

Providing load and fault interrupting switching for systems rated through 38kV, 800A continuous, 12.5kA symmetrical interrupting



IS BERR

- Submersible vault designs
- Dead-front padmount designs
- Time proven, solid epoxy insulation
- Modular construction
- Maintenance-free operation
- Ease of automation
- Lazer [™]ready





GENERAL FEATURES

Worldwide Experience AND Performance

Since 1905, G&W has been providing custom electrical products and innovative solutions to power users around the world. Today, G&W continues that tradition with a full line of solid dielectric switchgear using the industry's latest insulation technology. Trident switchgear combines the best solid dielectric insulation materials with time proven, rugged, and reliable switching designs. Drawing on many years of field experience in the areas of load break switching and vacuum fault interrupter technology, G&W offers one of the widest selections of electrical distribution switchgear in the industry.

Solid Dielectric Technology

Trident switchgear utilizes G&W's time proven, submersible epoxy polymer system to fully encapsulate the vacuum interrupters. This system provides excellent insulation properties and incorporates a permanently bonded semi-conductive external coating providing a fully shielded, void-free construction. Internal shields limit the electrical stress in the epoxy, therefore increasing its electrical integrity. All modules are UV protected and 100% factory tested for partial discharge. Dual ratio current transformers are encapsulated within each module providing either 500:1 or 1000:1 protection characteristics.

SUBMERSIBILITY

Solid dielectric switchgear is deadfront and fully submersible. Units have remained fully operable after withstanding a 20 foot head of water for 20 days.

MAINTENANCE BENEFITS

Solid dielectric insulation means no more routine maintenance as with



Three phase Trident-S fault interrupters in a submersible vault application.

oil and air switchgear. Solid dielectric insulation also offers an alternative to gas insulated devices.

APPLICATION FLEXIBILITY

Solid dielectric switchgear offers compact, modular construction. Module configurations permit elbow style connections to be all front mounted or front/back mounted depending on user preferrence. The same size modules can function as either load break or fault interrupting. Three phase switches can be linked together to create tailored multi-way switch configurations. Trident fault interrupters offer a wide variety of electronic overcurrent controls for customized system protection coordination. Automation is easy whether it is an automatic transfer scheme or a

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fully integrated distribution automation "Smart Grid" project.

IDEAL REPLACEMENT FOR OIL FUSE CUTOUTS

Trident fault interrupters are an ideal replacement for single phase or three phase oil fuse cutouts by offering the following advantages:

- No more fuse links to stock or replace
- Maintenance-free, nonflammable solid dielectric insulation
- Positive load break operation and easy reset of tripped circuits
- Electronic controls mirror fuse link curves
- Easy to automate
- 200A well or 600A separable connector bushing

FULLY TESTED

Trident switches are designed and tested to applicable standards including IEEE C37.74 (IEEE C37.71 and C37.72), IEEE 386, IEC 60265, IEEE 592 and ANSI 57.12.28. All fault interrupter devices must pass recloser-class duties as outlined in IEEE C37.60.

THE FLEXIBILITY OF SOLID DIELECTRIC TECHNOLOGY

- Spring-assisted or

OPERATING MECHANISM FLEXIBILITY

Trident-SP, S and ST switches incorporate integral single phase or three phase spring-assisted mechanisms for positive open and close operations. The operating mechanisms are located within a welded stainless steel, air insulated housing constructed to withstand continous submersible environments. The spring mechanisms operate the vacuum interrupters encapsulated within the epoxy modules to accomplish load break switching and fault interrupting protection.

Trident-SR switches incorporate an internal magnetic actuator in place of the spring-assisted mechanism, providing high speed operation. The magnetic actuator eliminates the need for add-on external motors and cabling making it an ideal solution for automated switching applications.

CABLE ENTRANCE FLEXIBILITY

Cable entrances can be either 200A well or 600A separable connector bushings for accepting elbow style connectors. The rugged epoxy surface minimizes the force required for removing elbow connections compared to rubber-to-rubber junctions. Different module orientations permit cable entry from the front, side, bottom or back of the unit.

INTERRUPTER CONTROL FLEXIBILITY

Trident switchgear offers a variety of overcurrent controls including many Schweitzer Engineering Laboratories (SEL) models for fault interrupting switches to suit most any protection requirement. All G&W controls are self-powered from the integral CTs and offer over 30 different TCC curve families. Certain models have inrush restraint, ground fault protection, and manual trip pushbuttons.

magnetic actuator operation
Submersible, welded construction
Operating handle options
Cable entrance options
Cable entrance options
Cable entrance options

"Z" Module -Front / back access "L" Module -Front / bottom access

Others may be programmed through a laptop computer, or with a front panel interface. Trident controls may be mounted within an external NEMA 4X (IP56) or 6P (IP67) enclosure, or within the switch mechanism housing, eliminating the need for external cabling. G&W can also integrate other manufacturer's controls depending on user preference.

"C" Module -

Front access

MOUNTING FLEXIBILITY

Trident switchgear is suitable for submersible vault or padmount installations. They may be mounted vertically or horizontally, on a wall or floor, and in any attitude. The small footprint is ideal for space restricted applications. Stainless steel mounting brackets are available for maximum corrosion resistance. Parking stands are available.

OPERATING **H**ANDLE **F**LEXIBILITY

Various styles of operating handles are available depending upon user preference. Handles can be removable or permanently fixed to the switch. Handles can be straight or angled providing the best mechanical advantage for operating personnel. Handles can be located on the front or side of the switch. All are hookstick operable.

AUTOMATION FLEXIBILITY

Trident switchgear is easily adapted for automation requirements. From simple remote control through sophisticated distribution automation schemes, G&W has the products and integration expertise to do the job.

TRIDENT[®]-S THREE PHASE SWITCHGEAR



Fault interrupter with wall mounted control box and side mounted operating handle.



Front mounted motor



Switch from fault interrupting to load break by just rotating a lever.

Trident-S three phase, springassisted switchgear is available for load break or fault interrupting switching. The Trident-S is ideal for three phase distribution switching and protection, as well as for three phase oil fuse cutout and oil switchgear replacements. Fault protection can be provided using vacuum interrupters with integral CTs and a variety of overcurrent controls.

FEATURES

- 15.5, 27, or 38kV, 800A continuous current
- 16kA symmetrical interrupting at 15.5kV, 12.5kA at 27 and 38kV
- Manual or automated operation
- Padmount and vault designs
- Vertical or horizontal mounting
- Hookstick operable with permanent or removable handles
- Submersible construction
- Optional handle permitting switch to function as a load break or fault interrupter



A Horizontal mounted fault interrupter in a submersible vault.



A Padmount switch with horizontal mounting and diagonal, spread bushing configuration.







Side mounted handles can be positioned with hookstick eye on top or bottom for best mechanical advantage.



TRIDENT[®]-SR THREE PHASE SWITCHGEAR



▲ Vault style Trident-SR with front mounted bushings.

Trident-SR, magnetic actuator, SCADA ready switches simplify the process of automated switching and fault interruption on systems rated through 38kV. The extremely flexible design permits the user to customize the best solution for their particular application. From manual load break or fault interrupting, to remote operation, to fully automated distribution automation or Smart Grid schemes, the Trident-SR offers multiple application functionality, all within the same compact switch footprint. Compare these features:

FEATURES

- 15.5, 27, or 38kV, 800A continuous current
- 12.5kA symmetrical interrupting
- Manual or automated operation
- Padmount and vault designs
- Vertical or horizontal mounting
- Hookstick operable with front mounted handles.

For load break switching - The rugged magnetic acutator is tested to over 10,000 mechanical load break operations.

For fault interrupting - A variety of Schweitzer Engineering Laboratories (SEL) relays and G&W electronic controls are available to best meet the specific protection needs of the application. Programming using a laptop computer or built-in LCD display are available options. G&W controls are powered by CTs housed within the epoxy module. Other style controls also available.

For remote operation - Hand held remote operators are available permitting pushbutton operation from either above ground for vault applications or from a control adjacent to the enclosure for padmount applications.

TRIDENT[®]-SR THREE PHASE SWITCHGEAR

*For SCADA ready automation -*Current transformers encapsulated within the epoxy modules provide integral current sensing. Integral capacitively coupled voltage screens provide three phase analog voltage values for connection to a wide selection of relays and RTUs.

For Lazer[™] ready automation -Trident-SR switches are an integral part of G&W's pre-engineered Lazer control package to provide automatic power restoration. Using SEL relays with distributed capabilities and peer-to-peer communication, G&W's Lazer solution with Trident switchgear can greatly simplify the automation process from small scale through large scale system requirements.

For future Smart Grid - Thinking of automating in the near future but need switches now? The built-in features and application flexibility of the Trident-SR can help simplify your decision.

Magnetic actuator - Switches incorporate an integral magnetic actuator for high speed operation. No external add-on motor or linkage is required for remote operation or automation schemes.

Compact, clean design -

No add-on motors or linkage. No external CTs or voltage sensors hanging from elbow connectors. Trident-SR switches feature built-in components.

Maintenance benefits - Solid dielectric insulation eliminates any concern about liquid or gaseous dielectrics. That means no more routine switch maintenance.

Contact position indicator

Manual open handle

A Manually controlled close handle

Submersibility - Solid dielectric switchgear is dead-front and fully submersible. Units have remained fully operable after withstanding a 20 foot head of water for 20 days.

Contact position indicator - A large viewing window permits visual verification of vacuum contact position, either open or close. The position indicator is connected directly to the drive assembly. In addition, three different color LEDs can also be provided to verify either Power OK, Tripped, or Blocked position. LED verification of "open" and "close", in addition to the flag indicator, can also be two of the three LED options. An operation counter is also included.

Manual open handle - A hookstick operable handle permits manual opening of the switch. Once opened, the switch is then blocked from any remote commands thereby prohibiting any close operation. The open and blocked positions are padlockable providing true mechanical lockout.

Manually controlled close handle

- A hookstick operable handle permits manual closing of an electronically tripped or manually opened fault interrupter.

Cable entrance flexibility - Cable entrances can be either 200A well or 600A separable connector bushings for accepting elbow style connectors. In-line or diagonal spread version configurations are available to facilitate cable training. The rugged epoxy surfaces minimize the breaking force required for removing separable connectors as compared to rubber-to-rubber connections.

Tested reliability - Switches are designed and tested to applicable standards including IEEE C37.74 (IEEE C37.71 and C37.72), IEEE 386, IEC 60265, IEEE 592 and ANSI 57.12.28. All fault interrupter devices pass recloser-class duties as outlined in IEEE C37.60.

TRIDENT[®]-SR THREE PHASE SWITCHGEAR

Padmount style , front access, horizontal mount Spread bushing configuration

Approximate Dimensions Approximate Weight = 1100 lbs. (500 kg)

Vault style

Approximate Dimensions. Approximate Weight = 400 lbs. (180 kg)

TRIDENT[®]-ST THREE PHASE SWITCHGEAR

▲ Trident-ST with individual, single phase operating handles.

Trident-ST three phase, springassisted switchgear can provide either three phase or single phase fault protection. The Trident-ST is ideal for three phase distribution switching and protection, as well as for three phase oil fuse cutout and oil switchgear replacements. Fault protection can be provided using vacuum interrupters with integral CTs and a variety of overcurrent controls.

FEATURES

- 15.5, 27, or 38kV, 800A continuous current
- 12.5kA symmetrical interrupting
- Padmount and vault designs
- Vertical or horizontal mounting
- Hookstick operable with permanent or removable handles.

Viewing window showing contact position indicator.

Vault style

Approximate Dimensions. Approximate Weight = 400 lbs. (180 kg)

How to Order - Trident® Three Phase Switchgear

How to Order:

Select from the various catalog breakdown chart options below. Enter the desired selection in the corresponding catalog number position.

| Description | Code |
|--------------------------------------------------------------|------|
| Padmount, front access, vertical mount | Р |
| Padmount, front access, horizontal mount | Н |
| Padmount, front/ back access, vertical | В |
| Padmount, front/ back access, horizontal | R |
| Vault style with nonsubmersible electronics (if supplied) | V |
| Vault style with submersible electronics (if supplied) | W |

2 CONFIGURATION*

| Description | Code |
|--------------------------------------|------|
| Bushings front; side mounted handle | А |
| Bushings front; front mounted handle | В |
| Bushings back; side mounted handle | С |
| Bushings back; front mounted handle | D |

* Contact your G&W representative for other configurations

3 VOLTAGE CLASS

4 NUMBER OF PHASES

| kV | Code |
|----|------|
| 15 | 1 |
| 25 | 2 |
| 35 | 3 |

| Phase | Code |
|-------|------|
| Three | 3 |

5 SWITCH STYLE

| Description | Code |
|-------------|------|
| Trident-S | S |
| Trident-ST | Т |
| Trident-SR | R |

6 CONTROLS, if applicable

| Description | Code |
|-----------------------------------------|------|
| Load break switch | L |
| Туре 1 | 1 |
| Туре 2 | 2 |
| Туре 3 | 3 |
| Туре 4 | 4 |
| Туре 7 | 7 |
| ATS control: ATC101, ATC451 | А |
| Connectorized: SEL 351R or SEL 651R | R |
| Pre-engineered control: Relay, RTU, IED | E |
| Provisions for future use: Junction box | Р |
| Customer to wire and supply control | W |

| Description | Code |
|-----------------------------------------------------------------------------------------------------------------------------------------|------|
| No options | 0 |
| Auxiliary contacts | 1 |
| Motor actuator (Trident-S only) | 2 |
| Stationary or portable (<i>Trident-S only</i>) or stationary or hand held control (<i>Trident-SR only</i>) | 3 |
| Voltage sensing (Trident-SR only) | 4 |
| Auxiliary contacts and voltage sensing (Trident-SR only) | 5 |
| Auxiliary contacts, voltage sensing and stationary or hand held control (<i>Trident-SR only</i>) | 6 |
| Auxiliary contacts and stationary or portable <i>(Trident-S only)</i> or stationary or hand held control <i>(Trident-SR only)</i> | 7 |
| Voltage sensing and stationary or hand held control (<i>Trident-SR only</i>) | 8 |
| Custom engineered | 9 |

8 BUSHING ARRANGEMENT

| Closest to Housing | Away from Housing | Code |
|--------------------|-------------------|------|
| 200A | 200A | 2 |
| 200A | 600A | 3 |
| 600A | 200A | 4 |
| 600A | 600A | 6 |

ORDERING EXAMPLES - TRIDENT[®]-S SWITCHGEAR

Example 1:

Oil Fuse Cutout Replacement

Vault style, 15kV, three phase fault interrupter with all 200A deepwell bushings and a Type 2 overcurrent control. A side mounted handle is required. **The catalog number would be: VA13-S202**

Example 3:

Fault interrupter with three phase electronic and manual trip, and three phase manual reset

Padmount style, 35kV, three phase fault interrupter with all 200A bushings and a Type 7 overcurrent control. A side mounted

handle is required. The catalog number would be: PA33-S702

Example 2:

Automated Load Break Switch

Vault style, 15kV, three phase, load break switch with all 600A bushings. A side mounted motor actuator with no control is required. **The catalog number would be:** VA13-SL26

ORDERING EXAMPLES - TRIDENT®-SR SWITCHGEAR

Example 1:

Oil Fuse Cutout Replacement

Submersible vault style, 15kV, three phase fault interrupter with all 200A deepwell bushings and a Type 7 overcurrent control. A front mounted handle is required. **The catalog number would be: WB13-R702**

Example 3:

Fault interrupter with SEL351R connectorized control and voltage sensing Padmount style, horizontal, front access, spread bushings, 35kV, three phase fault interrupter with all 600A bushings. A front mounted handle is required. The catalog number would be: HB33-RR46

Example 2:

Automated Load Break Switch

Vault style, 27kV, three phase, load break switch with all 600A bushings. A front mounted handle with a hand held control is required. **The catalog number would be:** VB23-RL36

ORDERING EXAMPLES - TRIDENT[®]-ST SWITCHGEAR

Example 1:

Oil Fuse Cutout Replacement

Submersible vault style, 15kV, three phase fault interrupter with all 200A deepwell bushings and a Type 1 overcurrent control. A front mounted handle is required. **The catalog number would be: VB13-T102**

Example 2:

Load Break Switch with remote trip Vault style, 27kV, three phase, load break switch with all 600A bushings, front mounted handle and remote trip. The catalog number would be: VB23-TL96

TRIDENT[®] MULTI-WAY SWITCHGEAR

Multi-way Trident switches consist of individual three phase modules linked together through a flexible inter-way bus connection. Design your own switch combination to ideally match your application requirements. Build multiple ways using the same style modules or combine Trident styles S, ST or SR in whatever combination you desire. Modules may be either fault interrupters or load break switches.

FEATURES

- 15.5 or 27kV maximum design voltage
- 12.5kA symmetrical interrupting rating
- Manual, motor actuator or magnetic actuator operation
- Padmount and vault designs
- Hookstick operable, either permanent or removable style
- Automatic source transfer applications available
- Integral PT for control power available
- Compact construction
- All front access or front/back access designs

AUTOMATIC TRANSFER OPTIONS

G&W offers two types of actuators for dual source load break switching. Each provides a different transfer speed.

Motor actuators are externally mounted to the switch operating shaft and permit a total transfer time* of approximately 8 seconds.

Magnetic actuators are mounted within the mechanism housing and permit a total transfer time* of approximately 8-12 cycles.

*Total transfer time is the sum of the voltage sensing time and twice the actuator operating time.

Automated padmount switch utilizing magnetic actuators and integral voltage sensing electronics for a high speed automatic transfer application.

Flexible inter-way bus connection system provides reliable performance in a low profile, compact design.

Four-way, manual, front/back access, padmount switch.

TRIDENT[®] MULTI-WAY SWITCHGEAR

Vault and Padmount style, Trident-S front access

Approximate Dimensions

Configurations B & D

| Vault Wall Mount | , Front Handle |
|------------------|----------------|
| Approximate Wid | th of Switch |
| 3 Way | 68" (1727mm) |
| 4 Way | 86" (2184mm) |
| 5 Way | 104" (2642mm) |
| 6 Way | 122" (3099mm) |
| Approximate Dep | oth21" (533mm) |
| Approximate Heig | ght33" (845mm) |
| | |

Padmount, Front Handle

| Approximate Width o | f Enclosure |
|---------------------|---------------|
| 3 Way | 70" (1778mm) |
| 4 Way | 88" (2235mm) |
| 5 Way | 106" (2692mm) |
| 6 Way | 124" (3150mm) |
| Approximate Depth | 48" (1219mm) |
| Approximate Height. | 68" (1727mm) |

| Vault Wall Mount, Side Handle |
|--------------------------------|
| Approximate Width of Switch |
| 3 Way |
| 4 Way103" (2629mm) |
| 5 Way128" (3251mm) |
| 6 Way152" (3874mm) |
| Approximate Depth31" (787mm) |
| Approximate Height53" (1346mm) |

Padmount, Side Handle

| Approximate Width | of Enclosure |
|-------------------|----------------|
| 3 Way | 81" (2057mm) |
| 4 Way | 105" (2680mm) |
| 5 Way | 130" (3302mm) |
| 6 Way | 154" (3924mm) |
| Approximate Depth | n48" (1219mm) |
| Approximate Heigh | nt68" (1727mm) |
| | |

How to Order - Trident® Multi-Way Switchgear

How to Order:

Select from the various catalog breakdown chart options below. Enter the desired selection in the corresponding catalog number position.

Last Way ⊥

| | _ |
|--------------------------------------------------------------|------|
| Description | Code |
| Padmount, front access, vertical mount | Р |
| Padmount, front/ back access, vertical | В |
| Vault style with nonsubmersible electronics (if supplied) | V |
| Vault style with submersible electronics (if supplied) | W |

2 CONFIGURATION*

| Description | |
|--------------------------------------|---|
| Bushings front; side mounted handle | А |
| Bushings front; front mounted handle | В |
| Bushings back; side mounted handle | С |
| Bushings back; front mounted handle | D |

* Contact your G&W representative for other configurations

| 3 VOLTAGE CLASS | | |
|------------------------|------|--|
| kV | Code | |
| 15 | 1 | |
| 25 | 2 | |

4 NUMBER OF PHASES

| Phase | Code |
|--------|------|
| Single | 1 |
| Three | 3 |

5 SWITCH STYLE

| Description | Code |
|----------------|------|
| Trident-S | S |
| Trident-ST | Т |
| Trident-SR | R |
| Trident-SP | Р |
| Unswitched way | U |

6 CONTROLS, if applicable

∟_{Way 2}∟

| Description | Code |
|-----------------------------------------|------|
| Load break switch | L |
| Туре 1 | 1 |
| Туре 2 | 2 |
| Туре 3 | 3 |
| Туре 4 | 4 |
| Туре 7 | 7 |
| ATS control: ATC101, ATC451 | А |
| Connectorized: SEL 351R or SEL 651R | R |
| Pre-engineered control: Relay, RTU, IED | E |
| Provisions for future use: Junction box | Р |
| Customer to wire and supply control | W |
| Unswitched way | U |

| Description | Code |
|---------------------------------------------------------------------------------------------------------------------------------------------|------|
| No options | 0 |
| Auxiliary contacts | 1 |
| Motor actuator (Trident-S only) | 2 |
| Stationary or portable (<i>Trident-S only</i>) or stationary or hand held control (<i>Trident-SR only</i>) | 3 |
| Voltage sensing (Trident-SR only) | 4 |
| Auxiliary contacts and voltage sensing (<i>Trident-SR only</i>) | 5 |
| Auxiliary contacts, voltage sensing and stationary or hand held control (<i>Trident-SR only</i>) | 6 |
| Auxiliary contacts and stationary or portable (<i>Trident-S only</i>) or stationary or hand held control (<i>Trident-SR only</i>) | 7 |
| Voltage sensing and stationary or hand held control (<i>Trident-SR only</i>) | 8 |
| Custom engineered | 9 |

ORDERING EXAMPLES - TRIDENT® MULTI-WAY SWITCHGEAR

Example 1: 3-Way Load Break with Auto Source Transfer

Vault style, 25kV switch. Ways 1 and 3 are load break switches

with magnetic actuators and voltage sensing for the auto transfer and have all 600A bushings. Way 2 is a fault interrupter and has all 200A bushings. Fault interrupter controls to be Type 7. All ways to have side mounted operating mechanisms/handles. ATC 451 control used. **The catalog number would be:** WB23-RA4-S70-RA4.

Example 2:

4-Way Combination Load Break and Fault Interrupter Switch

600A 600A 200A 200A

600A

200A

600A

Pad mount style, 15kV, 4-way

switch with two 600A load break switch modules (ways 1 and 2) and two 200A fault interrupters (ways 3 and 4). Fault interrupter controls to be Type 2. Side mounted handle, front access switch operators and bushings out the front. **The catalog number would be: PA13-SL0-SL0-S20-S20.**

Example 3:

3-Way Combination Load Break and Fault Interrupter Switch Padmount style, 25kV, 3-way switch with two 600A load break switch

modules (ways 1 and 3) and one 200A fault interrupter (way 2). Fault interrupter controls to be Type 3.

Switch operators to be front mounted with all bushings out the back. The catalog number would be: PC23-SL0-S30-SL0.

Four-way front access, padmount Trident-S.

Three-way, submersible vault, automatic transfer switch including submersible G&W ATC451 control.

TRIDENT[®]-SP SINGLE PHASE SWITCHGEAR

Trident-SP single phase, spring-assisted switchgear is available for load break or fault interrupting switching. The compact units are ideal for switching residential loops and for oil fuse cutout replacements. Fault protection can be provided using vacuum interrupters with integral CTs and a variety of overcurrent controls.

FEATURES

- 15.5 or 27kV, 800A continuous current
- 12.5kA symmetrical interrupting
- Padmount and vault designs
- Vertical or horizontal mounting
- Large viewing windows simplify visual identification of open (green) or closed (red) vacuum contact position. The position indicator is connected directly to the drive assembly.
- Hookstick operable, permanent mounted operating handles
- Submersible switch construction

- Submersible controls available
- Manual operation

IDEAL REPLACEMENT FOR OIL FUSE CUTOUTS

Trident fault interrupters are an ideal replacement for single phase oil fuse cutouts by offering the following advantages:

- No more fuse links to stock or replace
- Maintenance-free, nonflammable solid dielectric insulation
- Safe, positive load break operation and easy reset of tripped circuits
- Electronic controls mirror fuse link curves
- Compact footprint for easy change out
- Submersible construction
- 200A well or 600A separable connector bushings

Padmount style

Approximate Dimensions Approximate Weight = 150 lbs. (68 kg)

Vault style

Approximate Dimensions Approximate Weight = 75 lbs. (34 kg)

Configuration 'A' with front mounted bushings.

Ordering Examples Example 1:

Oil Fuse Cutout Replacement Vault style, 15kV, single phase fault interrupter. The fault protection scheme requires the oil fuse cutout TCC curve and a single phase setting (Type 7).

All 200A deepwell, front positioned bushings. The catalog number would be: VA11-P702.

Example 2: Load Break Switch Vault style, 25kV, single phase load break switch with all 200A deepwell front positioned bushings. The catalog number would be: VA21-PL02.

Submersible, subsurface installation permitting hookstick operation from above ground.

How to Order - Trident[®]-SP Single Phase Switchgear

How to Order:

Select from the various catalog breakdown chart options below. Enter the desired selection in the corresponding catalog number position.

| Description | Code |
|--------------------------------------------------------------|------|
| Padmount, front access, vertical mount | Р |
| Padmount, front access, horizontal mount | Н |
| Padmount, front/ back access, vertical | В |
| Padmount, front/ back access, horizontal | R |
| Vault style with nonsubmersible electronics (if supplied) | V |
| Vault style with submersible electronics (if supplied) | W |

2 CONFIGURATION*

| Description | |
|-------------------------------------|---|
| Bushings front; side mounted handle | А |
| Bushings back; side mounted handle | С |

* Contact your G&W representative for other configurations

| 3 VOLTAGE CLASS | | |
|------------------------|------|--|
| kV | Code | |
| 15 | 1 | |
| 25 | 2 | |

| WIMBER OF PHASES | | | |
|-------------------------|------|--|--|
| Phase | Code | | |
| Single | 1 | | |

| Description | Code |
|-------------------------|------|
| Trident-SP single phase | Р |

6 CONTROLS, if applicable

| Description | Code |
|-------------------|------|
| Load break switch | L |
| Type 1 | 1 |
| Туре 3 | 3 |
| Type 4 | 4 |
| Туре 7 | 7 |

7 OPTIONS

| Description | Code |
|--------------------|------|
| No options | 0 |
| Auxiliary contacts | 1 |

8 BUSHING ARRANGEMENT

| Closest to Housing | Away from Housing | Code |
|--------------------|-------------------|------|
| 200A | 200A | 2 |
| 200A | 600A | 3 |
| 600A | 200A | 4 |
| 600A | 600A | 6 |

OVERCURRENT PROTECTION CONTROL OPTIONS

G&W INTERRUPTER CONTROLS

The vacuum interrupter overcurrent control monitors the current on the tap circuits and activates a trip solenoid, which opens the vacuum interrupter to interrupt the current. The control is self-powered by current transformers molded inside the encapsulated module.

For padmount applications, standard control enclosures are NEMA 4X (IP56) rated and are mounted inside the padmount enclosure. For vault applications, standard control enclosures are NEMA 4X (IP56) rated and are hardwired with 25 feet of cable for mounting remotely from the switch where the enclosure will not be submerged. Optional submersible enclosures are NEMA 6P (IP67) rated.

G&W CONTROL OPTIONS

Type 1 controls operate three, single phase vacuum interrupting mechanisms. The Type 1 can be field set for either single phase or three phase trip mode. It is used on switches with either single phase reset or three phase reset. When in the three phase mode, all three phases trip if the selected trip level of any individual phase is reached. Trip level selections can be made under load or no-load conditions with current ranges in 12 selectable levels. Two ranges of minimum trip settings are available, 15 to 300 amps and 30 to 600 amps. Each unit is preprogrammed with multiple TCCs. The curve selection can be set or changed at any time.

An 8 pole dip switch allows the user to choose the TCC that best matches their individual coordination requirements. The control can be factory preset to meet the user's requirements. As protection or coordination requirements change, settings can easily be changed in the field. Depressing the manual trip button when the control is powered up electronically trips all three phases of the vacuum interrupter. Each control also includes "Last Cause of Trip" LEDs. These LEDs indicate which phase experienced an overcurrent condition, or that the control was given an external or manual trip command.

Type 2 controls offer features similar to Type 1 with the following exceptions:

- Three phase protection only
- Minimum trip set for all three phases with one selector switch
- Adjustable phase time delay
- Ground fault (phase imbalance) feature with separate adjustable time delay selector switch for protection of large three phase motors or transformers. The ground trip level is represented as a percent of the minimum trip level.
- Instantaneous trip and inrush restraint features

Type 3 controls offer features similar to Type 2 and more including:

- Single phase or three phase trip

- Vacuum fluorescent display
- Keypad operation for programming parameters and retrieving status of current values
- Multiple TCC curve capability
- Adjustable phase time delay
- Ground fault trip
- Inrush restraint
- Phase identification and magnitude of fault indication
- Readout of real-time current values
- Selectable instantaneous trip
- Selectable minimum response time
- RS232 or RS485 serial interface
- Laptop programming kit available

Type 4 controls provide the same features as Type 3 controls; however, there is no programming panel, display screen, or manual trip button. The controls are mounted

Type 1 control

Type 2 control

Type 3 control

Type 4 control

external in a separate enclosure. The control is programmed using a laptop computer. A laptop programming kit is available.

OVERCURRENT PROTECTION CONTROL OPTIONS

Type 7 control board mounted inside the mechanism housing.

Type 7 controls provide the same features as Type 4 controls, except that the controls are mounted internal to the switch mechanism housing, eliminating the need for a separate control enclosure and associated cabling. The control is programmed using a laptop computer. A laptop programming kit is available. Single and three phase versions are available.

LAPTOP PROGRAMMING KIT

For Type 3, Type 4 or Type 7 Provides software and cable connection to a portable laptop computer for programming or retrieving fault interrupter control information. One cable connects to the USB port of the computer and the other connects to the control box (Type 3 or 4) or mechanism housing (Type 7).

Catalog Number for Type 3: For USB ports:....LPK7-Type 3

Catalog Number for Type 4 and 7: For USB ports:.....LPK7-USB

COMPATIBLE RELAYS

Besides the G&W interrupter controls, various Schweitzer Engineering Laboratories relays can also be used with Trident switchgear. Specific models include the SEL Falcon, 351R, 651R, 501, 551, 351S and 751A. Other manufacturer's relays are also available.

LAZER[™] SMART GRID INTEGRATION

G&W's Lazer automation system is a pre-engineered control package that works in conjunction with power distribution switchgear to perform automatic switching operations on overhead and underground loop distribution circuits. G&W utilizes over 100 years of industry experience to match the proper switchgear with the proper control for the application. For the Lazer solution, G&W utilizes Schweitzer Engineering Laboratories controls, one of the industry's most popular suppliers of quality protective relays. The Lazer is a protection and control package that features one or more protective relays, equipped with distributed capabilities and peer-to-peer communication to make intelligent operating decisions and to monitor field conditions. The Lazer focuses on critical load installations to maximize service reliability.

G&W's Lazer automation system specifically addresses fault detection, isolation and restoration (FDIR) requirements. It continuously monitors the circuit. When it senses an electrical overload or short circuit fault within its protection zone, it issues a command to the appropriate switchgear to tripopen within a pre-determined time delay based on the severity of the fault. Communication with other upstream and downstream Lazer devices functions continually to determine what other actions are required to reconfigure the circuits

SEL's 751A control is one of many control options.

to automatically restore power to customers connected to the unfaulted lines. The entire process from fault detection to system restoration can typically be performed within 60 seconds or less.

REMOTE OPERATION

Motor Actuators For Trident-S

For spring-assisted switchgear, motor actuators are required for remote operation. Actuators are externally mounted to each switch operator. If controls are specified, the actuators are hardwired with 25 feet of cable. Padmount designs may have cables cut to length to fit within the enclosure. If no control is specified, the actuator is supplied with a male threaded connector for use with portable controls (see Accessories). Actuators are housed within a painted, stainless steel, welded enclosure suitable for submersible applications.

For Trident-SR

Trident-SR switchgear already incorporates an internal, high speed magnetic actuator and is SCADA ready by design. No external actuators required for remote operation. Various control options are available.

OPTIONS Specified as part of switch catalog number

REMOTE CONTROLS FOR TRIDENT-S

Stationary Controls

Single way and multi-way stationary controls are available for both load break switches and fault interrupters. Controls can be a combination of switch and fault interrupter ways, as required. Controls are designed for SCADA interface.

Portable Controls

For applications where AC power is not available at the switch site or if the flexibility of moving the control to different locations is desired, portable controls are ideal. The control is housed in an aluminum carrying case with handle and weighs approximately 12 lbs. (5.5kg). A 120 VAC cable is supplied to charge the batteries. The maximum control to motor actuator distance is 50 feet (15m). The Universal control can be used on both load break and fault interrupter switches.

Catalog Number (Includes control and specified length of cable): 9-foot cable: PMC120-U/B-09 12-foot cable: PMC120-U/B-12 25-foot cable: PMC120-U/B-25 50-foot cable: PMC120-U/B-50

Multi-way Controls

Multi-way stationary controls are available for both load break switches and fault interrupters. Multi-way controls can incorporate up to four switching ways in one cabinet. Controls can be a combination of switch and fault interrupter ways, as required. Controls are designed for SCADA interface.

OPTIONS Specified as part of switch catalog number

REMOTE CONTROLS FOR TRIDENT-SR

Stationary Controls

A pushbutton control is available permitting local onsite or remote SCADA operation of the switch. The control is hardwired into the switch and housed within a submersible, polycarbonate enclosure approximately 6"W x 10"H. Standard control cable is 25 feet. Other cable lengths are available up to 100 feet.

The 24V DC control can be powered by the 120V AC supplied to the switch or from a separate AC source directly to the control. Local operation and switch status indication is available on the faceplate of the control. Remote operation through a SCADA master station can be configured.

Stationary controls permit either local or remote SCADA operation.

Hand Held Controls

Besides the stationary control, a smaller version hand held control is available. This control is ideal for

A Hand held controls permit switch operation from outside the vault.

underground vault applications permitting switch operation from above ground. The control cable is hardwired into the switch and uses a threaded connector for attachment to the control. The polycarbonate control box is approximately 7"W x 4"H. The 24V DC control is powered by the switch.

AUTOMATIC TRANSFER CONTROLS

For critical load applications, various automatic transfer controls (ATC) are available. General features include:

- User selectable source transfer schemes for preferred/alternate, nonpreferred, or bus-tie
- User selectable time delays for initial and return transfers
- User selectable transfer sequence for paralleled or nonparalleled feeders
- Override for manual operation
- SCADA interface
- System test function
- Battery backup if AC is lost
- Generator source settings
- Sequence of events recorder

Model ATC 451 – Utilizes the SEL 451-4 relay for it's protection logic and programming scheme. The user interface is through keypad operation with LCD display.

Model ATC 101 – Utilizes selector switches, pushbuttons and LED display.

The ATC 451 is laptop programmable.

ACCESSORIES Specified as additional items

JUNCTION BOX

For auxiliary contacts and remote power/remote trip connections. Includes NEMA 4X (IP56) enclosure with terminal strip connections for terminating up to four sets of auxiliary contacts or four controls for remote power/remote trip.

KEY INTERLOCKS

Key interlocks are available to assure safe coordination of equipment. Switches can be specified with keylocks factory installed. Specify locking scheme when ordering, either lock in open or lock in closed position. For keylocks to be coordinated with other equipment, other manufacturer's information must be provided.

GROUND LUGS

Bronze, eyebolt style ground lugs are available for 4/0 maximum conductor cable.

FRAMES

Bolted, galvanized mounting frames are available for vertical mounting of vault style switches providing a 24" distance from the ground to the center of the bottom bushing. Other size frames are available. Consult your G&W representative for availability.

PARKING STANDS

Unpainted stainless steel parking stands are available for each entrance position. Parking stands can be designed to support mechanical dead break devices for visible break requirements. Consult your G&W representative with specific requirements.

SPREAD BUSHINGS

A diagonal bushing configuration is available which increases the distance between the bushings to facilitate cable training if required.

Junction Box

Key Interlock

Ground lug

Diagonal bushing arrangement with parking stands

OPERATING HANDLES

An angled stainless steel handle with hookstick operable eye is available for permanent attachment to each switch operator. The handle can be positioned up or down to provide for optimum operating leverage. If a removable handle is desired, a bronze handle with hookstick eye is provided which positions over the hex nut of the switch operator. One handle is provided per switch.

Permanently attached hookstick operating handle

Removable hookstick operating handle

AUXILIARY CONTACTS

Auxiliary contacts are mounted internal to the mechanism housing to provide remote indication of switch contact position. One normally open and one normally closed form C contact is provided. Junction boxes with terminal strip connections for up to four auxiliary contacts are available.

TYPICAL SPECIFICATIONS

GENERAL

This specification covers the requirements for solid dielectric, load break switches and fault interrupters for distribution systems through 38kV. The switches shall be manufactured by G&W Electric Company and designated as

____ Trident[®]-SP (single phase)

- ____ Trident[®]-S (three phase)
- ____ Trident[®]-ST (three phase)

____ Trident[®]-SR (three phase)

The manufacturer shall be ISO 9001:2000 and ISO 14001:2004 certified.

A. APPLICATION

Switches shall be (select one):

- ____ Padmount, front access,
- vertical mount Padmount, front access,
- horizontal mount Padmount, front / back
- access, vertical mount Padmount, front / back
- access, horizontal mount
- ____ Vault style with nonsubmersible electronics (if supplied)
- ____ Vault style with submersible electronics (if supplied)

A1. Two-Way (using one module) shall consist of (*select one only*):

Single phase load break
 Single phase fault interrupter
 Three phase load break
 Three phase fault interrupter

A2. Multi-way shall consist of

- (Qty) Three phase load break
- ____ (Qty) Three phase fault interrupter
- (Qty) Three phase load break, SCADA ready
- ____ (Qty) Three phase fault interrupter, SCADA ready

B. CONSTRUCTION

Assembly shall be dead-front design. The operating mechanism housing shall be stainless steel with a viewing window for verification of contact position. The housing shall be painted ANSI 70 light gray using corrosion-resistant epoxy paint. Operating handles shall be padlockable and adaptable to keylock schemes. The operating shaft shall be stainless steel providing maximum corrosion resistance. A double "O" ring shaft seal shall be used for a leak resistant, long life seal.

For Trident-S: The assembly shall be suitable for submersion under a 10 foot head of water for four years.

For Trident-SR: The assembly shall be suitable for submersion under a 20 foot head of water for 20 days.

Load Break Switches

The load break switch shall consist of vacuum bottle(s) encapsulated within solid dielectric epoxy modules with spring-assisted (or magnetic actuator for Trident-SR) operating mechanism. For three phase switches the mechanism shall consist of three vacuum bottles mechanically linked to a single, spring-assisted (or magnetic actuator for Trident-SR) operating mechanism. The operating mechanism shall be actuated from outside the mechanism housing.

Fault Interrupters

The fault interrupters shall consist of vacuum bottle(s) and internal current transformer(s) encapsulated within solid dielectric epoxy modules with spring-assisted (or magnetic actuator for Trident-SR) operating mechanism. For three phase interrupters, the mechanism shall consist of three vacuum bottles mechanically linked to a single spring-assisted (or magnetic actuator for Trident-SR) operating mechanism. Electrical opening shall be by a solenoid that is activated from an interrupter control. Closing (reset) of the interrupter shall be mechanical with the use of an operating mechanism actuated from outside the mechanism housing. The mechanical linkage assembly shall provide for a "tripfree" operation, which allows the fault interrupter to operate independent of the operating handle.

C. RATINGS AND STANDARDS

Load break switches shall be designed and tested per applicable sections of IEEE C37.74 (IEEE C37.71 and IEEE C37.72) and the latest version of IEC 60265 standards. Fault interrupters shall be designed and tested per applicable sections of IEEE C37.74 (IEEE C37.71 and IEEE C37.72), IEEE C37.60 and the latest version of IEC 60265. Certified test reports shall be provided.

The switch shall be rated: (select appropriate table)

Trident-SP Single Phase

| Voltage Class | | |
|------------------------|--------|-----|
| Nominal, kV | | 25 |
| Voltage Class | | |
| Maximum, kV | | 27 |
| BIL Impulse, | | |
| kV | 1101 | 25 |
| Continuous Current, | | |
| Amperes | 0088 | 00 |
| Load Break Current, | | |
| Amperes | 0088 | 00 |
| 1 Minute AC Withstar | nd, | |
| kV | | 40 |
| 15 Minute DC Withst | and, | |
| kV | 53 | 78 |
| Momentary Current, | | |
| kA asym | 20 | 20 |
| Fault-Close (3-times) | , | |
| kA asym | 20 | 20 |
| 1 Second Current, | | |
| kA sym | 12.512 | 2.5 |
| Mechanical Operation | ns | |
| | 200020 | 00 |
| Fault Interrupting Cur | rrent, | |
| kA sym | 12.512 | 2.5 |
| | | |

TYPICAL SPECIFICATIONS CONTINUED

| C. RATINGS AND STANDARDS continued |
|-------------------------------------------------------|
| The switch shall be rated: (select appropriate table) |
| Trident-S, -ST, -SR Three Phase |
| Voltage Class |
| Nominal, KV 152535 |
| Maximum kV 15.5 27 38 |
| BIL Impulse. |
| kV110125150 |
| Continuous Current, |
| Amperes800800800 |
| Load Break Current, |
| Amperes800800800 |
| 1 Minute AC Withstand, |
| KV |
| Prod Test $kV = 34 = 40 = 50$ |
| 15 Minute DC Withstand |
| kV |
| Momentary Current, |
| kA asym202020 |
| Fault-Close (3-times), |
| kA asym2020 20 |
| Fault Interrupting Current, |
| kA sym12.5**.12.512.5 |
| 1 Second Current, |
| Mechanical Operations |
| Trident S ST 2000 2000 2000 |
| Mechanical Operations. |
| Trident-SR10K 10K 10K |
| * 29.2kV available |
| **16kA available for -S model only |
| Multi-Way Switches |

viuili-vvay Switches

| Voltage Class | |
|----------------------|-----------|
| Nominal, kV | 1525 |
| Voltage Class* | |
| Maximum, kV | 15.527 |
| BIL Impulse, | |
| kV | 110125 |
| Continuous Current, | |
| Amperes | |
| Load Break Current, | |
| Amperes | |
| 1 Minute AC Withstar | nd, |
| kV | |
| 1 Minute AC Withstar | nd (dry), |
| Prod. Test, kV | |

| 15 Minute DC Withstand, |
|-------------------------------|
| kV78 |
| Momentary Current, |
| kA asym2020 |
| Fault-Close (3-times), |
| kA asym2020 |
| Fault Interrupting Current, |
| kA sym12.512.5 |
| 1 Second Current, |
| kA sym12.512.5 |
| Mechanical Operations, |
| Trident-S, -S20002000 |
| Mechanical Operations, |
| Trident-SR10K10K |
| [°] 29.2KV available |

D. IEEE C37.60 FAULT INTERRUPTING DUTY

| Percent of Maximum Interrupting Rating | Approx. Interrupting Current, Amps | No. of Fault Interruptions |
|-------------------------------------------------|---------------------------------------------|----------------------------------|
| 15-20% 45-55% 90-100% | 2,000 6,000 12,500 | 44 56 16 |
| Total # of Fault Interruptions: 116 | | |

Total # of Fault Interruptions: 116

E. BUSHINGS

E1. Two-Way (using one module): Bushings shall be integral to the switch module and designed and tested to IEEE 386.

Bushings shall be (check one bushing type for each location):

Closest to mechanism housing: ____ 600A ____ 200A

Away from mechanism housing: ____ 600A ____ 200A

E2. Multi-Way:

Bushings shall be designed and tested to IEEE 386.

Bushings shall be one or more of the following (check one or both): ____ 600A ____ 200A

F. VACUUM INTERRUPTER CONTROL

For fault interrupters, a control shall monitor the current on each phase using the integral encapsulated current transformer(s). The control shall compare currents on each phase of the load circuits on each phase of the load circuits with preselected time current curves and cause the fault interrupters to interrupt the current at the appropriate time. The control shall be powered from the current transformers molded into the epoxy encapsulation. No external power source shall be required for protection. See section J for control options.

G. PADMOUNT ENCLOSURE

(if applicable)

Enclosures shall be made of 12 gauge galvanized or 304 stainless steel and manufactured to IEEE C37.72 and C57.12.28 standards. Enclosures shall be tamper-resistant incorporating hinged access door(s) with pentahead locking bolt(s) and provisions for padlocking. The enclosures shall be provided with lifting provisions and painted with a Munsell 7.0GY3.29/1.5 green finish.

H. FACTORY PRODUCTION TESTS

Each assembly shall undergo a mechanical operations check, a one minute phase-to-phase, phaseto-ground and across the open contact AC hi-pot test. Circuit resistance shall be checked on all ways. Each module shall undergo an X-ray inspection and a partial discharge test to ensure void-free construction.

TYPICAL SPECIFICATIONS CONTINUED

I. STANDARD COMPONENTS

The following shall be included as standard:

- 1. Welded stainless steel mechanism housing painted light gray with stainless steel and brass fasteners.
- 2. Lifting provisions.
- 3. Corrosion-resistant nameplates and line diagram.
- Switch operating mechanism(s) with padlock provision and single keylock provision.
- 5. Mounting provisions.
- 6. Ground provisions (1/2-13 threaded boss).
- 7. For padmount switches: Padmount enclosure (see section G).
- 8. Hookstick operable handles for permanent mounting or removable style.

J. OPTIONS (included in catalog number) (*check all that apply*) The following options shall be supplied:

- Auxiliary contacts installed on spring operating mechanism
- ____ Stationary mounted motor actuator installed on spring operating mechanism
- Single way, stationary motor control
- ____ Hand held remote control (Trident-SR only)
- ____ Multi-way, stationary motor control
- ____ Type 1 interrupter control
- ____ Type 2 interrupter control
- ____ Type 3 interrupter control
- Type 4 interrupter control
- ____ Type 7 interrupter control
- Laptop programming kit for Types 3, 4 and 7 controls
- SEL 351R recloser control
- SEL 651R recloser control
- SEL 751A interrupter relay
- ____ SEL 501 interrupter relay
- SEL 551 interrupter relay
- SEL Falcon interrupter relay

- __ SEL 351S interrupter relay
- ____ ATC 451 auto transfer control
- ____ ATC 101 auto transfer control
- Handle permitting switch to function as a load break or fault interrupter

K. ACCESSORIES (additional items) (*check all that apply*) The following accessories shall be supplied:

- ____ 4/0 brass ground lug(s)
- ____ Portable motor control
- _____ Junction box for connection of remote power/remote trip or auxiliary contacts
- ____ Key interlocks
- ____ Galvanized frame (24" high
- bushing height)
- ____ Parking stands for each phase
- ____ Mechanical dead break device for visible break
- ____ Removable straight, fiberglass operating handle
- Hookstick operable, angled stainless steel handle

Submersible Application Example

Installation shows a 3-way switch, frame mounted so the unit faces upward with side operating handles hookstick operable from above ground. The location is subject to complete submersion for extended periods of time. The yellow cable is connected to a laptop computer permitting programming of the overcurrent protection parameters for the switch.

The Flexibility of Solid Dielectric Technology ...

G&W offers a variety of epoxy encapsulated products including:

Solid Dielectric Viper[®] Reclosers

- To 38kV, 12.5kA interrupting
- Overhead and padmount designs
- Maintenance-free operation
- Work with SEL controls

Other Solid Dielectric Products

- Mutiple point junction bars and sectionalizing cabinets
- Encapsulated current limiting fuses
- Distribution cable transition joints
- Variety of cable entrance bushings

ISO 9001:2000 Certified Company

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