DPB02, PPB02

True RMS 3-Phase voltage monitoring relay



Benefits

- **Wide voltages and frequency ranges**. Working in systems from 208 to 480 VAC and 50 to 400 Hz.
- **Adjustable voltage asymmetry level and time delay**. To allow a correct response to real alarm conditions.
- **Output and status LED indication**. For quick troubleshooting.
- **Two mounting versions**. Available for DIN-rail (DPB02) and Plug-in (PPB02) mounting.
- **Adjustable power ON delay**. To avoid nuisance tripping at start-up.
- **Ultra-high harmonic immunity**. For very noisy environments.

Description

DPB02 and PPB02 are 3-phase mains monitoring relays.

They operate on 3P and 3P+N systems, monitoring phase loss, phase sequence and voltage asymmetry.

Power supply provided by the monitored mains. Delay on alarm, up to 30 s, for asymmetry alarm.

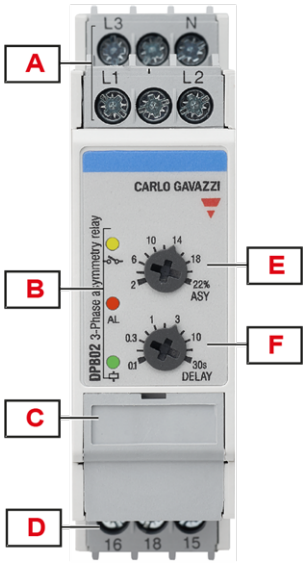
Main features

- Monitoring 3-phase mains with 3 wires (3P) or 4 wires (3P+N).
- Detection of the correct phase sequence and phase loss.
- Front dial adjustable voltage asymmetry setpoint.
- Time delay.
- Changeover relay output.

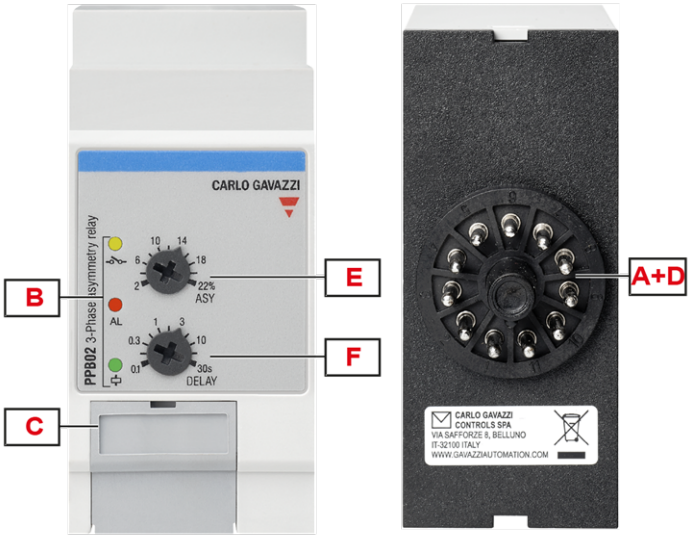
Order code

Mounting	Power supply	Component name/part number
DIN-rail	208 to 240 VAC	**DPB02CM23**
	208 to 480 VAC	**DPB02CM44**
	380 to 480 VAC	**DPB02CM48**
Plug-in	208 to 240 VAC	**PPB02CM23**
	208 to 480 VAC	**PPB02CM44**
	380 to 480 VAC	**PPB02CM48**

Structure



DPB02



PPB02

Element	Component	Function
A	Input terminals	Connection of the line voltages (neutral when present)
B	Information LEDs	Yellow for relay output status Red for signal alarm status Green for device ON
C	DIP switches	Setting the nominal voltage, type of mains, power ON delay
D	Output terminals	SPDT relay output
E	Asymmetry dial	Asymmetry setpoint adjustment
F	Delay time dial	Setting the alarm ON delay time

Features

Power supply

Power supply		Supplied by measured phases (L1, L2, L3)
Overvoltage category		III (IEC 60664)
Voltage range	**DPB02CM23** **PPB02CM23**	208 to 240 V_{L-L} AC ± 15% (177 to 276 V)
	DPB02CM44 **PPB02CM44**	208 to 480 V_{L-L} AC ± 15% (177 to 552 V)
	DPB02CM48 **PPB02CM48**	380 to 480 V_{L-L} AC ± 15% (323 to 552 V)
Frequency range		50 to 60 Hz ± 10% sinusoidal waveform **M44 only:** 50 to 400 Hz ± 10% sinusoidal waveform
Consumption		< 2.5 VA
Power ON delay		1 s ± 0.5 s or 6 s ± 0.5 s

Inputs

Terminals			**DPB02:** L1, L2, L3, N **PPB02:** 5, 6, 7, 11
Measured variables			Phase sequence Phase loss Asymmetry 3P: voltages V_{L12}, V_{L23}, V_{L31} 3P+N: voltages V_{L1N}, V_{L2N}, V_{L3N}
Nominal line range			208 to 480 VAC ± 15% (177 to 550 VAC)
Nominal voltages (*)	**DPB02CM23** **PPB02CM23**	**Delta voltage (3P)**	208 V, 220 V, 230 V, 240 V
		Star voltage (3P+N)	120 V, 127 V, 133 V, 140 V
	DPB02CM44 **PPB02CM44**	**Delta voltage (3P)**	208 V, 220 V, 230 V, 240 V, 380 V, 400 V, 415 V, 480 V
		Star voltage (3P+N)	120 V, 127 V, 133 V, 140 V, 220 V, 230 V, 240 V, 277 V
	DPB02CM48 **PPB02CM48**	**Delta voltage (3P)**	380 V, 400 V, 415 V, 480 V
		Star voltage (3P+N)	220 V, 230 V, 240 V, 277 V

(*) Note: connect the neutral only if it is intrinsically at the star centre.

Outputs

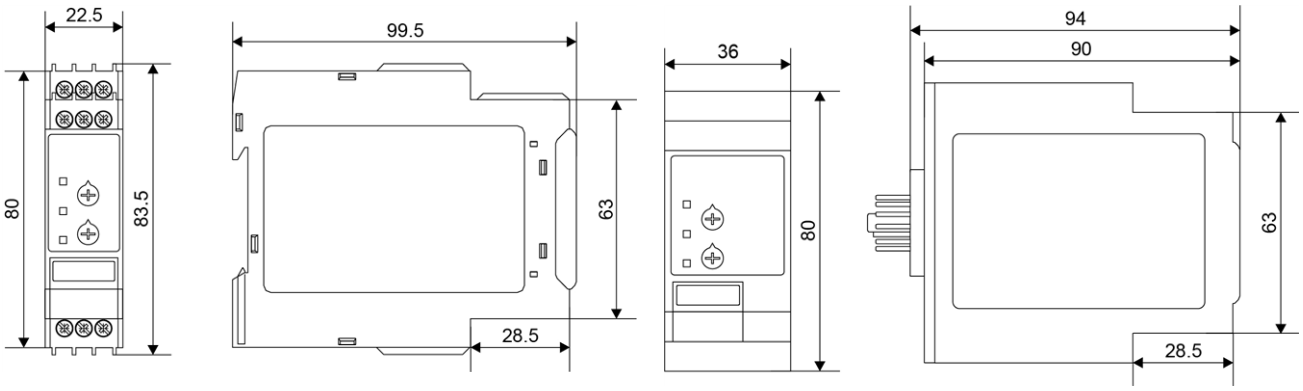
Terminals	**DPB02:** 15, 16, 18 **PPB02:** 1, 3, 4
Number of outputs	1
Type	SPDT electromechanical relay with changeover contacts
Logic	Output de-energised on alarm
Contact rating	**Ith:** 8 A @ 250 VAC **AC15:** 2.5 A @ 250 VAC **DC12:** 5 A @ 24 VDC **DC13:** 2.5 A @ 24 VDC
Electrical lifetime	≥50 x 10^3 operations (at 8 A, 250 V, cos φ= 1)
Mechanical lifetime	>30 x 10^6 operations
Assignment	Associated to all alarm types

Insulation

Terminals	**Basic**
Inputs to output	2.5 kVrms, 4 kV impulse 1.2/50 µs

General

Material	Polyamide (Nylon) (PA66/6) or Phenylene ether + Polystyrene (PPE-PS)
	Flammability rating: HB according to UL 94
Colour	RAL7035 (light grey)
Dimensions (W x H x D)	DPB02: 22.5 x 80 x 99.5 mm (0.89 x 3.15 x 3.92 in) PPB02: 36 x 80 x 94 mm (1.42 x 3.15 x 3.7 in)
Weight	150 g (5.29 oz)
Terminals	Cable size from 0.05 to 2.5 mm^2 (AWG30 to AWG13), stranded or solid
Tightening torque	Max. 0.5 Nm (4.425 lbin)
Terminal type	Double cage screw terminals (DPB02), Undecal Plug-in terminals (PPB02)



DIN-rail **Plug-in**

Environmental

Operating temperature	-20 to 60 °C (-4 to 140 °F)
Storage temperature	-30 to 80 °C (-22 to 176 °F)
Relative humidity	5 - 95% non condensing
Protection degree	IP20
Pollution degree	2
Operating max altitude	2000 m amsl (6560 ft)
Salinity	Non saline environment
UV resistance	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

Marking	CE
Dir-ectives	2014/35/EU (LVD - Low voltage) 2014/30/EU (EMC - Electromagnetic compatibility)
Stand-ards	Insulation coordination: EN 60664-1 Immunity: EN61000-6-2 Emission: EN61000-6-3
Approval-s	c UL us LISTED (UL508, UL61010) c TÜV us (E249822) PPB02 only CCC (GB/T14048.5) DPB02 only

Operating description

DIP switches		
Typology	**DPB02CM44** **PPB02CM44**	6 switches (switch number 6 is unused) (Fig.1)
	DPB02CM23 **PPB02CM23** **DPB02CM48** **PPB02CM48**	4 switches (Fig. 2 and 3)
Function		Power ON delay Mains type Mains voltage (M44: 8 ranges; M23 and M48: 4 ranges)

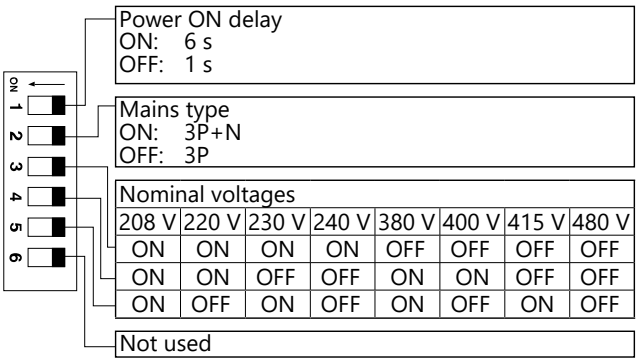


Fig. 1 *DIP switch settings table M44*

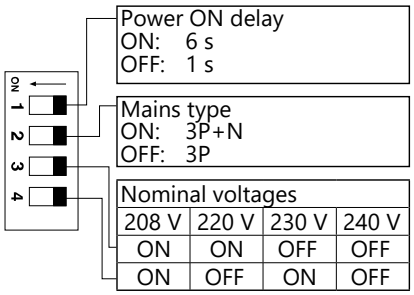


Fig. 2 *DIP switch settings table M23*

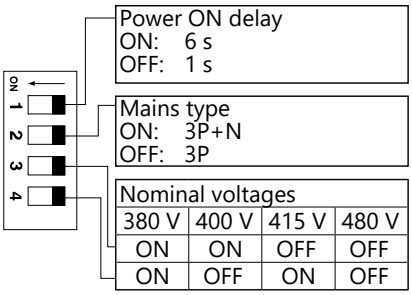


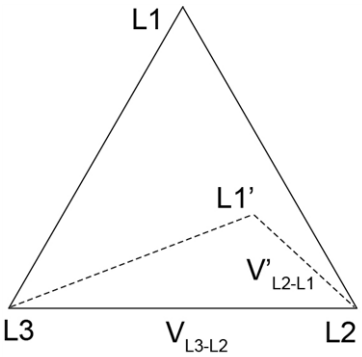
Fig. 3 *DIP switch settings table M48*

Device configuration

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

Asymmetry is an indicator of the mains quality and it is defined as the absolute value of the maximum deviation among the mains voltages, divided by the nominal voltage of the 3-phase system. The definition changes according to the voltage reference:

Main type	Voltage asymmetry (%)
3P	$\frac{\max \lvert\Delta V_{ph\text{-}ph}\rvert}{V_{\Delta NOM}} \times 100$
3P+N	$\frac{\max \lvert\Delta V_{ph\text{-}n}\rvert}{V_{\curlywedge NOM}} \times 100$

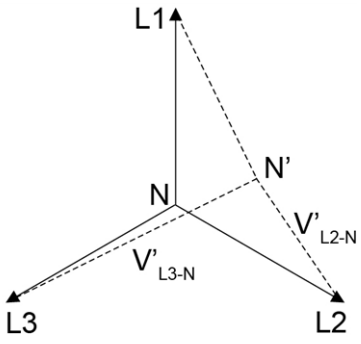


$V_{\Delta NOM} = V_{L1\text{-}L3} = V_{L2\text{-}L1} = V_{L3\text{-}L2}$

$\max |\Delta V_{PH\text{-}PH}| = |V_{L3\text{-}L2} - V'_{L2\text{-}L1}|$

$\max |\Delta V_{PH\text{-}PH}| = 0 \Rightarrow ASY = 0$

Phase-phase monitoring



$V_{\curlywedge NOM} = V_{L1\text{-}N} = V_{L2\text{-}N} = V_{L3\text{-}N}$

$\max |\Delta V_{PH\text{-}N}| = |V'_{L3\text{-}N} - V'_{L2\text{-}N}|$

$\max |\Delta V_{PH\text{-}N}| = 0 \Rightarrow ASY = 0$

Phase-neutral monitoring

Asymmetry adjustment dial	
Typology	Linear selection from 2 to 22%
Resolution	2% setpoint increase per notch
Function	Asymmetry setpoint

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

Alarms

DPB02 and PPB02 operate in 2 different modes depending upon the alarm type:

- Phase loss and incorrect phase sequence cause immediate output relay de-energisation.
- Asymmetry triggering causes output relay to turn OFF at the end of set delay.

Phase loss alarm	
Input variables	L1-L2, L2-L3 and L3-L1
Alarm setpoint	One phase ≤ 70% of the rated value (regenerated voltage detection)
Restore setpoint	All phases > 70% of the 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
Delay ON	None
Delay OFF	None

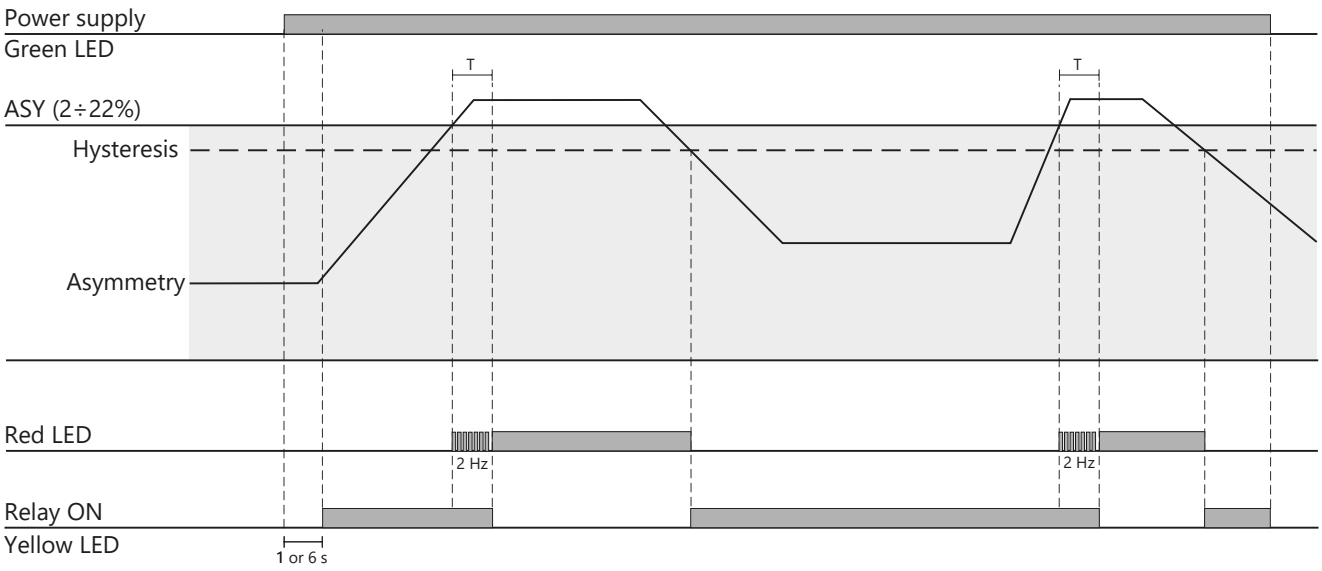
Asymmetry alarm	
Input variables	3P: voltages V_{L12}, V_{L23}, V_{L31} 3P+N: voltages V_{L1N}, V_{L2N}, V_{L3N}
Reaction time	≤ 200 ms + set delay ON alarm
Asymmetry setting range	From 2 to 22%
Repeatability	1% reading + 1 V
Hysteresis	Setpoint between 2% and 5% → Hys 1% Setpoint between 5% and 22% → Hys 2%

Asymmetry alarm	
Delay ON	Adjustable: from 0.1 to 30 s Accuracy: from ± 50 ms at 0.1 s to ± 5 s at 30 s Repeatability: from ± 10 ms at 0.1 s to ± 1 s at 30 s
Delay OFF	None

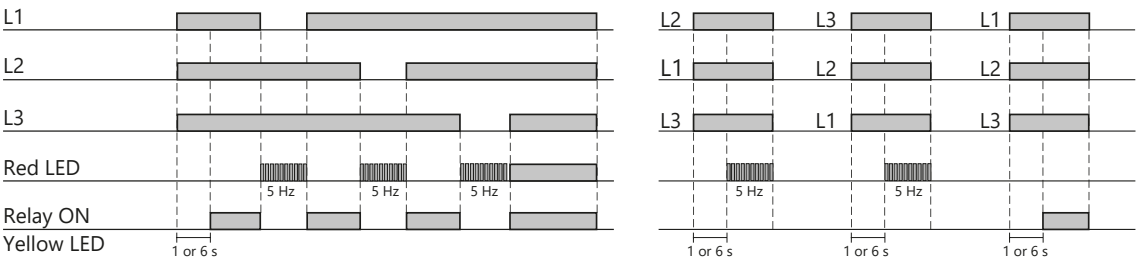
Information LEDs

Colour	Status		Description
Green (⏚)	Power supply	ON	Power supply ON
		OFF	Power supply OFF
Red (AL)	Alarm	ON (steady)	Alarm situation is still present at the end of delay
		OFF	Alarm OFF
		Flashing 2 Hz	Asymmetry alarm triggered with a delay on alarm elapsing
		Flashing 5 Hz	Phase loss or incorrect phase sequence alarm
Yellow (⊸)	Relay output	ON	Energised
		OFF	De-energised

Operating diagram



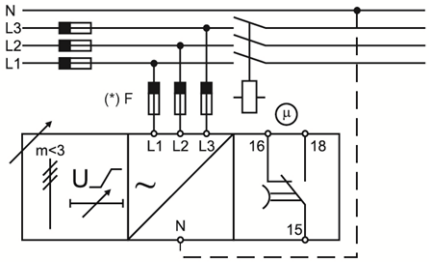
Asymmetry monitoring



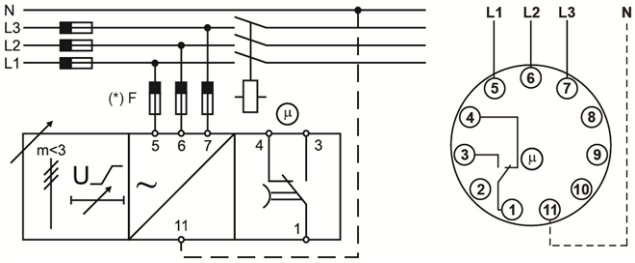
Total phase loss, phase sequence

Connection diagrams

(*) NOTE: fuses F of 315 mA delayed, if required by local law.



DPB01



PPB01

References

Further reading

Information	Where to find it	QR code
Installation manual	https://www.gavazziautomation.com/images/PIM/MANUALS/ENG/XPB02_IM.pdf	
	https://www.gavazziautomation.com/images/PIM/MANUALS/ENG/XPB02CM44_IM.pdf	
PSS selection tool	https://carlogavazzi-pss.com/	

COPYRIGHT ©2026
Content subject to change. Download the PDF: www.gavazziautomation.com