Network Protector
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New Issue

VisoVac™ fault interrupter

General

The medium voltage submersible vacuum fault interrupter from Eaton delivers economical, reliable, and flexible solutions for underground distribution and network load switching applications.

Eaton's VisoVac™ is a three-phase, submersible, load and high-fault interrupter. It includes vacuum interruption with visible isolation and visible grounding. Electrical insulation medium is air (no SF_6 gas or oil required). The vacuum interrupting mechanism can be remotely operated from a safe distance.

The VisoVac fault interrupter enclosure comes standard in stainless steel which is constructed for harsh vault and subsurface environments. The enclosure is also available in revolutionary molded high density polyethylene (HDPE) using patent-pending technology with a safe touch exterior.

The VisoVac fault interrupter is specifically designed for network distribution grids with a higher interrupting rating and higher operations, unlike alternative interrupting devices. Additionally, the VisoVac fault interrupter can be applied to any underground distribution application.

The VisoVac fault interrupter is designed and manufactured in accordance with IEEE Std C37.74™-2014 and IEEE Std C57.12.40™-2011 standards.

This innovative vacuum interrupting device yields operation savings.

- No regular maintenance
- Gas, oil and regulation free
- Advanced Eaton vacuum proven technology
- Robust, all-in-one design reduces need for extra equipment
- Manual and remote operation
- 10,000 mechanical operations
- Local isolation in networks

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Features and construction

The VisoVac fault interrupter is equipped with a local operating handle that can be placed in the OPEN, CLOSE or AUTO position. The local CLOSE functionality can be enabled or disabled at the factory based on the user's work safety procedures.

The top-side bushings can be installed on the front or rear of the enclosure. This offers flexibility on how the equipment is installed on the system. The grounding position is physically connected to the top-side bushings. Therefore, when the vacuum interrupter is OPEN and the isolation switch is OPEN it will allow the operator to ground the circuit connected to the top-side bushings.

The VisoVac fault interrupter can be mounted directly on the floor, mounted to a wall or placed on an adjustable elevating stand. Since the VisoVac fault interrupter is submersible the enclosure is pressurized with nitrogen to purge and remove any residual humidity or moisture in the enclosure which is then sealed for moisture free operation.

The switch is available in the most commonly used ac and dc voltages and comes prewired. All control wiring for power, status, control and auxiliary can be prewired to a submersible plug or to terminal strips installed in a bulkhead that resides external to the enclosure.

Visible isolation

A three-pole, group-operated, non-load break, air insulated, isolation switch is included internal to the enclosure. This feature also includes a viewing window to confirm a physical disconnect between the load and source side bushings.

Two viewing windows are installed on each side of the enclosure to clearly show that the bus of all three phases have separated. A mimic diagram physically linked to the operating mechanism shows exactly what position the isolation switch is in.

The isolation switch is mechanically interlocked internally with the vacuum interrupting load-break mechanism. Additionally, the switch comes standard with a back-up electrical interlock which causes the vacuum interrupter to OPEN should an attempt to break load via the isolation switch be performed.

The isolation switch is also mechanically interlocked internally with the grounding switch to prevent the grounding switch from being operated while the isolation switch is in the CLOSED position

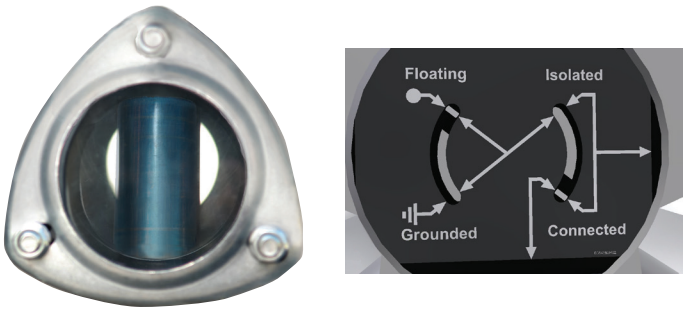


Figure 2. Visible isolation viewing window (left) and position indicator (right).

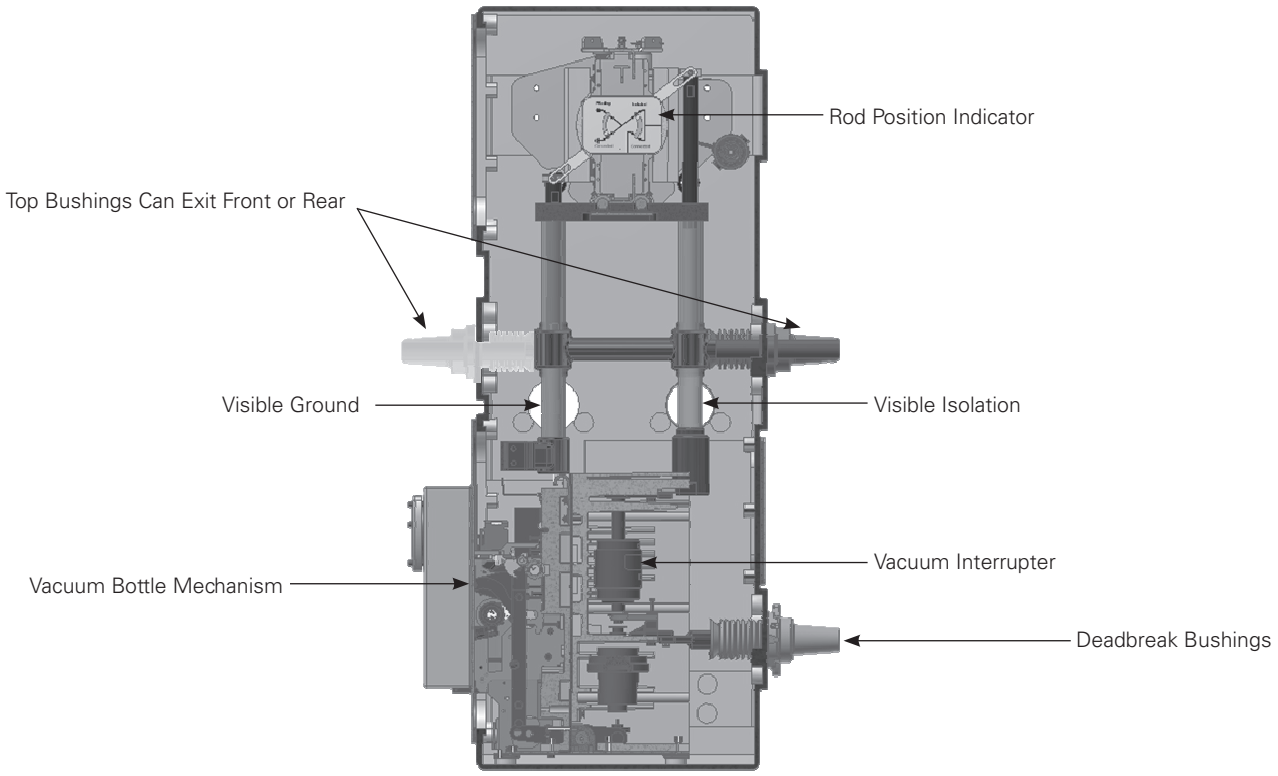


Figure 1. VisoVac fault interrupter internal layout.

Visible grounding

A three-pole, group-operated grounding switch is included internal to the enclosure. The grounding switch provides for the bus electrically tied to the top side bushings to be grounded.

The grounding switch is equipped with mechanical interlocks located internal to the enclosure to prevent operation of the grounding switch while the visible isolation switch is in the CLOSED position.

Two viewing windows installed on each side of the enclosure are provided to show that the grounding bus has made contact with all three phases electrically tied to the top side bushings. A mimic diagram physically linked to the operating mechanism shows exactly what position the grounding switch is in.

Vacuum interruption

The VisoVac fault interrupter's vacuum interrupting mechanism utilizes proven Eaton technology which allows for an exceptional 25 kA or 40 kA interrupting rating. Eaton's environmentally friendly medium voltage interrupters are capable of reliably switching high-stress currents robustly and carrying their rated continuous current without forced cooling.

The interrupting mechanism was designed for applications where space is a premium such as subsurface/vault environments. The load break mechanism is available with up-to a 900 A continuous current rating and comes with a mechanical endurance of 10,000 operations.

The three-phase vacuum interrupter can be opened manually or remotely via SCADA, protective relaying or pendant. The vacuum interrupter is equipped with a mechanical indicator and non-resettable operations counter.

Eaton vacuum interrupters are the industry standard in quality.

- Each Eaton vacuum interrupter is tested throughout the manufacturing process and once again before packaging
- A dielectric withstand test and a vacuum assurance test are performed on every interrupter
- Additionally, Eaton also incorporates a sequential bar code that allows us to track material lots, as well as the operators involved with building each interrupter in a database
- With well over three million Eaton vacuum interrupters in service around the world, our customers testify that our vacuum interrupters are one of the most critical and reliable components

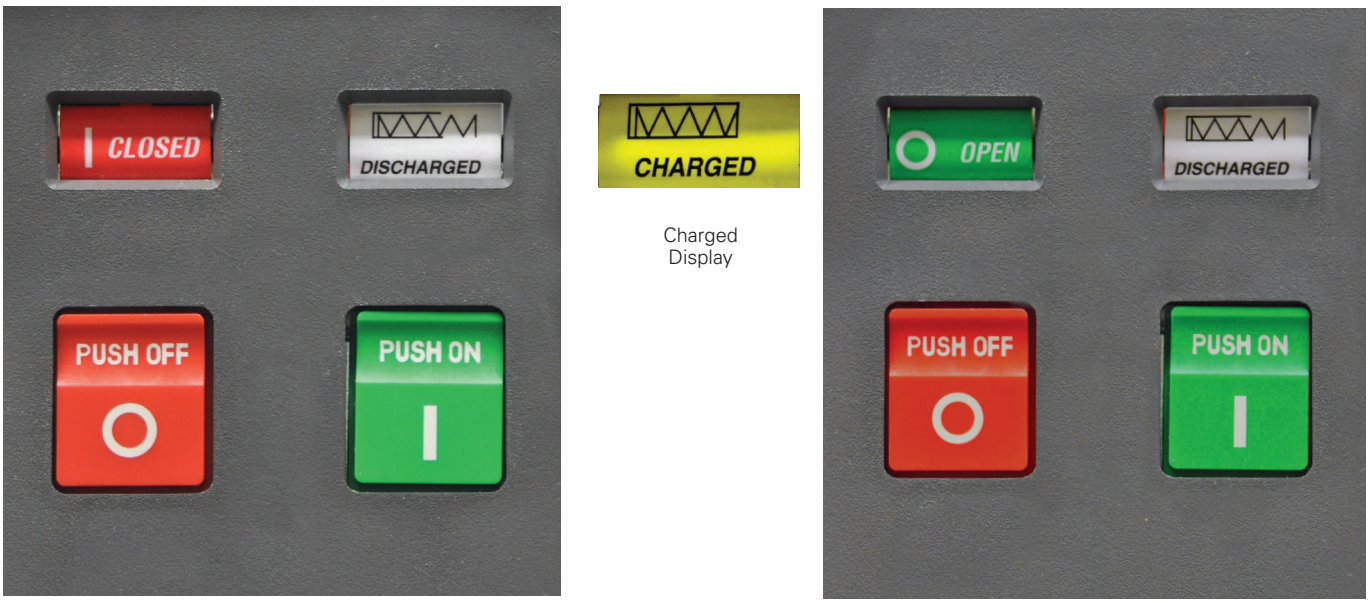


Figure 3. Vacuum interrupter status indicator. Left image shows status indicator in the closed position, the image on the right shows the status indicator in the open position.

Sequence of operations

In this position the vacuum interrupter and visible break are CLOSED. The grounding position is OPEN and the isolation rod is energized.

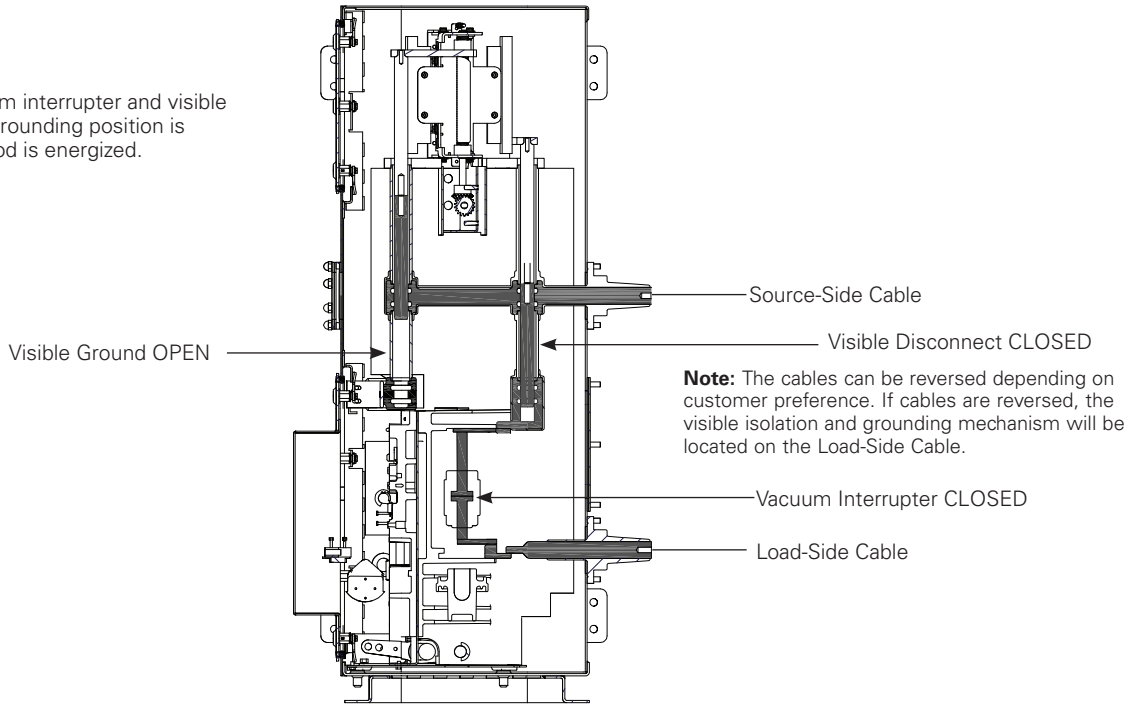


Figure 4. Service position.

In this position the vacuum interrupter is OPEN and the visible break are CLOSED. The grounding position is OPEN and the isolation rod is energized up to the vacuum contact. The Load-Side Cable is De-energized.

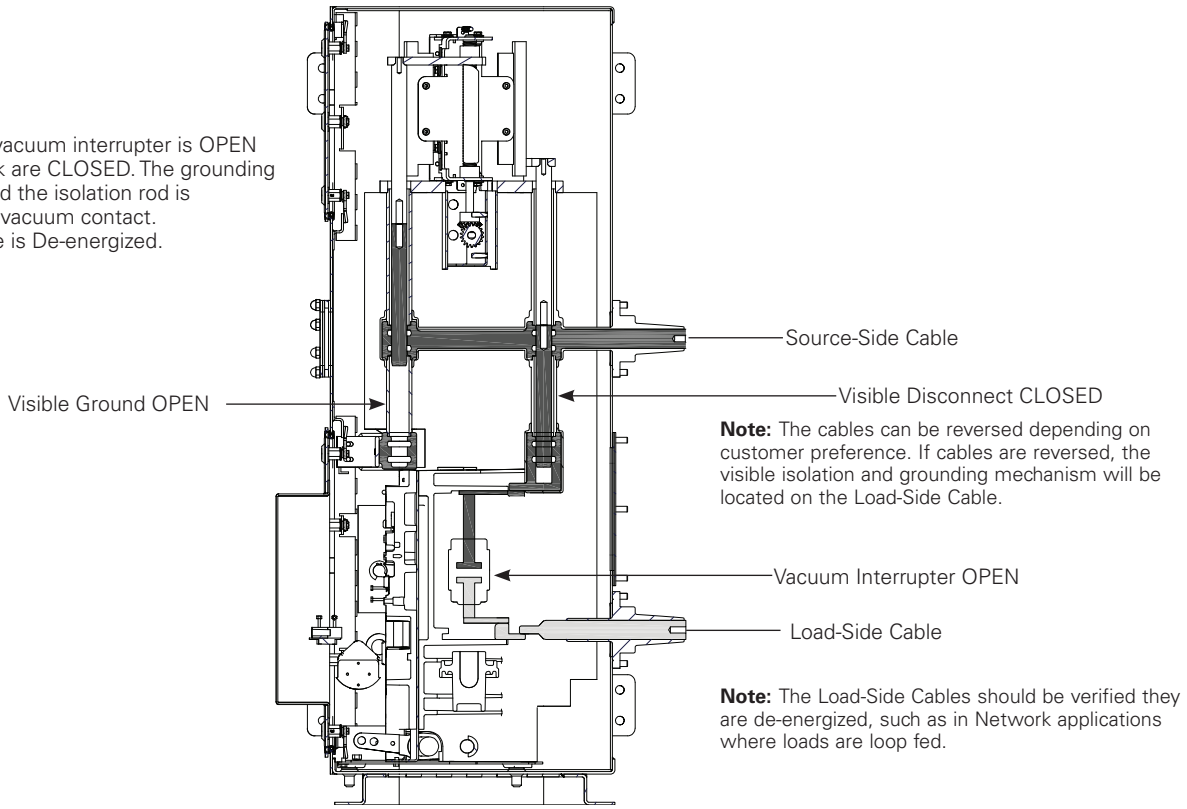


Figure 5. Disconnect position.

In this position the vacuum interrupter and visible break are OPEN. The grounding position is OPEN and the visible isolation from the source-side cable is attained.

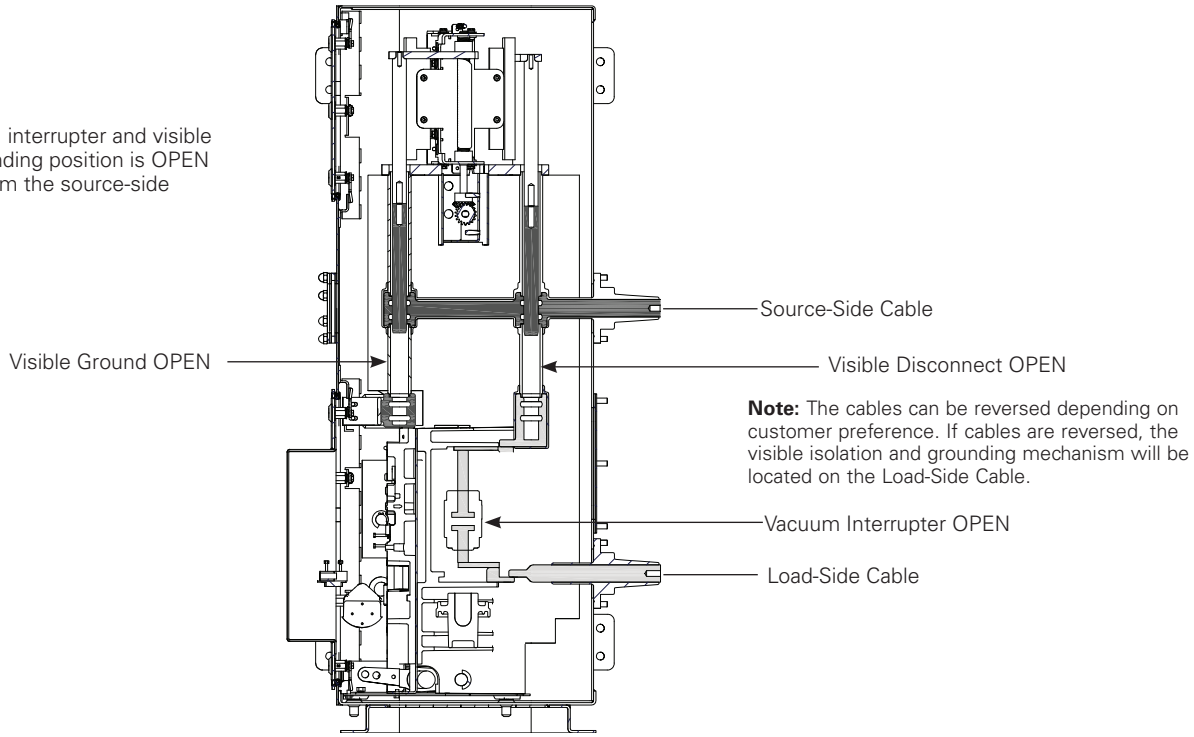


Figure 6. Disconnected position (with visible break).

In this position the vacuum interrupter and visible break are OPEN. The grounding position is CLOSED and the visible isolation rod is OPEN and de-energized.

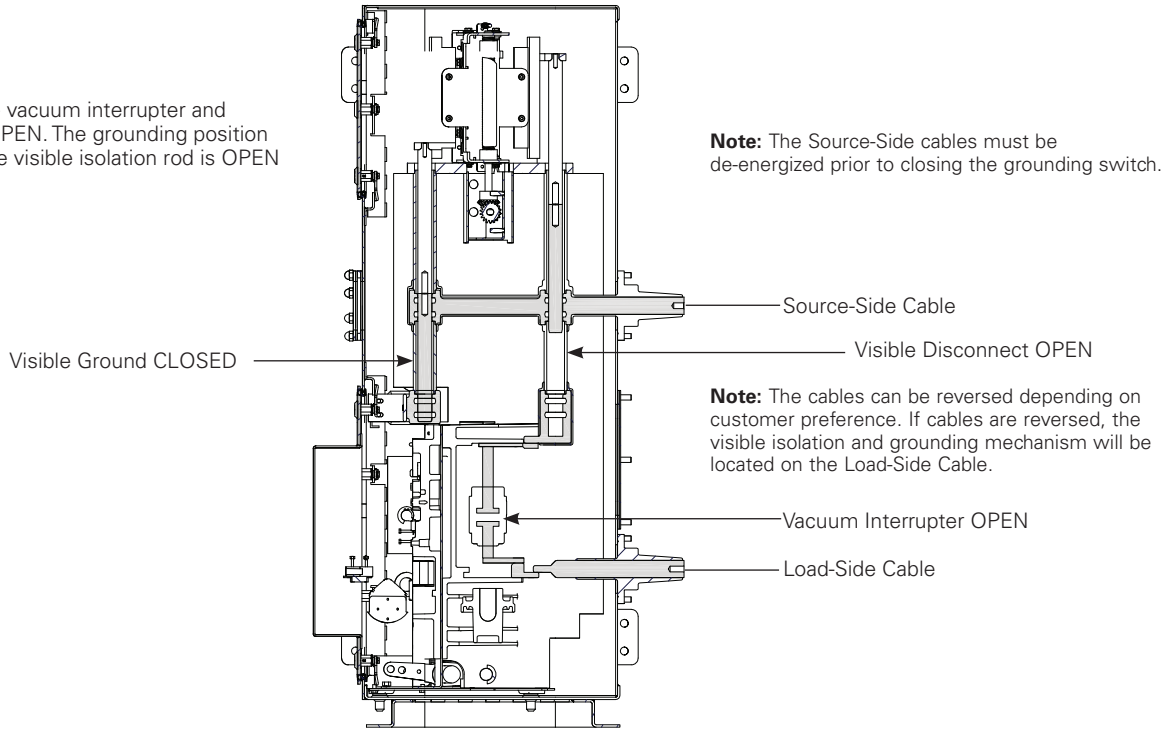


Figure 7. Disconnected position (with visible break and visible ground).

Ratings and specifications

Table 1. General Specifications

Feature	25 kA	40 kA
Rated Maximum Voltage, 50/60 Hz		
Maximum Design Voltage, kV	15.5/17.5	15.5/17.5
Impulse Withstand Voltage		
Line to ground (kV BIL)	95	95
Open Contact (kV BIL)	95	95
Withstand Voltage, 60 Hz		
1 min withstand, ac kV	35	35
5 min withstand, dc kV	53	53
Continuous Current, 50/60 Hz (A)	600/900	600/900
Load Break Current, 50/60 Hz (A)	600/900	600/900
Momentary Withstand (asym pk.)	65	104
1s sym withstand rating, kA	25	40
Sym interrupting rating, kA	25	40
Fault Close (asym pk.)	65	104
5s withstand in ground position, kA	15	15
0.2 withstand in ground position, kA	45	45
Mechanical Operations	10,000	10,000
High Density Polyethylene weight (lb/kg)	475/215	750/340
Stainless Steel weight (lb/kg)	590/268	840/381

Applications

Network primary switching and protection

The VisoVac fault interrupter is an ideal solution for primary switching on network systems. In many cases, utilities are required to open the network primary feeder at the substation often dropping other network transformers tied to the same feeder before maintenance can be performed in the vault or on that particular network transformer and protector.

The VisoVac fault interrupter can be installed to provide load break switching of the primary source right at the transformer. Additionally, a visible break is provided so that crews can see that the primary voltage has been physically removed from the source of the network transformer.

The VisoVac fault interrupter also comes equipped with a visible grounding position. The visible isolation and grounding switch can be installed on the load or source side of the vacuum interrupter. This typically varies based on the user's application requirements and safety practices.

Network maintenance has never been safer with the addition of the VisoVac fault interrupter. Crews can have remote operation and a visible disconnect of the primary source. Additionally, using it with Eaton's VisoBlock disconnect switch, crews can have a secondary visible break equipped with remote or local operation.

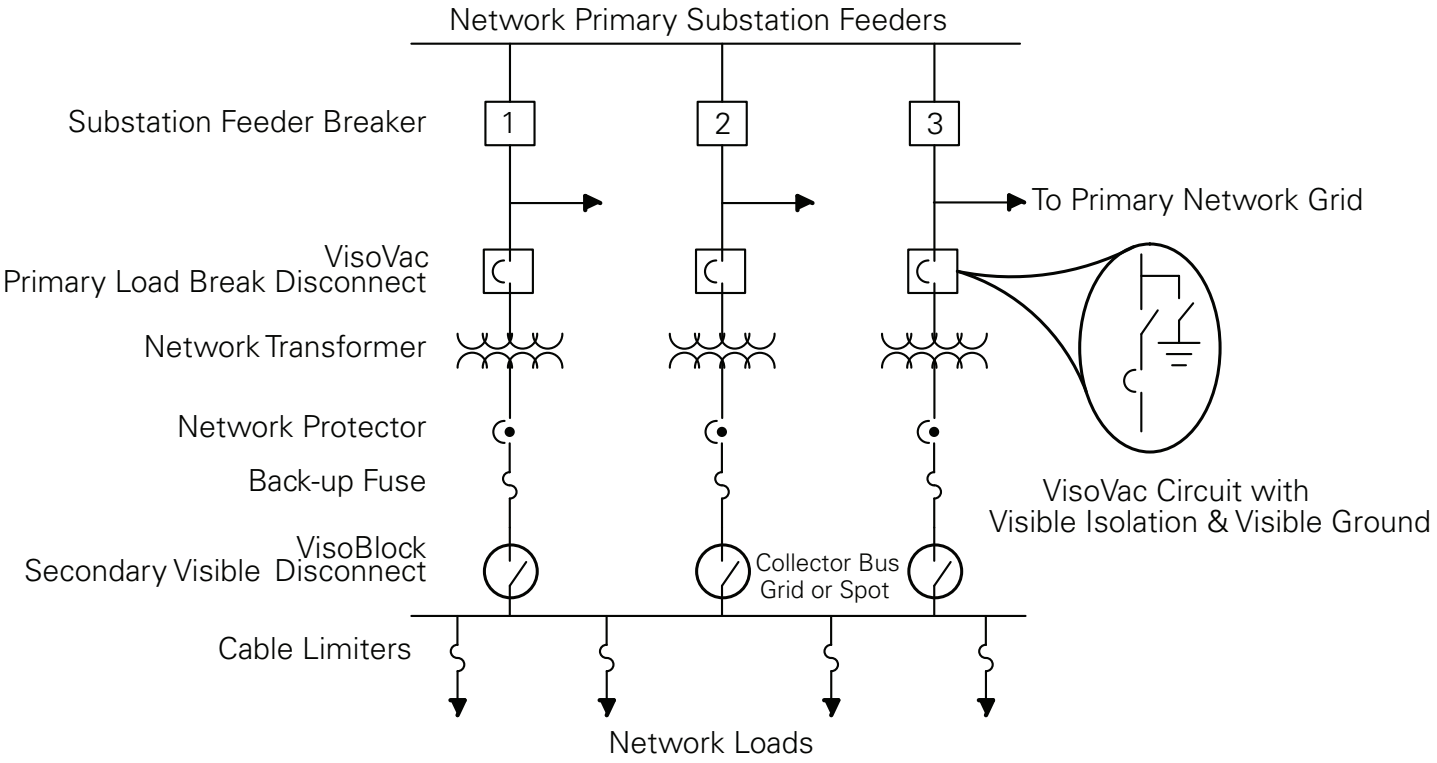


Figure 8. Grid and spot network applications.

Underground distribution sectionalizing

The VisoVac fault interrupter is an ideal solution for underground distribution sectionalizing. The VisoVac fault interrupter can be installed to provide local isolation and three-phase overcurrent protection for radial loads. Alternatively, the VisoVac fault interrupter can be used for single-ways or up to six-way switching configurations with or without the visible isolation and visible grounding. Utilizing Eaton's configured-to-order services, a solution can be designed to tailor fit the end user's requirements. The VisoVac fault interrupter can be placed inside an enclosure for pad-mounted applications. Enclosures conform to the security requirements of IEEE Std C57.12.28™-2005 standard.

The VisoVac fault interrupter is also available with an Eaton Digitrip controller that allows for unique control settings, overcurrent protection and the ability to communicate with utility feeder automation systems such as Eaton's Cooper Power™ series Yukon™ Feeder Automation platform.

Consult your local Eaton representative for more information.

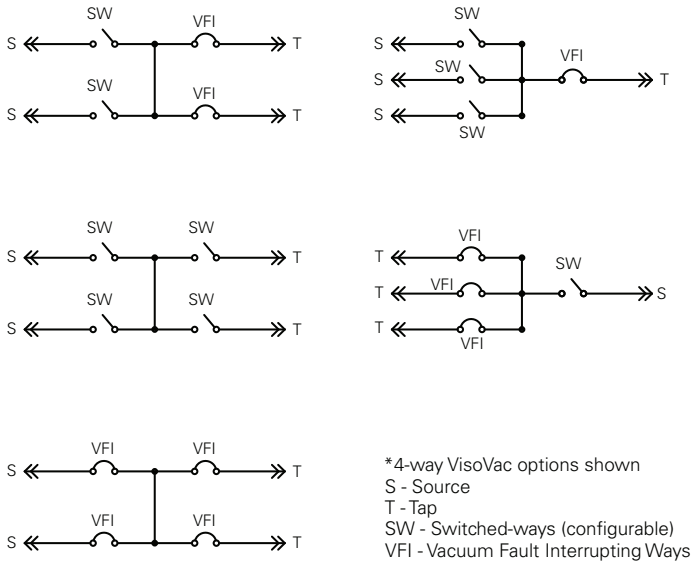


Figure 10. Example of multi-way VisoVac fault interrupter configurations.

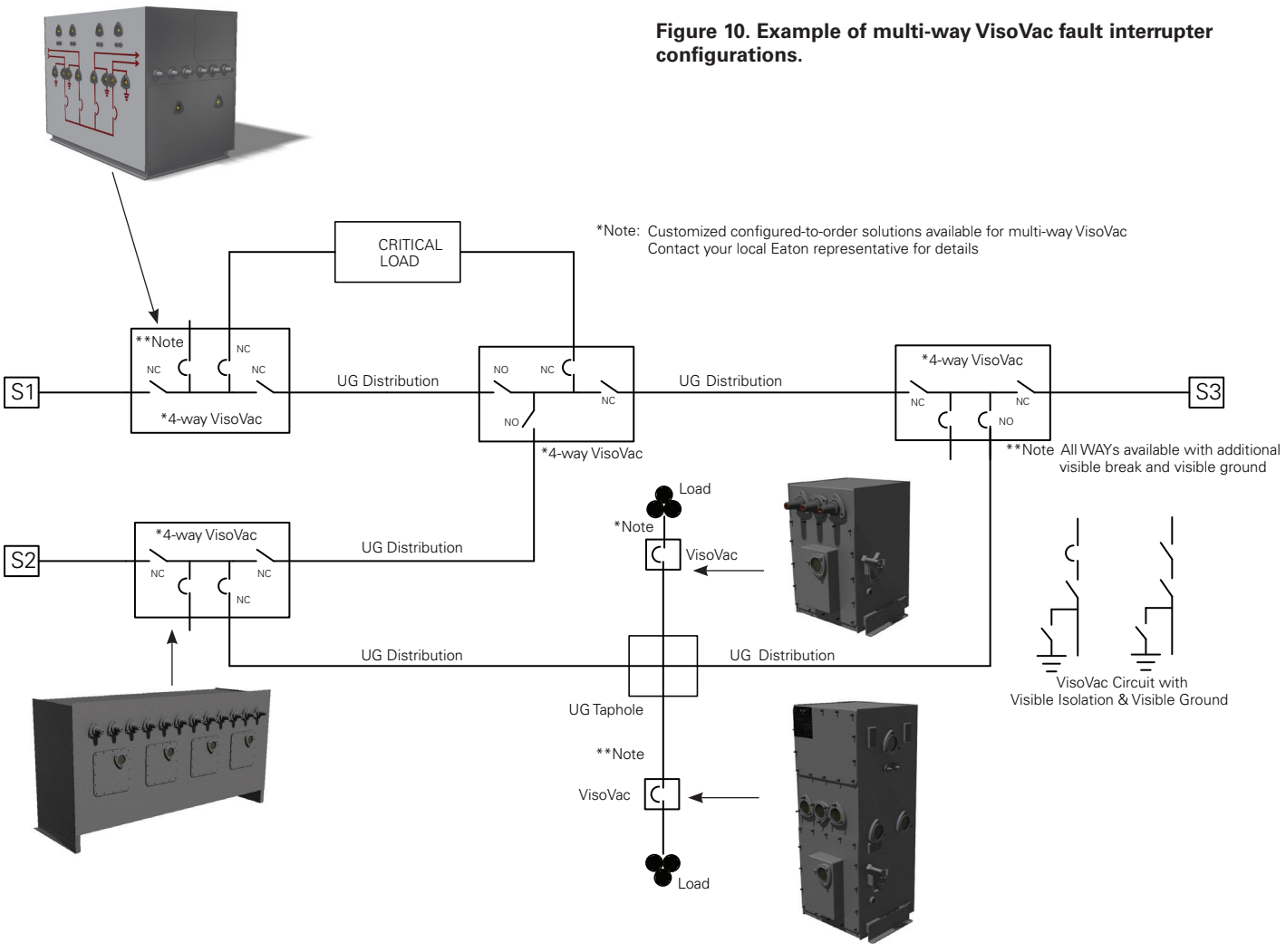


Figure 9. Underground distribution sectionalizing applications

Accessories

Bulkhead

Access for control power, auxiliary contacts, control and operation can be wired out to a submersible plug or to an external bulkhead based on application requirements.

Pendant control and/or SCADA control ready.

Pendant

Remote operation of the vacuum interrupter can be accomplished through SCADA or via a removable hand-held pendant cabled to the VisoVac fault interrupter. The pendant provides OPEN and CLOSE control of the vacuum interrupter and position indication of the isolation and grounding positions.

Digitrip 1150 V controller

The Digitrip 1150 V is used for advanced current and voltage protections, metering and communication functions.

The power required to operate the controller's basic over-current protection functions is provided by secondary output from the current sensors once the three-phase primary current through the vacuum interrupter exceeds approximately 10% to 12% of the current sensor rating or single-phase primary current exceeds approximately 30% of the current sensor rating.

The controller continuously analyzes secondary current signals from the current sensors and when preset current levels and time delay settings are exceeded, sends a trip signal to the trip actuator of the vacuum interrupter. The trip actuator causes tripping of the vacuum interrupter by providing the required mechanical force for tripping.

The trip actuator is automatically reset each time the vacuum interrupter opens. The current sensors, controller and vacuum interrupter are fully tested as a system for time-over-current response over the entire current range up to the interrupting rating of the vacuum interrupter.

Communications module

A communications module is used for remote and secure access to view or change the Digitrip settings, remote control of the VisoVac fault interrupter and gain status of the vacuum interrupter, isolation and grounding positions.

The communications module provides easy to configure data communications with the users central control system. Supports secure DNP3 and INCOM protocols.

Configured-to-order protection and control options

Eaton can provide a customized protection and control package configured to meet each user's unique application requirements. Protective relays like Eaton's Cooper Power series Edison™ Idea™ relay, relays from Schweitzer Engineering Laboratories or General Electric, or other suppliers can be designed and come ready to install. Please consult factory for details.

Figure 11. Bulkhead and submersible plug shown.

Figure 12. Pushbutton pendant four-button shown.

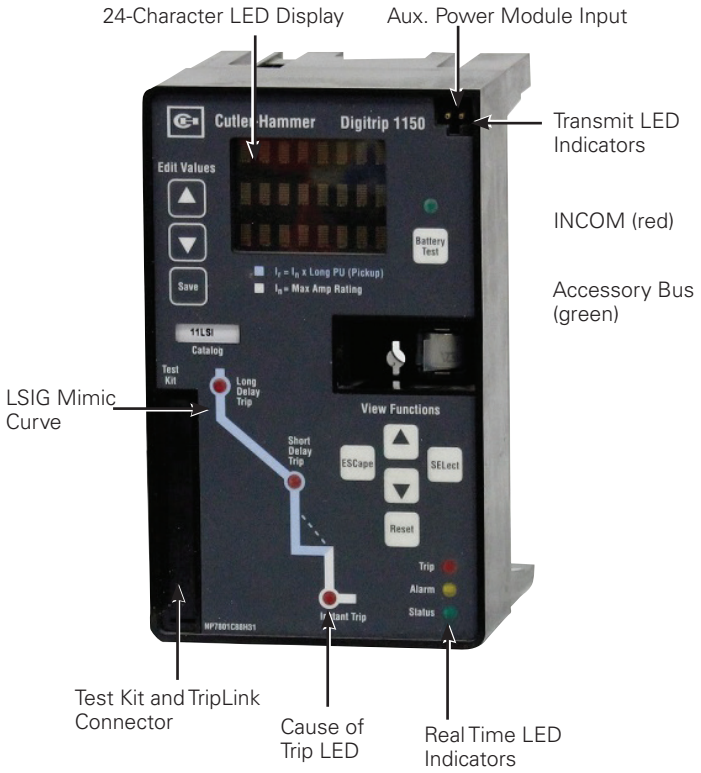


Figure 13. Digitrip 1150 V controller.

Ordering information

Table 2. Standard - Style Code[1]

VisoVac	Voltage Rating		Voltage Impulse Rating		Continuous Current Rating		Fault Withstand Rating		Enclosure Type		Operating Handle		Top-side Bushings		LV Wiring		Control Voltage		Accessories	
VS	5	15 kV	1	95 kV	6	600 A	2	25 kA	1	304 SS	R	Right Side	R	Rear Mount	BR	Bulkhead Right Side	1	24 Vdc	P	Pendant with cable[2]
	7	17.5 kV			9	900 A	4	40 kA	2	316 SS	L	Left Side	F	Front Mount	BL	Bulkhead Left Side	2	48 Vdc	D	Digitrip 1150 V controller with current sensors[3]
									3	HDPE					PR	Submersible 12-pin Plug Right Side	3	110 Vdc	C	Communication Module
															PL	Submersible 12-pin Plug Left Side	4	125 Vdc	Z	Customized Relay Panel[4]
																	5	120 Vac	X	None
																	6	220 Vac		
																	7	240 Vac		

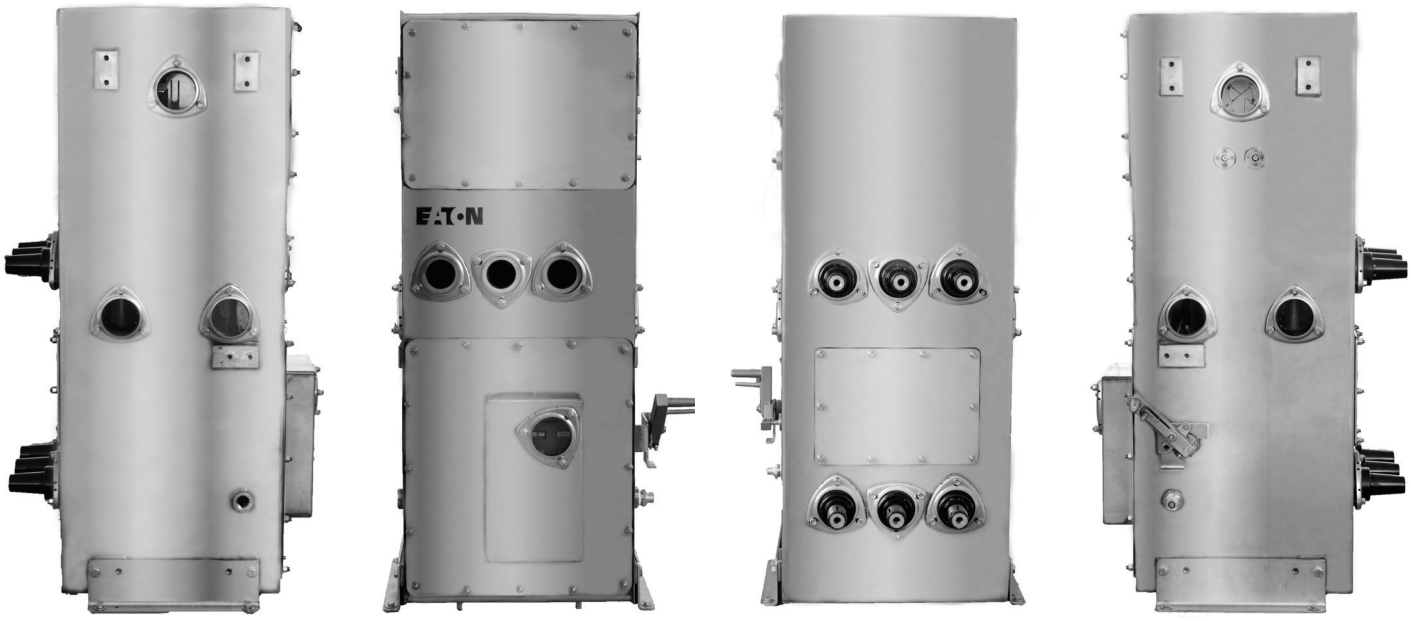
Notes:

1. Comes standard with visible break and visible ground positions
2. Cables are available in 18 and 40 foot lengths
3. Eaton current sensors required with Digitrip
4. Consult factory with application requirements for customized relay panels

Example:

VisoVac fault interrupter - 15 kV max, 600 A continuous, 95 kV BIL, 25 kA sym. int, HDPE, right-side operating handle with left-side mounted bulkhead, front mounted top bushings, 120 Vac control power with an Eaton 1150 V Digitrip, DNP3 communications and remote operating pendant.

Style Code #VS51623RFBL5PDC



Left Side View | Front View | Rear View | Right Side View

Figure 14. Left, front, rear, and right side views shown with rear mounted top bushings. Stainless steel enclosures are shown.

Dimensions

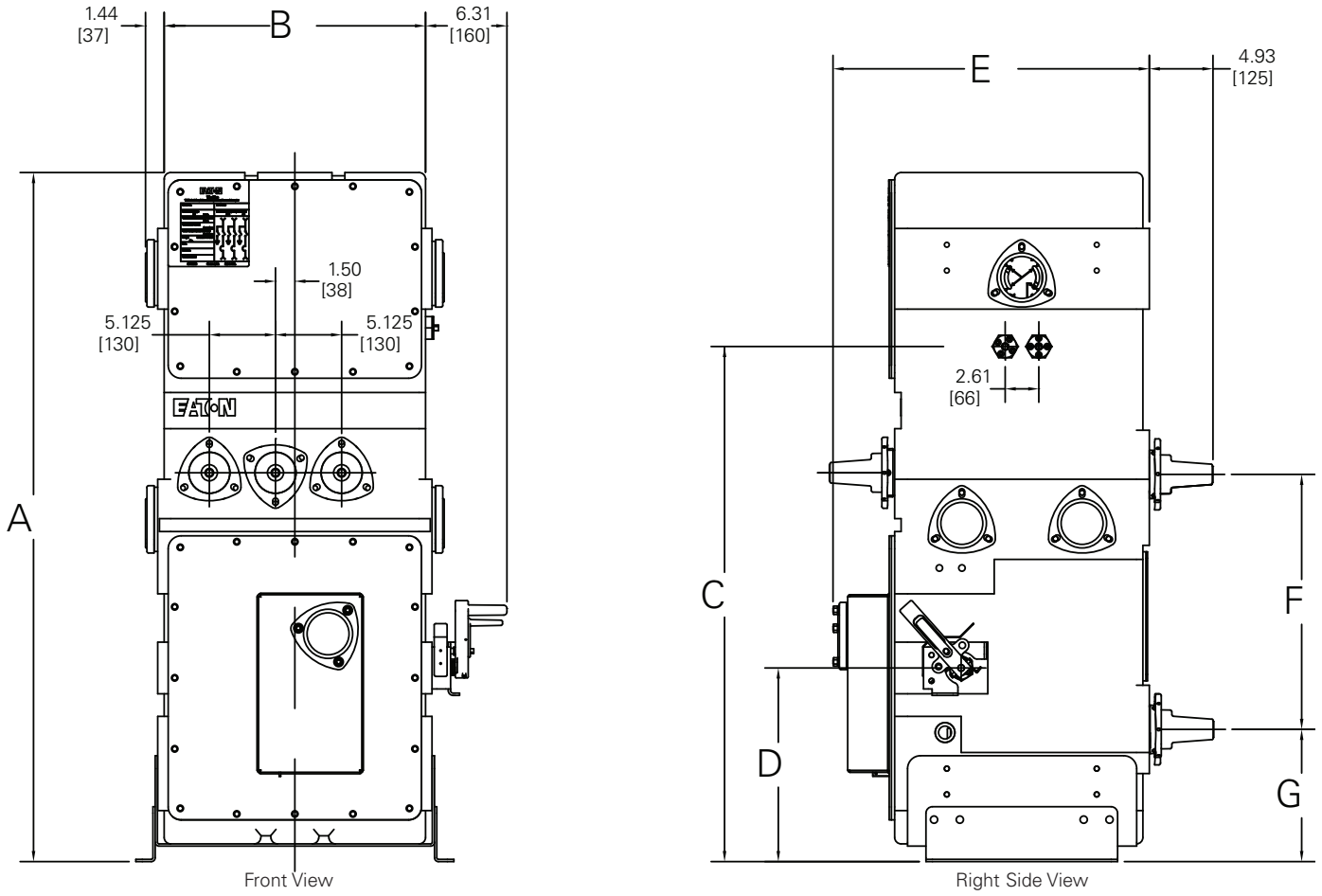


Figure 15. Standard VisoVac fault interrupter dimensions.

Table 3. Dimensional Information

	Stainless Steel		High Density Polyethylene	
Dim.	**25 kA**	**40 kA**	**25 kA**	**40 kA**
A	53.4"	58.6"	53.4"	58.6"
B	20.8"	25.1"	20.3"	24.6"
C	40.0"	45.2"	40.0"	45.2"
D	15.0"	20.2"	15.0"	20.2"
E	24.5"	24.1"	24.5"	24.1"
F	19.8"	21.5"	19.8"	21.5"
G	10.2"	13.7"	10.2"	13.7"

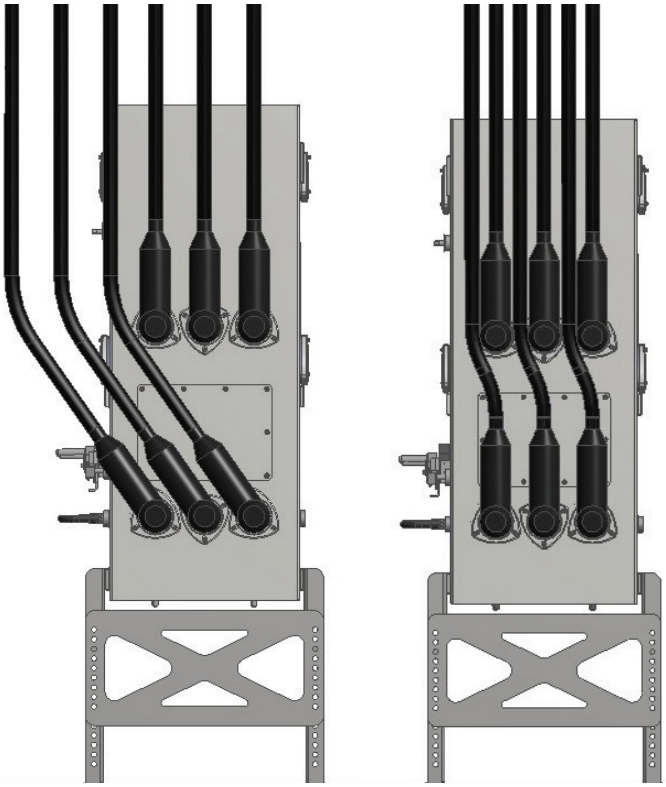


Figure 16. Top cable entry.

Figure 18. Top/bottom cable entry.

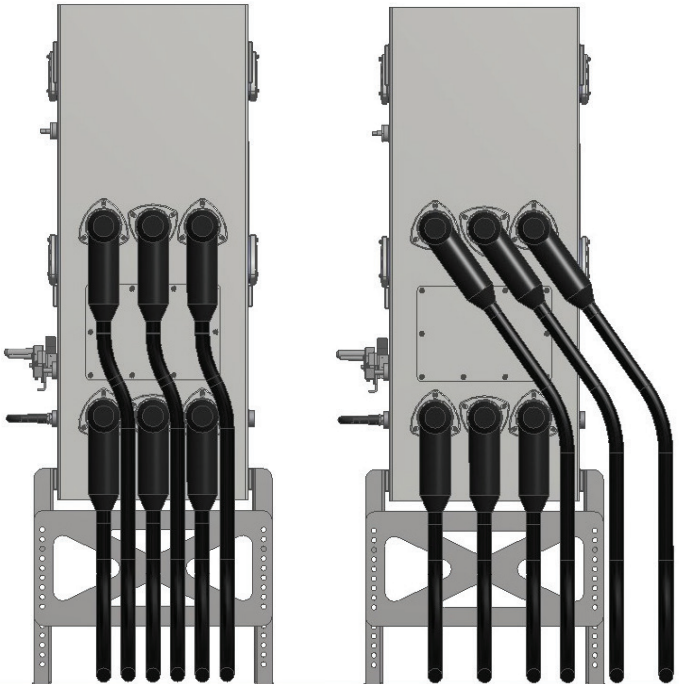


Figure 17. Bottom cable entry.

Table 4. Custom - Style Code[1]

VisoVac	Application	VFI-Ways[2]	Visible Break[3]	Visible Ground[3]	Voltage Rating	Voltage Impulse Rating	Continuous Current Rating	Fault Withstand Rating	Enclosure Type[4]	Control Voltage	Accessories
VC	1 Submersible	1 Single-way	Y Req'd	Y Req'd	5 15 kV	1 95 kV	6 600 A	2 25 kA	1 304 SS	1 24 Vdc	P Pendant with cable[5]
	2 Padmount	3 Three-way	X N/A	X N/A	7 17.5 kV		9 900 A	4 40 kA	2 316 SS	2 48 Vdc	D Digitrip 1150V controller with current sensors[6]
		4 Four-way								3 110 Vdc	C Communication Module
		5 Five-way								4 125 Vdc	Z Customized Relay Panel[7]
		6 Six-way								5 120 Vac	X None
										6 220 Vac	
										7 240 Vac	

Notes:
1. Style Code for general reference only, consult factory with specific application requirements
2. Single and Multi-way options available in different arrangements, consult factory with specific application requirements
3. Customized designs available without visible and visible ground.
4. HDPE enclosures only available in standard VisoVac fault interrupter offerings
5. Cables are available in 18 and 40 foot lengths
6. Eaton current sensors required with Digitrip controller
7. Consult factory with application requirements for customized relay panels

Example:

4-way VisoVac fault interrupter - submersible, 15 kV max, 900 A continuous, 95 kV BIL, 40 kA sym. int, 304 SS, visible break only, 120 Vac control power with an Eaton's Cooper Power series Edison Idea iDP-210 feeder protection relay, DNP3 communications and custom remote operating pendant.

Style Code #VC14YX519415PCZ

See Figure 7 for reference

Example:

1-way VisoVac fault interrupter - submersible, 17.5 kV max, 600 A continuous, 95 kV BIL, 25 kA sym. int, 304 SS, no visible break or visible ground,120 Vac control power with an Eaton 1150 V Digitrip controller, and custom remote operating pendant.

Style Code #VC11XX719415PD

See Figure 19 for reference

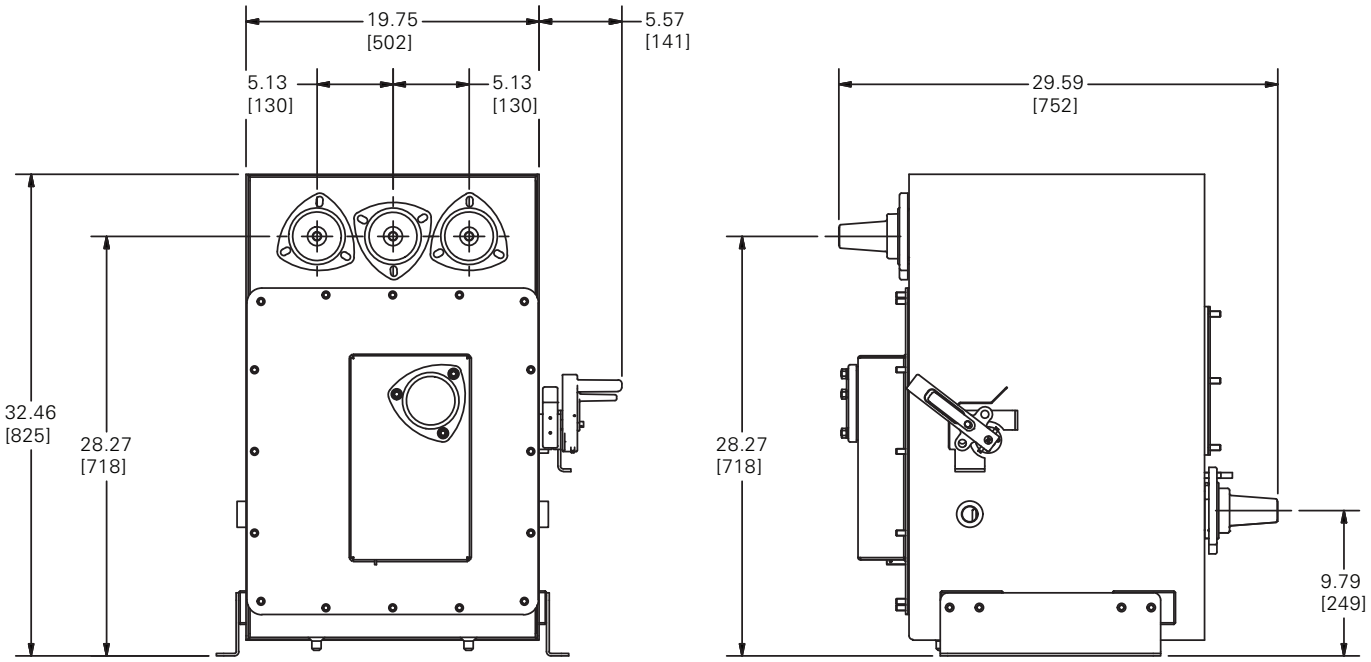


Figure 19. Example layout of a custom one-way VisoVac fault interrupter with Digitrip and internal current sensors.

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For Eaton's VisoVac fault interrupter product information call 1-877-277-4636 or visit: www.Eaton.com.

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