

## 3 PHASE & 3 PHASE + N VOLTAGE & FREQUENCY CONTROL RELAY

PAFA, PAGA  
PAFB, PAGB

### FEATURES

- Detect phase-loss and phase-regeneration in three phase systems
- High sensitivity for protection of motors and power transformers
- Insensitive to harmonics and spikes as the detection system includes a narrow band pass filter
- Adjustable version with individual adjustments for unbalanced and balanced under- and overvoltage settings and under- and overfrequency settings
- Function setting with dipswitch
- Ceramic resonator controlled reference
- Time delay - on and off - individually adjustable
- One unit for three mains voltages
- LEDs indicate the state of the frequency
- LED indicates the state of input
- LED indicates the state of relay
- LEDs indicate the timing function

### Description:

The phase failure relays are designed for applications where a three-phase system needs to be monitored for unbalance or deviation in balanced voltage or deviation in frequency. PADF includes a standard timing function. The PADF offers separate terminals for internal power.

A - function monitors the three-phase system for unbalance due to phase angle and phase voltage deviations e.g. a blown fuse or a bad connection.

B - function monitors the three-phase system for both unbalance (as the A - function) and balanced under voltage.

C - function monitors the three-phase system for both unbalance (as the A - function) and balanced over voltage.

D - function Monitors the three-phase system for all possible deviations by monitoring unbalance and balanced under-and over voltage.

Unbalance due to phase angle and phase voltage deviations 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 very insensitive to electrical noise.

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

### Operation:

Under normal phase conditions the relay is energized and the green LEDs are switched on. If a phase failure is detected, or the supply voltage for the electronic system is lost, the relay drops out and the LED, related to the type of failure, is switched off.

### 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.

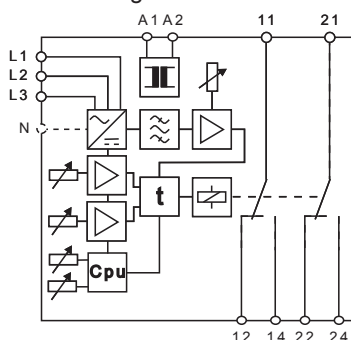
To monitor the mains frequency and control the use of local generators or stand-by supplies.

To protect dieselgenerator plants against over and under speed.

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

### CONNECTION DIAGRAM

Rail mounting



### PROGRAMMABLE FEATURES

Nominal Voltage Settings  
Phase to phase

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

■	ASYM	A
■	ASYM & SYM LOW	B
■	ASYM & SYM HIGH	C
■	ASYM & SYM HIGH, LOW	D

## SPECIFICATIONS

### INPUT

Phase to phase voltage	Type B110:	100, 110 and 115
Selectable by dipswitch	Type B230:	220, 230 and 240
	Type B400:	380, 400 and 415
Input resistance	300 kΩ	100 < U <sub>N</sub> < 200 V
	500 kΩ	200 < U <sub>N</sub> < 500 V
Frequency range	45 to 66 Hz	Unbalance
Balanced under voltage	Approx. - 40 %	A & C Function
	0 to - 20 %	B & D Function
Balanced over voltage	0 to + 20 %	C & D Function
Differential		
Unbalance	2 % of U <sub>N</sub>	
Balanced	2 % of U <sub>N</sub>	

### PERFORMANCE PARAMETERS

#### TIMING

Response time	Approx. 500 msec. with small variation
	Approx. 100 msec. with drop out
Time range during run	Separate On and Off delay
	0 - 10 sec. 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 msec.

#### ELECTRICAL

Unbalance sensitivity	5 to 25 %
Temp. dependence	Typ. ± 0.02 % / °C
Supply dependence	Typ. ± 0.01 % / % ΔU <sub>N</sub>

\* 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 supply range	110 V (From 80 to 138 V)
with transformer	230 V (From 176 to 288 V)
Standard voltage	400 V (From 304 to 498 V)
	460 V (From 352 to 576 V)
	24 to 480V 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	
Weight	0.22 kg	



International Standards	
EMC directive 89/336:	EN50081 - Emission
	EN50082 - Immunity
Low voltage directive 73/23:	EN60255 - Electrical Relays

## ORDERING INFORMATION

### EXAMPLE: TYPE

3 Phase voltage & frequency control relay with separate supply terminals PAFA

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

3 Phase voltage & frequency & Rotation control relay with separate supply terminals PAFB

3 Phase + N voltage & frequency & Rotation control relay with separate supply terminals PAGB

### INPUT

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

### FREQUENCY

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

### SUPPLY

AC with transformer  
AC/DC with switch mode supply

### SUPPLY VOLTAGE

18-360 VDC and 20-240 VAC	E400
From 19.2 to 28.8 V	B024
From 38.4 to 57.6 V	B048
From 80 to 138 V	B110
From 176 to 288 V	B230
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

Code end C  
Extended Code E

