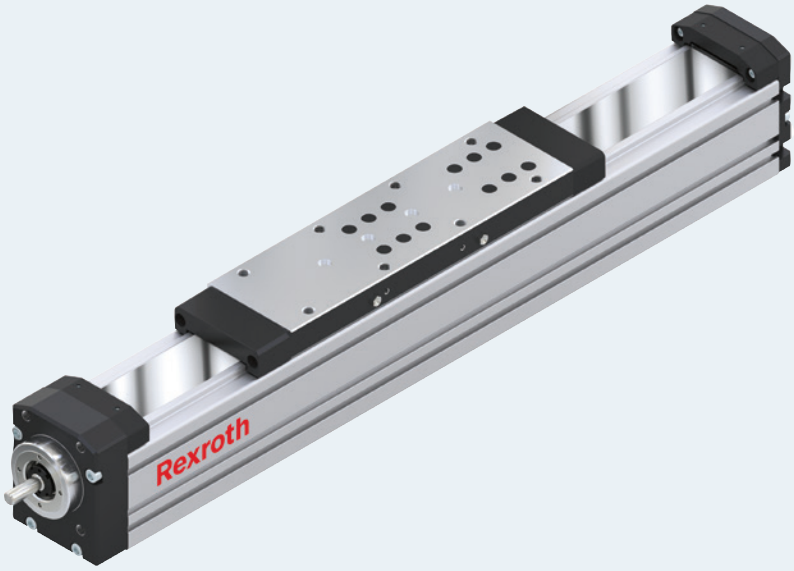
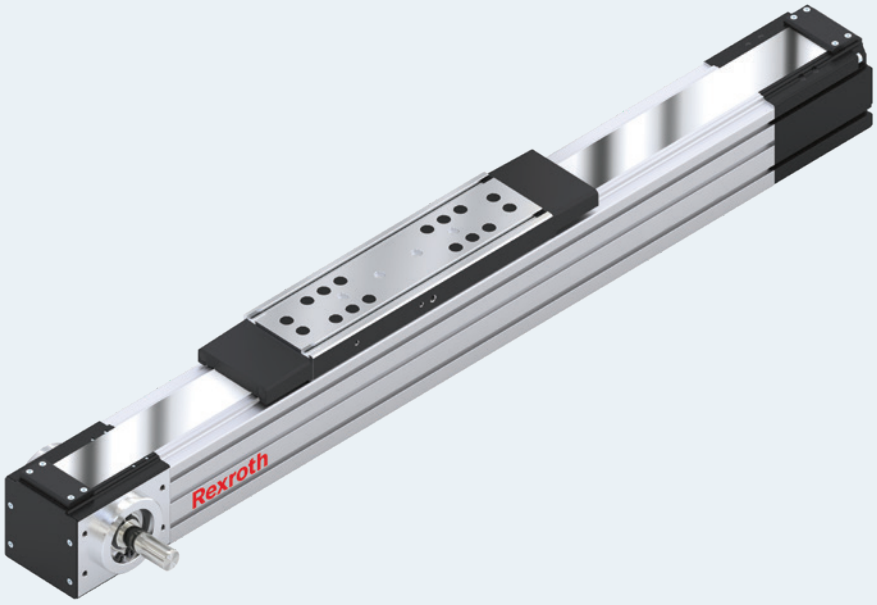
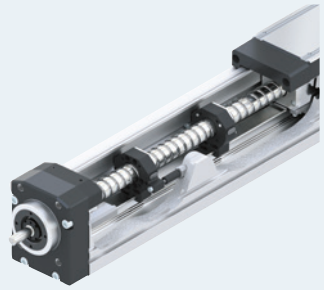
The Drive & Control Company

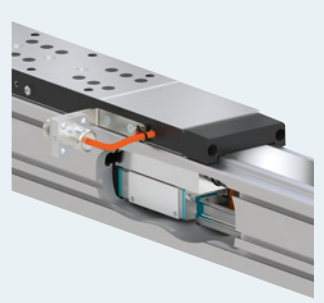
Rexroth
Bosch Group

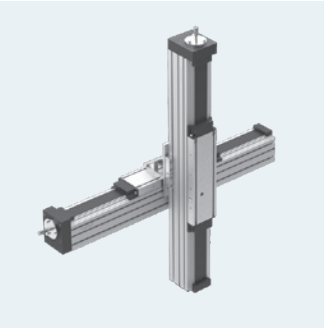
Linear Modules
MKK, MKR, MLR







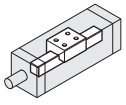
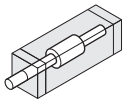
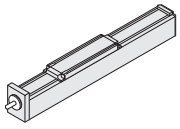
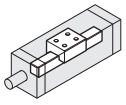
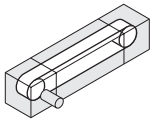
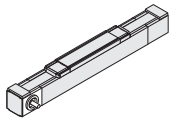
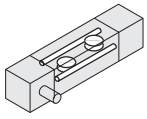
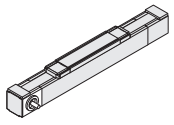
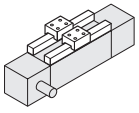
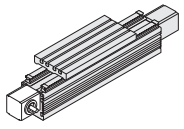




Rexroth Linear Modules

Identification system for short product names

Example		M	K	K	-	110	-	N N	-	3
System	= Linear Module (**M**)									
Guideway	= Ball Rail System (BSHP) (**K**) Cam Roller Guide (**L**)									
Drive	= Ball Screw Assembly (**K**) Belt drive (**R**)									
Size	= 040 / 065 / 080 / **110** / 145 / 165									
Version	= Normal (**NN**) Food & Packaging (**FP**)									
Generation	= Product generation **2/3**									

Type	Guideway	Drive	Linear Module
MKK	 **Ball Rail System (K)**	 **Ball Screw Assembly (K)**	
MKR	 **Ball Rail System (K)**	 **Belt drive (R)**	
MLR	 **Cam Roller Guide (L)**		
MKR-145	 **Two Ball Rail Systems (K)**		

Changes/additions at a glance

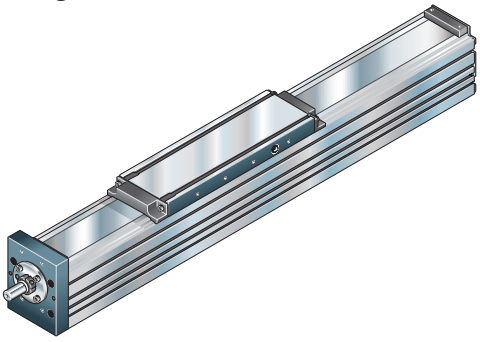
Catalog structure

- Inclusion of new product generation “NN-3”
- Dimension drawings for generation 3, dimension neutral
- Integration of the “Linear Modules for Food & Packaging MKR 080” catalog (R310DE2406 (2015-04)
- Additional chapter “Delivery form”
- Summary of formula names and abbreviations
- Technical data and drive data table layout revised
- Chapter “Attachments and accessories” revised
- Chapter “Motors” expanded (inclusion of servo motor MS2N)
- “Lubrication” chapter revised.

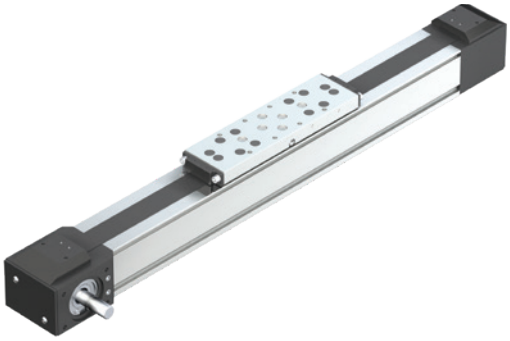
Technical changes

- Increase of the dynamic load capacities and moments
- Increase of the permissible drive torques for Linear Modules MKK
- Carriage with variable centerline-to-centerline distance
- “Without drive” option omitted (for Linear Modules MKK product generation NN-3)
- New guideway options:
  - Center holes
  - Center holes with elongated hole
- Optional IMS-A measuring system
- New screw support (SPU) with Linear Modules MKK
- New magnetic sensors with Linear Modules of product generation NN-3
- New gear option with Linear Modules MKR of product generation NN-3

Product generation 2

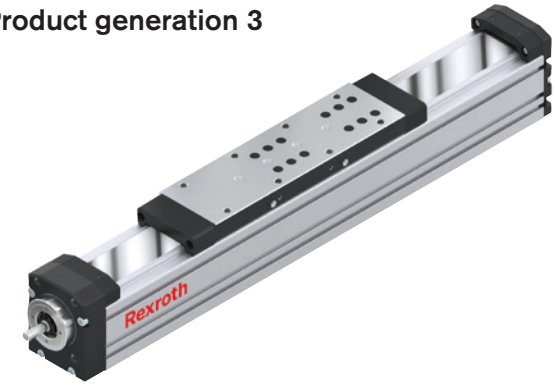


MKK

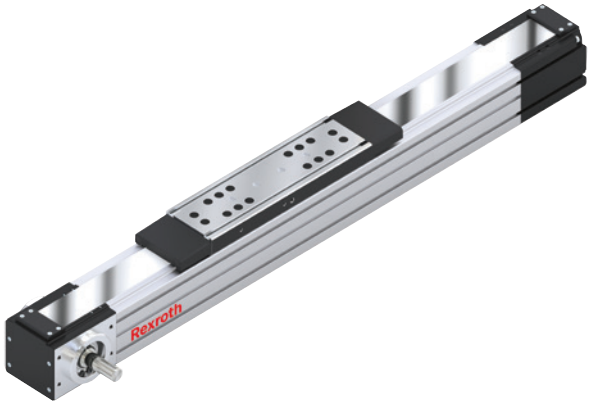


MKR

Product generation 3



MKK



MKR

Linear Module	Size	Product generation 2	Product generation 3 (new)
MKK - / MKR - NN	-040	MKx-040-NN-2	In preparation
	-065	Replaced by generation 3	MKx-065-NN-3
	-080	Replaced by generation 3	MKx-080-NN-3
	-110	Replaced by generation 3	MKx-110-NN-3
	-140	–	In preparation
	-165	MKx-165-NN-2	–
	-145 (MKR only)	MKR-145-NN-2	–
MLR - NN	-080	MLR-080-NN-2	–
	-110	MLR-110-NN-2	–
MKR - FP	-080	MKR-080-FP-2	–

MKx: x = K for ball screw drive, x = R for belt drive

Contents

Product description MKK/MKR-xxx-NN-3

Characteristic features

The new product generation 3 (MKX-XXX-NN-**3**) of the Rexroth Linear Modules is based on the consistent further development of the previous series. The usual Rexroth performance features have been improved once again with consideration of backward compatibility.

Linear Modules can be delivered complete with motors, controllers and control units.
For more information, see the "Motors" and "EasyHandling" chapters

Structural design

- Ready-to-install Linear Modules in any length up to L_{max}
- Extremely compact extruded aluminum profile (frame) with integrated Rexroth Ball Rail Systems
- Identical external dimensions between Linear Modules MKK and MKR
- Carriages made of aluminum with T-slots or threaded holes and with centering holes in each case
- Individual lubrication versions for connection to one-point lubrication systems

Attachments (accessories program)

- Sensors and extension cables
- Switches (proximity or mechanical)
- Switching cam
- Socket and plug
- Aluminum profile cable duct
- Clamping fixtures and sliding blocks
- Connecting shafts
- Connection technology for Linear Motion Systems

Further highlights

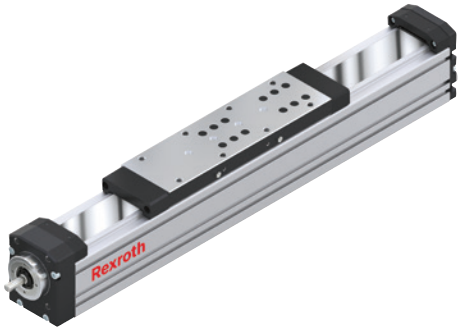
- Flexible thanks to selectable options
- Ready-to-install with various attachment parts
- Center holes for simple combination with other Linear Motion Systems and connection elements
- Available in two material pairings, ALST (aluminum/steel version) and ALCR (aluminum/steel hard chrome plated version).
- Optionally selectable absolute position measuring system IMS-A (MKx-080 & MKx-110)
- Magnetic field sensors can be mounted in frame/profile slot
- Motor attachment via mount and coupling or via timing belt side drive
- Planetary gearbox with various gear ratios
- Servo motor

Applications

- Pick and place
- Handling systems
- Placement systems, palletizers
- Machine tool feed units
- Inspection and analysis systems
- Feed units in transfer lines
- Motion units

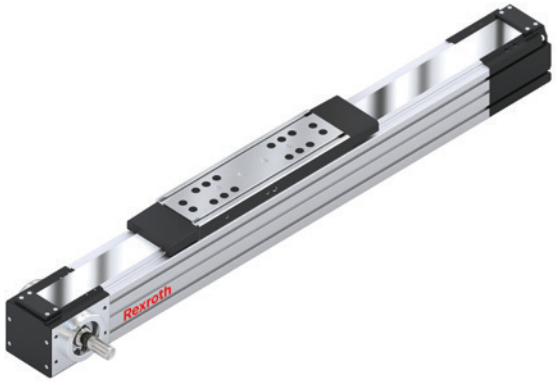
Linear Module MKK with Rexroth Ball Rail System and Ball Screw Assembly

- Driven by precision Rexroth Ball Screw Assembly, optionally in accuracy class T7 or T5
- Screw support to reach high speeds with large overall lengths (MKK-080 and MKK-110) optionally available. Suitable for the horizontal installation position
- Installation elements are protected by a plastic strip (MKK-065) or corrosion resistant steel strip (MKK-080,-110)
- Repeatability of up to +/- 0.005 mm



Linear Module MKR with a Ball Rail System and belt drive

- Realization of greater lengths of up to 9,400 mm
- High performance toothed belt (AT profile) for high traversing speeds of up to 5 m/s
- Installation elements are protected by a plastic strip (MKR-065) or corrosion resistant steel strip (MKR-080,-110)
- Repeatability of up to +/- 0.05 mm



Product description MKK/MKR-xxx-NN-2

Characteristic features

Rexroth Linear Modules of product generation 2 (MKX-XXX-NN-**2**are precise, ready-to-install guide systems with high performance features in compact dimensions.

Linear Modules can be delivered complete with motors, controllers and control units.
For more information, see the “Motors” and “EasyHandling” chapters

Structural design

- Ready-to-install Linear Modules in any length up to Lmax
- Extremely compact extruded aluminum profile (frame) with integrated Rexroth Ball Rail Systems
- Identical external dimensions between Linear Module types MKK and MKR
- Carriages made of aluminum with T-slots or threaded holes (depending on the size)

Attachments

- Switches (proximity or mechanical)
- Socket and plug
- Aluminum profile cable duct

Attachments (accessories program)

- Clamping fixtures and sliding blocks
- Connecting shafts
- Connection technology for Linear Motion Systems
- Sensors and extension cables

Further highlights

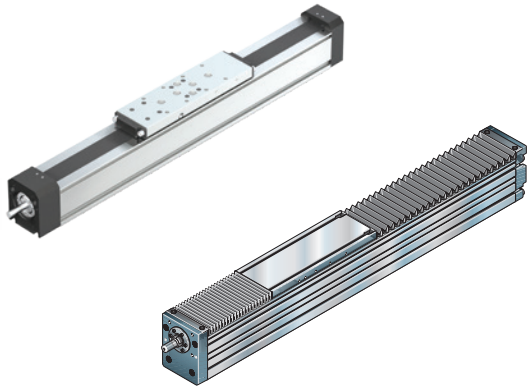
- Flexible thanks to selectable options
- Ready-to-install with various attachment parts
- The Rexroth Ball Rail System and the Ball Screw Assembly drive feature one-point lubrication (MKK) from both sides; lubrication is only suitable for grease lubrication with a manual grease gun.
- With PU sealing strip on MKx-040
- With bellows cover on MKK-165
- Motor attachment via mount and coupling or via timing belt side drive
- Planetary gearbox with various gear ratios
- Servo motor

Applications

- Pick and place
- Handling systems
- Placement systems, palletizers
- Machine tool feed units
- Inspection and analysis systems
- Feed units in transfer lines
- Motion units

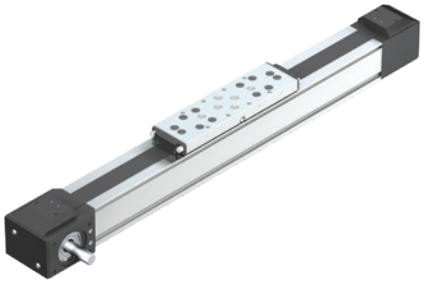
Linear Module MKK with Rexroth Ball Rail System and Ball Screw Assembly

- Drive via precision Rexroth Ball Screw Assembly accuracy class T7
- Installation elements are protected by a plastic strip (MKK-040) or bellows (MKK-165).
- Repeatability of up to +/- 0.005 mm



Linear Module MKR with a Ball Rail System and belt drive

- Realization of greater lengths of up to 12,000 mm
- High performance toothed belt (AT profile) for high traversing speeds of up to 5 m/s
- Installation elements are protected by a plastic strip on MKR-040.
- Repeatability of up to +/- 0.05 mm



Product description MKR-080-FP-2, Food & Packaging

Characteristic features

Rexroth Linear Modules for Food & Packaging have been designed for use in environments requiring a high level of hygiene and ease of cleaning. They are equipped with a Ball Rail System and belt drive and offer an outstanding combination of high performance and compact dimensions.

Linear Modules can be delivered complete with motors, controllers and control units.
For more information, see the “Motors” and “EasyHandling” chapters

Structural design

- Compact, anodized aluminum frame with no slots – resulting in an especially smooth, easy-to-clean surface
- Ready-to-install Linear Modules in any length up to L_{max}
- Integrated Rexroth Ball Rail System
- Carriage with sealable threads and one-point lubrication
- High performance toothed belt
- Drive journal made of heat-treated steel
- Deep-groove ball bearings (in the end enclosures) in corrosion-resistant materials
- Stainless steel sealing strip per DIN EN 10088

Further highlights

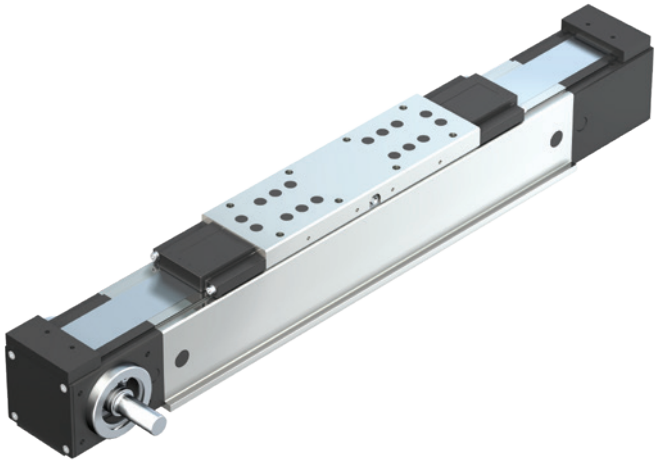
- Flexible thanks to selectable options
- The one-point lubrication feature of the Rexroth Ball Rail System on the carriage (only suitable for grease lubrication with a manual grease gun)
- Protection of the installation elements by steel strip
- Optional with Rexroth Ball Rail System in Resist NR II version (corrosion resistant steel)
- Planetary gearbox with various gear ratios
- Servo motor

Applications

- Handling systems
- Feed units in the packaging industry

Attachments (accessories program)

- Clamping fixtures
- Connecting shafts
- Connection technology for Linear Motion Systems



Product description MLR-xxx-NN-2

Characteristic features

Rexroth Linear Modules are precise, ready-to-mount guide systems that combine high performance with compact dimensions. Rexroth offers favorable price/performance ratios and fast delivery.

Linear Modules can be delivered complete with motors, controllers and control units.
For more information, see the “Motors” and “EasyHandling” chapters

Structural design

- Ready-to-install Linear Modules in any length up to L_{max}
- Extremely compact extruded aluminum profile (frame) with integrated Rexroth Cam Roller Guides
- Driven by belt drive for travel speeds up to 10 m/s

Attachments

- Switches (proximity and mechanical)
- Socket and plug
- Aluminum profile cable duct

Attachments (accessories program)

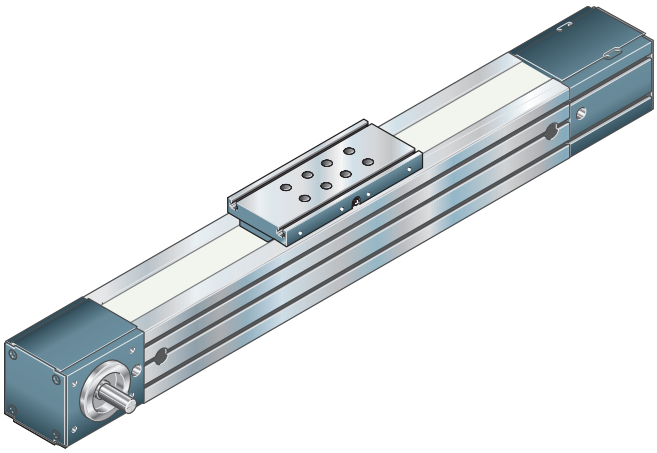
- Clamping fixtures and sliding blocks
- Connecting shafts
- Connection technology for Linear Motion Systems
- Sensors and extension cables

Further highlights

- Carriage with T-slots for fastening of attachments
- The Rexroth Cam Roller Guide features one-point lubrication from both sides; lubrication is only suitable for oil lubrication.
- Planetary gearbox with various gear ratios
- Servo motor

Applications

- Pick and place
- Handling systems
- Placement systems, palletizers
- Machine tool feed units
- Inspection and analysis systems
- Feed units in transfer lines
- Motion units



Product description MKR-145-NN-2

Characteristic features

Rexroth Linear Modules are precise, ready-to-mount guide systems that combine high performance with compact dimensions. Rexroth offers favorable price/performance ratios and fast delivery.

Linear Modules can be delivered complete with motors, controllers and control units.
For more information, see the “Motors” and “EasyHandling” chapters

Structural design

- Anodized aluminum frame of high inherent rigidity
- Two Ball Rail Systems with cover strips for high torque capacity
- Profiled aluminum carriage with four long Ball Runner Blocks
- Driven by belt drive for travel speeds up to 5 m/s

Attachments

- Switches (proximity and mechanical)
- Socket and plug
- Aluminum profile cable duct

Attachments (accessories program)

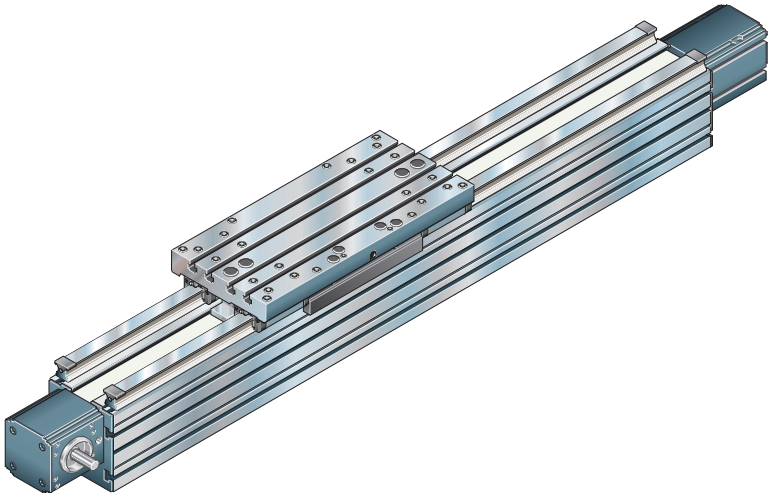
- Clamping fixtures and sliding blocks
- Connecting shafts
- Connection technology for Linear Motion Systems
- Sensors and extension cables

Further highlights:

- Flexible thanks to selectable options
- Ready-to-install with various attachment parts
- The Rexroth Ball Rail System features one-point lubrication from both sides (only suitable for grease lubrication with a manual grease gun)
- Planetary gearbox with various gear ratios
- Servo motor

Applications

- Pick and place
- Handling systems
- Placement systems, palletizers
- Machine tool feed units
- Feed units in transfer lines



Product description – Omega Modules OBB

Characteristic features:

Omega modules (OBB) with Ball Rail System and belt drive for speeds of up to 5.0 m/s.
Omega modules are ready-to-install linear axes for any installation position in freely configurable lengths of up to 5,500 mm.

Linear Modules can be delivered complete with motors, controllers and control units.
For more information, see the “Motors” and “EasyHandling” chapters

Structural design

Due to the structural design, omega modules are particularly suited to applications where the frame extends into the working area.

- Anodized aluminum frame of high inherent rigidity
- Integrated Rexroth Ball Rail System
- Profiled aluminum carriage with Ball Runner Blocks
- Driven by belt drive for travel speeds up to 5 m/s

Attachments

- Switches (proximity and mechanical)
- Socket and plug
- Aluminum profile cable duct

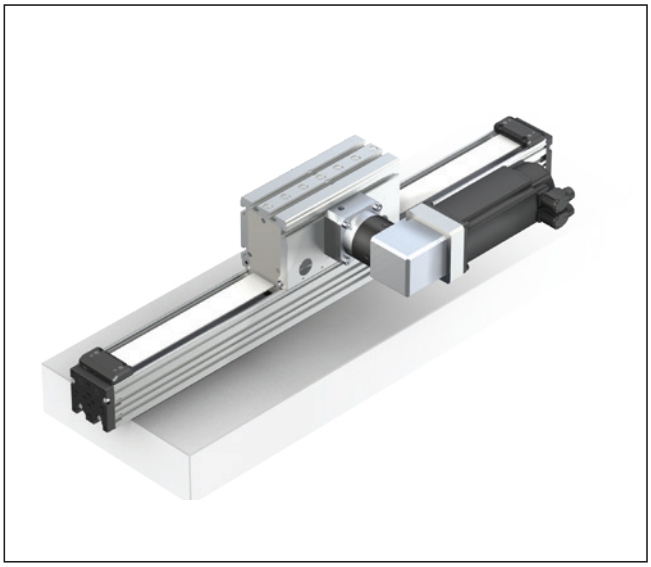
Further highlights:

- The Rexroth Ball Rail System features one-point lubrication from both sides (only suitable for grease lubrication with a manual grease gun)
- With center holes in the carriage and on the end plates
- Driven by a toothed belt for high dynamics and high traversing speeds
- Pneumatic Clamping Unit is optional
- With planetary gearbox (PG) or angular planetary gearbox (WPG) with various gear ratios
- Servo motor

Applications

- Pick and place
- Handling systems

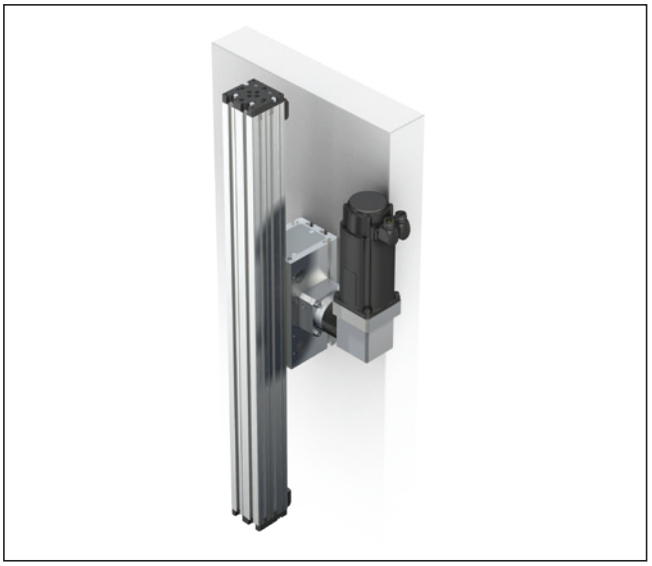
For more information, see the catalog
“Omega Modules OBB” R999001179



OBB as a horizontal axis

Installation case: Carriage travels

(fixed frame)



OBB as a vertical axis

Installation case: Frame moves

(fixed carriage)

Linear Modules delivery form

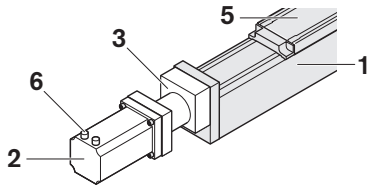
Product generation 3:

Rexroth Linear Modules with Ball Screw Assembly or belt drive are delivered completely assembled.

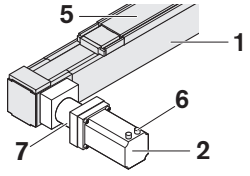
Attachment interface – gear – motor:

If a combination of attachment interface, gear and motor has been selected, the attachment of the components is done as shown in the figure below. When ordering Linear Modules only with attachment interface (without gears and motor!), not all parts can be mounted. The final assembly must be carried out by the customer. All necessary instructions and parameters for professional assembly are included. The installation variant is selected and determined during product configuration and is a part of the order key.

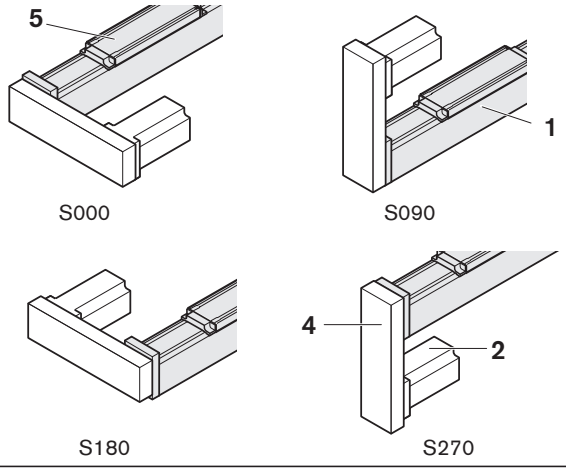
MKK with mount and coupling (F001)



MKR with planetary gearbox (G010, G011)

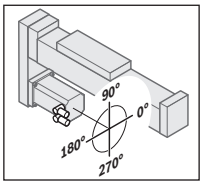


MKK with timing belt side drive (S000 - S270)



Motor connector position

- Linear Module in horizontal installation position (carriage at the top)
- Direction of vision toward the motor from the rear
- Selectable motor connector locations, see chapter “Configuration and ordering”



Example:
Timing belt side drive S270
Motor connector position 180°

Integrated Measuring System

For further information, see the “Integrated Measuring System” chapter

Switching system

Magnetic sensors are included as loose parts. Further switching components can be ordered in the accessories program. The exact position setting must be set before start-up.
See chapter “Switching system”.

Lubrication

Linear Modules of product generation 3 are delivered with the optional initial greasing, preserved or prepared for connection to a one-point lubrication system.
Information about lubricants are found in the chapter “Lubrication”.

Documentation

Each Linear Module will be delivered with the corresponding documentation.

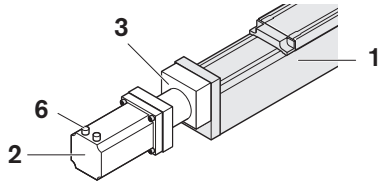
Product generation 2:

Rexroth Linear Modules with Ball Screw Assembly or belt drive are delivered completely assembled.

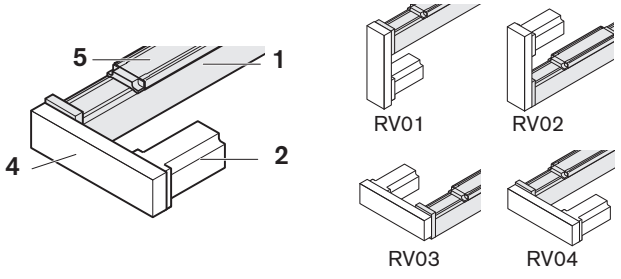
Motor attachment - motor:

If a combination of motor attachment and motor has been selected, the attachment of the components is done as shown in the figure below. When ordering Linear Modules only with motor attachments (without motor!), not all parts can be mounted. The final assembly must be carried out by the customer. All necessary instructions and parameters for professional assembly are included.
The installation variant is selected and determined during product configuration and is a part of the order key.

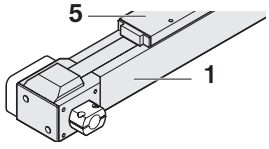
MKK with mount and coupling (MF01)



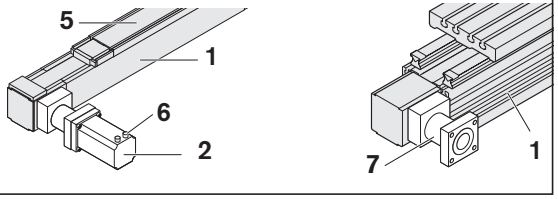
MKK with timing belt side drive (RV01-RV04)



MKR with clamping hub (MA05, MA06)



MKR with planetary gearbox (MG...)



Motor connector position

An individually selectable motor connector position is not configurable for Linear Modules of product generation 2, therefore a standard position is defined upon delivery. Selectable motor connector positions, see chapter “Configuration and ordering”.

Switching system

Cable duct, switch, switching angle and socket with plugs are included as loose parts.

Lubrication

Linear Modules of product generation 2 are delivered with initial greasing.
Information about lubricants are found in the chapter “Lubrication”.

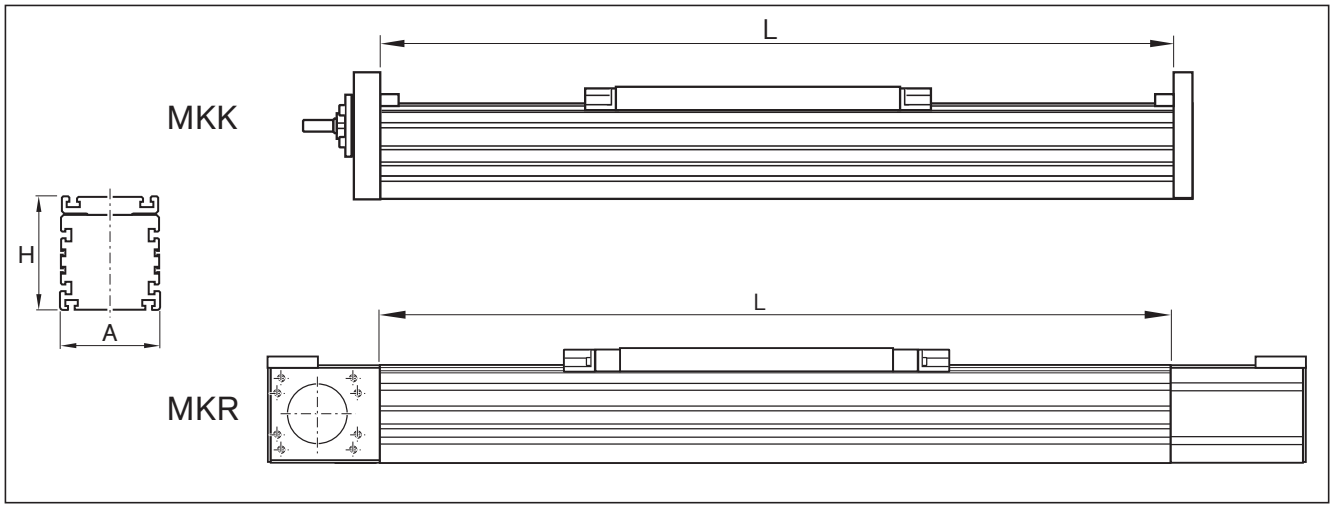
Documentation

Each Linear Module will be delivered with the corresponding documentation.

1 Linear Module
2 Motor
3 Mount and coupling
4 Timing belt side drive
5 Carriage
6 Motor connector
7 Gear reducer

Overview of types with load capacities

Observe the “General technical instructions” chapter below.
For calculation dimensions and values, see the technical data of the respective Linear Module.
For short product names, see the “Additional information” chapter



Type	Size	-040		-065		-080		-110		-140		-145		-165	
	Dimensions (mm)	**A**	**H**	**A**	**H**	**A**	**H**	**A**	**H**	**A**	**H**	**A**	**H**	**A**	**H**
		40	52	65	85	80	100	110	129			145	215	165	195
MKK	L_{max} (mm)	1 000		2 500		2 500 (with SPU2) 3 400)		4 000 (with SPU2) 5 400)		in preparation		-		4 000	
	C[1)] (N)	3 750		16 000		38 000		46 500				-		84 100	
MKR	L_{max} (mm)	2 500		5 900		6 000		9 400				–		12 000	
	C[1)] (N)	3 750		16 000		38 000		46 500				–		84 100	
MKR	L_{max} (mm)	–		–		–		–		–		6 000		–	
	C (N)	–		–		–		–		–		121 185		–	
MLR	L_{max} (mm)	–		–		10 000		10 000		–		–		–	
	C_y (N)	–		–		17 150		31 000		–		–		–	
	C_z (N)					10 050		18 200							

[1)] Maximum admissible values. They vary depending on carriage length.
[2)] SPU = screw support

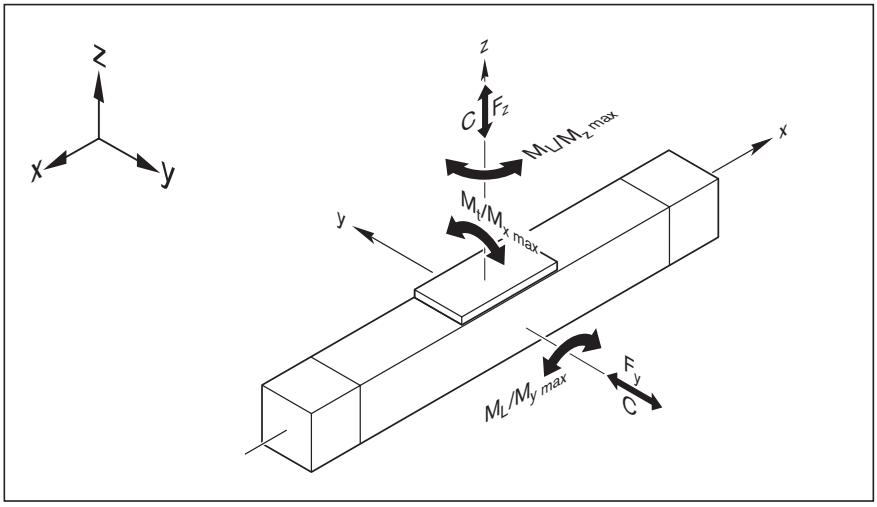
General technical instructions

Note on dynamic load capacities and load moments

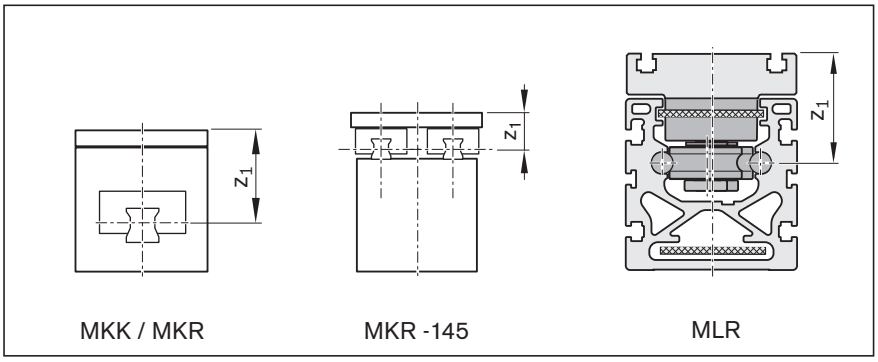
Determination of the dynamic load capacities and load moments is based on a travel life of 100,000 m. Often only 50,000 m are actually stipulated.
For comparison:
Multiply values C, M_t and M_L from the table by 1.26.

Suitable loads

With respect to the desired nominal life, loads for F_{comb}, F_m up to about 20% of the dynamic characteristic values (**C, M_t, M_L**) have proved acceptable.
See the chapter on “Calculation principles”.
Do not exceed the technical data for the Linear Motion System.



Application point of the effective force (Z_1)



Modulus of elasticity E

E = 70 000 N/mm²

General technical instructions

Maximum permissible load

When selecting Linear Motion Systems, it is essential to consider the upper limits for permissible loads and forces. The values are system-related. In other words, the upper limits are determined not only by the load ratings of the bearing points but also include structural design and material-related considerations.

Conditions for combined loads:

$$\frac{|F_y|}{F_{y\,max}} + \frac{|F_z|}{F_{z\,max}} + \frac{|M_x|}{M_{x\,max}} + \frac{|M_y|}{M_{y\,max}} + \frac{|M_z|}{M_{z\,max}} \leq 1$$

Combined equivalent load on bearing of the guideway

MKK / MKR:

$$F_{comb} = |F_y| + |F_z| + C \cdot \frac{|M_x|}{M_t} + C \cdot \frac{|M_y|}{M_L} + C \cdot \frac{|M_z|}{M_L}$$

MLR:

$$F_{comb} = |F_y| + C_y \cdot \frac{|F_z|}{C_z} + C_y \cdot \frac{|M_x|}{M_t} + C_y \cdot \frac{|M_y|}{M_L} + C_y \cdot \frac{|M_z|}{M_L}$$

Service life

Nominal life of the guideway in meters:

MKK / MKR:

$$L = \left(\frac{C}{F_{comb}}\right)^3 \cdot 10^5$$

MLR:

$$L = \left(\frac{C_y}{F_{comb}}\right)^3 \cdot 10^5$$

Nominal life of the guideway in hours:

$$L_h = \frac{L}{3600 \cdot v_m}$$

Screw Drive loading and life (BASA)

When the load and speed vary, the following applies for the average load F_m

$$F_m = \sqrt[3]{\left|F_{eff\,1}\right|^3 \cdot \frac{|n_1|}{n_m} \cdot \frac{q_{t1}}{100\%} + \left|F_{eff\,2}\right|^3 \cdot \frac{|n_2|}{n_m} \cdot \frac{q_{t2}}{100\%} + \ldots + \left|F_{eff\,n}\right|^3 \cdot \frac{|n_n|}{n_m} \cdot \frac{q_{tn}}{100\%}}$$

Service life

Nominal life (BASA) in revolutions:

$$L = \left(\frac{C_{bs}}{F_m}\right)^3 \cdot 10^6$$

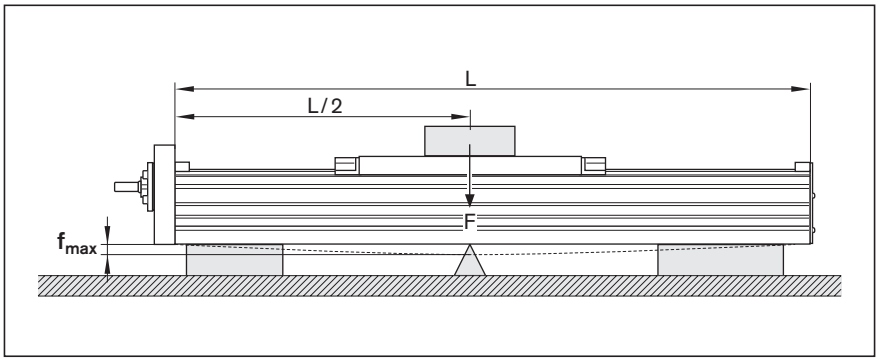
Nominal life (BASA) in hours:

$$L_h = \frac{L}{n_m \cdot 60}$$

Deflection

A particular feature of Linear Modules is that they can be installed as cantilevered axes.
Deflection must, however, be taken into consideration: It limits the possible load. If the maximum permissible deflection is exceeded, additional supports must be provided.

⚠ **Do not mount or support the Linear Module by the end blocks or end enclosures!**



The maximum permissible deflection f_{max} depends on the length L and the load F.

Maximum permissible deflection f_{max}

⚠ **f_{max} must not be exceeded! If high system dynamics are required, supports must be provided every 300 to 600 mm.**
(For f_{max} values, see "Technical data" chapter of the respective Linear Module)

Mass of the Linear Motion System m_s

Weight calculation:
- without motor
- without switch mounting
- without motor attachment

$$m_s = k_{g\,fix} + k_{g\,var} \bullet L + m_{ca}$$

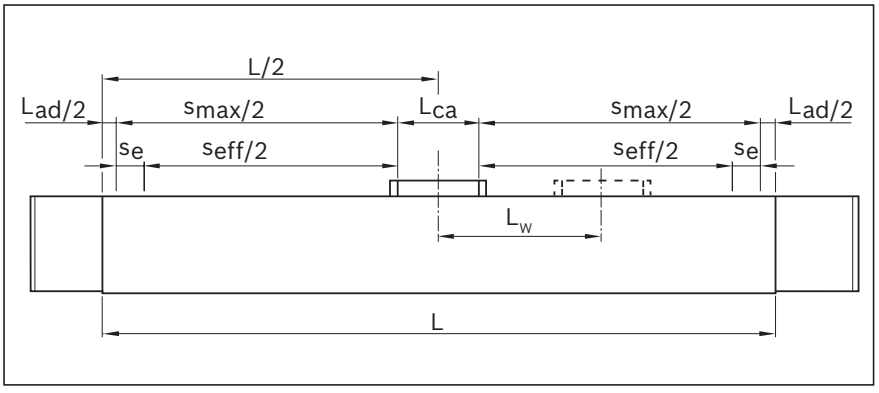
Length calculation of the Linear Motion System

$$L = s_{eff} + 2 \cdot s_e + L_{ca} + L_{ad} + L_w$$

MKK -165

$$L = (s_{eff} + 2 \cdot s_e) \cdot 1.17^* + L_{ca}\ mm + L_{ad}$$

* with protective bellows



For length calculation values see the "Technical data" chapter of the respective Linear Module (MKK/MKR/MLR)

Linear Modules MKK

Product description MKK-xxx-NN-3

Features

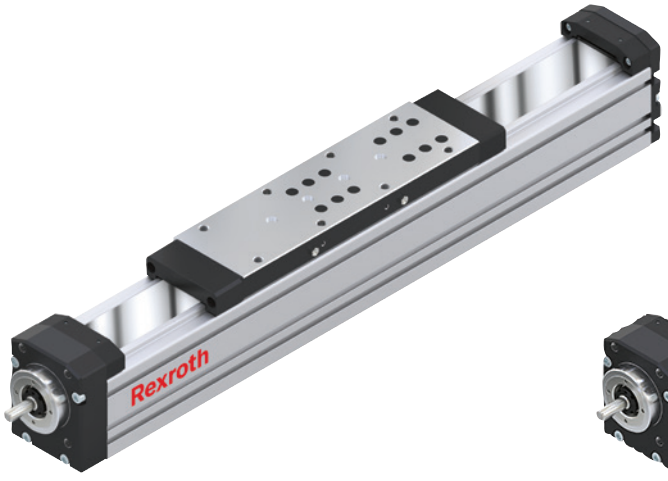
- Ready-to-install Linear Modules in any length up to L_{max}
- Extremely compact extruded aluminum profile (frame) with integrated Rexroth Ball Rail System. Ball Rail System with moderate preload (preload class C1)
- Driven by precision Rexroth Ball Screw Assembly (BASA) in rolled design, optionally in tolerance grade T7 or T5 according to ISO 3408-3 with zero-backlash Cylindrical Single Nut
- High linear speeds thanks to large leads with high precision over long lengths
- Carriage made of aluminum, in two design versions, with T-slots or threaded holes and with centering holes in each case
- Protection of the guideway and drive components by sealing strip (plastic strip for MKK-065, corrosion resistant steel strip for MKK-080 and MKK-110)
- Economical maintenance thanks to one-point lubrication feature (grease or oil lubrication) on either one or both sides of the carriage
- Repeatability of up to +/- 0.005 mm

Further highlights

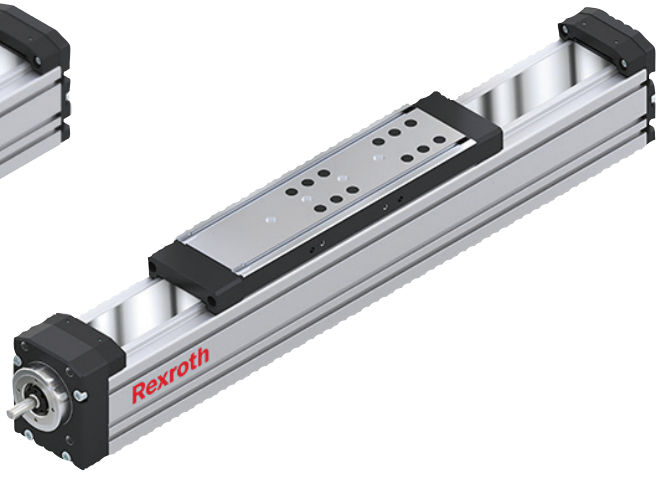
- Available in two material versions, ALST (aluminum/steel version) and ALCR (aluminum/steel hard chrome plated version).
- Center holes also in frame for simple combination with other Linear Motion Systems and connection elements
- Screw support (SPU) to reach high speeds with a large travel range (MKK-080 and MKK-110) optionally available
- Absolute position measuring system IMS-A directly integrated into the guide system (MKK-080 and MKK-110)
- Standard with integrated solenoid switch for magnetic field sensors
- Extensive accessories for connection and clamping elements
- Nameplate with parameters for easy start-up

Attachments

- Motor attachment with mount and coupling or via a timing belt side drive
- Attachment kits for motor according to customer specification
- Servo motor
- Magnetic field sensors for easy assembly directly on the profile frame
- Switch (proximity or mechanical) cable duct, socket plug and extension cable in the accessories program



Carriage with thread



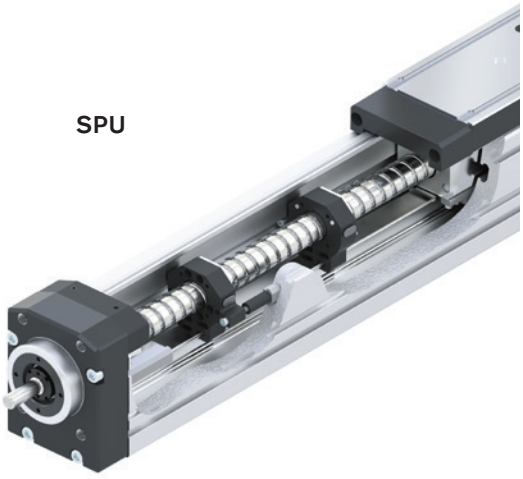
Carriage with T-slots

Product description for screw support (SPU)

For MKK-080-NN-3 and MKK-110-NN-3

The Screw Support (SPU) offers the following advantages:
- Screw support for horizontal applications (in preparation for vertical applications)
- Screw support can be selected as standard option via the option number.
- A maximum of two screw support pairs is possible.
- High speed over long lengths of up to 5400 mm.
- Guidance of the screw supports in the frame.
- Screw supports are maintenance-free.
- Screw supports are protected by optionally selectable sealing strip.

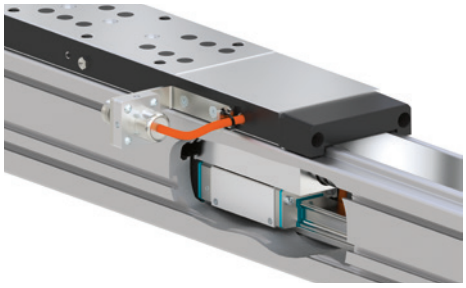
SPU

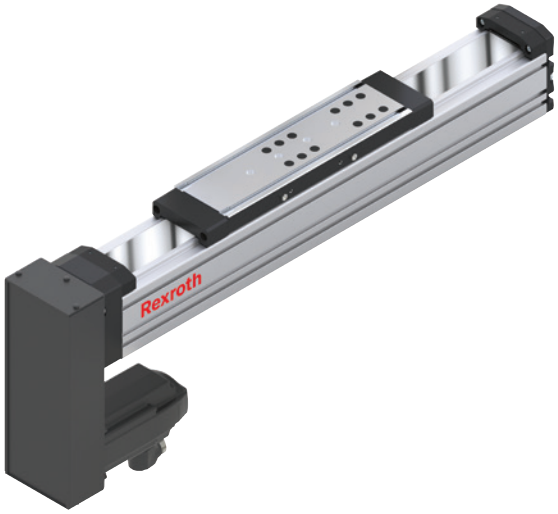


Product description for Integrated Measuring System

The IMS-A measuring system offers the following advantages:

- No additional space required.
- No external mounting surfaces required for the measuring system.
- No measurement inaccuracies due to parallelism offset between the measuring system and the guide system.
- Full integration of the measuring system components into the guide means no complex mounting or tuning work is needed.
- The Runner Block, Scanner and Guide Rail with scale can be replaced individually during servicing.
- Interfaces: HIPERFACE or DRIVE-CLiQ.
- Connecting cable directly on the side of the carriage.
- For further information, see the “Integrated Measuring System” chapter





Motor assembly with timing belt side drive

Motor assembly with mount-coupling

Linear Modules MKK

Product description MKK-xxx-NN-3

Material pairing

ALST:
- Frame, carriage and end blocks made of anodized aluminum (AL)
- Ball Guide Rail, Ball Runner Block and Rexroth Ball Screw Assembly made of rolling bearing steel (ST)
- Angular-contact ball bearing and deep-groove ball bearing of the Screw Drive bearing made of rolling bearing steel

ALCR:
- Frame, carriage and end blocks made of anodized aluminum (AL)
- Ball Guide Rail and Rexroth Ball Screw Assembly made of rolling bearing steel with corrosion resistant coating, matte-silver finish, hard chrome plated (Resist CR).
- Ball Runner Block made of corrosion-resistant steel (Resist NR)
- Angular-contact ball bearing and deep-groove ball bearing of the Screw Drive bearing made of rolling bearing steel

Lubrication variants

LSS: (Initial lubrication done at the factory)

MKK-065, MKK-080, MKK-110:
- Grease lubricant Dynalub 510, lithium-based high-performance grease of the NLGI grade 2 according to DIN 51818 (KP2K-20 according to DIN 51825)
- 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 Rexroth Ball Screw Assembly only with corrosion prevention.
- Basic lubrication required

LCF: (Prepared for connection to one-point lubrication systems with liquid grease)
- For liquid grease, lithium-based high-performance grease of NLGI grade 00 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 one-point lubrication systems with oil)
- Ball Runner Block and Rexroth 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

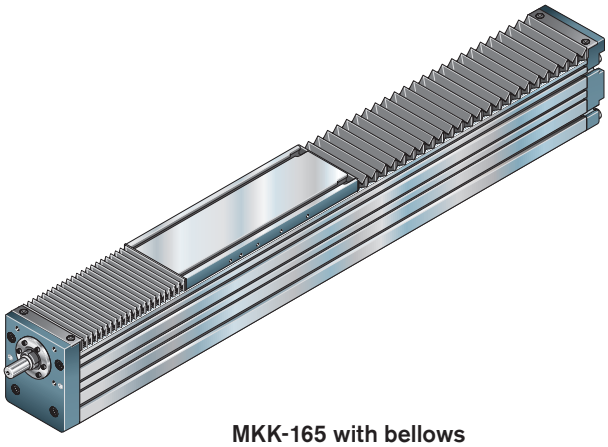
Product description MKK-xxx-NN-2

Characteristic features

MKK...: Linear Modules with Rexroth Ball Rail System and Ball Screw Assembly for high positioning accuracy and repeatability as well as thrust forces.

The Linear Modules MKK... comprise:
- A compact, anodized aluminum frame
- The integrated Rexroth Ball Rail System
- One carriage with T-slots (MKK-165) or threaded holes (for MKK-040) for attachments, and one-point lubrication
- The Rexroth Ball Screw Assembly set to zero-clearance (also available without a drive)
- Mountable switches
- Servo motor
- Mount, coupling or timing belt side drive for motor attachment
- Cover provided by:
  - plastic strip (with MKK-040)
  - bellows on MKK-165

MKK-040 with sealing strip



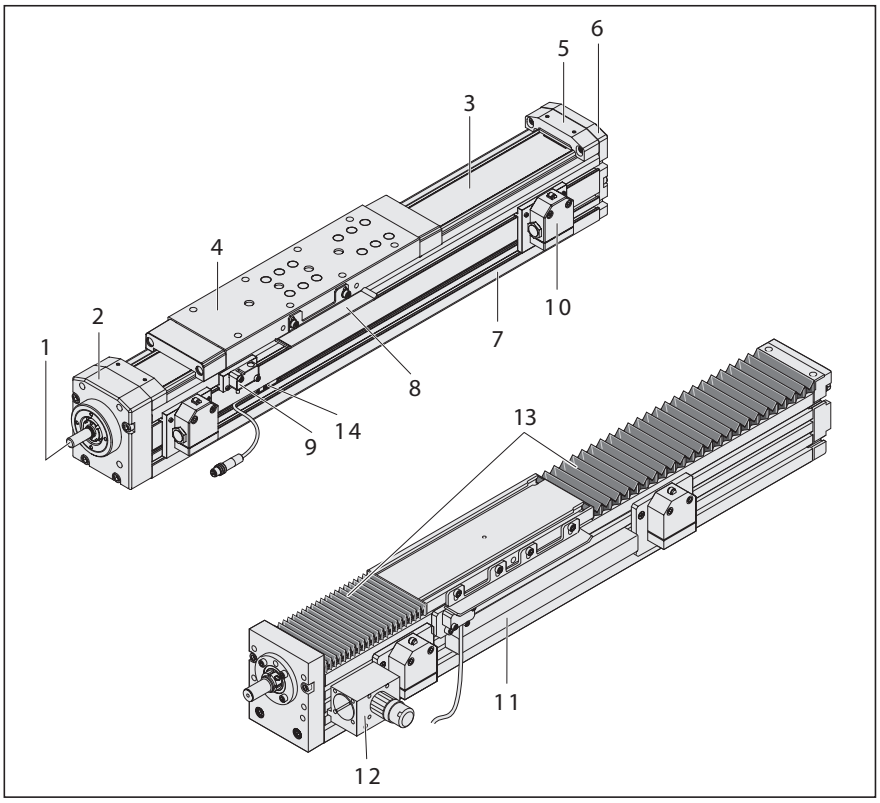
MKK-165 with bellows

Linear Modules MKK

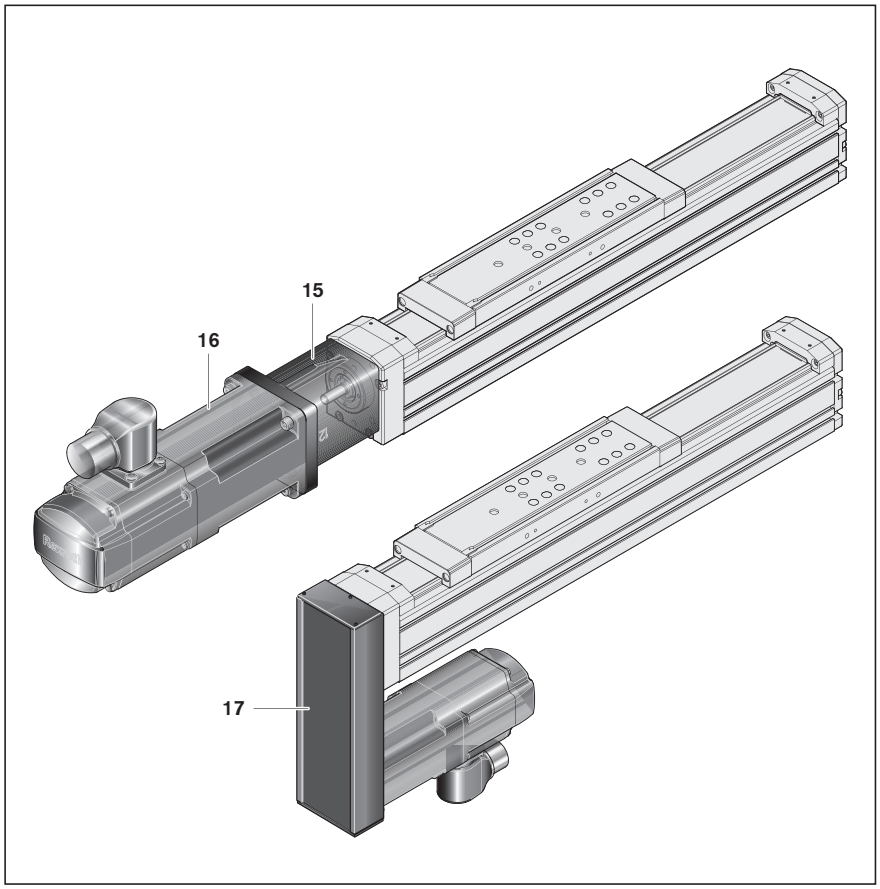
Structural design

1 Rexroth Ball Screw Assembly (BASA) with zero-backlash Cylindrical Single Nut
2 End block fixed bearing
3 Sealing strip on MKK-040/-065/-080/-110
4 Carriage with Runner Blocks
5 Strip fixing
6 End plate floating bearing
7 Frame

Attachments:
8 Switching cam
9 Proximity switch
10 Mechanical switch
11 Cable duct
12 Socket-plug
13 Bellows cover on MKK-165
14 magnetic field sensor on MKK-040



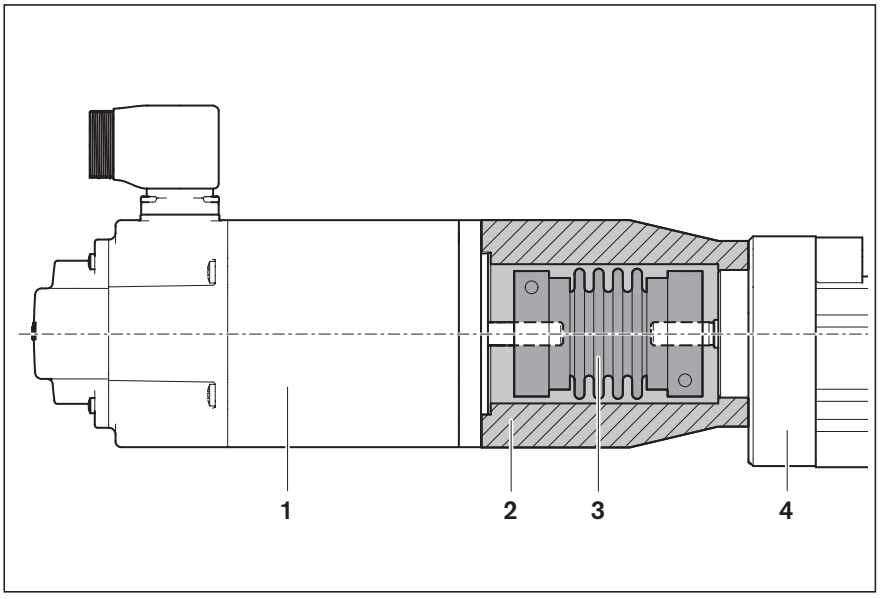
15 Mount
16 Servo motor
17 Timing belt side drive



Motor attachment with mount and coupling

A motor can be attached via a mount and coupling to all Linear Modules equipped with a Rexroth Ball Screw Assembly.
The mount serves to fasten the motor to the Linear Module and acts as a closed housing for the coupling.
The coupling transmits the motor drive torque free of distortive stresses to the Linear Module's drive shaft.
Our standard couplings compensate for the system's thermal expansion.

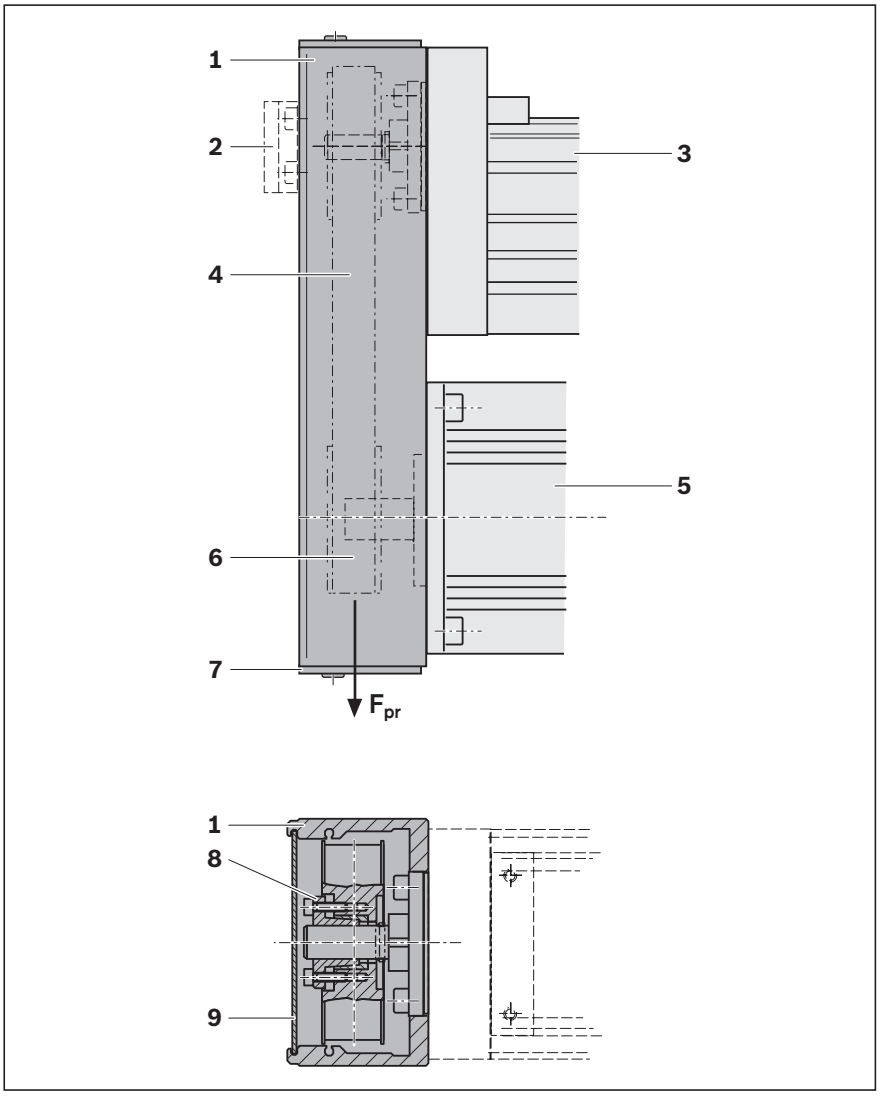
1 Motor
2 Mount
3 Coupling
4 Linear Module



Motor attachment via timing belt side drive

On all Linear Modules with Rexroth Ball Screw Assembly the motor can be attached via a timing belt side drive.
This makes the overall length shorter than when attaching the motor with a mount and coupling.
The space-saving, closed pulley housing serves as protection for the belt and as a motor bracket.
Various gear ratios are also available.
The timing belt side drive can be mounted in four different directions:

1 Pulley housing made of anodized aluminum frame
2 Partially with support bearing for Rexroth Ball Screw Assembly screw journal
3 Linear Module
4 Belt drive with gear ratio: i = 1; i = 1.5; i = 2
5 Servo motor
6 Pre-tensioning the belt: Apply pre-tensioning force F_{pr} to motor (F_{pr} is provided upon delivery).
7 Cover
8 Belt pulleys attached using tensioning units
9 Cover plate



Technical data

General technical data

Observe the chapters on “Calculation” and “General technical instructions”.

MKK	Number of carriages	Carriage		BASA d_0 x P		Dynamic characteristics					Maximum permissible loads			
						Dyn. Load ratings			Dyn. load moments		Max. permissible moments			
		L_{ca} (mm)	L_W [1] (mm)	d_0 (mm)	P (mm)	C (N)	C_{bs} (N)	C_{fb} (N)	M_t (Nm)	M_L [2] (Nm)	$M_{x\,max}$ (Nm)	$M_{y\,max}$ [3] (Nm)	$M_{z\,max}$ [3] (Nm)	
-040-NN-2	1	135	–	without	without	3750	without	4 000	22.3	93.8	11	47	47	
				12	2		2 420							
					5		4 100							
					10		2 700							
-065-NN-3	1	190	–	16	5	16000	13 320	13 400	154	533	62	213	213	
					10		10 350							
					16		10 080							
	2	2 x 190	variable min = 210 max = 750		5	32000	13 320		308	4 x Lw	124	1.6 x Lw	1.6 x Lw	
					10		10 350							
					16		10 080							
-080-NN-3	1	260	–	20	5	38000	15 480	16 900	487	1 843	195	737	737	
					10		15 210							
					20		14 400							
					40		12 600							
	1 (with IMS)	360	–		5		15 480							
					10		15 210							
					20		14 400							
					40		12 600							
	2	260	variable min = 320 max = 960		5	76000	15 480		974	9.5 x Lw	390	3.75 x Lw	3.75 x Lw	
					10		15 210							
					20		14 400							
					40		12 600							
-110-NN-3	1	305	–	32	5	46500	23 310	26 000	666	2 235	264	894	894	
					10		34 200							
					20		21 240							
					32		21 060							
	1 (with IMS)	430	–		5		23 310							
					10		34 200							
					20		21 240							
					32		21 060							
	2	305	variable min = 375 max = 1095		5		23 310		1 332	11.6 x Lw	528	4.6 x Lw	4.6 x Lw	
					10		34 200							
					20		21 240							
					32		21 060							
-165-NN-2	1	400	–	without	without	84100	without	29 000	1 803	5 130	723	2 085	2 085	
				40	5		31 410							
					10		54 000							
					20		40 950							
					40		39 960							

[1] Variable centerline-to-centerline distance defined by customer-built mounting base.
Centerline-to-centerline distance freely selectable between minimum and maximum distance in millimeters steps.

[2] Determine dynamic longitudinal load torque M_L with variable carriage centerline-to-centerline distance according to the selected centerline-to-centerline distance.

[3] Determine maximum permissible longitudinal moments $M_{y\,max}$ and $M_{z\,max}$ at variable carriage centerline-to-centerline distance according to the selected centerline-to-centerline distance.

Max. permissible forces $F_{y\,max}$ / $F_{z1\,max}$ / $F_{z2\,max}$ (N)	Additional length L_{ad} (mm)	Min. travel range s_{min} [4] (mm)	Max. length L_{max} (mm)	Application point of the effective force z_1 (mm)	Moved mass of system m_{ca} (kg)	Constant mass calculation $k_{g\,fix}$ (kg)	Constant mass calculation $k_{g\,var}$ (kg/mm)	Planar moment of inertia I_y (cm^4)	Planar moment of inertia I_z (cm^4)
1 875	25	50	1 000	42	0.35	0.53	0.0021	11.98	11.56
					0.39	0.65	0.0028		
					0.39				
					0.39				
6 400	34	60	2 500	67	1.57	3.00	0.0075	80.3	90.3
					1.75				
					1.82				
12 800					2.97	4.60			
					3.15				
					3.22				
15 200	109	60	2 500	74	2.91	3.60	0.0117	183	213
					2.86				
					3.14				
					3.20				
	122 [5]				3.31	4.00			
					3.26				
					3.54				
			3 400 [7]		3.60				
30 400	168 [6]				5.61	5.80			
					5.56				
					5.84				
					5.90				
18 600	119	60	4 000	94	4.75	7.00	0.021	508	676
					5.01				
					5.06				
					5.37				
	132 [5]				6.25	8.50			
					6.51				
					6.56				
			5 400 [7]		6.87				
37 200	178 [6]				9.15	11.00			
					9.41				
					9.46				
					9.77				
34 100	50	80	12 000	123	16.50	18.50	0.037	2468	3527
			4 000		17.30	23.50	0.045		
					17.60				
					17.60				
					18.40				

[4] Minimum required travel to ensure a reliable lubrication distribution. For operating conditions, see the “Additional information” chapter. If values are not met, please contact Bosch Rexroth.
[5] Additional length L_{ad} for version with screw support (SPU) 1 pair
[6] Additional length L_{ad} for version with screw support (SPU) 2 pair
[7] Maximum permitted length L_{max} for version with screw support (SPU)

For short product names, see the “Additional information” chapter

Technical data

Drive data

Observe the chapters on “Calculation” and “General technical instructions”.

MKK	BASA		Constant mass moment of inertia			Frictional torque[1]	Max. acceleration	Max. drive torque M_P	Max. speed
	d_0 x P (mm)	Number of carriages	$k_{J\,fix}$ (kgmm²)	$k_{J\,var}$ (kgmm)	$k_{J\,m}$ (mm²)	M_{Rs} (Nm)	a_{max} (m/s²)	(Nm)	v_{max} (m/s)
-040-NN-2	12 x 2	1	1.274	0.013	0.101	0.09	48.4	See graphs	See graphs
	12 x 5	1	1.468	0.011	0.633	0.10	50.0		
	12 x 10	1	2.201	0.011	2.533	0.11	50.0		
-065-NN-3	16 x 5	1	4.315	0.031	0.633	0.40	50.0		
		2	5.202			0.40			
	16 x 10	1	7.754	0.031	2.533	0.40			
		2	11.300			0.50			
	16 x 16	1	15.112	0.034	6.480	0.40			
		2	24.191			0.50			
-080-NN-3	20 x 5	1	11.226	0.084	0.633	0.40	39.8		
		2	12.936			0.50			
		1 (with IMS)	11.479			0.40			
	20 x 10	1	16.628	0.084	2.533	0.50	50.0		
		2	23.467			0.55			
		1 (with IMS)	17.651			0.50			
	20 x 20	1	41.223	0.081	10.140	0.50			
		2	68.580			0.60			
		1 (with IMS)	45.276			0.50			
	20 x 40	1	139.057	0.086	40.530	0.70	27.0		
		2	248.480			0.80			
		1 (with IMS)	155.268			0.70			
-110-NN-3	32 x 5	1	49.600	0.605	0.633	1.10	17.9		
		2	52.386			1.20			
		1 (with IMS)	50.550			1.10			
	32 x 10	1	59.037	0.640	2.533	1.10	30.7		
		2	70.183			1.20			
		1 (with IMS)	62.837			1.10			
	32 x 20	1	97.623	0.639	10.140	1.00	50.0		
		2	142.204			1.10			
		1 (with IMS)	112.821			1.00			
	32 x 32	1	185.796	0.617	25.940	1.00			
		2	299.925			1.10	50.0		
		1 (with IMS)	224.703			1.00			
-165-NN-2	40 x 5	1	217.000	1.564	0.633	2.00	12.2		
	40 x 10	1	248.000	1.355	2.533	2.40	16.8		
	40 x 20	1	381.000	1.352	10.140	2.20	33.0		
	40 x 40	1	947.000	1.342	40.530	2.60	50.0		

[1] at 200 rpm

Values also valid for the carriage version with variable centerline-to-centerline distance LW

Drive data for motor attachment via timing belt side drive

MKK	Motor	BASA d_0 x P (mm)	Length up to L[1] (mm)	Permissible torque exceeded M_{sd}[2] (Nm)		Reduced mass moment of inertia J_{sd} (10^{-6} kgm²)		Frictional torque M_{Rsd} (Nm)	Weight m_{sd} (kg)		Belt type B_t	
				i = 1[3]	i =1.5[3]	i = 1[3]	i = 1.5[3]		i = 1[3]	i = 1.5[3]	i = 1[3]	i = 1.5 [3]
-040-NN-2	MSM019B	12 x 2	1 000	0.79	0.53	10.7	4.1	0.10	0.28	0.26	6 AT3	6 AT3
		12 x 5		1.31	0.87							
		12 x 10		1.31	0.87							
	MSK030C MSM031B	12 x 5		0.80	0.50	34.8	13.0	0.15	0.63	0.60	10 AT3	10 AT3
		12 x 5		1.60	1.10							
		12 x 10		1.60	1.10							
-065-NN-3	MSM041B MS2N04	16 x 5	1 100	4.31	2.87	234.4	83.6	0.40	1.45	1.32	16 AT5	16 AT5
		16 x 10	1 300	5.85	3.90							
		16 x 16	1 550	6.42	4.28							

				i = 1	i = 1.5	i = 1	i = 1.5		i = 1	i = 1.5	i = 1	i = 1.5
-080-NN-3	MSM041B MS2N04	20 x 5	1 600	5.90	3.90	250.0	85.0	0.40	1.24	1.27	16 AT5	16 AT5
		20 x 10	2 000	7.60	5.00							
		20 x 20	2 500	8.30	5.50							
		20 x 40	2 500	8.50	5.70							

				i =1	i =2	i = 1	i =2		i = 1	i =2	i = 1	i =2
-080-NN-3	MS2N05	20 x 5	1 600	5.90	2.95	1 420.0	230.0	0.45	3.20	2.90	25 AT5	25 AT5
		20 x 10	2 000	7.70	3.85							
		20 x 20	2 500	8.50	4.25							
		20 x 40	2 500	8.70	4.35							

				i =1	i =2	i = 1	i =2		i = 1	i =2	i = 1	i =2
-110-NN-3	MS2N06	32 x 5	2 500	20.60	10.30	1 400.0	260.0	0.50	3.20	2.90	25 AT5	32 AT5
		32 x 10	3 200	22.80	14.60							
		32 x 20	4 000	22.80	14.60							
		32 x 32	4 000	22.80	14.60							
-165-NN-2	MSK076C	40 x 5	2500	26.00	13.00	7780.0	1260.0	0.60	8.40	7.20	50 AT10	50 AT10
		40 x 10	2250	52.00	26.00							
		40 x 20	2225	99.30	49.60							
		40 x 40	3000	99.30	49.60							

[1] For greater lengths, the permissible drive torque is determined from the length-variable value M_p of the Linear Motion System in accordance with the diagram! See chapter “Calculation principles”

[2] Values for M_{sd} do not factor in motor torque.

[3] With support bearing

Drive data for motor attachment via mount and coupling

MKK	Motor	Coupling M_{cN} (Nm)	J_c (10^{-6} kgm)	m_c (kg)	Mount and coupling m_{fc} (kg)
-040-NN-2	MSK030C	3.7	7.0	0.075	0.26
	MSM019B	1.9	2.1	0.039	0.13
	MSM031B	3.7	7.0	0.075	0.29
-065-NN-3	MS2N04	19.0	57.0	0.260	0.75
	MSM041B	9.0	61.0	0.260	0.85
-080-NN-3	MS2N04	19.0	57.0	0.260	1.00
	MS2N05	50.0	210.0	0.700	1.90
	MSM041B	14.5	63.0	0.260	0.90
-110-NN-3	MS2N06	50.0	210.0	0.700	1.80
-165-NN-2	MSK076C	98.0	390.0	0.900	2.80

Linear Modules MKK

Technical data

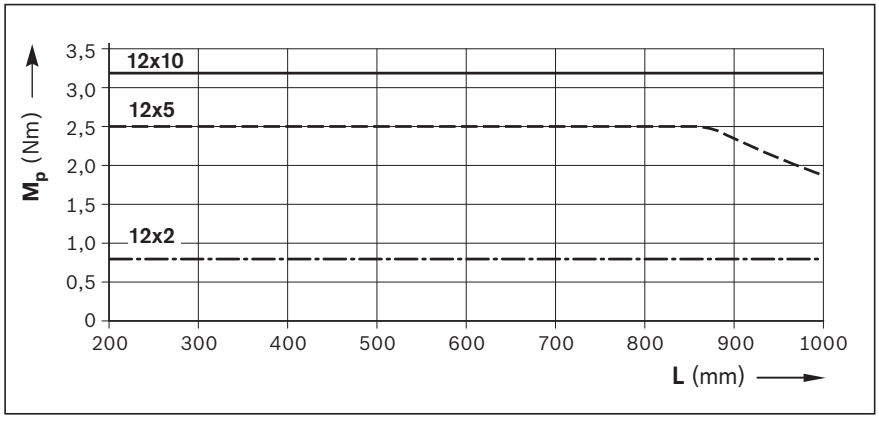
Permissible drive torque

The values for M_p apply under the following conditions:
– Screw journal without keyway
– No radial load on screw journal

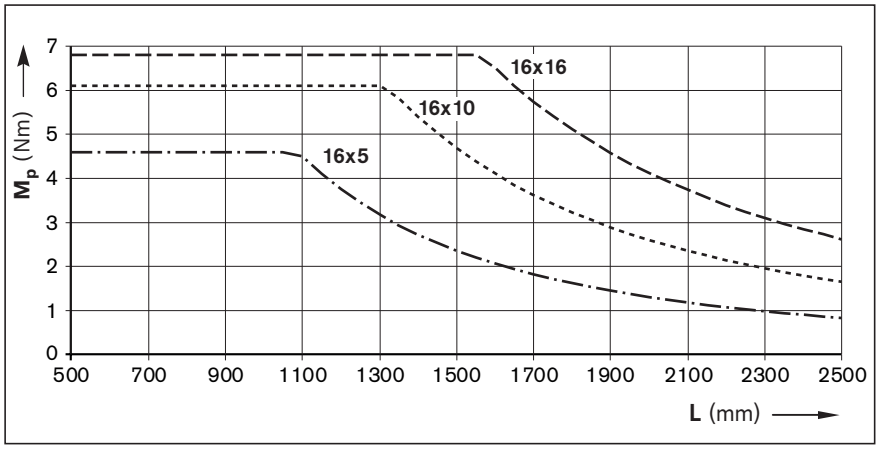
⚠ **Screw journal pin with keyway**
For reasons of stress concentration and a reduction of the effective diameter, do not exceed the following maximum values for drive torque!

⚠ **For ball Rexroth Ball Screw Assembly drive with keyway, the smallest value from the diagram and table is valid.**
Example:
MKK-065, BASA 16 x 10, length 1100 mm, i = 1.
Drive torque M_p from chart: ≈ 6.1 Nm
Maximum permissible drive torque as per table: 4.5 Nm
Drive torque for dimensioning: 4.5 Nm

MKK	M_p (Nm)
MKK-065	4.5
MKK-080	4.5
MKK-110	18.0
MKK-165	74.0



MKK-040-NN-2



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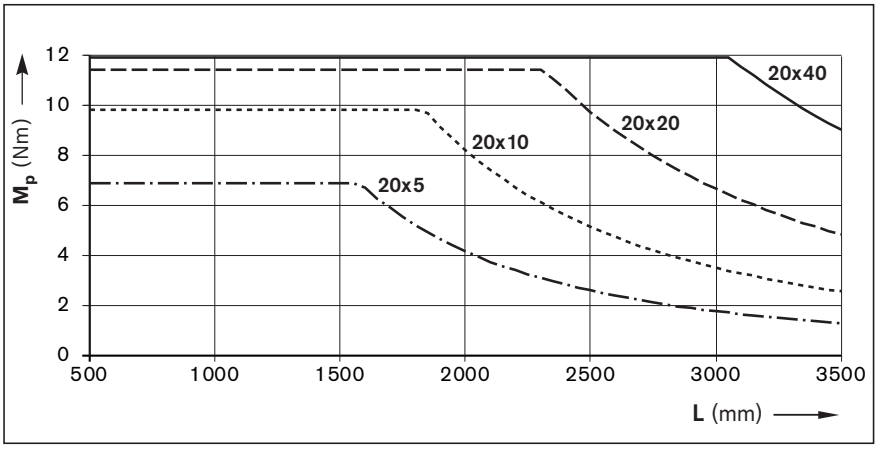
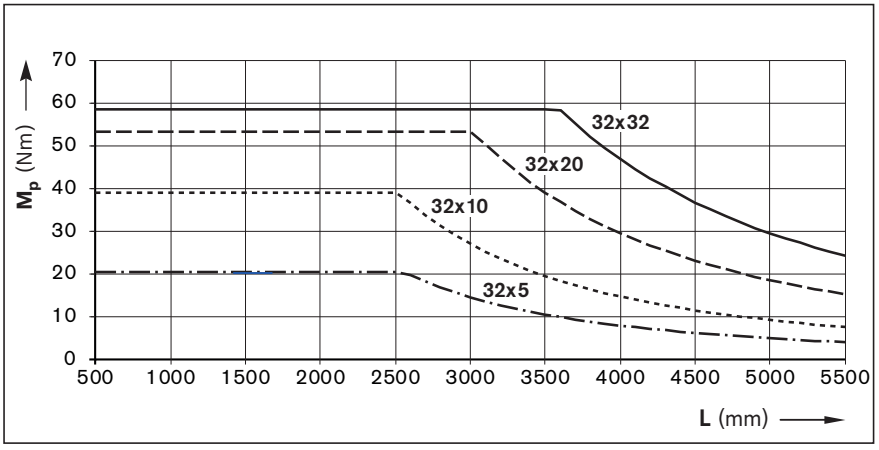


MKK-080-NN-3



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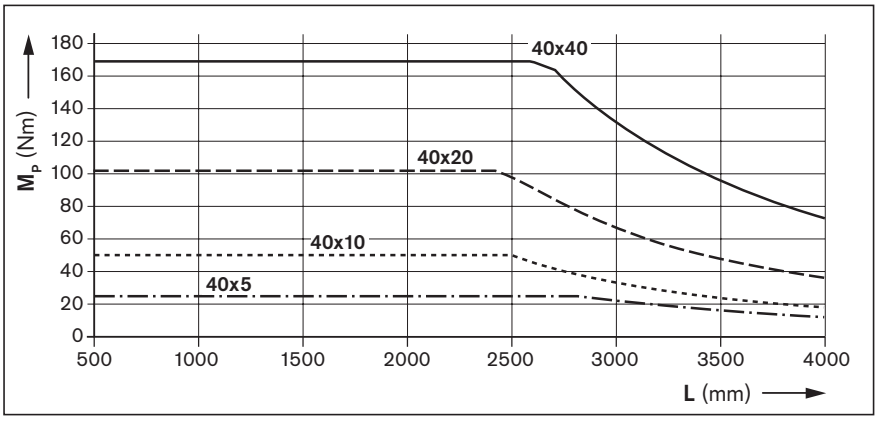
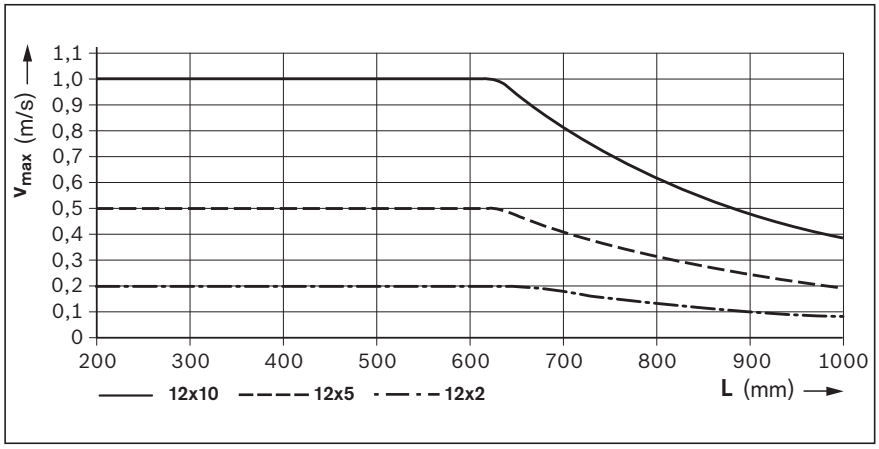


MKK-165-NN-2

Linear Modules MKK

Technical data

Permissible speed v_{max}



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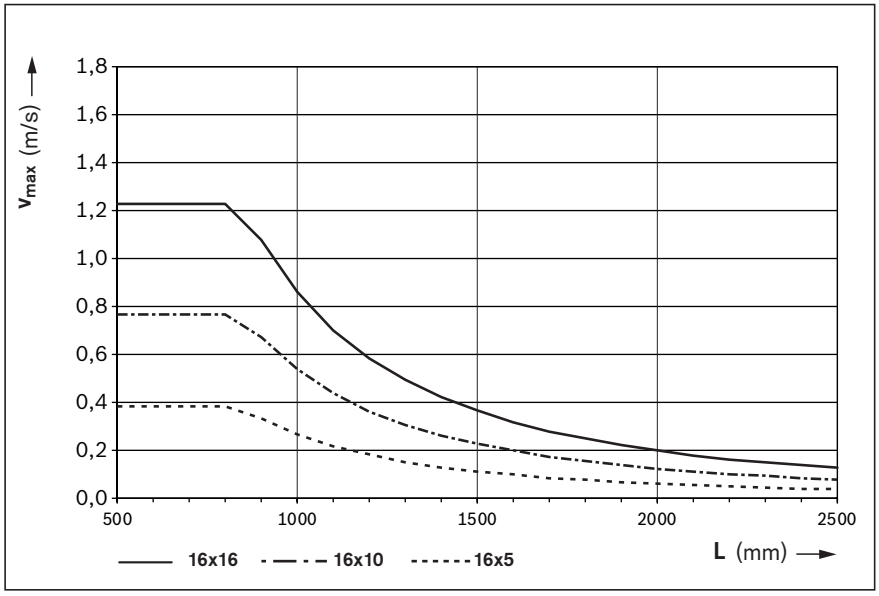

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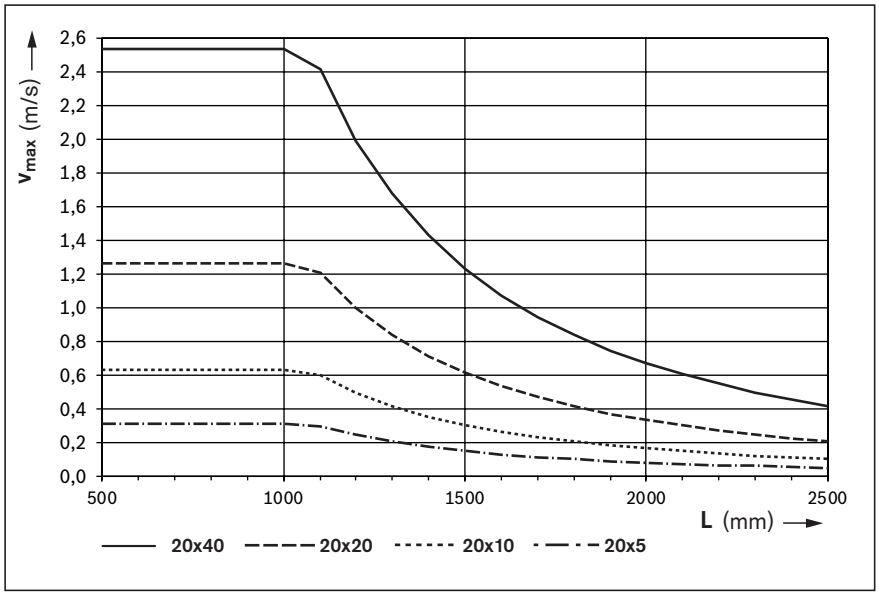

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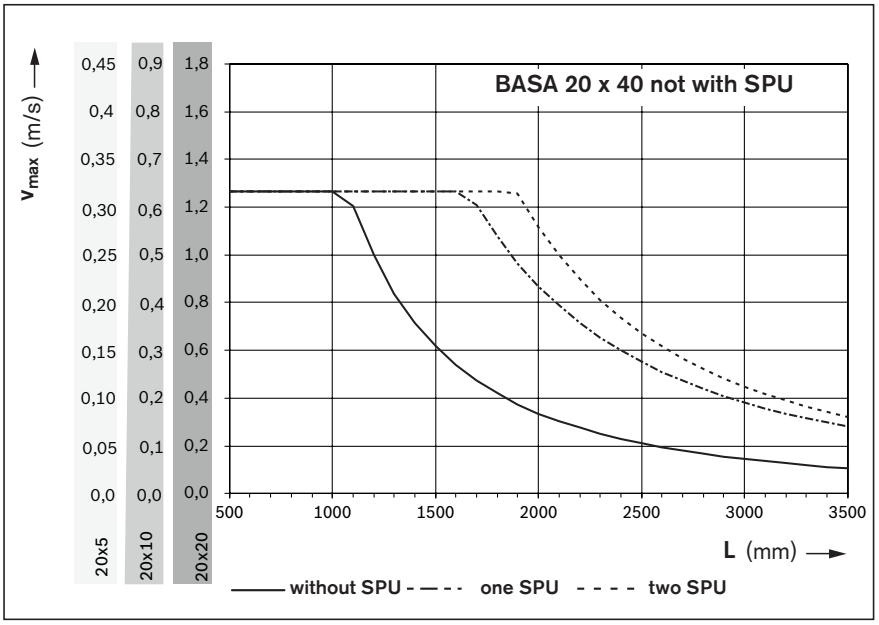

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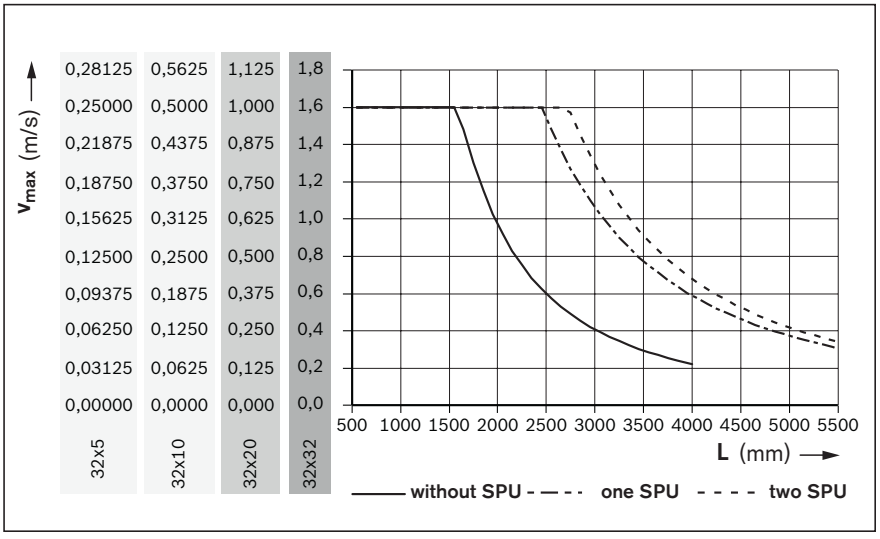

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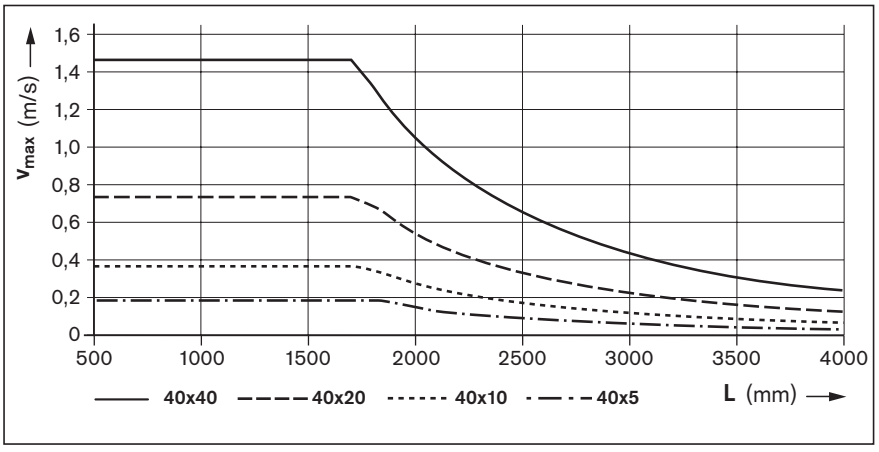


MKK-165-NN-2

Linear Modules MKK

Technical data

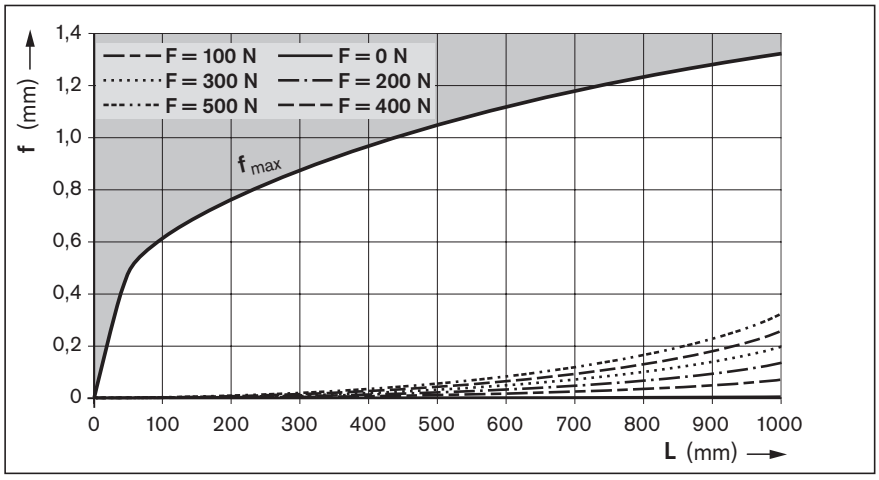
Deflection

Observe the “General technical instructions” chapter

Example

Linear Module MKK-080: L = 3000 mm, F = 1500 N
From chart MKK-080: f = 1.8 mm f_{max} = 3.5 mm
The deflection f lies well below the maximum permissible deflection f_{max}, so no additional supports are required.

The graphs apply under the following conditions:
- both ends firmly fixed (200 to 250 mm per end)
- 6 to 8 screws per side
- Solid mounting base
- Note L_{max}; see general technical data



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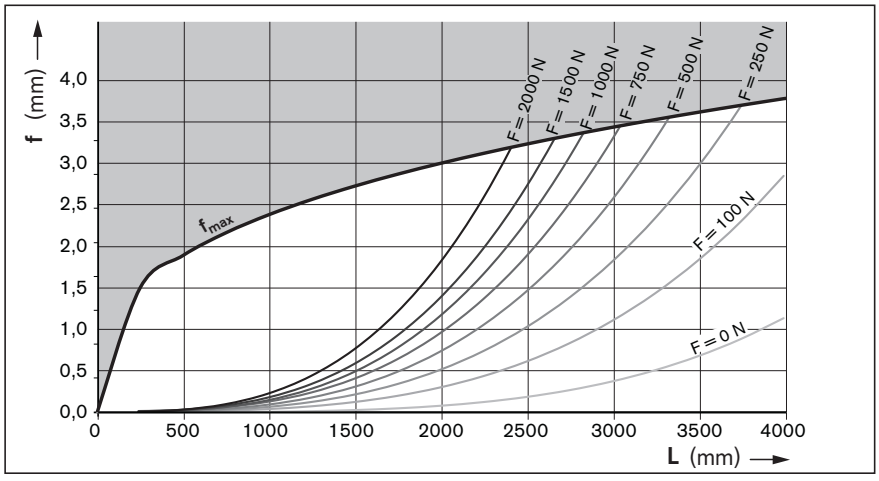

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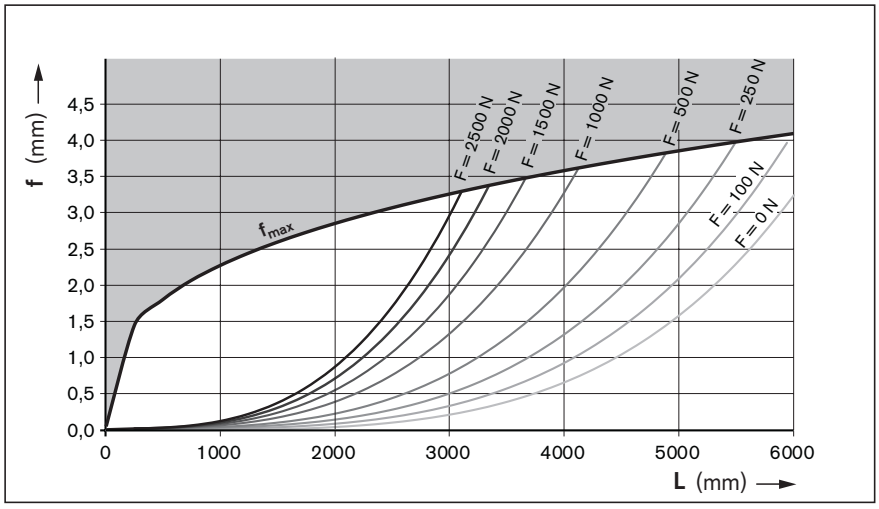
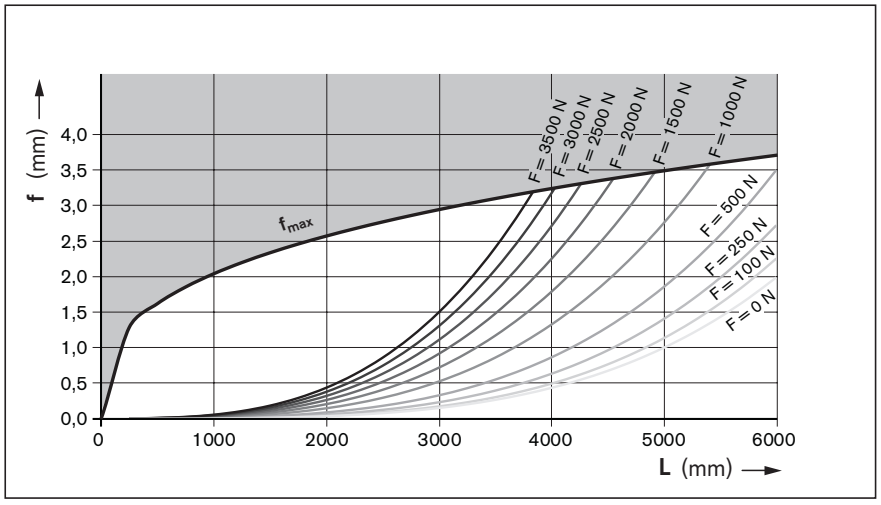


MKK-080-NN-3

MKK-110-NN-3



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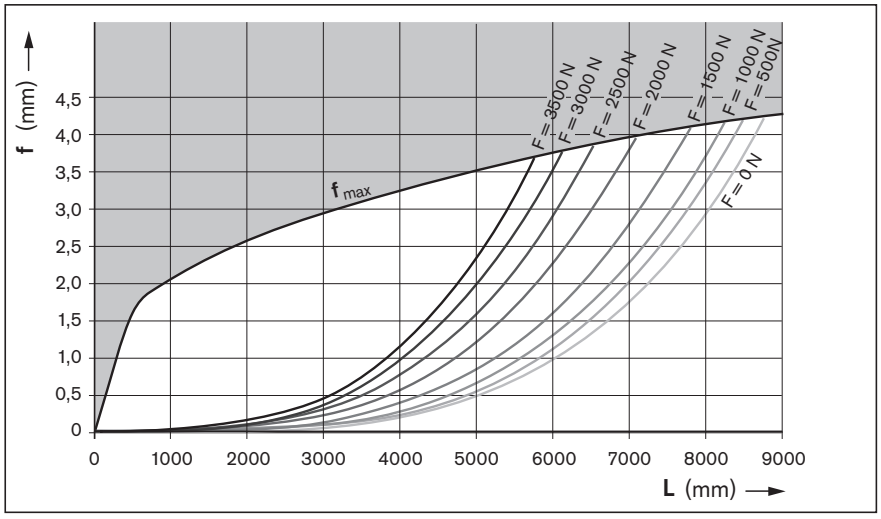
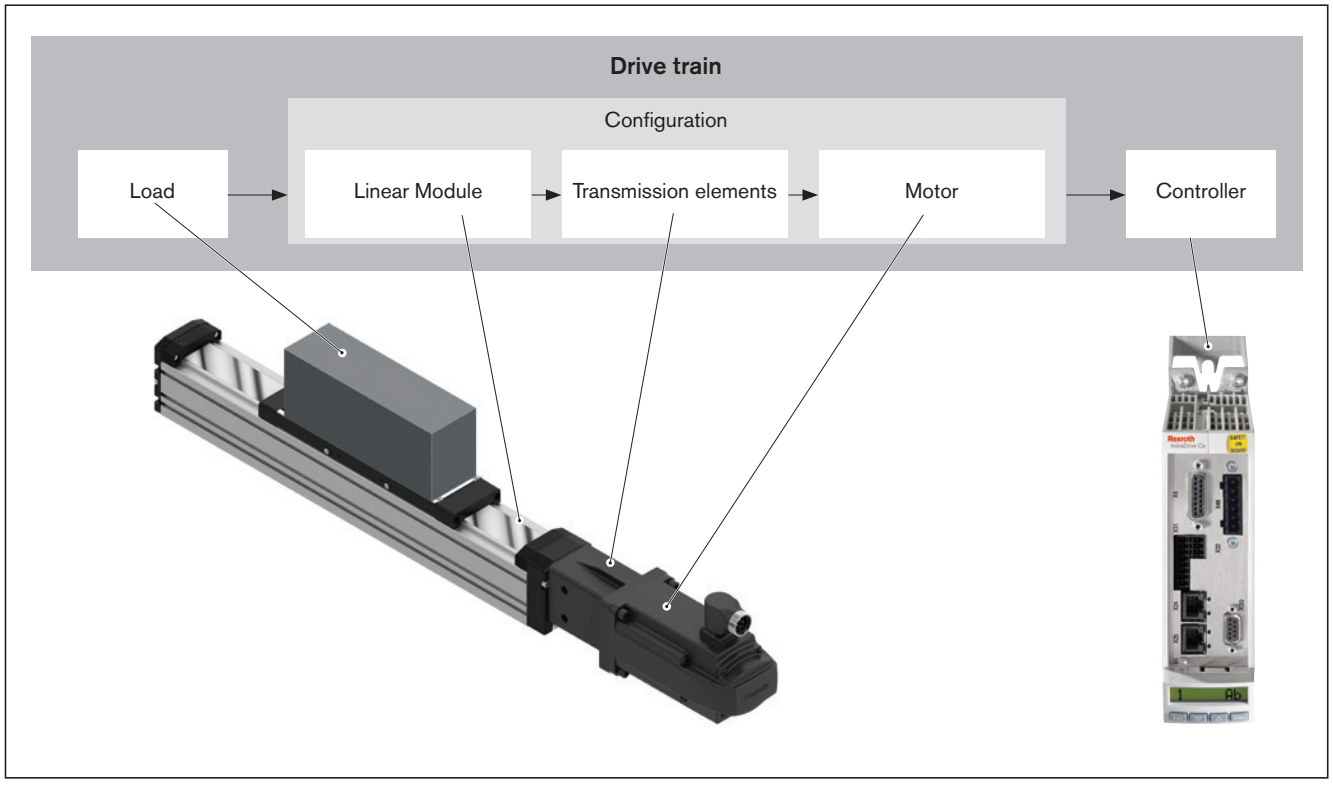


Linear Modules MKK

Calculation

Calculation principles

For short product names, see the “Additional information” chapter



The correct dimensioning and assessment of an application requires structured consideration of the drive train as a whole. The basic element of the drive train is the configuration – made up of the Linear Motion System, the transmission element (coupling or timing belt side drive) and the motor – which can be ordered in that constellation in the catalog.

Maximum permissible loads

When selecting Linear Motion Systems, it is essential to consider the upper limits for permissible loads and forces, as specified in the section on “Technical data”. The values given there are system-related. In other words, the upper limits are determined not only by the load ratings of the bearing points but also include structural design and material-related considerations.

Conditions for combined loads

$$\frac{|F_y|}{F_{y\,max}} + \frac{|F_z|}{F_{z\,max}} + \frac{|M_x|}{M_{x\,max}} + \frac{|M_y|}{M_{y\,max}} + \frac{|M_z|}{M_{z\,max}} \leq 1$$

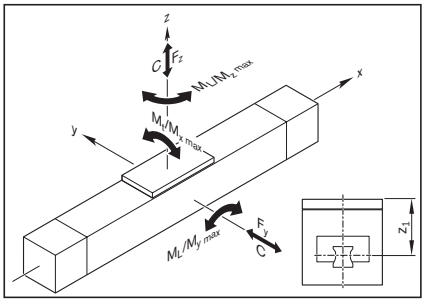
Service life of the linear guide

The service life of the rolling bearing points contained in a Linear Motion System can be calculated using the formulas given below. In a Linear Motion System with Rexroth Ball Screw Assembly, the rolling bearing points that are relevant for the service life are the linear guide, the Ball Screw Assembly (nut), and the fixed bearing.

⚠ **The projected service life of the Linear Motion System is determined by the lowest of the separately calculated service life values for the linear guide, the Ball Screw Assembly and the fixed bearing.**
The linear guide of a Linear Motion System must bear the load and any processing forces.

Combined equivalent load on bearing of the guideway

$$F_{comb} = F_y + F_z + C \cdot \frac{|M_x|}{M_t} + C \cdot \frac{|M_y|}{M_L} + C \cdot \frac{|M_z|}{M_L}$$



Nominal life
Nominal life in meters

$$L = \left(\frac{C}{F_{comb}}\right)^3 \cdot 10^5$$

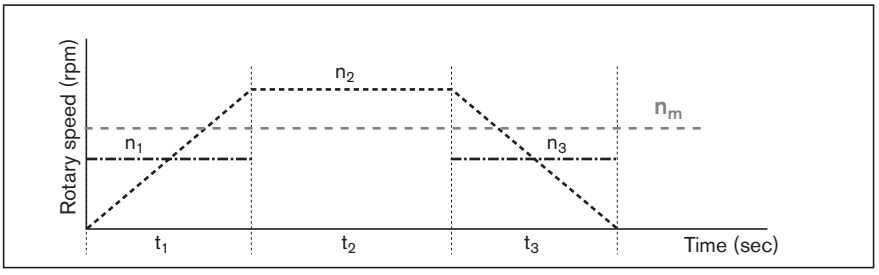
Nominal life in hours

$$L_h = \frac{L}{3\,600 \cdot v}$$

Service life of the Rexroth Ball Screw Assembly or the fixed bearing

If operating conditions vary (rotary speed and load), service life must be calculated using the averages $\mathbf{F_m}$ and $\mathbf{n_m}$.

If rotary speed varies, average rotary speed $\mathbf{n_m}$ is calculated as follows:



$$n_m = \frac{|n_1| \cdot t_1 + |n_2| \cdot t_2 + \ldots + |n_n| \cdot t_n}{t_{ges}}$$

$$t_{ges} = t_1 + t_2 + \ldots + t_n$$

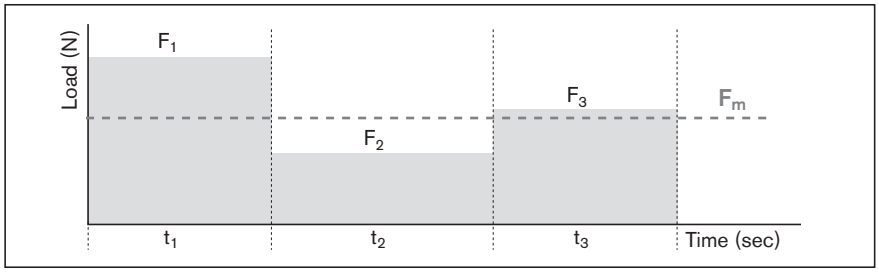
Rotary speed in acceleration and braking phases $\mathbf{n_{1\ldots n}}$:

$$n_{1\ldots n} = \frac{n_{A1\ldots n} + n_{E1\ldots n}}{2}$$

Linear Modules MKK

Calculation

When both the load and the speed vary, the average load $\mathbf{F_m}$ is calculated as follows:



$$F_m = \sqrt[3]{\left|F_1\right|^3 \cdot \frac{|n_1|}{n_m} \cdot \frac{t_1}{t_{ges}} + \left|F_2\right|^3 \cdot \frac{|n_2|}{n_m} \cdot \frac{t_2}{t_{ges}} + ... + \left|F_n\right|^3 \cdot \frac{|n_n|}{n_m} \cdot \frac{t_n}{t_{ges}}}$$

Nominal life
Nominal life in revolutions:

$$L = \left(\frac{C}{F_m}\right)^3 \cdot 10^6$$

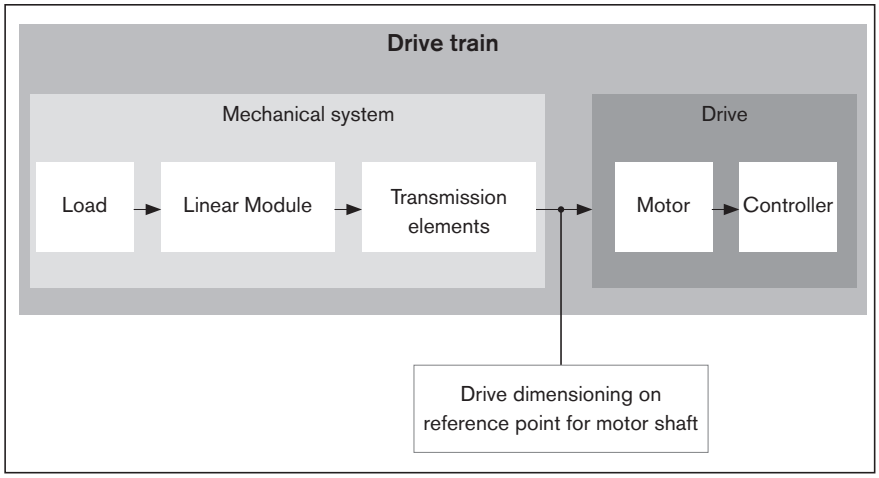
Nominal life in hours:

$$L_h = \frac{L}{n_m \cdot 60}$$

Drive dimensioning

Basic principles

For drive dimensioning, the drive train can be subdivided into the mechanical system and the drive itself.
The **mechanical** system includes the physical components – Linear Motion System and the transmission elements (timing belt side drive, coupling) – and the load to be carried.
The electric **drive** is a motor/controller combination with corresponding performance data.
The dimensioning of the electric drive is done taking the motor shaft as a reference point.
For drive dimensioning, limit values must be taken into account as well as basic values. The limit (i.e. maximum) values must not be exceeded, in order to avoid damaging the mechanical components.



Drive dimensioning

Technical data and formula symbols for the mechanical system
For each component (Linear Motion System, coupling, timing belt side drive), the relevant maximum permissible values must be identified for the drive torque and travel speed, as well as the basic values for frictional torque and mass moment of inertia.
The following technical data with the associated formula symbols are used when considering the basic **mechanical system** requirements in the design calculations for dimensioning the drive. The data in the table below can be found in the "Technical data" section or they are determined using the formulas described on the following pages.

		Mechanical system			
		Load	Linear Motion System	Transmission elements	
				Coupling	Timing belt side drive
Weight moment	(Nm)	M_g [6]	–	–	–
Frictional torque	(Nm)	–[5]	M_{Rs} [3]	–	M_{Rsd} [3]
Mass moment of inertia	(kgm^2)	J_t [1]	J_s [2]	J_c [3]	J_{sd} [3]
Max. permissible linear speed	(m/s)	–	v_{max} [4]	–	–
Max. permissible drive torque	(Nm)	–	M_p [4]	M_{cN} [3]	M_{sd} [3]

[1] Determine the value using the appropriate formula
[2] Length-dependent value, determined using the appropriate formula
[3] Use the value from the table
[4] Length-dependent value, to be read off the graph
[5] Any additional process forces are to be taken into consideration as load moments
[6] For vertical mounting position: Determine the value using the appropriate formula

Drive dimensioning on reference point for motor shaft

When dimensioning the drive, all relevant design calculation values for the mechanical components in the drive train have to be determined and be expressed, or reduced to the motor shaft. For a combination of mechanical components within the drive train, this will result in one value for each of the following:
- Frictional torque M_R
- Mass moment of inertia J_{ex}
- Maximum permissible speed v_{mech} (maximum permissible rotary speed n_{mech})
- Max. permissible drive torque M_{mech}

Determination of the values for each mechanical component in the drive train based on the motor shaft as a reference point

Frictional torque M_R

For motor attachment via mount and coupling

$$M_R = M_{Rs}$$

For motor attachment via timing belt side drive

$$M_R = M_{Rsd} + \frac{M_{Rs}}{i}$$

Mass moment of inertia J_{ex}

For motor attachment via mount and coupling

$$J_{ex} = J_s + J_t + J_c$$

For motor attachment via timing belt side drive

$$J_{ex} = J_{sd} + \frac{(J_s + J_t)}{i^2}$$

Mass moment of inertia for Linear Motion System components

$$J_s = (k_{J\,fix} + k_{J\,var} \cdot L) \cdot 10^{-6}$$

Determination of translatory mass moment of inertia of the external load

$$J_t = m_{ex} \cdot k_{J\,m} \cdot 10^{-6}$$

Linear Modules MKK

Drive dimensioning

Maximum permissible speed v_{mech}
The lowest of all the values for the maximum permissible speed of all mechanical components contained in the drive train determines the maximum permissible speed of the mechanical system which has to be taken into consideration as the upper limit for the drive when dimensioning the motor. Because it is a system in itself, a Linear Motion System with Rexroth Ball Screw Assembly will always have a maximum permissible or rotary speed that is lower than the maximum values for the other components in the mechanical system, such as coupling or timing belt side drive, and therefore determines the max. permissible speed of the overall mechanical system.

Maximum permissible linear speed

$$v_{mech} = v_{max}$$

Maximum permissible rotary speed
For motor attachment via mount and coupling

$$n_{mech} = \frac{v_{mech} \cdot 1000 \cdot 60}{P}$$

For motor attachment via timing belt side drive

$$n_{mech} = \frac{v_{mech} \cdot i \cdot 1000 \cdot 60}{P}$$

Max. permissible drive torque M_{mech}
The lowest (minimum) of all the values for permissible drive torque of all mechanical components contained in the drive train determines the maximum permissible drive torque of the mechanical system which has to be taken into consideration as the upper limit for the drive when sizing the motor.

For motor attachment via mount and coupling

$$M_{mech} = \text{minimum } (M_{cN}; M_p)$$

For motor attachment via timing belt side drive

$$M_{mech} = \text{minimum } (M_{sd}; \frac{M_p}{i})$$

⚠ **When considering the complete drive train (mechanical system + motor/controller), the maximum torque of the motor can lie below the maximum value for the mechanical system (M_{mech}) and thus limit the maximum permissible drive torque of the overall drive train.**
If the maximum torque of the motor lies above the upper limit for the mechanical system (M_{mech}), the maximum motor torque must be limited to the permitted value for the mechanical system.

Rough guide for motor selection

The following conditions can be used as a rough guide for preselecting the motor.

Condition 1:
The rotary speed of the motor must be greater than or equal to the rotary speed required for the mechanical system (but not exceeding the maximum permissible limit value).

$$n_{max} \geq n_{mech}$$

Condition 2:
Consideration of the ratio of mass moments of inertia of the mechanical system and the motor. The ratio of the mass moments of inertia serves as an indicator for the control performance of a motor/controller combination. The mass moment of inertia of the motor is directly related to the motor size.

Ratio of mass moments of inertia

$$V = \frac{J_{ex}}{J_m + J_{br}}$$

For pre-selection, past experience has shown the values opposite will result in high control performance.
These are not rigid limits, but values exceeding them will require closer consideration of the specific application.

Application area	V
Handling	≤ 6.0
Processing	≤ 1.5

Condition 3:
Estimation of the ratio of the static load moment to the continuous torque of the motor. The torque ratio must be smaller than or equal to the empirical value of 0.6. By looking at the required motor torque levels, this estimation roughly covers the dynamic v characteristics which still have be determined by plotting an exact motion profile.

Torque ratio

$$\frac{M_{stat}}{M_0} \leq 0{,}6$$

Static load moment

$$M_{stat} = M_R + M_g$$

Weight moment
For vertical mounting only!

For motor attachment via mount and coupling: i = 1

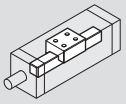
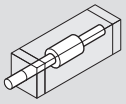
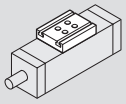
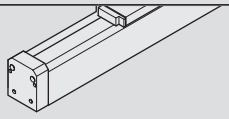
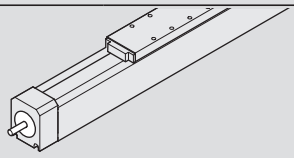
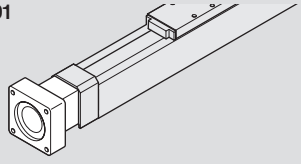
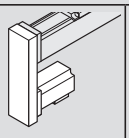
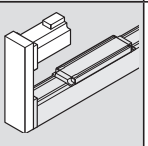
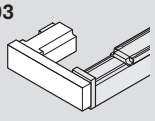
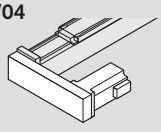
$$M_g = \frac{P \cdot (m_{ex} + m_{ca}) \cdot g}{2000 \cdot \pi \cdot i}$$

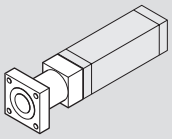
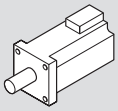
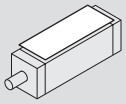
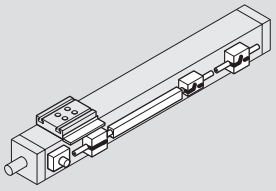
In the chapter “Configuration and Ordering” users can put together standard configurations, including motor attachment and motor, for the various Linear Motion System sizes by selecting the appropriate options. By checking the above conditions, it is possible to see whether a standard motor selected in a particular configuration will generally be of a suitable size for the specific application.

Precise drive dimensioning
Preselecting the motor according to this rough guide is no substitute for the required precise design calculations for the drive, taking all moments/torques and speed levels into account. For precise calculation of the electric drive, including consideration of the specific motion profile, please refer to the performance data in the catalog “Rexroth Drive technology”.
When dimensioning the drive, the maximum permitted values for linear speed, drive torque and acceleration must not be exceeded, in order to avoid damaging the mechanical system.

Linear Modules MKK

MKK-040-NN-2 Configuration and ordering data

Short product name, length MKK-040-NN-2, ... mm		Guideway		Drive				Carriage	
									
Version		Frame without center holes	Frame with center holes	Screw journal	Rexroth Ball Screw Assembly size d_0 x P			L_{ca} = 135 mm	
					12x2	12x5	12x10		
Without drive	OA01 	02			00			02	
With Rexroth Ball Screw Assembly, without mount	OF01 	01	03	Ø 6	01	02	03	01	
With Rexroth Ball Screw Assembly and mount	MF01 	01	03	Ø 6	01	02	03	01	
With Rexroth Ball Screw Assembly and timing belt side drive	RV01  RV02  RV03  RV04 	01	03	Ø 6	01	02	03	01	

Motor attachment [1]			Motor		Cover		Switches / Mounting duct / Socket-plug	Documentation	
									
Reduction i =	Attachment kit [2]	for motor	without Brake	with Brake	without Sealing strip [3]	with Sealing strip [3]		Standard report	Measurement report
–	00	–	00		00	01	Without switch mounting 00 Proximity switch PNP NC 36 / Switching cam 18 PNP NO 38 / Cable duct 25 Socket-plug 28 Magnetic field sensor with cable Reed sensor 51 / Cable duct 25 Hall sensor PNP NC 52 / Socket-plug 28 Magnetic field sensor with connector Reed sensor 58 Hall sensor PNP NC 59	01	02 Frictional torque 03 Lead deviation 05 Positioning accuracy
–	00	–	00						
–	05	MSM019B	134	135					
–	03	MSM031B	136	137					
–	01	MSK030C	84	85					
i = 1	22	MSM019B	134	135					
i = 1.5	23								
i = 1	17	MSM031B	136	137					
i = 1.5	18								
i = 1	15	MSK030C	84	85					
i = 1.5	16								

[1] Mount and coupling or timing belt side drive for motor type according to customer specification ➠ see chapter “Mounting kits for motors according to customer specification”.
[2] Attachment kit also available without motor (when ordering: enter “00” for motor)
[3] Plastic sealing strip

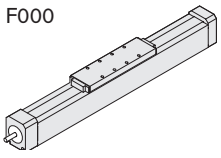
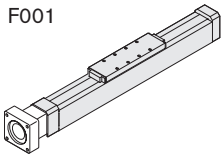
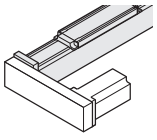
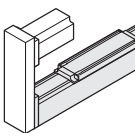
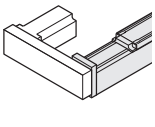
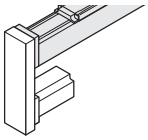
Length calculation ➠ see chapter “General technical instructions”

Linear Modules MKK

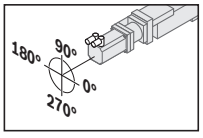
MKK-065-NN-3 Configuration and ordering data

$s_{max.}$[1] (mm)	Material pairing[2]	Lubrication[3]	Carriage (TT)		L_w (mm)	Guideway	Drive[4]		
			T-slot (S) Thread (T)	Number TT	(2 TT only)	Frame with or without center holes	keyway	BASA	Tolerance grade
s_{max}=	ALST (Aluminum/steel)	LSS	S	2	L_w =	001 without	0 without	16x5	T5
			T					16x10	T7
			S	1				16x16	
			T						
		LCF	S	1	–				
		LCO				004 with	1 with	16x5	T7
		LPG	T					16x10	
								16x16	
	ALCR (Aluminum/hard chrome plated steel)	LSS	S	1	–	011 without	0 without	16x5	T7
		LCF						16x10	
		LCO	T			014 with		16x16	
		LPG							

[1] Travel range s_{max} dependent on length L and option selection. Length calculation ➠ see chapter “General technical instructions”
[2] Material pairing ➠ see chapter “Product description MKK-xxx-NN-3”.
[3] Lubrication ➠ see chapter “Additional information”.
[4] Drive journal with keyway only available with F000 version!
[5] Mounting kit can also be deliver without motor.
Mounting kits according to customer specification ➠ see chapter “Mounting kits for motors according to customer specification”.
[6] Further switch mounting options ➠ see chapter “Switching system”.

Version	Attachment interface[5]		Motor						Cover		Sensor system[6]	Documentation
	Gear ratio	Mechanical interface	Motor code	Connection: 1 cable	Connection: 2 cable	Holding brake: with	Holding brake: without	Motor connector position	Cover	Side sealing	Number: 1-6	
			F000 									
F000 (without mount)	–	–	–	–	–	–		–	0 without	0 without	000 without switch 120 sensor, PNP / normally closed (NC) 121 sensor, NPN / normally closed (NC) 122 sensor, M8x1, PNP / normally open (NO) 123 sensor, M8x1, NPN / normally open (NO)	001 standard 002 frictional torque; 003 lead deviation; 005 positioning accuracy
			F001 									
F001 (with mount)	i = 1	MS2N04	MS2N04-C0BTN	1	2	Y	N	000 090 180 270				
		MSM041	MSM041B-0300	–	2							
			 S000  S090  S180  S270						2 with	0 without 1 with		
S000 S090 S180 S270 (with timing belt side drive)	i = 1	MS2N04	MS2N04-B0BTN	1	2	Y	N	000 090 180 270				
		MSM041	MSM041B-0300	–	2							
	i = 1.5	MS2N04	MS2N04-B0BTN	1	2							
		MSM041	MSM041B-0300	–	2							

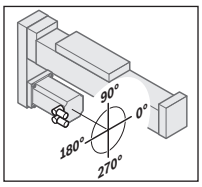
Mount	Motor connector position			
	0°	90°	180°	270°
F001	000	090 ★	180	270



Example:
Mount F001
Motor connector position 90°

Timing belt side drive	Motor connector position			
	0°	90°	180°	270°
S000	–	090	180 ★	270
S090	000	090 ★	180	–
S180	000 ★	090	–	270
S270	000	–	180	270 ★

★ standard delivery (connector orientation)



Example:
Timing belt side drive S270
Motor connector position 180°

Linear Modules MKK

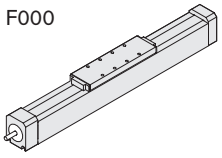
MKK-080-NN-3 Configuration and ordering data

$s_{max.}$[1] (mm)	Material pairing[2]	Lubrication[3]	IMS- A[4]	Carriage[5][6] (TT) T-slot (S) Thread (T)	Carriage[5][6] (TT) Number TT	L_w (mm) (2 TT only)	Guideway Frame with or without center holes	Drive[6][7] keyway	Drive[6][7] BASA	Drive[6][7] Tolerance grade	SPU[8][9]
s_{max}=	ALST (Aluminum/steel)	LSS	001 HF	S	1	–	104 with	0 without	20x5	T5	010 without SPU
			002 DQ	T					20x10	T7	
			–	S	2	L_w =	001 without		20x20		
				T					20x40		
				S	1	–					
				T							
		LCF	–	S	1		004 with	1 with	20x5	T7	001 with SPU (1 pair)
		LCO	–						20x10		
		LPG	–	T					20x20		
									20x40		
	ALCR (Aluminum/hard chrome plated steel)	LSS	–	S	1	–	011 without	0 without	20x5	T7	002 with SPU (2 pair)
		LCF	–						20x10		
		LCO	–	T			014 with		20x20		
		LPG	–						20x40		

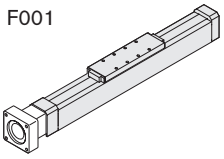
1) Travel range s_{max} dependent on length L and option selection. Length calculation ➠ see chapter “General technical instructions”
2) Material pairing ➠ see chapter “Product description MKK-xxx-NN-3”.
3) Lubrication ➠ see chapter “Additional information”.
4) No SPU available for version with IMS. IMS measuring system not available with BASA 20x40.
5) Carriage version “2 TT” optionally available without screw support (SPU).
6) Thread (T) carriage version not available with BASA 20x40.
7) Drive journal with keyway only available with F000 version!
8) SPU only possible for carriage version “1 TT”!
9) No screw support is available for BASA 20x40.
10) Mounting kit can also be deliver without motor.
Mounting kits according to customer specification ➠ see chapter “Mounting kits for motors according to customer specification”.
11) Further switch mounting options ➠ see chapter “Switching system”.

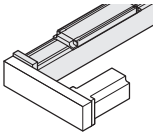
Version	Attachment interface[10]		Motor							Cover		Sensor system[11]	Documentation
	Gear ratio	Mechanical interface	Motor code	Connection: 1 cable	Connection: 2 cable	Holding brake: with	Holding brake: without	Motor connector position		Cover	Side sealing	Number: 1-6	
F000 (without mount)	–	–	–	–	–	–		–		0 without	0 without	000 = without sensor 120 sensor (PNP/normally closed (NC)); 121 sensor (NPN/normally closed (NC)) 122 sensor (PNP/normally open (NO)); 123 sensor (NPN/normally open (NO))	001 standard 002 frictional torque; 003 lead deviation; 005 positioning accuracy
F001 (with mount)	i = 1	MS2N04	MS2N04-B0BTN	1	2	Y	N		000	2 with	0 without		
			MS2N04-C0BTN						090				
			MS2N04-D0BQN						180				
		MSM041	MSM041B-0300	–	2				270				
		MS2N05	MS2N05-B0BTN	1	2								
			MS2N05-C0BTN										
S000 S090 S180 S270 (with timing belt side drive)	i = 1	MS2N05	MS2N05-C0BTN	1	2	Y	N		000		1 with		
			MS2N05-D0BRN										
		MS2N04	MS2N04-C0BTN	1	2				090				
			MS2N04-D0BQN										
		MSM041	MSM041B-0300	–	2								
	i = 1.5	MS2N04	MS2N04-B0BTN	1	2				180				
			MS2N04-C0BTN										
		MSM041	MSM041B-0300	–	2								
	i = 2	MS2N05	MS2N05-B0BTN	1	2				270				

F000

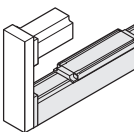


F001

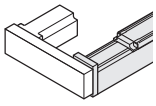




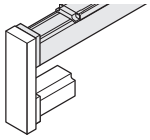
S000



S090

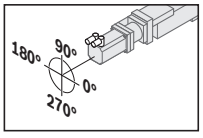


S180



S270

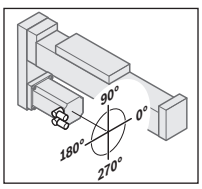
Mount	Motor connector position			
	0°	90°	180°	270°
F001	000	090 ★	180	270



Example:
Mount F001
Motor connector position 90°

Timing belt side drive	Motor connector position			
	0°	90°	180°	270°
S000	–	090	180 ★	270
S090	000	090 ★	180	–
S180	000 ★	090	–	270
S270	000	–	180	270 ★

★ standard delivery (connector orientation)



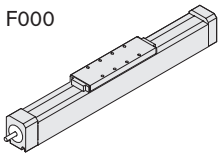
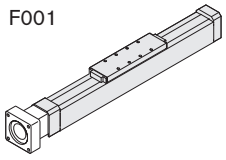
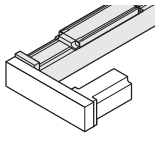
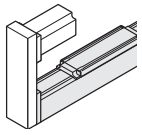
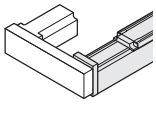
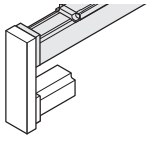
Example:
Timing belt side drive S270
Motor connector position 180°

Linear Modules MKK

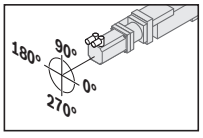
MKK-110-NN-3 Configuration and ordering data

$s_{max.}$[1] (mm)	Material pairing[2]	Lubrication[3]	IMS- A[4]	Carriage[5] (TT) T-slot (S) Thread (T)	Carriage[5] (TT) Number TT	L_w (mm) (2 TT only)	Guideway Frame with or without center holes	Drive[6] keyway	Drive[6] BASA	Drive[6] Tolerance grade	SPU[7]
s_{max}=	ALST (Aluminum/steel)	LSS	001 HF	S	1	–	104 with	0 without	32x5	T5	010 without SPU
			002 DQ	T					32x10		
			–	S	2	L_w =	001 without		32x20	T7	
				T					32x32		
				S	1	–					
				T							
		LCF	–	S			004 with	1 with	32x5	T7	001 with SPU (1 pair)
		LCO	–						32x10		
		LPG	–	T					32x20		
									32x32		
	ALCR (Aluminum/hard chrome plated steel)	LSS	–	S	1	–	011 ohne	0 without	32x5	T7	002 with SPU (2 pair)
		LCF	–						32x10		
		LCO	–	T			014 with		32x20		
		LPG	–						32x32		

[1] Travel range s_{max} dependent on length L and option selection. Length calculation ➠ see chapter “General technical instructions”
[2] Material pairing ➠ see chapter “Product description MKK-xxx-NN-3”.
[3] Lubrication ➠ see chapter “Additional information”.
[4] No SPU available for version with IMS
[5] Carriage version “2 TT” optionally available without screw support (SPU).
[6] Drive journal with keyway only available with F000 version!
[7] SPU only possible for carriage version “1 TT”!
[8] Mounting kit can also be deliver without motor.
Mounting kits according to customer specification ➠ see chapter “Mounting kits for motors according to customer specification”.
[9] Further switch mounting options ➠ see chapter “Switching system”.

Version	Attachment interface[8]		Motor							Cover		Sensor system[9]	Documentation
	Gear ratio	Mechanical interface	Motor code	Connection: 1 cable	Connection: 2 cable	Holding brake: with	Holding brake: without	Motor connector position		Cover	Side sealing	Number: 1-6	
F000 (without mount)	–	–	–	–	–	–		–	 F000	0 without	0 without	000 = without sensor 120 sensor (PNP/normally closed (NC)); 121 sensor (NPN/normally closed (NC)) 122 sensor (PNP/normally open (NO)); 123 sensor (NPN/normally open (NO))	001 standard 002 frictional torque; 003 lead deviation; 005 positioning accuracy
F001 (with mount)	i = 1	MS2N06	MS2N06-B1BNN	1	2	Y	N	000	 F001	2 with	0 without		
			MS2N06-C0BTN					090					
			MS2N06-D0BRN					180					
			MS2N06-D1BNN					270					
S000 (with timing belt side drive)	i = 1	MS2N06	MS2N06-B1BNN	1	2	Y	N	000	 S000  S090  S180  S270		1 with		
			MS2N06-D1BNN					090					
								180					
	i = 2	MS2N06	MS2N06-C0BTN					270					

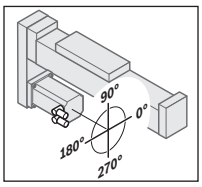
Mount	Motor connector position			
	0°	90°	180°	270°
F001	000	090 ★	180	270



Example:
Mount F001
Motor connector position 90°

Timing belt side drive	Motor connector position			
	0°	90°	180°	270°
S000	–	090	180 ★	270
S090	000	090 ★	180	–
S180	000 ★	090	–	270
S270	000	–	180	270 ★

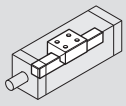
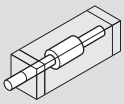
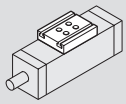
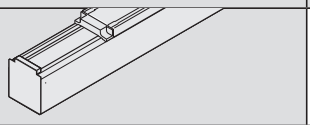
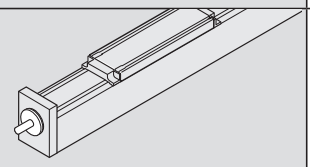
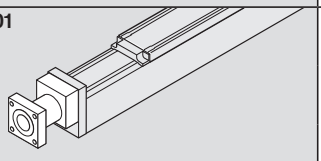
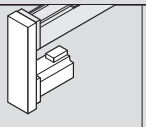
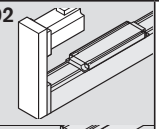
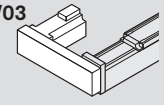
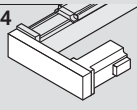
★ standard delivery (connector orientation)

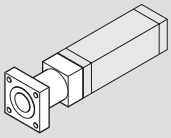
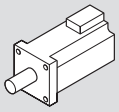
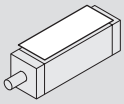
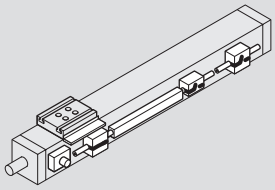


Example:
Timing belt side drive S270
Motor connector position 180°

Linear Modules MKK

MKK-165-NN-2 Configuration and ordering data

Short product name, length MKK-165-NN-2, ... mm		Guideway	Drive					Carriage	
									
Version			Screw journal	Rexroth Ball Screw Assembly size d_0 x P				L_{ca} = 400 mm	
				40x5	40x10	40x20	40x40		
Without drive	OA1 	01		00				10	
With Rexroth Ball Screw Assembly, without mount	OF1 	01	Ø 25	01	02	03	04	01	
			Ø 25 with keyway	11	12	13	14		
With Rexroth Ball Screw Assembly and mount	MF01 	01	Ø 25	01	02	03	04	01	
With Rexroth Ball Screw Assembly and timing belt side drive	RV01  RV02  RV03  RV04 	01	Ø 25	01	02	03	04	01	

Motor attachment[1]			Motor		Cover		Switches / Mounting duct / Socket-plug	Documentation	
									
Reduction i =	Attachment kit[2]	for motor	without Brake	with Brake	without PU bellows	with PU bellows		Standard report	Measurement report
–	00	–	00		00	01	**Without switch and mounting duct** 00	01	02 Frictional torque 03 Lead deviation 05 Positioning accuracy
–	00	–	00		00	01	**Switches:** – PNP NC 11 – PNP NO 13 – Mechanical 15		
–	02	**MSK076C**	92	93	00	01	**Cable duct (loose)** 20		
							External socket/plug (loose) 17		
i = 1	23	**MSK076C**	92	93	00	01	**External switching cam** 16		
i = 2	24								

[1] Mount and coupling or timing belt side drive for motor type according to customer specification, ➠ see chapter “Mounting kits for motors according to customer specification”.

[2] Attachment kit also available without motor (when ordering: enter “00” for motor)

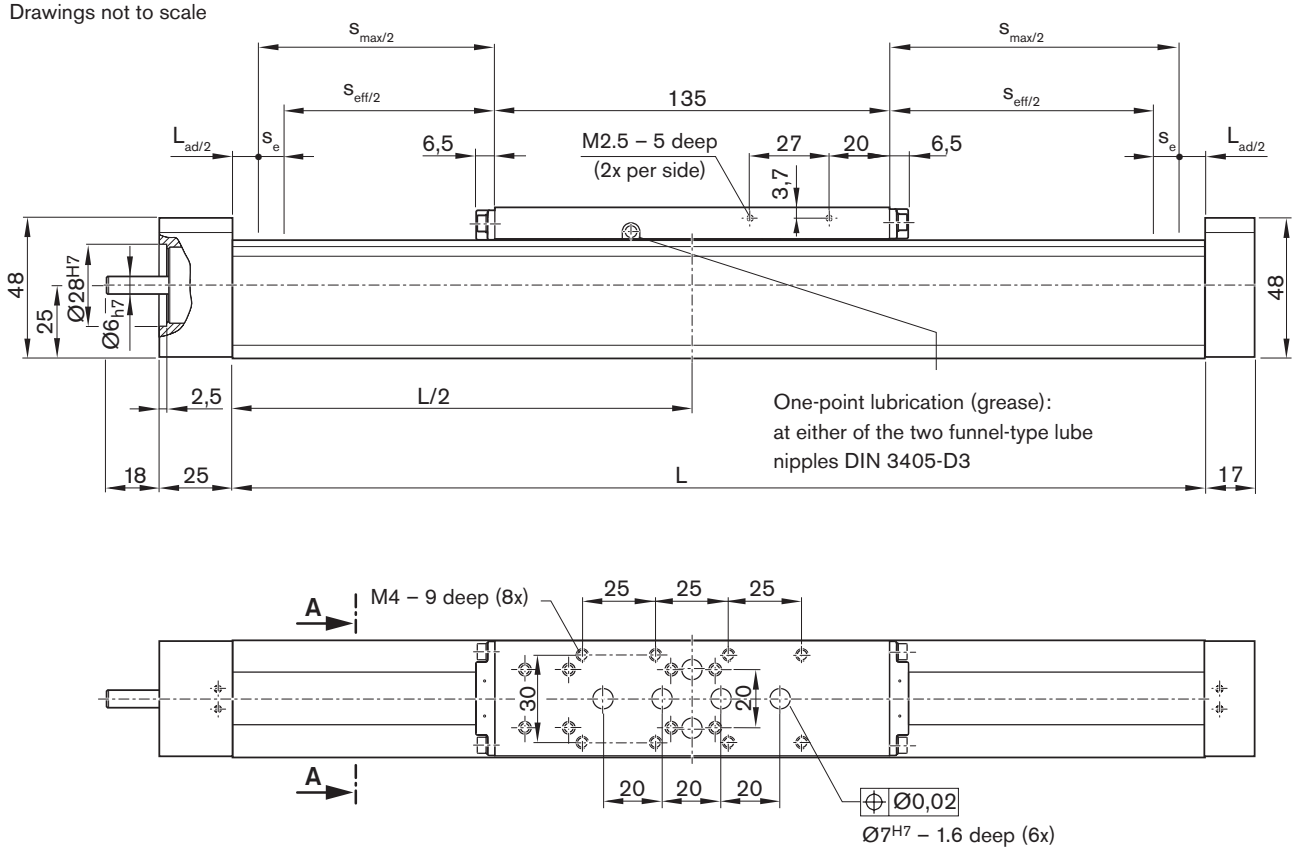
Length calculation ➠ see chapter “General technical instructions”

Linear Modules MKK

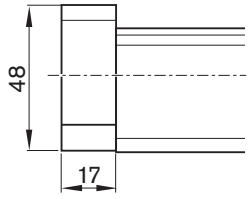
MKK-040-NN-2

Dimension drawings

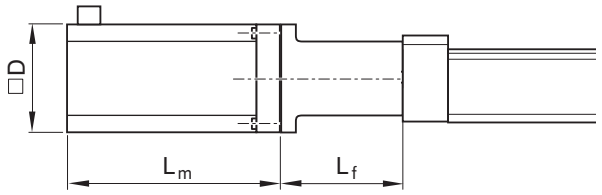
All dimensions in mm.
Drawings not to scale



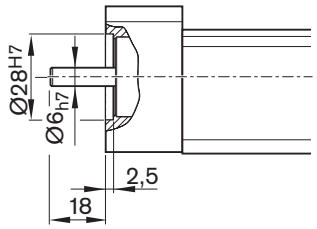
OA01



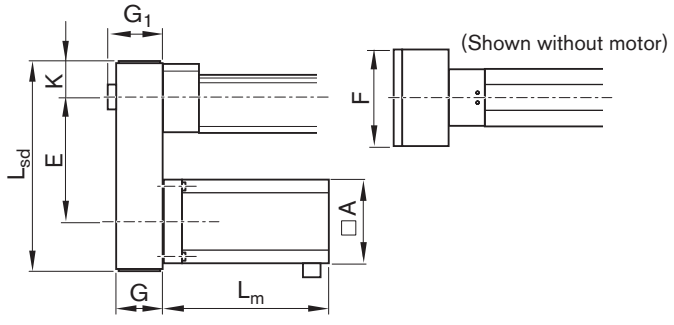
MF01



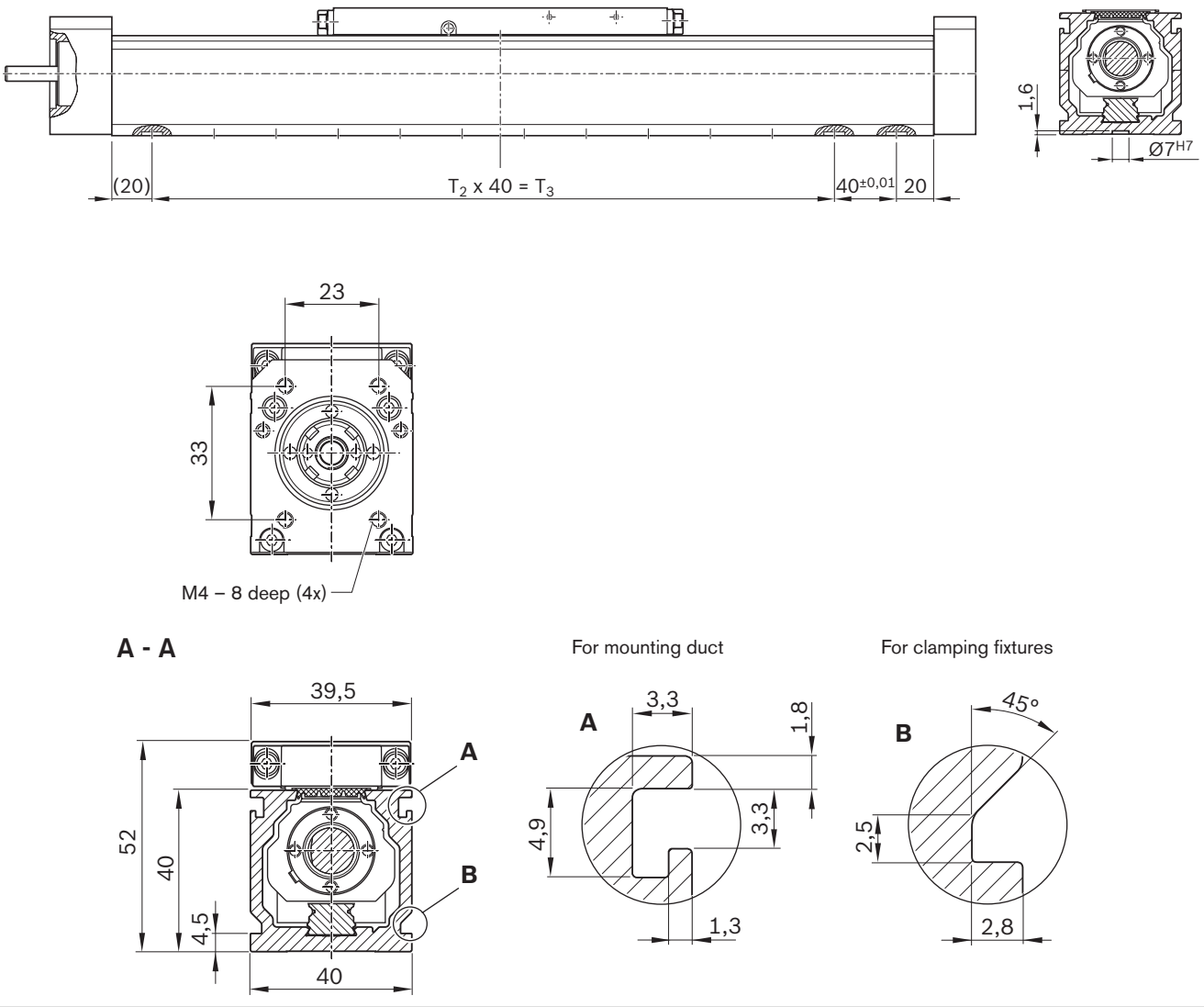
OF01



RV01 - RV04



Optional frame with center holes



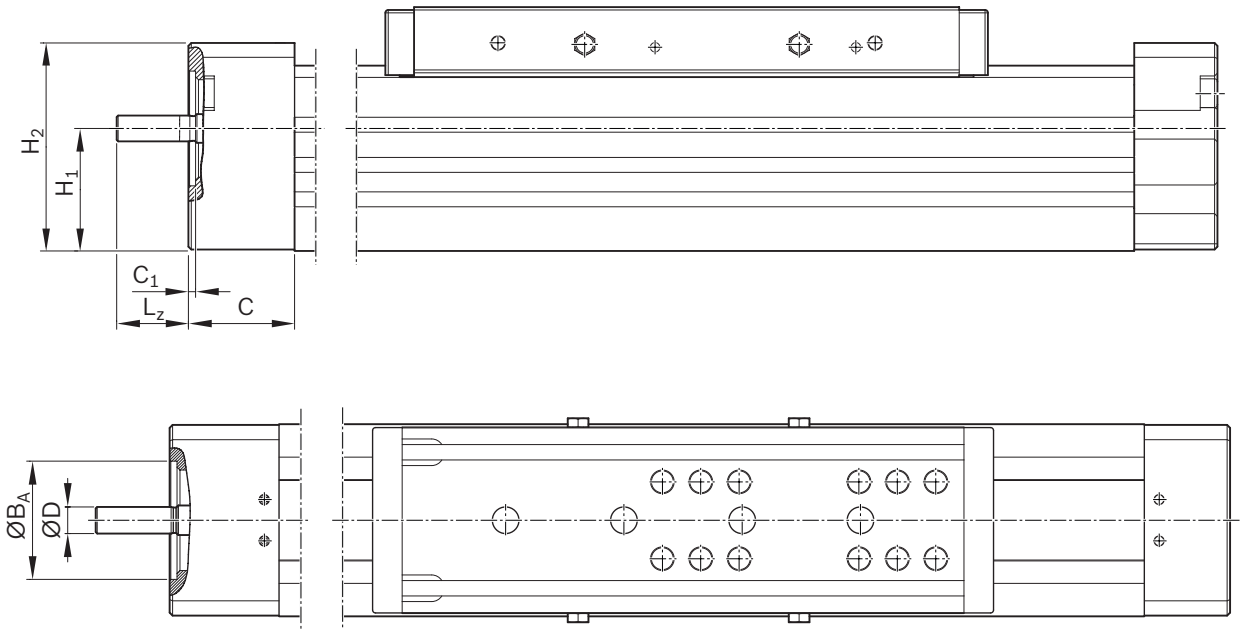
Version	Motor	Dimensions (mm) A	E i = 1	E i = 1.5	F	G	G_1	K	L_f	L_m without brake	L_m with brake	L_{sd}
RV01 - RV04	MSM019B	38.0	76.5	76.5	48.0	27	29.0	27.5	–	92	122.0	139
	MSM031B	60.0	78.0	75.0	64.5	37	43.5	33.5	–	79	115.5	157
	MSK030C	54.0	78.0	75.0	64.5	37	43.5	33.5	–	188	213.0	154
MF01	MSM019B	38.0	–			–			45	92	122.0	–
	MSM031B	60.0	–			–			50	79	115.5	–
	MSK030C	54.0	–			–			50	188	213.0	–

CAD configurator available on the Internet at www.boschrexroth.com ➠ “Product configurators”

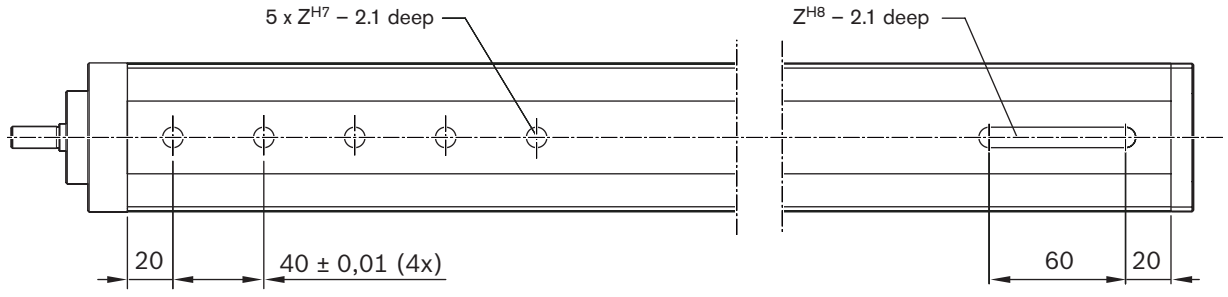
Linear Modules MKK

MKK-065/-080/-110/-NN-3 Frame dimension drawings

MKK-065-NN-3

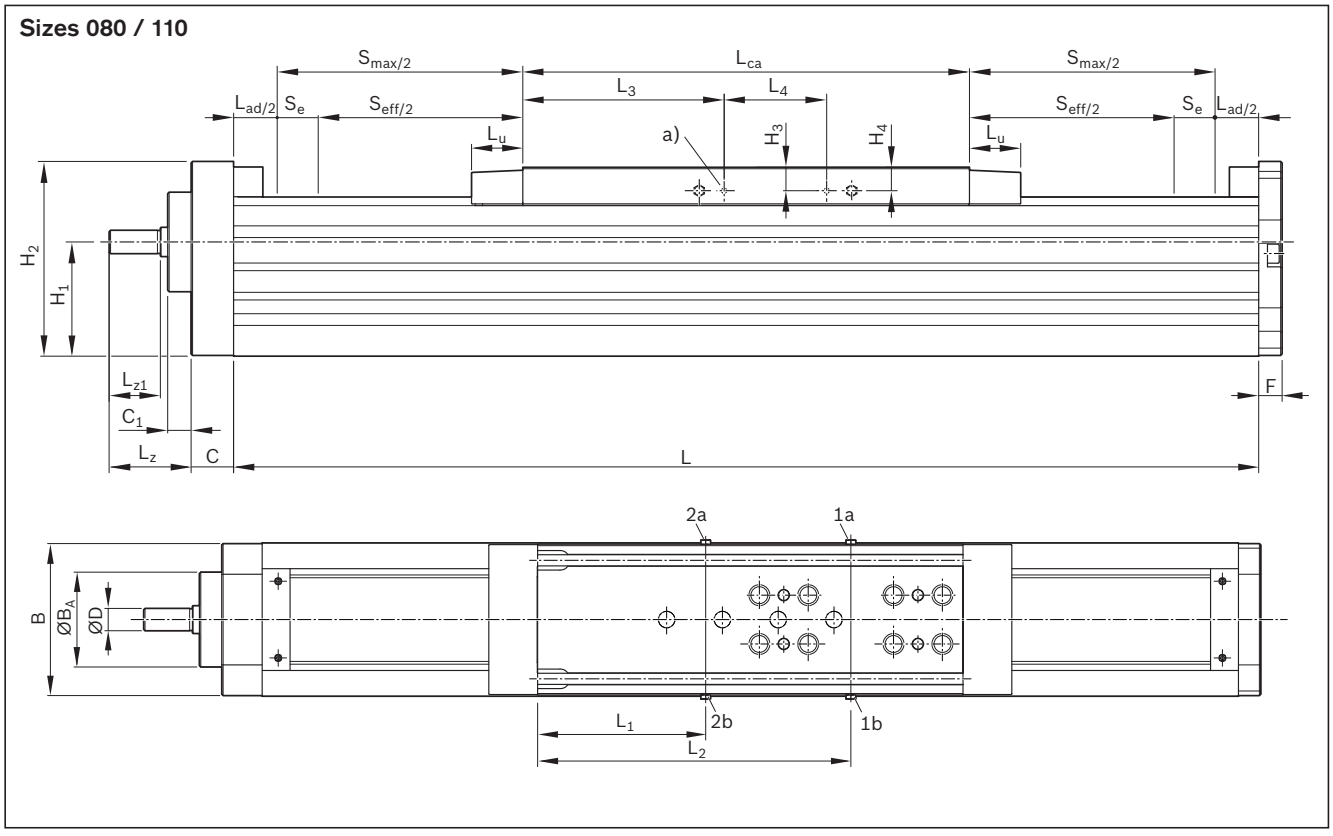


Optional frame with center holes and elongated hole in the bottom area

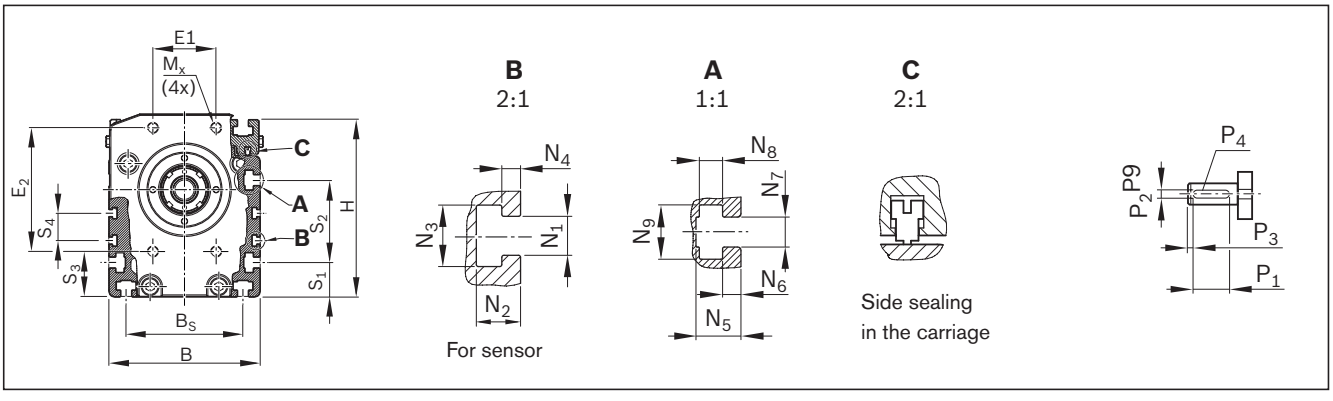


MKK	Dimensions (mm)																		
	B	B_S	$ØB_A$	C	C_1	ØD	E_1	E_2	F	H	H_1	H_2	H_3	H_4	L_1	L_2	L_3	L_4	L_{ca}
-065-NN-3	65	–	40	37	2.5	9	28	40	29	85	42.7	72.5	14	13.0	59.5	134.25	84.0	70	190
-080-NN-3	80	–	55	29	13.0	10	50	66	13	100	57.5	98.5	12	12.7	76.5	175.00	88.0	70	260
-110-NN-3	110	85	68	29	16.0	16	46	90	16	129	78.0	133.0	16	16.0	120.5	224.60	137.5	70	305

Note: all dimensions in mm. Drawings not schematically to scale. Detailed contours and dimensions can be found in the CAD model.
CAD configurator available on the Internet at www.boschrexroth.com “Product configurators”.
See following pages for dimension drawings for carriages and motor attachment.



1a / 1b lube fitting for Ball Runner Block: Lubrication optionally on one of the two connections.
2a / 2b lube fitting for Rexroth Ball Screw Assembly: Lubrication optionally on one of the two connections.
For further information, see the “Lubrication” chapter.
a) Fastening thread M4-10 deep (4x) for stepping angle

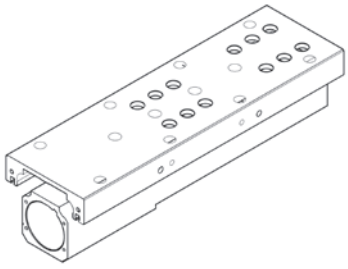


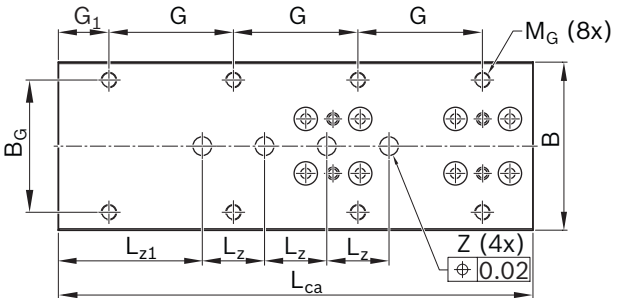
Lu	Lz	Lz1	Mx	Sliding block	N1	N2	N3	N4	N5	N6	N7	N8	N9	P1	P2	P3	P4 deep	S1	S2	S3	S4	ØZ
10	25	–	M6–14 deep	DIN557–M5	5.2	5.9	8.2	2.5	8.5	2.5	5.2	5.0	9.0	20	3	2.5	1.8	18	26	30	–	9
30	40	27	M8–18 deep	DIN557–M5	5.2	5.9	8.2	2.5	8.5	2.5	5.2	5.0	9.0	20	3	2.5	1.8	18	45	31	–	10
35	56	35	M8–18 deep	DIN508–M6	5.2	5.9	8.2	2.5	12.0	4.9	8.0	6.2	14.5	28	5	3.5	3.0	25	60	41	20	16

Linear Modules MKK

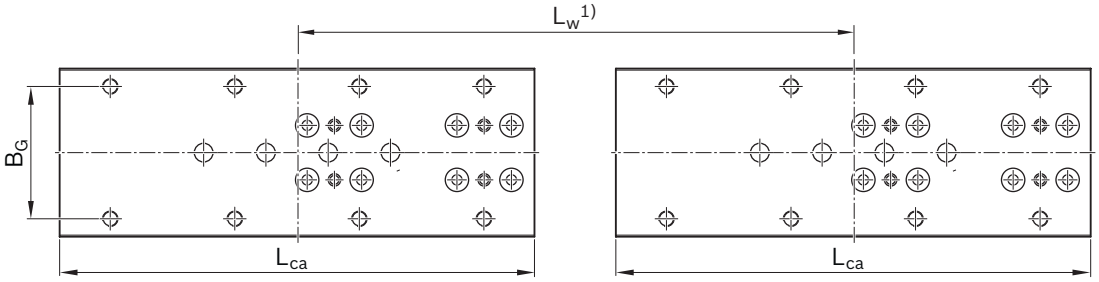
MKK-065/-080/-110/-NN-3 Carriage dimension drawings

Carriage with thread

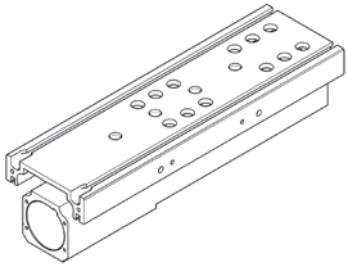


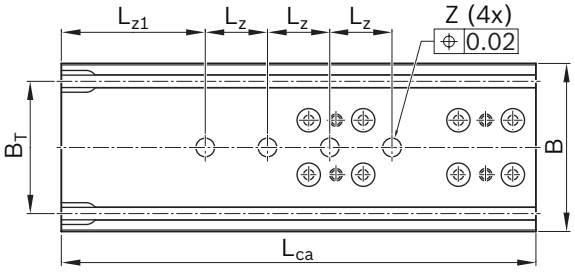


2 carriages (optional)

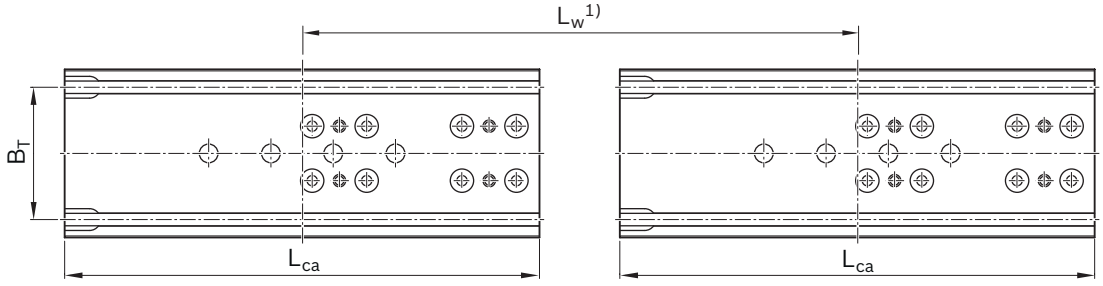


Carriage with T-slots





2 carriages (optional)

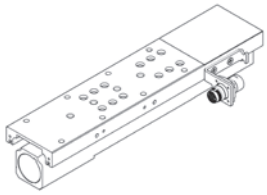


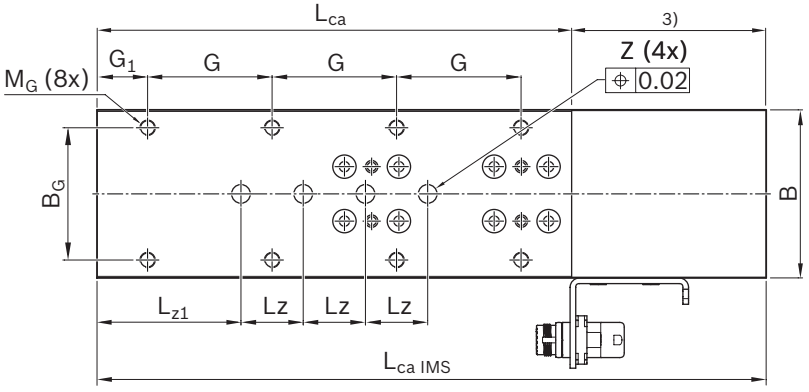
MKK	Dimensions (mm)													
	B	B_G	B_{IMS}	B_T	G	G_1	H_{IMS}	L_{ca}	$L_{ca\ IMS}$ 2)	$L_{w\ min}$	$L_{w\ max}$	L_z	L_{z1}	M_G
-065-NN-3	63	46	–	46	50	20.0	–	190	–	210	750	40	35.0	M6–9 deep
-080-NN-3	78	60	126	60	70	25.0	6.5	260	360	320	960	40	70.0	M8–10 deep
-110-NN-3	108	85	156	85	80	32.5	8.0	305	430	375	1095	40	92.5	M10–12 deep

1) Variable centerline-to-centerline distance defined by customer-built mounting base.
Centerline-to-centerline distance freely selectable between minimum and maximum distance in millimeters steps.
2) Clamping surface corresponds to L_{ca}
3) Non-usable clamping surface

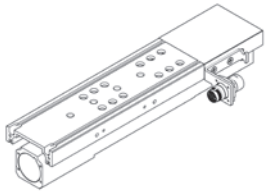
All dimensions in mm. Drawings not to scale

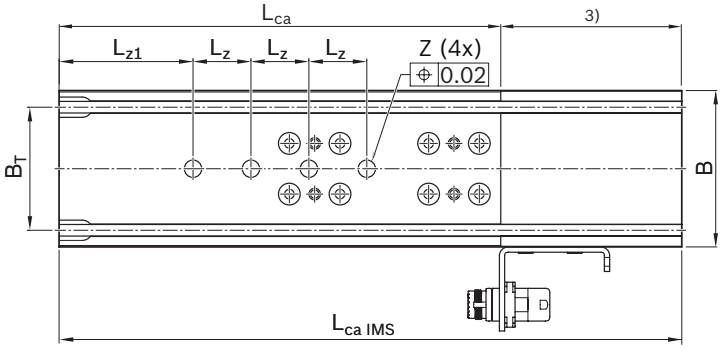
Carriage with threads and IMS



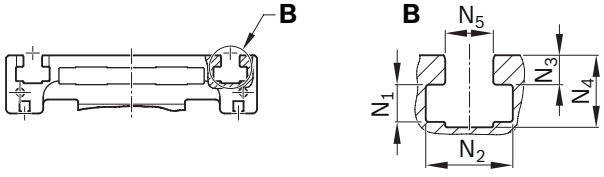


Carriage with T-slots and IMS

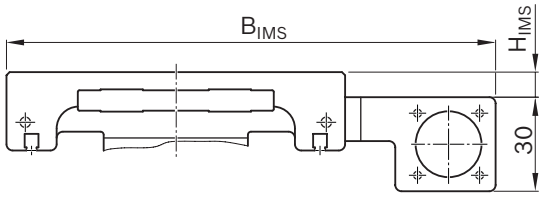




T-slots



IMS connector

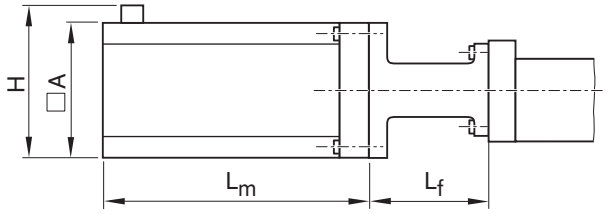


Sliding block	N_1	N_2	N_3	N_4	N_5	ØZ
DIN557–M5	5.0	9.0	2.5	8.5	5.2	9H7–2.1 deep
DIN557–M5	5.0	9.0	2.5	8.5	5.2	9H7–2.1 deep
DIN508–M6	6.2	14.5	4.9	12.0	8.0	12H7–2.1 deep

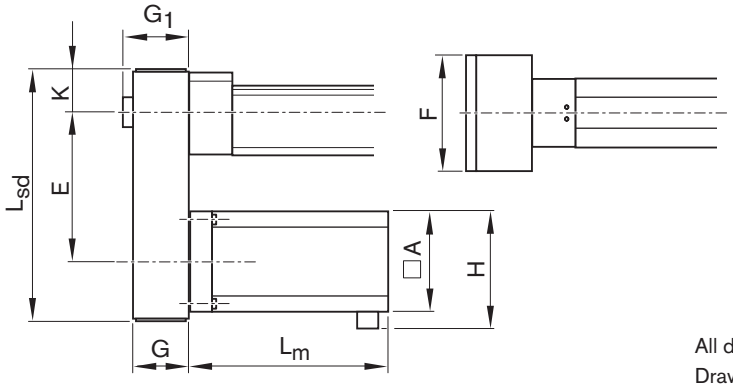
Linear Modules MKK

MKK-065/-080/-110/-NN-3 Motor attachment dimension drawings

Motor attachment, flanged type and coupling



Motor attachment – timing belt side drive



All dimensions in mm.
Drawings not to scale

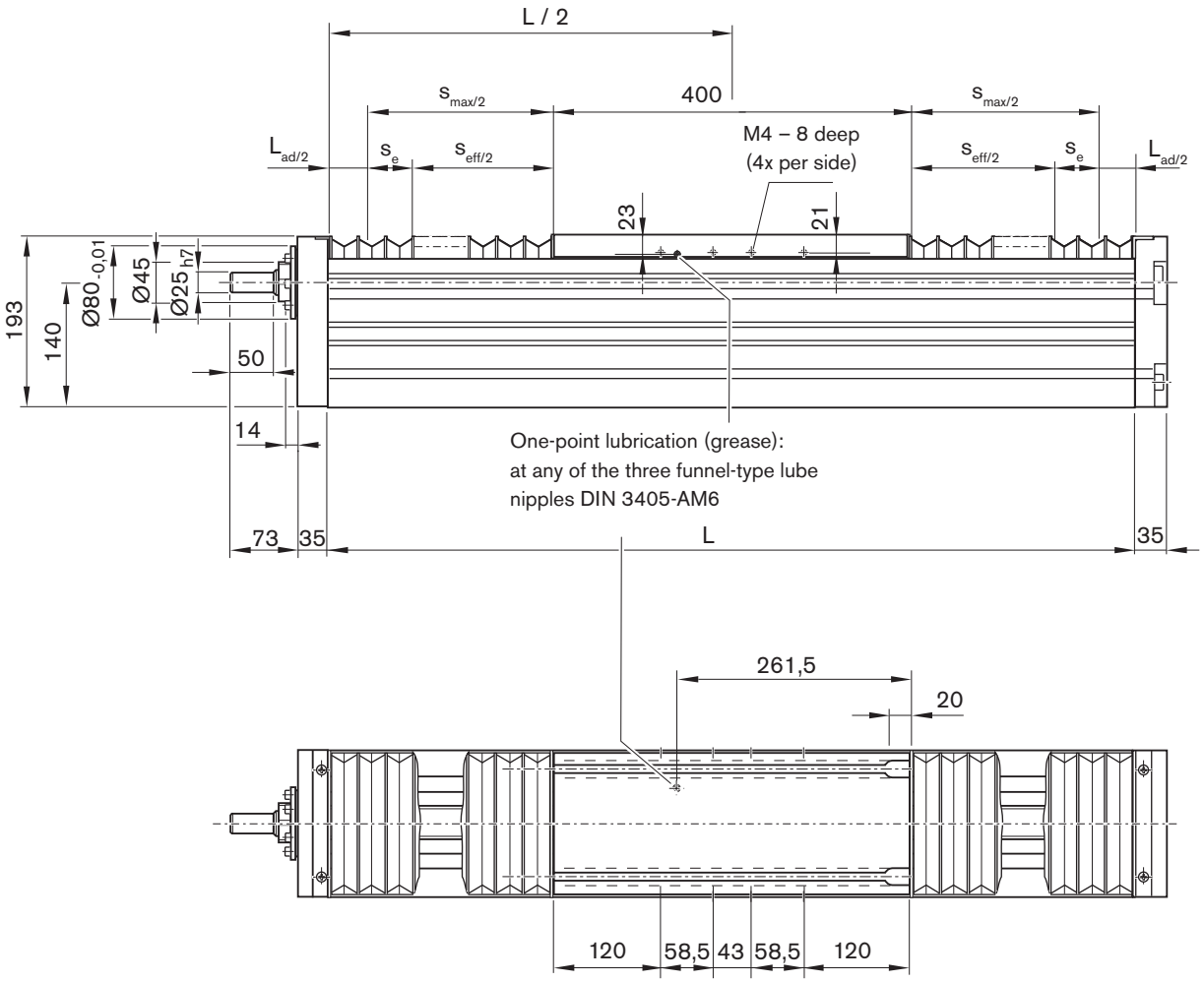
MKK	Motor	Gear ratio i	Motor coding	Dimensions (mm) Motor A	H Cable 1	H Cable 2	L_m without	L_m with	Mount L_f	Timing belt side drive E	F	G	G_1	K	L_{sd}
-065-NN-3	MSM041B	1	MSM041B-0300	80	–	93	112	149.0	90	122	88	51	57	45.5	231
		1.5	MSM041B-0300						–						
	MS2N04	1	MS2N04-C0BTN	82	123	108	194	226.5	95	–	–	–	–	–	–
		1	MS2N04-B0BTN				162	194.5	–	122	88	51	57	45.5	231
		1.5	MS2N04-B0BTN												
-080-NN-3	MSM041B	1	MSM041B-0300	80	–	93	112	149.0	90	122	88	51	–	47.5	231
		1.5	MSM041B-0300						–						
	MS2N04	1	MS2N04-B0BTN	82	123	108	162	194.5	95	–	–	–		–	–
		1	MS2N04-C0BTN				194	226.5	95	122	88	51		47.5	231
		1	MS2N04-D0BQN				226	258.5							
		1.5	MS2N04-B0BTN				162	194.5	–						
		1.5	MS2N04-C0BTN				194	226.5							
	MS2N05	1	MS2N05-B0BTN	98	139	124	188	218.0	115	–	–	–	–	–	–
		1	MS2N05-C0BTN				224	254.0	–	155	116	66	–	56.0	287
		1	MS2N05-D0BRN				260	290.0	–						
		2	MS2N05-B0BTN				188	218.0							
-110-NN-3	MS2N06	1	MS2N06-B1BNN	116	156	156	165	201.0	125	165	116	66	–	58.5	300
		1	MS2N06-C0BTN				184	202.0						–	–
		1	MS2N06-D0BRN				224	261.0		–	–	–			
		1	MS2N06-D1BNN							165	116	66		58.5	300
		2	MS2N06-C0BTN				184	202.0	–	162					

Linear Modules MKK

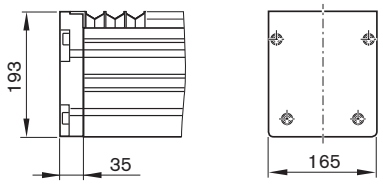
MKK-165-NN-2

Dimension drawings

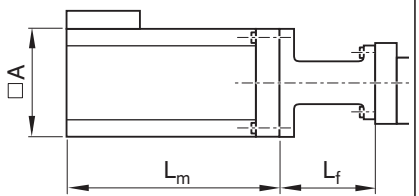
All dimensions in mm. Drawings not to scale



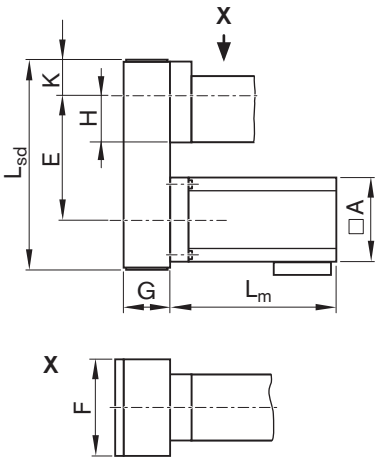
OA01



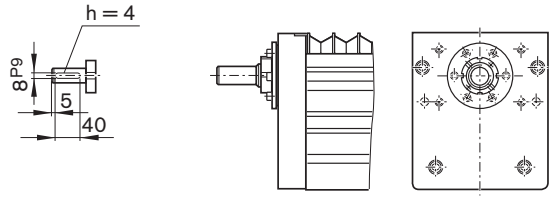
MF01

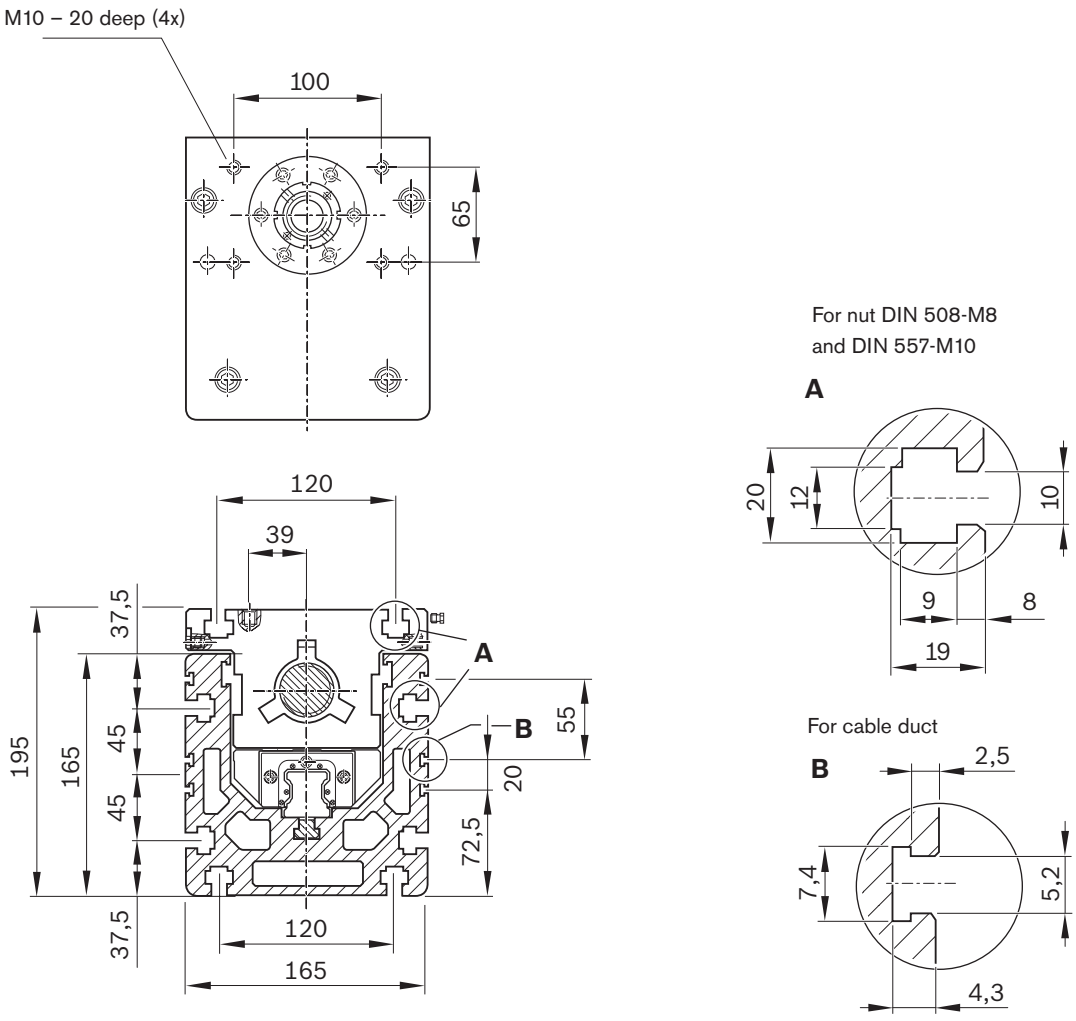


RV01 - RV04



OF01





Version	Motor	Dimensions (mm)											
		A	E			F	G	H	K	L_f	L_m without brake	L_m with brake	L_{sd}
			i = 1	i = 1.5	i = 2								
RV01 - RV04	**MSK076C**	140	240	–	238	160	90	140	77	–	292.5	292.5	409
MF01	**MSK076C**	140	–			–				140	292.5	292.5	–

CAD configurator available on the Internet at www.boschrexroth.com ➠ “Product configurators”

Linear Modules MKR

Product description MKR-xxx-NN-3

Features

- Ready-to-install Linear Modules in any length up to L_{max}
- Realization of greater lengths of up to 9,400 mm
- Extremely compact extruded aluminum profile (frame) with integrated Rexroth Ball Rail System with moderate preload (preload class C1)
- High travel speed combined with the wear-resistance typical of rolling-element high precision over long lengths
- High-performance toothed belt in the largest possible overall width for high drive torques with simultaneously high rigidity
- Carriages made of aluminum, in two design versions, with T- slots or threaded holes and with centering holes in each case
- Protection of the guideway and drive components by sealing strip (plastic strip on MKR-065, corrosion resistant steel strip on MKR-080 and MKR-110)
- Economical maintenance thanks to the one-point lubrication feature (grease lubrication or oil lubrication) from both sides via the carriage
- Repeatability of up to +/- 0.05 mm

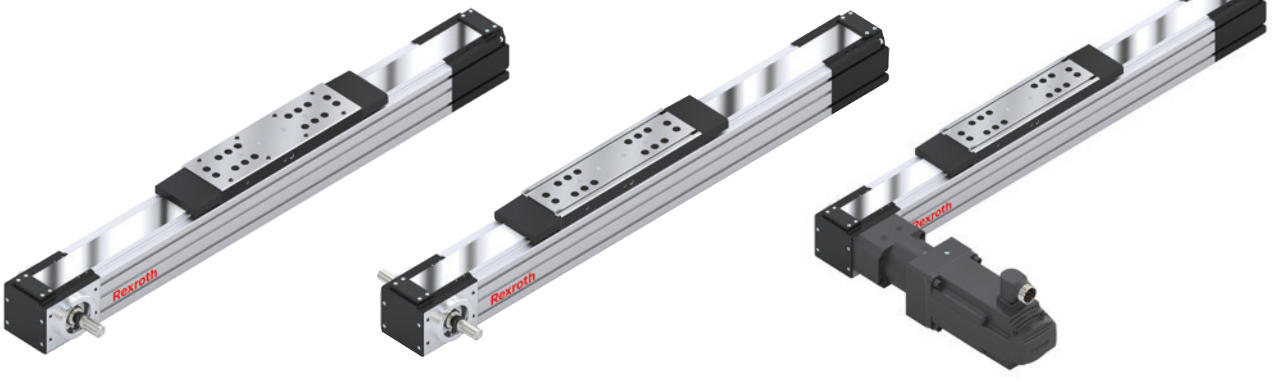
Further highlights

- Available in two material versions, ALST (aluminum/steel version) and ALCR (aluminum/steel hard chrome plated version)
- Center holes also in frame profile for simple combination with other Linear Motion Systems and connection elements
- Absolute position measuring system IMS-A directly integrated into the guide system (MKR-080 and MKR-110)
- Standard with integrated solenoid switch for magnetic field sensors
- Extensive accessories for connection and clamping elements and connecting shafts
- Nameplate with parameters for easy start-up
- Special version: Profile frame also interconnectable as multiple parts for lengths > L_{max} (on request)

Attachments

- Planetary gearbox with various gear ratios
- Attachment kits for motor according to customer specification
- Servo motor
- Magnetic field sensors for easy assembly directly on the profile frame
- Switch (proximity or mechanical) cable duct, socket plug and extension cables in the accessories program

Example variants



Two drive journals, long carriage with threads

Two drive journals, long carriage with T-slots

Planetary gearbox with motor, long carriage with T-slots

Material pairing

ALST:
- Frame, carriage and end enclosures made of anodized aluminum (AL)
- Ball Guide Rail and Ball Runner Block made of rolling bearing steel (ST)
- Deep-groove ball bearing of the drive mechanism (belt pulleys) made of rolling bearing steel

ALCR:
- Frame, carriage and end enclosures made of anodized aluminum (AL)
- Ball Guide Rail made of rolling bearing steel with corrosion resistant coating, matte-silver finish, hard chrome plated (Resist CR).
- Ball Runner Block made of corrosion-resistant steel (Resist NR)
- Deep-groove ball bearing of the drive mechanism (belt pulleys) made of rolling bearing steel

Lubrication variants

LSS: (Initial lubrication done at the factory)

MKR-065, MKR-080, MKR-110:
- Grease lubricant Dynalub 510, lithium-based high-performance grease of the NLGI grade 2 according to DIN 51818 (KP2K-20 according to DIN 51825)
- 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, only with corrosion prevention.
- Basic lubrication required

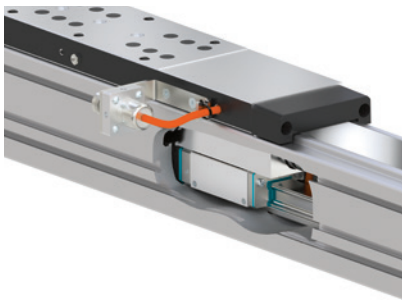
LCF: (Prepared for connection to one-point lubrication systems with liquid grease)
- For liquid grease, lithium-based high-performance grease of NLGI grade 00 according to DIN 51818 (GP00K-20 according to DIN 51826)
- Only use liquid grease lubrication with single-line total-loss lubrication systems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

LCO: (Prepared for connection to one-point lubrication systems with oil)
- Ball Runner Block with integrated non-return valves
- Only use oil lubrication with single-line total-loss lubrication systems via piston distributors.
- Basic lubrication required

Product description for Integrated Measuring System

The IMS-A measuring system offers the following advantages:

- No additional space required.
- No external mounting surfaces required for the measuring system.
- No measurement inaccuracies due to parallelism offset between the measuring system and the guide system.
- Full integration of the measuring system components into the guide means no complex mounting or tuning work is needed.
- The Runner Block, Scanner and Guide Rail with scale can be replaced individually during servicing.
- Interfaces: HIPERFACE or DRIVE-CLiQ.
- Connecting cable directly on the side of the carriage.
- For further information, see the “Integrated Measuring System” chapter



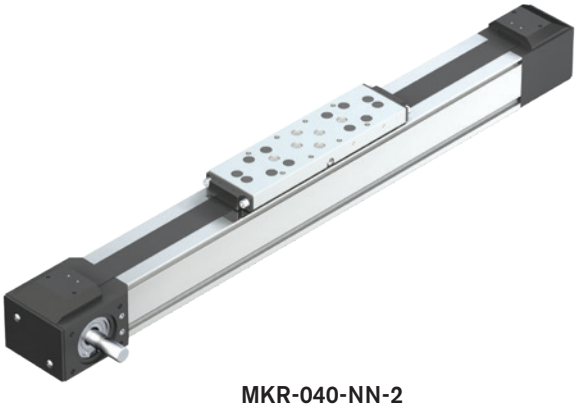
Linear Modules MKR

Product description MKR-xxx-NN-2

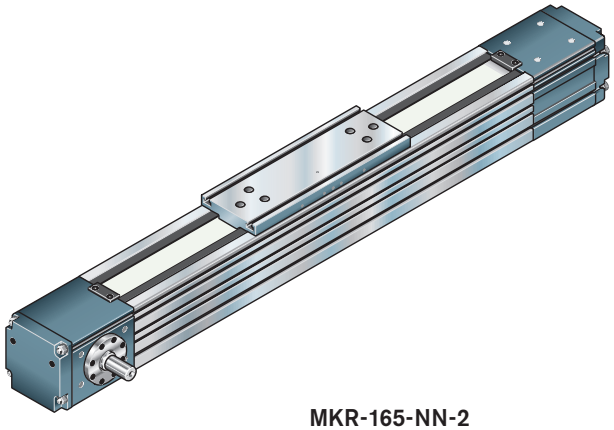
Characteristic features

MKR...: Linear Modules with Ball Rail System and belt drive for high speeds and high demands on the guideway. The integrated, backlash-free Rexroth Ball Rail System makes it possible for large masses to be moved at high speed thanks to high load ratings and optimal travel.

The MKR... Linear Modules comprise:
- A compact anodized aluminum frame
- The integrated Rexroth Ball Rail System
- One carriage with one-point lubrication
- High performance toothed belt (AT profile)
- Cover provided by:
  - plastic strip on MKR-040
  - toothed belt on MKR-165
- Mountable switches
- Servo motor
- Gear reducer for motor attachment



MKR-040-NN-2



MKR-165-NN-2

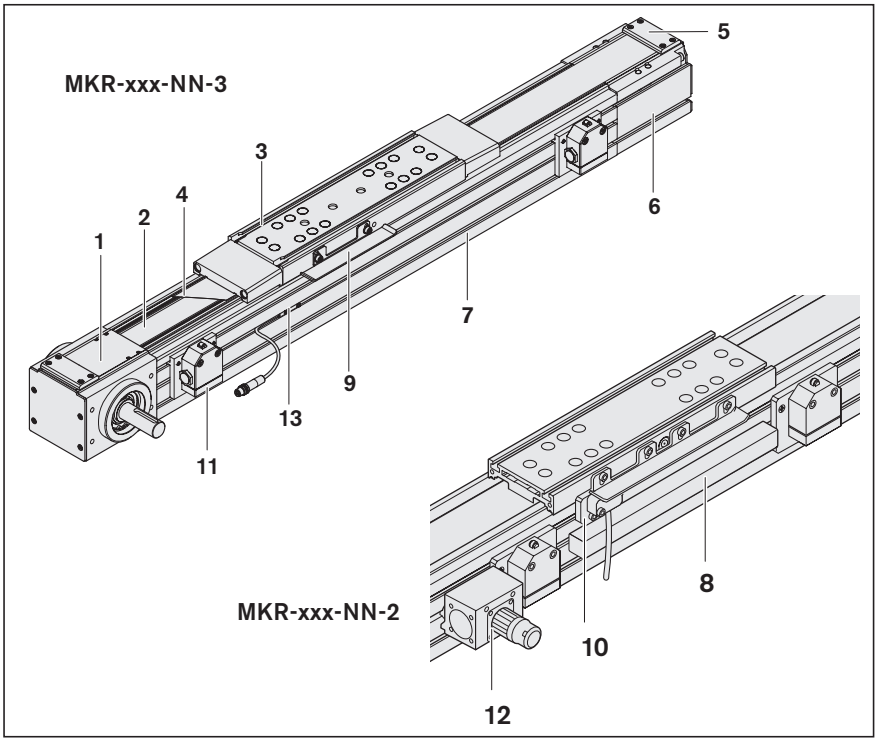
Structural design

Structural design

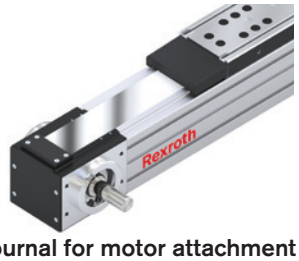
1 Drive end enclosure
2 Toothed belt (under cover)
3 Carriage with Runner Blocks
4 Sealing strip
5 Strip fixing
6 Idler (non-drive) end enclosure
7 Frame

Attachments:

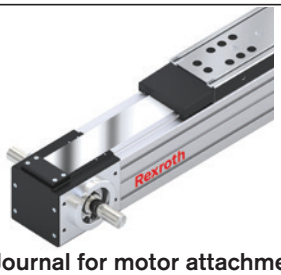
8 Cable duct
9 Switching cam
10 Proximity switch
11 Mechanical switch
12 Socket/plug
13 Magnetic field sensor



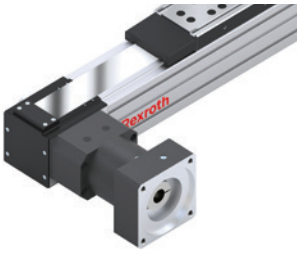
Versions



Journal for motor attachment right or left



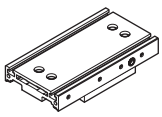
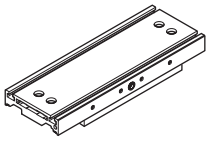
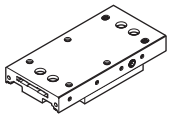
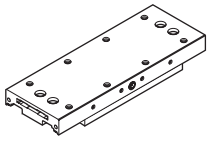
Journal for motor attachment on both sides



With gear reducer (Motor attachment with clamping hub)

Carriage variants MKR-xxx-NN-3

For further information, see the chapter on “Carriage dimension drawings”

Carriage with T-slots		with threaded holes	
Short	Long	Short	Long
			

Linear Modules MKR

Technical data

General technical data

Observe the chapters on “Calculation” and “General technical instructions”.

MKR	Carriage length		Dyn. Characteristic values			Maximum permissible loads				Moved mass of system
			Dyn. Load ratings	Dyn. load moments		Max. permissible moments			Max. permissible forces	
	L_{ca} (mm)	L_W[1] (mm)	C (N)	M_t (Nm)	M_L[2] (Nm)	$M_{x\,max}$ (Nm)	$M_{y\,max}$[3] (Nm)	$M_{z\,max}$[3] (Nm)	$F_{y\,max}$ / $F_{z1\,max}$ / $F_{z2\,max}$ (N)	m_{ca} (kg)
-040-NN-2	135	–	3 750	22.3	129.5	12	65	65	1 875	0.29
-065-NN-3	190	–	16 000	154	569	62	227	227	6 400	1.1
	2 x 190 (2 TT)	variable min = 234 max = 804	32 000	308	4.0 x Lw	123	2.0 x Lw	2.0 x Lw	12 800	2.2
-080-NN-3	190	–	23 400	300	200	120	80	80	9 360	1.4
	260	–	38 000	487	2 470	192	990	990	15 200	2.6
	2 x 260 (2 TT)	variable min = 404 max = 1004	76 000	974	9.5 x Lw	384	4.75 x Lw	4.75 x Lw	30 400	5.2
	360 (with IMS)		38 000	487	2 470	192	990	990	15 200	3.5
-110-NN-3	210	–	28 600	410	290	164	116	116	11 440	2.6
	305	–	46 500	666	2 790	264	1 120	1 120	18 600	4.1
	2 x 305 (2 TT)	variable min = 441 max = 1201	93 000	1332	11.6 x Lw	528	5.80 x Lw	5.80 x Lw	37 200	8.2
	410 (with IMS)	–	46 500	666	2 790	264	1 120	1 120	18 600	4.9
-165-NN-2	400	–	84 100	1 800	5 130	720	2 130	2 130	34 100	11.5

[1] Variable centerline-to-centerline distance defined by customer-built mounting base.
Centerline-to-centerline distance between minimum and maximum distance in 5 mm steps, available in 10 mm on MKR-110.

[2] Determine dynamic longitudinal load moment M_L with variable carriage centerline-to-centerline distance according to the selected centerline-to-centerline distance.

[3] Determine maximum permissible longitudinal moments $M_{y\,max}$ and $M_{z\,max}$ at variable carriage centerline-to-centerline distance according to the selected centerline-to-centerline distance.

[4] Minimum required travel to ensure a reliable lubrication distribution.
For operating conditions, see the “Additional information” chapter.
If values are not met, please contact Bosch Rexroth.

Version/ gear unit	Constant mass calculation		Additional length	Min. travel range	Max. length	Application point of the effective force	Planar moments of inertia	
	$k_{g\ fix}$ (kg)	$k_{g\ var}$ (kg)/mm	L_{ad} (mm)	s_{min} [4] (mm)	L_{max} (mm)	z_1 (mm)	I_y (cm^4)	I_z (cm^4)
MA01 - MA06	0.52	0.0027	10	50	2 500	34.5	10.53	14.61
MG10, MG11	1.43							
0000	0.3	0.006597	180	60	5 900	49.0	78.4	92.5
F010, F011, F020	2.4	0.0068	32					
G010, G011	2.7							
F010, F011, F020	2.4							
G010, G011	2.7							
0000	0.4	0.009875	218	60	6 000	59.5	150	212
F010, F011, F020	3.4	0.0102	17					
G010, G011	4.1							
0000	0.4	0.009875						
F010, F011, F020	3.4	0.0102						
G010, G011	4.1							
F010, F011, F020	3.4							
G010, G011	4.1							
F010, F011, F020	3.4							
G010, G011	4.1							
0000	0.4	0.0156	269	60	9 400	74.5	495	641
F010, F011, F020	6.8	0.0162	11					
G010, G011 (i = 3, i = 5)	7.4							
G010, G011 (i = 10)	7.6							
0000	0.4	0.0156						
F010, F011, F020	6.8	0.0162						
G010, G011 (i = 3, i = 5)	7.4							
G010, G011 (i = 10)	7.6							
F010, F011, F020	6.8							
G010, G011 (i = 3, i = 5)	7.4							
G010, G011 (i = 10)	7.6							
F010, F011, F020	6.8							
G010, G011 (i = 3, i = 5)	7.4							
G010, G011 (i = 10)	7.6							
OA01	29.5	0.0384	40	80	12 000	123.0	2 574	3 527
MA01 – MA03	29.5							
MG01, MG02 (i = 8)	36.0							
MG01, MG02 (i = 12, i = 16)	36.0							

For short product names, see the “Additional information” chapter

Linear Modules MKR

Technical data

Drive data/gear unit data

Observe the chapters on “Calculation” and “General technical instructions”.

MKR	Gear type [1]	Gear ratio i (–)	Max. acceleration torque (at the gear output) M_{Rs} [2] (Nm)	Base friction torque M_{Rge} (Nm)	Max. drive speed n_{ge} [2] (rpm)	
-040-NN-2	PG050	5	14	0.10	8 000	
		10	13	0.10	8 000	
-065-NN-3	PG060	3	45	0.15	13 000	
		5	64	0.10	13 000	
		10	24	0.10	13 000	
-080-NN-3	PG080	3	136	0.60	7 000	
		5	176	0.50	7 000	
		10	61	0.45	7 000	
-110-NN-3	PG080	3	136	0.60	7 000	
		5	176	0.40		
	PG120	3	184	1.20	6 500	
		5	312	0.90		
		10	152	0.65		
-165-NN-2	PG160	8	720	1.20	6 500	
		12	1 280	2.10		
		16	1 280	2.20		

[1] Planetary gearbox
[2] The limit values of the Linear Motion System must not be exceeded. For more information about calculations see the chapter “Calculation principles”.
[3] The clamping hub diameter is reduced by a spacer on the motor shaft diameter.

	Motor type	Mass moment of inertia	Weight	Clamping hub diameter	Motor shaft diameter
		J_{ge} (kgm^2)	m_{ge} (kg)	d_{ge} 3) (mm)	D (mm)
	MSK030C	0.0000055	0.77	11	9 k6
	MSM031B	0.0000055	0.87	11	11 h6
	MSM031C	0.0000200	0.93	14	14 h6
	MSK030C	0.0000055	0.77	11	9 k6
	MSM031B	0.0000055	0.87	11	11 h6
	MSM031C	0.0000200	0.93	14	14 h6
	MS2N03-B	0.0000128	0.90	11	9 k6
	MS2N04	0.0000135	0.90	14	14 k6
	MSM041B	0.0000369	1.20	19	19 h6
	MS2N03-B	0.0000080	0.90	11	9 k6
	MS2N04	0.0000100	0.90	14	14 k6
	MSM031C	0.0000100	0.90	14	14 k6
	MSM041B	0.0000347	1.20	19	19 h6
	MS2N03-B	0.0000065	0.90	11	9 k6
	MS2N04	0.0000085	0.90	14	14 k6
	MSM031C	0.0000085	0.90	14	14 k6
	MSM041B	0.0000345	1.20	19	19 h6
	MS2N04	0.0001521	2.80	14	14 k6
	MS2N05	0.0001521	2.80	19	19 k6
	MSM041B	0.0001521	2.80	19	19 h6
	MS2N04	0.0001290	2.80	14	14 k6
	MS2N05	0.0001290	2.80	19	19 k6
	MSM041B	0.0001290	2.80	19	19 h6
	MS2N04	0.0001246	2.80	14	14 k6
	MS2N05	0.0001246	2.80	19	19 k6
	MSM041B	0.0001246	2.80	19	19 h6
	MS2N06	0.0001520	3.00	24	24 k6
	MS2N06	0.0001290	3.00	24	24 k6
	MS2N07	0.0004723	7.40	32	32 k6
		0.0003995	7.40	32	32 k6
	MS2N06	0.0001378	6.20	32	24 k6
	MS2N07	0.0003744	7.40	32	32 k6
	MSK076C	0.0004630	18.00	32	24 k6
		0.0012400	22.00		
		0.0007500	22.00		

Linear Modules MKR

Technical data

Drive data/gear unit data

Observe the chapters on “Calculation” and “General technical instructions”.

MKR	Gear ratio i (–)	Max. drive torque M_P (Nm)	Lead constant u (mm/rev)	Max. speed v_{max} (m/s)	Carriage L_{ca} (mm)
-040-NN-2	1[1)]	3.9	90.0	3.0	135
	5[2)]	0.78	18.0	2.4	135
	10[2)]	0.39	9.0	1.2	
-065-NN-3	1[1)]	12.0	125.0	5.0	190
	1 (with keyway[3)]			5.0	2 x 190
	3[2)]	4.0	41.67	5.0	190
	5[2)]	2.4	25.00	4.5	2 x 190
	10[2)]	1.2	12.50	2.3	
-080-NN-3	1[1)]	36.0	205.0	5.0	190
					260
	1 (with keyway[3)]	27.0			360 (with IMS)
					2 x 260
	3[2)]	12.0	68.35	5.0	190
	5[2)]	7.2	41.0	3.0	260
	10[2)]	3.6	20.5	1.5	360 (with IMS)
					2 x 260
-110-NN-3	1[1)]	100.0	290.0	5.0	210
					305
	1 (with keyway[3)]	27.0			410 ,(with IMS)
					2 x 305
	3[2)]	33.3	96.53	5.0	210
	5[2)]	20.0	58.00	4.0	305
	10[2)]	10.0	29.00	2.0	410 (with IMS)
					2 x 305
-165-NN-2	1[1)]	367.0	440.0	5.0	400
	1 (with keyway[3)]	200.0			
	8[2)]	45.00	55.00	4.0	400
	12[2)]	30.00	36.70	3.0	
	16[2)]	23.00	27.50	2.0	

[1)] Valid for versions: 1 or 2 drive shafts
[2)] Valid for versions: Clamping hub or clamping hub with 2nd journal
[3)] Version with keyway
[4)] Maximum force that can be transmitted via the teeth meshing with the belt pulley.
[5)] The maximum permitted tensile load on the belt cross section (belt elasticity limit) is given here for easier comparability. This value represents the load limit in terms of plastic deformation and may not be used to calculate the maximum permissible drive torque.

Constants – mass moment of inertia			Frictional torque	Belt pulley diameter	Belt type	Max. belt running power	Elasticity limit	Specific spring rate	Max. acceleration
$k_{J\,fix}$ ($kgmm^2$)	$k_{J\,var}$ (kgmm)	$k_{J\,m}$ (mm^2)	M_{Rs} (Nm)	d_3 (mm)	B_t	F_{bp} [4] (N)	$F_{t\,perm}$ [5] (N)	c_{spe} (N)	a_{max} (m/s^2)
67.84	0.0181	205	0.46	28.65	20AT3	250	760	0.2×10^5	50
72.40									
538.00	0.0832	396	1.20	39.79	32AT5	600	2 240	0.56×10^6	
973.00			1.80						
544.00			1.20						
979.00			1.80						
2157.00	0.3188	1065	1.70	65.27	46AT5	1 100	3 200	0.875×10^6	
3114.00			2.00						
4070.00			2.00						
5660.00			2.90						
2240.00			1.70						
3197.00			2.00						
4153.00			2.00						
5750.00			2.90						
7252.00	1.2326	2125	3.10	92.20	50AT10	2 160	8 500	2.12×10^6	
10441.00			3.90						
12140.00			3.90						
19154.00			5.70						
7482.00			3.10						
10671.00			3.90						
12370.00			3.90						
19385.00			5.70						
70428.00	7.06	4904	14.50	140.05	75AT20	5 250	18 000	4.2×10^6	
72485.00									

Linear Modules MKR

Technical data

Deflection

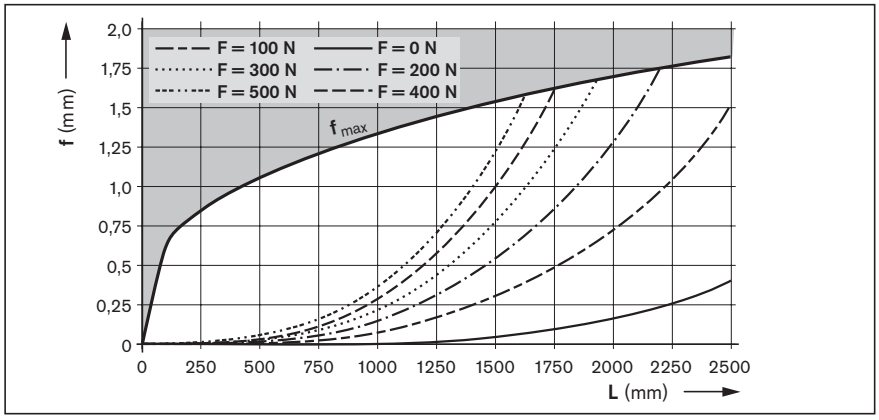
Observe the “General technical instructions” chapter

Example

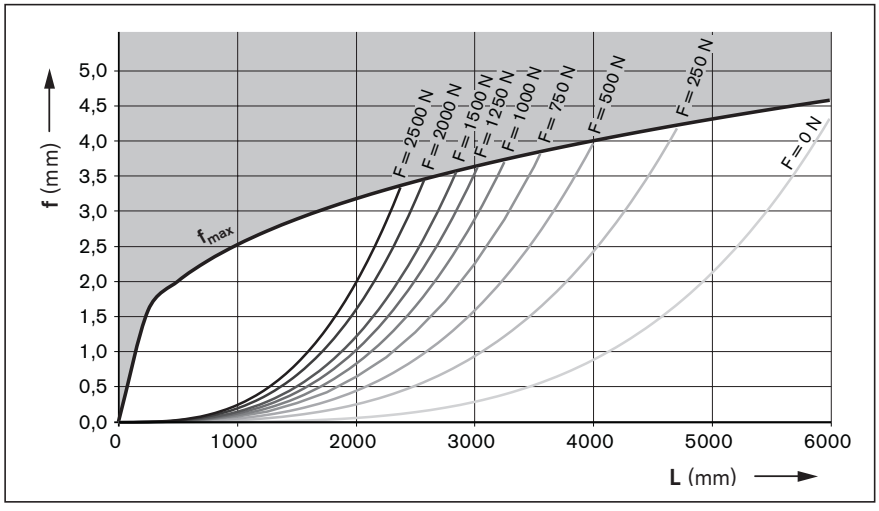
Linear Module MKR-080:
L = 3000 mm, F = 1000 N
From chart 20-80:
f = 1.55 mm f_{max} = 3.75 mm

The deflection f lies well below the maximum permissible deflection f_{max}, so no additional supports are required.

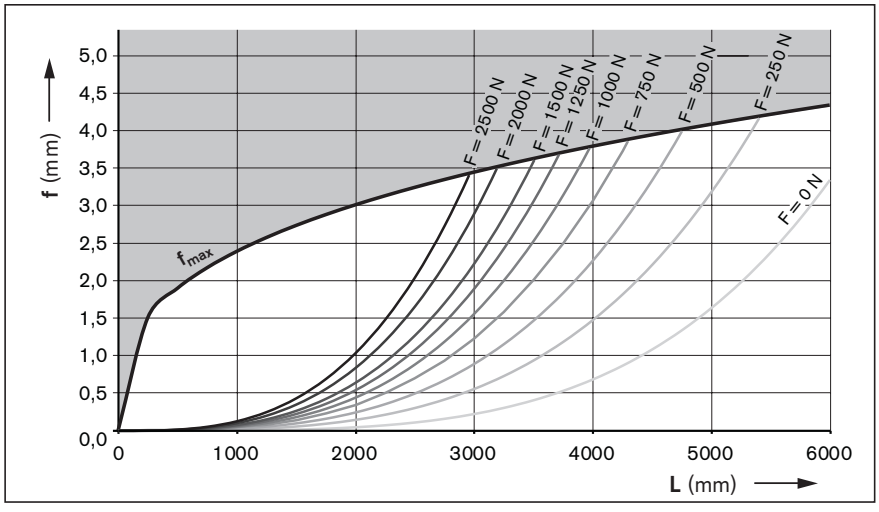
The graphs apply under the following conditions:
- both ends firmly fixed (200 to 250 mm per end)
- 6 to 8 screws per side
- Solid mounting base
- Note L_{max}; see general technical data



MKR-040-NN-2

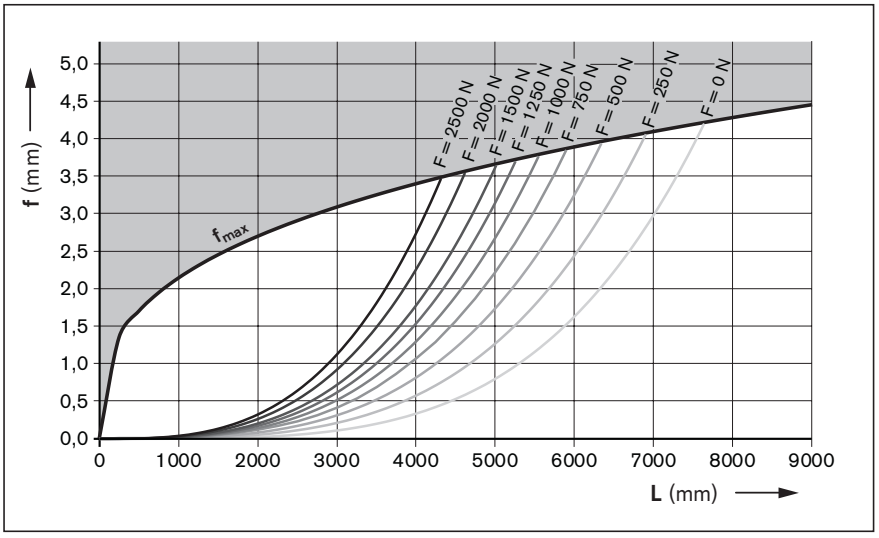


MKR-065-NN-3

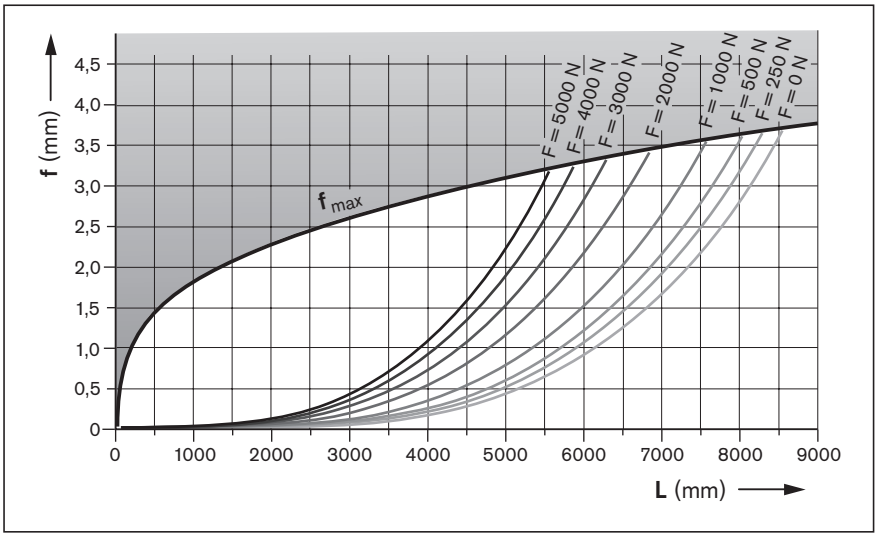


MKR-080-NN-3

MKR-110-NN-3



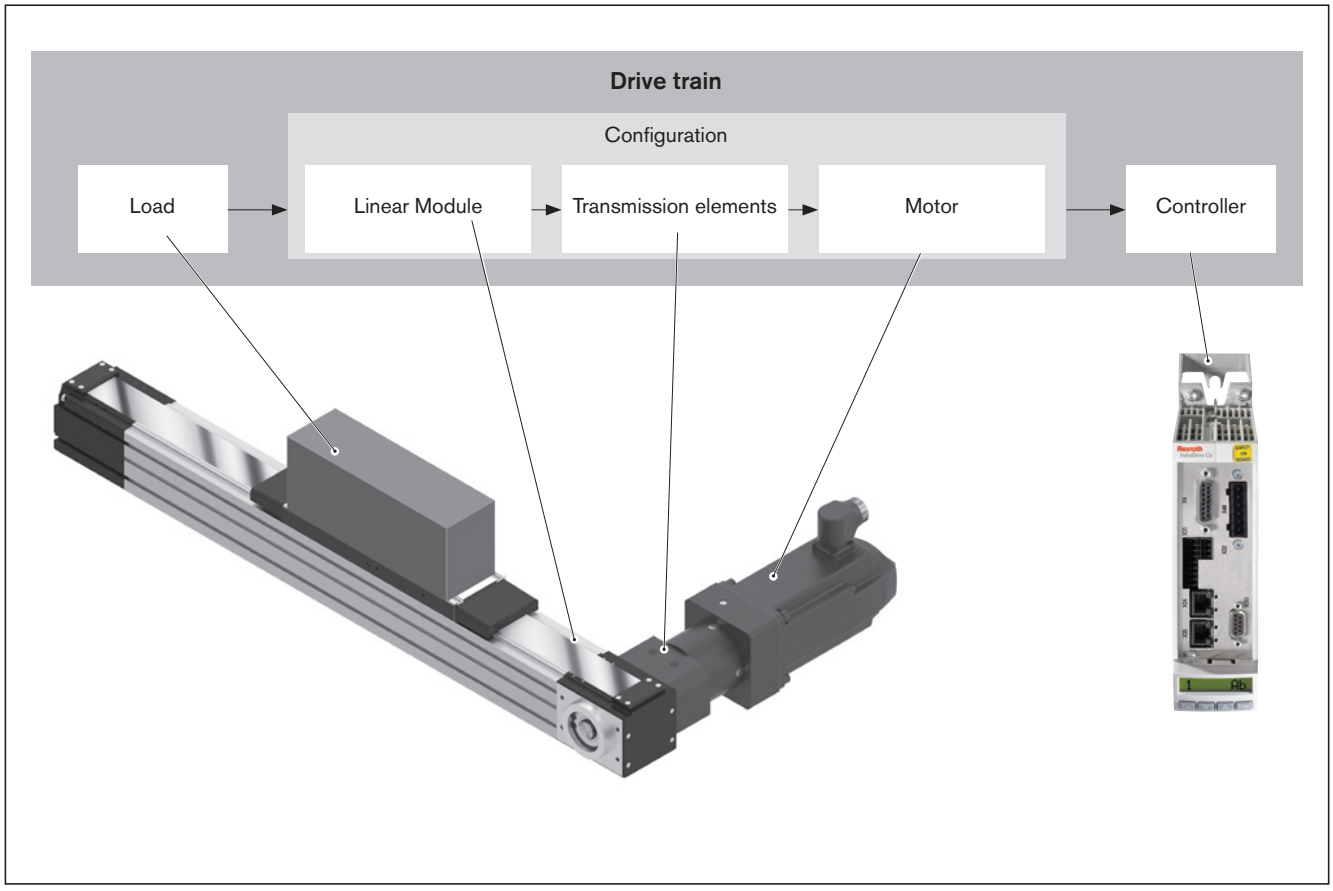
MKR-165-NN-2



Linear Modules MKR

Calculation

Calculation principles



The correct dimensioning and assessment of an application requires structured consideration of the drive train as a whole. The basic element of the drive train is the configuration – made up of the Linear Motion System, the transmission element (gears or directly without transmission element) and the motor – which can be ordered in that constellation in the catalog.

Maximum permissible loads

When selecting Linear Motion Systems, it is essential to consider the upper limits for permissible loads and forces as specified in the chapter on “Technical data” on page 70. The values given there are system-related. In other words, the upper limits are determined not only by the load ratings of the bearing points but also include structural design and material-related considerations.

Conditions for combined loads

$$\frac{|F_y|}{F_{y\,max}} + \frac{|F_z|}{F_{z\,max}} + \frac{|M_x|}{M_{x\,max}} + \frac{|M_y|}{M_{y\,max}} + \frac{|M_z|}{M_{z\,max}} \leq 1$$

Service life of the linear guide

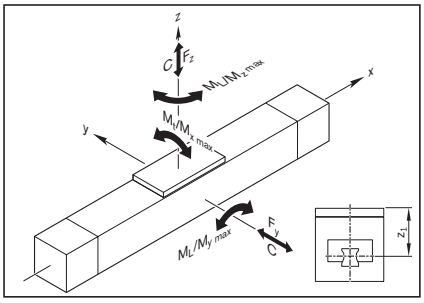
The service life of the rolling bearing points contained in a Linear Motion System can be calculated using the formulas given below. The rolling bearing point that is relevant to the service life in a Linear Motion System with geared belt drive is generally the linear guide.

⚠ **The computed service life specification for the Linear Motion System is determined by the service life specification of the linear guide.**

The linear guide of a Linear Motion System must bear the load and any processing forces.

Combined equivalent load on bearing of the guideway

$$F_{comb} = F_y + F_z + C \cdot \frac{|M_x|}{M_t} + C \cdot \frac{|M_y|}{M_L} + C \cdot \frac{|M_z|}{M_L}$$



Nominal life
Nominal life in meters

$$L = \left(\frac{C}{F_{comb}}\right)^3 \cdot 10^5$$

Nominal life in hours

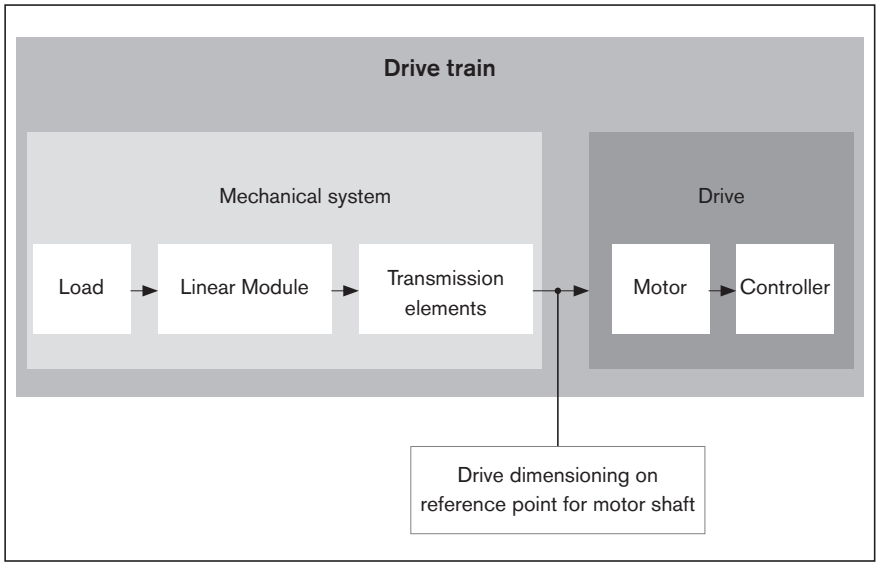
$$L_h = \frac{L}{3\,600 \cdot v_m}$$

Linear Modules MKR

Drive Dimensioning

Basic principles

For drive dimensioning, the drive train can be subdivided into the mechanical system and the drive itself.
The **mechanical** system includes the physical components – Linear Motion System and the transmission elements (gears or directly without transmission element) – and the load to be carried.
The electric **drive** is a motor/controller combination with corresponding performance data.
The dimensioning of the electric drive is done taking the motor shaft as a reference point.
For drive dimensioning, limit values must be taken into account as well as basic values. The limit (i.e. maximum) values must not be exceeded, in order to avoid damaging the mechanical components.



Technical data and formula symbols for the mechanical system

For each component (Linear Motion System, gears), the relevant maximum permissible values for the drive torque and travel speed, as well as the basic values for frictional torque and mass moment of inertia can be found in the chapter ➠ “Drive data” on page 70.
The following technical data with the associated formula symbols are used when considering the basic **mechanical system** requirements in the design calculations for dimensioning the drive. The data in the table below can be found in the “Technical data” section or they are determined using the formulas described on the following pages.

		Mechanical system		
		Load	**Linear Motion System**	**Transmission element Gear reducer**
Weight moment	(Nm)	M_g [5]	–	–
Frictional torque	(Nm)	–[4]	M_{Rs} [3]	M_{Rge} [3]
Mass moment of inertia	(kgm2)	J_t [1]	J_s [2]	J_s [3]
Max. permissible linear speed	(m/s)	–	v_{max} [3]	–
Max. permissible rotary speed	(rpm)	–	n_p [1]	n_{ge} [3]
Max. permissible drive torque	(Nm)	–	M_p [3]	M_{Rs} [3]

[1] Determine the value using the appropriate formula
[2] Length-dependent value, determined using the appropriate formula
[3] Use the value from the table
[4] Any additional process forces are to be taken into consideration as load moments
[5] For vertical mounting position: Determine the value using the appropriate formula

Drive dimensioning on reference point for motor shaft

When dimensioning the drive, all relevant design calculation values for the mechanical components in the drive train have to be determined and be expressed, or reduced to the motor shaft. For a combination of mechanical components within the drive train, this will result in one value for each of the following:

- Frictional torque M_R
- Mass moment of inertia J_{ex}
- Maximum permissible speed v_{mech} (maximum permissible rotary speed n_{mech})
- Max. permissible drive torque M_{mech}

Determination of the values for the mechanical system **in the drive train, based on the motor shaft as reference point**

Frictional torque M_R

For direct motor attachment (without gear)

$$M_R = M_{Rs}$$

For motor attachment via gear reducer

$$M_R = M_{Rge} + \frac{M_{Rs}}{i}$$

Mass moment of inertia J_{ex}

For direct motor attachment (without gear)

$$J_{ex} = J_s + J_t$$

For motor attachment via gear reducer

$$J_{ex} = J_{ge} + \frac{(J_s + J_t)}{i^2}$$

Mass moment of inertia for Linear Motion System components

$$J_s = (k_{J\,fix} + k_{J\,var} \cdot L) \cdot 10^{-6}$$

Determination of translatory mass moment of inertia of the external load

$$J_t = m_{ex} \cdot k_{J\,m} \cdot 10^{-6}$$

Linear Modules MKR

Drive dimensioning

Maximum permissible speed v_{mech} (max. permissible speed n_{mech})
The lowest of all the values for maximum permissible speed or rpm of all mechanical components contained in the drive train determines the maximum permissible speed of the mechanical system which has to be taken into consideration as the upper limit for the drive when sizing the motor.

Maximum permissible linear speed
For direct motor attachment (without gear)

$$v_{mech} = v_{max}$$

$$v_{mech} = \frac{n_{mech} \cdot \pi \cdot d_3}{1000 \cdot 60}$$

For motor attachment via gear reducer

$$v_{mech} = \frac{n_{mech} \cdot \pi \cdot d_3}{i \cdot 1000 \cdot 60}$$

Maximum permissible rotary speed
For direct motor attachment (without gear)

$$n_{mech} = \frac{v_{mech} \cdot i \cdot 1000 \cdot 60}{\pi \cdot d_3}$$

$$n_{mech} = n_p$$

For motor attachment via gear reducer

$$n_{mech} = \text{minimum}\ (n_p \cdot i\ ;\ n_{ge})$$

$$n_p = \frac{v_{max} \cdot 1000 \cdot 60}{\pi \cdot d_3}$$

Max. permissible drive torque M_{mech}
The lowest (minimum) of all the values for permissible drive torque of all mechanical components contained in the drive train determines the maximum permissible drive torque of the mechanical system which has to be taken into consideration as the upper limit for the drive when sizing the motor.

For direct motor attachment (without gear)

$$M_{mech} = M_p$$

For motor attachment via gear reducer

$$M_{mech} = \text{Minimum}\left(\frac{M_{ge}}{i}\ ;\ \frac{M_p}{i}\right)$$

⚠ **When considering the complete drive train (mechanical system + motor/controller), the maximum torque of the motor can lie below the maximum value for the mechanical system (M_{mech}) and thus limit the maximum permissible drive torque of the overall drive train.**
If the maximum torque of the motor lies above the upper limit for the mechanical system (M_{mech}), the maximum motor torque must be limited to the permitted value for the mechanical system.

Rough guide for motor selection

The following conditions can be used as a rough guide for preselecting the motor.

Condition 1:

The rotary speed of the motor must be greater than or equal to the rotary speed required for the mechanical system (but not exceeding the maximum permissible limit value).

$$n_{max} \geq n_{mech}$$

Condition 2:

Consideration of the ratio of mass moments of inertia of the mechanical system and the motor. The ratio of the mass moments of inertia serves as an indicator for the control performance of a motor/controller combination. The mass moment of inertia of the motor is directly related to the motor size.

Ratio of mass moments of inertia

$$V = \frac{J_{ex}}{J_m + J_{br}}$$

For preselection, experience has shown that the following ratios will result in high control performance. These are not rigid limits, but values exceeding them will require closer consideration of the specific application.

Application area	V
Handling	≤ 6.0
Processing	≤ 1.5

Condition 3:

Estimation of the ratio of the static load moment to the continuous torque of the motor. The torque ratio must be smaller than or equal to the empirical value of 0.6. By looking at the required motor torque levels, this estimation roughly covers the dynamic v characteristics which still have be determined by plotting an exact motion profile.

Torque ratio

$$\frac{M_{stat}}{M_0} \leq 0.6$$

Static load moment

$$M_{stat} = M_R + M_g$$

Weight moment
For vertical mounting only!

$$M_g = \frac{d_3 \cdot (m_{ex} + m_{ca}) \cdot g}{2000 \cdot i}$$

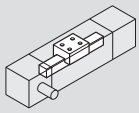
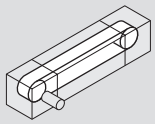
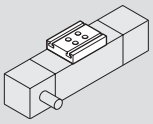
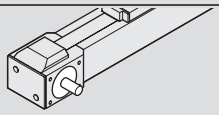
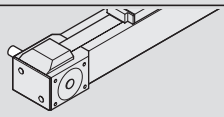
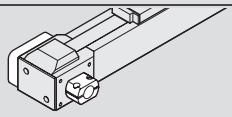
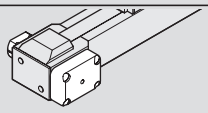
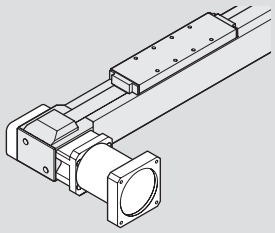
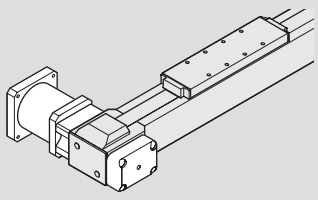
In the chapter ➠"Configuration and ordering" users can put together standard configurations, including gears and motor, for the various Linear Motion System sizes by selecting the appropriate options. By checking the above conditions, it is possible to see whether a standard motor selected in a particular configuration will generally be of a suitable size for the specific application.

Precise drive dimensioning

Preselecting the motor according to this rough guide is no substitute for the required precise design calculations for the drive, taking all moments/torques and speed levels into account. For precise calculation of the electric drive, including consideration of the specific motion profile, please refer to the performance data in the catalog “Rexroth Drive technology”.
When dimensioning the drive, the maximum permitted values for linear speed, drive torque and acceleration must not be exceeded, in order to avoid damaging the mechanical system.

Linear Modules MKR

MKR-040-NN-2 Configuration and ordering data

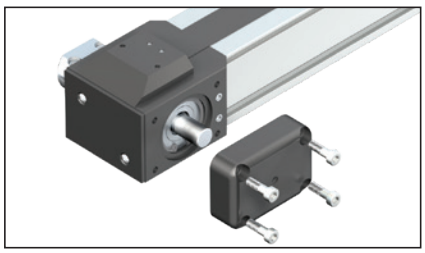
Short product name, length MKR-040-NN-2, … mm		Guideway		Drive		Carriage	
							
Version[1]		Frame without center holes	Frame with center holes	Drive journal		L_{ca} = 135 mm	
With drive (MA)	MA01 	01	03	Journal at right	01	01	
	MA02 	01	03	Journal at left	02		
	MA05 	01	03	Tubular Shaft at right	05		
	MA06 	01	03	Tubular Shaft at left	06		
With gear reducer (MG)	MG10 	01	03	Gear reducer at right	11	01	
	MG11 	01	03	Gear reducer at left	12		

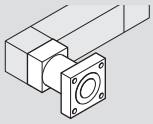
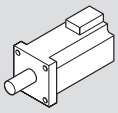
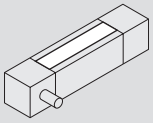
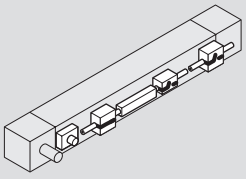
[1] Without drive: see MKK-040-NN-2
[2] Attachment kit also available without motor (when ordering: enter “00” for motor)
[3] Plastic sealing strip

Length calculation ➠ see chapter “General technical instructions”

Drive journal

Versions MA05, MA06, MG10 and MG11 also offer a drive journal, which can be accessed by removing the screws and the cover.



Motor attachment				Motor		Cover		Switches / Mounting duct / Socket-plug	Documentation	
										
Gear ratio i =	Attachment kit[2] with gear reducer	for motor		without	with	without	with		Standard report	Measure-ment report
				Brake		Sealing strip[3]				
–	00	–		00						
–	00	–		00						
–	00	–		00						
–	00	–		00						
i = 5	13	MSM031B		136	137	00	01		01	02 Frictional torque 05 Positioning accuracy
i = 10	14									
i = 5	15	MSM031C		138	139					
i = 10	16									
i = 5	11	MSK030		84	85					
i = 10	12									

Without switch mounting	00

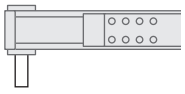
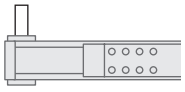
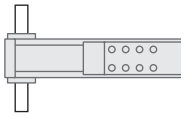
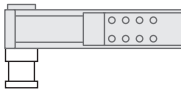
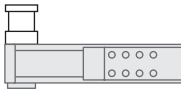
Proximity switch			
PNP NC	36	Switching cam	18
PNP NO	38	Cable duct	25
		Socket-plug	28

Magnetic field sensor with cable			
Reed sensor	51	Cable duct	25
Hall sensor PNP NC	52	Socket plug	28

Magnetic field sensor with connector	
Reed sensor	58
Hall sensor PNP NC	59

Linear Modules MKR

MKR-065-NN-3 Configuration and ordering data

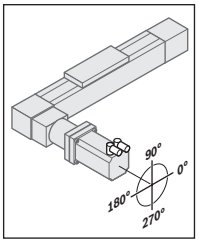
$s_{max.}$[1] (mm)	Material pairing[2]	Lubrication[3]	Carriage (TT) T-slot (S) Thread (T)	Carriage (TT) Long (L)	Carriage (TT) Number TT	L_w (mm) (2 TT only)	Guideway[4] Frame with or without center holes	Version
s_{max}=	ALST	LSS	S	L	2	L_w =	001 without	F010 
			S	L				
			T	L				
		LCF	S	L	1	–		F011 
		LCO					004 with	
		LPG	T					F020 
	ALCR	LSS	S	L	1	–	011 without	G010 
		LCF						
		LCO	T				014 with	G011 
		LPG						

[1] Travel range s_{max} dependent on length L and option selection. ➠ see chapter “General technical instructions”
[2] Material pairing ➠ see chapter “Product description MKR-xxx-NN-3”.
[3] Lubrication ➠ see chapter “Additional information”.
[4] Frame with center holes only possible up to a length of L = 5 500 mm.
[5] Mounting kit with gear unit also available without motor.
[6] Further switch mounting options ➠ see chapter “Switching system”.

Drive			Attachment interface[5]	Gear reducer		Motor					Cover		Sensor system[6]	Documentation
Without slot	with keyway	Clamping hub		Gear ratio	Mechanical interface	Motor code	Connection 1 cable	Connection 2 cable	Holding brake with	Holding brake without	Motor connector position	Cover	Side sealing	Number: 1 - 6	
001	003	–	–	–	–	–	–		–	–	–	0 without	0 without	000 = without sensor 120 sensor (PNP/normally closed (NC)); 121 sensor (NPN/normally closed (NC)) 122 sensor (PNP/normally open (NO)); 123 sensor (NPN/normally open (NO))	001 standard; 002 frictional torque; 005 positioning accuracy
002	004														
–	–	006	000	i = 1	–	–	–		–	–	–	2 with	0 without		
			011	i = 3 i = 5 i = 10	MS2N03-D	MS2N03-D0BYN	1	2	Y	N	000				
					MS2N04	MS2N04-B0BTN	1	2			090		1 with		
						MS2N04-C0BTN									
		016 With second journal				MS2N04-D0BQN					180				
					MSM031C	MSM031C-0300	–	2							
					MSM041	MSM041B-0300	–	2			270				

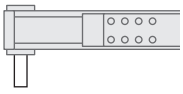
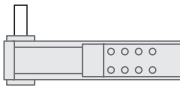
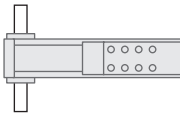
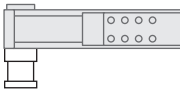
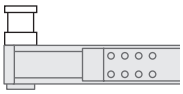
Version	Motor connector position			
	0°	90°	180°	270°
G010 / G011	000	090 ★	180	270

★ standard delivery (connector orientation)



Linear Modules MKR

MKR-080-NN-3 Configuration and ordering data

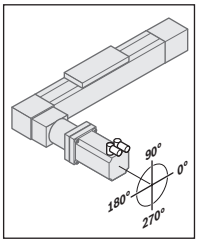
$s_{max.}$[1] (mm)	Material pairing[2]	Lubrication[3]	IMS- A[4]	Carriage (TT) T-slot (S) Thread (T)	Carriage (TT) Short (S) Long (L)	Carriage (TT) Number TT	L_w (mm) (2 TT only)	Guideway[5] Frame with or without center holes	Version
s_{max}=	ALST	LSS	001 HF	S	L	1	–	104 with	F010 
			002 DQ	T					
			–	S	L	2	L_w=	001 without	F011 
		LCF	–	S	S	1	–		
		LCO	–	T	L			004 with	F020 
		LPG	–						
	ALCR	LSS		S	S	1	–	011 without	G010 
		LCF	–						
		LCO	–	T	L			014 with	G011 
		LPG	–						

[1] Travel range s_{max} dependent on length L and option selection. ➠ see chapter “General technical instructions”
[2] Material pairing ➠ see chapter “Product description MKR-xxx-NN-3”.
[3] Lubrication ➠ see chapter “Additional information”.
[4] Absolute measuring system, L_{max} = 4 500 mm (HF = HIPERFACE® interface, DQ = DRIVE-CLiQ interface).
[5] Frame with center holes only possible up to a length of L = 5 500 mm.
[6] Mounting kit with gear unit also available without motor.
[7] Further switch mounting options ➠ see chapter “Switching system”.

Drive			Attachment interface[6]	Gear reducer		Motor					Cover		Sensor system[7]	Documentation
Without slot	with keyway	Clamping hub		Gear ratio	Mechanical interface	Motor code	Connection: 1 cable	Connection: 2 cable	Holding brake: with	Holding brake: without	Motor connector position	Cover	Side sealing	Number: 1 - 6	
001	003	–	–	–	–	–	–		–	–	–	0 without	0 without	000 = without sensor 120 sensor (PNP/normally closed (NC)); 121 sensor (NPN/normally closed (NC)) 122 sensor (PNP/normally open (NO)); 123 sensor (NPN/normally open (NO))	001 standard; 002 frictional torque; 005 positioning accuracy
002	004														
–	–	006	000	i = 1	–	–	–		–	–	–	2 with	0 without		
			011	i = 3 i = 5 i = 10	MSM041	MSM041B-0300	–	2	Y	N	000				
					MS2N05	MS2N05-B0BTN	1	2			090				
						MS2N05-C0BTN							1 with		
		016 with second journal				MS2N05-D0BRN					180				
					MS2N06	MS2N06-B1BNN	1	2			270				
						MS2N06-D1BNN									

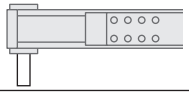
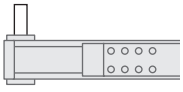
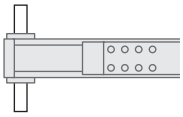
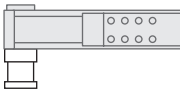
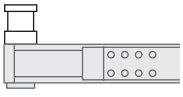
Version	Motor connector position			
	0°	90°	180°	270°
G010 / G011	000	090 ★	180	270

★ standard delivery (connector orientation)



Linear Modules MKR

MKR-110-NN-3 Configuration and ordering data

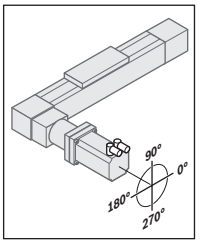
$s_{max.}$[1] (mm)	Material pairing[2]	Lubrication[3]	IMS- A[4]	Carriage (TT) T-slot (S) Thread (T)	Carriage (TT) Short (S) Long (L)	Carriage (TT) Number TT	L_w (mm) (2 TT only)	Guideway[5] Frame with or without center holes	Version
	ALST	LSS	001 HF	S	L	1	–	104 with	F010 
			002 DQ	T					
		LSS	–	S	L	2	L_w=	001 without	F011 
		LCF	–	S	S	1	–		
		LCO	–	T	L			004 with	F020 
s_{max}=		LPG	–						
	ALCR	LSS		S	S	1	–	011 without	G010 
		LCF	–						
		LCO	–	T	L			014 with	G011 
		LPG	–						

[1] Travel range s_{max} dependent on length L and option selection. ➠ see chapter “General technical instructions”
[2] Material pairing ➠ see chapter “Product description MKR-xxx-NN-3”.
[3] Lubrication ➠ see chapter “Additional Information”.
[4] Absolute measuring system, L_{max} = 4 500 mm (HF = HIPERFACE® interface, DQ = DRIVE-CLiQ interface).
[5] Frame with center holes only possible up to a length of L = 5 500 mm.
[6] Mounting kit with gear unit also available without motor.
[7] Further switch mounting options ➠ see chapter “Switching system”.

Drive			Attachment interface[6]	Gear reducer		Motor					Cover		Sensor system[7]	Documentation
Without slot	with keyway	Clamping hub		Gear ratio	Mechanical interface	Motor code	Connection: 1 cable	Connection: 2 cable	Holding brake: with	Holding brake: without	Motor connector position	Cover	Side sealing	Number: 1 - 6	
001	003	–	–	–	–	–	–		–	–	–	0 without	0 without	000 = without sensor 120 sensor (PNP/normally closed (NC)); 121 sensor (NPN/normally closed (NC)) 122 sensor (PNP/normally open (NO)); 123 sensor (NPN/normally open (NO))	001 standard; 002 frictional torque; 005 positioning accuracy
002	004														
–	–	006	000	i = 1	–	–	–		–	–	–	2 with	0 without		
			011	i = 3 i = 5	MS2N06	MS2N06-B1BNN	1	2	Y	N	000 090 180 270				
		016 with second journal				MS2N06-D1BNN									
		008	000	i = 1	–	–	–		–	–	–		1 with		
			012	i = 10	MS2N06	MS2N06-B1BNN	1	2	Y	N	000 090 180 270				
						MS2N06-D1BNN									
		018 with second journal		i = 3 i = 5 i = 10	MS2N07	MS2N07-B1BNN									
						MS2N07-C1BRN									
						MS2N07-D1BNN									

Version	Motor connector position			
	0°	90°	180°	270°
G010 / G011	000	090 ★	180	270

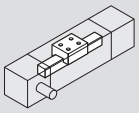
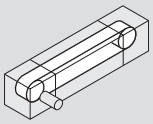
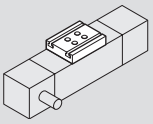
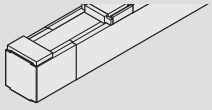
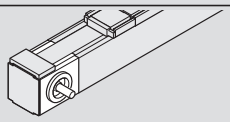
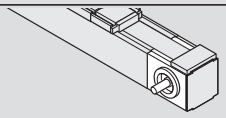
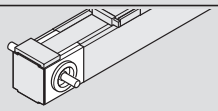
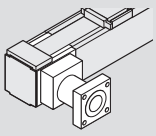
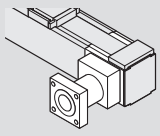
★ standard delivery (connector orientation)



Linear Modules MKR

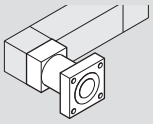
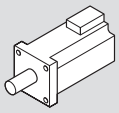
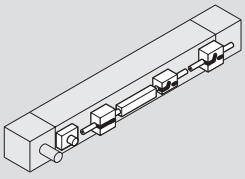
MKR-165-NN-2

Configuration and ordering data

Short product name, length MKR-165-NN-2, … mm		Guideway	Drive				Carriage	
								
Version			Drive journal	Gear ratio i = 1 [1]	 i = 1 [2]	with gear reducer	L_{ca} = 400 mm	
Without drive	OA01 	01		50			05	
With drive (MA), without gear reducer i = 1	MA01 	01	Right	01	03	–		
	MA02 	01	Left	01	03	–		
	MA03 	01	On both sides	02	04	–		
With gear (MG), external gear reducer	MG01  MG02 	01	Gear reducer right/left	–	–	30 31 with second journal		

[1] Without keyway
[2] With keyway
[3] Attachment kit also available without motor (when ordering: enter “00” for motor)

Length calculation ➠ see chapter “General technical instructions”

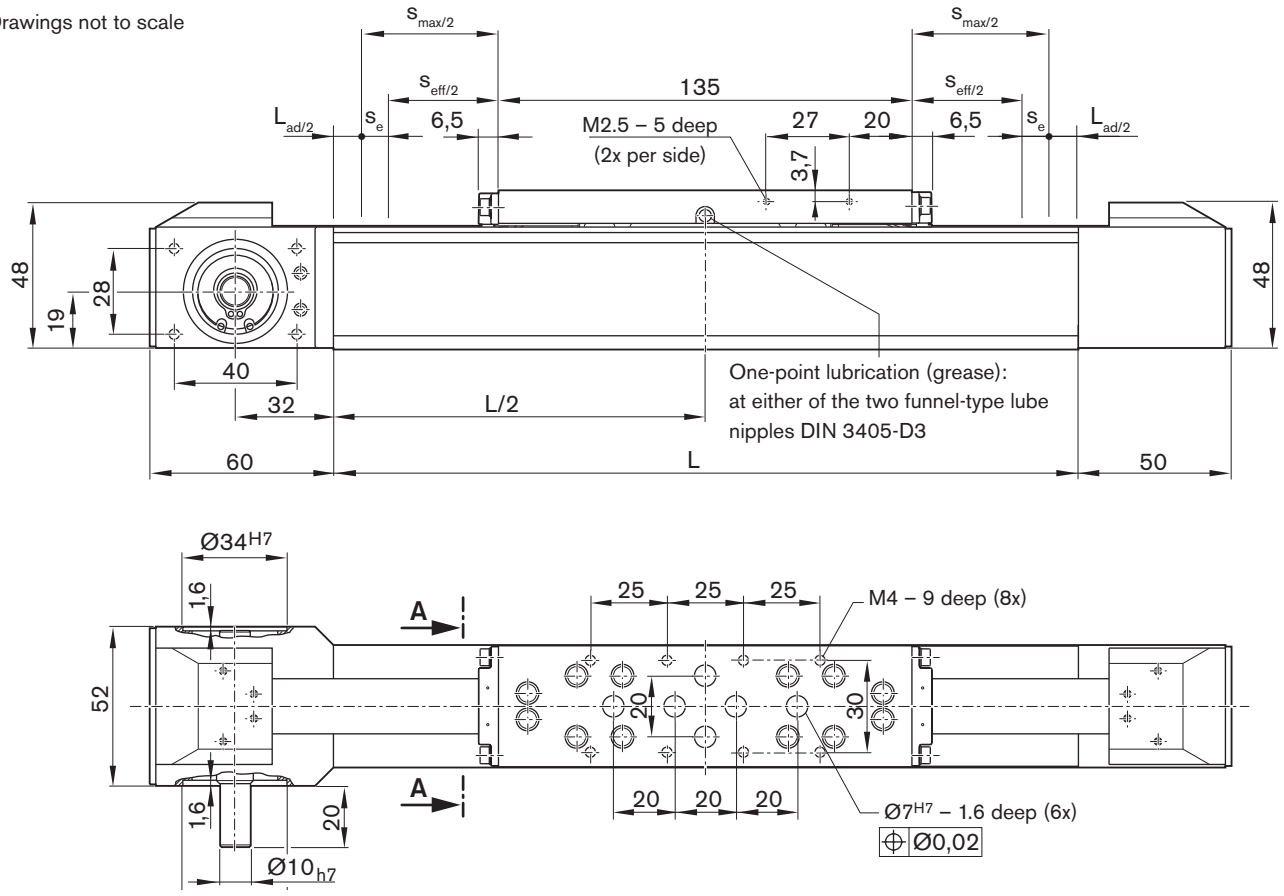
Motor attachment				Motor		Switches / Mounting duct / Socket-plug		Documentation	
									
Gear ratio i =	Attachment kit [3]	for motor		without Brake	with Brake			Standard report	Measurement report
–	00	–		00			00	01	02 Frictional torque 05 Positioning accuracy
–	00	–		00		**Without switch and mounting duct**			
–	00	–		00		**Switches:** – PNP NC – PNP NO – Mechanical	11 13 15		
–	00	–		00		**Cable duct (loose)**	20		
						External socket/plug (loose)	17		
i = 8	10	MSK076C		92	93	**Switching cam at one end**	16		
i = 12	20					**Switching cam at both ends**	26		
i = 16	30								

Linear Modules MKR

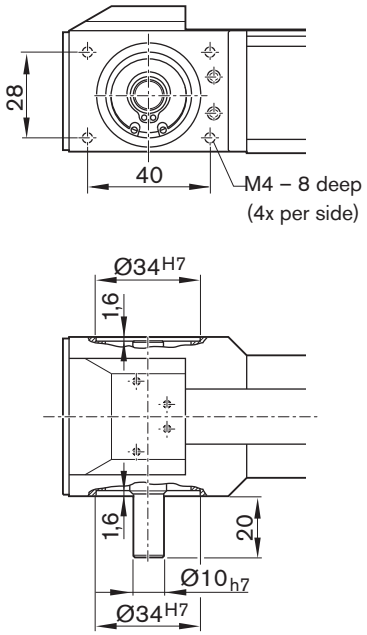
MKR-040-NN-2

Dimension drawings

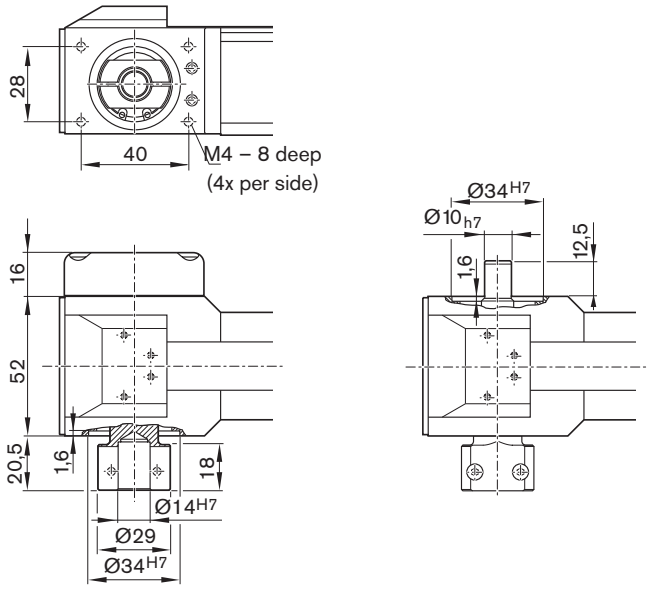
All dimensions in mm.
Drawings not to scale



MA01, MA02

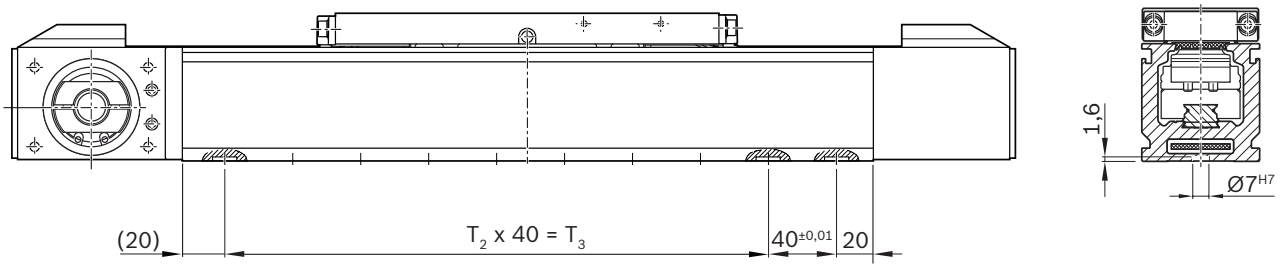


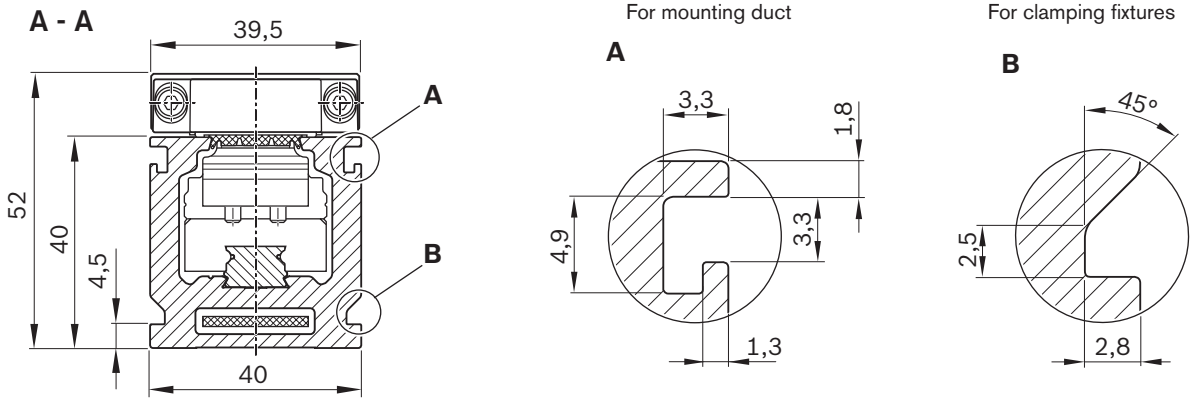
MA05, MA06



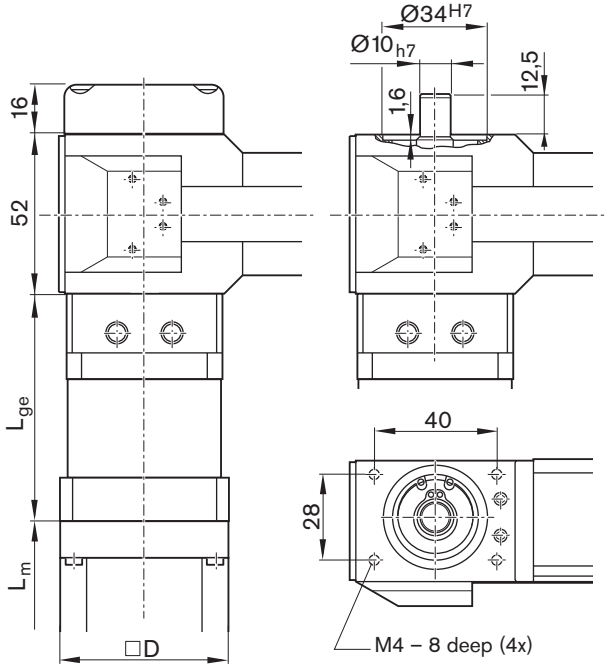
A second journal can be accessed by removing the cover.

Optional frame with center holes





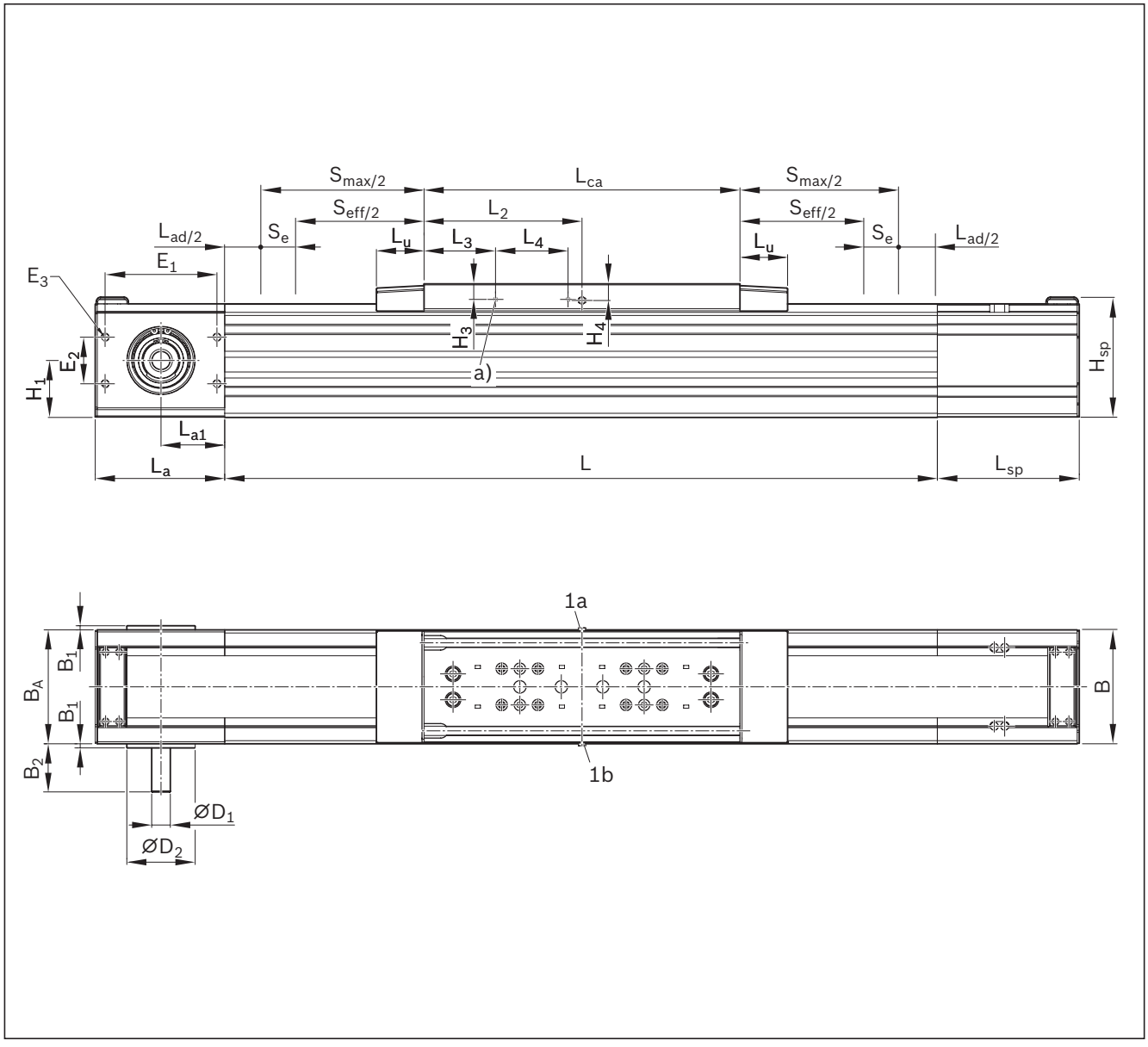
MG10, MG11



Version	Motor	Dimensions (mm)			
		D	L_{ge}	L_m without brake	L_m with brake
MG10, MG11	MSM031B	60	101	79.0	115.5
	MSM031C	60	111	98.5	135.0
	MSK030C	54	91	188.0	213.0

Linear Modules MKR

MKR-065/-080/-110/-NN-3 Frame dimension drawings



1a / 1b lube fitting for guideway: Lubrication optionally on one of the two connections. (Funnel-type lube nipple DIN 3405-AM6)

a) Fastening thread M4-10 deep (4x) for stepping angle

b) For drive option: Clamping hub with second journal (Ø D_1 x B_2)

MKR	Dimensions (mm)																		
	B	B_A	B_1	B_2	B_S	Ø D_1 h7	Ø D_2 h7/H7	E_1	E_2	E_3	H	H_1	H_3	H_4	H_{sp}	L_{ca}	L_2	L_3	L_4
-065-NN-3	65	80	-5	30.0	–	16	47	60	49	M5	85	30.5	13.5	13.5	75	190	95.0	60.0	
-080-NN-3	80	80	10	53.0	–	18	66	84	39	M6	100	41.0	11.5	12.5	90	190	140.5	47.5	
-080-NN-3																260	130.0	47.5	70
-110-NN-3	110	110	4	46.5	85	18	66	108	45	M8	129	55.0	15.0	16.0	115	210	153.0	50.0	
-110-NN-3																305	152.5	69.0	

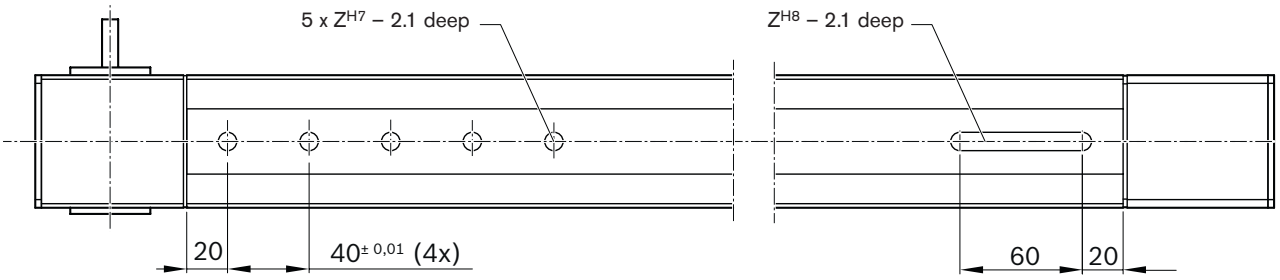
Note: all dimensions in mm. Drawings not schematically to scale. Detailed contours and dimensions can be found in the CAD model.

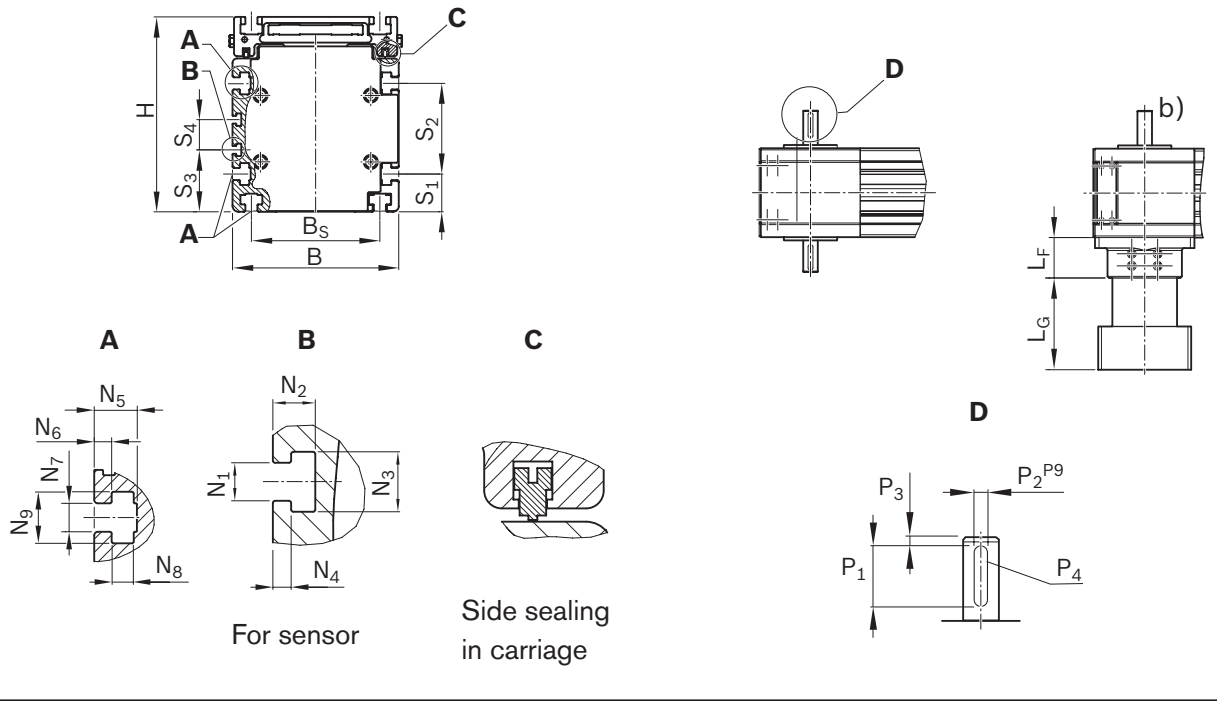
CAD configurator available on the Internet at www.boschrexroth.com “Product configurators”.

See following pages for dimension drawings for carriages and motor attachment.

* Depends upon motor

Optional frame with center holes and elongated hole in the bottom area



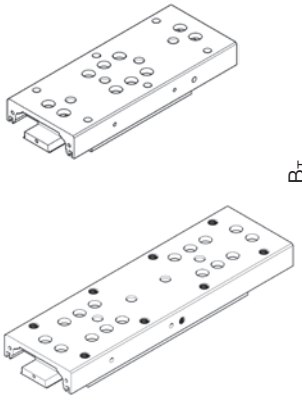


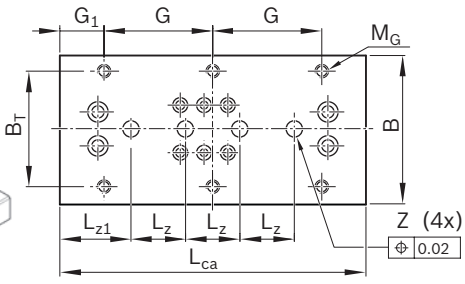
	La	La1	LF*	LG*	Lu	Lsp	Sliding block	N1	N2	N3	N4	N5	N6	N7	N8	N9	P1	P2 P9	P3	P4 deep	S1	S2	S3	S4	ØZ
	80	44.0	36.5	85.5	10	74	DIN557–M5	5.2	5.9	8.2	2.5	8.5	2.5	5.2	5.0	9.0	25	5	3.0	3.5	18	26	30	–	9
	102	50.0	54.0	104.0	50	103	DIN557–M5	5.2	5.9	8.2	2.5	8.5	2.5	5.2	5.0	9.0	32	6	2.0	3.5	18	45	42.5	–	9
	125	61.5	62.0	139.0	46	137	DIN508–M6	5.2	5.9	8.2	2.5	12.0	4.9	8.0	6.2	14.5	32	6	2.0	3.5	25	60	41	20	12

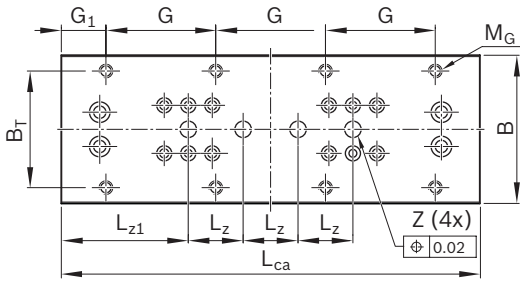
Linear Modules MKR

MKR-065/-080/-110/-NN-3 Carriage dimension drawings

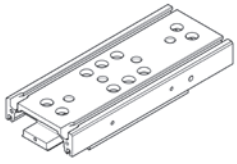
Carriage with thread (short / long)

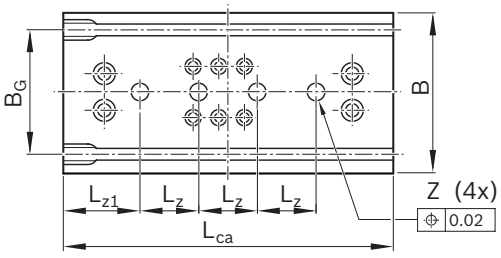


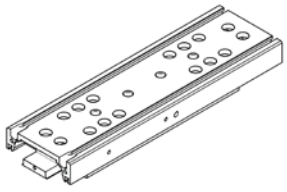


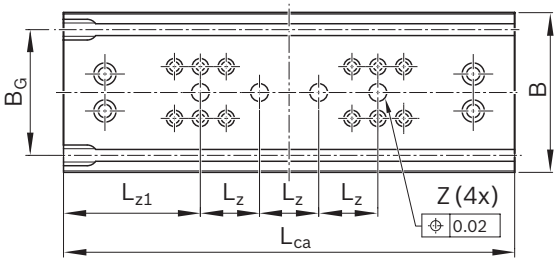


Carriage with T-slots (short / long)

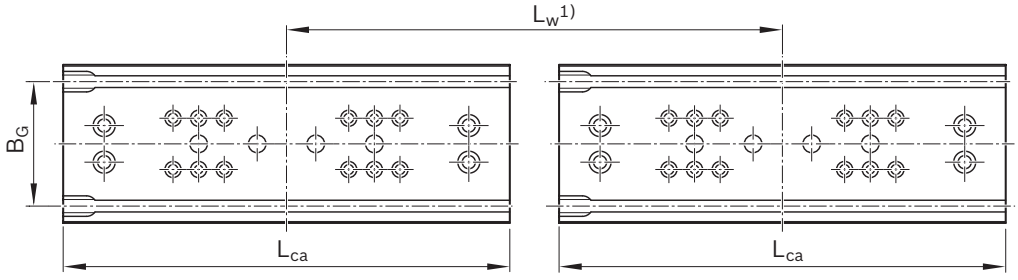








2 long carriages With T-slots (optional)

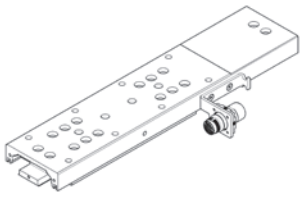


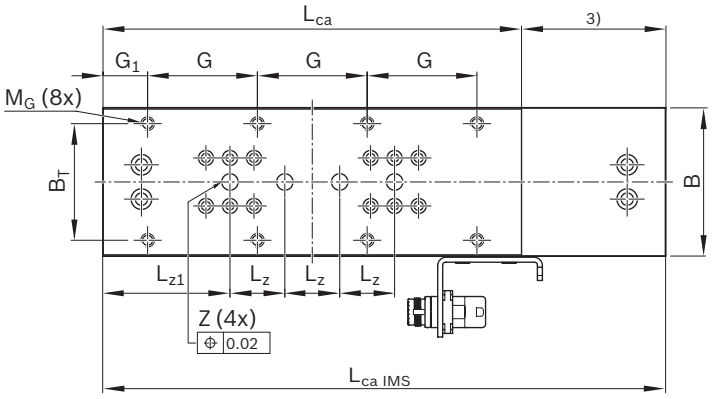
MKR	Dimensions (mm)												
	B	B_G	B_{IMS}	B_T	G	G_1	H_{IMS}	L_{ca}	$L_{ca\ IM\ S}$ 2)	$L_{w\ min}$	$L_{w\ max}$	L_z	L_{z1}
-065-NN-3 long TT	63	46	–	46	50	20.0	–	190	–	234	804	40	35.0
-080-NN-3 short TT	78	60	–	60	70	25.0	–	190	–			40	25.0
-080-NN-3 long TT	78	60	126	60	70	25.0	6.5	260	360	404	1004	40	70.0
-110-NN-3 short TT	108	85	–	85	80	32.5	–	210	–			40	45.0
-110-NN-3 long TT	108	85	156	85	80	32.5	8.0	305	410	441	1201	40	92.5

1) Variable centerline-to-centerline distance defined by customer-built mounting base.
Centerline-to-centerline distance between minimum and maximum distance in 5 mm steps, available in 10 mm steps on MKR-110.

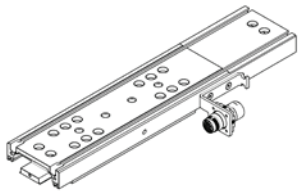
2) Clamping surface corresponds to L_{ca}

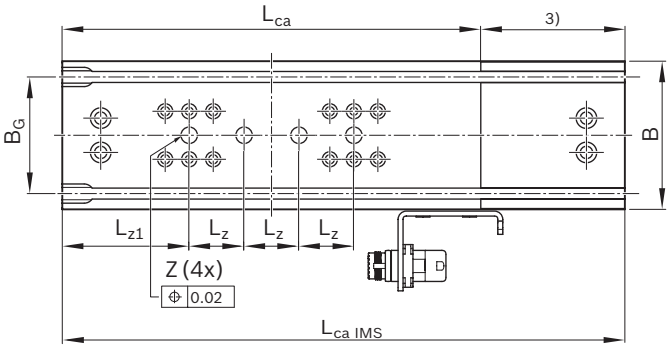
Carriage with threads and IMS



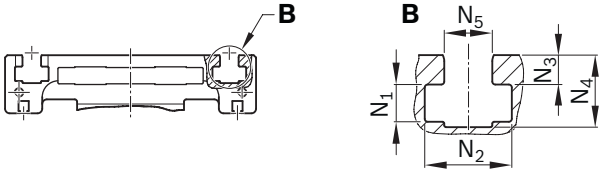


Carriage with T-slots and IMS

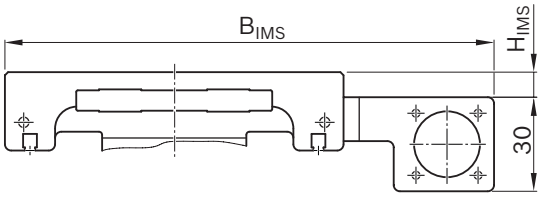




T-slots



IMS connector



M_G	Sliding block	N_1	N_2	N_3	N_4	N_5	ØZ
M6–9 deep (8x)	DIN557–M5	5.0	9.0	2.5	8.5	5.2	9H7–2.1 deep
M8–10 deep (6x)	DIN557–M5	5.0	9.0	2.5	8.5	5.2	9H7–2.1 deep
M8–10 deep (8x)	DIN557–M5	5.0	9.0	2.5	8.5	5.2	9H7–2.1 deep
M10–12 deep (6x)	DIN508–M6	6.2	14.5	4.9	12.0	8.0	12H7–2.1 deep
M10–12 deep (8x)	DIN508–M6	6.2	14.5	4.9	12.0	8.0	12H7–2.1 deep

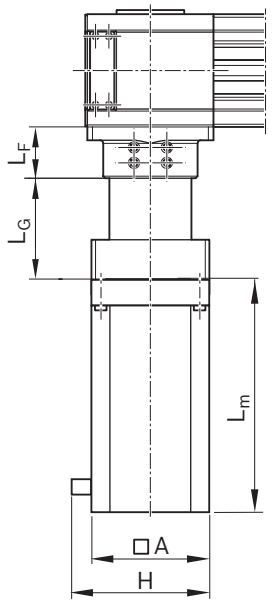
[3] Non-usable clamping surface

All dimensions in mm. Drawings not to scale

Linear Modules MKR

MKR-065/-080/-110/-NN-3 Motor attachment dimension drawings

All dimensions in mm. Drawings not to scale



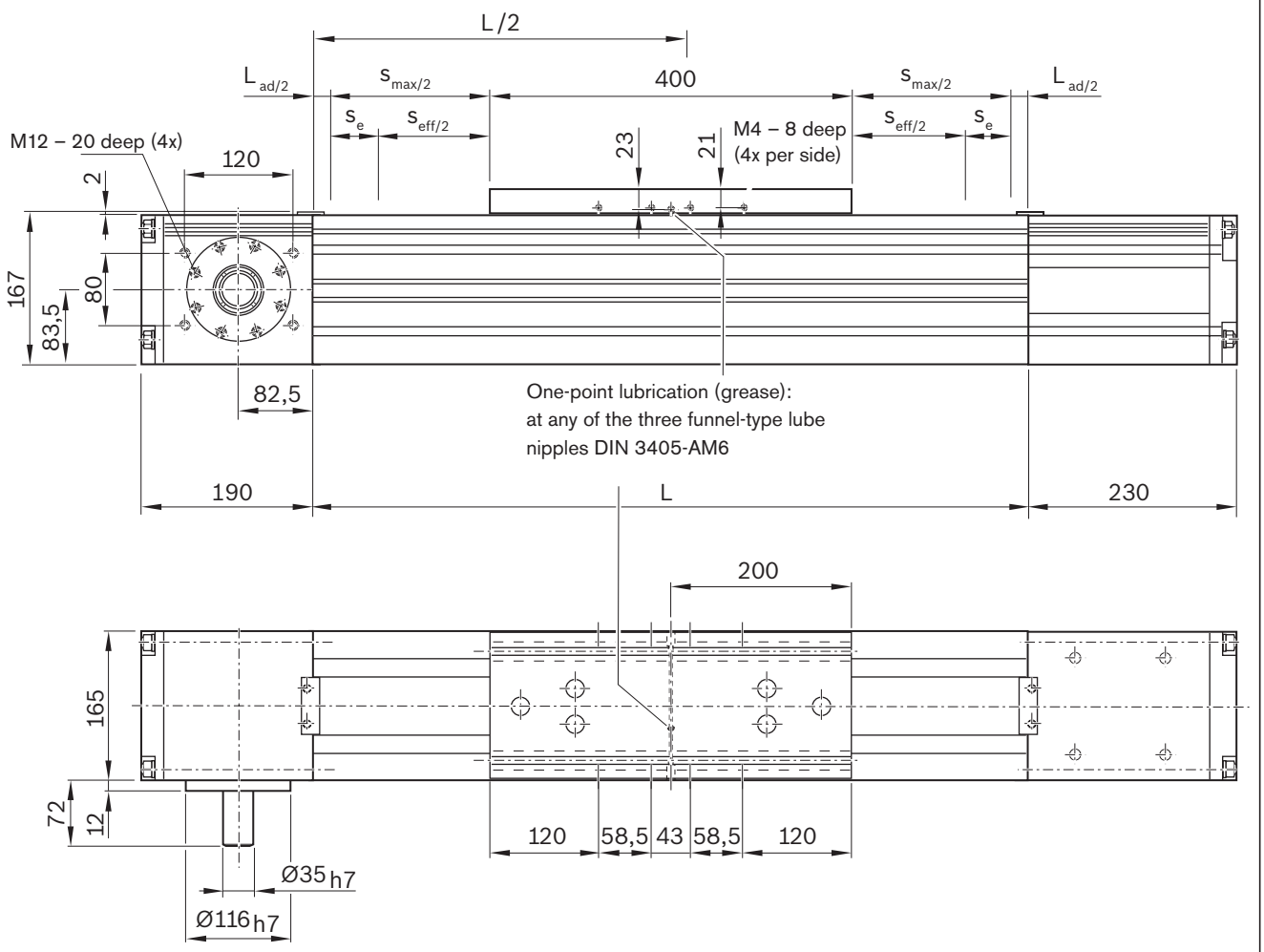
MKR	Gear ratio i	Motor	Motor coding	Dimensions (mm) A	H 1 cable	H 2 cable	L_m without brake	L_m with brake	L_F	L_G
-065-NN-3	3 / 5 / 10	MS2N03-D	MS2N03-D0BYN	58	99	84	203.0	232.0	36.5	85.5
		MS2N04	MS2N04-B0BTN	82	123	108	162.0	194.5		
			MS2N04-C0BTN				194.0	226.5		
			MS2N04-D0BQN				226.0	258.5		
		MSM031C	MSM031C-0300	60	–	73	98.5	135.0		
		MSM041B	MSM041B-0300	80	–	93	112.0	149.0		
-080-NN-3	3 / 5 / 10	MSM041B	MSM041B-0300	80	–	93	112.0	149.0	54.0	104.0
		MS2N05	MS2N05-B0BTN	98	139	124	188.0	218.0		
			MS2N05-C0BTN				224.0	254.0		
			MS2N05-D0BRN				260.0	290.0		
		MS2N06	MS2N06-B1BNN	116	156	156	165.0	201.0		
			MS2N06-D1BNN				224.0	261.0		
-110-NN-3	3 / 5	MS2N06	MS2N06-B1BNN	116	156	156	165.0	201.0	50.0	125.0
			MS2N06-D1BNN				224.0	261.0		
	10	MS2N06	MS2N06-B1BNN	116	156	156	165.0	201.0	62.0	139.0
			MS2N06-D1BNN				224.0	261.0		
	3 / 5 / 10	MS2N07	MS2N07-B1BNN	140	180	180	176.0	230.0		
			MS2N07-C1BRN				205.0	259.0		
			MS2N07-D1BNN				263.0	317.0		

Linear Modules MKR

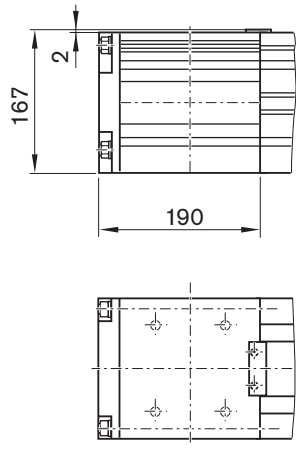
MKR-165-NN-2

Dimension drawings

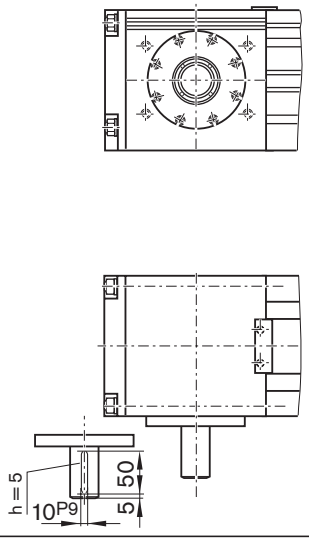
All dimensions in mm.
Drawings not to scale



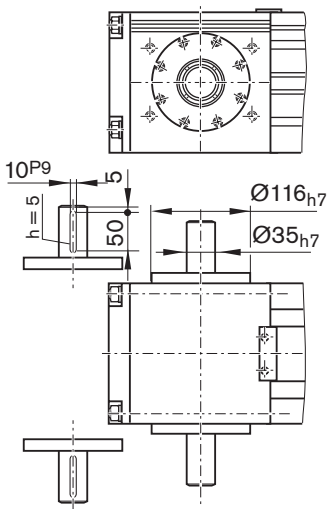
OA01

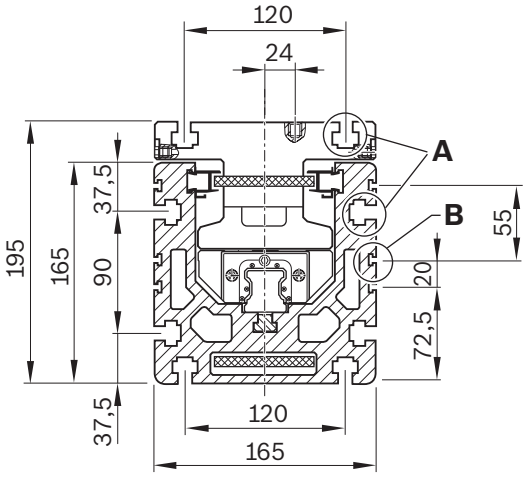


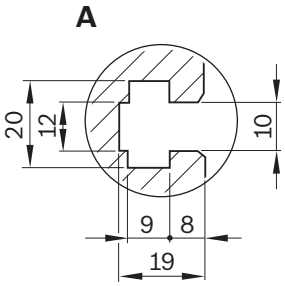
MA01, MA02



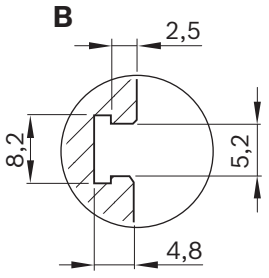
MA03





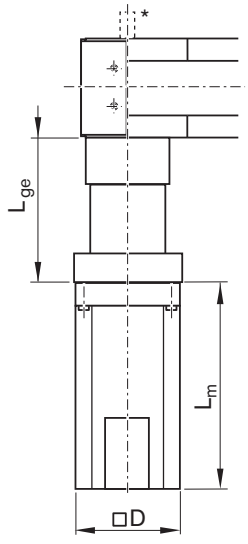


For nut DIN 508-M8
and DIN 557-M10



For cable duct

MG01*, MG02*



Motor	Dimensions (mm)					
	Gear reducer			Motor		
			L_{ge}	D		L_m
	i = 8	i = 12	i = 16		without brake	with brake
MSK076C	264.0	313.5	313.5	140.0	292.5	292.5

* For drive Option 31: second journal Ø 35 x 72 mm

Linear Modules MKR-xxx-NN-3 without drive / support axle

Product description MKR-xxx-NN-3 without drive / support axle

Features

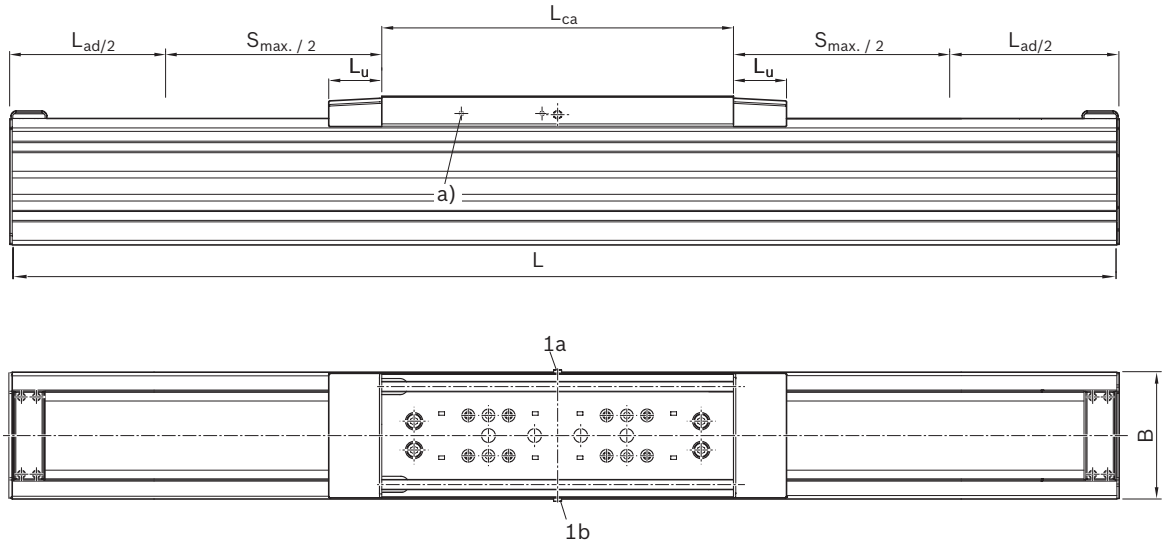
- Ready-to-install Linear Modules in any length up to L_{max}
- Realization of greater lengths of up to 9,400 mm
- Extremely compact extruded aluminum profile (frame) with integrated Rexroth Ball Rail System with moderate preload (preload class C1)
- Carriages made of aluminum, in two design versions, with T- slots or threaded holes and with centering holes in each case
- Protection of the guideway components by sealing strip (plastic strip on MKR-065, corrosion resistant steel strip on MKR-080 and MKR-110)

Further highlights

- Available in two material versions, ALST (aluminum/steel version) and ALCR (aluminum/steel hard chrome plated version)
- Center holes also in frame profile for simple combination with other Linear Motion Systems and connection elements
- Standard with integrated solenoid switch for magnetic field sensors

Attachments

- Magnetic field sensors for easy assembly directly on the profile frame
- Switch (proximity or mechanical) cable duct, socket plug and extension cables in the accessories program



MKR	Dimensions (mm) L_{ca}
-065-NN-3 long TT	190
-080-NN-3 short TT	190
-080-NN-3 long TT	260
-110-NN-3 short TT	210
-110-NN-3 long TT	305

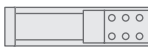
For further information, see chapter “Linear Modules MKR”, dimension drawings.

Configuration and ordering data

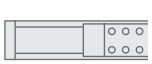
Size -065

$s_{max.}$[1] (mm)	Material pairing[2]	Lubrication[3]	Carriage (TT) T-slot (S) Thread (T)	Carriage (TT) Long (L)	Carriage (TT) Number TT	Guideway[5] Frame with or without center holes		Version	Drive (without)	Cover		Cover Side sealing		Documentation
s_{max}=	ALST	LSS	S	L	1	021	without	0000 	000	0	without	0	without	001 standard
						024	with			2	with	0	without	
	ALCR		T			031	without					1	with	
						034	with							

Size -080

$s_{max.}$[1] (mm)	Material pairing[2]	Lubrication[3]	Carriage (TT) T-slot (S) Thread (T)	Carriage (TT) Short (S) Long (L)	Carriage (TT) Number TT	Guideway[5] Frame with or without center holes		Version	Drive (without)	Cover		Cover Side sealing		Documentation
s_{max}=	ALST	LSS	S	S	1	021	without	0000 	000	0	without	0	without	001 standard
						024	with			2	with	0	without	
	ALCR		T	L		031	without					1	with	
						034	with							

Size -110

$s_{max.}$[1] (mm)	Material pairing[2]	Lubrication[3]	Carriage (TT) T-slot (S) Thread (T)	Carriage (TT) Short (S) Long (L)	Carriage (TT) Number TT	Guideway[5] Frame with or without center holes		Version	Drive (without)	Cover		Cover Side sealing		Documentation
s_{max}=	ALST	LSS	S	S	1	021	without	0000 	000	0	without	0	without	001 standard
						024	with			2	with	0	without	
	ALCR		T	L		031	without					1	with	
						034	with							

1) ... (5) see table “Configuration and ordering data” of the corresponding MKR size

Linear Modules MLR

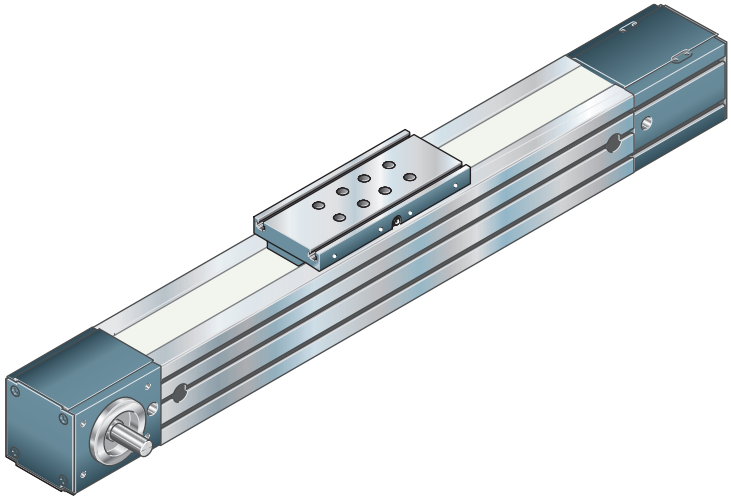
Product description MLR-xxx-NN-2

Characteristic features

MLR...: Linear Modules with Cam Roller Guide and belt drive for high-speed applications (up to 10 m/s)

⚠ **Linear Modules with Cam Roller Guide to be lubricated with oil only!**

The Linear Modules MLR... comprise:
- A compact anodized aluminum frame
- The integrated Rexroth Cam Roller Guides with internal Cam Rollers
- Cam rollers, set to zero-clearance via eccentric shafts
- A carriage with one-point oil lubrication for all cam rollers
- High performance toothed belt (AT profile)
- Mountable switches
- Servo motor
- Gear reducer for motor attachment
- A cover provided by the toothed belt



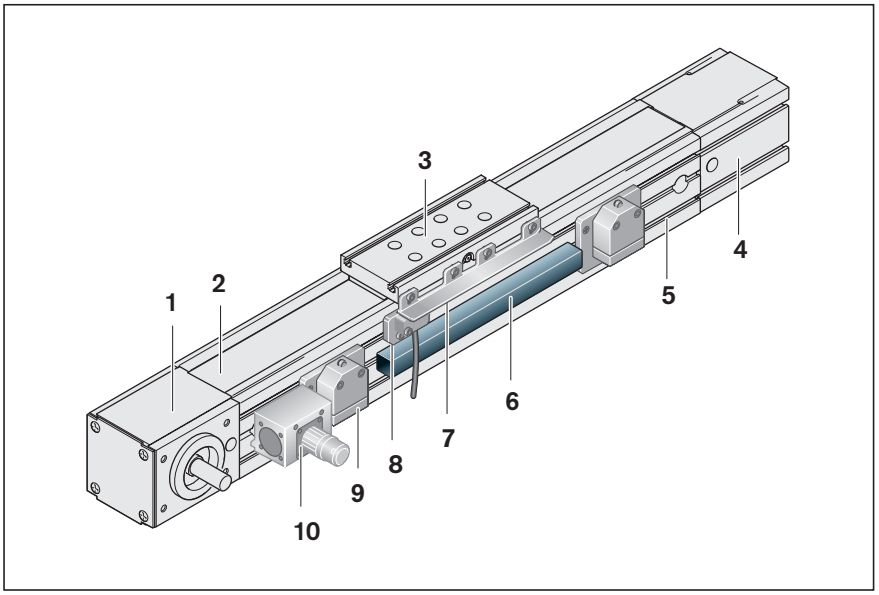
Structural design

Structural design

1 Drive end enclosure
2 Toothed belt
3 Carriage with Runner Blocks
4 Idler (non-drive) end enclosure
5 Frame

Attachments:

6 Cable duct
7 Switching cam
8 Proximity switch
9 Mechanical switch
10 Socket/plug



Versions

MA01 and MA02

With drive (MA) without gear reducer (i = 1), journal for motor attachment right or left.

MA03

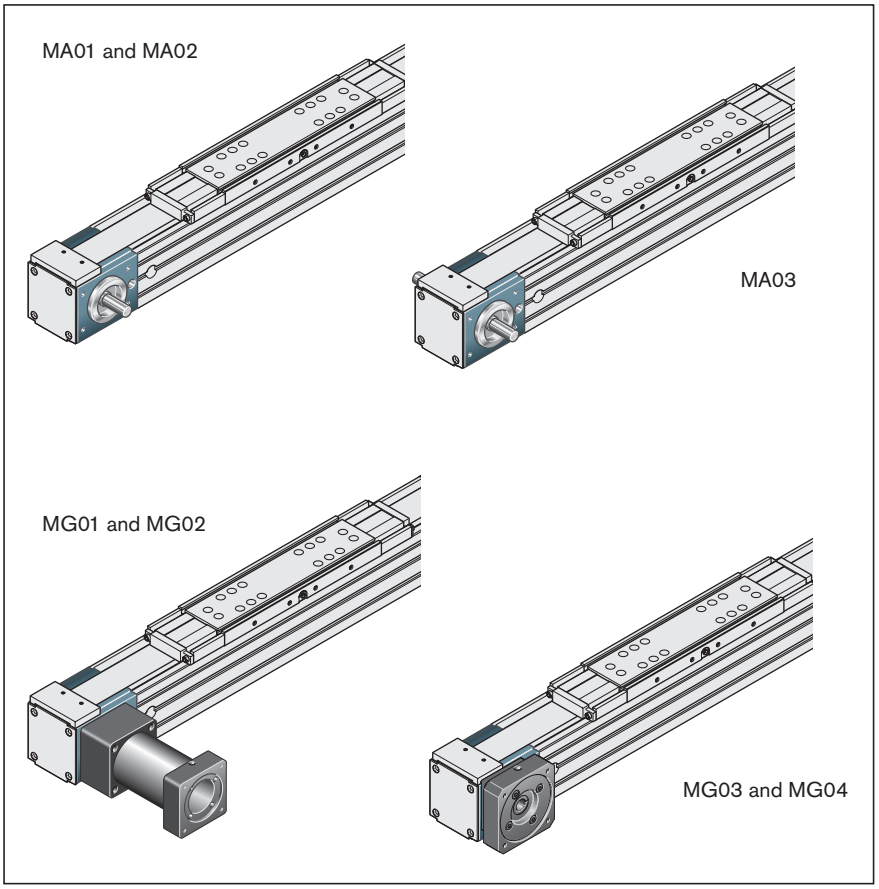
As MA01 and MA02,
journal for motor attachment on both sides.

MG01 and MG02

With gear reducer, motor attachment via mount and socket.

MG03 and MG04

With integrated gear reducer, motor attachment via mount and socket.



Linear Modules MLR

Technical data

General technical data

Observe the “General technical instructions” chapter!

MLR	L_{ca} (mm)	C_y [1] (N)	C_z [1] (N)	M_t [1] (Nm)	M_L [1] (Nm)	$M_{t\,max}$ (Nm)	$M_{l\,max}$ (Nm)	$F_{y\,max}$ (N)	$F_{z\,max}$ (N)	
-080-NN-2	190	17 150	10 050	226	316	35	158	2 500	1 500	
-110-NN-2	305	31 000	18 200	629	1121	49	302	8 000	4 800	

Drive data

MLR	i	M_P (Nm)	u (mm/rev)	v_{max} (m/s)	M_{Rs} (Nm)	$k_{J\,fix}$ (kg/mm²)	$k_{J\,var}$ (kg/mm)	$k_{J\,m}$ (mm²)	d_3 (mm)	B_T	F_{bp} [4] (N)	F_{max} [5] (N)	c_{spec} (N)	a_{max} (m/s²)
-080-NN-2	1	32.0	205.00	10.0	1.8	2 110	0.379	1 065	65.27	50AT5	980	3 500	$0.875 \cdot 10^6$	50
	1 [3]	27.0	205.00	10.0										
	3	10.7	68.33	5.0										
	5	6.4	41.00	3.0										
	10	3.2	20.50	1.5										
-110-NN-2	1	80.0	290.00	10.0	2.7	14 635	1.23	2 125	92.20	50AT10	1740	7 500	$2.12 \cdot 10^6$	
	1 [3]	27.0	290.00	10.0										
	3	26.7	96.66	5.0										
	5	16.0	58.00	4.0										
	10	8.0	29.00	2.0										

Deflection

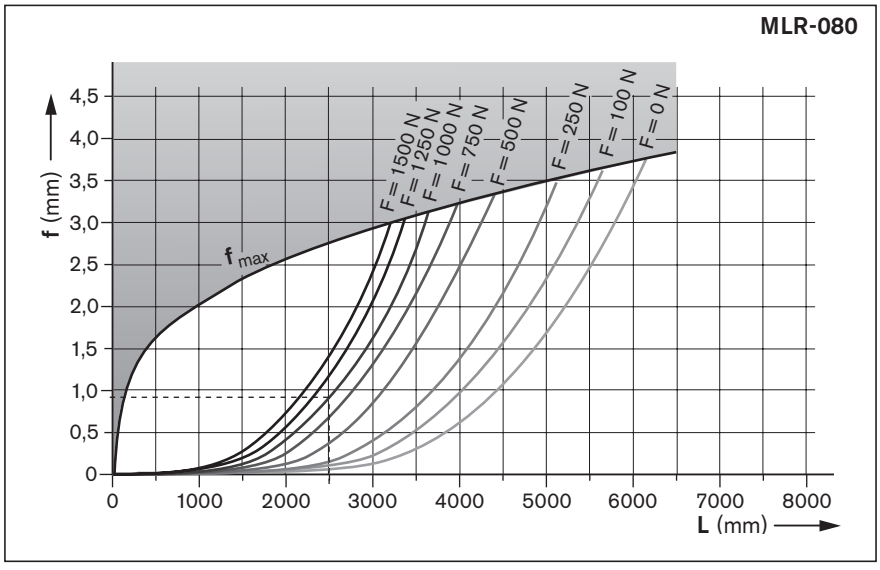
The graphs apply under the following conditions:

- both ends firmly fixed (200 to 250 mm per end)
- 6 to 8 screws per side
- Solid mounting base

Example

Linear Module MLR-080:
L = 3000 mm F = 500 N
From chart MLR-080:
f = 0.9 mm f_{max} = 3.4 mm

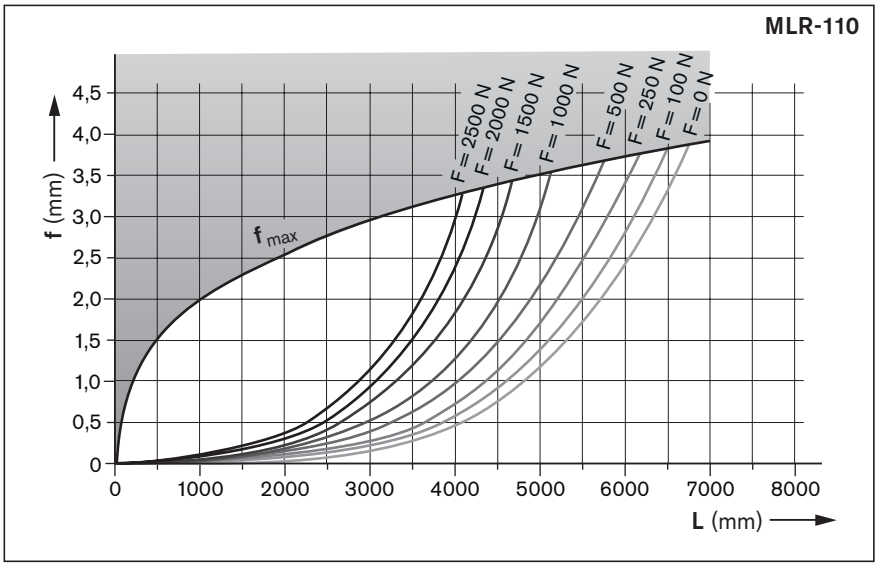
The deflection f lies well below the maximum permissible deflection f_{max}, so no additional supports are required.



	L_{ad} (mm)	s_{min} 2) (mm)	L_{max} (mm)	Z_1 (mm)	Version	$k_{g\ fix}$ (kg)	$k_{g\ var}$ (kg/mm)	m_{ca} (kg)	I_y (cm^4)	I_z (cm^4)
	100	100	10 000	50	OA01	2.7	0.0089	1.7	128	201
					MA01-03	3.2				
					MG01-02	6.6				
					MG03-04	4.7				
	70	155	10 000	55	OA01	6.4	0.0141	3.3	479	692
					MA01-03	6.8				
					MG01-02	13.6				
					MG03-04	11.6				

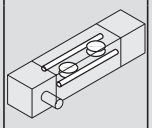
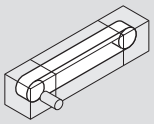
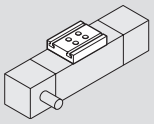
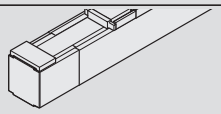
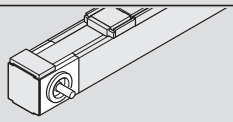
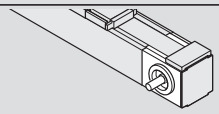
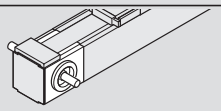
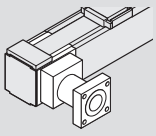
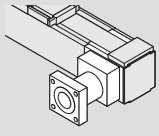
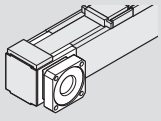
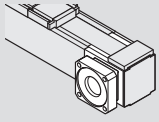
For short product names, see the “Additional information” chapter

1) Dynamic load capacities and torques for the life expectancy calculation
2) Minimum required travel to ensure a reliable lubrication distribution.
For operating conditions, see the “Additional information” chapter.
If values are not met, please contact Bosch Rexroth.
3) With keyway
4) Maximum force that can be transmitted via the teeth meshing with the belt pulley.
5) The maximum permitted tensile load on the belt cross section (belt elasticity limit) is given here for easier comparability. This value represents the load limit in terms of plastic deformation and may not be used to calculate the maximum permissible drive torque.



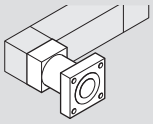
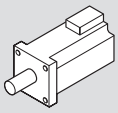
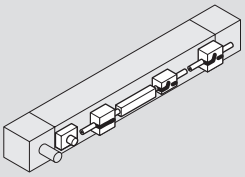
Linear Modules MLR

MLR-080-NN-2 Configuration and ordering

Short product name, length MLR-080-NN-2, ... mm		Guideway	Drive					Carriage	
									
Version			Drive journal	Gear ratio i = 1 [1]	Gear ratio i = 1 [2]	Gear ratio i = 3	Gear ratio i = 5	Gear ratio i = 10	L_{ca} = 190 mm with T-slot
Without drive	OA01 	01	without	50					01
With drive (MA), without gear reducer i = 1	MA01 	01	Journal at right	01	03	–			
	MA02 	01	Journal at left	01	03	–			
	MA03 	01	Journal on both sides	02	04	–			
With gear (MG), external gear reducer	MG01  MG02 	01	Gear reducer at right / at left	–	–	10			
			Gear reducer at right / at left	–	–	11 gear reducer with second journal			
With gear (MG), integrated LPB gear reducer	MG03  MG04 	01	Gear reducer at right / at left	–	–	20			

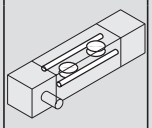
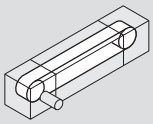
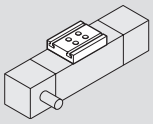
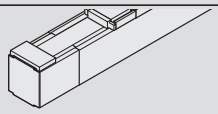
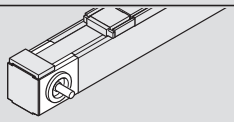
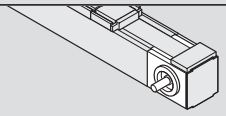
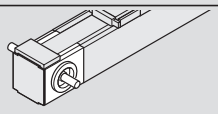
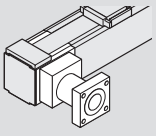
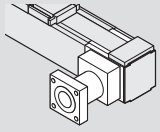
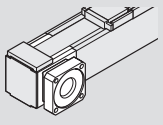
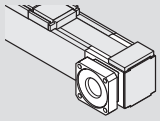
[1] Without keyway
[2] With keyway
[3] Attachment kit also available without motor (when ordering: enter “00” for motor)
[4] Note the orientation of the motor connectors (see Page 13)

Length calculation ➠ see chapter “General technical instructions”

Motor attachment				Motor[4]		Switches / Mounting duct / Socket-plug		Documentation	
									
Gear ratio i =	Attachment kit[3] with gear reducer	for motor		without Brake	with Brake			Standard report	Measurement report
–	00	–		00		Without switch Without mounting duct	00	01	02 Friction moment
–	00	–		00		Switches: – PNP NC – PNP NO – Mechanical	11 13 15		
–	00	–		00		Cable duct (loose)	20		
i = 3	01	MSK040C		86	87	External socket/ plug (loose)	17		05 Positioning accuracy
i = 5	10					Switching cam at one end	16		
i = 10	20					Switching cam at both ends	26		
i = 3	02	MSM041B		140	141				
i = 5	11								
i = 10	21								
i = 3	04	MSK050C		88	89				
i = 5	14								
i = 10	24								
i = 3	50	MSK040C		86	87				
i = 5	55								
i = 10	60								
i = 3	51	MSM041B		140	141				
i = 5	56								
i = 10	61								
i = 3	54	MSK050C		88	89				
i = 5	58								
i = 10	63								

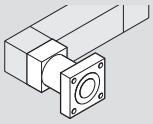
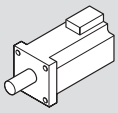
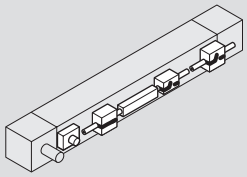
Linear Modules MLR

MLR-110-NN-2 Configuration and ordering

Short product name, length MLR-110-NN-2, ... mm	Version		Guideway	Drive					Carriage	
										
				Drive journal	Gear ratio i = 1 1)	Gear ratio i = 1 2)	Gear ratio i = 3	Gear ratio i = 5	Gear ratio i = 10	L_{ca} = 305 mm with T-slot
Without drive	OA01		01	without	50					05
With drive (MA), without gear reducer i = 1	MA01		01	Journal at right	01	03	–			
	MA02		01	Journal at left	01	03	–			
	MA03		01	Journal on both sides	02	04	–			
With gear (MG), external gear reducer	MG01		01	Gear reducer at right / at left	–	–	10			
	MG02			Gear reducer at right / at left	–	–	11 gear reducer with second journal			
With gear (MG), integrated LPB gear reducer	MG03		01	Gear reducer at right / at left	–	–	20			
	MG04									

1) Without keyway
2) With keyway
3) Attachment kit also available without motor (when ordering: enter “00” for motor)
4) Note the orientation of the motor connectors (see Page 13)

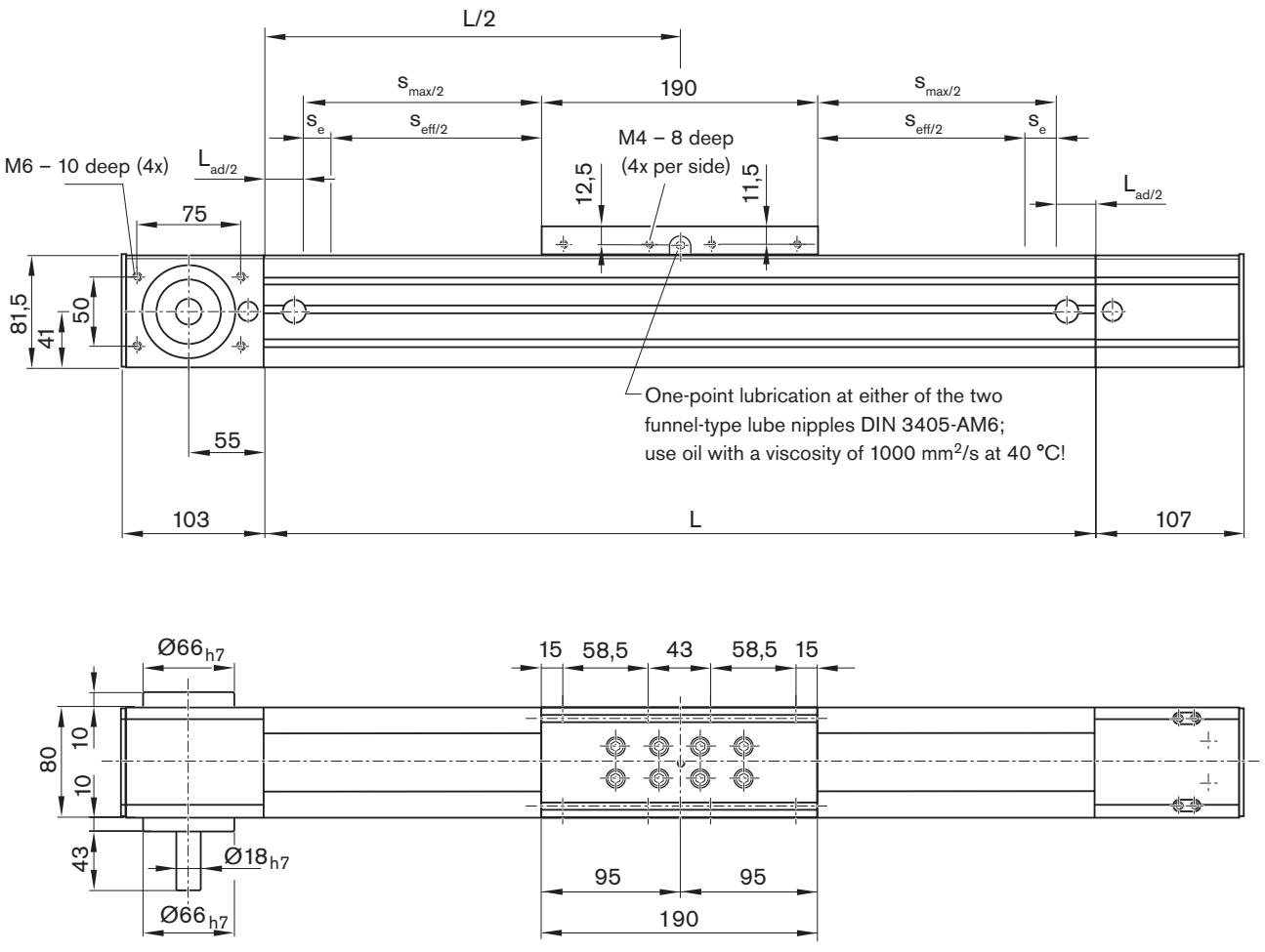
Length calculation ➠ see chapter “General technical instructions”

	Motor attachment			Motor[4]		Switches / Mounting duct / Socket-plug		Documentation	
									
	Reduction i =	Attachment kit[3] with gear reducer	for motor	without Brake	with Brake			Standard report	Measurement report
	–	00	–	00		Without switch Without mounting duct	00	01	02 Frictional torque
	–	00	–	00		Switches: – PNP NC – PNP NO – Mechanical	11 13 15		
	–	00	–	00					
	i = 3	06	MSK060C	90	91	Cable duct (loose)	20		05 Positioning accuracy
	i = 5	16				External socket/ plug (loose)	17		
	i = 10	26							
	i = 3	02	MSK076C	92	93	Switching cam at one end	16		
	i = 5	11							
	i = 10	21							
	i = 3	05	MSK060C	90	91	Switching cam at both ends	26		
	i = 5	15							
	i = 10	25							
	i = 3	04	MSK076C	92	93				
	i = 5	14							
	i = 10	24							

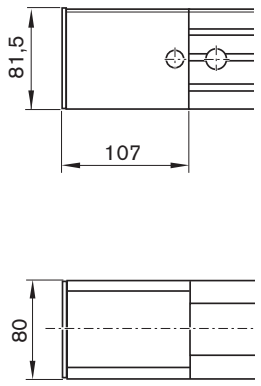
Linear Modules MLR

MLR-080-NN-2 – Dimension drawings

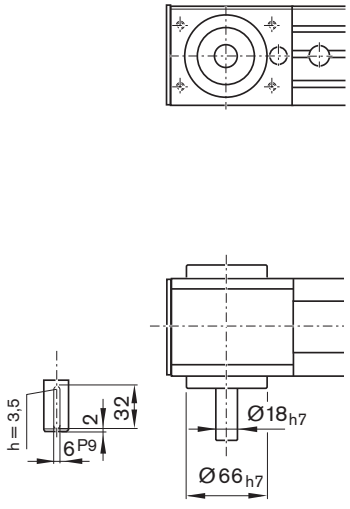
All dimensions in mm. Drawings not to scale



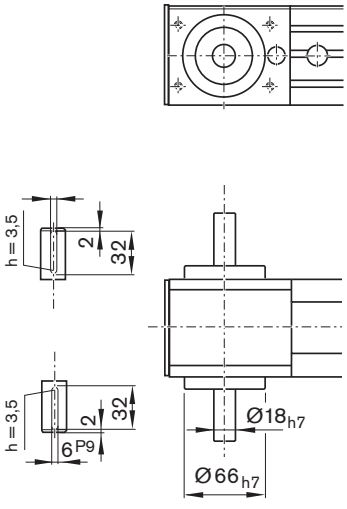
OA01

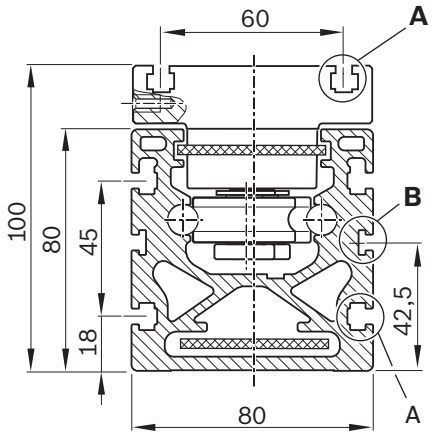


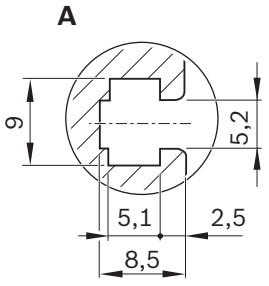
MA01, MA02



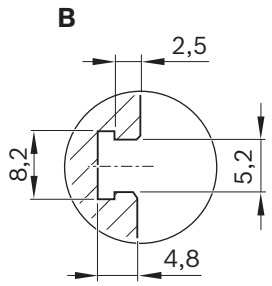
MA03





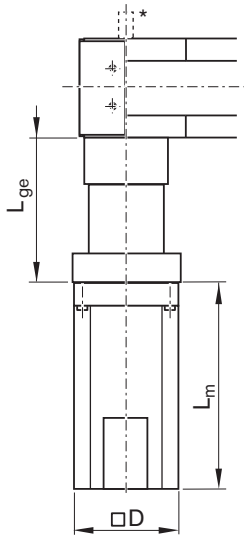


For nut
DIN 557-M5

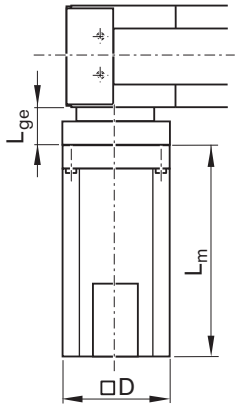


For cable duct

MG01*, MG02*



MG03, MG04



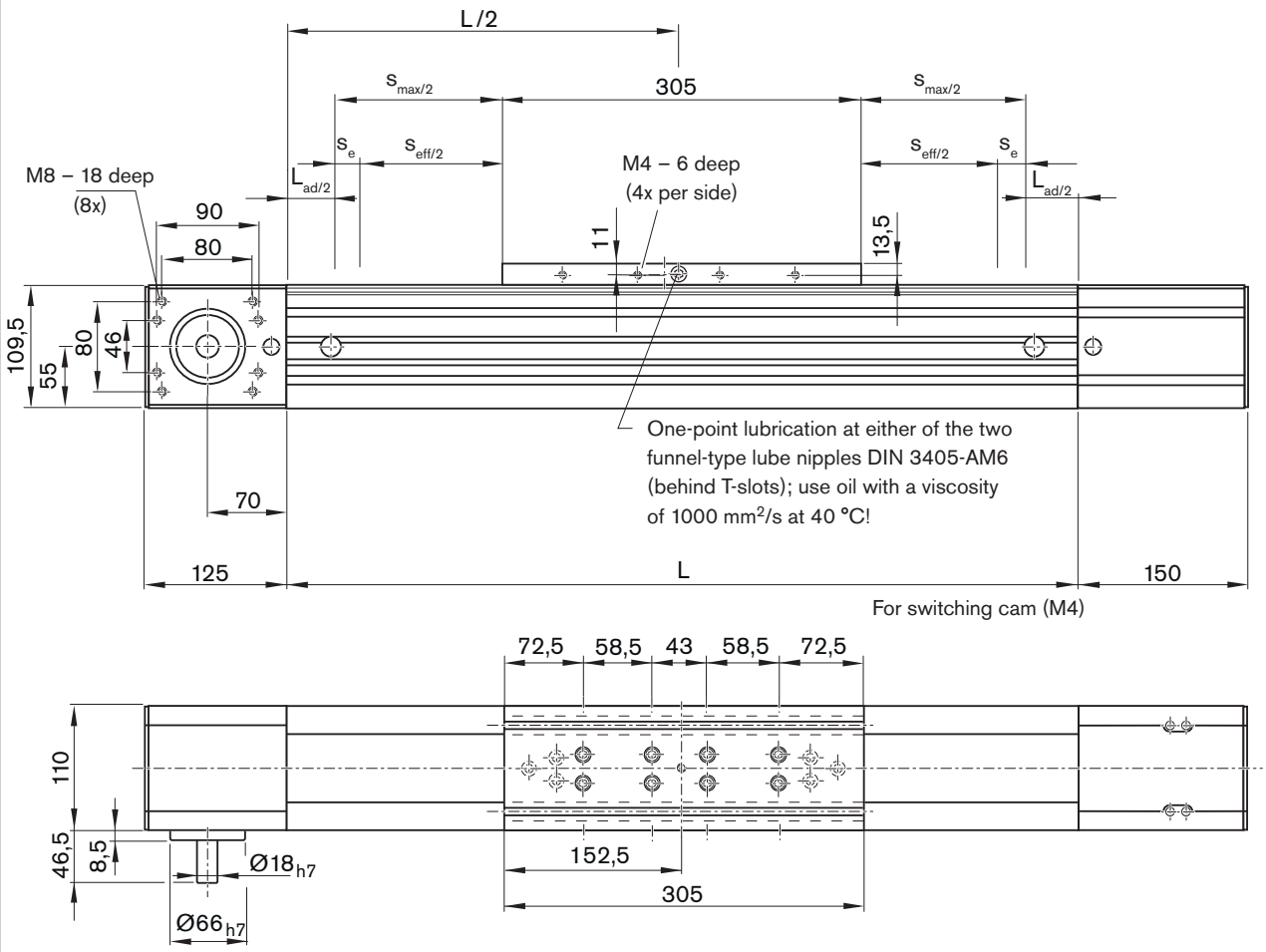
Motor	Dimensions (mm)				
	Gear reducer			Motor	
		L_{ge}	D		L_m
	MG01 MG02	MG03 MG04		without brake	with brake
MSK040C	135	41	82	185.5	215.5
MSK050C	145	51	98	203.0	233.0
MSM041B	140	46	80	112.0	149.0

* For drive Option 11: second journal Ø18 x 43

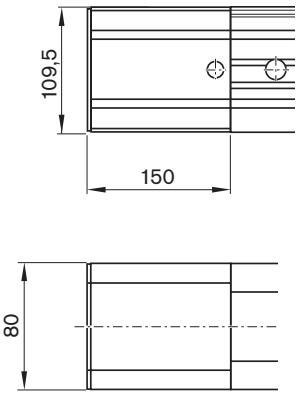
Linear Modules MLR

MLR-110-NN-2 – Dimension drawings

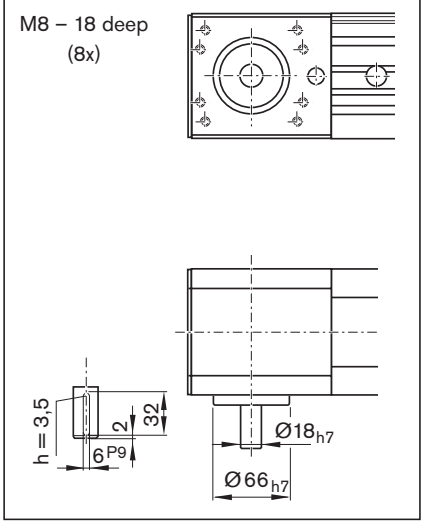
All dimensions in mm. Drawings not to scale



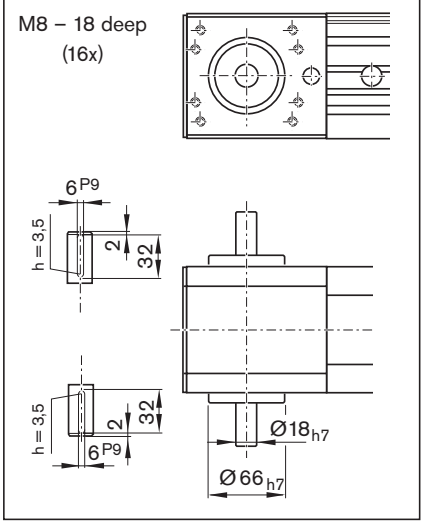
OA01

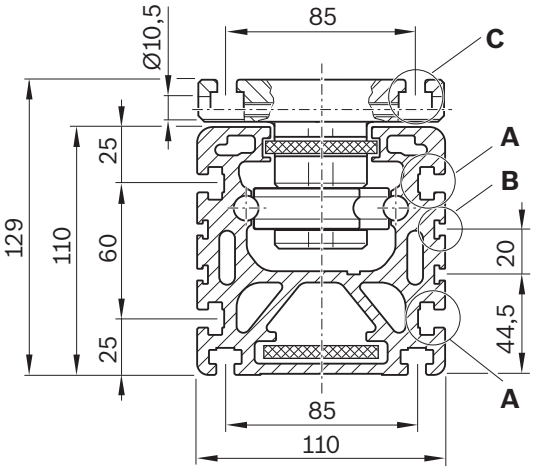


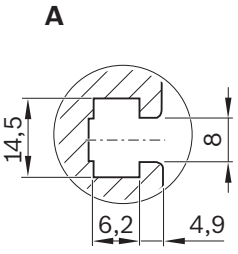
MA01, MA02



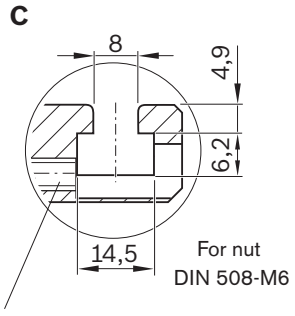
MA03



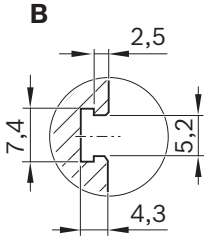




For nut DIN 508-M6

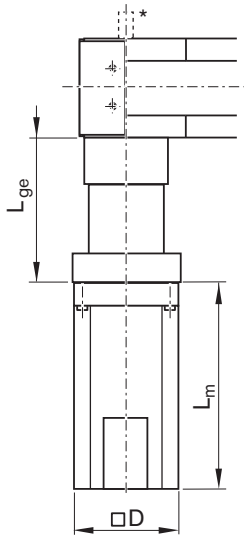


Funnel-type lube nipple DIN 3405-AM6

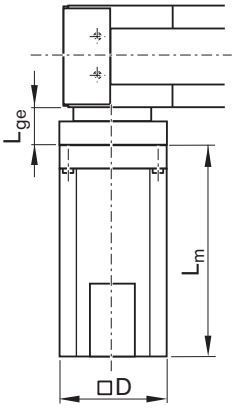


For cable duct

MG01*, MG02*



MG03, MG04



Motor	Dimensions (mm)				
	Gear reducer		Motor		
		L_{ge}	D		L_m
	MG01 MG02	MG03 MG04		without brake	with brake
MSK060C	162	50	116	226.0	259.0
MSK076C	172	60	140	292.5	292.5

* For drive Option 11: second journal Ø18 x 43 mm

Linear Modules MKR-080-FP

Product description MKR-080-FP-2

Characteristic features

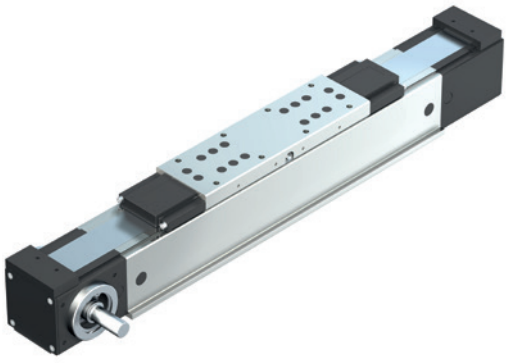
Linear Modules for Food & Packaging are designed for use in environments where hygiene and ease of cleaning are required. They are equipped with a Ball Rail System and belt drive and offer an outstanding combination of high performance and compact dimensions.

Features of the Linear Modules for Food & Packaging (Version 1 and Version 2):
- Space-saving, anodized aluminum frame with a smooth surface and no slots – especially easy to clean
- Ready-to-install Linear Modules in any length up to L_{max}
- Integrated Rexroth Ball Rail System
- Carriage with sealable threads and one-point lubrication
- High performance toothed belt (AT profile)
- Drive journal made of heat-treated steel
- Deep-groove ball bearings (in the end enclosures) in corrosion-resistant materials
- Stainless steel sealing strip per DIN EN 10088
- Gear reducer (planetary gear) for motor attachment (optional)
- Servo motor

Frame versions

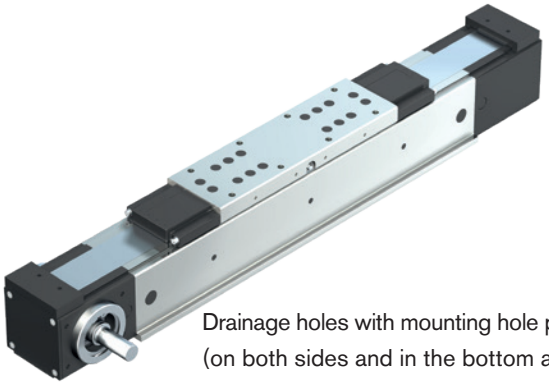
Version 1

Linear Modules for Food & Packaging **without drainage holes**



Version 2

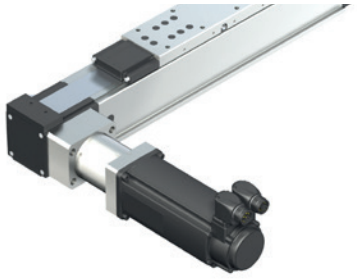
Linear Modules for Food & Packaging **with drainage holes**
Special features:
- Integrated Rexroth Ball Rail System Resist NR II made of corrosion-resistant steel
- Drainage holes in the aluminum profile (these are normally closed with mounting hole plugs but may be opened if necessary by removing the mounting hole plugs)



Drainage holes with mounting hole plugs (on both sides and in the bottom area)

Motor mounting (if ordered as an option)

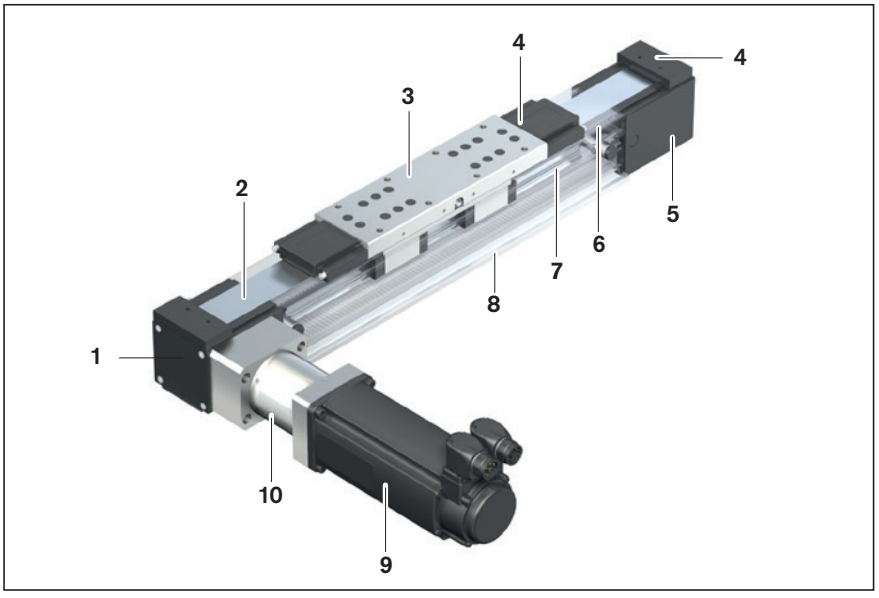
If a module has been ordered with an attached motor, it will be delivered only with the motor mounting configuration shown here. (Note the orientation of the motor connectors)!



Structural design

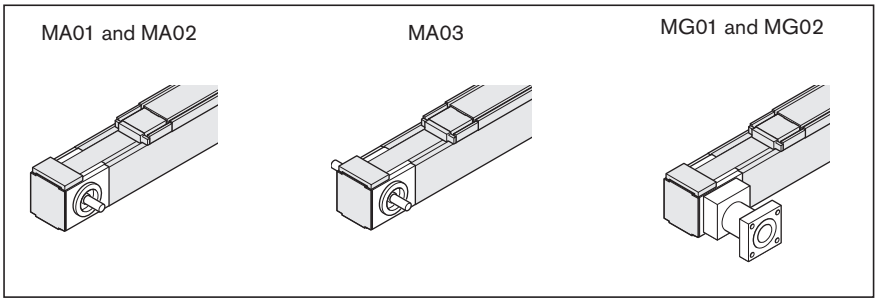
Structural design

1 Drive end enclosure
2 Sealing strip
3 Carriage with Runner Blocks (Runner blocks also available in corrosion-resistant version as an option)
4 Strip fixing
5 Idler (non-drive) end enclosure
6 Toothed belt (under sealing strip)
7 Ball Guide Rail (also available in corrosion-resistant version as an option)
8 Frame
9 Motor
10 Planetary gearbox



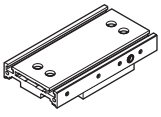
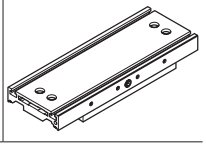
Drive versions

MA01 and MA02
With drive (MA), without gear reducer, i = 1, journal for motor attachment at right or left.
MA03
As MA01 and MA02, drive journal on both sides.
MG01 and MG02
With gear reducer, adapter flange for direct motor attachment



Carriage variants

(With Ball Runner Blocks in standard or corrosion-resistant versions)

Carriage	
L_{ca} 190 mm	L_{ca} 260 mm
	

Linear Modules MKR-080-FP

Technical data

General technical data

Observe the chapters on “Calculation” and “General technical instructions”.

	L_{ca} (mm)	Guideway type	C (N)	M_t (Nm)	M_L (Nm)	$M_{x\,max}$ (Nm)	$M_{y\,max}$ (Nm)	$M_{z\,max}$ (Nm)	$F_{y\,max}$ (N)	$F_{z\,max}$ (N)
MKR-080-FP-2	190	standard	18 800	221	121	110	60	60	8 700	8 700
		Resist NR II	12 300	205	110					
	260	standard	30 500	359	1 840	180	920	920	14 150	14 150
		Resist NR II	19 900	330	1 290					

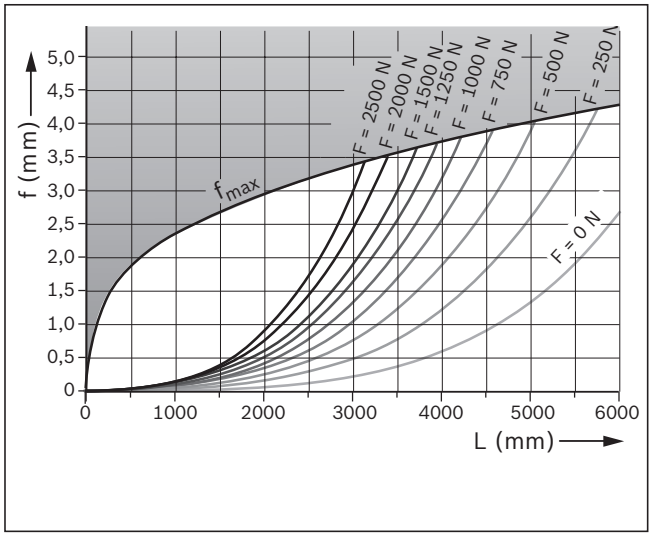
Drive data

	Gear reducer	i	M_P (Nm)	u (mm/rev)	v_{max} (m/s)	L_{ca} (mm)	M_{Rs} (mm)	$k_{J\,fix}$ (kg/mm²)	$k_{J\,var}$ (kg/mm)	$k_{J\,m}$ (mm²)	d_3 (mm)	B_t	F_{bp} [6] (N)	$F_{t\,perm}$ [7] (N)	c_{spec} (N)	a_{max} (m/s²)
MKR-080-FP-2	without	1 [4]	32.0	205.00	5.00	190	1.80	2 110	0.379	1 065	65.27	50AT5	980	3 500	$0.875 \cdot 10^6$	50
		1 [5]	27.0													
		1 [4]	32.0	205.00	5.00	260	2.30	2 970								
		1 [5]	27.0													
	Gear reducer (PG070)	3	10.7	68.66	5.00	190	0.90	2 110								
						260	1.07	2 970								
		5	6.4	41.00	4.10	190	0.56	2 110								
						260	0.66	2 970								
		10	3.2	20.50	2.05	190	0.33	2 110								
						260	0.38	2 970								

Deflection

The chart is valid for:
- both ends firmly fixed (200 to 250 mm per end)
- 6 to 8 screws per side
- Solid mounting base

MKR-080-FP-2



Example

MKR-080-FP-2:
L = 2500 mm F = 500 N
From chart MKR-080-FP-2:
f = 0.49 mm f_{max} = 3.2 mm;
The deflection f lies well below the maximum permissible deflection f_{max}, so no additional supports are required.

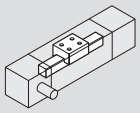
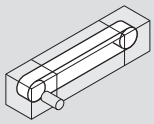
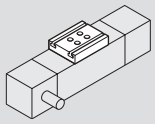
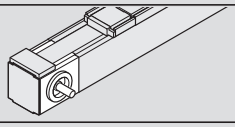
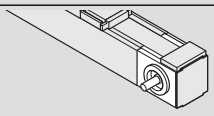
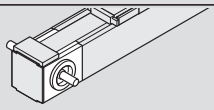
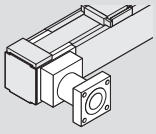
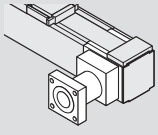
	L_{ad} (mm)	s_{min} [1] (mm)	L_{max} (mm)	Z_1 (mm)	$k_{g\ fix}$ (kg)	$k_{g\ var}$ (kg/mm)	m_{ca} (kg)	I_y (cm^4)	I_z (cm^4)
	20	60	5 500	59.5	3.20 [2]	0.0095	1.4	178	210
					6.60 [3]				
			5 500		3.20 [2]	0.0095	2.2		
					6.60 [3]				

For short product names, see the “Additional information” chapter

[1] Minimum required travel to ensure a reliable lubrication distribution. For operating conditions, see the “Additional information” chapter. If values are not met, please contact Bosch Rexroth.
[2] Without gear reducer
[3] With gear reducer
[4] For versions with 1 or 2 drive journals, clamping hub or clamping hub with 2nd journal
[5] Version with keyway
[6] Maximum force that can be transmitted via the teeth meshing with the belt pulley.
[7] The maximum permitted tensile load on the belt cross section (belt elasticity limit) is given here for easier comparability. This value represents the load limit in terms of plastic deformation and may not be used to calculate the maximum permissible drive torque.

Linear Modules MKR-080-FP

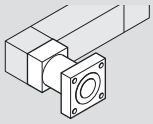
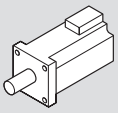
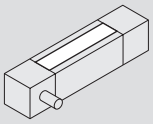
MKR-080-FP-2 Configuration and ordering

Short product name, length MKR-080-FP-2, ... mm		Guideway		Drive					Carriage						
															
Version					Gear ratio				L_{ca} = 190 mm			L_{ca} = 260 mm			
		BRS Std.	BRS NR II*)	Drive journal	i = 1	i = 3	i = 5	i = 10	BRB Std.	BRB NR II[1)*)]	BRB NR II[2)*)]	BRB Std.	BRB NR II[1)*)]	BRB NR II[2)*)]	
With drive (MA), without gear (i = 1)	MA01 	01	11	Journal at right	01	–			02	06	07	12	16	17	
	MA02 	01	11	Journal at left	01	–									
	MA03 	01	11	Journal on both sides	02	–									
With drive, with gear reducer (MG)	MG01  MG02 	01	11	Gear reducer at right / at left	–	10									
				Gear reducer at right / at left	–	11 with second journal									

[1)] Non-lubricated (with preservative oil)
[2)] Lubricated
[3)] Attachment kit also available without motor (when ordering: enter “00” for motor)
[4)] Note the orientation of the motor connectors (see Page 13)
[5)] Sealing strip permissible up to L = 3 500 mm

Length calculation ➠ see chapter “General technical instructions”

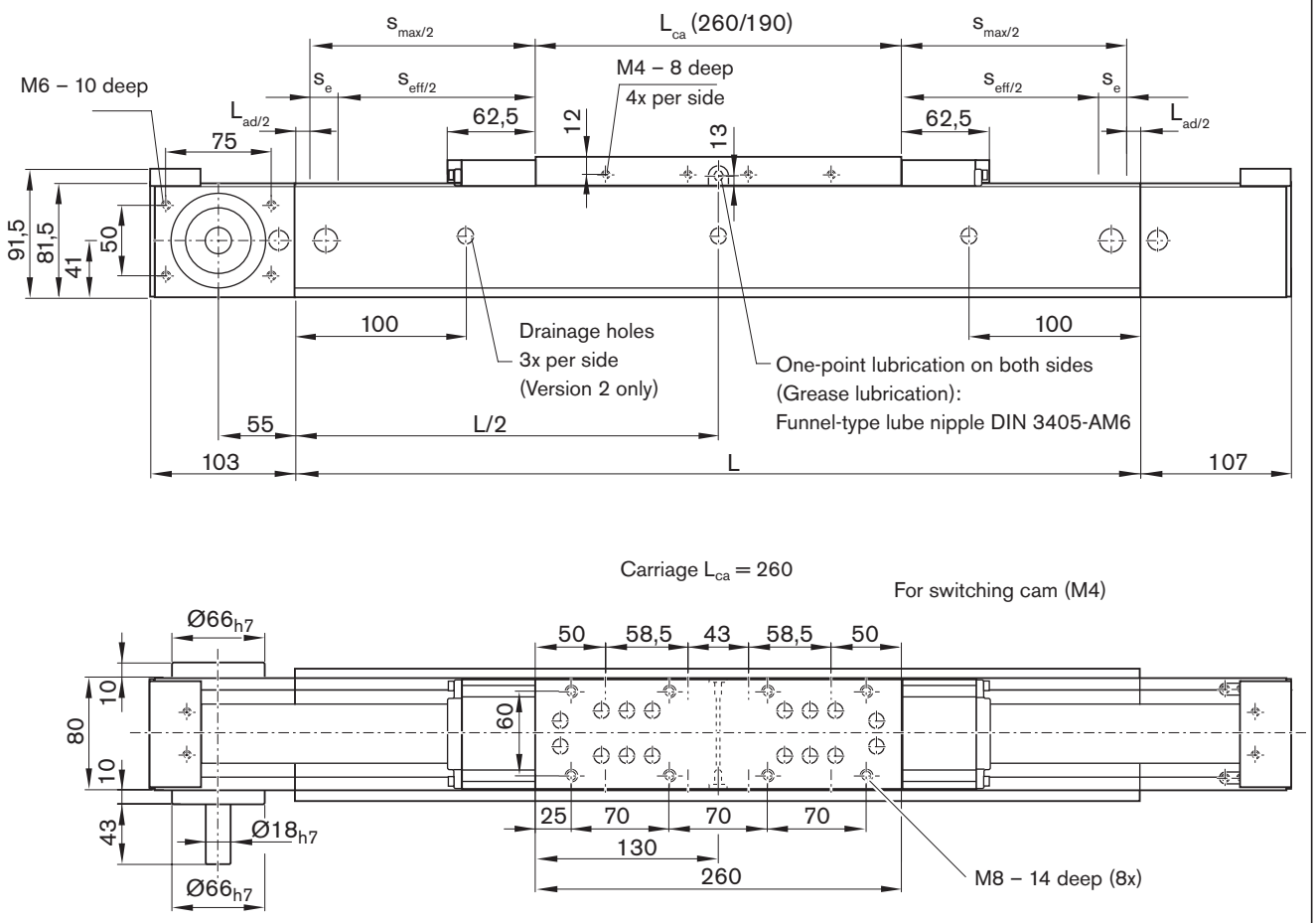
*) Version 2 only

	Motor attachment			Motor[4]		Cover[5]		Documentation	
									
	Gear ratio i =	Attachment kit[3] with gear reducer	for motor	without Brake	with Brake	without Sealing strip	with Sealing strip	Standard report	Measurement report
	–	00	–	00		00	10 without side sealing	01	02 friction moment
	–	00	–	00					
	–	00	–	00					
	i = 3	01	MSK040C	86	87		15 with side sealing		05 Positioning accuracy
	i = 5	10							
	i = 10	20							
	i = 3	02	MSM041B	110	111				
	i = 5	11							
	i = 10	21							
	i = 3	04	MSK050C	88	89				
	i = 5	14							
	i = 10	24							

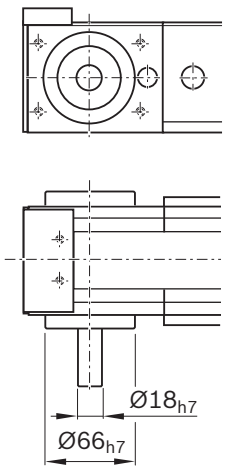
Linear Modules MKR-080-FP

MKR-080-FP-2 – Dimension drawings

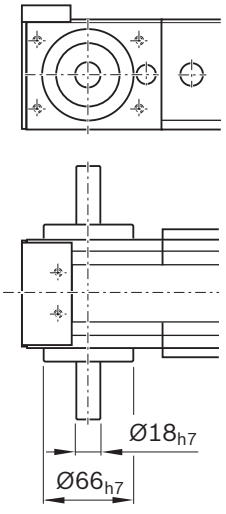
All dimensions in mm. Drawings not to scale



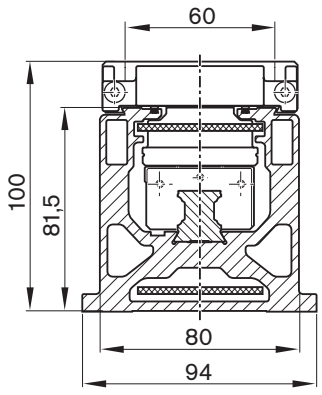
MA01, MA02



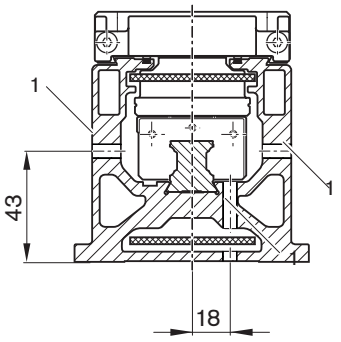
MA03



Version 1



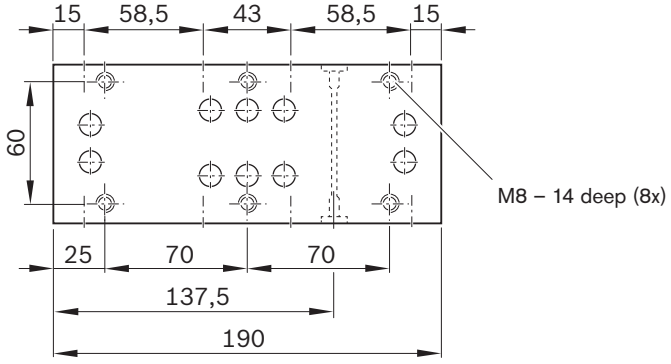
Version 2
with drainage holes (1)



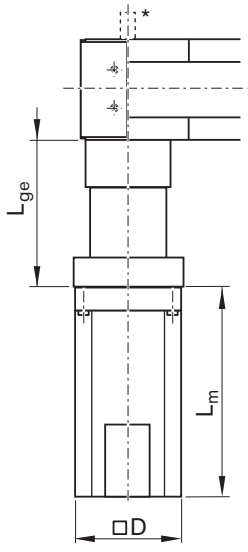
Side sealing in carriage

Carriage L_{ca} = 190

For switching cam (M4)



MG01, MG02



Motor[1)]	Dimensions (mm)			
	Gear reducer	Motor		
	L_g MG01 MG02	D	without brake	L_m with brake
MSK040C	135	82	185.5	215.5
MSK050C	145	98	203.0	233.0
MSM041B	140	80	157.5	191.5

[1)] Note the orientation of the motor connectors

* For drive Option 11: second journal Ø18 x 43

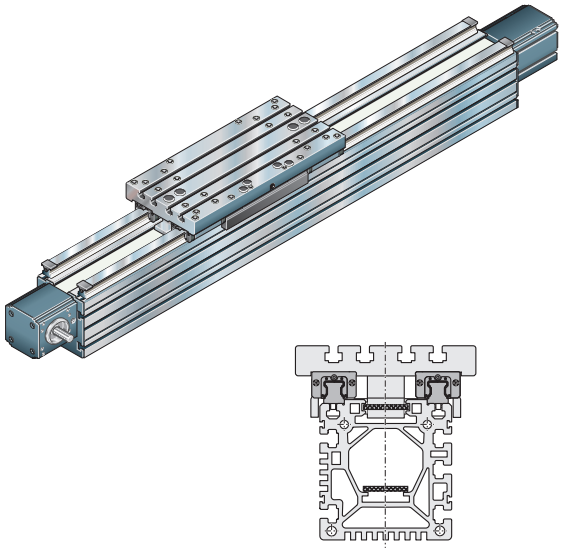
Linear Modules MKR-145

Product description MKR-145-NN-2

Characteristic features

MKR-145: Linear Module with two Ball Rail Systems for high torque load capacity and belt drive for high speeds

The Linear Module MKR-145 comprises:
- An anodized aluminum frame with high rigidity
- Two Rexroth Ball Rail Systems with cover strips
- Profiled aluminum carriage with four long Runner Blocks
- A planetary gear integrated in the drive pulley
- Gear reducer for motor attachment
- AC servo motor
- Mountable switches
- Control units for AC servo motors



Technical data

General technical data

Observe the chapters on “Calculation” and “General technical instructions”.

	L_{ca} (mm)	C (N)	M_t (Nm)	M_L (Nm)	$M_{t\,max}$ (Nm)	$M_{L\,max}$ (Nm)	$F_{y\,max}$ (N)	$F_{z\,max}$ (N)	
MKR-145	400	121 185	7 030	17 600	2 850	7 200	49 400	49 400	

Drive data

	i	M_a (Nm)	u (mm/rev)	d_3 (mm)	v_{max} (m/s)	M_{Rs} (Nm)	$k_{J\,fix}$ (kg/mm²)	$k_{J\,var}$ (kg/mm)	$k_{J\,m}$ (mm²)	B_t	F_{bp} [3] (N)	$F_{t\,perm}$ [4] (N)	c_{spe} (N)	a_{max} (m/s²)
MKR-145	1	80.0	290.00	92.21	5.0	5.2	23 850	1.2326	2 125	50AT10	1 740	7 500	$2.12 \cdot 10^6$	50
	1 [2]	27.0	290.00		5.0									
	3	26.6	96.66		5.0		24 360							
	5	16.0	58.00		4.0									
	10	8.0	29.00		2.0									

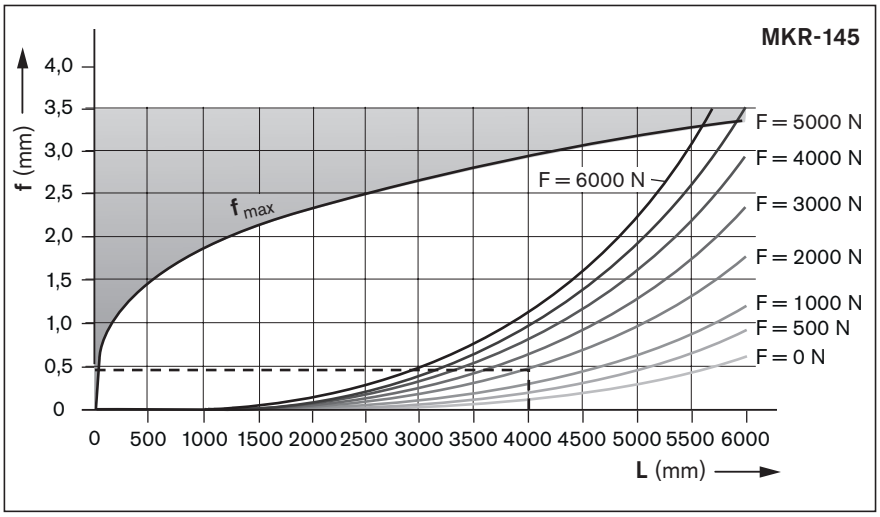
Deflection

The chart is valid for:
- Both ends firmly fixed (approx. 350 mm per end)
- 6 to 8 screws per side
- Solid mounting base

Example

Linear Module MKR-145:
L = 4000 mm F = 2000 N
From chart:
f = 0.47 mm f_{max} = 2.9 mm

The deflection f lies well below the maximum permissible deflection f_{max}, so no additional supports are required.



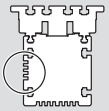
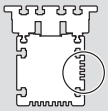
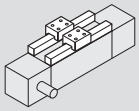
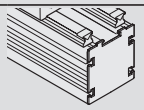
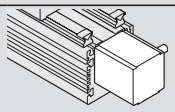
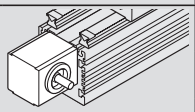
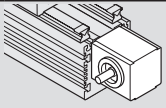
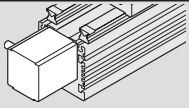
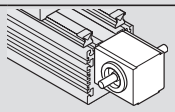
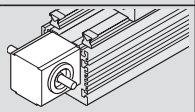
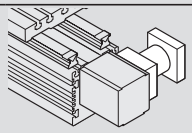
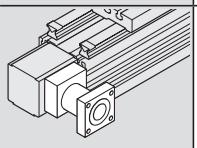
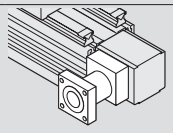
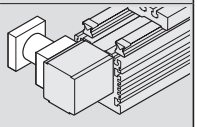
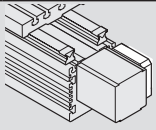
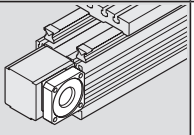
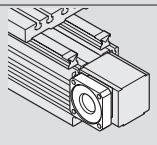
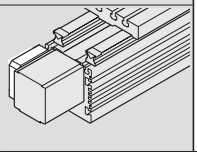
	L_{ad} (mm)	s_{min} [1] (mm)	L_{max} (mm)	Z_1 (mm)	Drive	$k_{g\ fix}$ (kg)	$k_{g\ var}$ (kg/mm)	m_{ca} (kg)	I_y (cm^4)	I_z (cm^4)
	40	80	6 000	50.5	OA01	17.4	0.0306	10.6	2 790	1 955
					MA...	17.4				
					MG...	24.6				

For short product names, see the “Additional information” chapter

[1] Minimum required travel curve to guarantee a reliable lubrication distribution. For operating conditions, see the “Additional information” chapter. If values are not met, please contact Bosch Rexroth.
[2] With keyway
[3] Maximum force that can be transmitted via the teeth meshing with the belt pulley.
[4] The maximum permitted tensile load on the belt cross section (belt elasticity limit) is given here for easier comparability. This value represents the load limit in terms of plastic deformation and may not be used to calculate the maximum permissible drive torque.

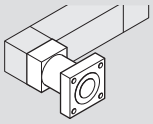
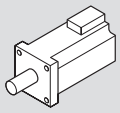
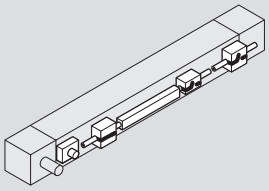
Linear Modules MKR-145

MKR-145-NN-2 Configuration and ordering

Short product name, length MKR-145-NN-2, ... mm			Guideway	Drive					Carriage	
Version	Slots for cable duct, left (L) 	Slots for cable duct, right (R) 		Drive journal	Gear ratio i = 1 [1]	1 [2]	3	5	10	L_{ca} = 400 mm
W/o drive (OA)	OA01 		01	without 00	–					10
With drive (MA), without gear reducer i = 1	MA01 	MA11 	01	Right	01	03	–			05
	MA02 	MA12 	01	Left	01	03	–			
	MA03 	MA13 	01	On both sides	02	04	–			
With external gear reducer (MG)	MG01 	MG03 	01	Gear reducer	–	–	10			05
	MG02 	MG04 		with 2nd journal	–	–	11			05
With integrated LPB gear reducer (MG)	MG05 	MG07 	01	Integrated gear unit	–	–	20			05
	MG06 	MG08 								

[1] Without keyway
[2] With keyway
[3] Attachment kit also available without motor (when ordering: enter “00” for motor)
[4] Note the orientation of the motor connectors (see Page 13)

Length calculation ➠ see chapter “General technical instructions”

	Motor attachment			Motor[4]		Switches / Mounting duct / Socket-plug		Documentation	
									
	Gear ratio i =	Attachment kit[3] with gear reducer	for motor	without Brake	with			Standard report	Measurement report
	–	00	–	00					
	–	00	–	00					
	–	00	–						
	–	00	–						
	i = 3	06	MSK060C	90	91				
	i = 5	16							
	i = 10	26							
	i = 3	02	MSK076C	92	93				
	i = 5	11							
	i = 10	21							
	i = 3	05	MSK060C	90	91				
	i = 5	15							
	i = 10	25							
	i = 3	04	MSK076C	92	93				
	i = 5	14							
	i = 10	24							

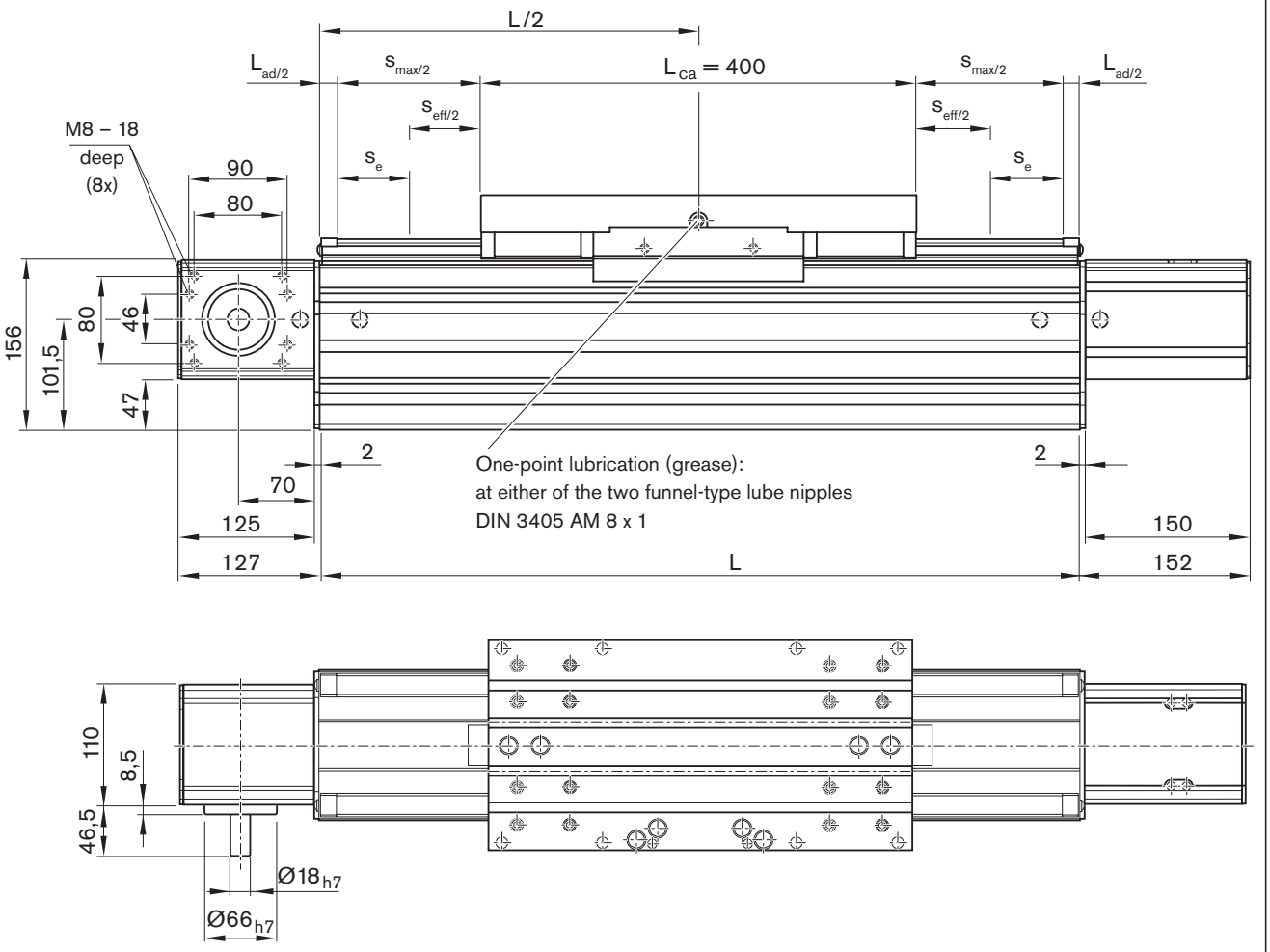
Without switch and mounting duct	00
Switches:	
– PNP NC	11
– PNP NO	13
– Mechanical	15
Cable duct (loose)	20
External socket/plug (loose)	17
External switching cam	16

Standard report	01
Measurement report	02 Frictional torque 05 Positioning accuracy

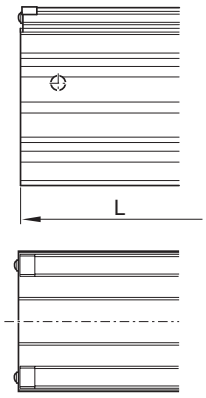
Linear Modules MKR-145

MKR-145-NN-2 – Dimension drawings

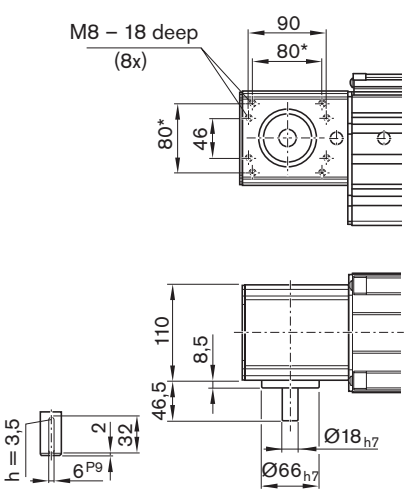
All dimensions in mm. Drawings not to scale



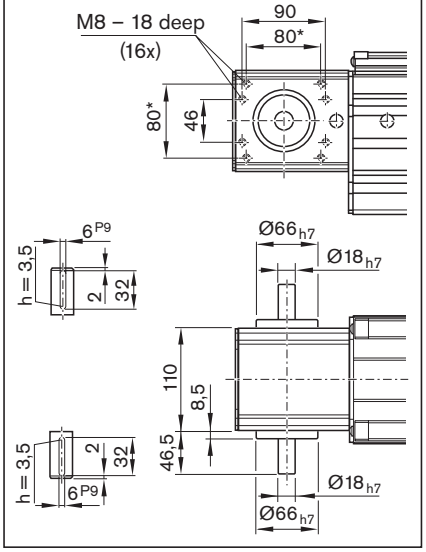
OA01

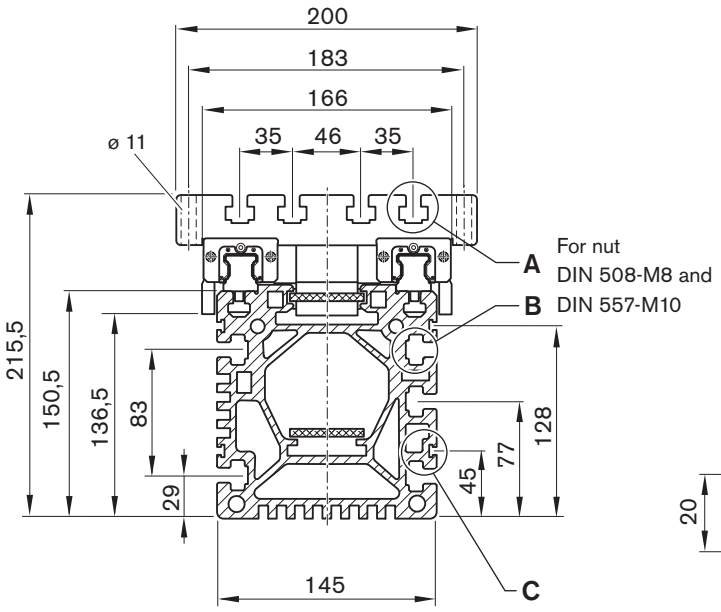


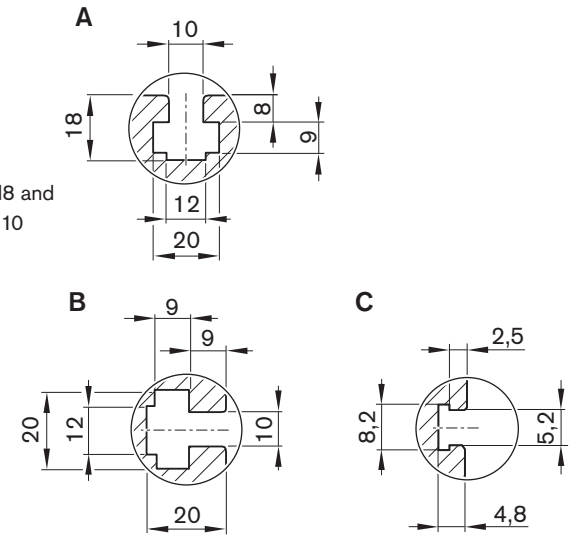
MA01, MA02, MA11, MA12



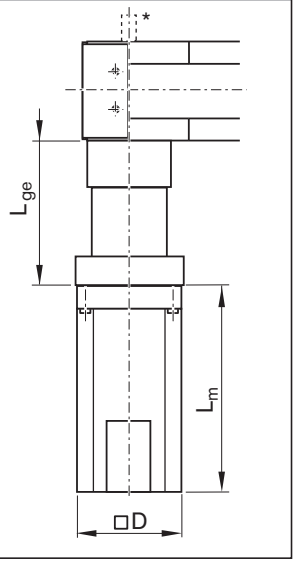
MA03, MA13



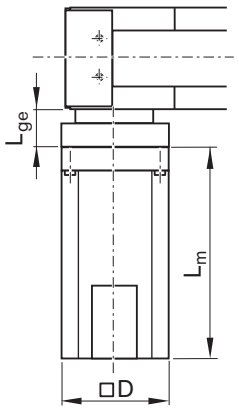




MG01* - MG04*



MG05 - MG08



Motor	Dimensions (mm)				
	Gear reducer		Motor		
		L_{ge}	D		L_m
	MG01 - MG04	MG05 - MG08		without brake	with brake
MSK060C	162	50	116	226.0	259.0
MSK076C	172	60	140	292.5	292.5

* For drive Option 11: second journal Ø18 x 43 mm

Mounting

General notes

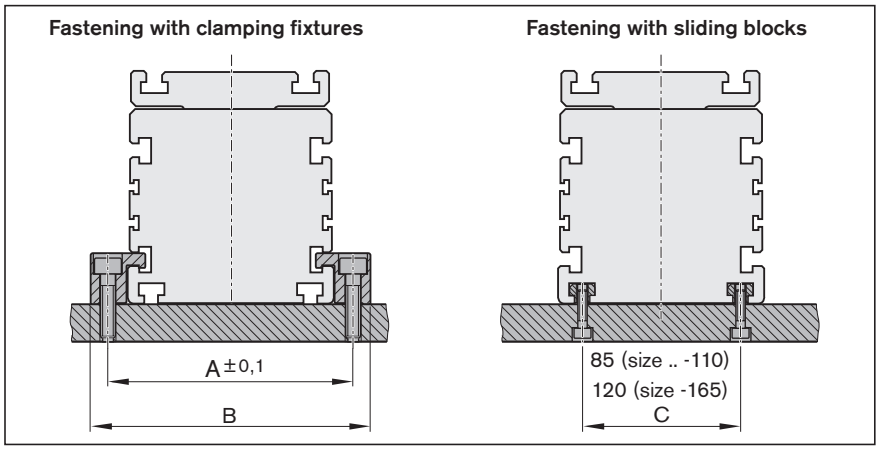
The Linear Modules are mounted using various fastening elements:
- Clamping fixtures
- Sliding blocks for size -110 and up
- Square nuts
- Spring nuts
- Screws for T-slots as per DIN 787 (no picture).

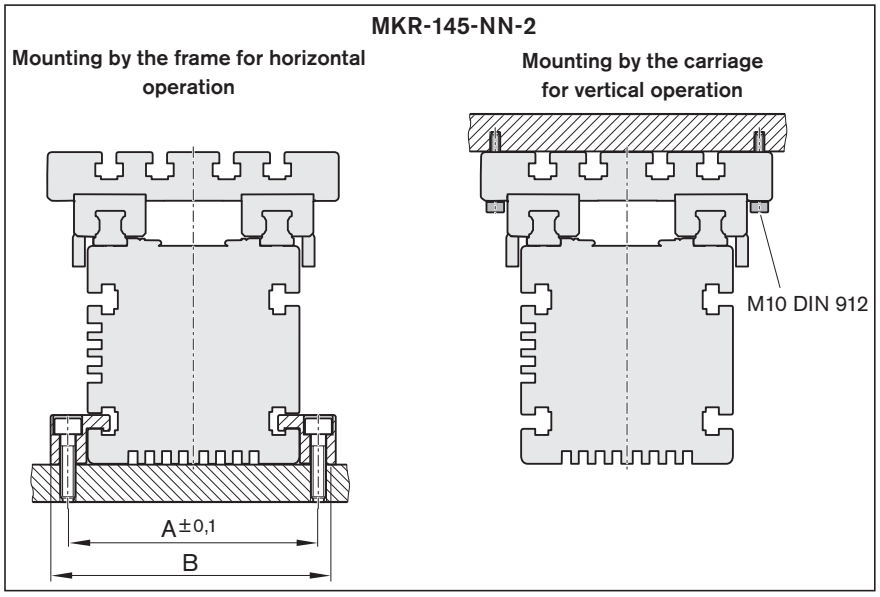
Length dependent on base.

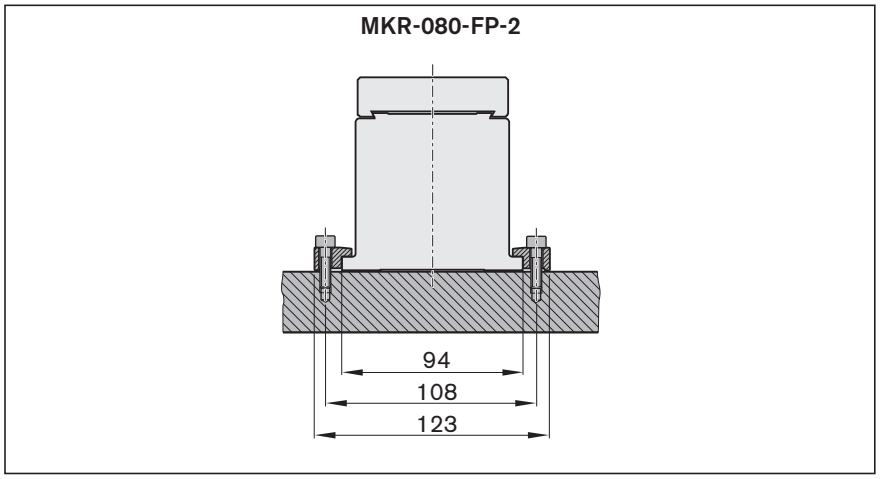
When mounting Linear Modules, please note the maximum tightening torques listed in the table.

Size	A (mm)	B (mm)
-040	52.2	65.5
-065	81.0	95.0
-080	96.0	110.0
-110	132.0	150.0
-165	192.0	218.0
-145	172.0	198.0

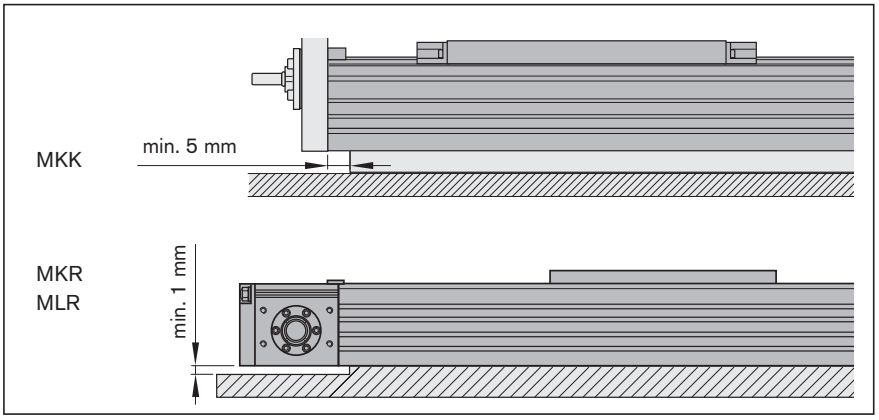
See “Robotic Erector System for Linear Modules” for additional mounting accessories for connecting Linear Modules.







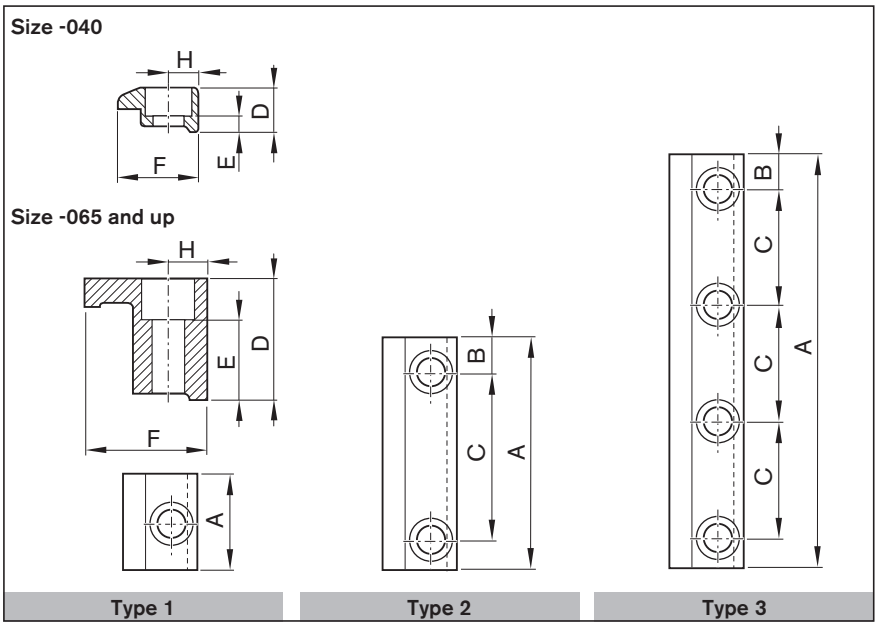
⚠ **Do not mount or support the Linear Module by the end block, end enclosure or end plate!**
The frame is the main load-bearing part!



Clamping fixtures

Recommended number of clamping fixtures for Linear Modules -040:
- Type 1: 6 pieces per side/m
- Type 2: 4 pieces per side/m
- Type 3: 3 pieces per side/m

Recommended number of clamping fixtures for Linear Modules -065 and up:
- Type 2: 3 per meter and side



Size	Countersink ISO 4762 for	Type	Number of holes N	Dimensions (mm) A	B	C	D	E	F	H	Part number
-040	M5	1	1	22	–	–	10.0	4.8	15	6.5	R141901001
		2	2	57	8.5	40					R141901043
		3	4	77	8.5	20					R141901044
-065	M6	2	2	78	14	50	20.0	11.5	20	7	R117519024
-080	M6			78	14	50	20.0	11.5	20	7	R117519024
-110	M8			108	19	70	27.5	16.5	29	9	R117529026
-165	M10			163	29	105	40.5	27.0	41	13	R117539014
-145	M10			163	29	105	32.0	18.5	41	13	R117529044

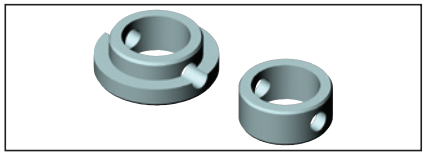
MKR-080-FP-2	Countersink ISO 4762 for	Type	Number of holes N	Dimensions (mm) A	B	C	D	F	H	Part number
	M6	1	1	25	–	–	11.5	19.3	7.5	R117519200
		2	2	62	11	40				R117519201
		3	4	142	11	40				R117519202

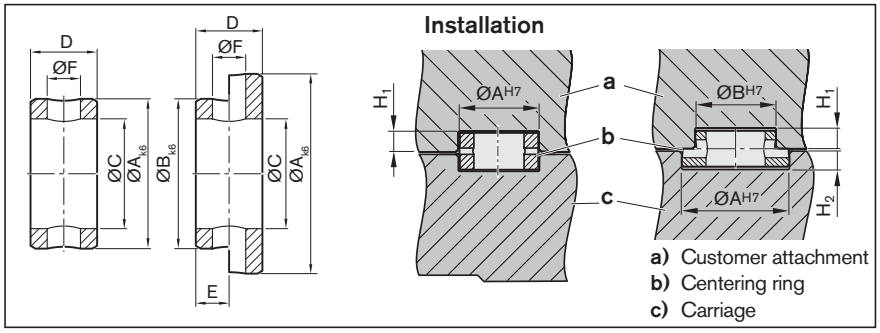
Mounting

Mounting and fastening elements

Centering rings

The centering ring serves as a positioning aid and for positive locking when mounting customer attachments to the carriage and the frame.
It creates a positive-locking connection with good reproducibility.
Material: Steel





Ø Size (mm)	Dimensions (mm) A	B	C ±0.1	D -0.2	E +0.2	ØF	H_1 +0.2	H_2 +0.2	Part number
5	5	–	3.4	3.0	–	1.6	1.6	–	R039660542
7	7	–	5.5	3.0	–	1.6	1.6	–	R039660543
9	9	–	6.6	4.0	–	2.0	2.1	–	R039660544
12	12	–	9.0	4.0	–	2.0	2.1	–	R039660545
16	16	–	11.0	6.0	–	3.0	3.1	–	R039660546
7 - 5	7	5	3.4	3.0	1.5	1.6	1.6	1.6	R039660547
9 - 5	9	5	3.4	3.5	1.5	1.6	2.1	1.6	R039660548
9 - 7	9	7	5.5	3.5	1.5	1.6	2.1	1.6	R039660549
12 - 9	12	9	6.6	4.0	2.0	2.0	2.1	2.1	R039660550
16 - 12	16	12	9.0	5.0	2.0	2.0	2.1	3.1	R039660551

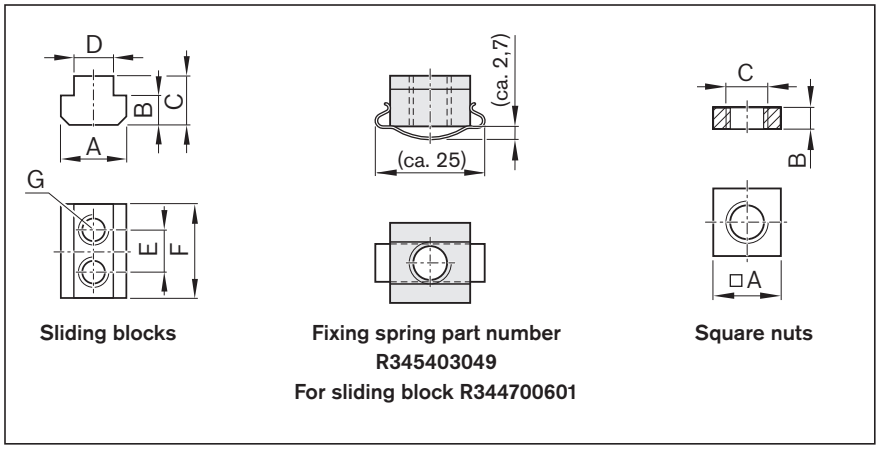
Sliding blocks

Size	Dimensions (mm) A	B	C	D	E	F	G	Part number
-110	13	6	10	8	–	13	M6 (1x)	R344700101*)
					9	20	M6 (2x)	R039175003*)
-165 / -145	15	6	12	10	–	15	M6 (1x) M8 (1x)	M6: R344700301*) M8: R344700201*)
					15	30	M8 (2x)	R039175004*)
	19	8.8	12	10	–	19	M10 (1x)	R344700601

*) Profile as per DIN 508

Square nuts

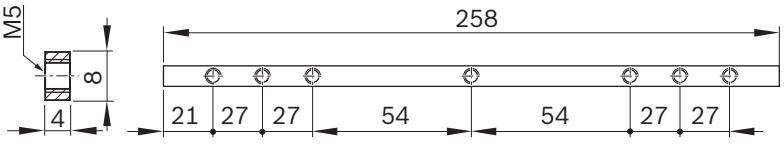
Size	Dimensions (mm) A	B	C	Part number
-065 / -080	8	4	M5	R913001655 (according to DIN 557)
-110	13	4	M8	R344200301 (according to DIN 562)
-165	16	8	M10	R344200200 (according to DIN 557)



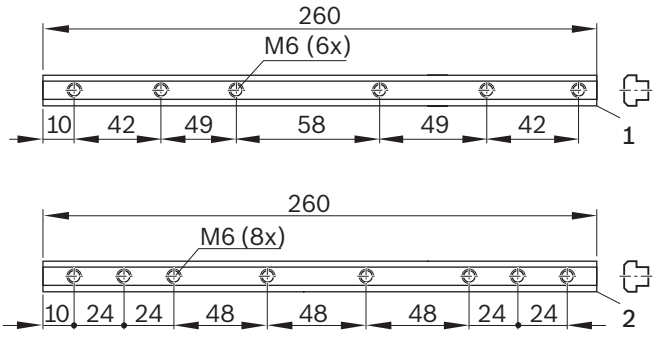
Threaded anchor strips

Steel, black finished
All anchor strips can be fixed in place for vertical installation.

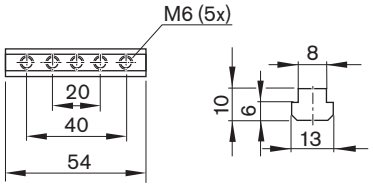
Sizes -080 / part number: R039171003



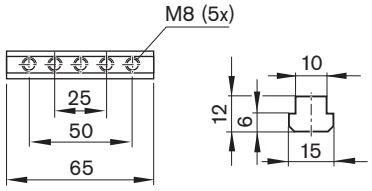
Sizes -110 / part number: 1: R039171001*) / 2: R039171000*)



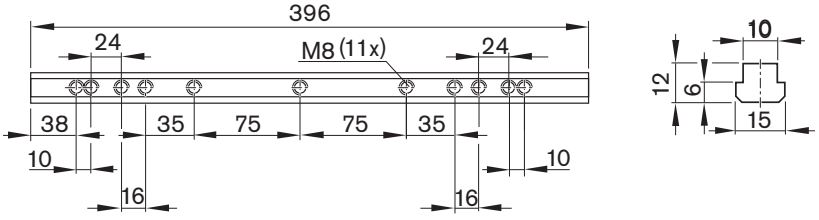
Size -110
Part number: R039171006*)



Sizes -145 / -165
Part number: R039171005*)



Sizes -165 / part number: R039171004*)



*) Profile as per DIN 50

Mounting

Connecting shafts

Steel connecting shafts with disk-pack coupling
(shaft 1, 2)
- Compensation of misalignments
- Backlash-free and torsionally stiff
- Bridge large distances between axes
- Dynamically balanced as per VDI 2060

Connecting shafts with flexible membrane coupling
(shaft 3 - 6)
- Compensation of misalignments
- Backlash-free and torsionally stiff
- Bridge large distances between axes
- Clamping hub (mounting and dismounting without shifting aligned axes)
- Dynamically balanced as per VDI 2060

Ordering
Please state the part number and length L_{cs} when ordering.
Alternative design subject to same technical data.

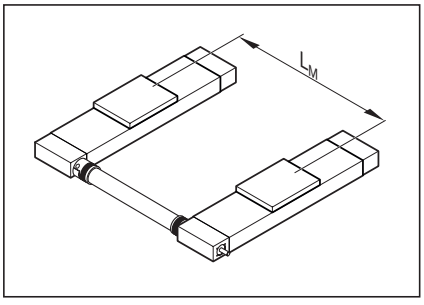
Notes on horizontal mounting orientation (version for vertical mounting orientation on request)
Alternative design subject to same technical data.

⚠ Install guards to protect against contact with rotating parts during operation! Comply with the equipment safety rules and machine safety regulations at all times!

Calculation of length L_{cs} for i = 1:

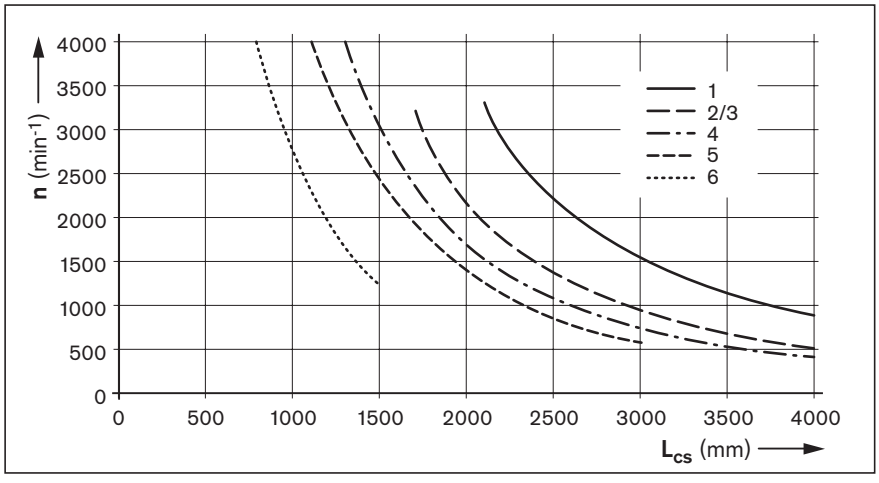
Shaft	Size	Length L_{cs} (mm)
1	-165	L_M – 220 mm
2	-110	L_M – 140 mm
	-080	L_M – 120 mm
3	-110	L_M – 155 mm
4	-080	L_M – 144 mm
5	-065	L_M – 105 mm
6	-040	L_M – 55 mm

L_{cs} = overall length of the connecting shaft (mm)
L_M = centerline-to-centerline distance between Linear Modules (mm)



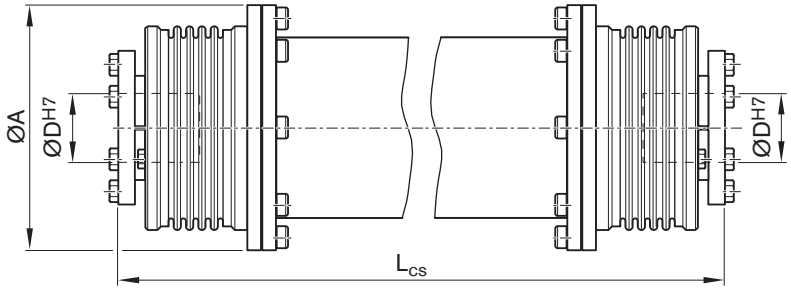
Critical speed as a function of overall length

n = speed (rpm)
L_{cs} = overall length of the connecting shaft (mm)



Dimension drawings

Steel connecting shafts (disk-pack coupling)

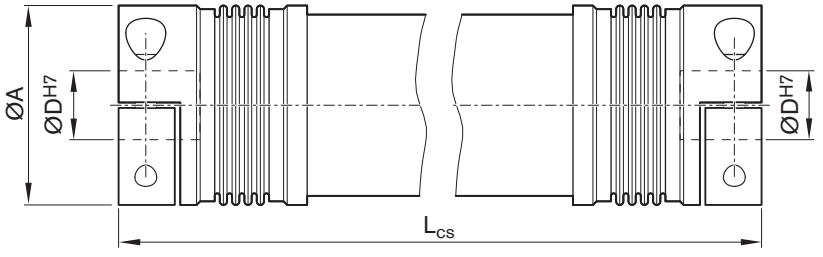


Dimensions and part numbers

Shaft	Size	Part number	Dimensions				Torque	Weight	Flexibility		Mass moment of inertia
			A	D	$L_{cs\ min}$	$L_{cs\ max}$			Δk_a	Δk_w	
			(mm)	(mm)	(mm)	(mm)	(Nm)	(kg)	(mm)	(°)	(10^{-6} kgm²)
1	**-165**	R039151011	149	35	280	4 000	400	12.8 + 0.0115 • (L_{cs} – 180)	2.6	1	32 320 + 38.5 • (L_{cs} – 180)
2	**-080, -110**	R039151012	110	18	250	4 000	100	4.2 + 0.008 • (L_{cs} – 160)	1.8	1	6 480 + 8.5 • (L_{cs} – 160)

Δk_a = axial flexibility (mm)
Δk_w = angular flexibility (°)

Connecting shafts (membrane coupling)



Dimensions and part numbers

Shaft	Size	Part number	Dimensions				Torque	Weight	Mass moment of inertia
			A	D	$L_{cs\ min}$	$L_{cs\ max}$			
			(mm)	(mm)	(mm)	(mm)	(Nm)	(kg)	(10^{-6} kgm²)
3	**-110**	R039151013	81	18	200	4 000	150	2.00 + 0.00318 • (L_{cs} – 160)	2 000 + 4.5 • (L_{cs} – 160)
4	**-080**	R039151014	66	18	171	4 000	60	0.85 + 0.00145 • (L_{cs} – 120)	510 + 1.18 • (L_{cs} – 120)
5	**-065**	R039151015	55	16	148	3 000	25	0.62 + 0.0012 • (L_{cs} – 120)	245 + 0.663 • (L_{cs} – 120)
6	**-040**	R039151021	32	10	101	1 500	25	0.12 + 0.00054 • (L_{cs} – 80)	30 + 0.09 • (L_{cs} – 80)

Connection technology for Linear Motion Systems

Product description

In the past, machine manufacturers themselves have had to devise, design and fabricate systems to install or mount and connect Linear Modules with precision ball screw assemblies or belt drives.

The Robotic Erector System for Linear Modules facilitates these tasks and brings savings for the user, since the system comprises mass-produced standardized components.

The result: Users can respond flexibly to the varied requirements and uses of linear motion technology.

The system offers various possibilities to construct two or three axes from Linear Modules and connection elements.

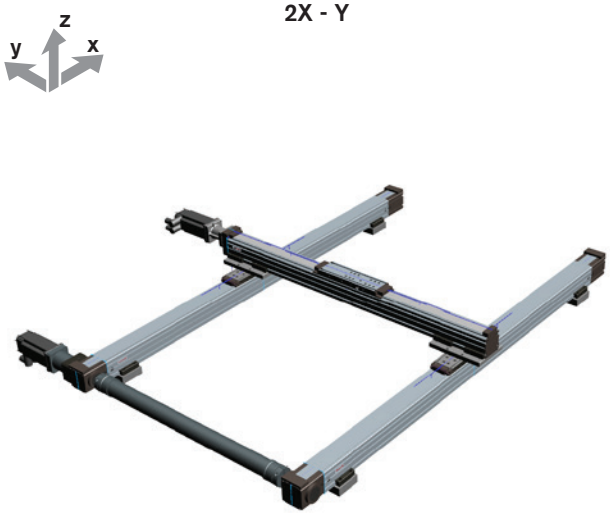
The basic elements (plates and brackets) have been designed to allow Linear Modules to be connected to other ones of the same size or one size larger or smaller.

The range also includes purpose-designed mounting accessories.
The Linear Modules and the connecting elements combine to form the Robotic Erector System.

Configuration options

2 axes

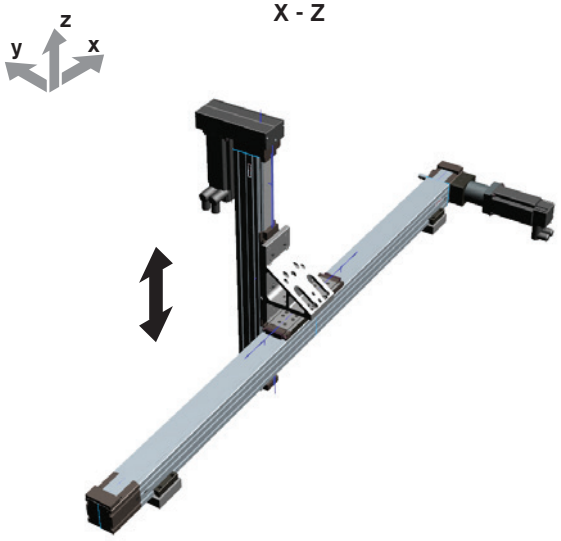
2X - Y



Connection elements:
2 connection plates

2 axes

X - Z



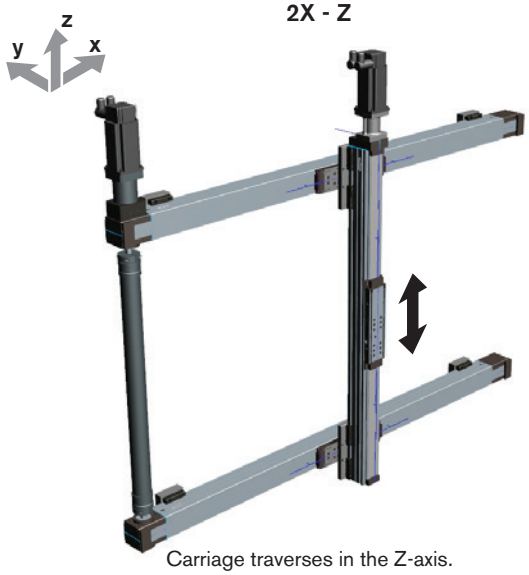
Linear module traverses in the Z-axis.

Connection elements:
1 connection bracket

See the catalog for further information about the connection system “Connection technology for Linear Motion Systems”.

2 axes

2X - Z



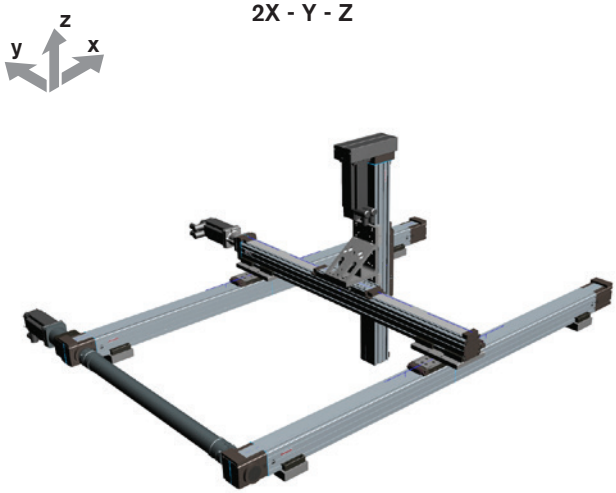
Carriage traverses in the Z-axis.

Connection elements:

2 connection plates

3 axes

2X - Y - Z



Connection elements:

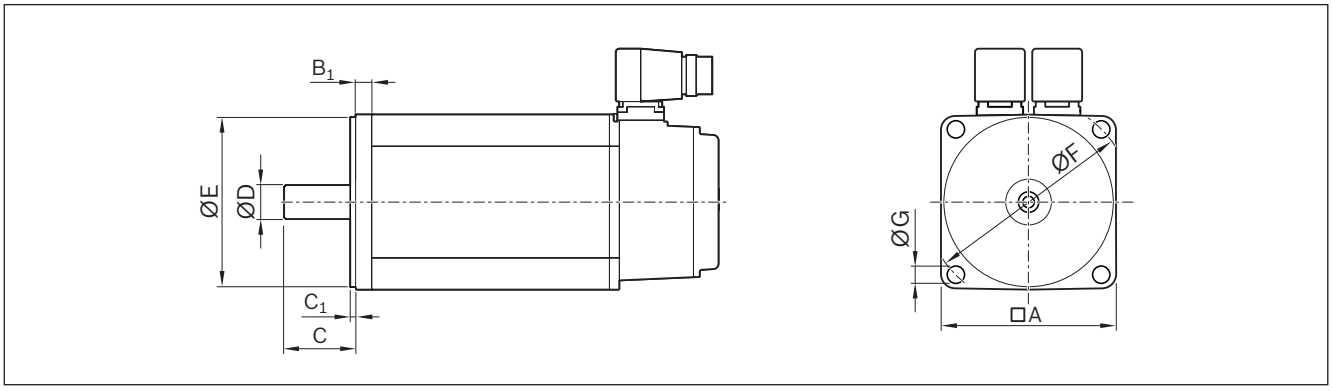
2 connection plates

1 connection bracket

Motors

Attachment kits for motors according to customer specification

The motor of a Linear Motion System with Rexroth Ball Screw Assembly is attached by either an attachment kit with mount and coupling or a timing belt side drive.
The available combinations are shown in the “Configuration and ordering” selection tables for each size. In addition to attachment kits for Rexroth motors, attachment kits for motors according to customer specification are also available. In order to determine the appropriate attachment kit, the connection geometry of the motor is crucial. Characteristics required to clearly determine motor geometry are shown below.

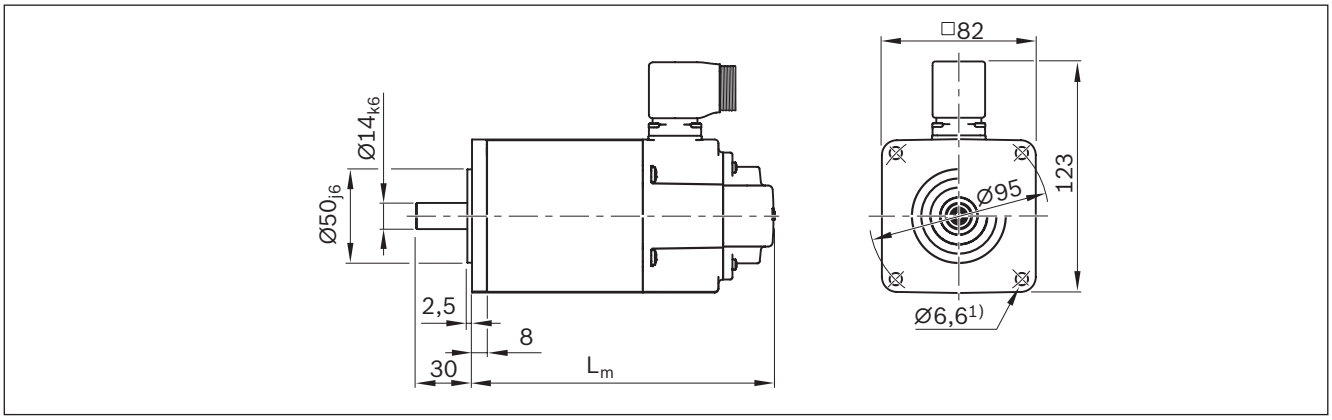


The dimensions queried result in a unique “motor geometry code”:

□□ □□ □□□ □□□ □□□ M□□ – □□□ – □□□

ØD	=	Shaft diameter
C	=	Shaft length
ØE	=	Centering diameter
C_1	=	Centering depth
ØF	=	Pitch diameter
ØG	=	Through-hole for mounting screw (specify thread diameter)
B_1	=	Mount thickness
A	=	Mount edge dimension

Example illustration of servo motor IndraDyn S Type MS2N04

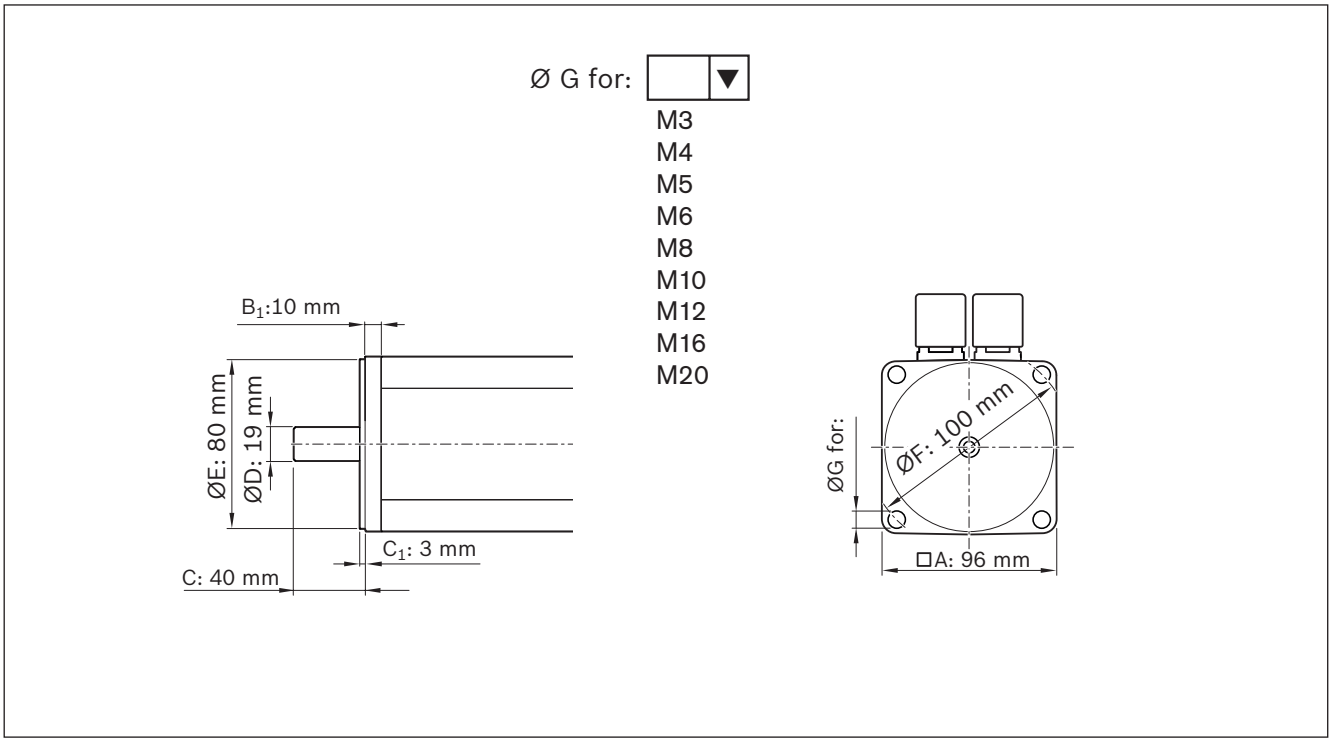


1	4	3	0	0	5	0	2	.	5	0	9	5	M	0	6	0	0	8	0	8	2		

1) The through-hole Ø 6.6 mm results in the type designation M06 for the geometry motor code (M6 fastening screw nominal thread).

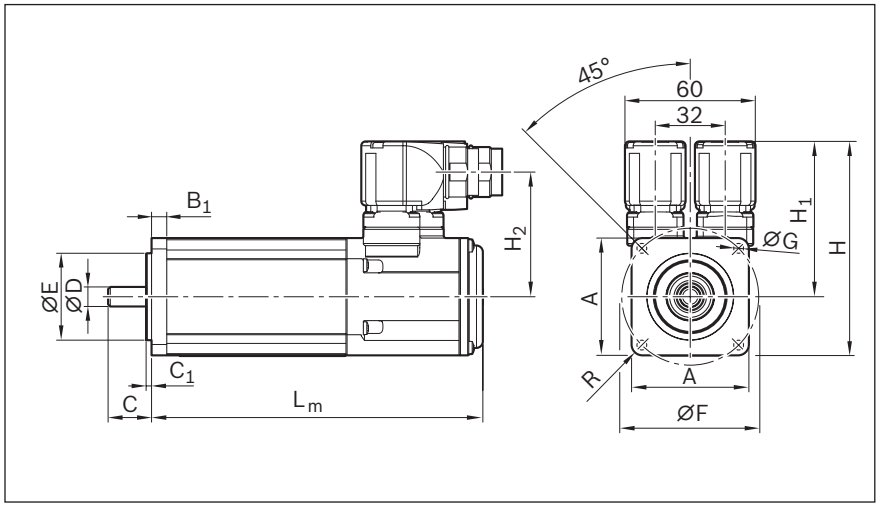
Attachment kits for motors according to customer specification can be configured using the online configurator in the eShop. To do this, select the “Attachment kits for motors according to customer specification” option.

Enter motor geometry in the input dialog box. The dimensions can be entered directly or by using a drop-down menu.



Motors

IndraDyn S - servo motors MSK



Motor schematic

Motor	Dimensions (mm)													
	A	B_1	C	C_1	ØD k6	ØE j6	ØF	ØG	H	H_1	H_2	L_m Without holding brake	L_m With holding brake	R
MSK030C-0900	54	7.0	20	2.5	9	40	63	4.5	98.5	71.5	57.4	188.0	213.0	R5
MSK040C-0600	82	8.0	30	2.5	14	50	95	6.6	124.5	83.5	69.0	185.5	215.5	R8
MSK050C-0600	98	9.0	40	3.0	19	95	115	9.0	134.5	85.5	71.0	203.0	233.0	R8
MSK060C-0600	116	9.5	50	3.0	24	95	130	9.0	156.5	98.5	84.0	226.0	259.0	R9
MSK076C-0450	140	14.0	50	4.0	24	110	165	11.0	180.0	110.0	95.6	292.5	292.5	R12

Motor data

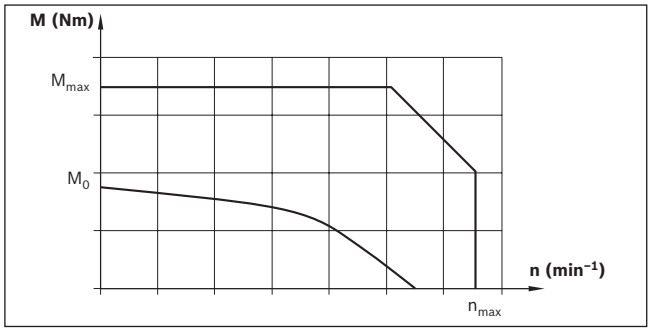
Motor	n_{max} (rpm)	M_0 (Nm)	M_{max} (Nm)	M_{br} (Nm)	J_m (kgm^2)	J_{br} (kgm^2)	m_m (kg)	m_{br} (kg)
MSK030C-0900	9 000	0.8	4.0	1	0.000030	0.000007	1.9	0.2
MSK040C-0600	7 500	2.7	8.1	4	0.000140	0.000023	3.6	0.3
MSK050C-0600	6 000	5.0	15.0	5	0.000330	0.000107	5.4	0.7
MSK060C-0600	6 000	8.0	24.0	10	0.000800	0.000059	8.4	0.8
MSK076C-0450	5 000	12.0	43.5	11	0.004300	0.000360	13.8	1.1

Motor	Holding brake		Type code	Part number
	without	with		
MSK030C-0900	X		MSK030C-0900-NN-M1-UG0-NNNN	R911308683
		X	MSK030C-0900-NN-M1-UG1-NNNN	R911308684
MSK040C-0600	X		MSK040C-0600-NN-M1-UG0-NNNN	R911306060
		X	MSK040C-0600-NN-M1-UG1-NNNN	R911306061
MSK050C-0600	X		MSK050C-0600-NN-M1-UG0-NNNN	R911298354
		X	MSK050C-0600-NN-M1-UG1-NNNN	R911298355
MSK060C-0600	X		MSK060C-0600-NN-M1-UG0-NNNN	R911306052
		X	MSK060C-0600-NN-M1-UG1-NNNN	R911306053
MSK076C-0450	X		MSK076C-0450-NN-M1-UG0-NNNN	R911318098
		X	MSK076C-0450-NN-M1-UG1-NNNN	R911315713

Version

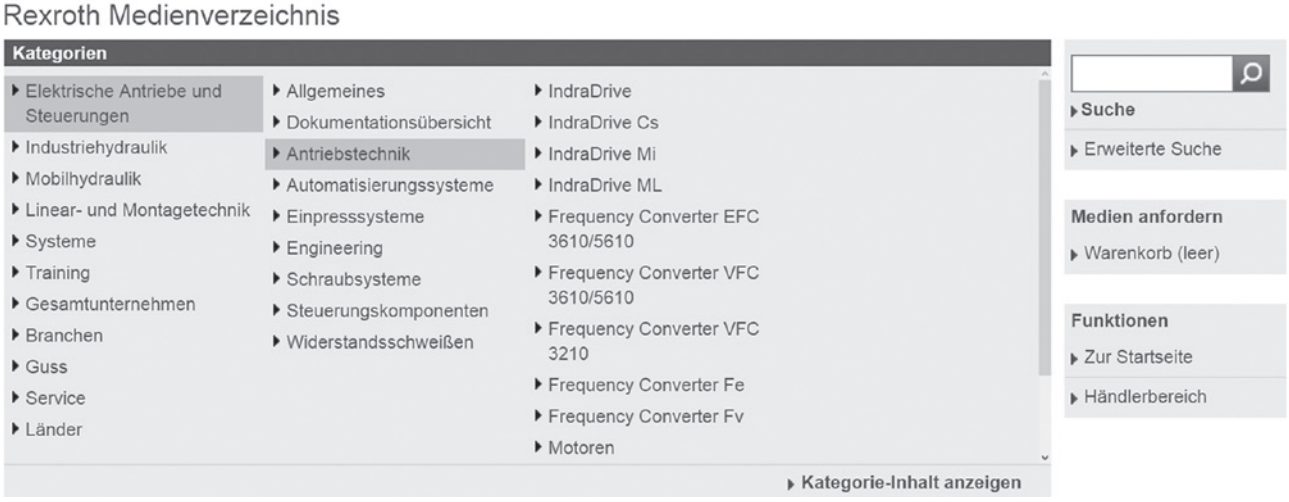
- Plain shaft with shaft seal ring
- Multiturn absolute encoder M1 (Hiperface)
- Cooling system: natural convection
- Protection class IP65 (casing)
- With or without holding brake

Torque/speed characteristic
(schematic)



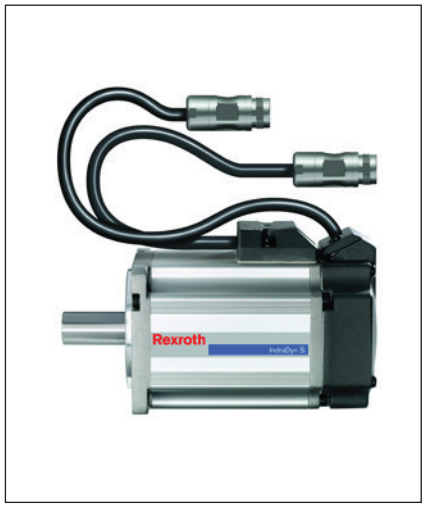
Note

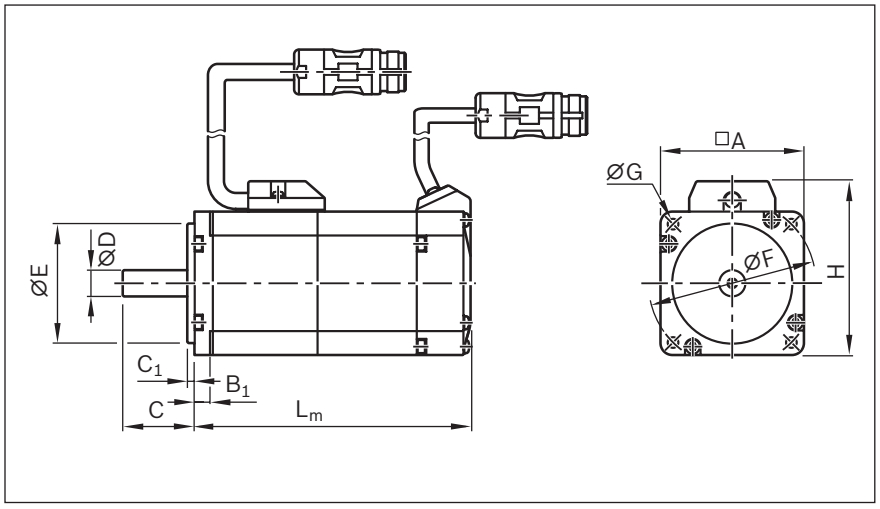
Motors are available with controllers and control systems. See the Rexroth Drive Technology catalog for other motor types and more information on motors, controllers and control systems www.boschrexroth.com/medienverzeichnis.



Motors

IndraDyn S - servo motors MSM





Motor schematic

Motor code	Dimensions (mm)										
	A	B_1	C	C_1	ØD h6	ØE h7	ØF	ØG	H	L_m Without holding brake	L_m With holding brake
MSM019B-0300	38	6.0	25	3	8	30	45	3.4	51	92.0	122.0
MSM031B-0300	60	6.5	30	3	11	50	70	4.5	73	79.0	115.5
MSM031C-0300	60	6.5	30	3	14	50	70	4.5	73	98.5	135.0
MSM041B-0300	80	8.0	35	3	19	70	90	6.0	93	112.0	149.0

Motor data

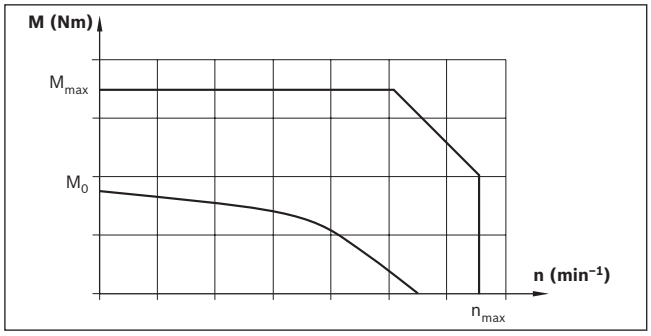
Motor code	n_{max} (rpm)	M_0 (Nm)	M_{max} (Nm)	M_{br} (Nm)	J_m (kgm²)	J_{br} (kgm²)	m_m (kg)	m_{br} (kg)
MSM019B-0300	5 000	0.32	0.95	0.29	0.0000051	0.0000002	0.47	0.21
MSM031B-0300	5 000	0.64	1.91	1.27	0.0000140	0.0000018	0.82	0.48
MSM031C-0300	5 000	1.30	3.80	1.27	0.0000260	0.0000018	1.20	0.50
MSM041B-0300	4 500	2.40	7.10	2.45	0.0000870	0.0000075	2.30	0.80

Motor code	Motor connection 1/ 2 cable	Holding brake (Yes / No)	Type code	Part number
MSM019B-0300-NN	2	N	MSM019B-0300-NN-M5-MH0	R911344211
		Y	MSM019B-0300-NN-M5-MH1	R911344212
MSM031B-0300-NN	2	N	MSM031B-0300-NN-M5-MH0	R911344213
		Y	MSM031B-0300-NN-M5-MH1	R911344214
MSM031C-0300-NN	2	N	MSM031C-0300-NN-M5-MH0	R911344215
		Y	MSM031C-0300-NN-M5-MH1	R911344216
MSM041B-0300-NN	2	N	MSM041B-0300-NN-M5-MH0	R911344217
		Y	MSM041B-0300-NN-M5-MH1	R911344218

Specification:

- Plain shaft without shaft seal ring
- Multiturn absolute encoder M5 (20 bit, absolute encoder function only available with backup battery)
- Cooling system: natural convection
- Protection class IP54 (shaft IP40)
- With or without holding brake
- Metal round connector M17

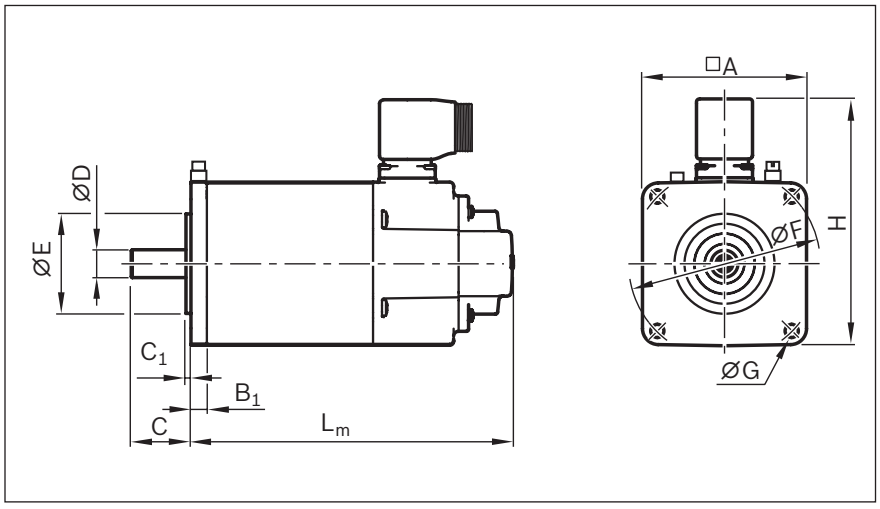
Torque/speed characteristic
(schematic)



Note

Motors are available with controllers and control systems. See the Rexroth Drive Technology catalog for other motor types and more information on motors, controllers and control systems www.boschrexroth.com/medienverzeichnis.

IndraDyn S - servo motors MS2N



Motor schematic

Motor code	Dimensions (mm)											
	A	B_1	C	C_1	ØD k6	ØE j7	ØF	ØG	H 2	H cable 1	L_m holding brake without	L_m holding brake with
MS2N03-D0BYN	58	7.5	23	2.5	11	40	63	4.5	84.0	99.0	203.0	232.0
MS2N04-B0BTN	82	8.0	30	2.5	14	50	95	6.6	108.0	123.0	162.0	194.5
MS2N04-C0BTN											194.0	226.5
MS2N04-D0BQN											226.0	258.5
MS2N05-B0BTN	98	9.0	40	3.0	19	95	115	9.0	124.0	139.0	188.0	218.0
MS2N05-C0BTN											224.0	254.0
MS2N05-D0BRN											260.0	290.0
MS2N06-B1BNN	116	14.0	50	3.0	24	95	130	9.0	156.0	156.0	164.0	201.0
MS2N06-C0BTN											184.0	202.0
MS2N06-D0BRN											224.0	261.0
MS2N06-D1BNN											224.0	261.0
MS2N07-B1BNN	140	18.0	58	4.0	32	130	165	11.0	180.0	180.0	176.0	230.0
MS2N07-C1BRN											205.0	259.0
MS2N07-D1BNN											263.0	317.0

Motor data

Motor code	n_{max} (rpm)	M_0 (Nm)	M_{max} (Nm)	M_{br} (Nm)	J_m (kgm^2)	J_{br} (kgm^2)	m_m (kg)	m_{br} (kg)
MS2N03-D0BYN	9 000	1.15	6.8	1.8	0.000037	0.000007	2.0	0.4
MS2N04-B0BTN	6 000	1.75	5.9	5.0	0.000070	0.000040	2.7	0.7
MS2N04-C0BTN		2.80	12.0	5.0	0.000110	0.000050	3.7	0.7
MS2N04-D0BQN		3.85	18.1	5.0	0.000160	0.000040	4.7	0.7
MS2N05-B0BTN		3.75	10.6	10.0	0.000170	0.000110	4.0	1.1
MS2N05-C0BTN		6.10	20.8	10.0	0.000290	0.000110	5.9	1.1
MS2N05-D0BRN		7.90	31.3	10.0	0.000400	0.000110	7.3	1.1
MS2N06-B1BNN		3.25	9.5	10.0	0.000480	0.000110	5.1	1.1
MS2N06-C0BTN		6.00	16.0	10.0	0.000390	0.000110	6.4	1.0
MS2N06-D0BRN		9.70	32.0	15.0	0.000650	0.000140	9.0	1.5
MS2N06-D1BNN		9.00	38.4	15.0	0.001400	0.000140	9.0	1.5
MS2N07-B1BNN		7.40	21.0	20.0	0.001970	0.000260	9.5	2.0
MS2N07-C1BRN		11.50	42.2	20.0	0.003050	0.000260	12.0	2.0
MS2N07-D1BNN		18.90	84.8	36.0	0.005290	0.000410	17.5	2.5

Note

Motors are available with controllers and control systems. See the Rexroth Drive Technology catalog for other motor types and more information on motors, controllers and control systems at www.boschrexroth.com/medienverzeichnis.

Motor code	Motor connection 1/ 2 cable	Holding brake (Yes / No)	Type code	Part number
MS2N03-D0BYN	2	N	MS2N03-D0BYN-BMDH0-NNNNE-NN	R911384770
		Y	MS2N03-D0BYN-BMDH1-NNNNE-NN	R911384771
	1	N	MS2N03-D0BYN-CMSH0-NNNNE-NN	R911384772
		Y	MS2N03-D0BYN-CMSH1-NNNNE-NN	R911384773
MS2N04-B0BTN	2	N	MS2N04-B0BTN-BMDH0-NNNNE-NN	R911384525
		Y	MS2N04-B0BTN-BMDH1-NNNNE-NN	R911384526
	1	N	MS2N04-B0BTN-CMSH0-NNNNE-NN	R911384527
		Y	MS2N04-B0BTN-CMSH1-NNNNE-NN	R911384528
MS2N04-C0BTN	2	N	MS2N04-C0BTN-BMDH0-NNNNE-NN	R911384529
		Y	MS2N04-C0BTN-BMDH1-NNNNE-NN	R911384530
	1	N	MS2N04-C0BTN-CMSH0-NNNNE-NN	R911384531
		Y	MS2N04-C0BTN-CMSH1-NNNNE-NN	R911384532
MS2N04-D0BQN	2	N	MS2N04-D0BQN-BMDH0-NNNNE-NN	R911384533
		Y	MS2N04-D0BQN-BMDH1-NNNNE-NN	R911384534
	1	N	MS2N04-D0BQN-CMSH0-NNNNE-NN	R911384535
		Y	MS2N04-D0BQN-CMSH1-NNNNE-NN	R911384536
MS2N05-B0BTN	2	N	MS2N05-B0BTN-BMDH0-NNNNE-NN	R911384539
		Y	MS2N05-B0BTN-BMDH1-NNNNE-NN	R911384540
	1	N	MS2N05-B0BTN-CMSH0-NNNNE-NN	R911384542
		Y	MS2N05-B0BTN-CMSH1-NNNNE-NN	R911384543
MS2N05-C0BTN	2	N	MS2N05-C0BTN-BMDH0-NNNNE-NN	R911384544
		Y	MS2N05-C0BTN-BMDH1-NNNNE-NN	R911384545
	1	N	MS2N05-C0BTN-CMSH0-NNNNE-NN	R911384546
		Y	MS2N05-C0BTN-CMSH1-NNNNE-NN	R911384547
MS2N05-D0BRN	2	N	MS2N05-D0BRN-BMDH0-NNNNE-NN	R911384548
		Y	MS2N05-D0BRN-BMDH1-NNNNE-NN	R911384549
	1	N	MS2N05-D0BRN-CMSH0-NNNNE-NN	R911384550
		Y	MS2N05-D0BRN-CMSH1-NNNNE-NN	R911384551
MS2N06-B1BNN	2	N	MS2N06-B1BNN-BMUH0-NNNNE-NN	R911384927
		Y	MS2N06-B1BNN-BMUH1-NNNNE-NN	R911384928
	1	N	MS2N06-B1BNN-CMSH0-NNNNE-NN	R911384929
		Y	MS2N06-B1BNN-CMSH1-NNNNE-NN	R911384930
MS2N06-C0BTN	2	N	MS2N06-C0BTN-BMUH0-NNNNE-NN	R911384931
		Y	MS2N06-C0BTN-BMUH1-NNNNE-NN	R911384932
	1	N	MS2N06-C0BTN-CMSH0-NNNNE-NN	R911384933
		Y	MS2N06-C0BTN-CMSH1-NNNNE-NN	R911384934
MS2N06-D0BRN	2	N	MS2N06-D0BRN-BMUH0-NNNNE-NN	R911384935
		Y	MS2N06-D0BRN-BMUH2-NNNNE-NN	R911384936
	1	N	MS2N06-D0BRN-CMSH0-NNNNE-NN	R911384937
		Y	MS2N06-D0BRN-CMSH2-NNNNE-NN	R911384938
MS2N06-D1BNN	2	N	MS2N06-D1BNN-BMUH0-NNNNE-NN	R911384939
		Y	MS2N06-D1BNN-BMUH2-NNNNE-NN	R911384940
	1	N	MS2N06-D1BNN-CMSH0-NNNNE-NN	R911384941
		Y	MS2N06-D1BNN-CMSH2-NNNNE-NN	R911384942
MS2N07-B1BNN	2	N	MS2N07-B1BNN-BMUH0-NNNNE-NN	R911384949
		Y	MS2N07-B1BNN-BMUH1-NNNNE-NN	R911384950
	1	N	MS2N07-B1BNN-CMSH0-NNNNE-NN	R911384951
		Y	MS2N07-B1BNN-CMSH1-NNNNE-NN	R911384952
MS2N07-C1BRN	2	N	MS2N07-C1BRN-BMUH0-NNNNE-NN	R911384957
		Y	MS2N07-C1BRN-BMUH1-NNNNE-NN	R911384958
	1	N	MS2N07-C1BRN-CMSH0-NNNNE-NN	R911384959
		Y	MS2N07-C1BRN-CMSH1-NNNNE-NN	R911384960
MS2N07-D1BNN	2	N	MS2N07-D1BNN-BMUH0-NNNNE-NN	R911384963
		Y	MS2N07-D1BNN-BMUH2-NNNNE-NN	R911384964
	1	N	MS2N07-D1BNN-CMSH0-NNNNE-NN	R911384965
		Y	MS2N07-D1BNN-CMSH2-NNNNE-NN	R911384966

Version

- Plain shaft without shaft seal ring
- Multi-turn encoder
- Standard encoder (B) combined with 2-cable connection (Hiperface interface)
- Advanced encoder (C) combined with 1-cable connection (AcuroLink interface)
- Protection class IP64
- With or without holding brake
- Separate grounding connection clamp available in the motor mount area (assignment if necessary)

Switching system MKK, MKR, MLR

Overview of switching system

1. Socket and plug
2. Mechanical switch with attachments
3. Proximity switch
4. Switching cam
5. Mounting duct/cable duct
6. Magnetic field sensor with fixed potted cable (Reed/Hall sensor (for mounting duct))
7. Reed/Hall sensor with plug and sensor mount
   7a: Sensor (Hall sensor option 59 or reed sensor option 58)
   7b: Sensor mount incl. set screws (loose) and square nut
   7c: Cable holder (3 pcs) incl. set screw (loose)
   7d: Plug
8. Magnetic switch
9. Clamping screw
10. **Sliding block**

Switch mounting arrangements MKK/MKR-040-NN-2

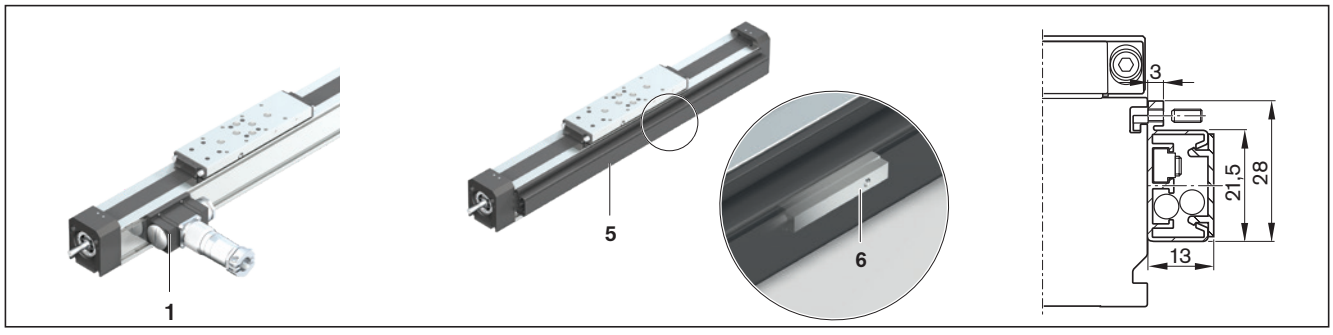
Switch mounting arrangements with magnetic field sensors with mounting duct

The switch activator is a magnet integrated in the carriage (no switching cam necessary). The switch activation points can be positioned anywhere along the stroke.

Specification: Hall sensor (PNP NC) or reed sensor (changer)

Notes for mounting:

The magnetic field sensors are pushed into the top T-slot in the cable duct and fixed with set screws. The cables are routed along the side of the T-slot for switches.

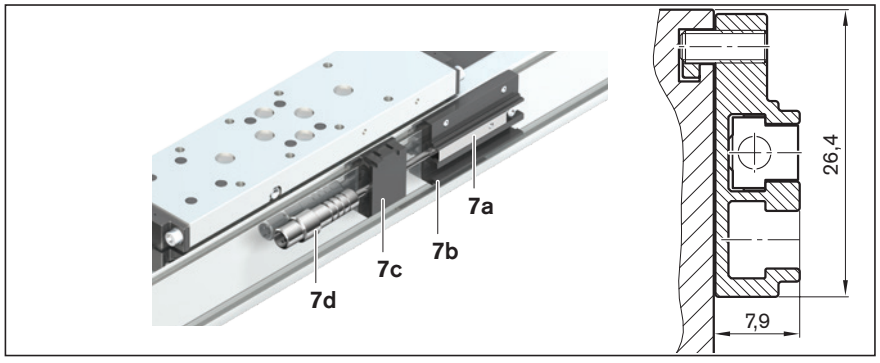


Part number		
Cable length	**Hall sensor**	**Reed sensor**
2 m	R347601003	R347600903
10 m	R913011324	R913011323

Switch mounting arrangements with magnetic field sensor, connector and sensor mount

Sensor mounting kit

The switch activator is a magnet integrated in the carriage (no switching cam necessary). The switch activation points can be positioned anywhere along the stroke.



Part number	
Hall sensor	**Reed sensor**
R347602403	R347602303

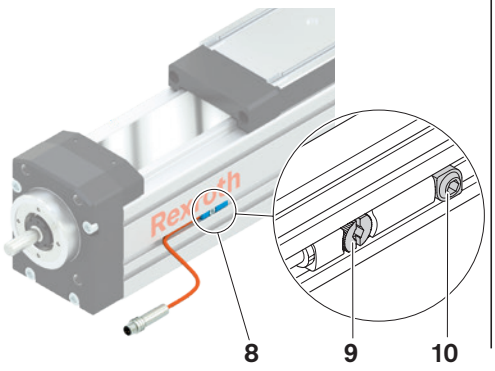
General mounting instructions:

Sensors may only be mounted on one side (left or right) of the Linear Module and should not be installed until the Linear Module has been screwed down on its base. For a description of the mounting procedure and determination of the switch activation points, see the mounting instructions for Linear Modules.

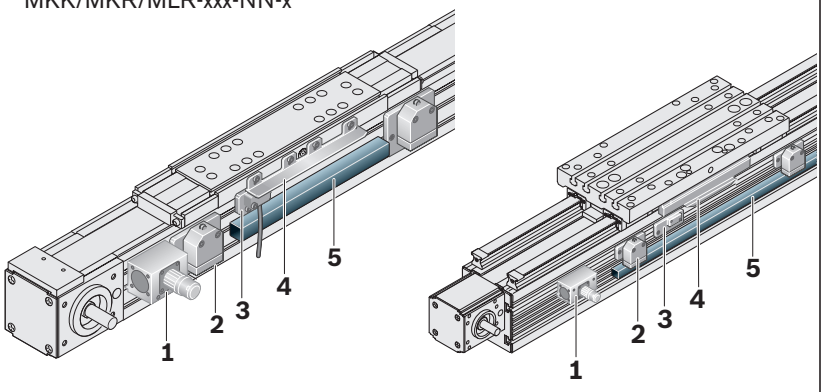
See chapter “Attachments and accessories” for technical data

Switch mounting arrangements MKK/MKR/MLR-xxx-NN-x

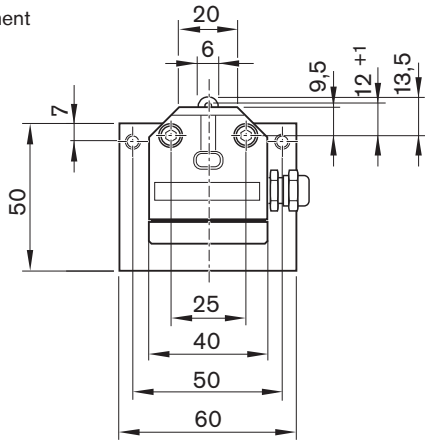
MKK/MKR-xxx-NN-3



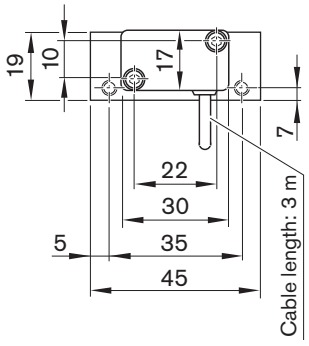
MKK/MKR/MLR-xxx-NN-x



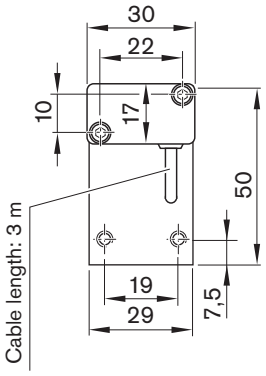
Mechanical switch with attachment



Proximity switch with attachment for sizes -040, -065, -080, -145, -165



Proximity switch (with attachment) for size -110



Ordering the switches and attachments

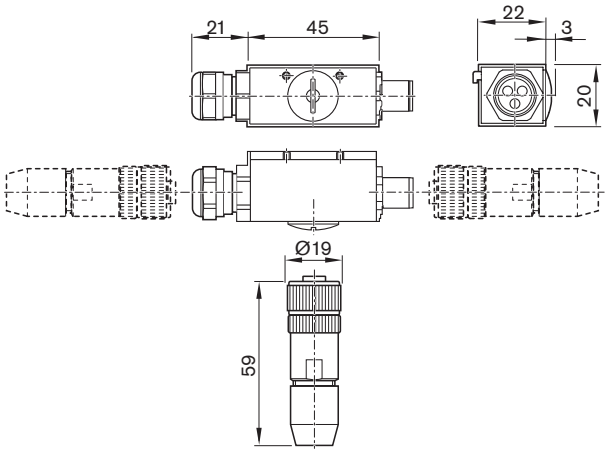
		Size					
		-040	-065	-080	-110	-145	-165
1	Socket-plug	R117560102	R117500153				
2	Mechanical switch with attachments		R117500151				
	Mechanical switch alone		R345304016				
3	Proximity switch						
	– Attachments without switch	R117560103	R117500152	R117500152	R117520152	R117500152	R117500152
	- PNP normally closed (NC)	R345304001	R345304001				
	- NPN normally closed (NC)	R345304002	R345304002				
	- PNP normally open (NO)	R345304003	R345304003				
	- NPN normally open (NO)	R345304004	R345304004				
4	Switching cam	R039980104	R117500149			R117500150	
5	Mounting duct / cable duct	R039662018	R039662017				
6	Reed sensor (for mounting duct)	R347600903					
	Hall sensor (for mounting duct)	R347601003					
7	Reed sensor with plug/sensor mount	R037530007					
	Hall sensor with plug/sensor mount	R037530008					
8	Magnetic switch	–	R913037443 (NC) / R913037444 (NO) R913037445 (NC) / R913037446 (NO)			–	
10	Sliding block	–	R1175 090 08				

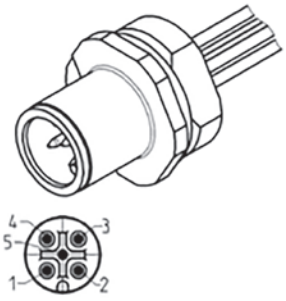
Switching system MKK, MKR, MLR

Socket and plug, cable duct

Attach the socket at the end with the most switches. The socket and plug are not pre-wired. Since the mounting arrangements allow shifting of the switches, the switch activation points can be optimized during start-up. The plug can be mounted in three directions.

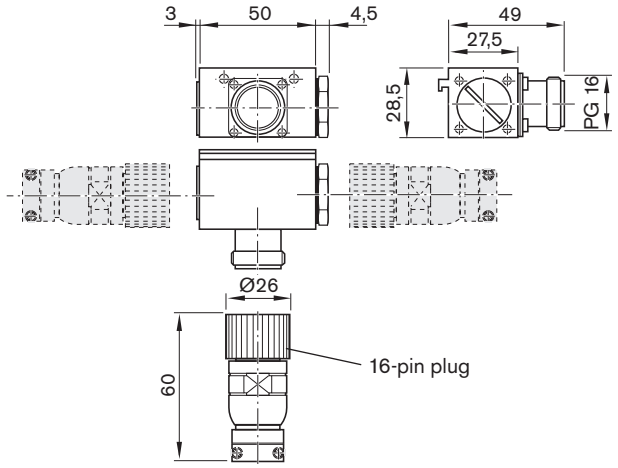
R117560102

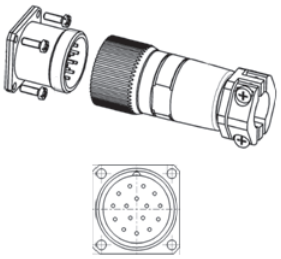




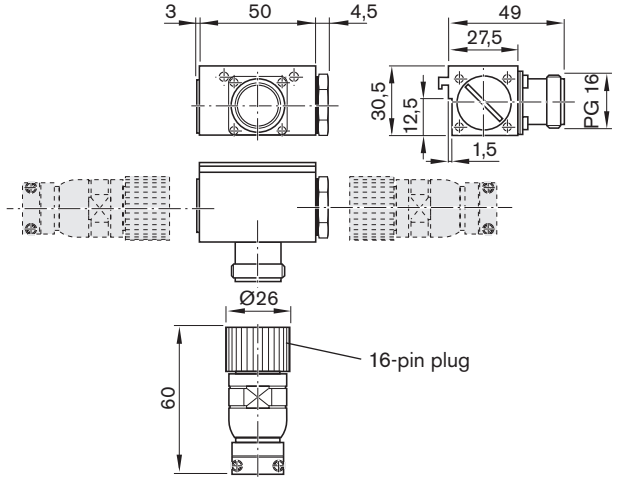
Pin		Color
1	BN	brown
2	WH	white
3	BU	blue
4	BK	black
5	GY	gray

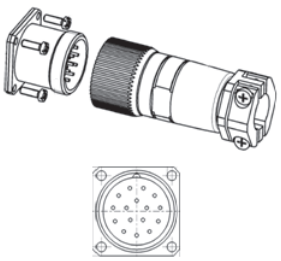
R037540000





R117500153





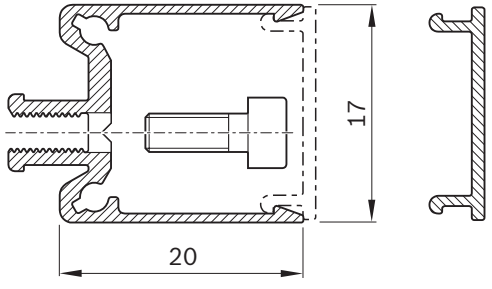
Use	Socket and plug		
Part number	R117560102	R037540000	R117500153
Designation	for MKK / MKR -040	for MKK / MKR -040	For MKx -065/-080/-110/-145/-165 for MLR-080/-110
Version	angled, for suspension in the lateral slot of the Linear Motion System		
Operating current per contact	max. 4 A	max. 8 A	
Operating voltage	10–30 V DC	150 V AC/DC	
1. Connection type	Straight plug, M12x1, 5-pin, spring-cage connection	Straight plug, 16-pin, soldered connection	
2. Connection type	Coupling / mount socket M12x1, 5-pin, with 0.5 m cable	Coupling / mount socket, 16-pin, soldered connection	
Cable bushing **Housing**	Cable gland M16x1.5 with seal (hole 3x3.5 mm) incl. cap and blind plug	1 seal with bore 2x5.5 mm, 1x3.5 mm hole 1 adaptable seal, max. 14 mm diameter incl. cap and dummy plug	
Cable bushing, plug	Gland with pull relief		
Connection cross-section	0.14 . . . 0.5 mm	0.14 …1 mm	
Cable diameter	4 … 8 mm	10 … 14 mm	
Ambient temperature	–25 °C to +85 °C	-20 °C to +125 °C	
Protection class	–		
Certifications and Approvals	–		

Cable duct

The cable duct is fastened in the T-slots on the side of the frame. Fastening screws widen the profile and give the cable duct a secure hold.
For the slot position, see “Configuration and ordering data” tables and “Dimension drawings”.

The cable duct will accommodate up to two cables for mechanical switches and three cables for proximity switches.

Fastening screws and cable grommets are included.



Switching system MKK, MKR, MLR

Mounting examples of switches

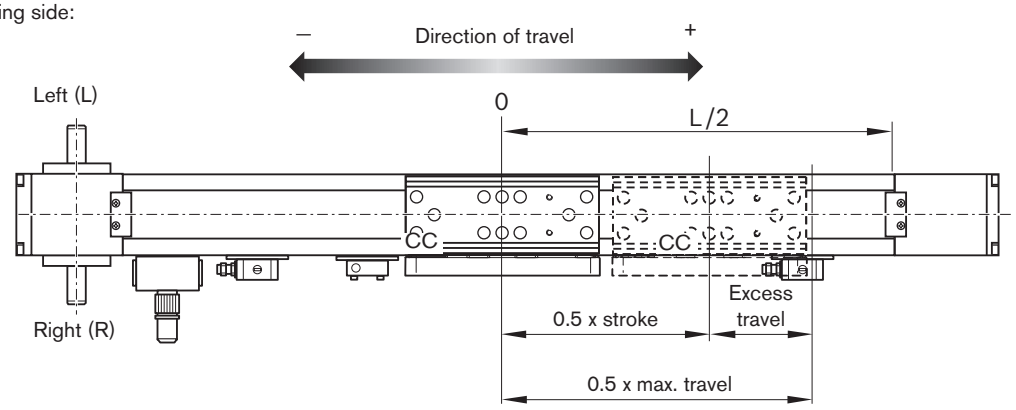
Determining the switch activation points

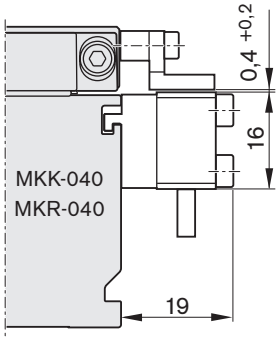
Switching distance: The switching distance is the distance between the carriage center (CC) and the zero point (0) when a switch is activated (given in mm). Example for a mechanical limit switch (provided the zero point is at L/2):
Maximum switching distance = 0.5 x (max. travel distance) - excess travel = 0.5 x effective stroke
For safe operation of the Linear Module, the excess travel must be longer than the braking distance.
For MKR... and MLR...: The acceleration travel s_a can be taken as a guideline value for the braking distance.
For MKK...: In most cases the recommended limit for excess travel (braking path) is: Excess travel = 2 x screw lead P.

Take note of the minimum switching distance (determined by the attachments):
mechanical-mechanical = 60 mm; mechanical-proximity = 45 mm; proximity-proximity = 28 mm.
For MKR-145: mechanical-mechanical = 62 mm; mechanical-proximity = 49 mm; proximity-proximity = 35 mm

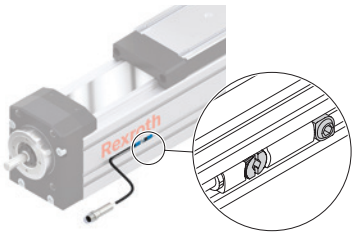
The switches as well as socket with plug are fixed in the upper T-slots of the frame and actuated by a switching cam on the carriage.

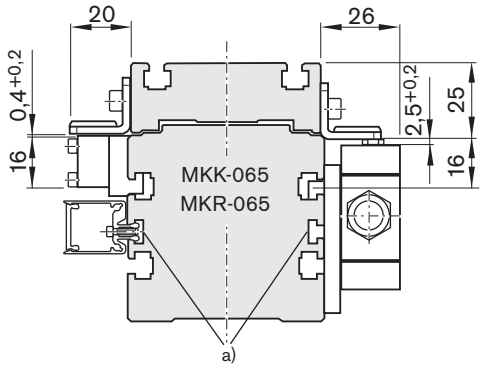
Switch mounting side:

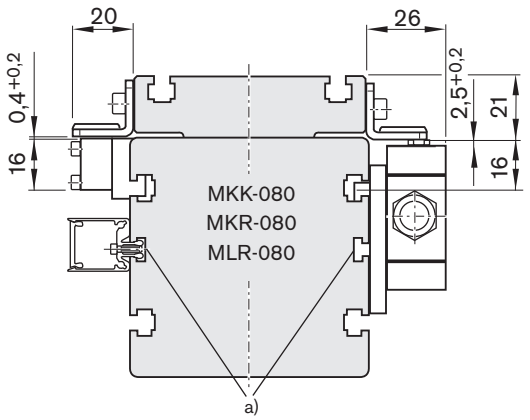


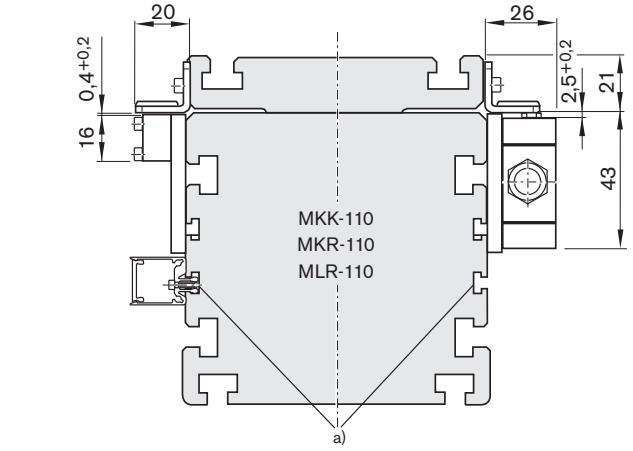


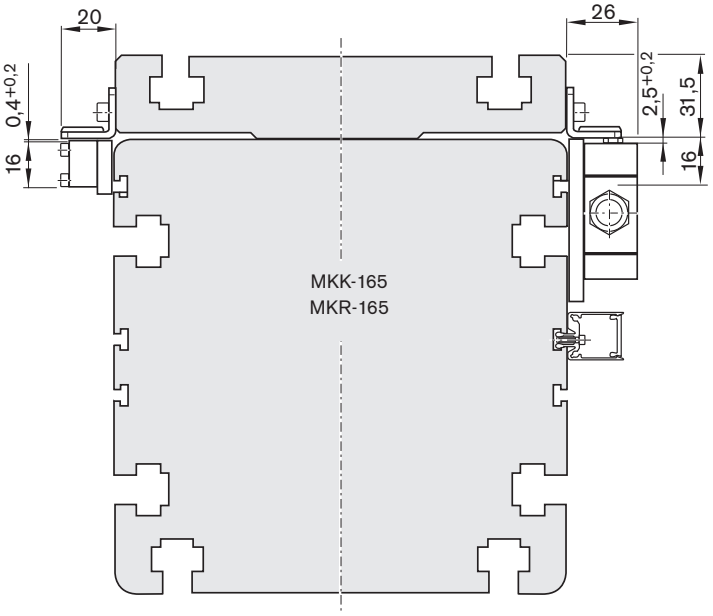
a) Sensor slot MKK/MKR-xxx-NN-3



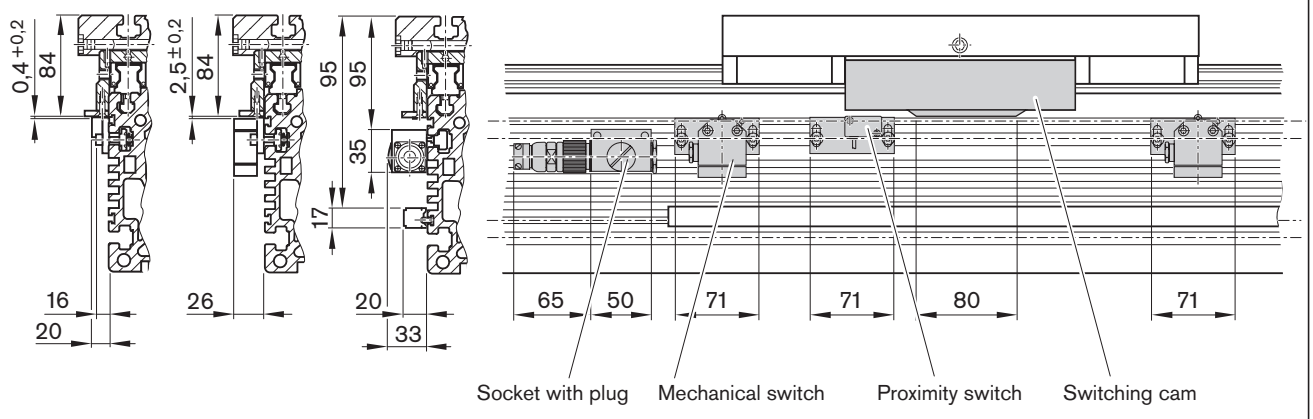





20
26
0,4+0,2
2,5+0,2
21
16
43
MKK-110
MKR-110
MLR-110
a)


20
26
0,4+0,2
2,5+0,2
31,5
16
16
MKK-165
MKR-165

MKR-145

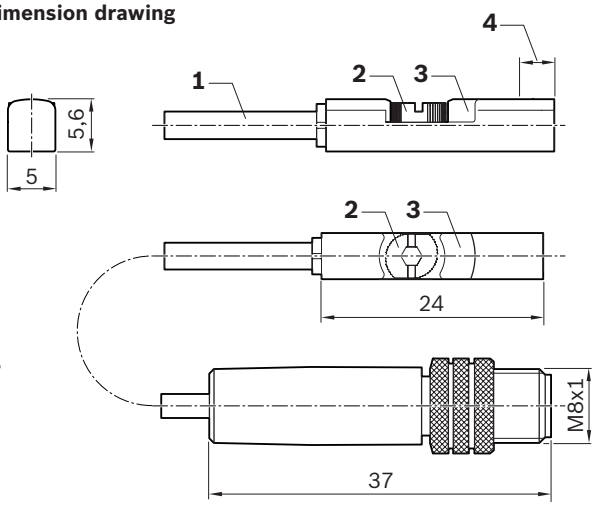

0,4 +0,2
84
2,5 ±0,2
84
95
95
35
17
16
20
26
20
33
65
50
71
71
80
71
Socket with plug
Mechanical switch
Proximity switch
Switching cam

Attachments and accessories

Sensors

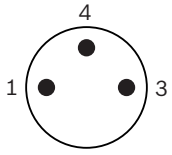
Magnetic sensor

Dimension drawing



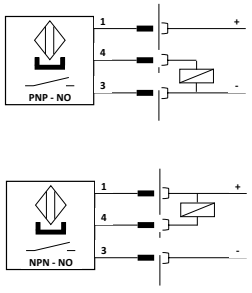
1) Connection
2) Fastening screw
3) LED display
4) Position of sensor element: 2 mm

1 brown (+)
3 blue (–)
4 black (signal)

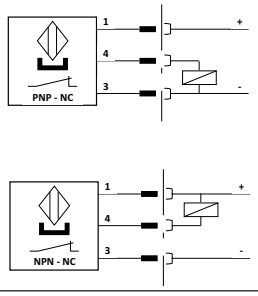


Connection diagram

R913037444
R913037446



R913037443
R913037445



Part numbers / technical data

Use	Limit switch	Reference switch	Limit switch	Reference switch
Part number	R913037445	R913037444	R913037443	R913037446
Designation	MZT8-03VPO-KRDS14	MZT8-03VPS-KRDS13	MZT8-03VNO-KRDS16	MZT8-03VNS-KRDS15
Functional principle	Magnetic			
Operating voltage	10 - 30 VDC			
Load current	≦ 200 mA			
Switching function	PNP/normally closed (NC)	PNP/normally open (NO)	NPN/normally closed (NC)	NPN/normally open (NO)
Connection type	Cable 0.5 m and plug M8x1, 3-pin with knurled screws			
Function indicator	✓			
Short-circuit protection	✓			
Reverse polarity protection	✓			
Switch-on suppression	✓			
Switching frequency	3 kHz			
Pulse delay (Off delay)	20 ms			
Max. permissible approach speed	5 m/s			
Suitable for drag chains*	✓			
Torsion-resistant*	✓			
Weld spark-resistant*	–			
Cable cross-section*	3x0.14 mm^2			
Cable diameter D*	2.9 ±0.15 mm			
Static bending radius*	≧ 5xD			
Dynamic bending radius*	≧ 10xD			
Bending cycles*	> 2 million			
Max. permissible linear speed*	5 m/s			
Max. permissible acceleration*	≦ 5 m/s^2			
Ambient temperature	-30 °C to +80 °C			
Protection class	IP68			
MTTFd (acc. to EN ISO 13849-1)	MTTFd = 2339.0 years			
Certifications and approvals**	CE cULus LISTED RoHS			

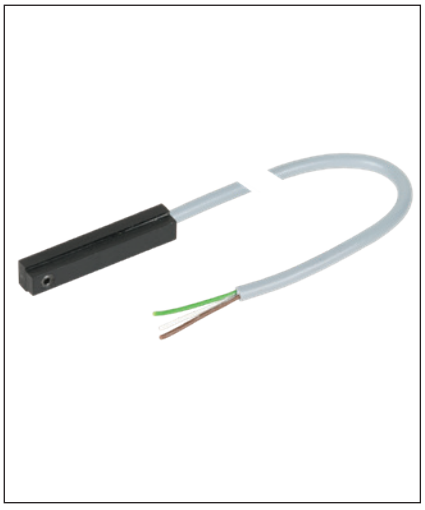
*) Technical data only for the one-piece connection cable (0.5 m) on the magnetic sensor. Even more performance, e.g. extension cables are offered for use in a cable management chain (see following pages).

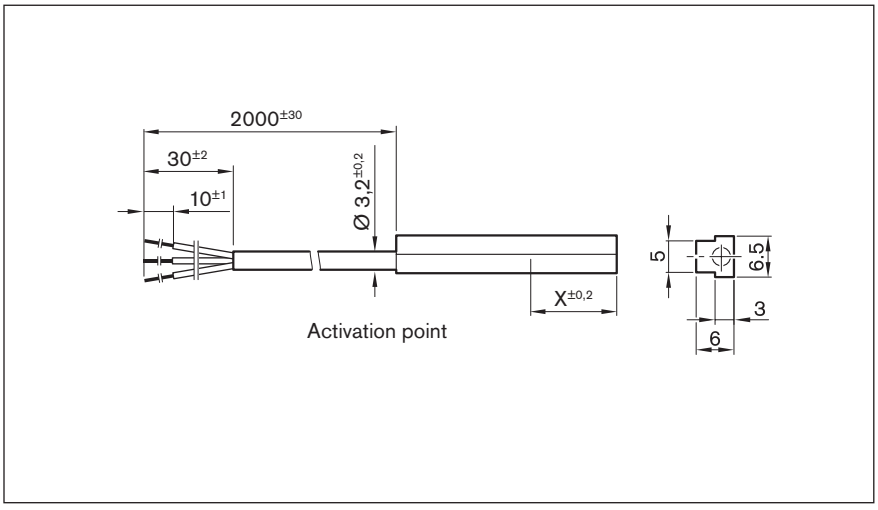
**) For these products, no CCC certificate is needed for launching on the Chinese market. “Sales Information CCC” document available on request.

Attachments and accessories

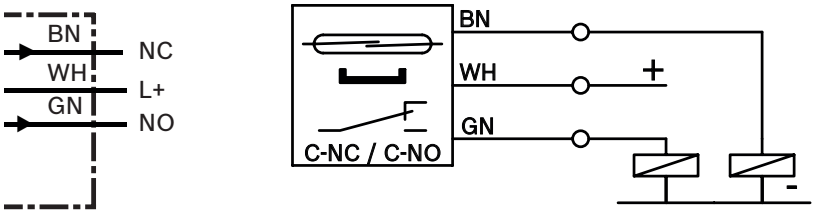
Sensors

Magnetic sensor with free cable end

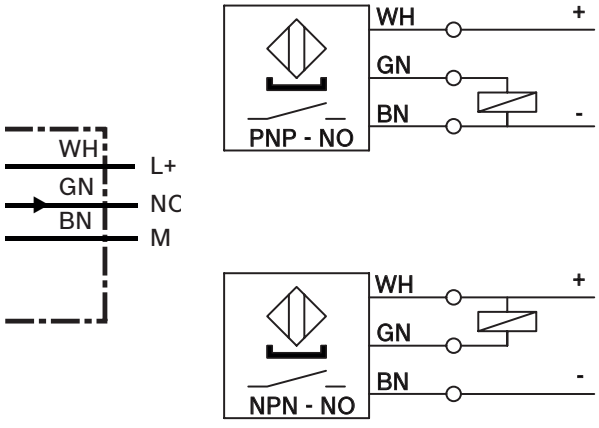




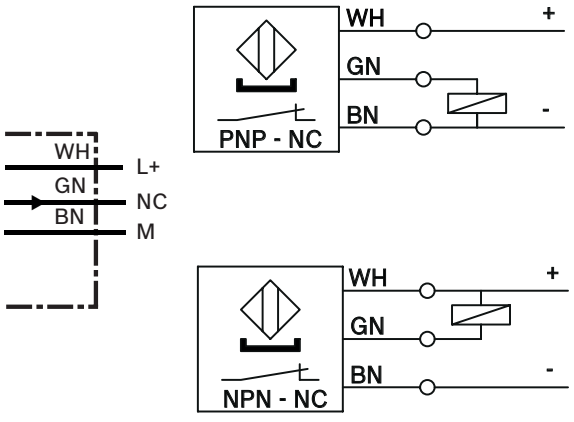
R347600903



R347601203
R347601403



R347601003
R347601303



Part number R347600903

Use	Reference, limit switch
Part number	R347600903
Designation	R12212
Functional principle	Magnetic
Operating voltage	max. 30 V DC
Load current	500 mA
Switching function	REED/changeover contact (NC: C+NC, NO: C+NO)
Activation point (dimension “X”)	9 mm

Part numbers R347601003 / R347601203 / R347601403 / R347601303

Use	Limit switch	Reference switch	Limit switch	Reference switch
Part number	R347601003	R347601203	R347601303	R347601403
Designation	H14118	H15637	H15638	H15080
Functional principle	Magnetic			
Operating voltage	3.8–30 V DC			
Load current	≤ 20 mA			
Switching function	Hall PNP/normally closed (NC)	Hall PNP/normally open (NO)	Hall NPN/normally closed (NC)	Hall NPN/normally open (NO)
Activation point, dimension “X”	13.65 mm			

Technical data for R347600903 / R347601003 / R347601203 / R347601403 / R347601303

Connection type	Cable 2,0 m, 3-pin
Galvanized connection ends	✔
Function indicator	–
Short-circuit protection	–
Reverse polarity protection	–
Switch-on suppression	–
Switching frequency	2.5 kHz
Pulse delay (Off delay)	–
Max. permissible approach speed	2 m/s
Suitable for drag chains*	–
Torsion-resistant*	–
Weld spark-resistant*	–
Cable cross-section*	3x0.14 mm^2
Cable diameter D	3.2 ±0.20 mm
Static bending radius*	–
Dynamic bending radius*	–
Bending cycles*	–
Max. permissible linear speed*	–
Max. permissible acceleration*	–
Ambient temperature	-40 °C to +85 °C
Protection class	IP66
MTTFd (acc. to EN ISO 13849-1)	–
Certifications and approvals**	–

* Technical data only for built-in sensor connection cable.

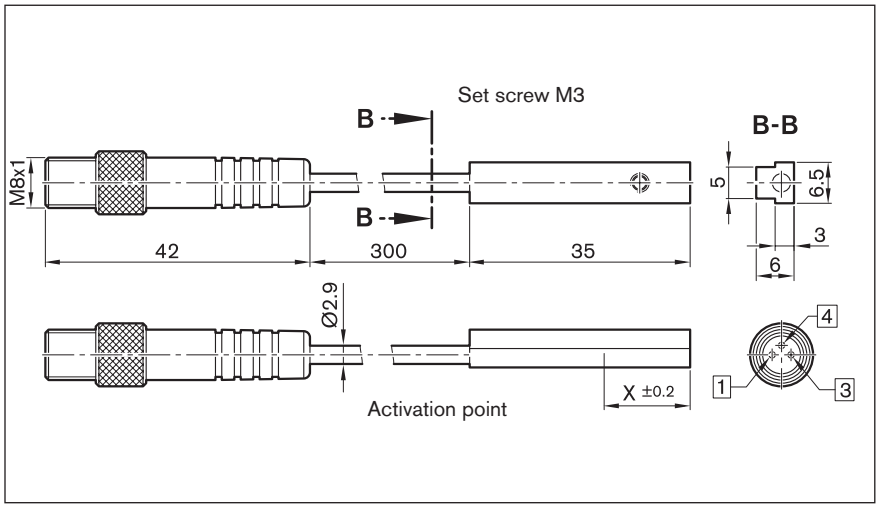
The available extension cables offer even better performance, e.g., when using a power cable chain (see following pages).

**) No CCC certificate is required to introduce these products to the Chinese market.

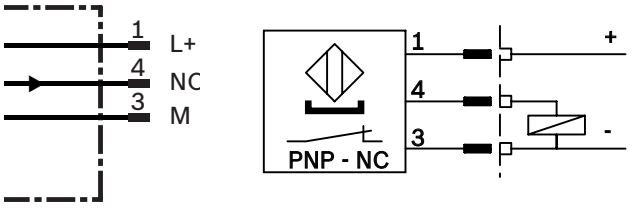
Attachments and accessories

Sensors

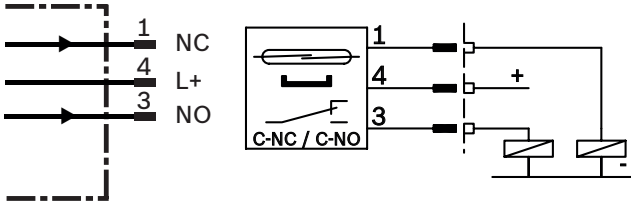
Magnetic sensor with M8x1 plug



R347602403



R347602303



Part numbers / technical data

Use	Reference / limit switch	Limit switch
Part number	R347602403	R347602303
Designation	H10706	R10705
Functional principle	Magnetic	
Operating voltage	3.8–30 V DC	30 V DC
Load current	≤ 20 mA	500 mA
Switching function	Hall PNP/normally closed (NC)	REED/single-pole changeover (NC: C+NC, NO: C+NO)
Activation point, dimension "X"	13.65 mm	9 mm
Connection type	Cable 0.3 m and plug M8x1, 3-pin with knurled screws	
Function indicator	–	
Short-circuit protection	–	
Reverse polarity protection	–	
Switch-on suppression	–	
Switching frequency	2.5 kHz	
Pulse delay (Off delay)	–	
Max. permissible approach speed	2 m/s	
Suitable for drag chains*	–	
Torsion-resistant*	–	
Weld spark-resistant*	–	
Cable cross-section*	3x0.14 mm^2	
Cable diameter D*	3.2 ±0.20 mm	
Static bending radius*	–	
Dynamic bending radius*	–	
Bending cycles*	–	
Max. permissible linear speed*	–	
Max. permissible acceleration*	–	
Ambient temperature	-40 °C to +85 °C	
Protection class	IP66	
MTTFd (acc. to EN ISO 13849-1)	–	
Certifications and approvals**	–	

*) Technical data only for the one-piece connection cable (0.3 m) on the magnetic sensor.

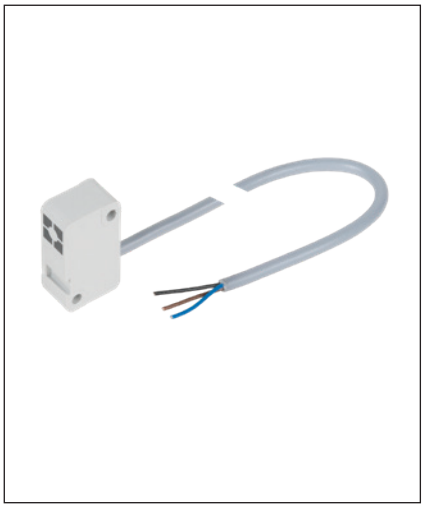
The available extension cables offer even better performance, e.g., when using a power cable chain (see following pages).

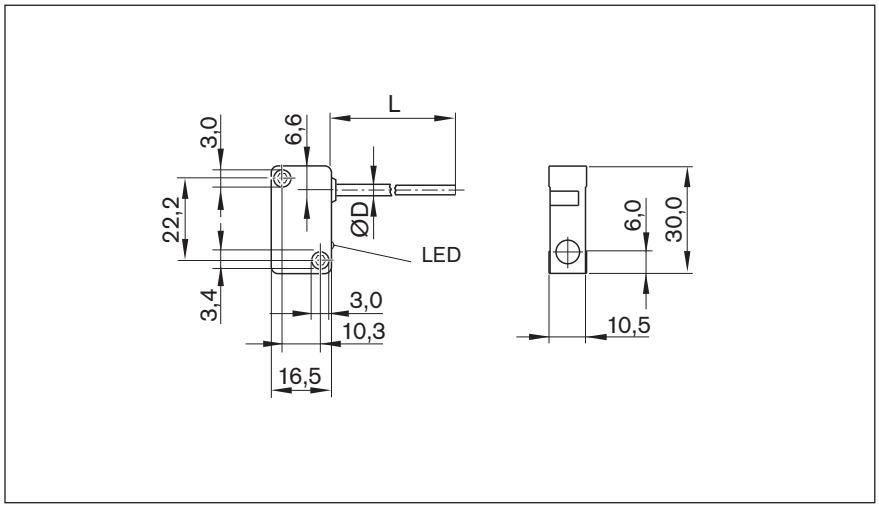
**) No CCC certificate is required to introduce these products to the Chinese market.

Attachments and accessories

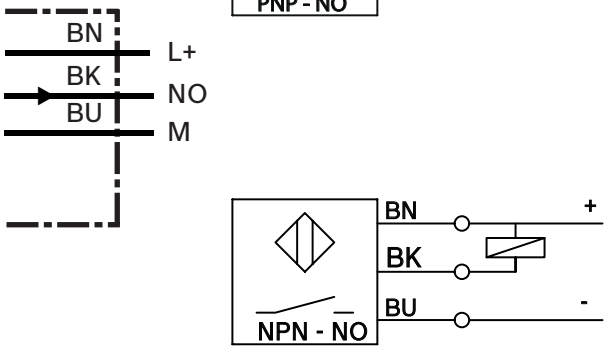
Sensors

Proximity sensor with free line end

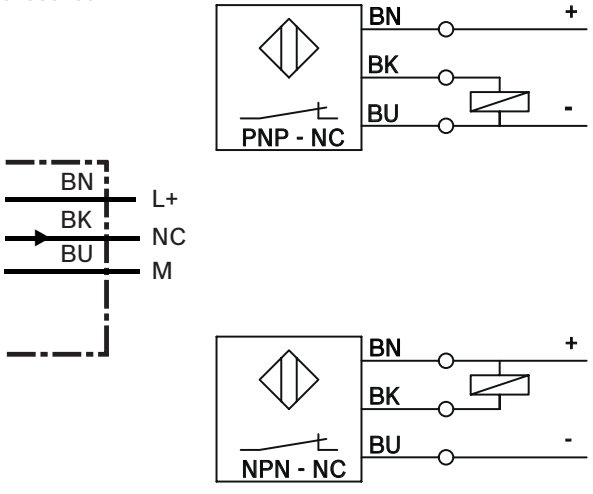




R345304003
R345304004



R345304001
R345304002



Part numbers / technical data

Use	Limit switch	Reference switch	Limit switch	Reference switch
Part number	R345304001	R345304003	R345304002	R345304004
Designation	BES 517-351-NO-C-03	BES 517-398-NO-C-03	BES 517-352-NO-C-03	BES 517-399-NO-C-03
Functional principle	inductive			
Operating voltage	10–30 V DC			
Load current	≤ 200 mA			
Switching function	PNP/normally closed (NC)	PNP/normally open (NO)	NPN/normally closed (NC)	NPN/normally open (NO)
Connection type	Line 3 m, 3-pin, free line end			
Function indicator	✓			
Short-circuit protection	✓			
Reverse polarity protection	✓			
Switching frequency	2.5 kHz			
Max. permissible approach speed	depending on the switching cam			
Suitable for drag chains*	–			
Torsion-resistant*	–			
Weld spark-resistant*	–			
Cable cross-section*	3x0.14 mm^2			
Cable diameter D*	3.5 ±0.15 mm			
Static bending radius*	12 mm			
Dynamic bending radius*	12 mm			
Bending cycles*	–			
Ambient temperature	-40 °C to +70 °C			
Protection class	IP65			
MTTFd (acc. to EN ISO 13849-1)	MTTFd = 830 years		MTTFd = 585 years	
Certifications and approvals**	CE cULus LISTED RoHS			

*) Technical data only for the cast-on connection line at the proximity sensor.

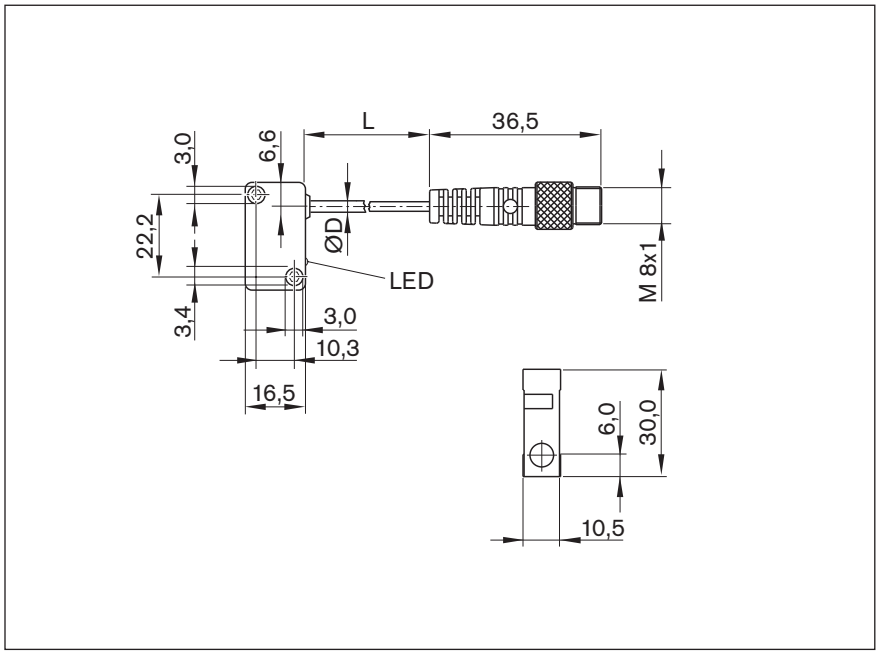
The available extension cables offer even better performance, e.g., when using a power cable chain (see following pages).

**) No CCC certificate is required to introduce these products to the Chinese market.

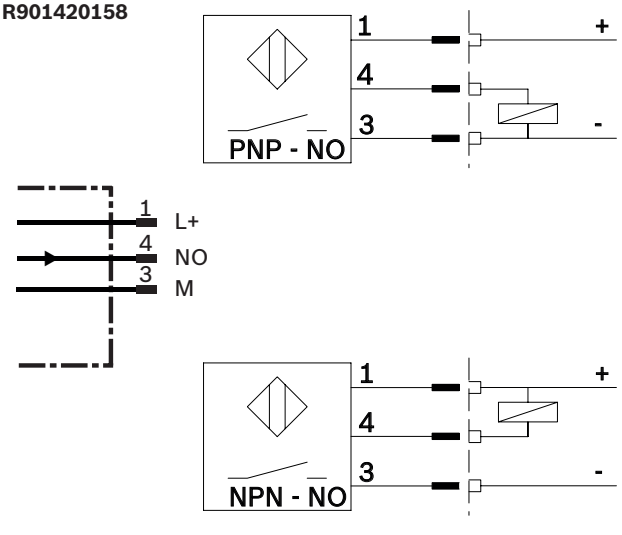
Attachments and accessories

Sensors

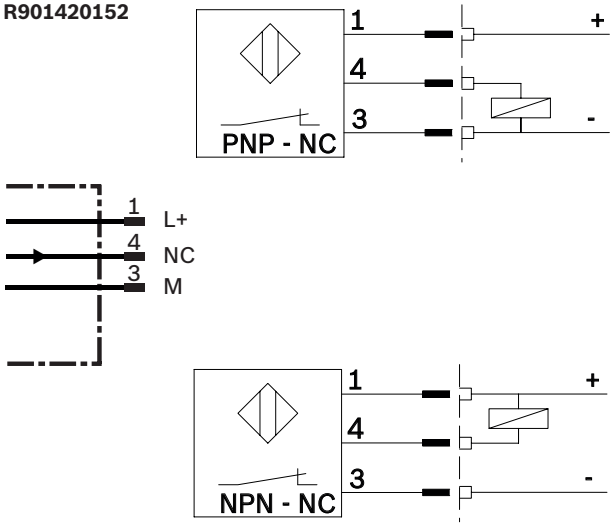
Proximity sensor with M8x1 plug



R901420156
R901420158



R901420149
R901420152



Part numbers / technical data

Use	Limit switch	Reference switch	Limit switch	Reference switch
Part number	R901420149	R901420156	R901420152	R901420158
Designation	BES 517-351-NO-C-S49-00.2	BES 517-398-NO-C-S49-00.2	BES 517-352-NO-C-S49-00.2	BES 517-399-NO-C-S49-00.2
Functional principle	inductive			
Operating voltage	10–30 V DC			
Load current	≤ 200 mA			
Switching function	PNP/normally closed (NC)	PNP/normally open (NO)	NPN/normally closed (NC)	NPN/normally open (NO)
Connection type	Cable 0.2 m and plug M8 x 1, 3-pin with knurled screw			
Function indicator	✓			
Short-circuit protection	✓			
Reverse polarity protection	✓			
Switching frequency	2.5 kHz			
Max. permissible approach speed	depending on the switching cam			
Suitable for drag chains*	–			
Torsion-resistant*	–			
Weld spark-resistant*	–			
Cable cross-section*	3x0.14 mm^2			
Cable diameter D*	3.5 ±0.15 mm			
Static bending radius*	12 mm			
Dynamic bending radius*	12 mm			
Bending cycles*	–			
Ambient temperature	-40 °C to +70 °C			
Protection class	IP65			
MTTFd (acc. to EN ISO 13849-1)	MTTFd = 830 years		MTTFd = 585 years	
Certifications and approvals**	CE cULus LISTED RoHS			

*) Technical data only for the cast-on connection line at the proximity sensor.

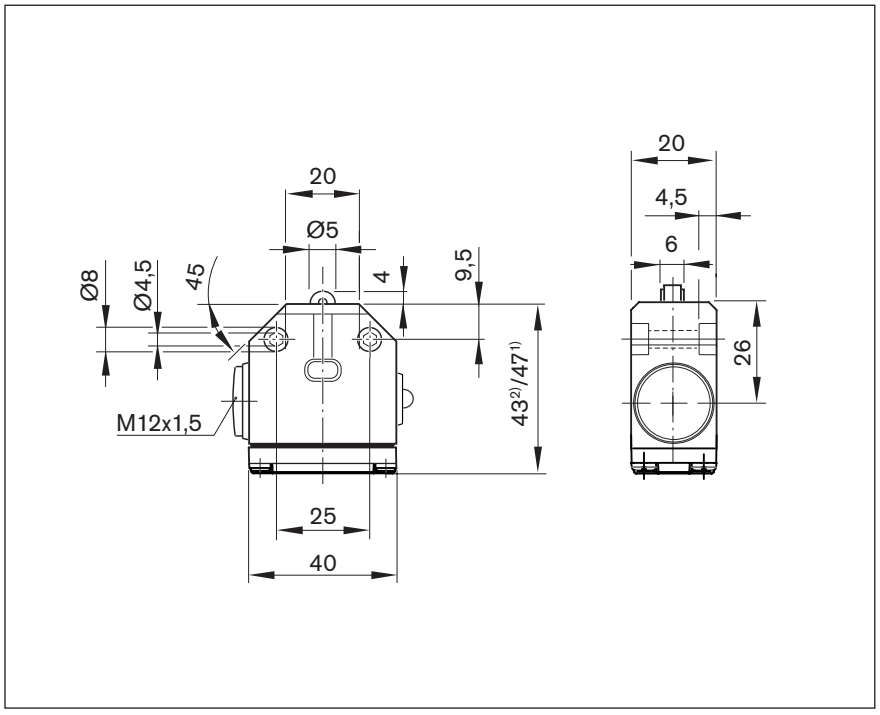
The available extension cables offer even better performance, e.g., when using a power cable chain (see following pages).

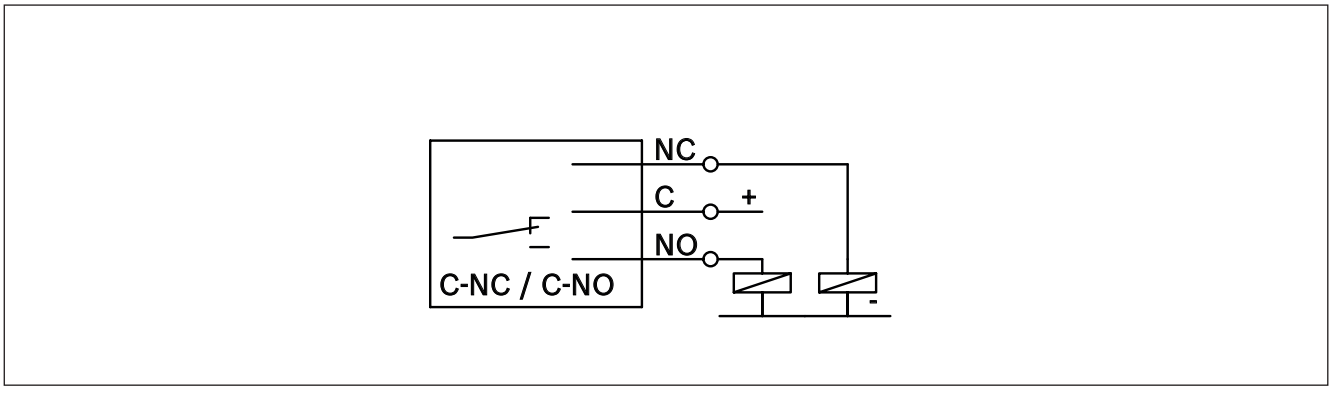
**) No CCC certificate is required to introduce these products to the Chinese market.

Attachments and accessories

Switches

Mechanical switch





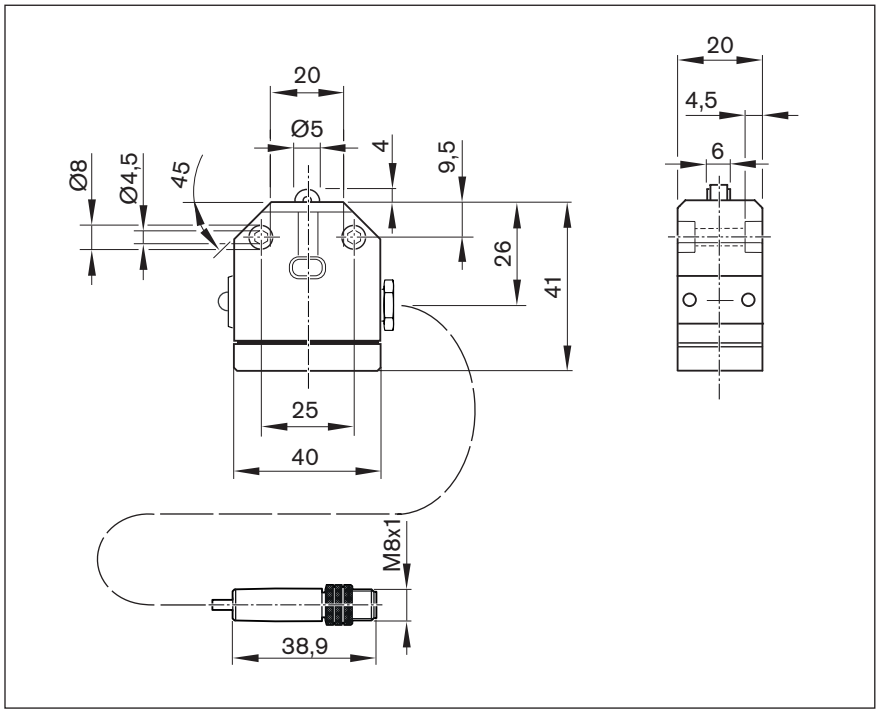
Part numbers / technical data

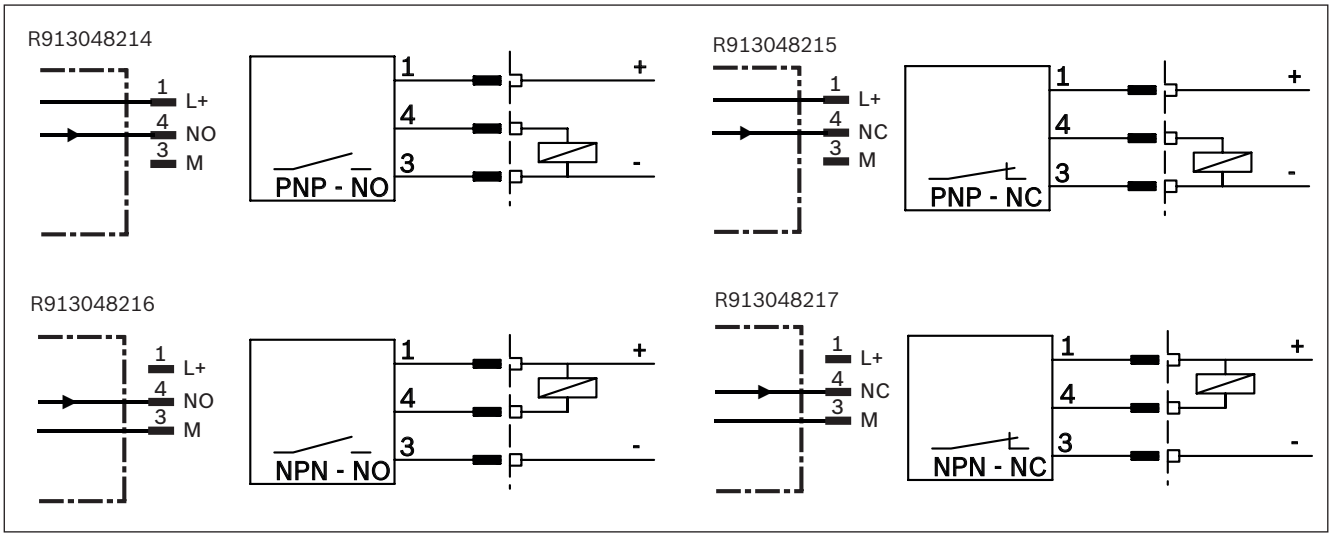
Use	Limit switch	
Part number	R345304016[1)]	R347600305[2)]
Designation	BNS 819-X496-99-R-11	BNS 819-X510-99-R-10
Functional principle	mechanical, roller	
Operating voltage	250 V AC	
Load current	≤ 5 A	
Switching function	Single-pole changeover / (NC: C+NC, NO: C+NO)	
Connection type	Screw connection, without line	
Function indicator	–	
Switching frequency	3.3 Hz	
Max. permissible approach speed	1 m/s	
Ambient temperature	–5 °C to +85 °C	
Protection class	IP67	
B10d value	$5x10^6$ (wet area); $10x10^6$ (dependent on current load (dry area))	
Certifications and approvals, housing	CE CCC RoHS	
Certifications and approvals, switching element	CE CCC SP RoHS	

Attachments and accessories

Switches

Mechanical switch with M8x1 plug





Part numbers / technical data

Use	Limit switch	Reference switch	Limit switch	Reference switch
Part number	R913048215	R913048214	R913048217	R913048216
Designation	BNS 819-X1002-99-R-10	BNS 819-X1001-99-R-10	BNS 819-X1004-99-R-10	BNS 819-X1003-99-R-10
Functional principle	mechanical, roller			
Operating voltage	10 - 30 VDC			
Load current	≤ 200 mA			
Switching function	PNP/normally closed (NC)	PNP/normally open (NO)	NPN/normally closed (NC)	NPN/normally open (NO)
Connection type	Cable 0.2 m and plug M8 x 1, 3-pin with knurled screw			
Function indicator	–			
Short-circuit protection	–			
Reverse polarity protection	–			
Switching frequency	3.3 Hz			
Max. perm. approach speed	1 m/s			
Suitable for drag chains[1)]	–			
Torsion-resistant[1)]	–			
Weld spark-resistant[1)]	–			
Cable cross-section[1)]	3x0.14 mm^2			
Cable diameter D[1)]	4.3 ±0.2 mm			
Static bending radius[1)]	12 mm			
Dynamic bending radius[1)]	12 mm			
Bending cycles[1)]	–			
Ambient temperature	-5 °C to +70 °C			
Protection class	IP65			
B10d value	5x10^6 (wet area); 10x10^6 (dependent on current load (dry area))			
Certifications and approvals[2)]	CE SP RoHS			

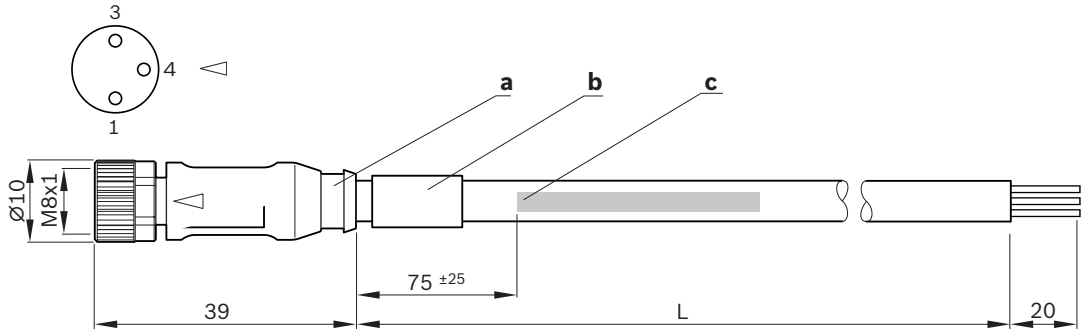
[1)] Technical data only for the cast-on connection line at the mechanical switch.
The available extension cables offer even better performance, e.g., when using a power cable chain (see following pages).
[2)] No CCC certificate is required to introduce these products to the Chinese market.

Attachments and accessories

Extensions

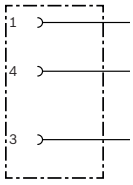
Pre-assembled on one side

Dimension drawing



Connection diagram

1 brown (BN) (+)
3 blue (BU) (–)
4 black (BK) (signal)



Part number			
Use	Extension cable		
Part number	R911344602	R911344619	R911344620
Designation	7000-08041-6500500	7000-08041-6501000	7000-08041-6501500
Length (L)	5.0 m	10.0 m	15.0 m
1. Connection type	M8x1 3-pin straight female connector		
2. Connection type	Free cable end		

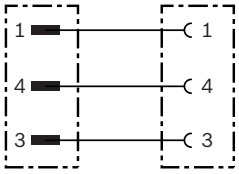
a) Contour for 6.5 mm corrugated tube (inner diameter)
b) Cable grommet
c) Cable label in accordance with labeling regulation

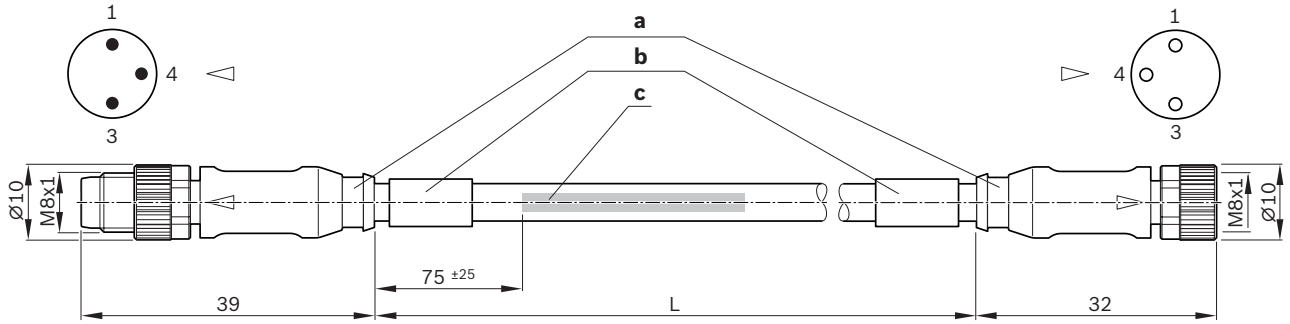
Pre-assembled on two sides

Dimension drawing

Connection diagram

1 brown (BN) (+)
3 blue (BU) (–)
4 black (BK) (signal)





Part number

Use	Extension cable				
Part number	R911344621	R911344622	R911344623	R911344624	R911344625
Designation	7000-88001-6500050	7000-88001-6500100	7000-88001-6500200	7000-88001-6500500	7000-88001-6501000
Length (L)	0.5 m	1.0 m	2.0 m	5.0 m	10.0 m
1. Connection type	M8x1 3-pin straight female connector				
2. Connection type	Straight plug, M8x1, 3-pin				

Technical data for extensions pre-assembled on one or two sides

Function indicator	–
Operating voltage indicator	–
Operating voltage	10–30 V DC
Type of cable	PUR black
Suitable for drag chains	✓
Torsion-resistant	✓
Weld spark-resistant	✓
Cable cross-section	3 x 0.25 mm^2
Cable diameter D	4.1 ±0.2 mm
Static bending radius	≥ 5xD
Dynamic bending radius	≥ 10xD
Bending cycles	> 10 mill.
Max. permissible travel speed	3.3 m/s - at 5 m travel range (type) up to 5 m/s at 0.9 m travel range
Max. permissible acceleration	≤ 30 m/s^2
Ambient temperature when secured	-40 °C to +85 °C
Ambient temperature when loose	-25 °C to +85 °C
Protection class	IP68
Certifications and approvals	CE, cULus LISTED, CSA C US, PG, RoHS

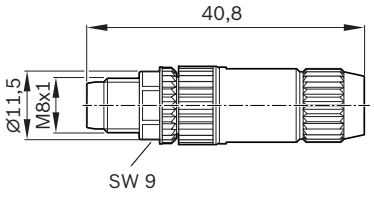
a) Contour for 6.5 mm corrugated tube (inner diameter)
b) Cable grommet
c) Cable label in accordance with labeling regulation

Attachments and accessories

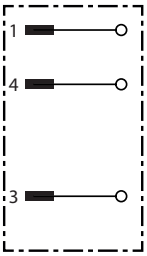
Plugs

R901388333

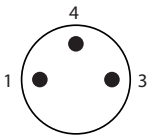
Dimension drawing



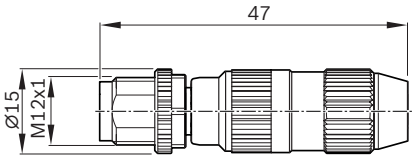
Connection diagram

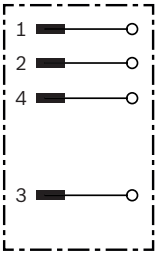


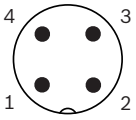
Connector side view



R901388352







Part numbers / technical data

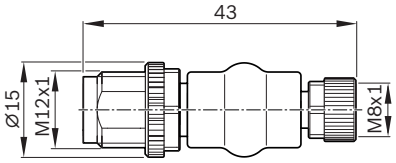
Use	Single plug	
Part number	R901388333	R901388352
Designation	7000-08331-0000000	7000-12491-0000000
Version	straight	
Operating current per contact	max. 4 A	
Operating voltage	max. 32 V AC/DC	
Connection type	Straight plug, M8x1, 3-pin, IDC, self-locking screw	Straight plug, M12x1, 4-pin, IDC, self-locking screw
Function indicator	-	
Operating voltage indicator	-	
Connection cross-section	0.14 ... 0.34 mm^2	
Ambient temperature	-25 °C to +85 °C	
Protection class	IP67 (plugged in & screwed down)	
Certifications and approvals		

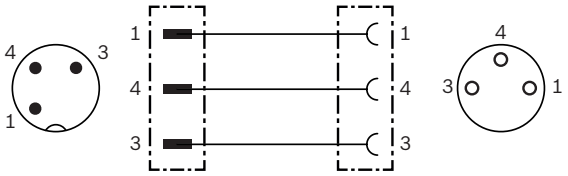
Adapters

Dimension drawing

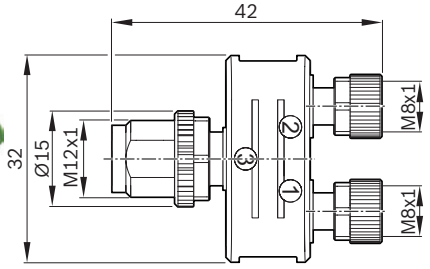
Connection diagram

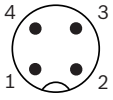
R911344591

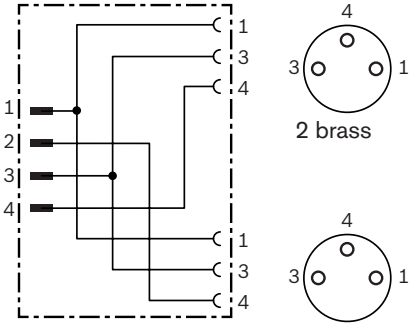




R911344592







Part numbers / technical data

Use	Adapter	Adapter or distributor
Part number	R911344591	R911344592
Designation	7000-42201-0000000	7000-41211-0000000
Version	straight for 1 sensor	Straight, for 1 - 2 sensors
Operating current per contact	max. 4 A	
Operating voltage	max. 32 V AC/DC	
1. Connection type	Straight female connector, M8x1, 3-pin, self-locking screw thread	2 X straight female connectors, M8x1, 3-pin, self-locking screw thread
2. Connection type	Straight plug, M12x1, 3-pin, IDC, self-locking screw thread	Straight plug, M12x1, 4-pin, IDC, self-locking screw thread
Function indicator	–	
Operating voltage indicator	–	
Connection cross-section	–	
Ambient temperature	-25 °C to +85 °C	
Protection class	IP67 (plugged in & screwed down)	
Certifications and approvals	RoHS	c UL us LISTED, RoHS

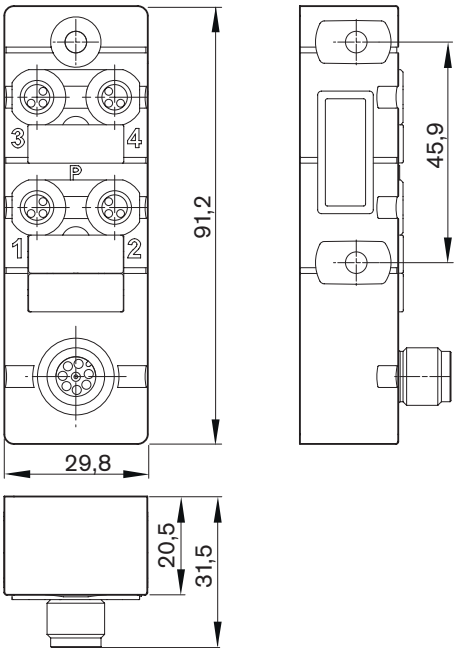
Attachments and accessories

Passive distributor

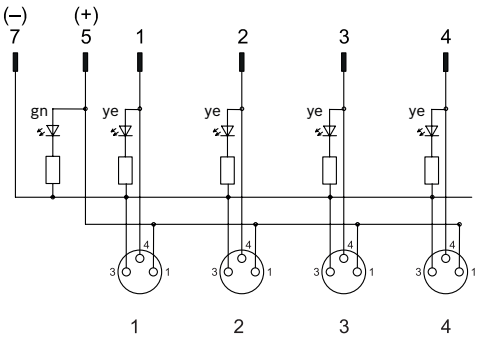
R901425737

R901429917

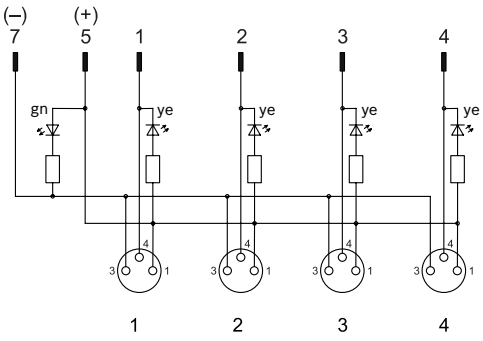
R911344592



R901425737



R901429917



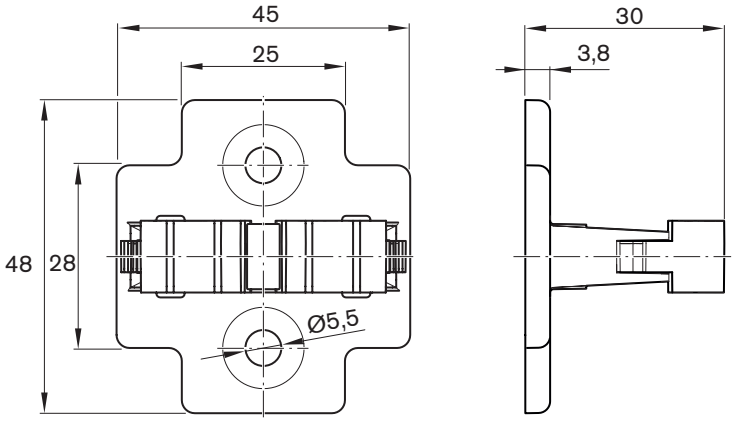
Part numbers / technical data

Use	Passive distributor		
Part number	R901425737	R901429917	R911344592
Designation	8000-84070-0000000	8000-84071-0000000	See the adapter for technical data and drawing
Version	Straight, for 1 - 4 sensors		
Operating current per contact	max. 2 A		
Operating voltage	24 V DC		
Switching logic	PNP	NPN	
1.Anschlusart	4x straight female connector, M8x1, 3-pin, IDC, self-locking screw thread		
2.Anschlusart	Straight plug, M12x1, 8-pin, IDC, self-locking screw thread		
Function indicator	✓		
Operating voltage indicator	✓		
Connection cross-section	–		
Ambient temperature	-20° to +70 °C		
Protection class	IP67 (plugged in & screwed down)		
Certifications and approvals			

Accessories for passive distributors

Holding plate

Screw plug



Part numbers / technical data

Use	For passive distributor R911344592	For passive distributors R901425737/ R901429917
Holding plate	R913047341	–
Designation	7000-99061-0000000	–
Set	1 pieces	–
Screw plug	–	R913047322
Designation	–	3858627
Set	–	10 pieces

Attachments and accessories

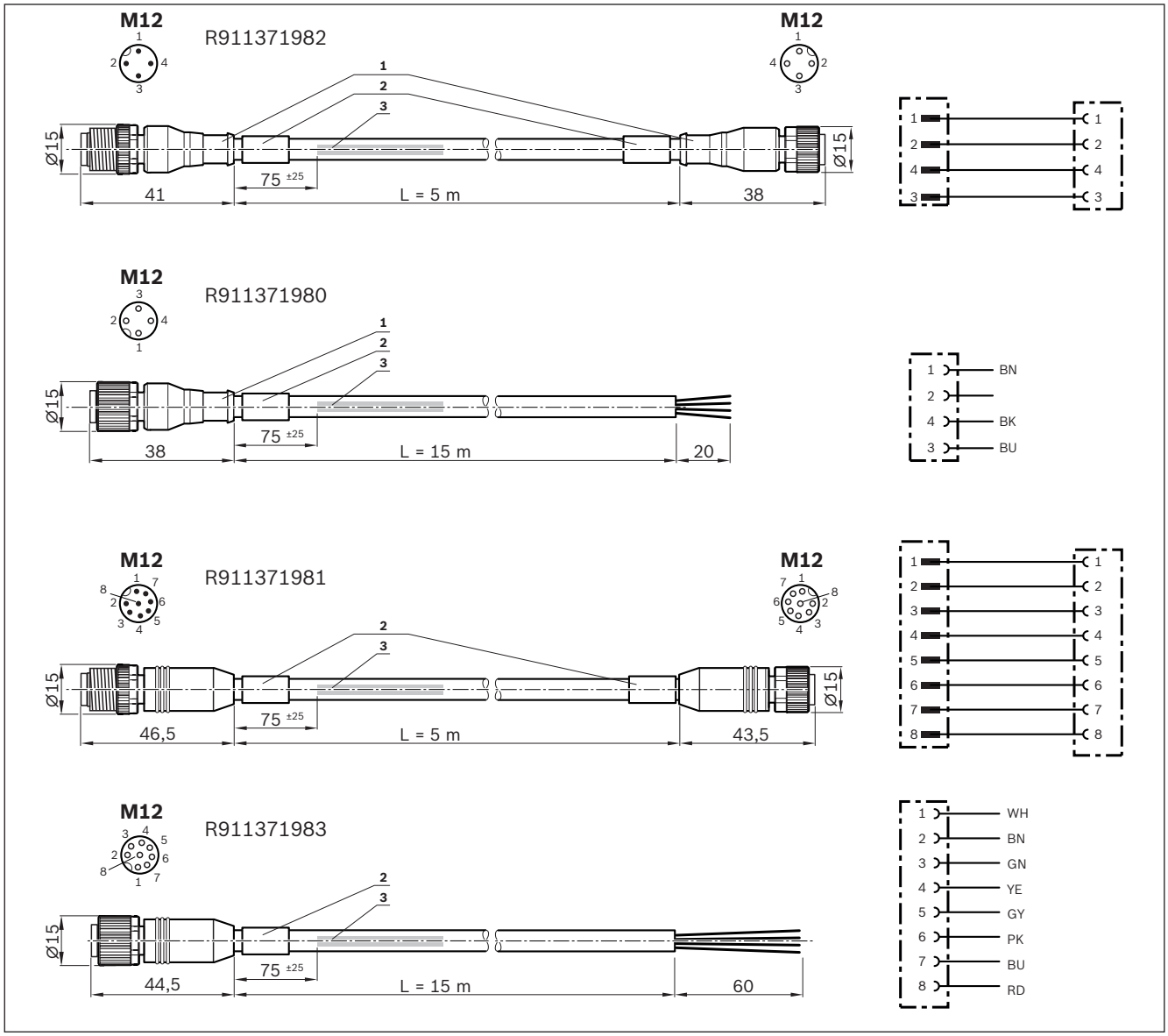
Extensions for passive distributors

R911371982

R911371981

R911371980

R911371983



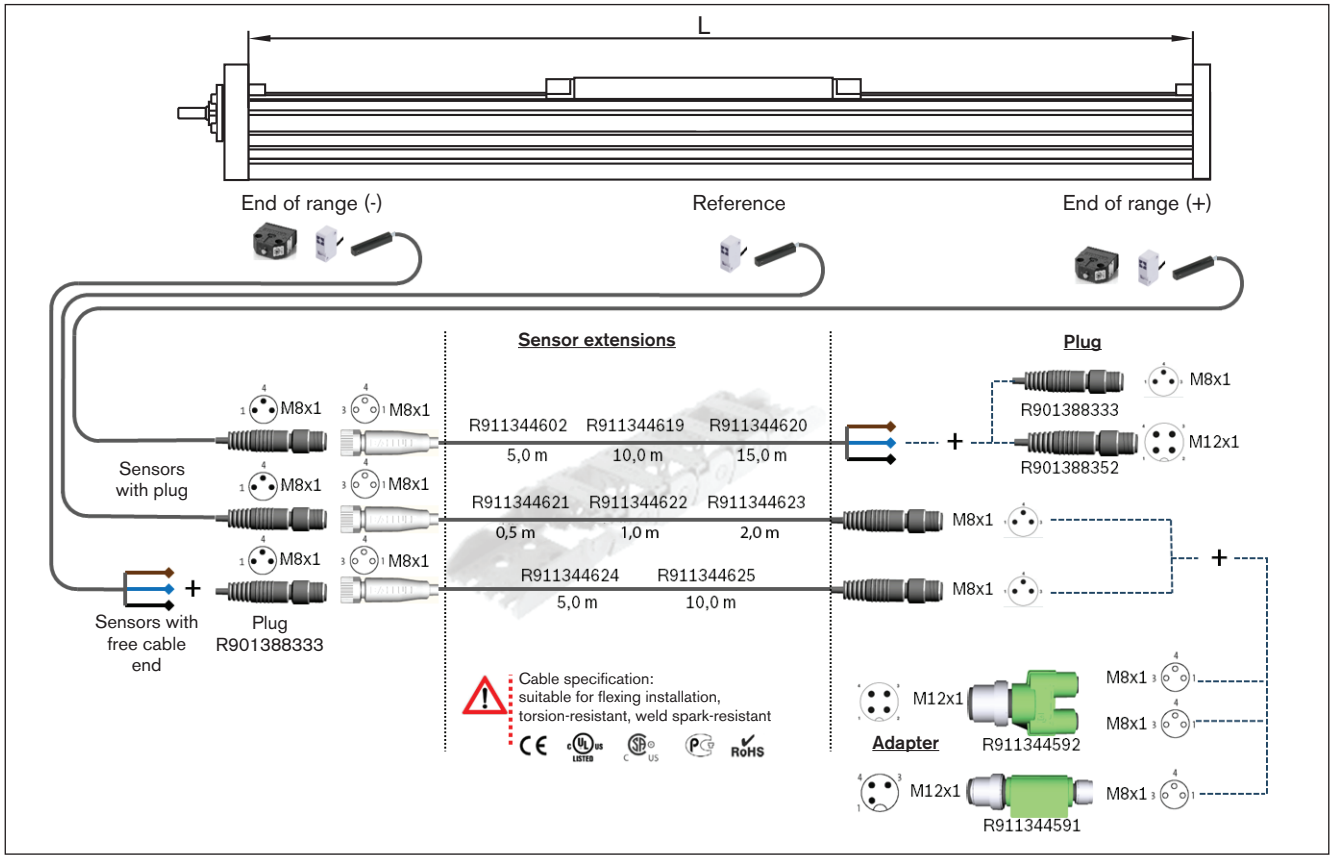
1) Contour for 10 mm corrugated tube (inner diameter)
2) Cable grommet
3) Label in accordance with ordering regulation 7000-08001

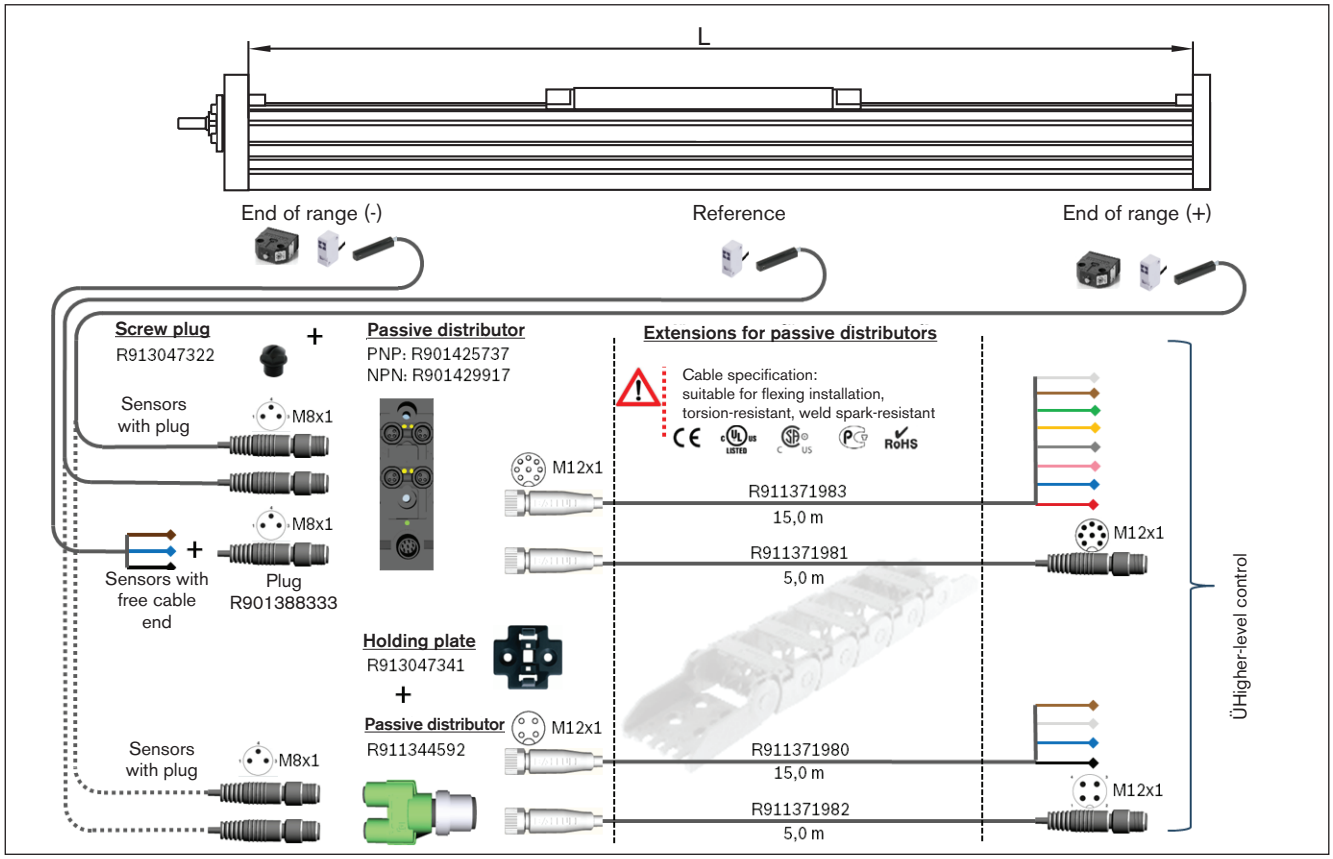
Part numbers / technical data

Use	Extension cable for passive distributor R911344592		Extension cable for passive distributors R901425737/R901429917	
Part number	R911371982	R911371980	R911371981	R911371983
Designation	7000-40021-6540500	7000-12221-6541500	7000-48001-3770500	7000-17041-3771500
Length	5.0 m	15.0 m	5.0 m	15.0 m
1.Anschlusart	M12x1 4-pin straight female connector		M12x1 8-pin straight female connector	
2.Anschlusart	Straight plug, M12x1, 4-pin	Free cable end	Straight plug, M12x1, 8-pin	Free cable end
Function indicator	–			
Operating voltage indicator	–			
Type of cable	PUR black		PUR gray	
Operating voltage	30 V AC/DC			
Operating current per contact	max. 4 A per contact		max. 2 A per contact	
Suitable for drag chains	✓			
Torsion-resistant	✓			
Weld spark-resistant	✓			
Cable cross-section	4x0.34 mm^2		8x0.34 mm^2	
Cable diameter D	4.7 ± 0.2 mm		6.2 ± 0.3 mm	
Static bending radius	≥ 5 x D			
Dynamic bending radius	≥ 10 x D			
Bending cycles	> 10 mill.			
Max. permissible travel speed	3.3 m/s - at 5 m travel range (type) up to 5 m/s at 0.9 m travel range			
Max. permissible acceleration	≤ 30 m/s^2			
Ambient temperature when secured	–40 °C to +80 °C (90 °C max. 10,000 h)			
Ambient temperature when loose	-25 °C to +80 °C (90 °C max. 10,000 h)			
Protection class	IP67 (plugged in & screwed down)			
Certifications and approvals	CE, cULus LISTED, CSA C US, PG, RoHS			

Attachments and accessories

Combination examples





Attachments and accessories

Integrated Measuring System IMS-A

The IMS-A measuring system offers the following advantages:

- No additional space required.
- No external mounting surfaces required for the measuring system.
- No measurement inaccuracies due to parallelism offset between the measuring system and the guide system.
- Full integration of the measuring system components into the guide means no complex mounting or tuning work is needed.
- The Runner Block, Scanner and Guide Rail with scale can be replaced individually during servicing.
- Interfaces: HIPERFACHE or DRICE-CLiQ.
- Connecting cable on the side of the carriage.

Inductive Measuring Principle

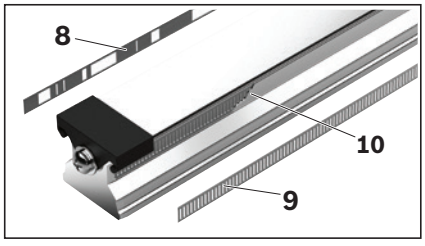
- Contact-free scanning ensures zero maintenance
- Resistant to water, oil, dust, shavings, etc.
- Insusceptible to magnetic fields

Absolute Measuring Principle

- Precise, absolute position detection thanks to an additional absolute code band
- No battery necessary for buffering the absolute information

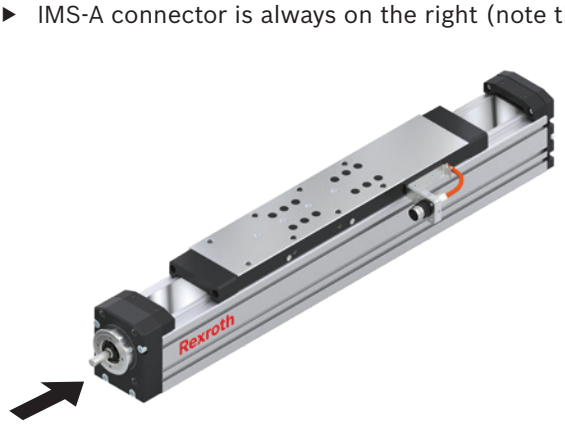
Scale

- The scales (**8**/**9**) are integrated in the Guide Rail.
- These consist of a steel mesh band (pitch period = 1000 µm)
- An absolute code band is integrated for absolute position detection.
- The cover (**10**) (stainless-steel band) protects the scale (**8**/**9**) from contamination.

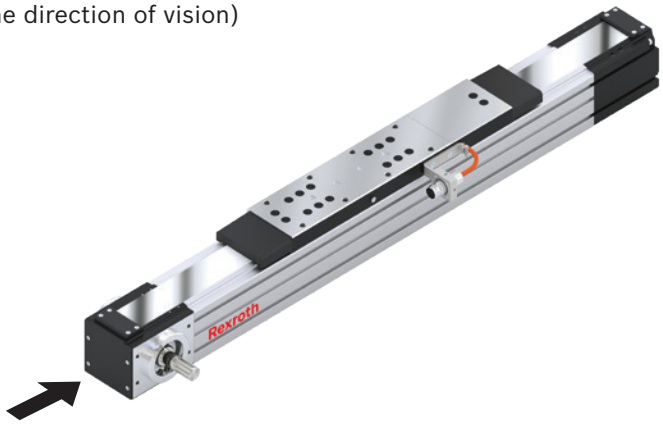


Delivery form MKx-xxx-NN-3

- IMS-A connector is always on the right (note the direction of vision)



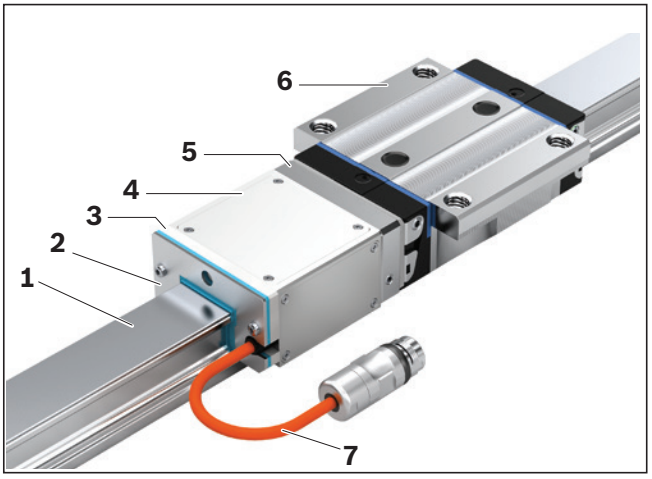
Direction of vision



Direction of vision

Structural design

1 Guide rail with scale, reference marks or absolute code band
2 Front seal
3 Support plate
4 Scanner
5 Adapter plate (fixed to the Runner Block)
6 Runner Block
7 Cable and connector



Technical data

System accuracy

Scale	Scanner	
	Interpolation accuracy (µm)	**Repeatability** (µm)
Accuracy class 5 µm	±0.75	±0.25

IMS-A		
Interface (signal)	**HF**	**DQ**
Resolution of the digital interface (µm)	1.25	0.025
Dissolvability of the 1 V_{SS} / 40 µm signal (µm)	0.025	–

Technical data

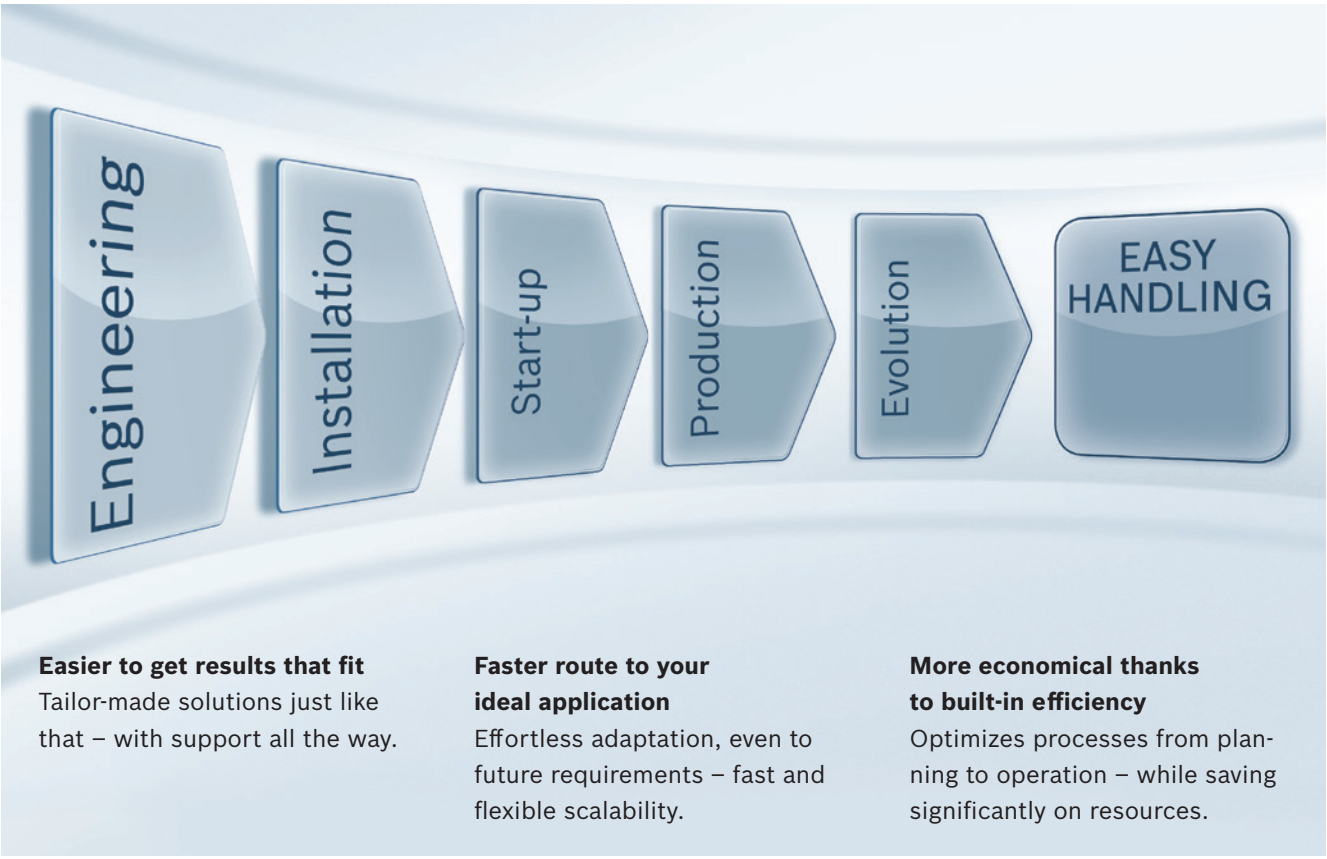
	Ball Rail System	Comment
Maximum traversing speed	5 m/s	
Acceleration a_{max}	500 m/s²	
EMC	Interference immunity: EN 61326-1: 2006 Emitted interference: EN 61000-6-2, Class B	CE-marking
RoHS compliant	yes	
UL compliant	yes	

For further information, see the “Integrated Measuring System IMS” catalog

The perfect system solution for every application

Efficient production processes are the key to your success in the marketplace. Today's environment, defined by rapid change and short product cycles, demands flexible systems with an optimal design and configuration. EasyHandling gives you the tools you need to automate your handling tasks with greater ease, speed, and efficiency. EasyHandling is more than just a modular collection of mechanical components; it takes an evolutionary step forward by providing an all-inclusive system solution – our best solution for your requirements.

EasyHandling –
Easier. Faster. More Economical.



Easier to get results that fit
Tailor-made solutions just like that – with support all the way.

Faster route to your ideal application
Effortless adaptation, even to future requirements – fast and flexible scalability.

More economical thanks to built-in efficiency
Optimizes processes from planning to operation – while saving significantly on resources.

Planning – up to 70% faster
EasyHandling tools help users right from the component selection stage – by proposing solutions with all the necessary information on parts lists, technical data and CAD drawings.

Installation – saves up to 60% on time
Thanks to positive-locking interfaces, the mechanical components are perfectly aligned and accurately connected right away.

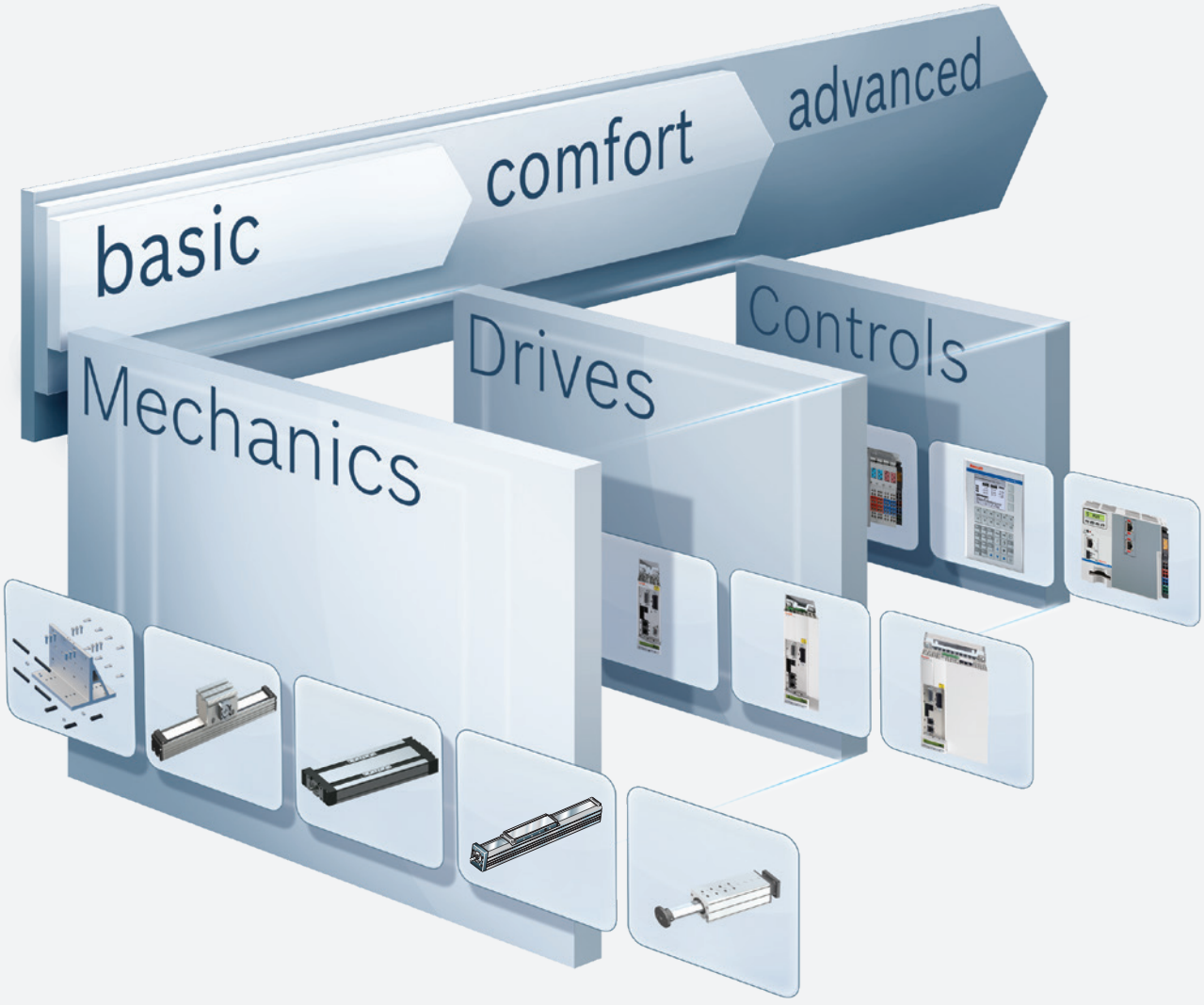
Start-up – reduces your effort by up to 90%
With the smart start-up assistant EasyWizard, parameterization and configuration take no time at all. Your handling system will be ready to go in just a few clicks.

Production – more economical and more efficient
Rexroth enhances the system effectiveness still further with smart application tools: The drive controller software sends maintenance-related messages to the user based on operating hours and travel to help schedule servicing at the right intervals. The result: longer life and reduced risk of failure.

Future developments – continuous improvement
Prepare now for future market developments:
One of the great features of EasyHandling systems is their openness. The flexibility of the mechanical and electrical components allows you to adapt quickly and efficiently to new production requirements.

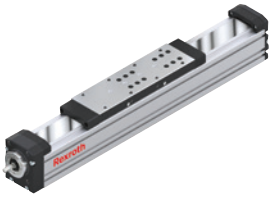
EasyHandling – more than just a building system

The modular system concept for perfect scalability



basic – made-to-measure mechanics

EasyHandling basic includes all mechatronic components for complete, custom **single and multi-axis Linear Motion Systems**.
All of the component interfaces are systematically standardized, making it possible to combine them with ease. Practical tools and aids make selection and configuration even easier.



comfort – get off to a faster start

EasyHandling comfort expands the basic component range by adding **powerful servo drives with multiple protocol capability**. The universal, smart control units are ideally suited for a variety of handling tasks.
It also features the uniquely convenient **start-up assistant EasyWizard**. Generate ready-to-use Linear Motion Systems after entering just a few application-specific details.

advanced – controls for demanding requirements

With its **individually scalable, high-performance Motion Logic solution**, EasyHandling advanced makes configuration and handling even easier. Predefined functions covering more than 90 percent of all handling applications eliminate the need for lengthy programming.

For more information about EasyHandling, see the brochure “EasyHandling – more than just a building system” R999000045.

Additional information

Operating conditions

Normal operating conditions

Ambient temperature with Rexroth servo motor	0 °C ... 40 °C, above 40 °C loss of performance
Ambient temperature for mechanical system (no dropping below dew point)	-10 °C ... 60 °C
Travel s_{min} [1)]	see the MKK/MKR/MLR “technical data” table
Contamination	not permissible

1) Minimum travel to ensure a reliable lubrication distribution.

Notes

For more information about Intended use and safety, see “Safety for Linear Motion Systems R320103152”.

For more information on installation/start-up see Linear Module instructions R320103918 and R320103169.

PDF files of these documents can be found on the Internet at:
www.boschrexroth.com/mediadirectory

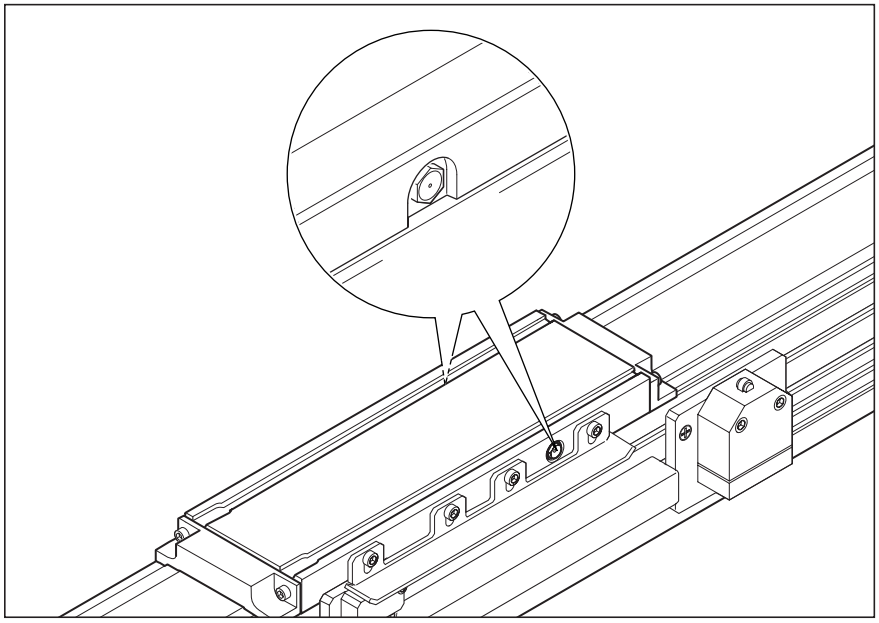
Lubrication Mxx-xxx-NN-2

Lubrication notes
Linear Modules (MKK/MKR) receive initial greasing with Dynalub 510 or Dynalub 520 and are only designed for grease lubrication using a manual grease gun. Maintenance is limited to the maintenance lubrication of the integrated Rexroth Ball Rail System and the Rexroth Ball Screw Assembly (on MKK) via one of the two funnel-type lube nipples.

Linear Modules with Cam Roller Guide (MLR) are designed for oil lubrication. With initial greasing on delivery.

⚠ **Do not use lubricants with solid particles (e.g. graphite or MoS_2 additives).**

⚠ **For short-stroke lubrication (< s_{min} mm), please consult us.**



Recommended lubricants

For maintenance lubrication and maintenance lubrication intervals, see the Linear Module instructions

MKK/MKR	Grease (DIN)	Consistency class DIN 51818	Recommended grease
-040	GP00K-20 (DIN 51826)	NLGI 00	Dynalub 520
-145, -165 -080-FP	KP2K-20 (DIN 51825)	NLGI 2	Dynalub 510

Grease	
Consistency class NLGI 2 per DIN 51818	**Consistency class NLGI 00 per DIN 51818**
We recommend	We recommend
Dynalub 510 (Bosch Rexroth)	**Dynalub 520** (Bosch Rexroth)
Cartridge (400 g) R341603700	Cartridge (400 g) R341604300
Hobbok (25 kg) R341603500	Bucket (5 kg) R341604200
May continue to be used	
Elkalub GLS 135 / N2 (Chemie-Technik)	Elkalub GLS 135 / N00 (Chemie-Technik)
Tribol GR 100-2 PD (Castrol)	Tribol GR 100-00 PD (Castrol)

MLR	Oil
-080	ISO VG 1000
-110	

Lube fitting

Linear Module	Lube nipple
MKK/MKR-040	DIN 3405–D3
MKK/MKR-145	DIN 3405–AM8x1
MKK/MKR-165	DIN 3405–AM6
MLR-080	DIN 3405–AM6
MLR-110	DIN 3405–DV1–M6
MKR-080-FP	DIN 3405–AM6

Lubrication MKx-xxx-NN-3

Lube version	LSS	LPG	
Size	MKx-065 / -080 / -110	MKx-065 / -080 / -110	
Basic lubrication	Dynalub 510	Preserved, initial basic lubrication required (See instructions)	
Consistency class	NLGI 2 (DIN 51818)	–	
Identification	KP2K-20 (DIN 51825)	–	
Lubrication with manual grease gun	yes	yes	
Prepared for connection to one-point lubrication systems	–	–	
Lubricant recommendation	Dynalub 510 (grease lubricant) (NLGI2 DIN 51818)	Dynalub 510 (grease lubricant) (NLGI2 DIN 51818)	
Features	• Good water resistance • Corrosion protection • Temperature range: –20 to +80 °C	• Good water resistance • Corrosion protection • Temperature range: –20 to +80 °C	
Part number	R3416 037 00 (cartridge 400 g)	R3416 037 00 (cartridge 400 g)	
	R3416 035 00 (Hobbock 25 kg)	R3416 035 00 (Hobbock 25 kg)	
Alternative lubricants	• Tribol GR 100-2 PD • Elkalub GLS 135/N2	• Tribol GR 100-2 PD • Elkalub GLS 135/N2 • Tribol GR 100-00 PD • Elkalub GLS 135/N00 • Dynalub 520	
Alternative lubricants with H1 approval	–	• Berulub FG H2 SL • Cassida Grease EPS2 • VP 874	

⚠ Notes on lubrication

- Follow the instructions for each product.
- Do not use lubricants containing solid particles (e.g. graphite or MoS_2)!
- 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 can take place between the plastics, lubricants and the anti-corrosion agents. In addition, pumpability in single-line one-point lubrication systems must be guaranteed.
- If using a one-point lubrication system, you must make sure that all the pipes and elements are filled with lubricant and do not contain any air pockets until they are connected to the consumer (carriage).
- Pumping or storage tanks for the lubricant must be fitted with a stirrer to guarantee the flow of lubricant (to avoid funneling in the tank).
- In the case of relubrication, it is not possible to change from grease to oil lubrication or vice versa.
- In the case of environmental influences such as contamination, vibration, jolting, etc., we recommend shortening the relubrication intervals appropriately. Even under normal operating conditions, the system must be relubricated at the latest after 2 years due to aging of the grease.
- Rexroth recommends piston distributors manufactured by SKF. These should be installed as close as possible to the lube fittings of the carriage. Long lines (maximum line length 1 m) and small line diameters should be avoided, and the lines should be laid on an upward slant. Install the lines at a gradient.
- If other consumers are connected to the single-line centralized lubrication system, the weakest link in the chain will determine the lubrication cycle time.
- Excess lubricant can accumulate inside of the Linear Module or flow out and may lead to contamination of the environment.
- Never put Linear Modules into operation without basic lubrication.
- For short stroke ($< s_{min}$), please consult us.

	LCF	LCO
	MKx-065 / -080 / -110	MKx-065 / -080 / -110
	required, see instructions	required, see instructions
	NLGI 00 (DIN51818)	–
	GP00K-20 (DIN 51826)	–
	–	–
	• only via single-line piston distributor system • smallest permitted piston distributor size: MKx -065, -080: 0.2 cm^3; MKx -110: 0.3 cm^3	• only via single-line piston distributor system • smallest permitted piston distributor size: MKx -065, -080: 0.2 cm^3; MKx -110: 0.3 cm^3
	Dynalub 520 (liquid grease) (NLGI00 DIN51818)	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 metal-working fluids
	R3416 043 00 (cartridge 400 g)	–
	R3416 042 00 (Bucket 5 kg)	–
	• 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
	–	–

⚠ **Use of lubricants with H1 approval:**

Loss of H1 approval
H1 lubricants or separating agent (anti-corrosion agent) only have H1 approval if they are available by material type in unmixed condition (including at the lubrication point). A blend of two H1 approval lubricants or separating agents does not have H1 approval.

No food industry authorization or approval
Because of the use of H1 lubricants, the Linear Modules do not have authorization or approval for the food industry.

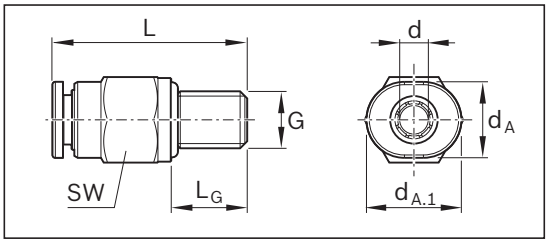
Lubrication of components at the factory
Components lubricated by the manufacturer at the factory, such as deep-groove ball bearings, do not use H1 lubricants.

For grease re-lubrication quantity and re-lubrication interval ⇒ Instructions Linear Modules

Lube fitting

Linear Module	Lube nipple (with “LSS / LPG lubrication”)	Connector (with “LCF / LCO lubrication”)
MKK/MKR-065 / -080 /- 110	DIN 3405–AM6	See dimension drawing

Straight connectors[1] for plastic tubes and metal pipes



Part number	Dimensions (mm)							Weight
	d_A	$d_{A.1}$	d±0.1	G	L	L_G	SW	(g)
R341703509	10.0	8	4	M6	20.5	8	9	1.4

[1] Maximum lubricant pressure: 30 bar (exerting slow pressure with manual grease gun)

Additional information

Documentation

Standard report

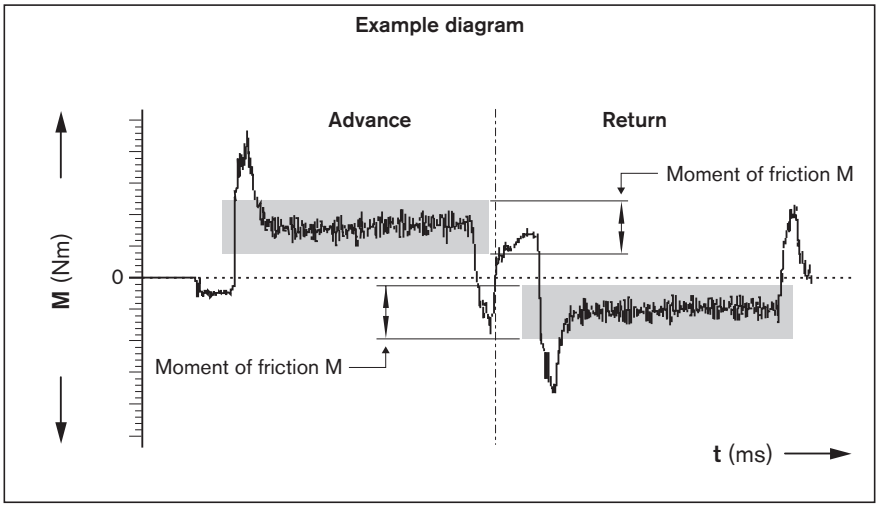
Option 001

The standard report serves to confirm that the checks listed in the report have been carried out and that the measured values lie within the permissible tolerances.

Checks listed in the standard report:
- functional checks of mechanical components
- functional checks of electrical components
- Design is in accordance with order confirmation

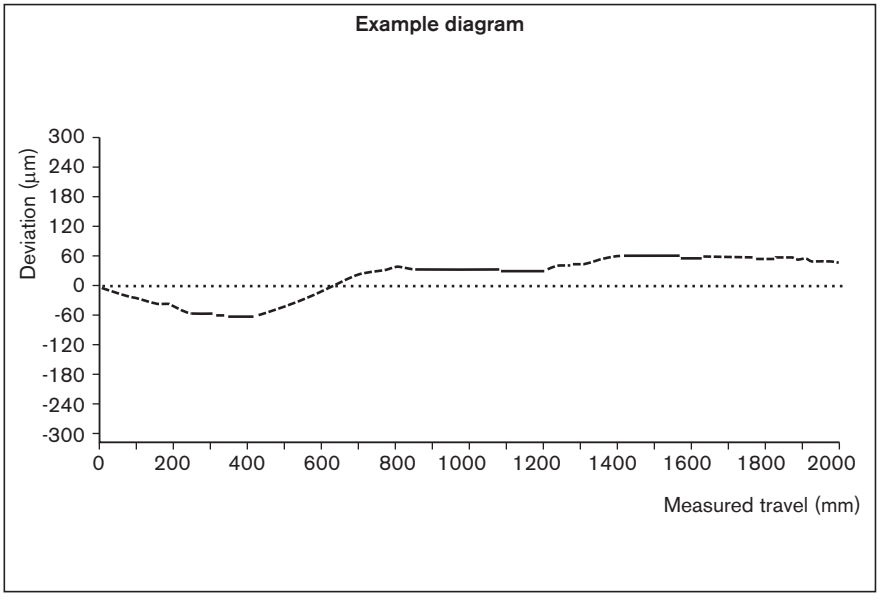
Measurement of frictional torque of complete system

Option 002
The moment of friction is measured over the entire travel range.



Lead deviation of the ball screw drive for Linear Modules MKK

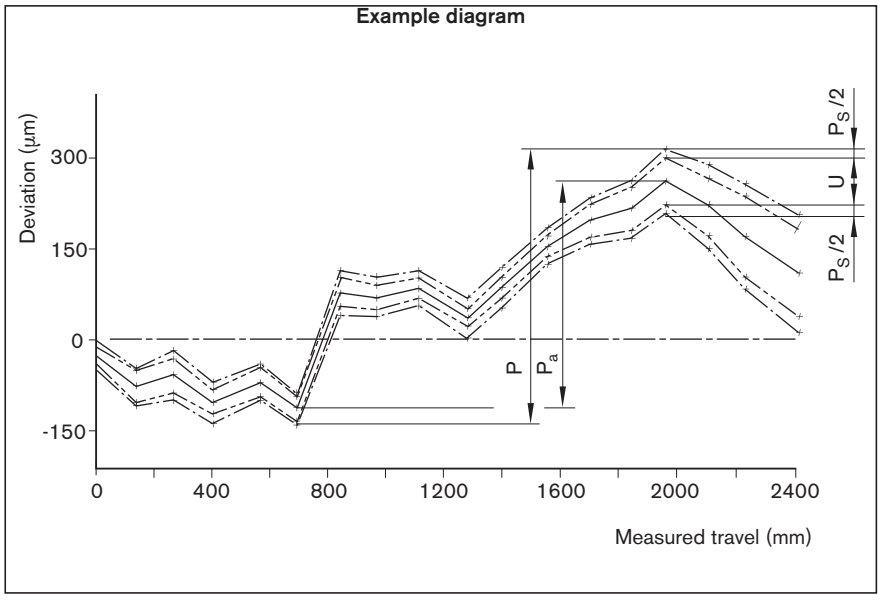
Option 003
In addition to graphical representation (see illustration), a measurement report is supplied in table form.



Positioning accuracy

per VDI/DGQ 3441 Option 005

Measurement points are selected at irregular intervals along the travel range. This enables even periodical deviations to be detected during positioning. Each measurement point is approached several times from both sides. This gives the following parameters.



Positional uncertainty P

The positional uncertainty corresponds to the total deviation.
It encompasses all the systematic and random deviations during positioning.

Positional uncertainty is a parameter for the positioning accuracy and corresponds to the total deviation. It encompasses all the systematic and random deviations during positioning.
Positional uncertainty takes the following characteristic values into consideration:
– position deviation
– reversal range
– position variation range

Positioning deviation P_a

The positioning deviation corresponds to the maximum difference arising in the mean values of all the measurement points.
It describes systematic deviations.

Reversal range U

The reversal range corresponds to the difference in mean values of the two approach directions. The reversal range is determined at every measurement point.
It describes systematic deviations.

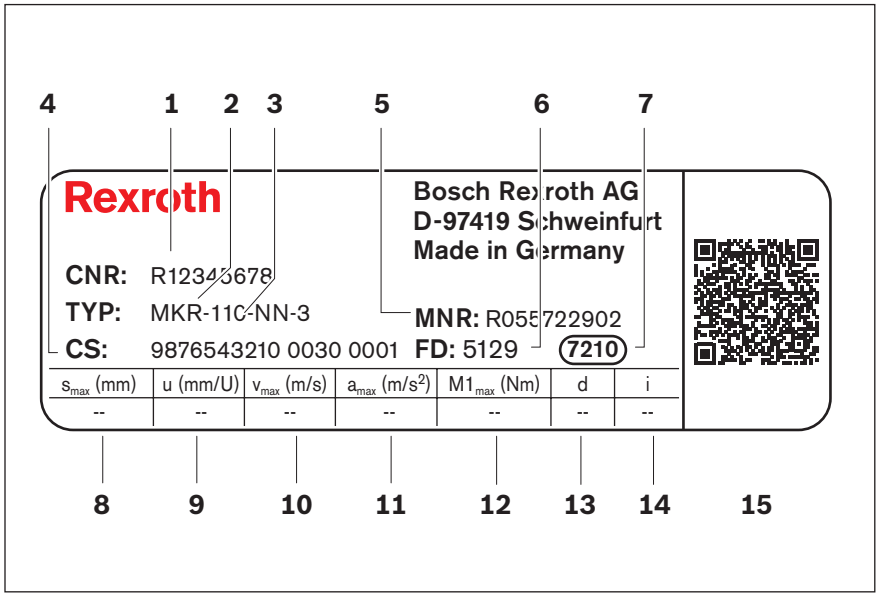
Position variation range P_S

The position variation range describes the effects of random deviations.
It is determined at every measurement point.

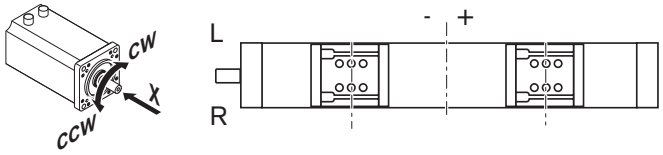
Additional information

Parameterization (start-up)

The nameplate contains reference information on the production of the Linear Motion System as well as technical start-up parameters.



1	CNR	Part number
2	TYP	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	Lead constant without motor attachment
10	v_{max}	Max. travel speed
11	a_{max}	Maximum acceleration travel
12	$M1_{max}$	Maximum drive torque at motor journal
13	d	Direction of rotation of the motor for travel in positive (+) direction CW = Clockwise CCW = Counter Clockwise



14	i	Transmission ratio
15		QR code

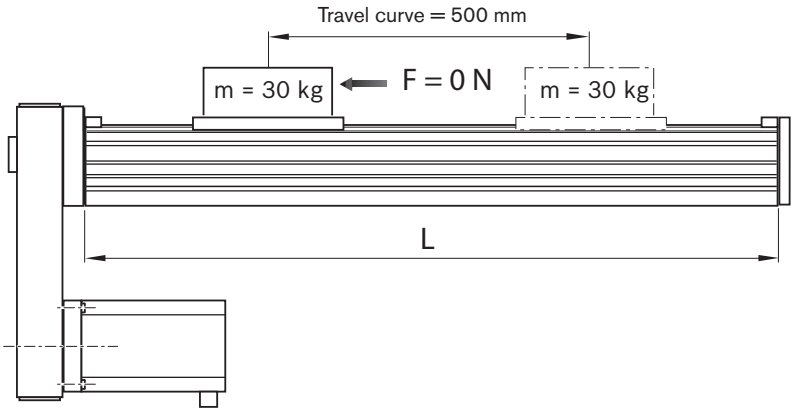
Additional information

Calculation example MKK with timing belt side drive

Given data

In a handling task, a mass of 30 kg is to be moved horizontally by 500 mm at a travel speed of 0.5 m/s. The following was selected based on the technical data and the installation space:

Linear Module MKK-080-NN-3
- With sealing strip
- Motor attachment via timing belt side drive, i = 1.5
- with AC servo motor MS2N04-B0BTN with brake



Estimation of the length L

(The first estimate assumes a large lead (P = 20 mm) and therefore length, since the permissible speed can decrease as length increases. For the excess travel s_e the value 2 x P is selected).

$$L = s_{eff} + 2 \cdot s_e + L_{ca} + L_{ad}$$

Excess travel: $s_e = 2 \cdot P = 2 \cdot 20 = 40$ mm

Max. travel: $s_{max} = s_{eff} + 2 \cdot s_e$

$= 500 + 2 \cdot 40 = 580$ mm

Length: $L = 580 + 260 + 109 = 949$ mm

Selection of ball screw drive

(Better to choose the lowest lead as this is favorable in terms of resolution, braking distance, length.)

Permissible ball screw drive according to the “Permissible speed” graph at v = 0.5 m/s and L = 949 mm:

Ball screw drive 20 x 10 and ball screw drive 20 x 20

Ball screw drive selected (smaller lead):

Ball screw drive 20 x 10

Maximum permissible speed for ball screw drive 20 x 10 as read off from diagram:

$v_{max} = 0.63$ m/s

Calculation of length L

(for selected ball screw drive)

Excess travel: $s_e = 2 \cdot P = 2 \cdot 10 = 20$ mm

Max. travel: $s_{max} = s_{eff} + 2 \cdot s_e$

$= 500 + 2 \cdot 20 = 540$ mm

Length: $L = 540 + 260 + 109 = 909$ mm

Frictional torque M_R

(motor attachment via timing belt side drive)

$$M_R = M_{Rsd} + \frac{M_{Rs}}{i}$$

Linear module: $M_{Rs} = 0.45$ Nm

Timing belt side drive: $M_{Rsd} = 0.40$ Nm (i = 1.5)

Frictional torque: $M_R = 0.40 + \frac{0.45}{1.5} = 0.70$ Nm

Mass moment of inertia J_{ex}

(motor attachment via timing belt side drive)

$$J_{ex} = J_{sd} + \frac{(J_s + J_t)}{i^2}$$

Timing belt side drive: $J_{sd} = 85 \cdot 10^{-6}$ kgm²

Linear module: $J_s = (k_{J\,fix} + k_{J\,var} \cdot L) \cdot 10^{-6} = (21.22 + 0.084 \cdot 909) \cdot 10^{-6}$

$= 97.576 \cdot 10^{-6}$ kgm²

External load: $J_t = m_{ex} \cdot k_{J\,m} \cdot 10^{-6} = 30 \cdot 2.533 \cdot 10^{-6} = 75.99 \cdot 10^{-6}$ kgm²

Mass moment of inertia: $J_{ex} = 85 \cdot 10^{-6} + \frac{(97.576 \cdot 10^{-6} + 75.99 \cdot 10^{-6})}{1.5^2}$

$= 162.14 \cdot 10^{-6}$ kgm²

Maximum permissible rotary speed n_{mech}

(motor attachment via timing belt side drive)
Limit for mechanical system

$$n_{mech} = \frac{(v_{mech} \cdot i \cdot 1000 \cdot 60)}{P}$$

Max. permissible speed: $v_{mech} = v_{max} = 0.63$ m/s

Max. perm. rotary speed: $n_{mech} = \frac{(0.63 \cdot 1.5 \cdot 1000 \cdot 60)}{10} = 5670$ rpm

Max. speed of application n_{mech}

(motor attachment via timing belt side drive)
Limit for application

Speed: $v_{mech} = 0.5$ m/s

Speed: $n_{mech} = \frac{0.5 \cdot 1.5 \cdot 1000 \cdot 60}{10} = 4500$ rpm

Max. permissible drive torque M_{mech}

(motor attachment via timing belt side drive)
Limit for mechanical system

$$M_{mech} = \text{minimum } (M_{sd}; \frac{M_p}{i})$$

Timing belt side drive: M_{sd} = 5.2 Nm (gear ratio i = 1.5 for MS2N-04)

Linear module: M_p = 9.8 Nm

Drive torque: $M_{mech} = \text{minimum } (5.2; \frac{9.8}{1.5})$

= Minimum (5.2; 6.53) = 5,2 Nm

Additional information

Calculation example MKK with timing belt side drive (continued)

Checking motor preselection

Selected motor:
MS2N04-B0BTN with brake

Condition 1:

Rotary speed: $n_{max} \geq n_{mech}$

$6000 \geq 4500$ condition met – motor selection OK

Condition 2:

Mass moment of inertia ratio: $V = \frac{J_{ex}}{J_m + J_{br}}$

Motor moment of inertia: $J_m = 70.0 \cdot 10^{-6}$ kgm^2

Brake moment of inertia: $J_{br} = 40 \cdot 10^{-6}$ kgm^2

Mass moment of inertia ratio: $V = \frac{162.14 \cdot 10^{-6}}{(70 \cdot 10^{-6} + 40 \cdot 10^{-6})}$

$= 0.78$

Condition for handling: $V \leq 6$

$0.78 \leq 6$ condition met – motor selection OK

Condition 3:

Torque ratio: $\frac{M_{stat}}{M_0} \leq 0.6$

Static load moment: $M_{stat} = M_R + M_g$ (horizontal mounting$M_g = 0$)

$= 0.70$ Nm

Torque of the motor: $M_0 = 1.75$ Nm

Torque ratio: $\frac{0.70}{1.75} = 0.4$

$0.4 \leq 0.6$ condition met – motor selection OK

All three conditions met ➠ selected motor is suitable for the application.

Result

Linear Module MKK-080-NN-3
L = 909 mm, s_{max} = 540 mm, L_{ca} = 260 mm; Rexroth Ball Screw Assembly: d_0 = 20 mm, P = 10 mm; with corrosion resistant sealing strip; gear ratio i = 1.5 pre-selected motor:: MS2N04-B0BTN with brake
For precise dimensioning of the electric drive, the motor-controller combination must always be considered, as the performance data (e.g. maximum useful speed and maximum torque) will depend on the controller used.
When doing this, the following data must be considered:

Frictional torque:	M_R	= 0.70 Nm
Mass moment of inertia:	J_{ex}	= 162.14 · 10^{-6} kgm^2
Speed:	v_{mech}	= 0.5 m/s (n_{mech} = 4500 rpm)
Limit for drive torque:	M_{mech}	= 5.2 Nm

➠ Motor torque should be limited to 5.2 Nm on the drive side.

Acceleration limit:	a_{max}	= 50 m/s^2
Limit value for speed:	v_{max}	= 0.63 m/s (n_{mech} = 5670 rpm)

Besides the preferred type MS2N04-B0BTN, other motors with identical connection dimensions can be adapted while taking care not to exceed the calculated limit values.

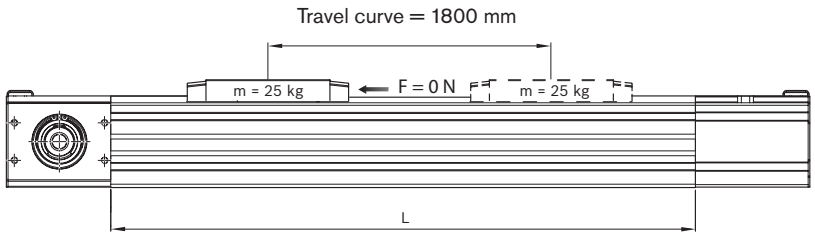
Calculation example MKR with gear reducer

Given data

In a handling task, a mass of 25 kg is to be moved horizontally by 1800 mm at a travel speed of 1.5 m/s. The following was selected based on the technical data and the installation space:

Linear Module MKR-080-NN-3

- Carriage length = 260 mm
- Motor attachment via gear reducer, I = 5
- Max. permissible speed = 3 m/s (i = 5)
- with AC servo motor MS2N05-C0BTN with brake



Calculation of length L

(In most cases, the recommended limit for excess travel is 2x lead constant. The excess travel must be greater than the emergency stop stopping distance, which is calculated for exact dimensioning of the electrical drive.)

$$L = s_{max} + L_{ca} + L_{ad}$$

Lead constant: $u = \frac{u(i=1)}{i}$

$$= \frac{205}{5} = 41 \text{ mm}$$

Excess travel: $s_e = 2 \cdot u = 2 \cdot 41 = 82 \text{ mm}$

Max. travel: $s_{max} = s_{eff} + 2 \cdot s_e$

$$= 1800 + 2 \cdot 82 = 1964 \text{ mm}$$

Length: $L = 1964 + 260 + 17 = 2241 \text{ mm}$

Frictional torque M_R

$$M_R = M_{Rge} + \frac{M_{Rs}}{i}$$

Linear module: $M_{Rs} = 2.0 \text{ Nm}$

Gear: $M_{Rge} = 0.4 \text{ Nm}$

Frictional torque: $M_R = 0.4 + \frac{2.0}{5} = 0.8 \text{ Nm}$

Mass moment of inertia J_{ex}

$$J_{ex} = J_{ge} + \frac{(J_s + J_t)}{i^2}$$

Linear module: $J_s = (k_{J\,fix} + k_{J\,var} \cdot L) \cdot 10^{-6}$

$$= (3197 + 0.3188 \cdot 2241) \cdot 10^{-6}$$

$$= 3911.43 \cdot 10^{-6} \text{ kgm}^2$$

External load: $J_t = m_{ex} \cdot k_{J\,m} \cdot 10^{-6}$

$$= 25 \cdot 1413 \cdot 10^{-6}$$

$$= 35325 \cdot 10^{-6} \text{ kgm}^2$$

Mass moment of inertia: $J_{ex} = 129 \cdot 10^{-6} + \frac{(3911.43 \cdot 10^{-6} + 35325 \cdot 10^{-6})}{5^2}$

$$= 1698.457 \cdot 10^{-6} \text{ kgm}^2$$

Additional information

Calculation example MKR with gear reducer (continued)

Maximum permissible rotary speed n_{mech}

(Motor attachment via gear reducer, without considering the motor)
Limit for mechanical system

$$n_{mech} = \text{minimum } (n_p \cdot i \; ; \; n_{ge})$$

Linear Module:

$$n_p = \frac{(v_{max} \cdot 1000 \cdot 60)}{\pi \cdot d_3} = \frac{(3 \cdot 1000 \cdot 60)}{\pi \cdot 65.28} = 878 \text{ rpm}$$

Gear: $n_{ge} = 7000$ rpm

Max. permitted speed:

$$n_{mech} = \text{minimum } (878 \cdot 5 \; ; \; 7000) = \text{minimum } (4390 \; ; \; 7000) = 4390 \text{ rpm}$$

Maximum permissible speed v_{mech}

(Motor attachment via gear reducer, without considering the motor)
Limit for mechanical system

Max. permissible speed:

$$v_{mech} = \frac{(n_{mech} \cdot \pi \cdot d_3)}{i \cdot 1000 \cdot 60}$$

$$n_{mech} = \frac{(4390 \cdot \pi \cdot 65.28)}{5 \cdot 1000 \cdot 60} = 3.0 \text{ m/s}$$

Maximum permitted speed of the application n_{mech}

(Motor attachment via gear reducer, without considering the motor)
Limit for application

Travel speed: $v_{mech} = 1.5$ m/s

Speed:

$$n_{mech} = \frac{(1.5 \cdot 5 \cdot 1000 \cdot 60)}{\pi \cdot 65.28} = 2194 \text{ rpm}$$

Max. permissible drive torque M_{mech}

(Motor attachment via gear reducer, without considering the motor)
Limit for mechanical system

$$M_{mech} = \text{minimum } \left(\frac{M_{ge}}{i} ; \frac{M_p}{i}\right)$$

Linear module: $M_p = 36$ Nm

Gear: $M_{ge} = 176$ Nm

Drive torque:

$$M_{mech} = \text{minimum } \left(\frac{176}{5} ; \frac{36}{5}\right) = \text{minimum } (35.2 \; ; \; 7.2) = 7.2 \text{ Nm}$$

Checking motor preselection

Selected motor:
MS2N05-C0BTN with brake

Condition 1:

Rotary speed: $n_{max} \geq n_{mech}$

$6000 \geq 2194$ condition met – motor selection OK

Condition 2:

Mass moment of inertia ratio: $V = \frac{J_{ex}}{J_m + J_{br}}$

Motor moment of inertia: $J_m = 290 \cdot 10^{-6}$ kgm²

Brake moment of inertia: $J_{br} = 110 \cdot 10^{-6}$ kgm²

Mass moment of inertia ratio: $V = \frac{1698.457 \cdot 10^{-6}}{400 \cdot 10^{-6}}$

$= 4.25$

Condition for handling: $V \leq 6$

$4.25 \leq 6$ condition fulfilled – motor selection OK

Condition 3:

Torque ratio: $\frac{M_{stat}}{M_0} \leq 0.6$

Static load moment: $M_{stat} = M_R + M_g$ (horizontal mounting $M_g = 0$)

$= 0.8$ Nm

Continuous motor of the motor: $M_0 = 6.1$ Nm

Torque ratio: $\frac{0.8}{6.1} = 0.13$

$0.13 \leq 0.6$ condition fulfilled – motor selection OK

All three conditions met ➠ selected motor is suitable for the application.

Result

Linear Module MKR-080-NN-3

$L = 2241$ mm, $s_{max} = 1964$ mm, $L_{ca} = 260$ mm, belt drive, motor attachment via planetary gearbox, gear ratio $i = 5$

Preselected motor: MS2N05-C0BTN with brake

For precise dimensioning of the electric drive, the motor-controller combination must always be considered, as the performance data (for example, maximum useful speed and maximum torque) will depend on the controller used.

When doing this, the following data must be considered.

Frictional torque	$M_R = 0.8$ Nm
Mass moment of inertia	$J_{ex} = 1698.457 \cdot 10^{-6}$ kgm²
Speed:	$v_{mech} = 1.5$ m/s ($n_{mech} = 2194$ rpm)
Limit for drive torque	$M_{mech} = 7.2$ Nm
➠ Motor torque should be limited to 7.2 Nm on the drive side.	
Limit for acceleration	$a_{max} = 50$ m/s²
Limit value for travel:	$v_{max} = 3.0$ m/s ($n_{mech} = 4390$ rpm)

After determining the emergency-stop braking path during precise dimensioning, the selected excess travel must be checked to see whether it is sufficient and adjusted if necessary.

Besides the preferred type MS2N05-C0BTN, other motors with identical connection dimension can be adapted while taking care not to exceed the calculated limits.

Additional information

Abbreviations

Abbreviation/index	Designation	Unit
a	Acceleration	(m/s^2)
a_{max}	Maximum acceleration travel	(m/s^2)
BASA	Rexroth Ball Screw Assembly	(–)
B_t	Belt type	(–)
c_{spe}	Specific spring rate	(N)
C	Dynamic load capacity, guideway	(N)
C_{bs}	Dynamic load capacity, ball screw drive	(N)
C_{fb}	Dynamic load capacity, fixed bearing	(N)
d_0	Rexroth Ball Screw Assembly nominal diameter	(mm)
d_3	Belt pulley diameter	(mm)
f_w	Load factor	(–)
F_1, F_2, ... F_n	Axial load during phases 1 ... n	(N)
F_{bp}	Max. belt drive transmission force	(N)
F_{comb}	Combined equivalent load	(N)
F_m	Equivalent dynamic axial load	(N)
F_{pr}	Preload force on motor	(N)
F_{tperm}	Belt elasticity limit	(N)
F_y	Load due to a resulting force in the y-direction	(N)
$F_{y\ max}$	Maximum dynamic load in y-direction	(N)
F_z	External load due to a resulting force in the z-direction	(N)
$F_{z\ max}$	Maximum dynamic load in z-direction	(N)
g	Force of gravity (= 9.81)	(m/s^2)
i	Gear ratio	(–)
Iy	Y-axis planar moment of inertia	
Iz	Z-axis planar moment of inertia	
J_{br}	Mass moment of inertia of the motor brake	(kgm^2)
J_c	Mass moment of inertia of the coupling	(kgm^2)
J_{dc}	Mass moment of inertia of the drive train	(kgm^2)
J_{ex}	Mass moment of inertia of the mechanical system	(kgm^2)
J_{ge}	Mass moment of inertia of the gear on the motor journal	(kgm^2)
J_m	Mass moment of inertia of the motor	(kgm^2)
J_s	Mass moment of inertia of the Linear Motion System	(kgm^2)
J_{sd}	Mass moment of inertia of the timing belt side drive	(kgm^2)
J_t	Translatory mass moment of inertia of external load based on the Linear Motion System screw journal	(kgm^2)
$k_{g\ fix}$	Constant for the fixed portion of the mass	(kg)
$k_{g\ var}$	Constant for the variable-length portion of the mass	(kg/mm)

Abbreviation/index	Designation	Unit
$k_{J\ fix}$	Constant for fixed-length portion of mass moment of inertia	($kgmm^2$)
$k_{J\ m}$	Constant for mass moment of inertia-length portion of mass moment of inertia	(mm^2)
$k_{J\ var}$	Constant for variable-length portion of mass moment of inertia	(kgmm)
L	Length of Linear Motion System	(mm)
L	Nominal life – in revolutions – in meters	 (rpm) (m)
L_{ad}	Additional length	(mm)
L_{ca}	Carriage length	(mm)
L_h	Nominal life	(h)
L_m	Motor length	(mm)
L_{max}	Maximum length	(mm)
L_W	Carriage centerline-to-centerline distance	(mm)
m_{br}	Holding brake mass	(kg)
m_{ca}	Moved mass of carriage	(kg)
m_{ex}	Moved external load	(kg)
m_{fc}	Mass of mount and coupling	(kg)
m_m	Motor mass	(kg)
m_s	Mass of the Linear Motion System (without attachments)	(kg)
m_{sd}	Mass of the timing belt side drive	(kg)
M_0	Continuous motor torque	(Nm)
M_{cN}	Rated torque of coupling	(Nm)
M_g	Force due to weight on the motor journal	(Nm)
M_{ge}	Maximum permissible acceleration torque of the gear (on the output drive)	(Nm)
M_L	Dynamic longitudinal moment load capacity	(Nm)
M_m	Equivalent dynamic torque	(Nm)
M_{max}	Max. possible motor torque	(Nm)
M_{mech}	Maximum permissible drive torque of the mechanical system	(Nm)
M_p	Maximum permissible drive torque (at the drive journal)	(Nm)
M_R	Frictional torque at the motor journal	(Nm)
M_{Rge}	Mass moment of frictional torque of the gear on the motor journal	(Nm)
M_{Rs}	Frictional torque of the system	(Nm)
M_{Rsd}	Frictional torque of the timing belt side drive on the motor journal	(Nm)
M_{sd}	Maximum permissible drive torque of the timing belt side drive	(Nm)
M_{stat}	Static load moment	(Nm)
M_t	Dynamic torsional moment load capacity	(Nm)
M_x	Dynamic torsional moment about the x-axis	(Nm)
$M_{x\ max}$	Maximum admissible torsional moment around the x-axis	(Nm)

Abbreviation/index	Designation	Unit
M_y	Dynamic torsional moment about the y-axis	(Nm)
$M_{y\ max}$	Maximum admissible torsional moment around the y-axis	(Nm)
M_z	Dynamic torsional moment about the z-axis	(Nm)
$M_{z\ max}$	Maximum admissible torsional moment around the z-axis	(Nm)
$n_1, n_2, \ldots n_n$	Rotary speed in acceleration and braking phases	(rpm)
$n_{A1 \ldots n}$	Speed at start in phase 1 ... n	(rpm)
$n_{E1 \ldots n}$	Speed at finish in phase 1 ... n	(rpm)
n_{ge}	Maximum permissible speed of the gear	(rpm)
n_m	Average speed	(rpm)
n_{mech}	Maximum permissible rotary speed for mechanical system	(rpm)
n_{max}	Maximum speed of motor	(rpm)
n_p	Maximum permissible speed of the Linear Motion System	(rpm)
P	Screw lead	(mm)
P_{app}	Useful power in the application	(W)
keyway	Keyway	(–)
s_a	Acceleration travel	(mm)
s_e	Excess travel (the excess travel s_e must be greater than the braking distance. The acceleration travel can be assumed as the reference value for the braking distance.)	(mm)
s_{eff}	Effective stroke	(mm)
s_{min}	Minimum travel distance	(mm)
s_{max}	Maximum travel range	(mm)
SPU	Screw support	
t_a	Acceleration time, braking time	(s)
$t_1, t_2, \ldots t_n$	Time for phase 1 ... n	(s)
u	Lead constant	(mm/rev)
$v_1, v_2, \ldots v_n$	Speed in phase 1 ... n	(m/s)
v_{max}	Maximum permissible speed	(m/s)
v_{mech}	Maximum permissible speed for mechanical system	(m/s)
v_m	Average linear speed	(m/s)
V	Ratio of mass moments of inertia of drive train and motor	(–)
z_1	Application point of the effective force	(mm)
π	pi	(–)

Additional information

Ordering example MKK-080-NN-3

Ordering data		Description
Linear Module	MKKK-080-NN-3	Linear Module MKK-080-NN-3
Travel range max. (s_{max})	2800	–
Material pairing	ALST	Aluminum/steel strip
Lubrication	LSS	Lube version LSS
Position measuring system	000	Without position measuring system
Carriage		
Carriage fastening	T	Carriage with thread
Number of carriages	1	One carriage
Carriage centerline-to-centerline distance L_W[1)]	–	–
Guideway	004	Ball Guide Rail / frame with center holes
Drive		
keyway	0	Without keyway
BASA (Rexroth Ball Screw Assembly do x P)	20x10	Nominal diameter = 20 mm, pitch = 10 mm
Accuracy class	T7	T7 = lead deviation 53 µm/300 mm
Screw support	002	2 Screw support (SPU)
Version	F001	With mount and coupling
Attachment interface		
Gear ratio	i = 1	Gear ratio i = 1
Mechanical interface	MS2N04	Motor attachment for servo motor MS2N04
Motor		
Motor code	MS2N04-D0BQN	Motor type
Motor connection	1	Motor connection (1 cable)
Motor holding brake	Y	With holding brake
Motor connector position	180	Motor connector location = 180°
Cover		
Cover version	2	With cover (corrosion resistant steel strip)
Cover with side sealing	0	Without side sealing
Sensor system (available with max. 6 switches)		
1. Sensor	120	PNP/normally closed (NC)
2. Sensor	120	PNP/normally closed (NC)
Documentation	001	Standard report

1) Only required for two carriages

Inquiry/order form MKK-xxx-NN-3

Ordering data		Description
Linear Module		
Travel range max. (s_{max})		
Material pairing		
Lubrication		
Position measuring system		
Carriage		
Carriage fastening		
Number of carriages		
Carriage centerline-to-centerline distance L_W[1)]		
Guideway		
Drive		
keyway		
BASA (Rexroth Ball Screw Assembly do x P)		
Accuracy class		
Screw support		
Version		
Attachment interface[2)]		
Gear ratio		
Mechanical interface		
Motor		
Motor code		
Motor connection		
Motor holding brake		
Motor connector position		
Cover		
Cover version		
Cover with side sealing		
Sensor system (available with max. 6 switches)		
1. Sensor		
2. Sensor		
Documentation		

1) Only required for two carriages
2) The motor geometry code is required for motors according to customer specification

Attachment kits for motors according to customer specification(motor geometry code)

The dimensions queried result in a unique “motor geometry code”:

□□ – □□ – □□□ – □□□ – □□□ M□□ □□□ □□□

ØD	=	Shaft diameter
C	=	Shaft length
ØE	=	Centering diameter
C_1	=	Centering depth
ØF	=	Pitch diameter
ØG	=	Through-hole for mounting screw (specify thread diameter)
B_1	=	Mount thickness
A	=	Mount edge dimension

Quantity Acceptance of: _____ pcs, _____ per month, _____ per year, per order, or _____
Comments:

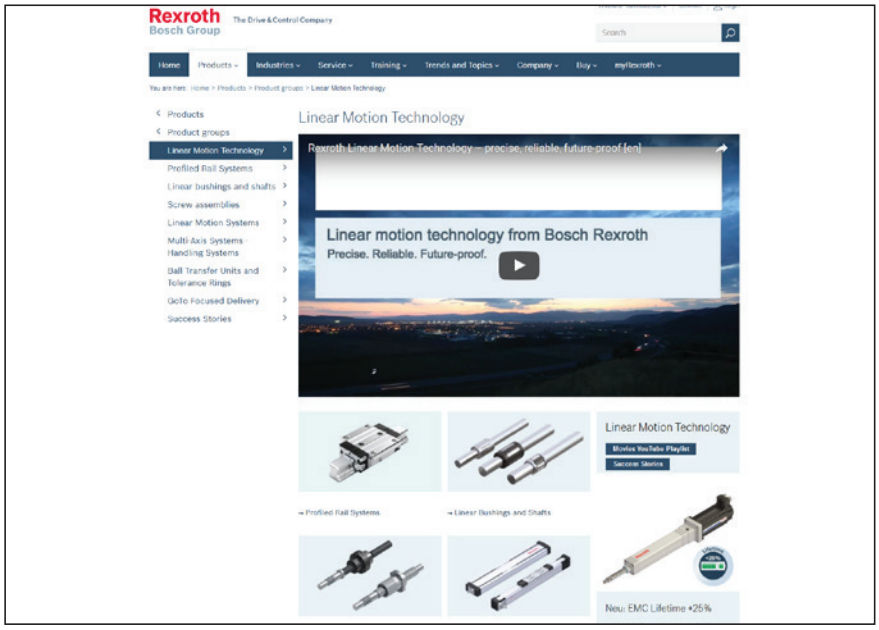
Sender

Company: Name:
Address: _____ Department: _____
_____ Telephone: _____
_____ Telefax: _____
_____ _____

Additional information

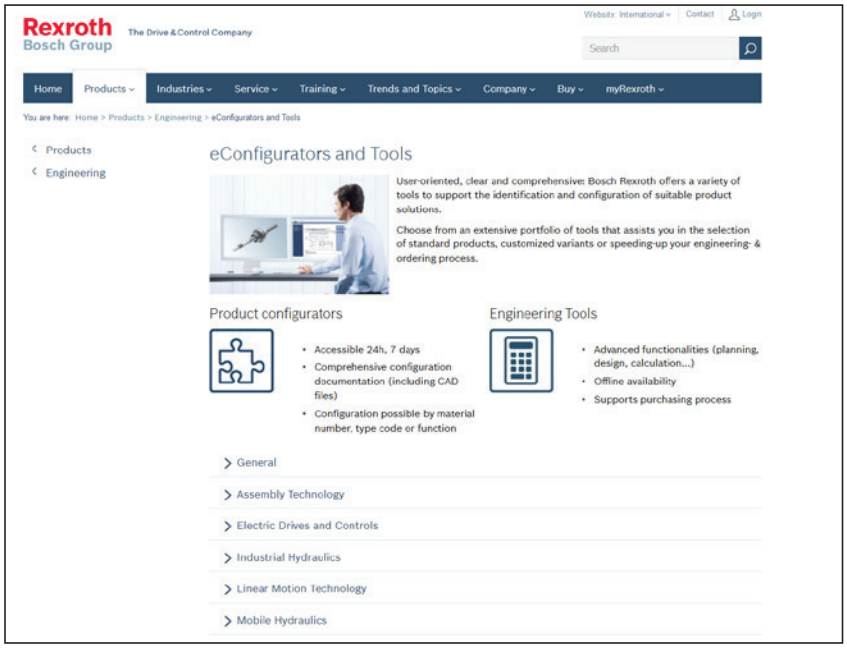
Further information

Bosch Rexroth Linear Motion Technology homepage:
https://www.boschrexroth.com/en/xc/products/product-groups/linear-motion-technology/index

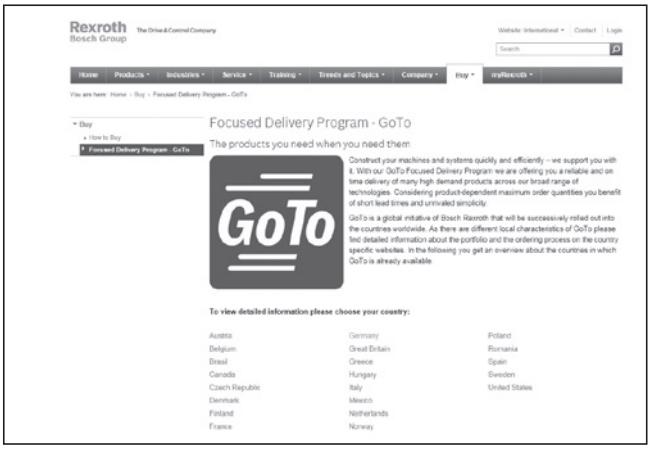


Configurators and tools

https://www.boschrexroth.com/en/xc/products/engineering/econfigurators-and-tools/econfigurators



GoTo Europe:
http://www.boschrexroth.com/goto



The Drive & Control Company

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