Steinmeyer Mechatronik

Englisch Operating manual

# FMC200-Controller




Edition: 03-2024

Document is valild for:

- FMC221 789000:236.26
- FMC222 789000:235.26
- FMC222_V2.1 789000:260.26
- FMC223 789000:237.26
- FMC241 789000:238.26

**Steinmeyer Mechatronik GmbH**
Fritz-Schreiter-Str. 32
D-01259 Dresden

Tel.: +49 351 88585-0
Fax: +49 351 88585-25
E-Mail: info@steinmeyer-mechatronik.de

**www.steinmeyer-mechatronik.de**

| Version | Bemerkung |
|---|---|
| 03-2018 | Erstausgabe |
| 05-2018 | Zweisprachige Ausgabe |
| 12-2018 | Gültigkeit des Dokuments für FMC222_V2.1 erweitert |
| 02-2024 | Betriebssysteme aktualisiert |
| | |
| | |
| | |

# Table of Contents

# 1 General Information

This chapter includes the following topics:



**INFORMATION**

For more information and help, please visit our website:

**www.mechatronik-steinmeyer.de**

## 1.1 Information about this manual

This manual enables you to safely handle the FMC200 series of controllers. The manual is an integral part of the product and has to be accessible to personnel at all times.

Read the enclosed manual completely before starting any work on the FMC controller. The prerequisite for safe working is the adherence to all safety and handling instructions specified in this manual.

In addition, the local accident prevention regulations and general safety regulations for the application area of the FMC controller, are applicable.

This manual should accompany the FMC controller if it is passed on to others.

Figures in this manual help in giving a basic understanding and may differ from the actual designs. Claims can not be made based on any deviations.

## 1.2 Copyright protection



## 1.3 Warranty conditions

The warranty conditions are included in the general terms and conditions of Steinmeyer Mechatronik GmbH.

## 1.4 Returns

All the returns have to bear an RMA (Return Material Authorization) number. The RMA number can be obtained from Steinmeyer Mechatronik GmbH by telephone or e-mail.

## 1.5 Repair

Repair work on the FMC controller may only be carried out by technicians of Steinmeyer Mechatronik GmbH. Returns for repair require an RMA number (see “Returns” starting from page 2).

Steinmeyer Mechatronik GmbH is not responsible for damage or consequential damage caused by any data loss during the repair (parameter setting). A data backup has to be taken before returning the FMC controller.

## 1.6 FTP server

You will be given a customer login for our webspace (FTP server) for retrieving product-specific data. Product specific data include controller software, parameter files, and product documentation.

You can access our FTP server at any time and download data as often as desired.

## 1.7 Customer Service

In case the information is not available or if your have questions, please ask for technical support from Steinmeyer Mechatronik GmbH:

Steinmeyer Mechatronik GmbH
Fritz-Schreiter-Str. 32
01259 Dresden

Tel.: +49 (0)351 / 88585-0

support@steinmeyer-mechatronik.de
www.steinmeyer-mechatronik.de

# 2 Safety instructions

This chapter includes the following topics:



This chapter contains all the important safety aspects for optimum safety of the personnel as well as the safe and smooth operation of the FMC controller.

Failure to follow the guidelines and safety instructions provided in this manual may result in considerable risk.

The instructions given in this manual for operating the FMC controller have to be included in the manual (prepared by the customer) of the machine in which the FMC controller is installed.

## 2.1 Explanations of symbols

Safety instructions are indicated by symbols in this manual. The instructions start with signal words which convey the extend of the danger.

**DANGER**

**Damage caused by incorrect configuration!**

Incorrect configuration of the FMC controller may result in property damage.

- Get the FMC controller configured only by qualified technicians.

## 2.2 Intended use

FMC200 series controllers are used for controlling axis systems. The following motor types can be connected to the FMC controller:

- DC motors
- 2-phase and 3-phase stepper motors
- Brushless motors (linear and rotary)

FMC200 controllers have RS232, USB and CAN bus interfaces.

Intended use also includes compliance with these instructions. Any use other than the intended use shall be considered as misuse.

## 2.3 Residual risk

Residual risks arising from the FMC controller even if used properly, are mentioned in the following section.

**Power supply**

Operate the FMC controller only within the specifications (see “Technical data of the FMC controller” starting from page 20).

**Electrostatic discharge**

Electrostatic discharges can be prevented using suitable protective measures. Protective measures include:

- Complying with applicable regulations related to electromagnetic compatibility
- Wearing anti-static wrist strap
- Connecting and disconnecting connectors only in the de-energized condition

**Ambient conditions**

Using FMC controller only in the specified ambient conditions (see “Technical data of the FMC controller” starting from page 20).

**Incorrect configuration**

Noting the specifications of the positioning systems to be connected.

**Damage**

Use the FMC controller only in perfect, technical condition.

**Modification or repair**

Do not modify or repair the controller by yourself (see “Repair” starting from page 3).

## 2.4 Responsibility of the operator

The FMC controller is used in the industrial sector. Hence the operator of the FMC controller has to comply with the legal obligations pertaining to work safety.

In addition to the safety instructions given in this manual, the safety regulations, accident prevention regulations and environment protection regulations applicable to the field of use of the FMC controller has to be complied with. The following are applicable in particular:

The operator has to:

- be aware of the applicable work safety regulations and, as part of a risk assessment, determine additional risks arising due to the special working conditions at the place where the FMC controller is used.
- Prepare a manual for operating the FMC controller.
- Check whether the operating manual prepared by him are in line with the latest rules and standards during the entire operating life of the FMC controller and modify them if necessary.
- Ensure that all the personnel who work with the FMC controller have read and understood this manual.
- Train the personnel at regular intervals and inform them of potential risks.
- Provide the necessary personal protection equipment.
- Check the functioning of the safety devices according to maintenance intervals mentioned in this manual.

## 2.5 Personnel requirements

The various tasks described in this manual require different qualifications of personnel who are entrusted with these responsibilities.

Only those personnel, who can be expected to carry out these tasks in a reliable manner, are permitted to work.

The qualifications of the personnel listed below for the various tasks are mentioned in this manual:

**Qualified technician**

Personnel having knowledge of relevant regulations and standards, owing to his professional training and experience.

Qualified technician has be in a position to:

- carry out the assigned tasks properly,
- identify potential risks independently,
- prevent physical injuries or damage to property through preventive measures.

**Electrician**

An electrician has knowledge of the relevant regulations and standards, owing to his technical training and experience.

An electrician has be in a position to:

- work on electrical equipment,
- identify and prevent potential risks independently.

An electrician is:

- trained specifically for the work environment in which he/she works,
- personnel of the operator or has been authorized by them to carry out the work.

# 3 Product information

This chapter includes the following topics:

## 3.1 Scope of supply

Delivery includes:

- Mains adapter
- USB connection cable
- Power cable
- Controller software on FTP server
  - FMC Quick Access
  - EasyMotion Studio
  - optional libraries for high-level language link
  - Backup (parameter files)

The following are available as accessories:

- Joystick
- Adapter for DIN rail mounting
- Communication cable for connection to FMC link (RS232 and CAN bus) and for daisy-chain wiring

## 3.2 Overview of the FMC controller and accessories

### Individual FMC controller

| Part number | Designation | Description |
|---|---|---|
| 789000:230.26 | FMC221 | Axis connections: 1<br>rated current per axis: 2 A |
| 789000:226.26 | FMC222 | Axis connections: 2<br>rated current per axis: 2 A |
| 789000:227.26 | FMC223 | Axis connections: 3<br>rated current per axis: 2 A |
| 789000:241.26 | FMC241 | Axis connections: 1<br>rated current per axis: 4 A |

### Individual power supply

| Part number | Designation | Description |
|---|---|---|
| 789000:233.26 | Desktop adapter | 24 V / 2,7 A |
| 789000:234.26 | Desktop adapter | 24 V / 5 A |
| 789000:244.26 | Desktop adapter | 36 V / 3,6 A |
| 789000:319.26 | DIN rail mains adapter[1)] | 24 V / 5 A |

[1)] Other versions on request.

### FMC controller set with mains adapter and USB cable

| Part number | Designation | Description |
|---|---|---|
| 789000:236.26 | FMC221<br>Tischnetzteil 24 V / 2.7 A | Axis connections: 1<br>rated current per axis: 2 A |
| 789000:235.26 | FMC222<br>Tischnetzteil 24 V / 5 A | Axis connections: 2<br>rated current per axis: 2 A |
| 789000:237.26 | FMC223<br>Tischnetzteil 24 V / 5 A | Axis connections: 3<br>rated current per axis: 2 A |
| 789000:238.26 | FMC241<br>Tischnetzteil 24 V / 5 A | Axis connections: 1<br>rated current per axis: 4 A |

### Individual software

| Part number | Designation | Description |
|---|---|---|
| 99.72892 | EasyMotion Studio | Commissioning software for setup settings (control parameters, safety devices etc.) as well as creating program functions and stand alone applications |
| 99.72893 | LabView libraries | |
| 99.73055 | C++, C#, C, Delphi, Visual Basic libraries for MS Windows | |
| 99.72884 | C++, C#, C, Delphi, Visual Basic libraries for Linux | |

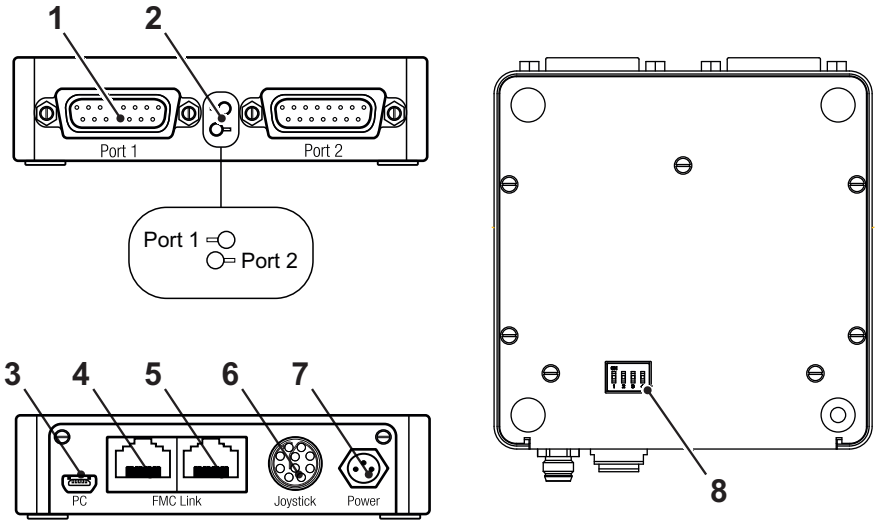
### Joystick

| Part number | Designation | Description |
|---|---|---|
| 789100:299.90 | 2-axis joystick | 2 keys, Mach IV with cable (3 m) |
| on request | 3-axis joystick on request | 3 keys, Mach IV with cable (3 m) |

### DIN rail adapter

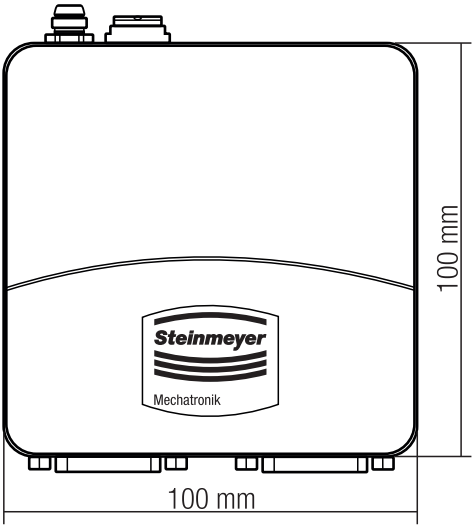
| Part number | Designation | Description |
|---|---|---|
| on request | DIN rail adapter | for DIN rail mounting |

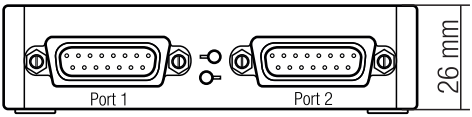
## 3.3 Front and rear view of the FMC controller



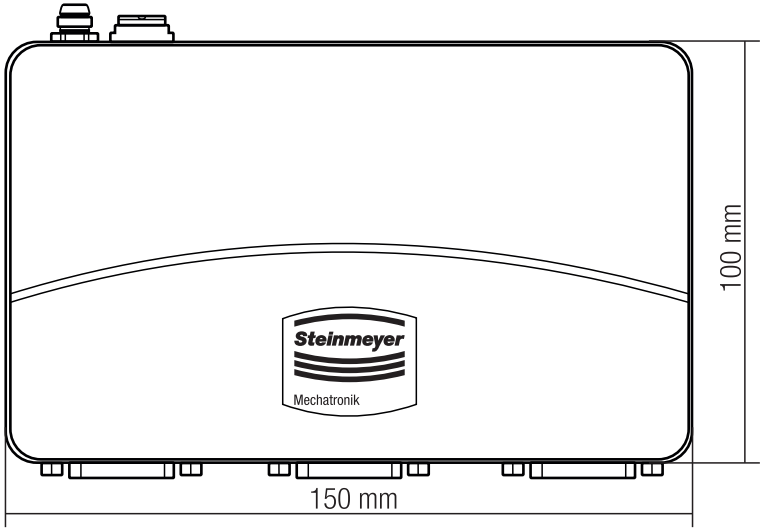

| | Designation | Description |
|---|---|---|
| **1** | Axis connection | Axis system connections<br>(Number depends on the controller design) |
| **2** | LED | Status of the corresponding axis<br>blue: logic voltage is switched on, there is no fault<br>red: axis fault |
| **3** | PC port | Communication via USB port |
| **4** | FMC Link 1 (left) | Communication via RS232 and CAN bus |
| **5** | FMC Link 2 (right) | Communication to next controller<br>(Daisy-chain wiring CAN bus) |
| **6** | Joystick port | Analog and digital input for all axes |
| **7** | Power supply | Power supply of the controller |
| **8** | DIP switch | Switching the CANopen or TMLCAN protocol on and off<br>as well as switching the bus terminating resistor on and off |

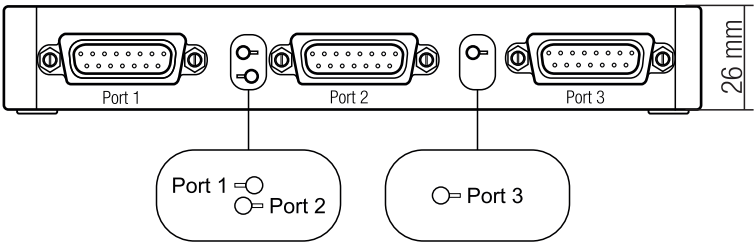
## 3.4 Dimensions 1- and 2-axis controller



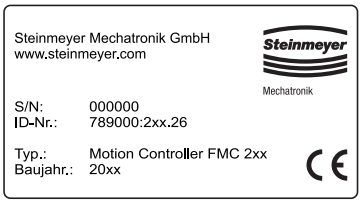
## 3.5 Dimensions 3-axis controller



## 3.6 Type label

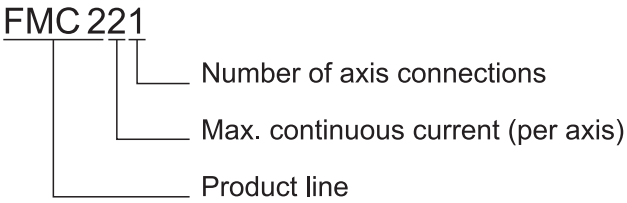
The label is at the bottom of the positioning system. It contains the following information:




- Name of manufacturer
- Serial Number
- Part Number
- Type designation
- Year of manufacture
- CE marking

## 3.7 Type code

The type code designates the type of the FMC controller as well as the number of axis connections and the maximum continuous current.



# 4 Technical Data

This chapter includes the following topics:

## 4.1 Technical data of the FMC controller

### Dimensions

| | | | |
|---|---|---|---|
| Length x Width x Height | FMC221, FMC222, FMC241 | 100 x 100 x 25 | mm |
| | FMC223 | 150 x 100 x 25 | mm |

### Protection category

| | | |
|---|---|---|
| Device protection category | IP41 | |

### Ambient conditions

| | | Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| Outside temperature | | 0 | | 40 | °C |
| Storage temperature | | -40 | | 85 | °C |
| Humidity | [non-condensing] | 0 | | 90 | % |

### Power supply logic

| | | Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| Supply voltage | [rated values] | 7 | | 36 | V |

### Power supply motor

| | | Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| Supply voltage | [rated values] | 9 | | 36 | V |
| Supply current | [operation] FMC241[1)] | -10 | +/-4 | +10 | A |
| | [operation] FMC221, FMC222, FMC223[2)] | -3,2 | +/-2 | +3,2 | A |

### Output current motor (A/A+, B/A-, C/B+, BR/B-)

| | | Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| Peak output current | [max. 2,5 s] FMC241[1)] | -10 | | +10 | A |
| | [max. 24 s] FMC221, FMC222, FMC223[2)] | -3,2 | | +3,2 | A |

### Digital inputs (IN0, IN2/LSP, IN3/LSN)

| | | Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| Input voltage | [Logic LOW] | | 0 | 0,8 | V |
| | [Logic HIGH] | 2 | 5...24 | | V |
| Input frequency | | 0 | | 150 | kHz |
| Mode compliance | | TTL / CMOS / LVTTL (3,3 V) / Open Collector / NPN / 24 V outputs | | | |
| Default state | Input floating (circuit isolated) | Logic HIGH | | | |
| Floating voltage (not connected) | | | 3 | | V |

### Encoder inputs (A/A+, A-, B/B+, B-, Z/Z+, Z-)

| | | Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| Counting frequency | [differential mode or single ended driven by push-pull (TLL/CMOS)] | 0 | | 10 | MHz |
| Differential mode compliance | [for full RS422 compliance] | TIA/EIA-422-A | | | |

### Sin-Cos encoder inputs (Sin+, Sin-, Cos+, Cos-)

| | | Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| Input voltage, differential | [Sin+ to Sin-,Cos+ to Cos-] | | 1 | 1,25 | Vpp |
| Interpolation resolution | [depends on the software settings] | | | 11 | bits |
| Signal frequency | [Sin-Cos, interpolation] | 0 | | 450 | kHz |

### Analog 0...5 V inputs (REF)

| | | Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| Input voltage | [operational range] | 0 | | 4,95 | V |
| Input resistance | [GND] | | 30 | | kΩ |
| Resolution | | | 12 | | bits |

### RS-232

| | | Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| Bitrate | [depends on the software settings] | 9600 | | 115200 | Baud |
| Standards compliance | | TIA/EIA-232-C | | | |

### CAN bus

| | | Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| Bitrate | [depends on the software settings] | 125 | | 1000 | kbps |
| Bus length | [1 Mbps] | | | 25 | m |
| | [800 Kbps] | | | 50 | m |
| | [500 Kbps] | | | 100 | m |
| | [≤ 250 Kbps] | | | 250 | m |
| Number of CAN nodes/ drives | | | | 125 | |
| Standards compliance | | ISO 11898, CiA® 301 v4.2, CiA® 402 v3.0 | | | |
| Terminating resistor | [between CAN-Hi, CAN-Lo] | 120 Ω switchable (see “Integrating the FMC controller in the CAN network” starting from page 44) | | | |

### Supply output (+5 V)

| | Min. | Typ. | Max. | |
|---|---|---|---|---|
| +5 V output voltage [current sourced = 250 mA] | 4,8 | 5 | 5,2 | V |
| +5 V output current | 250 | 350 | | mA |
| Short circuit protection | not available | | | |
| Overvoltage protection | not available | | | |

[1] iPOS3604
[2] iPOS3602

## 4.2 Drive control system

### Joystick operation

A joystick operation can be set up for speed control and position control. This usually requires a special program saved on the motion controller. This will be provided by Steinmeyer Mechatronik on request.

### Control loops

The following control loops are available:

- Current control (torque)
- Position control (position)
- Speed control (speed

Depending on the availability of an encoder or measuring system, all the controllers can work simultaneously in one loop or, depending on the system configuration, work independently or be combined.

Proportional, integral and differential parameters, as well as the integral limit can be adjusted to customize the control performance. Other parameters are available for optimizing the axis performance.

### Micro-step operation

A micro-step operation of up to 512 micro-steps per full step is possible for stepper motor operation.

## 4.3 Combination options

| | DC motor | Brushless motor | 2 phase stepper motor | 3 phase stepper motor |
|---|---|---|---|---|
| Analog encoder | | **x** | | |
| Incremental encoder | **x** | **x** | **x** | **x** |
| Closed control loop | **x** | **x** | **x** | |
| Open control loop | | | **x** | **x** |
| Brake / output | **x** | **x** | **x** | **x** |

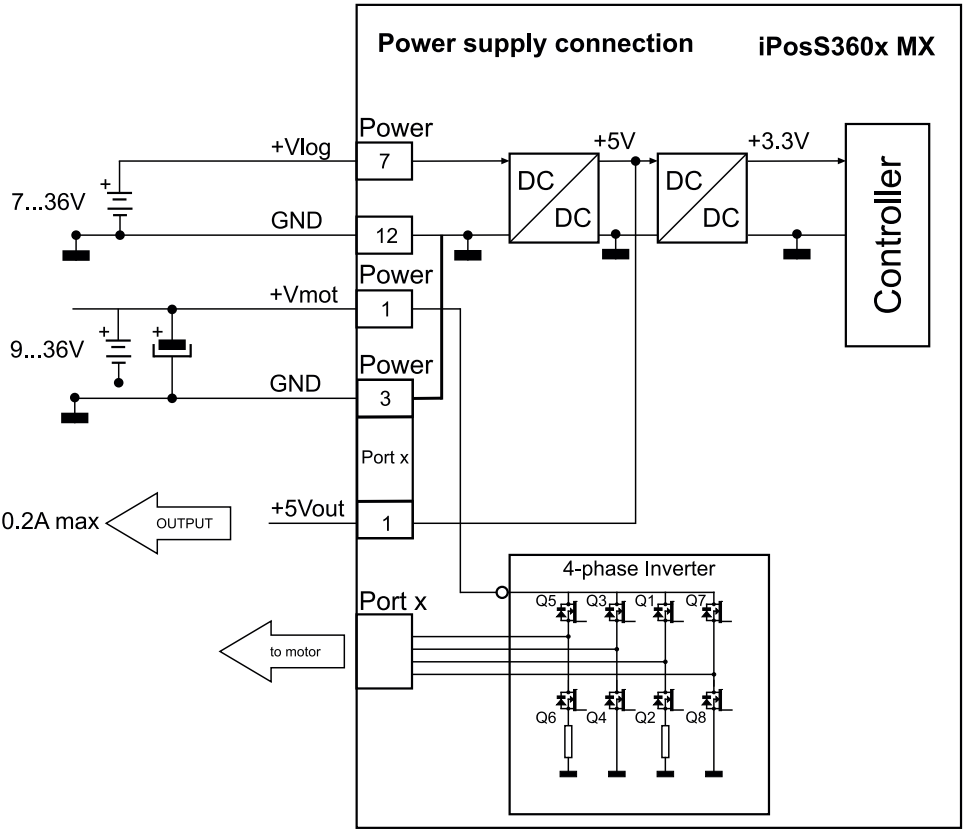
## 4.4 System requirements for software

| | |
|---|---|
| FMC Quick Access | • Windows 8/ 10/ 11<br>• Minimum Hard Disk 5 MB;<br>• If runtime engine is required, then 250 MB |
| EasyMotion Studio II | • 128 MB RAM<br>• Hard Disk 100 MB<br>• Windows 8/ 10/ 11 |
| TML Libraries | • 128 MB RAM<br>• Maximum Hard Disk 30 MB<br>• Windows 8/ 10/ 11/ Linux<br>• C/ C++/ C#/ Visual Basic/ Delphi/ MatLab/ LabView |

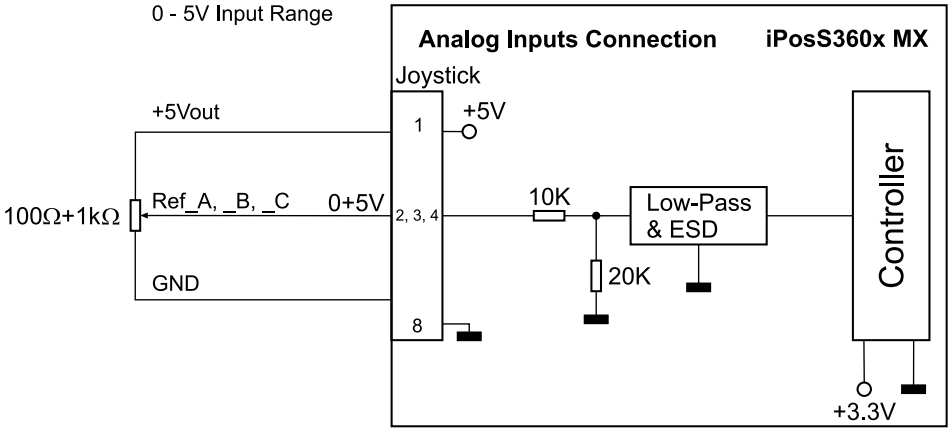
# 5 Wiring description

This chapter includes the following topics:

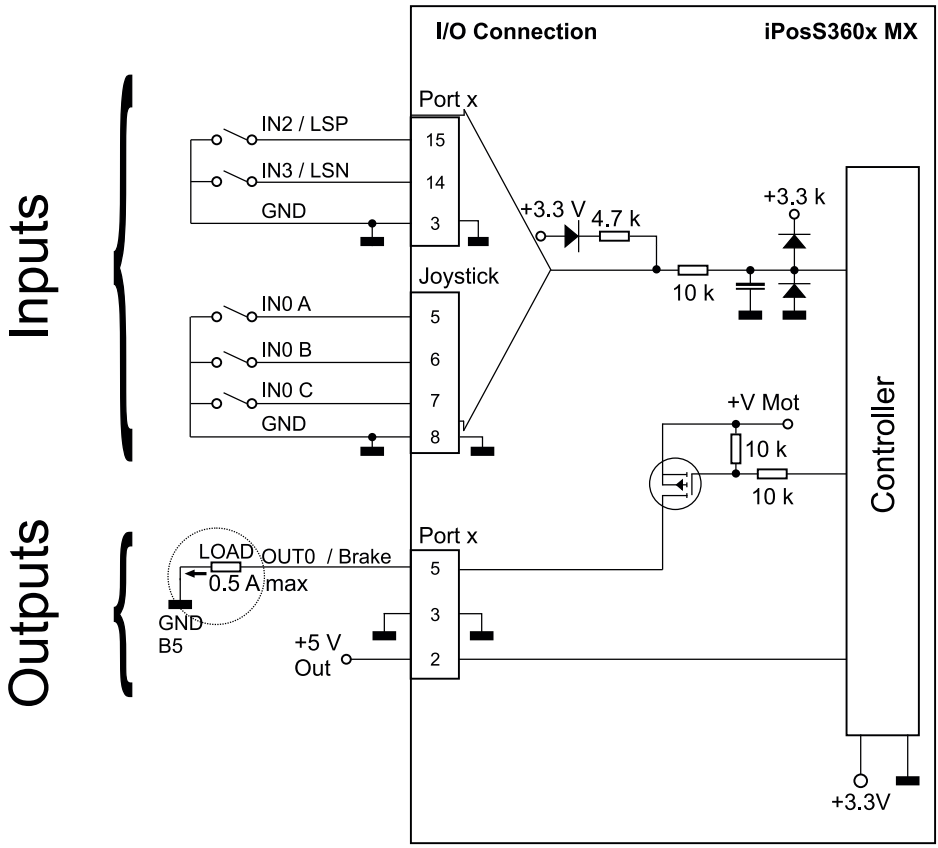
## 5.1 Connecting the power supply



## 5.2 Connecting the analog input



## 5.3 Connecting the digital I/O




**INFORMATION**

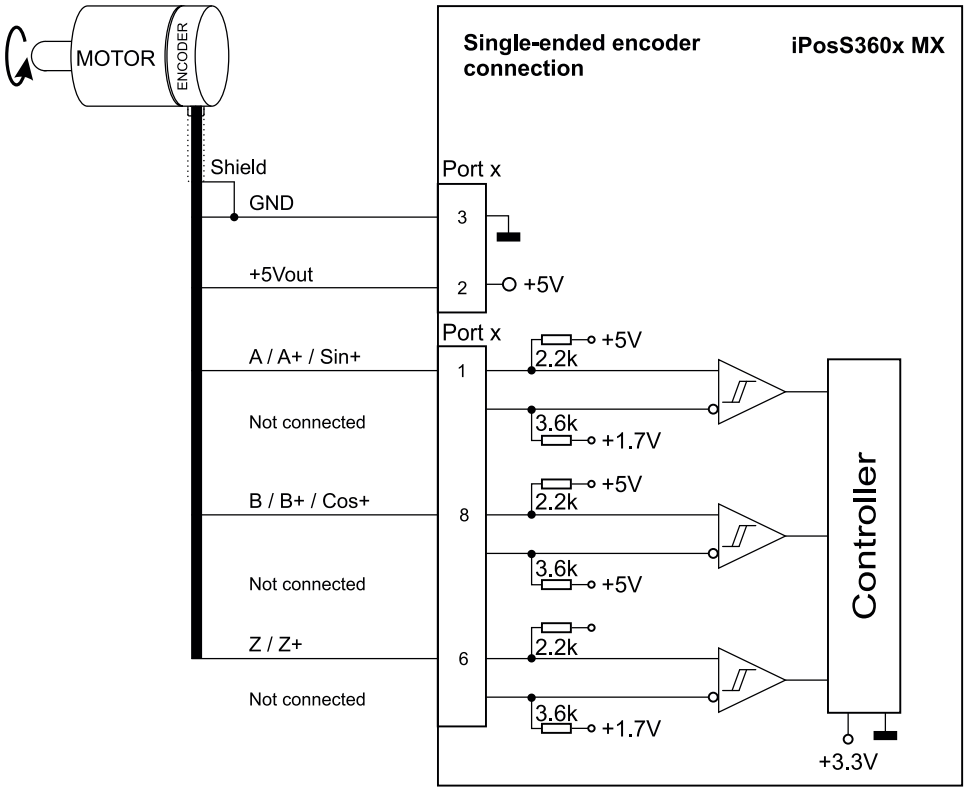
The inputs are compatible with TTL (5V), LVTTL (3.3V).

The output Out 0 on port x is connected to the Vmot level (typically 24 V).

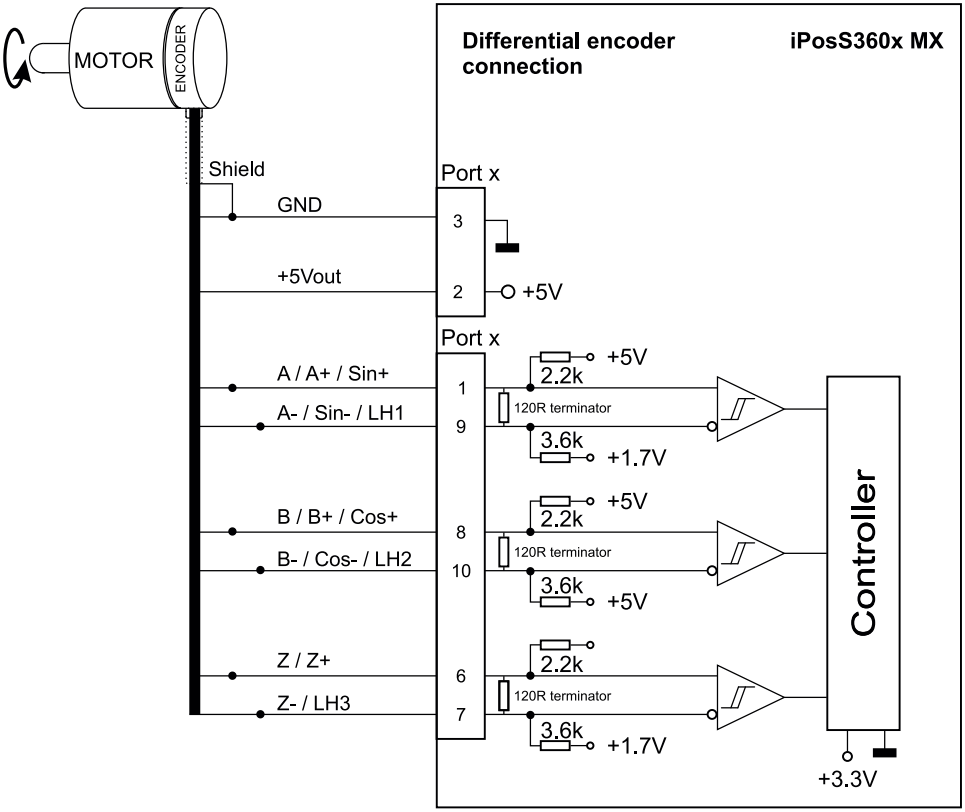
**Note:**

The level depends on the mains adapter used (see Vmot circuit). The maximum current is 0.5 A continuously and increases up to 1 A pulsed for less than 5 seconds.

## 5.4 Connecting an incremental measuring system

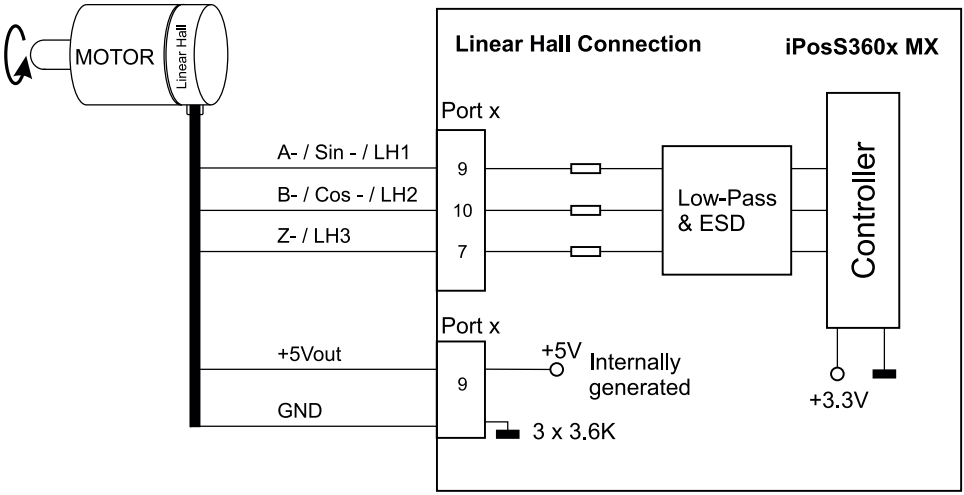


## 5.5 Connecting an differential measuring system

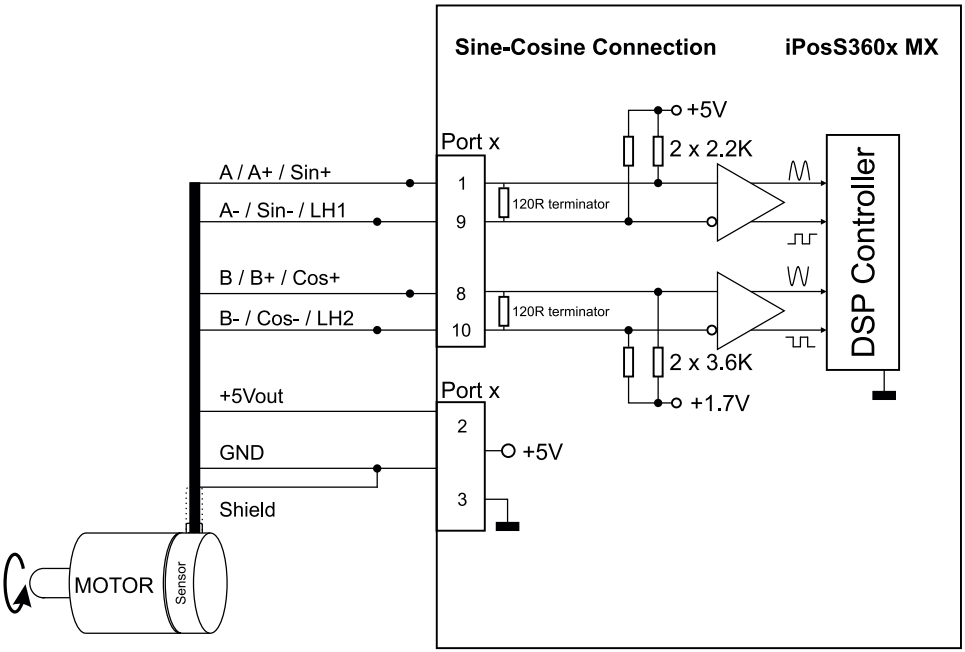



**INFORMATION** 120 ohm termination resistors are already integrated in the FMC controller (see circuit).

## 5.6 Connecting a linear hall sensor



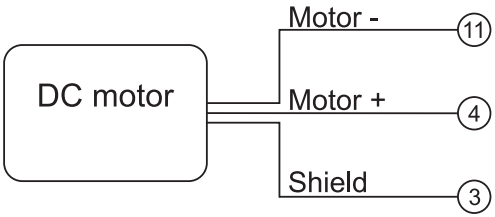
## 5.7 Connecting an analog encoder (sine-cosine)



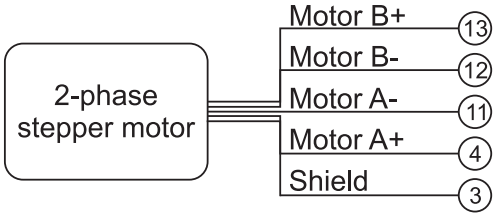
## 5.8 Connecting motors

The following overview shows the various connections of different motor types to the FMC controller:

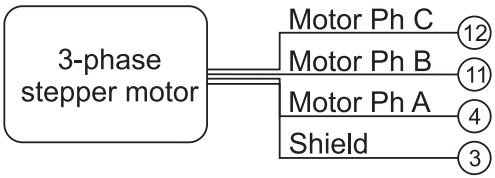
**Connecting a DC motor**



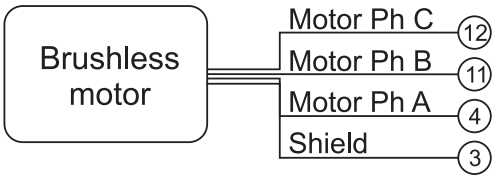

**Connecting a 2 phase stepper motor**




**Connecting a 3 phase stepper motor**




**Connecting a brushless motor**



## 5.9 Wiring instructions

If the position sensor has a differential output signal and has a positive and negative signal, then connect both the signals. Use a twisted pair for each differential signal group as follows:

- A + / Sin + with A- / Sin- / LH1
- B + / Cos + with B- / Cos- / LH2
- Z + with Z- / LH3.

Use another twisted pair for the 5V power supply and the ground (GND).

When using either a single ended encoder or a Hall sensor, capacitive coupling noises may arise if the cable lengths are more than 1 meter. Hence always use shielded cables.

Connect the cable shield to the ground (GND) only at one end. For example, you can use the GND pin of the FMC controller. Do not connect the shield at both ends.

Insert a decoupling capacitor close to the FMC controller between the + 5V and GND wires, if the 5V power supply output of the FMC controller is used by another device such as an encoder and the connection cable is longer than 5 meters.
The capacitor value can be 1...10 µF at 6.3 V.

# 6 Setting up and connecting the FMC controller

This chapter includes the following topics:

## 6.1 Set up options

You can set up or mount the FMC200 series controllers in two ways:

- on a smooth, clean and stable surface
- DIN rail mounting

## General Notes

### Disconnection

The FMC controller has to be disconnected for any installation and connection work.

### Setup conditions

The surface has to be even for setting up or mounting.

## 6.2 Connecting the FM controller to the positioning system

**WARNING**

**Risk of injury and property damage due to incorrect commissioning!**

Incorrect commissioning can result in serious injuries and considerable property damage.

- Route the cables in such a way that they do not pass through the action zone of the connected devices and people do not get caught in them.
- Note the permissible bending radius of cables.

1. Connect the axes of the positioning system to the axis ports of the controller (depending on the design port 1, port 2 and port 3).
2. Connect the computer to the USB or RS232 interface of the controller (PC port or FMC link).
3. Connect the controller to the mains adapter (power port).
4. Connect the mains adapter to the power supply.

**INFORMATION**

FMC controllers can also be used for setting up a CAN network (see “Integrating the FMC controller in the CAN network” starting from page 44).

# 7 Integrating FMC controllers in CAN networks

This chapter includes the following topics:



**INFORMATION**

Multiple connection examples for setting up a CAN network are given in the Appendix of this operating manual (see “Overview of connections” starting from page 54).

FMC controllers can also be integrated in CAN networks. Two communication protocols are supported here:

**TMLCAN**

TMLCAN is the CAN bus communication protocol of Technosoft (CAN 2.0 B, 29-bit identifier).

**CANopen®**

Communication protocol based on CAN, which supports the communication profile CiA® 301 v4.2 and CiA® 402 v3.0 (CAN 2.0A, 11-bit identifier).

Communication is possible in parallel using the TechnoCAN protocol.

**INFORMATION**

The desired communication protocol can be selected using a DIP switch at the bottom of the FMC controller (see “Integrating the FMC controller in the CAN network” starting from page 44).

## 7.1 CAN communication parameters

CAN communication parameters include:

- Address
- Baud rate
- Scheduling

The following section gives details on the parameters of address, baud rate, and scheduling, to establish the CAN communication of the FMC controller.

### Adress

The following address ranges are available:

TMLCAN address range: 1 to 195 and 255

CANopen® address range: 1 bis 127

The addressing is carried out via the commissioning software EasyMotion Studio. Each axis is given a separate address from the bus address range.

**INFORMATION**

Avoid multiple assignment of addresses to different axis. This can lead to communication problems on the CAN bus.

When assigning addresses, note that several positioning axes can be connected to one FMC controller.

### Baud rate

The following baud rates are available:

Baud rate: 125 Kbps - 1 Mbps

The baud rate is configured using the programming software EasyMotion Studio.

**INFORMATION**

Please note that the baud rate has to be the same for all the FMC controllers connected in the network.

### Termination

The first and last node of the CAN network has to be terminated with a termination resistor of 120 Ω. The resistance is connected using the DIP switch of the respective FMC controller (see see “Integrating the FMC controller in the CAN network” starting from page 44).

## 7.2 Integrating the FMC controller in the CAN network

**WARNING**

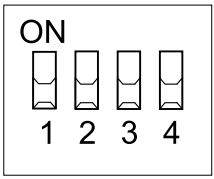
**Risk of injury and property damage due to incorrect commissioning!**

Incorrect commissioning can result in serious injuries and considerable property damage.

- Route the cables such that they do not pass through the action zone of the connected devices and people do not get caught in them.
- Note the permissible bending radius of cables.

1. Connect the axes of the positioning system to the axis ports of the controller or all the controllers being used (depending on the design port 1, port 2 and port 3).
2. Use the DIP switch at the bottom of the FMC controller to configure the CAN bus.
   You can configure both the CAN protocol as well as the termination resistor.

The overview shows the possible DIP switch settings:




| | Position DIP ON | Position DIP OFF |
|---|---|---|
| Switch 1 | enable CANopen® protocol | enable TMLCAN protocol |
| Switch 2 | enable bus termination resistor | disable bus termination resistor |
| Switch 3 | not used | not used |
| Switch 4 | not used | not used |

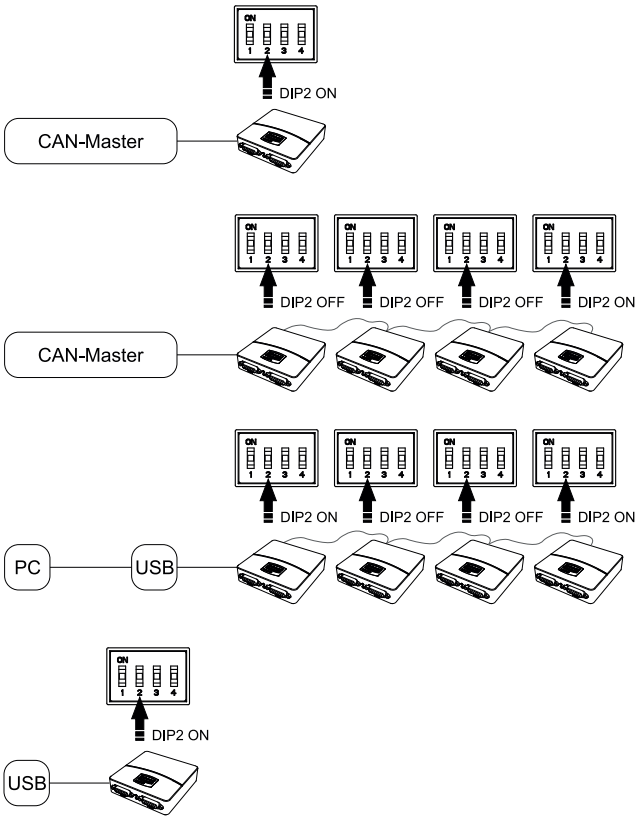
3. Connect the computer to the USB or RS232 interface of the first controller (PC port or FMC link).
4. Connect the controller to the mains adapter (power port).
5. Connect the mains adapter to the power supply.

**INFORMATION**

The bus terminating resistor is enabled by default. It has to be disabled if several FMC controllers are connected in a bus system.

If using a USB-CAN converter, then it represents the first node and it usually comes with a termination resistor.

## Examples



# 8 Commissioning software

This chapter includes the following topics:



**INFORMATION**

The system requirements for the individual software applications are given in chapter technical data (see “System requirements for software” starting from page 25).

**INFORMATION**

FMC controllers use servo controller manufactured by Technosoft. However, they are described here to provide adequate information about the FMC controller.

## 8.1 Software applications for FMC controller

The following software applications can be downloaded from our FTP server:

### FMC Quick Access

FMC Quick Access is the commissioning software. An appropriate configuration file provided for the supplied positioning system. After installing the program and loading the configuration file during startup, you can execute the initial movements in the positioning system.

FMC Quick Access has the following properties:

- enables absolute and relative positioning of the positioning system
- Referencing (various methods)
- Status display Move to limit switch
- Speed and acceleration settings
- Displaying the current position of the positioning system
- Creating sequence of movements

### EasyMotion Studio

EasyMotion Studio is the programming software of Technosoft. The FMC controller can fully configured, programmed and read using it.

The program uses the Technosoft Motion Language (TML).

**INFORMATION**

A document for the programming software EasyMotion Studio is available for download on our FTP server.

### Technosoft Motion Language Library (TML-LIB)

The available libraries are used to connect to various high-level languages such as C, C++, C#, Visual Basic, Delphi, or LabVIEW (part numbers for ordering are given in the Chapter Product information (see “Individual software” starting from page 14).

The libraries include movement control functions, function calling, reading and writing of variables. Many examples are also included with the libraries which help you to get started. Details on the integration and all the available functions can be found in the respective library documentation.

**INFORMATION**

You can find documentation on the available libraries for download on our FTP server.

# 9 Maintenance and cleaning

This chapter includes the following topics:

## 9.1 Maintenance

The FMC200 series controllers do not require any maintenance. Opening the device implies loss of warranty.

## 9.2 Cleaning

**DANGER**

**Damage caused by incorrect cleaning agent!**

Incorrect use of cleaning agents can result in considerable material damage.

- Do not use strong cleaning agents, especially acids or alkalis.
- Keep the cleaning agents away from live parts.

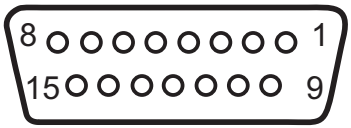
If necessary, clean the controller housing using a clean, lint-free cloth.

# 10 Annex

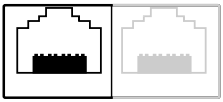
This chapter includes the following topics:

## 10.1 Overview of connections

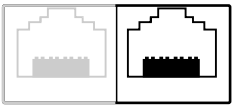
### Axis connection

| Front view connector | Pin | Pin Assignment | |
|---|---|---|---|
|  D-Sub 15 pin female connector | 1 | A + | Encoder |
| | 2 | 5V | |
| | 3 | GND / Brake - | |
| | 4 | Motor A | |
| | 5 | 24V Out / Brake + | |
| | 6 | I + | Encoder |
| | 7 | I - | Encoder |
| | 8 | B + | Encoder |
| | 9 | A - | Encoder |
| | 10 | B - | Encoder |
| | 11 | Motor B | |
| | 12 | Motor D | |
| | 13 | Motor C | |
| | 14 | Limit switch - | |
| | 15 | Limit switch + | |

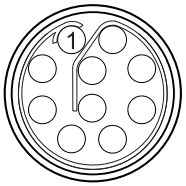
### FMC Link 1-Anschluss (left)

| Front view connector | Pin | Pin Assignment |
|---|---|---|
|  FMC Link 1 (left) | A1 | CAN_HI |
| | A2 | CAN_LO |
| | A3 | GND |
| | A4 | TX_232 |
| | A5 | RX_232 |
| | A6 | GND |

### FMC Link 2-Anschluss (right)

| Front view connector | Pin | Pin Assignment |
|---|---|---|
|  FMC Link 2 (right) | A1 | CAN_HI |
| | A2 | CAN_LO |
| | A3 | GND |
| | A6 | GND |

### Joystick

| Front view connector | Pin | Pin Assignment | |
|---|---|---|---|
|   10 pin female connector ODU Mini-Snap BG1 | 1 | 5 V | |
| | 2 | REF_A | analog |
| | 3 | REF_B[1)] | analog |
| | 4 | REF_C[2)] | analog |
| | 5 | IN0_A | digital IN |
| | 6 | IN0_B[1)] | digital IN |
| | 7 | IN0_C[2)] | digital IN |
| | 8 | GND | |

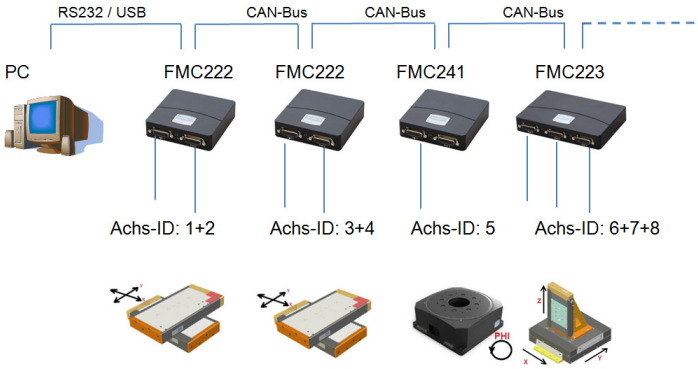
### Power supply

| Front view connector | Pin | Pin Assignment |
|---|---|---|
|   3 pin male connector M8 | 1 | V_Motor (9...36 V) |
| | 2 | V_Logik (9...36 V) |
| | 3 | GND |

[1)] Only available with 2- and 3-axis controller.
[2)] Only available with 3-axis controller.

## 10.2 Combination options

The following overview shows possible combinations of FMC200 controllers and different positioning systems.



# 11 Glossary

## B

| | |
|---|---|
| Brake | A brake is used to hold the load in the de-energized state of the motor. |

## C

| | |
|---|---|
| CAN | Controller Area Network<br>Serial bus system for networking controllers. |
| CiA | CAN in Automation e.V.<br>Users and manufacturers association for the spreading and standardization of CAN. |
| CiA® 301 v4.2 | CANopen application layer and communication profile<br>Standard for application layer and communication. |
| CiA® 402 v3.0 | CANopen drives and motion control device profile<br>Standard for axis controllers on the CAN bus. |
| Commutation | Method of energizing the motor. |
| Control parameters | Parameters that affect the control loop (position, speed, current). |
| Counts | Internal counting pulse for the connected encoder or measuring system after quadrature and interpolation (1 count = internal resolution of measuring system). |

## D

| | |
|---|---|
| Daisy-Chain wiring | Layout and wiring of controllers and axis systems via the FMC link. |
| Drag error | An excessively high difference between the actual and set-point value, which is detected by the safety device. |

## F

| | |
|---|---|
| Field bus | see CANopen |
| FMC-Link | Interface for connecting the CAN bus and / or RS232. Is also used to connect or chain other controllers. |

## I

| | |
|---|---|
| Index | Issued by encoder or measuring system and is used for referencing the system. |

## J

| | |
|---|---|
| Joystick | Input device for manually operating the positioning system. |

## O

| | |
|---|---|
| Overcurrent | A very high current in the motor winding, which is detected by the safety device. |

## R

| | |
|---|---|
| Reset | Restarting the controller. |

## S

| | |
|---|---|
| Short circuit | Electrical connection between two phases in this case. |
| Sin-Cos / Sine-Cosine | Describes the traces of the analog encoder with 90° offset. |

# 12 FAQ

**INFORMATION**

Please contact our support team if you are unable to find a solution to your problem in the answers to frequently asked questions given here:

**support@steinmeyer-mechatronik.de**

**Why is it not possible to establish communication with the controller via the USB interface?**

- The driver was probably not installed correctly. The supplied driver should be used.
- Problems may occur when using a USB3.0 interface with Windows 7 operating system. An updated USB driver may help in such cases.
- The USB connection cable may be too long.

**Why is the blue LED on the controller not glowing?**

- The logic voltage at the power input is not connected or is less than the allowed voltage level.

**Why is the red LED on the controller glowing?**

- The red LED indicates a fault in the respective axis controller. The fault may have been caused by overvoltage, drag error, short circuit or a low voltage of the motor power supply. For more details, read the status register. This can be done using the commissioning software EasyMotionStudio or in your application.

**How can the FMC controller communicate with a parent controller?**

- Various libraries are available for this in the operating system Windows or Linux for LabVIEW, C, C++, C#, VB or Delphi.
  The robust field bus can be used via CAN or CANopen.
  An external reference (analog voltage) via the existing analog input per axis also allows a position or speed to be specified.

**What is the resolution of the connected measuring system?**

- Information about the resolution of the measuring system are given in the assembly manual of the positioning system.

**Why does the positioning system oscillate when connected?**

- The control parameters may have to be adjusted due to the screwed connection, ground surface or various load conditions. The control parameters can be adjusted using the commissioning software EasyMotionStudio.

**How can the safety devices (overcurrent, drag error, etc.) be configured?**

- Safety devices can be customized using the commissioning software EasyMotionStudio (Drive Setup).

**How to change the axis ID of the respective axis?**

- The axis ID can be changed using the commissioning software EasyMotionStudio. For this purpose, the supplied project file has to be opened and the corresponding parameters have to be changed in the DriveSetup.

**How can a safety concept be implemented with the controller?**

- The controller has a separate motor supply, which provides power to the output stages. This can be switched off separately using a safety relay.

  Controller versions having a certified Safe Torque Off input (STO input) are available upon request from Steinmeyer Mechatronik.

**How to disable the auto-start of the controller program?**

- To do this, the value 0x0001 has to be entered in the address 0x4000 using the commissioning software EasyMotionStudio in the memory window. The auto-start is automatically enabled when the program is resent (except for CANopen protocol).

**Why is the auto-start program not starting?**

- A fault may have been triggered or detected, which is stopping the program. This may be shown by the red LED display.
- The controller is configured for the CANopen protocol via the jumpers. This does not allow an autostart.