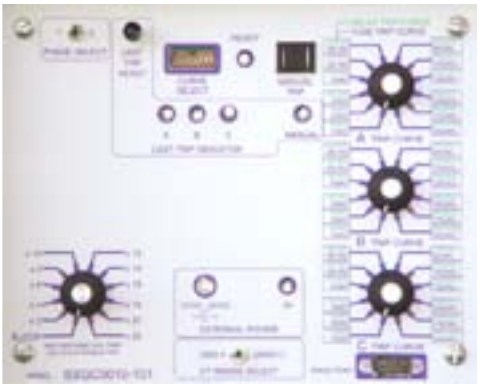
Trayer Engineering Corporation



4000 Series 15kV Padmount 66

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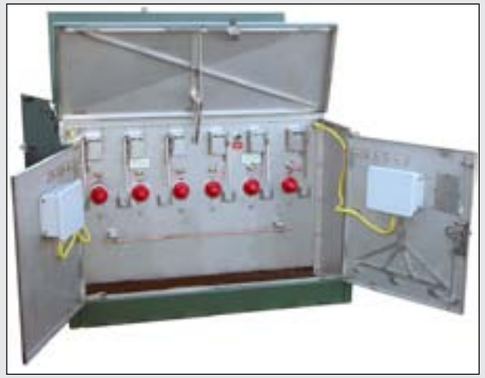


4000 Series 15kV Padmount 66:

Single-Phase VFI Protection with Optional Visible Disconnects

The 4000 Series 15kV Padmount 66 with optional visible disconnects is designed with a 66-inch wide footprint for easy retrofit applications to replace live front air-insulated switchgear with sealed dead front switchgear using the existing pad or box pad. The 4000 Series single-phase VFIs are Trayer's third generation of vacuum fault interrupters with the added versatility of single-phase or electronically controlled three-phase tripping. 4000 Series equipment is designed to simplify installation and to enable easy changes to system protection using microprocessor relays, eliminating the need to stock various amp fuses with differing curves. The 4000 Series VFIs are an upgrade from the Trayer 802 fused equipment that has been the backbone of the Trayer padmount protection line for over 20 years. For three-phase systems requiring synchronized three-phase mechanically ganged Open/Closed/Trip, Trayer offers its 3000 Series VFIs. The 3000 Series includes an internally mounted and fused potential transformer that is used to power the relay and is available for future SCADA control power.

Verified by Design: Simple *and* **Reliable**

Trayer's load break and fault interrupter operating handles and mechanisms verify open and closed positions by design. Using vacuum technology for more than thirty years, Trayer has integrated decades of experience into the basic design of our switchgear. Each generation of VFIs evolves with the needs of our customers and advances as systems change and develop. Trayer has developed fundamental design elements to increase the reliability of our switchgear and simplify the operations for solid communication between the operator and the state of the circuit.

The contacts within the vacuum interrupter do not provide a visible open since the contacts are sealed within the envelope of the interrupter. Some manufacturers attempt to resolve this issue with the provision of a pointer or semaphore to indicate contact separation, yet no open circuit can actually be seen. Trayer provides a **true visible OPEN set of contacts** on each visible disconnect device. The contacts are viewed through a window on the surface of the tank and are clearly visible. The visible disconnect device is a second switch in series with the vacuum switch. Building on the simplicity of the original Trayer design and patents, we now incorporate two mechanically interlocked operating handles so that once the vacuum load break switch is OPEN, access to the visible disconnect device operating handle is possible.

The Trayer VFI operating handle operates in the same way as the load break switch operating handle. Both mechanisms' operating handles have two positions, OPEN and CLOSED. When in the OPEN position, the handle is parallel with the face of the switch tank. Tripping power for the VFI mechanism is supplied by internal current transformers. The primary TRIP indication of the VFI mechanism is provided mechanically for each phase. This mechanical indicator is viewed through a clear sight glass on the face of switch tank near the operating handle. A yellow indicating rod is attached to the trip bar of the VFI mechanism inside the tank. When the mechanism is tripped, the VFI handle stays in the CLOSED position and the yellow rod protrudes from the tank and is visible inside the clear sight glass. For secondary TRIP indication, the customer can supply external power to the relay which then shows the faulted phase with a blinking LED light. To reset the mechanism after it has been tripped, the operator pulls the operating handle to the OPEN position. The mechanism is responsible for resetting itself. No additional cocking or verification of reset is required.

Visible Disconnect Window

Interlocking Handles: Visible Disconnect & Load Break Switch or VFI

Mechanical Trip Indicator

Ratings for the Units / System Voltage				
Nominal Voltage (Series)	15kV			
Maximum Design Voltage	15.5kV			
Catalog Number (Series)	805	3805	4805	802
Device	Load Break Switch	3-Phase VFI	1-Phase VFI	Universal Fuses (Liquid)
BIL Phase-to-Phase, Phase-to-Ground	125kV	95kV / 110kV	125kV	125kV
BIL Across Open Contacts	95kV	95kV	95kV	95kV
One Minute Withstand (60Hz)	34kV	34kV	34kV	34kV
Continuous Current	600A	600A	600A	600A
Load Current	600A / 200A	600A / 200A	600A / 200A	200A
Load Break Operations at Full Load (Liquid)	10,000	8,000	2,000	10,000
Load Break Operations at Full Load (SF6)	3,000	2,000	2,000	N/A
Maximum Interrupting Current (Symmetrical)	600A	12.5kA	12.5kA	50kA with Current Limiting Fuses
Number of Fault Inerruptions at 12.5kA	N/A	65	65	N/A
Maximum Emergency 3-Time Interrupting	2,000A	N/A	N/A	N/A
Momentary, Make & Latch 600A ways (Asym.) 200A ways (Asym.)	20kA 15kA	20kA 15kA	20kA 15kA	Switch Only 20kA 15kA

Padmount Features and Control Options

Features: **As seen on the cover**

A. Trayer offers a mechanically ganged 3000 Series three-phase VFI mechanism for three-phase load protection.

B. Trayer liquid filled fused equipment uses an optional squeegee fuse wipe to remove liquid from the fuse surface.

C. Trayer designed pushbutton motor-operator controller integrates seamlessly with SCADA. Trayer's Power Management Module monitors control power functions, including precise indication of battery life.

D. Trayer supplies a trident-style shotgun adapter to open or close all three single-phase VFI handles.

E. Trayer designed Maysteel Relay offers easy to set function controls and an RS232 connection.A. Trayer offers a mechanically ganged 3000 Series three-phase VFI mechanism for three-phase load protection.

F. Horizontally mounted linear actuators can be installed in a few minutes. SCADA open and closed status can be provided through auxiliary contacts.

G. Trayer designed Automatic Transfer Controller uses intuitive touch screen technology for easy programming displays providing detailed information.

H. Trayer options include a drain valve with sampler.

I. Trayer designed Maysteel 1-phase / 3-phase relay is powered by internally mounted current transformers and plugs directly into the face plate of the switch tank through a submersible connection.

J. Trayer offers several relaying options on the 3000 Series VFIs and standard control features that adapt to many systems.

K. Mechanically linked trip indicator provides a visual indication of the tripped position of the VFI>

Trayer & Maysteel Relay Control Combination

The Trayer 4000 Series Single-Phase Vacuum Fault Interrupters offer single-phase load protection and easy coordination with other system protection devices. Each of the VFI mechanisms are independent, but can be set through the relay to trip all three phases per way. This feature provides options for customers that have single-phase and three-phase loads throughout their system.

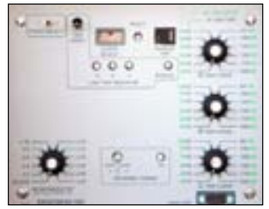
The 4000 Series VFIs are controlled by Trayer designed Maysteel over-current microprocessor relays and are powered from internally mounted 1000/1 current transformers. The minimum load current required to keep the relay active is 15A per way. The 15A requirement can be a combination of the three single-phase ways. If the continuous load current drops below 15A and a faulted condition occurs, the relay will operate the VFI mechanism within 10 milliseconds. *That is just under 1/2 cycle.* There is no "boot" time or batteries required for the relays, as with equipment from other manufacturers.

Another feature of the Trayer & Maysteel Relay control is that the relay stores the number of faults each single-phase VFI has seen per phase. The detailed information of the last event, including fault magnitude, can be downloaded through an RS232 serial port. This robust yet simple to operate control uses dials to set individual pick-up points per phase. Each relay has a pickup range of 10-200A. Additionally, the SSGC0010-101 relay is uniquely designed with dual ratio CTs with the optional ranges of 60-1200A relay pickup and 20-200A for fuse curve pickup for more flexibility and coordination.

Each relay comes complete with 23 standard curves installed and utilizes dip switches for curve selection. There is a manual trip button for three-phase manual tripping of the VFIs. A last trip LED indicator can be seen for A-phase, B-phase, C-phase or manual trip when 12-24V external power is supplied to the relay.

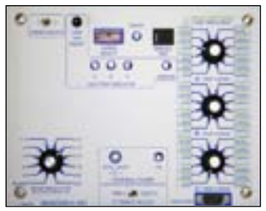
Trayer has taken this 4000 Series VFI and its controls to an even easier, user-friendly level. When the time should come that the relay be upgraded, the new version of the relay can simply be ordered. When the relay arrives, unplug the existing relay from the switch tank; the internal CTs will automatically short. Plug in the new relay and connect the submersible cable again to the tank.

SSGC0010-100



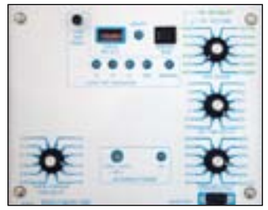
- 1o and 3o trip selection switch
-Instantaneous trip: 2x-22x of minimum pickup

SSGC0010-101



- 1o and 3o trip selection switch
-Dual ratio CT 1000/1, 2000/2
-Instantaneous trip: 2x-22x of minimum pickup

SSGC0020-100



- 3o trip only good for ground fault sensing
-Time delays fro ground fault and phase over current

Double-Side Access Padmount Overview

805 Series: Switch Only

The Trayer 805 Series represents our double-sided access padmounted switch-only units. The footprint and bushing design of the 15kV units are sized to make an easy retrofit conversion from live front air-insulated switchgear to sealed dead front using the existing box pad installation. The vacuum load break switched ways can be ordered as either 600A or 200A ways. Every switched way comes prepared with brackets and handles that are SCADA ready to accept furure linear actuators. Trayer's patented interlocking handle design on the tri-phase visible disconnect device supplies an extra measure of safety when operating Trayer switchgear. This optional device provides a visible and safe isolation point to work on the circuit or test the cable without the need to remove any cables. This unit is available in maintenance-free liquid or SF6-insulated designs.

3805 Series: Three-Phase VFI Protected

The Trayer 3805 Series is of the same design as the 805 Series with the addition of three-phase 3000 Series Vacuum Fault Interrupters added for protection on any or all ways. Based on our original VFI design introd uced in 1980, our 3000 Series VFI takes this patented and field-proven design and incorporates the latest advancements of vacuum technology and microprocessor-based relays. The 3805 Series configurations such as 9's, 11's, and 12's are available in maintenance-free liquid or SF6-insulated designs.

802 Series: Fuse Protected

The Trayer 802 Series is the backbone of Trayer's padmount line and has been field-proven for over 30 years. The 802 Series offers full-range, current-limiting protection for stable underground systems. This switch with fuse-protected ways features Trayer Universal Fusewells which accommodate liquid immersed current-limiting fuses through 200A continuous. The Trayer Universal Fusewell is designed so that a lineman never makes or breaks load with the fuse, but instead with a rated load break elbow device or optional vacuum switch. The 802 Series is constructed for price-conscious customers who do not require the coordination advantages and multiple resetting capabilities that VFIs offer.

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Padmount Features and Control Options

Features: **As seen on the cover**

A. Trayer offers a mechanically ganged 3000 Series three-phase VFI mechanism for three-phase load protection.

B. Trayer liquid filled fused equipment uses an optional squeegee fuse wipe to remove liquid from the fuse surface.

C. Trayer designed pushbutton motor-operator controller integrates seamlessly with SCADA. Trayer's Power Management Module monitors control power functions, including precise indication of battery life.

D. Trayer supplies a trident-style shotgun adapter to open or close all three single-phase VFI handles.

E. Trayer designed Maysteel Relay offers easy to set function controls and an RS232 connection.A. Trayer offers a mechanically ganged 3000 Series three-phase VFI mechanism for three-phase load protection.

F. Horizontally mounted linear actuators can be installed in a few minutes. SCADA open and closed status can be provided through auxiliary contacts.

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H. Trayer options include a drain valve with sampler.

I. Trayer designed Maysteel 1-phase / 3-phase relay is powered by internally mounted current transformers and plugs directly into the face plate of the switch tank through a submersible connection.

J. Trayer offers several relaying options on the 3000 Series VFIs and standard control features that adapt to many systems.

K. Mechanically linked trip indicator provides a visual indication of the tripped position of the VFI>

Trayer & Maysteel Relay Control Combination

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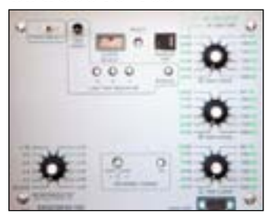
Another feature of the Trayer & Maysteel Relay control is that the relay stores the number of faults each single-phase VFI has seen per phase. The detailed information of the last event, including fault magnitude, can be downloaded through an RS232 serial port. This robust yet simple to operate control uses dials to set individual pick-up points per phase. Each relay has a pickup range of 10-200A. Additionally, the SSGC0010-101 relay is uniquely designed with dual ratio CTs with the optional ranges of 60-1200A relay pickup and 20-200A for fuse curve pickup for more flexibility and coordination.

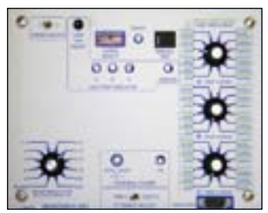
SSGC0010-100



- 1o and 3o trip selection switch
-Instantaneous trip: 2x-22x of minimum pickup

Each relay comes complete with 23 standard curves installed and utilizes dip switches for curve selection. There is a manual trip button for three-phase manual tripping of the VFIs. A last trip LED indicator can be seen for A-phase, B-phase, C-phase or manual trip when 12-24V external power is supplied to the relay.

SSGC0010-101



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-Dual ratio CT 1000/1, 2000/2
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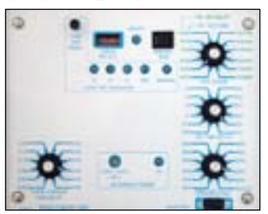
SSGC0020-100



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