Monitoring Relays
True RMS 3-Phase, 3-Phase+N, Multifunction
Types DPC01, PPC01

CARLO GAVAZZI


DPC01


PPC01

- **TRMS 3-phase over and under voltage, phase sequence, phase loss and asymmetry monitoring relay**
- **Detect when all 3 phases are present and have the correct sequence**
- **Detect if all the 3-phase-phase or phase-neutral voltages are within the set limits**
- **Detect if asymmetry is below set value**
- **Separately adjustable setpoints**
- **Separately adjustable delay functions (0.1 to 30 s)**
- **Output: 2 x 8 A relay SPDT NE**
- **For mounting on DIN-rail in accordance with DIN/EN 50 022 (DPC01) or plug-in module (PPC01)**
- **45 mm Euronorm housing (DPC01) or 36 mm plug-in module (PPC01)**
- **LED indication for relays, alarm and power supply ON**

Product Description

3-phase or 3-phase+neutral line voltage monitoring relay for phase sequence, phase loss, asymmetry, over and under voltage (separately adjustable set points) with built-in time delay function.

Supply ranges from 208 to 690 VAC covered by three multivoltage relays (ranges over 415 VAC only on the DIN-rail housing).

Ordering key

DPC 01 D M48

Housing
Function
Type
Item number
Output
Power Supply

Type Selection

Mounting	Output	Frequency	208 to 240 VAC	380 to 415 VAC	380 to 480 VAC	600 to 690 VAC
DIN-rail	2 x SPDT	50 - 60 Hz	**DPC 01 D M23**		**DPC 01 D M48**	**DPC 01 D M69**
DIN-rail	2 x SPDT	50 - 400 Hz	**DPC 01 D M23 400HZ**	**DPC 01 D M48 400HZ**		**DPC 01 D M69 440HZ**
Plug-in	2 x SPDT	50 - 60 Hz	**PPC 01 D M23**	**PPC 01 D M48**		

Input Specifications

Input		
L1, L2, L3, N	DPC01:	Terminals L1, L2, L3, N
	PPC01:	Terminals 5, 6, 7, 11 Measure on own supply
Note: Connect the neutral only if it is intrinsically at the star centre		
Measuring ranges		
M23		177 to 275 ΔVAC
M48	DPC01	323 to 550 ΔVAC
	DPC01 440HZ	323 to 475 ΔVAC
	PPC01	323 to 475 ΔVAC
M69	DPC01	510 to 793 ΔVAC
Ranges		
Upper level		+2 to +22% of the nominal voltage
Lower level		-22 to -2% of the nominal voltage
Asymmetry		2 to 22% of the nominal voltage
Tolerance		2 to 22% of the nominal voltage

Note: The input voltage must not exceed the maximum rated voltage or drop below the minimum rated voltage reported above.

Output Specifications

Output		2 x SPDT relays N.E.
Rated insulation voltage		250 VAC
Contact ratings ($AgSnO_2$)		μ
Resistive loads	AC 1	8 A @ 250 VAC
	DC 12	5 A @ 24 VDC
Small inductive loads	AC 15	2.5 A @ 250 VAC
	DC 13	2.5 A @ 24 VDC
Mechanical life		≥ 30 x 10^6 operations
Electrical life		≥ 10^5 operations (at 8 A, 250 V, cos φ = 1)
Operating frequency		≤ 7200 operations/h
Dielectric strength		
Dielectric voltage		≥ 2 kVAC (rms)
Rated impulse withstand volt.		4 kV (1.2/50 μs)

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Supply Specifications

Power supply	Overvoltage cat. III (IEC 60664, IEC 60038)
Rated operational voltage through terminals:	
L1, L2, L3, N (DPC01) 5, 6, 7, 11 (PPC01)	
M23 - Delta Voltage:	208 to 240VAC ±15%; 45 to 65Hz
DPC01 M48 - Delta Voltage:	380 to 480VAC ±15%;45 to 65Hz
DPC01 M48 - Star Voltage:	220 to 277VAC ±15%;45 to 65Hz
PPC01 M48 - Delta Voltage:	380 to 415VAC ±15%;45 to 65Hz
PPC01 M48 - Star Voltage:	220 to 240VAC ±15%;45 to 65Hz
M48 400HZ - Delta Voltage:	380 to 415VAC ±15%;45 to 440Hz
M48 400 HZ- Star Voltage:	220 to 240VAC ±15%;45 to 440Hz
M69 - Delta Voltage:	600 to 690VAC ±15%;45 to 65Hz
M69 - Star Voltage:	347 to 400VAC ±15%;45 to 65Hz
Rated operational power	
M23	9 VA @ Δ230 VAC, 50 Hz
M48	13 VA @ Δ400 VAC, 50 Hz
M69	21 VA @ Δ600 VAC, 50 Hz
	Supplied by L2 and L3 for the DIN-rail versions and by L1 and L2 for the Plug-in versions

General Specifications

Power ON delay	1 s ± 0.5 s or 6 s ± 0.5 s
Accuracy	(15 min warm-up time)
Temperature drift	± 1000 ppm/°C
Delay ON alarm	± 10% on set value ± 50 ms
Repeatability	± 0.5% on full-scale

General Specifications (cont.)

Reaction time	
Incorrect phase sequence or total phase loss	< 200 ms
Voltage level	(input signal variation from -20% to +20% or from +20% to -20% of set value)
Asymmetry level	
Alarm ON delay:	< 200 ms (delay < 0.1 s)
Alarm OFF delay:	< 200 ms (delay < 0.1 s)
Indication for	
Power supply ON	LED, green
Alarm ON	LED, red (flashing 2 Hz during delay time)
Output relays ON	2 x LED, yellow
Environment	(EN 60529)
Degree of protection	IP 20
Pollution degree	3 (DPC01), 2 (PPC01)
Operating temperature	
@ Max. voltage, 50 Hz	-20 to +60°C, R.H. < 95%
@ Max. voltage, 50 Hz	-20 to +60°C, R.H. < 95%
Storage temperature	-30 to +80°C, R.H. < 95%
Housing dimensions	
DIN-rail versions	45 x 80 x 99.5 mm
Plug-in versions	36 x 80 x 87 mm
Weight	Approx. 220 g
Screw terminals	(DPC01)
Tightening torque	Max. 0.5 Nm acc. to IEC 60947
Approvals	UL, CSA GL (DPC01 only)
CE Marking	Yes
EMC	Electromagnetic Compatibility
Immunity	According to EN 61000-6-2
Emissions	According to EN 50081-1

Mode of Operation

Connected to the 3 phases (and neutral) DPC01 and PPC01 operate when all 3 phases are present at the same time and the phase sequence is correct. It can be decided whether to monitor upper and lower voltage level of each phase or their asymmetry and tolerance.

Asymmetry is defined as:

$$\frac{\max |\Delta V_{ph\text{-}ph}|}{\text{nom. voltage}}$$

when measuring phase-phase voltages and as:

$$\frac{\max |\Delta V_{ph\text{-}n}|}{\text{nom. voltage}}$$

when measuring phase-neutral voltages.

Tolerance is defined as:

$$\frac{\max |\text{nom. voltage} - V_{ph\text{-}ph}|}{\text{nom. voltage}}$$

when measuring phase-phase voltages and as:

$$\frac{\max |\text{nom. voltage.} - V_{ph\text{-}n}|}{\text{nom. voltage}}$$

when measuring phase-neutral voltages.

Voltage level monitoring:
if one or more phase-phase or phase-neutral voltage exceed the upper set level or drop below the lower set level, the red LED starts flashing 2 Hz and the respective output relay releases after the set time period.

Asymmetry and tolerance monitoring:
if one or more phase-phase or phase-neutral voltage exceed the set levels the red LED starts flashing 2 Hz and the respective output relay releases after the set time period.
For both functions, if the phase sequence is wrong or one phase is lost, both output relays release immediately. Only 200 ms delay occurs. The failure is indicated by the red LED flashing 5 Hz during the alarm condition.

Example 1
(Mains monitoring - over and under phase-phase voltage)
The relay monitors over and under voltage, phase loss and correct phase sequence.

Example 2
(Motor monitoring - starting and operating load -asymmetry and tolerance of phase-neutral voltage)
DPC01 and PPC01 ensure correct starting and operating conditions. They monitor the voltage level, phase sequence (correct direction of the motor rotation) and asymmetry.

Frequent failures are fuse blowing and incorrect voltage level. In case of fuse blowing the motor regenerates a voltage in the interrupted phase. The relay detects the failure and reacts due to excessive imbalance among the phases.

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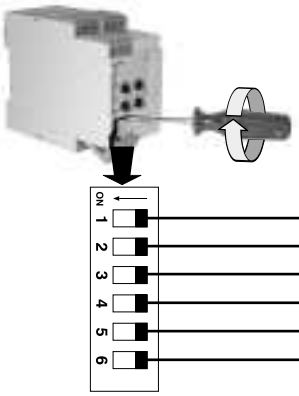
Function/Range/Level/Time Setting

Adjust the input range setting the DIP-switches 3 and 4. Select the desired function setting the DIP-switches 5 and 6 as shown on the left. To access the DIP-switches open the plastic cover using a screwdriver as shown below.

Centre knobs:
Setting of upper and lower level or setting of asymmetry and tolerance on relative scale.

Lower knobs:
Setting of delay on alarm time on absolute scale: 0.1 to 30 s.



Power-ON delay
ON: 6 s ± 0.5 s
OFF: 1 s ± 0.5 s

Monitoring
ON: Phase-Neutral voltages
OFF: Phase-Phase voltages

Measuring range

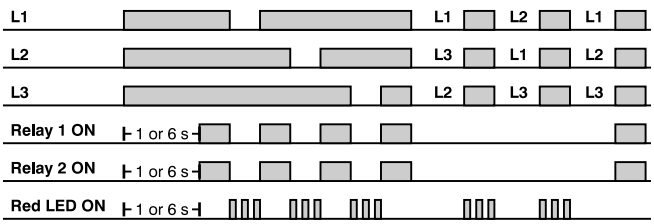
SW3	ON	ON	OFF	OFF
SW4	ON	OFF	ON	OFF
M23 Ph-Ph Voltage	208 VAC	220 VAC	230 VAC	240 VAC
M48 Ph-Ph Voltage	380 VAC	400 VAC	415 VAC	480 VAC DPC01 only
M48 Ph-N Voltage	220 VAC	230 VAC	240 VAC	277 VAC DPC01 only
DPC01DM69 Ph-Ph Volt.	600 VAC	600 VAC	690 VAC	690 VAC
DPC01DM69 Ph-N Volt.	347 VAC	347 VAC	400 VAC	400 VAC

Output
ON: 2 x SPDT relays
OFF: 1 x DPDT relay

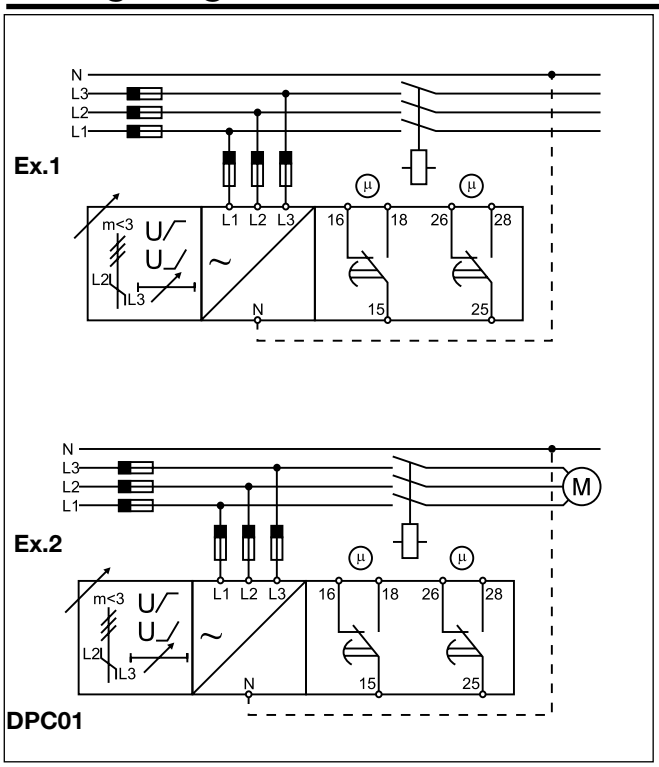
Function
ON: Asymmetry and tolerance monitoring
OFF: Over and undervoltage monitoring

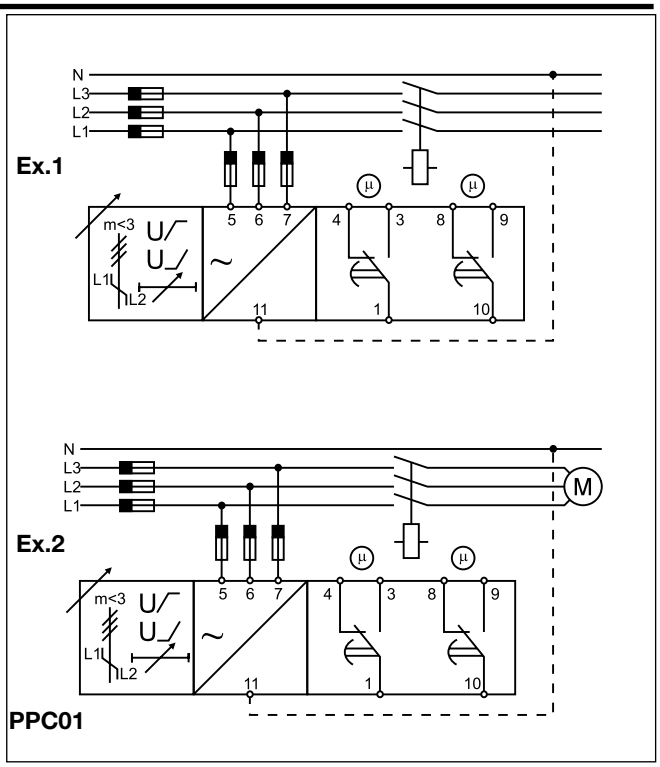
Operation Diagrams

Phase sequence, total phase loss



Wiring Diagrams





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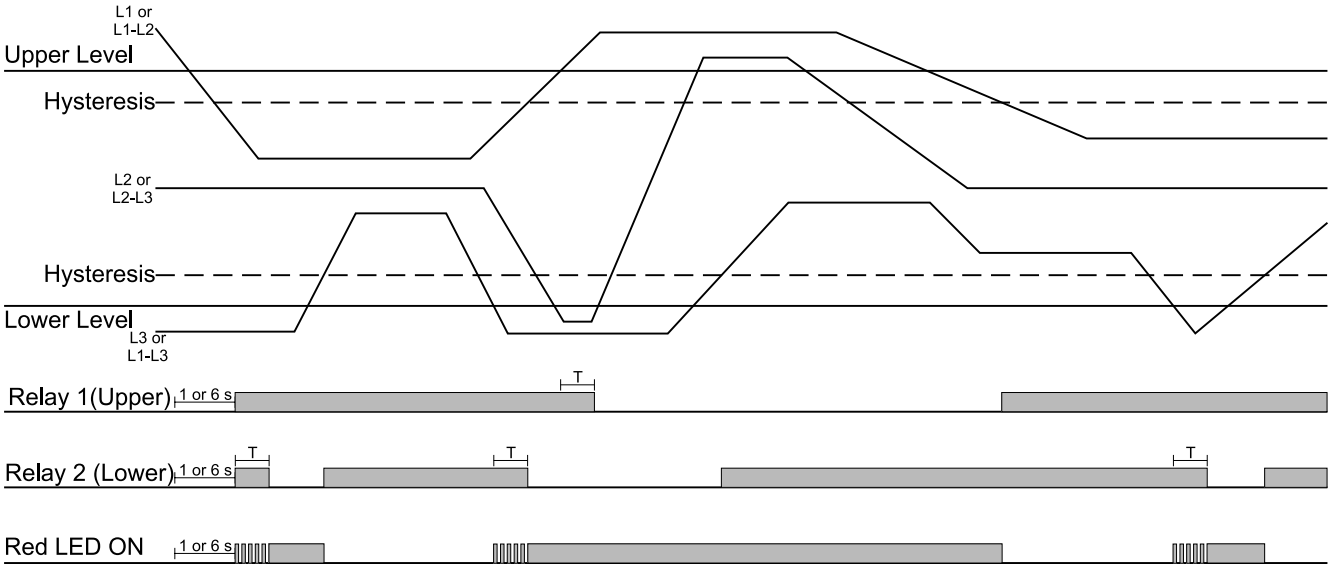
Operation Diagrams (cont.)

Over and undervoltage monitoring



Asymmetry and tolerance monitoring