



Grid Smart. Grid Tough.



Product Line Overview



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Grid Smart. Grid Tough.

Trayer Engineering Corporation

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5-35 kV Padmount and Submersible Vacuum Switchgear

Trayer Engineering Corporation is a pioneer and global leader in the design and manufacture of long-lasting,

maintenance-free, vacuum switchgear for medium voltage electrical distribution systems. Designed and man-

ufactured in the USA, Trayer's modular design allows customers to provide input into the design and choice of

controls for your distribution switchgear.

50 Years of Success in Continually Changing Markets

Since 1962, Trayer built padmount, submersible, and vaultmount products have been integral to the success of

worldwide customers from utilities to municipalities, government installations to colleges and universities, as

well as for a variety of industrial applications. Trayer switchgear are designed to order, allowing each cus-

tomers the opportunity to build a product to work the way it is needed, each time.

Quality, Dependability, Innovation

Effective, Reliable Design

Trayer has been using vacuum technology for more than 40 years and has integrated decades of experience into the

basic design of our switchgear. 50 years of hands-on design and manufacturing has led to the implementation of inno-

vative design elements. With an emphasis on simplicity and reliability, our design improvements are built to last the life

of your product and the safety and ease of it's use.

Two Position Visible Disconnect Window



A visible OPEN should be just that, **VISIBLE!** Trayer positions the visible disconnect switch device just inside the viewing window so that operators can actually see the OPEN contacts.

This positioning allows the operator to see the contacts in the OPEN position from a safe working distance while operating the switch.

Patented Tri-Phase Interlocking Handles



Trayer's patent on our safety interlocking handle design prohibits operating personnel from opening the visible disconnect switch before first breaking the load with the vacuum switch mechanism.

Even though the visible disconnect switch is a rated switching device, the interlocking handles insure the safety of the operator by only allowing switching of the visible disconnect device "dead".

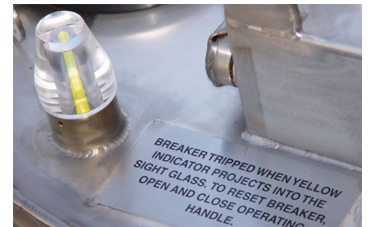
Tri-Phase Visible Disconnect with Ground Position



Trayer provides a larger window for the three position CLOSE/OPEN/GROUND visible disconnect switch device. The larger window permits viewing of all three contacts in all three positions.

Trayer stayed with the safety interlocking handle principle but modified it to work with this newer safety feature.

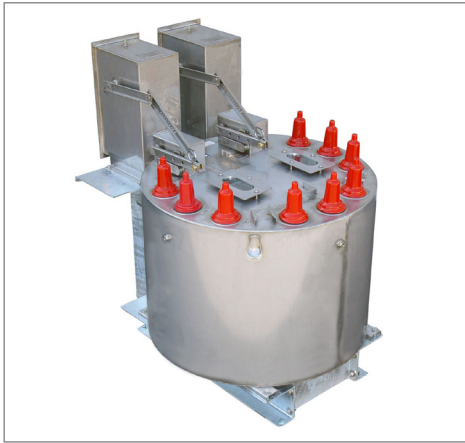
Mechanical VFI Trip Indicator



A yellow indicating rod attached inside the tank to the trip position bar of the VFI mechanism provides a positive position indication of the VFI's "tripped position".

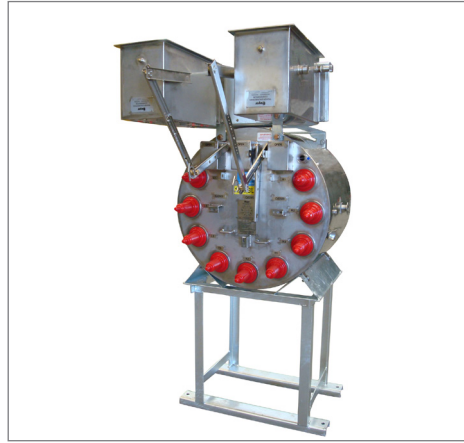
This mechanical "trip indicator" is viewed through a clear sight glass on the face of the switch, when the mechanism is tripped.

Submersible & Vaultmount Automation



Submersible Manhole Application Switchgear

- Submersible vacuum loadbreak switches designed for manhole installations.
- Trayer submersible “Motopaks”- 40 years of proven Automation.
- 304 stainless steel, built for the harshest conditions.
- Hot-dipped galvanized stands provide a sturdy foundation.
- Patented Visible Disconnect devices are available in limited round designs.



Submersible Switchgear for Vault Applications

- Trayer offers customers the options required to turn submersible equipment to fit vault style applications.
- Optional lifting provisions provide an easy way to rotate and position the gear on its side.
- Hot-dipped galvanized stands and motor operator mounts are designed to secure the equipment on its side.



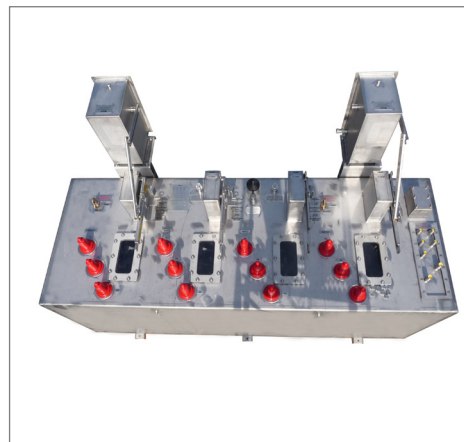
Vaultmount Switchgear for Wet Applications

- Trayer offers customers many styles and designs to fit their applications.
- Mounting rails can be welded to the side or bottom of the switch tank.
- Motor operators can be mounted directly to the switchgear in some applications.
- Rectangular designs available with up to six ways.



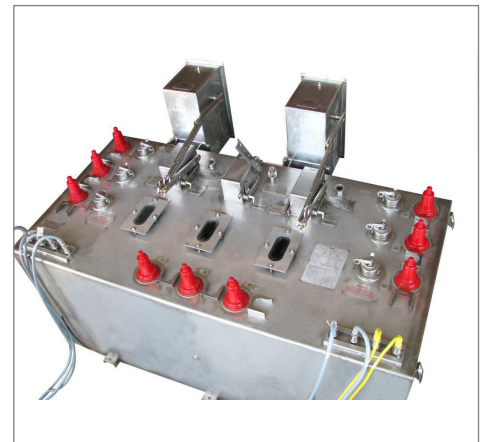
Dry Vault SCADA Application with Seismic Rated Stand

- Lower cost, water resistant motor operators for dry vault applications.
- Seismic rated stands and provisions to secure the unit to the vault wall are available.
- Base designs can be “customized” by adding a shroud to meet individual customer’s requirements.(pictured above).



SF6 Insulated Submersible Smart Grid Switchgear

- Vault mounted Submersible Control Enclosure.
- SEL Automation and Relay packages.
- Submersible Control Cables.
- 3 phase Voltage and Current from internally mounted CTs and PTs.
- Visible Disconnect with Internal Ground Position Switch.



10 cycle - Submersible Automatic Transfer Switchgear

- High Speed Automatic Transfer Mechanisms.
- Internally Mounted and Fused Potential Transformers, three on each Source Way.
- Optional Perimeter mounted bushings.
- Patented Tri-Phase Visible Disconnect Switches for a “truly visible” Open.
- SEL Automation and Over-current Controls.

Padmount Automation - Auto Transfer & SCADA



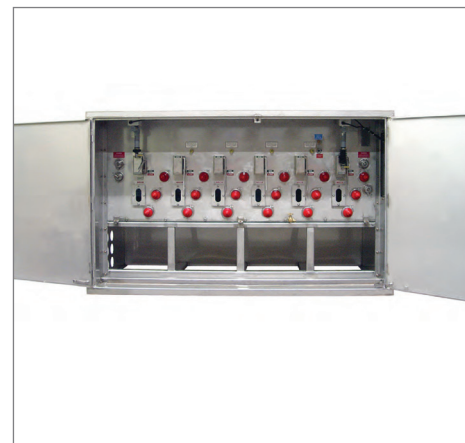
10 cycle - Padmount Single-sided Automatic Transfer Switchgear

- High Speed Automatic Transfer Mechanisms.
- Internally Mounted and Fused Potential Transformers, three on each Source Way.
- PT and CT accuracy for performing Power Calculations.
- Patented Tri-Phase Visible Disconnect Switches for a “truly visible” Open.
- SEL Automation and Over-current Controls.



Padmounted Smart Grid Automation Switchgear

- Flexible design available in a variety of shapes, sizes, and control options.
- Coupled with customer specified relays and remote terminal units (RTU).
- Built using 30 years of field-proven VFI design experience, incorporating the latest advancements in vacuum technology and microprocessor-based relay and communication controls.
- Variety of DNP3 and 61850 SCADA control options: Radio, Fiber optic, and Cellular communication.



Automatic Transfer / Smart Grid Automation - Customized up to six ways

- Powerful single-side access Automated Switchgear built from 304 stainless steel with customized auto transfer logic, motor control, over-current and fault protection.
- Any combination of vacuum loadbreak switching and up to five vacuum fault interrupter protected ways.
- Built on a SEL-400 Series Automation Platform with multi-channel over-current relay protection.



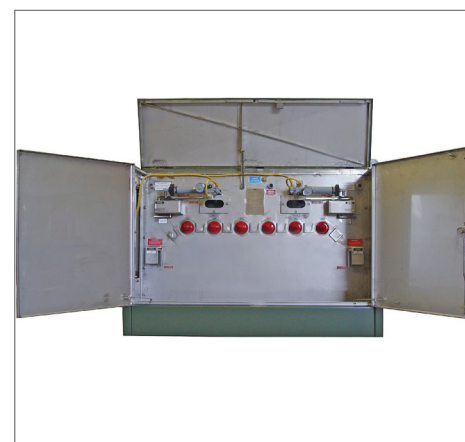
Smart Grid Automation in Double Sided Designs

- Trayer's proven technology in step with current automation, communication, and relaying advancements provide a perfect retrofit upgrade solution for your older double sided equipment.
- Replacements designs are available to replace air insulated, oil insulated or SF6 insulated switchgear with maintenance-free vacuum load break and vacuum fault interrupter.



Automatic Transfer / Smart Grid Automation - Customized up to six ways double sided

- Vacuum fault interrupters built to replace original equipment on existing foundations.
- Double-sided liquid and SF6 units combine vacuum loadbreak switching and vacuum fault interrupter and relay protection.
- Built using 20 years of field-proven VFI design experience, incorporating the latest advancements in vacuum technology and microprocessor-based relay and communication controls.
- Tri-phase Visible Disconnect with Ground Position optional on vacuum loadbreak switch and vacuum fault interrupter ways.



10 cycle - Padmount Double-sided Automatic Transfer Switchgear

- High Speed Automatic Transfer Mechanisms.
- Internally Mounted and Fused Potential Transformers, three on each Source Way.
- PT and CT accuracy for performing Power Calculations.
- Patented Tri-Phase Visible Disconnect Switches for a “truly visible” Open.
- SEL Automation and Over-current Controls.

Submersible Switchgear



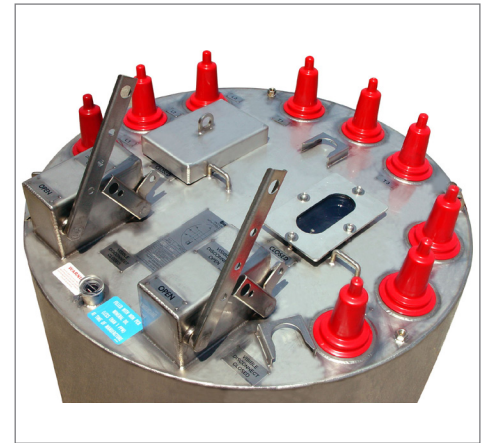
Oil Fused Cut-out Replacement VFI

- 27kV – 600 Amp – 12.5 kA, single-phase Oil Fused Cut-out replacement design, now 40% smaller than previous models.
- CT powered submersible over-current relay, 304 stainless steel construction.
- Includes Trayer's "truly visible" single-phase visible disconnect device.
- A variety of mounting options are available.



Liquid Insulated Round Submersible Vacuum Switches

- 600 Amp rated vacuum loadbreak for 15, 25 and 35kV applications.
- 10,000 mechanical operations in liquid dielectric and 3,000 operations in SF6
- Available in a two, three, or four way round switch designs.
- 600 Amp bushings or 200 Amp bushing wells.



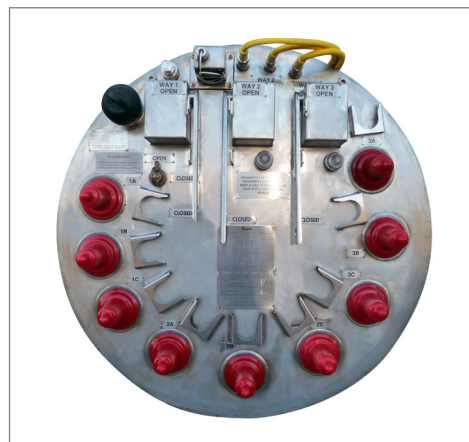
Submersible Switchgear with Patented "visible OPEN"

- Features Trayer's patented Tri-Phase Visible Disconnect in a 3 way round design.
- Submersible window covers keep visible disconnect view free from dirt and debris.
- Visible disconnects in the OPEN position provide a safe working isolation point for testing and grounding of 600 Amp cables without removing them from the bushings.



4-Way Round Switch with Visible Disconnects and Current Limiting Fuse Protection

- Low cost, proven reliable protection for underground circuits.
- 15kV, 25kV, and 35 kV solutions.
- Current limiting fuses available up to 200 amps at 15kV.



Submersible SF6 Insulated Round Switch Design with VFI Protection

- 15kV and 25kV Vacuum Fault Interrupters built for underground protection applications.
- 34-½ inch round design in 304 stainless steel provides a compact 3 way solution.
- CTs for over-current protection and one PT for control power are internally mounted.
- Submersible or Vaunt style relay control cabinets are available.



Submersible 4000 Series 3 phase Ganged VFI Mechanisms

- 15kV and 25kV compact Vacuum Fault Interrupter protected switchgear.
- CT powered relay offers single or three phase trip selection.
- 34-½ inch compact design able to pass through 36 inch manholes.
- Above design shown with optional rope operator provisions and circuit tag holders.

Submersible Switchgear



Rectangular Submersible Switch with Current Limiting Fuse Protection

- 15kV, 25kV, and 35kV submersible switch and fuse switchgear designs.
- Submersible “9” configuration: two switched and two fuse protected ways.
- Other configurations are available.
- Above design shown with optional Tri-Phase Visible Disconnect and viewing window cover.
- Full range current limiting fuses are available up to 200 Amps at 15kV.



Square Submersible Switch with Current Limiting Fuse Protection

- 15kV, 25kV, and 35kV submersible switch and fuse switchgear designs.
- Submersible “9” configuration: two switched and two fuse protected ways.
- Other configurations are available.
- Above design shown with optional Tri-Phase Visible Disconnect and viewing window cover.
- Full range current limiting fuses are available up to 200 Amps at 15kV.



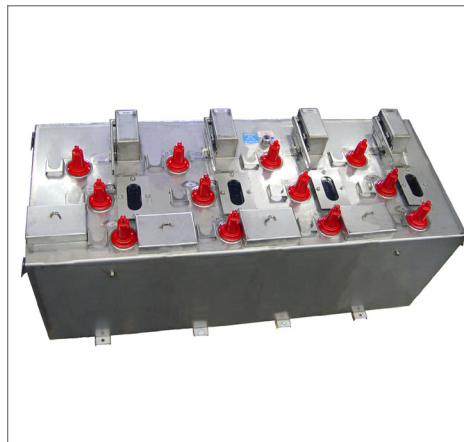
Submersible Switch with 600 amp CT powered 4000 Series VFI Protection

- 15kV and 25kV 4000 Series Vacuum Fault Interrupters.
- Sealed tanks and resettable VFIs eliminate the need to ever replace a fuse.
- Submersible rated, CT powered, over-current relays come installed with 24 of the most commonly used fuse and relay curves programmed into the relay.
- Submersible rated cables and an internally mounted shorting board circuit, allows relays to be removed while energized.



Submersible Switch with 600 amp 3000 Series three phase VFI Protection

- 15kV and 25kV 3000 Series Vacuum Fault Interrupter.
- 3 phase mechanisms allow for compact designs to fit in underground vaults and man-holes.
- Trayer built submersible control cabinets house SEL over-current relays for improved coordination.
- Fiber optic communication cable supplied for local download and settings changes.



Rectangular Submersible Switchgear with Patented Visible Disconnect Technology

- Trayer's modular designs permits many variations of switch and VFI arrangements.
- Optional Tri-phase Visible Disconnect Switches provide a safe working isolation point in the Open position.
- Visible Disconnect Switches add life to your equipment by reducing termination failures caused by removing T-bodies to get a safe isolation point.
- Rectangular submersible designs are available with up to 6 ways.



Insulated Submersible 3000 Series VFIs with Visible Disconnect and Ground Switch

- Trayer offers an internal Ground position option on the Tri-phase Visible Disconnect Switch.
- An internal grounding switch provides a safe alternative to removing cables underground.
- Large viewing windows permits viewing of all three contacts in the Closed, Open, and Ground position.
- Available in liquid and SF6 filled equipment.

Padmount Switchgear Single-Sided



Padmount Single Phase Protection

- Padmount two way single-phase unit replaces cable junctions and protects single-phase underground circuits.
- Single-phase VFIs and accompanying CT powered relays provide multiple protection options.
- Multiple design options with additional single phase ways are available.



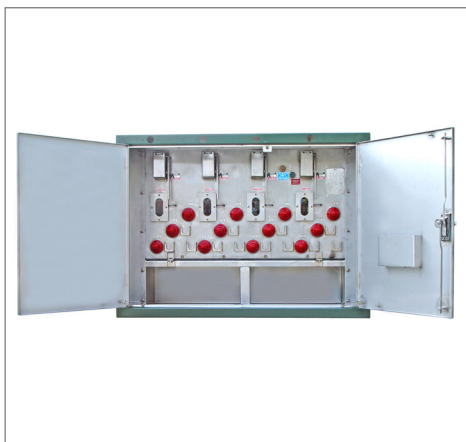
Padmount Single Phase Multi-way Switchgear

- Perfect upgrade to replace cable junctions with VFI protection on single phase circuits.
- Low profile padmount units help to hide electric equipment from view.
- Single phase / single pole relays allow individual settings to be applied to a variety of multi-way configurations.



Single Sided Padmount with 4000 Series Vacuum Fault Interrupters

- Liquid or SF6 insulated 15kV and 25kV VFIs and accompanying CT powered single-phase or three-phase trip relays provide many configurations and protection options.
- These 27kV rated devices can be used for 600 Amp load switching as well as 600 Amp VFI protection.
- Available as either 600 Amp bushings or 200 Amp bushing wells.
- Many custom designs are available to replace your existing equipment.



Single Sided 15kV and 25kV Padmount Switchgear with bushings to the right

- Vacuum loadbreak switch mechanisms are 600 Amp rated and provide 10,000 operations in liquid and 3,000 operations in SF6.
- Patented Tri-Phase Visible Disconnect devices with interlocking handle designs optional on all switched ways.
- Visible disconnect displays a truly visible "OPEN" set of contacts and provides a safe "isolation point" to test cables without the need to remove them.
- Above design shown with Trayer's Cabinet style enclosure and bushings slanted to the right.



Single Sided 15kV and 25kV Padmount Switchgear with bushings to the left

- Vacuum loadbreak switch mechanisms are 600 Amp rated and provide 10,000 operations in liquid and 3,000 operations in SF6.
- Patented Tri-Phase Visible Disconnect devices with interlocking handle designs optional on all switched ways.
- Visible disconnect displays a truly visible "OPEN" set of contacts and provides a safe "isolation point" to test cables without the need to remove them.
- Above design shown with Trayer's Cabinet style, vented, enclosure and bushings slanted to the left.



Padmount Vacuum Load Break Switch and 3000 Series VFI Protection

- 3000 Series VFI incorporates the latest advancements in vacuum technology and microprocessor-based relay controls.
- Vacuum load-break switching and vacuum fault interrupter protection in standard configurations up to six ways.
- Optional Tri-Phase 3 position Visible Disconnect with Ground is available on vacuum loadbreak switch and vacuum fault interrupter ways.
- Tall high voltage enclosures for SCADA motor operators are available.

Padmount Switchgear Double-Sided



Double Sided Padmount Switch Designs

- 600 Amp rated vacuum load-break switch mechanism with optional Visible Disconnects and with Ground.
- SCADA motor operator mounting provisions on every Switched way.
- Footprint and horizontal bushing designs sized to make an easy retrofit conversion from live front air-insulated switchgear to sealed dead front.
- Designs to replace oil switches and SF6 filled equipment on their original foundations are available.
- Low profile bases and lift up hoods or cabinet front enclosures are available.



Padmounted Switch with Current Limiting Fuse Protection

- 15kV, 25kV and 35kV class switchgear offer 600 Amp vacuum loadbreak switches with full-range, current-limiting fuse protection.
- Trayer's Universal Fuse Wells accommodate liquid immersed current limited fuses up to 200 Amps at 15kV.
- "Fool" proof fuse cap and integral bushing design "prohibits" fuse removal under load.
- Footprint designs available to replace live front and oil switchgear on their original foundations.



Padmount 15kV and 25kV Switch with 3000 Series VFI Protection

- 4 way designs are available in standard 9, 10, 11, and 12 configurations to upgrade or replace original fused equipment on their existing foundations.
- Typical 12 configuration is designed with a 600 Amp loadbreak switch IN, two 200 Amp VFI load tap ways and a 600 Amp three phase VFI OUT, for downstream main line protection.
- Cable fault protection and interruption provided by a 600 Amp VFI, isolating a fault mid circuit.
- Tri-phase Visible Disconnect devices available on both the vacuum loadbreak switch and vacuum fault interrupter mechanisms.



Padmount Double Sided with up to Six Ways

- Modular, double-sided, 6 way design allows for many combinations of load-break switch and vacuum fault interrupter configurations.
- Cabinet style enclosures with lift up lids reduce the weight of "old style" lift up hood designs.
- The horizontal operating handles are set up to add future Smart Grid or SCADA motor operators.



Padmount 15kV and 25kV 4000 Series CT Powered VFIs with Single Phase Operating Handles

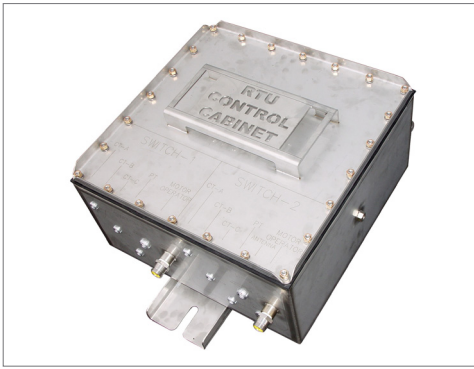
- Versatile single-phase trip 4000 Series vacuum fault interrupter provides reliable single phase circuit protection.
- Single-phase VFIs and accompanying single-phase or three-phase trip relays are powered from internally-mounted current transformers.
- In case of complete loss of power, the relay can trip the VFI on curve within as little as 10 milliseconds.
- Optional single-phase visible disconnects in series with 4000 Series VFIs permits customers to leave their 600 Amp cables attached while testing and grounding.



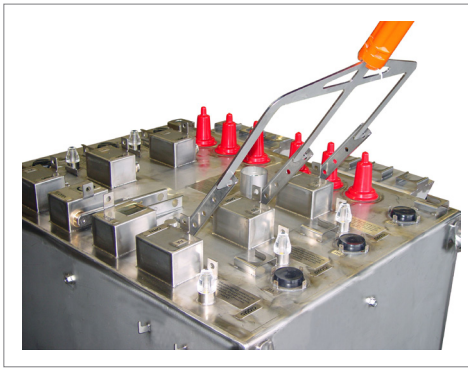
Padmount 15kV and 25kV 4000 Series CT powered VFIs with "ganged" Three Phase Operating Handle

- Above design offers single or three-phase tripping with three-phase Open/Reset/Close.
- Footprint and bushing layout offers easy retrofit of existing live front, air insulated switchgear.
- CT powered relays provide a low cost upgrade to fuse protected circuits.
- Multiple design options available.

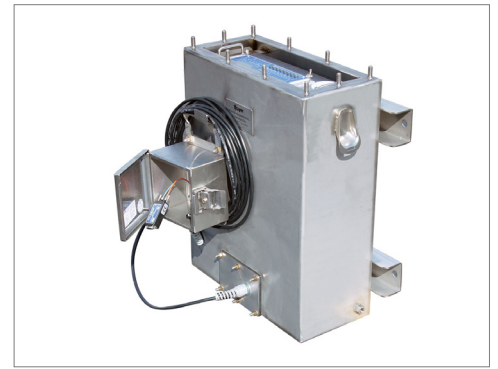
Submersible Features & Control Options



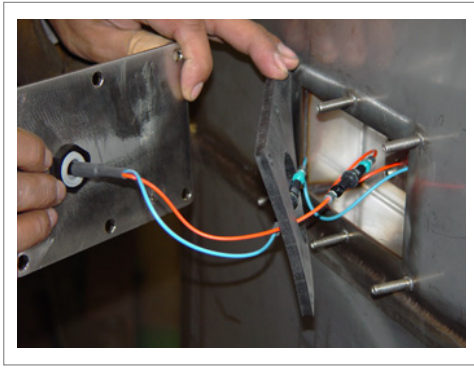
Submersible RTU Control



**Trident Submersible 3-Phase
OPEN/CLOSE Shotgun Adapter**



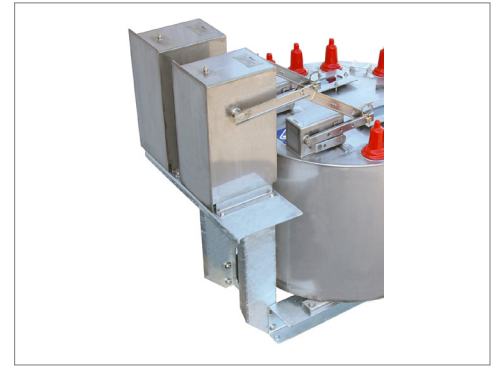
Remote Submersible Relay Enclosure



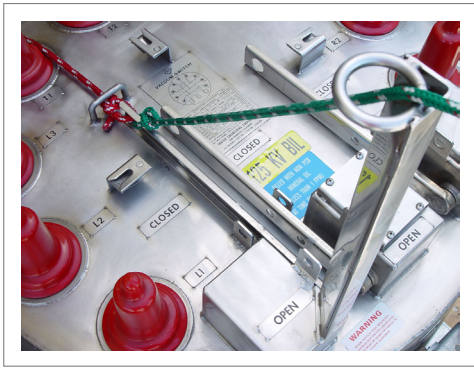
Fiber Optic Communication



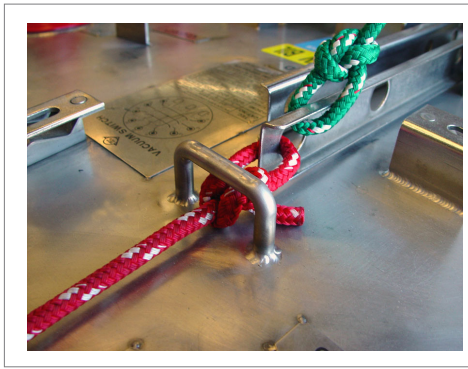
**Universal Fuseholder - Cap Guides &
Quick Close Clamps**



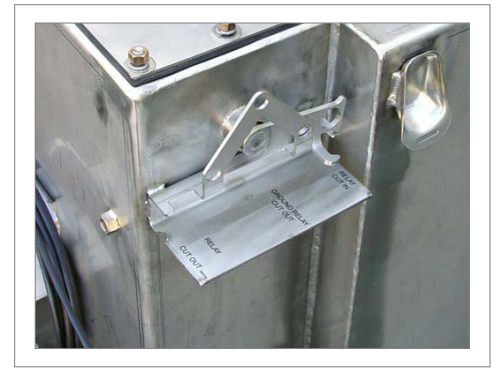
**Bolt on Motor Operator Mounting
Bracket and Stand**



**360° Open Rope Operator with
Upper Stanchion Ring**



360° Rope Close Operator Ring



External Ground & Relay Cut Out Switch



**Customer specified RTUs combined
with SEL over-current control.**

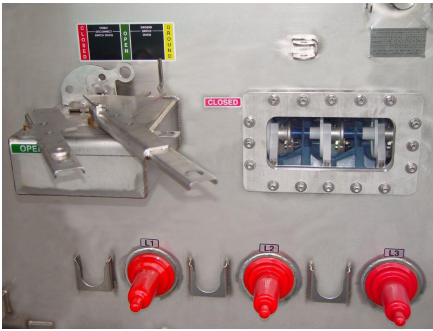


CT Powered Submersible Relay



Submersible Motopak

Padmount Features & Control Options



Visible Disconnect with Ground Position



Drain Valve with Sampler



Internal Potential Transformers for Power Calculations and Control Power



Single-Phase Visible Disconnects Switches



Liquid Level Gauge



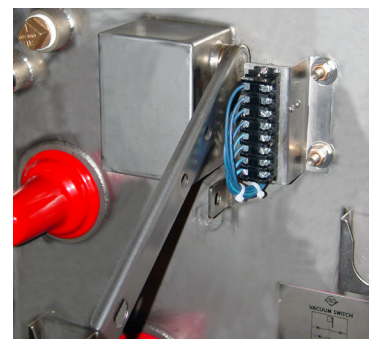
Optional External PT Control Power



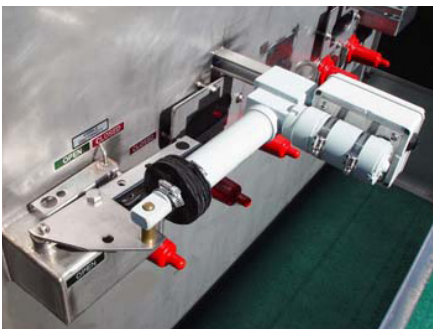
Fuse Wipes for 200 Amp Current Limiting Fuses



Trident Padmount 3-Phase OPEN/CLOSE Shotgun Adapter



External Status Position Switches



Padmount Linear Actuator



Option for Custom Enclosures and Cable Ways



Custom Automation and Relaying Controls for Smart Grid Applications

Trayer Vacuum Switchgear Ratings*	5/15 kV	25 kV	35 kV
Maximum Design Voltage (kV)	15.5	27	38
One Minute Withstand (kV @ 60 Hz)	34	40	50
Momentary Current 200 amp way (Bushing Dependent) (Asymmetrical Amps)	15,000	15,000	15,000
Momentary Current 600 amp way (Asymmetrical Amps)	20,000	20,000	20,000
Momentary and Make and Latch on Ways with Current Limiting Fuses (Asymmetrical Amps)	50,000	50,000	50,000
SWITCH ONLY			
BIL Across Open Contacts (kV)	95	125	150
BIL Phase-to-Phase and Phase-to-Ground (kV)	125	125	150
Load Switching (Amps)	600	600	600
Number of Full Load Operations	10,000	10,000	10,000
Continuous Current (Bushing Dependent) (Amps)	200/600	200/600	200/600
Maximum Interrupting Current (Three Shots) (Amps)	2,000	2,000	2,000
BREAKER (VFI)			
BIL Across Open Contacts (kV)	95	125	150
BIL Phase-to-Phase (kV)	95	125	150
BIL Phase-to-Ground (Bushing Dependent) (kV)	95	125	150
Continuous Current (Bushing Dependent) (Amps)	200/600	200/600	200/600
Interrupting Capacity (1.2 Asymmetry) (Symmetrical Amps)	16,000	12,000	10,000
*Ratings are nominal and intended to be general in nature. For ratings of specific Trayer switchgear units, contact your Sales Representative.			



Grid Smart. Grid Tough.



Represented by: