

# Electrical Rotary Module SCHUNK Torque Motor Type STM 48V

## Assembly and Operating Manual





Translation of the original manual

Dear Customer,

Congratulations on choosing a SCHUNK product. By choosing SCHUNK, you have opted for the highest precision, top quality and best service.

**You are going to increase the process reliability of your production and achieve best machining results – to the customer’s complete satisfaction.**

**SCHUNK products are inspiring.**

Our detailed assembly and operation manual will support you.

Do you have further questions? You may contact us at any time – even after purchase. You can reach us directly at the mentioned addresses in the last chapter of these instructions.

Kindest Regards,

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# 1 About this manual

## 1.1 Purpose/validity

This manual is part of the module and describes the safe and proper use during all phases of operation.

This manual is valid only for the module specified on the front page.

## 1.2 Target groups

Target group	Task
Manufacturer, operator	<ul style="list-style-type: none"> <li>➔ Keep this manual available for the personnel at all times.</li> <li>➔ Require personnel to read and observe this manual and the applicable documents, especially the safety notes and warnings.</li> </ul>
Skilled personnel, fitter	<ul style="list-style-type: none"> <li>➔ Read, observe and follow this manual and the applicable documents, especially the safety notes and warnings.</li> </ul>

Table 1

## 1.3 Applicable documents

You can find the following documents on our homepage:

Document	Purpose
Catalog	Technical data or application parameters of the module and information on accessories. The last version is always valid.
Software manual for MotionControl (only for using the MCS-12 controller)	Includes more detailed information about the firmware for the MCS-12 controller, which is required for controlling/configuring the STM torque motor.
General terms of business	Including notes on the warranty.

Table 2

## 1.4 Symbols in this manual

To give you quick access to information, the following symbols will be used in this guide:






Symbol	Designation
 <b>DANGER</b>	Dangers for persons. Nonobservance causes death or serious injuries.
 <b>WARNING</b>	Dangers for persons. Nonobservance can cause death or serious injuries.
 <b>NOTICE</b>	Information on avoiding material damage, for explanation or to optimize the work processes.
✓	Prerequisite for a handling instruction.
➔	Handling instruction, also measures in a warning or note.
1. 2. 3. ...	Step-by-step handling instruction. ➔ Observe the order.
 10	Component/spare part represented in a graphic.
 /10/	Part/detail shown in a graphic which is part of a spare part or which must be provided by the customer.
(10), (/10/)	Reference in the text or in a handling instruction to a part that is represented in a graphic.

Table 3

## 1.5 Terms used in this manual

Term	Meaning
Controller	Frequency converter, controller, AC converter, servo converter, control system

Table 4

## **2 Basic safety notes**

### **2.1 Intended use**

The STM was designed to rotate loads, workpieces and objects. The STM may only be operated in combination with a controller.

The module is intended for installation in a machine. The requirements of the applicable guidelines must be observed and complied with.

The module may be used only in the context of its defined application parameters.

Any other use or use exceeding that specified is an infringement of use for intended purpose. The manufacturer bears no liability for damage resulting from such use.

To use this module as intended, it is also essential to comply with the manufacturer's specifications regarding commissioning, assembly, operation and ambient conditions.

### **2.2 Environmental and operating conditions**

- ➔ The module may be used only in the context of its defined application parameters (see chapter 5, page 17 and catalog).
- ➔ Make sure that the module's range of application is outside the explosive area.
- ➔ Make sure that the environment is clean and the ambient temperature corresponds to the specifications per the catalog.
- ➔ Make sure that the environment is free from splash water and vapors as well as from abrasion or processing dust. Excepted are modules that are designed specially for contaminated environments.

## 2.3 Controlled production

The module represents the state of the art and the recognized safety rules at the time of delivery. However, it can present risks if, for example:

- The module is not used in accordance with its intended purpose.
- The module is not installed or maintained properly.
- The EC Machinery Directive, the VDE directives, the safety and accident-prevention regulations valid at the usage site, or the safety and installation notes are not observed.

### 2.3.1 Protective equipment

When the module is in use, protective equipment must be used to catch flying parts or to switch the drive into a safe mode should the module or part of the module fail.

The protective equipment must comply with the requirements of the EC Machinery Directive and IEC/EN 60204-1.

➔ The STM's housing must be grounded via the controller.

### 2.3.2 Special standards

The following harmonized standards were adhered to:

- Industrial scientific and medical (ISM) radio-frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measurement (IEC/CISPR 11:2003 + A1:2004, modified + A2:2006); German version EN 55011:2007 + A2:2007 class A (this is equivalent to EN 61000-6-4:2004)
- Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments (IEC 61000-6-2:2005); German version EN 61000-6-2:2005

### 2.3.3 Constructional changes, attachments, or modifications

Additional drill holes, threads, or attachments that are not offered as accessories by SCHUNK may be attached only with permission of SCHUNK.

Non-authorized modifications results in the exclusion from product liability.

### **2.3.4 After-sales service**

SCHUNK's after-sales service is available for technical information and questions concerning SCHUNK products.

- ➔ Call the contact. (see chapter 18, page 78)
- ➔ State the ID of the module. (see chapter 6.1, page 20)

## **2.4 Obligations of the manufacturer/operator**

### **2.4.1 Choice of personnel and personnel qualifications**

Work on the module may be carried out by authorized personnel only. The legal minimum age must be observed.

The assembly, commissioning and repair of the module may be performed only by trained specialist personnel who have been instructed how to perform the said work activities.

The manufacturer/operator must ensure that the personnel are adequately and appropriately trained to perform work on the module assigned to them.

### **2.4.2 Organizational measures**

- ➔ Make sure that at least one copy of this manual is kept in the direct vicinity of the machine/system where the module is installed, and that it is accessible for the relevant persons.
- ➔ Ensure that personnel have read and understood this manual, especially chapter 2 "Basic safety notes".
- ➔ Provide instructions about and observe the safety and accident-prevention regulations that apply at the site of use.
- ➔ Provide instructions about and observe the environmental protection regulations that apply at the site of use.
- ➔ Provide protective equipment.
- ➔ Check the personnel's conduct regarding the awareness of safety and hazards from time to time.

### **2.4.3 Disposal**

- ➔ Send components of the module for recycling or properly dispose of them according to the local regulations.

## **2.5 Personnel qualification**

### **2.5.1 Safety-conscious working**

- ➔ Avoid any manner of working that may interfere with the function and operational safety of the module.
- ➔ Observe the safety and accident-prevention regulations valid at the usage site.
- ➔ Wear protective equipment.

### **2.5.2 Safety measures during transport**

- ➔ When transporting and handling very heavy modules, take the corresponding safety precautions.
- ➔ Make sure the cables have strain relief.

### **2.5.3 Safety measures during operation**

- ➔ Only operate the module when all protective equipment has been fitted and is in full working order.
- ➔ Check the module at least once per shift for externally visible damage and faults.
- ➔ Report any changes including changes in operational behaviour to the responsible place/persons immediately. If necessary immediately shut down and lock out the machine/system.

### **2.5.4 Behaviour in the event of faults or emergencies**

If faults on the module occur which could impair safety or if the operational performance indicates the occurrence of a fault:

- ➔ Shut down the machine/system immediately, lock it and report the fault to the responsible place/persons.
- ➔ Faults may be eliminated by trained and authorized personnel only.
- ➔ Only restart the machine/system when the cause of the fault has been eliminated.

## 2.6 Notes on particular risks

### **Risk of injury from objects falling and being ejected!**

- ➔ Provide protective equipment to prevent objects from falling or being ejected, such as processed workpieces, tools, chips, fragments, rejects.
- ➔ Adapt the operating conditions, e.g. reduce the cycle time.

### **Risk of injury when the machine/system moves unexpectedly!**

- ➔ Do not move parts by hand when the energy supply is connected.
- ➔ Do not reach into the open mechanism or the movement area of the module.
- ➔ Remove the energy supplies before installation, modification, maintenance, or adjustment work.
- ➔ Perform maintenance, modifications, and additions outside the danger zone.
- ➔ For all work, secure the module against accidental operation.

### **Risk of injury due to moving parts if these are controlled incorrectly!**

Possible causes for control errors:

- Incorrect cabling or wiring
- Removal of safety devices
- Software errors
- Sensor and signal transmitter errors
- Entry of incorrect parameters prior to start-up
- Defective module

**Risk of burns due to contact with hot surfaces!**

During operation, the surface temperature of the STM may exceed +85°C (+185°F).

- ➔ Allow the module to cool down to at least +40°C (+104°F) before working on the module.
- ➔ Measure the surface temperature before touching the module.
- ➔ Wear protective gloves, if necessary.

**Risk of electric shock due to contact with live parts!**

- ➔ Before conducting work on the machine and the auxiliary equipment, disconnect them from the power supply and make sure they cannot be accidentally switched back on again.
- ➔ Wait until the frequency converter is discharged.

### 3 Warranty

The warranty is valid for 24 months from the delivery date to the production facility under the following conditions:

- Observation of the maintenance intervals (see chapter 14.1, page 69)
- Observation of the ambient conditions and operating conditions (see chapter 2.2, page 10)

Also observe our general terms of business.

The warranty does not cover the following:

- Damage occurring as a result of incorrect operation.
- Claims under warranty are excluded when repair or intervention is carried out by persons not authorized to do so.
- If accessories are used which are not designed for the module.

### 4 Scope of delivery

The scope of delivery includes:

- Electrical Rotary Module Type STM in the version ordered
- An exemplar of the Assembly and Operating Manual incl. Translation of original EC declaration of incorporation

The following accessories are required for the module:

- Connection cable in the version ordered:
  - length 5m, 10m, 15m or 20m

The following accessories are available for the module:

- MCS-12 Controller

➔ Order accessories separately.

➔ For additional accessories, see catalog or [www.schunk.com](http://www.schunk.com).

## 5 Description of the module

### 5.1 STM torque motor

#### 5.1.1 Design and description of the STM

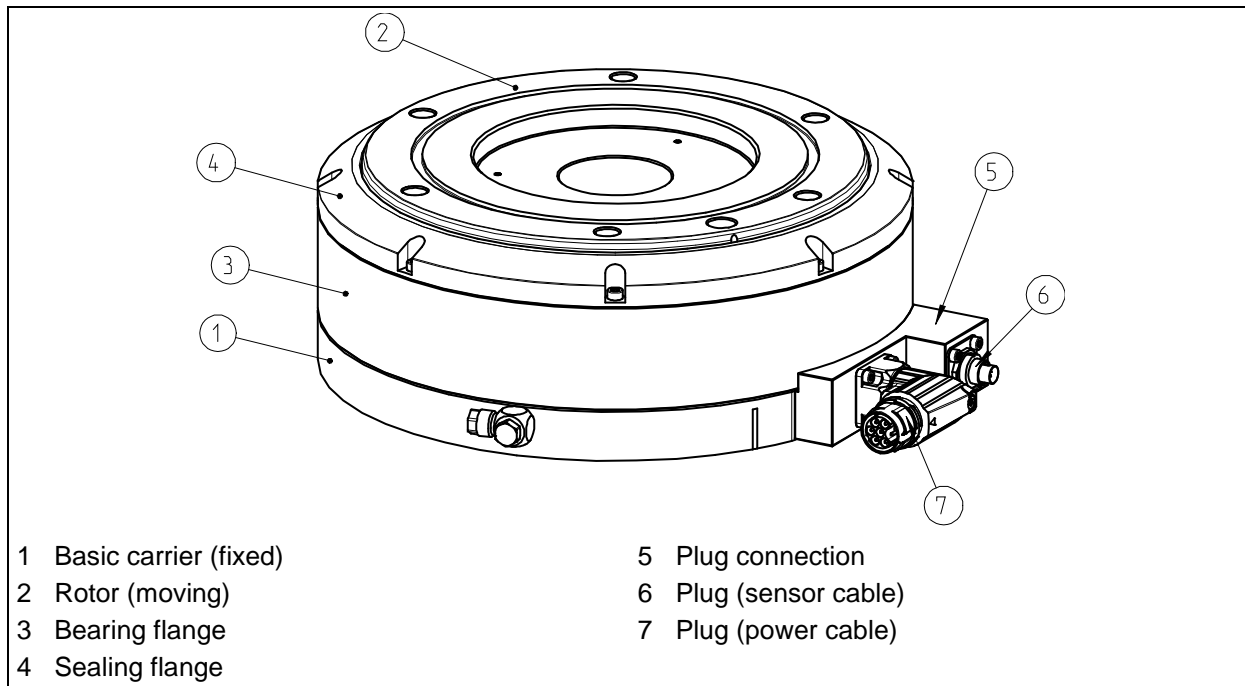


Figure 1 Components

#### Overview

The STM is a completely mounted, permanently excited synchronous motor in a cylindrical housing with a center bore.

The STM has an integrated measuring system. A temperature sensor is integrated in the motor winding.

#### Torque motor

The STM belongs to the category of torque motors. The typical characteristics of a torque motor are its high torque, low speeds and a strong rigidity.

#### Area of application

The STM is used typically for rotating and pivoting of large masses. The center bore can be used as a media feed-through.

#### Operating modes

The STM must be operated using a controller. The following operating modes can be set:

- Torque-controlled
- Speed-controlled
- Position-controlled

### 5.1.2 Mechanical interfaces

**Maintenance-free lubrication**

The STM is mounted on a single Franke bearing. This bearing is lubricated via one-time grease lubrication. Under normal operating conditions lubrication for 20.000 operating hours is sufficient.

The mechanical interfaces are shown on the drawing in chapter 16 page 73.

### 5.1.3 Electrical interface

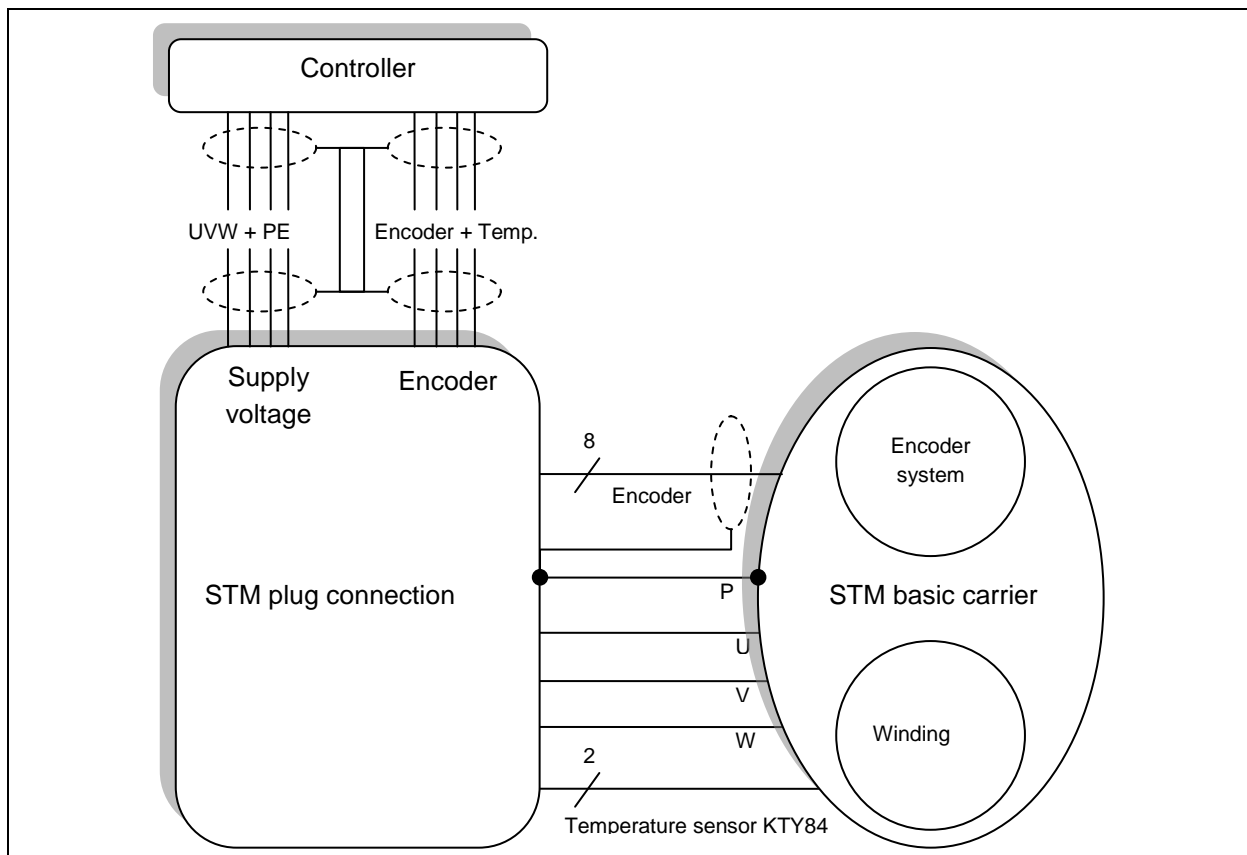


Figure 2 STM schematic diagram

An incremental encoder (TTL signals) is installed as position feedback unit.

### 5.1.4 Type key and nameplate

#### Order designation

	STMxxx - xxx - S - x - xx
Type	STM210 = d 210 mm STM170 = d 170 mm STM135 = d 135 mm
voltage	048 = 48 V rated motor voltage
cable version	S = with plug connection for power component and encoder cable
brake	N = without brake B = with brake
IP protection class	40 = IP40 protection class

The nameplate is attached to one of the broad sides of the module.

Designation	Specification
manufacturer	SCHUNK GmbH & Co. KG
type / model - protection class	STM210-48-S-N-40
ID	03068xx
rated torque ( $M_N$ )	10 Nm
voltage ( $U_N$ )	48 V
current ( $I_N$ )	7 A

Table 5 Data on the nameplate (example STM210)

## 6 Technical Data

### 6.1 Technical Data des STM

Further technical data can be found in our catalog. The most recent version applies.

#### 6.1.1 Technical Data STM135

##### Note

All the technical data shown in the chart refer to the indicated heat conducting surface.

Type	STM135 48V
ID	03068xx
Heat conducting surface [mm <sup>2</sup> ]	57686
<b>Mechanical operating data</b>	
deadweight [kg]	2,7
dimension (Ø x L) [mm]	135x 63
center bore (Ø) [mm]	15
ambient temperature [°C (°F)]	
Min.	+5 (+41)
Max.	+55 (+131)
mass moment of inertia of rotating parts [kg m <sup>2</sup> ]	0,001431
max. mass moment of inertia [kg m <sup>2</sup> ]	0,05
rotation range [°]	>360 (turning endlessly)
positioning accuracy * <sup>1</sup> [°]	0,02
* <sup>1</sup> Distribution of the end positions of 100 successive motions. When approaching from the same direction.	
measuring system	Incremental
IP rating	40
permissible operating mode	S1 - continuous operation* <sup>2</sup>
* <sup>2</sup> Applies only if the preconditions in chapter 7.1, page 27 are fulfilled. Otherwise, S6 - continuous mode with intermittent load is the permitted operating mode.	
<b>Electrical connection - required cable cross-sections and number of wire strands</b>	
power [mm <sup>2</sup> ]	3 x 1
grounding [mm <sup>2</sup> ]	1 x 1
shaft encoder [mm <sup>2</sup> ]	8 x 0,25
temperature sensor [mm <sup>2</sup> ]	2 x 0,25
<b>specifications for the integrated motor</b>	
motor type	synchronous
switching	star

Type	STM135 48V
temperature sensor (type)	KTY84
max. permissible operating temperature [°C (°F)]	+85 (+185)
insulation class	class F DIN 57530
output shaft power $P_n$ [kw]	0,08
intermediate circuit voltage $U_{ZK}$ [V]	48
rated torque $M_n$ [Nm]	2,5
rated current $I_n$ [A]	4,16
peak current $I_{max}$ [A]	12,98
torque constant K [Nm/A]	0,6
rated speed $n_n$ [rpm]	300
max. speed $n_{max}$ [rpm]	500
winding resistance (phase-phase) $R_{20}$ [Ohm]	3,2
winding inductivity (phase-phase) $L_{20}$ [mH]	4,77
electrical time constant T [ms]	1,49
numbers of pole pairings N	15
<b>Specifications for the integrated measuring system</b>	
type	5V TTL-Signal (Incremental), magnetic measuring system with reference track
power supply [V]	5 ± 10 %
mean current input [mA]	65
pulse number per revolution [pulses/rev.]	18432 (on quadruple evaluation)
absolute resolution of the sensor [°]	0,020

Table 6

### 6.1.2 Technical Data STM170

#### Note

All the technical data shown in the chart refer to the indicated heat conducting surface.

Type	STM170 48V
ID	03068xx
Heat conducting surface [mm <sup>2</sup> ]	49302
<b>Mechanical operating data</b>	
deadweight [kg]	4,7
dimension (Ø x L) [mm]	170 x 66
center bore (Ø) [mm]	32
ambient temperature [°C (°F)]	
Min.	+5 (+41)

Type	STM170 48V
Max.	+55 (+131)
mass moment of inertia of rotating parts [kg m <sup>2</sup> ]	0,003859
max. mass moment of inertia [kg m <sup>2</sup> ]	0,14
rotation range [°]	>360 (turning endlessly)
positioning accuracy * <sup>1</sup> [°]	0,02
* <sup>1</sup> Distribution of the end positions of 100 successive motions. When approaching from the same direction.	
measuring system	Incremental
IP rating	40
permissible operating mode	S1 - continuous operation* <sup>2</sup>
* <sup>2</sup> Applies only if the preconditions in chapter 7.1, page 27 are fulfilled. Otherwise, S6 - continuous mode with intermittent load is the permitted operating mode.	
<b>Electrical connection - required cable cross-sections and number of wire strands</b>	
power [mm <sup>2</sup> ]	3 x 1
grounding [mm <sup>2</sup> ]	1 x 1
shaft encoder [mm <sup>2</sup> ]	8 x 0,25
temperature sensor [mm <sup>2</sup> ]	2 x 0,25
<b>specifications for the integrated motor</b>	
motor type	synchronous
switching	star
temperature sensor (type)	KTY84
max. permissible operating temperature [°C (°F)]	+85 (+185)
insulation class	class F DIN 57530
output shaft power P <sub>n</sub> [kw]	0,74
intermediate circuit voltage U <sub>ZK</sub> [V]	48
rated torque M <sub>n</sub> [Nm]	5,0
rated current I <sub>n</sub> [A]	5,61
peak current I <sub>max</sub> [A]	19,1
torque constant K [Nm/A]	0,9
rated speed n <sub>n</sub> [rpm]	200
max. speed n <sub>max</sub> [rpm]	400
winding resistance (phase-phase) R <sub>20</sub> [Ohm]	1,36
winding inductivity (phase-phase) L <sub>20</sub> [mH]	2,53
electrical time constant T [ms]	1,86
numbers of pole pairings N	15
<b>Specifications for the integrated measuring system</b>	
type	5V TTL-Signal (Incremental), magnetic measuring system with reference track
power supply [V]	5 ± 10 %

Type	STM170 48V
mean current input [mA]	65
pulse number per revolution [pulses/rev.]	25600 (on quadruple evaluation)
absolute resolution of the sensor [°]	0,014

Table 7

### 6.1.3 Technical Data STM210

#### Note

All the technical data shown in the chart refer to the indicated heat conducting surface.

Type	STM210 48V
ID	03068xx
Heat conducting surface [mm <sup>2</sup> ]	37363
<b>Mechanical operating data</b>	
deadweight [kg]	7,8
dimension (Ø x L) [mm]	210 x 77
center bore (Ø) [mm]	40
ambient temperature [°C (°F)]	
Min.	+5 (+41)
Max.	+55 (+131)
mass moment of inertia of rotating parts [kg m <sup>2</sup> ]	0,011278
max. mass moment of inertia [kg m <sup>2</sup> ]	0,39472
rotation range [°]	>360 (turning endlessly)
positioning accuracy <sup>*1</sup> [°]	0,02
<sup>*1</sup> Distribution of the end positions of 100 successive motions. When approaching from the same direction.	
measuring system	Incremental
IP rating	40
permissible operating mode	S1 - continuous operation <sup>*2</sup>
<sup>*2</sup> Applies only if the preconditions in chapter 7.1, page 27 are fulfilled. Otherwise, S6 - continuous mode with intermittent load is the permitted operating mode..	
<b>Electrical connection - required cable cross-sections and number of wire strands</b>	
power [mm <sup>2</sup> ]	3 x 1
grounding [mm <sup>2</sup> ]	1 x 1
shaft encoder [mm <sup>2</sup> ]	8 x 0,25
temperature sensor [mm <sup>2</sup> ]	2 x 0,25
<b>specifications for the integrated motor</b>	
motor type	synchronous
switching	star
temperature sensor (type)	KTY84

Type	STM210 48V
max. permissible operating temperature [°C (°F)]	+85 (+185)
insulation class	class F DIN 57530
output shaft power P <sub>n</sub> [kw]	0,135
intermediate circuit voltage U <sub>ZK</sub> [V]	48
rated torque M <sub>n</sub> [Nm]	10
rated current I <sub>n</sub> [A]	6,22
peak current I <sub>max</sub> [A]	24
torque constant K [Nm/A]	1,6
rated speed n <sub>n</sub> [rpm]	100
max. speed n <sub>max</sub> [rpm]	200
winding resistance (phase-phase) R <sub>20</sub> [Ohm]	2
winding inductivity (phase-phase) L <sub>20</sub> [mH]	6,68
electrical time constant T [ms]	3,34
numbers of pole pairings N	16
<b>Specifications for the integrated measuring system</b>	
Type	5V TTL-Signal (Incremental), magnetic measuring system with reference track
power supply [V]	5 ± 10 %
mean current input [mA]	65
pulse number per revolution [pulses/rev.]	25600 (on quadruple evaluation)
absolute resolution of the sensor [°]	0,014

Table 8

## 6.2 Requirements for the power and sensor cables

cable type	power	sensor
number of wires	4x1mm <sup>2</sup> + 2x0,14mm <sup>2</sup>	4x2x0,25mm <sup>2</sup>
min. cross-section of the wires [mm <sup>2</sup> ]	1	0,25
max. cable diameter [mm]	10	6
max. voltage [V]	600	24
shielded	yes	yes
twisted	no	yes
cable track compatible	yes	yes
temperature application range [°C(°F)]	+5 to +55 (+41 to +131)	+5 to +55 (+41 to +131)
max. cable length [m] (between STM and controller)	20	20

Table 9

## 6.3 Brake

### NOTICE

This is not a service brake. Its use as a safety component is not permitted. The brake merely serves to support the standstill torque.

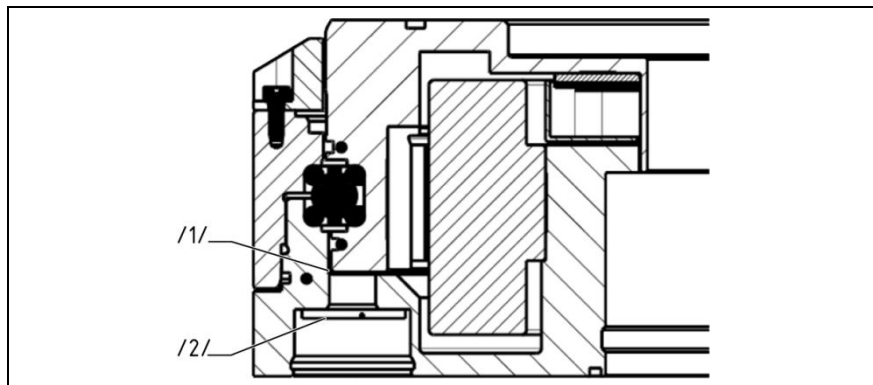


Figure 3 Brake design

Item	
/1/	Contact surface between brake pad and rotor
/2/	Pre-loaded brake piston with brake pad

Table 10 Legend of Figure 3

### 6.3.1 Technical data for brake valve MV15

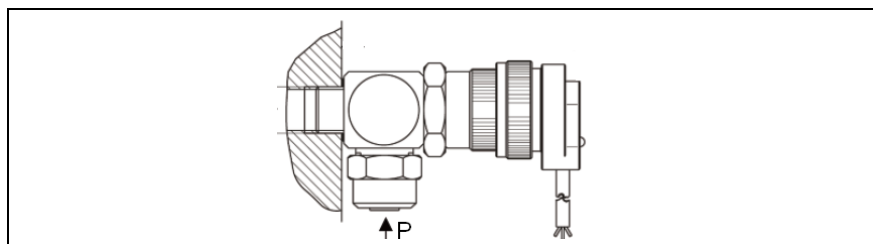


Figure 4 Valve assembly

Reference value	Values
Permissible medium	Filtered compressed air, oiled or dry Compressed air purity classes ISO 8573 - 1 7 4 4
Nominal flow rate at 6 bar	45 NI/min
Operating pressure range [bar]	P -1...1
Power consumption	2.8W
Voltage	24V (+10% / -5%)

Table 11 Technical data for brake valve MV15

➔ The additional technical data presented in the data sheet for valve MV15 must also be observed.

**Note**

If there is a low level signal from the controller pending on the valve, the electropneumatic brake valve is closed. In this state, the brake is active.

If there is a high level signal from the controller pending on the valve, the electropneumatic brake valve is opened. In this state, the brake is inactive.

**6.3.2 Connection to MCS-12**

When the two vales were screwed in the appropriate threads, connect the two red cables to the clamp BR1 and the black cables to the clamp BR2.

Terminal	Cable color, brake valve
BR1	red
BR2	black

*Table 12 Connection*

**6.3.3 Holding brake moment**

Motor type	Holding brake moment [Nm]
STM135	2,5
STM170	5
STM210	10

*Table 13 Holding brake moment*

## 7 Assembly

### 7.1 Mechanical connection

#### **WARNING**

**Risk of injury when the machine/system moves unexpectedly!**

➔ Switch off power supply.

#### **NOTICE**

**Malfunctions due to mechanical stress in the housing possible**

➔ Observe the requirements for the evenness of the mounting surface.

#### Check the evenness of the bolting surface

The values relate to the entire bolting surface.

diameter [mm]	Permissible unevenness [mm]
< 100	< 0,02
> 100	< 0,05

Table 14 Requirements for levelness of the bolting surface

#### Preconditions

Depending on the load, the STM develops a very large heat quantity that needs to be dissipated:

➔ Mount the motor on heat-conducting materials.

To achieve the IP protection class 40:

➔ Design the connection structure so that no chips, cooling water or dirt can enter the STM's connection area from the working area.

#### Note

- If the unit has to be referenced via the measuring system's index track, and if the moving range is limited when the STM is installed, make sure that the basic carrier is aligned correctly in the machine. (see Figure 5, page 28)
- After every switch-on the controller moves jerkily about 30°-40° anti-clockwise and about 30°-40° clockwise

- ➔ Align the zero point markings of the rotor and the base body so that they are at right angles on top of each other.
- ➔ Select the position of the STM in the machine so that the zero pulse is in the middle of the moving range.

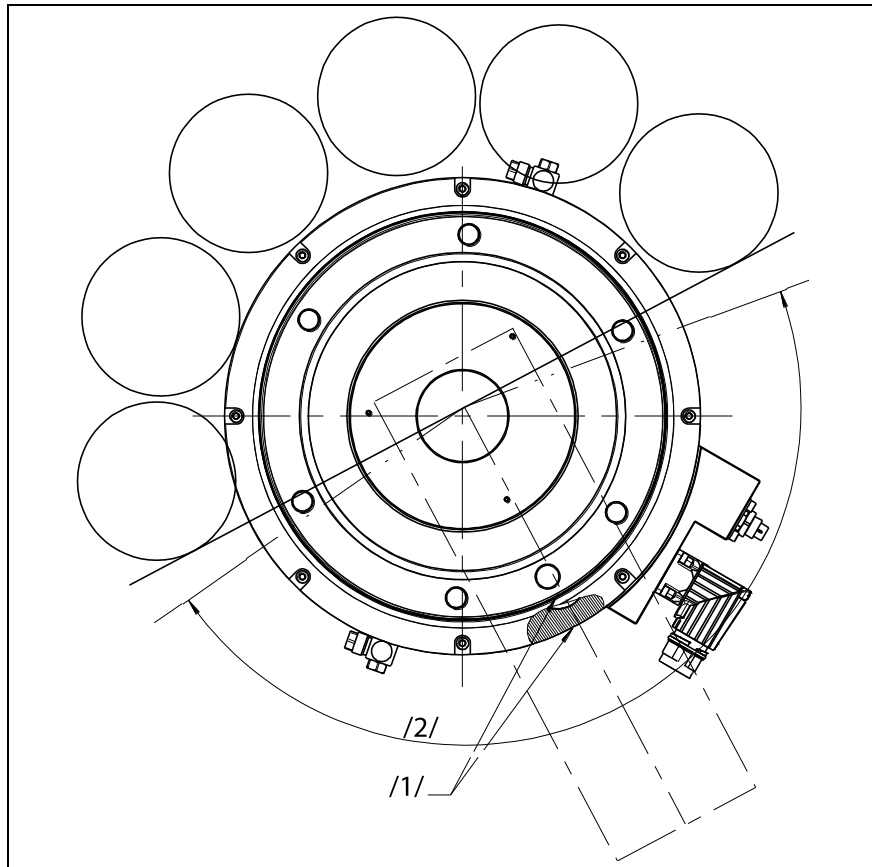


Figure 5 Zero pulse alignment

Item	Description
/1/	Zero point markings on rotor and base body
/2/	Maximum possible moving range

Table 15

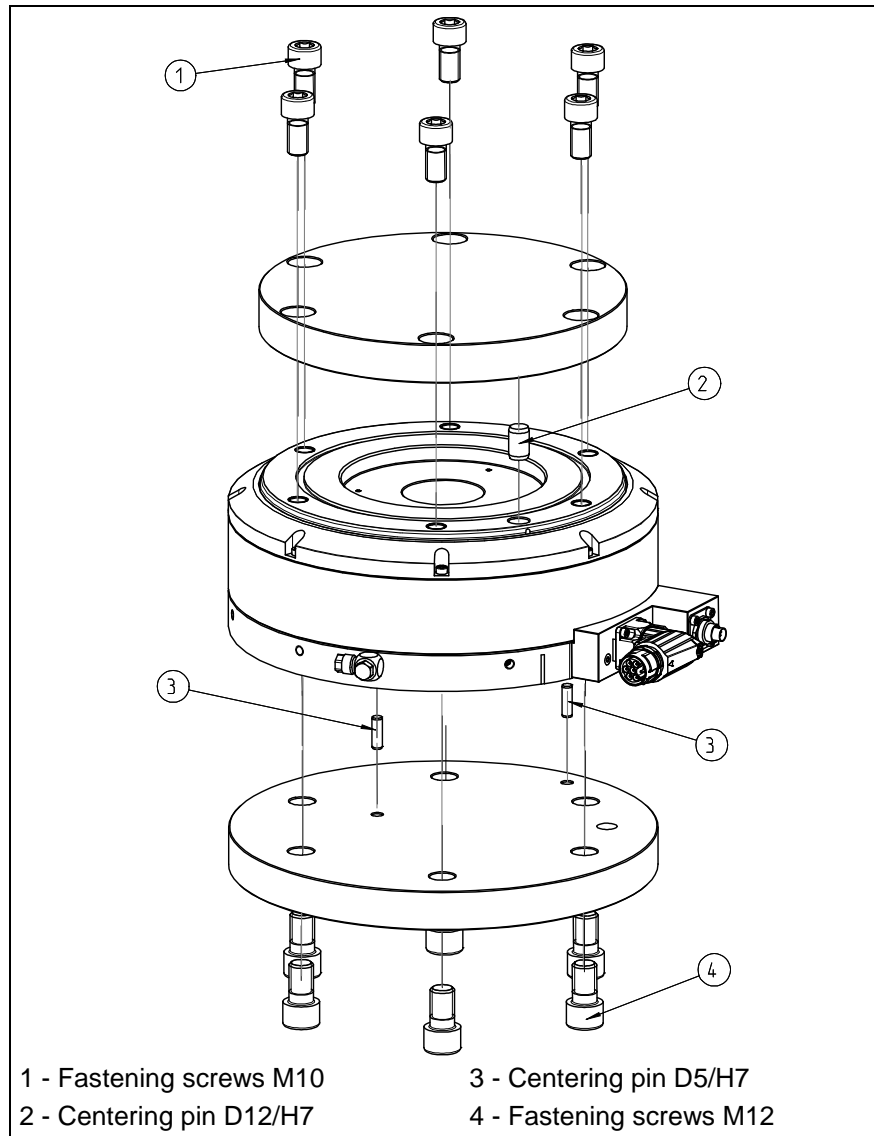
**Assembly**

- ✓ The interfaces to the attachments are clean and not damaged.

The module is mounted to the machine via the corresponding interface. Six fastening screws are required for each fastening side. (see Figure 6, page 29)

**Note**

All dimensions of the drawings can be taken from our internet site under "CAD data service".



*Figure 6 View of the assembly of the adapter plates on rotor and basic carrier*

## 7.2 Electrical connection

### **DANGER**

#### **Risk of fatal injuries due to electric shock!**

- Switch off power supply.
- Disconnect the controller from the power supply. The intermediate circuit capacitors must be discharged.
- Observe the sequence when connecting the cables (grounding cable first, then conductors)
- Only have the electrical connection established by the corresponding specialist personnel.

### **NOTICE**

#### **Damage of electronics is possible!**

In case of a high payload, dynamic energy may build up.

- The customer has to take care that the dynamic energy will be discharged.
- We recommend to use our brake chopper (Type: ACC3EA001 Id-No. 9951 504)

#### **Note**

Cables are electrical components which can receive and transfer interfering signals due to high-frequency interference or electromagnetic fields.

- Check that the cable is correctly connected and installed.
- There must be a sufficient distance between sources of interference and their supply cable.

Preconditions for installing the connection cables:

- ✓ The cables are without tensile and torsion loads. Use cable guide chains.
- ✓ The minimum bending radius (7.5 times the cable diameter) is complied with (see chapter 6.1, page 20)
- ✓ The motor's range of rotation and functions are not impaired.

**Note**

More information on the parameters of the controller can be found in the separate operating manual for the controller.

**Electrical connection  
STM**

The STM is supplied with prefabricated cables (red power cable, white encoder cable), which need to be connected via the corresponding plug-in connections.

The STM must be connected to a controller.

The cable colors and designations in the following tables apply to the SCHUNK connection cable.

➔ Observe the cable assignment.

Function	Signal	Cable designation
Power	U	black U
	V	black V
	W	black W
	PE	green/yellow
Temperature sensor	T1	red
	T2	blue

Table 16 Connection pin assignment of the red power cable

Function	Signal	Pin assignment – 15-pin D-Sub connector
Encoder	UB	Pin 12
	GND	Pin 10
	A	Pin 7
	/A	Pin 8
	B	Pin 6
	/B	Pin 5
	C	Pin 4
	/C	Pin 3

Table 17 Connection pin assignment of the white signal cable

## 8 Start-up

### NOTICE

#### **Malfunction in the event of an overload!**

- Avoid impact loads.
- Do not exceed the bearing load limits.

### NOTICE

#### **Malfunction in the event of overheating!**

- Observe the motor's technical data.  
(see chapter 6.1, page 20)

### WARNING

#### **Risk of injury and material damage when the machine/system moves unexpectedly**

- Only allow configuration work to be carried out by authorized specialist personnel.
- Observe the information in the operating manual for the controller.

### WARNING

#### **Collisions in setup mode when the machine/system moves unexpectedly**

The motor could overspeed.

- Keep the motor's moving range (360°) free.

#### **Note**

The SCHUNK controller MCS-12 is recommended for the optimum use of the SCHUNK torque motor (STM). (see chapter 9 from page 34)

**Starting up  
the STM with any  
controller**

- ➔ Connection the electrical connections (power cable, signal cable) to the controller.
  - ➔ Check that the rotor can be turned freely. In doing so, pay attention to any grinding noise.
  - ➔ Check that all required contact protection measures were taken for moving and live parts.
1. Switch on the controller and start the commissioning software MC demo.
  2. Select the communication interface, establish communication with the module and configure the converter.
  3. Check the encoder signal and the signal of the temperature sensor.
  4. Control the STM and optimize the parameters.
  5. Check the bearing noise at regular intervals.  
(see chapter 14.2, page 69)

**Note**

If the unit is referenced via the encoder's zero pulse, free motion must be ensured within the range of  $\pm 360^\circ$ .

If the STM is used in a multiple axis system, it is recommended to put the axes into operation individually.

To avoid collisions, prior to the first movement, check the alignment of the STM, the set direction of counting of the measuring system and the motor's direction of rotation.

**Note**

In the MCS12 controllers, the stepper mode is used for commutation. So after turning on, all three phases are energized.

This aligns the magnetic field of the rotor to the stator's magnetic field. As a result, the drive moves abruptly by a few degrees.

The resulting change in position is measured by the sensor and stored as an offset in the memory of the controller. To increase the accuracy of this offset, the energization of the phases is carried out several times in a row.

After switching on the controller, the motor can move jerkily in a range of  $\pm 30^\circ$ .

This stepping mode is used for incremental measuring systems after each restart of the controller.

## 9 Accessories

### 9.1 Connection and commissioning of the STM with the SCHUNK controller MCS-12

#### 9.1.1 Scope of delivery of the MCS-12 controller

The MCS-12 is an accessory for the module and needs to be ordered separately.

The scope of delivery includes:

- MCS-12 controller
- Adapter cable for terminal strip
- DVD

Content of DVD:

- MCDemo (configuration and commissioning tool)
- Operating manual in PDF format
- MotionControl software manual in PDF format

#### 9.1.2 Technical Data of the MCS-12 controller

Size	MCS-12
ID	307 010
Logic voltage supply at controller	24V DC
Current input of logic	0,5 A
Nominal current for controller	12 A
power supply	up to 48 V DC
Mass	0,98 kg
Interface = communication type (data rate)	Profibus DP (1,5 Mbaud), higher on request
	RS232 (9.600 Baud)
	CAN (max. 1 MBaud)
Control types	PI-Current regulation, (Field/Sinus- or P-controller)
	PI-Speed regulation
	P-Position regulation
Sensor systems	Encoder
	Resolvers
Communication	Block
	Sinus

Table 18

### 9.1.3 Design and description of the MCS-12 controller

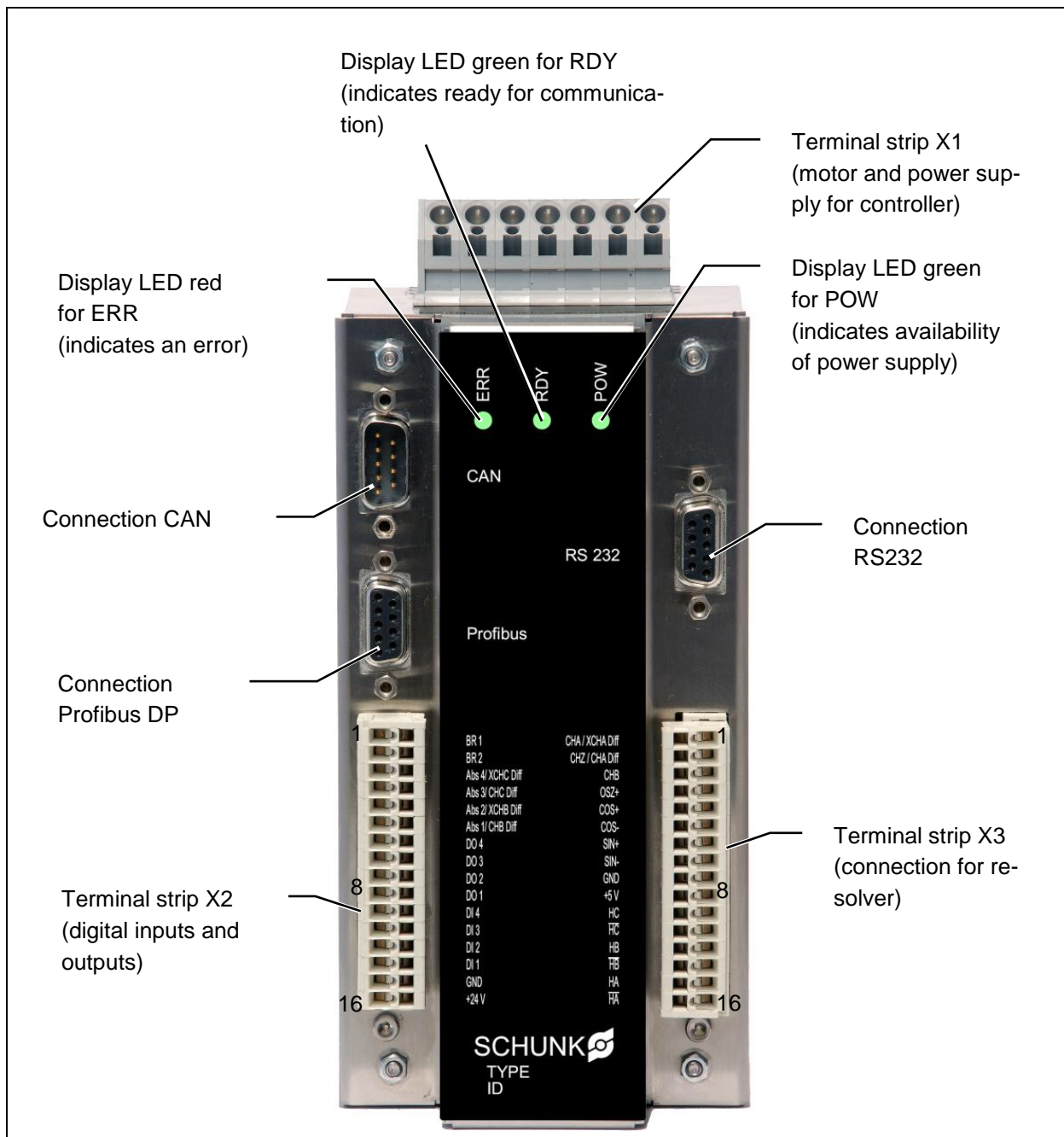


Figure 7 Design of the MCS-12 controller

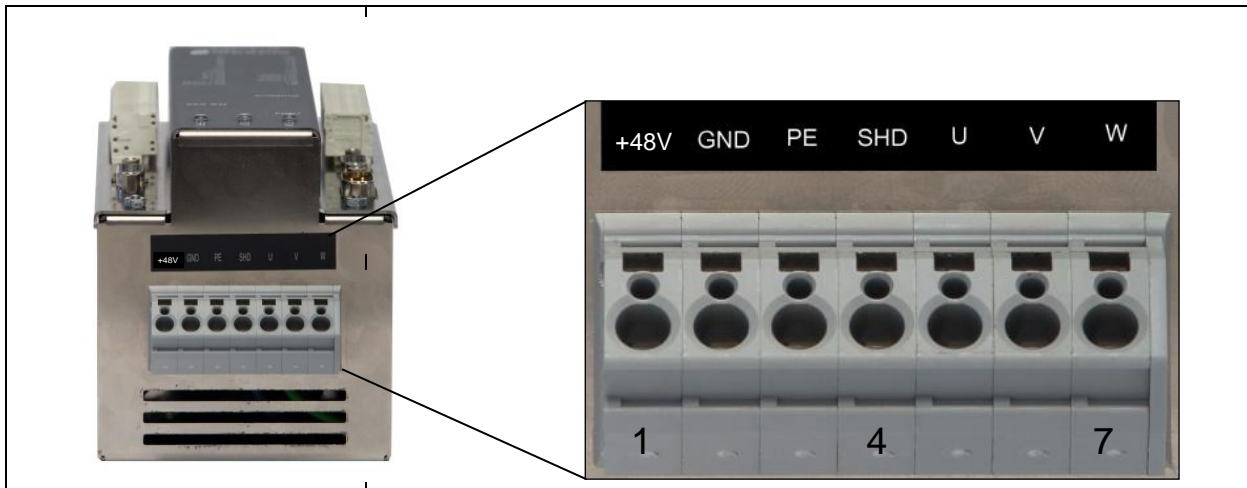


Figure 8 Position of X1 terminal strip (motor and power supply for controller)

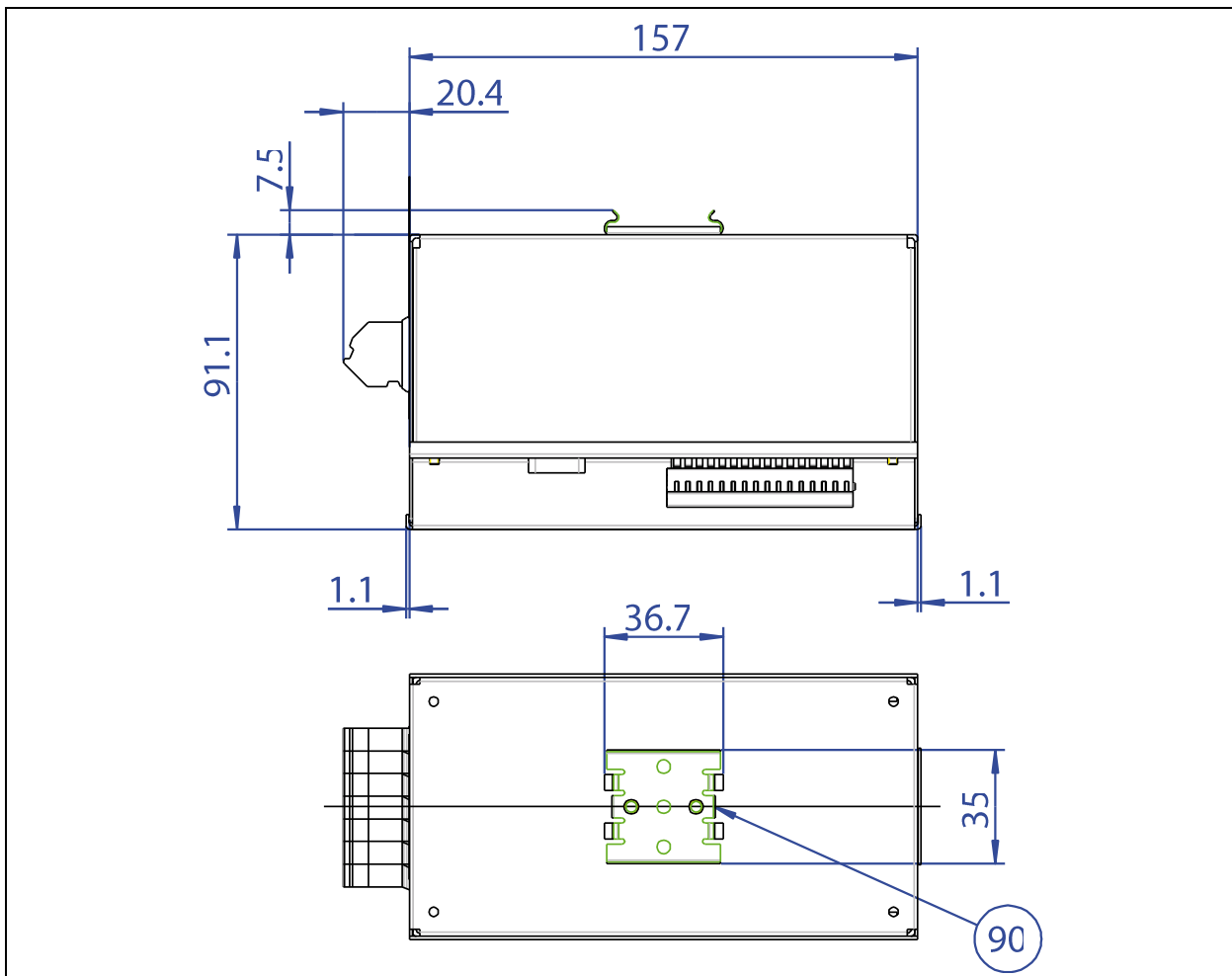


Figure 9 dimension and mounting the MCS-12 controller

The MCS-12 controller is mounted by means of the metal base bar (90) on the mounting rail according to EN 50022.

**DEFAULT function**

The module is reset to the factory setting using the SCHUNK controller.

**Notes**

Further information on the "DEFAULT values" can be found in the document MotionControl.pdf on the included DVD of the controller.

Perform the following steps:

1. Turn off the logic power supply on the controller.
2. Set the jumper between pin 6 (GND) and pin 8 (default) on the CAN bus connector.
3. Turn on the logic power supply on the controller.
4. Wait for approx. 10 seconds.
5. Remove the jumper.

The unit is now reset to the factory setting:

**DEFAULT values**

1. Module address = 12
2. Communication = RS232
3. Data rate = 9.600 Baud

**BOOT function**

New firmware is loaded on to the module using the SCHUNK controller.

**Notes**

Further information on the "BOOT function" can be found in the document MotionControl.pdf on the included DVD of the controller.

Perform the following steps:

1. Turn off the logic power supply on the controller.
2. Set the jumper between pin 6 (GND) and pin 1 (boot) on the CAN bus connector.
3. Turn on the logic power supply on the controller.  
The module is in BOOT mode.
4. Flatten the module using the "MC Demo" tool (see MotionControl.pdf on the DVD).
5. Remove the jumper.

A new firmware product has been loaded on to the unit.

## 9.2 Electrical connection of the module to the MCS-12 controller

### 9.2.1 Procedure and requirements

#### Requirements for the power supply

<b>⚠ DANGER</b>	
<b>Danger due to faulty connection</b>	
<ul style="list-style-type: none"> <li>➔ Observe the pin assignment of the connecting terminals.</li> <li>➔ Make sure that all components are grounded correctly.</li> </ul>	
Output power supply*	48 V DC ± 10% (I <sub>nom</sub> = 20A)
Power supply for logic	24 V DC (to 36 V DC) + 10% / - 4%; residual ripple below 150 mVSS; switching peaks below 240 mVSS
Connection value	Number of modules x rated module current x 1.2

Table 19

\*e.g. with Siemens Sitop Modular (order No. at Siemens: 6EP1457-3BA00)

The wiring diagrams and the cable dimensions for the lines, temperature sensor and shaft encoder must be followed (see chapter 6.1, page 20).

### 9.2.2 Connecting the STM to the MCS12 controller

#### Note

It is recommended to implement the power supply for the logic via an external power supply source. Equipotential bonding is to be performed between the power supply sources for logic and output.

#### Connecting the STM to the MCS12

1. Connect the encoder system (incremental encoder) of the STM to terminal strips X2 and X3 of the MCS-12 controller (for the position of the terminal strips, see Figure 7 page 35; for the pin assignment of the terminal strips, see Table 21, page 39)
2. Connect the STM's motor phases to terminal strip X1 of the MCS-12 controller (see Figure 8 page 36).
3. Connect the output power supply to the MCS-12 controller (see Table 21, page 39).
4. Connect the logic power supply to the controller MCS-12. (see Table 21, page 39).
5. Connect the signal cable's shielding (see Table 21 and Table 22, page 40).

### 9.2.3 Assignment of the terminal strips of the MCS-12 controller

**Terminal strip X1** Terminal strip X1 is for connecting the motor phases and the power supply of the controller's power component (for the position of the terminal strips, see Figure 7 page 35)

Terminal	Designation	Cable color	
1	+ 48V	Customer's connection cable	Connection of the output power supply for the MCS-12 controller.
2	GND		
3	PE	Green/yellow	Connection of the STM's motor phases to terminal strip X1 of the controller.
4	SHD	Shielding	
5	U	Black U	
6	V	Black V	
7	W	Black W	

Table 20

**Terminal strips X2 and X3** Terminal strips X2 and X3 are for connecting sensor signals.  
**→ Use the adapter cable (with a 15-pin SUB-D connector and a 16-pin terminal strip) for the connection of the encoder cable!**

The following terminals are required to connect the STM:  
 (for the position of the terminal strips, see Figure 7 page 35)

Terminal	Designation	Wire color (*)	Meaning
3	Abs 4/ XCHC Diff	brown	Channel /Z
4	Abs 3/ CHC Diff	White	Channel Z
5	Abs 2/ XCHB Diff	Yellow	Channel /B
6	Abs 1/ CHB Diff	green	Channel B
15	GND	Customer-specific	Reference potential for logic power supply
16	+24V	Customer-specific	Logic power supply

(\*)Wire color of the supplied SCHUNK cable, otherwise according to customer specifications

Table 21: Pin assignment of terminal strip X2 – pins required to connect the encoder

Terminal	Designation	Wire color (*)	Meaning
1	CHA / XCHA Diff	Grey	Channel A
2	CHZ / CHA Diff	White	Channel A

Terminal	Designation	Wire color (*)	Meaning
9	GND	orange	Reference potential for encoder power supply
10	+5 V	white	Power supply for encoder

(\*)Wire color of the supplied SCHUNK cable, otherwise according to customer specifications

Table 22: Pin assignment of terminal strip X3 – pins required to connect the encoder

### 9.2.4 Communication interfaces

The MCS-12 currently has three communication interfaces (RS232, CAN, Profibus DP). The controller can be controlled via these interfaces using the SCHUNK Motion Protocol (SMP).

All communication interfaces may be connected simultaneously. However, only one communication interface may be active.

#### Note

➔ The RS232 interface should be only used as a parameterization interface.

#### RS232 connection

The connection is established via a 9-pin SUB-D connector from the control system (PC / SPC) to the controller (MCS-12) (for the position of the connector, see Figure 7 page 35)

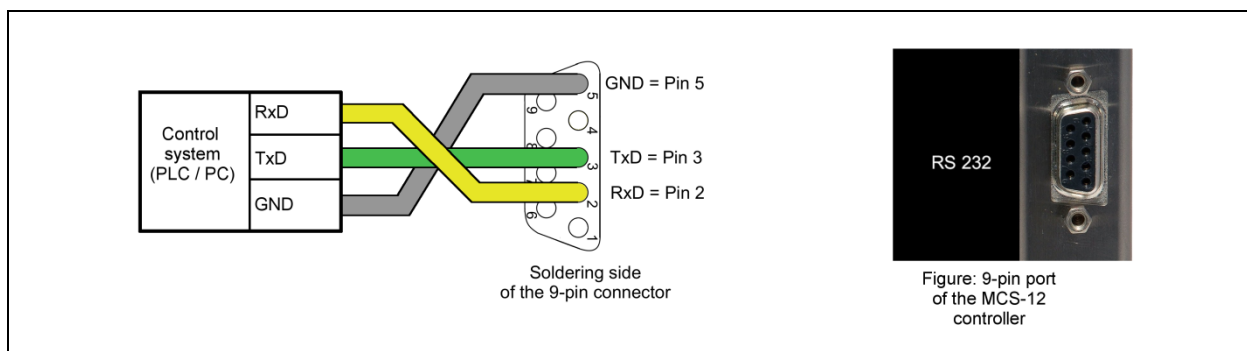


Figure 10 Connector assignment for RS232 connection to MCS-12

#### CAN connection

The connection is established via a 9-pin SUB-D socket from the control system (master) to the controller (MCS-12) (for the position of the connector, see Figure 7 page 35)

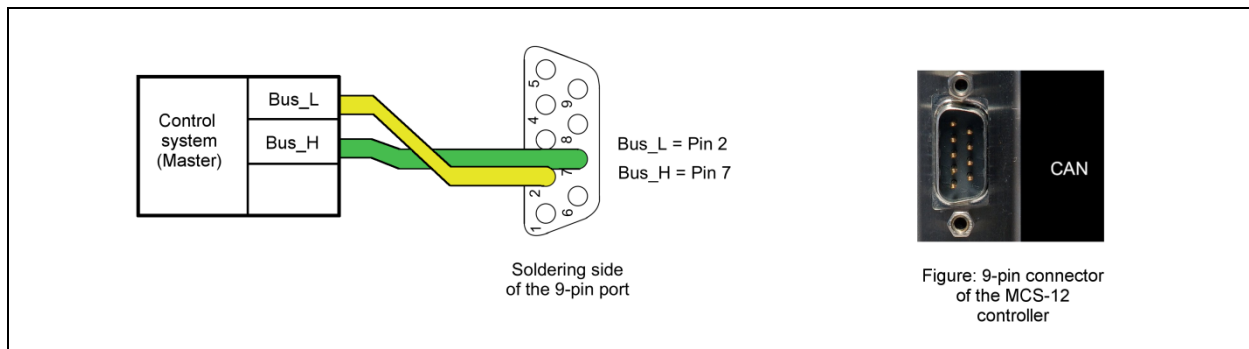


Figure 11 Connector assignment for CAN connection to MCS-12

**Profibus DP connection**

The connection is established via a 9-pin Profibus connector from the control system (master) to the controller (MCS-12) (for the position of the connector, see Figure 7 page 35).

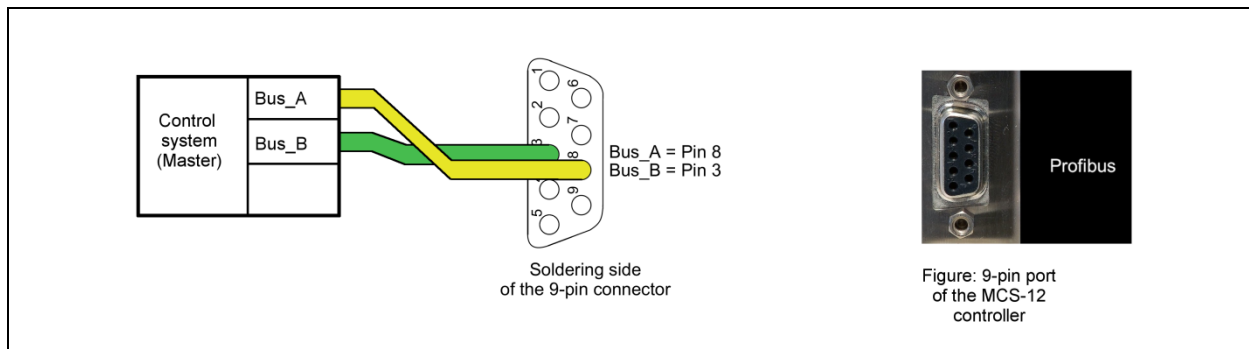


Figure 12 Connector assignment for Profibus DP connection to MCS-12

**Note**

Depending on the field bus system, up to 255 modules can be connected to each other.

It is recommended to use T connectors that correspond to the field bus type. A termination resistor must be set on the last bus node.

**digital inputs and outputs**

As an alternative to the field bus, the MCS-12 controller can be controlled via the digital inputs and outputs.

## 10 Start up with PC

### 10.1 SCHUNK MCS-12 controller

#### 10.1.1 Functional principle

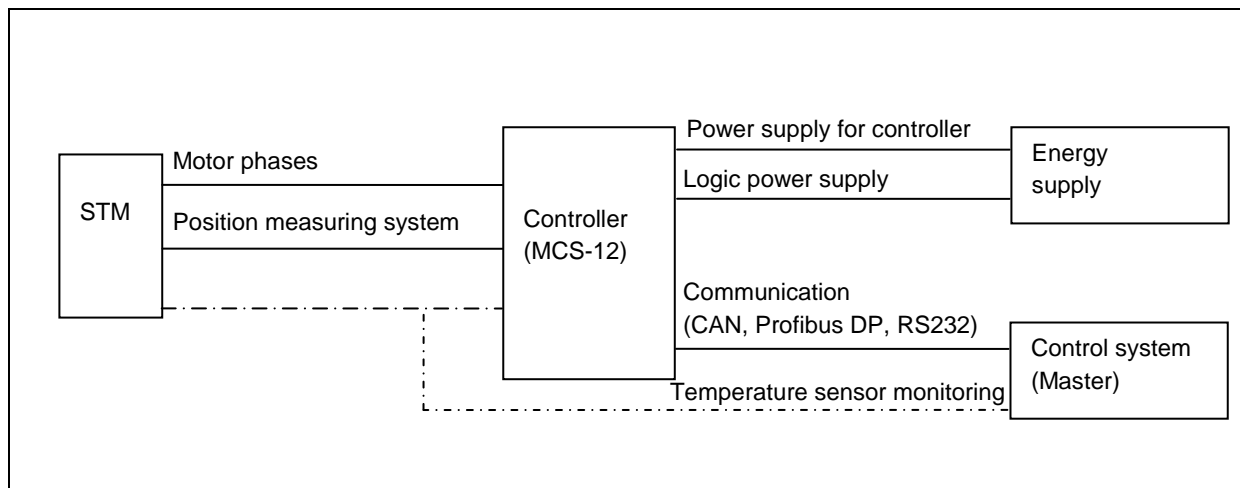


Figure 13 Functional principle

The actuator (in this case STM) is controlled by the external controller (MCS12). It receives the required parameters from the higher-level control system (master).

The STM's sequence of movement is linear. The rotor performs a mechanical movement. While this is done, its position is constantly checked. The data required for this is sent back to the controller from the sensors.

The temperature sensor can be evaluated via the controller, if it supports the function and KTY84. As an alternative, the evaluation can be performed directly via the control system (master).

The STM is controlled via the user interface, which transmits the required data to the external logic. For example, the following parameters can be specified:

- Target position
- Speed
- Acceleration
- Current

## 10.2 System integration

### 10.2.1 System structure

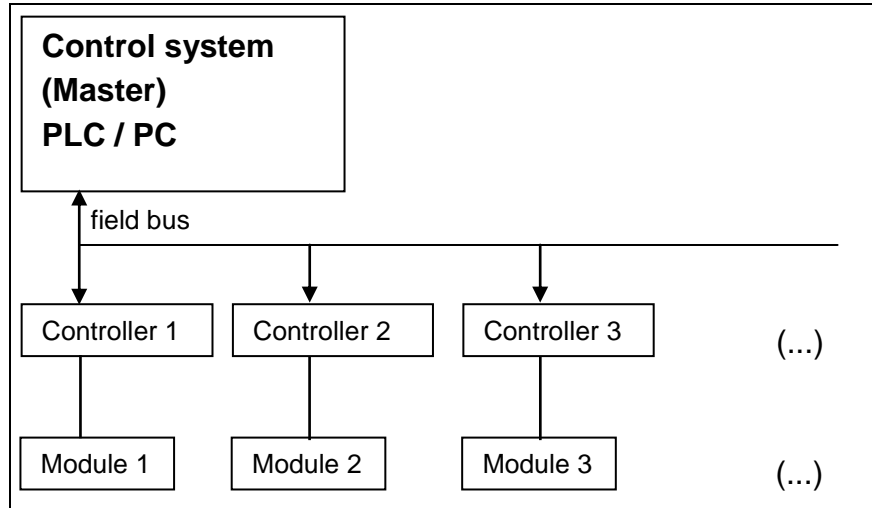


Figure 14

#### Data format

The data is transferred in INTEL Format (Little Endian Format).

#### SCHUNK motion protocol

#### Communication and data exchange with the module

Information for this

➔ see chapter 11 page 59

➔ see MotionControl.pdf operating manual on the DVD for the MCS-12 controller. This document contains a more detailed description of the MCDemo software (configuration and demonstration software).

## 10.2.2 Configuration with MCDemo

### Note

After every switch-on the controller moves jerkily about 30°-40° anti-clockwise and about 30°-40° clockwise

- ✓ The controller is connected to a PC.
- ✓ The supplied DVD is inserted.

1. Copy MCDemo from the enclosed DVD:



Figure 15

➔ Start the DVD and click on "Software". Then click on "MC-Demo.zip".

### Note

The software is available for download at our website [www.schunk.com](http://www.schunk.com).

(see Service>Downloads>2.4 Mechatronics)

➔ Observe the version status!

2. Save the file and unpack the file:

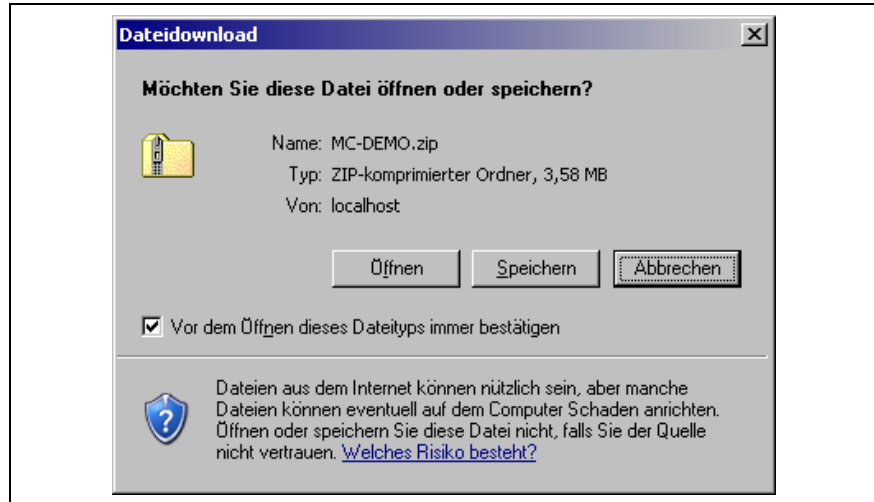


Figure 16

3. Start MC Demo by double-clicking on:



Figure 17

4. Configure the communication interface:  
(choice between RS232, CAN or Profibus)

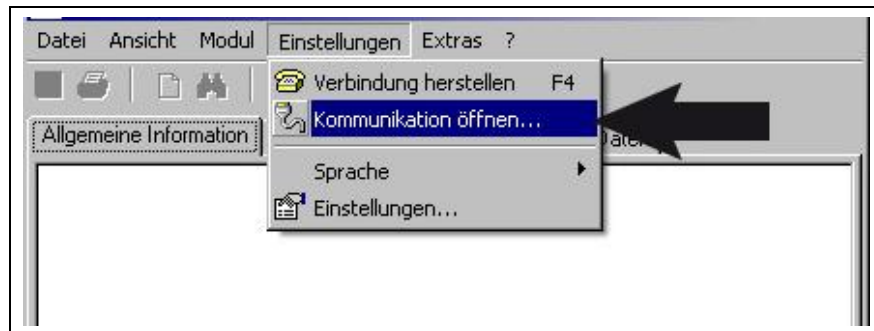


Figure 18

➔ Select "Settings" → "Open communication...".

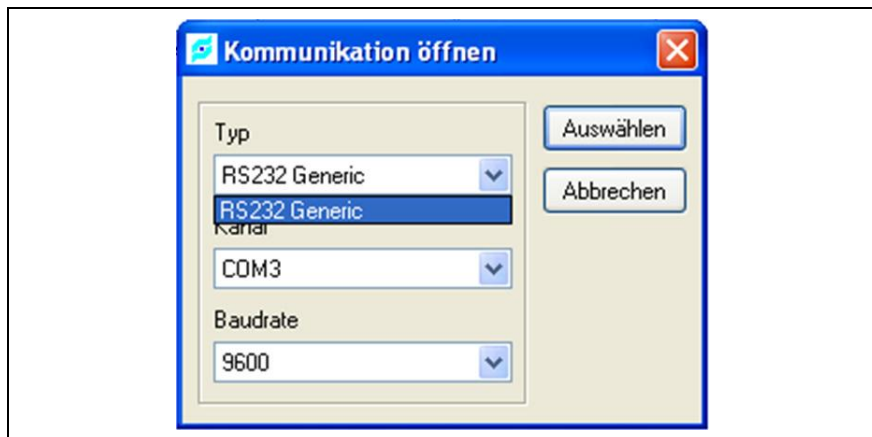


Figure 19

➔ Select RS232

5. Search for the module:

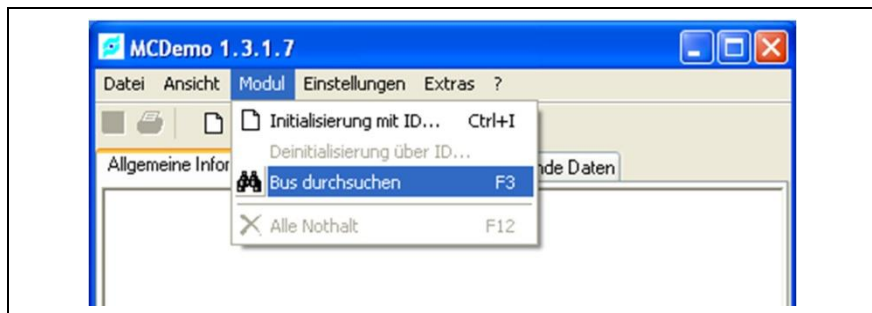


Figure 20

➔ Select "Module" → "Search bus".

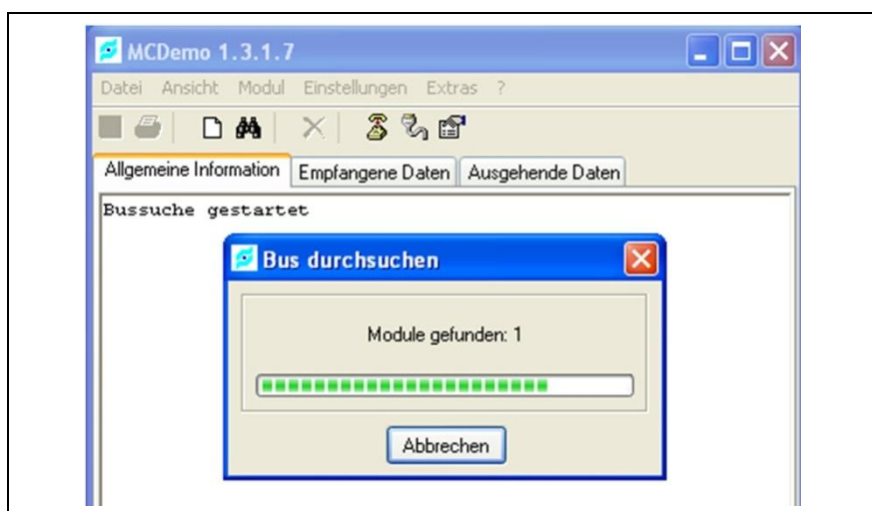


Figure 21

6. Enter or change parameters:

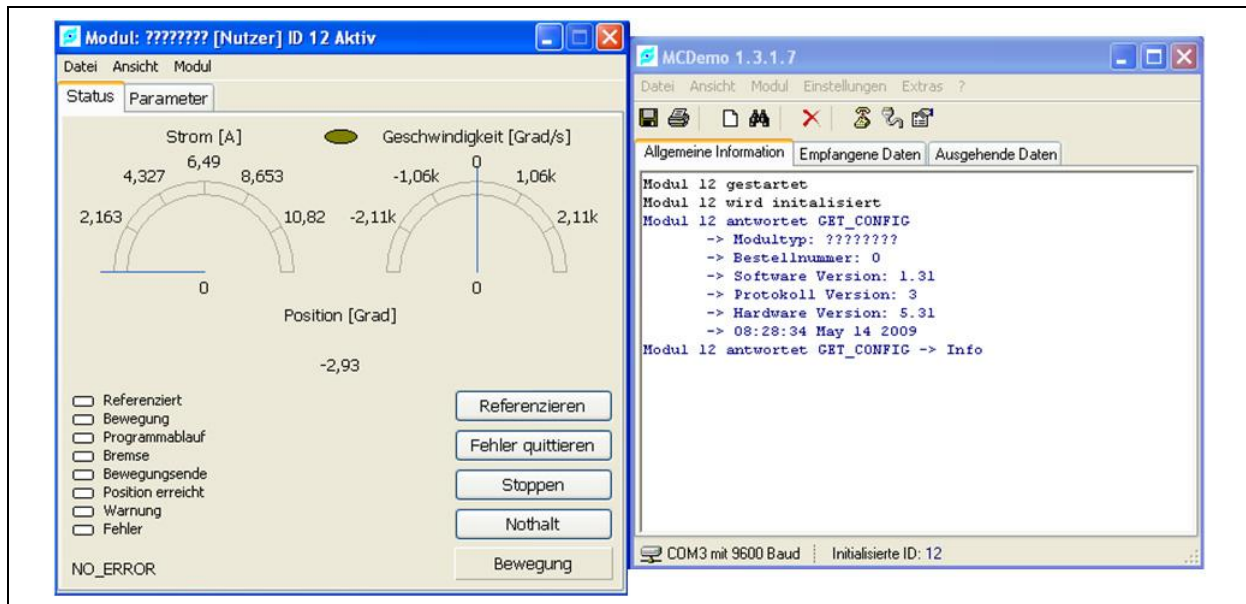


Figure 22 Control window of the module found

➔ Select the [Parameters] tab and adjust the parameters (see "Motion Control" document).

7. Perform a reference run:

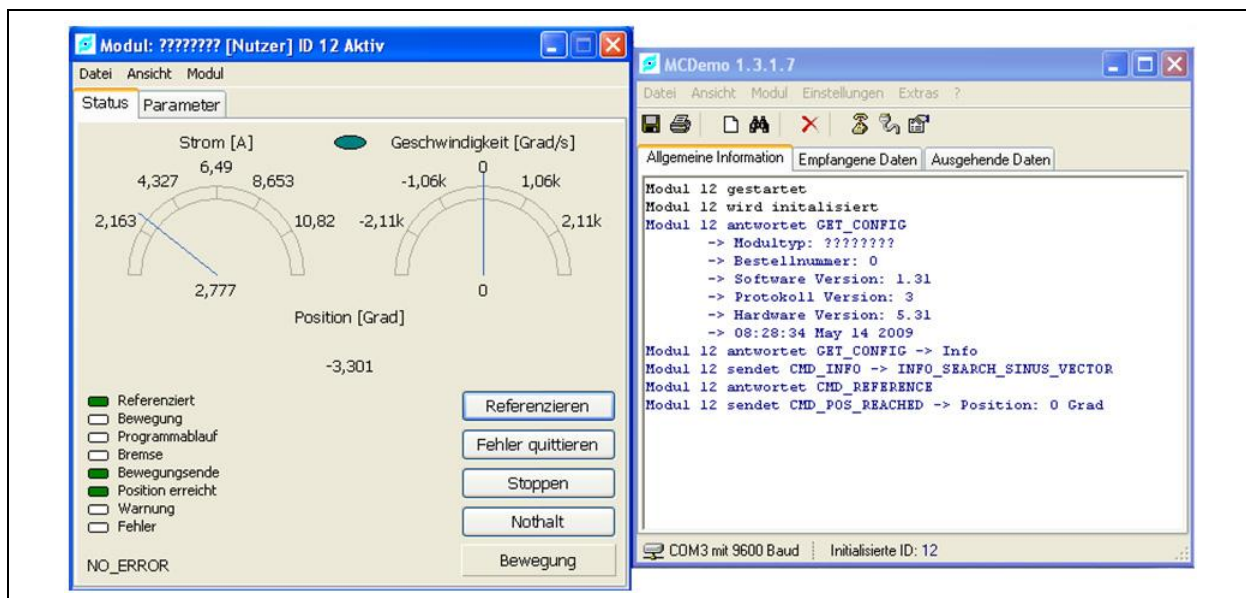


Figure 23

➔ Select the [Reference] button.

8. Select movement modes:

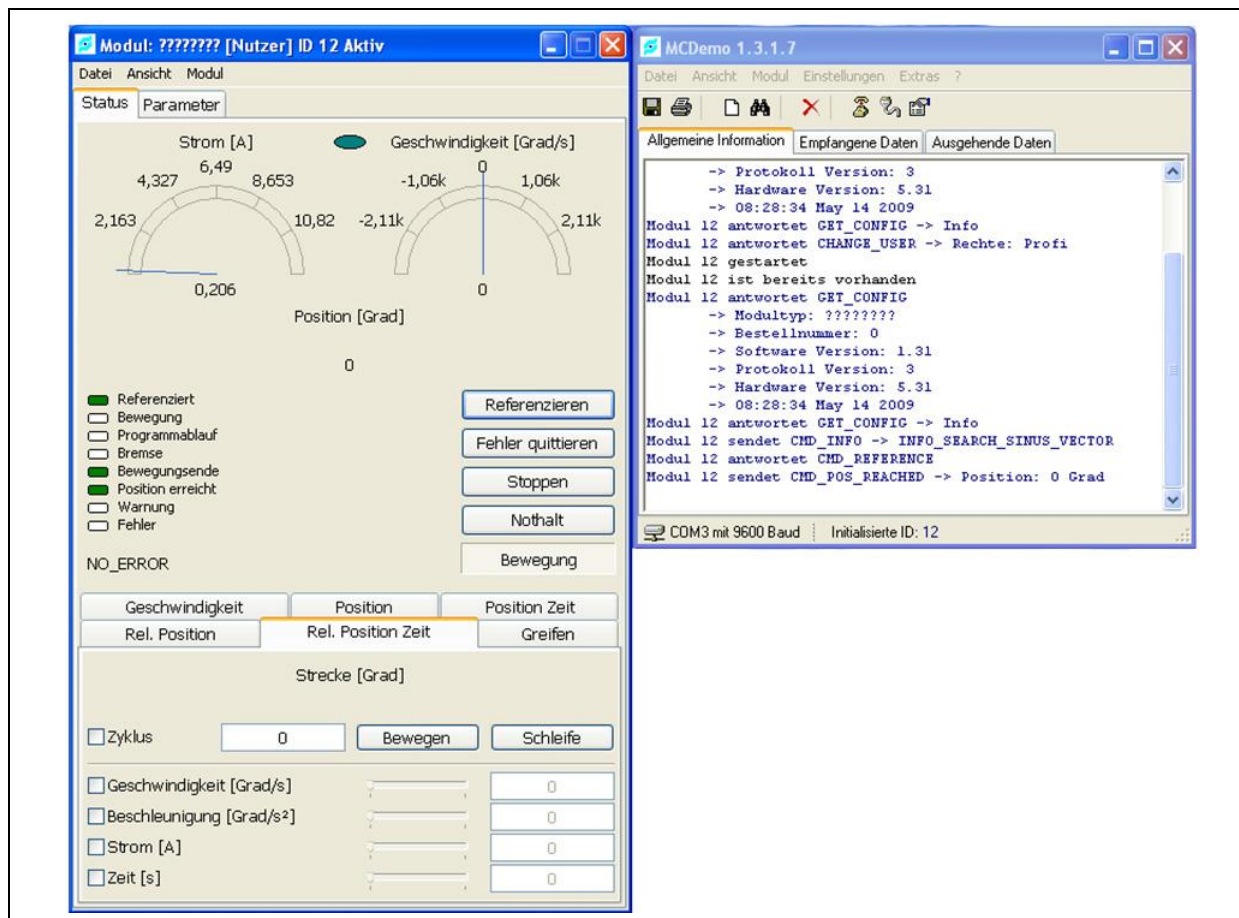


Figure 24

➔ Click on the desired tab (Relative position, Position, Speed etc.) and enter the desired target values in the input window.

**Note**

A password is required to change the control, referencing and device parameters. It is "Schunk".

➔ See Motion Control documentation.

**10.2.3 Commissioning of the digital inputs**

➔ Refer to the chapter entitled "Digital Inputs" in the Motion Control documentation (3.2.5.9).

**10.2.4 Commissioning of the digital outputs**

➔ Refer to the chapter entitled "Digital Outputs" in the Motion Control documentation (3.2.5.10).

## 10.3 Control parameters

### 10.3.1 STM135

Mass moment of inertia	KR_speed	TN_speed	KR_position
0	0	0	0,2
0,005	70	0,025	0,275
0,01	95	0,04	0,3
0,015	120	0,055	0,325
0,02	145	0,07	0,35
0,025	170	0,085	0,375
0,03	195	0,1	0,4
0,035	220	0,115	0,425
0,04	245	0,13	0,45
0,045	270	0,145	0,475
0,05	295	0,16	0,5

Table 23

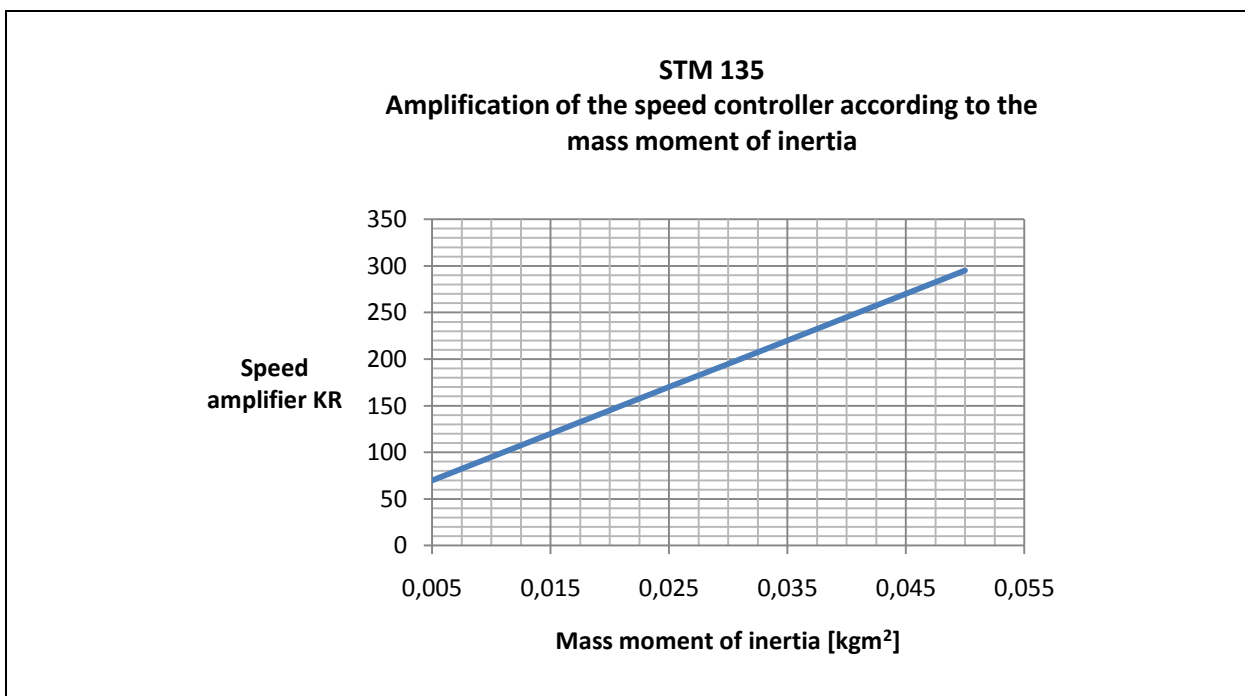


Figure 25

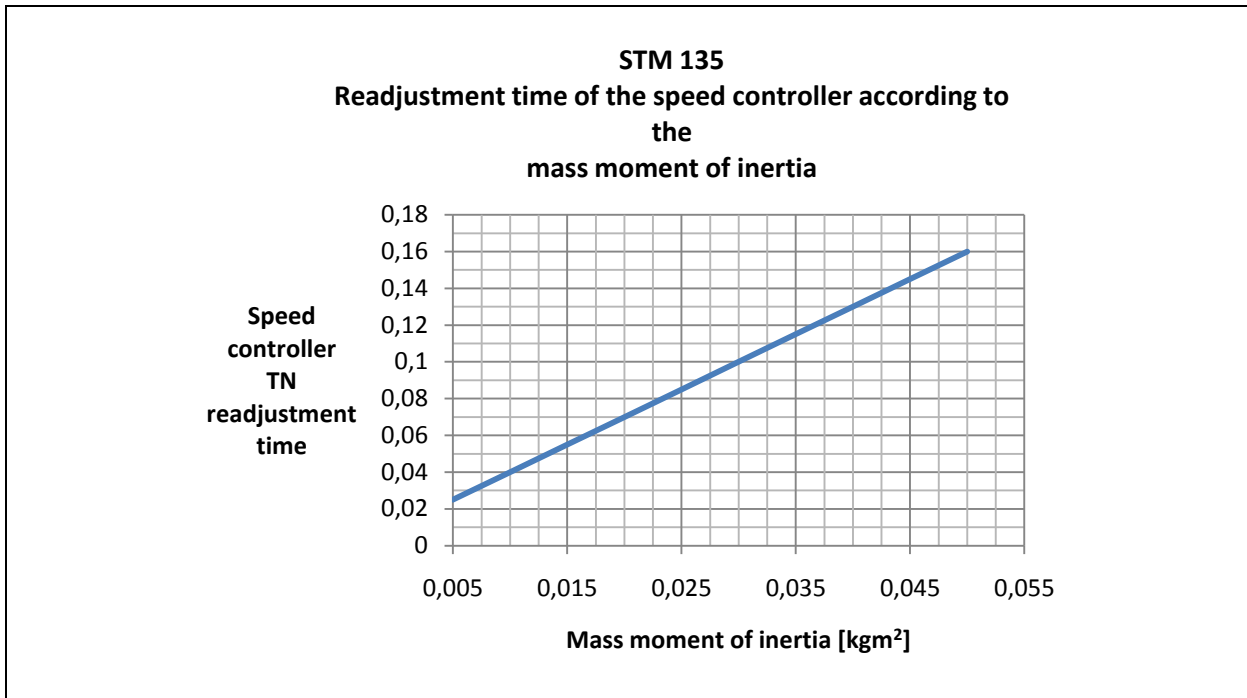


Figure 26

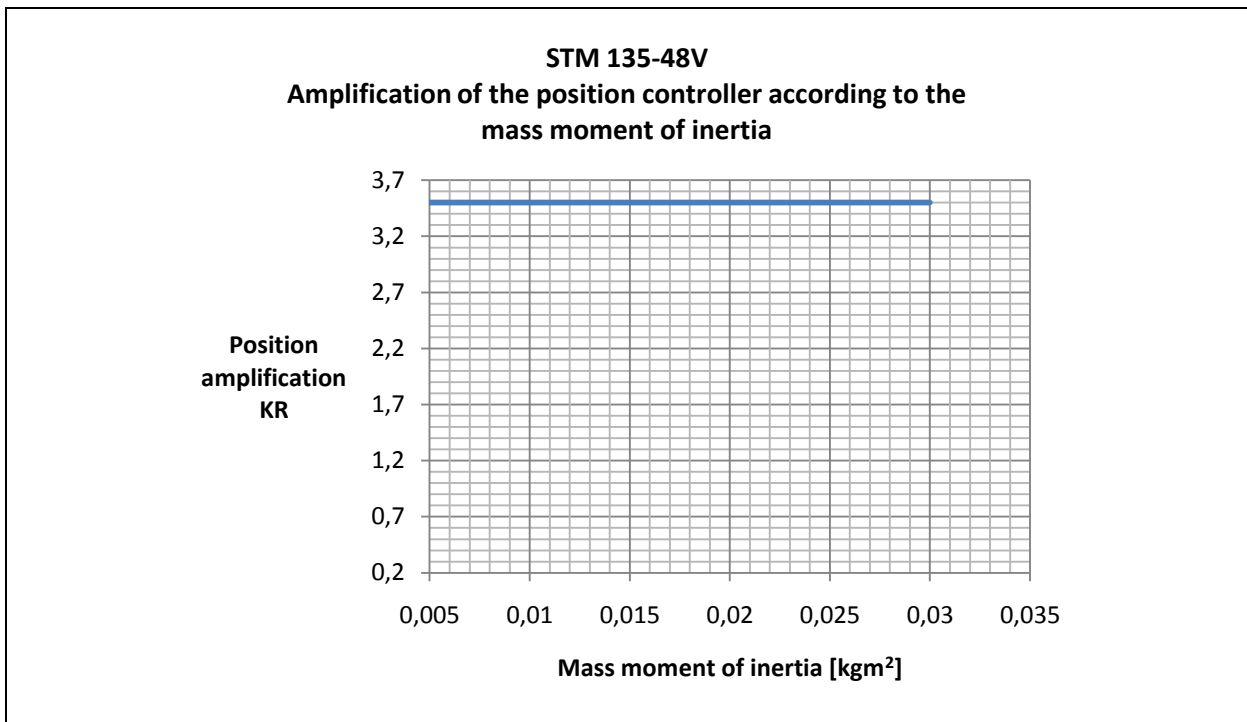


Figure 27

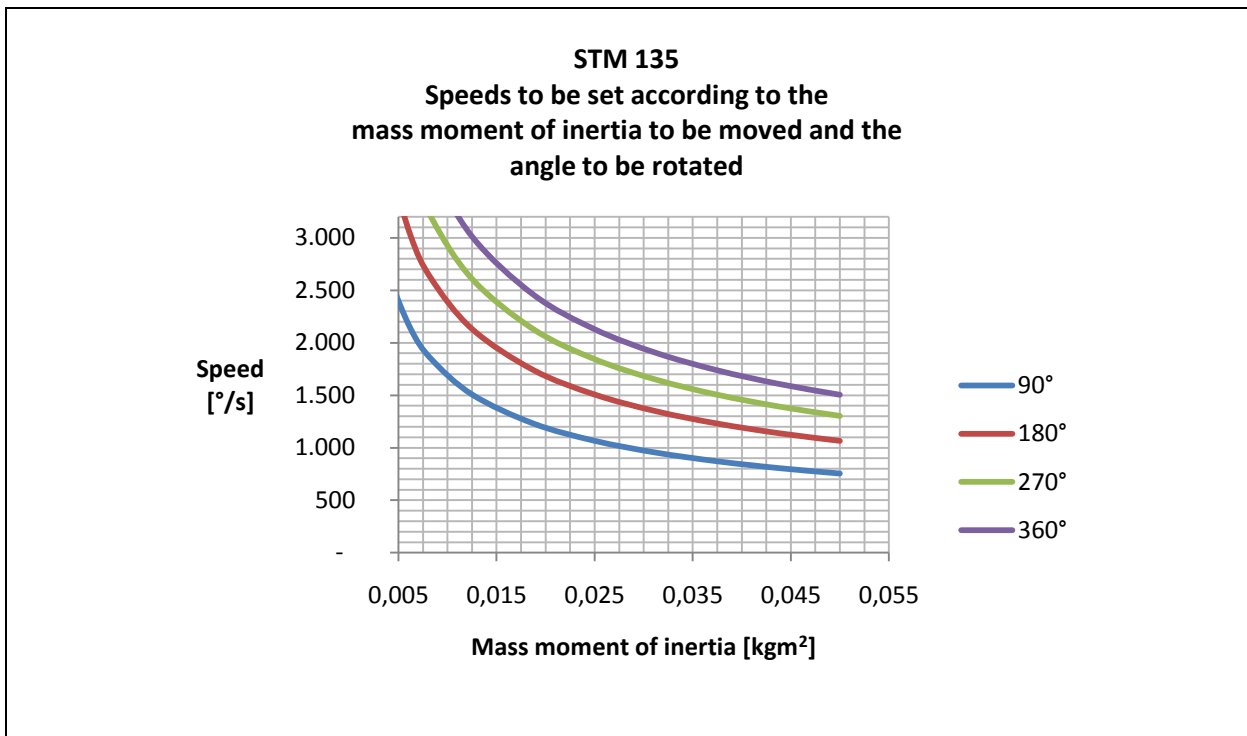


Figure 28

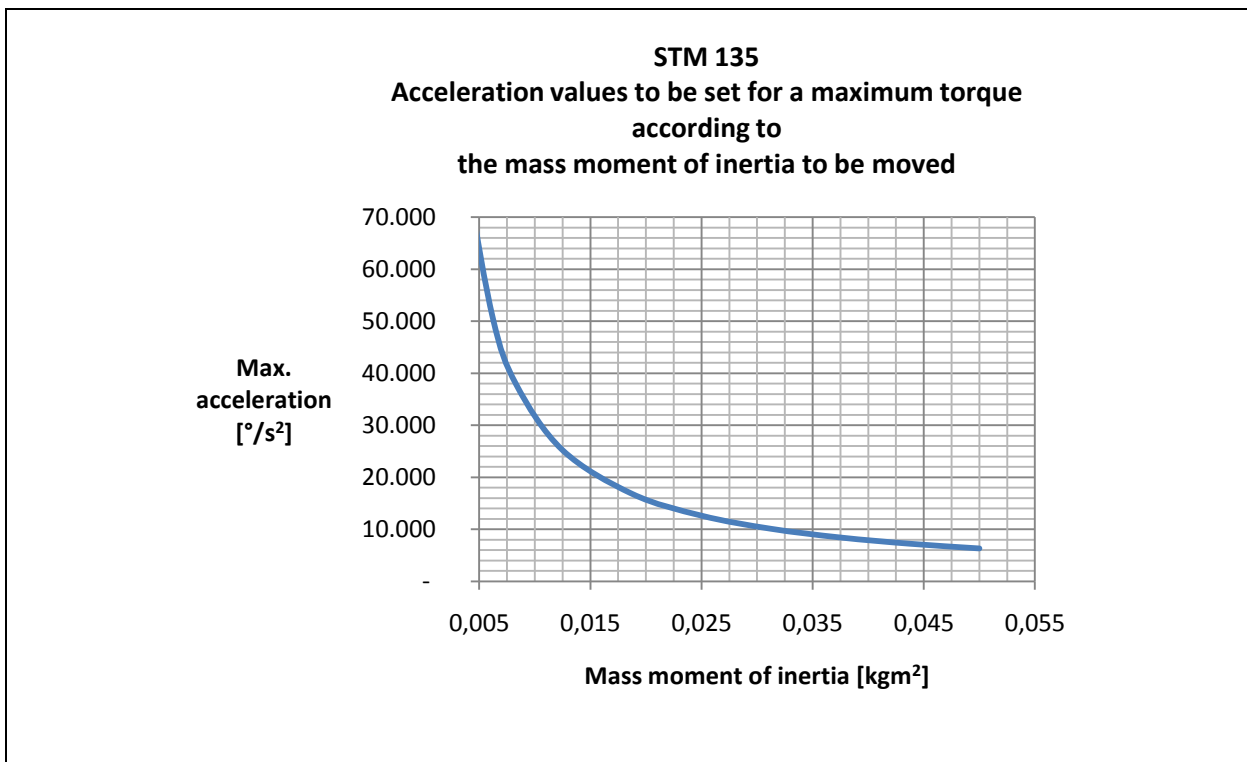


Figure 29

**10.3.2 STM170**

Mass moment of inertia	KR_speed	TN_speed	KR_position
0	0	0	11
0,055	16	0,10	11
0,06	17	0,11	11
0,065	17	0,11	11
0,07	18	0,12	11
0,075	18	0,13	11
0,08	19	0,14	11
0,085	19	0,15	11
0,09	20	0,16	11
0,095	21	0,17	11
0,1	21	0,17	11
0,105	22	0,18	11
0,11	22	0,19	11
0,115	23	0,20	11
0,12	23	0,21	11
0,125	24	0,22	11
0,13	24	0,23	11
0,135	25	0,23	11
0,14	26	0,24	11
0,145	26	0,25	11
0,15	27	0,26	11

*Table 24*

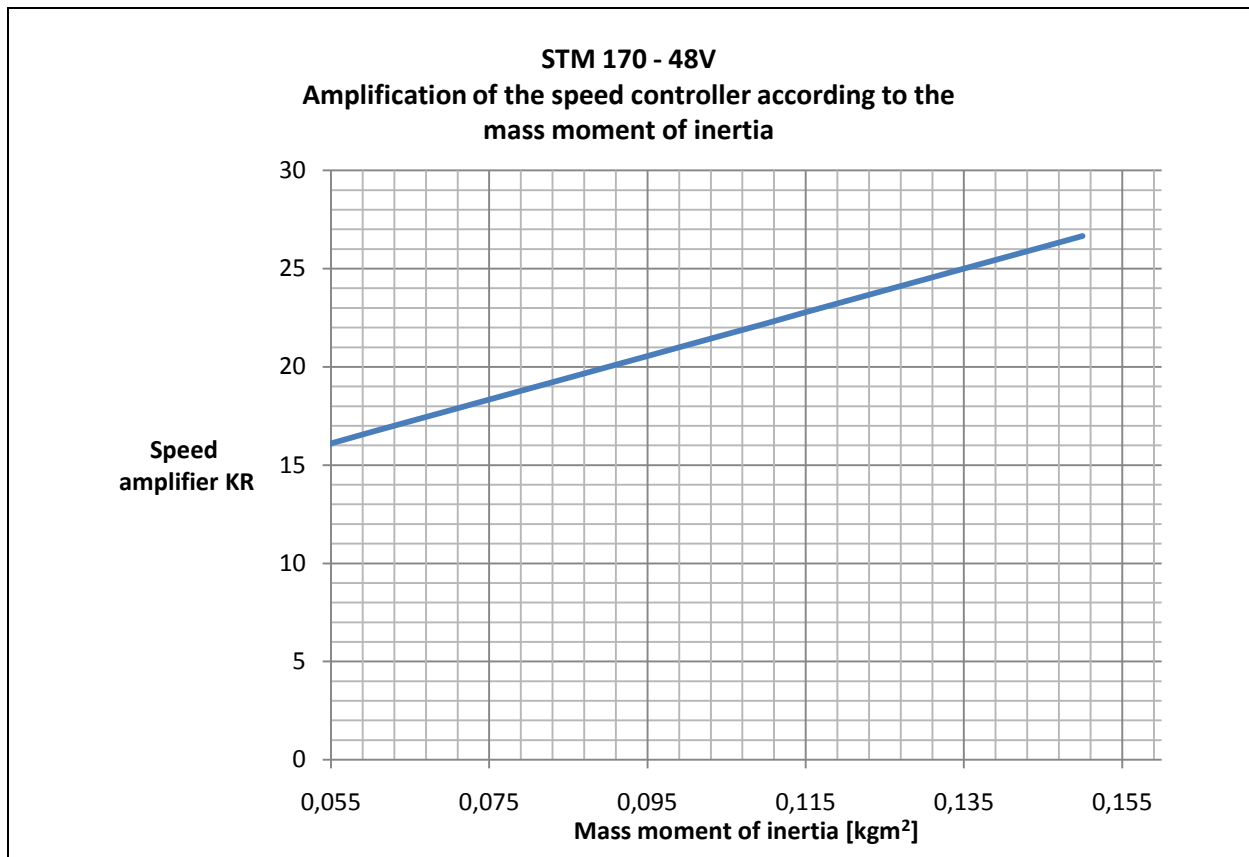


Figure 30

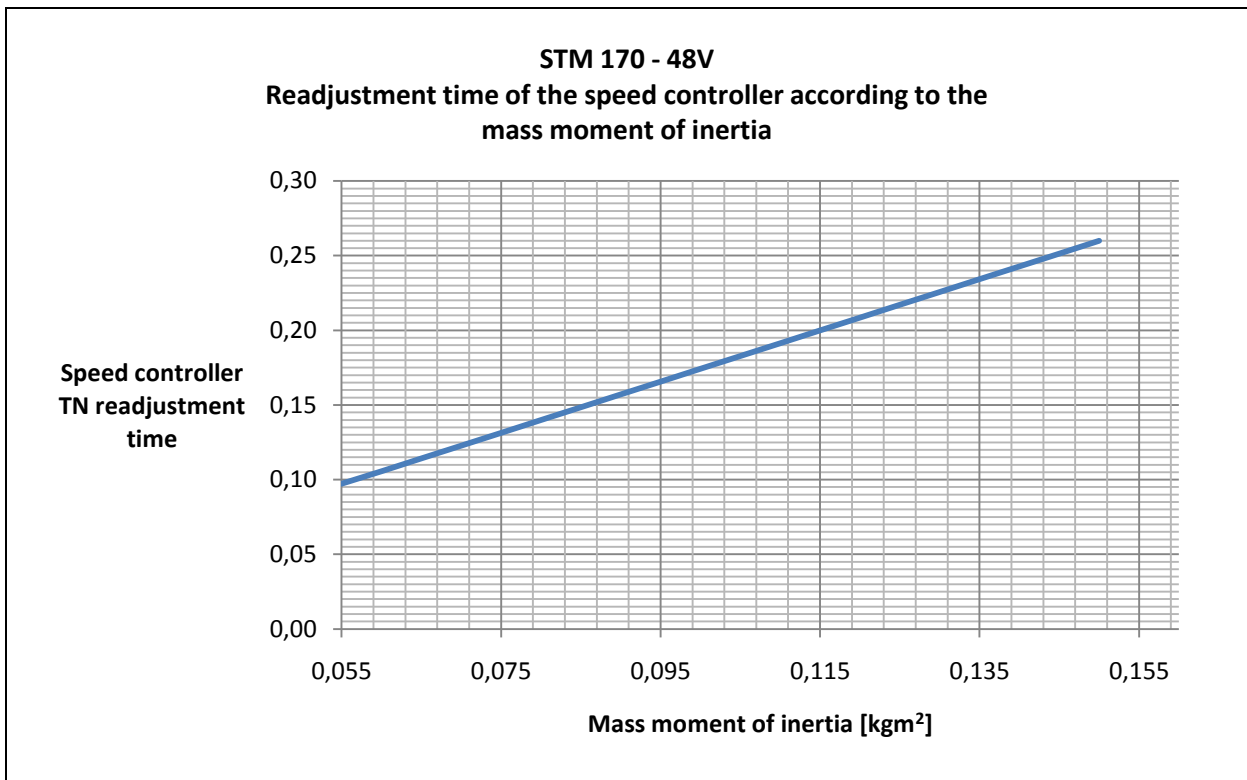


Figure 31

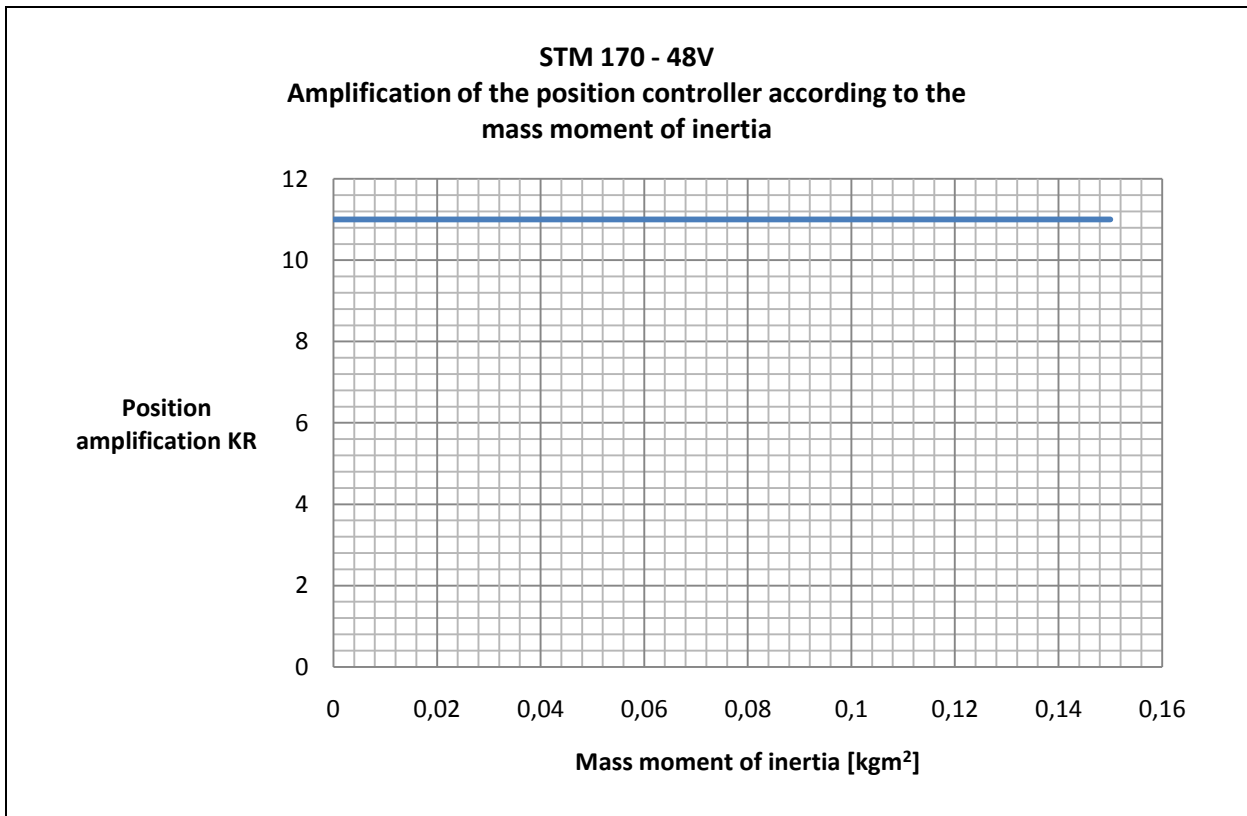


Figure 32

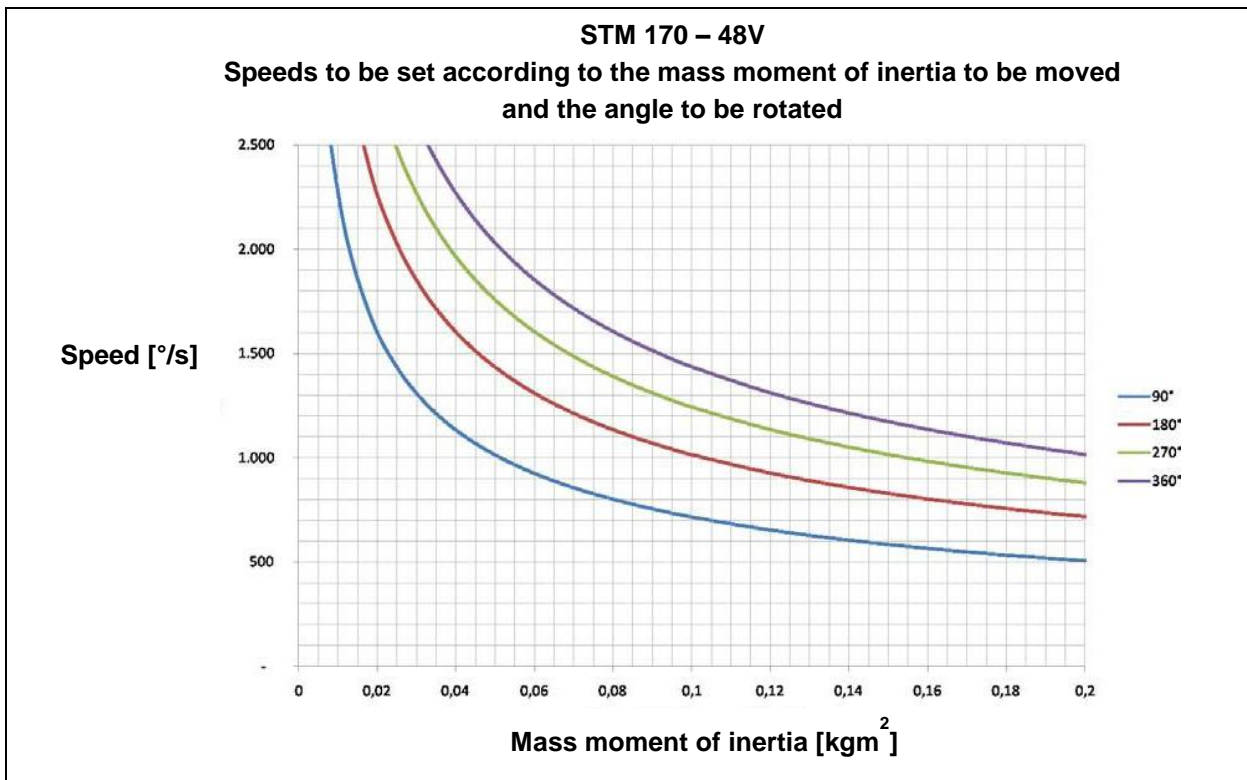


Figure 33

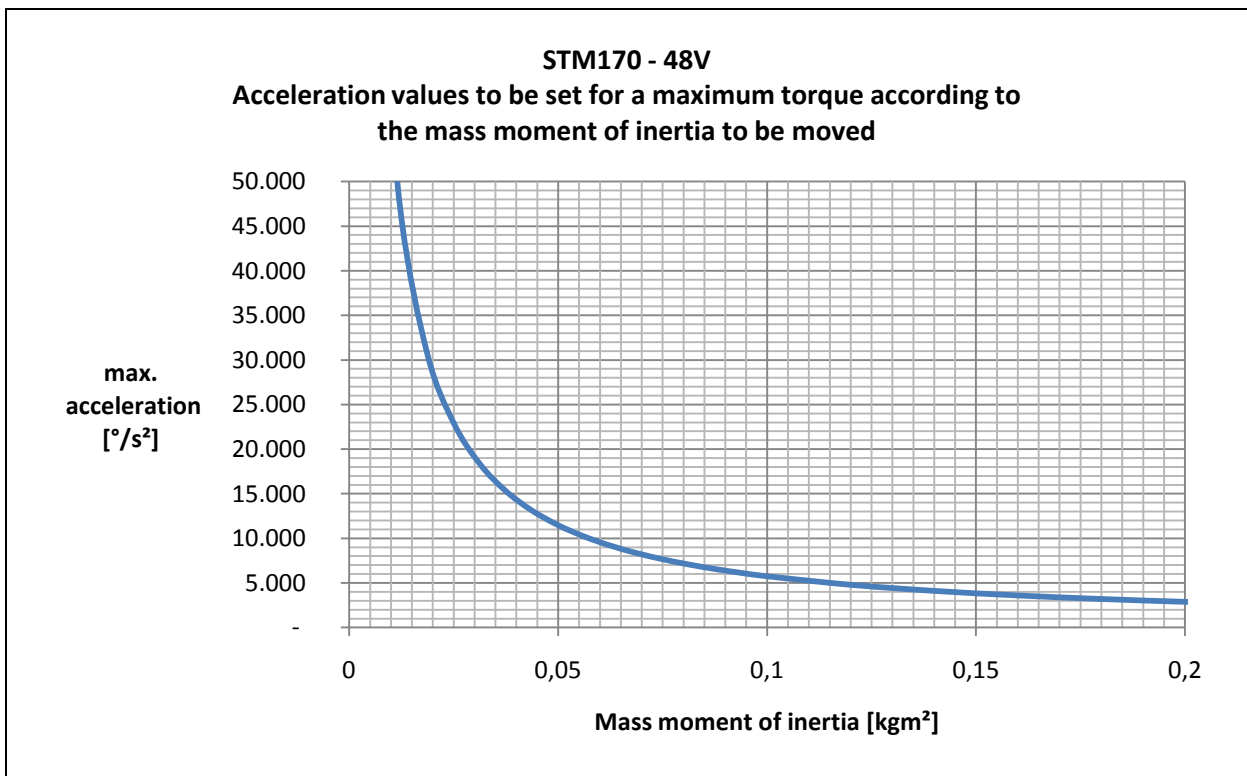


Figure 34

### 10.3.3 STM210

Mass moment of inertia	KR_speed	TN_speed	KR_position
0,00	5	0,06	4,5
0,04	5,5	0,07	4,5
0,08	6	0,08	4,5
0,12	6,5	0,09	4,5
0,16	7	0,1	4,5
0,20	7,5	0,11	4,5
0,24	8	0,12	4,5
0,28	8,5	0,13	4,5
0,32	9	0,14	4,5
0,36	9,5	0,15	4,5
0,40	10	0,16	4,5

Table 25

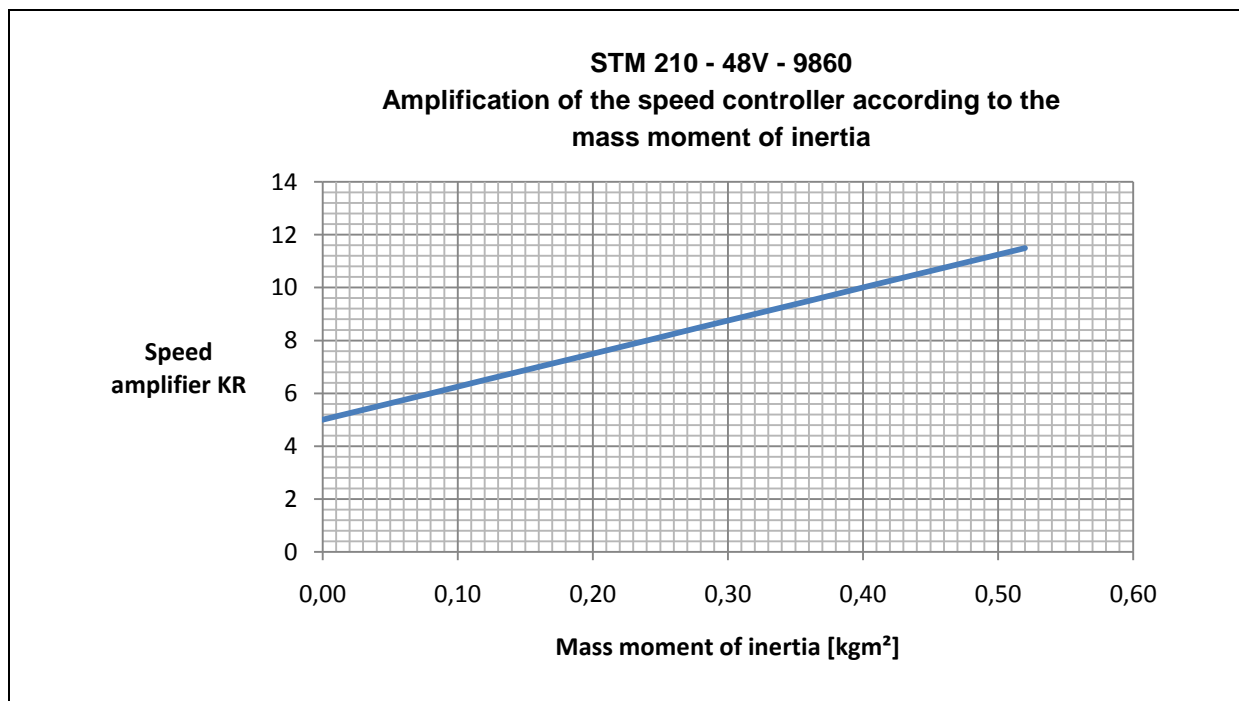


Figure 35

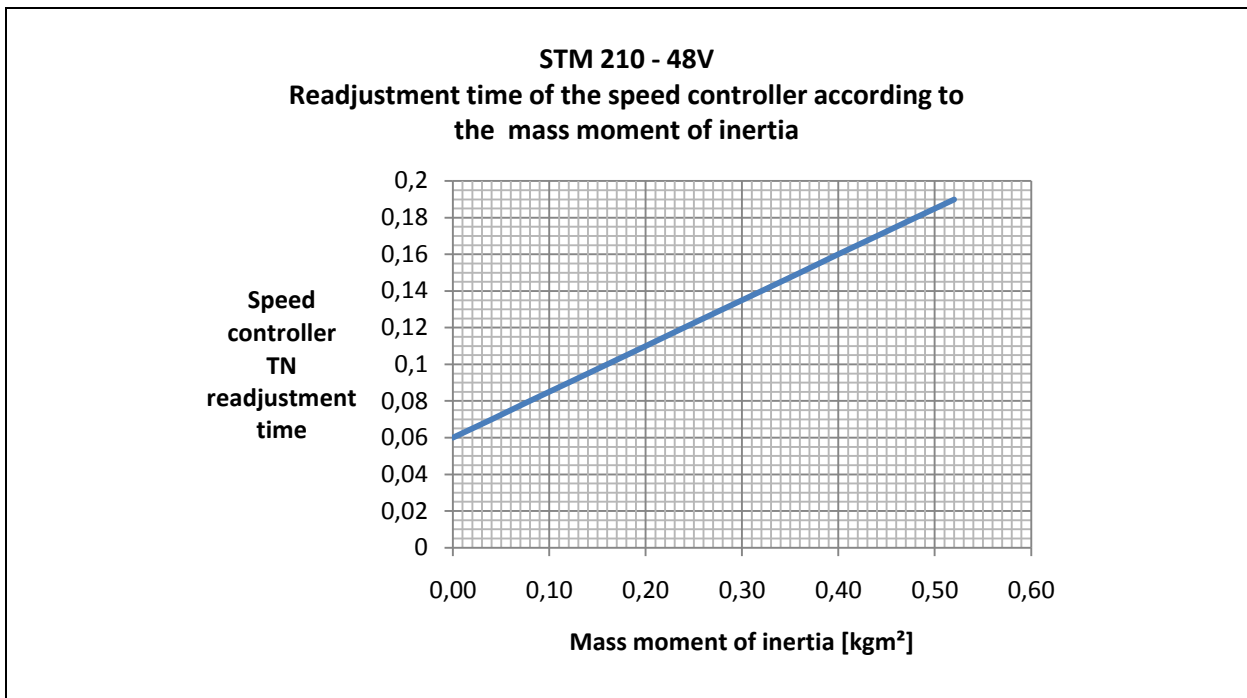


Figure 36

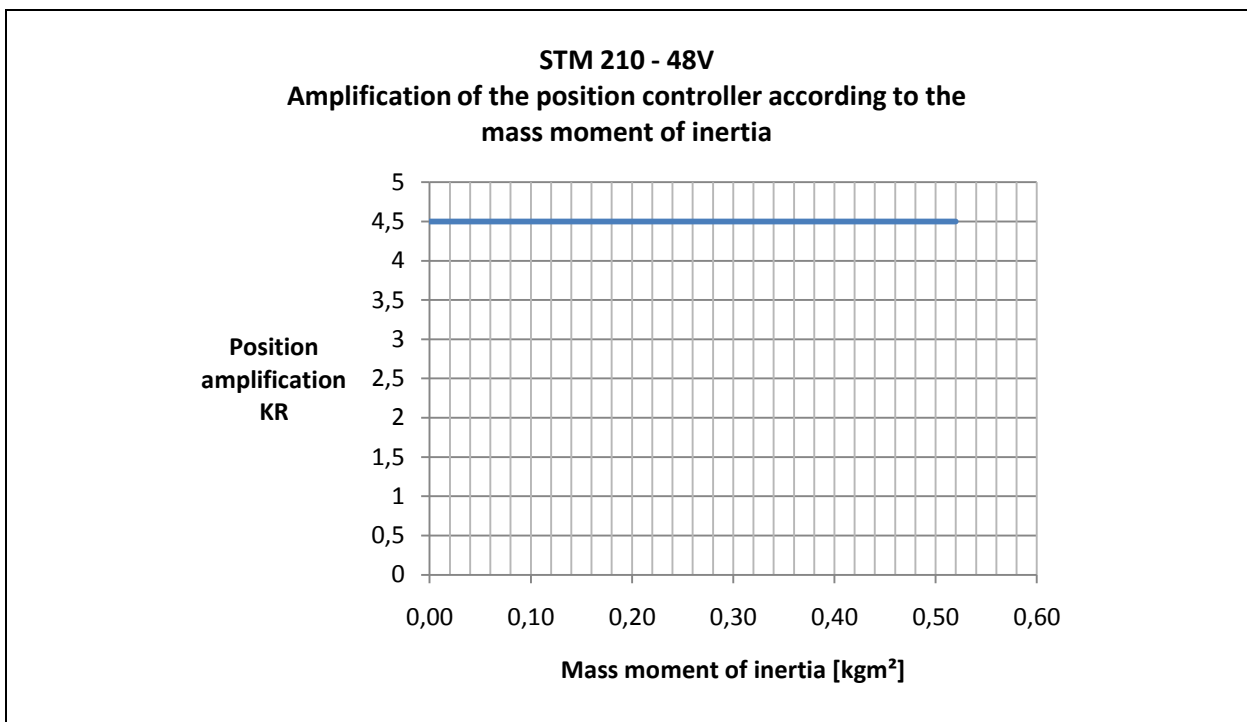


Figure 37

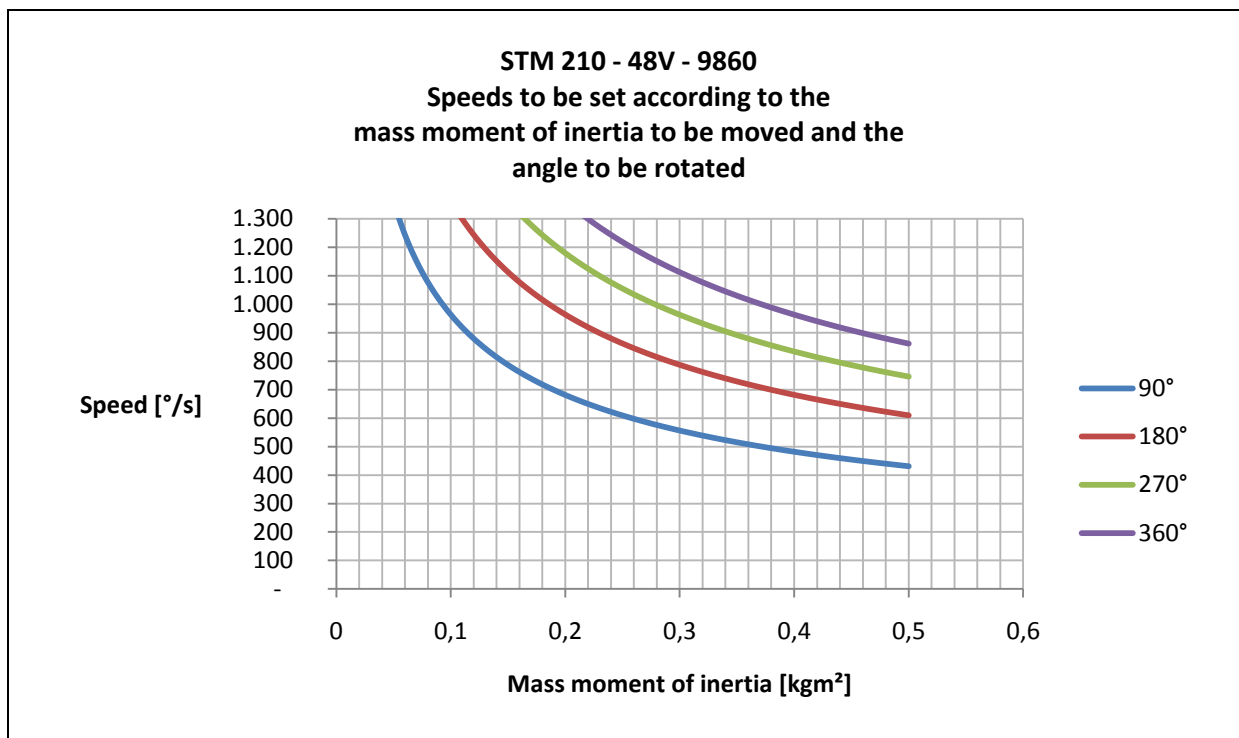


Figure 38

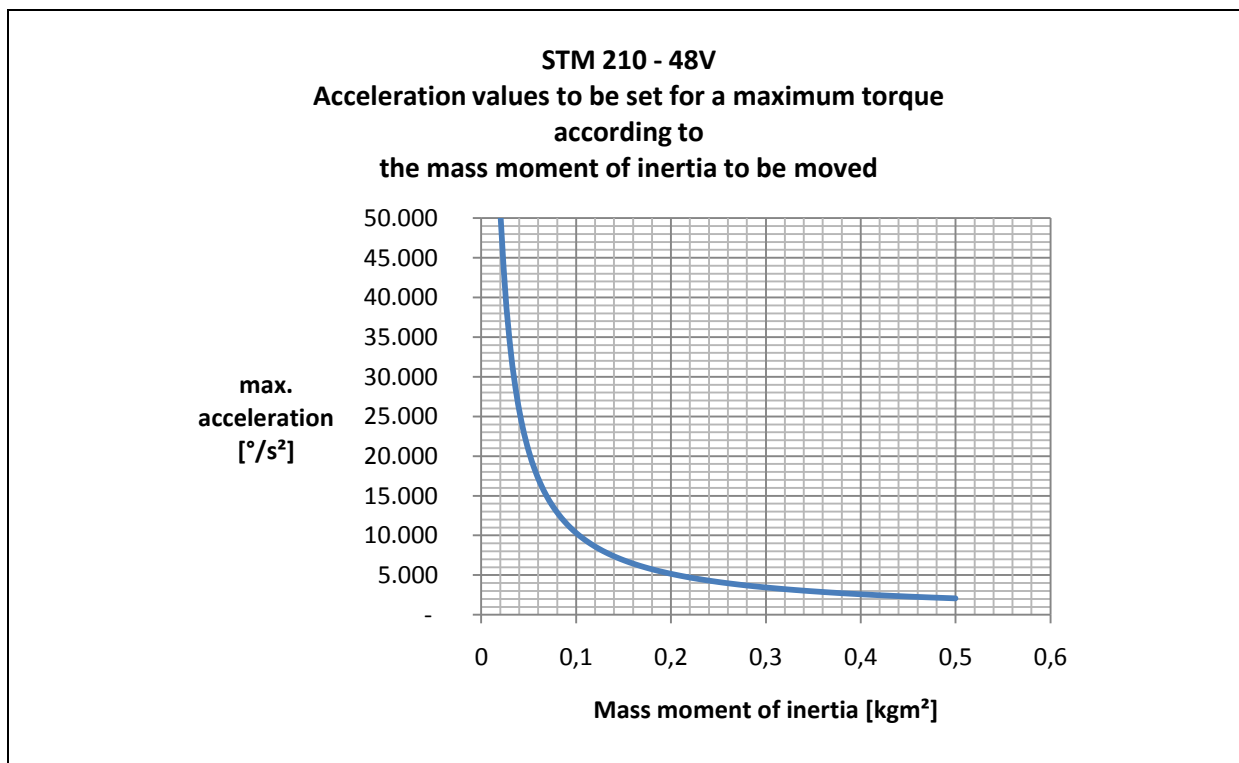


Figure 39

## 11 SCHUNK Motion protocol

### 11.1 Description

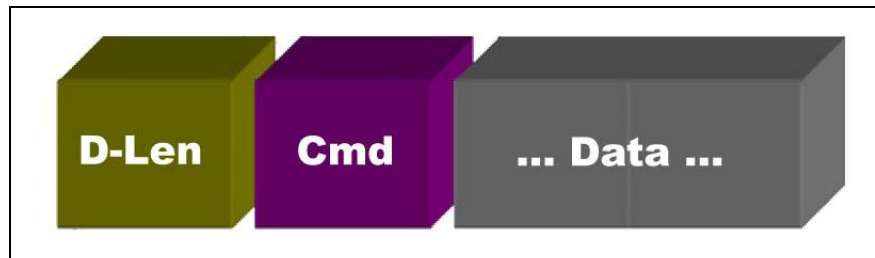


Figure 40

The data frame of the Motion protocol always includes the following elements:

- D-Len (1-byte)
- Command Code (1 byte)

D-Len (Data Length) specifies the number of subsequent items of user data including the command byte. The data frame consists of one byte, therefore a Motion protocol message can transfer a maximum of 255 data bytes.

The D-Len byte is always followed by the command code, consisting of one byte. If necessary, the command code is followed by the relevant parameters required. If required, a "master command" can be extended with a "sub-command".

All commands sent are immediately confirmed by the module with a response (acknowledge). This response also uses the data frame described above (D-Len, command code, any parameters). If the request has been successfully processed, D-Len always has a value that is not equal to "0x02". If the request failed, D-Len has the value "0x02".

#### Notes

The special features of the different bus systems are described in MotionControl.pdf (see DVD, Document: MotionControl.pdf).

### 11.1.1 Most important commands

**⚠ DANGER**

**Risk of injury when the machine/system moves unexpectedly due to incorrect programming!**

➔ Only specialist personnel or specially trained staff should carry out settings and enter parameters.

**Notes**

In all examples, only the necessary parameters are listed, not the optional parameters. In the examples, "M" stands for master and "S" for slave (= module).

**Referencing**

**Command Code:** 0x92

**Description:** A referencing is executed.

**Parameters (Master ► Slave):** None.

**Response (Slave ► Master):** "OK" (0x4F4B) if successful. The module executes the command.

**Miscellaneous:** Spontaneous response possible.

	D-Len	Cmd	Param	Meaning
M ► S	0x01	0x92		
S ► M	0x03	0x92	0x4F 0x4B	Successfully referenced

Table 26 Example for REFERENCE

**Positioning**

**Command Code:** 0xB0

**Description:** Moves the module to a specified position.

**Parameters (Master ► Slave):**

- Position in configured unit system (must be specified)
- Velocity (optional)
- Acceleration (optional)
- Current (optional)
- Jerk (optional)

**Response (Slave ► Master):** If possible, the time that the module needs for the movement is returned.

**Miscellaneous:** Spontaneous response when position reached or in case of prior termination of positioning.

	D-Len	Cmd	Param	Meaning
M ► S	0x05	0xB0	0x00 0x00 0x20 0x41	Move to position 10.0[mm]
S ► M	0x05	0xB0	0xCD 0xCC 0x04 0x41	Will reach position in 8.3[sec]

Table 27 Example for MOVE POS

### Current move

**Command Code:** 0xB3

**Description:** A current move is executed.

**Parameters (Master ► Slave):**

Current in configured unit system (must be specified).

**Response (Slave ► Master):** "OK" (0x4F4B) if successful. The module executes the command.

**Miscellaneous:** Spontaneous message is possible.

	D-Len	Cmd	Param	Meaning
M ► S	0x05	0xB3	0x00 0x00 0x60 0x40	Execute current move with 3.5[A]
S ► M	0x05	0xB3	0x4F 0x4B	

Table 28 Example for MOVE CUR

### Velocity move

**Command Code:** 0xB5

**Description:** A velocity move is executed.

**Parameters (Master ► Slave):**

- Velocity in configured unit system (must be specified)
- Current (optional)

**Response (Slave ► Master):** "OK" (0x4F4B) if successful. The module executes the command.

**Miscellaneous:** Spontaneous message is possible if the module is no longer moving.

	D-Len	Cmd	Param	Meaning
M ► S	0x05	0xB5	0x9A 0x99 0x31 0x41	Execute velocity move with 11.1[mm/s]
S ► M	0x05	0xB5	0x4F 0x4B	

Table 29 Example for MOVE VEL

**Stop module****Command Code:** 0x91**Description:** The module is braked and stopped in the current position.**Parameters** (Master ► Slave): None.**Response** (Slave ► Master): "OK" (0x4F4B) if successful.**Miscellaneous:** Spontaneous message is possible.

	D-Len	Cmd	Param	Meaning
M ► S	0x01	0x91		
S ► M	0x03	0xB5	0x4F 0x4B	OK

Table 30 Example for CMD STOP

**“FAST STOP”****Command Code:** 0x90**Description:** The module is stopped as quickly as possible. If a brake is fitted and appropriately configured, it is activated immediately. The motor phases are short circuited.**Parameters** (Master ► Slave): None.**Response** (Slave ► Master): Error message "ERROR FAST STOP" is triggered.**Miscellaneous:** Can only be reset by "CMD ACK".

	D-Len	Cmd	Param	Meaning
M ► S	0x01	0x90		
S ► M	0x03	0x88	0xD9	fast stop executed

Table 31 Example for CMD FAST STOP

**Acknowledge error****Command Code:** 0x8B**Description:** Acknowledgement of an error message.**Parameters** (Master ► Slave): None.**Response** (Slave ► Master): "OK" (0x4F4B)

**Miscellaneous:** When all errors have been successfully acknowledged, after sending "OK" (0x4F4B), an info message "INFO NO ERROR" is also sent.

	D-Len	Cmd	Param	Meaning
M ► S	0x01	0x8B		
S ► M	0x03	0x8B	0x4F 0x4B	OK

*Table 32 Example for CMD ACK*

**Notes**

For further information, refer to the MotionControl.pdf document on the DVD supplied.

## 12 Replacing the module

### **DANGER**

#### **Risk of electric shock due to contact with live parts!**

- Switch off the energy supply.
- Disconnect the MCS-12 controller from the power supply.
- Wait for approx. 5 minutes for the capacitors to discharge.

### **WARNING**

#### **Danger due to hot surfaces**

During normal operation, the module's surface may reach 85°C(185°F).

- Allow the module to cool down.

1. Stop the motor and exit the active sequential program.
2. Activate the "emergency stop" function.
3. Switch off the entire energy supply for MCS-12 and STM.
4. Check whether the supply of current to the auxiliary equipment is interrupted.
5. Remove all lines from the MCS-12 to the STM.
6. Remove all fastening screws from the STM.
7. Package the old module (if necessary, with a fault log) and store it at a dry place.
8. Mount the new module, as described in chapter 7.1 page 27.

#### **Note**

After being adjusted to the system, the replacement module needs to be re-configured.

## 13 Troubleshooting

### 13.1 SCHUNK Torque Motor STM

#### 13.1.1 STM is not turning

Possible cause	Corrective action
Interruption in the supply lines	<ul style="list-style-type: none"> <li>➔ Check the supply lines for defects</li> <li>➔ Check the electrical connections (see chapter 7.2, page 30)</li> </ul>
No motion release	<ul style="list-style-type: none"> <li>➔ Check the controller settings (see operating manual for the controller; for the MCS-12, see MotionControl.pdf on the DVD)</li> </ul>
Controller defective	<ul style="list-style-type: none"> <li>➔ Check whether there is voltage at the controller's output. If there is no voltage:                             <ul style="list-style-type: none"> <li>a) Check the connection pin assignment (see chapter 7.2, page 30)</li> <li>b) Consult the operating manual for the controller</li> </ul> </li> </ul>
Target value line or communication between master and controller is interrupted	<ul style="list-style-type: none"> <li>➔ Check the target value line and communication.</li> </ul>
Rotor is blocked mechanically	<ul style="list-style-type: none"> <li>➔ Check the mechanical components.</li> <li>➔ Check the evenness at the mounting surface (see chapter 7.1 page 27)</li> </ul>
Shaft encoder defective	<ul style="list-style-type: none"> <li>➔ Check shaft encoder and its connection. If a defect is detected, the STM must be sent to SCHUNK with a repair order.</li> </ul>
Short-circuit between turns in the motor	<ul style="list-style-type: none"> <li>➔ Check the difference of the winding resistance values. Do not exceed the difference.</li> <li>➔ If the difference between the individual motor phases exceeds 0.1 Ohm, the STM must be sent to SCHUNK with a repair order.</li> </ul>
Short-circuit to ground due to moisture short-circuit to ground due to electrical defect	<ul style="list-style-type: none"> <li>➔ Check the protective conductor.</li> <li>➔ Check the electrical connection and connectors for ground leakage.</li> <li>➔ If the STM has a ground leak while the power cable is disconnected, the STM must be sent to SCHUNK with a repair order.</li> </ul>
Incorrect phase connections	<ul style="list-style-type: none"> <li>➔ Check the electrical connections (see chapter 7.2, page 30)</li> </ul>
Incorrect controller settings	<ul style="list-style-type: none"> <li>➔ Check the parameters and setting values (see operating manual for the controller)</li> </ul>
Motor phases or encoder signals confused	<ul style="list-style-type: none"> <li>➔ Check the electrical connections (see chapter 7.2, page 30)</li> <li>➔ Check the encoder signals and the shielding of the encoder cable.</li> </ul>

Table 33

### 13.1.2 STM overspeed

Possible cause	Corrective action
Controller settings not ideal	→ Check the controller settings (direction of rotation of motor and encoder direction of counting).
Insufficient power supply for the controller's power component	→ Check the stability of the supply voltage. Use transformers instead of a switching power supply component.

Table 34

### 13.1.3 STM oscillates

Possible cause	Corrective action
Motor overload	<ul style="list-style-type: none"> <li>→ Check the dimensioning</li> <li>→ Reduce the load</li> <li>→ Check the controller settings</li> </ul>
Controller settings not ideal	→ Check the controller settings

Table 35

### 13.1.4 Bearing noise

Possible cause	Corrective action
Incorrect assembly	→ Check the evenness at the mounting surface (see chapter 7.1, page 27)
Configuration incorrect	→ Check the parameters and setting values (see operating manual for the controller).
Bearing defective due to overload	→ Send the module to SCHUNK with a repair order.

Table 36

### 13.1.5 Error message for the winding temperature

Possible cause	Corrective action
The electrical connection to the temperature sensor is faulty	→ Check resistance between the controller and the temperature sensor in the STM and replace the electrical connection, if necessary.
Temperature sensor defective	→ Check the resistance of the temperature sensor. → If the resistance exceeds 630 Ohms at room temperature, the STM must be sent to SCHUNK with a repair order.
Thermal motor overload	→ Reduce the load. → Mount the motor on heat-conducting materials to dissipate excess motor heat.
Rotor is blocked mechanically	→ Check the mechanical components. → Check the evenness at the mounting surface (see chapter 7.1, page 27)
Encoder signals are faulty; encoder line shielding is not corrected.	→ Check the encoder's power supply. → Check the encoder signals and the shielding of the encoder cable.
Motor overload; overvoltage or undervoltage	→ Check the dimensioning. → Reduce the load. → Check the controller settings. → Check the output power supply.

Table 37

## 13.2 MCS-12 controller

### 13.2.1 Software error messages

The MCS-12 controller indicates the error via the flashing red LED. To determine the error cause, the MCS-12 controller must be connected to the PC.

- Consult the operating manual, MotionControl.pdf, and rectify the error.

#### Note

In an error occurs, the STM is switched and the motor's phases are bypassed, so that an active motion of the unit via the digital inputs is not possible any more without acknowledging ("Error Acknowledge") the error.

### 13.2.2 Electrical signals are not transmitted

Possible cause	Remedial measures
Interruption in the supply lines	<ul style="list-style-type: none"> <li>➔ Check the supply lines for defects</li> <li>➔ Check the electrical connections (see chapter 9.2, page 38).</li> </ul>

Table 38

### 13.2.3 No LED lights up

Possible cause	Remedial measures
There is no voltage.	➔ Check the output and logic power supply on the MCS-12
Master (control system) on the field bus is not active.	➔ Check the master, activate field bus communication.

Table 39

### 13.2.4 „POW“ LED (green) does not light up

Possible cause	Remedial measures
There is no voltage.	➔ Connect the output power supply for the MCS-12 (see chapter 9.2.3, page 39)

Table 40

### 13.2.5 „RDY“ LED (green) on the controller is not flashing

Possible cause	Remedial measures
Faulty connection	➔ Check the connection (see chapter 9.2.3, page 39)
Logic power supply missing	➔ Check the logic power supply on the controller (see chapter 9.2.3, page 39)

Table 41

### 13.2.6 „ERR“ LED (red) on the controller is flashing or permanently on

Possible cause	Remedial measures
Insufficient voltage at "POW" (undervoltage)	➔ Check the output power supply on the controller (see chapter 9.2.3, page 39)
There is an error; module indicates: CMD_ERROR	➔ To rectify the error, see the operating manual for the controller: "MotionControl.pdf" (see DVD for the controller).

Table 42

## 14 Maintenance and care

### 14.1 Maintenance and lubrication intervals

**⚠ DANGER**

**Risk of fatal injuries due to electric shock**

If the electrical connections are released from the live module, arcing may be the result.

- ➔ Switch off the energy supply.
- ➔ Only have work on the module performed by appropriately trained specialist personnel.

**! NOTICE**

**If the operating temperature in the motor's winding exceeds 60° C, the lubricants will harden faster.**

- ➔ Lubrication and maintenance works have to be carried out more often.

We recommend that maintenance and seal replacement is done by SCHUNK because the rotor must be aligned and assembled with an assembly device.

**Maintenance intervals**

Type	STM 48V
Bearing lubrication Interval [h]	20.000
Visual inspection [h]	2.500

*Table 43*

This information refers to the use of the STM under normal operating and ambient conditions:

- Clean workshop atmosphere
- No splashing water
- Small amounts of abrasive and process dust

### 14.2 Module Servicing

For maintenance work or repairs, send the complete module along with a repair order to SCHUNK.

**Visual inspection**

The regular visual inspection of all supply lines is the prerequisite for the perfect operation of the STM.

- ➔ If supply lines are defective, put the machine out of operation immediately.
- ➔ Replace damaged connection cables.

Check the STM every 2500 operating hours or once a year for bearing noise:

**Acoustic bearing inspection**

Bearing noise	Further procedure
Smooth noise (typical bearing noise)	Everything okay, STM can continue to be operated.
Uneven grinding noise	The motor is not set up correctly: ➔ check the evenness of the mounting surfaces (see chapter 7.1, page 27)
Loud and uneven noise / motor not running smoothly	The motor is not set up correctly: ➔ check the evenness of the mounting surfaces (see chapter 7.1, page 27)  or bearings defective: ➔ Consult your SCHUNK contact and send the STM to SCHUNK along with a repair order.

Table 44

**Cleaning**

Clean the STM dry at regular intervals to remove all dirt.

If the housing is soiled, please only rub it dry, e.g. with a cloth. Do not immerse or spray.

When all maintenance work has been completed:

- ➔ Refit the safety devices provided, such as covers and safety switches.

**14.3 Dismantling the module**

The module may only be dismantled by SCHUNK as otherwise the mechanism or internal electronics may be damaged.

Non-compliance will invalidate the warranty.

## **15 Transport, storage and disposal**

### **15.1 Transport**

- The packaging must protect the drive from all external effects (such as mechanical shocks and humidity).
- Protect the module from shocks.
- Package the module in such a way that the electrical supply lines do not obstruct transport and are not damaged themselves.
- Comply with climatic category 2K3 in accordance with EN50178.
- Transport temperature -5°C (+23°F) to +60°C (+140°F), with maximum fluctuations of 20 K/hour.
- Transport air humidity: relative humidity of 5%-95%, non-condensing.
- During transport and handling, make sure that none of the components are bent or insulation space is changed.
- The STM contains components that are sensitive to electrostatic charge. Avoid any electrostatic charging of the STM.

### **15.2 Packaging**

- Cardboard packaging with paper foaming
- The maximum stacking height is three modules.

### **15.3 Storage**

- Protect the motor from the effects of moisture.
- The storage temperature should be between +5°C (+41°F) and +60°C (+140°F).
- The storage location must be clean, dry and well ventilated.
- No outdoor storage permitted.
- No condensation permitted!
- Comply with climatic category 1K4 in accordance with EN50178.
- Observe the maximum stacking height of three packaged modules.

### **15.4 Disposal**

- Observe the locally valid legal disposal regulations.
- Environmentally sound disposal via the corresponding recycling or workshop centers.
- SCHUNK GmbH & Co. KG accepts no liability for the consequences of incorrect disposal by the customer.

**16 Drawing**

**16.1 STM-135**

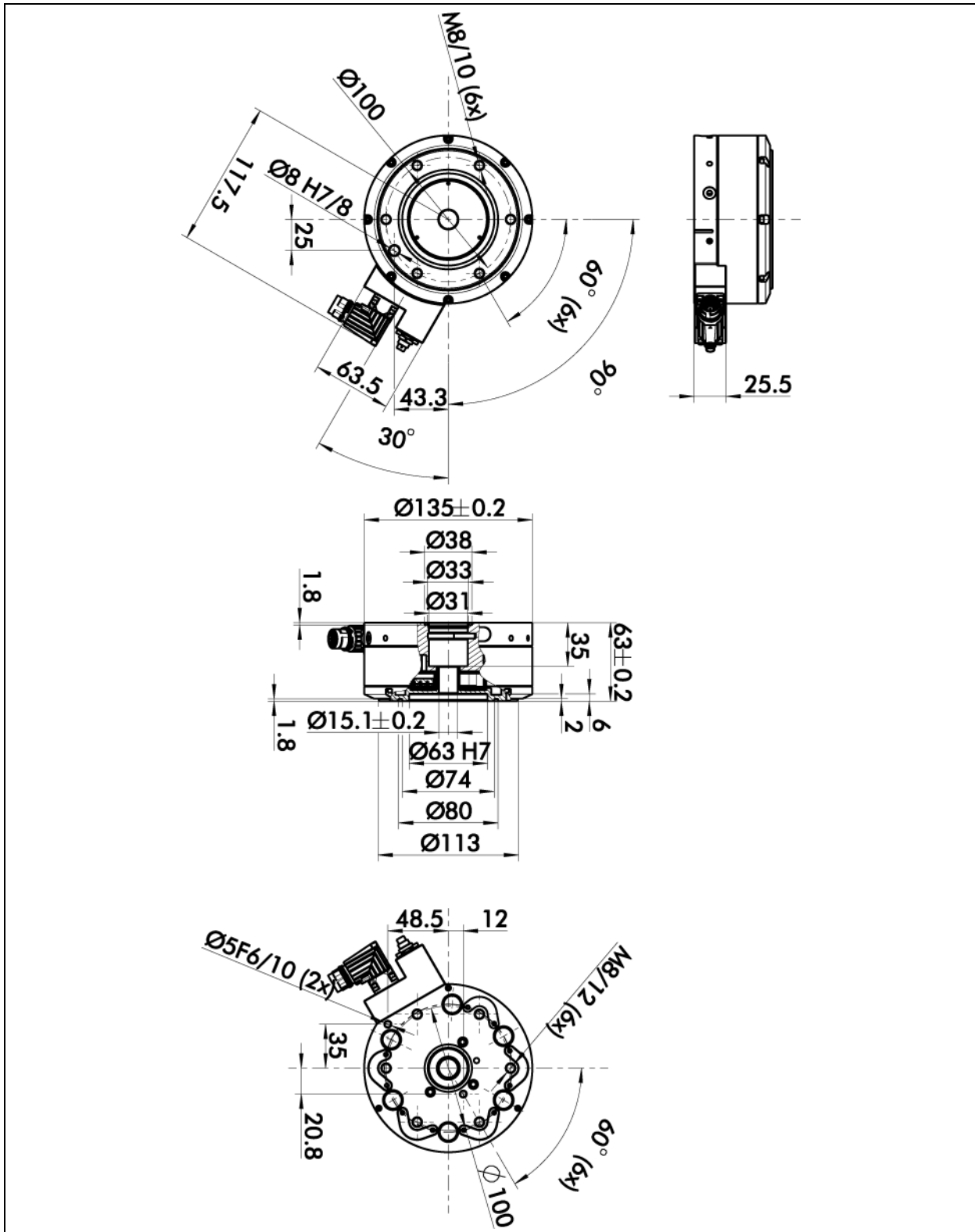


Figure 41 Dimensions of the STM-135 torque motor



**16.3 STM-210**

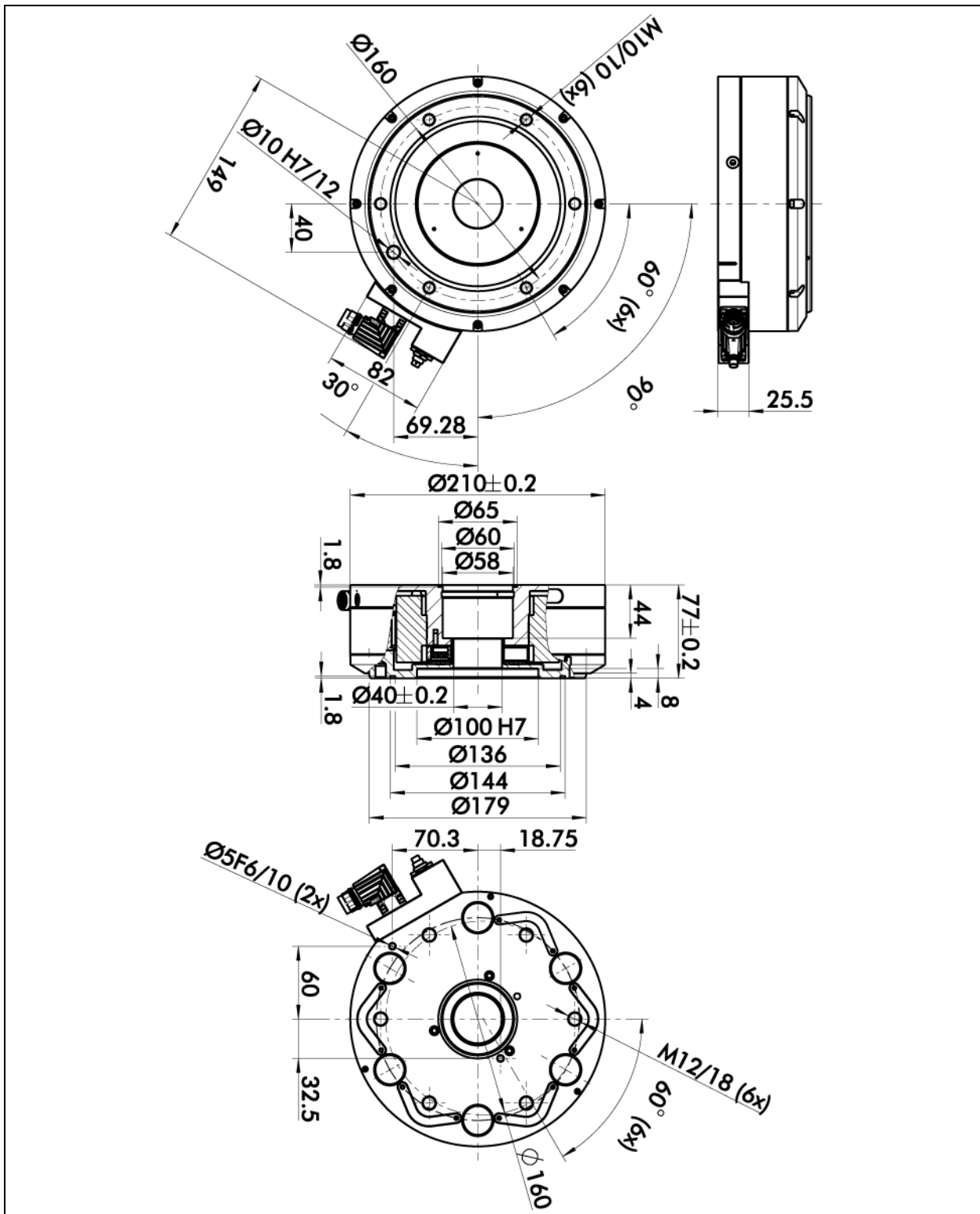


Figure 43 Dimensions of the STM-210 torque motor

## 17 Translation of original EC declaration of incorporation

In terms of the EC Machinery Directive 2006/42/EC, annex II B

Manufacturer/  
distributor SCHUNK GmbH & Co. KG.  
Spann- und Greiftechnik  
Bahnhofstr. 106 – 134  
D-74348 Lauffen/Neckar, Germany

We hereby declare that the following product:

**Product designation:** Electrical Rotary Module  
**Type designation:** STM 135 / STM 170 / STM 210  
**ID-number:** 0306800...0306808 / 0306810...0306818  
/0306820...0306828

meets the applicable basic requirements of the Directive Machinery (2006/42/EC).

The incomplete machine may not be put into operation until conformity of the machine into which the incomplete machine is to be installed with the provisions of the Machinery Directive (2006/42/EC) is confirmed.

Applied harmonized standards, especially:

EN ISO 12100-1 Safety of machines - Basic terminology, general design guidelines - Part 1: Basic terminology, methodology (ISO 12100-1:2003)  
EN ISO 12100-2 Safety of machines - Basic terminology, general design guidelines - Part 2: Technical guidelines (ISO 12100-2:2003)  
EN ISO 9409-1:2004 Industrial robots - Mechanical interfaces - Part 1: Plates (ISO 9409-1:2004); German version EN ISO 9409-1:2004

The manufacturer agrees to forward on demand the special technical documents for the incomplete machine to state offices.

The special technical documents according to Annex VII, Part B, belonging to the incomplete machine have been created.

Person responsible for documentation: Mr. Michael Eckert, Tel.: +49(0)7133/103-2204

Location, date/signature: Lauffen, January 2011 p.p. 

Title of the signatory Director for Development



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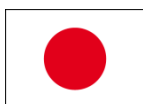
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