KALEJA

Industrial motor controller for brushless DC and DC motors 12 / 24 VDC
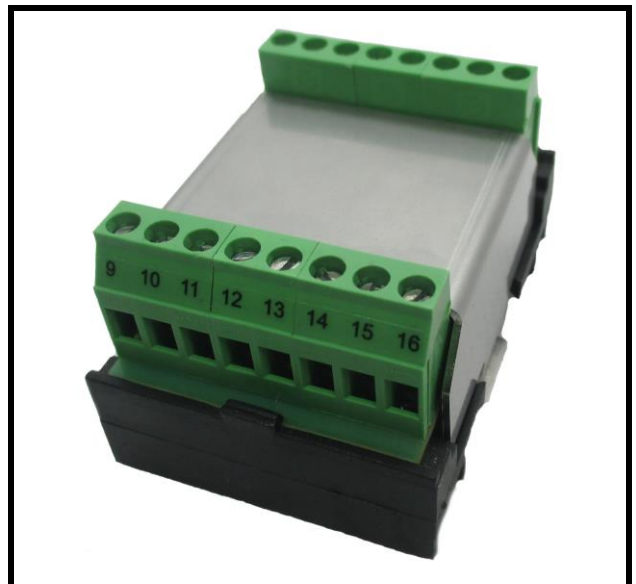
Design for output currents up to 2 A

Control with the following functions:
- reversal of direction of rotation
- open-loop speed control (external)
- overcurrent limit
- dynamic brake
- thermal protection
- "motor spinning" digital output
- 10V reference voltage output

To snap onto the DIN rail EN 50022

Unit width: 45 mm

CE

Type	UB-BL-2-24
Article number	**06.33.001**

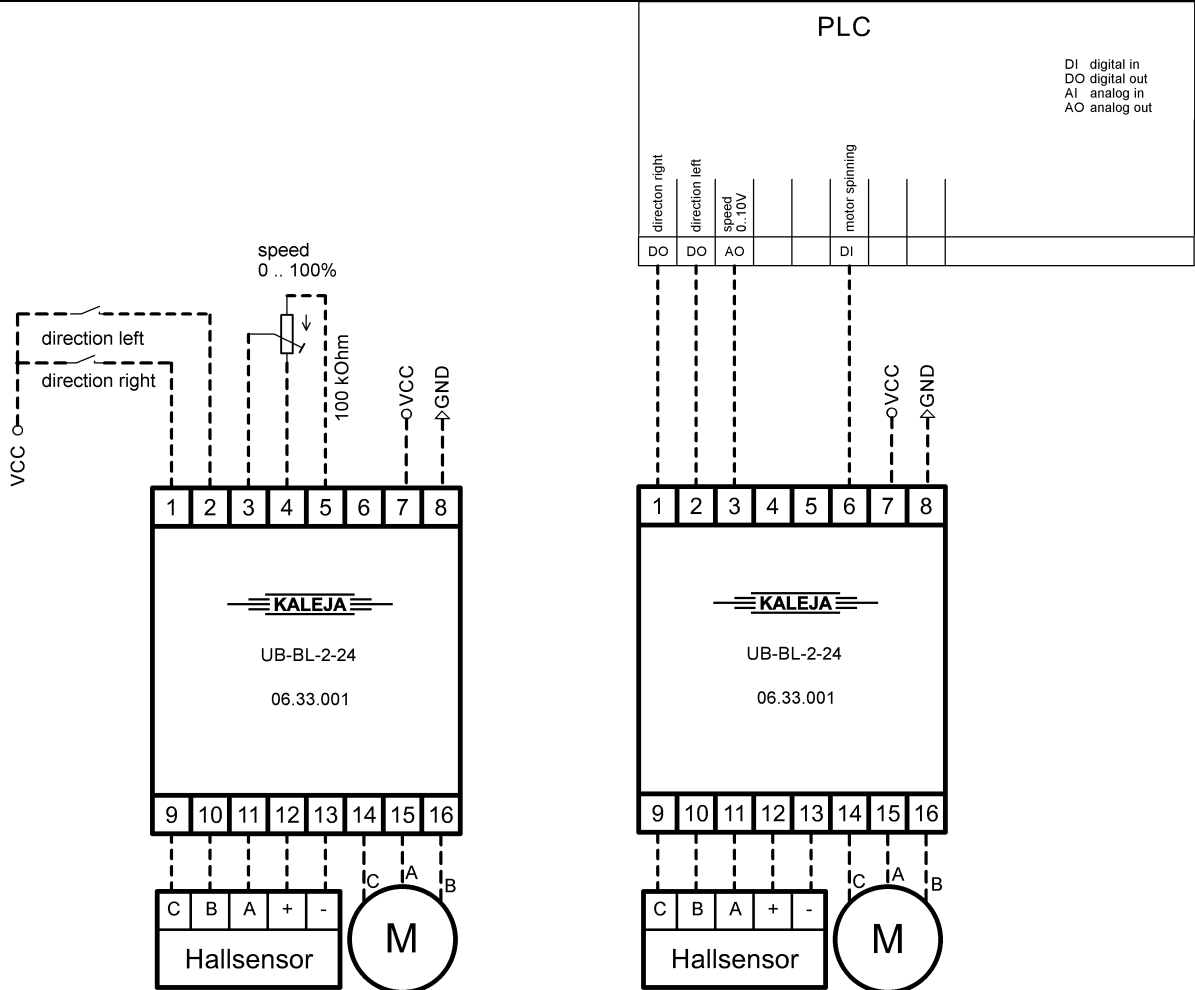| Operating data		
Nominal voltage	U_{nom}	24,0 VDC
Supply voltage	V_{CC}	8 .. 30 VDC
Control inputs	U_{DI}	24,0 VDC
Analog input	U_{AI}	0 .. 10 VDC
Quiescent current typ	I_0	
Technical data: load circuit		
Max. current / continuous load current typ	I_{max}/I_{con}	2,5 / 1,8 A
PWM frequency	F_S	TBD kHz
Duty cycle		0 .. 100 %
Power stage driver		MOS-FET
Other data		
Dimensions		45 x 64 x 36 mm
Connectors		screw terminal, pitch 5 mm
		cross section 0,2 – 2,5 mm²
Permissible ambient temperature	T_{amb}	-20 .. +50 °C
Temperature monitoring / overvoltage protection		yes / yes
Dynamic brake (Armature short circuit)		can be switched on

Other data	
Installation position / Assembly	any / top-hat rail EN 50022
Installation place, typical	Switch cabinet
Storage temperature	-30 to +85 °C
Permissible humidity	to 95 %, non-condensing
Weight	TBD kg
Hazardous substance norm	RoHS3
EMC interference immunity	EN 61000-6-2:2016
EMC emitted interference	EN 61000-6-3:2007 + A1:2011

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}	118,7 kΩ
Supply for external Potentiometer (at Supply Voltage 11 – 30 V)		10 V 100µA
recommended external Potentiometer resistance		100 kΩ

Technical data: Hall sensor inputs		
Internal pull up resistor		10kΩ
Hall supply voltage	U_{HALL}	5V DC 200mA max.
Hall sensor arrangement		120°

Technical data: digital output		
„Motor not spinning"		GND (3kΩ Pull-Down)
„Motor spinning"		VCC
Current typ	IDO	700 mA
Short circuit-proof		Yes, self-limiting

Description

The UB-BL-2-24 module is a motor controller for small BLDC-motors with integrated open collector hall sensors. It is intended for use in industrial environments. It ensures the switching on and off, as well as the controlled driving of motors. The Module has two digital inputs, one analog input and one digital output.
The motor's direction of rotation can be set via the digital inputs. The dynamic brake can be activated by setting both inputs high. By means of the analog input the speed can be set between 0 to 100%. An external 100 kΩ potentiometer for the speed input can be supplied by the module. The maximum motor current is limited by the hardware and is therefore not adjustable. The digital Output is switched on while the motor is spinning.

The UB-BL-2-24 module can also be operated with DC motors. The functionality differs only at the digital output. Since no Hall sensors are evaluated, the output has no function..

Typical application: Standard BLDC	**Typical application: PLC BLDC**

Terminal diagram BLDC

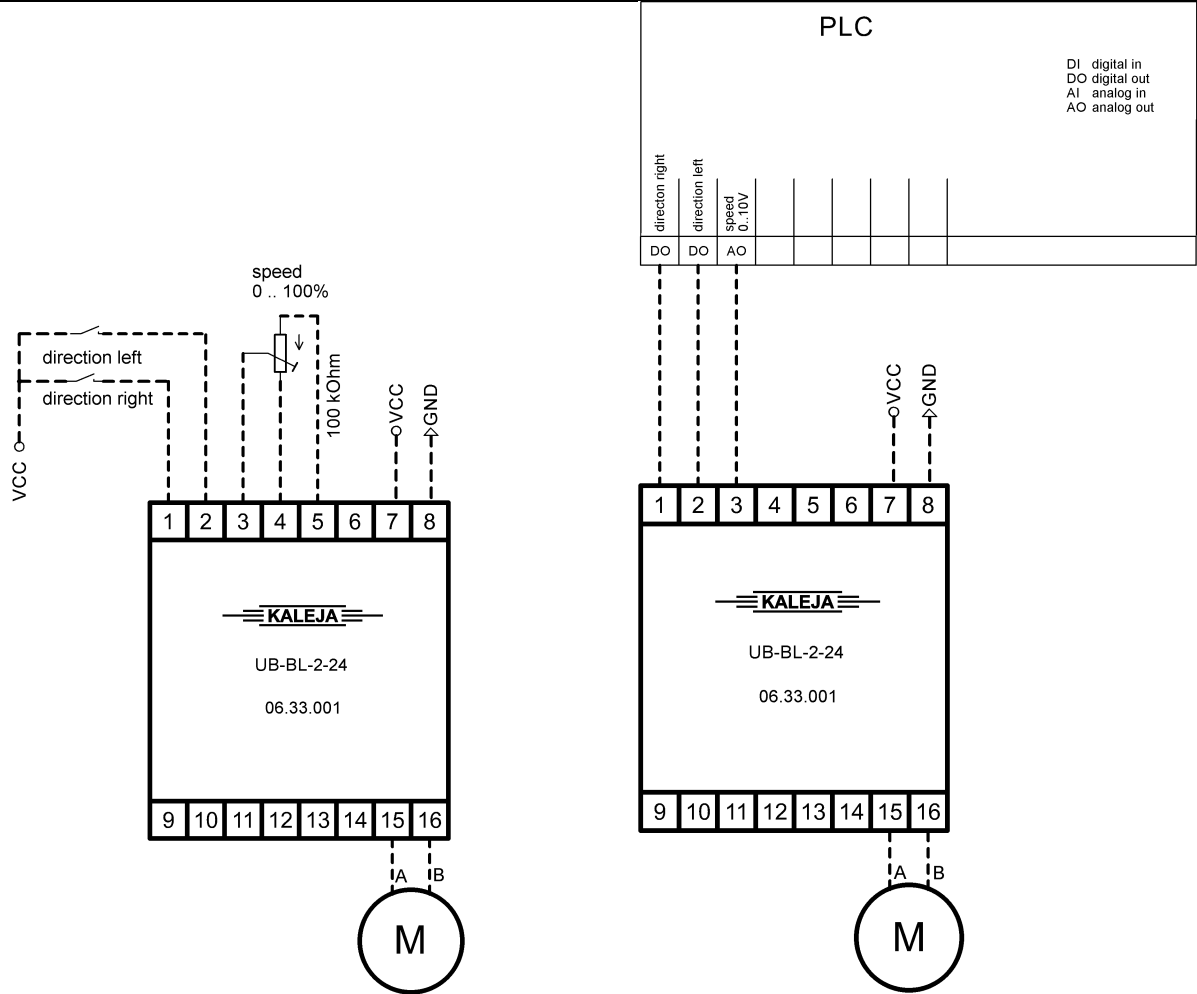| 1	2	3	4	5	6	7	8
Digital input „right/CW" (high active)	Digital input „left/CCW" (high active)	Analog input 0 .. 10V speed 0 .. 100%	GND for external potentiometer	+10VDC source for potentiometer	Digital output „spinning"	V_{CC} supply voltage	GND supply

9	10	11	12	13	14	15	16
Hall signal **C** 10kΩ pullup internal	Hall signal **B** 10kΩ pullup internal	Hall signal **A** 10kΩ pullup internal	Hall +5V 50mA Voltage source hall sensors	Hall GND	Motor phase **C**	Motor phase **A**	Motor phase **B**

State table BLDC

direction „left/CCW" (2)	direction „right/CW" (1)	Motor phase (14) (15) (16)	Function
0	1	A -> B -> C	run right
1	0	C -> B -> A	run left
1	1	GND	dyn. braking
0	0	open	off

0 = off   1 = on   x = don´t care

Typical application: Standard DC	**Typical application: PLC DC**

Terminal diagram DC

1	2	3	4	5	6	7	8
Digital input „right/CW" (high active)	Digital input „left/CCW" (high active)	Analog input 0 .. 10V speed 0 .. 100%	GND for external potentiometer	+10VDC source for potentiometer	Digital output "spinning"	V_{CC} supply voltage	GND supply

9	10	11	12	13	14	15	16
NC	NC	NC	NC	NC	NC	Motor phase **A**	Motor phase **B**

State table DC

direction „left/CCW" (2)	direction „right/CW" (1)	Motor Phase A (15)	Motor Phase B (16)	Function
0	1	GND	VCC	run right
1	0	VCC	GND	run left
1	1	GND	GND	dyn. braking
0	0	open	open	off

0 = off   1 = on   x = don´t care

Function: Speed setting	**Function: current limitation**

Via the analog input at terminal (4) it is possible to set the PWM duty cycle that is to be issued to the motor. Within a range from 0 V to 10 V, the voltage is applied as a 0 – 100 % output. With a loading of the motor, the speed reduces.

When the motor current exceeds the fixed max. current value, the module decreases the speed unless the motor current is equal or lower as the adjusted limit.

voltage (4)	Rotational speed / PWM
> 10V	100%
0…10V	Linear 0 – 100%
0 V	off
open	off

Function: dynamic brake	**Function: temperature shut-off**

The function "dynamic braking" is deactivated as standard. The function is activated by applying a High Signal at both direction terminals (7) and (8).
If dynamic braking is active, the motor winding is switched to GND at all motor terminals. The motor is stopped with armature short circuit braking.
If dynamic braking is not active, the motor spins with no braking.

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.

Function: DC motor	

The module can be used with a DC motor.
No Hall sensor must be connected for this. The motor is connected on motor terminal A (15) and motor terminal B (16).

The digital output "spinning" at terminal (6) has no function when using a DC motor.

Dimensional drawing
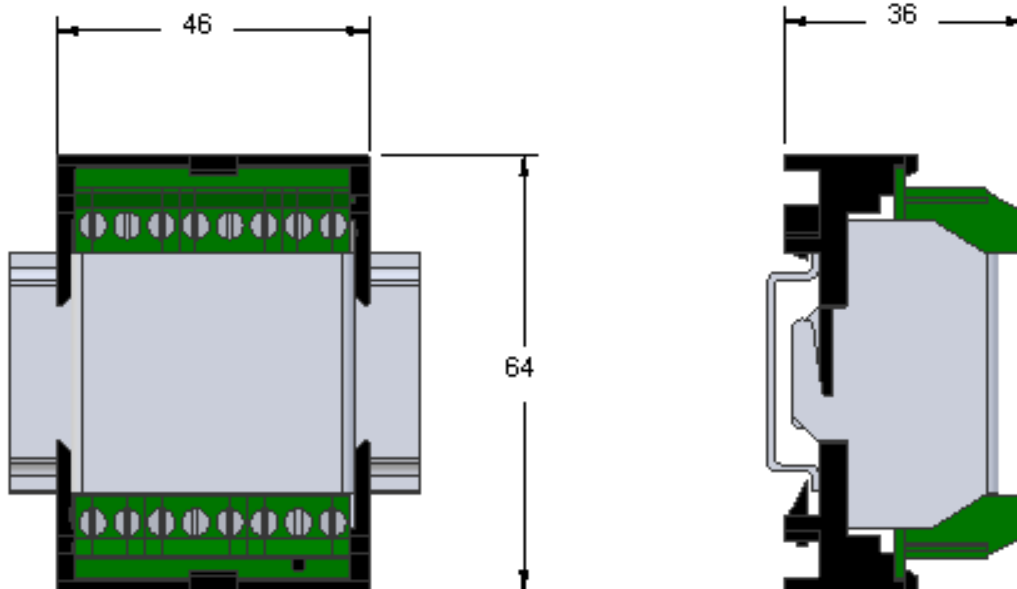
Safety notes

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.

Hot surface
Components and possibly existing heat sinks can become hot during operation! Do not touch!

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

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