

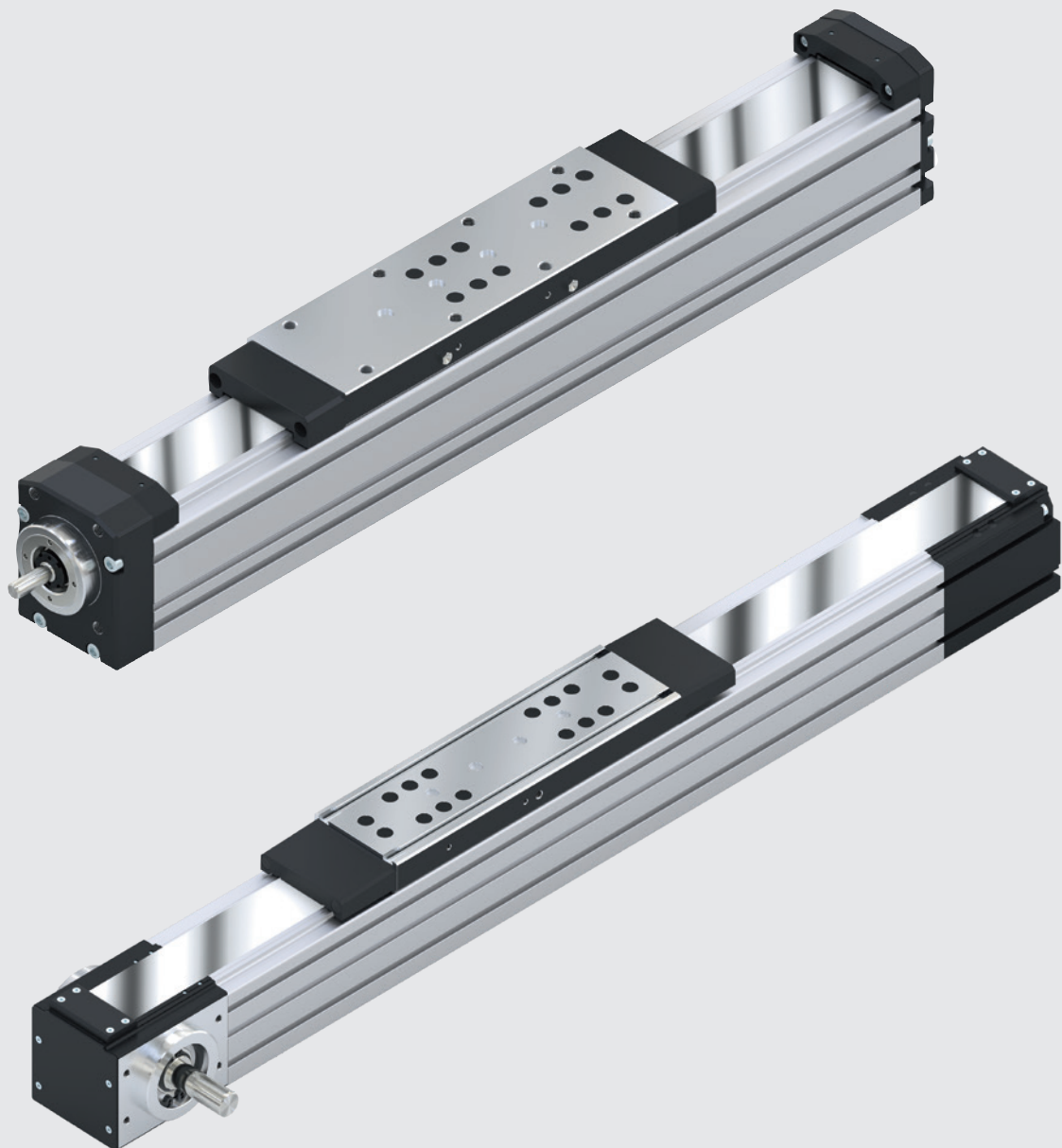
Linear modules
MKK/MKR/MLR
-040/-065/-080/-110/-140/-145-NN-3/-165-NN-2

R320103169/2020-08

EN

Instructions

ENGLISH



The information provided serves only 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. It should be noted that our products are subject to a natural process of aging and wear.

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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.

Die vorliegende Anleitung ist in folgenden Sprachen verfügbar.
These operating instructions are available in the following languages.

DE Deutsch (Originaldokumentation)

EN English

Translations are in preparation

Contents

1	About these instructions.....	4
1.1	Validity of the documentation.....	4
1.2	Required and supplementary documentation.....	4
1.3	Presentation of information.....	4
2	Safety instructions.....	6
3	Scope of delivery.....	7
3.1	Delivery condition.....	7
3.2	Accessories.....	7
3.3	Overview of linear modules.....	7
4	Product description.....	8
4.1	Performance description.....	8
4.2	Device description linear modules MKK.....	8
4.3	Device description linear modules MKR/MLR.....	9
4.4	Identification of the product.....	10
5	Transport and storage.....	10
5.1	Transporting the product.....	10
5.2	Storing the product.....	11
6	Mounting.....	11
6.1	Unpacking the product.....	12
6.2	Required accessories.....	12
6.3	Mounting conditions.....	12
6.4	Fastening the product to the adjoining structure.....	12
6.5	Switching system installation.....	14
6.6	Installing the socket.....	22
6.7	Mounting the cable channel.....	23
7	Mounting the MKK drive.....	24
7.1	Mounting the motor with flange and coupling.....	24
7.2	Mounting the motor with belt side drive.....	26
8	Mounting the MKR/MLR drive.....	31
8.1	Installing the flange and gear unit.....	31
8.2	Mounting the motor.....	31
9	Connecting the electrical power supply to the linear module.....	32
10	Start-up.....	32
10.1	Easy start-up using the integrated wizard.....	33
10.2	Checking the operating conditions.....	33
10.3	Test run, running in.....	34
10.4	Moving switches.....	34
11	Operation.....	35
12	Maintenance and repair.....	35
13	Lubrication.....	36
13.1	Notes.....	36
13.2	Overview of lubrication versions.....	37
13.3	Lubricants.....	38
13.4	Lube fittings.....	38
13.5	Initial lubrication MKx-NN-3.....	40
13.6	Relubrication.....	42
13.7	Lubrication MKx-165-NN-2.....	47
13.8	Lubrication MLR-080/110-NN-3.....	47
13.9	Repair.....	47
14	Removal and replacement.....	48
14.1	Removing the cable channel.....	48
14.2	Removing the switches.....	48
14.3	Removing the drive.....	49
15	Disposal.....	51
16	Technical data.....	51
17	Operating conditions.....	51
17.1	Tightening torques.....	51
18	Modules.....	52
19	Service and support.....	61

1 About these instructions

1.1 Validity of the documentation

This documentation applies to the following products:

- Linear modules MKK/MKR/MLR as found in the "Linear modules" catalog.

This documentation is intended for installers, operators and system owners.

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

- Before commencing any work with the product, be sure to read these Instructions and the "Safety instructions for linear motion systems" carefully and completely.

1.2 Required and supplementary 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
	Linear modules MKK / MKR / MLR	R999000476	Catalog
	Rexroth catalogs for drive technology		
	Product data sheet for Dynalub 510	R310 2052	
	Safety data sheet for Dynalub 510	R320103160	
	Product data sheet for Dynalub 520	R310 2053	
	Safety data sheet for Dynalub 520	R320103161	
	Instructions for the other components		

The Rexroth documentation is available for download at www.boschrexroth.com/mediadirectory.

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 document

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. ▶ Hazard prevention measure.

- 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 prevention measure: 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.

Table 2: Hazard classes as per ANSI Z535

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.
NOTE	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 3: 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. 2. 3.	Numbered work steps The numbers indicate the sequence of the work steps.
⇒ 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 4: Abbreviations and definitions

Abbreviation	Unit	Meaning
BASA	(–)	Ball screw assembly
C_{gw}	(N)	Dynamic load capacity, guideway
C_{bs}	(N)	Dynamic load capacity for ball screw assembly
d_0	(mm)	Nominal diameter of ball screw assembly
DH_{min}	(mm)	Minimum double stroke
F_{mgw}	(N)	Dynamic equivalent load on bearing of the guideway
F_{mbs}	(N)	Dynamic equivalent load on bearing of the ball screw assembly
F_{mgw} / C_{gw}	(–)	Load ratio of the guideway
F_{mbs} / C_{bs}	(–)	Load ratio of the ball screw assembly
F_{mgw} / C_y	(–)	Load ratio of the guideway MLR
M	(–)	Motor
MKK	(–)	Linear modules with ball rail system and ball screw assembly
MKR	(–)	Linear modules with ball rail system and toothed belt drive
MLR	(–)	Linear module with cam roller guide and toothed belt drive
LS	(–)	Linear motion system
LSS	(–)	Standard lubrication
LPG	(–)	Preserved
LCF	(–)	Carriage prepared for connection to central lubrication systems for liquid grease
LCO	(–)	Carriage prepared for connection to central lubrication systems for oil
L_w	(–)	Center-to-center distance between carriages
P	(mm)	Lead BASA (ball screw assembly)
TM	(cm ³)	Partial quantity
TT	(–)	Carriage

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: Linear module, drive (motor and gear unit, installed) if ordered.

Switch/sensor if ordered

3.1 Delivery condition

Depending on the order, completely assembled with drive and switching system.

3.2 Accessories

Available accessories: ➡ "Linear modules" catalog



Dimensions and material numbers of the accessories as well as additional fastening accessories ➡ "Linear modules" catalog

3.3 Overview of linear modules

3.3.1 Overview of types

The linear modules are available in different sizes and shapes. Specific data and dimensions ➡ "Linear modules" catalog.

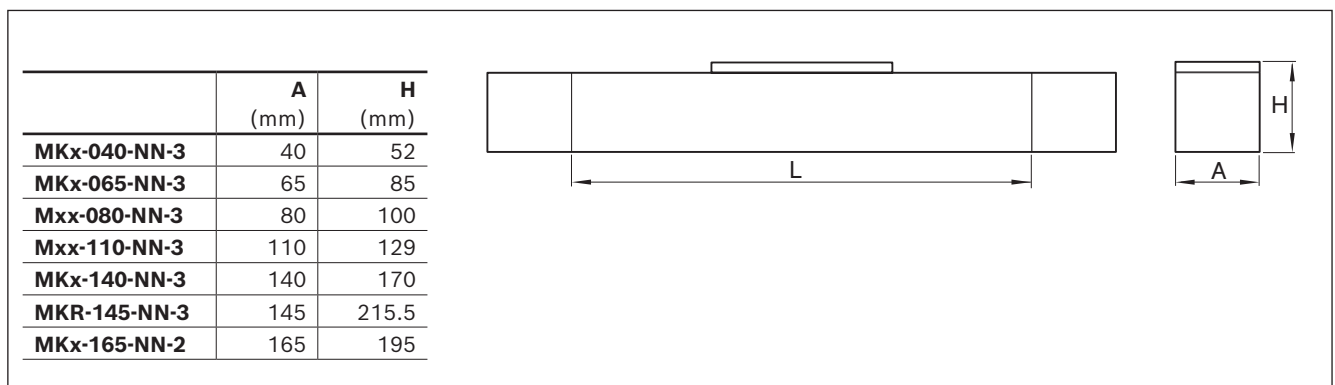


Fig. 1: Overview of linear modules

4 Product description

4.1 Performance description

Please refer to the notes, technical data, dimensions and descriptions of the products in the catalog.

4.2 Device description linear modules MKK

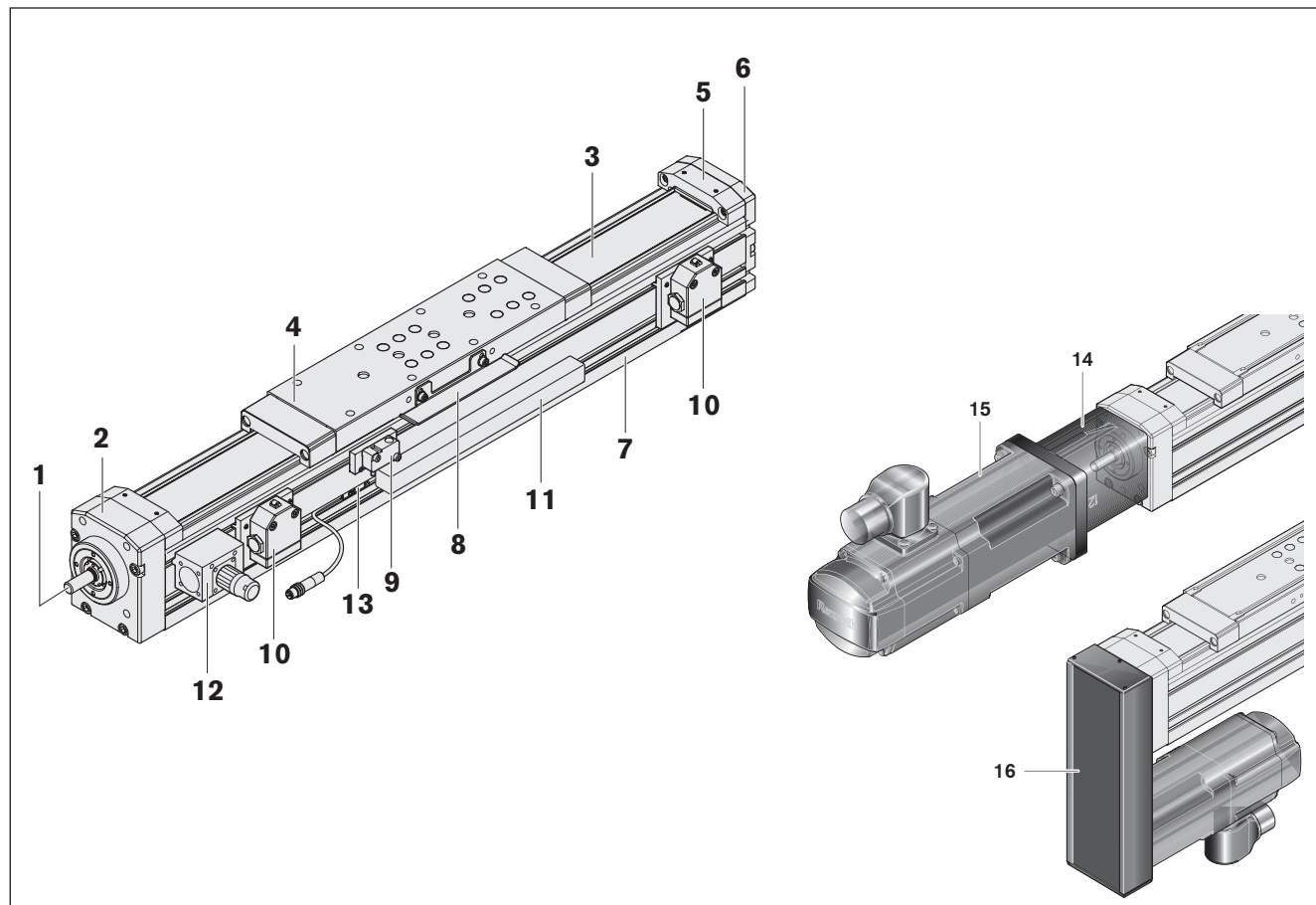


Fig. 2: Components of the linear module MKK

Linear modules MKK feature the following

Components:

- 1 Ball screw assembly (BASA)
- 2 End block fixed bearing
- 3 Cover strip/bellows at size -165-NN2
- 4 Carriage with runner block
- 5 Strip fixing
- 6 End plate floating bearing
- 7 Frame

Attachments:

- 8 Switching cam
- 9 Proximity switch
- 10 Mechanical switch
- 11 Cable channel
- 12 Socket/plug
- 13 Magnetic field sensor
- 14 Flange
- 15 Servo motor
- 16 Belt side drive

4.3 Device description linear modules MKR/MLR

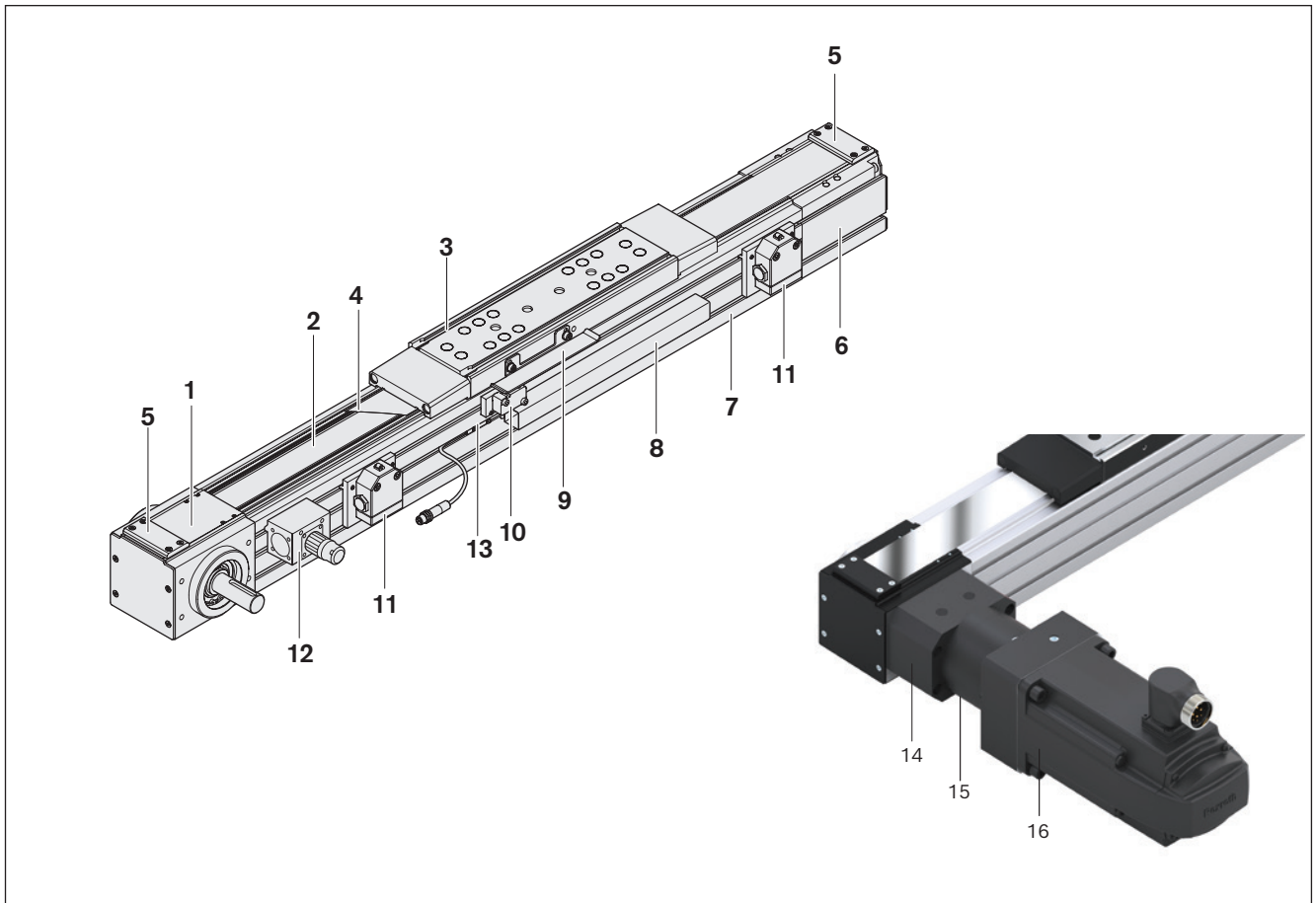


Fig. 3: Components of the linear module MKR/MLR

Linear modules MKR/MLR feature the following

Components:

- 1** Drive end enclosure
- 2** Toothed belt (covered)
- 3** Carriage with runner block
- 4** Cover strip (type-dependent)
- 5** Strip fixing (type-dependent)
- 6** Idler end enclosure
- 7** Frame

Attachments:

- 8** Cable channel
- 9** Switching cam
- 10** Proximity switch
- 11** Mechanical switch
- 12** Socket/plug
- 13** Magnetic field sensor
- 14** Flange
- 15** Gearing
- 16** Servo motor

4.4 Identification of the product

The name plate of the product contains the following information:

Table 5: Information on name plate

Name plate information	Meaning
MNR	Material number
FD	Date of manufacture
CS	Customer order number
7210	Manufacturing location

► When ordering wear parts, please always state all data given on the name plate.

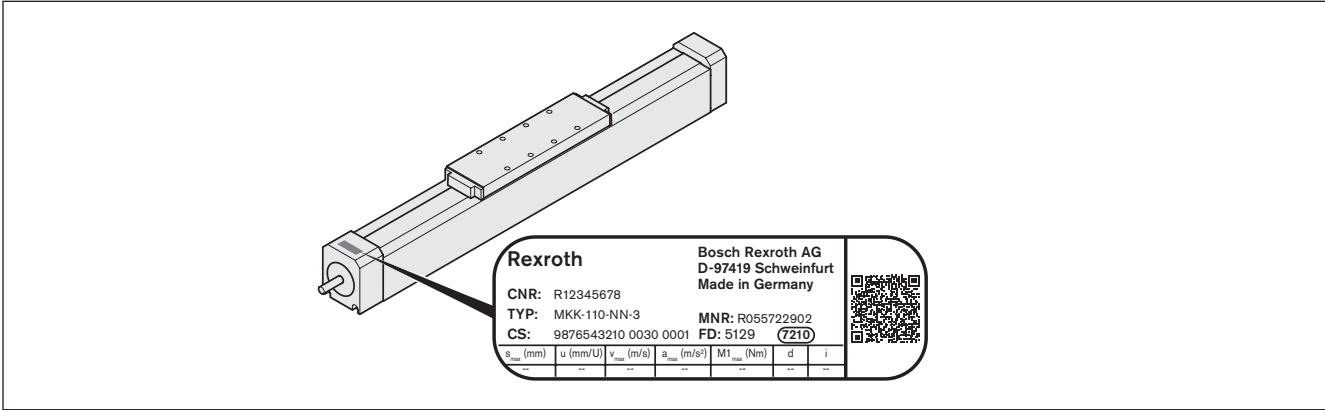


Fig. 4: Name plate (example)

The name plate contains additional technical data for start-up. With these parameters and the EasyWizard software, starting up the drives of linear motion systems becomes easier, faster and more effective than ever before ➡ 10 Start-up.

5 Transport and storage

5.1 Transporting the product

WARNING

Risk of product falling due to inadequate load handling equipment!

Death or severe injury.

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

NOTES

Risk of damage to motor connection through vibration!

Motor breaks off.

- When transporting the product with assembled motor, always provide support for the motor.
or
- Disassemble the motor prior to transport.

Selection of wrong anchor points

- When lifting and transporting, do not put pressure on end enclosures and screw journals.
- Never suspend from the middle or the ends only!

1. Before hoisting the product, note the weight ➡ Catalog.
2. Hoist the product as shown in the figure using suitable load hoisting equipment.

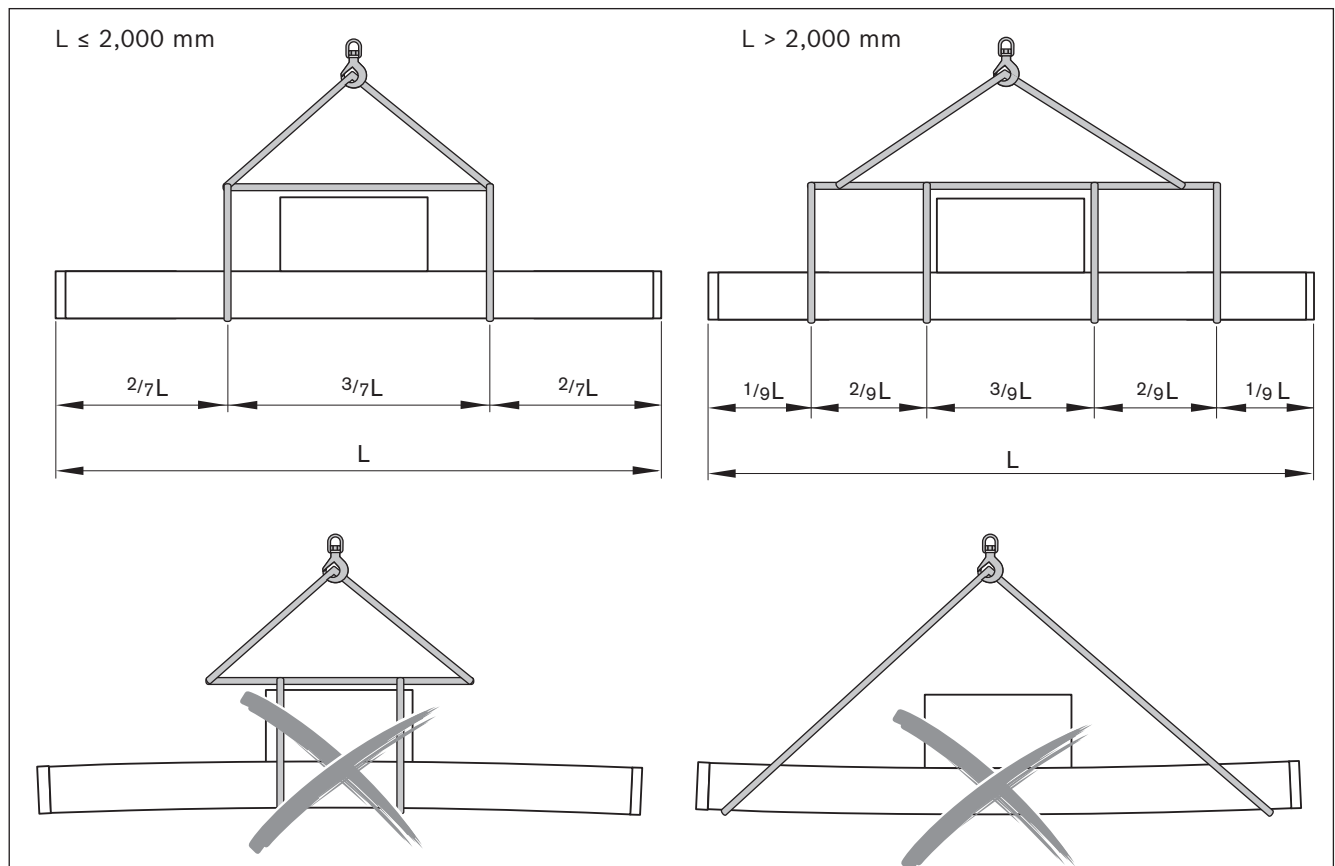


Fig. 5: Hoisting the linear module

5.2 Storing the product

NOTES

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

- Dimensions and material numbers of the individual components ➡ Catalog.

! WARNING

Danger of uncontrolled movements of the carriage due to lack of arrestor devices in vertical or slanting installations!

Death or severe injury.

- In vertical or slanting linear modules, secure the carriage so that it cannot drop down.
- Do not stand in the fall direction of the carriage.

- 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 packing material.
3. Dispose of the packing material according to the local regulations in your country.

6.2 Required accessories

- ▶ Required fastening accessories ➡ Catalog.
- ▶ Use suitable screws for fastening.

6.3 Mounting conditions

- ▶ Take note of the operating conditions ➡ 17 and the catalog.
- ▶ For special operating conditions, please contact us.
- ▶ The product can generally be installed in any position.

NOTES

Risk of damage due to improper loads!
Damage to the product.

- ▶ Do not attach any projecting loads.

6.4 Fastening the product to the adjoining structure

NOTES

Risk of product loosening or warping due to improper fastening.

Damage to the product.

- ▶ Fasten the product using the recommended fastening elements.
- ▶ Do not secure or support the product at the end plates.
- ▶ Observe specified tightening torques.
- ▶ Observe the maximum permissible deflection $f_{\max}$ (please refer to the diagrams in the catalog)!
If high system dynamics are required, supports (B) must be provided every 300 mm.
- ▶ When mounting to the frame, keep a minimum distance of 5 mm from the end plates ➡ ☒ Fig.6.

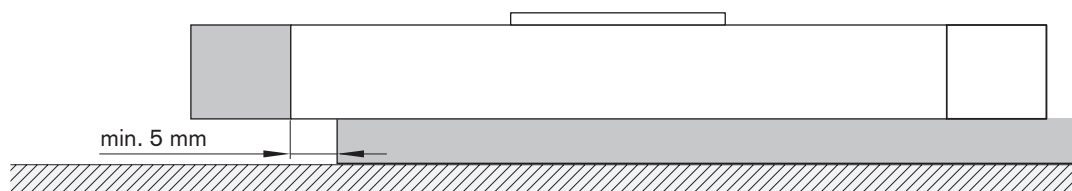


Fig. 6: Minimum distance to the end plates / maximum permissible deflection

6.4.1 Fastening the product with clamping fixtures

- ▶ Mount the frame with clamping fixtures (1/2/3) on the mounting base as shown in the figure below.
- ▶ Recommended number of clamping fixtures per meter and side: **1**: 6 pieces / **2**: 4 pieces / **3**: 3 pieces
- ▶ Observe specified tightening torque ➔ 17.1.

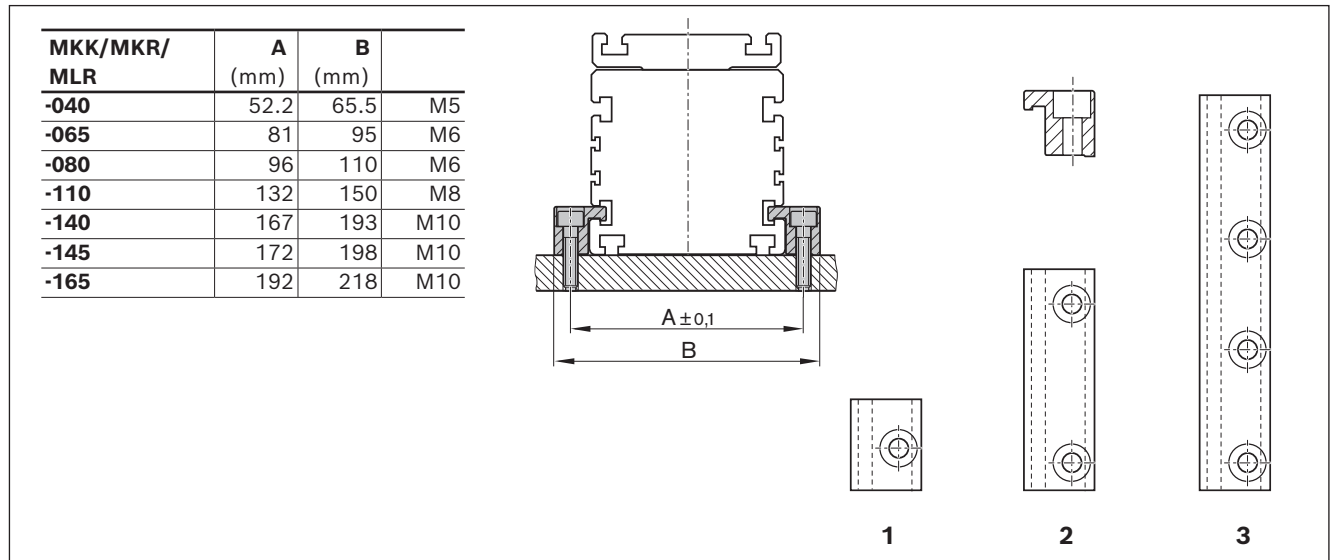


Fig. 7: Fastening the linear modules with clamping fixtures

6.4.2 Fastening the product with sliding blocks

- ▶ Linear modules can be fastened with sliding blocks.
- ▶ Recommended number per meter and side: 6 pieces
- ▶ Suitable sliding blocks can be obtained from Bosch Rexroth ➔ Catalog.

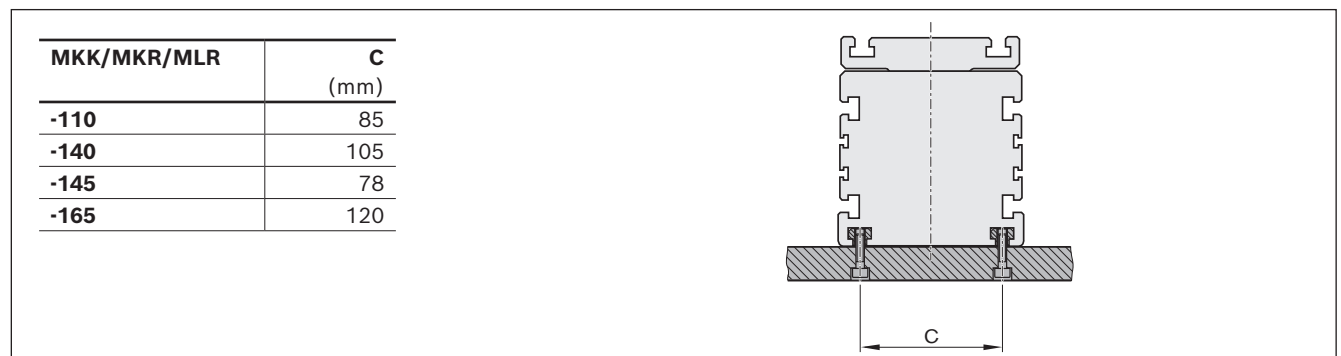
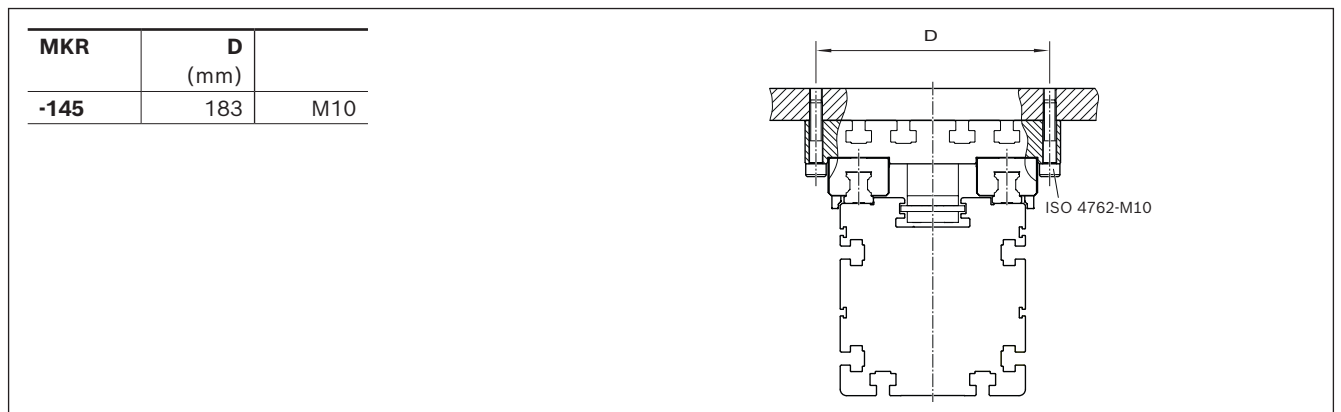


Fig. 8: Fastening the linear modules with sliding blocks

6.4.3 Product mounted on the carriage

- ▶ The linear module MKR-145 can be mounted at the carriage for vertical operation.



Switching system MKK, MKR, MLR

6.5 Switching system installation

NOTES

Risk of collision due to incorrect assembly of the switching system!

Damage to product, adjoining structure and workpieces.

- ▶ Prerequisite for the installation of the switching system is the fastening of the linear module frame.
- ▶ Install the entire switching system on one side of the product (recommendation).
- ▶ Move the carriage by hand to check for potential collision with the carriage or a mounted workpiece.



Magnetic sensor / magnetic field sensor

The switch activator is a magnet that is built into the carriage (no switching cam necessary). The switch activation points can be positioned anywhere along the stroke. ➔ 6.5.12

6.5.1 Overview

1. Socket and plug
2. Mechanical switch with attachments
3. Proximity sensor with additional components
4. Switching cam (for mechanical and proximity switches)
5. Mounting channel / cable channel
6. Magnetic field sensor with fixed potted cable (Reed/Hall sensor (for mounting channel))
7. Assembly magnetic sensor with plug and sensor mount
 - 7a: Magnetic sensor
 - 7b: Sensor mount incl. set screws (loose) and square nut
 - 7c: Cable holder (3 pcs) incl. set screw (loose)
 - 7d: Male connector M8x1, 3-pin
8. Magnetic sensor with M8x1 plug
9. Clamping screw
10. Sliding block

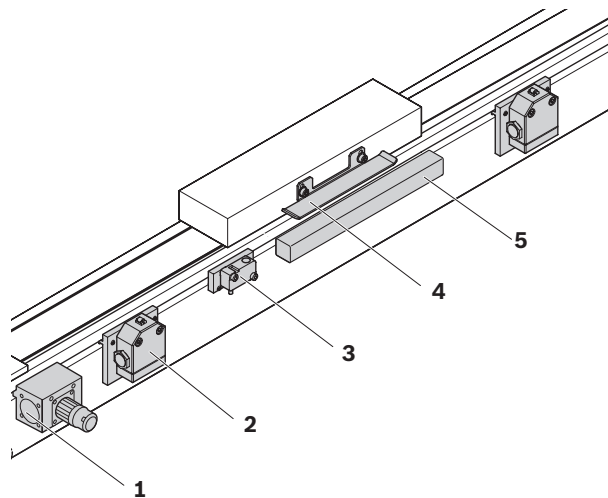


Fig. 9: Overview (pos. 1-5)

Further information on pos. 1-5 ➔ 6.5.10 / 6.5.11

6.5.2 Switch mounting arrangement MKK/MKR-040-NN-3

Magnetic sensor with M8x1 plug, switch mounting plate and cable holder

1. Insert sensor mount (7b) into the top slot in the frame, position it approximately and secure it with two set screws (11).
2. Insert the sensor (7a) into the top (MKK) or bottom (MKR) slot in the sensor mount and secure it by turning the clamping screw (9). If necessary, install the cable holder (7c) into the top slot.

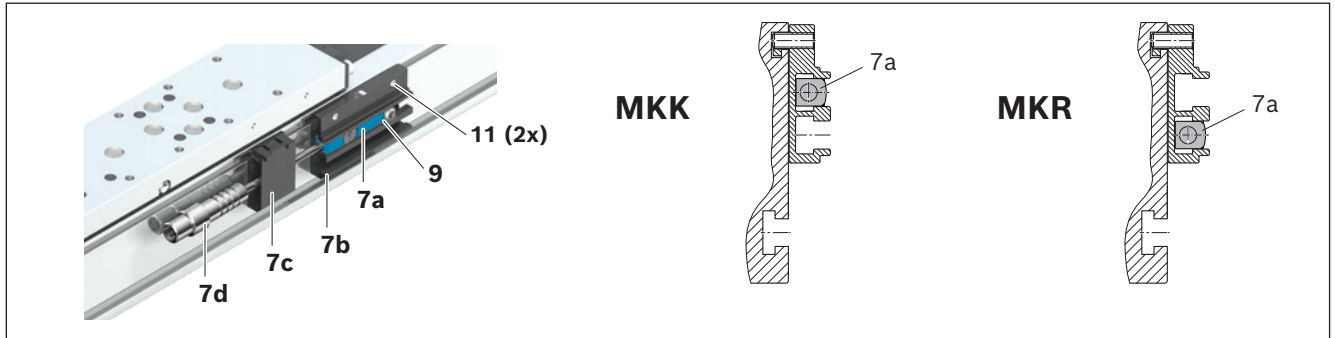


Fig. 10: Installing the magnetic sensor (MKK/MKR-040-NN-3)

Magnetic field sensor (6) and mounting channel (5)

- ▶ A mounting channel is needed to fasten the magnetic field sensors and cable guides. This is suspended in the upper slot on the linear module and secured with set screws (11).
- ▶ Insert sensor (6) into the top (MKK) or bottom (MKR) T-slot of the mounting channel and secure it with a set screw (12).

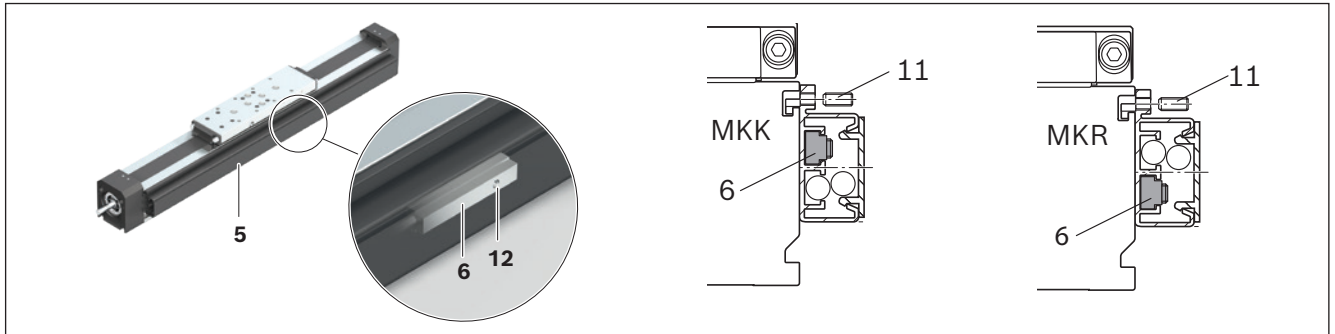


Fig. 11: Installing the magnetic field sensor MKK/MKR-040-NN-3

Proximity sensors and mechanical switches

- ▶ Assembly ➡ 6.5.10 / 6.5.11



Fig. 12: Proximity sensors and mechanical switches MKK/MKR-040-NN-3

6.5.3 Switch mounting arrangement MKK/MKR -065/-080/-110/-140-NN-3

Magnetic sensor with M8x1 plug

- Position the sensor (8) in the respective slot (S) in the frame and secure it by turning the clamping screw (9). The sliding block (10) is not necessarily required for mounting, it is only required for repeatable mounting of the sensor.

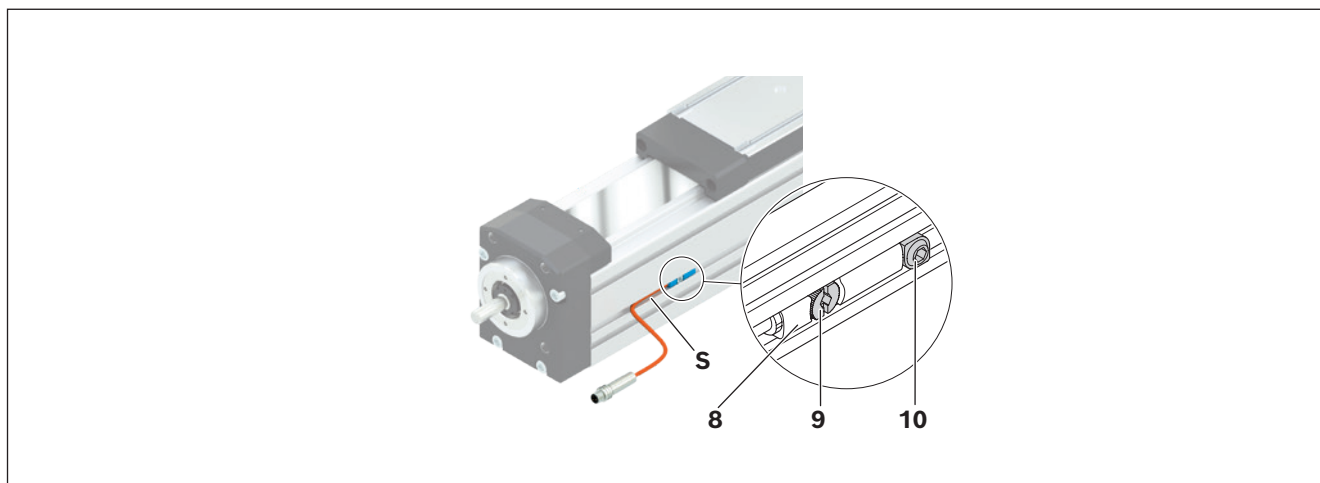


Fig. 13: Magnetic sensor MKK/MKR -065/-080/-110/-140-NN-3

Proximity sensors and mechanical switches

- Assembly ➡ 6.5.10 / 6.5.11

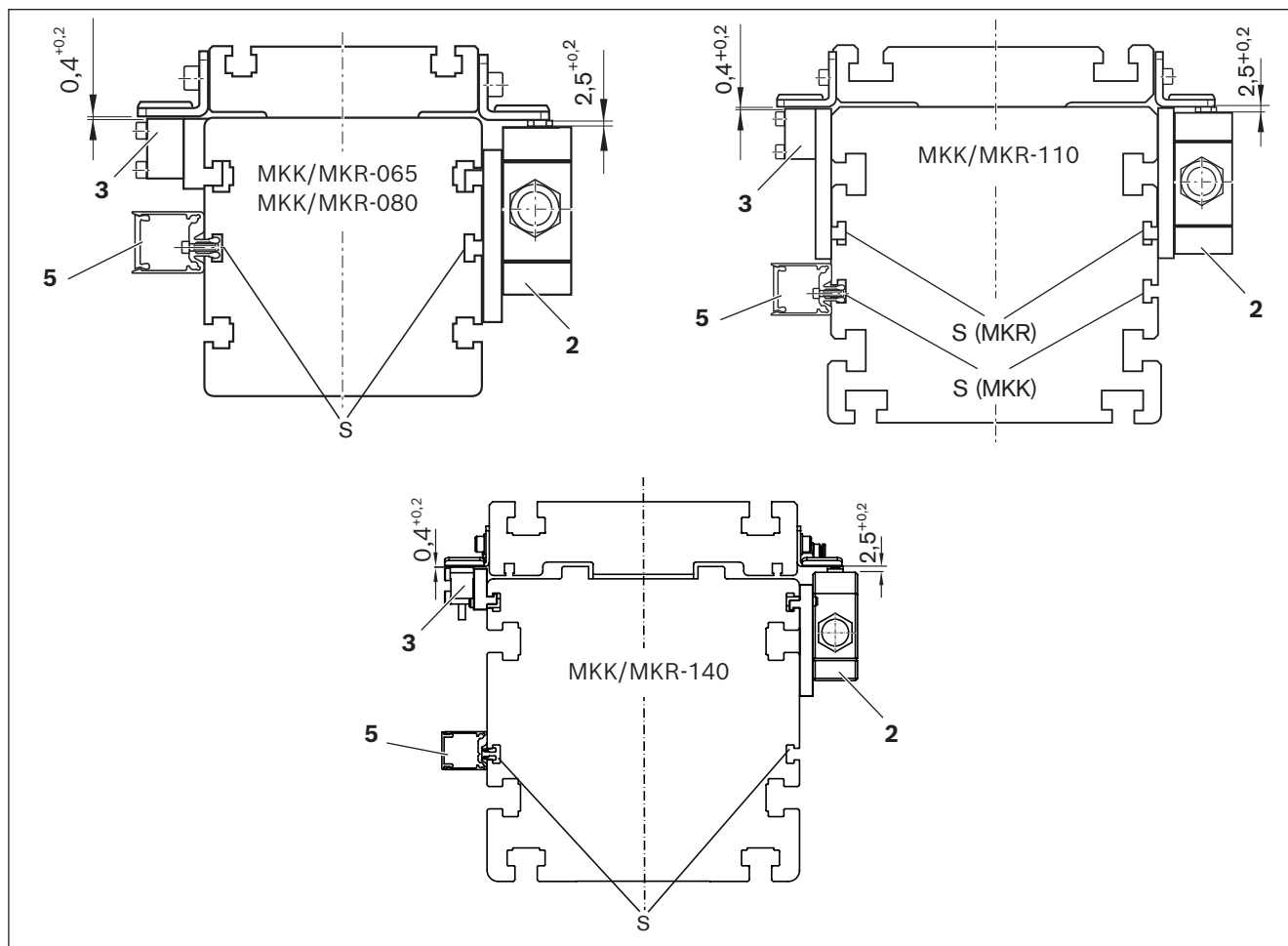


Fig. 14: Proximity sensors and mechanical switches MKK/MKR -065/-080/-110/-140-NN-3



S = Slot for magnetic sensor

6.5.4 MKR-145-NN-3

Magnetic sensor with M8x1 plug

1. Insert the sensor mount (a) into the respective slot (S) in the frame, position it approximately and secure it with two set screws (b).
2. Insert the sensor (8) into the sensor holder and secure it by turning the clamping screw (9).

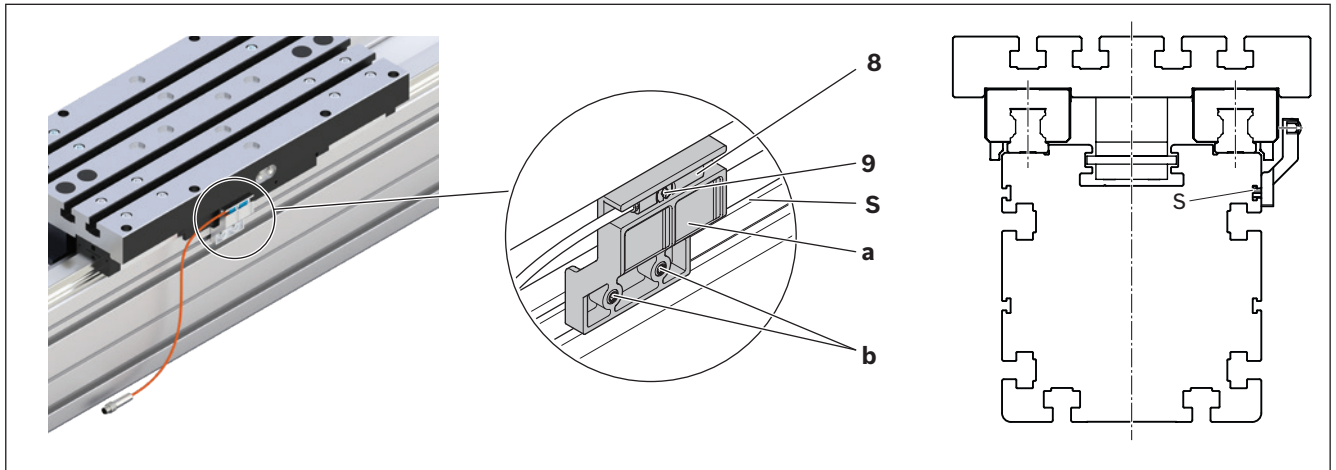


Fig. 15: Magnetic sensor MKR-145-NN-3

Proximity sensors and mechanical switches

► Assembly ➔ 6.5.10 / 6.5.11

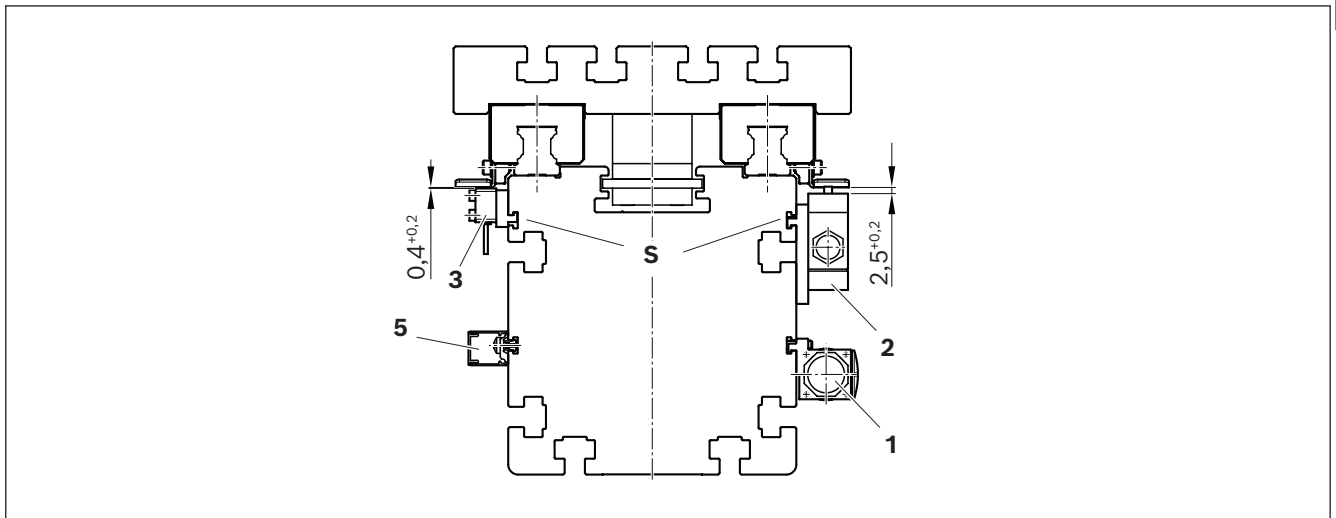


Fig. 16: Proximity sensors and mechanical switches MKR-145-NN-3



S = Slot for sensor mount (a), proximity sensors, mechanical switches

6.5.5 Switch mounting arrangement MKK/MKR-165-NN-2

Proximity sensors and mechanical switches

► Assembly ➡ 6.5.10 / 6.5.11

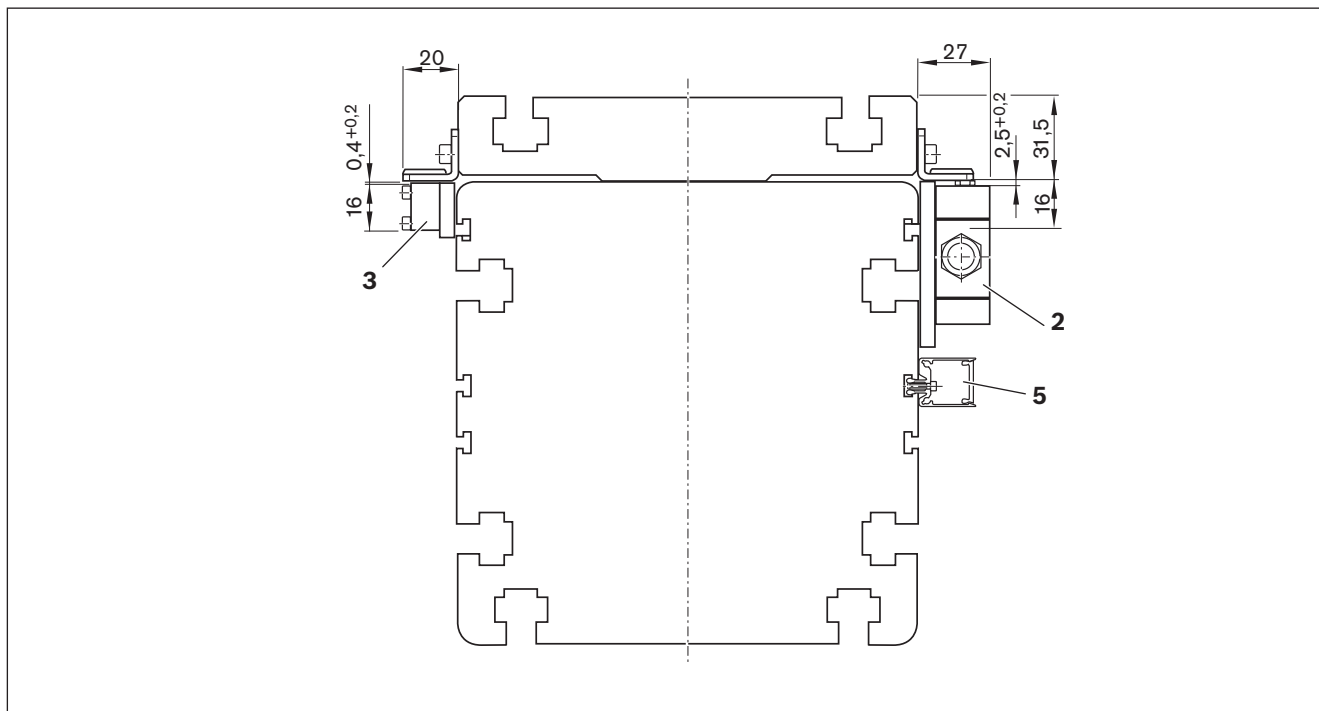


Fig. 17: Proximity sensors and mechanical switches MKK/MKR-165-NN-2



MKK/MKR-165-NN-2: Only proximity sensors (3) and mechanical switches (2) available

6.5.6 Switch mounting arrangement MLR-080/-110-NN-3

Magnetic sensor with M8x1 plug

1. Insert the sensor mount (a) into the respective slot (S) in the frame, position it approximately and secure it with two set screws (b).
2. Insert the sensor (8) into the sensor holder and secure it by turning the clamping screw (9).

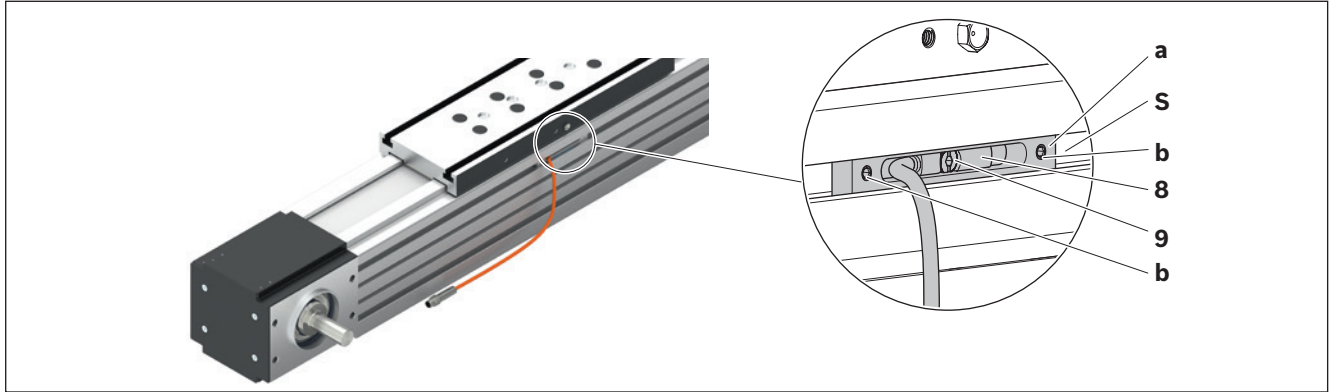


Fig. 18: Magnetic sensor MLR-080/-110-NN-3

Proximity sensors and mechanical switches

► Assembly ➡ 6.5.10 / 6.5.11

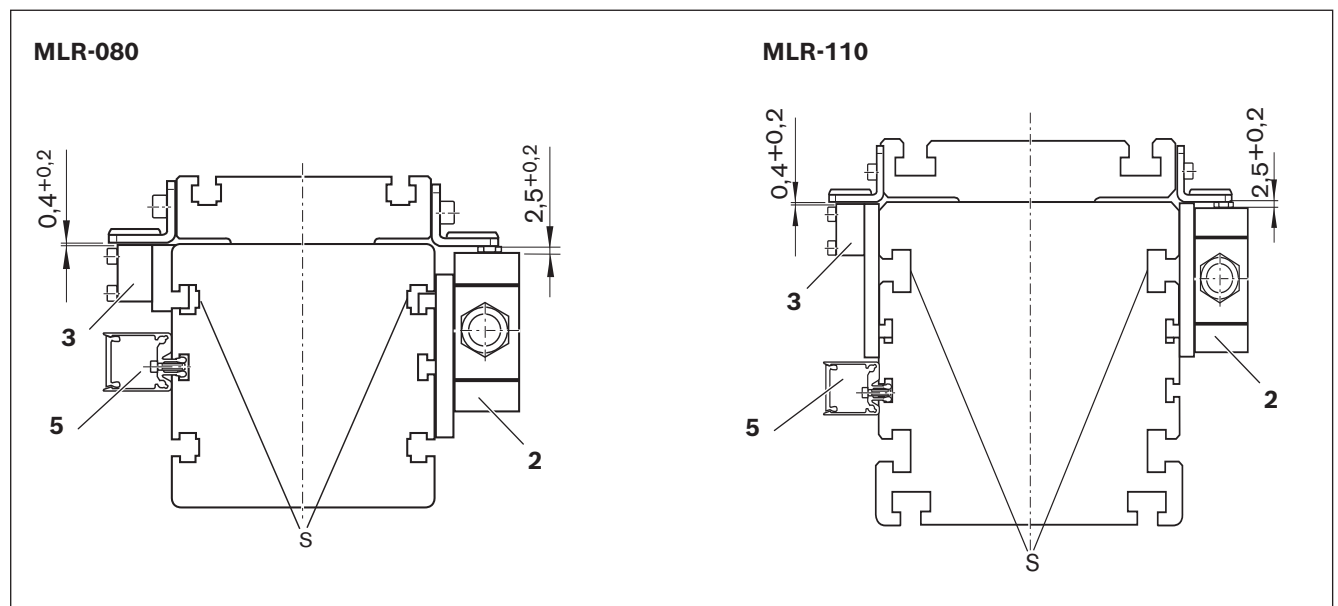


Fig. 19: Proximity sensors and mechanical switches MLR-080/-110-NN-3



MLR-080:

S = Slot for magnetic sensor mounts/proximity sensors/mechanical switches

MLR-110:

S = Slot for magnetic sensor mount

6.5.7 Mounting the switching cam

- Fasten the switching cam onto a carriage!

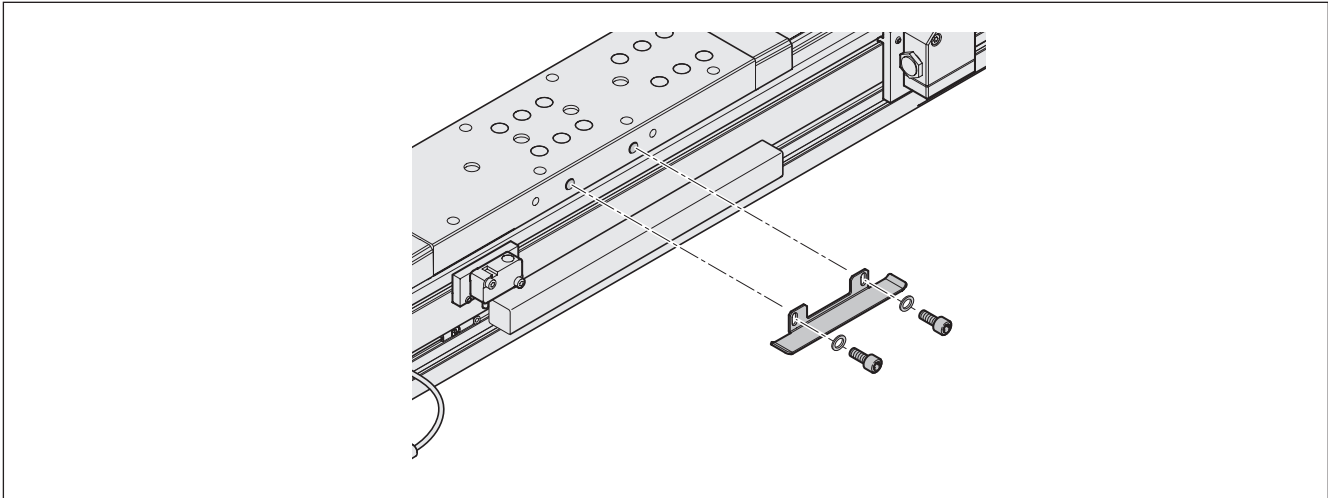


Fig. 20: Mounting the switching cam

6.5.8 Overview of mechanical switches, proximity sensors, socket-plugs, cable channel switching cams

- The mechanical switches, the proximity sensors and the box with connector and cable channel are fastened with attachments in the respective slots of the frame. Switch activation for mechanical switches and proximity sensors is carried out by a switching cam (4) on the carriage.

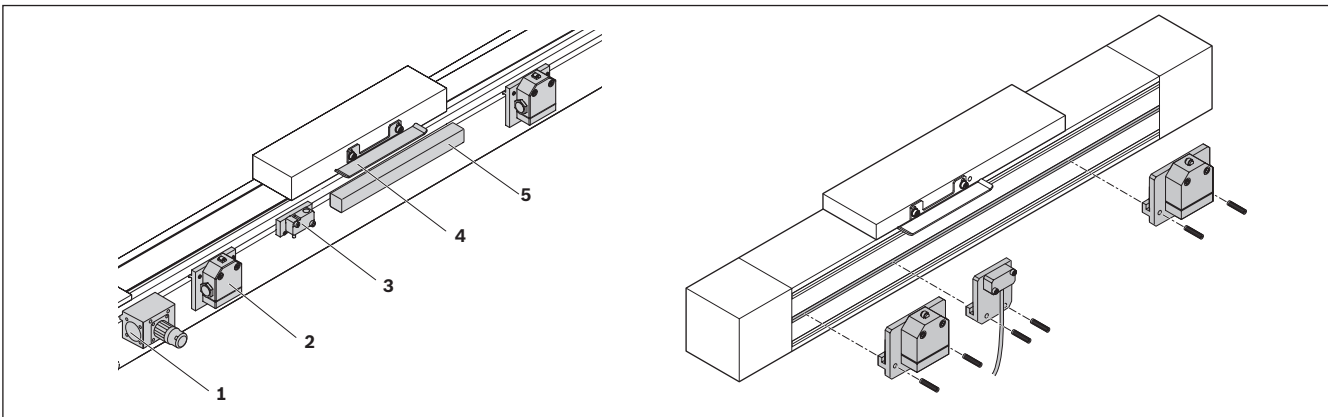


Fig. 21: Overview of mechanical switches, proximity sensors, socket-plugs, cable channel, switching cams

- | | |
|---|--|
| 1 Socket and plug | 4 Switching cams (for mechanical switch and proximity sensors) |
| 2 Mechanical switch with attachments | 5 Mounting channel / cable channel |
| 3 Proximity sensor with additional components | |

Assembling the switch / sensor

1. Hang the switch with the switch mounting plate into the corresponding slot in the frame, set the switch to the desired switching position and secure it with set screws.
2. Set the switching point and switching interval by adjusting the switches and the switching cam. (Observe the adjustment between switch and switching cam).
3. Tighten the bolts and set screws at the switching cam and switches.

6.5.9 Solenoid switch position for magnetic sensor

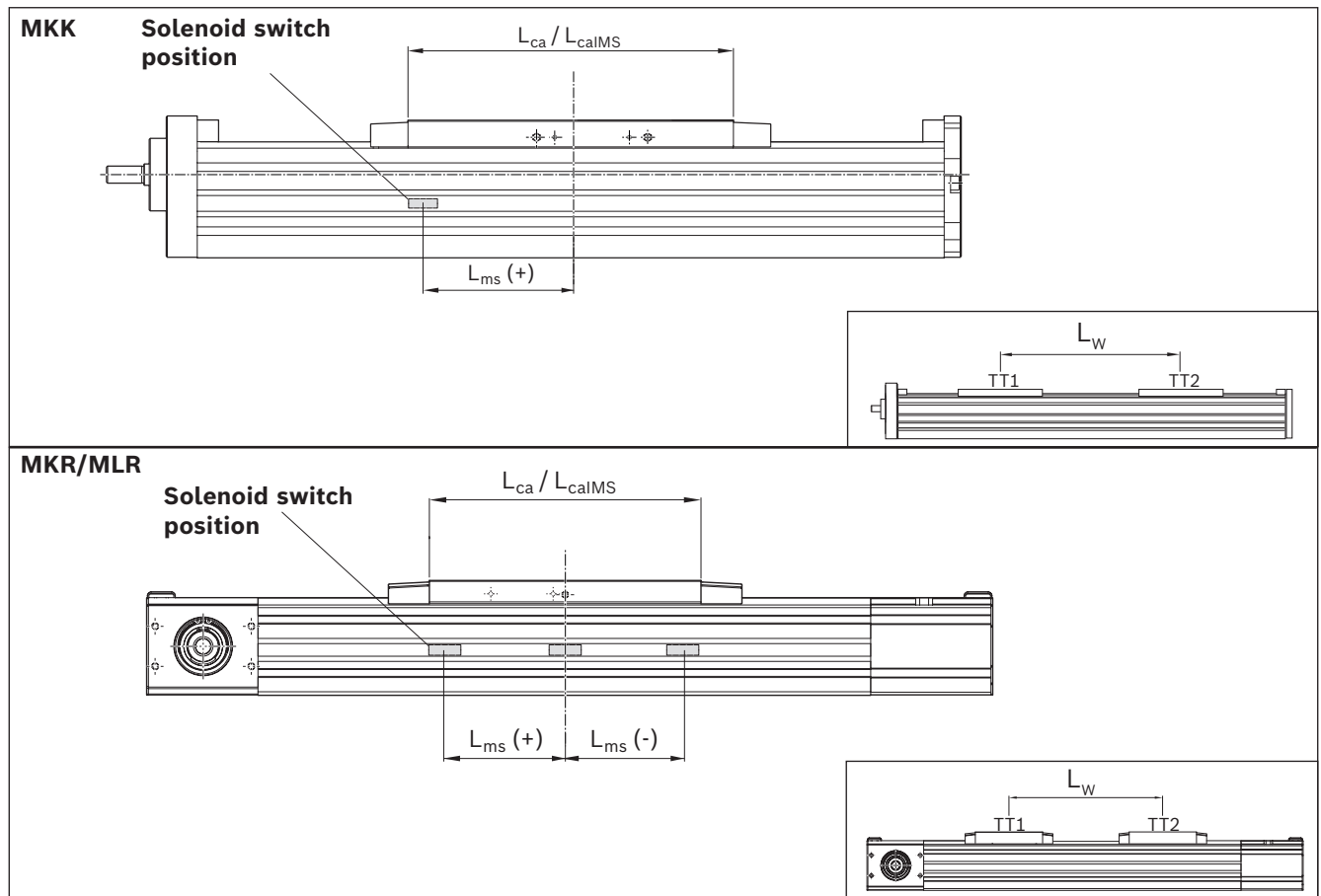


Fig. 22: Solenoid switch position for magnetic sensor

- The switch activator (both sides) is a magnet that is built into the carriage (no switching cam necessary). At versions with two carriages, the solenoid switch is always in carriage TT1. The switch activation points can be positioned anywhere along the stroke. The solenoid of linear modules MKR is integrated in + or - direction or centrally in the carriage (depending on size, see table 6 and fig. 22).

Table 6: Solenoid switch position in carriage

	L_{ca} / L_{calMS} (mm)	L_{ms} (mm)	Solenoid switch ($\varnothing$ x length) (mm)
MKK			
-040-NN-3	135	57.5	4 x 20
-065-NN-3	190	85	
-080-NN-3	260	102.5	6 x 15
	360	152.5	
-110-NN-3	305	125	
	430	187.5	
-140-NN-3	370	176	
	500	241	
MKR			
-040-NN-3	135	-60	4 x 12
-065-NN-3	190	-85	
-080-NN-3	190	-65	4 x 20
	260	0	
	360	50	
	210	-53	
-110-NN-3	305	0	
	430	62.5	
-140-NN-3	370	0	
	500	65	
-145-NN-3	400	0	
MLR			
-080-NN-3	190	0	4 x 20
-110-NN-3	305	2.5	6 x 15

6.6 Installing the socket

Installation position:

Various socket and plug installations are possible depending on the requirements.

Securing the socket to the frame

1. If they are not pre-drilled, make holes in the seals for the cables.
2. Guide all the cables through the compression screw (5), seal (4), socket housing (3) and flat gasket (6). Observe the connection position for the connector when doing so.
3. Use an o-ring (2) and screw plug (1) to seal the unused opening in the socket housing.

Connecting the socket

4. Connect/solder the cable in the flanged socket (7). Make a pin assignment diagram.
5. Attach the flanged socket to the socket housing (3).
6. Press in the seal (4) with the compression screw (5).
7. Engage the socket in the slot at the frame and fix in position with set screws.
8. Perform a functional check. Follow the instructions in chapter 9 and 10.

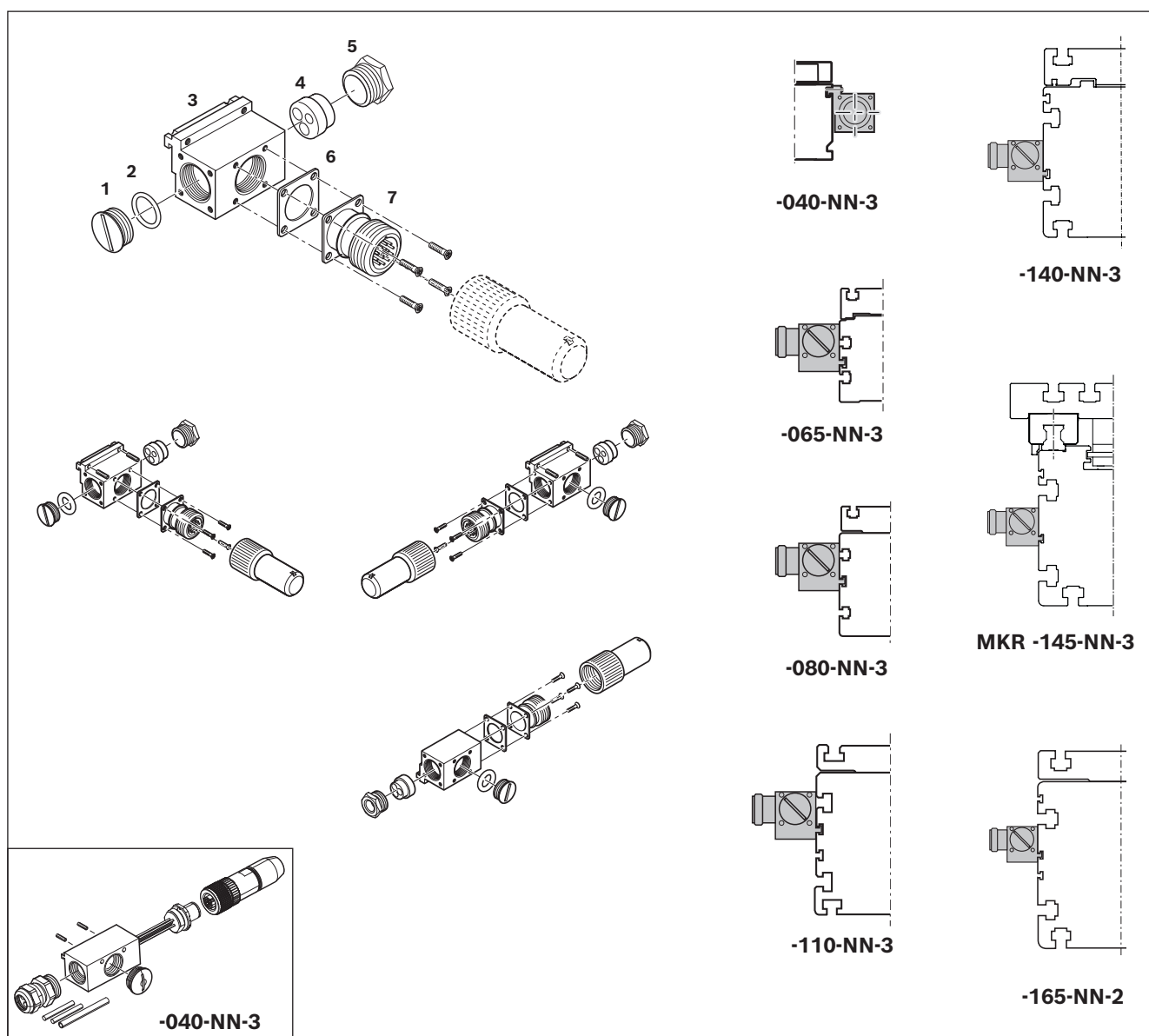


Fig. 23: Installing the socket

6.7 Mounting the cable channel

Attaching cable channel to frame

1. Measure the required length of the cable duct. Pay attention to the position of the switches and the socket.
2. Saw off and deburr the cable channel.
3. Create a recess to pass the cables through (1).
4. If the existing fastening bores (2) are not sufficient (300 mm intervals), drill additional fastening holes into the cable channel bottom ($\varnothing 3.1 \times 2.5$ deep).
5. Clip the cable duct into the slot at the linear module and screw on. Use the M3x8 bolts provided. For greater clearance in the cable duct, use M3x8 set screws.

Inserting cables

- Cut the cable grommets (3) open according to the diameter of the cables and insert them. (5 cable grommets included).
- Insert and wire the cables.

Mounting the cover strip with no cable channel end cover

- Measure out, saw off, deburr, install and engage the cover strip for the cable duct.

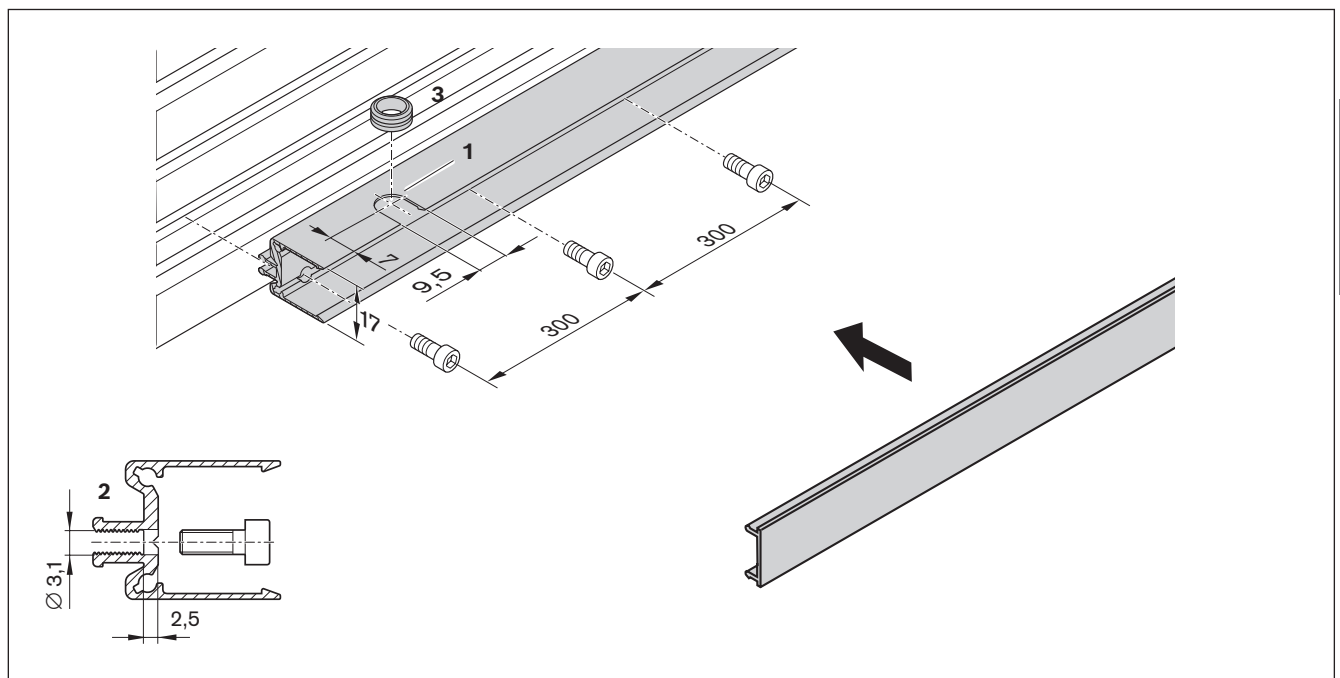


Fig. 24: Mounting the cable channel

7 Mounting the MKK drive

NOTES

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

Avoid tension due to the weight of the motor when mounting the motor!

Damage to the product.

► Observe the specified limits. Technical data and limits ► Catalog.

Drive versions:

- Flange and coupling (2) with motor (1)
- Timing belt side drive (3) with motor (1)

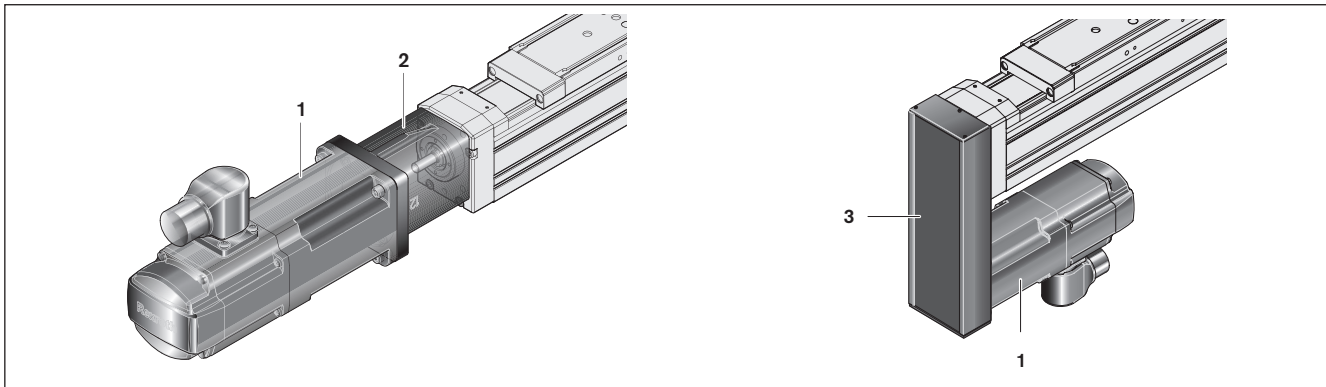


Fig. 25: MKK drive versions

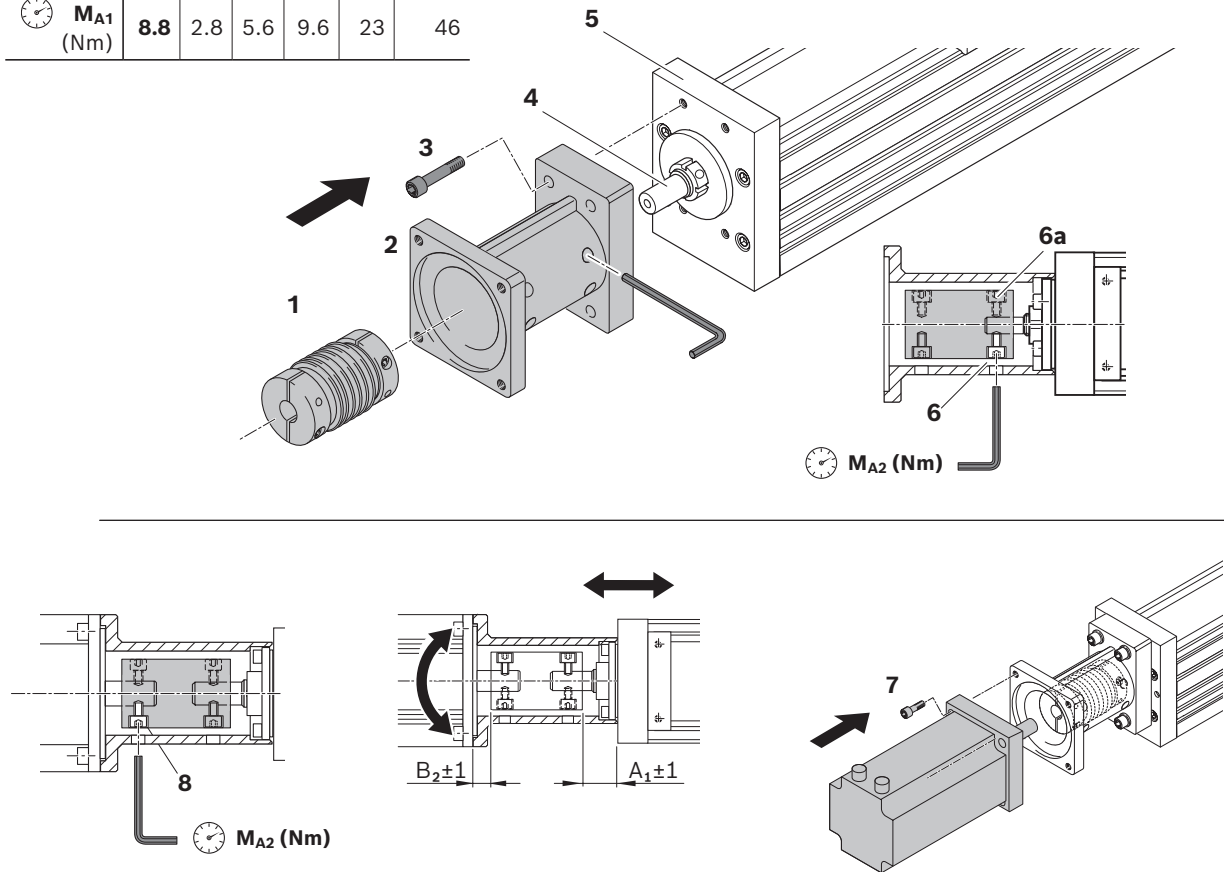
7.1 Mounting the motor with flange and coupling

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

Observe the tightening torques ► 17.1

1. Push the flange (2) into the centering on the product and screw down onto the end plates (5) using four screws (3) and tightening torque M_{A1} .
2. Insert coupling (1) into the flange (2) on the screw journal (4) of the product and set dimension A_1 .
3. Tighten the mounting screws (6) to tightening torque MA_2 .
4. Push the motor into the centering ring from the flange and coupling and using four screws (7) tighten to tightening torque MA_1 .
5. Tighten the motor-side mounting screws (8) of the coupling with the specified tightening torque MA_2 .
6. If necessary, release the motor brake and move the carriage so that the screw journal turns.

 $\mu = 0.125$	M4	M5	M6	M8	M10	
 M_{A1} (Nm)	8.8	2.8	5.6	9.6	23	46



MKK	Motor interface	A_1 (mm)	B_2 (mm)	M_{A2} (Nm)		$\mu = 0.125$
				Motor side (8)	System side (6)	
MKK-040-NN-3	MS2N03	5.0	9.0	1.0	1.0	
	MSM019B	5.0	10.0	1.0	1.0	
	MSM031B	2.0	5.0	1.7	3.5	
	08-18-030-2.5-046-M04-007-040	6.0	9.0	1.0	1.0	
	09-20-040-2.5-063-M05-010-05	2.0	5.0	1.7	3.5	
MKK-065-NN-3	MS2N04	2.0	10.5	8.0	14.0	
	MSM041B	11.0	13.0	8.0	8.0	
	14-30-060-3.0-075-M05-008-072	6.0	11.5	2.9	2.9	
	14-30-060-3.0-075-M06-008-072	6.0	11.5	2.9	2.9	
	19-40-080-3.0-100-M06-010-096	11.0	22.0	8.0	8.0	
MKK-080-NN-3	MSM041B	25.0	6.0	8.0	8.0	
	MS2N04	19.5	5.5	8.0	14.0	
	MS2N05	20.0	14.0	13.0	13.0	
	14-30-060-3.0-075-M05-008-072	19.5	5.5	8.0	14.0	
	14-30-060-3.0-075-M06-008-072	19.5	5.5	8.0	14.0	
	19-40-080-3.0-100-M06-010-096	20.0	9.0	13.0	13.0	
MKK-110-NN-3	MS2N06	26.5	17.5	13.0	13.0	
	MSK076	25.0	14.0	30.0	30.0	
	24-50-110-3.5-130-M08-010-126	26.5	17.5	13.0	13.0	
	32-58-130-3.5-165-M10-013-155	27.0	19.0	30.0	30.0	
MKK-140-NN-3	MS2N07	28.0	18.0	30.0	30.0	
MKK-165-NN-2	24-50-110-3.5-130-M08-010-126	28.0	18.0	30.0	30.0	
	32-58-130-3.5-165-M10-013-155	28.0	18.0	30.0	30.0	

Fig. 26: Mounting the motor with flange and coupling

7.2 Mounting the motor with belt side drive

Mounting the housing

- ▶ Screw on the housing (1) of the belt side drive to the product. The timing belt side drive can be mounted in four different directions. Any unused bores must be closed with the enclosed mounting hole plugs.

7.2.1 Installing the first belt pulley

- ▶ Position the belt pulley (2) with the tensioning unit and toothed belt fitted on the screw journal.
- ▶ Adjust distance A to the housing according to table 7 (page 30).

Installing tensioning units

- ▶ Lubricate the tensioning units slightly.



Do not use lubricant with MoS₂ additives!

Type 1:

- ▶ Install the tensioning unit (3).
- ▶ Screw the bolts (4) into the belt pulley and tighten slightly.
- ▶ Tighten the screws cross-wise in several equal steps until the tightening torque MA₁ according to the table is reached!

Types 2 and 3:

- ▶ Slide home the tensioning unit in the belt pulley.
- ▶ Tighten the screws cross-wise in several equal steps until the tightening torque MA₁ according to the table is reached!

Mounting the support bearing (if available)

1. Fasten the adapter shaft (1) to the belt pulley using screws (2).
2. Fix the ball bearing (3) to the adapter shaft by hand and secure with the retaining ring (4).
3. Carefully push the bearing flange (5) onto the bearing and secure it at the housing with screws (6).

Tightening torques ➡ 17.1

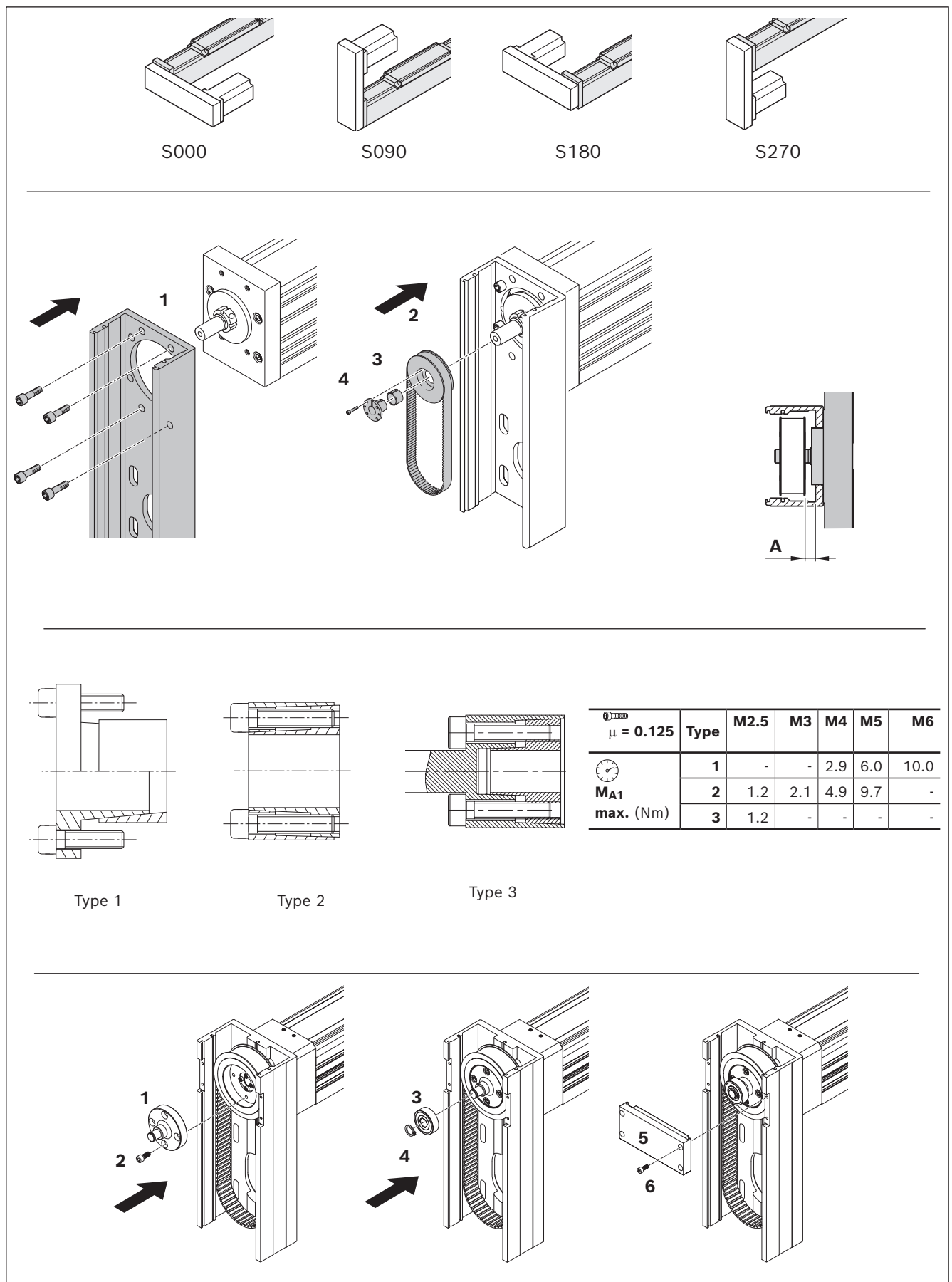


Fig. 27: Mounting the timing belt side drive / mounting the first belt pulley / mounting the support bearing

7.2.2 Installing second belt pulley and motor for $i = 1$

Pre-assembling the motor:

- Pre-assemble the motor with the two motor bars (1) as close as possible to the linear module to permit problem-free insertion of the second belt pulley (6).

Installing the belt pulley:

1. Lightly lubricate the tensioning unit (5).
2. Attach the belt pulley (6) and tensioning unit to the motor journal and guide into the belt.
3. Adjust distance B to the housing according to table 7 (page 30).
4. Install the tensioning unit. Refer to "Installing first belt pulley".

Tension the belt ➡ 7.2.4

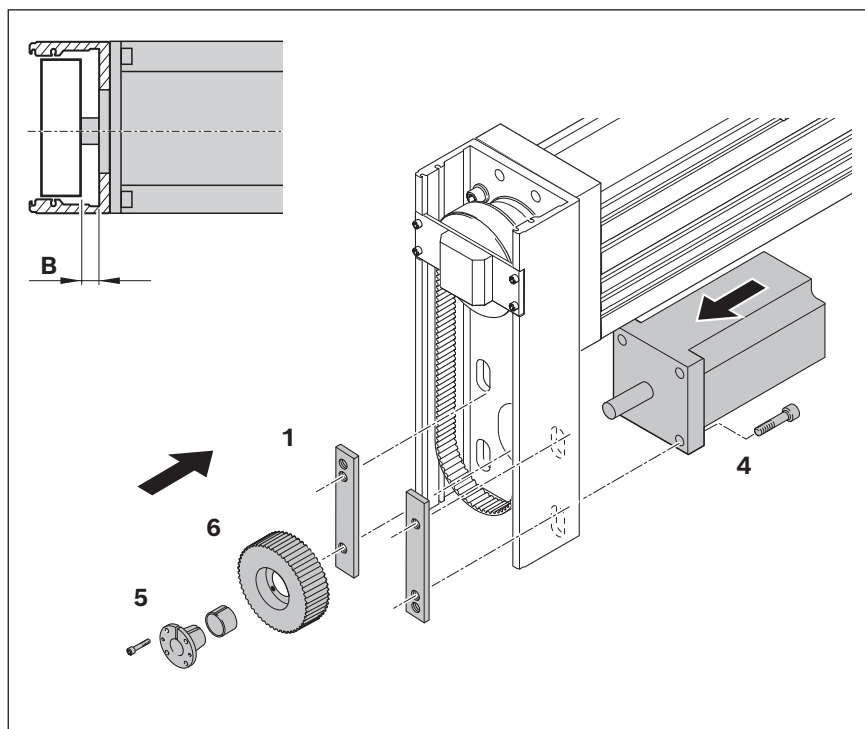


Fig. 28: Mounting the motor and second belt pulley ($i = 1$)

7.2.3 Mounting the second belt pulley and the motor at $i=1.5$ or $i=2$

Installing the belt pulley:

1. Lightly lubricate the tensioning unit (5).
2. Attach the belt pulley (6) and tensioning unit to the motor journal.
3. Adjust distance C to the motor according to table 7 (page 30).
4. Install the tensioning unit. Refer to "Installing first belt pulley".

Pre-assembling the motor:

- Guide in the motor and pre-assemble with the two motor bars (1).

Tension the belt ➡ 7.2.4

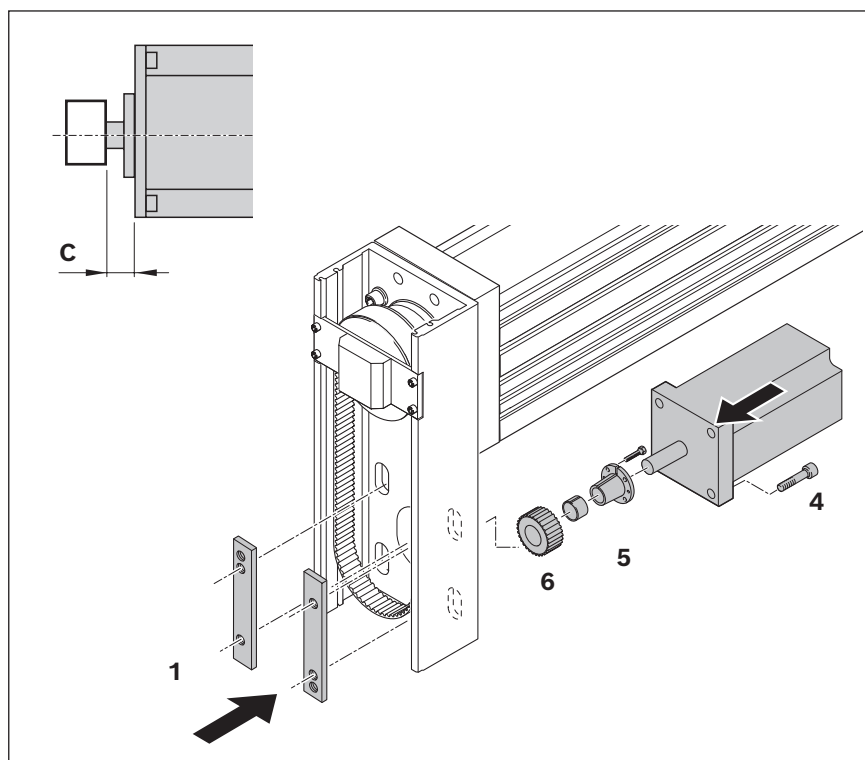


Fig. 29: Mounting the motor and second belt pulley ($i = 1,5$ or $i = 2$)

Tightening torques ➡ 17.1

Toothed belt pre-tension



The belt frequency or preload force of the toothed belt depends on the size of the unit, the motor, belt pulleys, and on the torque. It is indicated on the inside of the cover of the belt side drive. If the timing belt side drive is not positioned horizontally on assembly, make allowance for the dead weight of the motor.

NOTE

Excessive belt pulley preloading can cause the drive journal to break at the product or the motor!

Damage to the product.

► Observe permissible limits!

1. Screw suitable screws (2) through, for example, a clamping bar (3) into the two motor bars (1).
2. By tightening the screws (2) evenly, the motor is moved away from the linear motion system (LS) and so the toothed belt is tensioned. Set the belt frequency f using a frequency measuring instrument (R913057897) according to the note inside the housing and tighten the motor mounting screws (4).

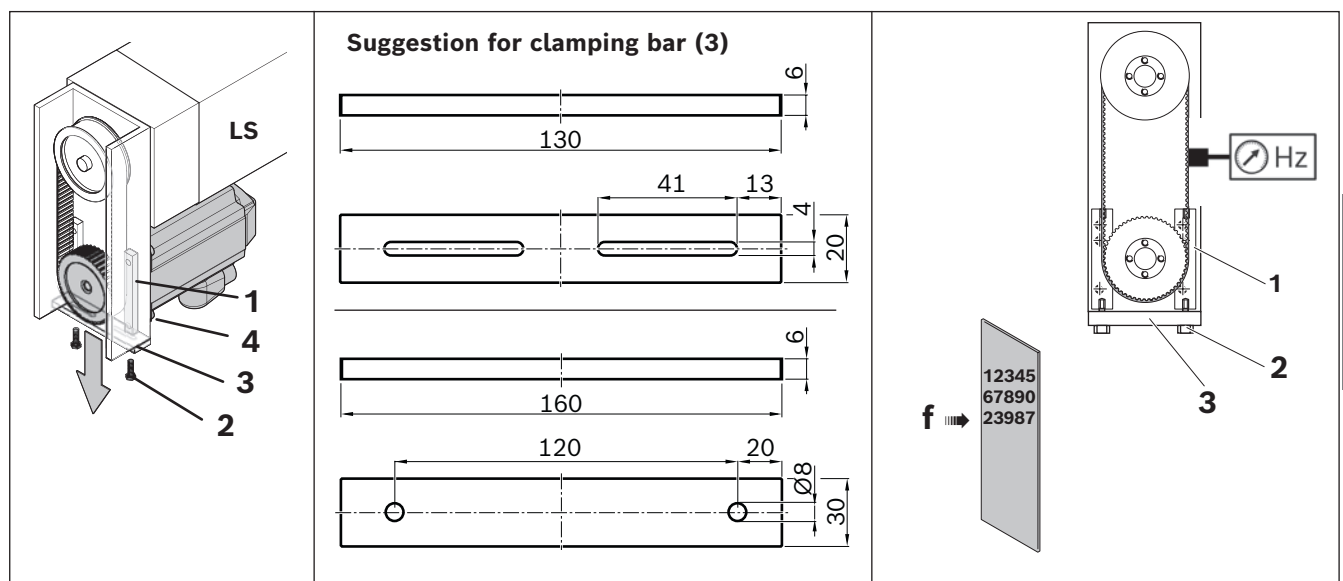


Fig. 30: Tensioning the belt

7.2.4 Tensioning the belt

7.2.5 Attaching the cover of the belt side drive with timing belt

- Install all caps to the housing of the belt side drive.

Versions:

A = Without support bearing

B = With support bearing



For functional checks observe chapter 9 and 10.

Tightening torques ➡ 17.1

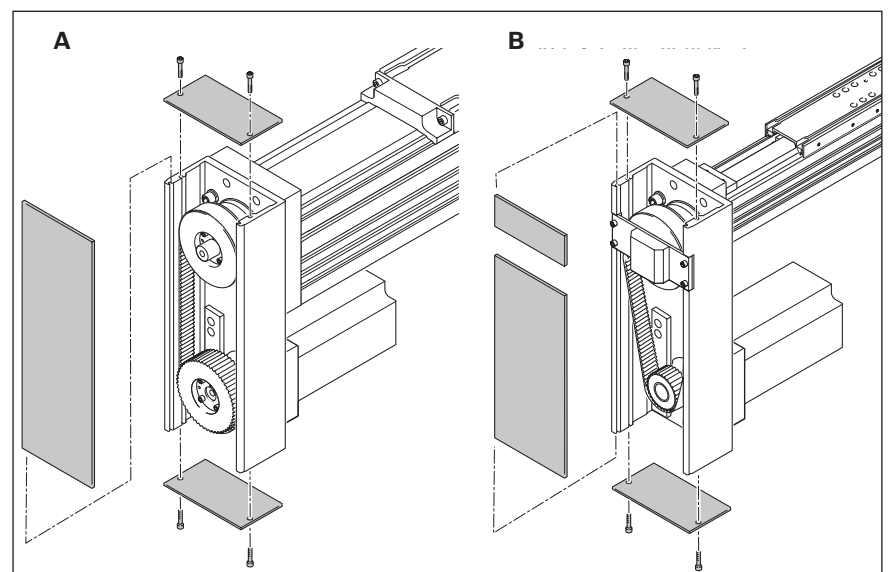


Fig. 31: Attaching the cover of the belt side drive with timing belt

Table 7: Distance A/B/C

MKK-040-NN-3	Motor interface		Dimensions (mm)		
			A	B	C
	MS2N03	i = 1	7	7	-
	MSM019B		5	5	
	MSM031B		7	7	
	S01-1.0-08-18-030-2.5-046-M04-007-040		5	5	
S01-1.5-09-20-040-2.5-063-M05-010-055	7		7		
MKK-040-NN-3	Motor interface		Dimensions (mm)		
			A	B	C
	MS2N03	i = 1.5	7	-	12
	MSM019B		5	5	-
	MSM031B		7	-	12
	S01-1.0-08-18-030-2.5-046-M04-007-040		5	5	-
S01-1.5-09-20-040-2.5-063-M05-010-055	7		-	13	
MKK-065-NN-3	Motor interface		Dimensions (mm)		
			A	B	C
	MS2N04	i = 1	8	7	-
	MSM041B			8	
	S10-1.0-14-30-060-3.0-075-M05-008-072			7	
	S10-1.0-14-30-060-3.0-075-M06-008-072			7	
MKK-065-NN-3	Motor interface		Dimensions (mm)		
			A	B	C
	MS2N04	i =1.5	8	-	14
	MSM041B				15
	S10-1.0-14-30-060-3.0-075-M05-008-072				14
	S10-1.0-14-30-060-3.0-075-M06-008-072				14
MKK-080-NN-3	Motor interface		Dimensions (mm)		
			A	B	C
	MS2N04	i = 1	10	9	-
	MS2N05		11	10	
	MSM041B		10	9	
	S06-1.0-14-30-060-3.0-075-M05-008-072		10	9	
	S06-1.0-14-30-060-3.0-075-M06-008-072		10	9	
	S06-2.0-19-40-080-3.0-100-M06-010-096		11	10	
MKK-080-NN-3	Motor interface		Dimensions (mm)		
			A	B	C
	MS2N04	i = 1.5	10	-	16
	MS2N05		11		19
	MSM041B		10		17
	S06-1.0-14-30-060-3.0-075-M05-008-072		10		16
	S06-1.0-14-30-060-3.0-075-M06-008-072		10		16
	S06-2.0-19-40-080-3.0-100-M06-010-096		11		19
MKK-110-NN-3	Motor interface		Dimensions (mm)		
			A	B	C
	MS2N06	i = 1	11	10	-
	S05-1.0-19-40-080-3.0-100-M06-010-096				
	S05-1.0-24-50-110-3.5-130-M08-010-126				
MKK-110-NN-3	Motor interface		Dimensions (mm)		
			A	B	C
	MS2N06	i = 2	12	-	19
	S05-1.0-19-40-080-3.0-100-M06-010-096				
	S05-1.0-24-50-110-3.5-130-M08-010-126				
MKK-140-NN-3 MKK-165-NN-2	Motor interface		Dimensions (mm)		
			A	B	C
	MS2N07	i = 1	13	11	-
	S07-1.5-24-50-110-3.5-130-M08-010-126				
	S07-1.5-32-58-130-3.5-165-M10-013-155				
MKK-140-NN-3 MKK-165-NN-2	Motor interface		Dimensions (mm)		
			A	B	C
	MS2N07	i = 2	13	21	-
	S07-1.5-24-50-110-3.5-130-M08-010-126				
	S07-1.5-32-58-130-3.5-165-M10-013-155				

8 Mounting the MKR/MLR drive

NOTES

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

Avoid tension due to the weight of the motor when mounting the motor!

Damage to the product.

- Observe the specified limits.
- Install the motor in a vertical position

Technical data and limits ➔ "Linear modules" catalog.

8.1 Installing the flange and gear unit

1. Attach the flange (1) to the gear (3) using 4 screws (2) M_{A1} .
2. Vertically attach the gear with flange to the end enclosure (4). Centering takes place via the tubular shaft (gear journal and hollow shaft must be free of grease). Insert the gear journal (5) into the clamping hub (6) and pre-assemble it with 4 screws (7) at the end enclosure (4).
3. Clamp gear journal (5) to the drive shaft with screws (8) to tightening torque M_{A2} .
4. Secure gear with flange to the end enclosure (4) with 4 screws (7) to tightening torque M_{A1} .

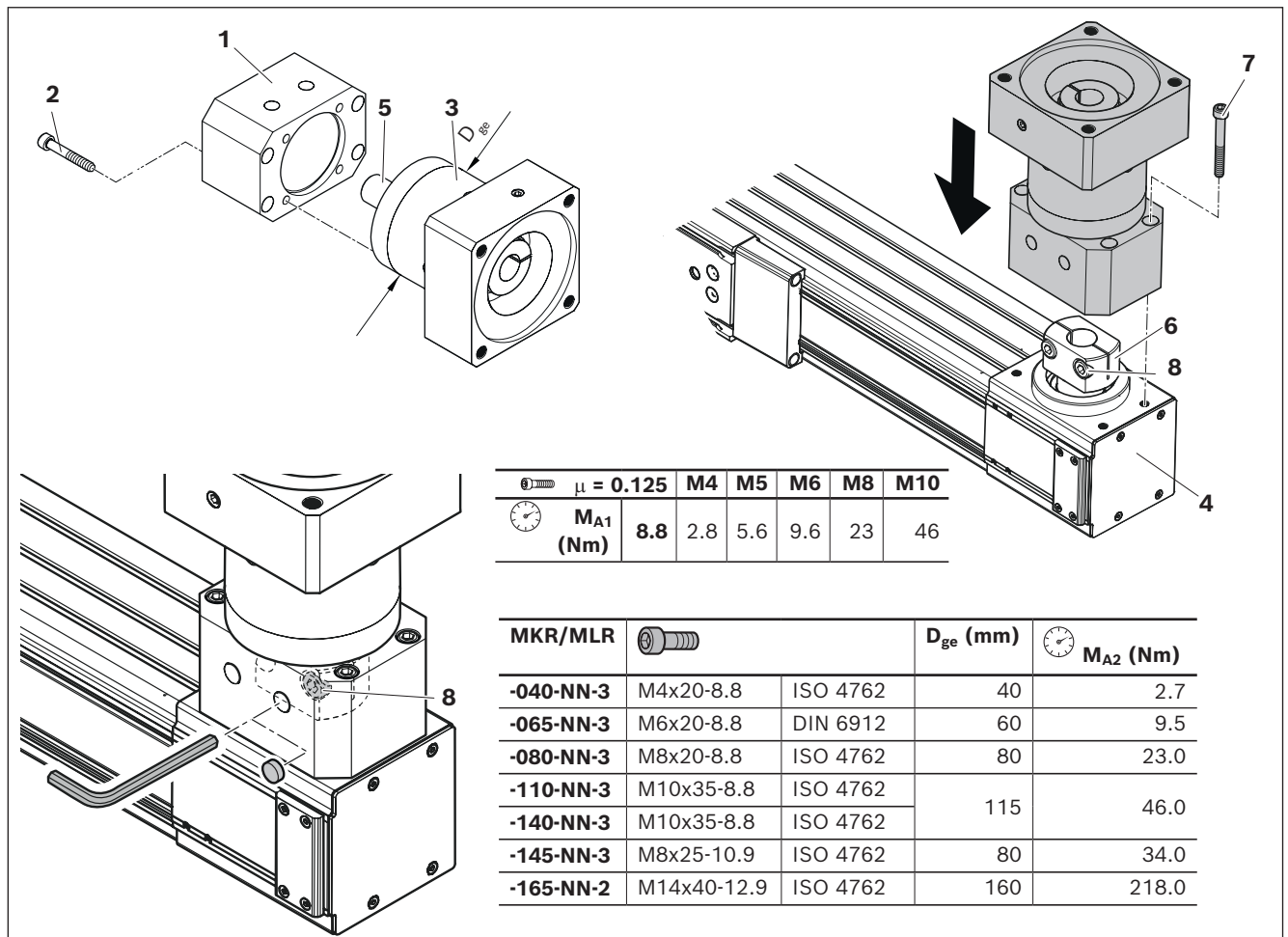


Fig. 32: Mounting the MKR drive

8.2 Mounting the motor

Mount the motor onto the gear unit ➔ refer to the enclosed gear instructions.



When checking the function, please follow the instructions chapter 9 and 10.

9 Connecting the electrical power supply to the linear module

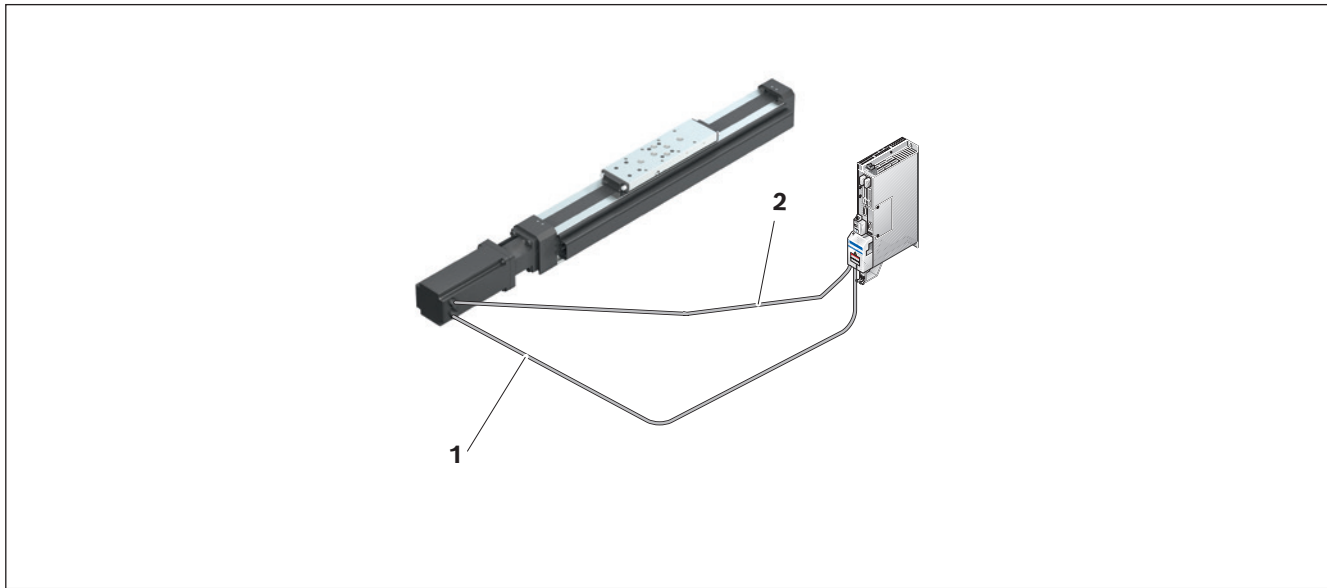


Fig. 33: Connecting the electrical power supply to the linear module

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!

1. Keep the documentation for the motor/controller at hand.
2. Lay the motor cable **(1)** at a distance from the encoder cables **(2)**!

10 Start-up

- ▶ Do not start up 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.
- ▶ Prior to start-up and at every lubrication interval, apply an oil film to the cover strip.

10.1 Easy start-up using the integrated wizard

EasyWizard is the standard wizard integrated in the Rexroth engineering framework IndraWorks DS to help you start up linear motion system drives easily and quickly. Start-up has never been easier thanks to pre-configured data sets and a name plate on the linear motion systems that is keyed to the wizard.

- Quick, easy and intuitive start-up
- Text-based and graphic online help for the individual input fields
- Plausibility checks for free data entry
- Compatible with all Rexroth linear motion systems
- Incorrect parameter settings are minimized by the similar arrangement of the data on the name plate and the wizard input mask
- For system optimization, the axis can be traversed in the test mode after parameterization

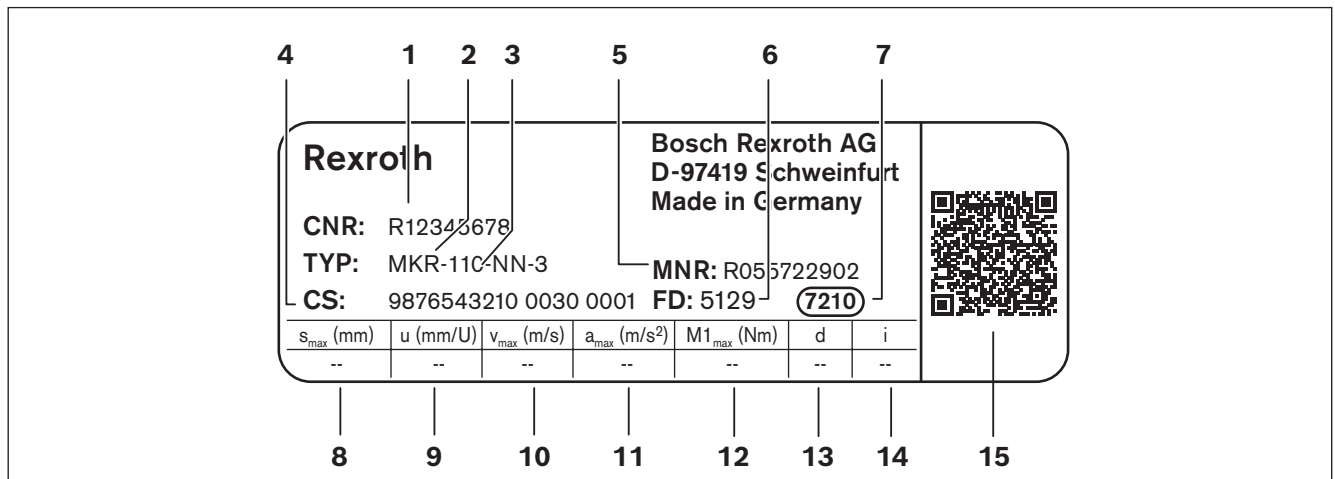
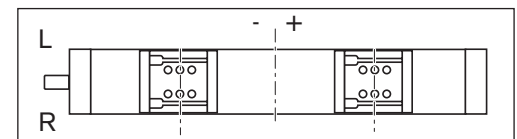
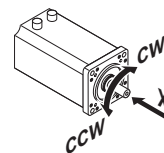


Fig. 34: Name plate (example)

1	CNR	Customer's material number
2	TYPE	Short product name
3	110	Size
4	CS	Customer information
5	MNR	Material number
6	FD	Date of manufacture
7	7210	Manufacturing location
8	$s_{\max}$	Maximum travel range
9	u	Feed constant without motor attachment
10	$v_{\max}$	Maximum speed
11	$a_{\max}$	Maximum acceleration rate

12	$M1_{\max}$	Maximum drive torque at motor journal
13	d	Direction of motor rotation to move in positive (+) direction CW = clockwise CCW = counterclockwise



14	i	Gear ratio
15		QR code (for start-up)

10.2 Checking the operating conditions

- Observe ambient temperature, load, travel speed and stroke ➡ Chapter "Operating conditions" and "Linear modules" catalog.
- For special operating conditions, please contact us.

10.3 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 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 stroke. While doing so, be sure to check the settings and the function of the limit switches.
- ▶ Prior to start-up and at every lubrication interval, apply an oil film to the cover strip.
- ▶ If necessary, optimize the interaction of the mechanical equipment and the electronics.

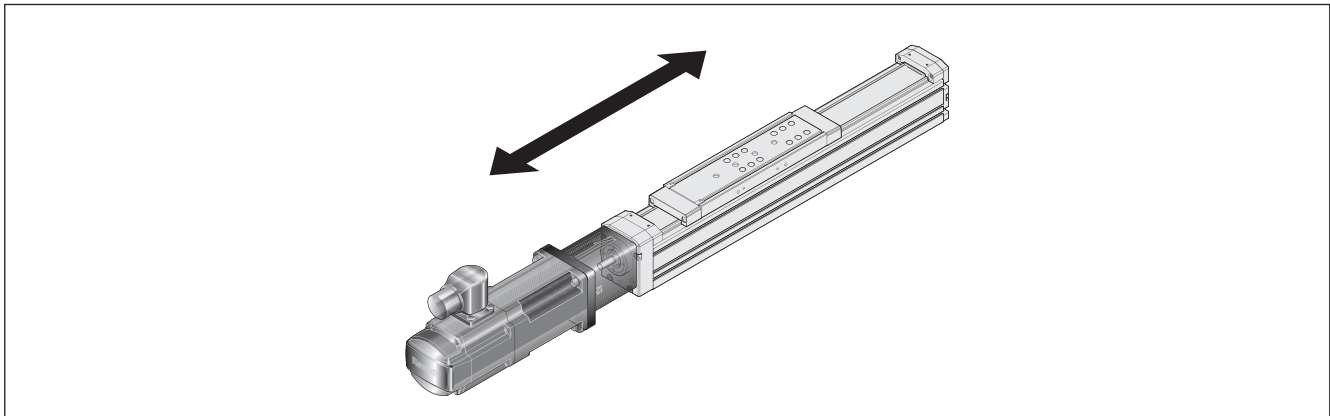


Fig. 35: Moving the carriage

10.4 Moving switches

Pushing mechanical or proximity switches

- ▶ If switching errors occur during the functional check / test run, reset the switch ➡ 6.5.



The cables are molded into the proximity switches. If necessary, we recommend a repurchase.

11 Operation

NOTES

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.

- ▶ During operation, be sure to comply with technical data such as load capacities, torques, maximum rotary speeds, motor data, etc.
 - ▢ "Linear modules" catalog.

12 Maintenance and repair

Maintenance is limited to lubrication.

13 Lubrication

13.1 Notes

This chapter describes the basic lubrication of the linear motion system, if this has not been done by the manufacturer, and the relubrication by the customer.

The required basic lubrication and relubrication by the customer is limited to the lubrication of the rail system and the ball screw assembly.

The basic lubrication of all other components, e.g. deep-groove ball bearings, cover strips, gear units, etc. is done by the manufacturer.

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



Do not use lubricants with solid particles (e.g. graphite or MoS₂).

If you use different lubricants from the ones stated, you may find that relubrication intervals are shorter and that performance decreases with short stroke and load ratio; in addition, chemical interactions may take place between the plastics and lubricants.

Central lubrication systems also need to be able to pump these lubricants.

If using a central lubrication system, make sure all lines and elements are filled with lubricant all the way to the connection to the consumer (carriage) and that there are no air bubbles.

- We recommend carrying out initial lubrication separately using a grease gun before connecting to the central lubrication system.
- The pulse count can be calculated as the quotient (rounded to the next whole figure) of the re-lubrication quantity and the smallest permissible piston distributor size (minimum impulse quantity). The lubricating cycle time is the result of dividing the lubrication interval by the determined pulse count.

Lubricant reservoirs should contain an agitator to ensure the lubricant can flow (avoids hardening in the reservoir).

For relubrication, it is not possible to switch from grease to oil lubrication and vice-versa.

If environmental factors such as contamination, vibrations, impact loads, etc. are present, we recommend shorter relubrication intervals. Even under normal operating conditions, relubrication is required every two years due to grease aging.

Rexroth recommends piston distributors by SKF. These should be installed as close to the carriage lube fittings as possible. Avoid long lines (no longer than 1 m) and narrow line diameters. Install the lines at a gradient.

If other consumers are connected to the single-line lubrication system, the weakest link in this chain determines the lubrication cycle. Excess lubricant can accumulate inside of the product or flow out and may lead to contamination of the environment.

Attention!

For special operating conditions, please contact us - especially in case of glass fiber dust, wood dust, solvents and short strokes!

NOTES

Lack of lubrication

Failure to perform basic lubrication will damage the product.

- ▶ Never put a linear motion system into operation without having carried out basic lubrication.
- ▶ The steel band cover strip is coated with an oil film at each lubrication interval.

Overlubrication

Increased coefficients of friction resulting in increased temperature generation in the ball screw assembly and the ball rail systems.

- ▶ Do not significantly overlubricate the linear motion system

Risk of insufficient lubrication due to use of improper lubricants!

Damage to the product.

- ▶ Use only the recommended lubricants

Risk of property damage due to insufficient lubrication!

Loss of performance and corrosion.

- ▶ Observe the lubrication intervals.

Avoiding pressure peaks due to excessive speed after lubrication

Damage to the product

- ▶ Move slowly (< 0.5 m/s) immediately after lubrication

Performance altered by special operating conditions!

Damage to the product.

- ▶ Before starting up the product under special operating conditions, please consult Bosch Rexroth AG. This applies especially to environments with glass fiber or wood dust, solvents, extreme temperatures, and for short-stroke applications.

13.2 Overview of lubrication versions

LSS: (Initial lubrication done at the factory)

- Initial standard greasing done at the factory, suitable for normal environmental conditions.
- Simple relubrication via manual grease gun.

LPG: (Corrosion prevention, no initial lubrication)

- Linear module without initial greasing done at the factory.
- Ball rail system and ball screw assembly only with corrosion prevention.
- Basic lubrication prior to start-up required

LCF: (Prepared for connection to central lubrication systems with liquid grease)

- For liquid grease, NLGI grade 00 lithium-based high-performance grease according to DIN 51818 (GP00K-20 according to DIN 51826)
- Only use liquid grease lubrication with single-line total-loss lubrication systems via piston distributors.
- Basic lubrication required

LCO: (Prepared for connection to central lubrication systems with oil)

- Ball runner block and ball screw assembly nut with integrated non-return valves
- Only use oil lubrication with single-line total-loss lubrication systems via piston distributors.
- Basic lubrication required

For further information regarding each lubrication type, please refer to the following pages.

13.3 Lubricants

Table 8: Lubricants MKx-NN-3

Lubrication version	LSS		LPG		
Size	MKx-065 / -080 / -110 / -140 / -145	MKx-040	MKx-065 / -080 / -110 / -140 / -145	MKx-040	
Basic lubrication	Dynalub 510	Dynalub 520	Preserved, basic lubrication required (see instructions)		
Consistency class	NLGI 2 (DIN 51818)	NLGI 00 (DIN 51818)	-		
Identification	KP2K-20 (DIN 51825)	GP00K-20 (DIN 51826)	-		
Lubrication with grease gun	yes	yes	yes		
Prepared for connection to central lubrication systems	-				
Recommended lubricants	Dynalub 510 (Grease lubricant) (NLGI2 DIN 51818)	Dynalub 520 (Liquid grease) (NLGI00 DIN 51818)	Dynalub 510 (Grease lubricant) (NLGI2 DIN 51818)	Dynalub 520 (Liquid grease) (NLGI00 DIN 51818)	
Features	• Good water resistance • Corrosion protection • Temperature range: -20 to +80 °C				
Material numbers	R3416 037 00 (400 g cartridge)	R3416 043 00 (400 g cartridge)	R3416 037 00 (400 g cartridge)	R3416 043 00 (400 g cartridge)	
	R3416 035 00 (25 kg container)	R3416 042 00 (5 kg bucket)	R3416 035 00 (25 kg container)	R3416 042 00 (5 kg bucket)	
Alternative lubricants	• Tribol GR 100-2 PD • Elkalub GLS 135/N2	• Tribol GR 100-00 PD • Elkalub GLS 135/N00	• Tribol GR 100-2 PD • Elkalub GLS 135/N2 • Tribol GR 100-00 PD • Elkalub GLS 135/N00 • Dynalub 520 • Klüberplex BEM 34-132	• Tribol GR 100-00 PD • Elkalub GLS 135/N00	
Alternative lubricants with H1 approval	-		• Berulub FG H2 SL • Cassida Grease EPS2 • VP 874	• Berulub FB 34-00 • Elkalub GLS 367/N00	

13.4 Lube fittings

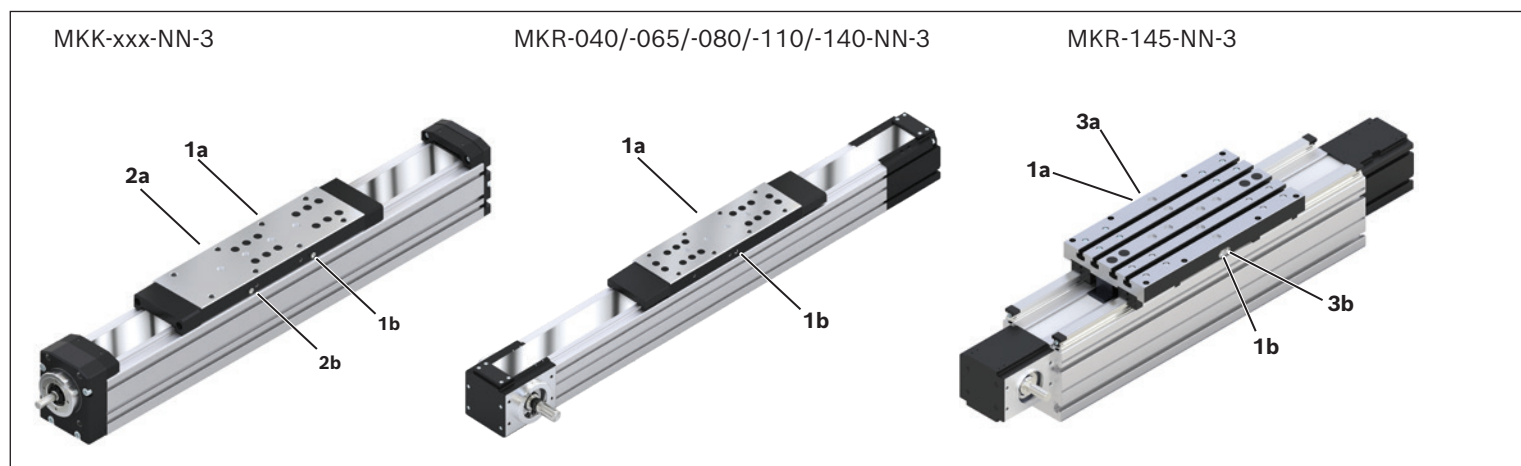


Fig. 36: Lube fittings/lubrication points

1a / 1b lube fitting (lubrication point) for ball runner block (MKK / MKR), for cam roller runner block (MLR):

2a / 2b lube fitting (lubrication point) for ball screw assembly (MKK)

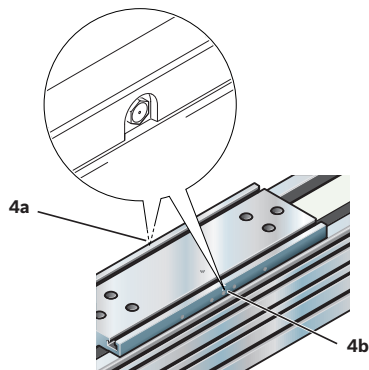
3a / 3b lube fitting (lubrication point) (in addition to lube fitting **1a/1b**) for ball runner block (MKR-145-NN-3);

4a / 4b lube fitting (lubrication point) for ball runner block (MKK / MKR -165-NN-2) and ball screw assembly (MKK-165-NN-2)

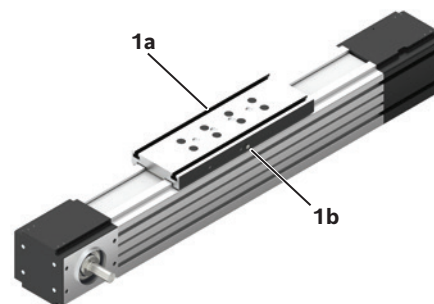
Lubrication via funnel-type lube nipples DIN 3405-A at the respective lube fitting. Optionally side a or b.

	LCF	LCO
	MKx -040 / -065 / -080 / -110 / -140 / -145	MKx -040 / -065 / -080 / -110 / -140 / -145
	required, see instructions	required, see instructions
	NLGI 00 (DIN 51818)	–
	GP00K-20 (DIN 51826)	–
	–	–
	• only via single-line piston distributor system • smallest permissible piston distributor size: MKx -040, -065, -080, -145: 0.2 cm³; MKx -110, -140: 0.3 cm³	• only via single-line piston distributor system • smallest permissible piston distributor size: MKx -040, -065: 0.2 cm³; MKx -080: 0.4 cm³; MKx -110, -140, -145: 0.6 cm³
	Dynalub 520 (liquid grease) (NLGI00 DIN 51818)	Shell Tonna S3 M220 (lubricant oil)
	• Good water resistance • Corrosion protection • Temperature range: -20 to +80 °C	• Special demulsifying oil CLP or CGLP as per DIN 51517-3 for machine bed tracks and tool guides • A blend of highly refined mineral oils and additives • Can be used even when mixed with significant quantities of metalworking fluids
	R3416 043 00 (400 g cartridge)	–
	R3416 042 00 (5 kg bucket)	–
	• Tribol GR 100-00 PD • Elkalub GLS 135/N00	• Special demulsifying oil CLP or CGLP as per DIN 51517-3 for machine bed tracks and tool guides
	–	–

MKK/MKR-165-NN-2 / lubrication ➔ 13.8



MLR-080/-110-NN-3 / oil lubrication ➔ 13.9



For lubrication types LCF and LCO, the lube fittings are closed with set screws. Before the straight connectors are mounted on the desired lube fittings, the set screws of the respective position must be removed!

13.5 Initial lubrication MKx-NN-3

- ▶ Pay attention to the notes on lubrication ➔ 13
- ▶ Lubricants ➔ 13.3
- ▶ Lube fittings ➔ 13.4
- ▶ Note the operating conditions ➔ 17

Lubrication version LSS:

Initial lubrication carried out by Bosch Rexroth.

Linear modules (MKx-165-NN-2) come with initial greasing with Dynalub 510 and are only designed for grease lubrication using a manual grease gun.

Lube version LCF and LCO:

Specified quantities applied at lube fittings.

Lubrication version LPG:

For the ideal distribution of the lubricant in the ball rail system as well as the ball screw assembly, the basic lubrication takes place in three partial quantities. After each lubrication with a partial quantity (TM), the carriage (TT) of the linear axis is moved with three double strokes. The double stroke should be larger than 3 times the carriage length.

Procedure for the basic lubrication:

1. Pre-lubricate the linear module with a partial quantity 1 (TM1) by slowly applying pressure to the grease gun.
2. Move the carriage three times with the double stroke (DH) at a slow speed ($<0.5 \text{ m/s}$).
3. Pre-lubricate the linear module with a partial quantity 2 (TM2) by slowly applying pressure to the grease gun.
4. Repeat steps 2 and 3.

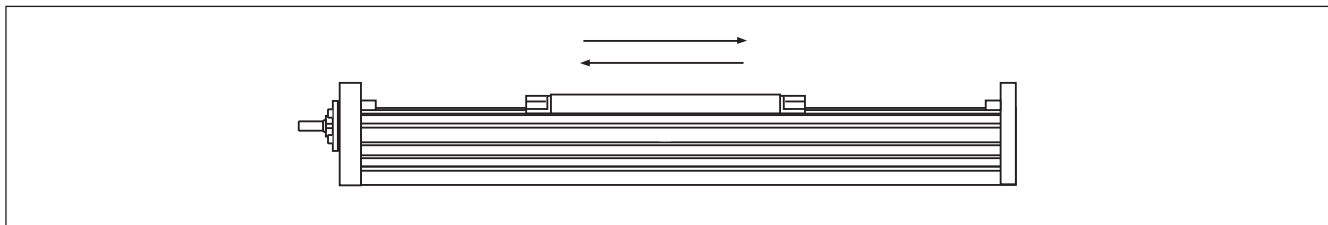


Fig. 37: Double stroke

Table 9: Initial lubrication quantity MKK-NN-3

	Guideway: Lubrication point 1 (a/b)				BASA: Lubrication point 2 (a/b)				
	Lubricant quantity (cm³)				do x P (mm)	Lubricant quantity (cm³)			
	LPG		LCF	LCO		LPG		LCF	LCO
TM1	TM2	TM1			TM2				
MKK-040	1.00	0.30	1.00	0.80	12x2	0.67	0.12	0.50	1.20
					12x5	0.77	0.22		
					12x10	0.77	0.22		
MKK-065	1.70	0.80	1.10	2.10	16x5	1.10	0.60	0.50	0.63
					16x10	1.15	0.65		
					16x16	1.30	0.80		
MKK-080	3.00	1.40	1.80	3.50	20x5	1.40	0.70	0.90	1.06
					20x10	1.70	1.00		
					20x20	2.70	1.60		
					20x40	1.90	1.20	1.00	1.26
MKK-110	4.50	2.80	1.90	4.15	32x5	2.80	1.50	1.30	1.26
					32x10	3.40	2.10		
					32x20	3.70	2.40		
					32x32	4.90	3.60		
MKK-140	6.40	4.40	8.00	14.00	40x5	4.20	2.00	3.00	2.50
					40x10	4.80	2.60		
					40x20	5.10	2.90		
					40x40	12.00	9.80		

Table 10: Initial lubrication quantity MKR-NN-3

	Guideway: Lubrication point 1, 3 (a/b)							
	Lubrication quantity short carriage (cm ³)				Lubrication quantity long carriage (cm ³)			
	LPG		LCF	LCO	LPG		LCF	LCO
	TM1	TM2			TM1	TM2		
MKR-040	–	–	–	–	1.00	0.30	0.30	0.60
MKR-065	–	–	–	–	1.45	0.80	1.60	1.80
MKR-080	1.60	0.70	1.40	1.90	2.60	1.40	2.80	3.00
MKR-110	3.00	1.40	2.80	2.80	4.10	2.80	5.60	3.70
MKR-140	–	–	–	–	6.40	0.30	5.60	12.00
MKR-145	–	–	–	–	9.0 ¹⁾	2.80 ¹⁾	5.60 ¹⁾	3.60 ¹⁾

13.6 Relubrication

13.6.1 Relubrication quantity MKK / MKR

- Pay attention to the notes on lubrication ➔ 13
- Lubricants ➔ 13.3
- Lube fittings ➔ 13.4
- Note the operating conditions ➔ 17
- Determining the load ratio and technical data ➔ Product catalog

Table 11: Relubrication quantity MKK

	Guideway: Lubrication point 1 (a/b) Lubricant quantity (cm ³)		BASA: Lubrication point 2, 4 (a/b) Lubricant quantity (cm ³)		
	LSS / LPG / LCF	LCO	d _o x P (mm)	LSS / LPG / LCF	LCO
MKK-040	0.30	0.60	12x2	0.17	0.13
			12x5	0.33	
			12x10	0.33	
MKK-065	1.60	1.00	16x5	0.70	0.13
			16x10	0.85	
			16x16	1.20	
MKK-080	2.80	1.70	20x5	1.00	0.16
			20x10	1.50	
			20x20	2.40	
			20x40	1.85	0.26
MKK-110	5.60	2.25	32x5	2.15	0.16
			32x10	3.05	
			32x20	3.55	
			32x32	5.45	
MKK-140	8.80	3.00	40x5	2.95	0.50
			40x10	8.15	
			40x20	8.70	
			40x40	14.00	

Table 12: Relubrication quantities MKR

	Guideway: Lubrication point 1, 3, 4 (a/b)			
	Lubrication quantity short carriage (cm ³)		Lubrication quantity long carriage (cm ³)	
	LSS / LPG / LCF	LCO	LSS / LPG / LCF	LCO
MKR-040	–	–	0.30	0.60
MKR-065	–	–	1.60	0.95
MKR-080	1.40	0.80	2.80	1.60
MKR-110	2.80	1.10	5.60	2.20
MKR-140	–	–	8.80	3.00
MKR-145	–	–	5.60 ¹⁾	2.20 ¹⁾

¹⁾ per lubrication point

Table 13: Minimum impulse quantity

Minimum impulse quantity (cm ³) ²⁾		
MKK/MKR	LCF	LCO
MKK/MKR-040	0.20	0.20
MKK/MKR-065	0.20	0.20
MKK/MKR-080	0.20	0.40
MKK/MKR-110	0.30	0.60
MKK/MKR-140	0.30	0.60
MKR-145	0.20	0.60

²⁾ ... smallest permissible piston distributor size (minimum pulse quantity) per lubrication point

Example calculation: Number of pulses and lubrication cycle MKK / lubrication version LCO

MKK-110-NN-3 with BASA 32 x 20	Guideway	BASA
Load ratio F_{mx} / C_x	0.15	0.20
Lubrication interval	3,800 km	20 km
Relubrication quantity	2.25 cm ³	0.16 cm ³
Piston distributor size	0.60 cm ³	0.60 cm ³
Number of pulses: $\frac{\text{Relubrication quantity}}{\text{Piston distributor size}}$	$\frac{2.25 \text{ cm}^3}{0.60 \text{ cm}^3} = 4$	$\frac{0.16 \text{ cm}^3}{0.60 \text{ cm}^3} = 5$
Lubrication cycle: $\frac{\text{Relubrication interval}}{\text{Number of pulses}}$	$\frac{3,800 \text{ km}}{4} = 950 \text{ km}$	$\frac{20 \text{ km}}{1} = 20 \text{ km}$



For number of pulses and lubrication cycle, see notes on lubrication in the beginning of the chapter.

13.6.2 Relubrication intervals MKK

Relubrication interval:

Relubricate each lube connection with the indicated relubrication quantity after reaching the travel distance (s).

- Relubrication interval of guideway and ball screw assembly (BASA) according to diagram.
- Relubrication is required every two years due to grease aging.

Load ratios (F_m/C) to be observed separately for guideway (F_{mgw}/C_{gw}) and BASA (F_{mbs}/C_{bs})

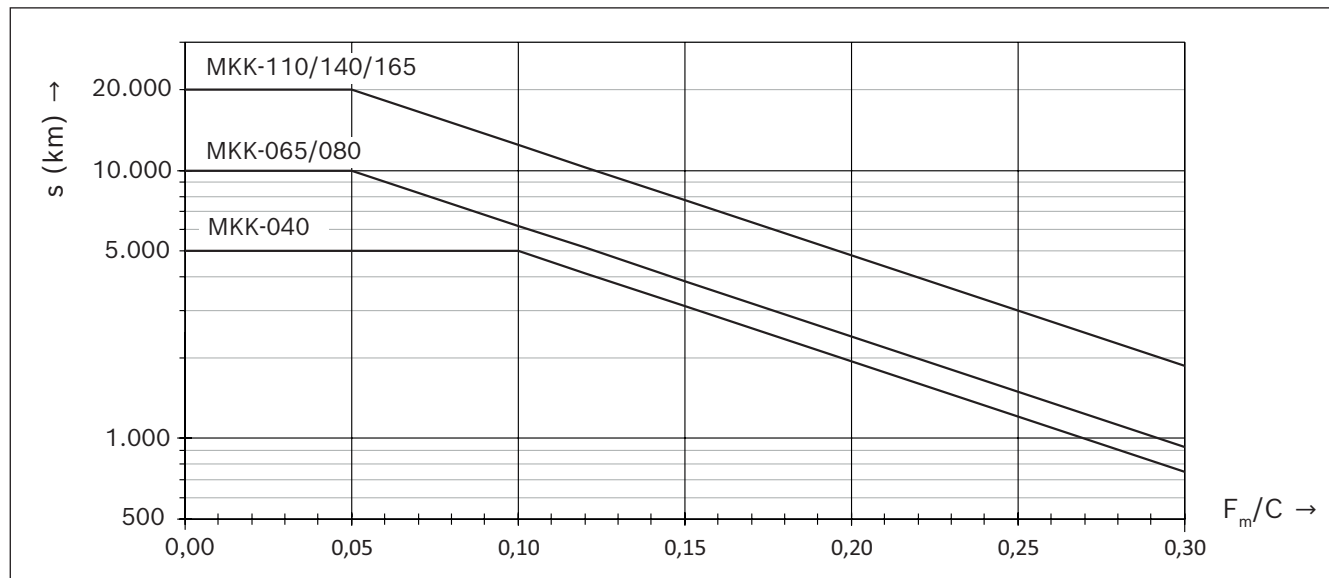


Fig. 38: Relubrication intervals guideway; lubrication versions LSS / LPG (greased with Dynalub 510 or 520)

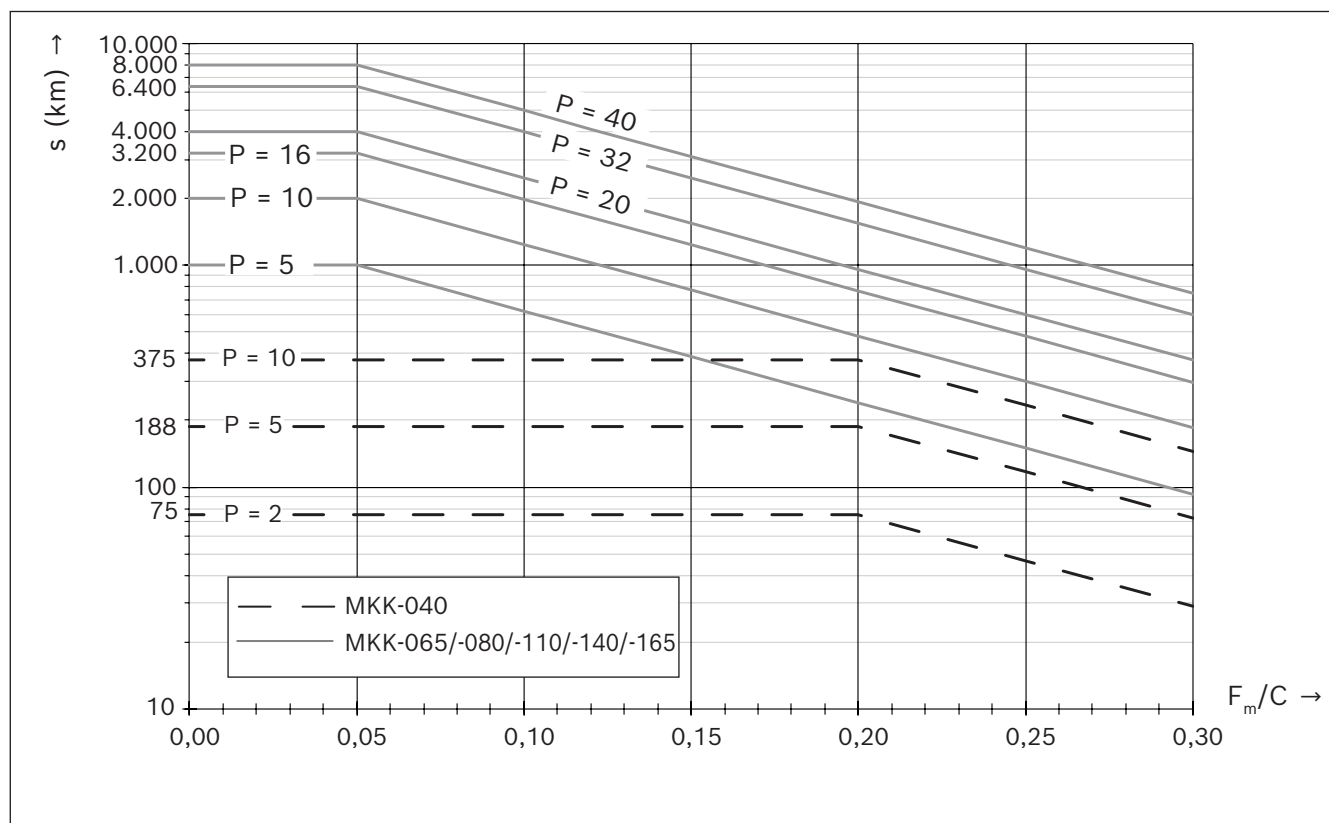


Fig. 39: Relubrication intervals BASA; lubrication versions LSS / LPG (greased with Dynalub 510 or 520)

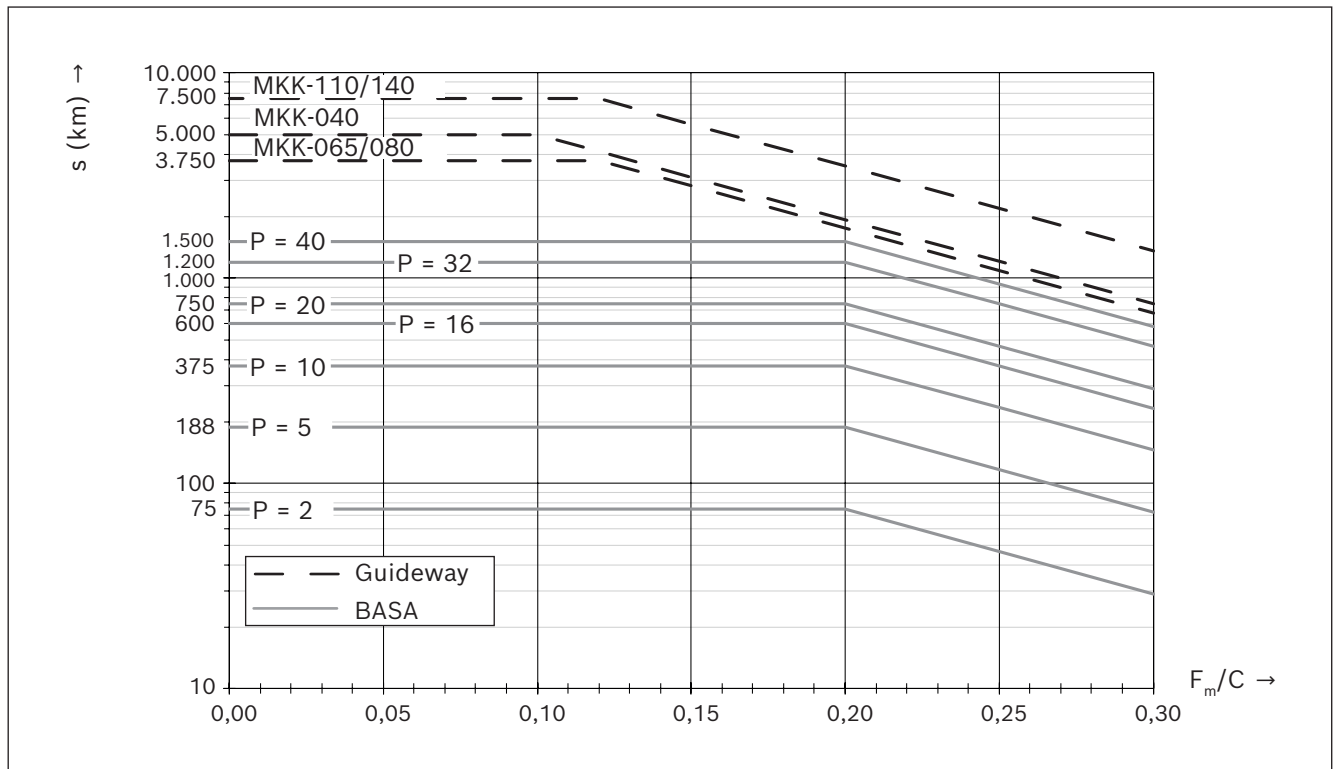


Fig. 40: Relubrication intervals guideway and BASA; lubrication versions LCF

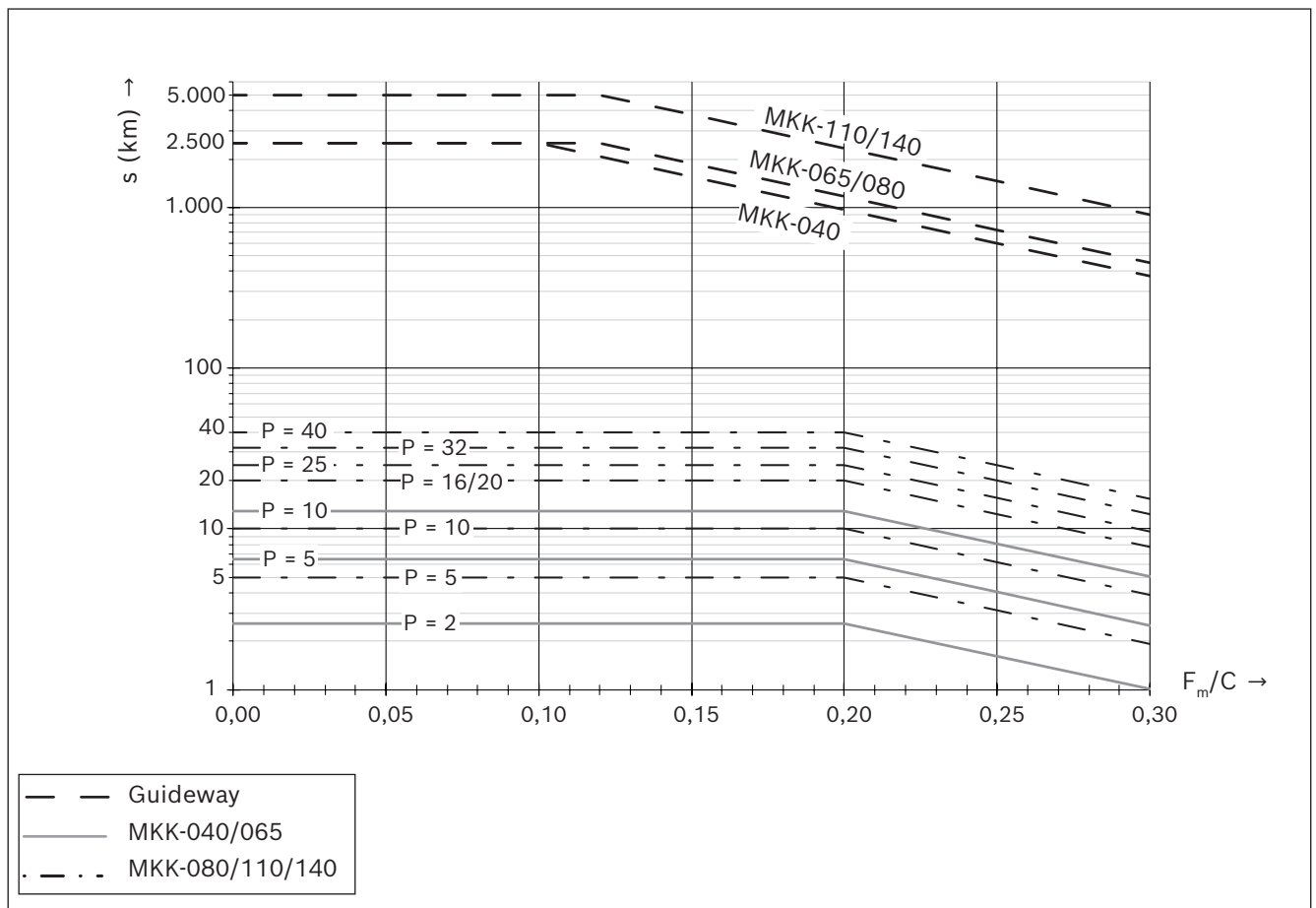


Fig. 41: Relubrication intervals guideway and BASA; lubrication versions LCO

13.6.3 Relubrication interval MKR:

Relubrication interval:

Relubricate each lube connection with the indicated relubrication quantity after reaching the travel distance (s).

- Relubrication interval of guideway acc. to diagram
- Relubrication is required every two years due to grease aging.

Observe load ratios (F_m/C)

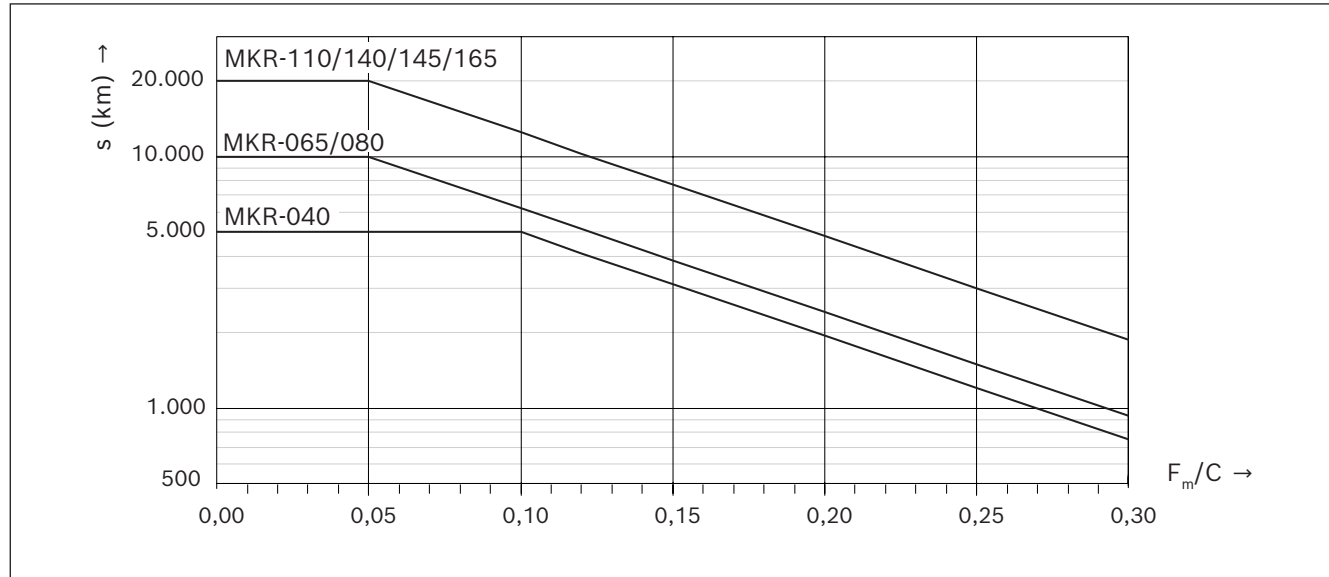


Fig. 42: Relubrication intervals guideway; lubrication versions LSS / LPG (LPG with standard lubrication)

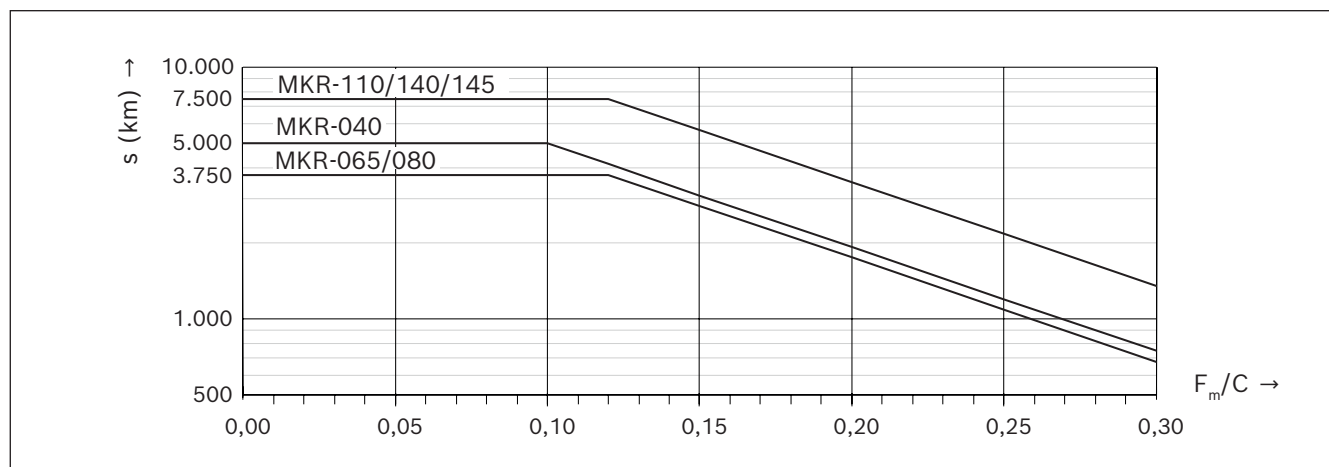


Fig. 43: Relubrication intervals guideway; lubrication versions LCF

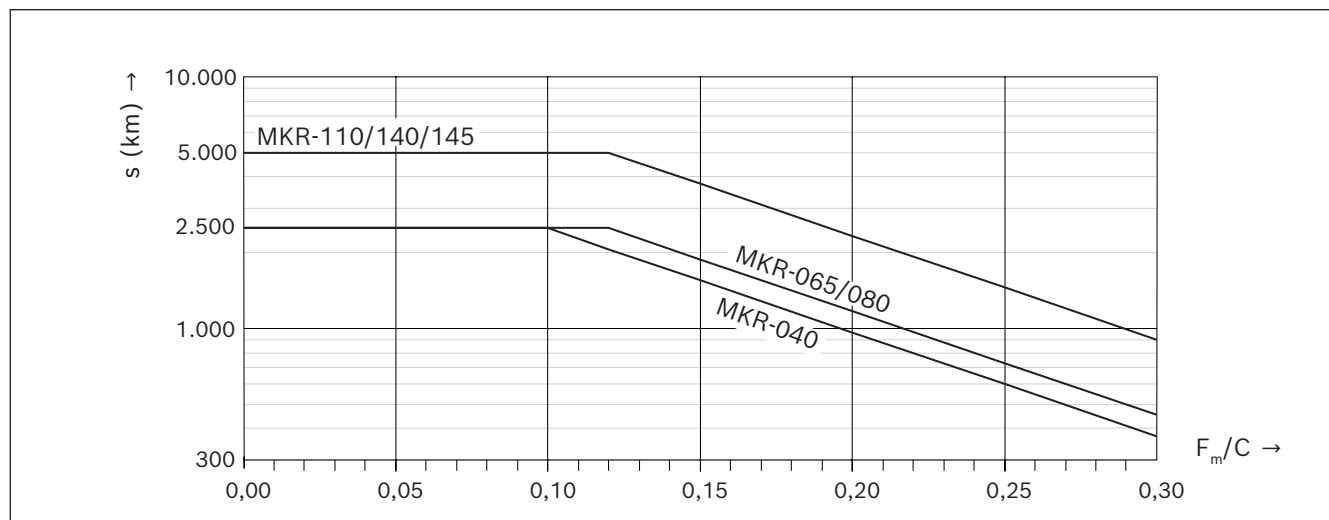


Fig. 44: Relubrication intervals guideway; lubrication versions LCO

13.7 Lubrication MKx-165-NN-2

Linear modules (MKx-165-NN-2) come with initial greasing with Dynalub 510 and are only designed for grease lubrication using a manual grease gun.

- ▶ Pay attention to the notes on lubrication ➔ 13
- ▶ Lube fittings ➔ 13.4
- ▶ Note the operating conditions ➔ 17
- ▶ Determining the load ratio and technical data ➔ Product catalog

Table 14: Lubricants MKx-165-NN-2

MKK/MKR	Grease	Consistency class DIN 51818	Recommended lubricants	Alternative lubricants
-165	KP2K-20 (DIN 51825)	NLGI 2	Dynalub 510 Cartridge (400 g) R341603700 Container (25 kg) R341603500	Elkalub GLS 135 / N2 (Chemie-Technik) Tribol GR 100-2 PD (Castrol)

Table 15: Relubrication MKK

	Guideway; lubrication point 4 (a/b)	Drive (BASA), lubrication point 4 (a/b)		
		d _o x P (mm)	Relubrication interval (km)	Relubrication quantity BASA (cm ³)
MKK-165-NN-2	Lubrication of the ball rail system is covered with the relubrication interval of the drive (BASA).	40x5	see relubrication interval MKK	5.0
		40x10		9.0
		40x20		10.0
		40x40		16.0

Table 16: Relubrication MKR

	Guideway; lubrication point 4 (a/b) Relubrication interval (km)	Relubrication quantity Short TT (cm ³)	Relubrication quantity Long TT (cm ³)
MKR-165-NN-2	see relubrication interval MKR	–	8.0

13.8 Lubrication MLR-080/110-NN-3

Linear modules with cam roller guide (MLR) are designed for oil lubrication. With initial greasing on delivery.

⚠ Attention! Grease lubricants must not be used!

- ▶ Pay attention to the notes on lubrication ➔ 13
- ▶ Lube fittings ➔ 13.4
- ▶ Note the operating conditions ➔ 17
- ▶ Determining the load ratio and technical data ➔ Product catalog
- ▶ It is recommended to use oil with a viscosity of approx. 1,000 mm²/s (ISO VG 1000) at 40 °C.

Table 17: Relubrication MLR

	Guideway; lubrication point 1 (a/b)	
	Relubrication interval (km) $F_{c_{gw}}/C_y \leq 0.50$	Relubrication quantity (cm ³)
MLR-080-NN-3	5,000	6.0
MLR-110-NN-3	5,000	12.5

13.9 Repair

Repairs to the linear axis should only be performed by Bosch Rexroth.

14 Removal and replacement

To ensure the accuracy of the product after replacement of assemblies (e.g. toothed belt, ball guide rail, carriage, frame, BASA, etc.), such assemblies may only be removed and replaced by Bosch Rexroth. The only exceptions to this rule are the work steps described in this section.

14.1 Removing the cable channel

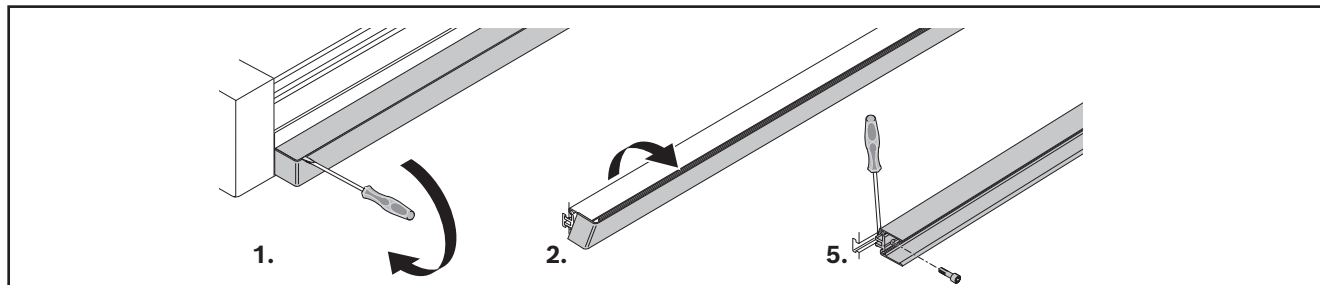


Fig. 45: Removing the cable channel

1. Widen the end of the cable duct using a screwdriver.
2. Lift and swivel out the cover strip.
3. Remove the cables.
4. Screw out the fastening screws.
5. Push the cable duct out of the recess of the profiled support using a screwdriver.

14.2 Removing the switches

CAUTION

Risk of electrical shocks due to contact with live parts (24 V)!

Risk of minor injuries.

- Before commencing work on any switches, switch off the power supply and secure it against reactivation.



The cables are molded into the proximity switches. If necessary, we recommend a repurchase.

- Disassemble the switches in the reverse order as during assembly ➔ 6.5

14.3 Removing the drive



WARNING

Risk of product crashing down in vertical or slanting installations due to lack of arrestor devices!

Death or severe injury.

- ▶ If the product is installed vertically or on a slant, secure the product against dropping before loosening the mounting screws.
- ▶ Do not stand in the fall direction of the product.

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.

14.3.1 Removing the motor (MKK flange/coupling)

1. Loosen the fastening screws on the motor end (8) at the coupling. If necessary, release the motor brake and move the carriage so that the drive journal turns.
2. Loosen the motor-side mounting screws (7) and remove the motor from the flange.

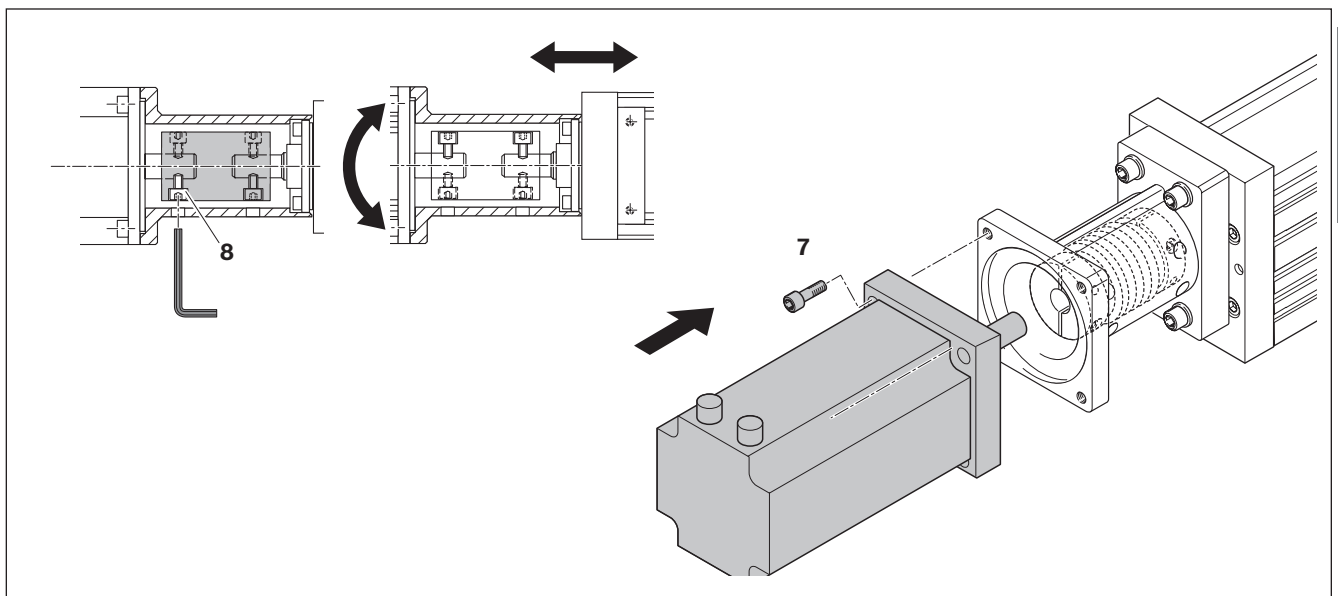


Fig. 46: Disassembling the motor

14.3.2 Removing the motor (MKK belt side drive)

 **The toothed belt is preloaded. Exercise caution when loosening the mounting screws.**

- Remove the covers at the housing as required.

Gear ratio $i = 1$

1. Loosen the mounting screws at the motor.
2. Move the motor as close as possible to the linear module.
3. Unfasten the tensioning unit at the second belt pulley. The tensioning units are provided with forcing-off threads for removal.
4. Remove the mounting screws at the motor. Detach the motor and motor bars.

Gear ratio $i = 1.5$ or $i = 2$:

1. Remove the mounting screws at the motor. Detach the motor and motor bars.
2. Unfasten the tensioning unit at the belt pulley. The tensioning units are provided with forcing-off threads for removal.
3. Detach the belt pulley with tensioning unit.

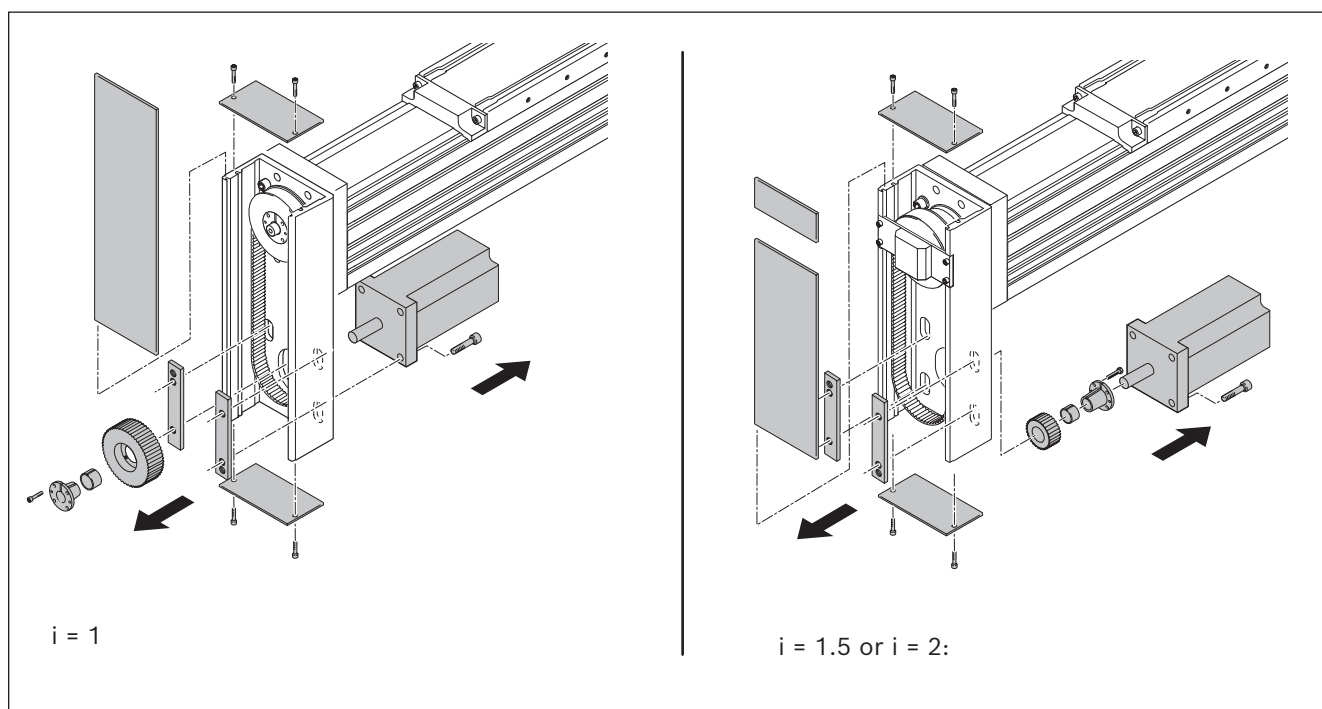


Fig. 47: Disassembling the motor

14.3.3 Removing the motor (MKR)

- Removal is carried out in the reverse order as the assembly.

15 Disposal

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

NOTES

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

Environmental pollution.

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

16 Technical data

Technical data ➡ "Linear modules" catalog.

17 Operating conditions

Table 18: Operating conditions

Operating conditions	Value
Ambient temperature with Bosch Rexroth servo motor	0 °C ... 40 °C, loss of performance above 40 °C
Ambient temperature for mechanical system (without dropping below dew point)	-10 °C ... 50 °C
Stroke $s_{\min}^{1)}$	See "Technical data" tables in the catalog
Soiling	Not permissible

¹⁾ Minimum travel to ensure a reliable lubrication distribution.

17.1 Tightening torques

If not specified otherwise here, please refer to the corresponding publications for tightening torques for mounting screws.

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

Table 19: Tightening torques

 8.8	M2	M2.5	M3	M4	M5	M6	M8	M10	M12	M14	M16
⌀ M_A (Nm) $\mu = 0.125$	0.4	0.7	1.3	2.7	5.5	9.5	23	46	80	127	194

18 Modules

18.1 Overview of MKK-040-NN-3

Position	Component
1	Carriage with runner block
2	Return units
2a	Return unit for cover strip
2b	Holding plate for cover strip
3	Cover strip (plastic cover strip)
4	Ball screw assembly (BASA)
4a	BASA nut
4b	Threaded ring

Position	Component
5	Fixed bearing
5a	Deep-groove ball bearing
5b	Fixed bearing end block
6	Floating bearing
6a	Deep-groove ball bearing
6b	Floating bearing end block
7	Frame with guide rail

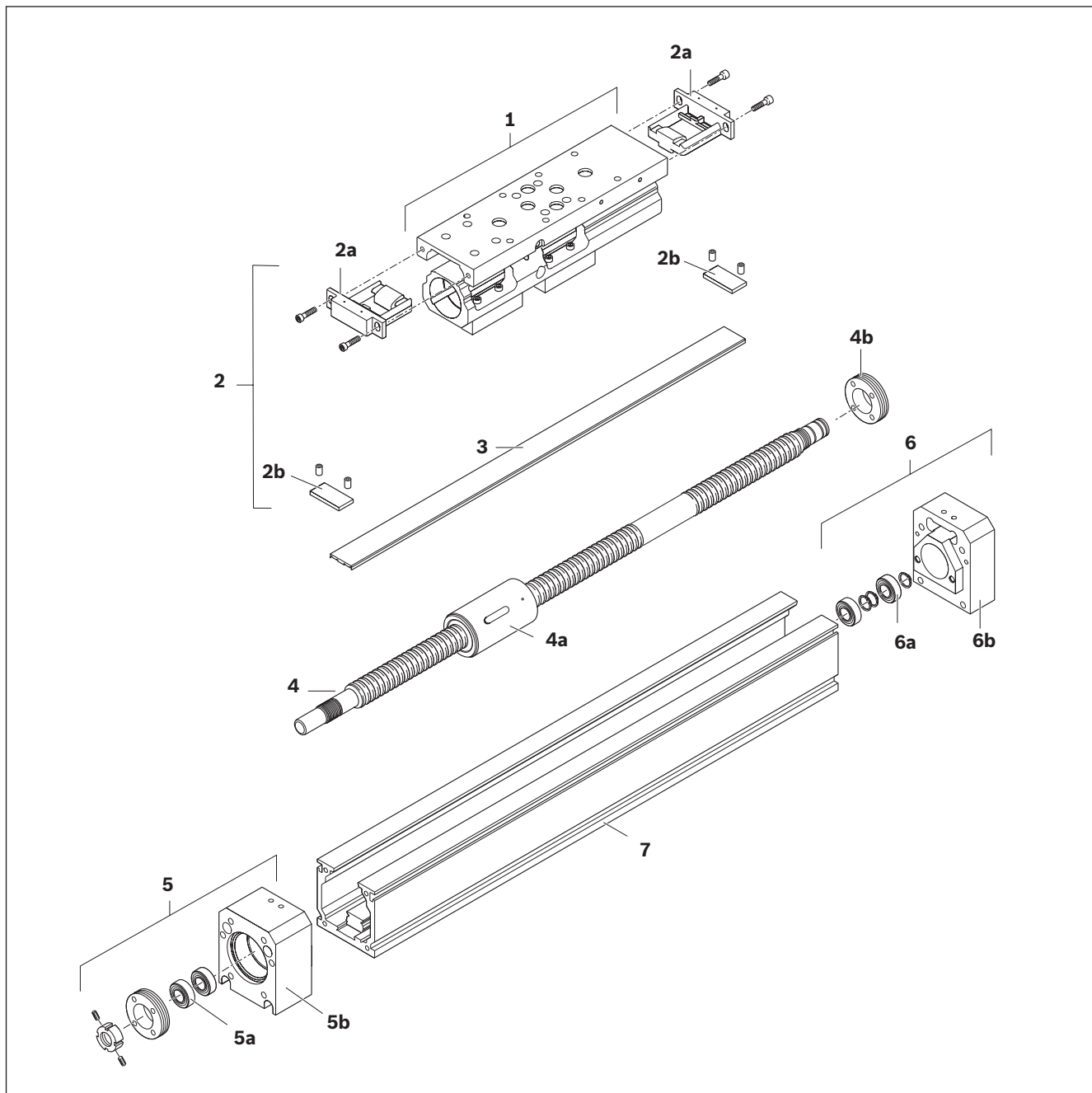


Fig. 48: Overview of MKK-040-NN-3

18.2 Overview of MKK-065/-080/-110-NN-3

Position	Component
1	Carriage with runner block
2	Return units
2a	Return unit for cover strip
2b	Belt clamp for cover strip
3	Cover strip (size -065: plastic cover strip Size -080/-110 corrosion-resistant steel cover strip)
4	Ball screw assembly (BSA)
4a	BASA nut
4b	Threaded ring

Position	Component
5	Fixed bearing
5a	Deep-groove ball bearing
5b	Fixed bearing end block
6	Floating bearing
6a	Deep-groove ball bearing
6b	Floating bearing end block
7	Frame with guide rail
8	Magnetic profile for steel cover strip

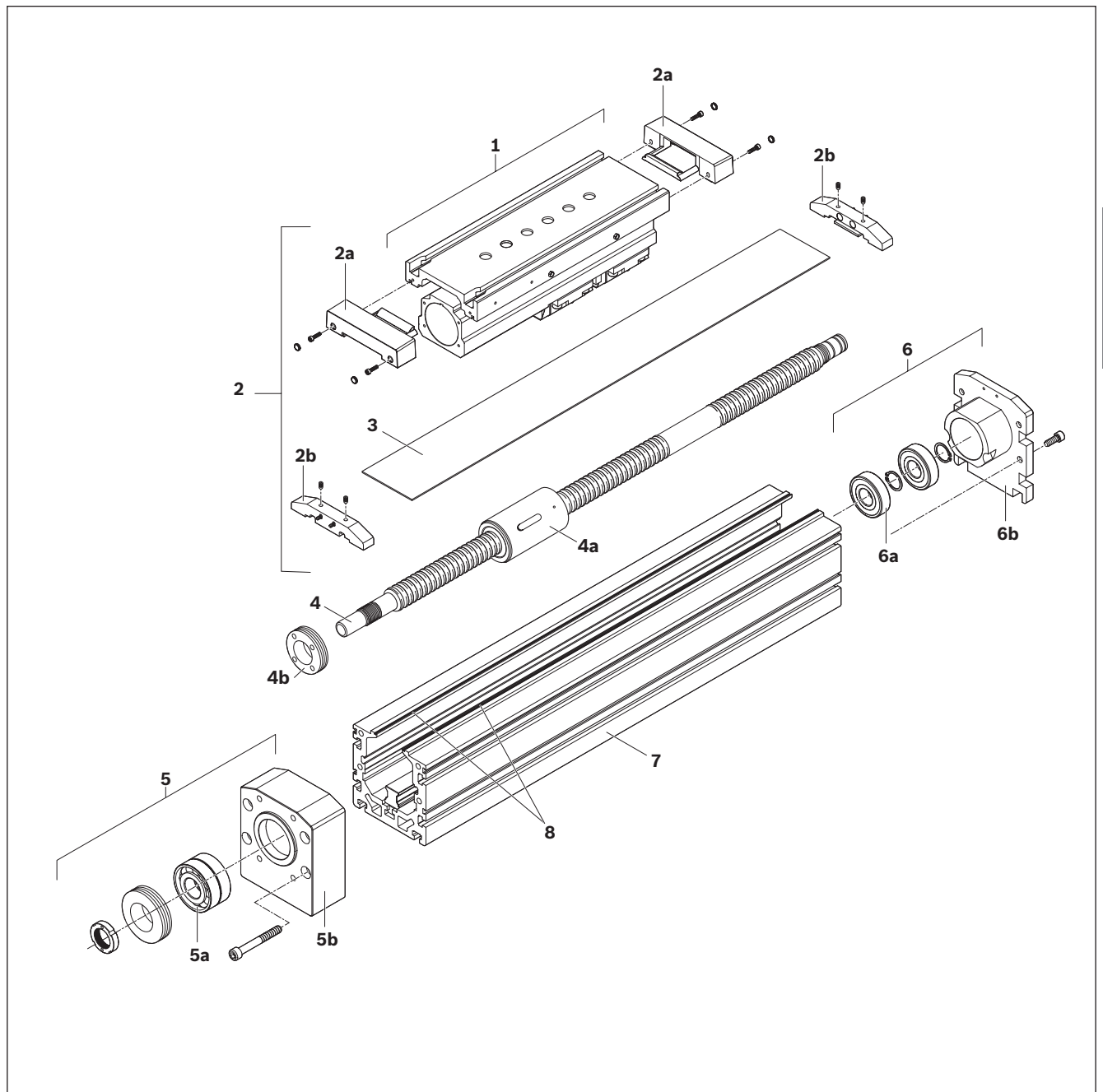


Fig. 49: Overview of MKK-065/-080/-110-NN-3

18.3 Overview of MKK-140-NN-3

Position	Component
1	Carriage with runner block
2	Return units
2a	Return unit for cover strip
2b	Belt clamp for cover strip
3	Cover strip (corrosion-resistant steel cover strip)
4	Ball screw assembly (BSA)
4a	BASA nut
4b	Threaded ring

Position	Component
5	Fixed bearing
5a	Deep-groove ball bearing
5b	Fixed bearing end block
6	Floating bearing
6a	Deep-groove ball bearing
6b	Floating bearing end block
7	Frame with guide rail
8	Magnetic profile for steel cover strip

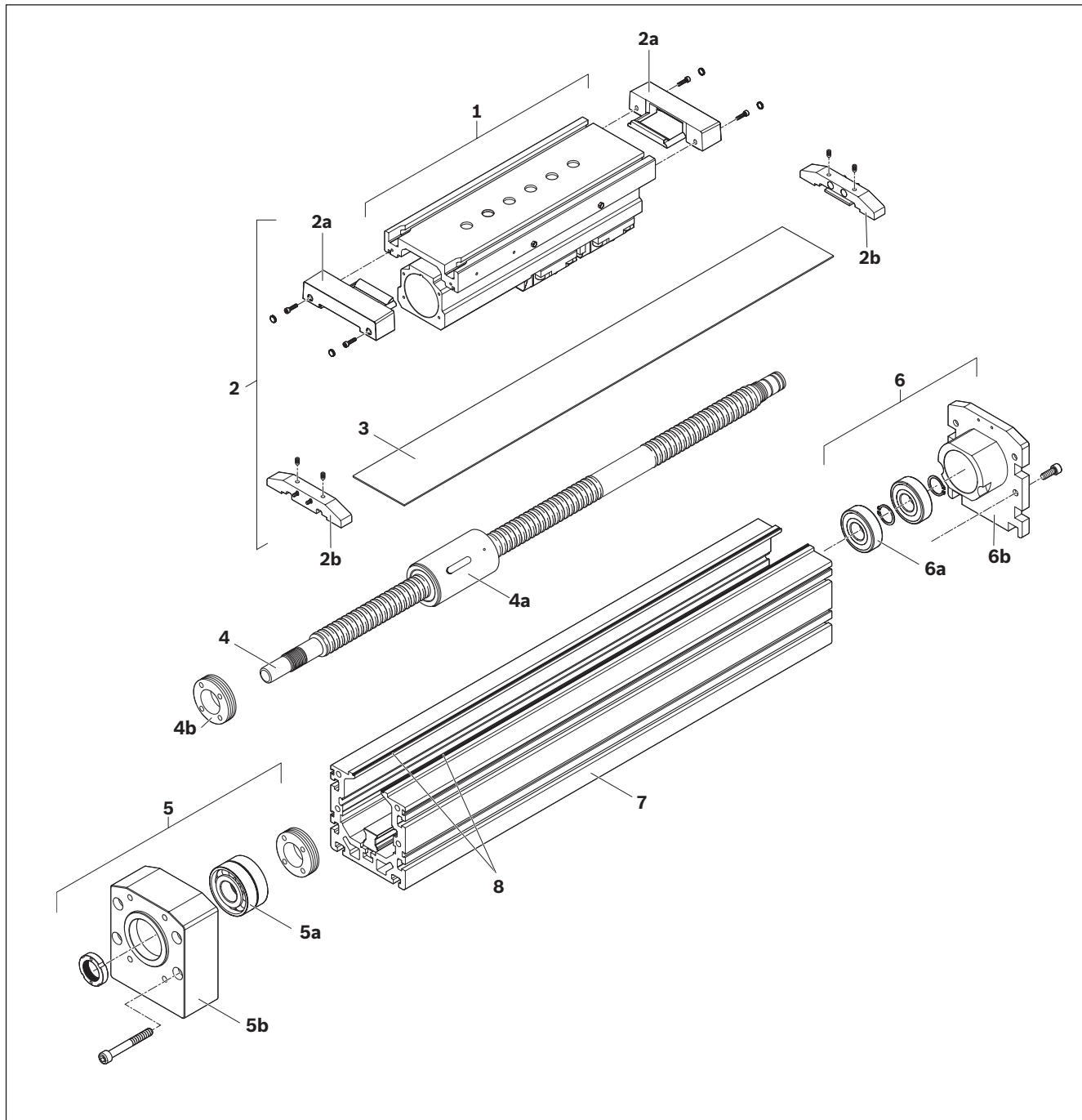


Fig. 50: Overview of MKK-140-NN-3

18.4 Overview of MKK-165-NN-2

Position	Component
1	Carriage with runner block
2	Bellows
3	Ball screw assembly (BASA)
4	Fixed bearing
4a	Deep-groove ball bearing
4b	Fixed bearing end block

Position	Component
5	Floating bearing
5a	Deep-groove ball bearing
5b	Floating bearing end block
6	Frame with guide rail

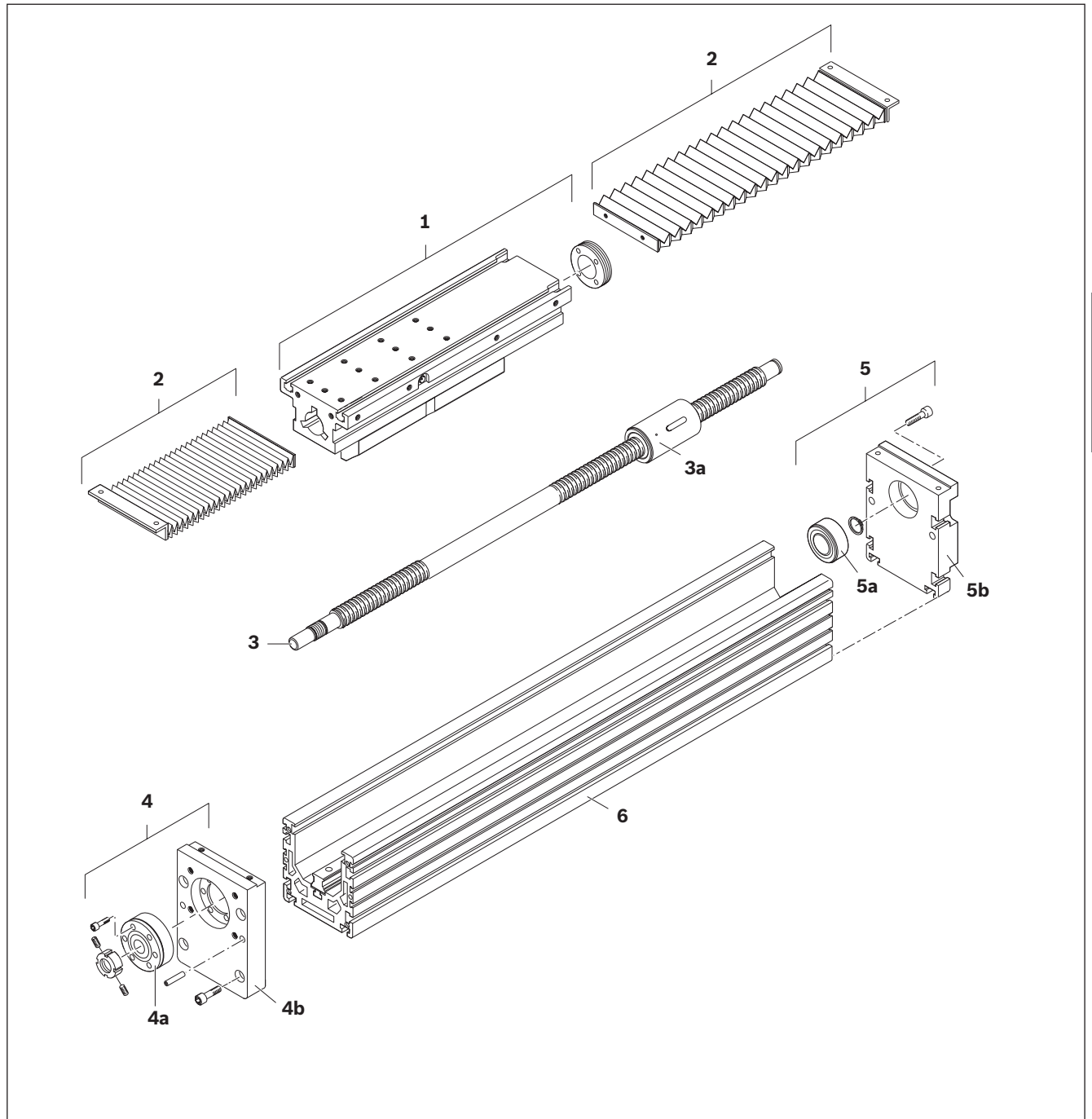


Fig. 51: Overview of MKK-165-NN-2

18.5 Overview of MKR-040-NN-3

Position	Component
1	Carriage with runner block
2	Return units
3	Cover strip (plastic cover strip)
4	Toothed belt
5	Drive end enclosure
6	Idler end enclosure
7	Frame with guide rail

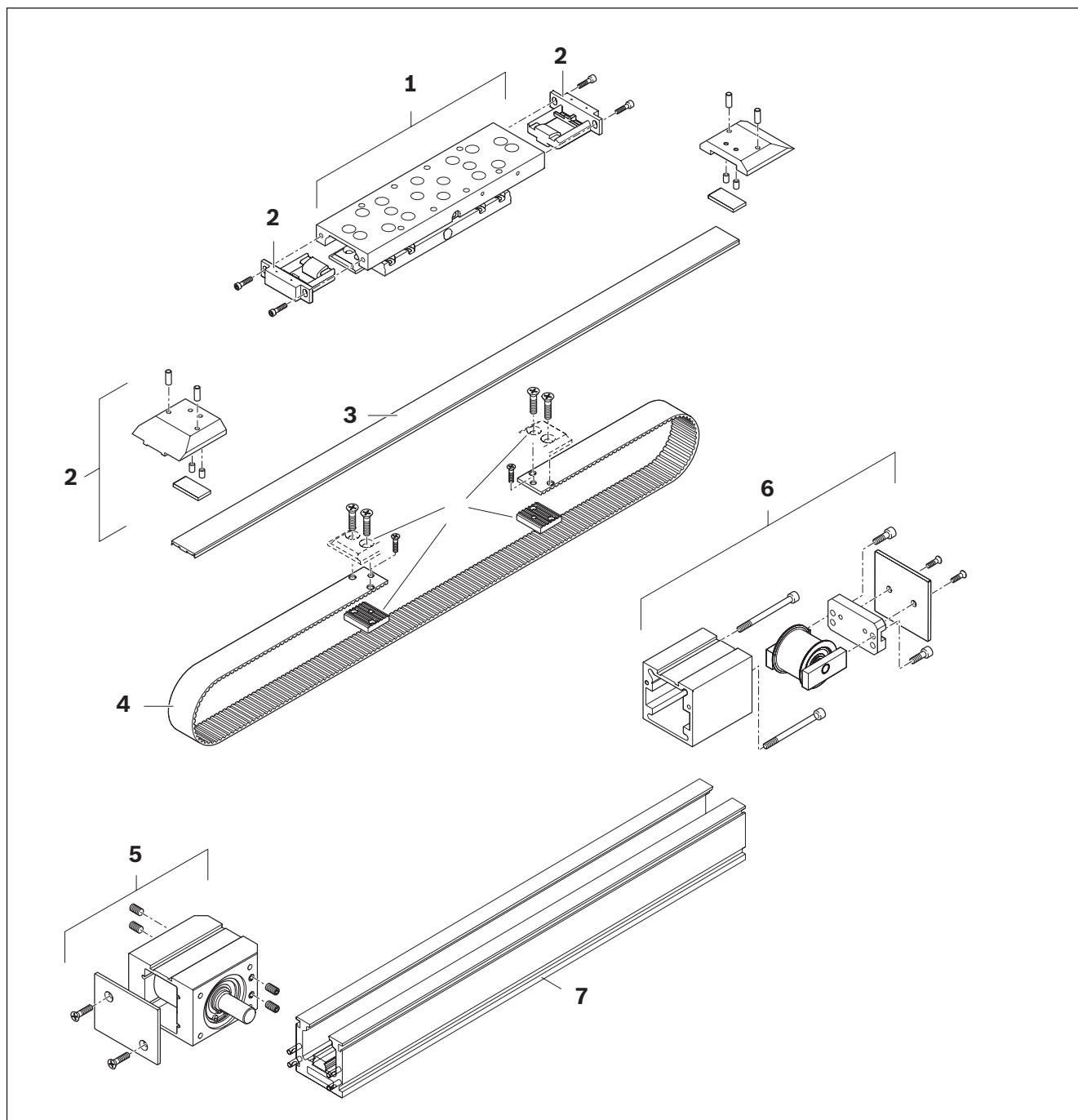


Fig. 52: Overview of MKR-040-NN-3

18.6 Overview of MKR-065/-080/-110/-140-NN-3

Position	Component
1	Carriage with runner block
2	Side sealings
3	Return units
4	Cover strip (size -065: plastic cover strip Size -080/-110/-140 corrosion-resistant steel cover strip)
5	Toothed belt
6	Drive end enclosure
7	Idler end enclosure
8	Frame with guide rail

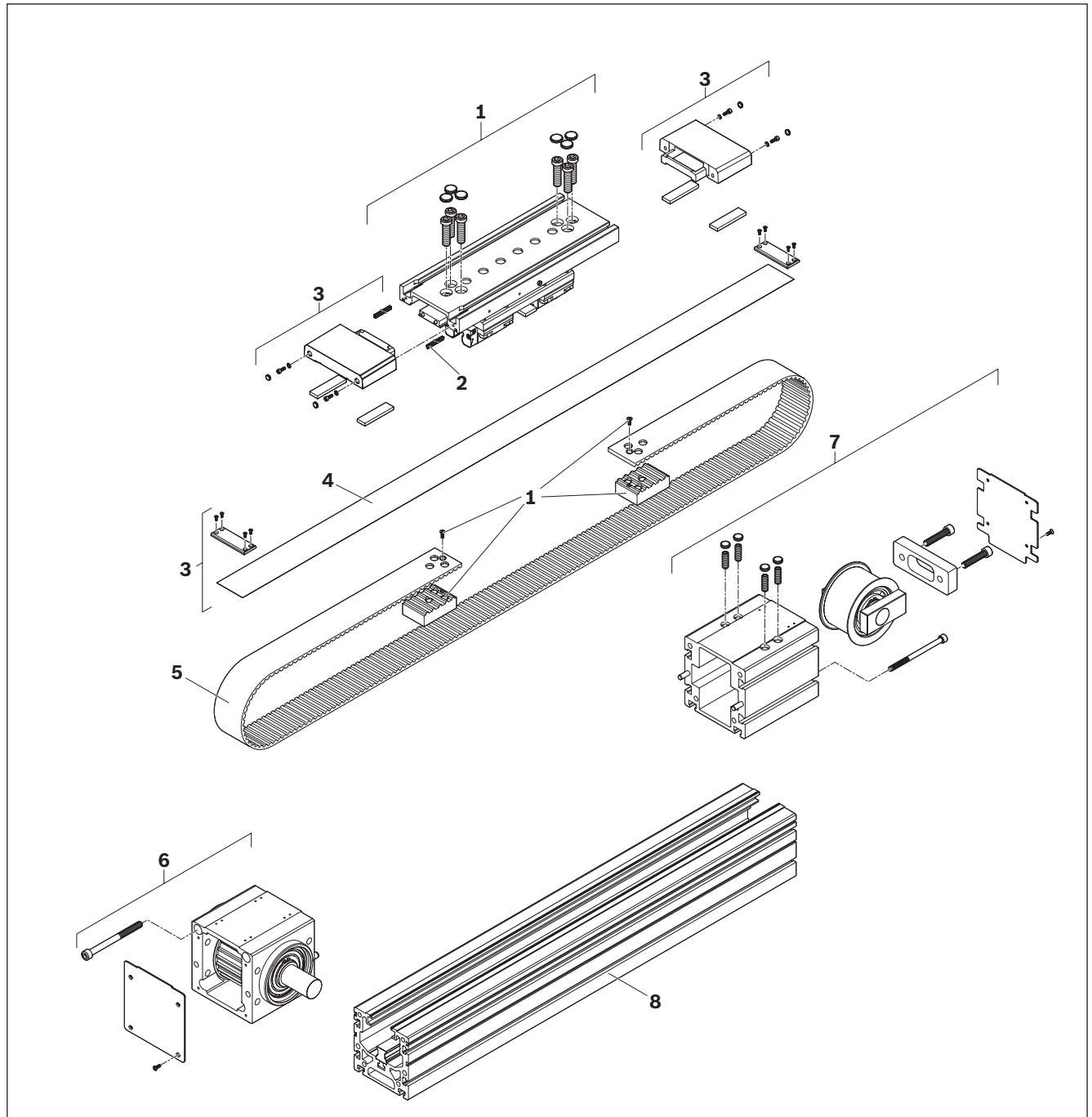


Fig. 53: Overview of MKR-065/-080/-110/-140-NN-3

18.7 Overview of MKR-165-NN-2

Position	Component
1	Carriage with runner block
2	Side sealings
3	Toothed belt
4	Drive end enclosure
5	Idler end enclosure
6	Frame with guide rail

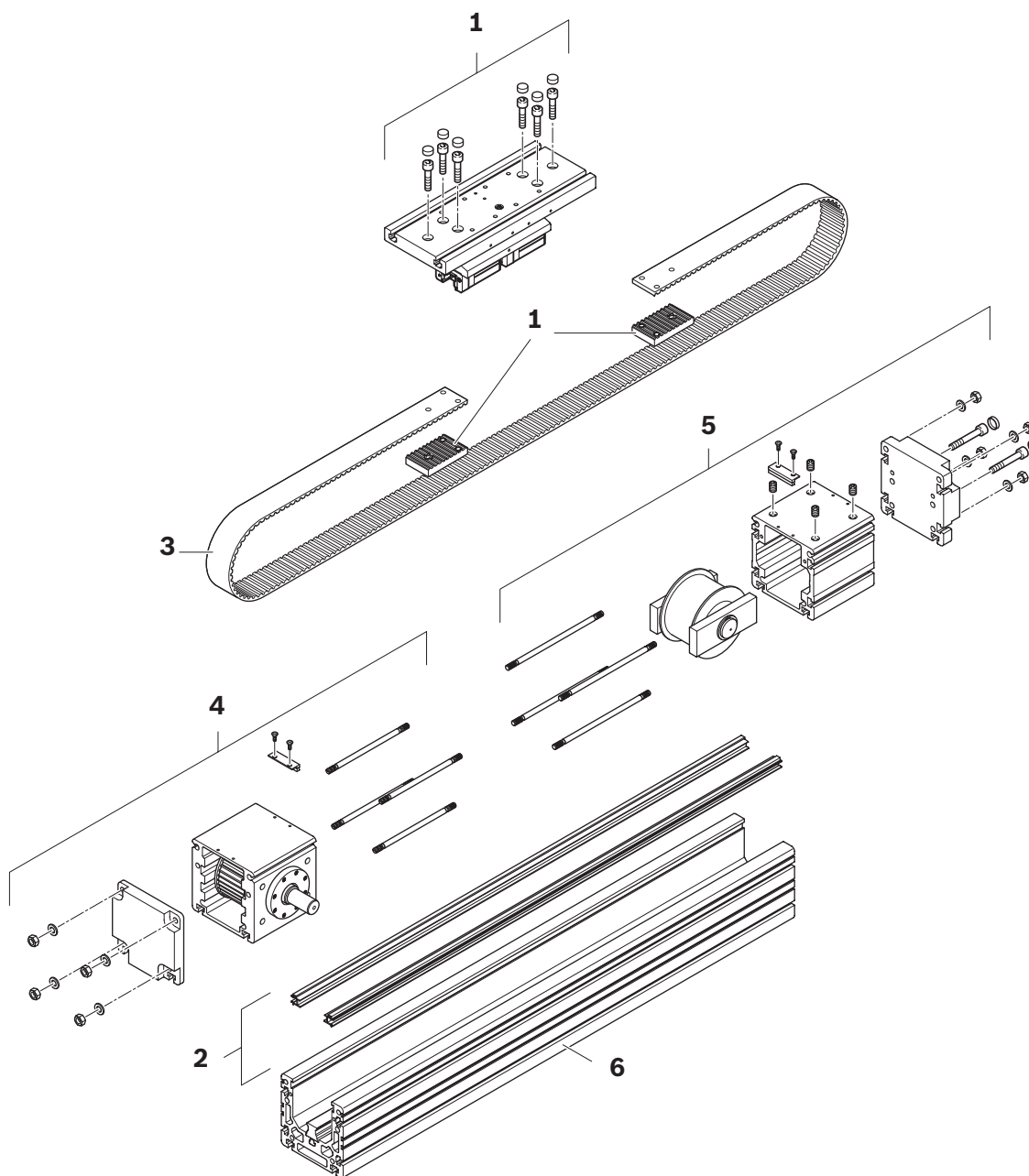


Fig. 54: Overview of MKR-165-NN-2

18.8 Overview of MKR-145-NN-3

Position	Component
1	Carriage with runner block
2	Toothed belt
3	Drive end enclosure
4	Idler end enclosure
5	Frame with guide rails

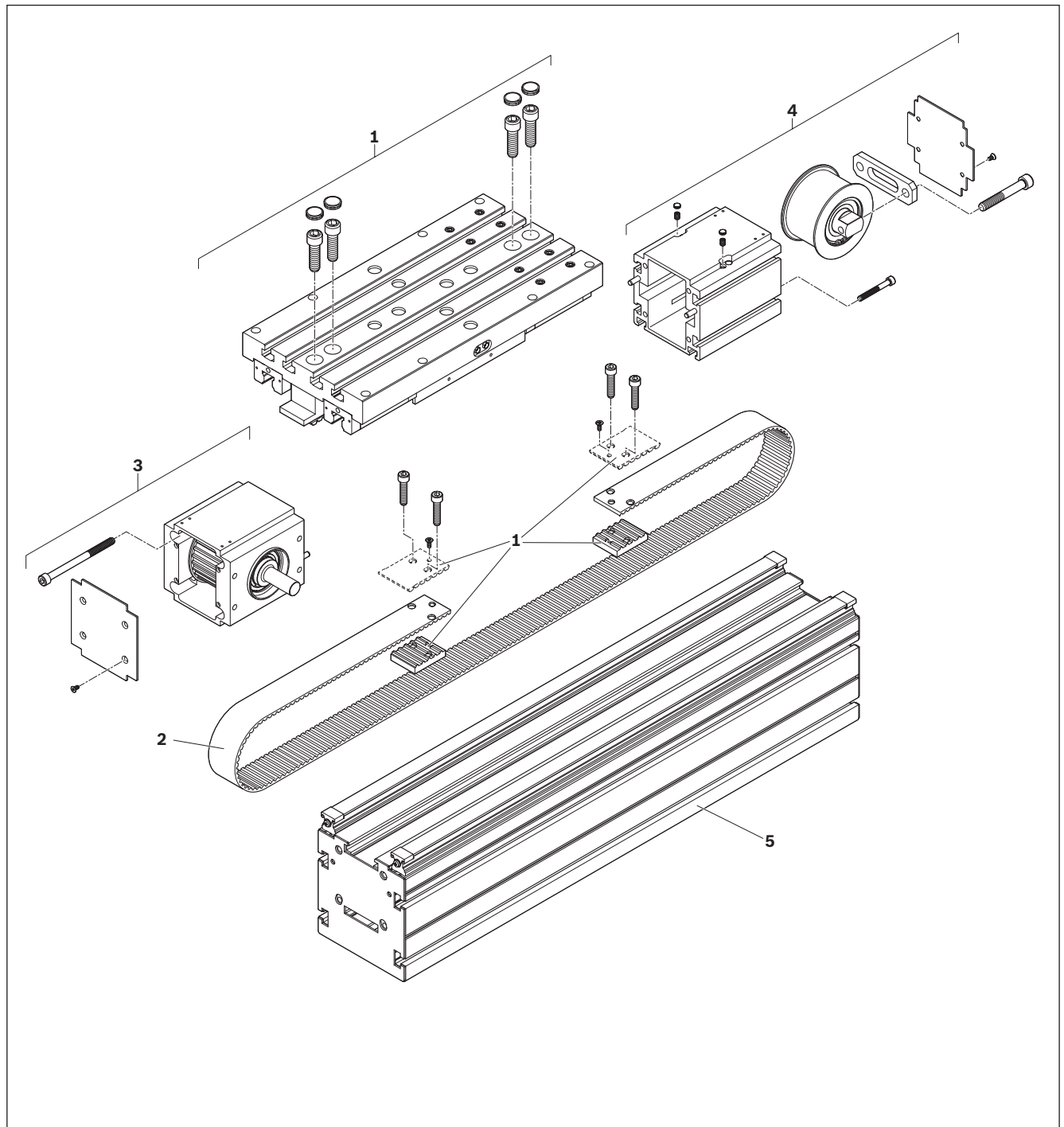


Fig. 55: Overview of MKR-145-NN-3

18.9 Overview of MLR-080/-110-NN-3

Position	Component
1	Carriage with cam rollers
2	Toothed belt
3	Drive end enclosure
4	Idler end enclosure
5	Frame with cam roller guide

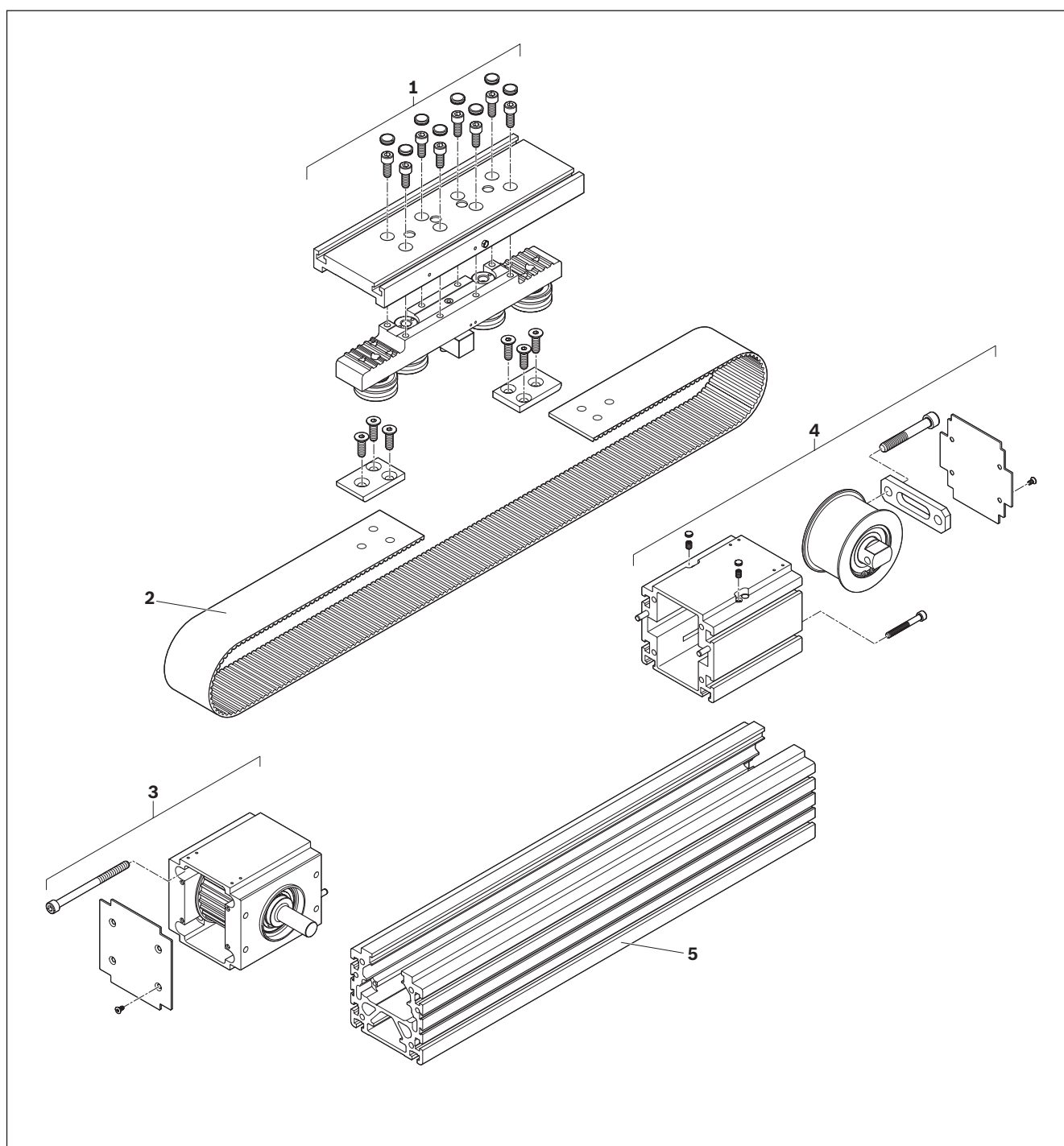


Fig. 56: Overview of MLR-080/-110-NN-3

19 Service and support

- ▶ When ordering spare parts, please specify all the data on the nameplate.
- ▶ To order spare parts, please contact your local Bosch Rexroth sales partner. You can find this on the Internet under www.boschrexroth.com/contact

In urgent cases, our Bosch Rexroth Customer Service help desk and hotline staff will be happy to assist you in any way they can.

Phone: +49 (0) 9352 40 50 60
E-mail: servicelt@boschrexroth.de

Return address:
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SERVICE
Röntgenstraße 5
97424 Schweinfurt

19.1 Assembly videos



Assembly videos are on Youtube available:

www.boschrexroth.com/how-to-LT



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