



Operating instructions

Motor Controller MAE-MR-5-30



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Industrial motor controller for brushed DC motors 24 V DC

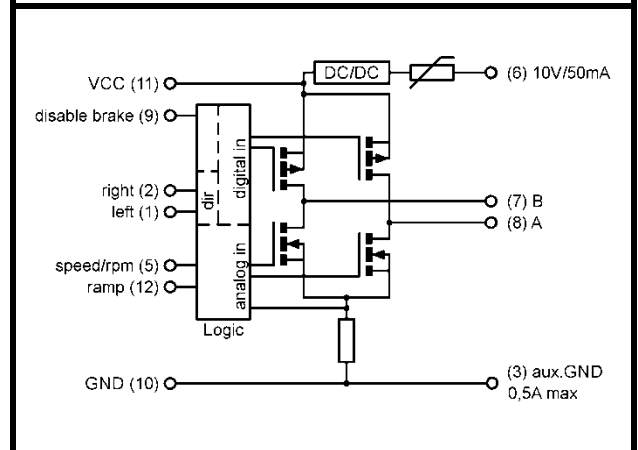
Design for output currents up to 5 A

Control with the following functions:

- reversal of direction of rotation
- open-loop speed control (external)
- adjustable start ramp (external)
- overload shut-down
- short circuit detection
- dynamic brake

To snap onto the DIN rail EN 50022

Unit width: 17,5 mm



Type	MAE-MR-5-30	
Article number	43046041	
Operating data		
Nominal voltage	U_{nom}	24,0 V DC
Supply voltage	V_{CC}	18 .. 30 V DC
Control inputs	U_{DI}	24,0 V DC
Analog input	U_{AI}	0 .. 10 V DC
Quiescent current typ	I_0	50 mA
Technical data: load circuit		
Max. current / continuous load current typ	I_{max}/I_{con}	15 / 5 A
Short circuit current detection typ	I_{SC}	80 A
Shut-down time after short circuit typ	t_{sc}	100 μ s
PWM frequency	F_S	15,6 kHz
Duty cycle		5 .. 100 %
Power stage driver		MOS-FET
Other data		
Dimensions		17,5 x 70,4 x 85,0 mm
Connectors		screw terminal, pitch 5 mm cross section 0,2 – 2,5 mm ²
Permissible ambient temperature	T_{amb}	-20 .. +50 °C
Temperature monitoring / overvoltage protection		yes / yes
Status indication: dynamic brake / Left / Right		LED1 yellow / LED2 green / LED3 green
Dynamic brake (Armature short circuit)		can be switched off
Start ramp		0,05 .. 4 s

Other data	
Installation position / Assembly	any / top-hat rail EN 50022
Installation place, typical	Switch cabinet
Storage temperature	-30 bis +85 °C
Permissible humidity	to 95 %, non-condensing
Weight	0,075 kg
Start up delay	2s
Hazardous substance norm	RoHS2
EMC interference immunity	EN 61326-1:2013-01 EN 61000-6-2:2005-08
EMC emitted interference, operation in industrial DC network	EN 61326-1:2013-01, Class A
EMC emitted interference, operation with power supply	EN 61326-1:2013-01, Class B

Technical data: digital input	
High Signal typ	U > 10 V
Low Signal typ	U < 4 V
Impedance typ	R _{DI} 15 kΩ

Technical data: analog input	
Voltage range	0 .. 10 V
V _{cc} tolerant	yes
Impedance typ	R _{AI} 98,5 kΩ

Flammability	
Housing, terminal, printed circuit board	UL94V-0

Starting behavior

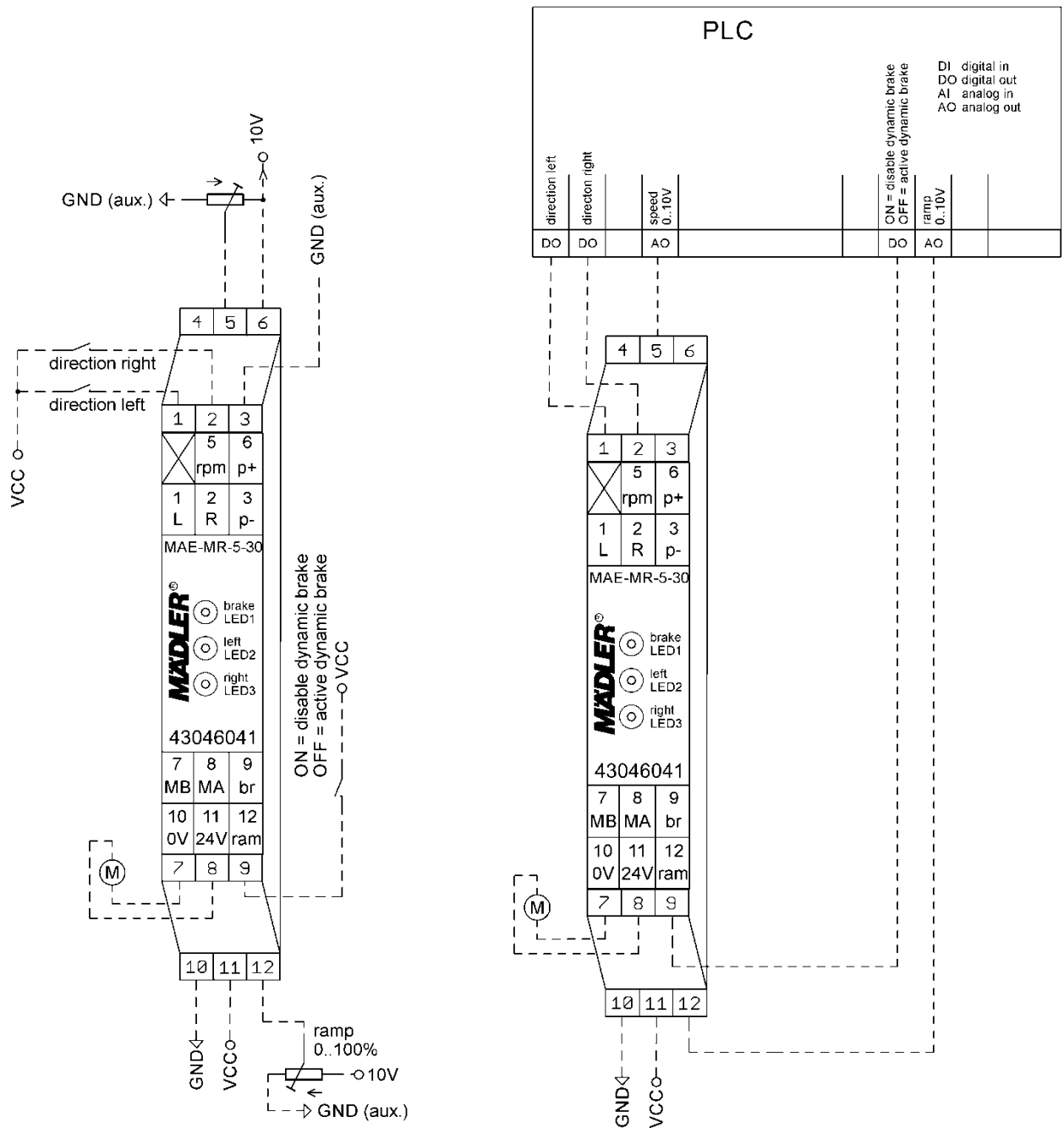
The module MAE-MR-5-30 is ready to use after the start up delay. After the module is powered up the startup delay time starts to run.

Description

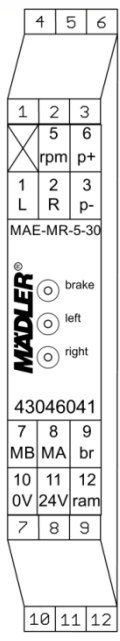
The module MAE-MR-5-30 is a two-quadrant motor control with open loop speed control for DC motors, for use in an industrial environment. It guarantees the switching on and off and the controlled drive of motors. Through two analog inputs it is possible to set the start ramp gradient and the speed of rotation. The motor can be stopped with and without dynamic braking.

Typical application: Standard

Typical application: PLC



Terminal diagram



Terminal	4	5	6
Function	NC	Analog input 1...10V rotational speed 0..100 %	Auxiliary voltage output +10V/approx. 50mA (PTC fuse)
Terminal	1	2	3
Function	Digital input „run left“ (p- switch)	Digital input „run right“ (p-switch)	GND for external potentiometer
Terminal	7	8	9
Function	Motor winding B	Motor winding A	Digital input „disable dynamic brake“ (p-switch)
Terminal	10	11	12
Function	GND supply	+24V supply voltage,	analog input 0 .. 10V Start ramp 50...4000ms

State table

direction „left“ (1)	direction „right“ (2)	disable dyn. braking (9)	Motor „A“ (7)	Motor „B“ (8)	Funktion
0	1	X	VCC	□□ GND	run right
1	0	X	□□ GND	VCC	run left
1	1	X	GND	GND	dyn. braking
0	0	0	GND	GND	dyn. braking
0	0	1	open	open	off

Function: Speed setting **Function: Start ramp**

Via the analog input at terminal (5) it is possible to set the PWM duty cycle that is to be issued to the motor. Within a range from 1 V to 10 V, the voltage is applied as a 0 – 100 % output. With a loading of the motor, the speed reduces.

voltage (5)	Rotational speed / PWM
> 10V	100%
1...10V	Linear 5 – 100%
< 1V	off
open	off

Via the analog input at terminal (12) it is possible to set the gradient of the start ramp resp. the time of the start ramp until 100 % PWM is reached. Example: If the speed specification is set to 50 % PWM and the start ramp is set to 4000 ms, the time until 50 % PWM is: 2000 ms.

voltage (12)	Start ramp time to 100%
0...10V	linear 50...4000ms
open	50ms

Function: dynamic brake **Function: Overload / short circuit detection**

The function “dynamic braking” is activated as standard. The function is deactivated by applying a High Signal at terminal (9). If dynamic braking is active, the motor winding is switched to GND at both terminals when switched off. The motor is stopped with armature short circuit braking. If dynamic braking is not active, the motor spins with no braking.

With an overload or short circuit, the motor switches off without dynamic braking. The motor can be restarted by means of a reset and fresh setting of a direction of rotation.

Device status **Display elements**

The module status is displayed via the LEDs on the module front plate.

LED1 yellow	LED2/LED3 green	meaning
On	Off	Module is ready break is active
Off	Off	Module is ready break is deactivated
Off	On	Motor is running rotation direction is indicated over LED
flashing	On	Module error 1 (see table)
flashing	flashing	Internal Error

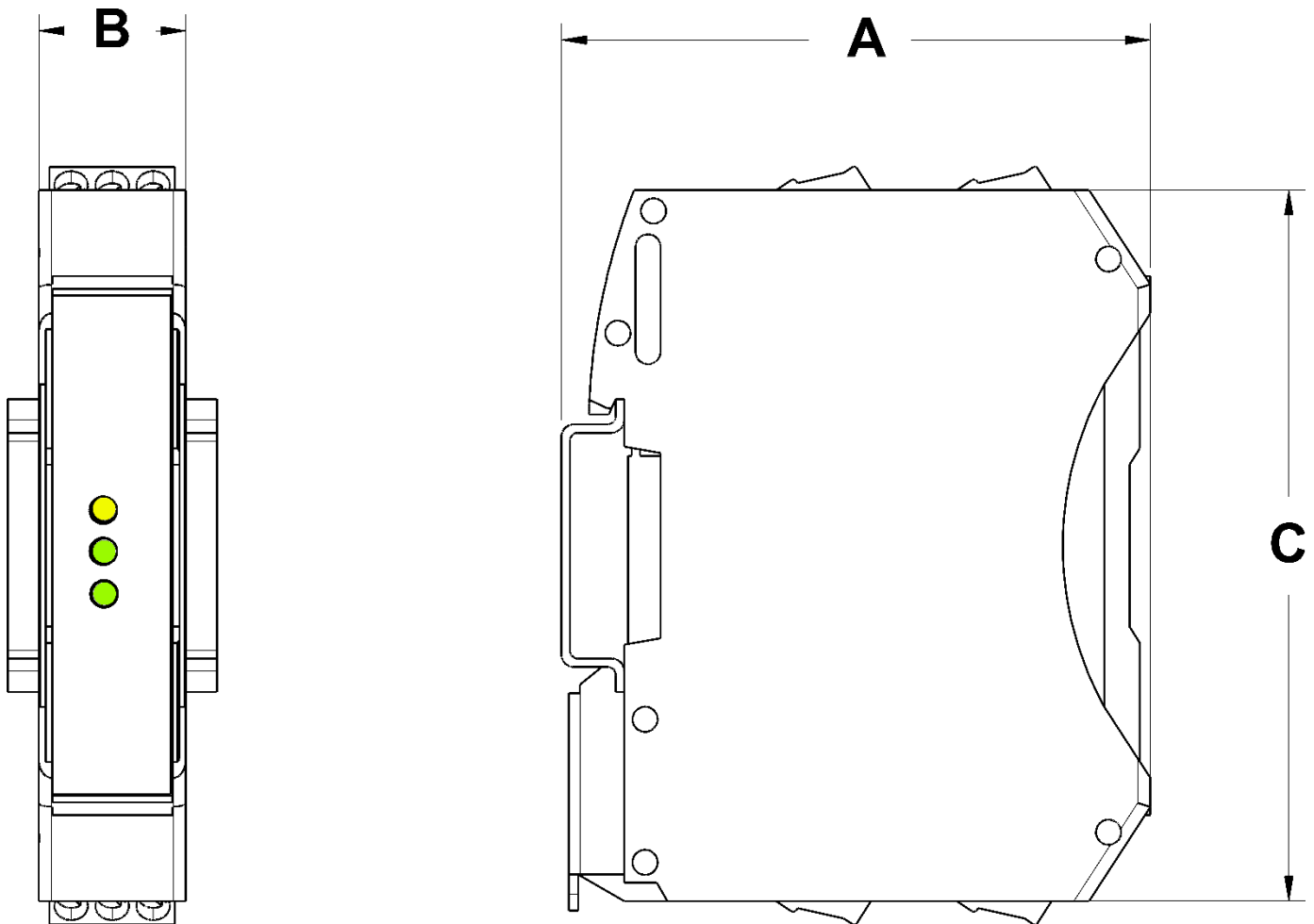
Module errors are displayed as flashing sequences. The end of the sequence is indicated by a pause of 1 second.

The number of flashes indicates the error number. LED2/LED3 indicates in which direction of rotation the error occurs. To reset the error the direction Input must be set low and the internal reset conditions must be fulfilled.

Module error 1

1	overcurrent
2	Over-temperature
3	short circuit detected
4	overvoltage
5	overload
6	Under-temperature
7	Low supply voltage

Dimensional drawing



A = 70,4 mm; B = 17,5 mm; C = 85 mm

Safety notes

Maximum operational data

The maximum operating data may not be exceeded.

Installation

The installation and start-up must be performed by specialist personnel exclusively.

All affected components must be disconnected from the mains.

Start-up

For the first start-up, the motor should be operated without load.

Risk of death

Do not touch live parts after switching on!

The assembly must be operated exclusively on safety extra-low voltage. With operation on extra-low voltage (e.g. via autotransformer), death or injury can occur.

Fire protection

The assembly must be installed in a switch cabinet, which is suitable as a fire protection enclosure.

The assembly must be safeguarded with a pre-fuse aligned with the nominal data.

Field of application

The assembly may only be used as intended.

Other components must be checked for their approvals and regulations.

Safety devices

An additional safety device must be used to bring the system into a safe state in case of a cable break, incorrect operation, failure of the control/controller unit.

EMC / EMI

The wiring must be done according to EMC / EMI standards. If necessary, shielded cables and EMC suppressors must be used for the connected consumer.

For operation in a public low-voltage distribution network, the module must be supplied with an approved AC adapter.

If the module is supplied with an AC adapter, other equipment, operated on the same power supply, must be suitable for use in industrial environments.

Repairs

Repairs must be performed by authorised persons exclusively. With unauthorised opening, the warranty cover is voided and this may also result in danger for the user and for the system.

Maintenance

The assembly is wear-free by design.

For modules **with** cooling openings free air circulation must be checked at the cooling openings or on the housing at regular intervals. If necessary, the cooling holes / the housing must be cleaned.

Good ventilation must be ensured.