

FAULHABER Motion Control

NEW

Feel the Power

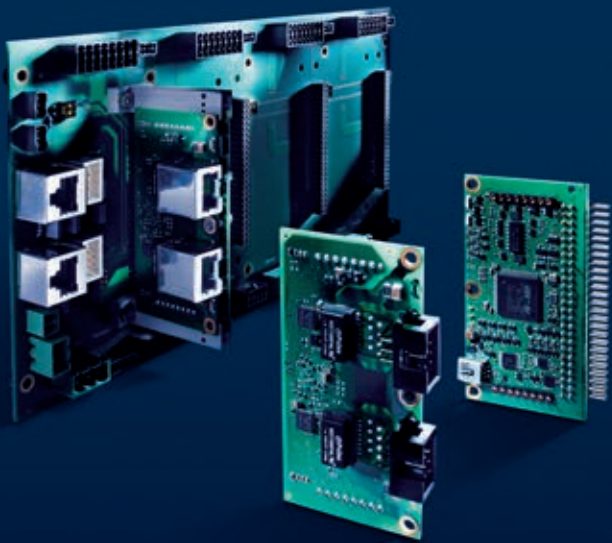


A new generation

Drive technology plays an important role within the context of networked industry, after all, automation is not possible without a “driving force”. The new approach has far reaching consequences particularly for control technology: decentralised intelligence, capacity for real-time communication with higher level process control technology, maximum compatibility regarding the drive technology used as well as maximum flexibility and scalability with the application areas are the primary requirements of today. FAULHABER has taken appropriate action and developed a new generation of motion controllers which leaves nothing to be desired in this respect.



MC 5005 and MC 5010 versions with housing



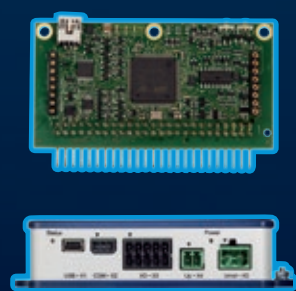
MC 5004 version plug-in card with optionally available MB4 motherboard as development environment



Integrated version as Motion Control System



FAULHABER Motion Control



Motion Controllers

MC 5004
MC 5005
MC 5010



Incremental encoder

Absolute encoder
Hall sensors
(analogue/digital)



DC-Motors

Brushless DC-Motors
Linear
DC-Servomotors



Planetary gearheads

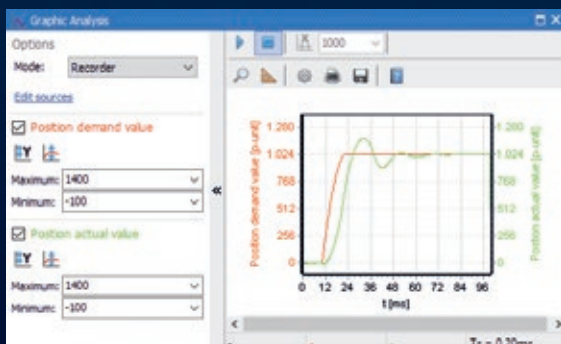
Spur gearheads
Ball screws

WE CREATE MOTION

Feel the Power

Decentralised intelligence promotes maximum performance

Not limited to, but perfectly optimised for the FAULHABER drive program, you extract the maximum from any FAULHABER drive with the MC 5004, MC 5005 and MC 5010 version positioning controllers – whether DC-Micromotors, Brushless or Linear DC-Servomotors.



Motion Manager 6 – Graphical analysis tools for drive behaviours and controller setting

Advantages of this series at a glance

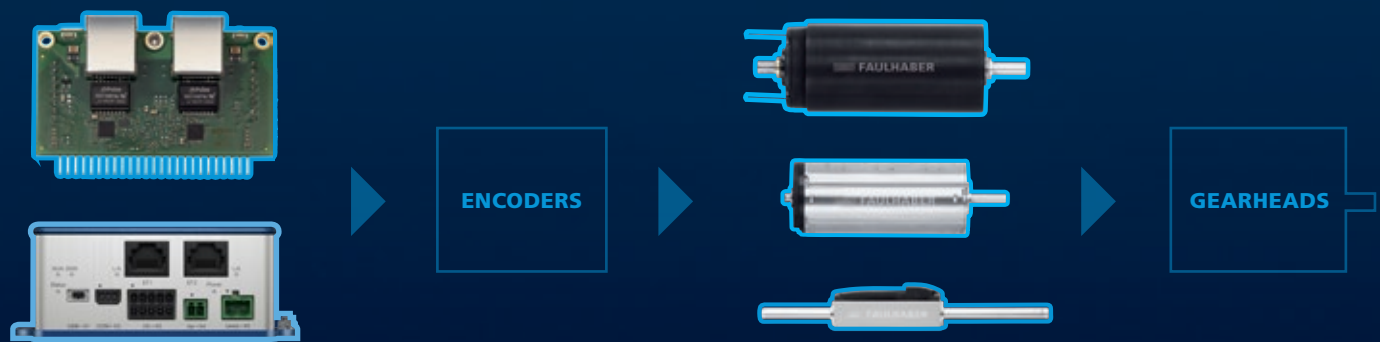
- Modular design with 3 performance classes
- New connection concept with plugs
- Interface variants RS232, CANopen, USB
- Can be used in slave or stand-alone operation
- High performance, peak current up to 30 A
- Extensive protective and diagnostic functions, status LEDs
- Expanded power supply range with separate electronics supply
- Improved current measurement
- Flexible motor control, fast control loops
- Many freely selectable operating modes
- Also suitable for DIN rail mounting

CANopen®

RS232 / USB



FAULHABER Motion Control



Motion Controllers

MC 5004
MC 5005
MC 5010

Incremental encoder

Absolute encoder
Hall sensors
(analogue/digital)

DC-Motors

Brushless DC-Motors
Linear
DC-Servomotors

Planetary gearheads

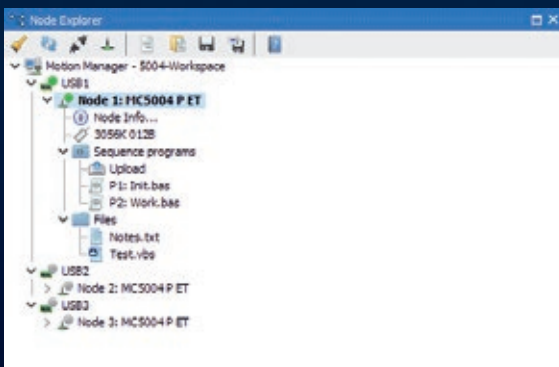
Spur gearheads
Ball screws

WE CREATE MOTION

Engineers, get ready to play

Well prepared for industrial networks

In addition to the variants enclosed in a housing, the Motion Controller is also available in a version as open plug-in card. In combination with an optionally available motherboard, you can easily control multiple axes in synch via the normal cyclic modes – CSP, CSV and CST – together with, e.g., a higher-level PLC.



Motion Manager 6 – Access to connected devices via Node-Explorer

Advantages of this series at a glance

- Modular design with 3 performance classes
- Available as plug-in card version
- Optional motherboard as development environment
- With EtherCAT interface for multi-axis applications
- Can be used in slave or stand-alone operation
- High performance, peak current to 30 A
- Extensive protective and diagnostic functions, status LEDs
- Expanded supply range with separate electronics supply
- Improved current measurement
- Flexible motor control, fast control loops
- Many inputs/outputs





FAULHABER Motion Control Systems



Motion Control Systems

MCS 3242 ... BX4
MCS 3268 ... BX4

Planetary gearheads

Ball screws

WE CREATE MOTION

It's not a trick. It's engineering.

Direct use in automation environment

It is hard to believe how much intelligent and high-performance drive technology we have conjured up in the compact FAULHABER Motion Control Systems. Their robust construction in accordance with IP 54 meets even demanding industrial requirements.



Motion Manager 6 – Start-up support wizards

Advantages of this series at a glance

- Maximum torque in compact dimensions
- Flexible modular system
- Can be mounted via either flange or base plate
- Standardised plug and connection cable concept
- 3 interface variants – RS232, CANopen, EtherCAT
- Can be used in slave or stand-alone operation
- Extensive protective and diagnostic functions, status LEDs
- Expanded power supply range with separate electronics supply
- Improved current measurement
- Flexible motor control, fast control loops
- Many freely selectable operating modes

CANopen® RS232 / USB

EtherCAT®

Motion Controller



Motion Controller

	Page
Technical Information	12 – 17
MC 5004	18 – 19
MC 5005	20 – 21
MC 5010	22 – 23

Motion Controller

Technical Information



Features

FAULHABER Motion Controllers of generation V3.0 are highly dynamic, optimally tuned positioning controllers for use in combination with DC-micromotors as well as BL and LM DC-servomotors from FAULHABER's line of motors. The motor type can be configured during commissioning using the FAULHABER Motion Manager from version 6.0.

In addition to use as a servo drive with controlled position, the speed or current can also be controlled. The actual values for speed and position can be ascertained here using a number of supported sensor systems. Limit switches and reference switches can be directly connected.

The control setpoints can be preset via the communication interface, via the analogue input or a PWM input or can come from internally stored sequential programs.

Supported as communication interfaces are – depending on the device – USB and RS232, CANopen and, optionally, EtherCAT. All functions of the drive are available here without limitation via all interfaces.

FAULHABER Motion Controllers of generation V3.0 are available in three sizes and three power classes:

- **MC 5004** – with a continuous current of up to 4 A, can be plugged directly into a motherboard and offers most I/Os
- **MC 5005** – with a continuous current of up to 5 A, is the ideal partner for most motors from the FAULHABER product portfolio
- **MC 5010** – with a continuous current of up to 10 A, is also suitable for applications with higher power requirements. Especially well suited for use in combination with the highly dynamic BL motors.

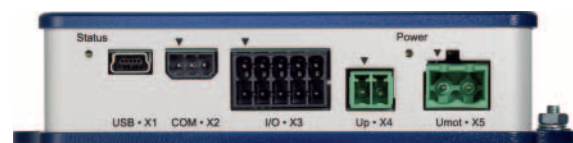
The possible applications are diverse: from laboratory automation to industrial equipment manufacturing, automation technology and robotics to aerospace.

The connection to the motors is established via pre-configured plugs or extension cables, which are available for all supported motors as options or as accessories.

Benefits

- One controller for all motor types and encoder types
- Very dynamic control
- Ideally matched to FAULHABER DC, BL and LM motors
- Various setpoint and actual value interfaces
- Stand-alone operation possible in all variants
- Connection via simple plug concept
- Fast feedback with status LEDs
- Commissioning with the free FAULHABER Motion Manager from version 6.0
- Extensive mounting accessories available

Product Code

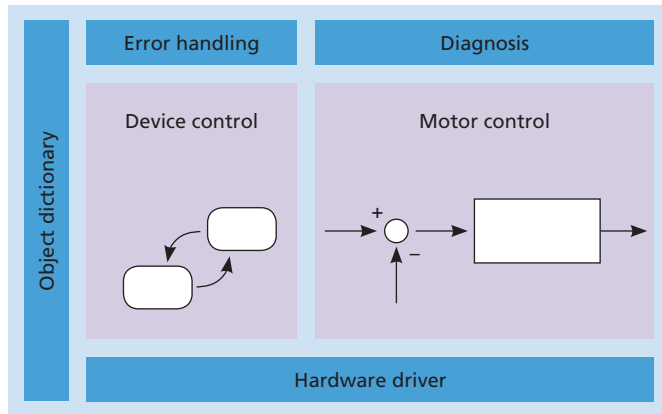


MC	Motion Controller
50	Max. supply voltage (50 V)
05	Max. continuous output current (5 A)
S	Housing with plug-in connections
RS	RS232 interface

MC_50_05_S_RS

Motion Controller

Technical Information



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 Controllers 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. 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 mode (VOLT)

In the voltage mode, 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

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

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

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

Interfaces – position encoder

FAULHABER Motion Controllers of generation V3.0 support all sensor systems typically used on micro motors for position and speed as well as analogue or digital Hall signals, incremental encoders with and without Line Driver or protocol-based AES or SSI encoders.

Options

All controllers can optionally be equipped with an EtherCAT interface.

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

Motion Controller

Technical Information

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 Controller 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.

Interfaces – Bus Connection

Configuration

All Motion Controllers of generation V3.0 are equipped with a USB interface. This is intended primarily as a configuration interface. Via a USB to RS232 or USB to CAN converter, the drives can alternatively likewise be configured without restriction.

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

The interfaces can also be used in parallel, thereby allowing a drive to be integrated in an industrial interface via the CANopen or EtherCAT interface, while diagnostics are evaluated with the trace function via the USB 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.

General Information

System description

The products of the MC 5004, MC 5005 and MC 5010 series are variants of the FAULHABER Motion Controllers with and without housing and control either DC, LM or BL motors. The Motion Controllers are configured here via the FAULHABER Motion Manager.

The drives can be operated in the network via the CANopen or EtherCAT fieldbus interface. In smaller setups, networking can also be performed via the RS232 interface.

The Motion Controller operates in the network in principle as a slave; master functionality for actuating other axes is not provided.

After basic commissioning via the Motion Manager, the controllers can alternatively also be operated without communication interface.

The controllers of the MC 5004 series can be plugged into a motherboard via the 50-pin connector strip. For this purpose, FAULHABER offers a motherboard for connecting up to four controllers.

The controllers of the MC 5005 and MC 5010 series are secured to a flat base plate via the mounting holes. With optional accessories, mounting is also possible on a DIN rail.

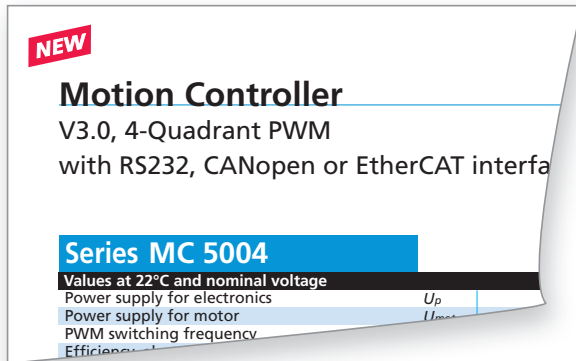
Modifications and accessories

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 Controller MC V3.0:

- Connection cables for the supply and motor side
- Adapter sets for encoders
- Connector sets
- Motherboard MC 5004
- Programming board
- Starter kits
- Customized special configuration and firmware

Motion Controller

Technical Information



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 Controllers of generation V3.0 generally feature – with the same ground connection – separate supply inputs for motor and electronics; if necessary, these inputs can also be used as a common supply.

Supply voltage for electronics U_p [V DC]

Describes the range of the permissible supply voltage for the integrated control electronics.

Supply voltage for motor U_{mot} [V DC]

Describes the range of the permissible supply voltage for the base motor integrated in the complete system.

PWM switching frequency f_{PWM} [kHz]

Pulse width modulation describes the change of the electrical voltage between two values. Bell-type armature motors have a low electrical time constant. To keep the losses associated with PWM low, a high switching frequency is necessary. In generation V3.0, this value is fixed at 100 kHz. Through the type of pulse pattern generation (centre aligned), the switching frequency effective at the motor is twice as high.

Electronics efficiency η [%]

Ratio between consumed and delivered power of the control electronics.

Max. continuous output current I_{dauer} [A]

Describes the current that the controller can continuously deliver to the connected motor at 22°C ambient temperature without additional cooling.

Max. peak output current I_{max} [A]

Describes the current that the controller can reach in S2 operation (cold start without additional cooling) at 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 current is equal to three times the continuous current.

Current consumption of the electronics I_{el} [A]

Describes the additional current consumption of the control electronics.

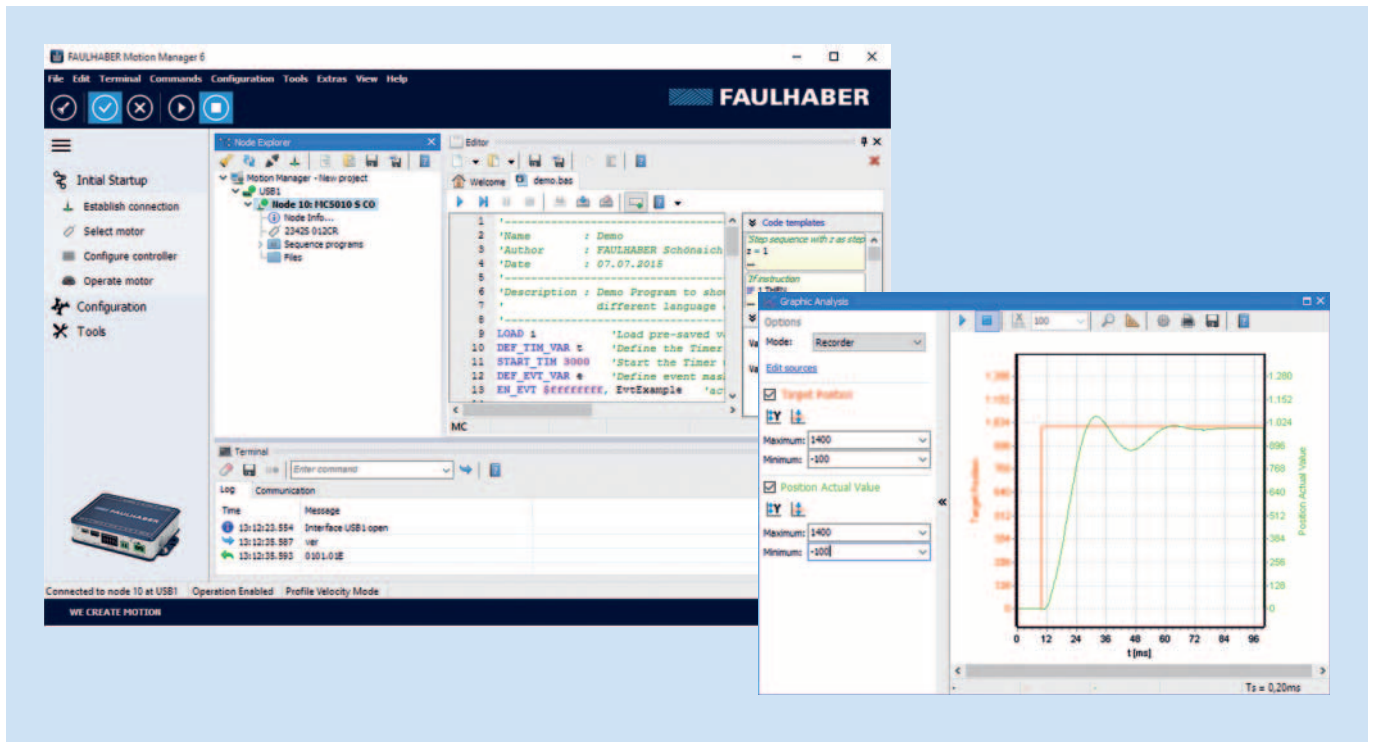
Operating temperature range [°C]

Shows the minimum and maximum operating temperature under nominal conditions.

Mass [g]

The typical mass of the standard controller may vary within the individual interface variants due to the different components.

Motion Controller Software



FAULHABER Motion Manager

The powerful 'FAULHABER Motion Manager' software is available for commissioning and configuring drive systems with motion and speed controllers.

Motion Manager generally supports interfaces RS232, USB and CANopen. Depending on the connected device, it may, however, be necessary to use an interface adapter, e.g., during the configuration of a Motion Control System via USB.

The graphical user interface makes uniform and intuitive procedures possible independent of the device family and interface used.

Supported Interfaces	Motion Controllers Motion Control Systems	Speed Controller Speed Control Systems
RS232	•	•
USB	•	•
CANopen	•	

The software is characterised by the following features:

- Start-up support wizards
- Access to connected devices via Node-Explorer
- Configuration of drive functions and controller parameters using convenient, coordinated dialogues for the respective device family
- Context-sensitive online help
- Only for Motion Controllers:
 - Graphical analysis tools for drive behaviours and controller setting
 - Macro function for execution of program sequences
 - Development environment for sequential programmes and Visual Basic Script programmes

New features in Motion Manager 6:

- Completely revised user interface with window docking function
- Node-Explorer with integrated project management
- Support for the MC V3.0 family Motion Controller
 - Controller configuration with route identification
 - Expanded graphical analysis options
 - Further tools for operation and controller tuning

Motion Controller

Software

“FAULHABER Motion Manager” for Microsoft Windows can be downloaded from www.faulhaber.com free of charge.

Commissioning and Configuration

FAULHABER Motion Manager can be used to easily access settings and parameters of the connected controller.

Wizards assist during the commissioning of a controller. Drive units detected on the selected interfaces are displayed in the device explorer.

The current interface and display settings can be saved in project files.

Sequential programs for saving and execution can be created, edited, transferred and executed on the devices. Possibilities for error detection and monitoring the program flow are also available.

The operation of a controller and the execution of motion tasks are performed via:

- Graphical operating elements
- Command entries
- Macro functions
- Programming of sequences via Visual Basic Script (VBScript)

Control parameters such as setpoints and actual values can be recorded in Logger or Recorder mode via a graphical analysis function. Additional tools are available for the creation and optimisation of control parameters.

Motion Controller

V3.0, 4-Quadrant PWM

with RS232, CANopen or EtherCAT interface

Series MC 5004

Values at 22°C and nominal voltage		MC 5004 P	
Power supply for electronics	U_p	12 ... 50	V
Power supply for motor	U_{mot}	0 ... 50	V
PWM switching frequency	f_{PWM}	100	kHz
Efficiency, electronics	η	95	%
Max. continuous output current	I_{dauer}	4	A
Max. peak output current ¹⁾	I_{max}	12	A
Total standby current (at 24V)	I_{el}	RS / CO: 0,06 ET: 0,07	A
Operating temperature range		- 40 ... + 85	°C
Mass		RS / CO: 22 ET: 47	g

¹⁾ S2 mode for max. 1s

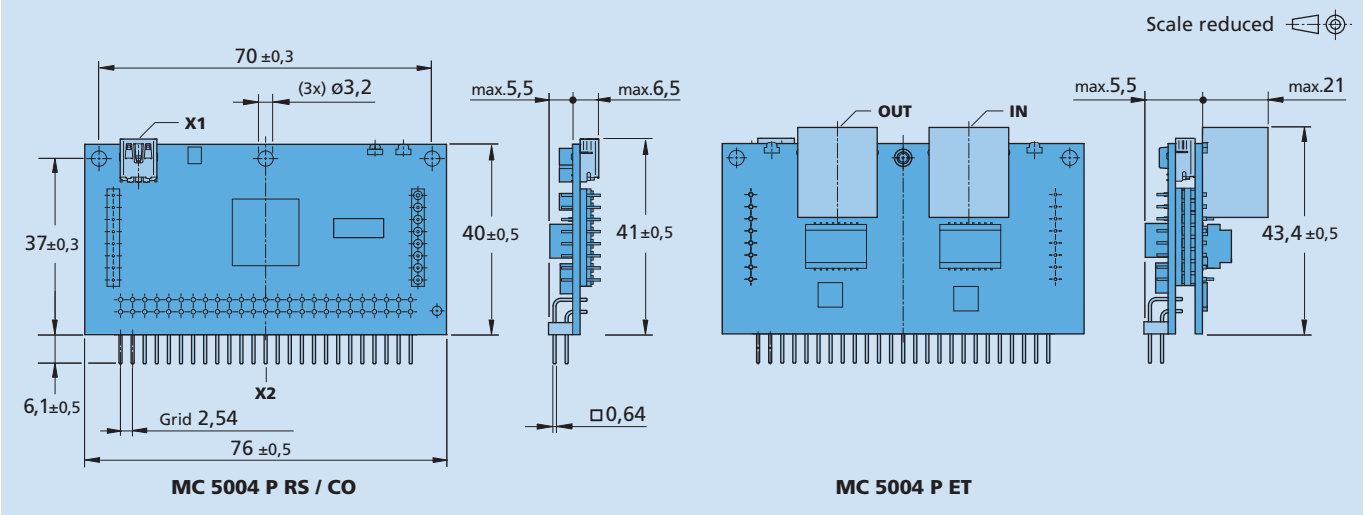
Interface	MC 5004 P RS/CO	MC 5004 P ET
Configuration with Motion Manager 6.0	RS232 / USB	RS232 / USB
Fieldbus	RS 232 / CANopen	EtherCAT

Basic features

- Control of brushless, DC- and linear motors
- Supported sensor systems: absolute encoders (AES or SSI), incremental encoders (optical or magnetic), Hall sensors (digital or analog), tachometers.
- Position resolution when using analog Hall sensors as position encoders: 4096 increments per revolution.
- 8 digital inputs, 3 digital outputs, 2 analog inputs, flexible configuration.
- Setpoint specification via fieldbus, quadrature signal, pulse and direction or analog inputs.
- Optional stand-alone operation via application programs in all interface versions

Range of functions	MC 5004 P
Operating modes	PP, PV, PT, CSP, CSV, CST and homing acc. to IEC 61800-7-201 or IEC 61800-7-301 as well as position-, speed- and torque control via analog setpoint or voltage controller
Speed range for brushless motors	0 min ⁻¹ ... 30,000 min ⁻¹ with sinusoidal commutation (optionally to 60,000 min ⁻¹ with block commutation)
Application programs	Max. 8 application programs (BASIC), one of which is an autostart function
Additional functions	Touch-probe input, connection of a second incremental encoder, control of a holding brake
Indicator	2 LEDs for displaying the operating state Trace as recorder (scope function) or logger
Motor types	DC, BL- and linear motors

Dimensional drawing



Option, cable and connection information

Example product designation: **MC 5004 P ET**

Option	Type	Description	Connection		
			Name	Function	Description
			X1	USB configuration interface	USB
			X2	Pin Header	Analog and digital input/output, motor and electronic power supply, fieldbus, motor phases, sensors
			IN	Fieldbus	EtherCAT IN
			OUT	Fieldbus	EtherCAT OUT
Note: For details on the connection assignment, see device manual for the MC 5004.					

Product Combinations

DC-Motors	Brushless DC-Motors	Linear DC-Servomotors	Cables / Accessories
1319 ... SR 1331 ... SR 1516 ... SR 1524 ... SR 1717 ... SR 1724 ... SR 2224 ... SR 2232 ... SR 1336 ... CXR 1727 ... CXR 1741 ... CXR 2237 ... CXR 2642 ... CXR 2657 ... CXR 2342 ... CR 2642 ... CR 2657 ... CR 2668 ... CR	1218 ... B 1226 ... B 1628 ... B 2036 ... B 2057 ... B 2057 ... BHS 2444 ... B 3056 ... B 2232 ... BX4 2250 ... BX4 3242 ... BX4 3268 ... BX4	LM 1247 ... 11 LM 2070 ... 11	<p>An extensive range of accessories is available for the products of the MC 5004 controller series.</p> <p>A motherboard is available that can be used to operate up to four controllers in multi-axis operation (slave).</p> <p>Furthermore, connection cables are available for controller and motor supply, sensors and interfaces as well as connector sets for the motor and supply side.</p> <p>Note: Detailed information about the accessories can be found in the accessory manual, which is available for download on our homepage at www.faulhaber.com.</p>

Motion Controller

V3.0, 4-Quadrant PWM

with RS232, CANopen or EtherCAT interface

Series MC 5005

Values at 22°C and nominal voltage		MC 5005 S	
Power supply for electronics	U_p	12 ... 50	V
Power supply for motor	U_{mot}	0 ... 50	V
PWM switching frequency	f_{PWM}	100	kHz
Efficiency, electronics	η	97	%
Max. continuous output current	I_{dauer}	5	A
Max. peak output current ¹⁾	I_{max}	15	A
Total standby current (at 24V)	I_{el}	RS / CO: 0,06 ET: 0,07	A
Operating temperature range		- 40 ... + 85	°C
Housing material		aluminium, powder-coated	
Mass		RS / CO: 230 ET: 270	g

¹⁾ S2 mode for max. 60s

Interface	MC 5005 S RS	MC 5005 S CO	MC 5005 S ET
Configuration with Motion Manager 6.0	RS232 / USB	CANopen / USB	RS232 / USB
Fieldbus	RS232	CANopen	EtherCAT

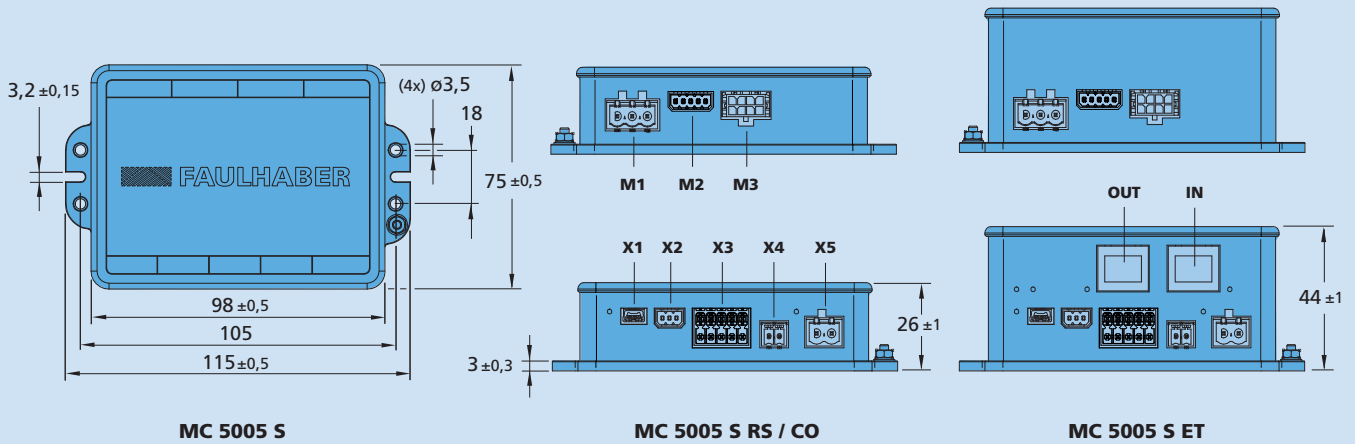
Basic features

- Operation of brushless, DC- and linear motors
- Supported sensor systems: absolute encoders (AES or SSI), incremental encoders (optical or magnetic), Hall sensors (digital or analog), tachometers.
- Position resolution when using analog Hall sensors as position encoders: 4096 increments per revolution.
- 3 digital inputs, 2 digital outputs, 2 analog inputs, flexible configuration.
- Setpoint specification via fieldbus, quadrature signal, pulse and direction or analog inputs.
- Optional stand-alone operation via application programs in all interface versions

Range of functions	MC 5005 S
Operating modes	PP, PV, PT, CSP, CSV, CST and homing acc. to IEC 61800-7-201 or IEC 61800-7-301 as well as position-, speed- and torque control via analog setpoint or voltage controller
Speed range for brushless motors	0 min ⁻¹ ... 30,000 min ⁻¹ with sinusoidal commutation (optionally to 60,000 min ⁻¹ with block commutation)
Application programs	Max. 8 application programs (BASIC), one of which is an autostart function
Additional functions	Touch-probe input, connection of a second incremental encoder, control of a holding brake
Indicator	LEDs for displaying the operating state Trace as recorder (scope function) or logger
Motor types	DC, BL- and linear motors

Dimensional drawing

Scale reduced



Option, cable and connection information

Example product designation: **MC 5005 S RS**

Option	Type	Description	Connection			
			Name	Function	Input/Output	Description
			X1	Configuration interface		USB
			X2	Fieldbus		RS: RS232 CO: CANOpen
			X3	Input/Output	DigIn1, DigIn2, DigIn3 DigOut1, DigOut2 AnIn1, AnIn2 U _{out} / GND	TTL or PLC level max. 0,7A cont. current ± 10V against AnGND 5V
			X4	Electronic power supply		
			X5	Motor power supply		
			M1	Motor phases	A, B, C	
			M2	Hall sensors	A, B, C U _{out} / GND	digital or analog 5V
			M3	Encoder	A, \bar{A} , B, \bar{B} , I, \bar{I} EN, \bar{EN} , CLOCK, \bar{CLOCK} , DATA, \bar{DATA} U _{out} / GND	max. 5MHz AES or SSI 5V
			IN	Fieldbus		EtherCAT IN
			OUT	Fieldbus		EtherCAT OUT
Note: For details on the connection assignment, see device manual for the MC 5005.						

Product Combinations

DC-Motors	Brushless DC-Motors	Linear DC-Servomotors	Cables / Accessories
2237 ... CXR 2642 ... CXR 2657 ... CXR 2342 ... CR 2642 ... CR 2657 ... CR 3242 ... CR 3257 ... CR 3272 ... CR	2036 ... B 2057 ... B 2057 ... BHS 2444 ... B 3056 ... B 3564 ... B 2232 ... BX4 2250 ... BX4 3242 ... BX4 3268 ... BX4	LM 1247 ... 11 LM 2070 ... 11	<p>An extensive range of accessories is available for the products of the MC 5010 and 5005 controller series.</p> <p>Included here are connection cables for controller and motor supply, sensors and interfaces, connector sets for motor- and supply side as well as mechanical components for optional top hat rail mounting.</p> <p>Note: Detailed information about the accessories can be found in the accessory manual, which is available for download on our homepage at www.faulhaber.com.</p>

Motion Controller

V3.0, 4-Quadrant PWM

with RS232, CANopen or EtherCAT interface

Series MC 5010

Values at 22°C and nominal voltage		MC 5010 S	
Power supply for electronics	U_p	12 ... 50	V
Power supply for motor	U_{mot}	0 ... 50	V
PWM switching frequency	f_{PWM}	100	kHz
Efficiency, electronics	η	97	%
Max. continuous output current	I_{dauer}	10	A
Max. peak output current ¹⁾	I_{max}	30	A
Total standby current (at 24V)	I_{el}	RS / CO: 0,06 ET: 0,07	A
Operating temperature range		- 40 ... + 85	°C
Housing material		aluminium, powder-coated	
Mass		RS / CO: 230 ET: 270	g

¹⁾ S2 mode for max. 3s

Interface	MC 5010 S RS	MC 5010 S CO	MC 5010 S ET
Configuration with Motion Manager 6.0	RS232 / USB	CANopen / USB	RS232 / USB
Fieldbus	RS232	CANopen	EtherCAT

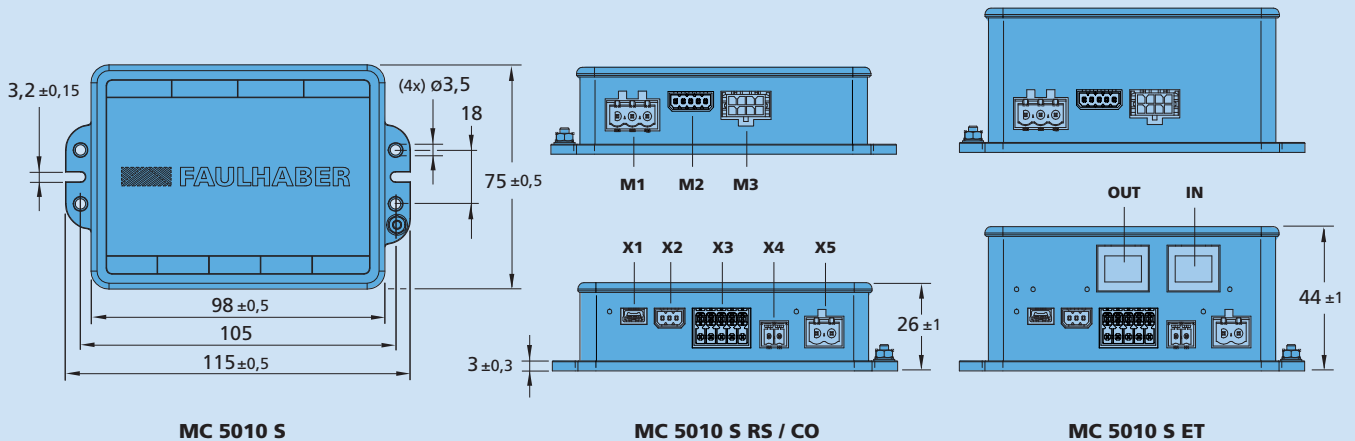
Basic features

- Operation of brushless, DC- and linear motors
- Supported sensor systems: absolute encoders (AES or SSI), incremental encoders (optical or magnetic), Hall sensors (digital or analog), tachometers.
- Position resolution when using analog Hall sensors as position encoders: 4096 increments per revolution.
- 3 digital inputs, 2 digital outputs, 2 analog inputs, flexible configuration.
- Setpoint specification via fieldbus, quadrature signal, pulse and direction or analog inputs.
- Optional stand-alone operation via application programs in all interface versions

Range of functions	MC 5010 S
Operating modes	PP, PV, PT, CSP, CSV, CST and homing acc. to IEC 61800-7-201 or IEC 61800-7-301 as well as position-, speed- and torque control via analog setpoint or voltage controller
Speed range for brushless motors	0 min ⁻¹ ... 30,000 min ⁻¹ (with sinusoidal commutation)
Application programs	Max. 8 application programs (BASIC), one of which is an autostart function
Additional functions	Touch-probe input, connection of a second incremental encoder, control of a holding brake
Indicator	2 LEDs for displaying the operating state Trace as recorder (scope function) or logger
Motor types	DC, BL- and linear motors

Dimensional drawing

Scale reduced



Option, cable and connection information

Example product designation: **MC 5010 S RS**

Option	Type	Description	Connection			
			Name	Function	Input/Output	Description
			X1	Configuration interface		USB
			X2	Fieldbus		RS: RS232 CO: CANOpen
			X3	Input/Output	DigIn1, DigIn2, DigIn3 DigOut1, DigOut2 AnIn1, AnIn2 U _{out} / GND	TTL or PLC level max. 0,7A cont. current ± 10V against AnGND 5V
			X4	Electronic power supply		
			X5	Motor power supply		
			M1	Motor phases	A, B, C	
			M2	Hall sensors	A, B, C U _{out} / GND	digital or analog 5V
			M3	Encoder	A, \bar{A} , B, \bar{B} , I, \bar{I} EN, \bar{EN} , CLOCK, \bar{CLOCK} , DATA, \bar{DATA} U _{out} / GND	max. 5MHz AES or SSI 5V
			IN	Fieldbus		EtherCAT IN
			OUT	Fieldbus		EtherCAT OUT
			Note: For details on the connection assignment, see device manual for the MC 5010.			

Product Combination

DC-Motors	Brushless DC-Motors	Linear DC-Servomotors	Cables / Accessories
3242 ... CR 3257 ... CR 3272 ... CR 3863 ... CR 3890 ... CR	3242 ... BX4 3268 ... BX4 3274 ... BP4 3564 ... B 4490 ... B 4490 ... BS		An extensive range of accessories is available for the products of the MC 5010 and 5005 controller series. Included here are connection cables for controller and motor supply, sensors and interfaces, connector sets for motor- and supply side as well as mechanical components for optional DIN rail mounting. Note: Detailed information about the accessories can be found in the accessory manual, which is available for download on our homepage at www.faulhaber.com .

Motion Control Systems



WE CREATE MOTION

Motion Control Systems

				Page
Technical Information				26 – 31
MCS 3242 ... BX4 ET	with integrated Motion Controller	76 mNm		32 – 33
MCS 3242 ... BX4 RS/CO	with integrated Motion Controller	76 mNm		34 – 35
MCS 3268 ... BX4 ET	with integrated Motion Controller	96 mNm		36 – 37
MCS 3268 ... BX4 RS/CO	with integrated Motion Controller	96 mNm		38 – 39

Electronic Accessories

				Page
6501.00283	Adapter board MCS			40
6501.00284	Adapter board MCS			41

Motion Control Systems

Technical Information



Features

FAULHABER Motion Control systems of generation V3.0 are highly dynamic positioning systems in two motor designs for use in combination with matched gearheads and ball screws from the FAULHABER product portfolio. The motor parameters are preconfigured ex works. Adaptation to the path is performed during commissioning using the FAULHABER Motion Manager from version 6.0.

In addition to use as a servo drive with controlled position, the speed or current can also be controlled. The actual values for speed and position are ascertained via the integrated encoders. Limit switches and reference switches can be directly connected.

The control setpoints can be preset via the communication interface, via the analogue input or a PWM input or can come from internally stored sequential programs.

Supported as communication interfaces are – depending on the device – RS232 or CANopen and optionally EtherCAT. All functions of the drive are available here without limitation via all interfaces.

FAULHABER Motion Control Systems of generation V3.0 are available in two motor variants and are, thus, perfectly scalable:

- MCS 3242 ... BX4
- MCS 3268 ... BX4

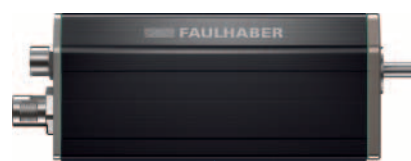
The possible applications are diverse: from laboratory automation to industrial equipment manufacturing, automation technology and robotics to aerospace.

The electrical connection of the systems is established via M12 plugs and extension cables. The flange profile is identical for all sizes.

Benefits

- Perfectly scalable thanks to various sizes
- Very dynamic control
- Various setpoint interfaces
- Stand-alone operation possible in all variants
- Connection via standard M12 plugs
- Fast feedback with status LEDs
- Commissioning with the free FAULHABER Motion Manager from version 6.0
- Configuration via adapter board

Product Code

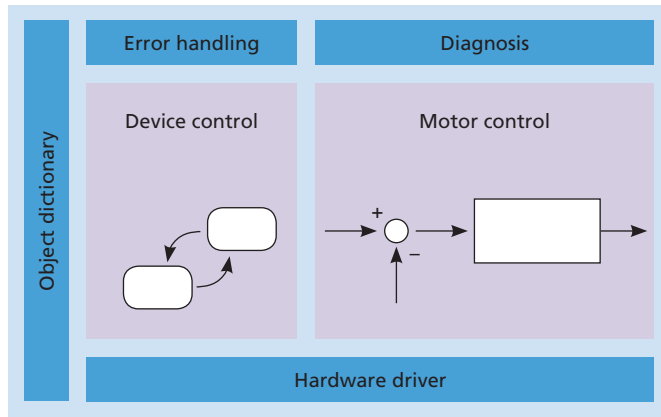


MCS	Motion Control System
3242	Motor series
G	Type of drive
024	Nominal voltage - motor
BX4	Brushless electronic commutation
ET	EtherCAT interface

MCS_3242_G_024_BX4_ET

Motion Control Systems

Technical Information



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. 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.

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.

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

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

Two analogue inputs ($\pm 10V$) 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.

Options

All controllers can optionally be equipped with an EtherCAT interface.

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

Motion Control Systems

Technical Information

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 Controller 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.

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 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.

Thanks to their robust construction, their compact design and the connection concept with industrial-grade standard cables, the new FAULHABER Motion Control Systems are perfectly suited for use in automation applications.

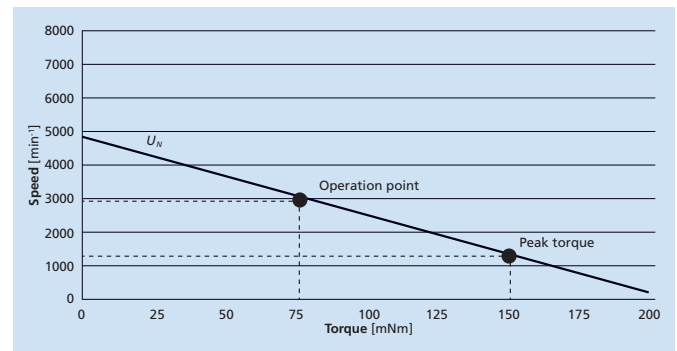
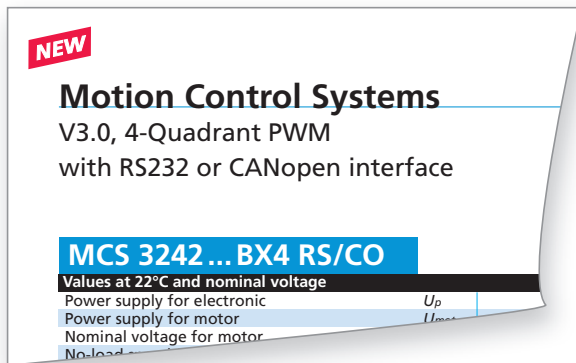
Modifications and accessories

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:

- Industrial-grade connection and interface cables with plugs
- 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
- Adaptation of the protection classification via shaft seals

Motion Control Systems

Technical Information



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.

Supply voltage for electronics U_p [V DC]

Describes the range of the permissible supply voltage for the integrated control electronics.

Supply voltage 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.

Current consumption of 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.

Motion Control Systems

Technical Information

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

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.

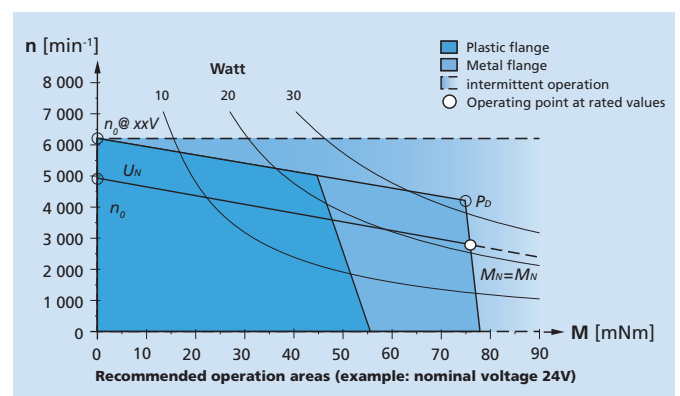
Rated current I_N [A]

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.

Motion Control Systems

Technical Information

Explanations on the Performance Diagram

The performance diagram shows the range of possible operating points of a drive at an ambient temperature of 22°C and includes both the operation on the plastic as well as aluminium flange.

The flange size here is 100 x 100 x 10 mm. 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 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.

NEW

Motion Control Systems
V3.0, 4-Quadrant PWM
with EtherCAT interface

76 mNm
32 W

MCS 3242 ... BX4 ET

Values at 22°C and nominal voltage		MCS 3242G024BX4 ..	
Power supply for electronic	U_p	12 ... 50	V DC
Power supply for motor	U_{mot}	0 ... 50	V DC
Nominal voltage for motor	U_N	24	V
No-load speed (at U_N)	n_0	4 900	min ⁻¹
Peak torque (S2 operation for max. 1s)	M_{max}	150	mNm
Torque constant	k_m	41,4	mNm/A
PWM switching frequency	f_{PWM}	100	kHz
Efficiency electronic	η	95	%
Standby current for electronic (at 24V)	I_{el}	0,06	A
Shaft bearings	ball bearings, preloaded		
Shaft load max.:			
– with shaft diameter	5		mm
– radial at 3 000 min ⁻¹ (5 mm from mounting flange)	50		N
– axial at 3 000 min ⁻¹ (push / pull)	5		N
– axial at standstill (push / pull)	50		N
Shaft play:			
– radial	≤ 0,015		mm
– axial	= 0		mm
Operating temperature range	– 40 ... + 85		°C
Speed range (up to 30V)	1 ... 6 200		min ⁻¹
Housing material	aluminium, stainless steel		
Protection class, with option V ring	IP 54		
Mass	356		g

Rated values for continuous operation			
Rated torque	M_N	76	mNm
Rated current (thermal limit)	I_N	1,82	A
Rated speed	n_N	2 800	min ⁻¹

Note: Rated values are calculated with nominal voltage and at a 22°C ambient temperature.

Interface	... ET
Configuration from MotionManager 6.0	RS232
Fieldbus	EtherCAT

Range of functions	MCS
Operating modes	PP, PV, PT, CSP, CSV, CST and homing acc. to IEC 61800-7-201 or IEC 61800-7-301 as well as position-, speed- and torque control via analog setpoint or voltage controller
Speed range	see motor diagram
Application programs	Max. 8 application programs (BASIC), one of which is an autostart function
Additional functions	Touch-probe input, connection of a second incremental encoder, control of a holding brake
Indicator	LEDs for displaying the operating state Trace as recorder (scope function) or logger

Note:

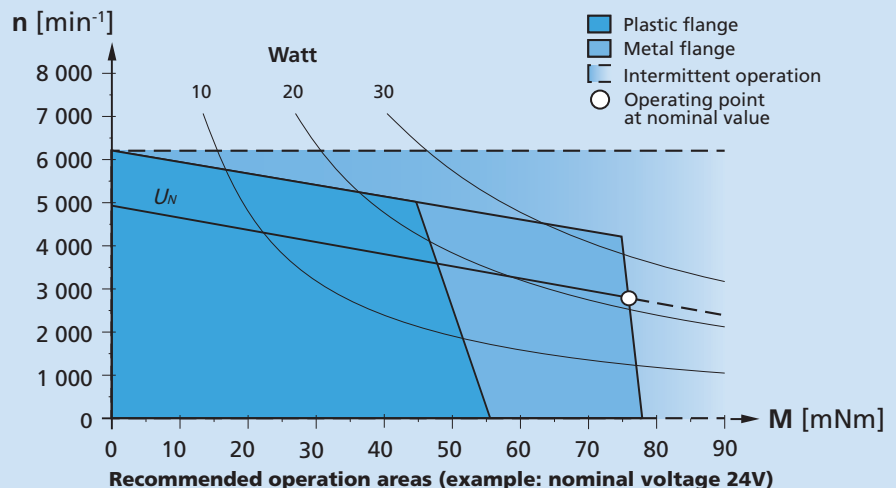
The display shows the range of possible operation points of the drives at a given ambient temperature of 22°C.

The diagram indicates the recommended speed in relation to the available torque at the output shaft.

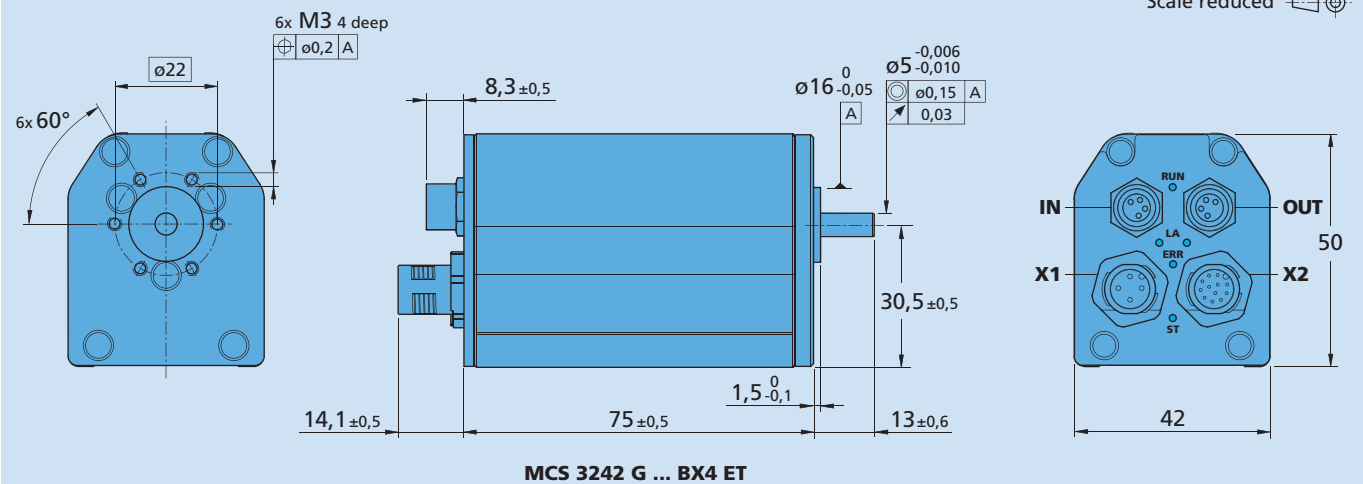
It includes the assembly on a plastic- as well as on a metal flange (assembly method: IM B 5).

The nominal voltage linear slope describes the maximal achievable operating points at nominal voltage.

Any points of operation above this linear slope will require a supply voltage $U_{mot} > U_N$.



Dimensional drawing



Option, cable and connection information

Example product designation: **MCS3242G024BX4ET-5453**

Option	Type	Description	Connection			
			Name	Function	Inputs-outputs	Description
5452	Shaft seal	Radial shaft seal ring	X1	Motor and electronic power supply		
5453	Shaft seal	External V-ring	X2	Inputs-outputs	DigIn1, DigIn2, DigIn3 DigOut1, DigOut2 AnIn1, AnIn2 U _{out} / GND	TTL or. PLC level max. 0,7A continuous current ± 10V against AGND 5V
			IN	Fieldbus		EtherCAT IN
			OUT	Fieldbus		EtherCAT OUT
			Note: For details on the connection assignment, see device manual for the MCS.			

Product Combination

Precision Gearheads / Lead Screws	Encoder	Drive Electronics	Cables / Accessories
32A 32/3 32/3S 38A BS32-2.0		Integrated	6501.00255 MCS connection cable: supply plug, straight 6501.00256 MCS connection cable: supply plug, angled 6501.00257 MCS connection cable: I/O plug, straight 6501.00258 MCS connection cable: I/O plug, angled 6501.00270 Cable EtherCAT, connector M8-M8 straight 6501.00210 EtherCAT connection cable: M8-M8 plugs 6501.00271 Cable EtherCAT, connector M8-RJ45 straight 6501.00211 EtherCAT connection cable: M8-RJ45 plugs 6501.00134 BC 5004 series brake chopper 6501.00284 Adapter board MCS, USB

NEW

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

76 mNm
32 W

MCS 3242... BX4 RS/CO

Values at 22°C and nominal voltage		MCS 3242G024BX4 ..	
Power supply for electronic	U_p	12 ... 50	V DC
Power supply for motor	U_{mot}	0 ... 50	V DC
Nominal voltage for motor	U_N	24	V
No-load speed (at U_N)	n_0	4 900	min ⁻¹
Peak torque (S2 operation for max. 1s)	$M_{max.}$	150	mNm
Torque constant	k_m	41,4	mNm/A
PWM switching frequency	f_{PWM}	100	kHz
Efficiency electronic	η	95	%
Standby current for electronic (at 24V)	I_{el}	0,06	A
Shaft bearings	ball bearings, preloaded		
Shaft load max.:			
– with shaft diameter	5		mm
– radial at 3 000 min ⁻¹ (5 mm from mounting flange)	50		N
– axial at 3 000 min ⁻¹ (push / pull)	5		N
– axial at standstill (push / pull)	50		N
Shaft play:			
– radial	≤ 0,015		mm
– axial	= 0		mm
Operating temperature range	-40 ... +100		°C
Speed range (up to 30V)	1 ... 6 200		min ⁻¹
Housing material	aluminium, stainless steel		
Protection class, with option V ring	IP 54		
Mass	340		g
Rated values for continuous operation			
Rated torque	M_N	76	mNm
Rated current (thermal limit)	I_N	1,82	A
Rated speed	n_N	2 800	min ⁻¹

Note: Rated values are calculated with nominal voltage and at a 22°C ambient temperature.

Interface	... RS	... CO
Configuration from MotionManager 6.0	RS232	CANopen
Fieldbus	RS232	CANopen

Range of functions	MCS
Operating modes	PP, PV, PT, CSP, CSV, CST and homing acc. to IEC 61800-7-201 or IEC 61800-7-301 as well as position-, speed- and torque control via analog setpoint or voltage controller
Speed range	see motor diagram
Application programs	Max. 8 application programs (BASIC), one of which is an autostart function
Additional functions	Touch-probe input, connection of a second incremental encoder, control of a holding brake
Indicator	LEDs for displaying the operating state Trace as recorder (scope function) or logger

Note:

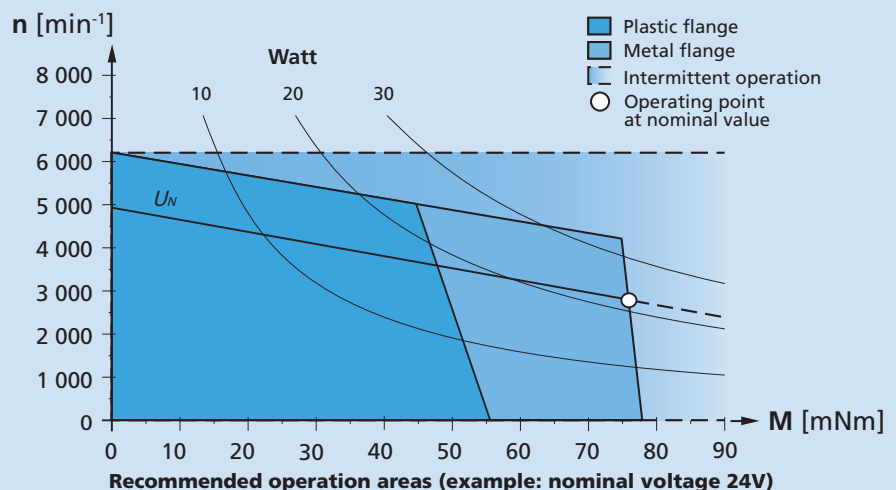
The display shows the range of possible operation points of the drives at a given ambient temperature of 22°C.

The diagram indicates the recommended speed in relation to the available torque at the output shaft.

It includes the assembly on a plastic- as well as on a metal flange (assembly method: IM B 5).

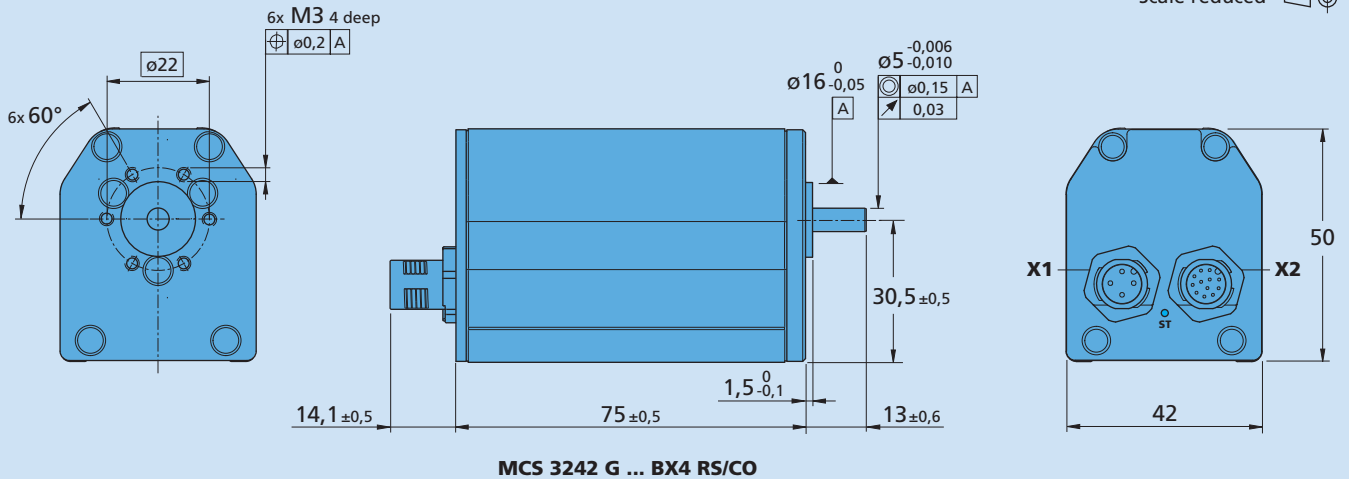
The nominal voltage linear slope describes the maximal achievable operating points at nominal voltage.

Any points of operation above this linear slope will require a supply voltage $U_{mot} > U_N$.



Dimensional drawing

Scale reduced


Option, cable and connection information

 Example product designation: **MCS3242G024BX4RS-5453**

Option	Type	Description	Connection												
5452	Shaft seal	Radial shaft seal ring	<table border="1"> <thead> <tr> <th>Name</th> <th>Function</th> <th>Inputs-outputs</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>X1</td> <td>Motor and electronic power supply</td> <td></td> <td></td> </tr> <tr> <td>X2</td> <td>Inputs / outputs</td> <td>DigIn1, DigIn2, DigIn3 DigOut1, DigOut2 AnIn1, AnIn2 U_{out} / GND</td> <td>TTL or. PLC level max. 0,7A continuous current ± 10V against AGND 5V</td> </tr> </tbody> </table>	Name	Function	Inputs-outputs	Description	X1	Motor and electronic power supply			X2	Inputs / outputs	DigIn1, DigIn2, DigIn3 DigOut1, DigOut2 AnIn1, AnIn2 U _{out} / GND	TTL or. PLC level max. 0,7A continuous current ± 10V against AGND 5V
Name	Function	Inputs-outputs		Description											
X1	Motor and electronic power supply														
X2	Inputs / outputs	DigIn1, DigIn2, DigIn3 DigOut1, DigOut2 AnIn1, AnIn2 U _{out} / GND	TTL or. PLC level max. 0,7A continuous current ± 10V against AGND 5V												
5453	Shaft seal	External V ring													

Note: For details on the connection assignment, see device manual for the MCS.

Product Combination

Precision Gearheads / Lead Screws	Encoder	Drive Electronics	Cables / Accessories
32A 32/3 32/3S 38A BS32-2.0		Integrated	6501.00255 MCS connection cable: supply plug, straight 6501.00256 MCS connection cable: supply plug, angled 6501.00257 MCS connection cable: I/O plug, straight 6501.00258 MCS connection cable: I/O plug, angled 6501.00134 BC 5004 series brake chopper 6501.00283 Adapter board MCS, RS232/CAN 6501.00284 Adapter board MCS, USB

NEW

Motion Control Systems
 V3.0, 4-Quadrant PWM
 with EtherCAT interface

96 mNm
41 W

MCS 3268 ... BX4 ET

Values at 22°C and nominal voltage		MCS 3268G024BX4 ..	
Power supply for electronic	U_p	12 ... 50	V DC
Power supply for motor	U_{mot}	0 ... 50	V DC
Nominal voltage for motor	U_N	24	V
No-load speed (at U_N)	n_0	4 700	min ⁻¹
Peak torque (S2 operation for max. 1s)	$M_{max.}$	190	mNm
Torque constant	k_m	43,5	mNm/A
PWM switching frequency	f_{PWM}	100	kHz
Efficiency electronic	η	95	%
Standby current for electronic (at 24V)	I_{el}	0,06	A
Shaft bearings	ball bearings, preloaded		
Shaft load max.:			
– with shaft diameter	5		mm
– radial at 3 000 min ⁻¹ (5 mm from mounting flange)	50		N
– axial at 3 000 min ⁻¹ (push / pull)	5		N
– axial at standstill (push / pull)	50		N
Shaft play:			
– radial	≤ 0,015		mm
– axial	= 0		mm
Operating temperature range	– 40 ... + 85		°C
Speed range (up to 30V)	1 ... 6 000		min ⁻¹
Housing material	aluminium, stainless steel		
Protection class, with option V ring	IP 54		
Mass	394		g

Rated values for continuous operation			
Rated torque	M_N	96	mNm
Rated current (thermal limit)	I_N	2,3	A
Rated speed	n_N	3 700	min ⁻¹

Note: Rated values are calculated with nominal voltage and at a 22°C ambient temperature.

Interface	... ET
Configuration from MotionManager 6.0	RS232
Fieldbus	EtherCAT

Range of functions	MCS
Operating modes	PP, PV, PT, CSP, CSV, CST and homing acc. to IEC 61800-7-201 or IEC 61800-7-301 as well as position-, speed- and torque control via analog setpoint or voltage controller
Speed range	see motor diagram
Application programs	Max. 8 application programs (BASIC), one of which is an autostart function
Additional functions	Touch-probe input, connection of a second incremental encoder, control of a holding brake
Indicator	LEDs for displaying the operating state Trace as recorder (scope function) or logger

Note:

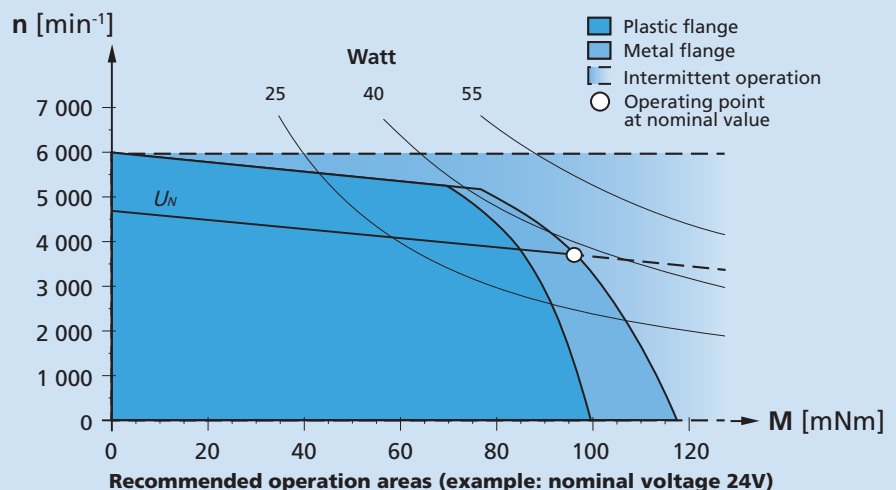
The display shows the range of possible operation points of the drives at a given ambient temperature of 22°C.

The diagram indicates the recommended speed in relation to the available torque at the output shaft.

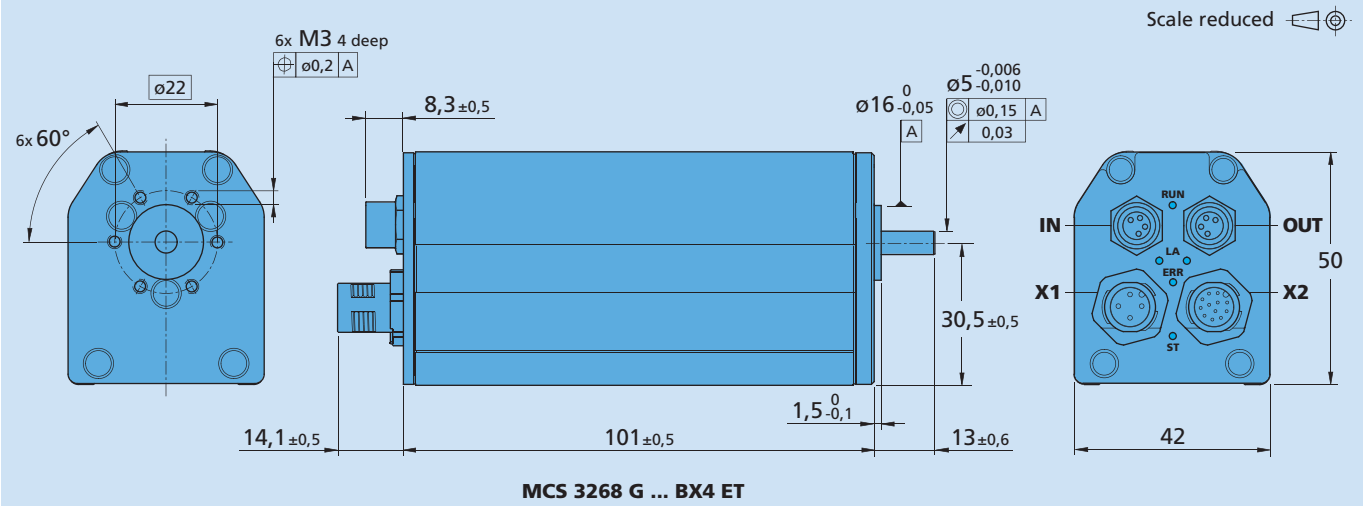
It includes the assembly on a plastic- as well as on a metal flange (assembly method: IM B 5).

The nominal voltage linear slope describes the maximal achievable operating points at nominal voltage.

Any points of operation above this linear slope will require a supply voltage $U_{mot} > U_N$.



Dimensional drawing



Option, cable and connection information

Example product designation: **MCS3268G024BX4ET-5453**

Option	Type	Description	Connection			
5452	Shaft seal	Radial shaft seal ring	Name	Function	Inputs-outputs	Description
5453	Shaft seal	External V-ring	X1	Motor and electronic power supply		
			X2	Inputs-outputs	DigIn1, DigIn2, DigIn3 DigOut1, DigOut2 AnIn1, AnIn2 U _{out} / GND	TTL or. PLC level max. 0,7A continuous current ± 10V against AGND 5V
			IN	Fieldbus		EtherCAT IN
			OUT	Fieldbus		EtherCAT OUT
			Note: For details on the connection assignment, see device manual for the MCS.			

Product Combination

Precision Gearheads / Lead Screws	Encoder	Drive Electronics	Cables / Accessories
32A 32/3 32/3S 38A BS32-2.0		Integrated	6501.00255 MCS connection cable: supply plug, straight 6501.00256 MCS connection cable: supply plug, angled 6501.00257 MCS connection cable: I/O plug, straight 6501.00258 MCS connection cable: I/O plug, angled 6501.00270 Cable EtherCAT, connector M8-M8 straight 6501.00210 EtherCAT connection cable: M8-M8 plugs 6501.00271 Cable EtherCAT, connector M8-RJ45 straight 6501.00211 EtherCAT connection cable: M8-RJ45 plugs 6501.00134 BC 5004 series brake chopper 6501.00284 Adapter board MCS, USB

NEW

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

96 mNm
41 W

MCS 3268... BX4 RS/CO

Values at 22°C and nominal voltage		MCS 3268G024BX4 ..	
Power supply for electronic	U_p	12 ... 50	V DC
Power supply for motor	U_{mot}	0 ... 50	V DC
Nominal voltage for motor	U_N	24	V
No-load speed (at U_N)	n_0	4 700	min ⁻¹
Peak torque (S2 operation for max. 1s)	$M_{max.}$	190	mNm
Torque constant	k_m	43,5	mNm/A
PWM switching frequency	f_{PWM}	100	kHz
Efficiency electronic	η	95	%
Standby current for electronic (at 24V)	I_{el}	0,06	A
Shaft bearings	ball bearings, preloaded		
Shaft load max.:			
– with shaft diameter	5		mm
– radial at 3 000 min ⁻¹ (5 mm from mounting flange)	50		N
– axial at 3 000 min ⁻¹ (push / pull)	5		N
– axial at standstill (push / pull)	50		N
Shaft play:			
– radial	≤ 0,015		mm
– axial	= 0		mm
Operating temperature range	-40 ... +100		°C
Speed range (up to 30V)	1 ... 6 000		min ⁻¹
Housing material	aluminium, stainless steel		
Protection class, with option V ring	IP 54		
Mass	378		g

Rated values for continuous operation			
Rated torque	M_N	96	mNm
Rated current (thermal limit)	I_N	2,3	A
Rated speed	n_N	3 700	min ⁻¹

Note: Rated values are calculated with nominal voltage and at a 22°C ambient temperature.

Interface	... RS	... CO
Configuration from MotionManager 6.0	RS232	CANopen
Fieldbus	RS232	CANopen

Range of functions	MCS
Operating modes	PP, PV, PT, CSP, CSV, CST and homing acc. to IEC 61800-7-201 or IEC 61800-7-301 as well as position-, speed- and torque control via analog setpoint or voltage controller
Speed range	see motor diagram
Application programs	Max. 8 application programs (BASIC), one of which is an autostart function
Additional functions	Touch-probe input, connection of a second incremental encoder, control of a holding brake
Indicator	LEDs for displaying the operating state Trace as recorder (scope function) or logger

Note:

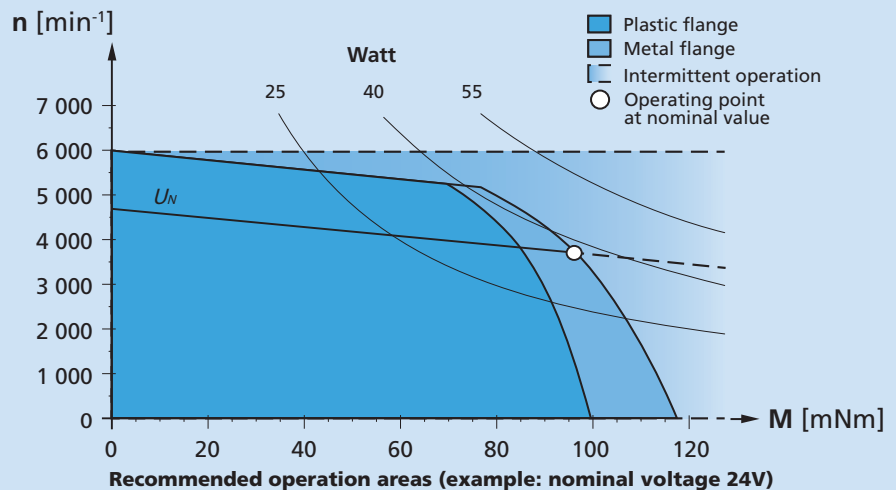
The display shows the range of possible operation points of the drives at a given ambient temperature of 22°C.

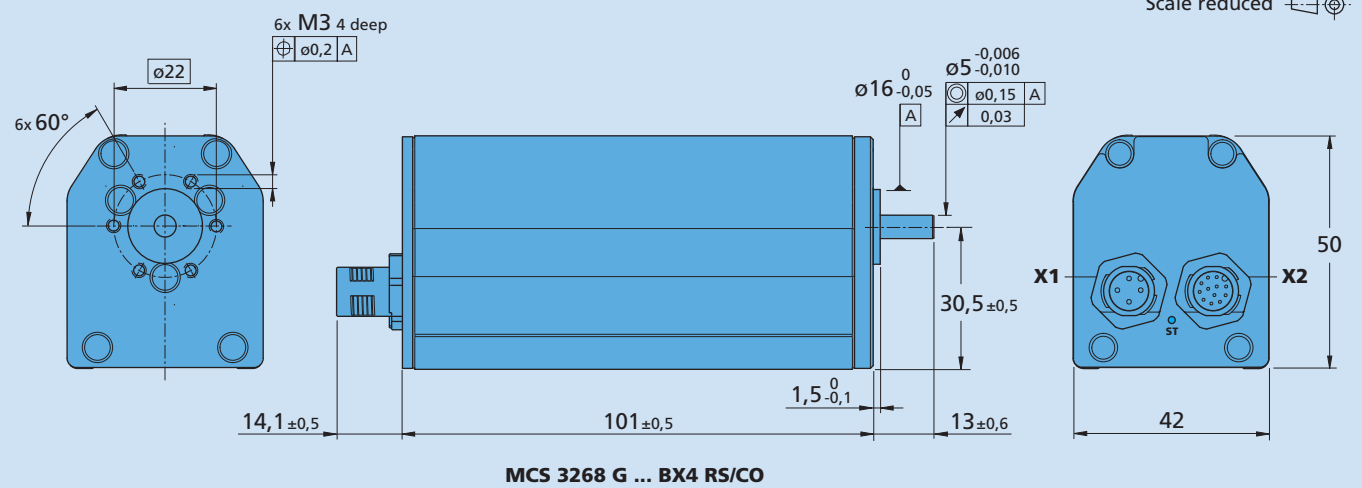
The diagram indicates the recommended speed in relation to the available torque at the output shaft.

It includes the assembly on a plastic- as well as on a metal flange (assembly method: IM B 5).

The nominal voltage linear slope describes the maximal achievable operating points at nominal voltage.

Any points of operation above this linear slope will require a supply voltage $U_{mot} > U_N$.



Dimensional drawing

Option, cable and connection information

Example product designation: **MCS3268G024BX4RS-5453**

Option	Type	Description	Connection												
5452	Shaft seal	Radial shaft seal ring	<table border="1"> <thead> <tr> <th>Name</th> <th>Function</th> <th>Inputs-outputs</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>X1</td> <td>Motor and electronic power supply</td> <td></td> <td></td> </tr> <tr> <td>X2</td> <td>Inputs / outputs</td> <td>DigIn1, DigIn2, DigIn3 DigOut1, DigOut2 AnIn1, AnIn2 U_{out} / GND</td> <td>TTL or. PLC level max. 0,7A continuous current ± 10V against AGND 5V</td> </tr> </tbody> </table>	Name	Function	Inputs-outputs	Description	X1	Motor and electronic power supply			X2	Inputs / outputs	DigIn1, DigIn2, DigIn3 DigOut1, DigOut2 AnIn1, AnIn2 U _{out} / GND	TTL or. PLC level max. 0,7A continuous current ± 10V against AGND 5V
Name	Function	Inputs-outputs		Description											
X1	Motor and electronic power supply														
X2	Inputs / outputs	DigIn1, DigIn2, DigIn3 DigOut1, DigOut2 AnIn1, AnIn2 U _{out} / GND	TTL or. PLC level max. 0,7A continuous current ± 10V against AGND 5V												
5453	Shaft seal	External V ring													
			Note: For details on the connection assignment, see device manual for the MCS.												

Product Combination

Precision Gearheads / Lead Screws	Encoder	Drive Electronics	Cables / Accessories
32A 32/3 32/3S 38A BS32-2.0		Integrated	6501.00255 MCS connection cable: supply plug, straight 6501.00256 MCS connection cable: supply plug, angled 6501.00257 MCS connection cable: I/O plug, straight 6501.00258 MCS connection cable: I/O plug, angled 6501.00134 BC 5004 series brake chopper 6501.00283 Adapter board MCS, RS232/CAN 6501.00284 Adapter board MCS, USB

Accessories

Adapter board MCS, RS232/CAN

Part No.: 6501.00283

6501.00283

Temperature range:		
– Operating temperature	– 10 ... + 65	°C
Dimension and Weight:		
– Dimension (L x B x H)	52 x 80	mm
– Weight	56	g

Note: All switches are in the "ON" position in the as-delivered condition. These switches must be set accordingly depending on the application.

General information

The adapter board is used to connect and for the parameter set-up of Motion Controller series MCS with serial RS232 or CAN interface.

The different operating modes can be selected using the 7 DIP switches. A Motion Control System can be connected to each adapter board.

Description of DIP switch (S1) settings

1: NETMODE	ON	Pull-down resistor (10 kΩ) for RS232 wiring connected. This may only be connected to a node in the RS232 network.
	OFF	Deactivated
2: TERM	ON	120Ω terminating resistor for the final node in the CAN network connected to the adapter board.
	OFF	Terminating resistor not connected
3: RS232 ¹⁾	ON	Operation with RS232 interface
	OFF	Deactivated
4: CAN ¹⁾	ON	Operation with CAN interface
	OFF	Deactivated
5: AGND	ON	AGND and GND interconnected.
	OFF	AGND and GND disconnected (with separate ground).
6: DigOut2	ON	Pull-up resistor with LED connected to adapter board.
	OFF	Open collector
7: DigOut1	ON	Pull-up resistor with LED connected to adapter board.
	OFF	Open collector

¹⁾ The pin assignments of X1 depend on the position of switches 3 and 4 of DIP switch S1.

²⁾ Jumper connected: common power supply for motor and electronics.

Connection

at RS232 operation¹⁾

Pin	Connection X1
2	RS-232 / RxD
3	RS-232 / TxD
5	GND

Pin Connection X3²⁾

1	U _{mot}
2	U _p

Pin Connection X5

1	GND
2	U _p
3	U _{mot}
4	EGND

Pin Connection X7

1	GND
2	RxD / CAN_L
3	TxD / CAN_H
4	+5V
5	DigOut1
6	DigOut2
7	DigIn1
8	DigIn2
9	DigIn3
10	AnIn1
11	AGND
12	AnIn2

at CAN operation¹⁾

Pin	Connection X1
2	CAN_L
3	GND
7	CAN_H

Pin Connection X4

1	GND
2	U _p


Pin Connection X6

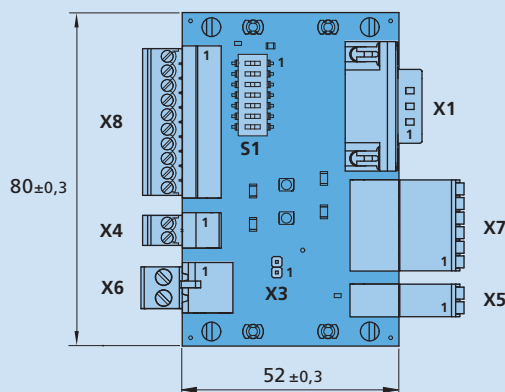
1	GND
2	U _{mot}

Pin Connection X8

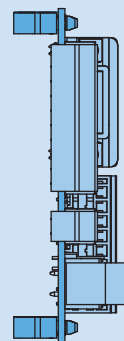
1	GND
2	+5V
3	DigOut1
4	DigOut2
5	DigIn1
6	DigIn2
7	DigIn3
8	AnIn1
9	AGND
10	AnIn2

Dimensional drawing and connection information

Scale reduced 



6501.00283



Connection

Nr.	Function
X1	RS232 / CAN
X3	Jumper voltage supply
X4	Voltage supply electronics
X5	Voltage supply MCS
X6	Voltage supply motor
X7	I/O MCS
X8	I/O application

Nr. Switch

S1	DIP-switch (7 switches)
----	-------------------------

Accessories

Adapter board MCS, USB

Part No.: 6501.00284

6501.00284

Temperature range:		
– Operating temperature	– 10 ... + 65	°C
Dimension and Weight:		
– Dimension (L x B x H)	52 x 80	mm
– Weight	56	g

Note: All switches are in the "ON" position in the as-delivered condition. These switches must be set accordingly depending on the application.

General information

The adapter board is used to connect and for the parameter set-up of Motion Control Systems series MCS.

The programming board is to be operated via an USB interface. Therefore the installation of a special USB driver is required.

Driver installation

The driver is included in the setup package of FAULHABER Motion Manager (from version 6), which can be downloaded from the FAULHABER internet site www.faulhaber.com/MotionManager.

The driver files are included in the installation register of the FAULHABER Motion Manager.

Description of DIP switch (S1) settings

1: N.C.	OFF	
2: N.C.	OFF	
3: USB	ON	Operation with USB interface
	OFF	Deactivated
4: N.C.	OFF	
5: AGND	ON	AGND and GND interconnected.
	OFF	AGND and GND disconnected (with separate ground).
6: DigOut2	ON	Pull-up resistor with LED connected to adapter board.
	OFF	Open collector
6: DigOut2	ON	Pull-up resistor with LED connected to adapter board.
	OFF	Open collector

¹⁾ Jumper connected: common power supply for motor and electronics.

Connection

Connection X1

USB

Pin Connection X3 ¹⁾

1	U _{mot}
2	U _p

Pin Connection X4

1	GND
2	U _p

Pin Connection X5

1	GND
2	U _p
3	U _{mot}
4	EGND

Pin Connection X6

1	GND
2	U _{mot}


Pin Connection X7

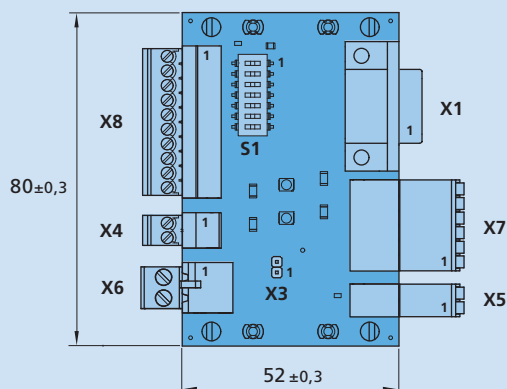
1	GND
2	RxD
3	TxD
4	+5V
5	DigOut1
6	DigOut2
7	DigIn1
8	DigIn2
9	DigIn3
10	AnIn1
11	AGND
12	AnIn2

Pin Connection X8

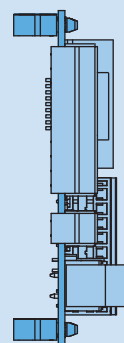
1	GND
2	+5V
3	DigOut1
4	DigOut2
5	DigIn1
6	DigIn2
7	DigIn3
8	AnIn1
9	AGND
10	AnIn2

Dimensional drawing and connection information

Scale reduced 



6501.00284



Connection

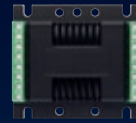
Nr.	Function
X1	USB
X3	Jumper voltage supply
X4	Voltage supply electronics
X5	Voltage supply MCS
X6	Voltage supply motor
X7	I/O MCS
X8	I/O application

Nr. Switch

S1	DIP-switch (7 switches)
----	-------------------------

FAULHABER Motion Control

Speed Controller



Series	SC 1801	SC 2402	SC 2804	SC 5004
For motor types	DC / BL*	DC / BL*	DC / BL*	DC / BL*
Supply voltage [V]	4 ... 18	5 ... 24	5 ... 28	6 ... 50
Continuous / peak current [A]	1 / 2	2 / 4	4 / 8	4 / 8
Speed range [min ⁻¹]	up to 100,000	up to 100,000	up to 100,000	up to 100,000
Temperature range [°C]	-25 ... +60	-25 ... +60	-25 ... +60	-25 ... +60
Channels	3	5	5	5

Speed Control Systems



Series	1525 ... BRC	1935 ... BRE	3153 ... BRC	2232 ... BX4 SC
Motor type	Brushless, 2-pole	Brushless, 2-pole	Brushless, 2-pole	Brushless, 4-pole
Nominal voltage [V]	9 / 12 / 15	6 / 9 / 12	9 / 12 / 24	12 / 24
Continuous torque [mNm]	1.8	3.2	28	16
Speed range [min ⁻¹]	1,000 ... 16,000	1,600 ... 10,000	1,000 ... 6,500	up to 22,500
Temperature range [°C]	-25 ... +85	0 ... +70	-25 ... +85	-40 ... +85

Motion Controllers



Series	MCxx 3002	MCxx 3003	MCxx 3006	MC 5004 NEW
For motor types	DC / BL / LM*	DC / BL / LM*	DC / BL / LM*	DC / BL / LM* (switchable)
Supply voltage [V]	5 ... 30	12 ... 30	12 ... 30	12 ... 50
Continuous / peak current [A]	2 / 3	3 / 10	6 / 10	4 / 12
Speed range [min ⁻¹]	5 ... 30,000	5 ... 30,000	5 ... 30,000	0 ... 60,000
Temperature range [°C]	-25 ... +85	-40 ... +85	-40 ... +85	-40 ... +85
Channels	5	5	5	13
Interface	RS232 / CANopen	RS232 / CANopen	RS232 / CANopen	RS232 / CANopen / EtherCAT / USB
Separate voltage supply	optional	optional	optional	yes

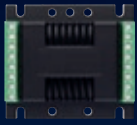
Motion Control Systems



Series	3564 ... B Cx	2232 ... BX4 CxD	2250 ... BX4 CxD	3242 ... BX4 Cx
Motor type	Brushless, 2-pole	Brushless, 4-pole	Brushless, 4-pole	Brushless, 4-pole
Nominal voltage [V]	24	24	24	24
Continuous torque [mNm]	53	18	35	56
Speed range [min ⁻¹]	5 ... 12,000	5 ... 8,000	5 ... 7,000	5 ... 6,500
Temperature range [°C]	-30 ... +85	-25 ... +85	-25 ... +85	-40 ... +85
Channels	3	3	3	3
Interface	RS232 / CANopen	RS232 / CANopen	RS232 / CANopen	RS232 / CANopen

Protection class

* DC = DC-Micromotors | BL = Brushless DC-Servomotors | LM = Linear DC-Servomotors



SC 5008

DC / BL*

6 ... 50

8 / 16

up to 100,000

- 25 ... + 60

5

A wide range of compact and versatile electronic components are available for activating the FAULHABER drive systems, both as stand-alone versions and in an integrated form together with high-performance, brushless DC servomotors.



2250 ... BX4 SC

Brushless, 4-pole

24

25

up to 12,500

- 40 ... + 85



3242 ... BX4 SC

Brushless, 4-pole

12 / 24

54

up to 14,000

- 40 ... + 100



3268 ... BX4 SC

Brushless, 4-pole

24

73

up to 7,000

- 40 ... + 100



2610 ... B SC

Brushless, 4-pole

6 / 12

3.7

up to 7,000

- 25 ... + 80



2622 ... B SC

Brushless, 4-pole

6 / 12

100

4 ... 635

- 25 ... + 80



MC 5005 **NEW**

DC / BL / LM* (switchable)

12 ... 50

5 / 15

0 ... 60,000

- 40 ... + 85

7

RS232 / CANopen /
EtherCAT / USB

yes



MC 5010 **NEW**

DC / BL / LM* (switchable)

12 ... 50

10 / 30

0 ... 30,000

- 40 ... + 85

7

RS232 / CANopen /
EtherCAT / USB

yes



MCST 3601

Stepper

9 ... 36

1.1 / 1.6

- 30 ... + 70

11

USB



3268 ... BX4 Cx

Brushless, 4-pole

24

96

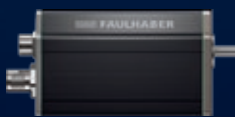
5 ... 6,500

- 40 ... + 85

3

RS232 / CANopen

-



MCS 3242 BX4 **NEW**

Brushless, 4-pole

24

76

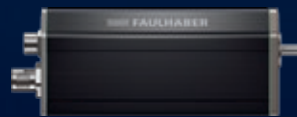
1 ... 6,200

- 40 ... + 100

7

RS232 / CANopen /
EtherCAT

IP 54 (opt.)



MCS 3268 BX4 **NEW**

Brushless, 4-pole

24

96

1 ... 6,000

- 40 ... + 100

7

RS232 / CANopen /
EtherCAT

IP 54 (opt.)



FAULHABER Motion Manager

The powerful 'FAULHABER Motion Manager' software is available for commissioning and configuring drive systems with motion and speed controllers.

More information at www.faulhaber.com

More information



[faulhaber.com](https://www.faulhaber.com)



[faulhaber.com/facebook](https://www.faulhaber.com/facebook)



[faulhaber.com/youtubeEN](https://www.faulhaber.com/youtubeEN)



[faulhaber.com/linkedin](https://www.faulhaber.com/linkedin)



[faulhaber.com/instagram](https://www.faulhaber.com/instagram)

Your local contact

DFF_MINIKAT_04-2015_EN_2000