

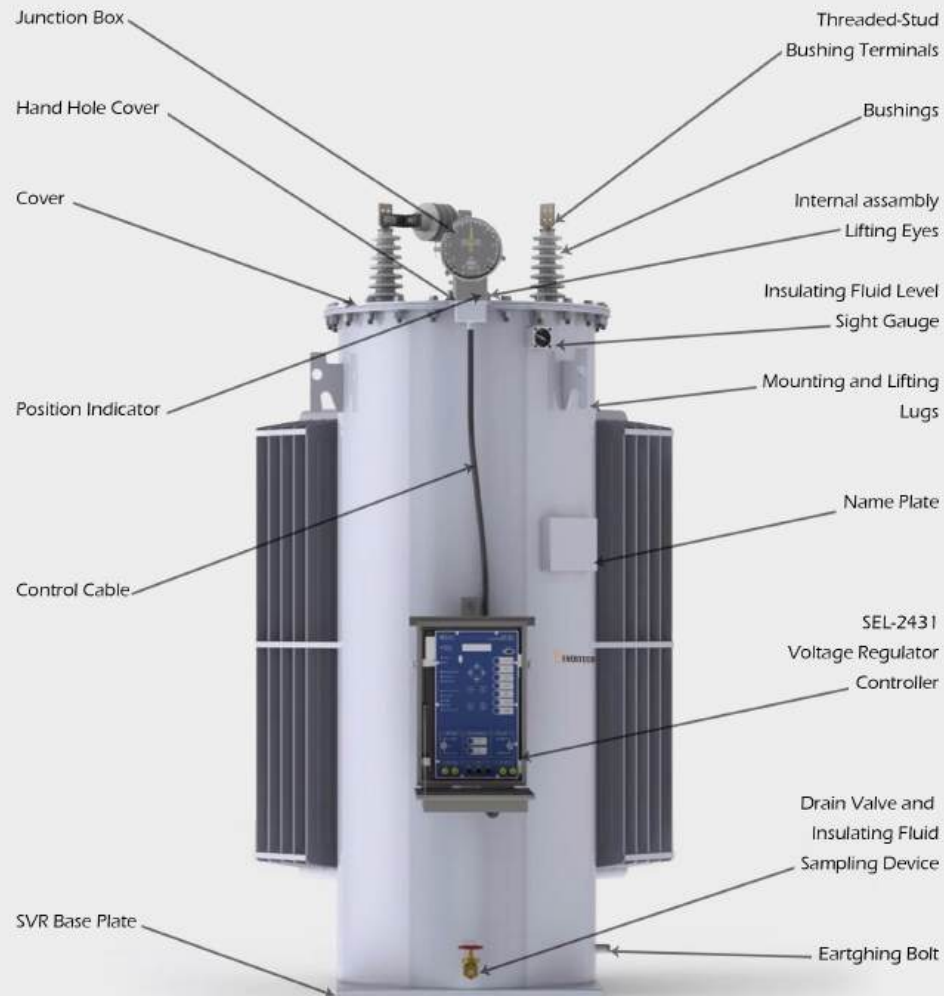
INNOVATION IS JUST STEPS AWAY

Single-Phase **STEP VOLTAGE REGULATOR**

Resolving your Voltage Fluctuation from the root.



SP Series Step Voltage Regulator



SEL Control and function features



- The operation interface is friendly, and you can modify setting and brows online data at will;
- Parameters like Voltage, bandwidth, time delay and compensation voltage can be set;
- Various data can be measured e.g. load voltage, load current, apparent power, reactive power, power factor, etc.
- It can realize automatic forward and reverse voltage regulation (for loop network power supply) according to the power flow direction of the power grid, and complete all functions;
- Provide RS232 and RS485 data interface for remote control and telemetry to realize distribution network automation;
- Cooperate with various communication protocols to directly communicate with the master station without adding RTU (FTU) devices;

Core and coil assembly

The Enertech SVR's core, coil, tap changer, and reactor assembly are engineered for exceptional serviceability. The entire assembly is suspended from the top cover, allowing for effortless tank removal and simplified inspection and maintenance.

The coil assembly utilizes either aluminum or copper strips in the series winding, carefully designed to achieve optimal ampere-turn balance, ensuring superior strength and reliability under fault conditions.

Constructed from grain-oriented steel with low-reluctance lap joints, the core is securely positioned for maximum stability, providing quiet operation and minimizing core loss for efficient, long-lasting performance.



Tap Changer

The Enertech Step Voltage Regulator (SVR) features a state-of-the-art On Load Tap Changer (OLTC) designed for superior performance and long-lasting durability. Engineered for a wide range of current and voltage applications, our OLTC ensures precise voltage regulation while minimizing wear and extending operational life. Coupled with the advanced SEL Regulator Controller, this robust system offers seamless adaptability, reliable performance, and low maintenance requirements, making it an ideal solution for demanding environments.



Single Phase STEP Voltage Regulator

Enertech's SP Series Voltage Regulators offer industry-leading voltage regulation by incorporating the advanced SEL-2431 voltage regulator controller and a state-of-the-art tap-changing system. The seamless integration of advanced control technology with fast-acting tap-changer mechanisms provides unparalleled performance, delivering precise voltage control, rapid response, and long-term reliability in even the most demanding conditions.

Core Functionality

- 32 Step Voltage Regulation for $\pm 10\%$ regulation
- approximately 5/8 % regulation step size
- Advance SCADA compatible regulator controller
- Voltage class of from 12 kV upto 35 kV
- BIL form 75kV upto 200kV

Standard

- IEEE Standar C57.15-2009
- GB/T-12325-2008

Standard Features

- SEL- 2431 Voltage regulation controller
- Corrosion resistant polymer Position indicator.
- Lifting Lugs for on site mentanance and Loading
- Oil drain valve and sampling device
- Oil sight gauge.
- Bushing, high creep with clamp connectors.
- Bolt-down provisions
- Pole-type mounting brackets
- Mounting base
- External series arrestor

Working principle of Step Voltage Regulator

The core of the SP Series SVR is a single-phase autotransformer, integrated with a 32-position tap changer and the advanced SEL intelligent controller to achieve precise 32-step voltage regulation. Each step provides a voltage regulation accuracy of 0.625%. The tap changer is connected to a specially designed reactor.

During tap changes, the reactor supplies current to neutralize arcing currents generated by switching, ensuring that the operation has no adverse effect on the internal insulating oil. This results in a truly maintenance-free system. The switch features a total of eight contacts.

For instance, when the tap contacts are positioned on 1 and 2 simultaneously, it counts as the first gear. The tap changer's positive and negative regulation allows for high-precision voltage control across 32 steps, surpassing traditional three-phase voltage regulators.



Arc and Maintenance free lifetime

Enertech Step Voltage Regulators not only eliminate voltage instability at its source but also extend the service life of your equipment, ensuring long-term reliability and performance.



Ease of Maintenance and Increased Capacity

The sealed-tank design of the Enertech SP Series SVR enables the use of a 65°C rise insulation system in a 55°C rise rated configuration, providing up to 12% additional capacity beyond the nameplate rating without compromising insulation life.

The SVR's cover suspends the entire internal assembly—comprising the core, coil, tap changer, and reactor—allowing for easy inspection and maintenance access.

Enertech Step Voltage Regulators are manufactured and tested to meet IEEE Std C57.15-2009 and GB/T-12325-2008 standards, ensuring high reliability and performance.

Functions and Characteristics

High precision : 32 step voltage regulation within setting range.

Long service life : unique voltage regulation tap design can avoid arc during voltage regulation and ensure the service life of 2 million operations.

Maintenance free : Fully sealed design, high protection grade, excellent weather resistance, and maintenance free for a long time.

Flexibility : installable in line and substation, operation function and switching can be controlled.

Communicable : SCADA compatible; can communicate with grid via RS232 interfacing.

Efficient : Designed to minimize iron loss /no-load Loss.

Economy : effectively adjusts the line voltage to greatly reduce the line loss and prolong the service life of equipment.



Single Phase STEP Voltage Regulator

Tabel 1: Selection Chart for 50 Hz Rating

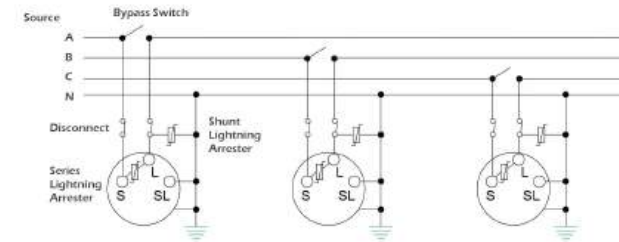
| Rated Volts | Rated kVA | Loadwise Current Rating (Amps) | | | | |
|---------------------|--------------|--------------------------------|---------|---------|---------|-----|
| | | SVR Regulation Range | | | | |
| | | ±10% | ±8 3/4% | ±7 1/2% | ±6 1/4% | ±5% |
| 6600 95 kV BIL | 33 | 50 | 55 | 60 | 68 | 80 |
| | 66 | 100 | 110 | 120 | 135 | 160 |
| | 99 | 150 | 165 | 180 | 203 | 240 |
| | 132 | 200 | 220 | 240 | 270 | 320 |
| | 198 | 300 | 330 | 360 | 405 | 480 |
| | 264 | 400 | 440 | 480 | 540 | 640 |
| | 330 | 500 | 550 | 600 | 668 | 668 |
| | 396 | 600 | 660 | 668 | 668 | 668 |
| 11000 95 kV BIL | 440 | 668 | 668 | 668 | 668 | 668 |
| | 55 | 50 | 55 | 60 | 68 | 80 |
| | 110 | 100 | 110 | 120 | 135 | 160 |
| | 165 | 150 | 165 | 180 | 203 | 240 |
| | 220 | 200 | 220 | 240 | 270 | 320 |
| | 330 | 300 | 330 | 360 | 405 | 480 |
| | 440 | 400 | 440 | 480 | 540 | 640 |
| | 550 | 500 | 550 | 600 | 668 | 668 |
| 15000 150 kV BIL | 660 | 600 | 660 | 668 | 668 | 668 |
| | 75 | 50 | 55 | 60 | 68 | 80 |
| | 150 | 100 | 110 | 120 | 135 | 160 |
| | 225 | 150 | 165 | 180 | 203 | 240 |
| | 300 | 200 | 220 | 240 | 270 | 320 |
| | 450 | 300 | 330 | 360 | 405 | 480 |
| | 600 | 400 | 440 | 480 | 540 | 640 |
| | 750 | 500 | 550 | 600 | 668 | 668 |
| 16000 150 kV BIL | 160 | 100 | 110 | 120 | 135 | 160 |
| | 320 | 200 | 220 | 240 | 270 | 320 |
| | 480 | 300 | 330 | 360 | 405 | 480 |
| | 110 | 50 | 55 | 60 | 68 | 80 |
| | 220 | 100 | 110 | 120 | 135 | 160 |
| | 330 | 150 | 165 | 180 | 203 | 240 |
| | 440 | 200 | 220 | 240 | 270 | 320 |
| | 660 | 300 | 330 | 360 | 405 | 480 |
| 22000 150 kV BIL | 880 | 400 | 440 | 480 | 540 | 640 |
| | 999 | 454 | 454 | 454 | 454 | 454 |
| | 165 | 50 | 55 | 60 | 68 | 80 |
| | 330 | 100 | 110 | 120 | 135 | 160 |
| | 495 | 150 | 165 | 180 | 203 | 240 |
| | 660 | 200 | 220 | 240 | 270 | 320 |
| | 825 | 250 | 275 | 300 | 337 | 373 |
| | 175 | 50 | 55 | 60 | 67.5 | 80 |
| 33000 200 kV BIL | 350 | 100 | 110 | 120 | 135 | 160 |
| | 525 | 150 | 165 | 180 | 202.5 | 240 |
| | 700 | 200 | 220 | 240 | 270 | 320 |

Country wise specific Rated voltage and BIL rating can be provided upon request.

Step Voltage Regulator Installation Method

WYE Connection : 4 Wire Mode

Events when three phase medium voltage lines are connected by three single phase step voltage regulators into a wye connection in 4 wire mode, with $\pm 10\%$ regulation.



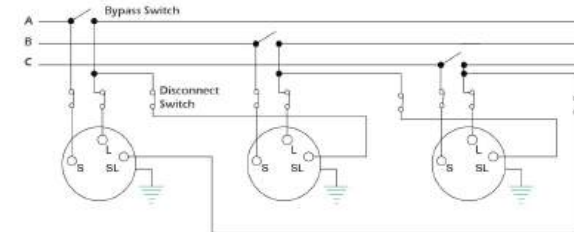
Delta Connection : 3 Wire Open Triangle

Events when three phase medium voltage lines are connected by two single phase step voltage regulators into a delta connection of 3 wire open triangular mode, with regulation of $\pm 10\%$



Delta Connection : 3 Wire Closed Triangle

Events when three phase medium voltage lines are connected by three single phase step voltage regulators into a delta connection of 3 wire close triangular mode, with regulation of $\pm 15\%$





Single-Phase Step Voltage Regulator
Catalog EN.SPSVR.2024.V1