



Integrated Controllers for brushless DC- motors



Content

Series	Description	Page
MCB23-01	2-Q Integrated Controller, 160 Watt, 24V	4-5
MCB23-02	2-Q Integrated Controller, 160 Watt, 48V	4-5
MCB34-01	2-Q Integrated Controller, 500 Watt, 24V	6-7
MCB34-02	2-Q Integrated Controller, 700 Watt, 48V	6-7
	Description of the control inputs	8
	Speed control settings	9
	Acceleration and brake function	9
	Start up procedure	10
	Supply Voltage	10
	Duty Cycle	10
	Options	10
	Ordering Information	11

General

The MCB series of products, are integrated 2-Quadrant controllers with electronic commutation, used in conjunction with 3-phase brushless DC-motors in the BN23 and BN34 range from MOOG CG.

An integrated Microcontroller evaluates using Hall-Effect-Sensors the position and the speed of the rotor. The target number of revolutions is sensed by a PI-controller and set by a PWM-controller into the exact number of revolutions. The monitoring of the temperature, current and operating voltage parameters take place superordinately of the control.

The desired default value of the number of revolutions can be made internally by a potentiometer or externally by a speed control signal of 0-10V, or a preset potentiometer. For change of rotational direction and enable appropriate inputs are available.

Acceleration and brake functions are available.

Complex wiring is eliminated by integrating the driver electronics directly onto the motor, coupled with the hall effect sensors internal connections. This ensures system integration is substantially simplified and is more cost effective. EMC and RLC-Loop issues will be effectively reduced.

MCB23-01 / -02

2-Q, 160 Watts, 24V and 48V

- Standard off the shelf unit
- Internal or External Speed Control
- High power to size ratio
- Electronic monitoring of temperature and operating voltage



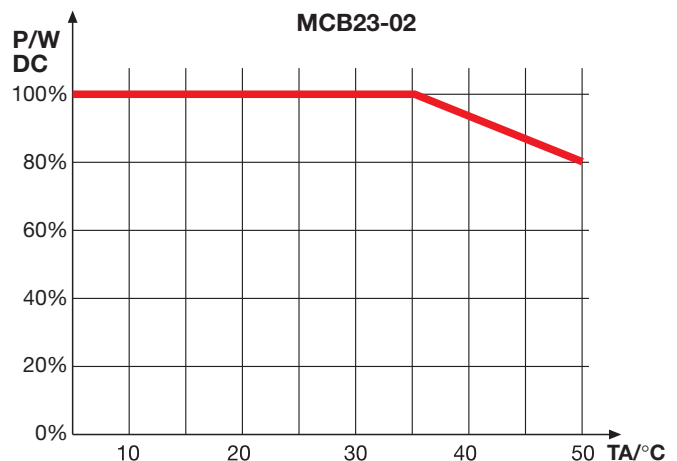
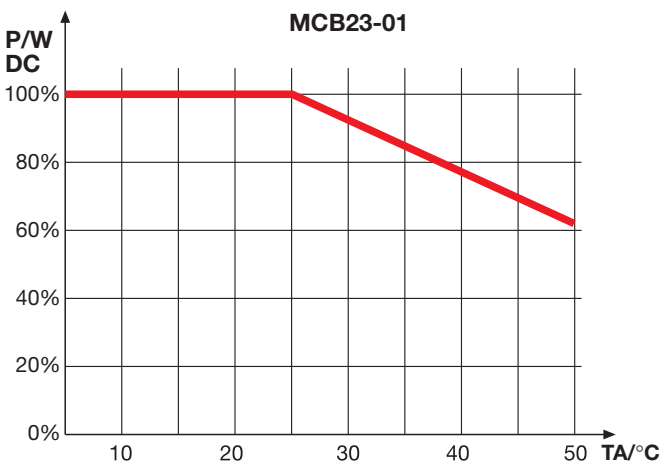
Suitable for the following motors:

- BN23-13EN-01LH / -02LH / -03LH
- BN23-18EN-01LH / -02LH / -03LH
- BN23-23EN-01LH / -02LH / -03LH
- BN23-28EN-01LH / -02LH / -03LH

Controller Data

Series		MCB23-01	MCB23-02
Rated Power (P _r)	Watts	160 (De-rated as from 25°C)	160 (De-rated as from 35°C)
Voltage (U _r)	VDC	24	48
Input Voltage Range	VDC	18...35 (Ripple <5%)	18...55 (Ripple <5%)
Rated Current (I _r)	A	8	6
Max. Current (I _{max})	A	1,5 x Rated Current (1 min. max., DC 25%)	1,5 x Rated Current (1 min. max., DC 25%)
Peak Current (I _{peak})	A	3 x Rated Current (1 sec. max., DC 10%)	3 x Rated Current (1 sec. max., DC 10%)
Current Limitation	A	24	18
Range of revolution adjustment		1:100 (based on rated motor speed)	1:100 (based on rated motor speed)
Speed tolerance (Driver)	%	+/- 3,5 x 100/rpm	+/- 3,5 x 100/rpm
Input «Direction of rotation»		Open, 5V: CW / GND: CCW	Open, 5V: CW / GND: CCW
Input «Enable»		Open, 5V: enabled / GND: disabled	Open, 5V: enabled / GND: disabled
Fault Output		Opto-coupled U _{max} = 48V, I _{max} = 20mA	Opto-coupled U _{max} = 48V, I _{max} = 20mA
PWM Frequency	kHz	20	20
Efficiency	%	>95	>95
Brake Function		see page 9	see page 9
Max. Brake Energy	Ws	$500 \times 10^{-6} \times U_{diff}^2$	$500 \times 10^{-6} \times U_{diff}^2$

Determining maximum power output/duty cycle vs. temperature (see also page 10)

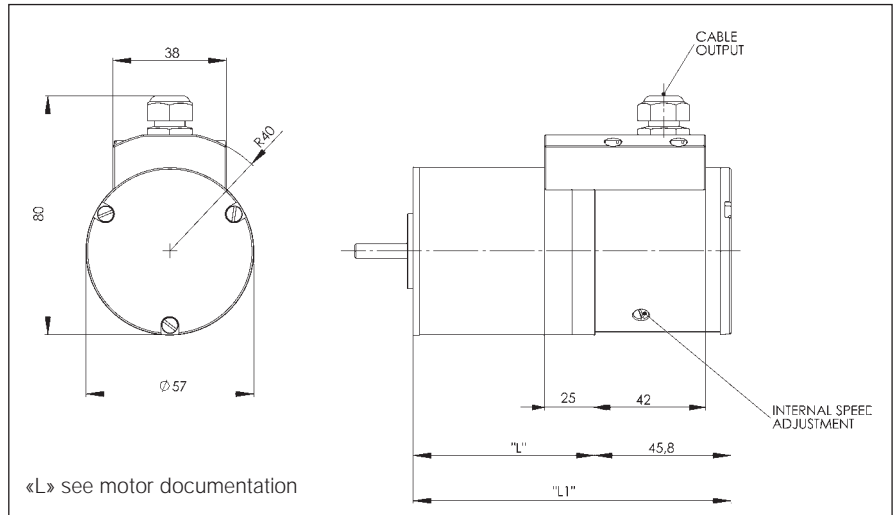


MCB23-01 / -02

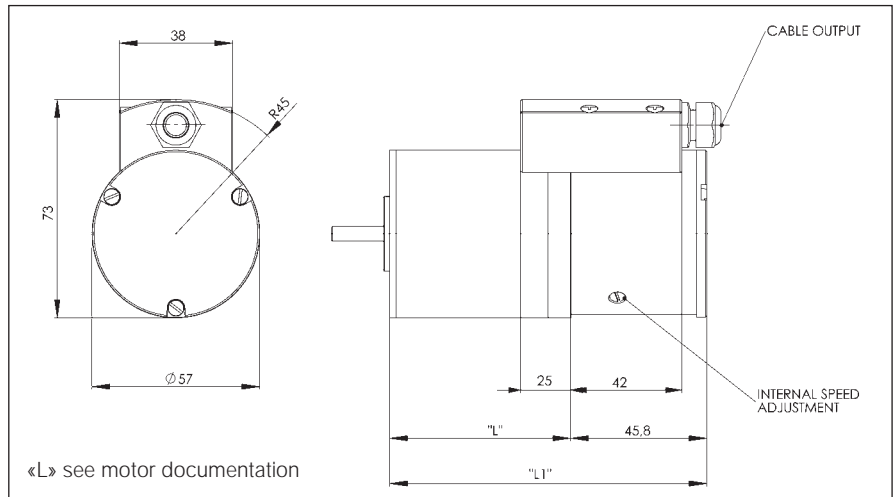
Mechanical Data

		MCB23-01	MCB23-02
Weight	g	290	290
Cable Length	cm	min. 40	min. 40
Lead Size	mm ²	Power: 1.5 / Signals: 0.14	Power: 1.5 / Signals: 0.14
Operating Temperature	°C	-10...+50	-10...+50
Storage Temperature	°C	-40...+85	-40...+85
Protection Degree		IP 54 / Optional IP 65	IP 54 / Optional IP 65
Humidity, not condensed	%	20...80	20...80

Dimensions Radial:



Dimensions Axial:



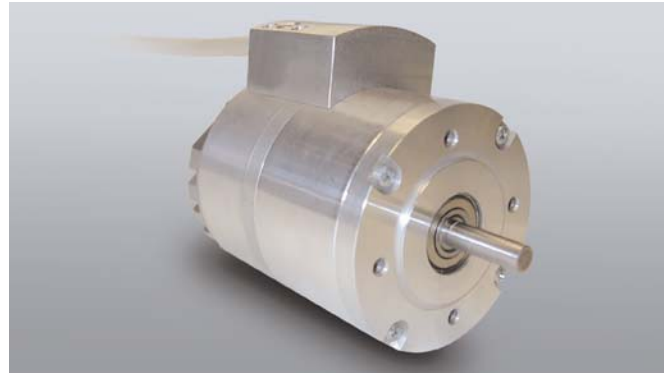
Lead Wire Color Codes

Inputs		Outputs	
Connection	Color Code	Connection	Color Code
+U _B (Supply Voltage)	■ RED	Reference Voltage 10V	■ ORN
GND (Supply Voltage)	■ BLK	Reference GND	■ BLU
Enable / Disable	■ YEL	+Fault	■ VIO
Direction of rotation	■ GRY	-Fault	■ GRN
Speed control	■ BRN		
		Optional (see page 10)	
		Encoder A (TTL)	■ WHT-BRN
		Encoder B (TTL)	■ BRN-RED

MCB34-01 / -02

2-Q, 500 Watts, 24V,
2-Q, 700 Watts, 48V

- Standard off the shelf unit
- Internal or External Speed Control
- High power to size ratio
- Electronic monitoring of temperature and operating voltage



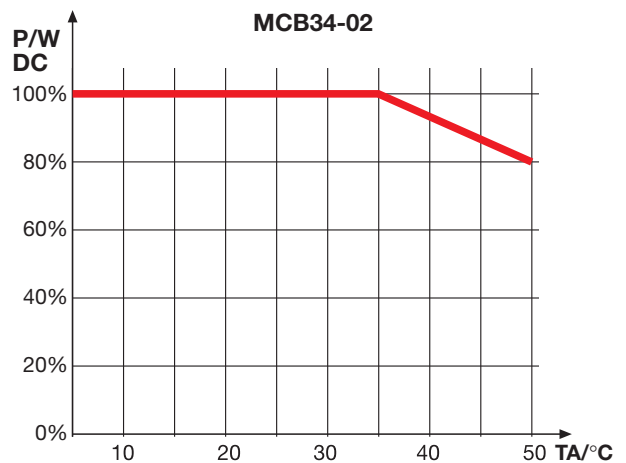
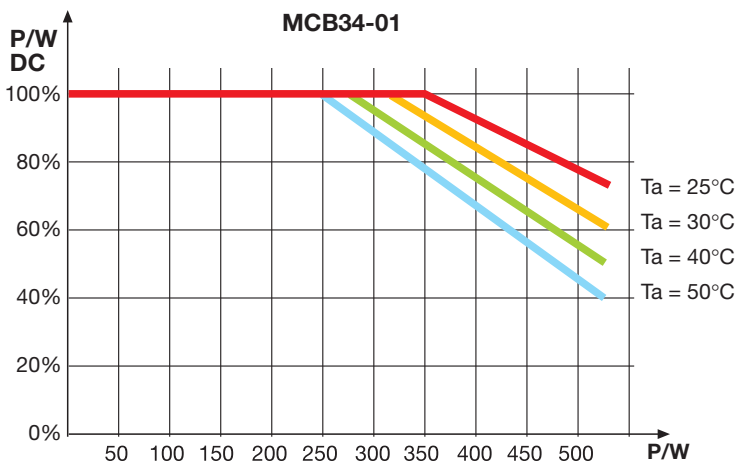
Suitable for the following motors:

- BN34-25EN-01LH / -02LH
- BN34-35EN-01LH / -02LH
- BN34-45EN-01LH / -02LH
- BN34-55EN-01LH / -02LH
- BN34HS-25EN-01LH / -02LH
- BN34HS-35EN-01LH / -02LH

Controller Data

Serie		MCB34-01	MCB34-02
Power Rated (P _r)	Watts	500 (De-rated as from 350 Watt)	700 (De-rated as from 35°C)
Voltage (U ₋)	VDC	24	48
Input Voltage Range	VDC	18...35 (Ripple <5%)	18...55 (Ripple <5%)
Rated Current (I _r)	A	24	17
Max. Current (I _{max})	A	1,5 x Rated Current (1 min. max., DC 25%)	1,5 x Rated Current (1 min. max., DC 25%)
Peak Current (I _{peak})	A	3 x Rated Current (1 sec. max., DC 10%)	3 x Rated Current (1 sec. max., DC 10%)
Current Limitation	A	71	51
Range of revolution adjustment		1:100 (based on rated motor speed)	1:100 (based on rated motor speed)
Speed tolerance (Driver)	%	+/- 3,5 x 100/rpm	+/- 3,5 x 100/rpm
Input «Direction of rotation»		Open, 5V: CW / GND: CCW	Open, 5V: CW / GND: CCW
Input «Enable»		Open, 5V: enabled / GND: disabled	Open, 5V: enabled / GND: disabled
Fault Output		Opto-coupled U _{max} = 48V, I _{max} = 20mA	Opto-coupled U _{max} = 48V, I _{max} = 20mA
PWM Frequency	kHz	20	20
Efficiency	%	>95	>95
Brake Function		see page 9	see page 9
Max. Brake Energy	Ws	2 x 10 ⁻³ x U _{diff} ²	1.4 x 10 ⁻³ x U _{diff} ²

Determining maximum power output/duty cycle vs. temperature (see also page 10)

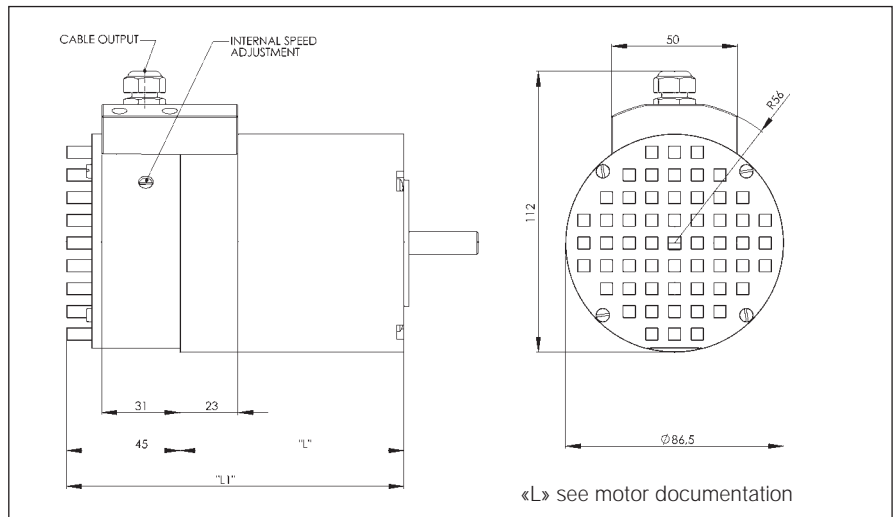


MCB34-01 / -02

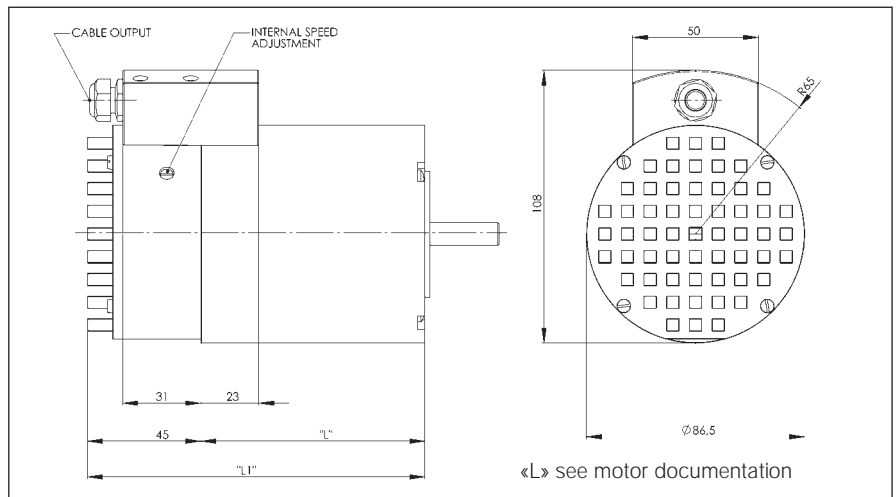
Mechanical Data

		MCB34-01	MCB34-02
Weight	g	440	440
Cable Length	cm	mind. 40	min. 40
Lead Size	mm ²	Leistung: 2.5 / Signale: 0.14	Power: 2.5 / Signals: 0.14
Operating Temperature	°C	-10....+50	-10....+50
Storage Temperature	°C	-40....+85	-40....+85
Protection Degree		IP 54 / Optional IP 65	IP 54 / Optional IP 65
Humidity, not condensed	%	20....80	20....80

Dimensions Radial:



Dimensions Axial:



Lead Wire Color Codes

Inputs		Outputs	
Connection	Color Code	Connection	Color Code
+U _B (Supply Voltage)	RED	Reference Voltage 10V	ORN
GND (Supply Voltage)	BLK	Reference GND	BLU
Enable / Disable	YEL	+Fault	VIO
Direction of rotation	GRY	-Fault	GRN
Speed control	BRN		
		Optional (see page 10)	
		Encoder A (TTL)	WHT-BRN
		Encoder B (TTL)	BRN-RED

Technical Description

Description of the control inputs

Enable / Disable:

If the Enable input remains open or if it is set at 5V, the control is enabled. If the input is set at GND, the control is disabled.

Setting direction of rotation:

The direction of the motor rotation is set by the input «direction of rotation» (lead «grey»).

If the connection is open or wired to +5 V, clockwise rotation is set.

If the connection is wired to GND, counter clockwise rotation is set.

If the direction of rotation is changed during operation, the motor will break and accelerate again, following a ramp of 100 msec. as standard.

Speed Control:

This input is typically connected with an external speed control voltage, or is connected to the trim of an external potentiometer.

Reference Voltage 10V / Reference GND:

For the speed setting with an external potentiometer (or a speed control voltage), the controller of the MCB series features as standard, reference potentials. See also section speed control settings page 9.

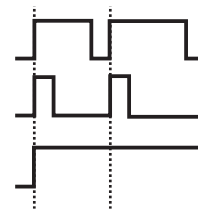
Monitoring:

The controller monitors the following Parameters for high and low values to occur, a PWM signal will be provided by an opto-coupled output (+ Fault «violet» lead; - Fault «green» lead).

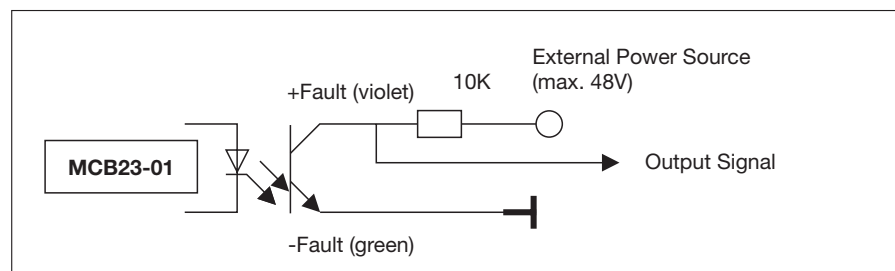
Over-Temperature: 75 : 25

Over-Voltage: 25 : 75

Low-Voltage: 100 : 00



Error control Circuit:



Speed control settings

The maximum number of revolutions of the driver is set by the factory to the maximum number of revolutions of the motor. When required these can be adjusted to the user application.

The number of revolutions can be set by the user as follows:

a) Speed control setting using the internal Potentiometer

Turn potentiometer to the left «-»: The number of revolutions decreases.

Left limit = Stop.

Turn potentiometer to the right «+»: The number of revolutions increases.

Right limit = Rated Speed.

b) Speed control setting using an external potentiometer

When using an external potentiometer, the internal potentiometer is automatically overridden.

External potentiometer: 10 k Ω .

The external potentiometer should be connected as follows:

Start: at lead «orange», End: at lead «blue», Trim: at lead «brown».

The logic is identical to the description under point a).

c) Speed control using external signal 0-10VDC

Connecting an external speed control signal automatically overrides the internal potentiometer.

Using this method of control the connections are:

Speed control I/P 0...10V: lead «brown».

Speed control GND: lead «blue».

0V corresponds to Stop. 10V correspond to the maximum number of revolutions = rated speed. The input is protected from over voltage.

An integrated A/D-Converter, converts the analog input with an accuracy of 10 Bits.

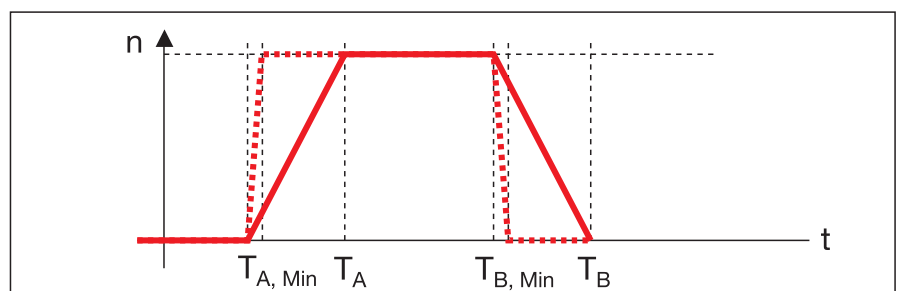
Acceleration and brake functions

The values for the minimum acceleration time $T_{A, \min}$ and deceleration time $T_{B, \min}$ are 100 ms. The driver will be delivered with this setting as standard. The 100 ms deceleration time can only be achieved if the rotational energy is \leq the max. brake energy.

On customer request (see ordering information) acceleration and brake ramps can be adjusted to the application. Thus the motor can be accelerated and/or decelerated over defined ramps.

The setting range for acceleration A and deceleration B lies between 100 ms and 2 secs.

With the option «remote control» (see page 10) one has the possibility of setting and of monitoring accelerations and brake ramp as well as other values independently.



Start up procedure

- Rough pre-setting of the number of revolutions, by internal or external potentiometer or speed control voltage
- Set the direction of rotation
- Attach supply voltage +Ub and GND
- Enable electronics
- If necessary, adjust number of revolutions

Supply Voltage

In order to operate the motor with the indicated nominal voltage (48V), the voltage drop over electronics should be compensated for. To achieve this, the voltage at the Power Supply should be increased by the amount derived from Rated Current (I_c) x 0.054.

Duty Cycle

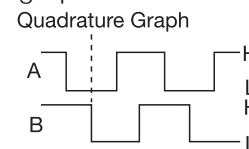
The duty cycle represents the relationship between operating and non-operating e.g.: DC 80% corresponds to 8 min. operating, 2 min. not operating.

Note: An over temperature measurement and an automatic shut down, for the protection of the motor and the driver unit is integrated according to standard.

Options

On customer's request the following options are available:

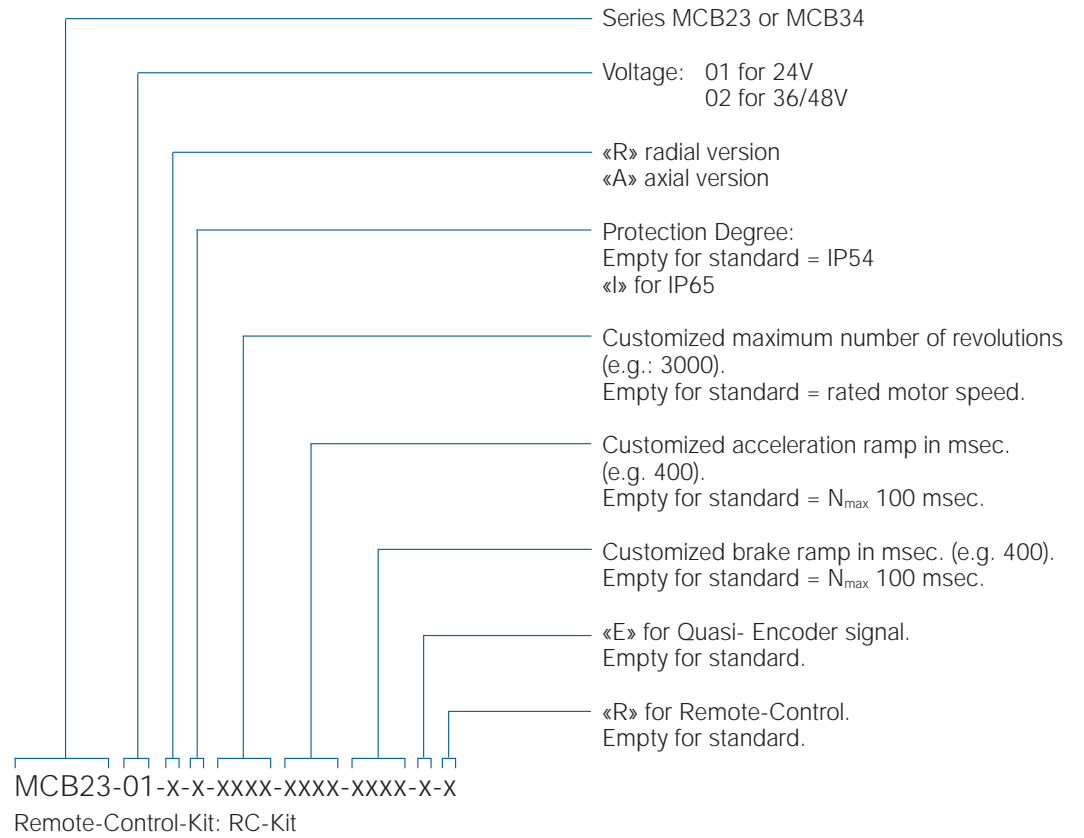
- Digital hall effect signal outputs for positioning (24 pulses per revolution)



- Protection degree IP65
- Remote control with RS232 adapter and a Windows program:
 - Monitoring of operating parameters i.e. current, voltage, speed
 - Setting of controller parameters (Tuning)
 - Setting of acceleration and brake parameters
 - Connection with a 4 way connector onto the RC-Kit
- The Remote-Control Kit comprises:
 - Control Box with D-Sub Interface
 - Software
 - D-Sub Connection Cable

Note: If the option, Encoder or Remote-Control is integrated, the size of the signal wires will be reduced from 0.14 mm² to 0.08 mm².

Ordering Information



Your local representative:

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