Trayer SWITCHGEAR

Grid Smart. Grid Tough.

MEDIUM VOLTAGE DISTRIBUTION SWITCHGEAR

CONTENTS

Trayer Engineering Corporation is a pioneer and global leader in the design and manufacture of premium long-lasting, vacuum switchgear for medium voltage electrical distrubution applications. Designed and manufactured in the USA, Trayer's extensive library and modular design options allow customers to provide input into the design and configuration of their switchgear.

NEW: Trayer enviroTEC Green Dielectric Medium (GDM) Lineup - Trayer is the only switchgear manufacturer that can provide an interchangeable, environmentally friendly alternative for any liquid, gas or solid dielectric switch design. All Trayer Engineering Switchgear is 100% Stainless Steel, completely welded and sealed offering added safety and extended performance. **enviroTEC** options are form fit function replacements for existing Trayer units. Backed by over 60 years of industry leading quality and performance Trayer can offer the following **enviroTEC** GDM options:

- **enviroTEC Gas - A 3M NOVEC**™ based gas that is a non-reportable and environmentally friendly alternative to SF6
- **enviroTEC Solid Dielectric -** Trayer solid dielectric insulation encapsulates our patented vacuum switchgear mechanism in a cycloaliphatic solid polymer
- **enviroTEC Liquids -** A long proven and reliable dielectric, Trayer can replace traditional transformer oil with FR3 or Alpha Fluid based liquid insulation.

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

TRAYER SWITCHGEAR: THE INDUSTRY STANDARD FOR OVER 60 YEARS

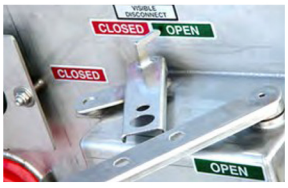
SAFETY, PERFORMANCE, RELIABILITY

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 manufaturing 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 the 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 operation 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 ensure the safety of the operator by only allowing switching of the visible disconnect device when "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 indication 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 Manhole Application Switchgear

- Submersible vacuum loadbreak 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

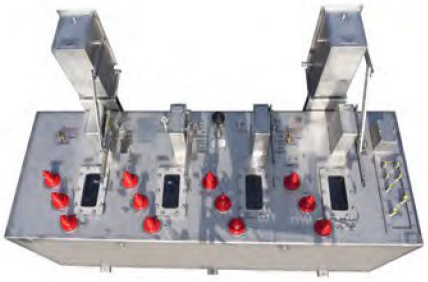
- Trayer offers customers the option to rotate or mount submersible equipment to fit vault style applications.
- Optional lifting provisions provide a way to rotate and position the gear on its side.
- Hot-dipped galvanized stands and motor operator mounts are designed to secure the equipment on its side.

Vaultmount Switchgear for Automated Applications

- Trayer offers customers many style 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 switch gear in some applications.
- Rectangular designs available with up to six ways.

Vaultmount 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 Fuse 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 40 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 six ways.
- Built on a SEL-400 Series Automation Platform with multi-channel over current relay 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 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 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 Fuse 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.

Oil Fused Cutout 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 overcurrent relay, 304 stainles 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 35 kV 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

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

Submersible SF6 Insulated Round Switch Design With VFI Protection

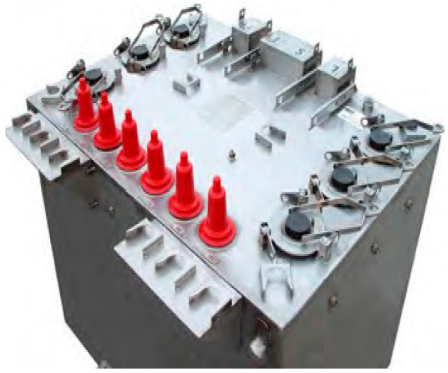
- 15kV and 25kV Vacuum Fault Interrupters built for underground protection applications.
- 34-1/2 inch round design in 304 stainless steel provides a compact 3 way solution.
- CTs for over-current protection and one PT for control power are internally mounted.
- Submersible or Vault style relay control cabinets are available.

Submersible 4000 Series 3 phase Ganged VFI Mechanisms

- 15kV and 25kV compact Vacuum Fault Interrrupter protected switchgear.
- CT powered relay offers single or three phase trip selection.
- 34-1/2 inch compact design able to pass through 36 inch manholes.
- Above design shown with optional rope operator provisions and circuit tag holders.

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

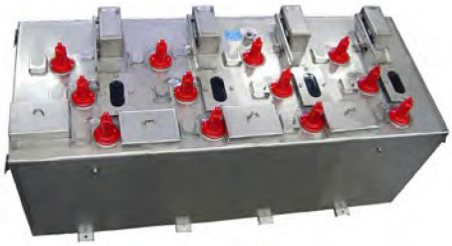
- 15kV 25KV, and 35kV submersible switch and fuse switchgear designs.
- Submersible “9” configuration: two switched and two fuse protected ways.
- Other configurations are available.
- Above design shown with optional Tri-Phase Visible Disconnect and viewing window cover.
- Full range current limiting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

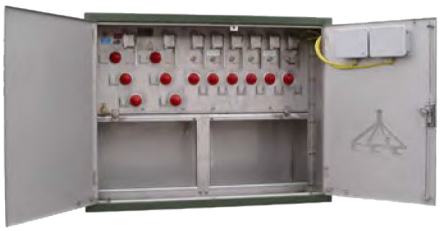
- Trayer offers an Internal Ground position option on the Tri-phase Visible Disconnect Switch.
- An internal grounding switch provides a safe alternative to removing cables underground.
- Large viewing windows permits viewing of all three contacts in the Closed, Open, and Ground position.
- Available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

Padmount 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 load break 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.

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

- Vacuum load break 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.

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 load break switch and vacuum fault interrupter ways.
- High voltage enclosures with SCADA motor operators are available.

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 switchear to sealed dead front.
- Designs to replace oil switches and SF6 filled equipment on their original foundations are available.

Padmount Switch with Current Limiting Fuse Protection

- 15kV, 25kV and 35kV class switchgear offer 600 Amp vacuum load break 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 load break switch IN, two 200 Amp VFI load tap ways on 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 load break switch and vacuum fault interrupter mechanisms.

Padmount Double Sided with up to Six Ways

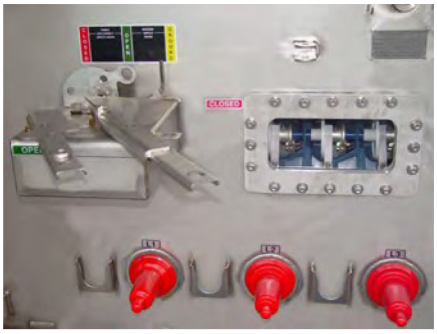
- Modular, double sided, 6 way design allows for many combination of load break switch and vacuum fault interrupter configurations.
- Cabinet style enclosures with lift up lids reduce the weight of "old style" lift up hood designs.
- The horizontal operating handles are set up to add future Smart Grid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

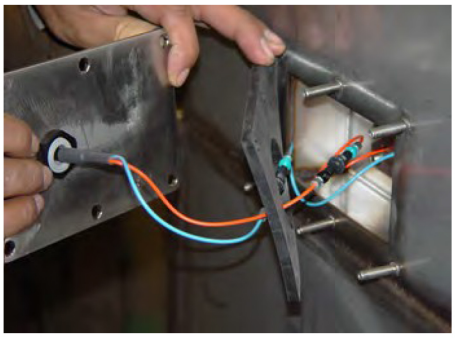
- Above design offers single or three phase tripping with three phase Open/Reset/Close.
- Footprint and bushing layout offers easy retrofit of existing live front, air insulated switchgear.
- CT powered relays provide a low cost upgrade to fuse protected circuits.
- Multiple design options available.



Visible Disconnect with Ground Position

Drain Valve with Sampler

Remote Submersible Relay Enclosure



Fiber Optic Communication

Single Phase Visible Disconnects Switches

Liquid Level Gauge

360° Open Rope Operator with Upper Stanchion Ring

Fuse Wipes for 200 Amp Current Limiting Fuses

Submersible Motopak

Customer Specified RTUs Combined with SEL Over Current Control

CT Powered Submersible Relay

Custom Automation & Relaying Controls for Smart Grid Applications

Ratings for the Unit/System Voltage (OIL & LIQUID DIELECTRIC INSULATION)						
Nominal Voltage (Series)	15kV		25kV		35kV	
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	125kV	150kV
BIL Across Open Contacts	95kV	95kV	125kV	125kV	125kV	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)	N/A	12.5kA	N/A	12.5kA	N/A	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

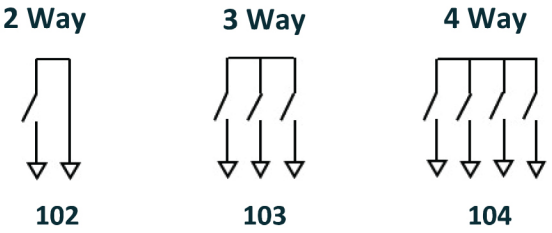
Ratings for the Unit/System Voltage (SOLID DIELECTRIC INSULATION)										
Nominal Voltage (Series)	15kV				25kV				35kV	
Maximum Design Voltage	15.5kV				25.5kV				38kV	
Device	Load Break Switch		Vacuum Fault Interrupter		Load Break Switch		Vacuum Fault Interrupter		Load Break Switch	Vacuum Fault Interrupter
BIL Phase-to-Phase, Phase-to-Ground	110kV	110kV	110kV	110kV	125kV	125kV	125kV	125kV	150kV	150kV
BIL Across Open Contacts	110kV	110kV	110kV	110kV	125kV	125kV	125kV	125kV	150kV	150kV
One Minute Withstand (60Hz)	34kV	34kV	34kV	34kV	40kV	40kV	40kV	40kV	50kV	50kV
Contiuous Current	630A	630A	630A	630A	630A	630A	630A	630A	630A	630A
Load Switching	630A	630A	630A	630A	630A	630A	630A	630A	630A	630A
Peak Current	41.6kA	52kA	41.6kA	52kA	41.6kA	52kA	41.6kA	52kA	32.5kA	32.5kA
Load Break Operations at Full Load	5,000	5,000	N/A	N/A	5,000	5,000	N/A	N/A	10,000	8,000
Maximum Emergency Three-Time Interrupting	2000A	2000A	N/A	N/A	2000A	2000A	N/A	N/A	2000A	N/A
Number of Fault Interruptions at 16kA	N/A	N/A	65	65	N/A	N/A	65	65	65	65
Short-time Withstand Current (1s), Short Circuit Current, and Fault-making Current	16kA	20kA	16kA	20kA	16kA	20kA	16kA	20kA	12.5kA	12.5kA
Short-time Withstand Current (1s), Short Circuit Current, and Fault-making Current	25.6kA	32kA	25.6kA	32kA	25.6kA	32kA	25.6kA	32kA	20kA	20kA

CONSULT FACTORY

Ratings for the Unit/System Voltage (GAS DIELECTRIC INSULATION)						
Nominal Voltage (Series)	15kV		25kV		35kV	
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	125kV	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
Peak Current	32.5kA	32.5kA	32.5kA	32.5kA	32.5kA	32.5kA
Load Break Operations at Rated Continuous Current	4,000	2,000	4,000	2,000	4,000	2,000
Maximum Emergency Three-Time Interrupting	2000A	N/A	2000A	N/A	2000A	N/A
Number of Fault Interruptions at Rated Short Circuit Current	N/A	65	N/A	65	N/A	65
Short-time Withstand Current (1s), Short Circuit Current, and Fault-making Current 600A Symmetrical **	12.5kA	12.5kA	12.5kA	12.5kA	12.5kA	12.5kA
Short-time Withstand Current (1s), Short Circuit Current, and Fault-making Current 600A ASymmetrical **	20kA	20kA	20kA	20kA	20kA	20kA

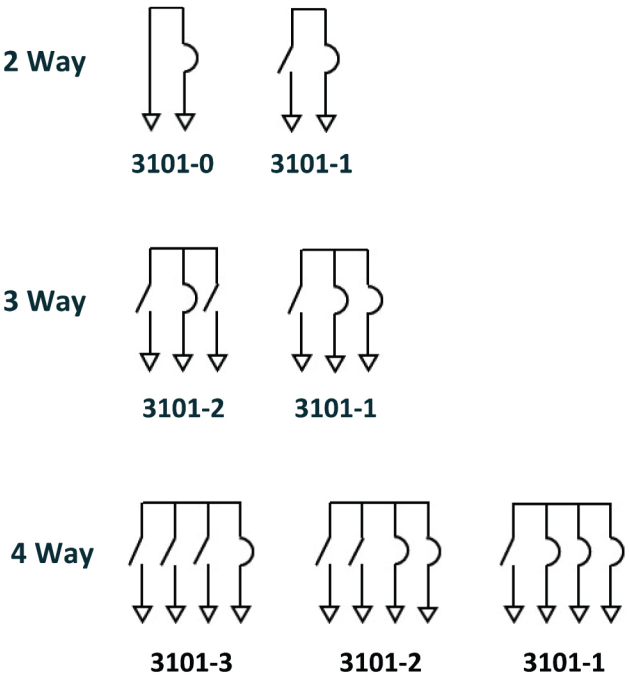
**200A Bushings without fuses limit rating to 10kA Symmetrical or 15KA Asymmetrical.

Submersible Loadbreak Switches



Submersible VFIs

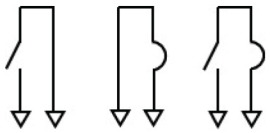
Available in our Ganged 3000 Series or Single Phase 4000 Series



Additional configurations are available. Please contact Trayer or your local representative for further information.

Available in Single Sided or Double-Sided Operation in Ganged or Single Phase Options

2 Way



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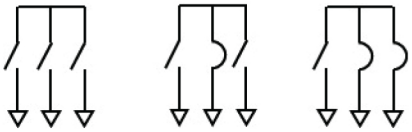
3 Way



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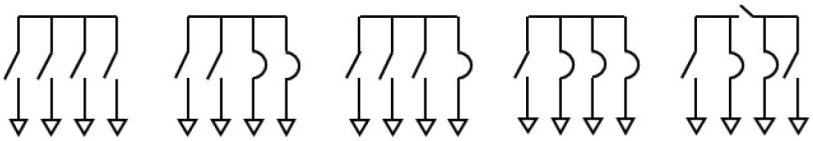
4 Way



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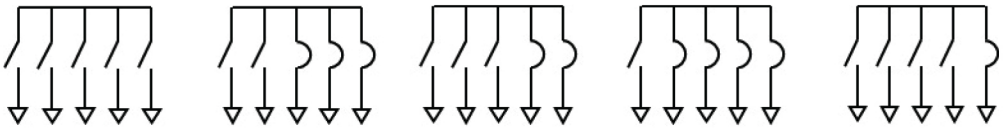
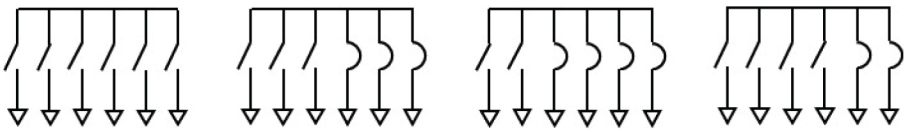
5 Way



27 35 54 58 78

6 Way



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Additional configurations are available. Please contact Trayer or your local representative for further information.

- **Interchangeable -** Form, Fit, Function “drop in” alternative for new or existing designs and installations. Does not require changing existing pads or vault(s), cabling or connections.
- Most compact solid dielectric switchgear available.
- 304 stainles steel, sealed, fully welded construction.
- Trayer-True Visible Disconnect
- 15kV and 25kV, 16A and 20kA (symmetrical fault current) vacuum switchgear.
- Submersible and padmount versions, storm hardened.
- Customizable and upgradable with SCADA and ATS options.
- Conforms to applicable industry standards.

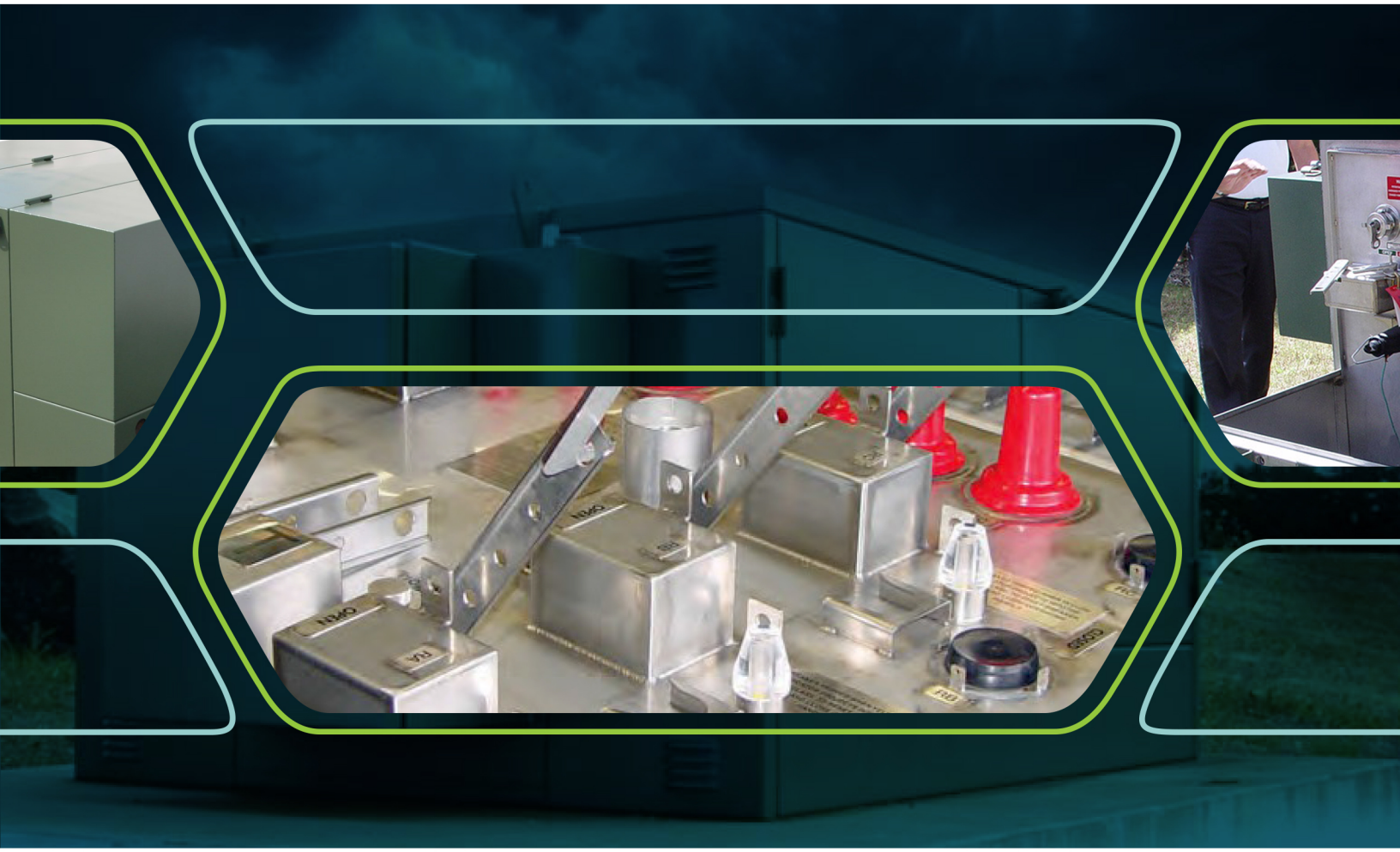
Trayer SD3000 Series
Padmount Vacuum Fault Interrupter up to 25kV Class. Configurable in single or double sided operation with 304 stainless steel switch tanks and cabinets. Multiple SCADA and Automation Options are available.

Trayer SD3100 Series
Vaultmount Vacuum Fault Interrupter up to 25kV Class. Multi-way configurations available and protected with Visible Disconnect mechanisms and viewing windows.

Trayer SD100 Series
Submersible Vacuum Load Break Switching up to 25kV Class. Configurable to as many as 6 ways in a single sealed ruggedized 304 stainless steel switch tank. Multiple SCADA and Automation options are also available

NOTES:

REPRESENTED BY:



Trayer SWITCHGEAR

Grid Smart. Grid Tough.

Trayer Engineering Corporation

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