



Industrial motor controller for BLDC-Motors 24 VDC

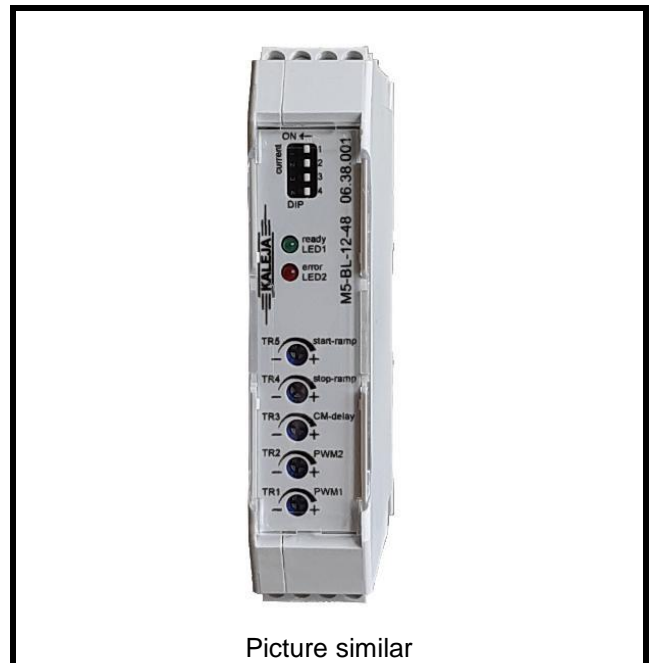
Design for output currents up to 6 A

Control with following functions:

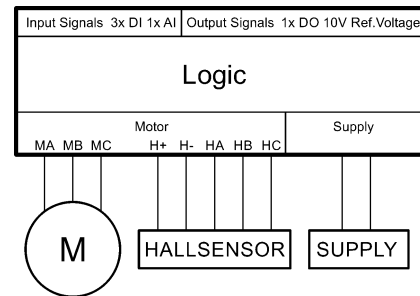
- speed control by analog input
- reversal of direction of rotation
- selectable dynamic braking
- current limitation
- short circuit detection

To snap onto DIN rail EN 50022

Unit width: 22,5 mm



Picture similar



Type	M5-BL-6-30	
Artikle number	06.38.004	
Operating data:		
Nominal voltage	U_{nom}	24 VDC
Supply voltage	V_{CC}	15 .. 30 VDC
5 digital inputs	U_{DI}	24,0 VDC
1 analog input	U_{AI}	0 – 10 VDC, 24 V tolerant
2 digital outputs, galvanic isolated	U_{DO}	24 VDC, 50 mA
3 Hall sensor inputs for open-collector sensors	U_{HALL}	13,5 VDC
Technical data: load circuit		
Max. current / continuous load current typ.	I_{max}/I_{con}	12 / 6 A
Short circuit current detection typ.	I_{SC}	80 A
Shut down time after short circuit typ.	t_{sc}	100 μ s
Power stage driver		MOS-FET
Other data		
Start ramp not adjustable		50 ms
PWM speed (PWM)	TR1	5 .. 97%
Current adjustable (current)	TR2	1 .. 6 A
Dynamic brake (armature short circuit)		Can be disabled
Temperature monitoring / overvoltage protection		yes / yes
Status indication : ready / error		LED1 green / LED2 red

Other data	
Size	114,5 x 22,5 x 99,0 mm
Connectors	Screw terminals cross section 0,2 .. 2,5 mm ²
Installation position / Assembly	any / top-hat rail EN 50022
Installation place, typical	Switch cabinet
Permissible ambient temperature	T _{amb} -20 .. +60 °C
Permissible humidity	up to bis 95 %, non-condensing
Storage temperature	-30 .. +85 °C
Weight	0,110 kg
Initializing delay	1 s
Hazardous substance norm	RoHS3
EMC interference immunity	EN 61000-6-2:2005-08 + AC:2005-9
EMC emitted interference	EN 61800-3:2004 +A1:2012 EN 61000-6-4:2007-01 +A1:2011-02
Power Supply for AC mains	Meanwell, SDR-480P-24
Line filter for industrial DC net	Würth, 810913014

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 .. 10V
24V DC tolerant	Yes
Impedance typ.	R _{AI} 98,5 kΩ

Technical data: Hall sensor inputs

Internal pull up resistor	10kΩ
Hall supply voltage	U _{HALL} 13,5V DC 50mA max.
Hall sensor arrangement	120°

Technical data: digital output

Output type	Potential free
Supply voltage for digital output (terminal 5)	V _{DO} 0 .. 24 V DC 50mA
Short circuit proof	Yes
OUT1 „over current“ / „current OK“	V _{DO} / open
Current capacity per output typ.	20mA

Flammability

Housing, terminals, printed circuit board	UL94V-0
---	---------

Initializing behavior

The module is ready for operation after the specified start time has elapsed. The start time begins when the supply voltage is applied.

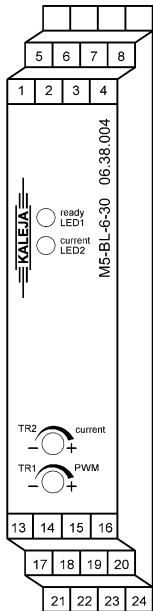
Description

The module M5-BL-5-30 is a motor control for brushless DC-motors, intended for the usage in an industrial environment. It ensures reliable switching on and off and controlled operation of BLDC motors.

The module is provided with:

- Digital inputs for CW and CCW direction
- Digital input for deactivation of the dynamic brake
- Current limitation. Maximum current adjustable via TR2
- Analog input 0-10 V for the speed control
- Digital output for overcurrent signal
- Trim potentiometer for setting maximum speed setpoint TR1, motor current TR2

Terminal assignment



5	6	7	8
V _{DO} 24V DC / 50mA Supply voltage input for digital outputs	Digital output „over current“	GND for external potentiometer 0,5A max	Voltage source +10V DC / 50mA for potentiometer
1	2	3	4
Digital input „CCW“ (high active)	Digital input „CW“ (high active)	Digital input „disable dynamic brake“ (high active)	Analog input 0 .. 10V „PWM scaling“ 0 .. 100%
13	14	15	16
Hall +10V 50mA Voltage source for hall sensors	Hall signal A 10kΩ pullup internal	Hall signal B 10kΩ pullup internal	Hall signal C 10kΩ pullup internal
17	18	19	20
Motor phase A	Motor phase B	Motor phase C	Hall GND
21	22	23	24
V _{CC} Supply voltage	V _{CC} supply voltage	GND supply	GND supply

State table

direction „left“ (1)	direction „right“ (2)	Disable Dynamic braking (3)	Function
0	1	X	CW direction
1	0	X	CCW direction
1	1	1	Stop without dynamic brake
1	1	0	Stop with dynamic brake
0	0	1	Stop without dynamic brake
0	0	0	Stop with dynamic brake

0=OFF 1=ON X=no effect

Function: Speed control

PWM max. is adjusted by trimmer TR1. By means of the analog input „PWM scaling“ (4), the speed value can be set from 0 up to the maximum speed adjusted with TR1

If the module shall only be operated with the set speed on trimmer TR1, then terminal (4) must be connected with +10V on terminal (8).

Function: dynamic Braking **Function: short circuit detection**

The dynamic brake is active when digital input „disable dynamic brake“(3) has „low“ signal. A „high“ signal at (3), deactivates the dynamic braking function, and the motor stops without dynamic brake.

If both inputs for direction of rotation (1 and 2) are set simultaneously to „high“ signal, the device stops with the behavior set on digital input “activate dynamic brake”(3).

The motor is shut-off without dynamic braking in case of a detected short circuit between the motor cables. The module remains disabled for a fixed delay, after a short circuit detection. After this delay, the motor can be started again by resetting and new setting of a direction input.

Function: temperature shut-off **Status digital output**

The module is equipped with a temperature sensor. If the maximum allowed temperature is exceeded, the motor is switched-off without dynamic braking. After a cooling down, the motor can be started again by setting of a direction input.

The necessary cooling down time is dependent on ambient temperature and mounting situation of the module.

„over current“	State
High	Motor current > MAX. current
Low	Motor current < MAX. current

Function: current limitation **Function: setting motor current limit**

When the motor current exceeds the adjusted limit value on trimmer TR2, the module decreases the speed unless the motor current is equal or lower as the adjusted limit.

The motor current limit is adjusted over trimmer TR2 (current).

Module state	Module errors
--------------	---------------

The state of the module is indicated by the LED's on the front side.

LED1 „ready“ green	LED2 “error“ red	Description
On	Off	Module operational
On	On	Current is limited by the device
Off	blinking	Module error
blinking	blinking	internal system error

When an error occurs, the motor is stopped. The motor can be started again after resetting the error. In case of an internal system error, the module needs to be repowered.

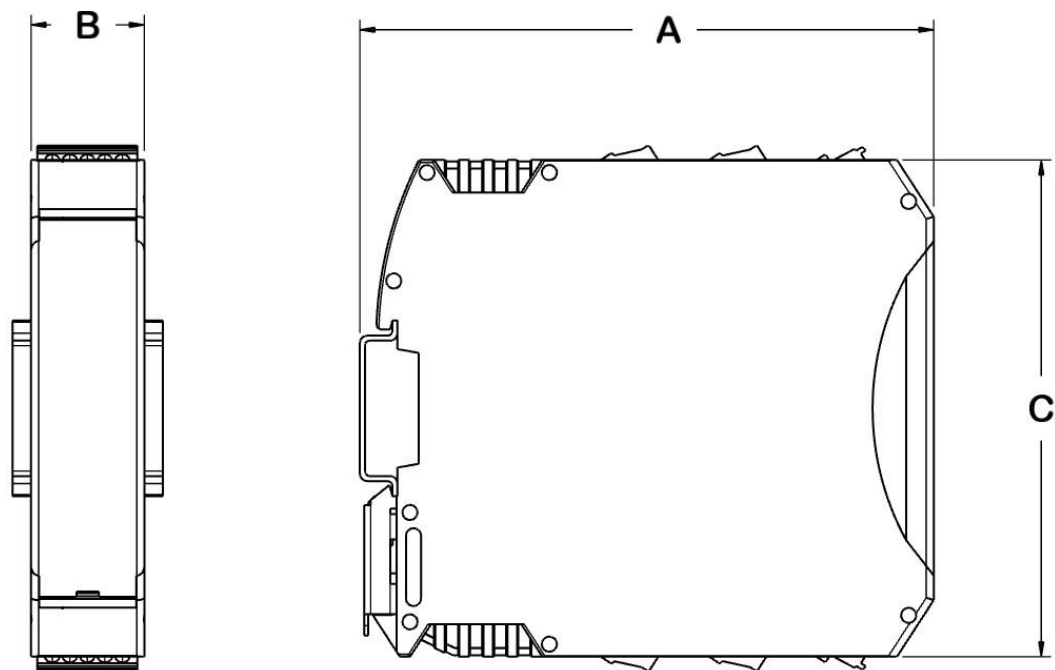
Errors resetting:

The error Nr.5 and 6 (supply errors) are reset automatically. All other errors must be reset by setting both direction inputs terminal1 and 2 to “low”.

Module errors are indicated with flashing sequence. The end of a flashing period is shown with a delay of (1s). The number of flashes indicates the No. of the module error:

1	Over current
2	Temperature overload
3	Short circuit
4	Over load
5	Over voltage of the supply voltage
6	Under voltage of the supply voltage
7	Power stage supply faulty
8	Hall signal error
9	
10	
11	
12	
13	
14	
15	

Dimensional drawing



A = 114,5 mm; B = 22,5 mm; C = 99 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 under 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

KALEJA GmbH

Strübelweg 14

D-73553 Alfdorf

Tel: +49 7172 93711 0

Fax: +49 7172 93711 90

E-Mail: info@kaleja.com

www.kaleja.com