

Electrical Rotary Module SCHUNK Torque Motor ERS 135-210 048V

Assembly and Operating Manual



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Applicable documents

- SCHUNK catalog rotary modules *
- Data sheet SCHUNK brake valve MV15 *
- SCHUNK CD with:
 - MCDemo-Software *
 - EEPROM-Files for SCHUNK controller MCS 12 *
 - Function module FB10 for Siemens S7-300/400 for commissioning of SCHUNK-modules*
- General terms of business *

The above with * characterized specified data can alternative be downloaded on the following page:

* www.schunk.com

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	➔ Keep this manual available for the personnel at all times. ➔ Require personnel to read and observe this manual and the applicable documents, especially the safety notes and warnings.
Skilled personnel, fitter	➔ Read, observe and follow this manual and the applicable documents, especially the safety notes and warnings.

Table 1

1.3 Symbols in this manual

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

Symbol	Meaning
 DANGER	Dangers for persons. Nonobservance causes death or serious injuries.
 WARNING	Dangers for persons. Nonobservance can cause death or serious injuries.
 WARNING	Warning of hot surfaces
 NOTICE	Information on avoiding material damage.
✓	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.
 xyz	Cross-reference to further information.
1-4	Reference to fig. 1, Item 4
Master M ➔ Slave S	Parameter will be transferred from Master M to Slave S

Table 2

1.4 Terms used in this manual

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

Table 3

2 Basic safety notes

2.1 Intended use

The ERS was designed to rotate loads, workpieces and objects.

The ERS 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.

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

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.

2.2 Environmental and operating conditions

- ➔ The module may be used only in the context of its defined application parameters
☞ [chapter 6 Technical Data , 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. Observe maintenance and lubrication intervals:
☞ [chapter 13.1 Maintenance and lubrication intervals, page 76](#)
- ➔ 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 especially 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.

- ➔ Provide protective equipment per EC Machinery Directive.
- ➔ The ERS housing must be grounded via the controller by means of the protective conductor in the power cable.

2.3.2 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.

2.3.3 Specific Standards

The following standards were kept:

- Transient emissions after EN 55011:2007 + A2:2007 class A (equates to EN 61000-6-4:2004)
- Interference immunity after EN 61000-6-2:2005

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 velocity.

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

 WARNING

Risk of burns due to contact with hot surfaces!

During operation, the surface temperature of the ERS 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 intermediate circuit voltage of the controller has discharged completely (see the manufacturer's manual pertaining to the controller).

3 Warranty

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

- ➔ Intended use in 1-shift operation
- ➔ Observation of the maintenance intervals
 - ☞ [chapter 13.1 Maintenance and lubrication intervals, page 76](#)
- ➔ Observation of the ambient conditions and operating conditions
 - ☞ [chapter 2.2 Environmental and operating conditions, page 9](#)

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.
- Also observe our general terms of business.

4 Scope of delivery

The scope of delivery includes:

- Electrical Rotary Module Type ERS in the version ordered
- an exemplar of the Assembly and Operating Manual incl. a translation of the EC declaration of conformity in accordance with the low voltage directive
- SCHUNK CD with EEPROM-Files for SCHUNK controller MCS 12 and MCDemo-Software
Function module FB10 for Siemens S7-300/400 for commissioning of SCHUNK-modules

5 Accessories

The following accessories are required for the module:

- Cable set (powercable/encoder cable)
- Y-junction ID-Nr. 9957232
- Sensor cable ID-Nr. 9957233

The following accessories are available for the module:

- Controller:
MCS 12

➔ Order accessories separately.

➔ For additional accessories, see catalog or www.schunk.com.

6 Technical Data

6.1 Basisal data

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

6.1.1 Technical Data ERS 135 048V

Note

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

Type	ERS 135 048V
Mechanical operating data	
heat conducting surface [mm ²]	57686
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 [kgm ²]	0,001431
max. mass moment of inertia [kgm ²]	0,039
rotation range [°]	>360 (turning endlessly)
repeatability * ¹ [°]	0,01
* ¹ 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 * ²
* ² Applies only if the preconditions in chapter 8.1 are fulfilled. Otherwise, S6 - continuous mode with intermittent load is the permitted operating mode.	

Type	ERS 135 048V
Electrical connection - required cable cross-sections and number of wire strands	
power [mm ²]	3 x 1
grounding [mm ²]	1 x 1
shaft encoder [mm ²]	8 x 0,25
temperature sensor [mm ²]	2 x 0,25
Specifications for the integrated motor	
motor type	synchronous
switching	star
temperature sensor (type)	KTY84-130
max. permissible operating temperature [°C (°F)]	+95 (+203)
insulation class	class F DIN 57530
output shaft power P _n [kw]	0,09
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]	320
max. speed n _{max} [rpm]	510
winding resistance (phase-phase) R ₂₀ [Ohm]	3,2
winding inductivity (phase-phase) L ₂₀ [mH]	4,77
numbers of pole pairings N	15
Specifications for the integrated measuring system	
type	5V TTL-signal (incremental), magnetic measuring system with reference track
power supply [V]	5 ± 10 %
mean current input [mA]	15
pulse number per revolution [pulses/rev.]	22400 (on quadruple evaluation)
resolution of the sensor [°]	0,016

Table 4 Technical Data ERS 135 048V

**Swing time
diagramm**

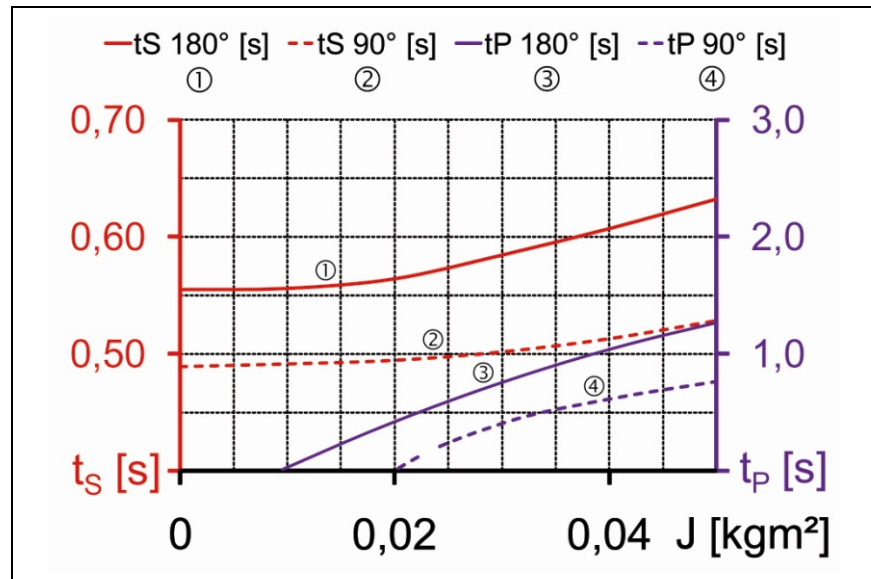


Figure 1 Swing time diagramm ERS 135 048V

Parameter	Description
t_s	Swing time [s]
t_p	Pulse off time [s]

Table 5 Legend to Swing time diagramm ERS 135 048V

**Moment
characteristics**

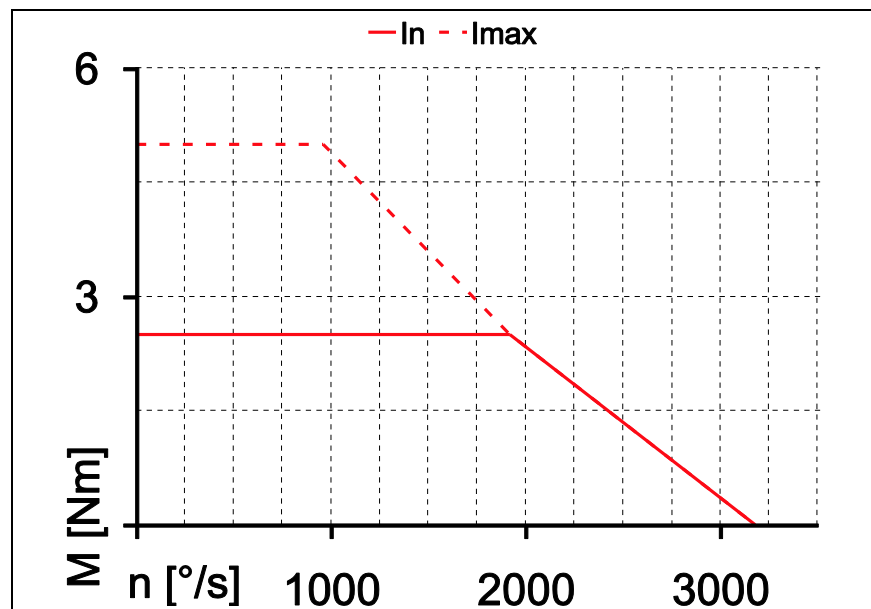


Figure 2 Moment characteristic ERS 135 048V

6.1.2 Technical Data ERS 170 048V

Note

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

Type	ERS 170 048V
Mechanical operating data	
heat conducting surface [mm ²]	49302
deadweight [kg]	4,7
dimension (Ø x L) [mm]	170 x 66
center bore (Ø) [mm]	32
ambient temperature [°C (°F)]	
min.	+5 (+41)
max.	+55 (+131)
mass moment of inertia of rotating parts [kgm ²]	0,003859
max. mass moment of inertia [kgm ²]	0,14
rotation range [°]	>360 (turning endlessly)
repeatability * ¹ [°]	0,04
* ¹ 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 * ²
* ² Applies only if the preconditions in chapter 8.1 are fulfilled. Otherwise, S6 - continuous mode with intermittent load is the permitted operating mode.	
Electrical connection - required cable cross-sections and number of wire strands	
power [mm ²]	3 x 1
grounding [mm ²]	1 x 1
shaft encoder [mm ²]	8 x 0,25
temperature sensor [mm ²]	2 x 0,25
Specifications for the integrated motor	
motor type	synchronous
switching	star

Type	ERS 170 048V
temperature sensor (type)	KTY84-130
max. permissible operating temperature [°C (°F)]	+95 (+203)
insulation class	class F DIN 57530
output shaft power P _n [kw]	0,14
intermediate circuit voltage U _{ZK} [V]	48
rated torque M _n [Nm]	5,0
rated current I _n [A]	5,61
peak current I _{max} [A]	19,1
torque constant K [Nm/A]	0,9
rated speed n _n [rpm]	250
max. speed n _{max} [rpm]	400
winding resistance (phase-phase) R ₂₀ [Ohm]	1,36
winding inductivity (phase-phase) L ₂₀ [mH]	2,53
numbers of pole pairings N	15
Specifications for the integrated measuring system	
type	5V TTL-signal (incremental), magnetic measuring system with reference track
power supply [V]	5 ± 10 %
mean current input [mA]	15
pulse number per revolution [pulses/rev.]	30240 (on quadruple evaluation)
resolution of the sensor [°]	0,012

Table 6 Technical Data ERS 170 048V

Swing time diagramm

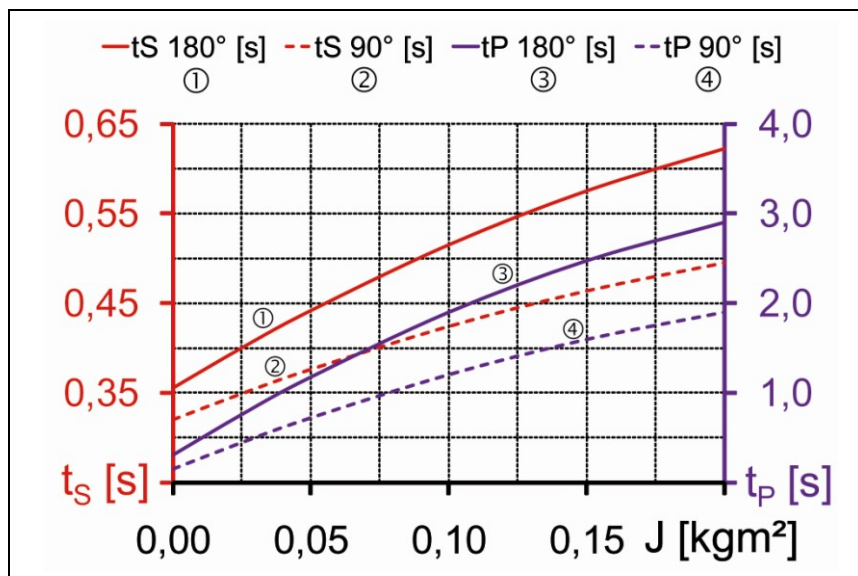


Figure 3 Swing time diagramm ERS 170 048V

Parameter	Description
tS	Swing time [s]
tP	Pulse off time [s]

Table 7 Legend to Swing time diagramm ERS 170 048V

Moment characteristic

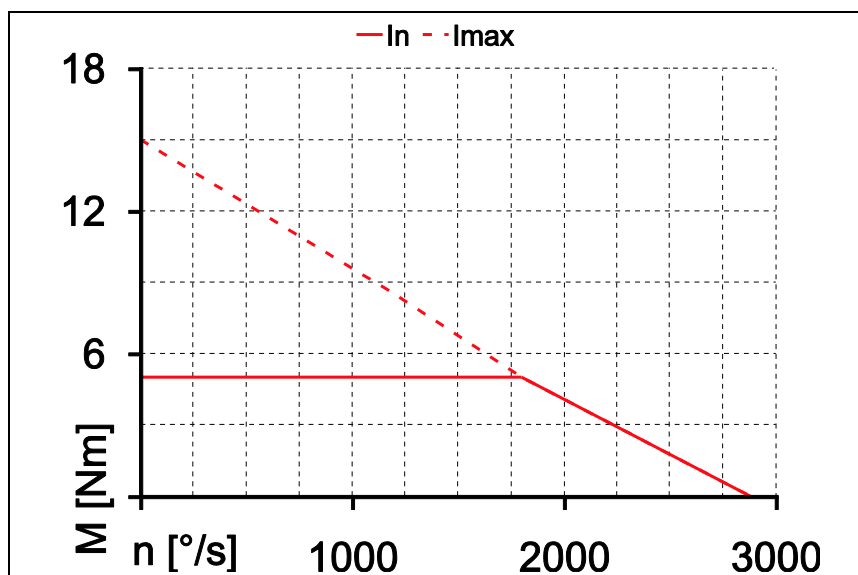


Figure 4 Moment characteristic ERS 170 048V

6.1.3 Data ERS 210 048V

Note

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

Type	ERS 210 048V
Mechanical operating data	
heat conducting surface [mm ²]	37363
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 [kgm ²]	0,011278
max. mass moment of inertia [kgm ²]	0,305
rotation range [°]	>360 (turning endlessly)
repeatability * ¹ [°]	0,04
* ¹ 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 * ²
* ² Applies only if the preconditions in chapter 8.1 e are fulfilled. Otherwise, S6 - continuous mode with intermittent load is the permitted operating mode.	
Electrical connection - required cable cross-sections and number of wire strands	
power [mm ²]	3 x 1
grounding [mm ²]	1 x 1
shaft encoder [mm ²]	8 x 0,25
temperature sensor [mm ²]	2 x 0,25
Specifications for the integrated motor	
motor type	synchronous
switching	star

Type	ERS 210 048V
temperature sensor (type)	KTY84-130
max. permissible operating temperature [°C (°F)]	+95 (+203)
insulation class	class F DIN 57530
output shaft power P _n [kw]	0,16
intermediate circuit voltage U _{ZK} [V]	48
rated torque M _n [Nm]	10
rated current I _n [A]	6,22
peak current I _{max} [A]	16
torque constant K [Nm/A]	1,6
rated speed n _n [rpm]	140
max. speed n _{max} [rpm]	200
winding resistance (phase-phase) R ₂₀ [Ohm]	2,00
winding inductivity (phase-phase) L ₂₀ [mH]	6,68
numbers of pole pairings N	16
Specifications for the integrated measuring system	
type	5V TTL-signal (incremental), magnetisches Messsystem mit Referenzspur
power supply [V]	5 ± 10 %
mean current input [mA]	15
pulse number per revolution [pulses/rev.]	30240 (on quadruple evaluation)
resolution of the sensor [°]	0,012

Table 8 Technical Data ERS 210-560

**Swing time
diagram**

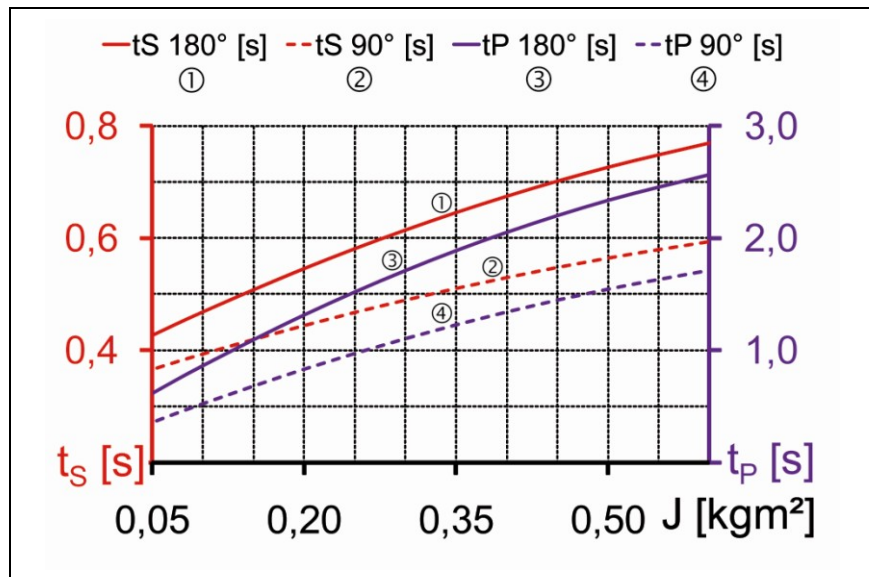


Figure 5 Swing time diagram ERS 210 048V

Parameter	Description
tS	Swing time [s]
tP	Pulse off time [s]

Table 9 Legend to Swing time diagram ERS 210 048V

**Moment
characteristics**

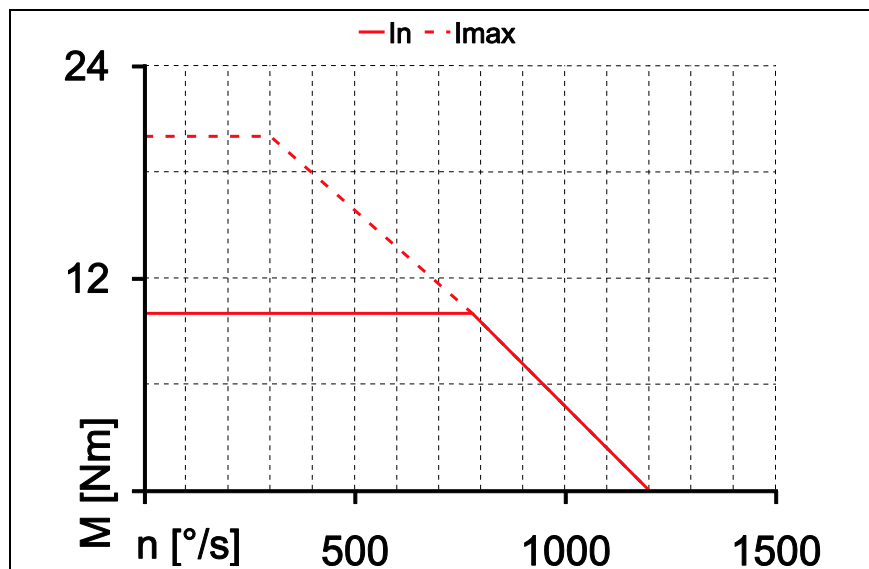


Figure 6 Moment characteristics ERS 210 048V

6.2 Requirements for the power and sensor cables

Cable type	power	sensor
number of wires	4x1 mm ² + 2x0,25mm ²	4x2x0,25mm ²
min. cross-section of the wires [mm ²]	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 bis +55 (+41 to +131)	+5 bis +55 (+41 to +131)
max. cable length [m] (between ERS and Controller)	20	20

Table 10

6.3 Option brake



WARNING

Risk of injury when the machine/system moves unexpectedly!

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

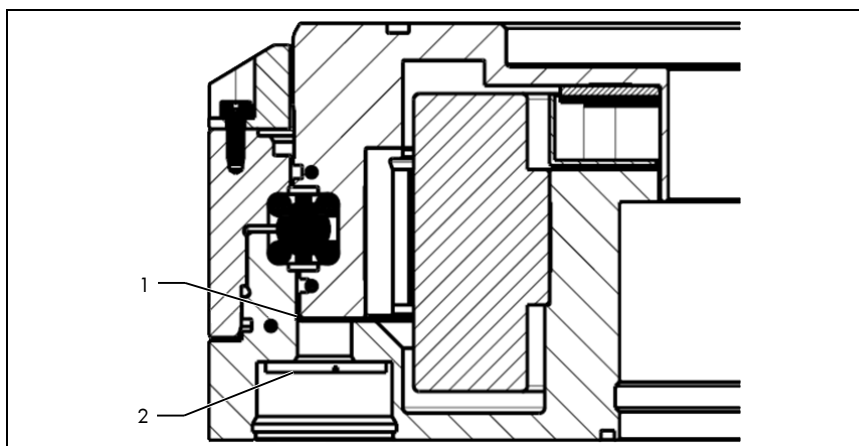


Figure 7 Brake design

Pos.	Description
1	Contact surface between brake pad and rotor
2	Pre-loaded brake piston with brake pad

Table 11 Legend to Brake design

6.3.1 Technical data for brake valve MV15

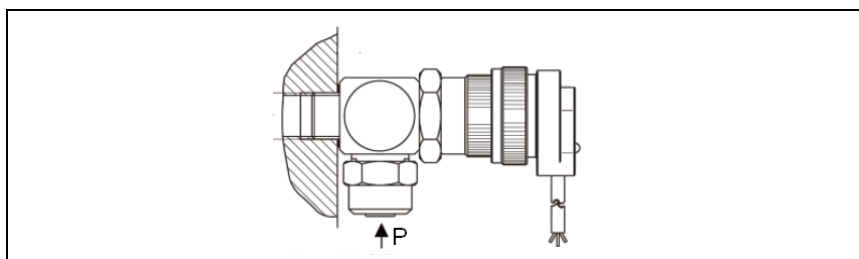


Figure 8 Valve assembly

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 [Nl/min]	45
Operating pressure range [bar]	-1 ... 1
Power consumption [W]	2,8
Voltage [V DC]	24 (+10% / -5%)

Table 12 Technical Data brake valve MV15

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

☞ Applicable documents

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 the MCS 12 controller

If both valves screwed in the provided threads:

1. Connect both M8 plugs with the ports 1 und 2 to the Y junction.
2. Connect the controller with the enclosed cable with 3-pin plug M8 to the Y-junction.

☞ [chapter 5 Accessories, page 16](#)

Cable color of the extension	
black	+24V
blue	GND
brown	n.c.

Table 13 Connection

Terminal	Cable color of the brake valve
BR1	black
BR2	blue

Table 14 Connection

6.3.3 Holding brake moment

Motor type	Holding brake moment [Nm]
ERS135	2,5
ERS170	5
ERS210	10

Table 15 Holding brake moment

7 Description of the module

7.1 ERS torque motor

7.1.1 Design and description of the ERS

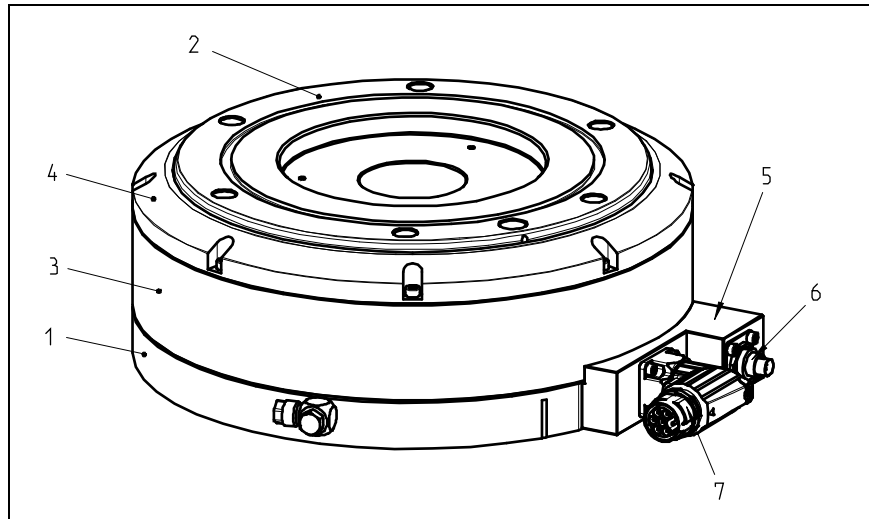


Figure 9 Components ERS

Pos.	Description
1	Basic carrier (fixed)
2	Rotor (moving)
3	Bearing flange
4	Sealing flange
5	Plug connection
6	Plug (sensor cable)
7	Plug (power cable)

Table 16 Legend to Components ERS

Overview

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

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

Torque motor

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

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

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

7.1.2 Mechanical interfaces

Maintenance-free lubrication The ERS is mounted on a single four point bearing. This bearing is lubricated via one-time grease lubrication. Under normal operating conditions lubrication for 20.000 operating hours is sufficient.

☞ [chapter 13 Maintenance and care, page 76](#) Mechanical interfaces:

☞ [chapter 15 Drawing, page 80](#)

7.1.3 Elektrische Schnittstellen

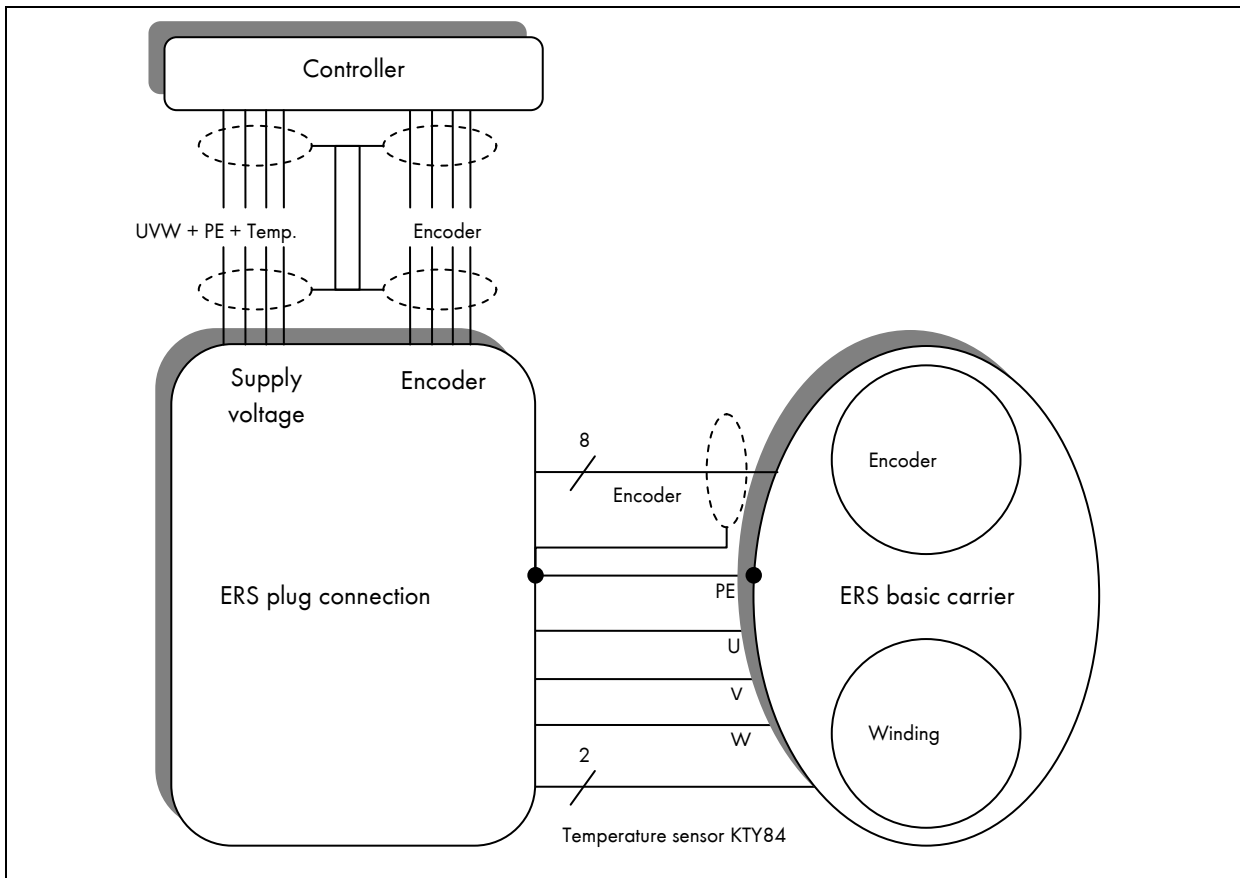


Figure 10 ERS schematic diagram

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

In order to protect against impermissible operating conditions, the temperature sensor can be used to control the temperature in the windings. This data can be evaluated by the controller.

Note

The MCS 12 does not evaluate the temperature sensor KTY84.

7.1.4 Type key and nameplate

Order designation

ERS xxx - xxx - xx - x - x - x

size

ERS 210 = d 210 mm
ERS 170 = d 170 mm
ERS 135 = d 135 mm

voltage

048 = 48 V rated motor voltage

IP rating

40 = IP 40

brake

N = without brake
B = with brake

rotor

N = without rotor
D = with rotor

measuring system

I = incremental
A = absolute

The nameplate is mounted on the width side of the module.

Designation	Specifications
manufacturer	Schunk GmbH & Co. KG
type / model - protection class	ERS210-048-40-B-N-I
ID	0310xxx
rated torque (MN)	10 Nm
voltage (UN)	48 V
current (IN)	6,22 A

Table 17 Data on the nameplate (example ERS210 560V)

8 Assembly

8.1 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 18 Requirements for levelness of the bolting surface

Preconditions

Depending on the load, the ERS 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 ERS'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 ERS is installed, make sure that the basic carrier is aligned correctly in the machine.

👉 [Figure 11 Zero pulse alignment, page 34](#)

- ➔ 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 ERS in the machine so that the zero pulse is in the middle of the moving range.

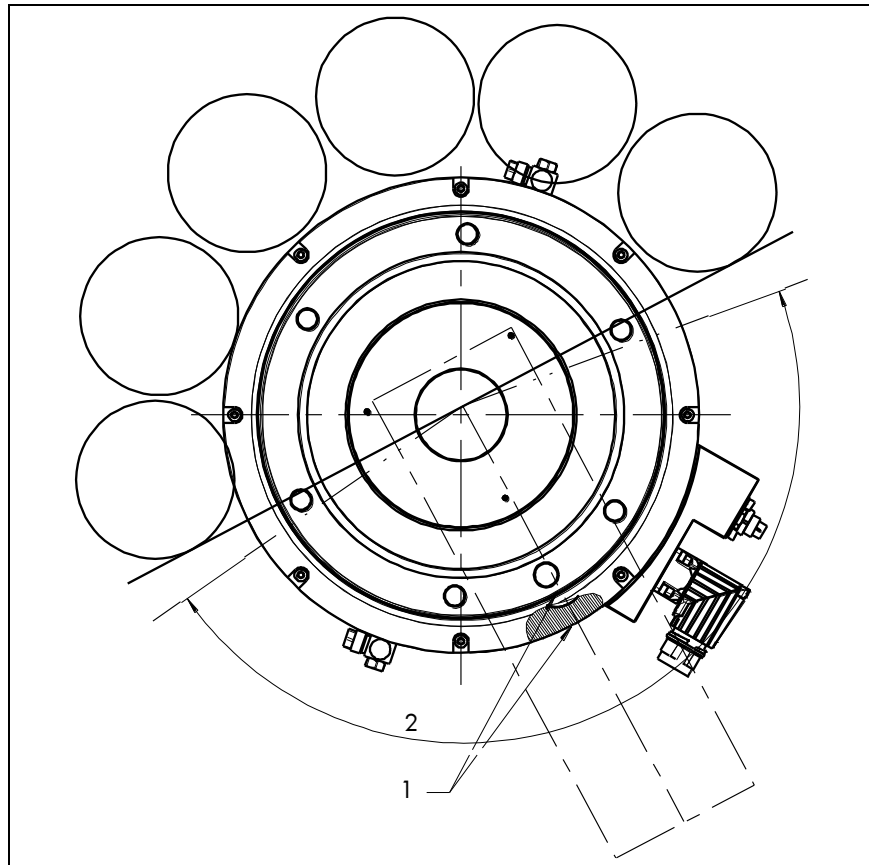


Figure 11 Zero pulse alignment

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

Table 19 Legend to Zero pulse alignment

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.

☞ [Figure 12, page 35](#)

Note

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

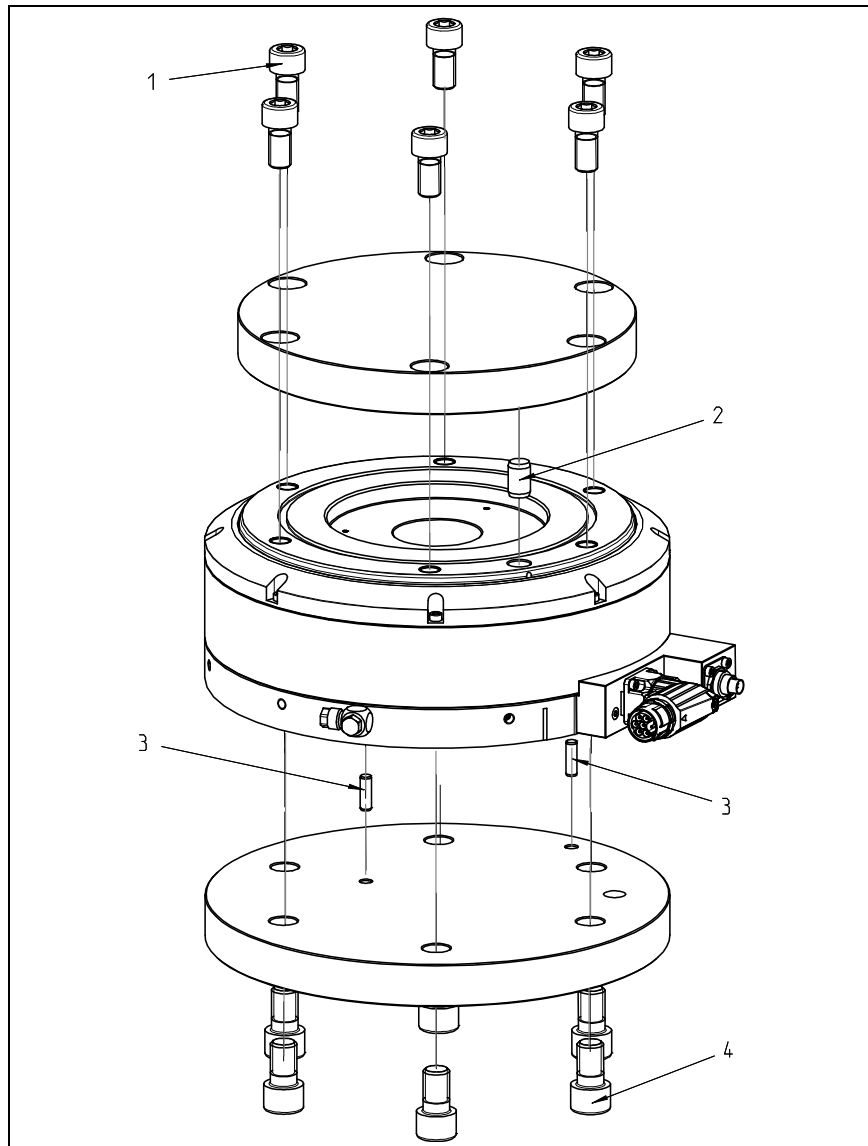


Figure 12 View of the assembly of the adapter plates on rotor and basic

Item	Description
1	Fastening screws M10
2	Centering pin D10/H7
3	Centering pin D5/H7
4	Fastening screws M12

Table 20 Legend to View of the assembly of the adapter plates on rotor and basic

8.2 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.

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.
 [chapter 6.2 Requirements for the power and sensor cables page 26](#)
- ✓ The motor's range of rotation and functions are not impaired.

Electrical connection ERS

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

☞ [chapter 4 Scope of delivery, page 15](#)

- ✓ The ERS 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 A1 (U)
	V	black A2 (V)
	W	black A3 (W)
	PE	green/yellow
temperature sensor	T1	red
	T2	blue

Table 21 Connection pin assignment of the red power cable for Bosch Rexroth

Function	Signal	Pin assignment - 15-pin D-Sub connector Bosch Rexroth
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 22 Connection pin assignment of the white signal cable for Bosch Rexroth

9 Connection and operating with SCHUNK controller MCS 12

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.
 [chapter 6 Technical Data , page 17](#)

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

- 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 (ERS)-

**Starting up
the ERS with any
controller**

- ➔ Connection the electrical connections (power cable, signal cable, Y-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 ERS and optimize the parameters.
- 5. Check the bearing noise at regular intervals.
 [chapter 12.1.4 Bearing noise, page 72](#)

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 ERS 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 ERS, the set direction of counting of the measuring system and the motor's direction of rotation.

Note

In the MCS 12 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.

9.1 Scope of delivery of MCS 12

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
- CD

Content of CD:

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

9.2 Technical Data of the MCS 12 controller

Technical Data	MCS 12		
motor/module/system	ERS (48V)		
version	ERS 135	ERS 170	ERS 210
ID	0307035	0307036	0307037
General Technical Data			
IP rating	IP30		
power supply (logic) [V DC]	24		
power supply (load) [V DC]	48		
rated-/max. current (load)	4.2/13.0	5.6/19	6.2/16
weight [kg]	0,98		
Dimensions (length x width x height)	82/157/92		
min./max. ambient temperature [°C (°F)]	5/41		
type of mounting	DIN rail		
sensor systems	Encoder, Resolver		
current consumption of logic [A]	0,5		
rated current of controller [A]	12		
max. [A]	24		
output power supply [V DC]	up to 48		
Interfaces			
number of digital I/Os	4/4		
number of analog I/Os	-/-		
fieldbus- type/number/connection	Profibus DP/1/SUB-D		
fieldbus- type/number/connection	CAN /1/SUB-D		
parameterisation - type/number/connection	RS232/1/SUB-D		
parameterisation -type/number/connection	Profibus DP/-/via fieldbus connection		
parameterisation- type/number/connection	CAN/-/ via fieldbus connection		
max. data rate Profibus DP [MBaud]	1,5 (higher on request)		
max. data rate RS232 [MBaud]	9.600		
max. data rate CAN [Mbaud]	1		

Technical Data	MCS 12
Control types/funktionalities	
PI-Current regulation,	yes
PI-Speed regulation	yes
P-Position regulation	yes
torque regulation	yes, via current value
technologic functions	Pseudo absolute-encoder-function, free programmable traversing blocks are storable, controlled directly or traversing through digital I / O or fieldbus
safety functions	-
commutation	Sinus
Tools	
software	MCDemo -Software for commisioning, Function module FB10 for Siemens S7-300/400 for commisioning SCHUNK- Modules

Table 23

9.3 Design and description of MCS 12

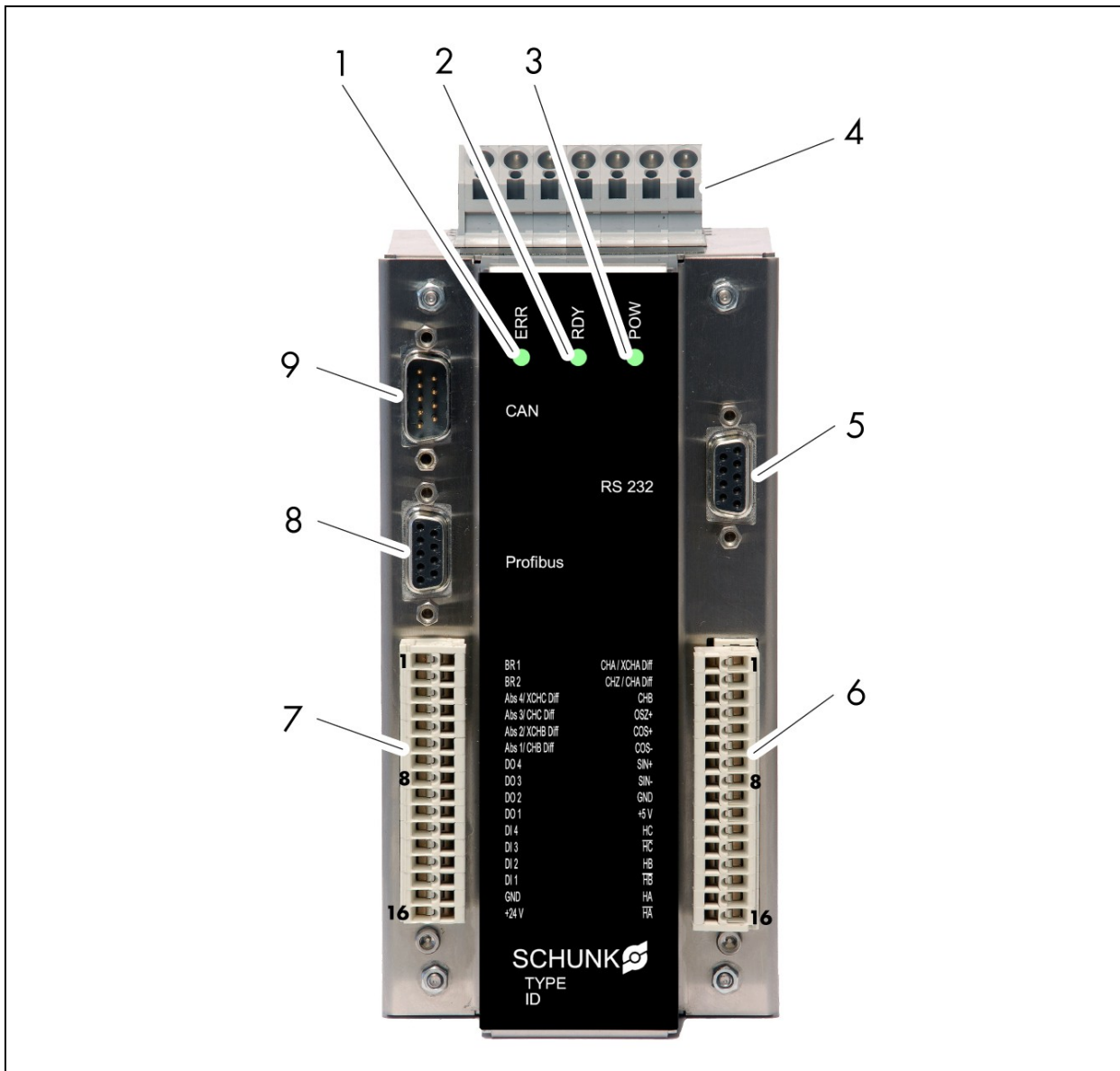


Figure 13 Design of the MCS 12 controller

Item	Description	Function
1	Display LED red for ERR	indicates an error
2	Display LED green for RDY	indicattes ready for communication
3	Display LED green for POW	indicates availabbility of power supply
4	terminal strip X1	motor and power supply for controller
5	connection RS232	
6	terminal strip X3	connection for resolver

Item	Description	Function
7	terminal strip X2	digital inputs and outputs
8	connection Profibus DP	
9	connection CAN	

Table 24

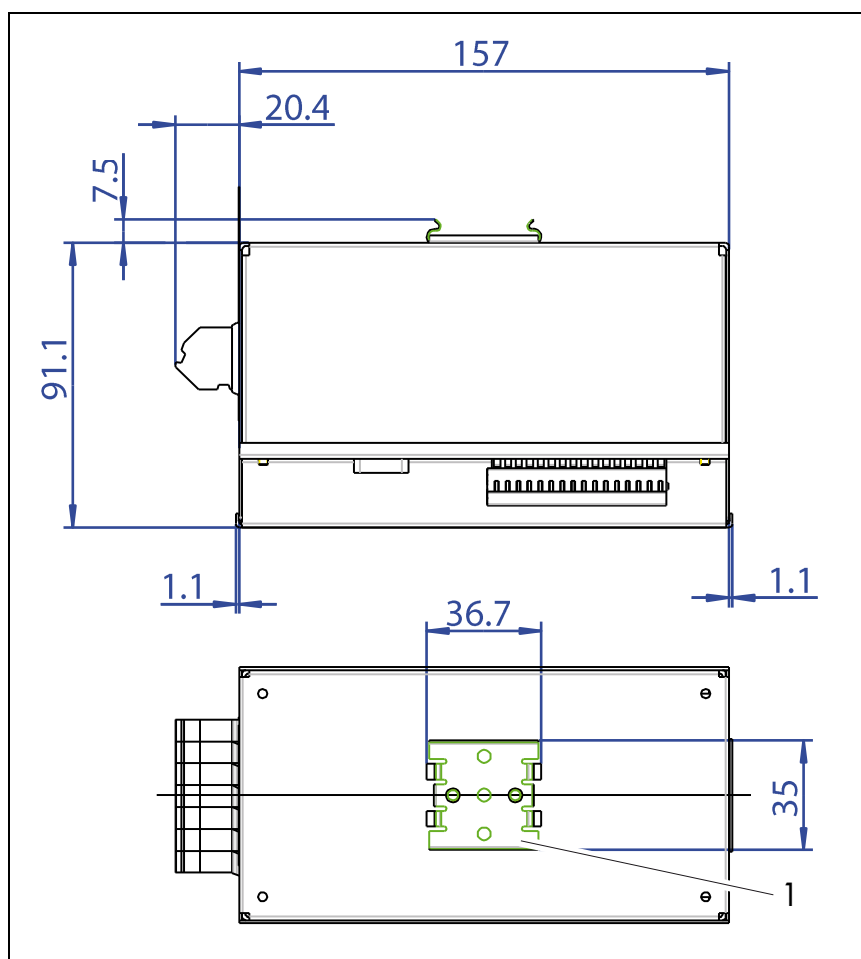


Figure 14 Dimension and mounting the MCS 12 controller

Item	Description
1	Metal base bar for the mounting rail according to EN 50022.

Table 25

Requirements for the power supply

Output power supply*	48 V DC $\pm$ 10% ($I_N = 20A$)
Power supply for logic	24 V DC (bis 36 V DC) + 10% / - 4%; residual ripple below 150 mVSS; switching peaks below 240 mVSS
Connection value [A]	Number of modules x rated module current x 1.2

Table 26 Anforderung an die Spannungsversorgung MCS 12

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

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 cD of the controller.

☞ Applicable documents

Procedure:

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.
☞ [chapter 9.4.5 CAN connection, page 48](#)
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

- module address = 12
- communication = RS232
- data rate = 9.600 Baud

9.4 Assignment of the terminal strips of the MCS 12

9.4.1 Assignment of terminal strip X1

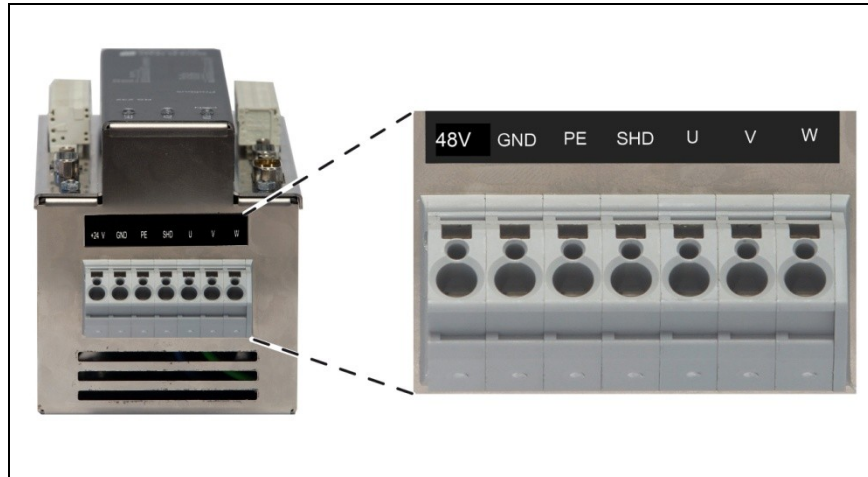


Figure 15 Position of X1 terminal strip (motor and power supply for controller)

Terminal	Designation	Type	Cable color	Meaning
1	48 V DC	ERS 130-210 048V	customer's connection cable	Connection of the output power supply for the MCS 12 controller.
2	GND			
3	PE		green/yellow	Connection of the ERS's motor phases to terminal strip X1 of the controller.
4	SHD		shielding	
5	U		black A1	
6	V		black A2	
7	W		black A3	

Table 27 Pin-assignment of terminal X1

Position of terminal X1

☞ [Figure 13 Design of the MCS 12 controller, page 43](#)

9.4.2 Assignment of terminal strip X2

Terminal	Designation	Wire color (*)	Cable color
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 28 Pin-assignment of terminal X2

Position of terminal X2

 [Figure 13 Design of the MCS 12 controller, page 43](#)

9.4.3 Assignment of terminal strip X3

Terminal	Designation	Wire color (*)	Cable color
1	CHA / XCHA Diff	grey	Channel /A
2	CHZ / CHA Diff	white	Channel A
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 29 Pin-assignment of terminal X3

Position of terminal X3

 [Figure 13 Design of the MCS 12 controller, page 43](#)

9.4.4 RS232 connection

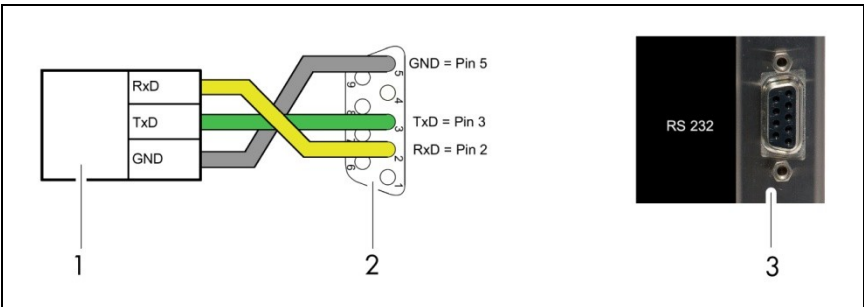


Figure 16 Connector assignment for RS232 connection to MCS 12

Item	Description
1	Control system (PC / SPS)
2	Soldering side of the 9-pin connector
3	Figure of the 9-pin port of the MCS 12 controller

Table 30 Connector assignment for RS232 connection to MCS 12

9.4.5 CAN connection

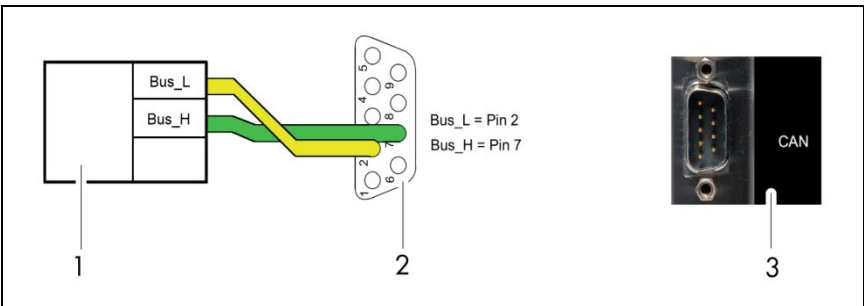


Figure 17 Connector assignment for CAN connection to MCS 12

Item	Description
1	Control system (PC / SPS)
2	Soldering side of the 9-pin connector
3	Figure of the 9-pin port of the MCS 12 controller

Table 31 Connector assignment for CAN connection to MCS 12

9.4.6 Profibus DP connection

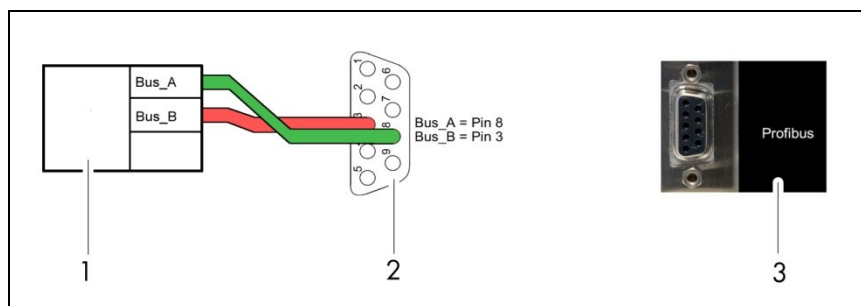


Figure 18 Connector assignment for Profibus DP connection to MCS 12

Item	Description
1	Control system (PC / SPS)
2	Soldering side of the 9-pin connector
3	Figure of the 9-pin port of the MCS 12 controller

Table 32 Connector assignment for Profibus DP connection to MCS 12

9.5 Connection of the interfaces of the MCS 12

9.5.1 Assignment of terminal X1

Terminal strip X1 is for connecting the motor phases and the power supply of the controller's power component.

☞ [Table 27 Pin-assignment of terminal X1, page 46](#)

9.5.2 Assignment of terminal X2

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!

☞ [Table 28 Pin-assignment of terminal X2, page 47](#)

9.5.3 Assignment of terminal 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!

☞ [Table 29 Pin-assignment of terminal X3, page 47](#)

9.5.4 Assignment of RS232

➔ The connection is established via a 9-pin SUB-D connector from the control system (PC / SPC) to the controller MCS 12.

Connector assignment

☞ [chapter 9.4.4 RS232 connection, page 48](#)

9.5.5 Assignment of CAN

➔ The connection is established via a 9-pin SUB-D socket from the control system (master) to the controller MCS 12.

Connector assignment

☞ [chapter 9.4.5 CAN connection, page 48](#)

9.5.6 Assignment of Profibus DP

➔ The connection is established via a 9-pin Profibus connector from the control system (master) to the controller MCS 12.

Connector assignment

☞ [chapter 9.4.6 Profibus DP connection, page 49](#)

9.6 Electrical connection of the module to the MCS 12 controller

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.

DANGER

Danger due to faulty connection!

- ➔ Observe the pin assignments of the terminals!
- ➔ Ensure proper grounding of all components.

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

The wiring diagrams and the cable dimensions for lines, temperature sensor and shaft encoder must be followed.

 [chapter 6 Technical Data, page 17](#)

9.6.1 Connecting the Rotary Module ERS 048V

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 ERS to the MCS 12

Connect the encoder system (incremental encoder) of the ERS to terminal strips X2 and X3 of the MCS 12 controller..

☞ [chapter 9.5.2 Assignment of terminal X2, page 50](#)

and

☞ [chapter 9.5.3 Assignment of terminal X3, page 46](#)

1. Pin-assignment of the terminals
☞ [Chapter 9.4 Assignment of the terminal strips of the MCS 12, page 46](#)
2. Connect the ERS's motor phases to terminal strip X1 of the MCS 12 controller
☞ [chapter 9.5.1 Assignment of terminal X1, page 50](#)
3. Connect the output power supply to the MCS 12 controller
☞ [chapter 9.5.1 Assignment of terminal X1, page 50](#)
4. Connect the output power supply to the MCS 12 controller
☞ [chapter 9.5.2 Assignment of terminal X2, page 50](#)
5. Connect the signal cable's shielding
☞ [chapter 9.5.2 Assignment of terminal X2, page 50](#) and
☞ [chapter 9.5.3 Assignment of terminal X3, page 50](#)

9.6.2 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 communication interface RS232 can't be used as a field bus system because of its properties.

→ **The RS232-interface should be only used as a parameterization interface.**

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 Functional principle MCS 12

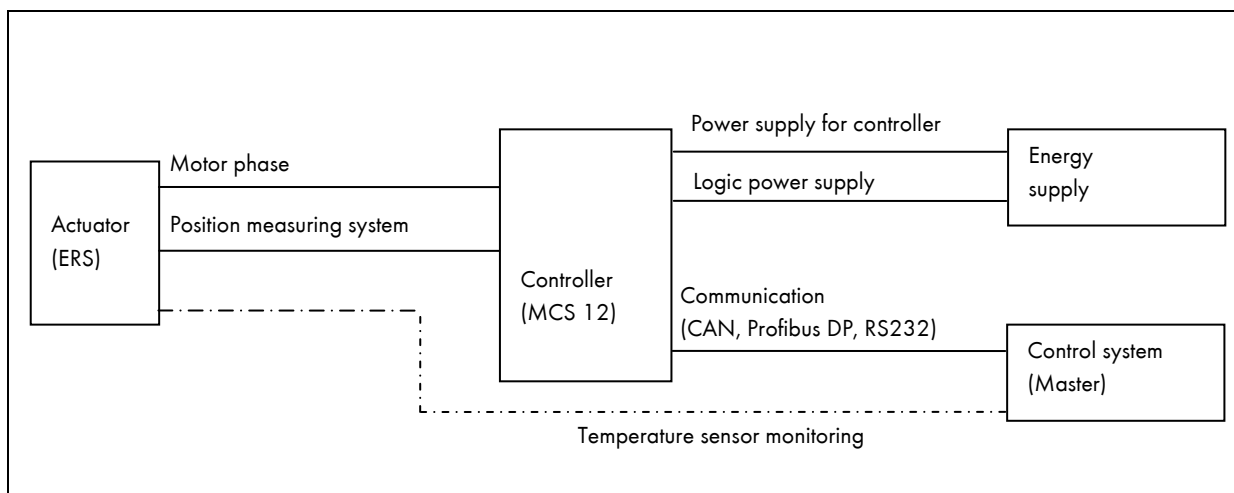


Figure 19 Functional principle (example)

The actuator (in this case ERS) is controlled by the external controller (MCS 12). It receives the required parameters from the higher-level control system (master).

The ERS'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 directly via the control system (master).

The ERS 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

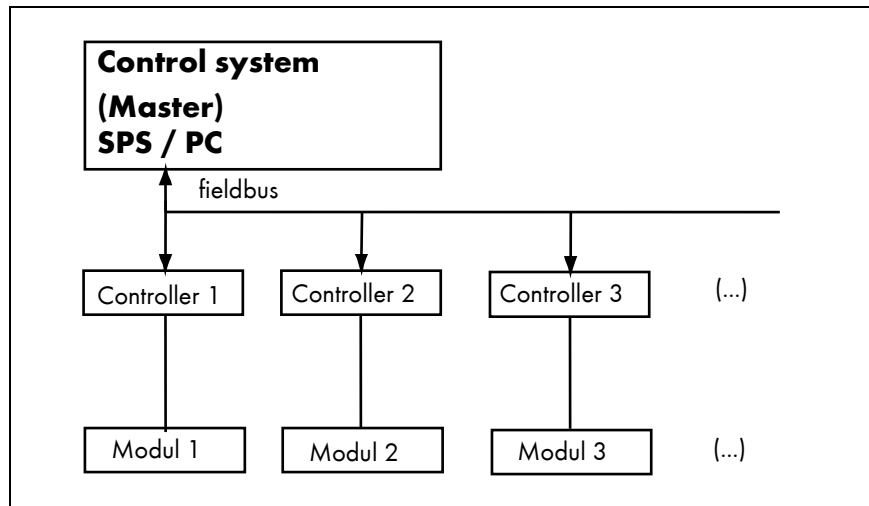


Figure 14

Data format

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

Note

The number of modules connected depends on the bus used. A maximum of 255 IDs can be assigned.

☞ CD, document: MotionControl.pdf

10.2.2 SCHUNK motion protocol

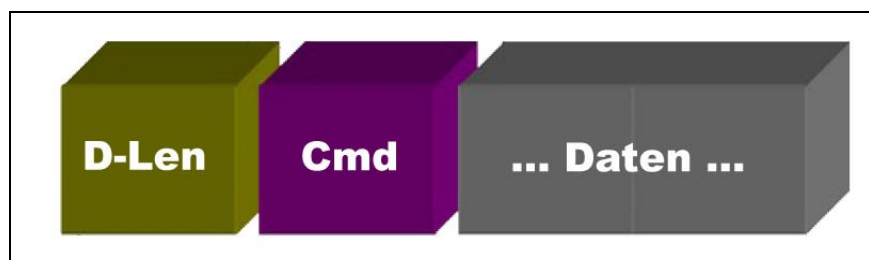


Figure 20

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".

Note

The special features of the different bus systems are described in MotionControl.pdf

📄 CD, document: MotionControl.pdf

10.2.3 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.

Note

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 $\Rightarrow$ Slave): None.

Response (Slave $\Rightarrow$ Master): "OK" (0x4F4B) if successful. The module executes the command.

Miscellaneous: Spontaneous response possible.

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

Table 33 Example for REFERENCE

Positioning

Command Code: 0xB0

Description: Moves the module to a specified position.

Parameters (Master $\Rightarrow$ Slave):

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

Response (Slave $\Rightarrow$ 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 $\Rightarrow$ S	0x05	0xB0	0x00 0x00 0x20 0x41	Move to position 10.0[mm]
S $\Rightarrow$ M	0x05	0xB0	0xCD 0xCC 0x04 0x41	Will reach position in 8.3[sec]

Table 34 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 35 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 36 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 37 Example for CMD STOP

Emergency 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 EMERGENCY 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	Emergency stop executed

Table 38 Example for CMD EMERGENCY STOP

Note

Further information:

☞ CD, document MotionControl.pdf

Acknowledge error**Command Code:** 0x8B**Description:** Acknowledgement of an error message.**Parameters** (Master $\Rightarrow$ Slave): None.**Response** (Slave $\Rightarrow$ 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 $\Rightarrow$ S	0x01	0x8B		
S $\Rightarrow$ M	0x03	0x8B	0x4F 0x4B	OK

Table 39 Example for CMD ACK

Notes

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

10.2.4 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 CD is inserted.

1. Copy MCDemo from the enclosed CD:

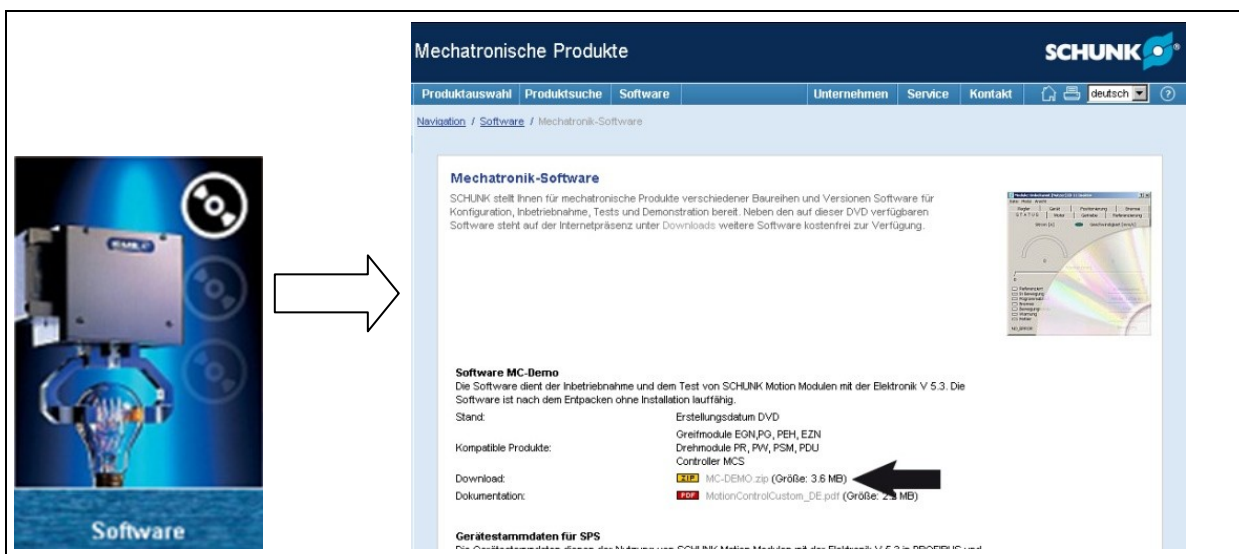


Figure 21

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

Note

The software is available for download at **www.schunk.com**.

- ➔ Observe the version status!

2. Save the file and unpack the file:

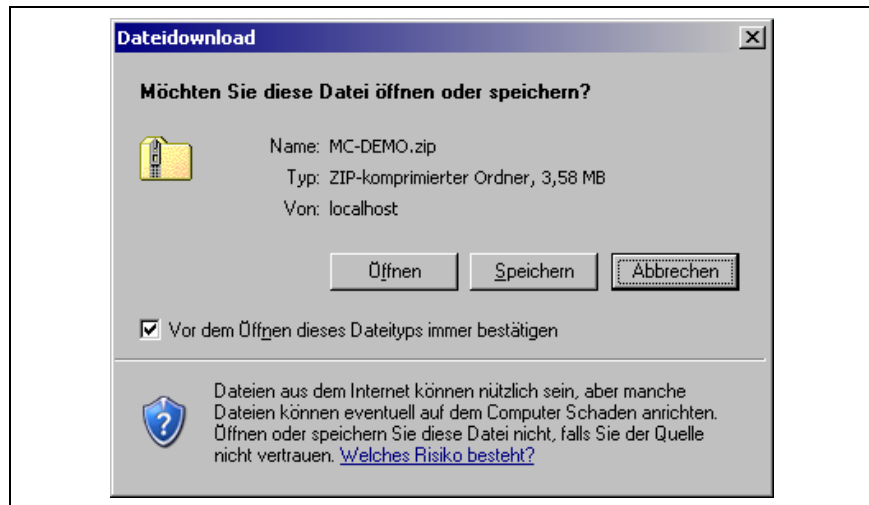


Figure 22

3. Start MC Demo by double-clicking on:



Figure 23

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



Figure 24

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

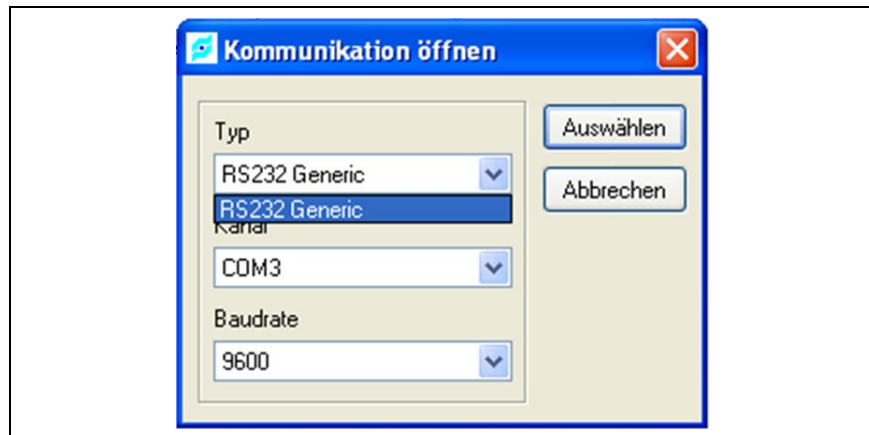


Figure 25

→ Select RS232

5. Search for the module:



Figure 26

→ Select "Module" → "Search bus".

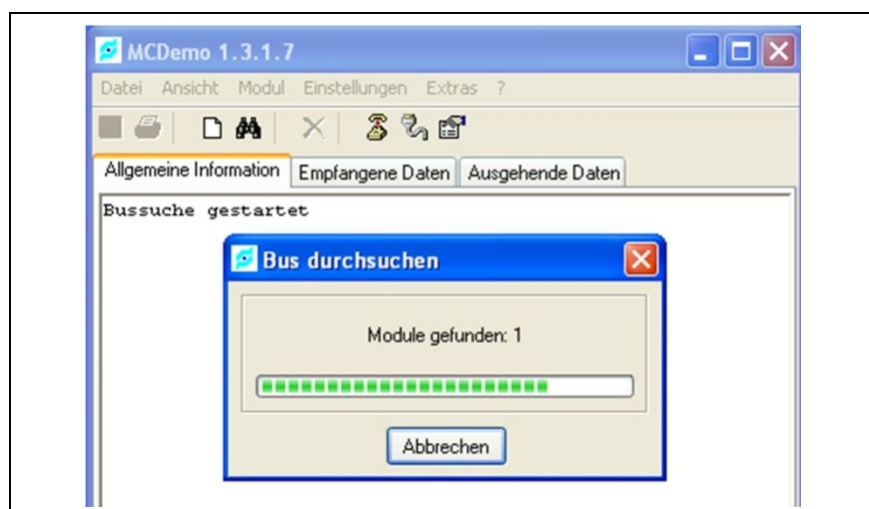


Figure 27

6. Enter or change parameters:

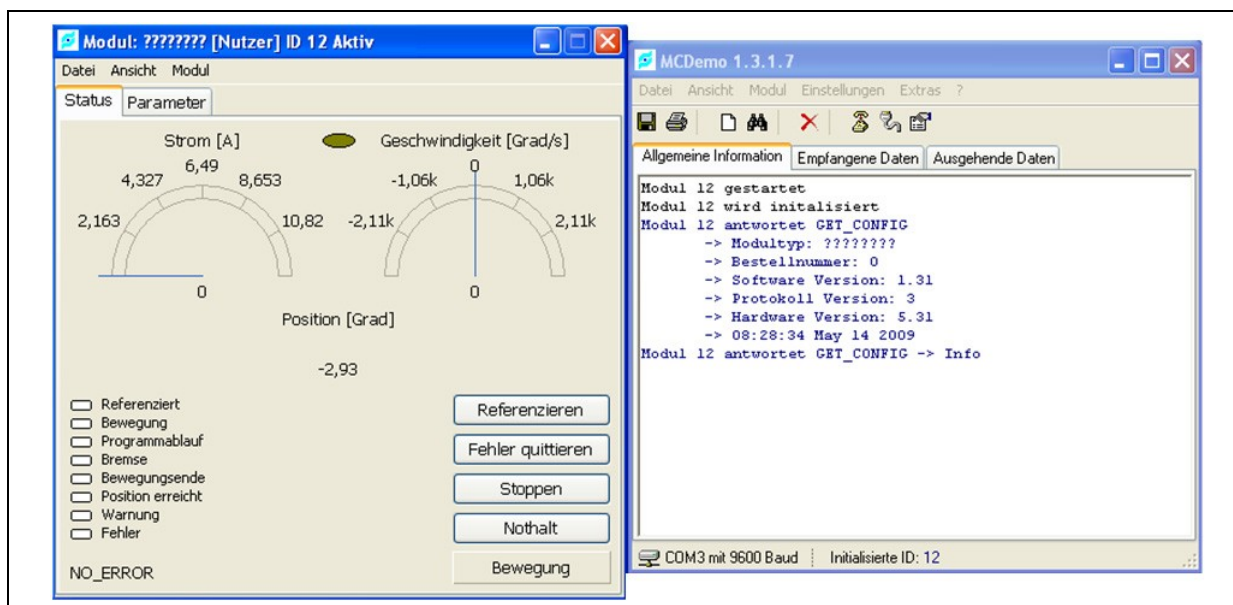


Figure 28 Control window of the module found

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

7. Perform a reference run:

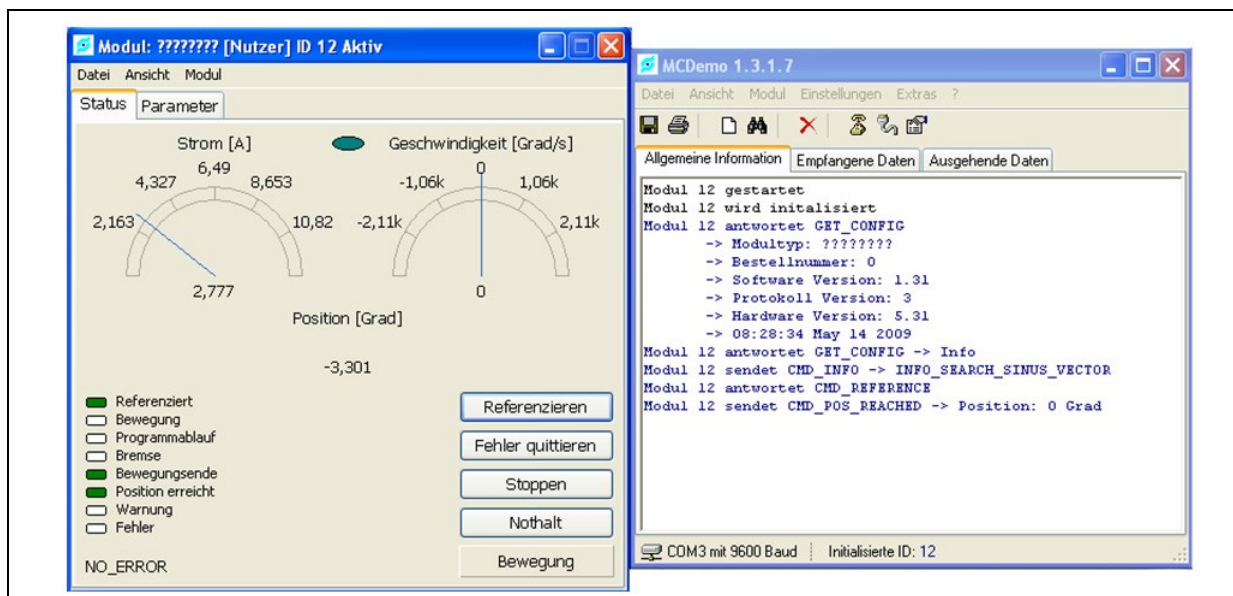


Figure 29

➔ Select the [Reference] button.

8. Select movement modes:

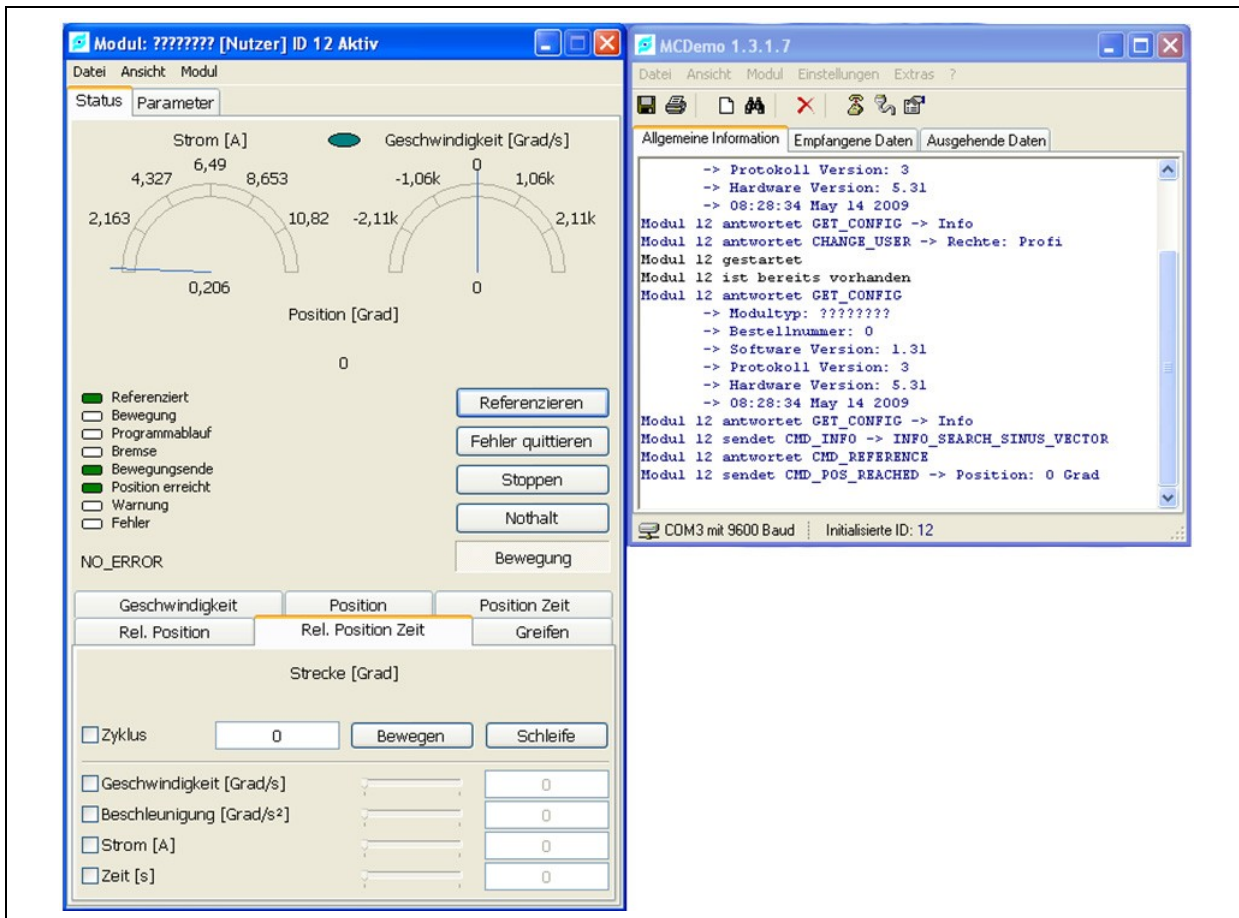


Figure 30

- ➔ 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".

☞ CD, document: MotionControl.pdf

Note

Further information:

☞ CD, document MotionControl.pdf

10.2.5 Commissioning of the digital inputs

- ➔ Refer to the chapter entitled "Digital Inputs" in the Motion Control documentation

10.2.6 Commissioning of the digital outputs

→ Refer to the chapter entitled "Digital Outputs" in the Motion Control documentation.

10.3 Control parameters

10.3.1 ERS 135 048V (Example for rotary module)

Moment of inertia	v_max [°/s]	a_max [°/s²]	Kp_position	Kp_speed	Tn_speed	Kp_current	Tn_current
0,01	2286,0	28992,0	4,5	5,9	0,026	1,98	0,006
0,02	1614,0	14496,0	4,5	9,1	0,026	1,98	0,006
0,03	1320,0	9683,0	4,5	13,7	0,026	1,98	0,006
0,04	1140,0	7277,0	4,5	18,3	0,026	1,98	0,006
0,05	1020,0	5787,0	4,5	22,8	0,026	1,98	0,006
0,06	930,0	4836,0	4,5	22,8	0,026	1,98	0,006
0,07	864,0	4142,0	4,5	22,8	0,026	1,98	0,006

Table 40 Example control parameters for ERS 135 048V

Note

The control parameters are pre-configured with the moment of inertia of the rotor (ERS 135: 0,0014kgm²).

10.3.2 ERS 170 048V (Example for rotary module)

Moment of inertia	v_max [°/s]	a_max [°/s²]	Kp_position	Kp_speed	Tn_speed	Kp_current	Tn_current
0,025	2334,0	30309,5	2,5	4,2	0,016	50,6	0,004
0,05	1650,0	15126,1	2,5	8,3	0,016	50,6	0,004
0,1	1170,0	7563,0	2,5	16,7	0,016	50,6	0,004
0,15	954,0	5047,8	2,5	25,0	0,016	50,6	0,004
0,2	828,0	3787,3	2,5	33,3	0,016	50,6	0,004

Table 41 Example control parameters for ERS 170 048V

Note

The control parameters are pre-configured with the moment of inertia of the rotor (ERS 170: 0,0039kgm²).

10.3.3 ERS 210 048V (Example for rotary module)

Moment of inertia	v_max [°/s]	a_max [°/s²]	Kp_position	Kp_speed	Tn_speed	Kp_current	Tn_current
0,1	1464,0	11860,2	2,5	16,7	0,016	58,1	0,004
0,2	1032,0	5958,8	2,5	33,3	0,016	58,1	0,004
0,3	846,0	3964,9	2,5	50,0	0,016	58,1	0,004
0,4	732,0	2973,7	2,5	66,7	0,016	58,1	0,004
0,5	654,0	2377,8	2,5	83,3	0,016	58,1	0,004
0,6	597,0	1982,4	2,5	100,0	0,016	58,1	0,004
0,1	1464,0	11860,2	2,5	16,7	0,016	58,1	0,004

Table 42 Example control parameters for ERS 210 048V

Note

The control parameters are pre-configured with the moment of inertia of the rotor (ERS 210: 0,0113kgm²).

11 Replacing the controller



DANGER

Risk of fatal injuries due to electric shock!

- ➔ Switch off power supply.
- ➔ Only have the electrical connection established by the corresponding specialist personnel.
- ➔ Disconnect the controller from the power supply. The intermediate circuit capacitors must be discharged (wait approx. 5 minutes for discharging the capacitors).
- ➔ Observe the sequence when connecting the cables (grounding cable first, then conductors).



WARNING

Risk of burns due to contact with hot surfaces!

During operation, the surface temperature of the ERS 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.

1. Stop the motor and exit the active sequential program.
2. Activate the "emergency stop" function.
3. Switch off the entire energy supply for controller and rotary module.
4. Check whether the supply of current to the auxiliary equipment is interrupted.
5. Remove all lines from controller and rotary module.
6. Remove the controller from the DIN rail

7. Package the old controller (if necessary, with a fault log) and store it at a dry place.
8. Mount the new controller on the DIN rail.
☞ [chapter 9.3 Design and description of MCS 12, page 43](#)
9. Reconnect all lines to the controller and the rotary module.
☞ [chapter 9.4 Assignment of the terminal strips of the MCS 12, page 46](#)
or
☞ [chapter 9.5 Connection of the interfaces of the MCS 12, page 50](#)

Note

After being adjusted to the system:

➔ The replacement module needs to be re-configured.

Note

When using the brake valve proceed as described in:

☞ [chapter 6.3.2 Connection to the MCS 12 controller, page 28](#)

12 Troubleshooting

12.1 Error message of SCHUNK Torque Motor ERS

12.1.1 ERS is not turning

Possible cause	Corrective action
Interruption in the supply lines	→ Check the supply lines for defects. → Check the electrical connections. ☞ chapter 8.2 Electrical connection, page 36
No motion release	→ Check the controller settings. ☞ For the controller MCS 12, see MotionControl.pdf on the CD)
Controller defective	→ Check whether there is voltage at the controller's output. If there is no voltage: → Prüfen der Anschlussbelegung. ☞ chapter 8.2 Electrical connection, page 36 → Operating manual for the controller
Target value line or communication between master and controller is interrupted	→ Check the target value line and communication.
Rotor is blocked mechanically	→ Check the mechanical components. → Check the evenness at the mounting surface. ☞ chapter 8.1 Mechanical connection, page 33
Shaft encoder defective	→ Check shaft encoder and its connection. If a defect is detected: → ERS must be sent to SCHUNK with a repair order.
Short-circuit between turns in the motor	→ Check the difference of the winding resistance values. Do not exceed the difference. If the difference between the individual motor phases exceeds 0.1 Ohm: → ERS must be sent to SCHUNK with a repair order.

Possible cause	Corrective action
Short-circuit to ground due to moisture short-circuit to ground due to electrical defect	➔ Check the protective conductor. ➔ Check the electrical connection and connectors for ground leakage. If the ERS has a ground leak while the power cable is disconnected: ➔ ERS must be sent to SCHUNK with a repair order.
Incorrect phase connections	➔ Check the electrical connections. ☞ chapter 8.2 Electrical connection, page 36
Incorrect controller settings	➔ Check the parameters and setting values. ☞ Operating manual for the controller
Motor blocks and draws given current.	➔ The EEPROM-file of the predecessor STM is on the controller. Load actual EEPROM-file for the ERS to the controller
Motor phases or encoder signals confused	➔ Check the electrical connections. ☞ chapter 8.2 Electrical connection, page 36 ➔ Check the encoder signals and the shielding of the encoder cable.

Table 43

12.1.2 ERS 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 44

12.1.3 ERS oscillates

Possible cause	Corrective action
Motor overload	➔ Check the dimensioning ➔ Reduce the load ➔ Check the controller settings
Controller settings not ideal	➔ Check the controller settings

Table 45

12.1.4 Bearing noise

Possible cause	Corrective action
Incorrect assembly	➔ Check the evenness at the mounting surface. ☞ chapter 8.1 Mechanical connection, page 33
Configuration incorrect	➔ Check the parameters and setting values. ☞ Operating manual for the controller
Bearing defective due to overload	➔ ERS must be sent to SCHUNK with a repair order.

Table 46

12.1.5 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 ERS. If necessary: → replace the electrical connection. Note: The MCS 12 does not evaluate the tempature sensor.
Temperature sensor defective	→ Check resistance between the controller and the temperature sensor in the ERS. If the resistance exceeds 630 Ohms at room temperature: → ERS must be sent to SCHUNK with a repair order. Note: The MCS 12 does not evaluate the tempature sensor.
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. ☞ chapter 8.1 Mechanical connection, page 33
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 47

12.2 Error message of the controller MCS 12

12.2.1 Software error messages

The MCS 12 controller indicates the error via the flashing red LED. To determine the error cause, 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 ERS 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.

12.2.2 Electrical signals are not transmitted

Possible cause	Corrective action
Interruption in the supply lines	➔ Check the supply lines for defects ➔ Check the electrical connections ☞ chapter 9.6 Electrical connection of the module to the MCS 12 controller, page 51

Table 48

12.2.3 No LED lights up

Possible cause	Corrective action
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 49

12.2.4 „POW“ LED (grün) leuchtet nicht

Possible cause	Corrective action
Es liegt keine Spannung an..	➔ Prüfen der Leistungsspannungsversorgung am MCS 12. ☞ chapter 9.4 Assignment of the terminal strips of the MCS 12, page 46

Table 50

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

Possible cause	Corrective action
Faulty connection	➔ Check the connection. chapter 9.4 Assignment of the terminal strips of the MCS 12, page 46
Logic power supply missing	➔ Check the logic power supply on the controller. chapter 9.4 Assignment of the terminal strips of the MCS 12, page 46

Table 51

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

Possible cause	Corrective action
Insufficient voltage at "POW" (Undervoltage)	➔ Check the output power supply on the controller. ☞ chapter 9.4 Assignment of the terminal strips of the MCS 12, page 46
There is an error; module indicates: CMD_ERROR	➔ To rectify the error, see the operating manual for the controller „MotionControl.pdf“. ☞ Applicable documents
Error ERROR_COMMUTATION	The EEPROM-file of the predecessor STM is on the controller: ➔ Load actual EEPROM-file for the ERS to the controller.

Table 52

13 Maintenance and care

13.1 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.

Recommendation

Maintenance and seal replacement is done by SCHUNK because the rotor must be aligned and assembled with an assembly device.

Maintenance intervals

Type	ERS 048V
Bearing lubrication interval [h]	20.000
Visual inspection [h]	2.500

Table 53

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

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

13.2 Modul 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 ERS.
- ➔ If supply lines are defective, put the machine out of operation immediately.
- ➔ Replace damaged connection cables.
- ➔ Check the ERS 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, ERS can continue to be operated.
Uneven grinding noise	The motor is not set up correctly: ➔ Check the evenness of the mounting surfaces. ☞ chapter 8.1 Mechanical connection, page 33
Loud and uneven noise / motor not running smoothly	The motor is not set up correctly: ➔ Check the evenness of the mounting surfaces. ☞ chapter 8.1 Mechanical connection, page 33 Or bearings defective: ➔ Consult your SCHUNK contact and send the ERS to SCHUNK along with a repair order.

Table 54

Cleaning

Clean the ERS 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.

13.3 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.

14 Transport, storage and disposal

14.1 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 ERS contains components that are sensitive to electrostatic charge.
- ➔ Avoid any electrostatic charging of the ERS.

14.2 Packing

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

14.3 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 1 K4 in accordance with EN50178.
- Observe the maximum stacking height of three packaged modules.

14.4 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.

15.2 ERS 170

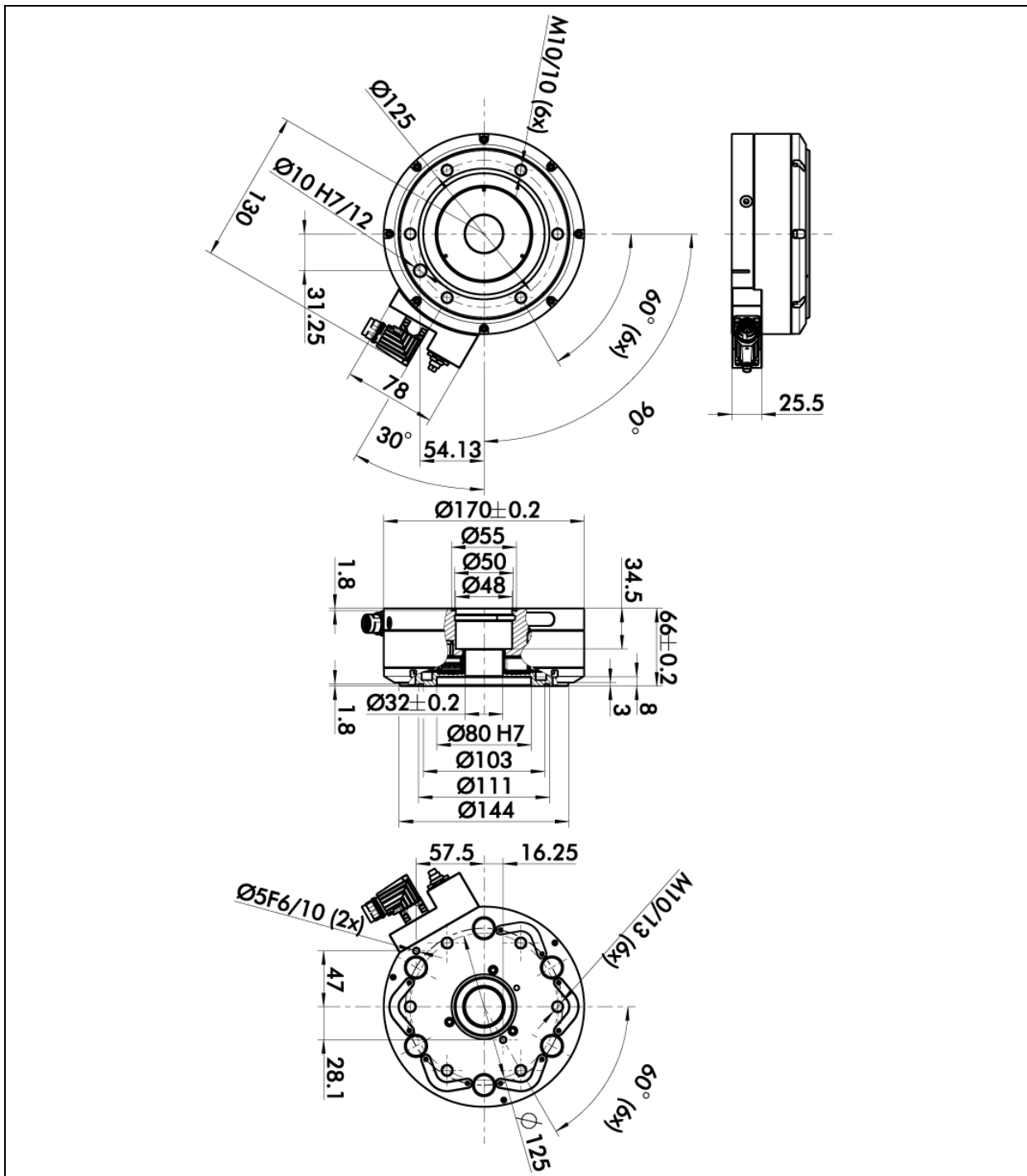


Figure 32 Dimensions of the Torquemotors ERS 170

15.3 ERS 210

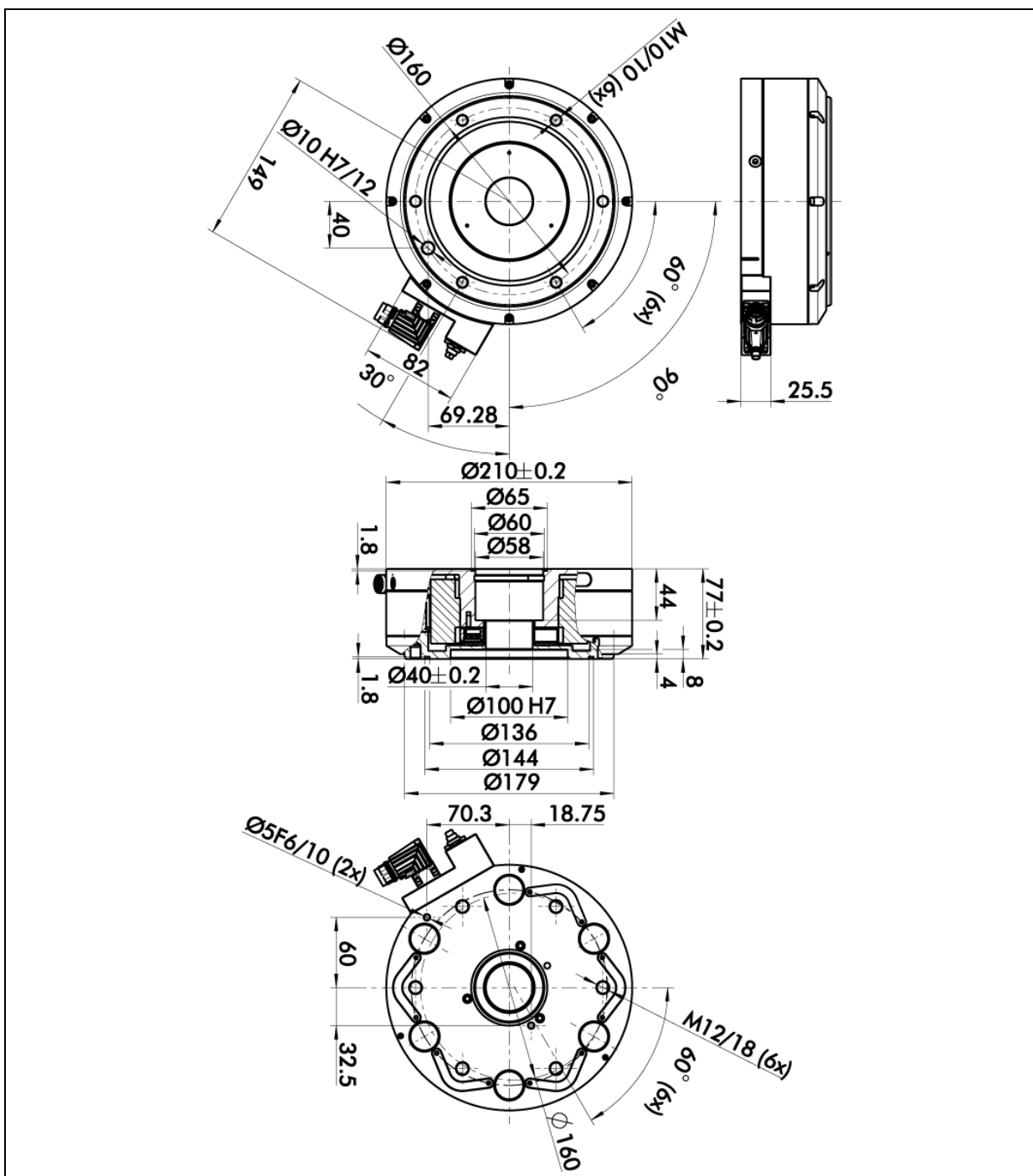


Figure 33 Dimensions of the Torquemotors ERS 210

16 EC declaration of incorporation

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

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

We hereby declare that the following product:

Product designation Electrical Rotary Module Type ERS 048V
Type designation: ERS 135 / ERS 170 / ERS 210
ID number: 0310130, 0310134, 0310162, 0310166, 0310194, 0310198

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 concepts, general principles for design – Part 1: Basic terminology, methodology
EN ISO 12100-2	Safety of machines - Basic concepts, general principles for design – Part 2: Technical principles
EN 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1: General requirements (IEC 61000-6-2:2005 (modified))
EN 61000-6-2:2005	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments (IEC 61000-6-2:2005)
EN 61000-6-4:2007	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments (IEC 61000-6-4:2006)
EN ISO 9409-1:2004	Manipulating 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, ☎: +49(0)7133/103-2204

Location, date/signature:

Lauffen, Germany, January
2011

ppa. 

Title of the signatory

Director for Development

