FAULHABER

Motors with integrated Electronics
Technical Information

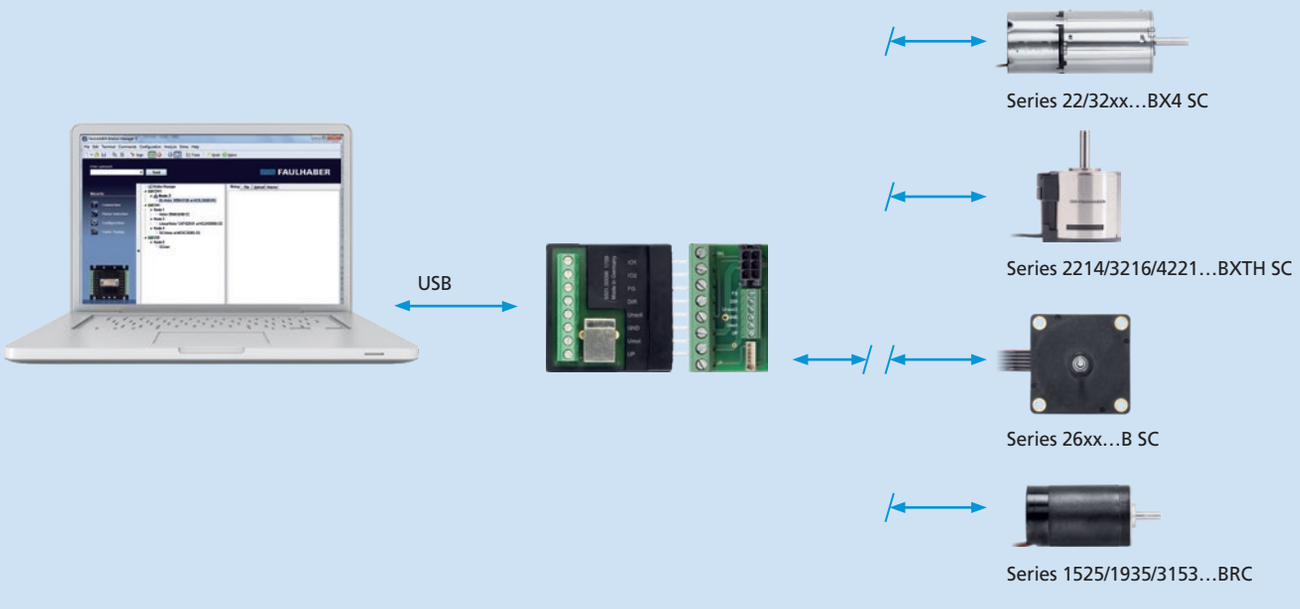
WE CREATE MOTION

EN

Speed Control Systems

Technical Information

Connection variants



General Information

FAULHABER Speed Control Systems are highly dynamic drive systems with controlled speed. The drive electronics are already integrated and matched to the respective motor.

The compact integration of the Speed Controller as well as the flexible connection possibilities open a wide range of applications in areas such as laboratory technology and equipment manufacturing, automation technology, pick-and-place machines and machine tools, or pumps.

The integration of the control electronics in space-optimised add-on systems reduces space requirements and simplifies installation and start-up.

The integrated electronics facilitate speed control by means of a PI controller with external setpoint input. The direction of rotation can be changed via a separate switching input; the speed signal can be read out via the frequency output.

The motors can optionally be operated as a voltage controller or in fixed speed mode.

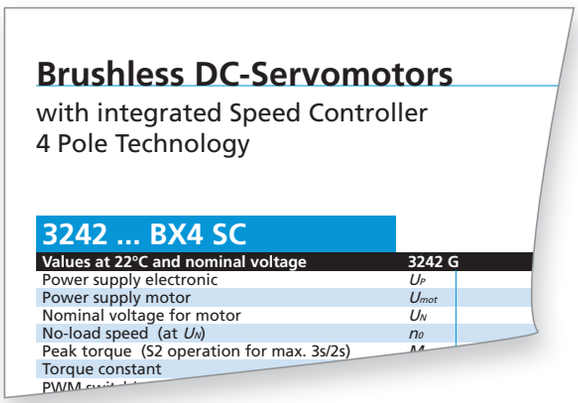
Speed Control Systems can be adapted to the application via the FAULHABER Motion Manager software. The type and scaling of the setpoint input, the operating mode and the control parameters can be adjusted. The USB programming adapter for Speed Controllers is used for configuration, and a contacting board is used for connecting the ribbon cables.

Interfaces – discrete I/O

- Analog input as setpoint input for setting the speed via PWM or analog voltage value
- Digital input as switching input for defining the direction of rotation of the motor
- Digital output, can be programmed either as frequency output or as error output

Note

Device manuals for installation and start-up, as well as the "FAULHABER Motion Manager" software, are available on request or on the Internet under www.faulhaber.com.



Notes on technical data sheet

The following data sheet values of the Speed Control Systems are measured or calculated at nominal voltage and at an ambient temperature of 22°C.

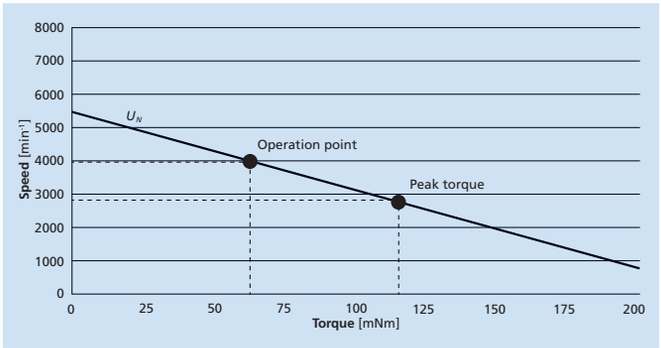
Power supply for electronics U_P [V DC]
Describes the range of the permissible supply voltage for the control electronics.

Power supply for motor U_{mot} [V DC]
Describes the range of the permissible supply voltage for the base motor integrated in the complete system.

Motor nominal voltage U_N [V]
The voltage applied between two winding phases. This is the voltage at which the data sheet parameters are measured or calculated. Depending on the required speed, a higher or lower voltage can be applied within the permissible range of the supply voltage.

No-load speed n_0 [min^{-1}]
Describes the motor speed when idling and in the steady-state condition at nominal voltage.

Peak torque $M_{max.}$ [mNm]
Specifies the torque that the drive can reach in S2 operation (cold start without additional cooling) at nominal voltage and nominal conditions under constant load for the time specified in the data sheet without exceeding the thermal limit. Unless otherwise defined, the value that applies for the peak torque is equal to two times the continuous torque.



Example: 3242...BX4 SC

Torque constant k_m [mNm/A]
Constant that describes the ratio between motor torque and current input.

Starting torque [M_A]
Load torque with which the motor starts at room temperature and nominal voltage. This value can change depending on the magnet type and magnet temperature as well as the winding temperature.

PWM switching frequency f_{PWM} [kHz]
Pulse width modulation describes the change of the electrical voltage between two values. The motors integrated in the SCS have a low electrical time constant. To keep the losses associated with PWM low, a high switching frequency is necessary.

Electronics efficiency η [%]
Ratio between consumed and delivered power of the control electronics.

Standby current for the electronics I_{el} [A]
Describes the additional current consumption of the complete system that can be attributed to the integrated electronics.

Speed range [min^{-1}]
Describes the maximum no-load speed for continuous operation in the steady-state condition at elevated nominal voltage. Depending on the required speed, higher or lower voltage can be applied within the given system limits.

Mounting of the system on a plastic flange according to installation type IM B 5.

Shaft bearings
The bearings used for the brushless DC motors.

Shaft load, max. permissible [N]
Max. permissible shaft load of the output shaft with specified shaft diameter. The values for load and service life of motors with ball bearings are based on manufacturer specifications. This value is not applicable for a possibly available rear or second shaft end.

Shaft play [mm]
Clearance between the shaft and bearing including the additional bearing clearance in the case of ball bearings.

Operating temperature range [°C]
Shows the minimum and maximum operating temperature of the complete system under nominal conditions.

Housing material
Housing materials and, if necessary, surface treatment.

Mass [g]
The typical mass of the standard system may vary due to the different component variants.

Length dimensions without mechanical tolerance specifications:
Tolerances according to ISO 2768:

≤	6	= ± 0.1 mm
≤	30	= ± 0.2 mm
≤	120	= ± 0.3 mm

The tolerances of non-specified values are available on request.

All mechanical dimensions of the motor shaft are measured with an axial shaft load in the direction of the motor.

Rated Values for Continuous Operation

The following values are measured at nominal voltage, an ambient temperature of 22°C and with mounting type IM B 5.

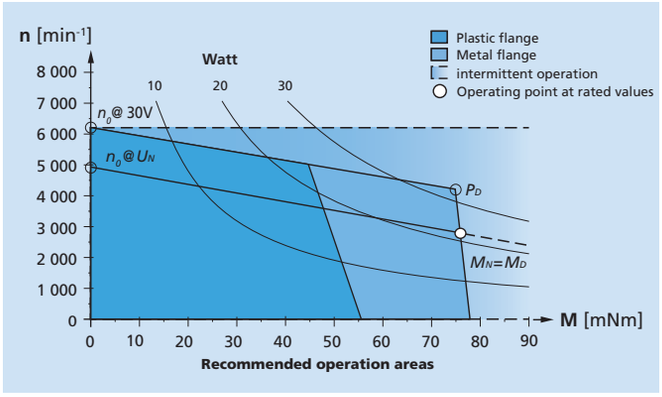
Mounting type IM B 5 defines the flange mounting of the drive without mounting feet with two bearing plates, free front shaft end and mounting flange close to the bearing.

Rated torque M_N [mNm]
Maximum continuous torque (S1 mode) at nominal voltage at which in the steady-state condition the temperature does not exceed the maximum permissible winding temperature and/or the operating temperature range of the motor. The motor is fastened to a metal flange here, which approximates the amount of cooling available from a typical mounting configuration of the motor. This value can be exceeded if the motor is operated intermittently, for example, in S2 mode and/or if more cooling is applied.

Rated current I_N [A]
Typical maximum continuous current in the steady-state condition which results from the rated torque in continuous operation. This value can be exceeded if the drive is operated intermittently, in start/stop mode, in the starting phase and/or if more cooling is used.

Rated speed n_N [min^{-1}]
Typical rated speed in the steady-state condition which is determined from the given rated torque.

This value takes into account the effects that motor losses have on the slope of the n/M characteristic curve.



Example: Performance diagram for rated values with continuous operation.

Explanations on the Performance Diagram

The performance diagram shows the possible operating points of the servo-drives.

Operating points in the dark blue area are reached continually in the case of pure flange mounting (IM B5) on a plastic flange (approx. 100mm x 100mm x 10mm) and at an ambient temperature of 22°C.

Operating points in the light blue area up to P_D are reached continually in the case of pure flange mounting (IM B5) on an aluminium flange (approx. 100mm x 100mm x 10mm) and at an ambient temperature of 22°C.

The maximum achievable speed depends on the motor supply voltage. At nominal voltage, the maximum achievable operating points are those on the nominal voltage line through the no-load point and nominal point.

Speeds above the nominal voltage line are reached at an increased supply voltage.

In this case, the maximum voltage for the electronics or motor supply must never be exceeded.

The possible speed ranges are shown in dependence on the shaft torque.

The sector shown dashed describes possible operating points in which the drive can be engaged in intermittent operation or with increased cooling.

Continuous torque M_D [mNm]
Describes the max. recommended continuous torque in the steady-state condition at nominal voltage and mounting on an aluminium flange. With Speed Control Systems, the continuous torque simultaneously corresponds to the rated torque.

Here, the speed is linear to the continuous torque. The continuous torque is independent of the continuous output power and can be exceeded if the motor is operated intermittently, for example, in S2 operation and/or if more cooling is applied.

Continuous output power P_D [W]
Describes the max. possible output power in continuous operation in steady-state condition with mounting on an aluminium flange. The value is independent of the continuous torque, responds linearly to the cooling factor and can be exceeded if the motor is operated intermittently, for example, in S2 operation and/or if more cooling is applied.

Nominal voltage curve U_N [V]
The nominal voltage curve describes the possible continuous operating points at U_N. In steady state, the starting point corresponds to the no-load speed n_0 of the drive. Operating points above this curve can be attained by an increase, operating points below by a reduction of the nominal voltage.

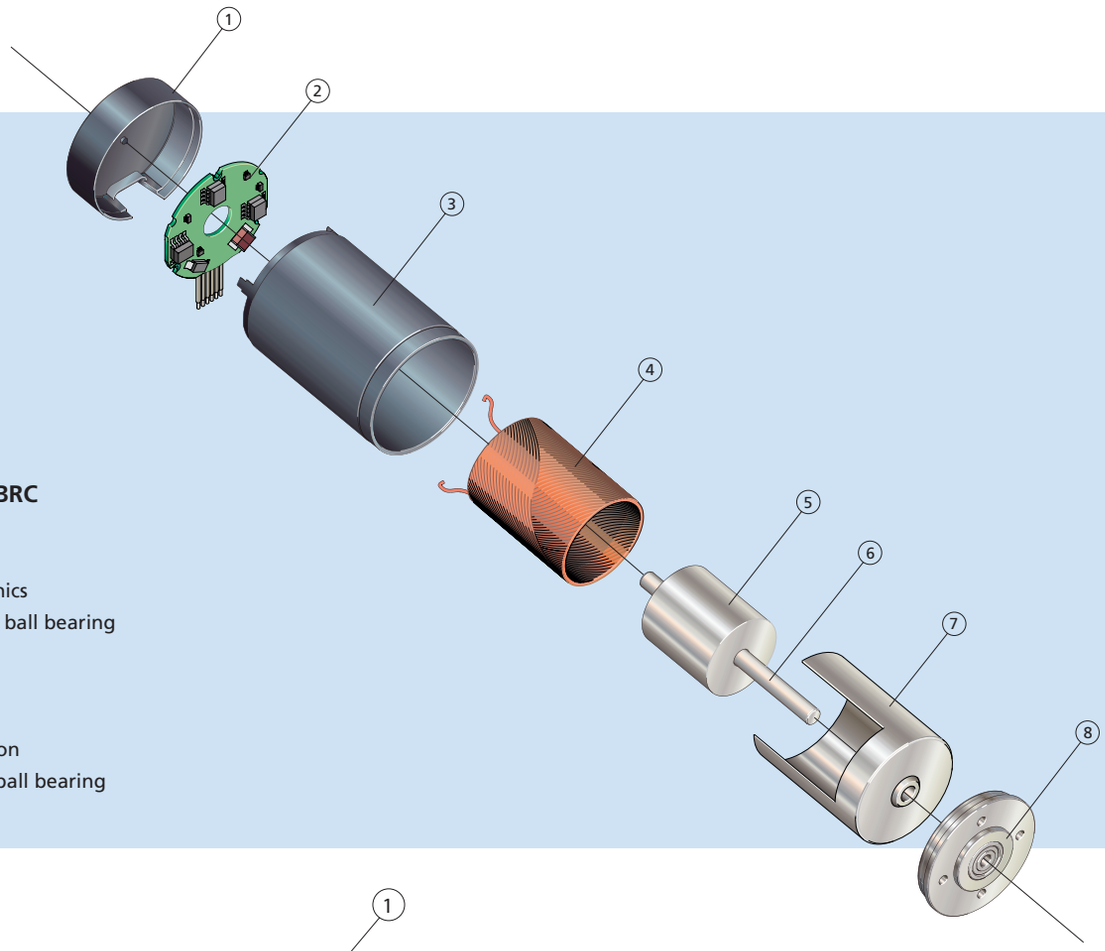
Note

Easy commissioning with the new Motion Manager 6.

Depending on the cooling factor, operating point and ambient temperature, it may be necessary to adjust the current limitation parameters using the operating software. See technical manual for details.

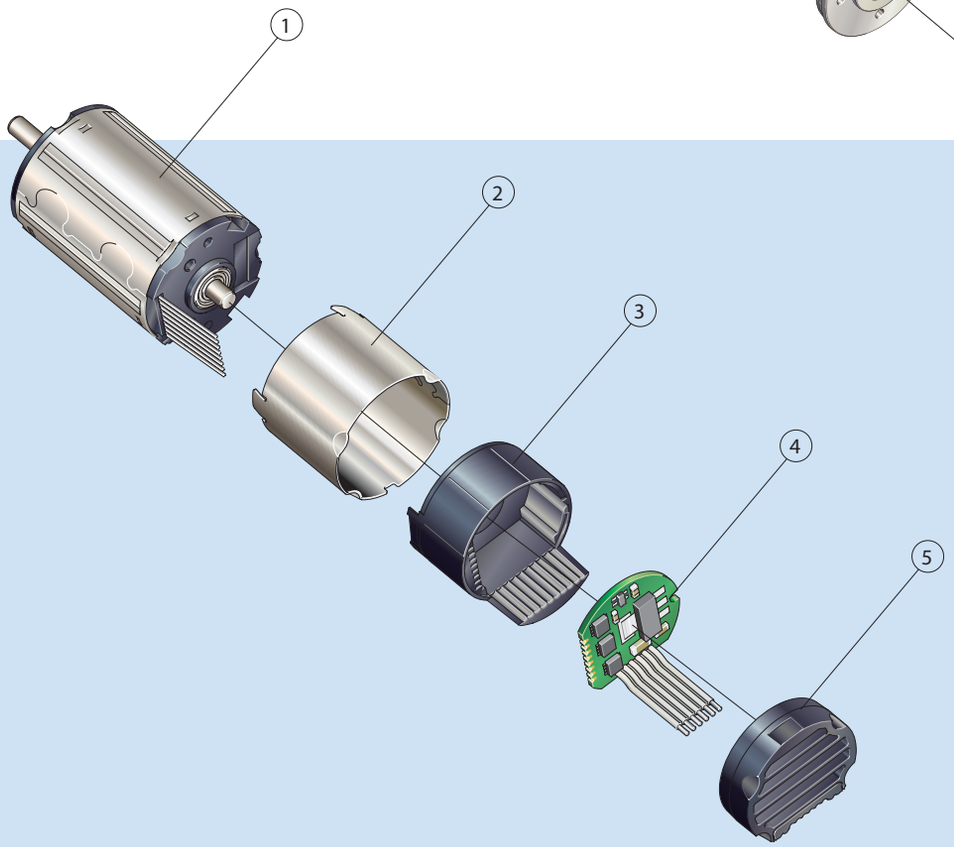
Speed Control Systems

Basic design



FAULHABER BRC

① Rear cover
② Drive Electronics
③ Housing with ball bearing
④ Winding
⑤ Magnet
⑥ Shaft
⑦ Rotor back-iron
⑧ Washer with ball bearing

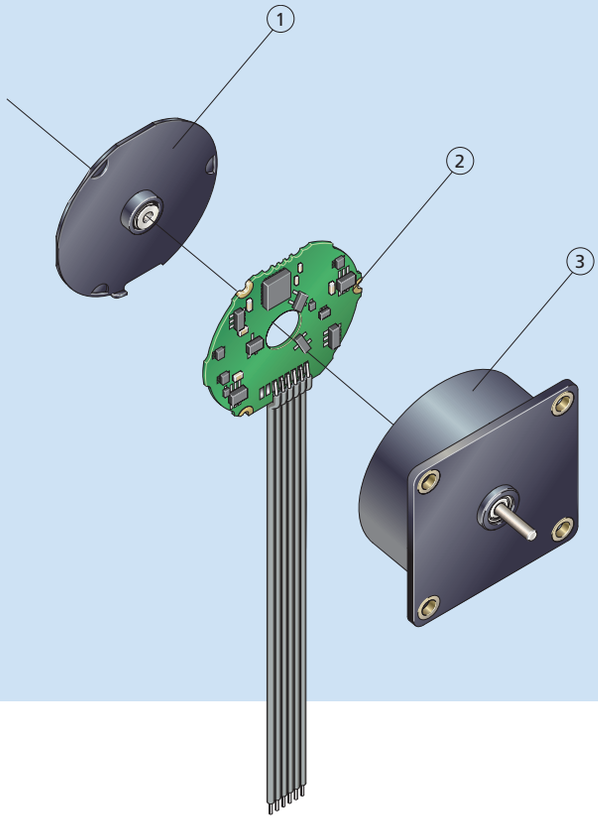


FAULHABER BX4 SC

① Motor
② Housing
③ Mounting flange
④ Electronics PCB
⑤ End cap

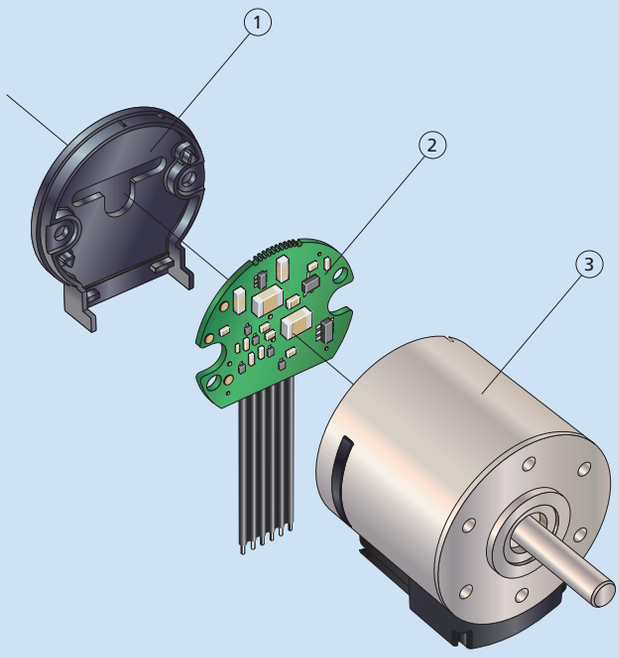
Speed Control Systems

Basic design



FAULHABER B-Flat SC

① End cap
② Electronics PCB
③ Motor (Front)



FAULHABER BXTH SC

① End cap
② Electronics PCB
③ Motor (Front)

Brushless DC-Motors with integrated Speed Controller

The efficient motor series with continuously smooth running impresses with an extraordinarily long service life. In optimised continuous operation, the motors of the BRC family convince with their high-performance bearings and cogging-free running in the linear speed and torque range. The brushless motors with integrated speed controller operate with precise speed control.

This allows the operating point and the operating behaviour to be precisely controlled by means of corresponding software. Measuring 15 to 31 mm in diameter, these motors are suitable for installation in extremely confined spaces and – thanks to their robust design – also for applications with high loads. The motors can be operated reversibly in a clockwise or anti-clockwise direction, depending on the required control mode. The frequency output of these motors enables precise reproduction and determination of the speed of the motor.

Series

1525 … BRC	1935 … BRC
3153 … BRC	

Key Features

Motor diameter	15 ... 31 mm
Motor length	25 ... 53 mm
Nominal voltage	6 ... 24 V
Speed	up to 25.000 min^{-1}
Torque	up to 5,9 mNm
Continuous output	up to 17,5 W

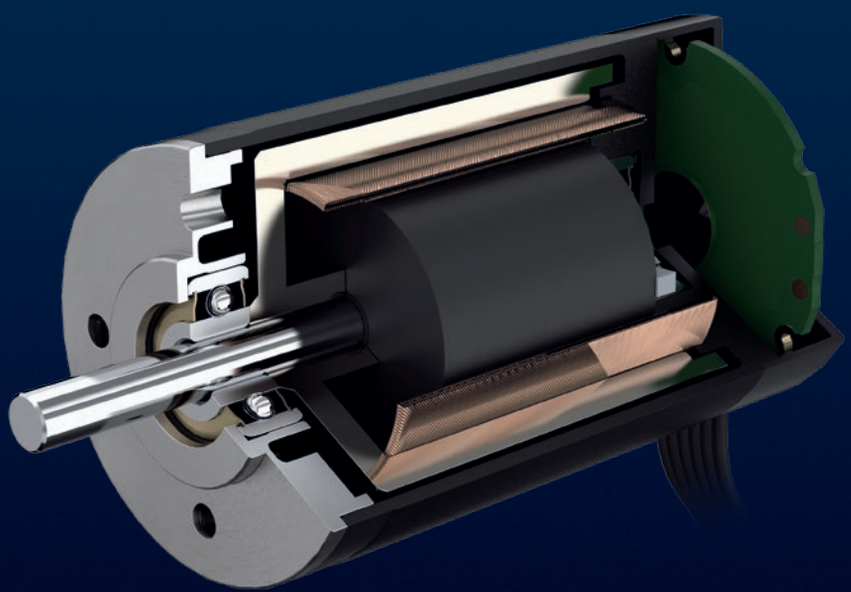
Product Code

31	Motor diameter [mm]
53	Motor length [mm]
K	Shaft type
012	Nominal voltage [V]
BRC	Product family

FAULHABER BRC

Advantages of this series at a glance

- Programmable motor characteristics through integrated speed controller
- Outstanding reliability, long service life
- Dynamically balanced rotor, quiet running
- No cogging
- Wide, more linear speed/torque range
- Smooth running



Brushless DC-Servomotors with integrated Speed Controller

The drives with integrated speed controller combine the advantages of brushless DC-Servomotors with diameter-compliant control electronics installed in the mounted motor unit measuring just 18mm in length.

Combinable with various precision gearheads, they can be used in a wide variety of market sectors such as laboratory technology, equipment manufacturing, automation technology or machine construction. The default factory preconfiguration in combination with the Motion Manager allows quick and easy commissioning of the system.

The selectable Hall sensor type (digital/analogue) ensures optimum coverage over a wide speed range. The integrated current limitation matched to the respective type protects the motor against overloading and therefore against potential destruction. The two-wire version SCDC allows brushed DC-Motors to be replaced easily in certain applications.

Series

2232 … BX4 SC	2250 … BX4 SC
3242 … BX4 SC	3242 … BX4 SCDC
3268 … BX4 SC	3268 … BX4 SCDC

Key Features

Motor diameter	22 ... 32 mm
Motor length	49,6 ... 85,4 mm
Nominal voltage	12 ... 24 V
Speed	up to 14.000 min^{-1}
Torque	up to 99 mNm
Continuous output	up to 53 W

2232 S 024 BX4 SC

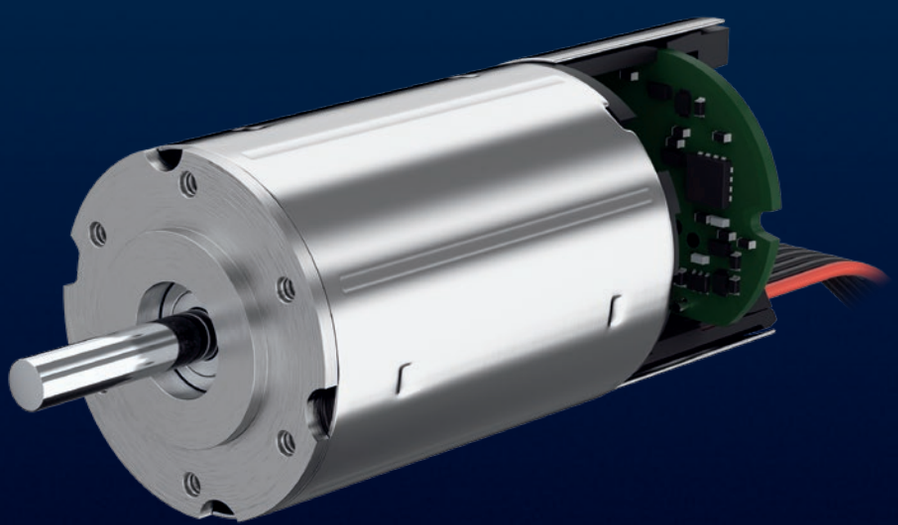
Product Code

22	Motor diameter [mm]
32	Motor length [mm]
S	Shaft type
024	Nominal voltage [V]
BX4	Product family
SC	Integrated Speed Controller

FAULHABER BX4 SC

Advantages of this series at a glance

- High torque and speed rigidity thanks to 4-pole technology
- Speed control in tight installation spaces; thanks to optional analogue Hall sensors, also available in the low speed range from 50 min^{-1}
- Modular, diameter-compliant mounting concept with integrated current limitation
- Simple and convenient programming using the Motion Manager and programming adapter
- High reliability and long service life
- Dynamically balanced rotor, quiet running



Brushless DC-Flat Motors and DC-Gearmotors with integrated Speed Controller

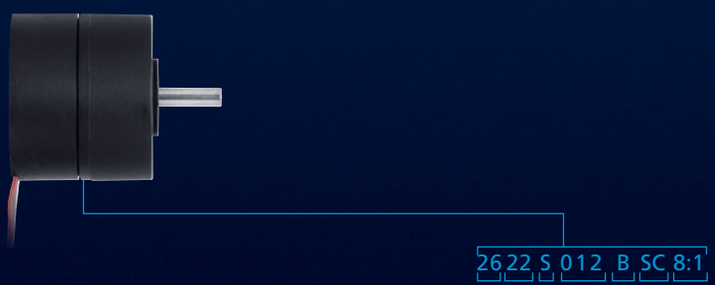
The brushless DC-Servomotors with integrated electronics are based on the motors of the B-Flat series. In the case of the B-Flat series, the four-pole brushless DC-Servomotors with their uniquely flat coil technology with three flat, self-supporting copper windings form the basis for drive systems in applications where installation space is extremely limited. As an integrated electronic actuation unit, a speed controller is already available for these motors. What makes this speed controller so special is that it is fully integrated on the motor circuit board and does not increase the length of the motor in any way. In combination with the extremely flat, integrated gearheads, these motors provide an extremely compact drive system with increased output torque.

Series

2610 … B SC	2622 … B SC

Key Features

Motor diameter	26 mm
Motor length	10,4 ... 22 mm
Nominal voltage	6 ... 12 V
Speed	up to 13.000 min^{-1}
Torque	up to 100 mNm
Continuous output	up to 1,6 W



Product Code

26	Motor diameter [mm]
22	Motor length [mm]
S	Shaft type
012	Nominal voltage [V]
B	Product family
SC	Integrated Speed Controller
8:1	Gearhead reduction

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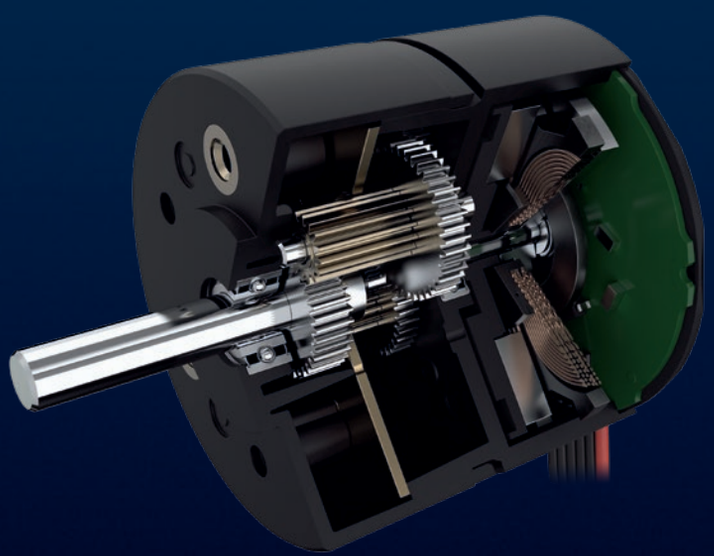
FAULHABER B-Flat SC

Advantages of this series at a glance

- Extremely flat design. Lengths ranging from 10 mm to 22 mm with speed controller already integrated
- 4-pole design
- Easy to use
- Integrated spur gearheads of minimal length with high gear ratio are available
- Precise speed control



Brushless DC-Servomotors with integrated Speed Controller

The drives with integrated speed controller combine the advantages of brushless DC-servomotors with diameter-compliant control electronics which, fully integrated, extend the motor by only 6.2 mm.

Combinable with various precision gearheads, they can be used in a wide variety of market sectors such as pumps, handheld devices, equipment manufacturing or laboratory and industrial automation. The default factory preconfiguration in combination with the Motion Manager allows quick and easy commissioning of the system.

The high number of poles of the motors ensures optimum coverage of a wide speed range, also with digital Hall sensors. The integrated current limitation matched to the respective type protects the motor against overloading and therefore against potential destruction. The combination of the BXT H motors with the integrated Speed Controller is the ideal solution if speeds need to be controlled precisely in the smallest of spaces and high torques are also required.

Series

2214 … BXT H SC	3216 … BXT H SC
4221 … BXT H SC	

Key Features

Motor diameter	22 / 32 / 42 mm
Motor length	21 / 23 / 28 mm
Nominal voltage	12 ... 24 V
Speed	up to 10.000 min^{-1}
Continuous torque	up to 92 mNm
Continuous output	up to 60 W

Product Code

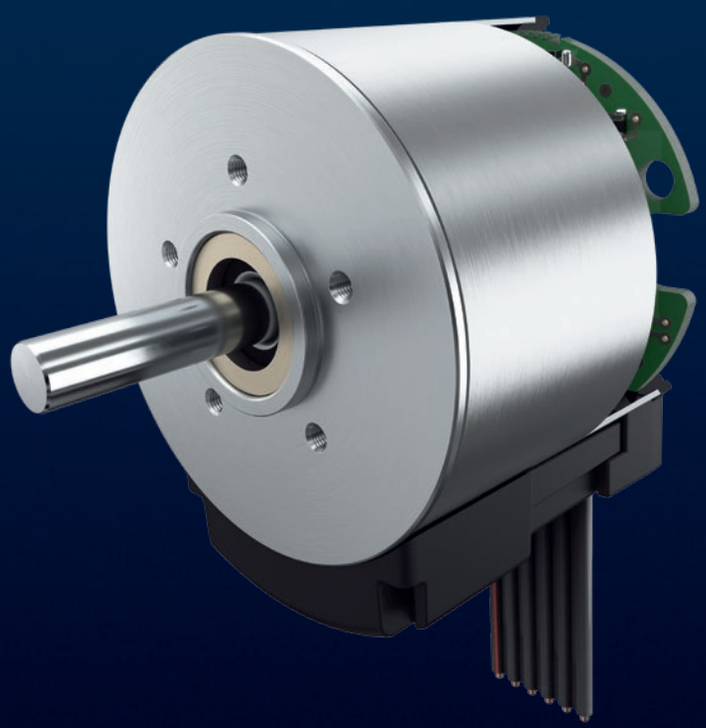
22	Motor diameter [mm]
14	Motor length [mm]
S	Output type
024	Nominal voltage [V]
BXTH	Product family
SC	Integrated Speed Controller

WE CREATE MOTION

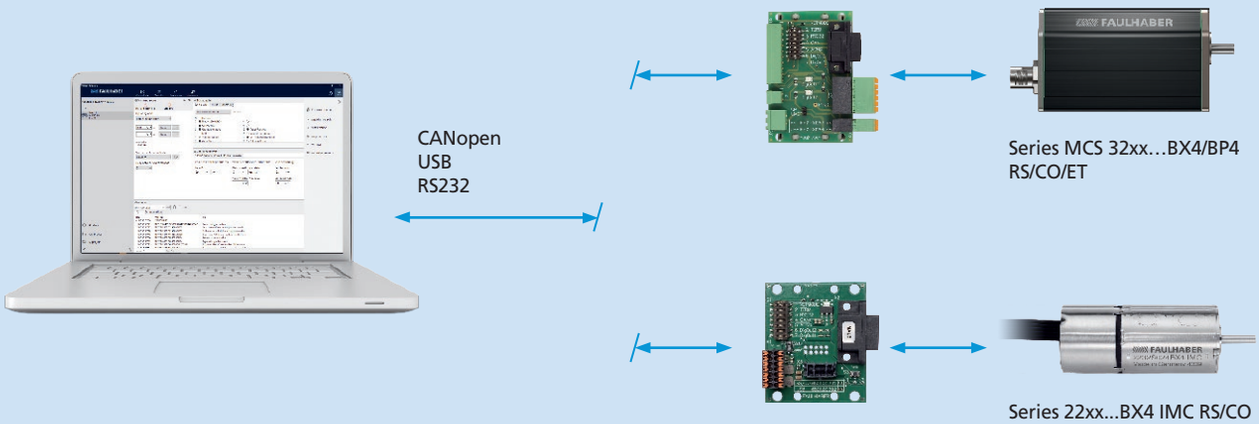
FAULHABER BXT SC

Advantages of this series at a glance

- High torque and speed rigidity thanks to 14-pole technology
- Speed control in tight installation spaces; thanks to the high number of poles of the motors, also available in the low speed range from 200 rpm
- Modular, diameter-compliant mounting concept with integrated current limitation
- Simple and convenient programming using the Motion Manager and programming adapter
- High reliability and long service life
- Second shaft end available in sizes 32 and 42 mm



Connection variants



General Information

System description

The drive systems integrate a brushless DC servomotor, a high-resolution encoder and a Motion Controller in a compact, complete drive unit.

Due to the fact that motor commutation is achieved electronically and not mechanically, the lifetime of a FAULHABER Motion Control System depends mainly on the lifetime of the motor bearings.

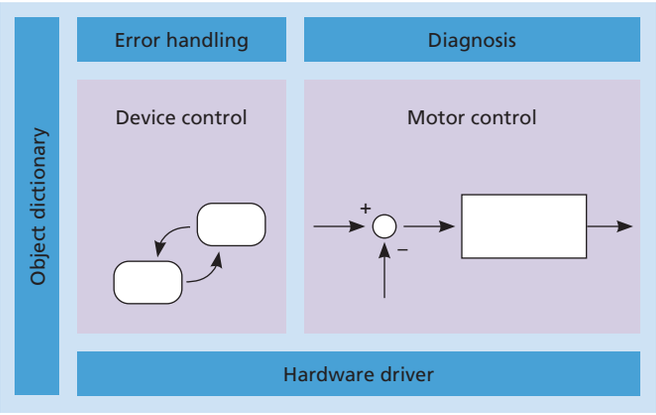
FAULHABER uses high-precision, preloaded ball bearings in all of its systems with integrated Motion Controller. Factors affecting the life of the motor bearings include the static and dynamic axial and radial bearing loads, the ambient thermal conditions, the speed, vibrational and shock loads, and the precision of the shaft coupling to the given application.

For highly dynamic servo applications requiring very high torque in the most compact dimensions, the integrated 4-pole DC-Servomotors, FAULHABER BX4 / BP4 series are ideal. Their robust design with very few parts and no glued components means that they are extremely durable and well suited for harsh ambient conditions such as extreme temperatures and high vibration and shock loads.

Modifications and accessories

FAULHABER specialises in the adaptation of its standard products for customer-specific applications. The following standard options and accessory parts are available for FAULHABER Motion Control Systems:

- Configurable shaft lengths
- Modified shaft dimensions and pinion configurations such as flats, gears, pulleys and eccenters
- Modifications for applications with higher speeds and/or higher loads
- Connection and configuration adapter
- Customized special configuration and firmware



Operating modes

Motor control
Current, speed and position of the drive can be controlled via the controller cascade. By means of the optional pilot paths, even the fastest movements can be reliably controlled in a reproducible manner. Adjustable filters enable adaptation to a wide range of encoders and loads.

Motion profiles
Acceleration and brake ramp as well as the maximum speed can be preset in speed and positioning operation in the Profile Position Mode (PP) and Profile Velocity Mode (PV) operating modes.

Autonomous operation
Up to eight sequential programs written in BASIC can be stored and executed directly on the controller. One of these can be configured from the autostart application. Access protection can be activated.

Protection and diagnostic functions
FAULHABER Motion Control systems of generation V3.0 protect motors and electronics against overload by means of thermal models. The supply voltage is monitored and can also be used in regenerative operation. External devices are thereby protected against overvoltage during dynamic operation.

Profile Position Mode (PP) / Profile Velocity Mode (PV)
For applications in which only the target of the movement is specified for the controller. The acceleration and brake ramp as well as a possible maximum speed are taken into account via the integrated profile generator. Profile-based movements are, thus, suited for a combination with standard networks, such as RS232 or CANopen.

Cyclic Synchronous Position (CSP) / Cyclic Synchronous Velocity (CSV) / Cyclic Synchronous Torque (CST)
For applications in which a higher-level controller performs the path planning, even synchronised for multiple axes. The setpoints for position, speed and current are constantly updated. Typical update rates are in the range of a few milliseconds. Cyclic modes are, thus, primarily suited for combination with EtherCAT (for MCS 32xx...BX4/BP4). CANopen can also be used.

Analogue Position Control (APC) / Analogue Velocity Control (AVC) / Analogue Torque Control (ATC)
For applications in which the setpoints of the control are specified as an analogue value or, e.g., via a directly connected reference encoder. These operating modes are therefore particularly well suited for stand-alone operation without higher-level master.

Voltage controller (voltage mode)
In the voltage controller, only a current limiting controller is used. All control loops are closed by a higher-level system. The setpoint can be set via the communication system or via an analogue input.

Interfaces

Discrete I/O for MCS 32xx...BX4/BP4
Three digital inputs for connecting limit and reference switches or for connecting a reference encoder. The logic levels are switchable.

Two analogue inputs (±10V) are available that can be freely used as setpoint or actual value.

Two digital outputs are available that can be freely used as error output, for direct actuation of a holding brake or as flexible diagnosis output.

Shared I/O for 22xx...BX4 IMC
Due to compactness, IMC has shared I/O.

Three digital inputs are selectable for connecting limit and reference switches or for connecting a reference encoder. The logic levels are switchable.

Two analogue inputs (0-10V) are selectable that can be freely used as setpoint or actual value.

Two digital outputs are selectable that can be freely used as error output, for direct actuation of a holding brake or as flexible diagnosis output.

Options

Motion Controllers (MCS 32xx...BX4/BP4) can optionally be equipped with an EtherCAT interface.

For highly dynamic applications, the use of a braking chopper can help to dissipate recovered energy.

Networking

RS – systems with RS232 interface
Ideal for device construction and for all applications in which the Motion Controller is to be operated on an embedded controller. Using Net mode, it is also possible to operate multiple RS controllers on an RS232 interface. The transmission rate can lie between 9600 baud and 115 kbaud.

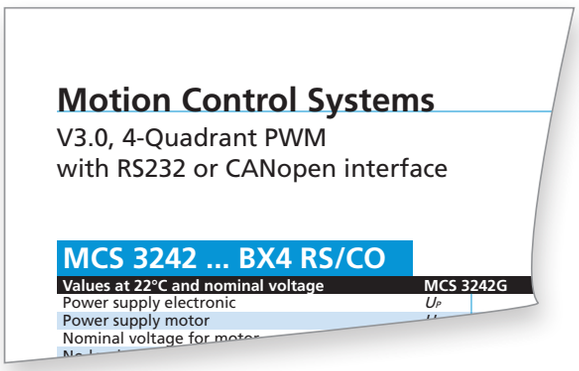
CO – CANopen acc. to CiA 402
The ideal variant for the operation of a FAULHABER Motion Controller on a PLC – directly via the CANopen interface or via a gateway on, e.g., Profibus/ProfiNET or on EtherCAT. Dynamic PDO mapping as well as node guarding or heartbeat are supported. Refresh rates for setpoint and actual values are typically from 10 ms here.

ET – EtherCAT
Motion Controllers (MCS 32xx...BX4/BP4) with direct EtherCAT interface. The controllers are addressed via CoE via the CiA 402 servo drive profile. Ideal in combination with a high-performance industrial controller that also performs path planning and interpolation of the movement for multiple axes. Refresh rates for setpoint and actual values from 0.5 ms are supported.

All described operating modes and functions are available independent of the used communication interface.

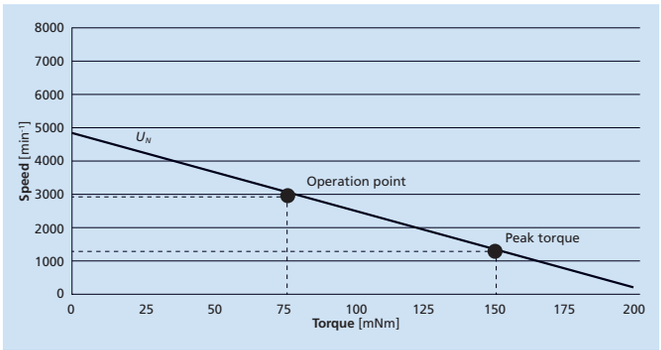
Note

Device manuals for installation and commissioning, communication and function manuals as well as the “FAULHABER Motion Manager” software are available on request or on the Internet under www.faulhaber.com.


Motion Control Systems
V3.0, 4-Quadrant PWM
with RS232 or CANopen interface

MCS 3242 ... BX4 RS/CO

Values at 22°C and nominal voltage	MCS 3242G
Power supply electronic	U_P
Power supply motor	
Nominal voltage for motor	



Example: MCS 3242...BX4

Explanatory Notes for Data Sheets

The following data sheet values of the Motion Control Systems are measured or calculated at nominal voltage and at an ambient temperature of 22°C.

Motion Control Systems generally feature separate supply inputs for motor and electronics with the same ground connection; if necessary, these inputs can also be used as a common supply.

Power supply for electronics U_P [V DC]
Describes the range of the permissible supply voltage for the integrated control electronics.

Power supply for motor U_{mot} [V DC]
Describes the range of the permissible supply voltage for the base motor integrated in the complete system.

Nominal voltage U_N [V]
The voltage applied between two winding phases by means of block commutation. This is the voltage at which the data sheet parameters are measured or calculated. Depending on the required speed, a higher or lower voltage can be applied within the permissible range of the supply voltage.

No-load speed n_0 [min^{-1}]
Describes the motor speed when idling and in the steady-state condition at nominal voltage and sinus commutation.

Peak torque $M_{max.}$ [mNm]
Specifies the torque that the drive can reach in S2 operation (cold start without additional cooling) at nominal voltage and nominal conditions under constant load for the time specified in the data sheet without exceeding the thermal limit. Unless otherwise defined, the value that applies for the peak torque is twice the continuous torque.

Torque constant k_m [mNm/A]
Constant that describes the ratio between motor torque and current input.

PWM switching frequency f_{PWM} [kHz]
Pulse width modulation describes the change of the electrical voltage between two values. The motors integrated in the MCS have a low electrical time constant. To keep the losses associated with PWM low, a high switching frequency is necessary.

Electronics efficiency η [%]
Ratio between consumed and delivered power of the control electronics.

Standby current for the electronics I_{el} [A]
Describes the additional current consumption of the complete system that can be attributed to the integrated electronics.

Shaft bearings
The bearings used for the brushless DC motors.

Shaft load, max. permissible [N]
Max. permissible shaft load of the output shaft with specified shaft diameter. The values for load and lifetime of motors with ball bearings are based on manufacturer specifications. This value is not applicable for a possibly available rear or second shaft end.

Shaft play [mm]
Play between the shaft and bearing including the additional bearing clearance for ball bearings.

Operating temperature range [°C]
Shows the minimum and maximum operating temperature of the complete system under nominal conditions.

Speed range [min^{-1}]
Describes the maximum no-load speed for continuous operation in the steady-state condition at elevated nominal voltage (30 V). Depending on the required speed, higher or lower voltage can be applied within the given system limits.

Mounting of the system on a plastic flange according to assembly method IM B 5.

Housing material
Housing materials and, if necessary, surface treatment.

Protection classification
For MCS 32xx...BX4/BP4, defines the level of protection of the housing against contact, foreign bodies and water. The codes that follow designation IP indicate the level of protection a housing offers against contact or foreign bodies (first digit) and humidity or water (second digit).

Maintenance measures are to be performed in defined time intervals due to additional protective measures such as shaft seals > see device manual for details.

Mass [g]
The typical mass of the standard system may vary within the individual interface variants due to the different component variants.

Length dimensions without mechanical tolerance specifications:
Tolerances according to ISO 2768:

≤	6	= ± 0.1 mm
≤	30	= ± 0.2 mm
≤	120	= ± 0.3 mm

The tolerances of non-specified values are available on request.

All mechanical dimensions of the motor shaft are measured with an axial shaft load in the direction of the motor.

Rated Values for Continuous Operation

The following values are measured at nominal voltage, an ambient temperature of 22°C and with assembly method IM B 5.

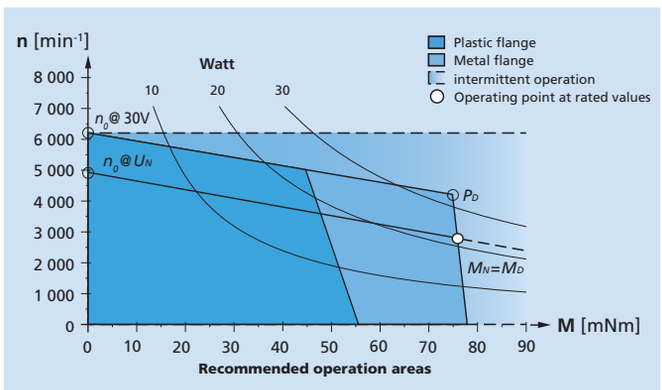
Assembly method IM B 5 defines the flange mounting of the drive without mounting feet with two bearing plates, free front shaft end and mounting flange close to the bearing.

Rated torque M_N [mNm]
Maximum continuous torque (S1 mode) at nominal voltage at which in the steady-state condition the temperature does not exceed the maximum permissible winding temperature and/or the operating temperature range of the motor. The motor is fastened to a metal flange here, which approximates the amount of cooling available from a typical mounting configuration of the motor. This value can be exceeded if the motor is operated intermittently, for example, in S2 mode and/or if more cooling is applied.

Rated current I_N [A]
Typical maximum continuous current in the steady-state condition which results from the rated torque in continuous operation. This value can be exceeded if the drive is operated intermittently, in start/stop mode, in the starting phase and/or if more cooling is used.

Rated speed n_N [min^{-1}]
Typical rated speed in the steady-state condition which is determined from the given rated torque.

This value takes into account the effects that motor losses have on the slope of the n/M characteristic curve.



Example: Performance diagram for rated values with continuous operation.

Explanations on the Performance Diagram

The possible speed ranges are shown in dependence on the shaft torque. The performance diagram shows the possible operating points of the servo-drives.

Operating points in the dark blue area are reached continually in the case of pure flange mounting (IM B5) on a plastic flange (approx. 100mm x 100mm x 10mm) and at an ambient temperature of 22 °C.

Operating points in the light blue area up to PD are reached continually in the case of pure flange mounting (IM B5) on an aluminium flange (approx. 100mm x 100mm x 10mm) and at an ambient temperature of 22 °C.

The maximum achievable speed depends on the motor supply voltage. At nominal voltage, the maximum achievable operating points are those on the nominal voltage line through the no-load point and nominal point.

Speeds above the nominal voltage line are reached at an increased supply voltage. In this case, the maximum voltage for the electronics or motor supply must never be exceeded.

The sector shown dashed describes possible operating points in which the drive can be engaged in intermittent operation or with increased cooling.

Continuous torque M_D [mNm]
Describes the max. recommended continuous torque in the steady-state condition at nominal voltage and mounting on an aluminium flange. With Motion Control Systems, the continuous torque simultaneously corresponds to the rated torque.

Here, the speed is linear to the continuous torque. The continuous torque is independent of the continuous output power and can be exceeded if the motor is operated intermittently, for example, in S2 operation and/or if more cooling is applied.

Continuous output P_D [W]
Describes the max. possible output power in continuous operation in steady-state condition with mounting on an aluminium flange. The value is independent of the continuous torque, responds linearly to the cooling factor and can be exceeded if the motor is operated intermittently, for example, in S2 operation and/or if more cooling is applied.

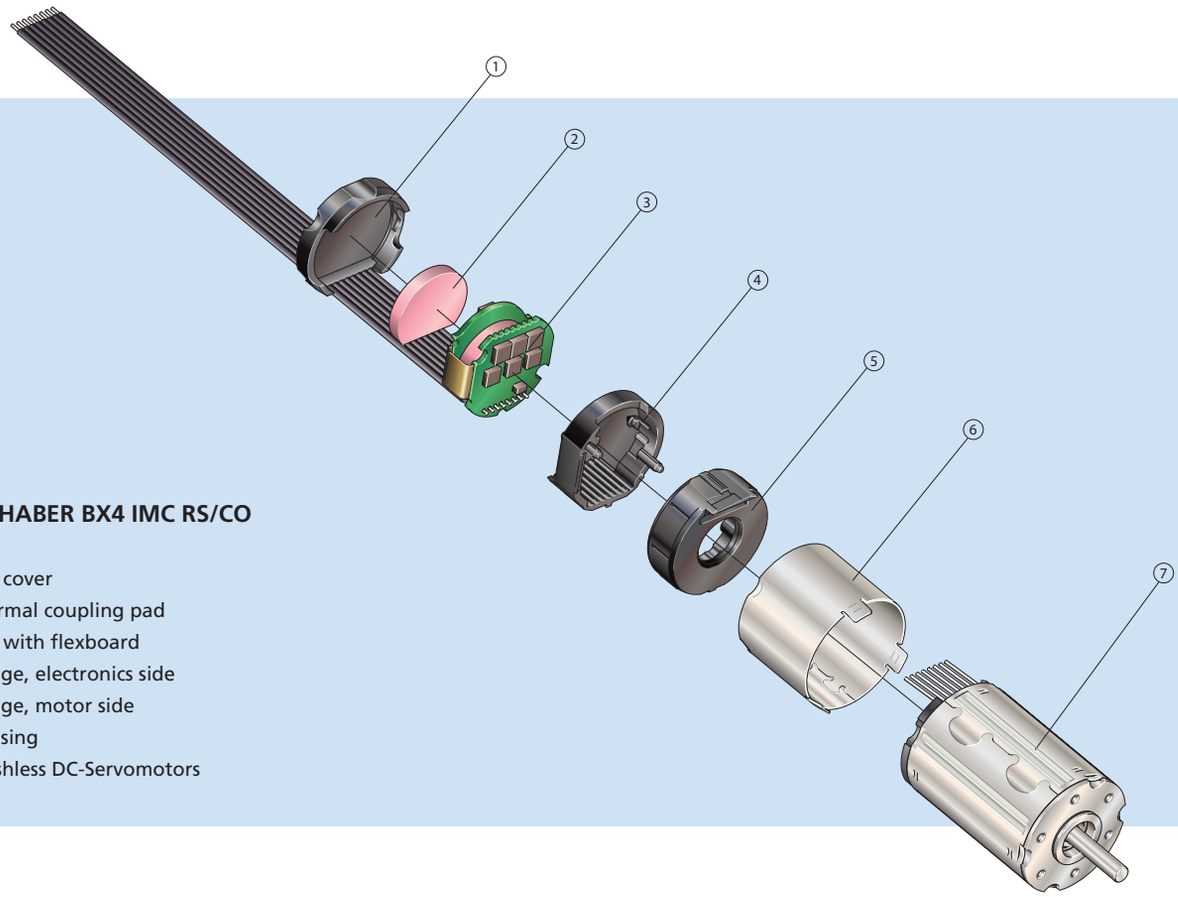
Nominal voltage curve U_N [V]
The nominal voltage curve describes the possible continuous operating points at U_N. In steady state, the starting point corresponds to the no-load speed n_0 of the drive. Operating points above this curve can be attained by an increase, operating points below by a reduction of the nominal voltage.

Easy commissioning with the new Motion Manager 7.

Depending on the cooling factor, operating point and ambient temperature, it may be necessary to adjust the current limitation parameters using the operating software. See technical manual for details.

Motion Control Systems V3.0

Basic design



FAULHABER BX4 IMC RS/CO

① End cover
② Thermal coupling pad
③ PCB with flexboard
④ Flange, electronics side
⑤ Flange, motor side
⑥ Housing
⑦ Brushless DC-Servomotors

Notes

Brushless DC-Servomotor with integrated Motion Controller

The motion control systems of the most recent generation V3.0 are available in three performance classes with a continuous torque of 76 to 160 mNm. The drives comprise a brushless DC-Servomotor, a high-resolution actual value encoder and a Motion Controller in a complete, compact drive unit. The large number of different communication interfaces, the highly dynamic controllability, the robust design with protection class IP 54 as well as the industry standard connection concept via M12 connectors enable use in industrial environments ranging from automation technology and industrial special machinery construction to robotics and aerospace.

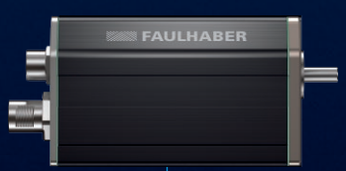
In combination with precision gearheads screw systems, this results in complete system solutions for a wide variety of different applications. The systems can be used with any of the interface variants, both as stand-alone axes or in slave mode at various master controls. Furthermore, flexible usage possibilities are supported by various libraries and application notes that are available for download on the home page. All features of the drives are available here without restriction via all of the standard interfaces.

Series

MCS3242 ... BX4 RS/CO	MCS3242 ... BX4 ET
MCS3268 ... BX4 RS/CO	MCS3268 ... BX4 ET
MCS3274 ... BP4 RS/CO	MCS3274 ... BP4 ET

Key Features

Motor diameter	▯ 42 x 50 mm
Motor length	75 ... 100 mm
Nominal voltage	24 V
Speed	up to 11.600 min^{-1}
Torque	up to 160 mNm
Continuous output	up to 140 W



MCS 32 42 G 024 BX4 ET

Product Code

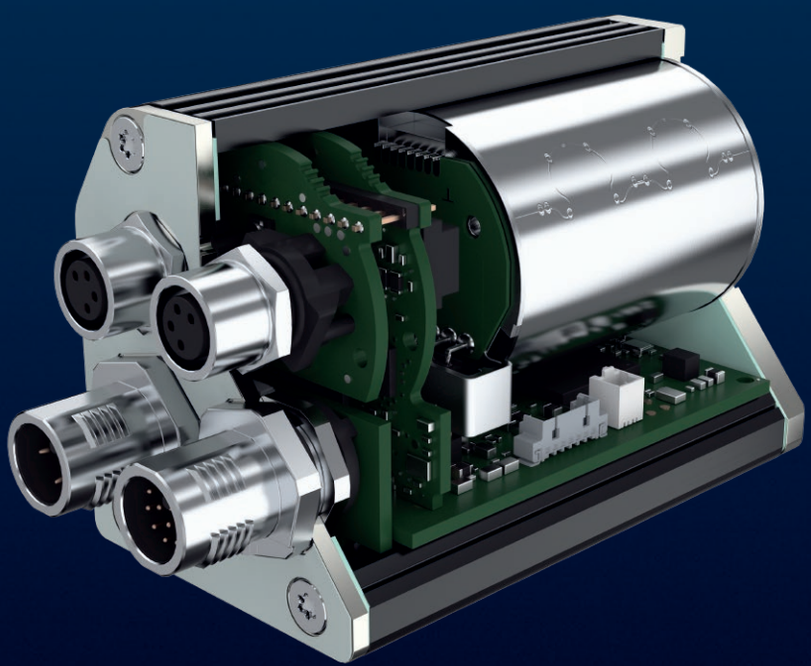
MCS	Motion Control System
3242	Motor series
G	Shaft type
024	Nominal voltage [V]
BX4	Product family
ET	EtherCAT interface

WE CREATE MOTION

FAULHABER MCS

Advantages of this series at a glance

- Maximum torque in compact installation space
- Interfaces: RS232, CANopen, EtherCAT, configuration via USB
- Optionally available with protection class IP 54
- Simple and convenient programming using the Motion Manager and programming adapter
- Standardised plug and connection cable concept
- Can be universally used in slave or stand-alone operation
- Extensive protective and diagnostic functions, local status LEDs
- Perfectly scalable thanks to various sizes



Brushless DC-Servomotor with integrated Motion Controller

The highly dynamic positioning systems are available in motor diameter 22 mm with integrated, diameter-compliant Motion Controllers. The different versions with their high torque, outstanding volume/performance ratio as well as highly dynamic control characteristics are suitable for a wide variety of market sectors, e.g. medical and laboratory technology, automation technology, robotics or special machinery construction. Integrated current control limits the torque of the drive if necessary, reliably protecting the drive against overload.

The interface (RS232 or CANopen) allows simple connection to networks. The integration of motor and control electronics in a single unit minimises both space and wiring requirements, thereby simplifying installation and commissioning. The control electronics are already perfectly matched to the motor when the unit leaves the factory. Programming is simple and convenient using the Motion Manager.

Series

2232 … BX4 IMC RS/CO

2250 … BX4 IMC RS/CO

Key Features

Motor diameter	Ø 22
Motor length	50 ... 68 mm
Nominal voltage	12 ... 24 V
Speed	up to 13.000 min^{-1}
Torque	up to 27 mNm
Continuous output	up to 15 W

Product Code

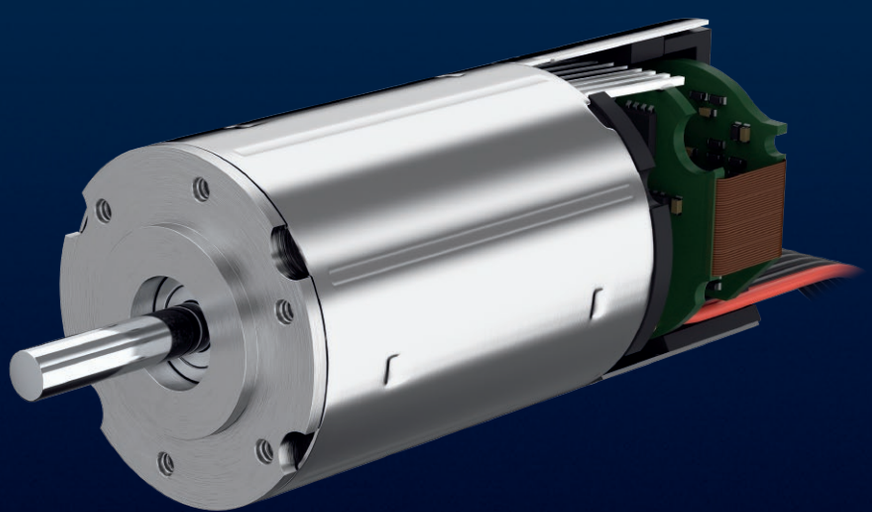
22	Motor diameter [mm]
50	Motor length [mm]
S	Shaft type
024	Nominal voltage [V]
BX4	Product family
IMC	Integrated motion control
RS	RS232 interface

WE CREATE MOTION

FAULHABER BX4 IMC

Advantages of this series at a glance

- Wide speed range from 1 to 13,000 min^{-1}
- RS232 or CANopen interface, adapter for connection to USB interface
- Compact mounting concept with integrated current limitation
- Simple and convenient programming using the Motion Manager and programming adapter
- Minimal wiring requirements
- Low EMC emission with CE labeling
- Diameter conform design



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