DPB01, PPB01

True RMS 3-Phase voltage monitoring relay

Benefits

- **Wide voltages and frequency ranges.** Working in systems from 208 to 480 VAC and 50 to 400Hz.
- **Adjustable voltage levels 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 (DPB01) and Plug-in (PPB01) mounting.
- **Adjustable power ON delay.** To avoid nuisance tripping at start-up.
- **Ultra-high harmonic immunity.** For very noisy environments.

Description

DPB01 and PPB01 are 3-phase mains monitoring relays.
They operate on 3P and 3P+N systems, monitoring phase loss and phase sequence (not present in versions with "N" ending), overvoltage and undervoltage.
Power supply provided by the monitored mains.
Delay on alarm, up to 30s, for over/under voltage alarms.

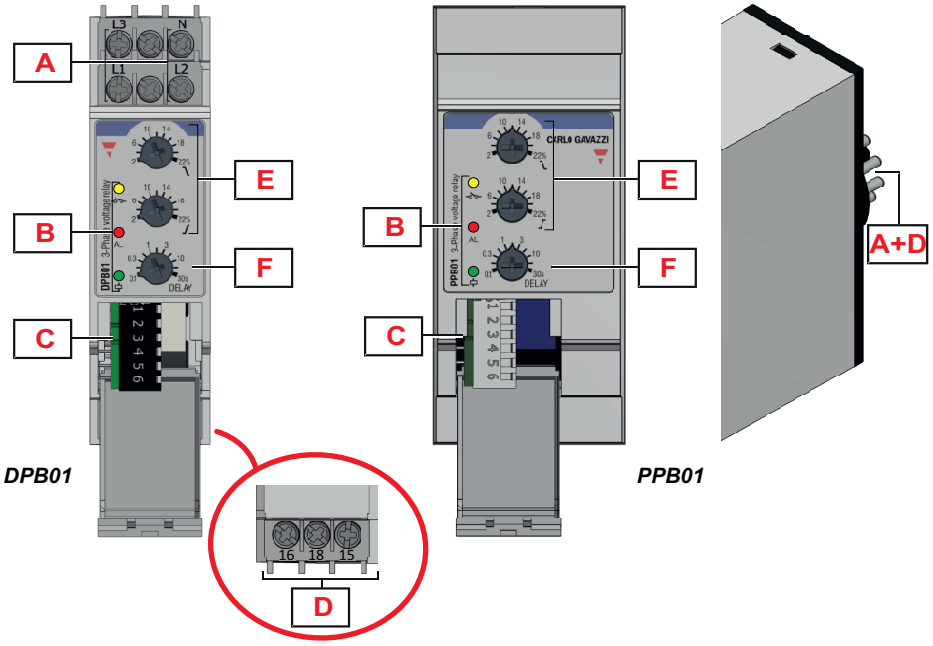
Applications

DPB01 and PPB01 offer solutions for a wide range of applications: lifts, escalators, HVAC, material handling, pumps, compressors and mobile machinery installations.

Main features

- Monitoring 3-phase mains with 3 wires (3P) or 4 wires (3P+N).
- Detection of the correct phase sequence (not present in versions with "N" ending) and phase loss.
- Front dial adjustable overvoltage and undevoltage setpoints.
- Time delay.
- Changeover relay output.

Structure

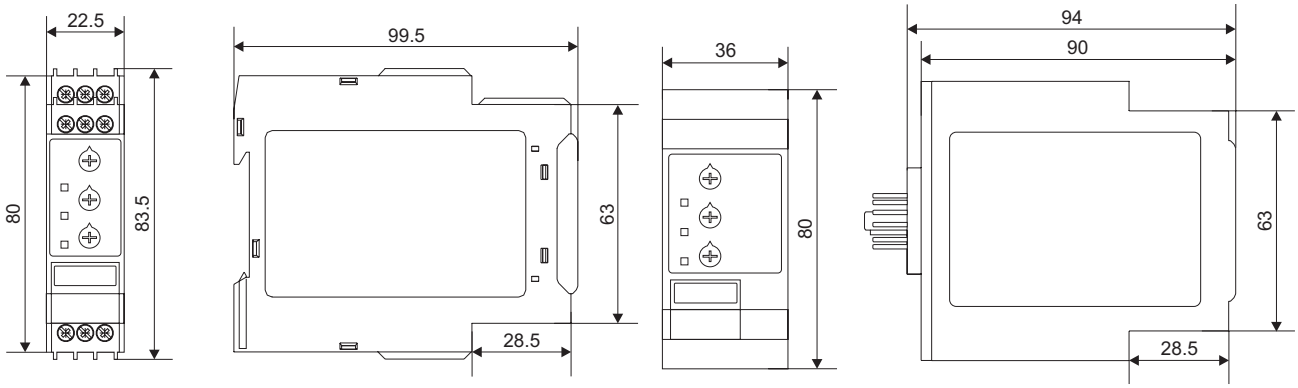


Element	Component	Function
A	Input terminals	Connection of the line voltages (neutral when present)
B	Information LED	Yellow for relay output status Red to signal alarm status Green for device ON
C	DIP-switches	Setting the nominal voltage, type of mains, power ON delay
D	Output terminals	SPDT relay output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

Features

General

Material	Polyamide (Nylon) or Phenylene ether + Polystyrene
Colour	RAL7035 (light grey)
Dimensions (W x H x D)	DPB01: 22.5mm x 80mm x 99.5mm PPB01: 36mm x 80mm x 94mm
Protection degree	IP20
Weight	150 g (5.29oz)
Terminals	Cable size from 0.05mm² to 2.5mm² (AWG30 to AWG13), stranded or solid
Tightening torque	Max. 0.5Nm (4.425lb.in)
Terminal type	Double cage screw terminals (DPB01), Undecal Plug-in terminals (PPB01)



Power supply

Power supply		Supplied by measured phases
Overvoltage category		III (IEC 60664)
Voltage range	M23, M23N	208 to 240 V_{L-L} AC ±15% (177V to 276V)
	M44	208 to 480 V_{L-L} AC ±15% (177V to 552V)
	M48W4, M48NW4, PPB01CM48, PPB01CM48N	380 to 415 V_{L-L} AC ±15% (323V to 477V)
	M48, M48N	380 to 480 V_{L-L} AC ±15% (323V to 552V)
Frequency range		50Hz to 60Hz ±10% sinusoidal waveform **M44** only: 50Hz to 400Hz ±10% sinusoidal waveform
Consumption		< 2.5 VA
Power ON delay		1 s ± 0.5 s or 6 s ± 0.5 s

Environmental

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

CE-marking	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
Approvals	(UL508, UL61010) (GB/T14048.5) DPB01 only

Inputs

Measuring ranges		
Measured variables		Phase sequence (except for N versions) Phase loss 3P: voltages V_{L12}, V_{L23}, V_{L31} 3P+N: voltages V_{L1N}, V_{L2N}, V_{L3N}
Nominal line range		208 VAC to 480 VAC ±15% (177 VAC to 550 VAC)
Nominal voltages (*)	M23	3P: 208V, 220V, 230V, 240V (delta voltage) 3P+N: 120V, 127V, 133V, 140V (star voltage)
	M44	3P: 208V, 220V, 230V, 240V, 380V, 400V, 415V, 480V (delta voltage) 3P+N: 120V, 127V, 133V, 140V, 220V, 230V, 240V, 277V (star voltage)
	M48	3P: 380V, 400V, 415V, 480V (DPB01CM48, DPB01CM48N only) (delta voltage) 3P+N: 220V, 230V, 240V, 277V (DPB01CM48, DPB01CM48N only) (star voltage)

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

Outputs

Number of outputs	1
Type	SPDT electromechanical relay with change-over contacts
Logic	Output de-energized on alarm
Contact rating	**AC1**: 8 A @ 250 VAC **AC15**: 2.5 A @ 250 VAC **DC12**: 5 A @ 24 VDC **DC13**: 2.5 A @ 24 VDC
Electrical lifetime	≥50 x10^3 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 insulation
Inputs: L1, L2, L3, N (DPB01) / 5, 6, 7, 11 (PPB01) to Output: 15, 16, 18 (DPB01) / 1, 3, 4 (PPB01)	2.5kVrms, 4kV impulse 1.2/50µs (basic)

Operating description

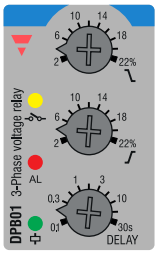
Device configuration

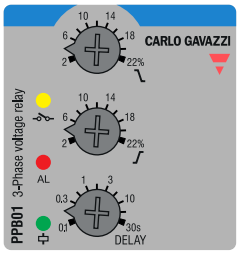
The relay operates when all the phases are present, the phase sequence is correct (not present in versions with N ending) and the phase-phase voltage levels are within set limits.
The relay releases when one or more phase-phase voltages exceeds the upper set level or drops below the lower set level.

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

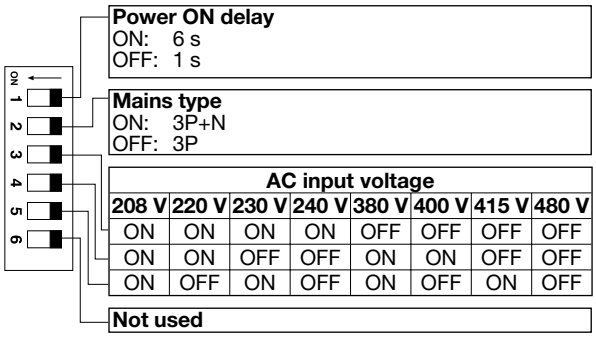
Overvoltage adjustment dial	
Typology	Linear selection from 2% to 22%
Resolution	2% setpoint increase per notch
Function	Relative overvoltage setpoint

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



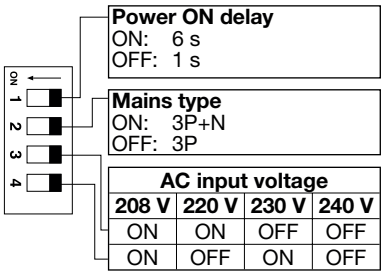


DIP-switches		
Typology	M44	6 switches (switch number 6 is unused) (Fig.1)
	M23, M48	4 switches (Fig. 2 and 3)
Function		- Power ON delay - Mains type - Mains voltage (M44: 8 ranges; M23 and M48: 4 ranges)



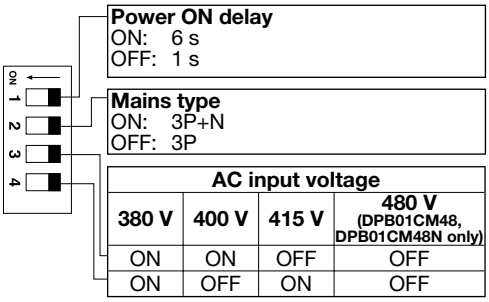
AC input voltage							
208 V	**220 V**	**230 V**	**240 V**	**380 V**	**400 V**	**415 V**	**480 V**
ON	ON	ON	ON	OFF	OFF	OFF	OFF
ON	ON	OFF	OFF	ON	ON	OFF	OFF
ON	OFF	ON	OFF	ON	OFF	ON	OFF

Fig. 1 *DIP switch settings table M44*



AC input voltage			
208 V	**220 V**	**230 V**	**240 V**
ON	ON	OFF	OFF
ON	OFF	ON	OFF

Fig. 2 *DIP switch settings table M23*



AC input voltage			
380 V	**400 V**	**415 V**	**480 V** (DPB01CM48, DPB01CM48N only)
ON	ON	OFF	OFF
ON	OFF	ON	OFF

Fig. 3 *DIP switch settings table M48*

► Alarms

DPB01 and PPB01 operate in 2 different modes depending upon the alarm type:
- Phase loss and incorrect phase sequence cause immediate output relay de-energisation.
- Under or over voltage triggering cause output relay to turn OFF at the end of set delay.

Over / under voltage alarms	
Input variables	3P: voltages V_{L12}, V_{L23}, V_{L31} 3P+N: voltages V_{L1N}, V_{L2N}, V_{L3N}
Reaction time	≤ 200ms + set delay ON alarm
Undervoltage setting range	From -2% to -22%
Overvoltage setting range	From 2% to 22%
Repeatability	0.5% reading
Hysteresis	Setpoint between 2% and 5% → Hys 1% Setpoint between 5% and 22% → Hys 2%
Delay ON	Adjustable from 0.1s to 30s Accuracy: from ±50ms at 0.1s to ±5s at 30s Repeatability: from ±10ms at 0.1s to ±1 at 30s
Delay OFF	None

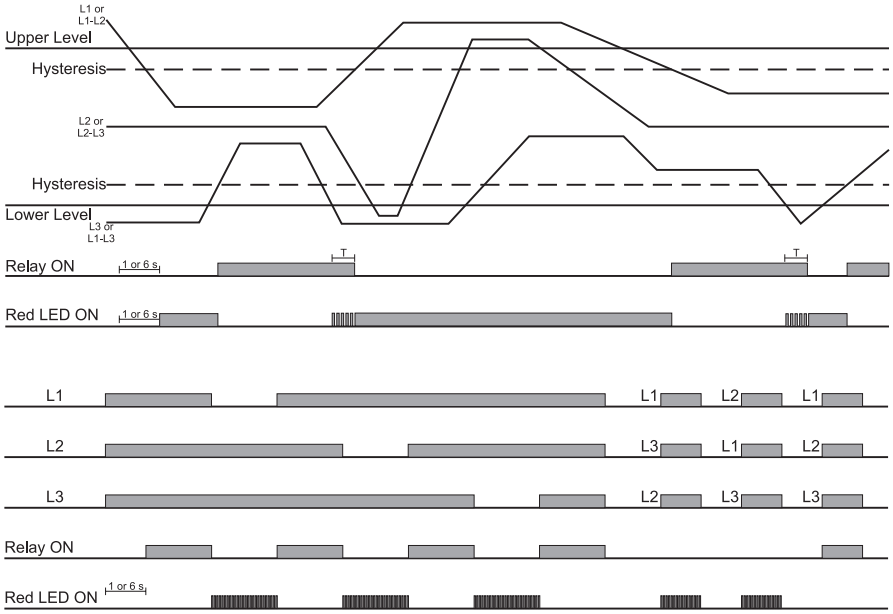
Phase loss alarm	
Input variables	Voltage measurements L1-L2, L2-L3 and L3-L1
Alarm setpoint	One phase ≤85% of the rated value (regeneration voltage detection)
Restore setpoint	All phases >85% of the rated value + Hysteresis
Reaction time	≤ 200 ms
Hysteresis	2% fixed
Delay ON	None
Delay OFF	None

Phase sequence alarm	
Input variables	Connection L1, L2, L3
Reaction time	≤ 200 ms
Delay ON	None
Delay OFF	None

► Visual information

DPB01 and PPB01 feature 3 front LEDs which provide operation status information.
- Green LED is ON when the power supply is present.
- Red "AL" LED provides alarm status information: when an over or under voltage alarm is triggered, and there is a delay on alarm elapsing, the LED blinks at 2Hz during the delay. If the alarm situation is still present at the end of delay, the LED turns steady ON.
If a phase is lost or the phase sequence is incorrect, the LED flashes fast at 5Hz.
- Yellow LED is ON when the output relay is energised.

Operating diagram



Connection Diagrams

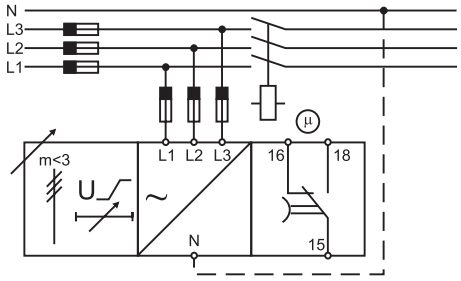


Fig. 4 *DPB01 - Example 1*

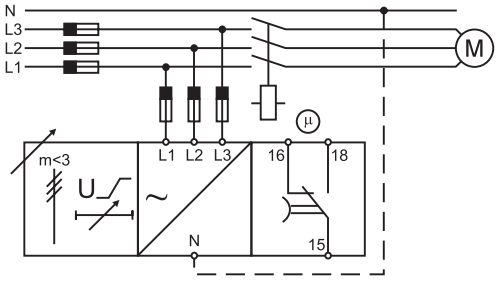


Fig. 5 *DPB01 - Example 2*

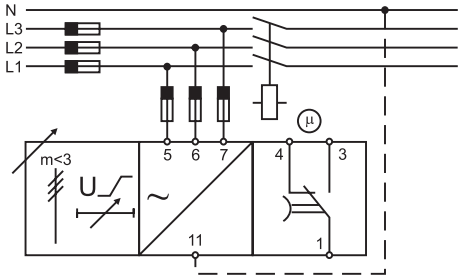


Fig. 6 *PPB01 - Example 1*

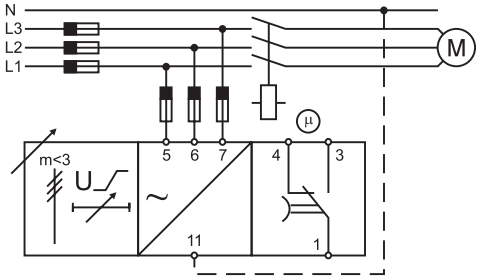


Fig. 7 *PPB01 - Example 2*

References

Order code

☐PB01C☐☐☐

Complete the code entering the corresponding option instead of ☐

Code	Option	Description
☐	D	DIN rail housing
	P	Plug-in housing
P	-	3-phase voltage
B	-	Extended functions
01	-	Item number
C	-	SPDT relay output
☐	M23	Power supply
	M44	
	M48	
☐	-	
	N	No phase sequence detection (with M23 and M48)
☐	-	
	W4	4 wires (with M23 and M48)

Component name/part number	Mounting	Frequency	Power supply
DPB01CM23	DIN rail housing	50 - 60 Hz	208 to 240 VAC
DPB01CM23N	DIN rail housing	50 - 400 Hz	208 to 240 VAC
PPB01CM23	Plug-in housing	50 - 60 Hz	208 to 240 VAC
PPB01CM23N	Plug-in housing	50 - 60 Hz	208 to 240 VAC
DPB01CM44	DIN rail housing	50 - 400 Hz	208 to 480 VAC
PPB01CM44	Plug-in housing	50 - 400 Hz	208 to 480 VAC
DPB01CM48W4	DIN rail housing	50 - 60 Hz	380 to 415 VAC
DPB01CM48NW4	DIN rail housing	50 - 60 Hz	380 to 480 VAC
PPB01CM48	Plug-in housing	50 - 60 Hz	380 to 415 VAC
PPB01CM48N	Plug-in housing	50 - 60 Hz	380 to 415 VAC
PPB01CM48W4	Plug-in housing	50 - 60 Hz	380 to 415 VAC
PPB01CM48NW4	Plug-in housing	50 - 60 Hz	380 to 415 VAC
DPB01CM48	DIN rail housing	50 - 60 Hz	380 to 480 VAC
DPB01CM48N	DIN rail housing	50 - 60 Hz	380 to 480 VAC