Assembly and Operating Manual

MCS 12

Controller for SCHUNK gripper and rotation modules

Superior Clamping and Gripping

SCHUNK®

Imprint

Technical changes:

We reserve the right to make alterations for the purpose of technical improvement.

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Dear Customer,

thank you for trusting our products and our family-owned company, the leading technology supplier of robots and production machines.

Our team is always available to answer any questions on this product and other solutions. Ask us questions and challenge us. We will find a solution!

Best regards,

Your SCHUNK team

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Table of contents

1 General

1.1 About this manual

This manual contains important information for a safe and appropriate use of the product.

This manual is an integral part of the product and must be kept accessible for the personnel at all times.

Before starting work, the personnel must have read and understood this operating manual. Prerequisite for safe working is the observance of all safety instructions in this manual.

Illustrations in this manual are provided for basic understanding and may differ from the actual product design.

In addition to these instructions, the documents listed under Applicable documents [▶ 6] are applicable.

1.1.1 Presentation of Warning Labels

To make risks clear, the following signal words and symbols are used for safety notes.

⚠ DANGER

Danger for persons!

Non-observance will inevitably cause irreversible injury or death.

⚠ WARNING

Dangers for persons!

Non-observance can lead to irreversible injury and even death.

⚠ CAUTION

Dangers for persons!

Non-observance can cause minor injuries.

NOTICE

Material damage!

Information about avoiding material damage.

1.1.2 Applicable documents

- General terms of business*
- Catalog data sheet of the purchased product *
- Assembly and operating manuals of the accessories *
- Software manual "Motion Control SCHUNK" *

The documents marked with an asterisk (*) can be downloaded on our homepage **schunk.com**

1.2 Warranty

If the product is used as intended, the warranty is valid for 24 months from the ex-works delivery date under the following conditions:

- Observe the ambient conditions and operating conditions, Environmental and operating conditions [▶ 8]

1.3 Scope of delivery

The scope of delivery includes

- Controller MCS 12
- Accessory pack
- USB to RS232 converter
- 9-pin SUB-D cable (1:1)
- DVD

Contents of DVD:

Contents of the DVD enclosed with the MCS 12 controller:

- Configuration and start-up tool "Motion Tool Schunk (MTS)"
- EEPROM files for MCS 12 controller
- Assembly and Operating Manual
- FB 20 function module for Siemens S7 3007400 for controlling SCHUNK products
- Software Manual "Motion Control Schunk"

2 Basic safety notes

2.1 Appropriate use

The product is used to control and regulate the EGN and EZN grippers as well as the ERS rotary module.

- The product is designed to be built into a control cabinet. The applicable guidelines must be observed and complied with.
- The product may only be used within the scope of its technical data, Technical data [▶ 17].
- The product is intended for industrial use.
- Appropriate use of the product includes compliance with all instructions in this manual.

2.2 Inappropriate use

It is considered improper use if the product is used to actuate or control products that are not from SCHUNK GmbH & Co. KG.

- Any utilization that exceeds or differs from the appropriate use is regarded as misuse.

2.3 Constructional changes

Implementation of structural changes

By conversions, changes, and reworking, e.g. additional threads, holes, or safety devices can impair the functioning or safety of the product or damage it.

- Structural changes should only be made with the written approval of SCHUNK.

2.4 Spare parts

Use of unauthorized spare parts

Using unauthorized spare parts can endanger personnel and damage the product or cause it to malfunction.

- Use only original spare parts or spares authorized by SCHUNK.

2.5 Environmental and operating conditions

Required ambient conditions and operating conditions

Incorrect ambient and operating conditions can make the product unsafe, leading to the risk of serious injuries, considerable material damage and/or a significant reduction to the product's life span.

- Make sure that the product is used only in the context of its defined application parameters, Technical data [▶ 17].
- Ensure that the product is protected against sprayed water, vapors, contamination, and EMC influences during operation. Exceptions are products that are designed especially for contaminated environments.

2.5.1 Electromagnetic compatibility

The product meets the requirements of the EMC act of the inner-European market, among other requirements. The product has passed the EMC test as per the following standards:

Standard	Title
EN 61000-6-2 (2006)	EMC: Generic standard – Immunity for industrial environments
EN 55011 (2009)	EMC: Generic standard – Emission

The product must be installed using interference-free cables and in a way that meets EMC requirements in order to ensure interference-free operation.

Interference:

Pulse-shaped interference:

The following table shows the electromagnetic compatibility in relation to pulse-shaped interference.

Pulse-shaped interference	Tested with	Corresponds to degree of severity
Burst pulses, fast transient interference as per EN 61000-4-4 (2008)	Supply cable: +/- 2 kV On signal, data and control cable: +/-1kV	3

Sinusoidal interference:
The following table shows the electromagnetic compatibility in relation to sinusoidal interference.

Sinusoidal interference	Test values	Corresponds to degree of severity
HF radiation (electromagnetic fields) as per EN 61000-4-3	80% amplitude modulation at 1 kHz to 10 V/m in the range of 80 … 1000 MHz to 3 V/m in the range of 1.4 … 2 GHz to 1 V/m in the range of 2 … 2.7 GHz	3
HF energization on cables and cable shielding as per EN 61000-4-6	Test voltage 10 V with amplitude modulation 80% of 1 kHz in the range of 150 kHz … 80 MHz	3

Emission of radio interference

The following table shows the interference emission from electromagnetic fields as per EN 55011 (2009), limit class A, group 1, measured at a distance of 3 m.

Interference	Value
30 … 230 MHz 230 … 1000MHz	< 50 dB (µV) quasi-peak, measured at a distance of 3 m < 57 dB (µV) quasi-peak, measured at a distance of 3 m

2.6 Personnel qualification

Inadequate qualifications of the personnel

If the personnel working with the product is not sufficiently qualified, the result may be serious injuries and significant property damage.

- All work may only be performed by qualified personnel.
- Before working with the product, the personnel must have read and understood the complete assembly and operating manual.
- Observe the national safety regulations and rules and general safety instructions.

The following personal qualifications are necessary for the various activities related to the product:

Trained electrician	Due to their technical training, knowledge and experience, trained electricians are able to work on electrical systems, recognize and avoid possible dangers and know the relevant standards and regulations.
Qualified personnel	Due to its technical training, knowledge and experience, qualified personnel is able to perform the delegated tasks, recognize and avoid possible dangers and knows the relevant standards and regulations.
Instructed person	Instructed persons were instructed by the operator about the delegated tasks and possible dangers due to improper behaviour.
Service personnel of the manufacturer	Due to its technical training, knowledge and experience, service personnel of the manufacturer is able to perform the delegated tasks and to recognize and avoid possible dangers.

2.7 Personal protective equipment

Use of personal protective equipment

Personal protective equipment serves to protect staff against danger which may interfere with their health or safety at work.

- When working on and with the product, observe the occupational health and safety regulations and wear the required personal protective equipment.
- Observe the valid safety and accident prevention regulations.
- Wear protective gloves to guard against sharp edges and corners or rough surfaces.
- Wear heat-resistant protective gloves when handling hot surfaces.
- Wear protective gloves and safety goggles when handling hazardous substances.
- Wear close-fitting protective clothing and also wear long hair in a hairnet when dealing with moving components.

2.8 Notes on safe operation

Incorrect handling of the personnel

Incorrect handling and assembly may impair the product's safety and cause serious injuries and considerable material damage.

- Avoid any manner of working that may interfere with the function and operational safety of the product.
- Use the product as intended.
- Observe the safety notes and assembly instructions.
- Do not expose the product to any corrosive media. This does not apply to products that are designed for special environments.
- Eliminate any malfunction immediately.
- Observe the care and maintenance instructions.
- Observe the current safety, accident prevention and environmental protection regulations regarding the product's application field.

2.9 Disposal

Handling of disposal

The incorrect handling of disposal may impair the product's safety and cause serious injuries as well as considerable material and environmental harm.

- Follow local regulations on dispatching product components for recycling or proper disposal.

2.10 Malfunctions

Behavior in case of malfunctions

- Immediately remove the product from operation and report the malfunction to the responsible departments/persons.
- Order appropriately trained personnel to rectify the malfunction.
- Do not recommission the product until the malfunction has been rectified.
- Test the product after a malfunction to establish whether it still functions properly and no increased risks have arisen.

2.11 Transport

Handling during transport

Incorrect handling during transport may impair the product's safety and cause serious injuries and considerable material damage.

- When handling heavy weights, use lifting equipment to lift the product and transport it by appropriate means.
- Secure the product against falling during transportation and handling.
- Stand clear of suspended loads.

2.12 Fundamental dangers

General

- Observe safety distances.
- Never deactivate safety installations.
- Install the provided protective product in the danger zone before switching on the product.
- Remove the energy supplies before installation, modification, maintenance, or adjustment work. Ensure there is no residual energy in the system.
- Do not move parts by hand while the energy supply is connected.
- Do not reach into the movement area of the product during operation.

2.12.1 Protection during handling and assembly

Incorrect handling and assembly

Incorrect handling and assembly may impair the product's safety and cause serious injuries and considerable material damage.

- Have all work carried out by appropriately qualified personnel.
- For all work, secure the product against accidental operation.
- Observe the relevant accident prevention rules.
- Use suitable assembly and transport equipment and take precautions to prevent jamming and crushing.

Incorrect lifting of loads

Falling loads may cause serious injuries and even death.

- Stand clear of suspended loads and do not step into their swiveling range.
- Never move loads without supervision.
- Do not leave suspended loads unattended.

2.12.2 Protection during commissioning and operation

Falling or violently ejected components

Falling and violently ejected components can cause serious injuries and even death.

- Take appropriate protective measures to secure the danger zone.
- Never step into the danger zone during operation.

2.12.3 Protection against dangerous movements

Unexpected movements

Residual energy in the system may cause serious injuries while working with the product.

- Switch off the energy supply, ensure that no residual energy remains and secure against inadvertent reactivation.
- The faulty actuation of conected drives may cause dangerous movements.
- Operating mistakes, faulty parameterization during commissioning or software errors may trigger dangerous movements.
- Never rely solely on the response of the monitoring function to avert danger. Until the installed monitors become effective, it must be assumed that the drive movement is faulty, with its action being dependent on the control unit and the current operating condition of the drive. Perform maintenance work, modifications, and attachments outside the danger zone defined by the movement range.
- To avoid accidents and/or material damage, human access to the movement range of the machine must be restricted. Limit/prevent accidental access for people in this area due through technical safety measures. The protective cover and protective fence must be rigid enough to withstand the maximum possible movement energy. EMERGENCY STOP switches must be easily and quickly accessible. Before starting up the machine or automated system, check that the EMERGENCY STOP system is working. Prevent operation of the machine if this protective equipment does not function correctly.

2.12.4 Protection against electric shock

Work on electrical equipment

Touching live parts may result in death.

- Work on the electrical equipment may only be carried out by qualified electricians in accordance with the electrical engineering regulations.
- Lay electrical cables properly, e. g. in a cable duct or a cable bridge. Observe standards.
- Before connecting or disconnecting electrical cables, switch off the power supply and check that the cables are free of voltage. Secure the power supply against being switched on again.
- Before switching on the product, check that the protective earth conductor is correctly attached to all electrical components according to the wiring diagram.
- Check whether covers and protective devices are fitted to prevent contact with live components.
- Do not touch the product's terminals when the power supply is switched on.

Possible electrostatic energy

Components or assembly groups may become electrostatically charged. When the electrostatic charge is touched, the discharge may trigger a shock reaction leading to injuries.

- The operator must ensure that all components and assembly groups are included in the local potential equalisation in accordance with the applicable regulations.
- While paying attention to the actual conditions of the working environment, the potential equalisation must be implemented by a specialist electrician according to the applicable regulations.
- The effectiveness of the potential equalisation must be verified by executing regular safety measurements.

2.12.5 Protection against magnetic and electromagnetic fields

Work in areas with magnetic and electromagnetic fields

Magnetic and electromagnetic fields can lead to serious injuries.

- Persons with pace-makers, metal implants, metal shards, or hearing aids require the consent of a physician before entering areas in which components of the electric drive and control systems are mounted, started up, and operated.
- Persons with pace-makers, metal implants, metal shards, or hearing aids require the consent of a physician before entering areas in which magnetic grippers or motor parts with permanent magnets are stored, repaired, or assembled.
- Do not operate high-frequency or radio devices in the proximity of electric components of the drive system and their feed lines.

  If the use of such devices is necessary:

  When starting up the electric drive and control system, check the machine or automated system for possible failures when such systems are used at different intervals and in different states of the control system. A special additional EMC test may be necessary if the system has a high risk potential.

2.12.6 Protection against burns

Working with hot surfaces

Depending on the circumstances the surface of the product can get very hot and cause burns when touching it.

- Do not touch hot surfaces, such as brake resistors, heat sinks, drive units, windings and sheet metals.
- Let the surface cool down before working with it. After switching off the cool-down time of some components can average up to an hour.
- Wear protection gloves.

3 Technical data

3.1 ID Number

Designation		MCS 12
ID number	EGN 80	0307020
	EGN 100	0307021
	EGN 160	0307022
	EZN 64	0307030
	EZN 100	0307031
	ERS 135	0307035
	ERS 170	0307036
	ERS 210	0307037

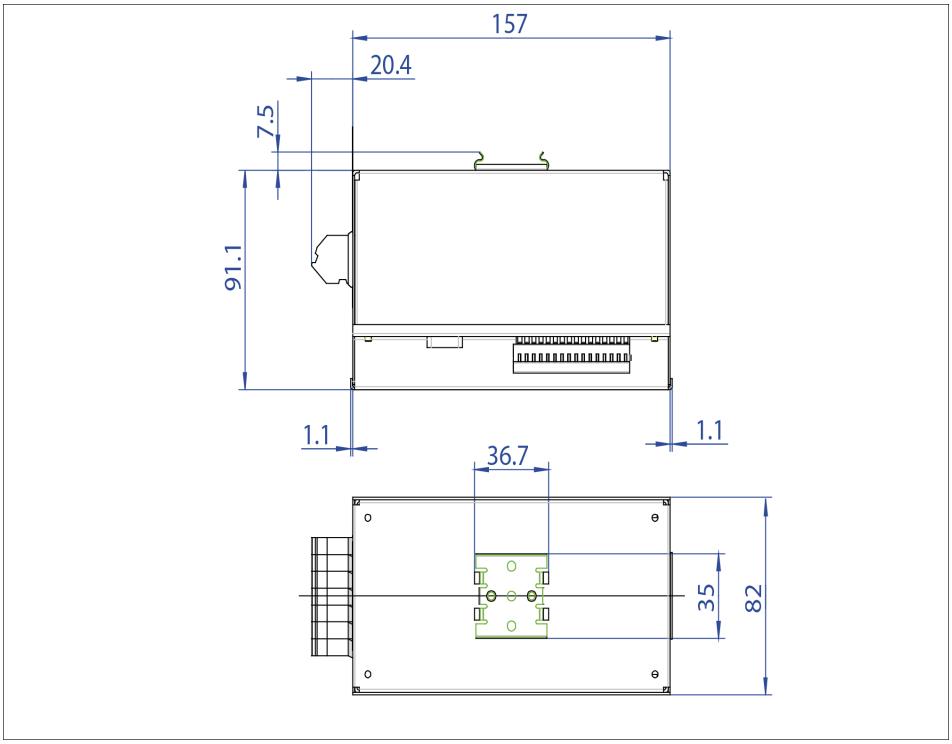
3.2 Basic Data

Designation	MCS 12
Mechanical operating data	
Weight [kg]	0.98
IP rating	IP30
Ambient temperature [°C] Min. Max.	 5 45
Supported transducer types	Encoder, resolver
Control types	PI current control
	PI velocity control
	PI position control
Electrical operating data (power)	
Power supply [VDC]	24 or 48 ± 10% (ERS)
Nominal power current [A] Max.	12 24
Electrical operating data (logic)	
Power supply [VDC]	24 ± 10%
Nominal power current [A]	0.5
Interface	
Profibus (1.5 MBaud)	X
RS232 (9,600 kBaud)	X
CAN (max. 1 MBaud)	X

3.3 Specific Data

Designation	MCS 12	
Nominal current (I nom) [A] Maximum current (I max) [A]	EGN 80	1.0 4.0
	EGN 100	1.8 4.0
	EGN 160	2.6 4.0
	EZN 64	1.4 4.0
	EZN 100	2.2 4.0
	ERS 135	4.16 13.0
	ERS 170	5.2 19.8
	ERS 210	6.2 16.0

3.4 Housing dimensions



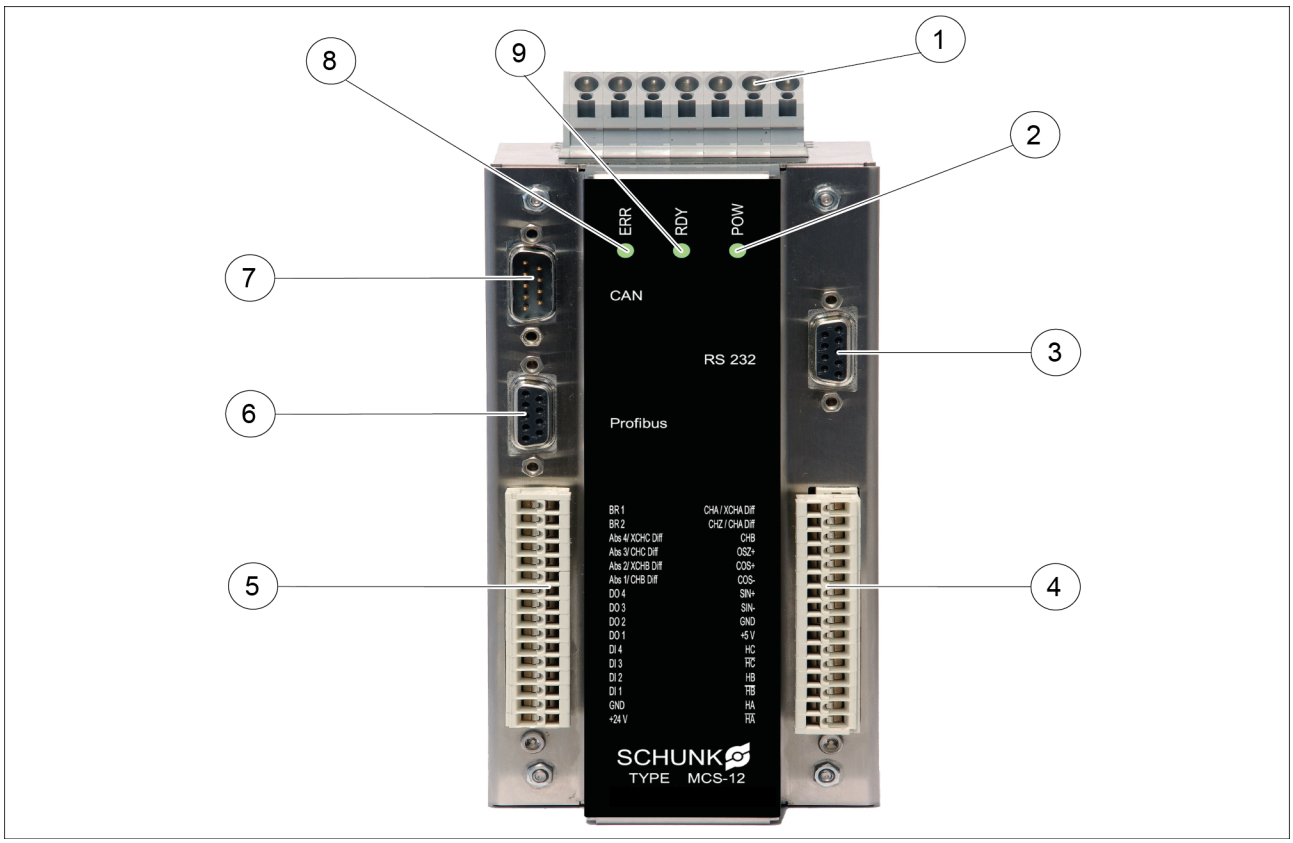
Housing dimensions (mm)

3.5 Digital Inputs and Outputs

Designation	MCS 12
Digital Outputs	
Type of outputsystem	opto-decoupled
Output voltage, U_{out} [VDC]	>12
Electric framework	GND
Electric current Max. [mA]	>3
Short-circuit-proof	yes
Inverse-polarity protection	yes
Opto-decoupled	yes
Digital Inputs	
Threshold level 'High'[VDC]	>3
Threshold level 'Low' [VDC]	<0.5
Power consumption [mA]	<5
Inverse-polarity protection	yes
Opto-decoupled	yes

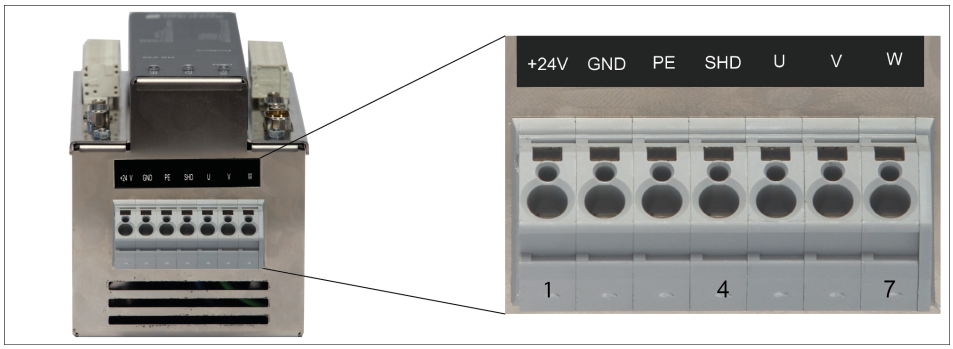
4 Design and description

4.1 Design



Design of the controller

Item	Description	Function
1	Terminal strip X1	Used to connect the module motor phases and supply power to the controller
2	*POW* LED (green)	Power voltage supply indicator
3	RS232 interface	RS232 connection
4	Terminal strip X3	Used to connect differential encoders, resolvers, Hall-effect sensors
5	Terminal strip X2	Used to connect brakes, differential encoders, logic voltage supply, digital inputs and outputs
6	Profibus DP interface	Used to connect Profibus DP
7	CAN bus interface	Used to connect CAN bus
8	*ERR* LED (red)	Error indicator
9	*RDY* LED (green)	Indicates when the module is ready to communicate with the higher-level control unit



Terminal strip X1

4.2 Description

The controller is designed to activate and control EVG, EGN and EZN grippers or the ERS rotary module.

The MCS 12 controller does not include temperature monitoring with KTY84.

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

5 Assembly

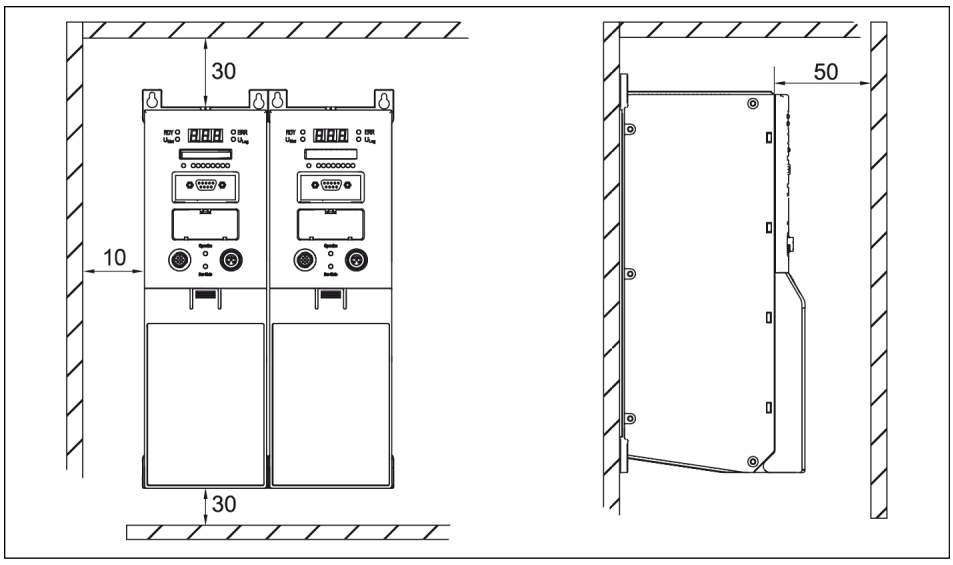
5.1 Mechanical assembly

NOTICE

Material damage due to improper assembly!

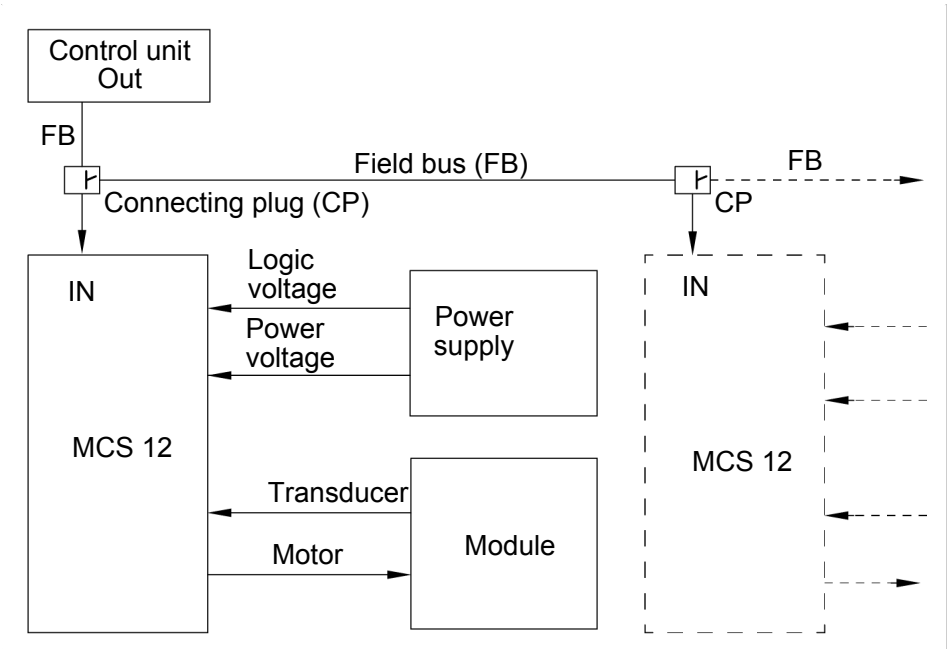
Splash water, vapors, contamination, overheating and EMC impact may cause damage to the controller.

- Install the controller in a control cabinet that meets at least the requirements of protection class IP54.
- Mount the controller horizontally.
- Protect the controller from foreign bodies.
- Observe assembly distances.
- Do not cover the louvers located on the side between the printed circuit board carrier and protection cover.



Assembly distances in the control cabinet (mm)

5.2 Connection diagram



Connection Diagram

5.3 Electrical connection

⚠ DANGER

Risk of fatal injuries due to electric shock!

- Always disconnect the logic voltage and motor voltage before performing any work on the controller.
- Do not carry out work on the controller before the intermediate circuit voltage has dropped to a residual voltage of below 10 V.
- It can be measured at terminal strip X1 between +24 V (+48 V ERS) and GND.

⚠ WARNING

Risk of injury when the machine/system moves unexpectedly!

Switch off power supply.

NOTICE

Material damage due to faulty connection!

Electronic components can be damaged in case of all-pole disconnection.

NOTE

Observe the cable dimensions for the cables, sensors and transducers of the connected module. The required information can be found in the operating manual for the module in question.

NOTE

The wiring diagrams and the cable dimensions for the cables, temperature sensors and shaft encoders on the ERS must be observed Technical data [▶ 17].

NOTE

If the logic and power voltages are supplied by a voltage source, the logic and power must be shielded separately. Equipotential bonding must be provided between the voltage sources for logic and power.

5.3.1 Observe ERS when connecting a rotary module

NOTICE

Material damage through regenerative energy!

Under great loads, regenerative energy (electric energy from generator effect) may build up and damage the regulator.

- Ensure discharge of regenerative energy on customer's premises.
- SCHUNK recommends the use of a brake chopper (Type: ACC3EA001 ID number 9951504).
- Adjust the response threshold of the brake chopper used.

  ✓ At 48 VDC operation, set the brake chopper to 53 VDC or "C"

NOTE

The stepper mode of the MCS 12 controller is used for commutation. In this mode, all three phases are energized when the controller is switched on. This directs the rotor's magnetic field toward that of the stator, causing the drive to jump a few degrees.

The resulting change in position is measured using the transducer and saved as the offset in the controller's memory. To increase the accuracy of this offset, the phases are energized several times in succession.

As such, the motor may jump in the +/- 30° range after the controller is switched on. In incremental measuring systems, this stepper mode is carried out each time the controller is restarted.

5.3.2 Connecting the Controller

Several modules are connected using connecting plugs with termination resistors. The termination resistor must be set on the last bus node.

NOTE

When establishing the electrical connections, observe the connection diagram, Appendix [▶ 52].

- The module is installed
- The master (higher-level control unit) is installed

➢ Connect the connecting plug to the master.
➢ Connect the connecting plug to the controller.
➢ Connect any other bus nodes to the connecting plug.
➢ Connect the termination resistor to the connecting plug if the controller is the last bus node.
➢ Connect the transducer cable between the module and the controller, Terminal Strip X3 [▶ 29].
➢ Connect the motor phases between the module and the controller, Terminal Strip X1 [▶ 27].
➢ Connect the logic voltage supply to the controller, Terminal Strip X2 [▶ 27].
➢ Connect the power voltage supply to the controller, Terminal Strip X1 [▶ 27].

5.3.3 Terminal Strip X1

Terminal strip X1 is used to connect the module motor phases, the functional ground and the voltage supply of the controller's power component, Design and description [▶ 20].

The maximum cable diameter is 4.0 mm^2.

Motor Phases and Power Voltage Supply

Terminal		Designation
1	+ 24 V	Power voltage supply
2	GND	
3	PE	Functional ground
4	SHD	Shield
5	U	Motor phases
6	V	
7	W	

5.3.4 Terminal Strip X2

Terminal strip X2 is used to connect the holding brake, sensor signals and logic voltage, Design and description [▶ 20].

- Use the supplied module adapter cable to connect the transducer cable.

The maximum cable diameter is 1.5 mm^2.

Brake

Terminal		Designation
1	BR1	Brake (+)
2	BR2	Brake (-)

Differential encoder

Terminal		Designation
3	Abs4/XCHC Diff	Differential encoder
4	Abs3/CHC Diff	
5	Abs2/XCHB Diff	
6	Abs1/CHB Diff	

Digital inputs and outputs

Terminal		Designation	
		Usage: Program	**Usage: Normal**
7	DO4	Movement blocked (low-active)	Digital output
8	DO3	Dependent on configuration (low-active)	Digital output

Terminal		Designation	
		Usage: Program	**Usage: Normal**
9	DO2	Error message (low-active)	Digital output
10	DO1	Referenced (low-active)	Digital output
11	DI4	Program block selection	Digital input (IN3)
12	DI3	Program block selection	Digital input (IN2)
13	DI2	Program block selection	Digital input (IN1)
14	DI1	Enable/external reference switch (firmware version 1.20 or higher)	Digital input (IN0)

Logic voltage

Terminal		Designation
15	GND	Reference potential – logic voltage supply
16	+24 V	Logic voltage supply

5.3.5 Terminal Strip X3

Terminal strip X3 is used to connect sensor signals, resolvers and single ended, Design and description [▶ 20].

- Use the supplied module adapter cable to connect the transducer cable.

The maximum cable diameter is 1.5 mm^2.

Differential Encoder and Single Ended

Terminal		Designation
1	CHA/ XCHA Diff	Terminals 1 and 2 have two connections each. Differential encoder: terminals 1 and 2 Single ended: terminals 1, 2 and 3
2	CHZ/ CHA Diff	
3	CHB	

Resolver

Terminal		Wire color (*)	Designation
4	OSZ+	White / Red	+ Ref
5	COS+	Black	+ Cos
5	COS-	Red	- Cos
7	SIN+	Yellow	+ Sin
8	SIN-	Blue	- Sin
9	GND	White / Yellow	- Ref
(*) Wire color of the supplied SCHUNK cable, otherwise according to customer specifications			

Hall-effect sensors

Terminal		Designation
10	+5 V	Hall-effect sensors
11	HC	
12	XHC	
13	HB	
14	XHB	
15	HA	
16	XHA	

5.3.6 Communication Interfaces

The controller has the following three communication interfaces:

- Fieldbus interface
  - CAN bus
  - Profibus DP
- Parameterization interface
  - RS232

NOTE

The characteristics of interface RS232 make it unsuitable for use as a fieldbus interface.

Only use interface RS232 as the parameterization interface.

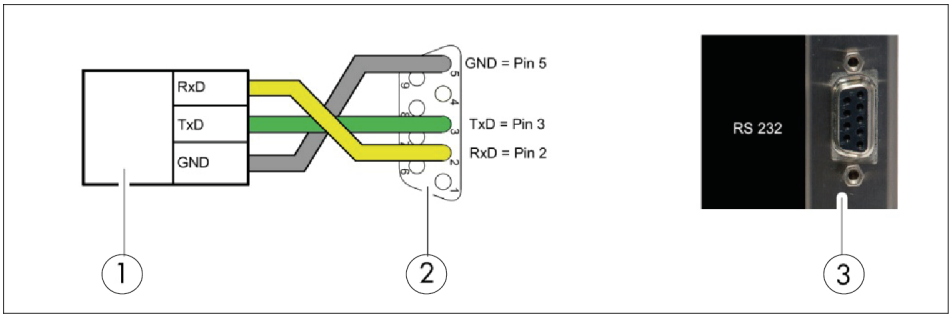
The controller can be controlled via these interfaces using the SCHUNK Motion Protocol (SMP).

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

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 in order to achieve this. A termination resistor must be set on the last bus node.

RS232 connection

The connection is established using a 9-pin SUB-D connector from the control unit (PC/PLC) to the controller.

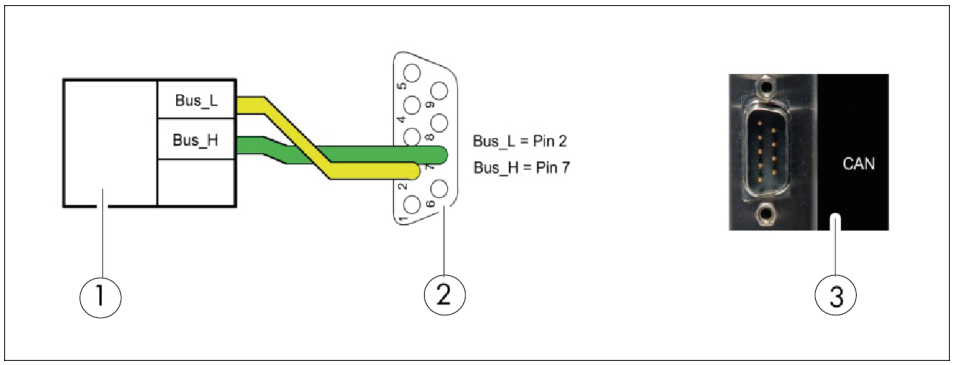


Connector assignment for RS232

Item	Description
1	Control unit (PC/PLC)
2	9-pin SUB-D connector
3	9-pin SUB-D socket on the controller

CAN connection

The connection is established using a 9-pin SUB-D socket from the control unit (master) to the controller.

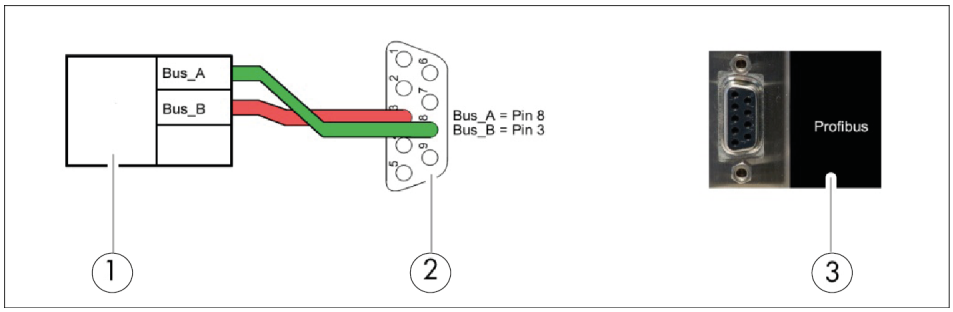


Socket assignment for CAN bus

Item	Description
1	Control unit (master)
2	9-pin SUB-D socket
3	9-pin SUB-D connector on the controller

Profibus DP connection

The connection is established using a 9-pin SUB-D connector from the control unit (master) to the controller.



Connector assignment for Profibus DP

Item	Description
1	Control unit (master)
2	9-pin SUB-D connector
3	9-pin SUB-D socket on the controller

Digital inputs and outputs

As an alternative to the field bus, the MCS 12 controller can be controlled via the digital inputs and outputs, see the *Motion Control* document.

6 Functional description

6.1 Display Elements

NOTE

For more information on display elements, see the *Motion Control* document.

A green LED *POW LED* is used as the status display for the motor voltage. If the LED does not light up, or only lights up very weakly, then the 24 V or 48 V DC ERS motor supply voltage must be checked.

The *RDY* and *ERR* LEDs light up for various events in different operating modes. The most important events are given in the following table.

RDY and ERR LEDs

Operating Mode	**Event**	***RDY* LED (green)**	***ERR* LED (red)**
Control mode	Ready for operation	On	Off
	Error	Off	Flashing
Firmware update	Downloading firmware	On	On
Miscellaneous	Hardware is not recognized	Flashing (in alternation with *ERR* LED)	Flashing (in alternation with *RDY* LED)

6.2 Restoring the Factory Settings (DEFAULT Function)

NOTE

For more information on the DEFAULT function and the DEFAULT values, see the *Motion Control* document.

The DEFAULT function resets the module to its factory settings.

- ➢ Turn off the logic voltage supply on the controller.
- ➢ Set the jumper between pin 6 (GND) and pin 8 (default) on the CAN bus connector.
- ➢ Turn on the logic voltage supply on the controller.
- ➢ Wait for approx. 10 seconds.
- ➢ Turn off the logic voltage supply on the controller.
- ➢ Remove the jumper between pin 6 (GND) and pin 8 (default).
- ✓ The module is now reset to its factory settings.

DEFAULT Values

- Module address = 11
  - – Controller for drives (ERS)
- Module address = 12
  - – Controller for grippers (EGN/EZN/EVG)
- Communication = RS232
- Data rate = 9,600 kBaud

6.3 Writing Firmware (BOOT Function)

NOTE

For more information on the BOOT function, see the *Motion Control* document.

The BOOT function is used to write the module firmware.

NOTICE

The module will cease to function if all the steps are not completed!

- This procedure must not be interrupted.

- ➢ Turn off the logic voltage supply on the controller.
- ➢ Set the jumper between pin 6 (GND) and pin 1 (boot) on the CAN bus connector.
- ➢ Turn on the logic voltage supply on the controller.
  - ✓ The module is in BOOT mode.
- ➢ Flash the module with the *Motion Tool Schunk* software, see the *Motion Control* document.
- ➢ Turn off the logic voltage supply on the controller.
- ➢ Remove the jumper between pin 6 (GND) and pin 1 (boot).

✓ The firmware has been written.

7 Start-up and System Integration

7.1 Compatibility

The *Motion Tool Schunk (MTS)* configuration and start-up tool and the *Schunk Motion Protocol (SMP)* firmware are not backward compatible. This means that the version of *MTS* that is used must always be equal to or higher than the *SMP* version.

If the version of *MTS* is higher than that of *SMP*, the module may end up in an undefined status during parameterization.

Example

SMP firmware	1.55	1.56	1.56
MTS	1.56.x	1.56.x	1.50.x
Compatibility	OK	OK	NOK

The version of the *Motion Tool Schunk (MTS)* program that is currently in use is shown at the top of the program window.

The software version can be found under the *General Information* tab, under *Software Version*.

The firmware version currently in use can be found in the module window under *Module -> Module Information*.

7.2 Configuration with the Motion Tool Schunk (MTS)

NOTE

For more information on configuration using the Motion Tool Schunk, see the *Motion Control* document.

The module is shipped pre-configured for a fixed fieldbus interface, CAN bus or Profibus, Communication Interfaces [▶ 30]. The RS232 serial interface is used to parameterize and test the module.

The status of the module must be observed when accessing it via the RS232 serial interface.

The module has two possible states:

- The module is in its delivered state [▶ 35]
- The module has been reset to its DEFAULT values [▶ 40]

7.2.1 The Module is in its Delivered State

If the module is in its delivered state and has an active error, e.g. *Motor voltage low*, start by performing the following steps. An active error is indicated by a flashing *ERR* LED.

If the *ERR* LED is not flashing when the machine is in its delivered state, the module's bus connection can be broken temporarily to trigger an active error, for example.

Launching MTS

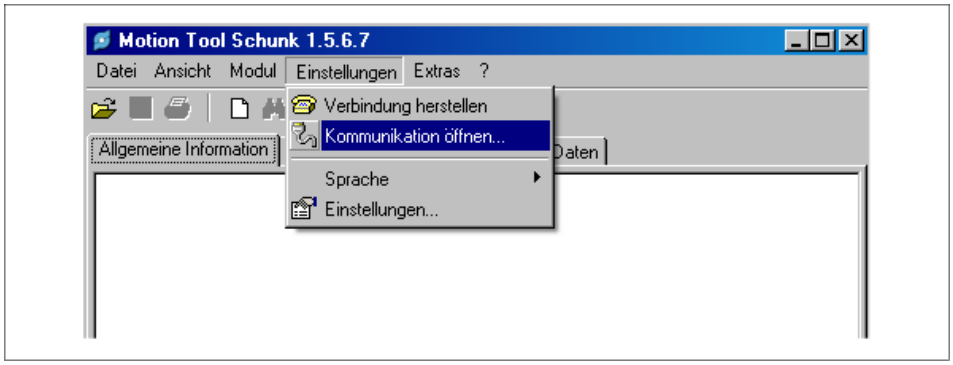
- *ERR* LED flashes red
- The controller is connected to a PC
- *Motion Tool Schunk (MTS)* is installed on the PC

➢ Double-click on the *mts.exe* icon.

✓ *Motion Tool Schunk (MTS)* will launch.

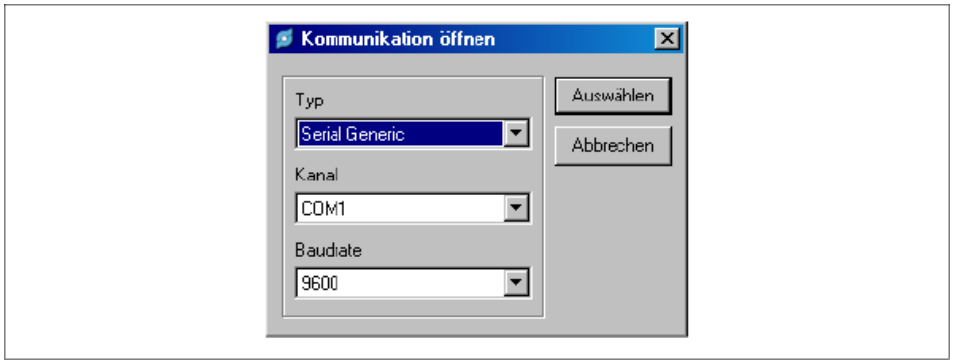
✓ The program window is displayed.

Selecting the RS232 interface



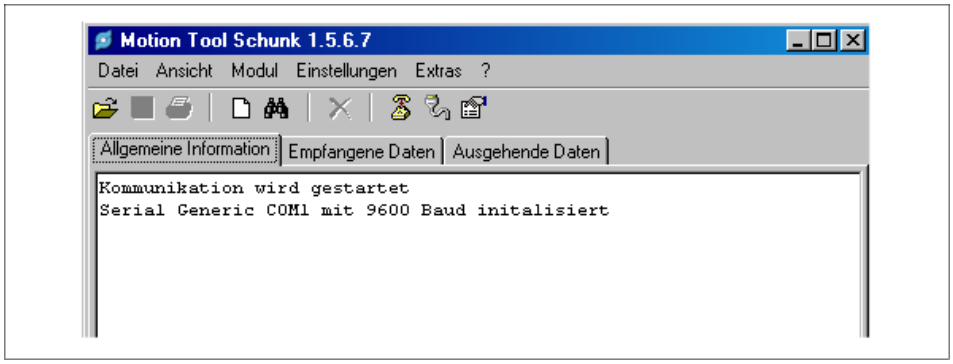
➢ Go to *Settings -> Open communication…*.

✓ The *Open communication* window appears.



➢ Under *Type*, select Serial Generic and press the *Select* button.

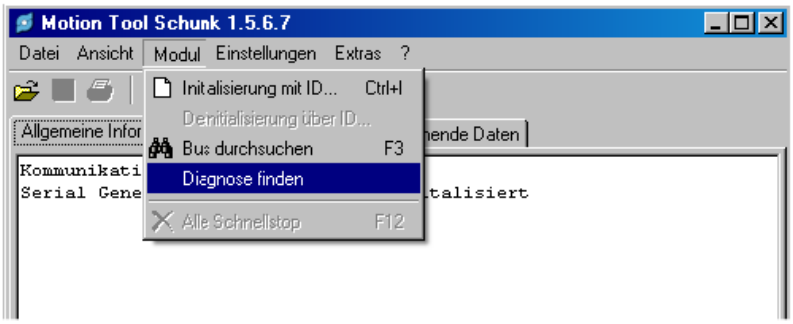
✓ The *Open communication* window closes.



✓ The program window is displayed.

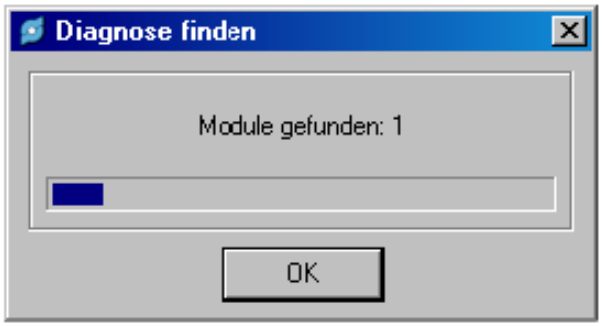
Searching for the module

- Module displays an error, *ERR* LED flashes red



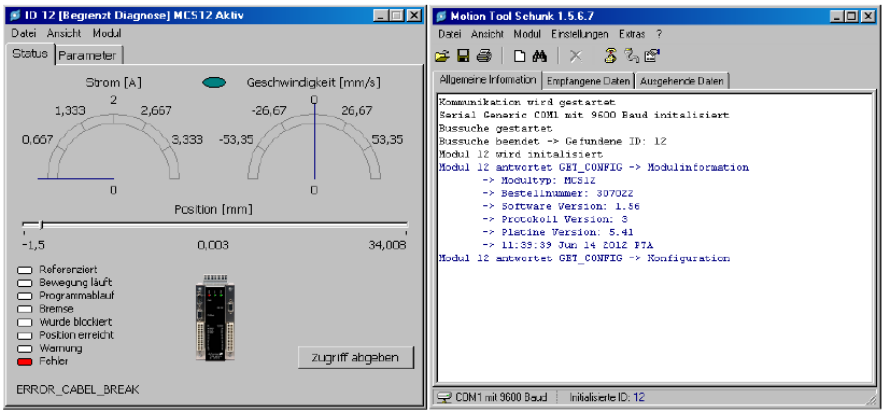
➢ Go to *Module -> Find diagnosis…*.

✓ The *Find diagnosis* window appears and the system starts to search for connected modules.

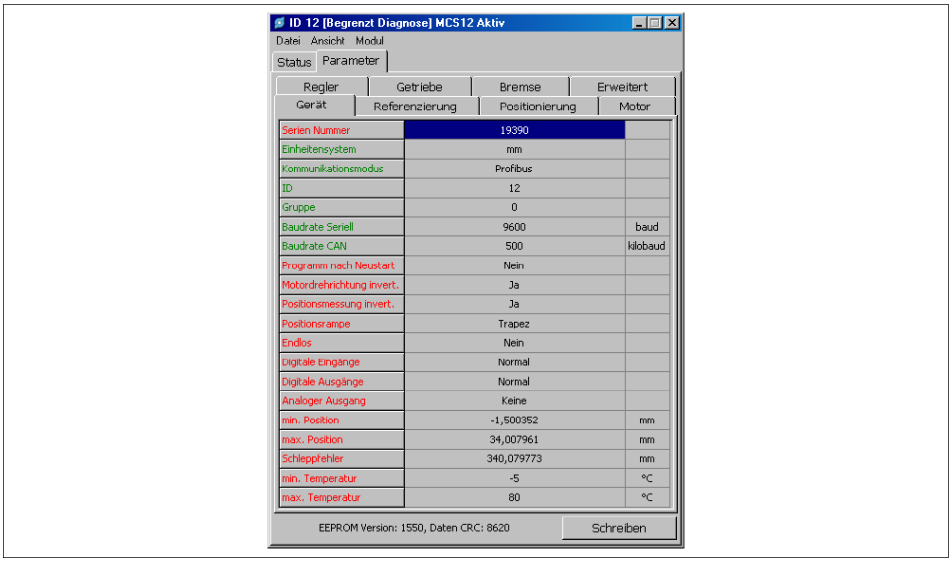


✓ Once the search is complete, the *find diagnosis* window closes and the module window appears.
NOTICE! Once the modules have been detected, you can also press OK to close the window.

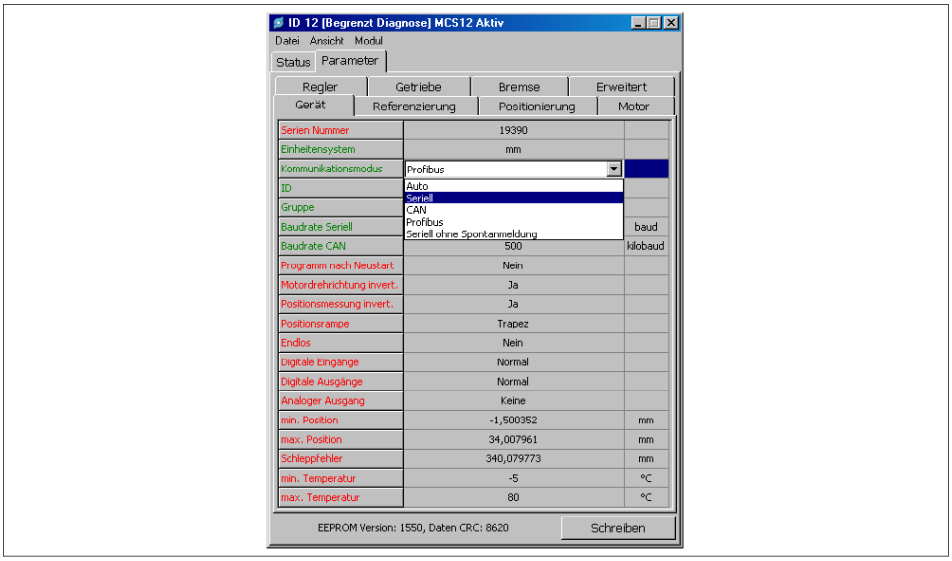
Changing the communication mode



➢ **NOTICE! The module window opens automatically when a fault is detected in the Schunk electronic system.**
Click on the *Parameters* tab.

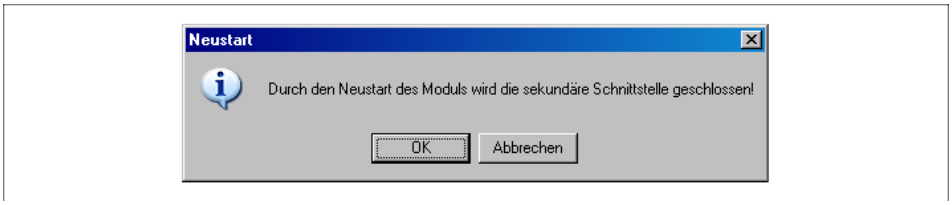


✓ The *Parameters* tab opens.



➢ Under *Communication mode*, switch from Profibus to Serial and press the *Write* button.

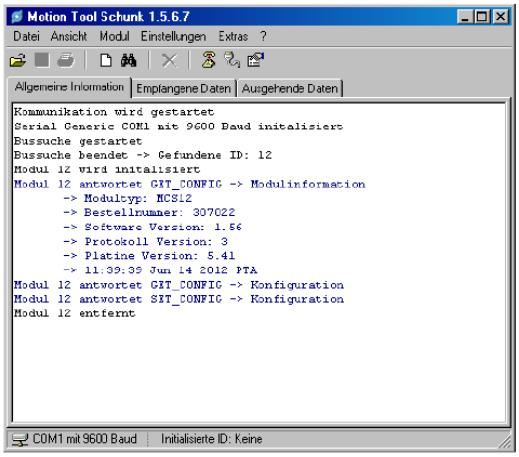
✓ The *Restart* window appears.



➢ Press *OK*

✓ The *Restart* window closes.

✓ Communication with the module is interrupted.



✓ The program window appears with the message *Module removed*.

➢ Close *Motion Tool Schunk (MTS)*.

NOTE

In order to parameterize the module and test its handling, it has been reset to its DEFAULT values, The module has been reset to its DEFAULT values [▸ 40].

7.2.2 The module has been reset to its DEFAULT values

Once the module has been reset to its DEFAULT values, Restoring the Factory Settings (DEFAULT Function) [▶ 33], perform these actions to parameterize and test the module using the RS232 interface.

Launching MTS

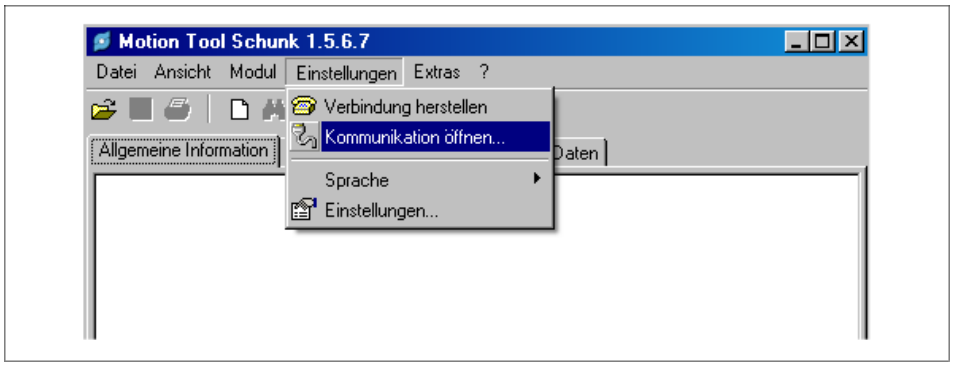
- The controller is connected to a PC
- *Motion Tool Schunk (MTS)* is installed on the PC

➢ Double-click on the *mts.exe* icon.

✓ *Motion Tool Schunk (MTS)* will launch.

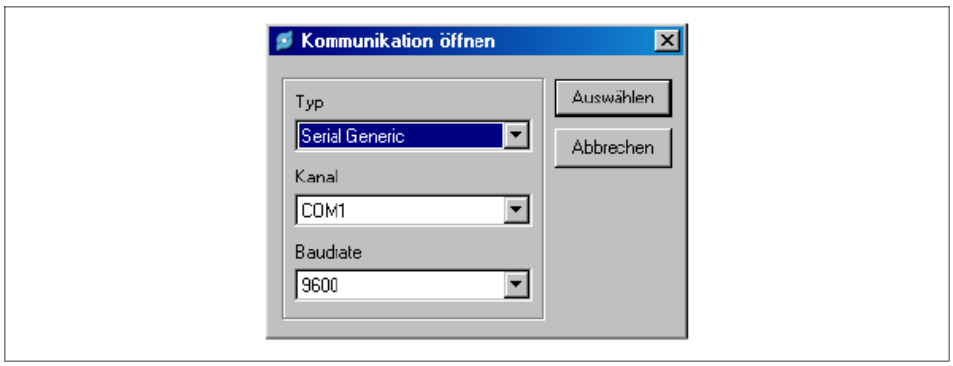
✓ The program window is displayed.

Selecting the RS232 interface



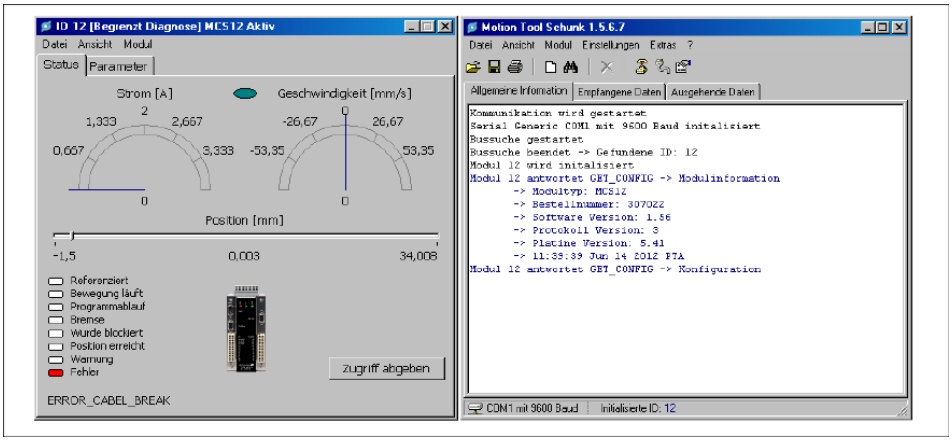
➢ Go to *Settings -> Open communication…*.

✓ The *Open communication* window appears.



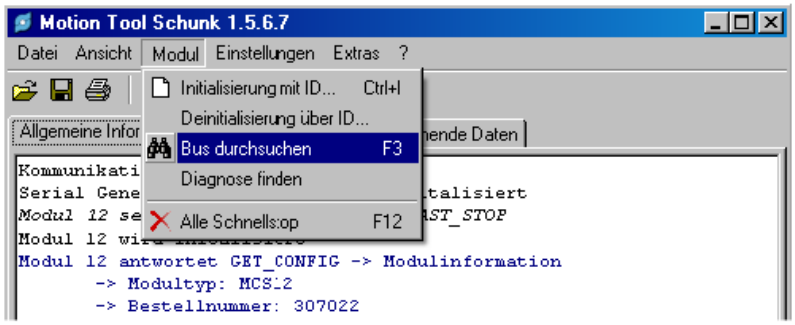
➢ Under *Type*, select Serial Generic and press the *Select* button.

✓ The *Open communication* window closes.



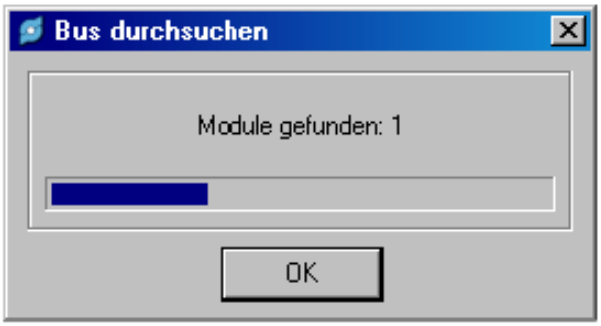
✓ The program and module windows appear.
WARNING! If the module window does not open automatically, a search must be performed to find the module.

Searching for the module



➢ Go to *Module -> Search bus*.

✓ The *Search bus* window appears and the system starts to search for connected modules.

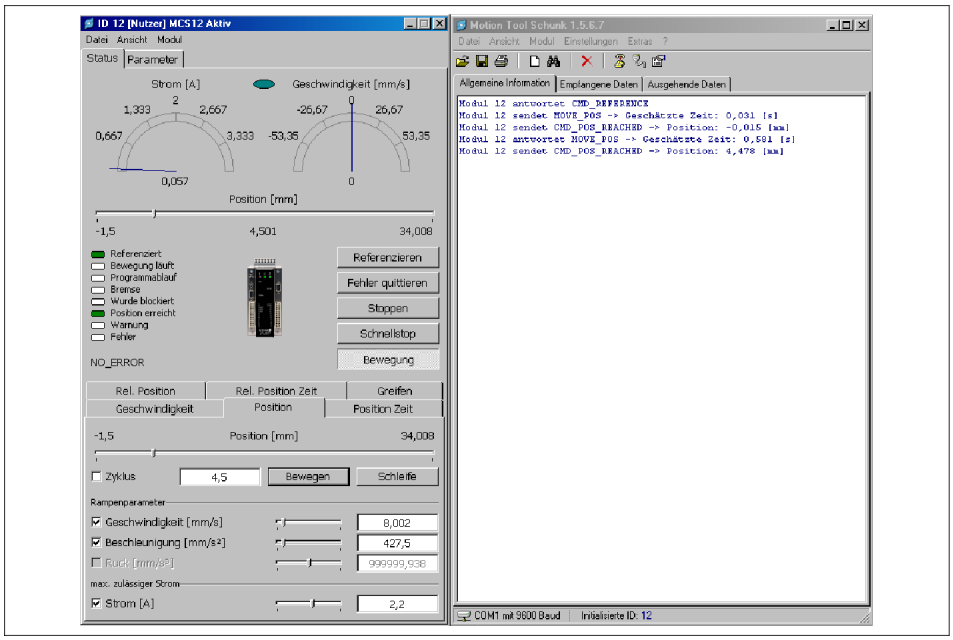


✓ Once the search is complete, the *find diagnosis* window closes and the module window appears.
NOTICE! Once the module has been detected, you can also press OK to close the window.

Entering parameters

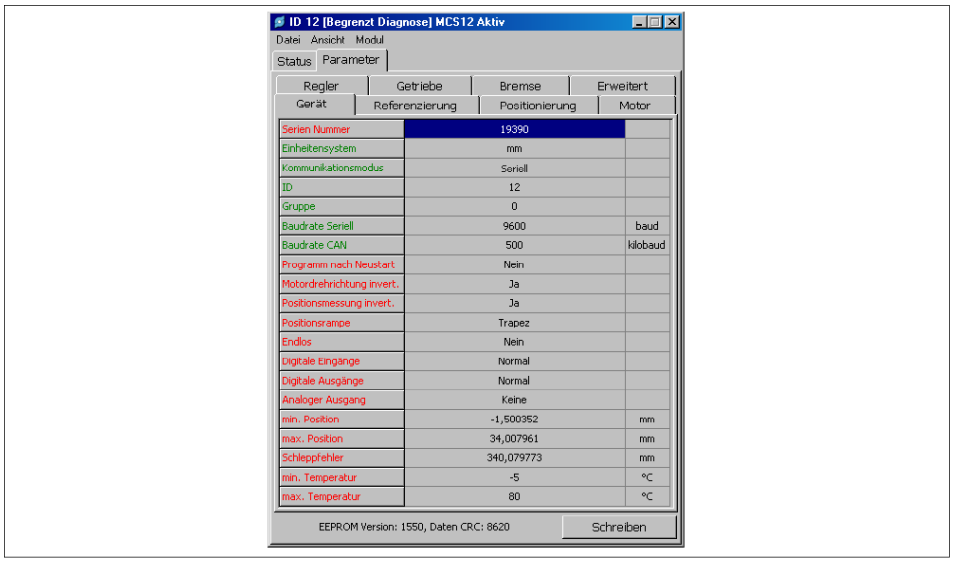
NOTE

The module can now be parameterized and tested, see the Help function in the program window or the *Motion Control* document.



➢ Click on the *Parameters* tab.

✓ The *Parameters* tab opens.



➢ Enter the parameters and press the *Write* button.

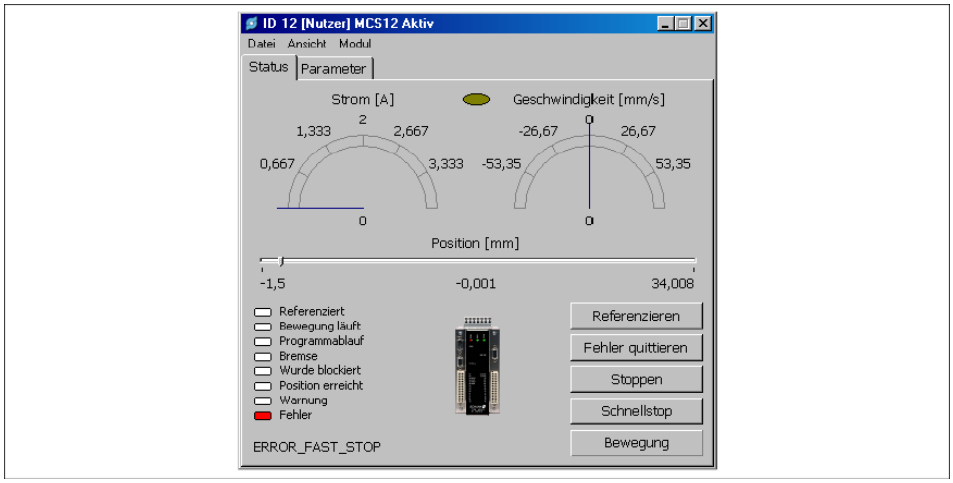
✓ The new values will be adopted into EEPROM.

➢ Click on the *Status* tab.

✓ The *Status* tab opens.

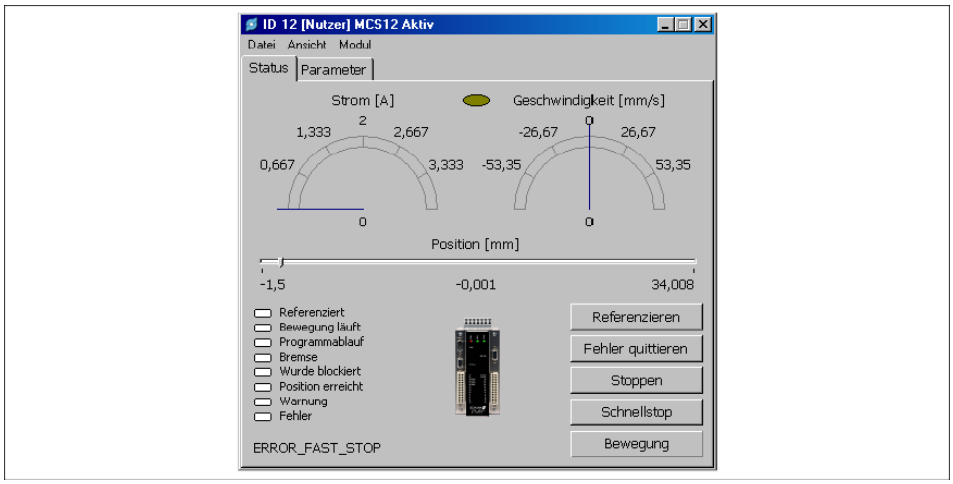
Performing a reference run

- The module has no errors, the *Error* status bit lights up white



➢ If the *Error* status bit lights up red:
Press the *Acknowledge error* button.

✓ The error is acknowledged and the *Error* status bit lights up white.

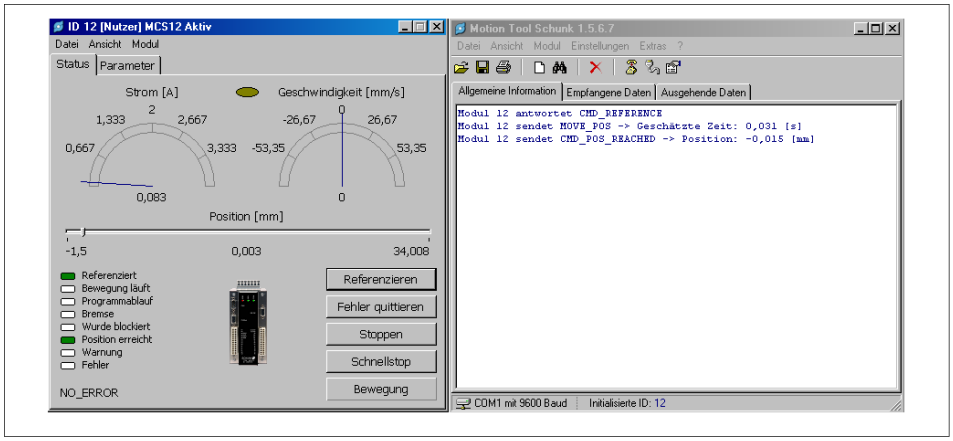


➢ Press *Reference*.

✓ A reference run will be carried out.

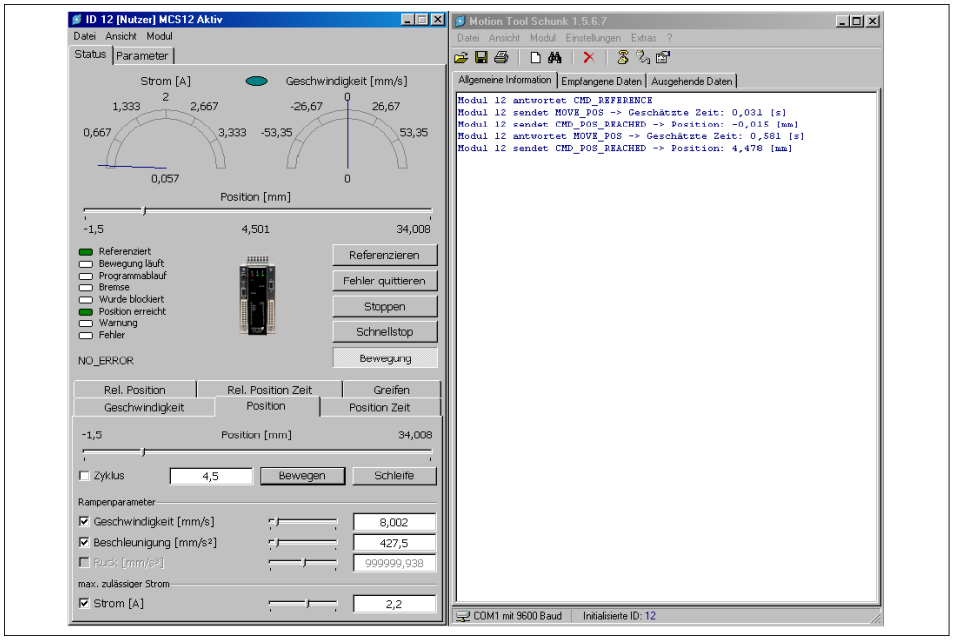
Selecting movement modes

- The module has no errors, the *Error* status bit lights up white
- The module is referenced; the *Referenced* and *Position reached* status bits turn green



➢ Press *Movement*.

✓ The *Velocity, Position, Position time, Rel. position, Rel. position time, Gripper* tabs are displayed.



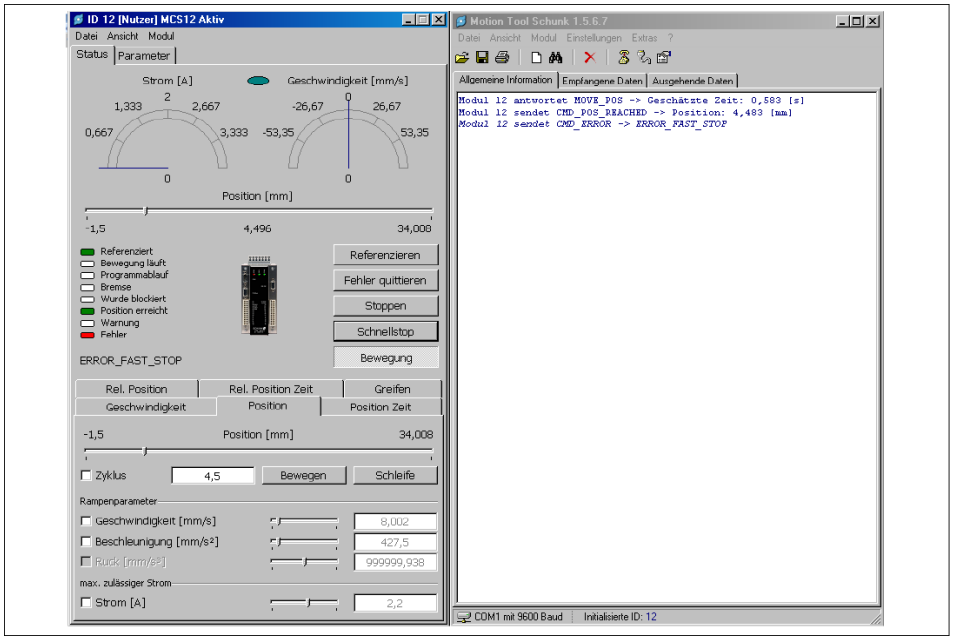
➢ Click on the tab you required and enter your preferred target values in the input fields.

NOTE

A password is required to change the control, referencing and device parameters; see the *Motion Control* document.

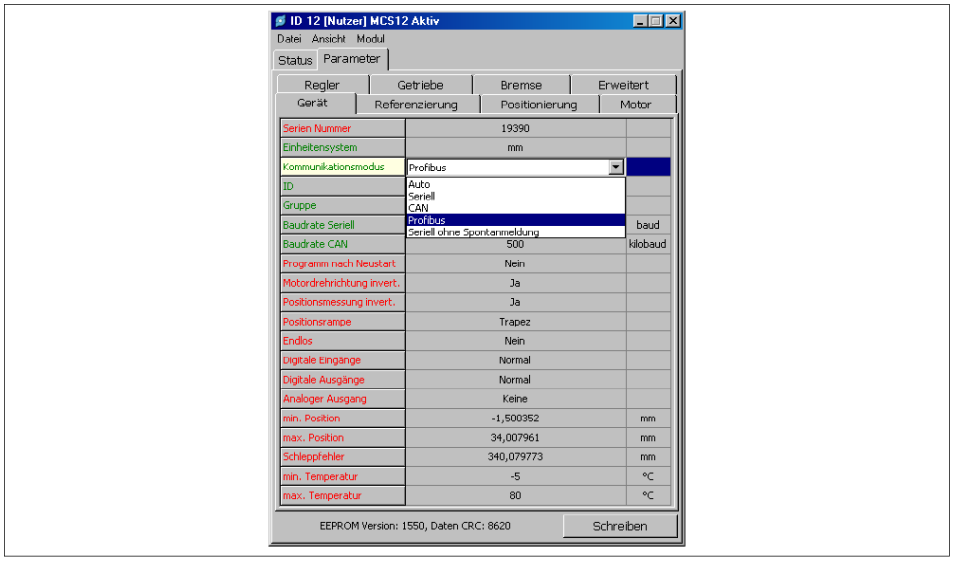
Exiting settings

➢ Press *Quick stop*.



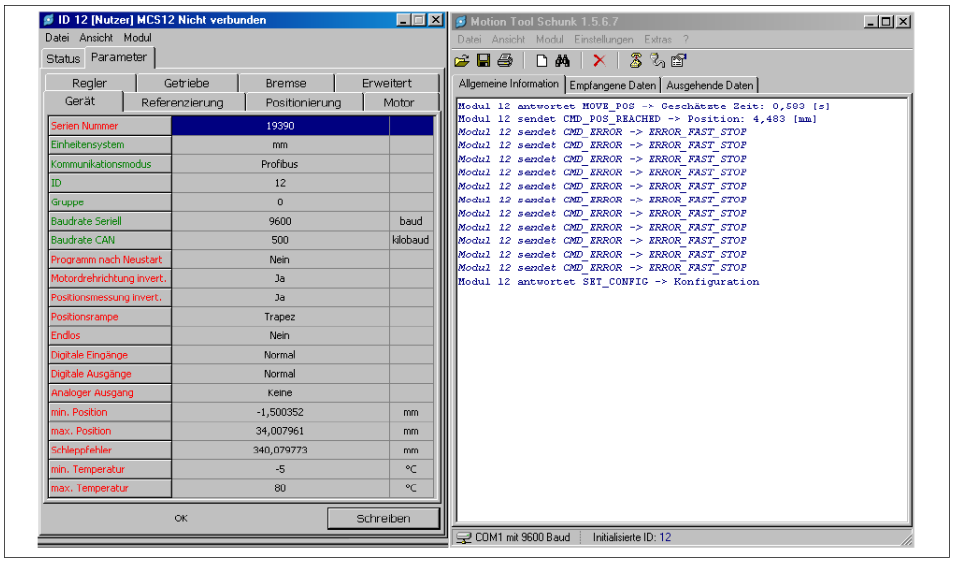
✓ All movement stops.

✓ The module displays an error; the *Error* status bit lights up red.



➢ Set the fieldbus communication to Profibus or CAN bus and press *Write*.

✓ The new values will be adopted into EEPROM.



✓ Serial communication with the module is interrupted and the message *MCS 12 not connected* appears.

7.3 Start-up

⚠ WARNING

Risk of injury due to unexpected movements of the machine/ automated system!

- Secure the danger zone with suitable protective devices, e.g. protective fencing, and wear personal protective equipment.

NOTE

The controller is parameterized at the factory for the module that is to be connected.

- ➢ Switch on the logic voltage.
- ➢ Switch on the motor voltage.
- ➢ Check whether motor voltage is present (*POW* LED must light up green).
- ➢ Adjust the Baud rate if necessary; see the *Motion Control* document.
- ➢ Set the fieldbus address; see the *Motion Control* document.
- ➢ Check whether the controller can communicate with the master (*RDY* LED lights up green).
- ➢ Make sure there are no pending error messages (*ERR* LED should not be flashing).
- ➢ If no error message is pending, the controller is ready for operation.
- ➢ If an error message is pending, Trouble shooting [▶ 49].

7.4 Start-up of the Digital Inputs

NOTE

For more information on starting up the digital inputs, see the *Motion Control* document.

7.5 Start-up of the Digital Outputs

NOTE

For more information on starting up the digital outputs, see the *Motion Control* document.

7.6 System Integration

7.6.1 SCHUNK Motion protocol

Schunk Motion Protocol

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

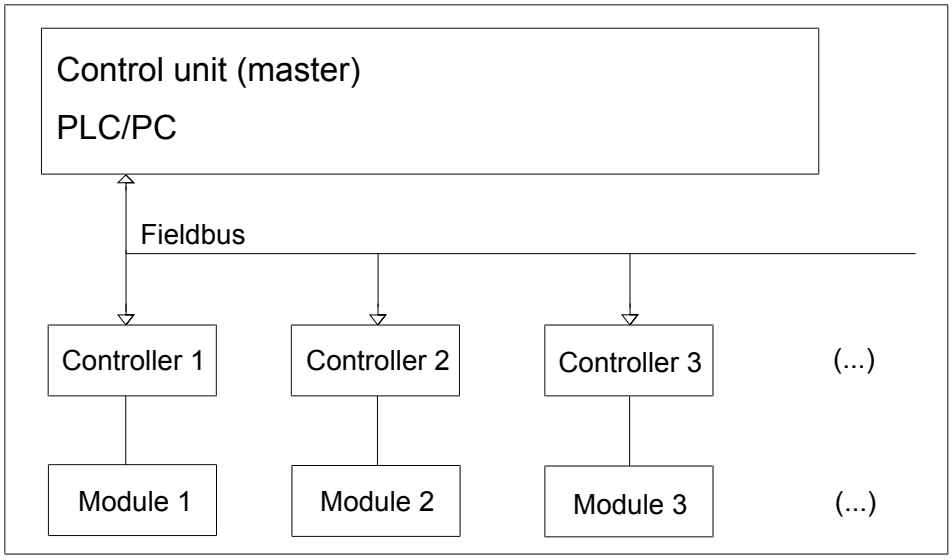
- D-Len (1 byte)
- Command code (1 byte)

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 that are required. If required, a "master command" can be extended with a "sub-command".
All commands sent are immediately confirmed by the product with a response (acknowledge). This response also uses the data frame described above (D-Len, command code, any parameters). If the request has been processed successfully, D-Len always has a value that is not equal to "0x02". If the request fails, D-Len will have the value "0x02".

NOTE

For specific features of the different bus systems, please consult the software manual *Motion control*.

7.6.2 System Structure



Data format

The data is transferred in Intel (little Endian) format.

NOTE

The numbers of connected products depends on which bus is used. A maximum of 255 IDs can be assigned: see the document "motion Control".

8 Trouble shooting

After an error with error message has been resolved, this error message has to be acknowledged, see document *Motion Control*. The error is indicated via the (red) LED *ERR*.

A list of the info and error codes is contained in the document *Motion Control*.

A detailed error information may be read out via *Motion Tool Schunk (MTS)*, see document *Motion Control*.

8.1 LEDs on Controller Do Not Light Up

Possible cause	Corrective action
No voltage connected.	Check the power and logic voltage supplies on the controller.
Master (control unit) on the field bus is not active.	Check the master; reactivate fieldbus communication if necessary.

8.2 RDY LED (Green) Does Not Light Up

Possible cause	Corrective action
Logic voltage supply missing.	Check logic voltage supply on terminal X2.
Faulty connection.	Check all connections.

8.3 LED POW (green) doesn't light up or is only slightly illuminated

Possible cause	Corrective action
There is no or too little power voltage.	Check power supply on terminal X1.

8.4 LED ERR (red) lights up and LED RDY (green) doesn't

NOTE

Troubleshooting, see document *Motion Control*.

8.5 Communication failure

Possible cause	Corrective action
Fuse logic supply triggered	Check fuse logic supply, replace it if necessary.
Connection between Controller and *Motion Tool Schunk (MTS)* has been interrupted.	Check bus cable or cable for interface RS232 for damage, replace it if necessary.
No establishment of communication possible with*Motion Tool Schunk (MTS)* (Interface RS232, Profibus or CAN-bus)	Check delivery status **NOTICE! The controller is delivered in the communication mode Profibus.**
	Check communication interface, Link Motion Tool Schunk starten.
	Check closing termination, Is module final station connected to the bus? Is a termination resistor necessary?
	Module with CAN-Bus
	Check and adjust address of the CAN-Bus, see document *Motion Control*.
	Check baud rate, Link Baudrate.
	Module with Profibus
	Check GSD-file, use convenient GSD-file if necessary.
	Check and adjust address Profibus, see document *Motion Control*.
	Check baud rate, max.l 1.5 MBaud.
Values are safed in the EEPROM but are not activated.	Before writing stop the module which is connected to the controller via quick stop and restart the module after writing. **NOTICE! In the EEPROM the new values are not adopted, if the module which is connected to the controller is in motion.**

9 Maintenance and care

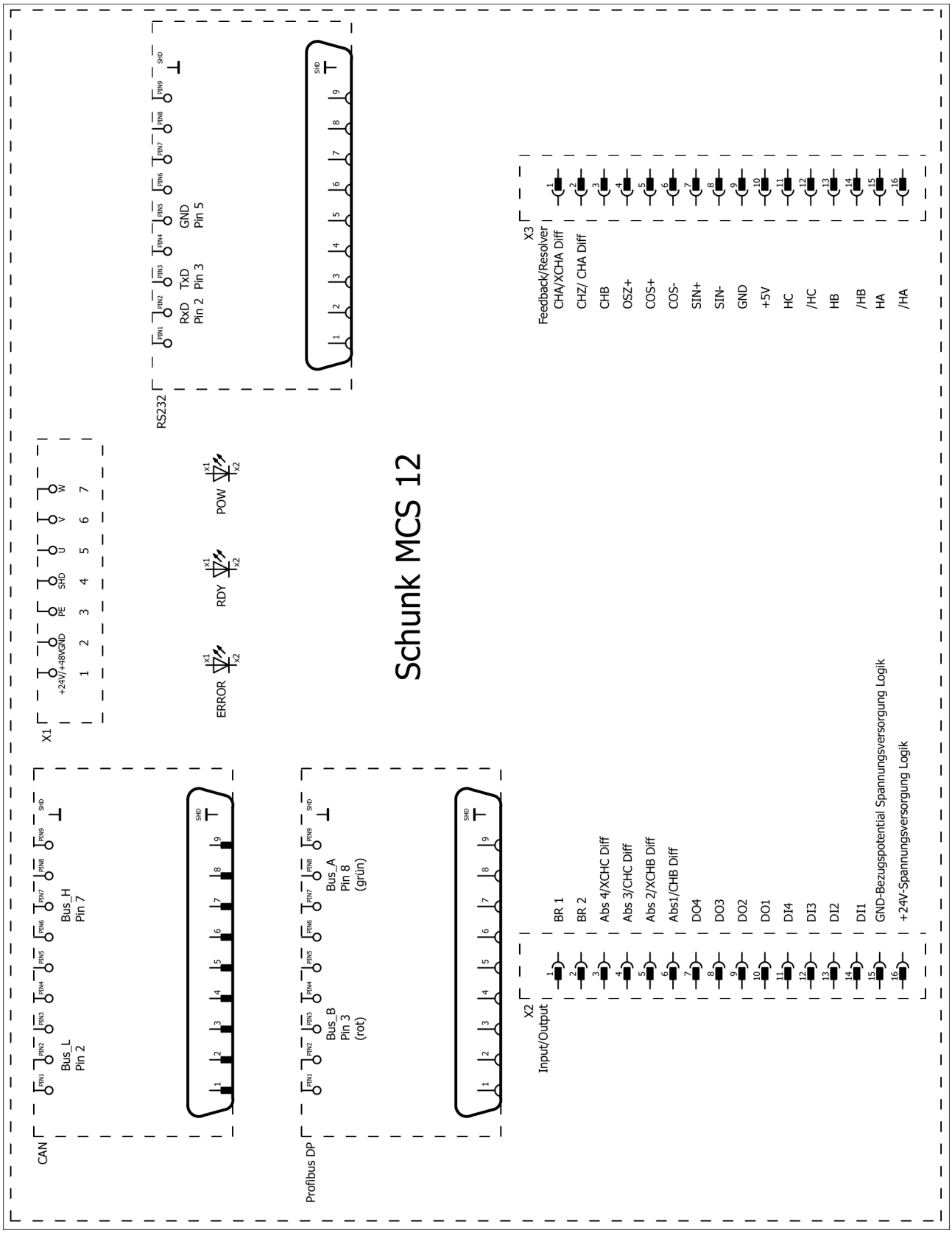
The controller is maintenance-free.

If the controller gets dirty, wipe it carefully with a soft cloth. Do not use solvents.

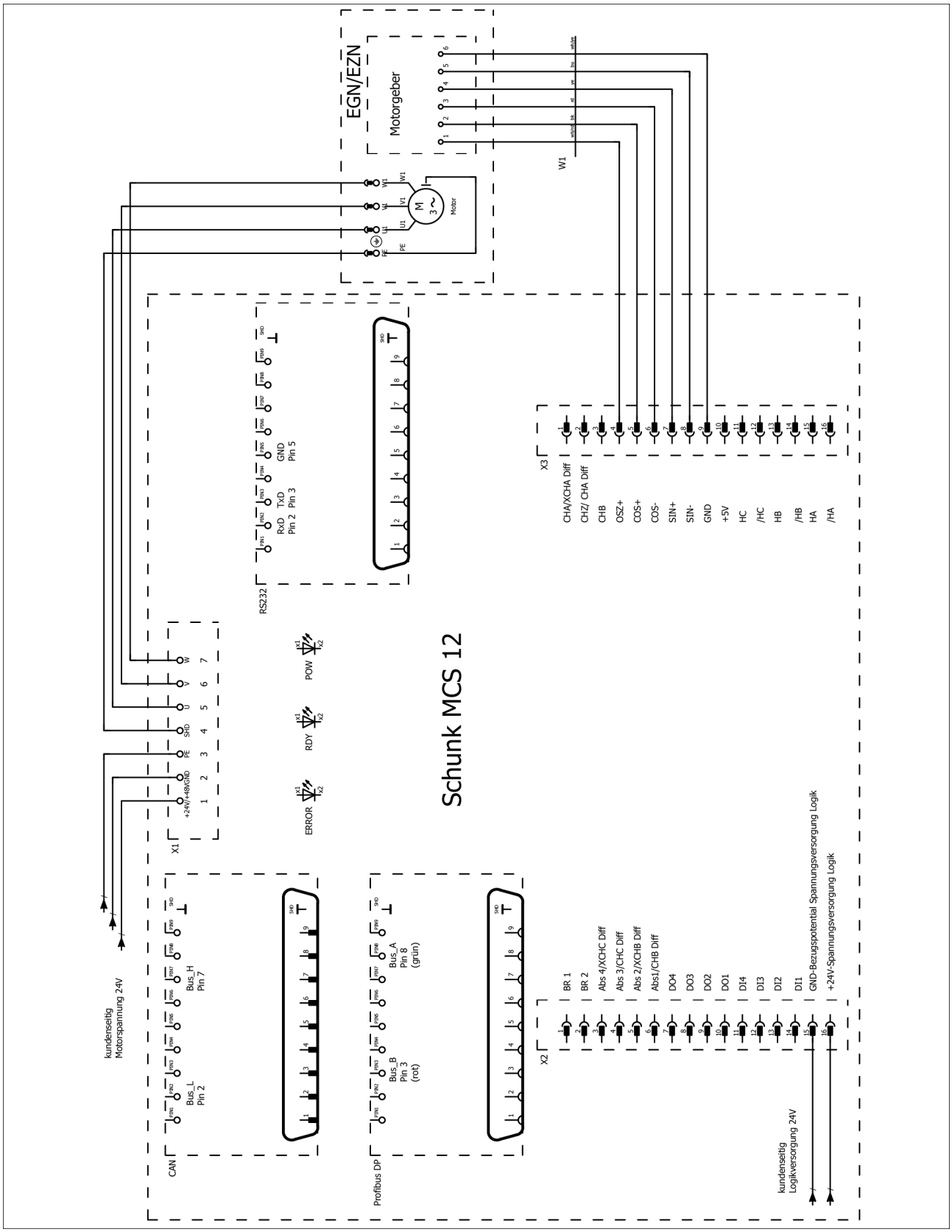
NOTE

In case of a defect, send the module to SCHUNK together with a repair order.

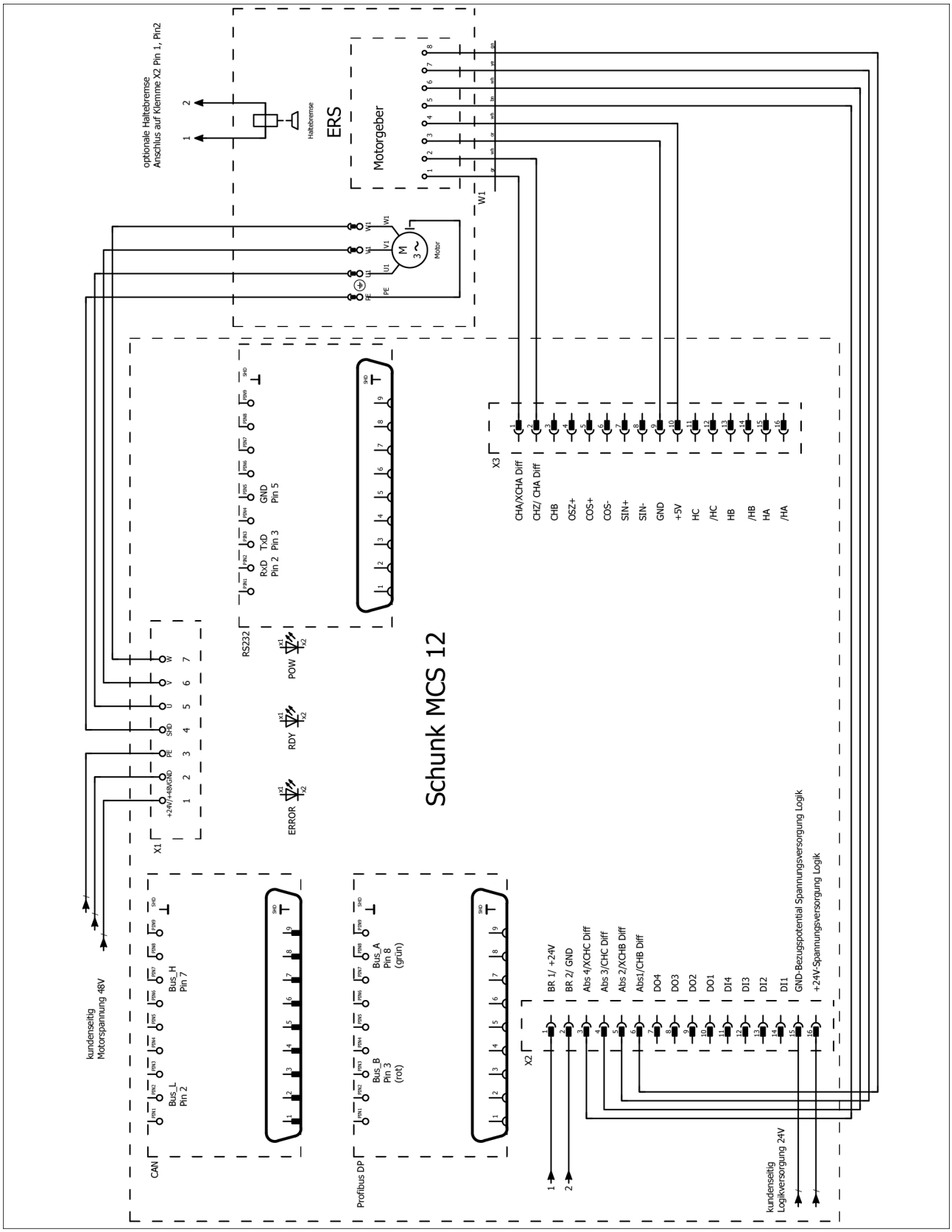
10 Appendix



MCS 12 Connection Diagram - Overview



MCS 12 Connection Diagram with EGN/EZN



MCS 12 Connection Diagram with ERS

Notes