Masterclad™ 15 kV Class Medium Voltage Switchgear

Indoor Switchgear

Instruction Bulletin

6055-30, Rev. 4

05/2024

www.se.com

Legal Information

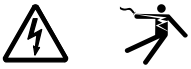
The information provided in this document contains general descriptions, technical characteristics and/or recommendations related to products/solutions.

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.

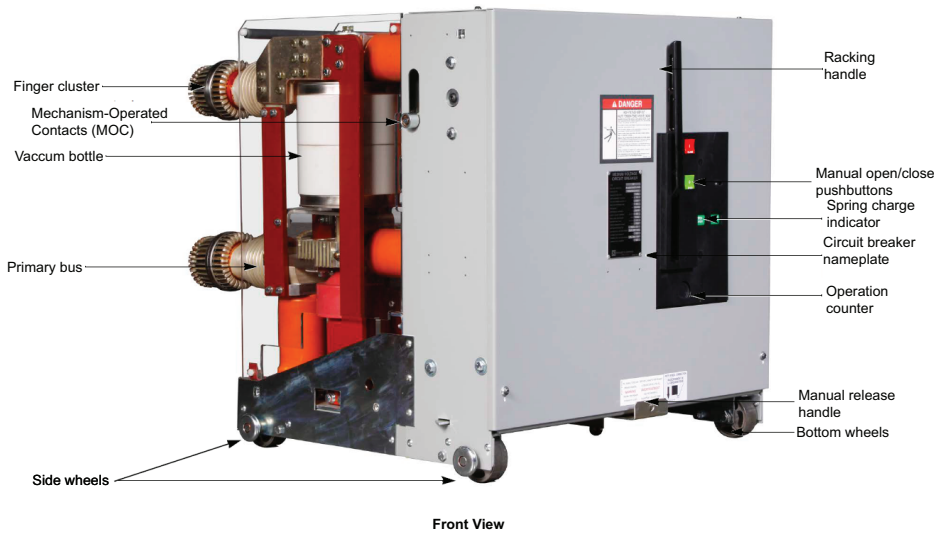
Electrical equipment should be transported, stored, installed, and operated only in the environment for which it is designed.

Introduction

This instruction bulletin contains direction for receiving, handling, storing, installing, operating, and maintaining Masterclad 5-15 kV metal-clad, drawout indoor switchgear that provides medium voltage power distribution. This equipment is manufactured by Schneider Electric. It is designed for use with Type VR drawout circuit breakers, which employ vacuum technology. The design accommodates one-high and/or two-high circuit breaker configurations on the top and/or bottom. Two auxiliary components can be substituted in place of each circuit breaker, including: voltage transformers, control power transformers, or primary fuses. A typical Masterclad switchgear assembly is shown in Typical Masterclad Metal-Clad Switchgear Assembly, page 6. The Type VR circuit breaker is shown in Type VR Circuit Breaker-Front and Rear Views, page 7.

Figure 1 - Typical Masterclad Metal-Clad Switchgear Assembly

Figure 2 - Type VR Circuit Breaker-Front and Rear Views



Refer to these instruction bulletins for complete information on the accessories available for this equipment:

- 6055-31 (VR Vacuum Circuit Breaker–1200 A and 2000 A, 50 kA)
- 6055-33 (VR Vacuum Circuit Breaker–3000 A, 50 kA and 1200 A, 2000 A, and 3000 A, 63 kA)
- 6055-34 (Manual Ground and Test Devices)
- 6055-36 (VR Electric Racking Device)
- 6055-37 (VR Electrically Operated Ground and Test Device)
- 6055-38 (VR Manual Ground and Test Device with Selector Switches)
- 6055-54 (Lift Truck for VR Circuit Breakers)
- 6055-60 (VR Electrically Operated Ground And Test Device)
- 6055-62B (Addendum for Integrated Racking Mechanism)

The switchgear assembly (see Typical Masterclad Metal-Clad Switchgear Assembly, page 6) consists of individually grounded, compartmentalized, steel structures. Each compartment has doors, barriers, and removable access panels to isolate the separate working functions. All of the circuit breakers, instrument and control power transformers, relays, meters, and other components are factory assembled, wired, and tested as an assembly.

The installer normally makes only the external control, ground, and power connections at the terminals provided, and reconnects the wiring and bus bars at the shipping splits.

Each assembly is custom designed, with standard structures and bus configurations arranged according to customer specifications. The structures are then combined with the circuit breaker and other components necessary for the required protective scheme, metering, and number of feeders.

Complete customer drawings are furnished for each Masterclad switchgear assembly. The drawings include floor plans and elevations, one-line diagrams, bills of material, control schematics, and wiring diagrams.

Safety Precautions

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, NOM-029-STPS-2011, or CSA Z462.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Perform such work only after reading and understanding all of the instructions contained in this bulletin.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Before performing visual inspections, tests, or maintenance on this equipment, disconnect all sources of electric power. Assume all circuits are live until they are completely de-energized, tested, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Always practice lock-out/tag-out procedures according to OSHA requirements.
- Open all circuit breaker and switch contacts and discharge all springs before performing maintenance work, disconnection, or removal of a circuit breaker.
- Move circuit breakers to the disconnected position before removing rear access panels.
- Conduct electrical testing to confirm no short-circuits were created during installation, maintenance, or inspection.
- Never insert a circuit breaker into a circuit breaker compartment that is not complete and functional.
- The complete assembly arrangement determines if the top or bottom contacts are the line side; both can be energized when the circuit breaker is removed from the compartment. Identify the line side contacts for each circuit breaker compartment.
- Disconnect all high voltage to the switchgear before accessing the horizontal bus compartment.
- Do not use liquid fire extinguishers or water on electrical fires. Before extinguishing fires within the assembly, ensure the main power source is disconnected and the main and all feeder circuit breakers are open.
- Carefully inspect your work area, and remove any tools and objects left inside the equipment.
- Replace all devices, doors, and covers before turning on power to this equipment.
- All instructions in this manual are written with the assumption that the customer has taken these measures before performing maintenance or testing.

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

⚠ **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 200 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 also 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, set the thermostats and/or humidistats to mitigate condensation. A minimum of 200 W of heat per section is recommended.
  - 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.

Receiving and Handling

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

If signs of moisture contamination are present, do not follow the instructions in this section. Proceed to Moisture Contamination Avoidance and Mitigation, page 10.

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

Receiving

Masterclad 4.76–15 kV metal-clad, indoor switchgear is shipped on skids in protective crates or wrapping. Circuit breakers are shipped in switchgear sections or on separate pallets. Circuit breakers shipped on pallets have crush cones attached to the top of the circuit breaker box on the pallet. If the cone is crushed, DO NOT accept or use the circuit breaker and report as potential shipping damage to the freight carrier.

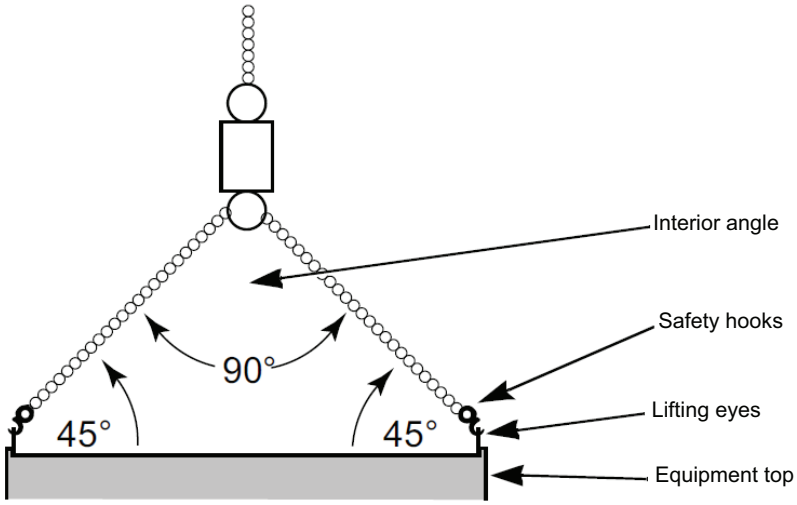
Upon receipt, compare the packing list to the equipment received to ensure that the order and shipment are complete. Claims for shortages or errors must be made in writing to Schneider Electric within 60 days of delivery. Failure to give such notice constitutes unqualified acceptance and a waiver of all such claims by the purchaser.

Immediately inspect the equipment for any damage that may have occurred in transit. If damage is found or suspected, file a claim with the carrier immediately and notify Schneider Electric. Delivery of equipment to a carrier at any of the Schneider Electric plants or other shipping point constitutes delivery to the purchaser regardless of freight payment and title. All risk of loss or damage passes to the purchaser at that time.

Handling

The switchgear is normally shipped in one or two section shipping splits. Each section has four lifting lugs bolted on top. If more than two bays are shipped as one section, lifting channels, frames, or spreader bars must be used when lifted. Put a crane hook through each of the four lifting eyes (see Lifting Sling, page 13) to lift and move the sections. Use load-rated cables or chains with safety hooks or shackles. A spreader bar may be necessary to maintain proper angles for lifting.

Figure 3 - Lifting Sling



To prevent structural damage, rig the lifting sling so that the minimum angle between lifting cables or chains and the top of the equipment is 45°, and the maximum interior angle is 90°. If a crane is not available, contact Schneider Electric before using any other lifting method. After the equipment has been placed in position, remove and discard the lifting eyes. Screw the bolts back into place to cover the mounting holes. Factory-built equipment is assembled using fixtures and on flat and level floor surfaces to maximize the alignment of the sheet metal components. Door and panel adjustments may be necessary once the equipment is removed from the pallet and placed in position.

NOTICE

EQUIPMENT DISTORTION

- Do not remove the skids until the shipping sections are in the final location.
- Do not maneuver the switchgear directly on rollers, always incorporate a pallet under the switchgear.
- Always use the skids when moving the switchgear.

Failure to follow these instructions can result in equipment damage.

⚠CAUTION

DAMAGED LIFTING LUGS

If moving by crane, the interior angle of the lifting sling should not exceed 90°. Angles greater than 90° apply greater inward pressure of lifting lugs which can damage or dislodge lifting lugs from switchgear.

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

Description

Masterclad metal-clad indoor switchgear is UL/cUL certified.

The number of bays in a Masterclad switchgear assembly depends on customer specifications. Each bay is a separate rigid, self-contained, bolted structure fabricated of heavy gauge steel. It consists of:

- Front section with secondary control devices
- Circuit breaker section, drawout voltage transformer and control power transformer, and fuse drawout section
- Main bus compartment
- Cable compartment

Figure 4 - Upper and Lower Circuit Breaker Sections with Circuit Breakers Removed

Front Section

The front section includes the front hinged doors with instruments, relays, and control switches, the terminal blocks, fuse blocks, and other required secondary control devices. It also houses the wiring space for inter-unit connection and customer cable connections.

Circuit Breaker Section

The circuit breaker section contains sixteen separate, but coordinated, features, each necessary for circuit breaker operation:

- Circuit breaker positioning rails
- Racking mechanism
- Circuit breaker position indicator
- Disconnect position latch
- Circuit breaker interlocks
- Compartment rating interlocks
- Control power receptacle
- Ground and test unit and dummy circuit breaker interlock
- Primary high voltage contacts
- Current transformers
- Shutters
- Barriers
- Section interlock
- Ground contact bar
- Mechanism-Operated Contacts (MOC)-circuit breaker positioning rails-optional
- Truck-Operated Contacts (TOC)-optional

Circuit Breaker Positioning Rails

The circuit breaker is equipped with rubber wheels for moving the circuit breaker when it is outside the switchgear and metal rollers to guide and position the circuit breaker inside the circuit breaker section. The four metal rollers are captured in rails (see Circuit Breaker Floor Plate, Racking Device, and Interlocks, page 16) which position the circuit breaker in the vertical position.

Racking Mechanism

The racking mechanism (see Circuit Breaker Floor Plate, Racking Device, and Interlocks, page 16) is located on the circuit breaker section floor. It is operated by a removable racking crank inserted into the front of the circuit breaker section. The front door may be either open or closed. The circuit breaker engages in a gear-driven racking roller (see Circuit Breaker Floor Plate, Racking Device, and Interlocks, page 16). As the roller rotates, it moves the circuit breaker from the test disconnect to the connect position.

NOTICE

DAMAGE TO RACKING MECHANISM

- Verify the torque required to rack a circuit breaker into the connected position on the first attempt to install a circuit breaker in the section.
- If using an electric racking device, verify the output to ensure the section racking mechanism will not be damaged from over-torquing. The torque limiter on the electric racking option is set at the factory at 18 lb-ft. (24.4 N•m).

Failure to follow these instructions can result in equipment damage.

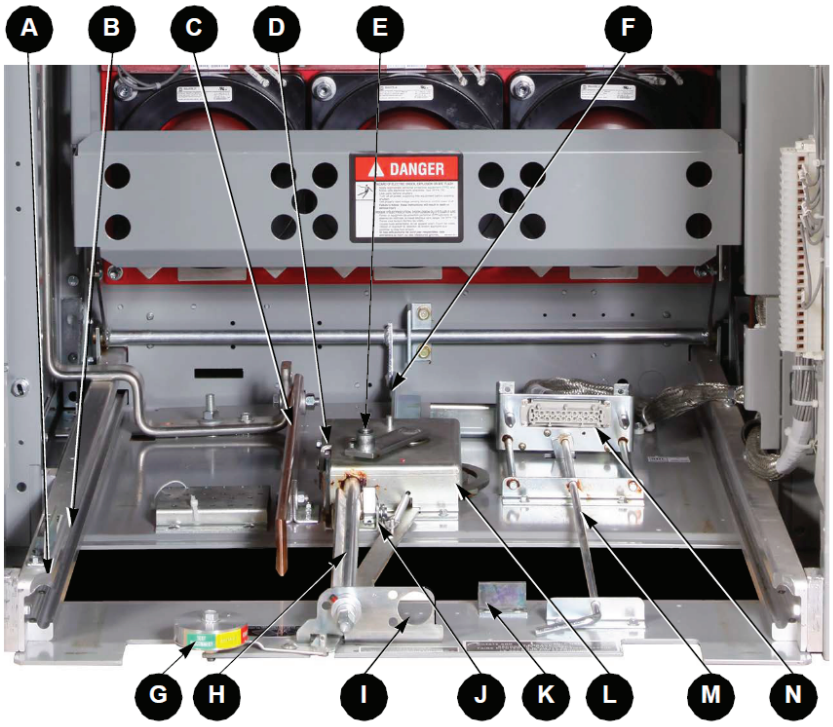
The racking mechanism can be damaged by over-torquing due to high resistance from the circuit breaker/section connection points or any obstruction in the section that blocks free movement of the circuit breaker through the guide rail by the racking mechanism. The section racking mechanism is designed for 18 lb-ft. (24.4 N•m) of maximum torque. Exceeding the maximum torque will damage the racking mechanism.

Circuit Breaker Interlocks

A racking block bar (see Circuit Breaker Floor Plate, Racking Device, and Interlocks, page 16) welded to the racking shaft hits an interlock pin on the circuit breaker when it is closed. This interlock mechanism stops a closed circuit breaker from being moved between the test/disconnected position and the connected position.

The racking roller actuates an interlock located underneath the circuit breaker. This interlock mechanism is designed to stop a circuit breaker from being closed when it is between the test/disconnected and connected positions.

Figure 5 - Circuit Breaker Floor Plate, Racking Device, and Interlocks



Callouts for the figure above are:

A	Circuit breaker position latch bracket	**H**	Racking block bar
B	Circuit breaker positioning rail	**I**	Section key interlock provision
C	Ground contact bar	**J**	Lockout lever
D	Racking block lever	**K**	Spring discharge bracket
E	Racking roller	**L**	Racking mechanism
F	Shutter actuator	**M**	Control power receptacle handle
G	Circuit breaker position indicator	**N**	Control power receptacle

A lockout lever located on the drawout gear box stops the circuit breaker from being inserted into the section when the racking roller is not in the test position.

A racking block lever blocks the racking mechanism from operating when the circuit breaker is not in the section. Without the circuit breaker in the section, the shutter cannot be opened.

A spring discharge interlock discharges the closing springs when the circuit breaker is inserted or withdrawn from the section.

⚠CAUTION

INTERLOCK DAMAGE

- Do not test interlocks by hand. Test interlocks only by moving the circuit breaker over the section-mounted operating cams.
- Do not operate interlocks in an incorrect sequence.

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

Compartment Rating Interlocks

These interlocks block insertion of circuit breakers with incorrect current, voltage, or interrupting ratings into the compartment. The stationary interference brackets are mounted on the floor of the compartment and the moving part of the interlock system is mounted on the underside of each circuit breaker.

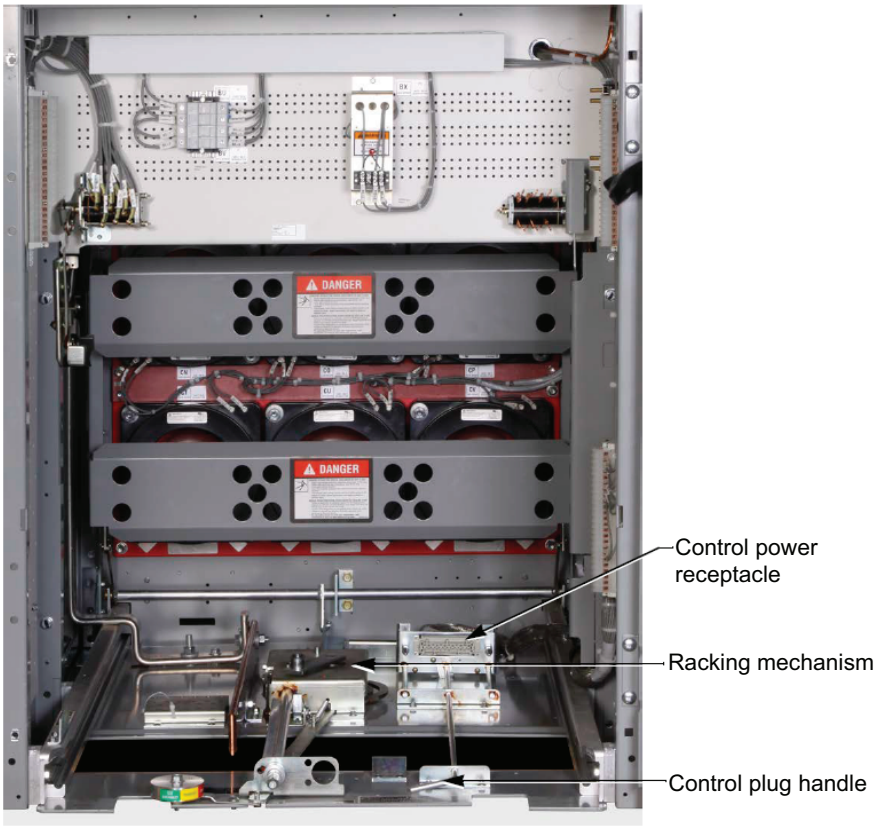
Ground and Test Unit Dummy Circuit Breaker Interlock

Each circuit breaker section is equipped with a ground and test unit (GTU) and dummy circuit breaker permissive interlock. GTUs and dummy circuit breakers that are not equipped with the required ground and test unit interlocks cannot be inserted into the circuit breaker section. The permissive interlocks are located beside the position interlock on the circuit breaker section floor. Refer to the specific GTU and dummy circuit breaker instruction bulletins.

Control Power Receptacle

The circuit breaker control power receptacle is located on the lower right floor of the compartment (see Circuit Breaker Floor Plate, Racking Device, and Interlocks, page 16 and Circuit Breaker Section without Circuit Breaker, page 18). The molded insulating receptacle contains twenty-four contacts and two tapered guide pins. The control power can be connected in the test position by rotating the control plug handle and pulling it forward.

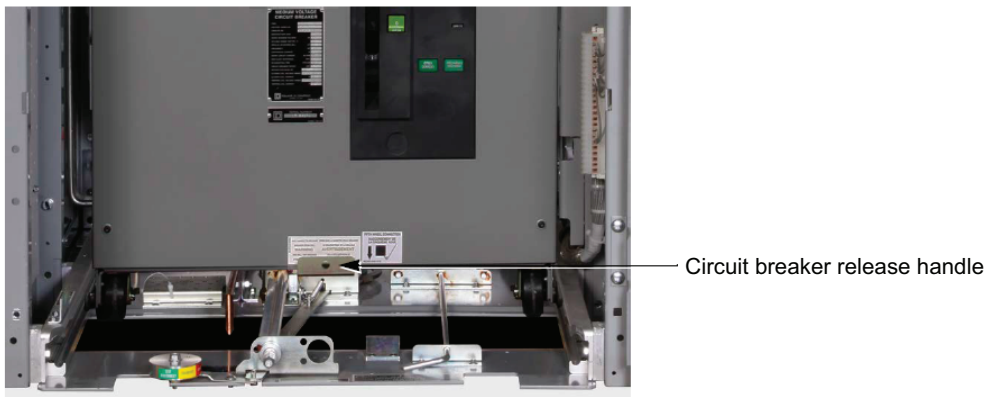
Figure 6 - Circuit Breaker Section without Circuit Breaker



Disconnect Position Latch

A spring-loaded latch on the circuit breaker engages behind the circuit breaker latch brackets on top of the left-hand guide rail (see Circuit Breaker Floor Plate, Racking Device, and Interlocks, page 16) when the circuit breaker is in the test/disconnected position. The latch is disengaged by the circuit breaker release handle (see Circuit Breaker Release Handle, page 18) when the circuit breaker is in the test/disconnected position.

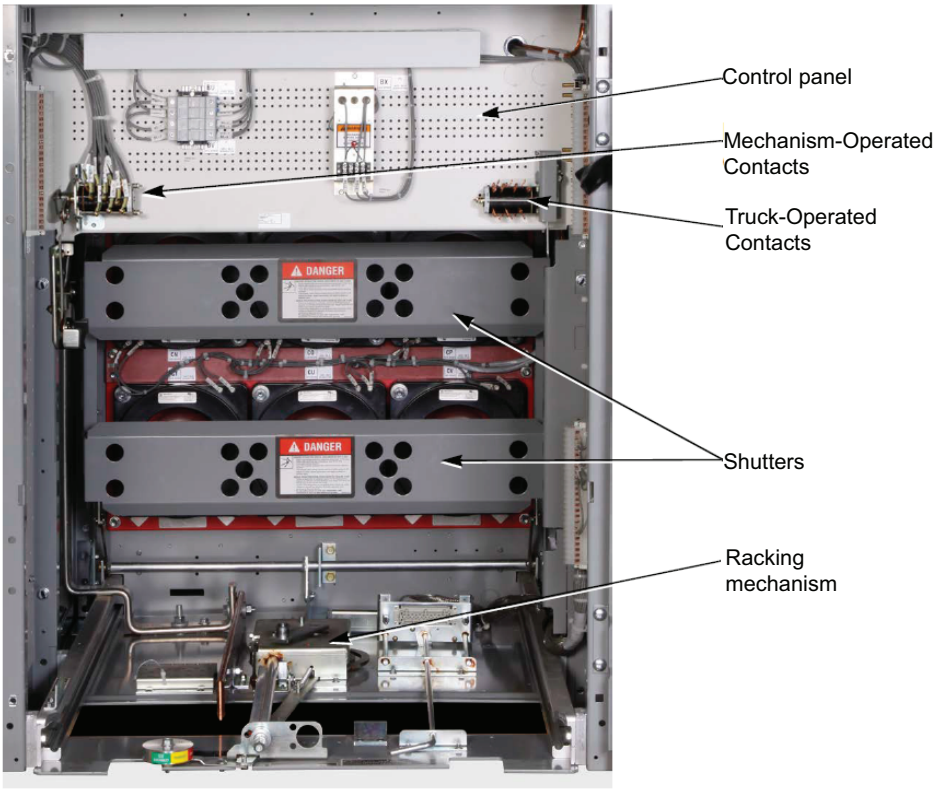
Figure 7 - Circuit Breaker Release Handle



Shutters

Two steel shutters (see Circuit Breaker Section without Circuit Breaker, page 19) are mounted directly in front of the primary high voltage contacts. The shutters move with a rotary motion, actuated by the racking mechanism. Circuit Breaker Floor Plate, Racking Device, and Interlocks, page 16 shows the shutter actuator.

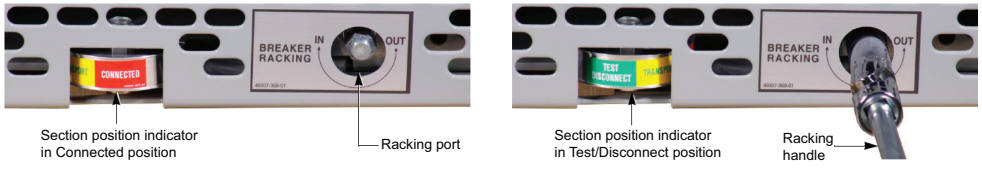
Figure 8 - Circuit Breaker Section without Circuit Breaker



Circuit Breaker Position Indicator

An indicator beside the racking port (see Circuit Breaker Floor Plate, Racking Device, and Interlocks, page 16, Racking Port, Handle, and Section Position Indicator, page 19, and Circuit Breaker Section without Circuit Breaker-Shutter Forced Open, page 20) shows which position the circuit breaker is in: test/disconnected, transport, or connected. When the door is open, two arrows which line up with the front cover are visible on the left hand rail. They also indicate the position of the circuit breaker.

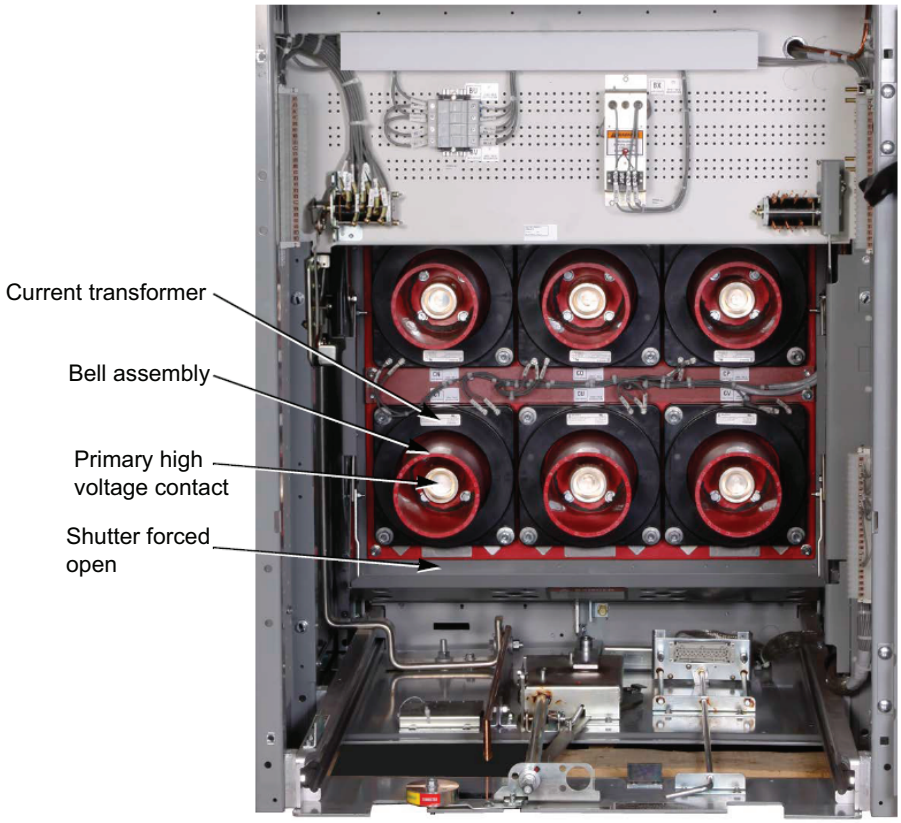
Figure 9 - Racking Port, Handle, and Section Position Indicator



Primary High Voltage Contacts

The primary main contacts are housed in a bell assembly (see Circuit Breaker Section without Circuit Breaker-Shutter Forced Open, page 20) consisting of insulating tubes extending toward the front. The current transformers are mounted around the bell assembly tubes which are covered at the open end by the shutter when the circuit breaker is in the test/disconnected position or is withdrawn from the section. The bell assembly is furnished with molded fiberglass polyester tubes as standard, but may also be equipped with optional porcelain tubes.

Figure 10 - Circuit Breaker Section without Circuit Breaker-Shutter Forced Open



Current Transformers

Bushing-type, single- or multi-ratio current transformers (see Circuit Breaker Section without Circuit Breaker-Shutter Forced Open, page 20) can be mounted around either the top or bottom insulating tubes. A maximum of four current transformers, depending on accuracy, can be mounted per phase: two on the line side and two on the load side.

Section Interlock

A section key interlock provision (see Circuit Breaker Floor Plate, Racking Device, and Interlocks, page 16) is provided in each circuit breaker section for locking a circuit breaker out of the connected position. The section interlock is located in the center of the section floor and has padlock provisions as standard. It can be equipped with a key interlock when specified by the user. The section interlock blocks racking

the circuit breaker into the connected position. A circuit breaker can be stored in the test/disconnected position with the section interlock locked.

Ground Contact Bar

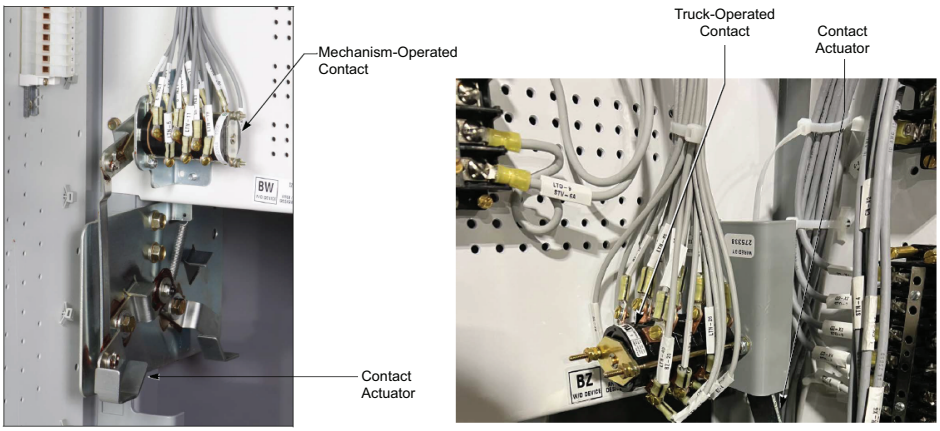
A ground contact bar is located on the bottom of the circuit breaker section. It is directly connected to the main ground bus. A mating set of sliding contacts is located on the underside of the circuit breaker. The contacts engage before the circuit breaker reaches the test position and stay continuously grounded to the connected position.

Mechanism-Operated Contacts (MOC) (Optional)

Mechanism-operated contacts (see Circuit Breaker Section without Circuit Breaker, page 19 and Mechanism and Truck-Operated Contacts, page 21) are compartment-mounted, auxiliary contacts operated by the circuit breaker mechanism. Like circuit-breaker-mounted auxiliary contacts, they indicate whether the circuit breaker is in the open or closed position. They operate in both the connected and test/disconnected positions.

The MOC unit is mounted on the left side of the circuit breaker section. It is operated by a mechanism that is driven vertically by a roller on the left side of the circuit breaker.

Figure 11 - Mechanism and Truck-Operated Contacts



Truck-Operated Contacts (TOC) (Optional)

Truck-operated contacts (see Racking Port, Handle, and Section Position Indicator, page 19 and Mechanism and Truck-Operated Contacts, page 21) indicate the physical position of the circuit breaker in the compartment. They indicate whether the circuit breaker is in the connected or test/disconnected position.

The TOC unit does not distinguish between the circuit breaker being in the test/disconnected position or withdrawn completely from the compartment.

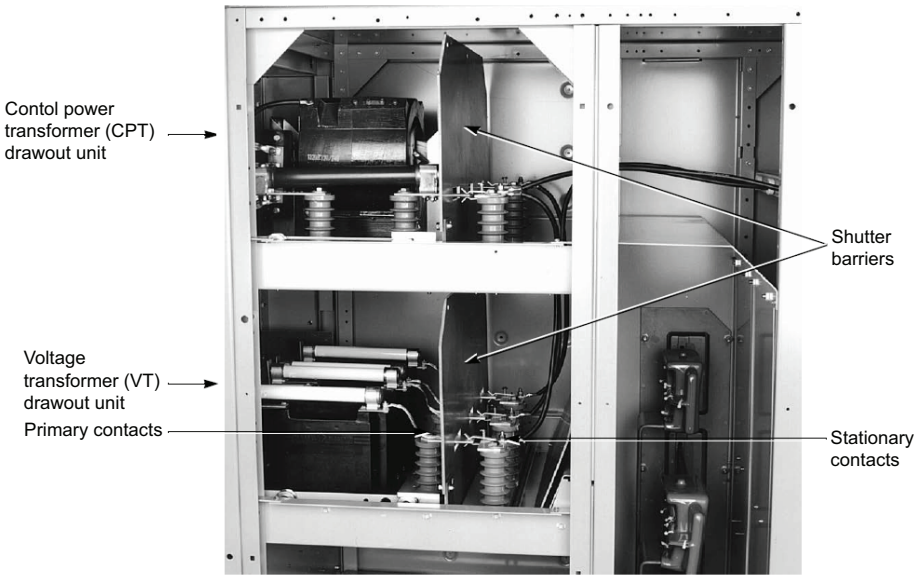
The TOC unit is mounted on the right side of the horizontal steel barrier in the top of the circuit breaker section. It is operated by a spring-loaded lever. This lever is activated, just before the circuit breaker reaches the connected position, by a pin on the upper right side of the front cover of the circuit breaker.

Voltage Transformer, Control Power Transformer, and Fuse Drawout Units

The voltage transformer (VT), control power transformer (CPT), and fuse drawout units are self-contained drawers (see Drawout Units in Connected Position, page 22) that roll from the disconnected to the connected position. The drawer front panel is recessed behind the front door in the connected position and is held in place by two thumbscrews.

An insulating barrier (see Drawout Units in Connected Position, page 22) divides the compartment. The stationary contacts (see Drawout Units in Connected Position, page 22) and associated high-voltage parts are mounted behind the barrier. Floating, self-aligning line contacts engage the moving contacts as the drawer is inserted into the connected position. As the drawer is withdrawn, a static ground contact mounted on top of the compartment grounds the primary connection.

Figure 12 - Drawout Units in Connected Position



Drawout Control Power Transformer

The control power transformer (CPT), Drawout Units in Connected Position, page 22, Control Power Transformer-Secondary Circuit Breaker Interlock, page 23, and Control Power Transformer-Secondary Contacts, page 23, supplies control voltage for circuit breaker closing, capacitor trip charging, and miscellaneous station auxiliary power functions. The transformer is sized for the specific order requirements. Do not add arbitrary non-specified loads after installation. The maximum capacity of the CPT in a drawout unit is 15 kVA.

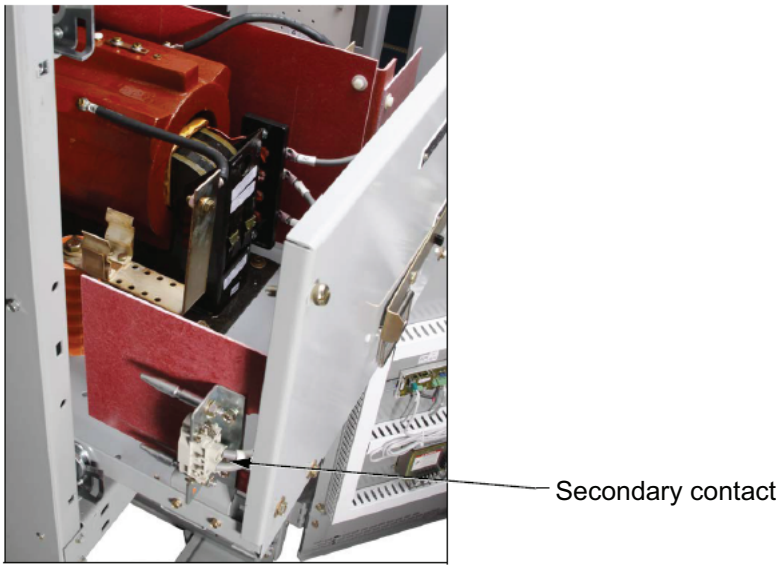
The CPT, its primary current limiting fuses, and secondary molded case circuit breaker are mounted on the drawer and are withdrawn as an assembly. The secondary circuit breaker handle must be in the **OFF** position in order to withdraw or insert the drawer. To release the latch, push the secondary circuit breaker handle to the left (**OFF** position). To engage the latch, push the secondary circuit breaker handle to the right (**ON** position) after returning the assembly to the connected position.

Each drawout control power transformer is equipped with a padlock provision (see Control Power Transformer-Secondary Circuit Breaker Interlock, page 23) which locks the unit in the engaged position.

Figure 13 - Control Power Transformer-Secondary Circuit Breaker Interlock

Secondary molded plug contacts are mounted on the front left side of the drawer (see Control Power Transformer-Secondary Contacts, page 23). They engage fixed-mounted contacts in the connected position.

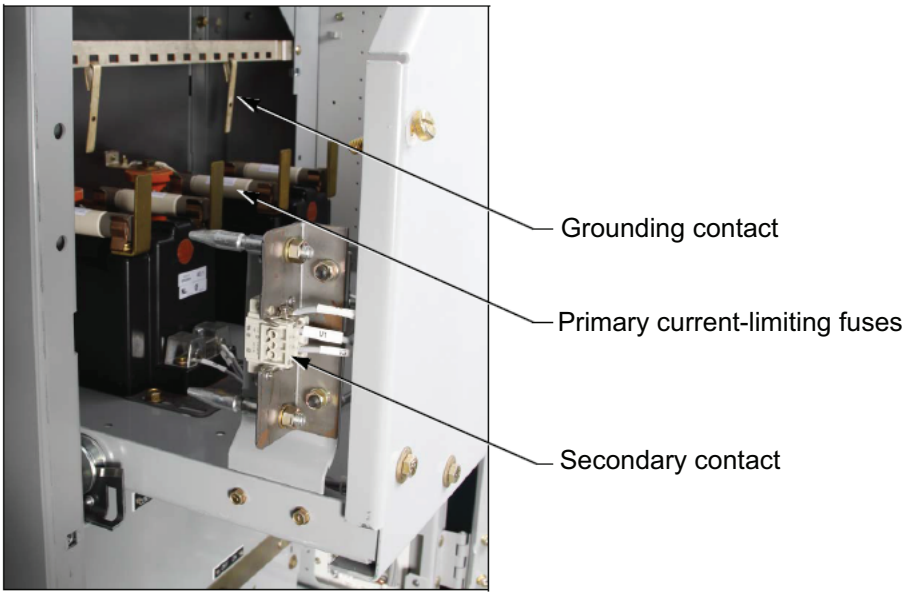
Figure 14 - Control Power Transformer-Secondary Contacts



Drawout Voltage Transformer

Drawout VTs (Drawout Voltage Transformer, page 24) supply voltage indication for metering and relaying purposes. Primary current-limiting fuses are mounted on each voltage transformer. Secondary molded plug contacts (see Drawout Voltage Transformer, page 24) are mounted on the front left side of the drawer and engage fixed compartment mounted contacts in the connected position. Secondary fuses for the voltage transformers are located in the front compartment.

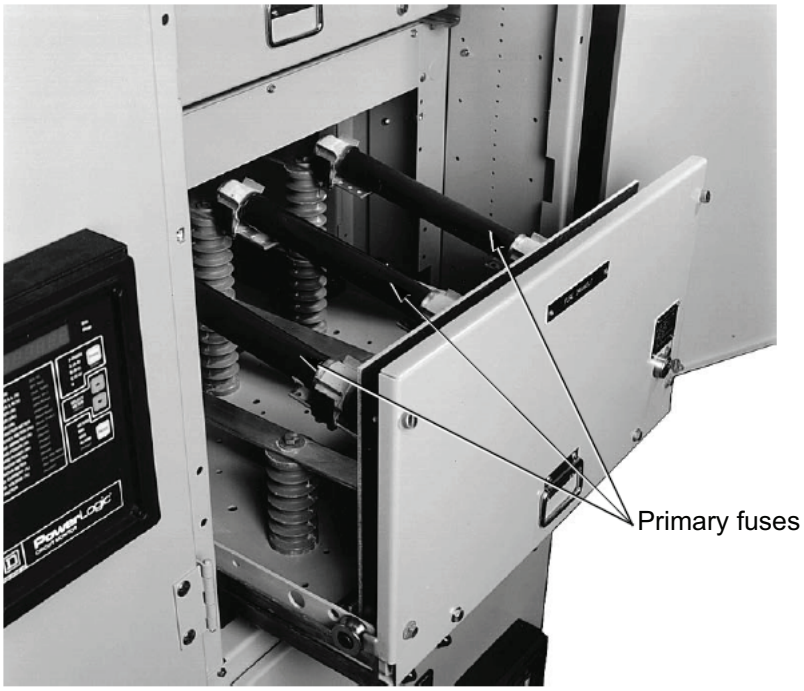
Figure 15 - Drawout Voltage Transformer



Drawout Fuse

Drawout fuses are provided for stationary control power transformers. Fixed-mounted CPTs are supplied when three-phase control power is required or control power requirements exceed 15 kVA. The current limiting fuses are mounted in the drawer and withdrawn as an assembly.

Figure 16 - Drawout Primary Fuses for Stationary Control Power Transformer



The fuse drawout is interlocked with the secondary circuit breaker by a key interlock system. One interlock locks the drawout in the connected position. A second interlock allows the fuse drawout to be withdrawn only when the secondary circuit breaker is in the **OPEN** position. The secondary circuit breaker with interlock is mounted above or below the drawout unit.

Figure 17 - Drawout Primary Fuses Interlock with Secondary Circuit Breaker

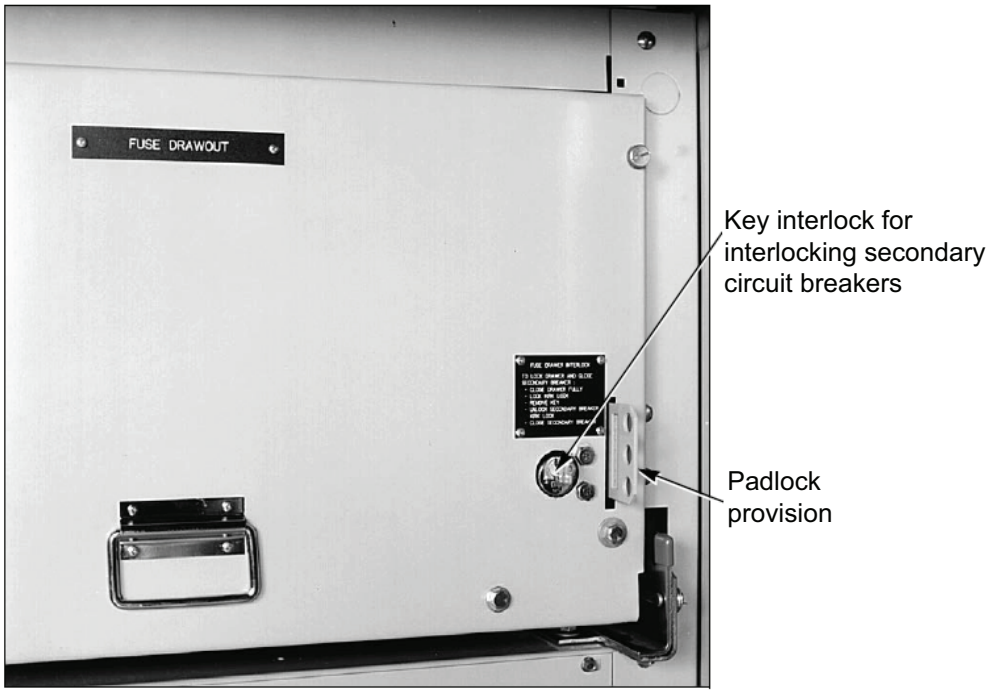
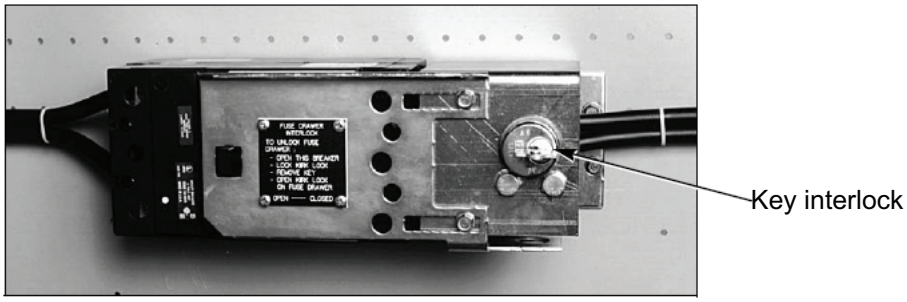


Figure 18 - Secondary Circuit Breaker and Interlock for Drawout Primary Fuses



Main Bus Compartment

The main bus compartment is located in the center of the switchgear. It is isolated from other compartments by the main bus compartment cover, which consists of removable metal access plates (see Two Bay Assembly-Rear View, page 26). The main bus compartment is accessible from the back (see Two Bay Assembly-Rear View, page 26) through the cable compartment and from the front through the circuit breaker section.

The 1200 and 2000 A, 50 kA main buses are available in aluminum or copper. The 3000 A, 50 kA and 1200, 2000, and 3000 A, 63 kA main bus is always copper.

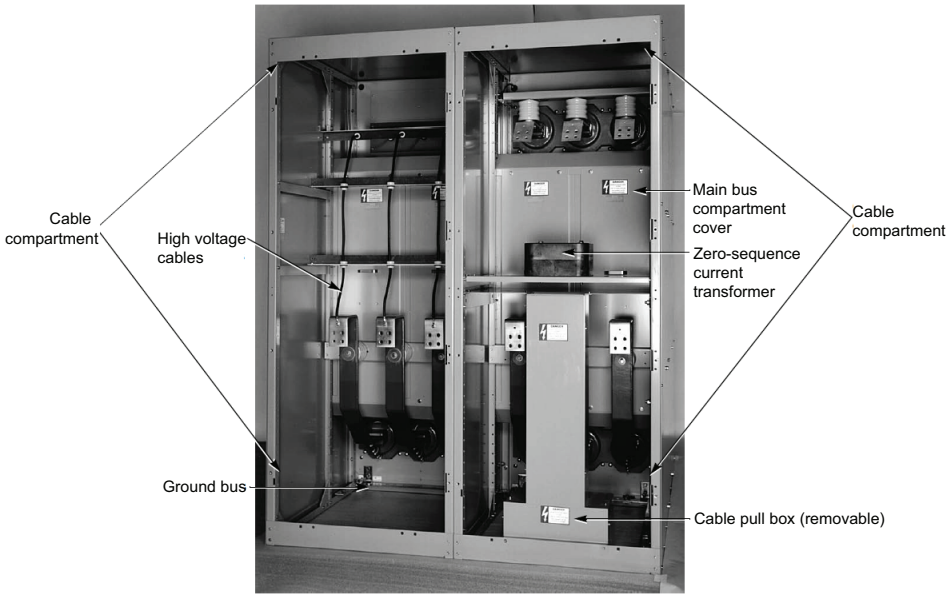
Each bus bar has fluidized bed epoxy insulation rated for 221°F (105°C) operation. Glass polyester barriers are used to separate the bus compartments between adjacent sections. Optional porcelain inserts are available for 50 kA bus only.

Polyvinyl chloride boots insulate the connection in the main bus compartment, overlapping the epoxy insulation on the bus bars. The bus bar insulation and boots form an integral insulating system for the equipment to meet its dielectric ratings. The bus bar insulation must not be damaged or modified. Bus joint boots must be in place before energizing the equipment.

Cable Compartments

Each circuit breaker in a vertical section has a separate cable compartment, accessible by removing a steel cover on the back. Insulated load connectors are provided for terminating cables. As standard, the load connectors are punched for terminating two cables per phase with a NEMA two-hole pattern. Schneider Electric provides lugs upon request. Tape and associated material for insulating cable terminations are not supplied as standard.

Figure 19 - Two Bay Assembly-Rear View



A ground bus in the cable compartment has lugs on each end for the assembly ground. This ground bus is connected to each circuit breaker compartment ground contact bar and to the individual ground bars in each cable compartment. All instrument transformer, metering, and relaying grounds are also connected to this common ground system.

A typical ground bus cross section:

- Up to 50 kA is 0.25 x 2.0 inch (6 x 51 mm)
- 63 kA is 0.5 x 2.0 inch (13 x 51 mm)

Conduit must enter the cable compartments, in the areas shown on the customer drawings, from either the top or bottom of the cable compartment. A removable steel cable pull box is provided to isolate cables when two circuit breakers are installed in one vertical section.

NOTE: Conduit should be stubbed in the concrete pad as part of the site preparation before the assembly is installed, but top entrance conduit must be installed after the assembly is in place. The top covers can be removed, punched to fit the conduit, and put back in place.

The front conduit area is for the bottom circuit breaker when all cables enter from below, and for the top circuit breaker when all cables enter from above. This cable pull box may be removed to install the rear cables first. When required, zero-sequence current transformers (see Two Bay Assembly-Rear View, page 26) are conveniently located in each cable compartment.

Various cable termination systems are used. These are detailed on the plans and specifications. Solderless or compression lugs can be supplied on the load connectors. Potheads are mounted on grounded support brackets. The compound and tape for their internal connections are shipped in a container with other miscellaneous parts. Tape and insulating material necessary for completing the field connection at the bus pad are not supplied with the assembly.

Cable compartment floor plates must be removed, punched to fit the conduit, and reinstalled with the appropriate hubs. These floor components form a barrier and block vermin (rodents, snakes, insects) from entering the switchgear. Depending on the application, an appropriate seal putty may be required if there is not an alternative barrier elsewhere in the construction of the site.

The operating environment for Masterclad switchgear is described in Circuit Breaker Section Interlock System Operation, page 28, as “provide adequate ventilation at all times so the ambient temperature around the assembly does not exceed 104°F (40° C). Clean, dry filtered air should be supplied.” This means air with high humidity, such as air above standing water, or airborne particles, must be kept out of the switchgear enclosure. See Site Preparation, page 36, list of “Good site preparation”.

Surge Arresters

Surge arresters are furnished only when listed in the user’s specifications. The vulnerability of the incoming and outgoing lines to lightning strikes or other high voltage transient conditions determines their type and justification. Surge arresters, when specified, are mounted in the incoming and outgoing cable compartments. Surge arresters must remain disconnected from the main bus during start-up testing. Surge arresters are shipped from the factory disconnected from the main bus to help prevent damage during hi-pot testing prior to energizing. Connect surge arrestors after hi-pot testing and before energization.

Circuit Breaker Section Interlock System Operation

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, NOM-029-STPS-2011, or CSA Z462.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Perform such work only after reading and understanding all of the instructions contained in this bulletin.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Before performing visual inspections, tests, or maintenance on this equipment, disconnect all sources of electric power. Assume all circuits are live until they are completely de-energized, tested, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Always practice lock-out/tag-out procedures according to OSHA requirements.
- Open all circuit breaker and switch contacts and discharge all springs before performing maintenance work, disconnection, or removal of a circuit breaker.
- Move circuit breakers to the disconnected position before removing rear access panels.
- Conduct electrical testing to confirm no short-circuits were created during installation, maintenance, or inspection.
- Never insert a circuit breaker into a circuit breaker compartment that is not complete and functional.
- The complete assembly arrangement determines if the top or bottom contacts are the line side; both can be energized when the circuit breaker is removed from the compartment. Identify the line side contacts for each circuit breaker compartment.
- Disconnect all high voltage to the switchgear before accessing the horizontal bus compartment.
- Do not use liquid fire extinguishers or water on electrical fires. Before extinguishing fires within the assembly, ensure the main power source is disconnected and the main and all feeder circuit breakers are open.
- Carefully inspect your work area, and remove any tools and objects left inside the equipment.
- Replace all devices, doors, and covers before turning on power to this equipment.
- All instructions in this manual are written with the assumption that the customer has taken these measures before performing maintenance or testing.

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

The circuit breaker and the circuit breaker section are equipped with an interlock system. The interlocks are designed to (see Circuit Breaker Floor Plate, Racking Device, and Interlocks, page 16):

- Not allow the circuit breaker to be pushed into the section when the circuit breaker is closed
- Not allow the circuit breaker to be closed while it is moved between the test and operating position
- Not allow the circuit breaker to be moved from the operating position when it is closed
- Discharge both the closing and trip springs when the circuit breaker is being moved from the circuit breaker section

Circuit Breaker Operation

Racking Mechanism

The racking mechanism moves the circuit breaker from the test/disconnected position to the connected position and vice versa.

Push the circuit breaker into the compartment to the test/disconnected position, and the disconnect release handle engages (see Circuit Breaker Release Handle, page 18).

With the front door closed, insert the racking handle and rotate it clockwise to rack the circuit breaker into the connected position. When in the connected position, the circuit breaker's forward motion stops. Do not over torque the racking handle once the circuit breaker motion stops. Excessive torque damages the racking mechanism if the circuit breaker does not move. Determine the cause before continuing.

With the door closed, the position indicator (see Racking Port, Handle, and Section Position Indicator, page 19) shows if the circuit breaker is in the test/disconnected, transport, or connected position. With the door open, two arrows on the left-hand rail show if the circuit breaker is in the test/disconnected position or in the connected position.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, NOM-029-STPS-2011, or CSA Z462.
- When the switchgear is energized, always open and close the circuit breaker, and rack the circuit breaker from one position to another with the door closed.
- Never use force to move the circuit breaker inside the circuit breaker section. If a mechanism is not operating smoothly, look for the cause.

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

To remove a circuit breaker from the connected position to the test/disconnected position:

- Open the circuit breaker electrically with the compartment door closed, and with the racking handle, move the circuit breaker to the test/disconnected position. Do not over torque the racking handle once the circuit breaker motion stops. Excessive torque damages the racking mechanism if the circuit breaker does not move. Determine the cause before continuing.

Control Power Plug

In normal operation, the control power plug automatically connects and disconnects as the circuit breaker is moved into and out of the connected position.

To test the control system with the circuit breaker in the test/disconnected position:

1. Rotate and pull the handle of the secondary control power receptacle forward until it can be rotated again and locks the receptacle in position. The circuit breaker can now be electrically operated the same as in the connected position.
2. Check all electrical functions; push the receptacle back in its normal operating position.
3. Rack the circuit breaker into the connected position.

Disconnect Position Latch

The disconnect position latch blocks the circuit breaker from rolling out of the compartment in the test/disconnected position. To remove the circuit breaker from the section, pull the release handle of the circuit breaker.

Manual Spring Charging Mechanism

In normal operation, when the control plug is engaged, the motor automatically charges the circuit breaker closing springs. The springs can also be charged manually, using the manual spring charging mechanism. This feature is provided for testing and maintenance purposes, and for emergency operating conditions.

⚠⚠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.
- Never manually close a circuit breaker in the connected position unless the opening source of power and protective relays are connected and operable.

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

Manual CLOSE and OPEN Push Buttons

Manual **CLOSE** and **OPEN** push buttons are located at the front of the circuit breaker. These push buttons operate the circuit breaker whether the circuit breaker is charged manually or electrically. Use them only when testing the circuit breaker during start-up or maintenance. Refer to the Type VR Circuit Breaker instruction bulletins 6055-31 (1200 and 2000 A, 50 kA) and 6055-33 (3000 A, 50 kA and 1200, 2000, 3000 A, 63 kA).

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

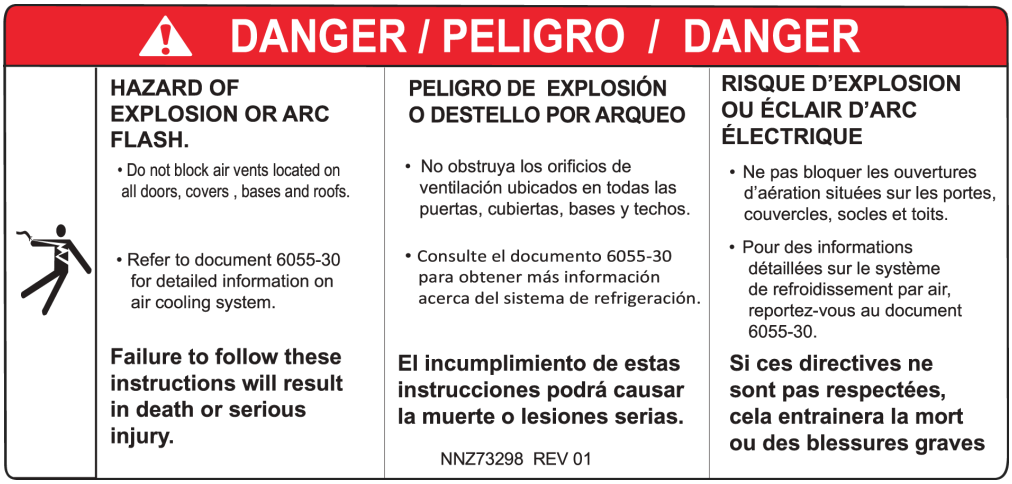
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, NOM-029-STPS-2011, or CSA Z462.
- When the switchgear is energized, never use the manual **OPEN** and **CLOSE** push buttons on the front of the circuit breaker. Use the control switch with the front door closed.

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

4000 A Switchgear Air Cooling

This section contains information related with the air cooling for 4000 A switchgear. It includes the logic overview and the fan location, as well as explaining how to locate the indicator devices in the doors of this specific equipment.

NOTE: The fan cooling system is only installed in sections with a 4000 A Circuit Breaker and is not required in auxiliary or feeder sections.



Logic Overview and Set Points for 4000 A Applications

- MT/ME = Main fans turn on when the continuous current is equal or above 2,500 A. If the current is below 2,500 A the fans remain off.
- CMA = This meter is on at all times measuring the continuous current.
- The high current relay in this meter closes after ten seconds when the current relay is equal or above 2,500 A.
- CMB, CMC, CMD = These meters and the main fans turn on once the high current relay in CMA is closed. The meters indicate current draw of the circuit breaker compartment, bus compartment, and cable compartment fans respectively.
- BE/BT = These are the backup fans and turn on after ten seconds if any of the main fans no longer move air. A low current relay in meters CMB, CMC, CMD monitors the current on each set of fans (circuit breaker, main bus, or cable compartment).
- WF = White indicating light that is ON when backup fans are running,- indicating problems with the main fans in that particular compartment. Inspect the fans and control circuit when an alarm is on.

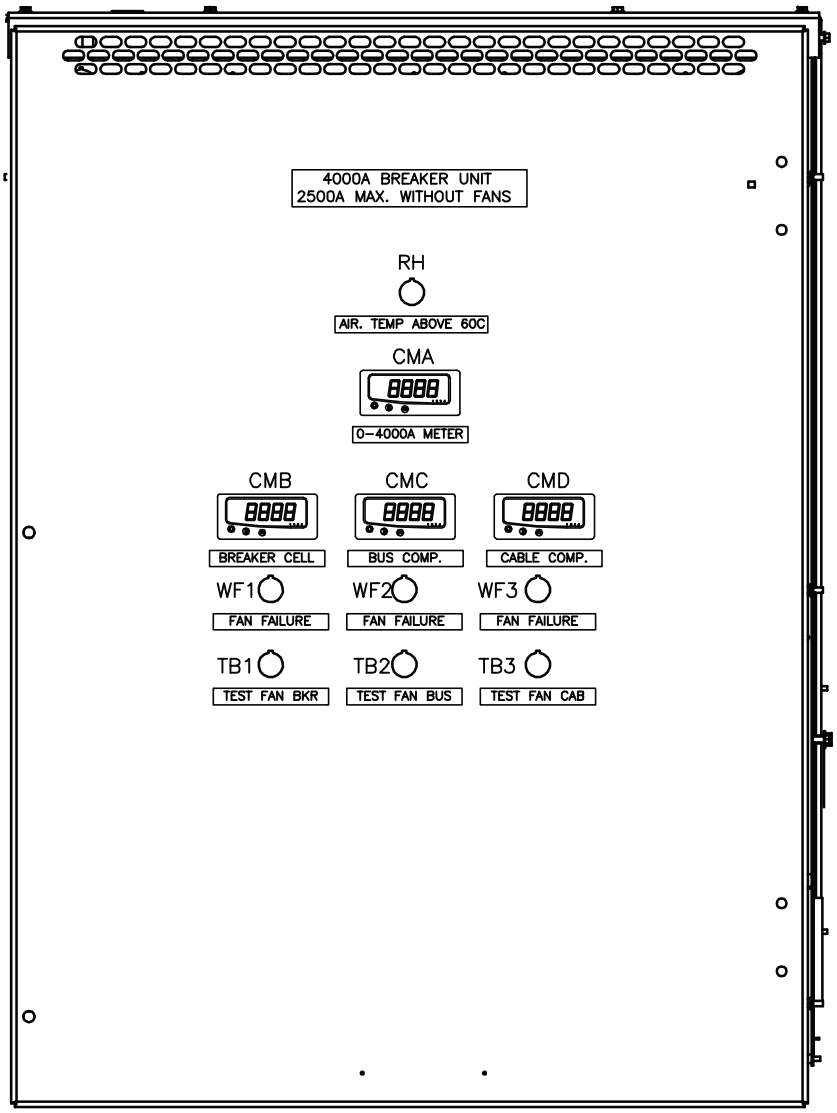
- TB1, TB2, TB3 = Test backup fans pushbuttons. Do not hold for more than ten seconds. These test the backup fans in the circuit breaker, bus, and cable compartment respectively.

  NOTE: If the test button is pressed longer that ten seconds, the backup fans will operate until control power for the fans is removed and reapplied. Removing the control power from the fans and then reapplying the control power resets the logic to normal operation. Extended operation of the fans will reduce their useful life.
- RH = Red light that is ON when air temperatures in circuit breaker section exceeds 140°F (60°C).
- An additional discrete LED alarm indicator is on the front panel of the CMA, CMB, CMC, CMD meters.
- It is optional to have CMB, CMC, CMD energized at all times or use the contact relay per diagram.

Note the following:

- The logic of the operation cannot be changed.
- The location of the fans cannot be changed.
- The supplier and type of fans cannot be changed unless reviewed and approved by Schneider Electric and UL.
- Metering devices and relays can be changed per customer preferences.
- The type of alarms and signal can be changed per customer preferences.
- CMA, CMB, CMC, CMD: These meters are true RMS meter 262-30A-AC01.
- PD1/PD2: Dual relay output 262-RLY.
- MT/ME Main fans (four in circuit breaker compartment and three in bus and cable compartments).
- BT/BE Backup fans (two in circuit breaker compartment and one in bus and cable compartments).
- Fans control equipment typically installed on upper door.
- The fan system is powered by a costumer supplied UPS at 120 VAC.

Figure 20 - Upper Door Detail Devices Can Be Installed in Either Upper or Lower Control Box Door



Devices associated with the fan cooling system are typically installed in the main section(s) upper door, on the upper portion of the door. The lower portion of the upper door can be used for additional devices required by customer.

Fan Location

Figure 21 - Side View 4000 A, 50/63 kA Switchgear with Forced Air Cooling

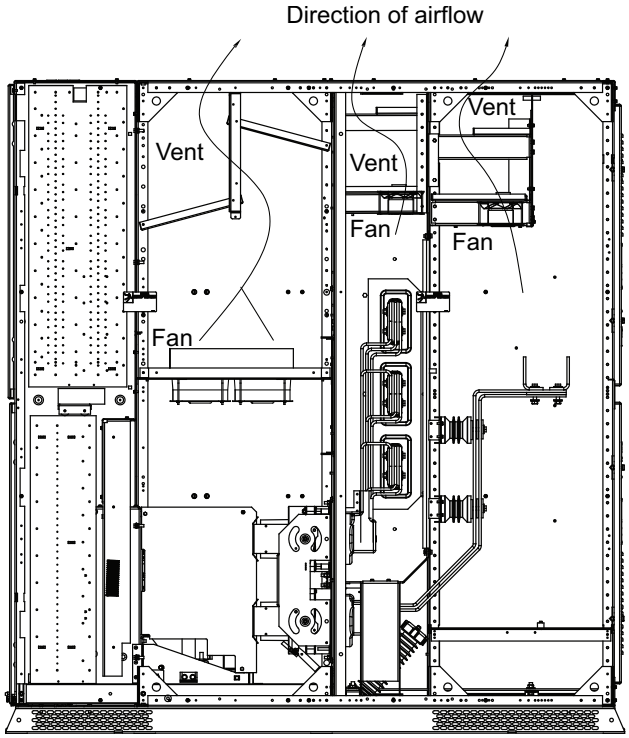
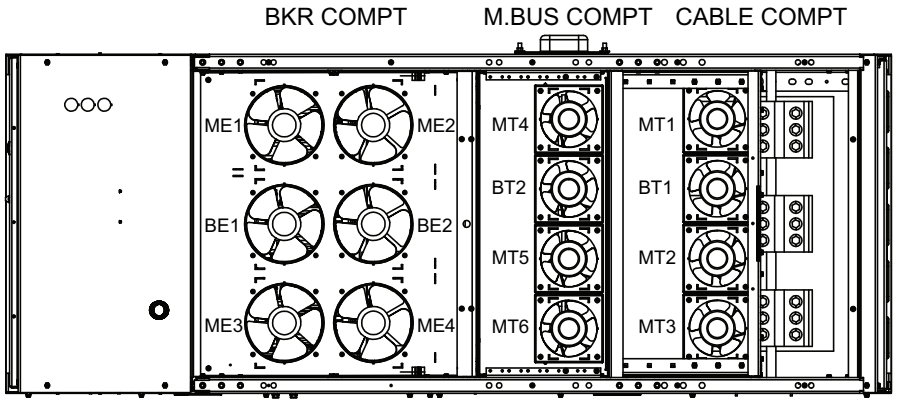


Figure 22 - Top View 4000 A, 63 kA Switchgear with Forced Air Cooling



Maintenance of Fan System

Special consideration must be given to the switchgear sections that employ fan cooling. In addition to all items in Inspection and Maintenance, page 57, the following additional steps are required:

- Fans potentially increase the volume of contaminants that accumulate throughout the equipment. Increase maintenance frequency if the equipment is subject to a high level of environmental contaminants, and/or the fan system is frequently in operation.
- Perform visual examination of the fan cooling hardware, including blades and cages annually. Abnormal operation requires immediate corrective action to help ensure the system functions as intended. During the inspection, look for damage, contaminants or pollutants throughout the switchgear section. Remove any buildup of dust or foreign materials by vacuuming and wiping with a clean dry cloth.
- Test the fan control system annually, (at a minimum) using the “TB” – Test backup fans pushbutton (for Circuit Breaker – TB1, for bus TB2, and for cable TB3). Momentarily press and the TB test button (no longer that ten seconds) to verify the backup fans are functioning properly. If the button is help longer that ten seconds, the backup fans will operate until control power for the fans is removed and reapplied. Removing the control power from the fans and then reapplying the control power resets the logic to normal operation. Extended operation of the fans will reduce their useful life. If a backup fan does not operate during the pushbutton test, contact Schneider Electric Services for assistance. Cooling fans are not a user replaceable item. Loading on the lineup should be restricted to 3000 A or less until the backup fans can be restored to proper working order.

The warning lights provide important information on the status of the system and should not be ignored.

Installation

Site Preparation

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Install the equipment in a clean, dry (including no condensation), well ventilated area with an ambient temperature of approximately 70°F (21°C).
- Place dust covers over circuit breakers.
- If heaters are furnished in the assembly, energize them from an external source. When energizing heaters from an external source, remove the primary current limiting fuses 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 200 W of heat per section is recommended.
- Avoid greasy, smoky heaters that can deposit carbon on insulation that could lead to tracking and insulation breakdown.

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.

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.

Good site preparation is essential for operation of the assembly. Carefully compare the plans and specifications with the customer drawings provided. Be sure to:

- Provide adequate ventilation at all times so the ambient temperature around the assembly does not exceed 104°F (40°C). Supply clean, dry, filtered air.
- Provide adequate lighting in both the front and back aisle spaces. Also provide convenience outlets in both areas for electrical hand tool use.
- Provide adequate floor drains
- Route sewer, water, and steam lines so they do not pass over or near the assembly. Dripping liquids that enter the equipment will cause damage.
- Do not allow water to collect or run under the equipment

- Do not install the equipment over locations that could retain moisture, such as a cable vault, without sealing the equipment to not allow moisture to enter the equipment.

Exposure to Moisture and Chemicals

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.

Weights

The weight of the average complete switchgear unit is 2500–2900 lb. (1134–1315 kg) for up to 50 kA and 3200 lb. (1451 kg) for 63 kA. Refer to Switchgear and Component Weights, page 37 and Individual Components, page 38 to determine switchgear and component weights for handling and structural considerations.

Table 1 - Switchgear and Component Weights

Item	Rating	Weight
Switchgear unit[1]	Up to 50 kA	2100 lb. (952 kg)
	63 kA	2400 lb. (1089 kg)
Circuit breaker	1200 A, 25 kA	380 lb. (172 kg)
	1200 A, 40 kA	380 lb. (172 kg)
	1200 A, 50 kA	430 lb. (195 kg)
	2000 A, 25 kA	430 lb. (195 kg)
	2000 A, 40 kA	450 lb. (204 kg)
	2000 A, 50 kA	500 lb. (227 kg)
	3000 A, 50 kA	700 lb. (318 kg)
	1200, 2000, and 3000 A, 63 kA	800 lb. (363 kg)
	4000 A, 50 kA	700 lb. (318 kg)
	4000 A, 63 kA	800 lb. (363 kg)
	Up to 50 kA, 15 kV	210 lb. (95 kg)
	63 kA, 15 kV	273 lb. (124 kg)
	Up to 50 kA, 15 kVA	270 lb. (122 kg)
Drawout VT unit (two VTs)	63 kA, 15 kVA	333 lb. (151 kg)
Drawout CPT unit	37.5 kVA	580 lb. (263 kg)
CPT fixed mounted	50 kVA	750 lb. (340 kg)
Surge arresters (three intermediate)	15 kV	120 lb. (54 kg)

1. For 4000 A units, base weight must be added to every unit in the lineup, and fans weight must be added to select units.

Table 2 - Individual Components

Item	50 kA	63 kA
Total Fan Assy	229 lb. (104 kg)	229 lb. (104 kg)
Base	164 lb. (74 kg)	168 lb. (76 kg)

Foundation

The switchgear is designed for installation on a concrete pad. Refer to the factory order drawings for any additional mounting details which may be required on specific orders. The pad must be flat and leveled to 0.06 in. (1.6 mm) per square yard to help ensure proper alignment and to help prevent distortion of the gear.

Provide a seven ft. (2.1 m) wide aisle space in front of the mounting pad, flush with and finished to the same tolerance as the mounting pad. This level surface is necessary for the circuit breaker lift truck and for inserting the circuit breakers into the bottom compartment.

Figure 23 - Floor Plan for Switchgear Rated Up to 50 kA

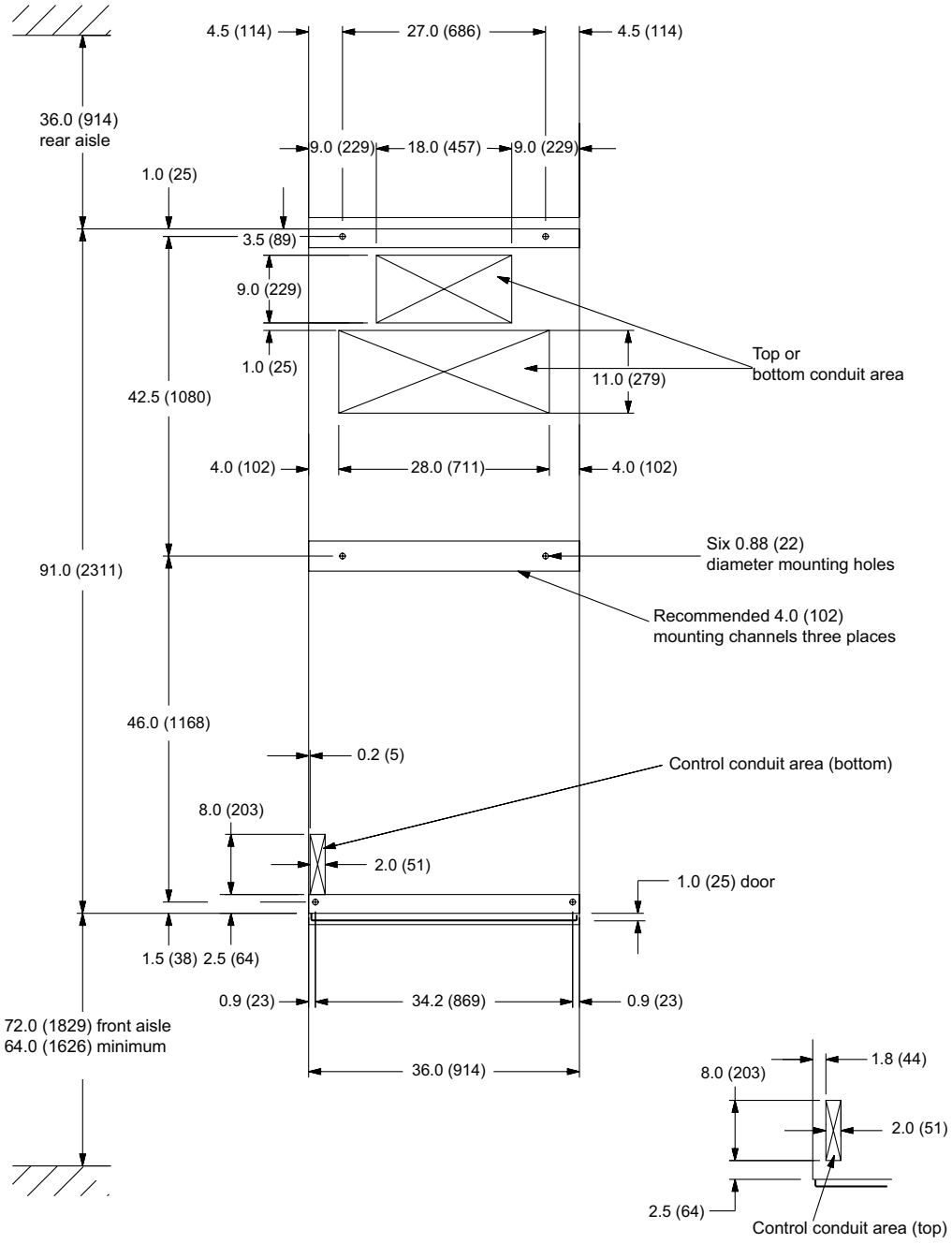
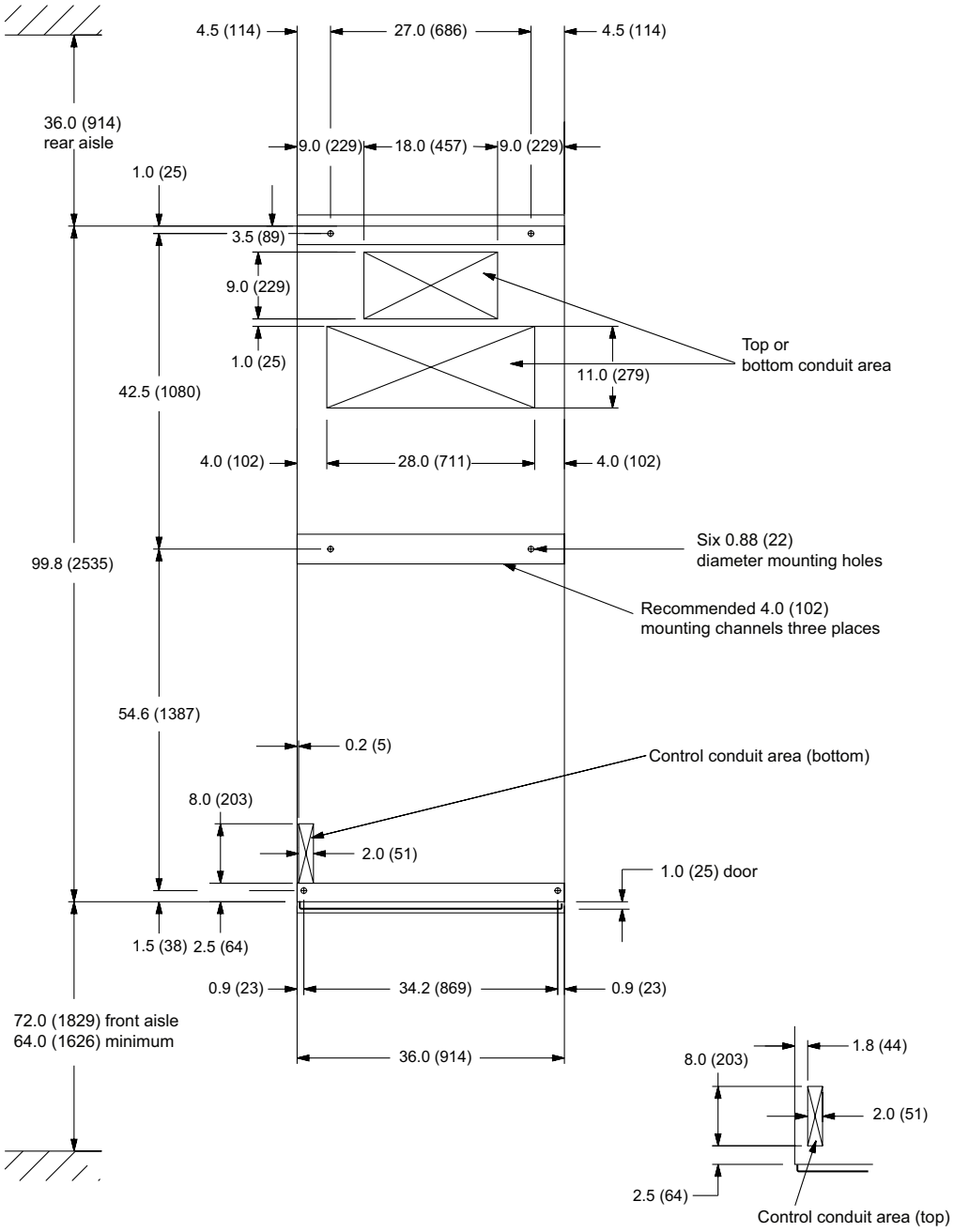


Figure 24 - Masterclad Extended Floor Plan for 63 kA-Rated Switchgear



NOTE: A minimum of three ft. (1 m) is necessary on the right end facing the front of the line-up. This space is necessary for door clearance, with door hinges on the right side of the door, when removing the circuit breakers. Typically, a minimum of three ft. (1 m) is necessary at the rear of the lineup for cable connections.

Stub conduits a maximum of one inch. (25 mm) above floor level. To simplify moving the switchgear into place, keep the conduit flush with the surface of the floor. Position the conduit accurately so that there is no mechanical interference with the assembly frame. Eliminate continuous loops of reinforcing rod or structural steel that do not enclose all conductors of the same circuit. Floor Plan for Switchgear Rated Up to 50 kA, page 39 and Masterclad Extended Floor Plan for 63 kA-Rated Switchgear, page 40 illustrate typical floor plans. Refer to the customer order drawings before using the typical foundation specifications. Customer order drawings are created to comply with specific customer requirements and therefore supersede the information provided here.

Switchgear Installation

Pre-Installation Procedures

1. The switchgear may be shipped in one or more shipping sections. Review the assembly drawings to verify that switchgear sections will be assembled in the correct order.
2. Verify that the conduit placement on the foundation is accurate according to customer drawings. Error in conduit placement may prohibit the proper installation of switchgear as described in this section (see the note below).
3. Sweep the pad and remove debris before installing any sections.

Installation

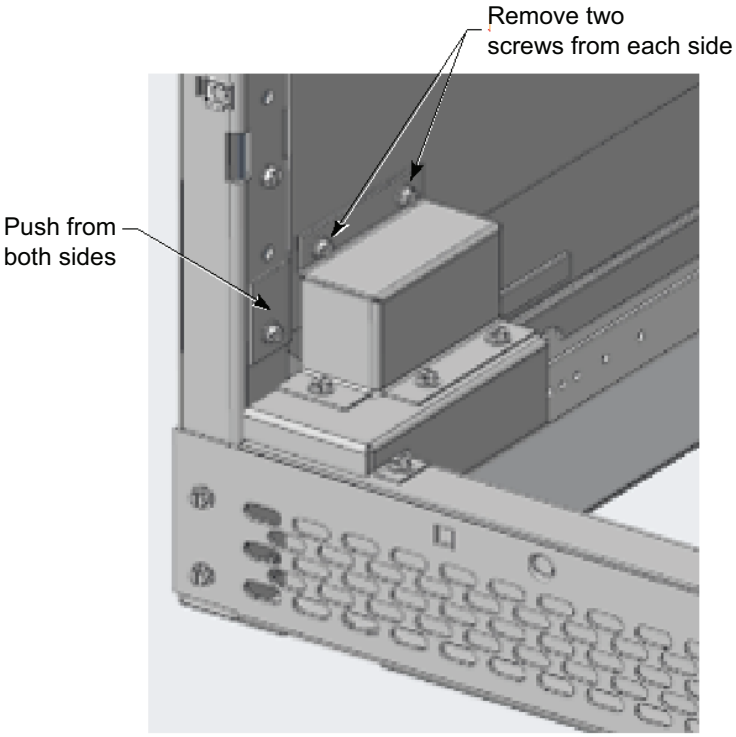
NOTE: When more than two shipping sections are involved, any error in conduit location can cause a cumulative error significant enough to prohibit the proper installation by the assembly sequence described in this section. To lessen cumulative error, unload and install the center shipping section first and work toward either end.

1. Move the sections, with skids attached, into place. Install the shipping section that allows the most maneuverability first. If rollers must be used, move with the skid in place. Remove the skid only when the switchgear is in proper position on the pad. Lower the first section onto the pad. Do not pry directly on the structure, doors, or covers.
2. Before proceeding, verify:
   - The conduits are in the center of the cutouts.
   - The back of the unit is perpendicular to the pad and has proper clearance.
   - The mounting holes line up with the mounting channels.
3. Move an adjacent switchgear shipping section into place.
4. Level each section before installing the next. Install steel shims, when necessary, between floor channels and switchgear.
5. Verify that the switchgear sections are level, aligned, and fit snugly together. If the sections do not fit properly, lift the most recently placed section by crane, remove any obstructions, and re-install.
6. Bolt switchgear shipping sections together.

   NOTE: All shipping sections must be bolted together in place before bolting them to the channel sills or installing the horizontal main bus.
7. Repeat steps 4–5 for additional switchgear shipping sections.
8. Verify that all switchgear shipping sections are in the correct position according to the job drawing after all sections are bolted together.
9. Install all cable compartment floor plates to create a barrier between cable compartment and space below the switchgear.

3000 A sections with auxiliaries on the top have the two rear bolt locations covered by a ventilation duct. In order to access those two locations, the two screws holding the ventilation boxes on left and right side need to be removed. Then the entire ventilation duct can be slid forward to access the anchor points. Replace the duct to its original position once the switchgear is bolted or welded.

Figure 25 - Access to Rear Bolt Locations in Auxiliary-3000 A Sections



Main Bus Installation

Install the main bus at the shipping split only after all sections are securely anchored in place and no additional movement of the assembly occurs. Bus bar extensions for shipping splits are shipped with the miscellaneous items.

A typical main bus assembly is shown in (see Main Bus Assembly, page 43). The side and rear views (see Main Bus Assembly, page 43) of the assembly show the general arrangement of the main bus and riser. The side (see Main Bus Connections-Side View, page 43) and top (see Main Bus Connections-Top View, page 44) views show the different bus connections and the orientation of the filler and splice plates. When aluminum bus is furnished, some of the circuit breaker connections and splice or filler plates are copper.

Figure 26 - Main Bus Assembly

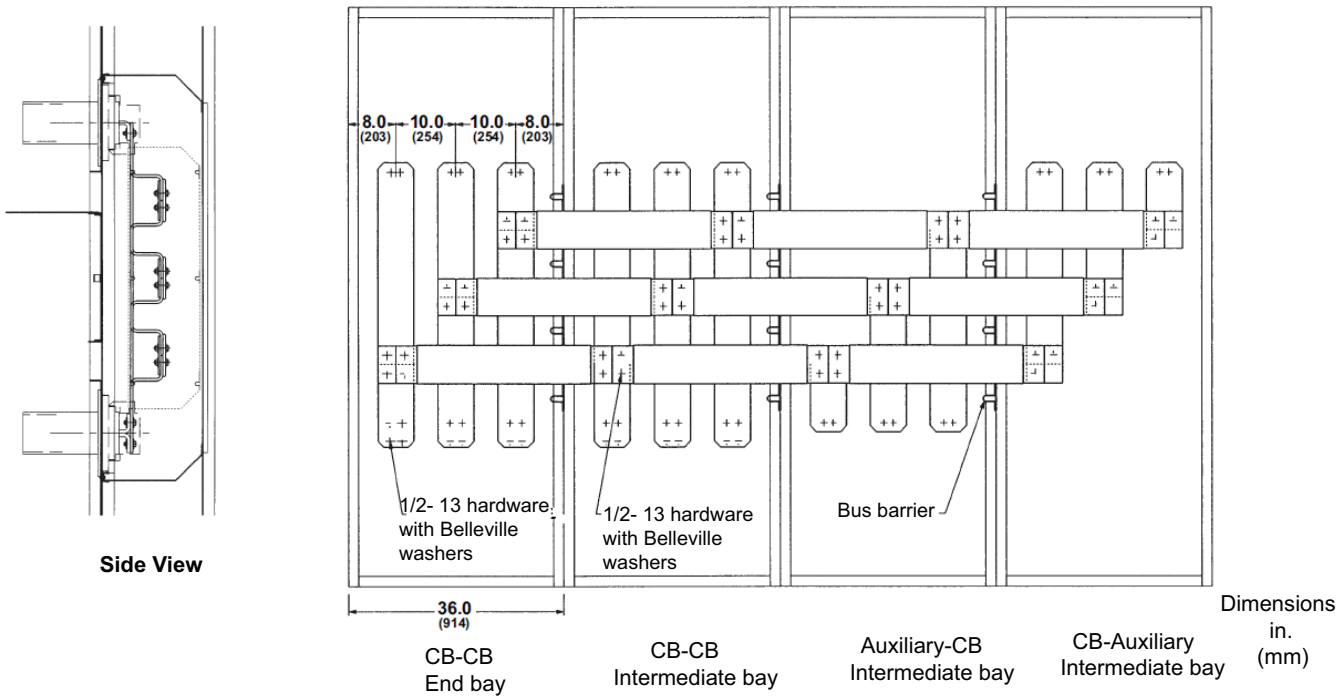


Figure 27 - Main Bus Connections-Side View

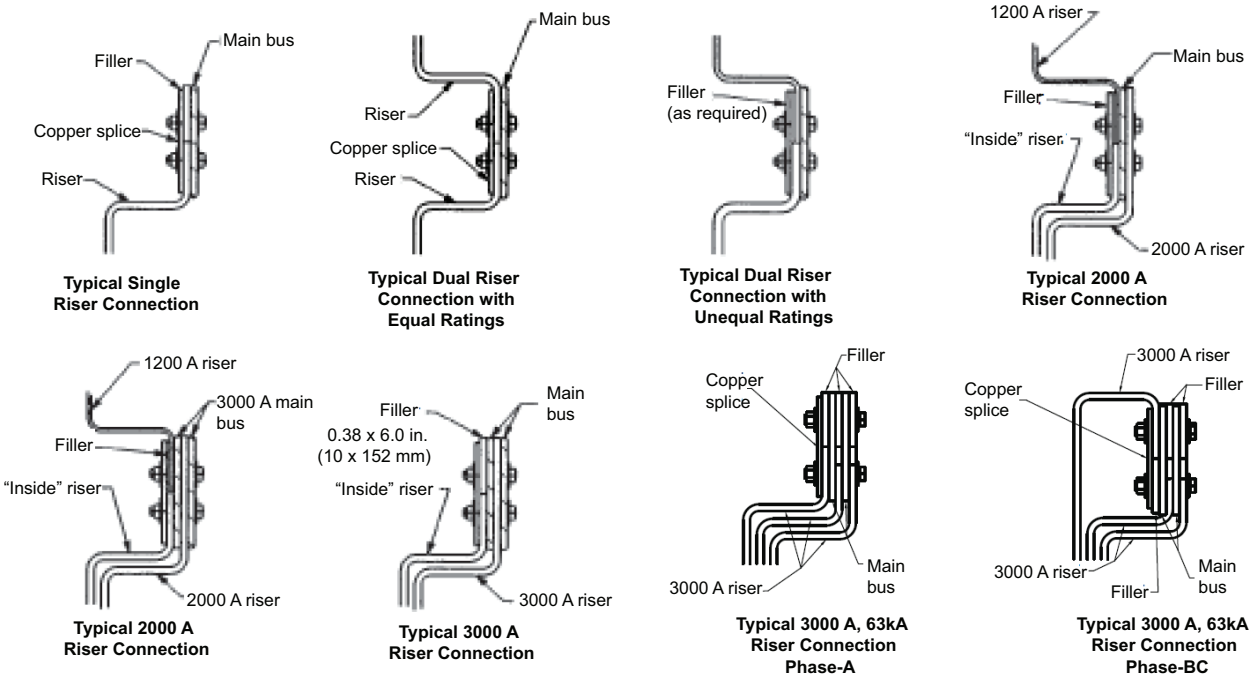
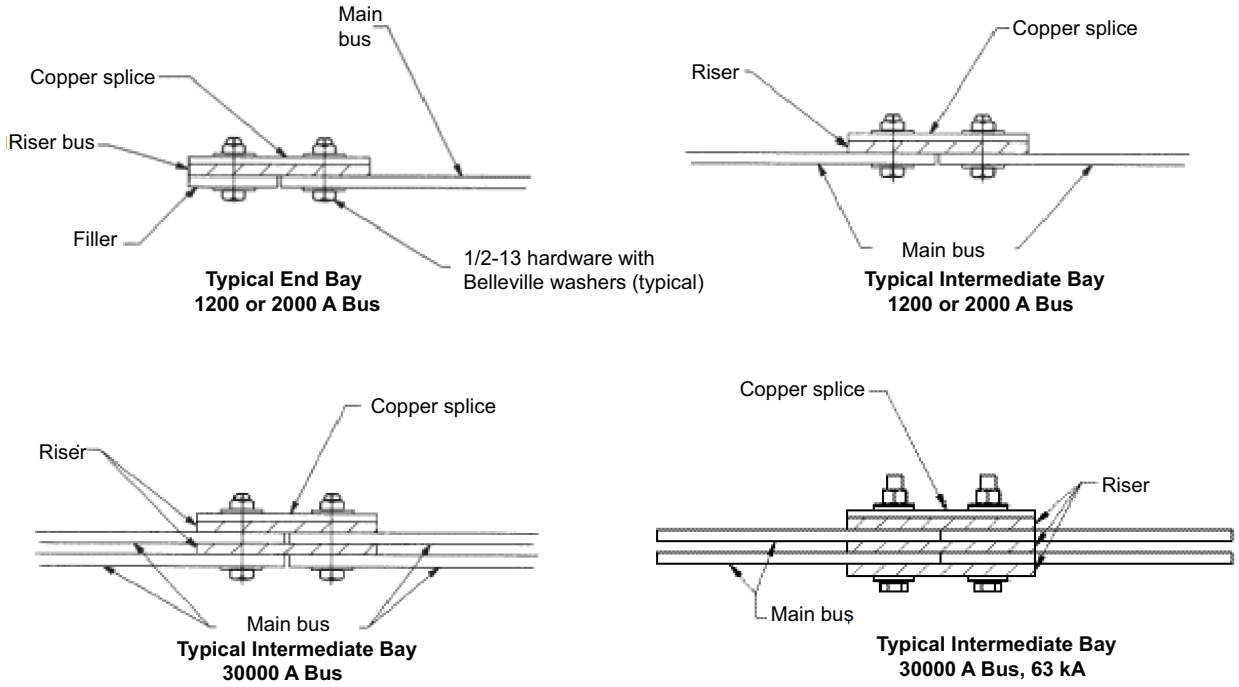
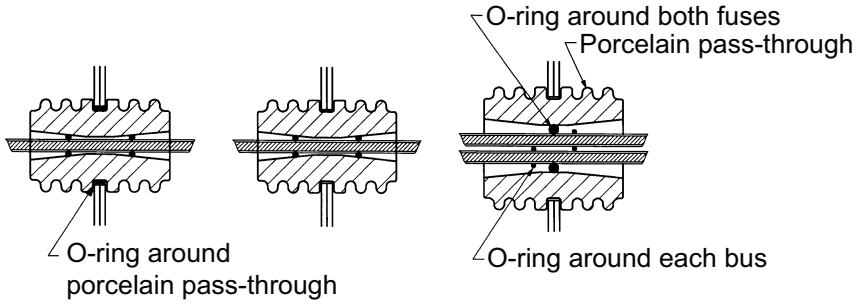


Figure 28 - Main Bus Connections-Top View



The standard switchgear is furnished with fiberglass-polyester bus barriers between bays. Porcelain “pass-throughs” are available as an option for 50 kA and below only.

Figure 29 - Main Bus Pass-Through, Porcelain—Optional for 50 kA and Below Only



For porcelain pass-throughs only, O-rings must be installed inside the passthroughs to cushion the bus bars under short-circuit conditions.

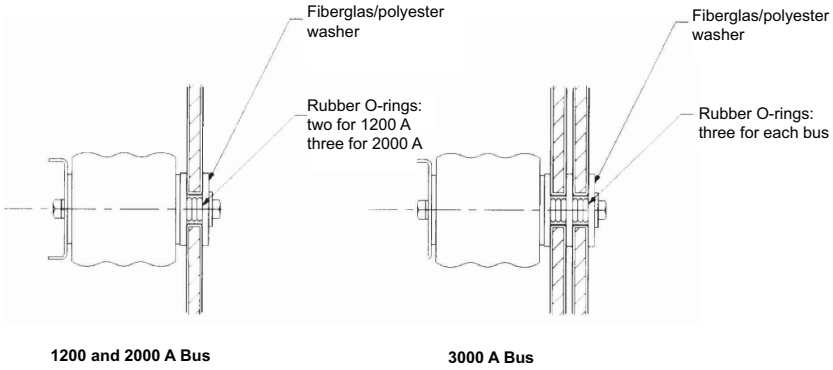
Schneider Electric recommends the following installation steps for installing two bus bars:

1. Place the larger O-ring around both bars at the correct distance from the end, and the smaller rings around each bar approximately one inch (25 mm) on each side from the large O-ring.

2. Slide both bars into the porcelain (one end of the porcelain may have a larger opening).

   NOTE: When bus bar stand-off insulator installation is required on shipping sections, fiberglass/polyester washers and rubber O-rings must be installed as shown.

Figure 30 - Stand-Off Bus Support



3. Remove the main bus covers and the insulating boots.
4. Install one phase at a time by sliding the bus bar through the bus barriers and loosely bolting the horizontal bus to the vertical bus. Do not bend or force the bus to make this connection. The through bushings and the divided insulating barrier may be loosened if necessary. They have sufficient clearance and adjustment to compensate for minor field misalignment of shipping sections.
5. Tighten the bolts holding the bus bar joints only after all three bus bars are in place and properly fitted. Use a torque wrench to make sure that the bolts for bus bar connections are tightened in accordance with recommended bolt torque values.
6. Reinstall all boots ensuring they are properly closed.

Table 3 - Bolt Torque Values

Bolt Size	Mechanical Joints	Bus bar Connections
1/4–20	4–7 lb-ft. (5.4–9.5 N•m)	—
5/16–18	11–15 lb-ft. (14.9–20.3 N•m)	—
3/8–16	18–24 lb-ft. (24.4–32.5 N•m)	30–40 lb-ft. (40.7–54.2 N•m)
1/2–13	32–44 lb-ft. (43.4–59.7 N•m)	47–62 lb-ft. (63.7–84.0 N•m)

Ground Bus Connection

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Connect the ground bus to the proper equipment ground per the local installation code requirements. The ground bus must be connected for proper operation of relaying and instrumentation, and for personnel safety.

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

Control Wiring Connections

Consult the customer wiring diagram for reconnection of wiring at the shipping break. Each wire is identified and has been previously connected during assembly and verified at the factory. If the identification is missing or blurred, ring-out before connecting to avoid control circuit and instrument panel problems at start-up.

Initial Circuit Breaker Installation

Follow these instructions for the initial install of the circuit breaker:

1. De-energize all primary and control power circuits.
2. Insert each circuit breaker into the connected position of its respective circuit breaker compartment. Observe the operation of the ground contacts, shutters, and disconnect position latch.
3. Remove each circuit breaker from its compartment. Open the shutters and check that tracks made in the contact grease by the fingers of the main disconnects extend back a minimum of 0.5 inch (13 mm) from the front edge of each bar. Make sure that the ground shoe leaves tracks on the ground bus.

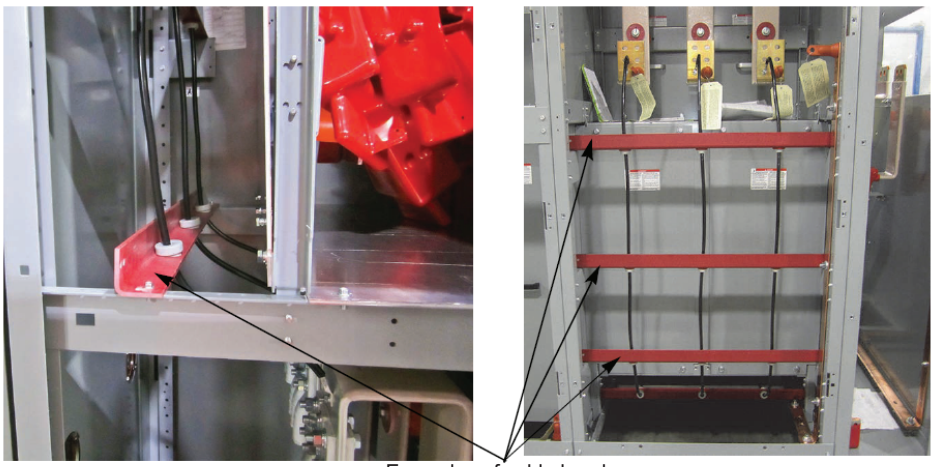
Do not force circuit breakers into circuit breaker compartments. Compartment rating interlocks help prevent inserting circuit breakers into incorrect sections.

VT, CPT, and Fuse Drawout Installation

1. Withdraw the drawout control power fuse drawer and the drawout voltage transformer drawer. Observe their operation. Verify that the static grounding contacts touch the moving drawout contacts and that the primary and secondary contacts make proper contact.
2. Prior to energization, verify spacing of all VT, CPT and fuse drawout cabling.

   The VT Cables are designed to run parallel and perpendicular to the barriers across their length in the cubicle. They are positioned and spaced correctly (from phase and ground) by the porcelain.
3. Verify the cables are routed properly and the porcelain bushings are not displaced from their designed location. Visually inspect for any damage to the insulation or accumulation of dust on the cable on both sides of the barrier.

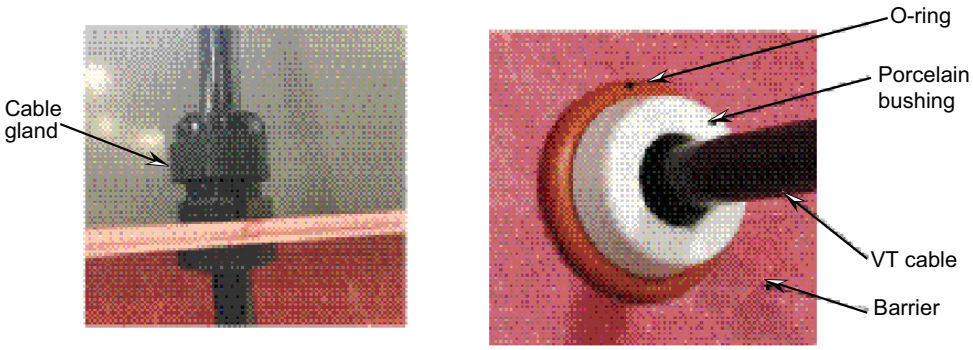
Figure 31 - Examples of Cable Breakers



Examples of cable breakers

4. If there is any visible sign of damage, replace the cables. Clean possible dust accumulation with a lint free cloth and denatured alcohol. Two types of cable pass through insulators are used within Masterclad, a porcelain bushing and a nylon cable gland. The cable gland was introduced to the assemblies in 2021. If the equipment contains nylon cable glands to route cables, disregard the information pertaining to porcelain bushings.
5. Make sure that all the VT cables pass freely through the porcelain bushings without stressing their placement in the barrier.
6. The bushings cannot tilt or displace because of interference with the cables. If needed, reshape the cables so that their axes match the axes of the bushing bores.
7. Make sure the O-rings are firmly in place in their mounting grooves.

Figure 32 - O-rings and Mounting Grooves



In general, the cables must always maintain the following minimum clearances:

	Voltage ≤ 5 kV in. (mm)	**5 kV ≤ Voltage ≤ 15 kV**
Phase to Phase	3 (76.2)	4 (101.6)
Grounded Metal	3 (76.2)	4 (101.6)

For additional information on proper field installation of customer cabled transformer connections, refer to document 46010-520.

High-Potential Testing

Before making external power connections, perform a high-potential (hi-pot) dielectric withstand test on the bus and circuit breakers as an assembly.

Use a reliable transformer-type tester with a built-in voltmeter and milliamp meter for hi-pot testing. Capacitor loaded bench-type testers with neon bulb indicators do not have sufficient capacity to give reliable results.

Test Preparation

1. Disconnect surge arresters.
2. Withdraw the voltage transformer drawer (if provided).
3. Place each of the circuit breakers in its proper circuit breaker compartment in the connected position. Charge their springs manually, and then close each circuit breaker by using the **CLOSE (I)** push button.

Phase-to-Phase Test

1. Perform a phase-to-phase hi-pot test on the main bus:
   a. Gradually increase the voltage to the levels shown in Table 5.
   b. Verify that the equipment sustains the specified voltage without flashover for one minute.
2. Turn off the test equipment. Discharge the phase bus to ground before removing the test cables.

Phase-to-Ground Test

1. Perform a phase-to-ground hi-pot test on the main bus:
   a. Gradually increase the voltage to the levels shown in List of Supported Regional Building Codes and Seismic Design Standards, page 50.
   b. Verify that the equipment sustains the specified voltage without flashover for one minute.
2. Turn off the test equipment. Discharge the phase bus to ground before removing the test cables.

Refer to List of Supported Regional Building Codes and Seismic Design Standards, page 50 for the nominal test values for dry, clean, new assemblies. Field hi-pot tests are made at 75% of factory test voltages in accordance with ANSI standards.

Table 4 - One Minute Hi-Potential Test[2]

Assembly Rated Maximum Voltage	Factory Test Voltage (AC)	Field Test Voltage	
		AC	DC
5 kV	19 kV	14 kV	20 kV
15 kV	36 kV	27 kV	38 kV

If satisfactory results are not obtained, locate the problem, correct it, and rerun the test before proceeding. If the issue seems to be occurring in the vacuum interrupter, change the polarity and rerun the test. If this resolves the issue, the vacuum interrupter is fit for duty. If results are acceptable, the power cables, ground wires, external wiring, and battery (if supplied) can be connected to the assembly. If results are not acceptable, contact your local Schneider Electric representative.

Phasing

In accordance with NEMA standards, all bus within the switchgear is phased A-B-C left to right, top to bottom, and front to back when viewing the assembly from the front (the circuit breaker compartment side). If, for any reason, the bus must be phased differently, the different phases are identified on the bus with a label.

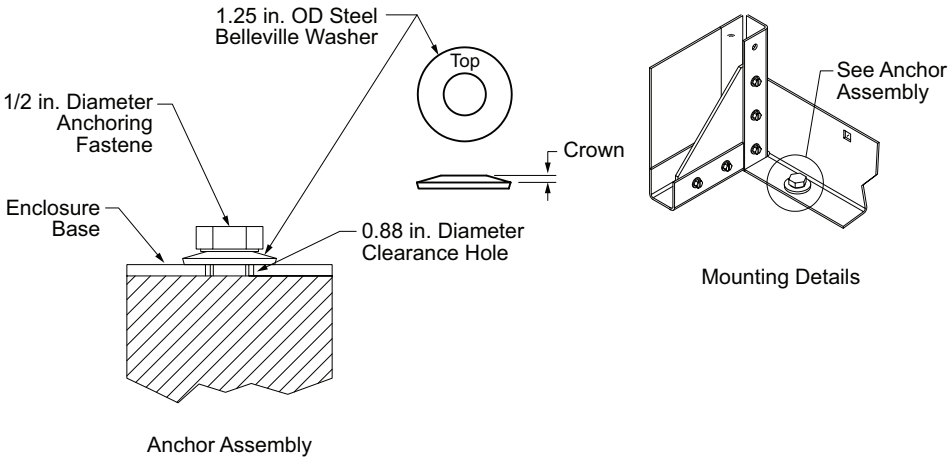
Equipment Anchorage for Non-Seismic Applications

The equipment enclosure provides anchorage tie-down points to accept anchor attachments to the building structure or foundation. Masterclad 5-15 kV Metal-Clad indoor enclosures provide enclosure base frame clearance holes to accept bolted anchorage attachments as shown in Non-seismic Switchgear Anchor Assembly, page 49. Four anchors are required for each section, two in the front and two in the rear

2. AC voltages are 60 Hz rms symmetrical.

located per the Floor Plan for Switchgear Rated Up to 50 kA, page 39 and Masterclad Extended Floor Plan for 63 kA-Rated Switchgear, page 40.

Figure 33 - Non-seismic Switchgear Anchor Assembly



Equipment Installation for Seismic Applications

Introduction Seismic Certification

Seismic certification is an optional feature on the Masterclad 5-15 kV Metal-Clad product line and provides seismic conformance options to any of the North American and International building codes and seismic design standards identified in Table 5. Masterclad 5-15 kV Metal-Clad 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 Masterclad 5-15kV Metal-Clad. 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 5 - List of Supported Regional Building Codes and Seismic Design Standards

Country / Region	Code Reference ID	Code Name
North American Codes		
Canada	NBCC	National Building Code of Canada
Mexico	CFE MDOC-15	Civil Works Design Manual, Earthquake Design
United States	IBC per ASCE 7 CBC per ASCE 7 UFC per DoD	International Building Code—IBC California Building Code—CBC Uniform Facilities Criteria—UFC
International Codes		
Argentina	INPRES-CIRSOC103	Argentinean Standards for Earthquake Resistant Constructions
Australia	AS 1170.4-2007 (R2018)	Structural design actions, Part 4: Earthquake actions in Australia
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
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

Responsibility for Mitigation of Seismic Damage

The Masterclad 5-15 kV Metal-Clad 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 (for example, special certification) servicing critical infrastructure and essential buildings where post-earthquake equipment functionality is a requirement.

Incoming and outgoing bus, cable, and conduit must also be considered as related but independent systems. These distribution systems must be designed and restrained to withstand the forces generated by the seismic event without increasing the load transferred to the equipment. For applications where seismic hazard exists, it is preferred that bus, cable, and conduit enter and exit the bottom of the equipment enclosure.

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 (for example, 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

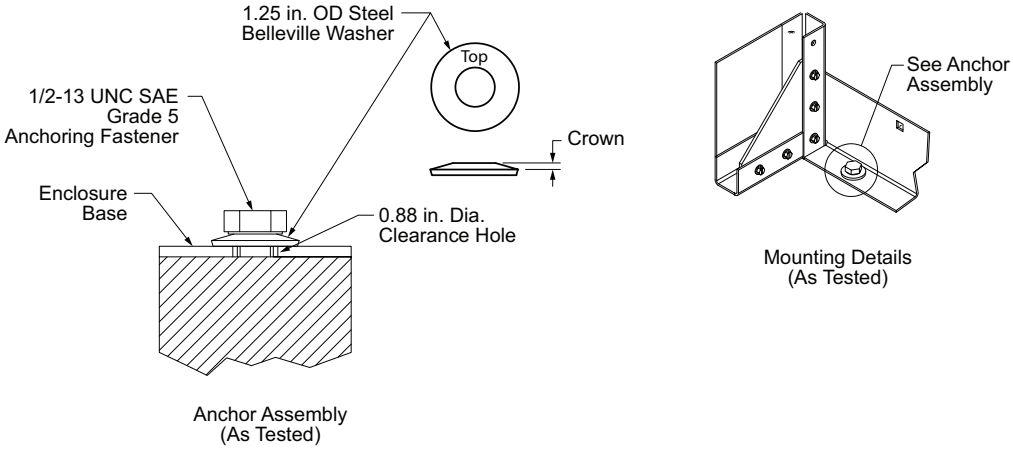
The equipment enclosure provides anchorage tie-down points to accept anchor attachments to the building structure or foundation. Masterclad 5-15 kV Metal-Clad indoor enclosures provide enclosure base frame clearance holes for bolted anchorage attachments. Equipment installations must be anchored using all enclosure tie-down points as shown in Floor Plan for Switchgear Rated Up to 50 kA, page 39 and Masterclad Extended Floor Plan for 63 kA-Rated Switchgear, page 40.

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 Switchgear as Tested Anchor Assembly, page 52 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, 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.

Figure 34 - Switchgear as Tested Anchor Assembly



Cable Connections

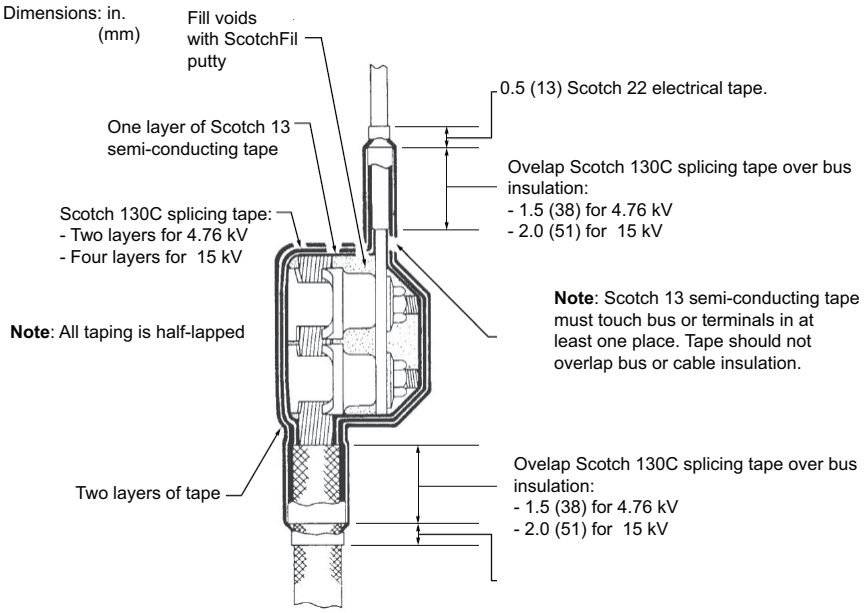
Before making cable connections, install the cable compartment floor plates.

Be very careful when making up all types of cable terminations, as terminations are critical to the successful operation of the electrical distribution system. Avoid sharp turns, edges or corners to help prevent damage to the cable insulation. Follow the cable manufacturer's recommendations for minimum bending radius. These instructions vary from manufacturer to manufacturer.

Solderless or compression-type cable lugs are the most common method for connecting power cables to metal-clad switchgear. When making the terminations for each type of power cable, follow the cable manufacturer's instructions. After the cable connections are made, insulate them with the boots if provided, or as follows:

1. Place 3M™ Scotchfil™ electrical insulating putty around the lugs and bolts to reduce the concentrated field created by their irregular shapes (see Non-seismic Switchgear Anchor Assembly, page 49). Apply a layer of 3M Scotch® 13 electrical semiconducting tape over the Scotchfil. Half-lap the tape, which must extend onto the conductor. Do not extend the tape up over the bus epoxy insulation. Apply 3M Scotch 130C splicing tape over the Scotch 13 tape. Half-lap this tape for two layers on 4.76 kV installations, and four layers on 8.25 kV and 15 kV installations. For 4.76 kV applications, extend this tape 1.5 inch (38 mm) up over the bus insulation and cable insulation. Extend the tape two inch (51 mm) for 15 kV applications.
2. Apply two layers of 3M Scotch 22 electrical tape, extending the tape up over the Scotch 130C tape in all directions. The tape and other insulating materials for completing these field connections are not supplied with the switchgear.
3. When terminators are supplied for terminating power cables, follow the power cable manufacturer's instructions for terminating the cables in these devices. To facilitate installation of the power cables, the bus side is not taped. After the cables are installed, insulate the terminator-to-bus connections according to the cable lug insulation instructions in this section.

Figure 35 - High Voltage Cable Lug Insulation



NOTE: The external surface of each shielded cable is at ground potential and must be positioned a minimum of six inches (152 mm) from any live part (even its own pole), including insulated bus bars.

Start-up

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- 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 be installed and serviced only by qualified electrical personnel.
- Perform such work only after reading and understanding all of the instructions contained in this bulletin.
- Turn off all power supplying this equipment before working on or inside equipment using a properly rated voltage sensing device to confirm power is off.
- Before performing visual inspections, tests, or maintenance on this equipment, disconnect all sources of electric power. Assume all circuits are live until they are completely de-energized, tested, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Always practice lock-out/tag-out procedures according to OSHA requirements.
- Open all circuit breaker and switch contacts and discharge all springs before performing maintenance work, disconnection, or removal of a circuit breaker.
- Move circuit breakers to the disconnected position before removing rear access panels.
- Conduct electrical testing to confirm no short-circuits were created during installation, maintenance, or inspection.
- Never insert a circuit breaker into a circuit breaker compartment that is not complete and functional.
- The complete assembly arrangement determines if the top or bottom contacts are the line side; both can be energized when the circuit breaker is removed from the compartment. Identify the line side contacts for each circuit breaker compartment.
- Disconnect all high voltage to the switchgear before accessing the horizontal bus compartment.
- Do not use liquid fire extinguishers or water on electrical fires. Before extinguishing fires within the assembly, ensure the main power source is disconnected and the main and all feeder circuit breakers are open.
- Carefully inspect your work area, and remove any tools and objects left inside the equipment.
- Replace all devices, doors, and covers before turning on power to this equipment.
- All instructions in this manual are written with the assumption that the customer has taken these measures before performing maintenance or testing.
- All personnel involved in the start-up operation should be thoroughly familiar with the information in this instruction bulletin and on provided customer drawings before working on this equipment.

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

Training of personnel for final start-up can be provided. Contact your local Schneider Electric field sales representative for information.

Preliminary Start-Up Procedures

1. Turn off all main and control power supplying the equipment.
2. Vacuum every compartment. Remove all loose parts, tools, miscellaneous construction items, and litter.
3. Verify that all insulating boots are installed correctly and properly closed. Verify that primary cable connections are properly insulated.
4. Verify that any customer installed low voltage cables with ground shield maintain 6 inches distance from primary conductors.
5. Verify primary cable routing is properly installed as per instructions provided in previous sections.
6. Replace all of the main bus covers and any other barriers or covers that were removed during installation.
7. Install the cable compartment back covers.
8. Connect the battery charger and batteries (if used) to the switchgear control bus according to the order drawings.
9. Unblock all of the relays and set to the relay schedule. Using a relay tester, verify the settings and electrical operation of each relay.
10. Verify that any control power transformer used has the current limiting fuses in place. Pull the drawer out to the withdrawn position.

Installing and Testing Circuit Breakers in the TEST/ DISCONNECT Position

Follow the steps for installing and testing the circuit breaker in the **TEST**/ **DISCONNECT** position outlined in Circuit Breaker Operation, page 29.

Operation

Before energizing the equipment (If necessary, use an external control power source):

1. Rack one circuit breaker at a time following the steps outlined in Circuit Breaker Operation, page 29.
2. While in the **Test**/**Disconnect** position, electrically close and open the circuit breaker with the door-mounted circuit breaker control switch. Open the circuit breaker by temporarily closing the contacts of each protective relay. Reset the relay targets after each operation.
3. Electrically operate from remote control locations and check the remote indicating lights.
4. Operate all electrical interlocks, transfer schemes, lock-out relays, and other control functions to validate proper operation.
5. Remove the temporary source of low voltage power (if used) and make the permanent connection of low voltage power. Rack all circuit breakers to the **Connected** position.
6. If drawout fuses and drawout voltage transformers are included in the installation, rack them into the connected position by following the steps outlined in Voltage Transformer, Control Power Transformer, and Fuse Drawout Units, page 22.
7. Using a properly rated voltage sensing device, verify again that trip voltage is available at the circuit breaker control terminals in each compartment.

Energizing the Switchgear

To establish electrical service follow these steps:

1. Energize the incoming high voltage circuits.
2. Close the main circuit breakers.
3. Close the feeder circuit breakers.
4. Energize loads one at a time.

Removing Circuit Breakers

Follow the steps outlined in Circuit Breaker Operation, page 29.

Inspection and Maintenance

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, NOM-029-STPS-2011, or CSA Z462.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Perform such work only after reading and understanding all of the instructions contained in this bulletin.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Before performing visual inspections, tests, or maintenance on this equipment, disconnect all sources of electric power. Assume all circuits are live until they are completely de-energized, tested, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Always practice lock-out/tag-out procedures according to OSHA requirements.
- Open all circuit breaker and switch contacts and discharge all springs before performing maintenance work, disconnection, or removal of a circuit breaker.
- Move circuit breakers to the disconnected position before removing rear access panels.
- Conduct electrical testing to confirm no short-circuits were created during installation, maintenance, or inspection.
- Never insert a circuit breaker into a circuit breaker compartment that is not complete and functional.
- Perform inspection and maintenance after the first year and annually, or as operating conditions require. Abnormal operation or conditions may require immediate corrective action. During the inspections listed in this section, the inspector should be looking for damage, contaminants or pollutants.
- The complete assembly arrangement determines if the top or bottom contacts are the line side; both can be energized when the circuit breaker is removed from the compartment. Identify the line side contacts for each circuit breaker compartment.
- Disconnect all high voltage to the switchgear before accessing the horizontal bus compartment.
- Do not use liquid fire extinguishers or water on electrical fires. Before extinguishing fires within the assembly, ensure the main power source is disconnected and the main and all feeder circuit breakers are open.
- Carefully inspect your work area, and remove any tools and objects left inside the equipment.
- Replace all devices, doors, and covers before turning on power to this equipment.

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

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- All instructions in this manual are written with the assumption that the customer has taken these measures before performing maintenance or testing.
- All personnel involved in the start-up operation should be thoroughly familiar with the information in this instruction bulletin and on provided customer drawings before working on this equipment.

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

Perform inspection and maintenance after the first year and annually, or as operating conditions require. Abnormal operation or conditions may require immediate corrective action.

During the inspections listed in this section, look for damage, contaminants or pollutants.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Perform inspection and maintenance only with the main sources of power disconnected and locked open with a “Lock out/Tag out”. Be sure there is no backfeed through any feeder circuit. Ground the main and feeder circuits before touching the main bus, bus pads, or primary contacts.
- Be sure there is no backfeed through any feeder circuit.
- Ground the main and feeder circuits before touching the main bus, bus pads, or primary contacts.

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.

Cleaning Instructions

This equipment contains components manufactured with various materials. Some cleaning agents could damage the integrity of the surface of the component reducing its insulating properties, structural strength or conductivity. Use this guide to determine a compatible cleaning agent for typical materials incorporated in this equipment. Never spray cleaners or use compressed air on or inside the equipment as this will cause the contamination or cleaners to become airborne and could contaminate other components.

- Greased joints:
  - Wipe surface grease away with a clean cloth. Reapply the grease recommended for that assembly, found in the maintenance section of the documentation for that assembly.

- Glass polyester insulator surfaces:
  - Wipe with a clean cloth dampened with denatured alcohol.
  - Use distilled or purified water to moisten the cloth in place of denatured alcohol, but standing/pooling water must be absorbed and not left to air dry.
  - Use care so the liquid does not flow between bus joints.
- Epoxy insulator surfaces:
  - Wipe with a clean cloth dampened with denatured alcohol.
  - Use distilled or purified water to moisten the cloth in place of denatured alcohol, but standing/pooling water must be absorbed and not left to air dry.
  - Remove residue by lightly rubbing with a dry Scotch-Brite non-scratch scour pad followed by wiping with a clean cloth moistened with denatured alcohol, distilled or purified water.
  - Use care so the liquid does not flow between bus joints or between the epoxy coating and bus.
- Ceramic/porcelain insulator surfaces:
  - Wipe with a clean cloth dampened with denatured alcohol.
  - Use distilled or purified water to moisten the cloth in place of denatured alcohol, but standing/pooling water must be absorbed and not left to air dry.
  - Use care so the liquid does not flow between bus joints or between the epoxy coating and bus.
  - Remove residue by lightly rubbing with a multi-functional HV insulator cleaning paste on a clean cloth followed by wiping with a clean cloth moistened with denatured alcohol, or distilled or purified water.
- Poly concrete standoff insulator surfaces:
  - Wipe with a clean cloth dampened with denatured alcohol.
  - Use care so the liquid does not flow between bus joints.
- Plastisol boot surfaces:
  - Wipe with a clean cloth dampened with denatured alcohol.
  - Use distilled or purified water to moisten the cloth in place of denatured alcohol, but standing/pooling water must be absorbed and not left to air dry.
  - Use care so the liquid does not flow inside the boot and between the bus joints.
- Polycarbonate/Lexan surfaces:
  - Wipe with a clean cloth dampened with denatured alcohol.
  - Use distilled or purified water to moisten the cloth in place of denatured alcohol, but standing/pooling water must be absorbed and not left to air dry.
  - Do not wipe in a circular motion, use linear strokes directed toward an exposed edge.
  - Change the water and rinse the cloth often.
  - Dry with a clean cloth.
  - Use denatured alcohol dampened on a clean cloth on the polycarbonate/ Lexan insulation barriers as there is no UV protection applied to the sheet that would cause degradation.
- Silver/tin plated copper surfaces:
  - Wipe with a clean cloth dampened with denatured alcohol.
  - Remove residue by lightly rubbing with a dry Scotch-Brite non-scratch scour pad followed by wiping with a clean cloth moistened with denatured alcohol.
  - Use care so the liquid does not flow between bus joints.

- Powder coated surfaces:
  - Wipe with a clean cloth dampened with denatured alcohol.
  - Use distilled or purified water to moisten the cloth in place of denatured alcohol, but standing/pooling water must be absorbed and not left to air dry.
  - Remove residue by lightly rubbing with a dry Scotch-Brite non-scratch scour pad followed by wiping with a clean cloth moistened with denatured alcohol, or distilled or purified water.
  - Use care so the liquid does not splash or flow into seams or onto other components.
- Control component surfaces:
  - Low voltage wires within this equipment are SIS insulated and may be wiped with a clean cloth dampened with distilled or purified water. Do not use alcohol.
  - Circuit boards can have isopropyl alcohol applied by small brush to remove deposits.
  - Solvents and alcohol (denatured, isopropyl) can damage some plastics, such as amorphous plastics. When in doubt, use a clean dry cloth, or a clean cloth dampened with distilled or purified water and dry completely.
- **NOTES:**
  - Do not use cleaners such as Lectra-Clean™ made by CRC (noted in some of the low voltage equipment manuals). Lectra-Clean can damage some plastics and other components.
  - Do not use chemicals such as Simple Green™ as it can cause corrosion on some parts and in some cases those cleaners describe rinsing the surface after application.
  - Do not splash or spray liquids as they can infiltrate areas that cannot be cleaned or dried properly.
  - Components within the equipment are not rated to be exposed to moisture. Exposure to moisture may cause performance issues to develop over the life of the product.

Main Bus Compartment

1. Turn off all main and control power supplying this equipment. Be sure there is no backfeed through any feeder circuit. Always use a properly rated voltage sensing device to confirm that power is off.
2. Ground the main and feeder circuits.
3. Disconnect and remove fuses.
4. Disconnect and remove the circuit breaker.
5. Remove the covers from each main bus compartment. Inspect the busbars, primary contact supports, and insulating barrier(s) for damage.

   NOTE: Slight discolorations or tarnish of the silver plate is normal. Severe discoloration of the silver plate is an indication of an improper or loose contact and overheating. Clean the discoloration from the contact surfaces of the bus bar and primary contact as instructed above. For questions concerning cleaning, repairing, or replacing bus bars contact your local Schneider Electric representative
6. Remove the insulating boots from the bus joints. Check all bus bar connections, and torque all 0.5 inch (13 mm) bolts to 55 lb-ft. (74.28 N•m). When replacing boots, utilize all locations on the boot to close the boot.
7. Vacuum each compartment to remove dust, spiderwebs, or other dirt. Clean the insulation as instructed above.

8. Lightly lubricate the moving primary and secondary contacts and fingers with red Mobilgrease® 28 (Schneider Electric part number 1615100950).
9. Lightly lubricate the following parts with red Mobilgrease 28 (Schneider Electric part number 1615-100950):
   - Rollers and sliding parts
   - Racking arm and shaft
   - Shutter actuator

Cable Compartment

1. Inspect the load connectors, stand-off insulators, primary contact supports, and all accessible cable terminations for indications of insulation deterioration.
2. Vacuum each compartment and clean all insulation as instructed above.
3. Replace removable back covers.

Circuit Breaker Compartment

NOTE: For the purpose of maintenance, the interlock which blocks the operation of the mechanism without a circuit breaker in the section can be defeated by simultaneously holding the racking block lever down (see Circuit Breaker Floor Plate, Racking Device, and Interlocks, page 16) and turning the racking handle.

1. Withdraw each circuit breaker from its compartment, and thoroughly inspect each of the moving mechanisms in the compartment for damage and contamination/ pollution.
2. Inspect the shutter hardware and tighten if necessary. The shutters should raise and lower smoothly with no indication of binding, twisting, or hesitation.
3. Inspect the primary contacts. They should have a silver-gray appearance, indicating good contact with the circuit breaker separable contacts. Slight discoloration or tarnish of the silver plate on the primary contact is normal. Severe discoloration of the silver plate is an indication of excessive heating and should be corrected. Typical causes are:
   - Poor contact between the circuit breaker finger cluster and the primary contacts.
   - Loose hardware or otherwise improper contact at the bus connection.
4. Clean the discoloration and tighten the contact mounting bolts to the proper torque. See Bolt Torque Values, page 45.
5. Inspect the primary contact and support insulators for damage.
6. Inspect the ground contact bar. It should have marks indicating good contact with the circuit breaker sliding contacts. Clean the contact surfaces, removing grease and dirt buildup. Inspect and tighten the hardware and re-grease with Mobil 28 grease, Schneider Electric part number 1615-100950, as instructed above.
7. Inspect the stationary control power receptacle, ensuring that the molding is free of cracks, the socket contacts are clean, and the assembly is free to move. Clean the front and back surfaces of the receptacle to remove any contamination buildup as instructed above.
8. Vacuum the compartment, and wipe off the primary contact high voltage insulating tubes and support insulation as instructed above.

9. Every 50 cycles of the racking mechanism:
   - Lightly lubricate the moving primary and secondary contacts and fingers with Mobil 28 grease, Schneider Electric part number 1615-100950.
   - Lubricate all moving joints (shutters, MOC, TOC, and so forth) with Mobil 28 grease, Schneider Electric part number 1615100950.
10. Check all terminal block connections for loose connections and crimps.
11. Make certain that the hinge wiring to the door is not frayed and has no insulation damage.
12. Ensure all wires are routed through the hinge loop.

Circuit Breakers

Consult the individual circuit breaker instruction and maintenance manual for cleaning, adjustment, and lubrication information.

Refer to the Type VR Circuit Breaker instruction bulletins 6055-31 (1200 and 2000 A, 50 kA) and 6055-33 (3000 A, 50 kA and 1200, 2000, and 3000 A, 63 kA).

VT, CPT and Fuse Drawout Units

1. Pull the drawer to the fully withdrawn position.
2. Inspect the moving and stationary primary and secondary contacts and the static ground contacts.
3. Clean the contact surfaces, removing any burn or pit marks if required. Use an abrasive pad such as 3M ScotchBrite.
4. Remove the current limiting fuses, and inspect the fuse clip and fuse contact surfaces.
5. Inspect the transformer for indication of insulation deterioration.
6. Check all hardware, including the secondary contact wiring terminals, for tightness. Refer to torque values in Bolt Torque Values, page 45.
7. Vacuum the compartment and drawer.
8. Wipe off the insulation and control power transformer with a clean, dry cloth.
9. Lightly lubricate the moving primary and secondary contacts and fingers with Mobil 28 grease, Schneider Electric part number 1615-100950.
10. Lubricate all rollers and sliding parts with Mobil 28 grease, Schneider Electric part number 1615-100950.
11. Inspect the interlock mechanism for proper operation.
12. Replace the current limiting fuses, but leave the drawer in the withdrawn position until all the inspection and maintenance is completed.

Replacing the Fuses

To replace damaged fuses in the voltage transformer drawout unit:

NOTE: When replacing fuses, handle them carefully to avoid breakage. Do not grasp the fuse in the middle. Replace all fuses, even if only one is damaged.

1. Follow the procedures outlined in Voltage Transformer, Control Power Transformer, and Fuse Drawout Units, page 22 to withdraw the appropriate fuse drawout unit.

2. Wearing personal protective equipment, such as insulated gloves and a face shield, grasp the fuse near the fuse clip and pull while rotating the fuse.
3. Insert the fuses one end at a time into the fuse clips.
4. Follow the racking procedures outlined in Voltage Transformer, Control Power Transformer, and Fuse Drawout Units, page 22 to return the unit to the **CONNECTED** position.

Re-energizing

1. Insert all of the circuit breakers to the test/disconnected position with their secondary control power plugs engaged, and close the compartment doors.
2. Connect the control power source.
3. Close the main source of power, and operate each circuit breaker electrically in the test/disconnected position.
4. If all controls are functioning properly, disconnect the secondary control plugs.
5. Rack the circuit breakers into the connected position.
6. Close the circuit breakers and resume normal operation.

Accessories

One circuit breaker lift truck is required for each line up stacked two-high. The cradle is raised and lowered by a self-braking rack and pinion drive system with a winch and wire cable. No ratchet release or locking is required because of the automatic load-retaining clutch feature. Rotating the handle clockwise raises the cradle. Rotating the handle counterclockwise lowers the cradle.

NOTE: The lift truck is designed to service Type VR circuit breakers. Refer to instruction bulletin 6055-54 to understand the requirements for using Type VR trucks to service auxiliary devices.

⚠⚠DANGER

TOPPLING

Check the nameplate of the lift truck before using it. Circuit breakers rated for 50 kA, and below, require a lift truck rated for 800 lb. (363 kg) or more. Circuit breakers rated for 63 kA require a lift truck rated for 950 lb. (431 kg).

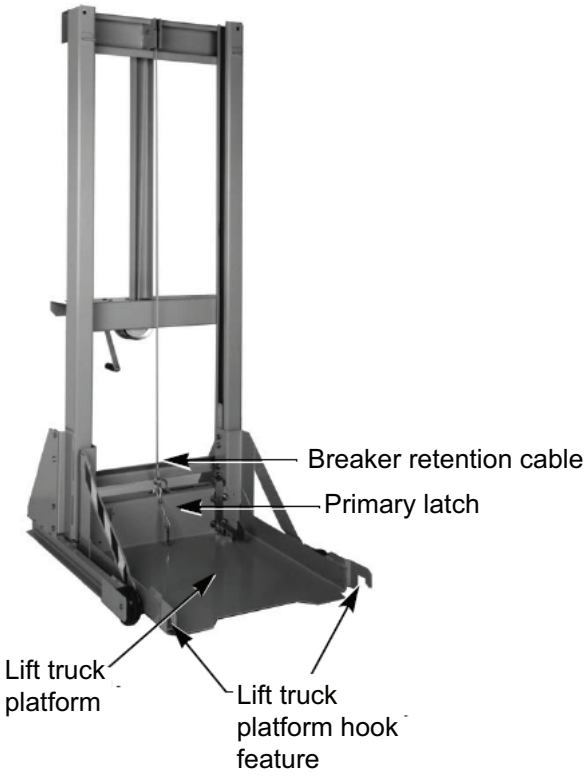
Failure to follow these instructions will result in death or serious injury.

Circuit Breaker Lift Truck

For 6055-30 Masterclad 15 kV Class Medium Voltage Indoor Switchgear Instruction Bulletin, 6055-52 and 6055-62 Masterclad Metal-Clad 15 kV Arc Resistant Switchgear User Guide

If the switchgear is installed on a raised pad OR if a device is being installed or removed from an upper section, a lift truck is required to install Type VR device.

Figure 36 - Typical Lift Truck



The lift truck platform is raised and lowered by a self-braking worm and pinion drive system with a winch and wire cable. No ratchet release or locking is required because of the automatic load; retaining clutch feature. Rotating the handle clockwise raises the lift truck platform. Rotating the handle counterclockwise lowers the lift truck platform.

NOTE: The lift truck is designed to service Type VR circuit breakers. Refer to instruction bulletin 6055-54 to understand the requirements for using Type VR trucks to service auxiliary devices.

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HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E and CSA Z462.
- Turn off all power supplying this equipment before working on it.
- Before performing maintenance on this device, disconnect all sources of electric power. Assume all circuits are live until they are completely de-energized, tested, grounded, and tagged. Pay particular attention to the design of the power system. Consider all sources of power. Check interconnection diagrams and make sure there are no backfeed potential sources.
- Always use a properly rated voltage sensing device to confirm that power is off.

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

To remove a Type VR device from the circuit breaker compartment with the lift truck:

1. Read and understand all instructions before beginning any work.
2. Turn off all power supplying the equipment before working on it.
3. Ensure the lift truck platform is completely lowered.

4. Position the lift truck directly in front of the circuit breaker compartment.
5. Follow the instructions provided in Racking Mechanism, page 29 to open the circuit breaker compartment door.
6. Push the lift truck forward within four to six inch (101.6 -152.4 mm) of the cubicle.
7. Raise the lift truck platform until the lift truck platform hook feature clears the cradle catch features of the circuit breaker compartment.
8. Push the lift truck in towards the cubicle to align the lift truck platform hook feature directly above the cradle catch features and apply the lift truck brake on the lift truck.
9. Lower the lift truck platform until the lift truck hook feature is engaged in the cradle catch features.
10. Roll the Type VR device onto the lift truck platform.
11. Ensure the primary latch is properly engaged on the frame of the Type VR device.
12. Attach the circuit breaker retention cable to the provided hole on the Type VR device.
13. Raise the lift truck platform until the lift truck platform hook feature clears the cradle catch features of the circuit breaker compartment.
14. Unlock the lift truck brake and slowly pull the lift truck back away from the cubicle approximately four to six inch (101.6 -152.4 mm).
15. Lock the brake again.
16. Lower the lift truck platform.
17. Unlock the lift truck brake and move the lift truck away from the cubicle to allow enough clearance to remove the Type VR device from the lift truck platform.
18. Ensure the lift truck platform is lowered all the way to the floor.
19. To remove the Type VR device from the lift truck, disconnect the circuit breaker retention cable from the front of the Type VR device.
20. Push the Type VR device slightly toward the back of the lift truck platform and pull the lever on the back of the cradle while rolling the Type VR device off of the lift truck platform.

To install a Type VR device in the circuit breaker compartment with the lift truck:

1. Read and understand all instructions before beginning any work.
2. Turn off all power supplying the equipment before working on it.
3. Ensure the lift truck platform is completely lowered.
4. Roll the Type VR device onto the lift truck platform.
5. Ensure the primary latch is properly engaged on the frame of the Type VR device.
6. Attach the circuit breaker retention cable to the provided hole on the Type VR device.
7. With the lift truck platform lowered, position the lift truck directly in front of the circuit breaker compartment.
8. Follow the instructions provided in Initial Circuit Breaker Installation, page 46 to open the circuit breaker compartment door.
9. Push the lift truck forward within four to six inch (101.6 -152.4 mm) of the cubicle and apply the lift truck brake.
10. Raise the lift truck platform until the lift truck platform hook feature clears the cradle catch features of the circuit breaker compartment.
11. Unlock the lift truck brake and slowly push the lift truck in towards the cubicle to align the lift truck platform hook feature directly above the cradle catch features and lock the wheels on the lift truck.
12. Lower the lift truck platform until the lift truck hook feature is secured in the cradle catch features and apply the lift truck brake.

13. To remove the Type VR device from the lift truck, disconnect the circuit breaker retention cable from the front of the Type VR device.
14. Push the Type VR device slightly toward the back of the lift truck platform and pull the lever on the back of the cradle while rolling the Type VR device off of the lift truck platform into the circuit breaker compartment.

Figure 37 - Label 1–Lift Truck Compatibility — Standard Lift Truck and 63 kA EG&T Version

⚠WARNING

LIFT TRUCK TIPPING HAZARD

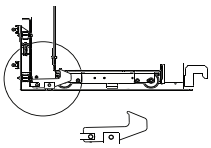
- Use lift truck to install and remove Type VR devices only.
- Do not transport Type VR device with the lift truck platform in the raised position.
- Secure the lift truck platform hook feature in the circuit breaker cradle before removing Type VR device from cradle or releasing primary latch and circuit breaker retention cable
- Do not raise or lower Type VR devices without engaging the primary latch and circuit breaker retention cable
- Check the lift truck rating nameplate before using:
  - Type VR devices rated 50kA and below require a lift truck rating of 800 lbs (363 kg) or greater.
  - Type VR devices rated above 50kA require a lift truck rating of 950 lbs (431 kg) or greater.

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

Figure 38 - Label 2–Lift Truck Operation

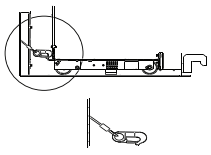
PRIMARY LATCH

- Roll Type VR device onto lift truck platform so the primary latch engages the slot on the frame of the Type VR device.



BREAKER RETENTION CABLE

- Attach the breaker retention cable in the provided hole on the Type VR device.



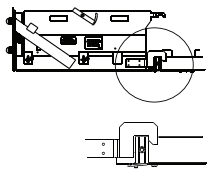
LIFT TRUCK PLATFORM HOOK FEATURE

Removing Type VR Device

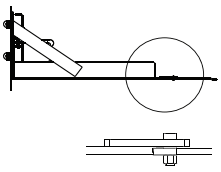
1. Position lift truck directly in front of the cubicle.
2. Raise the lift truck platform up until the lift truck platform hook feature is above the cradle interface.
3. Slowly push the lift truck forward to align the lift truck platform hook feature with the breaker cradle.
4. Lower the lift truck platform until the hook engages the breaker cradle.
5. Roll Type VR device from cradle to lift truck platform.
6. Secure Type VR device to lift truck using primary latch and breaker retention cable.

Installing Type VR Device

1. Secure the Type VR device to the lift truck using the primary latch and breaker retention cable.
2. Position lift truck directly in front of the cubicle within 4-6 inches.
3. Raise the lift truck platform up until the lift truck platform hook feature is above the cradle interface.
4. Slowly push the lift truck forward to aligh the lift truck platform hook feature with the breaker cradle.
5. Lower the lift truck platform until the hook feature engages the breaker cradle.
6. Release the primary latch and breaker retention cable and roll Type VR device onto the cradle.



Non-arc resistant version



Arc resistant version

Test Cabinet-Optional

An optional wall-mounted test cabinet (see Wall-Mounted Test Cabinet (optional), page 68) is furnished when listed in the user's specifications. The test cabinet consists of:

- Small enclosure with a power on-off toggle switch
- White power-on indicating light
- Red circuit-breaker-closed indicating light
- Green circuit-breaker-open indicating light
- **CLOSE** and **OPEN** push buttons
- Eight ft. (2.4 m) cable with a secondary control receptacle that can be plugged directly into the circuit breaker control plug

  NOTE: Some circuit breaker accessory combinations may not work with the test cabinet.

Refer to the customer drawings for the external power connections and requirements necessary for the cabinet. A convenient terminal block is provided inside the test cabinet for these connections.

Figure 39 - Wall-Mounted Test Cabinet (optional)

Ground and Test Device-Optional

Two types of ground and test devices are available:

- Manual
- Automatic

Ground and test devices are devices, typically used for:

- Grounding of circuits during maintenance periods
- Connection points for applying voltage for hi-pot testing and cable testing
- Access to both line- side and load-side circuits for phase sequence testing

A complete description, operating instructions, and maintenance information is included in a separate ground and test devices instruction bulletin. For specific ground and test device instructions, refer to 6055-34, 6055-37, 6055-38 or 6055-62 as required.

Outlines

Figure 40 - Masterclad 25–50 kA Indoor Switchgear Outline

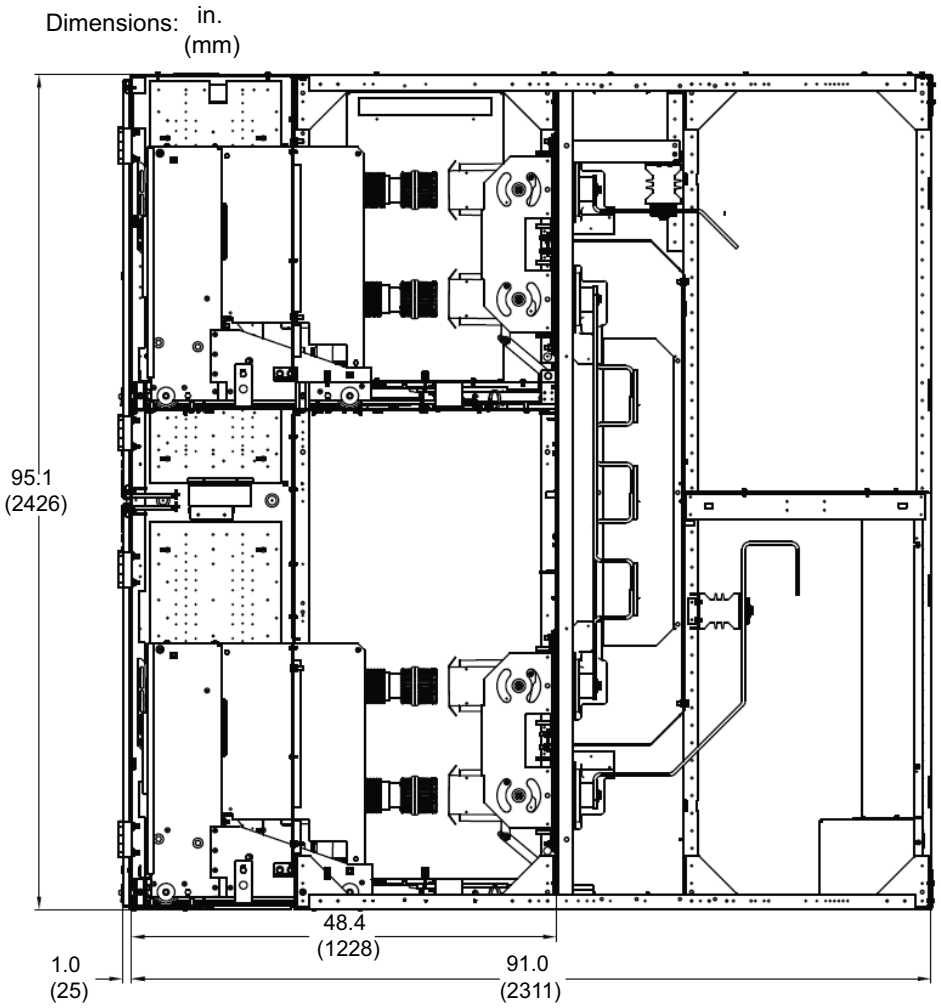
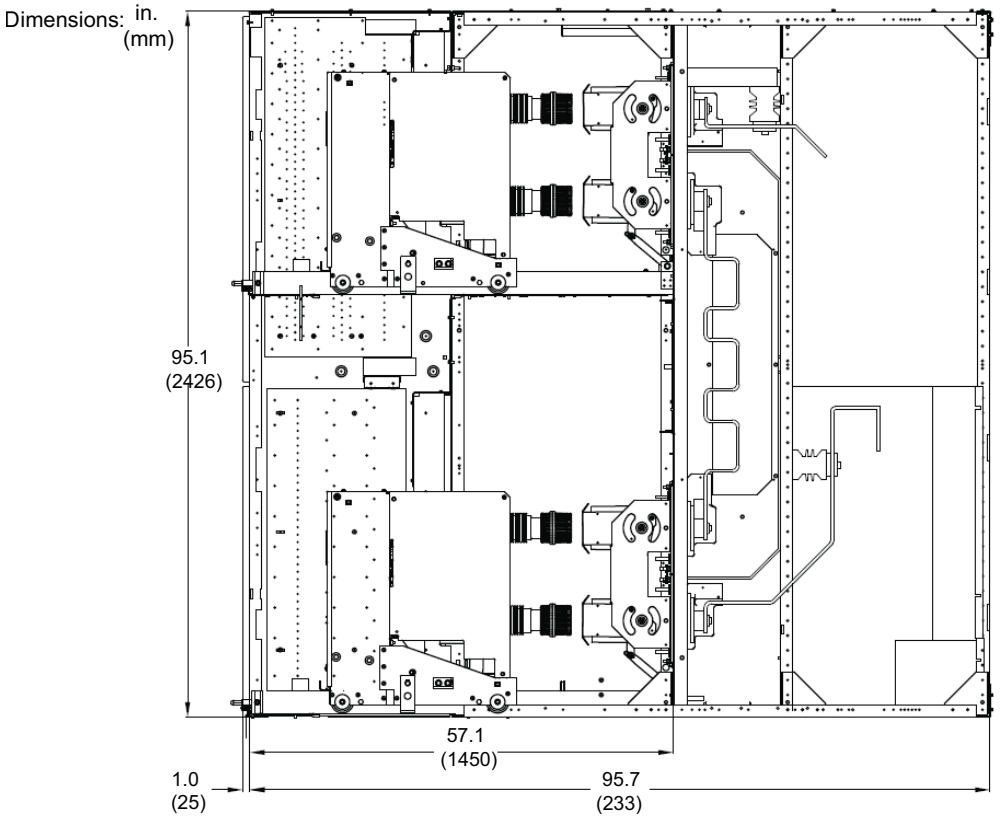


Figure 41 - Masterclad 63 kA Indoor Switchgear Outline



Installation and Maintenance Log

Table 6 - Installation and Maintenance Log

Date	Initials	Maintenance Performed

Printed in:
Schneider Electric
35 rue Joseph Monier
92500 Rueil Malmaison - France
+ 33 (0) 1 41 29 70 00

Schneider Electric
800 Federal Street
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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.

6055-30, Rev. 4