

NOVEMBER 1, 2019



# Solid dielectric switchgear

Customer presentation

---

# Elastimold solid dielectric switchgear — agenda

- Compelling value
- Design principles
- Product overview
- Switchgear applications
- Control types
- Appendix
  - Options and accessories

---

# Elastimold solid dielectric switchgear — agenda

Compelling value

Design principles

Product overview

Switchgear applications

Control types

Appendix

– Options and accessories

---

# Compelling value

## Summary

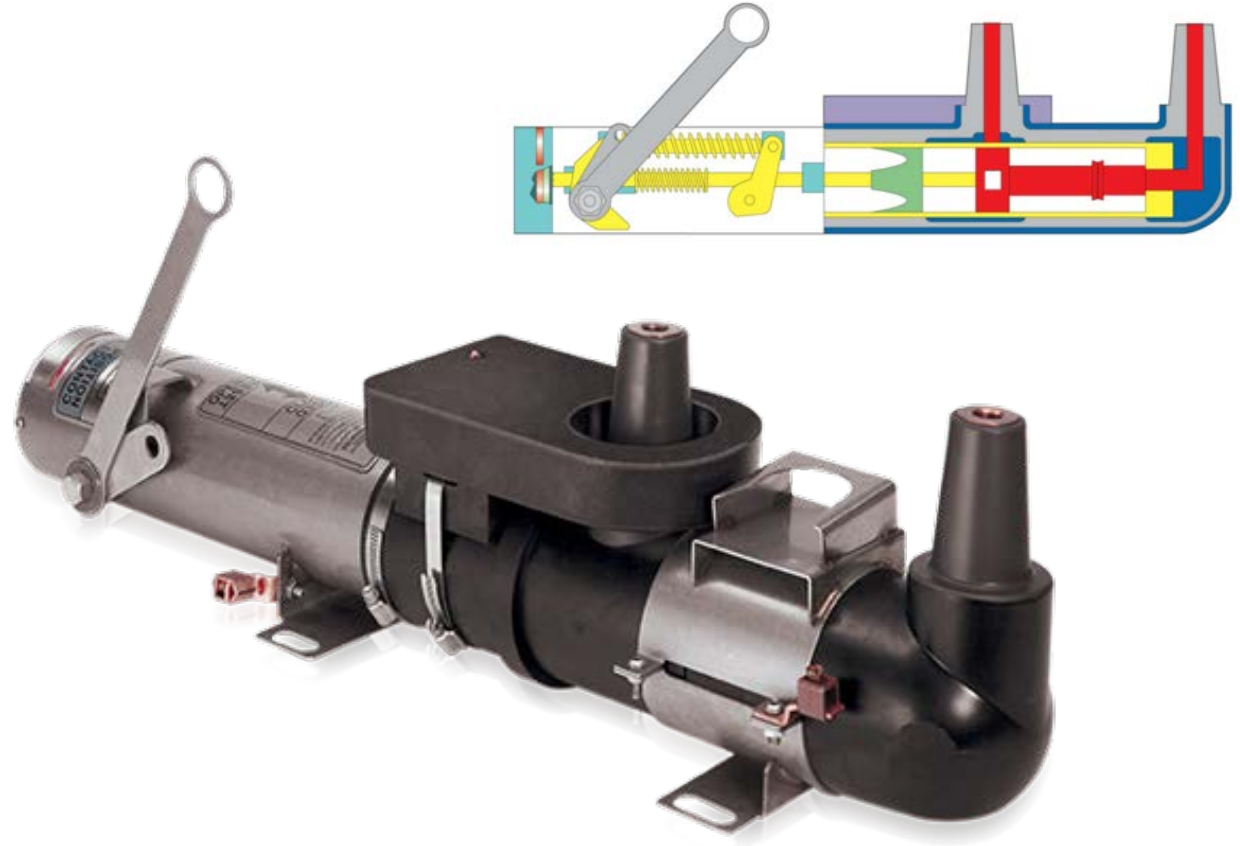
- Safe
- Reliable
- Flexible
- Compatible
- Environmentally friendly
- Lifecycle cost reducing



# Compelling value

Safe — dead-front construction eliminates exposure to live components

- Proprietary diaphragm provides electrical isolation
- Not dependent on oil, gases or air for proper isolation from high voltage

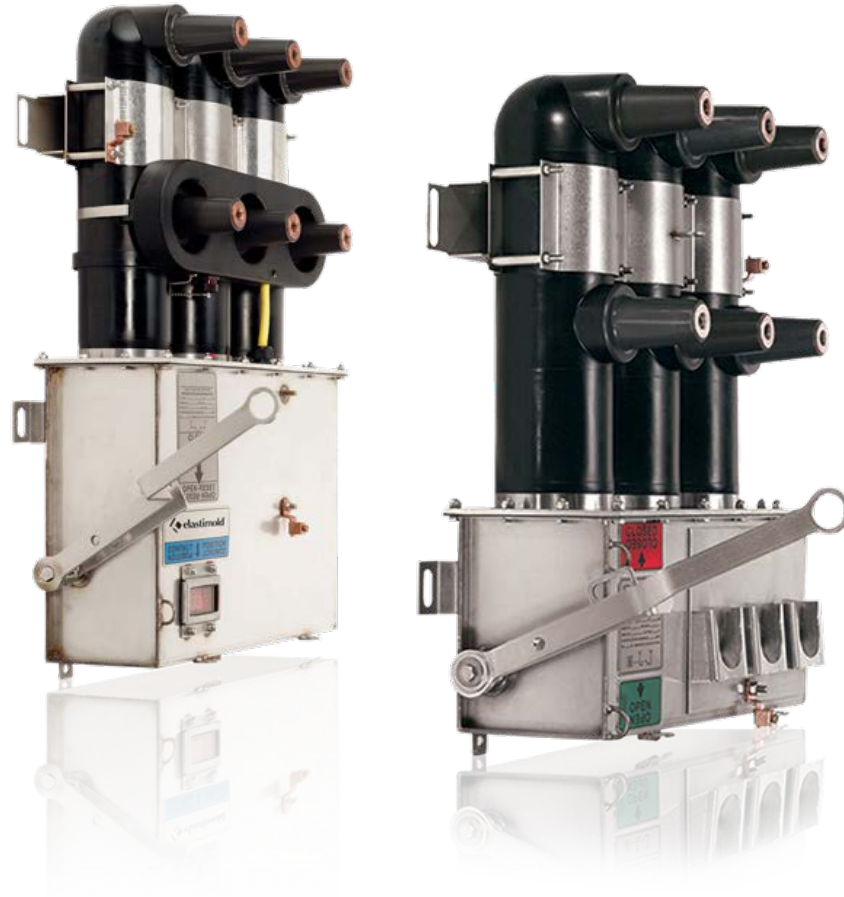


# Compelling value

## Reliable — maintenance-free vacuum and EPDM molded insulation

- Proven solid dielectric construction
- Technology with over 50 years of field-proven performance
- Fewer outages and significantly shorter outage duration
- All switchgear components are sealed and fully submersible

**Note:** Because the solid dielectric switchgear contains no oil or gas to leak, it is considered maintenance-free.





# Compelling value

Flexible — compact and lightweight design

- Modular design allows for combining with other devices
  - Interchangeable, upgradeable and customer configurable
  - Reduces your inventory (stock common components)
- Non-position sensitive — can be installed in any orientation
- Overall lower cost of ownership
- Up to 35 kV-rated load-break switches and fault interrupters



**Molded vacuum interrupter (MVI)**



**Molded vacuum switch (MVS)**



**Bus bar connection**

# Compelling value

Flexible — modular MVS/MVI units allow for an unlimited number of ways and configurations





# Compelling value

Flexible — retrofit your SF6 switchgear with modular three-way installation



Compact design easily fits through a manhole cover.

# Compelling value

Compatible — works with the industry-leading protection and automation controls

## SEL® 751A series



Feeder protection

## SEL® 451



Auto-transfer controls  
(standard and fast transfer options)

## SEL® 451 series



Automation

SEL® automation controls from Schweitzer Engineering Laboratories

# Compelling value

Environmentally friendly — for a safe, cost-effective and sustainable grid

- No oils or gases to monitor, maintain or dispose
- EPDM rubber is a **green** solution
- Emits no greenhouse gases, unlike SF6



# Compelling value

Lifecycle cost reducing — no oil or SF6 gas

- **Oil switchgear** = oil leaks and maintenance
- **SF6 switchgear** = SF6 leaks, maintenance, personal protective equipment (PPE) and regulatory requirements to monitor and measure usage/leakage
- Both of these add annual costs over the life of the product that Elastimold solid dielectric switchgear doesn't have

---

# Elastimold solid dielectric switchgear — agenda

Compelling value

**Design principles**

Product overview

Switchgear applications

Control types

Appendix

– Options and accessories



# Design principles

## Common interrupting and insulation mediums

### Common interrupting mediums:

- Oil
- Air
- SF6
- **Vacuum**

### Insulation mediums:

- Air insulated (AIS)
- Gas (SF6)
- Combination air and gas
- Oil
- **Solid dielectric**

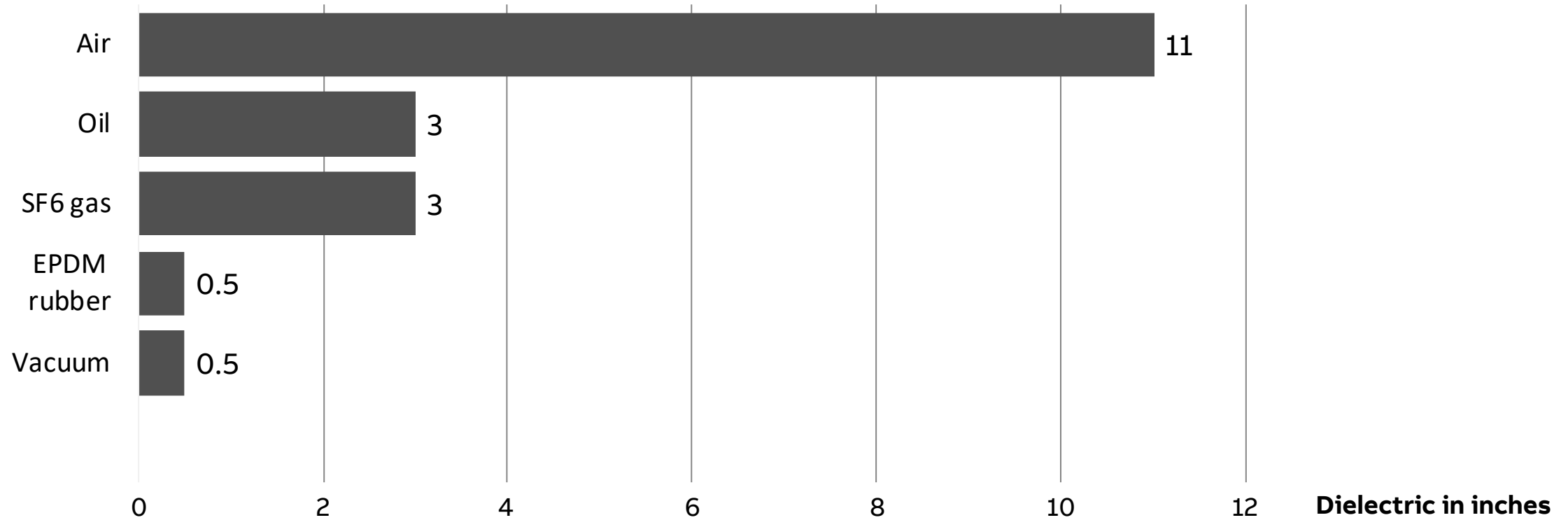
# Design principles

## Common interrupting and insulation mediums

**Example:**  
38 kV  
150 kV BIL

### High dielectric strength

EPDM rubber and vacuum are 20x better than air



---

# Design principles

## Benefits of solid dielectric and vacuum interruption

- Smaller footprints
- No sensitivity to environment and contaminates
- Maintenance-free\*
- Lower risk of failure
- Lower risk of fire
- Lower costs for maintenance staff and switching
- Shorter outages to repair/replace

\* **Note:** Because the solid dielectric switchgear contains no oil or gas to leak, it is considered maintenance-free.

---

# Elastimold solid dielectric switchgear — agenda

Compelling value

Design principles

**Product overview**

Switchgear applications

Control types

Appendix

– Options and accessories

# Product overview

## Elastimold solid dielectric switchgear

- System voltage ratings from 15 kV through 38 kV
- Standard current ratings of 600 A continuous and up to 25 kA interrupting (interrupters) and 40 kA momentary (switches)
- Three-phase and single-phase base designs

### Molded vacuum switches (MVS)



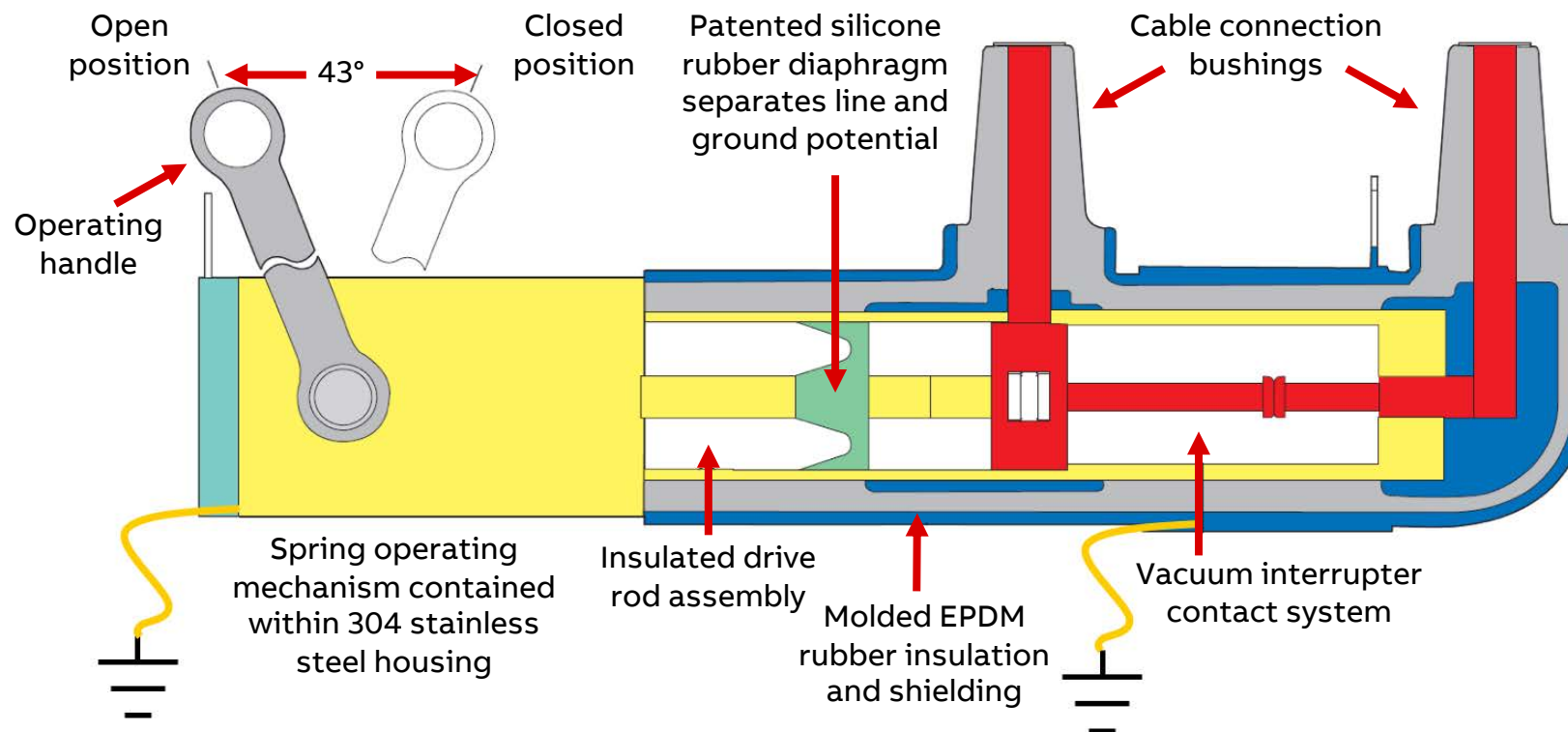
### Molded vacuum interrupters (MVI)





# Product overview

## Molded vacuum switch (MVS) — cutaway



Dead-front construction for added safety

# Product overview

## MVS ratings

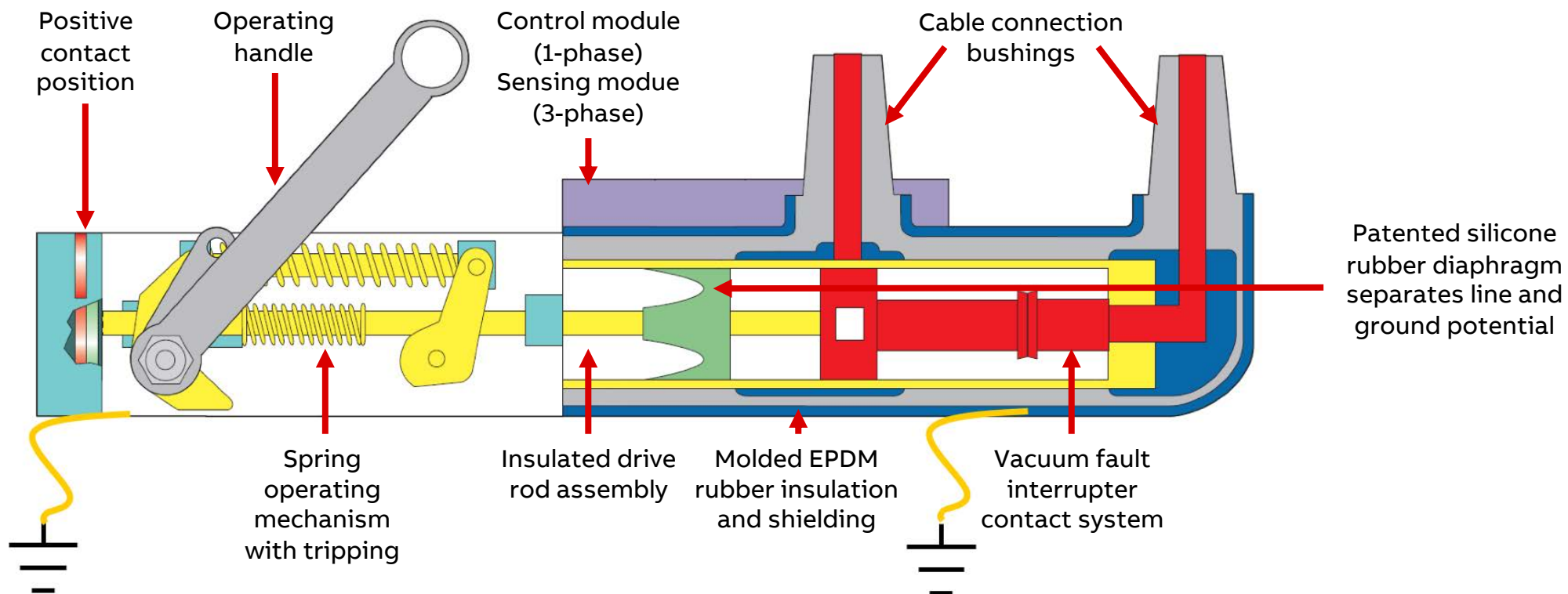
Maximum design voltage (kV)	15.5	27	38
Frequency (Hz)	50/60	50/60	50/60
BIL impulse (kV)	95	125	150
One-minute AC withstand (kV)	35	60	70
15-minute DC withstand (kV)	53	78	103
Load interrupting and loop switching (amp)	600	600	600
Transformer magnetizing interrupting (amp)	21	21	21
Capacitor or cable charging interrupting (amp)	40	40	40
Asymmetrical momentary and 3-operation fault close (amp)	20,000	20,000	20,000
Symmetrical one-second rating (amp)	12,500	12,500	12,500
Continuous current (amp)	600	600	600
Eight-hour overload current (amp)	900	900	900

### Application information

Construction: Submersible, corrosion resistant, fully shielded
Operating temperature range: -40 °C to 65 °C

# Product overview

## Molded vacuum interrupter (MVI) — cutaway



Dead-front construction for added safety

# Product overview

## MVI ratings

Voltage class (kV)	15.5	15.5	15.5	27	35	35
Maximum design voltage (kV)	17	17	15.5	29	38	38
Frequency (Hz)	50/60	50/60	50/60	50/60	50/60	50/60
BIL impulse withstand (kV)	95	95	95	125	150	150
One-minute AC withstand (kV)	35	35	35	60	70	70
Five-minute DC withstand (kV)	53	53	53	78	103	103
Continuous current (amp)	600	60	600	600	600	600
Load interrupting and loop switching (amp)	600	60	600	600	600	600
Transformer magnetizing interrupting (amp)	21	21	21	21	21	21
Capacitor or cable charging interrupting (amp)	40	40	40	40	40	40
Symmetrical/asymmetrical interrupting capability (kA)	12.5/20	16/25.6	20/32	12.5/20	12.5/20	25/40
Current sensor ratio	1,000:1	1,000:1	1,000:1	1,000:1	1,000:1	1,000:1

### Application information

Meets ANSI C37.60 requirements

Operating temperature range: -40 °C to 65 °C

# Product overview

Wide range of fault current ratings

	12.5 kA	16 kA	20 kA	25 kA	40 kA
MVS — 3-phase					
15 kV	X	X	X		
27 kV	X	X			X
38 kV	X				
MVI — 3-phase					
15 kV	X	X	X		
27 kV	X				
38 kV	X			X	



---

# Elastimold solid dielectric switchgear — agenda

Compelling value

Design principles

Product overview

**Switchgear applications**

Control types

Appendix

– Options and accessories

# Applications

Typical switchgear applications

**Padmount**



**Riser pole**

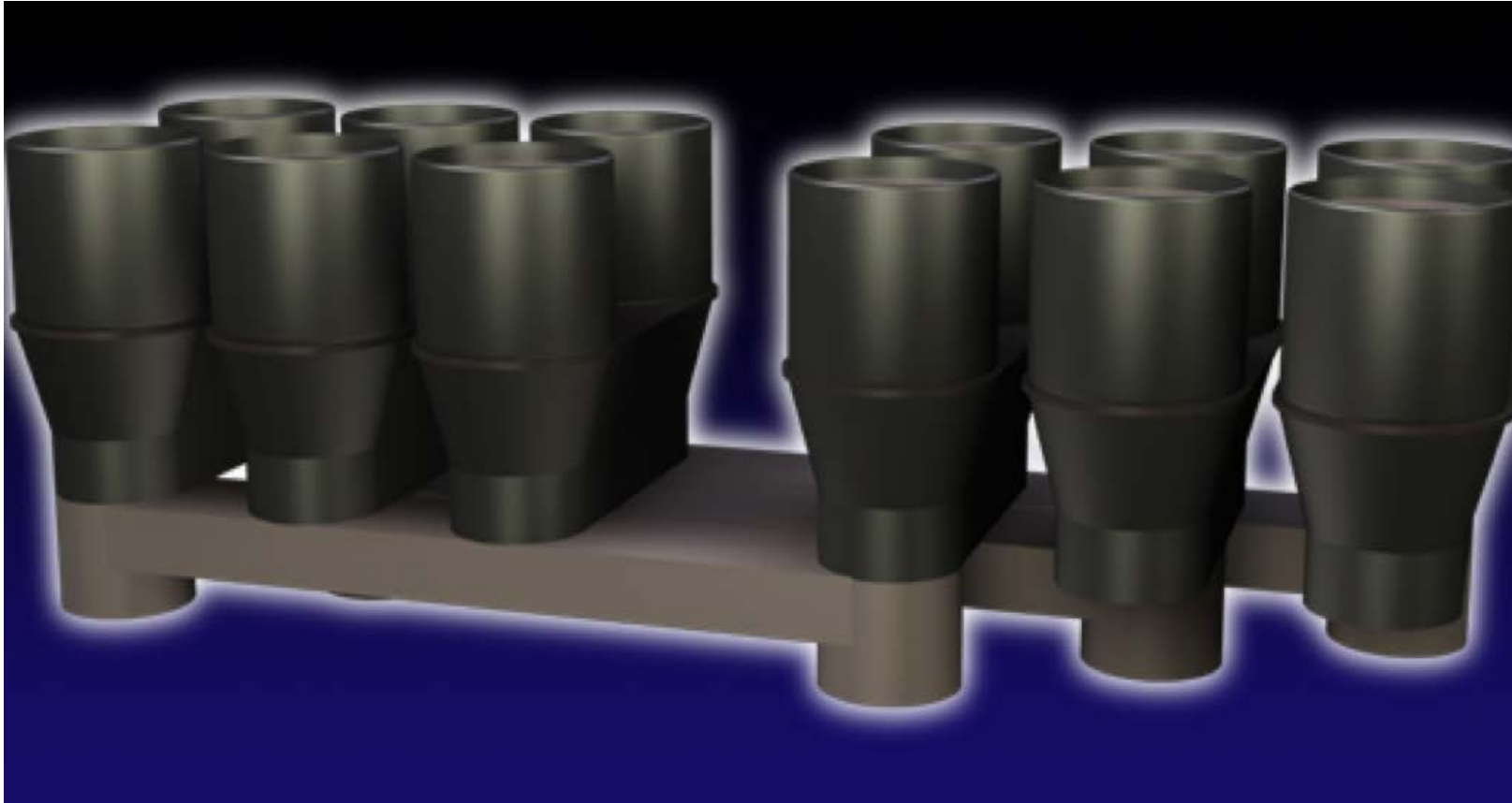


**Modular**



# Applications

Padmount — multi-way unit construction/bus system



# Applications

Padmount — multi-way unit construction



Multi-way  
bus system

# Applications

Padmount — multi-way unit construction



Two three-phase  
MVS switches



# Applications

Padmount — multi-way unit construction



Three single-phase  
MVI interrupters

# Applications

Padmount — multi-way unit construction



# Applications

Padmount — multi-way unit construction

## Free-standing frame



## Padmount



---

# Applications

## Modular

### **The modular switchgear provides solutions for:**

- Installations with confined vault spaces
- Modular design retrofits
- Ease of installation
- Unlimited number of ways
- Configuration flexibility
- Upgradeable
- Overall installation cost savings

---

# Applications

Modular — up to 35 kV-rated load-break switches and fault interrupters

---

## Molded vacuum interrupter (MVI)



---

## Molded vacuum switch (MVS)



---

## Bus bar connection



# Applications

Modular — unlimited number of ways and configurations



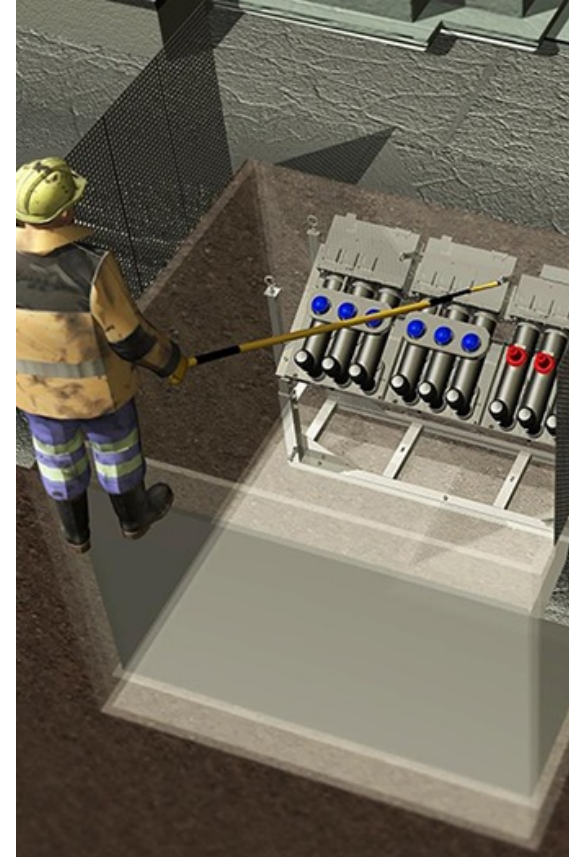


# Applications

## Small vault

### Why small vault switchgear?

- **Safety:** Increase safety, visibility and accessibility through simple, remote operation of switchgear from street level
- **Compact size:** Smaller gear fits in smaller vaults, which leads to lower installation costs
- **Reliability:** Maximize uptime in submersible applications with Elastimold's high-performance, proprietary mix of EPDM rubber and solid dielectric technology
- **Smart-grid ready:** Elastimold controls and Schweitzer Engineering Laboratories (SEL) offer a full range of smart-grid/automation-ready solutions





# Applications

## Small vault



### Safety and compact design

Increase safety, visibility and accessibility through simple, remote operation of switchgear from street level

# Applications

## Small vault — compact size

- 2, 3, 4, 5 and 6 ways
- 15 kV, 27 kV
- 12.5 kA
- Same BIL ratings
- Same withstand ratings for MVI/MVS
- 3-phase MVS and MVI only
- Manual or motor operated
- 200 A, 600 A bushings
- Elastimold 80, ATS, motor submersible and 80 submersible
- SEL 451A, 751A and 751A-submersible



# Applications

## Small vault — compact size

**Up to 14% reduction in width**  
created from unique compact bus  
design, which allows users to fit  
more gear in a smaller footprint



45° tilt angle improves operator safety  
through full operability and visibility  
from street level

**Up to 33% reduction in height** allows  
for installations in more applications  
with compact vaults

6" vertical adjustability of frame  
allows for customization to each vault

---

# Elastimold solid dielectric switchgear — agenda

Compelling value

Design principles

Product overview

Switchgear applications

**Control types**

Appendix

– Options and accessories



# Controls

## Protection and automation controls

### Elastimold controls



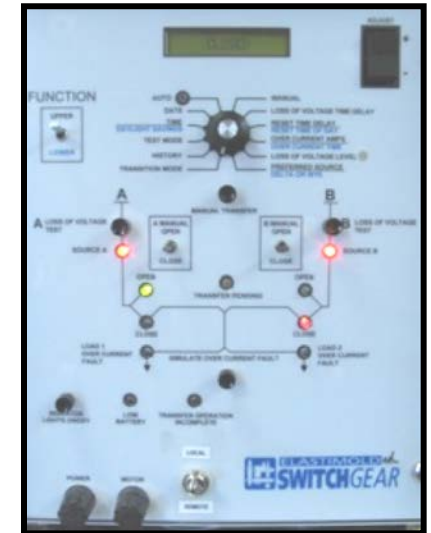
### Automation controls



### SEL controls



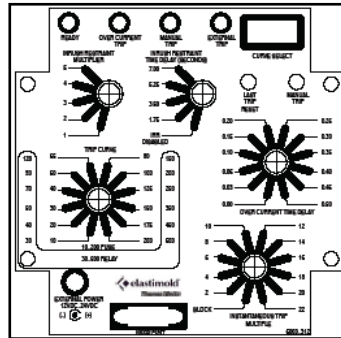
### Auto-transfer controls



Page 10 of 10

# Elastimold self-powered controls for fault interrupting devices

## Single-phase trip only



## Three-phase only



## Single-/three-phase trip



## Internal



## Phase/ground trip



## Programmable single-/ three-phase trip SCADA option



# Controls

## SEL automation controls

### SEL® 751/751A series



Feeder protection

### SEL® 451



Auto-transfer controls  
(standard and fast transfer options)

### SEL® 451 series



Automation

## Protection and automation controls



---

# Elastimold solid dielectric switchgear

## Compelling value summary

- Safe
- Reliable
- Flexible
- Compatible
- Environmentally friendly
- Lifecycle cost reducing



---

# Elastimold solid dielectric switchgear — agenda

Compelling value

Design principles

Product overview

Switchgear applications

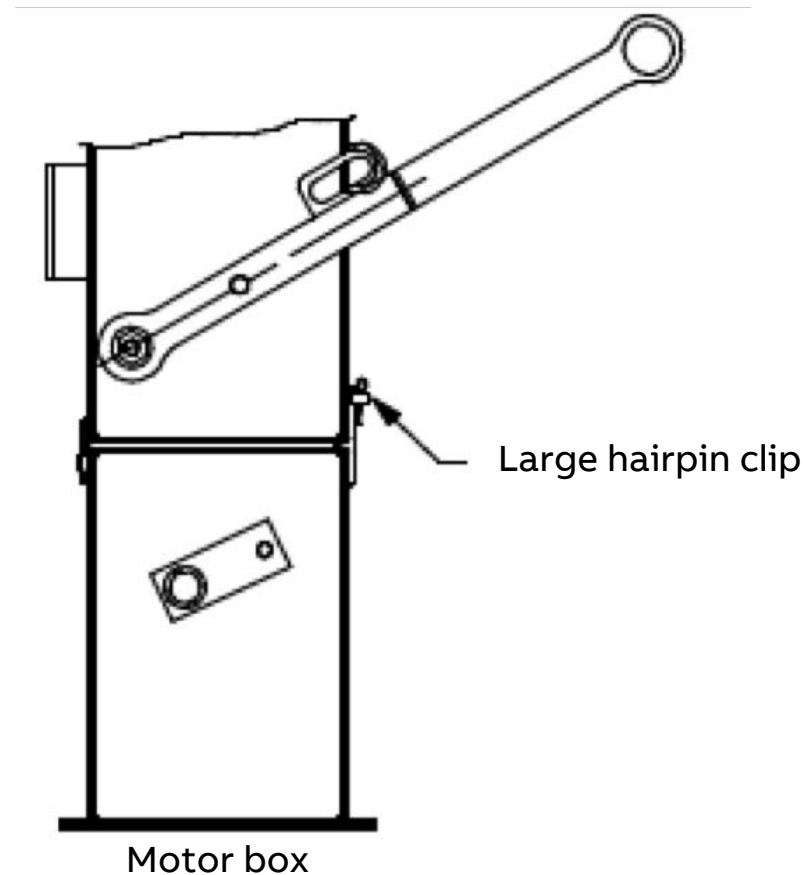
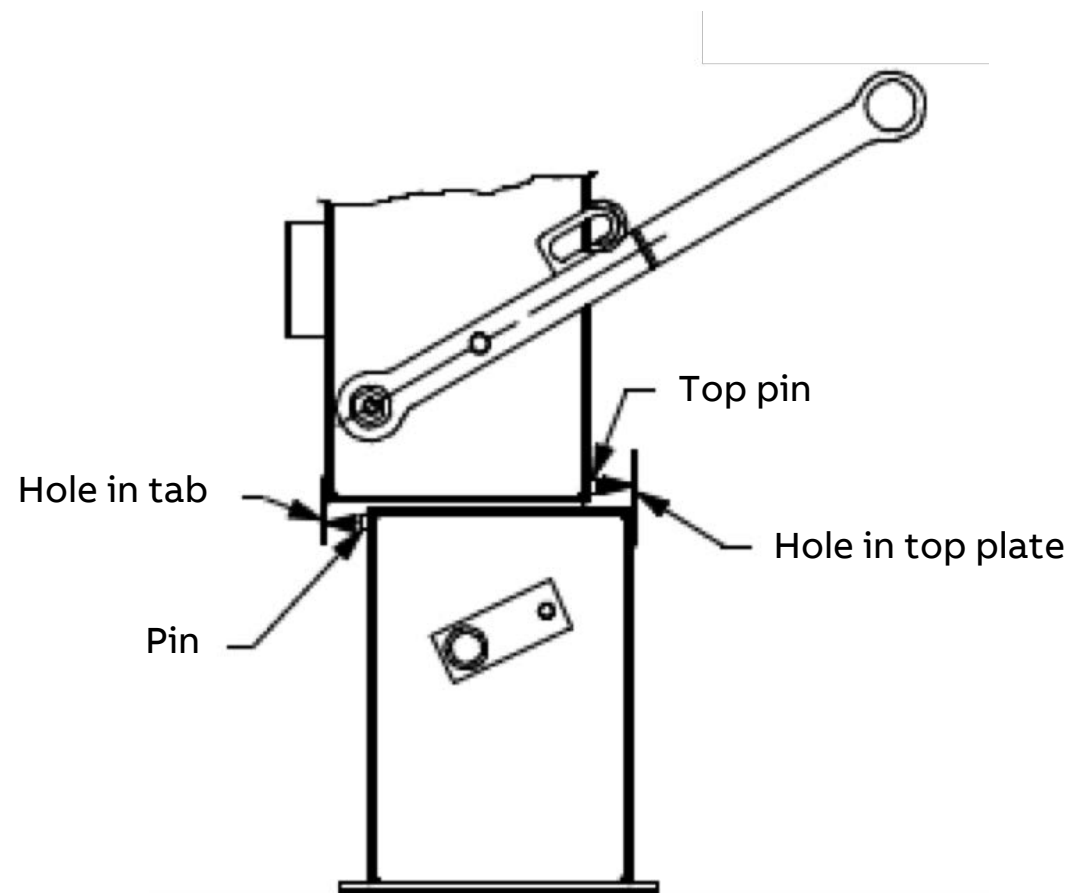
Control types

Appendix

– Options and accessories

# Appendix — options and accessories

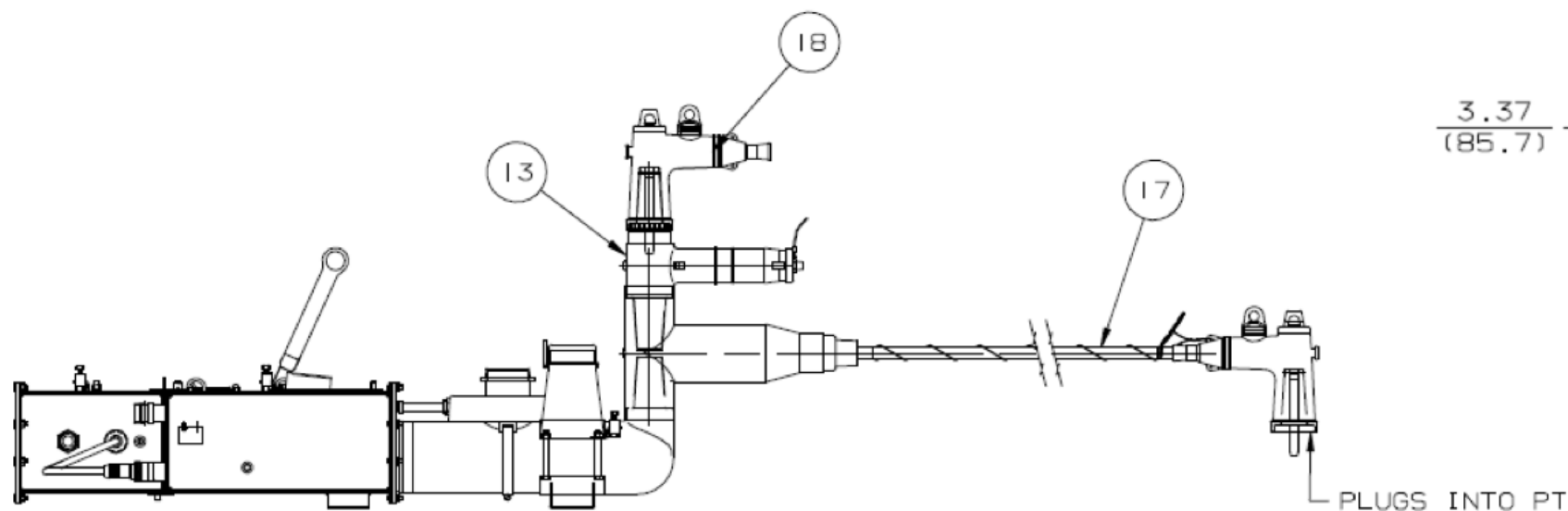
## Motor control system/motor installation



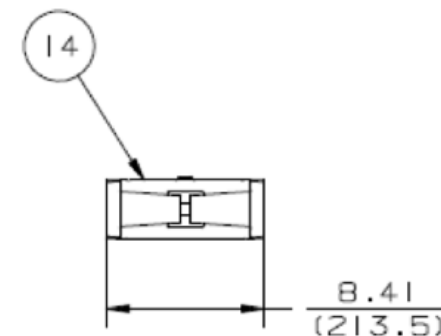
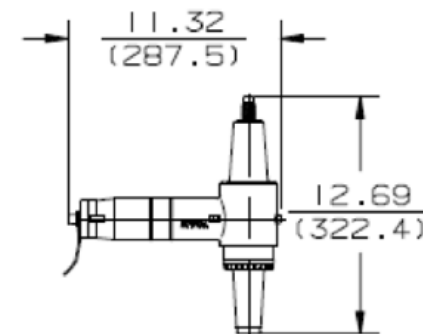
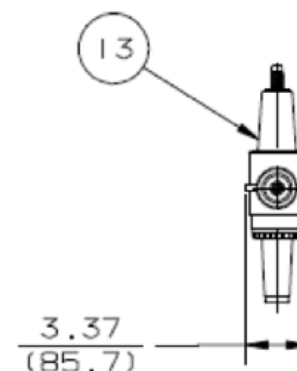
# Appendix — options and accessories

## Voltage sensor components

Note: No angle correction (offset) with Elastimold resistive-style voltage sensors, making them compatible with SEL control voltage inputs.



SIDE VIEW OF COMPONENTS ASSEMBLED



# Appendix — options and accessories

## Voltage sensor components



Voltage sensors view

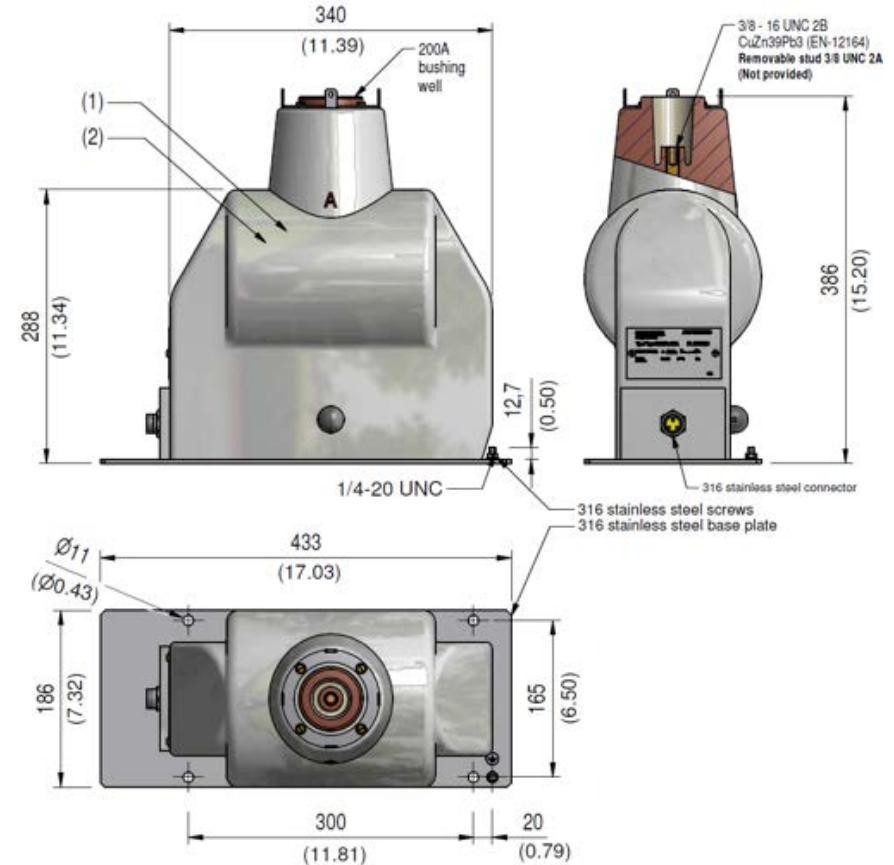


# Appendix — options and accessories

## Solid dielectric deadfront control power transformer

### Transformer ratings:

- 15 kV class
  - 2400/120 V
  - 7000–7620/116–127 V
- 25 kV class
  - 13,200–14,400/115–125 V
- 38 kV class
  - 19,000–20,750/115–125 V



# Appendix — options and accessories

## Submersible control box panel views

### Notes:

- Standard provisions allow connection for up to six ways
- Fiber and Ethernet interface connectors available





# Appendix — options and accessories

## Submersible control box panel views

**Panel  
front view**



**Selector switch for operation  
with up to six positions**



**Open/trip  
and close switch**



**Indication LEDs (displays  
status of position selected)**





# Appendix — options and accessories

## 600 amp deadbreak cam-op

- Easily retrofit existing equipment and switchgear
- Hot-stick operable
- Visible break feature for verified physical system disconnection in grounding applications



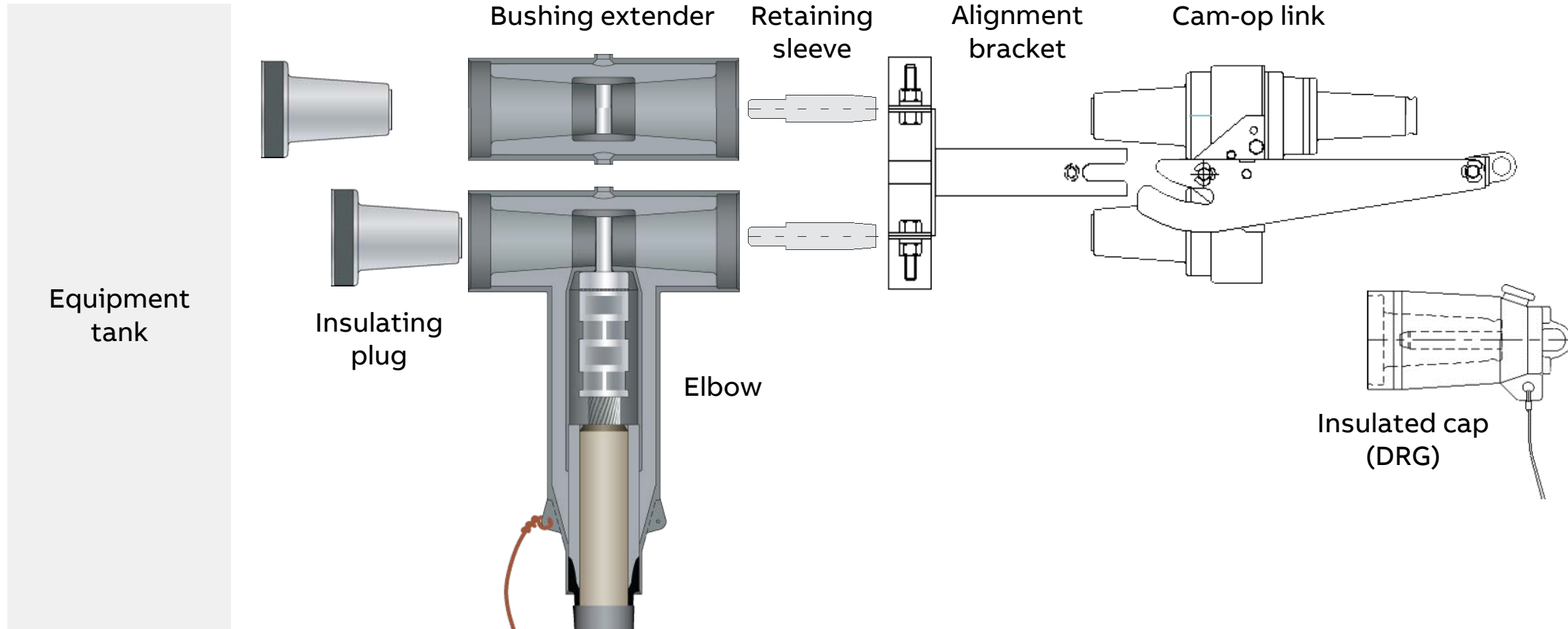
Reducing tap plug



Link

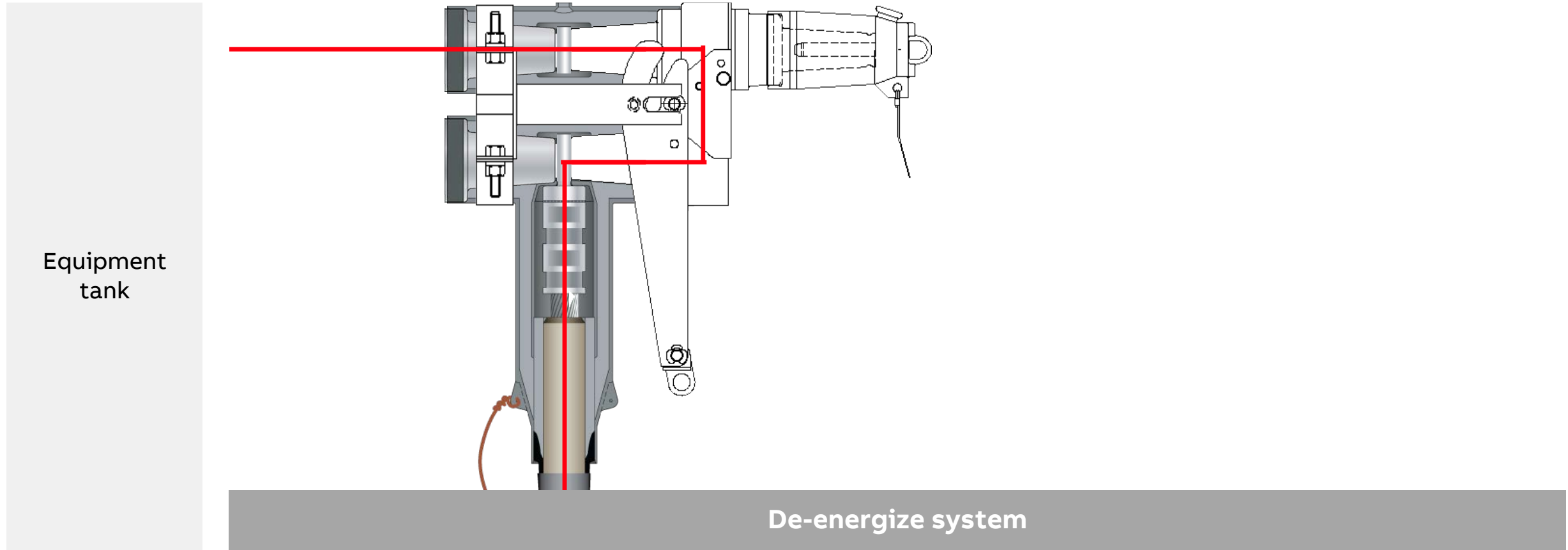
## Appendix — options and accessories

### Cam-op elbow-to-equipment bushing assembly application



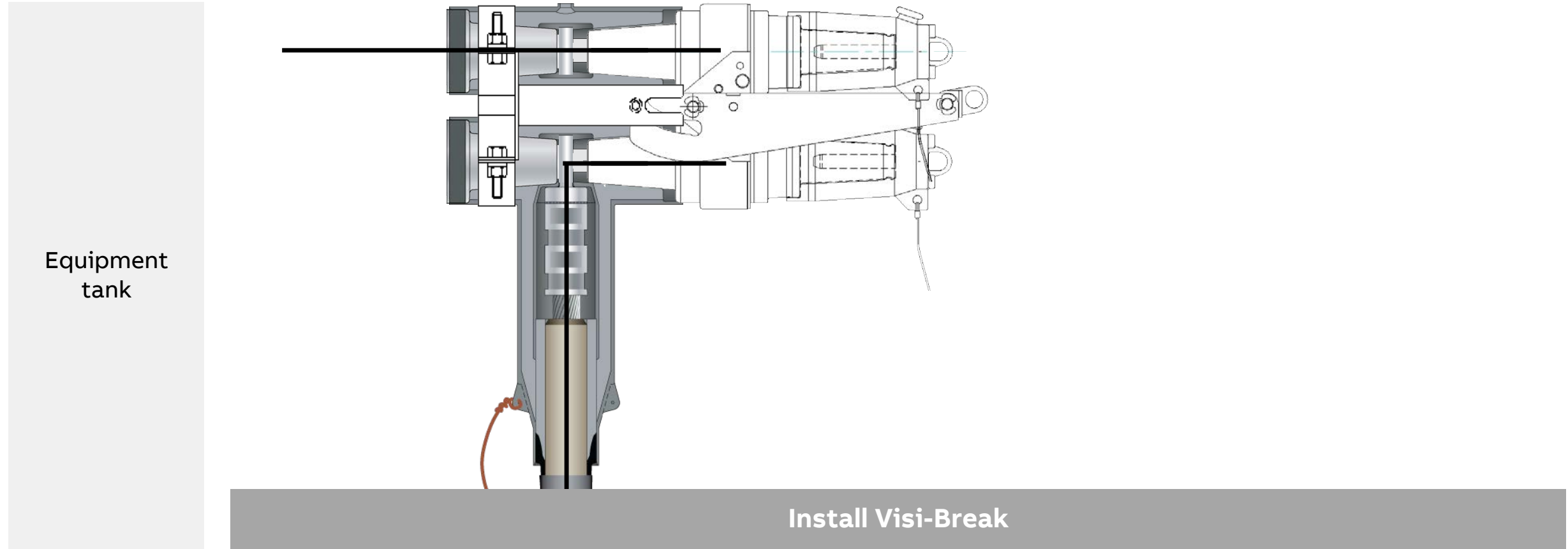
## Appendix — options and accessories

### Cam-op elbow-to-equipment bushing assembly application



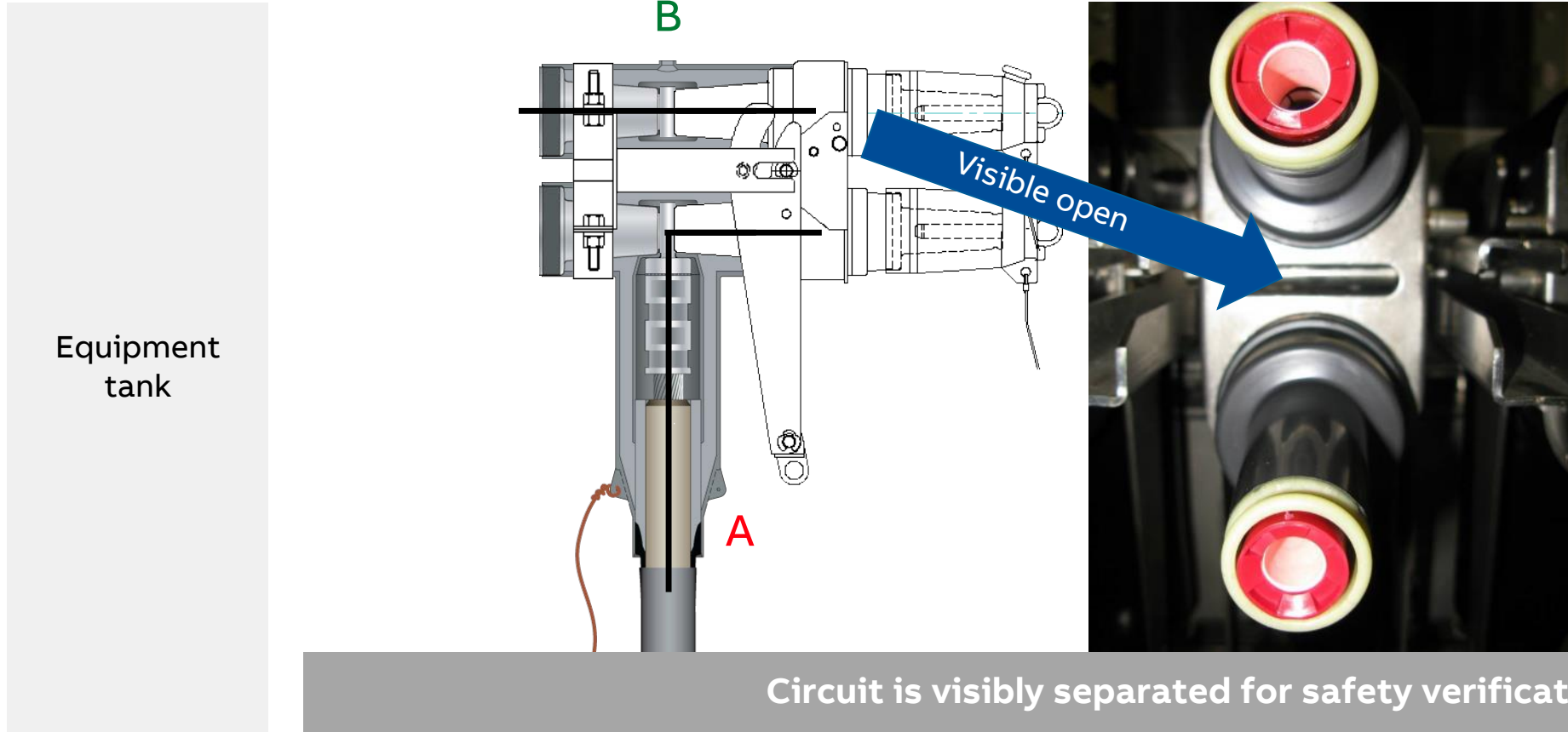
## Appendix — options and accessories

### Cam-op elbow-to-equipment bushing assembly application



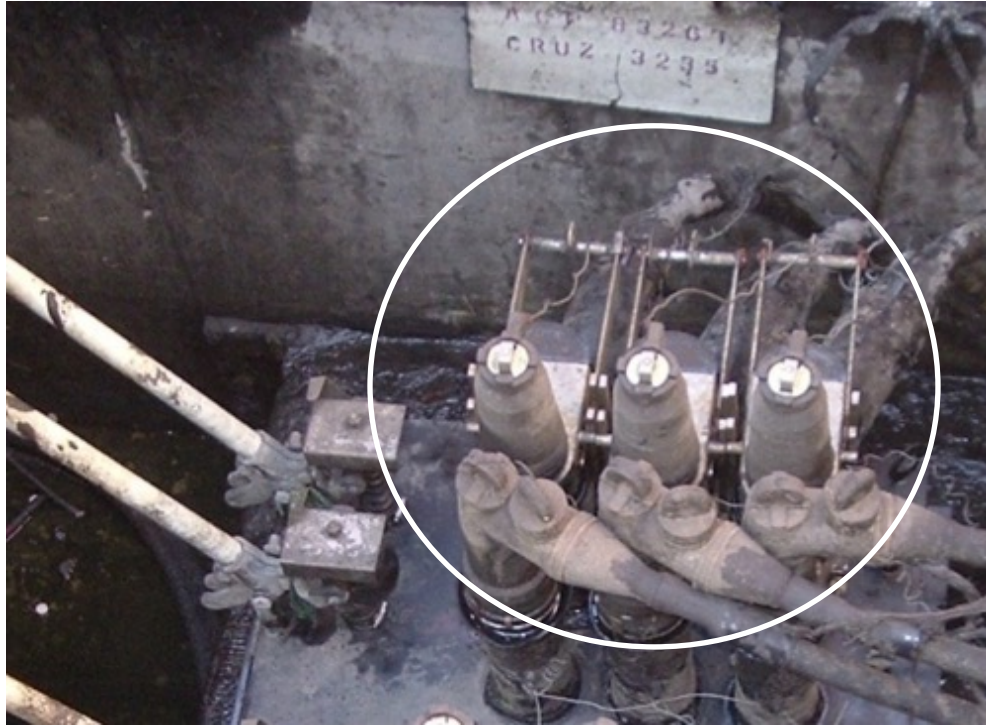
## Appendix — options and accessories

### Cam-op elbow-to-equipment bushing assembly application



## Appendix — options and accessories

### Cam-op elbow-to-equipment bushing assembly application

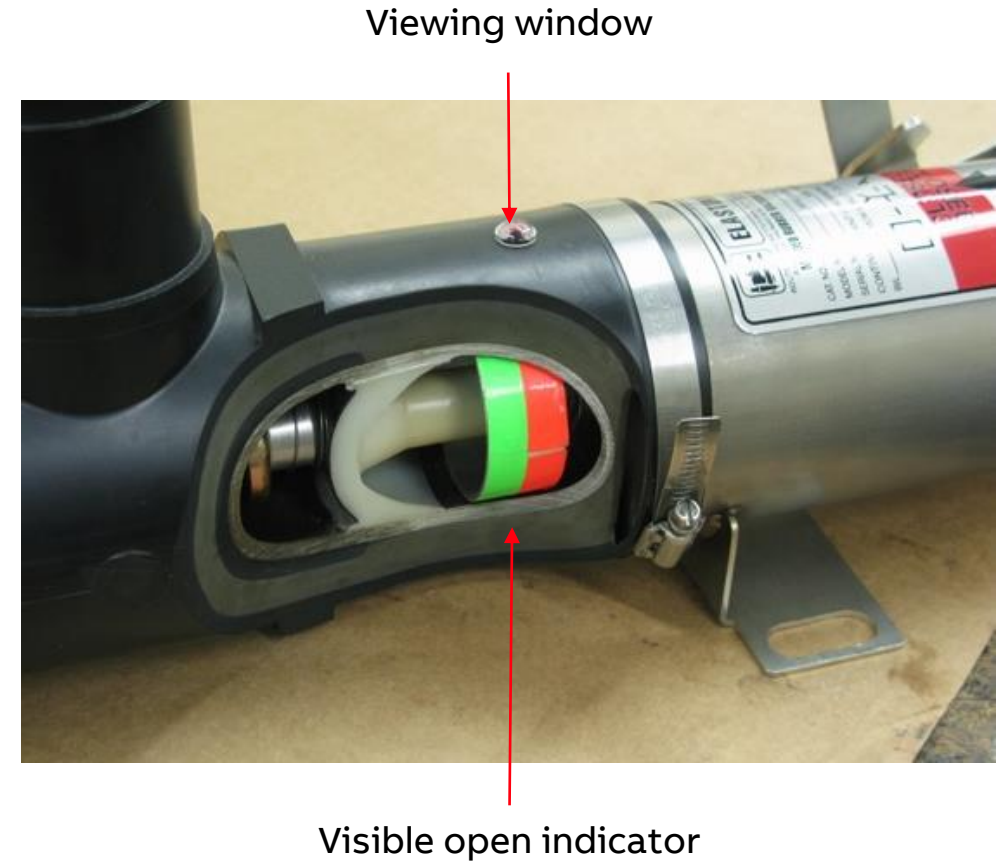
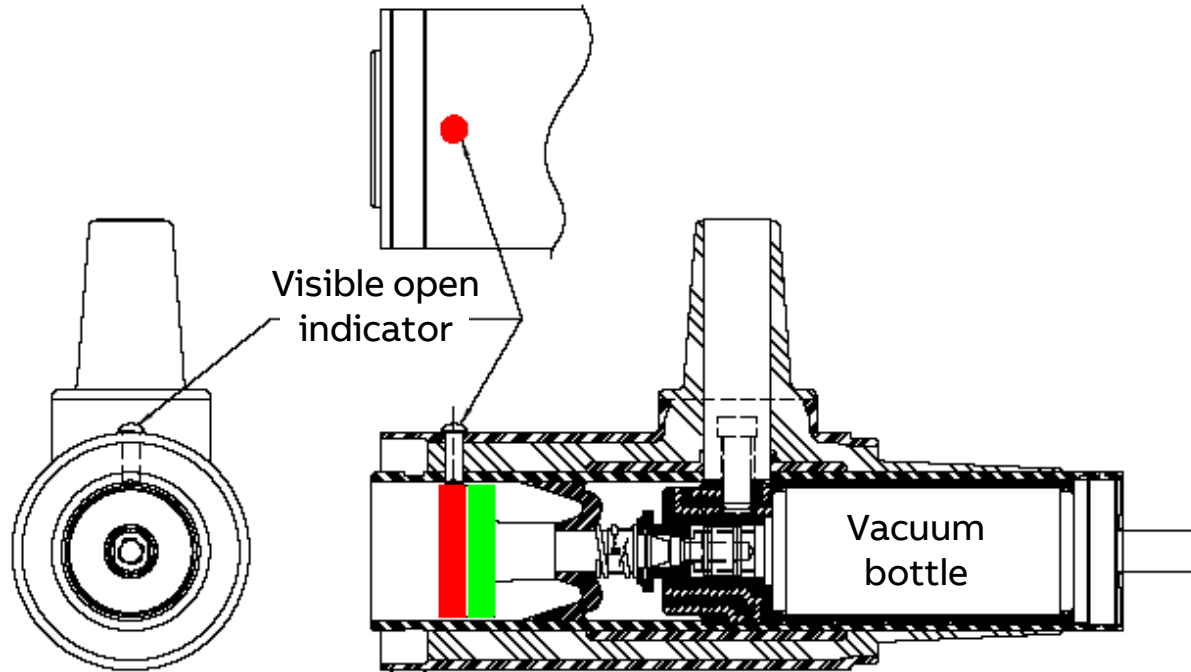


Cam-op in an underground vault after service under submerged conditions.



# Appendix — options and accessories

## Position indicator design criteria



## Appendix — options and accessories

Position indicator/viewing window open





## Appendix — options and accessories

Position indicator/viewing window close





**ABB**