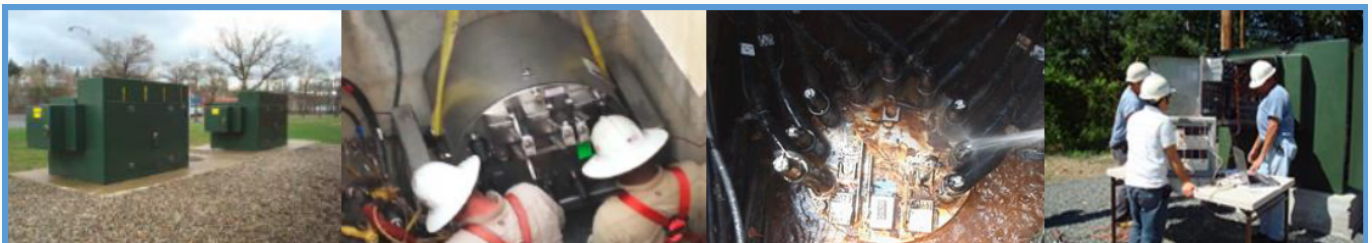




Grid Smart. Grid Tough.



Medium Voltage Distribution Switchgear Product Line Overview



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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 premium long-lasting, vacuum switchgear for medium voltage electrical distribution systems. Designed and manufactured in the USA, Trayer's modular design allows customers to provide input into the design and choice of controls for your distribution switchgear.

NEW: Trayer Solid Dielectric Switchgear ---a form fit function substitute for existing Trayer products and an excellent alternative for applications where liquid or gas insulation is not preferred. Trayer Solid Switchgear utilizes the same proven vacuum technology (all high voltage operations occur in a vacuum contact bottle) backed by over 50 years of industry leading quality and performance with the convenience of cycloaliphatic solid polymer insulation of the active switching components. Ask your Trayer Representative for additional information.

Over 50 Years of Success in Continually Changing Markets

Since 1962, Trayer built pad-mount, 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 customer the opportunity to build a product to work the way it is needed, each time.

Quality, Dependability, Innovation

Effective, Reliable Design

Trayer pioneered the use of vacuum technology in switchgear more than 45 years ago and has integrated decades of experience into the basic design of our products. Years of hands-on design and manufacturing has led to the implementation of innovative design elements. With an emphasis on safety, simplicity and quality, Trayer design improvements are built to insure ease of operability and maximum reliability decade after decade.

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.

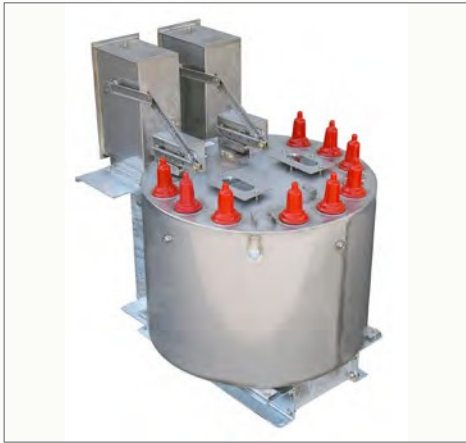
Mechanical VFI Trip Indicator



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 and Vaultmount Automation - Auto Transfer & SCADA



Submersible Manhole Application Switchgear

- Submersible vacuum loadbreak designed for manhole installations.
- Trayer submersible "Motopaks"- 40 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 quired to turn submersible equipment fit vault style applications.
- Optional lifting provisions provide a 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 Automated Applications

- Trayer offers customers many styles designs to fit their applications.
- Mounting rails can be welded to the 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.



Vaultmount SCADA Application with Seismic Rated Stand

- Lower cost, water resistant motor opera- tors 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.



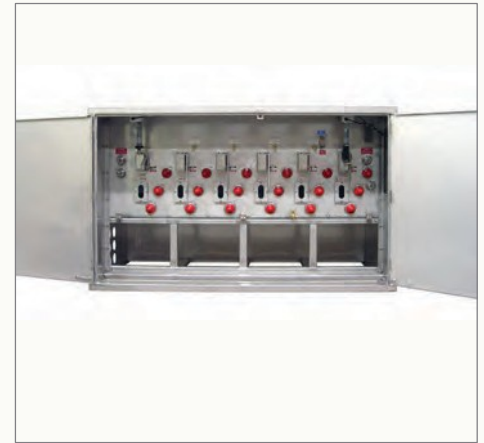
10 cycle - Padmount Single-sided Automatic Transfer Switchgear

- 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 re-lay protection.



ATS/PNP Uninterruptible Primary Power - Zero Cycles Interruption

- The connections to the ATS/PNP are similar to a standard ATS that is connected to two sources so that the load can be fed from either source. An ATS uses vacuum switches and electronic controls to change to the alternate source when a fault occurs on the primary feeder. In a ATS/PNP, the vacuum switches are replaced with vacuum fault interrupters and the two sources are tied together so that the load is normally fed from both sources simultaneously.



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 re- lay, 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.



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 re-places 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

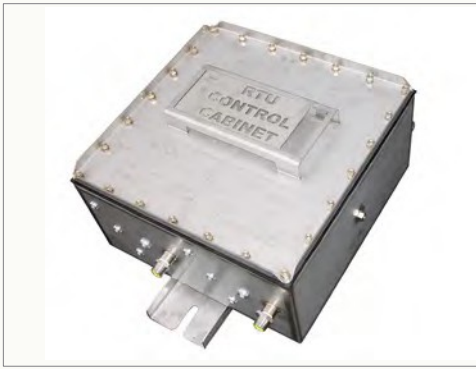
- Versatile single-phase trip 4000 Series vacuum fault interrupter provides reliable single phase circuit protection.
- Single-phase VFIs and accompanying single-phase or three-phase trip relays are powered from internally-mounted current transformers.
- Optional single-phase visible disconnects in series with 4000 Series VFIs permits customers to leave their 600 Amp cables attached while testing and grounding.



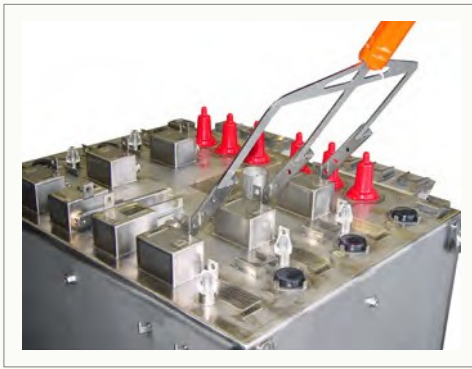
Padmount 15kV and 25kV 4000 Series CT powered VFIs with "ganged" Three Phase Operating Handle

- 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.

Features and Control Options



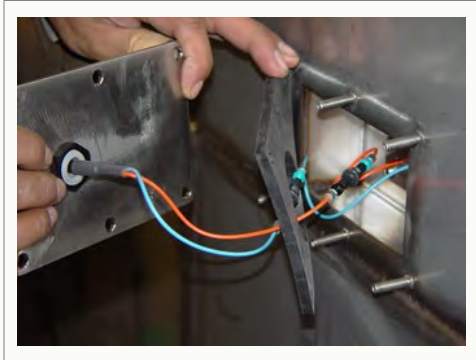
Submersible RTU Control



Trident Submersible 3-Phase OPEN/CLOSE Shotgun Adapter



Remote Submersible Relay Enclosure



Fiber Optic Communication



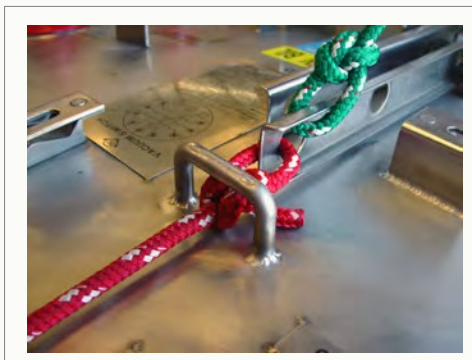
Universal Fuseholder - Cap Guides & Quick Close Clamps



Bolt on Motor Operator Mounting Bracket and Stand



360° Open Rope Operator with Upper Stanchion Ring



360° Rope Close Operator Ring



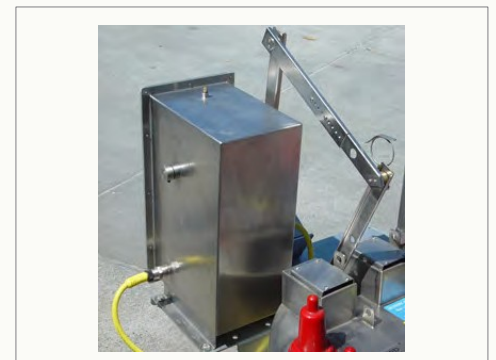
External Ground & Relay Cut Out Switch



Customer specified RTUs combined with SEL over-current control

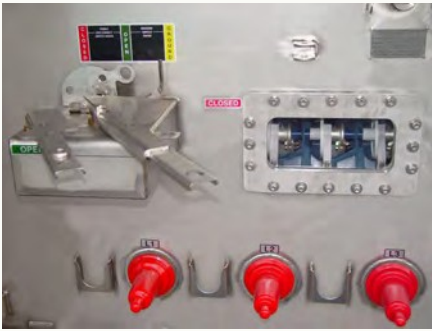


CT Powered Submersible Relay



Submersible Motopak

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



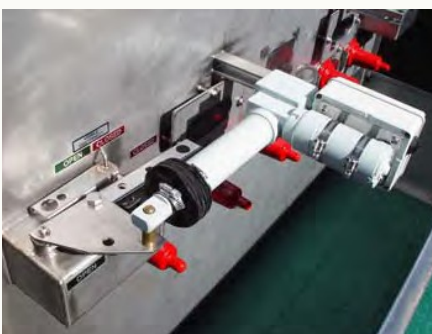
Fuse Wipes for 200 Amp Current Limiting Fuses



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

Features and Control Options

Ratings for the Unit/System Voltage						
Nominal Voltage (Series)	15kV (3800)		25kV (3810)		35kV (3820)	
Maximum Design Voltage	15.5kV		27kV		38kV	
Device	Load Break Switch	Vacuum Fault Interrupter	Load Break Switch	Vacuum Fault Interrupter	Load Break Switch	Vacuum Fault Interrupter
BIL Phase-to-Phase, Phase-to-Ground	95kV	95kV	125kV	125kV	150kV	150kV
BIL Across Open Contacts	95kV	95kV	150kV	125kV	150kV	150kV
One Minute Withstand (60Hz)	34kV	34kV	40kV	40kV	50kV	50kV
Continuous Current	600A	600A	600A	600A	600A	600A
Load Switching	600A	600A	600A	600A	600A	600A
Load Break Operations at Full Load	10,000	8,000	10,000	8,000	10,000	8,000
Maximum Interrupting Current (Symmetrical)	600A	12.5kA	600A	12.5kA	600A	12.5kA
Number of Fault Interruptions at 12.5kA	N/A	65	N/A	65	N/A	65
Maximum Emergency Three-Time Interrupting	2000A	N/A	2000A	N/A	2000A	N/A
Momentary & Make and Latch 600A ways (Asymmetrical) 200A ways (Asymmetrical)	20kA 15kA	20kA 15kA	20kA 15kA	20kA 15kA	20kA 15kA	20kA 15kA

*Higher fault current rated equipment available. Contact Representative or factory for details.



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