

# Monitoring Relays

## 3-Phase Active power direction

### Types DWB03, PWB03

CARLO GAVAZZI



DWB03



PWB03

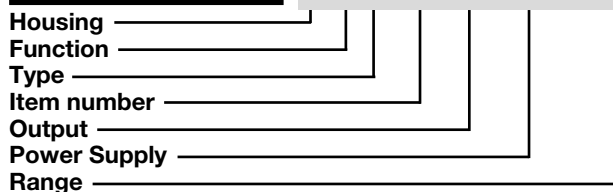
- TRMS active power relays for three phase balanced applications
- Measuring if active power is within set limits
- Measure their own power supply
- Measuring ranges: 5A, 10A, MI current transformers
- Power ON delay 1 to 30 s knob selectable
- Separately adjustable upper/lower level on relative scale
- Programmable latching or inhibit at set level
- Automatic and manual start and stop of the system
- Output: 8 A SPDT relay N.D. or N.E. selectable
- For mounting on DIN-rail in accordance with DIN/EN/EC 60715 (DWB03) or plug-in module (PWB03)
- 45 mm Euronorm housing (DWB03) or 36 mm plug-in module (PWB03)
- LED indication for relay, alarm and power supply ON

### Product Description

DWB03 and PWB03 are precise TRMS active power monitoring relays for 3-phase balanced systems. They can be used for monitoring the actual load of asynchronous motors and other symmetrical loads, as well as to see if the power flows in the correct direction. Start/stop input allows to

use a manual switch to start and stop the system, without the need of an auxiliary device. The advantage of using the latch function is that the alarm status can be kept even after the end of the alarm condition. The LED's indicate the state of the alarm and the output relay.

### Ordering key **DWB 03 C M48 10A**



### Type Selection

| Mounting | Output | Supply:<br>208 to 240 VAC | Supply:<br>380 to 415 VAC | Supply:<br>380 to 480 VAC | Supply:<br>600 to 690 VAC |
|----------|--------|---------------------------|---------------------------|---------------------------|---------------------------|
| DIN-rail | SPDT   | <b>DWB 03 C M23 10A</b>   | <b>PWB 03 C M48 10A</b>   | <b>DWB 03 C M48 10A</b>   | <b>DWB03 C M69 10A</b>    |
| Plug-in  | SPDT   | <b>PWB 03 C M23 10A</b>   |                           |                           |                           |

### Input Specifications

| Input                                    | Supply  | Standard CT (examples)  | 5 to 50 A                      | 60 A   |
|--|---|---|--------------------------------|--|
| Voltage (own power supply):<br>3 - phase | DWB03: L1, L2, L3<br>PWB03: 5, 6, 7<br>M23: 208 to 240 VAC ± 15%<br>DWB03CM48: 380 to 480 VAC ± 15%<br>PWB03CM48: 380 to 415 VAC ± 15%<br>DWB03CM69: 600 to 690 VAC ± 15%<br>DWB03CM23: L1, L2<br>PWB03CM23: 5, 6<br>208 to 240 VAC ± 15% | TADK2 50 A/5 A<br>CTD1 150 A/5 A<br>CTD4 400 A/5 A<br>TAD12 1000 A/5 A<br>TACO200 6000 A/5 A    | 15 to 150 A                    | 180 A  |
| 1- phase                                 | DWB03CM23: L1, L2<br>PWB03CM23: 5, 6<br>208 to 240 VAC ± 15%  | MI CT ranges<br>MI 100<br>MI 500  | 100 to 1000 A<br>600 to 6000 A | 1200 A<br>7200 A   |
| Current:                                 | DWB03: 5A, 10A: I1, I2<br>MI...:U1, U2<br>PWB03: 5A, 10A: 11, 10<br>MI...: 9, 8   | <b>Note:</b><br>The input voltage cannot raise over 300 VAC with respect to ground (PWB03 only) | 10 to 100 A<br>50 to 500 A     | 250 AAC<br>750 AAC   |
| <b>Measuring ranges</b><br>Active power  | <b>Upper level</b><br>-100 to 100 %<br><b>AACrms</b>  | <b>Lower level</b><br>-100 to 100 %<br><b>Max. curr. (30s)</b>                                  |                                |  |
| Direct input:                            | 0.5 to 5A<br>1 to 10A   | 30A<br>50A  |                                |  |
|  |   | <b>Contact input</b><br>DWB03<br>PWB03<br>Disabled<br>Enabled<br>Pulse width                    |                                | Terminals Z1, U2<br>Terminals 2, 9<br>> 10 kΩ<br>< 500 Ω<br>> 500 ms |
|  |   | <b>Hysteresis</b>   |                                | ~ 2% of set value - fixed  |

## Output Specifications

|                                 |  |
|---------------------------------|--|
| <b>Output</b>                   | SPDT relay   |
| <b>Rated insulation voltage</b> | 250 VAC  |
| <b>Contact ratings</b>          | $\mu$  |
| Resistive loads                 | AC 1 8 A @ 250 VAC<br>DC 12 5 A @ 24 VDC                                 |
| Small inductive loads           | AC 15 2.5 A @ 250 VAC<br>DC 13 2.5 A @ 24 VDC                            |
| <b>Mechanical life</b>          | $\geq 30 \times 10^6$ operations   |
| <b>Electrical life</b>          | $\geq 50 \times 10^3$ operations<br>(at 8 A, 250 V, $\cos \varphi = 1$ ) |
| <b>Dielectric strength</b>      |  |
| Dielectric voltage              | $\geq 2$ kVAC (rms)  |
| Rated impulse withstand volt.   | 4 kV (1.2/50 $\mu$ s)  |

## Supply Specifications

|                                     |  |
|-------------------------------------|--|
| <b>Power supply</b>                 | Overvoltage cat. III<br>(IEC 60664, IEC 60038) |
| Rated operational voltage           |  |
| Through terminals:                  |  |
| DWB03:                              | L1, L2, L3                                     |
| PWB03:                              | 5, 6, 7  |
| M23                                 | 177 to 276 VAC 45 to 65 Hz                     |
| DWB03CM48                           | 323 to 552 VAC 45 to 65 Hz                     |
| PWB03CM48                           | 323 to 477 VAC 45 to 65 Hz                     |
| DWB03CM69                           | 510 to 793 VAC 45 to 65 Hz                     |
| Dielectric voltage supply to output | 4 kV   |
| <b>Rated operational power</b>      |  |
| M23                                 | 9 VA @ 230 V, 50 Hz                            |
| M48                                 | 13 VA @ 400 V, 50 Hz                           |
| M69                                 | 21 VA @ 600 V, 50 Hz                           |
| Supplied by                         | L1 and L2                                      |

## General Specifications

|                         |  |
|-------------------------|--|
| <b>Power ON delay</b>   | 1 to 30 s $\pm$ 0.5 s  |
| <b>Reaction time</b>    | (input signal variation from -20% to +20% or from +20% to -20% of set value) |
| Alarm ON delay          | < 250 ms   |
| Alarm OFF delay         | < 250 ms   |
| <b>Accuracy</b>         | (15 min warm-up time)  |
| Temperature drift       | $\pm 1000$ ppm/ $^{\circ}$ C   |
| Delay ON alarm          | $\pm 10\%$ on set value $\pm 50$ ms  |
| Repeatability           | $\pm 0.5\%$ on full-scale  |
| <b>Indication for</b>   |  |
| Power supply ON         | LED, green   |
| Alarm ON                | LED, red (flashing 2 Hz during delay time)                                   |
| Output relay ON         | LED, yellow  |
| <b>Environment</b>      |  |
| Degree of protection    | IP 20  |
| Pollution degree        | 3 (DWB03), 2 (PWB03)   |
| Operating temperature   |  |
| @ Max. voltage, 50 Hz   | -20 to +60 $^{\circ}$ C, R.H. < 95%  |
| @ Max. voltage, 60 Hz   | -20 to +50 $^{\circ}$ C, R.H. < 95%  |
| Storage temperature     | -30 to +80 $^{\circ}$ C, R.H. < 95%  |
| <b>Housing</b>          |  |
| Dimensions              | DWB03 45 x 80 x 99.5 mm<br>PWB03 36 x 80 x 94 mm                             |
| Material                | PA66 or Noryl  |
| <b>Weight</b>           | Approx. 250 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

DWB03 and PWB03 measure the active power of a 3-phase balanced system. The relay has an adjustable power ON delay in order to avoid undesired overload detection during motor start.

### Example 1

Latching mode, relay NE. In this application DWB03 or PWB03 is connected to an external current metering transformer, type MI..., (connected between U1 & U2) as well as to a 3-phase asynchronous motor. The relay

is energized as soon as the power supply is applied. After the power ON delay, the unit starts to measure power. If it is within the setpoints, the relay is energized, and the yellow LED is ON. As soon as the power drops below the lower setpoint or raises above the upper setpoint the output relay releases after the set time has expired. To restart the measurement, connect Z1 and U1 (2 and 9) or interrupt the power supply for at least 1 s.

### Example 2

Latching mode, relay NE. Monitoring the correct power flow of a generator. DWB03 and PWB03 react as described in the previous example 1. Setting underpower setpoint at 0 allows to protect the generator both from overload and from becoming a motor (i.e.; supplied by other devices in the system) allowing, for example, to disconnect it in such an event.

### Example 3

Start/stop mode, relay NE. In this application DWB03 or PWB03 are directly connected to a 3-phase asynchronous motor. The relay is energized as soon as the power supply is applied and the start/stop contact is closed. After the power ON delay, the unit starts to measure the active power. If it is within the setpoints the relay is energized. As soon as the power drops below the lower setpoint or raises above the upper setpoint

## Mode of Operation (cont.)

the output relay releases and the red LED turns on after the set time has expired. When the start/stop contact is opened the relay is immediately de-energized. To restart the system just connect the start/stop contact.

**Note 1:** to use the start/stop function the output relay has to command a contactor in series to the load (see last two wiring diagrams).

**Note 2** (3-phase voltage): connect the 3-phase power supply to the terminals L1, L2 and L3 (DWB03) - 5, 6 and 7 (PWB03) taking care of the sequence.

## Function/Range/Level/Time Setting

Select the desired function setting the DIP-switches 1 to 4 as shown on the right. Adjust the input range setting the DIP-switches 5 and 6. To access the DIP-switches open the plastic cover using a screwdriver as shown below. If DIP switch 3 is set to ON (start/stop) the position of DIP switch 4 does not affect the products' working mode.

**Center knobs:**

Setting of upper and lower-level from -100 to 100% of nominal power.

**Lower left knob:**

Setting of delay on absolute scale: 0.1 to 30 s.

**Lower right knob:**

Setting of power ON delay on absolute scale: 1 to 30 s.

**Input current range (terminals I1, I2 or 10, 11)**

ON: 10A  
OFF: 5A/MI

**Relay status**

ON: Relay de-energized in normal condition  
OFF: Relay energized in normal condition

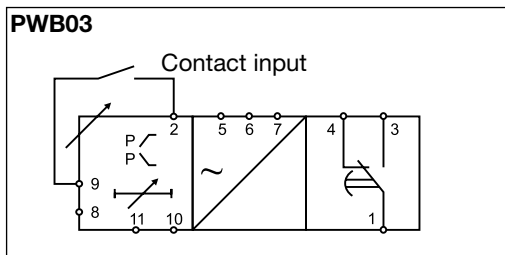
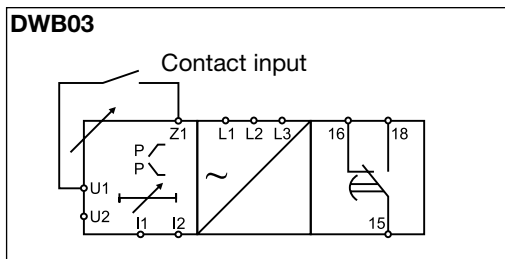
**Working mode**

ON: Contact input for start/stop functions  
OFF: Contact input for latch/inhibit functions

**Contact input (SW3 OFF)**

ON: Latch function enable  
OFF: Inhibit function enable

| Measuring range |         |         |         |                       |
|-----------------|---------|---------|---------|-----------------------|
| SW5             | ON      | ON      | OFF     | OFF                   |
| SW6             | ON      | OFF     | ON      | OFF                   |
| M23             | 208 VAC | 220 VAC | 230 VAC | 240 VAC               |
| M48             | 380 VAC | 400 VAC | 415 VAC | 480 VAC<br>DWB03 only |
| M69             | 600 VAC | 690 VAC | 600 VAC | 690 VAC               |



**Notes**

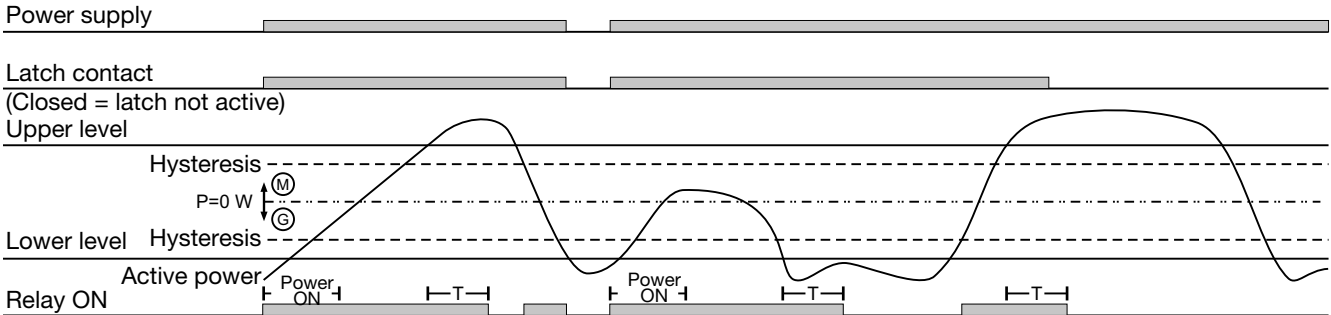
- DIP-switch 3 set ON enables the start/stop function that is managed by the closing-opening of the contact input.
- DIP-switch 3 set OFF enables the input contact for the latch/inhibit functions: the selection between these is allowed by DIP switch 4.

The following table shows as the input contact manages the mode of operation:

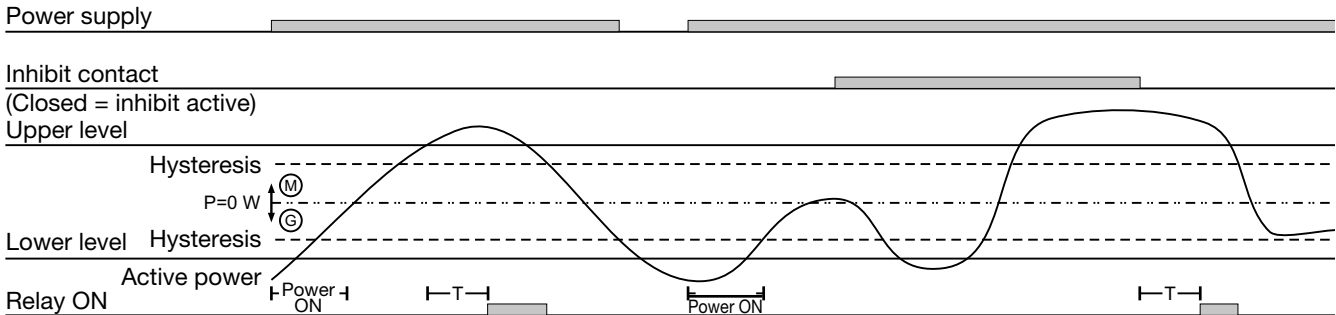
| Contact input working mode |            |            |
|----------------------------|------------|------------|
|                            | CLOSED     | OPEN       |
| LATCH                      | NOT ACTIVE | ACTIVE     |
| INHIBIT                    | ACTIVE     | NOT ACTIVE |
| START/STOP                 | START      | STOP       |

## Operation Diagrams

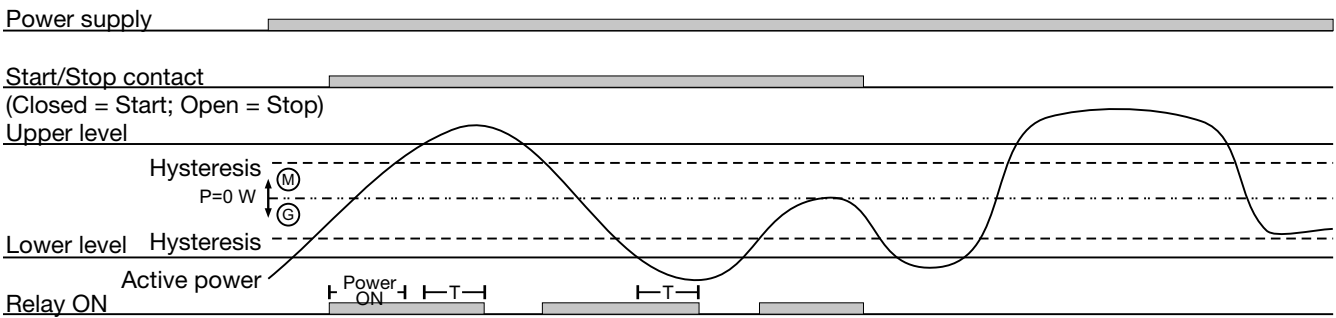
### Latch function - NE relay



### Inhibit function - ND relay

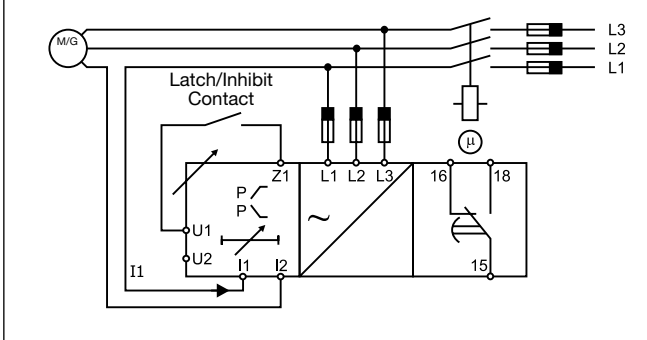


### Start and stop function - NE relay

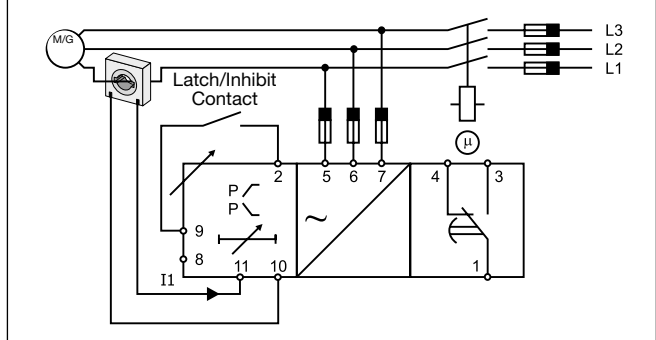


## Wiring Diagrams

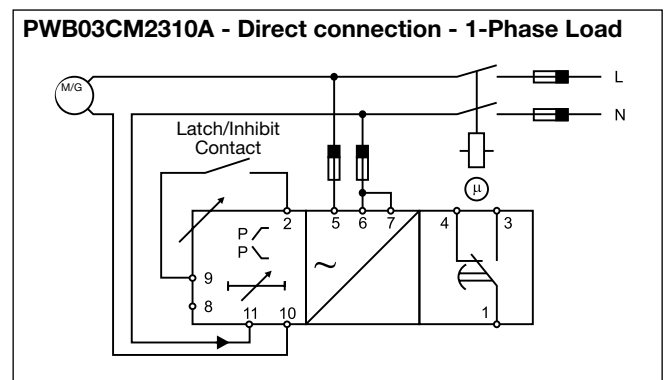
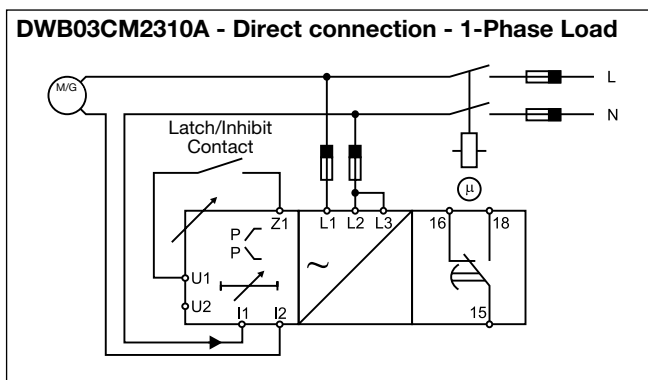
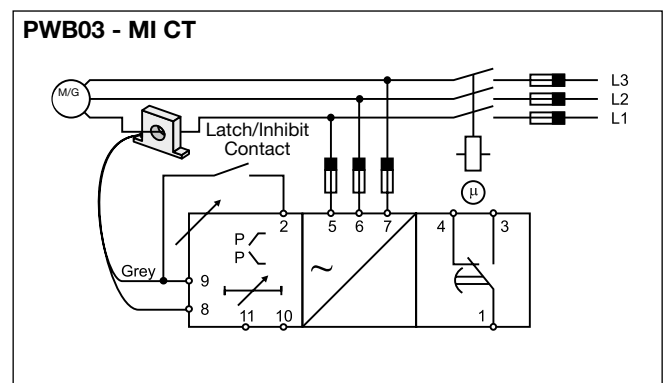
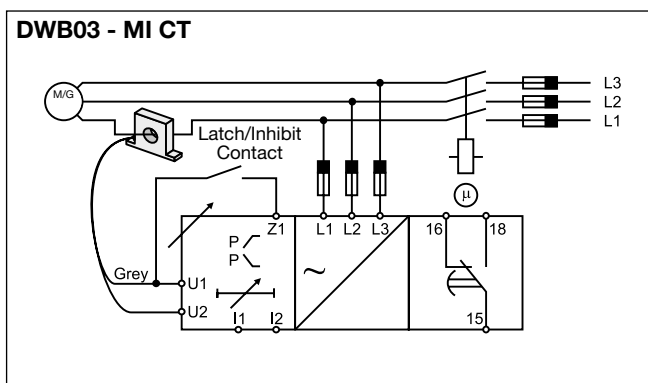
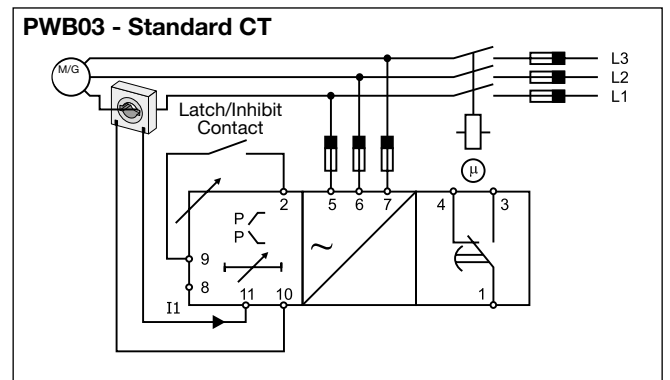
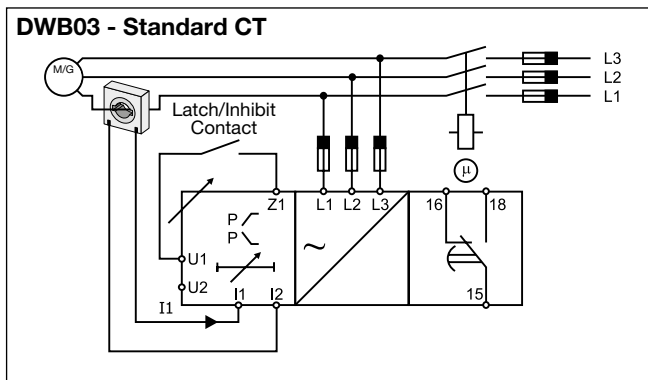
### DWB03 - Direct connection



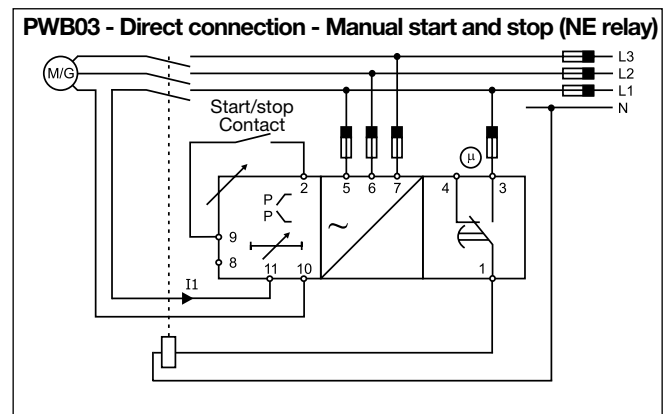
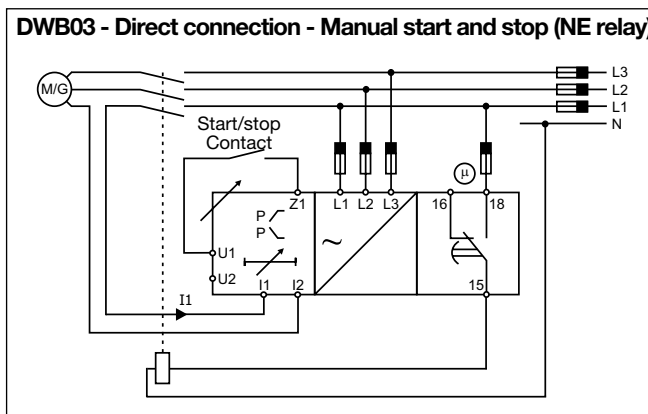
### PWB03 - Direct connection



## Wiring Diagrams (cont.)



With the start/stop function enabled, it's necessary to use the following wiring diagrams (which are two examples among many others). It is possible for both 3-phases loads and of 1-phase loads, either through direct connection or external current metering transformer.



## Dimensions

