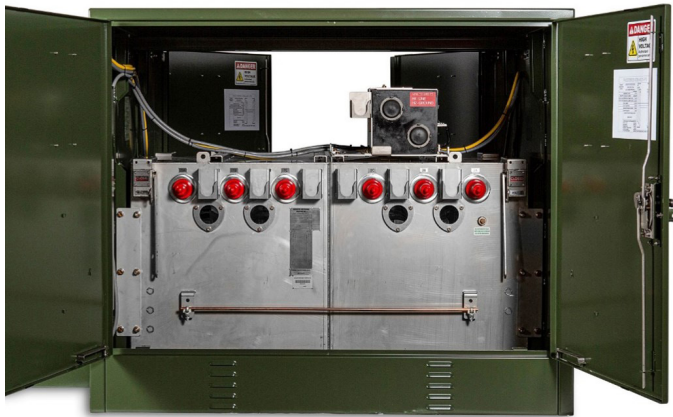


ISG-SD padmount switchgear



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General

Eaton's ISG-SD solid-dielectric switchgear for padmount installations features an enclosed solid-dielectric system which places the solid-dielectric insulated components within a welded 304 stainless-steel submersible tank. All switching and fault interruption duties are performed by maintenance-free vacuum bottles which are dual-certified to both IEEE C37.60 and C37.74. The switch and interrupter mechanisms can be operated manually via a hot-stick handle at the front plate of the switchgear as well as via optional motor operators. A simple, pull-to-open, and push-to-close, single-handle mechanism operates the vacuum-bottle contacts, as well as an internally interlocked visible open isolation point (VOIP) switch. VOIP switches are available for all three-phase switch and interrupter ways and consist of a deadbreak rotary-style knife-blade switch in series with the vacuum bottles to clearly display visual-opened and visual-closed positions.

ISG-SD switchgear can be supplied as a low-profile, single-sided configuration to minimize footprint requirements or in a double-sided configuration to match the footprint and bushing placement of air-insulated switchgear. ISG-SD switchgear is offered as a deadfront unit using 600 A one-piece bushings or 200 A bushing wells for connection to IEEE 386 deadfront connectors.

Using a wide variety of customizable microprocessor relays from industry trusted brands, the ISG-SD switchgear can be used in multiple applications from simple manual operation, to basic overcurrent protection using analog or microprocessor CT-powered relays, to advanced local automation and/or remote supervisory control.



Powering Business Worldwide

Overview and Features

- Enclosed solid-dielectric design requires virtually no maintenance
- Environmentally friendly insulation uses no SF₆ gas or oil insulation
- Suitable for 600 A applications, from 4 kV – 27 kV
- Welded-in 600 A one-piece bushings and 200 A bushing wells
- Submersible-rated 304 stainless-steel tank
- Powder-coated 304 stainless-steel and optional mild-steel padmount enclosures
- Single-sided configurations available up to six (6) ways
- Double-sided arrangements capable of matching the footprint of air, SF₆ gas or oil insulated switchgear
- Vacuum switches and interrupters dual-certified to IEEE C37.60 and C37.74
- VOIP switch
- Internal mechanically interlocked vacuum and VOIP mechanisms allow single-handle operation to de-energize, isolate, and create a visible open in one operation
- Standard open/closed semaphores follow vacuum mechanism position
- Standard motor operator provisions provided on all switchgear ways
- Available motor operators can be factory- or field-installed
- Optional internal and external voltage sensors for source transfer or protection packages requiring analog voltage monitoring
- Available solid-dielectric auxiliary power transformers for advanced relaying and automation packages
- Fully customizable overcurrent protection and automation relays factory assembled and tested
- Future-proof field-upgradeable automation packages
- Standard locking provisions for lockout/tagout safety
- Standard ½" x 13 grounding provisions and available ground lugs and rods

Enclosed solid-dielectric system

Eaton's ISG-SD switchgear features an industry-first enclosed solid-dielectric system which provides an extra layer of protection against contaminants, flooding, vegetation and wildlife intrusion for maximum reliability with virtually no maintenance. This makes the ISG-SD switchgear ideal for use in harsh coastal environments, areas near flood plains or industrial applications where loose contaminants or chemicals can deteriorate and damage the insulation of exposed switchgear units. The solid-dielectric insulation system is a key element to the reliability of this switchgear because there is no SF₆ gas to leak or fluids to spill.

Deadfront construction

In addition to protecting the solid-dielectric insulation from the elements, the 304 stainless-steel submersible rated tank of the ISG-SD switchgear provides the safety of a solid ground plane and a fully deadfront construction for the safety of crews and the public. The available 600 A one-piece and 200 A bushing wells are welded to the tank and capable of connection with IEEE 386 style separable connectors.

Visible open isolation point (VOIP) switches

VOIP switches create over seven inches of separation across the open contacts and are mechanically interlocked with the vacuum-bottle mechanisms to allow for a simple, pull-to-open and push-to-close, single-handle operation. The VOIP switches help to maximize the safety of the ISG-SD switchgear by providing a clearly visible confirmation of an open position.

Single- and double-sided construction

ISG-SD switchgear minimizes the required footprint in a low-profile, single-sided configuration up to six (6) ways. The double-sided configuration is available up to four (4) ways and can be built to match the footprint and bushing placement of air, SF₆ gas or oil insulated switchgear. This allows for the installation of modern switchgear with deadfront safety without the cost of replacing foundations or digging new cable trenches.

Future-proof control and automation packages

With a variety of fully upgradeable control packages to meet automation needs and cybersecurity protocols, ISG-SD switchgear can start operation with a simple overcurrent protection control and as requirements change, can be field-upgraded for advanced remote supervisory applications. Motor operators, analog voltage sensors, control power transformers and micro-processor relays can be field-installed onto ISG-SD switchgear without having to make changes to the switchgear tank. When combined with the flexibility of the dual-certified vacuum-bottle mechanisms, ISG-SD switchgear provides a significant costs savings over the life of the switchgear.

Virtually maintenance-free

Routine maintenance outages cost you time, money and put your operation at risk when back-up systems are offline for maintenance. Eaton's ISG-SD switchgear requires virtually no maintenance. The solid-dielectric insulation has no SF₆ to monitor and refill or fluids to test. The stainless-steel tank protects the insulation system from the environment and eliminates the need for routine cleaning, and the dual-certified vacuum switches and vacuum interrupters are completely maintenance-free.



Figure 1. Built for reliable performance in the harshest of environments.

Ratings and certifications

Table 1. Switching and fault interruption ratings with light duty mechanism (15 and 27 kV units)

System voltage	Symmetrical current	Asymmetrical current	Peak current	BIL
15.5 kV	12.5 kA	20 kA	32.5 kA	95 kV
27 kV	12.5 kA	20 kA	32.5 kA	125 kV
Close and latch				
15.5 kV	12.5 kA	20 kA	32.5 kA	95 kV
27 kV	12.5 kA	20 kA	32.5 kA	125 kV
Fault closing				
15.5 kV	12.5 kA	20 kA	32.5 kA	95 kV
27 kV	12.5 kA	20 kA	32.5 kA	125 kV
Fault interrupting				
15.5 kV	12.5 kA	20 kA	32.5 kA	95 kV
27 kV	12.5 kA	20 kA	32.5 kA	125 kV

Load break operations – 7500 at 600 amps

Fault close operations – 7500 at full fault rating

Table 2. Switching and fault interruption ratings with heavy-duty mechanism (15 and 27 kV units)

System voltage	Symmetrical current	Asymmetrical current	Peak current	BIL
Momentary				
15.5 kV	20 kA	32 kA	52 kA	95 kV
27 kV	16 kA	25.6 kA	41.6 kA	125 kV
Close and latch				
15.5 kV	20 kA	32 kA	52 kA	95 kV
27 kV	16 kA	25.6 kA	41.6 kA	125 kV
Fault closing				
15.5 kV	20 kA	32 kA	52 kA	95 kV
27 kV	16 kA	25.6 kA	41.6 kA	125 kV
Fault interrupting				
15.5 kV	20 kA	32 kA	52 kA	95 kV
27 kV	16 kA	25.6 kA	41.6 kA	125 kV

Load break operations – 2000 at 600 amps

Fault close operations – 2000 at full fault rating

Applicable standards

IEEE Std C37.74™-2003/2014 standard, Standard Requirements for Subsurface, Vault, and Pad-Mounted Load-Interrupter Switchgear and Fused Load-Interrupter Switchgear for Alternating Current Systems Up to 38 kV.

IEEE Std C37.60™-2012 standard, Standard Requirements for Overhead, Pad-Mounted, Dry Vault, and Submersible Automatic Circuit Reclosers and Fault Interrupters for Alternating Current Systems Up to 38 kV.

IEEE Std C57.12.28™-2005 standard, Standard for Pad-Mounted Equipment—Enclosure Integrity.

Dual-certified vacuum mechanism

Inside the ISG-SD switchgear's tank and under the solid-dielectric insulation, the switch and fault interrupter vacuum-bottle mechanisms have been certified to both IEEE C37.60 and C37.74. This dual certification allows for tremendous versatility because switch ways can perform fault-interruption duties and fault-interrupter ways can perform hundreds of switching operations. In new distributed energy resources (DER) applications in which changes to the normal power flow occur and microgrid applications where greater automation and flexibility is required, ISG-SD switchgear offers a truly future-proof design.

The available fault interruption ratings of 20 kA at 15 kV and 16 kA at 27 kV allow the application of the ISG-SD switchgear in areas of high load density and high fault currents. The vacuum-interrupter mechanism features a “trip-free” design which allows the vacuum bottles to trip open during a fault-close event without regard to the position of the hot-stick handle.

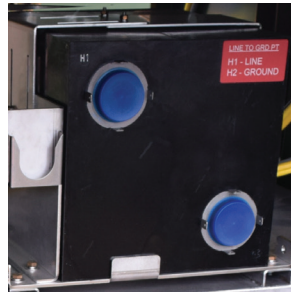
Features and Diagrams

Double-sided configuration

Shown with four (4) ways



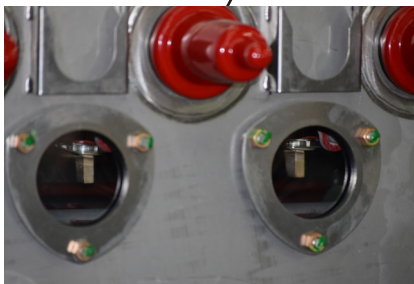
Control enclosure with SEL-751



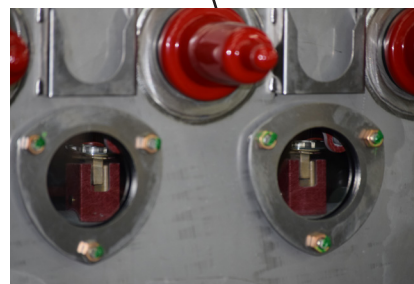
Control power PT



Motor operator provision and switch handle locking provisions



VOIP, open position



VOIP, closed position

Features and Diagrams (continued)

Single-sided configuration

Shown with five (5) ways with tie switch



FCI display provision



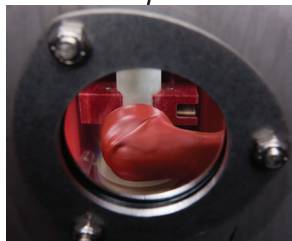
NEMA 6P control cables
(submersible version available)



Motor operator



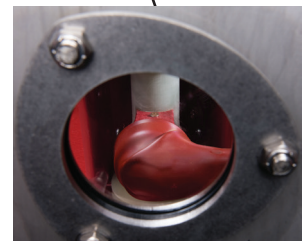
Open switch position indicator



VOIP, open position



Closed switch position indicator



VOIP, closed position

Switchgear operation

Single-handle operation

Eaton ISG-SD switchgear is equipped with vacuum interrupters in series with visible open isolation point (VOIP) switches. Both switches are interlocked and operated with a single, push-to-close and pull-to-open, hot-stick handle on the front-plate of the switchgear. The interlocking ensures that the vacuum interrupter opens before the VOIP switch to de-energize the line and closes after the VOIP switch. Optional motor operator allows for the remote operation.

Trip-free operation

The vacuum bottle mechanism cannot be held in the closed position if closed into a fault by manual or motor operation. In order to ensure operator safety, the ISG-SD switchgear will “trip-free” to clear the fault current regardless of the position of the external handle.

Resetting switchgear after trip operation

With the switchgear handle down in the closed position, the switch position indicator showing “closed” and the VOIP switch also visibly closed, we have confirmation that the ISG-SD switchgear is closed. See **Figure 2**.

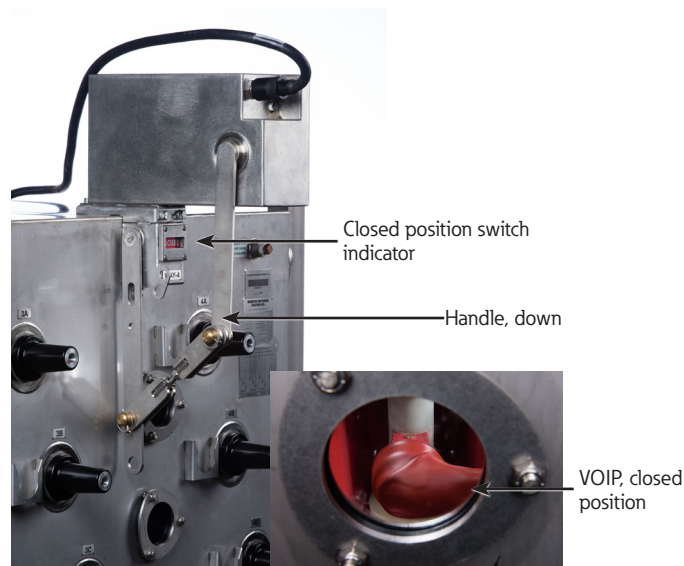


Figure 2. One-handle operation, closed position.

The position indicator showing an “open” with the switchgear handle down in the closed position and the VOIP switch also visibly closed, confirms that the vacuum mechanism has been tripped by an overcurrent event. See **Figure 3**.

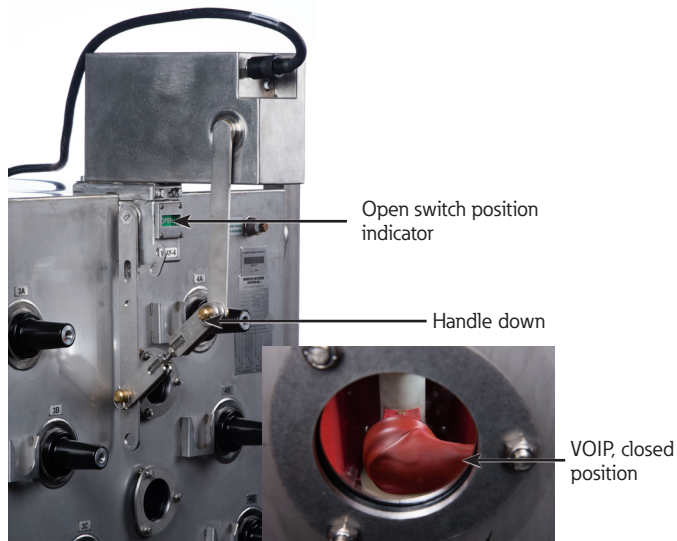


Figure 3. One-handle operation, tripped position.

To reset the vacuum mechanism following a trip operation, the switchgear handle must be moved up to the open position. Once the handle, the VOIP and the position indicator are in the open position, the switchgear can then be closed. See **Figure 4**.

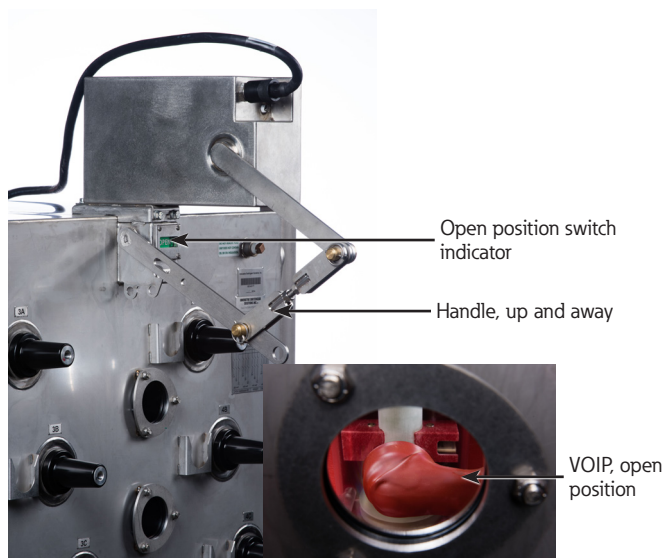


Figure 4. One-handle operation, open position.

Switchgear operation (continued)

Visible open isolation point (VOIP) switch

Integral to the VFI switch and VFI trip mechanisms shall be a three-phase isolation point switch in series electrically with the vacuum fault interrupter contacts. When the operating handle is pulled to the open position, the vacuum contacts open to de-energize the circuit, and the visible open isolation point switch shaft rotates 90-degrees, isolating the visible contact blades from the fixed contacts creating a safe-to-work isolation point. The contact blades of the VOIP can be visibly seen from a safe working distance through the viewing windows on the switch tank surface.

Isolation is always a deadbreak operation where the vacuum interrupter operates first to clear the line and the visible break switch operates the second. When the visible break switch is open it creates a seven (7) inch gap across the contacts.

Closed VOIP

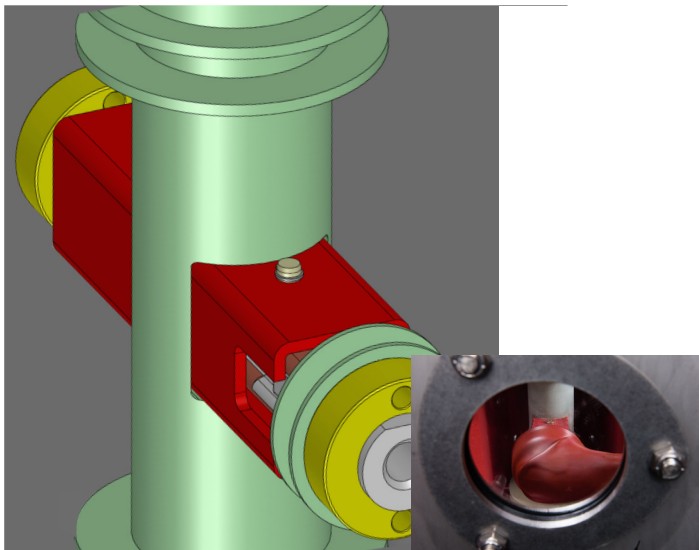


Figure 5. Shaft in line with fixed contacts, closed position.

Open VOIP

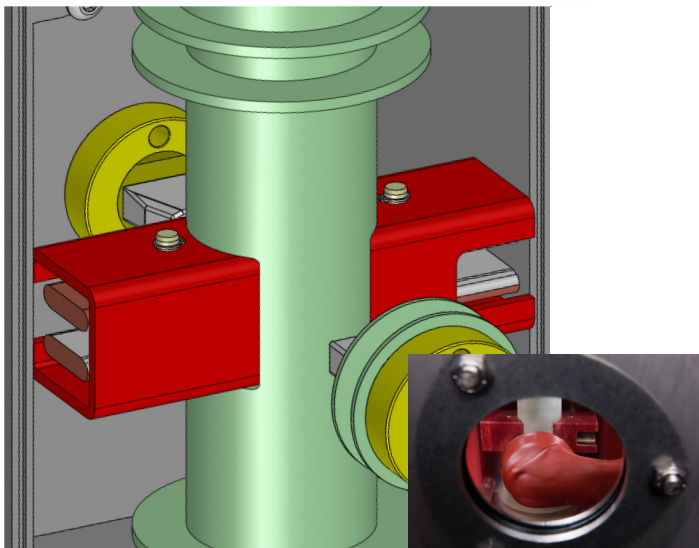


Figure 6. Shaft rotated 90-degrees, open position and isolated.

Installation

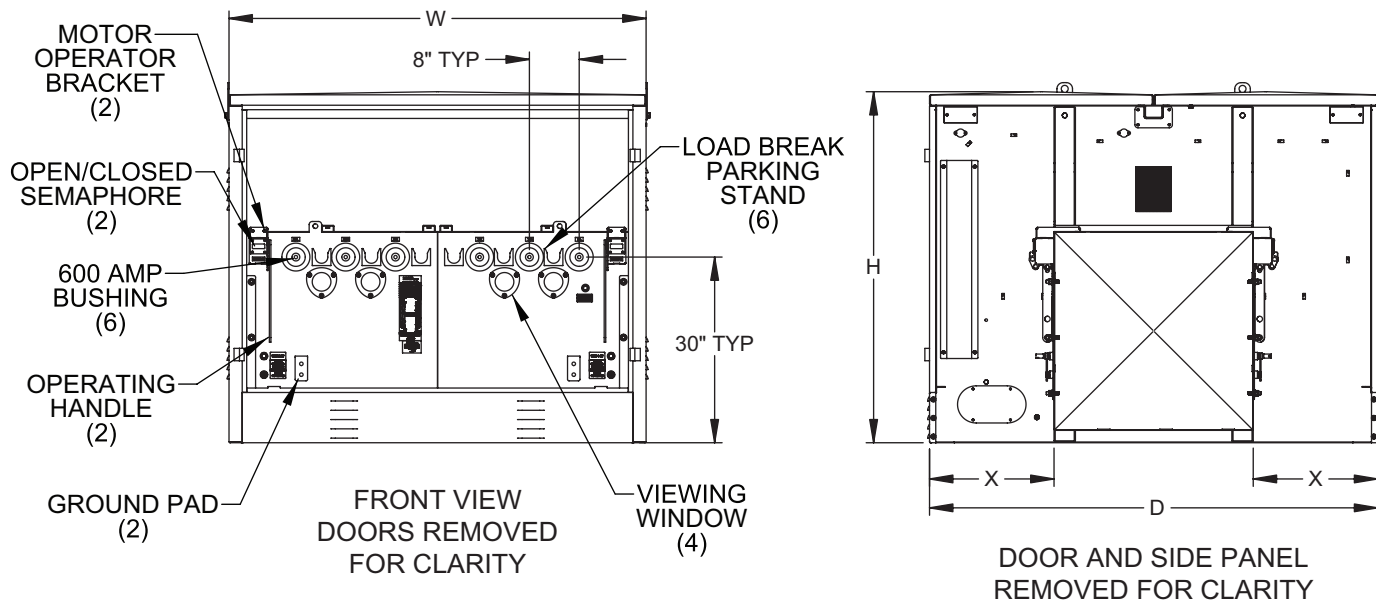
ISG-SD switchgear tank can be mounted to a customer foundation without the padmount enclosure to allow space to make up the cable terminations. The enclosure can then be mounted over the unit.



Figure 7. ISG-SD design allows for easy retrofit of existing air-insulating switchgear with no re-cabling or no new pad work needed.

Replacement of air-insulated switchgear

ISG-SD solid-dielectric switchgear is available in a double-sided configuration to match the footprint and bushing placement of air-insulated switchgear. By avoiding the cost of removing and replacing foundations and re-terminating cables, ISG-SD switchgear delivers great value and time savings. Additionally, the deadfront construction of the switchgear provides superior safety over livefront air-insulated switchgear. The solid-dielectric insulation and maintenance-free vacuum interrupters dramatically improve reliability, while available advanced control packages can add automation to older installation sites.



X = High voltage cable opening is 20 in. for 15 kV and 24 in. for 27 kV

Figure 8. Double-sided unit drawing.

Table 3. Double-sided unit weights and dimensions

# of Ways	Configurations	Enclosure size options (W x D x H)	Weight of tank with enclosure
2 Way	All configurations 600 A or 200 A	41" x 66" x 56.75"	1200 lbs
3 Way	1 switch, 2 tap	67" x 72" x 56.75"	2660 lbs
		67" x 76" x 56.75"	2700 lbs
		75" x 72" x 56.75"	2740 lbs
		67" x 80" x 56.75"	2700 lbs
		72" x 92" x 56.75"	2950 lbs
		75" x 80" x 56.75"	2790 lbs
		82" x 80" x 56.75"	2800 lbs
		84" x 84" x 56.75"	2865 lbs
4 Way	All configurations 600 A or 200 A	67" x 72" x 56.75"	2660 lbs
		67" x 76" x 56.75"	2700 lbs
		75" x 72" x 56.75"	2740 lbs
		67" x 80" x 56.75"	2700 lbs
		72" x 92" x 56.75"	2950 lbs
		75" x 80" x 56.75"	2790 lbs
		82" x 80" x 56.75"	2800 lbs
		84" x 84" x 56.75"	2865 lbs
Dual-voltage enclosure		75" x 80" x 56.75"	2790 lbs
15 kV enclosure		82" x 80" x 56.75"	2800 lbs
27 kV enclosure		84" x 84" x 56.75"	2865 lbs

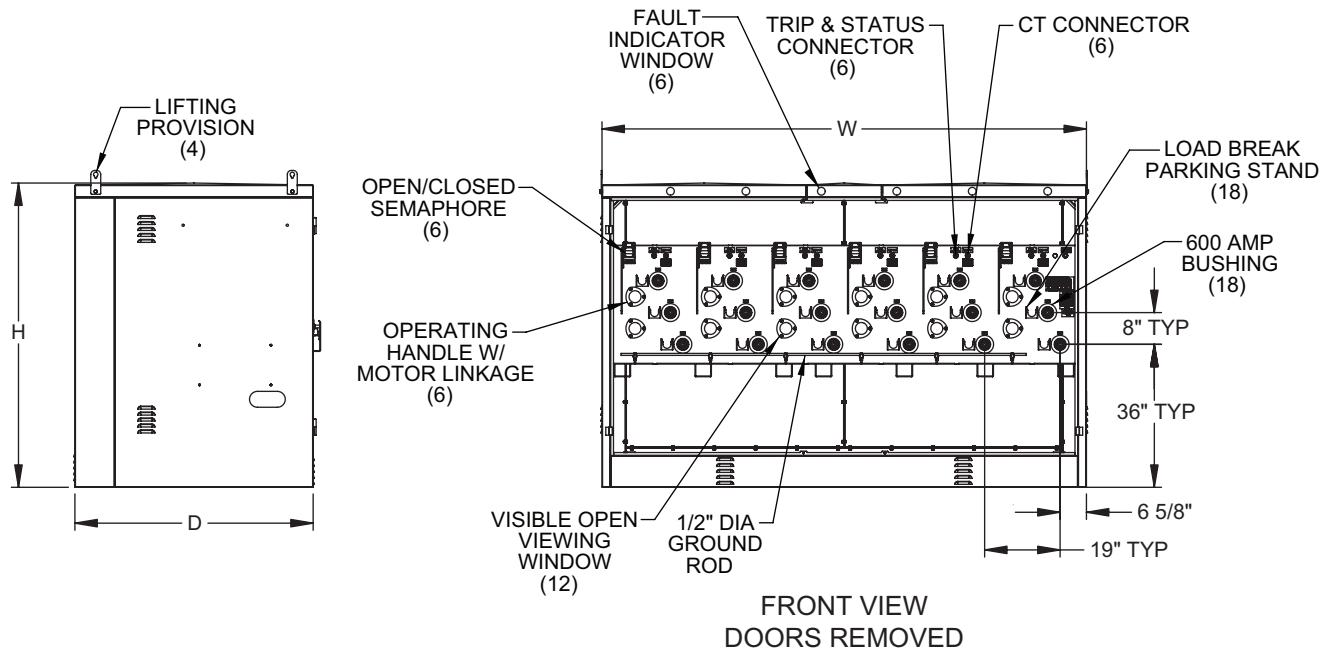


Figure 9. Single-sided unit drawing.

Note: High voltage cable opening is 26" for all single-sided units.

Note: Units with a 64.25" height have a 24" height to the lowest bushing. Units with a 76" height have a 36" height to the lowest bushing.

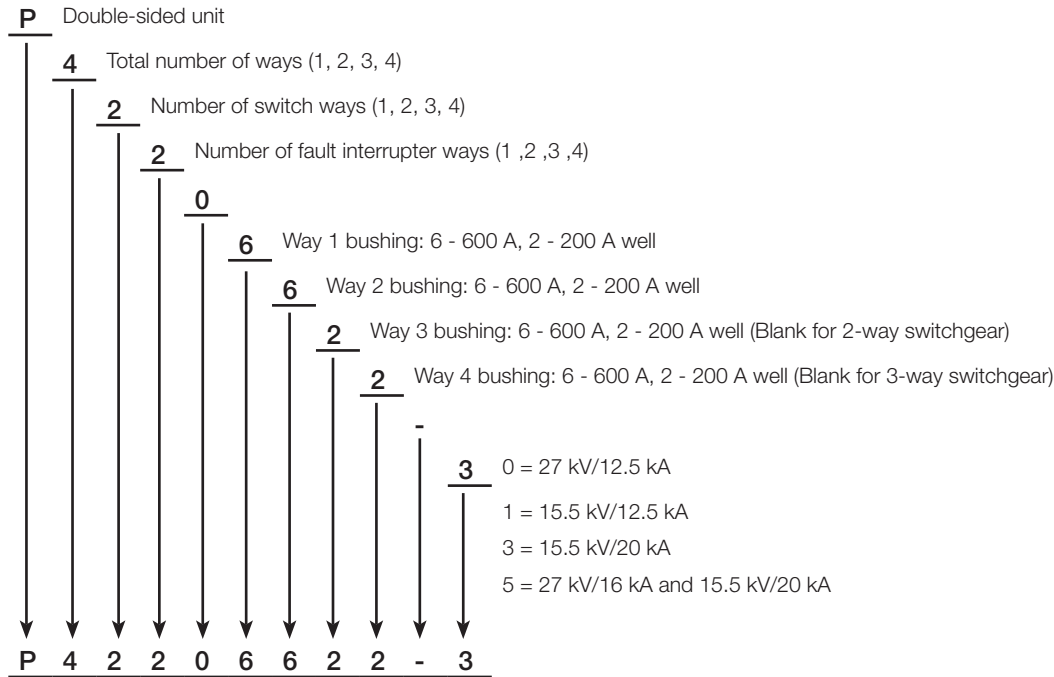
Table 4. Single-sided unit weights and dimensions

# of Ways	Configurations	Enclosure size options (W x D x H)	Weight of tank with enclosure
2 Way	All configurations 600 A or 200 A	48" x 60" x 58.875"	1195 lbs
3 Way	All configurations 600 A or 200 A	65" x 60" x 64.25"	1750 lbs
		65" x 60" x 76.125"	1865 lbs
4 Way	All configurations 600 A or 200 A	84" x 60" x 64.25"	2390 lbs
		84" x 60" x 76.125"	2450 lbs
5 Way	All configurations 600 A or 200 A	103" x 60" x 64.25"	2635 lbs
		103" x 60" x 76.125"	2770 lbs
6 Way	All configurations 600 A or 200 A	122" x 60" x 64.25"	3230 lbs
		122" x 60" x 76.125"	3355 lbs

Ordering information

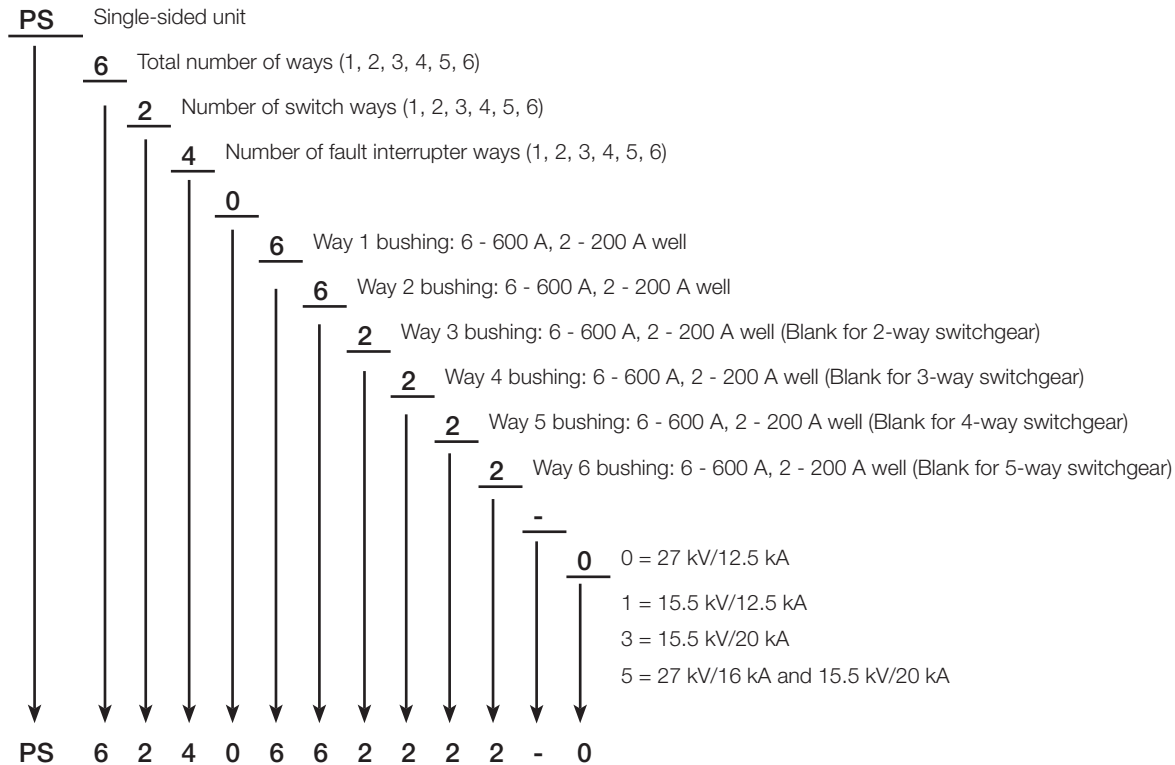
Catalog number guide

Table 5. Double-sided unit catalog number guide



Above model number example P42206622-3 is a double-sided unit, 4 way with 2 switch and 2 fault interrupter ways, 600 A bushings on ways 1 and 2, 200 A bushing wells on ways 3 and 4, 15.5 kV/20 kA rating.

Table 6. Single-sided unit catalog number guide



Above model number example PS624066222-0 is a single-sided unit, 6 way with 2 switch and 4 fault interrupter ways, 600 A bushings on ways 1 and 2, 200 A bushing wells on ways 3, 4, 5 and 6, 27 kV/12.5 kA rating.

Note: Additional control and switchgear customizations are available. Contact the factory for information.

Options and accessories

Padmount enclosures

SS	304 stainless-steel tank and enclosure
MS	Mild-steel enclosure with 304 stainless-steel skid plate and tank

Tie switch option

T	Contact factory
---	-----------------

Motor operators

MTR-A	Motor operators on all ways
MTR-S	Motor operators on switch ways only
MTR-I:	Motor operators on Fault Interrupters ways only

Grounding provisions

Ground nuts: Standard: 1/2" x 13 ground nuts are provided per way on all switchgear

Ground rods: Standard two (2) ground rods provided with double-sided units

Note: Optional ground rod across the width of the front plate on single-sided padmount units

Control power transformer

CPT-	
1, 2, 3, 4	Number of control power transformers supplied with switchgear
(XXXX)	Line-to-ground system voltage
Notes:	CPTs are one (1) kVA, sold-dielectric, IEEE metering accuracy 1.1, with 2 (two) 200 A bushing wells for line and ground connection
	CPTs are mounted to the switchgear tank and require customer to supply medium-voltage connection to CPT
	Example: CPT-2 (7200) : Qty. two (2) control power transformers with 7200 V line-to-ground rating (for 12,470 V system)

Voltage sensors

IVS-1	Three-phase internal voltage sensors connected to the common bus of the switchgear
EVS-1,2,3,4,5,6	External elbow connected Lindsey voltage sensors (specify quantity of three-phase sets)

Visible open isolation point (VOIP) switch

VOIP-A	All ways
VOIP-S	Switch ways only
VOIP-I	Interrupter ways only

Protection/Automation control packages

P116	CT powered protection control three-phase trip (one (1) supplied per protected way)
TPG	CT powered protection control three-phase and single-phase trip (one (1) supplied per protected way)
SEL 751	Externally powered overcurrent protection control three-phase or single-phase trip (one (1) supplied per protected way)
SEL 700	Externally powered overcurrent protection control three-phase trip (one (1) supplied per two (2) protected ways)
SEL 451	Externally powered automatic source transfer and overcurrent protection control three-phase trip (for up to two (2) protected ways)
SEL 487e	Externally powered automatic and overcurrent protection control three-phase trip (for up to five (5) protected ways)

Note: Additional relay options are available. Contact factory for details.

Additional customizations

Additional control and switchgear customizations are available. Contact the factory for information.

Weight of accessories

Control cabinet	500 lbs
Motor operators	35 lbs
Potential transformer 15 kV	130 lbs
Potential transformer 27 kV	210 lbs

Control options

Eaton offers a variety of fully upgradeable control packages to meet automation and cybersecurity requirements. Controls are field-upgraded for advanced remote supervisory applications. Motor operators, analog voltage sensors, control power transformers and micro-processor relays can be field-installed onto ISG-SD switchgear without having to make changes to the switchgear tank.



Schneider™ MiCOM P116 control

- CT-powered
- USB Port for PC programming
- Phase overcurrent
- Ground overcurrent
- Time stamp of trip events
- Housed in submersible relay case



TPG control with SCADA.

- CT-powered
- TPG control (with optional SCADA board)
- Settings entered manually
- Phase overcurrent
- Ground overcurrent
- Three-phase and one-phase trip capable
- Optional discrete SCADA



SEL-751 relay

- Requires control power transformer
- Touch-screen and PC programming
- Directional phase overcurrent
- Directional Ground Overcurrent
- Over / Under voltage protection with optional sensors
- Digital SCADA can command motor operators
- Up to six (6) relays can be housed in control enclosure

Control options (continued)**SEL-700GW relay**

- Single relay commands two (2) protected ways
- Requires control power transformer
- Touch-screen and PC programming
- Directional phase overcurrent
- Directional ground overcurrent
- Over / Under voltage protection with optional sensors
- Digital SCADA can command motor operators

**SEL-487E relay**

- Single relay commands five (5) protected ways
- Requires control power transformer
- Touch-screen and PC programming
- Directional phase overcurrent
- Directional ground overcurrent
- Over / Under voltage protection with optional sensors
- Digital SCADA can command motor operators
- Ideal for source transfer applications

**SEL-451 relay**

- Automatic source transfer control
- Two sets of three-phase voltage inputs
- Six current inputs
- Capable of commanding 2 source ways and providing overcurrent protection for 2 tap ways
- Directional phase overcurrent
- Directional ground overcurrent
- Digital SCADA

Additional literature

- SA285001EN – Underground distribution solutions for education
- SA285002EN – Underground distribution solutions for healthcare
- SA2850013N – Underground distribution solutions for government
- PA285009EN – ISG-SD padmount switchgear product aid
- PA285010EN – ISG-SD wallmount, vaultmount and submersible switchgear product aid.

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