

DPC01DM44



True RMS 3-Phase voltage monitoring relay



Benefits

- **Widest input voltage range and frequency.** Very wide input voltage range: from 208Vac to 690Vac $\pm 15\%$ (177Vac to 793Vac), up to 400Hz mains.
- **Adjustable voltage ranges.** 11 voltage ranges can be selected by front DIP Switches.
- **Asymmetry/tolerance or under/over voltage.** The function can be selected between asymmetry/tolerance or over/under voltage.
- **Switch mode power supply.** Very low consumption, heat and dissipation. Control circuit power supply is filtered and therefore immune to mains disturbances, noise and harmonics.
- **Output LED indication.** One LED each output provides output status information.
- **2 relay contact outputs.** Two relay outputs provide electrical (remote) indication of the alarms/output status.
- **2 delays on alarm.** Two independent alarms for asymmetry/tolerance or under/over voltage.

Description

DPC01DM44 relay is a multifunction threephase mains monitoring device.

It can operate on both 3Ph and 3Ph+N mains detecting, besides the phase loss and the correct phase sequence, possible overvoltages and undervoltages or asymmetry and tolerance excess.

Power supply is provided by the monitored mains, is wide input range and switch mode.

Consumption, dissipation and consequently heat are very limited.

It is certified for Marine applications and it operates up to 400Hz of mains frequency.

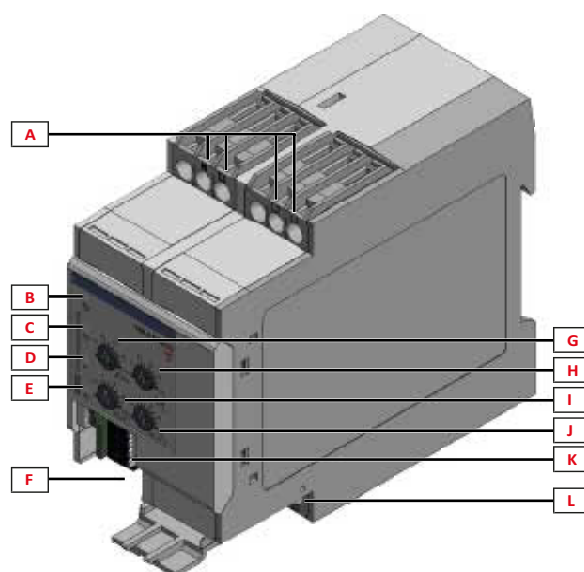
Applications

DPC01DM44 is suitable for applications where it is necessary to monitor, besides the phase presence and correct phase sequence of threephase mains, also the correct supply voltage or symmetry between phases: lifts, escalators, HVAC, material handling, pumps and compressors, mobile machinery, for places with unstable mains or for export markets, installation on vessels, airport and aircraft applications thanks to the Marine approval and 400Hz max. operating frequency.

Main functions

- 3Ph or 3Ph+N monitoring
- From 208V to 690V @50 to 400Hz, nominal voltage and frequency
- Over / under voltage or tolerance/asymmetry
- Phase sequence and phase loss alarm
- 2 x 8A SPDT relay outputs

Structure



Element	Component	Function
A	Input/supply terminals	L1, L2, L3 and N (when necessary), double cage clamp terminals
B	Output status LED (2)	Yellow, ON when output 2 active (No Alarm)
C	Output status LED (1)	Yellow, ON when output 1 active (No Alarm)
D	Alarm LED "AL"	5Hz Red flashes during phase loss, wrong phase sequence. Blinking slow (2Hz) when over / under voltage is triggered but delay is elapsing, RED steady ON when delay elapsed.
E	Power ON LED	Green, lit when device supplied on at least two input lines
F	Output terminals (1)	Output 1 relay contacts terminals 15 COM, 16 NC*, 18 NO* * when power supply not applied.
G	Alarm 1: Overvoltage / Asymmetry setting	Depending upon setting: - Overvoltage setting dial - Asymmetry setting dial
H	Alarm 2: Undervoltage / Tolerance setting	Depending upon setting: - Undervoltage setting dial - Tolerance setting dial
I	Delay on alarm 1	Delay on alarm 1 setting dial. Delay from 0.1s to 30s
J	Delay on alarm 2	Delay on alarm 2 setting dial. Delay from 0.1s to 30s
K	DIP switches	See fig. 1 (DIP switch settings table)
L	Output terminals (2)	Output 2 relay contacts terminals 25 COM, 26 NC*, 28 NO* * when power supply not applied.

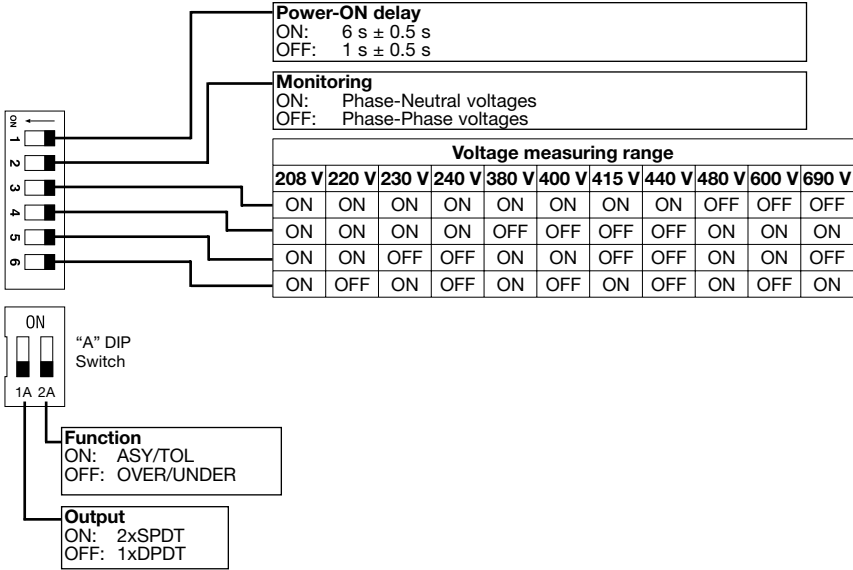
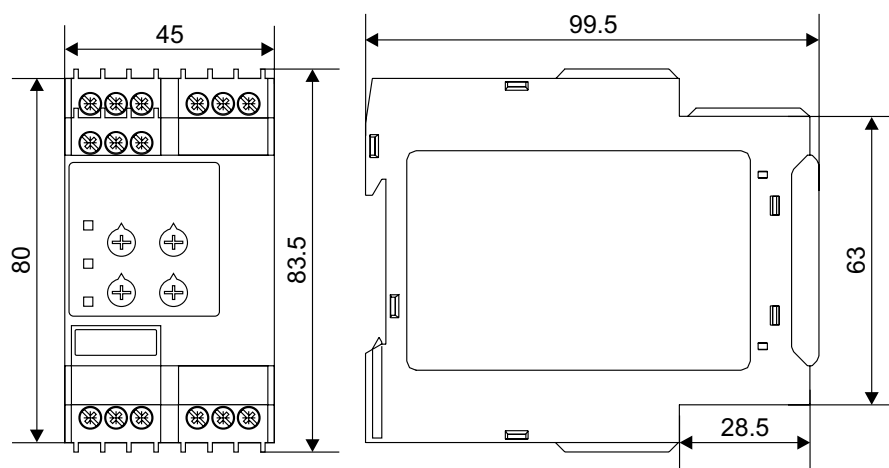


Fig. 1 DIP switch settings table

Features

General

Material	PA66 or Noryl
Colour	RAL7035 (light grey)
Dimensions d x h x w	99.5mm x 80mm x 45mm (3.92" x 3.15" x 1.77")
Protection degree	IP20
Weight	220 g (7.76oz)
Terminals	Cable size from 0.05mm ² to 2.5mm ² (AWG30 to AWG13), stranded or solid
Tightening torque	Max. 0.5Nm (4.425lb.in)
Terminal type	Double cage screw terminals



Power supply

Power supply	Voltage range: 208Vac to 690Vac $\pm 15\%$ (177V to 793V) Supplied from measured phases Frequency range: 50Hz to 400Hz $\pm 10\%$ sinusoidal waveform
Consumption	< 4.5 VA
Supply technology	Switch mode supply from all 3 phases

Environmental

Working 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	No 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, CSA Standard C22.2  , RINA

Inputs

Measuring ranges	
Measured variables	Voltage PH-PH measurement on L1, L2 and L3 lines Phase sequence Phase loss

Voltage measurement	
Typology	PH-PH voltage measurement on L1, L2 and L3 lines
Nominal line range	From 208Vac to 690Vac $\pm 15\%$
Setting ranges (Un)	208V, 220V, 230V, 240V, 380V, 400V, 415V, 440V, 480V, 600V, 690V

Over / under voltage alarms	
Input variables	Voltage measurements L1-L2, L2-L3, L1-L3 or L1-N, L2-N, L3-N when star mains is selected
Reaction time	≤ 200ms + set delay on Alarm
Undervoltage setting range (U<)	From -2% to -22%
Overvoltage setting range (U>)	From 2% to 22%
Resolution	1V + 2% notch
Accuracy	1V + 2%
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: absolute form ±50ms at 0.1s to ±5s at 30s Repeatability: absolute form ±10ms at 0.1s to ±1 at 30s
Delay OFF	None

Phase loss alarm	
Input variables	Voltage measurements L1-L2, L2-L3, L1-L3 or L1-N, L2-N, L3-N when star mains is selected
Alarm Threshold	≤70% of the least one compared to rated value
Restore threshold	>70% of least phase compared to 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
Adjustable range	Not applicable, always active
Delay ON	None
Delay OFF	None

▶ Outputs

Number of outputs	2
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	10 ⁵ operations
Mechanical lifetime	>30 x 10 ⁶ operations
Assignment	According to DIP 2A setting: Output 1: overvoltage or asymmetry Output 2: undervoltage or tolerance

Insulation

Terminals	Basic insulation
Inputs: L1,L2,L3,N to Output : 11,12,14	≥ 2kVac (rms), 4KV impulse 1.2/50us (basic)

Operating Description

• Suitability

DPC01DM44 can be used for power supply and mains quality monitoring of all threephase loads, with or without neutral, supply voltage from 208VAC to 690VAC and frequencies from 50 to 400Hz. It can be configured to monitor not only under/over voltage but also asymmetry between different phases voltages or the voltage tolerance.

• Device configuration

The relay operates when all the phases are present, the phase sequence is correct and the input voltage levels are within set limits.

Delay on alarm is configurable by front dials, each one of the two alarms (under/over or asymmetry/tolerance) can be set with individual delay.

Overvoltage / ASY adjustment dial	
Typology	Linear selection from 2% to 22%
Resolution	2% / notch
Function	Overvoltage or asymmetry percentage alarm setting

Undervoltage / tolerance adjustment dial	
Typology	Linear selection from -2% to -22% for undervoltage or ±2% to ±22% for tolerance
Resolution	2% / notch
Function	Undervoltage or tolerance percentage alarm setting

Alarm 1 delay setting dial	
Typology	Logarithmic adjustment from 0.1s to 30s
Resolution	From 100ms/notch at 0.1s to 10s/notch at 30s
Function	Delay on alarm 1, for overvoltage or asymmetry

Alarm 2 delay setting dial	
Typology	Logarithmic adjustment from 0.1s to 30s
Resolution	From 100ms/notch at 0.1s to 10s/notch at 30s
Function	Delay on alarm 2, for undervoltage or tolerance

DIP switches	
Typology	6 + 2 DIP Switches
Function	<ul style="list-style-type: none"> - Power ON Delay - Grid type - Grid voltage (11 ranges) - Output configuration - Operating function



- **Alarms**

The relays release immediately (<200ms), when an alarm goes off, in case of phase loss detection or wrong phase sequence.

Else it releases after the set "delay on alarm", in case of other, DPC01 possible configurable, events detection:

- Overvoltage
- Undervoltage
- Asymmetry excess
- Out of tolerance mains voltage

Overvoltage or asymmetry detection cause output 1 relay and LED 1 to turn OFF at the end of the set delay on alarm 1. During the delay elapsing the red "AL" LED blinks slowly and turn steady ON at the end of delay.

Undervoltage or out of tolerance detection cause output 2 relay and LED 2 to turn OFF at the end of the set delay on alarm 2. During the delay elapsing the red "AL" LED blinks slowly and turn steady ON at the end of delay.

- **Visual information**

DPC01DM44 feature 4 front LEDs which provide operation status information.

- LED 1, yellow, is ON when the output 1 relay is energised.
- LED 2, yellow, is ON when the output 2 relay is energised.
- LED "AL" provides Alarm Status information: when an over/under voltage or tolerance/asymmetry alarm is triggered, but there is a delay on alarm elapsing, the LED blinks red at 2Hz during the delay then, if alarm situation still present at the end of delay, it turns steady ON.

If a phase is lost or the phase sequence is wrong and the LED flashes fast at 5Hz.

- Bottom LED green, is ON when at least 2 phases are supplied.

- **Phase loss**

Phase loss measurement is performed by comparing the 3 phases voltages (L1-L2, L2-L3, L3-L1) or phase to neutral (L1-N, L2-N, L3-N) on star grid type. If the voltage of one phase falls below 70% compared to the other 2 phases, the alarm goes off. DPC01DM44 detects loads regenerated voltage, for instance on motor or transformer loads.

- **Asymmetry**

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 phase-phase voltages: $(\max |\Delta V_{LL}| / V_{NOM}) * 100$
- 2) in case of phase-neutral voltages: $(\max |\Delta V_{LN}| / V_{NOM}) * 100$

- **Tolerance**

Tolerance is another indicator of the mains quality and it is defined as the absolute value of the maximum deviation of the mains voltages 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: $(\max |V_{\Delta NOM} - V_{LL}| / V_{\Delta NOM}) * 100$
- 2) in case of measuring phase-neutral voltages: $(\max |V_{NOM} - V_{LN}| / V_{NOM}) * 100$

Operating diagram

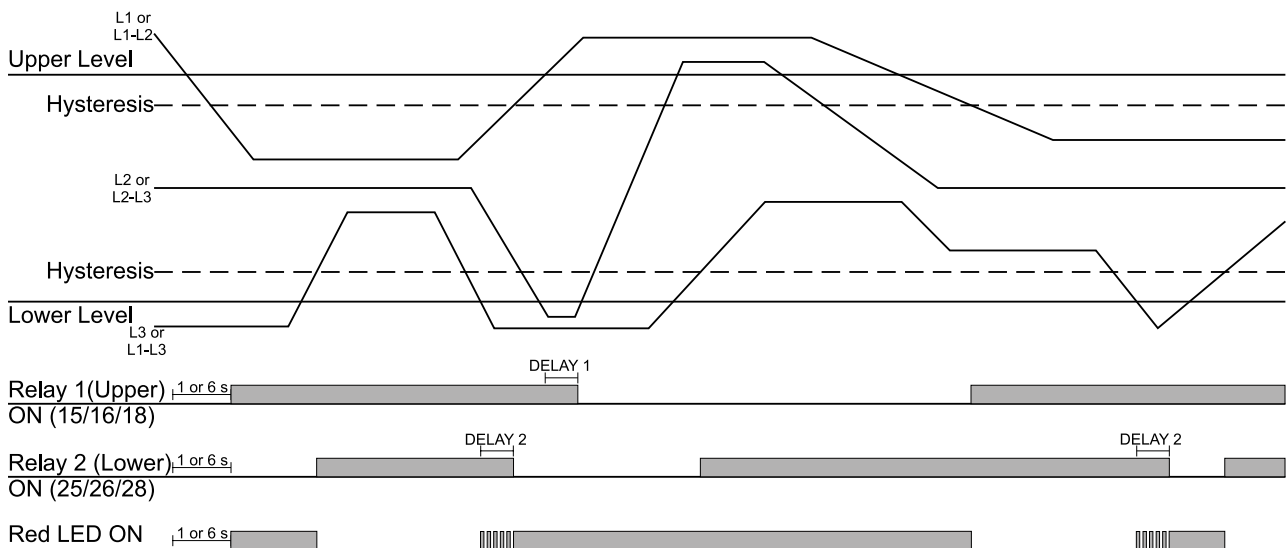


Fig. 2 Over and undervoltage monitoring (2 x SPDT relays)

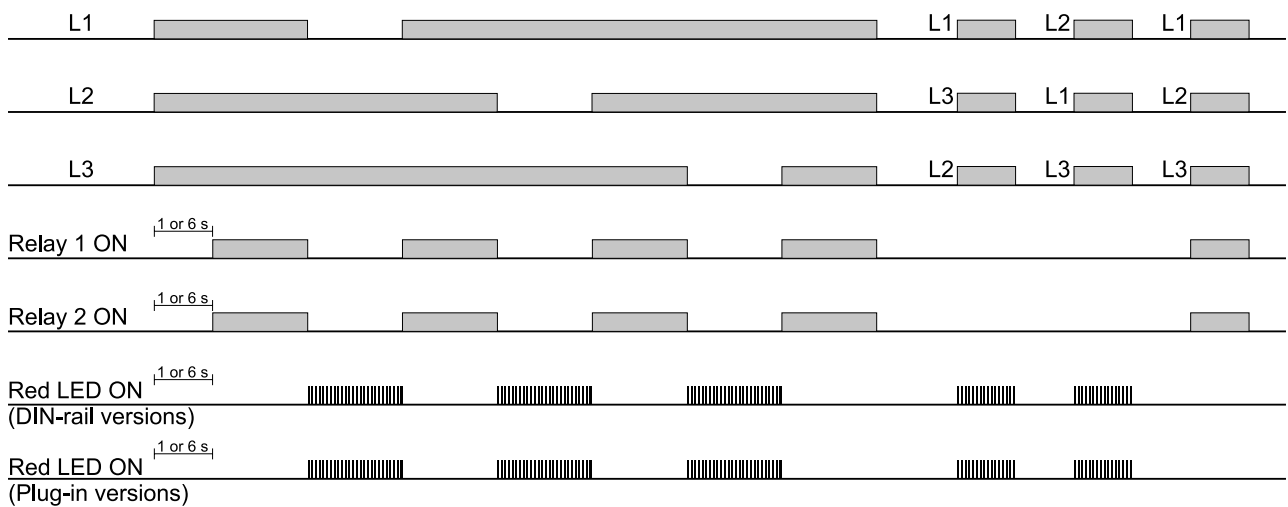


Fig. 3 Phase sequence, total phase loss

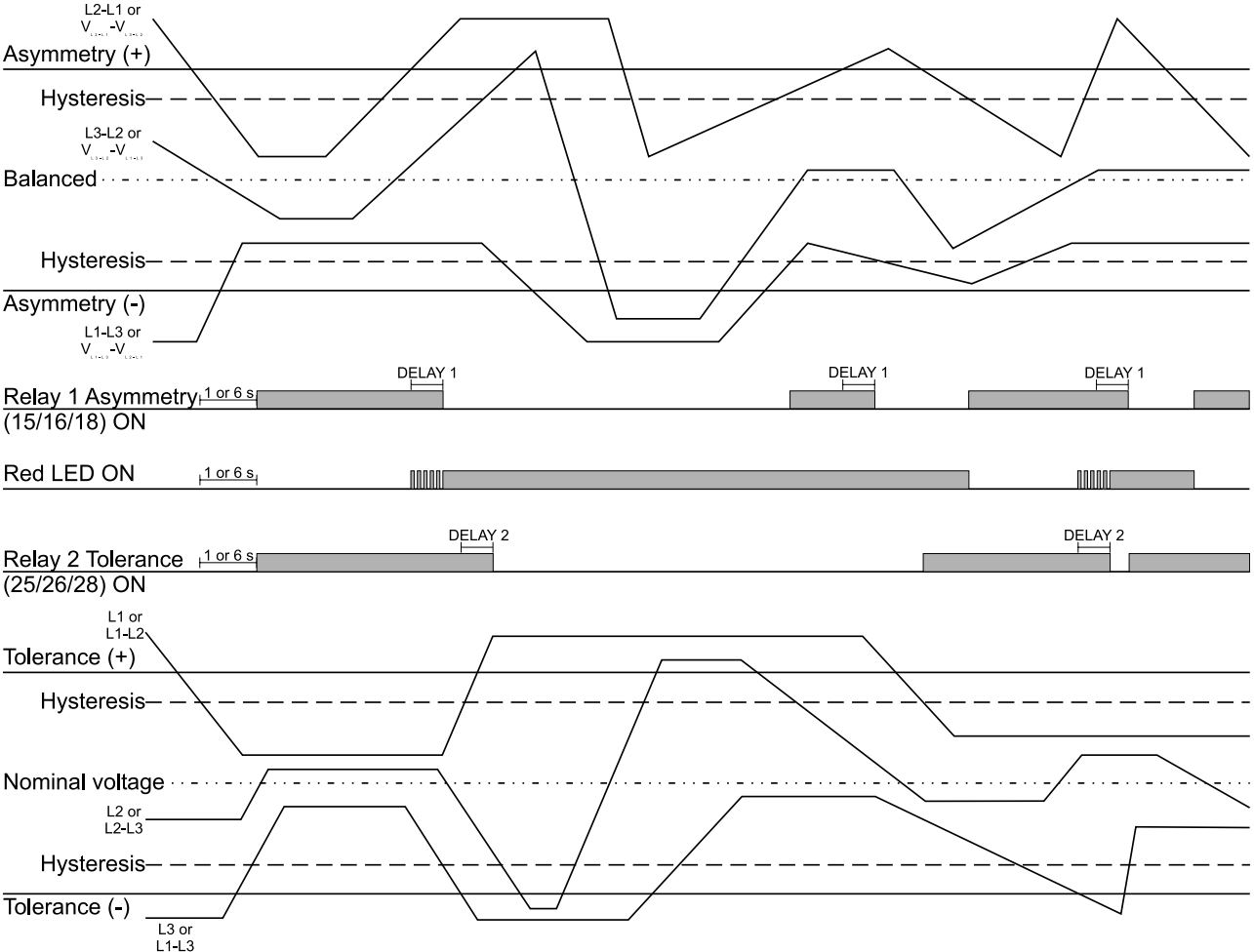


Fig. 4 Asymmetry and tolerance monitoring (2 x SPDT relays)

Connection Diagrams

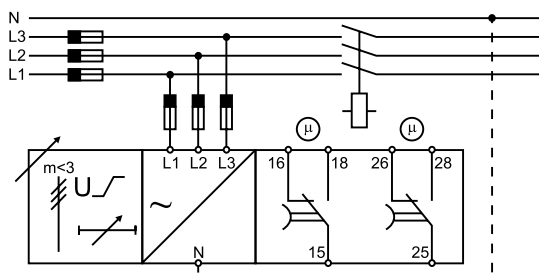


Fig. 5 DPC01 - Example 1

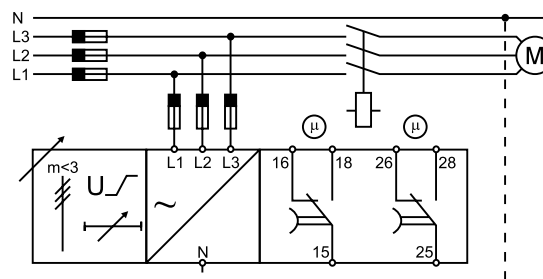


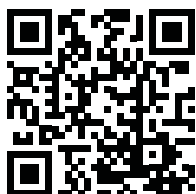
Fig. 6 DPC01 - Example 2

References

Order code



DPC01DM44



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