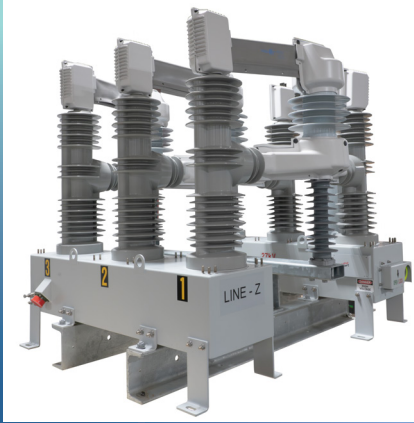


TranSwitcher®



**Southern
States**

The Power of Ideas

INTRODUCTION

The growing demand for clean, reliable power is forcing utilities to address the power quality problems arising when connecting distributed energy resources (DER), such as renewables and/or battery energy storage systems, to the distribution system. Energizing the transformers used to connect the DER to the distribution system can result in serious power quality issues such as:

- High magnitude inrush currents
- Large voltage drops on the distribution system
- Damaging ferroresonance

The Southern States **TranSwitcher®**, a patented switching device, was specifically designed to mitigate these power quality issues while providing protection for the transformer.

Traditionally, controlled switching technology was used to address the power quality issues of energizing transformers. This utilizes complex electronic controls to help the switching device close on a specific point on the voltage waveform to minimize disturbances. This approach, however, relies on many variables including ambient temperature, the mechanism wear knowledge, and knowledge of the residual flux in the transformer core. To ensure consistency, this costly approach requires continued maintenance by qualified personnel.

The Southern States **TranSwitcher®** takes an alternative approach by using a closing resistor to softly energize the transformer. The closing resistor is mechanically inserted into the circuit for a very short time to limit the inrush current prior to being bypassed by the main vacuum interrupter contacts. The resistance limits the inrush current and, thus, the resulting voltage drop and dampens any ferroresonance.

TranSwitcher®



Application Specific Devices For
Transformer Switching & Protection

SOUTHERN STATES *TranSwitcher*®

The Southern States *TranSwitcher*® is a patented, renewable intertie solution designed to ensure DER compliance with IEEE 1547 standards for interconnection while energizing. The fault clearing capability of the *TranSwitcher*® makes it ideal for protection of the intertie transformer and ideally suited for distribution systems with solar farms as well as other distributed energy resources. The use of a “soft close” helps to minimize system voltage drops caused by the high inrush currents and dampens any potential ferroresonance. Employing the *TranSwitcher*® can help utilities increase the life of their transformer as well as maintain system power quality.

KEY DESIGN FEATURES

- Solid insulation - hydrophobic cycloaliphatic epoxy (HCEP)
- Long-life vacuum interrupters
- Resistor insertion on closing
- 304 stainless steel tank
- Six built-in resistive voltage sensors (+/-1% rated accuracy)
- Three Current Transformers (CTs)
- High-visibility yellow manual trip and lockout handle
- High-visibility position indicator with 360° visibility

APPLICATION OVERVIEW

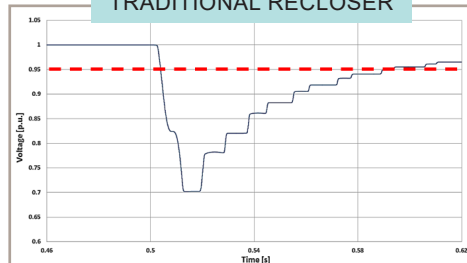
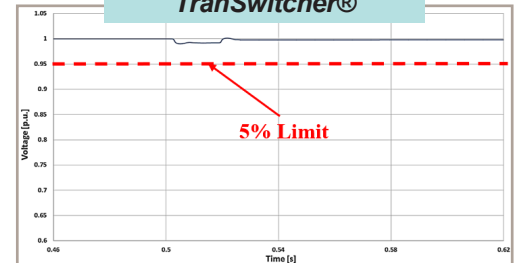
As more renewable energy installations are added to the grid, utilities are increasingly setting limits on the level of voltage sags and rapid voltage change (RVC) events as part of their interconnection requirements with developers, EPCs, and other consulting firms. Particularly evident on weak circuits, high inrush currents can often occur as DER transformers are energized. Not only does this have an adverse impact on power quality and system reliability, but, if switched frequently, it can also reduce the useful life of the intertie transformer. To meet utility interconnecting standards and solve problems associated with transformer switching, the inrush current must be sufficiently limited. The charts below illustrate a comparison of inrush voltages between a traditional recloser and the *TranSwitcher*® - both accounting for the presence of residual flux in the transformer. Using the total solar site's MVA value, Southern States can provide a quick estimate to assess the need for inrush mitigation (use QR code below). While this estimate does not take the place of a complete system study, it will provide guidance on the need for inrush mitigation and the cost-effective *TranSwitcher*®.



Does Your Renewable Site
Need Inrush Mitigation?



TRADITIONAL RECLOSER

*TranSwitcher*®

APPLICATION OPTIONS



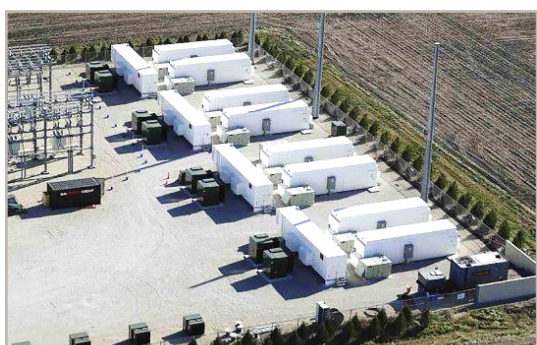
RENEWABLE TIE SWITCH

- Inrush currents from transformer energization can cause voltage sags when connected to weak distribution circuits
- Daily switching of DER transformers can reduce no-load losses at night - improper switching methods can lead to shortened transformer life and system reliability issues
- **TranSwitcher®**'s use of pre-insertion resistors allows for safe, daily switching that mitigates no-load losses, increases revenue, and improves overall system reliability



TRANSFORMER SWITCHING

- Substation applications requiring frequent transformer switching can result in high inrush current which lead to unacceptable system voltage drops. Ferroresonance issues are also a possibility, particularly if there is significant insulated cable connected to the transformer.
- **TranSwitcher®**'s use of closing resistors creates "soft close," eliminating power quality problems due to high inrush currents and ferroresonance and increases transformer life and reliability.



BATTERY STORAGE SYSTEM INTERCONNECTION

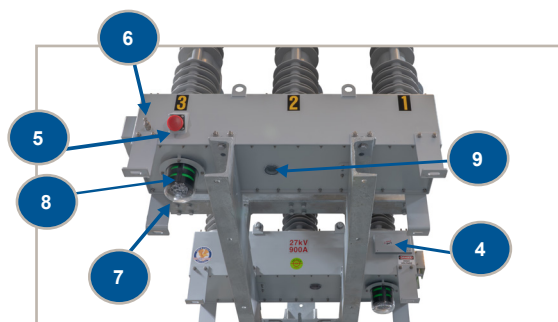
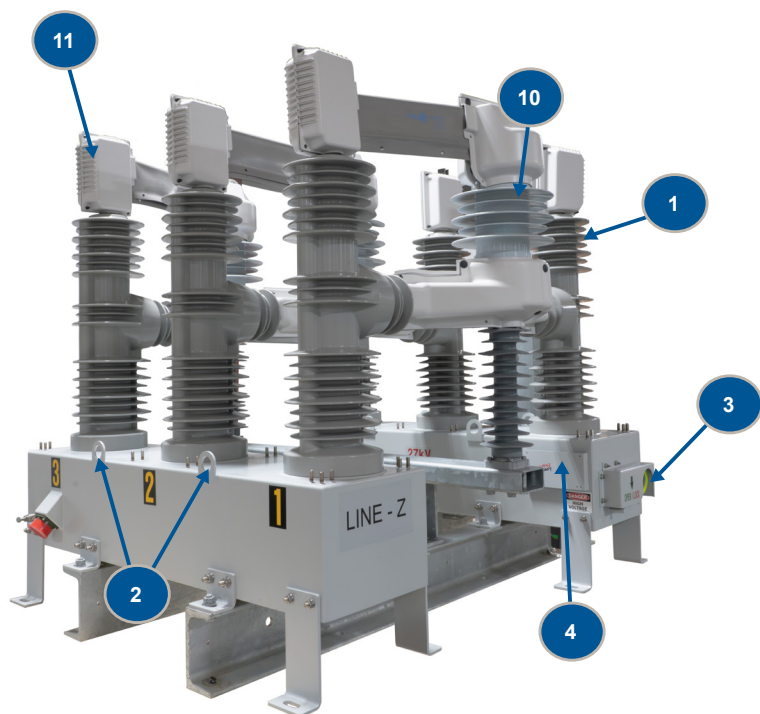
- Often connected without defined interconnection process - this may result in power quality concerns for utilities similar to solar intermittency applications
- Employing the **TranSwitcher®** can help to provide operational flexibility as well as an assurance of safe, reliable grid integration



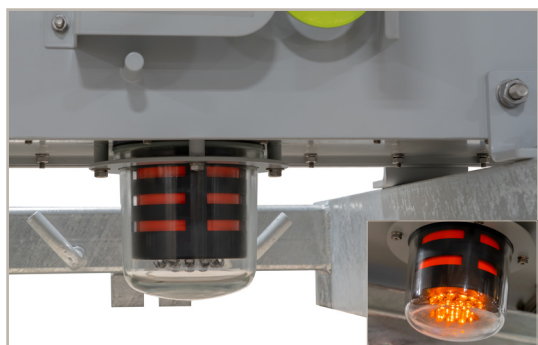
STATCOM WITH STEP-UP TRANSFORMER

- Often used to overcome voltage stability issues when renewable generation capability is low and load demand is high
- Large loads consume massive amounts of power and can cause excessive voltage drop, which at the extreme, becomes a complete voltage collapse
- TranSwitcher® facilitates its safe, efficient use to minimize power quality issues and maintain network reliability

FEATURES & BENEFITS



1	Epoxy Resin Bushing
2	Lifting Lugs
3	Manual Trip Handle
4	Nameplate
5	Control Receptacle
6	Ground Terminal
7	Fault Indicator
8	Open / Close Indicator
9	Operation Counter
10	Resistor Poles
11	Wildlife Guards (optional)



360° FIELD OF VIEW FAULT & POSITION INDICATOR

- Open / closed position can be clearly identified
- Replaceable tempered glass cover addresses visibility concerns of other market options which may use plastic or epoxy
- Programmable 19-LED fault indication
- Flashing light supports fault identification from the ground



CONTROL & POWER CABLES

- Terminated control cables - No point to point wiring
- 52' standard cable length
- Security sleeves available
- Armored cable option available

FEATURES & BENEFITS



MOUNTING BRACKET

- Supplied with each **TranSwitcher®**
- Three mounting holes to provide secure attachment to pole
- Minimal assembly and installation time required



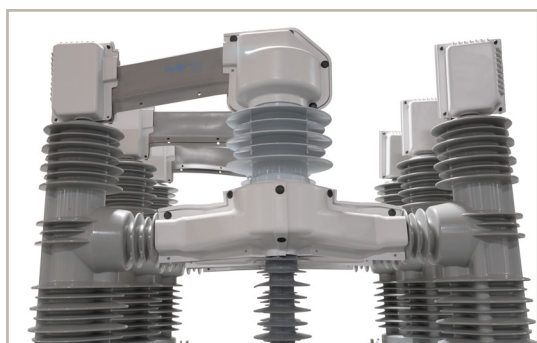
SOLID INSULATION (HCEP)

- Environmentally friendly hydrophobic cycloaliphatic epoxy (HCEP) serves as the dielectric insulating medium
- Provides complete encapsulation of the internal vacuum interrupters, current transformers, and voltage sensors
- Offers high damage resistance to ozone, oxygen, moisture, contamination, and ultraviolet light



CONTROL CABINET

- Rated NEMA 4X
- 304 Stainless Steel
- HygroTherm™ humidity and temperature control
- Surge protection
- AC & DC Breakers



ANIMAL GUARDS (OPTIONAL)

- Provides protection of energized connection points
- Minimizes operational and avian risks that can lead to outages
- Durable and effective in all weather conditions
- Easy and minimal installation requirements
- Fire rated V-0 per UL 94 standard

RATINGS

SWITCH SPECIFICATIONS

Maximum Voltage (kV)	15.5	27	38
Continuous Current (A)	630		
Rated Frequency (Hz)	50 / 60		
Basic Impulse Level (kV)	110	150	170
Symmetrical Interrupting Current (kA)	16	12.5	12.5*
Asymmetric Peak Making Current (kA)	40	32.5	32.5*
60 Hertz Withstand Voltage (kV):			
Dry, one minute	50	60	70
Wet, ten seconds	45	50	60
Creepage Distances (mm / in):			
Terminal to Terminal	673 / 26.5	876 / 34.5	1160 / 45.7
Lower Terminal to Ground	679 / 26.7	938 / 36.8	1500 / 59.0
IEC Pollution Class Terminal to Ground	Very Heavy		
Mechanical Life (Close / Open Operations)	10,000		
Ambient Temperature (°C)	-40 to +60		

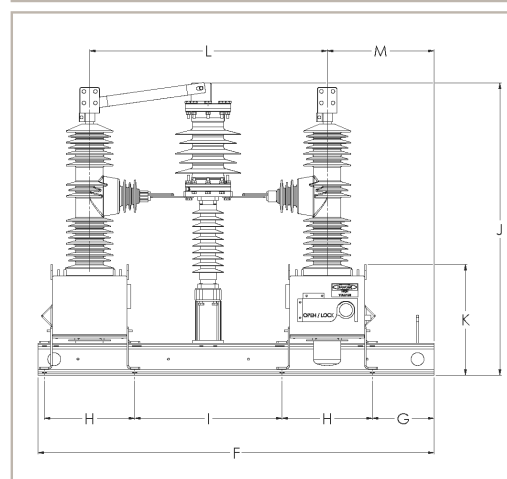
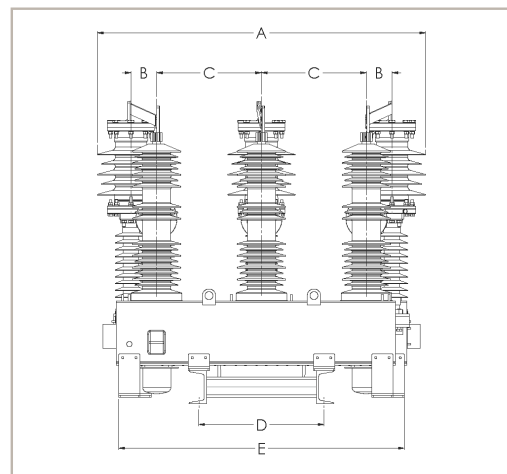
*Contact Factory for higher ratings

CONTROL CABINET & OTHER SPECIFICATIONS

Control Cabinet	Southern States LLC
Cabinet Enclosure Type	NEMA 4X
Cabinet & Tank Material	304 Stainless Steel (Painted)
Standard Relay	SEL 651R2 (LEA Voltage Input or 300 VAC Voltage Input Options Available)
Control & Power Cables	52' Standard (Armored Option Available)
Interrupter Housing Material	Hydrophobic Cycloaliphatic Epoxy (HCEP)
Fault Indicator	19 LED lights visible on bottom of tank

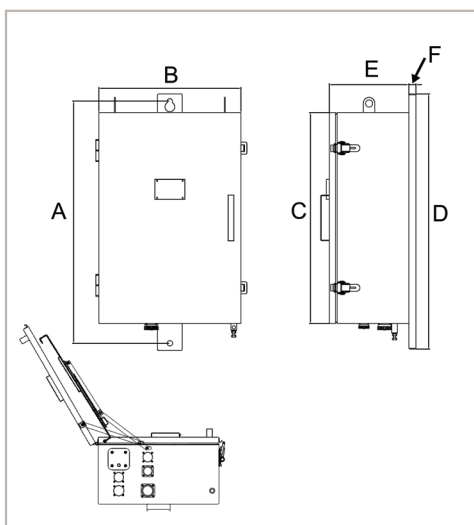
STANDARD DESIGN & DIMENSIONS

Figure	15.5 kV	27 kV	38 kV
A	48.5" (1233 mm)	48.5" (1233 mm)	49.63" (1260 mm)
B	3.75" (96 mm)	3.75" (96 mm)	4.5" (115 mm)
C	15.5" (394 mm)	15.5" (394 mm)	15.5" (394 mm)
D	18.5" (470 mm)	18.5" (470 mm)	18.5" (470 mm)
E	42.2" (1072 mm)	42.2" (1072 mm)	42.2" (1072 mm)
F	60.4" (1533 mm)	60.4" (1533 mm)	79.313" (1938 mm)
G	9.375" (238 mm)	9.375" (238 mm)	11.125" (283 mm)
H	13.75" (350 mm)	13.75" (350 mm)	14.1875" (360 mm)
I	22.4375" (570 mm)	22.4375" (570 mm)	35.8125" (910 mm)
J	42.63" (1081 mm)	44.625" (1134 mm)	53.13" (1349 mm)
K	17" (431 mm)	17" (431 mm)	15" (381 mm)
L	33.813" (859 mm)	36.25" (920 mm)	50" (1270 mm)
M	17.5" (445 mm)	16.25" (413 mm)	18.375" (466 mm)



651R STANDARD CONTROL CABINET

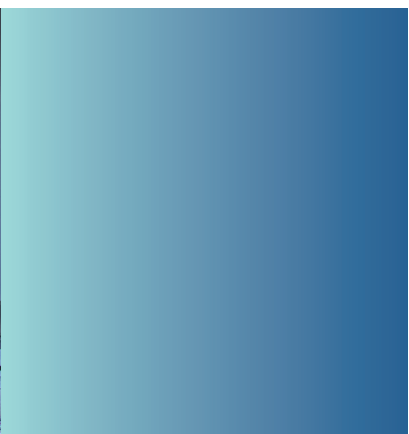
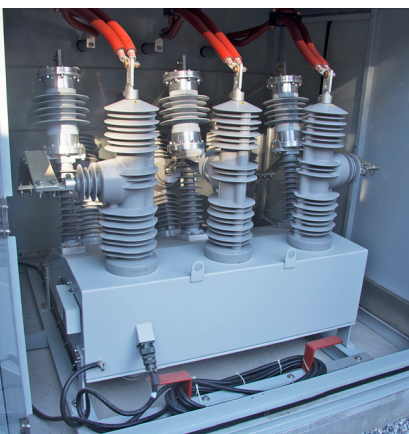
Fig.	Dimensions
A	35.8" (910 mm)
B	19.7" (500 mm)
C	31.5" (800 mm)
D	37.8" (960 mm)
E	13.4" (340 mm)
F	1" (25 mm)



PAD-MOUNT DESIGN



Contact Southern States
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