

# Brushless DC-Servomotor

with integrated Motion Controller  
and RS232 or CAN interface

## 96 mNm

For combination with  
Gearheads:  
30/1, 32A, 32/3, 32/3 S, 38/1, 38/1 S, 38/2, 38/2 S

### 3268 ... BX4 CS/CC

|  | 3268 G                              | 024 BX4 CS/CC             |                              |
|--|-------------------------------------|---------------------------|------------------------------|
| 1 Nominal voltage  | $U_N$                               | 24                        | Volt                         |
| 2 Terminal resistance, phase-phase                                   | R                                   | 1,45                      | $\Omega$                     |
| 3 Output power <sup>1)</sup>   | $P_{2 \text{ max.}}$                | 29,8                      | W                            |
| 4 Efficiency   | $\eta_{\text{ max.}}$               | 77,3                      | %                            |
| 5 No-load speed  | $n_o$                               | 5 200                     | rpm                          |
| 6 No-load current <sup>3)</sup>                                      | $I_o$                               | 0,203                     | A                            |
| 7 Stall torque at 8A   | $M_H$                               | 346                       | mNm                          |
| 8 Friction torque, static  | $C_o$                               | 1,7                       | mNm                          |
| 9 Friction torque, dynamic   | $C_v$                               | $1,3 \cdot 10^{-3}$       | mNm/rpm                      |
| 10 Speed constant  | $k_n$                               | 220                       | rpm/V                        |
| 11 Back-EMF constant   | $k_E$                               | 4,555                     | mV/rpm                       |
| 12 Torque constant   | $k_M$                               | 43,5                      | mNm/A                        |
| 13 Current constant  | $k_i$                               | 0,0230                    | A/mNm                        |
| 14 Slope of n-M curve  | $\Delta n / \Delta M$               | 7,3                       | rpm/mNm                      |
| 15 Terminal inductance, phase-phase                                  | L                                   | 110                       | $\mu\text{H}$                |
| 16 Mechanical time constant  | $\tau_m$                            | 4,6                       | ms                           |
| 17 Rotor inertia   | J                                   | 60                        | $\text{gcm}^2$               |
| 18 Angular acceleration  | $\alpha_{\text{ max.}}$             | 58                        | $\cdot 10^3 \text{ rad/s}^2$ |
| 19 Thermal resistance  | $R_{\text{th} 1} / R_{\text{th} 2}$ | 1,9 / 9,6                 | K/W                          |
| 20 Thermal time constant   | $\tau_{w1} / \tau_{w2}$             | 17 / 1 060                | s                            |
| 21 Operating temperature range                                       |                                     | - 20 ... +100             | $^{\circ}\text{C}$           |
| 22 Shaft bearings  |                                     | ball bearings, preloaded  |                              |
| 23 Shaft load max.:  |                                     |                           |                              |
| – radial at 3 000 rpm (4,5 mm from mounting flange)                  |                                     | 50                        | N                            |
| – axial at 3 000 rpm   |                                     | 5                         | N                            |
| – axial at standstill  |                                     | 50                        | N                            |
| 24 Shaft play:   |                                     |                           |                              |
| – radial   | $\leq$                              | 0,015                     | mm                           |
| – axial  | $\equiv$                            | 0                         | mm                           |
| 25 Housing material  |                                     | stainless steel           |                              |
| 26 Weight  |                                     | 460                       | g                            |
| 27 Direction of rotation   |                                     | electronically reversible |                              |
| <b>Recommended values - mathematically independent of each other</b> |                                     |                           |                              |
| 28 Speed up to   | $n_{e \text{ max.}}$                | 5 - 6 500                 | rpm                          |
| 29 Torque up to <sup>1) 2)</sup>                                     | $M_{e \text{ max.}}$                | 58 / 96                   | mNm                          |
| 30 Current up to <sup>1) 2) 3)</sup>                                 | $I_{e \text{ max.}}$                | 1,60 / 2,65               | A                            |

<sup>1)</sup> at 4 000 rpm    <sup>2)</sup> thermal resistance  $R_{\text{th} 2}$  not reduced / thermal resistance  $R_{\text{th} 2}$  by 55% reduced

<sup>3)</sup> total standby current 0,08 A

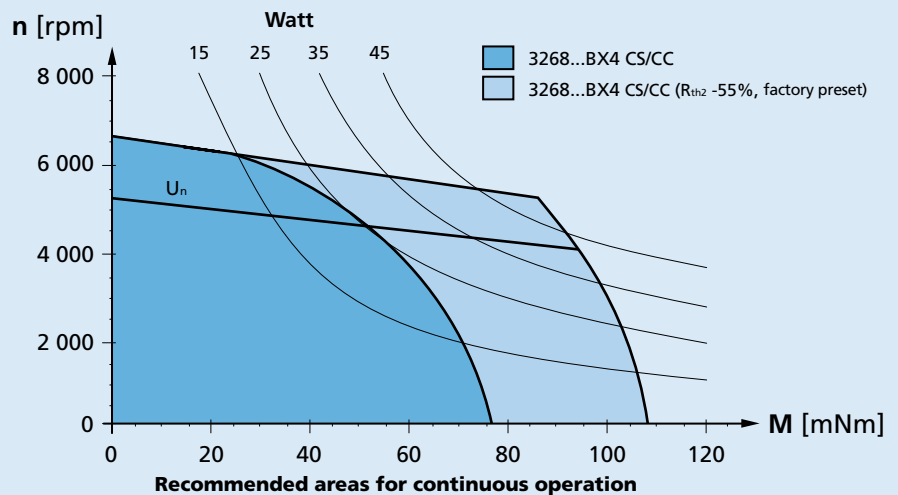
#### Note:

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

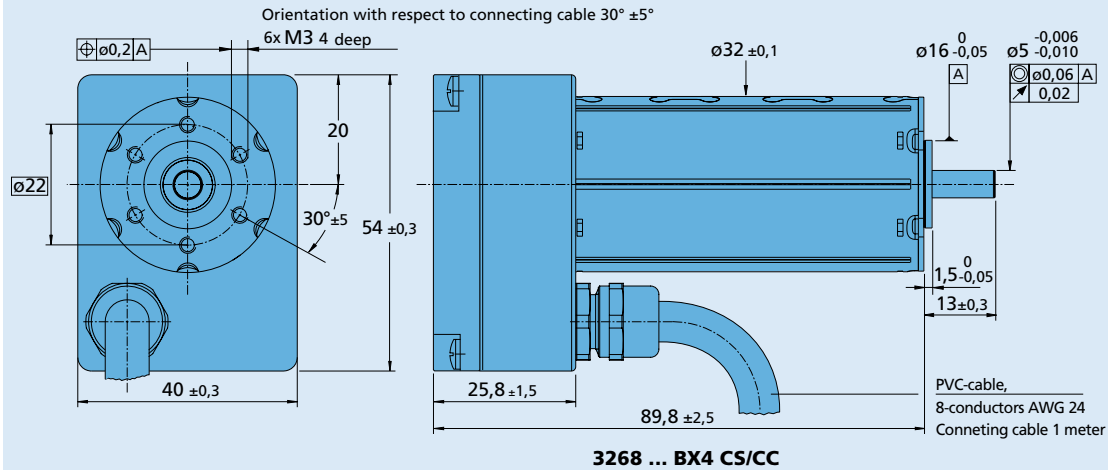
The motor can provide more power with adequate cooling (for ex.  $R_{\text{th} 2}$  reduction of -55%).


The maximum available torque and speed will be reduced if the ambient temperature is higher than 22°C and/or the motor is thermally insulated to the ambient environment.

The characteristics of the curve diagram is determined by  $U_b$  and the control characteristics of the integrated Motion Controller.



## Dimensional drawing



scale reduced 

## Connection

| Wires  | Function          |
|--------|-------------------|
| blue   | GND               |
| pink   | + 24 V            |
| brown  | Analog input      |
| white  | Fault output      |
| grey   | Analog GND        |
| yellow | RS232 RXD / CAN_L |
| green  | RS232 TXD / CAN_H |
| red    | Connection No. 3  |

## Caution:

be sure to connect motor supply terminals to the correct polarity. Motor electronics are protected against polarity reversal by an internal fuse. In case of damage due to polarity reversal, this internal fuse can only be replaced at the factory.

## Options

### Accessories

- Adapter board (Part No.: 6501.00065)

### Full product description

- Example:  
3268G024 BX4 CS (RS232 interface)  
3268G024 BX4 CC (CAN interface)

## Motion Controller

|   |            |                           |                    |           |
|---|------------|---------------------------|--------------------|-----------|
| Supply voltage <sup>1)</sup>              | $U_B$      |                           | 12 ... 30          | V DC      |
| Peak current <sup>2)</sup>                | $I_{max.}$ |                           | 8                  | A         |
| Input/output                              |            |                           | 3                  |           |
| 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                           | $f_{max.}$ | input resistance (at 24V) | 5                  | kΩ        |
| - External encoder                        | $f_{max.}$ |                           | 400                | kHz       |
| - Step frequency input                    |            |                           | 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                           | $U_B$      | input resistance          | 22                 | kΩ        |
| - Electronic supply voltage <sup>1)</sup> |            |                           | 12 ... 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...7,0V / High 12,5V... $U_B$ , TTL: Low 0...0,5V / High 3,5V... $U_B$

<sup>1)</sup> 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; connection 3.

<sup>2)</sup> Preset value. Can be changed over the interface.

## 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<sup>2</sup>t 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.

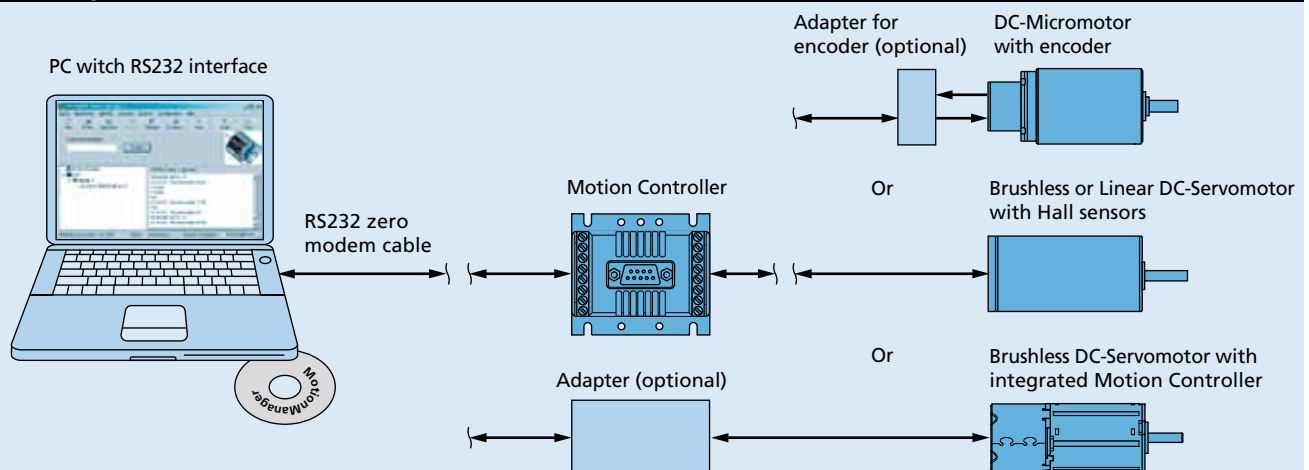
### Options

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

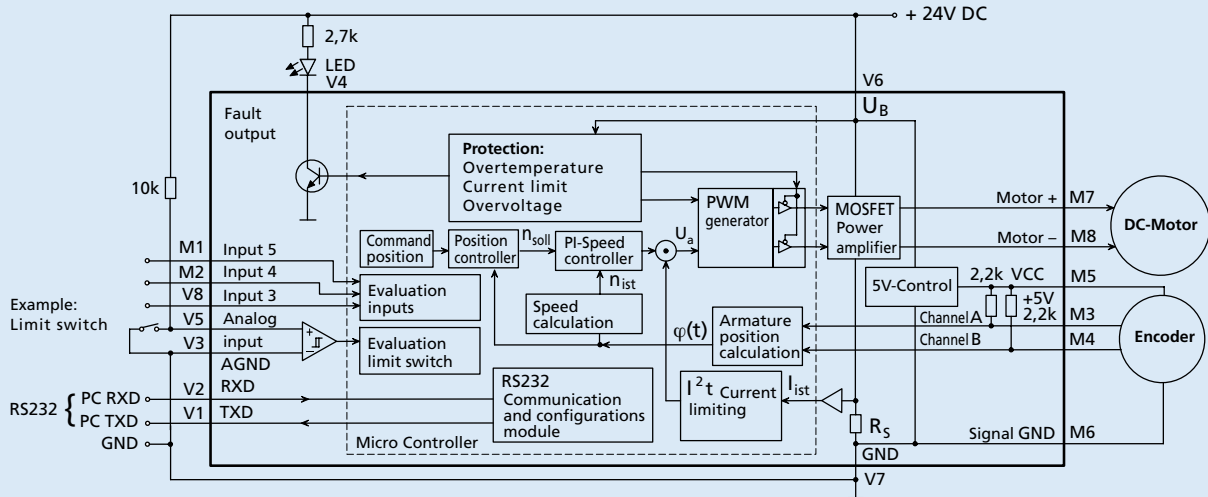
### Notes

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](http://www.faulhaber.com).

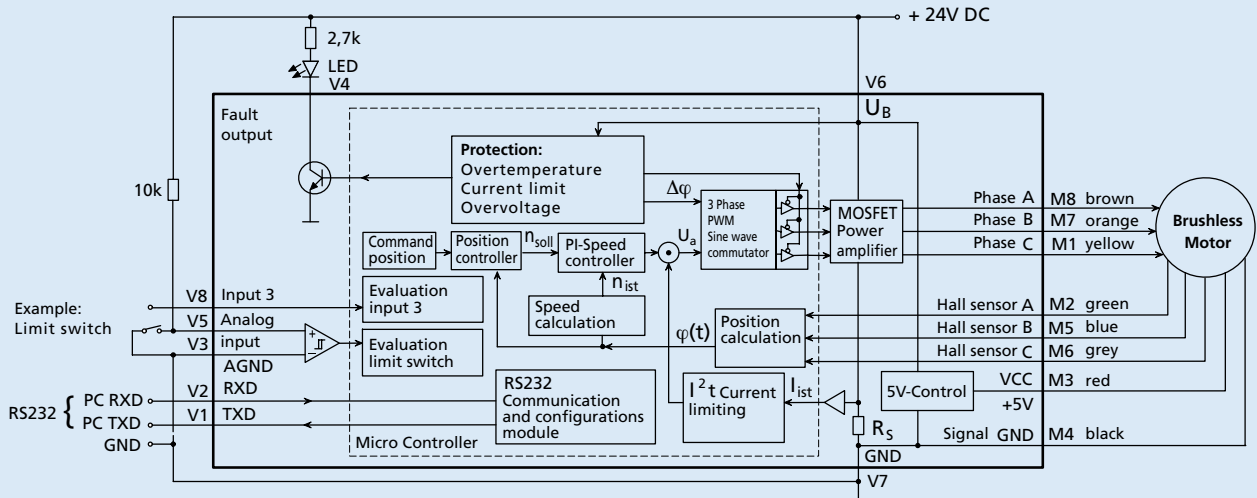
### Connection diagram



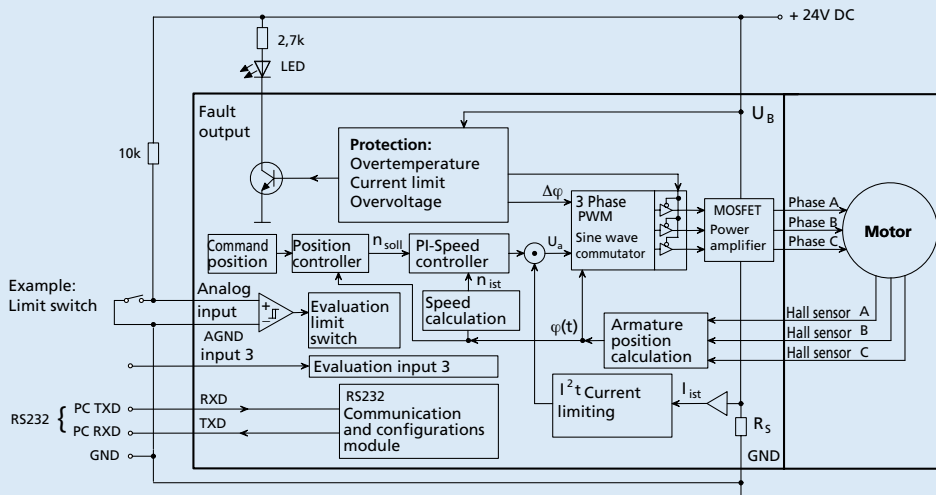
**Position control DC-Micromotor with encoder**



**Position control Brushless DC-Servomotor with Hall sensors**



**Position control Brushless DC-Servomotor with integrated Motion Controller**



## MC Function / CAN

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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.

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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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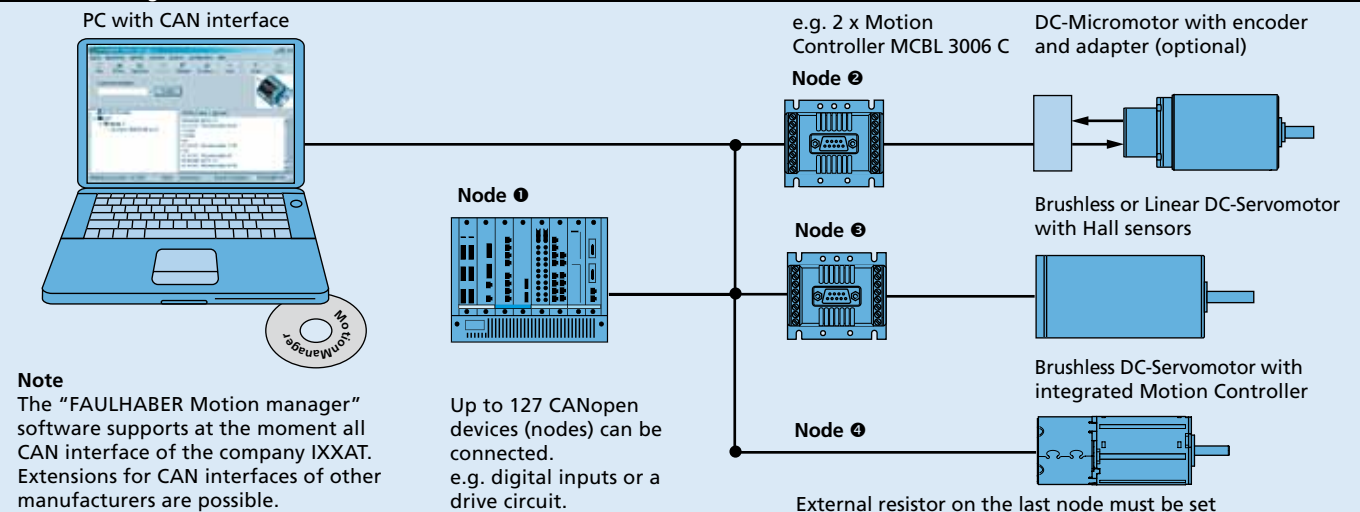
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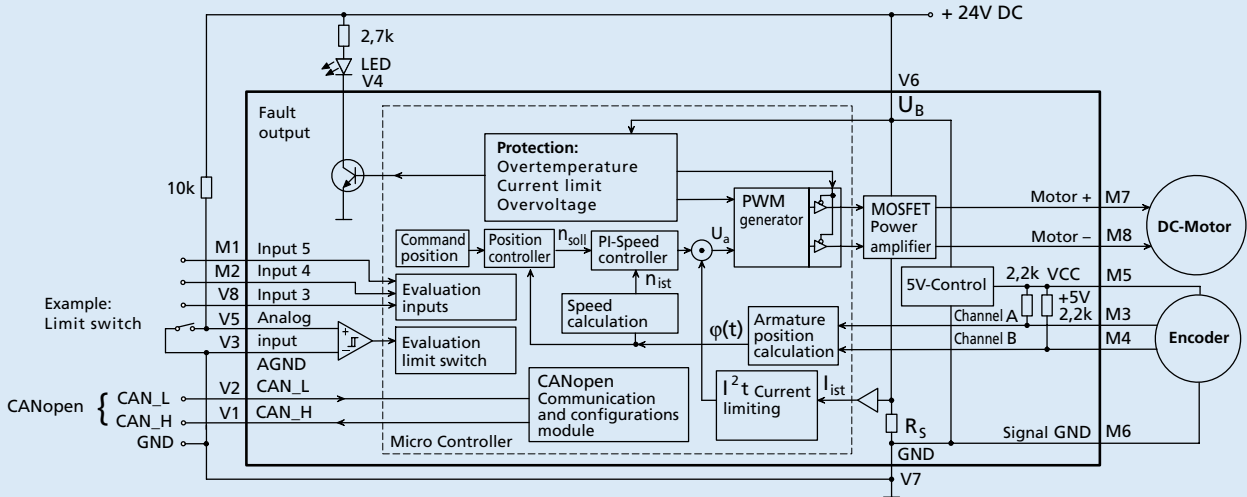
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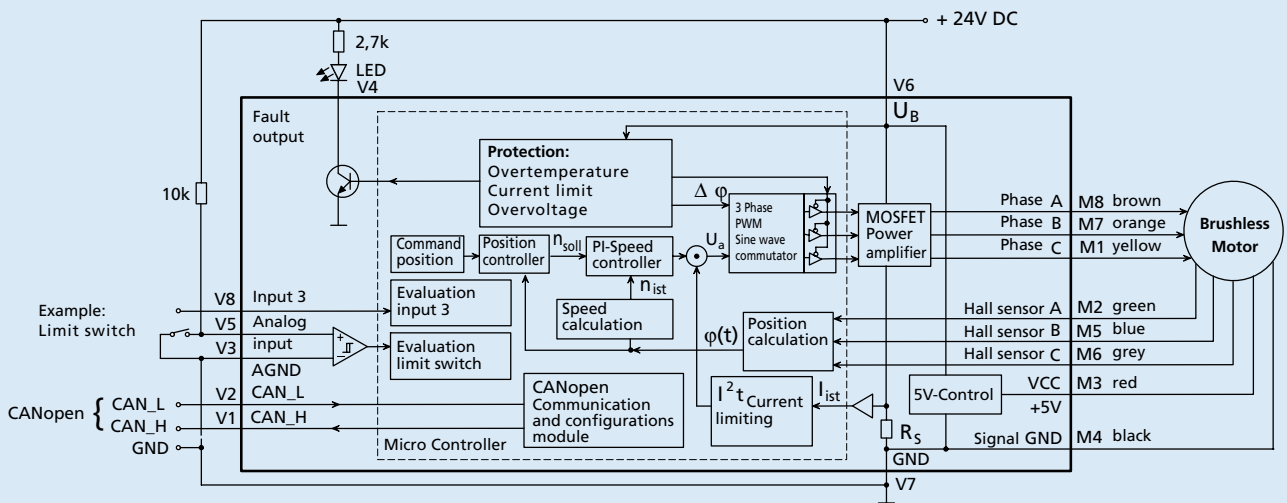
### Connection diagram



### Position control DC-Micromotor with encoder



### Position control Brushless DC-Servomotor with Hall sensors



### Position control Brushless DC-Servomotor with integrated Motion Controller

