# Monitoring Relays
# 3-Phase, 3-Phase+N, Multi-function
# Types DPC01, PPC01

CARLO GAVAZZI


DPC01


PPC01

- **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 or ND (selectable)**
- **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 relay, 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 480 VAC covered by two multivoltage relays.

## Ordering Key

**DPC 01 D M48**

**Housing**
**Function**
**Type**
**Item number**
**Output**
**Power supply**

## Type Selection

| Mounting | Output | Supply: 208 to 240 VAC | Supply: 380 to 480 VAC |
|---|---|---|---|
| DIN-rail | 2 x SPDT | **DPC 01 D M23** | **DPC 01 D M48** |
| Plug-in | 2 x SPDT | **PPC 01 D M23** | **PPC 01 D M48** |

## Input Specifications

| | |
|---|---|
| **Input** | |
| L1, L2, L3, N | DPC01: Terminals L1, L2, L3, N<br>PPC01: Terminals 5, 6, 7, 11<br>Measure on own supply |
| **Measuring ranges** | |
| 208 to 240 VAC | 177 to 275 VAC |
| 380 to 480 VAC (DPC01DM48) | 323 to 550 VAC |
| 380 to 415 VAC (PPC01DM48) | 323 to 475 VAC |
| **Ranges** | |
| Upper level | +2 to +22%<br>of the nominal voltage |
| Lower level | -22 to -2%<br>of the nominal voltage |
| Asymmetry | 2 to 22%<br>of the nominal voltage |
| Tolerance | 2 to 22%<br>of the nominal voltage |

## Output Specifications

| | | |
|---|---|---|
| **Output** | | 2 x SPDT relays |
| 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<br>(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: | 208 to 240 VAC ± 15% 45 to 65 Hz |
| M48: | 380 to 480 VAC ± 15% 45 to 65 Hz |
| **Rated operational power** | |
| M48 | 13 VA @ 400 VAC, 50 Hz |
| M23 | 13 VA @ 230 VAC, 50 Hz Supplied by L2 and L3 |

## General Specifications

| | |
|---|---|
| **Power ON delay** | 1 s ± 0.5 s or 6 s ± 0.5 s |
| **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) |
| **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.)

| | |
|---|---|
| **Indication for** | |
| Power supply ON | LED, green |
| Alarm ON | LED, red (flashing 2 Hz during delay time) |
| Output relay ON | 2 x LED, yellow |
| **Environment** | (EN 60529) |
| Degree of protection | IP 20 |
| Pollution degree | 3 (DPC01), 2 (PPC01) |
| Operating temperature | -20 to 60°C, R.H. < 95% @ 475 VAC, 65 Hz<br>-20 to 50°C, R.H. < 95% @ 550 VAC, 65 Hz |
| Storage temperature | -30 to 80°C, R.H. < 95% |
| **Housing dimensions** | |
| DIN-rail version | 45 x 80 x 99.5 mm |
| Plug-in version | 36 x 80 x 87 mm |
| **Weight** | Approx. 220 g |
| **Screw terminals** | |
| Tightening torque | Max. 0.5 Nm acc. to IEC 60947 |
| **CE-Marking** | Yes |

## 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. In any case if phase-netural measurement is selected both phase-phase and phase-neutral voltages are monitored.
Asymmetry is defined as follows:

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

when measuring phase-phase voltages and also as follows:

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

when measuring phase-neutral voltages. Tolerance is defined as

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

and also as

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

when measuring phase-neutral voltages.

Voltage level monitoring: if one or more phase-phase or phase-neutral voltage exceeds the upper set level or drops 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 of them exceeds the set level the red LED starts flashing 2 Hz and the respective output relay releases after the set time period. 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 - over and under phase-phase voltage - monitoring)

The relay monitors over and under voltage, phase loss and correct phase sequence.

**Example 2**
(starting and operating load - asymmetry and tolerance phase-neutral - monitoring)

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. These relays detect the failure and react due to excessive imbalance among the phases.

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## Function/Range/Level and Time Delay Setting

**Selection of function:**
DIP-switch selector (1 to 6)

1
ON Power ON delay 6 ± 0.5 s
Power ON delay 1 ± 0.5 s

2
Phase-neutral voltage
Phase-phase voltage

34
3 x 208 Δ VAC (M23)
3 x 380 Δ VAC (M48)

3 x 220 Δ VAC (M23)
3 x 400 Δ VAC (M48)

3 x 230 Δ VAC (M23)
3 x 415 Δ VAC (M48)

3 x 240 Δ VAC (M23)
3 x 480 Δ VAC
(DPC01DM48)

5
2 x SPDT relays
1 x DPDT relay

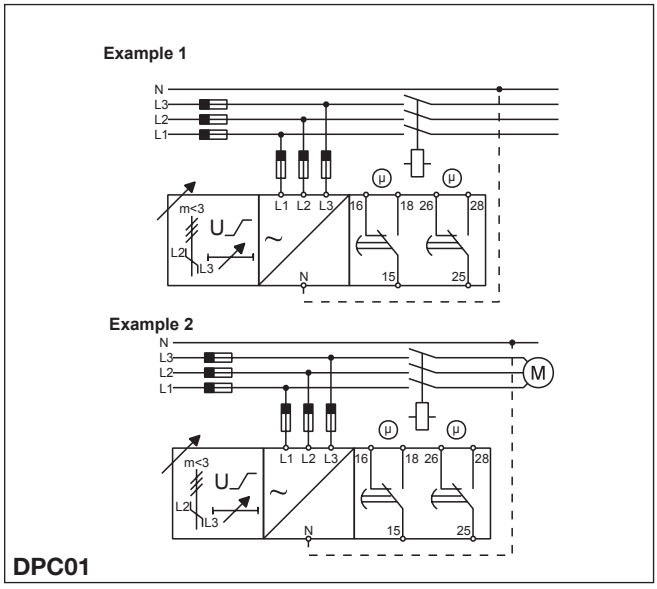
6
Asymmetry + tolerance
Overvoltage + undervoltage

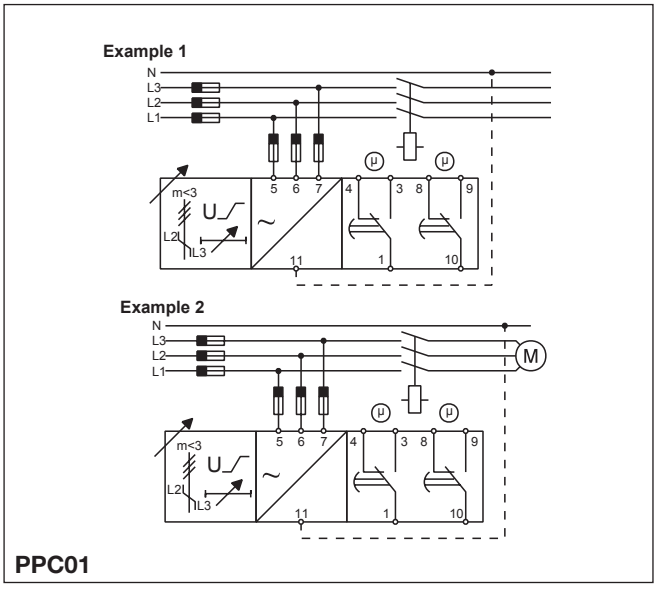
**Selection of level and time delay:**

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

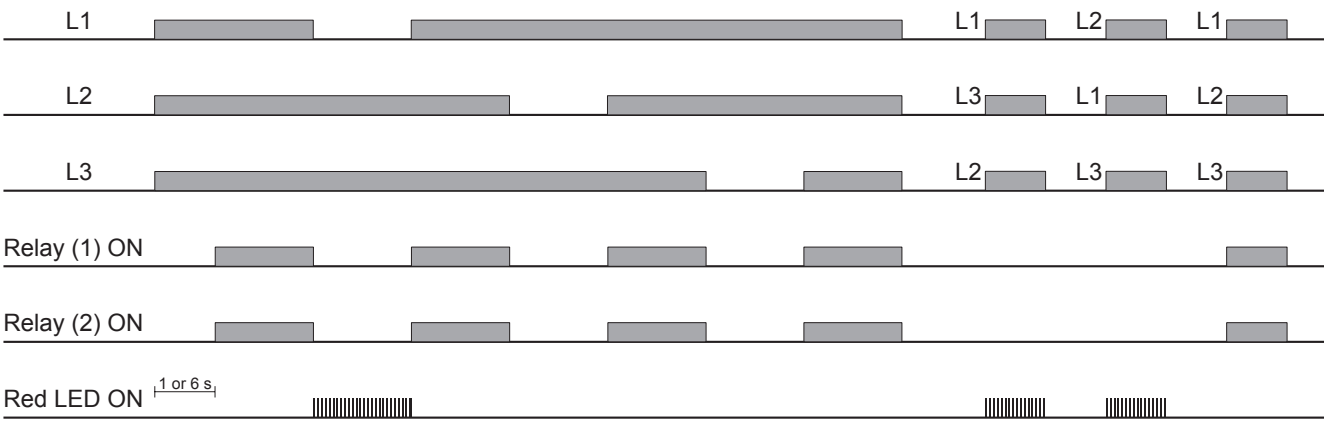
Lower knobs:
Setting of delay on alarm time on absolute scale (0.1 to 30 s).

## Wiring Diagrams




## Operation Diagrams



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## Operation Diagrams (cont.)