

Monitoring Relays

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

Types DPC01, PPC01



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 100 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	100 to 115 VAC	208 to 240 VAC	380 to 415 VAC
DIN-rail 2 x SPDT	50 - 60 Hz		DPC 01 D M23	
DIN-rail 2 x SPDT	50 - 400 Hz	DPC 01 D M11 400HZ	DPC 01 D M23 400HZ	DPC 01 D M48 400HZ
Plug-in 2 x SPDT	50 - 60 Hz		PPC 01 D M23	PPC 01 D M48
Mounting Output	Frequency	440 to 480 VAC	380 to 480 VAC	600 to 690 VAC
DIN-rail 2 x SPDT	50 - 60 Hz		DPC 01 D M48	DPC 01 D M69
DIN-rail 2 x SPDT	50 - 400 Hz	DPC 01 D M49 400HZ		DPC 01 D M69 400HZ

Input Specifications

Input	DPC01:	PPC01:	Terminals L1, L2, L3, N
L1, L2, L3, N			Terminals 5, 6, 7, 11
Note: Connect the neutral only if it is intrinsically at the star centre			
Measuring ranges			
M11			85 to 132 ΔVAC
M23			177 to 275 ΔVAC
M48	DPC01		323 to 550 ΔVAC
	DPC01 400HZ		323 to 475 ΔVAC
	PPC01		323 to 475 ΔVAC
M49	DPC01		375 to 550 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

Input Specifications (cont.)

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 (AgSnO₂)	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)

Supply Specifications

Power supply Rated operational voltage through terminals: L1, L2, L3, N (DPC01) 5, 6, 7, 11 (PPC01) M11 - Delta Voltage: M23 - Delta Voltage: DPC01 M48 - Delta Voltage: DPC01 M48 - Star Voltage: PPC01 M48 - Delta Voltage: PPC01 M48 - Star Voltage: M48 400HZ - Delta Voltage: M48 400 HZ- Star Voltage: M49 400HZ - Delta Voltage: M49 400 HZ- Star Voltage: M69 - Delta Voltage: M69 - Star Voltage: M69 400HZ- Delta Voltage: M69 400HZ- Star Voltage:	Overvoltage cat. III (IEC 60664, IEC 60038) 100 to 115VAC ±15%; 45 to 65Hz 208 to 240VAC ±15%; 45 to 65Hz 380 to 480VAC ±15%; 45 to 65Hz 220 to 277VAC ±15%; 45 to 65Hz 380 to 415VAC ±15%; 45 to 65Hz 220 to 240VAC ±15%; 45 to 65Hz 380 to 415VAC ±15%; 45 to 440Hz 220 to 240VAC ±15%; 45 to 440Hz 440 to 480VAC ±15%; 45 to 440Hz 254 to 277VAC ±15%; 45 to 440Hz 600 to 690VAC ±15%; 45 to 65Hz 347 to 400VAC ±15%; 45 to 65Hz 600 to 690VAC ±15%; 45 to 440Hz 347 to 400VAC ±15%; 45 to 440Hz
Rated operational power M11 M23 M48 M69	8 VA @ Δ115 VAC, 50 Hz 9 VA @ Δ230 VAC, 50 Hz 13 VA @ Δ400 VAC, 50 Hz 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 Temperature drift Delay ON alarm Repeatability	(15 min warm-up time) ± 1000 ppm/°C ± 10% on set value ± 50 ms ± 0.5% on full-scale

Mode of Operation

Asymmetry definition.

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:

1) in case of measuring phase-phase voltages:

$$\frac{\max |\Delta V_{PH-PH}|}{V_{\Delta NOM}} \times 100$$

2) in case of measuring phase-neutral voltages:

$$\frac{\max |\Delta V_{PH-N}|}{V_{\Delta NOM}} \times 100$$

Tolerance definition.

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

1) in case of measuring phase-phase voltages:

$$\frac{\max |V_{\Delta NOM} - V_{PH-PH}|}{V_{\Delta NOM}} \times 100$$

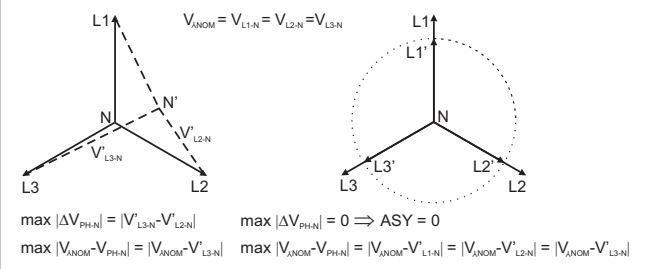
2) in case of measuring phase-neutral voltages:

$$\frac{\max |V_{\Delta NOM} - V_{PH-N}|}{V_{\Delta NOM}} \times 100$$

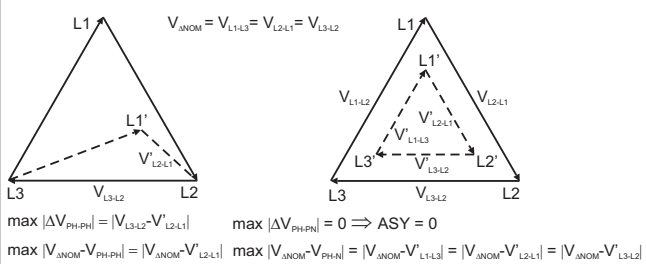
General Specifications (cont.)

Reaction time Incorrect phase sequence or total phase loss Voltage level Asymmetry level Alarm ON delay: Alarm OFF delay:	< 200 ms (input signal variation from -20% to +20% or from +20% to -20% of set value) < 200 ms (delay < 0.1 s) < 200 ms (delay < 0.1 s)
Indication for Power supply ON Alarm ON Output relays ON	LED, green LED, red (flashing 2 Hz during delay time) 2 x LED, yellow
Environment Degree of protection Pollution degree Operating temperature @ Max. voltage, 50 Hz @ Max. voltage, 50 Hz Storage temperature	(EN 60529) IP 20 3 (DPC01), 2 (PPC01) -20 to +60°C, R.H. < 95% -20 to +60°C, R.H. < 95% -30 to +80°C, R.H. < 95%
Housing dimensions DIN-rail versions Plug-in versions	45 x 80 x 99.5 mm 36 x 80 x 94 mm
Weight	Approx. 220 g
Screw terminals Tightening torque	(DPC01) Max. 0.5 Nm acc. to IEC 60947
Approvals	UL, CSA (except M11) GL (DPC01 only, except 400Hz, M11)
CE Marking	Yes
EMC Immunity Emissions	Electromagnetic Compatibility According to EN 61000-6-2 According to EN 61000-6-3

Example: phase-neutral monitoring



Example: phase-phase monitoring



Mode of Operation (cont.)

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.

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.

Note: 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.

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 below. To access the DIP-switches

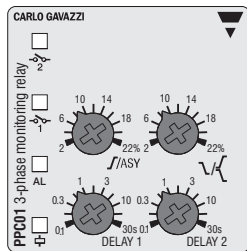
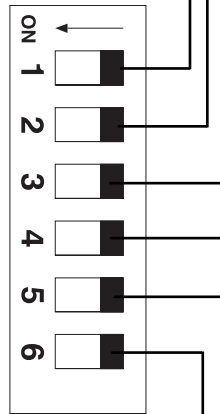
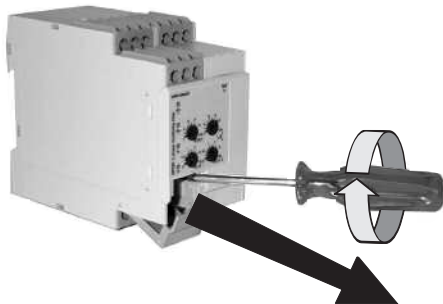
open the plastic cover using a screwdriver as shown below.

Centre knobs:

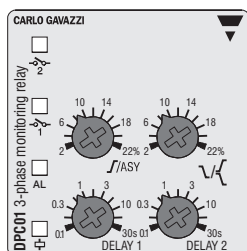
Setting of upper (r) and lower (l) level or setting of asymmetry (ASY) and tolerance (t) on relative scale.

Lower knobs:

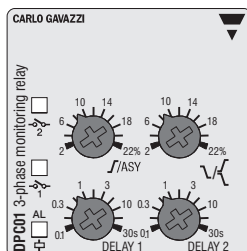
Setting of delay on alarm times (DELAY 1, DELAY 2) on absolute scale: 0.1 to 30 s.



PPC01



DPC01



DPC01 400 HZ

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

	ON	ON	OFF	OFF
SW3	ON	ON	OFF	OFF
SW4	ON	OFF	ON	OFF
M11 Ph-Ph Voltage	100 VAC	100 VAC	115 VAC	115 VAC
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
M49 Ph-Ph Voltage	440 VAC	440 VAC	480 VAC	480 VAC
M49 Ph-N Voltage	254 VAC	254 VAC	277 VAC	277 VAC
DPC01DM69 Ph-Ph Volt.	600 VAC	600 VAC	690 VAC	690 VAC
DPC01DM69 Ph-N Volt.	347 VAC	347 VAC	400 VAC	400 VAC

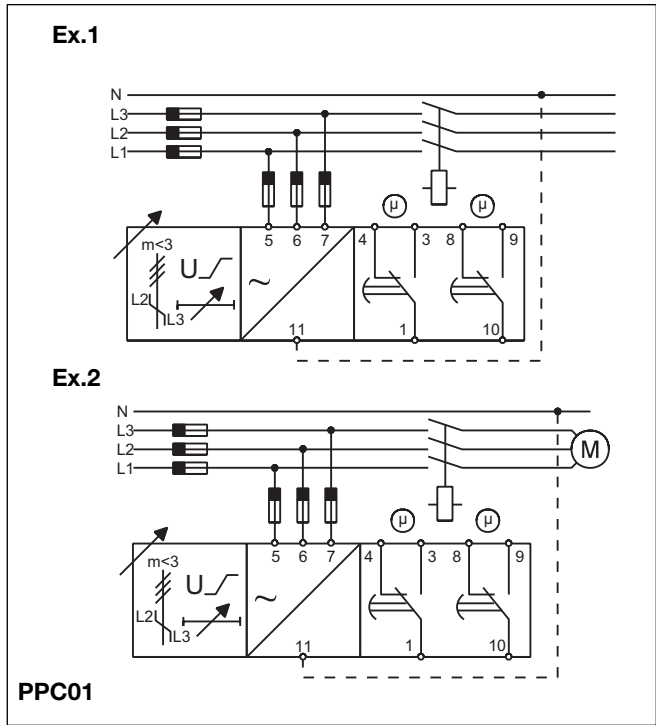
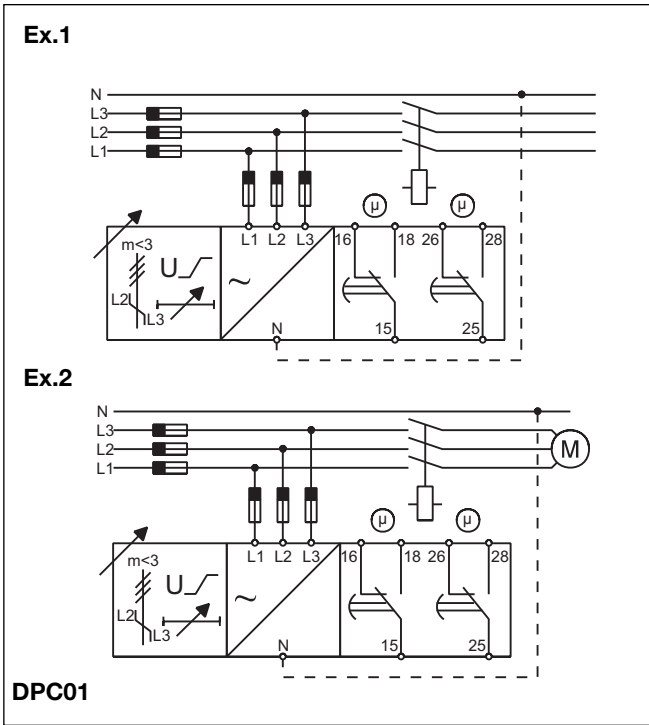
Output

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

Function

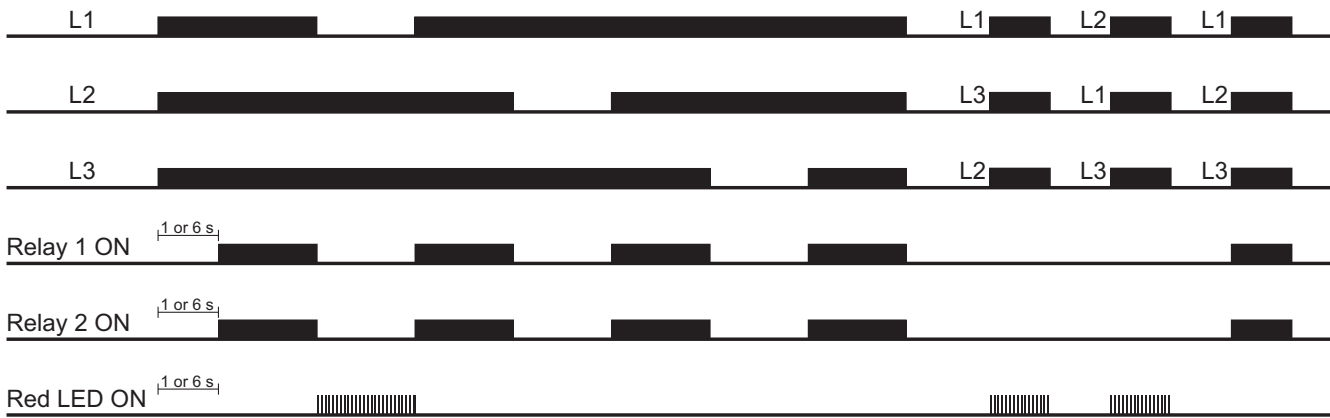
ON: Asymmetry and tolerance monitoring
OFF: Over and undervoltage monitoring

Wiring Diagrams



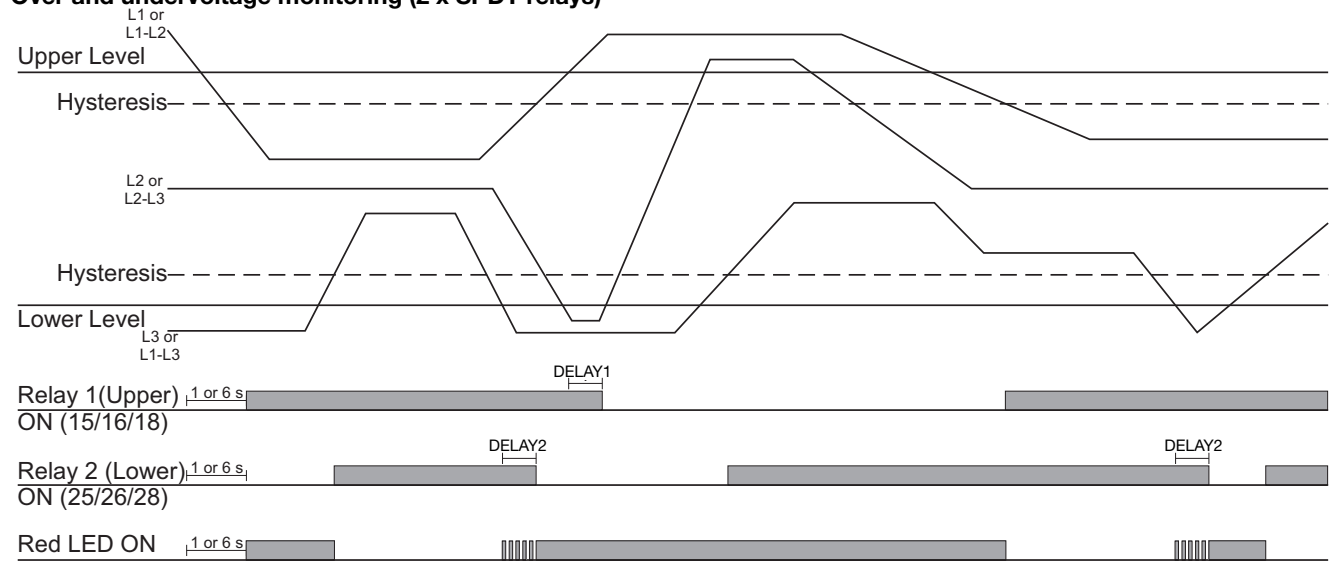
Operation Diagrams

Phase sequence, total phase loss

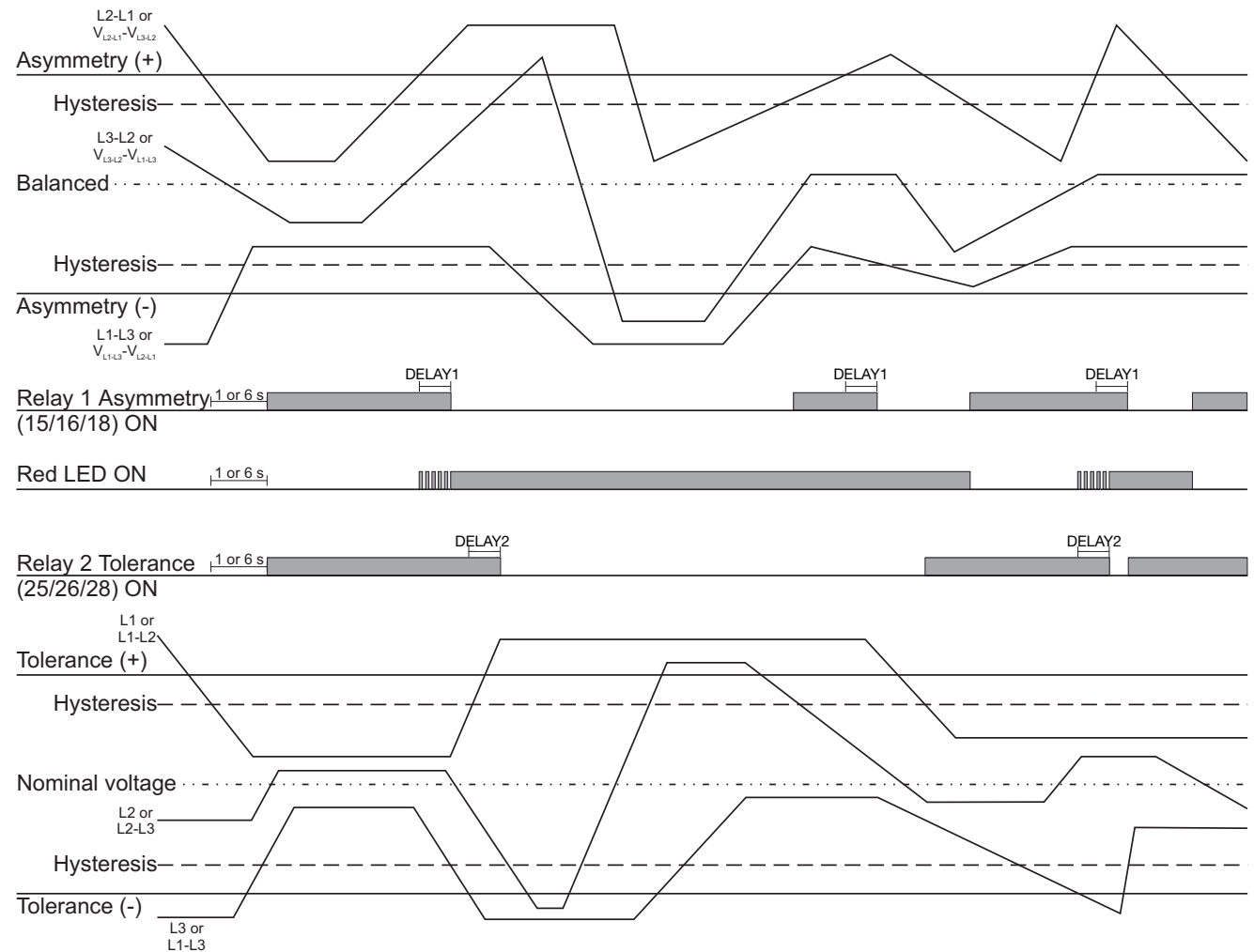


Operation Diagrams (cont.)

Over and undervoltage monitoring (2 x SPDT relays)



Asymmetry and tolerance monitoring (2 x SPDT relays)



Dimensions

