Monitoring Relays
3-Phase Active power direction
Types DWB03, PWB03

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.

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

<table>
<thead>
<tr>
<th>DWB 03 C M48 10A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing: DWB 03 CM48 10A</td>
</tr>
<tr>
<td>Function: Power Supply: 380 to 415 VAC</td>
</tr>
<tr>
<td>Type: SPDT</td>
</tr>
<tr>
<td>Item number: 10A</td>
</tr>
<tr>
<td>Output: Power Supply: 380 to 415 VAC</td>
</tr>
<tr>
<td>Power Supply: 380 to 415 VAC</td>
</tr>
<tr>
<td>Range: Power Supply: 380 to 415 VAC</td>
</tr>
</tbody>
</table>

Type Selection

<table>
<thead>
<tr>
<th>Mounting</th>
<th>Output</th>
<th>Supply: 208 to 240 VAC</th>
<th>Supply: 380 to 415 VAC</th>
<th>Supply: 380 to 480 VAC</th>
<th>Supply: 600 to 690 VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIN-rail</td>
<td>SPDT</td>
<td>DWB 03 C M23 10A</td>
<td>DWB 03 C M48 10A</td>
<td>DWB 03 C M48 10A</td>
<td></td>
</tr>
<tr>
<td>Plug-in</td>
<td>SPDT</td>
<td>PWB 03 C M23 10A</td>
<td>PWB 03 C M48 10A</td>
<td>PWB 03 C M69 10A</td>
<td></td>
</tr>
</tbody>
</table>

Input Specifications

<table>
<thead>
<tr>
<th>Input</th>
<th>Voltage (own power supply):</th>
<th>DWB03:</th>
<th>L1, L2, L3</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-phase</td>
<td>DWB03: 5, 6, 7</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>M23: 208 to 240 VAC ± 15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DWB03CM48: 380 to 480 VAC ± 15%</td>
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</tr>
<tr>
<td></td>
<td>PWB03CM48: 380 to 415 VAC ± 15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DWB03CM69: 600 to 690 VAC ± 15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-phase</td>
<td>DWB03CM23: 5, 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>208 to 240 VAC ± 15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5A, 10A: L1, I2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mi,...U1, U2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10A: L1, 11, 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mi,...9, 8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Current:</th>
<th>DWB03:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5A, 10A:</td>
</tr>
<tr>
<td></td>
<td>Mi,...U1, U2</td>
</tr>
<tr>
<td></td>
<td>10A:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measuring ranges</th>
<th>Active power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper level</td>
<td>100 to 100 %</td>
</tr>
<tr>
<td>Lower level</td>
<td>100 to 100 %</td>
</tr>
<tr>
<td>AACrms Max. curr.</td>
<td>(30s)</td>
</tr>
<tr>
<td>Direct input:</td>
<td>0.5 to 5A</td>
</tr>
<tr>
<td></td>
<td>30A</td>
</tr>
<tr>
<td></td>
<td>1 to 10A</td>
</tr>
<tr>
<td></td>
<td>50A</td>
</tr>
</tbody>
</table>

Note: The input voltage cannot raise over 300 VAC with respect to ground (PWB03 only)

Contact input

<table>
<thead>
<tr>
<th>DWB03:</th>
<th>Terminals Z1, U2</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWB03:</td>
<td>Terminals 2, 9</td>
</tr>
</tbody>
</table>

Specifications are subject to change without notice (07.06.10)
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Output Specifications

Output | SPDT relay
---|---
Rated insulation voltage | 250 VAC

Contact ratings (AgSnO₂)

- 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 10⁶ operations
Electrical life | (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
- Through terminals:
  - DWB03: L1, L2, L3
  - PWB03: 5, 6, 7
  - M23: 177 to 276 VAC 45 to 65 Hz
  - M48: 323 to 552 VAC 45 to 65 Hz
  - M69: 510 to 793 VAC 45 to 65 Hz
- Rated operational power
  - M23: 9 VA @ 230 V, 50 Hz
  - M48: 13 VA @ 400 V, 50 Hz
  - M69: 21 VA @ 600 V, 50 Hz
  - L1 and L2

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

Overvoltage cat. III (IEC 60664, IEC 60038)

- Through terminals:
  - DWB03: L1, L2, L3
  - PWB03: 5, 6, 7

General Specifications

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  - M48: 323 to 552 VAC 45 to 65 Hz
  - M69: 510 to 793 VAC 45 to 65 Hz

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- Electrical life | (at 8 A, 250 V, cos ϕ = 1)
- Operating frequency | ≤ 7200 operations/h
- Dielectric strength
  - Dielectric voltage | ≥ 2 kVAC (rms)
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- SPDT relay

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Rated operational power

- M23: 9 VA @ 230 V, 50 Hz
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- L1 and L2

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- L1 and L2

Power ON delay

- 1 to 30 s ± 0.5 s

Reaction time

- (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

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

Indication for

- Power supply ON LED, green
- Alarm ON LED, red (flashing 2 Hz during delay time)
- Output relay ON LED, yellow

Environment

- Degree of protection IP 20
- Pollution degree 3 (DWB03), 2 (PWB03)
- Operating temperature
  - @ Max. voltage, 50 Hz -20 to +60°C, R.H. < 95%
  - @ Max. voltage, 60 Hz -20 to +50°C, R.H. < 95%
- Storage temperature -30 to +80°C, R.H. < 95%

Housing

- Dimensions DWB03: 45 x 80 x 99.5 mm
  - PWB03: 36 x 80 x 94 mm
- Material PA66 or Noryl
- Weight
  - Approx. 250 g

Screw terminals

- Tightening torque
  - Max. 0.5 Nm acc. to IEC 60947

Product standard

- EN 60255-6
- Approvals
  - UL
  - CE Marking
  - L.V. Directive 2006/95/EC
  - EMC Directive 2004/108/EC
    - Immunity According to EN 60255-26
    - According to EN 61000-6-2
    - Emissions According to EN 60255-26
    - According to EN 61000-6-3

EMC

- Immunity According to EN 60255-26
- According to EN 61000-6-2
- Emissions According to EN 60255-26
- 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 the out-
Mode of Operation (cont.)

Input 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

<table>
<thead>
<tr>
<th></th>
<th>SW5</th>
<th>SW6</th>
<th>M23</th>
<th>M48</th>
<th>M69</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>208 VAC</td>
<td>380 VAC</td>
<td>600 VAC</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>220 VAC</td>
<td>400 VAC</td>
<td>690 VAC</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>230 VAC</td>
<td>415 VAC</td>
<td>600 VAC</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>240 VAC</td>
<td>480 VAC</td>
<td>690 VAC</td>
</tr>
</tbody>
</table>

DWB03
Contact input

PWB03
Contact input

Notes
1. DIP-switch 3 set ON enables the start/stop function that is managed by the closing-opening of the contact input.
2. 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:

<table>
<thead>
<tr>
<th>Contact input working mode</th>
<th>CLOSED</th>
<th>OPEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>LATCH</td>
<td>NOT ACTIVE</td>
<td>ACTIVE</td>
</tr>
<tr>
<td>INHIBIT</td>
<td>ACTIVE</td>
<td>NOT ACTIVE</td>
</tr>
<tr>
<td>START/STOP</td>
<td>START</td>
<td>STOP</td>
</tr>
</tbody>
</table>

Specifications are subject to change without notice (07.06.10)
### Operation Diagrams

#### Latch function - NE relay

**Power supply**

**Latch contact**

(Closed = latch not active)

**Upper level**

[Hysteresis diagram with active power ON]

**Lower level**

[Hysteresis diagram with active power ON]

**Relay ON**

#### Inhibit function - ND relay

**Power supply**

**Inhibit contact**

(Closed = inhibit active)

**Upper level**

[Hysteresis diagram with active power ON]

**Lower level**

[Hysteresis diagram with active power ON]

**Relay ON**

#### Start and stop function - NE relay

**Power supply**

**Start/Stop contact**

(Closed = Start; Open = Stop)

**Upper level**

[Hysteresis diagram with active power ON]

**Lower level**

[Hysteresis diagram with active power ON]

**Relay ON**

### Wiring Diagrams

#### DWB03 - Direct connection

![Wiring diagram for DWB03](image)

#### PWB03 - Direct connection

![Wiring diagram for PWB03](image)
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 1-phase loads, either through direct connection or external current metering transformer.
Dimensions

DIN-rail

Plug-in

Specifications are subject to change without notice (07.06.10)