MotorSeT™

Medium Voltage Across-the-Line (ATL) Motor Controller

Instruction Bulletin

PKR8059401 R08/24

SQUARE D™

Schneider Electric™

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

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

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

⚠⚠ DANGER

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

⚠WARNING

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

⚠CAUTION

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

NOTICE

NOTICE is used to address practices not related to physical injury.

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.

About This Document

Document Scope

Use this document to install, operate, maintain, and troubleshoot MotorSeT™ Medium Voltage Across-the-line (ATL) Motor Controller.

Validity Note

This instruction bulletin is valid for Square D™ MotorSeT Medium Voltage Across-the-Line (ATL) Motor Controller installations in the North American region only. Visit the Schneider Electric website (www.se.com) for additional information regarding this offer.

NOTE: This equipment is certified to Underwriters Laboratories Inc., standard UL 347. For regions outside of North America, consult your local and national standards to determine if and how they differ from UL 347.

For product compliance with environmental directives such as RoHS, REACH, PEP, and EOLI, go to www.se.com/green-premium.

For technical characteristics of the physical modules described in this bulletin, go to www.se.com.

The technical characteristics presented in this bulletin should be the same as those that appear online. We may revise content over time to improve clarity and accuracy. If you see a difference between the information contained in this bulletin and online information, use the online information.

Safety Precautions

Read and understand the following precautions before performing any procedures in this document.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA® 70E® Standard for Electrical Safety in the Workplace®, NOM-029-STPS, Maintenance of Electrical Installations in the Workplace – Safety Conditions, or CSA Z462 or local equivalent.
- Only qualified personnel familiar with medium voltage equipment are to perform work described in this set of instructions. Workers must understand the hazards involved in working with or near medium voltage circuits.
- 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 the equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Before performing visual inspections, tests, or maintenance on the equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, grounded, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding. More than one disconnector switch may be required to de-energize the equipment before servicing.
- Only apply the voltage to the terminals as specified on the controller rating nameplate.
- Handle this equipment carefully and install, operate, and maintain it correctly in order for it to function properly.
- Do not make any modifications to the equipment or operate the system with the interlocks removed. Contact your local field sales representative for additional instruction if the equipment does not function as described in this manual or if parts are missing or damaged.
- 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 installation, 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.

Qualified Personnel

Only appropriately trained persons who are familiar with and understand the content of this instruction bulletin and all other related product documentation are authorized to work on and with this product.

Electrical equipment must 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.

Pay particular attention to adhere to any safety information, electrical requirements, and normative standards that apply to your machine or process in the use of this equipment.

Refer to NFPA 70E, CSA Z462, or NOM-029-STPS for more information on safe electrical work practices and qualified personnel.

Intended Use

The product described in this instruction bulletin is intended for use according to the instructions, directions, examples, and safety information contained in this document and other supporting documentation.

The product may only be used in compliance with all applicable safety regulations and directives, the specified requirements, and the technical data.

Before using the product, perform a risk assessment of the planned application. Based on the results, appropriate safety related measures must be implemented.

Since the product is used as a component of a machine or process, the safety of persons must be ensured by means of the overall system design.

Whenever specific manufacturer components and accessories are specified as mandatory within the instruction manual or in equipment job drawings, those components must be used.

Any use other than the use explicitly permitted is prohibited and can result in unanticipated hazards.

Cybersecurity

NOTE: Schneider Electric adheres to industry best practices in the development and implementation of control systems. This includes a “Defense-in-Depth” approach to secure an industrial control system. This approach places the controllers behind one or more firewalls to restrict access to authorized personnel and protocols only.

⚠WARNING

UNAUTHENTICATED ACCESS AND SUBSEQUENT UNAUTHORIZED MACHINE OPERATION

- Evaluate whether the environment or machines are connected to critical infrastructure and, if so, take appropriate steps in terms of prevention, based on Defense-in-Depth, before connecting the automation system to any network.
- Limit the number of devices connected to a network.
- Isolate the industrial network from other networks.
- Protect any network against unintended access by using firewalls, VPN, or other, proven security measures.
- Monitor activities within the systems.
- Prevent subject devices from direct access or direct link by unauthorized parties or unauthenticated actions.
- Prepare a recovery plan, including backup of the system and process information.

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

Introduction

MotorSeT Medium Voltage (MV) Across-the-Line (ATL) Motor Controller features a standard base model configuration with a direct-to-supply-line motor starter for three-phase induction motors utilizing vacuum contactors. It also comes in a dual configuration that supplies two motor starters, two feeders or a motor starter and a feeder which minimizes the cabinet footprint for applications where space is a consideration. When combined with other electrical distribution and control products from Schneider Electric, the MotorSeT motor controller provides a system-wide solution.

A typical MotorSeT MV ATL Motor Controller assembly is shown in the figure Typical Views — Standard ATL Motor Controller, page 12. For views of the compact ATL and dual ATL motor controllers, see Compact ATL — Typical Views Diagram, page 71 and Dual ATL — Typical Views Diagram, page 72.

Figure 1 - Typical Views — Standard ATL Motor Controller

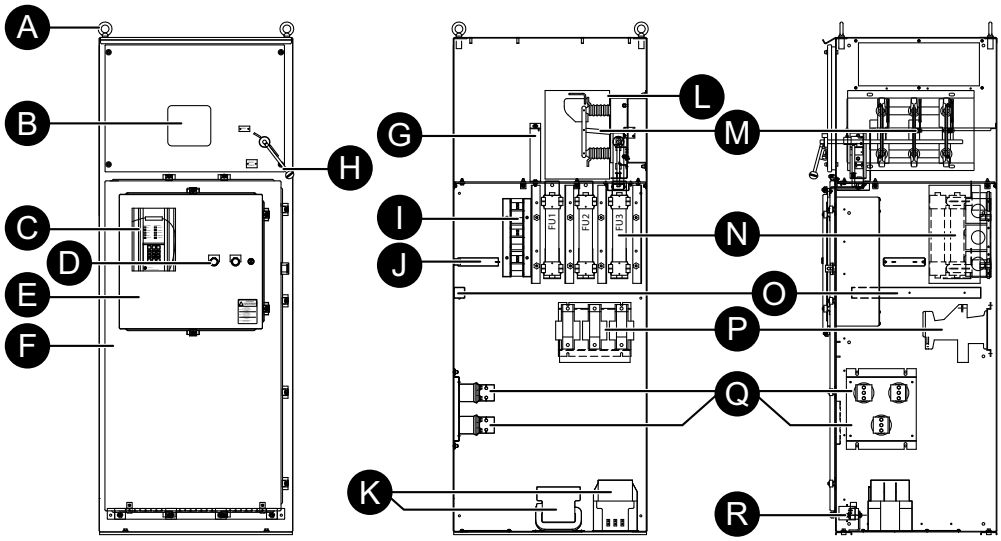


Table 1 - Legend — Typical Views of Standard ATL Motor Controller Diagram

A	Lifting eyebolts (removable)
B	Viewing window
C	Protective relay or MotorSeT Advanced Control Keypad
D	Start/Stop pushbuttons
E	Low voltage section
F	Medium voltage section
G	Ground bar for disconnecting switch
H	Disconnector switch handle
I	Current transformers (CT)
J	Ground fault CT (optional)
K	Control power transformers
L	Disconnector shield
M	Disconnector switch
N	Power fuses

Table 1 - Legend — Typical Views of Standard ATL Motor Controller Diagram (Continued)

O	Wireway
P	Vacuum contactor
Q	Motor landing pads
R	Ground bus

This instruction bulletin provides installation, operation, maintenance, and troubleshooting procedures for MotorSeT ATL motor controllers. It also contains ratings, a list of replacement parts, and information about optional features.

This bulletin does not cover all of the applications for the equipment or provide information on every possible contingency concerning installation, programming, operation, or maintenance specific to the equipment. For customized motor starters, refer to the starter specific drawings and parts list that comes with the customized starter. Manufacturer documentation or instruction sheets for optional equipment are supplied separately from this bulletin.

Carefully read this instruction bulletin, safety statements, and all product labels before installation and operation.

MotorSeT ATL starter is one of the latest innovations in Schneider Electric MV motor control equipment. The one-high design 450 A base unit is compact, measuring 20.0 in. (500 mm) wide and 30.0 in. (762 mm) deep. Its compact size allows two one-high units to occupy the same or less floor space than typical 450 A two-high equipment. The equipment is front accessible for installation and maintenance.

All MotorSeT starters available in either a lineup or stand-alone configuration.

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 from 70ºF (21ºC).
- If heaters are furnished in the assembly, energize them from an external source. When energizing heaters from an external source, remove the primary and secondary overcurrent protective devices from the control power transformer.
- If heaters are not installed in the assembly, and the area is cold and damp, use a temporary heating source within the assembly. A minimum of 125 watts 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.

Requirements for Shipping, Receiving, and Storage

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, ensure that the thermostats and/or humidistats are set to mitigate condensation. A minimum of 125 watts of heat per section is suggested.
  - If heaters are being 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.

Requirements for Installation, Operation, and Maintemance

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. See 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, Handling, and Storage

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- If signs of moisture contamination are present, do not follow the instructions in this section, contact the Schneider Electric Customer Care Center at 888-778-2733.

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

Receiving

- 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.
- Check the packing list against the equipment received to ensure the order and shipments are complete.
- Make claims for shortages or other errors in writing within 30 days after receipt of shipment. Failure to do so constitutes unqualified acceptance and a waiver of all such claims to the purchaser.
- Inspect the equipment for damage. If you find or suspect damage, immediately file a claim with the carrier 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.

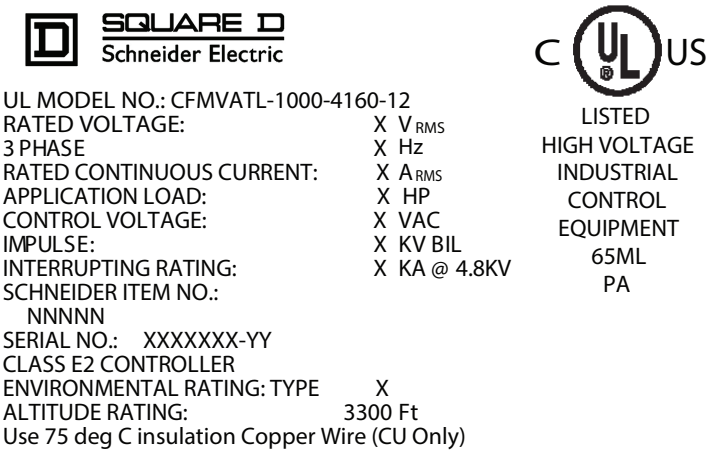
  NOTE: The equipment is shipped with the load break switch in the Closed position. To open the medium voltage door, the switch must be in the Open position. Refer to Opening the Disconnector Switch, page 54 for details.

See Requirements for Shipping, Receiving, and Storage, page 14 for additional information.

Identification

MotorSeT identification rating nameplate is located on the rear of the low voltage door.

Figure 2 - Example of MotorSeT™ Identification Rating Label



FUSE #	MFR	MODEL	AMPS	VOLTS
FU1	MERSEN	A480R9R-1	200	5500
FU2	MERSEN	A480R9R-1	200	5500
FU3	MERSEN	A480R9R-1	200	5500
FU4	MERSEN	A480T2E	2	4800
FU5	MERSEN	A480T2E	2	4800
FU6	MERSEN	ATQR	10	600

Handling

Review the shipping documentation to verify the actual weight of the MotorSeT motor controller to ensure that the lifting equipment is sufficient. When an overhead crane is not available, rollers, pipes, or a forklift may be used.

This equipment is shipped in individual sections or multiple sections coupled together in a shipping split. The maximum length of a shipping split is 144.00 in. (3657 mm) wide.

⚠WARNING

EQUIPMENT TOPPLING

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

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

Using a Forklift

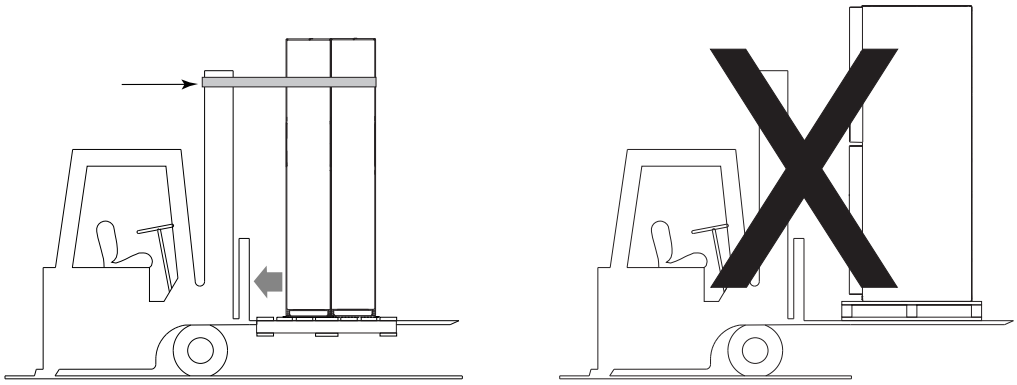
⚠WARNING

UNSTABLE LOAD

- If lifting the equipment by forklift, stabilize the shipping section with a safety strap to reduce the possibility of the equipment toppling over.
- Consult with a certified rigging and lifting expert for any situation not covered in these instructions.

Failure to follow this instruction can result in death, serious injury, or equipment damage.

Figure 3 - Handling Using a Forklift



This equipment is shipped in individual sections or multiple sections coupled together in a shipping split. The maximum length of a shipping split is 144.00 in. (3657 mm) wide.

Using a Crane

⚠WARNING

LIFTING EYE DAMAGE

If moving by crane, the interior angle of the lifting sling should not exceed a 90° angle. Greater than 90° applies greater inward pressure on lifting lugs which can damage or dislodge lifting lugs from the equipment.

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

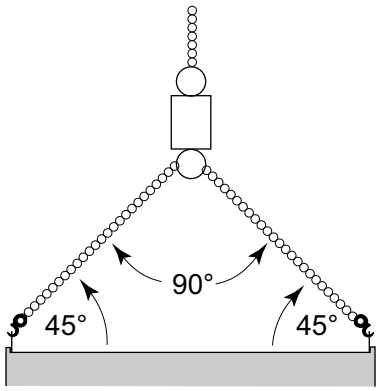
The MotorSeT motor starter is normally shipped in one to four section shipping splits. Each section has four lifting lugs bolted on top. If more than two bays are shipped as one section, lifting channels, frames, or spreader bars must be used when lifting.

1. Insert a crane hook through each of the four lifting eyes (see Lifting Sling, page 19) to lift and move the sections.

   NOTE: Use load-rated cables or chains with safety hooks or shackles. A spreader bar might be necessary to maintain proper angles for lifting.

2. To help 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°.

Figure 4 - Lifting Sling



3. If a crane is not available, contact Schneider Electric before using any other lifting method.
4. After the equipment has been placed in position, remove and discard the lifting eyes.
5. Use the bolts from the lifting eyes to cover the mounting holes.
6. 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 might be necessary once the equipment is removed from the pallet and placed in position.

Storage

- Keep this equipment in a clean, dry place that is free from corrosive elements and mechanical abuse.
- Energize the heaters inside the controller, or add heat from a separate source, such as a light bulb or blower. Use a minimum of 125 watts of heat per vertical section to keep the equipment dry during storage.
- Remove all flammable materials away from heaters prior to energizing.
- Cover the equipment with a tarpaulin when necessary to help protect it from contaminants and moisture. Do not store iIndoor and outdoor units outdoors.
- Do not stand or rest heavy objects on the equipment, as it might damage the equipment.
- Monitor the equipment closely in areas with high humidity. If necessary, use additional heat to keep the equipment dry.
- Contact the factory if the internal heaters do not adequately help prevent condensation for your location or environmental condition.

See Requirements for Shipping, Receiving, and Storage, page 14 for additional information.

Production Description

The MotorSeT Medium Voltage (MV) Across-the-Line (ATL) Motor Controller is available in four configurations:

- A standard ATL configuration
- A compact ATL configuration
- A dual ATL configuration
- A feeder configuration

Standard ATL Configuration

The standard ATL starter configuration of the MotorSeT MV ATL Motor Controller is a direct-on-line starter designed for starting three-phase induction motors utilizing vacuum contactors. This base model of the motor starter consists of the following sections:

- Isolation section
- Medium voltage section
- Low voltage section

A typical MotorSeT MV ATL Motor Controller assembly is shown in the figure Typical Views — Standard ATL Motor Controller, page 20.

Figure 5 - Typical Views — Standard ATL Motor Controller

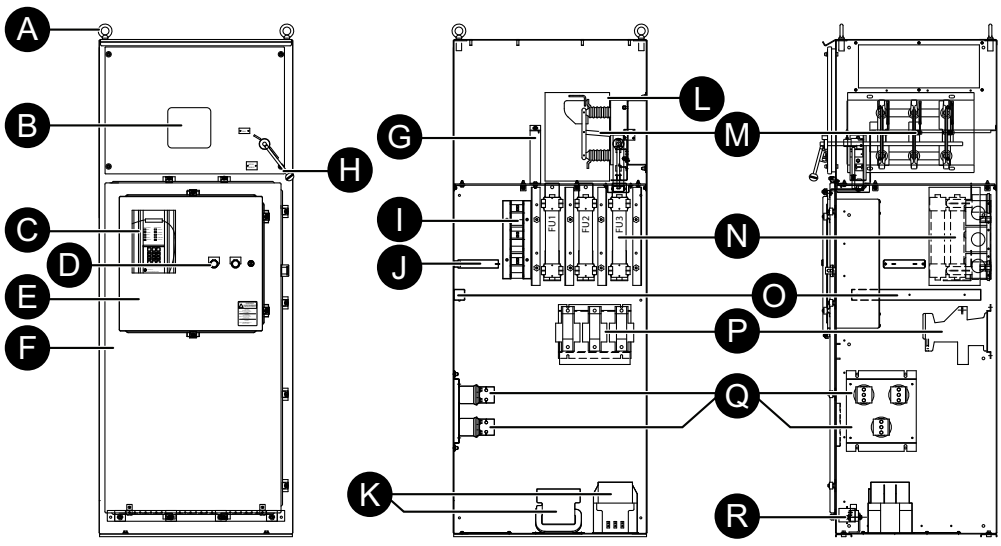


Table 2 - Legend — Typical Views of Standard ATL Motor Controller Diagram

A	Lifting eyebolts (removable)
B	Viewing window
C	Protective relay or MotorSeT Advanced Control Keypad
D	Start/Stop pushbuttons
E	Low voltage section
F	Medium voltage section

Table 2 - Legend — Typical Views of Standard ATL Motor Controller Diagram (Continued)

G	Ground bar for disconnecting switch
H	Disconnector switch handle
I	Current transformers (CT)
J	Ground fault CT (optional)
K	Control power transformers
L	Disconnector shield
M	Disconnector switch
N	Power fuses
O	Wireway
P	Vacuum contactor
Q	Motor landing pads
R	Ground bus

Isolation Section

The isolation section is located on the upper portion of the motor starter enclosure. The isolation section includes the following:

- A 400 A, 7.2 kV rated disconnector switch mechanically interlocked with the medium voltage access door to block access to the medium voltage compartment when the switch is in the On/Closed position. Provisions are provided for padlocking the disconnect switch in its Open position.
- A viewing window is provided for making visual confirmation of the switch position.
- Incoming power connections. Typical connections are made directly to the disconnector switch. Optionally, incoming power connection pads can be ordered with the starter.

  NOTE: When the optional 800, 1200, or 2000 A horizontal cross bus for line-up application is ordered with the motor starter, it is installed in the isolation section.

Medium Voltage Section

The medium voltage section of the motor starter is located below the isolation section. The medium voltage section houses the following:

- R-rated motor protective fuses (x3)
- Vacuum contactor
- Control power transformer

  NOTE:

  - The medium voltage section provides the cable connections for the motor (load).
  - When a customized starter is ordered, this section may contain optional items. Refer to the drawings supplied with the starter for more information.

Low Voltage Section

The low voltage section of the motor starter is a compartment in the door of the medium voltage section. The low voltage section houses the following:

- Electronic protective relay or customer specified protective relay
- Control power for 120 Vac door-mounted push-buttons and lights
- Terminal blocks
- Fuses

For ATL staters with MotorSeT Advance Motor Control system the low voltage section will also include:

- Plant interface module
- Motor control module
- 24 Vdc supply
- 120 Vac test plug

NOTE: A custom motor starter can include optional control logic, metering, monitoring, and protective devices. Refer to the drawings supplied with the starter for more information.

Compact ATL Configuration

The compact ATL starter configuration is a standard motor starter in a narrow enclosure for simple applications with limited space. In addition, with the compact ATL motor starter note the following:

- Not all standard ATL options are available with the compact ATL motor starter.
- The maximum mains/line voltage is 4160 Vac.
- The disconnector switch is rated 600 A, 4.76 kV.
- The top cable exit is only available with the 36 in. (914 mm) depth enclosure.

A typical view of the MotorSeT compact ATL motor controller assembly is shown in the figure Typical View — Compact ATL Motor Controller, page 22.

Figure 6 - Typical View — Compact ATL Motor Controller

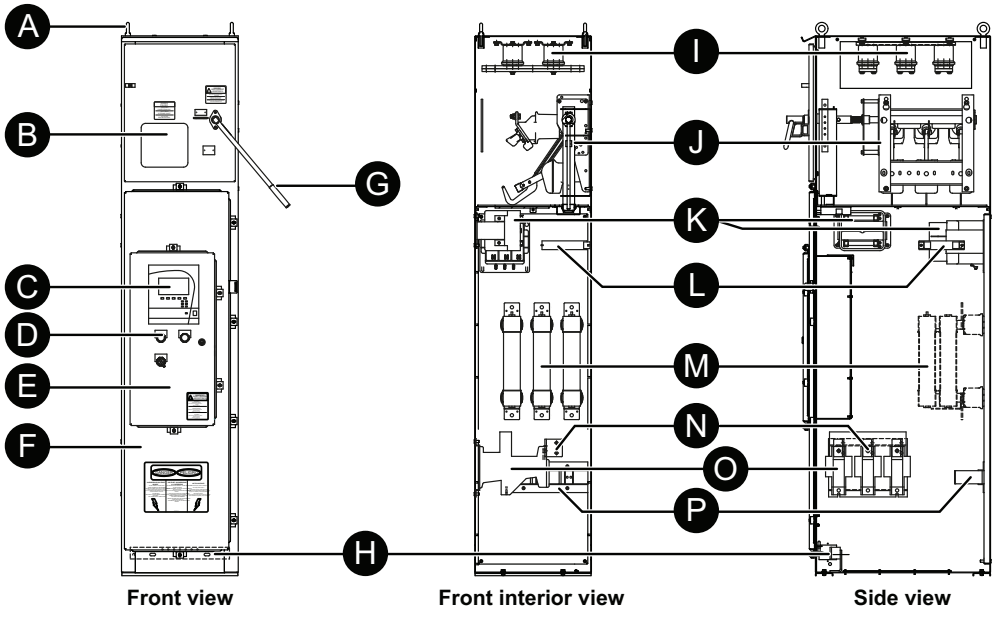


Table 3 - Legend — Typical Views of Compact ATL Motor Controller Diagram

A	Lifting eyebolts (removable)
B	Viewing window
C	Protective relay or MotorSeT Advanced Control Keypad
D	Start/Stop pushbuttons
E	Low voltage section
F	Medium voltage section
G	Disconnector switch handle
H	Ground bus
I	Incoming bus (optional)
J	Disconnector switch
K	Control power transformers
L	Current transformers
M	Power fuses
N	Motor landing pads
O	Vacuum contactor
P	Ground fault CT (optional)

Dual ATL Configuration

The MotorSeT dual ATL motor starter configuration consists of two motor starters, two feeders, or a motor starter and a feeder. This configuration minimizes the cabinet space requirement for applications with space constraints.

- The maximum fuse rating for the motor starter is 24R fuses at 5 kV.
- The maximum fuse rating for feeder applications is 200E at 5 kV.
- Dual ATL starter configurations are rated for maximum 5 kV operation.

In comparison to the standard ATL motor starter configuration, the dual ATL configuration has two equivalent compartments stacked on top of each other. The sections are housed in the compartments as follows:

- Isolation sections are located behind a barrier in each main compartment
- Medium voltage sections are located in the lower half of each main compartment
- Low voltage sections are located in a compartment on each door

The dual ATL starter configuration is designed for independent operation and maintenance of each compartment.

A typical MotorSeT dual ATL motor controller assembly is shown in the figure Typical View — Dual ATL Motor Controller, page 24.

Figure 7 - Typical View — Dual ATL Motor Controller

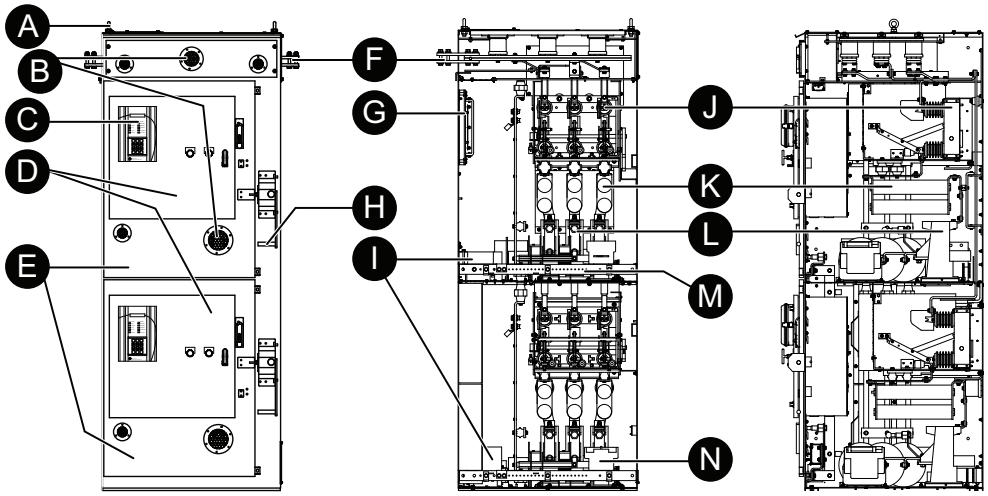


Table 4 - Legend — Typical Views of Dual ATL Motor Controller Diagram

A	Lifting eyebolts (removable)
B	Infrared viewing windows
C	Protective relay or MotorSeT Advanced Control Keypad
D	Low voltage section
E	Medium voltage section
F	Incoming bus (optional)
G	Voltage divider card
H	Disconnector switch handle
I	Voltage transformers (VT)
J	Disconnector switch
K	Power fuses
L	Vacuum contactor
M	Ground bus
N	Control power transformer

Feeder Configuration

MotorSeT ATL motor starter is also available in a feeder configuration. Feeder configurations are used for basic short-circuit protection for equipment other than motors. If the feeder becomes inoperable or is turned off, all downstream equipment loses power and operation stops.

Typical applications for feeders provide upstream protection for transformers or variable frequency drives (VFDs). For transformers, feeder protective relays are required because transformers have no built-in protection. VFDs have built-in protection and do not require additional protection.

Compared with the standard ATL configuration, the feeder unit comes as follows:

- E-rated fuses
- Power On and Power Off control buttons (the standard unit comes with Start and Stop control buttons)
- Optional customer-specified feeder protective relay in the low voltage section with potential transformer and current transformers for measurement and monitoring
- No electronic motor protective relay is installed

NOTE: The MotorSeT advanced motor control system cannot be used in a feeder configuration.

Arc Resistant Option

An arc-resistant option is available with the MotorSeT motor controllers. Should an internal arc event occur, the arc-resistant option directs the arc flash energy inside of the equipment to the release vents or plenum.

Two arc-resistant options are available for the ATL controller:

- The 40 kA, 0.5 seconds, Type 2B rating is available as either a flap or plenum vent design. These options require a 36 in. deep enclosure.
- The 50 kA, 0.5 seconds, Type 2B rating uses a plenum vent design. This option requires a 48 in. deep enclosure.

The total height of the ATL with plenum designs is 106 in.

NOTE: The arc-resistant option is not available for dual configurations.

Features

Standard Features

The MotorSeT motor controller standard features include:

- Fault make/load break isolation switch
- R-rated motor protective fuses
- Industrial vacuum contactor
- Local Start and Stop control buttons
- NEMA Type 1, 3R, 4, and 12 enclosures
- Electronic protective relay or MotorSeT control system
- Motor Power/OFF/Fault indication lights

MotorSeT ATL Motor Starter Indicator Lights, page 25 lists the three standard indicator lights on the motor starter:

Table 5 - MotorSeT ATL Motor Starter Indicator Lights

Indicator Light	Color	Description
Motor Power	Red	The motor starter is issued a start command and the contactor is closed.
Motor OFF	Green	The isolation switch is closed but no start command is issued.
Motor Fault	Red	The motor starter thermal overload has opened or an external stop switch is open.

Optional Features

The MotorSeT motor starter also comes with the following optional features:

- 800, 1200, or 2000 A copper power bus (isolation section)
- Optional metering and protection packages
- Underwriter's Laboratories listing, UL or c-UL-us
- Arc-resistant enclosure

Enclosure

The MotorSeT MV ATL Motor Controller enclosure is manufactured to meet the customer specification. It is designed and manufactured to meet the Uniform Building Code section on non-building structure, section 2338 for Zone 1, 2, 3, and 4 requirements.

Table 6 - Types of NEMA Enclosures

Option	NEMA Type			
	1	3R	4	12
Standard ATL	X	X	X	X
Dual ATL	X	—	—	—
Compact ATL	—	X	—	X

Motor Protection

ATL Motor Starter with Customer Specified Protective Relay

If a motor protective relay is ordered at the time the motor starter order was placed, the relay is installed at the factory along with other components (including potential transformers and current transformers) needed for the relay to operate correctly. The relay will be wired to de-energize and open the contactor if an event is detected.

The customer is responsible for setting the parameters in the motor protective relay and for testing and ensuring the operation of the protective relay.

ATL Motor Starter with Basic Electronic Protective Relay

If a motor protective relay is not specified when the across-the-line (ATL) motor starter is ordered, the ATL motor starter will come with a basic electronic protective relay. Refer to Basic Electronic Protective Relay, page 27 for instructions and an example of determining the correct relay setting for the electronic protective relay.

Basic Electronic Protective Relay

The electronic protective relay must be configured for full load current as indicated on the motor controller nameplate. To determine the correct overload setting, you need to know the current transformer ratio of the system. This ratio is on the current transformers label and also indicated on the system schematic.

To determine the correct relay setting, divide the motor controller full load amps (FLA) by the current transformer (CT) ratio.

Electronic protective relay example:

Motor FLA = 66 A, CT ratio = 300:5

The corresponding overload (O/L) setting would be calculated as follows:

$$\text{OL setting} = \frac{66}{300:5} = \frac{66}{60} = 1.1\ \text{A}$$

In this example, the dial on the motor overload should be set as close to 1.1 A as possible. Refer to the electronic protective relay catalog information shipped with the motor starter for more details about settings for overload, power factor, and time.

ATL Motor Starter with MotorSeT Advance Motor Control System

Motor Overload Protection

The MotorSeT Advanced ATL soft starter offers motor overload protection based on an advanced motor thermal model. The motor thermal model monitors the performance of the motor at all stages of operation and constantly calculates its temperature.

The thermal model offers a choice of 80 NEMA-based overload curves and includes current imbalance overload compensation, adjustable hot and cold load compensation, and adjustable exponential load cooling. Fro programming and configuration settings, refer to BRU3897001 MotorSeT Advanced Motor Control System instruction bulletin.

Feeder Configuration for Variable Frequency Drives

Feeder configurations used as upstream protection for variable frequency drives, have built-in protection and will not include any additional protective relays. The drive event permissive signal should be wired to open the contactor and turn off power to the drive when there is an event. The MotorSeT advanced motor control system cannot be used in a feeder configuration.

Feeder Configuration for Transformers

Feeder configurations used as upstream protection for transformers, require a feeder protective relay. If a feeder protective relay is ordered at the time the feeder configuration order was placed, the relay is installed at the factory along with other components (including potential transformers and current transformers) needed for the relay to operate correctly. The relay will be wired to de-energize and open the contactor if an event is detected.

The customer is responsible for setting the parameters in the feeder protective relay and for testing to ensure the operation of the protective relay. The MotorSeT advanced motor control system cannot be used in a feeder configuration.

Fuses

Fuses provide short-circuit protection and are selected based on the application.

R-rated Fuses

R-rated fuses are current-limiting, high interrupting rating fuses that provide short-circuit protection for medium voltage motor starters (loads) and controllers. R-rated fuses are backup fuses that have a minimum interrupting rating, and must be used in coordination with overload relays and/or overcurrent protection in combination motor starters.

E-rated Fuses

E-rated medium voltage fuses are general purpose fuses primarily used to help protect transformers. E-rated medium voltage fuses provide both current overload and short-circuit protection.

Technical Data

Product Ratings and Environmental Data

Table 7 - Ratings

Function	Description
Auxiliary output relays	
Run and fault relay	SPDT - Form C – 10 A, 250 Vac
Control power	
Control voltage	120 Vac, ±15%; derived from control power transformer
Frequency	50 or 60 Hz
Power consumption	Varies, depending on the control requirements
Fuse	Time delay control circuit protective fuses
Line power	
Mains voltage	Three phase, 2300, 3300, 4160, 7200 Vac ±20%
Frequency	50 or 60 Hz
Power consumption	Refer to the schematic
Fuse	R-rated motor protective fuses

Table 8 - Environmental Data

Storage and operating conditions	
Storage	–20ºC (–4°F) to +60°C (+140°F)
	0% to 75% relative humidity, non-condensing
Operating Under Load[1]	0°C (+32°F) to +40°C (+104°F)
	20% to 95% relative humidity, non-condensing
Altitude	≤ 1000 meters (3300 feet) above sea level **NOTE:** Derate the motor starter rate 1% for every 100 meters above 1000 meters (every 330 feet above 3300 feet).

NOTE: For additional ratings and environmental data for MotorSeT Advanced Motor Control System see instruction bulletin BRU3897001.

1. When not under load, storage conditions apply.

Dimensions

This section provides a list of typical motor controllers dimensions. Refer to the customer drawings for actual weights, dimensions, and conduit entry locations.

Figure 8 - MotorSeT MV ATL Motor Controller Dimensions

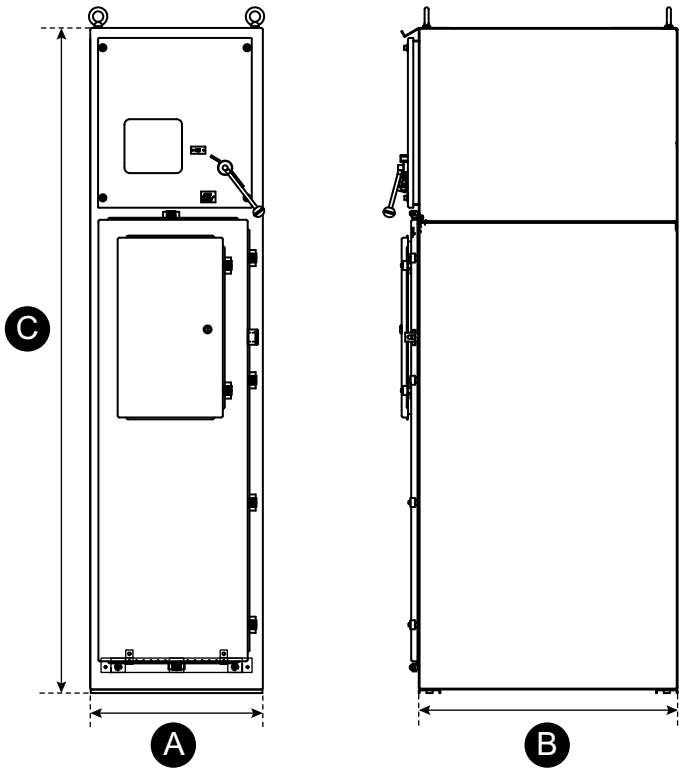


Table 9 - Dimensions

Model	A	B	C
	Width in. (mm)	Depth in. (mm)	Height in. (mm)
ATL 24x30x92	24.0 (610)	30.0 (762)	92.5 (2350)
ATL 24x32x92	24.0 (610)	32.0 (813)	92.5 (2350)
ATL 24x36x92	24.0 (610)	36.0 (914)	92.5 (2350)
ATL 30x32x92	30.0 (762)	32.0 (813)	92.5 (2350)
ATL 30x36x92	30.0 (762)	36.0 (914)	92.5 (2350)
ATL 36x30x92	36.0 (914)	30.0 (762)	92.5 (2350)
ATL 36x32x92	36.0 (914)	32.0 (813)	92.5 (2350)
ATL 36x36x92	36.0 (914)	36.0 (914)	92.5 (2350)
Dual ATL 36x38x92	36.0 (914)	38.0 (965)	92.5 (2350)
Compact ATL 20x30x92	20.0 (508)	30.0 (762)	92.5 (2350)
Compact ATL 20x36x92	20.0 (508)	36.0 (914)	92.5 (2350)

NOTE: Arc Resistant Option, page 25 for height and depth information for units with arc resistant option.

Installation

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, NOM-029-STPS-2011, or CSA Z462 or local equivalent.
- Only qualified personnel familiar with medium voltage equipment are to perform work described in this set of instructions. Workers must understand the hazards involved in working with or near medium voltage circuits.
- 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 the equipment
- Always use a properly rated voltage sensing device to confirm power is off.
- Before performing visual inspections, tests, or maintenance on the equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, grounded, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding. More than one disconnector switch may be required to de-energize the equipment before servicing.
- Only apply the voltage to the terminals as specified on the controller rating nameplate.
- Handle this equipment carefully and install, operate, and maintain it correctly in order for it to function properly.
- Do not make any modifications to the equipment or operate the system with the interlocks removed. Contact your local field sales representative for additional instruction if the equipment does not function as described in this manual or if parts are missing or damaged.
- 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 installation, maintenance or testing.

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

Site Selection and Preparation

Site preparation is essential for proper installation and operation of the equipment. To prepare the site for installation, be sure to:

- Compare the site plans and specifications with the motor controller drawings to be sure there are no discrepancies.
- Check the site to verify that the equipment will fit properly and withstand the weight of the equipment.
- Ensure that the floor is level within 1/16 in. per ft. (2 mm per 305 mm), or a maximum of 1/4 in. (6 mm) within the area of the controller lineup. If the floor is not within the tolerances, use shims or other means to ensure equipment is installed on level.
- Ensure that the installation site meets all environmental specifications for the enclosure's NEMA type rating, and all other applicable NEMA/CEMA rating.
- Ensure the site is in compliance with seismic hazard for site specific locations as defined by the current edition of the International Building Code or NFPA 5000 or relevant local building code or consulting engineer of record.
- Allow working space clearance per National Electrical Code (NEC) or local standard. Minimum clearances must meet all local and national requirements.
- This equipment is front accessible only and does not have rear access.
- Provide area ventilation, heating, and air conditioning to maintain the ambient temperature around the equipment between 0°C (32°F) and 40°C (104°F).
- Adequate lighting and convenience outlets with the correct power source should be available near the equipment.
- Ensure that the power cables have the correct NEC/CSA current rating for the unit being installed. Depending on the model, the power cables can range from a single #14 AWG conductor to four 750 MCM cables. Consult local and national codes for selecting wire size.
- Route sewer, water, and steam lines away from the equipment.
- Provide floor drains to help prevent water buildup.

Equipment Installation for Seismic Applications

Introduction

Seismic certification is an optional feature in the MotorSet product line that provides seismic conformance options to any of the North American and International building codes and seismic design standards identified in List of Supported Regional Building Codes and Seismic Design Standards, page 33. A MotorSeT product that is seismic 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 seismic certified MotorSeT products. 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 10 - List of Supported Regional Building Codes and Seismic Design Standards

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

Responsibility for Mitigation of Seismic Damage

The MotorSeT 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 Non-structural 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. Indoor and outdoor enclosures provide enclosure base frame clearance holes for bolted anchorage attachments as shown in job drawings.

Equipment installations of single, stand-alone sections must be anchored using all enclosure tie-down points as shown in job drawings for indoor and outdoor applications respectively. Equipment installations of multiple-section lineups (2 or more MotorSeT units bolted together) may not require every tie-down point to be used and specifics will be shown in the job drawings.

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

Anchorage Assembly Instructions

The bolted anchor assembly view depicted in job drawings illustrates the equipment's as-tested attachment to the seismic shake-table test fixture. The equipment seismic rated capacity, as stated on the Schneider Electric CoC, was achieved with the identified size and grade attachment hardware. For bolted attachments, the use of grade 5 or better hardware with thick, hardened, Belleville conical spring washers, where specified in job drawings, are required to maintain seismic conformance. Field installed equipment attachment and support detailing shall be in accordance with the anchorage system requirements as defined by the construction site EOR or RDP.

Before You Start

Read and understand the following information before performing motor starter installation procedures.

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, NOM-029-STPS or CSA Z462 or local equivalent.
- Verify that the installation site meets all of the required environmental specifications and requirements.
- Turn off all power supplying this equipment before working on or inside the equipment.
- Always us a properly rated voltage sensing device to confirm power is off.
- Install short-circuit protection (such as: fuses) if not installed by the factory as part of the package.
- The wiring must only be installed by qualified electrical personnel.
- Carefully inspect your work area and remove any tools and objects left inside the enclosure.
- Ensure that the motor starter is protected from debris, metal shavings, and any other objects.

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

Before installing the ATL motor starter, do the following:

NOTICE

STARTER OR MOTOR DAMAGE

- Verify that the wiring diagram (supplied separately) is correct for the required application.
- Verify the equipment is the correct current rating and voltage rating for the electrical load being controlled.
- Follow all of the installation safety precautions (see Safety Precautions, page 9).
- Verify the power source is correct for the equipment and available.
- Ensure the connection cables, lugs, and associated mounting hardware have been obtained.
- Verify that the installed motor is sized per the drawings and is ready for operation.

Failure to follow these instructions can result in equipment damage.

EMC Compliance

To comply with the European Electromagnetic Compatibility (EMC) standards, follow these guidelines.

NOTE: This product has been designed for Class A equipment. Use of the product in domestic environments may cause radio interference, which may require the use of additional mitigation methods.

Table 11 - Guidelines for EMC Installation Compliance

Function/Feature	Guideline
Enclosure	Install the product in a grounded metal enclosure.
Grounding	Connect a grounding conductor to the screw or terminal provided as standard on each controller. See power wiring schematic for grounding provision location.
Wiring	See Wiring Practices, page 36.
Filtering	To comply with Conducted Emission Limits (CE requirement), a high voltage (rated controlled voltage or greater) 0.1 uF capacitor must be connected from each input line to ground it at the point where the line enters the cabinet.

Table 12 - Applicable Standards and Codes

Electromagnetic Compatibility (EMC)	• EN 55011/05.98+A1:1999 • EN 50082-2 Immunity/Susceptibility • EN 61000-4-2 Electrostatic discharge immunity • EN 61000-4-3 Radiated, radio frequency, electromagnetic field immunity • EN 61000-4-4 Electrical fast transient/burst immunity • EN 61000-4-6 Immunity to conducted disturbances, induced by radio frequency fields

Wiring

Wiring Practices

⚠⚠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 or CSA Z462 or local equivalent.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside the equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

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

When wiring the motor controller, follow these guidelines:

- Never connect input AC power to motor controller (load) output terminals T1/U, T2/V, or T3/W.
- Power wiring to the load should be separated from all other wiring inside the enclosure.
- Do not run power wiring and control wiring (or any wiring group) in the same conduit. The minimum spacing between metallic conduits containing different wiring groups should be 3 in. (8 cm).
- The minimum spacing between different wiring groups in the same tray should be 6 in. (15 cm).
- When running wiring outside an enclosure, the wiring should be run in metallic conduit or have shielding/armour with equivalent attenuation (density).
- If the control wiring must cross the motor controller or mains cables, the wiring should cross at an angle of 90°.

NOTE: You must follow local electrical codes for all wiring practices.

Power Cables

Power wiring refers to wires/cables connected to the line and load terminals that normally carry 2200–7200 Vac. When selecting power wiring:

- Use only cables that meets UL or CSA requirements
- Grounding must be in accordance with NEC, CEC or local codes. If multiple devices are installed near each other, each must be grounded. Make sure not to form a ground loop. The grounds should be connected in a star configuration.

Control Wiring

Control wiring refers to wires connected to the control terminal strip that normally carry 24–115 V.

Signal Wiring

Signal wiring refers to wires connected to the control terminal strip with low voltage signals (below 15 V).

- Wires should be shielded/armour to help prevent electrical noise interference, which can cause improper operation or nuisance tripping.
- Signal wiring inside the enclosure should routed to maintain maximum separation as feasibly possibly from control and power wiring.
- Use signal wiring with the highest possible voltage rating (at least 300 V rating).

Joining Shipping Splits

After properly preparing the site, field assemble the shipping splits.

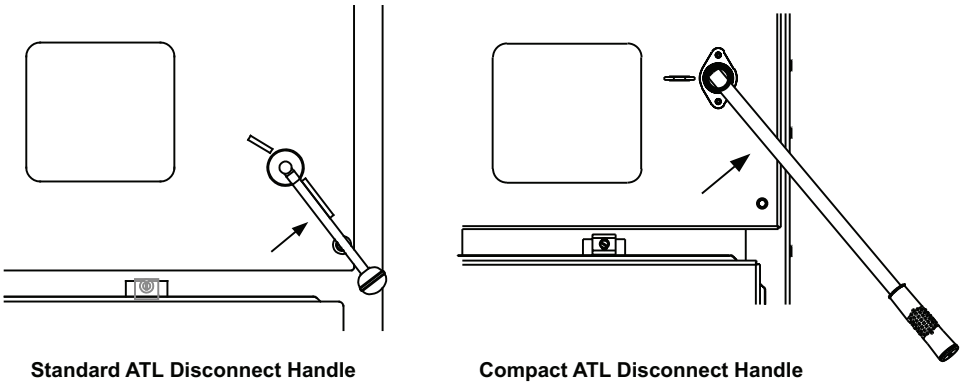
- Shipping splits are made to provide convenience for the installer.
- The installer must properly align, level, and bolt the units together and to the concrete floor.
- The installer must properly install the interconnection bus and any interconnection secondary control, instrumentation, heaters, wiring, etc. Schneider Electric provides all materials for interconnections including hardware, bus, insulation and internal secondary wiring.
- Install all interconnections in accordance with drawings and wiring diagrams provided with the equipment.

Accessing the Isolation Section Compartment—Standard and Compact Configurations

To access the isolation section compartment, follow these steps:

1. If an optional keylock is provided, use the key to unlock the isolation section cover.
2. Remove the disconnector switch operator handled from the cover.

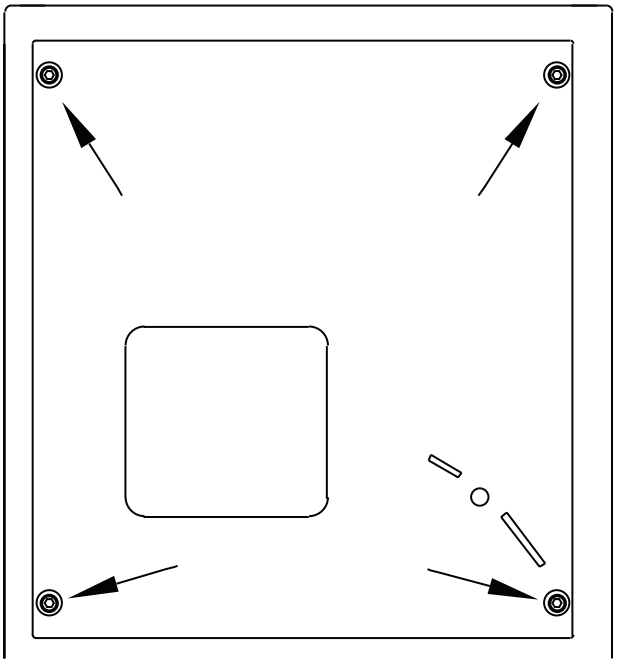
Figure 9 - Disconnector Switch Operator Handles



Standard ATL Disconnect Handle **Compact ATL Disconnect Handle**

3. Remove the four bolts attaching the isolation section cover to the unit and set aside.

Figure 10 - Isolation Section Cover



4. Remove the cover and set it aside.
5. When reversing the above steps to install the medium voltage isolation section cover, make sure to fully tighten the bolts on the cover, tighten the hardware attaching the operator handle, and lock the cover lock if a keylock option is included.

NOTE: For Dual Configuration starters, the isolation section / disconnector switch is location behind a barrier in the MV compartment

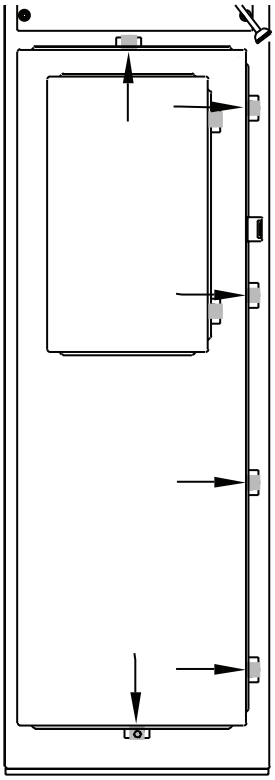
Accessing the MV Compartment—Standard and Compact Configurations

NOTE: To open the medium voltage door, the disconnector switch must in the Open position. Refer to Opening the Disconnector Switch, page 54 for more information.

To access the medium voltage compartment, follow these steps:

1. If an optional keylock is provided, use the key to unlock the medium voltage door.
2. Using a screwdriver or nut driver, loosen the screws on the door closure brackets and slide the door closure brackets off the door flange tabs.

Figure 11 - Medium Voltage Door Locking Brackets



3. The medium voltage door can now be opened.
4. When reversing the above steps to close the medium voltage door, make sure to slide brackets over the door flange tabs before fully tightening the door closure bracket screws and lock the door lock, if a keylock option is included.

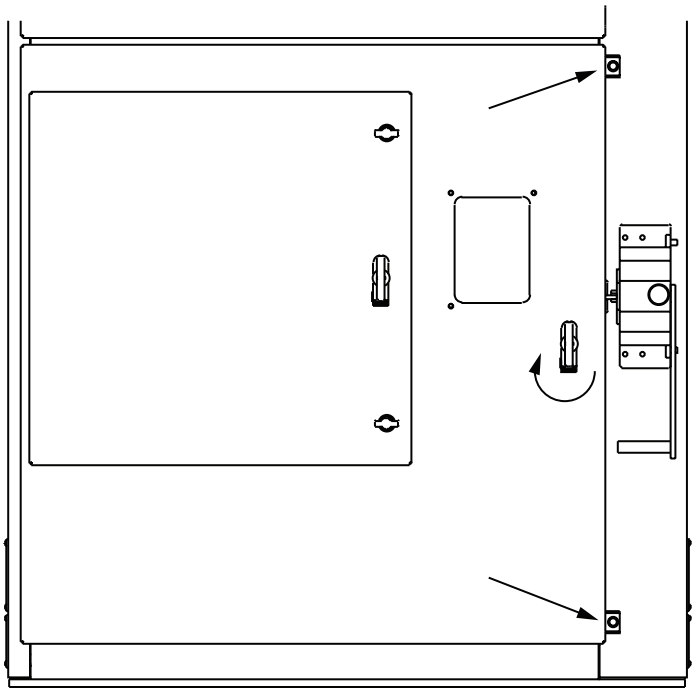
Accessing the MV Compartment—Dual Configuration

NOTE: To open the medium voltage door, the disconnector switch must in the Open position. Refer to Opening the Disconnector Switch, page 57.

To access the medium voltage compartment, follow these steps:

1. If an optional keylock is provided, use the key to unlock the medium voltage door.
2. Remove the screws in the upper and lower right corner of the medium voltage door.

Figure 12 - Medium Voltage Door



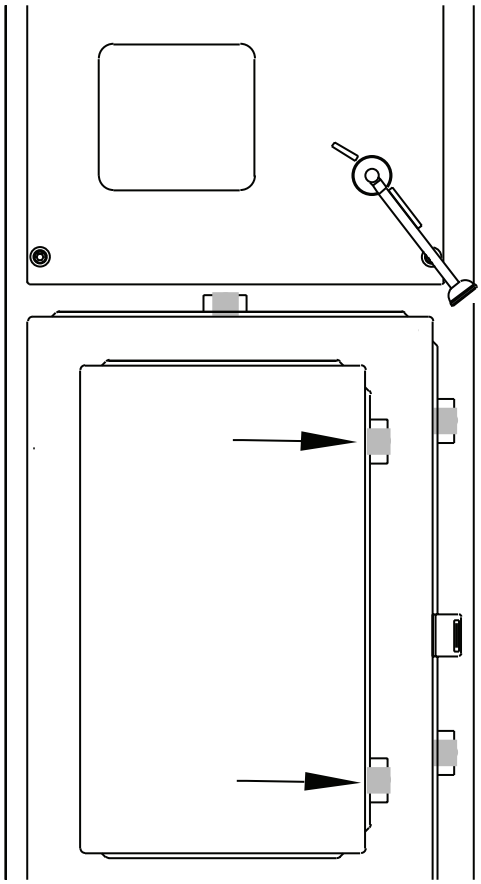
3. Lift and rotate the lift and turn latch up and pull the door open.
4. When reversing the above steps to close the medium voltage door, make sure to fully tightening the screws in the upper and lower right corner of the door and lock the door lock (if a keylock option is included).

Accessing the Low Voltage Compartment—Standard and Compact Configurations

To access the low voltage compartment, follow these steps:

1. If an optional keylock is provided, use the key to unlock the low voltage door.
2. Using a screwdriver or nut driver, loosen the screws on the door closure brackets and slide the door closure brackets off the door flange tabs.

Figure 13 - Low Voltage Door Locking Brackets



3. The low voltage door can now be opened.
4. When reversing the above steps to close the low voltage door, make sure to slide brackets over the door flange tabs before fully tightening the door closure bracket screws and lock the door lock, if a keylock option is included.

Accessing the Low Voltage Compartment—Dual Configuration

To access the low voltage compartment follow these steps:

1. If an optional keylock is provided, use the key to unlock the low voltage door.
2. Rotate the door locking knobs 90 degrees.
3. The low voltage door can now be opened.
4. When reversing the above steps to close the low voltage door, make sure to rotate the door locking knobs back to their original positions and lock the door lock, if a keylock option is included.

Anchoring the Equipment

Anchoring and Joining the Shipping Splits

Follow the steps below for instructions on anchoring the units.

1. Review the assembly drawings to ensure that the equipment shipping splits will be assembled in the correct order.

   NOTE: If the equipment will be connected to an existing lineup, mount the connecting section or shipping split first.

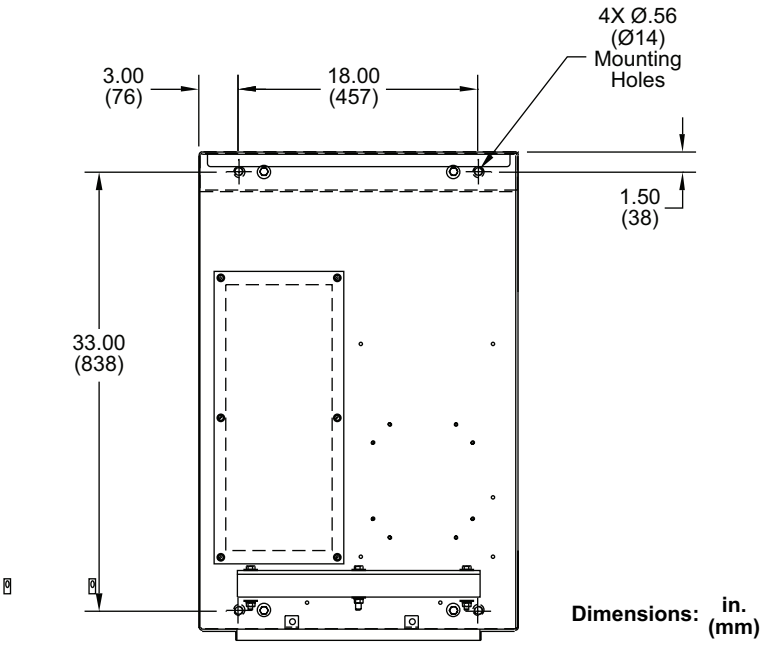
2. Locate and anchor the first shipping split.

   For seismic hazard designated locations, each section must be anchored per details supplied by the Engineer of Record to the load-bearing path of the building structure system. Use grade 5 or better hardware with thick, hardened, Belleville washers as specified in the job drawings to maintain equipment seismic ratings.

   For non-seismic hazard locations, 1/2 in. (12 mm) grade 5 or higher bolts are recommended; however, 3/8 in. (10 mm) grade 5 bolts are permissible.

   NOTE: Be sure to mount all shipping splits on the same plane and level them to verify that they are properly connected.

   Figure 14 - Bolt Hole Location for Enclosures — (24 in. wide shown)



3. Locate the next shipping split according to the assembly job drawings.

4. Level the shipping split and join it to the previously installed shipping split. Apply vertical and horizontal gasket and bolt enclosures together using 3/8 in. or M10 mm hardware in all eight locations (see Gasket, page 44 and Joining Enclosure Mounting Hole Locations, page 44).

Figure 15 - Gasket

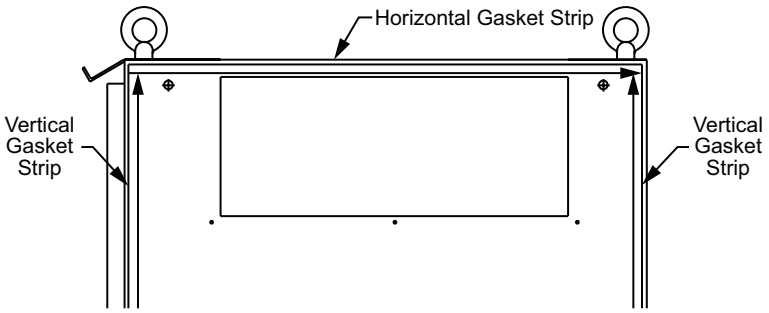
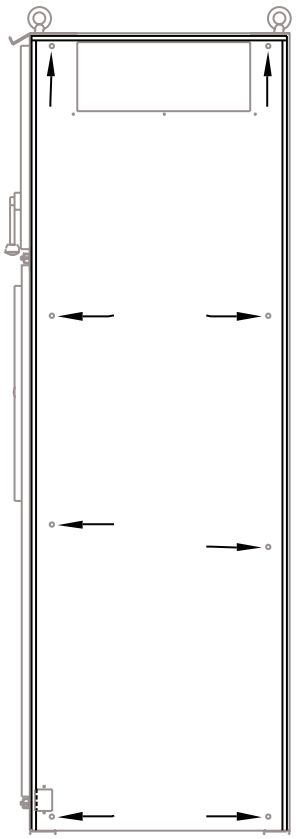


Figure 16 - Joining Enclosure Mounting Hole Locations



Bus Connections

When shipping several sections of switchgear for a lineup, it is necessary to disconnect the main bus before shipping.

- It is important that the MotorSeT equipment be anchored in place before reconnecting the main bus.
- It is essential that the bus bar connections be securely bolted to create the necessary pressure for proper conductivity between the bus bars.

Refer to the provided drawings and Bolt Torque Values for Bus Connections, page 45 for more information.

Follow these steps for all field-assembled joints in primary conductors, regardless of material or insulation method:

1. Wipe the bus surface clean with a lint-free cloth. Do not use sandpaper or any abrasive on the plated surface. Avoid touching the cleaned surface as much as possible.
2. Join the clean contact surfaces by using the hardware provided, see Busbar Connections, page 45 for more information.
3. Use the torque values as listed in Bolt Torque Values for Bus Connections, page 45.

   NOTE: The torque values in Bolt Torque Values for Bus Connections, page 45 do not apply to the contact mechanism of the disconnector switch.

Figure 17 - Busbar Connections

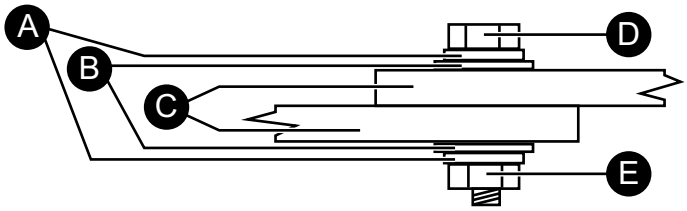


Table 13 - Legend — Busbar Connections Diagram

Call-out	Description
A	Lock washer[2]
B	Flat washer[2]
C	Busbars
D	Bolt
E	Nut

Table 14 - Bolt Torque Values for Bus Connections

Bolt Material	Torque in Feet (ft.) — Pounds (lbs.) for bolt size				
	1/ 4-20	5/16-18	3/8-16	1/ 2-13	5/8-11
Steel	5	12	20	50	95
Silicon bronze	5	10	15	40	55

2. These can be replaced with “Belleville” spring washer when specified.

Power Wiring Connections

Power wire (cable) should be selected based on the FLA of the load. Wire derating may be necessary based on ambient temperatures.

For assistance in selecting the correct wire size, consult local and national codes.

⚠⚠DANGER

HAZARD OF ELECTRICAL SHOCK, EXPLOSION, OR ARC FLASH

- Verify unsheilded, full voltage rated insulated cables do not contact any ground metal parts or other phase cables.
- If boots are required, the boots will be shown on the job drawings and supplied with the equipment.
- Use the shortest possible length bolts when connecting medium voltage lugs to contactor, disconnector switch, or lug pads.
- Install bolts so that threaded end of bolts (nut side) from different phases are not pointing toward each other.

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

To connect the line side and load side power cables, follow these steps:

1. Route the power cables through a connector into the enclosure.
2. Strip the cable insulation from the end of cable per the lug manufacturer's instructions.
3. If recommended by the lug manufacturer, apply anti oxidation paste to the cable prior to crimping lug to cable.
4. Connect the motor load cables to the T1, T2 and T3 lugs or terminals.
5. Connect the power source cables to the L1, L2 and L3 lugs or terminals.

Compression Lugs

The following is a list of recommended crimp-on wire connectors for copper wire manufactured by Penn-Union Corp.:

Table 15 - Single Hole Compression Lugs

Wire size	Part number
1/0	BLU-1/0S20
2/0	BLU-2/0S4
3/0	BLU-3/0S1
4/0	BLU-4/0S1
250 MCM	BLU-025S
300 MCM	BLU-030S
350 MCM	BLU-035S
400 MCM	BLU-040S4
450 MCM	BLU-045S1
500 MCM	BLU-050S2
600 MCM	BLU-060S1
650 MCM	BLU-065S5
750 MCM	BLU-075S
800 MCM	BLU-080S

Table 15 - Single Hole Compression Lugs (Continued)

Wire size	Part number
1000 MCM	BLU-100S
1500 MCM	BLU-150S
2000 MCM	BLU-200S

Torque Values for Power Wiring Terminations

Table 16 - Slotted Screws and Hex Bolts — Tightening Torque Values

Wire size installed in conductor		Tightening torque, in.-lb (N•m)							
		Slotted head No. 10 and larger				Hexagonal head-external drive socket wrench			
AWG or kcmil	(mm^2)	Slot width ≤ 0.047 in. (1.2 mm) and slot length ≤ 0.25 in. (6.4 mm)		Slot width > 0.047 in. (1.2 mm) or slot length > 0.25 in. (6.4 mm)		Split-bolt connectors		Other connectors	
18–10	(0.82–5.3)	20	(2.3)	35	(4.0)	80	(9.0)	75	(8.5)
8	(8.4)	25	(2.8)	40	(4.5)	80	(9.0)	75	(8.5)
6–4	(13.3–21.2)	35	(4.0)	45	(5.1)	165	(18.6)	110	(12.4)
3	(26.7)	35	(4.0)	50	(5.6)	275	(31.1)	150	(16.9)
2	(33.6)	40	(4.5)	50	(5.6)	275	(31.1)	150	(16.9)
1	(42.4)	–	–	50	(5.6)	275	(31.1)	150	(16.9)
1/0–2/0	(53.5–64.4)	–	–	50	(5.6)	385	(43.5)	180	(20.3)
3/0–4/0	85.0–107.2	–	–	50	(5.6)	500	(56.5)	250	(28.2)
250–350	(127–177)	–	–	50	(5.6)	650	(73.4)	325	(36.7)
400	(203)	–	–	50	(5.6)	825	(93.2)	375	(36.7)
500	(253)	–	–	50	(5.6)	825	(93.2)	375	(42.4)
600–750	(304–380)	–	–	50	(5.6)	1000	(113.0)	375	(42.4)
800–1000	(406–508)	–	–	50	(5.6)	1100	(124.3)	500	(56.5)
1250–2000	(635–1010)	–	–	–	–	1100	(124.3)	500	(67.8)

NOTE: Slot width is the nominal value. Slot length is measured at the bottom of the slot. For slot widths or lengths not corresponding to those values specified above, the largest torque value associated with the conductor size will be marked.

Table 17 - Inside Hex Screws — Tightening Torque Values

Socket size across flats		Torque Value	
Inches	(mm)	lb-in.	(N•m)
1/8	(3.2)	45	(5.1)
5/32	(4.0)	100	(11.3)
3/16	(4.8)	120	(13.6)
7/32	(5.6)	150	(16.9)
1/4	(6.4)	200	(22.6)
5/16	(7.9)	275	(31.1)
3/8	(9.5)	275	(42.4)
1/2	(12.7)	500	(56.5)
9/16	(14.3)	600	(67.8)

NOTE: For screws with multiple tightening means, the largest torque value associated with the conductor size will be marked. Slot length will be measured at the bottom of the slot.

Ground Bus Connections

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Connect the ground bus to the proper equipment ground according to the local installation code requirements. The ground bus must be connected for proper operation of relaying and instrumentation, and for personnel safety.
- Ensure that all parts of the equipment are grounded properly.

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

The ground bus is bolted to the frame near the bottom of the equipment. It is arranged so that connectors to the station ground can be made in any unit. If the equipment is shipped in more than one group, connect the sections of the ground bus by using the splice plates provided with the equipment. Assemble joints as described in Bus Connections, page 45.

Ground bus connections are made in the lower portion of the cable entrance compartment. Connect the ground bus to the station ground bus using a conductor with a current-carrying capacity equal to that of the ground bus.

Fuse Installation

The fuses provided by Schneider Electric should be installed following the equipment installation process. The installer is responsible for the proper installation of fuses, holders, fittings, etc.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Do not perform fuse installation or replacement on energized equipment.

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

- Verify that all fuses, holders, etc. are correctly installed and secured.
- Verify that all fuses are latched/locked in place if latching/locking style fuses are provided.

Refer to the relevant fuse instruction manuals for detailed assembly and installation instructions.

Interlocks

Interlocks should be checked for proper operation before power is applied to the motor controller equipment. Check the access interlock to verify that:

- The power fuses cannot be accessed unless the disconnector switch is open.
- The disconnector switch cannot be closed while the power fuses are accessible.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Properly destroy extra interlock keys (when supplied), or store them in a secure location.
- Make extra interlock keys accessible only to appropriate personnel.
- Do not modify or alter interlocks.

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

Before placing the equipment into operation, see Operation, page 54, and consult the drawings for proper operating sequence.

The load break interrupter switch is equipped with a mechanical device that blocks access to a closed switch. In addition, the load break interrupter switch must be opened before the medium voltage door can be opened.

High Potential (Hi-Pot) Testing

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Only qualified electrical personnel should perform this testing.
- During testing, maintain a minimum clearance of 6 ft. (1829 mm) from the equipment.

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

Power Circuit

Perform a one-minute power frequency voltage withstand test, commonly referred to as a high potential (hi-pot) test, to measure insulation integrity of the power circuit. Refer to the table Hi-Pot Field Test Values, page 50 for test values and additional information.

⚠WARNING

OVERVOLTAGE TO CONTROL AND PROTECTIVE COMPONENTS

- Disconnect all control and protective devices that may become damaged when conducting high-potential tests or insulation resistance tests.
- Consult the factory drawings to determine which devices must be disconnected from the circuit.

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

Take the following steps to help promote the safety of personnel and equipment:

- Restrict entry into the area to prevent any unauthorized personnel from approaching the gear during testing.
- Notify all persons that the test is going to be conducted.
- Follow all local lockout and tag-out procedures.
- Disconnect surge arresters, surge capacitors, and power factor correction capacitors (if supplied).
- Disconnect or ground capacitive dividers, if supplied.
- Do not use unfiltered, half-wave rectified DC hi-pot test units. Use of such devices greatly increases the chance of x-ray generation.
- Ground control side of circuit or disconnect control components that could be damaged during hi-pot testing. Refer to the job drawings.

Table 18 - Hi-Pot Field Test Values

Equipment Maximum Rating (kV)	Field Test Values	
	AC (kV)	DC (kV)
2.4	5.5	7.9
3.3	7.1	10.1
4.16	8.5	12.1
4.8	9.6	13.6
5	10.0	14.1
5.5	10.8	15.3
6	11.6	16.4

Table 18 - Hi-Pot Field Test Values (Continued)

Equipment Maximum Rating (kV)	Field Test Values	
	AC (kV)	DC (kV)
6.6	12.7	17.9
6.9	13.2	18.7

Phase-to-Phase Hi-Pot Testing

Follow these steps to perform a phase-to-phase hi-pot test:

1. Gradually increase the voltage to the levels shown in the table Hi-Pot Field Test Values, page 50 for test values and additional information.
2. Verify that the equipment sustains the specified voltage without flashover for one minute.
3. Turn off the test equipment. Discharge high potential test cables to ground before removing the test cables.

Phase-to-Ground Hi-Pot Testing

Follow these steps to perform a phase-to-ground hi-pot test:

1. Gradually increase the voltage to the levels shown in the table Hi-Pot Field Test Values, page 50 for test values and additional information.
2. Verify that the equipment sustains the specified voltage without flashover for one minute.
3. Turn off the test equipment. Discharge high potential test cables to ground before removing the test cables.

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

If the equipment has been stored for several months or has been exposed to high humidity during the storage time period, perform a hi-pot test. First energize the heater circuits for a minimum of 24 hours. See the table Hi-Pot Field Test Values, page 50 for test values and additional information. Follow other equipment testing procedures as required by customer in-house standards.

Control Circuit

NOTICE

OVERVOLTAGE TO CONTROL AND PROTECTIVE COMPONENTS

- Disconnect all control and protective devices that may become damaged when conducting high-potential tests or insulation resistance tests.
- Consult the factory drawings to determine which devices must be disconnected from the circuit.

Failure to follow these instructions can result in equipment damage.

Control Circuit-to-Ground Hi-Pot Testing

Follow these steps to perform a control circuit-to-ground hi-pot test:

1. Gradually increase the voltage to the appropriate test level based on the equipment's control voltage.
2. Verify that the equipment sustains the specified voltage without flashover for one minute.
3. Turn off the test equipment. Discharge high potential test cables to ground before removing the test cables.

Performing a Final Inspection

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, NOM-029-STPS-2011, or CSA Z462 or local equivalent.
- Only qualified personnel familiar with medium voltage equipment are to perform work described in this set of instructions. Workers must understand the hazards involved in working with or near medium voltage circuits.
- 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 the equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, grounded, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding. More than one disconnector switch may be required to de-energize the equipment before servicing.
- Only apply the voltage to the terminals as specified on the controller rating nameplate.
- Handle this equipment carefully and install, operate, and maintain it correctly in order for it to function properly.
- Do not make any modifications to the equipment or operate the system with the interlocks removed. Contact your local field sales representative for additional instruction if the equipment does not function as described in this manual or if parts are missing or damaged.
- 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 installation, maintenance, or testing.

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

After installing the equipment and making all interconnections, follow these steps to test the equipment and perform a final inspection before placing it in service:

1. Verify that a hi-pot test has been performed.

2. Check all control wiring with the wiring diagrams.
    a. Verify that all connections are properly made and tightened.
    b. Verify that all fuses are installed,
    c. Verify that current transformer circuits are complete.
    d. Verify that all event detection devices have been properly connected and set.
    e. Verify that loose connections are tightened to the proper tightening torque (see Slotted Screws and Hex Bolts — Tightening Torque Values, page 47 and Inside Hex Screws — Tightening Torque Values, page 48).
3. Verify that all protective relays have been configured with proper settings per the outcome of the customer’s coordination study.
    a. The contactor opening time must be coordinated with the supplied power fuse's time-current characteristics.
    b. Power fuses must interrupt currents which exceed contactor ratings.
4. Ensure that all transition, control, and timing relays are configured per application requirements.
5. Verify that all insulating surfaces, including the primary support insulators and isolation barriers, are clean and dry.
6. Verify that all fuses are installed and orientated properly and do not exceed the nameplate rating for their sections.
7. Before energizing any source of electric power, make a final check of the equipment. Inspect every compartment for loose parts, tools, litter, and miscellaneous construction items.
8. Review key interlock schemes carefully (if used). Insert only the proper keys in the locks. Remove all extra keys and store them where only authorized personnel can access them.
9. Verify that all barriers, covers, and doors are secured.

Operation

Disconnector Switch Operation—Standard and Compact Configurations

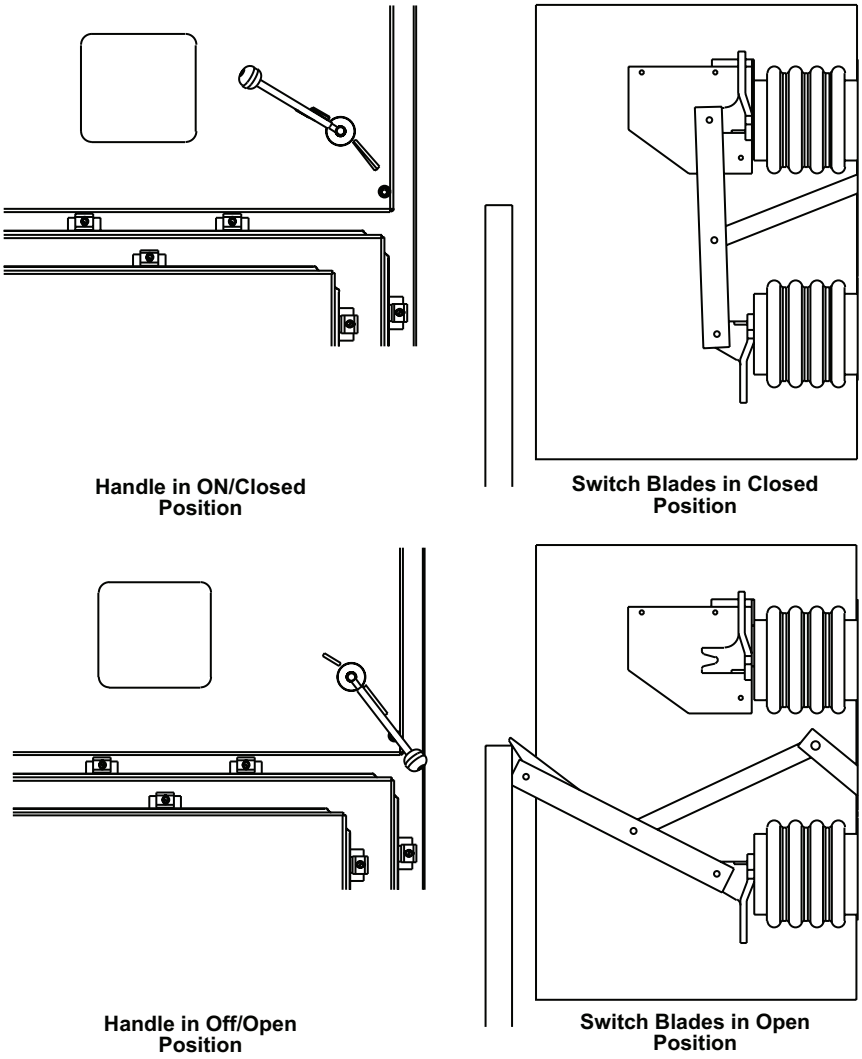
NOTE: Blade position images shown in this section of the instruction bulletin are for the Standard Configuration units.

Opening the Disconnector Switch

To open the disconnector switch, follow these steps:

1. If the controller is supplying power to the motor, press the Stop button on the control panel to remove power to the motor.
2. Grasp the disconnector switch operator handle and rotate the handle counter-clockwise downward to the Off/Open position (shown in Handle Positions, page 54).

Figure 18 - Handle Positions



3. Use the viewing window to view the disconnector switch and verify that the disconnector switch is in the Off/Open position.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- After operating disconnect switch to the open position, always look through the viewing window and verify all main and arc interrupter blades are fully open.
- Do not work on or in this equipment or on down stream equipment if any of the main or arc interrupter blades remain closed after the switch is opened. Contact Schneider Electric if blades remain closed.
- Perform inspection and preventative maintenance on disconnect switch at a minimum of once each year.

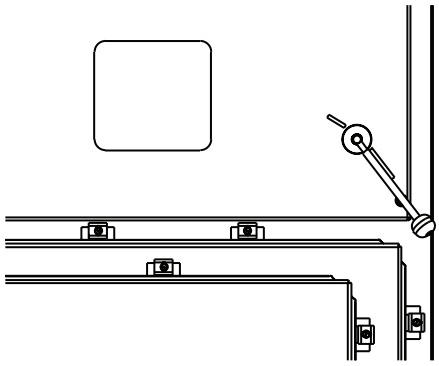
Failure to follow these instructions will result in death or serious injury.

Closing the Disconnector Switch

To close the disconnector switch, follow these steps:

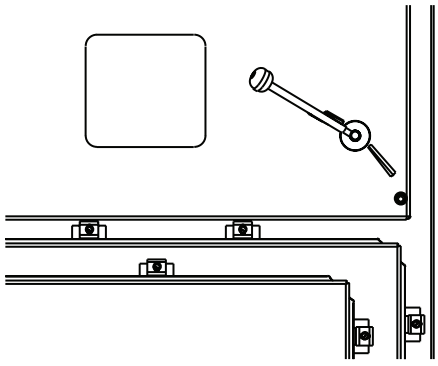
1. Use the viewing window to view the disconnector switch and verify that the disconnector switch is in the Off/Open position (shown in Handle in Off/Open Position, page 55) .

Figure 19 - Handle in Off/Open Position



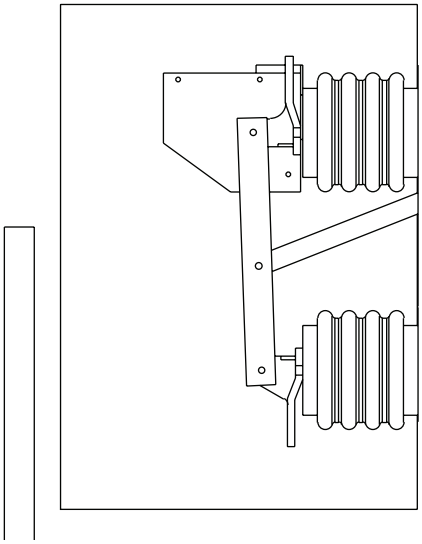
2. Grasp disconnector switch operator handle and rotate the handle clockwise upward to the On/Closed position (shown in Switch Handle On/Closed Position, page 55).

Figure 20 - Switch Handle On/Closed Position



3. Use the viewing window to view the disconnector switch and verify that the blades for all three phases are in the On/Closed position (shown in Switch Blades in Closed Position, page 56).

Figure 21 - Switch Blades in Closed Position



Disconnector Switch Operation—Dual Configuration

NOTICE
MECHANISM JAM AND DAMAGE • Before rotating the operating handle, the handle latch button must be pulled out to its maximum. **Failure to follow these instructions can result in equipment damage.**

Figure 22 - Handle Latch Button Positions

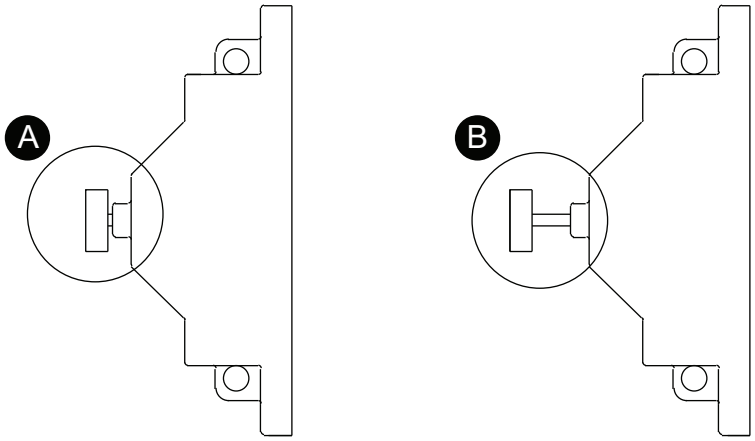


Table 19 - Legend — Handle Latch Button Positions

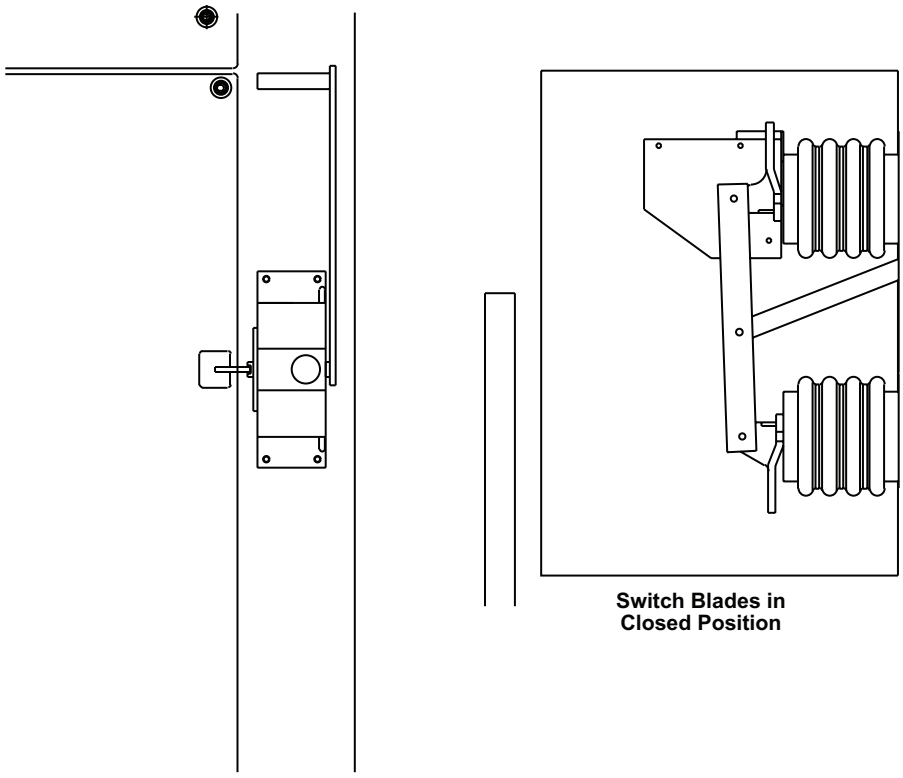
Call-out	Description
A	Handle latch button pushed in (“In position”)
B	Handle latch button pulled out to its maximum (“Out position”)

Opening the Disconnector Switch

To open the disconnector switch, follow these steps:

1. If the controller is supplying power to the motor, press the Stop button on the control panel to remove power to the motor.
2. Grasp and pull the handle latch button out all the way to its maximum extend (“Out” position) and hold it in this position.
3. While holding the handle latch button in its “Out” position, rotate the switch operating handle downward approximately 15° or until a resistive force is felt in the handle.

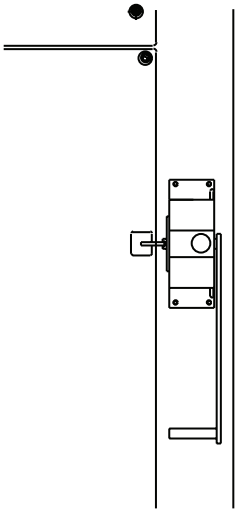
Figure 23 - Handle in ON Position



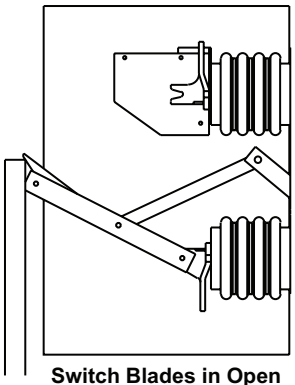
4. Release the handle latch button, and using a smooth, continuous motion firmly pull the switch operating handle downward until it stops.
5. Once the switch handle is completely down, the handle latch button will reset to its original position.

6. Use the viewing window to view the disconnector switch and verify that the disconnector switch handle is in the Off/Open position and the switch blades are in the Open position.

Figure 24 - Handle in OFF Position



Handle in Off/Open Position



Switch Blades in Open Position

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- After operating disconnect switch to the open position, always look through the viewing window and verify all main and arc interrupter blades are fully open.
- Do not work on or in this equipment or on down stream equipment if any of the main or arc interrupter blades remain closed after the switch is opened. Contact Schneider Electric if blades remain closed.
- Perform inspection and preventative maintenance on disconnect switch at a minimum of once each year.

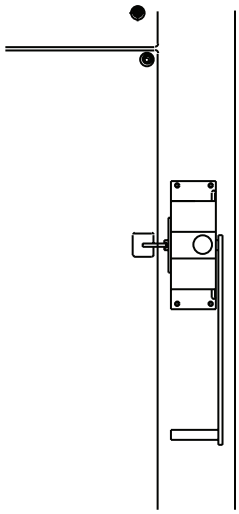
Failure to follow these instructions will result in death or serious injury.

Closing the Disconnector Switch

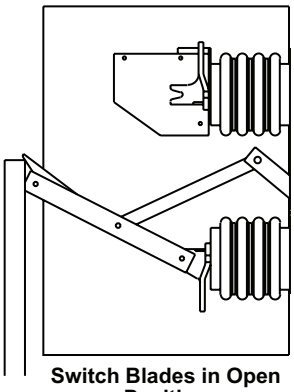
To close the disconnector switch, follow these steps:

1. Use the viewing window to view the disconnector switch and verify that the disconnector switch is in the Off/Open position.

Figure 25 - Handle in OFF Position



Handle in Off/Open Position

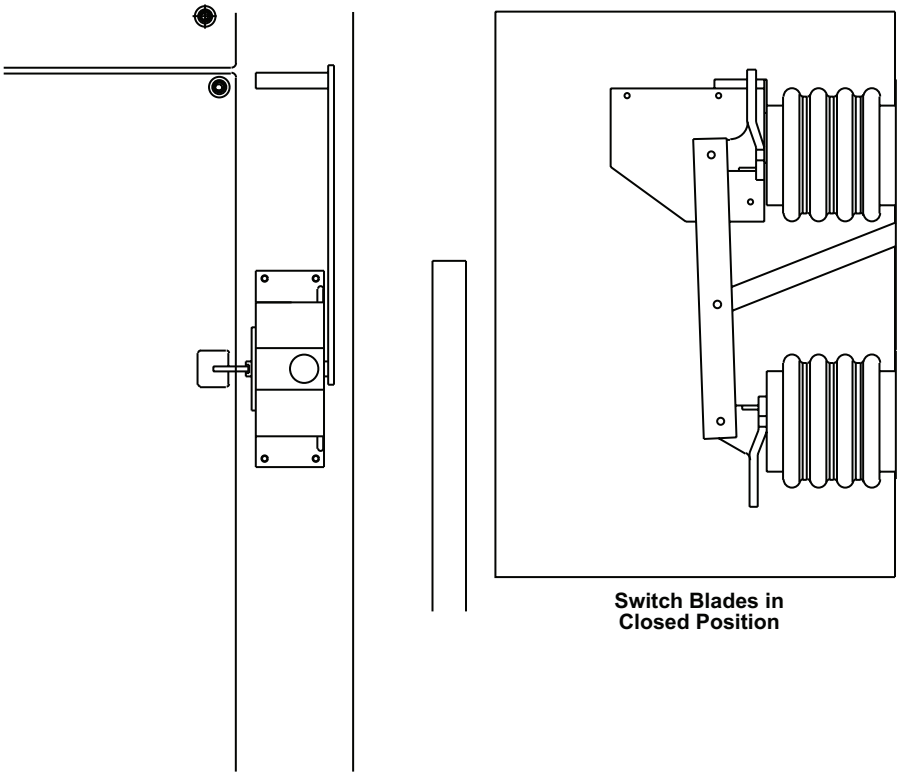


Switch Blades in Open Position

2. Grasp and pull the handle latch button out all the way to its maximum extent (“Out” position) and hold it in this position.
3. While holding the handle latch in its “Out” position, rotate the switch operating handle upward approximately 15° or until a resistive force is felt in the handle.

4. Release the handle latch button, and using a smooth and continuous motion, firmly pull the switch operating handle upward until it stops.

Figure 26 - Handle in ON Position



5. Once the handle is completely up, the handle latch button will reset to its original position.
6. Use the viewing window to view the disconnector switch and verify that the disconnect switch handle is in the On/Closed position and the switch blades are in the Closed position.

MotorSeT MV ATL Motor Starter Operation

With the MotorSeT MV ATL Motor Controller, the motor is directly connected to the supply lines, allowing full voltage to the motor for starting.

With the disconnector switch in the Closed position, when a start command is received (via the Start button on the control panel or a control input), the coil on the main contactor is energized, closing the contacts on the main contactor. Full voltage is supplied to the motor, allowing it to start and run at full speed.

The motor can be stopped by a Stop command (via the Stop button on the control panel or a control input) or by the motor protective relay. In both cases, the contactor coil is de-energized causing the main contactor to open. Voltage is no longer supplied to the motor and it coasts to a stop.

The motor protective relay stops the motor, when one of the protection parameters goes beyond the programmed settings. If the motor is stopped by the protective relay, it cannot be restarted until the protective relay has determined that the event has cleared.

For ATL starter configurations using the MotorSeT advanced motor control system, refer to instruction bulletin BRU3897001 for details on programming and operation of the system.

Feeder Configuration Operation

The feeder configuration operates similar to the ATL motor starter except that voltage is being provided to equipment that is not a motor. The MotorSeT advanced motor control system cannot be used in a feeder configuration.

When the feeder is powered on (via the Power On button on the control panel or a control input), the coil on the main contactor is energized, closing the contacts on the main contactor. Full voltage is supplied to all equipment downstream of the feeder.

The feeder can be powered off by a Power Off button on the control panel, by a control input, or by the protective relay. All equipment downstream of the feeder will lose power and shut off until the event is cleared or the equipment is powered back on manually.

Maintenance

Preventive Maintenance

Read and understand the following precautions before performing any 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 or local equivalent.
- Only qualified personnel familiar with medium voltage equipment are to perform work described in this set of instructions. Workers must understand the hazards involved in working with or near medium voltage circuits.
- 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 the equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Before performing visual inspections, tests, or maintenance on the equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, grounded, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding. More than one disconnector switch may be required to de-energize the equipment before servicing.
- Disconnect the equipment and enable a lockout command prior to performing maintenance on the equipment.
- Ensure that any stored energy in the capacitors has dissipated before energizing or de-energizing the equipment.
- Disconnect the controller from the load before measuring insulation resistance (IR).
- 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 installation, maintenance or testing.

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

Regular preventative maintenance will help ensure that the equipment continues to operate correctly and help prevent injury. The frequency of preventative maintenance depends upon the type of maintenance and the installation environment.

To ensure the motor controller is properly maintained, perform the following inspection procedures:

Table 20 - Preventive Maintenance Frequency and Action to Take

Maintenance Schedule	Recommended Action
During commissioning (prior to putting equipment in operation)	• Torque all power connections, including factory-wired equipment. • Inspect all of the control wiring for loose connections or damage. • If fans are installed, verify proper operation. Verify that the filters and guards are in place.
For the first month of operation	• Re-torque all power connections every two weeks. This includes factory-wired equipment. • Inspect cooling fans to verify proper operation (if installed). • Inspect filter for dirt and debris. Replace filter if clogged.
After the first month of operation	• Re-torque all power connections once a year. • Remove any accumulated dust using a vacuum cleaner. Wipe clean with a solvent such as denatured alcohol, if necessary. • Inspect the cooling fans every three months to verify proper operation (if installed). • Clean or replace air vent filters every three months.

NOTE: If mechanical vibrations are present at the installation site, inspect the electrical connections more frequently.

Maintenance Records

Maintaining well documented maintenance records will be helpful in locating possible intermittent problems by identifying a particular area where there are recurring issues within the system.

Vacuum Contactor Maintenance

To remove a contactor, follow these steps:

1. Review the Preventive Maintenance, page 62.
2. Ensure that the main disconnector is open and the grounding blades are seated (if grounding option is included).
3. Disconnect all power wires going to the vacuum contactor poles.
4. Remove any covers on the bottom of the contactor, if necessary.
5. Remove the control wires from the contactor.
6. Remove the four mounting bolts and remove the contactor.

To replace a contactor, reverse the steps for removing the contactor. Test the contactor before installing it to verify proper operation. A contactor manual comes with each motor controller. Refer to the contactor manual for more information when disassembling and reassembling the contactor. If required, contact your local field sales office or distributor for the manual.

Interlocks

Interlocks should be checked for proper operation before power is applied to the motor controller equipment. Check the access interlock to verify that:

- The power fuses cannot be accessed unless the disconnector switch is open.
- The disconnector switch cannot be closed while the power fuses are accessible.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Properly destroy extra interlock keys (when supplied), or store them in a secure location.
- Make extra interlock keys accessible only to appropriate personnel.
- Do not modify or alter interlocks.

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

Before placing the equipment into operation, see Operation, page 54, and consult the drawings for proper operating sequence.

The load break interrupter switch is equipped with a mechanical device that blocks access to a closed switch. In addition, the load break interrupter switch must be opened before the medium voltage door can be opened.

Disconnector Switch

1. Inspect the equipment for visible evidence of damage such as overheating.
2. Verify that all components are tightened correctly.

Refer to the manufacturer's instruction manual for additional maintenance requirements.

Replacing the Plant Interface Module (PIM) Battery

For ATL configurations using the MotorSeT advanced motor control system, the battery must be replaced if the starter trips on "Battery/clock" after the control power is applied. Refer to the maintenance section in instruction bulletin BRU3897001 for details.

Maintenance Checklist

The following tables list the inspection checks that are necessary to maintain and to verify that the equipment remains operational.

Table 21 - Cable and Bus Checklist

	Inspect bolts on bus connections for tightness
	Check clearance phase-to-phase and phase-to-ground of cable and bus.
	Check the bus and cable supports to verify they are adequate.
	Inspect the cables for insulation damage and broken conductor strands near the cable lug.
	Inspect the cable termination in the cable lugs for tightness.
	Inspect the placement of phase markings.
	Check the plating on busbars.
	Inspect the taped joints for tightness (when applicable).
	Check the connections on the lugs.
	Inspect the taped joints for coverage of insulating varnish and heating.

Table 22 - Key Interlocks Checklist

	Check the door block for lubrication.
	Check the key interlock system for appropriate sequence and operation.
	Verify that the interlock is free from binding.
	Check to verify the weather cap fits securely (outdoor only).
	Ensure that the key nameplate matches the key number.
	Check to verify that the handle stops on casting do not interfere with the interlock mechanism.
	Remove all spare keys.

Table 23 - Fuse Accessories Checklist

	Check contact of fuses mounted in the fuse clip.
	Inspect the unit for spare fuse holder or mounting.
	Check the alignment of fuses with the fuse clips.

Table 24 - Unit General Misc. Checklist

	Inspect the phase barriers for proper mounting.
	Check the unit for nomenclature and manufacturer's nameplates.
	Inspect the paint coverage of unit.
	Inspect the door handles, locking bars and mechanism and lubricate.
	Inspect for damaged, bent, or twisted doors.
	Check the unit for proper device markings.
	Inspect the unit for gasketed joints (outdoor only).
	Check the unit for water tightness, dirt, moisture, and rust.
	Inspect the unit for door stop alignment (when applicable).
	Inspect the unit doors for adequate opening.

Table 24 - Unit General Misc. Checklist (Continued)

	Check the louvers (if applicable) for proper backup and clean filters.
	Seal all non-ventilation openings to help prevent moisture, vermin, rodents, snakes, etc. from entering the equipment.
	Check the insulator for heat.
	Check and torque all bolts.
	Check the heaters, thermostats, and other environmental controls.

Troubleshooting

Read and understand the following precautions before performing any 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 or local equivalent.
- Only qualified personnel familiar with medium voltage equipment are to perform work described in this set of instructions. Workers must understand the hazards involved in working with or near medium voltage circuits.
- 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 the equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Before performing visual inspections, tests, or maintenance on the equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, grounded, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding. More than one disconnector switch may be required to de-energize the equipment before servicing.
- Disconnect the equipment and enable a lockout command prior to performing maintenance on the equipment.
- Ensure that any stored energy in the capacitors has dissipated before energizing or de-energizing the equipment.
- Disconnect the controller from the load before measuring insulation resistance (IR).
- 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 installation, maintenance or testing.

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

Use the troubleshooting information in the following tables to help determine and solve issues:

Table 25 - Motor Does Not Start, No Output to Load

Problem	Cause	Action
No start signal to motor	Control devices	Check the control devices and wiring.
No power to line	At least one phase of mains power is missing.	Check the power system.

Table 26 - Motor Rotates but Does Not Reach Full Speed

Problem	Cause	Action
Motor will not start	Mechanical problems	Check for stalled load.
		Check the motor.
	Line voltage is too low	Verify that the line voltage is sufficient and does not drop too low when starting the motor.
	Current to motor is too low	Check electronic protection relay settings.

Table 27 - Motor Stops Unexpectedly While Running

Problem	Cause	Action
Motor stopped	Motor received stop signal	Check the control system. Check for loose connections.

Table 28 - Other Issues

Problem	Cause	Action
Power metering not working	Current Transformer (CT) installed incorrectly	Install the CTs with the white polarity dot to the line/input side. Verify that the CT is on the correct phase.
Motor current or voltage fluctuates with steady load	Motor event	Verify that the motor is operating correctly.
	Power connection	Shut off all power and check the connections.
Erratic operation	Loose connections	Shut off all power and check all connections.
Motor overheats	Duty cycle	Allow the motor to cool between starts.
	High ambient temperature	Reduce the ambient temperature or provide better cooling.
	Acceleration time too long	Reduce motor load
	Incorrect overload protection settings.	Check and correct overload protection settings, if necessary.
Motor short circuit	Wiring event	Identify and correct the wiring issue.
	Power factor correction capacitors (PFCC) on starter output	Move PFCC to line side of starter.

NOTE: Additional troubleshooting information can be found in instruction bulletin BRU3897001 for ATL configurations using the MotorSeT advanced motor control system.

Replacement Parts

When ordering replacement or spare parts, include as much information as possible. In many cases, the part number of a new part can be obtained by identifying the old part. Always include the description of the part. Specify the rating, vertical section, and factory order number of the equipment in which the part is used.

Table 29 - Parts List

Description	Part Number	Standard/ Optional	Quantity
5kV vacuum contactor	Refer to specific order bill of materials	Standard	1
Power fuses	Refer to specific order bill of materials	Standard	3
Control power fuses	Refer to specific order bill of materials	Standard	2
Control power fuse, 10A	FU-627	Standard	1
Current transformers	Refer to specific order bill of materials	Standard	3
Relay, 3-pole, 120 Vac coil	Refer to specific order bill of materials	Standard	1
Relay base, 3-pole	Refer to specific order bill of materials	Standard	1
Relay, 4-pole, 120 Vac coil	Refer to specific order bill of materials	Optional	1
Relay base, 4-pole	Refer to specific order bill of materials	Optional	1
Indicator light replacement bulb	PD-52PX4EN	Standard	3
Electronic protective relay	Refer to specific order bill of materials	Standard	1

NOTE: Refer to MotorSeT instruction bulletin BRU3897001 for replacement or spare parts related to the control system, for ATL using MotorSeT Advanced Motor Control System.

Diagrams

Standard ATL — Typical Views Diagram

Figure 27 - Typical Views — Standard ATL Motor Controller

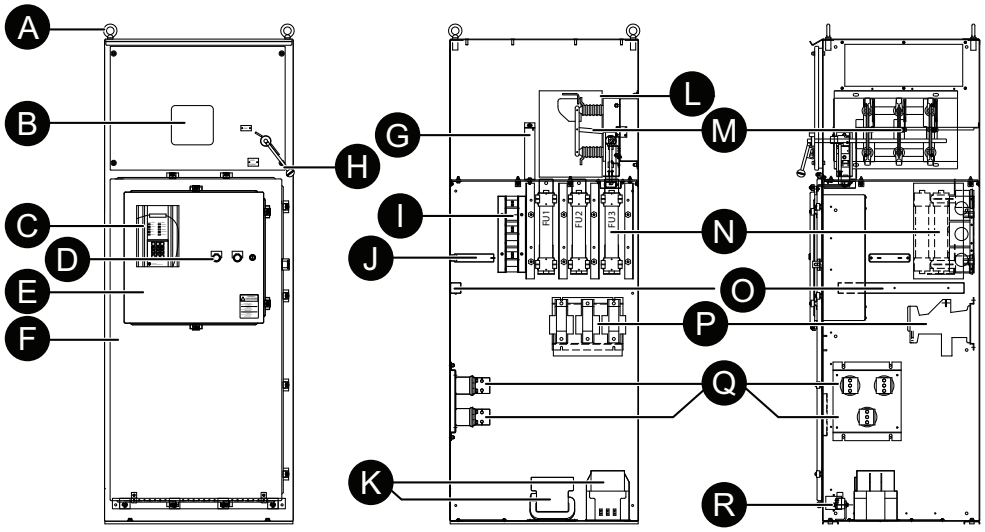


Table 30 - Legend — Typical Views of Standard ATL Motor Controller Diagram

A	Lifting eyebolts (removable)
B	Viewing window
C	Protective relay or MotorSeT Advanced Control Keypad
D	Start/Stop pushbuttons
E	Low voltage section
F	Medium voltage section
G	Ground bar for disconnecting switch
H	Disconnector switch handle
I	Current transformers (CT)
J	Ground fault CT (optional)
K	Control power transformers
L	Disconnector shield
M	Disconnector switch
N	Power fuses
O	Wireway
P	Vacuum contactor
Q	Motor landing pads
R	Ground bus

Compact ATL — Typical Views Diagram

Figure 28 - Typical View — Compact ATL Motor Controller

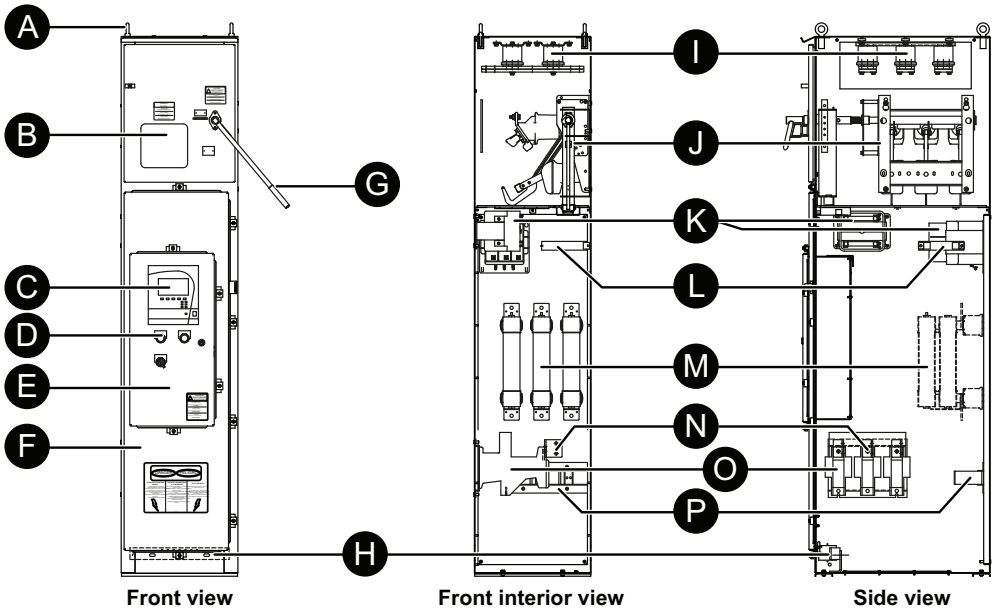


Table 31 - Legend — Typical Views of Compact ATL Motor Controller Diagram

A	Lifting eyebolts (removable)
B	Viewing window
C	Protective relay or MotorSeT Advanced Control Keypad
D	Start/Stop pushbuttons
E	Low voltage section
F	Medium voltage section
G	Disconnector switch handle
H	Ground bus
I	Incoming bus (optional)
J	Disconnector switch
K	Control power transformers
L	Current transformers
M	Power fuses
N	Motor landing pads
O	Vacuum contactor
P	Ground fault CT (optional)

Dual ATL — Typical Views Diagram

Figure 29 - Typical View — Dual ATL Motor Controller

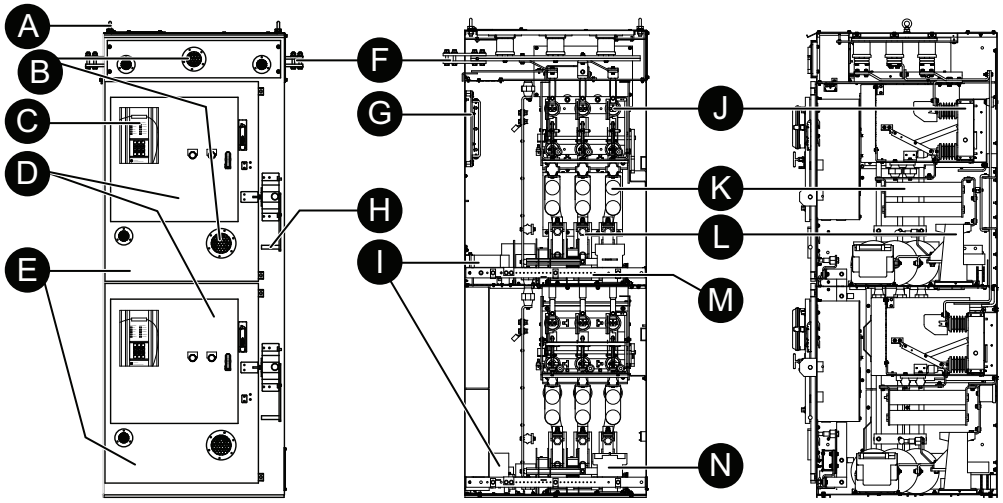


Table 32 - Legend — Typical Views of Dual ATL Motor Controller Diagram

A	Lifting eyebolts (removable)
B	Infrared viewing windows
C	Protective relay or MotorSeT Advanced Control Keypad
D	Low voltage section
E	Medium voltage section
F	Incoming bus (optional)
G	Voltage divider card
H	Disconnector switch handle
I	Voltage transformers (VT)
J	Disconnector switch
K	Power fuses
L	Vacuum contactor
M	Ground bus
N	Control power transformer

Typical ATL Schematic

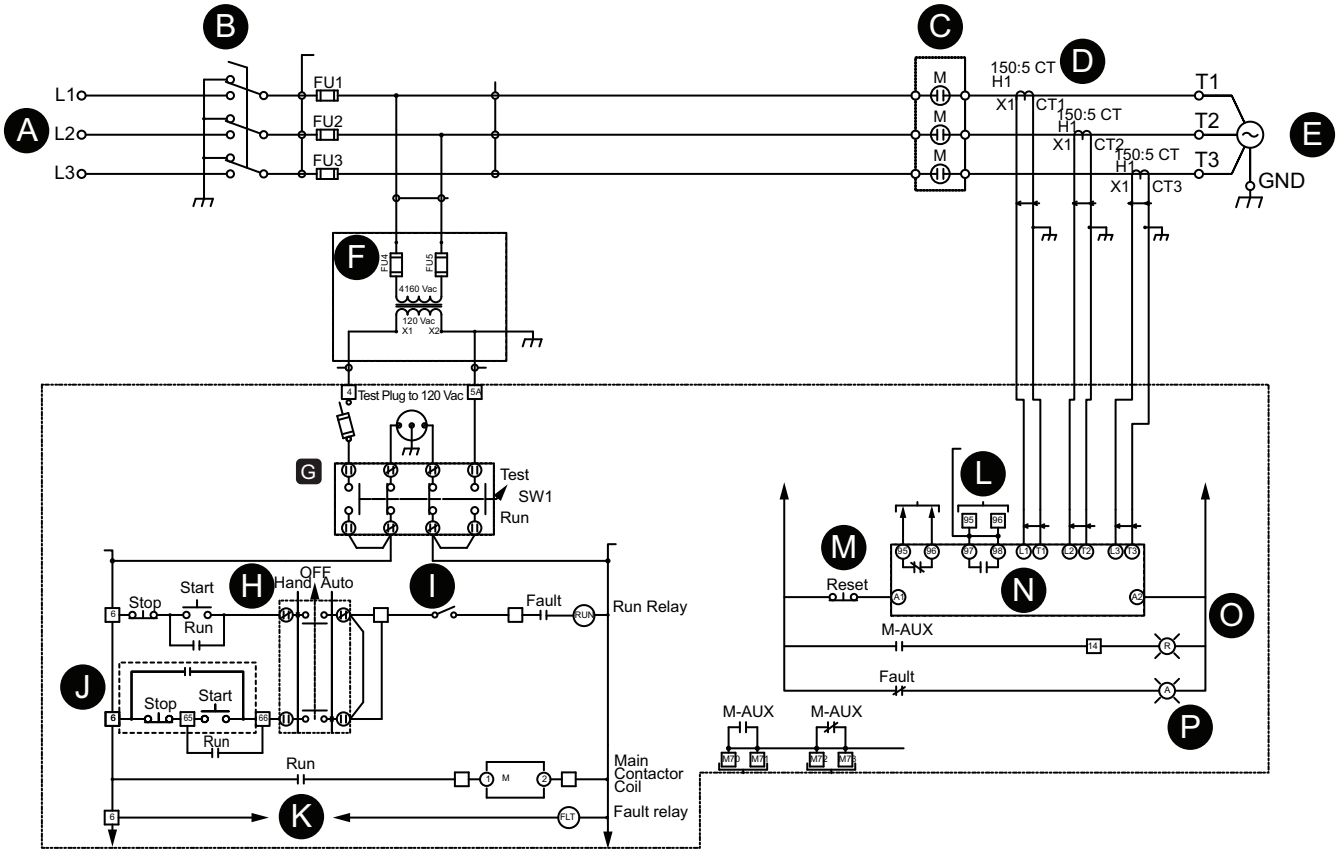


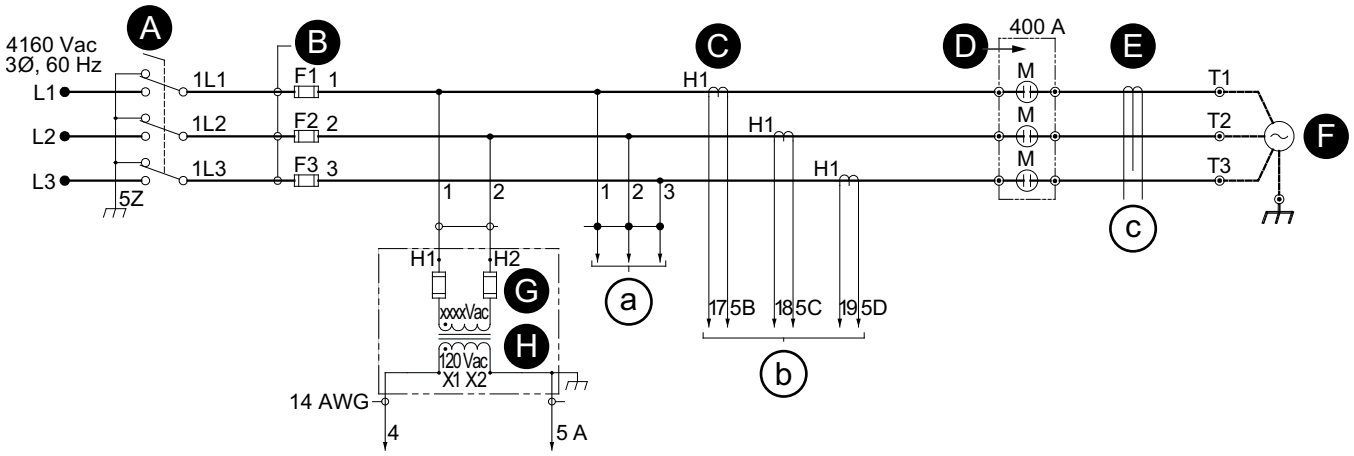
Table 33 - Legend — Typical Connection Diagram

A	Mains voltage
B	Disconnector switch
C	Main contactor
D	Current transformers (150:5)
E	Motor
F	Voltage transformer
G	Test/Run selector switch
H	Hand/Auto/Off selector switch
I	Disconnector switch interlock
J	Remote start/stop
K	To overload relay trip contact
L	Customer terminals for fault indication
M	Overload reset pushbutton
N	Overload relay
O	Run indicator light
P	Fault indicator light

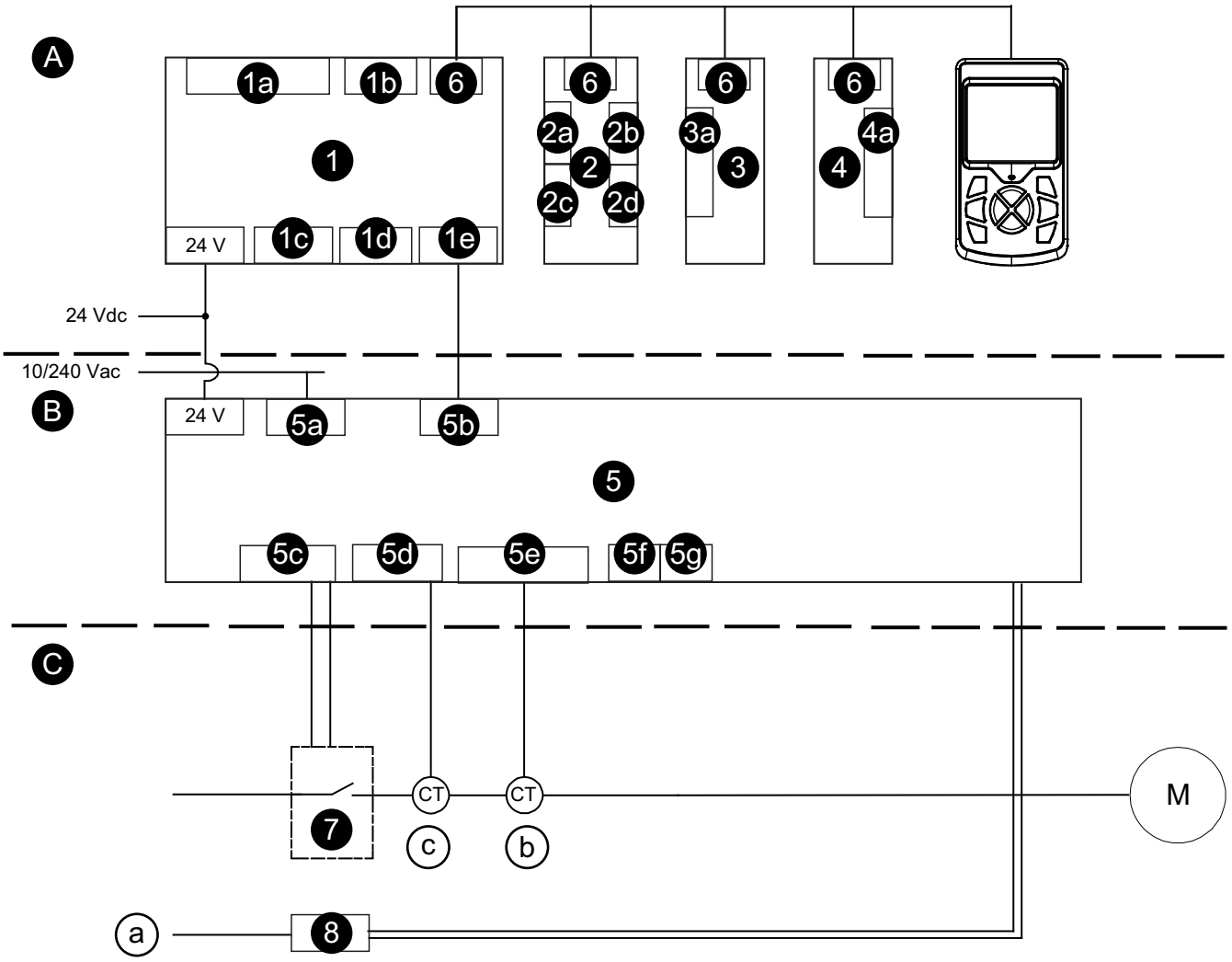
Typical ATL schematic when using MotorSeT Advanced Motor Control System

Figure 30 - Typical Connection Diagram — S2–Controlled ATL

NOTE: In order to show all details of a typical connection diagram, the figure has been split into two separate drawings. The drawings connect with each other. Connectors are flagged with captions “a” to “c” (in lower case letters on white background).



A	Disconnector switch	**E**	Ground fault CT
B	Power fuses	**F**	AC motor, 4160 Vac, 3–phase
C	Current transformers	**G**	Control power fuses
D	Main contactor	**H**	Control transformer



A	Operational controls		
	1	Plant Interface Module (PIM)	
		1a	Digital inputs
		1b	Modbus
		1c	Relay outputs
		1d	Analog outputs
		1e	Fibre
	2	I/O module	
		2a	Analog inputs
		2b	Analog outputs
		2c	Digital inputs
		2d	Digital outputs
	3	RTD module	
		3a	RTD inputs
	4	Communications module	
		4a	Fieldbus

	6	Bus	
B	Switchgear controls		
	5	Motor Control Module (MCM)	
		5a	Mains
		5b	Fibre
		5c	I/O
		5d	Ground fault
		5e	Phase current
		5f	Line voltage
		5g	Load voltage
C	Switchgear		
	7	Main contactor	
	8	Divider card	

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

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