

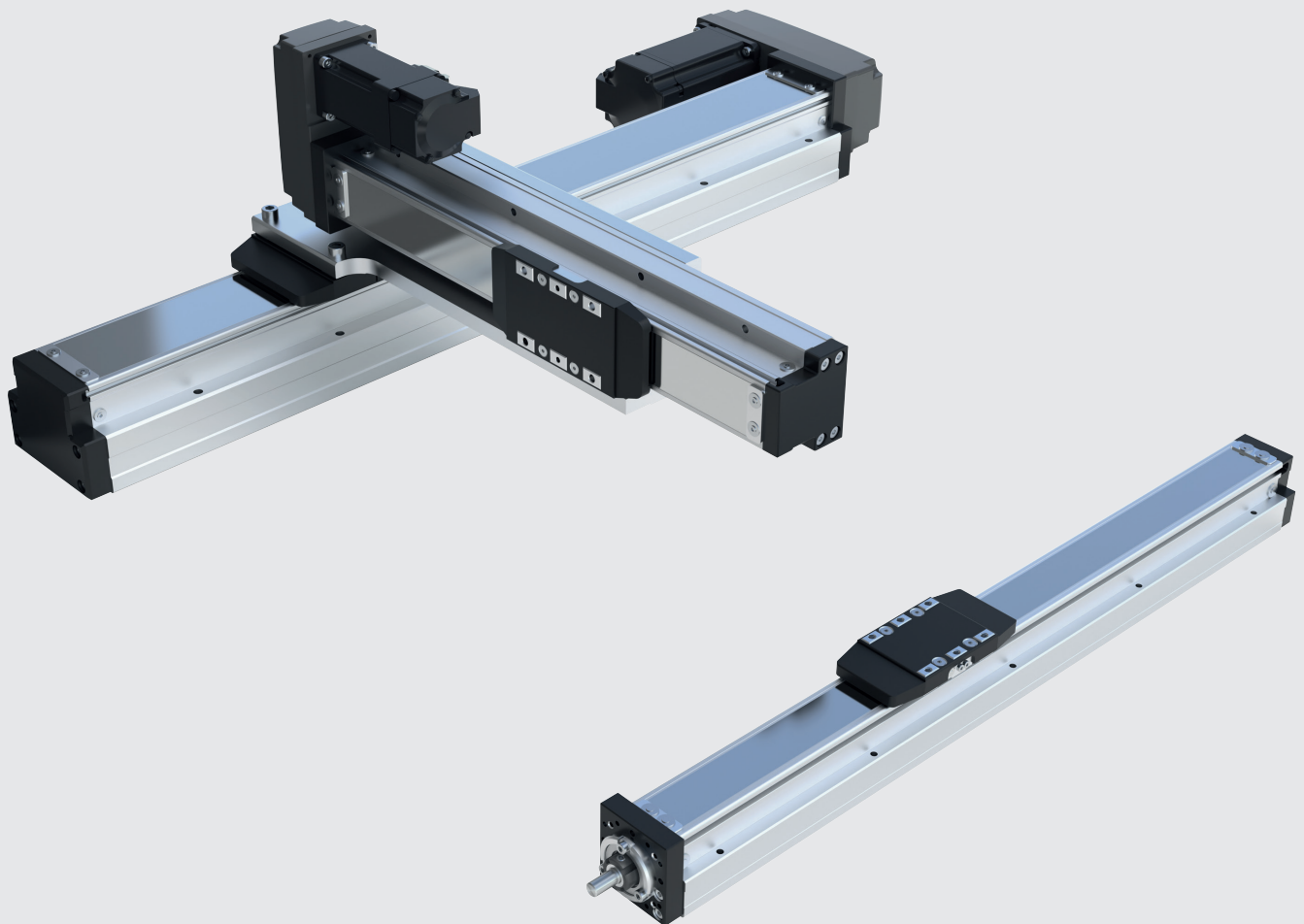
Small Modules Screw driven SMS

R320103227/2026-06
EN



Instructions

ENGLISH



The data specified above only serves to describe the product.

No statements concerning a certain condition or suitability for a certain purpose can be derived from our information.

The information given does not release the user from the obligation of own judgment and verification. Please note that our products are subject to a natural process of wear and aging.

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The title page contains an illustration of a sample configuration.
The product as delivered can differ from the illustration.

The original instructions are in German.

Any dissemination of the product must include these instructions and the safety instructions for linear motion systems R320103152.

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Source: Internet: <http://www.phoenixcontact.com>

Die vorliegende Dokumentation ist in folgenden Sprachen verfügbar.
This documentation is available in the following languages.

DE Deutsch (Originaldokumentation)

EN English

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1 About these instructions

1.1 Validity of the documentation

This documentation applies to the following products:

- Small Modules Screw driven – SMS according to "Small Modules Screw driven – SMS" catalog.

This documentation is intended for assembly personnel, operators and system owners.

This documentation contains important information for the proper and safe mounting, operation, maintenance and disassembly of the product and for troubleshooting simple errors oneself.

- Before working with the product, be sure to read these instructions carefully and completely, especially the chapter titled "Safety instructions".

1.2 Required documentation

Documentation which is indicated by the book symbol  must be obtained before handling the product and must be observed:

Table 1: Required documentation

	Title	Document number	Document type
	Safety instructions for linear motion systems	R320103152	Safety instructions
	Small Modules Screw driven – SMS catalog	R999002167	Catalog

The Rexroth documentation is available for download at www.boschrexroth.com/en/xc/myrexroth/media-directory.

1.3 Presentation of information

To enable users to work rapidly and safely with the product while following these instructions, this documentation uses standardized safety instructions, symbols, terms and definitions, and abbreviations. These are explained in the following sections.

1.3.1 Safety instructions in this manual

This document contains safety instructions preceding any actions that involve a risk of personal injury or damage to property. The safety precautions described must be adhered to.

Safety instructions are structured as follows:

 SIGNAL WORD
Type of hazard! Consequences if ignored. ▶ Precautions to avoid hazard.

- **Warning sign:** draws attention to the hazard
- **Signal word:** indicates the severity of the hazard
- **Type of hazard:** indicates the type or source of hazard
- **Consequences:** describes the consequences that may occur if precautions to avoid the hazard are not taken
- **Hazard avoidance precautions:** indicates how to avoid the hazard

The safety instructions cover the following hazard classes. The hazard class describes the risks involved if the safety instruction is not complied with.

Hazard levels per ANSI Z535.6 - 2006

Warning sign, signal word	Meaning
 DANGER	Indicates a hazardous situation which will result in death or serious injury if not avoided.
 WARNING	Indicates a hazardous situation which may result in death or serious injury if not avoided.
 CAUTION	Indicates a hazardous situation which may result in minor or moderate injury if not avoided.
NOTICE	Property damage: The product or surroundings may be damaged

1.3.2 Symbols

The following symbols indicate notes which are not related to safety but make the documentation easier to understand.

Table 2: Meaning of the symbols

Symbol	Meaning
	If this information is not observed, the product will not be optimally used / operated.
	Single, independent work step
1.	Numbered work steps
2.	The numbers indicate the sequence of the work steps.
3.	
⇒ 7	See section 7
⇒  Fig. 7.1	See figure 7.1
	Screw with strength class...
	Tightening torque
μ	Friction factor for screws

1.3.3 Abbreviations

The following abbreviations are used in this documentation:

Table 3: Abbreviations and definitions

Abbreviation	Unit	Meaning
BASA	(–)	Ball screw assembly
SMS	(–)	Small Modules Screw driven (with ball screw assembly)
f	(Hz)	Frequency
F_{pr}	(N)	Preload force of toothed belt
M	(–)	Motor

2 Safety instructions

The general safety instructions for this product can be found in the documentation "Safety Instructions for linear motion systems". You must have read and understood these before handling the product.

3 Scope of delivery

The following is included within the scope of delivery:

- SMS
 - Drive (motor with flange and coupling, or motor with belt side drive) if ordered. Not assembled.
 - Connecting elements if ordered (not mounted). The screws required to assemble the connecting elements are not included in the scope of delivery.
- Upon receipt of the delivery, immediately check for completeness against the receipt and notify the carrier or Bosch Rexroth AG if any parts are missing.

3.1 Condition as delivered

- Depends on order
- Product is pre-lubricated

3.2 Accessories

Accessories ➡ Catalog



Dimensions and material numbers of the accessories as well as additional fastening accessories ➡ Catalog.

4 Product description

4.1 Performance description

SMS are precise, ready-to-install linear motion systems that feature high performance in a compact size and can be delivered quickly with a favorable price/performance ratio.

Please refer to the note, technical data, dimensions and descriptions in the catalog.

4.2 Product description

The product consists of the following parts:

- SMS, motor¹⁾, flange¹⁾, belt side drive¹⁾

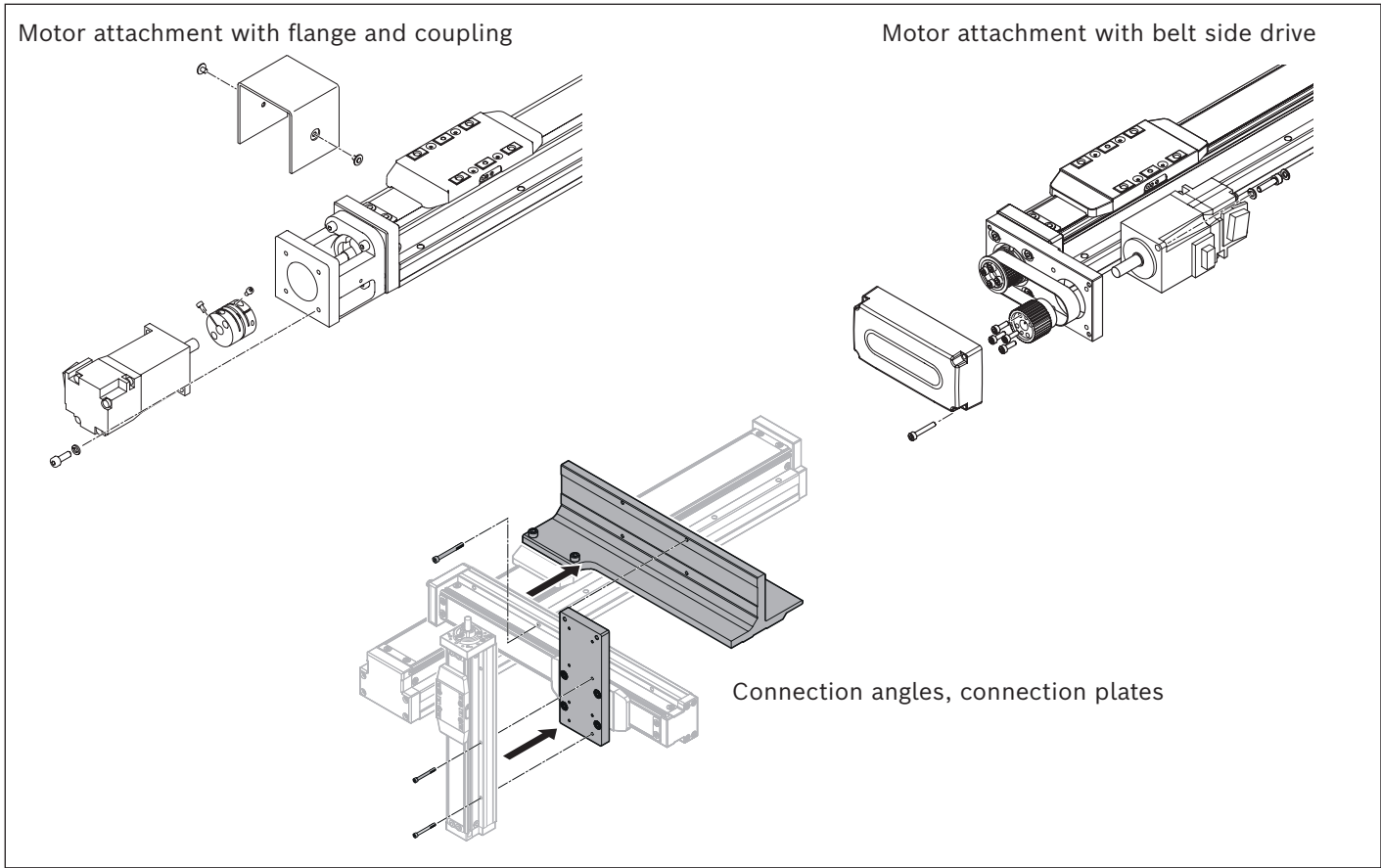


Fig. 1: Product components

¹⁾ Attachments (depend on order, not installed)

4.3 Identification

The nameplate of the product contains the following information:

Table 4: Information on nameplate

Nameplate information	Meaning
MNR	Material number
Type	SMS-030-P8-50
FD	Date of manufacture
(7211)	Manufacturing location

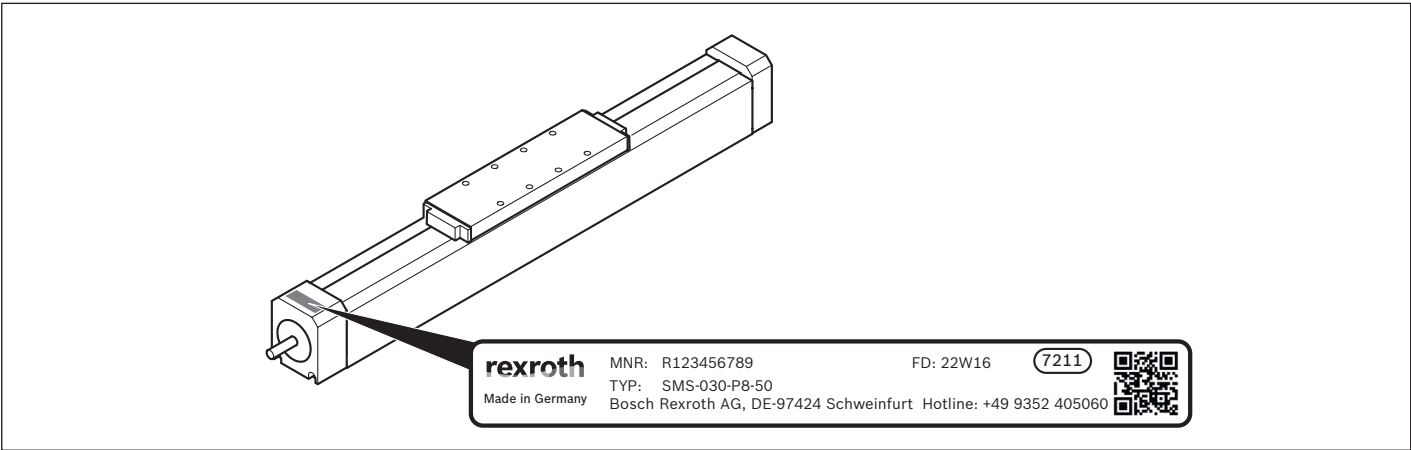


Fig. 2: Nameplate

5 Transport and storage

5.1 Transporting the product

Modules come ready-to-install.



WARNING

Risk of product falling due to inadequate load handling equipment!

Death or severe injury.

- ▶ Use only inspected and suitable load handling equipment.
- ▶ Fasten load handling equipment only to the frame or at the designated points.
- ▶ Do not stand under suspended loads.

1. Before hoisting the product, note the weight ➞ Catalog.
2. Hoist the product as shown in the figure.

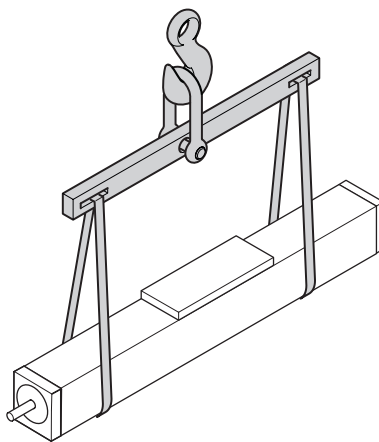


Fig. 3: SMS transport

5.2 Storing the product

NOTICE

Risk of damage due to improper storage!

Potential corrosion of product parts.

- ▶ Store the product only in dry, covered areas.
- ▶ Protect the product from humidity and corrosive agents.

6 Mounting

For dimensions and material numbers of the individual components ➡ Catalog.



WARNING

Risk of product falling due to inadequate load handling equipment!

Death or severe injury.

- ▶ Use only inspected and suitable load handling equipment.
- ▶ Fasten load handling equipment only to the frame or at the designated points.
- ▶ Do not stand under suspended loads.

Risk of product falling if installed vertically or suspended due to lack of protection against falling loads!

Death or severe injury.

- ▶ Secure the product against falling.
- ▶ Do not stand under the product in the hazard zone.

- ▶ Before hoisting the product, note the weight ➡ Catalog.

6.1 Unpacking the product

1. Before hoisting the product, note the weight ➡ Catalog.
2. Take the product out of the packaging and remove the packaging material.
3. Dispose of the packing material according to the local regulations in your country.

6.2 Required accessories

- ▶ Use suitable screws for fastening.

6.3 Installation conditions

- ▶ Take note of the operating conditions ➡ "Operating conditions" on page 41 and catalog.
- ▶ For special operating conditions, please contact us.

NOTICE

Risk of damage due to improper loads!

Damage to the product.

- ▶ Do not attach any projecting loads.

6.4 Installation position

The installation position is basically variable.

NOTICE

Limits are not observed for overhead installation

Damage to the product.

- ▶ All available fastening bores must be used.

The following applies to single-axis systems:

- ▶ The maximum moved external load must not exceed 50% of the horizontal application (➔ catalog Small Modules SMS chapter "Technical data").

The following applies to multi-axis systems:

- ▶ Installation position only as defined in chapter 6.9 "Assembling multi-axis systems".

! WARNING

Risk of carriage falling if installed vertically or at an angle due to lack of fall protection!

Death or severe injury.

- ▶ With a vertical or slanting product, secure the carriage so that it cannot drop down.

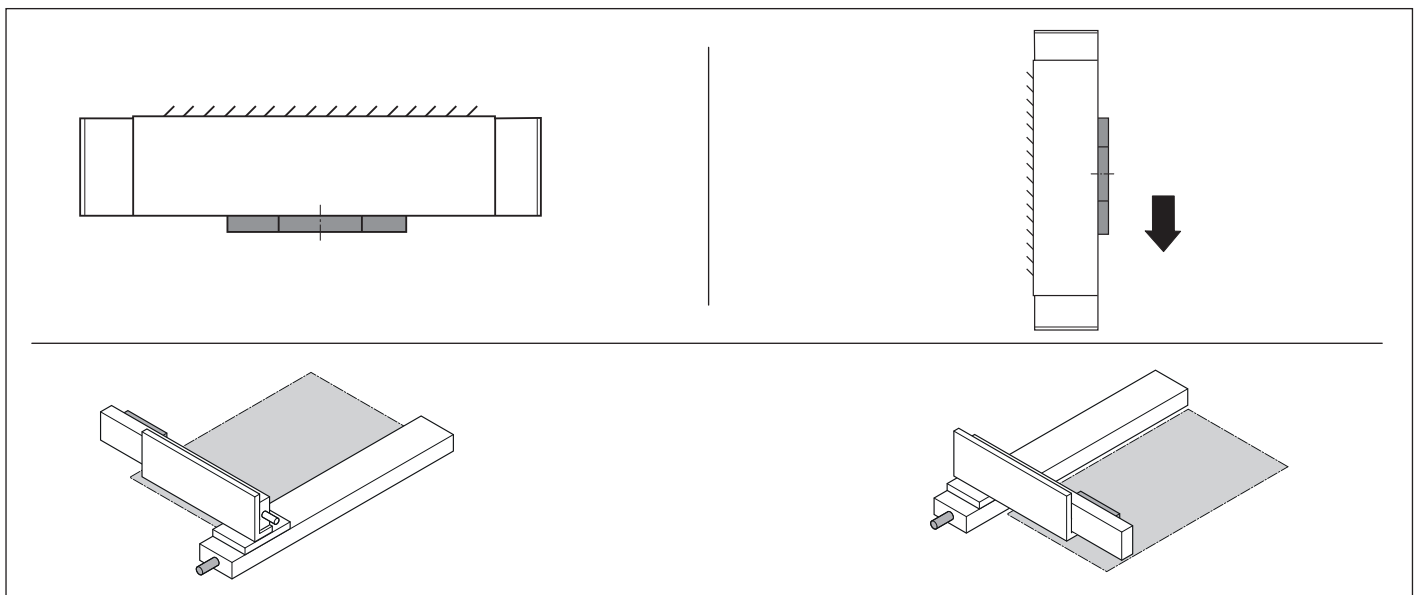


Fig. 4: Installation position

6.5 Fastening the product to the adjoining structure

NOTICE

Risk of product loosening or distortive stress due to improper fastening.

Damage to the product.

- ▶ Do not fasten or support the product at the end blocks/cross ties (1). The frame is the load-bearing part. If possible, support it over the entire length ➔ Fig.5.
- ▶ Recommended number of fastening screws per meter and side: 5 pieces
- ▶ Observe specified tightening torques.

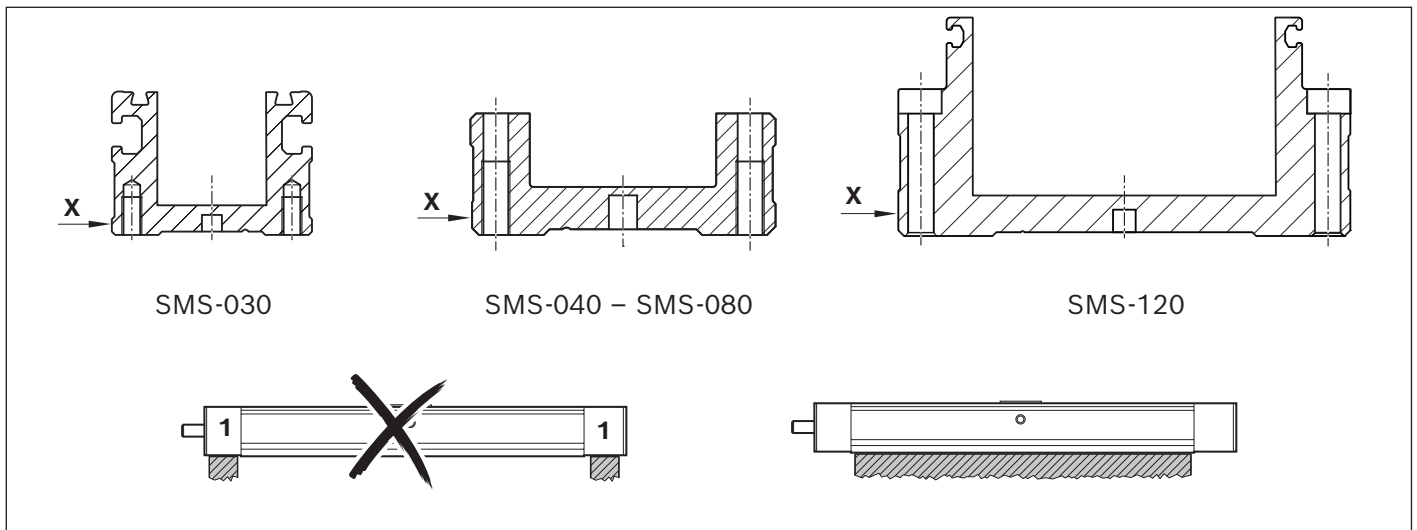


Fig. 6: Fastening

- ▶ Use reference edges (X).
- ▶ Pin holes and longitudinal hole present in the frame (base)
- ▶ Dimensions ➡ Catalog.

6.6 Mounting the electric drive

NOTICE

Risk of excessive torque and rotary speed if limits are not observed!

Damage to the product.

- ▶ Observe the specified limits.

Technical data and limits ➡ Catalog.

Drive types: Flange and coupling with motor, Belt side drive with motor

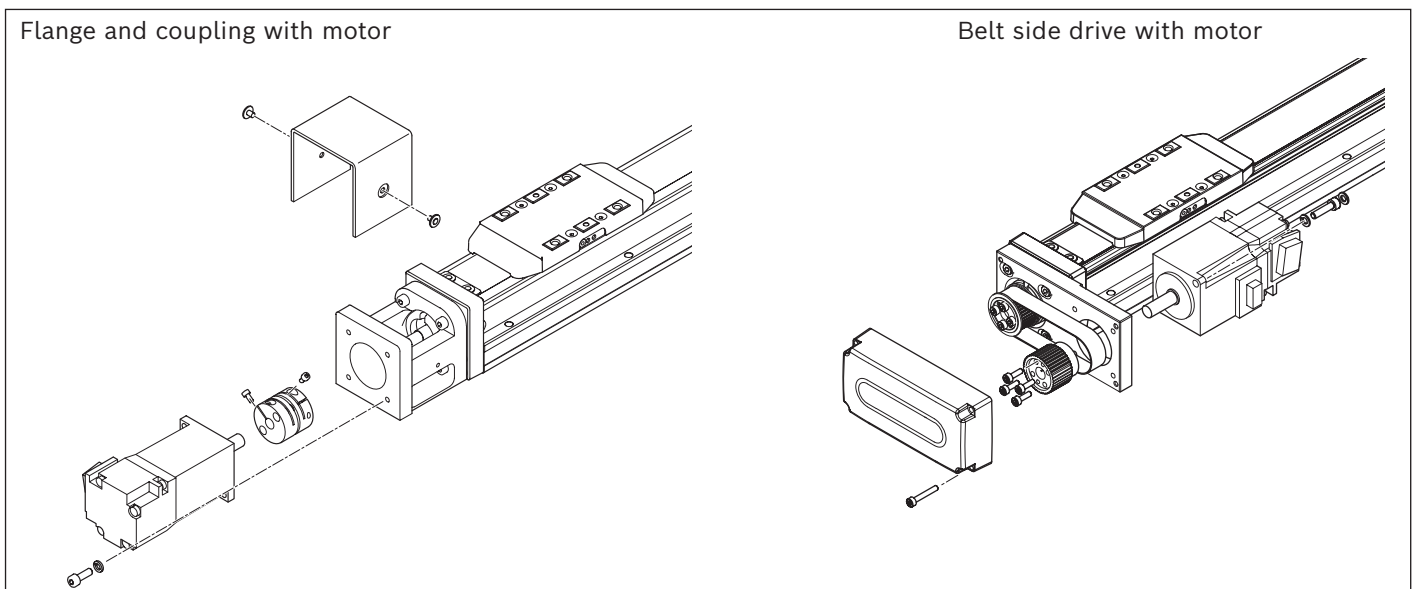


Fig. 5: Drive types



The screw journal of the product and the motor journal must be completely free of grease and oil before mounting.

6.7 Mounting the motor with flange and coupling

6.7.1 SMS-030

- ▶ Follow the safety instructions in chapter 6.6 on page 11.
 - ▶ Tighten the screws to the specified tightening torques ➡ Table 10 on page 41.
1. Push the flange (1) into/onto the locating feature on the product and screw it down onto the end block (3) using screws (2).
 2. Insert coupling (4) into the flange on the screw journal (5) of the product and set dimension A_1 ➡ Fig. 9 and Table 5.
 3. Tighten the screws (6) of the coupling.
 4. Push the motor into the locating feature of flange and coupling and fasten with screws (8) and washers (9).
 5. Tighten the screws (7) of the coupling.
 6. Mount the flange cover panels (10).

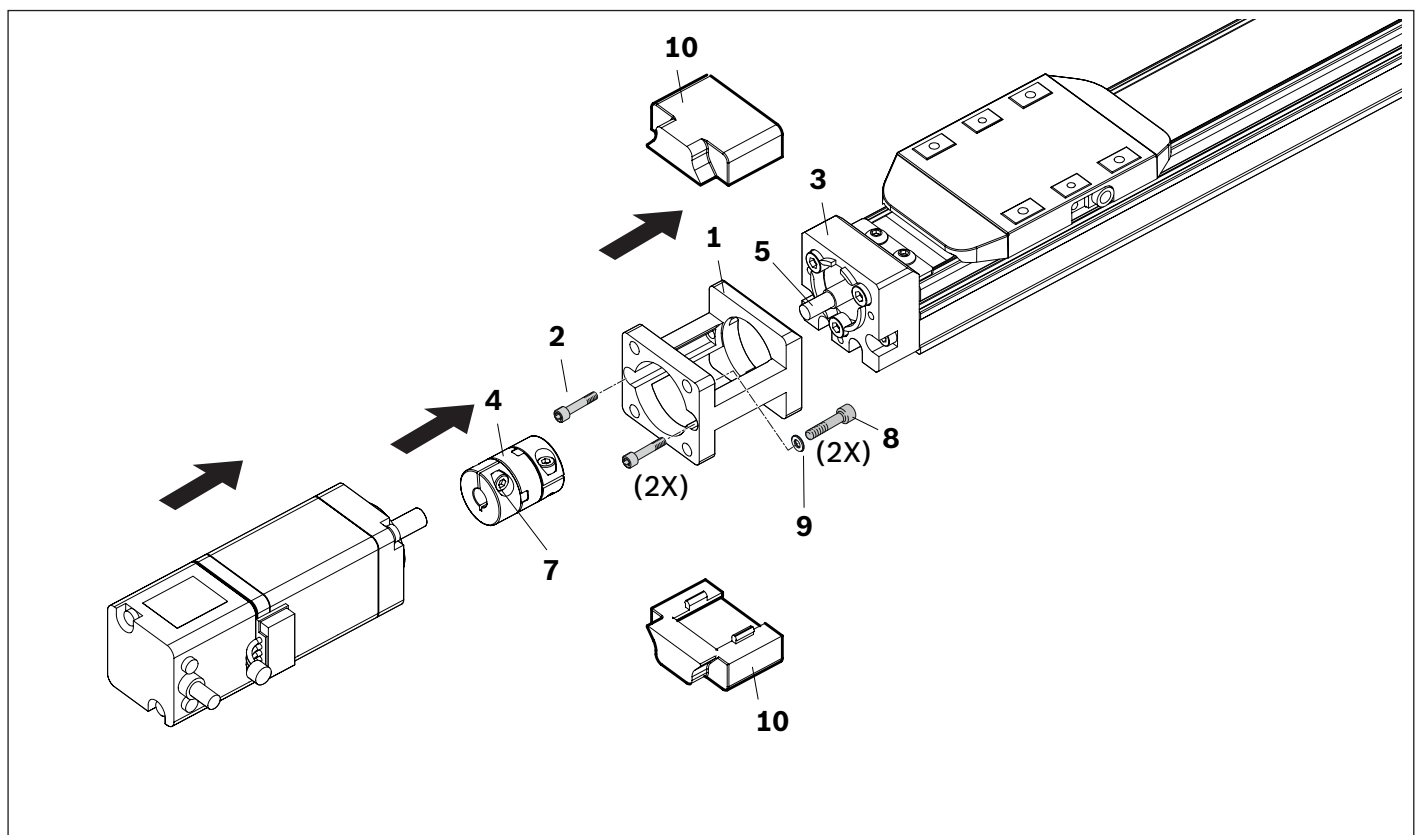


Fig. 7: Mounting the motor with flange and coupling (SMS-030)

6.7.2 SMS-040 – SMS-120

- Follow the safety instructions in chapter 6.6 on page 11.
 - Tighten the screws to the specified tightening torques ➔ Table 10 on page 41.
1. Push the flange (1) into/onto the locating feature on the product and screw it down onto the end block (3) using screws (2).
 2. Insert coupling (4) into the flange on the screw journal (5) of the product and set dimension A_1 ➔ Fig. 9 and Table 5.
 3. Tighten the screws (6) of the coupling.
 4. Push the motor into the locating feature of flange and coupling and fasten with screws (8) and washers (9).
 5. Tighten the screws (7) of the coupling.
 6. Mount the flange cover panels (10).

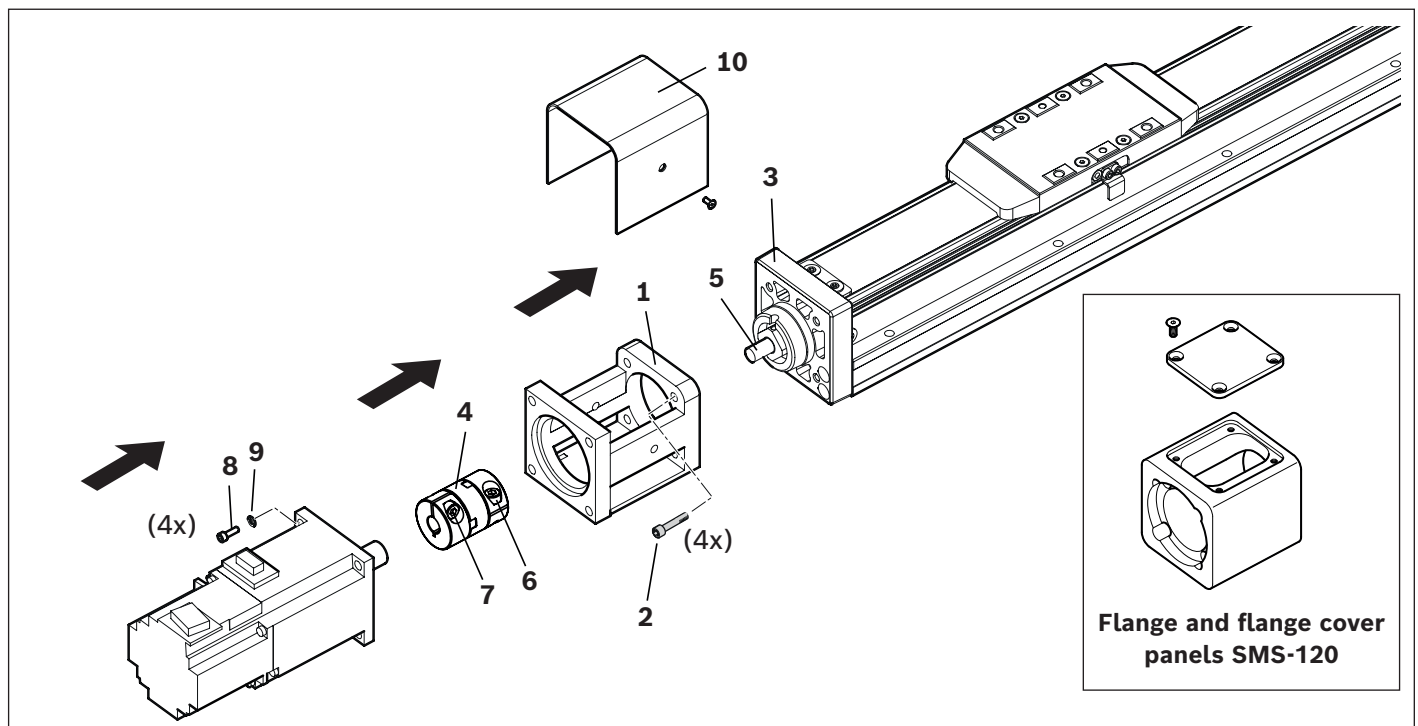
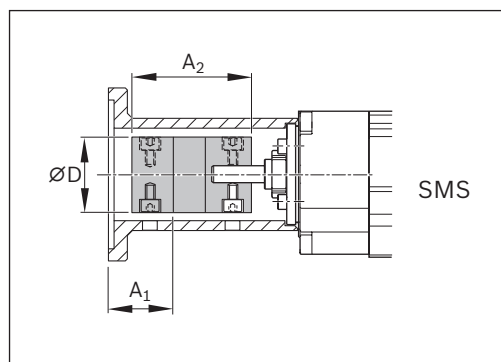


Fig. 8: Mounting the motor with flange and coupling (SMS-040 – SMS-120)

Fig. 9: Dimensions $A_1/A_2/D$ Table 5: Dimensions $A_1/A_2/D$ for motor mounting with flange and coupling

SMS		Maße (mm)			Schrauben (8)
		A_1	A_2	$\varnothing D$	
-030	Mitsubishi 30W	12,9	21,2	15	2 x M3x12
	Yaskawa 30W				4 x M3x6
	ISS0420073				
-040	Mitsubishi 50W	26,5	23,15	26	4 x M4x12
	Yaskawa 50W				
	Delta 50W				
	Panasonic 50W				4 x M4x16
-050	ISS0570106	27,1	23,15	26	4 x M4x12
	Mitsubishi 100W				4 x M3x12
	Yaskawa 100W				4 x M4x12
	Delta 100W				
	Panasonic 100W				
-080	ISS0860156	31,1	27,3	34	4 x M5x18
	Mitsubishi 200W				4 x M4x18
	Yaskawa 200W				4 x M5x30
	Delta 200W				
	Panasonic 200W				
-120	ISS0860156	31,1	27,3	34	4 x M5x18
	Mitsubishi 400W				4 x M4x18
	Yaskawa 400W				4 x M5x16
	Delta 400W				
	Panasonic 400W				

6.8 Mounting the motor with belt side drive

- ▶ Follow the safety instruction in chapter 6.6 on page 11.
- ▶ Tighten the screws to the specified tightening torques ➡ Table 10 on page 41.

The belt side drive (RV) can be attached in three directions.

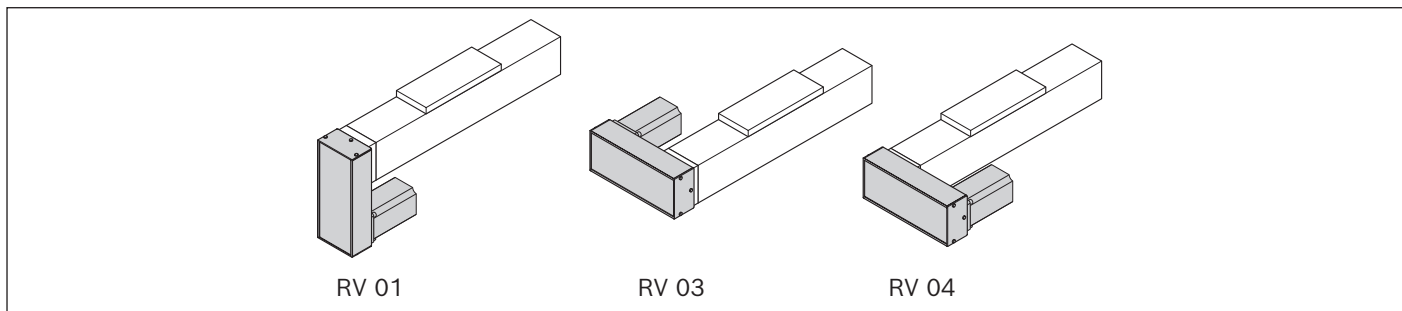


Fig. 10: Attachment options for the belt side drive

6.8.1 SMS-030 – SMS-050

- ▶ Screw the base plate (1) of the timing belt side drive onto the SMS using screws (6)
 - ▶ Assemble first belt pulley (4)
1. Pre-mount the belt pulley (4) (with tensioning unit if necessary) with the toothed belt (5) fitted onto the screw journal (10) of the SMS.
 2. Set distance A ➡ Fig. 13 and Table 6 and fasten belt pulley (4) with screws (12) or tensioning unit.
 - ▶ Mounting the second belt pulley and the motor
 1. Pre-mount the motor with screws (8) and washers (9) as close as possible to the SMS to permit problem-free insertion of the motor-side belt pulley (3) (with tensioning unit if necessary).
 2. Push the belt pulley (3) (with tensioning unit if necessary) onto the motor journal (11) and insert the toothed belt into the belt pulley.
 3. Set distance B ➡ Fig. 13 and Table 6, and fasten belt pulley (3) with screws (13) (with tensioning unit if necessary).
 4. Tension the toothed belt / complete the assembly ➡ 6.8.3 on page 16.

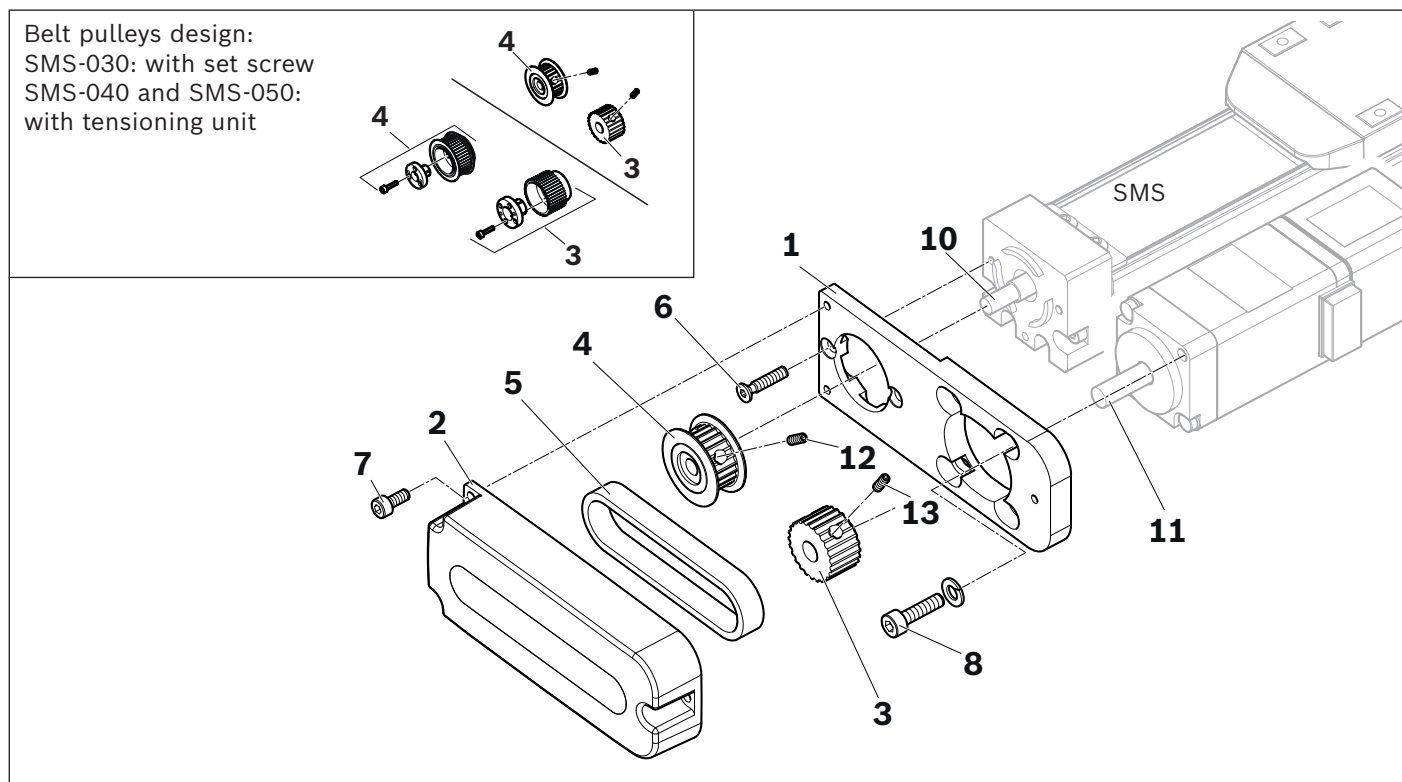


Fig. 11: Mounting the SMS-030 – SMS-050 belt side drive

6.8.2 SMS-080 / SMS-120

- Mount the base plate (1) of the timing belt side drive onto the SMS using screws (6)
- Mounting the first belt pulley
 1. Pre-mount the belt pulley (4), the fitted toothed belt (5) and tensioning unit (4) onto the screw journal (16) of the SMS.
 2. Set distance A ➡ Fig. 13 and Table 6 and fasten the tensioning unit.
- Mounting the second belt pulley and the motor
 1. Pre-mount the motor with screws (8) and washers (9) as close as possible to the linear system (SMS) to permit problem-free insertion of the motor-side belt pulley (4/3).
 2. Push the belt pulley (3) with tensioning unit onto the motor journal (17) and insert the toothed belt (8) into the belt pulley.
 3. Set distance B ➡ Fig. 13 and Table 6 and fasten the tensioning unit.
 4. Mounting the tensioning roller (18) for belt tensioning: pre-mount washer (13), bearing (10), bearing attachment (11) together with the screw (12) through the longitudinal hole with square nut (14) on the rear side of the base plate (1).
 5. Tension the toothed belt (5) / complete the assembly ➡ 6.8.3 on page 16.

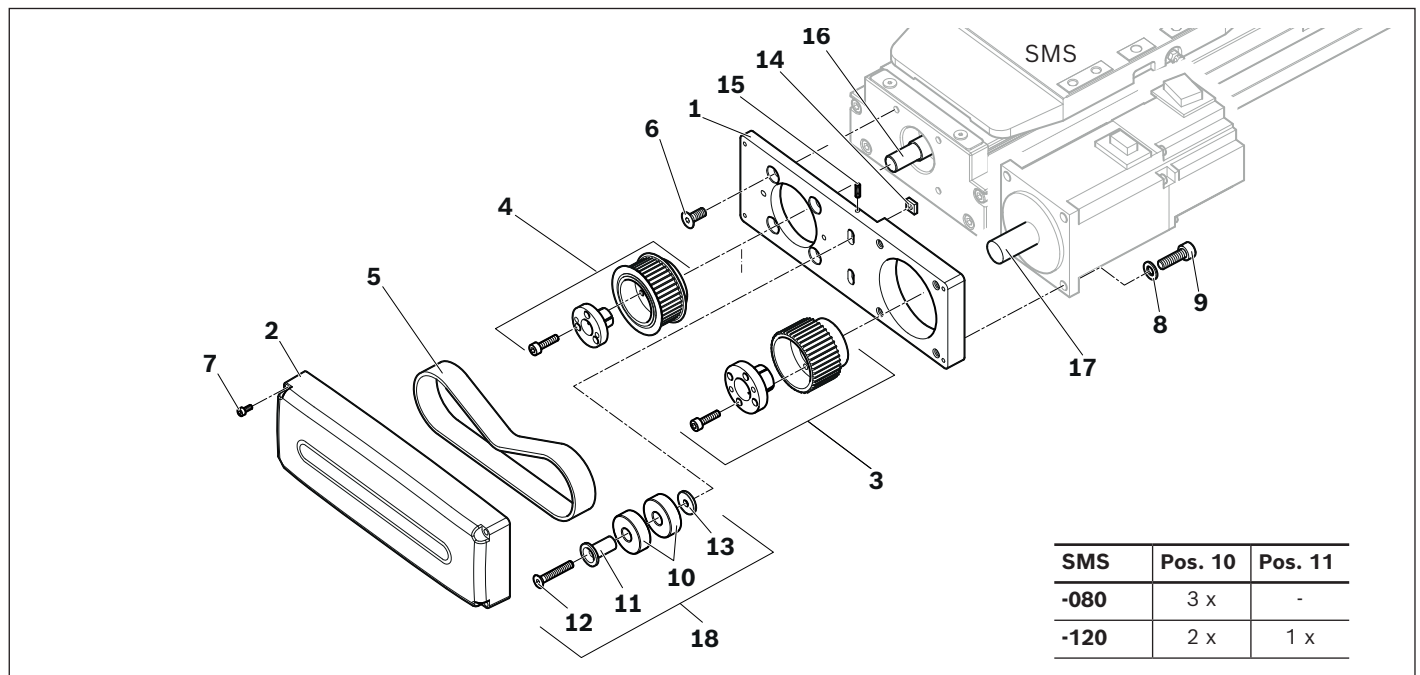


Fig. 12: Mounting the SMS-080 / SMS-120 belt side drive

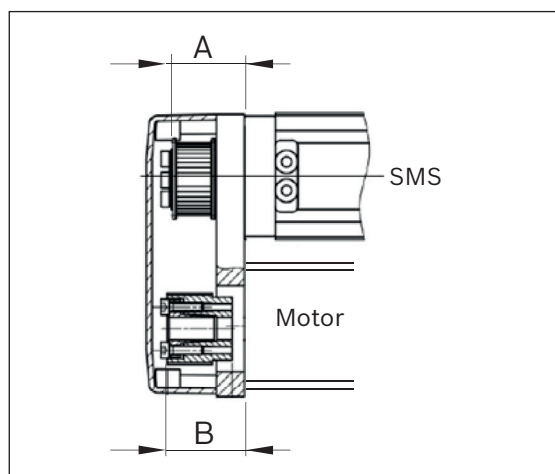


Fig. 13: Dimensions A/B

Table 6: Dimensions A / B for motor mounting with belt side drive

SMS		Dimensions (mm)		Screws (8)
		A	B	
-030	Mitsubishi 30W	13,25	15,50	2 x M3x12
	Yaskawa 30W		17,25	4 x M3x6
	ISS0420073			
-040	Mitsubishi 50W	24,60	27,50	4 x M4x12
	Yaskawa 50W			
	Delta 50W			
	Panasonic 50W	25,60	25,60	4 x M4x16
-050	ISS0570106			
	Mitsubishi 100W	29,50	27,50	4 x M4x12
	Yaskawa 100W			
	Delta 100W			4 x M3x12
-080	Panasonic 100W	30,00	30,00	4 x M4x12
	ISS0570106			
	Mitsubishi 200W	31,55	33,00	4 x M5x18
	Yaskawa 200W			
-120	Delta 200W			4 x M4x18
	Panasonic 200W	34,00	42,00	4 x M5x30
	ISS0860156			
	Mitsubishi 400W	RV 01: 25,85	32,10	4 x M5x18
	Yaskawa 400W	RV 03 / RV 04: 28,85		4 x M4x18
	Delta 400W			
	Panasonic 400W	RV 01: 26,60	32,10	4 x M5x16
	ISS0860156	RV 03 / RV 04: 29,60		

6.8.3 Tensioning toothed belt / completing drive assembly

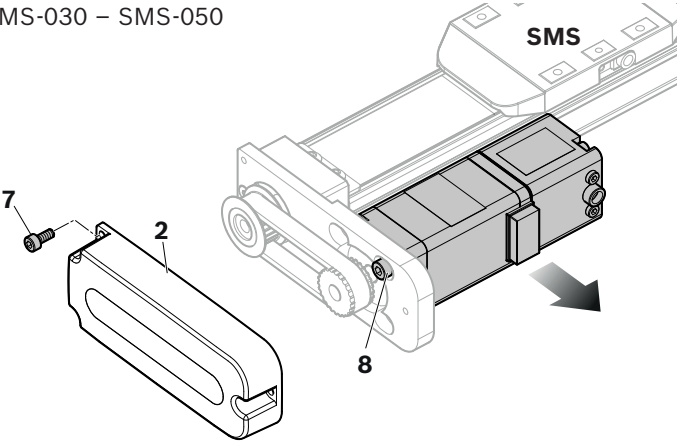
NOTICE

Excessive belt pulley pretensioning can cause the toothed belt to break at the product or the motor!
Damage to the product.
► Observe permissible limits!

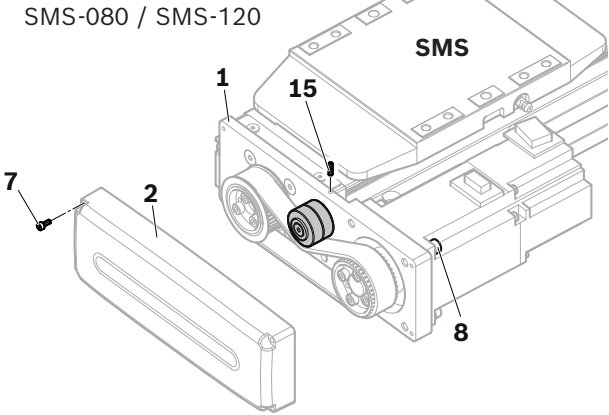
- 1. Loosen the motor mounting screws (8).
- 2. SMS-030 – SMS-050: by pulling the motor away from the SMS, the toothed belt is tensioned.
- 3. SMS-080 / SMS-120: by screwing in the set screw (15) (on the side of the base plate (1)), the square nut (14) is pressed down and the toothed belt tensioned.
- 4. Set the belt frequency f using a frequency measuring instrument or force F_{pr} and tighten the motor mounting screws (8).
- 5. Fasten the cover (2) of the belt side drive using screws (7).

 Observe the tightening torques!

SMS-030 – SMS-050



SMS-080 / SMS-120



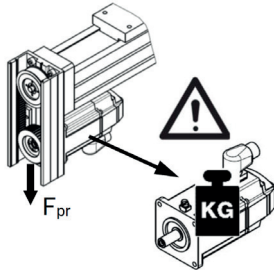
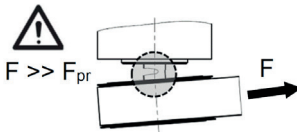
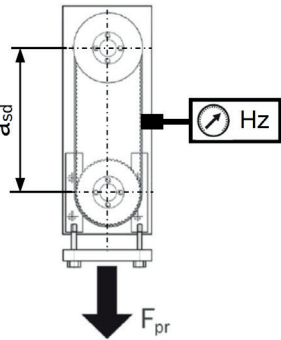
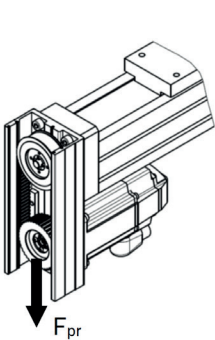


Table 7: Servo motors

SMS	a_{sd} (mm)	f (Hz)	F_{pr} (N)
-030	40	490~583	12-17
-040	50	302~359	
-050	58	239~284	
-080	80	182~209	32-42
-120	100	182~209	

Table 8: Stepper motors

SMS	Motor attachment	Stepper motors	a_{sd} (mm)	f (Hz)	F_{pr} (N)
-030	RV03/RV04	ISS0420073	45	430~493	12-17
	RV01		45		
-040	RV01/03/04	ISS0570106	64	242~305	
-050	RV01/03/04		67	283~331	32-42
-080	RV01/03/04	ISS0860156	94	132~218	
-120	RV03/RV04		120	115~154	
	RV01		95	145~182	

a_{sd} = Axle distanced (mm)

f = Belt frequency (Hz)

F_{pr} = Preload force (N)

Fig. 14: Tensioning the toothed belt / tightening the motor / mounting the cover

6.9 SMS multi-axis system assembling

! WARNING

Risk of product falling/toppling due to lack of protection!

Damage to the product/injuries

- Mounting of the axes must be performed by two persons.

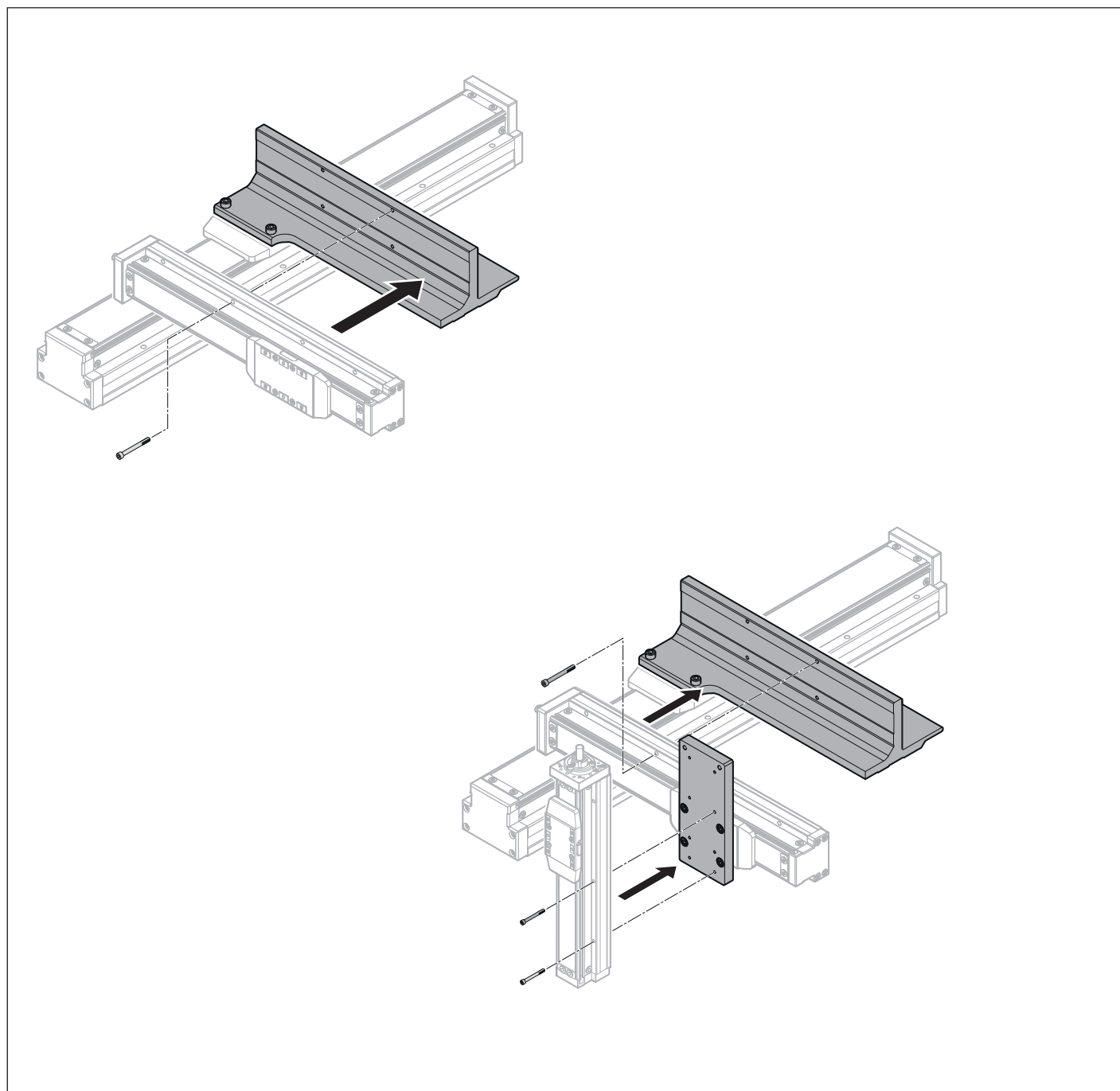


Fig. 15: SMS multi-axis system assembling



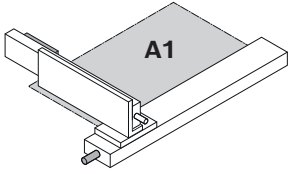
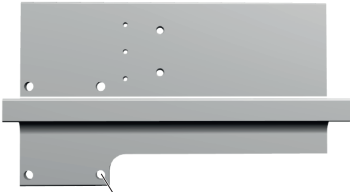
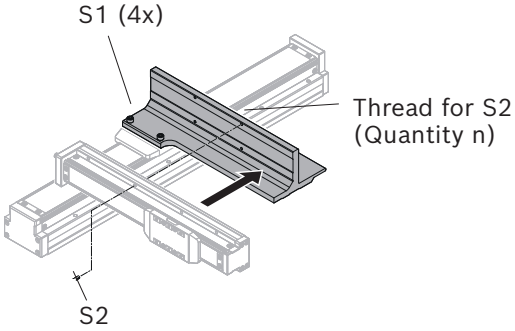
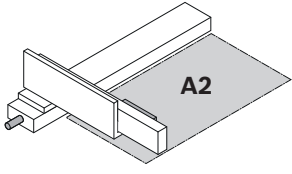
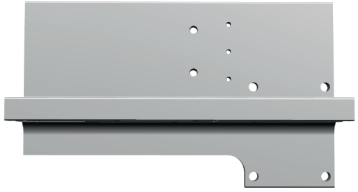
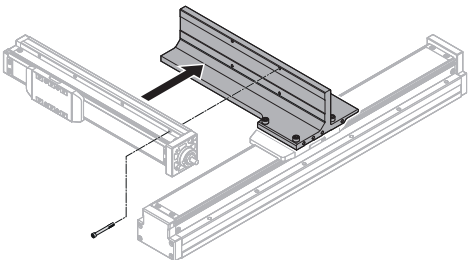
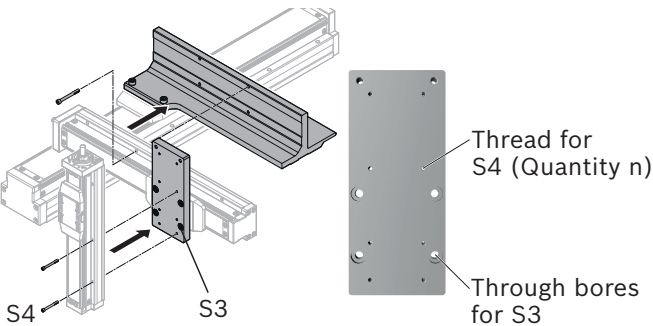
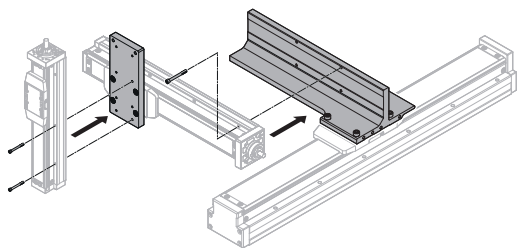
For further information on installing the multi-axis systems, see the following pages

6.9.1 Connection angles, connection plates

Table 9: Connection angles, connection plates

Connection angles						
Variant	Y stroke (mm)	Material-no.	 (KG)	 S1³⁾	 S2³⁾	Quantity (n)
2D1	100	R02680C003 ¹⁾	0.63	4 x M5 x 18	M3 x 30	4
		R02680C004 ²⁾				
2D2	100	R02680C005 ¹⁾	1.05	4 x M6 x 22	M4 x 30	4
		R02680C007 ²⁾				
	200	R02680C006 ¹⁾	1.54		M4 x 30	6
		R02680C008 ²⁾				
2D3	100	R02680C009 ¹⁾	1.87	4 x M6 x 30	M5 x 45	4
		R02680C011 ²⁾				
	200	R02680C010 ¹⁾	2.58		M5 x 45	6
		R02680C012 ²⁾				
2D4	100	R02680C013 ¹⁾	3.69	4 x M6 x 30	M6 x 50	6
		R02680C015 ²⁾				
	200	R02680C014 ¹⁾	4.67		M6 x 50	8
		R02680C016 ²⁾				
	400	R02680C021 ¹⁾	6.68		M6 x 50	12
		R02680C023 ²⁾				
600	R02680C022 ¹⁾	8.67	M6 x 50	16		
	R02680C024 ²⁾					
3D1	100	R02680C005 ¹⁾	1.05	4 x M6 x 22	M4 x 30	4
		R02680C007 ²⁾				
	200	R02680C006 ¹⁾	1.54		M4 x 30	6
		R02680C008 ²⁾				
3D2	100	R02680C009 ¹⁾	1.87	4 x M6 x 30	M5 x 45	4
		R02680C011 ²⁾				
	200	R02680C010 ¹⁾	2.58		M5 x 45	6
		R02680C012 ²⁾				
	400	R02680C017 ¹⁾	3.99		M5 x 45	10
		R02680C019 ²⁾				
600	R02680C018 ¹⁾	5.41	M5 x 45	14		
	R02680C020 ²⁾					
Connection plates						
				S3³⁾	S4³⁾	
3D1	-	R02680C001	0.31	4 x M5 x 18	M3 x 30	8
3D2	-	R02680C002	2.24	4 x M6 x 20	M4 x 30	10

1) Angle version for travel range „A1“
2) Angle version for travel range „A2“
3) Recommended cylinder head screws (not included in the delivery) with hexagon socket according to EN ISO 4762 / DIN 912; Strength class 8.8

Angle version	
Travel range A1	Travel range A2
 A1  Through bores for S1  S1 (4x) Thread for S2 (Quantity n) S2	 A2  
 S4 S3 Thread for S4 (Quantity n) Through bores for S3	

-  – S1: for mounting the connecting angle on the X-axis
- S2: for mounting the Y-axis on the connecting angle
- S3: for mounting the connection plate on the Y-axis
- S4: for mounting the Z-axis on the connection plate

7 Connecting the product electrically



Fig. 16: Connecting the product electrically



WARNING

Risk of electric shock due to contact with live parts!

Death or severe injury.

- ▶ Before working on the electrical equipment, switch off the power supply and secure it against being switched on again.
- ▶ Follow the safety instructions given in the documentation for the controller used.
- ▶ Observe the safety regulations for working with high-voltage equipment!

8 Commissioning

- ▶ Do not commission the product until it has been verified that the end product (for example a machine or system) into which the Rexroth product has been installed complies with the country-specific requirements, safety regulations and standards for the application.

8.1 Checking the operating conditions

- ▶ Observe the technical data ➡ Catalog.
- ▶ Operating conditions ➡ "Operating conditions"

8.2 Simple commissioning of the SMS axis with stepper motors

8.2.1 Startup for simple positioning applications

Standard use:

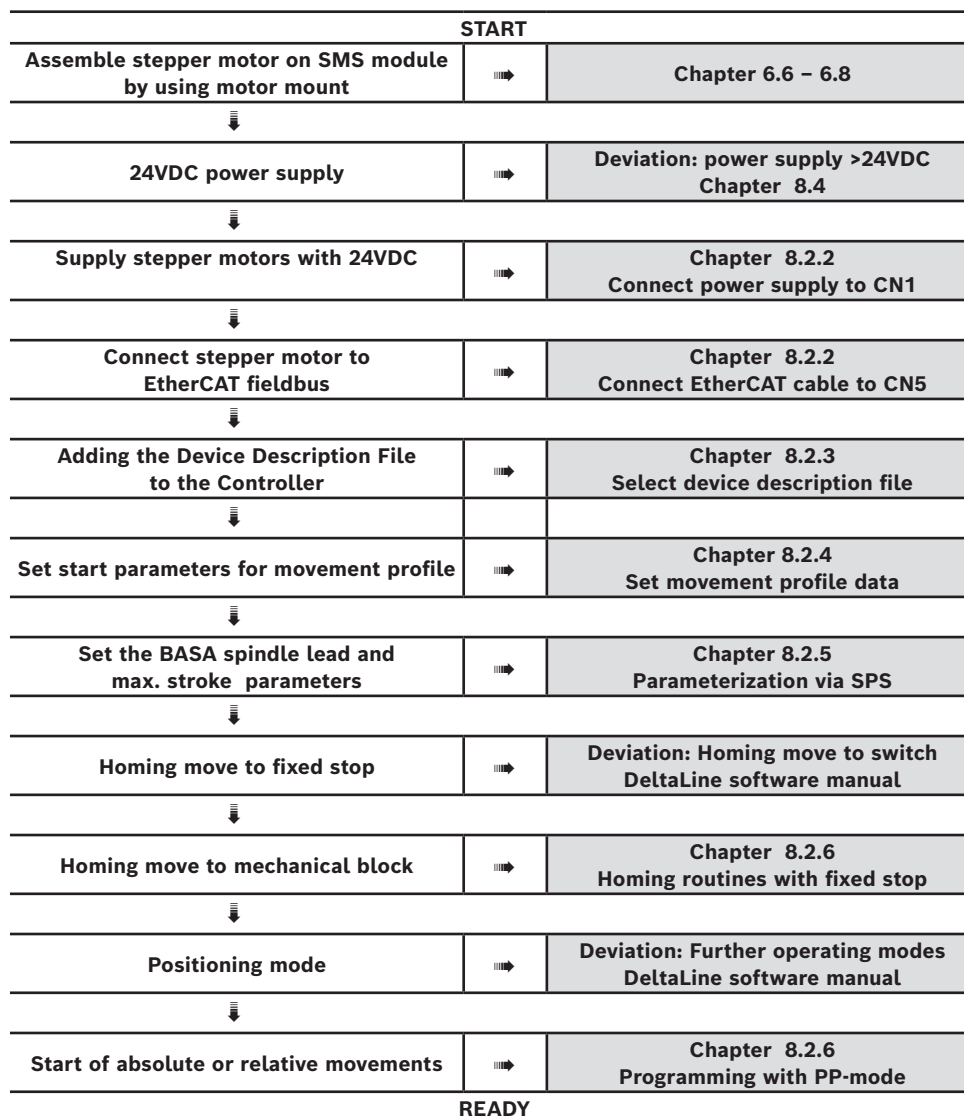
SMS modules with ISSxx stepper motors for multi-positioning tasks, i.e., relative or absolute movement of the SMS modules to two or more target positions. The travel cycles have fixed acceleration/deceleration ramps and optionally fixed or cycle-dependent travel speeds.

The performance spectrum of the travel cycles can be found in the catalog under technical data. The specified data refers to a supply voltage of 24 VDC for the ISSxx stepper motors.

For ease of use, the ISSxx stepper motors with EtherCAT interface are almost completely pre-parameterized at the factory. For final motor parameterization, only the maximum stroke and lead screw pitch must be set from the controller via the EtherCAT fieldbus.

In automatic mode, referencing to the mechanical stop of the SMS modules can be initiated via an EtherCAT command. After successful referencing, absolute or relative movement can be performed by specifying the target position and issuing a start command. This means that the motor's internal drive controller moves the SMS table to the target position using the specified travel profile.

- The process description shows the individual steps from commissioning to creating the PLC program with references to further information



8.2.2 Cabling

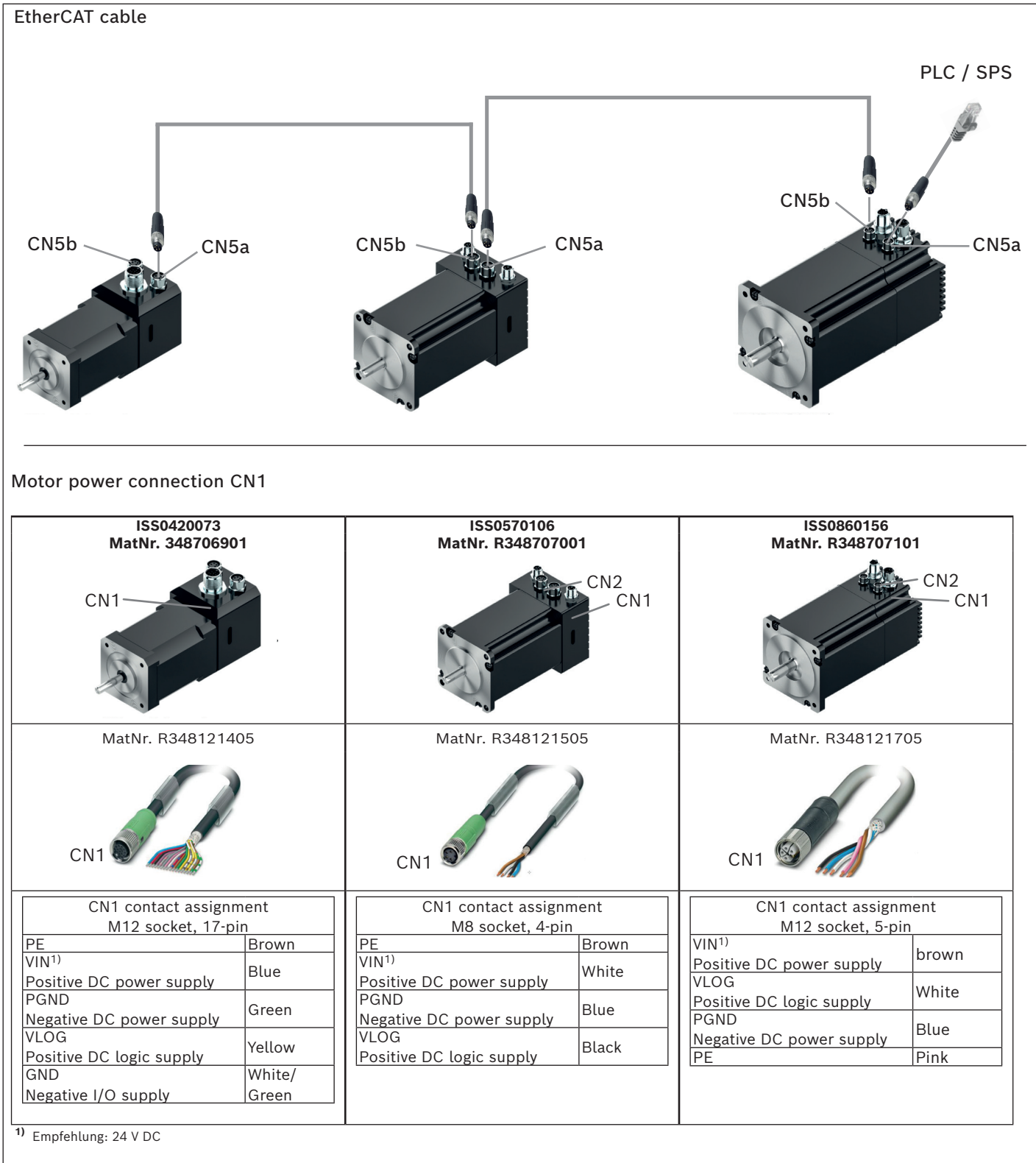


Fig. 17: Cabling

- ▶ Technical data for the cables ➔ 8.3
- ▶ Power supply recommendation ➔ 8.4
- ▶ Information on plug assignment: see motor data sheet

8.2.3 Selection and download of the correct device description file for the higher-level PLC

 ISS0420073_ETHERCAT_Fw_C680_VF3r81_...xml

 ISS0570106_ETHERCAT_Fw_C680_VF3r81_...xml

 ISS0860156_ETHERCAT_Fw_C680_VF3r81_...xml

Detail page
https://www.boschrexroth.com/de/de/media-details/e9acf9bb-1b50-4ade-af9e-4f716bedee9d

Direct link: File will be downloaded immediately
https://www.boschrexroth.com/media/e9acf9bb-1b50-4ade-af9e-4f716bedee9d


8.2.4 Start parameters for movement profile

After integrating the device description file into the PLC, the mapped cyclic real-time data is available for communication between the PLC and the stepper motor controller.

Cyclical real-time data

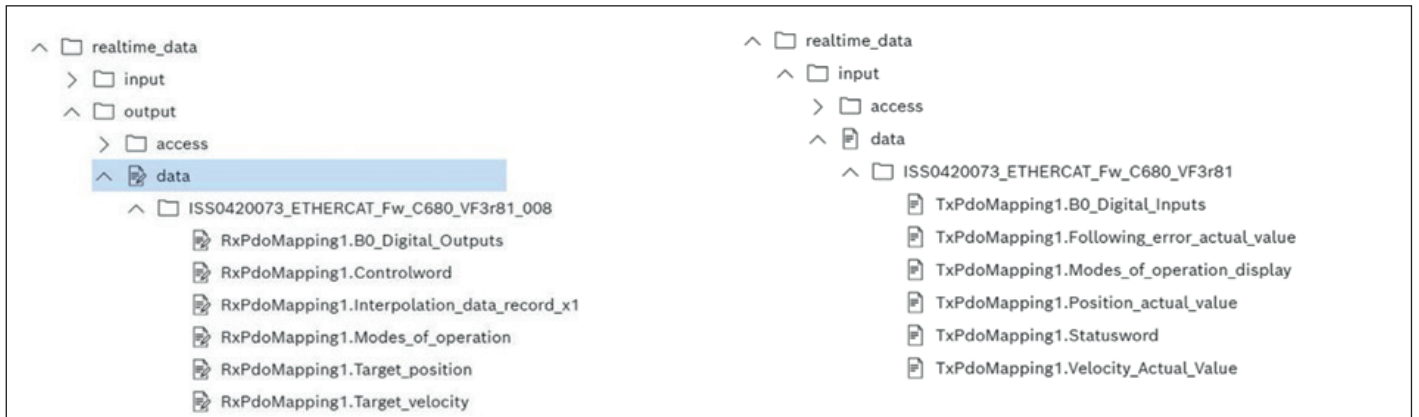


Fig. 18: Cyclical real-time data

For the standard "multi-positioning task" application, the cyclic real-time data control word, mode of operation, target position, and status word are required for fieldbus communication. Optionally, the target velocity can also be transmitted cycle-dependently for each positioning task.

If no start parameters are set for the motion profile, the pre-configured values of the homing routine are automatically used.

Index:Subindex	Name	Unity	Default values of the homing routine		
			ISS0420073	ISS0570106	ISS0860156
16#6083:16#00	Profile acceleration	$\mu\text{m/s}^2$	40000	33334	20000
16#6084:16#00	Profile deceleration	$\mu\text{m/s}^2$	40000	33334	20000
16#6081:16#00	Profile velocity	$\mu\text{m/s}$	20000	16667	10000

If higher values than the default values for acceleration, deceleration, or travel speed are required for the motion profile, adjustments can be made by modifying the start parameters during commissioning. ➡ Set the parameters via the controller.

Important: However, the maximum values of the SMS modules must not be exceeded during this adjustment.

➡ Catalog chapter "Technical Data" SMS with stepper motors.

8.2.5 Parameterization: lead (P) and travel Smax

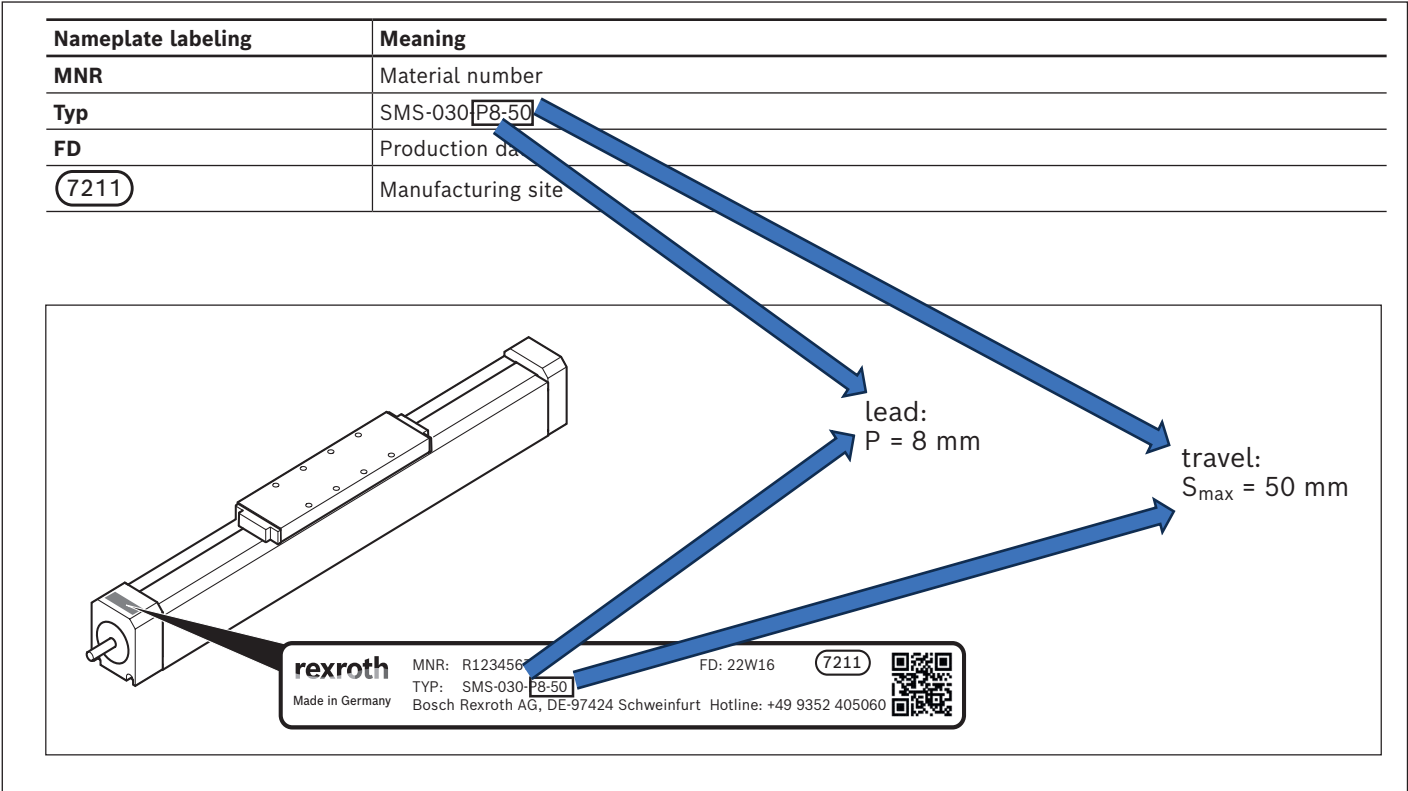


Fig. 19: Parameterization (example)

- Parameterize Smax and spindle pitch via the PLC using the EtherCAT protocol

The software limits “Max_Software_Position_Limit” and “Min_Software_Position_Limit” must be set to sensible values as specified on the rating plate. Otherwise, positioning in positioning mode (PP mode) is not possible.

Object name	Object Address	Value Default	Unit Measure
Max_Software_Position_Limit	607D.02h	1	µm
Min_Software_Position_Limit	607D.01h	1	µm
Feed_Constant_Feed (Feed)	6092.1h	**	µm/rotation

Example 1: P = 8 mm; Smax = 50 mm	Example 2: P = 8 mm; Smax = 50 mm
----> 607D.02h = 50 000µm	----> 607D.02h = +25 000µm
----> 607D.01h = 0µm	----> 607D.01h = -25 000µm
----> 6092.1h = 8 000µm/rotation	----> 6092.1h = 8 000µm/rotation

Note:
If Smax and Smin are set to 0µm at the same time, the monitoring of the software limits is deactivated when absolute travel distances are executed.
** Default values for Feed_Constant_Feed depend on the motor size.

8.2.6 Programming for automatic operation in the SPS / PLC

Homing routines with fixed stop

Rexroth ISSxx stepper motors do not have an absolute encoder system for position detection and must therefore be referenced each time the control system is started. Rexroth recommends the homing routines -14 or -13 which are matched to the SMS axes. Please select the appropriate homing routine from the following table according to your application.

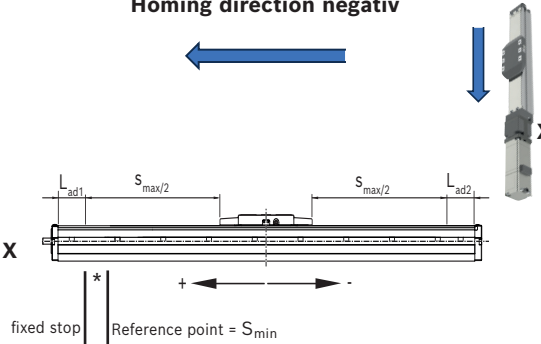
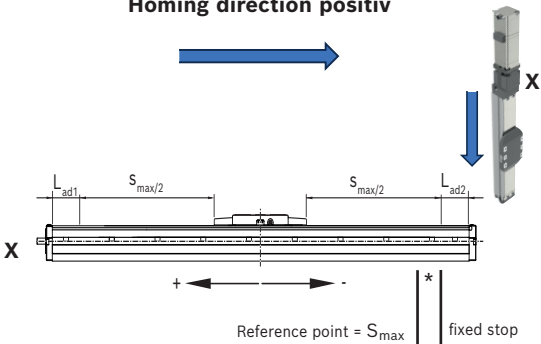
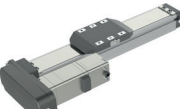
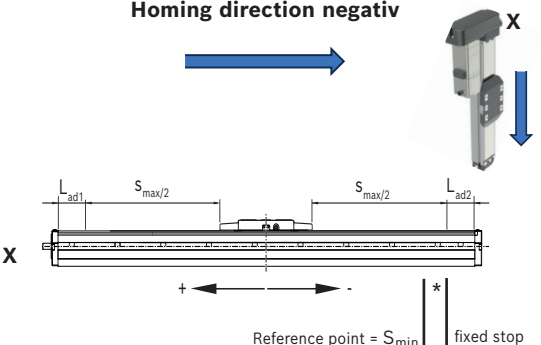
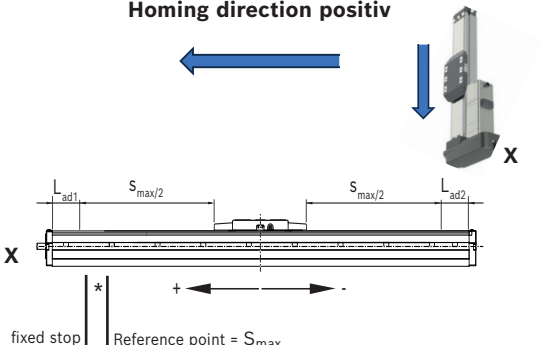
	Homing direction negativ ➡ use Homingroutine „-14“	Homing direction positiv ➡ use Homingroutine „-13“
Motor mounting with flange and coupling 	Homing direction negativ 	Homing direction positiv 
Motor mounting with Belt side drive 	Homing direction negativ 	Homing direction positiv 

Fig. 20: Homingroutinen

* = 4 mm = 4000µm

X = Motor mounting

Note:

- For vertical applications with the homing routine "-14" or "-13," the travel direction must always be downward.
- The homing routines "-14" and "-13" are pre-configured for speed, acceleration, and force limitation and must not be changed under any circumstances.
Note: Changing the homing parameters by the customer can lead to irreparable damage to the SMS module.
- Removing the entire power supply or logic power supply to the motor will result in the loss of the absolute measurement reference for the stepper motor. Upon reconnection, re-homing is required to establish the absolute measurement reference. However, if only the power voltage is disconnected from the motor and the logic voltage is still present, re-homing is not necessary after reconnecting the power voltage.
- When the motor is mounted via a belt drive, the direction of rotation of the motor is changed. Please observe the information in the table accordingly.

Object Name	Object Address	Value Default	Unit Measure
DS402_HomingMethod	6098.0h	-14	-

If the application does not allow homing to a fixed stop, homing to a switch is an alternative. Rexroth recommends using the approved homing routines 17 and 18 (referencing to a limit switch) or, alternatively, homing routines 19 and 20 (referencing to a reference switch). For details, see the "Homing mode (hm)" chapter in the software manual. When homing to a switch, the appropriate cable is required to connect the switch to the motor. ➡ See Chapter 8.3.

Programming the absolute and relative positioning commands in PP mode

The detailed software manual for Ethercat communication can be downloaded from the Deltaline website (1) (<https://de.delta-line.com>) in the Downloads section (2) under the heading “Fieldbus Manuals” (3) under the designation “CANopen & EtherCAT (DS402)” (4) can be downloaded.

Service email from Delta- Line: info@delta-line.com

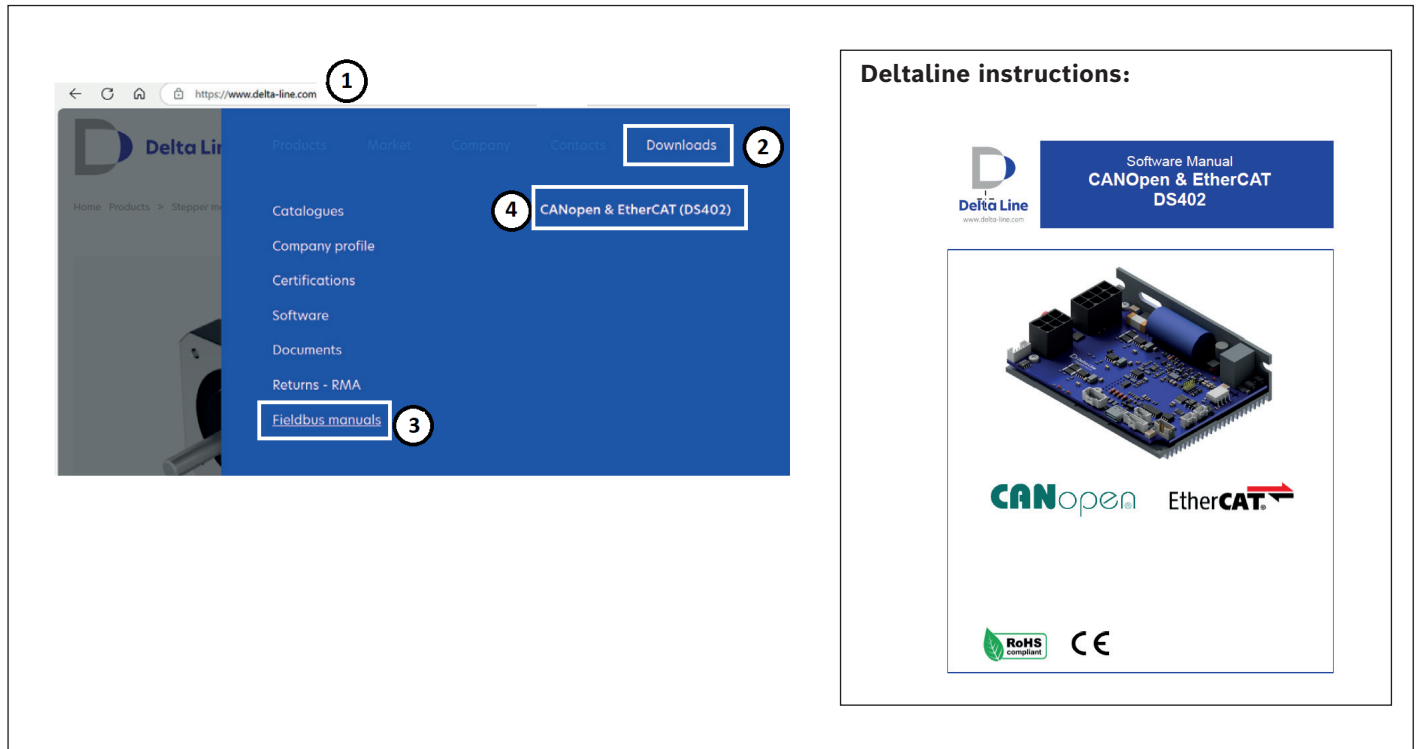


Fig. 21: Download Softwaremanual

Rexroth's ISSxx stepper motors are optimized for the standard multi-positioning application. The following deviations from the DeltaLine functionality have been implemented in the motor controllers to simplify use with SMS modules.

Deviations from the delta line instructions:

- ▶ Absolute positioning commands are only possible after successful homing. After a successful homing run bit 15 “Manuf 1” in statusword 6041h is set to “1”.
- ▶ After an absolute dimension reference has been established (by homing), the travel range between Smax and Smin is monitored. Positioning commands that have a travel target outside this travel range cannot be started.
- ▶ Speeds are parameterized in $\mu\text{m/s}$.
- ▶ Accelerations are parameterized in $\mu\text{m/s}^2$.

Jogging/manual movement during setup

1. Move the axis manually
2. Jogging with an absolute positioning command: possible only after a prior homing run (absolute positioning commands without homing are not executed).
3. Jogging with a relative positioning command: relative positioning is possible with or without homing (without homing, the travel range is not monitored; therefore, jogging must be monitored manually).

8.2.7 Example

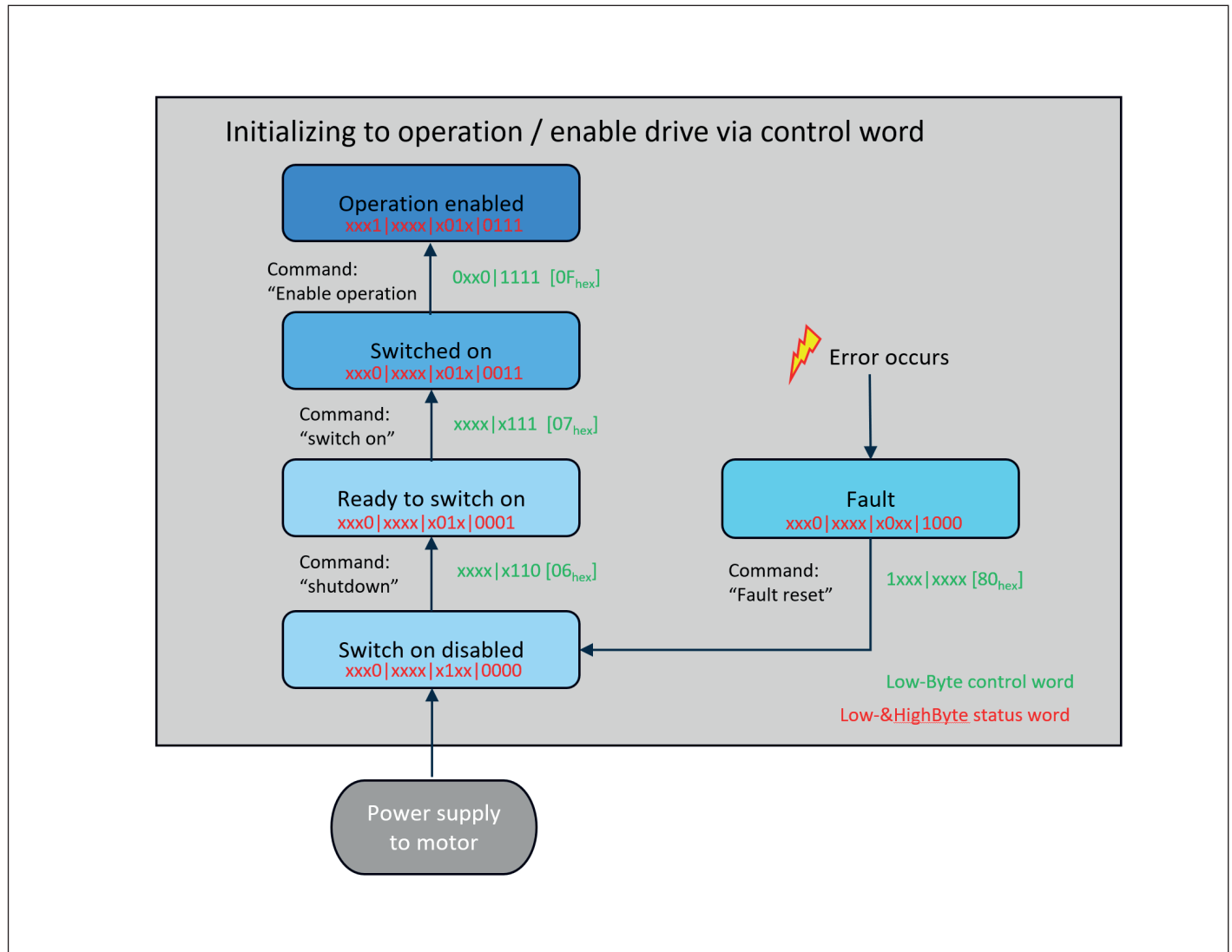


Fig. 22: Example

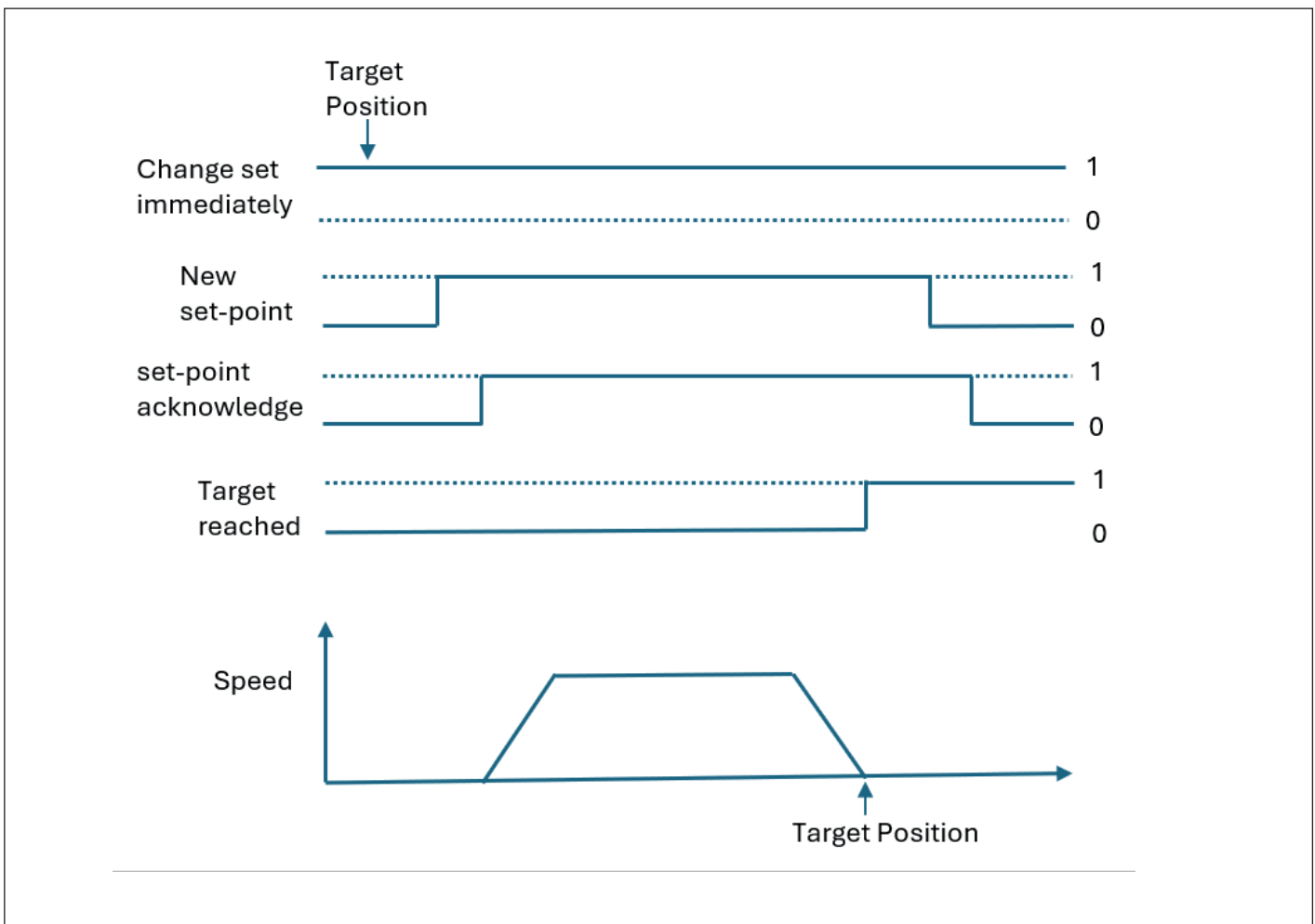
► Continued on the following pages

Table 10: Example

Initializing-Routine			
Step	Program	Parameter	Description
Switch supply voltage to motor -> motor drive starts			
1	Check IF status word Bit 0, 1, 2, 3 has value "0" and Bit 6 has value "1"	6041.0H	Check whether drive start is done and has reached status "Switch on disabled", means drive is now ready for PLC communication
2	Set control word Bit 1 and 2 to value "1" [06Hex]	6040.0H	Send "shutdown" command. Drive functions are deactivated, and no power voltage is present on the motor
3	Check IF status word Bit 1, 2, 3, and 6 has value "0" & Bit 0 and 5 has value "1"	6041.0H	Check whether drive has reached status "ready to switch on" and therefore is ready for power stage activation
4	Set control word Bit 0, 1 and 2 to value "1" [07Hex]	6040.0H	Send "switch on" command. Activates the drive power stage, motor is still without torque
5	Check IF status word Bit 2, 3 and 6 has value "0" & Bit 0, 1 and 5 has value "1"	6041.0H	Check whether drive has reached status "switch on" and therefore drive power stage is activated
6	Set control word Bit 0, 1, 2 and 3 to value "1" [0FHex]	6040.0H	Send "Enable operation" command. Set the motor to operating mode
7	Check IF status word Bit 3 and 6 has value "0" & Bit 0, 1, 2 and 5 has value "1"	6041.0H	Check whether drive has reached status "Operation enable", means no faults have been detected, the drive now executes operating commands, power is applied to the motor and motor is now with torque
Error Monitoring			
Step	Program	Parameter	Description
1	Check IF status word Bit 3 has value "1"	6041.0H	Check whether a fault has occurred in the drive and the drive function is disabled. Status word Bit 3 "Fault" was set to "1" (High)
2	Set control word Bit 7 to value "1" [0FHex]	6040.0H	Send "Fault reset" command to reset the error status
3	Start drive initialization at step 3		
Homing-Routine			
Step	Program	Parameter	Description
1a	Set "Homing_Method" to value "-14" [Dec] (or „F2Hex“)	6098.0H	Homing is done to SMS module fixed stop at the motor side (not absolutely necessary, as the parameter is already set ex works)
1b	Alternative: Set "Homing_Method" to value "-13" [Dec] (or „F3Hex“)	6098.0H	Homing is done to SMS module fixed stop at the motor opposite side
2	Set "Mode_of_operation" to value "6" [Dec]	6060.01H	Send command "Mode_of_Operation" with value for "Homing_mode" that operation mode is switched
3	Check IF "Modes_of_operation_display" is set to value "6" [Dec]	6061.01H	Check whether mode switch to "Homing_mode" is done
4	Set control word Bit 0, 1, 2, 3 and 4 to value "1" [1FHex]	6040.0H	Send "homing operation start" command by toggle control word Bit 4 from "0"->"1"
5	Check IF status word Bit 10 and 12 has value "1" and Bit 13 has value "0"	6041.0H	Check whether homing was done without error and axis is at standstill (v=0m/s)

Single set-point Positioning

Step	Program	Parameter	Description
1	Set "Mode_of_operation" to value = "1" [Dec]	6060.01H	Send command "Mode_of_Operation" with value for "Profil_Position_Mode" that operation mode is switched
2	Check IF "Modes_of_operation_display" is set to value "1" [Dec]	6061.01H	Check whether mode switch to "Profil Position Mode" is done
3	Set control word Bit 0, 1, 2, 3 and 5 to value "1" (= „2FHex“)	6040.0H	Send commands "Enable operation" and "change set immediately" for "Single set-point"- Positioning
4	Check IF status word Bit 0, 1, 2 and 5 at value "1" & Bit 3 and 6 at value "0"	6041.0H	Check whether drive is still at status "Operation enable"
5	Set "Profil velocity" at value for needed target speed	6081.0H	Send target speed to drive (optional if default value is not used)
6	Set "Target_position" with setpoint for next position	607A.0H	Send target position to drive
7	Set control word Bit 4 to value "1" and Bit 6 to value "0"	6040.0H	Send "New set-point" command. Starts absolute movement to the target position.
8	Check IF status word Bit 12 has value "1"	6041.0H	Check whether "Set_point_acknowledge" is done, means the absolute positioning is executed
9	Check IF status word Bit 10 has value "1" and Bit 13 has value "0"	6041.0H	Check whether target position is reached without following error (Target reached = 1) and axis is at standstill (v=0m/s).
10	Set control word Bit 4 at value "0"	6040.0H	Reset the "New set-point" command for next positioning

**Fig. 23: Example**

Note: The parameters "PositionWindow" (6067.00h) and "PositionWindowTime" (6068.00h) are preset at the factory for the "Target Reached Bit" (status word bit 10). For applications involving high dynamics and payloads, these two parameters may need to be increased and adjusted accordingly.

Table 11: functional scope status and control word

Status word for profil homing mode								
Bit	15	14	13	12	11	10	9	8
Function	not relevant		Homing error	Homing attained	not relevant	Target reached	not relevant	
Bit	7	6	5	4	3	2	1	0
Function	not relevant	Switch on disabled	Quick stop	not relevant	Fault	Operation enabled	Switched on	Ready to switch on
Control word for profil homing								
Bit	15	14	13	12	11	10	9	8
Function	not relevant							not relevant
Bit	7	6	5	4	3	2	1	0
Function	Fault reset	not relevant		Homing operation start	Enable Operation	Quick stop	Enable Voltage	Switch on
Status word for profil position mode (PP)								
Bit	15	14	13	12	11	10	9	8
Function	not relevant		Following error	Set-point acknowledge	not relevant	Target reached	not relevant	
Bit	7	6	5	4	3	2	1	0
Function	not relevant	Switch on disabled	Quick stop	not relevant	Fault	Operation enabled	Switched on	Ready to switch on
Control word for profil position mode (PP)								
Bit	15	14	13	12	11	10	9	8
Function	not relevant							not relevant
Bit	7	6	5	4	3	2	1	0
Function	Fault reset	Absolut/Relative	Change set immediately	New set point	Enable Operation	Quick stop	Enable Voltage	Switch on

8.2.8 FAQs

Error	Solution
Absolute movements are not executed	An absolute dimensional reference has not yet been established. Start referencing via the controller (► Chapter 8.2.5).
	The software limits are still set to the default value of 1. The maximum and minimum software limits must be set to appropriate values for the SMS module. (► Chapter 8.2.4)
	A target position was specified outside the soft limits
SMS module moves too slowly or the specified target distance is not executed	The spindle lead is still set to the default value (factory setting). Adjust the spindle pitch according to the SMS module (► Chapter 8.2.4).
Homing is performed in the wrong direction	The wrong homing routine was selected (! Chapter 8.2.5)
	When using a belt drive, the direction of rotation of the motor is changed (► Chapter 8.2.5)
Homing is not executed	The limited motor torque is insufficient to move the SMS module. (► Chapter 8.2.5.)
	Possible causes: - Vertical referencing upwards - Additional high friction forces, e.g., due to external guidance - Additional axial process forces during referencing
Motor reports in the fieldbus with incorrect designation or has general malfunctions	A faulty power supply (incorrect pin assignment) can irreparably damage the motor controller.
	Note: -Power and logic voltage must be connected correctly. -The information in this manual refers to the Rexroth motor cables.
Absolute positioning movements do not complete correctly in automatic mode	The "Target Reached" bit does not switch to a value of 1 upon reaching the target position due to high dynamics or payload. The "PositionWindow" and "PositionWindowTime" parameters must be increased or adjusted. (► Section 8.2.7)

► For further possible error situations, see engine data sheets

8.3 General and advanced functionalities

Detailed illustration of the cable color assignments for all cables at CN1 and CN2

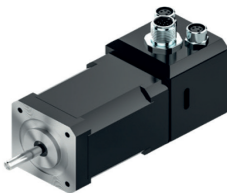
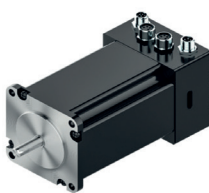
MatNo. 348706901 	MatNo. R348707001 	MatNo. R348707101 																																																																																																				
																																																																																																						
CN1 from motor to control cabinet Power supply MatNo. R348121405 Sensor/actuator cable, 17-pin, PUR/PVC, black RAL 9005, shielded, free cable end, to straight M12 SPEEDCON socket, coding: A	CN1 from motor to control cabinet Power supply MatNo. R348121505 Sensor/actuator cable, 4-pin, PUR halogen-free, black-grey RAL 7021, shielded, free cable end, to straight M8 socket, coding: A	CN1 from motor to control cabinet Power supply MatNo. R348121705 Power cable, 5-pin, PUR halogen-free, gray RAL 7001, shielded, free cable end, to straight M12 socket, coding: L																																																																																																				
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Fig. 24: Cable color assignments

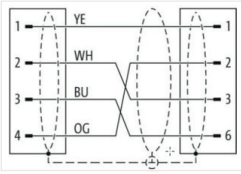
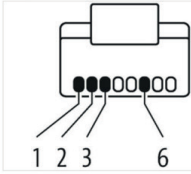
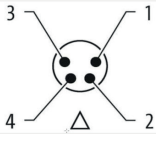
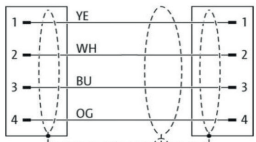
CN5A/B Ethercat communication from control cabinet/controller to 1st motor motor	MatNo. R348122105 ¹⁾ Ethernet CAT5 M8, 4-pin - RJ45, 8/4-pin shielded Length 5m		 
CN5A/B Ethercat communication from motor to motor	MatNo. R348121905 ¹⁾ Ethernet CAT5 M8 - M8, 4-pin shielded Length 1m		 
	MatNo. R348122005 ¹⁾ Ethernet CAT5 M8 - M8, 4-pin shielded Length 2m		
Engineering cable for connecting PC (DL-Studio tool) with drive.	MatNo. R348122205 Engineering cable only for commissioning with DL-Studio. (Cable is not intended for permanent installation) Length 1.5m		

Fig. 25: Kabel

¹⁾ Diameter d	4,9 mm ± 5 %
Weight	59,4 g/m
Suitable for drag chains	5 Mio. Cycles @ 25 °C
Bending radius fixed	7,5 x d
Bending radius flexibly laid	12,5 x d

Further information can be found on our website at www.boschrexroth.com/small-modules



Further documentation on signal assignments and motor data sheets can be found here <https://www.boschrexroth.com/de/de/media-details/adac0eca-cf95-404c-8957-29825f267e90>



8.4 Use of suitable power supply units

When selecting the DC power supply unit, the permissible voltage supply for the ISS stepper motors must be observed

Motortype	Power supply	Rated current
ISS0420073	12-30V DC	1,5 A
ISS0570106	12-48V DC	3,0 A
ISS0860156	12-48V DC	5,5 A

Note: The technical data listed in the SMS catalog are valid for the combination of SMS axes with ISS stepper motors at an operating voltage of 24V DC.

If the operating voltage is lower than 24V DC, the specified performance data for the SMS module/stepper motor combination will not be achieved.

If the operating voltage is higher than 24V DC, the SMS module/stepper motor combination can achieve higher performance data. Please consult us if required.

Note: If the SMS modules are installed vertically, the stepper motor may generate regenerative feedback during the downward movement. When selecting the power supply unit, it must therefore be ensured that the power supply unit is equipped with overvoltage protection.

Suitable power supply units are e.g. MEANWELL:

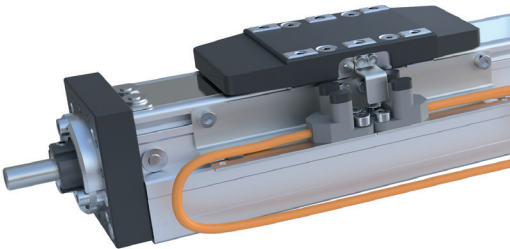
NDR-480-24 (480Watt / 24V / 20A)

NDR-240-24 (480Watt / 24V / 10A)



8.5 Switching system

Example switch installation



	Wire (L) not connected	Switch	confirmed	
		LED (red)	on	
	Wire (L) connected to Vcc	Transistor	on	
		OUT	off	
	Wire (L) not connected	Switch	confirmed	
		LED (red)	on	
	Wire (L) connected to Vcc	Transistor	on	
		OUT	off	

Vcc = Braun / Out = Schwarz / GND = Blau / (L) = Rosa

Fig. 26: Switching system

8.6 Test run, running in

WARNING

Dangerous movements! Risk of death, injury, serious physical injury or property damage!

Do not stand in the product's range of movement.

Do not allow persons to inadvertently enter the danger area.

Never perform maintenance on running machines.

Secure the system against restart and unauthorized use during maintenance.

Securely fasten the product in the system or machine.

The product is not self-locking; this means that if it is used vertically or at an angle, it can drop or move uncontrollably.

- ▶ To prevent this, the manufacturer/vendor must take precautions when installing in this manner. The Division Information Sheet on "Gravity-Loaded Axes" of DGUV Fachbereich Holz und Metall, the Woodworking and Metalworking Division of the German statutory accident assurance association (DGUV), and other sources offer further information on this topic.

Risk of burns due to hot surfaces! Temperatures above 60 °C are possible.

- ▶ Avoid touching the hot surface of, e.g., the carriage assembly or motor.
- ▶ After switching off the product, let hot surfaces cool down before touching them.
- ▶ Temperature-sensitive components should not touch the surface of the carriage assembly.
- ▶ Pay attention to the clearance of the connecting cables from other components.

- ▶ Only start up the product after running successful tests under simulated production conditions.
- ▶ Move at low speed over the entire travel range. While doing so, be sure to check the settings and the function of the limit switches.
- ▶ If necessary, optimize the interaction of the mechanical equipment and the electronics.

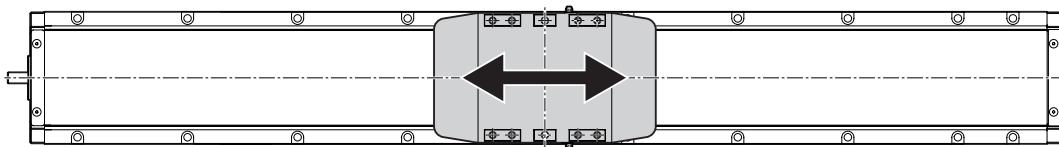


Fig. 27: Moving the carriage

9 Operation

NOTICE

Lubricant may leak if installed vertically!

Environmental contamination.

- Take suitable precautions to collect any leaking lubricant and dispose of it properly.

Risk of motor overheating when overloaded!

Risk of fire.

- Observe the technical data during operation ➡ Catalog.

10 Maintenance and repair

Maintenance is limited to lubrication.

11 Lubrication



WARNING

Never perform maintenance on running machines.

Secure the system against restart and unauthorized use during maintenance.



This chapter describes relubrication of the product by the customer.
The product is prelubricated at the factory.

- Before using lubricants, read and observe the appropriate safety data sheets.

11.1 Notes

Maintenance is limited to lubrication at the prescribed lubrication intervals.

Lubrication is designed for grease lubrication with a grease gun.

The ball screw assembly and guideway are simultaneously lubricated through a lube connection.

- Before using lubricants, read and observe the appropriate safety data sheets.

The basic lubrication of all other components, such as deep-groove ball bearings, is done by the manufacturer.

- Do not use lubricants with solid particles (e.g. graphite or MoS₂).
- Using lubricants other than those specified may impact performance and chemically interact with the plastics used in the product.

NOTICE

Overlubrication

Increased friction and temperatures in the ball screw assembly and guideway.

- Use only the recommended lubricants.

Insufficient lubrication

Damage to the product.

- Only use recommended lubricants and observe lubrication intervals.

Special operating conditions

Possible damage to the product.

- Consult Bosch Rexroth before commissioning the product under special operating conditions, specifically in the presence of fiber glass or wood dust and solvents, or in short-stroke operations and extreme temperatures.

11.2 Lube fittings / lubricants / lubrication intervals

11.2.1 Lube fittings

- ▶ The lube nipples (1) are available on both sides of the carriage (2). Lubrication from one side only is sufficient.
- ▶ Move carriage (2) to the center and grease with a manual grease gun ➡ Table 8.

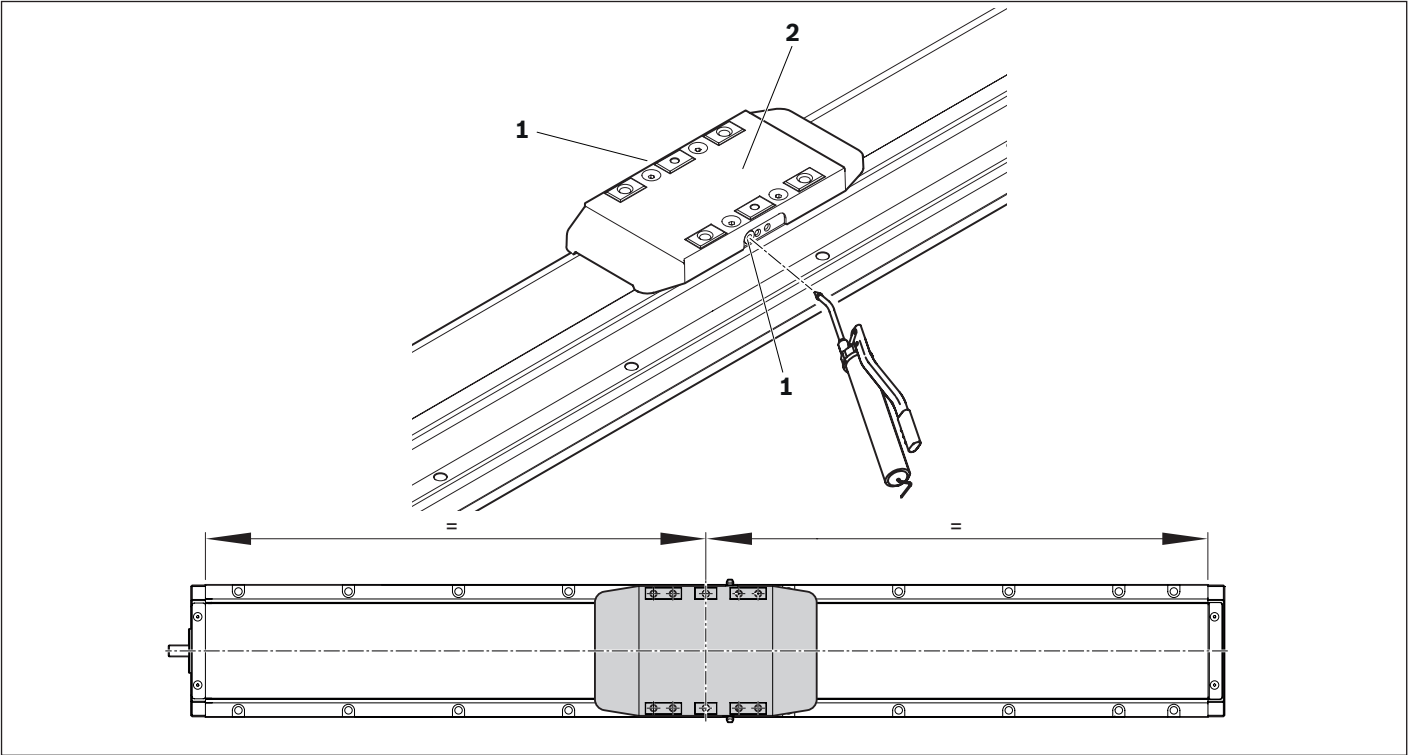


Fig. 28: Lube fittings

11.2.2 Lubricants

- ▶ Recommended lubricant: Tribol GR 100-2 PD
- ▶ Alternative lubricant:
 - Dynalub 510
 - Elkalub GLS 135/N2

11.2.3 Relubrication intervals / relubrication quantities / Lube nipples

Table 12: Relubrication intervals / relubrication quantities / Lube nipples

Relubrication of BASA and guideway			
SMS	Relubrication interval (km)	Relubrication quantity (cm ³)	Lube nipples
SMS-030-P8	900	0.5	DIN 3410- F
SMS-040-P12	1 300	1.0	
SMS-050-P10	1 100	1.0	
SMS-080-P10	1 100	2.5	
SMS-080-P20	2 200	2.5	
SMS-120-P10	1 100	3.5	DIN 71412- AM6
SMS-120-P32	3 500	3.5	

12 Removal and replacement

Assemblies may only be disassembled and replaced by Rexroth.
The only exceptions to this rule are the work steps described in this chapter.

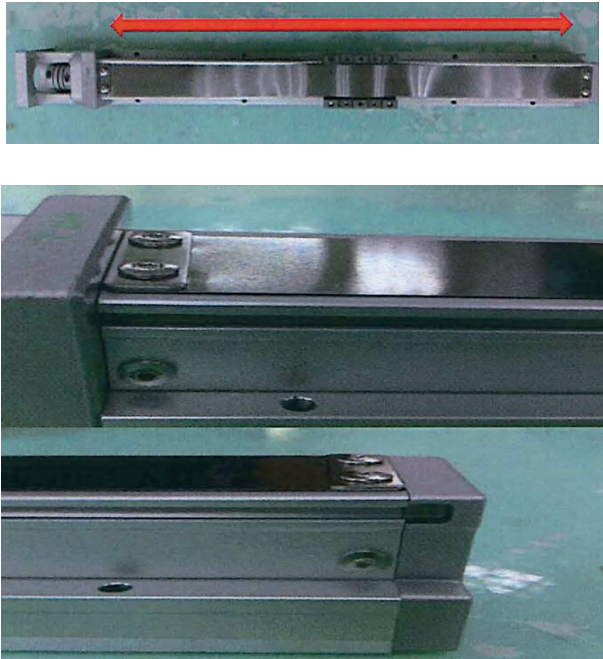
12.1 Sealing strip replacement

**CAUTION**

Cutting injuries due to sharp steel strips!

Risk of injury.

► Wear gloves.

1.	► If the sealing strip is not in place, loosen the screws of the mounting plates on the drive side and the opposite side of the drive.	
2.	► By pushing the carriage back and forth, the sealing strip is repositioned.	
3.	► Use the mounting plates to secure the sealing strip on the drive side and the opposite side of the drive.	

12.2 Removing the electric drive

Removal is the reverse of the chapter "Mounting the electric drive".
Be sure to observe the safety instructions in chapter "Mounting the electric drive"!

13 Disposal

The product contains a number of different materials: aluminum, steel, plastics, grease and possibly electronic components.

NOTICE

Environmentally hazardous materials can pollute the environment if not disposed of properly.

Environmental pollution.

- ▶ Collect any leaking lubricant and dispose of it properly.
- ▶ The product and its components must be recycled correctly and in compliance with all applicable national and international guidelines and regulations.

14 Technical data

Technical data ➞ Catalog.

15 Operating conditions

Table 13: Operating conditions

Operating conditions	Value
Ambient temperature	0 °C ... 40 °C
Soiling	Not permissible

15.1 Tightening torques

We use screws in the 8.8 strength class as standard. Any deviations are marked accordingly.

Table 14: Tightening torques

 8.8	M2	M2.5	M3	M4	M5	M6	M8
 M _{A max} (Nm)	0.3	0.8	1.3	3.1	6.1	9.9	24.6
μ = 0.125							

16 Service and support

The Bosch Rexroth Customer Service help desk and hotline staff will be happy to assist you in any way they can.

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E-Mail: Service@boschrexroth.de

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www.boschrexroth.com

Find your local contact person here:

www.boschrexroth.com/contact



Subject to modifications