Viper®-S

Solid Dielectric Three-Phase Recloser

G&W Electric

Engineered to order. Built to last.

Leader in Recloser Technology

As North America's leading supplier of reclosers, G&W Electric provides cutting-edge technology supported by over 120 years of expertise, comprehensive training, and dedicated support. Utilities on our Viper recloser line for medium voltage applications, renowned for its exceptional performance in a wide range of environments.

The Viper-S recloser, featuring magnetic actuator technology, delivers electronic three-phase overcurrent protection for medium voltage systems. It is rated for up to 38 kV, 800 A continuous current, and 12.5 kA symmetrical fault interrupting capacity.

Features

Reliable Performance - Viper-S reclosers utilize our time proven epoxy system to fully encapsulate the vacuum interrupters. This system provides excellent insulation properties while providing fully shielded, void-free construction. All modules are UV protected and 100% factory tested for partial discharge. The interrupter and actuator assembly are tested annually for 10,000 mechanical operations to ensure a long service life. If main power is lost, the recloser has enough stored energy to trip once, after the control sends the trip command, within a 24-hour period.

Control Flexibility - Viper-S reclosers are designed to work with a variety of different controls including SEL-651R2, SEL-751, INGEPAC™ DA PT4 / PT5, and Beckwith 7679.

Operator Safety - Vacuum interrupters are sealed within a solid dielectric insulation. A hot stick operable manual trip and lockout handle prohibits any close operations either from the control or remotely and the mechanical blocking device further assures against accidental close. An open and closed contact indicator verifies contact position in addition to the contact status and lockout an condition indicators on the control.

Maintenance-free - Solid dielectric insulation provides a maintenance-free installation. Electronic equipment associated with the operation of the magnetic actuator is located inside the Viper-S recloser tank.

Ease of Installation - Mounting bracket with keyhole and lifting provisions provide easy installation. Site-ready designs offer all accessories including mounting bracket, arresters and potential transformers with the associated cabling preassembled prior to shipment to significantly reduce installation time.

Application Flexibility - The Viper-S recloser can be designed for overhead, substation and padmount applications. Pole mounted units with replaceable horizontal and vertical insulators are standard for overhead applications, providing an easy field replacement if an insulator is damaged. Higher creepage distance rated insulators can also be specified or retrofitted if necessary.

A dual-ratio current transformer is encapsulated within each recloser module. The Viper-S recloser offers two CT options.The standard current transformer is a 1000/500:1 dual-ratio CT. Also available is the 400/200:1 dual-ratio CT for lower current detection. The dual-ratio CT inputs to the control are field adjustable. CT accuracy is +/-1%.

Six External CTs can be directly installed on the bushings of the Viper-S recloser for use in substation applications.

Capacitive low energy analog (LEA) voltage sensors, encapsulated within each module, permit voltage readings for use by the relay for basic metering capabilities and network reconfiguration. This eliminates the need for additional transformers and the complexity of the associated cabling and mounting requirements. LEA sensors have an accuracy of +/-2% from -20°C (-4°F) through +40°C (104°F) when tested as a system. The accuracy is +/-4% from -60°C (-76°F) through +65°C (149°F). The phase angle accuracy is +/-1° throughout the full temperature range. Two voltage ratios are available: a 10,000:1 ratio for applications at or above 13.8kV L-G and 2500:1 ratio for voltages lower than 13.8kV L-G. External Accusense© voltage and current sensors can also be used depending on application requirements.

Smart Grid / LaZer® Automation Solutions - The Viper-S recloser is automation ready, simplifying conversion for any future automation requirements. Complete G&W Electric LaZer automation solutions are available offering a pre-engineered solution for applications requiring intelligent automatic switching and power restoration. The automation packages feature one or more protective relays, equipped with distribution and communication capabilities. Available communication devices include Ethernet, fiber optic transceivers, and wireless radio. The typical control paired with the Viper-S recloser is the SEL-651R2 control.

Catalog Numbers

Voltage Class	Catalog Number
15.5kV	VIP378ER-12S
27kV	VIP388ER-12S
38kV	VIP398ER-12S

Approximate weight (without the frame) = 325 lbs. (148 kg).

Operation Options

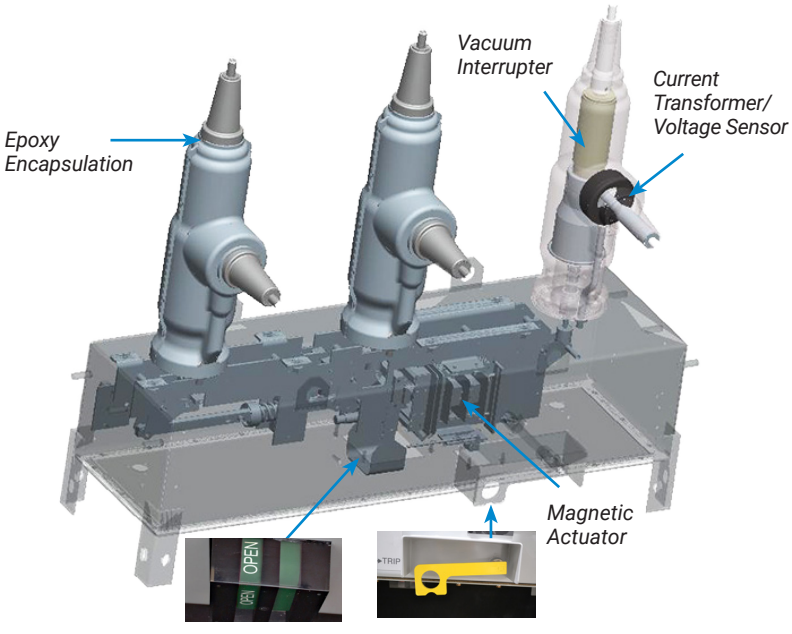
Dead-line Operation - Permits using the batteries located in the control for operation of the recloser when primary control power is lost. A remote status signal reports the operational status of the power supply permitting remote indication of the control's capability to open or close the recloser.

Custom Relay Solutions (CRS) - The CRS option permits using 24VDC, 48VDC or 125VDC control logic voltage as an alternative to the traditional 14-pin SEL control which uses 24VDC for control logic. Recloser power is not affected. This flexibility reduces installed cost for retrofit projects by limiting the need to change relays or replacing the input/output boards.

Internal Voltage Sensing - Permits voltage reading for network reconfiguration applications and provides a secondary analog 120V AC output accepted by most relays such as the SEL-651RA. Options for 3 or 6 internal voltage sensors are available. LEA Voltage Sensing can be used when the Viper-S recloser is paired with the SEL-651R2.

Manual Trip Operation

Operation of the hot stick manual trip handle opens and locks out the recloser. A contact position indicator is provided indicating open or closed status of the contacts. Recloser 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 from the control.



Isometric view of the Viper-S recloser without insulators.

Control Capabilities

Various recloser controls are available and can be provided depending upon application requirements. G&W Electric engineers consult with the customers to help provide a custom solution to fit the application by choosing the correct relay for the customer's specific needs.

Typical control settings include:

- Minimum trip for phase, ground and sensitive ground faults
- Standard library of pre-programmed and user-defined time current curves
- Programmable and independent reclose intervals
- Multiple operations to lockout
- Programmable reset time
- Sequence coordination
- Cold load pickup
- Hot line tag
- Advanced parameters. Refer to control specifications for more details

Control Power Viper-S Recloser

Many of today's reclosers require two to three cables between the control and the recloser to provide AC power to the recloser, control signals and commands, and in many cases, deadline operation. Now there is a cleaner, more efficient way to do the same tasks using G&W Electric's Control Power Viper-S recloser.

The Control Power Viper-S recloser provides a single cable solution for all current, control, recloser position status, and auxiliary power to operate the Viper-S recloser. This package uses the power from the control to operate the Viper-S recloser through a four-shot sequence. The power in the recloser control is backed up by batteries and provides an excellent solution for applications requiring deadline operation.

The Control Power Viper-S recloser paired with the SEL-651R2 provides an economical deadline operation solution, which the traditional 14-pin connector cannot provide, by utilizing the SEL-651R2 power source to drive the magnetic actuator and eliminate the AC/DC power supply within the recloser. The Control Power Viper-S recloser has less electronics in the recloser than traditional 14-pin reclosers.

Features

The Control Power Viper-S recloser utilizes the same magnetic actuators, with integrated trip spring, and proven solid dielectric encapsulated dead tank modules with removable silicone insulators. With the addition of the 19-pin interface, the Viper-S recloser is compatible with many of the popular recloser controls.

The chart of controls is a non-exhaustive list. Other relays can be integrated with the Viper-S recloser using our Custom Relay Solution for 48 or 125 VDC I/O applications.

SEL-651R2 recloser control.

Viper-S Recloser Control Comparison Chart*

Manufacturer	Control	Connectors Accepted	
		14-pin	19-pin
SEL	SEL-351R	•	
	SEL-751-751A	•	
	SEL-651RA	•	
	SEL-651R2	•	•
Cooper	FORM 6	•	•
	FORM 5	•	•
	FORM 4D	•	•
	FORM 4C	•	•
	FXB	•	
Ingeteam	IngePAC DA PT4/PT5	•	
GE	URC	•	
	R650	•	
Beckwith	M-7679	•	
ABB	RER620	•	

Interface Configurations

The traditional 14-pin recloser control connector design is the same as other legacy reclosers permitting easy retrofits of previously installed controls and/or reclosers. The Viper-S recloser comes with various interface configurations depending on the control used. The tables below give additional details of the connectors each of the following configurations:

Traditional 14-pin, SEL-651RA*		
Configuration	**Type**	**Description**
Required	14-pin, multi-turn	Control
	2-pin, multi-turn	AC (heaters, capacitator charging)
Optional	6-pin, multi-turn	Dead-line operation
	8-pin, multi-turn	Three 120VAC internal VS
	Hard-wired or connectorized	Additional aux. contacts

**Note: Not offered in the U.S. For additional compatible controls with these configurations see table on page 3.*

14-pin, SEL-651R2*		
Configuration	**Type**	**Description**
Required	14-pin, multi-turn	Control
	2-pin, multi-turn	AC (heaters, capacitator charging)
Optional	4-pin, 1/4 turn	3 LEA VS
	8-pin, 1/4 turn	3 or 6 LEA VS
	8-pin, multi-turn	Three 120VAC internal VS
	Hard-wired or connectorized	Additional aux. contacts

**Note: No Dead-line operation available with this configuration, use the 19-pin Control Powered version instead.*

19-pin, Custom Relay Solution (CRS)		
48 VDC or 125 VDC control powered		
Configuration	**Type**	**Description**
Required	19-pin, multi-turn	Control
	6-pin, multi-turn	AC: heaters* & DC: cap charging
Optional	8-pin, multi-turn	Three 120VAC internal VS
	Hard-wired or connectorized	Additional aux. contacts

**Note: If AC is not available, optional heaters can work on DC. Mostly used for substation applications where only DC is available.*

19-pin, Control Powered SEL-651R2		
Configuration	**Type**	**Description**
Required	19-pin, multi-turn	Control*
Optional	4-pin, 1/4 turn	3 LEA VS
	8-pin, 1/4 turn	3 or 6 LEA VS
	8-pin, multi-turn	Three or Six 120VAC internal VS
	Hard-wired or connectorized	Additional aux. contacts

**Note: Control cable includes AC for heaters and dead-line operation feature if battery is provided.*

VS = Voltage Sensors
LEA = Low Energy Analog

Traditional configuration: 2-pin AC, 14-pin for control, and 8-pin 120VAC voltage sensing connectors.

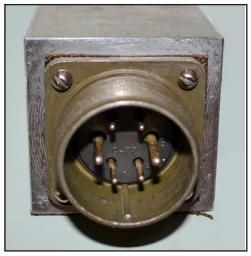
Control powered solution: 8-pin quick-disconnect for LEA voltage sensors and 19-pin connector with integrated dead-line operation control.

14-pin with 2-pin AC cable connectors.

Cable Configurations

14-pin connector

2 pin AC connector

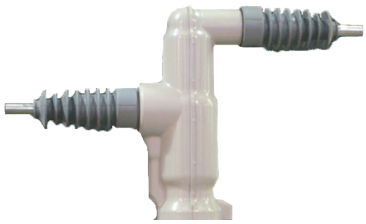


Optional 6-pin dead- line operation connector

19-pin connector

Insulator Flexibility

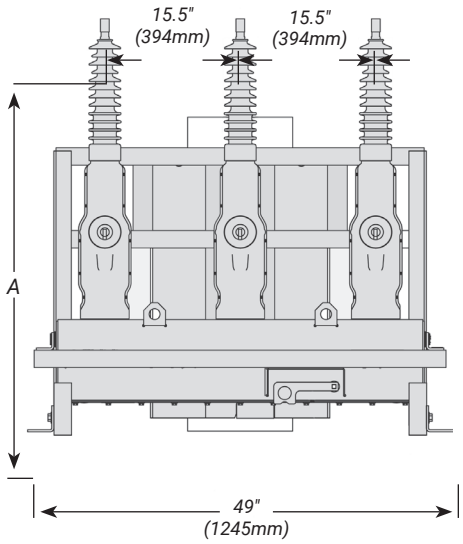
Pole-mounted units can be equipped with either horizontal or vertical insulators. Removable silicone insulators are standard for overhead applications. This feature permits easy field replacement if an insulator is damaged. Higher external extra creepage rated insulators can also be retrofitted if necessary. Three or six internal voltage sensors are available in both the L-shaped or Z-shaped modules options.

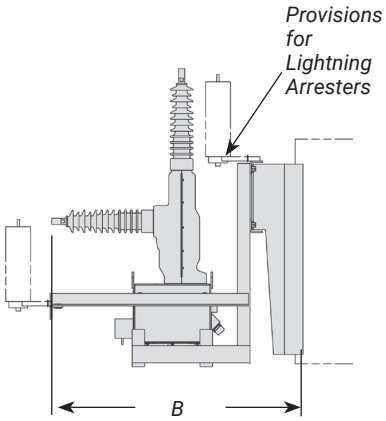


Shown with horizontal insulator configuration (Z-shaped module)

Pole Mount Center Bracket*

Approx. Dimensions*- ins. (mm)			
	15.5kV	27kV	38kV
A	42 (1067)	47 (1204)	51 (1295)
B	39 (991)	44 (1118)	48 (1219)

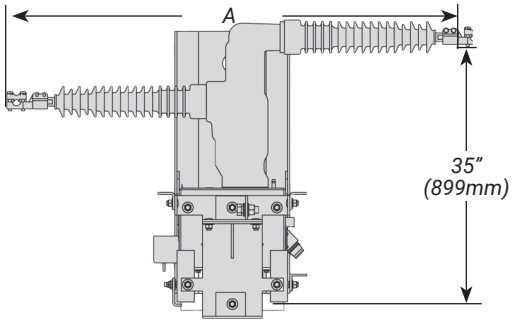




Pole Mount Alley-Arm*

Horizontal side mounting brackets with Z-shaped modules are ideal for overhead configurations where all three-phase conductors are on one side of the pole and space is limited.

Approx. Dimensions*- ins. (mm)			
	15.5kV	27kV	38kV
A	42 (1067)	50 (1270)	58 (1473)



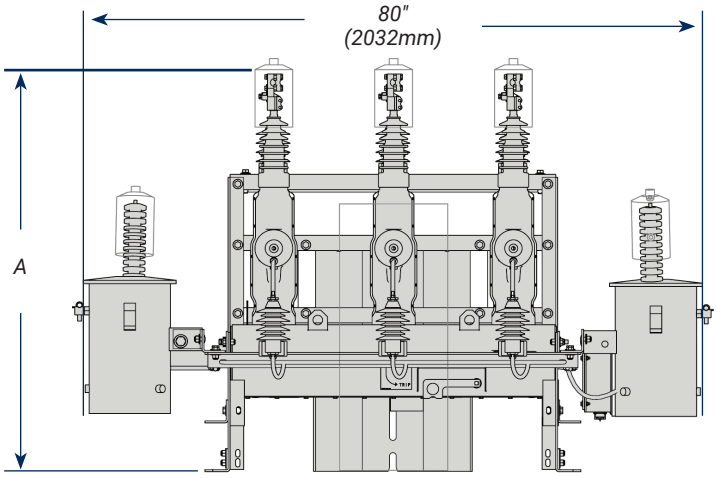
** Dimensions are approximate. Do not use for construction. Galvanized steel bracket is standard. Stainless steel is available.*

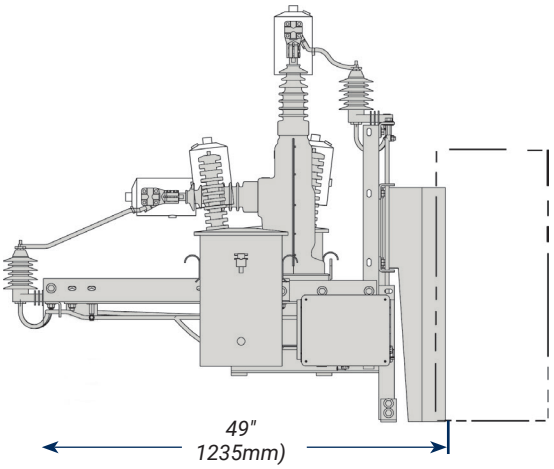
Pole Mount Site-Ready Assembly*

Preassembly of all auxilantly reduces recloser preparation time for product installation in the field and includes potential transformers, arresters, aerial lugs, terminal/junction boxes, wildlife protectors, and all associated wiring. Control cables are connectorized on both ends and cut to length for a cleaner installation. User identification markers can be applied to each unit prior to shipment further reducing installation time.

Approx. Dimensions*- ins. (mm)			
	15.5kV	27kV	38kV
A	54 (1378)	58 (1473)	62 (1575)

Packaged control cable is included.





** Dimensions are approximate. Do not use for construction.*
Galvanized steel bracket is standard. Aluminum or stainless steel is available.

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

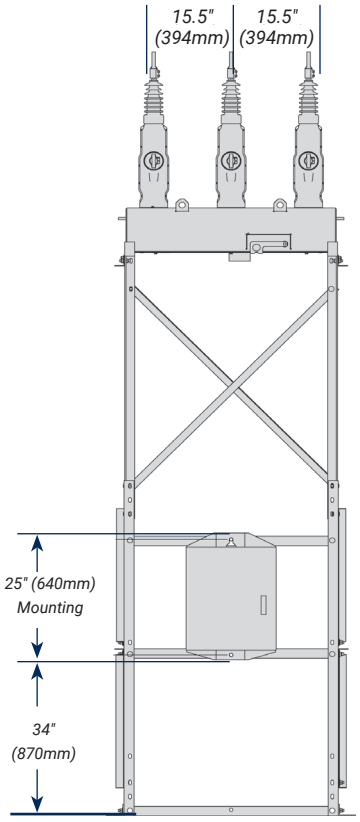
Custom mounted frame required for replacement of previously installed oil filled equipment.

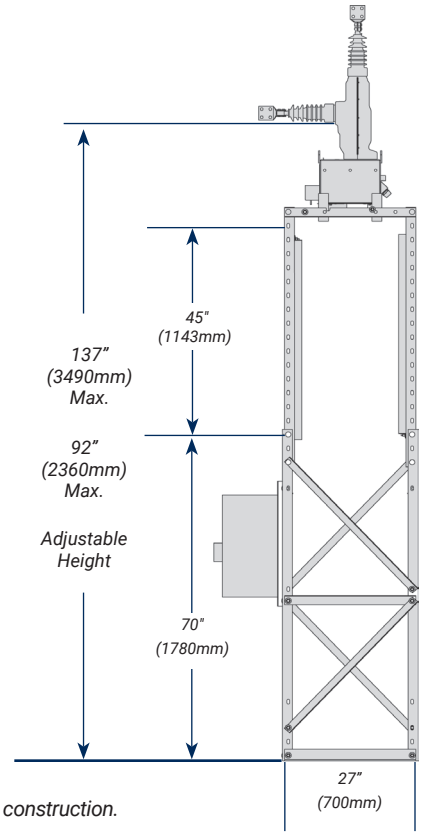
Substation Mount Recloser*

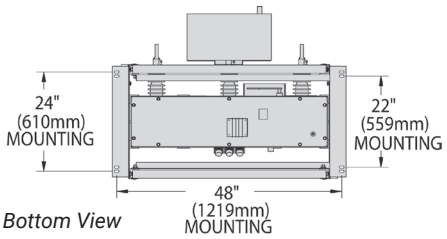
Substation frames are adjustable. Standard frames are galvanized and stainless steel frames are optional. Custom frames are available including the conversion for direct replacement of existing reclosers.

Dead-front construction makes it ideal for substation circuit breaker applications and ensures the shielded solid dielectric modules are grounded to earth potential.

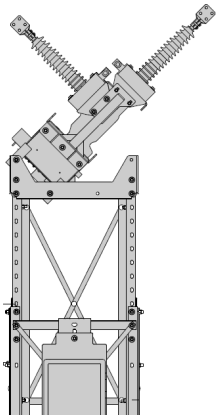
For applications where extended creepage is required, larger insulators can be applied up to 940mm of creepage distance and 150kV BIL. External bushing CTs can be mounted at the base of the insulator where they can be used for metering or relay protection schemes like bus differential. The mechanism housing for sub station applications is rated IP46 for protection from water intrusion. *Externally mounted CTs provide current monitoring on both the load and line side. Individual CTs and cabling are available.*







Bottom View



Viper-S recloser substation mount shown with CTs.

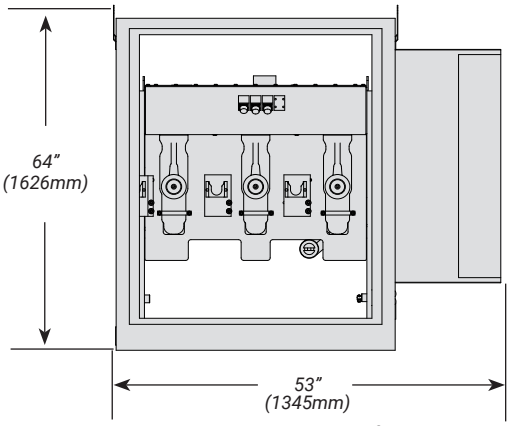
** Dimensions are approximate. Do not use for construction.*

Padmount Applications

In applications with limited space at the substation, fenceless substations, or where underground feeders require protection, the padmount Viper-S solid dielectric magnetically actuated three-phase recloser provides fault interrupting up to 12.5kA.

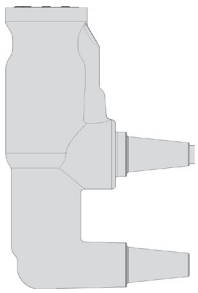
- 100% dead-front construction that eliminates the need for a transition compartment from live-front terminations to dead front and removes the necessity for insulating dielectric barriers.
- Used as a breaker, tie-switch, and for transitioning from underground to overhead cables as required for distributed energy resource interties or data centers.
- Where cable connections with either a standard IEEE 600A apparatus or 200A deepwell interface for elbow connectors are needed.
- Configured with Z-shaped (front/back access) or C-shaped (front access) modules, perfect for tie points in fault location, isolation and service restoration (FLISR) schemes and automatic transfer applications.

Galvanized steel enclosure is standard and 304 and 316 stainless steel are available.

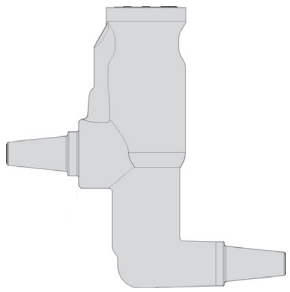


** Dimensions are approximate. Do not use for construction.*

Padmounted Viper-S recloser used in place of a circuit breaker in a solar generation intertie application



C -shaped module



Z -shaped module

Typical Specifications

A. Configurations

The configurations for an electronically controlled, mechanically ganged, solid dielectric vacuum recloser for use on distribution systems through 38kV are:

- Pole mount, center mount
- Pole mount, side horizontal (alley-arm)
- Pole mount Alley arm Z-shaped (front/back access)
- Substation, 90° mount L or Z -shaped
- Substation, 45° mount L or Z -shaped
- Padmount, Z-shaped (front/back access)
- Padmount, C-shaped (front access)

B. Design Ratings and Standards

Reclosers are tested and built per IEEE C37.60, IEC 62271-111, and IEEE 386 standards. Certified test reports can be provided upon request.

Voltage Class (kV)	15	25	35
Max System Voltage (kV)	15.5	27	38
Impulse Level (BIL), kV	110	125	150
Continuous Current (A)	800A*	800A*	800
Power-Frequency Voltage Withstand Rating, kV RMS(60 Seconds Dry)	50	60	70
Power-Frequency Voltage Withstand Rating, kV RMS(10 Seconds wet)	45	50	60
Short Circuit Interrupting Current, kA sym 3 seconds	12.5	12.5	12.5
PEAK Withstand Current (kA)	32	32	32
Mechanical Operations	10,000	10,000	10,000
Temperature Range	-60°C to +65°C	-60°C to +65°C	-60°C to +65°C

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

C. Recloser Construction

C1: Mechanism Enclosure

The magnetic actuator and corresponding linkage assembly are housed within a light gray painted stainless steel tank. A contact position indicator is easily visible from the ground a mechanical counter and air vent can be provided.

C2. Operating Mechanism

The operating mechanism utilizes a magnetic actuator for opening and closing the vacuum interrupters. The magnetic actuator is powered by capacitors located in the recloser tank. The manual trip and lockout handle are made of stainless steel for maximum corrosion resistance. Vacuum interrupter contact position green (open) and red (closed) indicators are located on the bottom of the tank and through LEDs inside the control.

C3. Vacuum Interrupters

Interruption of the fault or load currents is accomplished through vacuum interrupters located inside the solid dielectric modules.

C4. Solid Dielectric Modules

The solid dielectric modules utilize a time-proven epoxy insulation to fully encapsulate each of the three vacuum interrupters. The solid dielectric modules are fully shielded and incorporate a high impact poly-carbonate, track resistant, UV stable covering. The modules are dead-front technology and conduct a fault to ground through their external surface in case of a flash over. The operating temperature range is -60°C to +65°C. A 1000/500:1 or a 400/200:1 dual-ratio current transformer and optional voltage sensor(s) can be integrally molded into each module. CT accuracy is +/-1%. Modules are molded with one (1) source side and one (1) load side, IEEE 386 apparatus bushing interfaces. The bushing interfaces accommodate either connection of an underground cable elbow for padmount applications or silicone insulators for pole top and substation applications.

C5. Bushings

Bushing types:
For Overhead design:
- Air insulated, removable silicone insulators over an IEEE 386 bushing interface

For Riser Pole:
- Air insulated, silicone insulators on one side and IEEE 386 bushing interface on the other side.

For Padmount design:
- IEEE 386 600A apparatus bushing
- IEEE 386 200A deep well bushing

D. Operation

Monitoring of the distribution circuit is performed by using internal dual-ratio current transformers and voltage sensors and powered by an external 120/240 VAC or 48/125 VDC source. In the event main power is lost, the unit has full operating capabilities powered from the batteries located within the control. A minimum of 8 hours of operation will be available with a fully charged battery.

The magnetic actuator uses a permanent magnet to hold a solenoid plunger in the closed position while maintaining a charge on the opening spring. Trip operation is 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. Recloser sequencing, tripping and overcurrent sensing, are an automatic function of the electronic control. Manual trip and lockout by an external, hot stick operable handle activates a mechanical block device, disabling any local or remote closing operation until the handle is reset.

E. Smart Grid / LaZer® Automation System

Automation-ready for future requirements with up to 6 optional 120VAC sensors or LEA (Low Energy Analog) capacitive voltage sensors, encapsulated within each recloser module permits voltage reading for network reconfiguration while eliminating the need for add-on external sensors and cabling. LEA voltage sensing accuracy is +/-2% over the temperature range -20°C (-4°F) through +40°C (+104°F) when tested as a system. The accuracy is +/-4% from -40°C (-40°F) through +65°C (+149°F). The phase angle accuracy is +/-1° throughout the full temperature range.

Two voltage ratios are available:
- 10,000:1 for applications above 13.8 kV L-G
- 2500:1 below 13.8 kV L-G

External voltage and current sensors can also be used depending on application requirements.

F. Padmount Enclosure

Enclosures are made of 12 gauge galvanized or stainless steel and manufactured to NEMA 250 Type 4X and C37.75 standards. The enclosure is mounted independently to facilitate cable installation, if desired or for future replacement. Enclosures are tamper-resistant incorporating hinged access door(s) with penta-head locking bolts(s) and provisions for padlocking. The enclosure is available with lifting provisions and is painted with a Munsell 7.0GY3.29/1.5 green finish. Front cable connections or front/back cable connections are available.

G. Electronic Controls

The standard recloser control is Schweitzer model SEL-651R2 and can be used for up to 6 voltage inputs. Other controls are available upon request.

H. Factory Production Tests

Each individual solid dielectric recloser undergoes electrical and a mechanical operation check verifying contact trip/close velocity, travel profile, timing and phase synchronicity. The recloser is AC hi-pot tested one minute phase-to-phase, phase-to-ground, and across the open contacts. Circuit resistance is checked on all phases and time overcurrent tests are conducted to verify minimum pick up level performance. Full factory testing is performed on each Viper-S recloser with their respective matching control as a system and include any additional site-ready add-ons such as potential transformers.

I. Standard Components

1. Lifting provisions
2. Grounding provisions
3. Mechanical counter
4. Manual trip and lockout handle with true mechanical block
5. Fail-safe mechanically ganged operations
6. Dead-front solid dielectric epoxy modules with three dual-ratio CTs
7. Arrester mounting provisions (overhead applications only)
8. Field changeable silicone insulators
9. AC connectorized cable for heaters and power source to the magnetic actuator circuitry
10. Galvanized center pole mount frame (overhead applications only)

J. Options

- 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
- Stainless steel pole mount center bracket with arrester provisions on the load and source side.
- Stainless steel pole mount side bracket (a.k.a. alley-arm frame) with arrester provisions on the load and source side.
- Galvanized steel substation frame.
- Pole mount site-ready assembly
- Lightning arresters
- Dead-front padmounted design with stainless steel enclosure.
- External 1.0 KVA oil potential transformer for 120 VAC supply power with hardware to mount on standard frame
- External 0.75 KVA solid dielectric potential transformer (0.3% accuracy) for 120 VAC supply power with hardware to mount on standard frame
- High impact, UV stable wildlife protectors for source and load insulators
- External CTs for current monitoring
- Three or six internal voltage sensors

Contact us today

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G&W Electric

Engineered to order. Built to last.

Since 1905, G&W Electric has been a leading provider of innovative power grid solutions including the latest in load and fault interrupting switches; reclosers; sensors; system protection equipment; power grid automation; transmission and distribution cable terminations; and joints and other cable accessories. G&W Electric is headquartered in Bolingbrook, Illinois, U.S.A., with manufacturing facilities and sales support in more than 100 countries, including Canada, Italy, China, Mexico, Brazil, India and Singapore. We help our customers meet their challenges and gain a competitive edge through a suite of advanced products and technical services.

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