



Viper[®]-ST

Solid-Dielectric, Independent Pole Option Recloser
Providing electronic overcurrent protection for single or three phase operation on systems rated through 38kV, 800A continuous current, 12.5kA or 16kA interrupting current



- Interrupting rating up to 16kA through 27kV
- Overhead, substation and dead-front padmount designs
- Operator safety with mechanical block and triple redundancy on trip handle
- Smart Grid/Lazer[®] solutions
- Ease of installation with site-ready design
- Reliable performance
- Maintenance-free recloser
- High accuracy Accusense voltage sensors
- Up to six internal voltage sensors
- Works directly with SEL-651R, ABB RER620, Beckwith M-7679, and GE R650 controls
- RUS accepted

G&W Engineered to order. Built to last.

Viper-ST

Viper-ST is an independent pole operated (IPO) recloser which combines the time-proven reliability of electronically controlled, vacuum fault interrupters with the maintenance-free benefits of a solid-dielectric insulated device. The IPO feature offers user flexibility by permitting three distinct mechanical operating modes.

- 1 phase trip / 1 phase lockout
- 1 phase trip / 3 phase lockout
- 3 phase trip / 3 phase lockout

The Viper-ST provides overcurrent protection for systems through 38kV maximum, 800A continuous current and 16kA symmetrical interrupting up to 27kV and 12.5kA symmetrical interrupting at 38kV.

FEATURES

Reliable Performance - The Viper-ST recloser utilizes G&W's time-proven epoxy system to fully encapsulate the vacuum interrupter. This system provides excellent insulation while providing fully shielded, void-free construction. All modules are UV protected and 100% factory tested for partial discharge. The Viper-ST recloser utilizes the latest in magnetic actuator technology. The interrupter and actuator assembly has been tested for over 10,000 mechanical operations to assure a long operating life.

Operator Safety - The vacuum interrupter and all other energized parts are sealed within solid-dielectric insulation. The body of the modules are fully grounded to provide a dead-tank construction. This dead-front concept provides optimum operator safety and additional protection to wildlife. A hookstick operable, manual trip and lockout handle prohibits operation from either the control or remotely. A mechanical blocking device further assures against accidental close. An open and closed contact indicator verifies contact position. Contact status and lockout condition can also be verified at the control.

Maintenance-free - Solid-dielectric insulation provides a maintenance-free installation. Electronic equipment associated with the operation of the magnetic actuator(s) are located in the control.

Ease-of-Operation - The Viper-ST is compatible with the SEL-651R, Beckwith M-7679, ABB RER620, and GE R650 controls with 32-pin and 42-pin interfaces.

Ease-of-Installation - The Viper-ST is lightweight and compact. Site-ready designs provide all accessories including brackets, arresters and voltage transformers preassembled prior to shipment, significantly reducing installation time. All Viper-ST designs are system tested, including the site-ready units. One single control cable brings all current, voltage, breaker status and trip/close information into the control.



38kV Viper-ST recloser with center mount frame.

Application Flexibility - Units are designed for overhead, substation and padmount applications. Polemounted units can be equipped with either one horizontal and one vertical insulator or both horizontal insulators. Viper reclosers are designed with IEEE 386 interface apparatus bushings permitting the use of either silicone insulators for overhead applications or elbow connectors for padmount or riser applications. Removable silicone insulators are standard for overhead applications. This feature permits easy field replacement if an insulator is damaged. Higher external BIL rated insulators can also be used in high pollution areas and can be retrofitted on site if necessary. Silicone is the best hydrophobic material used in the industry.

Smart Grid / Lazer® Automation Solutions - The Viper-ST is automation ready, simplifying conversion for any future automation requirements.

Complete Lazer automation packages are available offering a pre-engineered solution for applications requiring intelligent automatic switching and power restoration. The packages feature one or more protective relays, equipped with distribution and communication capabilities. Available communication devices include fiber optic transceivers, wireless radios or modems.

DEAD-LINE OPERATION

The unique design of the Viper-ST magnetic actuator system provides for local and remote operation of the recloser in the event that the AC source power is lost or interrupted. Dead-line operation allows the unit to operate through the battery located in the control.

OPERATION PRINCIPLE

The Viper-ST recloser monitors the circuit using internal multi-ratio current transformers and voltage sensors. The unit is powered by an external 120 VAC or 48/125 VDC source. The Viper-ST is powered directly from the control, with no other external power required.

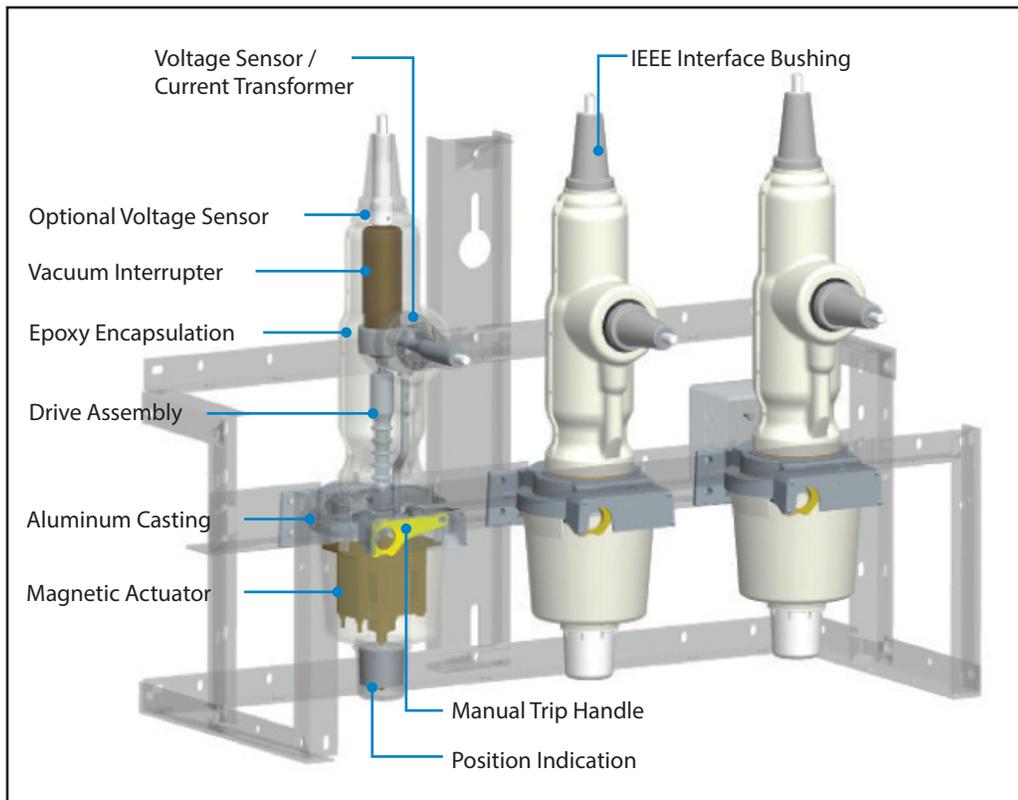
Recloser sequence operations, tripping and overcurrent sensing is an automatic function of the electronic control. Each phase module incorporates a magnetic actuator and drive assembly. Each magnetic actuator uses a permanent magnet to hold a solenoid plunger in the closed position while maintaining a charged opening spring. Trip/close operation is simply accomplished by energizing the trip coil which generates a magnetic flux in the opposite direction and releases the trip spring. The trip spring guarantees an open gap of the contacts inside the vacuum interrupter resulting in a fail-safe operation.

MANUAL TRIP OPERATION

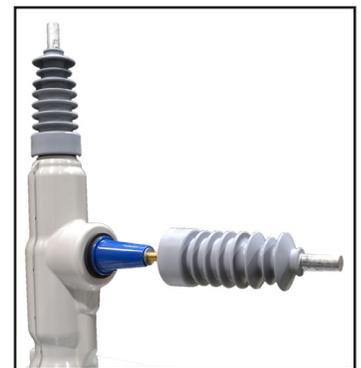
Operation of the hookstick operable manual trip handle trips and locks out the recloser. Pulling the handle down trips and locks out the selected phase. A contact position indicator is provided, indicating open or closed status of the contacts for each phase. Module contact status is also displayed at the control. Operation of the manual trip handle disables any local or remote closing operation until the handle is reset. A mechanical blocking device further assures against accidental close. The handle is operable from ground level. Once reset, the recloser can be closed using the control.



Manual trip handle



Isometric view of the Viper-ST without insulators.



Silicone insulators are removable permitting easy replacement in the field if damaged or if higher external BIL level is required.

Viper-ST

CONTROL CAPABILITIES

The Viper-ST works directly with the SEL-651R, Beckwith M-7679, ABB RER620, and GE Multilin R650 controls. See the control manufacturers product literature for further information.

CONTROL CONNECTIONS

A 1/4 turn twist-lock style, 32-pin connector makes the cable connection between the control and the interrupter control box. The cable provides the normal power supply to the magnetic actuator. The 32-pin interface control cable also brings down the CT and VS outputs to the control.

A standard 52a auxiliary contact for each phase comes with the 32-pin Amphenol connector. As an option, a 42-pin interface with a Harting connector is provided when an additional 52b auxiliary contact is requested. Both 52a and 52b are on the same Form C micro-switch. This 42-pin interface also offers a cable-disconnected alarm when the cable is unplugged or cut.

ACCUSENSE VOLTAGE SENSORS

Accusense Voltage Sensors are a metering-class voltage sensing solution that enables users to collect critical voltage data needed for optimizing grid power delivery and reliability. Accusense voltage sensing technology eliminates the need for metering with traditional voltage transformers and is available as a site-ready solution with the Viper-ST.

Accusense voltage sensors have been tested to IEC 60044-7:1999 standard and comply with 0.5 accuracy class ($\pm 0.5\%$ Magnitude, $\pm 0.344^\circ$ Phase). They are rated to operate up to 38kV voltages, 225kV BIL, -40°C to $+65^\circ\text{C}$ temperature range, and do not require ratio correction factors.

SOLID-DIELECTRIC MODULES

The Viper-ST modules are manufactured with an IEEE apparatus bushing interface. Removable silicone insulators are standard for all overhead applications. If higher external BIL ratings are required due to high altitude or local environmental conditions, higher rated insulators can be provided initially or retrofitted in the field by utility personnel. For dead-front, padmounted applications, 600A apparatus bushings or 200A deep well bushings (up to 27kV) are available.

- A 1000/500:1 dual ratio current transformer is encapsulated within each module. An optional 400/200:1 dual ratio CT is also available for lower current detection.
- CT accuracy is $\pm 1\%$.
- Capacitive voltage sensors are encapsulated within each module and operate at Low Energy Analog (LEA) levels. The accuracy $\pm 2\%$ over the temperature range -20°C (-4°F) through $+40^\circ\text{C}$ (104°F) and $\pm 4\%$ from -60°C (-76°F) through $+65^\circ\text{C}$ (149°F). The voltage sensing phase angle accuracy is $\pm 1^\circ$ throughout the full temperature range.



SEL-651R front access control for conventional recloser applications.



Beckwith M-7679 front access control for recloser applications.



32-pin interface control cable with 1/4 twist lock connectors permit easy field installation.



42-pin interface.



Cabling from each recloser module is terminated inside a junction box permitting a single cable to go to the control. Cable entry can be using either strain relief or twist lock style connectors.



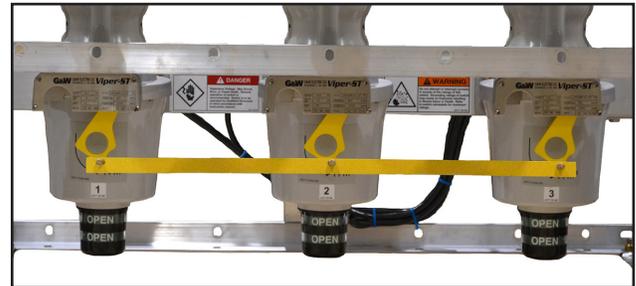
Accusense Voltage Sensor

Polemount Center Bracket (15kV drawing shown)*

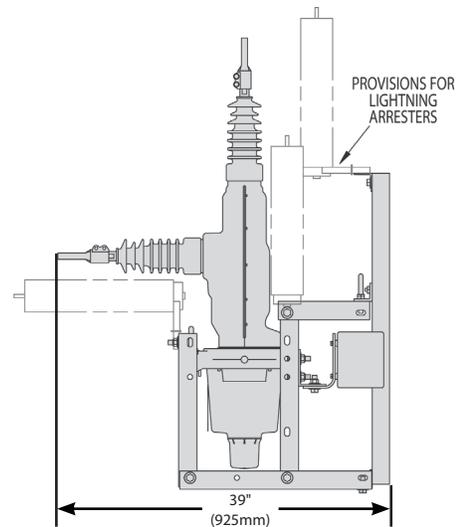
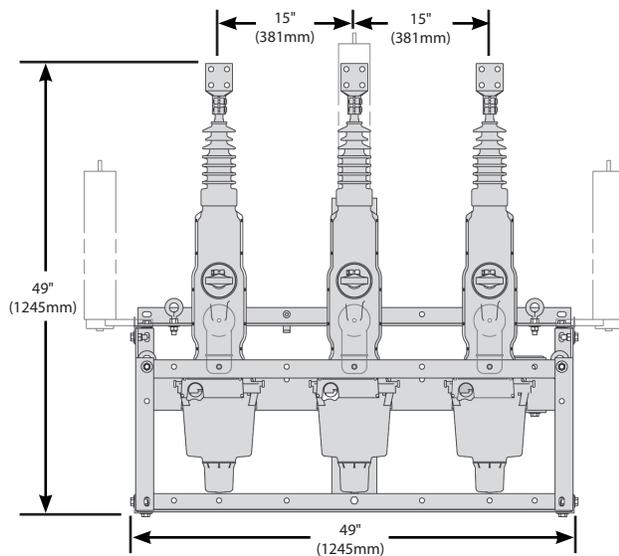
Centermount frames are available in aluminum as standard. These frames can be designed to incorporate site-ready accessories, such as potential transformers and lightning arrestors.



38kV center polemount Viper-ST

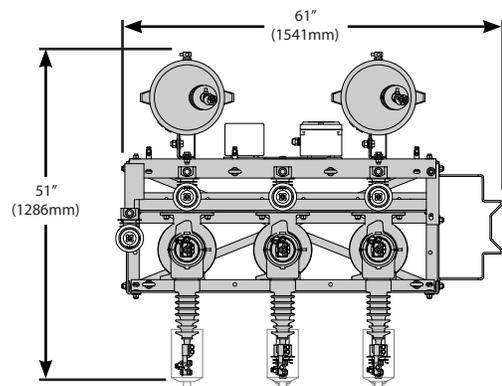
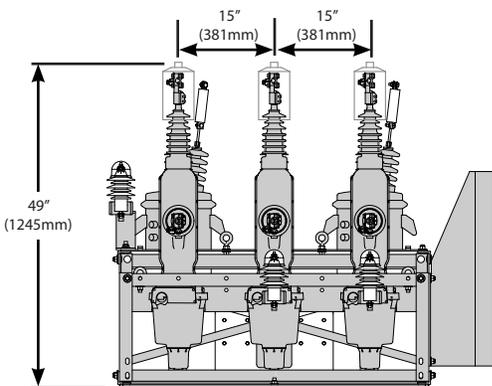


▲ Optional 3-phase ganged manual trip handle.



Full site-ready Alley-arm with two oil PTs (15kV shown)*

Mounting bracket can be mounted on either side of the Viper-ST to match overhead lines. Bracket position can be changed onsite without the need of special tools.



* Dimensions are approximate. Do not use for construction. Brackets are aluminum as standard.

Viper-ST

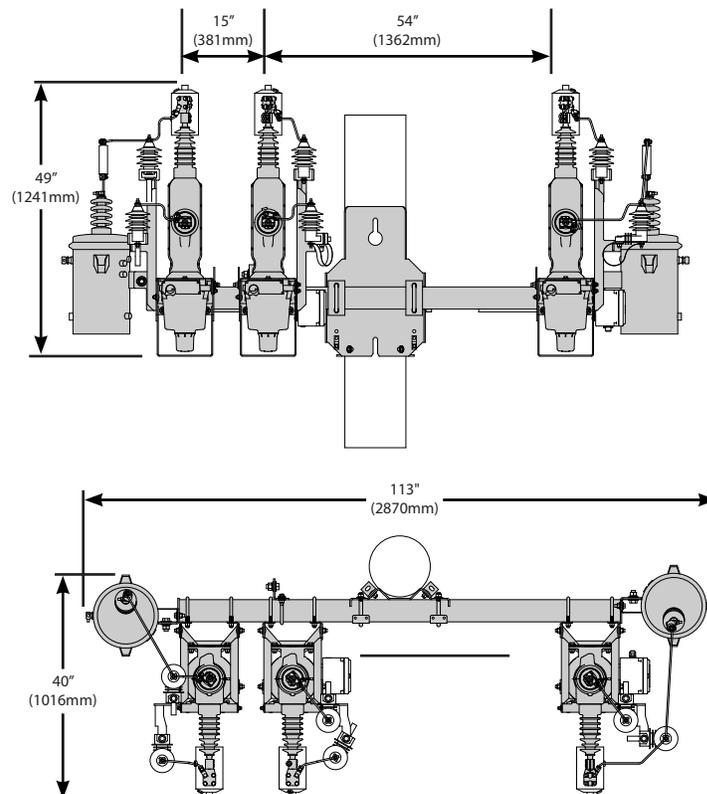
Polemount Site-Ready Assembly (15kV shown)

Preassembly of all auxiliary equipment significantly reduces recloser preparation time for product installation in the field. It includes oil potential transformers or solid-dielectric voltage transformers, arresters, aerial lugs, terminal/junction boxes, wildlife protectors and all associated wiring. Control cables are connectorized on both ends. Various lengths are available for a cleaner installation. User identification markers can be pre-applied to each unit prior to shipment further reducing installation time. Galvanized steel frames are standard and stainless steel frames are an option.

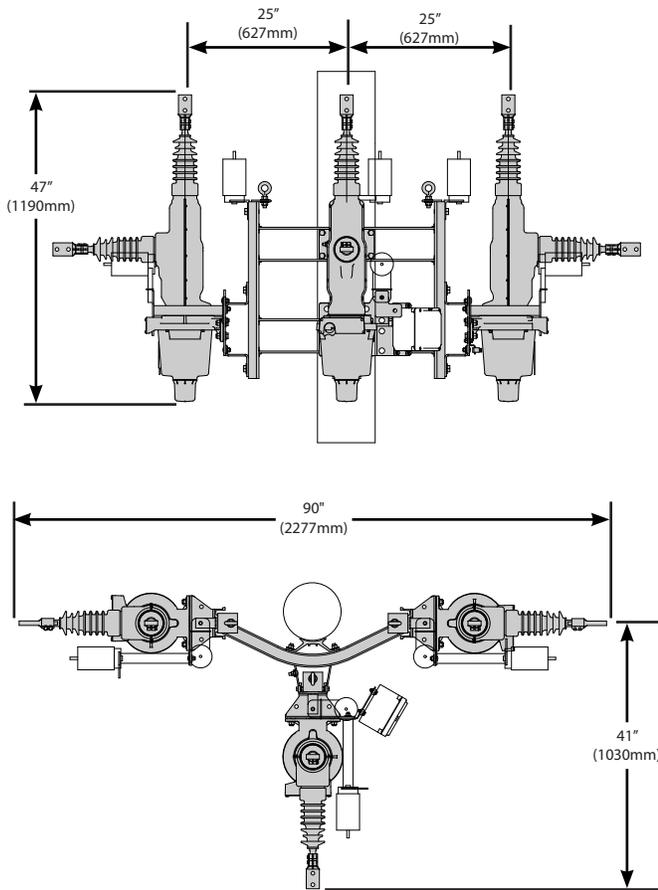


Cross-arm frame (15kV shown)*

Phase B can be moved at site, without special tools, to either side of the pole to match the overhead line configuration. Shown as a site-ready unit. Galvanized steel frames are standard.

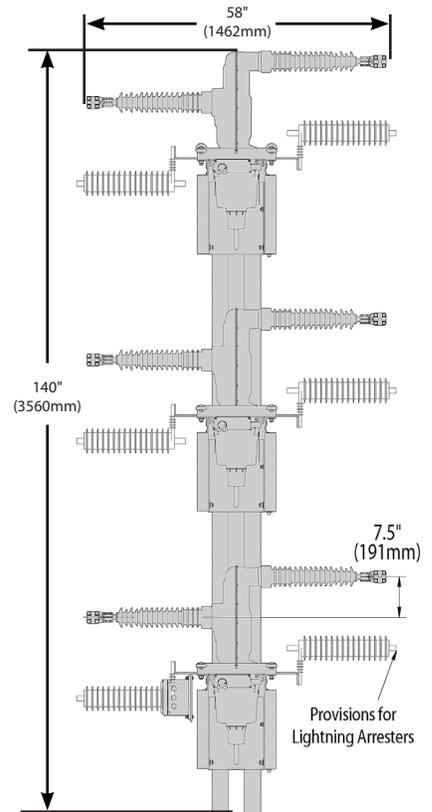


Polemount Cluster Bracket (15kV shown)*



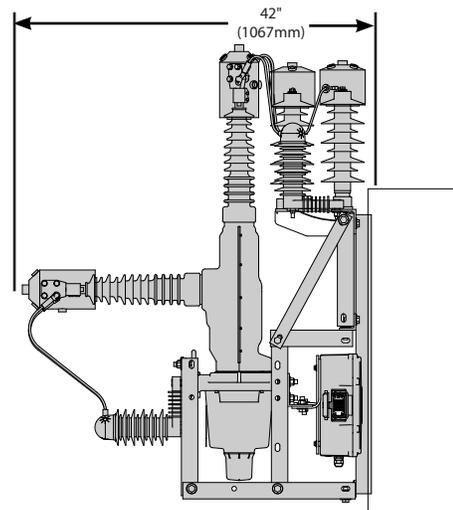
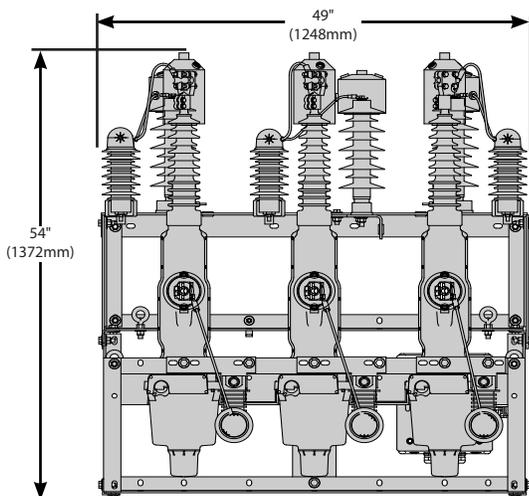
Horizontal Insulator Bracket (38kV shown)*

This configuration is ideal for overhead applications where all three phase conductors are on the same side of the pole or for congested installations with minimal phase spacing. Galvanized bracket is standard.



Viper-ST with Accusense (27kV shown)*

Centermount or cross-arm frames with factory installed Accusense voltage sensors and lightning arresters. Additional site-ready options are available, such as potential transformers for control power. Aluminum frames are standard.



* Dimensions are approximate. Do not use for construction.

Viper-ST

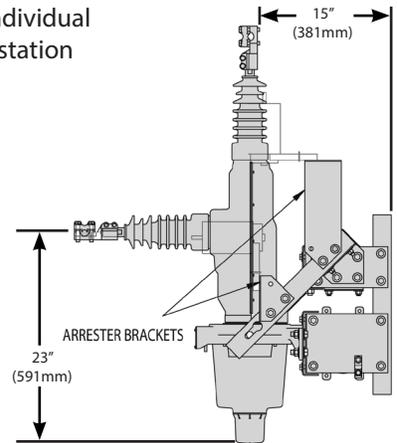
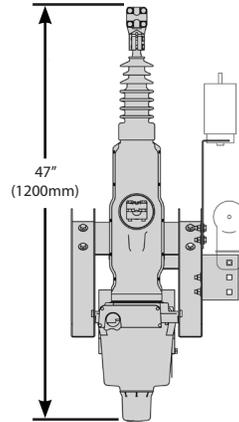
Substation Mount Recloser*

Frame height is adjustable. Photo and drawings below show a three phase mounted unit. Substation frame is made of galvanized steel.

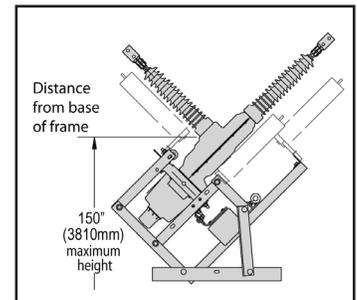
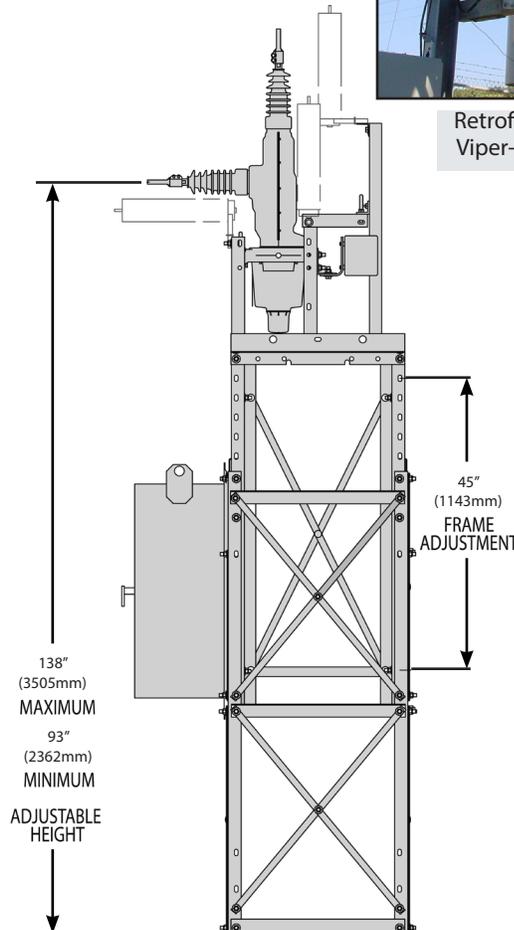
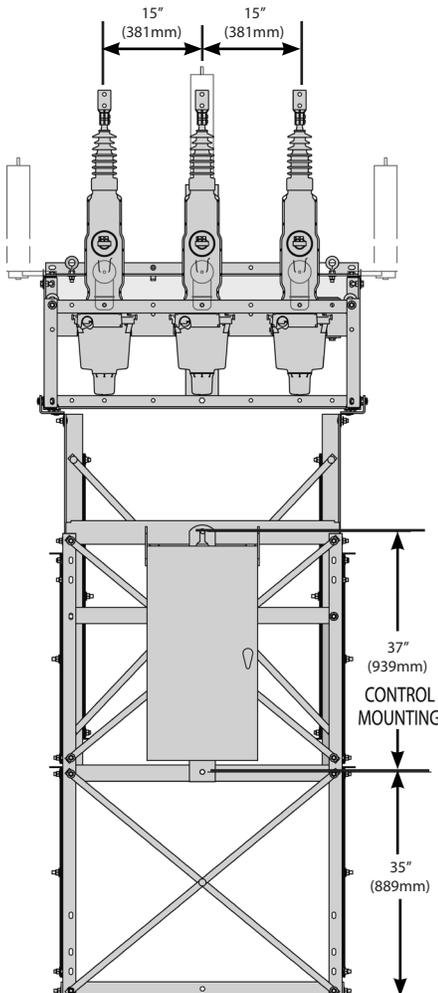


Viper-ST with one set of external CTs. A second set of CTs can be provided on the other side.

Brackets can be supplied for each individual module permitting customized substation configurations. See photo below.



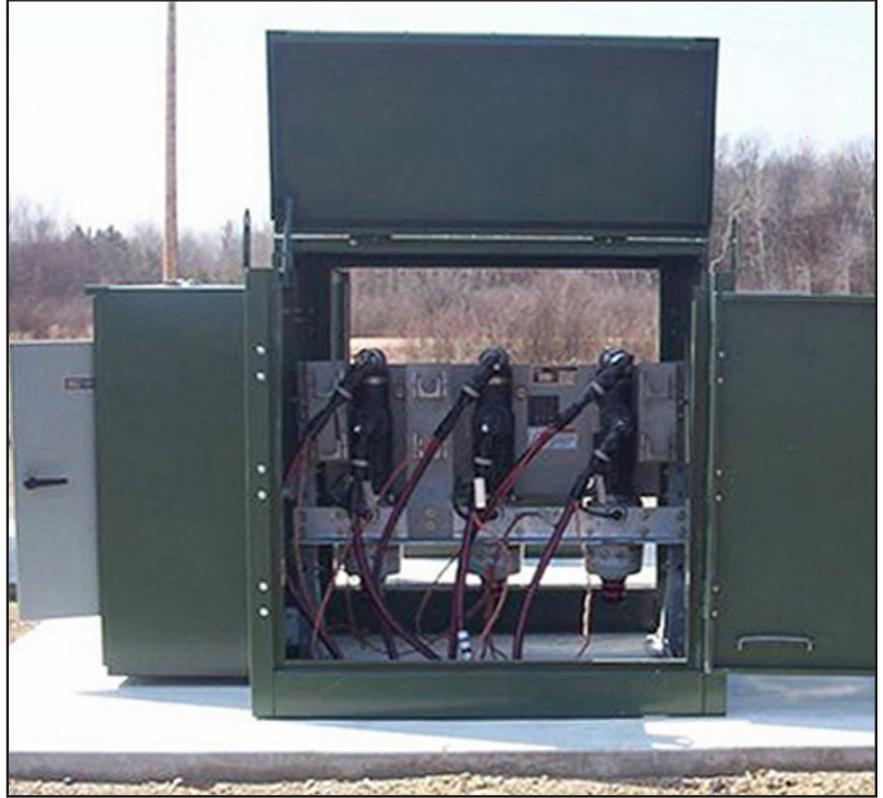
Retrofit installation with Z modules Viper-ST on individual frames



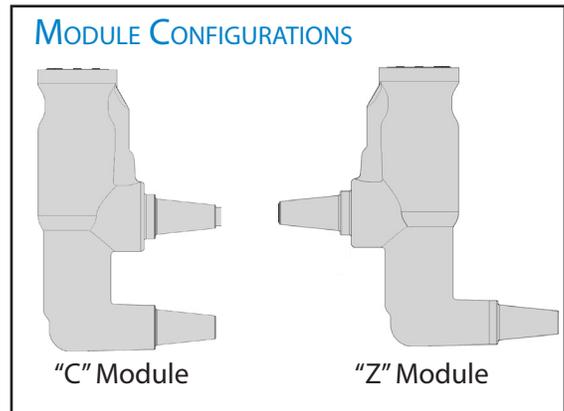
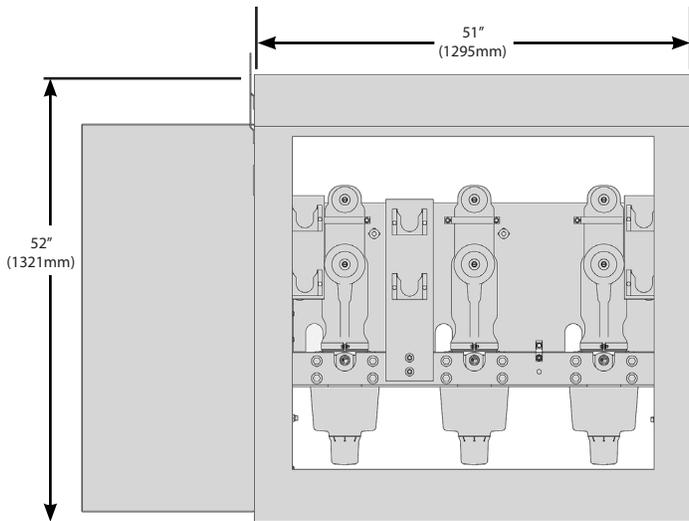
Drawing shows 45° angle mounting for applications requiring the same load and line side connector height.

PADMOUNT APPLICATIONS

For applications where space is limited at the substation or where underground feeders require protection, Viper-ST solid-dielectric reclosers can provide an ideal solution using a dead-front padmount design. The padmounted Viper-ST can be used as a breaker or as a tie-switch. Padmount applications can be considered for fenceless substations. In this configuration, the cable connections can be provided with either a standard IEEE 600A apparatus or 200A deepwell interface for elbow connectors. Controls can be mounted inside the recloser enclosure or within a separate adjacent low voltage enclosure. Up to six internal LEA voltage sensors can be provided on padmounted designs with Z or C modules, perfect for tie points on FDIR schemes and automatic transfer applications.



Padmount Reclosers with Front only or Front / Back Access*
Galvanized steel enclosure is standard.
Stainless steel is optional.



* Dimensions are approximate. Do not use for construction.

Typical Specifications

DESIGN RATINGS AND STANDARDS

Reclosers shall be designed, tested and built per IEEE C37.60 and IEC 62271-111 standards. Certified test reports shall be provided. The recloser shall be rated (select column):

Max System Voltage (kV)	15.5	27	38
Rated Voltage (kV)	15	25	35***
Interrupting Rating RMS (kA)	16*	16*	12.5
BIL (kV)	110	125	150
Continuous Current (A)	800/ 1000**	800/ 1000**	800
8 Hr. Overload, at 20° C	960	960	960
Making Current, RMS, asym, KA	25*	25*	20
Peak, asym (kA)	42*	42*	32
Short Circuit Current, kA sym, 3 seconds	16*	16*	12.5
60Hz Withstand, kV rms Dry, 1 minute	50	60	60
60Hz Withstand, kV rms Wet, 10 seconds	45	50	50
Operating Temperature	-60°C to +65°C		
Mechanical Operations	10K	10K	10K

* 29.3kV system voltages are available

** Consult factory for higher continuous current up to 1000A

12.5kA Interrupting Current rating available

Voltage Class	Catalog Number
15.5kV	VIP378ER-[12 or 16]*-1-ST
27kV	VIP388ER-[12 or 16]*-1-ST
38kV	VIP398ER-[12]*-1-ST

*12=12.5kA sym. fault interrupting or

16=16kA sym. fault interrupting

Approximate weight (for single-phase module less frame) is 100lbs. (45kg)



◀ NEMA 4-hole, 2-hole and clamp style aerial lugs.

OPTIONS*

The following options shall be supplied:

(Check as necessary)

- NEMA 2-hole aerial lugs
- NEMA 4-hole aerial lugs
- Clamp style aerial lugs (#2 - 500 kcmil)
- Clamp style aerial lugs (250 -750 kcmil)
- 4/0 brass eyebolt ground lug
- Polemount site-ready assembly
- Lightning arresters
- Dead-front padmounted design with stainless steel enclosure
- External Accusense Voltage Sensors (0.5 class accuracy)
- External 1.0 KVA oil potential transformer (3% accuracy) for 120 VAC supply power with hardware to mount on standard aluminum frame
- External 0.75 KVA solid-dielectric voltage transformer (0.3% accuracy) for 120 VAC supply power with hardware to mount on standard aluminum frame
- High impact, UV stable wildlife protectors for source and load insulators
- External CTs for current monitoring
- Six internal voltage sensors
- Junction box with all twist lock connections
- 42 pin interface with additional 52b auxiliary contact (Form C type) and cable-disconnected alarm
- 3-phase ganged manual trip handle

* Additional Cost

Contact factory for additional options or customization.

Applications

Reclosers play a critical role in improving distribution reliability. By applying Viper-ST reclosers on the distribution system, permanent faults can be isolated to minimize outage areas and temporary faults can be cleared to restore power, thereby improving service continuity and system reliability.

The G&W Viper-ST can be used in a variety of applications including stand-alone reclosers, complex loop schemes with sectionalizing and tie switches, replacements for circuit breakers for feeder protection, and distributed generation intertie switches. The Viper-ST recloser is a versatile solution for your over-current protection and distribution automation needs.

High accuracy Accusense voltage sensors integrated with the Viper-ST can be used as a tool to assist in improving power optimization initiatives such as volt-var optimization (VVO), conservation voltage reduction (CVR), and end-of-line metering. The Viper-ST solution with Accusense voltage sensors can serve as a metering point to provide data required for power factor adjustments, reducing voltages, optimizing voltages, and managing peak loads. External CT's can be installed over the Viper insulators for applications requiring high accuracy current measurement.

Stand-Alone Recloser Application Temporary Fault Between Viper and Load

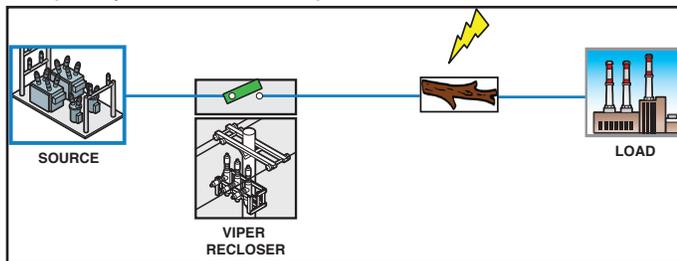


Figure 1: Stand-Alone Viper Recloser trips on a fault

1. A tree branch falls on the line causing a fault between the Viper recloser and Load.
2. The Viper recloser begins reclose sequence and trips open, as shown in Figure 1.

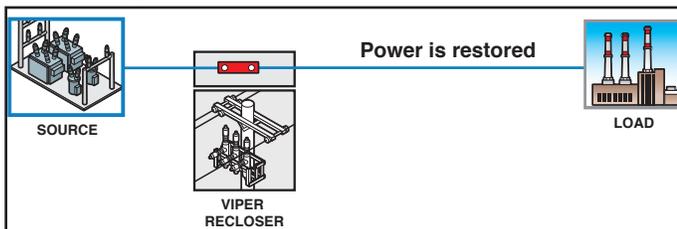


Figure 2: Stand Alone Recloser restores power after temporary fault cleared

3. A tree branch falls and the temporary fault clears.
4. The Viper recloser closes, as shown in Figure 2.

Loop Scheme Application

Loop schemes generally consist of two or more sources tied into a distribution system to ensure backup power is available when the primary feeder is lost. The scheme utilizes sectionalizers and tie switches to automatically isolate the fault, quickly and reliably restores power to all areas unaffected by the fault.

Open Loop Viper-ST Application

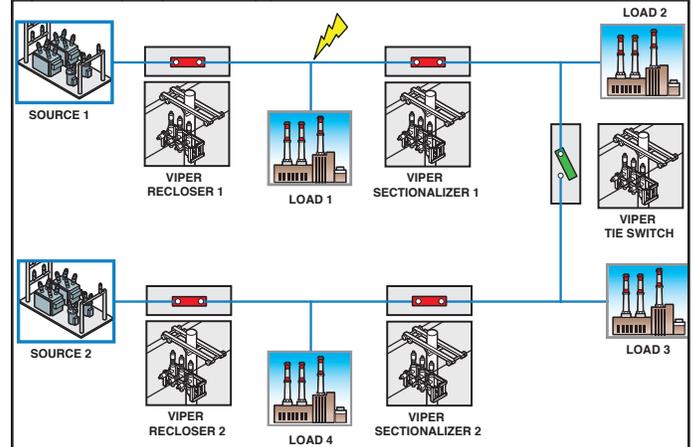


Figure 3: Open Loop Scheme Configuration

Permanent Fault Between Recloser 1 and Sectionalizer 1

1. Viper Recloser 1 Trips open, operates through its reclosing sequences and locks-out
2. Viper Sectionalizer 1 opens after Viper Recloser 1 trips to lock-out, isolating the fault. The power is lost between Viper Tie Switch and Viper Sectionalizer 1
3. The Viper Tie Switch closes
4. Power is restored to Load 2, as shown in Figure 4.

Note: Custom relay programming may be required for Viper loop scheme applications.

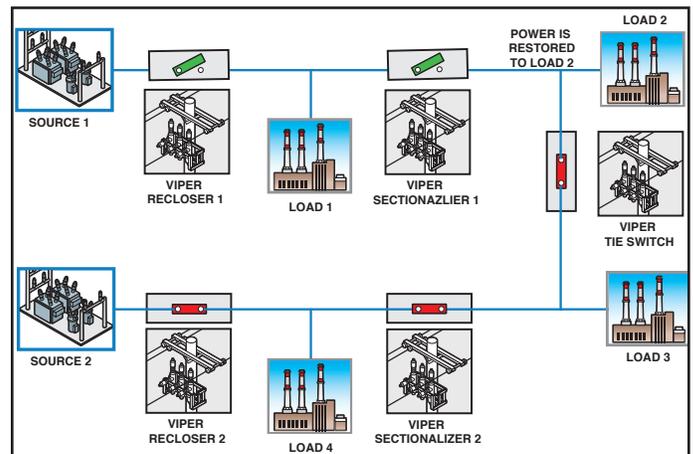


Figure 4: Open Loop Scheme with Fault Isolated

Automatic Transfer

For critical load applications such as hospitals, processing plants, and military bases among others, automatic transfer schemes are common. For overhead systems, this scheme requires two switches, voltage sensors & current transformers, and a voltage-time controller. A loss of voltage on the primary source is sensed and initiates the control to open the primary source and close the alternate source switch to automatically restore power.

Lazer Automation

The distribution automation expertise and products of G&W have been combined to provide a state of the art solution called Lazer Automation. Various levels of Lazer Solutions are available for peer-to-peer product applications, stand-alone controller based systems and total system wide management and control.

G&W offers a complete line of smart distribution voltage equipment including:

Lazer® Automation

- Multiple levels of protection
- Open, flexible communication
- Pre-engineered, factory tested
- Transfer, loop, and network applications



Solid-Dielectric Switchgear

- To 38kV, 16kA interrupting
- Submersible vault and padmount
- Smart Grid / Lazer® solutions
- Single phase and three phase
- Integral Visible Break Designs



SF6 Insulated Switchgear

- To 38kV, 25kA interrupting
- Submersible vault and padmount
- Smart Grid / Lazer® solutions
- Load and Fault Interrupting



Solid-Dielectric Reclosers

- To 38kV, 12.5kA interrupting
- To 27kV, 16kA interrupting
- Overhead, substation and padmount
- Smart Grid / Lazer® solutions
- Single phase and three phase
- Six voltage sensing available



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