3 PHASE ASYMMETRY, VOLTAGE AND FREQUENCY RELAY

PAFA & PAGA

Features

- Detects phase-loss and phase-regeneration in 3-phase systems with or without neutral, as well as deviation in phase voltage and nominal frequency
- High sensitivity for the protection of AC motors, frequency converters and transformers
- Built-in narrow band pass filter limiting electrical noise
- Individual adjustments for unbalanced and balanced under- and overvoltage levels
- Additional individual adjustment for accepted deviation (%) from nominal frequency

Benefits

- Switches off AC Motors or Frequency converters before damage due to faulty supply, and on when supply is re-established
- Insensitive to electrical noise
- Ensures optimum functionality in applications sensitive to bigger frequency variation
- Protects against over-/undervoltage, over/under frequency and incorrect phase sequence
- Helps ensure system operation and efficiency

Applications

- Mains power connection
- Supply to heavy duty machinery with moving parts
- AC motors and transformers
- Power systems with frequency converters causing variation in system frequency

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DESCRIPTION

The phase failure relays (PAFA (3P) & PAGA (3P+N)) are designed for applications where a three-phase system needs to be monitored for unbalance or deviation in balanced voltage or deviation in frequency.

The user can set the PAFA and PAFG to the following functionalities:

A Monitoring unbalance due to phase angle and phase voltage deviations e.g. a blown fuse or a bad connection

B Monitoring both unbalance (as the A-function) and balanced undervoltage

C Monitoring both unbalance (as the A-function) and balanced overvoltage

D Monitoring all possible deviations by monitoring unbalance and balanced under- and overvoltage

Unbalance due to phase angle and phase voltage deviations is accurately measured by measuring the inverse phase system relatively to the main system. The method is independent of the actual balanced voltage and very insensitive to electrical noise.

Balanced voltage is measured by rectifying and adding the three-phase voltages.

APPLICATION

To switch off motors automatically before damage due to faulty supply, and to switch them on again as soon as the supply is re-established. E.g. pumps, oilburners, ventilators and refrigerators.

To monitor the three-phase main system and control the use of local emergency generators.

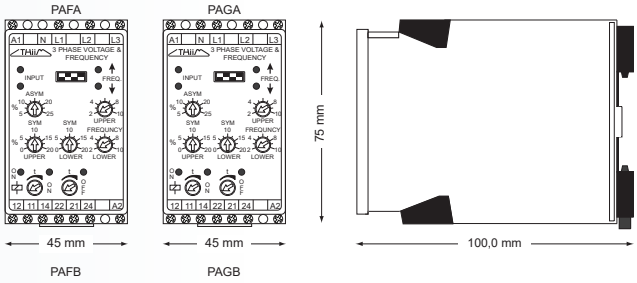
To prevent motors from being switched on to a faulty supply e.g. cranes and elevators.

To monitor the mains frequency and control the use of local generators or stand-by supplies.

To protect dieselgenerator plants against over and under speed.

To protect electrical and electronic equipment from damage due to over and under frequency.

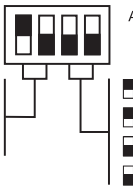
DIMENSIONS



CONFIGURATION

Nominal Voltage Settings
Phase to phase

Type 110 V	Type 230 V	Type 400 V	Type 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	TYPE
ASYM	A
ASYM & SYM LOW	B
ASYM & SYM HIGH	C
ASYM & SYM HIGH, LOW	D

3 PHASE ASYMMETRY, VOLTAGE AND FREQUENCY RELAY

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INSTALLATION AND SETUP

The relay is designed for DIN rail mounting with built-in screw terminal conections 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.

OPERATIONS

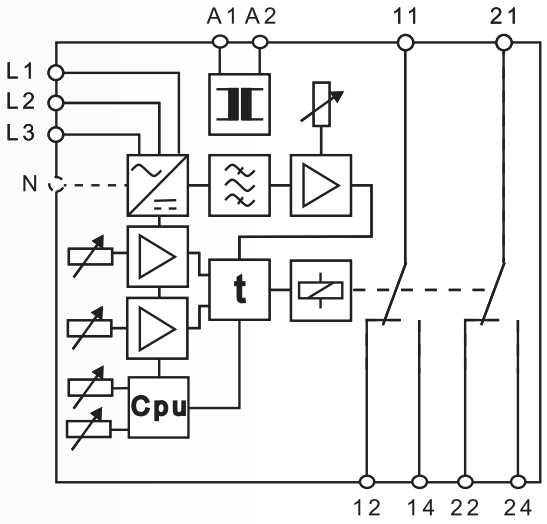
If a failure is detected or supply power is lost, the RED Input LED is switched on.

Depending on the nature of the failure the respective green LED related to phase asymmetry, over frequency and under frequency will switch off.

If the failure is related to wrong phase sequence the red LED corresponding to phase sequence will switch on.

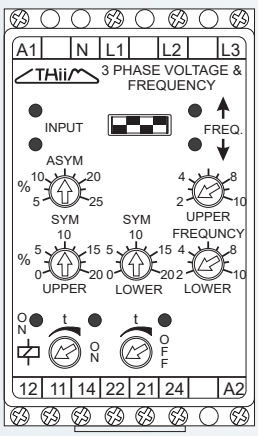
CONNECTIONS

Rail mounting

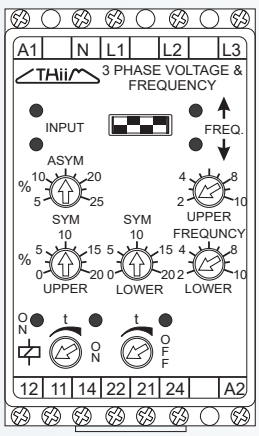


FRONT

PAFA



PAGA



Company info

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SPECIFICATIONS

INPUT

Phase to phase voltage		
Selectable by dip-switch	1102	100, 110, and 115 VAC
	2302	220, 230, and 240 VAC
	4002	380, 400, and 415 VAC
	4602	440, 460, and 480 VAC
Input resistance	300 kΩ	100 < UN < 200 V
	500 kΩ	200 < UN < 500 V
Frequency range	45 to 66 Hz	Unbalance
Balanced undervoltage	Approx. -40 %	A & C Function
	0 to -20 %	B & D Function
Balanced overvoltage	0 to +20 %	C & D Function
Differential		
Unbalance	2 % of UN	
Balanced	2 % of UN	

PERFORMANCE PARAMETERS

TIMING	
Response time	Approx. 500 ms with small variation
	Approx. 100 ms with drop out
Time range during run	Separate On and Off delay
	0-10 s adjustable
Frequency unit	
Differential	Fixed approx. 10 % of tripping deviation
Ref. deviation	± 0.5 %
Ref. temp. dependence	± 0.3 % (-20 to 80 °C)
Response time	max 200 ms
ELECTRICAL	
Unbalance sensitivity	5 to 25 %
Temp. dependence	Typ. ± 0.02 %/°C
Supply dependence	Typ. ± 0.01 %/% ΔUN

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

OUTPUT	Relay, 2 C/O	
Contact rating	6 A, 250 VAC, 1500 W	
Mechanical life	30 million operations	
SUPPLY	AC/DC voltage from A1 & A2	
AC and DC supply		
isolated switch mode supply	18 to 360 VDC and 20 to 240 VAC	
AC supply range	From 400 to 480 can be specified	
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
	Pole to pole (45 mm)	2500 VAC
	11-12-14 to 21-22-24	
TERMINALS		
Tightening torque	0.32 Nm to 0.39 Nm	
Screw type	PH1	
Cable size	Accepts up to 3.3 mm² or 12 AWG	
Weight	0.22 kg	

CE

International standards

2011/65/EU	RoHS 2 directive
2015/863/EU	RoHS 3 amending
EC1907/2006	REACH
2017/821/EU	3TG

EMC directives 89/336:

EN 50081	Emission
EN 50082	Immunity

EU directive: Low voltage directive 73/23:

EN 60255	Electrical Relays

ORDERING INFORMATION

EXAMPLE PAFA 4002 F5 10 B400 A A 4 C

TYPE

3 Phase voltage & frequency control relay with separated supply terminals	PAFA
3 Phase + N voltage & frequency control relay with separated supply terminals	PAGA

INPUT

100, 110 and 115 VAC	1102
220, 230 and 240 VAC	2302
380, 400 and 415 VAC	4002
440, 460 and 480 VAC	4602

FREQUENCY

Center frequency 50 Hz	F5
Center frequency 60 Hz	F6
Frequency range ± 2-10 %	10
Frequency range ± 4-20 %	20

SUPPLY VOLTAGE

18-360 VDC and 20-240 VAC	E400
From 304 to 498 V	B400
From 352 to 576 V	B460
(other voltages on request)	

ADJUSTMENT

Trimpot and dipswitch adj.	A

HOUSING

Rail mounting	A

SIZE

45 mm	4

CODE END

Code end	C

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