



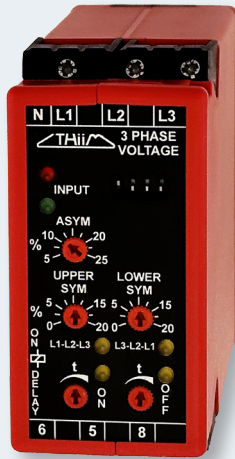
3 PHASE ASYMMETRY, VOLTAGE AND PHASE ROTATION RELAY

PAHA & PAHI – 3 Phase

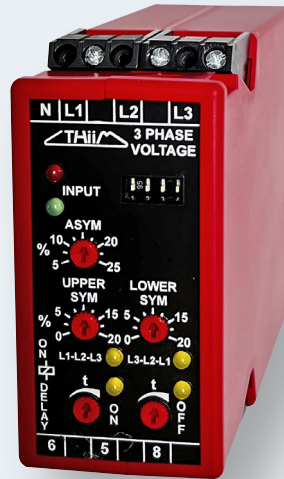
PAMA & PAMI – 3 Phase + Neutral

AC

M
3~



PAHA-PAHI



PAMA-PAMI



Features

- Detects phase sequence, phase failure, phase regeneration and phase loss in 3 phase or 3 phase + neutral systems
- Individual N/O output contacts for each phase sequence
- High sensitivity for the protection of AC motors and transformers
- Built-in narrow band pass filter limiting electrical noise
- Individual adjustments for unbalanced and balanced under- and overvoltage settings
- True time delay providing 6 s self-powered back-up (PAHI/PAMI)



Benefits

- Prevents motors from rotating in wrong direction and get switched on to faulty supply
- Enables automatic phase sequence correction when connecting to unknown supply, e.g. mobile power
- Prevents damage to AC motors from being switched on to faulty power supply
- Prevents damage or malfunction of connected machinery or appliances due to faulty power supply
- Insensitive to electrical noise
- Functionality is maintained in minimum 6 s in case of total power loss (PAHI/PAMI versions)



Applications

- Mains power connection
- Supply to heavy duty machinery with moving parts
- AC Motors and drives
- Generators
- Transformers



3 PHASE ASYMMETRY, VOLTAGE AND PHASE ROTATION RELAY

PAHA & PAHI – 3 Phase
PAMA & PAMI – 3 Phase + Neutral

DESCRIPTION

PAHA and PAHI are 3-wire relays for sequence and phase voltage monitoring in 3 phase systems, whereas PAMA and PAMI are 4-wire relays for sequence and phase voltage monitoring in 3 phase + neutral systems.

PAHI and PAMI versions include true time delay function ensuring that the relays will maintain full functionality in minimum 6 s in case of system power black out

The phase sequence and phase and neutral monitoring relays are designed for applications where the sequence of a three-phase system needs to be controlled. In addition to the sequence control the relays monitor the three-phase system for phase unbalance, and according to the selected setting, they can further monitor balanced under or overvoltage, as well as both under and overvoltage. The relays work in "fail-safe" mode and the 35 mm modules need no external power supply. If an external stable power supply is available, the 45 mm modules offer separate terminals for the internal power.

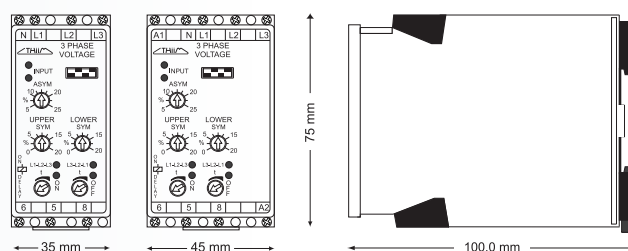
Unbalance, due to phase angle and phase voltage deviation, is very accurately measured by measuring the inverse phase system relatively to the main system. The method is independent of the actual balanced voltage and perfect for the protection of three-phase motors, generators and transformers. The measuring system is insensitive to higher harmonics and secures the relays from false triggering due to "noisy" power lines. As the measuring system includes the phase angles in the measurement, it provides full protection against regenerated phases. Balanced voltage is measured by adding the three individual rectified phase voltages.

APPLICATION

To prevent motors from rotating in the wrong direction and being switched on to a faulty supply. Motor protection by controlling the direction of rotation and on-off switching depending on supply conditions. E.g. pumps, compressors, ventilators and refrigerators.

Automatic control of phase sequence and monitoring of phase and neutral voltages in mobile equipment like refrigerated containers, control and distribution panels and machines used on building sites and on service jobs.

DIMENSIONS



CONFIGURATION

VOLTAGE SETTING

TYPE	TYPE	TYPE	TYPE
110 V	230 V	400 V	460 V
100 V	220 V	380 V	440 V
110 V	230 V	400 V	460 V
115 V	240 V	415 V	480 V



ACTUATOR ■

FUNCTION	SET
ASYM	A
ASYM & SYM LOW	B
ASYM & SYM HIGH	C
ASYM & SYM HIGH, LOW	D

OPERATION

Under normal phase conditions the green input LED is on and one of the sequence sensitive relays will be energized, indicated by the yellow LED corresponding with the actual sequence, L1-L2-L3 or L3-L2-L1.

If there is a phase deviation beyond one of the set levels, the red input LED will go on. During the set delay period the yellow timing LED for off delay will be on.

At the end of the timing period the relay will drop out and only the red input LED will stay on. If the common phase voltage drops below -40%, the relay will drop out, even if the under-voltage detection is disabled. If the phase or the separate supply voltage is lost, the relay and all LED's will de-energize with out delay for PAHA and PAMA. The PAHI and PAMI will be able to hold the relays for more than 6 s.



3 PHASE ASYMMETRY, VOLTAGE AND PHASE ROTATION RELAY

PAHA & PAHI – 3 Phase
PAMA & PAMI – 3 Phase + Neutral

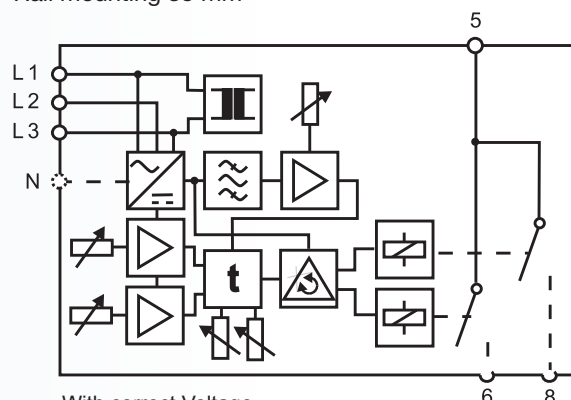
INSTALLATION AND SETUP

The relay is designed for DIN rail mounting with built-in screw terminal connections for corresponding wires of the installation, as indicated on the front panel and connection diagram

Setup is done from the front of the relay using the dip-switches for setting the desired functionality and nominal system voltage, and the screw potentiometers for setting desired trip levels, sensitivity and time delay.

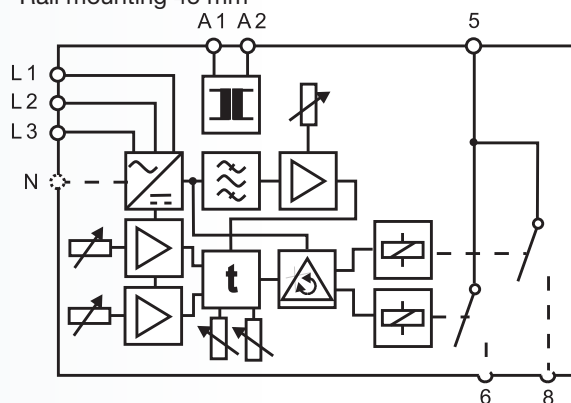
CONNECTIONS

Rail mounting 35 mm

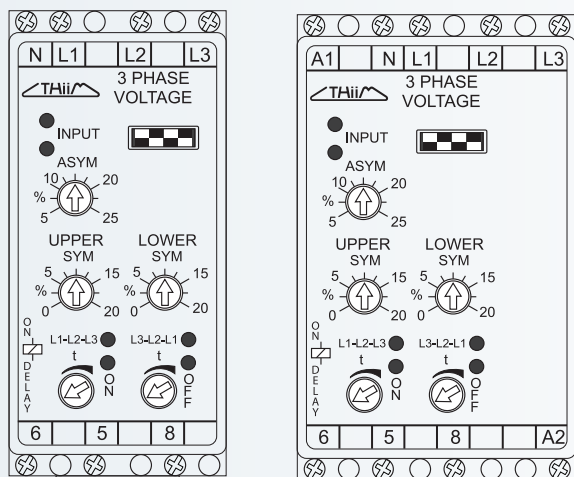


With correct Voltage
Phase Sequence Relay Contact
L1-L2-L3: 5-6 on
L3-L2-L1: 5-8 on

Rail mounting 45 mm

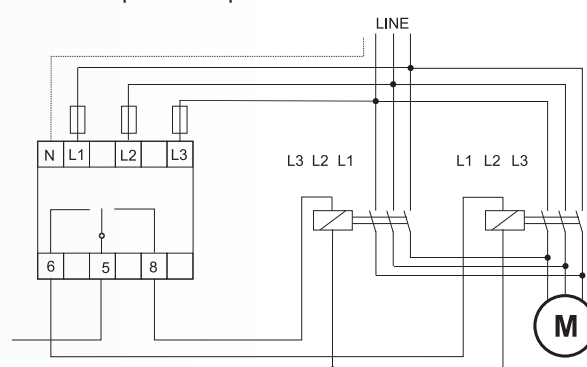


FRONT



APPLICATION DIAGRAM

Automatic phase sequence correction





3 PHASE ASYMMETRY, VOLTAGE AND PHASE ROTATION RELAY

PAHA & PAHI – 3 Phase
PAMA & PAMI – 3 Phase + Neutral

SPECIFICATIONS

INPUT

MEASURING CIRCUIT

Phase to phase voltage 100, 110 and 115
220, 230 and 240
380, 400 and 415
440, 460 and 480

Selectable by DIP switch

Input resistance 300 kΩ 100 < UN < 200 V
500 kΩ 200 < UN < 480 V

Frequency range 45 to 66 Hz

Unbalance sensitivity * Adj. 5 to 25 %

Balanced undervoltage Approx. -40 % A function

Adj. 0 to -20 % B & D function

Adj. 0 to +20 % C & D function

Balanced overvoltage

Differential

Unbalance 2 % of UN

Balanced 2 % of UN

*Unbalance is defined and tested by varying one phase against neutral keeping the two other phases on nominal value against neutral.

The 4-wire units PAMA & PAMI are further tested for the same sensitivity by varying neutral, keeping the three phase to phase voltages on nominal values.

PERFORMANCE PARAMETERS

TIMING

Response time 100 to 500 ms depending on fault

Approx. 100 ms with drop out

Time range during run Separate On and Off delay

0-10 s adjustable

True time delay PAHI & PAMI > 6 s at total supply loss

ELECTRICAL

Temp. dependence Typical: ± 0.02 %/°C

Supply dependence Typical: ± 0.01 %/ΔU

OUTPUT

Relay, 2 NO (moving contact connected)

Contact rating 6 A, 250 VAC, 1500 W

Mechanical life 30 million operations

SUPPLY

AC voltage from L1 & L3

110 V (from 80 to 138 V)

230 V (from 176 to 288 V)

Standard voltage 400 V (from 304 to 498 V)

460 V (from 352 to 576 V)

Separate external supply AC/DC voltage from A1 & A2

AC and DC supply 18 to 360 VDC and 20 to 240 VAC

24 to 480 V can be specified

AC supply range From 400 to 480 VAC

AC frequency range 45 to 440 Hz

Power consumption 4 VA, 2 W

GENERAL

Temperature range -25 °C to +55 °C ambient

Humidity Up to 90 % RH non-condensing

Dielectric test voltage Coil to relay contacts 4000 VAC

Weight 0.22 kg



International standards

Directive 2002/95/EC

of January 27th 2003: RoHS

EMC directives 89/336:

EN 50283:2000 Emission

EN 61000-3-2 Immunity

EN 61000-3-3 Immunity

EU directive: Low voltage directive 73/23:

EN 60255 Electrical Relays

ORDERING INFORMATION

EXAMPLE: 35 mm housing, Internal supply connection

TYPE

3 Phase sequence & voltage relay
3 Phase + N sequence & voltage relay
PAHA + True time delay
PAMA + True time delay

INPUT

Standard voltages with transformer
internally connected to L1-L3

100, 110 and 115 VAC

220, 230 and 240 VAC

380, 400 and 415 VAC

440, 460 and 480 VAC

ADJUSTMENT

Trimpot and dipswitch adj.

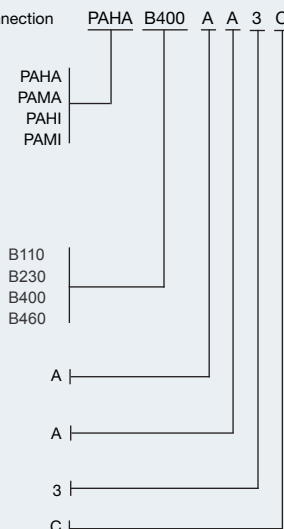
HOUSING

Rail mounting

SIZE

35 mm

CODE END



EXAMPLE: 45 mm w/socket

External supply connections

TYPE

3-Phase sequence & voltage relay
3-Phase + N sequence & voltage relay
PAHA + True time delay
PAMA + True time delay

INPUT

Standard voltages

100, 110 and 115 VAC

220, 230 and 240 VAC

380, 400 and 415 VAC

440, 460 and 480 VAC

100. to 999. V

SUPPLY VOLTAGE

18-360 VDC and 20-240 VAC

From 304 to 498 VAC

From 352 to 576 VAC

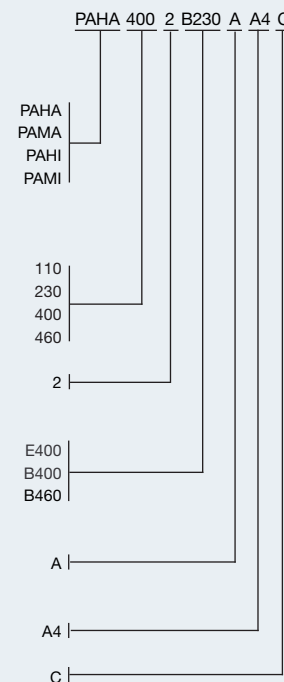
ADJUSTMENT

Trimpot and dipswitch adj.

HOUSING

Rail mounting 45 mm wide

CODE END



Company info