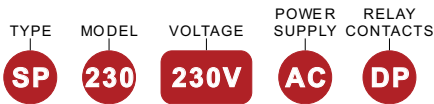


# SP-230/SP-231/SP-232

Voltage Window Comparator  
Three Phase



## ORDERING CODE



## Application Examples

- Detection of Phase Failure.
- Phase monitoring of voltage transformers to ensure the voltage integrity of control circuits in high voltage panels.
- Monitoring of the line supply in rural areas for over- and under-voltage protection.
- Monitoring of supply voltage from standby generator sets to ensure a constant voltage supply.
- Monitoring the voltage output of UPS systems.

## Features

- Failsafe feature.
- Combined over-voltage and under-voltage detection.
- Monitoring of own supply voltage.
- Adjustable response delay on SP-231
- SP-232 available with neutral.
- High precision and repetitive accuracy.
- Independent setting of over- and under-voltage tripping points.
- LED indication for type of fault and status of the relay.
- Latching facility.
- 10A SPDT relay output.

## Description of Operation

The **SP-230**, **SP-231** and **SP-232** are precision voltage window comparators for three phase AC applications, monitoring phase-to-phase voltage. They respond to both over-voltage as well as under-voltage conditions. Power supply to the unit is tapped off the voltage sensing inputs.

**Voltage Sensing:** The relay is energised when the voltage is maintained between the set over-voltage and under-voltage thresholds. If the voltage between any two phases rises above the over-voltage setpoint or drops below the under-voltage setpoint, the relay de-energises and the appropriate LED indicates "over-voltage" or under-voltage" respectively. The relay energises again if the voltage recovers to within the set voltage window bandwidth.

**Note:** The SP-230 is calibrated to respond to the RMS of sinusoidal waveform. In exceptional circumstances where voltages are not sinusoidal in nature, scale inaccuracies may be experienced.

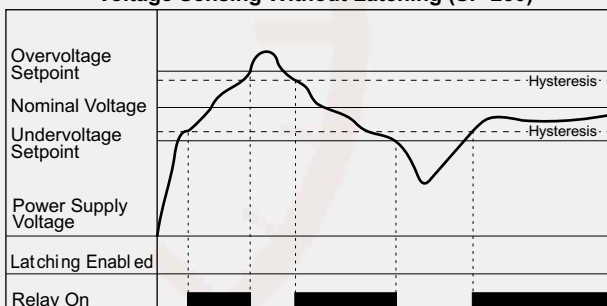
**Hysteresis:** Hysteresis represents the difference between the tripping point and the recovery point of the unit. The hysteresis is fixed to 2% to prevent relay chatter when the voltage fluctuates around the setpoint.

**Latching:** When latching is armed, the relay will not recover from a tripped condition, but will remain de-energised until reset. The appropriate LED will indicate the type of fault responsible for the tripped condition. The unit can be reset by either breaking and re-applying power supply to the unit or by momentarily disabling the latching circuit (e.g. push-to-open switch). On power-up of the module, the latching is inactive for approximately 10 seconds.

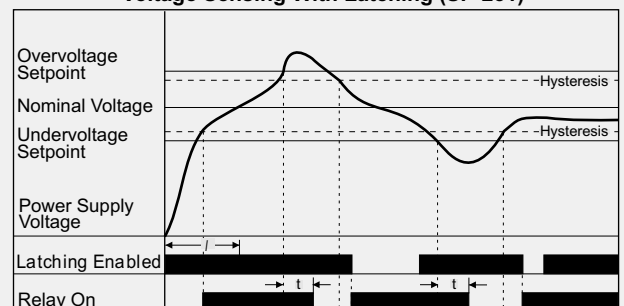
**Adjustable Response (SP-231):** Response delay can be adjusted from 1 to 10 seconds. When a trip condition is detected, the relay will only de-energise after the set response time (a delayed on recovery is also available on special order).

## Operational Diagrams

Voltage Sensing Without Latching (SP-230)

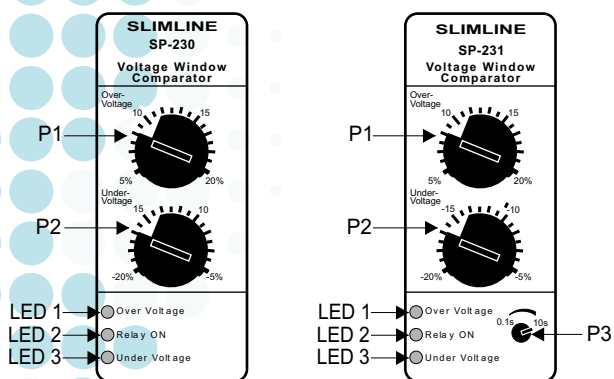


Voltage Sensing With Latching (SP-231)



$l$  = Latching disabled for approximately 10 seconds at power up.  
 $t$  = response delay

## Description of Controls



P1: The **Over-voltage Threshold** is adjusted on P1.

P2: The **Under-voltage Threshold** is adjusted P2.

**Note:** The scales for over-voltage and under-voltage threshold settings are calibrate in percentage deviation from nominal supply voltage.

P3: **Adjustable Response Delay** from 0.1 to 10 seconds.

LED 1: The red LED marked "**Over-voltage**" will illuminate whenever the current exceeds the set over-voltage threshold.

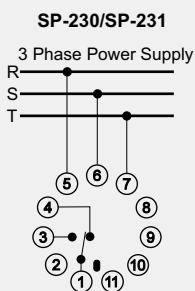
LED 2: The green LED marked "**Relay ON**" will illuminate when the relay is energised, i.e. under normal supply conditions.

LED 3: The red LED marked "**Under-voltage**" will illuminate whenever the current drops below the set under-voltage threshold.

## Wiring and Connection

### Power Supply

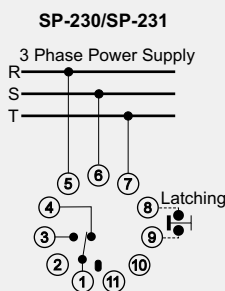
The three phase R, S and T are to be connected to pins 5,6 and 7 respectively.



**APPLICATION 1**  
Without latching

### Relay Contacts

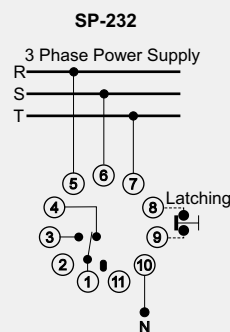
Normally Open	1 + 3
Normally Closed	1 + 4



**APPLICATION 2**  
With latching

### Latching

Latching to be enabled by interconnecting pin 8 and pin 9 (e.g. Push-to-open reset switch)



**APPLICATION 3**

## Technical Specifications

### Power Supply

Supply voltage (phase-to-phase): 12, 24, 110, 230, 400, 415, 525V AC  $\pm 15\%$   
Power consumption: 3VA (approx.)  
6VA for 415, 525V AC (approx.)

### Voltage Sensing

Calibrated to respond to the RMS of a sinusoidal waveform.  
Repetitive accuracy: 1%  
Hysteresis: 2% fixed (relative to its supply voltage).  
Response delay: SP230/ SP232 - 1 second.  
SP231 - adjustable from 0.1 to 10 seconds.  
(other ranges on special order)  
Latching disabled during power-up: approx. 10 seconds.