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CATALOG

# Joslyn Hi-Voltage®

## Overhead reclosers & switches



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**Thomas & Betts is now ABB Installation Products, but our long legacy of quality products and innovation remains the same. From connectors that help wire buildings on Earth to cable ties that help put machines in space, we continue to work every day to make, market, design and sell products that provide a smarter, safer and more reliable flow of electricity, from source to socket.**

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# TriMod™ reclosers

## Overview

Improve your system reliability by using Joslyn Hi-Voltage® reclosers

- Vacuum interrupter technology provides twice the contact life required by ANSI C37.60 plus maintenance-free operation
- Solid dielectric Joslyte provides superior insulation and environmentally friendly technology – No oil, no gas, no hassle
- Magnetic actuator mechanisms offer 10,000 trip and close full-load operations with no maintenance required
- Variety of microprocessor relay controls are compatible with Schweitzer's SEL351R and SEL651R recloser controls
- PowerMAX 100 and 130 batteryless control option for single-phase reclosers
- Supports single-phase tripping, single-phase lockout; single-phase tripping, three-phase lockout; and three-phase tripping, three-phase lockout
- Mounting options include wood pole, cross arms and cluster frame mounting
- Lightweight control can be mounted directly to recloser or remotely for single-phase models
- Moisture-control bladder system means no internal heater required, no need to energize heaters during long storage periods and no maintenance worries
- Externally mounted current transformers on grounded plane with covers for enhanced safety and easy replacement in the field

**To improve system reliability, many utilities are moving toward system configurations such as:**

- Open-tie reclosers
- Midpoint reclosers
- Single-phase reclosing
- Feeder loop restoration

These configurations, when combined with remote communication capability, can substantially improve reliability indices and subsequently enhance customer service.

**Utility companies' performance is measured by reliability indices.**

These indices will measure duration and frequency of interruption for distribution systems and will help assess penalty and/or performance-based rates at the utilities:

- System Average Interruption Frequency Index (SAIFI)
- System Average Interruption Duration Index (SAIDI)
- Momentary Average Interruption Frequency Index (MAIFI)

Joslyn TriMod automated reclosers feature capabilities well suited for specialty applications that help utilities reduce outages and improve service reliability.

**Available in both single- and three-phase models, TriMod reclosers offer advanced capabilities such as:**

- Fault location
- Adaptive protection
- Power quality
- Control monitoring
- SCADA communications
- Single- and three-phase tripping
- Loop automation

On the following page are illustrations of typical system reliability improvement applications using TriMod reclosers.

**Utilities can reduce outages an average of 45% with the use of reclosers.**

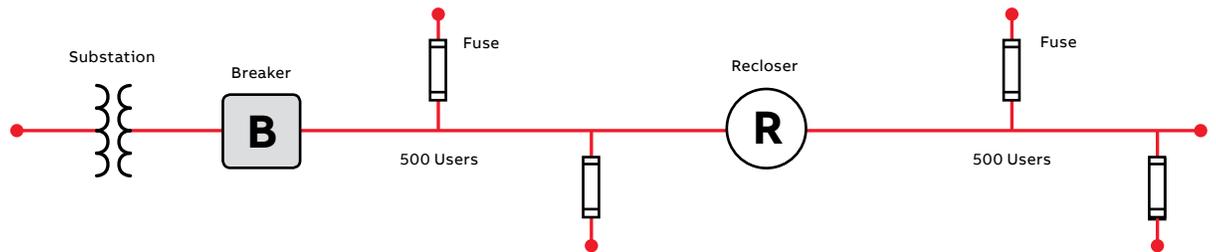
Compact and easily installed, TriMod reclosers can be applied in substations as well as on riser poles. They feature advanced, microprocessor-based relay control for easy coordination with upstream and downstream devices such as:

- Substation circuit breakers
- Sectionalizers
- Line fuses (for fuse savings or fuse clearing schemes)
- Existing reclosers

Feeder with midpoint recloser

Without midpoint recloser	With midpoint recloser	With midpoint recloser and single-phase tripping
SAIFI = 2 int/yr	SAIFI = 1.5 int/yr (25% reduction)	SAIFI = 1.3 int/yr (35% reduction)
SAIDI = 3 hr/yr	SAIDI = 2 hr/yr (33% reduction)	SAIDI = 1.8 hr/yr (40% reduction)
MAIFI = 7 mom/yr	MAIFI = 5.5 mom/yr (21% reduction)	MAIFI = 4.5 mom/yr (36% reduction)

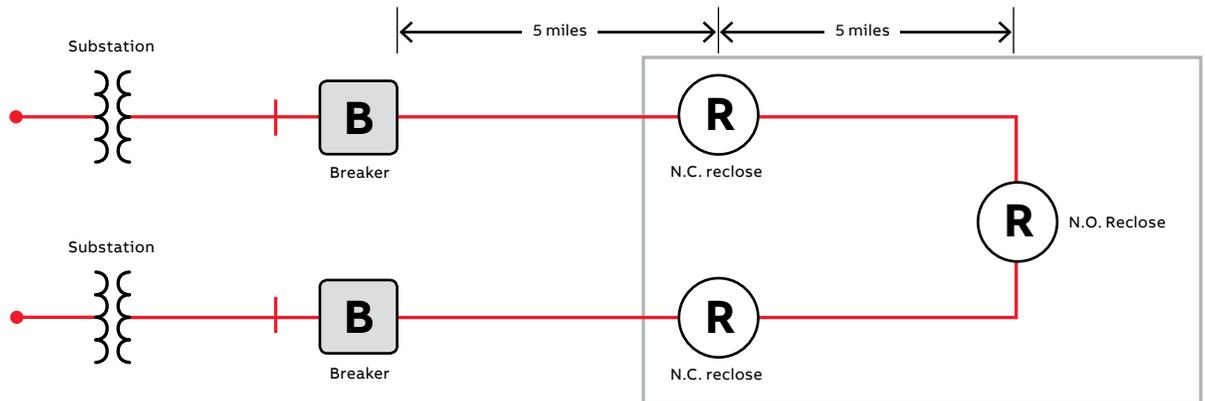
Feeder with midpoint recloser



Loop configuration

Loop without reclosers	Loop with reclosers and single-phase tripping
SAIFI = 1.4 int/yr (30% reduction versus feeder configuration)	SAIFI = 1.12 int/yr (44% reduction versus feeder configuration)
SAIDI = 1.8 hr/yr (40% reduction versus feeder configuration)	SAIDI = 1.5 hr/yr (50% reduction versus feeder configuration)
MAIFI = 5.1 mom/yr (27% reduction versus feeder configuration)	MAIFI = 2.3 mom/yr (67% reduction versus feeder configuration)

Loop configuration



# TriMod™ reclosers

## Joslyn Hi-Voltage® TriMod 100 Series single-phase vacuum recloser

Raising the standard of recloser performance and reliability

—  
01 Joslyn Hi-Voltage  
TriMod 100 series  
single-phase  
vacuum recloser

- Vacuum interrupter technology provides twice the duty-cycle interruption life and uses no oil or gas for interruption
- Joslyte solid dielectric insulating system provides maintenance-free, environmentally safe operation, with no need to monitor or maintain gas pressure or oil levels
- Magnetic actuator system yields a minimum of 10,000 operations with no maintenance required
- PowerMAX 100 microprocessor-based control offers reliable accuracy regardless of time and temperature – Plus it offers features traditionally only available with three-phase recloser controls
- Mounts to a wood pole, cross arms or cluster mounting frame – With control mounted directly to TriMod recloser or remotely
- Manual operating handles on recloser for mechanical opening and lockout and disabling automatic reclosing
- Large color-coded reflective open and closed position indicators located on bottom of recloser for easy visibility from ground level
- Durable module materials: upper housing – Cycloaliphatic epoxy, lower housing – Aluminum casting
- Externally mounted current transformers on grounded plane with covers for enhanced safety and easy replacement in the field

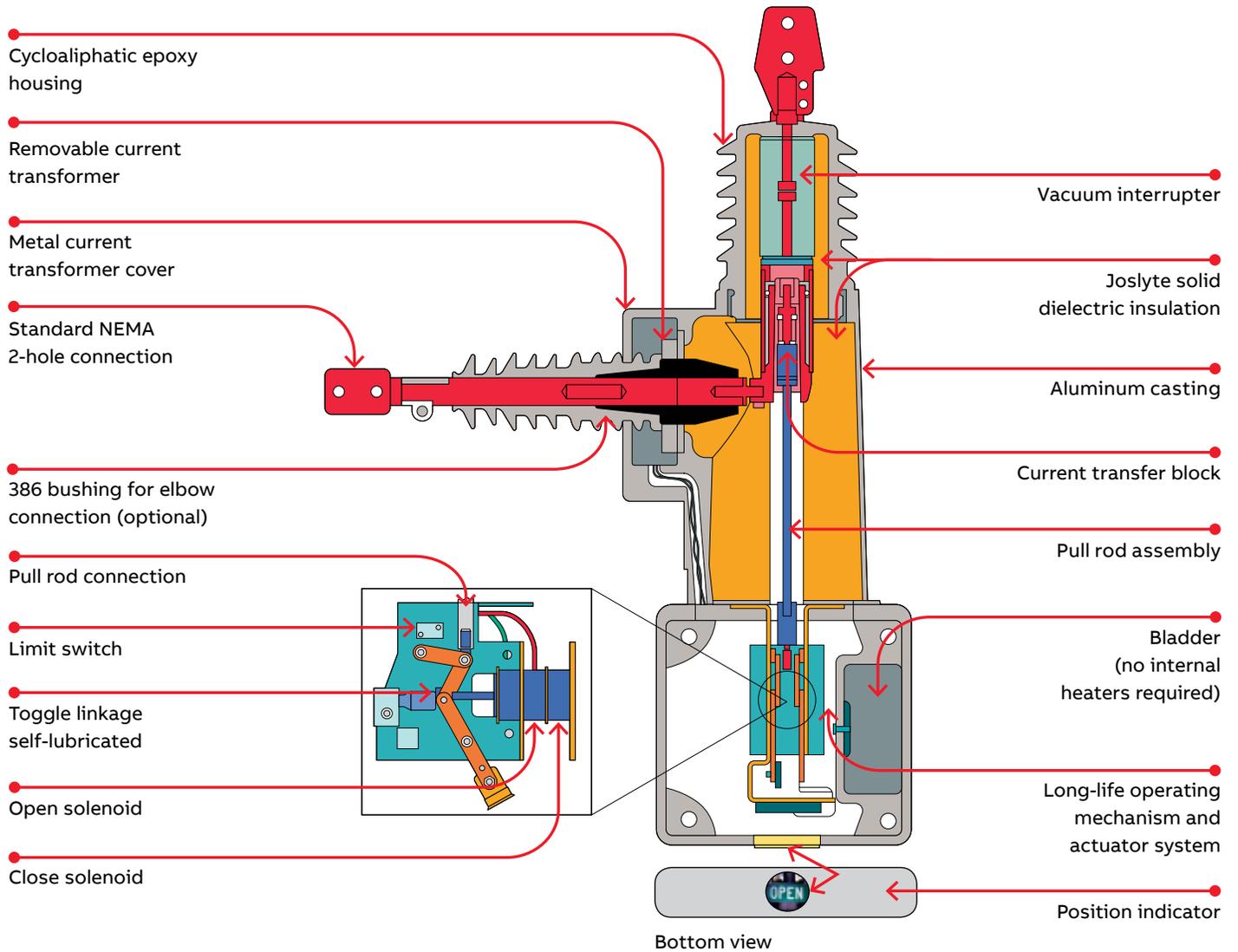


The Joslyn Hi-Voltage TriMod 100 series single-phase vacuum recloser raises the standard of recloser performance by incorporating state-of-the-art vacuum interrupter technology with Joslyn's field-proven Joslyte solid dielectric insulating system and a long-life operating mechanism and magnetic actuator system. Unique, field-proven features make the TriMod 100 series recloser the long-life, easy-to-use solution for utility recloser needs.

The TriMod 100 recloser contains no oil or gas for interruption or insulation. The 40-year field-proven Joslyte solid dielectric insulation system provides dielectric strength around the vacuum interrupter without the danger of leaks or environmental hazards.

Traditional single-phase reclosers with hydraulic controls have difficulty maintaining accuracy over time, particularly through temperature variations. This can affect coordination and limit protection flexibility. Conversely, the TriMod 100 series recloser features microprocessor-based PowerMAX control. Its accuracy does not change over time or with temperature variations, thus enabling better and more reliable protection coordination.

For user convenience, manual operating handles are located on the recloser. The yellow handle permits mechanical opening and mechanically actuated, electrical closing of the recloser. The non-reclosing lever provides the capability of blocking reclosing after the first trip operation regardless of the number of recloses pre-programmed in the control.



— Removable epoxy bushing, elbow connection available

**Recloser construction**

The Joslyn Hi-Voltage TriMod 100 series single-phase vacuum recloser is manufactured for a range of distribution voltages with continuous current capabilities up to 800 A. It is operated electrically by energizing a magnetic actuator system.

Each pole has a vacuum interrupter sealed in Joslyte solid dielectric insulation, which provides mechanical strength, high dielectric strength and complete moisture sealing. The pole is constructed of an epoxy main bushing and aluminum casting. The side terminal may be a permanently fixed epoxy bushing or a removable polymer bushing that enables an elbow connection to a 386 bushing assembly.

The operating mechanism is located in a completely sealed housing. An expansion bladder in the mechanism housing prevents breathing in of

outside contaminants and/or moisture. Based on this design, external power is NOT supplied or required by the recloser.

The “open-close” position indicator connects directly to the operating mechanism linkage. An external manual trip assembly, located on the front of the recloser, is provided for manual tripping of the recloser by pulling down on the yellow trip lever. The manual trip lever, in the down position, will maintain the recloser in a lockout position until it is manually restored to the normal position. The trip lever does not move during the electrical operation.

All electrical control connections to the mechanism are made through a sealed single environment control cable connector located on the side of the recloser.

## TriMod™ reclosers

### Joslyn Hi-Voltage® PowerMAX 100 control unit and ControlMAX interface software

- 01 Trip test button
- 02 Event recording

The PowerMAX 100 control unit provides unprecedented application flexibility and data recording capabilities. All protection settings are changeable from the integrated keypad, without the need to change or stock any components. Remote monitoring and operation is available via dry contacts or the RS-232 communications port.

#### Enhanced features

The PowerMAX 100 control unit offers features traditionally only available with three-phase recloser controls. The microprocessor-based control uses only a small lithium clock battery to maintain accurate time and date event stamping. The unit's enhanced accuracy and reliability means that its timing remains constant and is not affected by temperature.

No other batteries are used in the operation of the control, thus eliminating costly battery maintenance normally associated with electronic controls. All settings and stored information are retained without the use of batteries – Even in the absence of line voltage.

The PowerMAX 100 control unit is incredibly versatile. It can be mounted directly to the TriMod 100 series recloser or conveniently placed at a remote location. What's more, connecting the control unit to other PowerMAX 100 controllers provides single-phase tripping and three-phase lockout.

#### Trip test button

The trip test button is a convenient option to verify recloser trip sequence. It enables simulation of a 1,000 A fault.

#### Programmable settings

Programming of the PowerMAX 100 control unit is easily accomplished with the self-explanatory keypad. No DIP switches or additional components are required to make any setting changes. All settings are changeable from the keypad, and no computer is required. Changes to the settings and retrieval of stored information can be accomplished with a computer using the ControlMAX interface software.

#### Time-current curves

All traditional single-phase recloser curves plus ANSI inverse curves are user-programmable without the need to change any components. Select from A, B, C, D, E, F, N, R, EF, KF and TF (with modifier curves).

#### Voltage protection

The PowerMAX 100 control unit has the ability to be programmed to trip on overvoltage or undervoltage conditions.

#### Single-phase trip, three-phase lockout

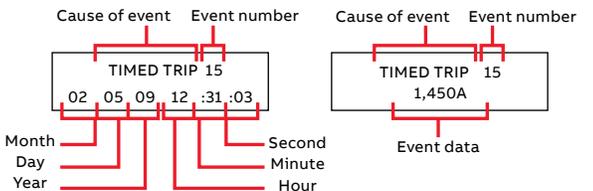
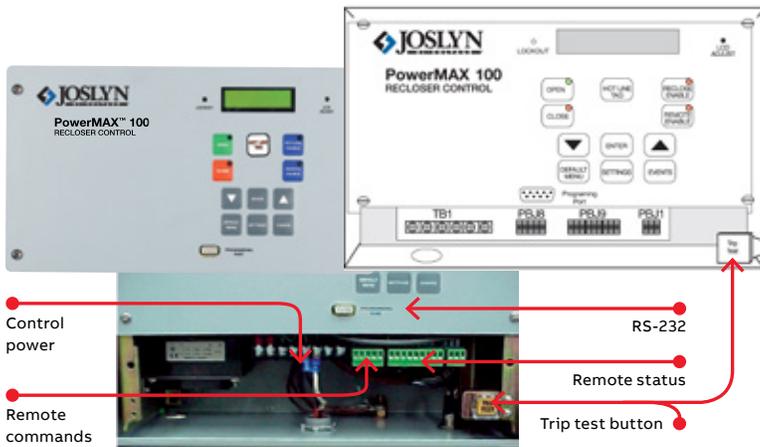
The PowerMAX 100 control unit may be connected to other PowerMAX controls to provide single-phase tripping and three-phase lockout.

#### Event recording

The event recorder stores the 20 most recent events, enabling fast troubleshooting of problematic feeders. Each time- and date-stamped event includes the cause of the event and any data associated with it. The events can be retrieved locally using the keypad and display or remotely via the RS-232 port.

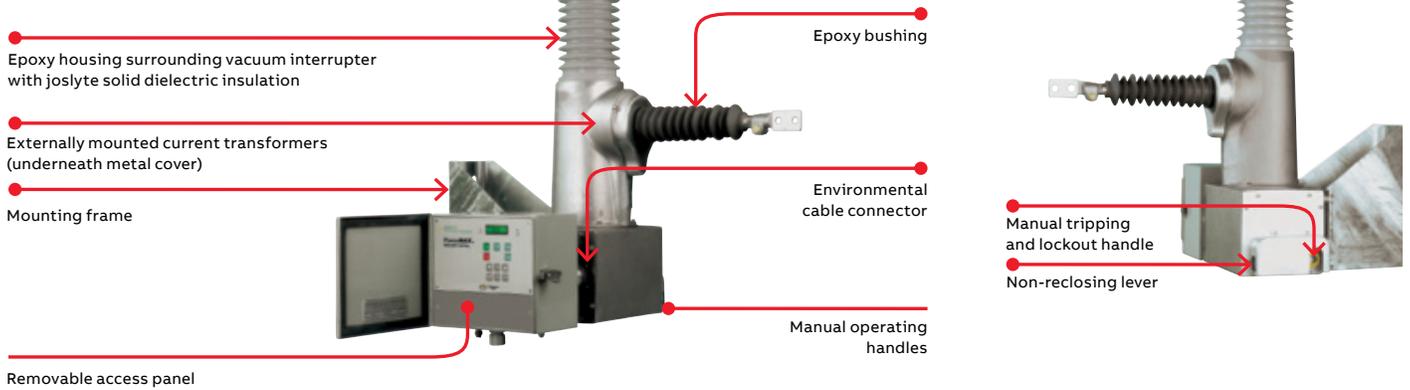
#### SCADA ready

The PowerMAX 100 control unit has an isolated RS-232 port that can be configured for communications and uses the MODBUS communications protocol.



## Direct control mounting

(Remote control mounting optional)



- 01 Lockout Indicator
- 02 Main Menu
- 03 Setpoint menu

### Lockout indicator

The control indicates lockout by illuminating the lockout LED on the front panel as well as a high-powered LED on the bottom of the control enclosure. This enables quick and accurate determination from ground level as to which TriMod 100 Series Recloser has operated to lockout.



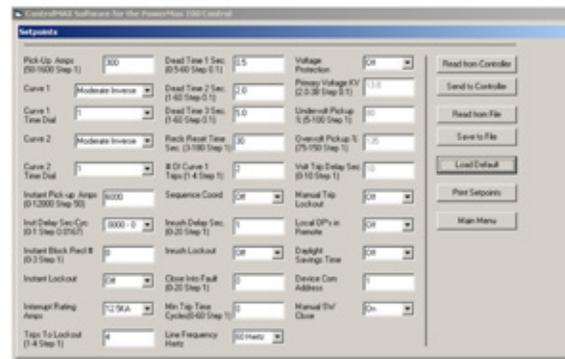
01

### Low-voltage testing capability

The PowerMAX 100 control unit is powered from 120 or 240 V AC. This, along with the fact that the TriMod 100 series recloser does not use a high-voltage closing solenoid, enables safe and convenient testing of the recloser system. In addition, the operations counter and duty monitor are stored in each recloser, eliminating the need for manual recording of recloser operational data. The PowerMAX 100 control unit reads this information and displays it on the LCD.



02



03

### ControlMAX interface software

The ControlMAX interface software can be accessed via a computer connection to view and/or modify settings. The software auto-links with the PowerMAX 100 control unit with a straight communication cable connection and enables the user to program the unit or change its settings in the shop or in the field.

### Mounting options

The PowerMAX 100 control unit can come mounted directly to the TriMod 100 series recloser, or it can be remotely mounted with a remote mounting package. The package includes a pole-mounting bracket-on control enclosure and a 35-ft. control cable with environmental connectors on both ends.

A PowerMAX 100 mounting bracket is available to install three individual controls at the bottom of a pole on the same bracket.

### Joslyn Hi-Voltage® PowerMAX 130 control option

Integrates three PowerMAX 100 control units in one enclosure!

- Faster installation
- Wired for single-phase trip and three-phase lockout
- Less pole clutter
- More convenient field access
- Battery-backup option available



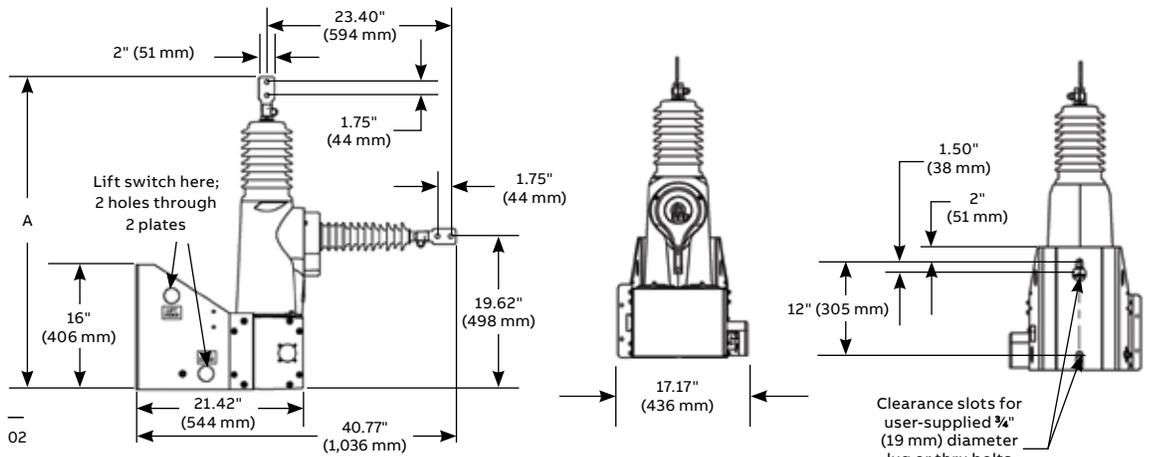
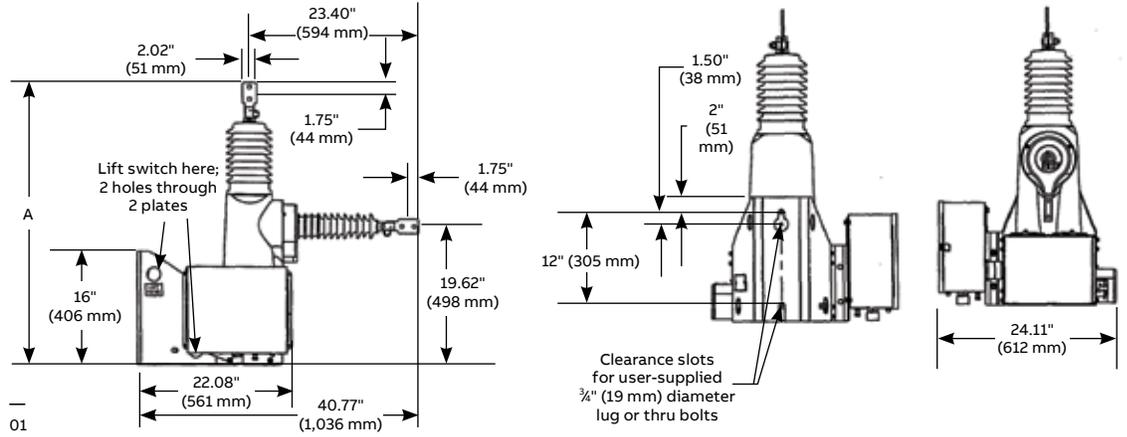
### Package includes:

- (1) PowerMAX 130 control
- (3) TriMod 100 single-phase reclosers
- (3) Control cables

# TriMod™ reclosers

01 Dimensions and creepage distances for TriMod 100 series reclosers with direct-control mounting of PowerMAX 100 control unit

02 Dimensions and creepage distances for TriMod 100 series reclosers with remote-control mounting of PowerMAX 100 control unit



## Creepage distances

Description	15 kV, 110 kV BIL in. (mm)	27 kV, 125 kV BIL in. (mm)
Top terminal	15.83 (402)	20.36 (517)
Side terminal	17.75 (451)	21.35 (542)

## Dimensions – Direct-control mounting

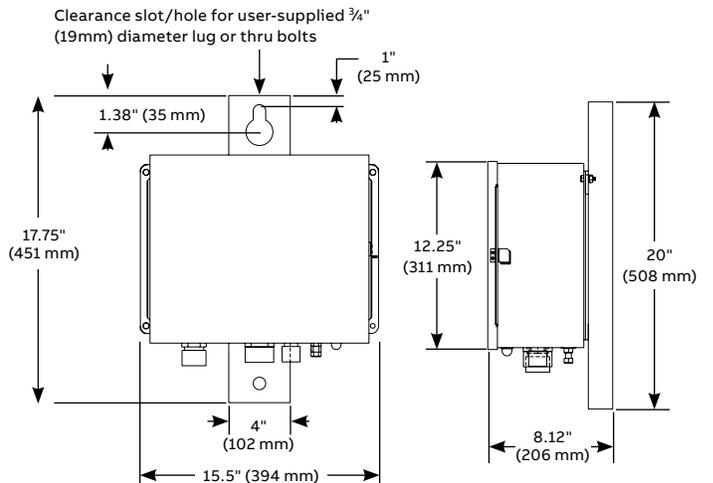
System kV	Height (A) in. (mm)	Weight lb. (kg)
15 kV, 110 kV BIL	37.92 (963)	137 (62)
27 kV, 125 kV BIL	40.07 (1,018)	144 (65)

## Dimensions – Remote-control mounting

System kV	Height (A) in. (mm)	Weight lb. (kg)
15 kV, 110 kV BIL	37.92 (963)	97 (44)
27 kV, 125 kV BIL	40.07 (1,018)	109 (49)

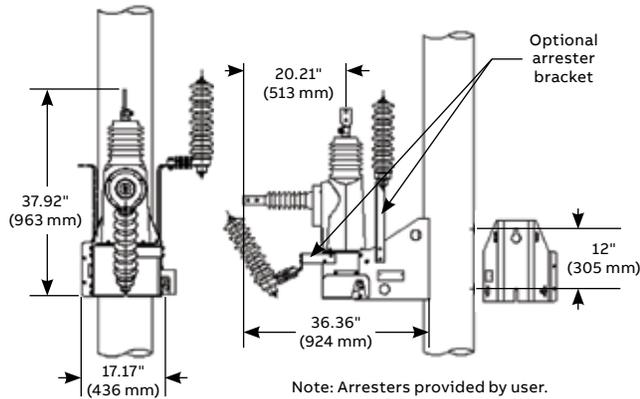
Note: Maximum cantilever terminal pad load of 60 lb. (27 kg) per pad.  
Horizontal cable tensions to be opposite in direction.

## Remote-mounted control cabinet



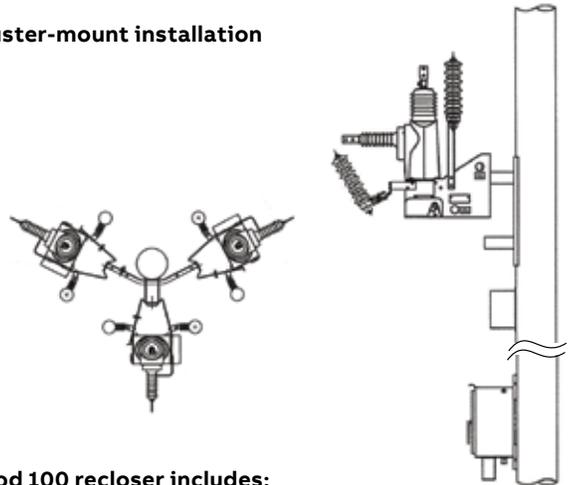
# TriMod™ reclosers

## Typical pole-mounting installation



Note: Arresters provided by user.

## Typical cluster-mount installation



### Ratings

Description	15 kV	27 kV
Nominal system voltage (kV, RMS)	14.4	25
Rated maximum voltage (kV, RMS)	17.1	27
Nominal frequency (Hz)	50 or 60	50 or 60
Number of phases	1	1
BIL (kV)	110	125
Power frequency withstand – dry (kV)	50	60
Power frequency withstand – wet (kV)	45	50
Continuous current (A RMS)	630/800	630/800
8-hour overload current (A RMS)	800	800
CT ratio	600:1 (800:1)*	600:1 (800:1)*
Interrupting current (kA RMS symmetrical)	10/12.5	10/12.5
Making current (kA asymmetrical peak)	33	33
Arc extinction medium	Vacuum	Vacuum
Insulating medium	Solid high-dielectric insulation	Solid high-dielectric insulation
Mechanical operations	10,000	10,000

\* Other CT ratios are available upon request.

### Each TriMod 100 recloser includes:

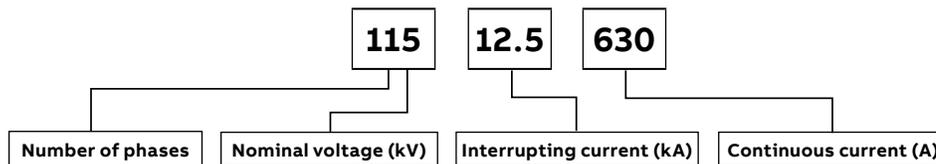
- PowerMAX microprocessor-based recloser control unit mounted to the TriMod recloser (remote mounting of the control is optional)
- Mounting frame that can mount the TriMod recloser to a wood pole, cross arms or a standard transformer cluster mounting bracket

### Options

- Remote mounting control package including pole-mounting bracket for the control and shielded control cable with connectors on both ends (specify length up to 45 feet)
- Arrester mounting provision

### Example:

- TriMod 115-12.5-630 vacuum recloser
- Remote mounting control package with 35-foot control cable
- Arrester mounting provision



## Joslyn Hi-Voltage® TriMod 100 series single-phase vacuum reclosers

Cat. no.	Voltage range (kV)	Continuous current (A)	Interrupting current (kA RMS symmetrical)	BIL (kV)	Height in. (mm)	Weight lb. (kg)	
						Direct	Remote
115-10-630	4–17.1	630	10	110	37.92 (963)	137 (62)	97 (44)
115-12.5-630	4–17.1	630	12.5	110	37.92 (963)	137 (62)	97 (44)
115-12.5-800	4–17.1	800	12.5	110	37.92 (963)	137 (62)	97 (44)
127-10-630	17–27	630	10	125	40.07 (1,018)	144 (65)	109 (49)
127-12.5-630	17–27	630	12.5	125	40.07 (1,018)	144 (65)	109 (49)
127-12.5-800	17–27	800	12.5	125	40.07 (1,018)	144 (65)	109 (49)

Note: Specify TriMod 100 Series vacuum reclosers by selecting voltage class, continuous current and interrupting current rating from the ratings table. Maximum cantilever terminal pad load of 60 lb. (27 kg) per pad. Horizontal cable tensions to be opposite in direction.

# TriMod™ reclosers

## Joslyn Hi-Voltage® TriMod 300R Series three-phase vacuum recloser

Raises the standard.

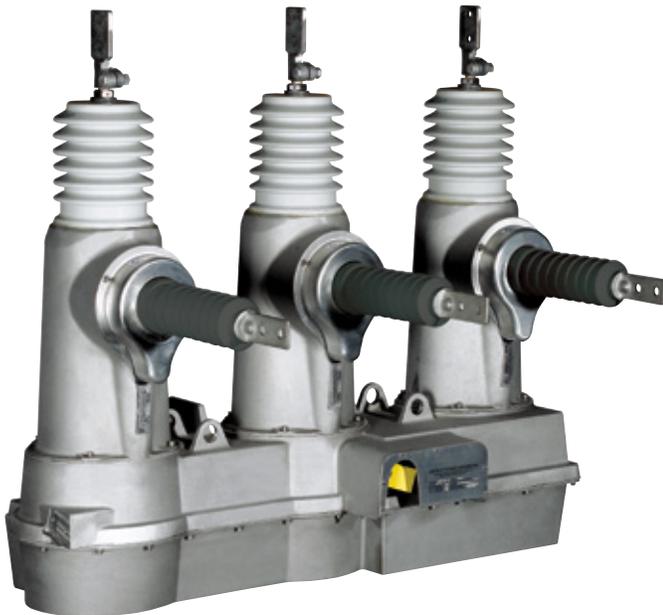
—  
01 TriMod 300R series  
vacuum-interrupting,  
three-phase,  
microprocessor-  
controlled automatic  
circuit recloser

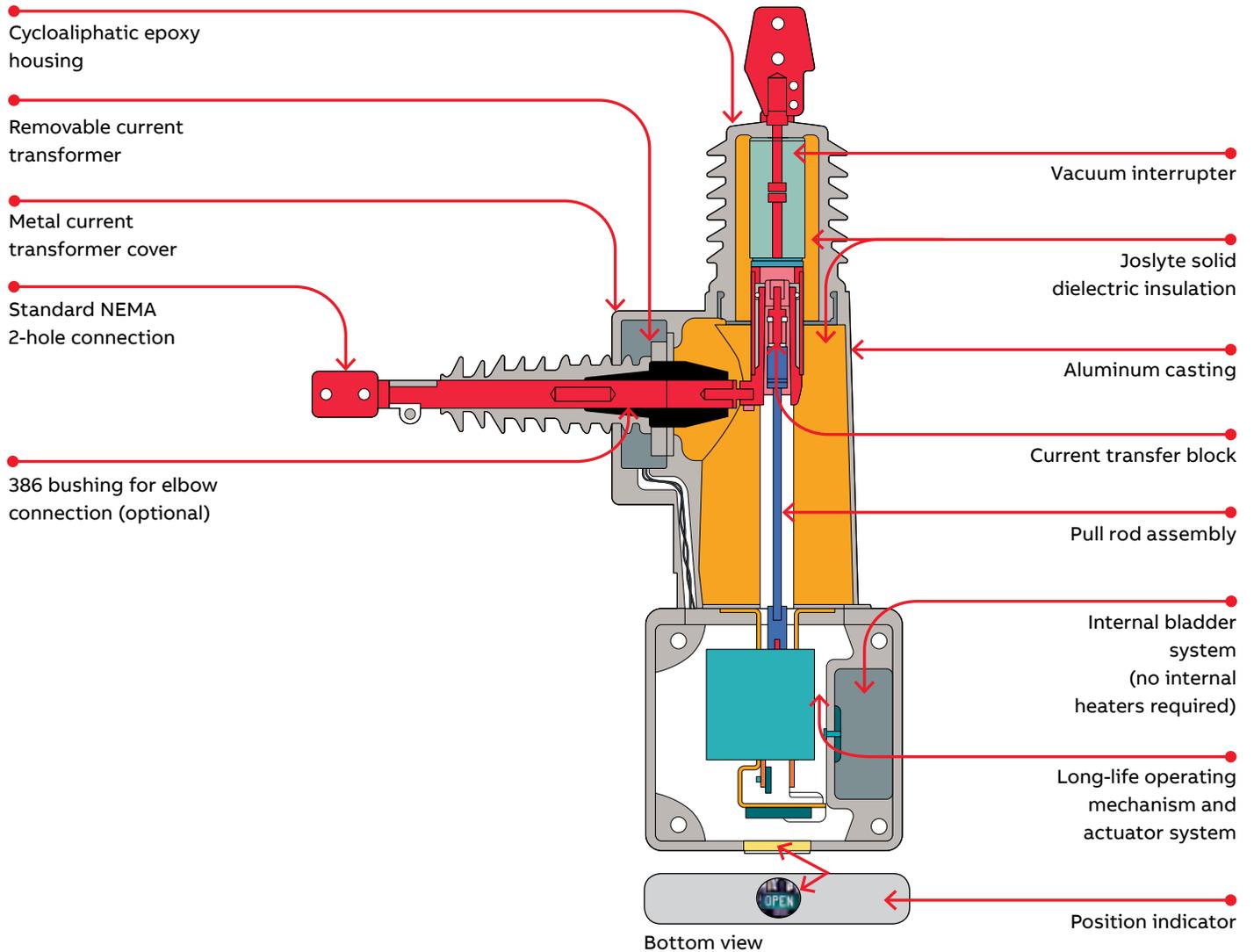
- Vacuum interrupter technology provides twice the duty cycle required by ANSI C37.60
- Joslyte solid dielectric insulating system provides maintenance-free, environmentally safe operation, with no need to monitor or maintain gas pressure or oil levels
- Magnetic actuator mechanism offers 10,000 trip and full-load operations with no maintenance
- Variety of microprocessor relay controls are compatible with Schweitzer's recloser controls SEL351R and SEL651R
- Requires only one C510 SEL 14-pin control cable – faster and more economical to install than other reclosers, which require up to three cables
- Externally mounted current transformers on grounded plane with covers for enhanced safety and easy replacement in the field
- Balanced load-lifting provisions – The TriMod 300R Series Recloser can be smoothly raised by utilizing the four lifting rings

The Joslyn Hi-Voltage TriMod 300R series three-phase vacuum recloser raises the standard of recloser performance by incorporating state-of-the-art vacuum interrupter technology with Joslyn's field-proven Joslyte solid dielectric insulating system and a long-life operating mechanism and magnetic actuator system. Unique, field-proven features make the

TriMod 300R series recloser the long-life, easy-to-use solution for utility recloser needs.

The TriMod 300R series recloser contains no oil or gas for interruption or insulation. The 40-year field-proven Joslyte solid insulation system provides dielectric strength around the vacuum interrupter without the danger of leaks or environmental hazards.





— Removable epoxy bushing, elbow connection available

**Recloser construction**

The Joslyn Hi-Voltage TriMod 300R series three-phase vacuum recloser is manufactured for a range of distribution voltages with continuous current capabilities up to 800 A. The mechanism is operated electrically by energizing a magnetic actuator.

Each pole has a vacuum interrupter sealed in Joslyte solid dielectric insulation, which provides mechanical strength, high dielectric strength and complete moisture sealing. The pole is constructed of an epoxy main bushing, epoxy housing and aluminum casting. The side terminal may be a permanently fixed epoxy bushing or a removable polymer bushing that enables a cable elbow connection to a 386 bushing assembly.

Each pole is identical and is mechanically connected to a ganging bar assembly in a completely sealed operating mechanism housing. An expansion bladder in the mechanism housing prevents breathing in of

outside contaminants and/or moisture. Based on this design, external power is NOT supplied or required by the recloser.

The “open-close” position indicator joins directly to the ganging bar mechanism. The ganging bar is used to group each of the three single poles together to ensure three-phase synchronization for both open and close operations. An external manual trip assembly, located on the front of the recloser, connects to the gang bar for manual tripping of the recloser by pulling down on the yellow trip lever.

The manual trip lever, in the down position, will maintain the recloser in a lockout position until it is manually restored to the normal position. The trip lever does not move during electrical operation.

All electrical control connections to the mechanism are made through a sealed single environment control cable connector located on the side of the recloser.

## TriMod™ reclosers

### Joslyn Hi-Voltage® TriMod 300R series recloser operation

—  
01 Schweitzer  
SEL351R control

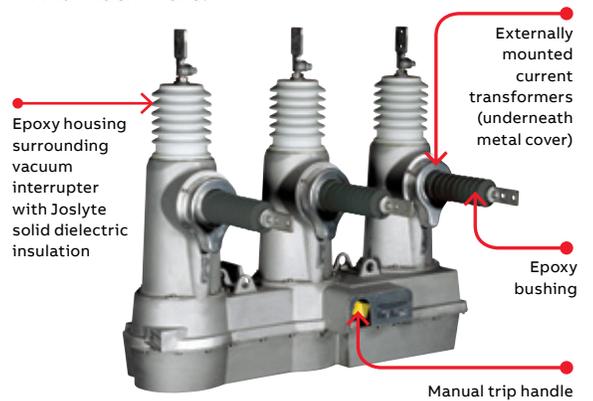
The TriMod 300R series recloser is connected to an electronic control through the use of a standard 14-pin cable. The combination of the TriMod 300R series recloser and an electronic control provides state-of-the-art technology in accurate detection of a wide range of line disturbances and reliable, high-speed isolation against adverse conditions common to utility lines.

Various style controls are available for different applications. Typical control settings include:

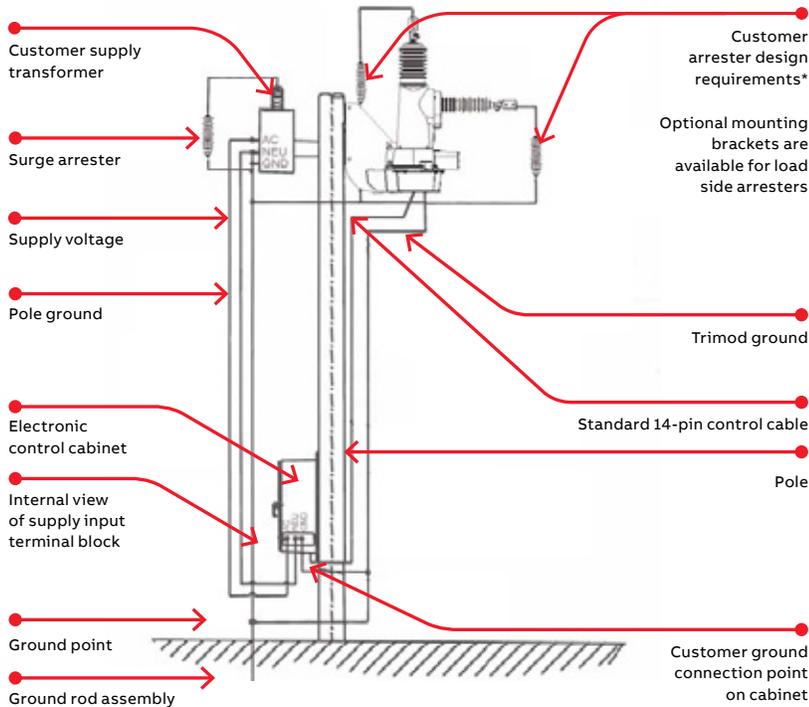
- Overcurrent protection – Fast and delay curves
- Sensitive earth fault
- Complete metering capabilities
- Recloser wear monitor
- Fault locator
- Flexible control logic and integration
- SCADA ready with multiple available communications protocols
- Load profile
- And much more!



—  
01



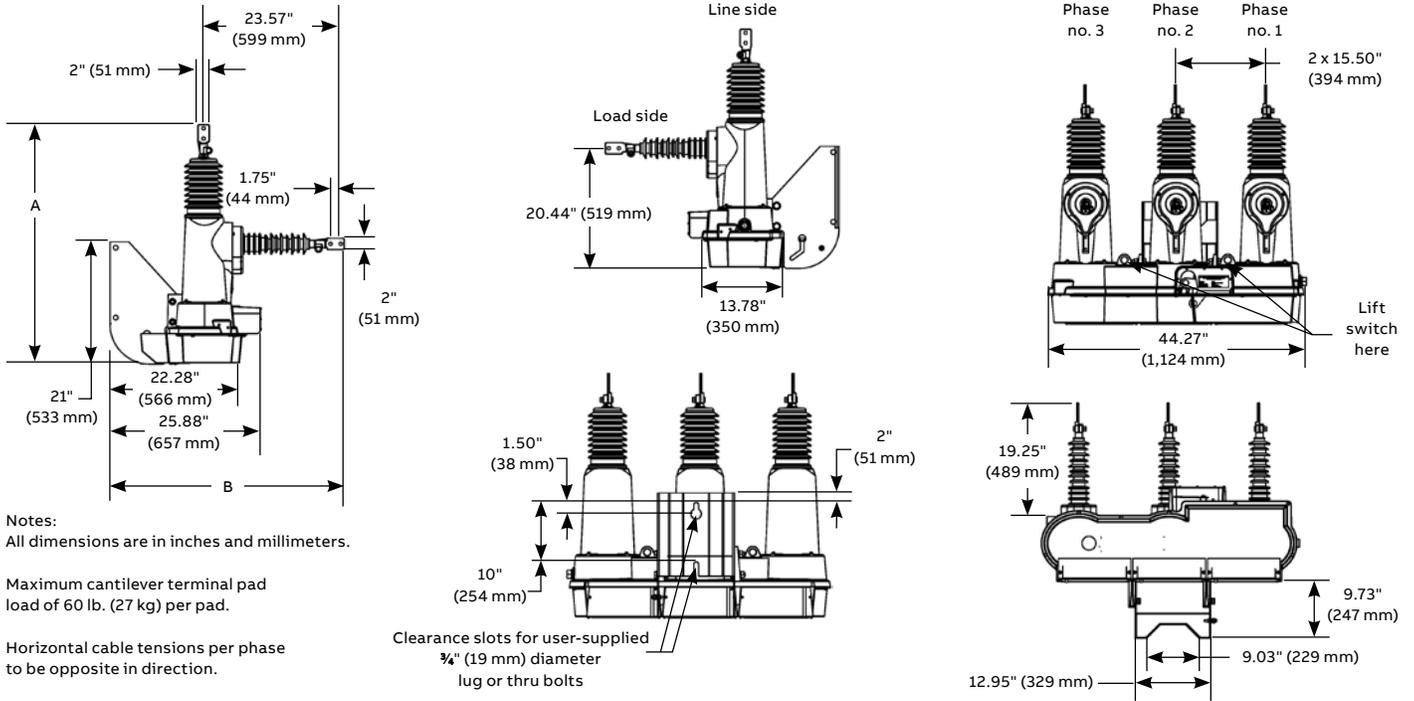
### Typical TriMod 300R series recloser installation detail



\*Arresters are recommended to provide protection against lightning overvoltage conditions. When arresters are installed, they should be mounted on the supplied arrester brackets or as close to the recloser as practical.

# TriMod™ reclosers

Dimensions and creepage distances for TriMod 300R series reclosers



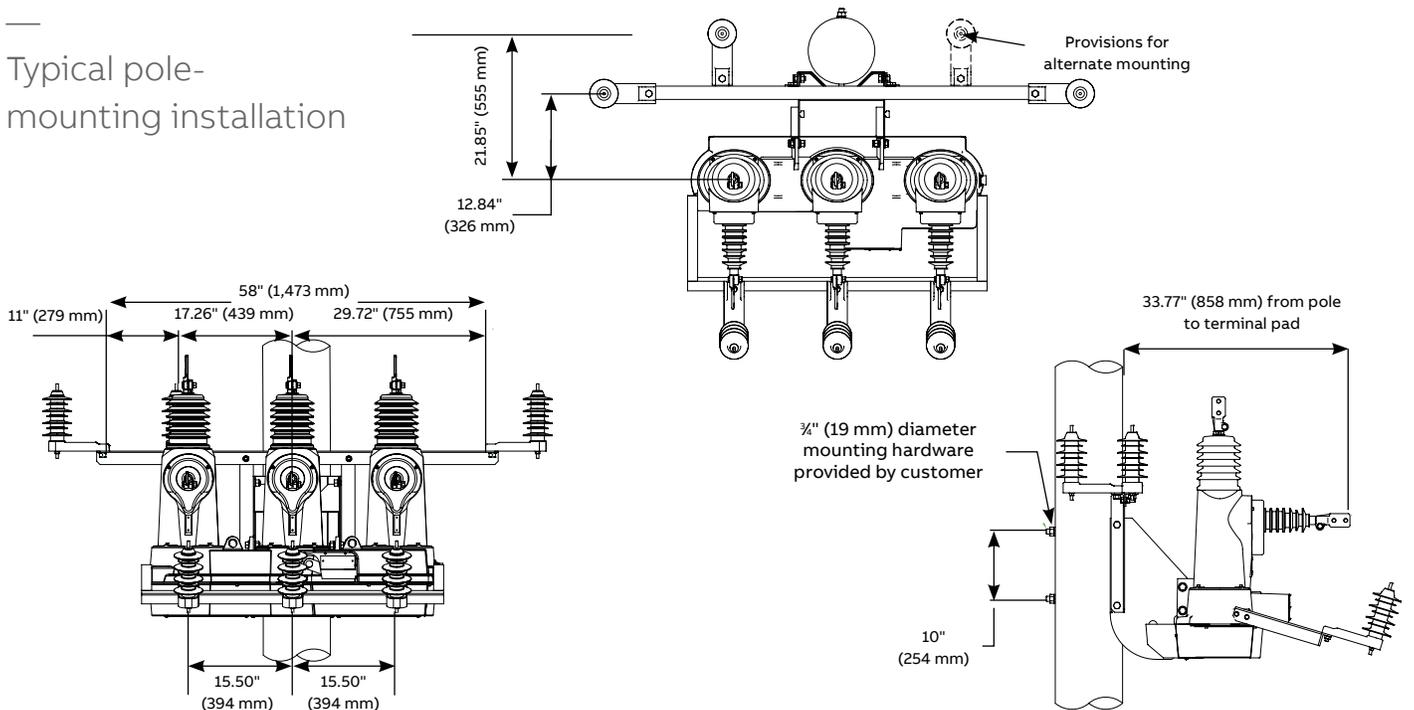
## Creepage distances

Description	15 kV, 110 kV BIL in. (mm)	27 kV, 125 kV BIL in. (mm)
Top terminal	15.83 (402)	20.36 (517)
Side terminal	17.75 (451)	21.35 (542)

## Dimensions

System kV	A in. (mm)	B in. (mm)	Weight lb. (kg)
15 kV, 110 kV BIL	39.07 (992)	39.67 (1,008)	330 (150)
27 kV, 125 kV BIL	41.15 (1,045)	40.30 (1,024)	340 (154)

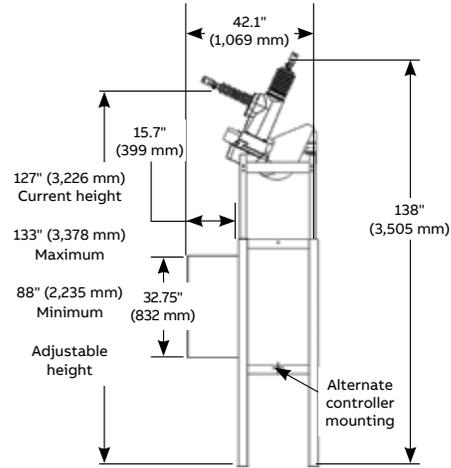
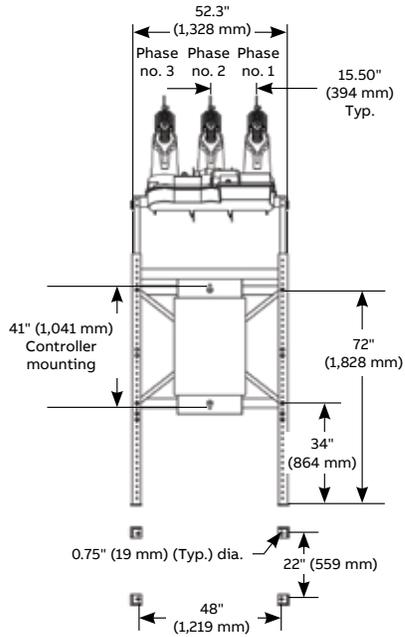
## Typical pole-mounting installation



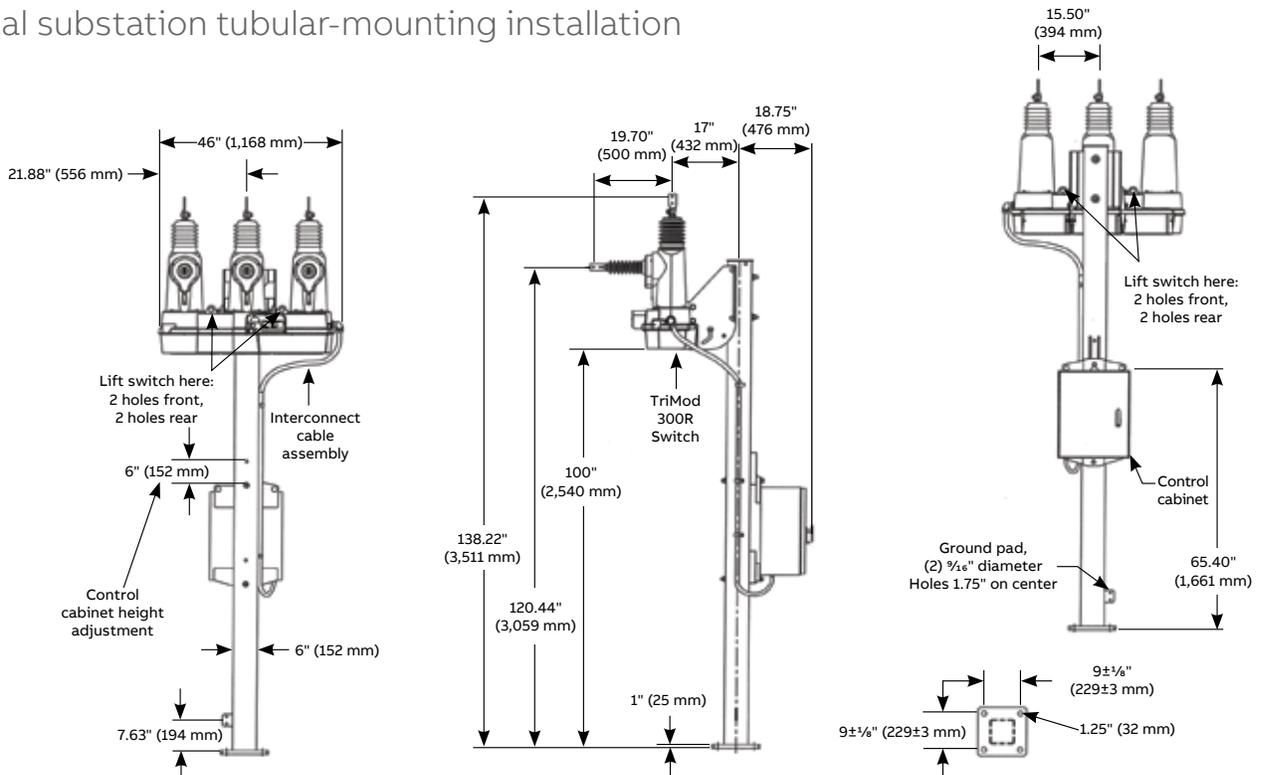
## TriMod™ reclosers

### Typical substation installation

### Typical substation adjustable frame-mount installation



### Typical substation tubular-mounting installation



## TriMod™ reclosers

### Ratings & 300R series three-phase vacuum reclosers

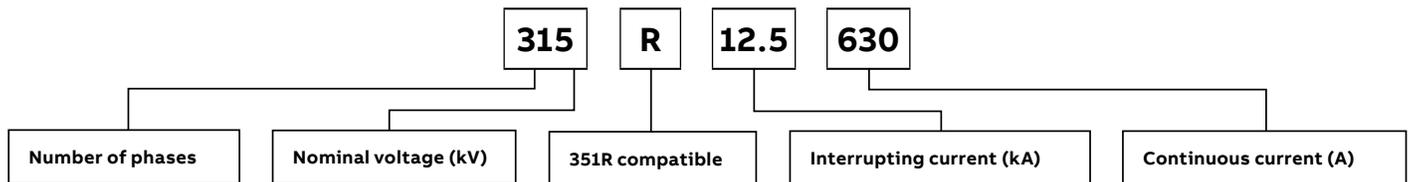
#### Ratings

Description	15 kV	27 kV
Nominal system voltage (kV, RMS)	14.4	25
Rated maximum voltage (kV, RMS)	17.1	29.3
Nominal frequency (Hz)	50 or 60	50 or 60
Number of phases	3	3
Phase spacing (inches)	15.5	15.5
BIL (kV)	110	125
Power frequency withstand – Dry (kV)	50	60
Power frequency withstand – Wet (kV)	45	50
Continuous current (A RMS)	630 or 800	630 or 800
8-hour overload current (A RMS)	800	800
CT ratio	1000:1	1000:1
Interrupting current (kA RMS symmetrical)	12.5 or 16	12.5 or 16
Making current (kA asymmetrical peak)	42	42
Arc extinction medium	Vacuum	Vacuum
Insulating medium	Solid high-dielectric insulation	Solid high-dielectric insulation
Mechanical operations	10,000	10,000
Weight (lb./kg) (with standard mounting frame)	330/150	340/154

1. Select model number from table.
2. Specify length of interconnecting control cable up to 50 ft.
3. Specify SEL351R or SEL651R (14-pin model only)
4. Select options and accessories.

#### Options

- Arrester mounting brackets (source and load side)
- Substation mounting frames
- Extra creepage bushings
- Removable side bushings
- 400:1, 600:1 or 800:1 CT ratio recloser control.



#### Joslyn Hi-Voltage® TriMod 300R series three-phase vacuum reclosers

Cat. no.	Voltage range (kV)	Continuous current (A)	Interrupting current (kA RMS symmetrical)	BIL (kV)	Height		Depth		Weight	
					(in)	(mm)	(in)	(mm)	(lb)	(kg)
315R-12.5-630	4–17.1	630	12.5	110	39.07	992	39.67	1,008	330	150
315R-12.5-800	4–17.1	800	12.5	110	39.07	992	39.67	1,008	330	150
315R-16-630	4–17.1	630	16	110	39.07	992	39.67	1,008	330	150
315R-16-800	4–17.1	800	16	110	39.07	992	39.67	1,008	330	150
327R-12.5-630	17–29.3	630	12.5	125	41.15	1,045	40.30	1,024	340	154
327R-12.5-800	17–29.3	800	12.5	125	41.15	1,045	40.30	1,024	340	154
327R-16-630	17–29.3	630	16	125	41.15	1,045	40.30	1,024	340	154
327R-16-800	17–29.3	800	16	125	41.15	1,045	40.30	1,024	340	154

# TriMod™ reclosers

## Joslyn Hi-Voltage® TriMod 600R series vacuum recloser

Single- or three-phase operation!

01 TriMod 600R series vacuum-interrupting, single- or three-phase operation, microprocessor-controlled, automatic circuit recloser

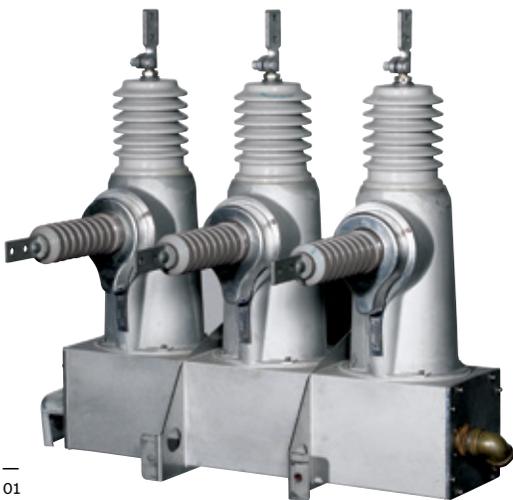
- Vacuum interrupter technology provides twice the duty cycle required by ANSI C37.60
- Joslyte solid dielectric insulating system provides maintenance-free, environmentally safe operation, with no need to monitor or maintain gas pressure or oil levels
- Magnetic actuator system offers 10,000 operations with no maintenance required
- State-of-the-art microprocessor control is compatible with Schweitzer's recloser control SEL651R
- Requires only one C510 SEL 27-pin control cable – Faster and more economical to install than other reclosers, which require up to three cables
- Externally mounted current transformers on grounded plane with covers for enhanced safety and easy replacement in the field
- Balanced load-lifting provisions – The TriMod 600R Series recloser can be smoothly raised by utilizing the four lifting rings

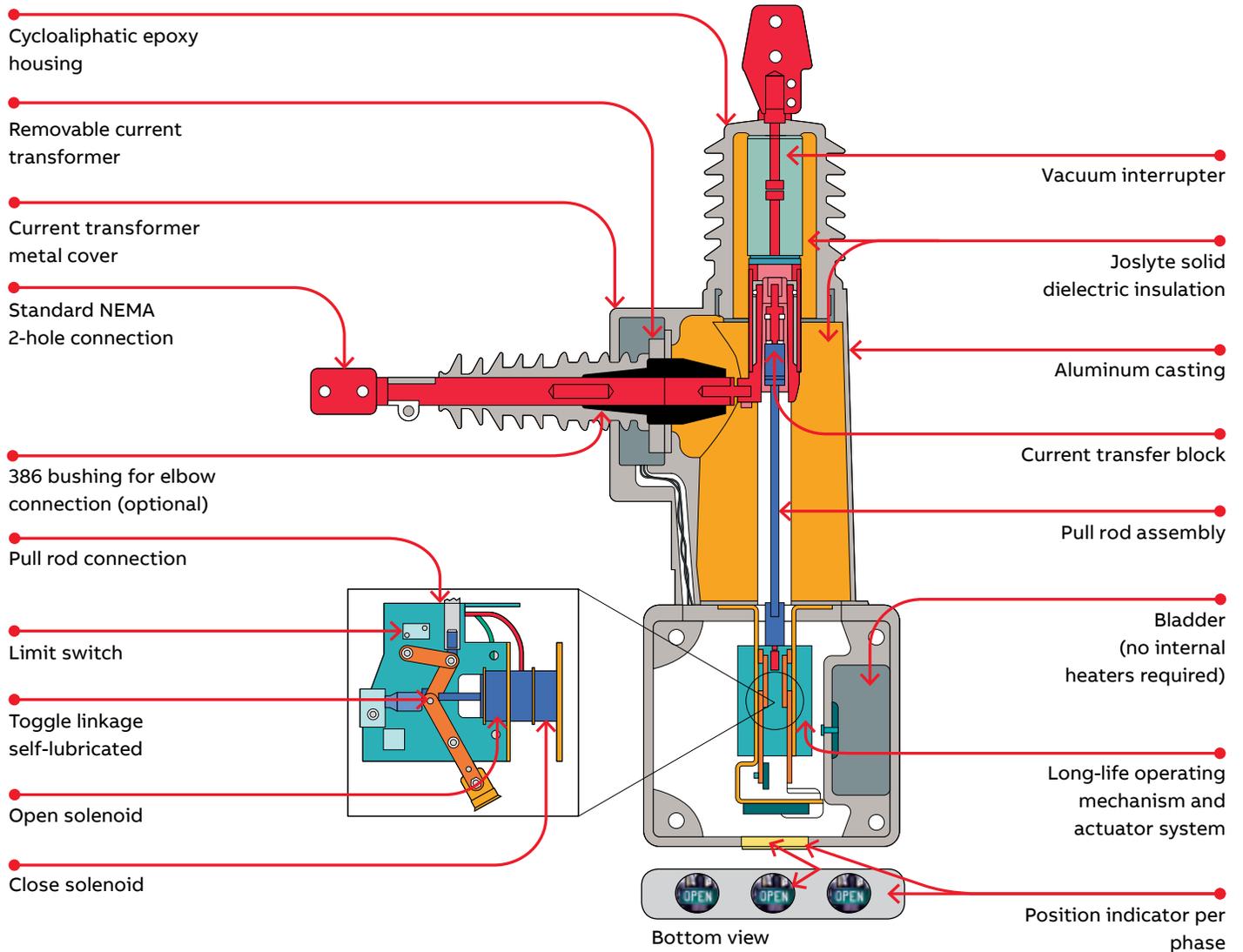
The Joslyn Hi-Voltage TriMod 600R series recloser raises the standard of recloser performance by incorporating state-of-the-art vacuum interrupter technology with Joslyn's field-proven Joslyte solid dielectric insulating system and a long-life operating mechanism and magnetic actuator system. Unique, field-proven features make the TriMod™ 600R series recloser the long-life, easy-to-use solution for utility recloser needs.

The TriMod 600R series recloser contains no oil or gas for interruption or insulation. The 40-year field-proven Joslyte solid dielectric insulation system provides dielectric strength around the vacuum interrupter without the danger of leaks or environmental hazards.

The TriMod 600R series recloser features single- or three-phase operation modes:

- Single-phase trip/single-phase lockout
- Single-phase trip/three-phase lockout
- Three-phase trip/three-phase lockout





— Removable epoxy bushing, elbow connection available

**Recloser construction**

The Joslyn Hi-Voltage® TriMod 600R series vacuum recloser for single- or three-phase operation is manufactured for a range of distribution voltages with continuous current capabilities up to 800 A. The mechanism is operated electrically by energizing a magnetic actuator system.

Each pole has a vacuum interrupter sealed in Joslyte solid dielectric insulation, which provides mechanical strength, high dielectric strength and complete moisture sealing. The pole is constructed of an epoxy main bushing and aluminum casting. The side terminal may be a permanently fixed epoxy bushing or a removable polymer bushing that enables an elbow connection to a 386 bushing assembly.

Each pole is identical and is mechanically independent of each other. Each step of the reclose cycle can be individually configured to single- or three-phase trip

lockout for optimum coordination. An expansion bladder in the mechanism housing is provided to prevent breathing in of outside contaminants and/or moisture. Based on this design, external power is NOT supplied or required by the recloser.

The “open-close” position indicator connects directly to each individual mechanism. An external manual trip assembly, located on the side of the recloser, connects to the gang bar for manual tripping of the recloser by pulling down on the yellow trip lever. The manual trip lever, in the down position, maintains the recloser in a lockout position until it is manually restored to the normal position. The trip lever does not move during electrical operation.

All electrical control connections to the mechanism are made through a sealed single environment control cable connector located on the side of the recloser.

## TriMod™ reclosers

### Joslyn Hi-Voltage® TriMod 600R series recloser operation

The TriMod 600R series recloser connects to an electronic control through the use of a 27-pin cable. The combination of the TriMod 600R series recloser and an electronic control provides state-of-the-art technology in accurate detection of a wide range of line disturbances and reliable, high-speed isolation against adverse conditions common to utility lines. Standard control settings include:

Three-phase reclosing with single-phase tripping

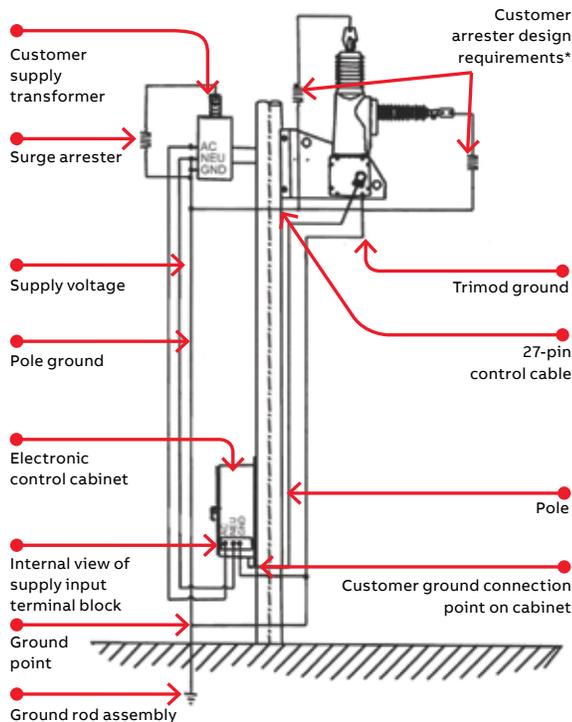
- Overcurrent protection – Fast and delay curves
- Sensitive earth fault
- Complete metering capabilities
- Load-encroachment logic
- Fault locator
- Flexible control logic and integration
- Event reporting and oscillography
- Recloser wear monitor
- Load profile
- And much more!

For TriMod 600R series recloser installation, testing and programming features specific to your application, refer to the electronic control instruction manuals and factory drawings provided at delivery.

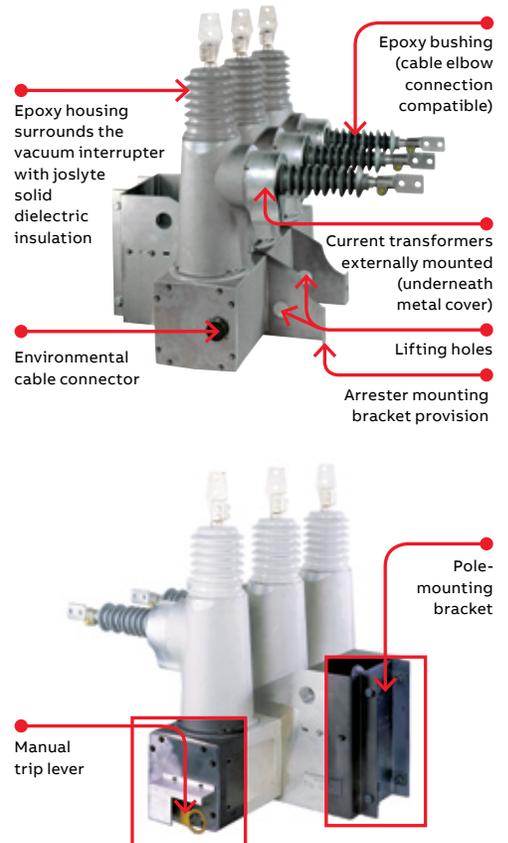


Schweitzer SEL651R single-door control for recloser applications. Front-/rear-access control cabinets are available.

### Typical TriMod 600R series recloser installation detail

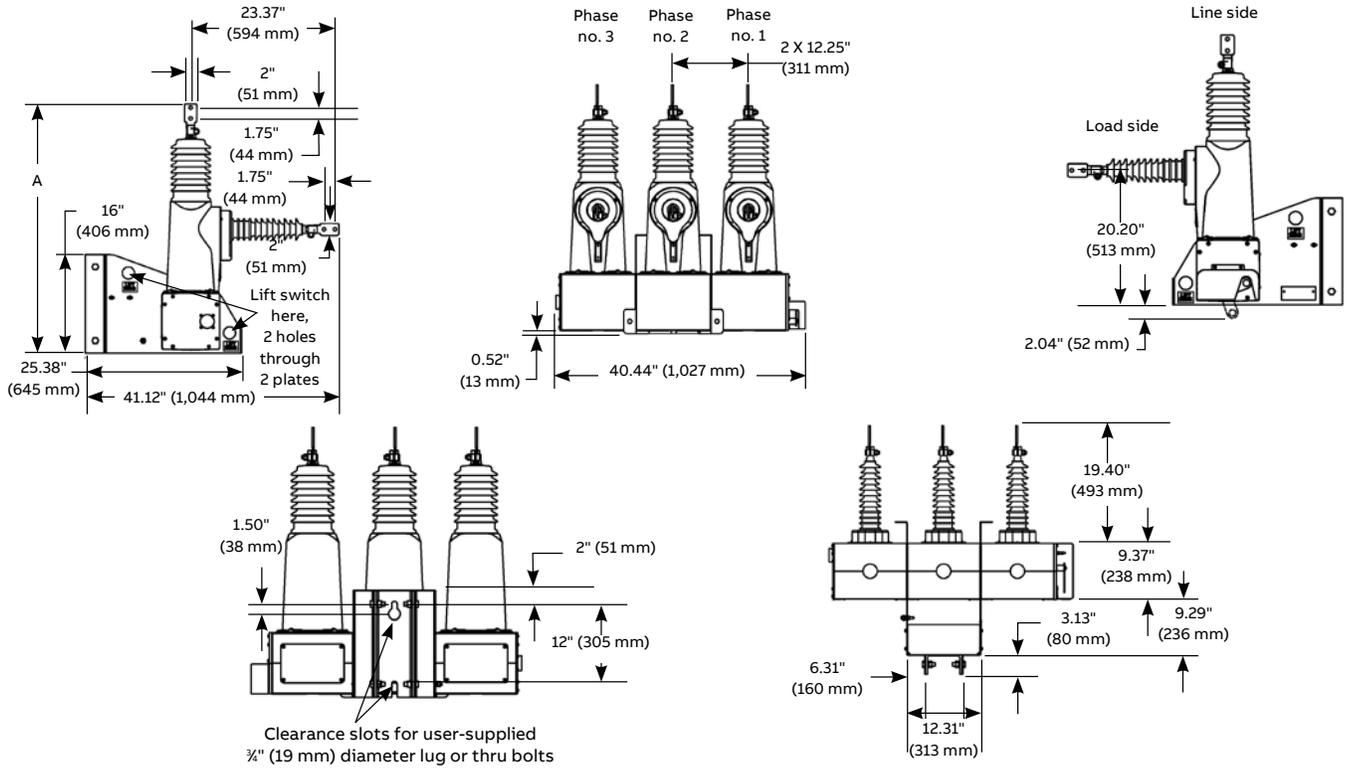


\*Arresters are recommended to provide protection against lightning overvoltage conditions. When arresters are installed, they should be mounted on the supplied arrester brackets or as close to the recloser as practical.



# TriMod™ reclosers

Dimensions and creepage distances for TriMod 600R series reclosers



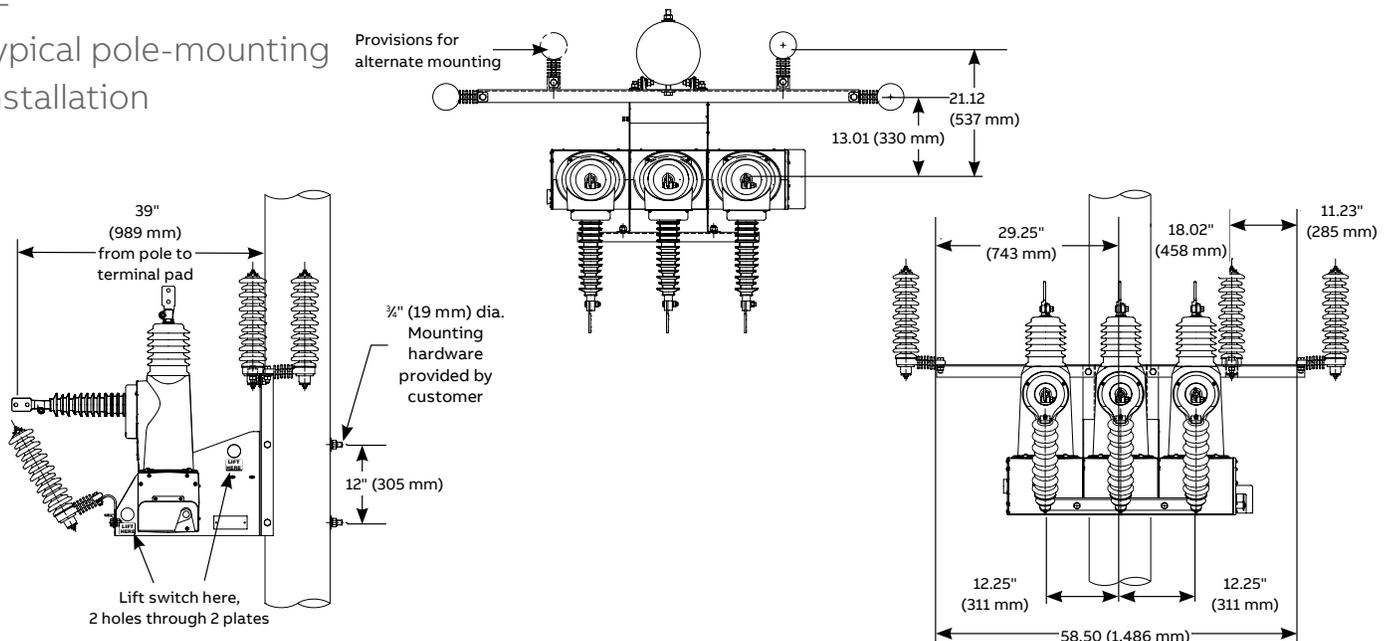
## Creepage distances

Description	15 kV, 110 kV BIL in. (mm)	27 kV, 125 kV BIL in. (mm)
Top terminal	15.83 (402)	20.36 (517)
Side terminal	22.50 (572)	22.50 (572)

## Dimensions

System kV	Height A in. (mm)	Weight lb. (kg)
15 kV, 110 kV BIL	37.92 (963)	251 (114)
27 kV, 125 kV BIL	40.07 (1,018)	279 (127)

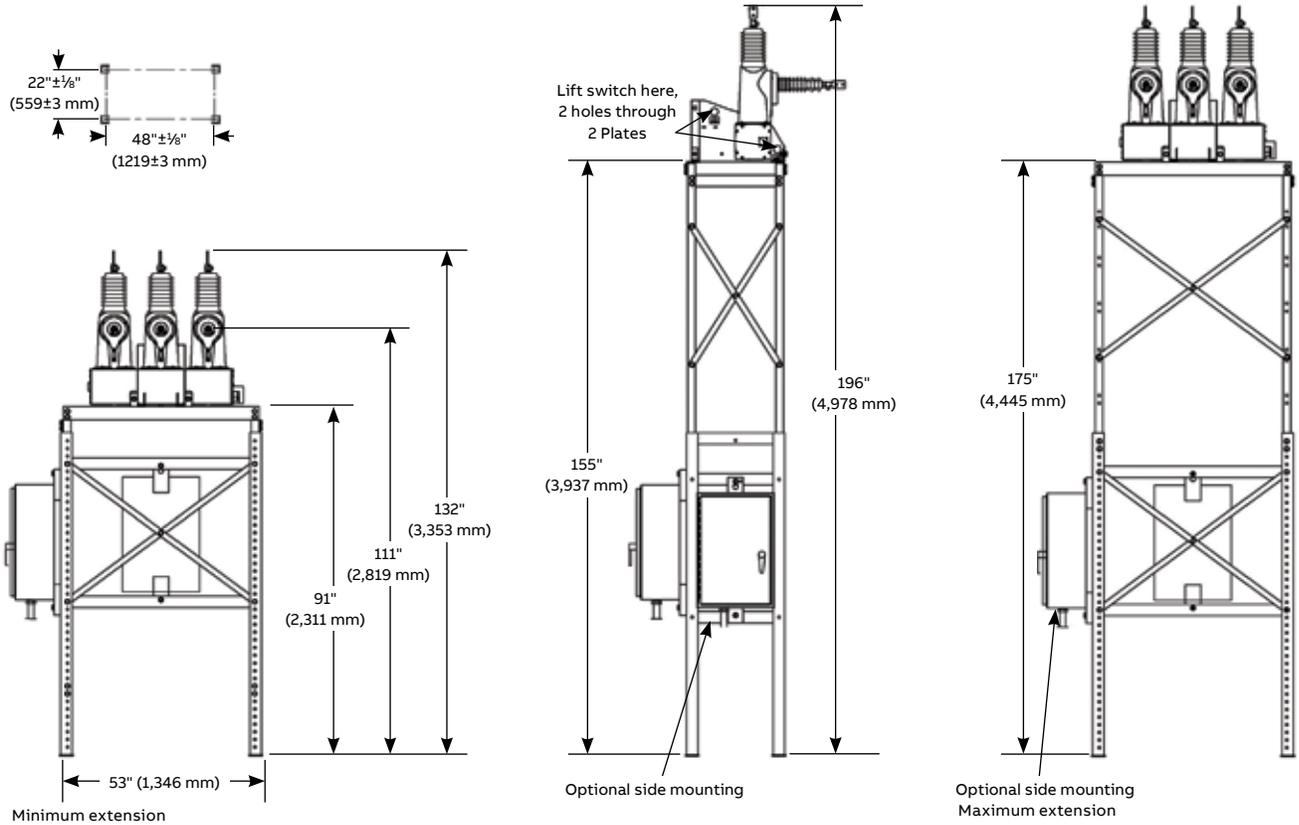
## Typical pole-mounting installation



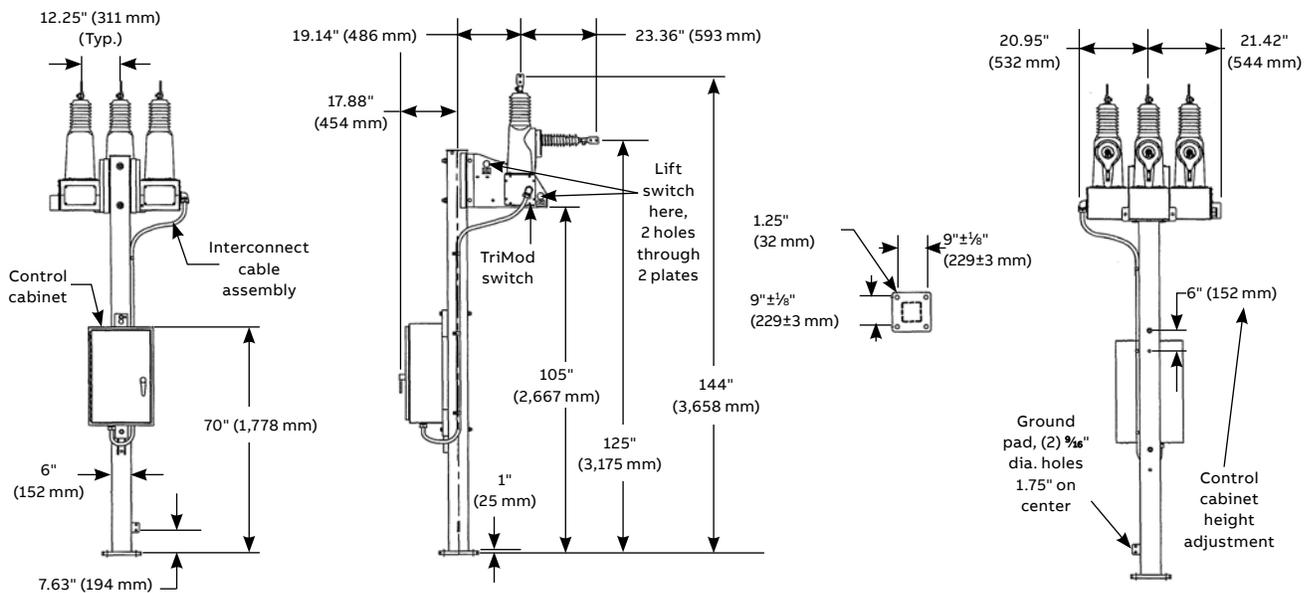
## TriMod™ reclosers

### Typical substation installation

### Typical substation adjustable frame-mount installation



### Typical substation tubular-mounting installation



# TriMod™ reclosers

## Ratings & 600R series vacuum reclosers

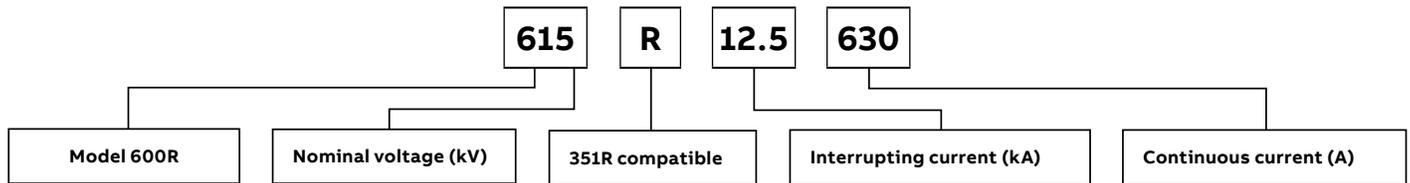
### Ratings

Description	15 kV	27 kV
Nominal system voltage (kV, RMS)	14.4	25
Rated maximum voltage (kV, RMS)	17.1	27
Nominal frequency (Hz)	50 or 60	50 or 60
Number of phases	3	3
Phase spacing (inches)	15.5	15.5
BIL (kV)	110	125
Power frequency withstand – Dry (kV)	50	60
Power frequency withstand – Wet (kV)	45	50
Continuous current (A RMS)	630 or 800	630 or 800
8-hour overload current (A RMS)	800	800
CT ratio	600:1 (800:1)	600:1 (800:1)
Interrupting current (kA RMS symmetrical)	12.5	12.5
Making current (kA asymmetrical peak)	33	33
Arc extinction medium	Vacuum	Vacuum
Insulating medium	Solid high-dielectric insulation	Solid high-dielectric insulation
Mechanical operations	10,000	10,000
Weight (lb./Kg) (with standard mounting frame)	251/113	279/127

1. Select model number from table.
2. Specify length of interconnecting control cable up to 50 ft.
3. Specify Schweitzer 651R recloser control.
4. Select options and accessories.

### Options

- Arrester mounting brackets (source and load side)
- Substation mounting frames
- Extra creepage bushings
- Removable side bushings
- 1000:1 CT ratio



### Joslyn Hi-Voltage® TriMod 600R series vacuum reclosers

Cat. no.	Voltage range (kV)	Continuous current (amps)	Interrupting current (kA RMS symmetrical)	BIL (kV)	Height in. (mm)	Weight lb. (kg)
615R-12.5-630	4–17.1	630	12.5	110	37.92 (963)	251 (114)
615R-12.5-800	4–17.1	800	12.5	110	37.92 (963)	251 (114)
627R-12.5-630	17–27	630	12.5	125	40.07 (1,018)	279 (127)
627R-12.5-800	17–27	800	12.5	125	40.07 (1,018)	279 (127)

Note: Maximum cantilever terminal pad load of 60 lb. (27 kg) per pad. Horizontal cable tensions per phase to be opposite in direction.

# TriMod™ reclosers

## Joslyn Hi-Voltage® TriMod 46 kV three-phase vacuum recloser

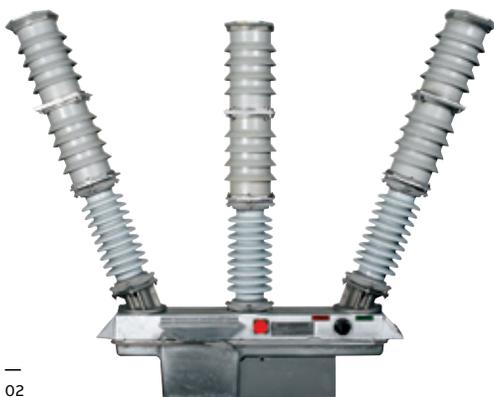
The only 46 kV-rated recloser in the industry.

—  
01 Typical pole-mounting installation  
—  
02 TriMod 46 kV vacuum-interrupting, three-phase, microprocessor-controlled automatic circuit recloser

- Vacuum interruption and solid dielectric Joslyte insulation – No oil, no gas, no maintenance
- Magnetic actuator system offers 10,000 operations with no maintenance required
- State-of-the-art microprocessor control is compatible with Schweitzer's SEL651R recloser control



—  
01



—  
02

Joslyn Hi-Voltage TriMod 46 kV three-phase vacuum reclosers use Varmaster VBM switches. These switches are completely sealed, breaker-class devices using vacuum as the interrupting dielectric. The TriMod 46 kV vacuum recloser offers high reliability with little or no maintenance and quick, safe interruption with no external arcing. The 40-year field-proven Joslyte solid dielectric insulation system provides dielectric strength around the vacuum interrupter without the danger of leaks or environmental hazards.

The combination of the TriMod 46 kV vacuum recloser and Schweitzer SEL651R recloser control provides state-of-the-art technology and accurate detection of a wide range of line disturbances and reliable high-speed isolation against adverse conditions common to utility lines.

### — Ratings

Description	46 kV
Nominal system voltage (kV, RMS)	46
Rated maximum voltage (kV, RMS)	48.3
Power frequency (Hz)	50 or 60
Number of phases	3
BIL (kV)	200/250
Power frequency withstand – Dry (kV)	60
Power frequency withstand – Wet (kV)	50
Continuous current (A RMS)	600
Interrupting current (kA RMS symmetrical)	3
Making current (kA asymmetrical peak)	20
Arc extinction medium	Vacuum
Insulating medium	Solid high-dielectric insulation
Mechanical operations	10,000
Weight (lb./kg)	300/136

Note: To order TriMod 46 kV three-phase vacuum reclosers, contact your ABB sales representative.

## Disconnect switches

Joslyn Hi-Voltage® disconnect switches offer installation flexibility and dependable service.

Joslyn Hi-Voltage disconnect switches offer installation flexibility with their ability to mount in a horizontal, vertical or underhung position. The operating mechanism can be located at various positions. One pole of a three-pole switch has an adjustable crank, permitting easy installation. Space requirements are minimized by the side-break opening offered by Joslyn Hi-Voltage series RB-1 switches.

**The series RF-2 switch's advanced design features give you highly dependable, year-round switching.** Modern power systems demand highly dependable equipment. The Joslyn Hi-Voltage series RF-2 disconnect switch is designed and built specifically to provide longer service and more reliable operation wherever you need a high-voltage air-break switch. Series RF-2 switches use all copper and bronze parts and hardware for superior corrosion protection in harsh environments. Switches rated through 161 kV can be mounted vertically or underhung as well as upright. The series RF-2 switch includes these outstanding features:

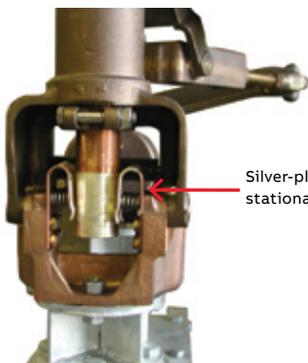
1. Operating mechanism connections can be located at various positions. One pole of the three-pole switch has an adjustable crank, permitting mechanism bearings to be arranged in virtually any required position.
2. Counter-balance assembly affixed to blade is standard for switches from 69 kV to 230 kV or for switches with 3,000 A continuous rating. The counter-balance assembly provides a uniform opening and closing stroke and reduces stress on switch mechanism parts.

3. Blade arm and rotating mechanism feature low-friction bearings throughout. Maximum force is delivered to the blade by locating rotator insulator "stops" at the blade hinge.
4. Switch blade built from a single piece of copper. Contact surfaces are silver plated to increase conductivity to prevent hot joints typical with braided connections.
5. Heavy-duty u-shaped contacts are silver-surfaced and backed with insulated stainless-steel springs to provide constant pressure.
6. Switch frame is constructed of heavy-gauge galvanized steel or aluminum for rigidity.
7. Current flow is diverted through the arc horns during operation, preventing wear on stationary contacts.

### Operation

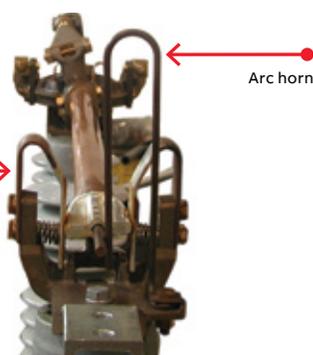
- Rotating blade action firmly engages contacts.
1. Switch in fully open position. Rotation of rear insulator stack causes blade to move in downward arc toward closed position.
  2. As it moves downward, the blade makes contact first with the arcing horn, eliminating any pitting on the main stationary contact surfaces. Any current flow is diverted through the arc horns, away from stationary contacts.
  3. Blade does not engage stationary contacts until it is well into contact zone. Switch mechanism's high mechanical advantage provides slashing action to help clear contacts of any ice formation.
  4. Rotating 45°, the blade "wipes" into place. Current flows up around U-shaped contacts, puts squeezing pressure on blade and effectively locks it in place under high momentary currents.

Open position



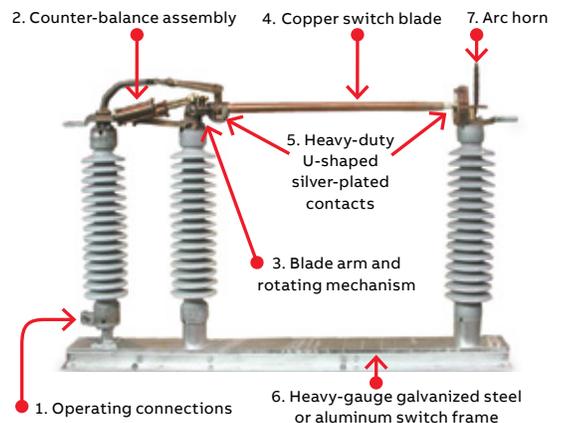
Silver-plated U-shaped stationary contacts

Closed position



Arc horn

### 115 kV, 1,200 A Series RF-2 switch



## Disconnect switches

Series RF-2 switches are ideally suited for demanding industrial applications.

—  
01 34.5 kV 3,000 A series  
RF-2 switch with MVI  
—  
02 Underhung application

Exhaustive tests in development laboratory and cold room prove the series RF-2 disconnect switch's service life.

**Heat run** – During the heat run, the Series RF-2 switch's temperature rose less than 30 °C above ambient at each thermocouple location. This lower temperature rise results in a much longer service life due to lower stress on copper parts and less corrosion.

**Impulse and open break tests** – The 161 kV, 1,600 A series RF-2 switch more than met NEMA standards requiring open-break withstand test voltage 10% in excess of 750 kV. Radio noise and corona tests revealed no visible corona in complete darkness.

**Life test** – The 161 kV, 1,600 A series RF-2 switch showed no visible excessive wear after 10,000 operations.

**Short-circuit tests** – At the development laboratory, all series RF-2 switches demonstrated the ability to meet NEMA short-circuit requirements.

**Ice test** – Blades of the 161 kV, 1,600 A series RF-2 switch were frozen closed before the start of the first ice test. Even under extreme icing conditions, subsequent operation proved the ability of the

switch to clear the contacts. Cold-room tests were conducted on switches preset in both the open and closed positions. Water at 34 °F was sprayed on the pole units and operating mechanisms while room temperature was maintained at 25 °F for 12 hours. After an additional three hours setting time, the series RF-2 switches were operated and proved capable of breaking and clearing ice from the contact structures.

## FB-4 grounding switch

### Rugged, long-life, maintenance-free operation for the Series RF-2 switch.

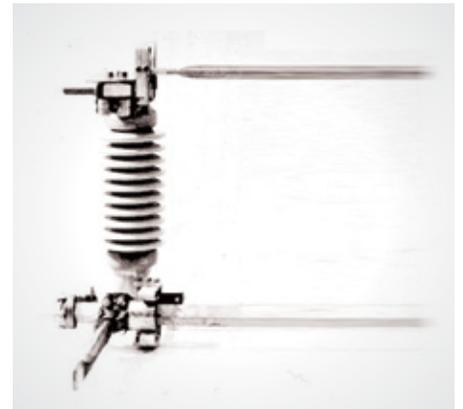
Joslyn Hi-Voltage® series RF-2 switches are available with an optional FB-4 grounding switch. The FB-4 grounding switch can have a parallel or perpendicular operation and can be mounted on the hinge side or contact end. FB-4 grounding switches can also be supplied for freestanding installation, not associated with an isolating switch.



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01



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02



## Disconnect switches

### Joslyn Hi-Voltage® series RF-2 vertical-break air disconnect switches

—  
01 34.5 kV 3,000 A series  
RF-2 switch with MVI

#### Rugged construction for applications demanding positive all weather operation.

- Available in ratings of 15 kV–230 kV for currents of 600 A–3,000 A
- Runs cooler than other switch designs, offering longer service life
- Tested and proven reliable more than 50 years in the field
- Systems can be designed and supplied with manual operators (swing-handle type), electric motor operators (MGO), Kirk key interlocks, auxiliary position indicator contacts and a full range of Joslyn Hi-Voltage load interrupter attachments
- Grounding switches (FB-4) are available in parallel or perpendicular configurations and can also be supplied for free-standing installations

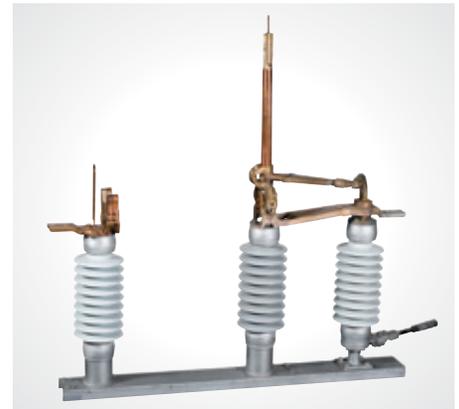
Joslyn Hi-Voltage series RF-2 vertical-break air disconnect switches have been subjected to exhaustive testing both in the field and in the lab and have met or surpassed all duty requirements within their prescribed ratings.

Because they run cooler than other switch designs, series RF-2 Switches suffer less oxidation and corrosion to yield a longer service life. They were originally tested in accordance with ANSI Standard C37.70-1962, which allowed a more severe temperature rise of 30 °C above a 40 °C ambient while carrying rated current.

The series RF-2 switch is a rotating-insulation, vertical-break air switch. During opening and closing, the switch blade rotates into (or out of) the contacts, helping to provide a highly efficient ice-breaking action and contact surface wiping. Designed for group operation, the series RF-2 switch's interphase connections are easy to install and adjust.

Silver-surfaced, U-shaped stationary contacts actually increase pressure on the switch blade during momentary current flow, helping to lock the blade in place. Insulated stainless steel backup springs maintain constant pressure. A replaceable arc horn diverts current away from the primary contacts during opening and closing, eliminating contact pitting and erosion.

The series RF-2 switch is available in voltage ratings from 15 kV through 230 kV, for currents from 600 A through 3,000 A. The horn-gap-type is capable of interrupting magnetizing currents and relatively low charging currents.



## Disconnect switches

### Ratings

#### Ratings

Rated max. voltage (kV RMS)	Rated withstand voltage			Current ratings in amperes			Insulator NEMA tech. ref. post	Switch bolt circle (in.)
	Impulse 1.2 X 5 wave kV crest	60 Hz kV RMS wet 10 seconds	60 Hz kV RMS dry 1 minute	Continuous current at 60 Hz	Momentary (1)	4 seconds (2)		
15.5	110	45	50	600	40,000	25,000	TR 205	3
15.5	110	45	50	1,200	61,000	38,125	TR 205	3
15.5	110	45	50	2,000	100,000	62,500	TR 225	5
15.5	110	45	50	3,000	120,000	75,000	TR 225	5
25.8	150	60	70	600	40,000	25,000	TR 208	3
25.8	150	60	70	1,200	61,000	38,125	TR 208	3
25.8	150	60	70	2,000	100,000	62,500	TR 227	5
25.8	150	60	70	3,000	120,000	75,000	TR 227	5
38.0	200	80	95	600	40,000	25,000	TR 210	3
38.0	200	80	95	1,200	61,000	38,125	TR 210	3
38.0	200	80	95	2,000	100,000	62,500	TR 231	5
38.0	200	80	95	3,000	120,000	75,000	TR 231	5
48.3	250	100	120	600	40,000	25,000	TR 214	3
48.3	250	100	120	1,200	61,000	38,125	TR 214	3
48.3	250	100	120	2,000	100,000	62,500	TR 267	5
48.3	250	100	120	3,000	120,000	75,000	TR 267	5
72.5	350	145	175	600	40,000	25,000	TR 216	3
72.5 HD	350	145	175	600	40,000	25,000	TR 278	5
72.5	350	145	175	1,200	61,000	38,125	TR 216	3
72.5 HD	350	145	175	1,200	61,000	38,125	TR 278	5
72.5 HD	350	145	175	1,600	70,000	43,750	TR 278	5
72.5 HD	350	145	175	2,000	100,000	62,500	TR 278	5
72.5 HD	350	145	175	3,000	120,000	75,000	TR 278	5
121.0	550	230	280	600	40,000	25,000	TR 286	5
121.0	550	230	280	1,200	61,000	38,125	TR 286	5
121.0	550	230	280	1,600	70,000	43,750	TR 286	5
121.0	550	230	280	2,000	100,000	62,500	TR 286	5
121.0	550	230	280	3,000	120,000	75,000	TR 286	5
145.0	650	275	335	600	40,000	25,000	TR 288	5
145.0	650	275	335	1,200	61,000	38,125	TR 288	5
145.0	650	275	335	1,600	70,000	43,750	TR 288	5
145.0	650	275	335	2,000	100,000	62,500	TR 288	5
169.0	750	315	385	600	40,000	25,000	TR 291*	5
169.0	750	315	385	1,200	61,000	38,125	TR 291*	5
169.0	750	315	385	1,600	70,000	43,750	TR 291*	5
169.0	750	315	385	2,000	100,000	62,500	TR 291*	5
242.0	900	385	465	1,200	61,000	38,125	TR 304*	5
242.0	900	385	465	1,600	70,000	43,750	TR 304*	5
242.0	900	385	465	2,000	100,000	62,500	TR 304*	5
242.0	1,050	455	545	1,200	61,000	38,125	TR 312*	5
242.0	1,050	455	545	1,600	70,000	43,750	TR 312*	5
242.0	1,050	455	545	2,000	100,000	62,500	TR 312*	5

\* These insulators are for horizontal upright installation only. Contact ABB for additional information.

Notes: 1. The momentary current rating is the maximum RMS total current which the switch shall be required to carry for at least one cycle. The current shall be the RMS value, including the D-C component, during the maximum cycle as determined from the envelope of the current wave, and the test period shall be at least 10 cycles.

2. The 4-second rating is the total RMS current, including the D-C component if present, which the switch shall be taken as the integrated heating equivalent of the 4-second rating; the maximum test period shall not exceed 8 seconds. Note: To order Joslyn High-Voltage® RF-2 Series Switch and FB-4 grounding switch, please contact your ABB sales representative.

## Disconnect switches

### Joslyn Hi-Voltage® MGO motor operator for RF-2 switches

#### Ensures reliable switching operation under the most adverse conditions.

The optional MGO motor operator provides dependable local or remote operation for the series RF-2 disconnect switches. The standard features of the MGO include an internal decoupler, hinged and removable doors on three sides and a view window in the front door allowing positive reading of the decoupler position. Adjustable external mechanical stops, asymmetric coupling and a permanent magnet motor that allows dynamic braking all add to the ease of operation. An eight-stage auxiliary switch is provided for customer use, along with open/close push buttons, a 230/115 V AC thermostatically controlled heater and with fuse protection on the motor, control and heater circuits. Optional features include stop-push button operation, local/remote selector switch indicating lights, additional auxiliary switch stages, operations counter and circuit breakers to identify a few. Note the differentiating feature of the internal decoupler in the MGO. The internal decoupler allows the auxiliary switch to be above the decoupler. The auxiliary switch always reflects the position of the disconnect switch and is not subject to icing. A second, optional auxiliary switch assembly is available to follow the motor, if desired. A single padlock secures the operator from “kick” as energy from the vertical pipe wrap-up is released during decoupling.

#### Standard features

- Internal decoupler
- Asymmetric coupling prevents re-coupling 180° out of position
- View window in front door allows positive reading of decoupler position
- Large housing – 32"H x 23"W x 18"L – ample room for incoming wires
- Hinged, removable doors on three sides – maintenance free
- Adjustable external mechanical stops – swing handle operation kept within the same arc as when the motor is operated

- Permanent magnet motor allows dynamic braking, which adds to the ease of operation
- “U” joint output – Allows for connected torsional
- 8-stage auxiliary switch for customer use
- Automatic lockout of motor circuit when hand crank is inserted – safety feature
- 230/115 V AC thermostatically controlled 150-watt heater
- Fuse protection on motor/control and heater circuits

#### Optional features

- Stop push-button operation
- Local/remote selector switch indicating lights
- Operations counter
- Circuit breakers
- Auxiliary switch below decoupler

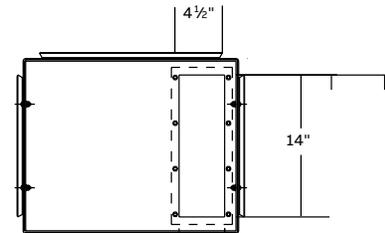
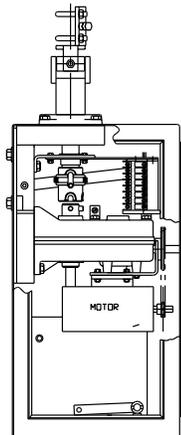
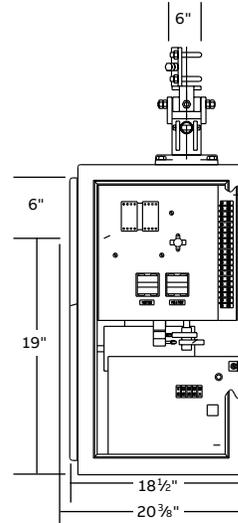
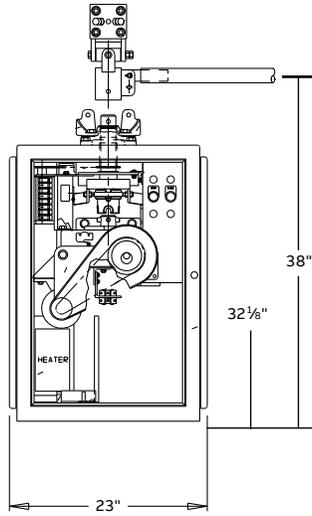
#### Differentiating features

- Internal decoupler allows auxiliary switch to be above decoupler
- The auxiliary switch always reflects position of switch and is not subject to icing
- A single padlock secures the decoupler and housing
- A second, optional auxiliary switch is available to follow the motor, if desired
- A slip-ring mechanism isolates the operator from “kick” as energy from the vertical pipe wrap-up is released during decoupling



## Disconnect switches

### Dimensions



Bottom view

Net weight: 210 lbs.  
Shipping weight: 250 lbs.

### Electrical parameters

#### Motor current ratings

Motor	Current (amps)	
	Inrush locked rotors	Running full load
24 V DC	122	20
48 V DC	59	10
125 V DC	21	4

Note: To order the Motor Operator (MGO), contact your ABB sales representative.

#### Operating characteristics

Motor	Operating time (sec.)*	Output torque in.-lbs. (X 1000)
DC	4	10
	6	15
	8	20
	10	30

\* Time is for 180° rotation of output shaft.

## Disconnect switches

### Joslyn Hi-Voltage® Series RB-1 side-break disconnect switches

#### The copper solution for isolating and sectionalizing your service.

- Available in ratings of 15 kV–115 kV for currents of 600 A–1,200 A
- Ability to be mounted vertically, horizontally or in an underhung position offers installation flexibility; side-break opening minimizes space requirements
- One pole of the three-pole switch features an adjustable crank to permit easy installation
- Silver-to-silver constant-pressure contacts provide long, trouble-free service life
- Fully tested to NEMA and ASA standards – meets or exceeds all industry requirements, ensuring maximum reliability and service
- Systems can be designed and supplied with manual operators (swing-handle type), electric motor operators (MGO), Kirk key interlocks, auxiliary position indicator contacts and a full range of Joslyn Hi-Voltage load interrupter attachments

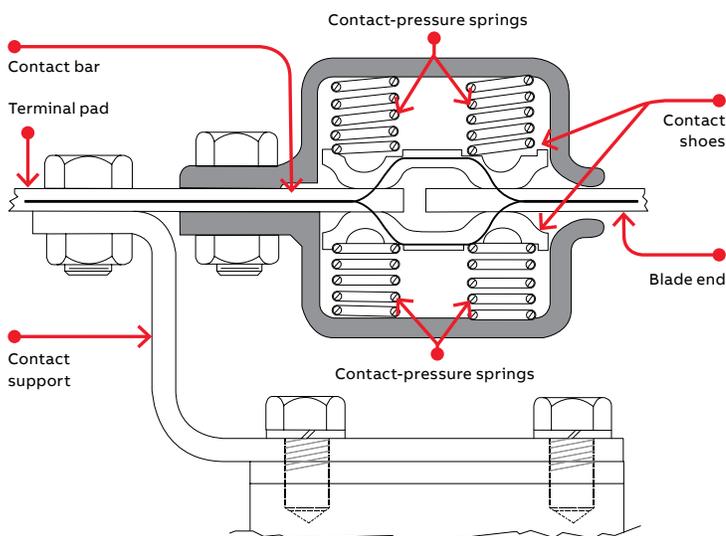
Joslyn Hi-Voltage series RB-1 side-break disconnect switches provide affordable, reliable and time-proven isolating of power circuit breakers, sectionalizing of transmission lines and opening primaries of transformer banks from 15 kV through 115 kV.

Featuring braidless side-break construction, series RB-1 switches yield long, trouble-free service life with silver-to-silver, constant-pressure contacts. Low-gradient compression springs create constant pressure for the contact shoes within the main contact. The full-floating shoes allow for variations in blade alignment, are self-adjusting and wipe the blade clean with every operation of the switch. High-density silver contact surfaces minimize wear and lengthen the life of the contacts.

Series RB-1 switches offer installation flexibility with their ability to mount in a horizontal, vertical or underhung position. Space requirements are minimized by the side-break opening. The operating mechanism can be located at various positions. One pole of a three-pole switch has an adjustable crank, permitting easy installation.

Modern power systems demand highly dependable equipment, and series RB-1 switches are designed, tested and proven over years in the field to yield maximum reliability and service.

In a series of cold-room tests, the series RB-1 switch demonstrated complete ice-breaking action. Cold-room tests were conducted on switches preset in both open and closed positions. Water was sprayed on the pole units until a ¼" thick coating of clear ice formed. The switches were operated and proved capable of breaking and clearing ice from the contact structures.



## Disconnect switches

### RB-1 switch test results

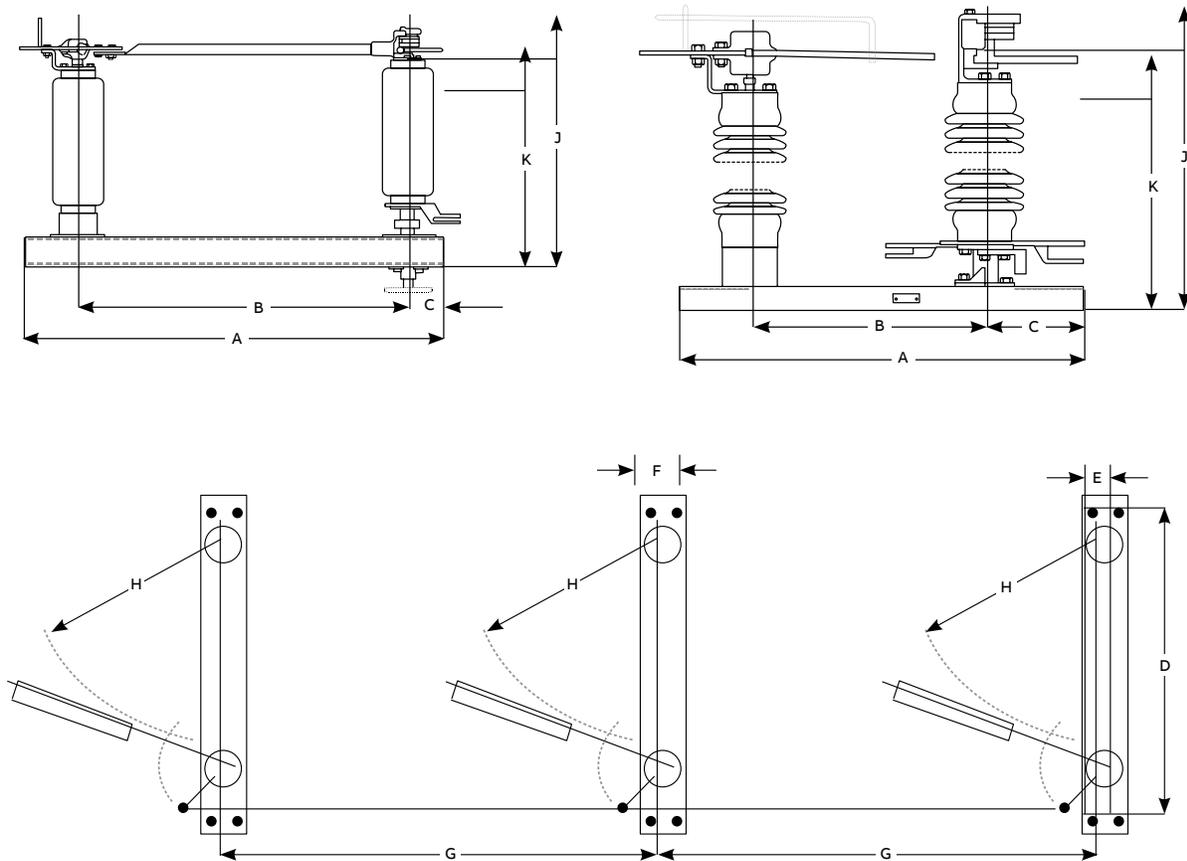
**Short-circuit tests** – The series RB-1 switch demonstrated ability to meet all industry requirements.

**Ice test** – Even under extreme icing conditions, the series RB-1 switch proved capable of breaking and clearing ice from the contact structure.

**Heat run** – During heat runs, the series RB-1 switch's temperature rose less than 30 °C above ambient at each thermocouple location.

**Corona tests** – Tests proved that the series RB-1 switch operated well within industry limits for radio noise and corona.

### Mechanical data



## Disconnect switches

### RB-1 switch ratings

#### RB-1 switch ratings

Ratings		Impulse with standing kV	Insulator NEMA ref. no.	Dimensions in inches (approx)*										
kV	Amps			A	B	C	D	E	F	G		H	J	K
				Horn-gap		Disc. sw.								
14.4	600	110	TR205	27 $\frac{3}{4}$	15	7 $\frac{5}{8}$	24	3	5	36	30	10 $\frac{3}{4}$	20 $\frac{1}{2}$	17 $\frac{1}{2}$
14.4	1,200	110	TR205	27 $\frac{3}{4}$	15	7 $\frac{5}{8}$	24	3	6.7 #/ft.	36	30	10 $\frac{3}{4}$	21 $\frac{1}{4}$	17 $\frac{5}{8}$
23	600	150	TR208	30 $\frac{3}{4}$	18	7 $\frac{5}{8}$	27	3	5	48	36	13 $\frac{1}{2}$	22 $\frac{1}{2}$	19 $\frac{1}{2}$
23	1,200	150	TR208	30 $\frac{3}{4}$	18	7 $\frac{5}{8}$	27	3	6.7 #/ft.	48	36	13 $\frac{1}{2}$	23 $\frac{1}{4}$	19 $\frac{5}{8}$
34.5	600	200	TR210	36 $\frac{3}{4}$	24	7 $\frac{5}{8}$	33	3	5	60	48	19	25 $\frac{1}{2}$	22 $\frac{1}{2}$
34.5	1,200	200	TR210	36 $\frac{3}{4}$	24	7 $\frac{5}{8}$	33	3	6.7 #/ft.	60	48	19	26 $\frac{1}{4}$	22 $\frac{5}{8}$
46	600	250	TR214	42 $\frac{3}{4}$	30	7 $\frac{5}{8}$	39	3	6	72	60	25 $\frac{1}{4}$	28 $\frac{3}{4}$	25 $\frac{3}{4}$
46	1,200	250	TR214	42 $\frac{3}{4}$	30	7 $\frac{5}{8}$	39	3	8.2 #/ft.	72	60	25 $\frac{1}{4}$	29 $\frac{1}{2}$	25 $\frac{7}{8}$
69	600	350	TR216	54 $\frac{3}{4}$	42	7 $\frac{5}{8}$	51	3	6 ship	84	72	36 $\frac{1}{2}$	40 $\frac{3}{4}$	37 $\frac{1}{4}$
69	1,200	350	TR216	54 $\frac{3}{4}$	42	7 $\frac{5}{8}$	51	3	12 #/ft.	84	72	36 $\frac{1}{2}$	41	37 $\frac{5}{8}$
69HD	600	350	TR278	67	48	9 $\frac{1}{2}$	62	8 $\frac{1}{4}$	2-5	108	96	38	44 $\frac{7}{8}$	41 $\frac{1}{8}$
69HD	1,200	350	TR278	67	48	9 $\frac{1}{2}$	62	8 $\frac{1}{4}$	6.7 #/ft.	108	96	38	45 $\frac{5}{8}$	42
115	600	550	TR286	76	60	9 $\frac{1}{2}$	71	8 $\frac{1}{4}$	2-5	120	108	50	59 $\frac{5}{8}$	56 $\frac{5}{8}$
115	1,200	550	TR286	76	60	9 $\frac{1}{2}$	71	8 $\frac{1}{4}$	6.7 #/ft.	120	108	50	60 $\frac{1}{8}$	56 $\frac{1}{2}$

\* Dimensions are subject to change and should not be used for construction.

Note: To order series RB-1 side-break disconnect switches, contact your ABB sales representative.

# Joslyn Hi-Voltage®

## Load interrupter attachments

Use load interrupter attachments to enable loop sectionalizing, line dropping, load breaking and transformer-magnetizing current interruption.

— 01 Series HVI hi-velocity interrupter attachment

— 02 Series UVI universal vac-rupter interrupter attachment

Increase the capability of your disconnect switches by adding Joslyn Hi-Voltage load interrupter attachments to expand their versatility for loop sectionalizing, line dropping, load breaking and transformer-magnetizing current interruption. The value of this added capability is increased operational efficiency and flexibility, as well as reduced number of circuit breaker operations and/or investment. Additionally, devices that provide multiple functions on a single switch, such as the Joslyn Hi-Voltage series LSI load sectionalizer interrupter, which provides both loop splitting and line dropping, increase personnel safety because they can eliminate switch misoperation.

Joslyn Hi-Voltage load interrupter attachments do not in any way reduce the rating of the disconnect switch, nor do they violate the coordinated open gap design of the switch. Joslyn Hi-Voltage interrupter attachments include custom-designed mounting brackets and arc horns to ensure that interrupters are properly transitioned into the circuit when the disconnect switch opens. In addition, the arc horns are designed to withstand the prestrike developed upon closing of the switch. Joslyn Hi-Voltage load interrupter attachments are designed for a 30-year life and can be operated 5,000 times without any maintenance.

### Series HVI hi-velocity interrupter attachment

This device stores energy in the spring rod and in the coil spring inside the aluminum housing. The stored energy in the spring rod is added to the energy stored in the coil spring at the instant the spring rod separates from the latch. The parting velocity is 22" (558 mm) per cycle. This allows the Series HVI to be the highest rated device in this category. Applications include interruption of line charging current up to 161 kV and transformer-magnetizing current up to 230 kV.

### Series UVI universal vac-rupter interrupter attachment

This device uses one vacuum interrupter per phase. The vacuum interrupter is inserted into the circuit when the disconnect switch is opened. Once the switch blade is sufficiently away from the switch jaw, the vacuum contacts separate and interrupt the circuit. Specially designed arcing horns are designed to handle prestrikes upon closing of the switch. Applications include 2,000 A load breaking up to 34.5 kV for solidly grounded systems and parallel switching up to 230 kV.

Add the Joslyn Hi-Voltage voltage limiter (V/L) attachment to interrupt line charging current of 15 A up to 69 kV.



01



02

—  
01 Series LSI load sectionalizer interrupter attachment

—  
02 Series JMVI modular vac-rupter interrupter attachment for 230 kV systems

### Series LSI load sectionalizer interrupter attachment

The series LSI combines both the series HVI and Series UVI devices into one system.

The interrupter automatically determines which device will be providing the interruption with a preset latch/spark gap assembly.



01



02

### Series JMVI modular vac-rupter interrupter attachment for 230 kV systems

This device uses up to eight vacuum interrupters in series per phase for 230 kV systems. The vacuum interrupters are inserted into the circuit when the disconnect switch is opened. Once the switch blade is sufficiently away from the switch jaw, the vacuum contacts separate and interrupt the circuit. Specially designed arcing horns handle prestrikes upon closing of the switch. Applications include 2,000 A load breaking, line charging current interruption and parallel switching up to 230 kV.

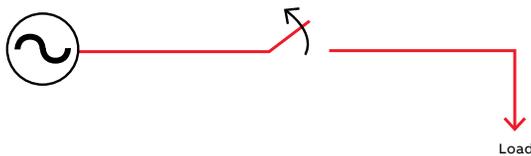
## Applications for Joslyn Hi-Voltage® load interrupter attachments

### Load dropping

Loads are being fed from one source, and opening the switch will disconnect the loads from that source. The interrupter needs to be able to interrupt the continuous load current at the system voltage. This is rarely done since it interrupts service to customers, and is usually specified only as a safety measure in case of an emergency.

#### Products used in this application:

- Series UVI (34.5 kV and below)
- Series JMVI (46 kV to 230 kV)

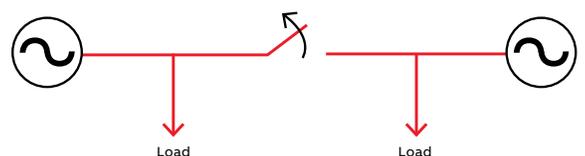


### Loop sectionalizing

Loads are being fed from multiple sources, and a switch in the circuit needs to be opened. The interrupter needs to be able to interrupt the circulating current between the two energized sources. When the switch is open, both sides will still be energized at the system voltage. The recovery voltage is typically low, but currents can be high.

#### Products used in this application:

- Series UVI (230 kV and below, unless peak recovery voltage is greater than 30 kV)
- Series JMVI (if peak recovery voltage is greater than 30 kV)



## Joslyn Hi-Voltage®

### Load interrupter attachments

#### Line and cable dropping

When a section of line is energized and no load is connected, a small amount of charging current is flowing. When the line is de-energized, the recovery voltage will be high, because the system voltage will be seen on the source side of the switch and a charge will be trapped on the other side of the switch.

Products used in this application:

- Series UVI (34.5 kV and below; up to 69 kV with voltage limiter)
- Series HVI (69 kV to 161 kV)
- Series JMVI (230 kV and below)

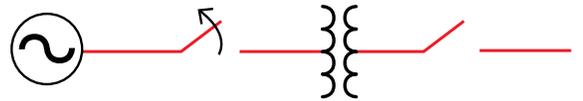


#### Transformer-magnetizing current

When a transformer is energized and no load is connected to it, a small amount of current still flows. This current is called transformer-magnetizing current. When the transformer is de-energized, the recovery voltage will be high, because the system voltage will be seen on the source side of the switch and a charge will be trapped on the other side of the switch.

Products used in this application:

- Series UVI (34.5 kV and below; up to 69 kV with voltage limiter)
- Series HVI (69 kV to 230 kV)



#### Typical conductor and cable charging currents

##### Underground cable

Many factors determine the amount of cable charging current, such as the cable insulation material and geometry of the conductors. A common guideline for determining the charging current is to use 1.5 A per 1,000 ft. of cable; however, it is always recommended to contact the cable manufacturer to obtain the exact charging current for a particular cable.

##### Overhead conductor

System voltage (kV)	Typical charging current per mile (A)
69	0.226
115	0.377
138	0.440
161	0.502
230	0.737

#### Transformer general reference information\*

System voltage (kV)	Transformer MVA	Magnetizing current per phase (A)	Full load current (%)
69	10	2.6	3.1
	25	5.0	2.4
138	10	0.98	2.4
	25	3.2	3.1
	50	6.5	3.1
161	25	3.5	3.9
	50	7.0	3.9
230	25	2.2	3.5
	50	3.5	2.8

\* Transmission & Distribution – Westinghouse Electric Corp., Fifth Edition, 1964

## Series LSI load sectionalizer interrupter application

A typical application for the series LSI load sectionalizer interrupter is when a particular section of a circuit needs to be de-energized for maintenance. Loop sectionalizing is the first step in this process. At the other end of the line, a device will have to de-energize the line by interrupting the line charging current. The series LSI load sectionalizer interrupter combines the functions of both low charging current interruption and higher current loop sectionalizing. To accomplish this, the series LSI load sectionalizer interrupter consists of two complementary devices connected in parallel:

- Series UVI universal vac-rupter Interrupter
- Series HVI hi-velocity interrupter

The UVI device interrupts the high current associated with loop sectionalizing, and the HVI device interrupts the line charging current. During an opening operation, the two interrupters are mechanically controlled so that the vacuum contact opens prior to the separation of the HVI device. If the recovery voltage is within the capability of the UVI device, the UVI device interrupts the circuit. If the recovery voltage exceeds the capability of the UVI device, a spark gap will ignite and instantly place the HVI device in the circuit. The HVI device

will then interrupt the circuit. The mechanical operation of the series LSI load sectionalizer interrupter is the same every time it is operated. The determining factor as to which interrupter is used is the magnitude of the recovery voltage.

In the figure below, series LSI load sectionalizer interrupters are installed on both switches. When switch 1 is opened while switch 2 is closed, loop sectionalizing will be performed. Because the recovery voltage is low, the UVI device interrupts the loop current. When switch 2 is subsequently opened, the higher recovery voltage associated with line dropping will result in the HVI device being inserted into the circuit. The HVI device will then interrupt the line charging current.

The significant advantage of the series LSI load sectionalizing interrupter is that the switches can be opened in any sequence, because this device automatically inserts the correct interrupting device in the circuit. This provides operational flexibility and is inherently safer than specific function devices. Some advantages are:

- Reduce switching time
- Eliminate misoperation due to switching errors
- Increase personnel safety
- Reduce breaker operations



Application summary table

System voltage (kV)	2,000 A load droppng	2,000 A loop sectionalizing <sup>1,2</sup>	Line droppng <sup>2</sup>	Magnetizing current <sup>2</sup>
15.5	UVI	UVI	UVI	UVI
25	UVI	UVI	UVI	UVI
34.5	UVI	UVI	UVI V/L	UVI
46	JMVI	UVI	UVI V/L	UVI V/L
69	JMVI	UVI	HVI	HVI
		UVI V/L	UVI V/L	UVI V/L
		LSI	LSI	LSI
115	JMVI	UVI	HVI	HVI
		LSI	LSI	LSI
		JMVI V/L	JMVI V/L	JMVI V/L
138	JMVI	UVI	HVI	HVI
		LSI	LSI	LSI
		JMVI V/L	JMVI V/L	JMVI V/L
161	JMVI	UVI	HVI	HVI
		LSI	LSI	LSI
		JMVI V/L	JMVI V/L	JMVI V/L
230	JMVI	UVI	JMVI	HVI
		LSI		LSI
		JMVI V/L		JMVI V/L

Notes: 1. UVI and LSI can be applied where the peak recovery voltage is less than 30 kV.  
 2. V/L = Joslyn Hi-Voltage<sup>®</sup> voltage limiter attachment.

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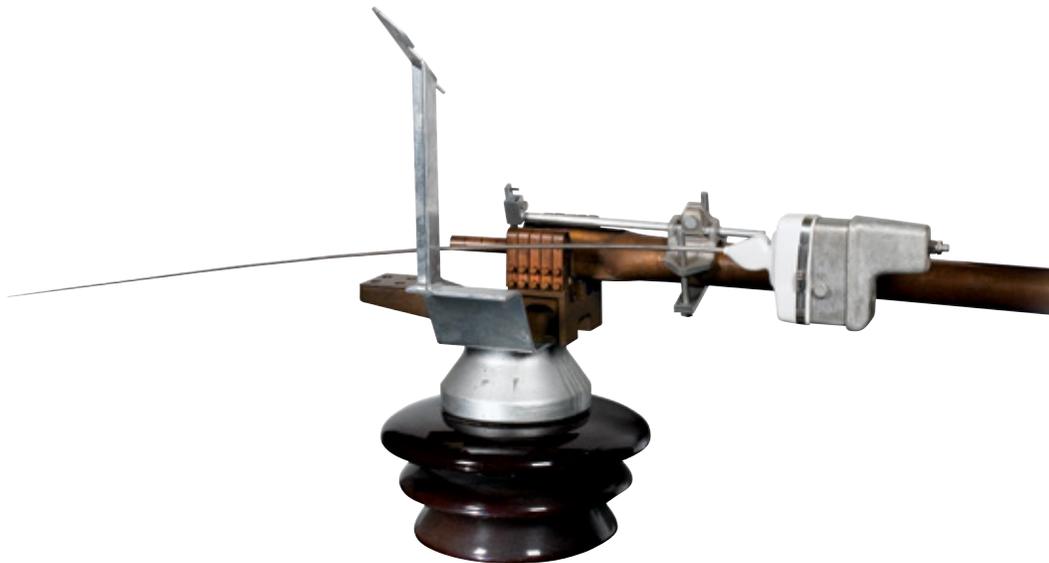
## Joslyn Hi-Voltage®

### Load interrupter attachments

**Easy and economical interrupting of line charging or transformer-magnetizing current.**

**Joslyn Hi-Voltage series HVI hi-velocity load interrupter attachments**

- Economical attachments for air switches mount quickly on most gear- or motor-operated vertical- and side-break switches, enabling affordable conversion of existing air switches
- Install on the air switch's existing hardware – No special tools or training required
- Reliable operation
- Interruption reliability is not dependent upon switch opening speed
- Virtually maintenance-free; requires only an inspection every five years or 5,000 operations
- Unique design ensures proper operation at all times, and air switches equipped with series HVI interrupters have operated dependably in the field for many years
- Interrupting performance far exceeds the capabilities of quick-break attachments of more conventional design
- Mount on almost any vertical- or side-break horn gap air switch equipped with 3" or 5" bolt circle insulators and a manual gear or motor-operated mechanism



**Operation**

01 With the air switch closed (top diagram), current flows through the main blade. The series HVI interrupter is out of the circuit.

02 As the air switch blade operates (second diagram), the movable arc horn slides along the fixed arc horn until the spring rod engages the latch. Current flow is established through the series HVI interrupter, its spring rod and the latch.

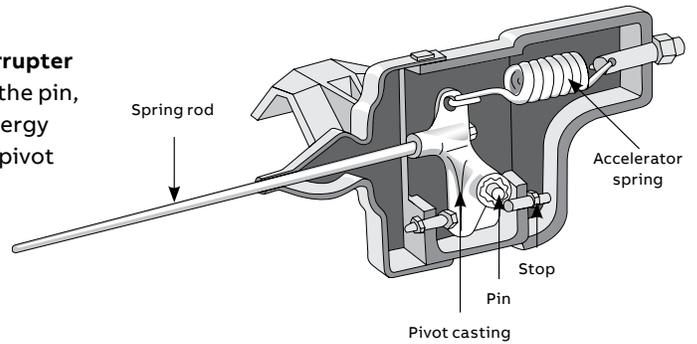
03 As the air switch blade continues to open (third diagram), energy is stored in the spring rod of the series HVI interrupter.

04 At the point where the spring rod is released from the latch, a large open gap has been established between the movable arc horn and the fixed arc horn (bottom diagram). The circuit is interrupted, and visible isolation is provided.

**Mechanical data**

**Cutaway of series HVI hi-velocity load interrupter**

When latched, the spring rod pivots around the pin, loading the accelerator spring. Maximum energy is stored in the accelerator spring when the pivot casting reaches its full travel as set by stop.



**Ratings**

**Loop dropping and cable switching**

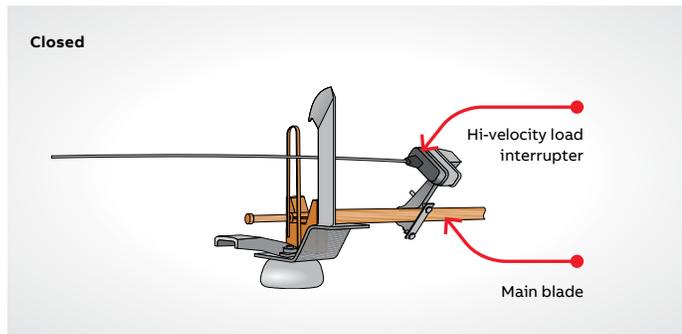
System voltage (kV)	96	115	138	161	230
Approximate line length (miles)	70	50	30	20	–
Current (amps)	20	20	15	10	0.5

**Transformer-magnetizing switching**

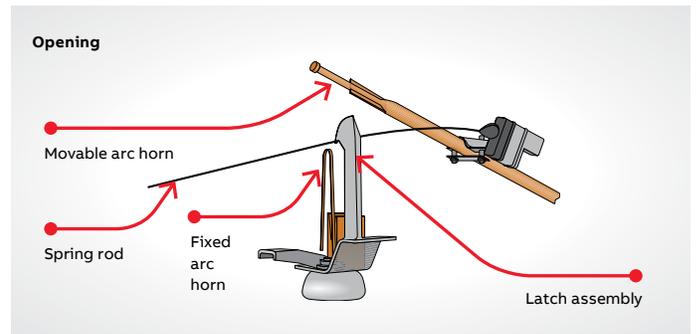
System voltage (kV)	96	115	138	161	230
Transformer size (MVA)	70	100	150	200	300

Note: To order a Joslyn Hi-Voltage® series HVI load interrupter, please supply the following information:

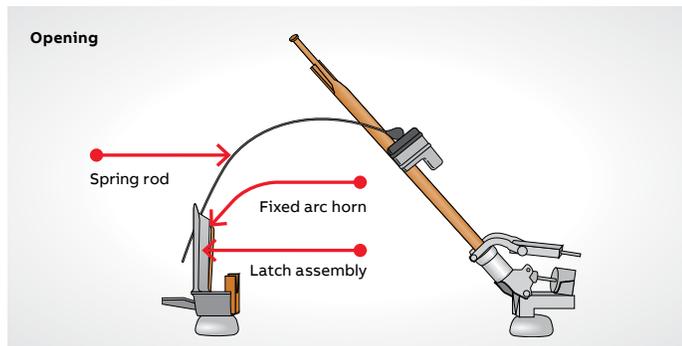
1. Air switch manufacturer
2. Switch model number
3. Voltage rating
4. Current rating
5. Size of insulator bolt circle
6. Description of blade movement, including rotation as viewed from hinge end looking back at the jaw assembly end



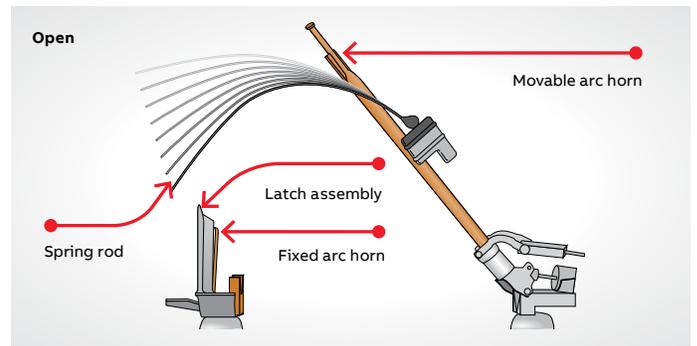
01



02



03



04

# Joslyn Hi-Voltage®

## UVI universal vac-rupter load interrupter attachments

Convert an isolating switch into a load interrupter switch.

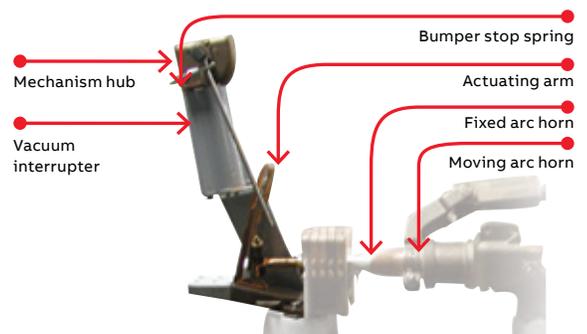
- Quick and affordable conversion of existing switches
- Mount quickly on most group-operated isolating switches, including vertical-break, side-break, double-side break, center-side break and in-line designs, in all configurations including phase-over-phase, with no special tools or training required
- May be used for full load interruption up to 34.5 kV
- May also be used for reduced recovery voltage applications of loop splitting or parallel switching up to 230 kV, depending on system voltage, grounding of system and load and load characteristics
- Optional voltage limiter expands capability for transmission line charging current and transformer-magnetizing current interruption at voltages up to 72.5 kV, in addition to providing 2,000 A of loop splitting or parallel switching capability
- Virtually maintenance-free; requires only an inspection every five years or 5,000 operations
- Anodized aluminum mechanism housing protects against corrosive action
- Fiberglass interrupter module housing with special coating inhibits ultraviolet activity
- Sealed vacuum interrupter chamber is encapsulated in Joslyte solid-dielectric, closed-cell insulation to seal against moisture and contamination
- Current-transfer and arcing horn components are made from special non-welding, high-current materials
- The series UVI interrupter is in the power circuit only for a few seconds during the opening operation; it is not in the circuit while the switch is closing or closed, and continuous momentary and impulse ratings of the switch are unaffected
- Reliable operation – A spring toggle mechanism opens the vacuum contacts at the proper speed, independent of air switch operation
- External spark gap protects vacuum module if operated above its recovery voltage capability

Joslyn Hi-Voltage series UVI universal vac-rupters are economical attachments to convert an isolating switch into a load interrupter switch. Depending upon system voltage, grounding considerations of the system and the load and load characteristics, the series UVI interrupter enables the switch to be used for full load interruption or for the reduced recovery voltage application of loop splitting or parallel switching.

Series UVI interrupters mount quickly on most types of group-operated isolating switches from all manufacturers, whether vertical-break, side-break, double side-break, center side-break or in-line designs in all configurations, including phase-over-phase.

You can easily and affordably convert an existing air switch. No special tools or training are required. Instructions detail simple procedures to install the interrupter, along with the fixed and moving arc horns, and to verify proper operation. Adding a series UVI load interrupter will not affect the mechanical operation of the switch.

The series UVI interrupter converts an isolating switch into a load interrupter switch. The switch may be used for full 2,000 A load interruption up to 34.5 kV. The Series UVI Interrupter may also be used for the reduced recovery voltage application of loop splitting or parallel switching up to 230 kV, depending on system voltage, grounding considerations of the system and load and load characteristics. Use the ratings table for determination.



### Operation opening sequence

01 Air switch is closed. series UVI interrupter is not in the circuit. Current flows between the jaw and blade contacts. Vacuum contacts are closed, but no current flows through them because the device is not engaged in the circuit when the switch is fully closed.

02 Air switch contacts separate, but the circuit is maintained through the moving arc horn and fixed arc horn. As blade movement continues, the moving arc horn engages the actuating arm. Vacuum contacts are closed.

03 As blade movement continues farther, the fixed and moving arc horns separate. The current has been transferred to a path through the closed vacuum contacts. Rotation of the mechanism hub brings the spring toggle mechanism to the trip position after adequate clearance distance is established. Current is interrupted inside the vacuum chamber with no external arcing as contacts open.

04 The switch moves to full open position, releasing the actuating arm, which is spring loaded to return to original position, closing the vacuum contacts.

### Closing sequence

05 As the switch blade closes, the circuit is energized between the moving and fixed arc horns.

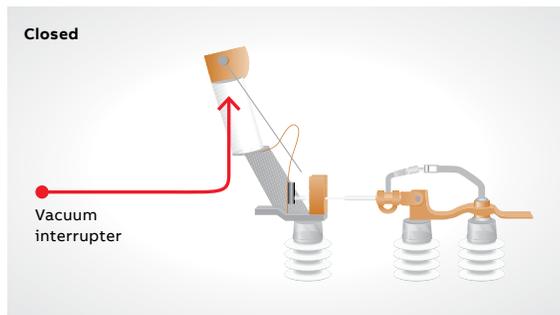
06 As the switch nears the fully closed position, the moving arc horn depresses the actuating arm. The bumper stop spring returns the actuating arm to its original position for the next operation.

## Loop sectionalizing (loop splitting – parallel switching)

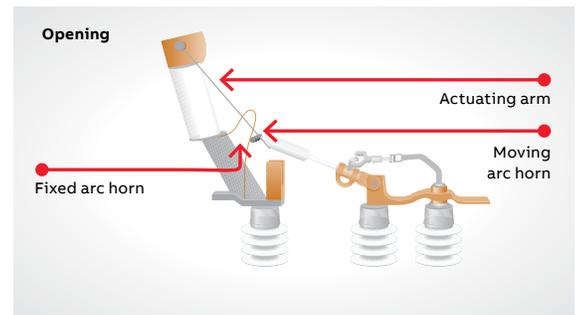
This switching requirement arises at switches in closed transmission loops and tie switches in substation primary and secondary buses. These are situations in which the switch will still be energized at both terminals after it has opened. Depending upon system conditions, rated load current may be flowing through the switch. The recovery voltage (i.e. the voltage that will appear across the switch terminals immediately following interruption of the circuit) is generally a small percentage of full system voltage. This reduced recovery voltage enables the economics of application of the Series UVI Interrupter on systems energized at voltages up to 230 kV. A more detailed technical discussion

of this application is contained in the Joslyn Hi-Voltage® paper, "Some Fundamental Aspects of Recovery Voltage," TD 745-510.

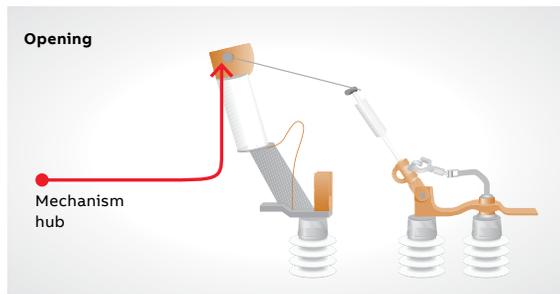
As load currents increase, the ability to reliably open transmission loop switches and substation tie switches while they are energized becomes increasingly important from the standpoint of safety and system operating efficiency. Unlike other types of interrupters, the life of the Joslyn Hi-Voltage Series UVI Interrupter does not significantly relate to number of amps interrupted or recovery voltage duty.



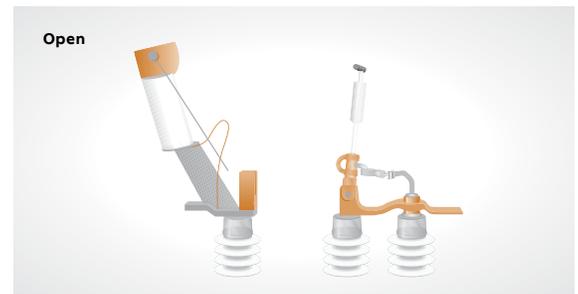
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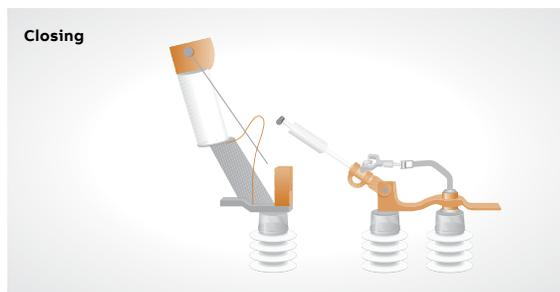
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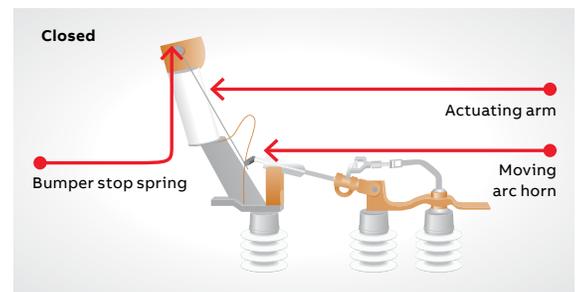
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## Joslyn Hi-Voltage®

### Load interrupter attachments

01 Series UVI interrupter with voltage limiter



01

#### Voltage limiter extends capability of Series UVI interrupter.

With the addition of the Joslyn Hi-Voltage voltage limiter (V/L), the series UVI interrupter can be used for transmission line charging current and transformer-magnetizing current interruption at voltages up to 72.5 kV in addition to providing 2,000 A of loop splitting or parallel switching capability. The V/L and series UVI interrupter combination enables a single switch to be opened to split a loop or drop charging current – The two operations required to isolate a section of a transmission line for maintenance. Sequential switching operations or temporary outages are thereby eliminated with a resulting economical increase of system operating convenience and efficiency. The small, lightweight V/L and series UVI interrupter combination represents an advanced technology version of the Joslyn Hi-Voltage series LSI load sectionalizer interrupter, which provides the same functions through 161 kV.

#### Ratings for standard UVI

System voltage (kV)	Application	Interrupting capability (amps) (peak recovery voltage of 30 kV)
Up to 15	Capacitor switching, grounded & ungrounded	800
25	Capacitor switching, grounded only	140
Up to 25	Load switching, grounded & ungrounded	2,000
34.5	Load switching, grounded only	2,000
Up to 25	Reactor switching	2,000
Up to 25	Transformer-magnetizing switching	2,000
Up to 25	Line dropping	140
Up to 25	Cable switching	800
Up to 230	Loop splitting/parallel switching	2,000

#### Ratings for UVI with voltage limiter

System voltage (kV)	Cable charging current (amps)	Line charging current (amps)	Parallel or loop switching current (amps)
38	50	25	2,000
48.3	25	20	2,000
72.5	15	15	2,000

Note: To order a Joslyn Hi-Voltage series UVI load interrupter, please supply the following information:

1. Air switch manufacturer
2. Switch model number
3. Voltage rating
4. Current rating
5. Size of insulator bolt circle
6. Description of blade movement, including rotation as viewed from hinge end looking back at the jaw assembly end
7. Application, system voltage and grounding

## Joslyn Hi-Voltage®

### Series LSI load sectionalizer interrupter attachments

#### Convert an isolating switch into an interrupter switch.

- Eliminate sequential switching of a loop system, which minimizes the possibility of a switching error, thereby increasing personnel safety and system operating flexibility
- Can be supplied mounted and pre-adjusted on Joslyn Hi-Voltage isolating switches to provide a complete, single-source interrupter switch
- Also available as an add-on for existing air switches – Can be applied easily and economically to existing vertical-break or side-break disconnect switches rated 69 kV through 161 kV, regardless of manufacturer
- 69 kV series LSI with voltage limiter is ideally suited for additional switch types including center-break and in-line designs
- Virtually maintenance-free; requires only an inspection every five years or 5,000 operations
- Anodized aluminum mechanism housing protects against corrosive action
- Fiberglass interrupter module housing with special coating inhibits ultraviolet activity
- Sealed vacuum interrupter chamber is encapsulated in Joslyte solid-dielectric, closed-cell insulation to seal against moisture and contamination
- Current-transfer and arcing horn components are made from special non-welding, high-current materials
- The series LSI interrupter is in the power circuit only for a few seconds during the opening operation; it is not in the circuit while the switch is closing or closed, and the continuous momentary and impulse ratings of the switch are unaffected
- Spring toggle mechanism opens the vacuum contacts at the proper speed, independent of air switch operating time
- External spark gap protects vacuum module if operated above its recovery voltage capability



Joslyn Hi-Voltage series LSI load sectionalizer interrupters convert isolating switches into interrupter switches for sectionalizing transmission loops. A transmission loop switch requires the functions of loop splitting, or parallel switching, and line dropping (see load interrupter attachment applications on page 48 for more information). The series LSI interrupter is a co-ordinated device that combines the capability of a vacuum interrupter for loop splitting with the articulated spring-rod interrupter (HVI) or the Joslyn Hi-Voltage voltage limiter (V/L) for line dropping. The spring rod design incorporates a gap-type voltage sensor, which automatically determines the required function and inserts the proper interrupter into the power circuit. The series LSI interrupter can also interrupt the magnetizing current of unloaded transformers.

#### Design features

Each series LSI interrupter consists of a vacuum interrupter (UVI) and an articulated spring rod interrupter (HVI) or a voltage limiter (V/L). A gap-type sensor measures the recovery voltage across the switch when the spring rod is supplied. If the recovery voltage is within the capability of the vacuum interrupter – Which will be the case in the reduced recovery voltage loop-splitting situation – The circuit will be interrupted within the vacuum interrupter. If the recovery voltage exceeds the capability of the vacuum interrupter – Which will be the case if another switch in the loop has already opened – The voltage limiter will function, or the gap-type sensor will trigger and insert the articulated spring rod to interrupt the line charging current. Therefore, it doesn't matter which switch is opened first. The series LSI interrupter will automatically determine the required function and insert the correct interrupter. Use of the series LSI load sectionalizer Interrupter on every transmission loop switch eliminates sequential switching procedures and precludes the possibility of switching sequence error.

## Joslyn Hi-Voltage®

### Load interrupter attachments

#### Series LSI operation

##### Opening sequence of series LSI interrupter with spring rod component

01 With the air switch closed (top diagram), the series LSI interrupter is completely out of the circuit. The only current path is through the air switch blade.

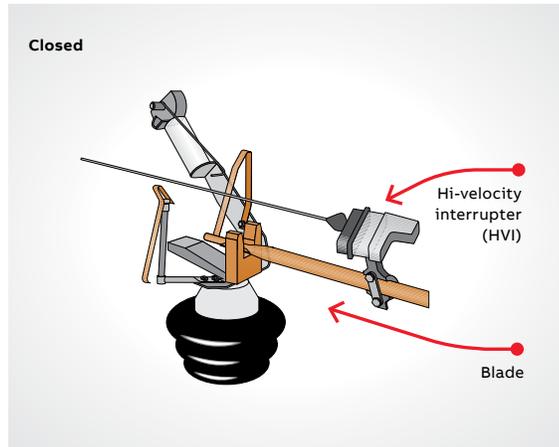
02 As the air switch blade operates (second diagram), the movable arc horn slides along the fixed arc horn and engages the actuator arm of the vacuum interrupter. Current flow is diverted through the closed contacts of the vacuum interrupter. The spring rod of the hi-velocity interrupter (HVI) is caught on its latch. No current flows through the hi-velocity interrupter (HVI) because an insulating rod supports the latch.

03 When the actuator arm approaches the limit of travel (third diagram), a toggle mechanism within the weatherproof housing opens the vacuum interrupter contacts. If the application is loop sectionalizing (parallel switching), the circuit is interrupted. If the application is line dropping, cable switching or transformer-magnetizing switching, the air gap ignites, inserting the hi-velocity interrupter (HVI) into the circuit. Current flow is established through the hi-velocity interrupter (HVI), spring rod, latch and air gap.

04 As the air switch blade continues to open (bottom diagram), the movable arc horn disengages from the actuator arm and allows it to reset, closing the vacuum contact. After a sufficient opening is established between the air switch blade and fixed arc horn, the spring rod releases from the latch. The circuit is interrupted. Visible isolation is now provided by the air switch.

#### Closing

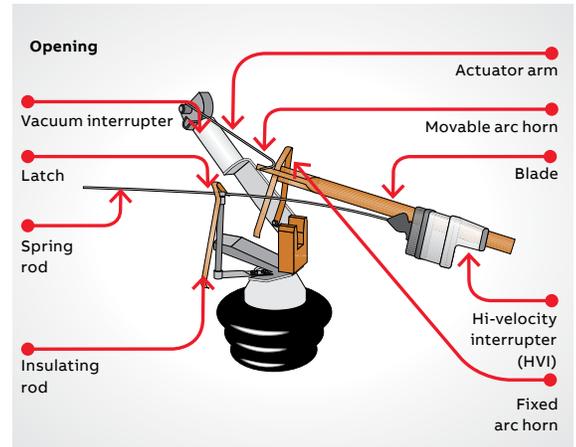
As the air switch blade closes, the load is picked up through the movable arc horn and fixed arc horn.



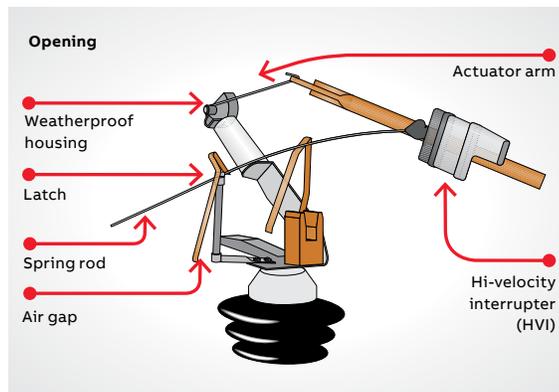
01

#### Opening sequence of series LSI interrupter with voltage limiter

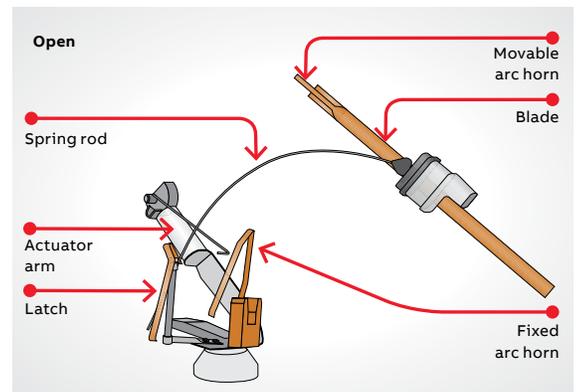
Operation is similar except the spark gap and spring rod considerations are eliminated.



02



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## Joslyn Hi-Voltage®

### Load interrupter attachments

#### Ratings

##### Loop splitting/parallel switching

69–230 kV: Maximum interrupting current 2,000 A – Maximum recovery voltage 30 kV peak

##### Line dropping and cable switching

System voltage (kV)	69	115	138	161	230
Approximate line length (miles)	70	50	30	20	–
Current (amps)	20 (15*)	20	15	10	0.5

##### Transformer-magnetizing switching

System voltage (kV)	69	115	138	161	230
Transformer size (MVA)	70	100	150	200	300

\* Rating using voltage limiter instead of HVI.

Note: To order a Joslyn Hi-Voltage series LSI load interrupter, please supply the following information:

1. Air switch manufacturer
2. Switch model number
3. Voltage rating
4. Current rating
5. Size of insulator bolt circle
6. Description of blade movement, including rotation as viewed from hinge end looking back at the jaw assembly end

## Joslyn Hi-Voltage®

# Series JMVI modular vac-rupter interrupter attachments

Use with a disconnect switch to provide load switching capability.

- Consist of one or more vacuum interrupter modules connected in series to form an interrupter assembly to be installed on a disconnect switch to provide load switching capability
- Supplied complete with all mounting hardware, enabling fast and easy installation on most vertical-break disconnect switches from any manufacturer
- Available with Joslyn Hi-Voltage series RF-2 vertical break switches to provide a complete load interrupter switch package

The Joslyn Hi-Voltage series JMVI modular vac-rupter interrupter is one or more vacuum interrupter modules connected in series to form an interrupter assembly, which is installed on a disconnect switch to provide load switching capability. The movement of the air switch blade activates a high-speed toggle mechanism that opens all contacts of each phase simultaneously. The contact speed is independent of the air switch blade speed. Switches equipped with series JMVI interrupters can provide a high degree of pole-to-pole synchronization. The series JMVI interrupter does not change the continuous, momentary or closing capabilities of the air switch because the interrupter is not in the circuit when the air switch is closing or fully closed. Interruption takes place inside permanently sealed ceramic vacuum chambers encapsulated in Joslyte, a sealed, solid-dielectric insulation, to provide a permanent dielectric system inside a rugged housing.

The photo at left shows a single pole of a series JMVI interrupter installed on the series RF-2 vertical-break switch.



### Operation opening

01 Switch is closed. Series JMVI interrupter is not in circuit. The only current path is through the switch blade and jaw contacts.

02 As switch begins to open, blade has rotated and raised out of the jaw. The current path is maintained through the moving and fixed arc horns. As the blade continues to open, the contact on the moving arc horn engages the actuator arm of the series JMVI interrupter and the control transfer rod. The control transfer rod holds the moving arc horn contact against the actuator arm and breaks any accumulation of ice on the arm.

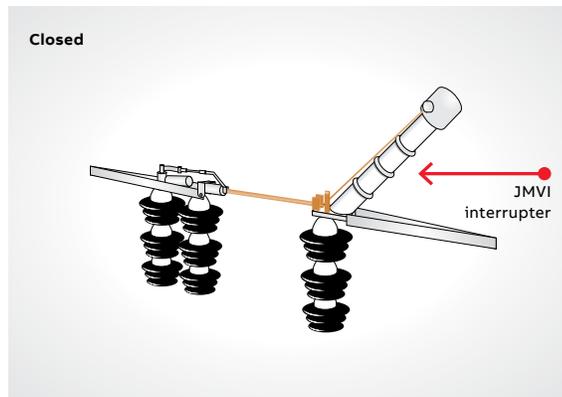
03 After the moving and fixed arc horns have separated, continuity is retained through the switch blade, moving arc horn contact, actuator arm and closed vacuum contacts to the jaw terminal.

04 When the blade raises the actuator arm to a position that establishes necessary clearances between the blade and the jaw, the over-center toggle mechanism in the housing on top of the interrupter stack opens the vacuum contacts at high speed.

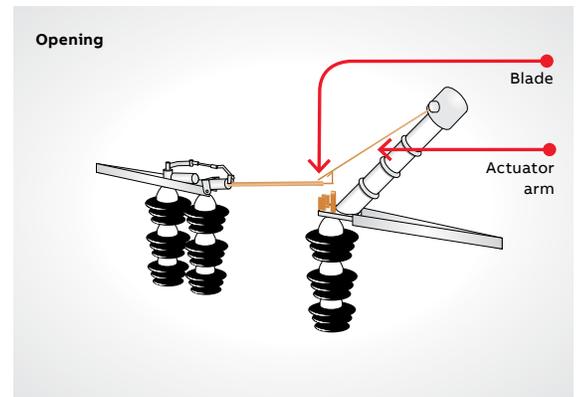
05 As the air switch blade continues to its full open position, the actuator arm is disengaged and returns to its normal position. This closes the vacuum contacts and resets the mechanism for the next operation.

### Closing

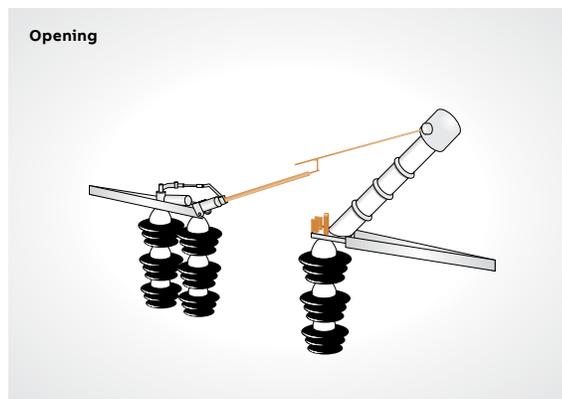
06 As the blade closes, the moving arc horn approaches the fixed arc horn until an arc strikes to close the circuit in air. After the arc horns contact, the moving arc horn will depress the bottom tip of the actuator arm and pass under it in reaching the fully closed position. The interrupter is not in the circuit when the switch is closed or closing.



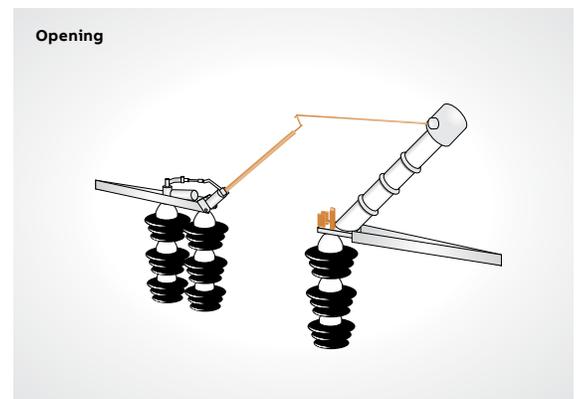
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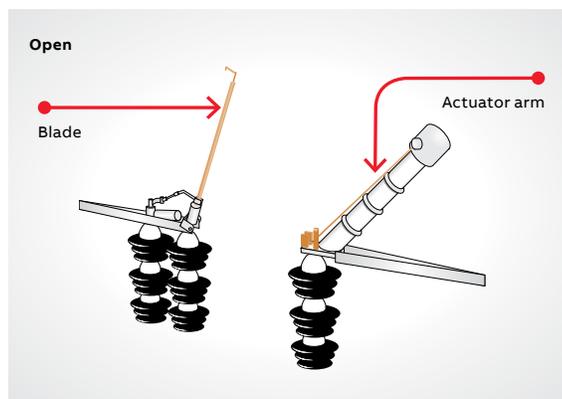
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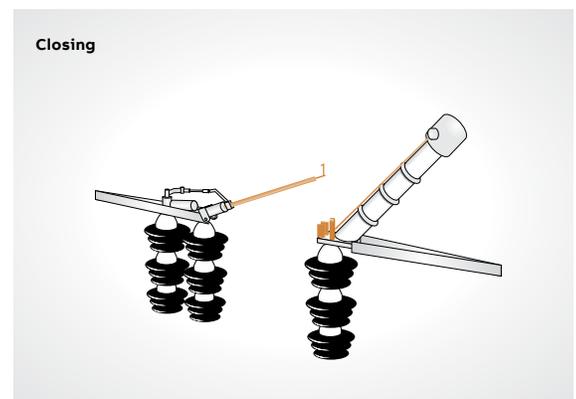
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## Joslyn Hi-Voltage®

### Load interrupter attachments

#### Vacuum module requirements guide for full-voltage applications

##### Applications

- High-voltage transmission line switching
- High-voltage capacitor bank switching
- Shunt reactor bank switching
- Cable switching

##### Reduced voltage applications

For loop switching or parallel switching, each vacuum contact per phase is rated 2,000 A interrupting at a peak recovery voltage of 30 kV. In most cases, these applications may be served with a single vacuum contact per phase.

#### Voltage limiter extended capability

For loop splitting and line dropping/load sectionalizing, use the Joslyn Hi-Voltage Voltage limiter in parallel with series JMVI interrupter modules to extend capability. The resulting interrupting will be smaller because fewer modules are required. See series LSI load sectionalizer interrupters on pages 43–45.

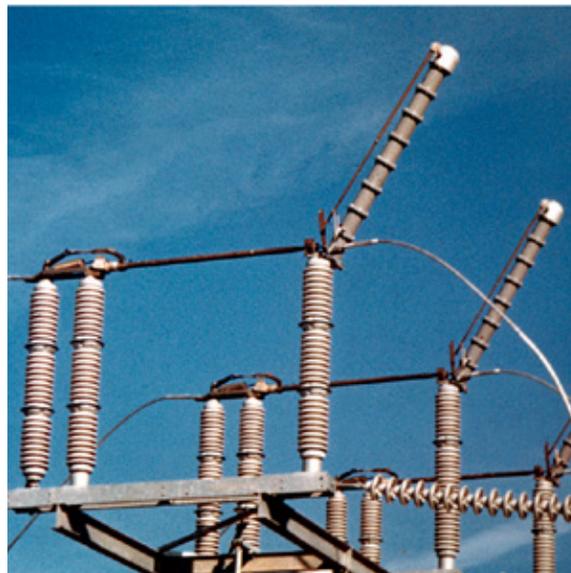
#### Ratings for standard JMVI

Nominal system voltage (V)	Maximum interrupting current (RMS amps) switching application				Modules required per phase
	70% P.F. load	Line charging or 3-phase cable	Capacitor bank grounded neutral	Ungrounded neutral	
14.4	2,000	600	800	140	1
14.4	2,000	600	1,000	800	2
23	2,000	140	700	–	1
23	2,000	600	700	600	2
34.5	2,000	600	700	–	2
34.5	2,000	600	700	600	3
46	2,000	450	700	–	2
46	2,000	600	800	140	3
46	2,000	600	1,000	600	4
69	2,000	450	600	–	3
69	2,000	600	600	–	4
69	2,000	600	600	450	5
69	2,000	600	600	600	6
115	2,000	450	600	Call	5
115	2,000	600	600	Call	6
115	2,000	600	600	Call	7
138	2,000	450	600	Call	6
138	2,000	600	600	Call	7
161	1,200	110	450	Call	6
161	2,000	450	600	Call	7
230	2,000	110	450	Call	8

## Joslyn Hi-Voltage®

### Load interrupter attachments

01 138 kV typical full load-break switch combining the series JMVI interrupter with the Joslyn Hi-Voltage series RF-2 vertical-break switch. The series JMVI interrupter converts the isolating switch for full load switching at system voltages up to 230 kV.



01

#### Ratings for JMVI with voltage limiter

System voltage (V)	JMVI required modules per phase	Cable charging current (amps)	Line charging current (amps)	Parallel or loop switching (amps)
72.5	2	50	50	2,000
121	2	50	15	2,000
145	2	10	10	2,000
145	3	50	20	2,000
169	3	50	25	2,000
242	4	15	15	2,000
242	5	50	100	2,000

Note: To order Joslyn Hi-Voltage series JMVI modular vac-rupter interrupter attachments, please supply the following information:

1. Air switch manufacturer
2. Switch model number
3. Voltage rating
4. Current rating
5. Size of insulator bolt circle
6. Description of blade movement, including rotation as viewed from hinge end looking back at the jaw assembly end
7. Application, system voltage and grounding

## Appendix

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