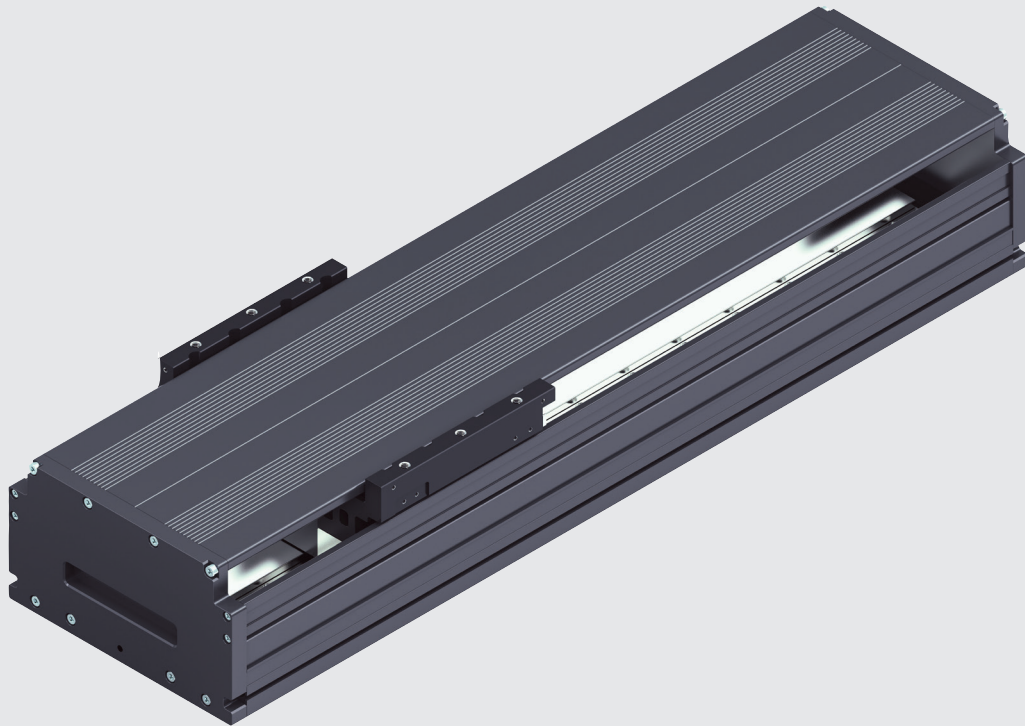


Linear Motor-Modules LMM

R320103235/2024-07
EN

Instructions



The data provided is for the purpose of the product description. Any references to possible uses are provided merely as a convenience and shall be understood as sample applications or suggestions. Catalog data may not be construed as guaranteed characteristics. 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 guide was compiled in German.

Any dissemination of the product must include this guide.

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

DE German (original document)

EN English

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1 About this documentation

1.1 Validity of the documentation

This documentation applies to the following products:

- Linear Motor-Modules LMM according to the "Linear Motor-Modules LMM" catalog.

This documentation is intended for assembly/installation personnel, line operators and machinery/plant users or manufacturers.

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 commencing any work with the product, be sure to read this guide and the "Safety instructions for linear axes and electromechanical cylinders" guide in full.
- ▶ Tightening torques: unless otherwise specified, apply the tightening torques for screws ➡ 13.1. Deviations are marked accordingly.

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 axes and electromechanical cylinders	R320103152	Safety instructions
	Linear Motor-Modules LMM	R999002332	Catalog
	Linear Motor-Modules LMM	R320103235	Guide

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 guide

In this guide, safety instructions take priority over all instructions that entail 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 and source of hazard!
Consequences if ignored.
► Hazard prevention measure.

- **Warning sign:** draws attention to the hazard
- **Signal word:** indicates the severity of the hazard
- **Type and source of hazard:** indicates the type or source of the 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 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	Damage to property: 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.	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
	Warning of dangerous magnetic and electromagnetic fields
	Hot surface warning

1.3.3 Abbreviations

The following abbreviations are used in this documentation:

Table 4: Abbreviations and definitions

Abbreviation	Meaning
LMM	Linear Motor Modules

2 Safety instructions

The general safety instructions for this product can be found in the "Safety instructions for linear axes and electromechanical cylinders" documentation, which is included in the scope of delivery. It is necessary for you to have read and understood these before handling the product. Bosch Rexroth AG will not accept any liability for damage caused by non-compliance with our safety instructions.

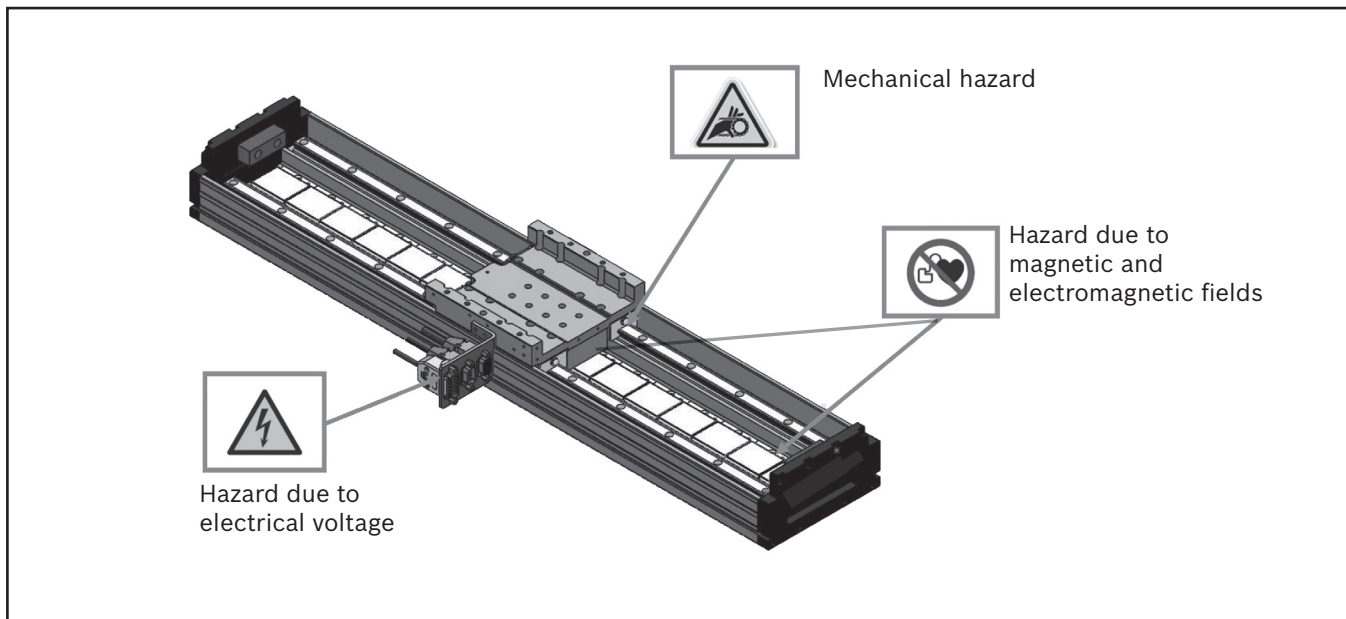


Fig. 1: Safety instructions

2.1 Protection against mechanical hazards

! WARNING

Dangerous movements! Danger to life, risk of injury, serious physical injury or property damage!

Do not stand in the machine'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 designed for installation and operation in the horizontal position.

In the event that a vertical or inclined installation situation is required, the customer must implement appropriate safety measures to prevent the frame or the carriage from falling or dropping.

For example, through

- ▶ the mechanical locking of the vertical axis,
- ▶ an external braking/catching/clamping device or
- ▶ the sufficient counterbalancing on the axis.

2.2 Protection against electrical voltage

WARNING

Danger to life or risk of injury caused by electric voltage!

During operation, the cables may wear due to the continuous mechanical load and reveal live conductors. Defective connection cables are to be replaced, the system must be decommissioned immediately. Do not perform provisional repairs at the connection cables.

Work on the electrical system may only be carried out by specialized electricians. Electrical components must be installed in compliance with locally applicable and state-of-the-art regulations.

Before starting work:

- ▶ 1. Disconnect.
- ▶ 2. Secure against reactivation.
- ▶ 3. Check that there is no voltage.
- ▶ 4. Ground and short circuit.
- ▶ 5. Cover or enclose any live parts in the vicinity.

After the completion of the work, undo the measures in reverse order.

Before switching on, establish the fixed connection of the grounding conductor at the connection points provided for this purpose.

The ball rail system does not have a grounding conductor function.

You are not permitted to operate the device, even for the purpose of taking brief measurements and tests, unless the grounding conductor is firmly connected to all the points provided for this purpose on the system.

If the carriage is moved manually, dangerous voltages may result at the connection pins for the power cable! Synchronous motor generator principle: conversion of mechanical energy into electrical energy.

ENGLISH

2.3 Protection against magnetic and electromagnetic fields

Magnetic and electromagnetic fields occur in the immediate vicinity of conductive cables.

Suitable protective measures (such as warning notices, protective equipment, marking of the danger zone) must be taken to ensure that the persons in the danger area are sufficiently informed about the existing risks.

WARNING

Danger to persons with pacemakers, metal implants and hearing aids in the immediate vicinity of motor components due to strong magnetic and electromagnetic fields!

- ▶ Persons with pacemakers and metal implants must not approach the product or handle it.

Risk of crushing due to strong magnetic forces!

- ▶ Keep ferromagnetic components (such as tools) at a distance.

NOTICE

Risk of destruction of sensitive parts!

Keep watches, credit cards, bank cards and identity cards with magnetic strip as well as all ferromagnetic metal parts such as iron, nickel and cobalt away from the permanent magnets.

2.4 Protection against burns

WARNING

Risk of burns due to hot surfaces! Temperatures above 70 °C are possible.

- ▶ Avoid touching the hot surface of the carriage assembly
- ▶ 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 mounting clearance of the connecting cables from other components.

2.5 Electrostatic sensitive components (ESD)

NOTICE

The product contains components that are subject to an electrostatic hazard. These components, such as the temperature sensors of the motor winding, may be easily destroyed if improperly handled.

- ▶ Avoid direct contact with the openly accessible contact pins in the electrical connection area of the carriage assembly without prior electrostatic discharge or grounding.
- ▶ Before handling endangered components, take suitable EEP protection measures (e.g. EEP protective clothing, wristband, conductive floor, earthed cabinets and working areas) to avoid damage.

3 Scope of delivery

The following is included within the scope of delivery:

- Linear Motor Modules LMM
- Linear Motor Modules LMM guide
- Safety instructions for linear systems guide
- ▶ Upon receipt of the delivery, immediately check for completeness against the receipt.

3.1 Condition as delivered

- The product is supplied fully assembled and lubricated.

3.2 Accessories

For accessories, see the Linearmotor-Modules LMM catalog:



Dimensions and material numbers of the accessories as well as the additional fastener accessories
⇒ "Linear Motor Modules LMM" catalog.

4 Product description

4.1 Performance description

Observe the notes, technical data, dimensions and descriptions in the Linearmotor-Modules LMM catalog.

4.2 Device description

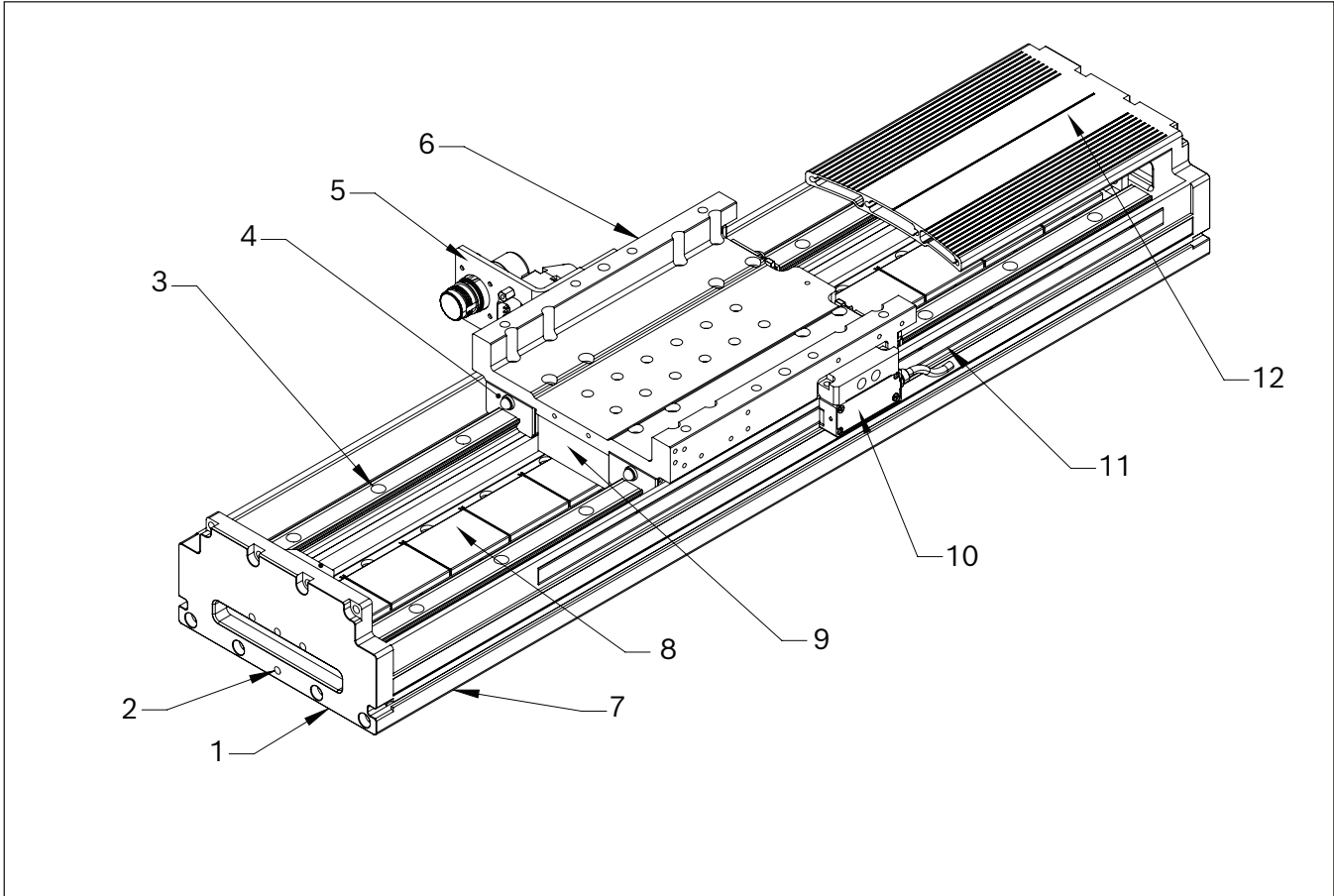


Fig. 2: Components of the LMM (example)

- 1** End block
- 2** Ground connection (without screw)
- 3** Guide rail
- 4** Runner block
- 5** Connectors
- 6** Carriage
- 7** Frame
- 8** Linear motor/secondary part
- 9** Linear motor/primary part
- 10** Encoder
- 11** Scale
- 12** Cover

4.3 Identification

LMM name plate

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

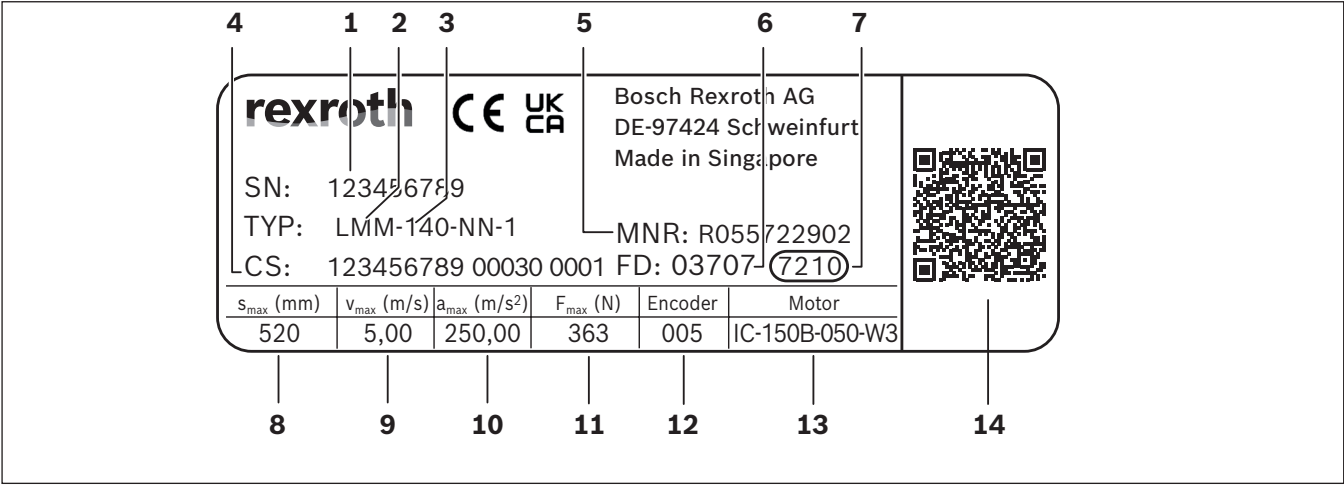


Fig. 3: LMM name plate (Example)

The name plate contains additional technical data for the commissioning.
The LMM name plate contains the following information:

Table 5: Information on name plate

Name plate information		Meaning
1	SN	Customer order number
2	TYP	Short description
3	140	Size
4	CS	Customer information
5	MNR	Material number
6	FD	Manufacturing date
7	7210	Manufacturing location
8	s_{max}	Maximum travel range
9	v_{max}	Maximum speed
10	a_{max}	Maximum acceleration
11	F_{max}	Maximum force
12		Encoder
13		Motor
14		QR-Code

Further specific data and parameters for commissioning of the Linear Motor Module LMM can be found on the link below:

[Homepage Linear Motor Modules](#)

5 Transport and storage

⚠ 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 carefully at the designated points only.
- ▶ Do not stand under suspended loads.
- ▶ Before hoisting the product, note the weight ➡ "LMM" catalog
- ▶ Secure the movable carriage against falling, dropping or slipping.

5.1 Transporting the product

NOTICE

Damage due to transport under inappropriate environmental influence!

Potential corrosion of product parts.

- ▶ Transport only in undamaged, unopened original packaging.
- ▶ Protect the product from humidity and corrosive agents.

Hoisting the product:

1. Before hoisting the product, note the weight ➡ "LMM" catalog.
2. Only hoist the product using suitable load handling equipment, as shown in the figure.

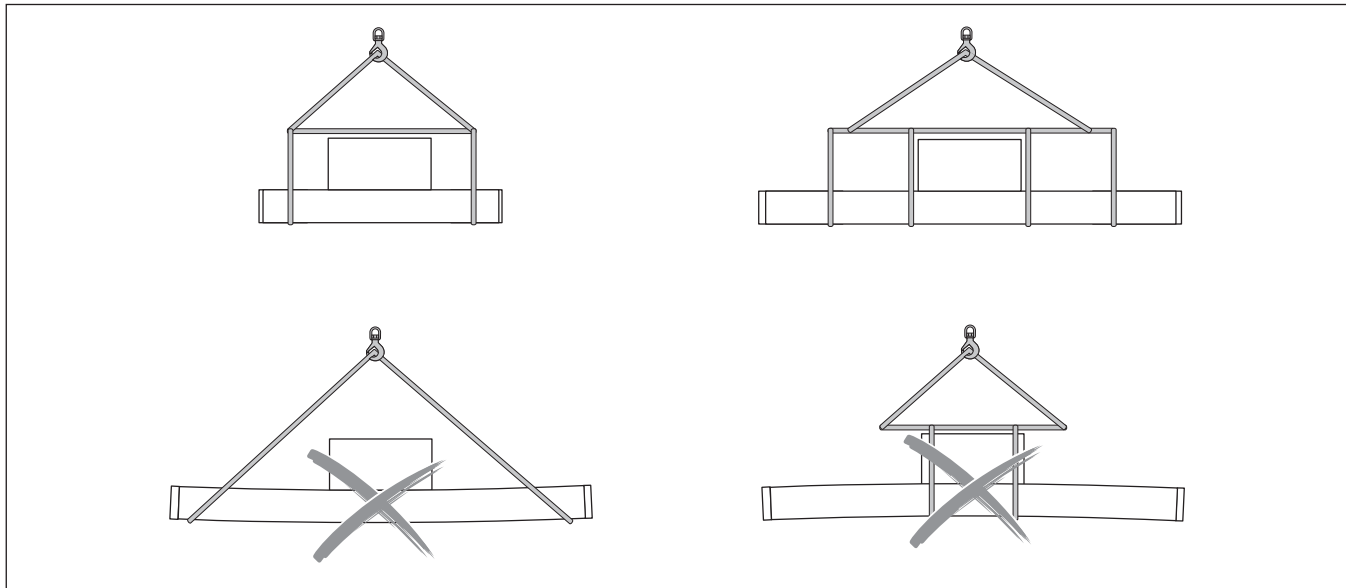


Fig. 4: Hoisting the product

5.2 Storing the product

NOTICE

Damage due to storage under inappropriate environmental influence!

Potential corrosion of product parts.

- ▶ Storage only in undamaged, unopened original packaging.
- ▶ Only store the product in a roofed, dry area.
- ▶ Protect the product from humidity and corrosive agents.

6 Mounting

Transporting the product ➞ 5.



Do not use ferromagnetic tools during the mounting.

6.1 Installation position

- ▶ The product is designed for installation and operation in the horizontal position. Take appropriate measures in the case of deviating installation positions. Observe the safety instructions ➞ 2.

6.2 Fastening the product to the adjoining structure

NOTICE

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

Damage to the product.

- ▶ Fasten the product using the recommended fastening elements.
- ▶ Do not fasten or support the product at the end blocks. The frame is the load-bearing part!
- ▶ Ensure the flatness and sufficient rigidity of the mounting surface
- ▶ Observe specified tightening torques

6.2.1 Preparation of the mounting surface

- ▶ The mounting surface should have a flatness of 20 µm per 500 mm and a sufficient rigidity to take full advantage of the performance of the product.

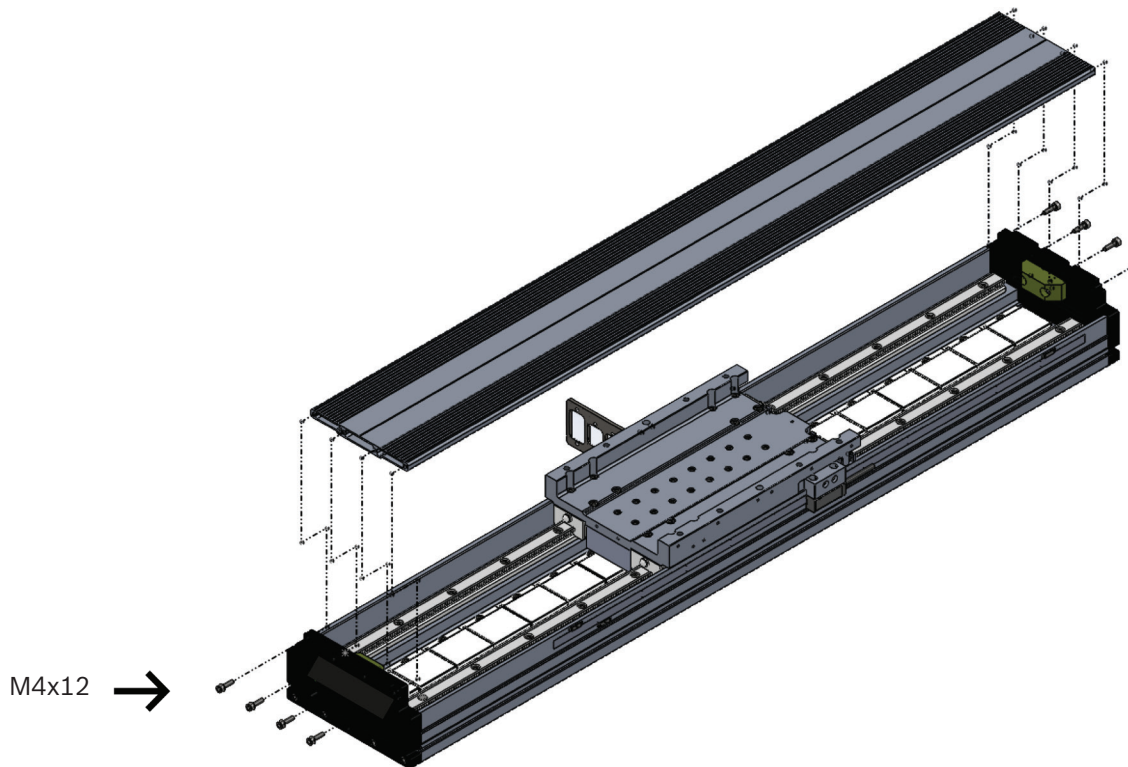
6.2.2 Mounting of the LMM

- 1 Remove the top cover (size 140/180) or side covers (size 220).

Size 140 / 180: Remove 8x M4x12 screws on both end covers.

Size 220: Remove M3x5 countersunk screws on the side covers and M3x12 on the two end covers.

Size 140 / 180



Size 220

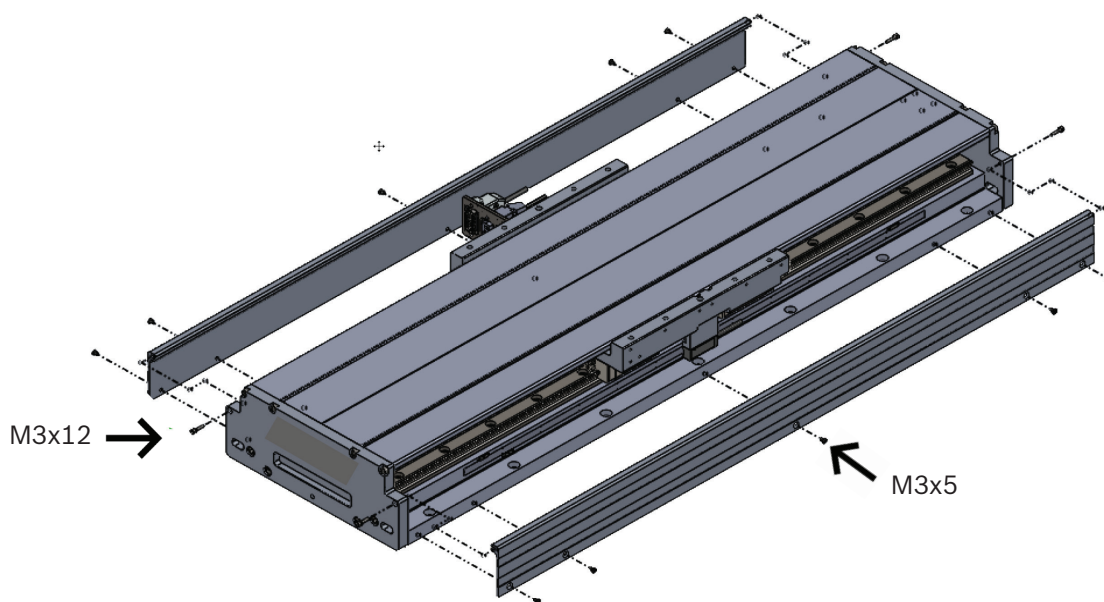
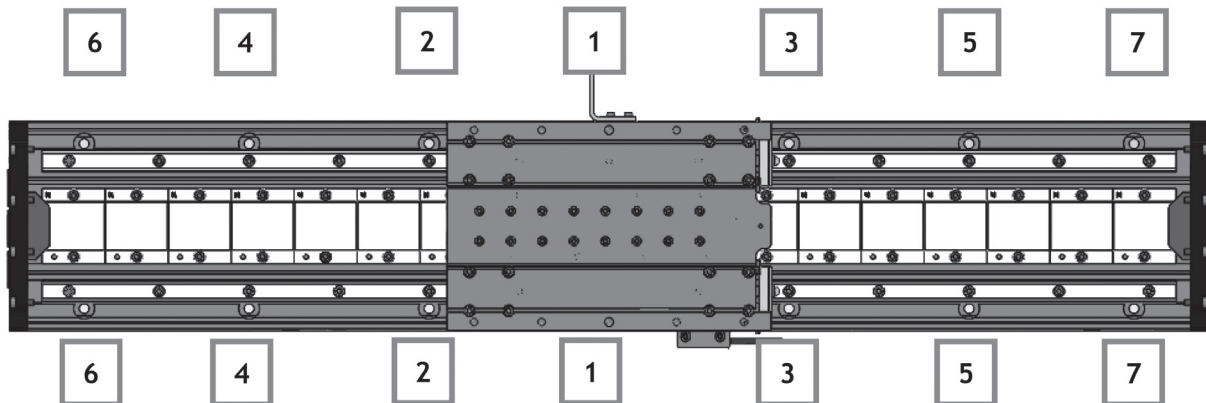


Fig. 5: Remove covers

- 2 Remove any burrs present on the mounting surface and ground surface of the product with an oil stone, and remove any dirt/dust present with an appropriate cleaning solution (isopropyl alcohol) and a lint-free cloth.
- 3 Place the product on the mounting surface and align/pin using locating pins.
- 4 Fasten the product to the mounting surface with the appropriate number of M6 hex socket screws. Tighten the pair of screws (1/1 to 7/7) with a torque of 8.8 Nm from the center outward according to the sequence shown below (1–7). Move the carriage so that the fastening bores are concealed.
- 5 Assemble the top cover / side covers in reverse order as shown in step 1.
Size 140 / 180: during the mounting of the top cover, tighten the M4 screws on the end cover with a torque of 2.1 Nm until the top cover is flush with the end cover. (► Fig. 6).
Size 220: mount both side covers; tighten the M3 countersunk screws with a torque of 0.7 Nm.

Size 140 / 180 (top view)



Size 220 (top view)

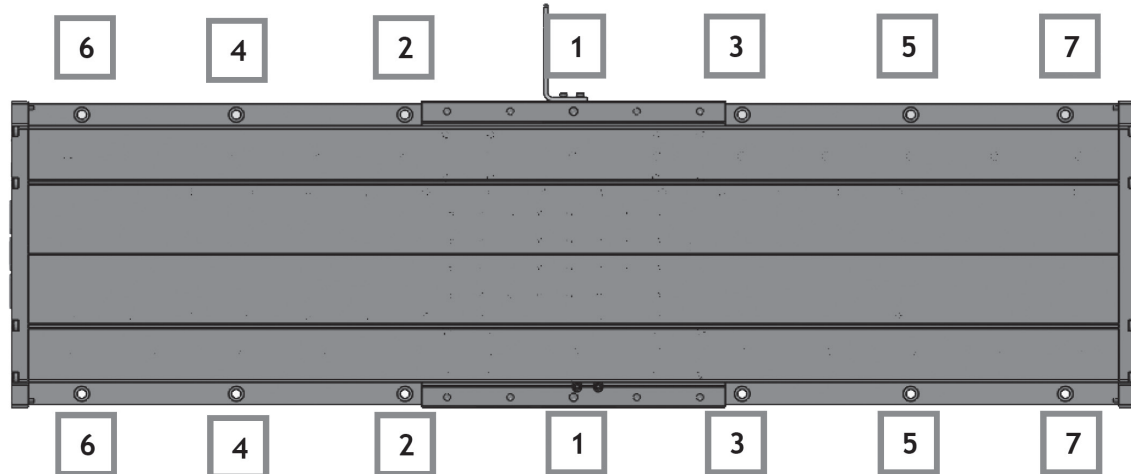


Fig. 6: Mounting of the LMM



Fig. 7: Mount the covers

6.2.3 Mounting of the payload/carriage sections

NOTICE

Distortive stress of the product due to the incorrect fastening of the payload!

Damage to the product.

- ▶ Fasten the product using the recommended fastening elements.
 - ▶ Ensure the flatness of the payload mounting surface
- ▶ The mounting surface of the payload should have a flatness of 20 µm to take full advantage of the performance of the product.
1. Remove any burrs present on the mounting surface of the payload and the carriage with an oil stone, and remove any dirt/dust present with an appropriate cleaning solution (isopropyl alcohol) and a lint-free cloth.
 2. Place the payload on the carriage and align/pin using locating pins.
 3. Fasten the payload to the carriage with the appropriate number of hex socket screws (M6/M8). Starting from the center, tighten the hex socket screws towards the ends in the cross sequence shown below with a torque of 8.8 Nm (M6) / 21.4 Nm (M8).

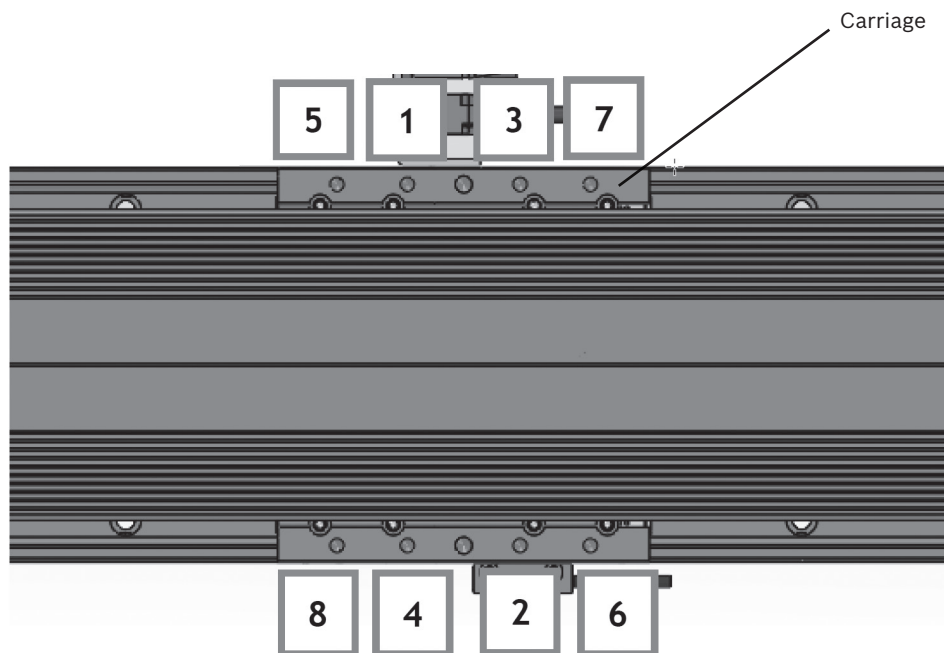


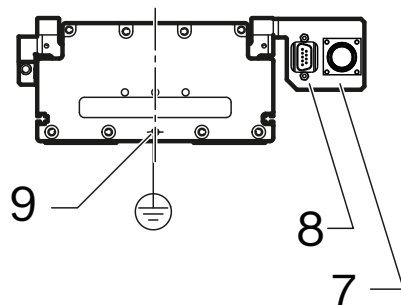
Fig. 8: Mounting of the payload

7 Electrical connection

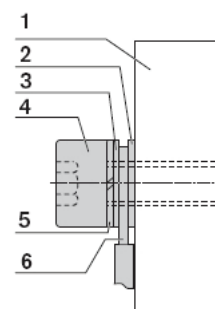
7.2.1 Additional grounding conductor connection at the end block grounding point

End block grounding point:

A grounding point is provided on the both end blocks of the LMM (the contact occurs via a thread in the end block). In this respect, the grounding screw is fastened in the end block from the outside. The grounding points on the end blocks on the frame are used for protective equipotential bonding in the event of fault currents (the rail system has no grounding conductor function). The grounding conductor connection must be designed in accordance with national and regional regulations.



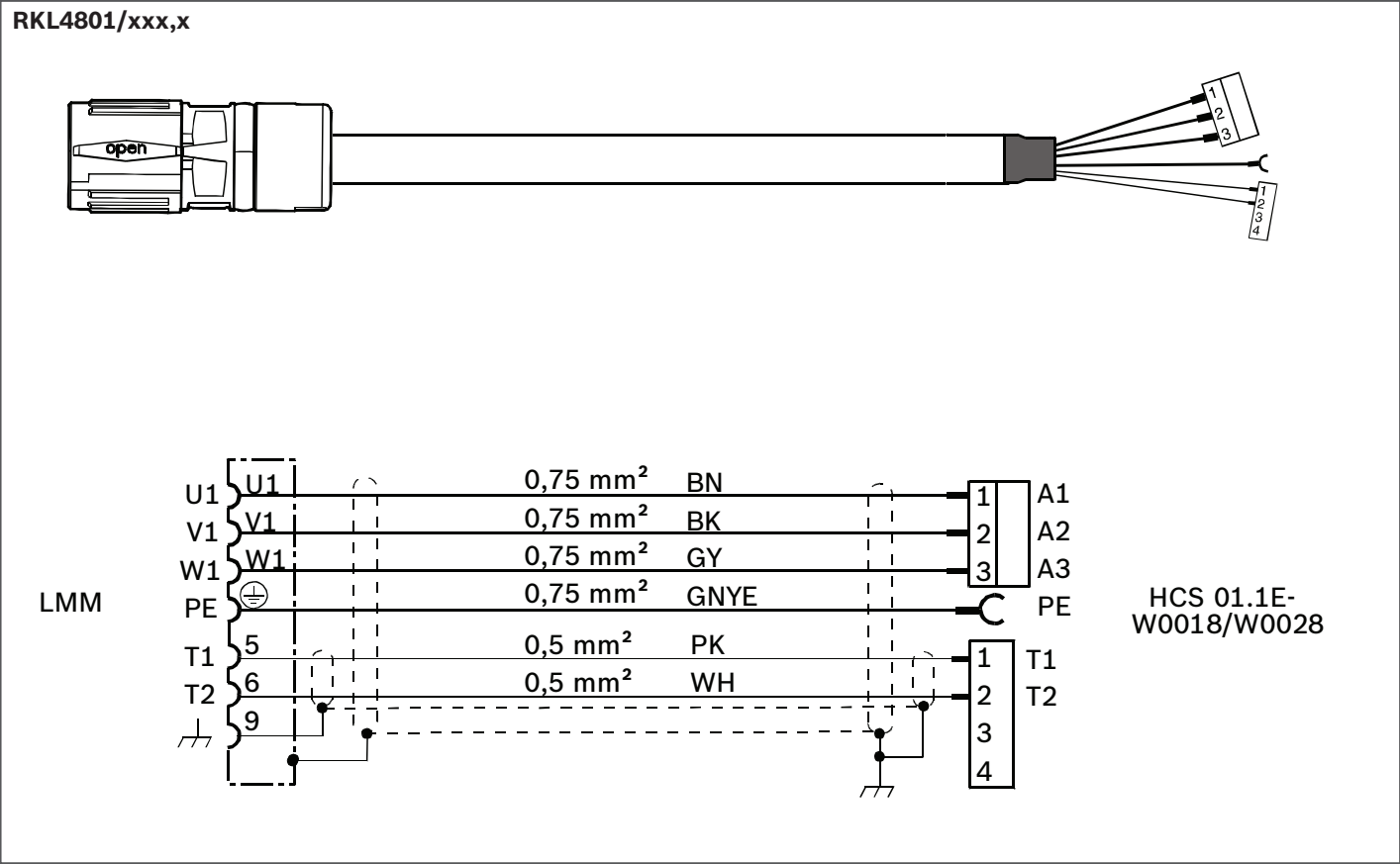
Example ground connection



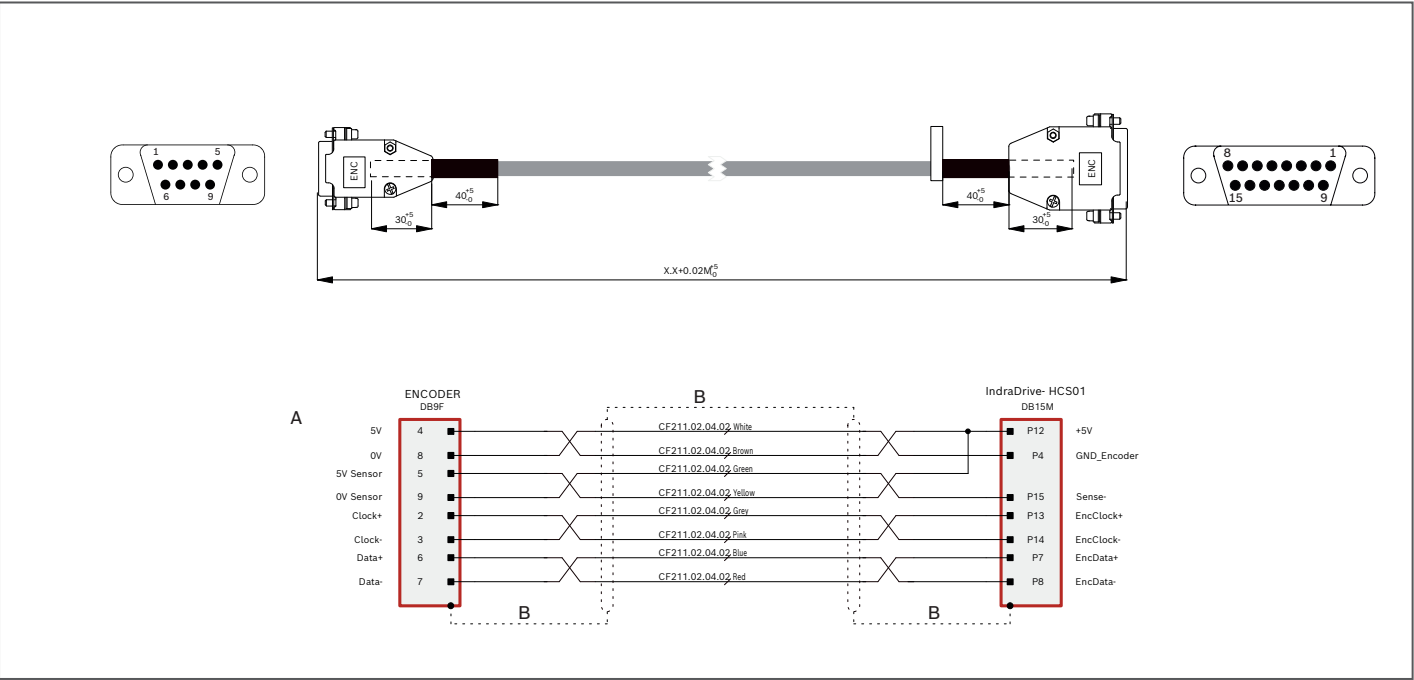
- 1 End block
- 2 Lock washer
- 3 Washer
- 4 Screw (M5)
- 5 Spring washer
- 6 Cable lug
- 7 Connection Motor
- 8 Connection Encoder
- 9 Grounding point

Fig. 9: Electrical connections

Power cable for Drive HCS01.1-W0018 and HCS01.1-W0028



Encoder-Kabel



Encoder-Kabel

8 Commissioning and operation

8.1 Checking the operating conditions

⇒ 13 Operating conditions

NOTICE

Performance altered by special operating conditions!

Damage to the product.

- ▶ Before commissioning 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.

8.2 Commissioning

Commissioning files/parameters for download:

www.boschrexroth.com/linearmotormodules



8.3 Test run, running in

- ▶ Before the first test run, consider possible restrictions due to system-inherent interference contours.
- ▶ During the first test run, move at low speed over the entire travel range. In particular, check the setting and function of the switches.
- ▶ If necessary, optimize the interaction of the mechanical equipment and the electronics.

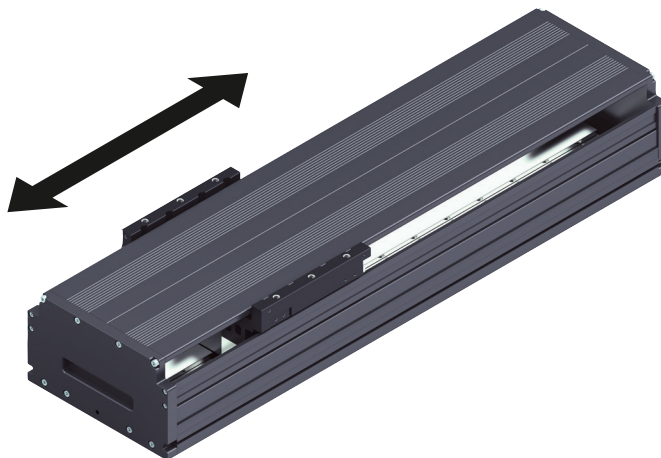


Fig. 10: Moving the carriage

8.4 Operation

During operation, the specified conditions of use and technical data must be complied with.

Controls during operation:

- Look out for unusual noises.
- Look out for increased vibrations.
- Check the cleanliness of the product.
- Check the monitoring equipment and the diagnosis / error messages of the controllers.
- Check the cabling for wear at regular intervals

NOTICE

Immediately decommission the drive if there are any deviations from normal operation!

Damage to the product.

- For the further procedure, refer to chapter 14 "Service and support"

9 Maintenance and repair

9.1 Visual inspection and cleaning

- Excessive dirt, dust or chips may have negative influence on the function of the motors; in extreme cases, this may even lead to failure of the motors. You should therefore clean the motor at regular intervals (after one year at the latest) in order to achieve a sufficiently large heat radiation surface. If the cooling fins are partially covered with dirt, for example, a sufficient heat dissipation via the ambient air is no longer possible.
- Check connection cables for damage at regular intervals and exchange them, if necessary.
- Check the grounding conductor connection at regular intervals for its proper condition and tight fit and replace it if necessary.

9.2 Lubrication

To ensure the service life of the product, lubrication is required at appropriate lubrication intervals, taking the operating conditions into account. Without regular lubrication, wear will occur to the linear guides, reducing the service life of the product.

- ▶ Before using lubricants, read and observe the appropriate safety data sheets.
- ▶ For the lubrication of the linear guide (ball runner block), a commercially available manual grease gun is to be used.
- ▶ Basic lubrication is carried out by the manufacturer.

NOTICE

Risk of property damage due to insufficient lubrication!

Loss of performance and corrosion as well as early failure of the guideways.

- ▶ Under normal operating conditions, re-lubricate the product every 2 years or when relubrication interval has reached. In the case of special operating conditions, please contact us. (For example, in the case of fiberglass dust, wood dust, solvents and short stroke, contamination, vibration, impact load, etc.)

Risk of insufficient lubrication due to use of improper lubricants!

Damage to the product, reduced relubrication intervals, loss of performance in short stroke applications and under load; possible chemical interactions between plastic materials and lubricants.

- ▶ Do not use lubricants containing solid particles (e.g. graphite or MoS₂)!
- ▶ Recommended lubricant see table

Table 6: Lubrication Notes/Relubrication interval

- ▶ Maintenance is limited to relubricating all runner blocks using the mounted grease nipples (1).

Lubricating version		Grease lubrication	
Basic lubrication		Tribol GR 100-2 PD	
Consistency class		NLGI 2 (DIN 51818)	
Identification		KP2K-20 (DIN 51825)	
Lubrication with hand grease gun		yes	
Prepared for connection to central lubrication systems		-	
Recommended lubricants		Dynalub 510 (Grease lubrication) Tribol GR 100-2 PD Elkalub GLS 135/N2 (NLGI2 DIN 51818)	
Features		• Good water resistance • Corrosion protection	
Material numbers		Dynalub	R3416 037 00 (400 g cartridge) R3416 035 00 (25 kg container)
		Tribol	R3416 031 00
		Elkalub	R9130 187 10

LMM	Funnel grease nipple	Relubrication quantity (cm ³)	Relubrication interval (km) or after 2 years
-140	DIN 3405-A M3x5	0,4 (2x)	6000
-180-IL			10000
-180-IC-150B			6000
-180-IC-250B	DIN 3405-B M3x5	0,7 (1x)	3500
-220-IL	DIN 3405-A M3x5	0,4 (2x)	6000
-220-IC-150B	DIN 3405-B M3x5	0,7 (1x)	3500
-220-IC-250B		1,4 (1x)	10000

Example: LMM-140 relubrication quantity 0.4 cm³ (2x) = Grease all ball runner blocks with a portion of 0.4 cm³ via grease nipples. Move the carriage over the maximum travel distance s_{max}. Then repeat the lubrication process.

9.2.1 Re-lubrication

1. Remove the 8 x M4 screws and remove the top cover
2. Grease all runner blocks with the appropriate amount of relubrication with a manual grease gun via the lube nipples (1). See example.
3. After the greasing, move the carriage several times over the entire stroke to ensure a uniform greasing of the runner block. Ensure that there is a visible film of grease on the guide rail.
4. Mount the top cover again and tighten the 8 x M4 screws to a torque of 2.1 Nm.

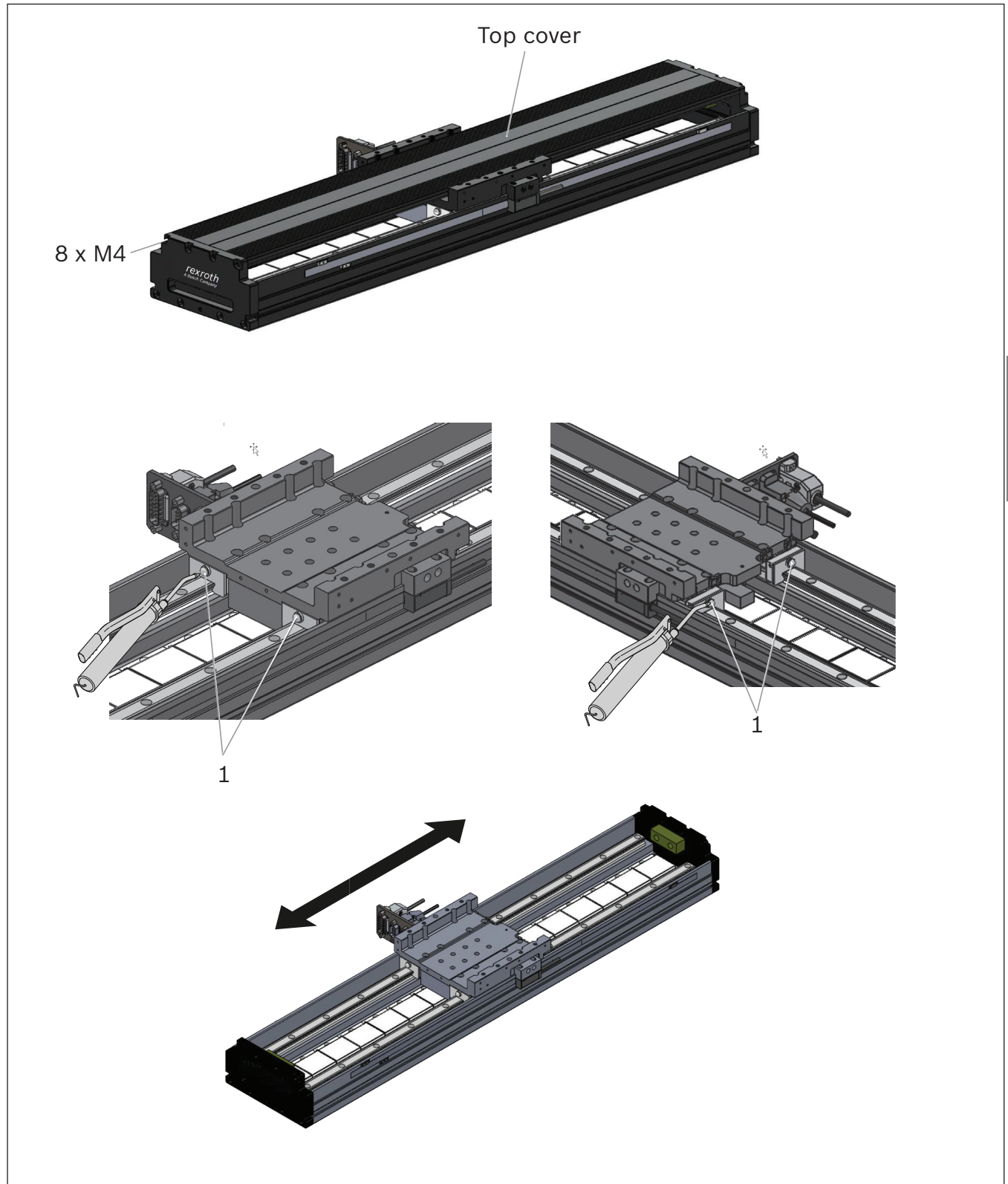
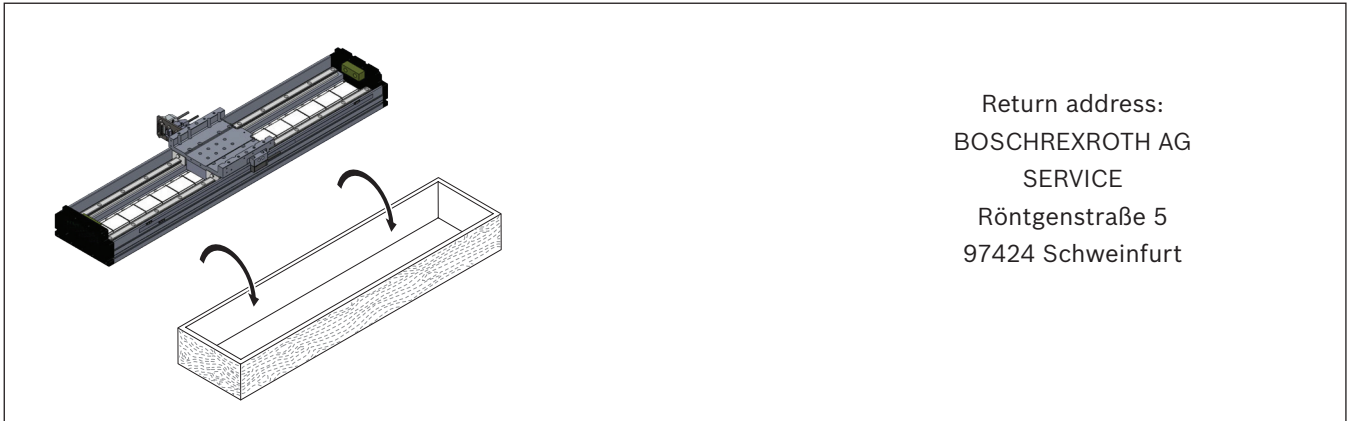


Fig. 11: Lubricating the product

9.3 Repair

Repairs to the product may only be carried out by Bosch Rexroth.



Return address:
BOSCHREXROTH AG
SERVICE
Röntgenstraße 5
97424 Schweinfurt

Fig. 12: Returning the product to Bosch Rexroth

10 Removal and replacement

To ensure the accuracy and function of the product after replacement of assemblies (e.g. linear motor, ball rail systems, carriage, frame, etc.), such assemblies may only be removed and replaced by Rexroth.

11 Environmental protection and disposal

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.
- ▶ The permanent magnets at the secondary part must be demagnetized before disposal to prevent injuries and damage to property.

Recycling:

- ▶ Due to the high metal content, the products can mostly be recycled. To achieve an optimum metal recovery, disassembly into individual assemblies is required. Metals contained in the electric and electronic assemblies can also be recycled using special separating procedures.

The LMM primarily consists of the following components:

- ▶ Steel, aluminum, copper, brass
- ▶ Plastics, insulation and combined materials
- ▶ Electronic components
- ▶ Permanent magnets
- ▶ Lubricants

Demagnetizing the magnets:

- ▶ The magnets at the secondary part are demagnetized by means of a special thermal treatment. In this connection, the duration of the treatment is influenced by the size. The secondary part must remain in the oven for at least 30 minutes, starting at the time at which the magnet surface has reached a temperature of 300 °C. In case of successful demagnetization, the magnets can be separated from the carrying plate without force after the secondary part has cooled down.

Package:

- ▶ Our packaging materials do not contain any problematic materials and can be recycled without problems. The following is used as packaging materials: wood, cardboard and plastics.

Disposal by the manufacturer:

- ▶ Products manufactured by us can be returned to us for disposal. Please make sure that no foreign substances or foreign components are contained. In case of air transport, observe the hazardous materials regulations (IATA) for the secondary part, if applicable.

Please send the products carriage paid to the following address:

- ▶ BOSCHREXROTH AG
SERVICE
Röntgenstraße 5
97424 Schweinfurt

12 Technical data

Technical data ➡ "Linearmotor-Modules LMM" catalog.

13 Operating conditions

Table 7: Standard operating conditions

Condition	Value
Temperature range	0 °C ... 40 °C, loss of performance above 40 °C
Ambient temperature for mechanical system (without dropping below dew point)	−10 °C ... 60 °C
Stroke $s_{min}^{1)}$	See "Technical data" tables in the catalog
Soiling	Not permissible
Engine thermal class	130 (B)

¹⁾ Minimum travel range to ensure a reliable lubrication distribution.

In the case of special operating conditions, please contact us - especially in case of glass fiber dust, wood dust, solvents and short stroke, etc.!

13.1 Tightening torques

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

Table 8: Tightening torques

 8.8	M2	M2.5	M3	M4	M5	M6	M8	M10	M12	M14	M16
$\varnothing M_{A \max}$ (Nm) $\mu = 0.125$	0.4	0.7	1.3	2.7	5.5	9.5	23	46	80	123	194

14 Service and support

Service Germany.

The service helpdesk & hotline is available at:

- Phone: +49 9352 40 50 60
- Email: Service@boschrexroth.de

Worldwide service.

If you are located outside of Germany, please contact your contact person first.

Hotline numbers can be found with the sales addresses in the Internet.

- Internet: <http://www.boschrexroth.com>

Information preparation

We will be able to help you quickly and efficiently if you have the following information ready:

- Detailed description of the malfunction and conditions
- Information on the name plate
- More far-reaching information on the control periphery, if possible (e.g. control type, firmware, bus system)
- Your contact data (contact person, telephone number and email address)

14.1 Troubleshooting and fault clearance

Table 9: Troubleshooting and fault clearance

Encoder	Mode	LED	Status
Absolute	Standard operation	Green	Optimum setup
		Orange	Poor setup, adjust the read head to attain a green flashing LED
		Red	Poor setup, adjust the read head to attain a green flashing LED

14.2 Further information

Homepage Bosch Rexroth Lineartechnik	
Homepage Linear Motor Modules	

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