KALEJA

Industrial motor controller
for brushed DC motors 24 VDC
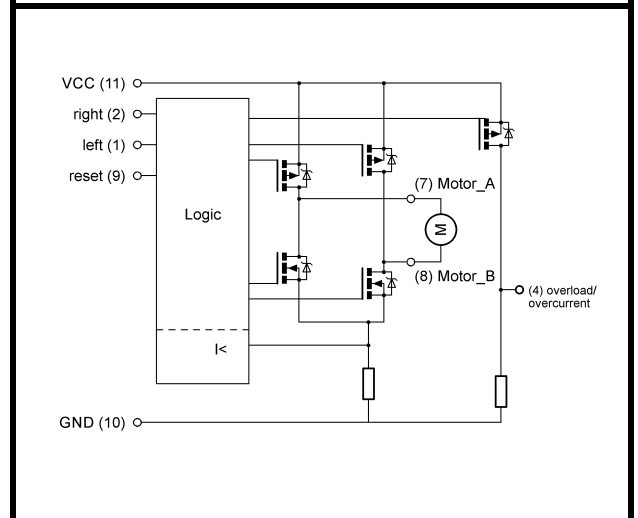
Design for output currents up to 6 A

Control with the following functions:
- **reversal of direction of rotation**
- **overcurrent shutdown depends on direction of rotation**
- **overcurrent indication output**
- **adjustable current monitoring delay**
- **short circuit detection**
- **dynamic brake**

To snap onto the DIN rail
EN 50022

Unit width: 17,5 mm

CE

Type	M2-MWT-6-30
Article number	**06.34.007**

Operating data		
Nominal voltage	U_{nom}	24,0 VDC
Supply voltage	V_{CC}	18 .. 30 VDC
Control inputs	U_{DI}	24,0 VDC
Quiescent current typ	I_0	50 mA

Technical data: load circuit		
Max. current / continuous load current	I_{max}/I_{con}	15 / 6 A
Short circuit current detection typ	I_{SC}	80 A
Shut-down time after short circuit typ	t_{sc}	100 µs
Power stage driver		MOS-FET

Other data		
Dimensions		17,5 x 70,4 x 85,0 mm
Connectors		push-in terminal, pitch 5 mm cross section 0,2 – 2,5 mm²
Permissible ambient temperature	T_{amb}	-20 .. +60 °C
Temperature monitoring / overvoltage protection		yes / yes
Status indication: error / right / left		LED1 red / LED2 green / LED3 green
Current limitation left adjustable over DIP(3,4) and TR2		0,4 .. 6 A
Current limitation right adjustable over DIP(1,2) and TR3		0,4 .. 6 A
Disable Time trimmer TR1 (CM-delay)		0 .. 0,7 s
Dynamic brake (Armature short circuit)		always on

Other data	
Installation orientation / Assembly	any / top-hat rail EN 50022
Installation place, typical	Switch cabinet
Storage temperature	-30 .. +85 °C
Permissible humidity	0 to 95 %, non-condensing
Weight	0,075 kg
Start up time	2 s
MTBF (SN29500, 40°C, rated load)	88,2 years
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
supply unit / power unit	KDR 120-24, Ott GmbH & Co. KG or comparable

Technical data: digital output overcurrent		
„Ready"		GND (4,7kΩ Pull-Down)
„Overcurrent"		V_{CC}
Current typ	I_{DO}	700 [mA]
Short circuit-proof		Yes, self-limiting

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

Flammability	
Housing, terminals, printed circuit board	UL94V-0

Starting behavior

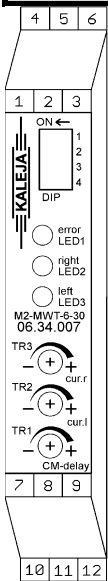After applying supply voltage, the module is ready for operation when the start up time has elapsed.

Description

The module is a two quadrant motor control for use in industrial environments. It ensures the switching on and off, as well as the controlled driving of motors. Over a DIP switch and two internal trimmer the motor current limit value for the overcurrent shutdown is for each direction of rotation adjustable. The continuous load current form the module is 6A. A digital output reports if the module is in overcurrent shutdown mode. Current monitoring delay is adjustable over Trimmer TR1.
The module has two digital inputs to select the rotation directions and one digital input to reset the module if an overcurrent shutdown has appeared.

Typical application: Standard	Typical application: PLC

PLC

DI digital in
DO digital out
AI analog in
AO analog out

direction left — DO
direction right — DO
overcurrent overload — DI
reset — DO

Standard application:

digital out "overcurrent" "overload"

4 5 6

direction right
direction left

VCC

1 2 3

ON ←
1
2
3
4
DIP

DIP current see table

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error LED1
right LED2
left LED3

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TR3 – (+) + cur.r
TR2 – (+) + cur.l
TR1 – (+) + CM-delay

TR1 current monitoring delay

reset VCC

M

7 8 9

10 11 12

GND
VCC

PLC application:

4 5 6

1 2 3

ON ←
1
2
3
4
DIP

DIP current see table

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error LED1
right LED2
left LED3

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TR3 – (+) + cur.r
TR2 – (+) + cur.l
TR1 – (+) + CM-delay

TR1 current monitoring delay

M

7 8 9

10 11 12

GND
VCC

Datasheet   M2-MWT-6-30   06.34.007

Terminal diagram

4	5	6
digital output „overcurrent" High-active	Reserved NC	Reserved NC
1	**2**	**3**
digital input „direction left" (p- switch)	digital input „direction right" (p- switch)	Reserved NC
7	**8**	**9**
Motor winding B	Motor winding A	digital input „reset" (p- switch)
10	**11**	**12**
GND supply	+24 V supply +/-10 %	Reserved NC

State table

direction „left" (1)	direction „right" (2)	Motor „A" (8)	Motor „B" (7)	Funktion
0	1	VCC	⎍ GND	run right
1	0	⎍ GND	VCC	run left
1	1	GND	GND	dyn. braking
0	0	GND	GND	dyn. braking

0 = off   1 = on   x = don´t care

Function: overcurrent shut-off

The module has two trimmers(TR2 and TR3) and an DIP switch to adjust the maximum motor current. For each direction of rotation the maximum motor current can be set separately. See description "setting the maximum motor current"

In case of an overcurrent shut-off the digital output (4) is set HIGH.
To reset the module set a HIGH Signal on digital input "reset" (9) or set both direction inputs(1 & 2) to low and start again in any direction.

Function: setting the maximum motor current

The maximum motor current is adjusted via the DIP switch on the module. With the corresponding trimmer the current is adjustable from 50 to 100% of the current set at the DIP switch.

DIP1	DIP2	DIP3	DIP4	Current[A] Min.	Max.	Trimmer
Motor current direction right						
Off	Off	X	X	0,375	0,75	TR3
On	Off	X	X	0,75	1,5	TR3
Off	On	X	X	1,5	3	TR3
On	On	X	X	3	6	TR3
Motor current direction left						
X	X	Off	Off	0,375	0,75	TR2
X	X	On	Off	0,75	1,5	TR2
X	X	Off	On	1,5	3	TR2
X	X	On	On	3	6	TR2

Function: dynamic brake	**Function: overload / short circuit detection**
The motor always stops with dynamic brake while normal operation.	When the module detects overload or short circuit on the motor output, the motor switches off without dynamic braking. The motor can be restarted by means of a reset (9) or fresh setting of any input of direction of rotation.

Function: disable overcurrent shutdown	**Function: current monitoring delay**
The overcurrent shutdown is disabled while there is a HIGH signal applied on the digital input on terminal (9). The overload shutdown is still active.	The current monitoring delay is adjustable by trimmer TR1. After setting any direction of rotation input the overcurrent shutdown is disabled for the adjusted time.

Function: overcurrent output	**Function: overload shutdown**
The overcurrent output (digital output terminal 4) is "high" when the modul detects an overcurrent. With active overcurrent shutdown the motor is switched off simultaneous with the overcurrent output. With deactivated overcurrent shutdown the overcurrent output is "high" when an overcurrent is detected and the motor runs till overload shutdown or stop from the user.	The module is internally protected with an overload shutdown. In case of rising of the motor current over the rated continuous load current the module switches of with a thermal safety function. After the shutdown the module is locked for a cooldown phase which is managed by the module. In case of an overcurrent shut-off the digital output (4) is set HIGH. To reset the module the cooldown phase must be elapsed and both direction inputs (1 & 2) must set to low and start again in any direction.

Device status	**Display elements**

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

| LED1 red	LED2 green	LED2 green	meaning
Off	Off	Off	Module is operational
Off	On	Off	Run right
Off	Off	On	Run left
flashing	Off	On	Module error 1 (see table) Occurred while running left
flashing	On	Off	Module error 1 (see table) Occurred while running right
flashing	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.

Module error 1

1	overcurrent
2	Over-temperature
3	short circuit detected
4	overvoltage
5	overload
6	Under-temperature
7	Low supply voltage
8	

Temperature derating

At 100% duty cycle and aligned modules with 10mm
spacing the following diagram is valid.
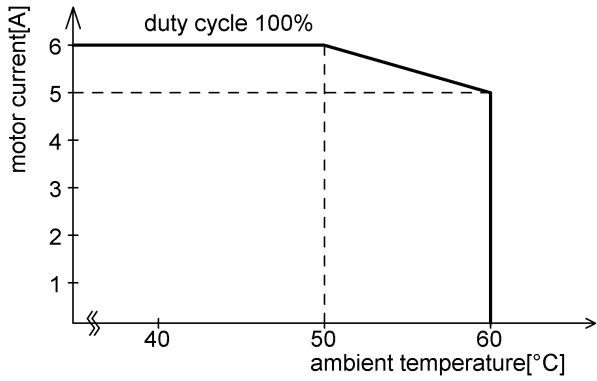
Dimensional drawing
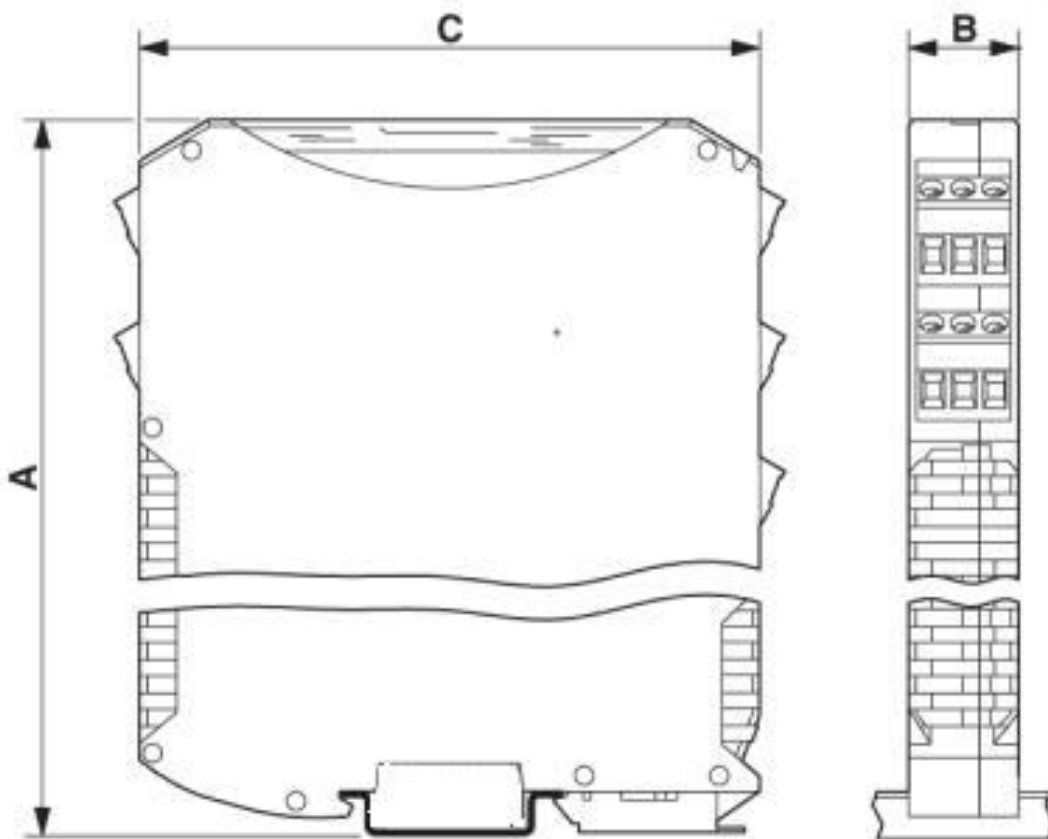
A = 70,4 mm; B = 17,5 mm; C = 85 mm

Safety notes

Maximum operational data
The maximum operating data must 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.

contact details

ready-to-use motor control solutions
electronics design & manufacturing

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