KALEJA

Industrial motor actuation for brush-type direct current motors 24VDC
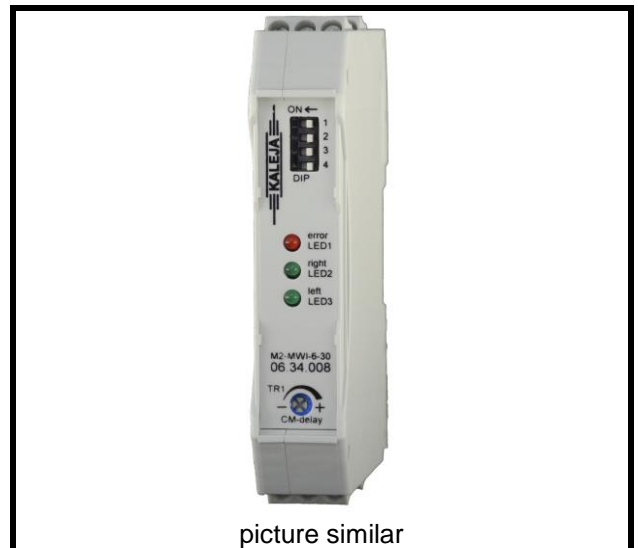
Design for switching currents up to 5A

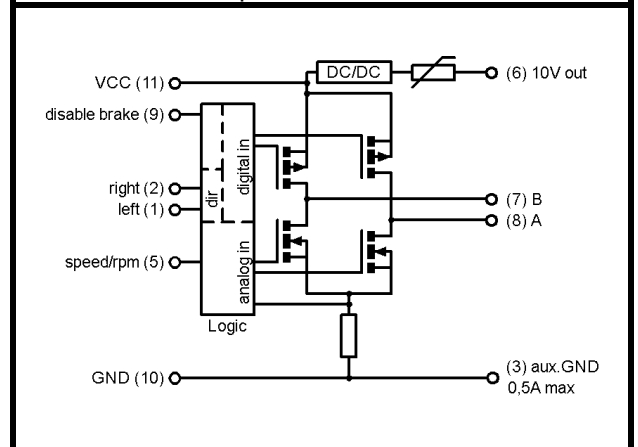**Control with the following functions:**
- **Reversal of direction of rotation**
- **Rotational speed control (external)**
- **start ramp 100 ms**
- **over-load shut-down**
- **short circuit protection**
- **dynamic brake**
- **IxR Compensation**

To the snap-on DIN rail: EN 50022

overall width: 17,5 mm

CE

picture similar

Type	M2-2Q-5-30
Article number	**06.34.013**

Operating data		
Nominal voltage	U_{nom}	24,0 VDC
Supply voltage	V_{CC}	18 … 30 VDC
Control inputs	U_{DI}	24,0 VDC
Analog input	U_{AI}	0 .. 10 VDC
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 µs
PWM frequency	F_S	15,6 kHz
Duty cycle		5 .. 100 %
Power driver		MOS-FET
Other data		
Dimensions		17,5 x 70,4 x 85,0 mm
Terminal		Screw terminal RM 5 mm cross section 0,2 – 2,5 mm²
Permissible ambient temperature	T_{amb}	-20 bis +50 °C
Temperature monitoring/short circuit protection		yes / yes
Status indication: error / left / right		LED1 red / LED2 green / LED3 green
Dynamic brake (Armature short circuit)		Can be switched off
Start ramp		100 ms
IxR Compensation Trimmer TR1 (IxR)	R_I	0 .. 2,1 Ω

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
MTBF (SN29500, 40°C, rated load)	123,2 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 input		
High Signal typ		$U > 10$ V
Low Signal typ		$U < 4$ V
Impedance typ	R_{DI}	15 kΩ

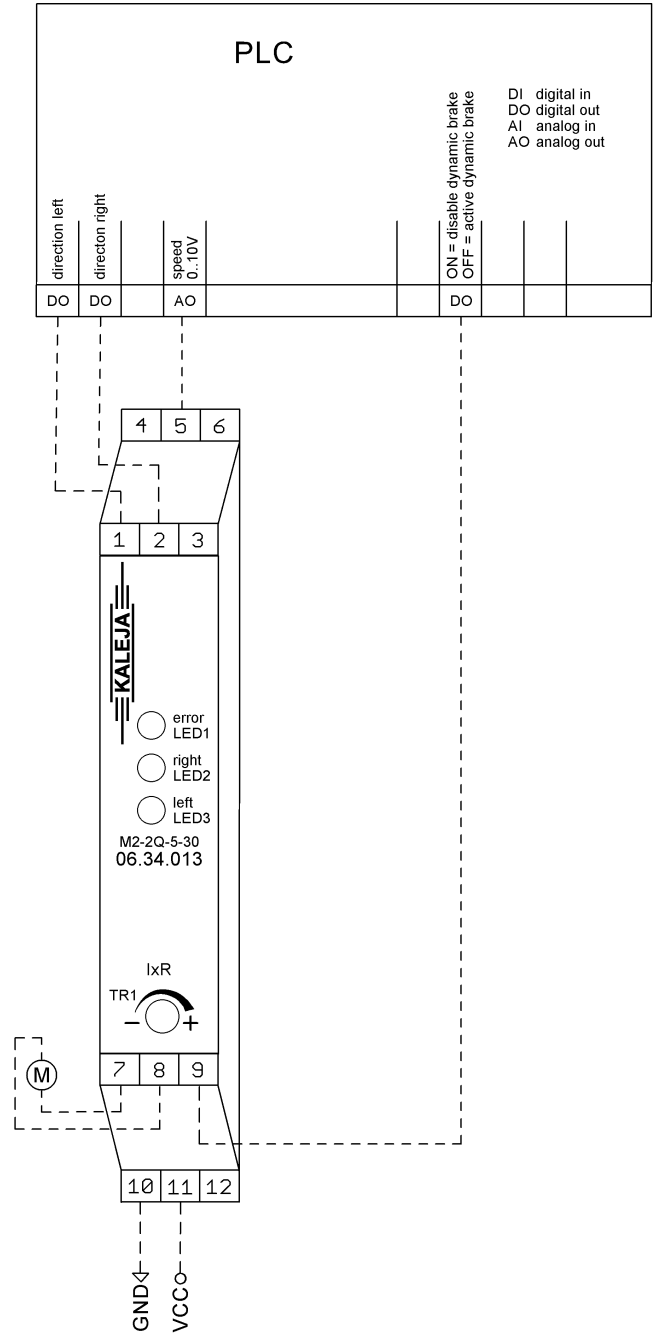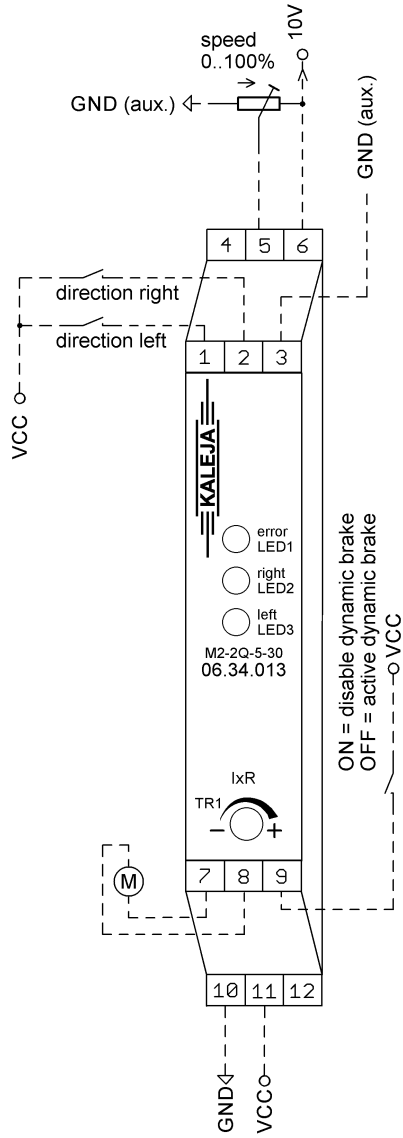| Technical data: analog input		
Voltage range		0 .. 10 V
V_{CC} tolerant		yes
Impedance typ	R_{AI}	98,5 kΩ

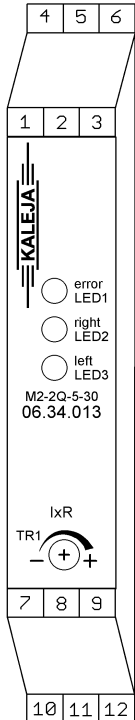| Flammability	
Housing, terminal, printed circuit board	UL94V-0

Starting behavior

The module 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 M2-2Q-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 an analog inputs it is possible to set the speed of rotation. The motor can be stopped with and without dynamic braking. The IxR compensation can be used to minimize current dependent speed changes.

Typical application: Standard	Typical application: PLC

Typical application: Standard

speed
0..100%

10V

GND (aux.)

GND (aux.)

direction right

direction left

VCC

4	5	6

1	2	3

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error
LED1

right
LED2

left
LED3

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ON = disable dynamic brake
OFF = active dynamic brake

VCC

IxR
TR1
− +

M

7	8	9

10	11	12

GND

VCC

Typical application: PLC

PLC

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

direction left

direction right

speed
0..10V

ON = disable dynamic brake
OFF = active dynamic brake

DO	DO		AO			DO		

4	5	6

1	2	3

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error
LED1

right
LED2

left
LED3

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IxR
TR1
− +

M

7	8	9

10	11	12

GND

VCC

Terminal diagram

4	5	6
NC	Analog input 0,5…10V rotational speed 5..100 %	Auxiliary voltage output +10V (PTC-Fuse) for 2 x 10kOhm potentiometer
1	**2**	**3**
Digital input „run left" (p- switch)	Digital input „run right" (p-switch)	GND for external potentiometer
7	**8**	**9**
Motor winding B	Motor winding A	Digital input „disable dynamic brake" (p-switch)
10	**11**	**12**
GND supply	+24V supply voltage	NC

State table

direction „left" (1)	direction „right" (2)	disable dyn. braking (9)	Motor „B" (7)	Motor „A" (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

0 = off   1 = on   x = don´t care

Function: Speed setting

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%
0,5…10V	Linear 5 – 100%
< 0,5V	off
open	off

Function: dynamic brake

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.

Funktion: IxR Compensation

The module has a built in IxR compensation function. This function can be used to compensate load depending speed changes of the motor. The gain factor is set with trimmer TR1.
!ATTENTION! Please use this function carefully! Incorrect gain factors may cause instable operation!

Function: Overload / short circuit detection

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 red	LED2 green	LED3 green	meaning
Off	Off	Off	Module is ready
Off	On	Off	Motor is running direction right
Off	Off	On	Motor is running direction left
Off	On	On	Motor stops with break
flashing	On	Off	Module error 1 occurs in direction right
Flashing	Off	On	Module error 1 occurs in direction left
Flashing	Off	Off	Module error 1
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. 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
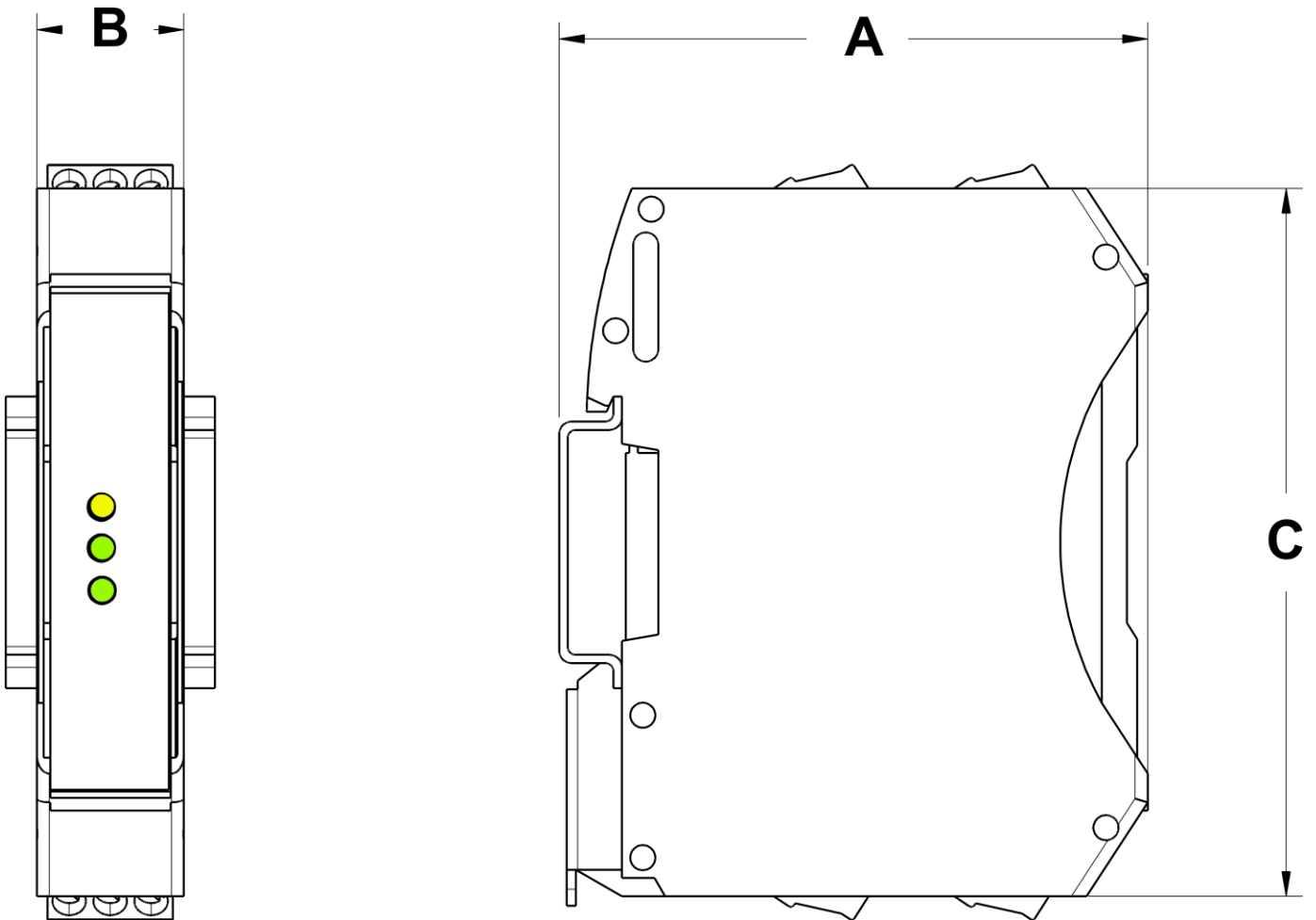
A = 70,4 mm; B = 17,5 mm; C = 85 mm

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.

contact details

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

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