Installation and Operational Instructions for ROBA®-switch 24V Type 018.100.2

(B.0181002.GB)

Manufacturer's Declaration

This product is intended for installation in a machine or system, based on the machine directive 2006/42/EC.
It is forbidden to start use of the product until the machine or system into which it should be built is operating in accordance with the EC directives.
The product corresponds to the low voltage directive 2006/95/EC.

Safety Regulations

Danger!

To prevent injury or damage, only professionals and specialists should work on the devices, following the relevant standards and directives. Please read the Installation and Operational Instructions carefully before installation and initial operation of the device.

- Danger of device failures caused by short circuits and earth short circuits at the terminals
- Electronic devices cannot be guaranteed fail-safe
- Danger of burns when touching hot surfaces

Please Observe:

Without a conformity inspection, the product is not suitable for use in areas where there is a high danger of explosion. This statement is based on directive 94/9/EC (ATEX directive).

Application

ROBA®-switch 24V fast switching modules are used to operate DC consumer units with overexcitation or power reduction, for example electromagnetic brakes and clutches (ROBA-stop®, ROBA®-quick, ROBATIC®), as well as electromagnets, electrovalves etc.

Fast switching module ROBA®-switch 24V 018.100.2

- Load operation with overexcitation or power reduction
- Integrated DC-side switch-off (shorter connection time t_1)
- Input voltage: 24 VDC
- Max. output current I_{RMS}: 5A

The ROBA®-switch 24V with integrated DC-side switch-off is not suitable for functioning as the only safety switch-off on the application!

Function

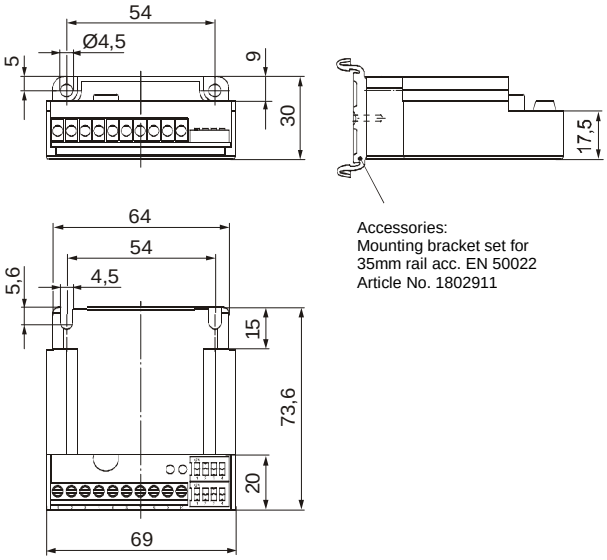
The ROBA®-switch 24V units are used for an input voltage of 24 VDC. It can switch internally automatically, meaning that the output voltage switches to holding voltage from the input voltage (=overexcitation voltage) via pulse-width modulation using 20 kHz. The overexcitation time can be adjusted via a DIP switch to 150 ms, 450ms, 1s, 1,5s and 2,15s. The holding voltage can be adjusted via a further DIP switch to ¼, ⅓, ½ and ⅔ of the input voltage (equals 6V, 8V, 12V and 16V at an input voltage of 24V).

Apart from this, the ROBA®-switch 24V has an integrated DC-side switch-off. In contrast to the usual DC-side switch-off, no further protective measures or external components are required. The DC-side switch-off is activated in standard mode and causes short switching times on the electromagnetic consumer. This can, however, be deactivated by installing a bridge between terminals 7 and 8 in order to produce softer braking and quieter switching noises. However, this substantially lengthens the switching times (c. 6 - 10 times).

Electrical Connection (Terminals)

2 + 3	Input voltage ground
4	Control input
5 – 7	Input voltage +24 VDC
8 + 9	Output voltage +
10	Output voltage –

Dimensions (mm)



Accessories:
Mounting bracket set for 35mm rail acc. EN 50022
Article No. 1802911

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Technical Data

	Type 1/018.100.2
Input voltage U_I +20%/-10% SELV PELV ripple content ≤5%	24 VDC
Output voltage U_{over}	Input voltage U_I
Output voltage U_{hold} ±20%	¼, ⅓, ½,⅔ x U_I
Output current at ≤ 45 °C I_{RMS}	5,0 A
Output current at max. 70 °C I_{RMS}	2,5 A
Conformity markings	CE
Protection fuse	F12,5A (5x20mm)
Protection	IP00
Terminals	Nominal cross-section 1,5 mm² (AWG 22-14) screws M3, max. tightening torque 0,5 Nm
Ambient temperature	-25 °C up to +70 °C
Storage temperature	-40 °C up to +105 °C
Installation conditions	The installation position can be user-defined. Please ensure sufficient heat dissipation and air convection! Do not install this product near to sources of intense heat!

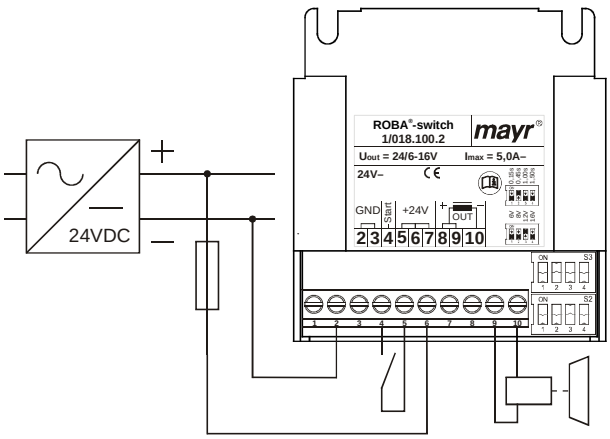
Maximum Coil Capacity (Watt)

	U_{hold} 6 VDC		
	≤45 °C	70 °C	Index
Coil nominal voltage 6 VDC	30	15	1
Coil nominal voltage 8 VDC	53	27	3
Coil nominal voltage 12 VDC	120	60	3
Coil nominal voltage 16 VDC	213	107	3
Coil nominal voltage 24 VDC	480	240	2
	U_{hold} 8 VDC		
	≤45 °C	70 °C	Index
Coil nominal voltage 8 VDC	40	20	1
Coil nominal voltage 12 VDC	90	45	3
Coil nominal voltage 16 VDC	160	80	3
Coil nominal voltage 24 VDC	360	180	2
	U_{hold} 12 VDC		
	≤45 °C	70 °C	Index
Coil nominal voltage 12 VDC	60	30	1
Coil nominal voltage 16 VDC	107	53	3
Coil nominal voltage 24 VDC	240	120	2
	U_{hold} 16 VDC		
	≤45 °C	70 °C	Index
Coil nominal voltage 16 VDC	80	40	1
Coil nominal voltage 24 VDC	180	90	2

Index 1) Operation with overexcitation
2) Operation with power reduction
3) Operation with overexcitation and power reduction

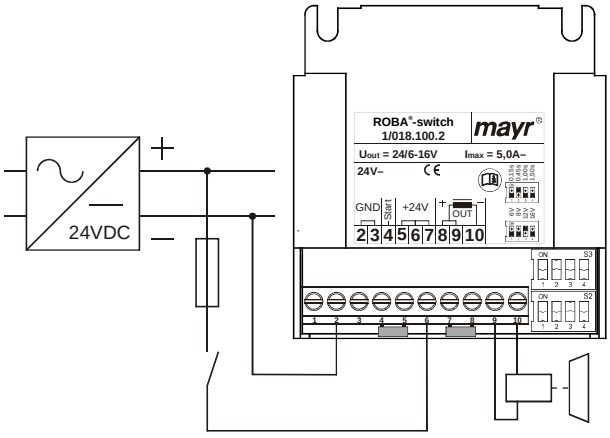
Wiring Example

fast switch-off via integrated DC-side switch-off
power-free switching via control input



Wiring Example

slow switch-off (freewheeling)
control via contactor in power supply cable



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Switch-on

Switch-on can take place by switching the supply voltage or via a power-free control input (terminal 4). The current consumption is c. 10mA. A green light-emitting diode emits a signal when the unit is switched-on. After switching from overexcitation voltage to holding voltage, the diode continues glowing with reduced intensity.

Switch-off

If short switching times are required, please switch DC-side and via the control input. Here, the ROBA®-switch 24V limits the switch-off voltage to c. 70V. DC-side switch-off is signalized by the red light-emitting diode flashing at the moment of switch-off.

If a longer brake engagement time or a quieter switching noise is required, please switch free-wheeling. For this, a bridge must be installed between terminals 7 and 8.

Protection fuse

In order to protect against damage caused by short circuits or earth short circuits, please install suitable protection fuses in the mains supply.

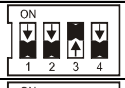
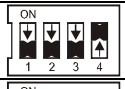
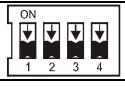
Short circuits or earth short circuits can cause failure of the ROBA®-switch. After fuse elements have reacted, the ROBA®-switch 24V must be tested for functional and operational safety (overexcitation voltage, switch-off voltage, switch-off time, holding voltage). The same procedure is to be carried out after coil failure.

Overexcitation

On overexcitation, the brake is initially energised with a voltage higher than the nominal voltage. This decreases the disconnection time t_2.

Increased wear (enlarged air gap) as well as coil heat lengthen the brake disconnection time t_2. Therefore, when dimensioning the overexcitation time t_{over}, please select at least double the disconnection time t_2 on each brake Type and size (catalogue values).

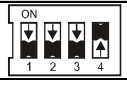
The overexcitation time can be adjusted via the DIP switch S3 to 150ms, 450ms, 1s, 1,5s and 2,15s ±20 %. The switches may only be switched in de-energised state and may only be adjusted as depicted.

DIP switch	Overexcitation time t_{over}
	0,15 s
	0,45 s
	1,00 s
	1,50 s
	2,15 s

manufacturer-side setting

Holding voltage

The holding voltage can be adjusted via the DIP switch S2 to ¼, ⅓, ½ and ⅔ of the input voltage U_I. The switches may only be switched in de-energised state and may only be adjusted as depicted. Each stated holding voltage corresponds to an input voltage of 24 VDC.

DIP switch	Holding voltage	
	¼ x U_I	6 VDC
	⅓ x U_I	8 VDC
	½ x U_I	12 VDC
	⅔ x U_I	16 VDC

manufacturer-side setting

Recovery time 100 ms

The recovery time is the amount of time the ROBA®-switch 24V requires in order to reach its starting position after switch-off. Therefore, the device may be switched on again at the earliest after 100 ms.

During cycle operation, please take suitable measures to ensure that the recovery time of 100 ms is kept to.

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Maximum Coil Capacity P_{RMS}

The Table values are guidelines for a switching frequency of max. 1 cycle per minute and for keeping to the permitted current I_{RMS}.

Please Observe!
If the switching frequency is larger than 1 cycle per minute or if the overexcitation time t_{over} for each disconnection time t_2 is larger than the Table values, please observe the following:

$$P_{RMS} \leq P_{nom}$$

The coil capacity P_{RMS} may not be larger than P_{nom} or the nominal current I_{RMS} which flows through the ROBA®-switch 24V may not be exceeded, otherwise the coil and the ROBA®-switch 24V may fail due to thermic overexcitation.

Calculations:

P_{RMS} (W) RMS coil capacity, dependent on switching frequency, overexcitation, power reduction and switch-on time duration

$$P_{RMS} = \frac{P_{over} \times t_{over} + P_{hold} \times t_{hold}}{t_{tot}}$$

P_{nom} (W) Coil nominal capacity (catalogue values or Type tag)

P_{over} (W) Coil capacity on overexcitation

$$P_{over} = \left(\frac{U_{over}}{U_{nom}}\right)^2 \times P_{nom}$$

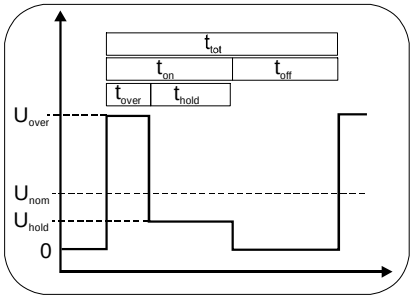
P_{hold} (W) Coil capacity on power reduction

$$P_{hold} = \left(\frac{U_{hold}}{U_{nom}}\right)^2 \times P_{nom}$$

t_{over} (s) Overexcitation time
t_{hold} (s) Time of operation with power reduction
t_{off} (s) Time without voltage
t_{tot} (s) Total time ($t_{over} + t_{hold} + t_{off}$)
U_{over} (V) Overexcitation voltage
U_{hold} (V) Holding voltage
U_{nom} (V) Coil nominal voltage
I_{RMS} (A) RMS current, dependent on switching frequency, overexcitation time and switch-on time duration

$$I_{RMS} = \sqrt{\frac{P_{RMS} \times P_{nom}}{U^2_{nom}}}$$

Time Diagram



EMC-compatible Installation

Please Observe!

- Avoid antennae effect: keep the supply cables as short as possible, do not form ring or bow shapes with the cables!
- Mount good earth connections onto the metal body of the brake!
- Lay control cables separately from power cables or strongly pulsating cables!
- During operation with a frequency converter, please ensure EMC-compatible installation of the frequency converter!
- Please always check the holding voltage of the ROBA®-switch 24V during operation of all components in the system.

Standards

EMC- Inspections

DIN EN 61000-6-2:2006-03	Interference immunity
DIN EN 61000-6-4:2002-08	Noise emission
VDE 0160 / DIN EN 50178:1998-04	Equipment of high-voltage current plants with electronic machinery materials

Insulation coordination acc. VDE 0110 / DIN EN 60664:2003-11
Pollution degree 2
Rated insulation voltage 60 VDC

Appointed use:
Acc. DIN EN 50178:1998-04

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