

# Assembly and operating manual

## PW V6

### Servo-electric rotary pan-tilt actuator



## Imprint

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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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## 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 specified maintenance and lubrication intervals
- Observe the ambient conditions and operating conditions

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 rotary pan-tilt actuator PW V6 in the version ordered
- M5 plug for RS232 interface
- Adaptor cable, USB to M5 plug (length 2 m)
- DVD

Contents of DVD:

- "SCHUNK Motion Tool (MTS)" configuration and commissioning tool
- "SCHUNK Motion Tool (MTS)" software manual
- "SCHUNK Motion Protocol (SMP)" software manual
- "SCHUNK Drive Protocol (SDP)" software manual
- Firmware manager
- Assembly and Operating Manual
- USB driver

### 1.4 Accessories

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

- Hybrid cable
- Connection cap
  - DMI

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#### 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.

---

A wide range of accessories are available for this product. For information regarding which accessory articles can be used with the corresponding product variants, see catalog data sheet.

## 2 Basic safety notes

### 2.1 Intended use

The product may only be used for swiveling permissible attachment parts or workpieces.

- The product may only be used within the scope of its technical data, [Technical data](#) [▶ 16].
- 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 Not intended use

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

- 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](#) [▶ 16].

## 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	PW V6	
	70	90
<b>Mechanical operating data</b>		
Weight [kg]	1.8	3.4
Noise emission [dB(A)]	≤ 70	
IP rating	54	
Ambient temperature [°C]		
Min.	+ 5	
Max.	+ 55	
<b>Control electronics</b>		
Power supply [VDC]	24	
<b>Axis 1</b>		
Nominal torque [Nm]	12.0	23.0
Maximum torque [Nm]	24.0	46.0
Angle of rotation [°]	± 120	± 105
Max. acceleration [mm/s <sup>2</sup> ]	960	600
Max. angular velocity [°/s]	240	150
<b>Axis 2</b>		
Nominal torque [Nm]	2.0	12.0
Maximum torque [Nm]	4.0	24.0
Angle of rotation [°]	>360	
Max. acceleration [mm/s <sup>2</sup> ]	1,440	960
Max. angular velocity [°/s]	360	240
<b>Interface</b>		
CAN bus [up to 1 MBit/s]	X	X
PROFIBUS DP [1.5 MBit/s]	X	X
RS232, parameterization interface	X	X

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

### 3.2 Electrical operating data

Designation	PW V6	
	70	90
Nominal voltage [VDC]	24	
Nominal power current [A]	4	
Max. current [A]	8	

### 3.3 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.

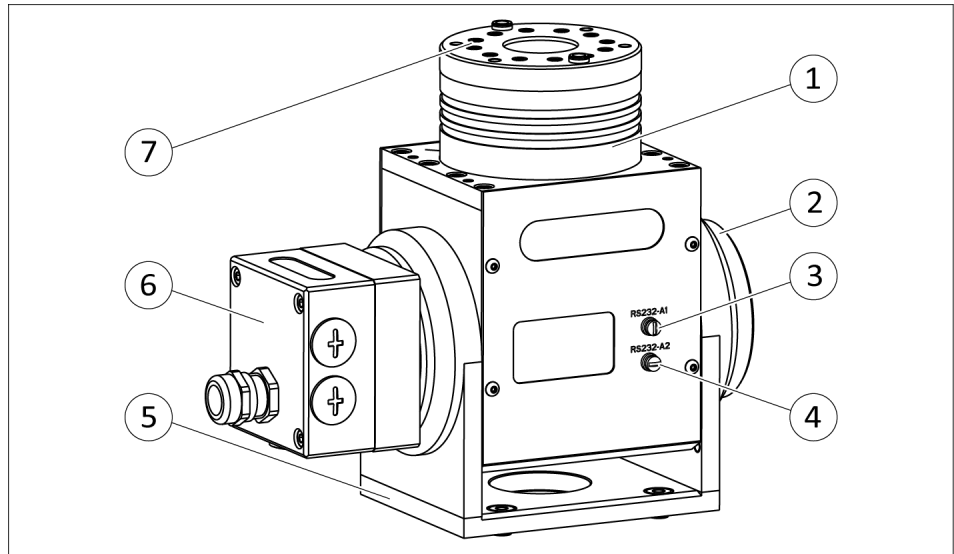
The power supply unit used for the power needs to be able to handle this overvoltage and must not switch off its output voltage. Otherwise, the product, for example, will stop with the error message "ERROR\_Motor\_Voltage\_LOW!" or "ERROR\_Motor\_Voltage\_High" which must be acknowledged.

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 Design



*Servo-electric rotary pan-tilt actuator*

1	Axis 2 (swivel axis)	5	Base plate
2	Axis 1 (tilt axis)	6	Connection cap with blind plug and metric cable fitting
3	RS232 interface for Axis 2	7	Assembly interface for attachments
4	RS232 interface for Axis 2		

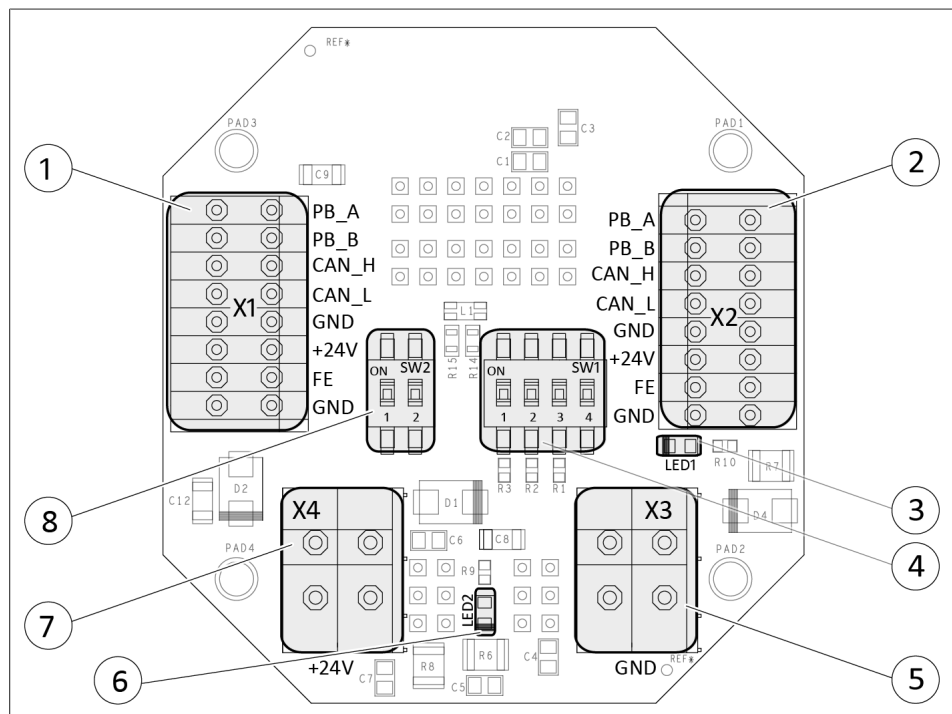
### 4.2 Description

The product is a Servo-electric rotary pan-tilt actuator with integrated electronics and two independently movable axes.

Either a PROFIBUS or a CAN bus can be used as the bus system. The PROFIBUS address range is between 0 and 127 and the CAN bus range is between 0 and 255.

The RS232 interfaces are used to parameterize the axes of the rotary pan-tilt actuator.

### 4.3 Connection board



Adapter boards

1	<b>X1</b> Supply of the product and supply loop-through, bus connection	5	<b>X3</b> Motor voltage GND
2	<b>X2</b> Connection of other products, bus connection	6	<b>LED2</b> <i>Motor voltage LED</i>
3	<b>LED1</b> <i>Logic voltage LED</i>	7	<b>X4</b> Motor voltage +24V
4	<b>SW1</b> DIP switches for <i>PROFIBUS termination</i> and <i>CAN bus termination</i>	8	<b>SW2</b> DIP switches for <i>Boot</i> and <i>Default</i>

<b>X1/X2</b>	
<b>Marking</b>	<b>Function</b>
PB_A	PROFIBUS_A
PB_B	PROFIBUS_B
CAN_H	CAN bus_H
CAN_L	CAN bus_L
GND	GND
+24 V	Logic supply
FE	Functional earth (optional)

X1/X2	
Marking	Function
GND	GND

X3	
Marking	Function
GND	Motor voltage GND

X4	
Marking	Function
+24 V	Motor voltage

SW1	
Marking	Function
S1 – 3 (PROFIBUS termination)	Sets the terminating resistor for the PROFIBUS.
S4 (CAN termination)	Sets the terminating resistor for the CAN bus.

SW2	
Marking	Function
S1 (boot)	Sets firmware to Boot mode (only for servicing purposes). New firmware can be loaded onto the product.
S2 (Default)	Resets the product to default settings.

### DIP switches for PROFIBUS

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

-If the product 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 product is the last device on the CAN bus, the *CAN termination* DIP switch must be in the *ON* position.

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

#### 4.4 LED

LED	Color	Designation	Function
1	Green	Logic voltage	Indicates whether the logic voltage is connected.
			<ul style="list-style-type: none"><li>• <b>Lights up</b> as long as voltage is present in the product.</li><li>• <b>Does not light up</b> if there is no voltage in the product.</li></ul>
2	Green	Motor voltage	Indicates whether the motor voltage is connected.
			<ul style="list-style-type: none"><li>• <b>Lights up</b> as long as voltage is present in the product.</li><li>• <b>Does not light up</b> if there is no voltage in the product.</li></ul>

## 5 Assembly and installation



### **⚠ 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.

### 5.1 Mechanical connection

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

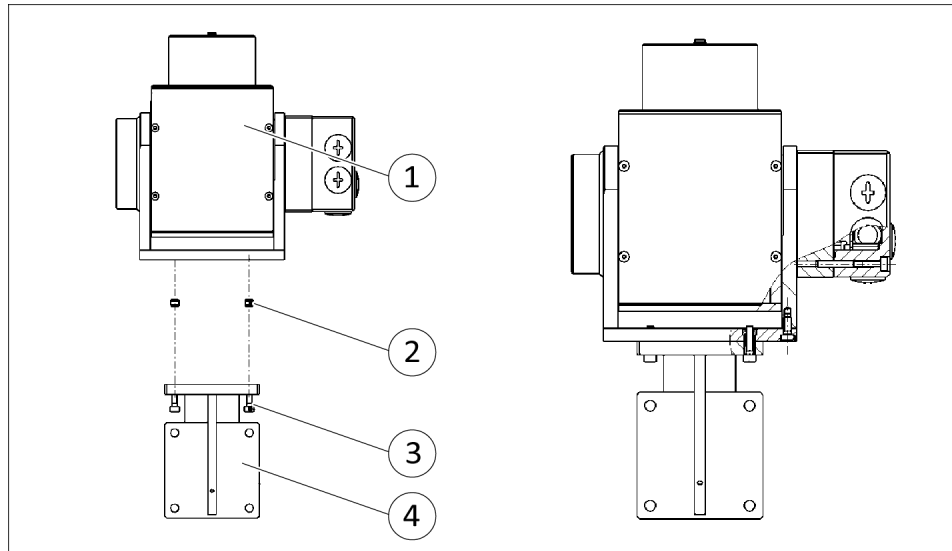
The values apply to the whole mounting surface to which the product is mounted.

*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.



Assembly option

1	PW V6	3	Fastening screws
2	Centering sleeves	4	Connecting element

Depth of engagement and tightening torque Mounting material (provided by the customer)

Designation	PW V6 70		PW V6 90	
	Base plate	Axis 2	Base plate	Axis 2
Centering sleeve [Ø]	6	6	8	8
Mounting screws	M4	M4	M5	M5
Minimum depth of engagement [mm]	6	6	7	7
Maximum depth of engagement [mm]	8	8	8	8
Tightening torque [Nm]	5.87	5.87	11.7	11.7

## 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**

#### **Risk of damage to the electronics!**

A faulty connection can cause damage to the internal electronics.

- The supply network must be a network of type "PELV" for power and logic.
- Observe the PIN assignment of the connecting terminals.
- Make sure that all components are grounded correctly.

---

### **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"

---

### **NOTE**

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

---

### 5.2.1 RS232 interface

#### NOTICE

##### Squashing of the M5 plug!

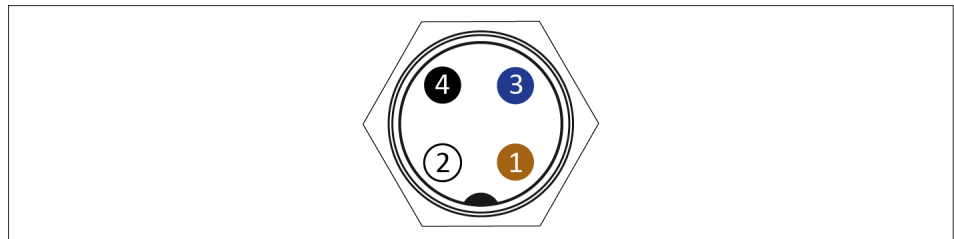
If the M5 plug is connected to the RS232 interface when the product is started up, the swiveling and tilting motion of the product can squash the cable or the plug.

- Pull out the M5 plug before starting up the product.

#### NOTE

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

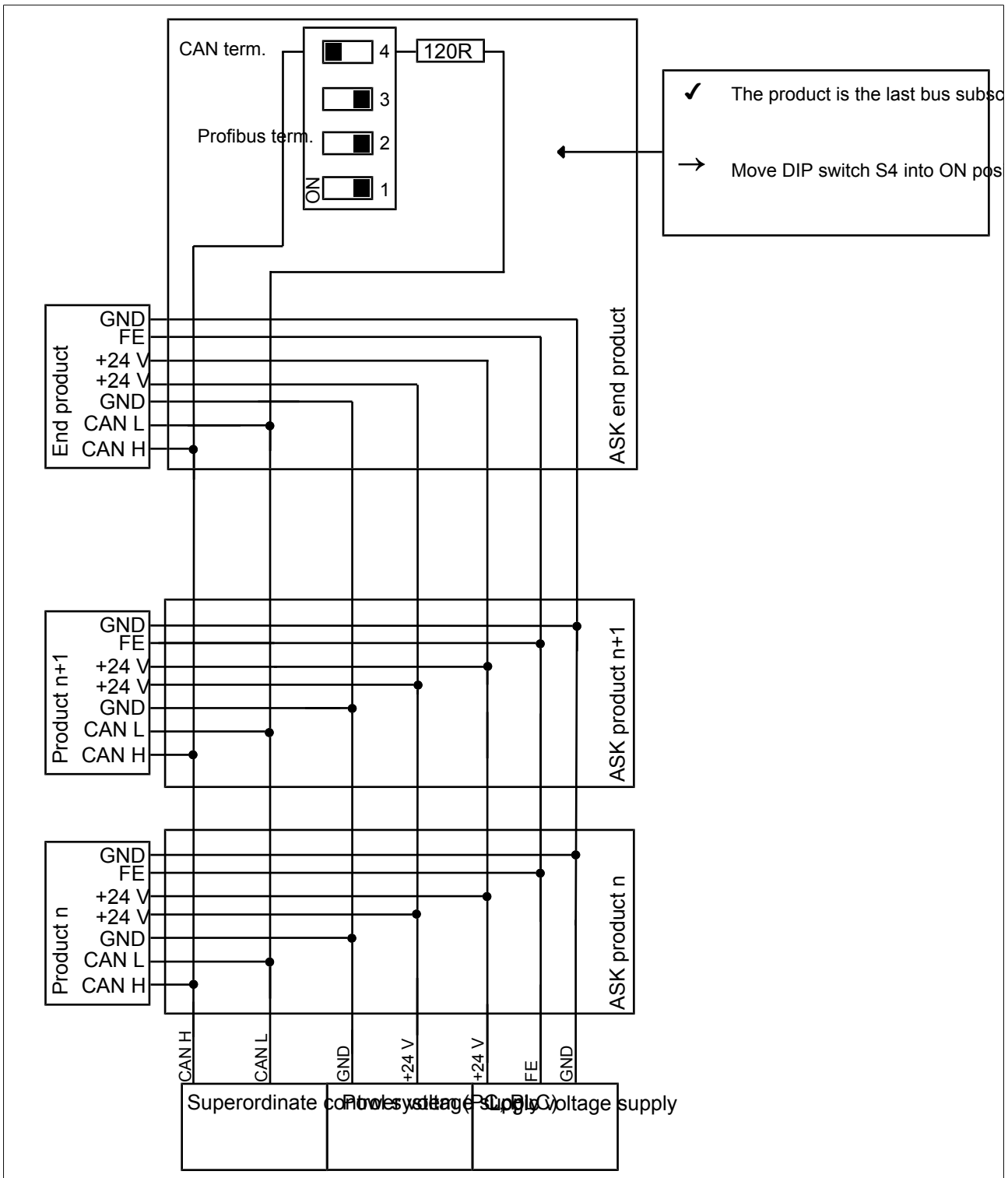
The tilt axis (Axis 1) and the swivel axis (Axis 2) can be parameterized via the respective RS232 interfaces, [Commissioning the product](#) [► 34].



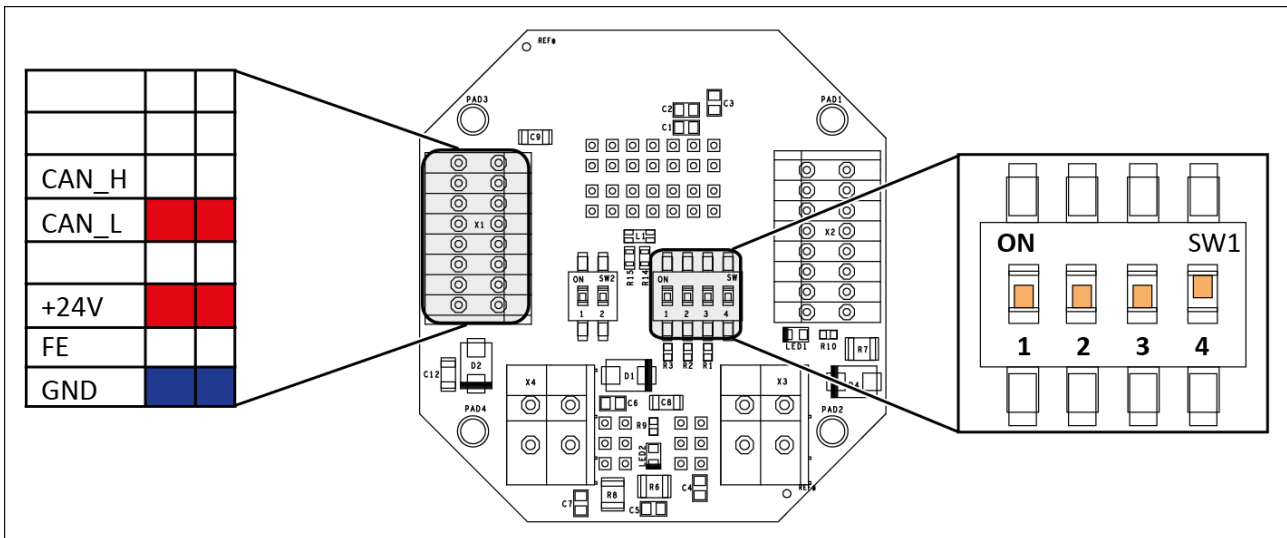
RS232 interface

PIN	Color	Designation
1	Brown	n. c.
2	White	RxD
3	Blue	GND
4	Black	TxD

### 5.2.2 CAN bus interface



CAN bus circuit diagram



Terminal strip X1 and DIP switches for termination resistor

**Assignments of the terminal strip X1 and the energy supply (Cable 1)**

Connection	Terminal	SCHUNK cable color
CAN bus interface	CAN_H	White
	CAN_L	Red
	FE	Functional earth (optional)

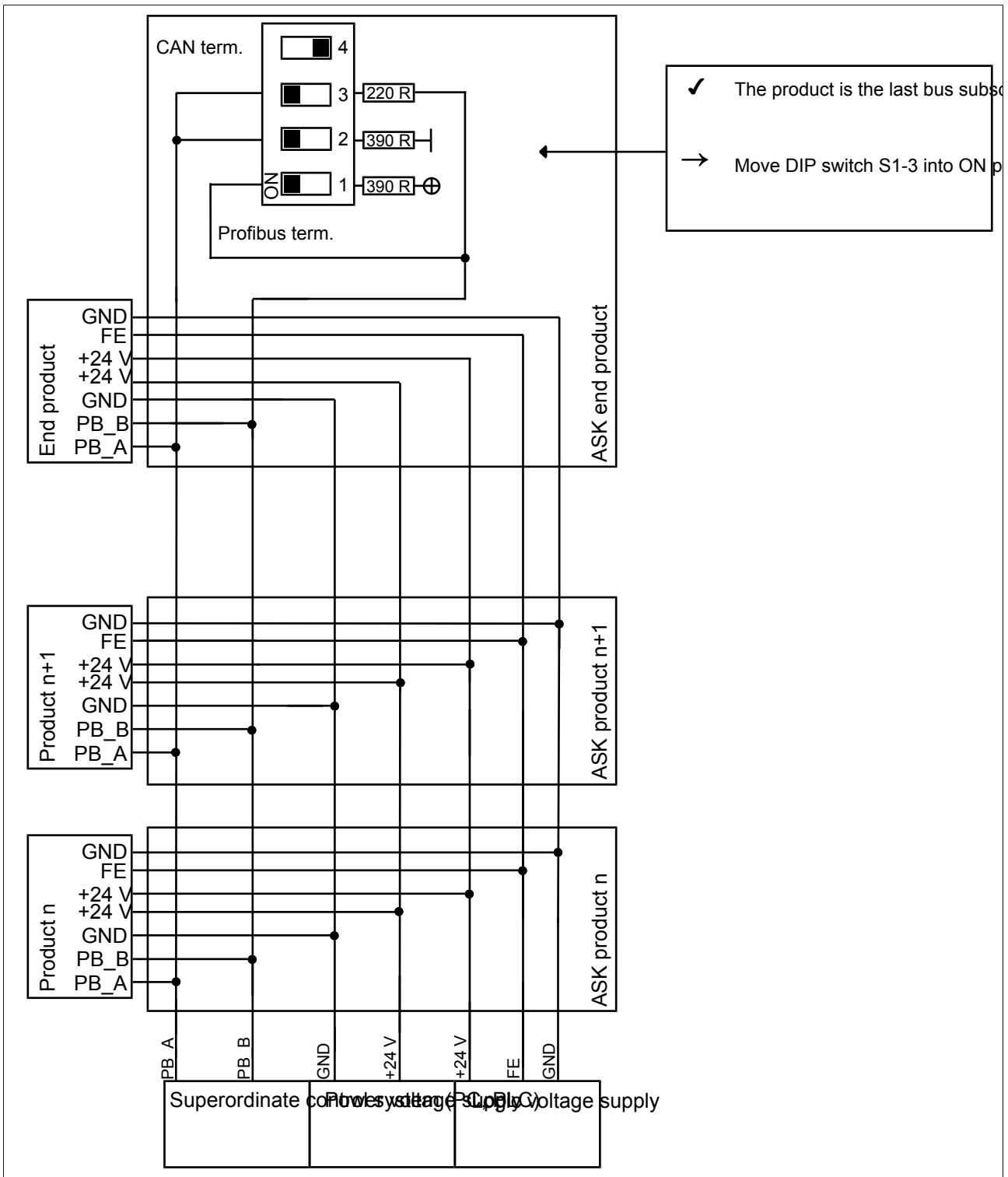
**Assignments of the terminal strip X1 and the energy supply (Cable 2)**

Connection	Terminal	SCHUNK cable color	
Logic connection	+24V	Red	0.25 mm <sup>2</sup>
	GND	Blue	0.25 mm <sup>2</sup>
Power voltage supply	+24V	Red	2.5 mm <sup>2</sup>
	GND	Blue	2.5 mm <sup>2</sup>

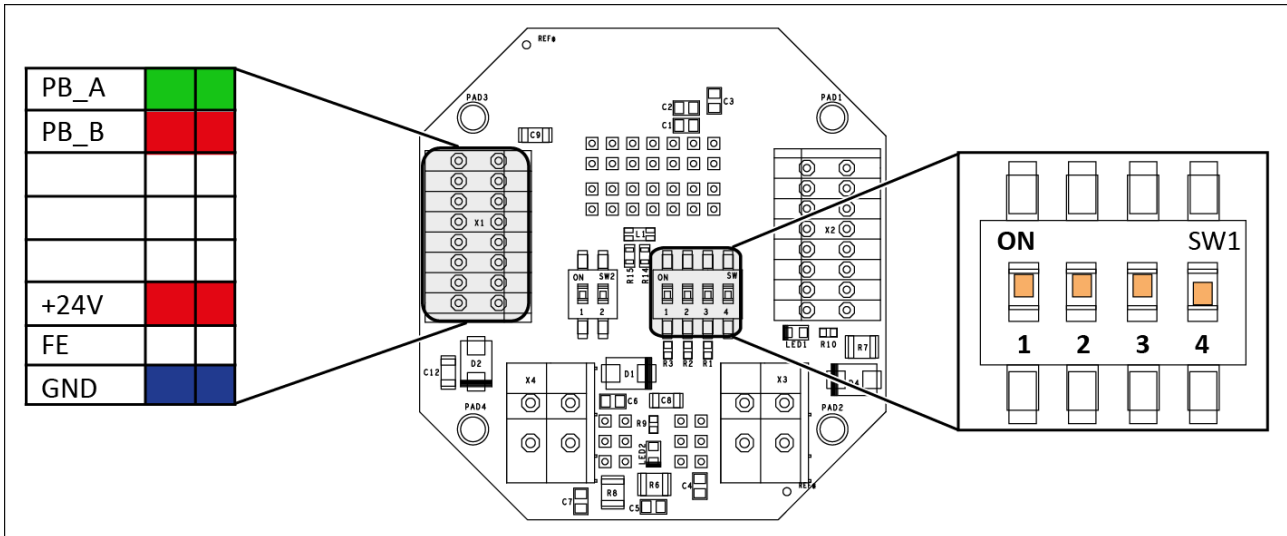
CAN assignment of the 9-pin D-sub socket

D-sub socket solder side	Pin	Terminal
	2	CAN_L
	7	CAN_H

### 5.2.3 PROFIBUS DP interface



PROFIBUS DP circuit diagram



Terminal strip X1 and DIP switches for termination resistor

**Assignments of the terminal strip X1 and the energy supply (Cable 1)**

Connection	Terminal	SCHUNK cable color
PROFIBUS DP interface	PB_A	Green
	PB_B	Red
	FE	Functional earth (optional)

**Assignments of the terminal strip X1 and the energy supply (Cable 2)**

Connection	Terminal	SCHUNK cable color	
Logic connection	+24V	Red	0.25 mm <sup>2</sup>
	GND	Blue	0.25 mm <sup>2</sup>
Power voltage supply	+24V	Red	2.5 mm <sup>2</sup>
	GND	Blue	2.5 mm <sup>2</sup>

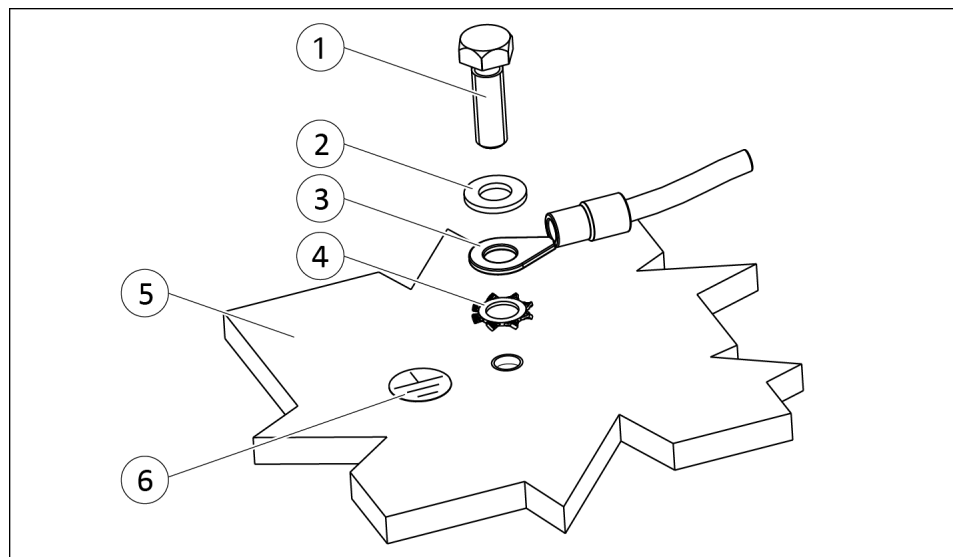
PROFIBUS DP assignment of 9-pin D-sub plug

D-sub plug solder side	Pin	Terminal X1
	3	PB_B
	8	PB_A

### 5.3 Installing and connecting

- Check the flatness of the screw-on surface, [Mechanical connection](#) [▶ 22].
- Fasten the product to the machine/system with screws, [Mechanical connection](#) [▶ 22].
  - ✓ Use suitable connecting elements (adapter plates) if necessary.
  - ✓ Observe the permissible depth of engagement.
  - ✓ Observe the tightening torque for the mounting screws.
- Connect the ground cable between the product and the machine/system, [Connecting ground cable](#) [▶ 31].
- Position the connection cap on the product and tighten the screws.
  - ✓ Tightening torque: 3 Nm
- Mount connection cap, [Installing connection cap](#) [▶ 32].
- Connect cable for CAN bus, [CAN bus interface](#) [▶ 26].
- OR: connect cable for PROFIBUS, [PROFIBUS DP interface](#) [▶ 28].
- Connect cable for logic voltage, [Electrical connection](#) [▶ 24].
- Connect cable for power supply, [Electrical connection](#) [▶ 24].
- If applicable: connect multiple products to each other, [Combination of multiple products](#) [▶ 33].
- Set terminating resistor for CAN bus or PROFIBUS on the last product, [CAN bus interface](#) [▶ 26] and [PROFIBUS DP interface](#) [▶ 28].
- Start up the product, [Commissioning the product](#) [▶ 34].
  - ✓ *Logic voltage* LED lights up.
  - ✓ *Motor voltage* LED lights up.

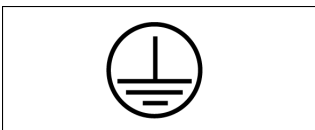
## 5.4 Connecting ground cable



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.

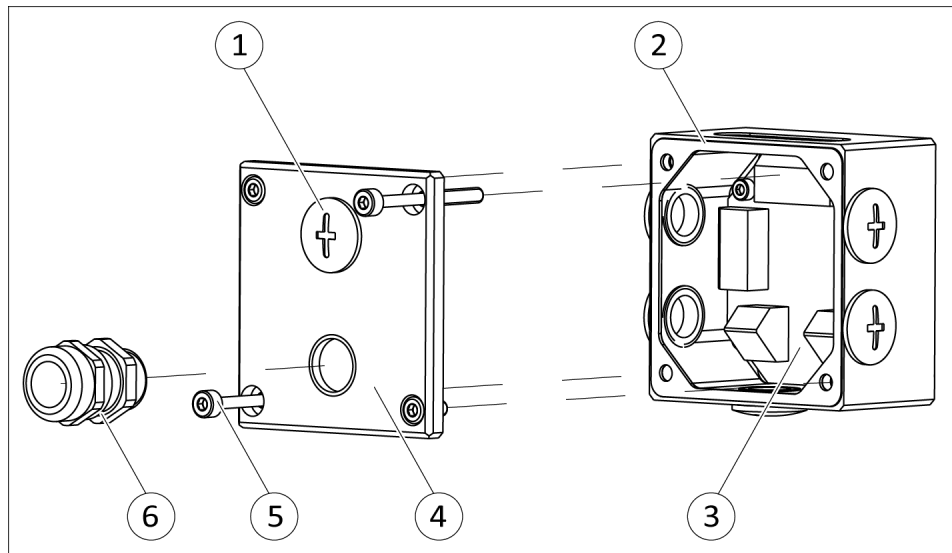
## 5.5 Installing connection cap

### NOTICE

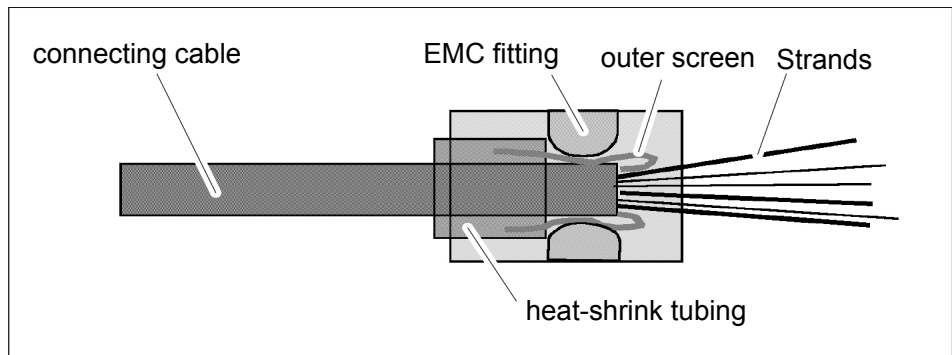
#### Risk of damaging the adapter board!

Fastening the screws too tightly can damage the adapter board.

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



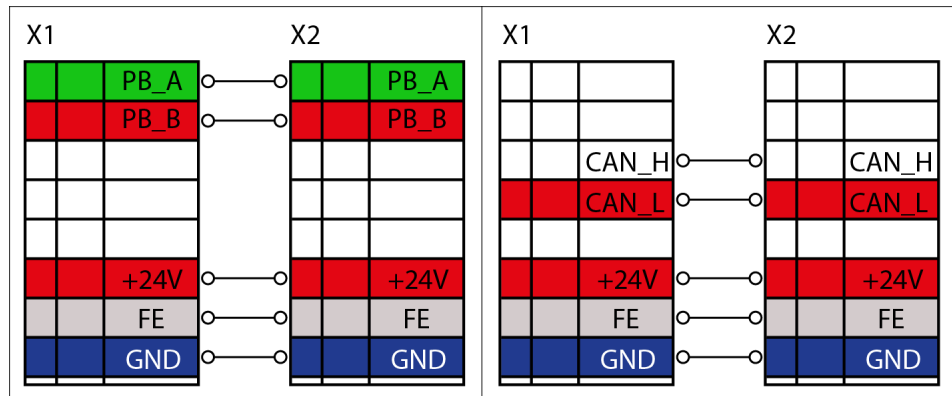
- Unfasten the screws (5) from the cover (4) of the connection cap (2) and remove the cover (4).
- Unscrew the blind plugs (1) from the cover (4) or the connection cap (2).



- 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.

## 5.6 Combination of multiple products



Combination of multiple products, PROFIBUS and CAN bus

When multiple products are combined, the signals are looped through from Product n to Product n+1. The wires from Terminal X2 of the product are clamped in Terminal X1 of Product n+1.

The terminating resistor for CAN bus or PROFIBUS must be set on the last product, [CAN bus interface](#) [▶ 26] and [PROFIBUS DP interface](#) [▶ 28].

## 5.7 Commissioning the product

---

### NOTE

The swivel and tilt axes must be individually parameterized. The same sequence must be followed for both axes.

The product has a CAN bus interface, a PROFIBUS interface, and an RS232 interface.

When you open the *Motion Tool Schunk (MTS)*, you must select the interface you wish to use for communication.

Only the selected interface is active. The other two interfaces are not used.

Commissioning the product and communicating via the RS232 interface are described below.

---

The product is commissioned by means of the *Motion Tool Schunk (MTS)* configuration and commissioning tool.

The *Motion Tool Schunk (MTS)* can be opened via the DVD or directly on the computer. To open the *Motion Tool Schunk (MTS)* directly on the computer, you must copy the *MTS* folder to a directory of your choice on the computer. **NOTICE! Motion Tool Schunk (MTS) does not require any installation!** We recommend using a directory for which you have write permission so that the settings that you make for the *Motion Tool Schunk (MTS)* can be saved and retained.

Default values for motions are predefined for the product as standard values. The following default values are used:

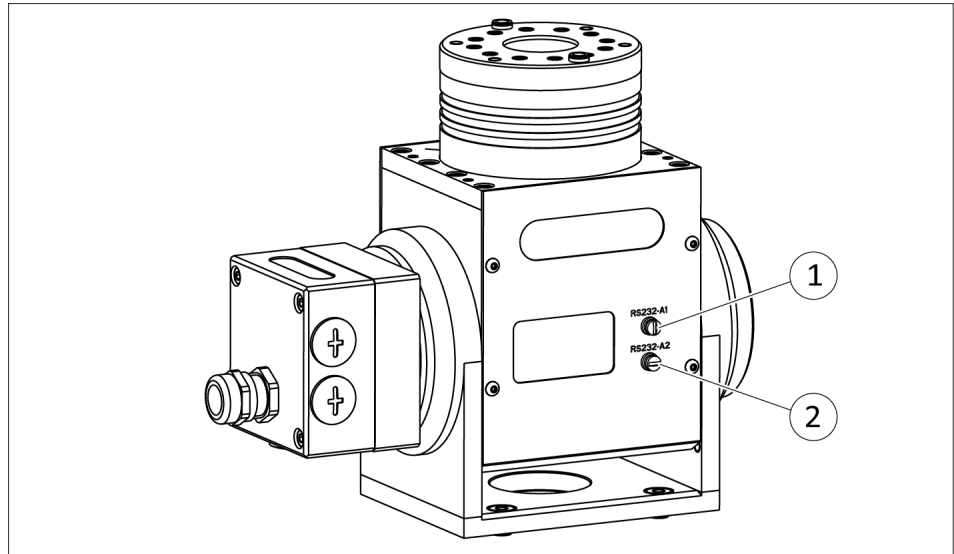
- Target speed
  - 10% of the maximum value
- Target acceleration
  - 10% of the maximum value
- Target jerk
  - 50% of the maximum value

If these values are changed, the change is only saved temporarily, for as long as the product is connected to the logic voltage. When the logic voltage is disconnected from the product and switched on again, the product is always reset to these default values.

- The product has been mechanically and electrically connected
- Connect the product to the computer, [Connect the product to the computer](#) [▶ 35].
- Open *Motion Tool Schunk (MTS)* via *mts.exe*, [Open Motion Tool Schunk \(MTS\)](#) [▶ 36].
- Perform initial commissioning via *Motion Tool Schunk (MTS)*, [Performing initial commissioning](#) [▶ 39].

### 5.7.1 Connect the product to the computer

#### Procedure for Windows 7



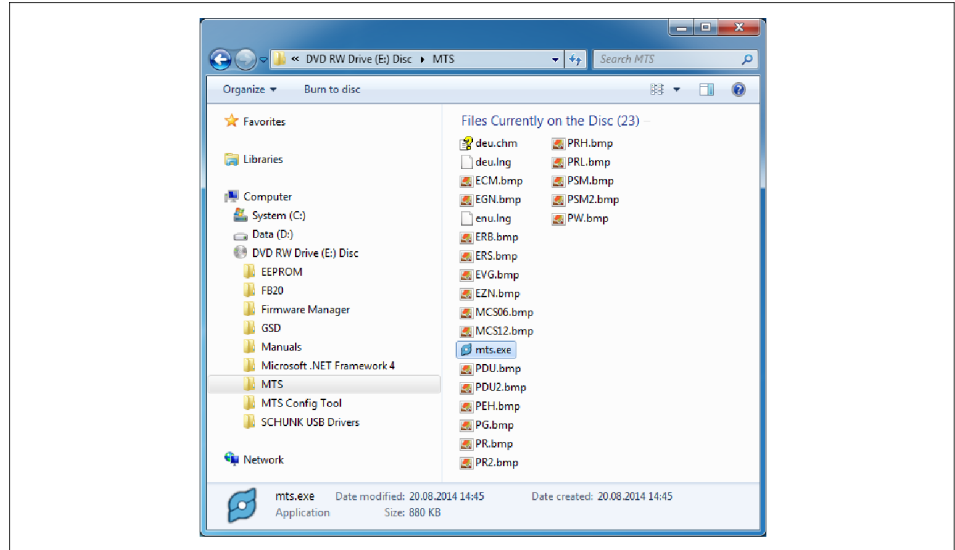
1	RS232 interface for tilt axis	2	RS232 interface for swivel axis
---	-------------------------------	---	---------------------------------

- The power supply of the product is connected
- Connect the USB parameterization cables on the computer and the product to the respective RS232 interfaces.

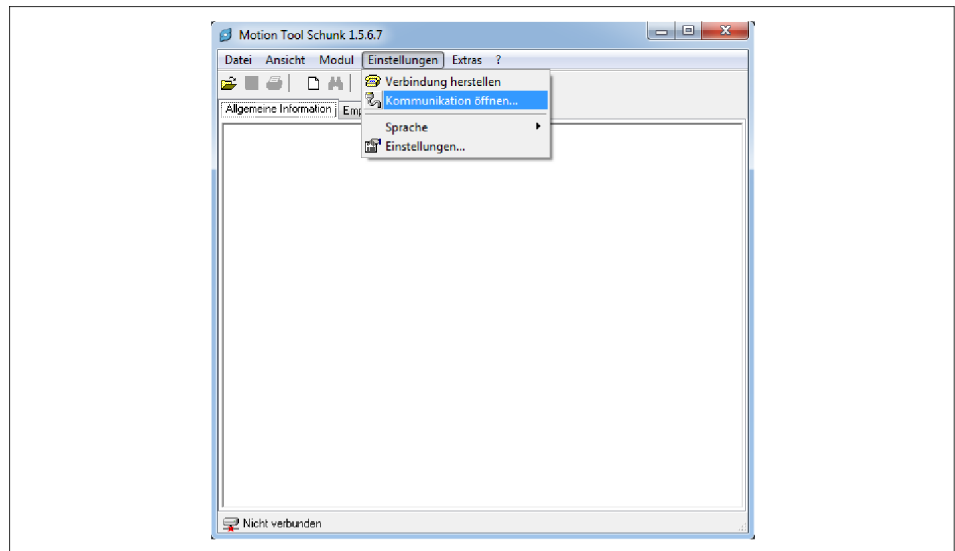
## 5.7.2 Open Motion Tool Schunk (MTS)

### Procedure for Windows 7

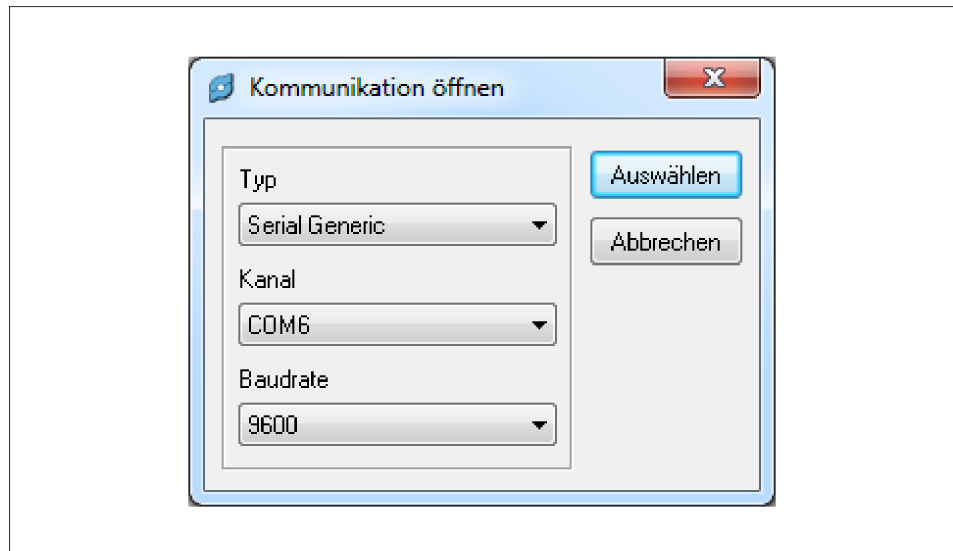
- The computer is connected to the product via the RS232 interface



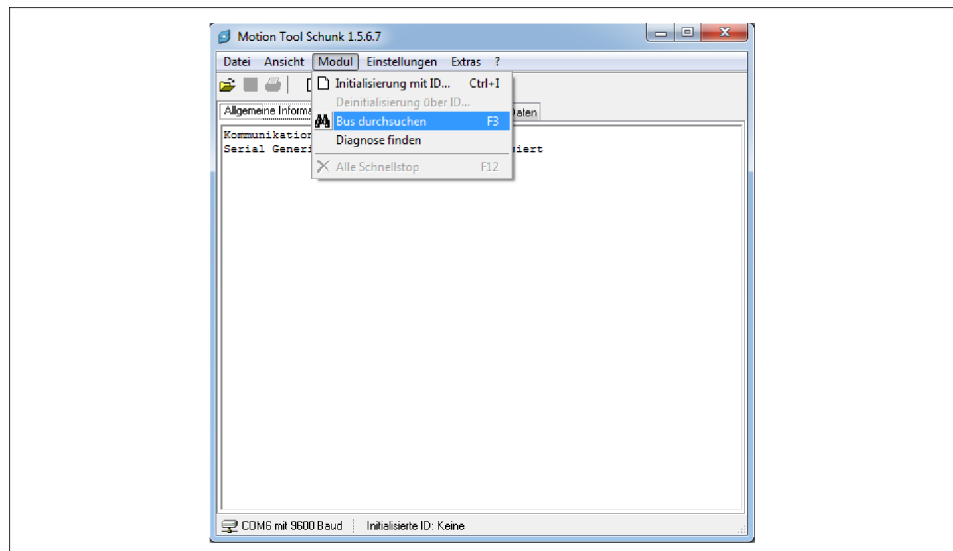
- Open Motion Tool Schunk (MTS) by using *mts.exe*.



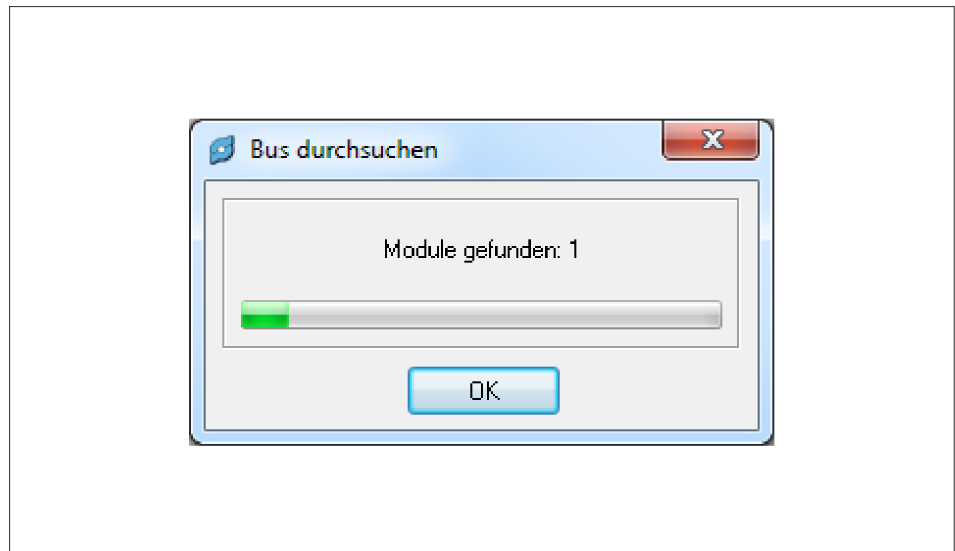
- ✓ The program window is displayed.
- Go to *Settings* and choose *Open Communication...* from the menu.



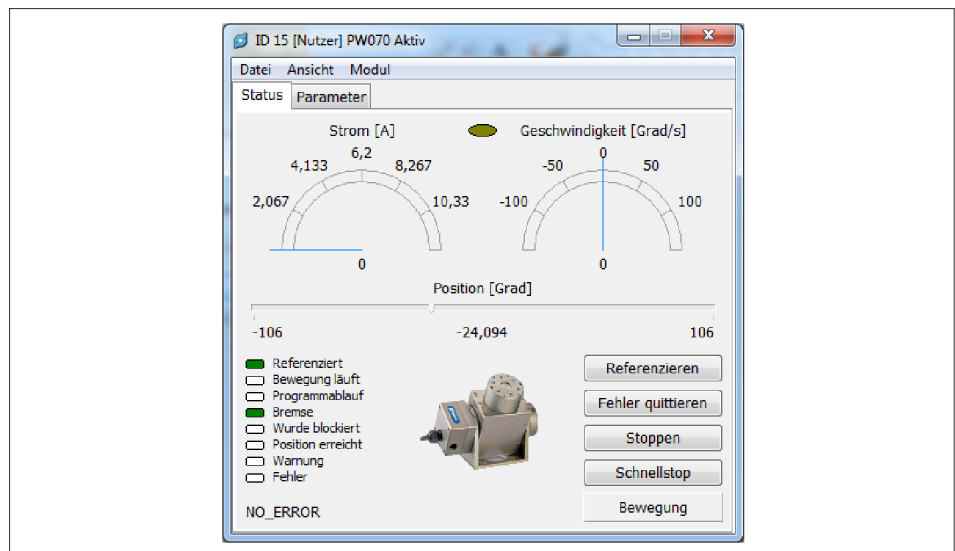
- ✓ The *Open Communication* window appears.
- Select the *Serial Generic* interface and the customer-specific channel, set the baud rate, and press the *Select* button.



- Go to *Module* and select *Search Bus*.



- ✓ Bus is searched and communication is established with the product that is found.

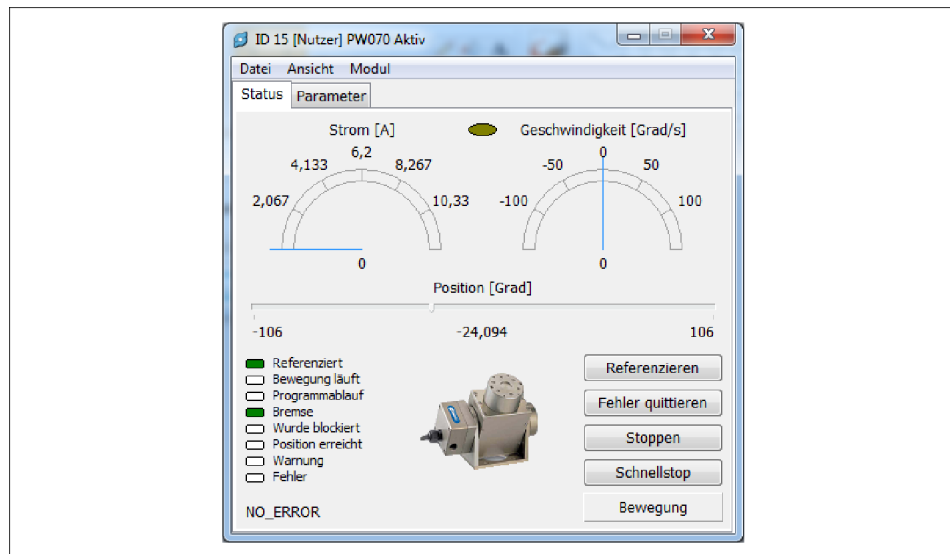


- ✓ The product window is displayed.

### NOTE

In the product window, you can view the status of the product, change parameters, and test Schunk Motion Protocol (SMP) commands; see the *Motion Control* document.

### 5.7.3 Performing initial commissioning



Example of product window in Windows 7

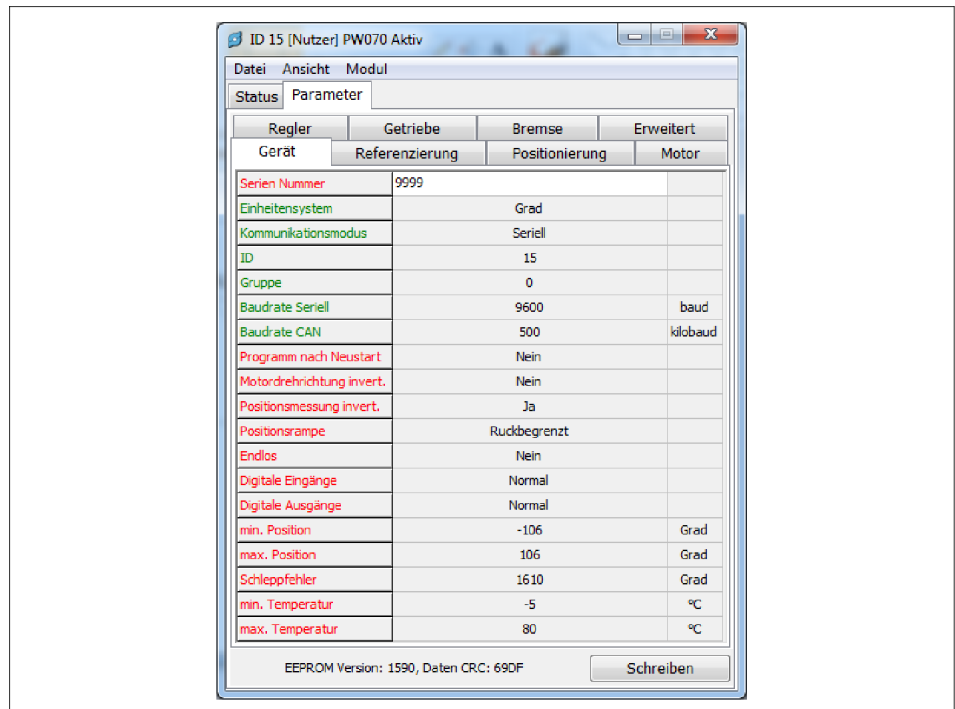
Initial commissioning of the product can be performed without any further parameterization.

The status of the product is displayed on the left side of the product window.

The most important SMP commands can be selected on the right side of the product window. All other possible SMP commands can be found under the *Module* menu option.

#### Procedure for Windows 7

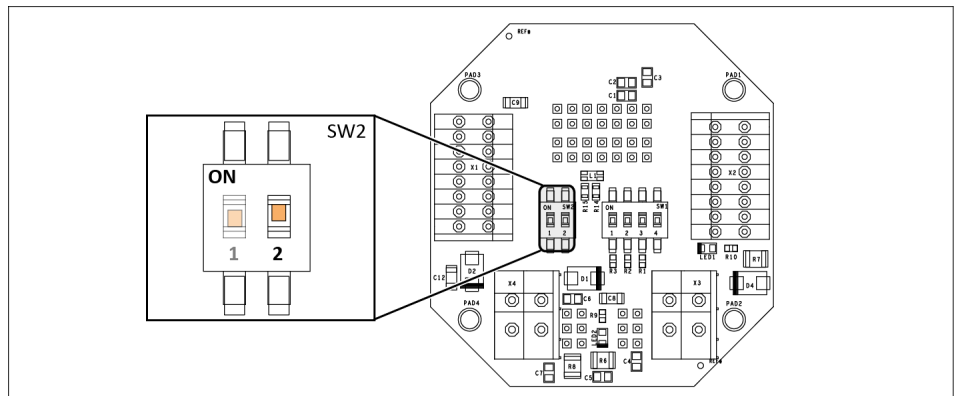
- Click the *Movement* button.
  - ✓ Additional control elements for motion commands are displayed.
- Click the *Move* button.
  - ✓ The product moves in the defined cycle.
- To test further SMP commands, choose the *Module* option.



➤ To set parameters, select the *Parameters* option.

## 5.8 Set the product to its factory settings

The product can be set to its factory settings by the *DEFAULT* function.



Adapter board

2	Default DIP switch		
---	--------------------	--	--

Factory settings/DEFAULT values

Reference value	Axis 1	Axis 2
Interface	RS232	RS232
Baud rate	9600	9600
Address	13	14

- Disconnect the product from the power supply.
- Unscrew the cover of the connection cap.
- Switch *Default* DIP switch (2) to *ON* position.
- Connect the product to the power supply.
- Switch *Default* DIP switch (2) to *OFF* position.
- Disconnect product from the power supply and reconnect again.
- Screw on the cover of the connection cap.
- ✓ The product is now reset to its factory settings.

## 5.9 Updating firmware

### NOTICE

#### Risk of damaging the adapter board!

Faulty updating of the firmware can cause damage to the adapter board.

- Contact SCHUNK service.

## 5.10 Systemintegration

### 5.10.1 Compatibility

The *Motion Tool Schunk (MTS)* configuration and commissioning tool and the *Schunk Motion Protocol (SMP)* firmware are not backward compatible. This means that the versions of *MTS* and *SMP* must always be the same, or that *MTS* must have the same or higher designation than *SMP* within one version.

If the *MTS* version and the *SMP* version are not the same, the product may end up in an undefined status during parameterization.

Example:

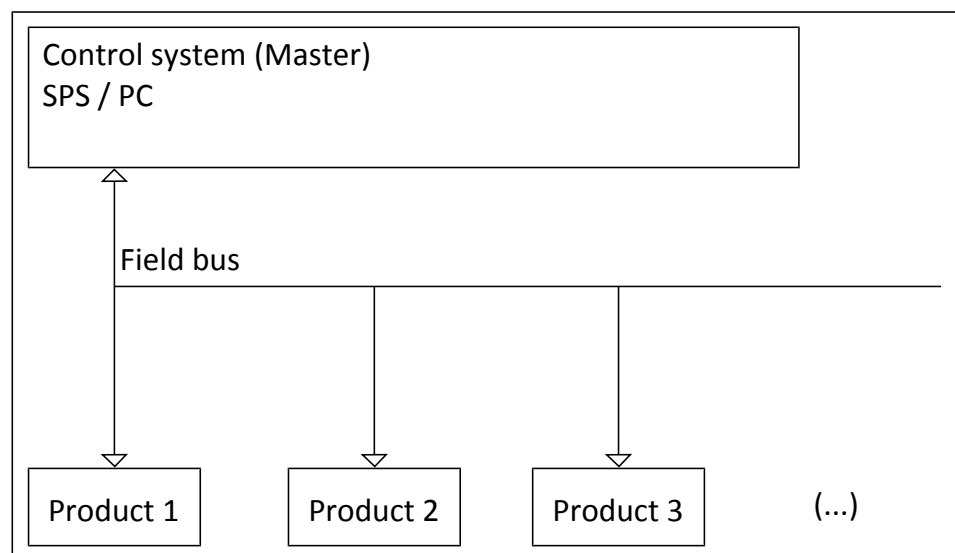
SMP firmware	1.x	1.5 5	1.5 5	1.5 5
MTS	2.x	1.5.0	1.5.5	1.5.6
Compatibility	NOK	NOK	OK	OK

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*.

### 5.10.2 System structure



System structure

#### Data format

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

#### NOTE

The number of connected products depends on the used bus system. A maximum of 255 IDs can be assigned. For more information, see *Motion Control* document.

### 5.10.3 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*.

### 5.10.4 Important commands



#### **⚠ DANGER**

#### **Risk of injury by unexpected movements of the machine/system!**

When settings and parameter entries are faulty, components can move in an uncontrolled manner and cause serious injuries.

- Only specialists or specially trained personnel should carry out settings and enter parameters.

#### **NOTE**

In all examples only the required parameters are listed, not the optional ones. In the examples "M" stands for Master and "S" for Slave (= product).

#### **NOTE**

For further information on the commands, see Software Manual "SCHUNK Motion Protocol".

#### **Reference run**

**Command code:** 0x92

**Description:** Eine Referenzfahrt wird ausgeführt.

**Parameter:** (Master -> Slave): Keine.

**Response** (Slave -> Master): "OK" (0x4F4B) if successful. Product is executing the command.

**Others:** Spontaneous response is possible

*Example for REFERENCE*

	D-Len	Cmd	Param	Meaning
M -> S	0x01	0x92		
S -> M	0x03	0x92	0x4F0x4B	successfully referenced

#### **Positioning run**

**Command code:** 0xB0

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

**Parameter** (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.

**Others:** Spontaneous response occurs when position is reached or if positioning run is terminated earlier

*Example for MOVE POS*

	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]

### Velocity run

**Command Code:** 0xB5

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

**Parameter (Master -> Slave):**

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

**Response (Slave -> Master):** "OK" (0x4F4B) if successful. Product executes the command.

**Others:** Spontaneous message is possible if the product is no longer moving.

*Example for MOVE VEL*

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

### Stop the product

**Command Code:** 0x91

**Description:** Product braked and stopped in the current position.

**Parameter (Master -> Slave):** None.

**Response (Slave -> Master):** "OK" (0x4F4B) if successful.

**Others:** Spontaneous message is possible.

*Example for CMD STOP*

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

### Stop the product immediately

**Command Code:** 0x90

**Description:** Product is stopped as quickly as possible. If a brake is fitted and configured appropriately, it is activated immediately. The motor phases are short-circuited.

**Parameter (Master -> Slave):** None.

**Response (Slave -> Master):** Error message "ERROR EMERGENCY STOP" is triggered.

**Others:** Can only be reset by "CMD ACK."

*Example for EMERGENCY STOP*

	<b>D-Len</b>	<b>Cmd</b>	<b>Param</b>	<b>Meaning</b>
M -> S	0x01	0x90		
S -> M	0x03	0x88	0xD9	Emergency stop executed

**Acknowledge error**

**Command Code:** 0x8B

**Description:** Acknowledgement of an error message.

**Parameter (Master -> Slave):** None.

**Response (Slave -> Master):** "OK" (0x4F4B)

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

*Example for CMD ACK*

	<b>D-Len</b>	<b>Cmd</b>	<b>Param</b>	<b>Meaning</b>
M -> S	0x01	0x8B		
S -> M	0x03	0x8B	0x4F 0x4B	OK

## 6 Troubleshooting

### 6.1 Product does not move

Possible cause	Corrective action
Communication not possible.	Check bus connection., <a href="#">Electrical connection</a> [▶ 24]

### 6.2 Product moves sluggishly or jerks

Possible cause	Corrective action
Dirt deposits in the cavities.	Clean cavities., <a href="#">Maintenance intervals</a> [▶ 48]

### 6.3 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> [▶ 16]

### 6.4 Product stops abruptly

If the delivered GSD file has been integrated, the product can report this by means of the **ERROR\_CABLE\_BREAK (0x76)** parameter.

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
Interval [Mio. cycles]	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 rotary pan-tilt actuator
Type designation	PW V6
ID number	0307330; 0307332; 0307333

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	
1.3.5	Risks related to combined machinery			X

<b>1.3</b>	<b>Protection against mechanical hazards</b>			
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	