



MASTER BREAK LIS

Medium Voltage Load Interrupter Switch
with VD4 Evolution Breaker



Applications:

Spike Electric Controls Master Break LIS provides reduced Arc Flash incident energy levels for customers on their existing MV equipment. This new solution product includes a fixed-mount VD4 Evo vacuum circuit breaker (VCB) in the fused compartment of LIS. Operating in three cycles, the fast-acting SecoVac VCB offers a new adds an Arc Flash mitigating solution designed in response to upholding Arc Flash Safety Standards.

Features:

The Master Break LIS reduces Arc Flash levels to help enhance safety and provides increased flexibility:

- Reduced Arc Flash levels from the transformer down to the LV system
- Use as a main or feeder device which can also be \ part of a line-up that includes the fusible or unfusible Master Break LIS
- Relay options that provide upstream and/or downstream communications
- Maintains the same footprint as the fusible Master Break LIS
- The added reliability and quality of an IEC-rated, fast-acting, 3-cycle Vacuum Circuit Breaker with embedded pole technology

- Protection provided via the latest relay technology including bus and transformer differential options

Standards and Approvals:

- American National Standards Institute (ANSI) Applicable sections of: ANSI/IEEE C37.20.3, C37.20.4, C37.22 - as existing and installed.
- IEC-62271-200 Standard
- National Electrical Code (NEC)

Note: The Master Break LIS includes low voltage control wiring from the VD4 Evo circuit breaker and current transformers to terminal blocks located in the LV Compartment. Before energizing, contact Spike Field Services or qualified personnel for wiring and programming of the factory-installed SEL-751 feeder protection relay or any customer- specified or provided relays or components.

Standard Features:

- Copper silver-plated bus
- Full length ground bus
- Polyester coat paint
- ANSI 61 paint color (gray)
- Oversized viewing window
- Full height inter-phase barriers
- 11 gauge doors, barriers and covers

- Generous cable termination area
- Permanent non-corrosive nameplate
- Individual doors over switch and fuses
- Concealed door hinges
- Switch padlock provisions
- Key interlock provisions
- Split rear and side covers
- Tungsten-tipped arc interrupting blade
- Mechanical switch and door interlocking
- Louvered ventilation at top and bottom
- Safety horizontal barrier

Standard Outdoor Features:

- Removable filters for louvers
- Long life space heaters
- 4" channel base
- Sloped roof
- Bottom closure plates
- Rodent barriers

Optional Accessories and Features:

- UL / cUL listing
- Copper tin-plated bus
- Insulated bus and bus boots over joints
- 80kA momentary bus rating
- Automatic transfer switch
- Weather resistant
- Dust resistant
- NEMA 2 drip-proof enclosure
- Rear doors (full height or double)
- Vertical barriers
- Rodent barriers
- Bottom closure plates
- Seismic Zone 4 bracing
- Tamper resistant hardware
- Auxiliary switches (2NO-2NC)
- Thermostat
- Space heater (standard on outdoor, optional on indoor)
- Porcelain insulators
- Customer metering
- Surge arresters
- Mimic bus
- Space heater switch
- Ground studs
- Convenience light
- Duplex receptacle
- Top hat
- Run back bus
- And more!



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VD4 Evo Breaker for Quality Protection:

VD4 Evo circuit breaker is a three-phase AC indoor breaker with 17.5kV rated voltage. It is used for control and protection of electrical equipment in industrial and mineral enterprises, power plant and substations. Durable and reliable, the VD4 Evo breaker is especially suited for conditions that require frequent operation.

The VD4 Evo series MV embedded pole vacuum circuit breaker (VCB) uses Automatic Pressure Gelatin (APG) technology to embed the vacuum interrupter and connection terminals within epoxy resin. The embedded pole technology simplifies pole assembly and provides increased assembly accuracy and quality. Embedded pole technology also improves the environmental-resistant capability of the breaker. The primary circuit is completely embedded in epoxy resin, which minimizes the risk of insulation fault caused by operating environment conditions such as dust, humidity, vermin, polluted ambient and high altitudes.

VD4 Evo Breaker Features:

Breaker Mechanism

All the mechanical parts of the mechanism are integrated into opening and closing modules individually. The closing and opening modules are universal to the entire series of VB2 Plus embedded pole vacuum circuit breakers. This design offers reduced likelihood of mechanical readjustment, reducing your operation and maintenance costs.

Differential Relay Options

The Master Break LIS includes all major components including the Load Interrupter Switch, VD4 Evo vacuum circuit breaker, and the choice of a SEL-751 feeder protection relay or other specified relay.



- Basic mechanical kinematic chain anomalies detection
- Accessories monitoring and replacement suggestions
- Loose connections detection and CB contacts monitoring
- Predict CB mechanical failures
- Advanced thermal checks & VI life
- Advanced mechanical chain and travel curve monitor

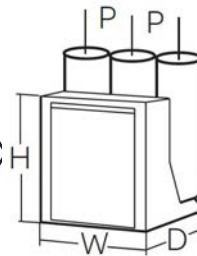


VD4 Rating Tables

Rated and Insulation voltage	kV	17.5
Withstand voltage (1min)	kV	38
Impulse withstand voltage	kVp	95
Rated frequency	Hz	50-60
Rated normal current	A	1250
Rated breaking capacity and rated		
Short-time withstand current (3s)	kA	40
Making capacity	kAp	104
Mechanical endurance	Close-Open	10,000
Operating sequence		O-0.3s -CO-15s-CO
Opening time	ms	33...60
Arc time	ms	10...15
Total interruption time	ms	43...75
Closing time	ms	30...60
Overall dimensions (withdrawable version)	H mm	589
	W mm	450
	D mm	424
	P mm	150
Weight	Fixed	Kg (approx.) 81
	Withdrawable	Kg (approx.) 111

H = Height of the circuit breaker
W = Width of the circuit breaker
D = Depth of the circuit breaker

P = Pole horizontal center distance
* New upcoming ratings will also be available soon.





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Complete health status assessment for intelligent operation and maintenance

30%

Reduction of
unexpected outages



Reliability

60%

Operation and maintenance
efficiency increase



Efficiency

15%

Footprint optimization
and time savings



Productivity



Improve your OpEx by cutting outages and maintenance cost with the future of medium voltage circuit breakers

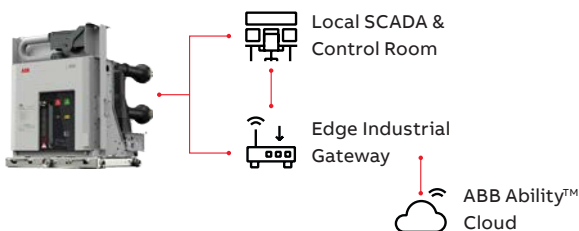
VD4 is now available with the new VD4 evo series of accessories and configuration coming from the ABB family of Digital components. VD4 evo can be ordered with different configurations specific for your need: either fully equipped device option for Advanced Monitor & Diagnostic features or as a standard configuration, but with possibility of future upgrade. Check the accessories section of the catalogue for the full list.

The most compact medium voltage circuit breaker selection for your application

New most compact 17kV 40kA breaker to enable 15% of space saving*. New features include also a new QR CODE for enhanced product interaction and EPD green certification.

Interfaces

Edge + Cloud



Local and remote access



On-premise real time
local data availability



Condition monitoring and
advanced diagnostic



Notification of warnings
and alarms



Data historian

Cloud Asset Management



Data gathering from
additional resources



Asset overview and
reporting



Advanced analytics

OPTIONAL
Coming soon



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SEL-751

Feeder Protection Relay



2 ms arc-flash protection and feeder relay in one platform

- Support low-energy analog (LEA) voltage sensor inputs and Rogowski coil or low-power current transformer (LPCT) inputs in small-enclosure installations.
- Detect open-phase conditions with phase discontinuity detection logic.
- Prevent faults caused by broken conductors on single-circuit lines using broken-conductor detection, and mitigate possible fire hazards.
- Safely re-energize your system after an extended outage with the cold-load pickup element.
- Improve network recovery via alternate paths in a network with the Rapid Spanning Tree Protocol (RSTP).





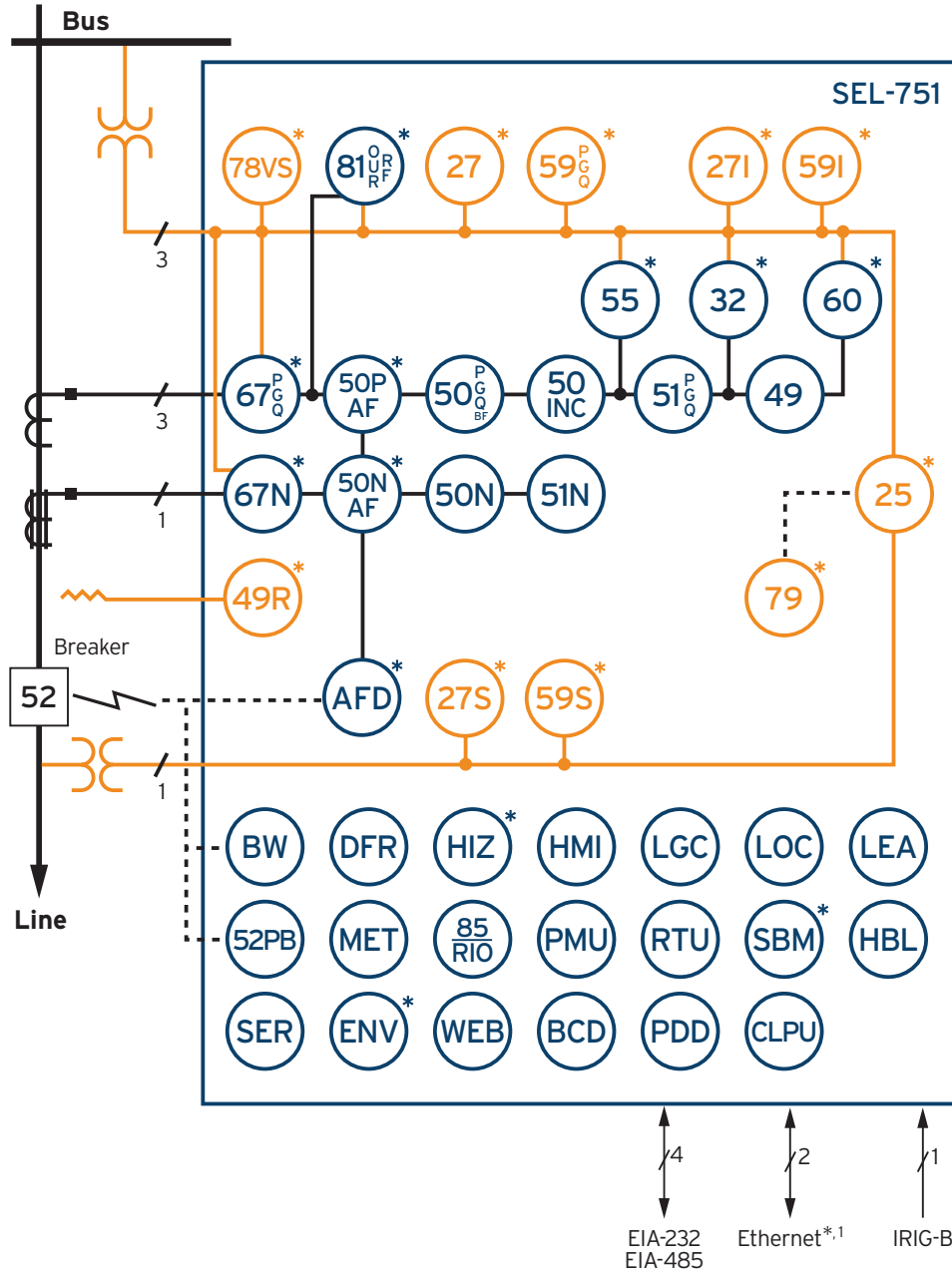
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Powered By: **ABB**

Functional Overview



*Optional Feature ¹Copper or Fiber-Optic



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ANSI Numbers/Acronyms and Functions

25	Synchronism Check*
27	Definite-Time Undervoltage*
27I	Phase Undervoltage With Inverse Characteristic*
27S	Synchronism-Check Undervoltage*
32	Directional Power*
49	IEC Cable/Line Thermal
49R	RTD Thermal*
50	Adaptive Overcurrent
50 (P,G,Q)	Overcurrent (Phase, Ground, Negative Sequence)
50BF	Breaker Failure
50INC	Incipient Cable Fault Detection
50N	Neutral Overcurrent
50N AF	Arc-Flash Neutral Overcurrent*
50P AF	Arc-Flash Phase Overcurrent*
51 (P,G,Q)	Time Overcurrent (Phase, Ground, Negative Sequence)
51N	Neutral Time Overcurrent
52PB	Trip/Close Pushbuttons
55	Power Factor*
59 (P,G,Q)	Definite-Time Overvoltage (Phase, Ground, Negative Sequence)*
59I	Overvoltage With Inverse Characteristic*
59S	Synchronism-Check Overvoltage*
60	Loss of Potential*
67 (P,G,Q)	Directional Overcurrent (Phase, Ground, Negative Sequence)*
67N	Directional Neutral Overcurrent*
78VS	Vector Shift*
79	Autoreclosing*
81 (O,U,R,RF)	Over-/Underfrequency (Rate, Fast Rate)*

Additional Functions

85 RIO	SEL MIRRORRED BITS® Communications
AFD	Arc-Flash Detector*
BCD	Broken Conductor Detection
BW	Breaker Wear Monitoring
CLPU	Cold-Load Pickup
DFR	Event Reports
ENV	SEL-2600 RTD Module Support*
HBL	Harmonic Blocking
HIZ	SEL Arc Sense™ Technology (AST)*
HMI	Operator Interface
LDE	Load Encroachment
LDP	Load Data Profiling
LEA	Rogowski Coil or LPCT Inputs and LEA AC Voltage Inputs (8 Vac RMS)
LGC	SELogic® Control Equations
LOC	Fault Locator
PDD	Phase Discontinuity Detection
PMU	Synchrophasors
RTD	10 Internal or 12 External (see ENV) RTD Inputs*
RTU	Remote Terminal Unit
SBM	Station Battery Monitor*
SER	Sequential Events Recorder
WEB	Web Server

*Optional Feature



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Key Features

Feeder Protection

Protect radial and looped distribution circuits with comprehensive protection capabilities, including time overcurrent, directional overcurrent, autoreclosing, over-/undervoltage, frequency, cable/line thermal, and more.

LEA Sensor Inputs

Apply the SEL-751 in medium- and low-voltage applications that use low-energy current/voltage sensors. LEA sensors for measurement of primary voltages and currents are gaining popularity, owing to their excellent linearity and wide dynamic range characteristics, reduced size, and reduced weight as well as the enhanced personnel safety they provide. The LEA current/voltage input card supports three current channels that are either Rogowski coil or low-power current inputs, three LEA voltage sensor inputs, and one 200 mA neutral input. LEA current and voltage channels accept an RJ45 connector input, and the 200 mA neutral channel accepts a terminal block input.

Expanded Arc-Flash Solutions

Improve safety with options for either four or eight arc-flash detection (AFD) inputs to improve arc-flash coverage. The SEL-751 Feeder Protection Relay offers combined light and high-speed overcurrent detection for arc-flash events. This combination provides the ideal solution for speed and security.

Sensitive Earth Fault (SEF) Protection

Improve ground protection with the 200 mA neutral input. You can protect ungrounded, solidly grounded, Petersen coil-grounded, or other impedance-grounded systems with a sensitive 67N or 50N element for directional or nondirectional ground overcurrent, respectively.

High-Impedance Fault Detection

Detect downed conductors, even on poorly conducting surfaces, with Arc Sense technology (AST). AST algorithms detect arcing produced by some high-impedance faults and will send an alarm or trip the breaker. This technology provides an added level of protection over conventional feeder protection methods.

Islanding Protection

Detect islanding conditions using the vector shift function. The SEL-751 quickly identifies waveform changes during islanding operations and provides logic to support a systematic response to changing grid conditions.

Cold-Load Pickup Element

Cold-load pickup is the phenomenon that takes place when a distribution circuit is re-energized following an extended outage of that circuit. Cold-load pickup can result in current levels that are significantly higher than normal peak load levels. This excess amount of current draw could be falsely identified as an overcurrent condition by the relay. The cold-load pickup element identifies possible cold-load pickup events per the settings in a distribution line after an outage.

Incipient Cable Fault Detection

Cable insulation degrades over time. The incipient cable fault detection element can monitor for self-extinguishing, half-cycle overcurrent events that precede typical cable insulation failure. Monitoring the number of incipient faults can provide an early warning of cable insulation breakdown for preventative maintenance.

Automation and Control

Apply the SEL-751 on feeders to provide protection, automation, and control capabilities, all in one package. SELogic torque control equations support many automated applications without the need for additional automation controllers. The configurable front-panel pushbuttons can replace conventional panel controls and simplify overall applications and wiring. The 14 digital inputs (DI) card option expands available contact inputs for enhanced automation solutions.



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Thermal Protection

Protect cable and feeder insulation against thermal damage using the IEC 49 cable/line thermal element. It extends conductor life and provides backup protection for the overcurrent elements.

Event Analysis

Conduct post-event analysis more efficiently with detailed event records. You can combine oscillographic and digital information to find root cause. Adding a satellite-synchronized time source, like an SEL satellite-synchronized clock (e.g., SEL-2401 or SEL-2407®), provides convenient alignment of event information from multiple devices.

Reliable in Harsh Environments

All SEL relays are designed to operate in harsh environments where other relays may fail. The SEL-751 operates in extreme conditions, with an operating temperature of -40° to $+85^{\circ}\text{C}$ (-40° to $+185^{\circ}\text{F}$), and is designed and tested to exceed applicable standards, including vibration, electromagnetic compatibility, and adverse environmental conditions. In addition, the SEL-751 is ATEX- and Underwriters Laboratories (UL) Class I, Division 2-certified for use in hazardous and potentially explosive environments.

Open Conductors Detection

Apply the SEL-751 to detect and isolate open conductors. The SEL-751 incorporates phase discontinuity detection and optional broken conductor detection to provide a reliable solution for open-conductor faults that convert to high-impedance faults.

Wildfire Risk Reduction

Identify downed conductors and minimize wildfire risk by detecting high-impedance faults. SEL's unique AST detects and clears faults that might not be detected by traditional overcurrent protection.

Flexible Communications

Advanced protocols support communications using legacy and modern supervisory and control systems. These protocols include IEC 61850 Edition 2, RSTP, EtherNet/IP, the IEEE 1588 Precision Time Protocol (PTP) (firmware-based), IEC 60870-5-103, DNP3, Modbus TCP/IP, Telnet, the File Transfer Protocol (FTP), the Simple Network Time Protocol (SNTP), MIRRORED BITS communications, and ASCII. In addition, the IEC 61850 test mode in the SEL-751 enables in-service testing, which reduces commissioning time.





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Product Overview





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Touchscreen Overview

The 5-inch color display with a resolution of 800 × 480 offers direct navigation via a capacitive touchscreen.

A full onscreen keyboard facilitates easy adjustment of settings.

Folders and applications provide quick access to bay screens, metering and monitoring data, reports, settings, and more.

The home pushbutton allows users to easily return to the default home screen.

The front panel is available in English or Spanish.



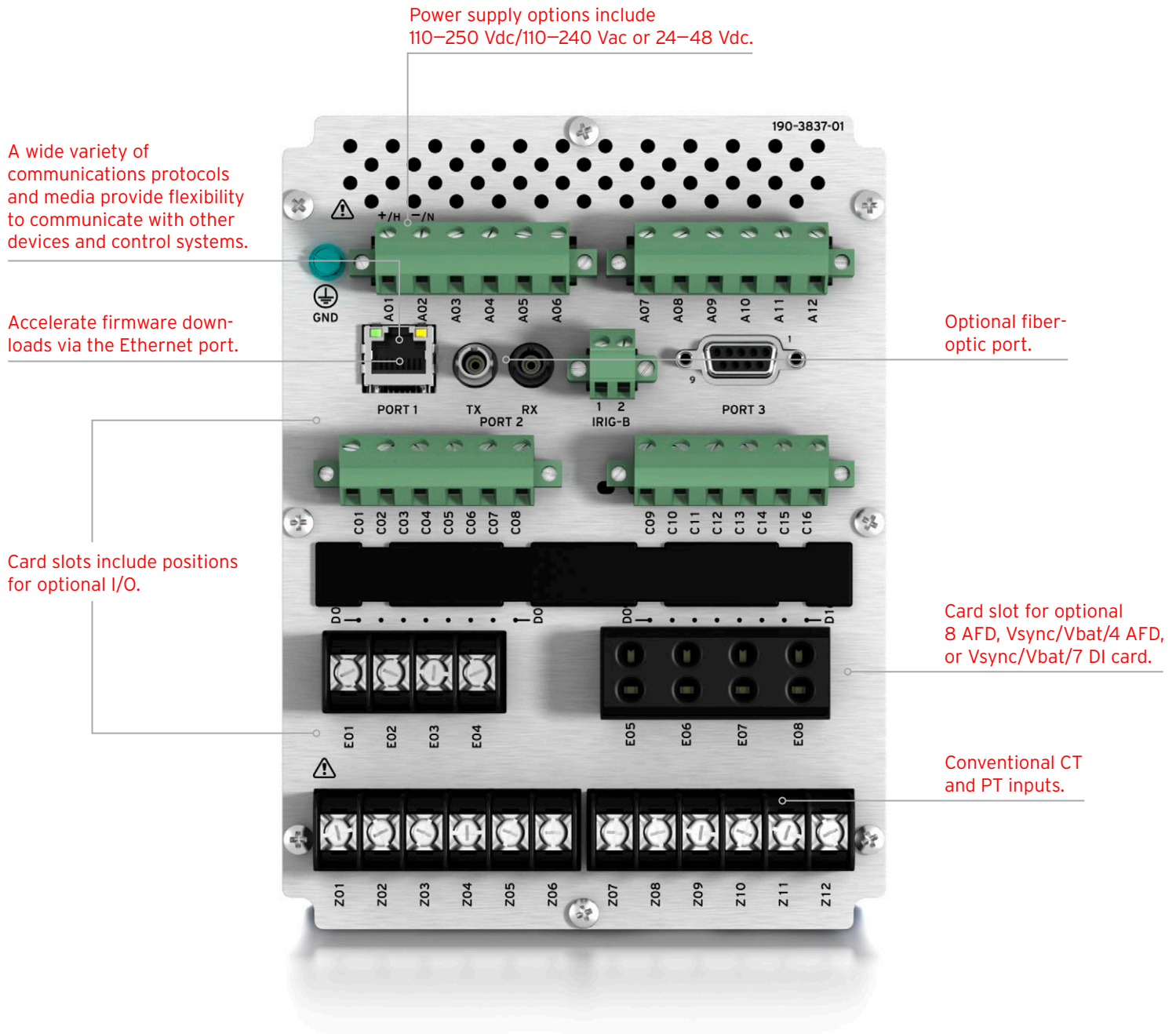


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Conventional CT and PT Input Option





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LEA Current and Voltage Inputs Option

Power supply options include
110–250 Vdc/110–240 Vac or 24–48 Vdc.

A wide variety of
communications protocols
and media provide flexibility
to communicate with other
devices and control systems.

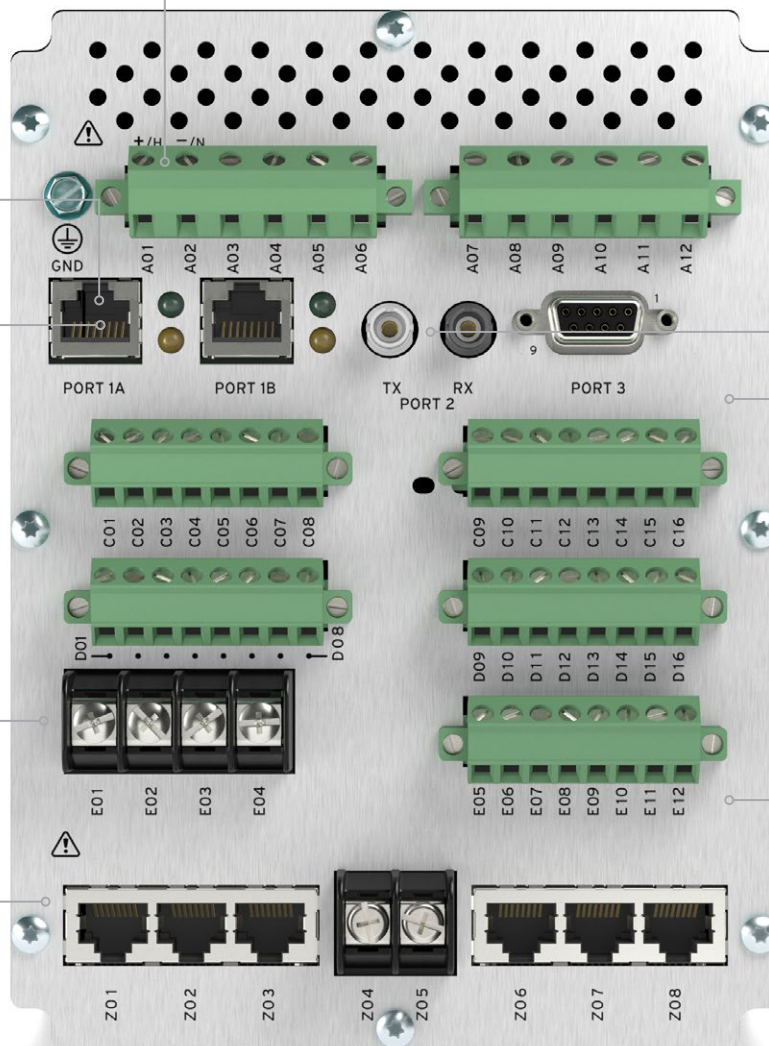
Accelerate firmware
downloads via the
Ethernet port.

Optional fiber-
optic port.

Card slot for optional
8 AFD, Vsync/Vbat/4 AFD,
or Vsync/Vbat/7 DI card.

Card slots include
positions for
optional I/O.

LEA current and
voltage sensor inputs.*



*Compliant with IEC 61869-10, -11 standards.



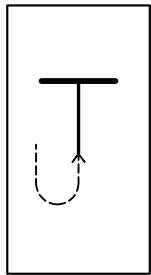
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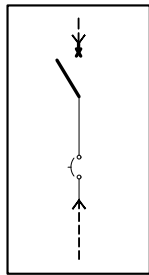


Standard Configuration Features

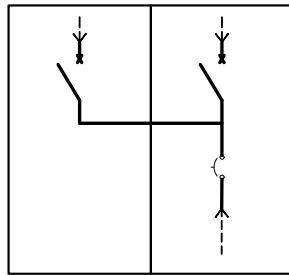
	SINGLE WITH TRANSITION TO DRY/CAST COIL	SINGLE WITH TRANSITION TO LIQUID SST
15kv switch: 42" width by 48" depth by 98.5" high	•	
27kv switch: 54" width by 80" depth by 98.5" high	•	
38kv switch: 60" width by 80" depth by 98.5" high	•	
35" width (when indoor transition)	•	
38" width (when outdoor transition)	•	
40" width (when motor operator is included) -	•	•
53" width (35" + 18" transition section) Indoor/outdoor	•	•
Standard/Reverse orientation available	•	•
60" depth standard, 50" depth available (limited components)	•	•
95"H indoor, 99"H outdoor	•	•
Front and rear access	•	•



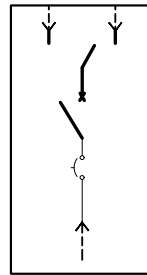
Incoming



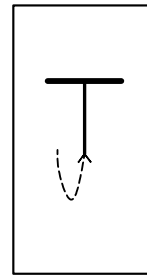
Single



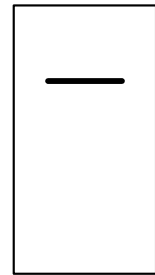
Duplex



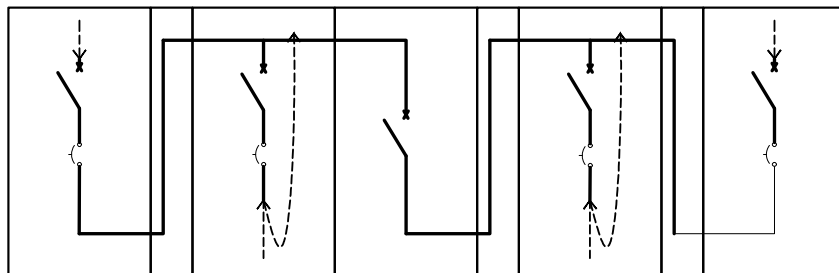
Selector



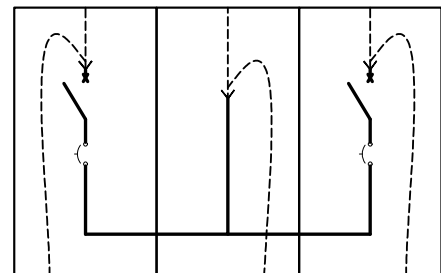
Incoming
20" / 35" W



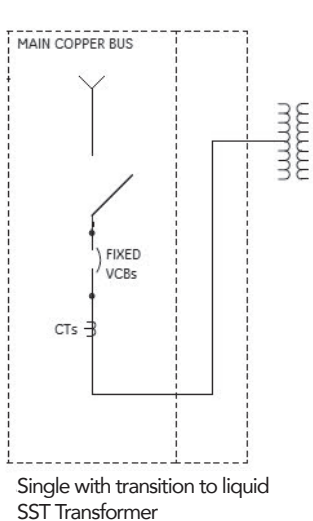
Auxiliary Sections
20" / 35" / 40 W



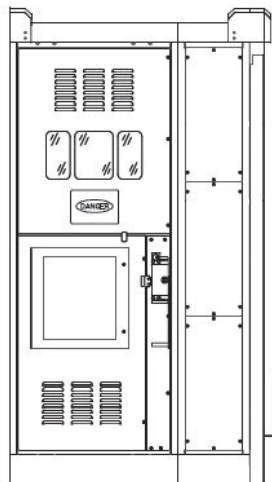
Line-up (main-tie-main)



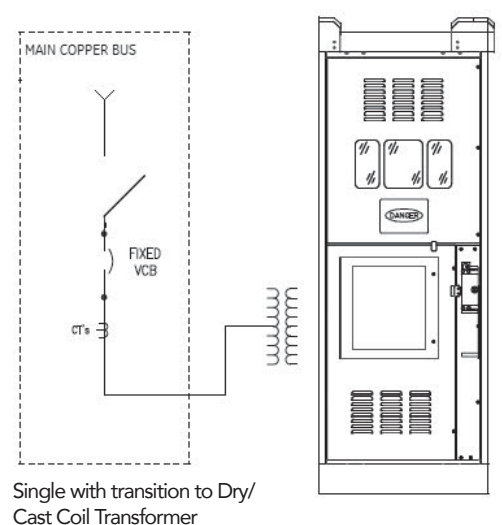
Automatic Transfer



Single with transition to liquid
SST Transformer



** Information provided is
subject to change without
notice. Please verify all details
with Spike. All values are
design or typical values when
measured under laboratory
conditions.



Single with transition to Dry/
Cast Coil Transformer