

# Monitoring Relays

## True RMS 3-Phase, 3-Phase+N, Multifunction

### Type DPC02

CARLO GAVAZZI



- TRMS 3-phase over and under voltage, over and under frequency, phase sequence and phase loss 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 the system frequency is between the set limits
- Separately adjustable setpoints
- Separately adjustable delay functions (0.1 to 30 s)
- Output: 2 x 8 A relay SPDT
- For mounting on DIN-rail in accordance with DIN/EN 50 022
- 45 mm Euronorm housing
- LED indication for relays, alarm and power supply ON

## Product Description

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

Supply ranges from 208 to 690 VAC covered by four multivoltage relays. The main application is for generator sets.

## Ordering key

**DPC 02 D M48**

Housing \_\_\_\_\_  
 Function \_\_\_\_\_  
 Type \_\_\_\_\_  
 Item number \_\_\_\_\_  
 Output \_\_\_\_\_  
 Power Supply \_\_\_\_\_

## Type Selection

| Mounting | Output   | Supply:<br>208 to 240 VAC | Supply:<br>380 to 415 VAC | Supply:<br>440 to 480 VAC | Supply:<br>600 to 690 VAC |
|----------|----------|---------------------------|---------------------------|---------------------------|---------------------------|
| DIN-rail | 2 x SPDT | DPC 02 D M23              | DPC 02 D M48              | DPC 02 D M49              | DPC 02 D M69              |

## Input Specifications

|                                                                                                |  |                                                                                                                                       |                                                                                                                                       |                                                                                                                                  |                                                                                                                     |
|------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>Input</b><br>L1, L2, L3, N      DPC02:                                                      |  | Terminals L1, L2, L3, N<br>Measures its own supply                                                                                    | <b>Ranges</b><br>Upper voltage level<br>Lower voltage level<br>Frequency window                                                       |                                                                                                                                  | +2 to +22%<br>of the nominal voltage<br>-22 to -2%<br>of the nominal voltage<br>10 to 110%<br>of the selected range |
| Note: Connect the neutral only if it is intrinsically at the star centre                       |  |                                                                                                                                       | <b>Hysteresis (frequency)</b><br>2 Hz range<br>15 Hz range                                                                            |                                                                                                                                  | ~ 0.05 Hz<br>~ 0.25 Hz                                                                                              |
| <b>Measuring ranges (voltage)</b><br>M23<br>M48<br>M49<br>M69                                  |  | 177 to 275 ΔVAC<br>323 to 475 ΔVAC<br>374 to 552 ΔVAC<br>510 to 793 ΔVAC                                                              |                                                                                                                                       |                                                                                                                                  |                                                                                                                     |
| <b>Measuring ranges (frequency)</b><br>Selectable by DIP-switches<br>2 Hz range<br>15 Hz range |  | <b>Upper level</b><br>+0.2 to +2.2 Hz<br>50.2 to 52.2 Hz<br>60.2 to 62.2 Hz<br>+1.5 to +16.5 Hz<br>51.5 to 66.5 Hz<br>61.5 to 76.5 Hz | <b>Lower level</b><br>-2.2 to -0.2 Hz<br>47.8 to 49.8 Hz<br>57.8 to 59.8 Hz<br>-16.5 to -1.5 Hz<br>33.5 to 48.5 Hz<br>43.5 to 58.5 Hz | <b>Note:</b> The input voltage must not exceed the maximum rated voltage or drop below the minimum rated voltage reported above. |                                                                                                                     |

## Output Specifications

|                                              |                                                            |
|----------------------------------------------|------------------------------------------------------------|
| <b>Output</b>                                | 2 x SPDT relays N.E.                                       |
| Rated insulation voltage                     | 250 VAC                                                    |
| <b>Contact ratings</b> (AgSnO <sub>2</sub> ) | 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                                             |
| <b>Mechanical life</b>                       | ≥ 30 x 10 <sup>6</sup> operations                          |
| <b>Electrical life</b>                       | ≥ 10 <sup>5</sup> operations<br>(at 8 A, 250 V, cos φ = 1) |
| <b>Operating frequency</b>                   | ≤ 7200 operations/h                                        |
| <b>Dielectric strength</b>                   |                                                            |
| Dielectric voltage                           | ≥ 2 kVAC (rms)                                             |
| Rated impulse withstand volt.                | 4 kV (1.2/50 μs)                                           |

## Supply Specifications

|                                              |                        |
|----------------------------------------------|------------------------|
| <b>Power supply</b>                          | Overvoltage cat. III   |
| Rated operational voltage through terminals: | (IEC 60664, IEC 60038) |
| M23 - Delta Voltage:                         | L1, L2, L3, N          |
|                                              | 208 to 240 VAC ± 15%   |
|                                              | 45 to 65 Hz            |
| M48 - Delta Voltage:                         | 380 to 415 VAC ± 15%   |
|                                              | 45 to 65 Hz            |
| M48 - Star Voltage:                          | 220 to 240 VAC ± 15%   |
|                                              | 45 to 65 Hz            |
| M49 - Delta Voltage:                         | 440 to 480 VAC ± 15%   |
|                                              | 45 to 65 Hz            |
| M49 - Star Voltage                           | 254 to 277 VAC ± 15%   |
|                                              | 45 to 65 Hz            |
| M69 - Delta Voltage:                         | 600 to 690 VAC ± 15%   |
|                                              | 45 to 65 Hz            |
| M69 - Star Voltage:                          | 347 to 400 VAC ± 15%   |
|                                              | 45 to 65 Hz            |
| <b>Rated operational power</b>               | 8 VA, 50/60 Hz         |
|                                              | Supplied by L2 and L3  |

## General Specifications

|                                              |                                                                              |
|----------------------------------------------|------------------------------------------------------------------------------|
| <b>Power ON delay</b>                        | 1 s ± 0.5 s                                                                  |
| <b>Accuracy</b>                              | (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                                                         |
| <b>Reaction time</b>                         |                                                                              |
| 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) |
| Frequency level                              |                                                                              |
| Alarm ON delay:                              | < 200 ms (delay < 0.1 s)                                                     |
| Alarm OFF delay:                             | < 200 ms (delay < 0.1 s)                                                     |
| <b>Indication for</b>                        |                                                                              |
| Power supply ON                              | LED, green                                                                   |
| Alarm ON                                     | LED, red (flashing 2 Hz during delay time)                                   |
| Output relays ON                             | 2 x LED, yellow                                                              |
| <b>Environment</b>                           | (EN 60529)                                                                   |
| Degree of protection                         | IP 20                                                                        |
| Pollution degree                             | 3                                                                            |
| Operating temperature                        |                                                                              |
| 8A output                                    | -20 to +50°C, R.H. < 95%                                                     |
| 5A output                                    | -20 to +60°C, R.H. < 95%                                                     |
| Storage temperature                          | -30 to 80°C, R.H. < 95%                                                      |
| <b>Housing</b>                               |                                                                              |
| Dimensions                                   | 45 x 80 x 99.5 mm                                                            |
| Material                                     | PA66 or Noryl                                                                |
| <b>Weight</b>                                | Approx. 220 g                                                                |
| <b>Screw terminals</b>                       |                                                                              |
| Tightening torque                            | Max. 0.5 Nm<br>acc. to IEC 60947                                             |
| <b>Product standard</b>                      | EN 60255-6                                                                   |
| <b>Approvals</b>                             | UL, CSA                                                                      |
| <b>CE Marking</b>                            | L.V. Directive 2006/95/EC<br>EMC Directive 2004/108/EC                       |
| EMC                                          |                                                                              |
| Immunity                                     | According to EN 60255-26<br>According to EN 61000-6-2                        |
| Emissions                                    | According to EN 60255-26<br>According to EN 61000-6-3                        |

## Mode of Operation

Connected to the 3 phases (and neutral) DPC02 operates when all 3 phases are present at the same time and the phase sequence is correct.

### Voltage and frequency 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. If the mains frequency gets out of the symmetrical window across the nominal frequency the red LED starts flashing 2 Hz and the respective output relay releases after the set time period.

### Example 1

(Generator monitoring - 2xSPDT relays - phase-phase voltage)  
The relay monitors phase loss and correct phase sequence, over and under voltage and the frequency of the system. A voltage failure is detected through relay 1 and a frequency failure is detected through relay 2.

### Example 2

(Mains monitoring - DPDT relay)  
DPC02 monitors phase loss and correct phase sequence, over and under voltage and the frequency. Every failure is detected through relays 1 and 2 at the same time to allow independent operations.

## Function/Range/Level/Time Setting

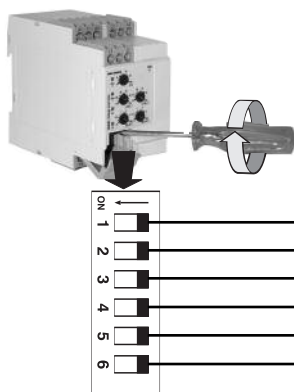
Adjust the input range setting the DIP-switches 3 and 4. Select the desired function setting the DIP-switches 5 and 6 as shown on the left. To access the DIP-switches open the plastic cover using a screwdriver as shown below.

**Upper left knob:**  
Setting of upper voltage level on relative scale.

**Centre left knob:**  
Setting of lower voltage level on relative scale.

**Centre right knob:**  
Setting of frequency window width on relative scale.

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



### Output

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

### Monitoring

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

### Measuring range

|                   | ON      | ON      | OFF     | OFF     |
|-------------------|---------|---------|---------|---------|
| 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 | 415VAC  | 415VAC  |
| M48 Ph-N Voltage  | 220 VAC | 230 VAC | 240 VAC | 240 VAC |
| M49 Ph-Ph Voltage | 440 VAC | 440 VAC | 480 VAC | 480 VAC |
| M49 Ph-N Voltage  | 254 VAC | 254 VAC | 277 VAC | 277 VAC |
| M69 Ph-Ph Voltage | 600 VAC | 600 VAC | 690 VAC | 690 VAC |
| M69 Ph-N Voltage  | 347 VAC | 347 VAC | 400 VAC | 400 VAC |

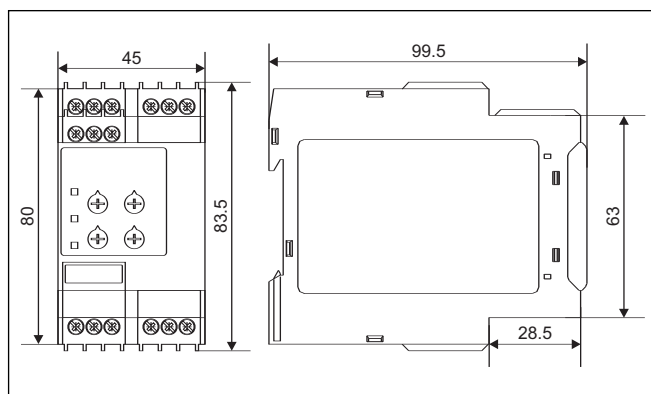
### System frequency

ON: 60 Hz  
OFF: 50 Hz

### Frequency setpoint range

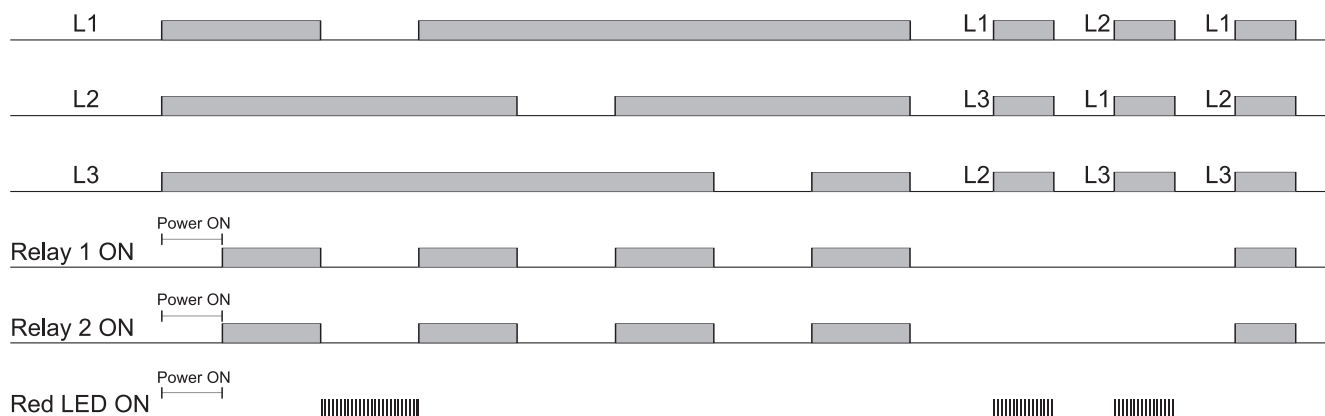
ON: 2 Hz  
OFF: 15 Hz

## Dimensions



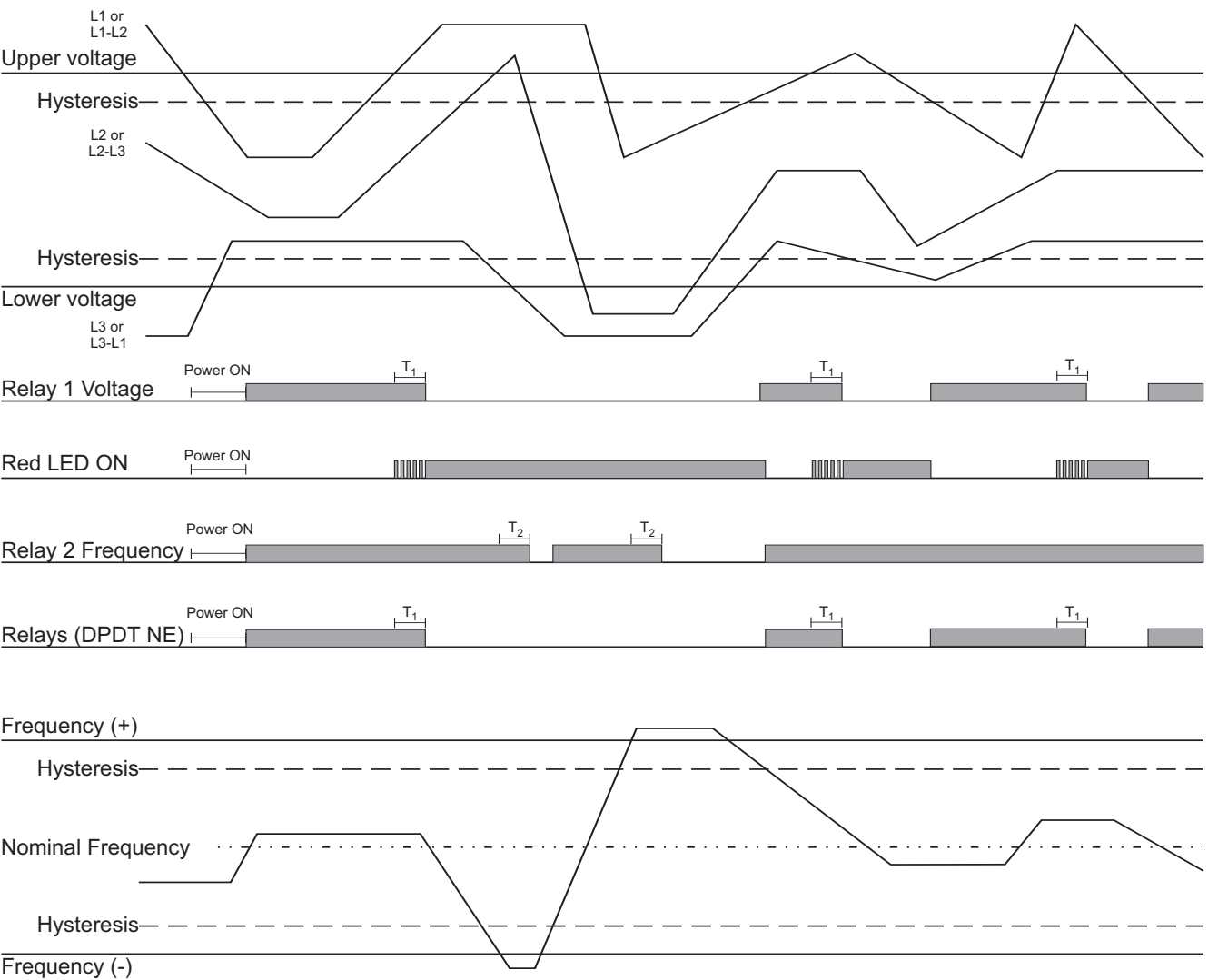
## Operation Diagrams

### Phase sequence, total phase loss





Operation Diagrams (cont.)



Wiring Diagrams

