

## Phase Balance, Sequence and Voltage Monitor PSF/G3/4 100/120 -173/240 -380/480 DIN-rail mounted

### Introduction

This unit monitors a 3-phase supply for phase imbalance, low or missing phases or incorrect phase sequence and trips a relay if it detects any anomaly. A front panel control allows selection of minimum voltage level. LEDs indicate power on and trip status.

Versions are available to suit 3-wire, 3ph (PSF/G3) and 4-wire, 3ph+N (PSF/G4) supplies of 110V, 210V and 430V nominal. The 110V and 120V versions occupy a single module width on the DIN rail and have a single relay contact whereas the 430V version occupies a three-module width and has two relay contacts.

These instructions contain important safety information. Please read them thoroughly before commissioning, operating or maintenance of the unit.

### Specification

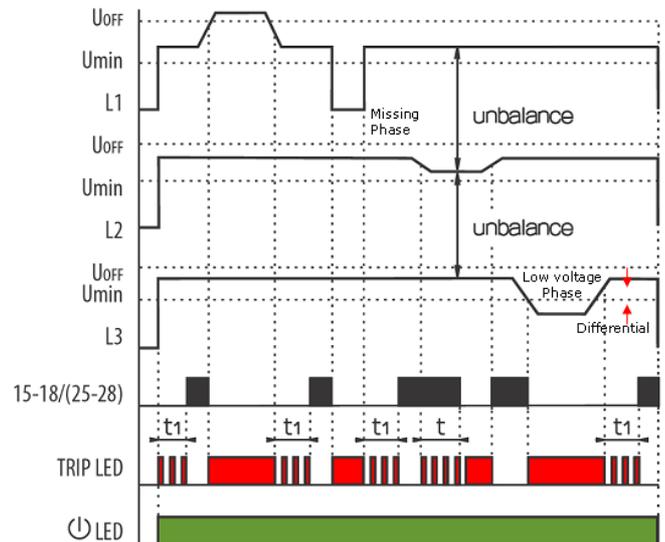
Parameter	PSF/Gn-	100/120	173/240	380/480
Voltage range	PSF/G3 L-L	100-120V	173-240V	380-480V
Un (Vnom)	PSF/G4 L-N	58-69V	100-139V	220-277V
Overload - cont.	PSF/G3	150V	300V	600V
	PSF/G4	87V	174V	346V
- 10s max	PSF/G3	180V	360V	720V
	PSF/G4	104V	209V	416V
Max. operating voltage	U <sub>off</sub>	187V	374V	749V
Burden on supply (Max)		1.7 3 VA max		
Operating frequency		45-65 Hz		
Phase imbalance trip level		Adjustable 5-15% Un (Vnom)		
Differential		Fixed at 1% Un (Vnom)		
Low-voltage trip level (U <sub>min</sub> )		Adjustable 50-85% Un (Vnom)		
Trip delay t		Adjustable 0.5 - 10s		
Trip reset delay t <sub>1</sub>		Fixed at 0.5s		
<b>Relay contacts:</b> volt-free, for general switching operations		PSF/Gn 100/120 & 173/240 1 x c/o, PSF/Gn 380/480 2 x c/o		
Load capacity - a.c.		250V @ 8A, 2 kVA		
Load capacity - d.c.		30V 8A		
Insulation		4 kV/1 min		
Mechanical endurance		30x10 <sup>6</sup> operations		
<b>Other Data:</b>				
Weight- single/triple module		66g (123g PSF/Gn 380/480) approx.		
Dimensions - single/triple		90x17.6x64 mm / 90x52x64 mm (PSF/Gn 380/480)		
Maximum conductor size		2 x 2.5 mm <sup>2</sup> or 1 x 4 mm <sup>2</sup> 2 x 1.5 mm <sup>2</sup> or 1 x 2.5 mm <sup>2</sup> (PSF/Gn 380/480)		
Operating temperature		-20 to +55 °C		
Storage temperature		-30 to +70 °C		
Over-voltage category		III		
Pollution degree		2		
Environmental protection (triple module)		IP40 for front panel IP10 (IP20 PSF/Gn 380/480) for terminals.		
Standards		EN 60255-6, EN 60255-27, EN 61000-6-2, EN 61000-6-4		
	Insulation Class: Ensure any external circuits connected to the relay are provided with double or reinforced insulation.			

### Operation

The unit obtains its power supply from the supply being

monitored. The green  LED lights to show when this supply is present on at least one phase.

Under normal conditions, with all phases present at nominal levels (above U<sub>min</sub>), balanced and connected in the correct sequence (L1, L2, L3), the red LED will be off and the relay will be energised.



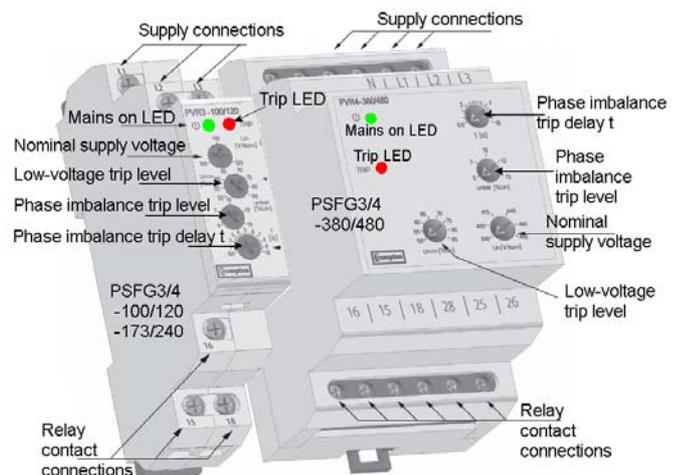
The time delay and differential trip levels help to prevent relay chatter as the monitored parameter fluctuates.

As the relay has changeover contacts, the relay outputs can be inverted by wiring to the alternative terminals 15-16 or 25-26.

When a trip occurs, the red LED lights and the relay De-energises. A trip will occur if:

- a supply phase falls below a set minimum value U<sub>min</sub> or goes above a maximum limit U<sub>off</sub>.
- a phase is lost,
- one phase voltage differs from the others by more than the percentage set by the imbalance trip level control. This trip will be delayed by the time t set by the front panel control, OR
- If the supply phases are connected in the wrong sequence, e.g. L1, L3, L2.

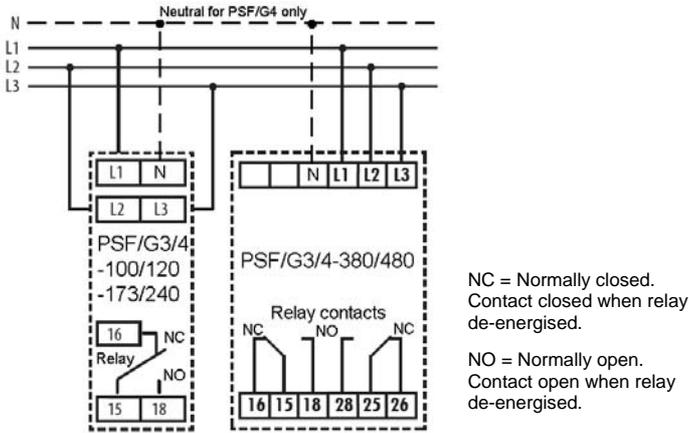
After the cause of a trip has been removed, there will be a short, fixed delay t<sub>1</sub> before a reset occurs, the relay energises again and the red LED goes off. Following a low voltage trip, the reset does not occur until the voltage exceeds U<sub>min</sub> plus a differential. The red Trip LED flashes during any delay period.



## Installation

The unit is intended for mounting on a standard DIN rail. Hook the unit onto the top of the rail and press the bottom of the unit until it locks in place. To remove the unit from the rail, lever down the black tab at the bottom of the unit to release it from the rail.

The unit is intended for use in a reasonably stable ambient temperature within the range -20 to +55°C. Do not mount the unit where there is excessive vibration or in excessive direct sunlight.



- During normal operation, voltages hazardous to life may be present at some of the terminals of this unit. Installation and servicing should be performed only by qualified, properly trained personnel abiding by local regulations. Ensure all supplies are de-energised before attempting connection or other procedures.
- It is recommended adjustments be made with the supplies de-energised, but if this is not possible, then extreme caution should be exercised.
- Terminals should not be user accessible after installation and external installation provisions must be sufficient to prevent hazards under fault conditions.
- This unit is not intended to function as part of a system providing the sole means of fault protection - good engineering practice dictates that any critical function be protected by at least two independent and diverse means.
- The unit does not have internal fuses therefore external fuses must be used for protection and safety under fault conditions.
- If this equipment is used in a manner not specified by the manufacturer, protection provided by the equipment may be impaired.

## Safety

The unit was designed in accordance with BS EN 60255-6 and -27 – Permanently connected use, Normal condition. Insulation category III, pollution degree 2, basic insulation for rated voltage. Measurement Category III.

## EMC Installation Requirements

This unit has been designed to provide protection against EM (electro-magnetic) interference in line, in accordance with BS EN 61000-6-2 and -6-4. Precautions necessary to provide

All of the above information, including drawings, illustrations and graphic designs, reflects our present understanding and is to the best of our knowledge and belief correct and reliable. Users, however, should independently evaluate the suitability of each product for the desired application. Under no circumstances does this constitute an assurance of any particular quality or performance. Such an assurance is only provided in the context of our product specifications or explicit contractual arrangements. Our liability for these products is set forth in our standard terms and conditions of sale.

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proper operation of this and adjacent equipment will be installation dependent and so the following can only be general guidance:

- Avoid routing wiring to this unit alongside cables and products that are, or could be, a source of interference.
- To protect the product against incorrect operation or permanent damage, surge transients must be controlled. It is good EMC practice to suppress differential surges to 2kV or less at the source. The unit has been designed to automatically recover from typical transients, however in extreme circumstances it may be necessary to temporarily disconnect the auxiliary supply for a period of greater than 5 seconds to restore correct operation.
- Screened communication leads are recommended and may be required. These and other connecting leads may require the fitting of RF suppression components, such as ferrite absorbers, line filters etc., if RF fields cause problems.
- It is good practice to install sensitive electronic instruments that are performing critical functions in EMC enclosures that protect against electrical interference causing a disturbance in function.

## Wiring

All connections are made to screw clamp terminals. Terminals are suitable for copper wires only and will accept one stranded 0.05 - 2.5mm<sup>2</sup> (30 - 12 AWG) stranded or solid core cables. Terminal screws should be tightened to 0.5 Nm. Choice of cable should meet local regulations.

Instrument transformers used for connection to the meter must be of approved type, compliant with ANSI/IEEE C57.13 / IEC 60044-1 to provide isolation from measuring inputs.

For UL approved installation, use National Electrical Code (NEC) Class 1 wiring, rated at 600V 60°C min rating.

## Fusing

A suitable switch or circuit breaker conforming to the relevant parts of IEC 60947-1 and IEC 60947-3 should be included in the building installation. It should be positioned so as to be easy to operate, in close proximity to the equipment, and clearly identified as the disconnecting device.

This unit must be fitted with external fuses in voltage supply lines. Lines must be fused with a quick blow fuse 1A maximum. Choose fuses of a type and with a breaking capacity appropriate to the supply and in accordance with local regulations.

For UL approved installations:

UL listed branch circuit fuses, suitable for the installation voltage, shall be provided and installed in accordance with national installation code – 1A fast acting AC rated at the inputs.

## Maintenance

In normal use, little or no maintenance is needed. Where used, ensure any CT secondary circuits are short circuited prior to carrying out installation or maintenance of the unit. As appropriate for service conditions, isolate electrical power, inspect the unit and remove any dust or other foreign material present. Periodically check all connections for freedom from corrosion and screw tightness, particularly if vibration is present.