NEW

FAULHABER

Brushless DC-Servomotor

with integrated Motion Controller
and RS232 or CAN interface

35 mNm

For combination with
Gearheads:
22F, 22/7, 26A

2250 ... BX4 CSD/CCD

			2250 S		024 BX4 CSD/CCD	
1	Nominal voltage	U_N			24	Volt
2	Terminal resistance, phase-phase	R			5,9	Ω
3	Output power [1]	$P_{2\ max.}$			12,2	W
4	Efficiency	$\eta_{max.}$			75,1	%
5	No-load speed	n_o			5 900	rpm
6	No-load current	I_o			$7{,}20 \cdot 10^{-2}$	A
7	Stall torque at 3A	M_H			110	mNm
8	Friction torque, static	C_o			1,20	mNm
9	Friction torque, dynamic	C_v			$2{,}4 \cdot 10^{-4}$	mNm/rpm
10	Speed constant	k_n			259	rpm/V
11	Back-EMF constant	k_E			3,864	mV/rpm
12	Torque constant	k_M			36,90	mNm/A
13	Current constant	k_I			$2{,}71 \cdot 10^{-2}$	A/mNm
14	Slope of n-M curve	$\Delta n/\Delta M$			41,4	rpm/mNm
15	Terminal inductance, phase-phase	L			240	µH
16	Mechanical time constant	τ_m			4,3	ms
17	Rotor inertia	J			10	gcm^2
18	Angular acceleration	$\alpha_{max.}$			110	$\cdot 10^3 rad/s^2$
19	Thermal resistance	$R_{th\,1}$ / $R_{th\,2}$	1,2 / 14			K/W
20	Thermal time constant	τ_{w1} / τ_{w2}	4,2 / 566			s
21	Operating temperature range		– 25 ... + 85			°C
22	Shaft bearings		ball bearings, preloaded			
23	Shaft load max.:					
	– radial at 3 000 rpm (4 mm from mounting flange)		20			N
	– axial at 3 000 rpm		2			N
	– axial at standstill		20			N
24	Shaft play:					
	– radial	≤	0,015			mm
	– axial	=	0			mm
25	Housing material		stainless steel			
26	Weight		117			g
27	Direction of rotation		electronically reversible			

Recommended values - mathematically independent of each other

28	Speed up to	$n_{e\ max.}$			5 - 7 000	rpm
29	Torque up to [1] [2]	$M_{e\ max.}$			22 / 35	mNm
30	Current up to [1] [2]	$I_{e\ max.}$			0,7 / 1,1	A

[1] at 4 000 rpm
[2] thermal resistance $R_{th\,2}$ not reduced / thermal resistance $R_{th\,2}$ by 55% reduced

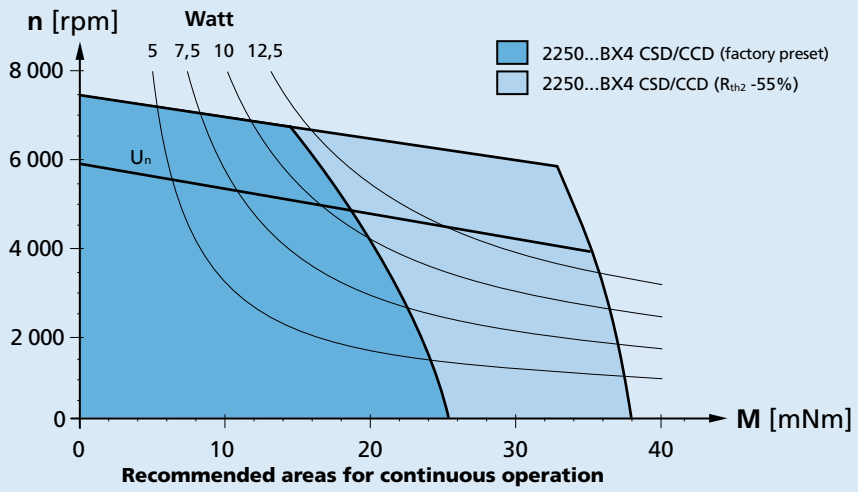
Note:

The diagram indicates the recommended speed in relation to the available torque at the output shaft for a given ambient temperature of 22°C.

The diagram shows the motor in a completely insulated as well as thermally coupled condition ($R_{th\,2}$ 55% reduced).

The motor is factory pre-configured to a continuous current for the thermally insulated condition. The controller must be reconfigured with the easy to use Motion Manager Software for use at higher continuous current.

The nominal voltage (U_N) curve shows the operating point at nominal voltage in the insulated and thermally coupled condition. Any points of operation above the curve at nominal voltage will require a higher operating voltage. Any points below the nominal voltage curve will require less voltage.

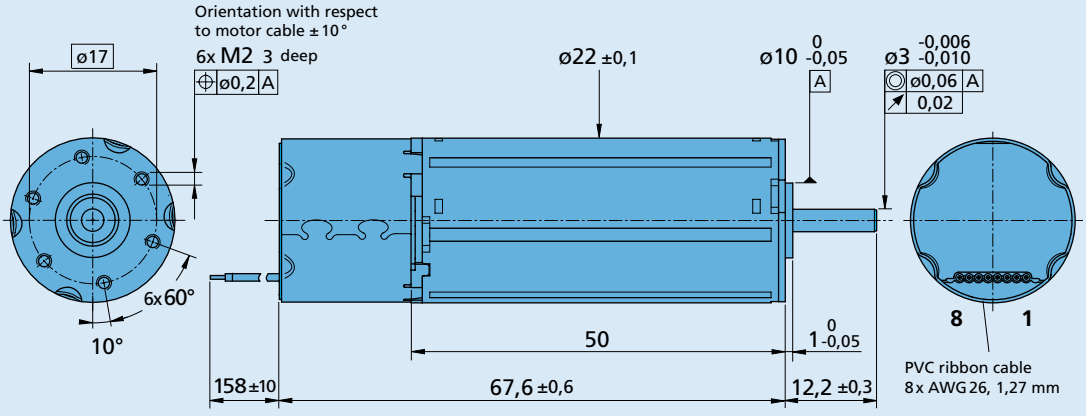


For notes on technical data and lifetime performance refer to "Technical Information".

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Dimensional drawing

M 1:1



2250 ... BX4 CSD/CCD

Connection

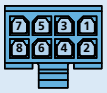
No.	Function
1	3.input
2	+24V
3	GND
4	Analog input
5	Analog GND
6	Fault output
7	RS232 RXD / CAN_L
8	RS232 TXD / CAN_H

Caution:
Incorrect lead connection will damage the motor electronics!

Options

Options

- Connector variant (Option no. 3830)
  AWG 26 / PVC ribbon cable
  with connector Micro-Fit



Accessories

- Adapter board BX4 CxD (Part No.: 6501.00113)

Full product description

- Example:
  2250S024 BX4 CSD

Motor Controller

Supply voltage [1]	U_B		5 ... 30	V DC
Peak current [2]	$I_{max.}$		3	A
Connection "Analog input":				
– Speed command analog input		voltage range	±10	V
– Speed command PWM input		frequency range	100 ... 2 000	Hz
		pulse duty factor 50%	0	rpm
– Digital input		input resistance (at 24V)	5	kΩ
– External encoder	$f_{max.}$		400	kHz
– Step frequency input	$f_{max.}$		400	kHz
Connection "Fault output":				
– Fault output		no error	switched to GND	
– Digital output		open collector	max. U_B / 30 mA	
– Digital input		input resistance	100	kΩ
Connection "3.input":				
– Digital input		input resistance	22	kΩ
– Electronic supply voltage [1]	U_B		5 ... 30	V DC
Encoder:				
– Scanning rate			200	µs
– Resolution internal encoder			3 000	Inc./turn

The signal level of the digital inputs can be set using the above commands:
Standard (PLC): Low 0...4,5V / High 12,5V...U_B, TTL: Low 0...0,5V / High 2,5V...U_B

[1] Separate supply of motor and control electronics for safetyrelevant applications is optionally available (Option no. 2993).
In this case the 3rd input is not available for digital signals.
[2] Preset value. Can be changed over the interface.

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MC Function / RS232

General description

FAULHABER Motion Controllers are available as external electronic controls to be used in combination with DC-Micromotors, Brushless DC-Servomotors and Linear DC-Servomotors or, if already integrated, with Brushless DC-Servomotors in the form of motion control systems. Motion control is thus possible for the majority of motors from a diameter of 6 mm upward. The integrated systems reduce the amount of space required. At the same time, their wiring requirements are minimal, which helps to simplify installation.

Operating modes

- **Speed control**
  PI speed control, even for demanding synchronization requirements
- **Positioning**
  For moving to defined positions with a high level of resolution. With a PD Controller, the dynamic response can be adjusted to suit the application. Reference and limit switches are evaluated by means of various homing modes.
- **Speed profiles**
  Acceleration ramps, deceleration ramps and maximum velocity can also be defined for each section. As a result, even complex profiles can be implemented quickly and effectively.
- **Current control**
  Protects the drive by limiting the motor current to the set peak current. The current is limited to the continuous current by the integrated I^2t monitoring if required.
- **Protective functions**
  - Protection against ESD
  - Overload protection for the electronic circuitry and the motor
  - Self-protection against overheating
  - Overvoltage protection in generator mode
- **Extended operating modes**
  - Stepper motor mode
  - Gearing mode
  - Position control to analog set point
  - Operation as servo amplifier in voltage adjuster mode
  - Torque/force controller using variable set current input

Interfaces - Discrete I/O

- **Setpoint input**
  Depending on the operating mode, setpoints can be input via the serial port, via an analog voltage value, a PWM signal or a quadrature signal.
- **Error output** (Open Collector)
  This can also be used as a digital input for the evaluation of reference switches or for specifying direction of rotation.
- **RS232 interface**
  For connection to a PC with a transmission rate of up to 115 kbaud. The information can be stored in the integrated memory (FLASH).

The interface also offers the option of querying online operating data and values. The RS232 interface also allows the operation of several networked drives on one control.

Sensor interfaces (position and speed sensors, depending on motor type)

- **Analog Hall signals**
  Three analog Hall signals, offset by 120°, for motor position and speed in the case of Brushless DC-Motors and Linear DC-Servomotors
- **Incremental encoders**
  Incremental encoders for motor position and speed in the case of DC-Micromotors and as additional sensors for Brushless DC-Motors
- **Absolute encoders**
  Serial SSI port for motor position and speed matching Brushless DC-Servomotors with an AES Encoder

RS232 Programming / Configuration

An extensive ASCII command set is available for programming and operation. This can be preset from the PC, e.g. via any Windows terminal program or via any other control computer.

In addition, even complex processes can be created from these commands and stored in the drive. Once programmed as a stepper motor, electronic gear or as a speed or position controller via the analogue input, the drive can be operated independently of the RS232 interface.

"Faulhaber Motion Manager" software is available for Windows operating systems. It considerably simplifies operation and configuration and also enables graphic online analysis of the operating data.

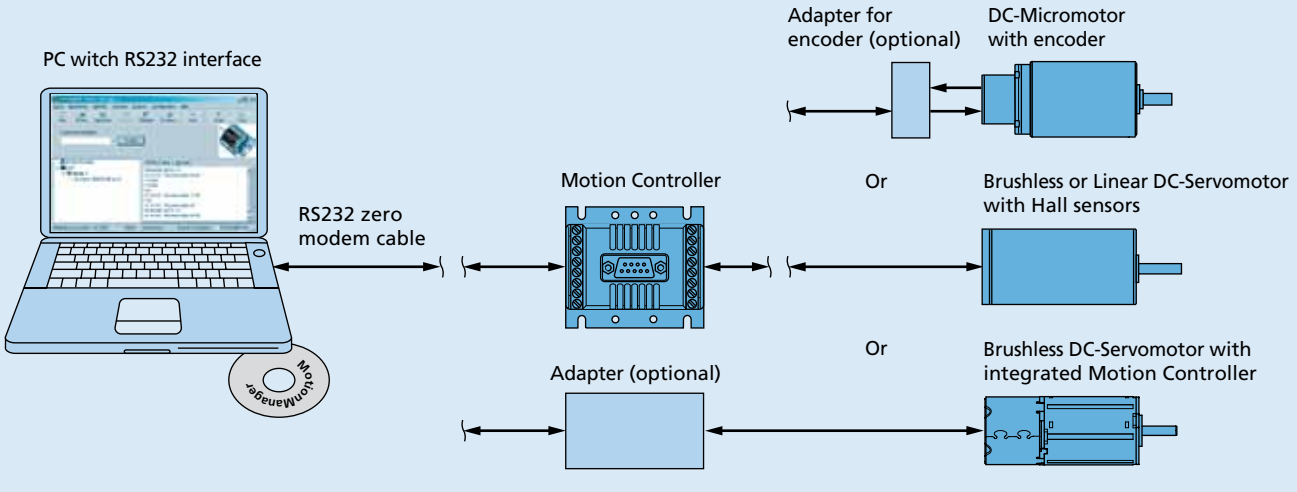
Options

Separate supply of power to the motor and electronic actuator is optional (important for safety-relevant applications), in which case no third input is required. Depending on the controller, additional programming adaptors and connection aids are available. The modes and parameters can be specially preconfigured on request

Notes

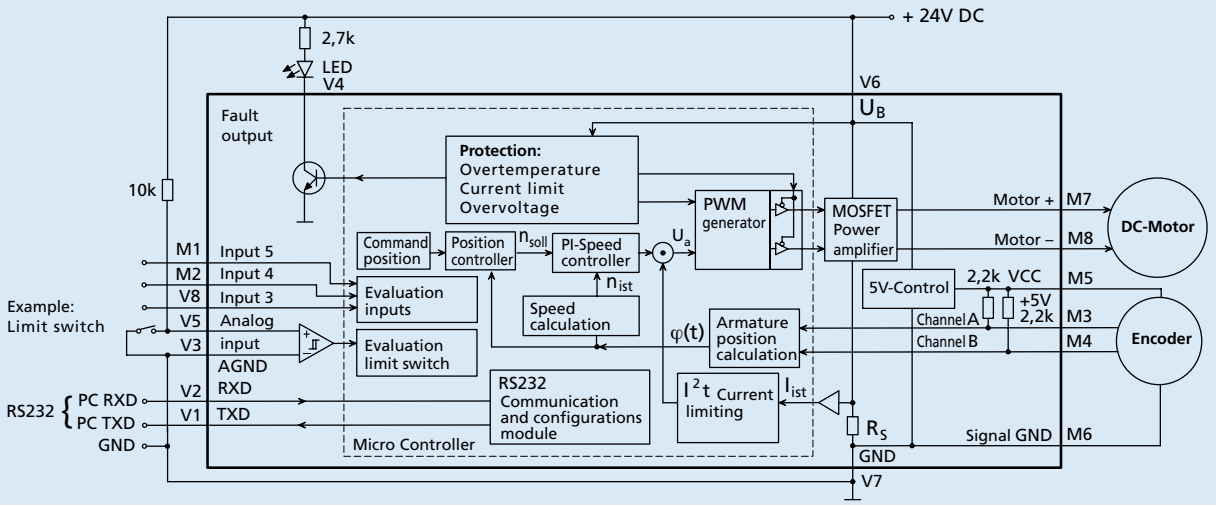
Motion Controllers and Motion Control Systems are accompanied by a **device manual** for installation and putting into operation.
A communication and function manual and the **"Faulhaber Motion Manager"** software are available on request and on the Internet at www.faulhaber.com.

Connection diagram

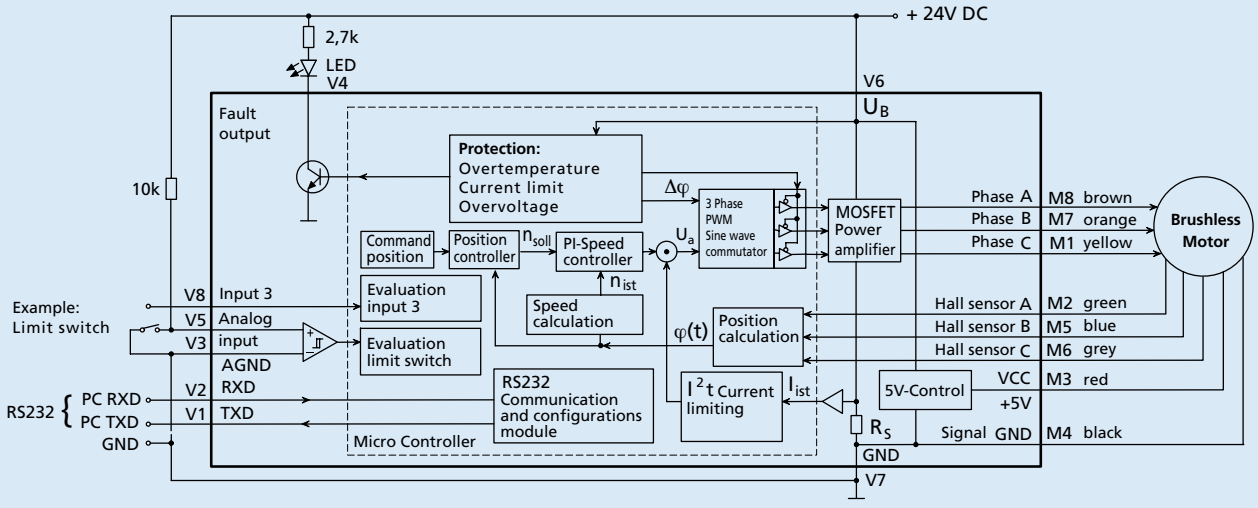


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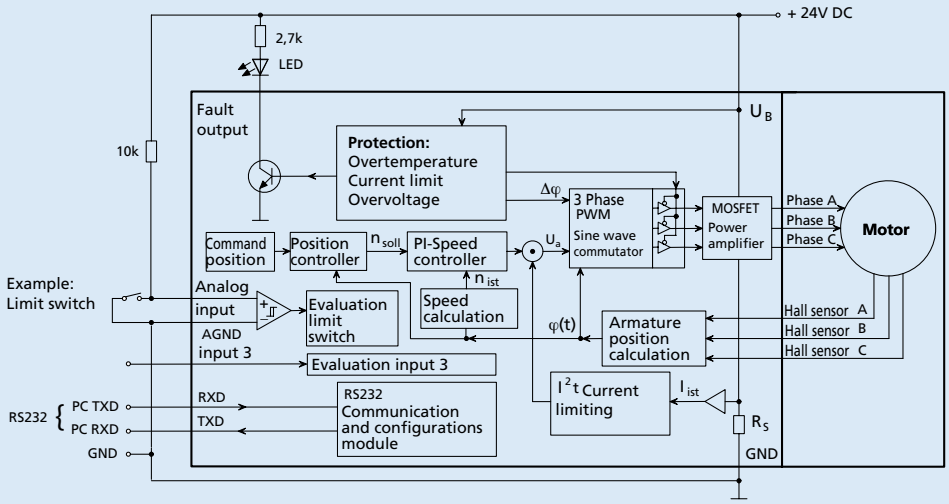
Position control DC-Micromotor with encoder



Position control Brushless DC-Servomotor with Hall sensors



Position control Brushless DC-Servomotor with integrated Motion Controller



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Interfaces - Discrete I/O

- **Setpoint input**
  Depending on the operating mode, setpoints can be input via the serial port, via an analog voltage value, a PWM signal or a quadrature signal.
- **Error output** (Open Collector)
  This can also be used as a digital input for the evaluation of reference switches or for specifying direction of rotation.
- **CANopen interface**
  For integration into a CAN network with transfer rates of up to 1 Mbit/s. Via the CAN interface a number of drives can be networked and operated on a higher-level control.

Sensor interfaces (position and speed sensors, depending on motor type)

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CAN Programming / Configuration

FAULHABER Motion Controllers support the CANopen communication profile under DS301 V4.02 in accordance with the CiA specification for slave devices with the following services:
- 1 Server SDO
- 3 transmit PDOs, 3 receive PDOs
- Static PDO mapping
- NMT with node guarding
- Emergency Object

The transfer rate and node no. are set via the network in accordance with the LSS protocol conforming to DSP305 V1.11, and automatic baud rate detection is also implemented. In addition, all the functions and parameters of the drive unit can be easily activated via a special FAULHABER PDO channel.

As regards the CiA device profile for Motion Controllers (CiA 402), the following are supported:
- Profile Position Mode and Position Control Function
- Homing Mode
- Profile Velocity Mode

Also, for each Faulhaber command there is an appropriate CAN frame available on the PDO channel, with which the CAN unit can be operated in the same way as the serial variant and the extended operating modes can be supported.
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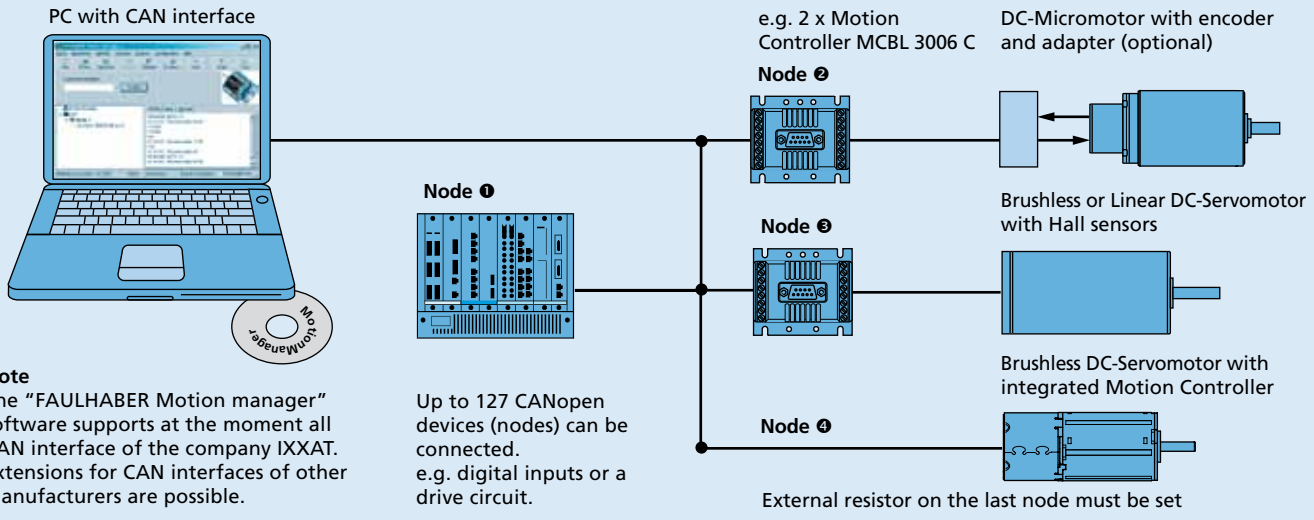
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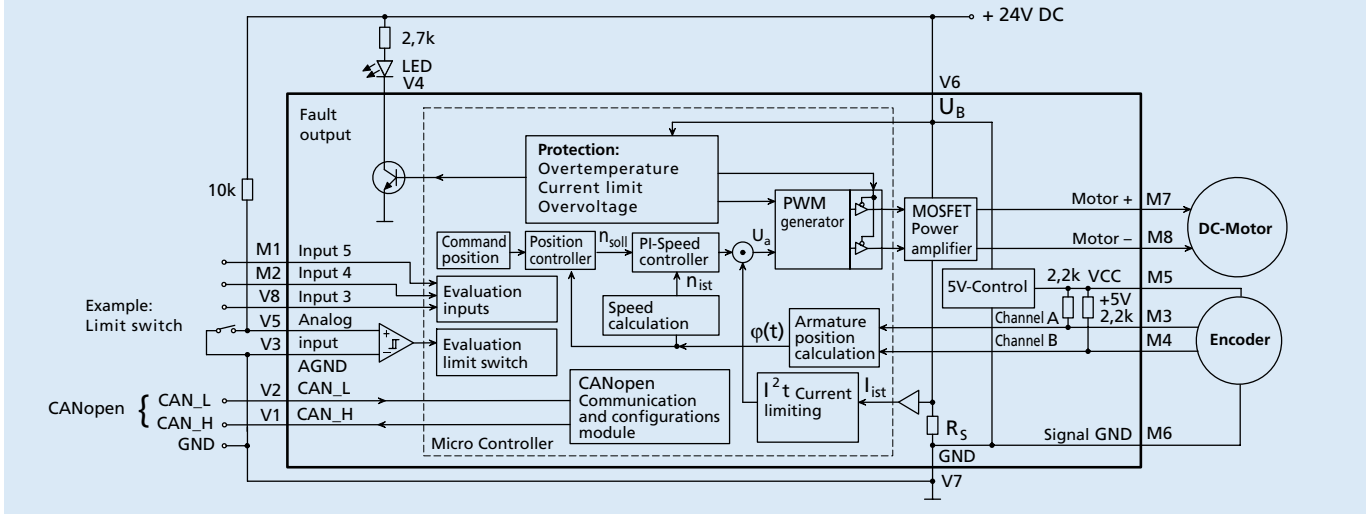
Note
The "FAULHABER Motion manager" software supports at the moment all CAN interface of the company IXXAT. Extensions for CAN interfaces of other manufacturers are possible.

Up to 127 CANopen devices (nodes) can be connected.
e.g. digital inputs or a drive circuit.

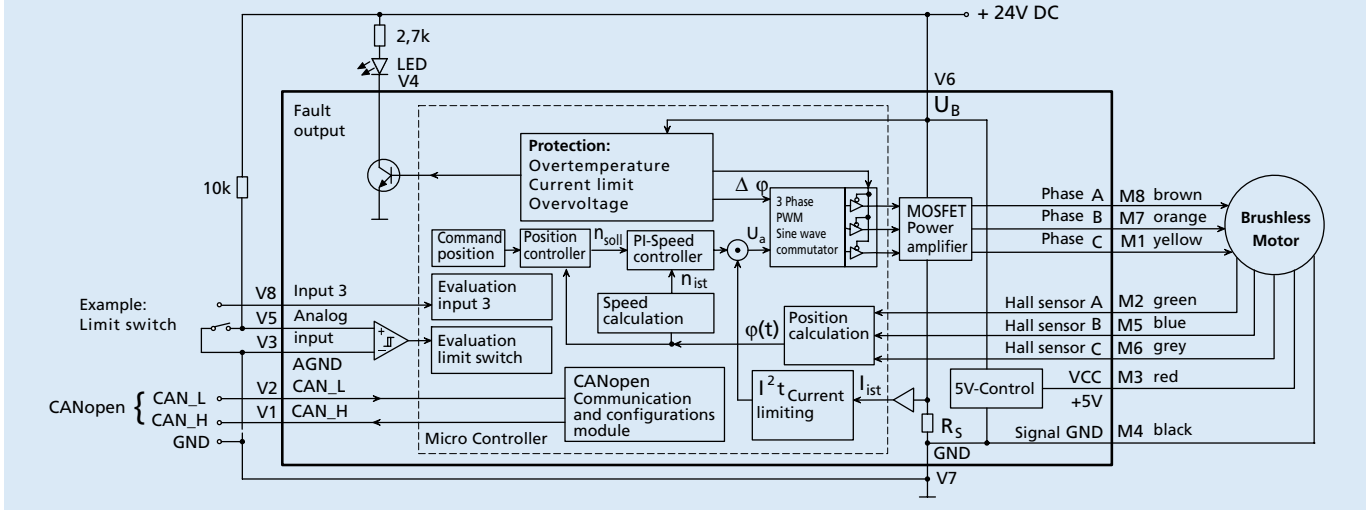
External resistor on the last node must be set

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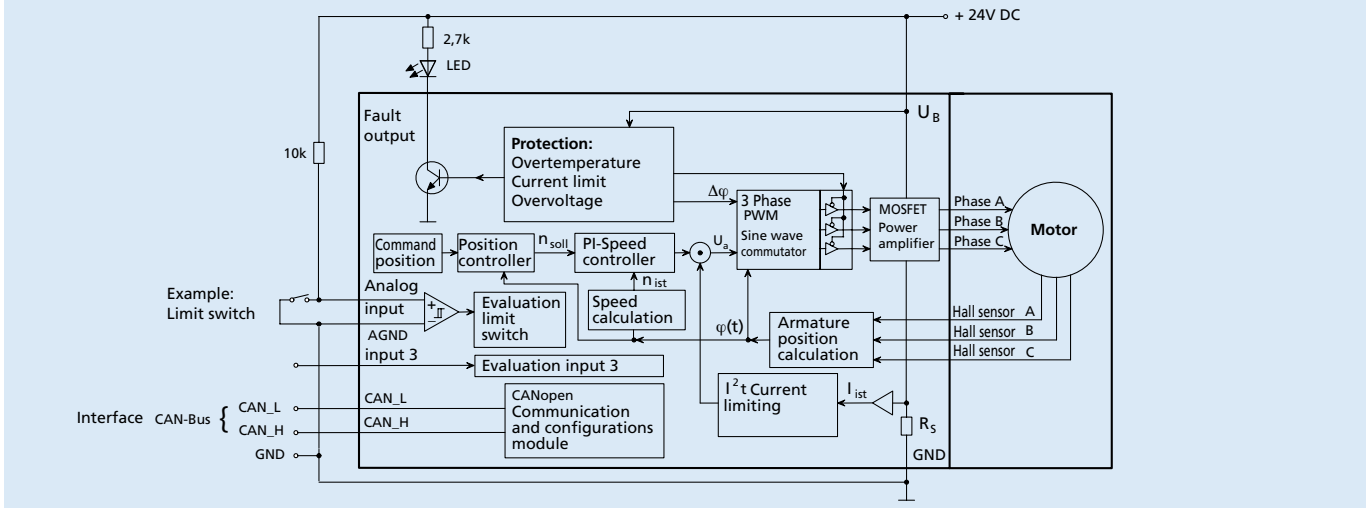
Position control DC-Micromotor with encoder



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Position control Brushless DC-Servomotor with integrated Motion Controller



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