

# DPB02CM44 - PPB02CM44



## True RMS 3-Phase voltage monitoring relay



### Benefits

- **Wide input voltage range and frequency.** Very wide input voltage range: from 208Vac to 480Vac  $\pm 15\%$  (177Vac to 552Vac), up to 400Hz mains.
- **Adjustable voltage ranges and asymmetry level.** 8 voltage ranges can be selected by front DIP Switches. Asymmetry trip level can be adjusted from 2% to 22%.
- **Switch mode power supply.** Very low consumption, heat and dissipation. Control circuit power supply is filtered and therefore immune to mains disturbances, noise and harmonics.
- **Output LED indication.** A yellow LED provides visual indication of the output status.
- **Relay contact output.** A relay contact provides electrical (remote) indication of the alarms/output status.
- **Enclosure versatility.** DPB02 features 22.5mm standard DIN enclosure. PPB02 is the Plug-In version, suitable for Undecal socket.

### Description

xPB02CM44 relays are threephase mains monitoring devices.

They can operate on both 3Ph and 3Ph+N mains detecting, besides the phase loss and the correct phase sequence, possible phase values asymmetries.

Power supply is provided by the monitored mains, is wide input range and switch mode.

Consumption, dissipation and consequently heat are very limited.

A delay on alarm, up to 30s, for asymmetry alarm, filters unwanted trippings for temporary conditions. Operating frequency is up to 400Hz.

### Applications

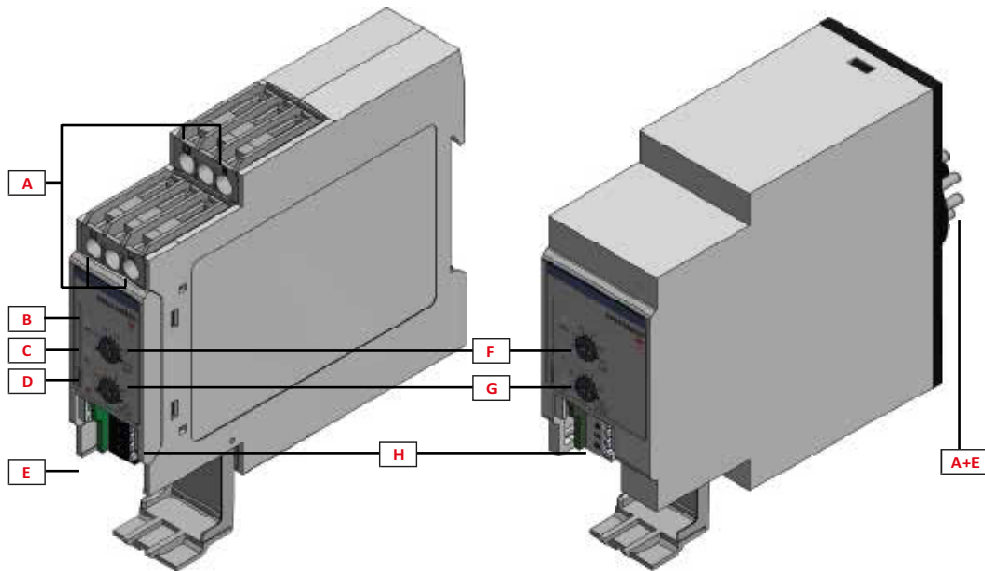
DPB/PPB02CM44 are suitable for applications where it is necessary to monitor, besides the phase presence and correct phase sequence of threephase mains, also that the difference of the three phases voltages is within a certain limit. Motors lifetime is significantly shortened by high supply asymmetry values. Applications such as HVAC, pumping and compressors will benefit. This device can also be used in airport and aircraft applications due to 400Hz max. operating frequency.

### Main functions

- 3Ph or 3Ph+N monitoring
- From 208V to 480V @50 to 400Hz, nominal voltage and frequency
- Adjustable asymmetry and delay on alarm

- Phase sequence and phase loss alarm
- 8A SPDT relay output

**Structure**



Element	Component	Function
A	Input/supply terminals	DIN rail mounting: L1, L2, L3 and N (when necessary), double cage clamp terminals Plug-in mounting: 5, 6, 7, 11
B	Output status LED	Yellow, ON when output active (No Alarm)
C	Alarm LED "AL"	5Hz RED flashes during phase loss, wrong phase sequence. Blinking slow (2Hz) when asymmetry is triggered but delay is elapsing, RED steady ON when delay elapsed.
D	Power ON LED	GREEN, lit when device supplied on at least two input lines
E	Output terminals	Output relay contacts terminals DPB02: 15 COM, 16, NC*, 18 NO* PPB02: 1COM, 4 NC*, 3 NO* * when power supply not applied.
F	Asymmetry setting	Asymmetry setting dial, range from 2% to 22%
G	Delay on alarm	Delay on alarm setting dial. Delay from 0.1s to 30s
H	DIP switches	See fig. 1 (DIP switch settings table)

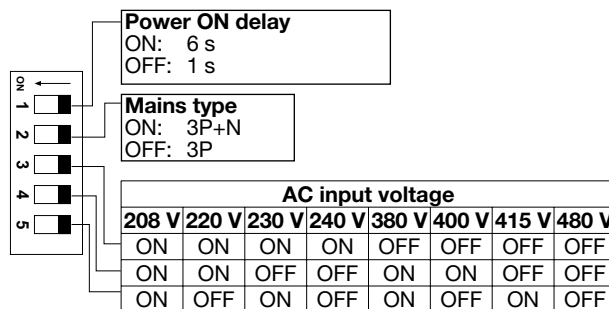
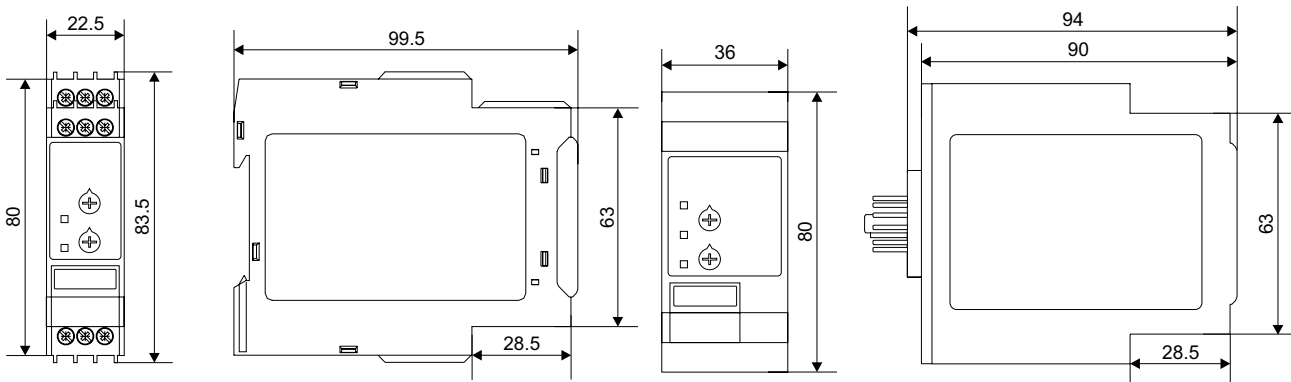


Fig. 1 DIP switch settings table

# Features

## General

<b>Material</b>	PA66 or Noryl
<b>Colour</b>	RAL7035 (light grey)
<b>Dimensions d x h x w</b>	DPB02: 99.5mm x 80mm x 22.5mm (3.92" x 3.15" x 0.886") PPB02: 94mm x 80mm x 36mm (3.7" x 3.15" x 1.42")
<b>Protection degree</b>	IP20
<b>Weight</b>	150 g (5.29oz)
<b>Terminals</b>	Cable size from 0.05mm <sup>2</sup> to 2.5mm <sup>2</sup> (AWG30 to AWG13), stranded or solid
<b>Tightening torque</b>	Max. 0.5Nm (4.425lb.in)
<b>Terminal type</b>	Double cage screw terminals (DPB02), Undecal Plug-in terminals (PPB02)



## Power supply

<b>Power supply</b>	Voltage range: 208Vac to 480Vac $\pm$ 15% (177V to 552V) Supplied from measured phases Frequency range: 50Hz to 400Hz $\pm$ 10% sinusoidal waveform
<b>Consumption</b>	< 2.5 VA
<b>Supply technology</b>	Switch mode supply from all 3 phases
<b>Power-ON delay</b>	Alarms are inhibited for the set time at power ON

## Environmental

<b>Working temperature</b>	-20° C to 60° C (-4° F to 140° F)
<b>Storage temperature</b>	-30° C to 80° C (-22° F to 176° F)
<b>Relative humidity</b>	5-95% non condensing
<b>Pollution degree</b>	2
<b>Operating max altitude</b>	2000 m amsl ( 6560ft )
<b>Salinity</b>	No saline environment
<b>UV resistance</b>	No





**Vibration/Shock resistance**

Test condition	Test	Level
Tests with unpacked device	Vibration response (IEC60255-21-1)	Class 1
	Vibration endurance (IEC 60255-21-1)	Class 1
	Shock (IEC 60255-21-2)	Class 1
	Bump (IEC 60255-21-2)	Class 1
Tests with packed device	Vibration random (IEC60068-2-64)	Class 1
	Shock (IEC 60255-21-2)	Class 1
	Bump (IEC 60255-21-2)	Class 1

Class 1: Monitoring devices for normal use in power plants, substations and industrial plants and for normal transportation conditions.

The packaging type is designed and implemented in such manner that the severity class parameters will not be exceeded during transportation.

**Compatibility and conformity**

<b>CE-marking</b>	According to EN 60947-5-1. Complies to European LV directive 2014/35/EU and EMC directive 2014/30/EU: Immunity according to EN61000-6-2; Emissions according to EN61000-6-3
<b>Approvals</b>	 UL508, CSA Standard C22.2 

**Inputs**

Measuring ranges	
<b>Measured variables</b>	Voltage PH-PH measurement on L1, L2 and L3 lines Phase sequence Phase loss

Voltage measurement	
<b>Typology</b>	PH-PH voltage measurement on L1, L2 and L3 lines
<b>Nominal line range</b>	From 208Vac to 480Vac ±15%
<b>Setting ranges (Un)</b>	208V, 220V, 230V, 240V, 380V, 400, 415, 480V

Asymmetry alarm	
<b>Input variables</b>	Voltage measurements L1-L2, L2-L3, L1-L3
<b>Reaction time</b>	≤ 200ms + set delay ON alarm
<b>Asymmetry setting range</b>	from 2% to 22%
<b>Repeatability</b>	0.5% reading
<b>Hysteresis</b>	Setpoint between 2% and 5% = Hys 1% Setpoint between 5% and 22% = Hys 2%
<b>Delay ON</b>	Adjustable from 0.1s to 30s Accuracy: absolute form ±50ms at 0.1s to ±5s at 30s Repeatability: absolute form ±10ms at 0.1s to ±1 at 30s
<b>Delay OFF</b>	None



Phase loss alarm	
Input variables	Voltage measurements L1-L2, L2-L3 and L1-L3
Alarm Threshold	≤70% of the least one compared to rated value
Restore threshold	>70% of least phase compared to rated value + Hysteresis
Reaction time	≤ 200 ms
Hysteresis	2% fixed
Delay ON	None
Delay OFF	None

Phase sequence alarm	
Input variables	Connection L1, L2, L3
Reaction time	≤ 200 ms
Adjustable range	Not applicable, always active
Delay ON	None
Delay OFF	None

**Outputs**

Number of outputs	1
Type	SPDT electromechanical relay with change-over contacts
Logic	Output de-energized on alarm
Contact rating	<b>AC1:</b> 8 A @ 250 VAC <b>AC15:</b> 2.5 A @ 250 VAC <b>DC12:</b> 5 A @ 24 VDC <b>DC13:</b> 2.5 A @ 24 VDC
Electrical lifetime	10 <sup>5</sup> operations
Mechanical lifetime	>30 x 10 <sup>6</sup> operations
Assignment	Associated to all alarm types

**Insulation**

Terminals	Basic insulation
Inputs: L1,L2,L3,N to Output : 11,12,14	2.5KVrms, 4KV impulse 1.2/50us (basic)



**Operating Description**

**Suitability**

DPB/PPB02CM44 can be used for power supply and mains quality monitoring of threephase motors, or other loads that require balanced threephase voltage, with or without neutral, supply voltage from 208VAC to 480VAC and frequencies from 50 to 400Hz.

**Device configuration**

The relay operates when all the phases are present, the phase sequence is correct and the asymmetry is below the set limit.

The relay releases when alarm goes off.

An asymmetry alarm is triggered when the voltage difference, in percentage, between highest phase value and the lowest one exceeds the set asymmetry level.

The DPB/PPB02CM44 is configurable by trimmers, in order to set asymmetry level and delay on alarm.

Asymmetry adjustment dial	
<b>Typology</b>	Linear selection from +2% to +22%
<b>Resolution</b>	2% / notch
<b>Function</b>	Asymmetry percentage threshold setting alarm

Delay setting dial	
<b>Typology</b>	Logarithmic adjustment from 0.1s to 30s
<b>Resolution</b>	From 100ms/notch at 0.1s to 10s/notch at 30s
<b>Function</b>	Alarm ON Delay setting for asymmetry

DIP switches	
<b>Typology</b>	6 switches DIP Switch (switch number 6 is unused)
<b>Function</b>	- Power ON delay - Grid type - Grid voltage (8 ranges)

**Alarms**

The DPB/PPB02CM44 operates in 2 different modes depending upon the alarm type:

- Phase loss and wrong phase sequence cause immediate (only <200ms delay occur due to device reaction time) output relay de-energisation, yellow LED turns OFF at the same time. Red "AL" flashes fast to display this type of alarm.

- Asymmetry triggering cause output relay and yellow LED to turn OFF at the end of set delay. During the delay elapsing the red "AL" LED blinks slowly and turn steady ON at the end of delay.

**Visual information**

DPB/PPB02CM44 feature 3 front LEDs which provide operation status information.

- LED 1, green, is ON when the power supply is applied.

- LED 2 "AL" provides Alarm Status information: when an asymmetry alarm is triggered, but there is a delay on alarm elapsing, the LED blinks Red at 2Hz during the delay then, if alarm situation still present at the end of delay, it turns steady ON.

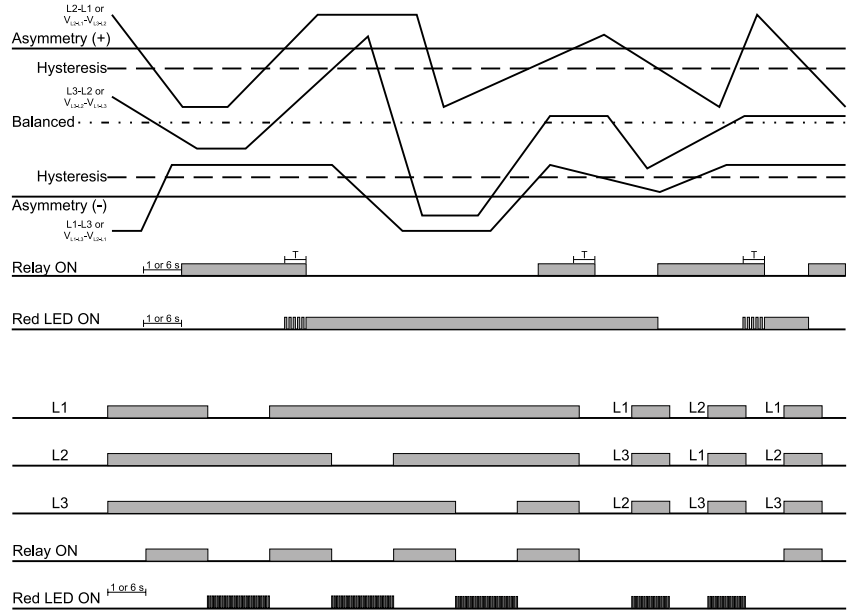
If a phase is lost, the phase sequence is wrong and the LED flashes fast at 5Hz.

- LED 3, yellow, is ON when the output relay is energised.

**Phase loss**

Phase loss measurement is performed by comparing the 3 phases voltages (L1-L2, L2-L3, L3-L1) or phase to neutral (L1-N, L2-N, L3-N) on star grid type. If the voltage of one phase falls below 70% compared to the other 2 phases, the alarm goes off. DPB/PPB02CM44 detects loads regenerated voltage, for instance on motor or transformer loads.

**Operating diagram**



**Connection Diagrams**

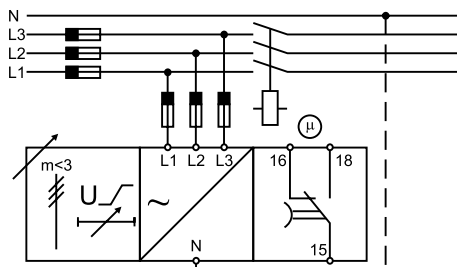


Fig. 2 DPB02 - Example 1

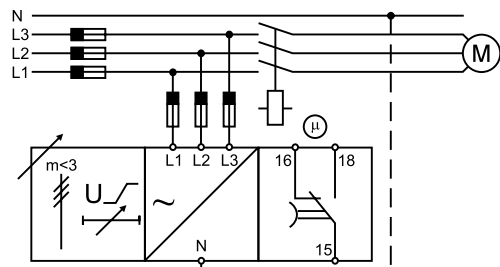


Fig. 3 DPB02 - Example 2

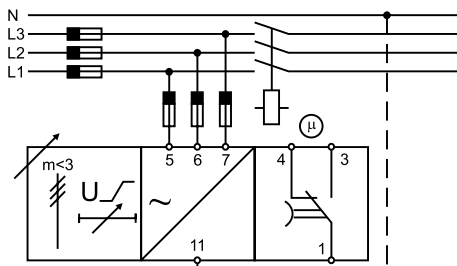


Fig. 4 PPB02 - Example 1

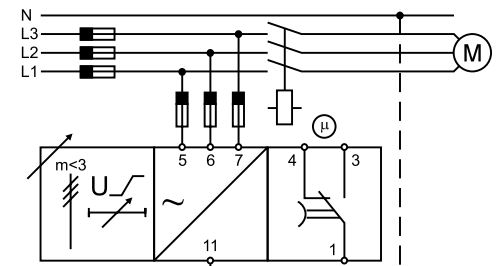


Fig. 5 PPB02 - Example 2