Solid Dielectric, Triple Option Reclosers

Providing electronic overcurrent protection for single or three phase operation on systems rated through 38kV, 800A continuous current, 12.5kA symmetrical interrupting

- Reliable performance
- Works directly with SEL-651R control
- Independent pole operation
- Operator safety with mechanical block
- Maintenance-free recloser
- Overhead, substation and dead-front padmount designs
- Ease of installation with site-ready design
- Three internal current transformers
- Up to six internal voltage sensors
- Smart Grid/Lazer® solutions
- RUS accepted

Catalog O-vst14
Viper-ST, triple option, is an independent pole operation (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 Ø trip / 1 Ø lockout
- 1 Ø trip / 3 Ø lockout
- 3 Ø trip / 3 Ø lockout

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

**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, unique to G&W, 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 control and a single 32-pin interface.

**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.

**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. A multi-ratio current transformer is encapsulated within the module. The current transformer is provided with 1000/500:1 ratios. A 400/200:1 dual ratio CT option is also available for lower current detection. Inputs to the control are field changeable. CT accuracy is +/-1%. LEA (Low Energy Analog) capacitive voltage sensors encapsulated within each module permit voltage reading for network reconfiguration while eliminating the need for add-on 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 -60°C (-76°F) through +65°C (149°F). Two voltage ratios are available: a 10,000:1 for applications above 13.8 kV L-G and a 2,500:1 ratio below that voltage. The phase angle accuracy is +/-1° throughout the full temperature range. External voltage and current sensors can also be used depending on application 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 charge on the 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.
CONTROL CAPABILITIES
The Viper-ST works directly with the SEL-651R control. Typical features of the SEL-651R include:

- Six voltage inputs necessary for loop scheme designs
- Full line metering capabilities using the voltage inputs from the internal sensors
- Programming to recognize seasonal loads and shift between three phase and single phase trip/close modes for optimal system efficiency up to eight group settings
- For loop schemes the control can be programmed to act as a recloser “looking” in either direction
- Minimum trip for phase, ground and sensitive earth faults (SEF) and very SEF
- Capable of up to four shots to lockout
- Sequence coordination
- Harmonics up to the 16th for the THD analysis
- Cold load pickup
- Ethernet port/ USB port

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. The 42-pin interface option is only available with the SEL-651R and requires a different control part number.

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 or 200A deep well bushings are available.

APPLICATIONS
- Distribution automation
- Distributed automatic transfer
- Sectionalizing schemes
- Circuit breaker alternative
- Open bus tie
- High Impedence Fault detection
- Phase loss application
- Mobile substation
- Synchrophasor
- Revenue grade metering

CATALOG NUMBERS

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<td>38kV</td>
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Approximate weight (for a single phase module less bracket) = 125lbs. (57kg)
Polemount Center Bracket (15kV drawing shown)*

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 on site without the need of special tools.

* Dimensions are approximate. Do not use for construction. Brackets are aluminum as standard.
Polemount Site-Ready Assembly (15kV shown)*
Preassembly of all auxiliary equipment significantly reduces recloser preparation time for product installation in the field. 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 and cut to length for a cleaner installation. User identification markers can be pre-applied to each unit prior to shipment further reducing installation time.

6LEA voltage sensing Viper-ST with two solid dielectric VTs (38kV shown)*

* Dimensions are approximate. Do not use for construction. Aluminum bracket is standard.
Polemount Cluster Bracket (15kV 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. Stainless steel is available.

Horizontal Insulator Bracket (38kV shown)*

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 lines. Shown as a site-ready unit.

* Dimensions are approximate. Do not use for construction.
Substation Mount Recloser*  
Frame is adjustable. Photo and drawings below show a three phase gang mounted unit. Galvanized is standard. Stainless steel is available.

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

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

▲ 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.

Control cabinet mounting options:
• Front
• Either side
• In control house

* Dimensions are approximate. Do not use for construction.
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. Separate compartments are provided for accessing the cables and operators. Controls can be mounted directly to the recloser frame 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 transfers.

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.
A. GENERAL
This specification covers the requirements for an electronically controlled, solid dielectric vacuum recloser with Independent pole operation (IPO) capabilities for use on distribution systems through 38kV. The recloser shall be manufactured by G&W Electric Company designated as Viper-ST solid dielectric recloser. Recloser configuration shall be (check one):

___ Polemount, center
___ Polemount, side horizontal
___ Polemount, cluster
___ Polemount, cross-arm
___ Substation, 90°
___ Substation, 45°
___ Padmount, dead-front
___ Phase-over-phase

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

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<tr>
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<tr>
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<tr>
<td>60Hz Withstand, kV rms Dry, 1 min</td>
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<td>60</td>
<td>70</td>
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<tr>
<td>60Hz Withstand, kV rms Wet, 10 sec</td>
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<td>50</td>
<td>60</td>
</tr>
<tr>
<td>Mechanical Operations</td>
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C. RECLOSER CONSTRUCTION
C1: Mechanism Enclosure
The magnetic actuator and corresponding linkage assembly shall be housed within a high impact, UV stable, air insulated, poly-carbonate enclosure. A contact position indicator and air vent shall be provided.

C2. Operating Mechanism
The operating mechanism shall utilize a magnetic actuator for opening and closing of the vacuum interrupters. The magnetic actuator shall be powered by capacitors located in the control enclosure. The manual trip and lockout handle shall be made of aluminum for maximum corrosion resistance. Vacuum interrupter contact position indication shall be accomplished using green (open) and red (closed) indicators located on the bottom of each mechanism enclosure and through LEDs inside the control.

C3. Vacuum Interrupters
 Interruption of the fault or load current shall be accomplished through vacuum interrupters located inside the solid dielectric modules.

C4. Solid Dielectric Modules
The solid dielectric modules shall utilize a time-proven solid dielectric epoxy insulation to fully encapsulate each of the three vacuum interrupters. The solid dielectric modules shall be fully shielded and incorporate a high impact poly-carbonate, track resistant, UV stable covering. The operating temperature range shall be -60°C to +65°C. A 1000/500:1 or a 400/200:1 dual ratio current transformer and voltage sensor shall be integrally molded into each module. CT accuracy shall be +/-1%. Modules shall be molded with one (1) source side and one (1) load side, IEEE apparatus bushing interface.

C5. Bushings
Cable bushings shall be (check one):
For Overhead design:
___ Air insulated, removable silicone insulators over an IEEE apparatus bushing interface
For Riser Pole:
___ Air insulated, silicone insulators for line side and elbow connectors on load side.
For Padmount design:
___ 600A apparatus bushing
___ 200A deep well bushing

D. OPERATION
Monitoring of the circuit shall be accomplished using internal multi-ratio current transformers and voltage sensors. The unit shall be powered by an external 120 VAC or 48/125 VDC source. In the event main power is lost, the unit shall have trip/close operating capabilities through the battery located in the control.

Recloser sequencing, tripping and overcurrent sensing, shall be an automatic function of the electronic control. If the control is set for single phase trip/lockout, the control will trip only the affected phase and not disturb the other two phases. If set for single phase trip, three phase lockout, only the affected phase will trip, and if the fault is not cleared, all three phases...
will lockout. If set for three phase trip, a fault current on any phase will trip all three phases. Manual trip and lockout shall be provided by an external, hookstick operable handle. Operation of the manual trip handle shall activate a mechanical block device, disabling any local or remote closing operation until the handle is reset.

E. SMART GRID / LAZER® AUTOMATION
The recloser shall be automation ready simplifying conversion for any future automation requirements. LEA (Low Energy Analog) capacitive voltage sensors shall be encapsulated within each recloser module permitting voltage reading for network reconfiguration while eliminating the need for add-on 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 -60°C (-76°F) through +65°C (+149°F). Two voltage ratios are available: a 10,000:1 for applications above 13.8 kV L-G and a 2,500:1 ratio below that voltage. The phase angle accuracy is +/-1° through the full temperature range. External voltage and current sensors can also be used depending on application requirements. Available communications include fiber optic transceivers, or wireless radio.

F. PADMOUNT ENCLOSURE
Enclosures shall be made of 12 gauge galvanized or stainless steel and manufactured to IEEE C37.72 and C57.12.28 standards. The enclosure shall be mounted independently to facilitate cable installation, if desired or for future replacement. Enclosures shall be tamper-resistant incorporating hinged access door(s) with pent-head locking bolt(s) and provisions for padlocking. The enclosure shall be provided with lifting provisions and painted with a Munsell 7.0GY3.29/1.5 green finish. Front cable connections or front/back cable connections shall be available. 0, 3 or 6 voltage sensors shall be internal to the modules.

G. ELECTRONIC CONTROLS
The recloser shall be controlled using the Schweitzer model SEL-651R control.

H. FACTORY PRODUCTION TESTS
Each individual recloser shall undergo a mechanical operation check verifying contact trip/close velocity, travel profile, timing and phase synchronicity. The recloser shall be AC hi-pot tested one minute phase-to-phase, phase-to-ground and across the open contacts. Circuit resistance shall be checked on all phases. Timing tests shall be conducted to verify TCC performance. System testing shall be performed on each Viper-ST with their respective matching control and any other site-ready add-on such as lightning arrester or potential transformers.

I. STANDARD COMPONENTS
The following shall be included as standard:
1. Lifting provisions
2. Grounding provisions
3. Operations counter for each phase located in the control
4. Manual trip and lockout handle(s)
5. SEL-651R control and associated control cable
6. Independent pole operation capabilities
7. Junction box with connectorized 32 pin interface cable to the control.
8. One 52a auxiliary contact per phase
9. Solid dielectric epoxy modules with up to six internal voltage sensors and three dual ratio CT’s
10. Arrester mounting provisions (overhead applications only)
11. Field changeable silicone insulators
12. Junction box with strain relief connections from the modules.

J. 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
___ Galvanized polemount center bracket with arrester provisions on the load and source side.
___ Stainless steel polemount center bracket with arrester provisions on the load and source side.
___ Stainless steel polemount side bracket with arrester provisions on the load and source side.
___ Stainless steel substation frame.
___ Polemount site-ready assembly
___ Lightning arresters
___ Dead-front padmounted design with stainless steel enclosure.
___ 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 (SEL-651R only)
___ 3-phase ganged manual trip handle

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

G&W Electric Company
305 W. Crossroads Pkwy
Bolingbrook, IL 60440-4938 USA
Tel 708.388.5010  Fax 708.388.0755

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ISO 14001:2004 Certified

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