



# PRODUCT SELECTION GUIDE

## PRODUCT CATEGORIES

- Reclosers
- Capacitor & Reactor Switching
- Sectionalizers
- Disconnect Switches
- Load Interrupter Attachments
- Underground Switchgear
- Contactors

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## QUICK REFERENCE

### Joslyn Hi-Voltage™ Reclosers

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## Solid-dielectric single- and three-phase TriMod™ reclosers provide maximum continuity of service — simply and efficiently.

Joslyn Hi-Voltage™ TriMod™ reclosers use no gas or oil for interruption or insulation and offer 10,000 maintenance-free operations. Electronic controls are easy to use and provide both application flexibility and data recording capability. TriMod 100 single-phase and TriMod 600R single-/three-phase reclosers have high interrupting ratings of up to 12.5kA with continuous current ratings up to 800A. TriMod 300R three-phase reclosers have interrupting ratings up to 16kA with continuous current ratings up to 800A. Long-life operating mechanisms and interrupters provide twice the duty cycle required by ANSI C37.60. TriMod three-phase reclosers are directly compatible with Schweitzer recloser controls.

## Improve your system reliability by using Joslyn Hi-Voltage™ reclosers.

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)

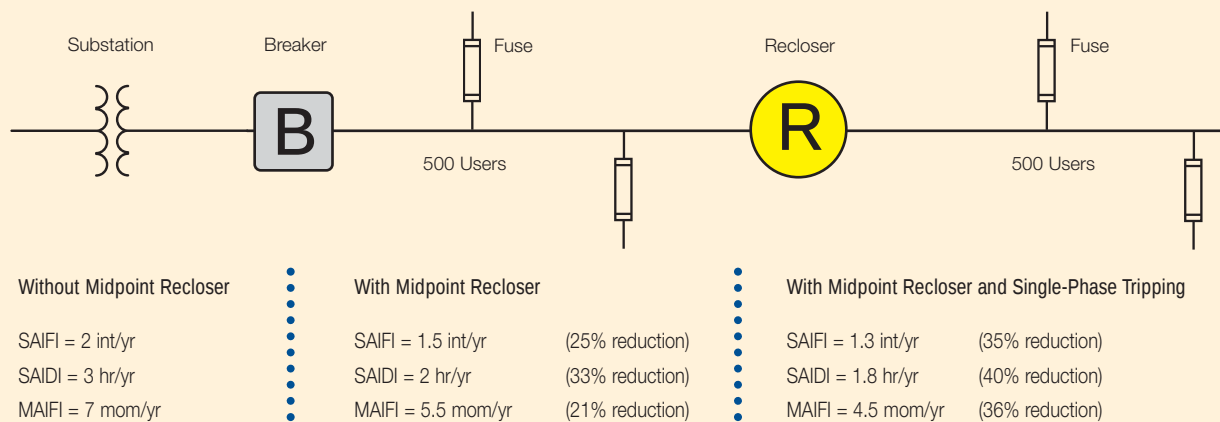
Joslyn TriMod™ automated reclosers feature capabilities well suited for specialty applications that help utilities reduce outages and improve service reliability.

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

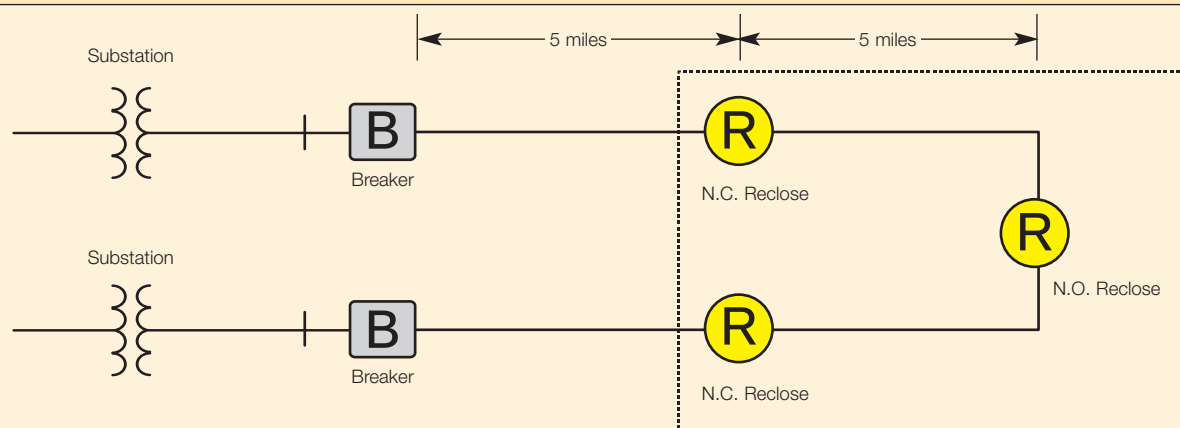
- Fault location
- SCADA communications
- Adaptive protection
- Single- and three-phase tripping
- Power quality
- Loop automation
- Control monitoring

Following are illustrations of typical system reliability improvement applications using TriMod™ reclosers:

### Feeder with Midpoint Recloser



## Loop Configuration



### Loop without Reclosers

|                    |                                             |
|--------------------|---------------------------------------------|
| SAIFI = 1.4 int/yr | (30% reduction versus Feeder configuration) |
| SAIDI = 1.8 hr/yr  | (40% reduction versus Feeder configuration) |
| MAIFI = 5.1 mom/yr | (27% reduction versus Feeder configuration) |

### Loop with Reclosers and Single-Phase Tripping

|                     |                                             |
|---------------------|---------------------------------------------|
| SAIFI = 1.12 int/yr | (44% reduction versus Feeder configuration) |
| SAIDI = 1.5 hr/yr   | (50% reduction versus Feeder configuration) |
| MAIFI = 2.3 mom/yr  | (67% reduction versus Feeder configuration) |

## 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

| Features                                      | Benefits/Descriptions                                                                                                                                                          |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Vacuum Interrupter Technology                 | Provides twice the contact life required by ANSI C37.60; maintenance-free operation.                                                                                           |
| Solid Dielectric Joslyte Insulation           | Proprietary Joslyte solid dielectric with superior insulation and mechanical properties; 40-year field-proven, environmentally friendly technology; NO oil, NO gas, NO hassle. |
| Long-Life Operating Mechanism                 | Magnetic actuator mechanisms offer 10,000 trip and close full-load operations with no maintenance required.                                                                    |
| Variety of Microprocessor Relay Controls      | Compatible with Schweitzer's recloser controls SEL351R and SEL651R; PowerMAX 100 and 130 batteryless control option for single-phase reclosers.                                |
| Single- and Three-Phase Tripping Capabilities | Supports single-phase tripping, single-phase lockout; single-phase tripping, three-phase lockout; and three-phase tripping, three-phase lockout.                               |
| Mounting Versatility                          | Lightweight; mounting options include wood pole, cross arms and cluster frame mounting; control can be mounted directly to recloser or remotely for single-phase models.       |
| Moisture-Control Bladder System               | No internal heater required; no need to energize heaters during long storage periods; moisture and maintenance free.                                                           |
| Removable Current Transformers                | Externally mounted CTs on grounded plane with covers for enhanced safety and easy replacement in the field.                                                                    |

# Joslyn Hi-Voltage™ TriMod™ 100 Series Single-Phase Vacuum Recloser

## Raising the standard of recloser performance and reliability.

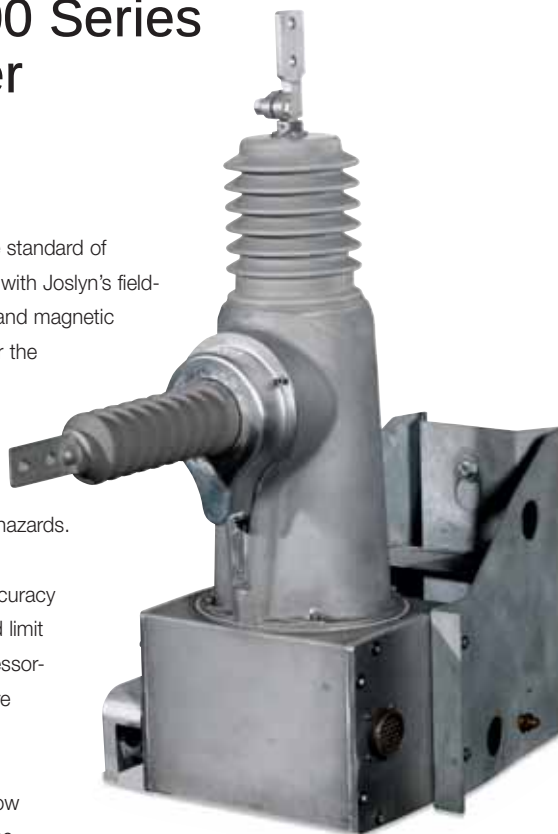
The Joslyn Hi-Voltage™ TriMod™ 100 Series Single-Phase Vacuum Recloser raises the standard of recloser performance by incorporating state-of-the-art vacuum interrupter technology with Joslyn's field-proven Joslyte solid dielectric insulating system and a long-life operating mechanism and magnetic actuator 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.

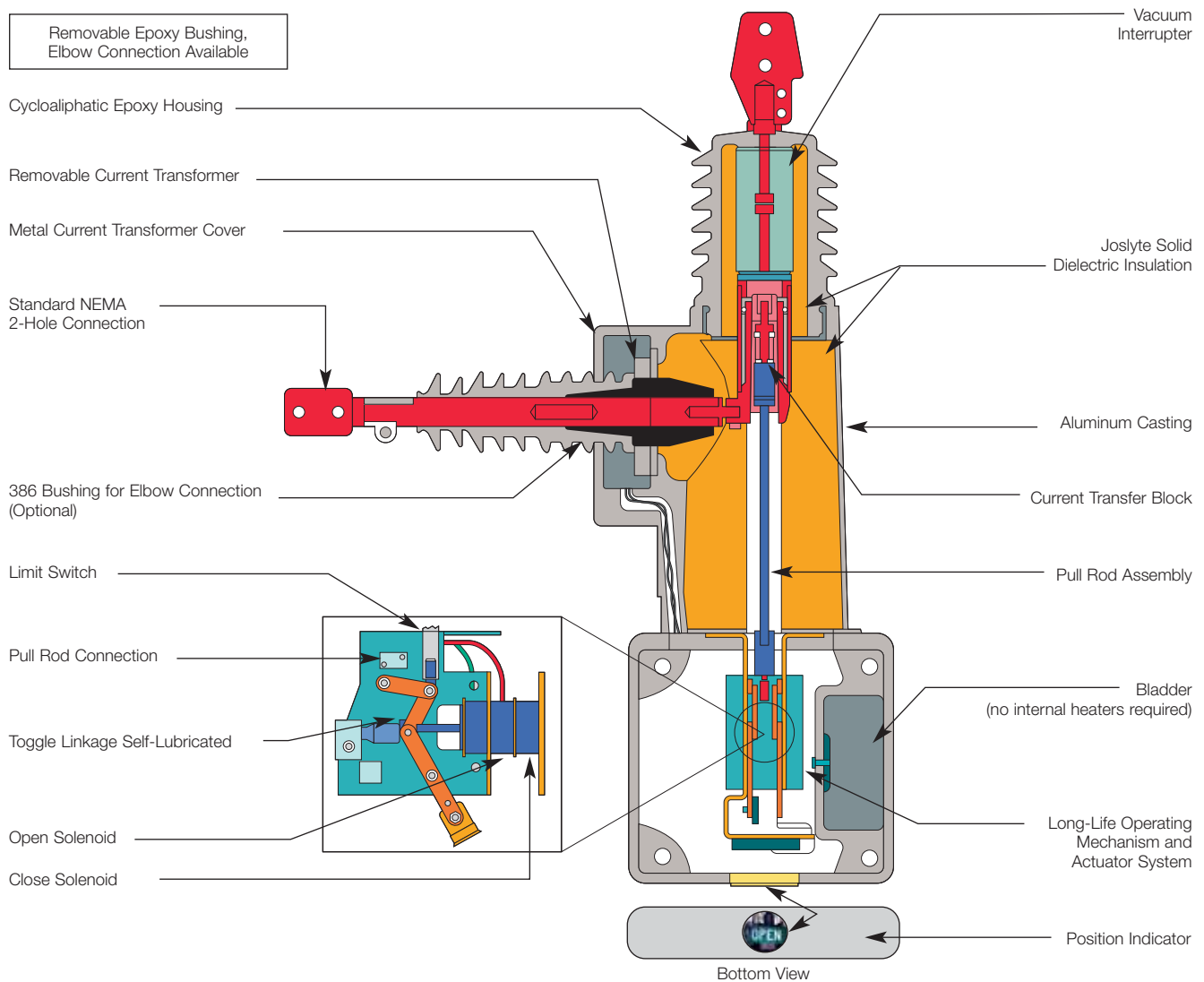
Traditional single-phase reclosers with hydraulic controls have difficulty maintaining accuracy over time, particularly through temperature variations. This can affect coordination and limit protection flexibility. Conversely, the TriMod™ 100 Series Recloser features microprocessor-based PowerMAX control. 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.



TriMod™ 100 Series Vacuum-Interrupting, Single-Phase, Microprocessor-Controlled Automatic Circuit Recloser

| Features                                  | Benefits/Descriptions                                                                                                                                            |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Vacuum Interrupter Technology             | Provides twice the duty-cycle interruption life; uses no oil or gas for interruption.                                                                            |
| Solid Dielectric Joslyte Insulation       | Joslyte solid dielectric insulating system provides maintenance-free, environmentally safe operation. No need to monitor or maintain gas pressure or oil levels. |
| Long-Life Operating Mechanism             | 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 offers features traditionally only available with three-phase recloser controls.              |
| Variety of Mounting Options               | 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      | Provisions for mechanical opening and lockout and disabling automatic reclosing.                                                                                 |
| Highly Visible Position Indicators        | 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.                                                                                          |
| Removable Current Transformer             | Externally mounted CTs on grounded plane with covers for enhanced safety and easy replacement in the field.                                                      |



## 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 800A. 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.

## Joslyn Hi-Voltage™ PowerMAX 100 Control Unit and ControlMAX Interface Software

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.

### 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.

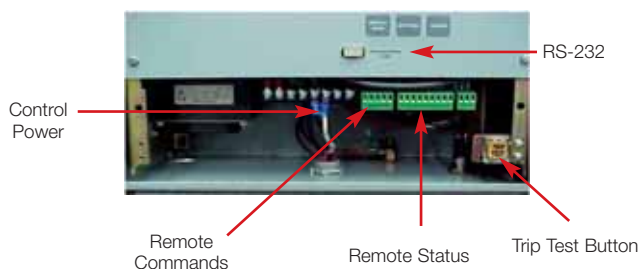
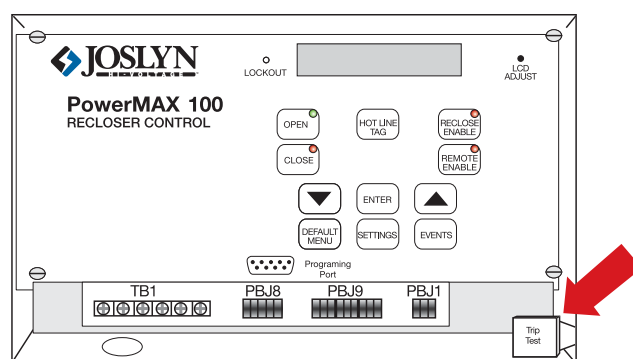
### Single-Phase Trip, Three-Phase Lockout

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



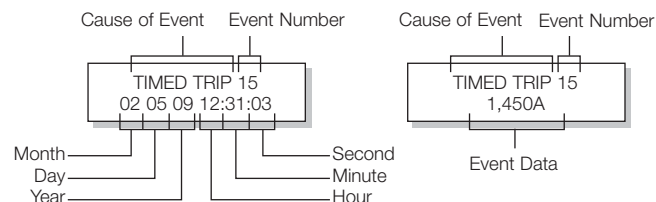
### Trip Test Button

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



### 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.

## 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.



Lockout Indicator

## Low-Voltage Testing Capability

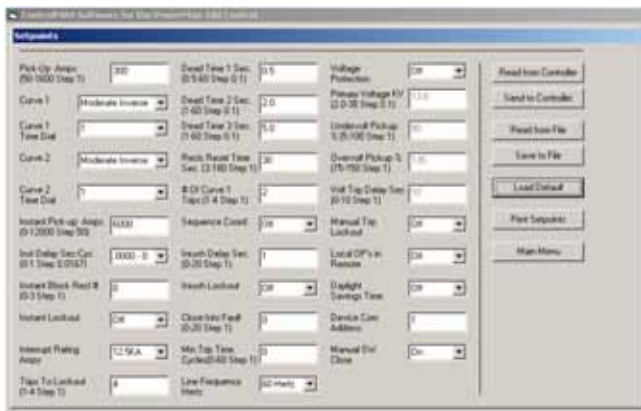
The PowerMAX 100 control unit is powered from 120 or 240VAC. This, along with the fact that the TriMod™ 100 Series Recloser does not use a high-voltage closing solenoid, enables safe and convenient testing of the recloser system. In addition, the operations counter and duty monitor are stored in each 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.

## 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.



Main Menu



Setpoint Menu

## 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

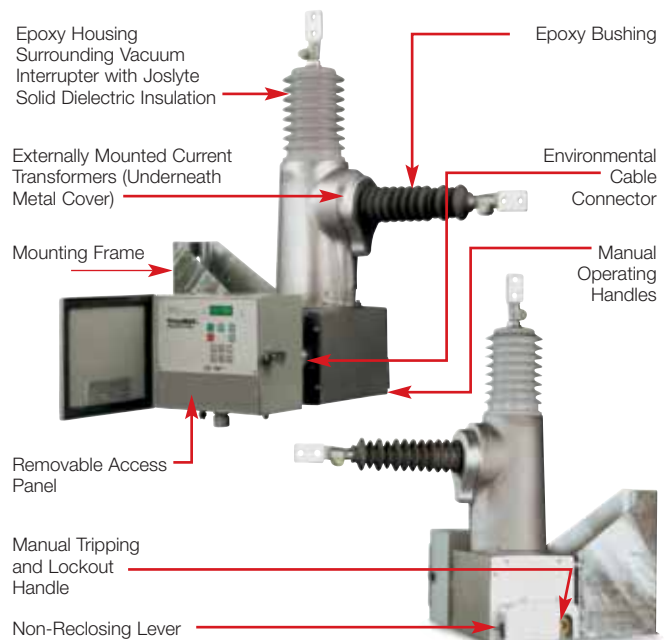
### Package Includes:

- (1) PowerMAX 130 Control
- (3) TriMod™ 100 Single-Phase Reclosers
- (3) Control Cables

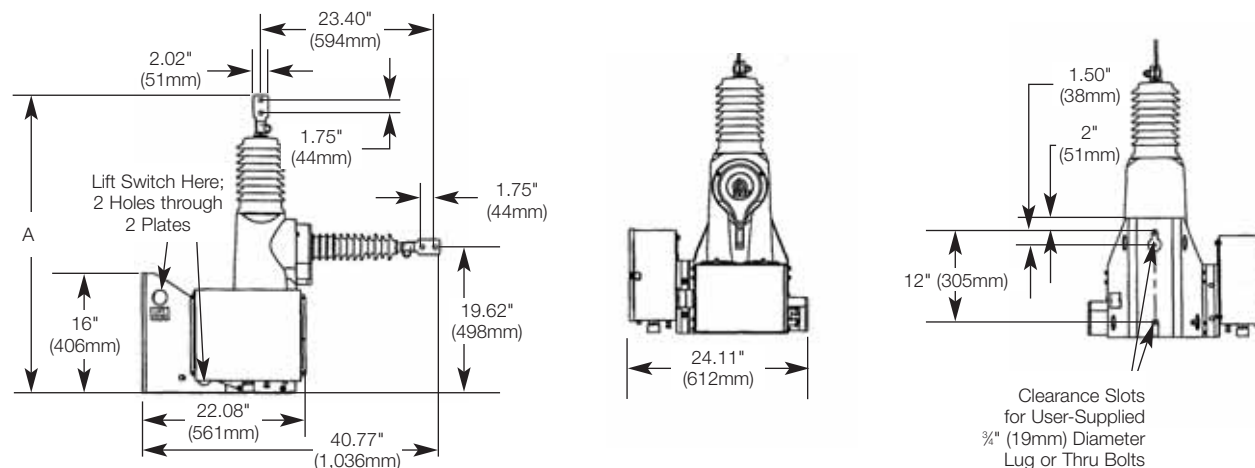


## Direct Control Mounting

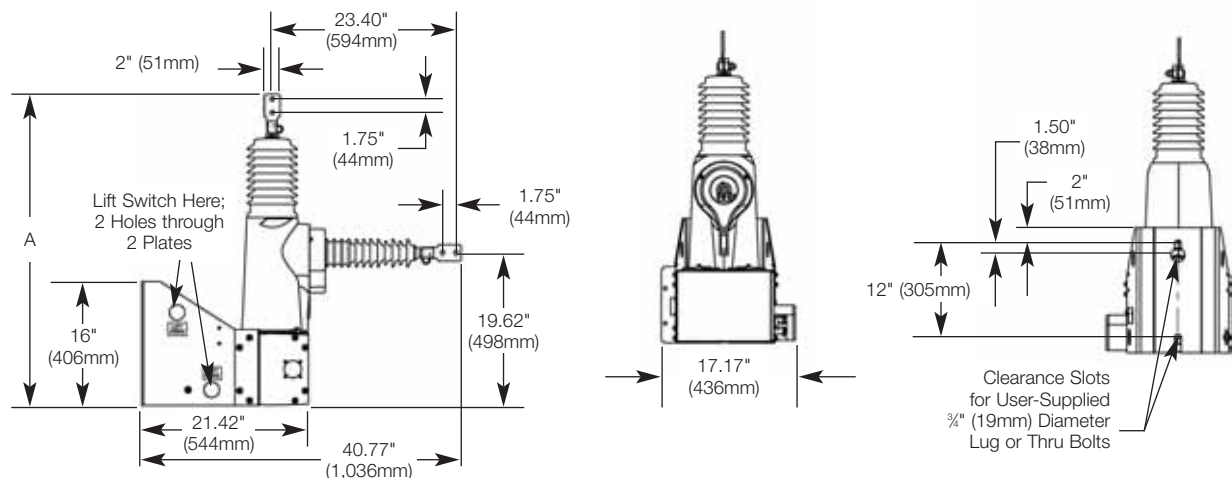
(Remote Control Mounting Optional)



### Dimensions and Creepage Distances for TriMod™ 100 Series Reclosers with Direct-Control Mounting of PowerMAX 100 Control Unit



### Dimensions and Creepage Distances for TriMod™ 100 Series Reclosers with Remote-Control Mounting of PowerMAX 100 Control Unit



#### Creepage Distances

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

#### Dimensions — Direct-Control Mounting

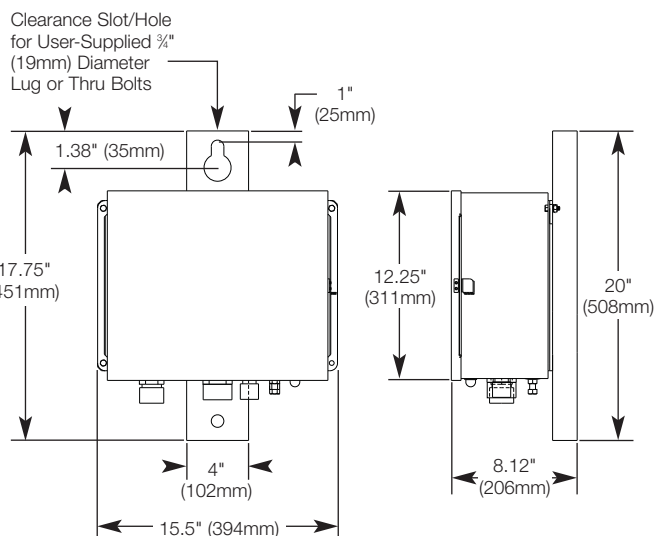
| System kV       | Height (A) in. (mm) | Weight lb. (kg) |
|-----------------|---------------------|-----------------|
| 15kV, 110kV BIL | 37.92 (963)         | 137 (62)        |
| 27kV, 125kV BIL | 40.07 (1,018)       | 144 (65)        |

#### Dimensions — Remote-Control Mounting

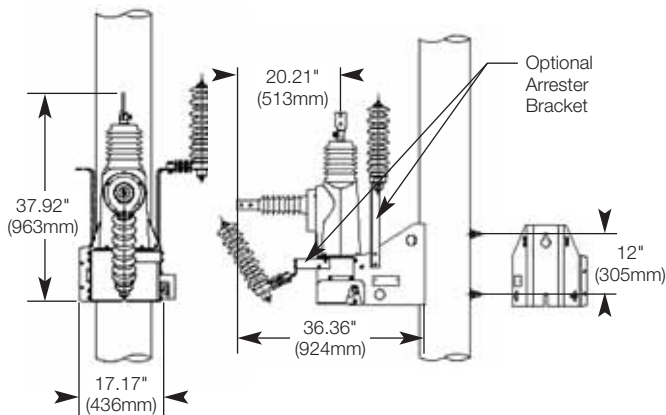
| System kV       | Height (A) in. (mm) | Weight lb. (kg) |
|-----------------|---------------------|-----------------|
| 15kV, 110kV BIL | 37.92 (963)         | 97 (44)         |
| 27kV, 125kV BIL | 40.07 (1,018)       | 109 (49)        |

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

#### Remote-Mounted Control Cabinet

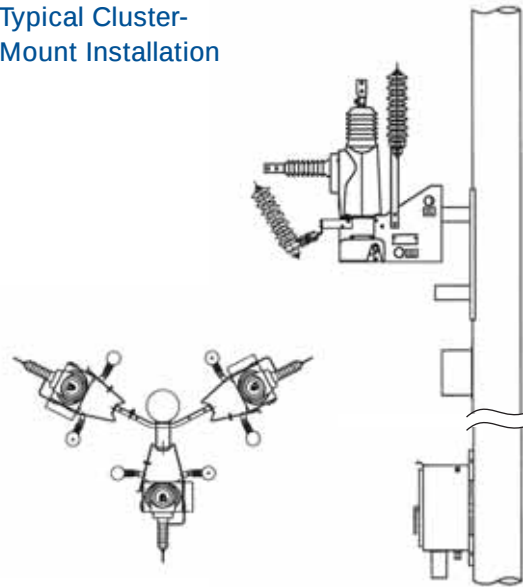


## Typical Pole-Mounting Installation



NOTE: Arresters provided by user.

## Typical Cluster-Mount Installation



## Ratings

| Description                               | 15kV                             | 27kV                             |
|-------------------------------------------|----------------------------------|----------------------------------|
| 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:

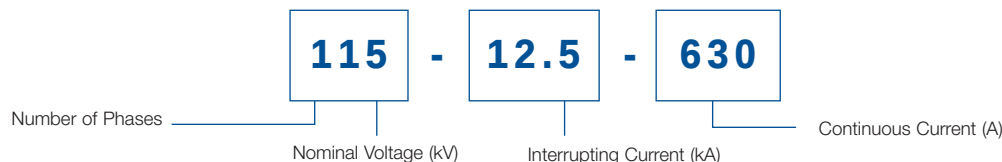
- PowerMAX microprocessor-based recloser control unit mounted to the TriMod™ recloser (remote mounting of the control is optional)
- Mounting frame that can mount the TriMod™ recloser to a wood pole, cross arms or a standard transformer cluster mounting bracket

## 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



## Ordering Information for Joslyn Hi-Voltage™ TriMod™ 100 Series Single-Phase Vacuum Reclosers

| CAT. NO.     | Voltage Range (kV) | Continuous Current (Amps) | 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. (27kg) per pad.  
Horizontal cable tensions to be opposite in direction.

# Joslyn Hi-Voltage™ TriMod™ 300R Series Three-Phase Vacuum Recloser

## Raises the standard.

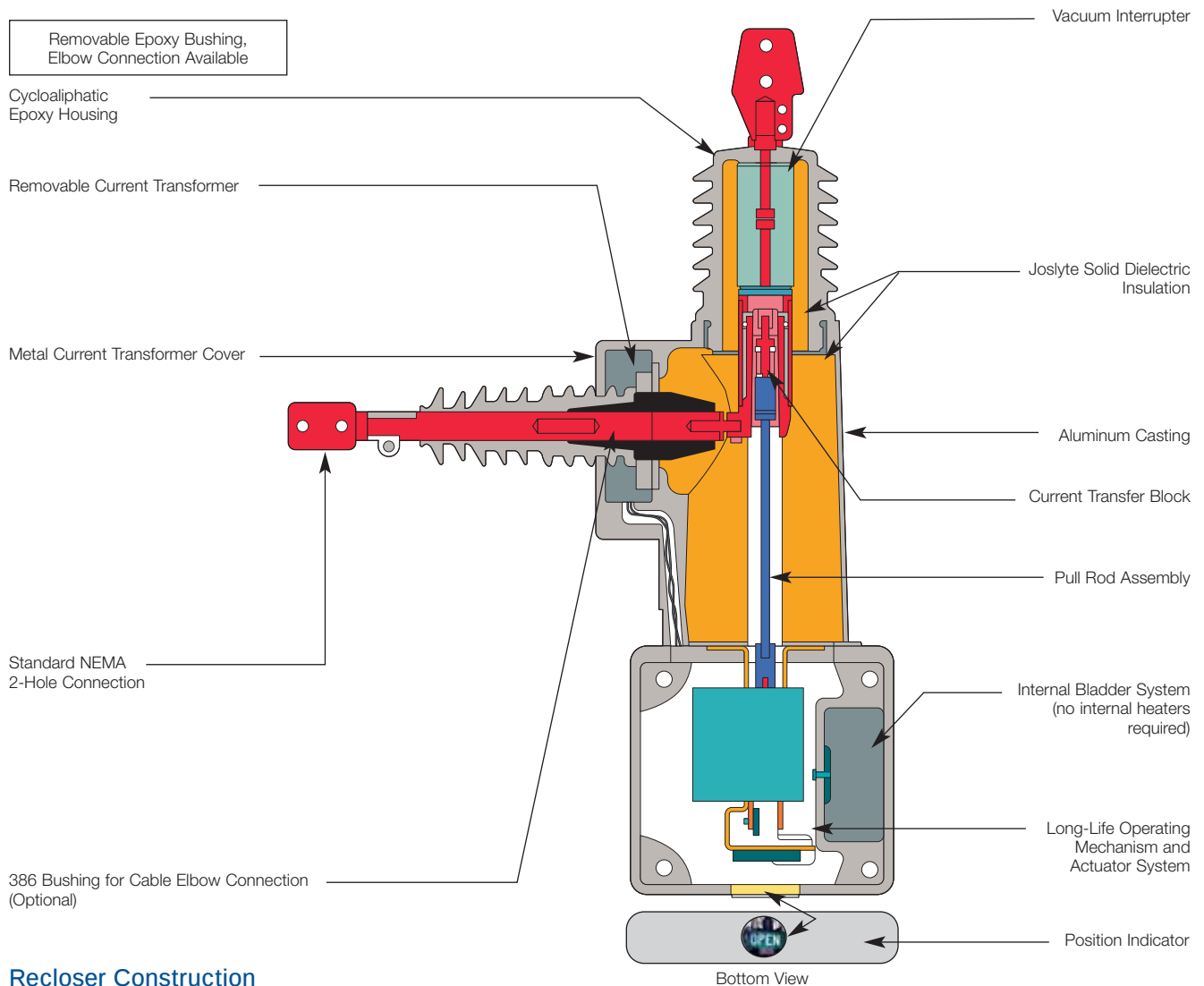
The Joslyn Hi-Voltage™ TriMod™ 300R Series Three-Phase Vacuum Recloser raises the standard of recloser performance by incorporating state-of-the-art vacuum interrupter technology with Joslyn's field-proven Joslyte solid dielectric insulating system and a long-life operating mechanism and magnetic actuator 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.



TriMod™ 300R Series Vacuum-Interrupting,  
Three-Phase, Microprocessor-Controlled Automatic Circuit Recloser

| Features                                        | Benefits/Descriptions                                                                                                                                            |
|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Vacuum Interrupter Technology                   | Provides twice the duty cycle required by ANSI C37.60.                                                                                                           |
| Solid Dielectric Joslyte Insulation             | Joslyte solid dielectric insulating system provides maintenance-free, environmentally safe operation. No need to monitor or maintain gas pressure or oil levels. |
| Long-Life Operating Mechanism                   | Magnetic actuator mechanism offers 10,000 trip and full-load operations with no maintenance.                                                                     |
| Variety of Microprocessor Relay Controls        | 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.                                                                    |
| Removable Current Transformers                  | Externally mounted CTs 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.                                                                     |



## 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 800A. 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.

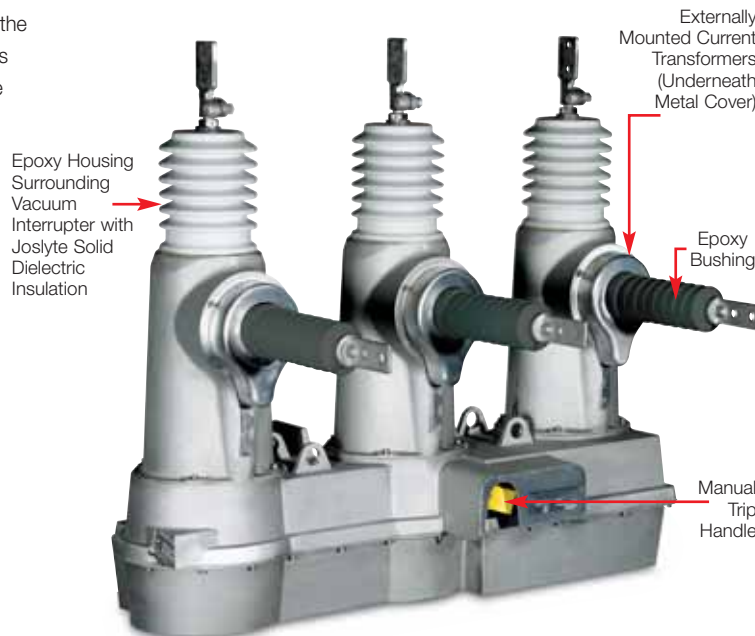
All electrical control connections to the mechanism are made through a sealed single environment control cable connector located on the side of the recloser.

## Joslyn Hi-Voltage™ TriMod™ 300R Series Recloser Operation

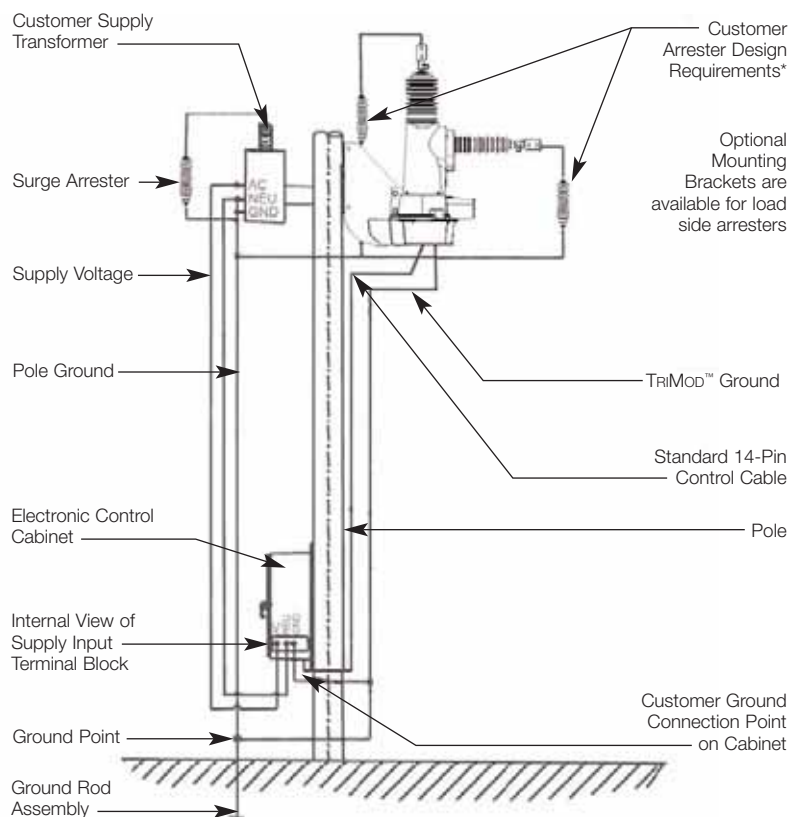
The TriMod™ 300R Series Recloser is connected to an electronic control through the use of a standard 14-pin cable. The combination of the TriMod™ 300R Series Recloser and an electronic control provides state-of-the-art technology in accurate detection of a wide range of line disturbances and reliable, 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!

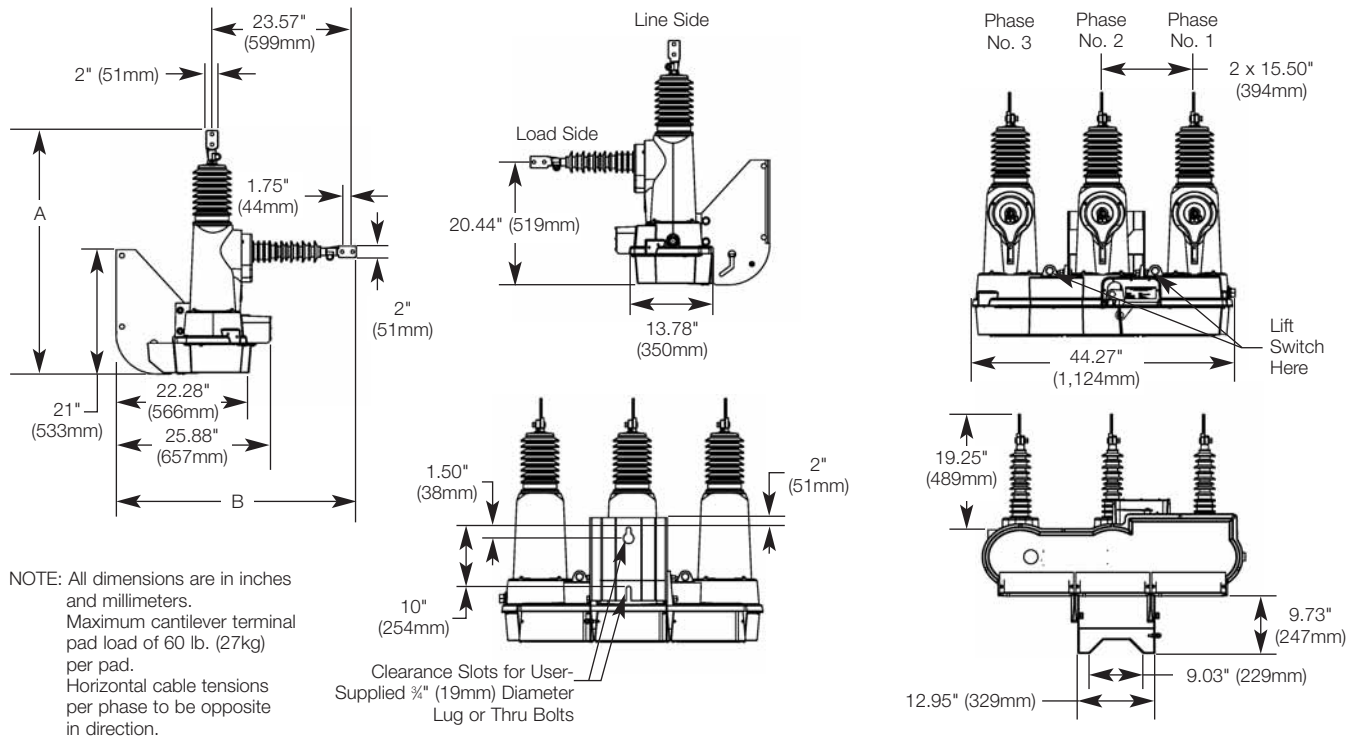


## Typical TriMod™ 300R Series Recloser Installation Detail



\*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.

## Dimensions and Creepage Distances for TriMod™ 300R Series Reclosers



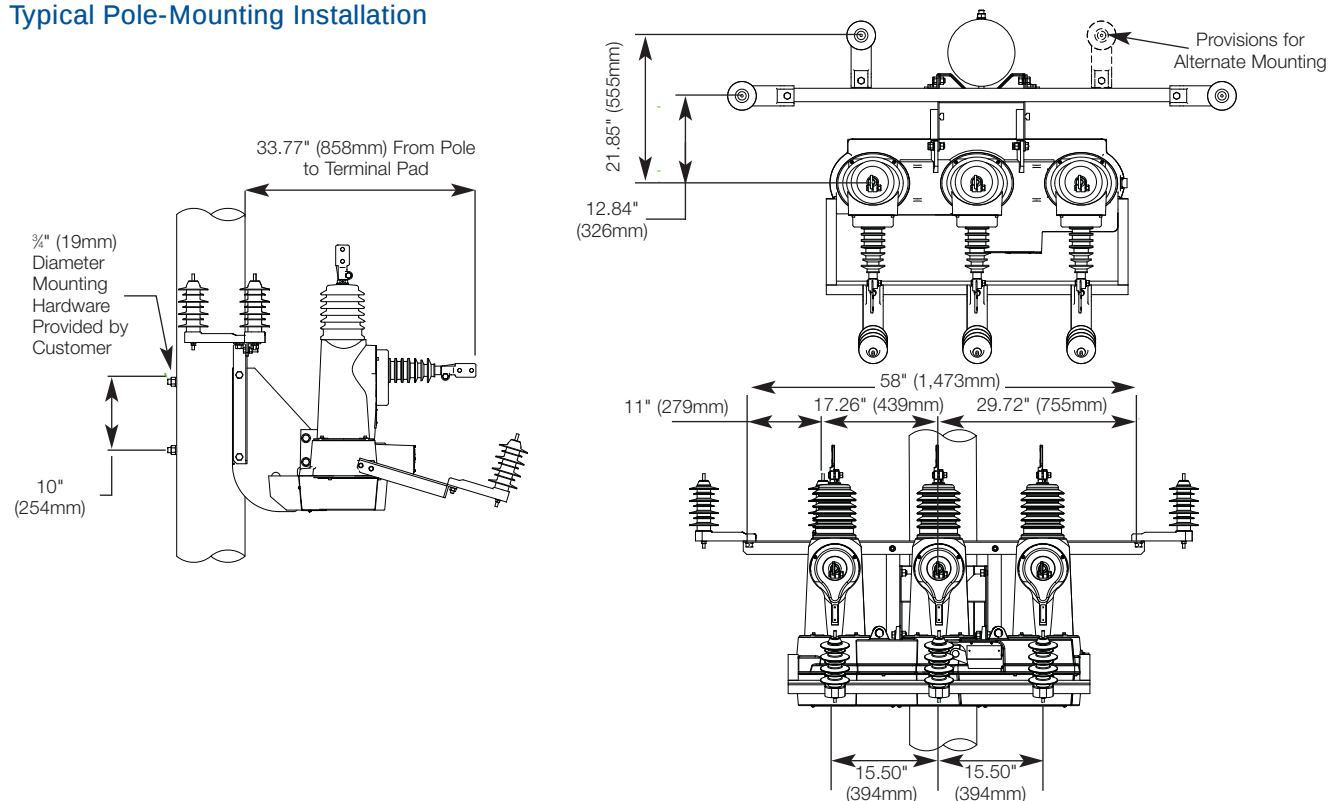
### Creepage Distances

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

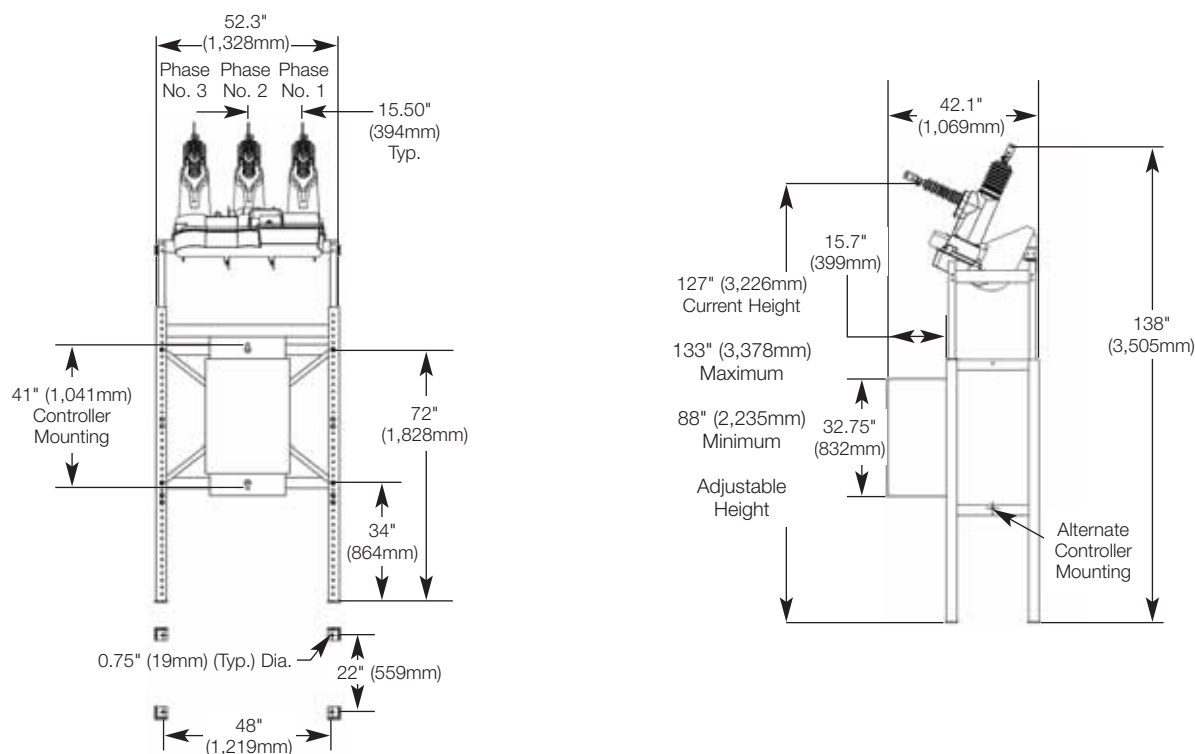
### Dimensions

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

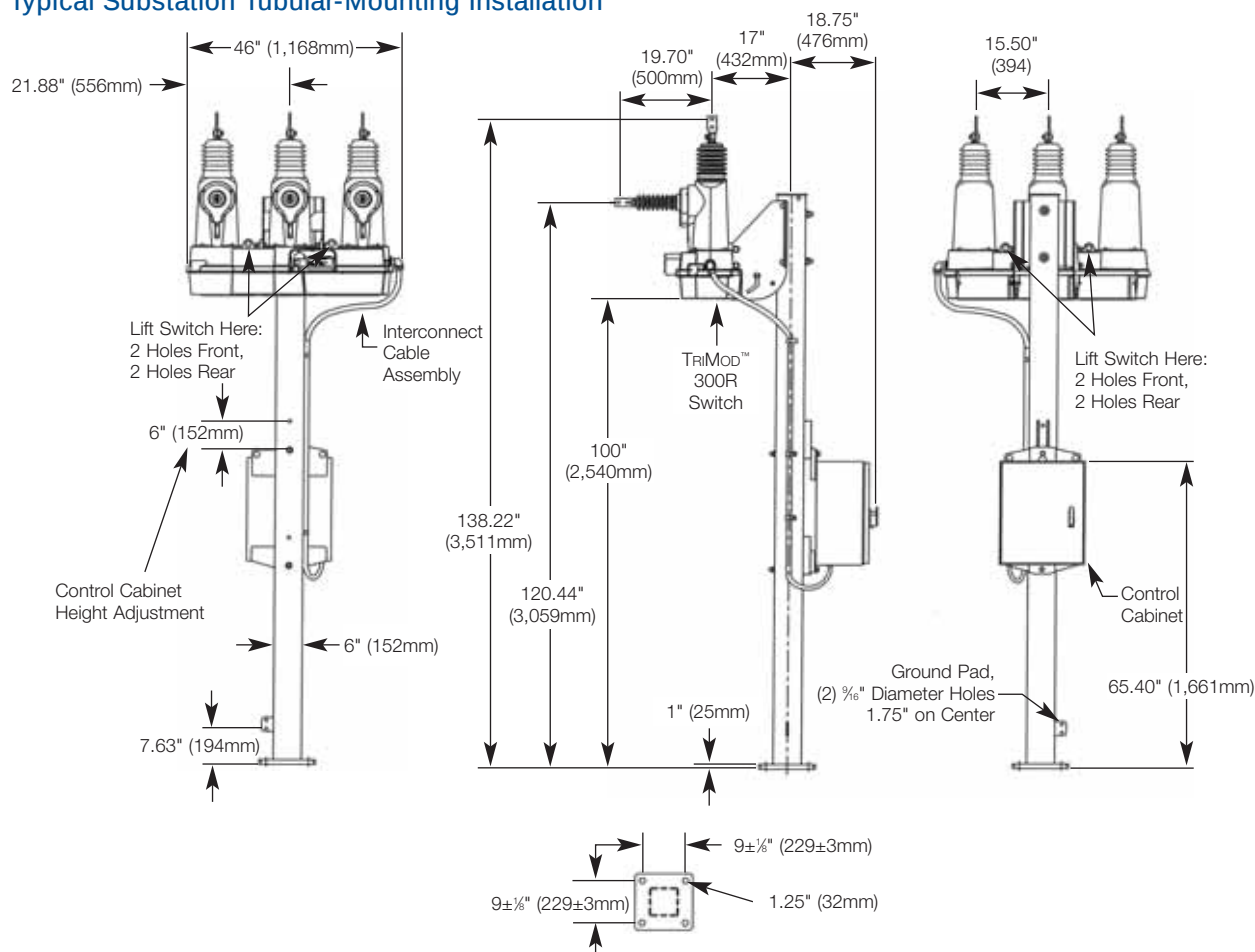
### Typical Pole-Mounting Installation



## Typical Substation Adjustable Frame-Mount Installation



## Typical Substation Tubular-Mounting Installation



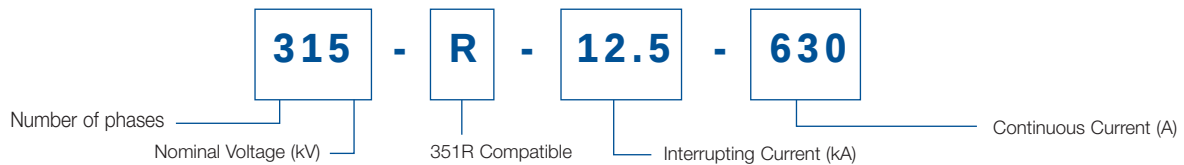
## Ratings

| Description                                    | 15kV                             | 27kV                             |
|------------------------------------------------|----------------------------------|----------------------------------|
| 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) recloser control.
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



## Ordering Information for Joslyn Hi-Voltage™ TriMod™ 300R Series Three-Phase Vacuum Reclosers

| CAT. NO.      | Voltage Range (kV) | Continuous Current (Amps) | Interrupting Current (kA RMS Symmetrical) | BIL (kV) | Height in. (mm) | Depth in. (mm) | Weight 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)       |

# Joslyn Hi-Voltage™ TriMod™ 600R Series Vacuum Recloser

## Single- or three-phase operation!

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.

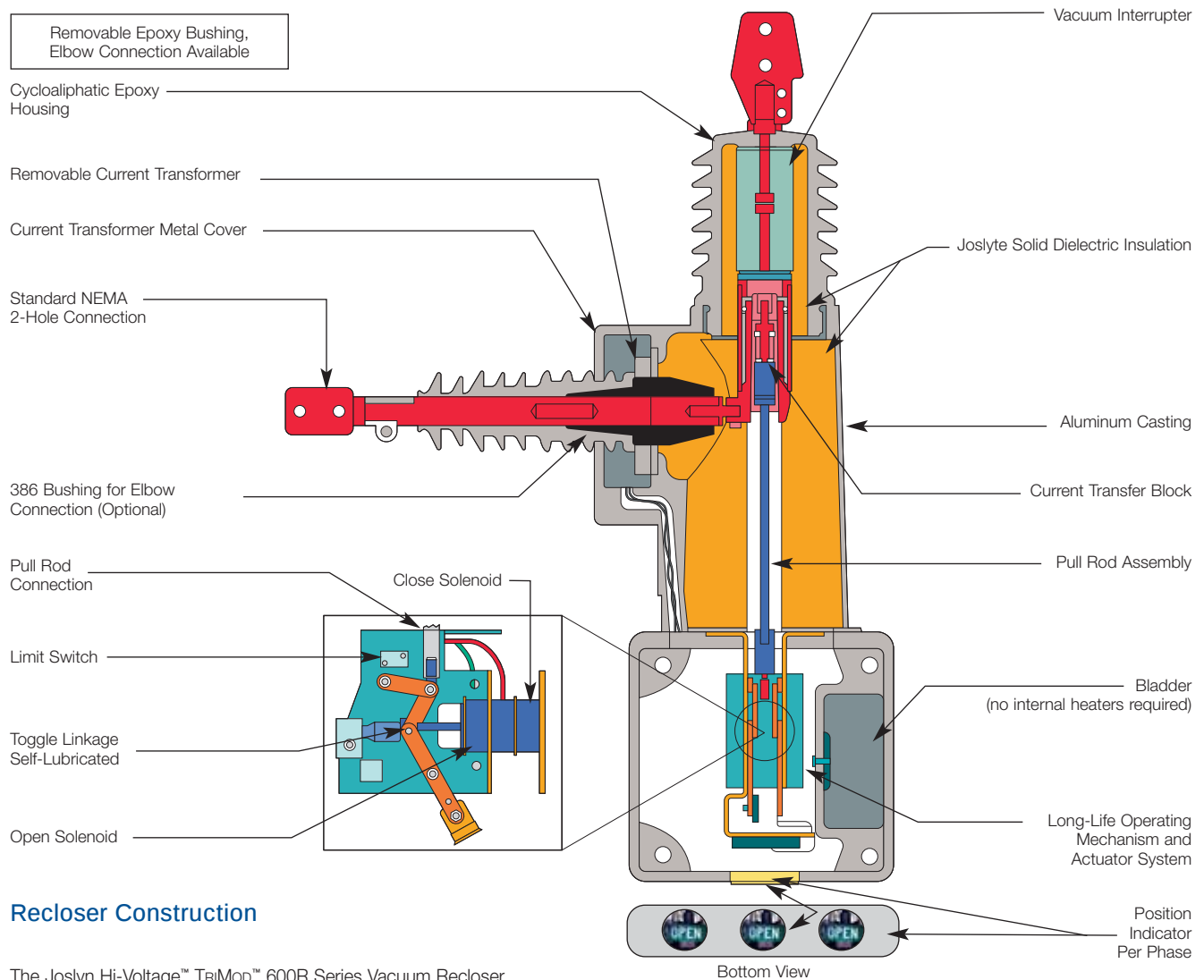
The TriMod™ 600R Series Recloser features single- or three-phase operation modes:

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



TriMod™ 600R Series Vacuum-Interrupting, Single- or Three-Phase Operation, Microprocessor-Controlled, Automatic Circuit Recloser

| Features                                        | Benefits/Descriptions                                                                                                                                            |
|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Vacuum Interrupter Technology                   | Provides twice the duty cycle required by ANSI C37.60.                                                                                                           |
| Solid Dielectric Joslyte Insulation             | Joslyte solid dielectric insulating system provides maintenance-free, environmentally safe operation. No need to monitor or maintain gas pressure or oil levels. |
| Long-Life Operating Mechanism                   | Magnetic actuator system offers 10,000 operations with no maintenance required.                                                                                  |
| State-of-the-Art Microprocessor Control         | 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.                                                                    |
| Removable Current Transformers                  | Externally mounted CTs 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.                                                                     |



## 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 800A. The mechanism is operated electrically by energizing a magnetic actuator system.

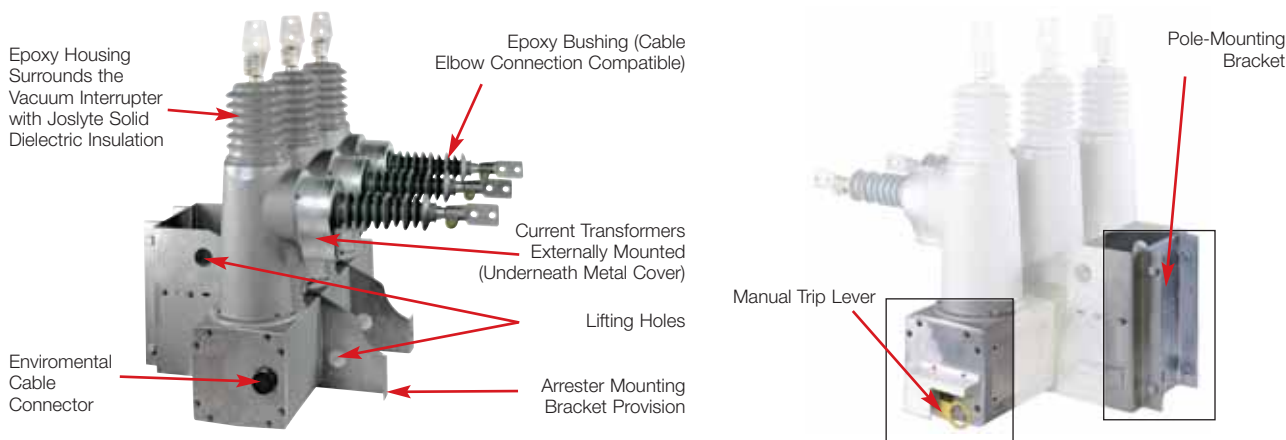
Each pole has a vacuum interrupter sealed in Joslyte solid dielectric insulation, which provides mechanical strength, high dielectric strength and complete moisture sealing. The pole is constructed of an epoxy main bushing and aluminum casting. The side terminal may be a permanently fixed epoxy bushing 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.

## Joslyn Hi-Voltage™ TriMod™ 600R Series Recloser Operation

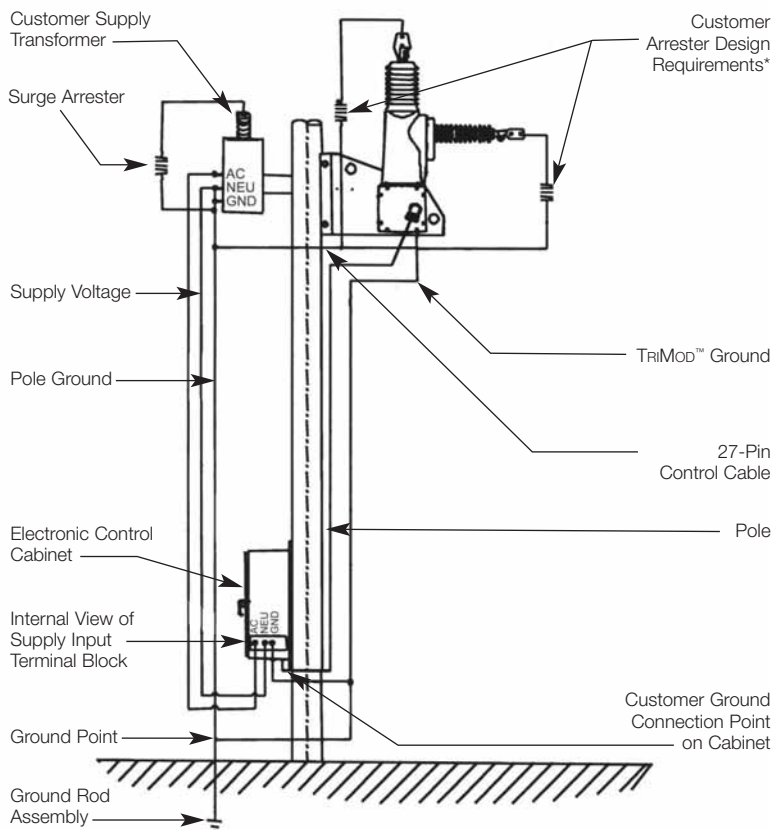


The TriMod™ 600R Series Recloser connects to an electronic control through the use of a 27-pin cable. The combination of the TriMod™ 600R Series Recloser and an electronic control provides state-of-the-art technology in accurate detection of a wide range of line disturbances and reliable, high-speed 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!

## Typical TriMod™ 600R Series Recloser Installation Detail



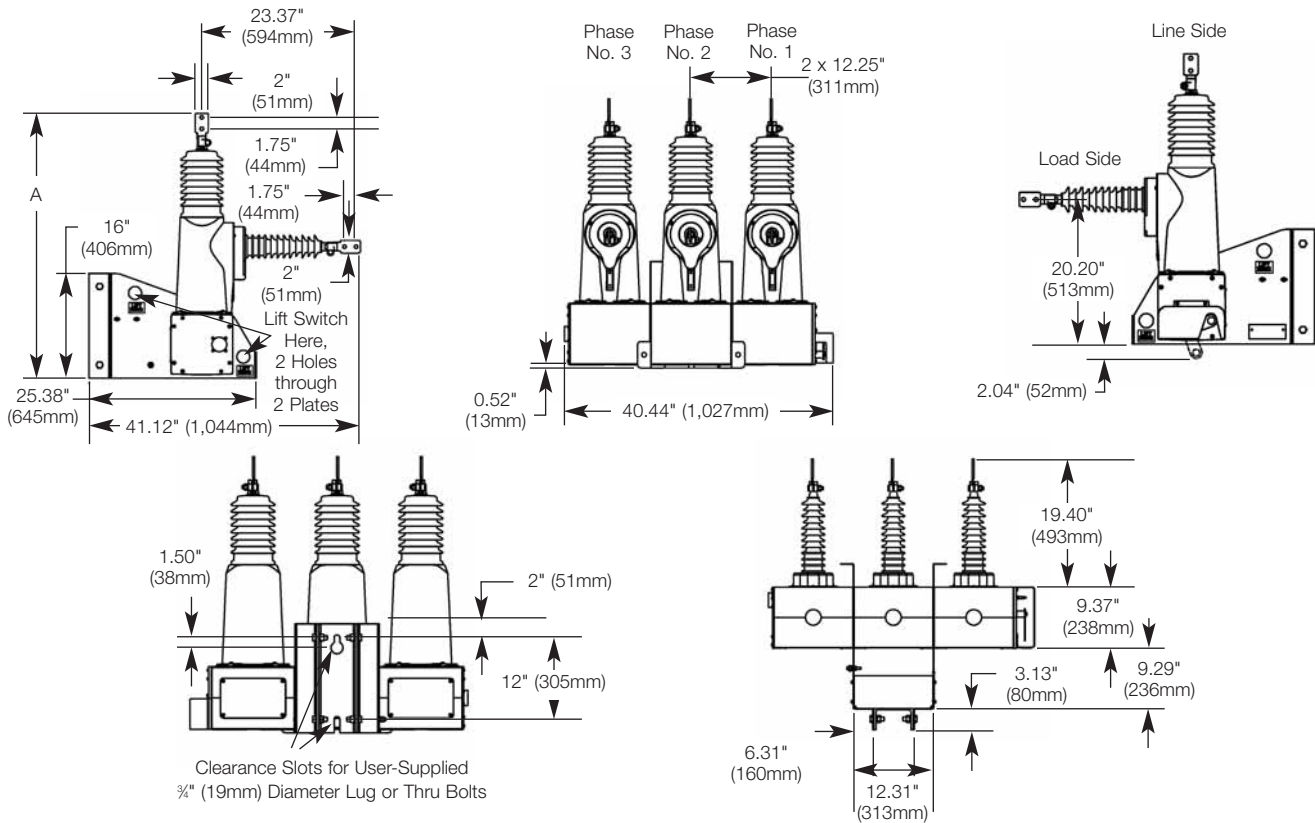
For TriMod™ 600R Series Recloser installation, testing and programming features specific to your application, refer to the electronic control instruction manuals and factory drawings provided at delivery.



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

\*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.

## Dimensions and Creepage Distances for TriMod™ 600R Series Reclosers



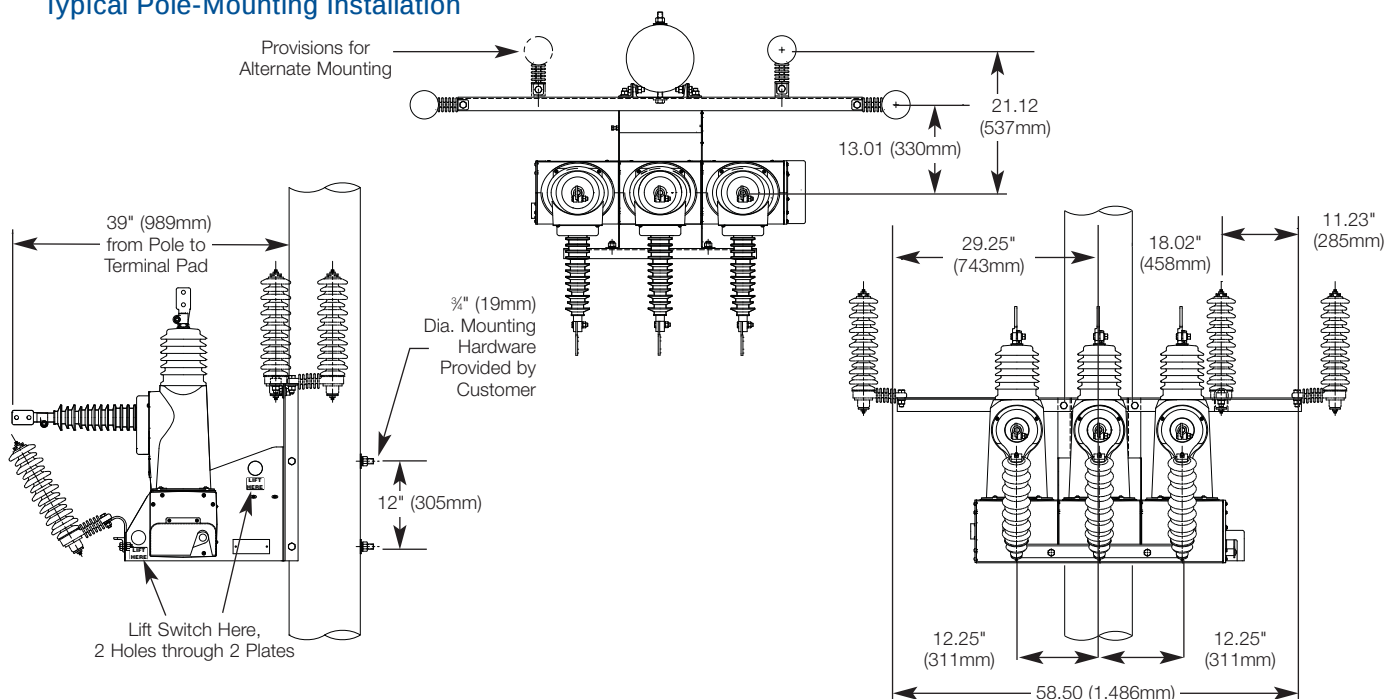
### Creepage Distances

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

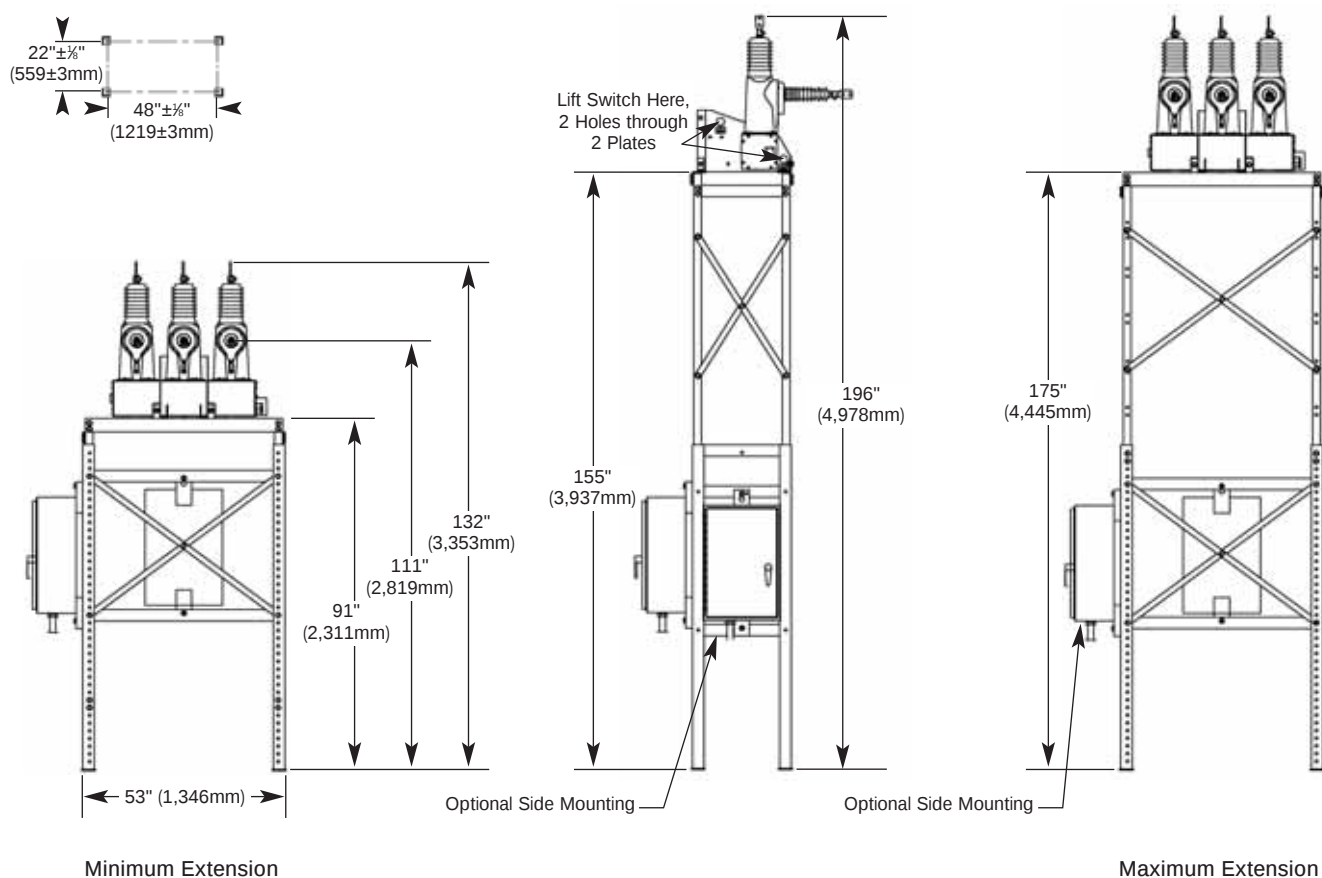
### Dimensions

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

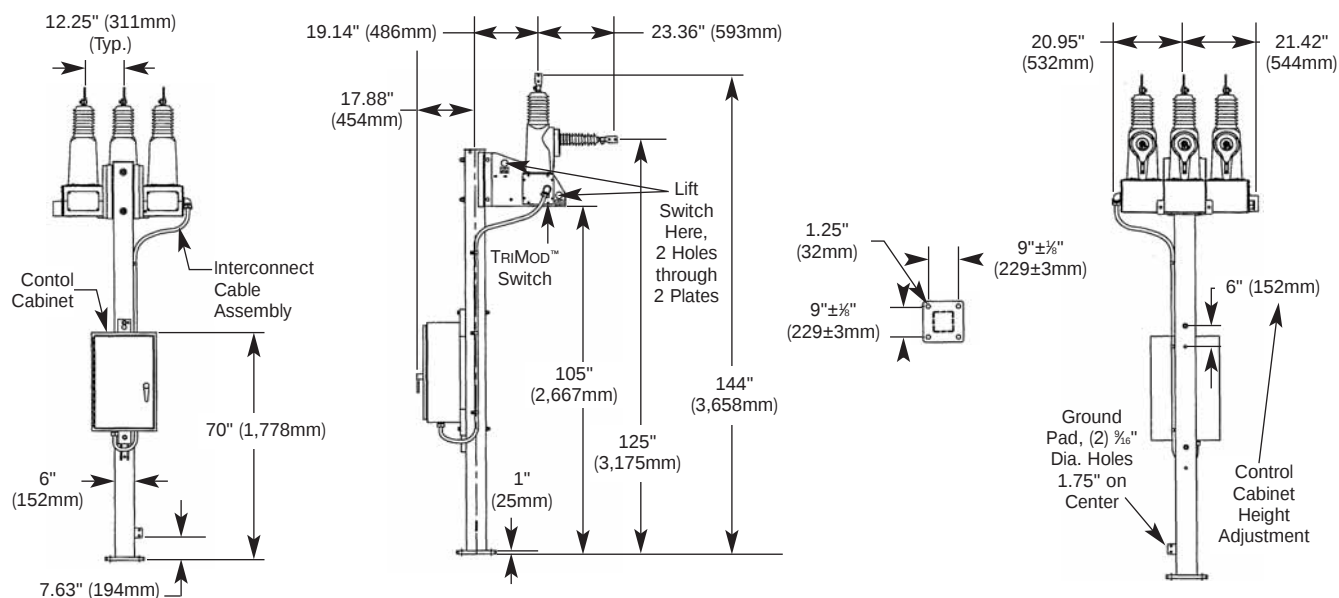
### Typical Pole-Mounting Installation



## Typical Substation Adjustable Frame-Mount Installation



## Typical Substation Tubular-Mounting Installation



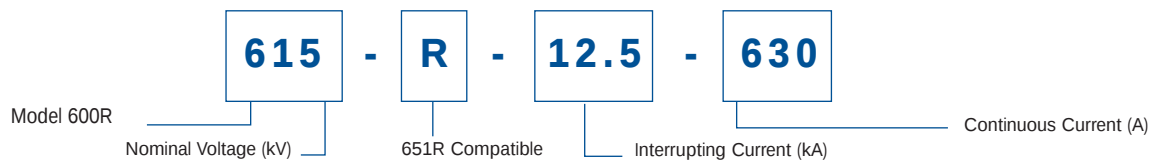
## Ratings

| Description                                    | 15kV                             | 27kV                             |
|------------------------------------------------|----------------------------------|----------------------------------|
| 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



## Ordering Information for 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. (27kg) per pad.  
Horizontal cable tensions per phase to be opposite in direction.

# Joslyn Hi-Voltage™ TriMod™ 46kV Three-Phase Vacuum Recloser

The only 46kV-rated recloser in the industry.

Joslyn Hi-Voltage TriMod 46kV Three-Phase Vacuum Reclosers use Varmaster VBM switches. These switches are completely sealed, breaker-class devices using vacuum as the interrupting dielectric. The TriMod 46kV 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 46kV vacuum recloser and Schweitzer recloser control SEL651R 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.



TriMod™ 46kV Vacuum-Interrupting, Three-Phase, Microprocessor-Controlled Automatic Circuit Recloser

| Features                                                    | Benefits/Descriptions                                                           |
|-------------------------------------------------------------|---------------------------------------------------------------------------------|
| 46kV System                                                 | The only 46kV-rated recloser in the industry.                                   |
| Vacuum Interruption and Solid Dielectric Joslyte Insulation | No oil, no gas, no maintenance.                                                 |
| Long-Life Operating Mechanism                               | Magnetic actuator system offers 10,000 operations with no maintenance required. |
| State-of-the-Art Microprocessor Control                     | Compatible with Schweitzer's recloser control SEL651R.                          |

## Ratings

| Description                               | 46kV                             |
|-------------------------------------------|----------------------------------|
| 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                          |



Typical Pole-Mounting Installation

## Ordering Information for Joslyn Hi-Voltage™ TriMod™ 46kV Three-Phase Vacuum Recloser

Contact your Sales Representative.



## QUICK REFERENCE

### Joslyn Hi-Voltage™ Capacitor and Reactor Switches page(s)

VerSaVac® Switches . . . . . 28–35

Varmaster VBM Switches . . 36–48

VBU Switches . . . . . 49–54

ZVC Control . . . . . 55–58



## Joslyn Hi-Voltage™ capacitor and reactor switches offer the longest maintenance-free life in the industry.

Joslyn Hi-Voltage™ vacuum capacitor switches contain no oil or gas. They use vacuum interruption and solid dielectric insulation for 15kV to 230kV applications. VerSaVac® pole-top capacitor switches provide a long operational life of 50,000 open and 50,000 close operations with no required maintenance. Varmaster capacitor and reactor switching systems use Joslyn Hi-Voltage VBM switches for 15kV to 69kV system voltages. Applications include repetitive switching of any load, capacitor switching and shunt-reactor switching. VBU switches offer high reliability for applications from 69kV to 230kV with continuous current capability from 600A.

VerSaVac® and VBM switches are now available with the Vacstat® vacuum interrupter monitor. A breakthrough in vacuum switching technology, the Vacstat monitor provides the operator with the status of the vacuum interrupter and will block electrical operation if a problem is detected. The Vacstat monitor reduces operating and maintenance costs, increases service reliability and reduces the risk of harm to personnel and equipment.

# Why Use Joslyn Hi-Voltage™ Capacitor Switches?

There are four major reasons for using switched power capacitors:

1. To reduce losses caused by reactive load current
2. To reduce kVA demand
3. To improve voltage profile
4. To increase revenue or decrease customer energy consumption

Switched capacitor banks can dramatically reduce losses caused by the reactive component of the load. The resistance of the feeder conductors causes about 60% of a system's energy loss. Thus, it is important to locate the power capacitors on the feeders as close to the loads as practical. Losses can be reduced by 89% by installing one bank that is only two-thirds as large as the peak load KVA. Typically, the VAR sensing control should be set to switch the bank to close when the load inductive current equals two-thirds of the bank capacitive current. Even though this scheme drives the line leading when the bank is first turned on and before it is turned off, the loss reduction is optimum for a single bank.

The reduction in reactive current caused by a switched power capacitor also reduces the total line current. This reduction in kVA demand during heavy load periods has a number of benefits:

- The peak allowable loading is increased when it is most needed
- The effective ampacity of the lines is increased
- The operating temperatures of the lines and transformers are reduced, increasing equipment life
- The necessity to upgrade lines and transformers may be delayed

The demand capacity of distribution feeders is usually limited by voltage drop along the line. The service entrance voltage of all customers must be kept within certain limits, usually +5 to +10%. "Flattening" the feeder voltage profile offers several benefits:

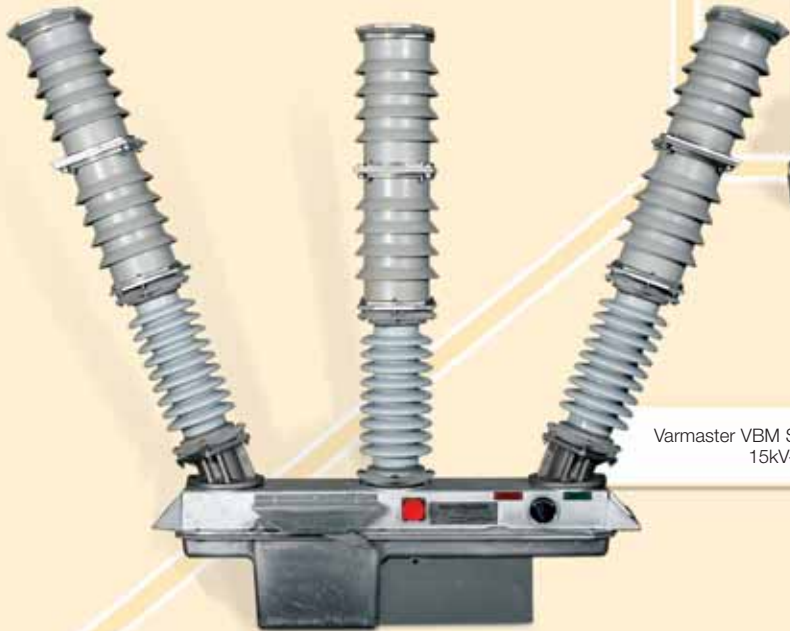
- The kVA demand can be increased
- The substation voltage can be lowered to reduce peak demand and save energy
- The service entrance voltage can be allowed to increase, resulting in increased revenue

When one bank on a feeder is switched on, the entire feeder voltage, upstream and downstream from the bank, is increased. Additional banks on the line will add to the voltage rise, so that all active capacitors contribute to the shape of the voltage profile along the entire feeder.

Joslyn Hi-Voltage™ capacitor and reactor switches, together with Fisher Pierce® capacitor controls, provide a complete solution to optimize losses, voltage, kVA demand and, ultimately, revenue in electrical systems from 15 to 230kV.

VerSaVac®  
Single-Phase Switch  
15kV–38kV





Varmaster VBM Switch  
15kV-69kV



VerSaVac®  
Three-Phase Switch  
15kV-38kV

VBU Switch  
69kV-230kV

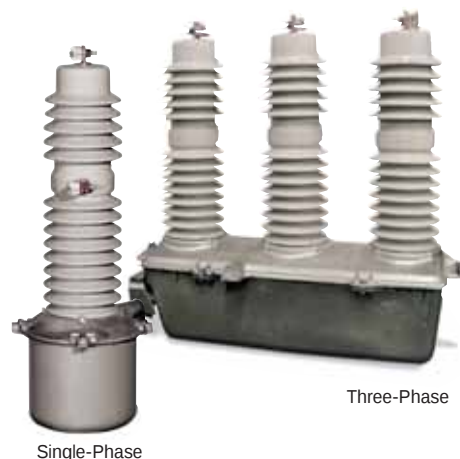


Varmaster VBM Switch with  
Vacstat® Vacuum Interrupter Monitor  
15kV-69kV

# Joslyn Hi-Voltage™ VerSaVac® Capacitor Switches

Solenoid operating mechanism offers the longest life of any distribution capacitor switch — 100,000 maintenance-free operations!

The Joslyn Hi-Voltage™ VerSaVac® Capacitor Switch is a completely sealed vacuum switch that provides an operational life of more than 100,000 (50,000 open/50,000 close) maintenance-free operations — greater than other switches used for pole-top capacitor switching. Specifically designed as a replacement for maintenance-intensive oil switches, the VerSaVac switch can be used as a direct replacement on existing capacitor banks or supplied by capacitor manufacturers on new banks. The VerSaVac switch not only results in substantial savings from reduced maintenance and maximized capacitor bank uptime, but also improves power quality.



Single-Phase

Three-Phase

- Synchronized operation from a fast, repeatable solenoid operating mechanism ensures all phases will operate within ¼ cycle — unlike slow motor-operated devices — reducing recovery voltage when the bank is switched off, which in turn reduces electrical stress on capacitor bank insulation
- Optional Zero Voltage Closing (ZVC) Control mitigates transients associated with bringing capacitor banks online, virtually eliminating costly customer equipment damage resulting from voltage spikes created when switching capacitor banks
- Retrofits to existing oil switch power supply transformer impedances and existing 14 AWG oil switch wiring\*
- Optional manual trip lever not mechanically connected to operating mechanism to eliminate wear during normal operation

\* See I 750-271 Single-Phase VerSaVac® Switch Installation and Operating Procedure for complete details.

| Features                                                    | Benefits/Descriptions                                                                           |
|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Vacuum Interruption and Solid Dielectric Joslyte Insulation | No oil, no gas, no maintenance.                                                                 |
| Long-Life Solenoid Operating Mechanism                      | Yields 100,000 maintenance-free operations (50,000 open and 50,000 close).                      |
| 15kV – 38kV, Single- or Three-Phase                         | Available in models to support grounded and ungrounded systems in a variety of applications.    |
| Compatibility                                               | Compatible with existing oil switch or vacuum switch installations.                             |
| Available with Vacstat® Vacuum Interrupter Monitor          | Provides local/remote status of vacuum bottle and can block operation if a problem is detected. |
| Field-Proven Reliable Design                                | More than 150,000 worldwide installations and more than 20 years of operational experience.     |
| Choice of Housing Material                                  | Select porcelain or polymer housing.                                                            |

## VerSaVac® Single-Phase Capacitor Switch

### No Oil or Gas

Vacuum interruption and solid dielectric Joslyte insulation around vacuum bottle. This material is non-hydroscopic and absorbs stresses from the thermal expansion and shock. Joslyte insulation has been field-proven for more than 40 years.

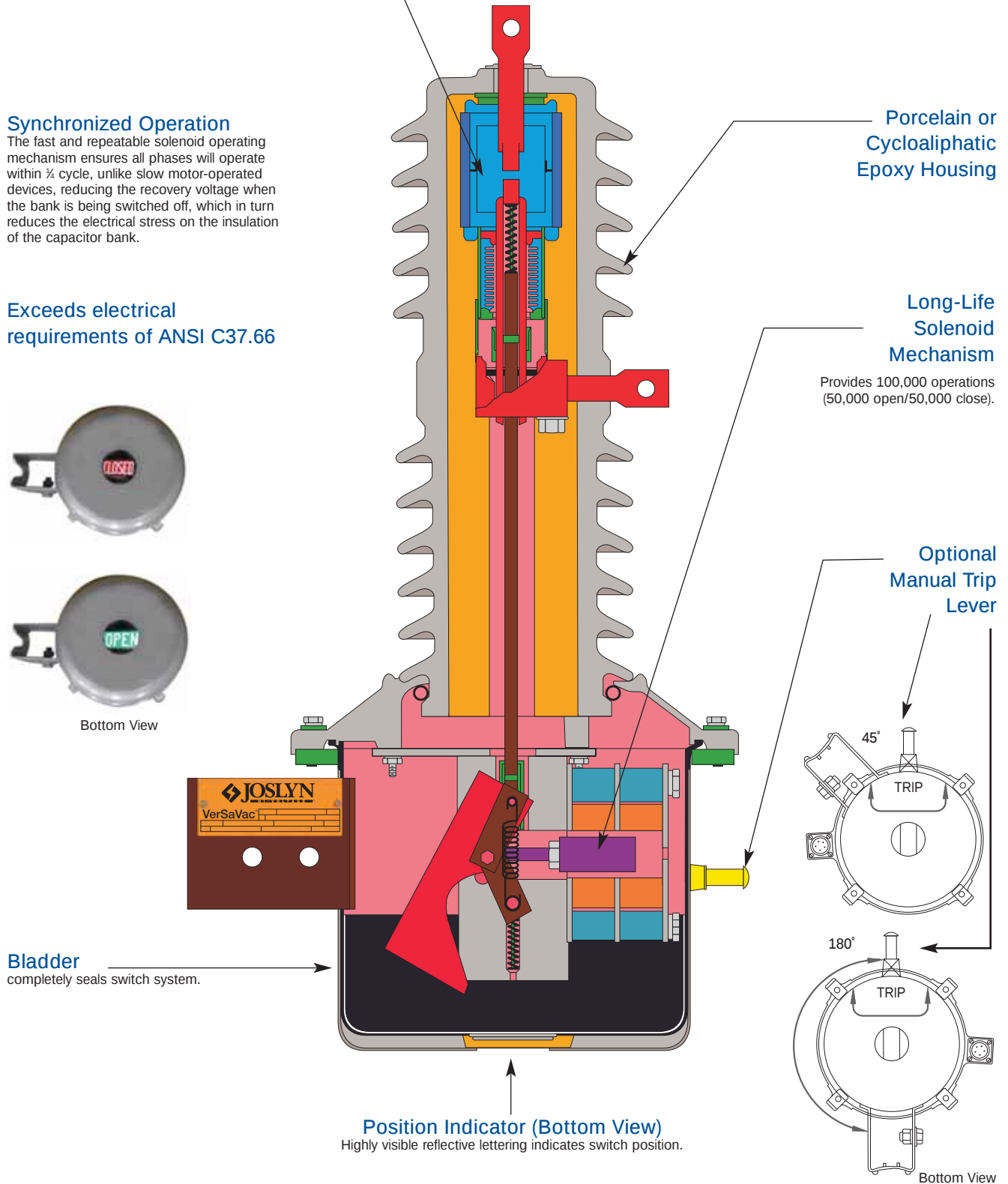
### Synchronized Operation

The fast and repeatable solenoid operating mechanism ensures all phases will operate within  $\frac{1}{4}$  cycle, unlike slow motor-operated devices, reducing the recovery voltage when the bank is being switched off, which in turn reduces the electrical stress on the insulation of the capacitor bank.

Exceeds electrical requirements of ANSI C37.66

### Zero Voltage Closing (ZVC) Control

Optional Zero Voltage Closing control mitigates transients associated with bringing capacitor banks online. Virtually eliminates costly customer equipment damage resulting from voltage spikes created when switching capacitor banks.



## Eliminate costs associated with off-line vacuum interrupter inspections by using the VerSaVac® Single-Phase Capacitor Switch with Vacstat® Vacuum Interrupter Monitor.

The Vacstat® Vacuum Interrupter Monitor is the only system that can give you real-time status of your vacuum interrupters. This simple device notifies you immediately of a loss of vacuum through a visual indicator located on the switch and via a contact in the VerSaVac® Switch control. The Vacstat monitor will also block further operation of the switch. Use the Vacstat Vacuum Interrupter Monitor to:

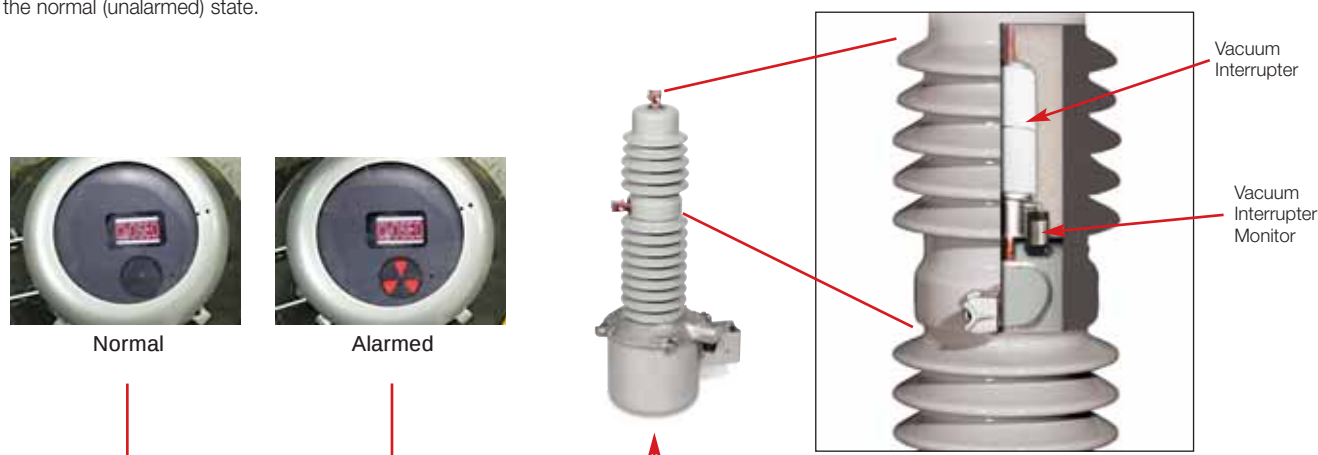
- Increase reliability
- Reduce maintenance costs
- Reduce the risk of harm to employees and assets

### How the Vacstat Vacuum Interrupter Monitor works.

The Vacstat sensor is attached to the vacuum interrupter of a VerSaVac capacitor switch during the manufacturing process. The sensor then continuously monitors the interrupter for the presence of vacuum.

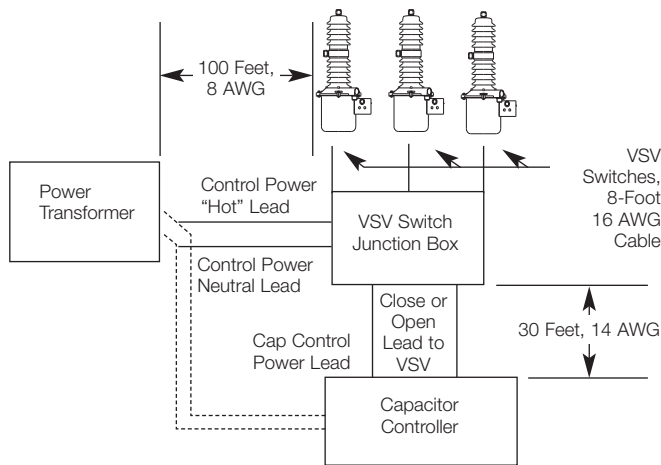
Once the capacitor switch is installed, the sensor generates an optical signal that travels via a pair of fiber optic cables to a control board in the low-voltage section of the switch. As long as vacuum exists, the fiber optic signal has a continuous path, and the Vacstat indicator remains in the normal (unalarmed) state.

If a loss of vacuum occurs, the sensor blocks the optical signal to the control board, and the Vacstat status indicator automatically turns to red to alert the operator to the problem. In addition, the remote status dry contact provides a means to send an alarm signal to a remote location. The Vacstat monitor also blocks further electrical operation of the switch to prevent possible damage to equipment or injury to personnel.

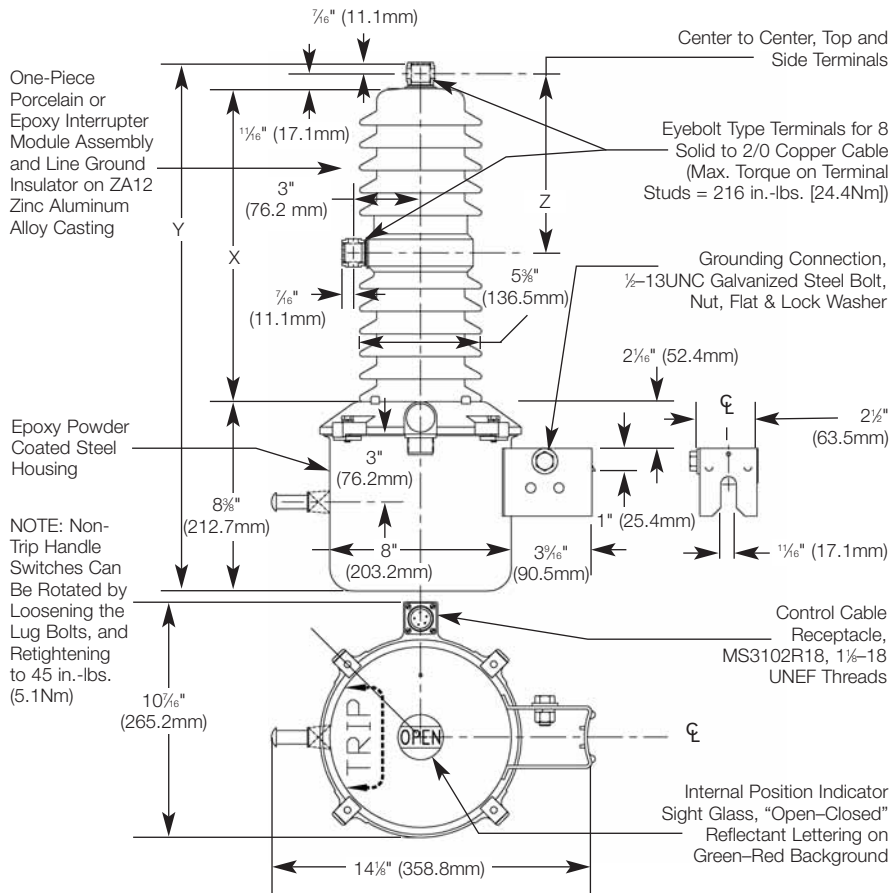


| Features                                                                                     | Benefits/Descriptions                                                                                                                                                          |
|----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Continuously Monitors Vacuum Interrupter Status While the Switch Is Energized and in Service | Reduces operating and maintenance costs by eliminating the need for routine off-line vacuum interrupter inspections.                                                           |
| Blocks Switch Operation if Vacuum Loss Is Detected                                           | Protects your equipment and personnel from potential harm.                                                                                                                     |
| Provides Local and Remote Indication of Vacuum Interrupter Status                            | Enables operating and maintenance personnel to take corrective action immediately in the event of loss of vacuum, maximizing system reliability. SCADA notification available. |

## Typical VerSaVac® Single-Phase Installation



## Dimensions and Creepage Distances for Joslyn Hi-Voltage™ VerSaVac® Single-Phase Capacitor Switch



## Dimensions and Creepage Distances

| Max. Voltage | Line to Ground kV BIL | X in. (mm) | Y in. (mm)     | Line to Ground Insulation Creepage Distance in. (mm) | Weight lbs. (kg) | Z in. (mm)      |
|--------------|-----------------------|------------|----------------|------------------------------------------------------|------------------|-----------------|
| 15kV         | 95                    | 14 (355.6) | 23 3/8 (600.1) | 12 3/8 (320.7)                                       | 27.5 (12.5)      | 7 15/16 (201.6) |
| 15kV         | 125                   | 16 (406.4) | 25 3/8 (650.9) | 17 3/8 (436.6)                                       | 28.5 (12.9)      | 7 15/16 (201.6) |
| 27kV         | 125                   | 17 (431.8) | 26 3/8 (676.3) | 17 3/8 (436.6)                                       | 29.3 (13.3)      | 8 15/16 (227.0) |
| 27kV         | 150                   | 18 (457.2) | 27 3/8 (701.7) | 19 3/8 (493.7)                                       | 30.8 (14.0)      | 8 15/16 (227.0) |

## Ratings

Exceeds Electrical Requirements of ANSI C37.66

|                                                                               |                                         |        |       |
|-------------------------------------------------------------------------------|-----------------------------------------|--------|-------|
| Continuous Current                                                            | 200A                                    |        |       |
| Short-Time Current                                                            | 6kA (½ sec.), 4.5kA (1 sec.)            |        |       |
| Asymmetrical Momentary/Making Current                                         | 9kA Asymmetrical RMS/23kA Peak          |        |       |
| Peak Inrush Current Limit for Parallel or Back-to-Back Switching Applications | 6kA                                     |        |       |
| Control Voltages                                                              | 120VAC, 240VAC (see accessories, p. 48) |        |       |
| Minimum Operating Voltage                                                     | 80VAC, 160VAC                           |        |       |
| Recommended Control Pulse Time                                                | 100 msec.                               |        |       |
| Auxiliary Contact Rating                                                      | 15A @ 120VAC, 0.5A @ 125VDC             |        |       |
| Voltage Class (kV)                                                            | 15                                      | 27     | 38    |
| Maximum Voltage                                                               |                                         |        |       |
| - Solid Grounded Applications (kV)                                            | 15.5                                    | 27.5   | 38    |
| - Ungrounded Applications (kV)                                                | 15.5                                    | 27.5   | N/A   |
| - Ungrounded Applications with Manual Trip* (kV)                              | 12.47                                   | 22.5   | N/A   |
| Impulse Withstand (kV BIL)                                                    |                                         |        |       |
| - Line to Ground                                                              | 95                                      | 125    | 150   |
| - Open-Gap                                                                    | 95                                      | 95/125 | 125   |
| Power Frequency AC Withstand Dry/Wet (kV RMS)                                 | 36/60                                   | 60/50  | 70/60 |

\* Units equipped with manual trip handle.

## Ordering Information for Joslyn Hi-Voltage™ VerSaVac® Single-Phase Distribution Capacitor Switch

| CAT. NO.<br>Porcelain<br>(120VAC) <sup>1</sup> | CAT. NO.<br>Epoxy<br>(120VAC) <sup>1</sup> | CAT. NO.<br>for Use with<br>ZVC Control<br>(120VAC) <sup>1</sup> | Max.<br>System<br>Voltage<br>(kV) | Line-to-<br>Ground/<br>Open-Gap<br>BIL | Auxiliary<br>Contacts  | No. of<br>Pins in<br>Connector | Trip Lever<br>Location | Power Frequency<br>AC Withstand<br>Dry/Wet<br>(kV RMS) |
|------------------------------------------------|--------------------------------------------|------------------------------------------------------------------|-----------------------------------|----------------------------------------|------------------------|--------------------------------|------------------------|--------------------------------------------------------|
| <b>Grounded Systems</b>                        |                                            |                                                                  |                                   |                                        |                        |                                |                        |                                                        |
| 3148X0302G1                                    | 3148X2006G1                                | 3148X0723G1                                                      | 15.5                              | 95/95                                  | 1 (B)                  | 5                              | N/A                    | 36/30                                                  |
| 3148X0302G3                                    | 3148X2006G1                                | Call                                                             | 15.5                              | 95/95                                  | 2 (1A 1B) <sup>2</sup> | 6                              | N/A                    | 36/30                                                  |
| 3148X0636G1                                    | 3148X2009G1                                | Call                                                             | 15.5                              | 95/95                                  | 1 (B)                  | 5                              | 45°                    | 36/30                                                  |
| 3148X0637G1                                    | 3148X2010G1                                | 3148X0723G3                                                      | 15.5                              | 95/95                                  | 1 (B)                  | 5                              | 180°                   | 36/30                                                  |
| 3148X0637G3                                    | 3148X2010G3                                | 3148X0723G5                                                      | 15.5                              | 95/95                                  | 2 (1A 1B) <sup>2</sup> | 6                              | 180°                   | 36/30                                                  |
| 3148B1060G1                                    | Call                                       | Call                                                             | 22.5                              | 125/125                                | 1 (B)                  | 5                              | 45°                    | 60/50                                                  |
| 3148B1061G1                                    | 3148B2007G1                                | 3148B0960G4                                                      | 22.5                              | 125/125                                | 1 (B)                  | 5                              | 180°                   | 60/50                                                  |
| 3148X0302G13                                   | 3148X2006G13                               | 3148X0723G2                                                      | 27.5                              | 125/95                                 | 1 (B)                  | 5                              | N/A                    | 60/50                                                  |
| 3148X0302G26                                   | 3148X2006G26                               | Call                                                             | 27.5                              | 125/95                                 | 1 (A)                  | 5                              | N/A                    | 60/50                                                  |
| 3148X0302G24                                   | 3148X2006G24                               | 3148X0723G16                                                     | 27.5                              | 125/95                                 | 2 (1A 1B) <sup>2</sup> | 6                              | N/A                    | 60/50                                                  |
| 3148X0636G13                                   | 3148X2009G13                               | Call                                                             | 27.5                              | 125/95                                 | 1 (B)                  | 5                              | 45°                    | 60/50                                                  |
| 3148X0637G13                                   | 3148X2010G13                               | 3148X0723G4                                                      | 27.5                              | 125/95                                 | 1 (B)                  | 5                              | 180°                   | 60/50                                                  |
| 3148X0637G23                                   | 3148X2010G23                               | Call                                                             | 27.5                              | 125/95                                 | 2 (1A 1B) <sup>2</sup> | 6                              | 180°                   | 60/50                                                  |
| 3148B0947G1                                    | 3148B2008G1                                | 3148B0960G1                                                      | 38                                | 125/125                                | 1 (B)                  | 5                              | N/A                    | 60/50                                                  |
| 3148B1060G1                                    | Call                                       | Call                                                             | 38                                | 125/125                                | 1 (B)                  | 5                              | 45°                    | 60/50                                                  |
| 3148B1061G1                                    | 3148B2007G1                                | 3148B0960G4                                                      | 38                                | 125/125                                | 1 (B)                  | 5                              | 180°                   | 60/50                                                  |
| 3148B1060G2                                    | Call                                       | Call                                                             | 38                                | 150/125                                | 1 (B)                  | 5                              | 45°                    | 70/60                                                  |
| 3148B1061G2                                    | 3148B2007G2                                | 3148B0960G9                                                      | 38                                | 150/125                                | 1 (B)                  | 5                              | 180°                   | 70/60                                                  |
| 3148B0947G5                                    | 3148B2008G5                                | 3148B0960G2                                                      | 38                                | 150/125                                | 1 (B)                  | 5                              | N/A                    | 70/60                                                  |

## Ungrounded Systems

|             |             |             |       |         |                        |   |      |       |
|-------------|-------------|-------------|-------|---------|------------------------|---|------|-------|
| 3148X0636G1 | 3148X2009G1 | Call        | 12.47 | 95/95   | 1 (B)                  | 5 | 45°  | 36/30 |
| 3148X0636G3 | Call        | Call        | 12.47 | 95/95   | 2 (1A 1B) <sup>2</sup> | 6 | 45°  | 36/30 |
| 3148X0637G1 | 3148X2010G1 | 3148X0723G3 | 12.47 | 95/95   | 1 (B)                  | 5 | 180° | 36/30 |
| 3148X0637G3 | 3148X2010G3 | 3148X0723G5 | 12.47 | 95/95   | 2 (1A 1B) <sup>2</sup> | 6 | 180° | 36/30 |
| 3148X0302G1 | 3148X2006G1 | 3148X0723G1 | 15.5  | 95/95   | 1 (B)                  | 5 | N/A  | 36/30 |
| 3148X0302G3 | 3148X2006G3 | Call        | 15.5  | 95/95   | 2 (1A 1B) <sup>2</sup> | 6 | N/A  | 36/30 |
| 3148B1060G1 | Call        | Call        | 22.5  | 125/125 | 1 (B)                  | 5 | 45°  | 60/50 |
| 3148B1061G1 | 3148B2007G1 | 3148B0960G4 | 22.5  | 125/125 | 1 (B)                  | 5 | 180° | 60/50 |
| 3148B0947G1 | 3148B2008G1 | 3148B0960G1 | 27.5  | 125/125 | 1 (B)                  | 5 | N/A  | 60/50 |
| 3148B0947G5 | 3148B2008G5 | 3148B0960G2 | 27.5  | 150/125 | 1 (B)                  | 5 | N/A  | 70/60 |

## Accessories

Junction Boxes, Cable Assemblies, Current Sensors, Mating Connectors, Animal Protectors (2 per switch), Undervoltage Trip Control, Zero Voltage Closing (ZVC) Control, 125 DC Control Interface

NOTE: For more information on the ZVC Control, see pages 55–58.

For more information on Capacitor Controls, see our Fisher Pierce Product Selection Guide, PG-PC-FP-1008.

1. For ordering information on models for 240VAC applications, consult your T&amp;B sales representative.

2. Form C contact.

## Ordering Information for Joslyn Hi-Voltage™ VerSaVac® Single-Phase Switch with Vacstat® Monitor

| CAT. NO.<br>Epoxy<br>(120VAC) | Max. System<br>Voltage (kV) | Line-to-Ground/<br>Open-Gap BIL (kV) | Auxiliary Contacts | No. of Pins in<br>Connector | Trip Lever<br>Location | Power Frequency<br>AC Withstand<br>Dry/Wet (kV RMS) |
|-------------------------------|-----------------------------|--------------------------------------|--------------------|-----------------------------|------------------------|-----------------------------------------------------|
| <b>Grounded Systems</b>       |                             |                                      |                    |                             |                        |                                                     |
| 3148X2148G1                   | 15.5                        | 95/95                                | 0                  | 10                          | N/A                    | 35/30                                               |
| 3148X2149G1                   | 15.5                        | 95/95                                | 0                  | 10                          | 45°                    | 35/30                                               |
| 3148X2150G1                   | 15.5                        | 95/95                                | 0                  | 10                          | 180°                   | 35/30                                               |
| 3148X2148G2                   | 27.5                        | 125/95                               | 0                  | 10                          | N/A                    | 60/50                                               |
| 3148X2149G2                   | 27.5                        | 125/95                               | 0                  | 10                          | 45°                    | 60/50                                               |
| 3148X2150G2                   | 27.5                        | 125/95                               | 0                  | 10                          | 180°                   | 60/50                                               |
| <b>Ungrounded Systems</b>     |                             |                                      |                    |                             |                        |                                                     |
| 3148X2148G1                   | 12.47                       | 95/95                                | 0                  | 10                          | N/A                    | 35/30                                               |
| 3148X2149G1                   | 12.47                       | 95/95                                | 0                  | 10                          | 45°                    | 35/30                                               |
| 3148X2150G1                   | 12.47                       | 95/95                                | 0                  | 10                          | 180°                   | 35/30                                               |
| 3148X2148G2                   | 15.5                        | 125/95                               | 0                  | 10                          | N/A                    | 60/50                                               |
| 3148X2149G2                   | 15.5                        | 125/95                               | 0                  | 10                          | 45°                    | 60/50                                               |
| 3148X2150G2                   | 15.5                        | 125/95                               | 0                  | 10                          | 180°                   | 60/50                                               |

## VerSaVac® Three-Phase Capacitor Switch

The Joslyn VerSaVac® switch is a completely sealed, long-life vacuum switch that provides an operational life of over 100,000 (50,000 open/50,000 close) maintenance-free operations. This results in an operational life greater than other switches used for pole-top capacitor switching. The VerSaVac switch was specifically designed as a

replacement for maintenance-intensive oil switches and can be used as a direct replacement on existing banks or supplied by capacitor manufacturers on new banks. Using the VerSaVac switch will result in substantial savings from reduced maintenance and maximized bank uptime and will also improve power quality.

### No Oil or Gas

Vacuum interruption and solid dielectric Joslyte insulation around vacuum bottle. This material is non-hydroscopic and absorbs stresses from thermal expansion and shock. Joslyte insulation has been field proven for more than 40 years.

### Compatibility

VerSaVac switches are compatible with existing oil switch or vacuum switch installations.

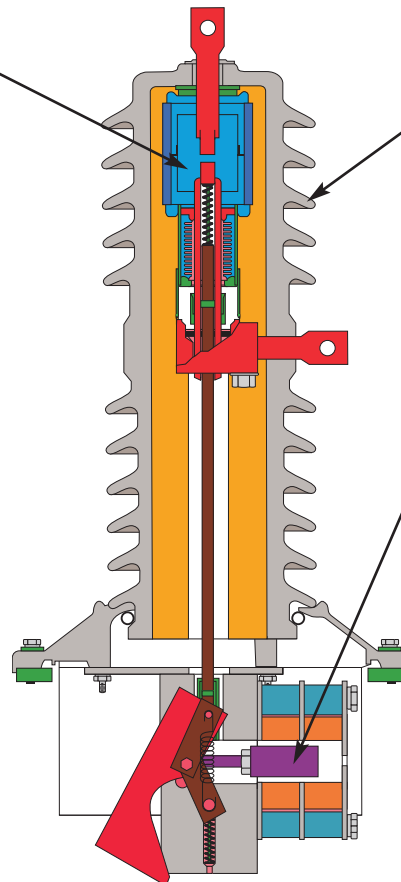
### Reliability

Proven design with over 150,000 worldwide installations and over 35 years of operational experience.

### Exceeds Electrical Requirements of ANSI C37.66



\*See I 750-272 Three-Phase VerSaVac® Switch Installation and Operating Procedure for complete details



### Porcelain or Cycloaliphatic Epoxy Housing

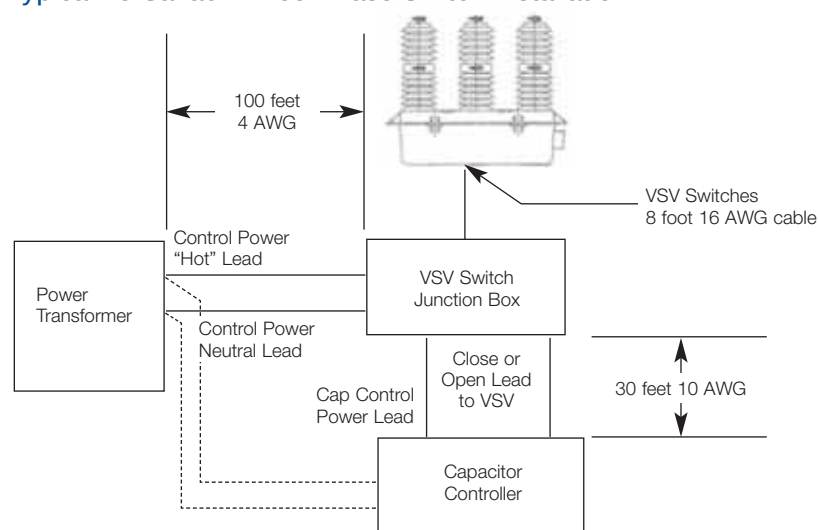
### Long-Life Solenoid Mechanism

Provides 100,000 operations (50,000 open/50,000 close).

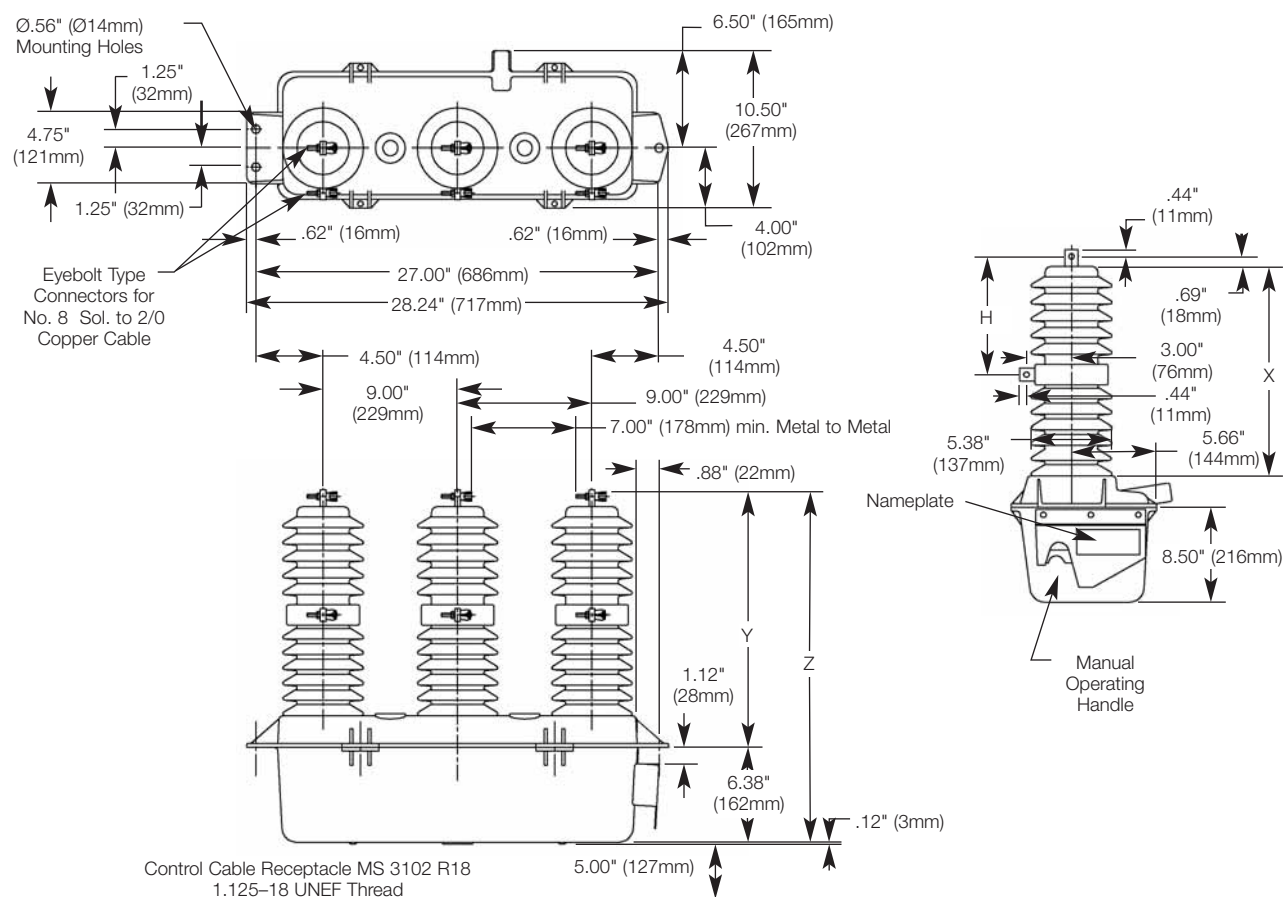


Manual Operating Handle for Open and Close

## Typical VerSaVac® Three-Phase Switch Installation



## Dimensions and Creepage Distances for Joslyn Hi-Voltage™ VerSaVac® Three-Phase Capacitor Switch



## Dimensions and Creepage Distances

| Line to Ground<br>kV BIL | Line to Ground Insulation<br>Creepage Distance in. (mm) | X<br>in. (mm) | Y<br>in. (mm) | Z<br>in. (mm) | H<br>in. (mm) | Weight<br>lbs. (kg) |
|--------------------------|---------------------------------------------------------|---------------|---------------|---------------|---------------|---------------------|
| 95                       | 12.63 (321)                                             | 14 (356)      | 17.25 (438)   | 23.63 (600)   | 7.94 (202)    | 75 (34.0)           |
| 125                      | 17.19 (437)                                             | 16 (406)      | 19.25 (489)   | 25.63 (651)   | 7.94 (202)    | 78 (35.4)           |
| 150                      | 19.44 (494)                                             | 18 (457)      | 21.25 (540)   | 27.63 (702)   | 8.94 (227)    | 85 (38.6)           |

## VerSaVac® Three-Phase Capacitor Switch

- Now available with optional DC control
- Includes operating handle for manual open and close

See I 750-272 Three-Phase VerSaVac® Switch Installation and Operating Procedure for complete details.



### Ordering Information for Joslyn Hi-Voltage™ VerSaVac® Three-Phase Distribution Capacitor Switch

| CAT. NO.<br>Porcelain     | CAT. NO.<br>Epoxy | Max. System<br>Voltage (kV) | Line-to-<br>Ground/<br>Open-Gap BIL | Auxiliary<br>Contacts | No. of Pins<br>in Connector | Power Frequency<br>AC Withstand<br>Dry/Wet (kV RMS) | Control<br>Voltage (VAC) |
|---------------------------|-------------------|-----------------------------|-------------------------------------|-----------------------|-----------------------------|-----------------------------------------------------|--------------------------|
| <b>Grounded Systems</b>   |                   |                             |                                     |                       |                             |                                                     |                          |
| 3148X0654G1               | 3148X2154G1       | 15.5                        | 95/95                               | 1 (B)                 | 5                           | 36/30                                               | 120                      |
| 3148X0654G2               | 3148X2154G2       | 15.5                        | 95/95                               | 1 (B)                 | 5                           | 36/30                                               | 240                      |
| 3148X0654G3               | 3148X2154G3       | 15.5                        | 95/95                               | 2 (1A 1B)             | 6                           | 36/30                                               | 120                      |
| 3148X0654G4               | 3148X2154G4       | 15.5                        | 95/95                               | 2 (1A 1B)             | 6                           | 36/30                                               | 240                      |
| 3148X0654G5               | 3148X2154G5       | 15.5                        | 125/95                              | 1 (B)                 | 5                           | 60/50                                               | 120                      |
| 3148X0654G6               | 3148X2154G6       | 15.5                        | 125/95                              | 1 (B)                 | 5                           | 60/50                                               | 240                      |
| 3148X0654G7               | 3148X2154G7       | 15.5                        | 125/95                              | 2 (1A 1B)             | 6                           | 60/50                                               | 120                      |
| 3148X0654G8               | 3148X2154G8       | 15.5                        | 125/95                              | 2 (1A 1B)             | 6                           | 60/50                                               | 240                      |
| 3148X0654G1               | 3148X2154G1       | 27.5                        | 95/95                               | 1 (B)                 | 5                           | 36/30                                               | 120                      |
| 3148X0654G2               | 3148X2154G2       | 27.5                        | 95/95                               | 1 (B)                 | 5                           | 36/30                                               | 240                      |
| 3148X0654G3               | 3148X2154G3       | 27.5                        | 95/95                               | 2 (1A 1B)             | 6                           | 36/30                                               | 120                      |
| 3148X0654G4               | 3148X2154G4       | 27.5                        | 95/95                               | 2 (1A 1B)             | 6                           | 36/30                                               | 240                      |
| 3148X0654G5               | 3148X2154G5       | 27.5                        | 125/95                              | 1 (B)                 | 5                           | 60/50                                               | 120                      |
| 3148X0654G6               | 3148X2154G6       | 27.5                        | 125/95                              | 1 (B)                 | 5                           | 60/50                                               | 240                      |
| 3148X0654G7               | 3148X2154G7       | 27.5                        | 125/95                              | 2 (1A 1B)             | 6                           | 60/50                                               | 120                      |
| 3148X0654G8               | 3148X2154G8       | 27.5                        | 125/95                              | 2 (1A 1B)             | 6                           | 60/50                                               | 240                      |
| 3148X1150G1               | 3148X2161G1       | 38.0                        | 125/125                             | 1 (B)                 | 5                           | 60/50                                               | 120                      |
| 3148X1150G2               | 3148X2161G2       | 38.0                        | 150/125                             | 1 (B)                 | 5                           | 70/60                                               | 120                      |
| 3148X1150G3               | 3148X2161G3       | 38.0                        | 150/125                             | 1 (B)                 | 5                           | 70/60                                               | 240                      |
| <b>Ungrounded Systems</b> |                   |                             |                                     |                       |                             |                                                     |                          |
| 3148X0654G1               | 3148X2154G1       | 15.5                        | 95/95                               | 1 (B)                 | 5                           | 36/30                                               | 120                      |
| 3148X0654G2               | 3148X2154G2       | 15.5                        | 95/95                               | 1 (B)                 | 5                           | 36/30                                               | 240                      |
| 3148X0654G3               | 3148X2154G3       | 15.5                        | 95/95                               | 2 (1A 1B)             | 6                           | 36/30                                               | 120                      |
| 3148X0654G4               | 3148X2154G4       | 15.5                        | 95/95                               | 2 (1A 1B)             | 6                           | 36/30                                               | 240                      |
| 3148X0654G5               | 3148X2154G5       | 15.5                        | 125/95                              | 1 (B)                 | 5                           | 60/50                                               | 120                      |
| 3148X0654G6               | 3148X2154G6       | 15.5                        | 125/95                              | 1 (B)                 | 5                           | 60/50                                               | 240                      |
| 3148X0654G7               | 3148X2154G7       | 15.5                        | 125/95                              | 2 (1A 1B)             | 6                           | 60/50                                               | 120                      |
| 3148X0654G8               | 3148X2154G8       | 15.5                        | 125/95                              | 2 (1A 1B)             | 6                           | 60/50                                               | 240                      |
| 3148X1150G1               | 3148X2161G1       | 27.5                        | 125/125                             | 1 (B)                 | 5                           | 60/50                                               | 120                      |
| 3148X1150G2               | 3148X2161G2       | 27.5                        | 150/125                             | 1 (B)                 | 5                           | 70/60                                               | 120                      |
| 3148X1150G3               | 3148X2161G3       | 27.5                        | 150/125                             | 1 (B)                 | 5                           | 70/60                                               | 240                      |

#### Accessories

Junction Boxes, Cable Assemblies, Current Sensors, Mating Connectors, Animal Protectors, Undervoltage Trip Control, 125 DC Control Interface

For more information on capacitor controls, see our Fisher Pierce® Product Selection Guide, PG-PC-FP-1008.

# Joslyn Hi-Voltage™ Varmaster VBM Switching Systems

## For substation capacitor and reactor switching.

Joslyn Hi-Voltage Varmaster switching systems use VBM switches that are completely sealed, breaker-class devices using a vacuum as the interrupting dielectric. VBM switches offer high reliability with little or no maintenance and quiet, safe interruption with no external arcing. Manufactured for system voltages from 15kV to 69kV, VBM switches are electrically connected in series to provide the necessary recovery voltage characteristics for the specific application. They may also be electrically connected in parallel for high continuous or momentary current requirements. VBM switches ship completely factory-assembled, ready for fast, easy installation requiring no special foundations or supports due to their compact, lightweight design. Each vacuum interrupter is enclosed in a shatterproof, high-dielectric housing to form a module designed with all solid insulation. The interrupter is surrounded by Joslyte high-dielectric, non-hydroscopic solid insulation that does not absorb moisture, eliminates condensation and increases the impulse level on the outside of the vacuum interrupter. No gas, oil or other material is required to maintain electrical properties.

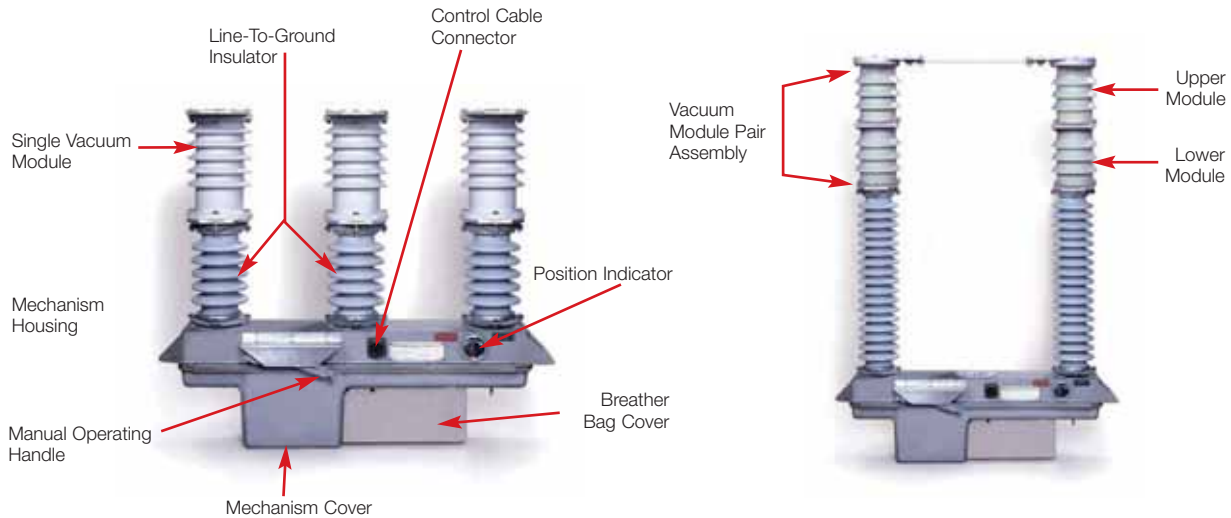


One or two vacuum modules are mounted on each line-to-ground insulator and connected to the operating mechanism by a high-strength pull rod. The operating mechanism is completely sealed in a housing that supports the line-to-ground insulators and the modules. An environmental protection system in the housing, consisting of a breather chamber and desiccant, prevents moisture and contaminated air from entering the switch operator, and an "Open/Closed" position indicator is directly coupled to the mechanism. The entire assembly can withstand a force of several G's without damage.

Stored-energy operating mechanisms, which can be operated manually or electrically, move the contacts at high speed and are unaffected by control voltage fluctuation or manual operating speed. Each switch features an operation counter. A wide range of AC and DC voltage control package options are available. All electrical control connections to the operating mechanism are made through a single environmental-control cable connector.

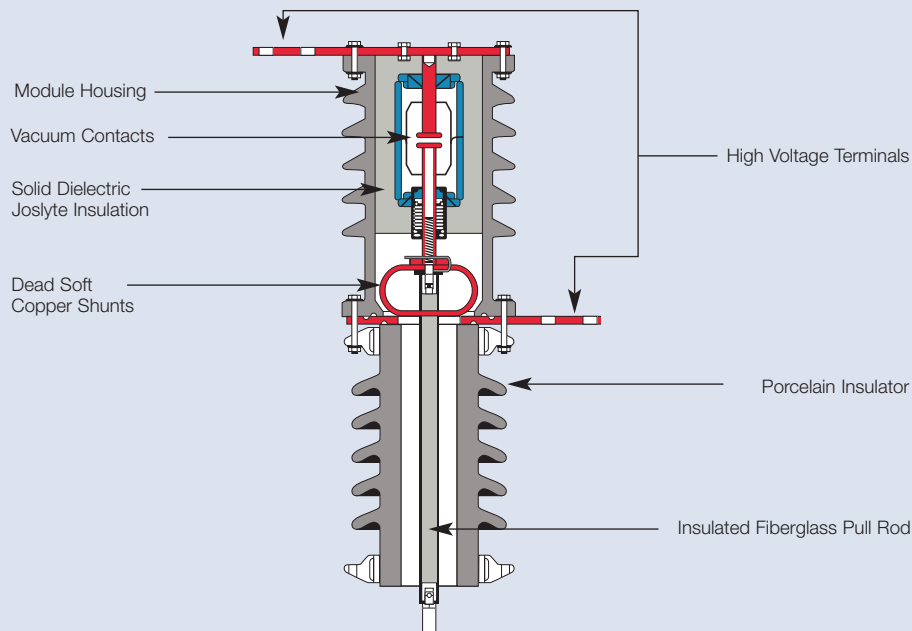
| Features                                                    | Benefits/Descriptions                                                                                                                                                                         |
|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Vacuum Interruption and Solid Dielectric Joslyte Insulation | No oil, no gas, no maintenance.                                                                                                                                                               |
| Long, Maintenance-Free Service Life                         | Depending on operating mechanism and control voltage selection, offers up to 100,000 maintenance-free operations.                                                                             |
| 15kV – 69kV System Range                                    | Substation or pole mounted installations.                                                                                                                                                     |
| Available with Vacstat® Vacuum Interrupter Monitor          | Provides local/remote status of vacuum bottle and can block operation if a problem is detected.                                                                                               |
| Zero Voltage Closing (ZVC) Control Available                | Mitigates the system overvoltages and high inrush currents typically associated with bringing capacitor banks online to prevent resulting customer equipment damage and stress on capacitors. |
| Compact and Lightweight                                     | No special foundations or support required.                                                                                                                                                   |
| Completely Sealed Construction                              | Safe interruption with no external arcing; quiet yet high-speed operation.                                                                                                                    |
| Factory-Assembled                                           | Fast, easy, low-cost installation.                                                                                                                                                            |
| Choice of Operating Mechanisms and Controls                 | Solenoid or motor operating mechanism with AC or DC control voltage.                                                                                                                          |

## VBM Switch Construction



The VBM switch is manufactured in voltage ratings from 15kV to 69kV with continuous current capabilities from 200A to 600A. The mechanism may be operated manually, or electrically by solenoid or motor operators.

### Single Vacuum Module Cutaway



Cutaway of single-vacuum module mounted on 15kV line-to-ground insulator.

The assembly containing the vacuum interrupter is called a module. Each module has a vacuum interrupter contact sealed in Joslyte solid dielectric insulation, which provides mechanical strength, high dielectric strength and complete moisture sealing. The module housing is cycloaliphatic or EPR rubber bonded to a fiberglass tube. One or two modules are mounted on each insulator and connect to the mechanism by a high-strength pull rod.

## Varmaster VBM Switch with Vacstat® Vacuum Interrupter Monitor alerts you immediately of loss of vacuum!

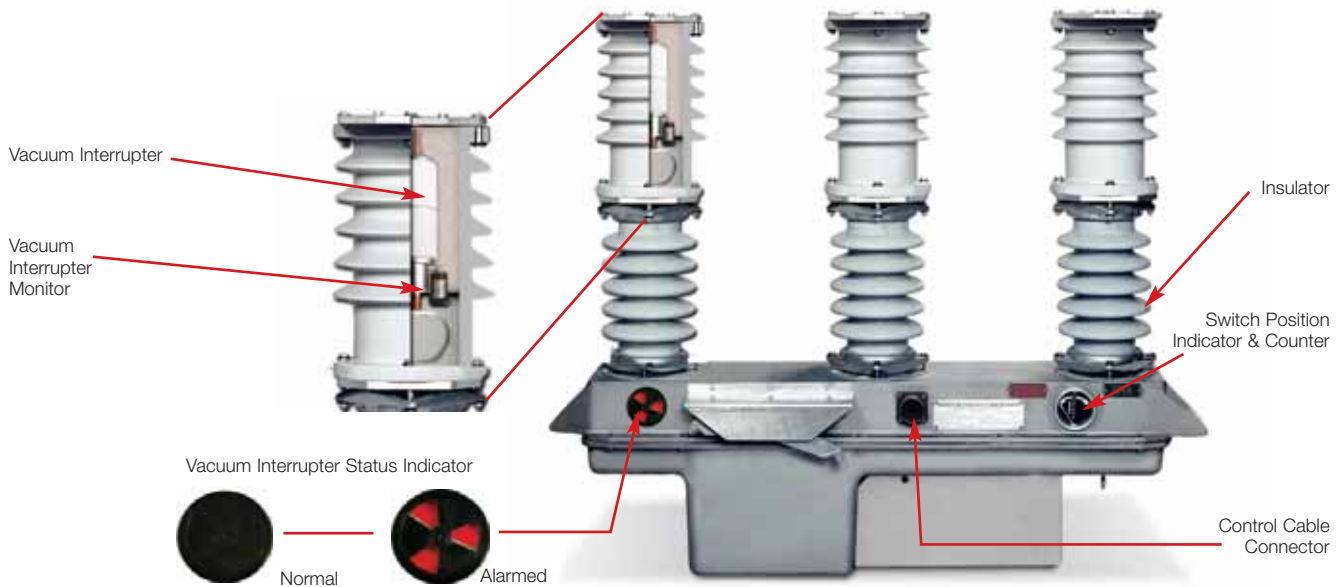
The Joslyn Hi-Voltage™ Vacstat Vacuum Interrupter Monitor provides you real-time status monitoring of your vacuum interrupters. This simple device notifies you immediately of a loss of vacuum through a visual indicator located on the switch and via a contact in the switch control. Once the Vacstat Vacuum Interrupter Monitor senses a loss of vacuum, all switch operations will be blocked until the switch has been serviced.

### How the Vacstat Vacuum Interrupter Monitor works.

The Vacstat sensor is attached to the vacuum interrupter of a Varmaster VBM Switch during the manufacturing process. The sensor then continuously monitors the interrupter for the presence of vacuum.

Once the capacitor switch is installed, the sensor generates an optical signal that travels via a pair of fiber optic cables to a control board in the low-voltage section of the switch. As long as vacuum exists, the fiber optic signal has a continuous path, and the Vacstat indicator remains in the normal (unalarmed) state.

If a loss of vacuum occurs, the sensor blocks the optical signal to the control board, and the Vacstat status indicator automatically turns to red to alert the operator to the problem. In addition, the remote status dry contact provides a means to send an alarm signal to a remote location. The Vacstat monitor also blocks further electrical operation of the switch to prevent possible damage to equipment or injury to personnel.



| Features                                                                                     | Benefits/Descriptions                                                                                                                                                          |
|----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Continuously Monitors Vacuum Interrupter Status While the Switch Is Energized and in Service | Reduces operating and maintenance costs by eliminating the need for routine off-line vacuum interrupter inspections.                                                           |
| Blocks Switch Operation if Vacuum Loss Is Detected                                           | Protects your equipment and personnel from potential harm.                                                                                                                     |
| Provides Local and Remote Indication of Vacuum Interrupter Status                            | Enables operating and maintenance personnel to take corrective action immediately in the event of loss of vacuum, maximizing system reliability. SCADA notification available. |

## Varmaster VBM Switch Models



Three Phase  
15kV/25kV\* 400A  
15kV/25kV\* 600A

\* 25kV rating for solidly grounded capacitor bank configurations only.



Three Phase  
25kV 200A  
25kV 300A  
25kV 400A

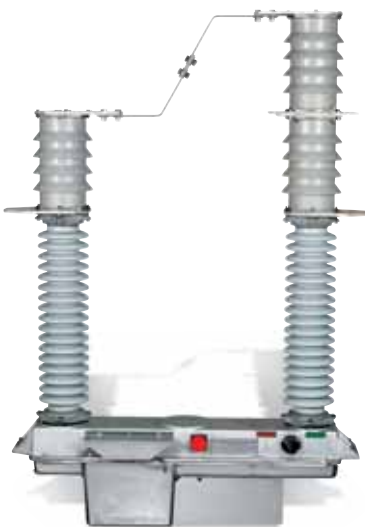


Three Phase  
38kV 300A



One Pole\*  
38kV 400A  
38kV 600A  
48.5kV 200A\*\*

\* Three poles required for a three-phase installation.  
\*\* Solidly grounded capacitor bank configurations only.



One Pole\*  
48.5kV 300A  
48.5kV 400A

\* Three poles required for a three-phase installation.



One Pole\*  
72.5kV 300A

\* Three poles required for a three-phase installation.

## Varmaster VBM Switch Options and Accessories

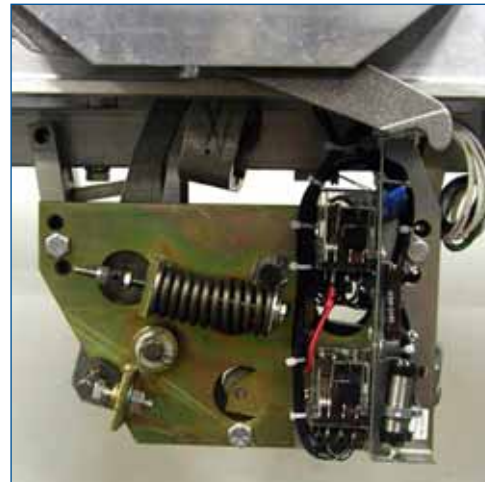
### Operating Mechanisms

A solenoid mechanism has an expected maintenance-free life of 100,000 operations on AC and 15,000 operations on DC. Controls for solenoid operators are mounted in a separate enclosure.

A motor operator is only used on single-mechanism three-phase Varmaster VBM switches, such as 15kV, 400A and 600A models and 34.5kV, 300A models. All controls are located inside the VBM mechanism housing. Inspection after 10,000 operations is recommended.



Solenoid Operator



Motor Operator

The completely sealed operating mechanism housing supports line-to-ground insulators and the modules. An expansion bag in the housing prevents the intake of contaminants or moisture and contains a desiccant package to maintain dry air.

All electrical control connections to the mechanism are made through a single environmental control cable connector.

An “open-closed” position indicator is directly coupled to the mechanism. A separate operating crank enables manual operation of the switch. The entire assembly can withstand several G’s without damage. Note that there may be one or more mechanisms for a three-phase Varmaster VBM switch.

### Operating Mechanism Options

| Control Voltage | Operating Mechanism     | Control Current per Switch Mechanism | Close Time <sup>4</sup> | Trip Time <sup>4</sup> | Auxiliary Contacts       |
|-----------------|-------------------------|--------------------------------------|-------------------------|------------------------|--------------------------|
| AC 120V         | Motor <sup>5</sup>      | 5A                                   | 3 sec.                  | 2 cycles               | 2 A and 2 B <sup>1</sup> |
| AC 120V         | Solenoid <sup>3</sup>   | 60A <sup>7,8</sup>                   | 6 cycles                | 6 cycles               | 4 A and 4 B <sup>2</sup> |
| AC 48V          | Motor <sup>5</sup>      | 3A                                   | 5 sec.                  | 2 cycles               | 2 A and 2 B <sup>1</sup> |
| AC 48V          | Solenoid <sup>3,8</sup> | 60A <sup>6</sup>                     | 6 cycles                | 6 cycles               | 4 A and 4 B <sup>2</sup> |
| DC 125V         | Motor <sup>5</sup>      | 4A                                   | 3 sec.                  | 2 cycles               | 2 A and 2 B <sup>1</sup> |
| DC 125V         | Solenoid <sup>3</sup>   | 60A <sup>7,8</sup>                   | 6 cycles                | 6 cycles               | 4 A and 4 B <sup>2</sup> |
| DC 250V         | Solenoid <sup>3,8</sup> | 60A                                  | 6 cycles                | 6 cycles               | 4 A and 4 A <sup>2</sup> |

1. Two A and two B mechanically operated contacts are standard. Six A and six B contacts are available as an option. Contacts are rated at 10A, 125VDC or 115VAC.

2. Four A and four B contacts available from auxiliary relay. Eight A and eight B contacts are available as an option. Contacts are rated at 15A, 120VAC and 10A, 125VDC.

3. For capacitor or reactor switching, a low-energy control is available. See Options and Accessories.

4. Close or Trip Times are measured from applying of close or trip signals. Vacuum contact travel time is six milliseconds. All Varmaster VBM switches have built-in anti-pump controls.

5. Motor operating mechanisms are designed for single-mechanism three-phase switches only.

6. Current is 60A peak for one-, two- or three-mechanism switch systems.

7. Current is 120A for the 34.5kV, 300A Varmaster VBM switch.

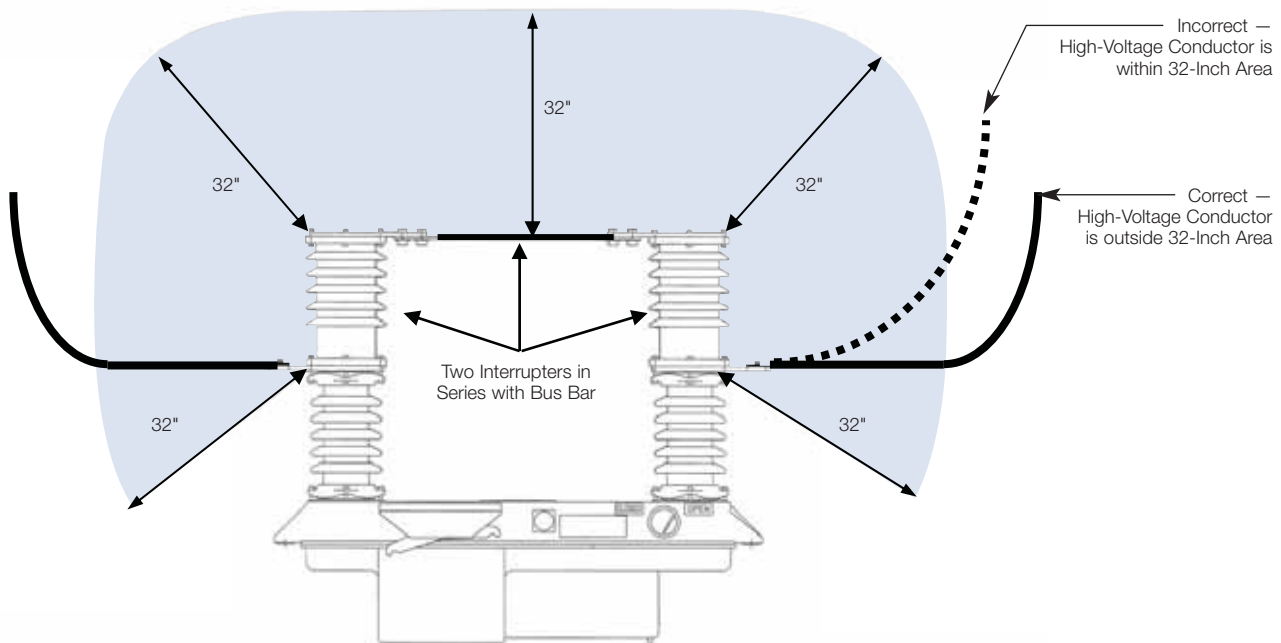
8. Current for three-mechanism switch systems is approximately 180A peak for three cycles.

## Varmaster VBM Switch Clearance Requirements

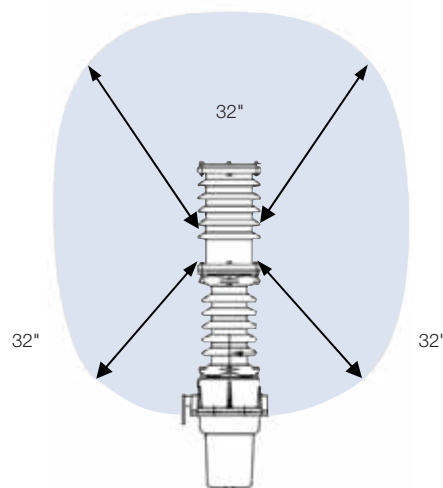
For Varmaster VBM switches with multiple vacuum interrupters in series, a 32" (813mm) clearance must be maintained from all switch line parts to adjacent equipment, such as buses, reactors, CTs, transformers or frames. Adjacent equipment also includes high-voltage conductors, which must run horizontally for at least 32" before bending upward.

Failure to meet this clearance requirement will adversely affect the electrical voltage distribution and electromagnetic field within the interrupters during opening and closing operations. This insufficient clearance can prevent proper interruption within the vacuum switch interrupters, resulting in undesirable restrikes during opening operations for some application parameters.

### 32" Clearance around 38kV Single-Phase Interrupters, Front View



### 32" Clearance around 38kV Single-Phase Interrupters, Side View



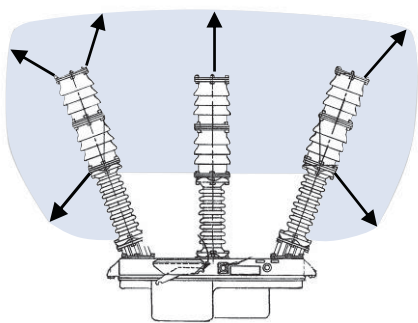
### One Interrupter per Phase, 32" (813mm) Clearance Not Required



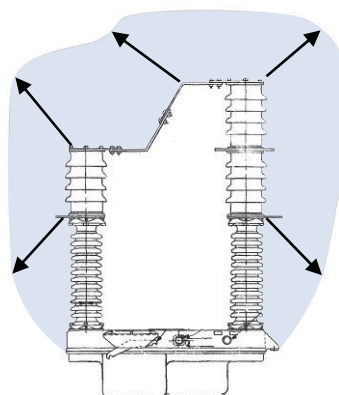
Three Phase  
15kV/25kV

NOTE: The 32" (813mm) clearance requirement does not apply to Varmaster VBM switches with only one interrupter per phase, as shown above. All other configurations shown must maintain the 32" (813mm) clearance.

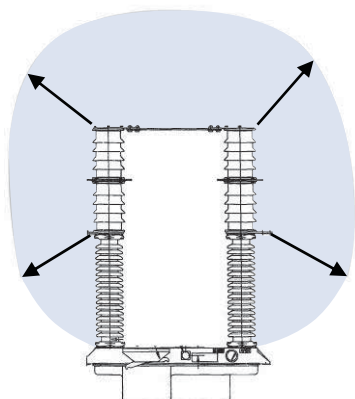
### Two or More Interrupters per Phase, 32" (813mm) Clearance Required



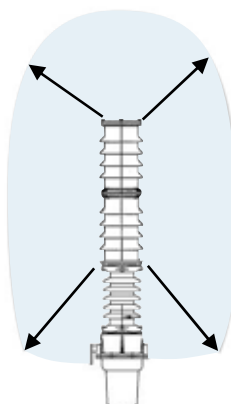
Three Phase  
38kV



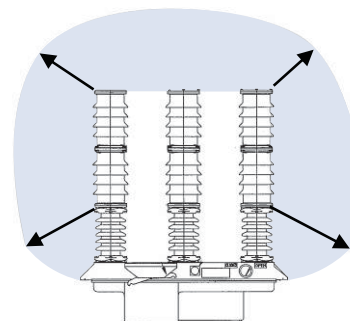
Single Phase  
48.5kV



Single Phase  
69kV

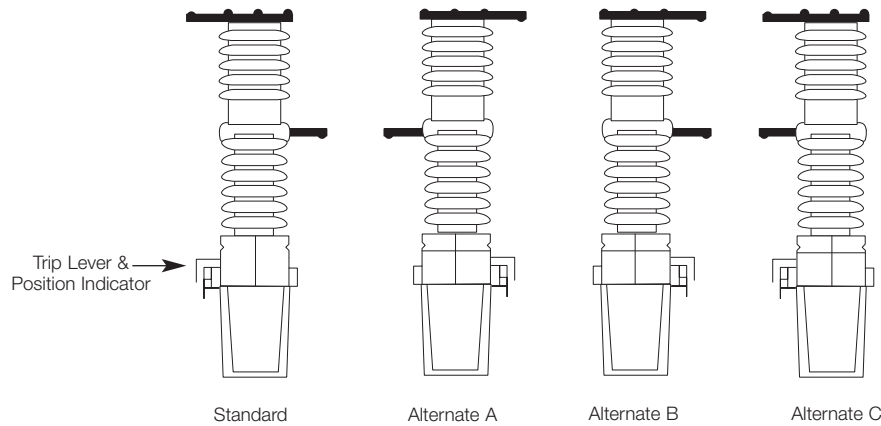


Double-Stack Interrupters



Three Phase  
25kV

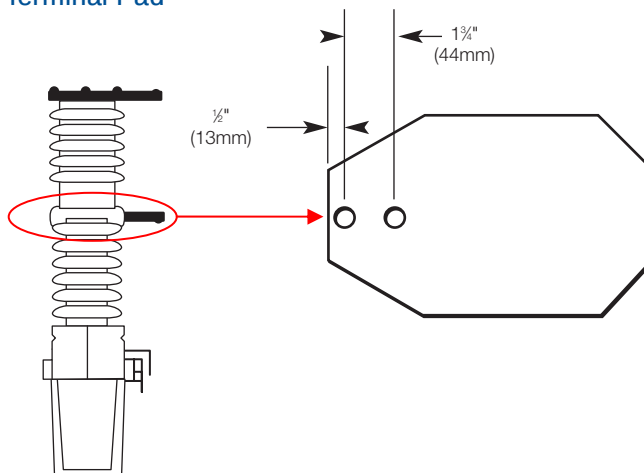
## Varmaster VBM Terminal Pad Orientation Options for Single-Mechanism Switches



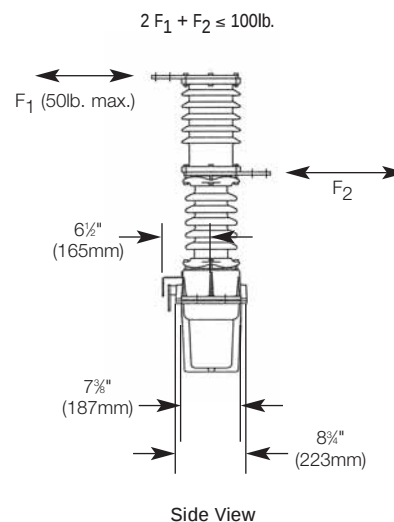
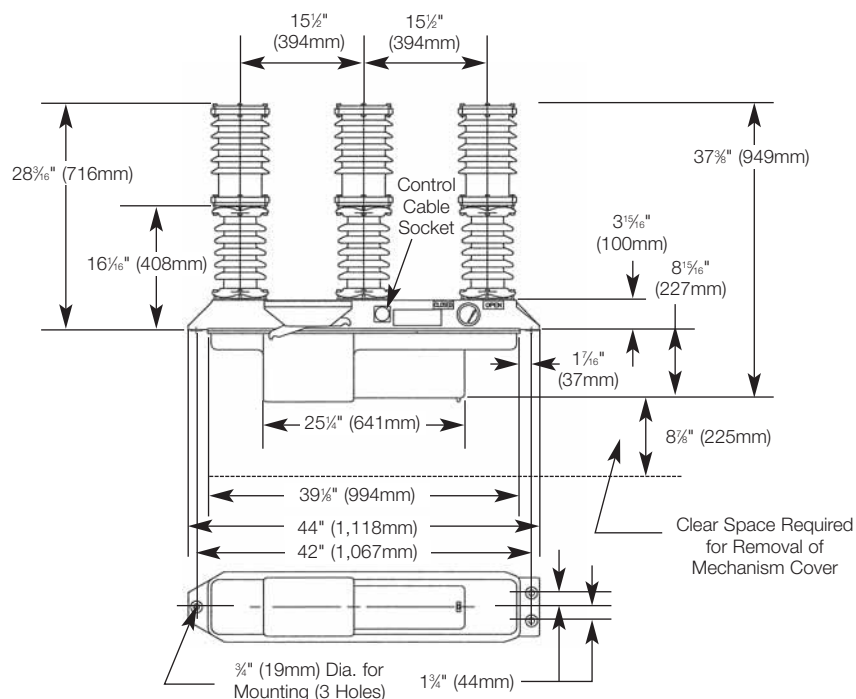
## High-Voltage Connections

Varmaster VBM switches have terminal pads made of aluminum alloy with standard NEMA two-hole drilling. The electrical connection at the terminal pad must be treated with Alcoa No. 2 joint compound or equivalent. Remove the brown paper from the terminal pad before making electrical connections. Wire brushing through the compound will improve the connection.

### Terminal Pad



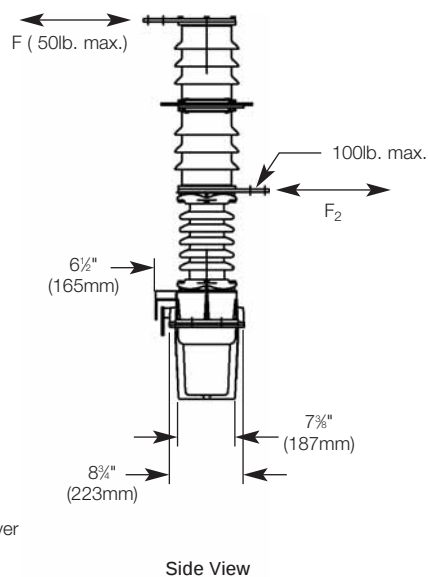
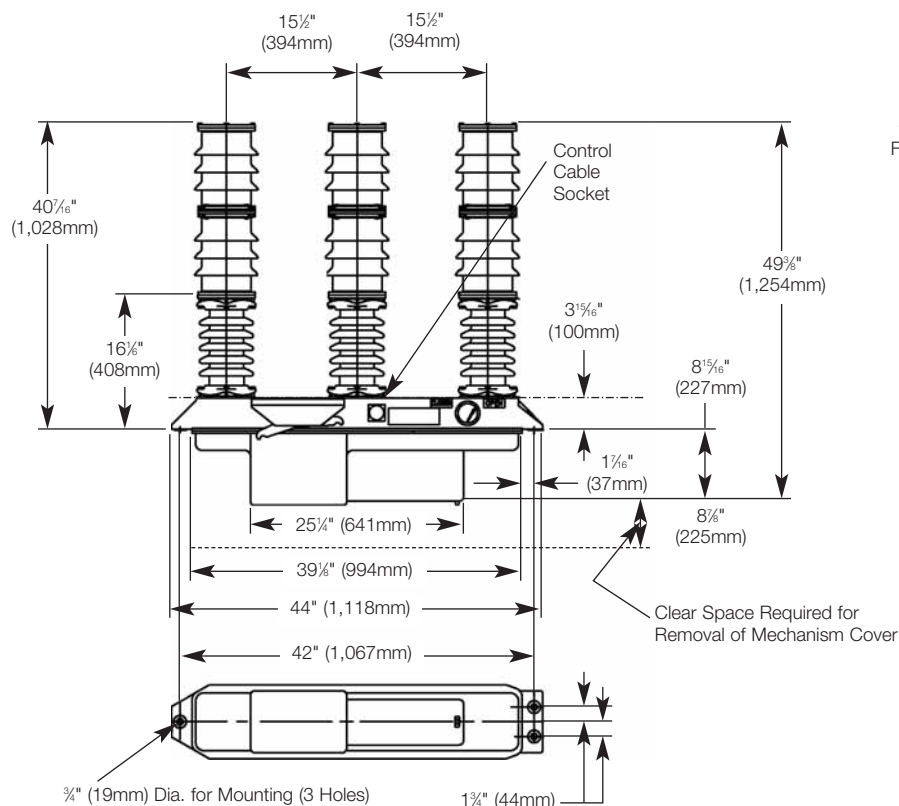
### Dimensions for Three-Phase Switch, 15kV/25kV\* Grounded 400A, 15kV/25kV\* Grounded 600A



\* Solid grounded systems and capacitor bank only.

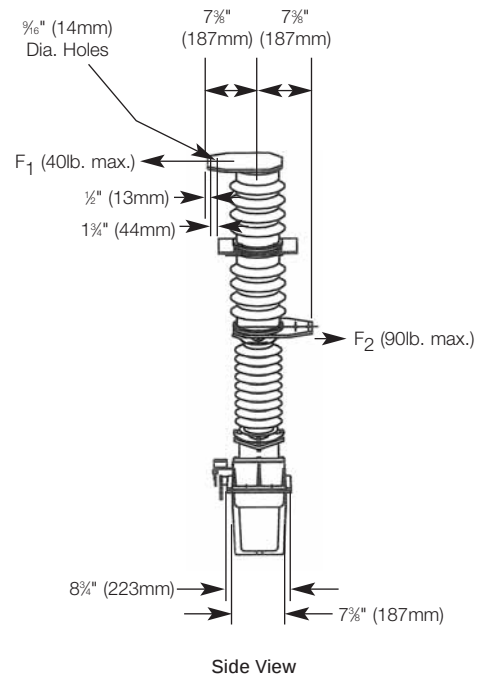
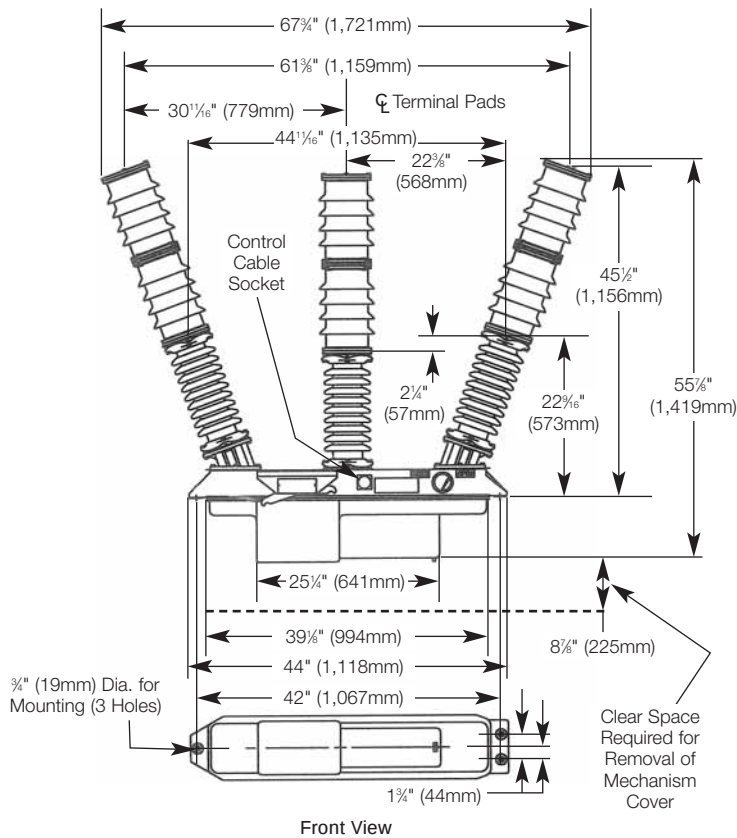
Weight: 148lb. (67kg) maximum.

### Dimensions for Three-Phase Switch, 25kV 200A, 25kV 300A, 25kV 400A



Weight: 225lb. (102kg) maximum.

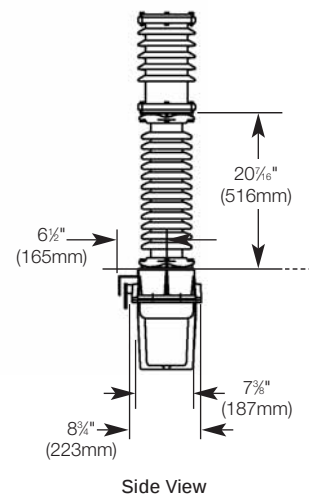
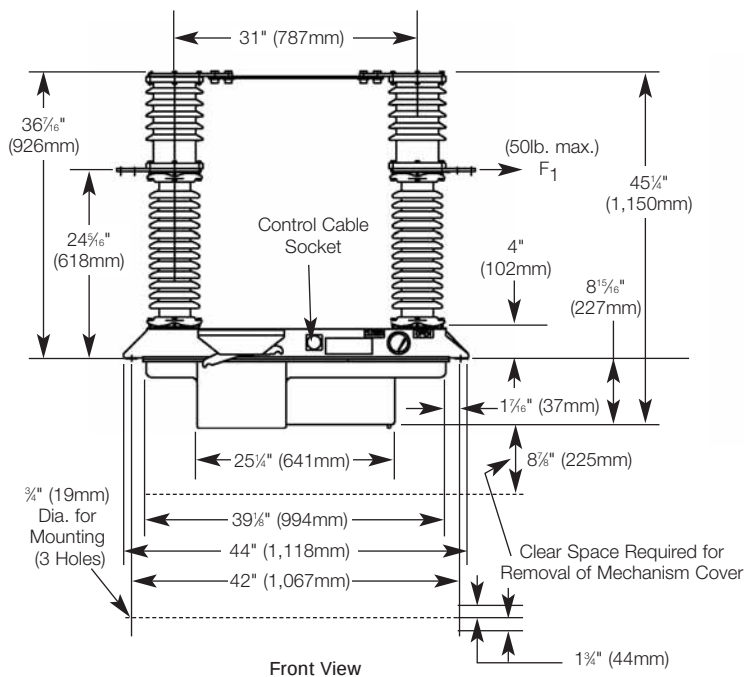
### Dimensions for Three-Phase Switch, 38kV 300A



NOTE: Other insulation ratings are available for extra creepage.

Weight: 225lb. (102kg) maximum.

### Dimensions for One-Pole\* Switch, 38kV 400A, 38kV 600A, 48.5kV 200A\*\*

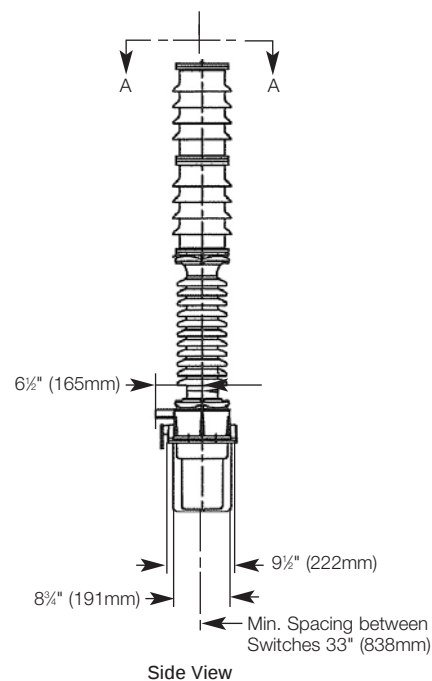
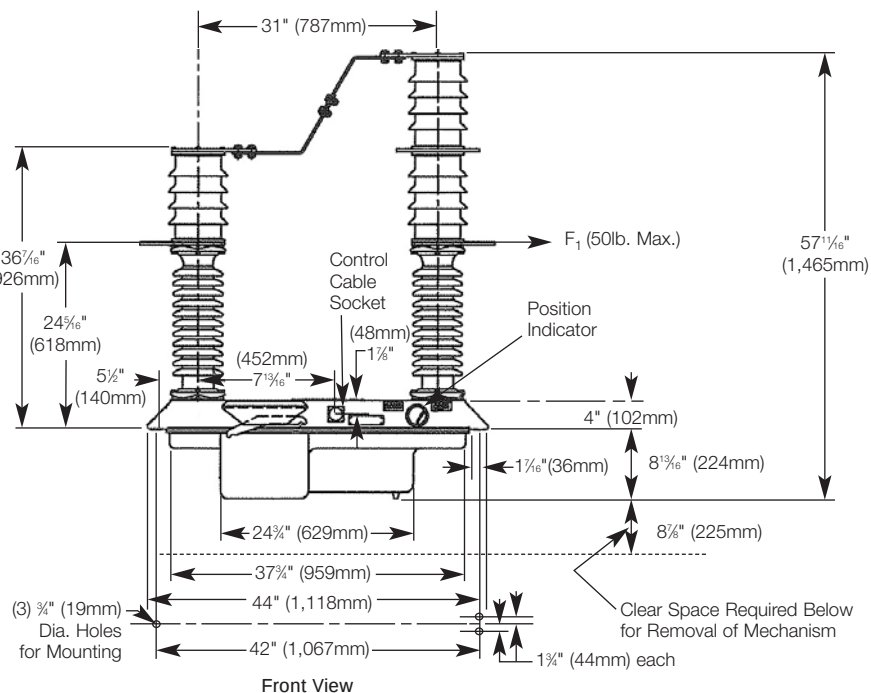


Weight: 180lb. (82kg) maximum.

\* Three poles are required for a three-phase installation.

\*\*Solidly grounded 46kV capacitor bank configuration.

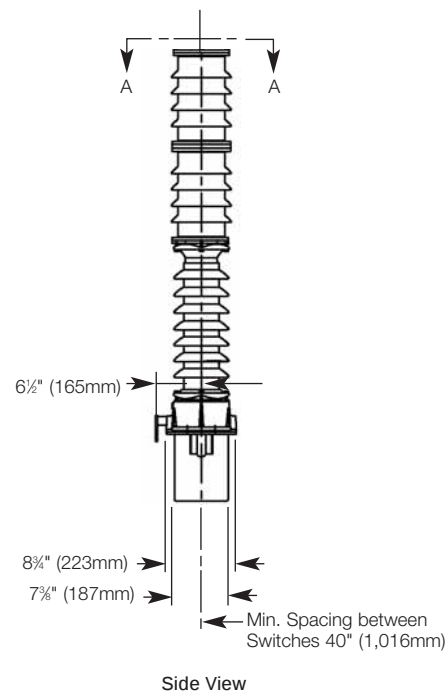
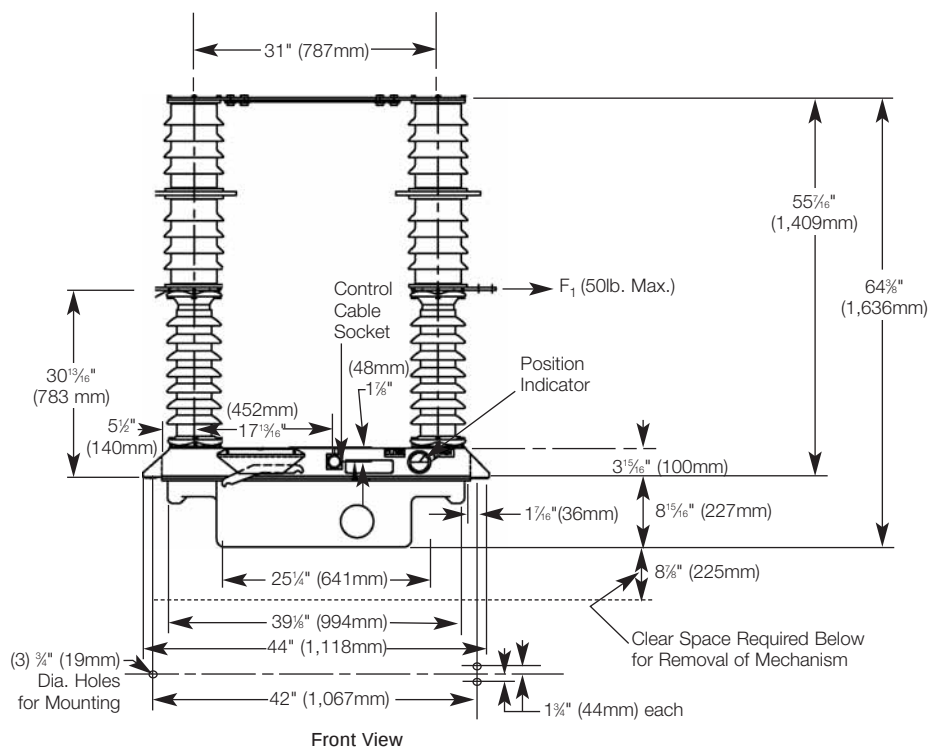
### Dimensions for One-Pole\* Switch, 48.5kV 300A, 48.5kV 400A



Weight of one pole switch: 200lb. (91kg) maximum.

\*Three poles are required for a three-phase installation.

### Dimensions for One-Pole\* Switch, 72.5kV 300A



Weight of one pole switch: 225lb. (103kg) maximum.

\* Three poles are required for a three-phase installation.

## Varmaster VBM Switch

### Ratings

| Maximum Voltage                                               | 15.5kV/25kV <sup>3</sup> |     |     | 25kV |     |     | 38kV |     |     |     | 48.5kV           |     |     | 72.5kV |
|---------------------------------------------------------------|--------------------------|-----|-----|------|-----|-----|------|-----|-----|-----|------------------|-----|-----|--------|
| Capacitor and Load Switching Current <sup>1,2</sup> (Amps)    | 400                      | 600 | 600 | 200  | 300 | 400 | 300  | 400 | 600 | 600 | 200 <sup>4</sup> | 300 | 400 | 300    |
| Fault Interrupting Current (kA)                               | 3                        | 4   | 8   | 3    | 3   | 3   | 3    | 3   | 4   | 8   | 4                | 3   | 3   | 3      |
| Momentary Current (kA RMS, Asymmetric)                        | 20                       | 20  | 20  | 15   | 15  | 15  | 15   | 20  | 20  | 20  | 20               | 15  | 15  | 15     |
| Impulse Withstand (kV BIL) Terminal-to-Terminals <sup>5</sup> | 110                      | 110 | 110 | 200  | 200 | 200 | 200  | 200 | 200 | 200 | 200              | 250 | 250 | 280    |
| Line-to-Ground (kV BIL) (1.2 x 50 Positive Wave)              | 150                      | 150 | 150 | 150  | 150 | 150 | 200  | 200 | 200 | 200 | 250              | 250 | 250 | 350    |
| Maximum 60-Cycle Withstand Line-to-Ground (kV)                |                          |     |     |      |     |     |      |     |     |     |                  |     |     |        |
| One Minute Dry                                                | 101                      | 101 | 101 | 101  | 101 | 101 | 138  | 138 | 138 | 138 | 178              | 178 | 178 | 178    |
| Two Seconds Wet                                               | 74                       | 74  | 74  | 74   | 74  | 74  | 119  | 119 | 119 | 119 | 176              | 176 | 176 | 176    |
| Maximum Peak Making Current (kA)                              | 20                       | 20  | 20  | 15   | 15  | 15  | 15   | 20  | 20  | 20  | 20               | 15  | 15  | 15     |
| Maximum Peak Back-to-Back Inrush Current (kA) <sup>6</sup>    | 10                       | 10  | 10  | 8    | 8   | 8   | 8    | 10  | 10  | 10  | 10               | 8   | 8   | 8      |
| Two-Second Current (Amps)                                     | 12,500                   |     |     |      |     |     |      |     |     |     |                  |     |     |        |
| Four-Second Current (Amps)                                    | 9,000                    |     |     |      |     |     |      |     |     |     |                  |     |     |        |

- Varmaster VBM switches can switch loads of any power factor up to their continuous current rating. Include effects of voltage variances, harmonic currents and load tolerances in calculating continuous current.
- Varmaster VBM switches are available with continuous current ratings through 3,000A for non-capacitor bank applications. Consult your T&B representative regarding application of these switches.
- Grounded systems only at 25kV.
- In capacitor switching applications, the 48.5kV, 200A Varmaster VBM may be used on solidly grounded systems and grounded capacitor banks with total current less than 200A. For all other loads, this VBM rating is 600A.
- Interrupter portion of switch does not provide a visible open gap; therefore, it cannot be used to establish a safety clearance for personnel.
- In back-to-back capacitor bank switching applications, it is recommended that inrush current be limited to the values shown for maximum maintenance-free performance. Current limiting reactors through 60 microhenries/phase are available from Joslyn Hi-Voltage. Refer to Joslyn Hi-Voltage bulletin T.D. 750-457.

**Ordering Information** for Joslyn Hi-Voltage™ Varmaster VBM Switching Systems

Please specify:

**1. Application**

Capacitor Switching, Reactor Switching or Filter Bank Switching

NOTE: a) With capacitor bank applications, specify grounded or ungrounded configuration.  
b) Certain filter banks may require additional vacuum interrupters. Please consult your Thomas & Betts representative when applying Varmaster VBM switches for filter bank switching.

1. Capacitor Switching — Ungrounded

**2. Voltage Rating**

12.5kV, 15.5kV, 25kV, 38kV, 46kV or 69kV

2. 38kV Varmaster VBM

**3. Continuous Current Rating**

200A, 300A, 400A or 600A

3. 600A Continuous

**4. Control Voltage**

120VAC, 220/240VAC, 48VDC, 110VDC, 125VDC or 250VDC

4. 120VAC Control Voltage

**5. Operating Mechanism**

Solenoid or Motor. Motor operator can only be supplied with a single-mechanism switch, such as a 15kV model.

5. Solenoid-Operated Mechanism

**6. Terminal Pad Orientation**

Select terminal pad orientation from diagram on page 43

6. Terminal Pad Orientation — Standard

**7. Cable Length**

Solenoid: 17' 6" or 26'

Motor: Up to 50' in 5' increments

7. 17' 6" Cable

8. 8-ft. Galvanized Steel Mounting Stand

**8. Mounting Stand**

Substation Frame — Height: 8 or 10 ft.;

Material: Galvanized Steel or Aluminum

Pole Mounting Frame — For 15.5kV or 38kV single-mechanism

Varmaster VBM switches; Material: Galvanized Steel

9. Zero Voltage Closing Control, Fisher Pierce® Series 4400 AutoCap™ Capacitor Control

**9. Options & Accessories**

- Capacitor Controls: Fisher Pierce® 4400, 4500, AC100 AutoCap™ Control
- Zero Voltage Closing (ZVC) Control
- Current Limiting Reactors

NOTE: For standard control configurations and faster delivery, call 800.326.5282.

For more information on capacitor controls, see the Fisher Pierce Product Selection Guide PG-PC-FP-1008.

# Joslyn Hi-Voltage™ VBU Capacitor Switches

## Ideally suited for capacitor switching on 69kV to 230kV systems.

Joslyn Hi-Voltage™ VBU Capacitor Switches are sealed against the environment, immune to ice and contamination and designed to withstand system voltage continuously in the open position. The completely sealed operating mechanism requires neither heaters nor routine exercise.

Suitable for all loads, the reliable vacuum interrupters in the VBU capacitor switches ensure dependable switching of magnetizing current, cable or line charging current or load current of any power factor. VBU capacitor switches are ideally suited for capacitor switching.

VBU capacitor switches can be applied on 69kV to 230kV systems. The flexibility of their modular design makes a change in the voltage rating of VBU capacitor switches as simple as adding or subtracting the appropriate number of vacuum contact modules.

VBU capacitor switches are free of explosive or combustible materials and are designed to be virtually maintenance-free. Normal operation inspections should be conducted every 5–10 years or 10,000 operations. Testing, when required, is fast and easy.

VBU capacitor switches ship completely assembled and adjusted. They are lightweight and easy to install, requiring a minimum of structural support and space. Less expensive to purchase and install than circuit breakers, they are often mounted on potential transformer stands and offer quiet yet high-speed operation.



VBU Capacitor Switch

Capacitor & Reactor  
Switching

| Features                                                    | Benefits/Descriptions                                                                                                                                                                    |
|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Vacuum Interruption and Solid Dielectric Joslyte Insulation | Completely oil-free operation. No explosive or combustible materials to compromise the safety of personnel or equipment.                                                                 |
| Modular Design                                              | Change voltage rating simply by adding or removing vacuum contact modules.                                                                                                               |
| Completely Sealed Construction                              | Long, virtually maintenance-free service life; no heaters or routine exercise required.                                                                                                  |
| Wide Choice of Control Options                              | Ensures dependable switching of magnetizing current, cable or line charging current or load current of any power factor.                                                                 |
| Zero Voltage Closing (ZVC) Control Available                | Closes three switch poles independently, synchronized with the occurrence of zero voltage in each phase, eliminating overvoltage duty on capacitors and system overvoltage disturbances. |

## Interrupter Module

Each vacuum interrupter module contains a vacuum interrupter mounted within an outer housing. Capacitors are connected in parallel with each vacuum interrupter to ensure uniform voltage distribution across all interrupter modules in an interrupter assembly. The space within the outer housing is filled with Joslyte solid dielectric insulation, which provides increased dielectric strength over the exterior of the vacuum interrupter and enables the module assembly to resist physical shock.

The electrical connection between interrupter modules is accomplished through the upper end flange and lower end flange. Current is transferred from the upper end flange to the movable contact end of the vacuum interrupter through laminated shunts. The non-moving end of the vacuum interrupter is connected directly to the lower end flange. The vacuum interrupter contacts are opened and closed by the module drawbar.

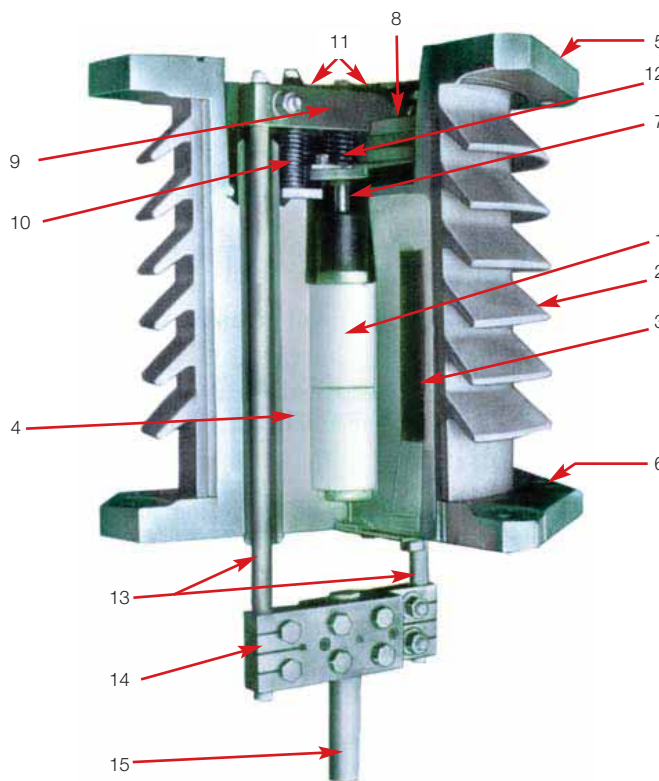
A pair of compression springs forces the drawbar upward — which opens the vacuum interrupter — and drawbar stop bolts limit the amount of upward motion of the module drawbar.

The stop bolts determine the separation of the vacuum contacts in the open position. The vacuum interrupter contacts close with a downward motion of the module drawbar. The downward motion also compresses the springs, providing stored energy for the opening operation.

After the module drawbar has been moved downward to the point where the vacuum contacts close, it is moved downward an additional distance. This distance is referred to as overtravel. During overtravel, the vacuum contacts are not moving since they are a butt design and are essentially fully closed once continuity is established. The overtravel of the module drawbar increases the stored energy in the opening springs and compresses the contact pressure spring. The contact pressure spring is preset so the amount of contact pressure is substantially independent of the amount of overtravel.

The module drawbars connect mechanically to each other and to the master drawbar by a pair of pull rods, which pass through each module. The master drawbar connects to the operating mechanism via the master pull rod located within the line-to-ground insulator.

1. Vacuum Interrupter
2. Outer Housing
3. Capacitors
4. Joslyte Solid Dielectric Insulation
5. Upper End Flange
6. Lower End Flange
7. Movable Contact End
8. Laminated Shunts
9. Module Drawbar
10. Compression Springs
11. Drawbar Stop Bolts
12. Contact Pressure Spring
13. Pull Rods
14. Master Drawbar
15. Master Pull Rod



## Position Indicator

A visual position indicator attaches to each mechanism housing.

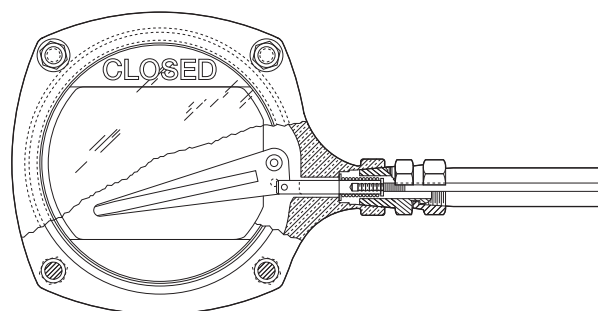
It directly activates by movement of the primary switch mechanism.

Auxiliary switch contacts are available in each VBU pole for remote indication of VBU position and interlocking the VBU with other equipment.

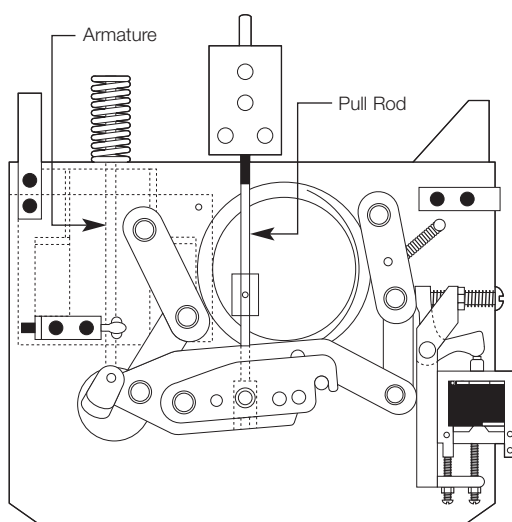
## Operating Mechanism

Each pole of the VBU contains an operating mechanism; there is no mechanical interphase connection.

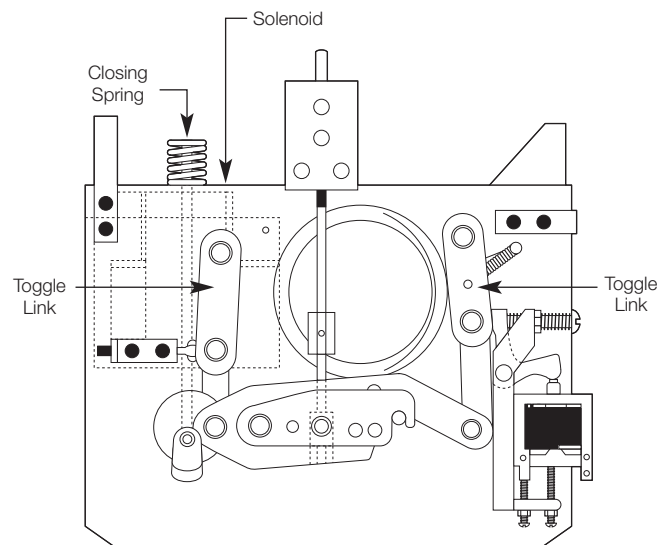
The vacuum interrupters are held in the open position by the opening springs located in each interrupter module. The operating mechanism utilizes solenoids to impart a downward motion to the master pull rod, which pulls the vacuum interrupters to the closed position. The operating mechanism linkages then lock in an overtoggle position to restrain the contacts in the closed position. When the mechanism reaches the closed overtoggle position, the close solenoids are automatically de-energized. The VBU is opened by energizing a low-energy trip solenoid. The solenoid untoggles the mechanism and removes the restraining force that holds the contacts closed. This action enables the opening springs within the interrupter modules to open the vacuum contacts.



Position Indicator



Operating Mechanism (open)

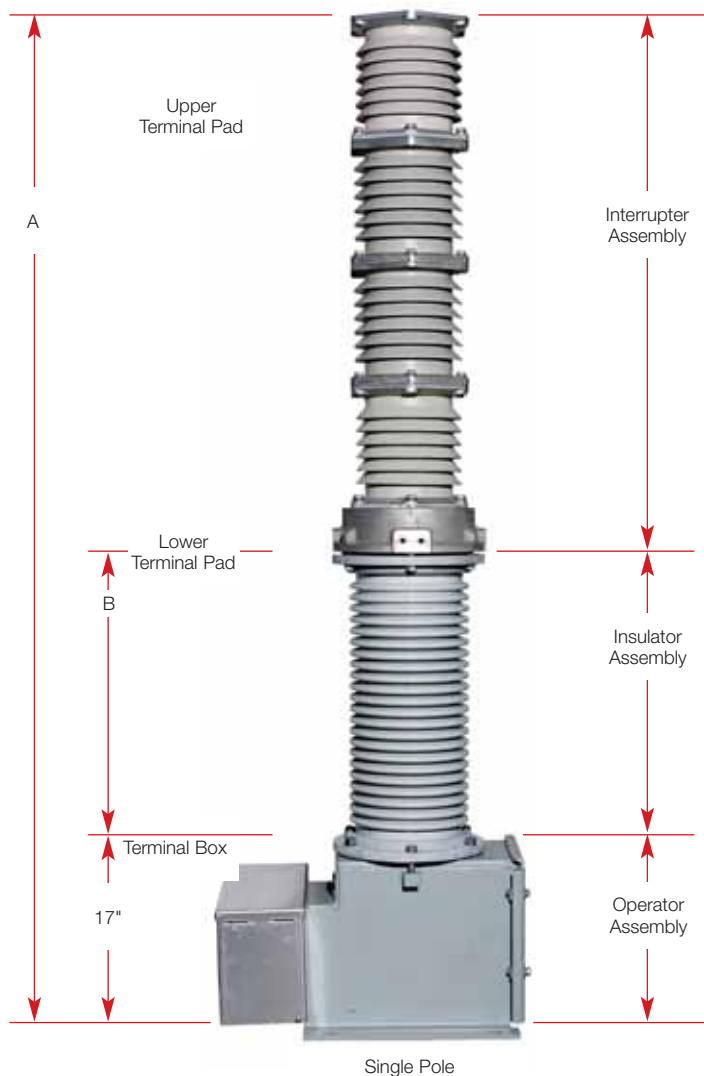


Operating Mechanism (closed)

## General Description

The major components of a Joslyn Hi-Voltage™ VBU Capacitor Switch are the interrupter assembly, the insulator assembly and the operator assembly.

The interrupter assembly is a modular design that connects vacuum interrupter modules electrically in series. The number of vacuum interrupter modules is determined by recovery voltage considerations. The interrupter assembly is connected to the operating mechanism with an insulating operating rod located within the hollow line-to-ground insulator assembly.



## Specifications and Ratings

The VBU capacitor switch yields a very long service life with a modular design including vacuum interrupter modules connected electrically in series and mechanically in parallel. The VBU system is supplied with the appropriate number of modules determined by recovery voltage considerations for specific applications (refer to VBU Ratings table). Order by fully describing the application, options and accessories.

### Specifications

#### Standard Control Features Include:

Electrical Operations Counter, Heater, Anti-Single Phasing Circuit

#### Voltage Class:

69kV–230kV

#### Continuous Current (Amperes):

600

#### Fault Interrupting Current (Amperes, Symmetrical):

4,000

#### Momentary Current (Amperes, Asymmetric):

40,000

#### Two-Second Current (Amperes):

10,000

#### Three-Second Current (Amperes):

8,000

#### Four-Second Current (Amperes):

7,000

#### Closing Time:

55 milliseconds

#### Max. Interrupt Time:

2 cycles

#### Control Current Close:

1A peak at 48VDC or 125VDC

#### Control Current Trip:

18A at 125VDC; 54A at 48VDC

### VBU Switch Ratings

| Rated Maximum Voltage (kV) | L-G BIL (kV) | Term. to Term. BIL (kV) | Interrupter Modules per Phase | A       | B   | Weight per Phase (lbs.) | Primary Application* |
|----------------------------|--------------|-------------------------|-------------------------------|---------|-----|-------------------------|----------------------|
| 72                         | 350          | 400                     | 4                             | 8' 7¼"  | 30" | 710                     | T G U                |
| 121                        | 550          | 550                     | 5                             | 11' 1¼" | 48" | 860                     | T G                  |
| 121                        | 550          | 750                     | 7                             | 13' 1¼" | 48" | 940                     | U                    |
| 145                        | 750          | 650                     | 6                             | 13' 1¼" | 60" | 950                     | T                    |
| 145                        | 750          | 750                     | 7                             | 14' 1¼" | 60" | 990                     | G                    |
| 145                        | 750          | 850                     | 8                             | 15' 1¼" | 60" | 1,030                   | U                    |
| 169                        | 750          | 750                     | 7                             | 14' 1¼" | 60" | 990                     | T                    |
| 169                        | 750          | 850                     | 8                             | 15' 1¼" | 60" | 1,030                   | G                    |
| 169                        | 750          | 950                     | 9                             | 16' 1¼" | 60" | 1,070                   | U                    |
| 242                        | 900          | 950                     | 9                             | 17' 7¼" | 78" | 1,180                   | T G                  |

\* Primary Application Codes:

T = Transformer Switching & Fault Protection — Grounded or Ungrounded

G = Shunt Capacitor or Reactor Switching — Solidly Grounded Source & Load

U = Shunt Capacitor or Reactor Switching — Ungrounded Source or Load

Refer to Joslyn Hi-Voltage Bulletin TD 750-457 for recommended inrush current-limiting reactor size if applied for back-to-back capacitor banks.

## Ordering Information for Joslyn Hi-Voltage™ VBU Switches

Please specify:

## 1. Application

Capacitor Switching, Reactor Switching or Filter Bank Switching

NOTE: a) With capacitor bank applications, specify grounded or ungrounded configuration.  
 b) Certain filter banks may require additional vacuum interrupters. Please consult your Thomas & Betts representative when applying VBU switches for filter bank switching.

Example:

1. Capacitor Switching — Ungrounded

## 2. Voltage Rating

72kV, 121kV, 145kV, 169kV or 242kV

2. 169kV VBU Switch

## 3. Continuous Current Rating

600A

3. 600A Continuous

## 4. Control Voltage

120VAC, 220/240VAC, 48VDC, 110VDC, 125VDC or 250VDC

4. 120VAC Control Voltage

## 5. Operating Mechanism

Solenoid only

5. Solenoid-Operated Mechanism

## 6. Cable Length

Solenoid: 17' 6" or 26'

6. 17' 6" Cable

## 7. Mounting Stand

Substation Frame — Height: 8 ft.; Material: Galvanized Steel

7. 8-ft. Galvanized Steel Substation Frame

## 8. Options &amp; Accessories

- Capacitor Controls: Fisher Pierce® 4400, 4500, AC100 AutoCap™ Control
- Zero Voltage Closing (ZVC) Control
- Current Limiting Reactors

8. Zero Voltage Closing Control, Fisher Pierce® Series 4400 AutoCap™ Capacitor Control

NOTE: For standard control configurations and faster delivery, call 800.326.5282.  
 For more information on capacitor controls, see the Fisher Pierce Product Selection Guide PG-PC-FP-1008.

# Joslyn Hi-Voltage™ Zero Voltage Closing (ZVC) Control

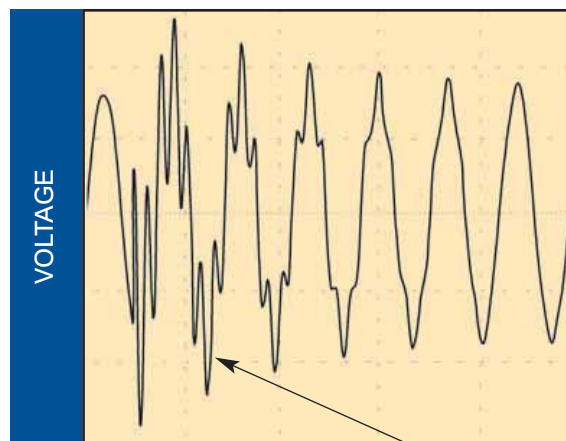
## Eliminates overvoltage disturbances.

The Joslyn Hi-Voltage™ Zero Voltage Closing (ZVC) Control is a cutting-edge microprocessor-based capacitor control. When an external close command is received, the ZVC virtually eliminates capacitor energization transients by closing three switch poles independently, synchronized with the occurrence of zero voltage in each phase. The closing sequence of the poles minimizes the time from the first pole closure to the last pole closure.

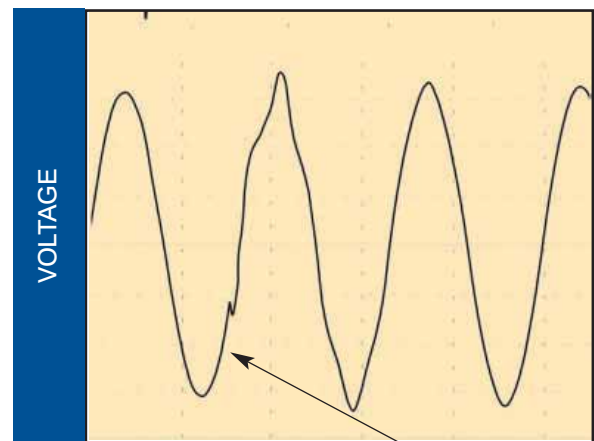
A selected reference phase of the system voltage is used for determining the zero voltage crossing information, and an internal calibration process is used for determining accurate closing time requirements. With this information, the microprocessor sets the individual close command delays required to ensure pole closures at points corresponding to the system zero voltage crossing.

The expected benefits include:

- Increased power quality by utilizing capacitor switching, significantly reducing voltage spikes that are a nuisance to sensitive equipment like computers and adjustable-speed drives
- Increased capacitor and switch life
- A reduction of induced voltages into the low-voltage control wiring
- A reduction of station ground transients and distribution ground transients



CLOSE CAP #1\*  
Standard Control



CLOSE CAP #1\*  
With ZVC Control

\* Only one phase shown for clarity.

| Features                                  | Benefits/Descriptions                                                                                                                                    |
|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interfaces with a Variety of Equipment    | Works with new or existing capacitor controllers and Joslyn Hi-Voltage™ VerSaVac® Capacitor Switches, Varmaster VBM Switches and VBU Capacitor Switches. |
| Mitigates System Overvoltage Disturbances | Eliminates electronic adjustable speed drive nuisance tripping.                                                                                          |
| Eliminates High Inrush Currents           | Increases capacitor and related high-voltage equipment life.                                                                                             |
| Field-Proven Design                       | Installations worldwide — more than 15 years successful field experience.                                                                                |
| Available for 15kV to 230kV Voltages      | Supports a variety of systems and applications; available for pole-top distribution capacitor banks.                                                     |
| Easy Installation and Setup               | Simply select phase rotation, reference phase, voltage sensing and bank configuration (grounded or ungrounded).                                          |

The ZVC is designed to automatically close Joslyn Hi-Voltage™ VerSaVac® Capacitor Switches, Varmaster VBM Switches and VBU Capacitor Switches at strategic points that correspond to the zero voltage crossing and the bank's configuration. For a grounded bank configuration, the capacitor phases energize 0.3 milliseconds after each respective phase zero voltage crossing point. For an ungrounded capacitor bank configuration, the ZVC initiates the first pole to close 0.3 milliseconds after the zero voltage crossing reference point. The second pole automatically closes 0.3 milliseconds after the voltage difference between the first and second phases is zero (which occurs 30 electrical degrees after the first pole's zero voltage crossing point). The third pole is closed at 0.3 milliseconds after the zero voltage crossing reference point

associated with that phase. The microprocessor control circuitry is intentionally designed to energize at these timing points to allow for any switch variations to have minimal effect on the intended transient reduction results.

A timing accuracy of  $\pm 0.89$  milliseconds, with respect to the zero voltage crossing target point, should be maintained after initial set-up of the ZVC. With this level of accuracy and control, overvoltages can be reduced from a theoretical maximum of 2 per-unit voltage to 0.1 per-unit voltage. Also, overcurrents can be reduced to less than 0.2 per-unit current of the maximum theoretical inrush currents that ranged from 40 to 100 per-unit current for back-to-back capacitor bank switching and 5 to 20 per-unit current for single-bank switching.

### The ZVC Control works with any manufacturer's new or existing capacitor controllers and offers:

- Zero voltage closing
- Low close energy
- Automatic calibration
- Calibration data storage (non-volatile memory)
- Voltage zero synchronization
- Improper sequence trip monitoring
- Flashing self-check LED
- Error-indication LED
- Error-reset push buttons

#### Provided Standard Features

- Automatic improper sequence trip
- Extra switch auxiliary contacts (4-A and 4-B)
- Control alarm output contact (form C)
- Control cabinet heater
- Calibration cable (either 18.5- or 27-ft. length)

#### Additional Available Options

- Two-pole control for ungrounded capacitor bank applications
- Capacitor-operated low-energy trip
- Undervoltage trip
- Aluminum cabinet
- Bypass ZVC mode switch — enables emergency close operations without using the ZVC control logic

### Specifications

#### Timing Accuracy:

$\pm 0.89\text{ms}$  @ 3 sigma with respect to designated zero voltage crossing target point

#### Close Response Time:

5–7 cycles after receiving external close command

#### Open Response Time:

3–5 cycles after receiving external open command

#### Temperature Range:

-22 to +158° F (-30 to +70° C)\*

#### Control Voltage:

120VAC nominal,  $\pm 10\%$

\* Control is designed for operation through this range; however, timing variances greater than 0.89ms could be encountered at temperatures colder than -4° F (-18° C) and warmer than 140° F (60° C). These variances are expected to remain within 1ms of the zero voltage crossing reference point.

Specifications can change without notice.

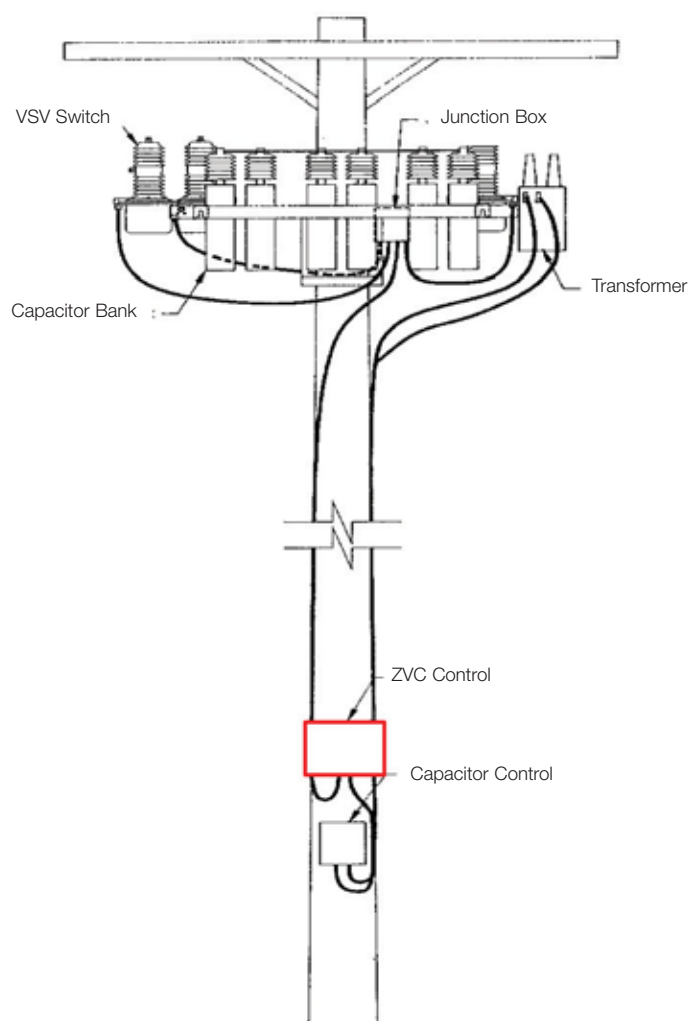
## ZVC Control and VerSaVac® switches

A typical layout of system and control using both the ZVC and a VerSaVac® switch is shown below. As a customer-ordered option, the ZVC Control can be mounted directly on the capacitor rack assembly. This application will eliminate the need for the junction box assembly.

For greater control, opt for the Joslyn Hi-Voltage™ ZVC Control System with VerSaVac switches. It consists of the following components:

- ZVC Control
- Three VerSaVac switches
- Junction box assembly that includes three separate VerSaVac cables and one main control cable

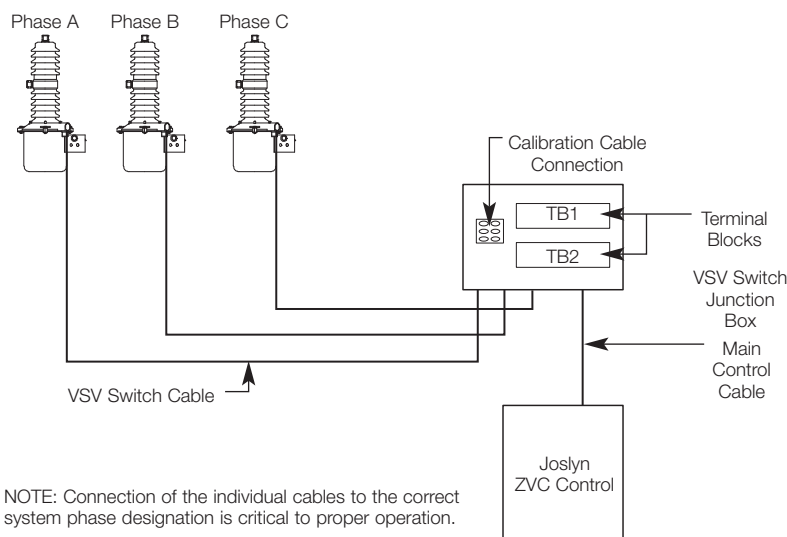
### General Equipment Layout



## ZVC Control and the junction box assembly

Additional details on the junction box assembly are shown in the diagram below. The individual switches are connected to the junction box using cables with threaded pin connectors. Also, a keyed pin connector is provided for an easy and secure connection of the main control cable to the ZVC Control. The main control cable runs from the junction box to the control. All necessary connections into the junction box for the individual VerSaVac switch cables and the main control cable are made at the factory.

### Junction Box Assembly

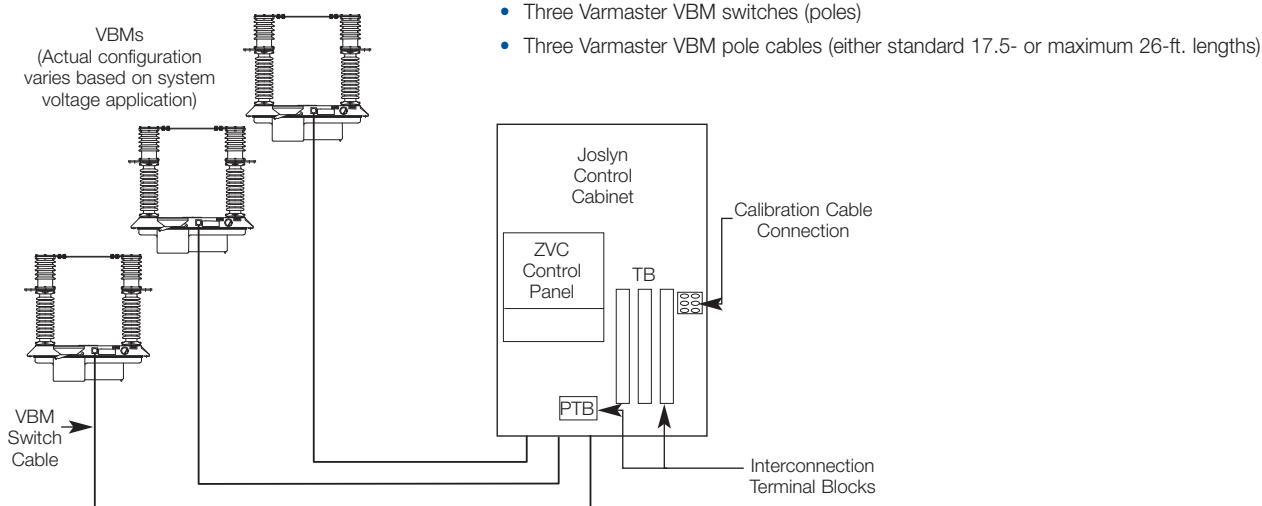


## ZVC Control and Varmaster VBM switches

A typical layout of system and control using both the ZVC and Varmaster VBM switches is shown below. The individual poles are connected to the ZVC Control using cables with keyed pin connectors on the switch end.

For greater control, opt for the Joslyn Hi-Voltage™ ZVC Control System with Varmaster VBM switches. It consists of the following components:

### General System Layout



NOTE: The cables can be shortened as required in the field, but it is recommended that all three cables be the same length. Connection of the individual cables to the correct system phase designation is critical to proper operation.

### Ordering Information for ZVC Control

See pages 48 and 54.



## QUICK REFERENCE

### Joslyn Hi-Voltage™ Sectionalizers

page(s)

Reclosing Sectionalizers . . . 64–67

Automaster™ Switch  
Package with ConeBreak™  
Isolating Switch. . . . . 68

## Reduce the customer impact of permanent faults.

Joslyn Hi-Voltage™ distribution sectionalizers are designed to improve reliability of distribution systems by isolating faults and outages to a small number of customers. Applications include automatic sectionalizing, automatic transfer systems and/or remote supervisory control with optional dead-line switching capability. Models are available through 69kV.

# Maximize circuit reliability with Joslyn Hi-Voltage™ reclosing sectionalizers.

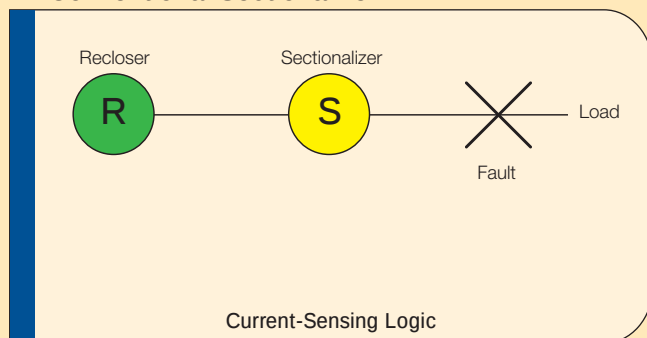
Joslyn Hi-Voltage™ reclosing sectionalizers are used on distribution feeders to reduce the customer impact of permanent faults and to further improve the circuit reliability. Typically, sectionalizers are used on a line downstream from a recloser or a breaker in the substation. The function of a sectionalizer is not to interrupt a faulted line, but to operate in a coordinated manner with reclosing operation. Joslyn Hi-Voltage distribution controls can be provided with different operating logic depending on the application:

- Automatic sectionalizing
- Open-tie logic
- Automatic source transfer
- Remote supervisory control interface

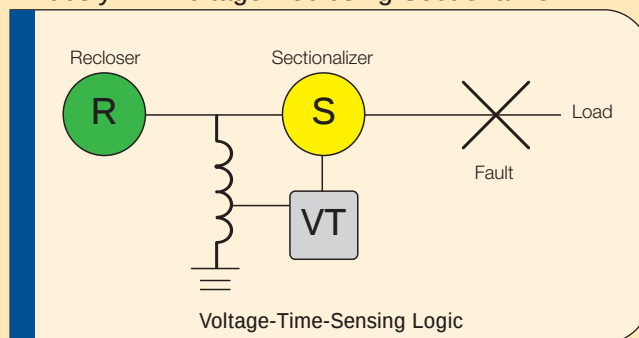
Joslyn Hi-Voltage reclosing sectionalizers provide the ability to choose complete control of the sectionalizing point, or to give a command to the local intelligence at the sectionalizing device to perform automatic operations. In addition, sectionalizing VBM switches provide full loadbreak and fault closing capabilities.



## Conventional Sectionalizer



## Joslyn Hi-Voltage Reclosing Sectionalizer



## Fault-Current-Counting Type Sectionalizer

- Fault-counting sectionalizers and reclosers in series measure the same fault pulse, making coordination difficult
- Fault-current counting devices sometimes count when they should not, in many cases due to inrush currents and cold load currents
- Current-sensing logic inherently limits the number of devices in series, usually to one or two maximum
- Coordination with other current-sensing devices in series must be carefully planned, particularly regarding actuating current levels, including ground-fault levels or changes on the system
- Mid-line reclosers are required on long lines that exceed a good protection zone for the substation feeder recloser

## Voltage-Time (V-T) Type Sectionalizer

- V-T-sensing sectionalizers (reclosing sectionalizers) need to sense only voltage, they do not measure fault current or count the number of recloser shots prior to lockout
- V-T logic monitors only voltage and time; current coordination is not necessary
- Reclosing sectionalizers automatically open upon loss of voltage and systematically close distribution switches until the fault is re-exposed
- V-T input-sensing logic enables more selective operation of sectionalizers, particularly in lateral taps
- The V-T-sensing sectionalizer is operated in conjunction with an upstream recloser, but requires no current threshold or inrush current coordination
- The number of voltage-time-sensing sectionalizers in a series is without practical limit

| Features                                                     | Benefits/Descriptions                                                                                                                                                                                                                                                                                      |
|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| V-T-Control Logic                                            | Does not require fault current or count the number of recloser shots prior to lockout; eliminates typical problems associated with short, highly loaded distribution lines since current coordination is not required; any number of sectionalizers can be used in series to maximize circuit reliability. |
| Vacuum Interruption and Heavy-Duty Motor Operating Mechanism | Proven, maintenance-free performance. Only requires inspection every 15,000 operations.                                                                                                                                                                                                                    |
| Solid Dielectric Joslyte Insulation                          | Proprietary Joslyte solid dielectric with superior insulation and mechanical properties; environmentally friendly, 40-year, field-proven technology; NO oil, NO gas, NO hassle.                                                                                                                            |
| Moisture-Control Bladder System                              | No internal heater required; no need to energize heaters during long storage periods; moisture- and maintenance-free.                                                                                                                                                                                      |
| Ease of Installation                                         | Lightweight design with options for wood-pole mounting.                                                                                                                                                                                                                                                    |
| Microprocessor Control                                       | Source-side lockout logic; automatic source transfer; remote supervisory control interface; automatic open-tie logic; no batteries required.                                                                                                                                                               |

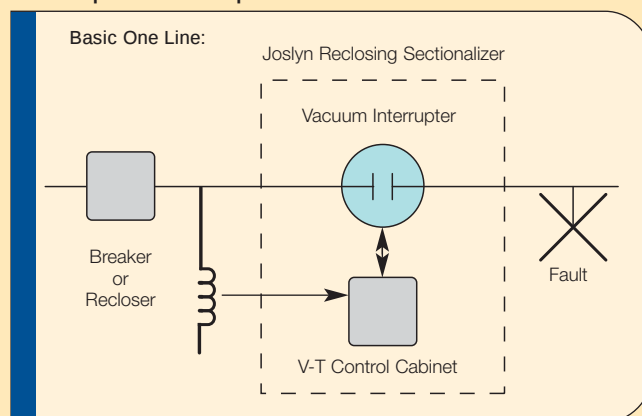
## Reclosing Sectionalizers with Voltage-Time (V-T) Controls

The V-T controls used with the Joslyn Hi-Voltage™ reclosing sectionalizer sense the presence or absence of line voltage on the system. Sensing voltage rather than current eliminates the problems inherent in coordinating with the time-current characteristics of reclosers or breakers.

V-T controls operate in the following sequence:

1. When a fault occurs, a breaker or recloser opens. Upon loss of voltage, the Joslyn Hi-Voltage reclosing sectionalizer automatically opens after a user-set time duration (0.1–25.5 seconds).
2. When the upstream breaker or recloser closes, line voltage is stored to the controls of the open Joslyn Hi-Voltage reclosing sectionalizer. The Joslyn Hi-Voltage reclosing sectionalizer automatically closes after a preset time. This time is determined by an adjustable timer in the control cabinet (1–255 seconds).
3. After the reclosing sectionalizer closes, a lockout timer starts. The lockout timer is an adjustable timer (1–255 seconds) in the control cabinet. If a fault occurs and the breaker opens within the preset time interval of the lockout timer, the Joslyn Hi-Voltage reclosing sectionalizer will open and lock out.
4. The reclosing sectionalizer can lock out only if voltage is lost while the lockout timer is running. If the preset time of the lockout timer has expired with no loss of voltage, the control resets to its initial position.

## Sequence of Operations



## Open Loop System with Reclosing Sectionalizers

Joslyn Hi-Voltage™ reclosing sectionalizers provide a simple approach to isolating faults by eliminating coordination problems. In Figure 1, Joslyn Hi-Voltage reclosing sectionalizers with V-T Logic controls are shown as S1 and S2 and are mounted between Recloser R1 and Sectionalizer S3. The sectionalizer shown as S3 utilizes the Open-Tie (O-T) Logic and is in the open position, while all the other devices are shown closed. If a fault occurs anywhere on the load side of R1, R1 senses the fault and opens. Assume that the fault (F1) is actually between S1 and S2. When the fault occurs, R1 senses the fault and opens. Line voltage on the load side of R1 becomes zero. When this occurs, the V-T controls sense loss of voltage, and S1 and S2 always open automatically upon loss of voltage after a pre-set time delay. R1 will automatically reclose depending on the setting of its control circuit. This restores line potential up to S1.

The control circuit of S1 senses that line voltage has been restored and initiates the control's close timer. When the close timer completes its cycle, S1 closes. A second adjustable timer called the lockout timer immediately begins its timing cycle. If S1 has closed into a fault, then R1 will sense the fault and open. Upon loss of potential to S1, S1 will also open during the period the line is de-energized. Since S1 opens while its lockout timer is timing, S1 will be in a locked-out state and will not close again automatically. The S2 sectionalizer downstream will remain open because of an added time delay set in the close timer of S2, so that the sectionalizer would not close unless S1 closes and resets. When R1 recloses, it restores all customers up to the open and locked-out S1. S1 must be reset before it can be closed and/or begin any additional automatic operation. Note that if the fault was upstream from S1, R1 would open and lock out to isolate the faulted section. S1 would open on loss of voltage and remain open but would not lock out.

### Open Loop System — Reclosing Sectionalizers

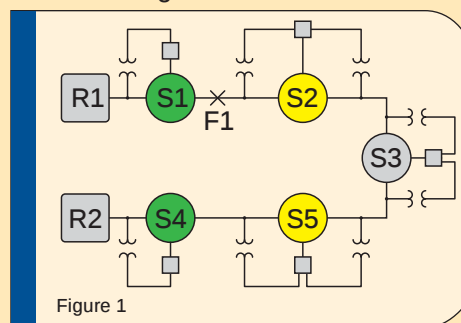


Figure 1

During the process of the S1 sectionalizer locking out, S2's source-side voltage input senses line voltage coming and going in a short duration, providing the S2 control with the capability to recognize that a permanent fault occurred upstream. Based on this capability, the S2 control will actually open and lock out, completely isolating the other side of the faulted area. The S3 sectionalizer, programmed with the available O-T Logic, will automatically sense the loss of potential on one side and close after a predetermined delay in order to restore all customers on the non-faulted section of the circuit between S2 and S3. The same logic and sequence of events would occur on the R2 side of the loop scheme shown in Figure 1.

### Radial Feeds with Lateral Taps

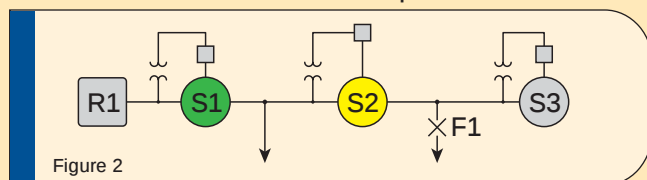


Figure 2

Figure 2 is similar to Figure 1, except this circuit is a standard radial feeder with the addition of a tapped line between the series of three Joslyn Hi-Voltage reclosing sectionalizers. If we assume that the tapped line is long and relatively less reliable than the main feeder, the Joslyn Hi-Voltage reclosing sectionalizers can be used effectively to isolate the unreliable line and maintain service to the section of line between recloser R1 and S1. In the series combination sectionalizers utilizing V-T Logic,

all sectionalizers open when R1 senses a fault, opens and de-energizes the line. As the system attempts to restore the line and isolate the faulted area, each sectionalizer independently closes and resets until the faulted area is encountered and isolated. In this figure, the fault F1 is on the lateral tap between S2 and S3, so after the series of operations, R1 and S1 will close to restore the load, S2 will open and enter into a lockout state (based on the same logic as described for S1 in Figure 1) and S3 will be open but not locked out.

### Fused Lateral Tap

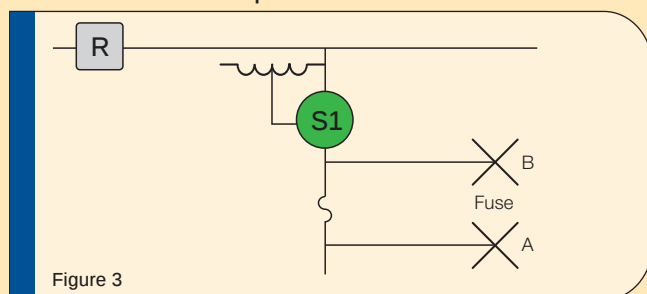


Figure 3

Figure 3 represents a three-phase tap fused at its midpoint. The recloser is set to open on a fast curve to prevent fuse-blowing on temporary faults. The reclosing sectionalizer will remain closed while the recloser attempts to restore the circuit. If a permanent fault occurs at point A, the fuse will blow before the recloser opens a second time on a slow curve, which also means the sectionalizer S1 will remain closed. If the fault is at point B, the recloser will open on a slow curve and after the pre-set open time delay, the reclosing sectionalizer S1 will now open. The recloser will open to interrupt the fault, and the reclosing sectionalizer

will lock out to isolate the fault. The recloser will then close to restore the rest of the circuit. On mixed cable and overhead systems, the reclosing sectionalizer can be enabled to open instantaneously whenever the recloser opens. This minimizes the number of reclosings that may involve cable systems.

## Preferred-Alternate Automatic Transfer Operation Schemes

The standard Joslyn Hi-Voltage™ reclosing sectionalizer controls can be configured for use in Preferred-Alternate arrangements to provide quick restoration of service to any critical load, with the additional feature of automatic fault isolation.

### P-A Operation Schemes with No Interconnection between Controls

The most basic arrangement includes the standard control set for O-T and V-T control functions as shown **below**. This specific arrangement requires no interconnection between the controls, which provides flexibility in the location of the switches without any distance limitations.

#### Case 1: Loss of the Preferred Source

When the preferred source is lost, the NC switch opens after its variable open delay timer expires. The open delay timer can be set by the user to enable permanent loss of the preferred source prior to a transfer. The NO switch then closes and restores service to the load after its variable restraint timer and close timer expire.

#### Case 2: Automatic Throwback

When the preferred source returns, the open NC switch closes after its close timer expires, and the sources will be paralleled.\* The system can be returned to the normal configuration by placing the NO control to manual mode and opening the O-T switch. Once the switch is open, return the control to automatic mode.

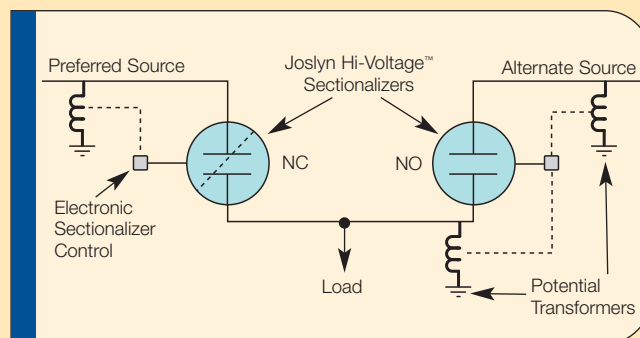
\* By adding a potential transformer on the load side of the preferred switch and enabling the "V-T Close Inhibit" feature, the NC switch can be prevented from closing if it is not desired to parallel the sources. However, when the alternate source is lost, the NO switch automatically opens and the NC switch closes, returning the system to initial/normal status.

#### Case 3: Fault on the Load

If a permanent fault\* occurs on the load side of the NC switch, the NC switch opens and locks out due to its normal voltage-time logic. The NO switch closes in response to the loss of the preferred source. The NO switch then opens and locks out due to its voltage-time logic. Once the O-T control closes the NO switch, it acts like a V-T control until returned to its normally open position. The NO switch can be prevented from closing into the fault by selecting the "Source Side Lock Out" feature, which locks the switch open upon sensing the operation of the NC switch. The fault is now isolated and both feeders are in service up to the open switches. Once the fault is repaired, both controls will need to be reset because they were locked out.

\* The V-T logic prevents transfer for temporary faults following reclosing.

#### No Interconnection



NOTE: NC = Normally Closed; NO = Normally Open

#### Case 4: Fault on the Load while Being Served by the Alternate Source

If a fault on the load occurs after a transition to the alternate source, the closed NO switch opens and locks out per the voltage-time logic. If the preferred source returns, the open NC switch closes into the fault after its close timer expires and then opens and locks out. The closing can be blocked if the V-T control is placed in the manual mode prior to the return of the preferred source.

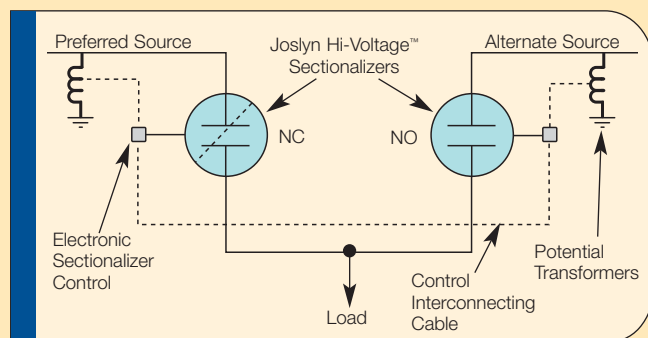
#### Case 5: Alternate Source Is Lost while the Load Is Served by the Preferred Source

If the alternate source is lost, the NO switch closes and the preferred source back-feeds the alternate source. This sequence can be changed to prevent O-T closure by utilizing the selected close option if back feed is not desired.

### P-A Operation Schemes with Interconnection between Controls

Below is a typical application with interconnected controls. This configuration eliminates the need for potential transformers on the load side of the NO switch, provides automatic throwback and automatically locks out both switches for load-side faults.

#### Interconnection



NOTE: NC = Normally Closed; NO = Normally Open

#### Timer Suggestions

The total time of the close timer in the NO control must be at least 5 seconds greater than the total time of the close timer plus the maximum reclosing time of the upstream protective device on the preferred source. This will enable the sectionalizers to properly isolate faults.

#### Case 1: Loss of the Preferred Source

When the preferred source is lost, the NC switch opens after its adjustable open delay timer expires. The NO switch closes and restores service to the load after its adjustable close timer expires. The restraint timer is not used because the control is not configured as an O-T.

#### Case 2: Automatic Throwback

When the preferred source returns, the NC switch closes after its close timer expires. Then, the NO switch automatically opens when its open delay timer expires, providing a hot transfer back to the preferred source. The system will then be back in its initial configuration.

#### Case 3: Fault on the Load

If a permanent fault occurs on the load following attempts to clear it from the system, the NC switch opens and locks out due to its normal voltage-time logic. The NO switch is automatically prevented from closing because the NC switch has locked out. The fault is now isolated and both feeders are in service up to the open switches. The NC control will have to be reset once the fault is repaired.

#### Case 4: Fault on the Load while Being Served by the Alternate Source

If a fault occurs on the load after a transition to the alternate source, the closed NO switch opens and locks out per the voltage-time logic. If the preferred source returns, the open NC switch is prevented from closing. The NO control will have to be reset once the fault is repaired.

#### Case 5: Alternate Source Is Lost while the Load Is Served by the Preferred Source

If the alternate source is lost, the NO switch will not close and back-feed the alternate source.

# Joslyn Hi-Voltage™ Reclosing Sectionalizers for Automatic Sectionalizing

## No batteries required!

Joslyn Hi-Voltage™ reclosing sectionalizers are designed to improve continuity of service in distribution systems. By isolating faults, outages are confined to a small number of customers. Joslyn Hi-Voltage™ reclosing sectionalizers are unique in combining recloser and sectionalizer logic without the limitations of current coordination.

Unlike other reclosers and sectionalizers, Joslyn Hi-Voltage™ reclosing sectionalizers do not require fault current or count the number of recloser shots prior to lockout. The control automatically opens the Joslyn Hi-Voltage™ vacuum switch during the “dead time” of the station recloser. The Joslyn Hi-Voltage™ switches then systematically close as voltage is restored to their source side until the faulted section is located, causing automatic opening and lockout of the Joslyn Hi-Voltage™ switch that closed into the fault. This basic voltage-time (V-T) logic does not require current coordination.

15 through 69kV sectionalizer packages are available with Joslyn Hi-Voltage™ VSV and VBM Switches.



Microprocessor-Based  
V-T Control for Automatic Sectionalizing

### Specifications

Source-Side Lockout: Detection requires 5–6 cycles above voltage threshold

Voltage-Sensing Response Time: Approximately 2 cycles

Low-Voltage Threshold Range: Adjustable range 90–115VAC

Remote Indication Contacts: 5A @ 120VAC/30VDC

Adjustable Operating Times: Timer range

Open Delay Timer: 0.1–25.5 sec.

Close Timer: 1.0–255 sec.

Lockout Timer: 1.0–255 sec.

O-T Restraint Timer: 2.0–510 sec.

Source-Side Lockout Reset Timer: 1.0–15 sec.

High-Current Reset Timer: 0.1–12.7 sec.

Immediate Second Close Reset Timer: 5.0 sec.–5.0 min.

Control Power: 90–140VAC RMS, 50/60Hz, 40–60W normal

Ambient Temperature: -50° C to 50° C\*

Standards: ANSI/IEEE C37.90.1, 1974

\* For applications below -25° C, order low-temperature package, Option L.

### Reference Operating Specifications

|                             | Operating Voltage             | Vacuum Switch Close Time | Open Time |
|-----------------------------|-------------------------------|--------------------------|-----------|
| VBM Reclosing Sectionalizer | 120VAC                        | 3 sec.                   | 2 cycles  |
| VBM with Battery Operation  | 24VDC                         | 6 sec.                   | 2 cycles  |
| VSV Reclosing Sectionalizer | 120VAC or Capacitor Discharge | 1 cycle                  | 1 cycle   |

(Subject to change due to specific controls)

## Ordering Information for Joslyn Hi-Voltage™ V-T Controls for Automatic Sectionalizers

### Specify:

**Version 1** This control includes all three (3) option PC boards and the O-T option

**Version 2** This control includes the O-T option and has provision for all three (3) plug-in option PC boards; the option PC boards themselves must be ordered separately

**Version 3** This control includes all of the standard featured options including the O-T option; it does not have provision for the three (3) option PC boards

**Version 4** This control includes all of the standard featured options but does not include the O-T option; sockets are provided to add the O-T option; this control does not have provision for the three (3) option PC boards

### Options for Version 2

**A** Three-Phase Voltage-Sensing Option PC Board (6 inputs max.)

**B** Remote Control Input Option PC Board

**C** High Overcurrent with Voltage-Loss Options PC Board (includes 3 optional responses)

### Optional Accessories

**D** Open-Tie Relays (for upgrading a Version 4 to a Version 3)

**E** Terminal Box — mounted on Vacuum Switch for hard wiring between Switch and Control

**F** Shielded Cable with Plug on Both Cable Ends (Option G required)

**G** Cable Connector on Bottom of Control Cabinet for Plug-In Shielded Cable Option F

**H** Cable Connector on Bottom of Control Cabinet and Plug with Cable for 120VAC Power Source, 25-ft. Length Standard

**I** External Lamp — Amber — for Lockout Indication

**J** External Lamps — Red/Green — for Vacuum Switch Closed/Open Indication

**K** Simulator Control Box with Cable (tester box for switch simulation)

**L** Low-Temperature Package for Operation to -50° C

**M** Control Cabinet Door Closing Toggle Clamps

**N** Cable Connector on Bottom of Control Cabinet and Plugs with Cables for Three-Phase 120VAC Inputs (specify length)

**O** Operations Counter in the Control (note that a mechanically actuated Operations Counter is supplied on the VBM Switch as standard)

**P** Control Cabinet with Extra Space for an RTU and/or Radio

**Q** Control Cabinet with Battery Backup for Dead-Line Switching

**R** Joslyn Hi-Voltage™ Control with Power Supply and Battery Backup for Radio and RTU (specify RTU and Radio)

**S** High-Security Cable with Internal Connectors

### Other Automatic Controls

**P-A** Preferred-Alternate controls use V-T logic to provide automatic source transfer with the automatic delayed reclosing feature to allow temporary faults to clear. These controls also provide automatic faulted load isolation from the feeding source and prevent backfeeding from one source to the other.

**A-T** Automatic Transfer systems provide automatic source transfer for high-reliability, dual-power-sourced loads. The system will transfer after loss of voltage on one source meets a user-set time period. The control can transfer at high speeds of approximately 10 cycles.

The user can specify the following features for either the P-A or A-T controls:

- Automatic return to preferred
- Parallel or dead-line transfer
- Three-phase voltage sensing
- Two loads with three Joslyn Hi-Voltage™ switches
- Battery backup for dead-line switching
- Current sensor package
- Remote supervisory control interface
- R-S Plus control integration with RTU and Radio

### Non-Automatic Controls

**Remote** A Control Cabinet containing open and close push buttons, enabling local and/or remote operation using only the user-provided 120VAC.

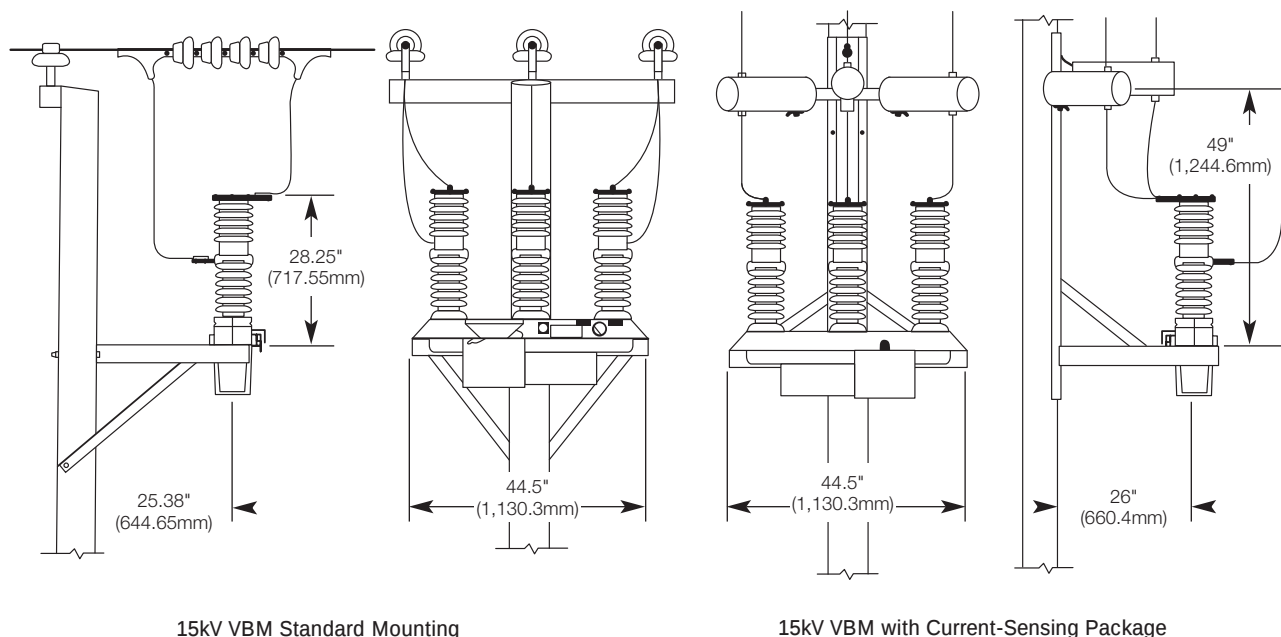
**R-S** DC power supply and batteries designed to control the Joslyn Hi-Voltage™ switch by remote-supervisory signals with battery backup for dead-line switching. The Joslyn Hi-Voltage™ control is normally operated directly from the AC control power and uses the DC power for backup operation only when AC control power is lost.

**R-S Plus** RTU, radio and switch control integration complete with one DC power supply and battery backup for the total control system. User to specify RTU and radio to be provided or Joslyn Hi-Voltage™ factory to provide mounting provisions only.

**NOTE:**

- All the above control systems can be manually operated by open and close buttons in the control cabinet.
- Joslyn Hi-Voltage™ vacuum switches can be operated directly using the supplied control cable without requiring a Joslyn Hi-Voltage™ control cabinet.

## Typical Mounting 15kV VBM Distribution Sectionalizer



### Joslyn Hi-Voltage™ Distribution Sectionalizer Ratings

| System Voltage (kV) <sup>6</sup> | Switch Type | Impulse Withstand BIL <sup>2</sup> |                            | Continuous Current (Amps) | Interrupting Rating (Amps) <sup>4</sup> | Fault Closing and Momentary Current Rating (Amps) <sup>5</sup> |
|----------------------------------|-------------|------------------------------------|----------------------------|---------------------------|-----------------------------------------|----------------------------------------------------------------|
|                                  |             | Line to Ground (kV)                | Open Gap (kV) <sup>3</sup> |                           |                                         |                                                                |
| 15 <sup>1</sup>                  | VSV         | 95                                 | 95                         | 200                       | 200                                     | 9,000                                                          |
| 15                               | VSV         | 125                                | 95                         | 200                       | 200                                     | 9,000                                                          |
| 15                               | VBM         | 150                                | 110                        | 400                       | 3,000                                   | 20,000                                                         |
| 15                               | VBM         | 150                                | 110                        | 600                       | 4,000                                   | 20,000                                                         |
| 15                               | VBM         | 150                                | 110                        | 600                       | 8,000                                   | 20,000                                                         |
| 25 <sup>1</sup>                  | VSV         | 95                                 | 95                         | 200                       | 200                                     | 9,000                                                          |
| 25 <sup>1</sup>                  | VSV         | 125                                | 95                         | 200                       | 200                                     | 9,000                                                          |
| 25 <sup>1</sup>                  | VBM         | 150                                | 110                        | 400                       | 3,000                                   | 20,000                                                         |
| 25 <sup>1</sup>                  | VBM         | 150                                | 110                        | 600                       | 3,000                                   | 20,000                                                         |
| 25 <sup>1</sup>                  | VBM         | 150                                | 110                        | 600                       | 6,000                                   | 20,000                                                         |
| 25                               | VBM         | 150                                | 125                        | 600                       | 3,000                                   | 20,000                                                         |
| 25                               | VBM         | 150                                | 200                        | 300                       | 3,000                                   | 15,000                                                         |
| 34.5 <sup>1</sup>                | VBM         | 200                                | 110                        | 600                       | 600                                     | 20,000                                                         |
| 34.5                             | VBM         | 200                                | 200                        | 300                       | 3,000                                   | 15,000                                                         |
| 46                               | VBM         | 250                                | 200                        | 300                       | 3,000                                   | 15,000                                                         |
| 69 <sup>7</sup>                  | VBM         | 350                                | 300                        | 300                       | 3,000                                   | 15,000                                                         |

1. Solidly grounded systems only.

2. 1.2 x 50 microsecond WAVE.

3. Note that VBM and VSV switches do not provide a visible open gap or a coordinated open gap/line-to-ground insulation system. Therefore, they cannot be used to establish a safety clearance for personnel. Voltage surge protection should be coordinated with the open gap BIL.

Contact Thomas & Betts for additional information.

4. RMS amperes symmetrical.

5. RMS amperes asymmetrical.

6. Consult factory for higher-voltage applications through 230kV.

7. Solenoid-operated, three mechanisms.

**Ordering Information** for Joslyn Hi-Voltage™ Distribution Sectionalizers

1. Specify Joslyn Hi-Voltage™ Distribution Sectionalizer by selecting voltage class and current rating desired from Sectionalizer Ratings Table on page 66.
2. Specify type of control required.

**Example:**

- A. Joslyn Hi-Voltage™ Distribution Sectionalizer Switch Model VBM, 25kV, 600A control type, R-S Plus.
- B. Joslyn Hi-Voltage™ Distribution Sectionalizer Switch Model VBM, 15kV, 400A control type, Reclosing Sectionalizer, Version 1, Options F and G.

NOTE: Pole-mounting bracket for VBM is included.

Standard control cable length is 26 ft. Specify if longer cable is required (45 ft. max. for VBM motor-operated).

1A and 1B auxiliary contacts are standard.

Line voltage sensing is usually provided by user.

Specify if current-sensing mounting provisions are required.

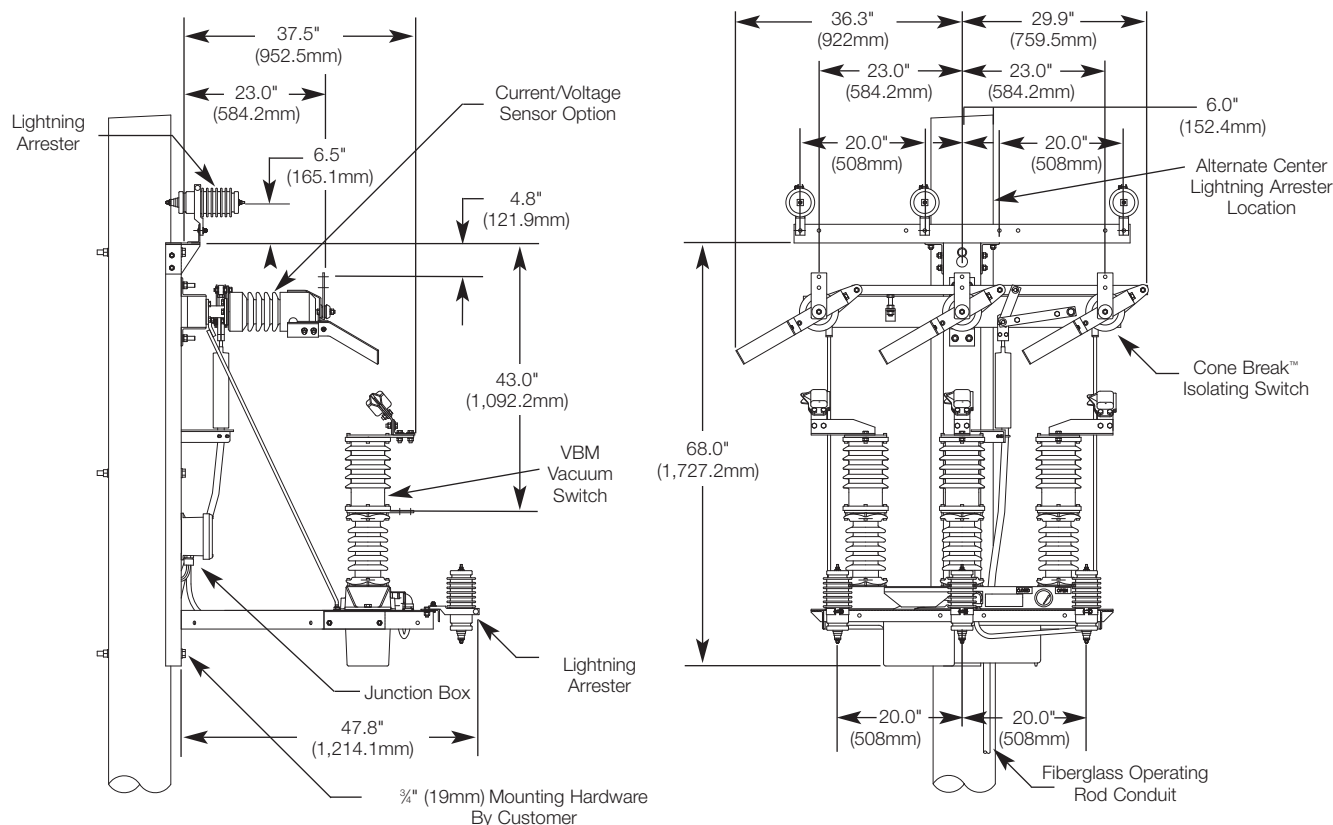
# Joslyn Hi-Voltage™ Automaster™ Distribution Automation Switch Package with ConeBreak™ Isolating Switch

The Automaster Distribution Automation Switch Package expands the already impressive Joslyn Hi-Voltage™ distribution automation switch offering by combining the 40-year, field-proven VBM vacuum switch and the economical, low-profile ConeBreak Isolating Switch with any one of a number of advanced automatic manual and remote control options. This component approach to distribution automation allows the customer to choose from a low-cost package to a complete package that includes switch, isolator, current/voltage sensors and integrated automatic or remote-operated controls that include RTU, radio and backup battery supply for all components.



The ConeBreak Isolating Switch is group operated via a unique, non-metallic, flexible operating rod, providing fast, easy and safe mounting that can be routed using a standard conduit pathway to avoid underbuild obstacles. The rotating insulators in each ConeBreak phase can be supplied with optional current, voltage or current/voltage sensors. No external moving parts traverse the pole during operation, and manual operation can be performed at either switch (with a switch stick) or at ground level using the reciprocating pump-handle operating mechanism. The ConeBreak switch can be provided with the VBM sectionalizing switches to provide quick and easy visible circuit isolation using a single manual operating mechanism, or retrofitted to existing VBM switches. The Automaster package is available for either distribution automation (remote controlled) or automatically controlled VBM distribution switches through 38kV. Joslyn Hi-Voltage experts can also provide automatic transfer switch systems that include electro-mechanical or solid-state switches and solid-state control circuitry. These systems can provide transfer times ranging from 10 cycles to 5 seconds.

## 15kV, 6,000A Automaster Package



## Ordering Information for Joslyn Hi-Voltage™ Automaster™ Switch Package

Contact your Sales Representative.



## QUICK REFERENCE

### Joslyn Hi-Voltage™ Disconnect Switches

page(s)

Series RF-2 . . . . . 72–73

Model JMO . . . . . 74–75

Series RB-1 . . . . . 76–77

## Sectionalize or isolate with Joslyn Hi-Voltage™ air disconnect switches.

Joslyn Hi-Voltage Series RF-2 vertical-break disconnect switches provide sectionalizing or isolating service for voltage ratings from 15kV through 230kV for currents from 600 to 3,000A. Joslyn Hi-Voltage Series RB-1 side-break disconnect switches are designed for isolating power circuit breakers, sectionalizing transmission lines and opening primaries of transformer banks for voltage ratings from 15kV through 115kV for currents from 600 through 1,200A. Both Series RF-2 and Series RB-1 disconnect switches feature all copper and bronze construction.

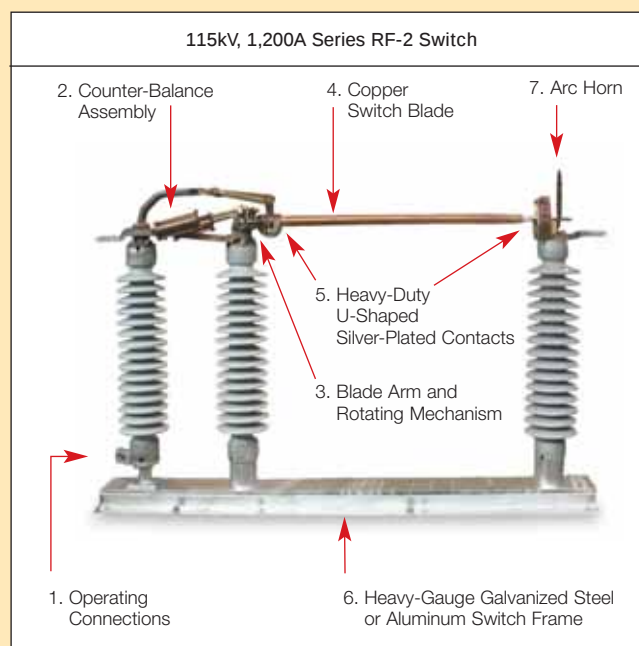
## Joslyn Hi-Voltage™ disconnect switches offer installation flexibility and dependable service.

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 161kV can be mounted vertically or underhung as well as upright. The Series RF-2 switch includes these outstanding features:

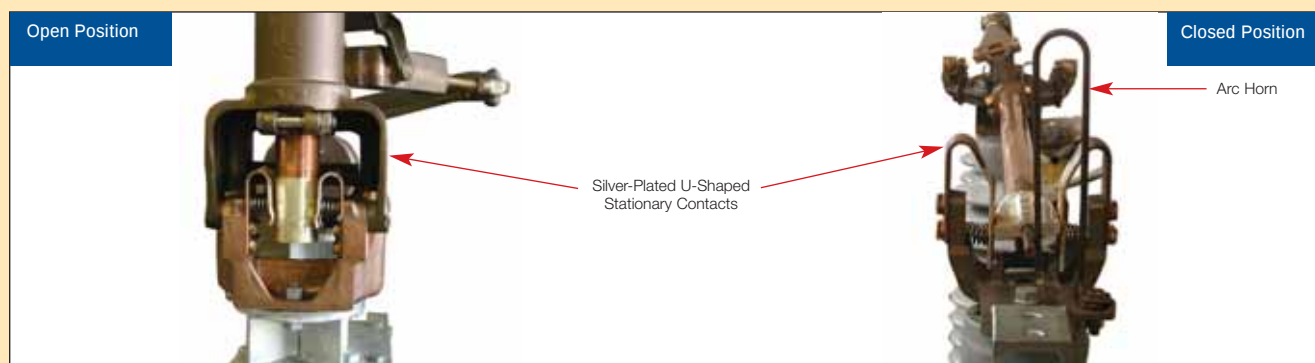
1. Operating mechanism connections can be located at various positions. One pole of the three-pole switch has an adjustable crank, permitting mechanism bearings to be arranged in virtually any required position.
2. Counter-balance assembly affixed to blade is standard for switches from 69kV to 230kV or for switches with 3,000A 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.



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

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

**Life Test** — The 161kV, 1,600A 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 161kV, 1,600A 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.



34.5kV 3,000A Series RF-2 Switch with MVI

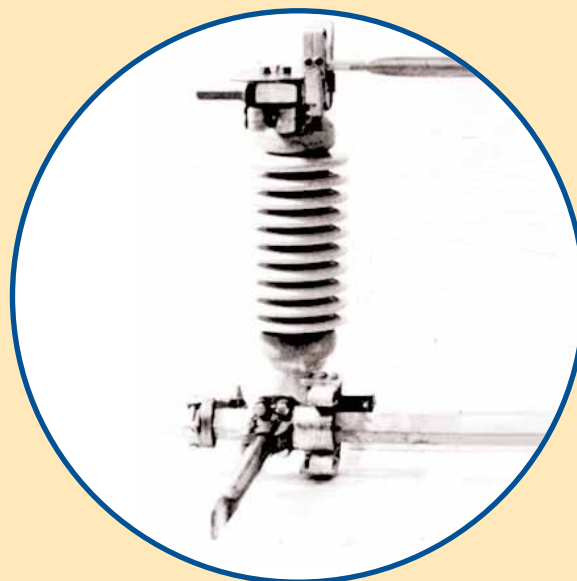


Underhung Application

## 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.



# Joslyn Hi-Voltage™ Series RF-2 Vertical-Break Air Disconnect Switches

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

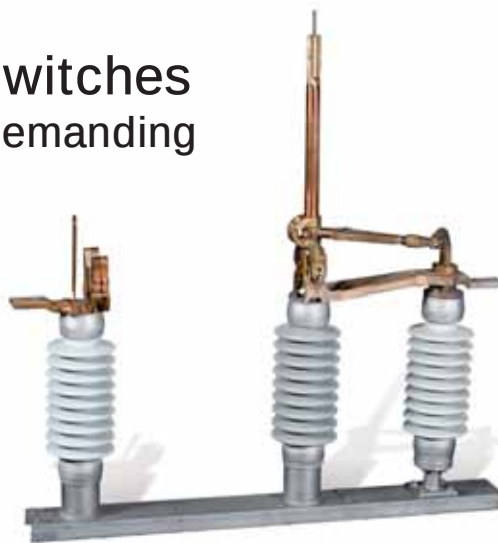
Joslyn Hi-Voltage™ Series RF-2 Vertical-Break Air Disconnect Switches have been subjected to exhaustive testing both in the field and in the lab and have met or surpassed all duty requirements within their prescribed ratings.

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 15kV through 230kV, for currents from 600A through 3,000A. The horn-gap-type is capable of interrupting magnetizing currents and relatively low charging currents.



34.5kV 3,000A Series RF-2 Switch with MVI



Underhung Application

| Features                             | Benefits/Descriptions                                                                                                                                                                                                                          |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wide Voltage/Current Range           | Available in ratings of 15kV–230kV for currents of 600A–3,000A.                                                                                                                                                                                |
| Cool Operation                       | Runs cooler than other switch designs, offering longer service life.                                                                                                                                                                           |
| 50 Years of Field Experience         | Tested and proven reliable more than 50 years in the field.                                                                                                                                                                                    |
| Flexible Product Packaging           | Systems can be designed and supplied with manual operators (swing-handle type), electric motor operators (JMO), Kirk Key interlocks, auxiliary position indicator contacts and a full range of Joslyn Hi-Voltage Load Interrupter Attachments. |
| Optional Grounding Switch Provisions | Grounding Switches (FB-4) are available in parallel or perpendicular configurations. Can also be supplied for free-standing installations.                                                                                                     |

## Ratings

| Rated Max.<br>Voltage<br>(kV RMS) | Rated Withstand Voltage                |                                     |                                   | Current Ratings in Amperes       |                  |                  | Insulator NEMA<br>Tech. Ref. Post | Switch<br>Bolt<br>Circle |
|-----------------------------------|----------------------------------------|-------------------------------------|-----------------------------------|----------------------------------|------------------|------------------|-----------------------------------|--------------------------|
|                                   | Impulse<br>1.2 x 5<br>Wave kV<br>Crest | 60Hz<br>kV RMS<br>Wet<br>10 Seconds | 60Hz<br>kV RMS<br>Dry<br>1 Minute | Continuous<br>Current<br>at 60Hz | Momentary<br>(1) | 4 Seconds<br>(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                                 | 174                               | 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 Thomas & Betts for additional information.

NOTE: 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.

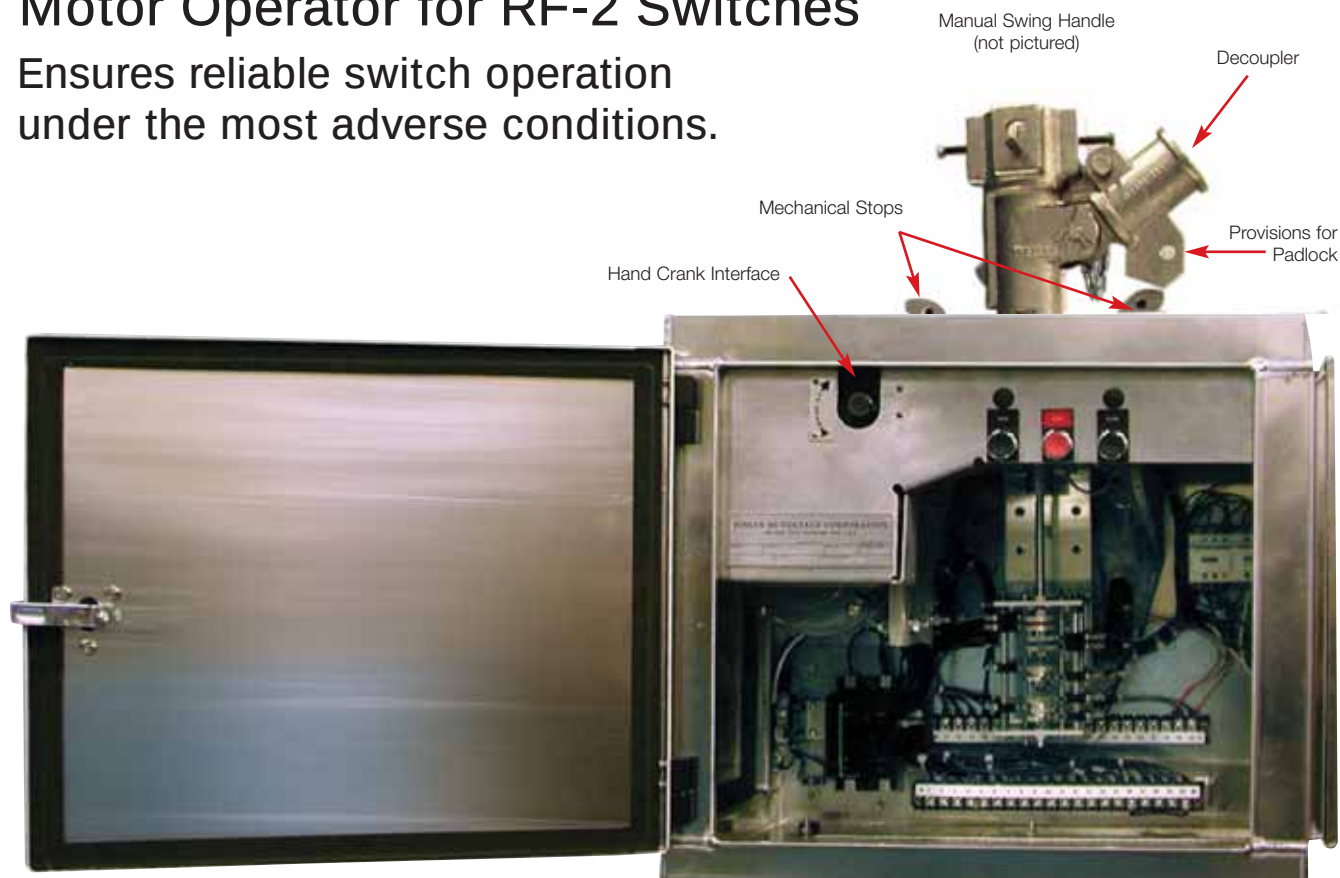
2. The 4-second rating is the total RMS current, including the D-C component if present, which the switch shall be taken as the integrated heating equivalent of the 4-second rating; the maximum test period shall not exceed 8 seconds.

## Ordering Information for Joslyn High-Voltage™ RF-2 Series Switch and FB-4 Grounding Switch

Contact your Sales Representative.

# Joslyn Hi-Voltage™ Model JMO Motor Operator for RF-2 Switches

Ensures reliable switch operation under the most adverse conditions.



The JMO Motor Operator, supplied for remote operation, can also be operated manually.

The optional Model JMO Motor Operator for the Series RF-2 Switches consists of a worm gear, housed in a rugged aluminum casting, that converts the output of a ½-horsepower series-wound motor and provides inherent safety. Dynamic braking eliminates the need for mechanical braking. The gears use a solid lubricant for corrosion-resistant long life and low-temperature operation. The Model JMO Motor Operator is packaged in an aluminum enclosure with space and access for easy installation wiring. A thermostatically controlled heater is provided. An all-aluminum hand crank connects directly to the gear drive and is interlocked, blocking the electrical control circuits when the handle is engaged.

The Model JMO Motor Operator has a decoupler system to disconnect the air switch operating shaft from the operator. The decoupler offers provision for padlocking the switch open or closed, as well as mechanical stops for manual switch operation when it is disengaged from the Model JMO Motor Operator. For this situation, a swing handle is provided for direct operation and for ice chopping.

| Features                                | Benefits/Descriptions                                                                                                                                                                                                                             |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10,000 or 20,000 in.-lbs. Torque Output | Developed at minimum operating voltages to ensure reliable switch operation.                                                                                                                                                                      |
| Fast Acting                             | Operating speeds range from 3 to 8 seconds.                                                                                                                                                                                                       |
| Built-In Decoupler with Swing Handle    | Provides the ability to disconnect the air switch operating shaft from the operator and to padlock the switch open or closed; swing handle enables direct operation of air switch when disengaged from operator and can be used for ice chopping. |

## Torque and Speed Ratings (at Min. Operating Voltage)

- 10,000 in.-lbs., 3–4 sec. at 180° rotation
- 20,000 in.-lbs., 6–8 sec. at 180° rotation
- Rated torque provided at minimum operating voltage
- Maximum shaft rotation 270°
- A ½ HP series-wound motor with split-field winding and dynamic braking

## Auxiliary Contacts

Five independent auxiliary contacts are provided for customer use. Fully adjustable through 360° and rated 15A at 125/250VAC and 0.5A at 125VDC, they are wired to the terminal strip.

## Enclosure

- Aluminum
- Front door features handle with provision for padlocking
- Print holder on inside of front door
- Side doors provided with latches on inside
- All doors hinged, swing 180° and can be removed
- Dual-voltage heater and thermostat included

## Gearing Motor

The motor output is geared down through a spur gear system and then to a worm gear. The worm gear prevents rotation of the system through the output shaft, eliminating any need for a mechanical brake. The worm gear is mounted in an aluminum-cast housing, and the gear train is guarded to prevent access to the mesh points for personnel safety. Gears are coated with a solid lubricant for corrosion-resistant long life and low-temperature operation.

## Manual Operation

An all-aluminum hand crank connects directly to the gear drive and is interlocked to block the control contactor circuits, preventing normal electrical operation when the handle is engaged. A 3-ft. swing handle is provided. The handle is to be applied with the output decoupler in the disengaged position for direct operation of the vertical operating pipe only.

## Output Decoupler

The output of the Model JMO Motor Operator has a decoupler system to disconnect the vertical operating pipe. A swing handle enables direct operation and ice chopping when the system is disconnected. The decoupler offers provision for padlocking in the open or closed position while in the disengaged position and can also be padlocked in the engaged position. The unit cannot be padlocked in the open or closed position while in the engaged position. Mechanical stops in the open and closed position enable manual operation. The coupler is indexed to the output shaft to ensure synchronization of the Model JMO Motor Operator position with the air switch position. Provisions for structural expansion allow for vertical displacement of the vertical operating pipe up to ½".

## Other Standard Features

- Operating push buttons for open, close and stop
- Removable conduit plate
- Thermal overload protective relay; mechanically and electrically interlocked reversing contactors
- Fused disconnects

## Optional Features

- Counter
- Indicating lights
- Additional auxiliary contacts for customer use in multiples of three
- Alternative auxiliary contacts rated 5A at 125VDC for customer use

## Specifications

| Control Voltages | Motor Rated Current (Amps) | Approximate Locked Rotor Current at Rated Control Voltage (Amps) |
|------------------|----------------------------|------------------------------------------------------------------|
| 48VDC            | 17                         | 58                                                               |
| 125VDC           | 6.8                        | 25                                                               |
| 250VDC           | 2.4                        | 15                                                               |
| 120VAC           | 6.4                        | 24                                                               |
| 230VAC           | 2.0                        | 14                                                               |

## Ordering Information for Joslyn Hi-Voltage™ Model JMO Motor Operator

Contact your Sales Representative.

# Joslyn Hi-Voltage™ Series RB-1 Side-Break Disconnect Switches

The copper solution for isolating and sectionalizing your service.

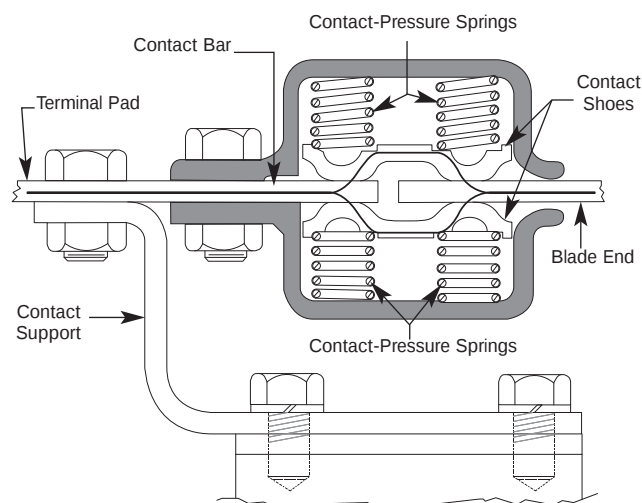
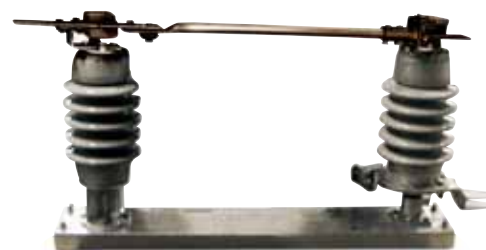
Joslyn Hi-Voltage™ Series RB-1 Side-Break Disconnect Switches provide affordable, reliable and time-proven isolating of power circuit breakers, sectionalizing of transmission lines and opening primaries of transformer banks from 15kV through 115kV.

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 3/4" thick coating of clear ice formed. The switches were operated and proved capable of breaking and clearing ice from the contact structures.



**Short-Circuit Tests** — The Series RB-1 Switch demonstrated ability to meet all industry requirements.

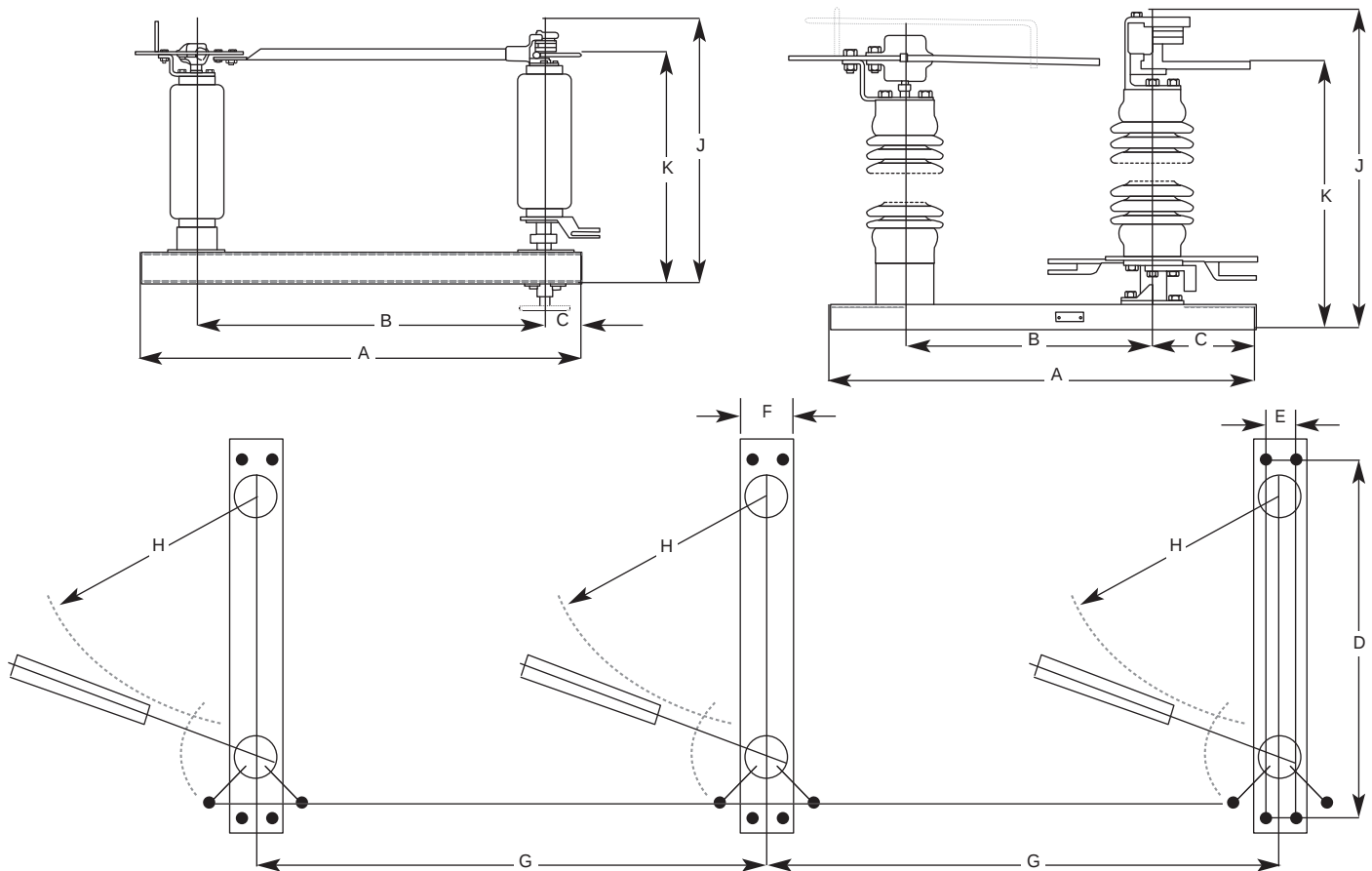
**Ice Test** — Even under extreme icing conditions, the Series RB-1 Switch proved capable of breaking and clearing ice from the contact structure.

**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.

| Features                                    | Benefits/Descriptions                                                                                                                                                                                                                          |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wide Range of Voltages and Currents         | Available in ratings of 15kV–115kV for currents of 600A–1,200A.                                                                                                                                                                                |
| Variety of Mounting Options                 | Ability to be mounted vertically, horizontally or in an underhung position offers installation flexibility; side-break opening minimizes space requirements.                                                                                   |
| Adjustable Crank on One Pole                | 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.                                                                                                                                                          |
| Flexible Product Packaging                  | Systems can be designed and supplied with manual operators (swing-handle type), electric motor operators (JMO), Kirk Key interlocks, auxiliary position indicator contacts and a full range of Joslyn Hi-Voltage Load Interrupter Attachments. |

## Mechanical Data



## Ratings

| Ratings |       | Impulse<br>Withstand kV | Insulator NEMA<br>Tech. Ref. No. | Dimensions in Inches (Approx.)* |    |    |    |    |           |                   |              |     |     |     |
|---------|-------|-------------------------|----------------------------------|---------------------------------|----|----|----|----|-----------|-------------------|--------------|-----|-----|-----|
|         |       |                         |                                  | A                               | B  | C  | D  | E  | F         | G<br>Horn-<br>Gap | Disc.<br>Sw. | H   | J   | K   |
| 14.4    | 600   | 110                     | 4                                | 27¾                             | 15 | 7⅞ | 24 | 3  | 5         | 36                | 30           | 10¾ | 20½ | 17½ |
| 14.4    | 1,200 | 110                     | 4                                | 27¾                             | 15 | 7⅞ | 24 | 3  | 6.7 #/ft. | 36                | 30           | 10¾ | 21¼ | 17¾ |
| 23      | 600   | 150                     | 7                                | 30¾                             | 18 | 7⅞ | 27 | 3  | 5         | 48                | 36           | 13½ | 22½ | 19¾ |
| 23      | 1,200 | 150                     | 7                                | 30¾                             | 18 | 7⅞ | 27 | 3  | 6.7 #/ft. | 48                | 36           | 13½ | 23¾ | 19¾ |
| 34.5    | 600   | 200                     | 10                               | 36¾                             | 24 | 7⅞ | 33 | 3  | 5         | 60                | 48           | 19  | 25½ | 22½ |
| 34.5    | 1,200 | 200                     | 10                               | 36¾                             | 24 | 7⅞ | 33 | 3  | 6.7 #/ft. | 60                | 48           | 19  | 26¼ | 22¾ |
| 46      | 600   | 250                     | 13                               | 42¾                             | 30 | 7⅞ | 39 | 3  | 6         | 72                | 60           | 25¾ | 28¾ | 25¾ |
| 46      | 1,200 | 250                     | 13                               | 42¾                             | 30 | 7⅞ | 39 | 3. | 8.2 #/ft. | 72                | 60           | 25¾ | 29½ | 25¾ |
| 69      | 600   | 350                     | 16                               | 54¾                             | 42 | 7⅞ | 51 | 3  | 6 ship    | 84                | 72           | 36½ | 40¾ | 37¾ |
| 69      | 1,200 | 350                     | 16                               | 54¾                             | 42 | 7⅞ | 51 | 3  | 12 #/ft.  | 84                | 72           | 36¾ | 41  | 37¾ |
| 69HD    | 600   | 350                     | 56                               | 67                              | 48 | 9½ | 62 | 8¾ | 2-5       | 108               | 96           | 38  | 44⅞ | 41⅞ |
| 69HD    | 1,200 | 350                     | 56                               | 67                              | 48 | 9½ | 62 | 8¾ | 6.7 #/ft. | 108               | 96           | 38  | 45⅞ | 42  |
| 115     | 600   | 550                     | 19                               | 76                              | 60 | 9½ | 71 | 8¾ | 2-5       | 120               | 108          | 50  | 59¾ | 56¾ |
| 115     | 1,200 | 550                     | 19                               | 76                              | 60 | 9½ | 71 | 8¾ | 6.7 #/ft. | 120               | 108          | 50  | 60¾ | 56¾ |

\* Dimensions are subject to change and should not be used for construction without confirmation.

## Ordering Information for Joslyn Hi-Voltage™ Series RB-1 Side-Break Disconnect Switches

Contact your Sales Representative.

This image shows a full page of blank, lined paper. It features approximately 28 horizontal blue lines spaced evenly across the page, typical of standard notebook paper. The lines are thin and light blue, set against a plain white background. There are no margins, text, or other markings on the page.

## QUICK REFERENCE

### Joslyn Hi-Voltage™ Load Interrupter Attachments for Air Switches — 15 to 230kV

page(s)

Series HVI . . . . . 84–85

Series UVI . . . . . 86–88

Series LSI . . . . . 89–91

Series JMVI . . . . . 92–94



## Expand the capabilities of disconnect switches.

Joslyn Hi-Voltage™ load interrupter attachments improve your operational efficiency and flexibility — and reduce the number of circuit breaker operations — by enabling the use of disconnect switches for applications such as loop sectionalizing, line dropping, load breaking and transformer-magnetizing current interruption. Devices that provide multiple functions on a single switch, like the Joslyn Hi-Voltage Series LSI Load Sectionalizer Interrupter, also increase personnel safety because they can eliminate the hazards of switch misoperation.

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

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" (558mm) 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 161kV and transformer-magnetizing current up to 230kV.



### 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 2,000A load breaking up to 34.5kV for solidly grounded systems and parallel switching up to 230kV.

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

### 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.





### Series JMVI Modular Vac-Rupter Interrupter Attachment for 230kV Systems

This device uses up to eight vacuum interrupters in series per phase for 230kV 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 2,000A load breaking, line charging current interruption and parallel switching up to 230kV.

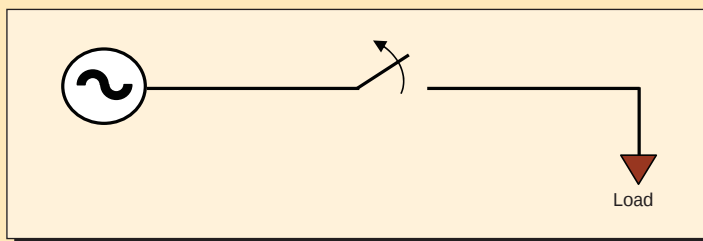
## Applications for Joslyn Hi-Voltage™ Load Interrupter Attachments

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

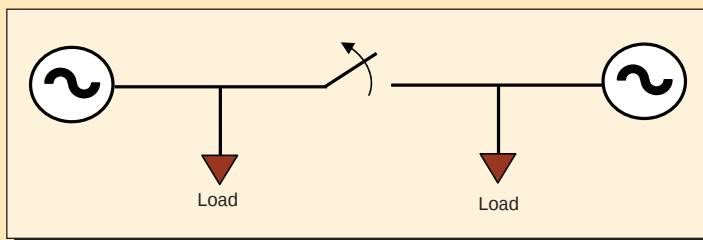


### Loop Sectionalizing

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



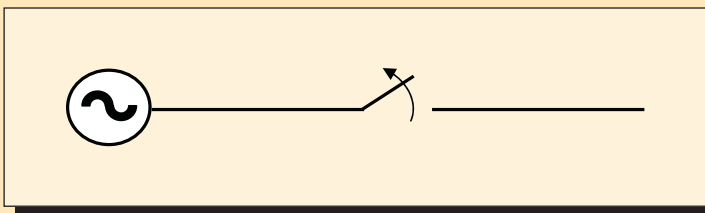
## Line and Cable Dropping

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 (34.5kV and below; up to 69kV with Voltage Limiter)
- Series HVI (69kV to 161kV)
- Series JMVI (230kV and below)



## Typical Conductor and Cable Charging Currents

### 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                                 |

### 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 1.5A 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.

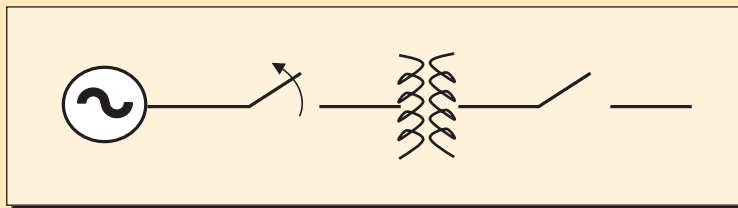
## Transformer-Magnetizing Current

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 (34.5kV and below; up to 69kV with Voltage Limiter)
- Series HVI (69kV to 230kV)



## Transformer General Reference Information\*

| System Voltage (kV) | Transformer MVA | Magnetizing Current per Phase | 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:

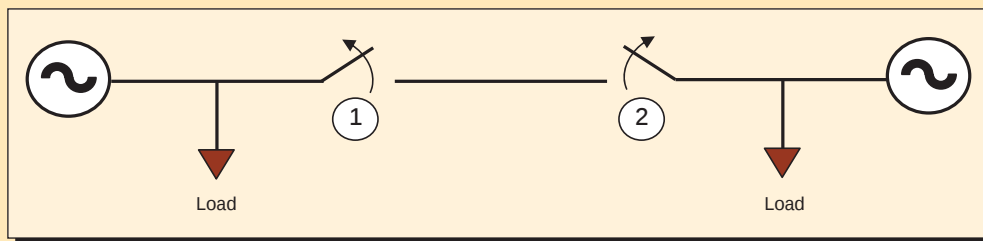
- Series UVI Universal Vac-Rupter Interrupter
- Series HVI Hi-Velocity Interrupter

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) | 2,000A Load Dropping | 2,000A Loop Sectionalizing <sup>1,2</sup> | Line Dropping <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<br>UVI V/L<br>LSI                     | HVI<br>UVI V/L<br>LSI      | HVI<br>UVI V/L<br>LSI            |
| 115                 | JMVI                 | UVI<br>LSI<br>JMVI V/L                    | HVI<br>LSI<br>JMVI V/L     | HVI<br>HVI<br>JMVI V/L           |
| 138                 | JMVI                 | UVI<br>LSI<br>JMVI V/L                    | HVI<br>LSI<br>JMVI V/L     | HVI<br>LSI<br>JMVI V/L           |
| 161                 | JMVI                 | UVI<br>LSI<br>JMVI V/L                    | HVI<br>LSI<br>JMVI V/L     | HVI<br>LSI<br>JMVI V/L           |
| 230                 | JMVI                 | UVI<br>LSI<br>JMVI V/L                    | JMVI                       | HVI<br>LSI<br>JMVI V/L           |

NOTE: 1. UVI and LSI can be applied where the peak recovery voltage is less than 30kV.

2. V/L = Joslyn Hi-Voltage™ Voltage Limiter Attachment.

# Joslyn Hi-Voltage™ Series HVI Hi-Velocity Load Interrupter Attachments

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

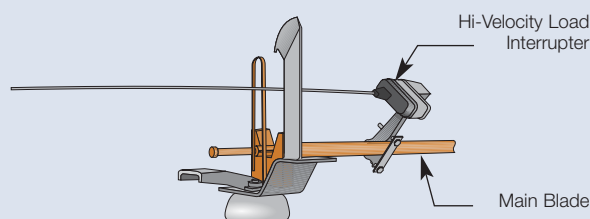
These economical air switch attachments mount on most gear- or motor-operated vertical- and side-break switches. They mount quickly and enable the affordable conversion of existing air switches — no special tools or training required. They install with the air switch on its mounting frame.

## Operation

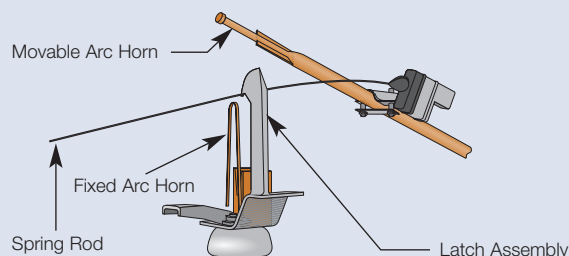
1. With the air switch closed (top diagram), current flows through the main blade. The Series HVI Interrupter is out of the circuit.
2. As the air switch blade operates (second diagram), the movable arc horn slides along the fixed arc horn until the spring rod engages the latch. Current flow is established through the Series HVI Interrupter, its spring rod and the latch.
3. As the air switch blade continues to open (third diagram), energy is stored in the spring rod of the Series HVI Interrupter.
4. 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.



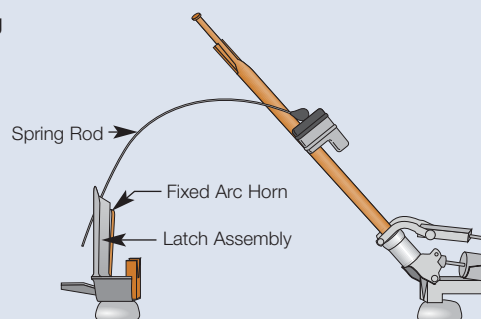
1. Closed



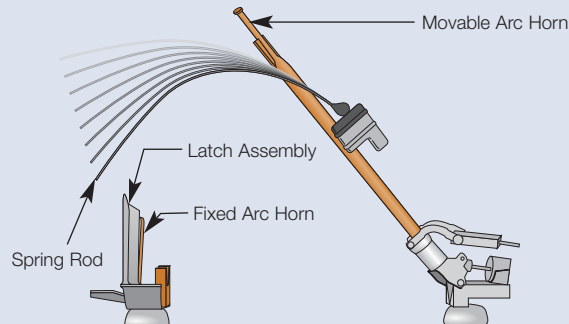
2. Opening



3. Opening



4. Open

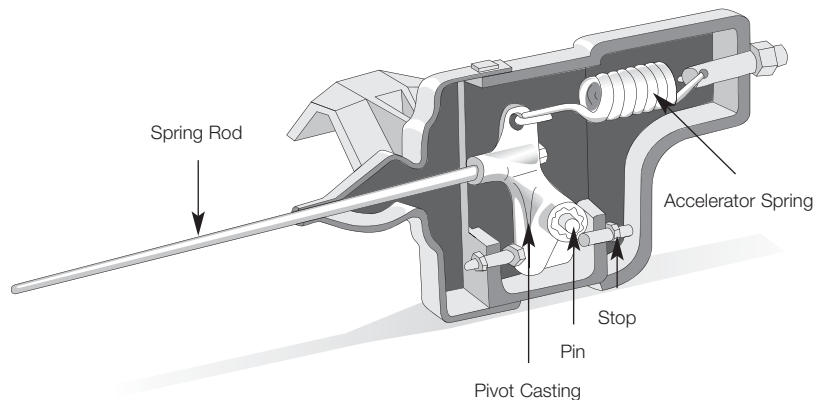


| Features                                | Benefits/Descriptions                                                                                                                                                                                                                                                           |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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.                                                                                                                                       |
| Quick and Easy to Install               | 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.                                                                                                                                                                                                            |
| Long, Low-Maintenance Service Life      | Virtually maintenance-free; requires only an inspection every 5 years or 5,000 operations.                                                                                                                                                                                      |
| Proven Performance                      | 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. |
| Universal Mounting                      | 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.                                                                                                                    |

## 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 |

## Ordering Information for Joslyn Hi-Voltage™ Series HVI Hi-Velocity Load Interrupter Attachments

To order a Joslyn Hi-Voltage™ Series HVI Load Interrupter, please supply the following information:

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

# Joslyn Hi-Voltage™ Series UVI Universal Vac-Rupter Load Interrupter Attachments

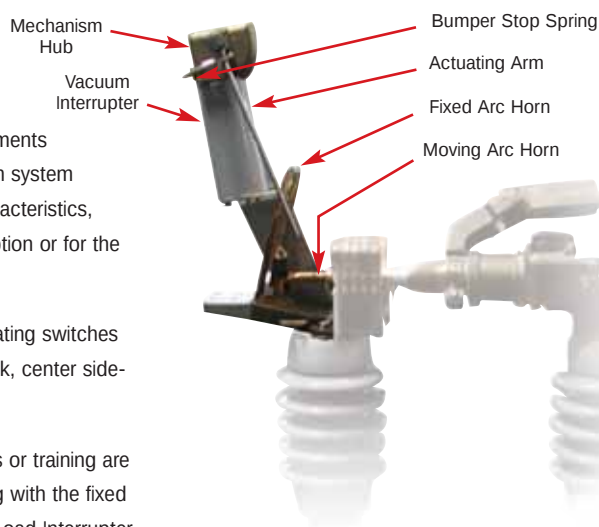
## Convert an isolating switch into a load interrupter switch.

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



| Features                                             | Benefits/Descriptions                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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. Won't affect mechanical operation of the switch.                                                                                                                   |
| Wide Operating Range                                 | May be used for full load interruption up to 34.5kV. May also be used for reduced recovery voltage applications of loop splitting or parallel switching up to 230kV, 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 72.5kV, in addition to providing 2,000A of loop splitting or parallel switching capability.                                                                                                                                                                                                  |
| Long, Low-Maintenance Service Life                   | Virtually maintenance-free; requires only an inspection every 5 years or 5,000 operations.                                                                                                                                                                                                                                                                                                                                |
| Rugged Construction                                  | 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. |
| Safe Interruption                                    | 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. The 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.                                                                                                                                                                                                                                                                                                             |
| Self Protecting                                      | External spark gap protects vacuum module if operated above its recovery voltage capability.                                                                                                                                                                                                                                                                                                                              |

## 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 230kV. 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.

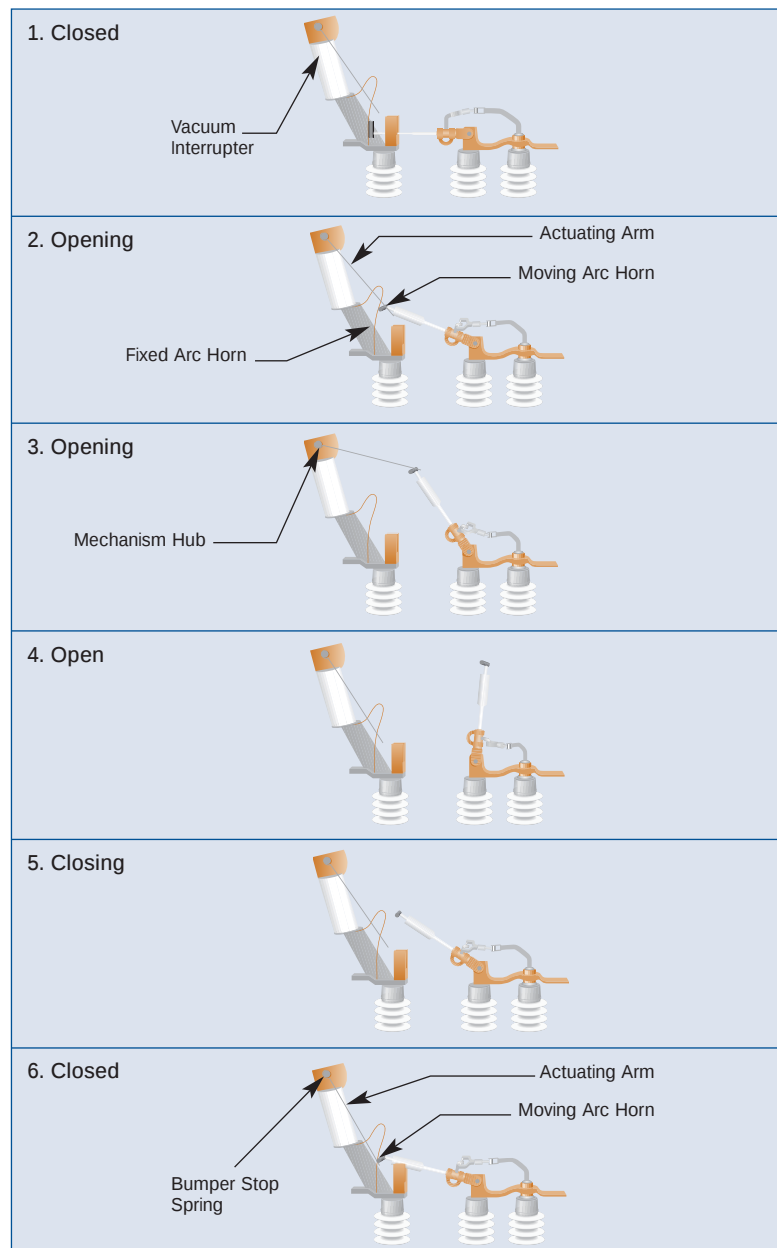
## Operation

### Opening Sequence

1. 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.
2. 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.
3. 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.
4. 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

5. As the switch blade closes, the circuit is energized between the moving and fixed arc horns.
6. 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.



### Voltage Limiter Extends Capability of Series UVI Interrupter

With the addition 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 72.5kV in addition to providing 2,000A 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 161kV.



Series UVI Interrupter with Voltage Limiter

### Ratings for Standard UVI

| System Voltage (kV) | Application                                | Interrupting Capability (Amps) (Peak Recovery Voltage of 30kV) |
|---------------------|--------------------------------------------|----------------------------------------------------------------|
| 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                                     |

### Ordering Information for Joslyn Hi-Voltage™ Series UVI Universal Vac-Rupter Load Interrupters

To order a Joslyn Hi-Voltage™ Load Interrupter, please supply the following information:

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

# Joslyn Hi-Voltage™ Series LSI Load Sectionalizer Interrupter Attachments

## Convert an isolating switch into an interrupter switch.

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 83 for more information). The Series LSI Interrupter is a co-coordinated 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.

## Operation

### Opening Sequence of Series LSI Interrupter with Spring Rod Component

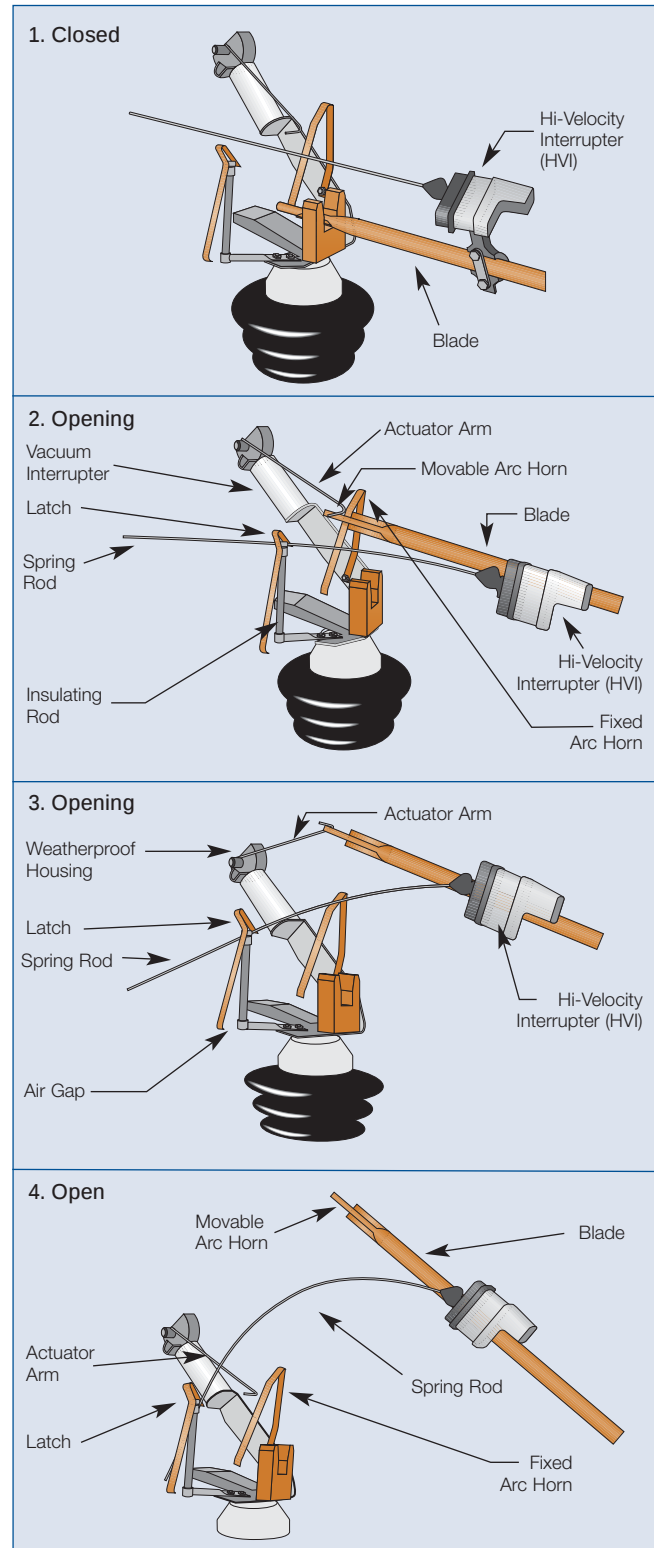
1. With the air switch closed (top diagram), the Series LSI Interrupter is completely out of the circuit. The only current path is through the air switch blade.
2. As the air switch blade operates (second diagram), the movable arc horn slides along the fixed arc horn and engages the actuator arm of the 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.
3. 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.
4. 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.

### Opening Sequence of Series LSI Interrupter with Voltage Limiter

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



## 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.



| Features                                              | Benefits/Descriptions                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Eliminate Sequential Switching of a Loop System       | Minimize the possibility of a switching error, thereby increasing personnel safety and system operating flexibility.                                                                                                                                                                                                                                                                                                      |
| Available as an All-in-One Package                    | 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 69kV through 161kV, regardless of manufacturer; 69kV Series LSI with Voltage Limiter is ideally suited for additional switch types including center-break and in-line designs. No special tools or training required for installation.                                                                          |
| Long, Low-Maintenance Service Life                    | Virtually maintenance-free; requires only an inspection every 5 years or 5,000 operations.                                                                                                                                                                                                                                                                                                                                |
| Rugged Construction                                   | 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. |
| Safe Interruption                                     | 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. The continuous momentary and impulse ratings of the switch are unaffected.                                                                                                                                                                        |
| Reliable Operation                                    | Spring toggle mechanism opens the vacuum contacts at the proper speed, independent of air switch operating time.                                                                                                                                                                                                                                                                                                          |
| Self Protecting                                       | External spark gap protects vacuum module if operated above its recovery voltage capability.                                                                                                                                                                                                                                                                                                                              |

## Ratings

### Loop Splitting/Parallel Switching

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

## Ordering Information for Joslyn Hi-Voltage™ Series LSI Load Sectionalizer Interrupter Attachments

To order a Joslyn Hi-Voltage™ Series LSI Load Interrupter, please supply the following information:

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

# Joslyn Hi-Voltage™ Series JMVI Modular Vac-Rupter Interrupter Attachments

Use with a disconnect switch to provide load switching capability.

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.

## Operation

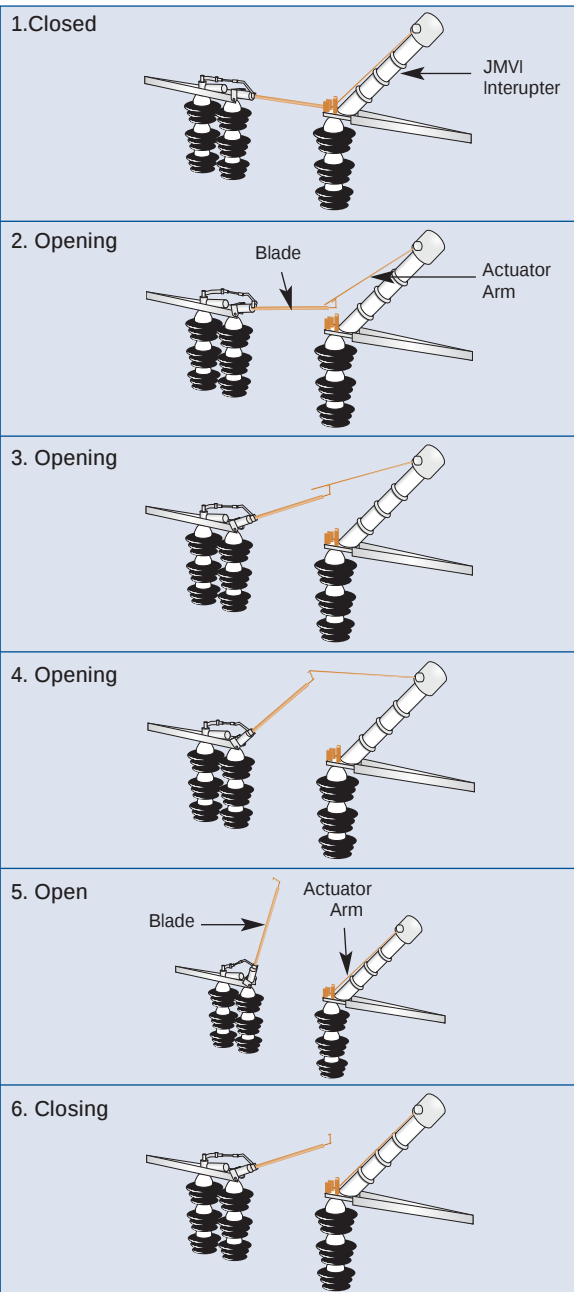
### Opening

1. Switch is closed. Series JMVI Interrupter is not in circuit. The only current path is through the switch blade and jaw contacts.
2. 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.
3. 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.
4. 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.
5. 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

6. 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.

Single pole of Series JMVI Interrupter installed on the Series RF-2 Vertical-Break Switch.



| Features                                                              | Benefits/Descriptions                                                                                                                                                              |
|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Install on a Disconnect Switch                                        | 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                          | Enable fast and easy installation on most vertical-break disconnect switches from any manufacturer.                                                                                |
| Available with Joslyn Hi-Voltage™ Series RF-2 Vertical-Break Switches | Provide a complete load interrupter switch package.                                                                                                                                |

## Vacuum Module Requirements Guide 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 2,000A interrupting at a peak recovery voltage of 30kV. 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 89–91.



138kV 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 230kV.

## Ratings for Standard JMVI

| Nominal System Voltage (kV) | 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                          |

## Ratings for JMVI with Voltage Limiter

| System Voltage (kV) | 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                             |

## Ordering Information for Joslyn Hi-Voltage™ Series JMVI Modular Vac-Rupter Interrupter Attachments

To order a Joslyn Hi-Voltage™ Series JMVI Modular Vac-Rupter Interrupter, please supply the following information:

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



## QUICK REFERENCE

### Joslyn Hi-Voltage™ Underground Switchgear

page(s)

SF6 Switch . . . . . 98–104



## Designed to be the most reliable three-position SF6 loadbreak switch.

Whether you have a submersible or padmount application, the Joslyn Hi-Voltage™ Three-Position SF6 Loadbreak Switch can be configured with two, three or four switched ways and 600A deadbreak bushings. Plus, it can be supplied with either a manual operator or an integrated motor operator for remote control via SCADA. In addition, you can outfit the switch with a variety of options to truly make this loadbreak switch the unique solution for your one-of-a-kind application.

## Loadbreak switching.

A high-voltage circuit with several hundred thousand volts requires a special switch for reliable operation. This device is known as a loadbreak switch. A loadbreak switch is able to carry a large amount of current without overheating in the closed position. Furthermore, it has enough insulation to isolate a circuit in the open position and is equipped with ways to interrupt the load current.

For insulating and interrupting, the three-position switch uses low-pressure SF<sub>6</sub> gas with a linear puffer contact system for quick arc extinguishing performance during loadbreak operations.



Contact system assembled in the switch

## How SF<sub>6</sub> works with loadbreak switches.

SF<sub>6</sub> is the abbreviation for sulfur hexafluoride. It is formed by a chemical reaction between molten sulfur and fluorine. Pure SF<sub>6</sub> gas is colorless, odorless and nonflammable. It is not poisonous and is about six times heavier than air.

SF<sub>6</sub> is chemically stable, does not react with other substances at room temperature and is useful in electrical power systems. When high- or medium-voltage equipment (such as a circuit breaker) cuts off power during a fault, an electric arc strikes between the circuit breaker contacts. Breaker contacts filled with SF<sub>6</sub> are electrically insulating and effectively extinguish arcs. SF<sub>6</sub> insulates so well because it is strongly electronegative. In other words, the SF<sub>6</sub> gas molecules catch free electrons and build heavy negative ions that do not move quickly. This electrical property prevents the creation of electron avalanches that may lead to flashovers.



## The loadbreak switch with built-in reliability.

The Joslyn Hi-Voltage™ Three-Position SF<sub>6</sub> Loadbreak Switch is designed to operate in underground or auxiliary substation applications. It has three-phase 15kV or 27kV interrupter assemblies connected by a set of main bus bars to operate in various configurations as a network interrupter. The apparatus assembly with its set of bus bars and contacts is enclosed in a stainless steel tank, hermetically sealed and SF<sub>6</sub> pressurized, making it completely submersible and deadfront.

Handles that are hook-stick accessible operate each three-phase interrupter. The handles have a position indicator with regulatory colors, and they can be padlocked in three positions (closed, opened, ground) to ensure operational safety.

A permanent connection to a high-voltage network is made via 600A (ANSI 386) deadbreak connectors on the apparatus bushing. If the SG6TG model is equipped with the ground/test bushing option, connection to the ground position is accomplished via the same 600A deadbreak connectors (independent for the A, B and C phases). This connection enables testing of the switch and/or cables through the bushings.



Subsurface vault application

## The best electrical power systems demand the best loadbreak switch.

Oil switches, solid-dielectric switches and air-insulated switches all have their place and purpose. But for the best interruption and insulation for your system, you need the Joslyn Hi-Voltage™ Three-Position SF6 Loadbreak Switch.

Only our SF6 switch provides this many advantages:

### Low-pressure SF6 dielectric

- Eliminates safety and environmental concerns associated with oil insulation
- Increases arc extinguishing performance and eliminates oxidization of main contacts and interrupting medium
- Mounts in any orientation

### Puffer contact system

- Yields superior arc extinguishing performance
- Permits DC circuit testing without flashover concerns
- Provides superior loadbreaking and overload capability

### Three-position contact assembly

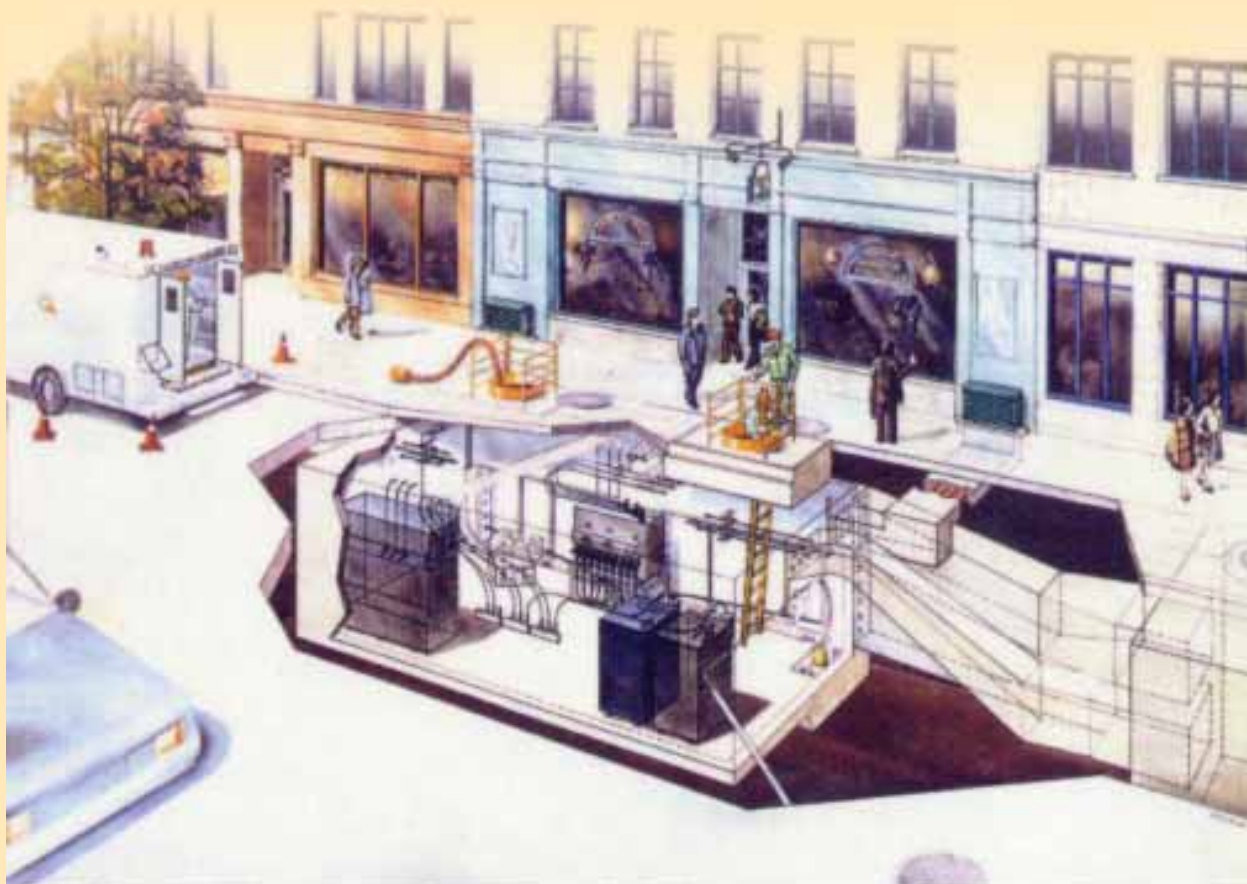
- Eliminates the need to remove and park elbow connectors for visible isolation and cable testing

### TIG-welded stainless steel tank with deadfront design

- Prevents pinholes associated with regular welding to provide a sealed compartment
- Contains pressure in the event of an internal fault

### Superior proprietary sealing system

- Ensures leak-free performance up to 30 years



# Three-Position SF6 Loadbreak Switch

## Low-pressure SF6 gas insulates and provides arc extinction during loadbreak operations.

The Joslyn Hi-Voltage™ Three-Position SF6 Loadbreak Switch is a three-phase deadfront switch with an all-sealed and welded stainless steel tank design, including welded bushings for maximum reliability and corrosion resistance. Low-pressure SF6 gas is used for both the insulating and interrupting media, employing a linear puffer contact system for quick arc extinction during loadbreak operations.

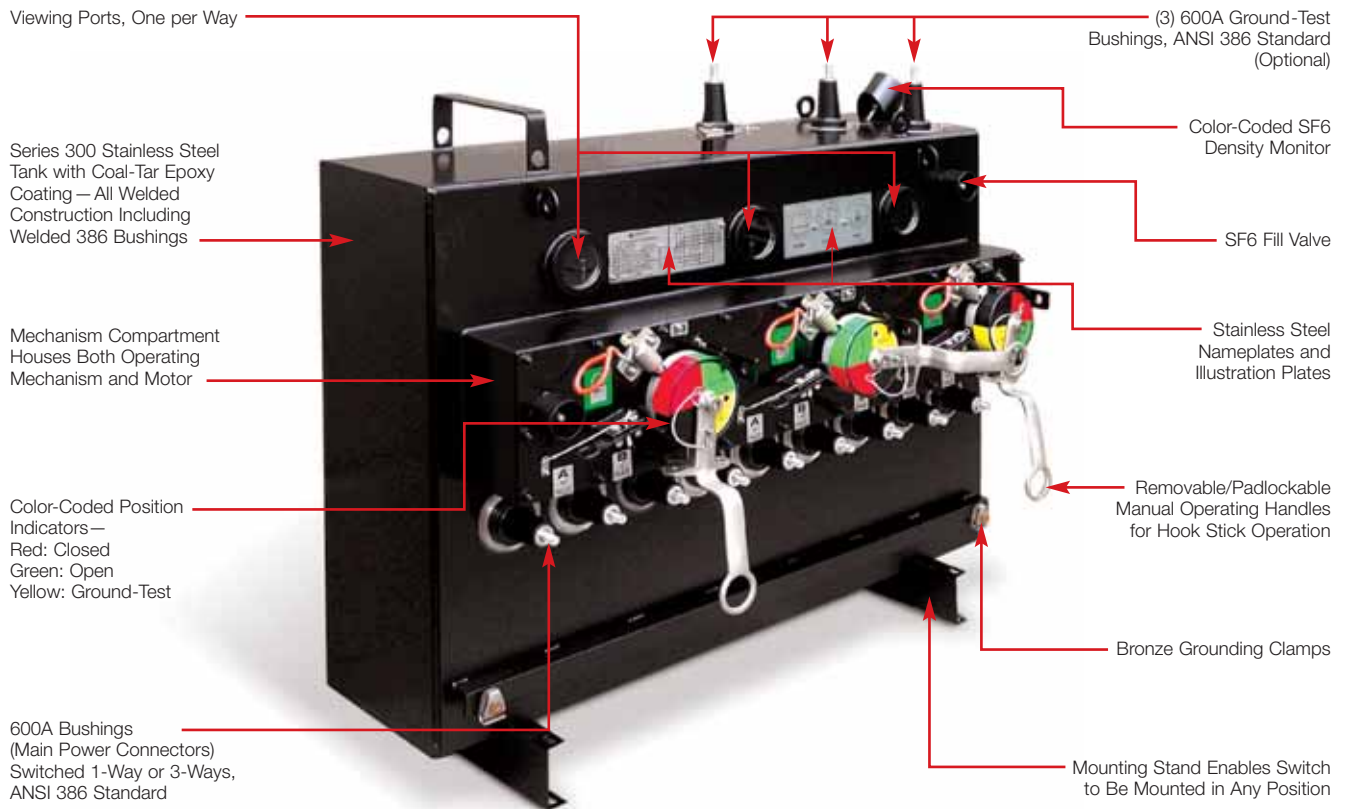
The switch features a single-handle, three-position operating mechanism. It enables operating personnel to go from a closed to an open position and then to a ground/test position to safely ground the switch and system without having to remove connections to the switch.

The switch can be configured for two, three and four switched ways with 600A deadbreak bushings. It operates in both submersible and padmounted applications and can be supplied with either a manual operator or an integrated motor operator for remote control via SCADA. What's more, the motor operator enables the switch to be operated without removing mechanical linkages in either mode.

The switch can also be supplied with a number of options, including viewing ports for visual confirmation of contact positions, grounding bushings to provide a convenient way of testing underground cables and integrated remote supervisory control packages for remote SCADA applications.

| Features                                                                     | Benefits/Descriptions                                                                                                                                                                                 |
|------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| All-Sealed and Welded Stainless Steel Tank with Bushings                     | Provides maximum reliability, leak-free performance and corrosion resistance.                                                                                                                         |
| Puffer Contact System                                                        | Uses SF6 gas for quick arc extinction during loadbreaks.                                                                                                                                              |
| Single-Handle, Three-Position Operating Mechanism                            | Enables operators to switch between positions without having to remove connections or move elbows and operates the switch's puffer contact system independently of the speed of the operating handle. |
| Houses up to Four Switched Ways and Can Be Supplied with a Number of Options | Can be customized for your submersible or padmount applications.                                                                                                                                      |
| Integrated Motor Operator Option                                             | Enables remote control operator via SCADA. Plus, the switch can be operated without removing mechanical links for manual or motorized operation.                                                      |

## 3 Way–3 Way Switched Model Shown

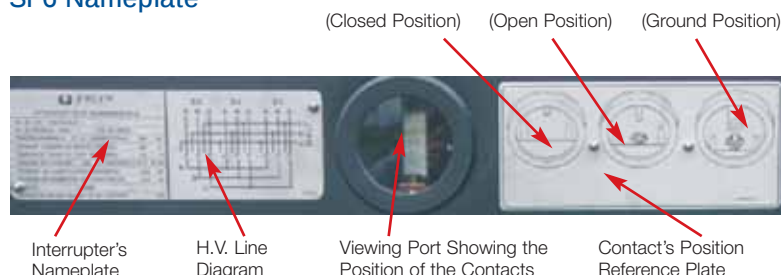


- The interrupter assembly and bus bar assembly are enclosed within an SF6-filled stainless steel tank that is hermetically sealed and submersible.
- A separate mechanism compartment eliminates potential loss of SF6 pressure from the main compartment.
- Switched ways use operating handles (manual hotsticks) that can be padlocked and are equipped with safety anti-reversing latching mechanisms.
- High-voltage connection on the bushings uses standard 600A IEEE 386 deadbreak connectors.
- Optional grounding connections can be done via ground bushings using the same 600A IEEE 386 connectors (independent ABC phases).

## Verifying Contact Positions

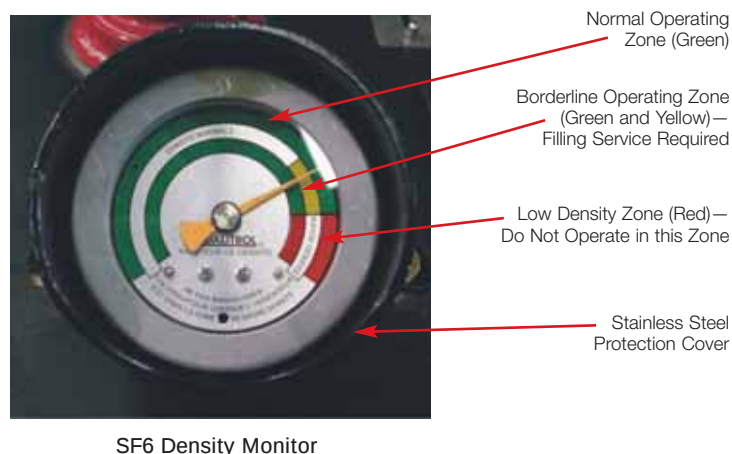
Verification of the contact's position for each switch way is performed by looking through the viewing port using a flashlight and checking the position against the switch's reference plate.

### SF6 Nameplate

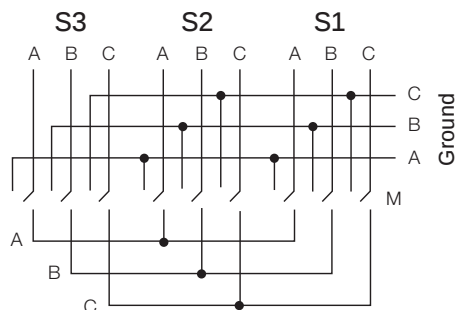


## Color-Coded SF6 Density Monitor

A monitor measuring the insulating SF6 gas density is installed on the interrupter to indicate the safe operating zone of the switch. The monitor is temperature-compensated to provide accurate pressure readings throughout the switch's operating temperature range.

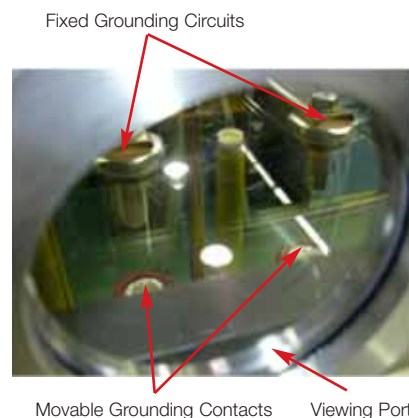


### Three-Way, Three-Phase Switch Schematic

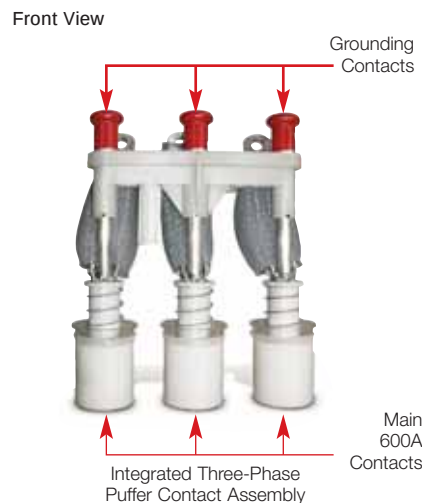


- This line diagram is of a typical 15/27kV switch with the test/ground option.
- Three contact systems are connected to a main bus bar set (ABC), enabling operation as a three-way network switch.

### Viewing Port (Visual Confirmation of Ground Position)



### Three-Position Contact System (One per Switched Way)



#### Rear View



- Operation is by a quick-action mechanism, independent from the operator, and activated manually by a handle or electrically (motorized option only).
- The ground portion of the switch has a short-circuit closing capability equivalent to main contacts.

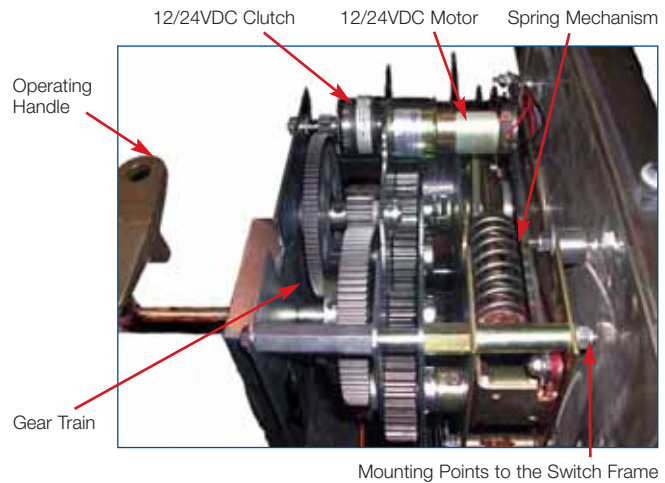
## SF6 Loadbreak Switch with Optional Motorized Ways

The SF6 Loadbreak Switch can be outfitted with optional motorized ways. A motorized way is equipped with a 12VDC or 24VDC motor and clutch system to remotely open and close the interrupter. The interrupter has the option of electrical operation in the local position. It can also be operated remotely while maintaining the possibility of manual operation with the motorized mechanism's handle.

The following operating conditions are available for remote control from the generating station:

- Remote opening and closing command by push button
- 120VAC/12VDC/24VDC supply system with automatic transfer to batteries in case of power failure (optional)
- Remote Close-Open-Ground indication of the switch
- Batteries charger with automatic equalizing (optional)
- Low-pressure alarm (optional)
- Water presence alarm (optional)
- Loss of 120VAC supply (optional)
- Weak batteries status alarm (optional)
- Mechanical fault alarm (optional)

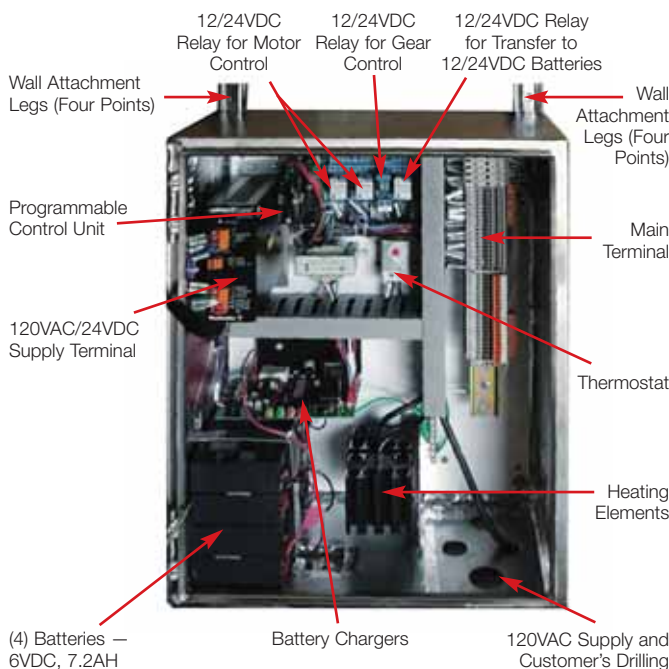
NOTE: Remote operation is only for opened and closed positions.



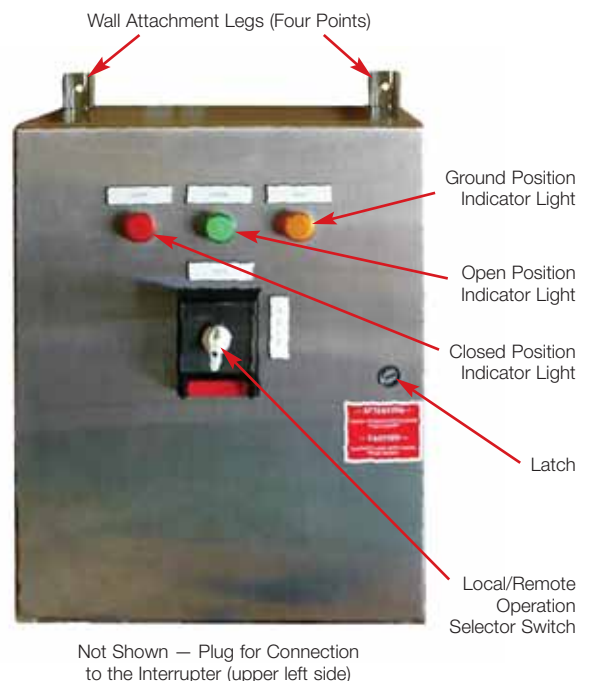
## Remote Supervisory Control Cabinet Supplied with Optional Motorized Ways

For ease of operation and checking the interrupter's position at a glance, the front door of the control cabinet includes a local/remote operation selector switch and indicator lights displaying the opened, closed or ground position of the interrupter. Perfect for multiple applications, the Remote Supervisory Control Cabinet can be modified to fit anyone's installation.

### Control Panel Inside View



### Control Panel Front Door



## Portable Remote Control

The optional Portable Remote Control has two indicator lights that provide the status of SF6 gas pressure in the switch. The green light indicates that pressure is at normal level for safe operation of the switch. The red light indicates that pressure is below the normal level for safe switch operation, and operation of the switch via the Portable Remote Control is prevented.



The Portable Remote Control interfaces with the SF6 switch via its supplied 12-pin, 30-ft. (9.1m) cable. Watertight connectors found on both the Portable Remote Control and SF6 switch complete the connection.



### Ratings — Applicable ANSI C37.71 and C37.72

| Description                                                   | 15kV             | 27kV             |
|---------------------------------------------------------------|------------------|------------------|
| Frequency (Hz)                                                | 50/60            | 50/60            |
| BIL Impulse Withstand (kV)                                    | 95               | 125              |
| One-Minute AC Withstand (kV)                                  | 35               | 60               |
| Fifteen-Minutes DC Withstand (kV)                             | 53               | 78               |
| Corona Extinction @ 3PC (kV)                                  | 11               | 19               |
| Load Interrupting and Load Switching Current (Amp)            | 600              | 600              |
| Transformer Magnetizing Interrupting Current (Amp)            | 21               | 25               |
| Capacitor and Line Charging Interrupting Current (Amp)        | 27               | 40               |
| Asymmetrical Momentary Current* (kA)                          | 22.5             | 22.5             |
| Three-Operation Fault Close Current (kA)                      | 22.5             | 22.5             |
| Symmetrical One-Second Current Rating (kA)                    | 15               | 15               |
| Continuous Current Rating (Amp)                               | 600              | 600              |
| Eight-Hour Overload Current (Amp)                             | 900              | 900              |
| Overload Interrupting Capability, 10 Operations (Amp)         | 1,400            | 1,400            |
| Operations — 600A Load-Interrupting Endurance                 | 500              | 500              |
| Open-Gap BIL Flashover Withstand (kV)                         | 145              | 145              |
| Mechanical Life Operations (Including Motor Operations)       | 2,000            | 2,000            |
| SF6 Gas Normal Operating Pressure (PSIG)                      | 2–15             | 2–15             |
| Maximum Gas Leakage (cc/second) Helium Spectrometer Test      | 10 <sup>-7</sup> | 10 <sup>-7</sup> |
| ASTM B-117 Corrosion Resistance                               | 2,000            | 2,000            |
| Fault Withstand Symmetrical "Phase to Phase" — 22 Cycles (kA) | 12               | 12               |
| Internal Fault Withstand Before Venting — 40 Cycles (kA)      | 5                | 5                |

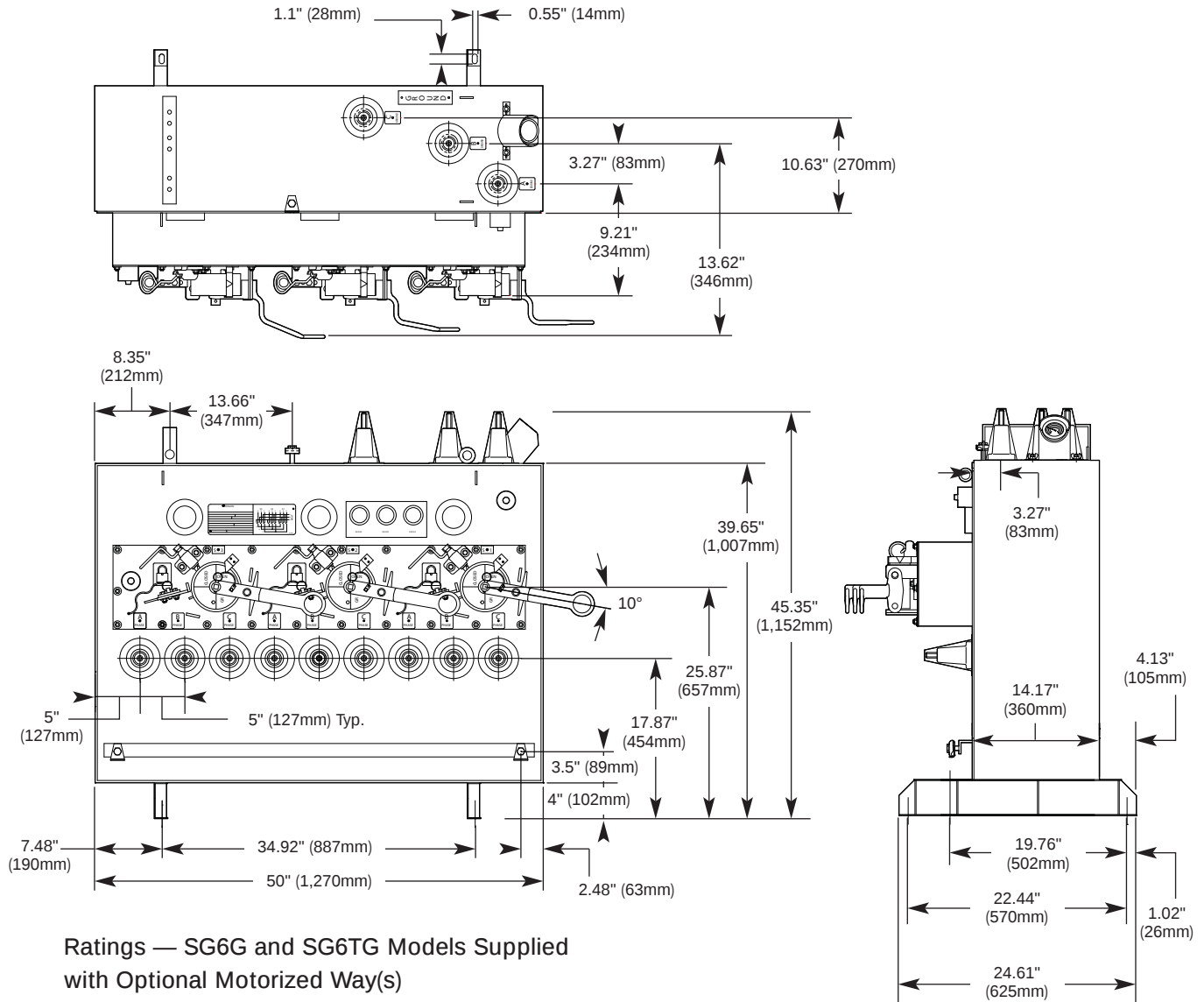
\* When 200A elbow connections are used, the continuous current, overload, momentary and one-second ratings will be derated. Typically, 200A accessories are rated 200A continuous, 300A 8-hour overload, 15kA asymmetrical momentary and 10kA for a half second.

#### Options

- Viewing Windows — Enable visual confirmation of contact position
- Ground-Test Bushings — Provide convenient disconnecting, ground and test of incoming lines
- Motor Operators — Enable remote operation on multi-way switches
- Remote Supervisory — Control packages with battery back-up
- Padmount — Enclosed padmount unit

NOTE: For options, please consult your T&B sales representative.

## 3 Way–3 Way Switched Dimensions (SG6G, SG6TG Models)

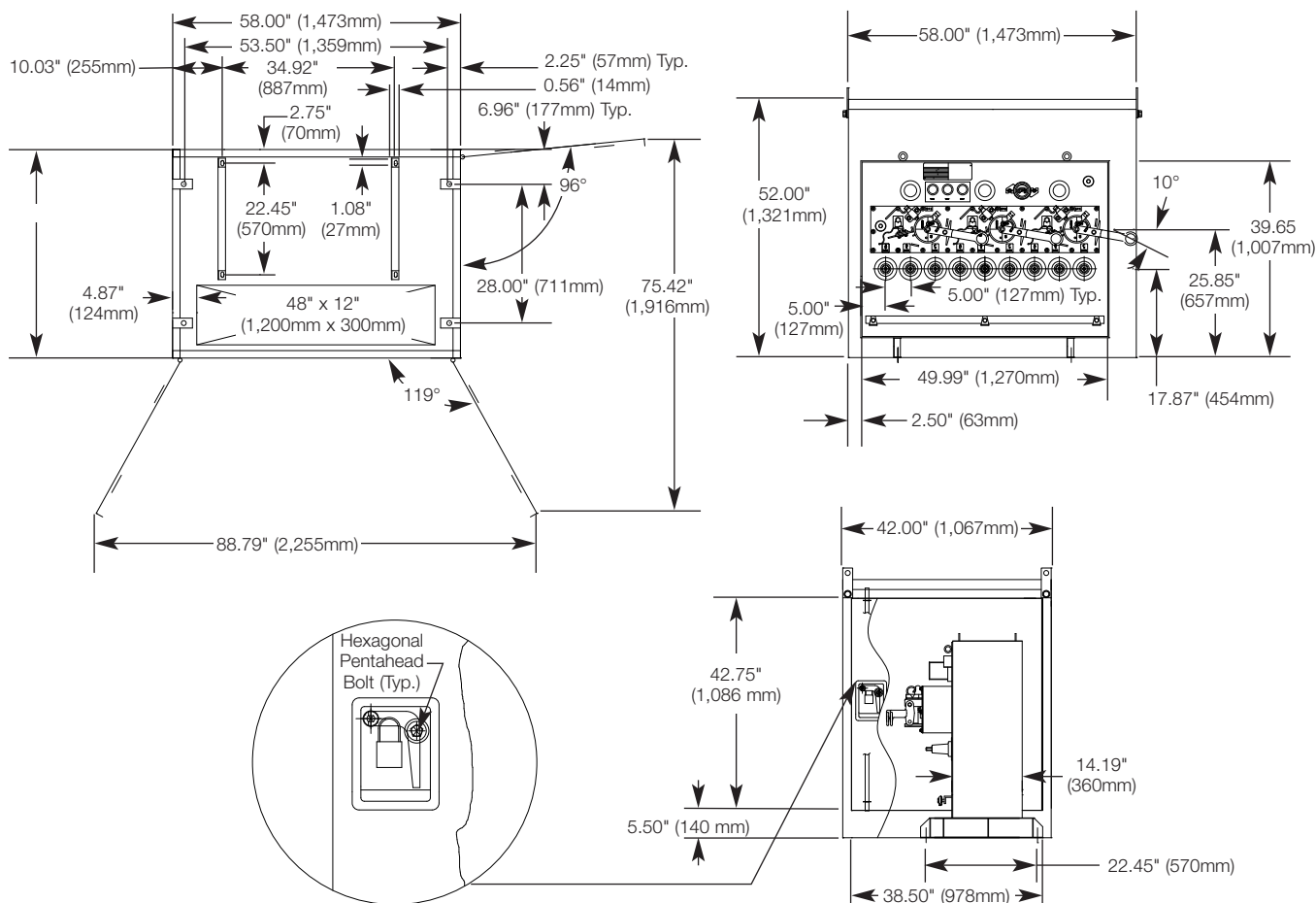


## Ratings — SG6G and SG6TG Models Supplied with Optional Motorized Way(s)

| Description                      |             |
|----------------------------------|-------------|
| Motor's Engaging Voltage         | 12VDC/24VDC |
| Normal Operating Current         | 3.5A/1.4A   |
| Motor Current (Locked Mechanism) | 5.2A/3.1A   |

NOTE: 600A ground bushing option available only with SG6TG models.

### Padmount 3 Way-3 Way Switched Dimensions (PG6G, PG6TG Models)



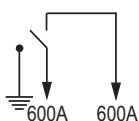
NOTE: Padmount enclosures available in 12-gauge mild steel or optional stainless steel meeting ANSI C57.12.28.

### Ordering Information for Joslyn Hi-Voltage™ Three-Position SF6 Loadbreak Switches

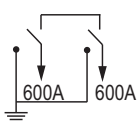
| CAT. NO.           | Switch Configuration  | Maximum Voltage (kV) | Standard Weight lb. (kg) | Width in. (mm) | Height in. (mm) | Depth (with Motor) in. (mm) |
|--------------------|-----------------------|----------------------|--------------------------|----------------|-----------------|-----------------------------|
| SG6G-, SG6TG-21-15 | 2 Way/1 Switched Way  | 15.5                 | 450 (204)                | 35 (889)       | 39.5 (1,003)    | 34.9 (886)                  |
| SG6G-, SG6TG-21-27 | 2 Way/1 Switched Way  | 27                   | 450 (204)                | 35 (889)       | 39.5 (1,003)    | 34.9 (886)                  |
| SG6G-, SG6TG-22-15 | 2 Way/2 Switched Ways | 15.5                 | 500 (227)                | 35 (889)       | 39.5 (1,003)    | 34.9 (886)                  |
| SG6G-, SG6TG-22-27 | 2 Way/2 Switched Ways | 27                   | 500 (227)                | 35 (889)       | 39.5 (1,003)    | 34.9 (886)                  |
| SG6G-, SG6TG-33-15 | 3 Way/3 Switched Ways | 15.5                 | 680 (308)                | 50 (1,270)     | 39.5 (1,003)    | 34.9 (886)                  |
| SG6G-, SG6TG-33-27 | 3 Way/3 Switched Ways | 27                   | 680 (308)                | 50 (1,270)     | 39.5 (1,003)    | 34.9 (886)                  |
| SG6G-, SG6TG-44-15 | 4 Way/4 Switched Ways | 15.5                 | 900 (408)                | 65 (1,651)     | 39.5 (1,003)    | 34.9 (886)                  |
| SG6G-, SG6TG-44-27 | 4 Way/4 Switched Ways | 27                   | 900 (408)                | 65 (1,651)     | 39.5 (1,003)    | 34.9 (886)                  |

NOTE: 600A ground bushing option available with only SG6TG models.

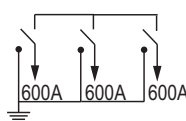
For ordering information on padmount versions, please consult your Thomas & Betts representative.



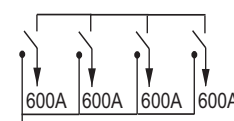
2 Way/1 Switched Way



2 Way/2 Switched Ways



3 Way/3 Switched Ways



4 Way/4 Switched Ways



## QUICK REFERENCE

### Joslyn Hi-Voltage™ Contactors

page(s)

Vacuum Contactors . . . . 108–112

SPST Contactors . . . . . 113–114

**Joslyn Hi-Voltage™ vacuum contactors offer one of the most reliable means available for remotely controlling electric power.**

Joslyn Hi-Voltage™ vacuum contactors provide all the operating advantages of a vacuum interrupter plus the benefits of a matching actuator to meet specific application requirements. These low- and medium-voltage contactors offer the most reliable means of remotely controlling electric power.

# Joslyn Hi-Voltage™ 1.5kV, 450A Low-Voltage Vacuum Contactors

One million maintenance-free  
open and close operations  
provide the greatest reliability  
for the most applications.

Joslyn Hi-Voltage™ 1.5kV, 450A Low-Voltage Vacuum Contactors may be small (11.8"H x 10.5"W x 5.5"D) and weigh less than 30 lbs. each, but they can take on requirements of the most demanding equipment. Utilizing a trio of vacuum interrupters, these three-phase units provide a short contact-to-contact gap required to interrupt the circuit for highly reliable operation. The contact materials are rated for 1.5kV, 450A load life and 4,500A fault current.

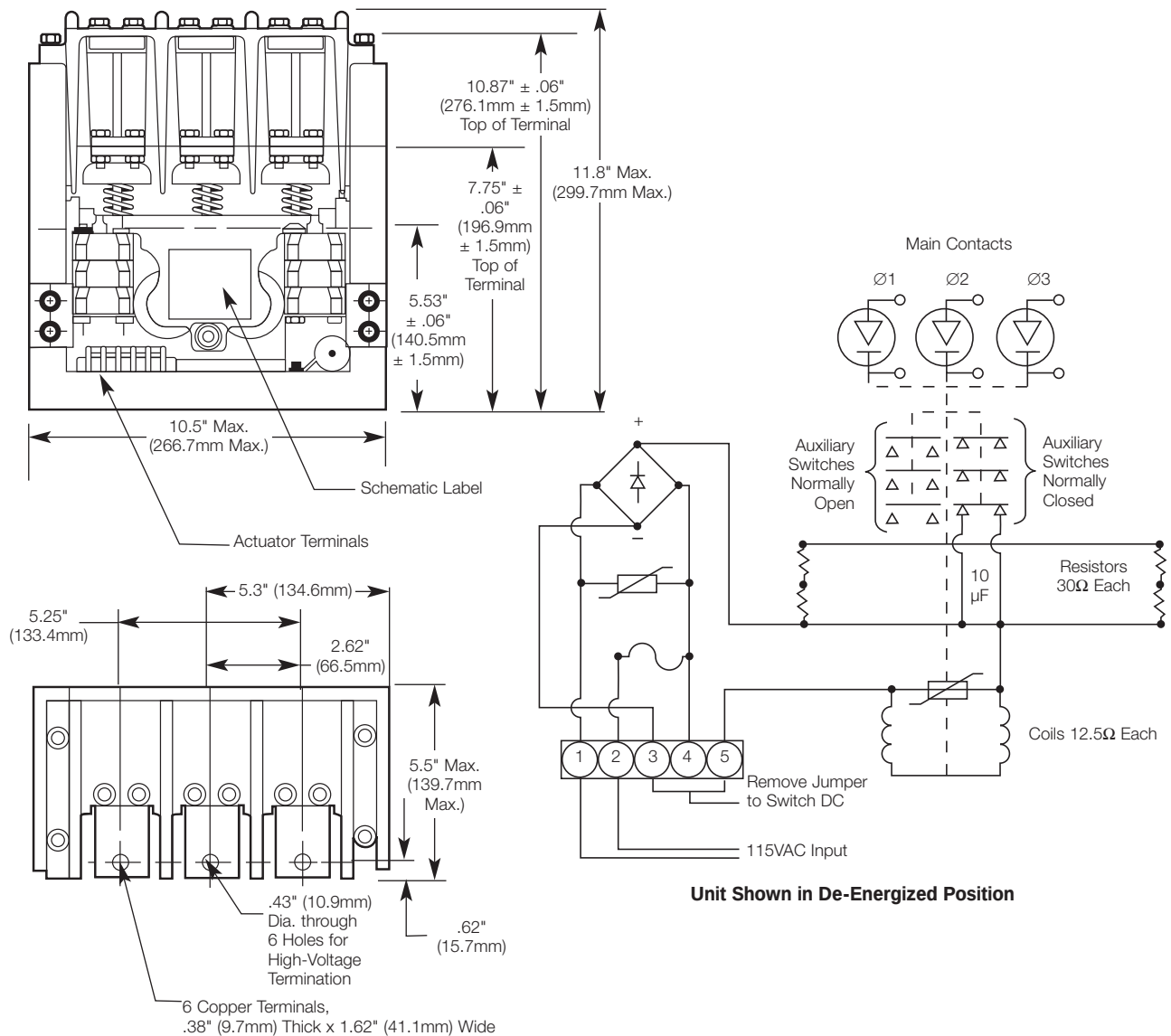


Designed to withstand the frequent switching required to control furnaces and large air conditioning motors, these contactors are commonly used to protect power transformers and DC power supplies. Use them to switch capacitor banks for voltage regulation and power factor correction as a means of reducing operating costs. Reliable and durable, Joslyn Hi-Voltage™ 1.5kV, 450A Vacuum Contactors can also be used in motor controllers that operate production and processing equipment, mining and construction equipment, earth movers or carriers, power shovels, rock crushers and conveyors. Look for the unique blue color as your assurance of a Thomas & Betts quality vacuum contactor.

| Features                               | Benefits/Descriptions                                                        |
|----------------------------------------|------------------------------------------------------------------------------|
| Sealed Main Contacts                   | Provide a minimum of one million maintenance-free open and close operations. |
| Reliable in Harsh Temperature Extremes | Operate in temperatures ranging from -40° to 185° F (-40° to 85° C).         |
| Versatile Use                          | Deploy with heavy-duty motors, power equipment and motor controllers.        |

## Ratings

|                                                                            |                                                      |
|----------------------------------------------------------------------------|------------------------------------------------------|
| <b>Voltage</b>                                                             |                                                      |
| Maximum Three-Phase Line (V & kV)                                          | 600 and 1.5                                          |
| Dielectrics 50/60/400Hz, 60-Seconds Withstand                              |                                                      |
| - Line-to-Ground (kV RMS)                                                  | 6.5                                                  |
| - Line-to-Line (kV RMS)                                                    | 6.5                                                  |
| - Across Open Contacts (kV RMS)                                            | 6.5                                                  |
| BIL, 1.2 x 50 µsec Impulse                                                 |                                                      |
| - Line-to-Ground Peak (kV)                                                 | 20                                                   |
| - Line-to-Line Peak (kV)                                                   | 20                                                   |
| - Across Open Contacts (kV)                                                | 20                                                   |
| <b>Current</b>                                                             |                                                      |
| Continuous (Amps RMS)                                                      | 450                                                  |
| Load-Switching (Amps RMS)                                                  | 450                                                  |
| - Capacitors                                                               | 750KVAR @ 15kV                                       |
| - Motors                                                                   | 750HP @ 1.1kV                                        |
| Making Current                                                             |                                                      |
| - Random Make 100 Times @ 15kV with 3-Second Backup (kA RMS)               | 4.5                                                  |
| - Random Make 10 Times @ 15kV with Current-Limiting Fuse (kA)              | 28 peak                                              |
| - Random Make 100 Times @ 15kV with 3-Second Backup (kA RMS)               | 6                                                    |
| Minimum Load Life @ 450A RMS                                               | 1 million open/close operations                      |
| Interrupt (Amps RMS @ 1.5kV)                                               | 4,500                                                |
| <b>Actuator</b>                                                            |                                                      |
| Control Voltage                                                            | 115VAC, 50/60Hz or 110VDC                            |
| Control Current                                                            | 7.1 pull-in amps, 0.9 hold-in amps                   |
| Auxiliary Contacts Configuration                                           | 2 NC/3 NO, SPST double break, 10A resistive @ 600VAC |
| <b>Mechanical</b>                                                          |                                                      |
| Weight (lb.)                                                               | 30 max.                                              |
| Release Time from Control Switch Off to Separation of Main Contacts (msec) | 16 max.                                              |
| Mounting                                                                   | Operates in any position                             |



## Ordering Information for Joslyn Hi-Voltage™ 1.5kV, 450A Low-Voltage Vacuum Contactors

| CAT. NO.        | Mounting Option | Actuator Volts | Line-to-Line Voltage (RMS) | Outline Drawing No. |
|-----------------|-----------------|----------------|----------------------------|---------------------|
| RP133-2332-00-J | 2332            | 115VAC/110VDC  | 1,500                      | 2585                |
| RP133-2332-01-J | 2332            | 115VAC/110VDC  | 3,300                      | 2611                |
| RP133-2334-00-J | 2334            | 100VDC         | 1,500                      | 2909                |
| RP133-2335-00-J | 2335            | 115VAC/110VDC  | 1,500                      | 3091                |

# Joslyn Hi-Voltage™ 7.2kV, 600A Medium-Voltage Vacuum Contactors

Unparalleled reliability for equipment with higher voltage ratings.

Measuring 18"H x 18"W x 8"D, Joslyn Hi-Voltage™ 7.2kV, 600A Medium-Voltage Vacuum Contactors are built tough to work in a variety of heavy-duty applications. Able to withstand the frequent switching required to control furnaces and large motors, these contactors can also be used to switch power transformers and capacitor banks for voltage regulation and power factor correction as a means of reducing operating costs. Joslyn Hi-Voltage 7.2kV, 600A Vacuum Contactors are ideal for use in motor controllers that operate production and processing equipment, mining and petroleum equipment, earth movers and conveyors, power shovels and all types of industrial loads.

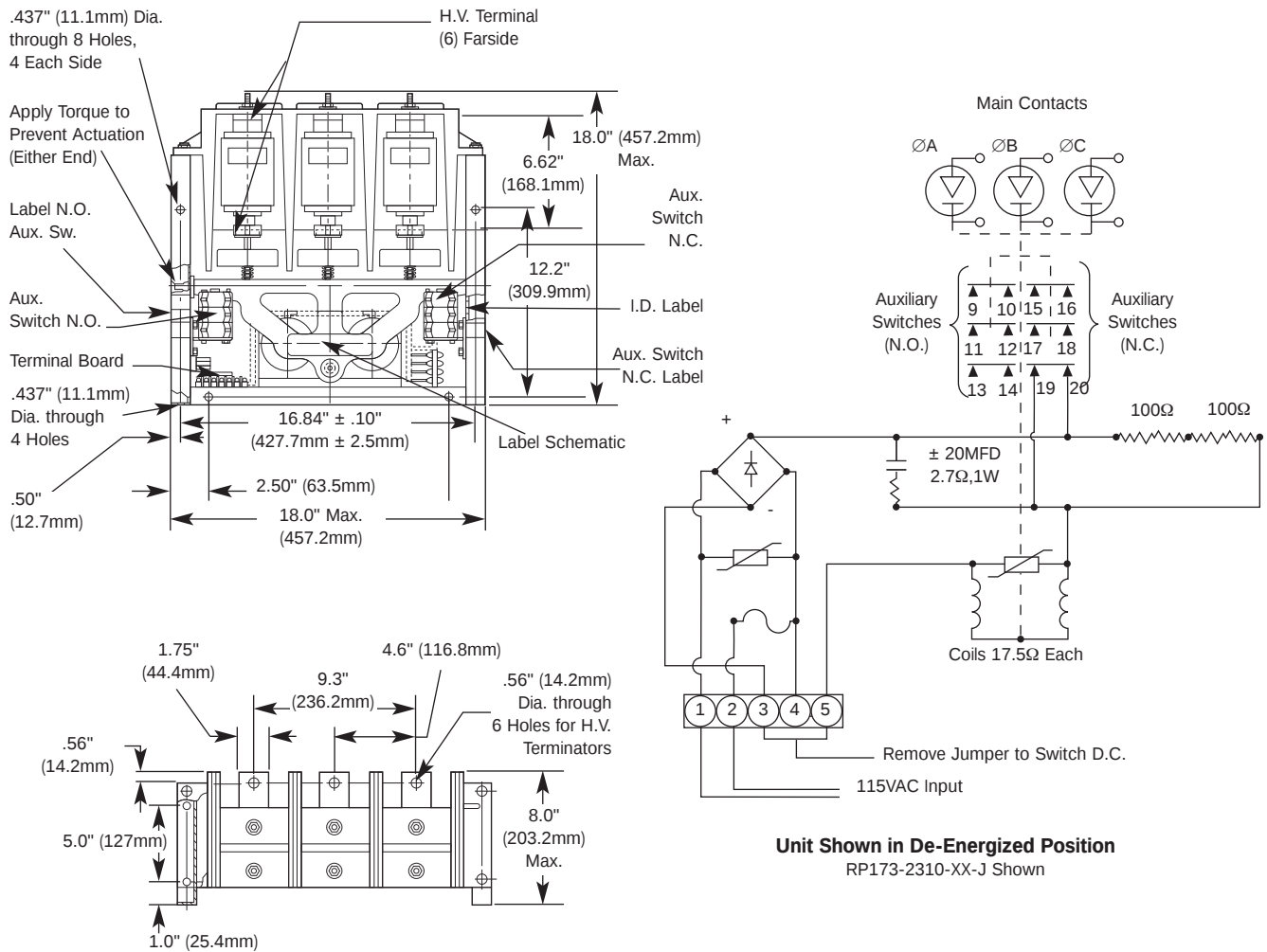


Utilizing a trio of vacuum interrupters, these three-phase units provide a short contact-to-contact gap required to interrupt the circuit for highly reliable operation. The contact materials are rated for 7.2kV, 600A load life and 6,000A fault current. Look for the unique blue color as your assurance of a Thomas & Betts quality vacuum contactor.

| Features                               | Benefits/Descriptions                                                        |
|----------------------------------------|------------------------------------------------------------------------------|
| Sealed Main Contacts                   | Provide a minimum of one million maintenance-free open and close operations. |
| Reliable in Harsh Temperature Extremes | Operate in temperatures ranging from -40° to 185° F (-40° to 85° C).         |
| Versatile Use                          | Deploy with heavy-duty motors, power equipment and motor controllers.        |

## Ratings

|                                                                            |                                                      |
|----------------------------------------------------------------------------|------------------------------------------------------|
| Voltage                                                                    |                                                      |
| Maximum Three-Phase Line (kV)                                              | 1.5, 2.5, 5.0, 7.2                                   |
| Dielectrics 50/60/400Hz, 60-Seconds Withstand                              |                                                      |
| - Line-to-Ground (kV RMS)                                                  | 30                                                   |
| - Line-to-Line (kV RMS)                                                    | 30                                                   |
| - Across Open Contacts (kV RMS)                                            | 30                                                   |
| BIL, 1.2 x 50 µsec Impulse                                                 |                                                      |
| - Line-to-Ground Peak (kV)                                                 | 60                                                   |
| - Line-to-Line Peak (kV)                                                   | 60                                                   |
| Current                                                                    |                                                      |
| Continuous (Amps RMS)                                                      | 450/600                                              |
| Load-Switching (Amps RMS)                                                  | 450                                                  |
| - Capacitors                                                               | 2,000KVAR @ 4.16kV grounded neutral                  |
| - Motors                                                                   | 5,000HP @ 7.2kV                                      |
| - Transformer                                                              | 5,000KVA @ 7.2kV                                     |
| Making Current                                                             |                                                      |
| - Random Make 100 Times @ 7.2kV with 3-Second Backup (kA RMS)              | 4.5                                                  |
| - Random Make 10 Times @ 7.2kV with Current-Limiting Fuse (kA)             | 55 peak                                              |
| - Random Make 100 Times @ 5.0kV with 3-Second Backup (kA RMS)              | 6                                                    |
| Minimum Load Life @ 600A RMS                                               | 1 million open/close operations                      |
| Interrupt (Amps RMS @ 5.0kV)                                               | 6,000                                                |
| Actuator                                                                   |                                                      |
| Control Voltage                                                            |                                                      |
| - RP173-2310-00-J                                                          | 115VAC, 50/60Hz or 110VDC                            |
| - RP173-2311-00-J                                                          | 230VAC, 50/60Hz or 220VDC                            |
| Control Current                                                            | 3.3 pull-in amps, 0.5 hold-in amps                   |
| Auxiliary Contacts Configuration                                           | 2 NC/3 NO, SPST double break, 10A resistive @ 600VAC |
| Mechanical                                                                 |                                                      |
| Weight (lb.)                                                               | 67 max.                                              |
| Release Time from Control Switch Off to Separation of Main Contacts (msec) | 100 max.                                             |
| Mounting                                                                   | Operates in any position                             |



## Ordering Information

| CAT. NO.         | Mounting Option | Actuator Volts | Line-to-Line Voltage (RMS) | Outline Drawing No. |
|------------------|-----------------|----------------|----------------------------|---------------------|
| RP173-2310-00-J  | Standard        | 115VAC/110VDC  | 7,200                      | 2530                |
| RP173-2310-01-J* | Standard        | 115VAC/110VDC  | 7,200                      | 2530                |
| RP173-2311-00-J  | Standard        | 230VAC/220VDC  | 7,200                      | 2529                |
| RP173-2311-01-J† | Standard        | 230VAC/220VDC  | 7,200                      | 2529                |
| RP173-2314-00-J  | 180°            | 115VAC/110VDC  | 7,200                      | 2758                |
| RP173-2315-00-J  | 180°            | 115VAC/110VDC  | 7,200                      | 3092                |

\* Includes ruggedized frame.

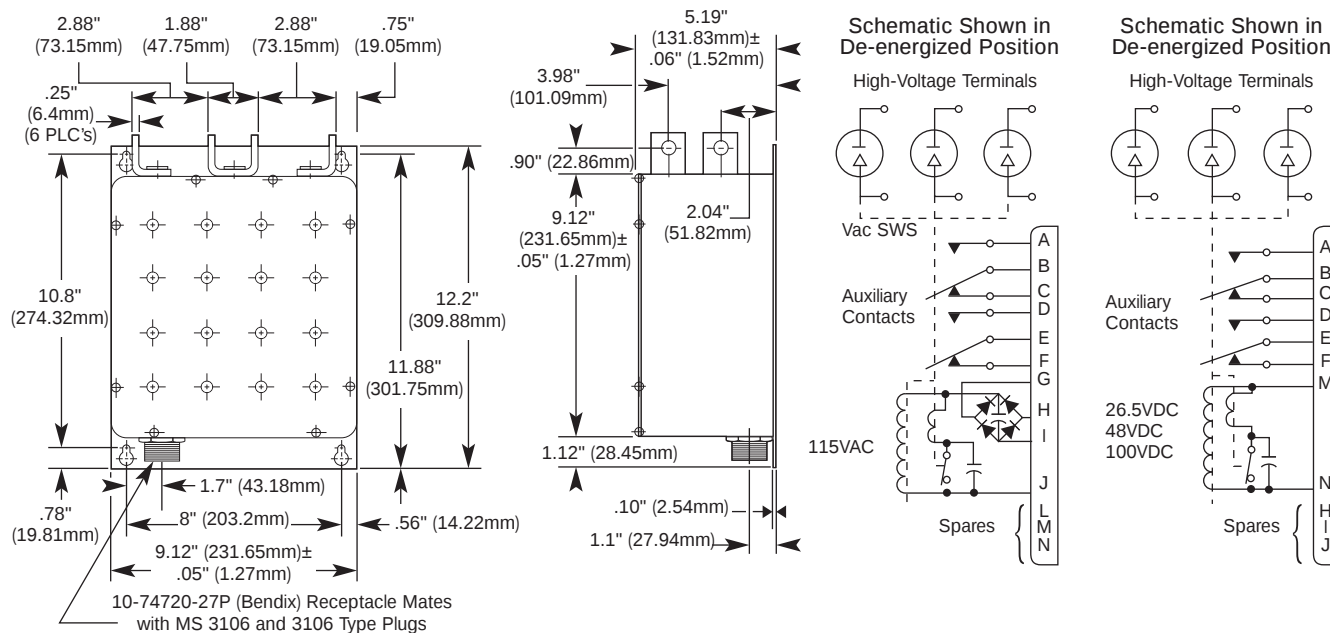
† Includes contact-wear indicator line.

Erosion-resistant contacts provide 250,000 operations without adjustment or maintenance.

Joslyn Hi-Voltage™ 600V, 200A Vacuum Contactors are compact, normally open, three-phase devices for use in equipment that requires a high-speed interrupt. They are useful as overload interrupters to 2,000A RMS interrupting capacity. Special erosion-resistant contacts provide an operational load life of 250,000 maintenance-free operations at the rated 200A current.



| Features                             | Benefits/Descriptions                                               |
|--------------------------------------|---------------------------------------------------------------------|
| Maintenance-Free, Long Life          | Erosion-resistant contacts provide a minimum of 250,000 operations. |
| 2,000A RMS Interrupting Capacity     | Ideal for use as overload interrupters.                             |
| Three-Phase, Normally Open Operation | Provides high-speed interrupt.                                      |



## Ratings

|                                                |                    |
|------------------------------------------------|--------------------|
| Voltage, 50/60/400Hz (V)                       | 600                |
| Continuous Current (Amps)                      | 200                |
| Maximum Interrupting Capability Current (Amps) | 2,000              |
| Minimum Load Life                              | 250,000 operations |
| Interrupt                                      | Less than 2 cycles |
| Auxiliary                                      | DPDT               |
| Contacts                                       | 115/230VAC, 8A     |

## Ordering Information for Joslyn Hi-Voltage™ 600V, 200A Vacuum Contactors

| CAT. NO.           | Mounting Options | Voltage | Pull-In Current (Amps) | Hold Current (Amps) | Outline Drawing No. |
|--------------------|------------------|---------|------------------------|---------------------|---------------------|
| RP151B4541X44R20-J | 4541             | 26.5VDC | 4.0                    | 0.40                | 2206                |
| RP151B4541X46R20-J | 4541             | 100VDC  | 1.5                    | 0.05                | 2206                |
| RP151B4541X47R20-J | 4541             | 115VAC  | 1.5                    | 0.05                | 2206                |
| RP151B4541X4XR20-J | 4541             | 50VDC   | 2.1                    | 0.17                | 2206                |
| RP151B4548X46R20-J | 4548             | 100VDC  | 1.5                    | 0.05                | 2210                |

# Joslyn Hi-Voltage™ 30kV, 100A AC/DC SPST Contactors

Choose the AC or DC actuation you need for your single-pole/single-throw switch application.

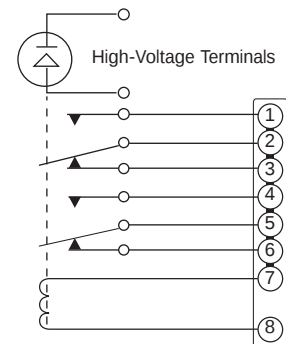
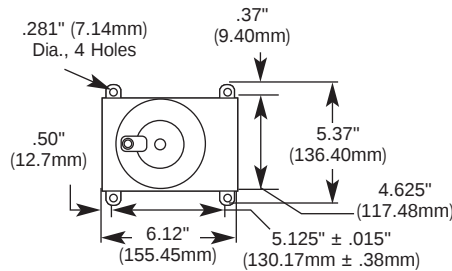
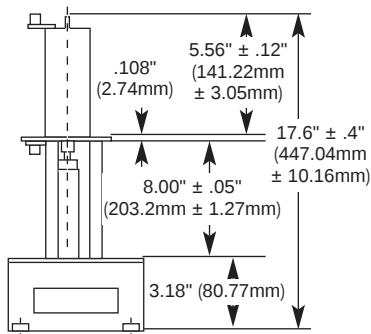
These contactors feature a vacuum interrupter and an actuator linked together by an insulated actuating rod. The contactors provide all of the operating advantages of vacuum interrupting plus the benefits of a matching actuator-solenoid motor.

| Features             | Benefits/Descriptions                        |
|----------------------|----------------------------------------------|
| Long Mechanical Life | Provide a minimum of 100,000 operations.     |
| Versatile Use        | Deploy in high-power broadcast transmitters. |

## Ratings

|                                                 | RP101F             | RP103F             |
|-------------------------------------------------|--------------------|--------------------|
| Tested Voltage (kV Peak)                        | 50                 | 50                 |
| Rated Voltage (kV Peak)*                        | 30                 | 30                 |
| Rated Continuous Current (Amps)                 | 100DC              | 100RMS             |
| Maximum Interrupting Capability (Amps RMS)      | —                  | 2,000              |
| Maximum Interrupt DC Power (kW)                 | 500 (10A max.)     | —                  |
| Capacitor Discharge Decaying to 0 in 200μs (kA) | 50                 | 50                 |
| Contact Resistance (Micro Ohms)                 | 200                | 200                |
| Contact Capacity (pF)                           | 4.5                | 4.5                |
| Contact Inductance (nH)                         | 32                 | 32                 |
| Mechanical Life                                 | 100,000 operations | 100,000 operations |
| Auxiliary Contacts                              | DPDT               | DPDT               |
| Auxiliary Contact (Volts AC RMS)                | 230                | 230                |
| Auxiliary Contact Current (Amps RMS)            | 15                 | 15                 |

\* Derate to 15.5kV RMS for 50/60Hz cycle power.



## Ordering Information for Joslyn Hi-Voltage™ 30kV, 100A AC/DC SPST Contactors

| CAT. NO.           | Contact Arrangement | Insulator Length (in.) | Actuator (Volts) | Pull-In Current (Amps) | Hold Current (Amps) | Hold Power (Watts) | Time to Close (msec) | Break Time (msec) | Outline Drawing No. |
|--------------------|---------------------|------------------------|------------------|------------------------|---------------------|--------------------|----------------------|-------------------|---------------------|
| RP101F4903D21B20-J | NO                  | 6                      | 115VAC           | 5.2RMS                 | 0.54RMS             | 18                 | 46                   | 26                | 2195                |
| RP101F4304D26B20-J | NC                  | 6                      | 100VDC           | 15.0DC                 | 0.07DC              | 7.0                | 36                   | 30                | 2192                |
| RP103F4903D21B20-J | NO                  | 6                      | 115VAC           | 5.2RMS                 | 0.54RMS             | 18.0               | 50                   | 60                | 4903                |
| RP103F4903D2LB20-J | NO                  | 6                      | 230VAC/50Hz      | 5.2RMS                 | 0.54RMS             | 18.0               | 50                   | 60                | 4903                |
| RP101F4903A21B20-J | NO                  | 2                      | 115VAC           | 5.2RMS                 | 0.54RMS             | 18.0               | 46                   | 26                | 2195                |
| RP101F4903D2KB20-J | NO                  | 6                      | 110VAC/50Hz      | 3.0RMS                 | 0.30RMS             | 17.0               | 46                   | 26                | 2195                |
| RP103C4803C26D20-J | NO                  | 4                      | 100VDC           | 1.6DC                  | 0.07DC              | 160.0              | 40                   | 100               | 2197                |
| RP103F4302D24B20-J | NO                  | 6                      | 26.5VDC          | 4.0DC                  | 0.40DC              | 10.6               | 60                   | 10                | 2198                |
| RP103F4302D26B20-J | NO                  | 6                      | 100VDC           | 1.5DC                  | 0.07DC              | 7.0                | 60                   | 10                | 2198                |
| RP103F4304C25B20-J | NC                  | 4                      | 48VDC            | 2.9DC                  | 0.14DC              | 6.7                | 36                   | 30                | 2199                |
| RP103F4402D21B10-J | SPDT Latching       | 6                      | 115VAC           | 8.5RMS                 | NA                  | NA                 | 70                   | 70                | 2200                |
| RP103F4464D21B10-J | NC                  | 6                      | 115VAC           | 2.5RMS                 | 0.50RMS             | 17.0               | 20                   | 20                | 2201                |
| RP103F4904D21B20-J | NC                  | 6                      | 115VAC           | 7.0RMS                 | 0.85RMS             | 18.0               | 46                   | 26                | 2205                |

# Joslyn Hi-Voltage™ 50kV, 400A SPST Contactors

## Configure contactors that match your single-pole/single-throw switch application.

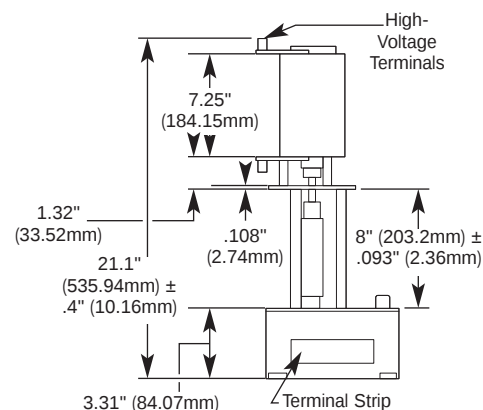
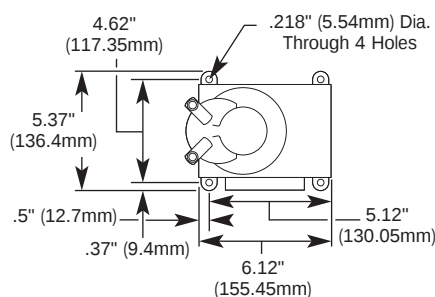
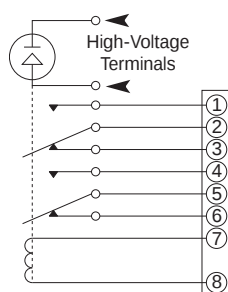
These contactors are for remotely controlling electric power. They feature a vacuum interrupter and an actuator linked together by an insulated actuating rod. The contactors provide all of the operating advantages of a vacuum-interrupting medium, plus the benefits of a matching actuator-solenoid motor.

| Features             | Benefits/Descriptions                                                 |
|----------------------|-----------------------------------------------------------------------|
| Long Mechanical Life | Provide a minimum of 100,000 operations.                              |
| Versatile Use        | Deploy with heavy-duty motors, power equipment and motor controllers. |

### Ratings

|                                                 |                    |
|-------------------------------------------------|--------------------|
| Tested Voltage (kV Peak)                        | 70                 |
| Rated Voltage (kV Peak)*                        | 50                 |
| Rated Continuous Current (Amps)                 | 200RMS             |
| Maximum Interrupting Capability (Amps RMS)      | 4,000              |
| Capacitor Discharge Decaying to 0 in 200μs (kA) | 100                |
| Contact Resistance (Micro Ohms)                 | 200                |
| Contact Capacity (pF)                           | 5.5                |
| Contact Inductance (nH)                         | 45                 |
| Mechanical Life                                 | 100,000 operations |
| Auxiliary Contacts                              | DPDT               |
| Auxiliary Contact (Volts AC RMS)                | 230                |
| Auxiliary Contact Current (Amps RMS)            | 15                 |

\* Derate to 15.5kV RMS for 50/60Hz cycle power.



### Ordering Information for Joslyn Hi-Voltage™ 50kV, 400A SPST Contactors

| CAT. NO.           | Contact Arrangement | Insulator Length (in.) | Actuator Volts | Pull-In Current (Amps) | Hold Current (Amps) | Hold Power (Watts) | Time to Close (msec) | Break Time (msec) | Outline Drawing No. |
|--------------------|---------------------|------------------------|----------------|------------------------|---------------------|--------------------|----------------------|-------------------|---------------------|
| RP900K4903D21B30-J | NO                  | 6                      | 115VAC         | 5.20RMS                | 0.54RMS             | 18.0               | 25                   | 46                | 2222                |
| RP900K4904D21B30-J | NC                  | 6                      | 115VAC         | 5.20RMS                | 0.54RMS             | 18.0               | 40                   | 70                | 2223                |
| RP900K4903D2LB30-J | NC                  | 6                      | 220VAC/50Hz    | 2.50RMS                | 0.35RMS             | 12.0               | 40                   | 70                | 2223                |
| RP900K4601D26B30-J | NO                  | 6                      | 100VDC         | 3.75DC                 | 0.14DC              | 14.3               | 18                   | 7                 | 2217                |
| RP900K4602D26B30-J | NC                  | 6                      | 100VDC         | 3.75DC                 | 0.20DC              | 20.0               | 23                   | 14                | 2218                |
| RP900K4315E26B30-J | NO                  | 8                      | 100VDC         | 1.50DC                 | 0.07DC              | 7.0                | 80                   | 10                | 2216                |
| RP900K4665X6B30-J  | NC                  | NA                     | 100VDC         | 3.75C                  | 0.20DC              | 20.0               | 40                   | 12                | 4665                |
| RP900K4667DX6B30-J | NO                  | 6                      | 100VDC         | 5.20DC                 | 0.14DC              | 15.9               | 18                   | 7                 | 2457                |
| RP900K4803D25B30-J | NO                  | 6                      | 48VDC          | 2.0DC                  | 0.14DC              | 7.0                | 40                   | 100               | 2221                |
| RP900K4803D26B30-J | NO                  | 6                      | 100VDC         | 1.60DC                 | 0.07DC              | 7.0                | 40                   | 100               | 2221                |
| RP900K4903C2KB20-J | NC                  | 4                      | 115VAC/50Hz    | 5.10RMS                | 0.70RMS             | 19.0               | 26                   | 46                | 2222                |



This image shows a full page of blank, lined paper. It features approximately 28 horizontal blue lines spaced evenly across the page, typical of standard notebook paper. The lines are thin and light blue, set against a plain white background. There are no margins, text, or other markings on the page.

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