Electric Drives and Controls | Hydraulics | Linear Motion and Assembly Technologies | Pneumatics | Service

Rexroth
Bosch Group

Miniature Linear Modules
MKK/MKR 12-40

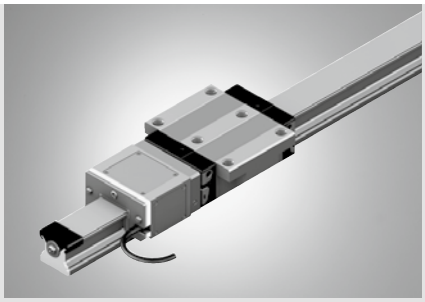
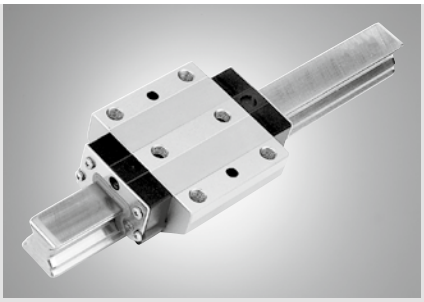
The Drive & Control Company

Linear Motion and Assembly Technologies

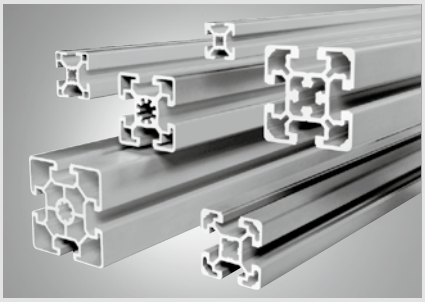
Ball Rail Systems
Roller Rail Systems
Linear Bushings and Shafts

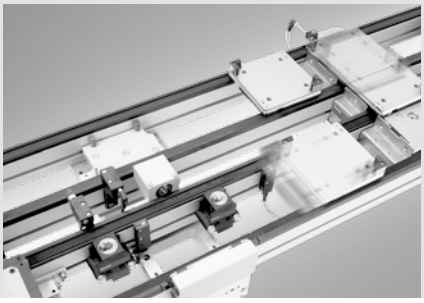
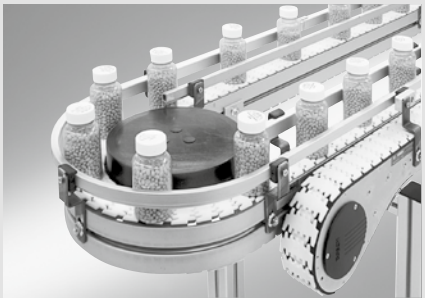
Ball Screw Drives
Linear Motion Systems

Basic Mechanical Elements
Manual Production Systems
Transfer Systems





Miniature Linear Modules

Linear Module MKK 12-40 **4**
Product Description 4
Structural Design 5
Technical Data 6
Calculations 9
Components and Ordering Data 10
Dimensions 12
Linear Module MKR 12-40 **14**
Product Description 14
Structural Design 15
Technical Data 16
Components and Ordering Data 18
Dimensions 20
Switch Mounting Arrangements **22**
Motors **25**
AC Servo Motors MSK 25
AC Servo Motors MSM 25
3-phase Stepping Motors VRDM 26
Mounting **27**
Lubrication **28**
Documentation **29**
Inquiry/Order Form **31**

Linear Module MKK 12-40

Product Description

Outstanding features

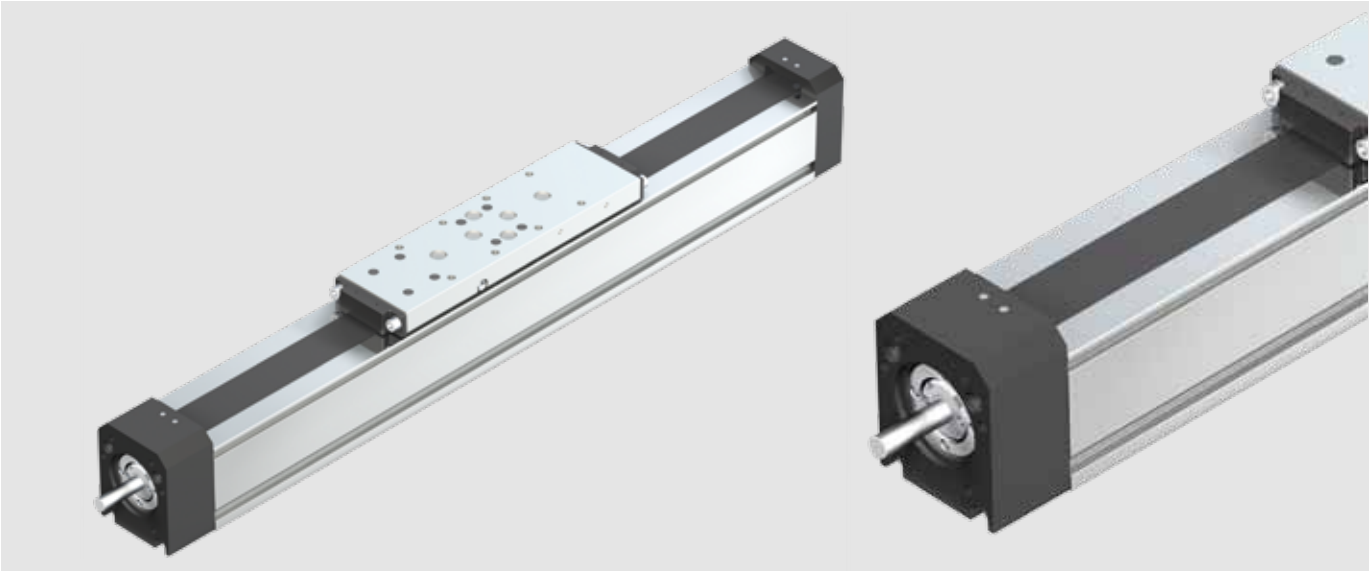
Rexroth Miniature Linear Modules are precise, ready-to-install linear motion systems that combine high performance with compact dimensions.
They are especially suitable for handling tasks requiring high precision within restricted spaces. Rexroth offers favorable price/performance ratios and fast delivery.

Structural design
- Extremely compact extruded aluminum profile (frame) with integrated Rexroth Ball Rail System
- With Precision Ball Screw Assembly
- Special protective plastic sealing strip
- Ready-to-install linear modules in any length up to L_{max}

Attachments
- Maintenance-free digital AC servo drives with integrated brake and attached feedback, or 3-phase stepping motors
- Motor mount and coupling or timing belt side drive for motor attachment
- Proximity switches or magnetic field sensors with various mounting options
- Available as complete drive units with drive controller and control unit
- Standardized mounting interfaces

Further highlights

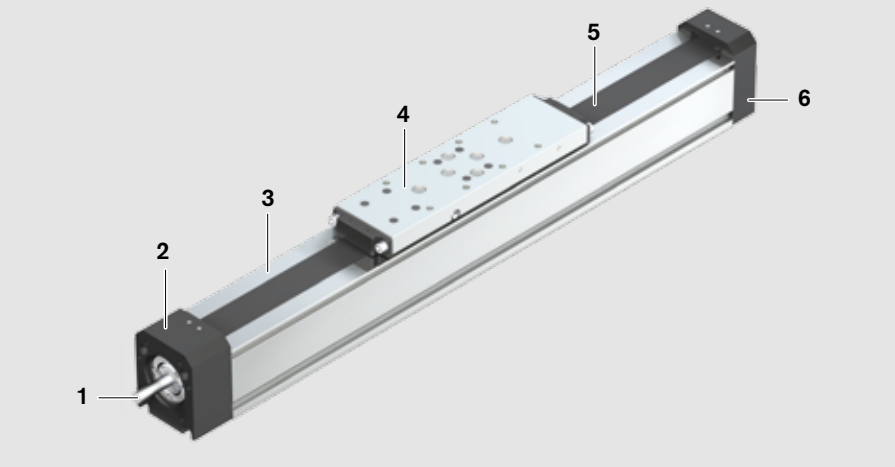
- Optimal travel performance due to integrated, zero-clearance Ball Rail System
- High load capacities and high rigidity
- Especially compact design due to integrated Ball Screw Drive
- High positioning accuracy and repeatability due to Precision Ball Screw Assembly with zero-backlash nut system
- High travel speeds combined with high precision and smooth running over long travel ranges
- Low-cost maintenance provided by one-point lubrication (grease) for Ball Rail System and Precision Ball Screw Assembly
- Easy motor attachment via locating feature and fastening threads
- Switches adjustable over the entire travel range
- Fully compatible with the camoLINE-system
- Positive-locking connection technology with centering rings
- Same outside dimensions mean that accessories and attachments can be used on either the MKK or the MKR
- Mounting in any orientation



MKK with screw journal

Structural Design

1 Ball screw with zero-backlash cylindrical single nut
2 Fixed bearing end block
3 Frame
4 Carriage
5 Sealing strip
6 Floating bearing end block

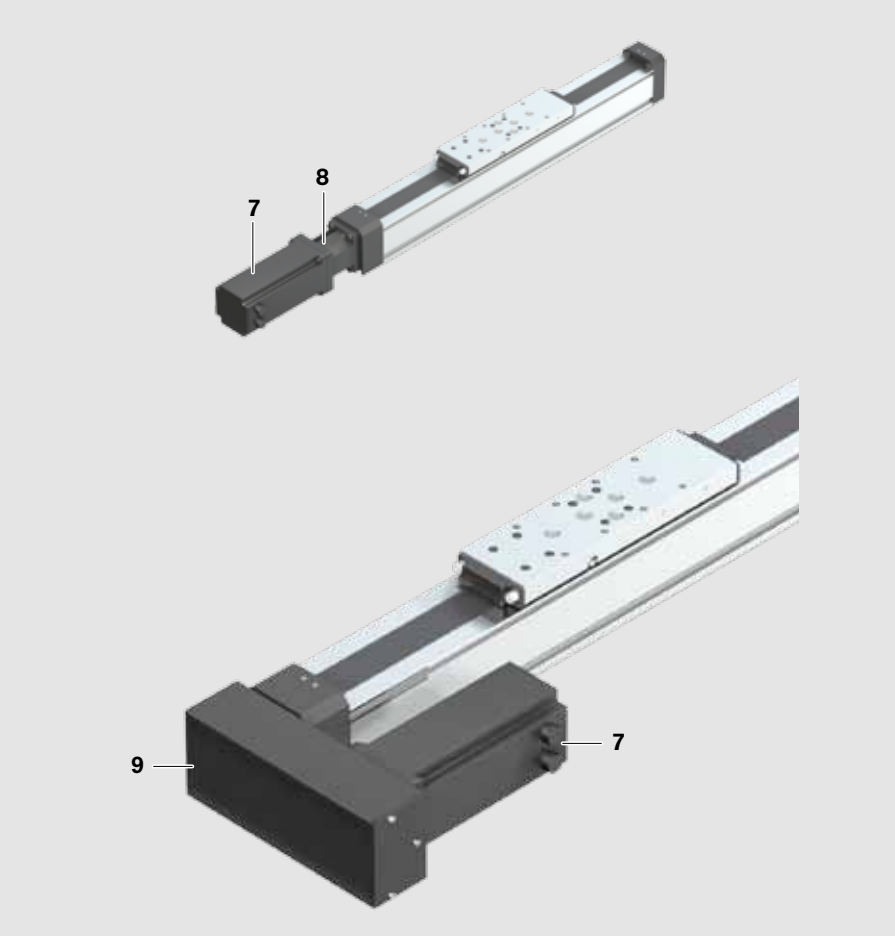


Motor attachment

7 Motor
8 Motor mount and coupling
9 Timing belt side drive

Motor mount and coupling

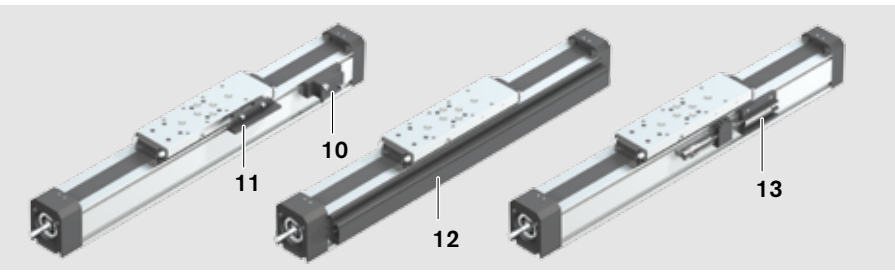
A motor can be attached to the Linear Module MKK 12-40 by means of a motor mount and coupling.
The motor mount serves to fasten the motor to the Linear Module and acts as a closed housing for the coupling.
The coupling transmits the motor drive torque free of distortive stresses to the Linear Module's ball screw journal.



Timing belt side drive

On Linear Modules MKK 12-40 the motor can be attached via a side drive with timing belt.
This makes the overall length shorter than when attaching the motor with a motor mount and coupling.
The compact, closed housing serves as protection for the belt and as a motor bracket. Different gear ratios are available:
– i = 1 : 1
– i = 1 : 1.5

The timing belt side drive can be mounted in four different directions:
– below, above (RV01 and RV02)
– left, right (RV03 and RV04)



Switch Mounting Arrangements

10 Proximity switch
11 Switching cam
12 Cable duct
13 Magnetic field sensor

Linear Module MKK 12-40

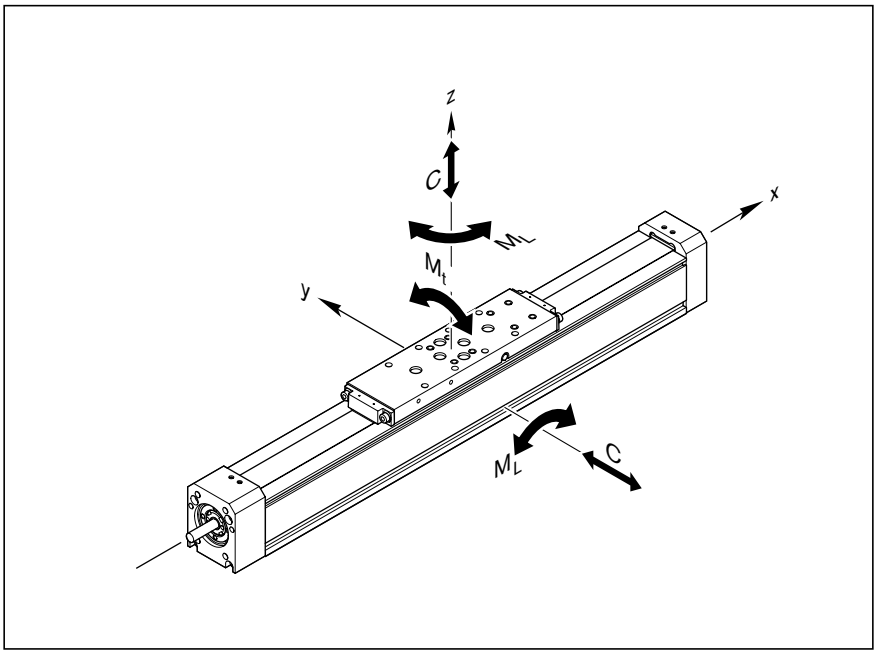
Technical Data

Dynamic characteristics

Linear module	Guideway			Ball Screw		Fixed bearing
	Dyn. load capacity	Dyn. load moments		Size	Dyn. load rating	Dyn. load rating
	C	M_t	M_L	d_0 x P	C	C
	(N)	(Nm)	(Nm)		(N)	(N)
MKK 12-40	3 750	22.3	93.8	12 x 2	2 240	4000
				12 x 5	3 800	
				12 x 10	2 500	

d_0 = screw diameter (mm)
P = lead (mm)

Suitable loads (recommended values on the basis of past experience)
As far as the desired service life is concerned, loads of up to approximately 20% of the dynamic characteristic values (**C, M_t, M_L**) have proved acceptable.
At the same time, the following may not be exceeded:
– maximum permissible loads
– permissible drive torque
– permissible travel speed



Note on dynamic load capacities and moments
Determination of the dynamic load capacities and 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.

General Technical Data

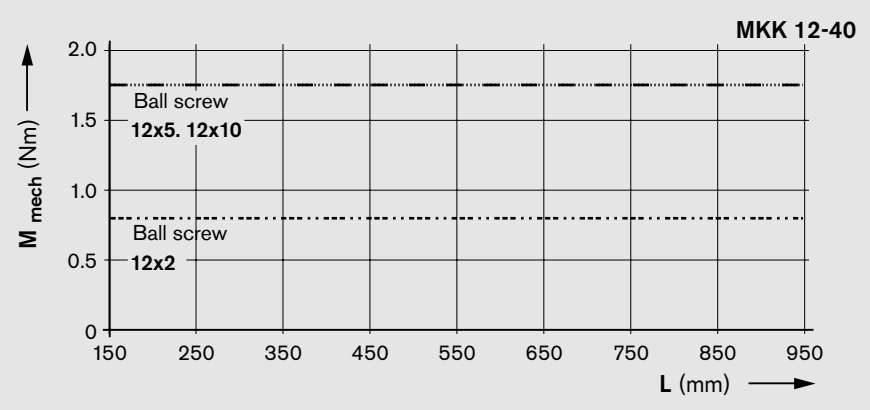
Linear module	Planar moment of inertia		Length of carriage	Length of linear module L		Mass of linear system m_s (kg)		Moved mass of system m_{ca}
	I_y	I_z		min.	max.	without drive	with drive	
	(cm^4)	(cm^4)	(mm)	(mm)	(mm)			(kg)
MKK 12-40	11.96	11.55	135	250	1000	0.0021 · L (mm) + 0.53	0.0021 · L (mm) + 0.65	0.39

Modulus of elasticity E E = 70,000 N/mm^2

Maximum permissible drive torque for mechanical system M_{mech}

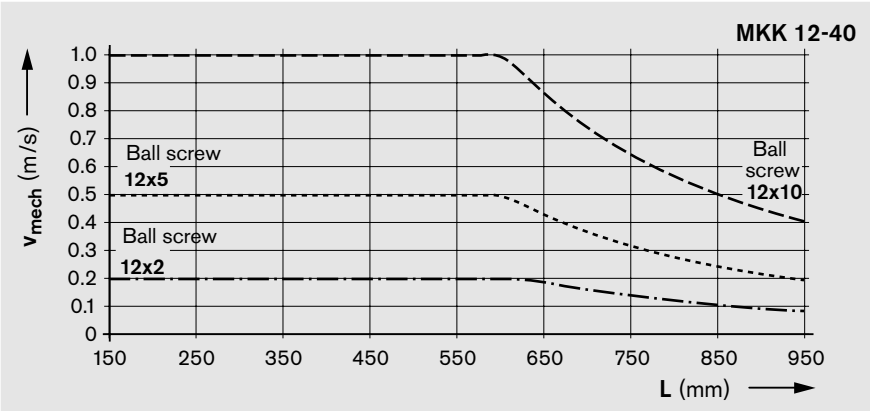
The values shown for M_{mech} are applicable under the following conditions:
- Horizontal operation
- Ball screw journal without keyway
- No radial load on ball screw shaft

Consider the rated torque of the coupling used!



Maximum permissible linear speed of mechanical system v_{mech}

Consider the motor speed!

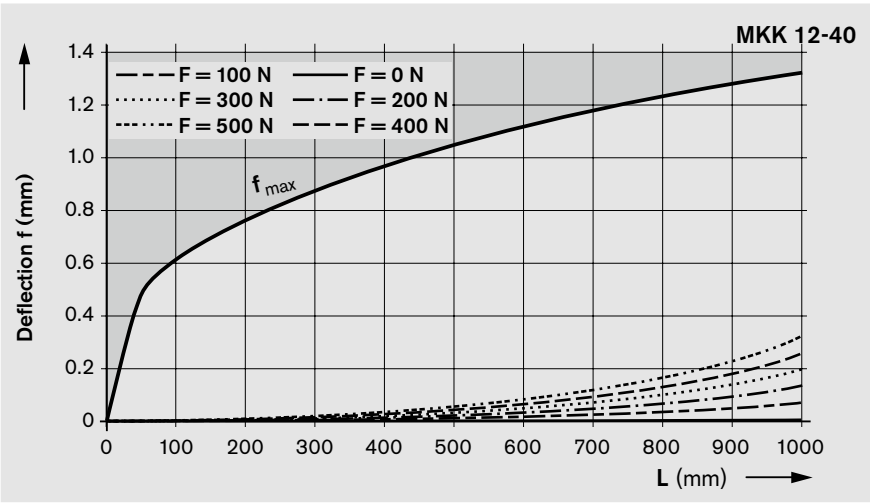


Deflection f

The chart applies under the following conditions:
- Both ends firmly fixed (6 to 8 screws per side)
- Solid mounting base

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

⚠ **f_{max} must not be exceeded!**



Linear Module MKK 12-40

Technical Data

Drive data of timing belt side drive, fixed bearing end, for motor attachment via timing belt side drive

Motor		MSM 030B / MSM 030C / MSK 030C				
Frictional torque M_{Rsd} (Nm)		0.15				
		Permissible torque up to length L = ... at			Reduced mass moment of inertia at	
Gear ratio			i = 1	i = 1.5	i = 1	i = 1.5
Linear module	Ball screw size d_0 x P (mm)	L (mm)	M_{sd} (Nm)	M_{sd} (Nm)	J_{sd} (10^{-6} kgm^2)	J_{sd} (10^{-6} kgm^2)
MKK 12-40	12 x 2	1000	0.80	0.50	45.6	17.7
	12 x 5	1000	1.60	1.10	45.6	17.7
	12 x 10	1000	1.60	1.10	45.6	17.7

$M_{R\,sd}$ = frictional torque of timing belt side drive at motor journal (Nm)
M_{sd} = maximum permissible drive torque of the timing belt side drive (Nm)
Consider the maximum torque of the motor M_{max}
J_{sd} = reduced mass moment of inertia of timing belt side drive (kgm^2)
i = timing belt side drive reduction
d_0 = screw diameter (mm)
P = lead (mm)

Mass moment of inertia of linear system J_S and frictional torque of the linear system M_{Rs}

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

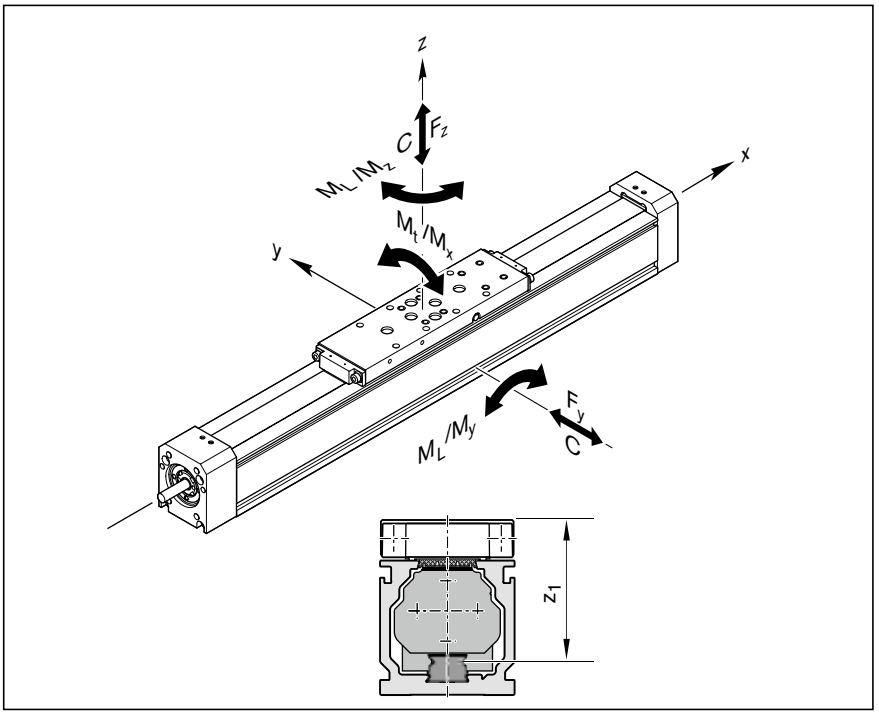
Linear module	Ball screw size d_0 x P	$k_{J\,fix}$	$k_{J\,var}$	M_{Rs} (Nm)
MKK 12-40	12 x 2	1.2744	0.013	0.08
	12 x 5	1.4678	0.011	0.09
	12 x 10	2.2011	0.011	0.11

J_S = mass moment of inertia of linear motion system (without external load) (kgm^2)
$k_{J\,fix}$ = constant for fixed-length portion of mass moment of inertia (10^6 kgm^2)
$k_{J\,var}$ = constant for variable-length portion of mass moment of inertia (10^9 kgm)
L = length (mm)
M_{Rs} = Frictional torque of linear motion system (Nm)

Coupling data

Linear module	Motor attachment	Coupling data		
		Rated torque M_{cN} (Nm)	Mass moment of inertia J_c (10^{-6} kgm^2)	Mass m_c (kg)
MKK 12-40	MSM 020B	1.9	2.1	0.039
	MSM 030B MSK 030C	3.7	7.0	0.075
	VRDM 368	5.5	20.0	0.040

Calculations



Combined equivalent load on bearing of the linear guide

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

	z_1 (mm)
MKK 12- 40	42

Nominal life

Nominal life of the guideway in meters:

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

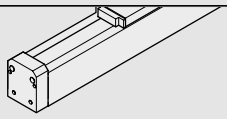
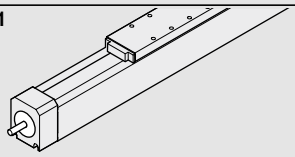
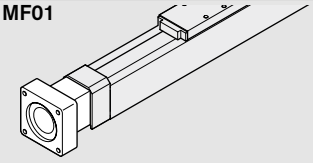
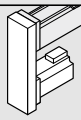
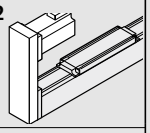
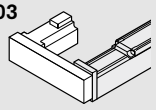
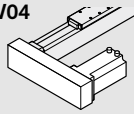
Nominal life of the guideway in hours:

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

C	=	dynamic load capacity	(N)
F_{comb}	=	combined equivalent load on bearing	(N)
F_y	=	force in y-direction	(N)
F_z	=	force in z-direction	(N)
L	=	nominal life	(m)
L_h	=	nominal life	(h)
M_L	=	dynamic longitudinal moment load capacity	(Nm)
M_t	=	dynamic torsional moment load capacity	(Nm)
M_x	=	torsional moment about the x-axis	(Nm)
M_y	=	torsional moment about the y-axis	(Nm)
M_z	=	torsional moment about the z-axis	(Nm)
v_m	=	average travel speed	(m/s)
z_1	=	application point of the effective force	(mm)

Linear Module MKK 12-40

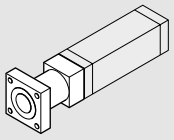
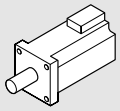
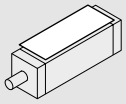
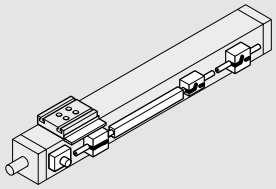
Linear Module MKK 12-40 Components and Ordering Data

Version		Part number, length R1160 660 00, ... mm	Guideway	Drive unit				Carriage	
				Screw journal	Ball screw size d_0 x P			L_{ca} = 135 mm	
					12x2	12x5	12x10		
without drive	OA1 	OA01	02		00			02	
with ball screw, w/o motor mount	OF01 	OF01	01	Ø 6	01	02	03	01	
with ball screw and motor mount	MF01 	MF01	01	Ø 6	01	02	03	01	
with ball screw and timing belt side drive	RV01  RV02 	RV01 - RV04	01	Ø 6	01	02	03	01	
	RV03  RV04 			Ø 6	01	02	03	01	

⚠ **Ordering example: See “Inquiry/Order” form**

⚠ **Please check whether the selected combination is a permissible one (load capacities, moments, maximum speeds, motor data, etc.)!**

d_0 = screw diameter (mm)
P = screw lead (mm)
L_{ca} = carriage length

Motor attachment				Motor		Cover		Switches / Cable duct / Socket-plug	Documentation	
										
Reduction i =	Attachment kit [1]	for motor		without brake	with brake	without sealing strip	with sealing strip		Standard report	Measurement report
–	00	–		00		00	01	Without switches 00 Proximity switch PNP NC 36-.±.... Switching cam 18 PNP NO 38-.±.... Cable duct 25 Switch type / Mounting side (R/L) / Direction of travel / Switching distance: Socket/plug 27 Magnetic field sensor with cable Reed sensor 51 Cable duct 25 Hall sensor PNP NC 52 Socket/plug 27 Magnetic field sensor with connector Reed sensor 58 Hall sensor PNP NC 59	01	02 Friction moment 03 Lead deviation 05 Positioning accuracy
–	00	–		00						
–	04	MSM 020B		68	69					
–	03	MSM 030B		70	71					
–	01	MSK 030C		84	85					
–	02	VRDM 368		35	36					
i = 1	17	MSM 030B		70	71					
i = 1.5	18									
i = 1	15	MSK 030C		84	85					
i = 1.5	16									

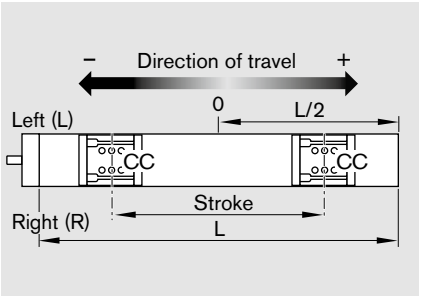
1) Attachment kit also available without motor (when ordering: enter “00” for motor).

Length of the Linear Module MKK 12-40:

L = max. travel + 160 mm

Max travel = effective stroke + 2 · excess travel

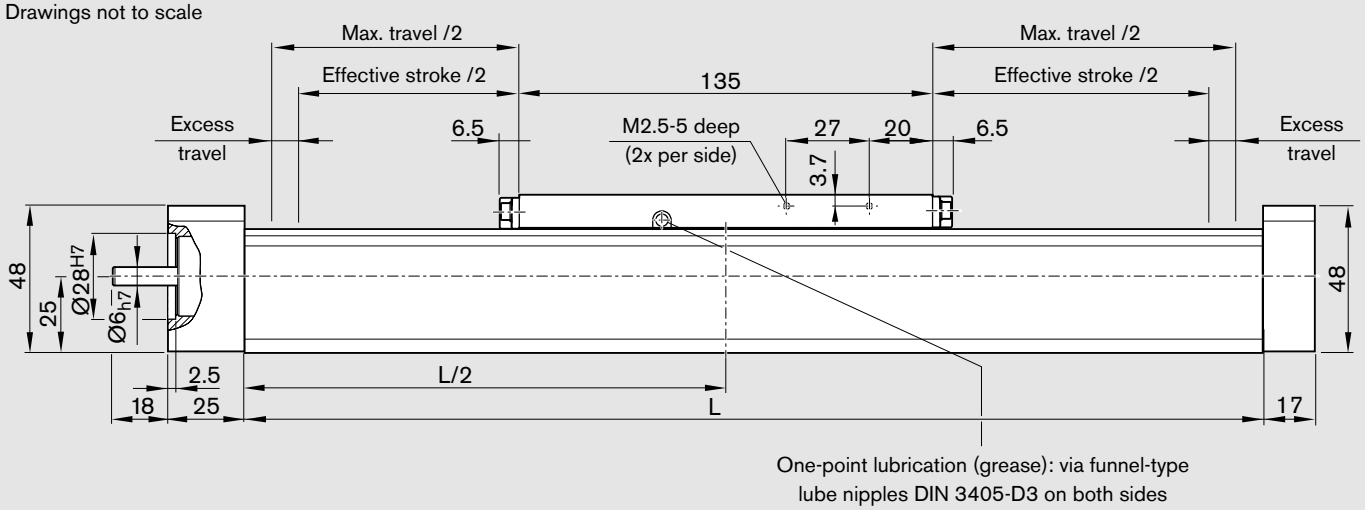
Stroke = maximum travel of carriage center (CC) between the outermost switch activation points
Excess travel:
In most cases the recommended limit for excess travel (braking path) is:
Excess travel = 2 · screw lead P
Example: Ball screw 12 x 10 (d_0 x P),
Excess travel = 2 · P = 2 · 10 mm = 20 mm

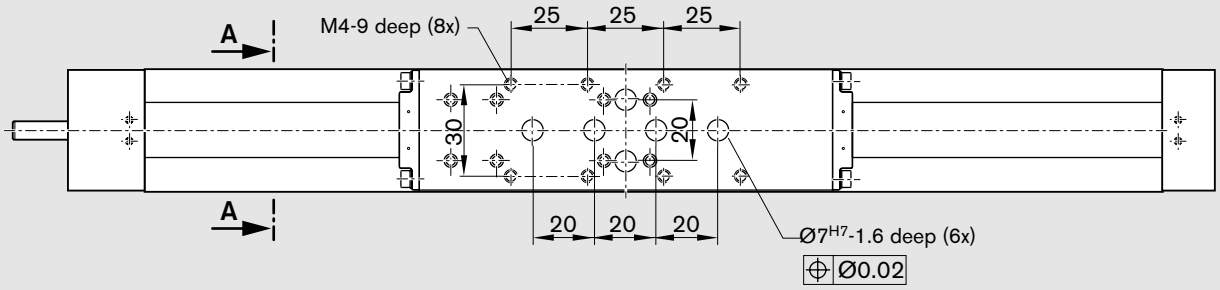


Linear Module MKK 12-40

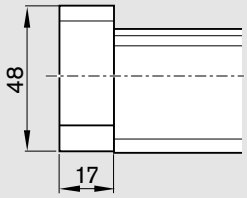
Linear Module MKK 12-40 Dimensions

All dimensions in mm.
Drawings not to scale

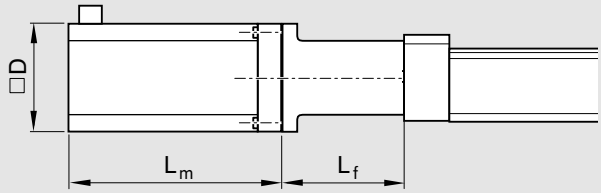




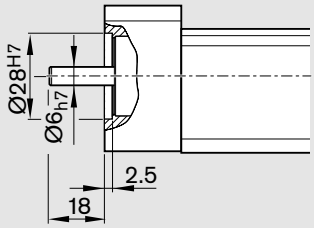
Version OA01



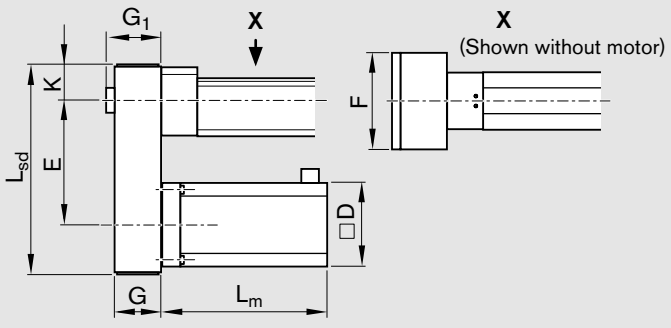
Version MF01

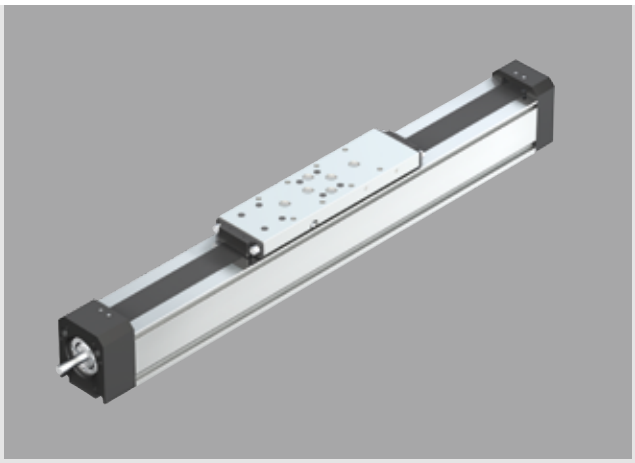


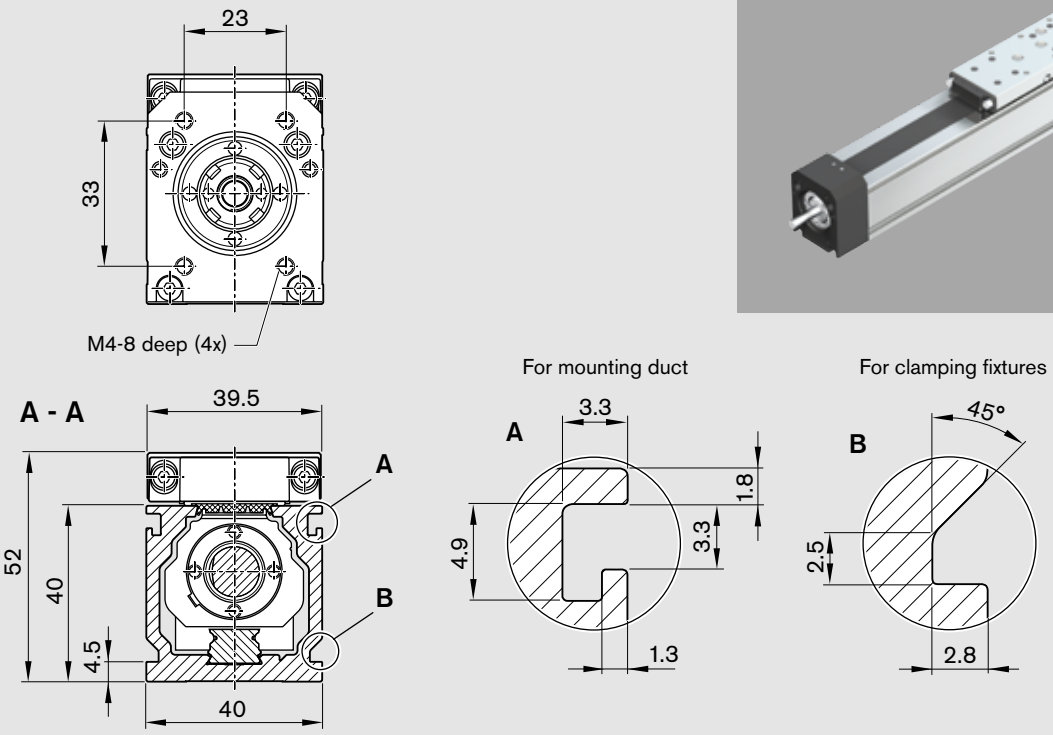
Version OF01



Version RV01 - RV04







Version	Motor	Dimensions (mm)										
		D	E		F	G	G_1	K	L_f	L_m		L_{sd}
			i = 1	i = 1.5						without brake	with brake	
RV01 - RV04	MSM 030B	60	78	75	64.5	37	43.5	33.5	–	111	144	157
	MSK 030C	54	78	75	64.5	37	43.5	33.5	–	188	213	154
MF01	MSM 020B	42	–	–	–	–	–	–	44	109	140	–
	MSM 030B	60	–	–	–	–	–	–	50	111	144	–
	MSK 030C	54	–	–	–	–	–	–	50	188	213	–
	VRDM 368	57.2	–	–	–	–	–	–	50	116	157	–

Linear Module MKR 12-40

Product Description

Outstanding features

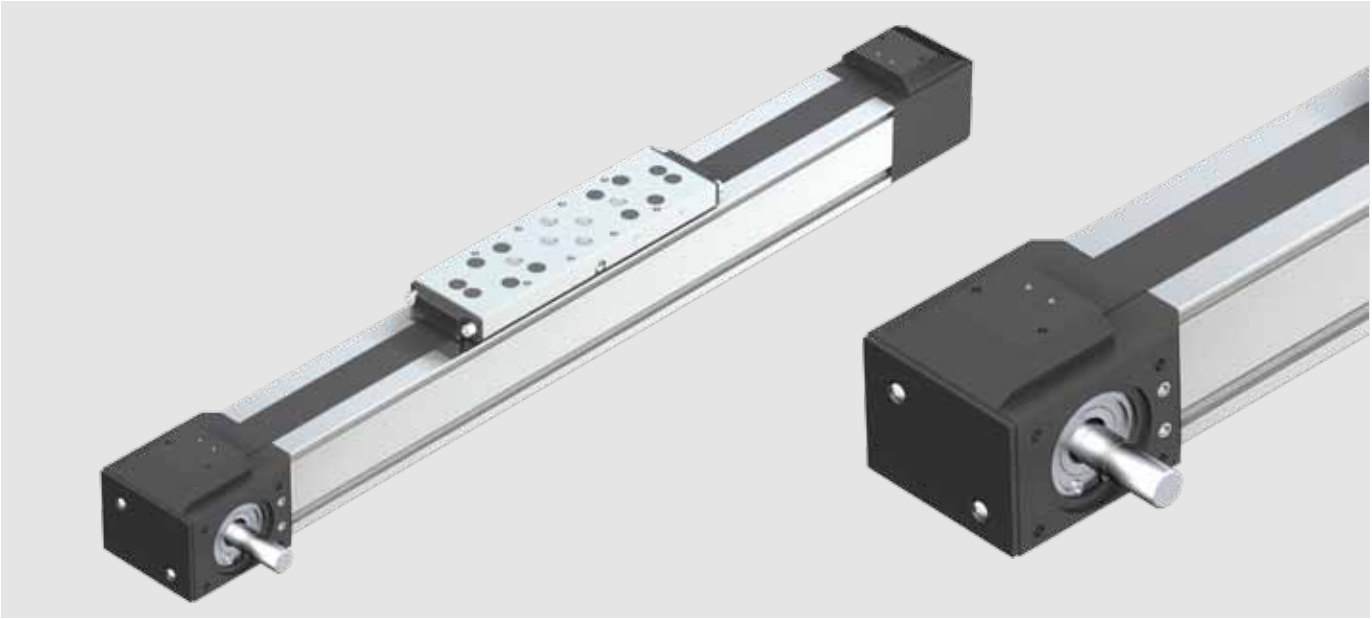
Rexroth Miniature Linear Modules are precise, ready-to-install linear motion systems that combine high performance with compact dimensions.
They are especially suitable for handling tasks requiring high precision within restricted spaces. Rexroth offers favorable price/performance ratios and fast delivery.

Structural design
- Extremely compact extruded aluminum profile (frame) with integrated Rexroth Ball Rail System
- With toothed belt drive
- Special protective plastic sealing strip
- Ready-to-install linear modules in any length up to L_{max}

Attachments
- Maintenance-free digital AC servo drives with integrated brake and attached feedback, or 3-phase stepping motors
- Motor attachment via side gear reducer
- Proximity switches or magnetic field sensors with various mounting options
- Available as complete drive units with drive controller and control unitStandardized mounting interfaces

Further highlights

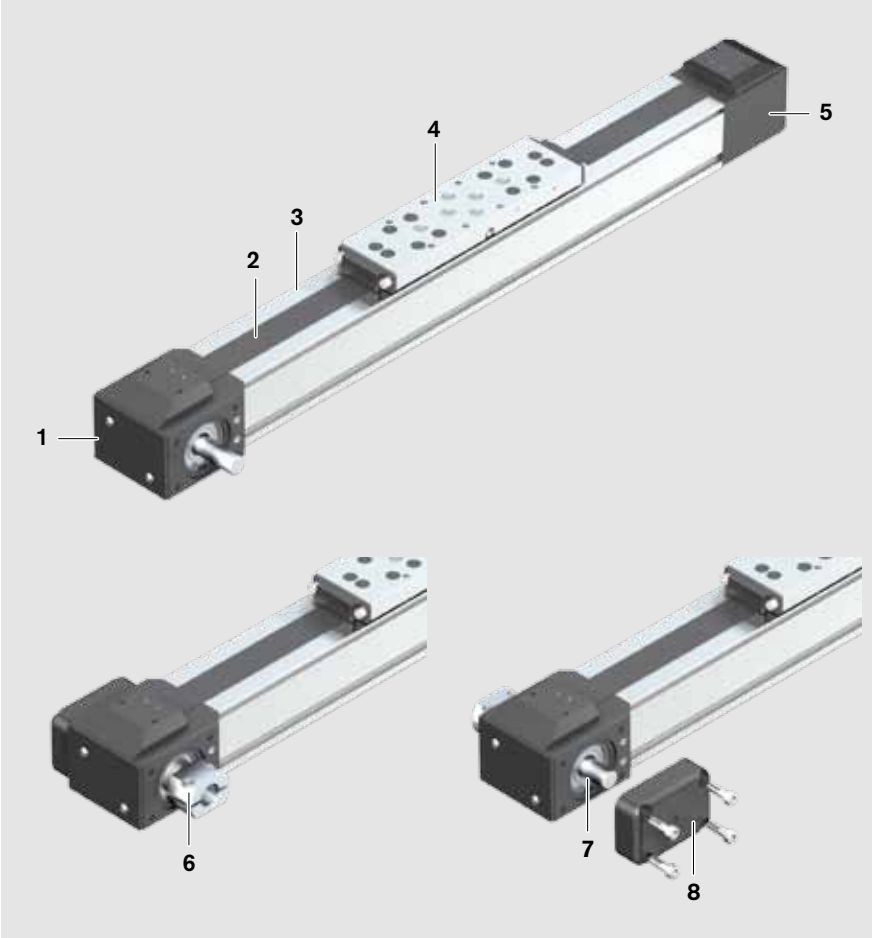
- Optimal travel performance due to integrated, zero-clearance Ball Rail System
- High load capacities and high rigidity
- High travel speeds combined with high precision and smooth running over long travel ranges
- Low-cost maintenance provided by one-point lubrication (grease)
- Easy motor attachment via locating feature and fastening threads
- Switches adjustable over the entire travel range
- Fully compatible with the camoLINE system
- Positive-locking connection technology with centering rings
- Same outside dimensions mean that accessories and attachments can be used on either the MKK or the MKR
- Mounting in any orientation



MKR with side drive journal

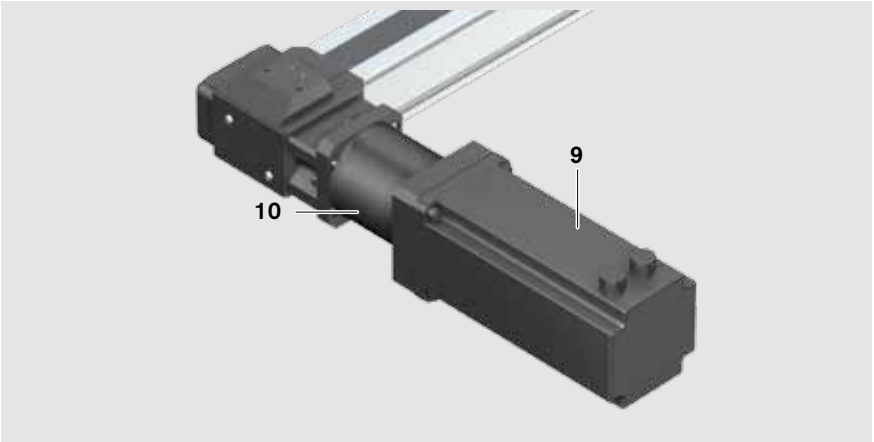
Structural Design

1 Drive end enclosure
2 Sealing strip (with toothed belt underneath)
3 Frame
4 Carriage
5 Idler (non-drive) end enclosure
6 Version with hollow shaft
7 Hollow shaft with second shaft end
8 Cover of second shaft end



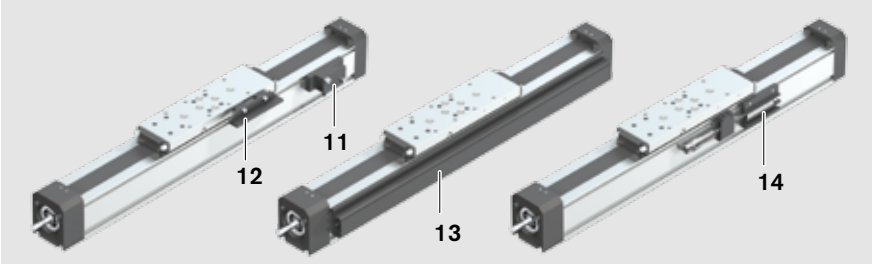
Motor attachment

9 Motor
10 Gear reducer



Switch Mounting Arrangements

11 Proximity switch
12 Switching cam
13 Cable duct
14 Magnetic field sensor



Linear Module MKR 12-40

Technical Data

Dynamic characteristics and general technical data

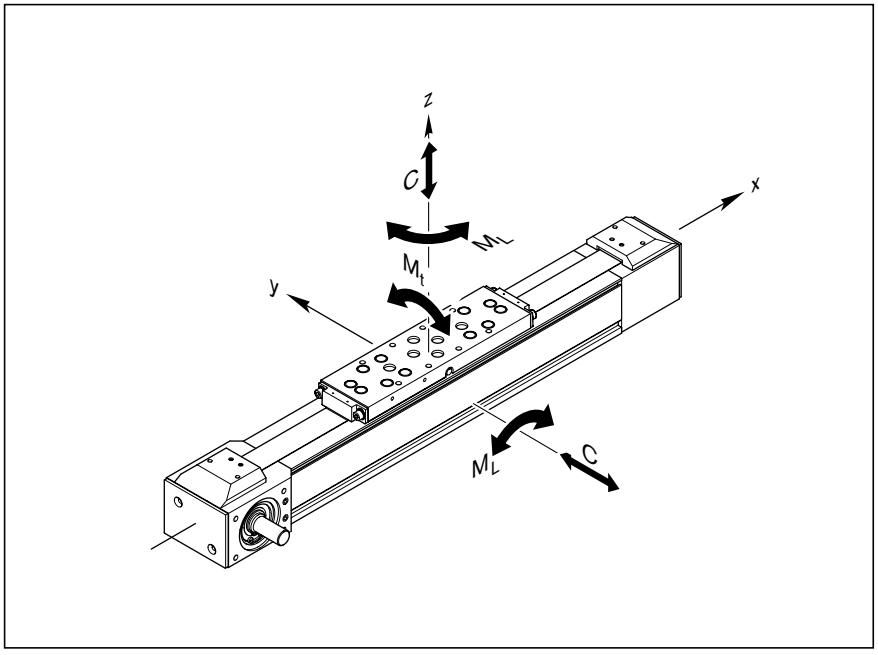
Linear module	Guideway			Planar moment of inertia		Length of carriage	Length of linear module L		Moved mass of system
	Dyn. load capacity	Dyn. load moments							
	C	M_t	M_L	I_y	I_z		min.	max.	m_{ca}
	(N)	(Nm)	(Nm)	(cm^4)	(cm^4)	(mm)	(mm)	(mm)	(kg)
MKR 12-40	3750	22.3	129.5	10.53	14.61	135	250	2500	0.29

Modulus of elasticity E

$E = 70{,}000\ N/mm^2$

Suitable loads (recommended values on the basis of past experience)

As far as the desired service life is concerned, loads of up to approximately 20% of the dynamic characteristic values (**C, M_t, M_L**) have proved acceptable.
At the same time, the following may not be exceeded:
- maximum permissible loads
- permissible drive torque
- permissible travel speed



Note on dynamic load capacities and moments

Determination of the dynamic load capacities and 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.

Load on bearing and life expectancy of the guideway

For the calculation of the combined equivalent load on bearing and the life expectancy of the guideway ☞🗎 9.

Drive data

Gear ratio			i = 1	i = 5	i = 10
Maximum drive torque for mechanical system	M_{mech}	(Nm)	3.9	0.78	0.39
Drive unit diameter	d_3	(mm)	28.65	28.65	28.65
Lead constant		(mm/U)	90	18	9
Maximum travel speed for mechanical system	v_{mech}	(m/s)	3.0	2.4	1.2
Frictional torque at motor journal	M_R	(Nm)	0.46	0.14	0.10
Mass moment of inertia of linear system	J_s	(10^{-6} kgm^2)	0.0181 · L (mm) + 67.84	(0.0181 · L (mm) + 72.37)/i^2 + 5.50	
Mass of linear system	m_s	(kg)	0.0027 · L (mm) + 0.81	0.0027 · L (mm) + 1.72	
Characteristic data of toothed belt					
Belt type			20 AT 3		
Max. belt drive transmission force		(N)	250		
Belt elasticity limit		(N)	760		
Specific spring rate		(N/mm · m)	200 000		

Performance values for horizontal operation

⚠ **The tables contain performance data examples for different gearbox-motor-controller combinations. They are intended to serve as a guide for selection; exact values must be calculated based on individual cases.**

With servo motor MSM 030B and ECODRIVE Cs controller[1)]
Connection voltage: 3 x 400 V

Gear reducer ratio	i		5					10						
Moved external load	m_{ex}	(kg)	1	2	3	4	5	2	4	6	8	10	12	14
Acceleration time	t_a	(ms)	22	28	34	40	46	38	45	51	58	65	71	78
Acceleration travel	s_a	(mm)	10	13	15	18	21	9	10	12	13	15	16	18
Acceleration	a	(m/s^2)	40.5	32.0	26.4	22.5	19.6	11.8	10.1	8.8	7.8	7.0	6.3	5.8
Travel speed	v_{dc}	(m/s)	0.90					0.45						
Repeatability ±		(mm)	0.1					0.1						

With servo motor MSM 030C and ECODRIVE Cs controller[1)]
Connection voltage: 3 x 400 V

Gear reducer ratio	i		5					10							
Moved external load	m_{ex}	(kg)	2	4	6	8	10	2	4	6	8	10	12	14	16
Acceleration time	t_a	(ms)	33	45	57	69	81	49	56	63	69	76	83	89	96
Acceleration travel	s_a	(mm)	15	20	26	31	36	11	13	14	16	17	19	20	22
Acceleration	a	(m/s^2)	27.1	20.0	15.8	13.1	11.1	9.1	8.0	7.2	6.5	5.9	5.5	5.0	4.7
Travel speed	v_{dc}	(m/s)	0.90					0.45							
Repeatability ±		(mm)	0.1					0.1							

With servo motor MSK 030C and IndraDrive servo controller[1)]
Connection voltage: 3 x 400 V

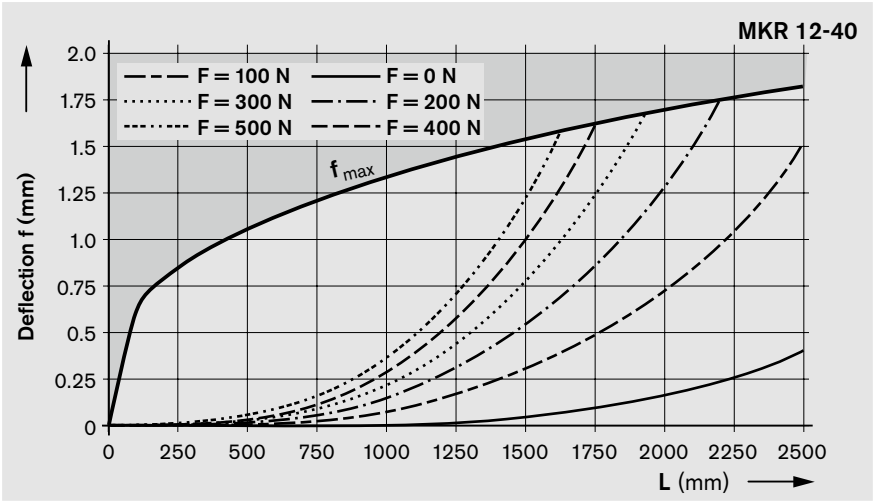
Gear reducer ratio	i		5						10							
Moved external load	m_{ex}	(kg)	2	4	6	8	10	12	2	4	6	8	10	12	14	16
Acceleration time	t_a	(ms)	121	153	185	216	248	280	205	223	240	258	276	293	311	329
Acceleration travel	s_a	(mm)	146	184	222	260	298	336	123	134	144	155	165	176	187	197
Acceleration	a	(m/s^2)	19.8	15.7	13.0	11.1	9.7	8.6	5.9	5.4	5.0	4.7	4.4	4.1	3.9	3.7
Travel speed	v_{dc}	(m/s)	2.4						1.2							
Repeatability ±		(mm)	0.1						0.1							

1) For more information on motors, controllers and control systems, please refer to the catalogs “ECODRIVE Cs” and “IndraDrive for Linear Motion Systems.” These figures do not take the effective torque of the motor-controller combination into account.

Deflection f

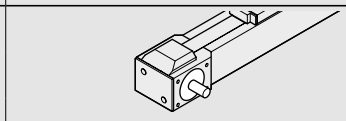
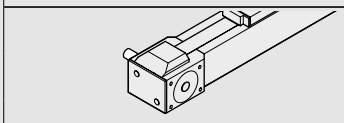
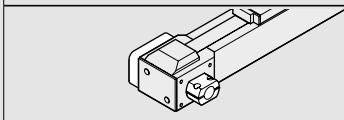
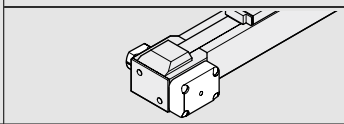
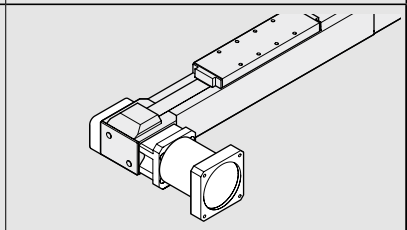
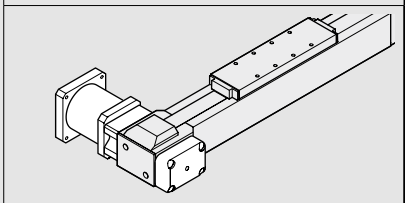
The chart applies under the following conditions:
– Both ends firmly fixed (6 to 8 screws per side)
– Solid mounting base
The maximum permissible deflection f_{max} depends on the length L and the load F.

⚠ **f_{max} must not be exceeded!**



Linear Module MKR 12-40

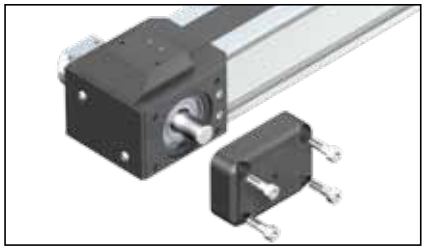
Linear Module MKR 12-40 Components and Ordering Data

Part number, length R1140 660 00, ... mm Version[1]			Guideway	Drive unit Screw journal		Carriage L_{ca} = 135 mm	
With drive (MA)		**MA01**	01	Journal at right	01	01	
		**MA02**	01	Journal at left	02		
		**MA05**	01	Hollow shaft at right Journal at left	03		
		**MA06**	01	Hollow shaft at left Journal at right	04		
With gear reducer (MG)		**MG10**	01	Gear reducer at right Journal at left	11		
		**MG11**	01	Gear reducer at left Journal at right	12		

1) Without drive: see MKK12-40 ☞ 10-11

L_{ca} = carriage length

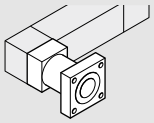
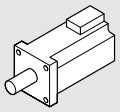
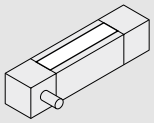
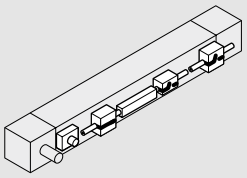
Ordering example: See “Inquiry/Order” form



⚠ **Please check whether the selected combination is a permissible one (load capacities, moments, maximum speeds, motor data, etc.)!**

Screw journal

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

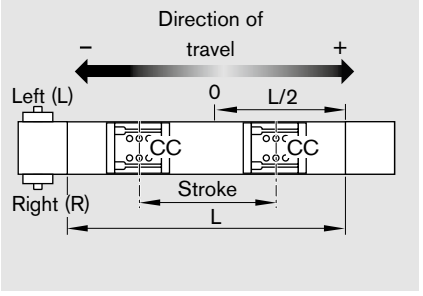
Motor attachment			Motor		Cover		Switches / Cable duct / Socket-plug	Documentation	
									
Reduction i =	Attachment kit [2] with gear reducer	for motor	without brake	with	without sealing strip	with		Standard report	Measurement report
–	00	–	00		00	01	**Without switches** 00	01	02 Friction moment 05 Positioning accuracy
–	00	–	00				**Proximity switch** **PNP NC** 36-.±.... **Switching cam** 18 **PNP NO** 38-.±.... **Cable duct** 25 Switch type / Mounting side (R/L) / Direction of travel / Switching distance **Socket/plug** 27		
–	00	–	00						
–	00	–	00				**Magnetic field sensor with cable** **Reed sensor** 51 **Cable duct** 25 **Hall sensor PNP NC** 52 **Socket/plug** 27		
i = 5	13	**MSM 030B**	70	71			**Magnetic field sensor with connector** **Reed sensor** 58 **Hall sensor PNP NC** 59		
i = 10	14								
i = 5	15	**MSM 030C**	72	73					
i = 10	16								
i = 5	11	**MSK 030**	84	85					
i = 10	12								

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

Length of Linear Module MKR 12-40:

L = stroke + 2 · excess travel + 145 mm

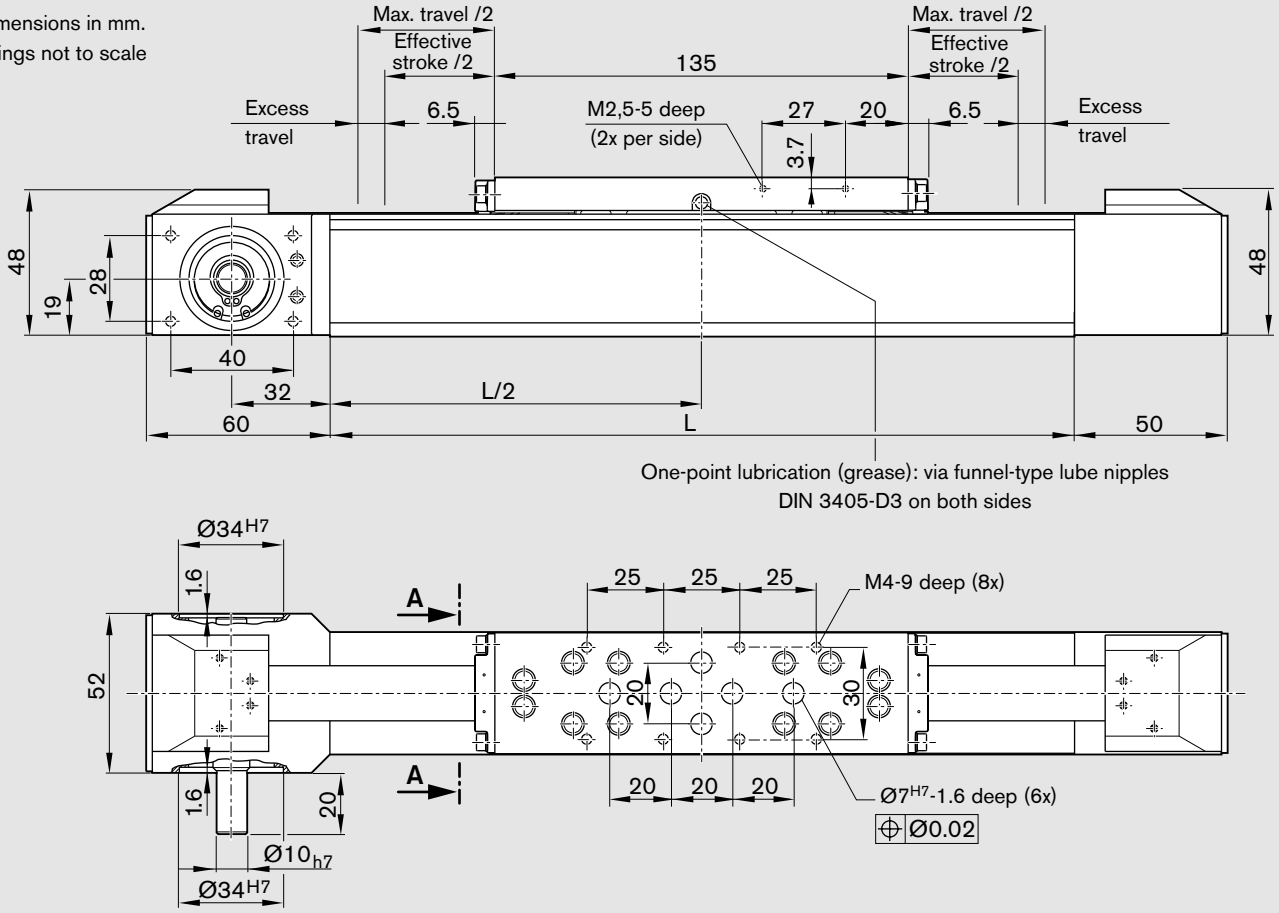
Stroke = maximum travel of carriage center (CC) between the outermost switch activation points
For safe operation, the excess travel must be longer than the braking distance.
The acceleration travel can be taken as a guideline value for the braking distance.



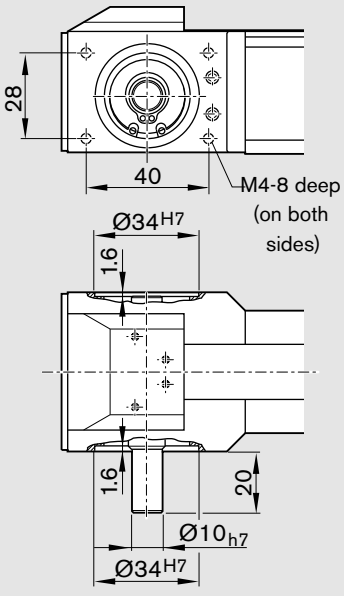
Linear Module MKR 12-40

Linear Module MKR 12-40 Dimensions

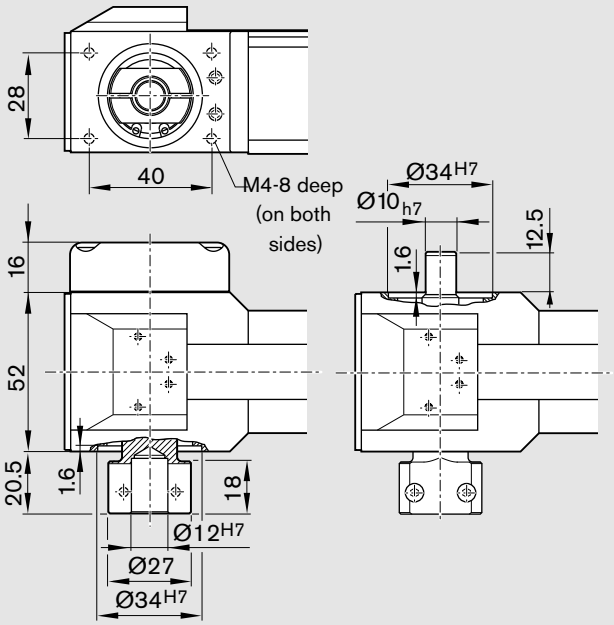
All dimensions in mm.
Drawings not to scale



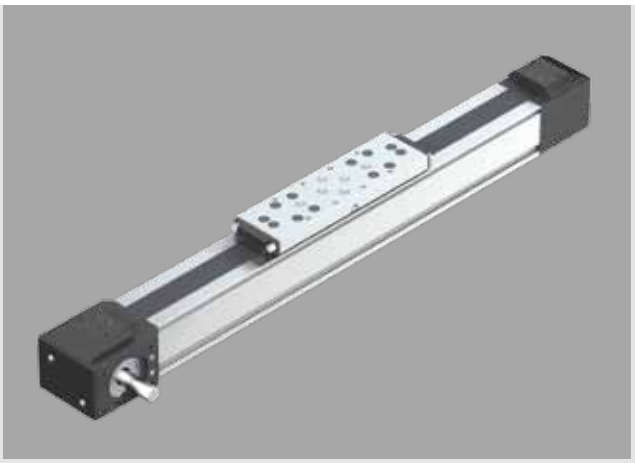
Version MA01, MA02

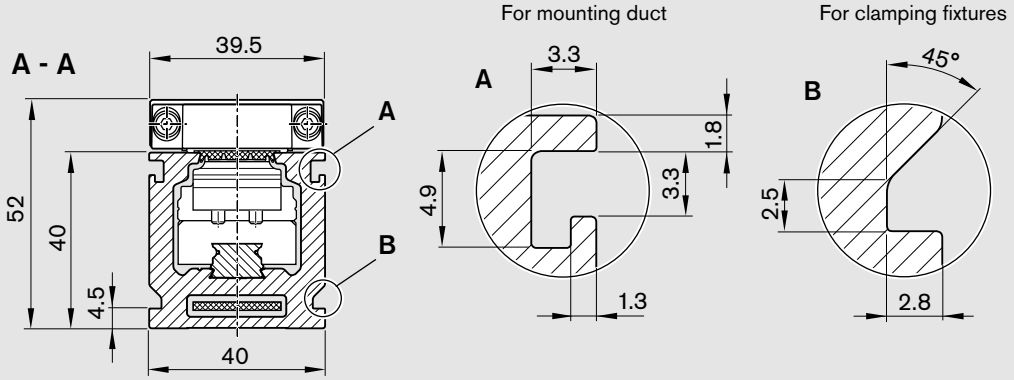


Version MA05, MA06

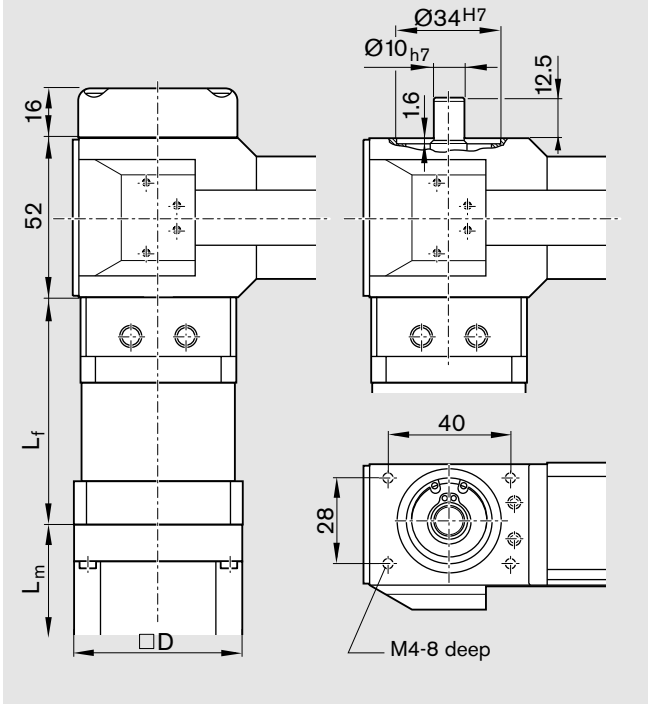


A second shaft end can be accessed by removing the cover.





Version MG10, MG11



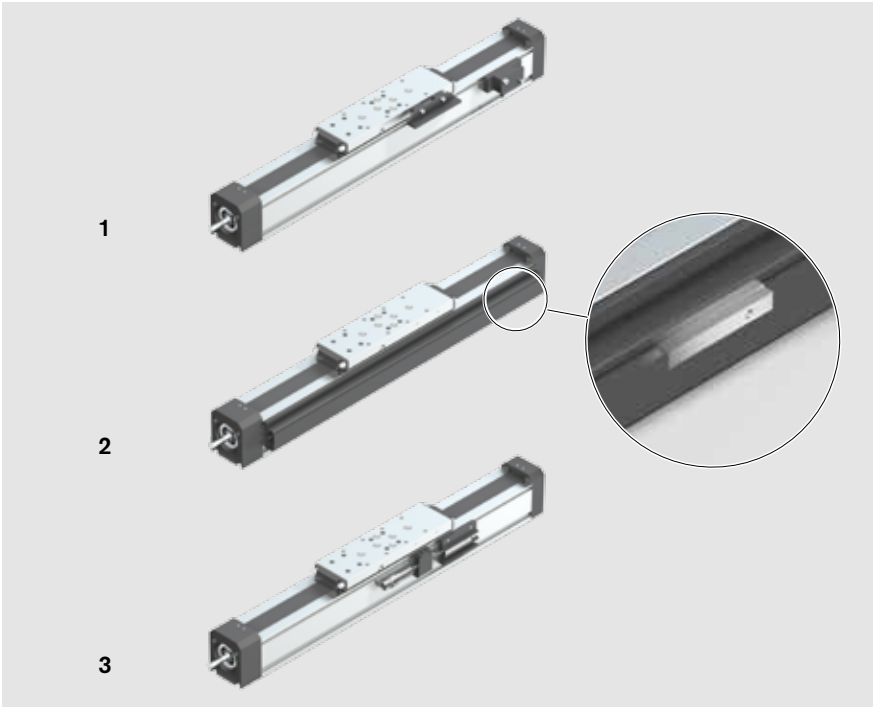
Version	Motor	Dimensions (mm)			
		D	L_f	L_m without brake	L_m with brake
MG10, MG11	MSM 030B	60	101	111	144
	MSM 030C	60	111	138.5	171.5
	MSK 030C	54	91	188	213

Switch Mounting Arrangements

Overview

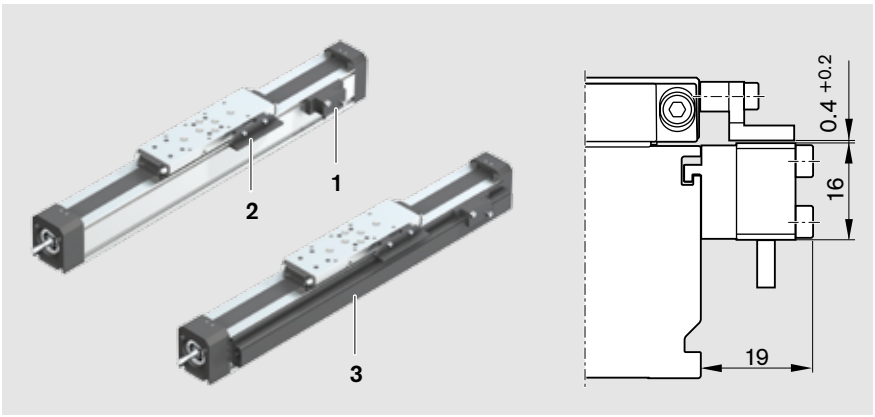
The following switch versions can be used with Linear Modules MKK 12-40 and MKR 12-40:

1 Proximity switch
2 Magnetic field sensor with mounting duct
3 Magnetic field sensor with connector and sensor mount



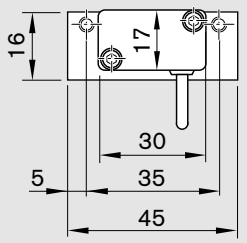
Switch mounting arrangements for proximity switches

1 Proximity switch
2 Switching cam
3 Cable duct



Proximity switches with potted cable (3 x 0.14 mm² Unitronic) Technical Data	
Housing form	NO
Minisensor	Form A DIN 41635
Operating voltage	10 ... 30 V DC
Residual ripple	≤ 10 %
Load	200 mA
No-load current	≤ 20 mA
Switching frequency	max. 1500 Hz
Temperature-related shift in make point	≤ 4 µm/K
Output signal steepness	≥ 1V/µs
Repeatability of make point per EN 50008	≤ 0.1 mm
Cable length	3 m (10 m on request)

Proximity switch (with mount)



Switch mounting arrangements for magnetic field sensors with mounting duct

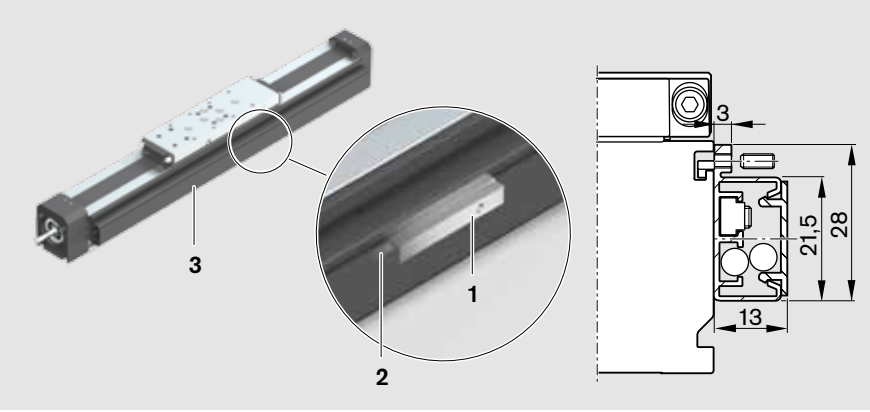
1 Switch (magnetic field sensor) with potted cable
2 Cable
3 Mounting duct

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

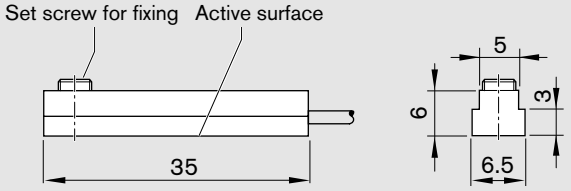
Version
– Hall sensor (PNP-NC) or
– Reed sensor (changeover)

For technical data, see “Magnetic field sensor” on the next page.

Notes for mounting
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.
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 details regarding mounting and switching positions, see mounting instructions for Linear Modules.



Magnetic field sensor with potted cable

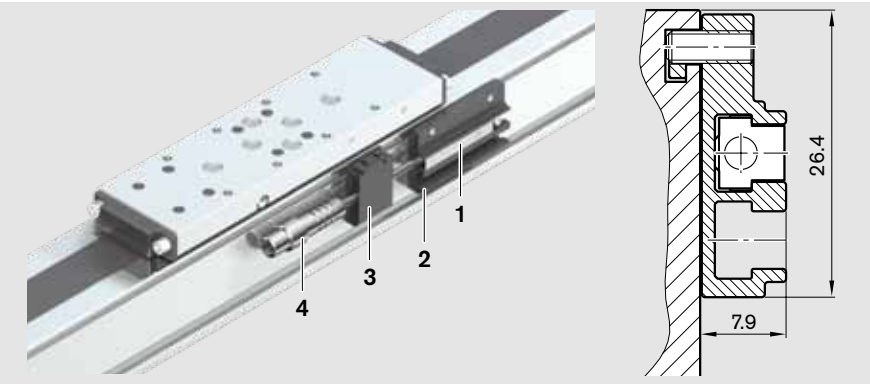


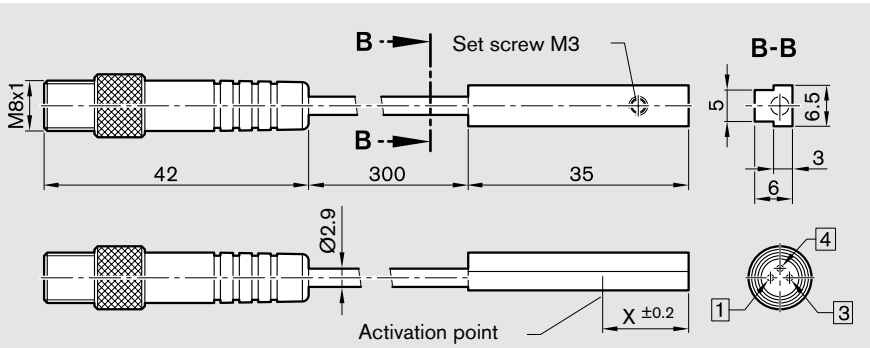
Switch mounting arrangements for magnetic field sensor with connector and sensor mount

Sensor mounting kit
1 Sensor (Hall or Reed)
2 Sensor mount incl. set screws (loose) and square nut
3 Cable holder (3 pcs) incl. set screw (loose)
4 Plug

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

Notes for mounting
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 details regarding mounting and switching positions, see mounting instructions for Linear Modules.





Dimension X: Hall sensor = 13.65 mm, Reed sensor = 9 mm

Switch Mounting Arrangements

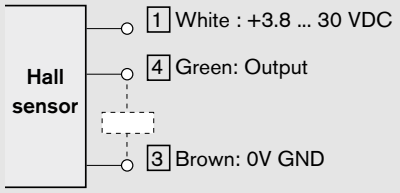
Magnetic field sensor

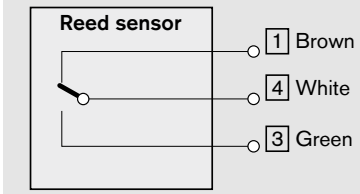
Technical Data

Hall sensor	
Contact type	PNP NC
Operating voltage	3.8–30 V DC
Current consumption	max. 10 mA
Output current	max. 20 mA
Cable length	2 m (10 m on req.)
Protection class	IP 66
Short-circuit protection	No
Max. travel speed	2 m/s
Part number	R3476 024 03

Reed sensor	
Contact type	changeover
Switching voltage	max. 100 V DC
Switching current	max. 0.5 mA
Cable length	2 m (10 m on req.)
Protection class	IP 66
Max. travel speed	2 m/s
Switching points	2
Part number	R3476 023 03

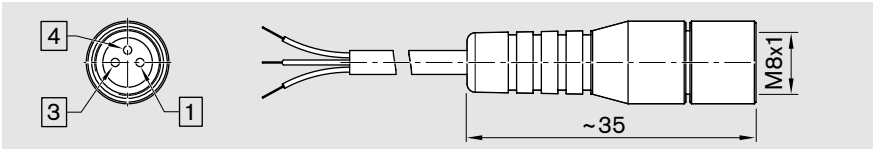
Pin assignment





Extension cable for sensor (Hall / Reed) with connector

The extension cable (approx. 5 m) is supplied complete with a female connector M8x1 for connection to the sensor.



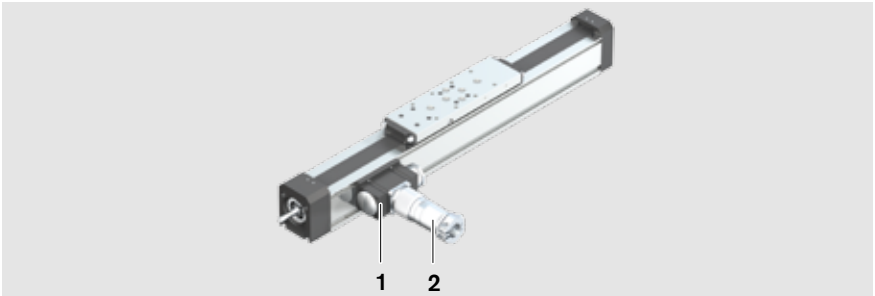
Extension cable					
Part number	Connector contact	1	3	4	Protection class
R3476 025 03	to core	brown	blue	black	IP 66 when connected

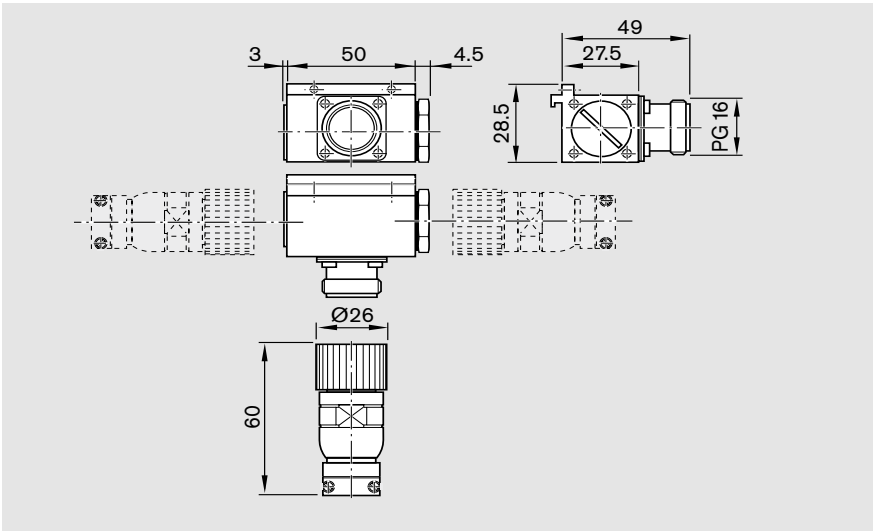
Socket/plug

1 Socket
2 Plug

Notes
The socket and plug have 16 pins
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.



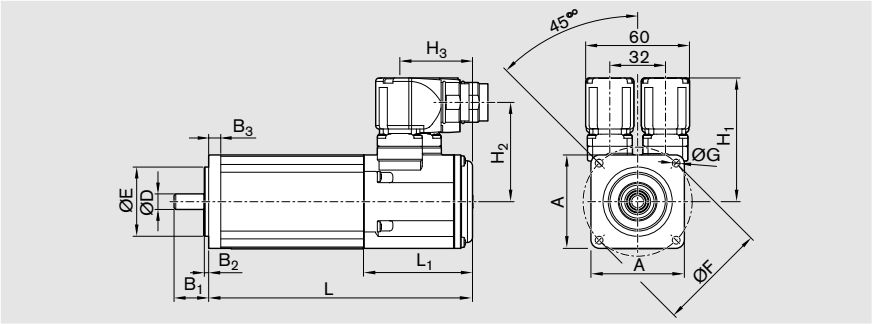


Motors

AC Servo Motors MSK

Notes

All MSK motors have an absolute multiturn encoder. The motors can be supplied complete with controller and control unit. For more information on motors, controllers and control systems, please refer to the catalogs “ECODRIVE Cs” and “IndraDrive for Linear Motion Systems.”



Dimensions and motor data

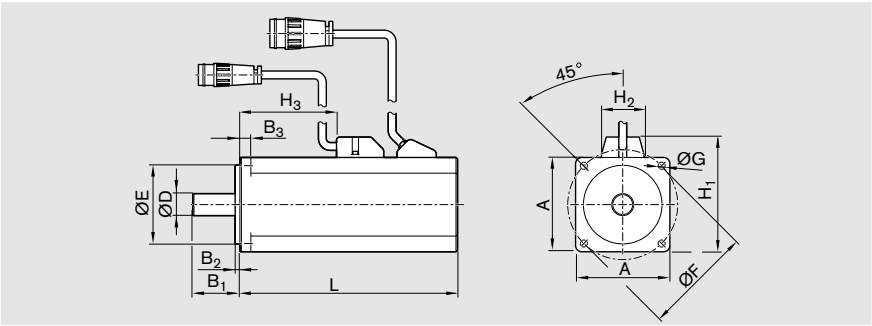
	Dimensions (mm)													
	A	B_1	B_2	B_3	ØD k6	ØE j6	ØF	ØG	H_1	H_2	H_3	L w/o brake	L with brake	L_1
MSK 030C	54	20	2.5	7	9	40	63	4.5	71.5	57.4	42	188	213	–

Motor		Unit	MSK030C-0900
Maximum rotary speed	n_{max}	(min^{-1})	9000
Maximum permissible torque	M_{max}	(Nm)	4
Rated torque	M_N	(Nm)	0.8
Motor mass moment of inertia	J_m	(10^{-6} kgm^2)	30
Mass without brake	m_m	(kg)	2.1
Holding brake			
Holding torque	M_{br}	(Nm)	1.0
Brake mass moment of inertia	J_{br}	(10^{-6} kgm^2)	7
Mass of brake	m_{br}	(kg)	0.25

AC Servo Motors MSM

Notes

All MSM motors have an absolute multiturn encoder. The motors can be supplied complete with controller and control unit. For more information on motors, controllers and control systems, please refer to the catalogs “ECODRIVE Cs” and “IndraDrive for Linear Motion Systems.”



Dimensions and motor data

Motor	Dimensions (mm)												
	A	B_1	B_2	B_3	ØD h6	ØE h7	ØF	ØG	H_1	H_2	H_3	L w/o brake	L with brake
MSM 020B	42	24	2	7	8	22	48	3.4	55	27	38.8	109.0	140.0
MSM 030B	60	30	3	7	11	50	70	4.5	73	27	34.0	111.0	144.0
MSM 030C	60	30	3	7	14	50	70	4.5	73	27	61.5	138.5	171.5

Motor		Unit	MSM 020B	MSM 030B with absolute encoder	MSM 030C with absolute encoder
Maximum rotary speed	n_{max}	(min^{-1})	3000	3000	3000
Maximum permissible torque	M_{max}	(Nm)	0.95	1.91	3.80
Rated torque	M_N	(Nm)	0.32	0.64	1.20
Motor mass moment of inertia	J_m	(10^{-6} kgm^2)	3.20	10.00	17.00
Mass without brake	m_m	(kg)	0.50	0.96	1.50
Holding brake					
Holding torque	M_{br}	(Nm)	0.29	1.27	1.27
Brake mass moment of inertia	J_{br}	(10^{-6} kgm^2)	0.40	3.00	3.00
Mass of brake	m_{br}	(kg)	0.20	0.40	0.40

Motors

3-phase Stepping Motors VRDM

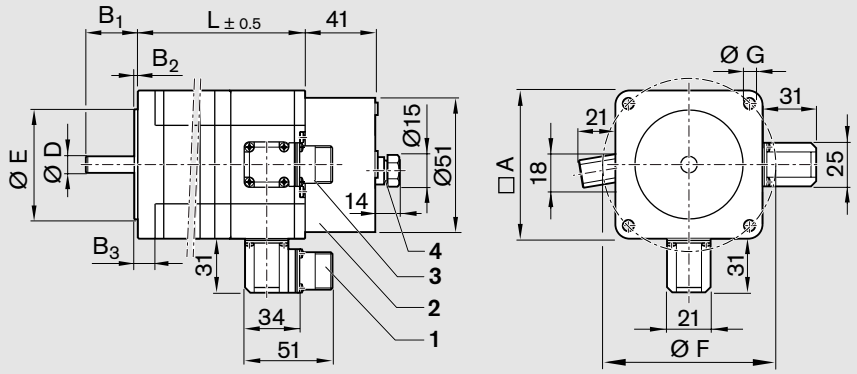
Notes

All VRDM motors are equipped with an encoder for rotation monitoring.
The motors can be supplied complete with controller and control unit. For more information on motors, controllers and control systems, please refer to the catalogs “ECODRIVE Cs” and “IndraDrive for Linear Motion Systems.”

Key to illustration

1 Motor connector
2 Brake
3 Encoder connector
4 Brake connector

VRDM 368



Dimensions

Motor	Dimensions (mm)									
	A	B_1	B_2	B_3	ØD	ØE	ØF	ØG	L without brake	L with brake
VRDM 368	57.2	21	1.6	5	8 $_{-0.013}$	38.1 $_{\pm 0.025}$	66.7	5.2	116.0	157.0

Motor data

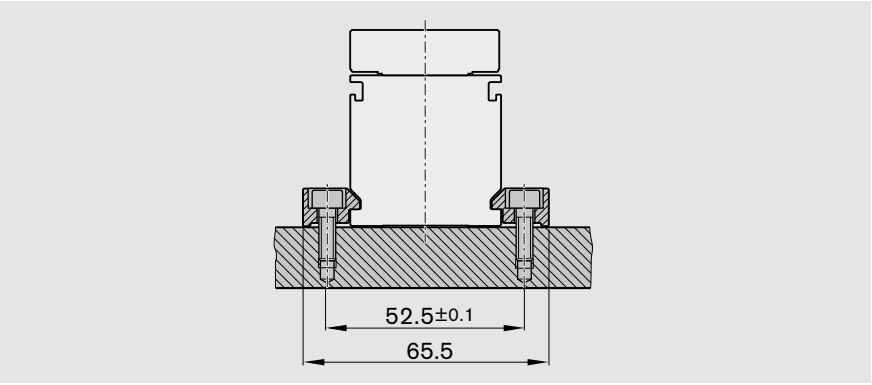
Motor		Unit	VRDM 368
Maximum permissible torque	M_{max}	(Nm)	1.50
Motor mass moment of inertia	J_m	(10^{-6} kgm^2)	38
Motor holding torque	M_m	(Nm)	1.74
Mass without brake	m_m	(kg)	1.1
Step count	z	(–)	200 / 400 / 500 / 1000 / 2000 / 4000 / 5000 / 10000
Stepping angle per step	α	(°)	1.8 / 0.9 / 0.72 / 0.36 / 0.18 / 0.09 / 0.072 / 0.036
Encoder resolution			1000 increments/revolution
Holding brake			
Brake holding torque	M_{br}	(Nm)	1
Brake mass moment of inertia	J_{br}	(10^{-6} kgm^2)	1.6
Mass of brake	m_{br}	(kg)	0.5

Mounting

General notes

Clamping fixtures
The modules are mounted using clamping fixtures which engage in the T-slots on the side of the frame.

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

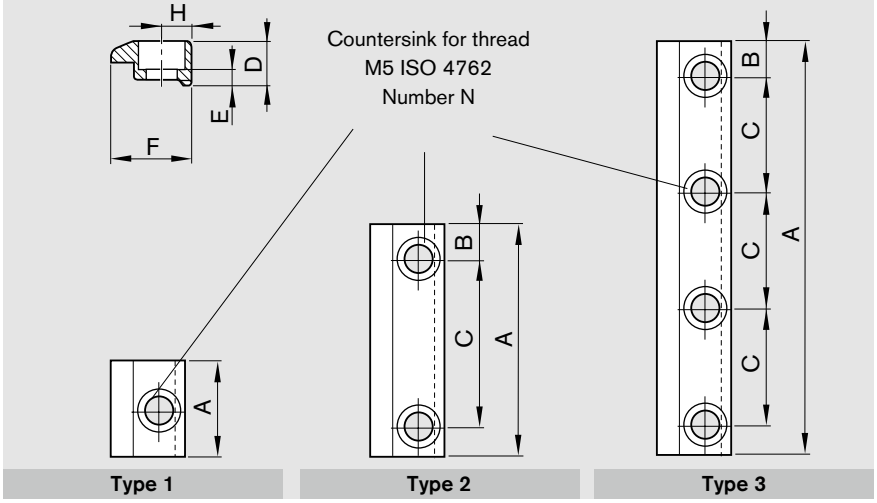


Clamping fixtures

Recommended number of clamping fixtures:
- Type 1: 6 pieces per side
- Type 2: 4 pieces per side
- Type 3: 3 pieces per side

Tightening torque

		M5
8.8	(Nm) max.	5.5

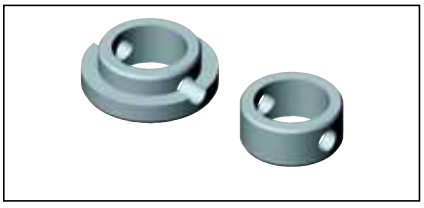


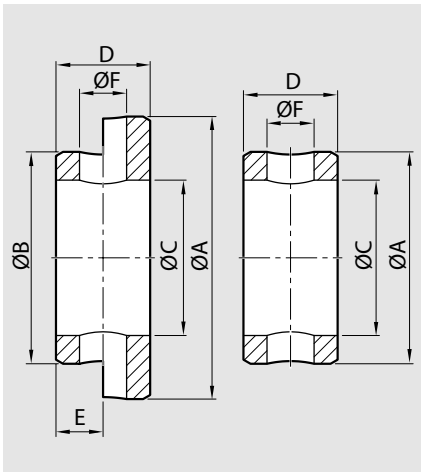
Module	for	Type	Number of holes N	Dimensions (mm) A	B	C	D	E	F	H	Part number
MKK 12-40	M5	1	1	22	–	–	10	4.8	15	6.5	R1419 010 01
MKR 12-40		2	2	57	8.5	40					R1419 010 43
		3	4	77	8.5	20					R1419 010 44

Centering rings

The centering ring serves as a positioning aid.
It creates a positive-locking connection with good reproducibility.

Material: steel (stainless)



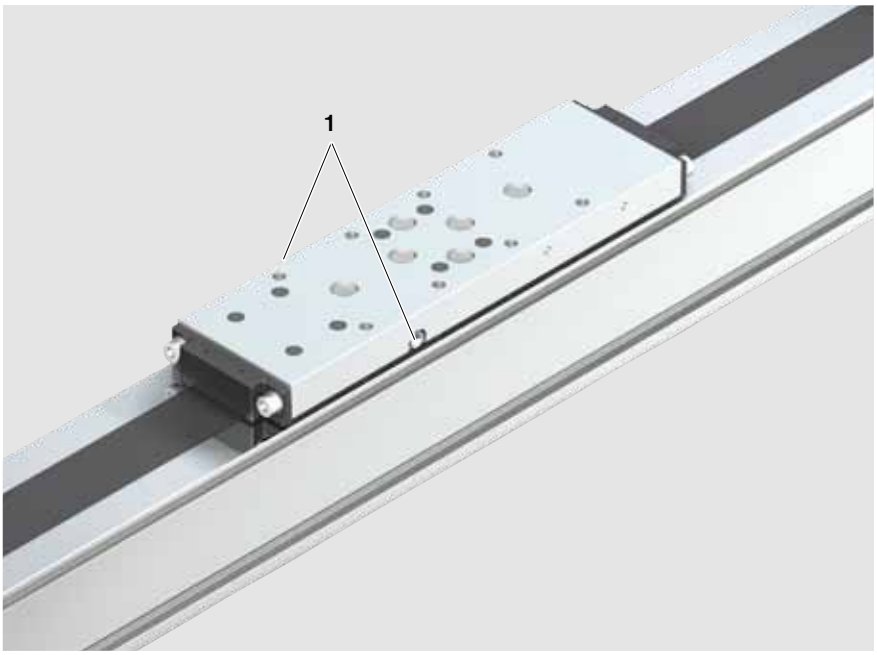


Module	Centering ring size	Part numbers	Dimensions (mm) A k6	B k6	C ±0.1	D -0.2	E +0.2	ØF
MKK 12-40	7	R0396 605 43	7	–	5.5	3	–	1.6
MKR 12-40	7-5	R0396 605 47	7	5	3.4	3	1.5	1.6
	9-7	R0396 605 49	9	7	5.5	3.5	1.5	1.6
	12-7	R0396 605 77	12	7	5.5	3.5	1.5	1.6

Lubrication

Lubrication notes
Basic lubrication is applied in-factory before shipment.
Linear Modules have been designed for lubrication with grease using a grease gun. The only maintenance required is re-lubrication of the guideway and the ball screw via the funnel-type lube nipples (1).

Lubrication points
1 Funnel-type lube nipple DIN 3405-D3 for the runner blocks and the ball screw (on both sides, either side can be used).



Recommended lubricants
For lubricant quantities and intervals, see “Mounting Instructions for Linear Modules”.

⚠ **Do not uses greases containing solid particles (e.g., graphite or MoS_2).**

For lubrication in short-stroke applications (< 50 mm), please consult us.

Frame size	Grease DIN 51825	Consistency class DIN 51818
40	KP00K	NLGI 00

Documentation

Standard report

Option no. 01

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

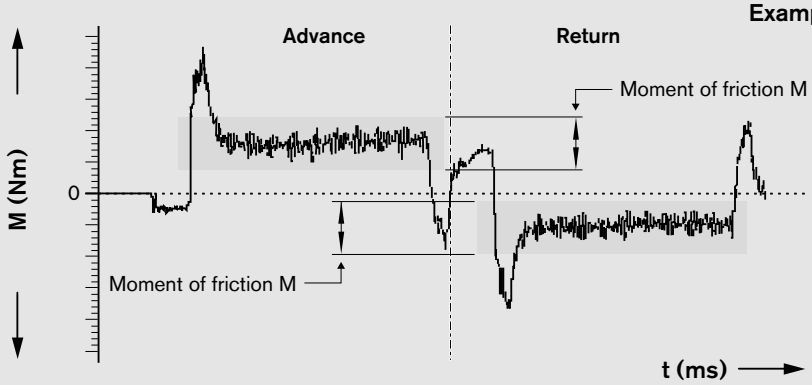
Frictional moment of complete system

Option no. 02

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

M = moment of friction (N)
t = travel time (ms)

Example



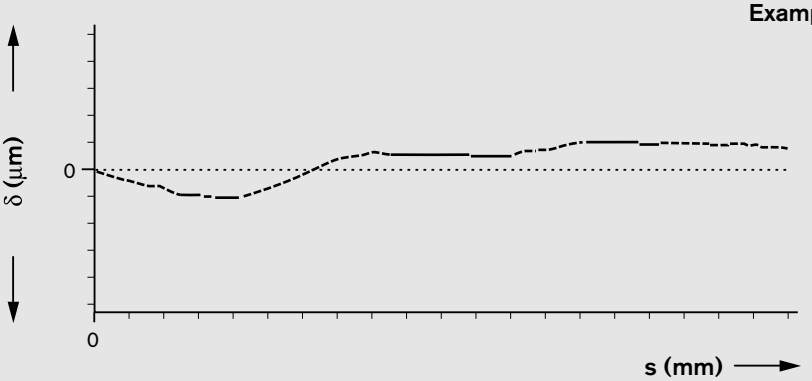
Lead deviation of ball screw

Option no. 03

A measurement report of the lead deviation δ over the measured travel s (see illustration) is provided in table form in addition to the graph.

δ = deviation (µm)
s = measured travel (mm)

Example



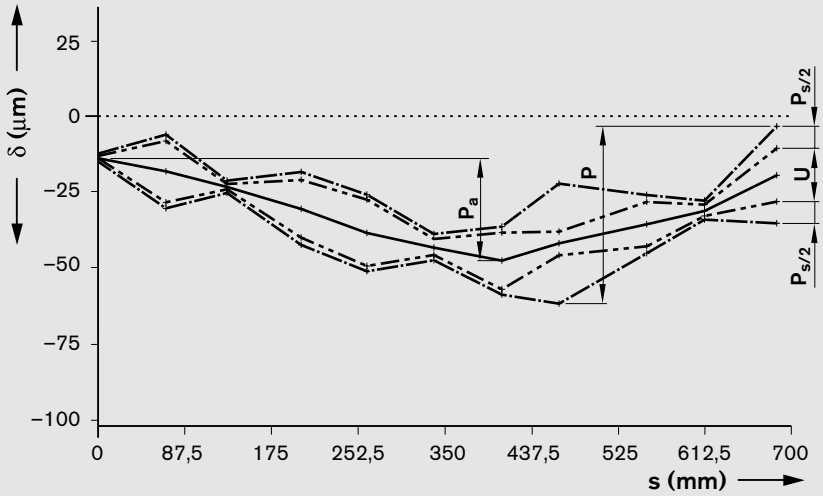
Documentation

Positioning accuracy per VDI/DGQ 3441

Option no. 05

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

Example



δ = deviation (µm)
s = measured travel (mm)

Positioning accuracy P

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

The positioning accuracy takes the following characteristic values into consideration:
- Position deviation
- Reversal range
- Position variation range

Position deviation P_a

The position 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.

Inquiry/Order Form

Bosch Rexroth Corporation
14001 South Lakes Drive
Charlotte, NC 28273

Phone: (704) 583-4338 / 800-438- 5983
Fax: (704)583-0523
www.boschrexroth-us.com

Rexroth – Miniature Linear Modules

Order example

Ordering Data		Description
Option	**Option code**	
Linear module	MKK 12-40	Miniature Linear Module with ball screw drive, length 755 mm
Part number, length	R1160 660 00, 755 mm	
Version	MF01	With motor mount and motor, as shown in diagram MF01
Guideway	01	Ball rail system
Drive unit	03	Ball screw, size d_0xP = 12x10
Carriage	01	Carriage
Motor attachment	03	With motor mount for motor MSM 030B
Motor	71	Motor MSM 030B with brake
Cover	01	With sealing strip
1st switch	36-L + 300	Proximity switch, PNP NC, switching position: left + 300 mm
2nd switch	38-L + 50	Proximity switch, PNP NO, switching position: left + 50 mm
3rd switch	36-L – 300	Proximity switch, PNP NC, switching position: left – 300 mm
Cable duct	25, 755	Cable duct, loose, length 755 mm
Socket/plug	27	Socket/plug on switch side
Switching cam	18	Switching cam for switch activation
Documentation	01	Measurement report: Standard report

To be completed by customer: Inquiry ☐ / Order ☐

Linear Module _____

Part number: R_____ _____ _____**, length** _____**mm**

Version = ☐☐☐☐
Guideway = ☐☐
Drive unit = ☐☐
Carriage = ☐☐
Motor attachment = ☐☐
Motor = ☐☐
1st switch = ☐☐ - ☐ + ☐☐☐☐ **mm**
2nd switch = ☐☐ - ☐ ± ☐☐☐☐ **mm**
3rd switch = ☐☐ - ☐ – ☐☐☐☐ **mm**
Cable duct = ☐☐ ☐☐☐☐ **mm**
Socket/plug = ☐☐
Switching cam = ☐☐
Documentation = ☐☐

Individual parts (e.g. accessories, connection elements):
Part number: **R**_____ _____ _____
R_____ _____ _____
R_____ _____ _____
R_____ _____ _____

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

From
Company: _____ **Name:** _____

Address: _____ **Department:** _____

_____ **Telephone:** _____

_____ **Telefax:** _____

Rexroth
Bosch Group

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Assembly Technologies
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