

# Assembly and Operating Manual

## PDU

### Servo Electric Drive

Firmware 1.x



## Imprint

### Copyright:

This manual is protected by copyright. The author is SCHUNK GmbH & Co. KG. All rights reserved. Any reproduction, processing, distribution (making available to third parties), translation or other usage - even excerpts - of the manual is especially prohibited and requires our written approval.

### Technical changes:

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

**Document number:** 389491

**Version:** 07.00 | 29/04/2019 | en

© SCHUNK GmbH & Co. KG

All rights reserved.

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

SCHUNK GmbH & Co. KG  
Spann- und Greiftechnik

Bahnhofstr. 106 – 134  
D-74348 Lauffen/Neckar

Tel. +49-7133-103-0

Fax +49-7133-103-2399

info@de.schunk.com

schunk.com

## Table of contents

<b>1</b>	<b>General</b> .....	<b>5</b>
1.1	About this manual .....	5
1.1.1	Presentation of Warning Labels .....	5
1.1.2	Applicable documents .....	6
1.1.3	Sizes .....	6
1.2	Warranty .....	6
1.3	Scope of delivery .....	6
1.4	Accessories .....	7
1.4.1	Connecting elements.....	7
1.4.2	Connection caps (ASK) .....	8
<b>2</b>	<b>Basic safety notes</b> .....	<b>9</b>
2.1	Intended use.....	9
2.2	Inappropriate use .....	9
2.3	Constructional changes .....	9
2.4	Spare parts .....	9
2.5	Ambient conditions and operating conditions .....	10
2.6	Personnel qualification.....	11
2.7	Personal protective equipment.....	12
2.8	Notes on safe operation .....	12
2.9	Transport .....	13
2.10	Malfunctions.....	13
2.11	Disposal .....	13
2.12	Fundamental dangers.....	13
2.12.1	Protection during handling and assembly .....	14
2.12.2	Protection during commissioning and operation .....	14
2.12.3	Protection against dangerous movements.....	15
2.12.4	Protection against electric shock.....	16
2.12.5	Protection against magnetic and electromagnetic fields .....	17
2.13	Notes on particular risks.....	18
<b>3</b>	<b>Technical data</b> .....	<b>20</b>
3.1	Basic data .....	20
3.2	Electrical operating data.....	21
3.3	Factory settings / DEFAULT Value .....	21
3.4	Special requirements for the voltage supply .....	21
<b>4</b>	<b>Design and description</b> .....	<b>22</b>
4.1	Structure.....	22
4.2	Functional principle .....	23
4.3	Connection board .....	24

<b>5</b>	<b>Assembly and installation .....</b>	<b>27</b>
5.1	Mechanical Connection .....	27
5.2	Electrical connection .....	29
5.2.1	Installing connection cap .....	30
5.2.2	RS232 interface .....	31
5.2.3	CAN interface.....	32
5.2.4	PROFIBUS DP interface .....	35
5.2.5	Electrical connection of the terminal strip X3 .....	38
5.2.6	DEFAULT and BOOT function.....	40
5.3	Connecting ground cable.....	41
5.4	Information on the compatibility of software and firmware versions .....	42
<b>6</b>	<b>Troubleshooting .....</b>	<b>43</b>
6.1	Product can no longer be referenced.....	43
6.2	Drive does not move .....	43
6.3	Drive is sluggish or jerky .....	43
6.4	Motor does not turn.....	43
6.5	Product stops abruptly .....	43
<b>7</b>	<b>Maintenance .....</b>	<b>44</b>
7.1	Maintenance intervals.....	44
7.2	Disassembly and assembling .....	44
<b>8</b>	<b>Translation of original declaration of incorporation .....</b>	<b>45</b>
<b>9</b>	<b>Annex to Declaration of Incorporation.....</b>	<b>46</b>

## 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](http://schunk.com)

### 1.1.3 Sizes

This operating manual applies to the following sizes:

- PDU - 70
- PDU - 90
- PDU - 110

## 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, [Ambient conditions and operating conditions](#) [► 10]
- Observe the specified maintenance intervals, [Maintenance](#) [► 44]

Parts touching the workpiece and wear parts are not included in the warranty.

## 1.3 Scope of delivery

The scope of delivery includes

- Servo Electric Drive PDU in the version ordered
- Centering sleeve
- SMP firmware
- DVD

Contents of DVD:

- "SCHUNK Motion Tool (MTS)" configuration and commissioning tool
- Software manual "Motion Control SCHUNK"
- Assembly and Operating Manual
- USB driver

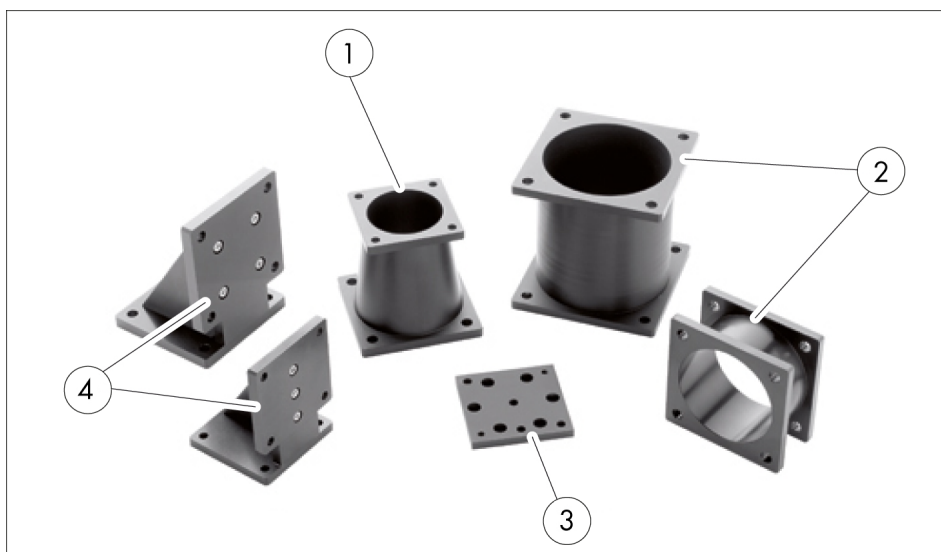
## 1.4 Accessories

The following accessories, which must be ordered separately, are required for the product:

- Connecting elements (PAM)
- Connection cable
- a wide range of connection caps

For information regarding which accessory articles can be used with the corresponding product variants, see catalog data sheet.

### 1.4.1 Connecting elements



*Connecting Elements*

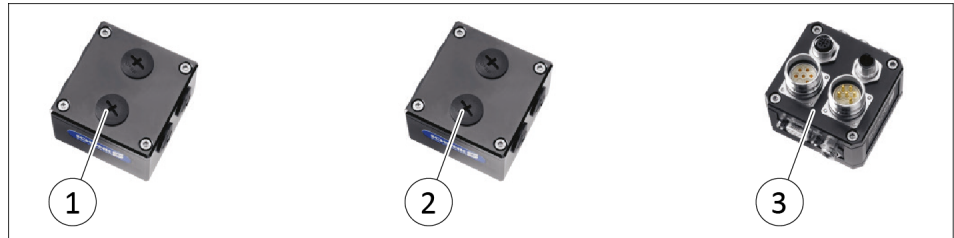
1	Conical	3	Adapter plate
2	Straight	4	Angle

Precise type designations of the suitable connecting elements, see catalog.

### 1.4.2 Connection caps (ASK)

**NOTE**

The product is delivered without the connection cap. This must be ordered separately as an accessory. A connection cap is necessary to operate the product.



*Connection caps*

Item	Designation
1	DMI
2	DMI with Bluetooth
3	MMI

Precise type designations of the connection caps, see catalog.

## 2 Basic safety notes

### 2.1 Intended use

The product is designed for installation and operation of automation components.

- The product may only be used within the scope of its technical data, [Technical data](#) [► 20].
- When implementing and operating components in safety-related parts of the control systems, the basic safety principles in accordance with DIN EN ISO 13849-2 apply. The proven safety principles in accordance with DIN EN ISO 13849-2 also apply to categories 1, 2, 3 and 4.
- The product is intended for installation in a machine/system. The applicable guidelines must be observed and complied with.
- The product is intended for industrial and industry-oriented use.
- Appropriate use of the product includes compliance with all instructions in this manual.

### 2.2 Inappropriate use

Inappropriate use includes using the product as a lifting tool or tool guide, for example.

- 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 Ambient conditions 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](#) [► 20].

## 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:

<b>Trained electrician</b>	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.
<b>Qualified personnel</b>	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.
<b>Instructed person</b>	Instructed persons were instructed by the operator about the delegated tasks and possible dangers due to improper behaviour.
<b>Service personnel of the manufacturer</b>	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 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.

## 2.10 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 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.

## 2.12 Fundamental dangers

### General

- Observe safety distances.
- Never deactivate safety devices.
- Before commissioning the product, take appropriate protective measures to secure the danger zone.
- Disconnect power sources before installation, modification, maintenance, or calibration. Ensure that no residual energy remains in the system.
- If the energy supply is connected, do not move any parts by hand.
- Do not reach into the open mechanism or 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 connected 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.

## 2.13 Notes on particular risks



### **⚠ DANGER**

#### **Danger from electric voltage!**

Touching live parts may result in death.

- Switch off the power supply before any assembly, adjustment or maintenance work and secure against being switched on again.
- Only qualified electricians may perform electrical installations.
- Check if de-energized, ground it and hot-wire.
- Cover live parts.



### **⚠ DANGER**

#### **Risk of fatal injury from suspended loads!**

Falling loads can cause serious injuries and even death.

- Stand clear of suspended loads and do not step within their swiveling range.
- Never move loads without supervision.
- Do not leave suspended loads unattended.
- Wear suitable protective equipment.



### **⚠ WARNING**

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

Falling and ejected objects during operation can lead to serious injury or death.

- Take appropriate protective measures to secure the danger zone.



### **⚠ WARNING**

#### **Risk of injury due to unexpected movements!**

If the power supply is switched on or residual energy remains in the system, components can move unexpectedly and cause serious injuries.

- Before starting any work on the product: Switch off the power supply and secure against restarting.
- Make sure, that no residual energy remains in the system.

**⚠ WARNING****Risk of injury from sharp edges and corners!**

Sharp edges and corners can cause cuts.

- Use suitable protective equipment.

**⚠ WARNING****Risk of burns through contact with hot surfaces!**

The product can heat up considerably during operation. Touching hot surfaces can cause burns.

- Do not touch hot surfaces.
- Let them cool down before working on the product.
- Wear appropriate safety equipment.

**⚠ WARNING****Risk of injury from objects falling during energy supply failure!**

Electronic devices are not fail-safe. In case of an energy supply failure, the gripping force decreases. As a consequence, it cannot be guaranteed that the workpiece is held safely.

- In case of an energy supply failure, it is the user's responsibility to revert the drive into a safe state.

### 3 Technical data

#### 3.1 Basic data

Designation	PDU		
	70	90	110
<b>Mechanical operating data</b>			
Weight [kg]	1.6	3.1	5.5
Noise emission [dB(A)]	≤ 70		
IP rating* (for use of the DMI connection cap)	54		
Ambient temperature [°C]			
Min.	+ 5		
Max.	+ 55		
<b>Electronic control unit (logic)</b>			
Nominal voltage [VDC]	24 V DC +10%/-4%; Ripple <150 mV <sub>SS</sub> ; Spikes <240 mV <sub>SS</sub>		
Nominal power current [A]	Number of modules x rated module current x 1.2		
<b>Internal motor operating data</b>			
Note: for configuration and programming of the module, ensure that the internal motor current is used for force and torque limitation.			
Nominal current for rated torque [A]	4.4	10	10
Max. current [A]	12.4	20	20
<b>Interface</b>			
RS 232	X	X	X
CAN bus [up to 1 MBit/s]	X	X	X
PROFIBUS [1.5 MBit/s]	X	X	X
Note: applies in combination with the DMI connection cap. When using a different connection cap, interfaces in accordance with the respective connection cap are available.			
<b>Holding brake</b>			
Operation principle	magnetic, low active		
Actuation	automatic, parameterizable		

\* For use in dirty ambient conditions (e.g. sprayed water, vapors, abrasion or processing dust) SCHUNK offers corresponding product options as standard. SCHUNK also offers customized solutions for special applications in dirty ambient conditions.

More technical data is included in the catalog data sheet. Whichever is the latest version.

### 3.2 Electrical operating data

#### NOTE

The electrical operating data relates to the inlet power that is tapped by the power supply unit.

Designation	PDU		
	70	90	110
<b>Power connection</b>			
Nominal voltage [VDC]	24	24	24
Nominal power current [A]	4	4	4
Max. current [A]	12.4	20	20

### 3.3 Factory settings / DEFAULT Value

Reference	DEFAULT Value
Interface	RS232
Data rate	9600
Module address	15

### 3.4 Special requirements for the voltage supply

#### NOTE

If the product is operated during a position run at high speed, acceleration and jerk values, then voltage peaks in the power supply may occur when delaying/braking due to the engine recovering. The terminal voltage of the power supply can increase via the output voltage of the power supply unit.

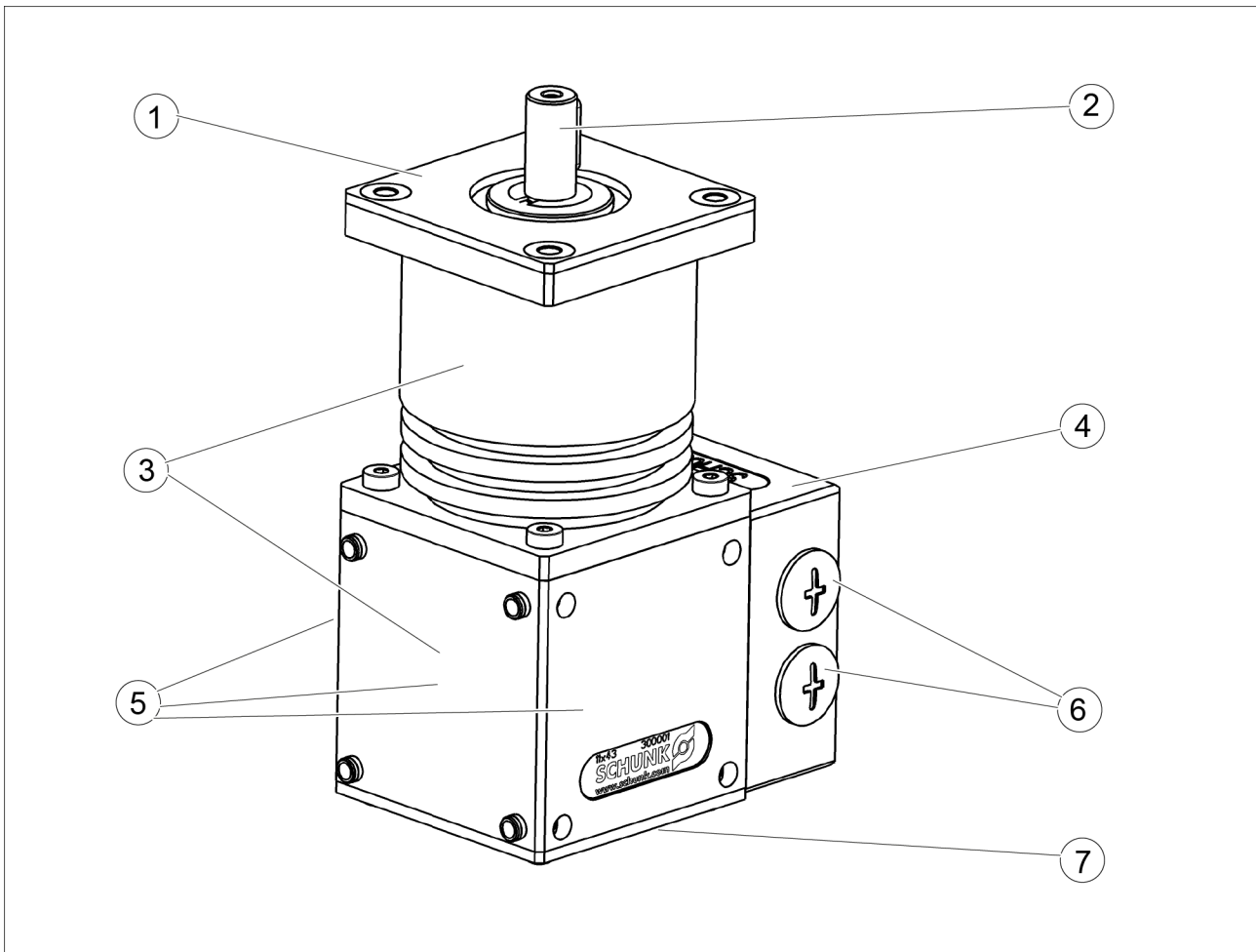
The power supply unit used for the power needs to be able to handle this overvoltage and must not switch off its output voltage. Otherwise, the product, for example, will stop with the error message "ERROR\_Motor\_Voltage\_LOW!" or "ERROR\_Motor\_Voltage\_High" which must be acknowledged.

Supply of the logic and power are to be separate. For this reason, it is recommended that the product be connected in the following way:

- Connection of the logic supply of the product to a 24V power supply unit.
- Connection of the power supply of the product to a transformer power supply unit or to a switching power supply unit.

## 4 Design and description

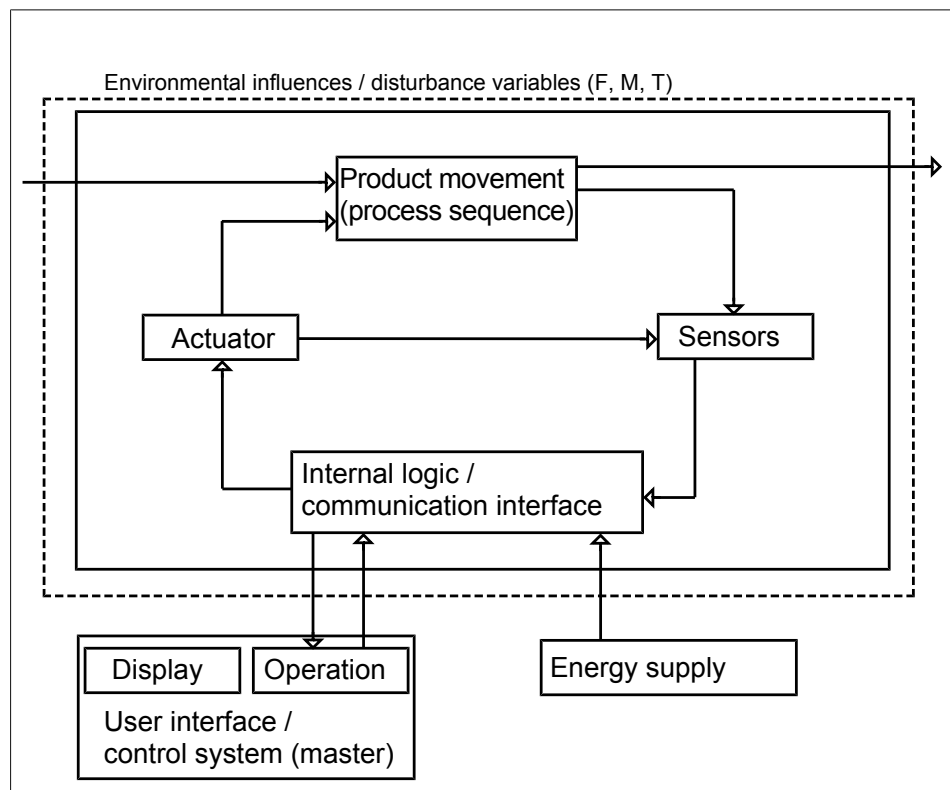
### 4.1 Structure



Servo Electric Drive PDU 2

Item	Designation	Notes
1	interface to the attachment module	for example: linear axes PLS
2	motor shaft	
3	housing of the module	with cooling element
4	ASK	connection cap with metric cable fitting (M16 x 1.5)
5	sides B	
6	blind plug	plug screw of the connection cap ASK
7	side A	

## 4.2 Functional principle



### Operation principle

The actuator (in this case a DC motor) is regulated by the internal logic. The required parameters are transferred from the higher level controller (master) to the internal logic.

The product carries out a movement. Its position is checked constantly. The parameters required for this are transmitted by the sensors back to the internal logic.

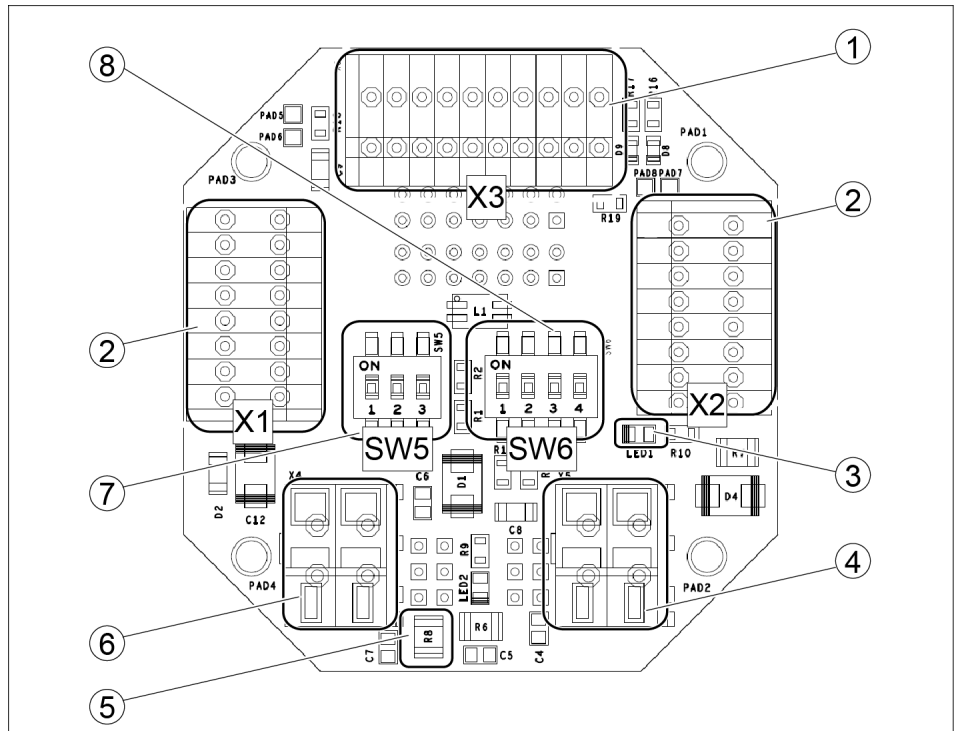
The following parameters can be transferred from the overriding control (master) to the internal logic:

- Current  $I$
- Speed  $v$
- Acceleration  $a$
- Position

### NOTE

All possible parameters and the special features of each communication interface (of the individual bus systems) are described in more detail in the document about SCHUNK Motion Protocol, see DVD, document: MotionToolSchunk.pdf.

### 4.3 Connection board



Adapter board

Item	Designation	Item	Designation
1	Digital inputs and outputs (X3)	5	Motor voltage LED
2	Supply of the module and supply loop-through, bus connection (X1/X2)	6	Motor voltage +24V
3	Logic voltage LED	7	Boot/default switch (SW5)
4	Motor voltage GND	8	Termination resistors switch (SW6)

Function of terminals:

- X1 is for communication with the module.
- X2 is for connecting additional modules.
- X3 is for using digital inlets and outlets. Additional sensors can be connected here. The assignment of this terminal is independent of the communication interfaces.

Connection for the digital inlets and outlets (X1/X2)	
Marking	Function
BUS_H	CAN_H / PROFIBUS BUS_A
BUS_L	CAN_L / PROFIBUS BUS_B
Tx	RS232 TX (caution: previously RX)
Rx	RS232 RX (caution: previously TX)
GND	GND
+24 V	+24 V logic supply
PE	Connection for e.g. Shield
GND	GND

Connection for the digital inlets and outlets (X3)	
Marking	Function
VS/2	Supply IOs 5V-24V
GND/2	Supply IO's GND
IN0	Digital input 0
IN1	Digital input 1
IN2	Digital input 2
IN3	Digital input 3
OUT0	Digital output 0
OUT1	Digital output 1
OUT2	Digital output 2
OUT3	Digital output 3

Switch for Boot/Default (SW5)	
Marking	Function
S1 (boot)	Sets firmware to Boot mode (only for servicing purposes). New firmware can be loaded onto the module, <a href="#">DEFAULT and BOOT function</a> [▶ 40].
S2 (Default)	Resets the module to default settings, <a href="#">DEFAULT and BOOT function</a> [▶ 40].
S3 (Tx)	Only for internal purposes. The switch must be in the "OFF" position.

Termination resistors switch (SW6)	
Marking	Function
S1 – 3 (PROFIBUS termination)	Sets the terminating resistor for the PROFIBUS.
S4 (CAN termination)	Sets the terminating resistor for the CAN bus.

**DIP switches for PROFIBUS**

If the PROFIBUS module is the last device on the PROFIBUS, all three "PROFIBUS termination" DIP switches must be in the "ON" position.

If the PROFIBUS module is not the last device on the PROFIBUS, all three "PROFIBUS termination" DIP switches must be in the "OFF" position.

**DIP switch for CAN bus**

If the CAN module is the last device on the CAN bus, the "CAN termination" DIP switch must be in the "ON" position.

If the CAN module is not the last device on the CAN bus, the "CAN termination" DIP switch must be in the "OFF" position.

## 5 Assembly and installation

### 5.1 Mechanical Connection



#### **⚠ WARNING**

##### **Risk of injury due to unexpected movements!**

If the power supply is switched on or residual energy remains in the system, components can move unexpectedly and cause serious injuries.

- Before starting any work on the product: Switch off the power supply and secure against restarting.
- Make sure, that no residual energy remains in the system.

#### **Evenness of the mounting surface**

The values apply to the whole mounting surface to which the product is mounted.

*Requirements for evenness of the mounting surface (Dimensions in mm)*

Edge length	Permissible unevenness
< 100	< 0.02
> 100	< 0.05

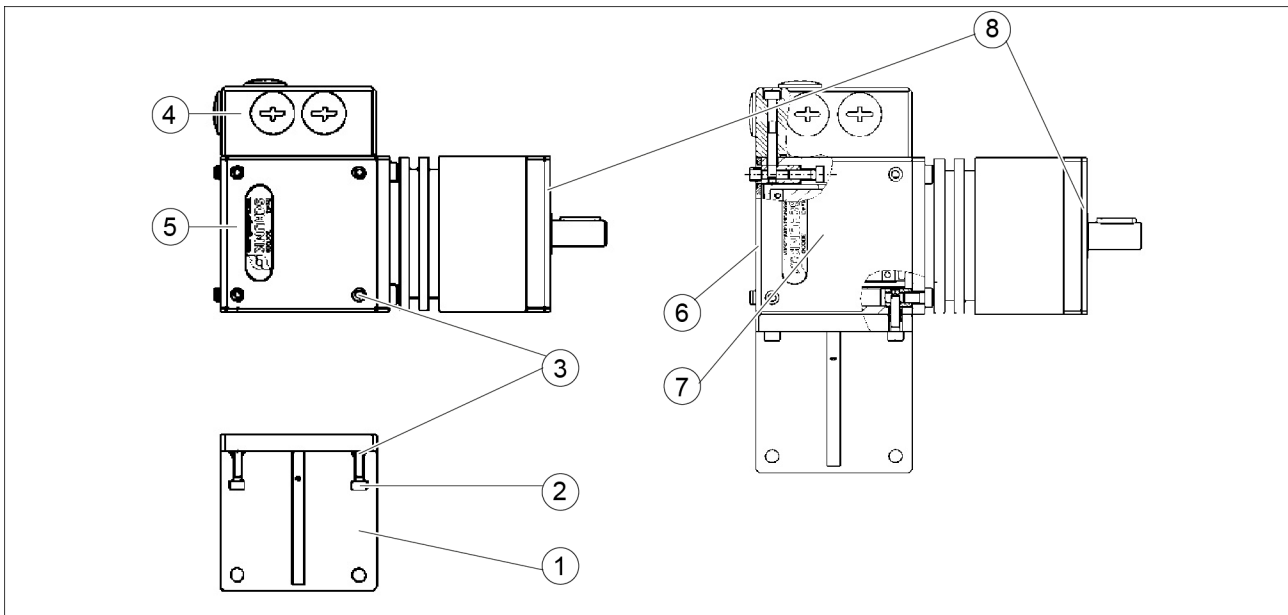
Choose the installation position so that connection cables are not damaged or cannot wrap around the product when swiveling.

- Connect the product to the machine/system with screws.
  - ✓ Use suitable connecting elements (adapter plates) if necessary.
  - ✓ Observe the permissible depth of engagement.
  - ✓ Observe the tightening torque for the mounting screws.

#### **NOTE**

The mounting screws of the ASK reduce the maximum depth of engagement of the screws which border on the ASK.

Observe the dimensions for the cross-bolting.



Module with connecting element PAM angle

Item	Designation	Note
1	PAM angle	See catalog (accessories)
2	Mounting screws	shown from side A
3	Centering sleeves (4x)	
4	ASK	
5	Swivel unit PDU	
6	A side	Specifications for the mounting screws, see the table below
7	B side	
8	Interface to the attachment module	4x bore holes and 1x drive shaft

		PDU 70	PDU 90	PDU 110
Thread		M4	M5	M6
Minimum depth of engagement [mm]	Side A	14	18	19
	Side B	7	7	7
Maximum depth of engagement [mm]	Side A	18	22	26
	Side B	10	10	10
Maximum depth of engagement for lateral displacement [mm]	Side A/B	5.5	5.5	5.5
Tightening torque [Nm]		3	5.9	10
The specifications refer to screws of strength class 8.8.				

## 5.2 Electrical connection



### **⚠ DANGER**

#### **Danger from electric voltage!**

Touching live parts may result in death.

- Switch off the power supply before any assembly, adjustment or maintenance work and secure against being switched on again.
- Only qualified electricians may perform electrical installations.
- Check if de-energized, ground it and hot-wire.
- Cover live parts.

### **NOTICE**

#### **Damage through regenerative energy!**

Regenerative energy may build up under great loads. This can damage the electronics.

- Ensure discharge of regenerative energy on customer's premises.  
SCHUNK recommends the use of a brake chopper (Type: ACC3EA001 ID number 9951504). The response threshold of the utilized brake chopper must be set as follows:  
**For 24 V operation:**  
set the brake chopper to 28 V or "0"

### **NOTICE**

#### **Material damage due to faulty connection!**

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

### **NOTE**

The cable color throughout this chapter refers to the use of a SCHUNK connection cable.

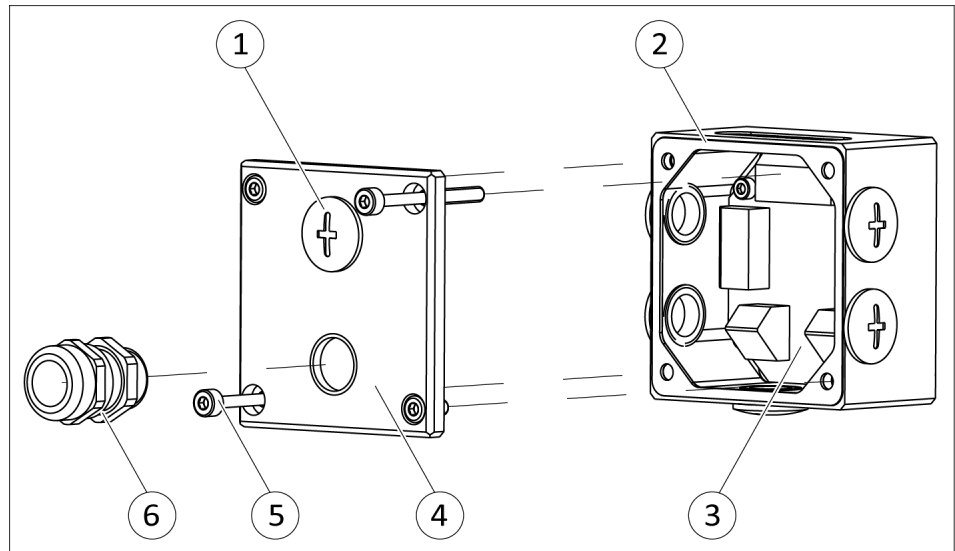
### 5.2.1 Installing connection cap

#### NOTICE

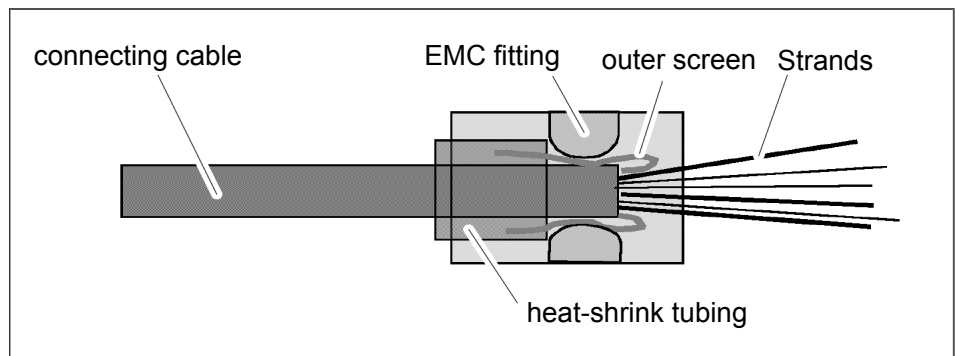
#### Risk of damaging the adapter board!

Fastening the screws too tightly can damage the adapter board.

- Only fix the screws in place on the adapter board.



- Unfasten the screws (5) from the cover (4) of the connection cap (2) and remove the cover (4).
- Unscrew the blind plugs (1) from the cover (4) or the connection cap (2).



- Pull the connection cable through the metric cable fitting (6).
- Strip approx. 50 mm of insulation from the connection cable.
- Strip approx. 5 mm of the individual wires.
- Push the outer shielding of the connection cable back over the cable sheath.
- Fix the shielding in place with shrink hose so that the shielding at the end of the sheath remains visible.
- Pull the connection cable through the cover (4) or the connection cap (2) and connect it to the adapter board (3).

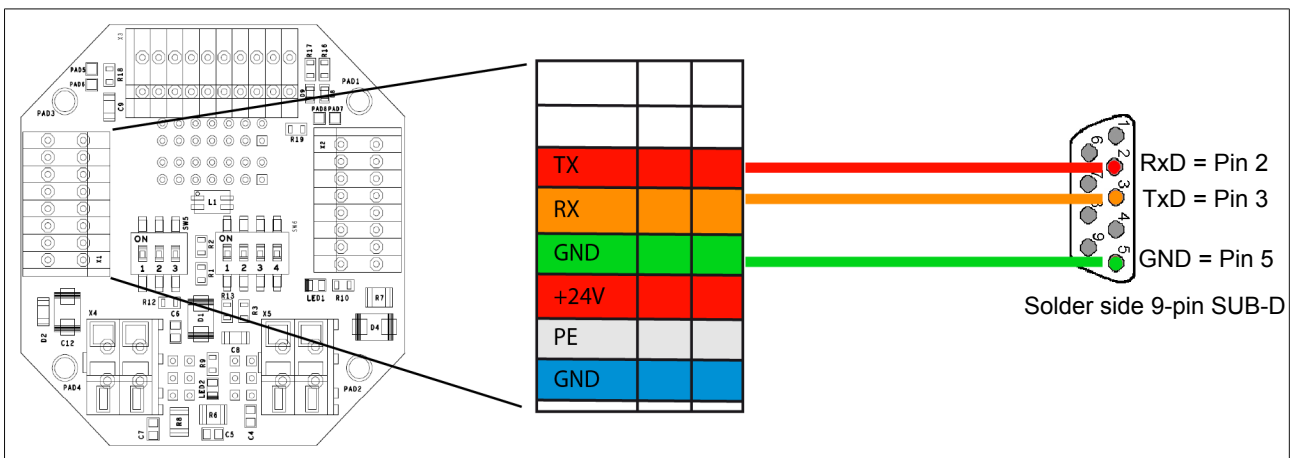
- Pull the metric cable fitting (6) just far enough over the shrink hose so that the individual wires remain visible.
- Screw the metric cable fitting (6) to the cover (4) or the connection cap (2).
- Place the cover (4) on the connection cap (2) and screw it tight.

### 5.2.2 RS232 interface

The characteristics of the RS232 interface make it unsuitable for use as a field bus system.

#### NOTE

Use the RS232 interface only as a parameterization interface.

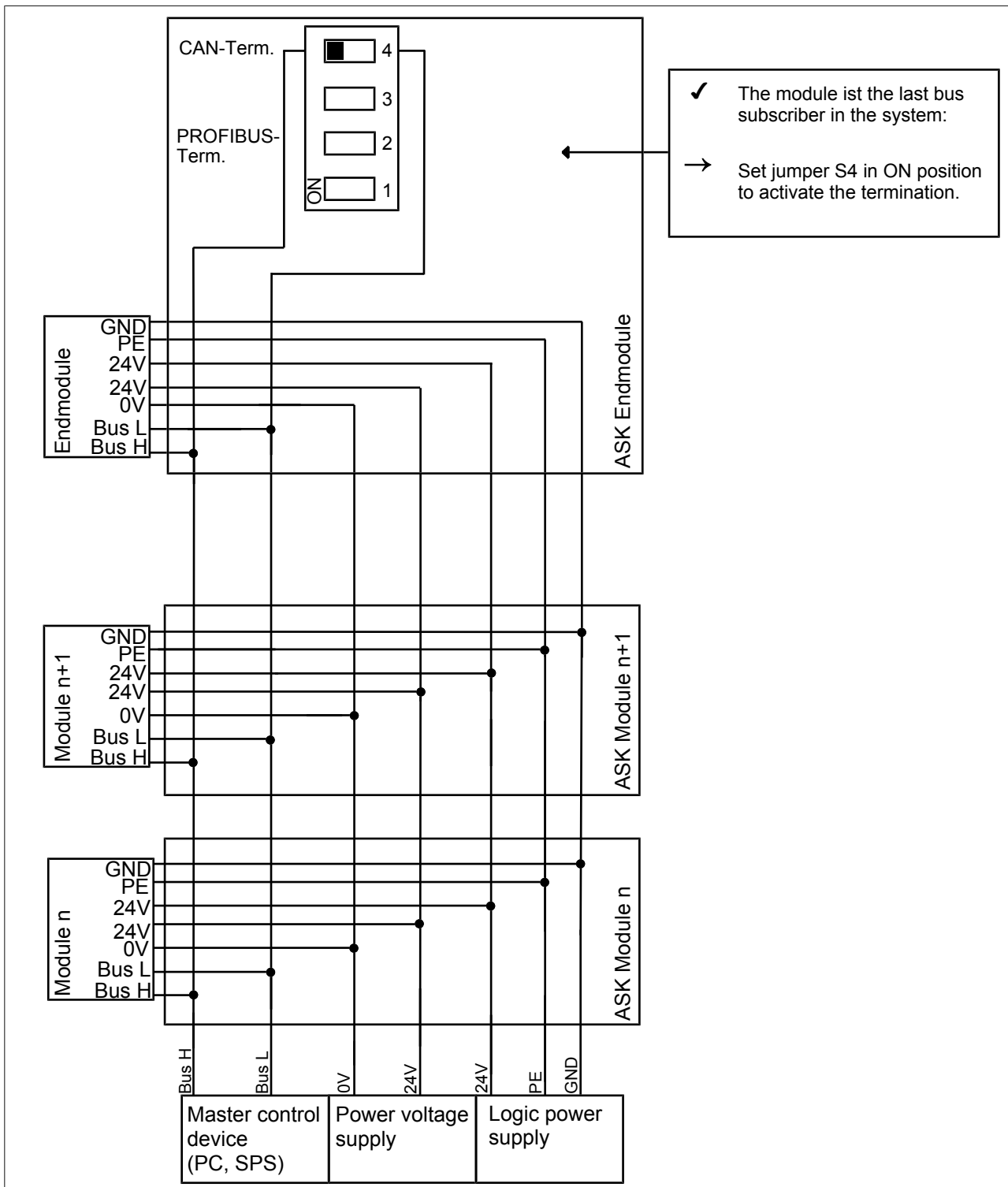


Connection board: Terminal strip X1 and connection to 9-pin SUB-D socket

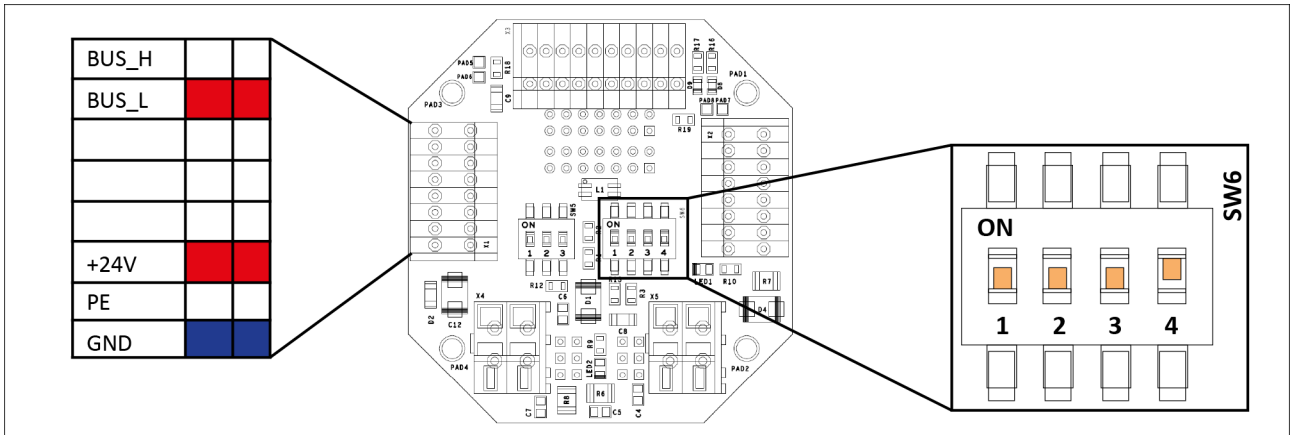
#### Connection RS232: Assignment of terminal strip X1 and power supply

Connection	Terminal	SCHUNK cable color		Pin
RS232 interface	Tx	Red		2
	Rx	Orange		3
	GND (Rx/Tx)	Green (von Rx/Tx)		5
Logic connection	24V	Red	0.25 mm <sup>2</sup>	
	GND	Blue	0.25 mm <sup>2</sup>	
Output power supply	+UB	Red	2.5 mm <sup>2</sup>	
	-UB	Blue	2.5 mm <sup>2</sup>	

### 5.2.3 CAN interface



circuit diagram CAN



Adapter board: terminal strip X1 and switch for terminating resistor

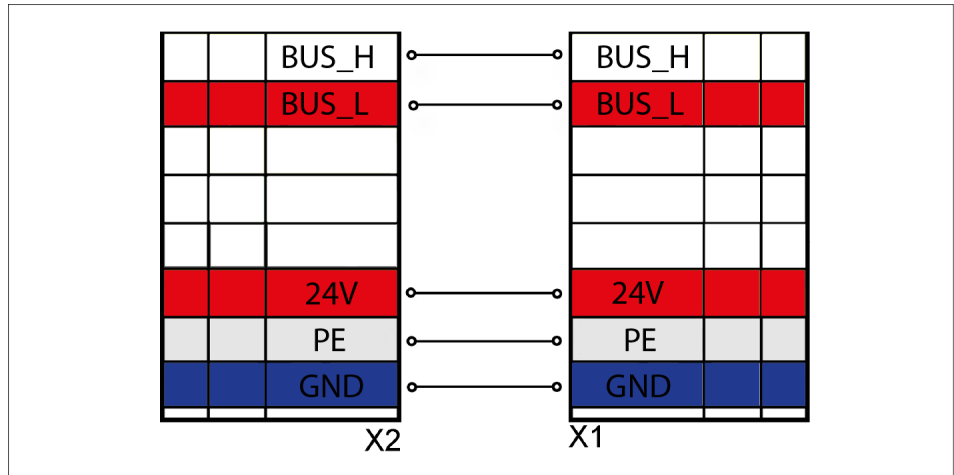
**CAN connection: assignments of terminal strip X1 and the energy supply**

Connection	Terminal	SCHUNK cable color	
CAN interface	Bus_H	White	
	Bus_L	Red	
	PE	Shield	
Logic connection	24V	Red	0.25 mm <sup>2</sup>
	GND	Blue	0.25 mm <sup>2</sup>
Power voltage supply	+UB	Red	2.5 mm <sup>2</sup>
	-UB	Blue	2.5 mm <sup>2</sup>

CAN assignment of 9-pin SUB D socket

SUB D socket solder side	Pin	Terminal
	2	Bus_L
	7	Bus_H

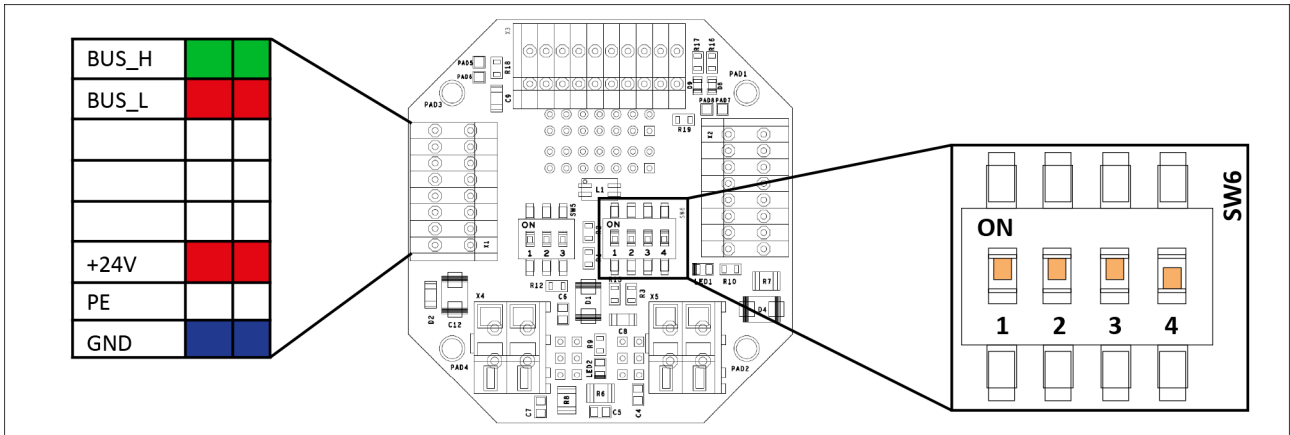
**Combining several modules**



*Combining module n with module n+1*

When combining several modules, the signals from module n are looped through to module n+1. The wires from terminal X2 on module n are connected to terminal X1 on module n+1.





Connection board: Terminal strip X1 and jumper for termination

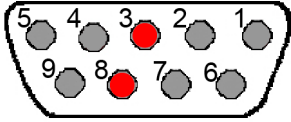
**PROFIBUS connection: Assignment of terminal strip X1 and the energy supply cable 1**

Connection	Terminal	SCHUNK cable color
PROFIBUS DP interface (cable 1)	Bus_H (Bus_A)	Green
	Bus_L (Bus_B)	Red
	PE	shield (of cable 1 & 2)

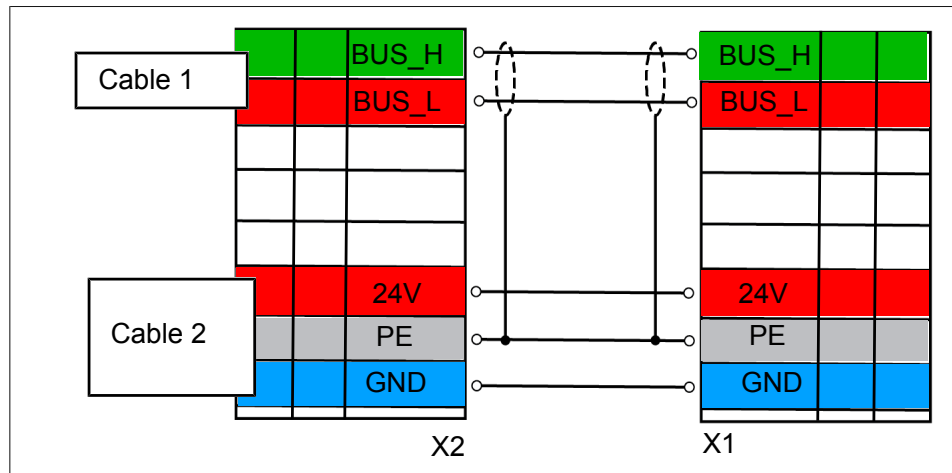
**PROFIBUS connection: Assignment of terminal strip X1 and the energy supply cable 2**

Connection	Terminal	SCHUNK cable color	
Logic connection (cable 2)	24V	Red	0.25 mm <sup>2</sup>
	GND	Blue	0.25 mm <sup>2</sup>
Output power supply	+UB	Red	2.5 mm <sup>2</sup>
	-UB	Blue	2.5 mm <sup>2</sup>

Profibus DP assignment of 9-pin SUB D connector

SUB D socket solder sider	Pin	Terminal X1
	3	Bus_L (Bus_B)
	8	Bus_H (Bus_A)

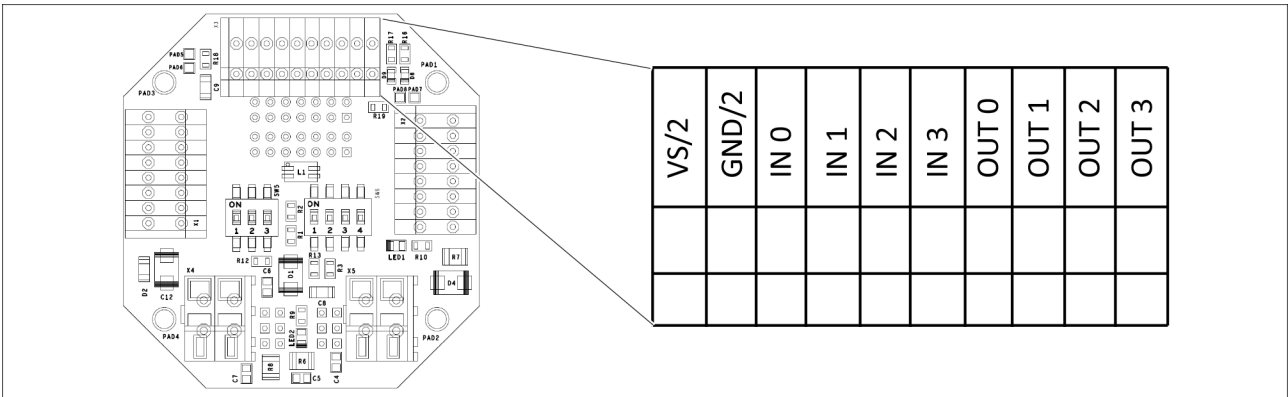
**Combining several modules**



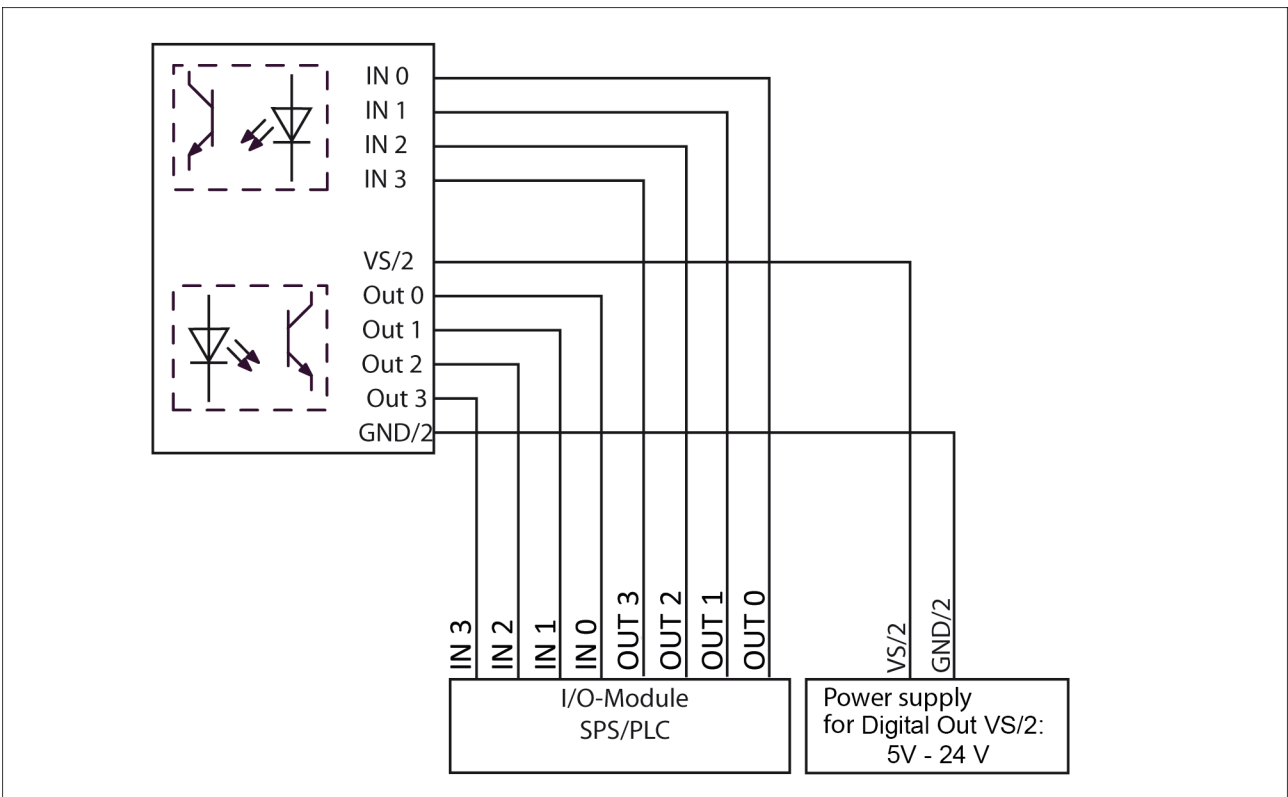
*Combining module n with module n+1*

When combining several modules, the signals from module n are looped through to module n+1. The wires from terminal X2 on module n are connected to terminal X1 on module n+1.

### 5.2.5 Electrical connection of the terminal strip X3




Connection board: terminal strip X3



Circuit diagram for digital inputs and outputs

### Assignment of terminal strip X3

#### In- and outputs

Designation	Application: Program	Application: Normal
IN0	Release / External reference switch (as of Firmware 1.20)	Digital input
IN1	Sentence selectionI	Digital input
IN2	Sentence selection	Digital input
IN3	Sentence selection	Digital input
OUT0	Reference (low active)	Digital output
OUT1	Error message (low active)	Digital output
OUT2	Depending on the configuration (low active)  Table below	Digital output
OUT3	Movement finished (low active)	Digital output

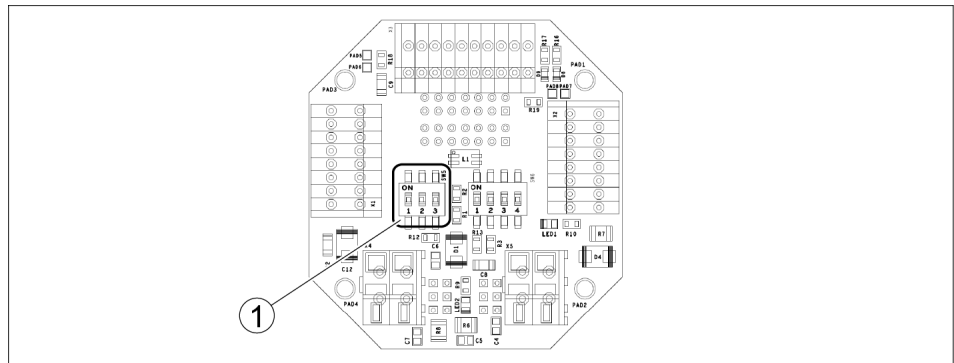
#### Switching possibilities of the output OUT2 via MC-Demo (as of Firmware V1.22)

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.

#### NOTE

Further information and usage options for terminal strip X3 can be found in "MotionToolSchunk" configuration tool, see DVD, Document: MotionToolSchunk.pdf.

### 5.2.6 DEFAULT and BOOT function



Adapter board

1	Boot/default switch (SW5)	
---	---------------------------	--

#### Set product to factory settings

The product can be reset to factory settings using the DEFAULT function.

- Disconnect the product from the voltage supply.
- Switch DIP switch S2 (SW5) to "ON" position.
- Connect the product to the voltage supply.
- Switch DIP switch S2 (SW5) to "OFF" position.
- Disconnect product from the voltage supply and reconnect again.
- ✓ The product is now reset to its factory settings.

#### Loading new firmware to the product

##### NOTE

Software and firmware version must be attuned to one another.

#### Software-Boot

##### NOTE

For a firmware update via the menu item "Update firmware...", the BOOT function is not required.

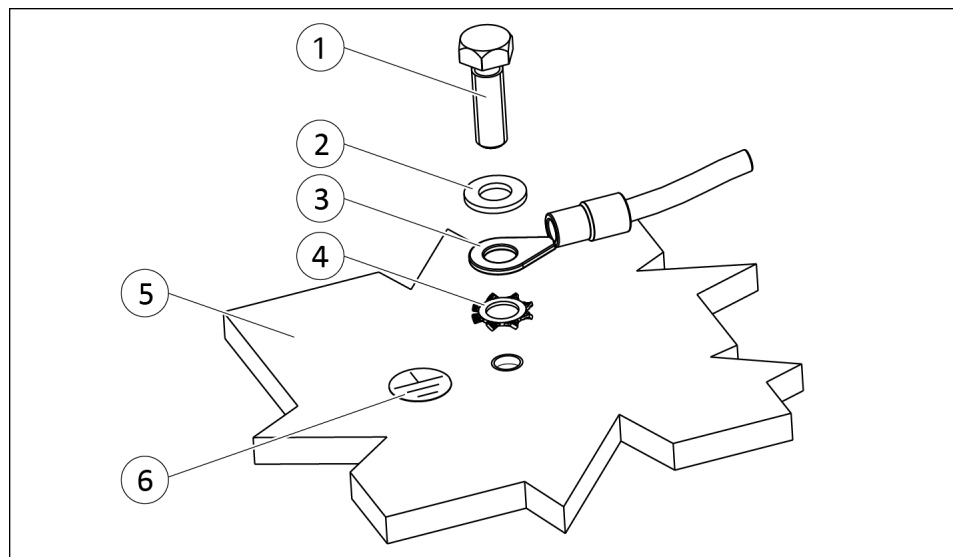
For more information, see DVD, document "MotionToolSchunk".

#### Hardware-Boot

The product can be described by the BOOT function via the menu item "Firmware administration" with new firmware.

- Switch DIP switch S1 (SWS) to "ON" position.
- Connect the product to the voltage supply.
  - ✓ Product is in the BOOT mode.
- Transfer new firmware using the Motion Tool Schunk (MTS) to the product, see DVD, document "MotionToolSchunk".
- Switch DIP switch S1 (SW5) to "OFF" position.
- Disconnect product from the voltage supply and reconnect again.
- ✓ New firmware is loaded on the product.

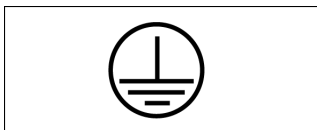
### 5.3 Connecting ground cable



Ground connection

1	Screw *	4	Toothed lock washer
2	Washer	5	Product
3	Cable lug	6	Ground marking

\*) Tightening torque: 5 Nm



A ground connection with a sufficient cross-section must be established between the product and the machine on the customer's premises.

The ground cable must be mounted on the threaded hole identified by the ground marking.

#### NOTE

Only connect the ground cable at the location intended for this purpose.

Always mount the ground cable singly.

Always use all components to screw in the ground cable and install them in this order: toothed lock washer, cable lug, washer and bolt. See "Ground connection" diagram. Observe the tightening torque.

#### 5.4 Information on the compatibility of software and firmware versions

The "Motion Tool SCHUNK (MTS)" configuration and commissioning tool and the firmware are coordinated with each other. Only the combinations of "MTS" and firmware version listed in the following table are compatible with each other. If other combinations are used, the product may end up in an undefined status during parameterization.

Compatibility of Firmware and Motion Tool SCHUNK (MTS)		
Firmware	1.5.5	1.6.0
MTS	from version 1.5.5	from version 1.6.0

The program version of the "Motion Tool SCHUNK (MTS)" is shown at the top of the program window.

The software version is displayed on the "General Information" tab under "Software Version".

The firmware version of the product can be found in the product window by choosing "Module" and then "Module Information".

## 6 Troubleshooting

### 6.1 Product can no longer be referenced

The product completes the referencing again. According to the referencing, the "not referenced" notification appears.

Possible cause	Corrective action
The "distance to the index" is exceeded.	Enlarge "distance to the index", see software handbook "Motion Control SCHUNK".

### 6.2 Drive does not move

Possible cause	Corrective action
Communication not possible.	Check bus connection., <a href="#">Electrical connection</a> [▶ 29]

### 6.3 Drive is sluggish or jerky

Possible cause	Corrective action
Dirt deposits in the cavities.	Clean cavities., <a href="#">Maintenance intervals</a> [▶ 44]

### 6.4 Motor does not turn

Possible cause	Corrective action
No voltage connected.	Check the power supply.
Insufficient voltage.	Check the power supply., <a href="#">Technical data</a> [▶ 20]

### 6.5 Product stops abruptly

Possible cause	Corrective action
Bus cable fault (connection interrupted).	Check bus cable for damage and replace if necessary.
	Further troubleshooting, see document. <i>Motion Control.</i>

## 7 Maintenance

### 7.1 Maintenance intervals

Size	70	90	110
Interval [Mio. cycles]	2	2	2

The product conforms to protection class IP 54 when the DMI connection cap is mounted.

- Clean the product dry (do not use water or liquid cleaners); remove all coarse dirt and chips from the cavities in the product.
- Check for damage and replace the product if necessary.

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

### 7.2 Disassembly and assembling

This product must not be disassembled for maintenance.

#### **NOTICE**

##### **Material damage due to improper disassembly!**

Incorrect works can cause damage to the mechanics and internal electronics.

- Disassembly or opening of the product is not permitted.
- Only allow SCHUNK to repair the product.



## 9 Annex to Declaration of Incorporation

according 2006/42/EG, Annex II, No. 1 B

1. Description of the essential health and safety requirements pursuant to 2006/42/EC, Annex I that are applicable and that have been fulfilled with:

Product designation	Servo Electric Drive
Type designation	PDU
ID number	0307350, 0307352, 0307354, 0307360, 0307362, 0307364, 0307370, 0307372, 0307374

To be provided by the System Integrator for the overall machine	↓
Fulfilled for the scope of the partly completed machine	↓
Not relevant	↓

1.1	Essential Requirements		
1.1.1	Definitions	X	
1.1.2	Principles of safety integration	X	
1.1.3	Materials and products	X	
1.1.4	Lighting	X	
1.1.5	Design of machinery to facilitate its handling	X	
1.1.6	Ergonomics	X	
1.1.7	Operating positions		X
1.1.8	Seating		X

1.2	Control Systems		
1.2.1	Safety and reliability of control systems	X	
1.2.2	Control devices	X	
1.2.3	Starting	X	
1.2.4	Stopping	X	
1.2.4.1	Normal stop	X	
1.2.4.2	Operational stop	X	
1.2.4.3	Emergency stop	X	
1.2.4.4	Assembly of machinery	X	
1.2.5	Selection of control or operating modes	X	
1.2.6	Failure of the power supply		X

1.3	Protection against mechanical hazards		
1.3.1	Risk of loss of stability		X
1.3.2	Risk of break-up during operation		X
1.3.3	Risks due to falling or ejected objects		X
1.3.4	Risks due to surfaces, edges or angles	X	

<b>1.3</b>	<b>Protection against mechanical hazards</b>			
1.3.5	Risks related to combined machinery			X
1.3.6	Risks related to variations in operating conditions			X
1.3.7	Risks related to moving parts		X	
1.3.8	Choice of protection against risks arising from moving parts			X
1.3.8.1	Moving transmission parts		X	
1.3.8.2	Moving parts involved in the process			X
1.3.9	Risks of uncontrolled movements			X
<b>1.4</b>	<b>Required characteristics of guards and protective devices</b>			
1.4.1	General requirements			X
1.4.2	Special requirements for guards			X
1.4.2.1	Fixed guards			X
1.4.2.2	Interlocking movable guards			X
1.4.2.3	Adjustable guards restricting access			X
1.4.3	Special requirements for protective devices			X
<b>1.5</b>	<b>Risks due to other hazards</b>			
1.5.1	Electricity supply		X	
1.5.2	Static electricity		X	
1.5.3	Energy supply other than electricity		X	
1.5.4	Errors of fitting		X	
1.5.5	Extreme temperatures			X
1.5.6	Fire			X
1.5.7	Explosion			X
1.5.8	Noise			X
1.5.9	Vibrations			X
1.5.10	Radiation	X		
1.5.11	External radiation	X		
1.5.12	Laser radiation	X		
1.5.13	Emissions of hazardous materials and substances			X
1.5.14	Risk of being trapped in a machine	X		
1.5.15	Risk of slipping, tripping or falling	X		
1.5.16	Lightning			X
<b>1.6</b>	<b>Maintenance</b>			
1.6.1	Machinery maintenance		X	
1.6.2	Access to operating positions and servicing points		X	
1.6.3	Isolation of energy sources		X	
1.6.4	Operator intervention		X	
1.6.5	Cleaning of internal parts		X	

<b>1.7</b>	<b>Information</b>			
1.7.1	Information and warnings on the machinery		X	
1.7.1.1	Information and information devices		X	
1.7.1.2	Warning devices		X	
1.7.2	Warning of residual risks		X	
1.7.3	Marking of machinery	X		
1.7.4	Instructions	X		
1.7.4.1	General principles for the drafting of instructions	X		
1.7.4.2	Contents of the instructions	X		
1.7.4.3	Sales literature	X		
	<b>The classification from Annex 1 is to be supplemented from here forward.</b>			
2	Supplementary essential health and safety requirements for certain categories of machinery			X
2.1	Foodstuffs machinery and machinery for cosmetics or pharmaceutical products			X
2.2	Portable hand-held and/or guided machinery			X
2.2.1	Portable fixing and other impact machinery			X
2.3	Machinery for working wood and material with similar physical characteristics			X
3	Supplementary essential health and safety requirements to offset hazards due to the mobility of machinery		X	
4	Supplementary essential health and safety requirements to offset hazards due to lifting operations		X	
5	Supplementary essential health and safety requirements for machinery intended for underground work			X
6	Supplementary essential health and safety requirements for machinery presenting particular hazards due to the lifting of persons		X	