

AP-234/AP-235

Combined Over and Under Voltage Monitor

Three Phase (Separate Relays)

A-LINE
MONITORING RELAYS



ORDERING CODE

TYPE	MODEL	VOLTAGE	POWER SUPPLY	RELAY CONTACTS
AP	234	230V	A	S

SEE PAGE 32 FOR ORDERING OPTIONS

Application Examples

- Detection of phase failure (AP-234).
- Detection of phase or neutral failure (AP-235).
- 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-voltage and under-voltage protection.
- Monitoring of supply voltage from standby generator sets to ensure a constant supply.

Features

- Fail-to-safe design.
- DIN rail format.
- Combined over-voltage and under-voltage monitoring.
- Monitoring of own supply voltage.
- Selectable power supply voltages.
- High precision and repetitive accuracy.
- Independent adjustment of over-voltage and under-voltage setpoints.
- Adjustable response times - available on trip and/or recovery (0.1 to 10 seconds).
- LED indication of Over-voltage Relay ON, and Under-voltage Relay ON (Power LED flashes when timing).
- 8A SPDT Over-voltage Relay output.

Description of Operation

The A-line **AP-234** and **AP-235** are combined over-voltage and under-voltage monitors for three phase AC applications. Both units also detect and protect against incorrect phase sequence. They have separate relay outputs for indicating over-voltage and under-voltage faults. The voltage to be monitored is tapped off internally from the supply to the comparator.

Voltage Sensing: The relays are energised when the voltage is maintained between the over-voltage and under-voltage setpoints. If the voltage rises above the over-voltage setpoint, the over-voltage relay de-energises. If the voltage drops below the under-voltage setpoint, the under-voltage relay de-energises.

Incorrect Phase Sequence: When an incorrect phase sequence is detected both relays de-energise and the power LED will flash to indicate the fault.

Loss of Neutral: The **AP-235** will detect loss of neutral when the three phase supply is connected to an

unbalanced load.

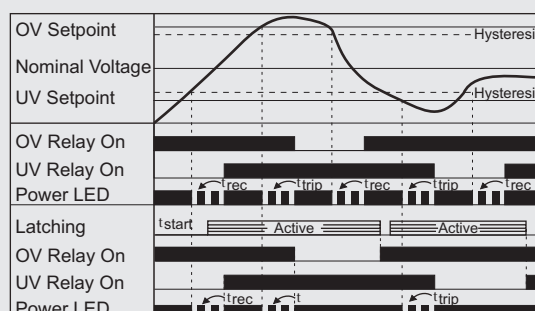
Hysteresis: Hysteresis represents the difference between the setpoint and the recovery point of the unit. The hysteresis is fixed at 2% to prevent relay chatter when the voltage fluctuates around either of the setpoints.

Latching: When latching is enabled, the relay will not recover from a tripped condition, but will remain de-energised until reset. The unit can be reset by either interrupting its power supply to the unit or by momentarily disabling the latching circuit (e.g. push-to-open switch).

Start-up delay: The latching circuit is inhibited at start-up for a period of time which is adjustable from 0 to 10 seconds.

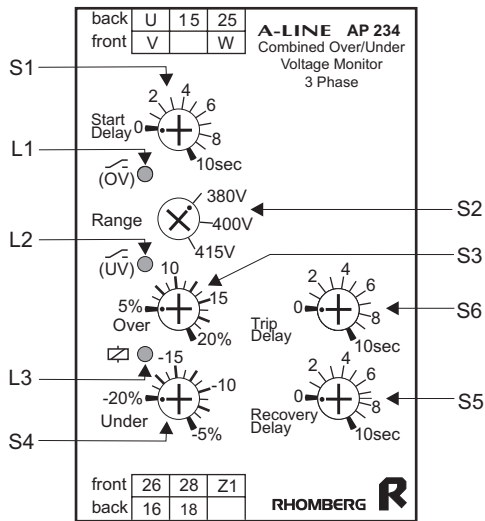
Delay on Trip: Response time on trip for over-voltage and under-voltage is adjustable from 0.1 to 10 seconds. When a trip condition is detected the relevant relay will de-energise after the set response time.

Operational Diagram





Description of Controls



L1: The yellow “Over-voltage” LED marked (\overline{OV}) illuminates when the over-voltage relay is energised.

L2: The yellow “Under-voltage” LED marked (\overline{UV}) illuminates when the under-voltage relay is energised.

L3: The red “Power On” LED marked \square illuminates when power is supplied to the unit. It also flashes to indicate a phase sequence error and during response time for trip and recovery.

S1: **Start-up delay** (for disabling latching) is set on **S1**. This time is adjustable from 0 to 10 seconds.

S2: **Supply voltage** is set on **S2** (e.g. 380, 400, 415V).

S3: **Over-voltage** setpoint is adjusted on **S3** (5 - 20%).

S4: **Under-voltage** setpoint is adjusted on **S4** (-20 to -5%).

S5: **Recovery Delay** response time for the over-voltage and under-voltage is set on **S5**. This time is adjustable from 0.1 to 10 seconds.

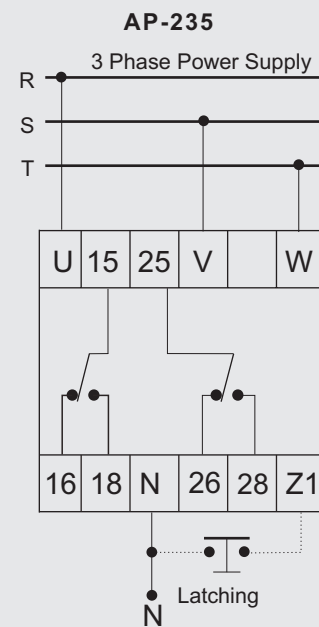
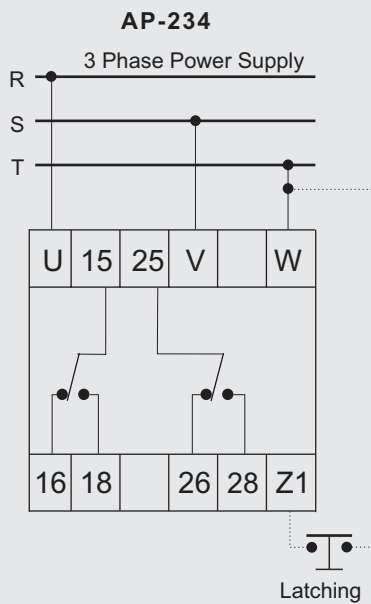
S6: **Trip Delay** response time for over-voltage and under-voltage is set on **S6**. This time is adjustable from 0.1 to 10 seconds.

Wiring and Connection

Power Supply	
Phase R	U
Phase S	V
Phase T	W
Neutral N (AP235 only)	N

Under-voltage Relay Contacts	
Normally Open	15+18
Normally Closed	15+16

Over-voltage Relay Contacts	
Normally Open	25+28
Normally Closed	15+16



Note: Position of relay contacts are shown in the de-energised state.

Technical Specifications

POWER SUPPLY	
Supply type	AC transformer supply only
Supply voltage	115(110, 115 or 120), 230(220, 230 or 240), 400(380, 400 or 415), 525V AC
Housing width	45mm
Power consumption	2VA (approx.)
Isolation	Galvanic (without latching)
Voltage tolerance	±20%

VOLTAGE SENSING	
Setpoints	The unit is calibrated to trip on the RMS value of the supply voltage(assuming no AC waveform distortion).
Repetitive accuracy	1%
Hysteresis	2% (fixed). Hysteresis relates to the supply voltage.

START-UP DELAY	
Start-up delay	0 - 10 seconds (Adjustable)

RESPONSE TIMES	
Response time on trip	0.1 - 10 seconds (Adjustable)
Response time on recovery	0.1 - 10 seconds (Adjustable)

Additional information in Section J, page 131.