

3-Finger Centric Gripper

EZN 64-100

Assembly and Operating Manual



Imprint:

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Technical changes:

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Dear Customer,

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

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

SCHUNK products are inspiring.

Our detailed assembly and operation manual will support you.

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

Kindest Regards,

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1 About this manual

This instruction is an integral part of the product and contains important information for a safe and proper assembly, commissioning, operation, maintenance and helps for an easier trouble shooting.

Before using the product, read and note the instruction, especially the chapter "Basic safety notes".

1.1 Warnings

The following signal words and symbols are used to highlight dangers

1.1.1 Signal words

DANGER	Dangers for persons. Non-compliance will inevitably cause irreversible injury or death.
WARNING	Dangers for persons. Non-compliance may cause irreversible injury or death.
CAUTION	Dangers for persons. Non-observance may cause minor injuries.
NOTICE	Information about avoiding material damage

1.1.2 Symbols



Warning about a danger point



Warning about hand injuries



Risk of electric shock



General mandatory sign to prevent material damage

1.2 Applicable documents

You can find the following documents on our homepage:

Document	Purpose
Catalog	Technical data or application parameters of the module and information on accessories. The last version is always valid.
Software Manual (Motion-Control.pdf)	More detailed information about the parameters and special features of the individual bus systems.
General terms of business	Including notes on the warranty.

Table 1

1.3 Terms used in this manual

Term	Meaning
Cycle	A cycle includes the following movement: ➔ to open and close the gripper once

Table 2

2 Basic safety notes

2.1 Intended use

The module was designed to grip and to temporarily and reliable hold workpieces or objects.

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

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

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

2.2 Not intended use

It is not an intended use if the module is used, for example, as a pressing tool, stamping tool, lifting gear, guide for tools, cutting tool, clamping device or a drilling tool.

2.3 Environmental and operating conditions

- ➔ The module may be used only in the context of its defined application parameters (see chapter 5, page 13 and catalog).
- ➔ Make sure that the module and the top jaws are a sufficient size for the application.
- ➔ Make sure that the environment is clean and the ambient temperature corresponds to the specifications per the catalog. Maintenance and lubrication intervals.
(see chapter 9.1, page 43)
- ➔ Make sure that the environment is free from splash water and vapors as well as from abrasion or processing dust. Excepted are modules that are designed specially for contaminated environments.

2.4 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.

2.4.1 Condition of the inputs/ outputs (I/O)

During the run-up of the module, and due to the peculiarities of the used processor, not defined I/O conditions may occur.

➔ Do not allow a direct connection with actuators.

2.4.2 Protective equipment

➔ Provide protective equipment per EC Machinery Directive.

2.4.3 Constructional changes, attachments or modifications

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

2.4.4 Special standards

The following harmonized standards were adhered to:

- Fast transient events on supply lines and I/O lines (burst) according to IEC/ EN 61000-4-4
- HF power input according to IEC/EN 61000-4-6
- HF irradiation according to IEC/ EN 61000-4-3
- Interference field strength in the 3m absorber chamber according to German version EN 55011:2007 +A2 class A (corresponds to EN 61000-6-4:2007)

2.5 Personnel qualification

The assembly, initial commissioning, maintenance, and repair of the module may be performed only by trained specialist personnel.

The assembly, initial commissioning, maintenance, and repair of the module may be performed only by trained specialist personnel.

Every person called upon by the operator to work on the module must have read and understood the complete Assembly and Operating Manual, especially chapter 2 "Basic safety notes". This applies particularly to occasional personnel such as maintenance personnel.

2.6 Using personal protective equipment

When using this product, observe the relevant industrial safety regulations and use the personal protective equipment (PPE) required!

- Use protective gloves, safety shoes and safety goggles.
- Observe safe distances.
- Minimal safety requirements for the use of equipment.

2.7 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.

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.

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 and lubrication intervals (see chapter 9.1, page 43)
- Observation of the ambient conditions and operating conditions (see chapter 2.3, page 8)

Parts touching the work piece are not part of the warranty. Also observe our general terms of business.

4 Scope of delivery

The scope of delivery includes:

- 3-Finger Centric Gripper ECN in the version ordered
- enclosed pack inclusive centering sleeves

The following accessories are required for the module:

- Controller (e.g. SCHUNK MCS 12)
- USB to RS232 converter inclusive driver CD

➔ Order accessories separately.

➔ For additional accessories, see catalog.

5 Technical Data

5.1 Basic data

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

Type	64	100
Mechanical operating data		
weight [kg]	0,98	2,30
noise level [dB(A)]	≤ 70	≤ 70
IP rating	41	41
ambient temperature [°C]		
min.	+5	+5
max.	+55	+55
stroke per finger [mm]	6	10
min. adjustable gripping force [N]	140	300
max. gripping force [N]	500	800
max. speed [mm/s]	80	80
max. acceleration a [mm/s ²]	3000	3000
max. finger length [mm]	80	125
max. mass per finger [kg]	0,35	1,10
workpiece weight [kg] (recommendation for $\mu=0.1$ and $v=2$)	2,5	4,0
positioning accuracy [mm] (coming from the same direction)	±0,05	±0,05
repeat accuracy [mm] in power mode (Scattering of the end positions after 100 consecutive strokes)	±0,01	±0,01
Electrical operating data		
rated voltage [V DC]	24	24
nominal power current [A]	1,4	2,2
max. current [A]	4,0	4,0

Tab. 3

5.2 Technical Data for the integrated motor

Designation	Constants	Value
terminal voltage [V]	U_{KL}	24
nominal torque [Nm]	M_n	0,41
nominal power current [A]	I_n	see Tab. 3
peak current [A]	I_{eff}	see Tab. 3
torque constants [Nm/A]	K	0,069
nominal speed [U/min]	U_n	1700
max. speed [rpm]	U_{max}	2200
max. frequency [Hz]	F_{max}	256,7
power loss at M_n [W]	P_v	9
motor constants [N/w]	K_m	0,1
link voltage [V]	U_{zk}	24
counter voltage constants (Phase-Phase) [V]	EMF	0,00642 bei 1 U/min
resistance (Phase-Phase) [Ω]	$R_{\pi 20}$	1,5
inductance (Phase-Phase) [mH]	L_{π}	1,4
time constants [ms]	τ_{ξ}	0,93
number of pairs of poles	N	7

Tab. 4

Usefull formula

Finger stroke = $\tan(40^\circ) \times \text{motor angle[rad]}/\Phi$

Technical recommendation

Type EZN	64	100
I [A]	1,4	2,2
gripping force [N]	500	800
max. v [mm stroke/sec.]	80	80
max. a [mm stroke/sec.]	3000	3000

Tab. 5

To observe!

- ➔ The tolerance of M, I, n can be as high as $\pm 20\%$.
- ➔ All temperatures correspond to insulation class F.
- ➔ M_{max} is limited by the maximum current.

5.3 Technical Data of integrated resolver

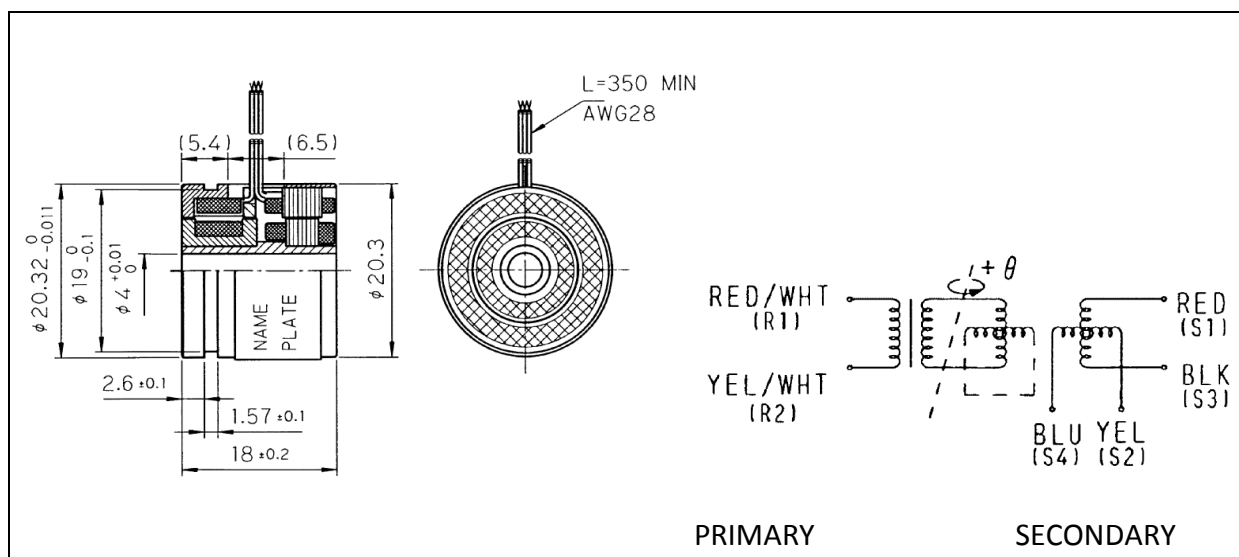


Fig. 1 dimension of resolver and schematic diagram

characteristic	specification	comment
Function	1X – BRX	
Primary	rotor	
transmission ratio	0,5 ± 5%	
zero voltage	20 mV max.	
input impedance Z_{RO}	140 Ω ± 20%	
output impedance Z_{SS}	120 Ω ± 20%	
dielectric strength	AC 500 Vms 1 Min.	60Hz
Insulation resistance	100 m Ω min.	DC 500V
weight	0,03 kg nom.	
operating temperature	-50°C ~ +155°C	

Tab. 6 technical data of the resolver

Note

1. Dimension in mm
2. Mass without tolerances ± 0.4 mm
3. Output equation

$$ES1-S3 = KER1-R2 \cos \Theta$$

$$ES2-S4 = KER1-R2 \sin \Theta$$

+ Θ : Rotor turns CCW from the attachment side

6 Description of the module

6.1 Structure

The gripper base jaws are designed so that many different types of fingers for centric grippers can be mounted. The gripper is provided with power via a controller.

➔ For optimum use of your SCHUNK gripper, the SCHUNK controller MCS 12 is recommended.

6.2 Functional principle

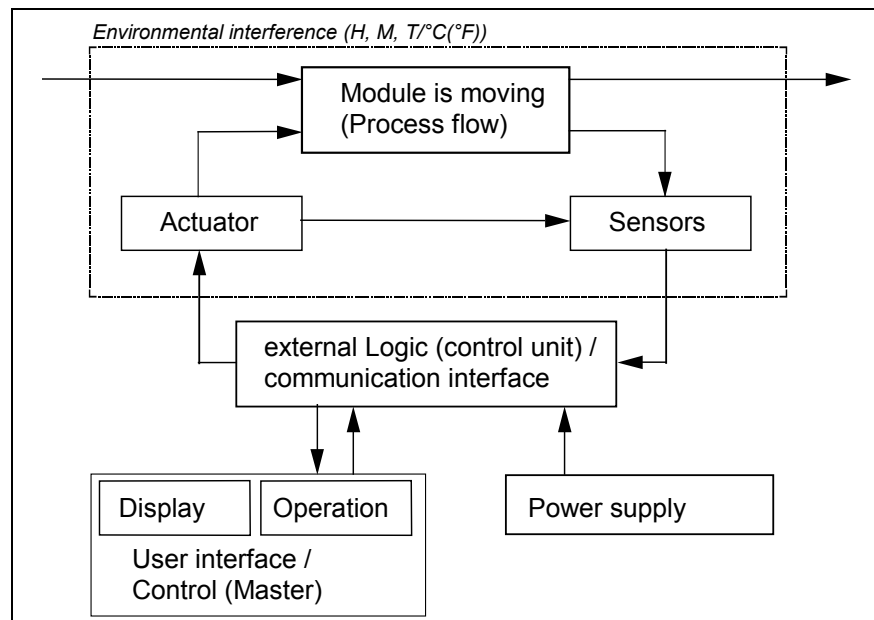


Fig. 2

7 Assembly and commissioning

7.1 Mechanical Connection

	 WARNING
	Risk of injury when the machine/system moves unexpectedly! Switch off energy supply.

Check the evenness of the bolting surface

The values relate to the entire bolting surface.

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

Tab. 7 Requirements for levelness of the bolting surface

- ✓ The installation position of the module has been designed so that cable wrapping is not possible.
- ➔ Use suitable connecting elements to connect the module in the machine / system.
- ➔ Observe the permissible length of engagement.

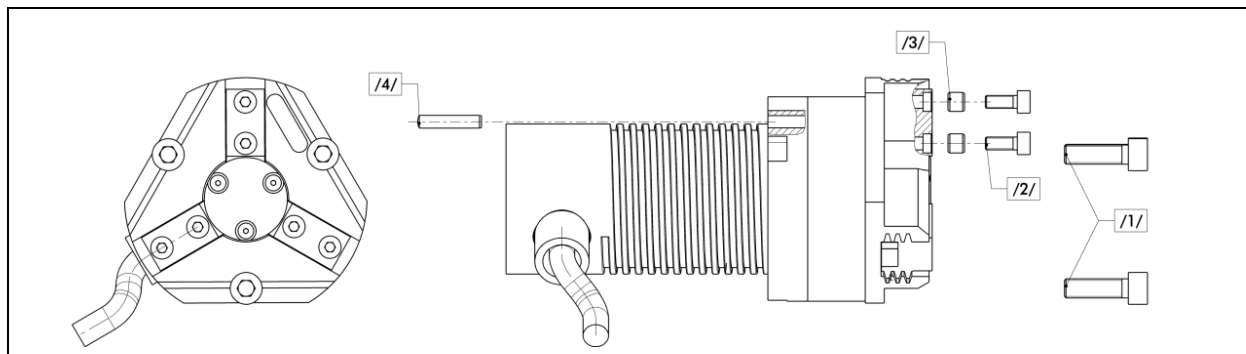


Fig. 3 Assembly options

Item	Designation	EZN 64	EZN 100
/1/	Screws for gripper mounting	M5 / 15 deep	M6 / 14 deep
/2/	Screws for finger mounting	M5 / 10 deep	M6 / 13 deep
/3/	Centering sleeves for finger mounting	M4	M5
/4/	Centering sleeves for gripper mounting	Ø 8	Ø 10

Tab. 8

7.2 Electrical Connection

Note

The cable color throughout this chapter relates to the use of a SCHUNK connecting cable.

7.2.1 EMV-fitting

	 WARNING
	Risk of injury when the machine/system moves unexpectedly!! Switch off energy supply

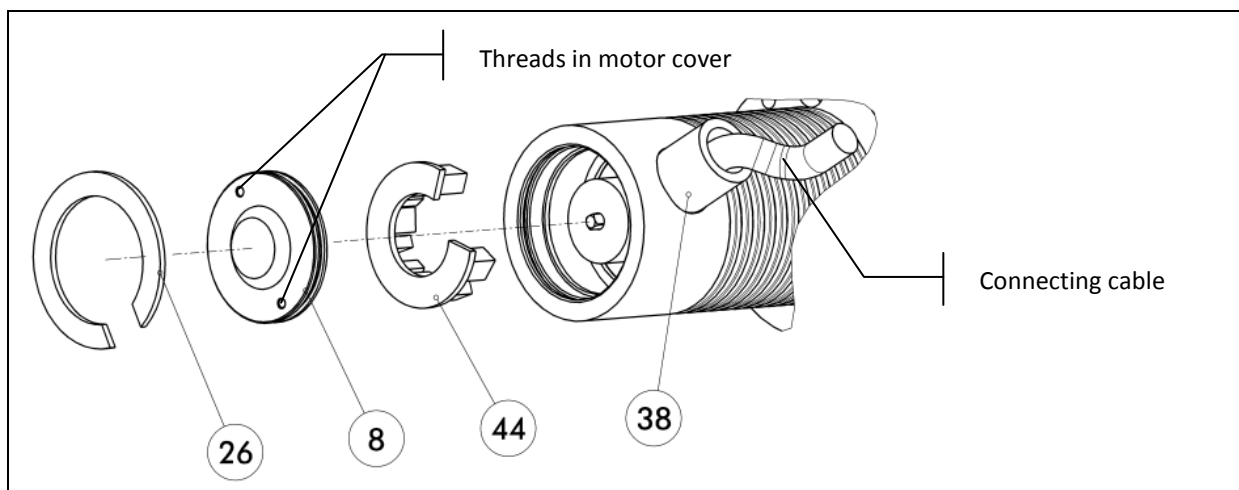


Fig. 4 Motor housing of gripper - removing the connection board (44)

Note

If the cable has to be replaced, we recommend sending the gripper to SCHUNK.

	NOTICE
	Damage to board is possible! Connection cables have to be exchanged by qualified personnel, only.

replace the connection cable

✓ The module is delivered with a connected cable.

(For Item see Fig. 4, page 19)

1. Remove the safety ring (26).
2. Turn in two screws (M2.5) into the thread of the motor cover and remove the motor cover (8) out of the module's housing.
3. Draw out the board (44) of the module's housing and remove the connection cable.

EMC fitting

4. The connection cable and the individual strands have to be dismantled correspondingly.

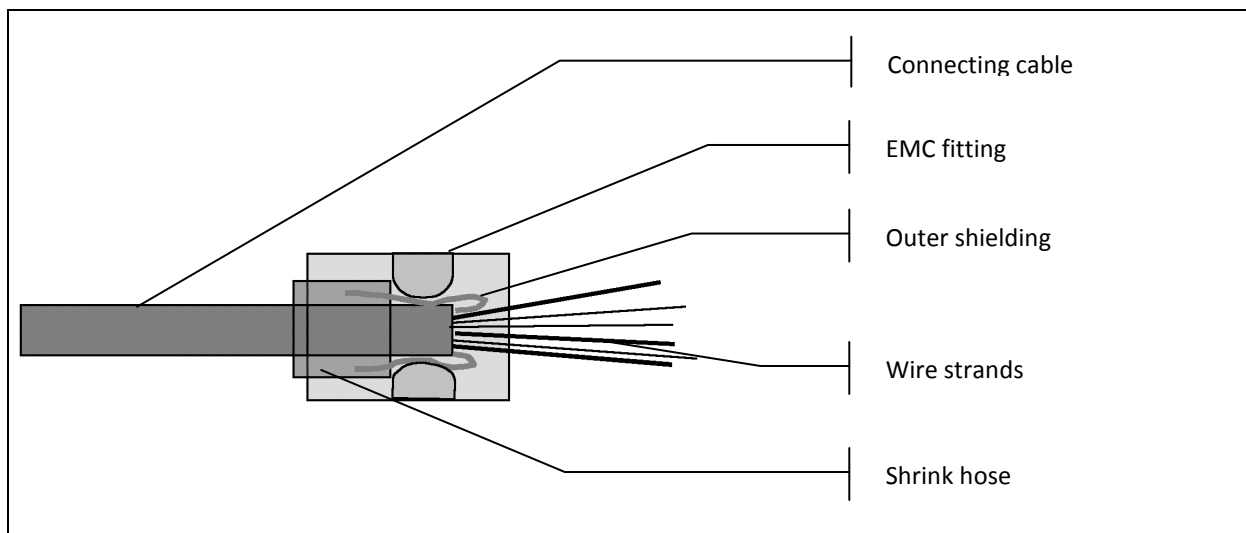


Fig. 5 EMC fitting

5. Turn back the outer shielding via the coating of the connection cable and fix it with the heat shrinkable tubing.

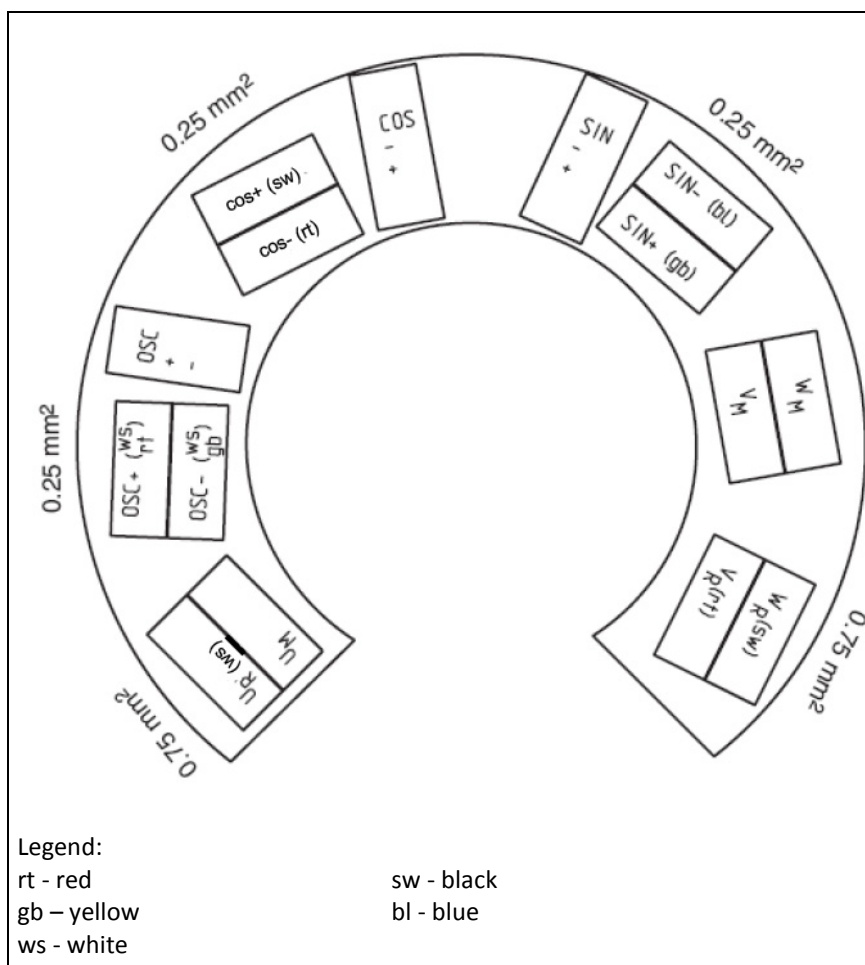


Fig. 6 Layout of connection board

6. Join the connection cable with the circuit board.
7. Assemble the motor housing in reverse order again.

7.3 Electrical connection of the module to the MCS 12 controller

7.3.1 Scope of delivery of the MCS 12 controller

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

The scope of delivery includes:

- MCS 12 controller
- USB to RS232 converter inclusive driver CD
- DVD

Content of DVD:

- Motion Tool Schunk (MTS is a configuration and commissioning tool)
- Operating manual in PDF format
- MotionControl software manual in PDF format

7.3.2 Technical Data of the MCS 12 controller

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

Tab. 9

7.3.3 Design and description of the MCS 12 controller

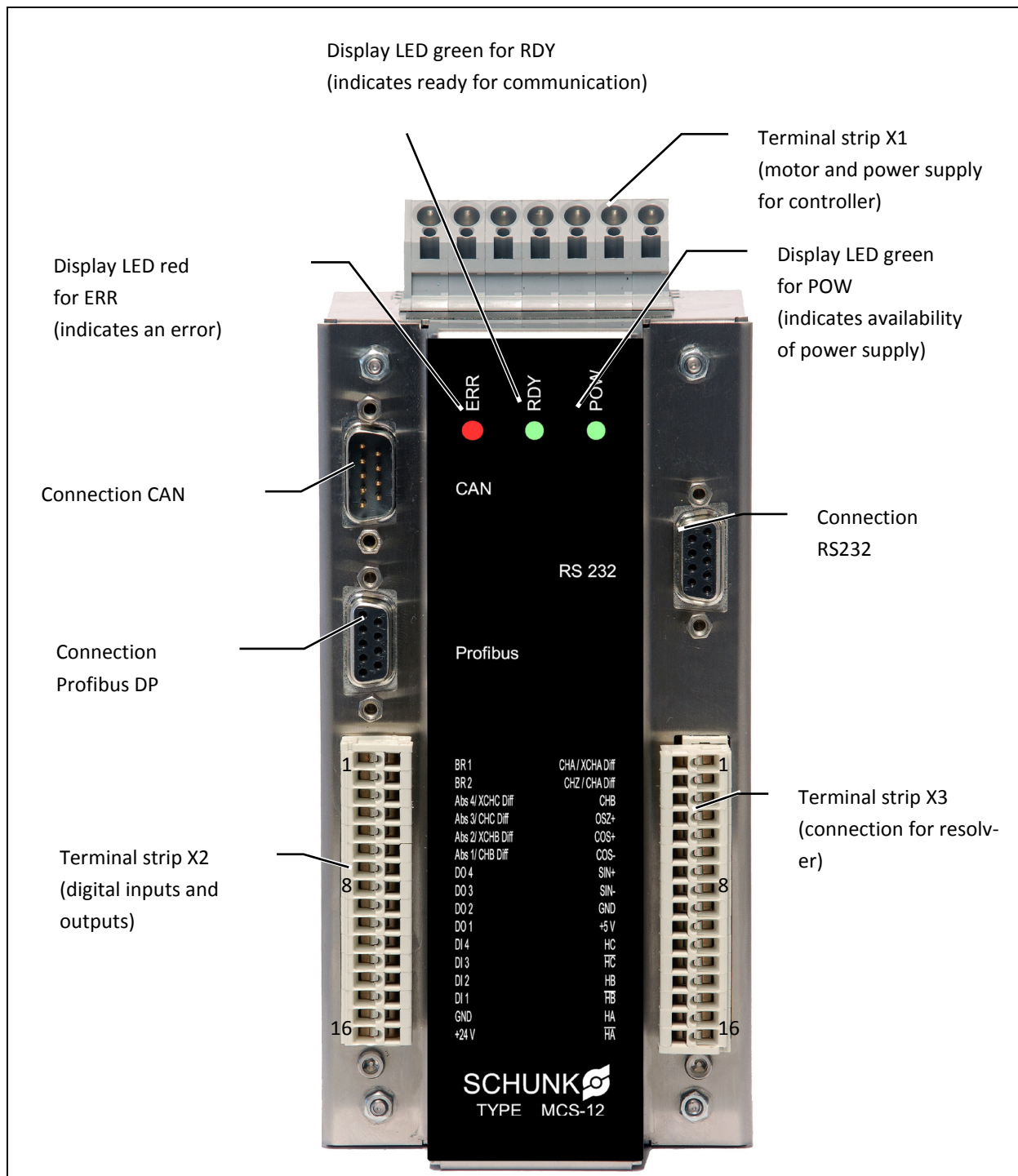


Fig. 7 Design of the MCS 12 controller

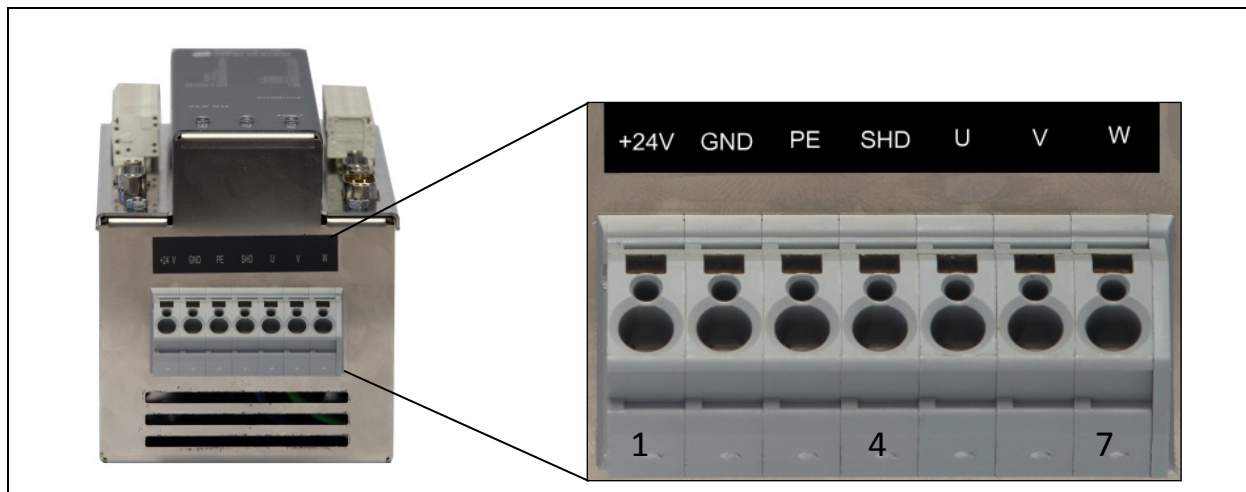


Fig. 8 Position of X1 terminal strip (motor and power supply for controller)

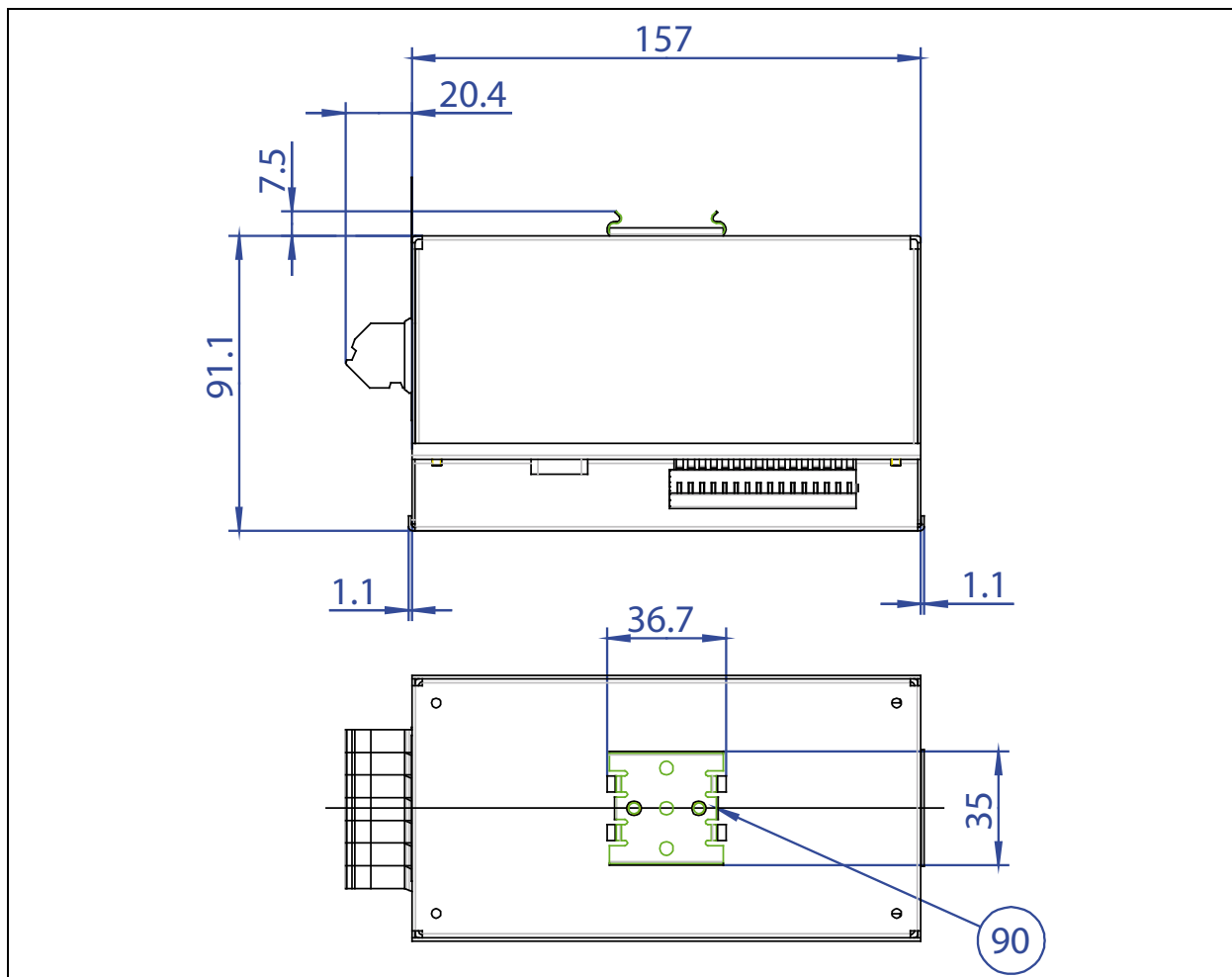


Fig. 9 dimension and mounting the MCS 12 controller

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

DEFAULT function

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

Note

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

Perform the following steps:

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

The unit is now reset to the factory setting:

DEFAULT values

- Module address = 12
- Communication = RS232
- Data rate = 9.600 Baud

BOOT function

The firmware of the controller MCS12 is updated with the BOOT function.

Note

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

	NOTICE
	Gripper does not work anymore, if not all steps are carried out completely! Do not stop process

Perform the following steps:

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

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

7.3.4 Procedure and requirements

	! WARNING
	Danger of electric shock due to faulty connection! ➔ Observe the pin assignment of the connecting terminals. ➔ Make sure that all components are grounded correctly

Requirement for the power supply

Output power supply (MCS 12)	24 V DC $\pm$ 10%
Power supply for logic	24 V DC + 10% / - 4%; residual ripple below 150 mVSS; switching peaks below 240 mVSS
Connection value	Number of modules x rated module current x 1.2

Tab. 10

7.3.5 Assignment of the terminal strips of the MCS 12 controller

Terminal strip X1

Terminal strip X1 is for connecting the motor phases and the power supply of the controller's power component.
(for the position of the terminal strips, see Fig. 7, page 23)

Terminal	Designation	Cable color	
1	+ 24V	Customer's connection cable	Connection of the output power supply for the MCS 12 controller.
2	GND		
3	PE		
4	SHD	shielding (all)	Connection of the gripper motor phases to terminal strip X1 of the controller.
5	U	black	
6	V	red	
7	W	white	

Tab. 11

Terminal strips X2 and X3

Terminal strips X2 and X3 are for connecting sensor signals and logic voltage. The following terminals are required to connect the module:

(For the position of the terminal strips, see Fig. 6, page 21)

Terminal	Designation	Wire color	Meaning
15	GND	customer - specific	Reference potential for logic power supply
16	+24V	customer - specific	Logic power supply

Tab. 12: Pin assignment of terminal strip X2 - pins required to connect the logic

Assignment of the digital in- and outputs

Terminal	Description	Application: Program	Application: Normal
14	DI1	Release / External reference switch (as of Firmware 1.20)	Digital input (IN0)
13	DI2	Sentence selection	Digital input (IN1)
12	DI3	Sentence selection	Digital input (IN2)
11	DI4	Sentence selection	Digital input (IN3)
10	DO1	Reference (low active)	Digital output (OUT0)
9	DO2	Error message (low active)	Digital output (OUT1)
8	DO3	Depending on the configuration (low active) -see Tab. 14	Digital output (OUT2)
7	DO4	Movement finished (low active)	Digital output (OUT3)

Tab. 13 In- and outputs terminal strip X2

Set-up	Description
Normal	Digital output via CMD_DIO switchable
Status + movement	OUT2 reports, if the module is moving.
Status + position achieved	OUT2 reports, if the module achieved a position.
Status + brake	OUT2 reports the condition of the brake.
Status + warning	OUT2 reports if a warning is pending.
Status + program run	OUT2 indicates, if the module is situated in a program run.

Tab. 14 Switching possibilities of the output DO3 via Motion Tool Schunk (MTS) (as of Firmware V1.22)

Please note

Further information and various possibilities of use of the in- and outputs are contained in the configuration tool "MTS" (see DVD, document: MotionControl.pdf)

The digital input IN0 cannot be used as an external reference switch, while the gripper is in a program mode! The digital input IN0 can only be used in the setting "normal", when the reference is set to "external switch IN0".

Terminal	Designation	Wire color (*)	Meaning
4	OSZ+	white / red	+ Ref
5	COS+	black	+Cos
6	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			

Tab. 15: Pin assignment of terminal strip X3 - pins required to connect the resolver

7.3.6 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.

RS232 connection

The connection is established via a 9-pin SUB-D connector from the control system (PC / SPC) to the controller (MCS 12) (for the position of the connector, see Fig. 7, page 23)

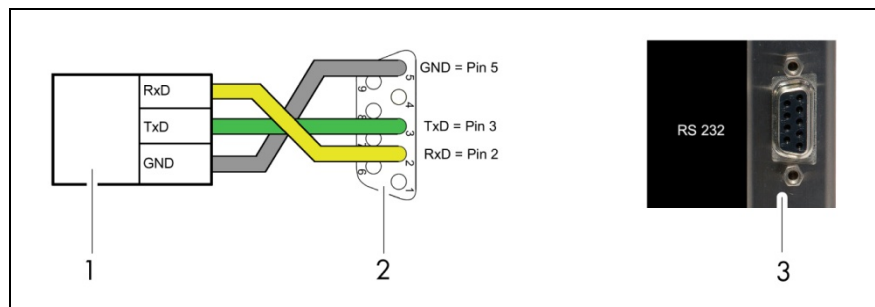


Fig. 10 Connector assignment for RS232 connection to MCS 12

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

Tab. 16

CAN connection

The connection is established via a 9-pin SUB-D socket from the control system (master) to the controller (MCS 12) (for the position of the connector, see Fig. 7, page 23)

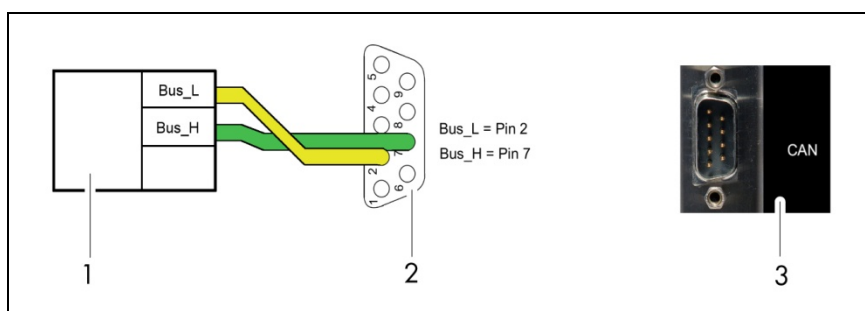


Fig. 11 Connector assignment for CAN connection to MCS 12

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

Tab. 17

Profibus DP connection

The connection is established via a 9-pin Profibus connector from the control system (master) to the controller (MCS 12) (for the position of the connector, see Fig. 8 page 23).

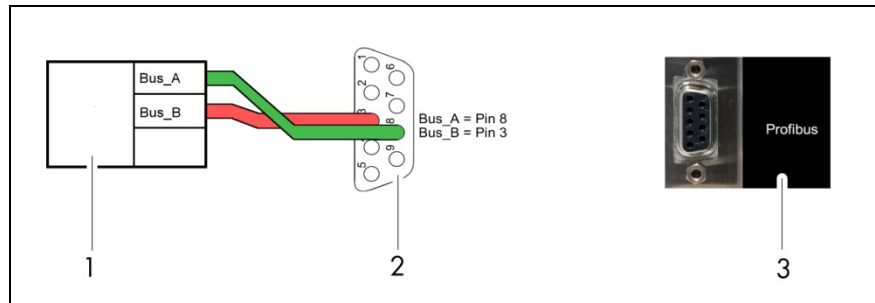


Fig. 12 Connector assignment for Profibus DP connection to MCS 12

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

Tab. 18

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.

The digital inputs and outputs are connected to the terminal strip X2 (Position of the terminal strip X2 see Fig. 8 page 23).

Please note

Further information and various possibilities of use of the in- and outputs are contained in the configuration tool MTS (see DVD, document: MotionControl.pdf)

7.4 Start up and system integration with the SCHUNK Controller MCS 12

7.4.1 System structure

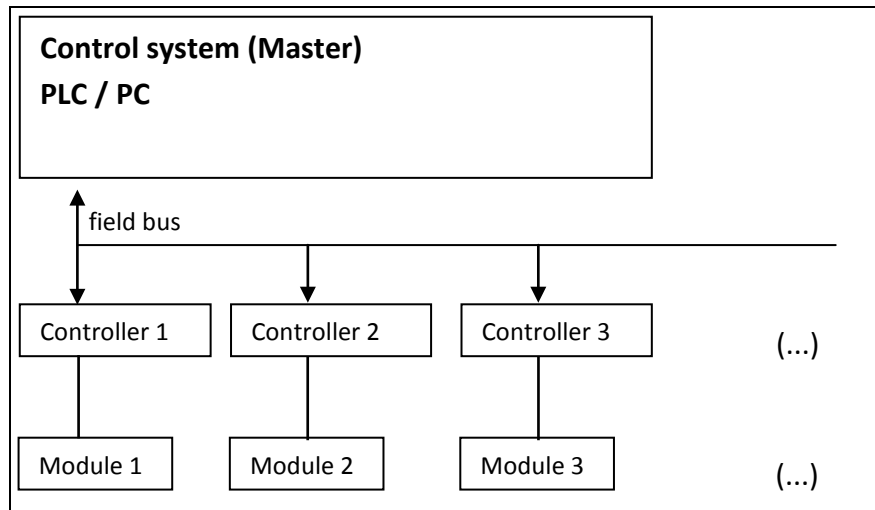


Fig. 13

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 (see DVD, Document: MotionControl.pdf).

7.4.2 SCHUNK Motion protocol

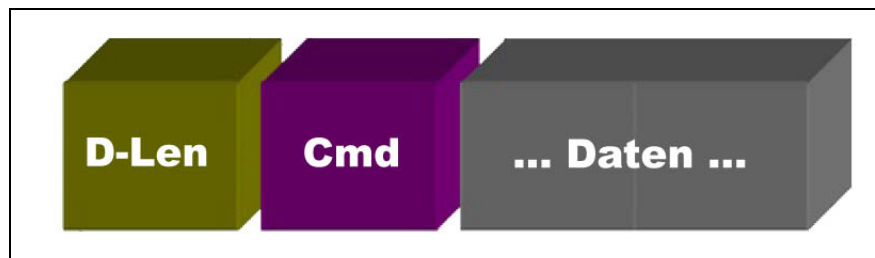


Fig. 14

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 (see DVD, Document: MotionControl.pdf).

7.4.3 Important commands

	 WARNING
	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 ⇌ Slave): None.

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

Miscellaneous: Spontaneous response possible.

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

Tab. 19 Example for REFERENCE

Positioning

Command Code: 0xB0

Description: Moves the module to a specified position.

Parameters (Master ⇌ Slave):

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

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

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

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

Tab. 20 Example for MOVE POS

Current move**Command Code:** 0xB3**Description:** A current move is executed.**Parameters** (Master $\Rightarrow$ Slave):

Current in configured unit system (must be specified).

Response (Slave $\Rightarrow$ Master): "OK" (0x4F4B) if successful. The module executes the command.**Miscellaneous:** Spontaneous message is possible.

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

Tab. 21 Example for MOVE CUR

Velocity move**Command Code:** 0xB5**Description:** A velocity move is executed.**Parameters** (Master $\Rightarrow$ Slave):

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

Response (Slave $\Rightarrow$ 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 $\Rightarrow$ S	0x05	0xB5	0x9A 0x99 0x31 0x41	Execute velocity move with 11.1[mm/s]
S $\Rightarrow$ M	0x05	0xB5	0x4F 0x4B	

Tab. 22 Example for MOVE VEL

Stop module

Command Code: 0x91

Description: The module is decelerating and stopped in the current position.

Parameters (Master $\Rightarrow$ Slave): None.

Response (Slave $\Rightarrow$ Master): "OK" (0x4F4B) if successful.

Miscellaneous: Spontaneous message is possible.

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

Tab. 23 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 $\Rightarrow$ Slave): None.

Response (Slave $\Rightarrow$ Master): Error message "ERROR EMERGENCY STOP" is triggered.

Miscellaneous: Can only be reset by "CMD ACK".

	D-Len	Cmd	Param	Meaning
M $\Rightarrow$ S	0x01	0x90		
S $\Rightarrow$ M	0x03	0x88	0xD9	Emergency stop executed

Tab. 24 Example for CMD EMERGENCY STOP

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

*Tab. 25 Example for CMD ACK***Note**

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

8 Troubleshooting

8.1 Troubleshooting for the gripper

8.1.1 Module does not move / Modul does not respond

Possible cause	Corrective action
Spindle / nut defective (overload)	➔ Open the rear cover of the gripper (cable connection) and attempt to move the gripper. If the shaft moves, but the jaws do not move, then the spindle is damaged. The gripper can only be repaired at the factory! The gripper must be sent to SCHUNK with a repair order.
Motor is connected incorrectly	➔ Check the connection of motor at controller.

Tab. 268

8.1.2 The gripping force drops

Possible cause	Corrective action
Accumulations of dirt	➔ Clean the gripper.

Tab. 27

8.1.3 The Gripper does not execute the full stroke

Possible cause	Corrective action
Dirt deposits between the base jaws and the guide	➔ Clean the gripper and re-lubricate, if necessary (see chapter 9.3, page 45)

Tab. 28

8.1.4 The gripper opens and closed abruptly

Possible cause	Corrective action
Accumulations of dirt	➔ Clean the gripper

Tab. 29

8.1.5 Motor turns but module does not move

Possible causes	Remedial measures
Fingers are mechanically jammed	➔ Check the levelness of the bolting surface. (see chapter 7.1 page 19) ➔ Check whether the adapter plate is displaced (only in case of side mounting).

Tab. 30

8.1.6 The module's motor is not turning

Possible cause	Corrective action
Defective motor lines	Check the armature resistance: – Motor lines to each other: ca. 2,2Ω – Resolver lines: - red/white to yellow/white: 24-28Ω - yellow to blue: 56-68Ω - black to red: 56-68Ω

Tab. 31

8.2 Troubleshooting for the SCHUNK controller MCS 12

8.2.1 No LED lights up on the controller

Possible cause	Corrective action
There is no voltage.	→ Check the power supply and the logic power supply on the controller. → Observe the values of the Tab. 10 on page 26.
Master (control system) on the field bus is not active.	→ Check the master, activate field bus communication.

Tab. 32

8.2.2 "POW" LED (green) does not light up

Possible cause	Corrective action
There is no voltage.	→ Check the power supply on the controller. → Observe the values of the Tab. 10 on page 26.

Tab. 33

8.2.3 "RDY" LED (green) does not light up

Possible cause	Corrective action
Faulty connection	→ Check the connection (see chapter 7.3.5, page 27)
logic power supply missing	→ Check the logic power supply on the controller. → Observe the values of the Tab. 10 on page 26.

Tab. 34

8.2.4 “ERR” LED (red) is flashing or permanently on

Possible cause	Corrective action
Insufficient voltage at “POW” (undervoltage)	➔ Check the power supply on the controller. ➔ Observe the values of the the Tab. 10 on page 26.
There is an error = module indicates: CMD_ERROR	➔ To rectify the error, see the operating manual for the controller “MotionControl.pdf”

Tab. 35

8.2.5 Module stops abruptly

(This can be reported by the module using the **ERROR_CABLE_BREAK (0x76)** parameter if the GSD file supplied has been integrated.)

Possible cause	Corrective action
Malfunctions at the bus cable (connection to module was interrupted)	➔ Check bus cable for signs of damage, replace the cable if necessary. ➔ For more information about the troubleshooting see DVD, Document: MotionControl.pdf.

Tab. 36

8.2.6 Module does not move/ Module does not respond

Possible cause	Corrective action
Resolver is connected incorrectly	➔ Check the connection at the gripper and at the controller MCS 12 (see Tab. 15, page 29)
Motor is connected incorrectly	➔ Check the connection of motor at controller (see Tab. 11, page 27)

Tab. 37

9 Maintenance and care

9.1 Maintenance intervals

	 WARNING
	Risk of injury when the machine/system moves unexpectedly! Switch off energy supply.

Type	64	100
Interval [Mio. cycles]	2	2

Tab. 38

This information refers to the use of the gripper under normal operating and ambient conditions. (Observe technical Data, see chapter 5 on page 13 and catalog).

9.2 Action for keeping the gripper operable

The maintenance and lubrication intervals must be adapted to the ambient conditions and operating conditions.

The following factors must be taken into account:

- Extreme operating temperatures
- Effects of condensation and humidity
- High vibrational stress
- Use in a vacuum
- Highly dynamic operation
- Constant, small stroke movements
- Effects of foreign substances (e.g. vapors, acids, etc.)

Conservation of function for the gripper:

- Do not expose the gripper to drilling emulsions.
- The gripper may be operated only at an ambient temperature between +5°C (+40°F) and +55°C (+130°F).
- When laying the cable, the bending radius must be observed. Torsional movements are not permissible.
- Since the system is a servo system, the motor can temporarily create forces far above the nominal values. These forces can overload the gripper and destroy it mechanically. Operate the gripper only within the range of the nominal data. Any overload reduces the service life of the system!
- Gripping force:
Repeat accuracy of the gripping force is $\pm 20\%$.
The breakaway force can vary greatly from gripper to gripper!
If an automatic gripper change is to be enabled, the breakaway force has to be determined in the higher-level controller for each initialization!
For programming instructions, please refer to the manual for your controller.

9.3 Cleaning

9.3.1 Gripper

The module complies with protection class IP 41.

- ➔ Clean the module dry, remove all coarse dirt and chips from the cavities on the module.
- ➔ Check for damage and replace the module if necessary.

Notes

On request you can get the gripper incl. dust cover protection IP 64.

Any repair work on the module may only be carried out by SCHUNK.

- ➔ Call the Service-Hotline or your SCHUNK contact.
- ➔ Send the module to SCHUNK with a repair request.

9.3.2 Controller

The module complies with protection class IP 20.

- ➔ Clean the module dry, remove all coarse dirt and chips from the cavities on the module.
- ➔ Check for damage and replace the module if necessary.

9.4 Lubricants/Lubrication points (basic lubrication)

We recommend the lubricants listed. Provably equivalent lubricants can also be used.

➔ During maintenance, treat all grease areas with lubricant.

Lubrication points	Lubricant
meta sliding surface	KP2-K or CLP32-100 (Details see Tab. 40)

Tab. 39

Details	Lubrication grease	Lubrication oil
DIN	KP2-K	CLP32-100
DIN No.	51502 / 51825	51517 part 3
Note	Soap grease	ISO VG 32-100

Tab. 40

9.5 Dismantling the module

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

10 Translation of the original EC declaration of incorporation

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

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

We hereby declare that the following product:

Product designation: 3-Finger Centric Gripper, Universal Gripper
Type designation: EZN 80...EZN 160
Seriennummer: 0306100...0306103

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:

Safety of machines - Basic concepts, general principles for design -- Part 1:
Basic terminology, methodology

Safety of machines - Basic concepts, general principles for design -- Part 2:
Technical principles

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. Robert Leuthner, Address: see address of the manufacturer

Location, date/signature: Lauffen, February 2013



Title of the signatory

Ralf Winkler, Business Unit Manager
R& D Mechanical Gripping Systems

