

VisoVac™ fault interrupter installation instructions



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Contents

SAFETY INFORMATION	
Safety information	iv
PRODUCT INFORMATION	
Introduction	1
Handling and storage	1
Standards	1
Application and description	1
CONFIGURATION	
Ratings and specifications	2
Internal layout	2
Features and construction	3
SEQUENCE OF OPERATIONS	4
DIMENSIONS	6
INSPECTION/MAINTENANCE	7
SAFETY	7
CONTROL OPTIONS	
Manual control	7
Remote control	7
Relay control	7
CALLOUT DESCRIPTION	8
SCHEMATICS AND CONTROL WIRING	9
CONTROL AND STATUS WIRING PINOUT	10
RENEWAL PARTS	11



Safety for life



Eaton's Cooper Power™ series products meet or exceed all applicable industry standards relating to product safety. We actively promote safe practices in the use and maintenance of our products through our service literature, instructional training programs, and the continuous efforts of all Eaton employees involved in product design, manufacture, marketing, and service.

We strongly urge that you always follow all locally approved safety procedures and safety instructions when working around high voltage lines and equipment, and support our "Safety For Life" mission.

Safety information

The instructions in this manual are not intended as a substitute for proper training or adequate experience in the safe operation of the equipment described. Only competent technicians who are familiar with this equipment should install, operate, and service it.

A competent technician has these qualifications:

- Is thoroughly familiar with these instructions.
- Is trained in industry-accepted high and low-voltage safe operating practices and procedures.
- Is trained and authorized to energize, de-energize, clear, and ground power distribution equipment.
- Is trained in the care and use of protective equipment such as arc flash clothing, safety glasses, face shield, hard hat, rubber gloves, clampstick, hotstick, etc.

Following is important safety information. For safe installation and operation of this equipment, be sure to read and understand all cautions and warnings.

Hazard Statement Definitions

This manual may contain four types of hazard statements:

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in equipment damage only.

Safety instructions

Following are general caution and warning statements that apply to this equipment. Additional statements, related to specific tasks and procedures, are located throughout the manual.

DANGER

Hazardous voltage. Contact with hazardous voltage will cause death or severe personal injury. Follow all locally approved safety procedures when working around high- and low-voltage lines and equipment.

G103.3

WARNING

Before installing, operating, maintaining, or testing this equipment, carefully read and understand the contents of this manual. Improper operation, handling or maintenance can result in death, severe personal injury, and equipment damage.

G101.0

WARNING

This equipment is not intended to protect human life. Follow all locally approved procedures and safety practices when installing or operating this equipment. Failure to comply can result in death, severe personal injury and equipment damage.

G102.1

WARNING

Power distribution and transmission equipment must be properly selected for the intended application. It must be installed and serviced by competent personnel who have been trained and understand proper safety procedures. These instructions are written for such personnel and are not a substitute for adequate training and experience in safety procedures. Failure to properly select, install or maintain power distribution and transmission equipment can result in death, severe personal injury, and equipment damage.

G122.3

Product information

Introduction

This instruction bulletin covers the installation, operation, and maintenance of a 15.5/17.5 kV VisoVac™ fault interrupter. It does not cover all possible contingencies, variations, and details that may arise during installation, operation, or maintenance of this equipment.

Read this manual first

Read and understand the contents of this manual and follow all locally approved procedures and safety practices before installing or operating this equipment.

Additional information

These instructions cannot cover all details or variations in the equipment, procedures, or process described nor provide directions for meeting every possible contingency during installation, operation, or maintenance. For additional information, contact your Eaton representative.

Acceptance and initial inspection

Each VisoVac fault interrupter is in good condition when accepted by the carrier for shipment. Upon receipt, inspect the shipping container for signs of damage. Unpack the fault interrupter and inspect it thoroughly for damage incurred during shipment. If damage is discovered, file a claim with the carrier immediately.

Handling and storage

Be careful during handling and storage of the fault interrupter to minimize the possibility of damage. If the fault interrupter is to be stored for any length of time prior to installation, provide a clean, dry storage area.

Standards

ISO 9001 Certified Quality Management System

Application and description

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 SF₆ 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.

CAUTION

Before energizing the VisoVac assembly, ensure that:

- 1. The VisoVac assembly is secured on a true and level surface.**
 - 2. Confirm that all fastening hardware is in place and tightened.**
 - 3. Confirm that all conductor connections are torqued to the correct value.**
-

Configuration

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

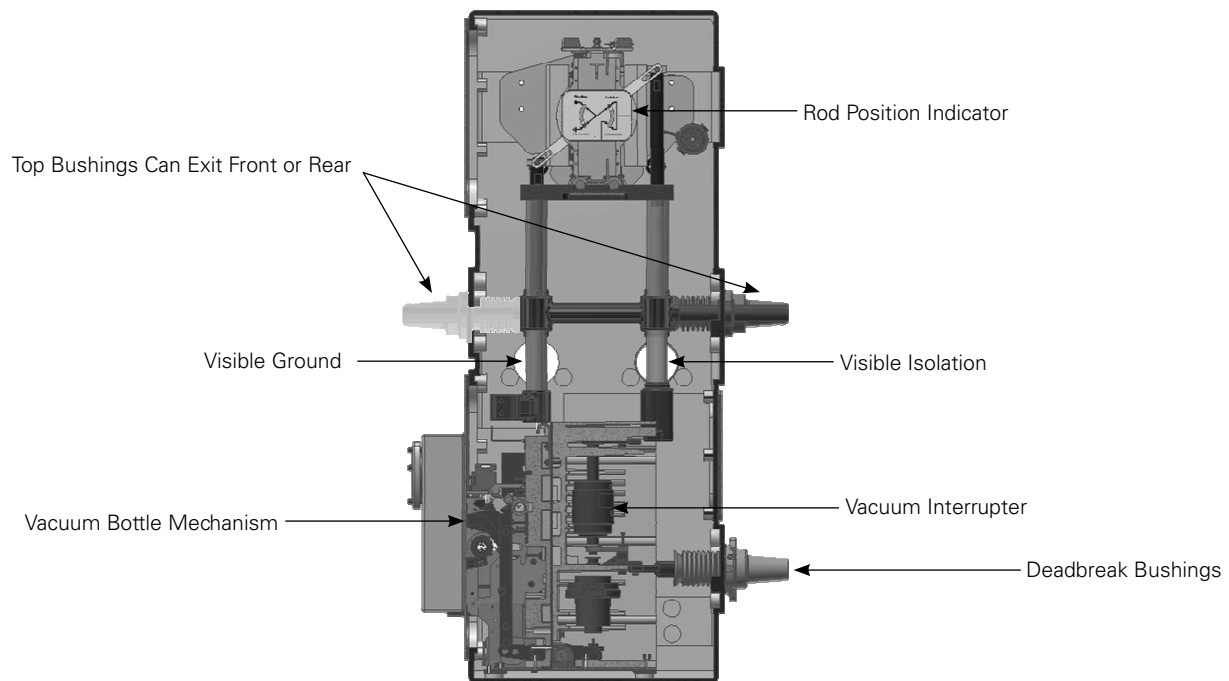


Figure 1. VisoVac fault interrupter internal layout.

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

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

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.

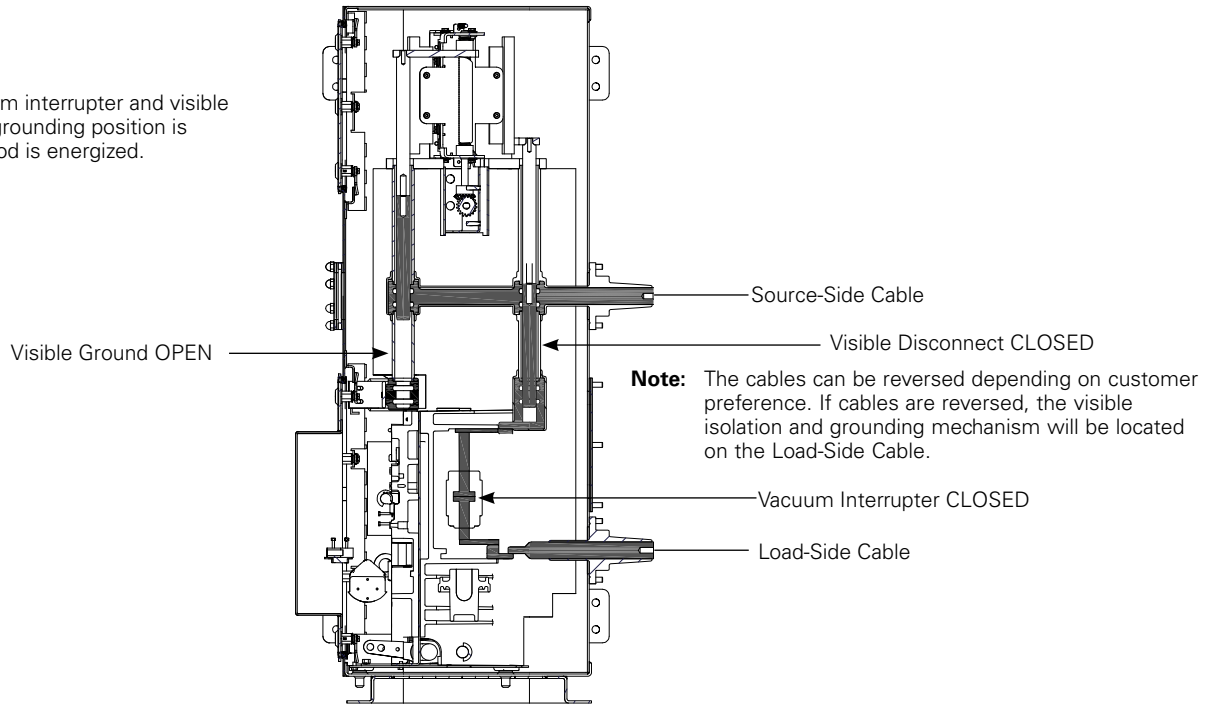


Figure 2. Service position.

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.

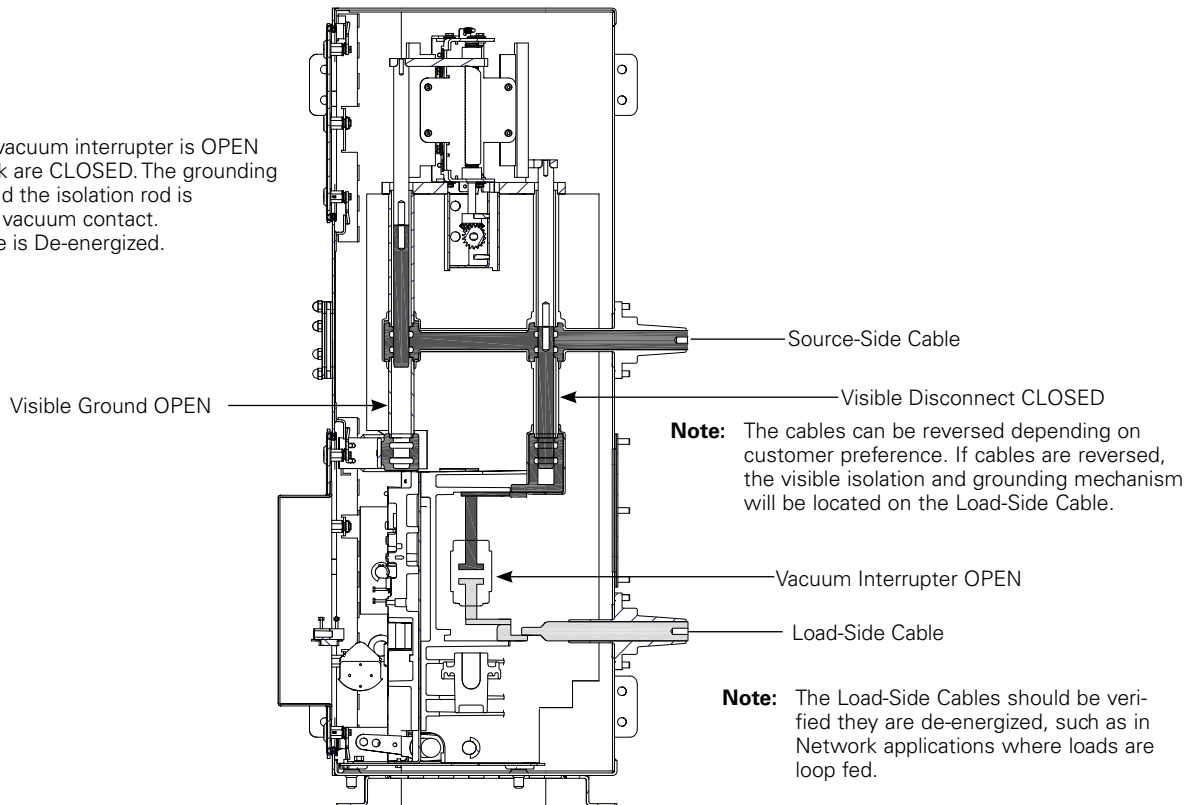


Figure 3. Disconnect position.

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.

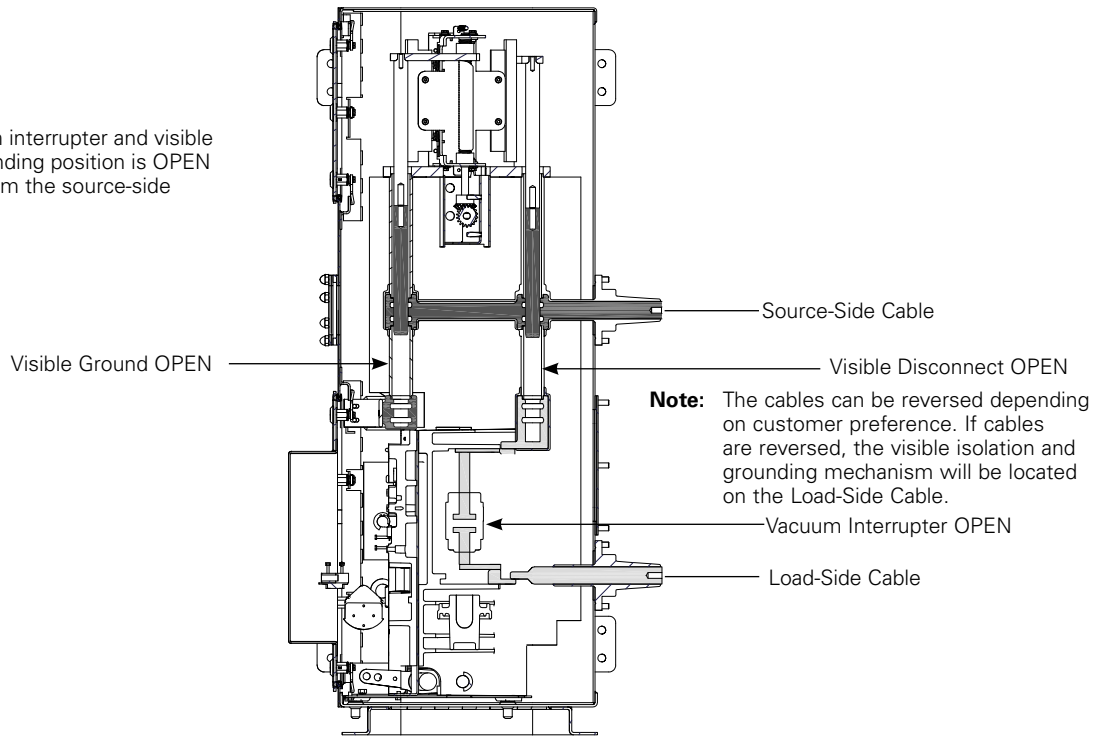


Figure 4. Disconnected position (with visible break).

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.

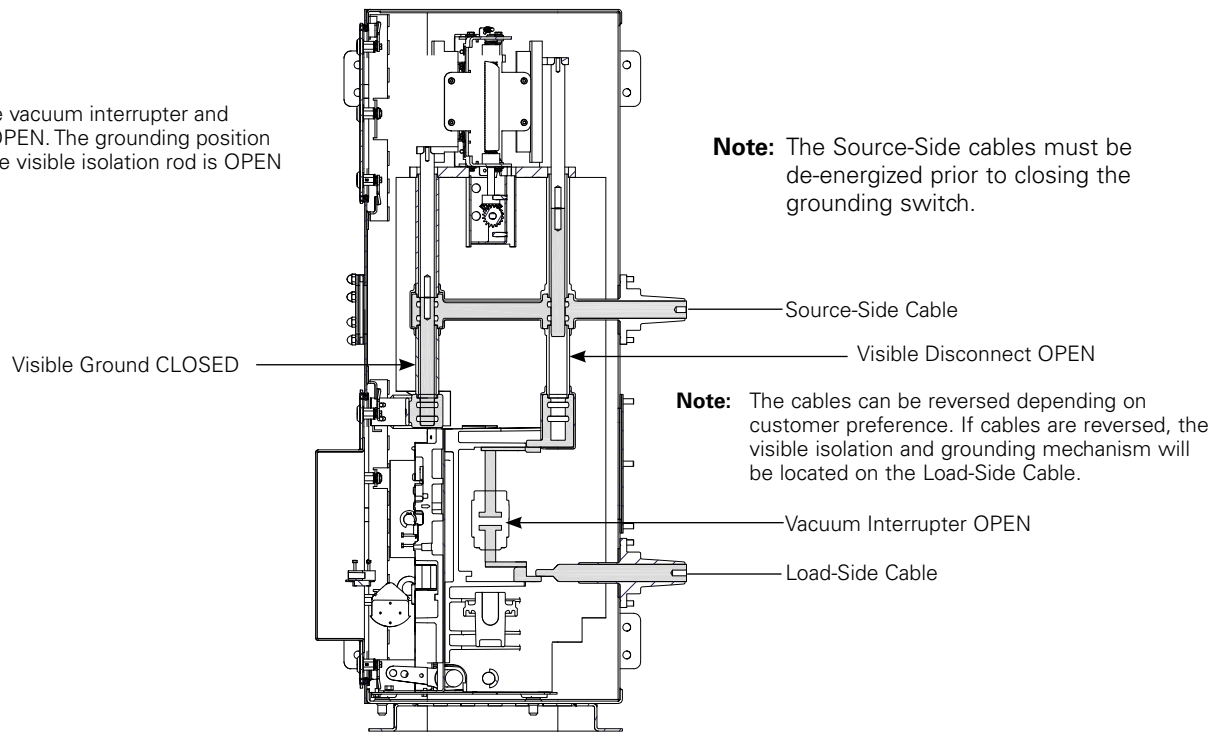


Figure 5. Disconnected position (with visible break and visible ground).



Figure 6. Left, front, rear, and right side views shown with rear mounted top bushings. Stainless steel enclosures are shown.

Dimensions

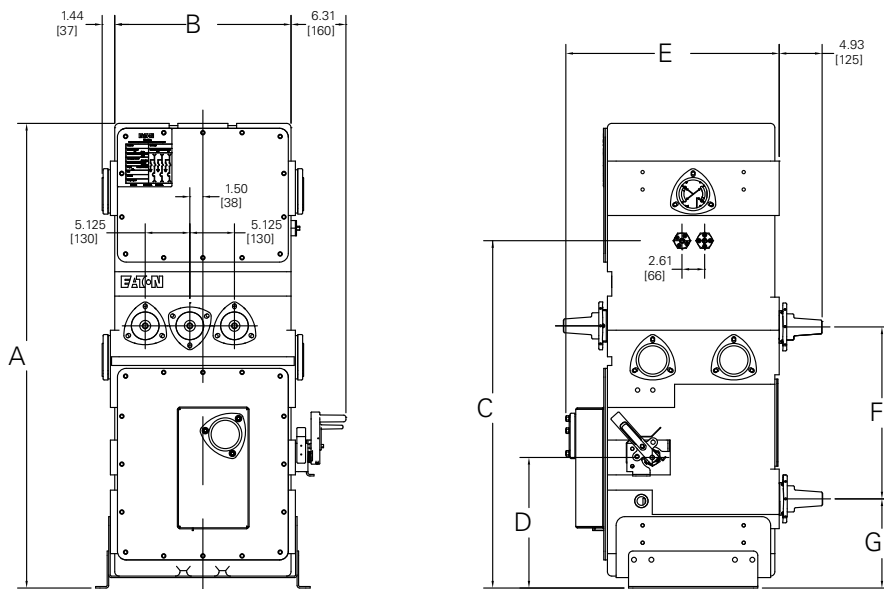


Figure 7. Standard VisoVac fault interrupter dimensions.

Table 2. Dimensional Information

Dim.	Stainless Steel		High Density Polyethylene	
	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"

Inspection / maintenance

In general the VisoVac interrupter is maintenance free. The vacuum interrupter has been tested to 10,000 operations and should not require maintenance so long as it is in a sealed environment without contaminants. This ISO/GRD mechanism is tested to 250 operations and does not require any periodic maintenance.

It is recommended that the assembly be cycled at least once per year. One cycle is defined below.

1. Open the vacuum interrupter
2. Open the Isolation mechanism
3. Close the Ground mechanism (Note: it may not be possible to complete steps 3 and 4 without de-energizing the upstream device. In this case step 3 and 4 can be skipped)
4. Open the Ground mechanism
5. Close the Isolation mechanism
6. Close the vacuum interrupter

It is not recommended that any covers be removed from the VisoVac interrupter while the assembly is in service. If any fasteners are loosened the submergibility of the enclosure will be compromised. If repair is necessary it is recommended that the assembly be taken out of service and moved into a controlled maintenance environment. If any cover is removed new gasketing is required for reassembly and a leak test must be performed to ensure the integrity of the seals.

Safety

Safety Features:

There are several safety interlocks built into the VisoVac assembly to ensure the proper sequence of operations.

1. Vacuum interrupter to Isolating mechanism interlock.
 - a. The vacuum interrupter is both mechanically and electrically interlocked with the Isolating mechanism.
 - b. The vacuum interrupter will not close unless the isolating rods are in the fully connected position.
 - c. If a tool is placed on the isolating rod mechanism, the vacuum interrupter will trip open before any electrical contact is broken.
2. Isolation mechanism to Ground Mechanism
 - a. The isolating mechanism is mechanically interlocked with the ground mechanism.
 - b. When the isolating rods are in the connected position, the ground rods are blocked from moving and remain blocked until the isolating rods are in the fully open position.

- c. When the ground rods are in the connected position, the isolating rods are blocked from moving and remain blocked until the ground rods are in the fully open position.
 3. Ground mechanism to upstream device
 - a. It is imperative that there be no voltage present on the upper cable bushings before closing the ground rods.
 - b. Since this requires opening the upstream device that may be blocks or even miles away, it is recommended that the user deploy their Lock-out/Tag-out and/or operational procedures to ensure no voltage is present before closing the ground rods.

Control options

Manual control

The VisoVac vacuum interuption can be controlled manually via the operating handle located on below the ISO/GRD viewing windows. This handle has 3 positions:

1. "Open" (This will hold the vacuum interrupter in the open position mechanically and electrically and can be locked in that position)
2. "Auto" or "Remote" (This position will allow remote operation via pendant, control box, or relay. The handle is held in this position and can be locked)
3. "Close" (This handle position is a momentary position and will close the breaker electrically. The breaker will not close without control power)

The isolation and ground rods are currently only manually controlled using a tool inserted onto the drive mechanism located above the ISO/GRD viewing windows.

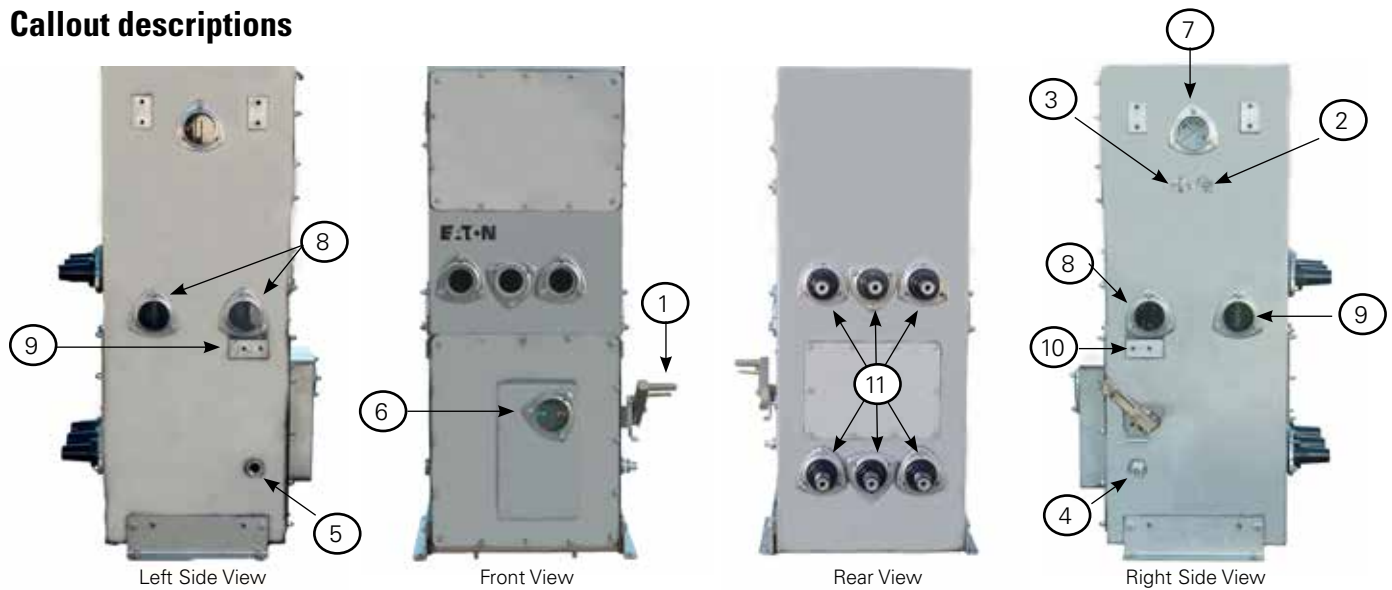
Remote control

The VisoVac interrupter can be monitored and controlled via pendant or remote control box. This includes vacuum interrupter open/close, open /close indication and isolation and ground rod status.

Relay control

The VisoVac interrupter can be connected to any variety of relay and set to trip and close by programming the relay accordingly.

Callout descriptions



1. Vacuum interrupter control handle. (Open, Close and Auto/Remote positions)
2. Isolating rod operating crank location
3. Grounding rod operating crank location
4. 12-pin control/indicating wiring receptacle
5. 2-pin control power receptacle
6. Vacuum interrupter mechanical indicator
7. Iso/grd rod mechanical indicator
8. Ground rod viewing windows
9. Isolation rod viewing windows
10. Ground pad (NEMA® 2-hole pattern)
11. 600 A dead break cable bushings

Figure 8. Call out descriptions.

Schematics and control wiring

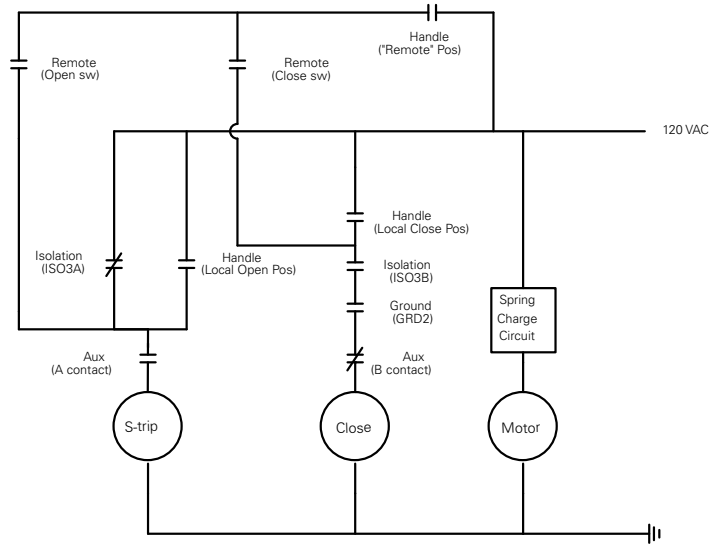


Figure 9. Basic control schematic.

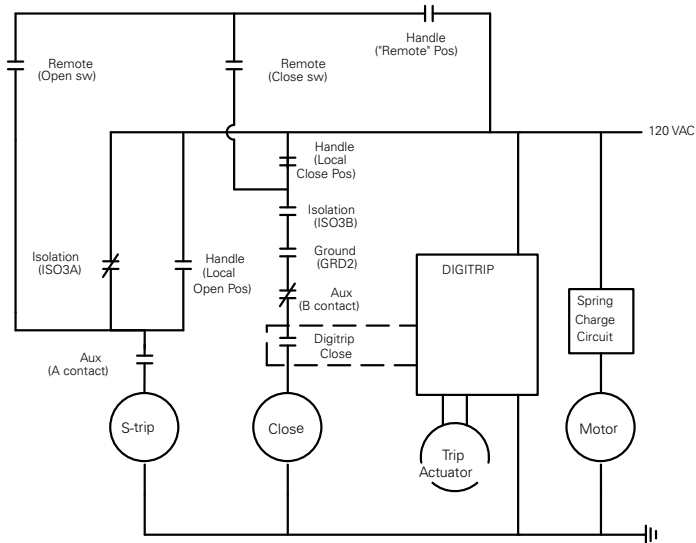


Figure 10. Control schematic with Digitrip.

Control and status wiring pin out

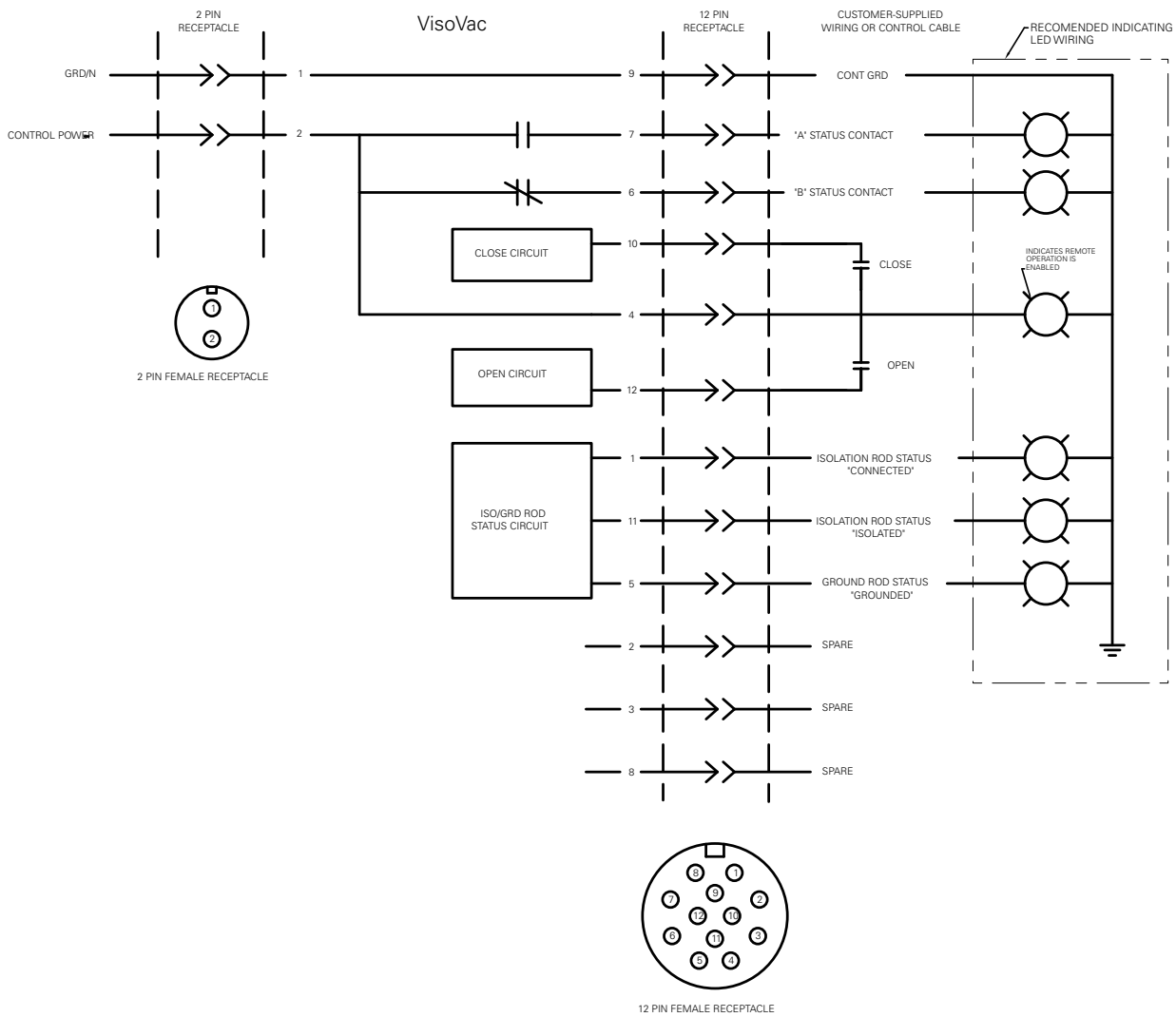


Figure 11. VisoVac interrupter 2- and 12-pin receptacle diagram. Shown in the open position.

Renewal parts

Table 3. Renewal Parts

Description	Catalog Number
Iso/Ground Crank	6814861G01
Gaskets	Consult Factory
Lifting Brackets	Consult Factory
Mounting Stands	Consult Factory
Pendants	Consult Factory
Control Cabinets	Consult Factory



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