every five years	Every two years
Housing interior (all bus and mechanisms)	Every ten years	Every five years	Every two years
Housing	Every ten years	Every five years	Every two years

These inspection/maintenance guidelines cover only the switch and enclosure manufactured by Schneider Electric. If conditions cannot be established and documented, then the aggressive operating condition must be assumed.

These inspection/maintenance guidelines do not warrant any field connections, field modifications, or supersede any maintenance procedures or schedules recommended by component manufacturers.

Environmental Conditions

Ideal Conditions:

- Unit is installed and commissioned in accordance with manufacturer's instructions
- Humidity below 40% and no dripping water
- Indoor protected from weather
- Minimum dust and air circulation
- Ambient temperature between 32°F and –104°F (–0°C and +40°C)
- No contact with any chemical agents (salt, H_2S, etc.)
- No infestation of any animal life (rodents, insects)
- No contact with any plant life (mold or other)
- No earth movements
- No damage to the unit of any kind
- No mal-operation of any kind
- No abnormally high number of operations (see Typical Life of HVL/cc (a) 25.8 and 38 kV, (b) 5 and 15 kV, page 61)
- No abnormally high number of trips (see Typical Life of HVL/cc (a) 25.8 and 38 kV, (b) 5 and 15 kV, page 61)
- No over-voltage or over-current (above ratings)
- Thermal scanning of the joints at-least once a year

  NOTE: Optional thermal IR scanning windows or an integrated thermal monitoring system package is available from Schneider Electric.

Standard Conditions:

All the above conditions listed under "Ideal Conditions" apply (see Recommended Maintenance Guidelines, page 60) with the exception of the following:

- Bullet 2: Humidity below 60%.
- Bullets 3 through 5: The unit may be indoors or outdoors but must not be subjected to regular extremes of weather (heavy rainstorms, dust storms, flooding, temperature cycles greater than 104°F (40°C), temperatures less than –22°F (–30°C), dense coastal fog or acid rain).
- Bullet 8: No regular thick covering of leaves or other debris.

1. See Environmental Conditions, page 60 for definitions.

Aggressive Conditions:

Any environmental conditions, which do not satisfy one of the two above descriptions, must be deemed aggressive.

The product has been tested under ideal laboratory conditions to the values listed below.:

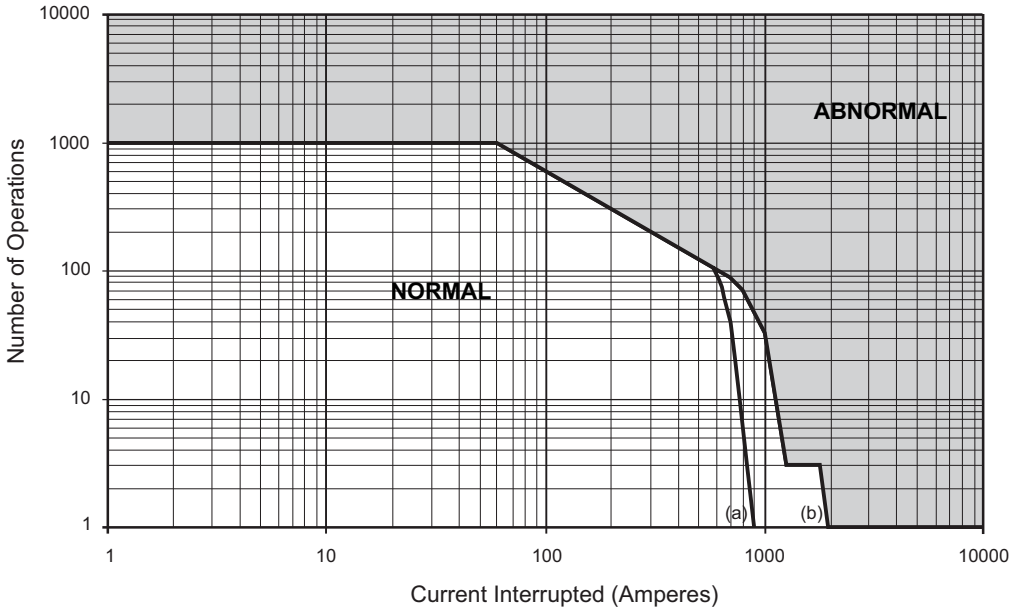
- 1000 Mechanical no load operations
- 100 Full load current interruptions

The device has been designed and tested to IEEE Std C37.20.4 and CSA C22.2, No.193 requirements. Typical Life of HVL/cc (a) 25.8 and 38 kV, (b) 5 and 15 kV, page 61 illustrates the typical life of the equipment under ideal laboratory conditions. This chart represents an accumulated total (ksi) at greater than 80% power factor, less than 17.5 kV of the 600 A interrupter.

NOTE: Example: The device successfully interrupts a 600 A current (nameplate rating) 100 times or 100 A current 600 times.

The contact life can also be verified by performing a millivoltage or micrometer test. The value should not increase by 300% of the original value of 80 microohms using a 100 A test micrometer. The 1200 A disconnect has an electrical endurance (full load operations) of 18.

Figure 41 - Typical Life of HVL/cc (a) 25.8 and 38 kV, (b) 5 and 15 kV



Replacement Parts

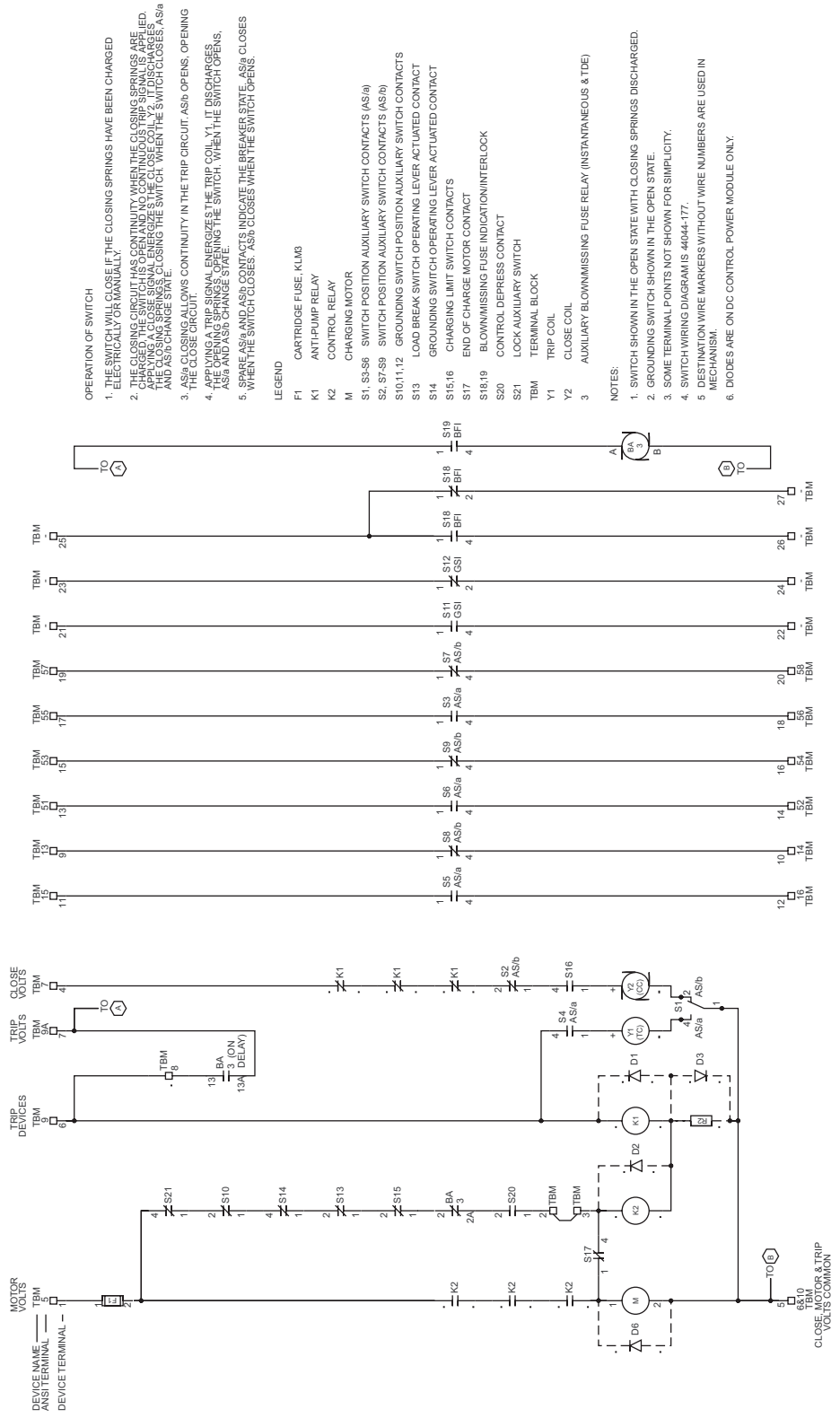
The contact life can also be verified by performing a millivoltage or micrometer test. The value should not increase by 300% of the original value of 80 microohms using a 100 A test micrometer.

Table 11 - Replacement Parts

Description	Part Number
Auxiliary Switch	25713203
Bulb, Push-button 120 V, 60 Hz	120 MB
Fuse, 10 A	BAF10
Mobil red grease #28	1615-100950
Handle, operator	3728693
Motor limit switch	25713203
Motor cut-off switch	25713203
Motor, Electric SEM & OTM	
Motor 24 Vdc	SPK997932
Motor 48 Vdc	997933
Motor 125 Vdc/120 Vac	997934
Motor 250 Vdc/240 Vac	SPK997935
Fuses	
Fuses for motor 24 Vdc	SPK29743211EE
Fuses for motor 48 Vdc	29743211DH
Fuses for motor 125 Vdc/120 Vac	SPK29743211CZ
Fuses for motor 250 Vdc/240 Vac	29743211CN
Coils	
Opening and closing coil 24 Vdc	178024
Opening and closing coil 48 Vdc	178026
Opening and closing coil 125 Vdc	178030
Opening and closing coil 250 Vdc	178032
Opening and closing coil 120 Vac	178027
Opening and closing coil 240 Vac	178030
Air flters (NEMA 3R)	46011-560-01
Live line Indicators	
Wiring harness	Contact Schneider Electric[2]
Replacement Lights	Contact Schneider Electric[2]
2.4–15 kV Capacitive standoff divider	Contact Schneider Electric[2]
25.8–38 kV Capacitive standoff divider	Contact Schneider Electric[2]
Phase Sequence Testing Unit	Contact Schneider Electric[2]
Strip heater for standard equipment	29904-00682
Class 1, Division 2 T3B rated heater	XP13020T3B
Fuse clip for Mersen CS-3 style fuses	80012-004-01
Fuse clip spring for Mersen CS-3 style fuses	80012-005-01

2. Must be ordered from the factory. Contact your local Schneider Electric representative for details.

Figure 42 - Typical Schematic



Corrective Maintenance

This section contains information on how to perform corrective maintenance on HVL/cc Metal-Enclosed Switchgear.

Medium Voltage Fuses

Medium voltage fuses provide over-current protection for the medium-voltage switch as well as short circuit interrupting protection up to the short-circuit current rating of the equipment. Schneider Electric HVL/cc equipment can use only Square D (or Bussmann equivalent) or Mersen current limiting fuses.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Use only Square D, Bussmann, or Mersen identical fuses that came with HVL/cc equipment. Do not substitute any other fuse.

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

Always follow the steps listed below before entering the fuse compartment to replace or perform maintenance on the fuses.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, NOM-029-STPS-2011, or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Only qualified electrical personnel familiar with medium voltage circuits should perform the instructions in this bulletin. Personnel must understand the hazards involved in working with or near medium voltage equipment.
- Qualified electrical personnel must perform work in accordance with national and local electric codes.
- 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.
- The Live Line Indicator is not an indicator of the absence of voltage.
- Always use a properly rated voltage sensing device to confirm power is off.
- Before performing visual inspections, tests, or maintenance on the equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, grounded, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Before making any electrical connection, ensure that all leads to be connected are de-energized with proper safety grounds applied.
- Metal-enclosed switchgear have interlocks designed to minimize hazards to the user. It is not possible to eliminate every hazard with interlocks. The user of this device is responsible for recognizing the potential hazards, for wearing protective safety equipment, and for taking adequate safety precautions.
- Do not make any adjustments to the equipment or operate the system with safety features removed. Contact your local Schneider Electric representative for additional instructions if the device does not function as described in this manual.
- Handle this equipment carefully and install, operate and maintain it correctly in order for it to function properly.
- Carefully inspect your work area and remove any tools and objects left inside the equipment.
- Replace all devices, doors, and covers before turning on the 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.

1. If equipped, verify if blown fuse indicator is showing a fuse has blown / opened.
2. De-energize (turn off) the switch. Use a properly rated voltage sensing device to test and verify that the power is off. Perform lock-out tag-out on all upstream or downstream sources that could energize the primary fuses or control power to help prevent inadvertent closure or energization.

3. Place the switch in the **OPEN** position. The load-side LLIs must not be on. Close the ground for the switch if so equipped (see Operating the Ground Switch (if equipped), page 34, Switchgear Operation (OTM), page 35, and Switchgear Operation (SEM), page 36.

   NOTE: Always replace all three fuses even if only one has blown to maintain system coordination. When one fuse blows, the other two fuses may experience an over-current condition and could also be damaged.

4. Replace the load-side panel. Verify that it is properly placed in the interlock slot and all hooks are engaged.
5. Open the ground switch first (if so equipped), then the main switch can be closed re-energizing the circuit.

Live Line Indicator (LLI) Replacement

Live Line Indicator (LLI) lights are connected by a capacitive circuit to the main bus bars on the line or load side of the HVL/cc switch. LLI lights connected to the load side of the HVL/cc switch are mounted on the front of the switch mechanism cover. LLI lights connected to the line side of the HVL/cc switch are mounted on the front door of the Low Voltage Compartment.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, NOM-029-STPS-2011, or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Only qualified electrical personnel familiar with medium voltage circuits should perform the instructions in this bulletin. Personnel must understand the hazards involved in working with or near medium voltage equipment.
- Qualified electrical personnel must perform work in accordance with national and local electric codes.
- 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.
- The Live Line Indicator is not an indicator of the absence of voltage.
- Always use a properly rated voltage sensing device to confirm power is off.
- Before performing visual inspections, tests, or maintenance on the equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, grounded, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Before making any electrical connection, ensure that all leads to be connected are de-energized with proper safety grounds applied.
- Metal-enclosed switchgear have interlocks designed to minimize hazards to the user. It is not possible to eliminate every hazard with interlocks. The user of this device is responsible for recognizing the potential hazards, for wearing protective safety equipment, and for taking adequate safety precautions.
- Do not make any adjustments to the equipment or operate the system with safety features removed. Contact your local Schneider Electric representative for additional instructions if the device does not function as described in this manual.
- Handle this equipment carefully and install, operate and maintain it correctly in order for it to function properly.
- Carefully inspect your work area and remove any tools and objects left inside the equipment.
- Replace all devices, doors, and covers before turning on the 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.

To replace LLIs:

1. Turn off all power supplying the equipment. Use a properly rated voltage sensing device to confirm that the power is off.
2. Remove the two mounting screws.
3. Pull the LLI outside of the cover.
4. Unplug the wiring harness.
5. Plug the wiring harness into the new LLI head.
6. Push the LLI back into the cover opening.
7. Replace the two mounting screws.
8. Restore power to the equipment.

If the lights on the LLI do not light up repeat steps 1–8 above. If after repeating the procedure results are not satisfactory, turn off all power to the equipment and contact your Schneider Electric representative.

Class 1, Division 2 Maintenance Requirements

Follow the maintenance requirements below for Class 1, Division 2 rated switchgear used in hazardous areas.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, NOM-029-STPS-2011, or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Only qualified electrical personnel familiar with medium voltage circuits should perform the instructions in this bulletin. Personnel must understand the hazards involved in working with or near medium voltage equipment.
- Qualified electrical personnel must perform work in accordance with national and local electric codes.
- 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.
- The Live Line Indicator is not an indicator of the absence of voltage.
- Always use a properly rated voltage sensing device to confirm power is off.
- Before performing visual inspections, tests, or maintenance on the equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, grounded, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Before making any electrical connection, ensure that all leads to be connected are de-energized with proper safety grounds applied.
- Metal-enclosed switchgear have interlocks designed to minimize hazards to the user. It is not possible to eliminate every hazard with interlocks. The user of this device is responsible for recognizing the potential hazards, for wearing protective safety equipment, and for taking adequate safety precautions.
- Do not make any adjustments to the equipment or operate the system with safety features removed. Contact your local Schneider Electric representative for additional instructions if the device does not function as described in this manual.
- Handle this equipment carefully and install, operate and maintain it correctly in order for it to function properly.
- Carefully inspect your work area and remove any tools and objects left inside the equipment.
- Replace all devices, doors, and covers before turning on the 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

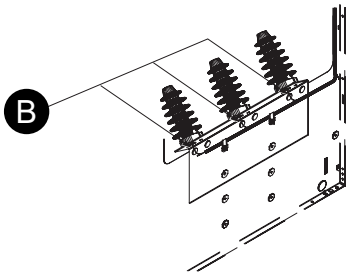
HAZARD OF EXPLOSION

Follow instructions provided as NEC class 1 Division 2 environments may contain ignitable gases.

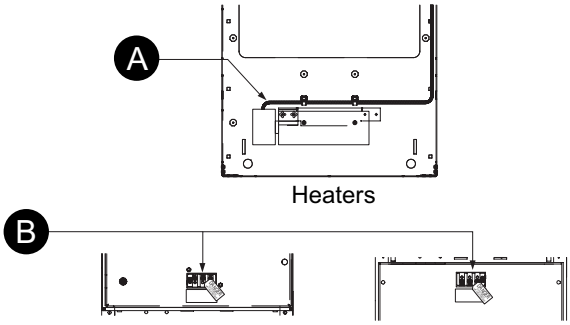
Failure to follow these instructions will result in death or serious injury.

- When replacing heaters, use only explosion proof T3B rated heaters. Seal wiring connections and openings with silicone before turning on the power.
- When replacing LLIs, seal connections at the insulators with silicone before turning on the power.
- Use only non-indicating fuses.
- Test ports on the LLI heads are factory plugged and are not for use for Class 1, Division 2 rated equipment.
- Use only manually operated switch mechanisms (OTM and SEM).

Figure 43 - Class 1, Division 2 Required Features

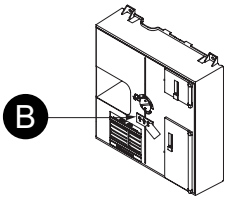


Voltage indicators



Heaters

Live Line Indicators–Application A (left) and B (right)



Live Load Indicators
(Application A shown)

NOTE: All wires must be permanently connected and sealed with silicone. LLI test ports should be plugged.

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, NOM-029-STPS-2011, or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Only qualified electrical personnel familiar with medium voltage circuits should perform the instructions in this bulletin. Personnel must understand the hazards involved in working with or near medium voltage equipment.
- Qualified electrical personnel must perform work in accordance with national and local electric codes.
- Perform such work only after reading and understanding all of the instructions contained in this bulletin.
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- Before making any electrical connection, ensure that all leads to be connected are de-energized with proper safety grounds applied.
- Metal-enclosed switchgear have interlocks designed to minimize hazards to the user. It is not possible to eliminate every hazard with interlocks. The user of this device is responsible for recognizing the potential hazards, for wearing protective safety equipment, and for taking adequate safety precautions.
- Do not make any adjustments to the equipment or operate the system with safety features removed. Contact your local Schneider Electric representative for additional instructions if the device does not function as described in this manual.
- Handle this equipment carefully and install, operate and maintain it correctly in order for it to function properly.
- Carefully inspect your work area and remove any tools and objects left inside the equipment.
- Replace all devices, doors, and covers before turning on the 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.

The following tables list conditions, mechanisms, and solutions to problems that may occur in HVL/cc Metal-Enclosed Switchgear.

Table 12 - Troubleshooting General Issues

Condition	Mechanism	Action
Live-line Indicator will not illuminate	ALL	• Test for voltage using a properly rated voltage sensing device on two of the test ports on the Live-line indicators • Check that the switch is closed • Check the Live-line block is okay • Check that the fuses are installed • Check that the fuses are not blown (blown fuse indicator in Lexan cover if provided) • Check that the incoming cables are live
Load-side panel cannot be removed or installed	ALL	• Check that switch is open and in the grounded position (if applicable)
Ground switch cannot be operated	ALL	• Check that the switch is open • Check if fuse/load-side panel is properly installed
Switch cannot be operated	ALL	• Check that grounding switch is open • Check if fuses are installed and not blown (FuseLogic) • Check if fuse/load-side panel is properly installed

Table 13 - Troubleshooting Mechanism Issues

Condition	Mechanism	Action
Electrical operation impossible but manual operation is possible	ALL	• Check for loose connections • Check coil circuit • Check control fuses • Check electrical interlocks motor cutoff switch • Main interrupter cutoff switch Open/Close microswitches • Check grounding switch position and cutoff switch • Check the configuration of the CIP1 subassembly (see Over-Toggle Mechanism (OTM), page 12 and Stored Energy Mechanism (SEM), page 13)
Operation impossible following an electrical closing	SEM and OTM (with motor)	• Use the operating handle to apply torque in the closing direction until the end position is reached, then check voltage supply so that adequate power is available.
Insertion of operating handle is impossible following electrical closing	SEM and OTM (with motor)	• Open switch using backup power. • Lock-out the electrical operating mechanism. Push the back of the switch shaft in the closing direction using a large screwdriver to allow insertion of handle, • Using a properly rated voltage sensing device, check voltage so that the correct power is supplied to the motor.

Table 14 - Maintenance Log

DATE	INITIALS	ACTION

Schneider Electric
800 Federal Street
01810 Andover, MA
USA

1-888-778-2733

www.se.com

As standards, specifications, and design change from time to time, please ask for confirmation of the information given in this publication.

6045–1