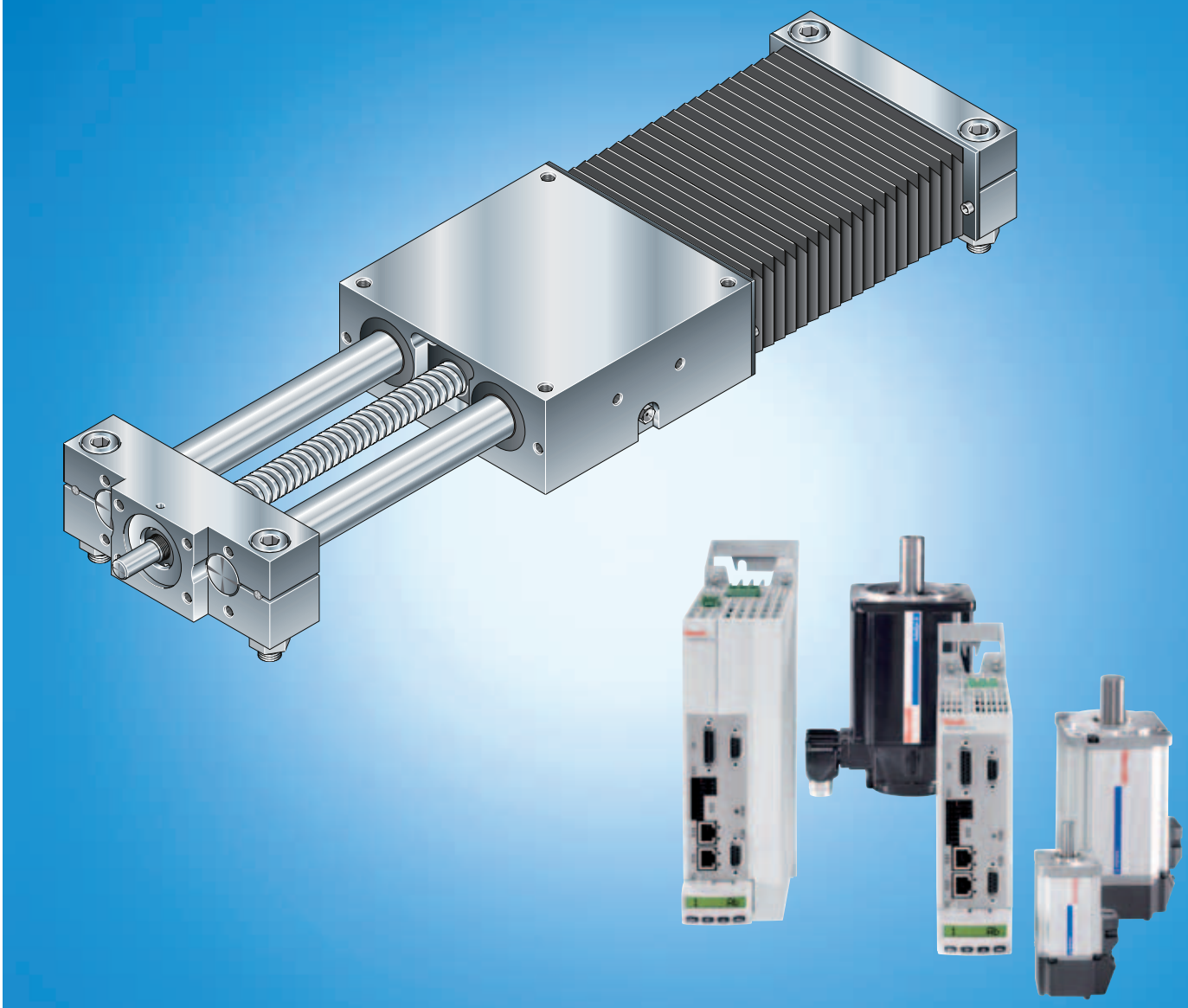
Rexroth
Bosch Group

Linear Motion Slides

R310EN 3001 (2012-06)

The Drive & Control Company



Rexroth
Bosch Group

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22 February 2013

Catalog Linear Motion Slides R310xx 3001 (2012-06)

Ladies and gentlemen,

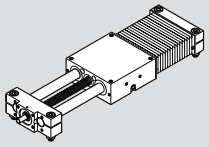
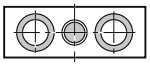
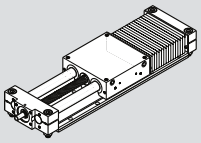
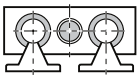
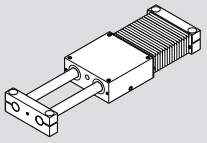
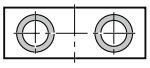
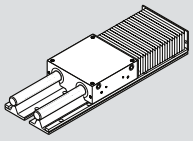
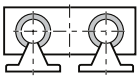
The current PDF version of the catalog differs from the printed catalog concerning the following items:

Page 14/15: m_s of size 30-180
Page 45: option motor attachment 03 (SOK 12-85/16-100)
Page 55: option carriage 01

Yours sincerely

Bosch Rexroth AG
Martin Hauk

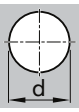
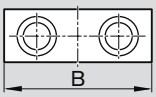
Rexroth Linear Motion Slides

Linear Motion Slide	Type	Construction form	Guide	Drive unit	Page
	SGK	Closed type for cantilever-type installation 	 Super Linear Bushing closed type	 Precision ball screw assembly	Page 36
	SOK	Open type for installation with shaft support rails 	 Super Linear Bushing open type		Page 44
	SGO	Closed type for cantilever-type installation 	 Super Linear Bushing [1] closed type	 Without drive unit	Page 54
	SOO	Open type for installation with shaft support rails 	 Super Linear Bushing open type		Page 58

1) Size 8-65 with Standard Linear Bushings

Identification system for short product names

Slide (example) =	Type			Size	
	S	G	K	16	-100

System	=	Linear Motion Slide (**S**)
Construction form	=	Closed type (**G**) Open type (**O**)
Drive unit	=	Precision ball screw assembly (**K**) Without drive unit (**O**)
Dimensions of guideway	=	
Overall width	=	

Rexroth Linear Motion Slides

General Product Description

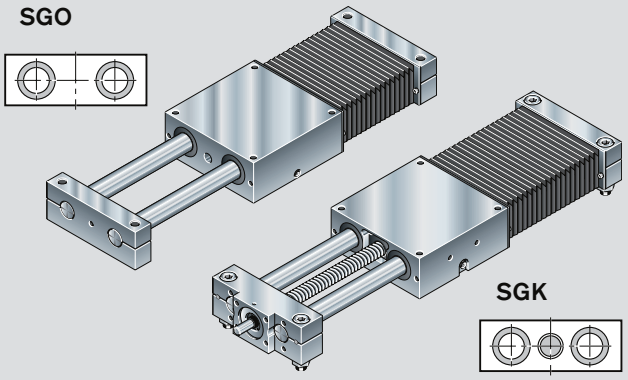
Product Description

Characteristic features

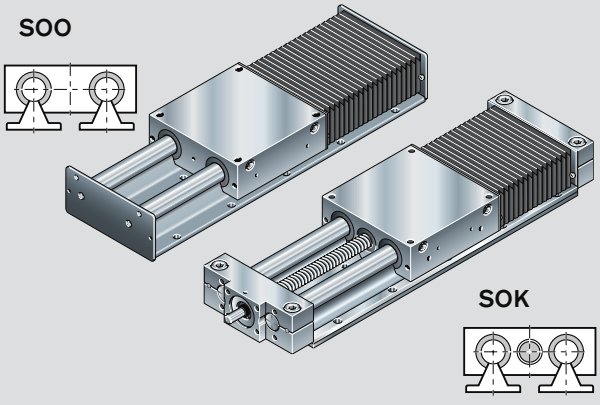
- Particularly smooth running and long service life thanks to Rexroth Super Linear Bushings
- Oil- and moisture-resistant PU bellows-type protective cover (the last fold is mechanically clamped)
- Ready-to-install Linear Motion Slides in any length up to L_{max}
- Integrated Rexroth Super Linear Bushings
- Version with drive unit includes Precision Ball Screw Assembly

Further highlights
- Greater flexibility due to options
- One-point lubrication ports for the Super Linear Bushings are provided on both sides of the carriage
- Ready for installation with different attachments

Closed-type construction form for cantilevered installation
High thrust forces
- Especially suited for environments with heavy contamination (closed bellows)



Open-type construction form for installation with shaft support rails
- Shaft support rails permit long travel distances
- High thrust forces
- With protective bellows



Note:
Bellows are installed on both sides of the carriage. The units are shown here with bellows on only one side of the carriage to better illustrate structural design and the function of the Linear Motion Slides.

General information

Delivery condition:

Linear motion slide with drive unit (closed and open construction form) SGK and SOK:
The Linear Motion Slides with ball screw drive are delivered fully assembled. Also assembled are the bellows, motor attachment and motor, if these options were included in the order. All further attachments, such as switches, switching cams, cable ducts, etc., are delivered as separate parts along with the slide. Linear Motion Slides with drive unit are delivered prelubricated with grease.

Linear Motion Slide without drive unit (closed and open construction form) SGO and SOO:
Linear Motion Slides without drive unit are delivered unassembled. Shafts and end blocks are provided. The carriage is mounted as a sub-assembly without pre-greasing. Initial grease lubrication must be performed by the customer in accordance with the instructions provided. If bellows have been ordered, these are mounted on frames and included in the delivery. Fastening screws are not included in scope of delivery. Linear Motion Slides without drive unit can also be supplied with corrosion-resistant steel shafts per DIN 17230 / EN 10088.
For more information on Linear Bushings and precision steel shafts, see the "Linear Bushings and Shafts" catalog.

Linear Motion Slides in open construction form (with and without drive unit) SOK and SOO:
The precision steel shafts are screw-fastened to the shaft support rails.

Length L:

Linear Motion Slides consist of components of varying length and assemblies of fixed length. The length-dependent components are cut to size as required for each order. Linear Motion Slides can thus be custom-designed in any desired length (infinitely variable).
Lengths in excess of the specified L_{max} are available on request.

Instructions:

Each Linear Motion Slide is delivered complete with the relevant instructions for mounting and maintenance.

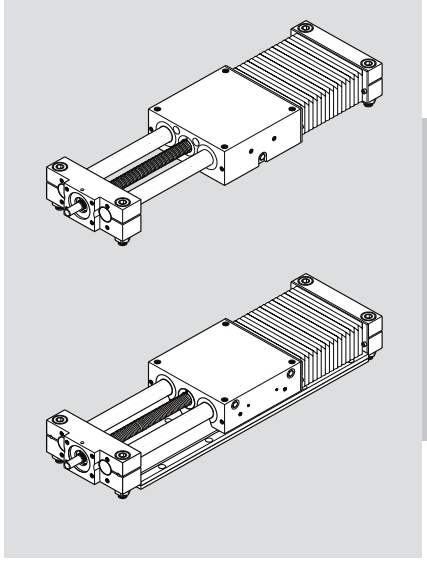
General Product Description

Product Overview, Motors and Controllers (Control Systems)

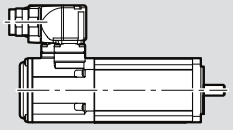
Motor Selection

in accordance with controllers and control systems

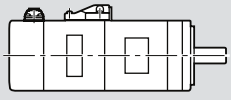
Several motor-controller combinations are available in order to provide the most cost-effective solution for every customer application.
When sizing the drive, always consider the motor-controller combination
➠ “Motors” on page 66.
For more information on motors, controllers and control systems, please refer to the Rexroth catalog “Drive System Rexroth IndraDrive” R999000018.



SAFETY ON BOARD

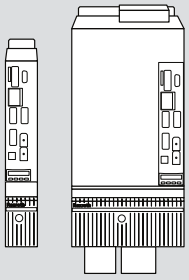


IndraDyn S servo motor MSK



IndraDyn S servo motor MSM

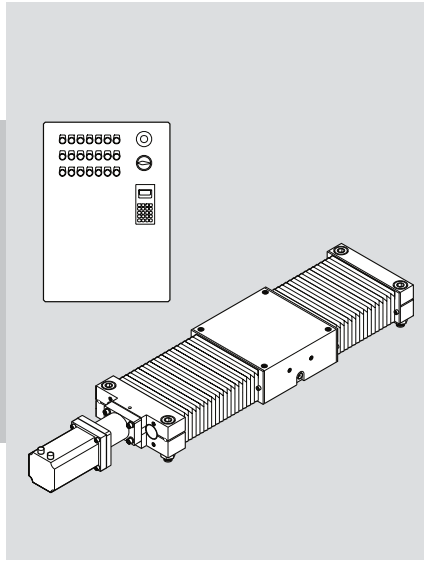
SAFETY ON BOARD



Digital controller
IndraDrive C
Power unit HCS
Control unit CSH

Digital controller
IndraDrive Cs
HCS 01
Compact and dynamic solution
for lower power ranges

Digital controller
IndraDrive Cs
HCS 01
Compact and dynamic solution
for lower power ranges



Linear Motion Slides can be supplied complete with motor, controller and control system.

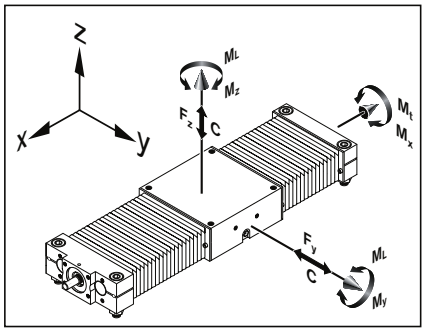
General Product Description

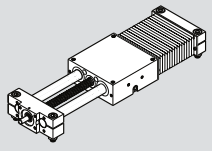
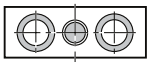
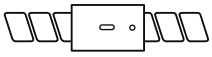
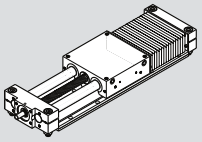
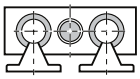
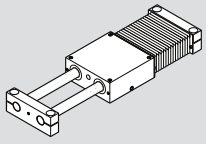
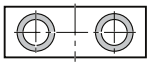
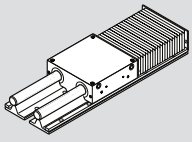
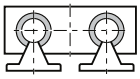
Overview of Types with Load Capacities

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**, $\mathbf{M_t}$, $\mathbf{M_L}$) have proved acceptable.

At the same time, the following may not be exceeded:
- the maximum permissible shaft deflection
- maximum permissible drive torque
- the maximum permissible load
- the permissible travel speed
- the maximum permissible acceleration



Linear Motion Slide	Type	Construction form	Guide	Drive unit	
	**SGK**	**Closed type for cantilever-type installation** 	 **Super Linear Bushing closed type**	 **Precision ball screw assembly**	
	**SOK**	**Open type for installation with shaft support rails** 	 **Super Linear Bushing open type**		
	**SGO**	**Closed type for cantilever-type installation** 	 **SSuper Linear Bushing [1] closed type**	 **Without drive unit**	
	**SOO**	**Open type for installation with shaft support rails** 	 **Super Linear Bushing open type**		

1) Size 8-65 with Standard Linear Bushings

Note on dynamic load capacities and moments:

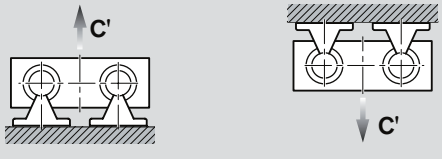
Determination of the dynamic load capacities and moments is based on a travel life of 100 000 m. Often only 50 000 m are actually stipulated.
For comparison: Multiply values C, M_t and M_L by 1.26.

	Type	Size	8-65	12-85	16-100	20-130	25-160	30-180	40-230	50-280
	SGK	**Maximum length L_{max}** (mm)		1 000	1 500	2 500	3 000	3 000	4 000	4 000
		Dynamic load capacity C (N)		2 700	3 310	6 560	12 830	15 600	26 770	39 180
	SOK	**Maximum length L_{max}** (mm)		1 000	1 500	2 500	3 000	3 000	4 000	4 000
		Dynamic load capacity C (N)		2 850	3 440	6 100	11 950	14 520	24 950	36 380
	SGO	**Maximum length L_{max}** (mm)	700	1 000	1 500	2 500	3 000	3 000	4 000	4 000
		Dynamic load capacity C (N)	1 040	2700	3 310	6 560	12 830	15 600	26 770	39 180
	SOO	**Maximum length L_{max}** (mm)		4 000	4 000	4 000	5 300	5 300	5 300	5 300
		Dynamic load capacity C (N)		2 850	3 440	6 100	11 950	14 520	24 950	36 380

The load capacities of the open versions are reduced as follows under lift-off loads:

Sizes 12 and 16 $C' = 0.42 \cdot C$

Sizes 20 to 50 $C' = 0.60 \cdot C$



General Product Description

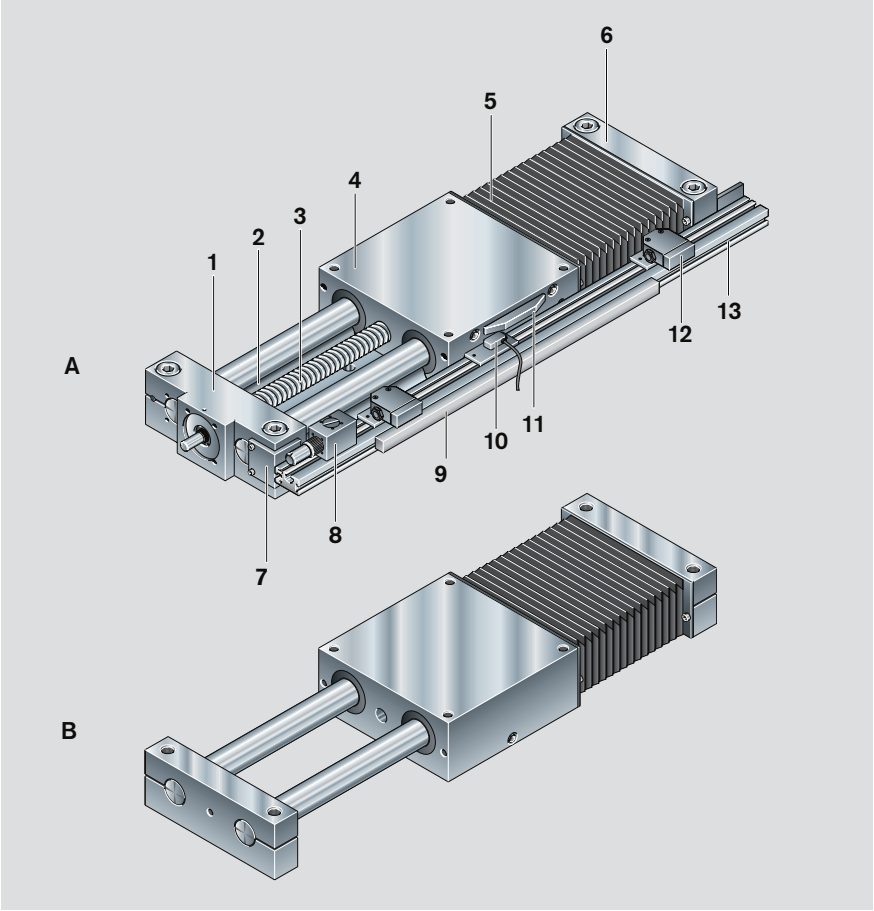
Structural Design

Linear Motion Slide (closed / open)

A with ball screw drive
B without drive unit

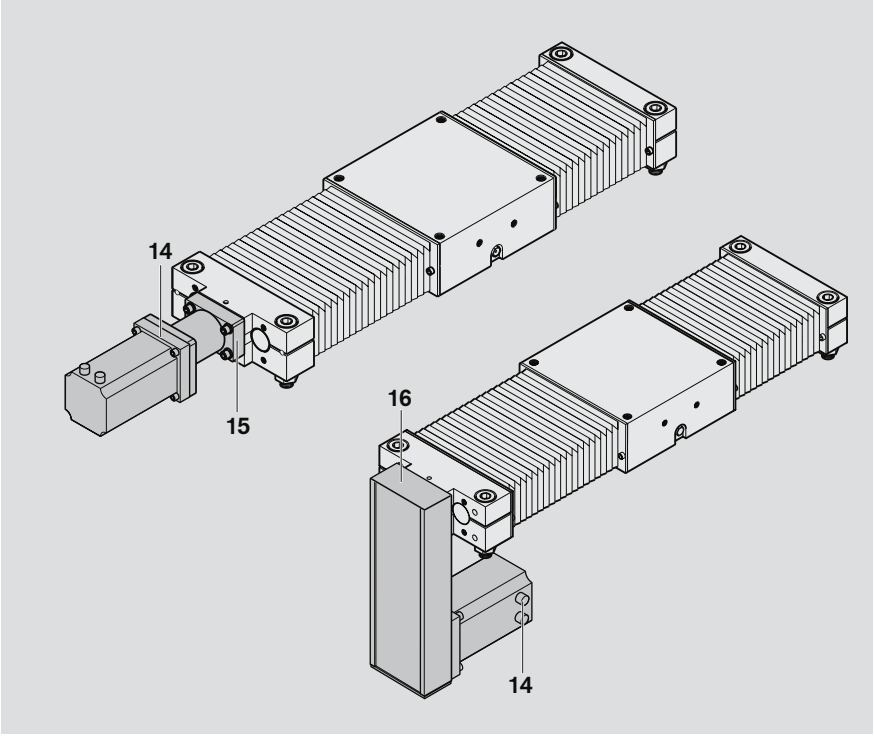
1 Fixed bearing end block
2 Shaft support rails (for open version only)
3 Ball screw with zero-backlash cylindrical single nut
4 Carriage with four Super Linear Bushings[1] (closed or open type)
5 Polyurethane bellows-type protective cover
6 Floating bearing end block

Accessories:
7 Mounting bracket
8 Socket + plug
9 Cable duct (aluminum alloy)
10 Proximity switch (with mounting accessories)
11 Switching cam
12 Mechanical switch (with mounting accessories)
13 Mounting profile



14 Motor
15 Motor mount and coupling
16 Timing belt side drive

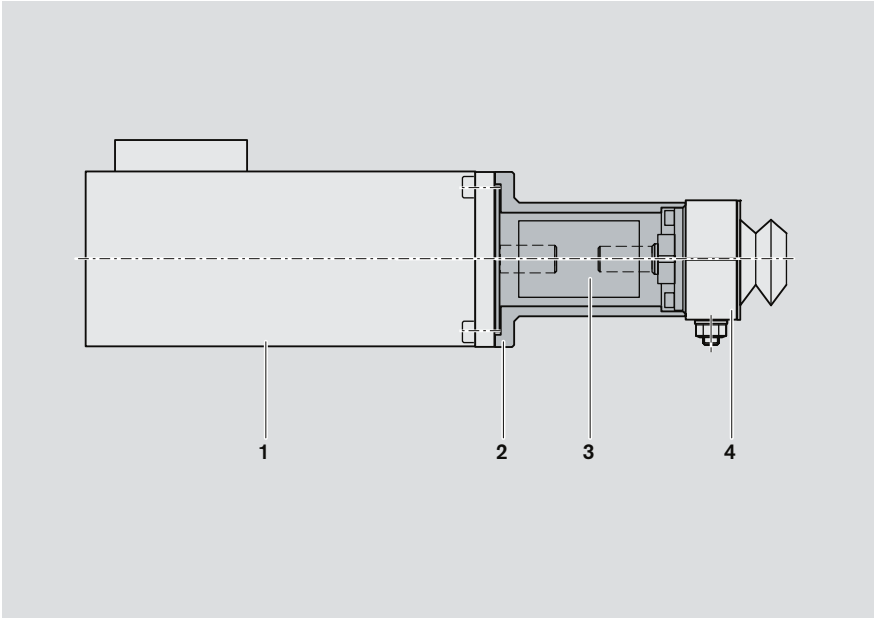
1) Size 8-65 with Standard Linear Bushings



Motor attachment with mount and coupling

A motor can be attached via a mount and coupling to all Linear Motion Slides equipped with a ball screw drive. The motor mount serves to fasten the motor to the Linear Motion Slide and acts as a closed housing for the coupling. The coupling transmits the motor drive torque free of distortive stresses to the Linear Motion Slide's drive shaft. Our standard couplings compensate for the thermal expansion of the system. If other makes of couplings are used, their thermal expansion must be taken into account.

1 Motor
2 Motor mount
3 Coupling
4 Linear Motion Slide

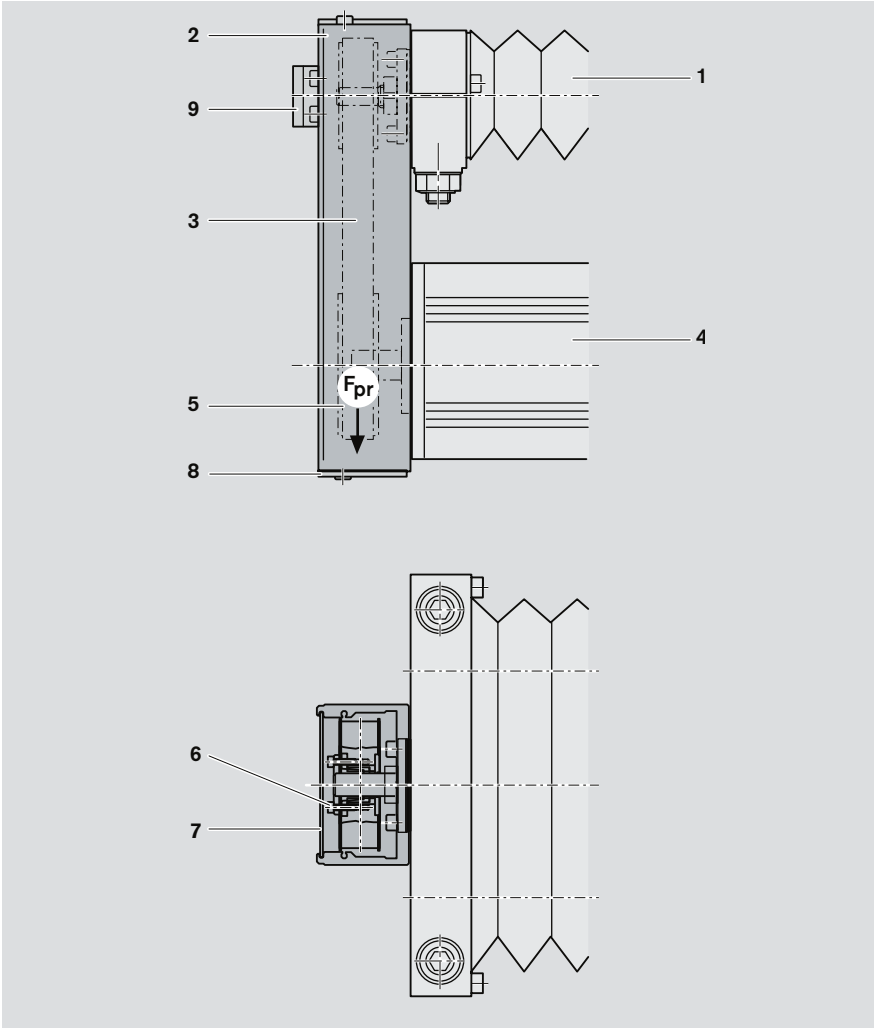


Motor attachment via timing belt side drive

For Linear Motion Slides from size 25-160 and up, 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 protects the belt and secures the motor. Different gear ratios are available:
i = 1 : 1
i = 1 : 1.5 (size 25-160, 30-180)
i = 1 : 2 (size 40-230, 50-280)

The timing belt side drive can be mounted in four different directions:
– below, above (RVO1 and RV02)
– left, right (RVO3 and RV04)

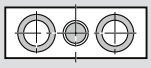
1 Linear Motion Slide
2 Housing (extruded, anodized aluminum profile)
3 Toothed belt
4 Motor
5 Pre-tensioning of the toothed belt: Apply pretensioning force F_{pr} to motor (F_{pr} will be indicated on delivery)
6 Belt pulleys attached using tensioning units
7 Cover plate
8 Cover
9 On sizes 25-160 and 30-180: Ball screw journal with additional support bearing

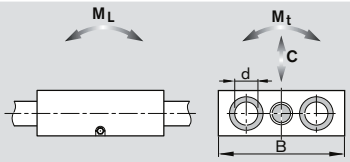


Technical Data

Load Capacities and Moments

Please note the “Calculations” section ➠ page 21!





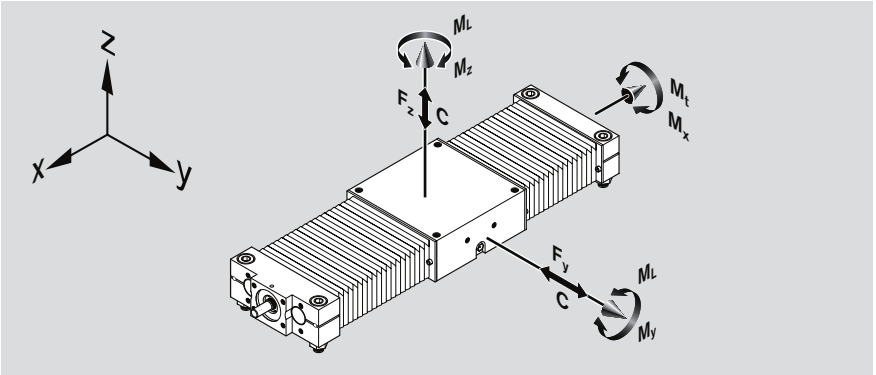
Type	Size	Ball screw d_0 x P (mm)	Dynamic characteristics C Guideway (N)	C_{bs} (N)	C_{fb} (N)	M_t (Nm)	M_L (Nm)	Maximum permissible loads F_{ymax}, F_{zmax} (N)	M_{xmax} (Nm)	M_{ymax}, M_{zmax} (Nm)
SGK	12-85	8 x 2.5	2 700	2 200	5 280	56	62	840	18	19
	16-100	12 x 5	3 310	3 800	5 280	89	94	1 060	29	30
		12 x 10		2 500						
	20-130	16 x 5	6 560	12 300	13 400	236	249	2 100	76	80
		16 x 10		9 600						
		16 x 16		6 300						
	25-160	20 x 5	12 830	14 300	17 000	564	596	4 360	192	203
		20 x 20		9 100						
		25 x 10		15 700						
	30-180	20 x 5	15 600	14 300	17 000	748	787	5 580	268	282
		20 x 20		9 100						
		25 x 10		15 700						
	40-230	32 x 5	26 770	21 600	26 000	1 633	1 860	8 700	531	605
		32 x 10		31 700						
		32 x 20		19 700						
		32 x 32		19 500						
	50-280	32 x 5	39 180	21 600	26 000	2 977	3 271	12 940	983	1 080
		32 x 10		31 700						
		32 x 20		19 700						
		32 x 32		19 500						
SGO	8-65	–	1 040	–	–	16	17	480	8	8
	12-85	–	2 700	–	–	56	62	840	18	19
	16-100	–	3 310	–	–	89	94	1 060	29	30
	20-130	–	6 560	–	–	236	249	2 100	76	80
	25-160	–	12 830	–	–	564	596	4 360	192	203
	30-180	–	15 600	–	–	748	787	5 580	268	282
	40-230	–	26 770	–	–	1 633	1 860	8 700	531	605
	50-280	–	39 180	–	–	2 977	3 271	12 940	983	1 080

C = dynamic load capacity
C_{bs} = dyn. load rating of the ball screw
C_{fb} = dynamic load rating of the fixed bearing
d_0 = screw diameter
F_{ymax} = max. dynamic load in y-direction
F_{zmax} = max. dynamic load in z-direction
M_L = dynamic longitudinal moment load capacity
M_t = dynamic torsional moment load capacity

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

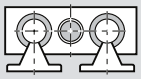
As far as the desired service life is concerned, loads of up to approximately 20% of the dynamic characteristic values (**C**, $\mathbf{M_t}$, $\mathbf{M_L}$) have proved acceptable. At the same time, the following may not be exceeded:

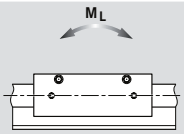
- the maximum permissible shaft deflection ➠ page 20
- maximum permissible drive torque
- the maximum permissible load
- the permissible travel speed
- the maximum permissible acceleration



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 by 1.26.





Type	Size	Ball screw d_0 x P (mm)	Dynamic characteristics C Guideway (N)	C_{bs} (N)	C_{fb} (N)	M_t (Nm)	M_L (Nm)	Maximum permissible loads F_{ymax}, F_{zmax} (N)	M_{xmax} (Nm)	M_{ymax}, M_{zmax} (Nm)
SOK	12-85	8 x 2.5	2 850	2 200	5 280	25	27	1 020	10	11
	16-100	12 x 5	3 440	3 800	5 280	39	41	1 260	16	17
		12 x 10		2 500						
	20-130	16 x 5	6 100	12 300	13 400	134	141	2 140	49	52
		16 x 10		9 600						
		16 x 16		6 300						
	25-160	20 x 5	11 950	14 300	17 000	320	339	4 500	127	134
		20 x 20		9 100						
		25 x 10		15 700						
	30-180	20 x 5	14 520	14 300	17 000	425	447	5 760	177	186
		20 x 20		9 100						
		25 x 10		15 700						
	40-230	32 x 5	24 950	21 600	26 000	928	1 057	8 960	350	399
		32 x 10		31 700						
		32 x 20		19 700						
		32 x 32		19 500						
	50-280	32 x 5	36 380	21 600	26 000	1 687	1 853	13 240	644	708
		32 x 10		31 700						
		32 x 20		19 700						
		32 x 32		19 500						
SOO	8-65	–	–	–	–	–	–	–	–	–
	12-85	–	2 850	–	–	25	27	1 020	10	11
	16-100	–	3 440	–	–	39	41	1 260	16	17
	20-130	–	6 100	–	–	134	141	2 140	49	52
	25-160	–	11 950	–	–	320	339	4 500	127	134
	30-180	–	14 520	–	–	425	447	5 760	177	186
	40-230	–	24 950	–	–	928	1 057	8 960	350	399
	50-280	–	36 380	–	–	1 687	1 853	13 240	644	708

M_{xmax} = maximum permissible torsional moment about the X-axis

M_{ymax} = maximum permissible torsional moment about the Y-axis

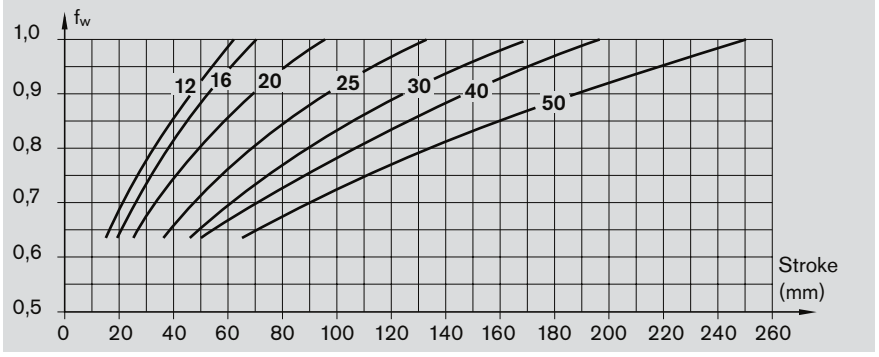
M_{zmax} = maximum permissible torsional moment about the Z-axis

P = lead

Reduced load capacity in short-stroke applications

In short-stroke applications, the service life of the shafts is shorter than that of the Super Linear Bushings.

For this reason, the dynamic load capacities and moments given in the tables must be multiplied by the factor f_W.

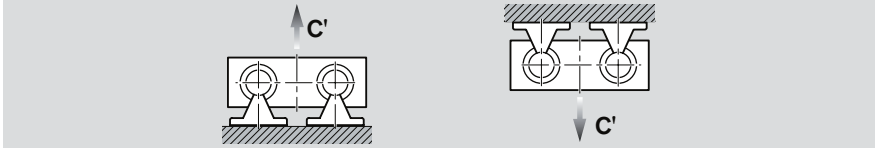


Reduced load capacity under lift-off loads

The load capacities of the open versions are reduced as follows under lift-off loads:

Sizes 12 and 16 $C' = 0.42 \cdot C$

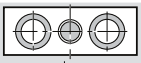
Sizes 20 to 50 $C' = 0.60 \cdot C$



Technical Data

General Technical Data

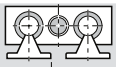
Please note the "Calculations" section ➠ page 21!

 Type	Size	Ball screw d_0 x P (mm)	m_{ca} (kg)	m_s (kg)	s_{min} (mm)	L_{max} (mm)	F_R (N)	M_{Rs} (Nm)	a_{max} (m/s^2)	v_{max} (m/s)
SGK	12-85	8 x 2.5	0.54	0.0021 · L + 0.92	65	1 000	–	0.06	27	[2]
	16-100	12 x 5	0.80	0.004 · L + 1.4	70	1 500	–	0.13	27	
		12 x 10					–	0.16	27	
	20-130	16 x 5	1.80	0.006 · L + 3.0	95	2 500	–	0.40	27	
		16 x 10					–	0.43	27	
		16 x 16					–	0.46	27	
	25-160	20 x 5	3.30	0.011 · L + 5.5	135	3 000	–	0.53	22	
		20 x 20					–	0.64	27	
		25 x 10					–	0.66	27	
	30-180	20 x 5	4.60	0.014 · L + 7.4	170	3 000	–	0.53	22	
		20 x 20					–	0.64	27	
		25 x 10					–	0.66	27	
	40-230	32 x 5	9.30	0.025 · L + 14.2	190	4 000	–	1.14	8	
		32 x 10					–	1.24	15	
		32 x 20					–	1.23	27	
		32 x 32					–	1.27	27	
	50-280	32 x 5	16.00	0.036 · L + 22.8	250	4 000	–	1.14	8	
		32 x 10					–	1.25	15	
		32 x 20					–	1.25	27	
		32 x 32					–	1.30	27	
SGO	8-65	–	0.28	0.0008 · L + 0.39	50	700	3	–	150[1]	3[3]
	12-85	–	0.55	0.0018 · L + 0.8	65	1 000	7	–		
	16-100	–	0.82	0.003 · L + 1.2	70	1 500	9	–		
	20-130	–	1.80	0.005 · L + 2.6	95	2 500	11	–		
	25-160	–	3.30	0.008 · L + 4.8	135	3 000	14	–		
	30-180	–	4.70	0.011 · L + 6.7	170		18	–		
	40-230	–	9.40	0.020 · L + 13.3	190	4 000	22	–		
	50-280	–	16.40	0.031 · L + 22.1	250		27	–		

a_{max} = maximum acceleration
d_0 = nominal diameter
F_R = friction force
L = length of linear motion system
m_{ca} = moved mass
M_{Rs} = frictional torque of system
m_s = mass of the linear system
P = lead
v_{max} = maximum travel speed
s_{min} = minimum required travel in order to ensure reliable distribution of lubricant ➠ "Operating Conditions" on page 70.

Mass of the Linear Motion Slide:
Weight calculation does not include motor attachment, timing belt side drive and switches.

m_s = weight factor (kg/mm) · length L (mm) + weight of all parts of fixed length (kg)

 Type	Size	Ball screw d_0 x P (mm)	m_{ca} (kg)	m_s (kg)	s_{min} (mm)	$L_{max.}$ (mm)	F_R (N)	M_{Rs} (Nm)	a_{max} (m/s^2)	v_{max} (m/s)
SOK	12-85	8 x 2.5	0.47	0.0040 · L + 0.82	65	1 000	–	0.06	27	2)
	16-100	12 x 5	0.76	0.006 · L + 1.3	70	1 500	–	0.13	27	
		12 x 10					–	0.16	27	
	20-130	16 x 5	1.60	0.010 · L + 2.7	95	2 500	–	0.40	27	
		16 x 10					–	0.43	27	
		16 x 16					–	0.46	27	
	25-160	20 x 5	2.90	0.015 · L + 5.0	135	3 000	–	0.53	22	
		20 x 20					–	0.64	27	
		25 x 10					–	0.66	27	
	30-180	20 x 5	4.20	0.020 · L + 6.8	170	3 000	–	0.53	22	
		20 x 20					–	0.64	27	
		25 x 10					–	0.66	27	
	40-230	32 x 5	8.50	0.032 · L + 13.2	190	4 000	–	1.14	8	
		32 x 10					–	1.24	15	
		32 x 20					–	1.23	27	
		32 x 32					–	1.27	27	
	50-280	32 x 5	14.80	0.046 · L + 21.3	250	4 000	–	1.14	8	
		32 x 10					–	1.25	15	
		32 x 20					–	1.25	27	
		32 x 32					–	1.30	27	
SOO	12-85	–	0.47	0.0035 · L + 0.47	65	4 000	7	–	150[1)]	3[3)]
	16-100	–	0.75	0.005 · L + 0.75	70		9	–		
	20-130	–	1.60	0.008 · L + 1.6	95		11	–		
	25-160	–	2.80	0.011 · L + 2.8	135	5 300	14	–		
	30-180	–	4.10	0.016 · L + 4.1	170		18	–		
	40-230	–	8.30	0.026 · L + 8.3	190		22	–		
	50-280	–	14.80	0.039 · L + 14.8	250		27	–		

1) Linear Motion Slides without drive unit SGO/SOO differ from the SGK/SOK models as they have no ball screw drive acting as a limiting factor for the acceleration.

2) v_{max} ➠ graphs on page 17

3) Travel speeds of up to 5 m/s are possible. Service life is limited by the increased wear on plastic parts.

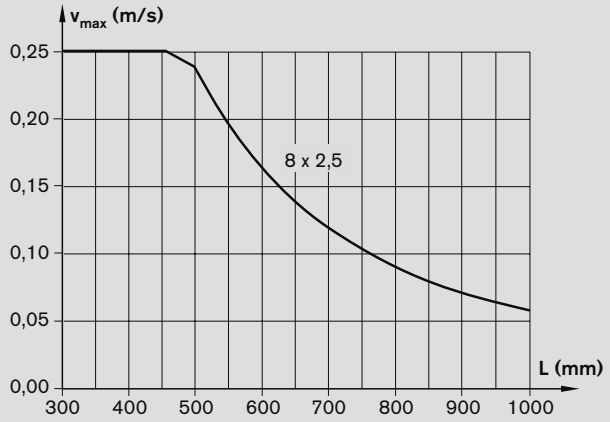
Technical Data

Drive Data

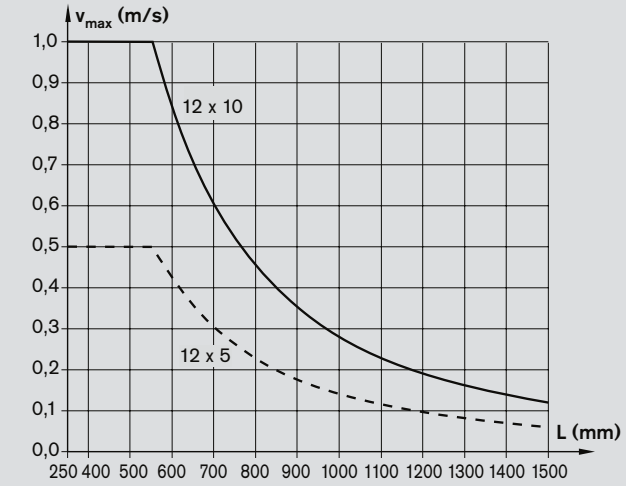
Please note the “Calculations” section ➠ page 21!

Maximum permissible linear speed v_{max}

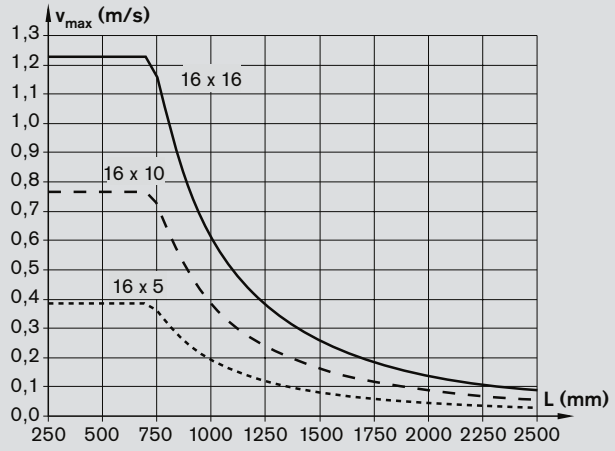
SGK / SOK 12-85



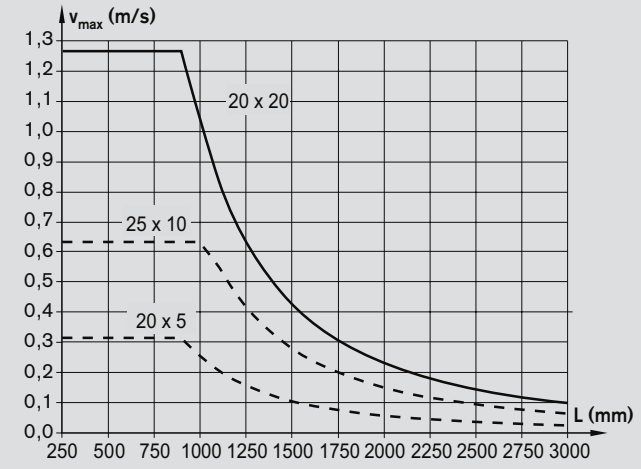
SGK / SOK 16-100



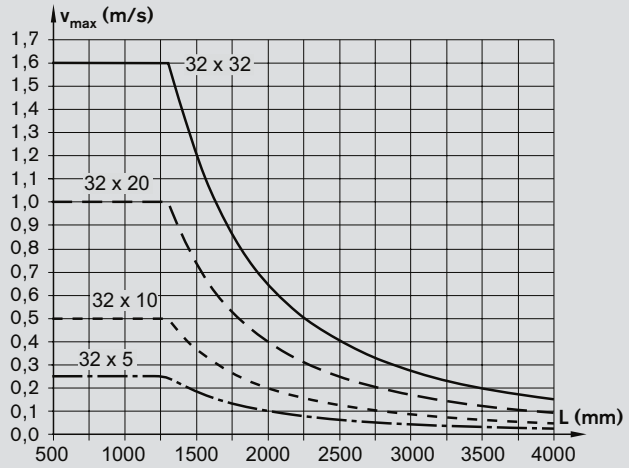
SGK / SOK 20-130



SGK / SOK 25-160/30-180

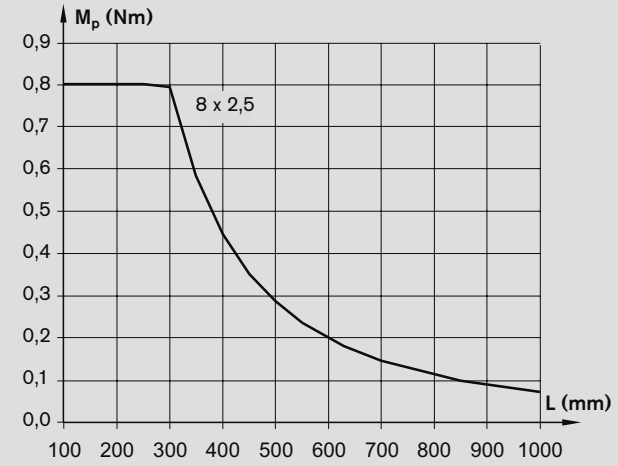


SGK / SOK 40-230/50-280

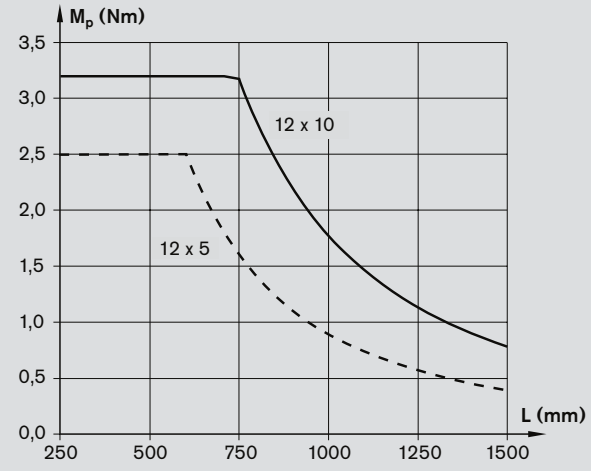


Maximum permissible drive torque at the screw journal M_p
(no radial load on ball screw shaft journal)

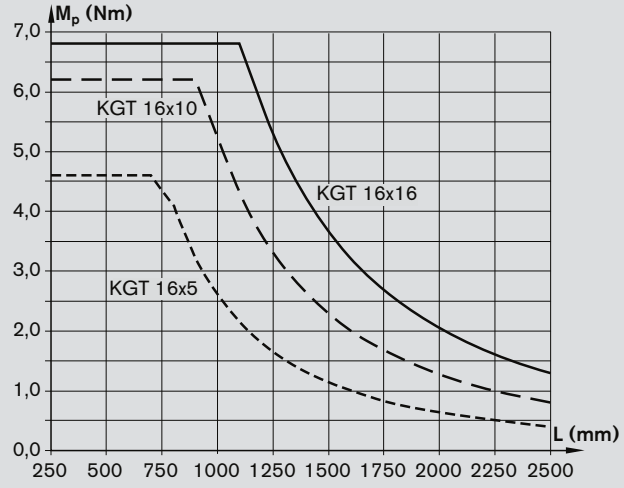
SGK / SOK 12-85



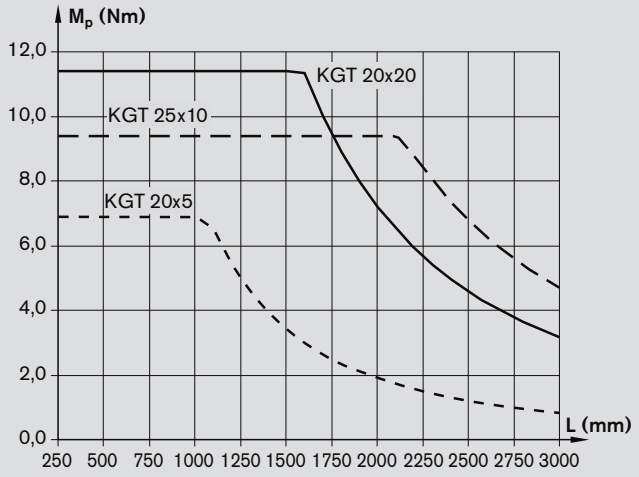
SGK / SOK 16-100



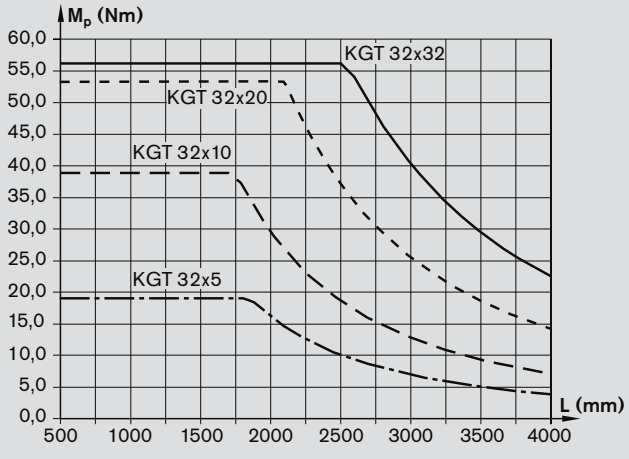
SGK / SOK 20-130[1)]



SGK / SOK 25-160/ 30-180[2)]



SGK / SOK 40-230/ 50-280[3)] KGT = ball screw



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

Size	M_p (Nm)
SGK/SOK 40-230	48.6
SGK/SOK 50-280	

⚠ **If a ball screw with keyway is used, when comparing the chart against the table, the lower of the two values will always apply.**

Example: Linear Motion Slide 40-230, ball screw 32x20, length 1500 mm.
M_p from graph: approx. 53.0 Nm
M_p from table: 48.6 Nm
Value for design calculations: 48.6 Nm

Technical Data

Drive Data

Please note the “Calculations” section ➠ page 21!

Motor attachment via timing belt side drive (on fixed bearing side of the Linear Motion Slide)

			MSK 040C-0600, MSM 041B-0300							
			M_{sd}[1] (Nm)		J_{sd} (10^{-6} kgm²)		M_{Rsd} (Nm)	m_{sd} (kg)	F (mm)	B_t
	Ball screw d_0 x P	up to L[2] (mm)	i = 1	i =1.5	i =1	i =1.5				
SGK/SOK 25-160	20 x 5	1000	6.61	4.41	250	84	0.4	1.5	88	16 AT5
SGK/SOK 30-180	20 x 20	1800	8.22	5.48						
	25 x 10	2200								

			MSK 060C-0600								
			M_{sd}[1] (Nm)		J_{sd} (10^{-6} kgm²)		M_{Rsd} (Nm)	m_{sd} (kg)	F (mm)	B_t	
	Ball screw d_0 x P	up to L[2] (mm)	i = 1	i = 2	i = 1	i = 2				i = 1	i = 2
SGK/SOK 40-230	32 x 5	1800	19.10	9.55	1400	260	0.5	3.8	116	25 AT5	32 AT5
SGK/SOK 50-280	32 x 10	2200	19.21	12.30							
	32 x 20	3000									
	32 x 32	3800									

1) Values for M_{sd} do not take motor torque into account.

2) For longer lengths, the permitted drive torque is determined by the length-dependent value M_p of the linear system as given in the graphs ➠ graphs in “Drive Data” section, page 17.

Motor attachment via motor mount and coupling (on fixed bearing side of the Linear Motion Slide)

The couplings with the specifications shown in the table are used with standard motors.

Linear Motion Slide	Motor type	M_{cN} (Nm)	J_c (10^{-6} kgm²)	m_{fc} (kg)
SGK/SOK 12-85	MSM 031B-0300	3.7	7	0.3
SGK/SOK 16-100				
SGK/SOK 20-130	MSK 030C-0900	19.0	57	0.5
	MSK 040C-0600			0.6
	MSM 031C-0300			0.5
	MSM 041B-0300			0.7
SGK/SOK 25-160	MSM 041B-0300	19.0	57	0.8
	MSK 040C-0600			
SGK/SOK 30-180	MSM 041B-0300			
	MSK 040C-0600			
SGK/SOK 40-230	MSK 060C-0600	50.0	200	1.7
	MSK 076C-0450	98.0	390	2.2
SGK/SOK 50-280	MSK 060C-0600	50.0	200	1.7
	MSK 076C-0450	98.0	390	2.2

B_t = belt type
i = gear ratio of timing belt side drive
J_c = mass moment of inertia, coupling
J_{sd} = reduced mass moment of inertia of timing belt side drive at motor journal
F = width of belt pulley housing (➠ page 52)
M_{cN} = rated torque of coupling
m_{fc} = mass of motor mount and coupling
M_{Rsd} = frictional torque of timing belt side drive at motor journal
M_{sd} = maximum permissible drive torque of the timing belt side drive
m_{sd} = mass of timing belt side drive

Determination of mass moment of inertia of the linear 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

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

J_s = mass moment of inertia of system (kgm^2)
J_t = translatory mass moment of inertia of external load (kgm^2)
$k_{j\,fix}$ = constant for fixed-length portion of mass moment of inertia (–)
$k_{j\,var}$ = constant for variable-length portion of mass moment of inertia (–)
$k_{j\,m}$ = constant for mass-specific portion of mass moment of inertia (–)
L = length of the Linear Motion Slide (mm)
m_{ex} = moved external load (kg)

Constants for the individual sizes
with ball screw drive

Size	Ball screw	Constant		
SGK/SOK	d_0 x P	$k_{j\,fix}$	$k_{j\,var}$	$k_{j\,m}$
12-85	8 x 2.5	0.203	0.002	0.158
16-100	12 x 5	1.088	0.013	0.633
	12 x 10	2.367	0.013	2.533
20-130	16 x 5	3.238	0.039	0.633
	16 x 10	6.692	0.039	2.533
	16 x 16	13.878	0.039	6.485
25-160	20 x 5	8.216	0.100	0.633
	20 x 20	39.990	0.100	10.132
	25 x 10	23.575	0.256	2.533
30-180	20 x 5	9.103	0.100	0.633
	20 x 20	54.169	0.100	10.132
	25 x 10	27.120	0.256	2.533
40-230	32 x 5	51.853	0.712	0.633
	32 x 10	69.446	0.712	2.533
	32 x 20	138.210	0.667	10.132
	32 x 32	268.830	0.667	25.938
50-280	32 x 5	56.025	0.712	0.633
	32 x 10	87.214	0.712	2.533
	32 x 20	209.280	0.667	10.132
	32 x 32	468.780	0.667	25.938

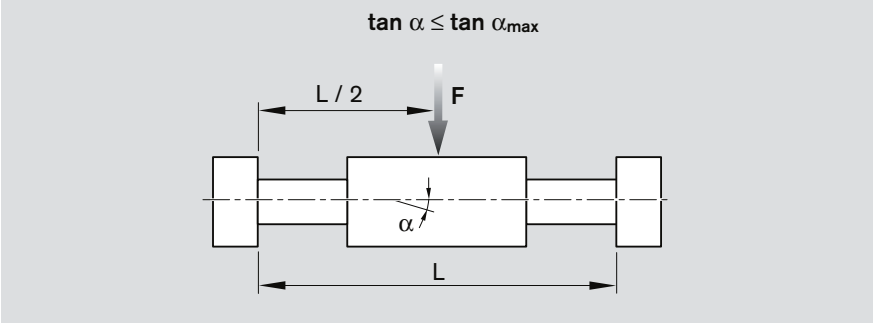
Technical Data

Deflection

The maximum permissible deflection of the Linear Motion Slides in the closed version SGK (with drive unit) and SGO (without drive unit) is determined according to the permissible shaft inclination for the linear bushings installed in the carriage.

Permissible shaft inclination in the linear bushing

Due to the use of Super Linear Bushings (except in size 8-65), the permissible shaft inclination in the linear bushing is greater than with conventional linear bushings. When selecting the length **L** and the size, be sure to consider the permissible shaft inclination in the linear bushing.



Permissible shaft inclination in the linear bushing in the individual sizes for the closed-type construction form

$$\tan \alpha \leq \tan \alpha_{max}$$

F = load (N)
tan α = shaft inclination (–)
tan α_{max} = max. permissible shaft inclination (–)

Linear Motion Slide	tan α =	tan α_{max} =
SGO 8-65	$F \cdot (L - 9) \cdot 4.970 \cdot 10^{-8}$	$10 \cdot 10^{-4}$
SGO 12-85	$F \cdot (L - 18) \cdot 1.376 \cdot 10^{-8}$	$8.72 \cdot 10^{-3}$
SGO 16-100	$F \cdot (L - 21) \cdot 5.381 \cdot 10^{-9}$	$8.72 \cdot 10^{-3}$
SGO 20-130	$F \cdot (L - 36) \cdot 2.932 \cdot 10^{-9}$	$8.72 \cdot 10^{-3}$
SGO 25-160	$F \cdot (L - 43) \cdot 1.468 \cdot 10^{-9}$	$8.72 \cdot 10^{-3}$
SGO 30-180	$F \cdot (L - 51) \cdot 7.698 \cdot 10^{-10}$	$8.72 \cdot 10^{-3}$
SGO 40-230	$F \cdot (L - 79) \cdot 3.407 \cdot 10^{-10}$	$8.72 \cdot 10^{-3}$
SGO 50-280	$F \cdot (L - 107) \cdot 1.649 \cdot 10^{-10}$	$8.72 \cdot 10^{-3}$

Mass of the Linear Motion Slide:
Weight calculation does not include motor attachment, timing belt side drive and switches.

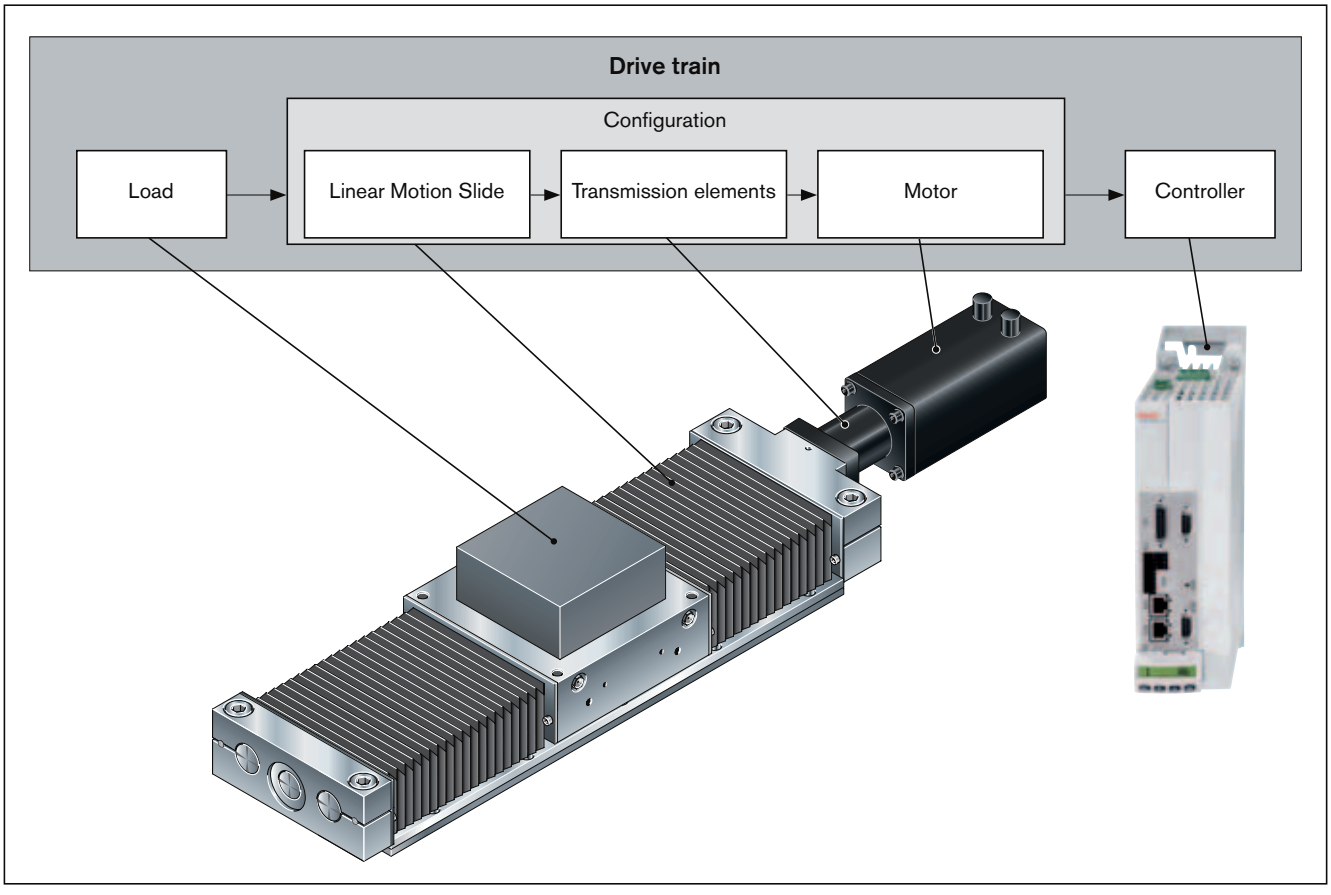
m_s = weight factor (kg/mm) · length L (mm) + weight of all parts of fixed length (kg)

L = length (mm)
m_s = mass of the linear system (kg)

Calculations

Calculation Principles

Drive train



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 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 systems, it is essential to consider the upper limits for permissible loads and forces, as specified in the section “Technical Data” on page 12. 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.

Calculations

Calculation Principles

Service life

The service life of the rolling bearing points contained in a linear system can be calculated using the formulas given below. In a linear system with ball screw drive, the rolling bearing points that are relevant for the service life are the linear guide, the ball screw drive (ball nut), and the fixed bearing.

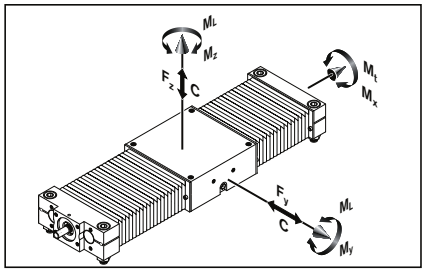
⚠ **The value to be indicated for the calculated service life of linear system is determined by the lowest of the separately calculated service life values for the linear guide, the ball screw drive or the fixed bearing.**

Service life of the linear guide

The linear guide of a linear system must bear the load and any processing forces.

Combined equivalent load on bearing of the linear guide

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



C = dynamic load capacity (N)
F_{comb} = combined equivalent load on bearing (N)
F_y = load due to a resulting force in the y-direction (N)
F_z = load due to a resulting force in the z-direction (N)
L_{10} = nominal life (m)
L_{10h} = nominal life (h)
M_L = dynamic longitudinal moment load (Nm)
M_t = dynamic torsional moment load (Nm)
M_x = dynamic torsional moment about the X-axis (Nm)
M_y = dynamic torsional moment about the Y-axis (Nm)
M_z = dynamic torsional moment about the Z-axis (Nm)
v_m = average travel speed (m/s)

Nominal life

Nominal life in meters

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

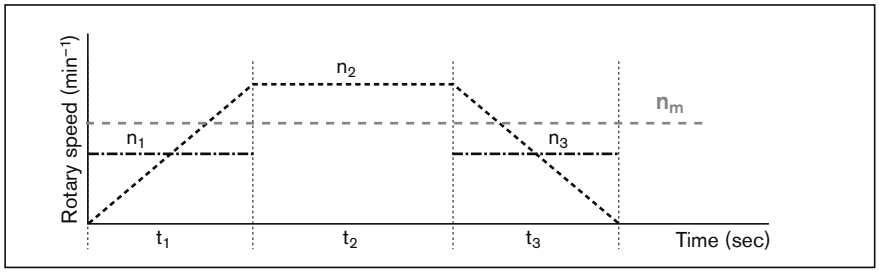
Nominal life in hours

$$L_{10h} = \frac{L_{10}}{3600 \cdot v_m}$$

Service life of ball screw or the fixed bearing

Where the rotary speed and load fluctuate, the service life must be calculated using the averages $\mathbf{F_m}$ and $\mathbf{n_m}$.

Where the rotary speed fluctuates, the average speed $\mathbf{n_m}$ is calculated as follows:



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

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

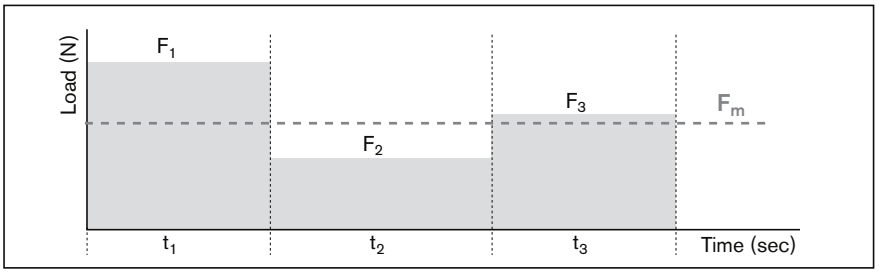
$n_1, n_2, \ldots n_n$ = rotary speed in phases 1 … n (min⁻¹)
n_m = average speed (min⁻¹)
$t_1, t_2, \ldots t_n$ = discrete time step in phases 1 … n (sec)
t_{tot} = sum of the discrete time steps (sec)

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

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

n_1 = rotary speed in acceleration and braking phases
$n_{A1 \ldots n}$ = speed at start in phase 1 … n (min⁻¹)
$n_{E1 \ldots n}$ = speed at finish in phase 1 … n (min⁻¹)

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



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

$F_1, F_2, \ldots F_n$	=	axial load during phases 1 ... n	(N)
F_m	=	equivalent dynamic axial load	(N)
$n_1, n_2, \ldots n_n$	=	rotary speed in phases 1 … n	(min^{-1})
n_m	=	average rotary speed	(min^{-1})
$t_1, t_2, \ldots t_n$	=	discrete time step in phases 1 ... n	(sec)
t_{tot}	=	sum of the discrete time steps	(sec)

Life expectancy

Service life in revolutions:

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

Service life in hours:

$$L_{10h} = \frac{L_{10}}{n_m \cdot 60}$$

C	=	dynamic load rating	(N)
F_m	=	equivalent dynamic axial load	(N)
L_{10}	=	service life	(–)
L_{10h}	=	service life	(h)
n_m	=	average rotary speed	(min^{-1})

Calculations

Sizing the Drive Unit

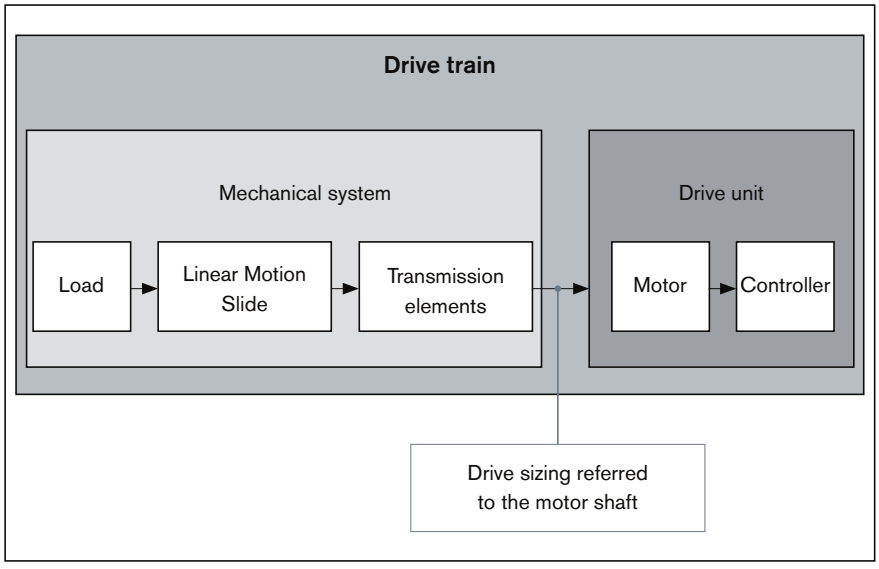
Basic principles

When calculating the required size of drive, the drive train can be subdivided into the mechanical system and the drive itself.

The **mechanical system** includes the physical components – linear 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 the appropriate performance data. The sizing or dimensioning of the electric drive is done taking the motor shaft as a reference point.

When sizing the drive, 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 symbols for the mechanical system

For each component (linear 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 ➠ “Drive Data” on page 18.

The following technical data with the associated symbols are used when considering the basic **mechanical system** requirements in the design calculations for sizing the drive. The data listed 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 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	(kgm²)	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) Value as per table
4) Length-dependent value, to be read off from the graph
5) Any additional process forces are to be taken into consideration as load moments
6) For vertical mounting orientation: determine the value using the appropriate formula

Drive sizing referred to the motor shaft

For drive sizing, all the relevant design calculation values for the mechanical components contained in the drive train must be determined as they relate to – and be expressed in terms of 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}
- Max. permissible linear speed v_{mech} (max. permissible rotary speed n_{mech})
- Max. permissible drive torque M_{mech}

Determination of the values for the individual mechanical components in the drive train, referred to the motor shaft

Frictional torque M_R

For motor attachment via motor 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 motor mount and coupling

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

For motor attachment via timing belt side drive

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

Determination of mass moment of inertia of the linear 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

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

i	=	gear ratio of timing belt side drive	(–)
J_c	=	mass moment of inertia, coupling	(kgm^2)
J_{ex}	=	mass moment of inertia of mechanical system	(kgm^2)
J_s	=	mass moment of inertia of the linear system	(kgm^2)
J_{sd}	=	mass moment of inertia of timing belt side drive at motor journal	(kgm^2)
J_t	=	translatory mass moment of inertia of external load referred to the linear system screw journal	(kgm^2)
$k_{j\,fix}$	=	constant for fixed-length portion of mass moment of inertia	(–)
$k_{j\,m}$	=	constant for mass-specific portion of mass moment of inertia	(–)
$k_{j\,var}$	=	constant for variable-length portion of mass moment of inertia	(–)
L	=	length of linear system	(mm)
m_{ex}	=	moved external load	(kg)
M_R	=	frictional torque at motor journal	(Nm)
M_{Rs}	=	frictional torque of system	(Nm)
M_{Rsd}	=	frictional torque of timing belt side drive at motor journal	(Nm)

Calculations

Sizing the Drive Unit

Maximum permissible linear speed v_{mech}
The lowest of all the values for max. permissible linear speed of all mechanical components contained in the drive train determines the maximum permissible linear speed of the mechanical system which has to be taken into consideration as the upper limit for the drive when sizing the motor. Because it is a system in itself, a linear system with ball screw drive will always have a maximum permissible linear 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 linear speed of the overall mechanical system.

Maximum permissible linear speed

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

Maximum permissible rotary speed
For motor attachment via motor mount and coupling

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

For motor attachment via timing belt side drive

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

i	=	gear ratio of timing belt side drive	(–)
n_{mech}	=	maximum permissible rotary speed of mechanical system	(min^{-1})
P	=	screw lead	(mm)
v_{max}	=	maximum permissible linear speed of linear system	(m/s)
v_{mech}	=	maximum permissible linear speed of mechanical system	(m/s)

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 motor mount and coupling

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

For motor attachment via timing belt side drive

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

i	=	gear ratio of timing belt side drive	(–)
M_p	=	maximum permissible drive torque of the linear system	(Nm)
M_{cN}	=	rated torque of coupling	(Nm)
M_{sd}	=	maximum permissible drive torque of the timing belt side drive	(Nm)
M_{mech}	=	maximum permissible drive torque for mechanical system	(Nm)

⚠ **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 speed of the motor must be the same as or higher than the speed required for the mechanical system (but not exceeding the maximum permissible value).

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

n_{max} = maximum speed of the motor (min^{-1})
n_{mech} = maximum permissible rotary speed of mechanical system (min^{-1})

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.

Mass moment of inertia ratio:

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

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

J_{br} = mass moment of inertia of the motor brake (kgm^2)
J_{ex} = mass moment of inertia of mechanical system (kgm^2)
J_m = mass moment of inertia, motor (kgm^2)
V = ratio of mass moments of inertia of drive train and motor (–)

Calculations

Sizing the Drive Unit

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 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 orientation only!
For motor attachment via motor mount and coupling: i = 1

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

g	=	gravitational acceleration (= 9.81)	(m/s^2)
i	=	gear ratio of timing belt side drive	(–)
m_{ca}	=	moved mass of carriage	(kg)
m_{ex}	=	moved external load	(kg)
M_g	=	weight moment at motor journal	(Nm)
M_0	=	continuous motor torque	(Nm)
M_R	=	frictional torque at motor journal	(Nm)
M_{stat}	=	static longitudinal moment load	(Nm)
P	=	screw lead	(mm)
π	=	pi	(–)

In the section ➠ “Components and Ordering” users can put together standard configurations, including motor attachment and motor, for the various linear 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.

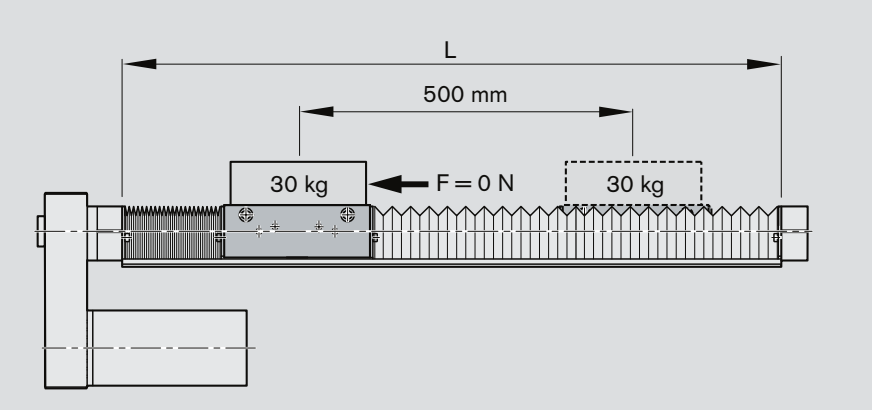
Precise sizing of the drive unit
Preselecting the motor according to this rough guide is no substitute for the required precise design calculations for the drive, taking all moments/torques and speed levels into account. For precise calculation of the electric drive, including consideration of the specific motion profile, please refer to the performance data in the catalogs “IndraDrive Cs” and “IndraDrive C”.
When sizing 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.

Calculation Example for Sizing the Drive Unit

Given data:

In a handling task, a mass of 30 kg is to be moved horizontally by 500 mm at a travel speed of 0.4 m/s. The following was selected based on the technical data and the installation space:

Linear Motion Slide SOK 25-160:
- open-type design
- with protective bellows
- motor attachment via timing belt side drive, i = 1.5
- with IndraDyn S servo motor MSK 040C with brake



Estimation of the slide length L:

(For a first estimation, the largest possible lead and therefore length is assumed, since the permitted linear speed can decrease with increasing length.)
For length formula, see Dimension Tables.

	L	$= s_{max} \cdot 1.24 + L_{ca} + 39$
Excess travel (per side):	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
Slide length:	L	$= 580 \cdot 1.24 + 160 + 39 = 919$ mm

Selection of ball screw

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

Permitted ball screw assemblies from “Permissible speed” chart for v = 0.4 m/s and L = 919 mm:

Ball screw 25 x 10 and ball screw 20 x 20

Ball screw selected (lower lead):

Ball screw 25 x 10

Maximum permissible linear speed for ball screw 25 x 10 as read off from chart:

$v_{max} = 0.63$ m/s

Calculation of the slide length L:

(for selected ball screw)

Excess travel (per side):	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
Slide length:	L	$= 540 \cdot 1.24 + 160 + 39 = 869$ mm

Friction moment M_R:

(motor attachment via timing belt side drive)

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

Linear Motion Slide: $M_{Rs} = 0.66$ Nm

Timing belt side drive: $M_{Rsd} = 0.4$ Nm

Frictional torque: $M_R = 0.4 + \frac{0{,}66}{1.5} = 0.84$ Nm

Calculations

Calculation Example for Sizing the Drive Unit

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: $J_{sd} = 84 \cdot 10^{-6}\ kgm^2$

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

$= (23.575 + 0.256 \cdot 869) \cdot 10^{-6}$

$= 246.039 \cdot 10^{-6}\ kgm^2$

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

$= 30 \cdot 2.533 \cdot 10^{-6}$

$= 75.99 \cdot 10^{-6}\ kgm^2$

Mass moment of inertia: $J_{ex} = 84 \cdot 10^{-6} + \frac{(246.039 \cdot 10^{-6} + 75.99 \cdot 10^{-6})}{1.5^2}$

$= 227.124 \cdot 10^{-6}\ kgm^2$

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 linear speed: $v_{mech} = v_{max} = 0.63\ m/s$

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

$= 5670\ min^{-1}$

Rotary speed of application n_{mech}:
(motor attachment via timing belt side drive)

Travel speed: $v_{mech} = 0.4\ m/s$

Rotary speed: $n_{mech} = \frac{0.4 \cdot 1.5 \cdot 1000 \cdot 60}{10}$

$= 3600\ min^{-1}$

Maximum permissible drive torque M_{mech}:

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

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

Timing belt side drive: $M_{sd} = 4.41$ Nm (gear ratio $i = 1.5$ and MSK 040C)

Linear Motion Slide: $M_p = 9.4$ Nm

Drive torque:

$$M_{mech} = \text{minimum}\left(4.41; \frac{9.4}{1.5}\right)$$

$$= \text{minimum}\,(4.41; 6.26)$$

$$= 4.41 \text{ Nm}$$

Checking the motor preselection:

Selected motor: MSK 040C with brake

Condition 1:

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

$7500 \geq 3600$ Condition met – motor size OK.

Condition 2:

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

Motor moment of inertia: $J_m = 140 \cdot 10^{-6}$ kgm²

Brake moment of inertia: $J_{br} = 23 \cdot 10^{-6}$ kgm²

Mass moment of inertia ratio:

$$V = \frac{227.124 \cdot 10^{-6}}{(140 \cdot 10^{-6} + 23 \cdot 10^{-6})}$$

$$= 1.393$$

Condition for handling: $V \leq 6$

$1.393 \leq 6$ Condition met – motor size OK.

Condition 3:

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

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

$$= 0.84 \text{ Nm}$$

Continuous motor torque: $M_0 = 2.7$ Nm

Torque ratio: $\frac{0.84}{2.7} = 0.31$

$0.31 \leq 0.6$ Condition met – motor size OK.

Calculations

Calculation Example for Sizing the Drive Unit

Result:

Linear Motion Slide SOK 25-160

Length	L =	869 mm,
Max. travel	s_{max} =	540 mm
Carriage length	L_{ca} =	160 mm
Ball screw:	Diameter d_0:	25 mm
	Lead P:	10 mm

With protective bellows
Motor attachment via timing belt side drive, gear ratio i = 1.5
Preselected motor: MSK 040C with brake

For precise sizing 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	= 0.84 Nm
Mass moment of inertia	J_{ex}	= $227.124 \cdot 10^{-6}$ kgm^2
Travel speed	v_{mech}	= 0.4 m/s (n_{mech} = 3600 min^{-1})
Limit for drive torque	M_{mech}	= 4.41 Nm

➠ The motor torque must be limited to 4.41 Nm on the drive side!

Limit for acceleration	a_{max}	= 27 m/s^2
Limit for travel speed	v_{max}	= 0.63 m/s (n_{mech} = 5670 min^{-1})

Besides the preferred type MSK 040C, other motors with identical connection dimensions can be adapted while taking care not to exceed the calculated limits.

Linear Motion Slide with Ball Screw Drive

Product Description

Characteristics

- Particularly smooth running and long service life thanks to Rexroth Super Linear Bushings
- High travel speed thanks to large leads
- Low-cost maintenance provided by one-point lubrication (grease) on either side of the guide system
- Ready-to-install Linear Motion Slides in any length up to L_{max}
- Oil- and moisture-resistant PU bellows-type protective cover (fixed by mechanical clamping of the last folds)

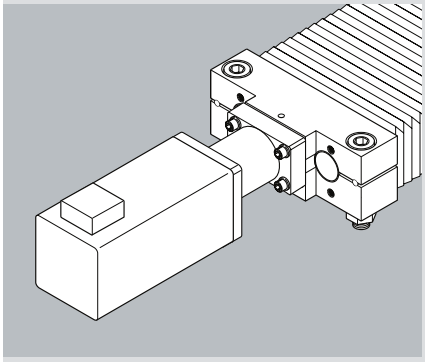
Further highlights

- Rexroth Precision Ball Screw Assembly in rolled quality, tolerance grade T7 as per DIN 69051, with zero-backlash cylindrical single nut
- Simple motor attachment due to locating feature and tapped mounting hole
- Greater flexibility due to options
- Extensive range of accessories

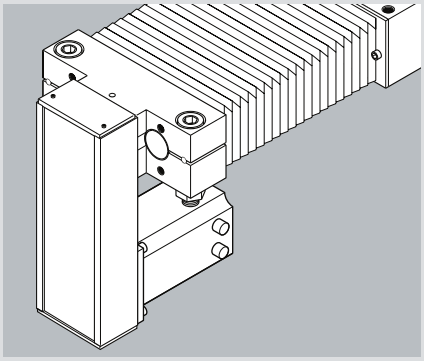
Add-on parts

- Motor with control units
- Switches (proximity and mechanical)
- Socket and plug
- Aluminum profile cable duct

Choice of motor attachment methods

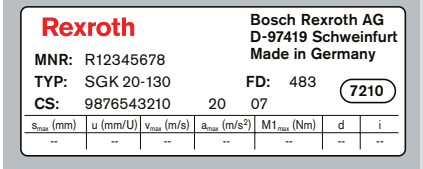


Motor attachment with motor mount and coupling

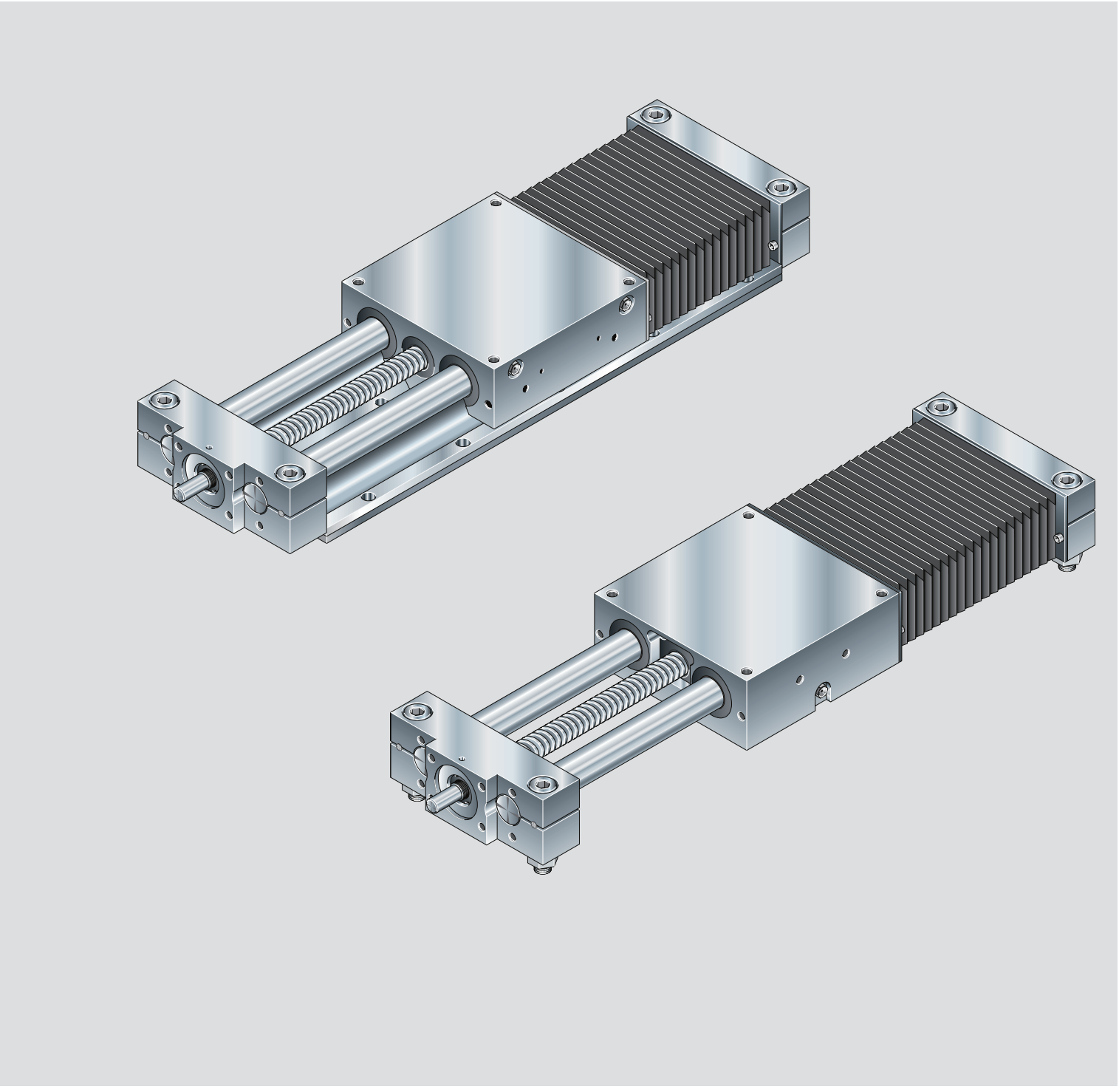


Motor attachment via timing belt side drive

Parameters for easy start-up

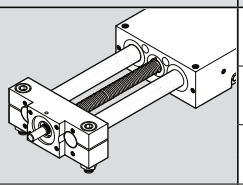
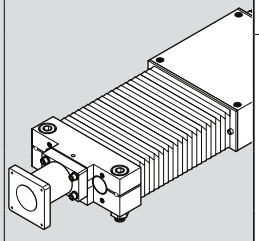


On the nameplate you will find technical data for start-up. With these parameters and the EasyWizard assistant from Bosch Rexroth, starting up the drives of linear systems becomes easier, faster and more effective than ever before.



Linear Motion Slide with Ball Screw Drive

SGK 12-85 to SGK 20-130 Components and Ordering Data

		Slide	Part number, length[1] R0261 .00 00, ... mm	Type	Guide: Standard shafts	Drive unit: Screw journal	Drive unit: Ball screw d_0 x P 8 x 2.5	12 x 5	12 x 10	16 x 5	16 x 10	16 x 16
With ball screw, w/o motor mount		SGK 12-85	R0261 000 00	OF01	01	Ø6	01					
		SGK 16-100	R0261 100 00		01	Ø6		01	02			
		SGK 20-130	R0261 200 00		01	Ø9				01	02	03
						Ø9[2]				04	05	06
With ball screw and motor mount		SGK 12-85	R0261 000 00	MF01	01	Ø6	01					
		SGK 16-100	R0261 100 00		01	Ø6		01	02			
		SGK 20-130	R0261 200 00		01	Ø9				01	02	03

d_0 = screw diameter (mm)
P = screw lead (mm)
i = transmission ratio

For explanations of the ordering parameters and an order example ➠ "Inquiry/Order" on page 76

Carriage	Motor attachment			Motor		Cover		Switches / Cable duct / Socket-plug	Documentation	
Standard	i =	Attachment kit[3]	for motor	Brake without	Brake with	PU bellows without	PU bellows with		Standard report	Measurement report[6]
01	–	00		00				**Without switches** **Without cable duct** 00 **Without socket and plug**		
01	–	00		00						
01	–	00		00				**Switches:** – PNP NC 11 – PNP NO 13 – Mechanical 15		02
01	–	03	MSM 031B	106[4]	107[4]					
01	–	03	MSM 031B	106[4]	107[4]	00	01	**Ordering data:** Switch type	01	
01	–	01	MSK 040C	86[4]	87[4]					
		04	MSK 030C	84[4]	85[4]			**Cable duct**[5] 20		
		05	MSM 031C	108[4]	109[4]			**Socket-plug** 17		03
		06	MSM 041B	110[4]	111[4]			**Switching cam and profiled support for switches** 16		

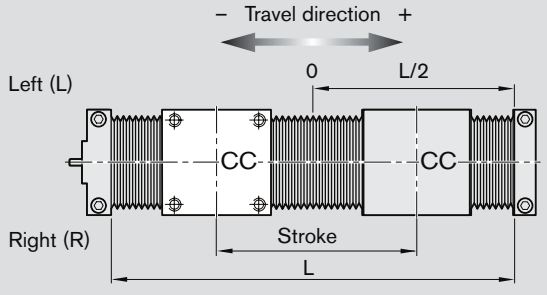
1) Length calculation ➠ Dimensions tables.
2) With keyway
3) Attachment kit also available without motor. When ordering, enter “00” for motor!
4) Recommended motor. Motor data and type designations ➠ “Motors” on page 66.
5) The length of the delivered cable duct is the same as that of the profiled support. If a different length is required, please order the cable duct as a separate part (➠ “Ordering the switches and accessories” on page 62).
6) “02” = Moment of friction measurement; “03” = Lead deviation: ➠ “Documentation” on page 73.

Determining the switch activation point

The switch activation point is determined by the mounting side, the direction of travel and the switching distance (see table above and ordering example).
Mounting side: Switches may be mounted on the left (L) or right (R) side of the slide.
Direction of travel: Switches may be mounted on the minus (-) or plus (+) side of zero.

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).
Refer to the section “Switch mounting arrangements” for more information on switch mounting, switch types, and fixing the mounting duct.

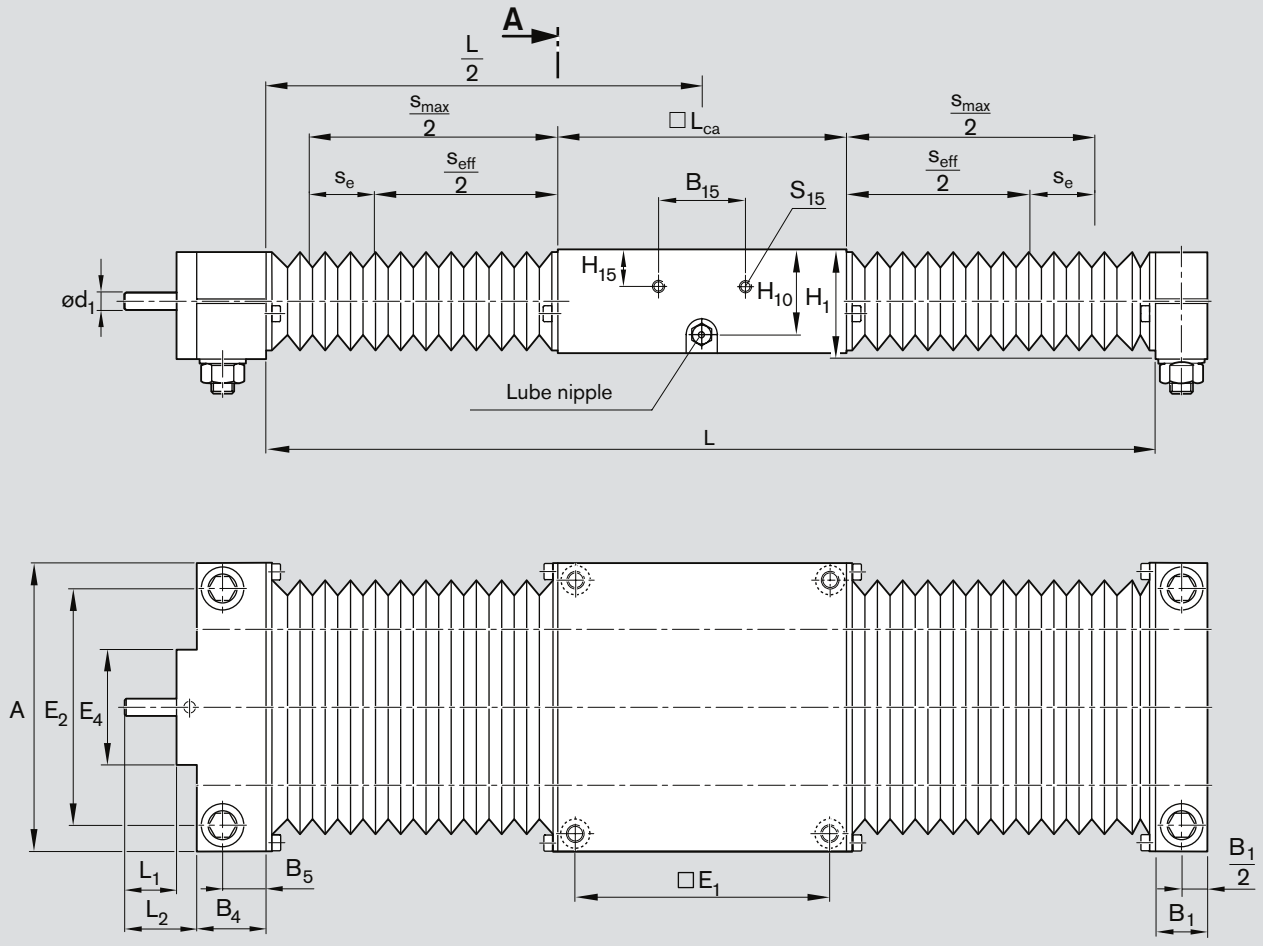
Switch mounting side:



Linear Motion Slide with Ball Screw Drive

SGK 12-85 to SGK 20-130 Dimensions

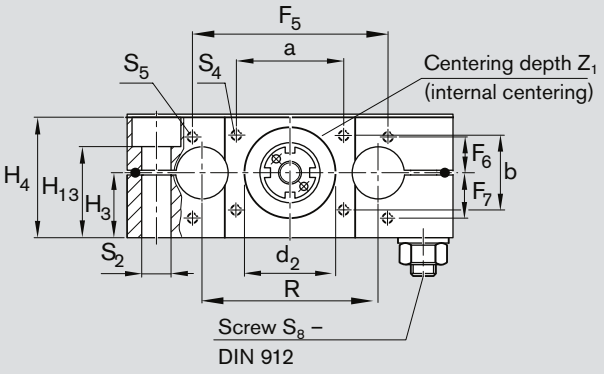
All dimensions in mm
Drawings not to scale

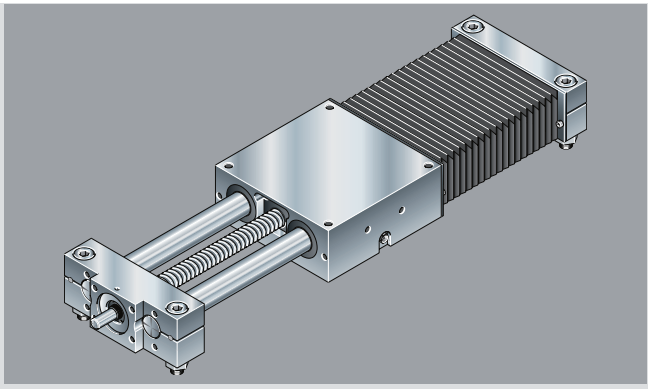


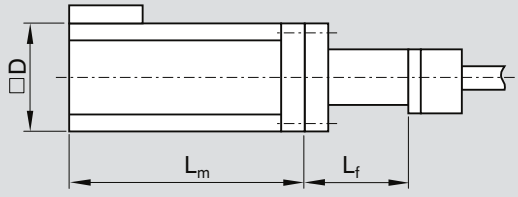
Motor dimensions ➠ “Motors” on page 66.

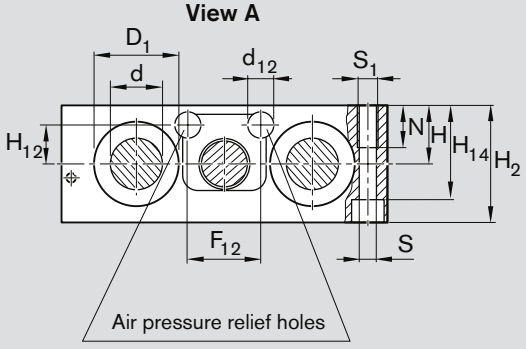
Slide	Screw journal Mounting geometry									Holes for locating bracket in both end blocks				For switching cam			Air pressure relief holes		
	d_1 h7	d_2 H7	L_1	L_2	Z_1	E_4	a	b	S	F_5	F_6	F_7	S_5	B_{15}	H_{15}	S_{15}	F_{12}	H_{12}	d_{12}
SGK 12-85	6	28	18	25.0	2.1	40	33	23	M4 - 8 deep	53	9.5	11.5	M4 - 8 deep	30	13.5	M4 - 7 deep	16.0	10.4	6.8
SGK 16-100	6	28	18	25.0	2.1	40	33	23	M4 - 8 deep	60	11.0	14.0	M4 - 8 deep	30	13.0	M4 - 7 deep	24.4	12.0	8.5
SGK 20-130	9	40	25	34.5	2.1	52	40	28	M6-12 deep	74	15.5	18.5	M5 - 12 deep	64	23.0	M4 - 8 deep	37.0	15.5	10.0

Slide	Dimensions (mm)																					
	d h6	R	B_1	B_4	B_5	H ±0.02	H_1	H_2	H_3 ± 0.015	H_4	H_{10}	H_{13}	H_{14}	D_1	E_1	E_2	L_{ca}	S	S_1	S_2	S_8	N
SGK 12-85	12	42	14	24	17	16	34	32	18	33	27	26.6	25.0	22	73	70	85	5.3	M6	6.6	M6 x 35	13
SGK 16-100	16	54	18	24	15	18	38	36	20	37	31	28.6	29.0	26	88	82	100	5.3	M6	9.0	M8 x 40	13
SGK 20-130	20	72	20	29	19	23	48	46	25	47	39	36.6	37.5	32	115	108	130	6.6	M8	11.0	M10 x 55	18







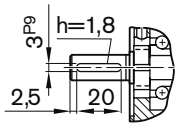
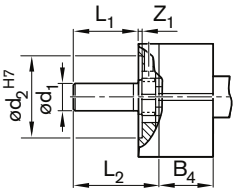


Motor	Slide	Dimensions (mm)			
		L_m		D	L_f
		without brake	with brake		
MSM 031B	SGK 12-85	79.0	115.5	60.0	30.0
	SGK 16-100				
MSM 031C	SGK 20-130	98.5	135.0	60.0	72.0
MSM 041B		112.0	149.0	80.0	83.0
MSK 030C		188.0	213.0	51.0	75.0
MSK 040C		185.5	215.5	82.0	77.5

$s_{eff} = s_{max} - 2 \cdot s_e$

s_e = excess travel (mm)
s_{eff} = effective stroke (mm)
s_{max} = maximum travel (mm)

	Length calculation L (mm)	
	with bellows	without bellows
	$L = s_{max} \cdot 1.33 + L_{ca} + 37$	
	$L = s_{max} \cdot 1.33 + L_{ca} + 37$	$L = s_{max} + L_{ca} + 3$
	$L = s_{max} \cdot 1.30 + L_{ca} + 38$	

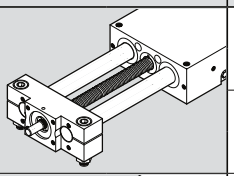
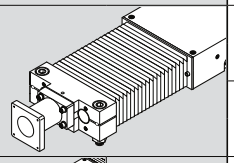
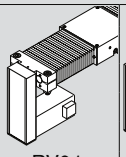
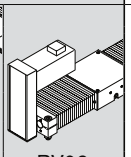
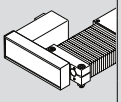
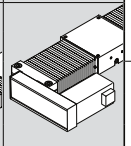
Size	Screw journal	
	with keyway	without keyway
SGK 20-130 with centering depth Z_1, internal		

	Lube nipple DIN 3405	For any required work on the carriage, the following drawings are available as downloads[1)]
	AM6	TB02-016-01
	AM6	TB02-016-02
	AM6	TB02-016-03

1) www.boschrexroth.com/mediadirectory, Linear Motion and Assembly Technologies – Linear Motion Systems – Linear Motion Slides – CAD 83001

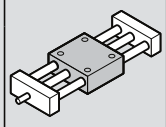
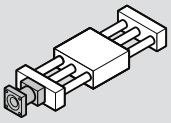
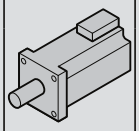
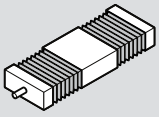
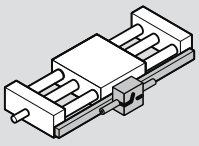
Linear Motion Slide with Ball Screw Drive

SGK 25-160 to SGK 50-280 Components and Ordering Data

		Slide	Part number, length[2] R0261 .00 00, ... mm	Type	Guide: Standard shafts	Drive unit: Screw journal	Ball screw d_0 x P: 20 x 5	20 x 20	25 x 10	32 x 5	32 x 10	32 x 20	32 x 32
With ball screw, w/o motor mount		SGK 25-160 SGK 30-180	R0261 300 00 R0261 400 00	OF01	01	Ø10	01	02	04				
						Ø10[3]	05	06	08				
		SGK 40-230 SGK 50-280	R0261 500 00 R0261 600 00		01	Ø16				01	02	03	04
						Ø16[3]				05	06	07	08
With ball screw and motor mount		SGK 25-160 SGK 30-180	R0261 300 00 R0261 400 00	MF01	01	Ø10	01	02	04				
		SGK 40-230 SGK 50-280	R0261 500 00 R0261 600 00		01	Ø16				01	02	03	04
With ball screw and timing belt side drive	 RV01	SGK 25-160 SGK 30-180	R0261 300 00 R0261 400 00	RV01 RV02	01	Ø10[4]	11	12	14				
	 RV02			RV03 RV04	01	Ø10[4]	11	12	14				
	 RV03[1]	SGK 40-230 SGK 50-280	R0261 500 00 R0261 600 00	RV01 RV02	01	Ø16				01	02	03	04
	 RV04[1]			RV03 RV04	01	Ø16				01	02	03	04

d_0 = screw diameter (mm)
P = screw lead (mm)
i = transmission ratio

For explanations of the ordering parameters and an order example ➠ "Inquiry/Order" on page 76

Carriage	Motor attachment			Motor		Cover		Switches / Cable duct / Socket-plug	Documentation	
										
Standard	i =	Attachment kit[5]	for motor	Brake without	Brake with	PU bellows without	PU bellows with		Standard report	Measurement report[8]
01	–	00		00		00	01	**Without switches** **Without cable duct** 00 **Without socket and plug**	01	02
01	–	03	MSK 040C	86[6]	87[6]			**Switches:** – PNP NC 11 – PNP NO 13 – Mechanical 15 **Ordering data:** Switch type		
		06	MSM 041B	110[6]	111[6]					
01	–	02	MSK 076C	92[6]	93[6]					
		05	MSK 060C	90[6]	91[6]					
01	1	10	MSK 040C	86[6]	87[6]					
		20	MSM 041B	110[6]	111[6]			**Cable duct (loose)**[7] 20		
	1.5	12	MSK 040C	86[6]	87[6]					
		22	MSM 041B	110[6]	111[6]					
01	1	14	MSK 040C	86[6]	87[6]			**Socket-plug** 17		
		24	MSM 041B	110[6]	111[6]					
	1.5	16	MSK 040C	86[6]	87[6]					03
		26	MSM 041B	110[6]	111[6]					
01	1	30	MSK 060C	90[6]	91[6]			**Switching cam and profiled support for switches** 16		
	2	31								
01	1	32								
	2	33								

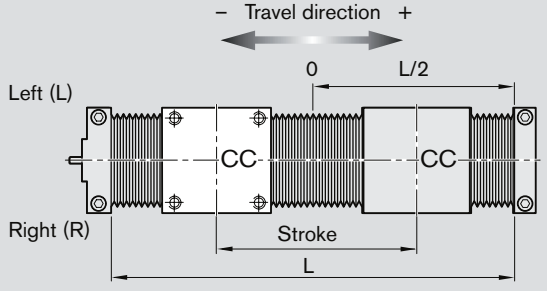
1) Switches can only be mounted on the side opposite the timing belt side drive.
2) Length calculation ➠ Dimensions tables.
3) With keyway
4) Journal version for timing belt side drive with support bearing.
5) Attachment kit also available without motor. When ordering, enter “00” for motor!
6) Recommended motor. Motor data and type designations ➠ “Motors” on page 66.
7) The length of the delivered cable duct is the same as that of the profiled support. If a different length is required, please order the cable duct as a separate part (➠ “Ordering the switches and accessories” on page 62).
8) “02” = Moment of friction measurement; “03” = Lead deviation: ➠ “Documentation” on page 73.

Determining the switch activation point

The switch activation point is determined by the mounting side, the direction of travel and the switching distance (see table above and ordering example).
Mounting side: Switches may be mounted on the left (L) or right (R) side of the slide.
Direction of travel: Switches may be mounted on the minus (-) or plus (+) side of zero.

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).
Refer to the section “Switch mounting arrangements” for more information on switch mounting, switch types, and fixing the mounting duct.

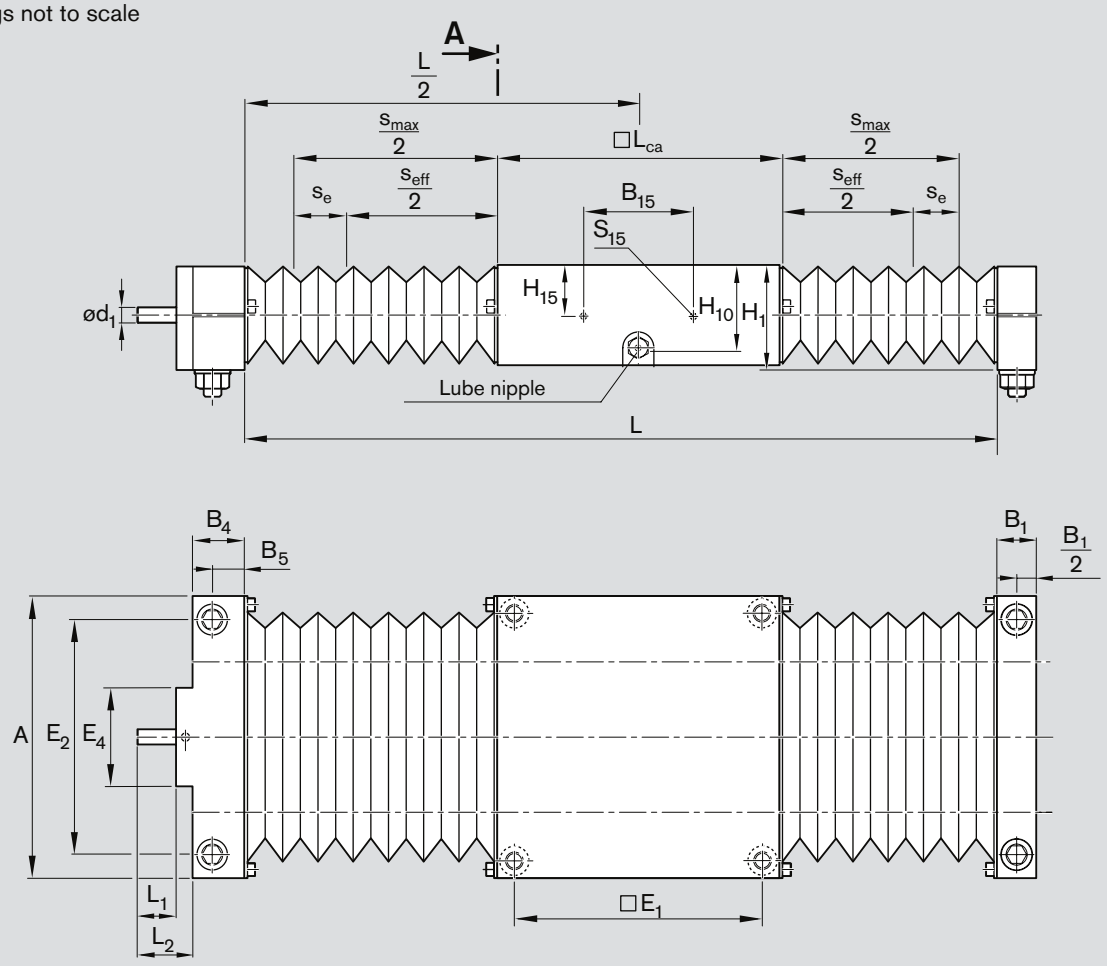
Switch mounting side:



Linear Motion Slide with Ball Screw Drive

SGK 25-160 to SGK 50-280 Dimensions

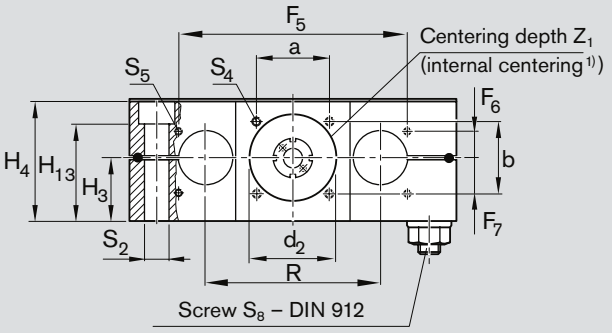
All dimensions in mm
Drawings not to scale

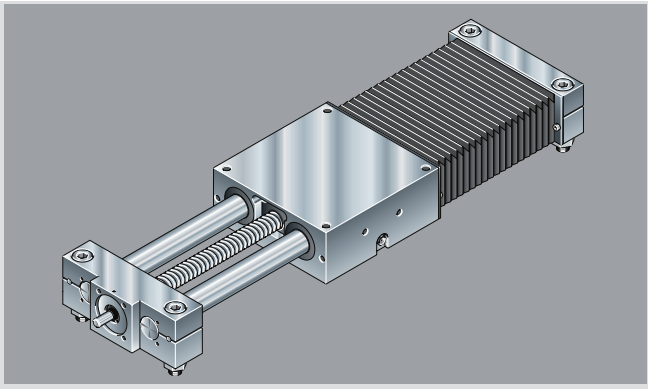


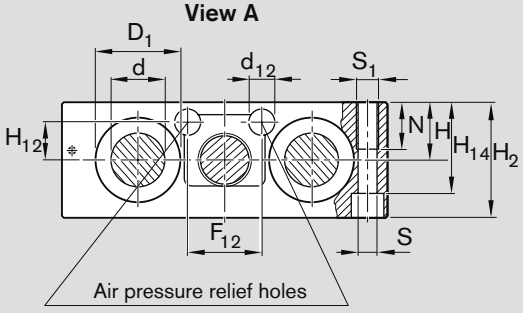
Dimensions for motor attachment ➠ “Motor attachment for SGK / SOK 25-160 to 50-280” on page 52.
Motor dimensions ➠ “Motors” on page 66.

Slide	Screw journal									Holes for locating bracket in both end blocks			
	d_1 h7	d_2	L_1	L_2	Z_1	E_4	a	b	S_4	F_5	F_6	F_7	S_5
SGK 25-160	10	48 H7	25	35.5	2.1	63	40	40	M6 - 12 deep	104	17.5	16.5	M5 - 12 deep
SGK 30-180	10	48 H7	25	35.5	2.1	63	40	40	M6 - 12 deep	126	14.5	19.5	M5 - 12 deep
SGK 40-230	16	$68_{-0.01}$	35	58.0	8.0	–	90	46	M8 - 16 deep	221	14.0	20.0	M5 - 12 deep
SGK 50-280	16	$68_{-0.01}$	35	58.0	8.0	–	90	46	M8 - 16 deep	271	22.0	12.0	M5 - 12 deep

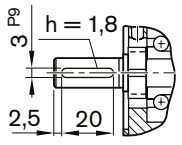
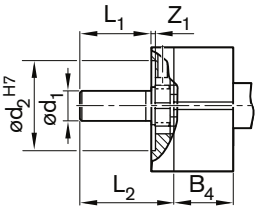
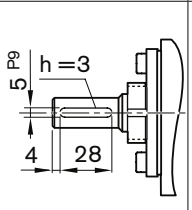
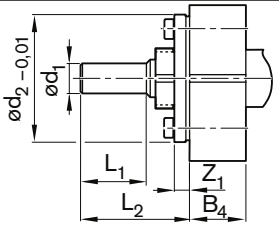
Slide	Dimensions (mm)																					
	d h6	R	B_1	B_4	B_5	H ±0.02	H_1	H_2	H_3 ± 0.015	H_4	H_{10}	H_{13}	H_{14}	D_1	E_1	E_2	L_{ca}	S	S_1	S_2	S_8	N
SGK 25-160	25	88	25	33	20.5	28	58	56	30	57	48	44.6	45.0	40	140	132	160	8.4	M10	13.0	M12 x 60	22
SGK 30-180	30	96	25	33	20.5	32	67	64	35	66	55	53.6	50.5	47	158	150	180	10.5	M12	13.0	M12 x 70	26
SGK 40-230	40	122	30	30	15.0	40	84	80	44	83	71	66.6	64.0	62	202	190	230	13.5	M16	17.0	M16 x 90	34
SGK 50-280	50	152	30	30	15.0	48	100	96	52	99	86	82.6	80.0	75	250	240	280	13.5	M16	17.0	M16 x 100	34







1) Only for SOK 25-160 and SOK 30-180

Size	Screw journal with keyway	Screw journal without keyway
SGK 25-160 SGK 30-180 with centering depth Z_1, internal		
SGK 40-230 SGK 50-280 with centering depth Z_1, external		

$s_{eff} = s_{max} - 2 \cdot s_e$

s_e = excess travel (mm)
s_{eff} = effective stroke (mm)
s_{max} = maximum travel (mm)

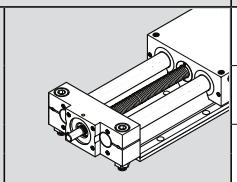
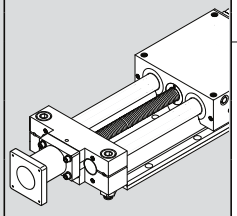
For switching cam			Air pressure relief holes			Length calculation L (mm)	
						with bellows	without bellows
B_{15}	H_{15}	S_{15}	F_{12}	H_{12}	d_{12}		
64	26	M4 - 10 deep	40	18.5	12.5	$L = s_{max} \cdot 1.24 + L_{ca} + 39$	$L = s_{max} + L_{ca} + 3$
64	33	M4 - 10 deep	40	21.0	15.0	$L = s_{max} \cdot 1.20 + L_{ca} + 38$	
64	21	M4 - 10 deep	54	28.0	18.0	$L = s_{max} \cdot 1.17 + L_{ca} + 43$	
64	21	M4 - 10 deep	60	30.0	22.0	$L = s_{max} \cdot 1.14 + L_{ca} + 43$	

Lube nipple DIN 3405	For any required work on the carriage, the following drawings are available as downloads[2)]
AM8 x 1	TB02-016-04
AM8 x 1	TB02-016-05
AM8 x 1	TB02-016-06
AM8 x 1	TB02-016-07

2) www.boschrexroth.com/mediadirectory, Linear Motion and Assembly Technologies – Linear Motion Systems – Linear Motion Slides – CAD 83001

Linear Motion Slide with Ball Screw Drive

SOK 12-85 to SOK 20-130 Components and Ordering Data

		Slide	Part number, length[1] R0266 .00 00, ... mm	Type	Guide: Standard shafts	Drive unit: Screw journal	Ball screw d_0 x P: 8 x 2.5	12 x 5	12 x 10	16 x 5	16 x 10	16 x 16
With ball screw, w/o motor mount		SOK 12-85	R0266 000 00	OF01	02	Ø6	01					
		SOK 16-100	R0266 100 00		02	Ø6		01	02			
		SOK 20-130	R0266 200 00		02	Ø9				01	02	03
						Ø9[2]				04	05	06
With ball screw and motor mount		SOK 12-85	R0266 000 00	MF01	02	Ø6	01					
		SOK 16-100	R0266 100 00		02	Ø6		01	02			
		SOK 20-130	R0266 200 00		02	Ø9				01	02	03

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

For explanations of the ordering parameters and an order example ➠ "Inquiry/Order" on page 76

Carriage	Motor attachment			Motor		Cover		Switches / Cable duct / Socket-plug	Documentation	
Standard	i =	Attachment kit[3]	for motor	Brake without	Brake with	PU bellows without	PU bellows with		Standard report	Measurement report[6]
01	–	00		00		00	01	**Without switches / Without cable duct / Without socket and plug** 00	01	02
01	–	00		00						
01	–	00		00				**Switches:** – PNP NC 11 – PNP NO 13 – Mechanical 15 **Ordering data:** Switch type		
01	–	03	MSM 031B	106[4]	107[4]					
01	–	03	MSM 031B	106[4]	107[4]					
01	–	01	MSK 040C	86[4]	87[4]			**Cable duct (loose)[5]** 20		
		04	MSK 030C	84[4]	85[4]			**Socket-plug** 17		03
		05	MSM 031C	108[4]	109[4]			**Switching cam and profiled support for switches** 16		
		06	MSM 041B	110[4]	111[4]					

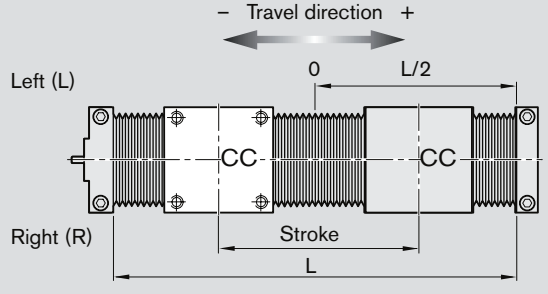
1) Length calculation ➠ Dimensions tables.
2) With keyway
3) Attachment kit also available without motor. When ordering, enter “00” for motor!
4) Recommended motor. Motor data and type designations ➠ “Motors” on page 66.
5) The length of the delivered cable duct is the same as that of the profiled support. If a different length is required, please order the cable duct as a separate part (➠ “Ordering the switches and accessories” on page 62).
6) “02” = Moment of friction measurement; “03” = Lead deviation: ➠ “Documentation” on page 73.

Determining the switch activation point

The switch activation point is determined by the mounting side, the direction of travel and the switching distance (see table above and ordering example).
Mounting side: Switches may be mounted on the left (L) or right (R) side of the slide.
Direction of travel: Switches may be mounted on the minus (-) or plus (+) side of zero.

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).
Refer to the section “Switch mounting arrangements” for more information on switch mounting, switch types, and fixing the mounting duct.

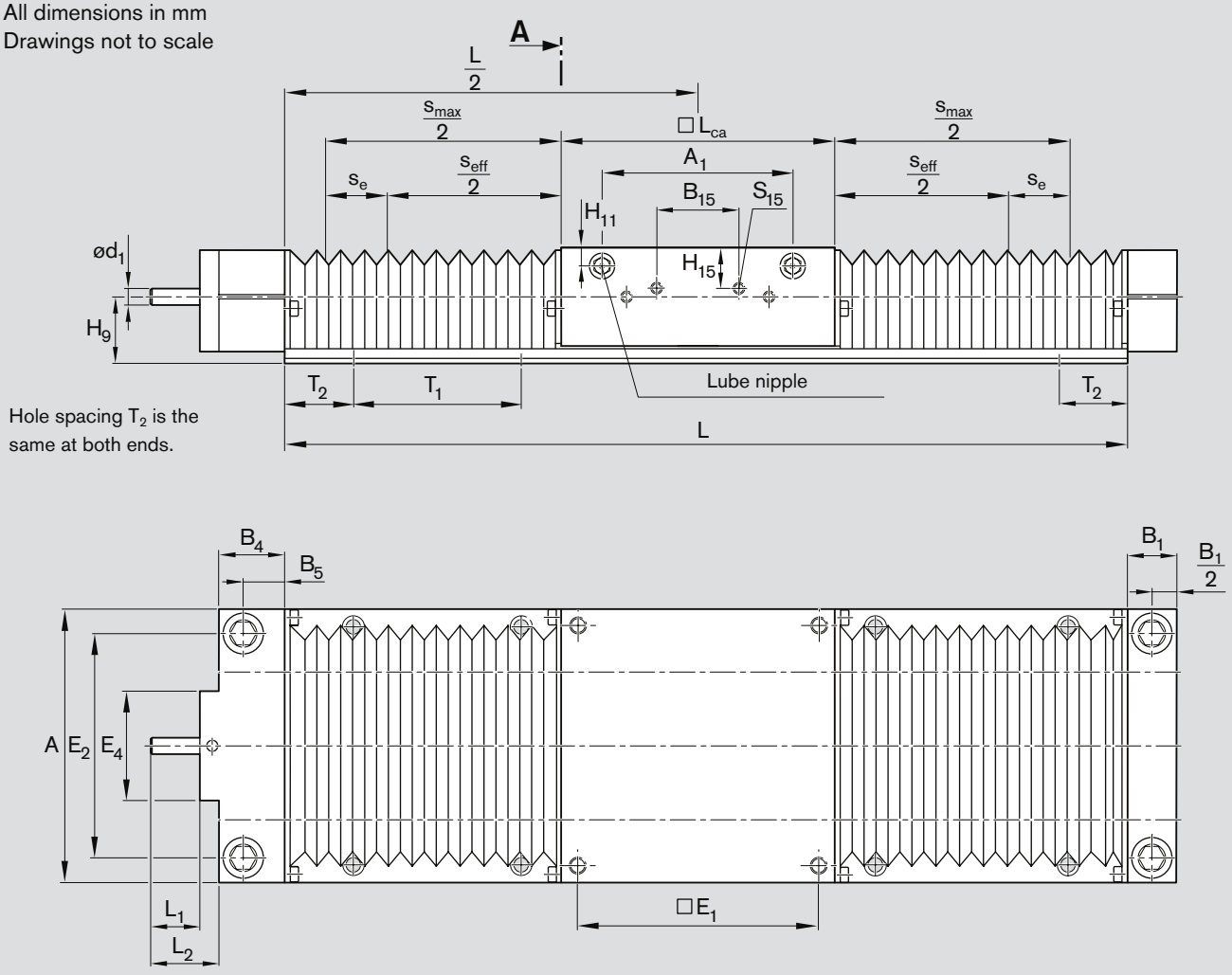
Switch mounting side:



Linear Motion Slide with Ball Screw Drive

SOK 12-85 to SOK 20-130 Dimensions

All dimensions in mm
Drawings not to scale

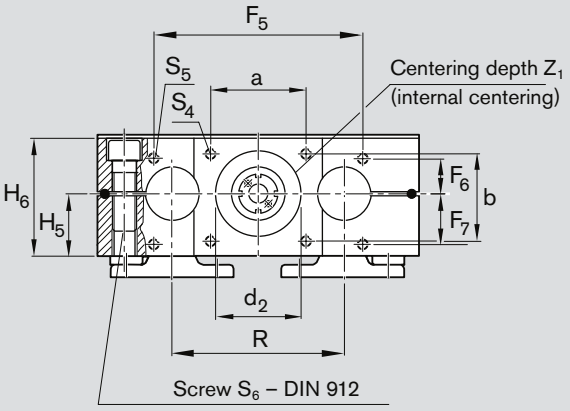


Hole spacing T_2 is the same at both ends.

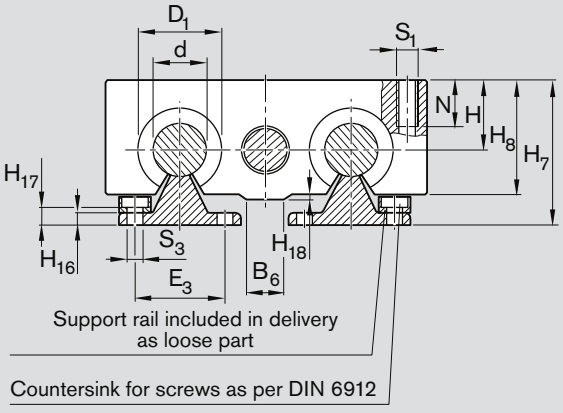
Motor dimensions ➠ “Motors” on page 66.

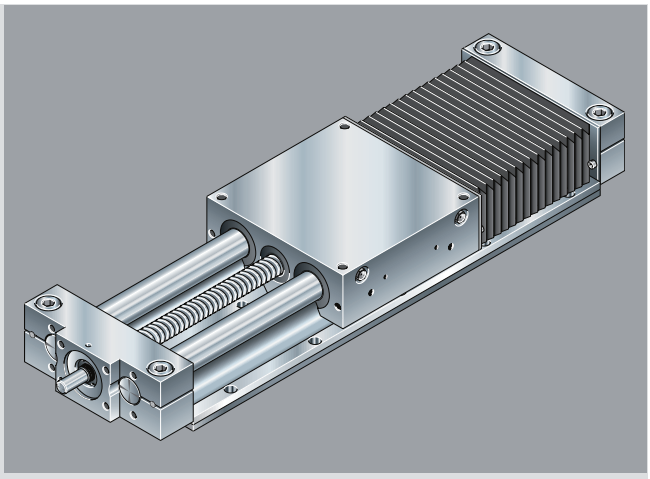
Slide	Screw journal									Holes for locating bracket in both end blocks				For switching cam		
	d_1 h7	d_2 H7	L_1	L_2	Z_1	E_4	a	b	S_4	F_5	F_6	F_7	S_5	B_{15}	H_{15}	S_{15}
SOK 12-85	6	28	18	25.0	2.1	40	33	23	M4 - 8 deep	53	9.5	11.5	M4 - 8 deep	30	13.5	M4 - 7 deep
SOK 16-100	6	28	18	25.0	2.1	40	33	23	M4 - 8 deep	60	11.0	14.0	M4 - 8 deep	30	13.0	M4 - 7 deep
SOK 20-130	9	40	25	34.5	2.1	52	40	28	M6 - 12 deep	74	15.5	18.5	M5 - 12 deep	64	23.0	M4 - 8 deep

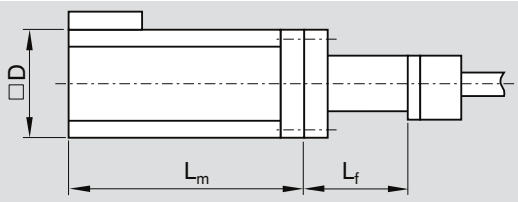
Slide	Dimensions (mm)																			
	d h6	R	B_1	B_4	B_5	H ± 0.02	H_5	H_6	H_7	H_8	H_9	H_{18}	B_6	D_1	E_1	E_2	L_{ca}	S_1	S_6	N
SOK 12-85	12	42	14	24	17	18	15	30	40	30	22	–	–	22	73	70	85	M6	M6 x 22	13
SOK 16-100	16	54	18	24	15	22	17	34	48	35	26	3.0	15	26	88	82	100	M6	M8 x 25	13
SOK 20-130	20	72	20	29	19	25	22	44	57	42	32	3.5	12	32	115	108	130	M8	M10 x 30	18



View A





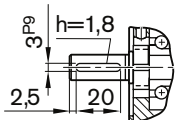
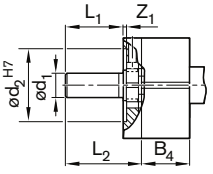


Motor	Slide	Dimensions (mm)			
		L_m		D	L_f
		without brake	with brake		
MSM 031B	SOK 12-85	79.0	115.5	60.0	50.0
	SOK 16-100				
MSM 031C	SOK 20-130	98.5	135.0	60.0	72.0
MSM 041B		112.0	149.0	80.0	83.0
MSK 030C		188.0	213.0	51.0	75.0
MSK 040C		185.5	215.5	82.0	77.5

$$s_{eff} = s_{max} - 2 \cdot s_e$$

s_e = excess travel (mm)
s_{eff} = effective stroke (mm)
s_{max} = maximum travel (mm)

Length calculation L (mm) with bellows	without bellows
$L = s_{max} \cdot 1.33 + L_{ca} + 37$	
$L = s_{max} \cdot 1.33 + L_{ca} + 37$	$L = s_{max} + L_{ca} + 3$
$L = s_{max} \cdot 1.30 + L_{ca} + 38$	

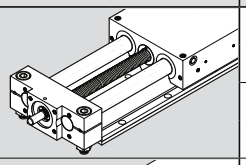
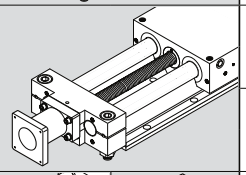
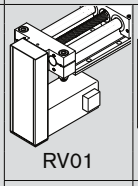
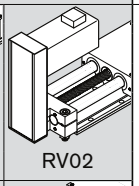
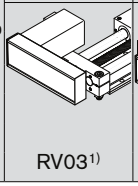
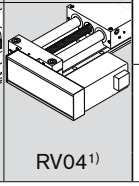
Size	Screw journal with keyway	without keyway
SOK 20-130 with centering depth Z_1, internal		

Shaft support rails						Lube nipple			For any required work on the carriage, the following drawings are available as downloads[1)]
H_{16}	H_{17}	E_3	S_3	T_1	T_2	A_1	H_{11}	DIN 3405	
5	6.5	29	4.5	75	≥ 15	57	7.0	AM6	TB02-016-11
5	8.3	33	5.5	100	≥ 20	68	7.2	AM6	TB02-016-12
6	9.8	37	6.6	100	≥ 20	94	7.2	AM6	TB02-016-13

1) www.boschrexroth.com/mediadirectory, Linear Motion and Assembly Technologies – Linear Motion Systems – Linear Motion Slides – CAD 83001

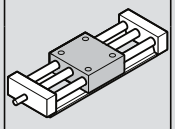
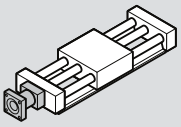
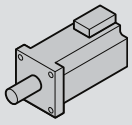
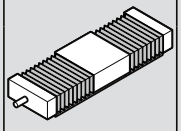
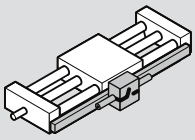
Linear Motion Slide with Ball Screw Drive

SOK 25-160 to SOK 50-280 Components and Ordering Data

		Slide	Part number, length[2] R0266 .00 00, ... mm	Type	Guide: Standard shafts	Drive unit: Screw journal	Ball screw d_0 x P: 20 x 5	20 x 20	25 x 10	32 x 5	32 x 10	32 x 20	32 x 32
With ball screw, w/o motor mount		SOK 25-160 SOK 30-180	R0266 300 00 R0266 400 00	OF01	02	Ø10	01	02	04				
						Ø10[3]	05	06	08				
		SOK 40-230 SOK 50-280	R0266 500 00 R0266 600 00		02	Ø16				01	02	03	04
						Ø16[3]				05	06	07	08
With ball screw and motor mount		SOK 25-160 SOK 30-180	R0266 300 00 R0266 400 00	MF01	02	Ø10	01	02	04				
		SOK 40-230 SOK 50-280	R0266 500 00 R0266 600 00		02	Ø16				01	02	03	04
With ball screw and timing belt side drive	 RV01	SOK 25-160 SOK 30-180	R0266 300 00 R0266 400 00	RV01 RV02	02	Ø10[4]	11	12	14				
	 RV02			RV03 RV04	02	Ø10[4]	11	12	14				
	 RV03[1]	SOK 40-230 SOK 50-280	R0266 500 00 R0266 600 00	RV01 RV02	02	Ø16				01	02	03	04
	 RV04[1]			RV03 RV04	02	Ø16				01	02	03	04

d_0 = screw diameter (mm)
P = screw lead (mm)
i = transmission ratio

For explanations of the ordering parameters and an order example ➠ "Inquiry/Order" on page 76

Carriage	Motor attachment			Motor		Cover		Switches / Cable duct / Socket-plug	Documentation	
										
Standard	i =	Attachment kit[5]	for motor	Brake without	Brake with	PU bellows without	PU bellows with		Standard report	Measurement report[8]
01	1	00		00		00	01	**Without switches** **Without cable duct** 00 **Without socket and plug**	01	02
01	1	00		00						
01	1	03	MSK 040C	86[6]	87[6]			**Switches:** – PNP NC 11 – PNP NO 13 – Mechanical 15 **Ordering data:** Switch type		
		06	MSM 041B	110[6]	111[6]					
01	1	02	MSK 076C	92[6]	93[6]					
		05	MSK 060C	90[6]	91[6]					
01	1	10	MSK 040C	86[6]	87[6]					
		20	MSM 041B	110[6]	111[6]					
	1.5	12	MSK 040C	86[6]	87[6]					
		22	MSM 041B	110[6]	111[6]					
01	1	14	MSK 040C	86[6]	87[6]			**Cable duct (loose)[7]** 20		
		24	MSM 041B	110[6]	111[6]					
	1.5	16	MSK 040C	86[6]	87[6]			**Socket-plug** 17		03
		26	MSM 041B	110[6]	111[6]					
01	1	30	MSK 060C	90[6]	91[6]			**Switching cam and profiled support for switches** 16		
	2	31								
01	1	32								
	2	33								

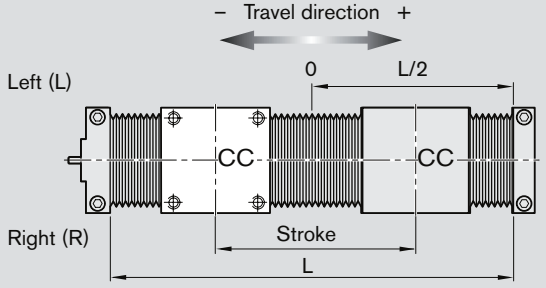
1) Switches can only be mounted on the side opposite the timing belt side drive.
2) Length calculation ➠ Dimensions tables.
3) With keyway
4) Journal version for timing belt side drive with support bearing.
5) Attachment kit also available without motor. When ordering, enter “00” for motor!
6) Recommended motor. Motor data and type designations ➠ “Motors” on page 66.
7) The length of the delivered cable duct is the same as that of the profiled support. If a different length is required, please order the cable duct as a separate part (➠ “Ordering the switches and accessories” on page 62).
8) “02” = Moment of friction measurement; “03” = Lead deviation: ➠ “Documentation” on page 73.

Determining the switch activation point

The switch activation point is determined by the mounting side, the direction of travel and the switching distance (see table above and ordering example).
Mounting side: Switches may be mounted on the left (L) or right (R) side of the slide.
Direction of travel: Switches may be mounted on the minus (-) or plus (+) side of zero.

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).
Refer to the section “Switch mounting arrangements” for more information on switch mounting, switch types, and fixing the mounting duct.

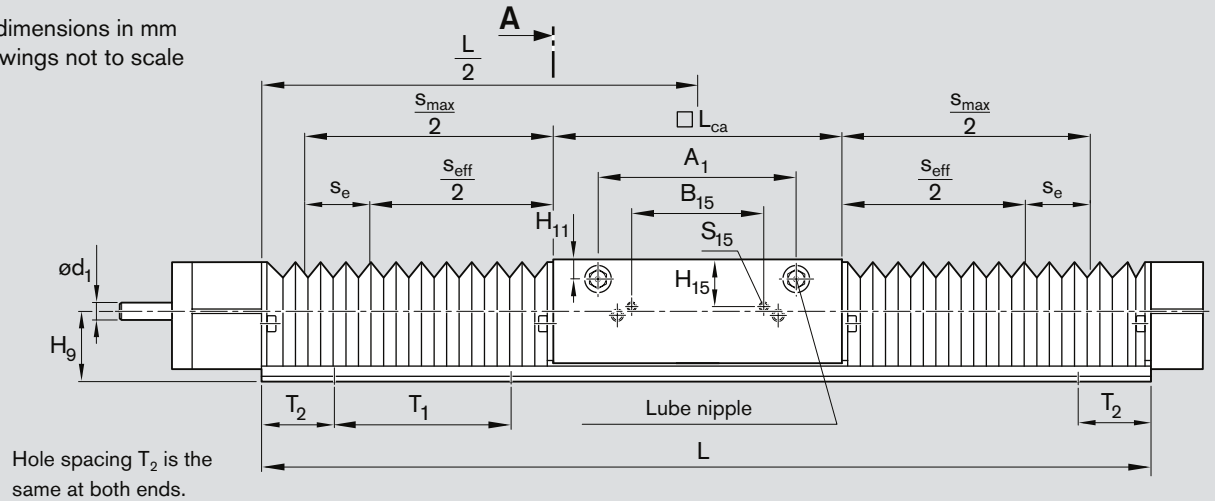
Switch mounting side:



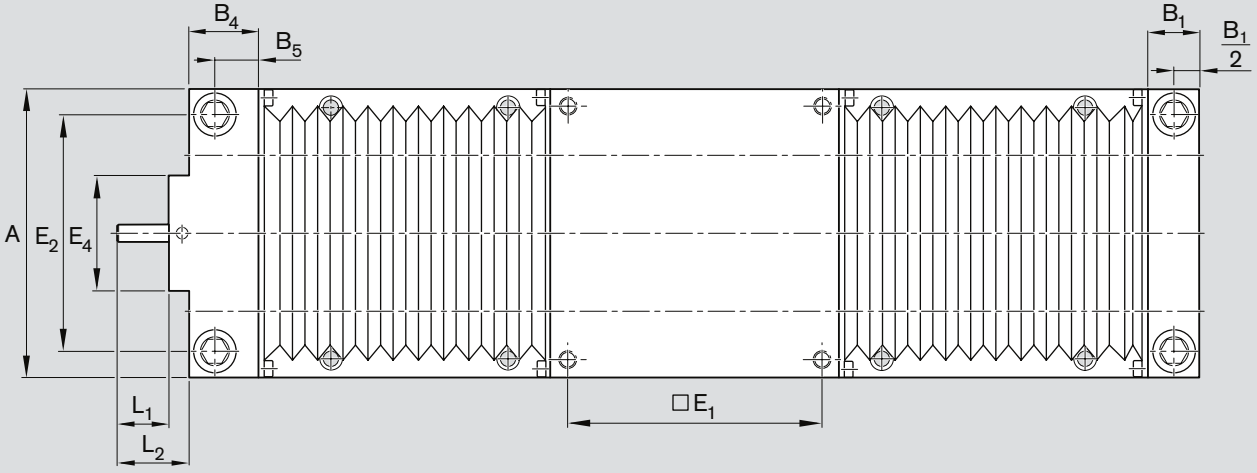
Linear Motion Slide with Ball Screw Drive

SOK 25-160 to SOK 50-280 Dimensions

All dimensions in mm
Drawings not to scale



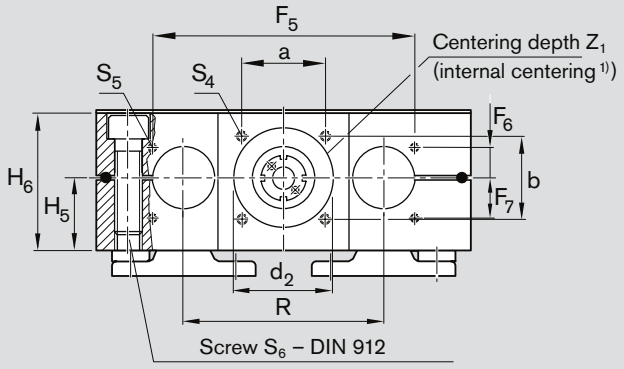
Hole spacing T_2 is the same at both ends.

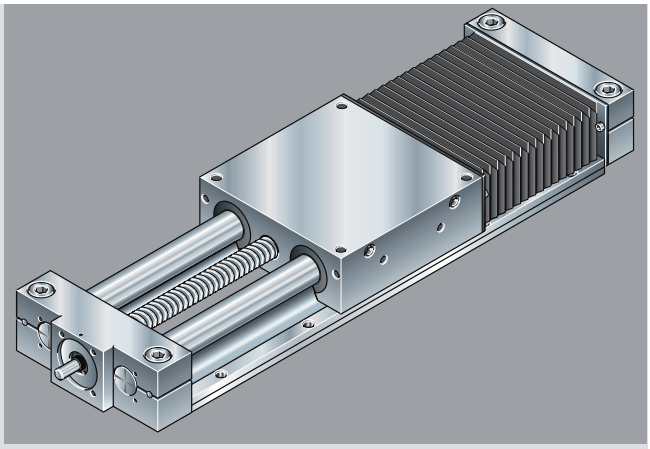


Dimensions for motor attachment ➠ “Motor attachment for SGK / SOK 25-160 to 50-280” on page 52.
Motor dimensions ➠ “Motors” on page 66.

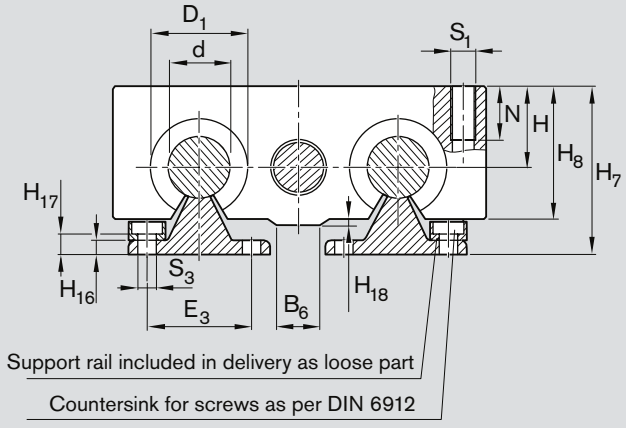
Slide	Screw journal, Mounting geometry (mm)										Holes for locating bracket in both end blocks			
	d_1 h7	d_2	L_1	L_2	L_{ca}	Z_1	E_4	a	b	S_4	F_5	F_6	F_7	S_5
SOK 25-160	10	48 ^{H7}	25	35.5	160	2.1	63	40	40	M6 - 12 deep	104	17.5	16.5	M5 - 12 deep
SOK 30-180	10	48 ^{H7}	25	35.5	180	2.1	63	40	40	M6 - 12 deep	126	14.5	19.5	M5 - 12 deep
SOK 40-230	16	68$_{-0.01}$	35	58.0	230	8.0	–	90	46	M8 - 16 deep	221	14.0	20.0	M5 - 12 deep
SOK 50-280	16	68$_{-0.01}$	35	58.0	280	8.0	–	90	46	M8 - 16 deep	271	22.0	12.0	M5 - 12 deep

Slide	Dimensions (mm)																	
	d h6	R	B_1	B_4	B_5	H ± 0.02	H_5	H_6	H_7	H_8	H_9	H_{18}	B_6	D_1	E_1	E_2		S_1
SOK 25-160	25	88	25	33	20.5	30	27	54	66	51	36	2.5	15	40	140	132	160	M10
SOK 30-180	30	96	25	33	20.5	35	31	62	77	60	42	–	–	47	158	150	180	M12
SOK 40-230	40	122	30	30	15.0	45	39	78	95	77	50	–	–	62	202	190	230	M16
SOK 50-280	50	152	30	30	15.0	55	47	94	115	93	60	–	–	75	250	240	280	M16

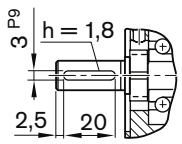
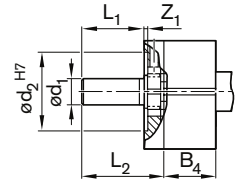
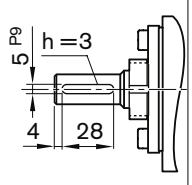
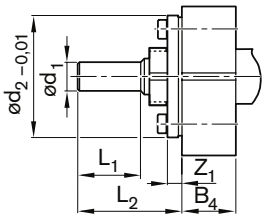




View A



1) Only for SOK 25-160 and SOK 30-180

Size	Screw journal with keyway	without keyway
SOK 25-160 SOK 30-180 with centering depth Z_1, internal		
SOK 40-230 SOK 50-280 with centering depth Z_1, external		

$s_{eff} = s_{max} - 2 \cdot s_e$

s_e = excess travel (mm)
s_{eff} = effective stroke (mm)
s_{max} = maximum travel (mm)

For switching cam B_{15}	H_{15}	S_{15}	Length calculation[2] L (mm) with bellows	without bellows
64	28	M4 - 10 deep	$L = s_{max} \cdot 1.24 + L_{ca} + 39$	$L = s_{max} + L_{ca} + 3$
64	36	M4 - 10 deep	$L = s_{max} \cdot 1.20 + L_{ca} + 38$	
64	26	M4 - 10 deep	$L = s_{max} \cdot 1.14 + L_{ca} + 39$	
64	28	M4 - 10 deep	$L = s_{max} \cdot 1.112 + L_{ca} + 40$	

2) For Linear Motion Slides SOK 40-230 L > 400 and L < 460 and Linear Motion Slides SOK 50-280 L > 600 and L < 660 please request information concerning spacing and mounting hole pattern for shafts and shaft support rails.

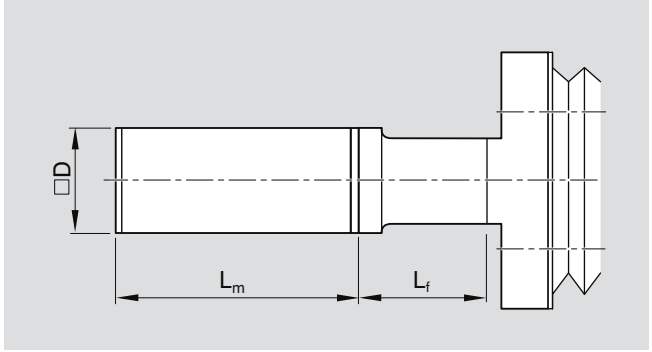
Shaft support rails S_6	N	H_{16}	H_{17}	E_3	S_3	T_1	T_2	Lube nipple A_1	H_{11}	DIN 3405	For any required work on the carriage, the following drawings are available as downloads[3]
M12 x 40	22	6	9.8	42	6.6	120	≥ 24	116	9.5	AM8 x 1	TB02-016-14
M12 x 45	26	7	10.0	51	9.0	150	≥ 30	130	9.5	AM8 x 1	TB02-016-15
M16 x 60	34	8	11.8	55	9.0	200	≥ 30	170	11.5	AM8 x 1	TB02-016-16
M16 x 60	34	9	14.3	63	11.0	200	≥ 30	220	15.0	AM8 x 1	TB02-016-17

3) www.boschrexroth.com/mediadirectory, Linear Motion and Assembly Technologies – Linear Motion Systems – Linear Motion Slides – CAD 83001

Linear Motion Slide with Ball Screw Drive

Motor attachment for SGK / SOK 25-160 to 50-280

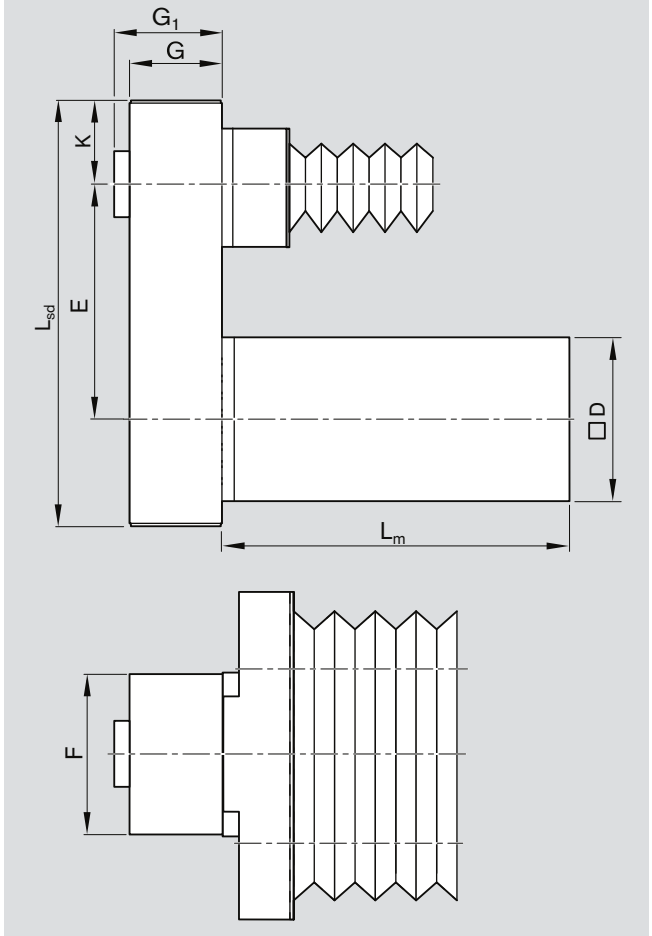
MF01



Motor	Dimensions (mm)			
	D	L_f		L_m
			Brake without	with
MSM 031B	60.0	50	79.0	115.5
MSM 031C	60.0	72	98.5	135.0
MSM 041B	80.0	83	112.0	149.0
MSK 030C	54.0	75	188.0	213.0
MSK 040C	82.0	81	185.5	215.5
MSK 060C	116.0	125	226.0	259.0
MSK 076C	140.0	125	292.5	292.5

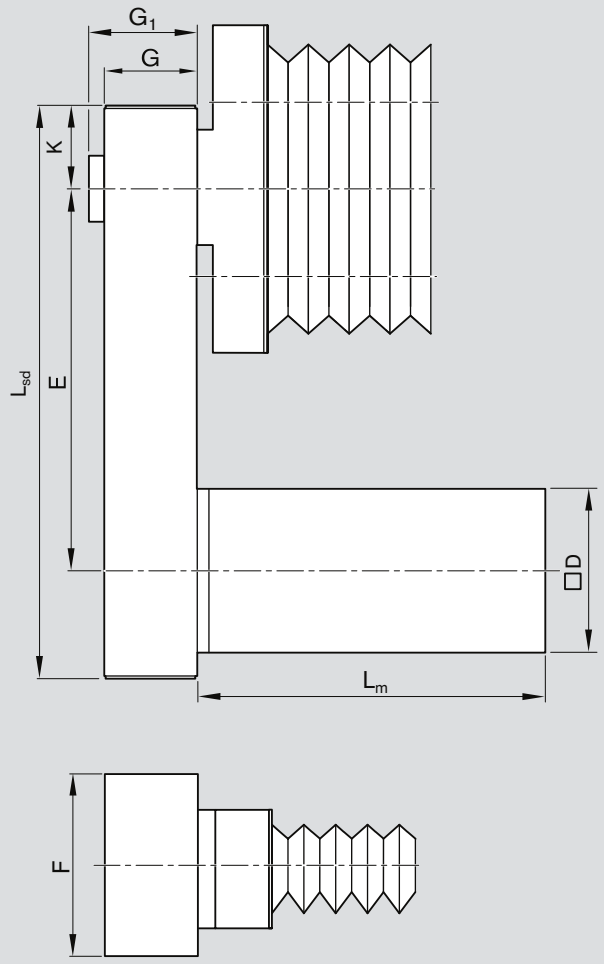
L_f = length of motor mount
L_m = length of motor
L_{sd} = length of timing belt side drive
F = width of belt pulley housing

RV01, RV02



Motor	Dimensions (mm)										
	D			E	G_1	G	F	K		L_m	L_{sd}
		i = 1	i = 1.5	i = 2					Brake w/o	with	
MSM 041B	80.0	165.0	162	–	57	66	116	59.0	112.0	149.0	300
MSK 040C	82.0	122.5	122	–	57	51	88	43.5	185.5	215.5	227
MSK 060C	116.0	165.0	–	162	–	66	116	59.0	226.0	259.0	300

RV03, RV04



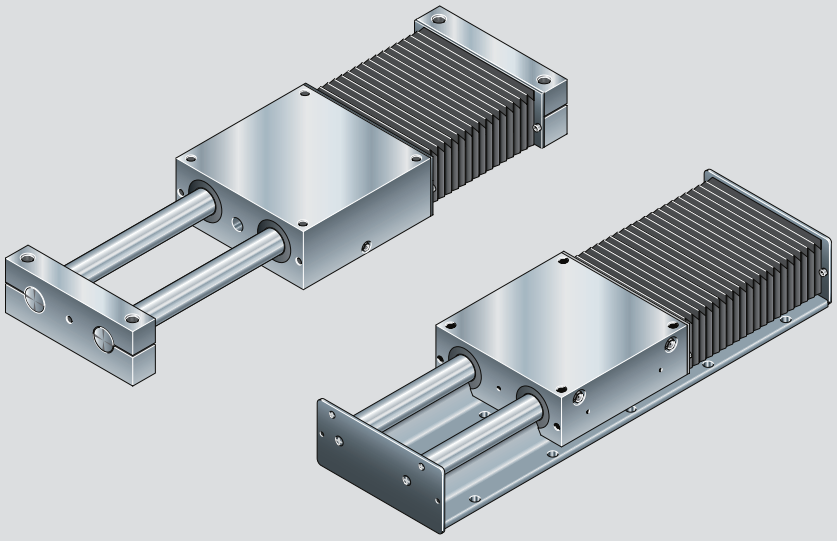
Motor	Dimensions (mm)										
	D	E			G_1	G	F	K	L_m		L_{sd}
		i = 1	i = 1.5	i = 2					Brake		
									w/o	with	
MSM 041B	80.0	267.5	265	–	57	66	116	59.0	112.0	149.0	403
MSK 040C	82.0	157.5	162	–	57	51	88	43.5	185.5	215.5	267
MSK 060C	116.0	267.5	–	265	–	66	116	59.0	226.0	259.0	403

Linear Motion Slide without Drive Unit

Product Description

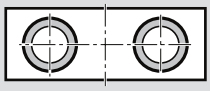
Characteristics

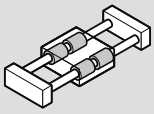
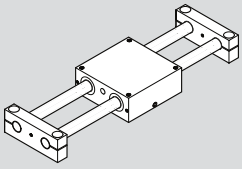
- Particularly smooth running and long service life thanks to Rexroth Super Linear Bushings[1)]
- One-point lubrication on either side of the guide system, for grease lubrication only
- Freely selectable length
- Oil- and moisture-resistant PU bellows-type protective cover (the last fold is mechanically clamped)



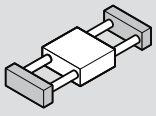
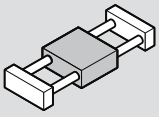
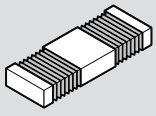
1) Size 8-65 with Standard Linear Bushings

SGO 8-65 to SGO 50-280 Components and Ordering Data



	Slide	Part number, length[1)] R0260 .00 00, ... mm	Type	Guide		
						
				Standard shafts	Corrosion-resistant steel shafts per DIN 17230 / EN 10088	
	SGO 8-65	R0260 900 00	OA01	01	02	
	SGO 12-85	R0260 000 00				
	SGO 16-100	R0260 100 00				
	SGO 20-130	R0260 200 00				
	SGO 25-160	R0260 300 00				
	SGO 30-180	R0260 400 00				
	SGO 40-230	R0260 500 00				
	SGO 50-280	R0260 600 00				

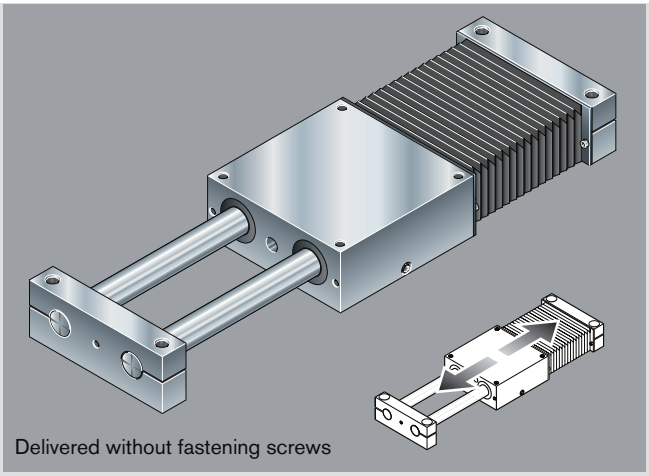
1) Length calculation ➠ table on page 57

	Drive Unit (end block)		Carriage	Cover		Documentation
						
	End block A	End block B	Standard	Polyurethane bellows without	Polyurethane bellows with	Standard
	01	02	01	00	01	01

Linear Motion Slide without Drive Unit

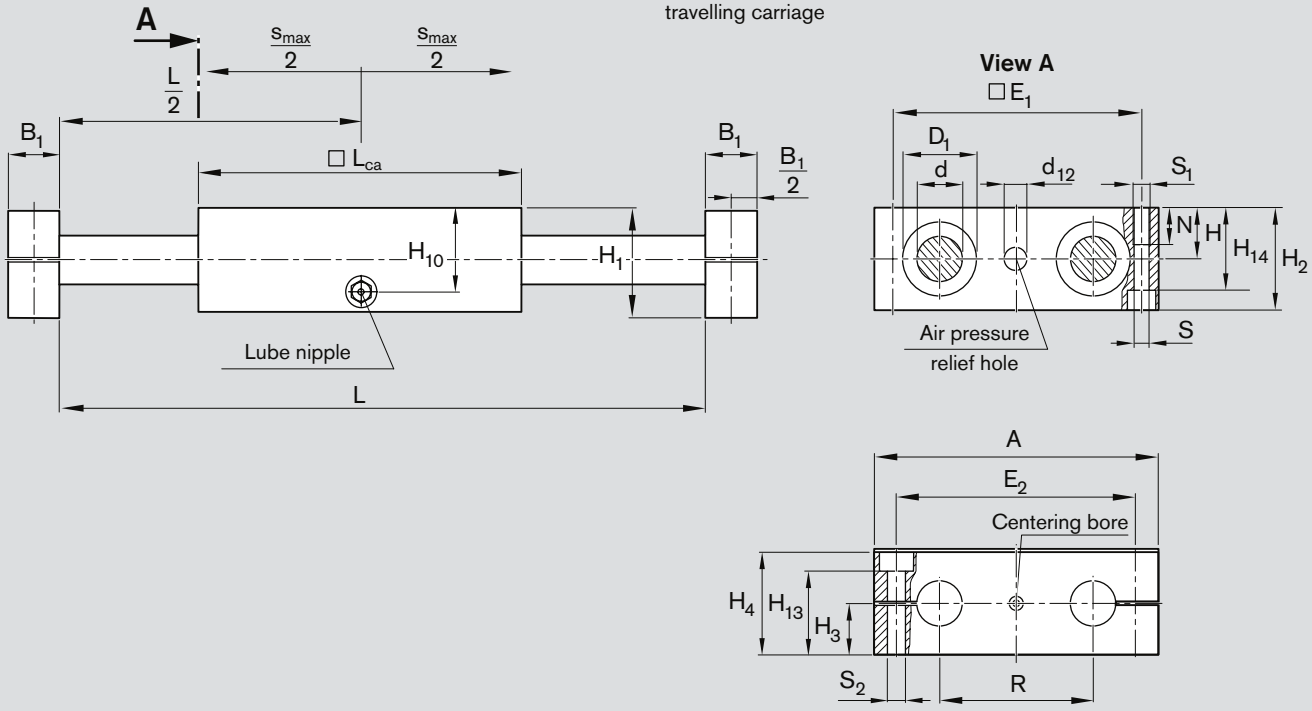
SGO 8-65 to SGO 50-280 Dimensions

Linear Motion Slides consist of:
- carriage (Al alloy)
- four Super Linear Bushings; size 8: Standard Linear Bushings
- four seals
- two end blocks (Al alloy)
- two precision steel shafts: tolerance grade h6
- air pressure relief holes for versions with installed bellows



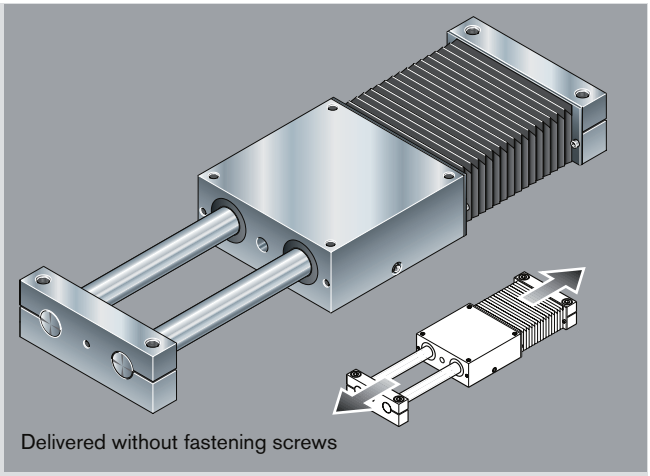
End block A

For applications with screwed-down end blocks and travelling carriage



Slide	Dimensions (mm)																		
	d h6	L_{ca}	R	B_1	H ± 0.02	H_1[1]	H_2	H_3 ± 0.015	H_4	H_{10}	H_{13}	H_{14}	D_1	E_1	E_2	S	S_1	S_2	N
SGO 8-65	8	65	32	12	11.5	24	23	12.5	23.5	19.5	18.1	17.5	16	55	52	4.3	M5	5.5	11
SGO 12-85	12	85	42	14	16	34	32	18.0	33.0	27.0	26.6	25.0	22	73	70	5.3	M6	6.6	13
SGO 16-100	16	100	54	18	18	38	36	20.0	37.0	31.0	28.6	29.0	26	88	82	5.3	M6	9.0	13
SGO 20-130	20	130	72	20	23	48	46	25.0	47.0	39.0	36.6	37.5	32	115	108	6.6	M8	11.0	18
SGO 25-160	25	160	88	25	28	58	56	30.0	57.0	48.0	44.6	45.0	40	140	132	8.4	M10	13.0	22
SGO 30-180	30	180	96	25	32	67	64	35.0	66.0	55.0	53.6	50.5	47	158	150	10.5	M12	13.0	26
SGO 40-230	40	230	122	30	40	84	80	44.0	83.0	71.0	66.6	64.0	62	202	190	13.5	M16	17.0	34
SGO 50-280	50	280	152	30	48	100	96	52.0	99.0	86.0	82.6	80.0	75	250	240	13.5	M16	17.0	34

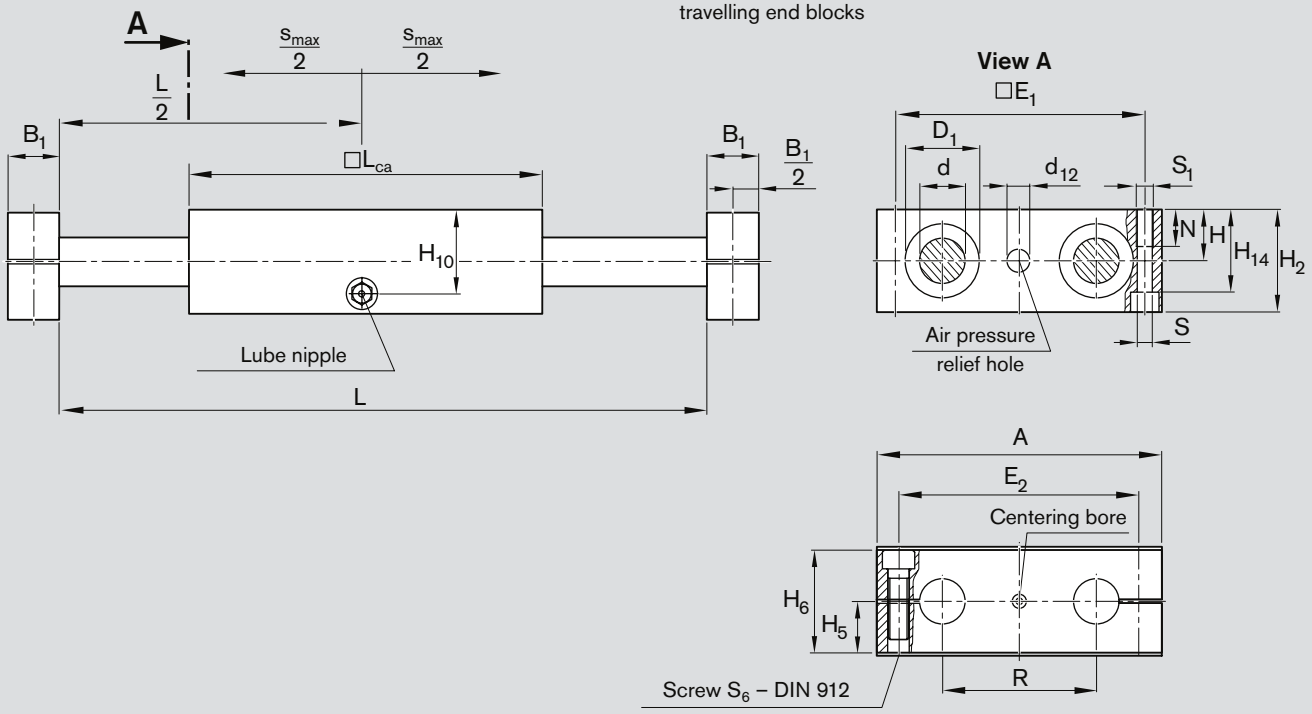
1) Only for end block A



Delivered without fastening screws

End block B

For applications with screwed-down carriage and travelling end blocks

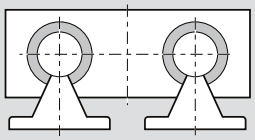


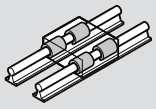
End block B S_6	H_5	H_6	Lube nipple DIN 3405	For versions with bellows: air pressure relief hole d_{12} (mm)	Length calculation L (mm) with bellows	without bellows
M 5 x 15	11	22	D 4	8	$L = s_{max} \cdot 1.40 + L_{ca} + 34$	$L = s_{max} + L_{ca} + 3$
M 6 x 22	15	30	AM 6	10	$L = s_{max} \cdot 1.33 + L_{ca} + 37$	
M 8 x 25	17	34	AM 6	12	$L = s_{max} \cdot 1.33 + L_{ca} + 37$	
M 10 x 30	22	44	AM 6	14	$L = s_{max} \cdot 1.30 + L_{ca} + 38$	
M 12 x 40	27	54	AM 8 x 1	16	$L = s_{max} \cdot 1.24 + L_{ca} + 39$	
M 12 x 45	31	62	AM 8 x 1	20	$L = s_{max} \cdot 1.20 + L_{ca} + 38$	
M 16 x 60	39	78	AM 8 x 1	22	$L = s_{max} \cdot 1.17 + L_{ca} + 43$	
M16 x 60	47	94	AM 8 x 1	25	$L = s_{max} \cdot 1.14 + L_{ca} + 43$	

s_{max} = maximum travel (mm)

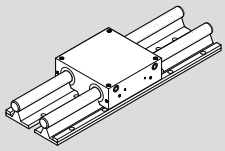
Linear Motion Slide without Drive Unit

SOO 12-85 to SOO 50-280 Components and Ordering Data

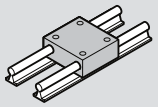
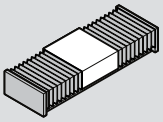




Slide	Part number, length[1] R0265 .00 00, ... mm	Type	Guide: Standard shafts Bellows[3] without	Guide: Standard shafts Bellows[3] with	Guide: Corrosion-resistant steel shafts[2] Bellows[3] without	Guide: Corrosion-resistant steel shafts[2] Bellows[3] with
SOO 12-85	R0265 000 00	OA01	01	04	02	05
SOO 16-100	R0265 100 00					
SOO 20-130	R0265 200 00					
SOO 25-160	R0265 300 00					
SOO 30-180	R0265 400 00					
SOO 40-230	R0265 500 00					
SOO 50-280	R0265 600 00					



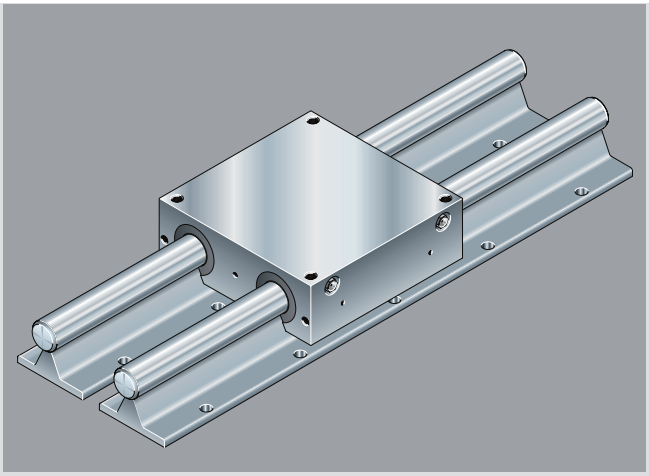
1) Length calculation ➠ table on page 60
2) As per DIN 17230 / EN 10088
3) In the Linear Motion Slide SOO with bellows, end plates are screwed to each end of the shafts. (See Dimensions).

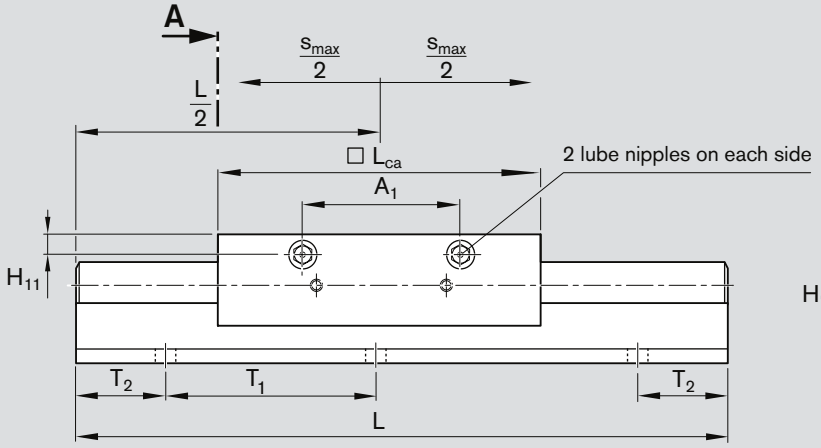
	Carriage  Standard	Cover  Polyurethane bellows without	with	Documentation  Standard
	01	00	01	01

Linear Motion Slide without Drive Unit

SOO 12-85 to SOO 50-280 Dimensions

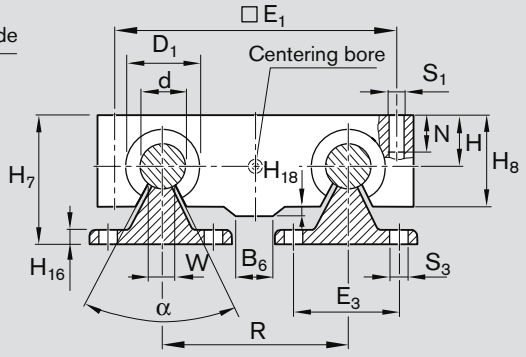
Linear Motion Slides consist of:
- carriage (Al alloy)
- four Super Linear Bushings
- four seals
- two precision steel shafts, tolerance grade h6, with shaft support rails (Al alloy)





Hole spacing T2 is the same at both ends.

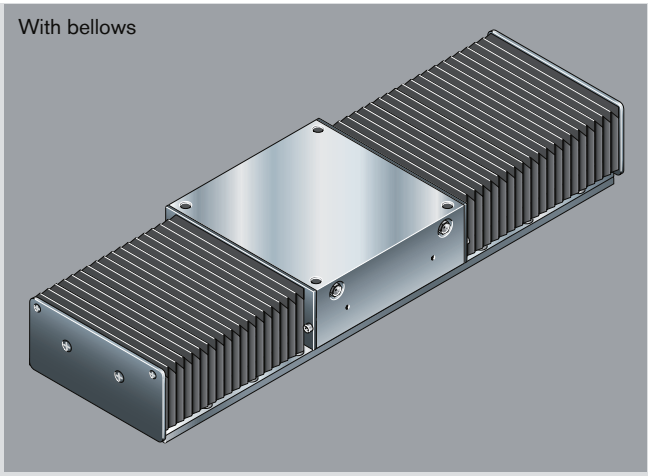
View A

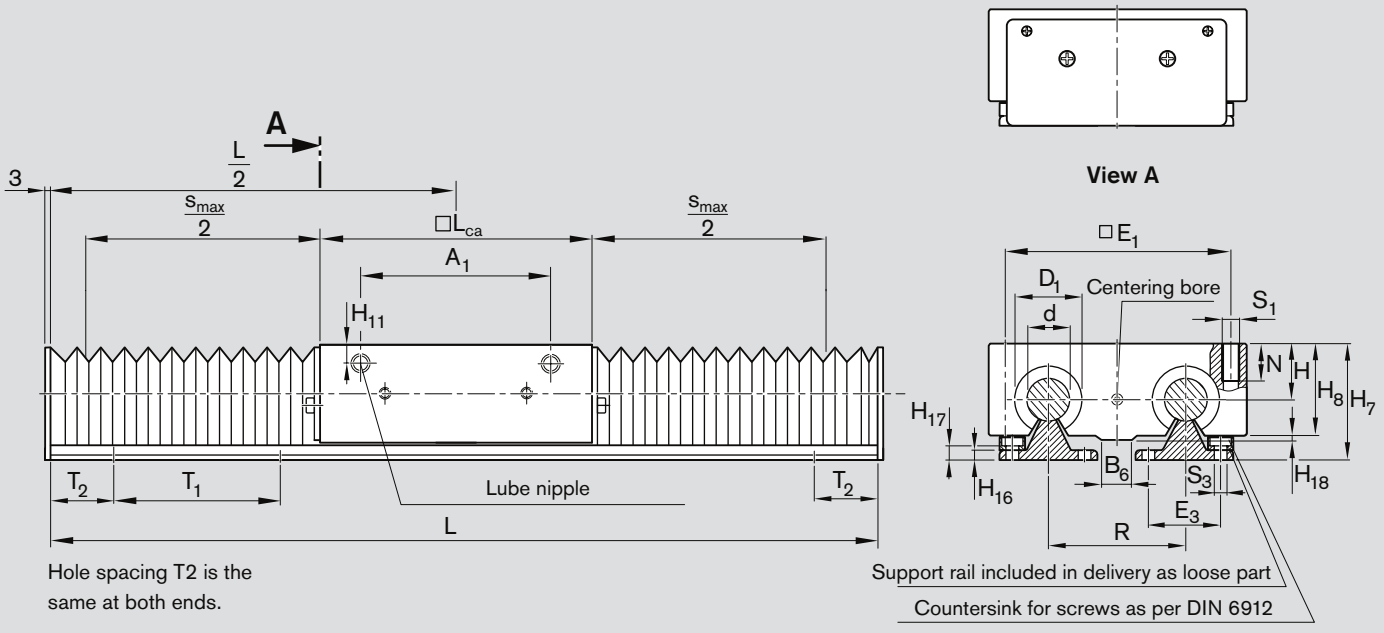


Slide	Dimensions (mm) – except for angle α													
	d h6	L_{ca}	R	H ± 0.02	H_7	H_8	H_{18}	B_6	W	α	D_1	E_1	S_1	N
SOO 12-85	12	85	42	18	40	30	–	–	6.5	66°	22	73	M6	13
SOO 16-100	16	100	54	22	48	35	3.0	15	9.0	68°	26	88	M6	13
SOO 20-130	20	130	72	25	57	42	3.5	12	9.0	55°	32	115	M8	18
SOO 25-160	25	160	88	30	66	51	2.5	15	11.5	57°	40	140	M10	22
SOO 30-180	30	180	96	35	77	60	–	–	14.0	57°	47	158	M12	26
SOO 40-230	40	230	122	45	95	77	–	–	19.5	56°	62	202	M16	34
SOO 50-280	50	280	152	55	115	93	–	–	22.5	54°	75	250	M16	34

All dimensions in mm
Drawings not to scale

With bellows





Hole spacing T2 is the same at both ends.

Support rail included in delivery as loose part

Countersink for screws as per DIN 6912

Shaft support rails						Lube nipple			Length calculation[1] L (mm)	
H_{16}	H_{17}	S_3	E_3	T_1	T_2	A_1	H_{11}	DIN 3405	with bellows	without bellows
5	6.5	4.5	29	75	≥ 15	57	7.0	AM6	$L = s_{max} \cdot 1.330 + L_{ca} + 37$	
5	8.3	5.5	33	100	≥ 20	68	7.2	AM6	$L = s_{max} \cdot 1.330 + L_{ca} + 37$	
6	9.8	6.6	37	100	≥ 20	94	7.2	AM6	$L = s_{max} \cdot 1.300 + L_{ca} + 38$	
6	9.8	6.6	42	120	≥ 24	116	9.5	AM8 x 1	$L = s_{max} \cdot 1.240 + L_{ca} + 39$	$L = s_{max} + L_{ca} + 3$
7	10.0	9.0	51	150	≥ 30	130	9.5	AM8 x 1	$L = s_{max} \cdot 1.200 + L_{ca} + 38$	
8	11.8	9.0	55	200	≥ 30	170	11.5	AM8 x 1	$L = s_{max} \cdot 1.140 + L_{ca} + 39$	
9	14.3	11.0	63	200	≥ 30	220	15.0	AM8 x 1	$L = s_{max} \cdot 1.112 + L_{ca} + 40$	

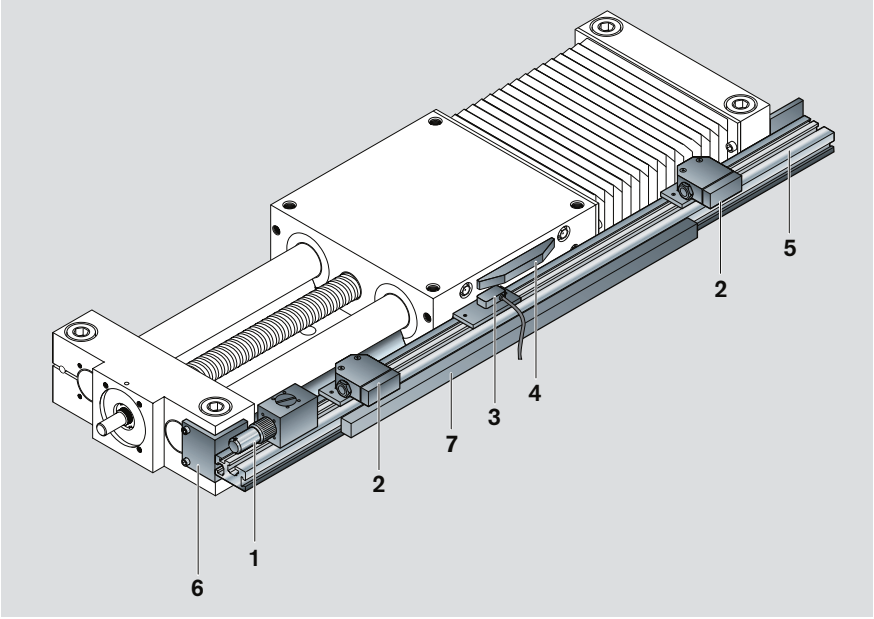
1) For Linear Motion Slides SOO 40-230 L > 400 and L < 460 and for Linear Motion Slides SOO 50-280 L > 600 and L < 660 please request information concerning spacing and mounting hole pattern for shafts and shaft support rails.

s_{max} = maximum travel (mm)

Switch Mounting Arrangements

Overview of Switching System

1 Socket and plug
2 Mechanical switch (with mounting accessories)
3 Proximity switch (with mounting accessories)
4 Switching cam
5 Cable duct (aluminum alloy)
6 Mounting bracket
7 Profiled support



Ordering the switches and accessories

Refer to the following table for part numbers.
Accessories can also be ordered separately.

Item		Option number[1]	Linear Motion Slides SGK / SOK		
			12-85	16-100	20-130 / 25-160 30-180 / 40-230 / 50-280
1	Socket + plug	**17**	R1414 000 61	R1414 000 61	R1414 000 61
2	Mechanical switches with mounting accessories	**15**	R0236 203 01	R0236 203 01	R0236 203 01
	Mechanical switches without mounting accessories		R3453 040 16	R3453 040 16	R3453 040 16
3	Proximity switches (option no. includes switch and accessories)				
	– Accessories without switch		R0236 203 02	R0236 203 02	R0236 203 02
	– PNP NC (option no. includes switch and accessories)	**11**	R3453 040 01	R3453 040 01	R3453 040 01
	– PNP NO (option no. includes switch and accessories)	**13**	R3453 040 03	R3453 040 03	R3453 040 03
4+6	Switching cam + mounting bracket with all accessories for mounting profiled support	**16**	R0236 003 03	R0236 103 03	R0236 203 03
5	Profiled support, L_T =		R0396 620 08 [2]	R0396 620 08 [2]	R0396 620 08 [2]
7	Cable duct, L_K =	**20**	R0396 620 17 [2]	R0396 620 17 [2]	R0396 620 17 [2]

1) From the “Components and Ordering” table
2) When ordering cable ducts or profiled supports, please always state the required length. Example: “R0396 620 17, 285 mm”.

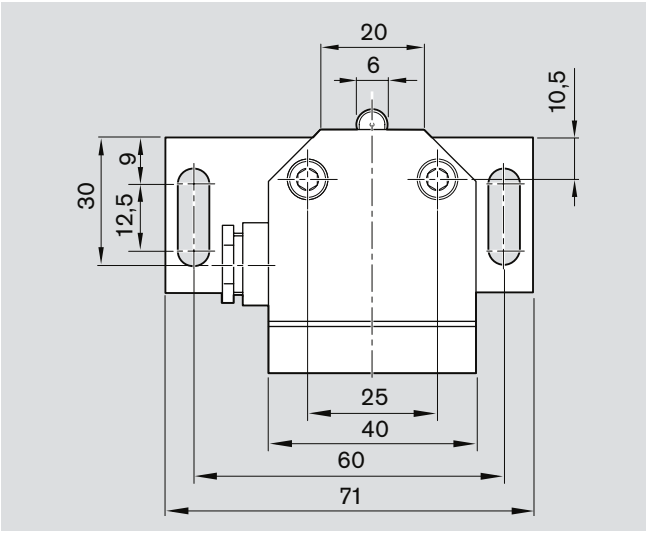
Length calculation for cable duct and profiled support

Slide	Length of profiled support L_T (mm)
SGK/SOK 12-85	$L_T = L + 38$
SGK/SOK 16-100	$L_T = L + 87$
SGK/SOK 20-130	$L_T = L + 94$
SGK/SOK 25-160	$L_T = L + 103$
SGK/SOK 30-180	$L_T = L + 103$
SGK/SOK 40-230	$L_T = L + 105$
SGK/SOK 50-280	$L_T = L + 105$

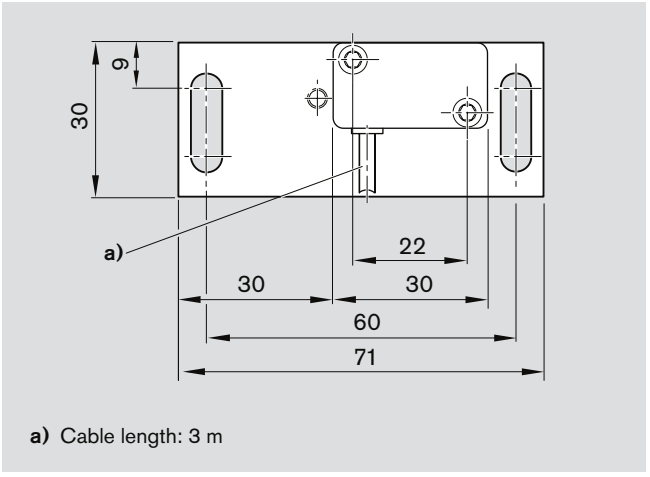
$L_T = L_K$

L_K = length of cable duct (mm)
L_T = length of profiled support (mm)
L = length of linear system (mm)

Mechanical switch (with mount)		
Repeatability	=	± 0.05 mm
Permissible ambient temperature	=	–5 °C … +80 °C
Protection class	=	IP 67
Bounce time	=	< 2 ms
Insulation class	=	Group C as per VDE 0110
Permitted voltage for combination of switch and socket-plug	=	10 ... 30 V AC
Continuous current		5 A
Switching capacity at 220 V, 40-60 Hz	=	cosφ = 0.8 at 2 A
Contact resistance when new	=	< 240 mΩ
Connection type	=	Screw connector
Contact system	=	Single-pole changeover
Switching system	=	Snap-action



Proximity switch (with mount)		
Miniature circuit-breaker with potted cable (3 x 0.14 mm² Unitronic)		
Switching function	=	PNP NO / NC
Repeatability	=	≤ 0.1 mm
MTTFd (as per EN 13849)	=	835 years
Operating voltage	=	10 ... 30 V DC
Residual ripple	=	≤ 3.6 V
No-load current	=	≤ 3 mA
Load current	=	≤ 200 mA
Voltage drop at load current	=	≤ 2 V
Permissible ambient temperature	=	–25 °C ... +70 °C
Protection class	=	IP 65
Cable length	=	3 m
Connection at cable end	=	flying leads

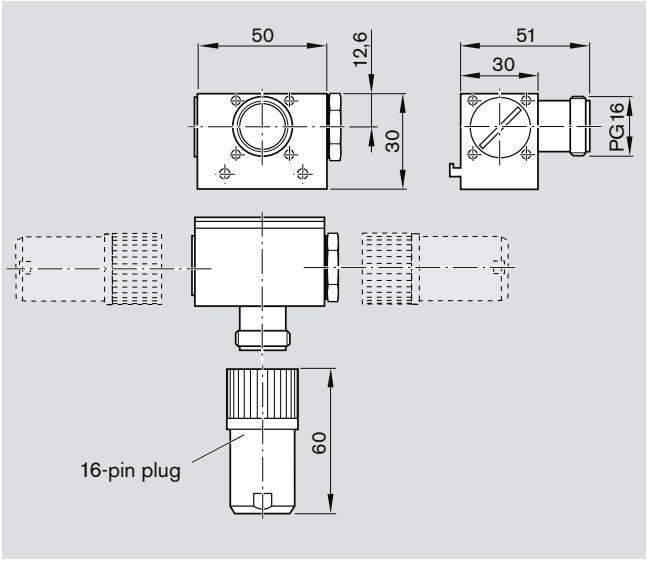


a) Cable length: 3 m

Socket and plug

A plug is provided.
The plug can be mounted in three directions (see diagram).

Socket/plug subassembly	
No. of pins	16
Permitted voltage for combination of switch and socket-plug	10 ... 30 V DC
Rated current (at 25 °C)	8 A / contact
Permissible ambient temperature	–20 °C to +125 °C
Mating cycles	> 50
Cable entry into housing	1 seal with hole 2 x 5.5 mm, 1 x 3.5 mm 1 seal adaptable, max. Ø 14 mm
Connection to flanged socket	Soldered connection, ≤ 1 mm
Connection to plug	Soldered connection, ≤ 1 mm
Cable entry into plug	Screw connection with strain relief Cable Ø 10 - 14 mm



Switch Mounting Arrangements

Switch Mounting Arrangements SGK/SOK

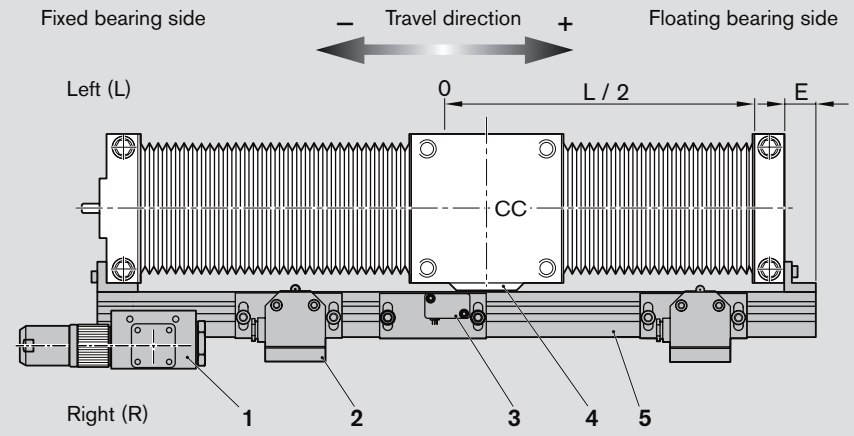
The switch activation point characterizes the position of the center of the carriage (CC) after travel. The zero point is at L / 2.

Maximum switch activation point
= 0.5 max. travel – excess travel

For safe operation of the Linear Motion Slide, the excess travel must be longer than the braking distance.
The acceleration travel can be taken as a guideline value for the braking distance.

1 Socket with plug
2 Proximity switch
3 Mechanical switch
4 Switching cam
5 Profiled support

Switch mounting side:



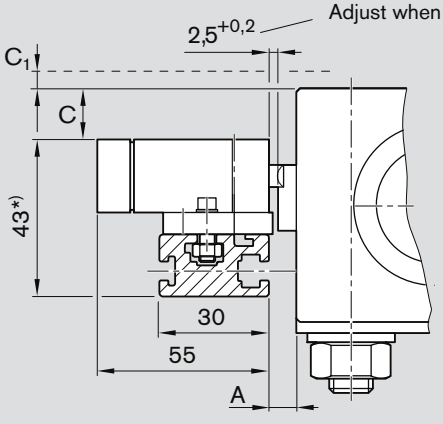
Recommended standard configuration:
– 2 mechanical switches
– 1 proximity switch
Slide the mounting plates with switches into the slot and fix with the screws and square nuts.

Do not go below the minimum switching distance:

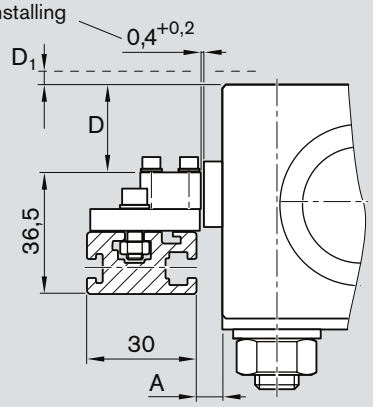
mechanical / mechanical	=	62 mm
mechanical / proximity	=	49 mm
proximity / proximity	=	35 mm

⚠ **The mounting plates must be installed mirror-inverted.**

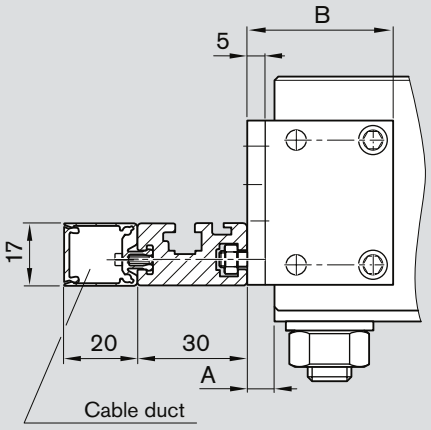
View of mechanical switch



View of proximity switch



View of mounting bracket with cable duct



*) 37 for SGK / SOK 12-85

Switch mounting:
- Adjust the switching distances for the mechanical and proximity switches during installation.
- In special operating conditions (vibrations, switches in the middle of the travel range) the profiled support may have to be provided with additional support.

Dimensions of mechanical switches (mm)

	A	B	C	C1[1)]	D	D1[1)]	E
SGK 12-85	5.5	27		4		3.5	40
SGK 16-100	5.5	30		6	0.5		40
SGK 20-130	6.5	40	4		10.5		40
SGK 25-160	6.5	40	7		13.5		40
SGK 30-180	7.5	40	14		20.5		40
SGK 40-230	9.0	40	2		8.5		40
SGK 50-280	9.0	40	2		8.5		40

Dimensions of proximity switches (mm)

	A	B	C	C1[1)]	D	D1[1)]	E
SOK 12-85	5.5	27		2		1.5	40
SOK 16-100	5.5	30		2	4.5		40
SOK 20-130	6.5	40	6		12.5		40
SOK 25-160	6.5	40	9		15.5		40
SOK 30-180	7.5	40	17		23.5		40
SOK 40-230	9.0	40	7		13.5		40
SOK 50-280	9.0	40	9		15.5		40

1) The switch projects beyond the upper edge of the carriage.

Determining the switch activation point

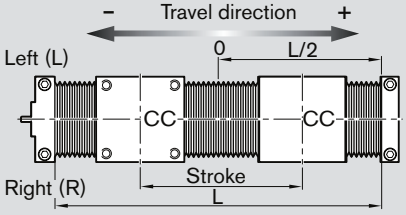
The switch activation point is determined by the following factors:

- Mounting side:
  Switches may be mounted on the left (L) or right (R) side of the slide.
- Direction of travel:
  Switches may be mounted on the minus (-) or plus (+) side of zero.
- 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).

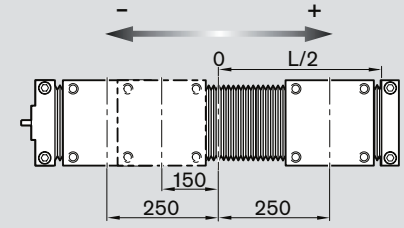
Example
Effective stroke = 500 mm
Limit switches:
Switch position for 1st switch = + 250 mm
Switch position for 3rd switch = – 250 mm
Positioning switch:
Switch position for 2nd switch = – 150 mm

Length L
For length calculations, see “Length calculation” for the respective Linear Motion Slide.

Switch activation point

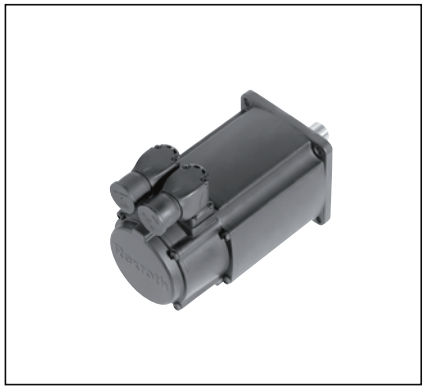


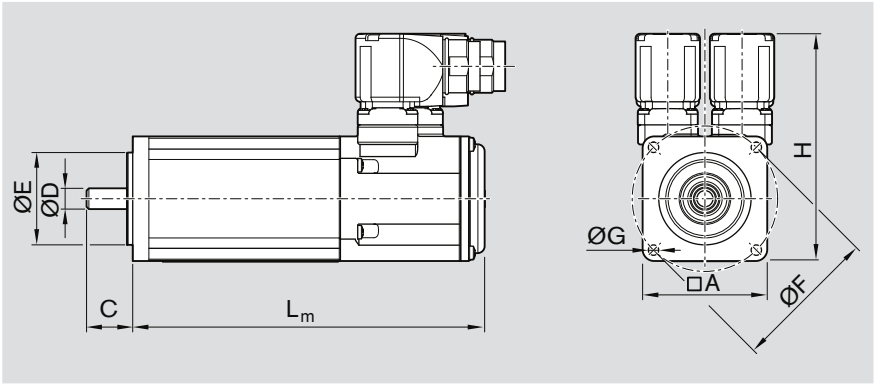
Switch activation point example



Motors

IndraDyn S Servo Motors MSK





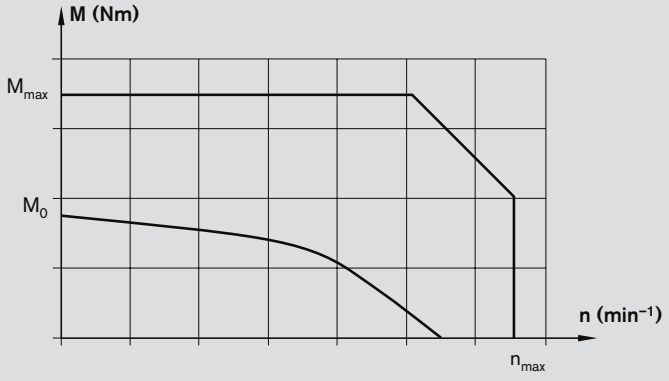
Motor	Dimensions (mm)								
	A	C	ØD	ØE	ØF	ØG	H	L_m	
								Without holding brake	With holding brake
MSK 030C-0900	54	20	9	40	63	4.5	98.5	188.0	213.0
MSK 040C-0600	82	30	14	50	95	6.6	124.5	185.5	215.5
MSK 060C-0600	116	50	24	95	130	9.0	156.0	226.0	259.0
MSK 076C-0450	140	50	24	110	165	11.0	180.0	292.5	292.5

Motor data

Motor	n_{max} (min^{-1})	M_0 (Nm)	M_{max} (Nm)	M_{br} (Nm)	J_{rm} (kgm^2)	J_{br} (kgm^2)	m_m (kg)	m_{br} (kg)
MSK 030C-0900	9 000	0.8	4.0	1	0.000030	0.000007	1.9	0.2
MSK 040C-0600	7 500	2.7	8.1	4	0.000140	0.000023	3.6	0.3
MSK 060C-0600	6 000	8.0	24.0	10	0.000800	0.000059	8.4	0.8
MSK 076C-0450	5 000	12.0	43.5	11	0.004300	0.000360	13.8	1.1

J_{br} = mass moment of inertia of the holding brake
J_m = mass moment of inertia, motor
L_m = length of the motor
M_0 = standstill torque
M_{br} = holding torque of holding brake when switched off
M_{max} = maximum possible motor torque
n_{max} = maximum motor speed

Motor torque speed curve (schematic)



Option number[1)]	Motor	Part number	Version Holding brake		Type designation
			without	with	
84	**MSK 030C-0900**	R911308683	X		MSK030C-0900-NN-M1-UG0-NNNN
85		R911308684		X	MSK030C-0900-NN-M1-UG1-NNNN
86	**MSK 040C-0600**	R911306060	X		MSK040C-0600-NN-M1-UG0-NNNN
87		R911306061		X	MSK040C-0600-NN-M1-UG1-NNNN
90	**MSK 060C-0600**	R911306052	X		MSK060C-0600-NN-M1-UG0-NNNN
91		R911306053		X	MSK060C-0600-NN-M1-UG1-NNNN
92	**MSK 076C-0450**	R911318098	X		MSK076C-0450-NN-M1-UG0-NNNN
93		R911315713		X	MSK076C-0450-NN-M1-UG1-NNNN

1) From the “Components and Ordering” table

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

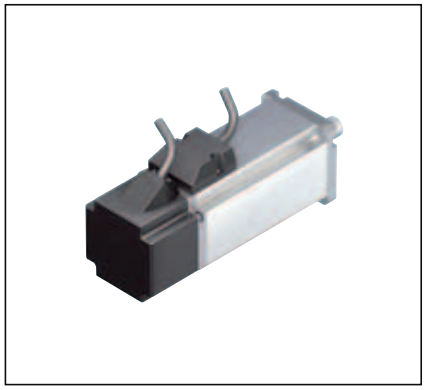
Note
The motors can be supplied complete with controllers and control units. For further motor types and more information on motors, controllers and control systems, please refer to the following Rexroth catalogs on drive technology:
- Drive System Rexroth IndraDrive, R999000018
- Rexroth IndraDyn S Synchronous Motors MSK, R911296289
- Rexroth IndraDrive C Drive Controllers, R911314904
- Rexroth IndraDrive Cs Drive Systems with HCS01, R911322209.

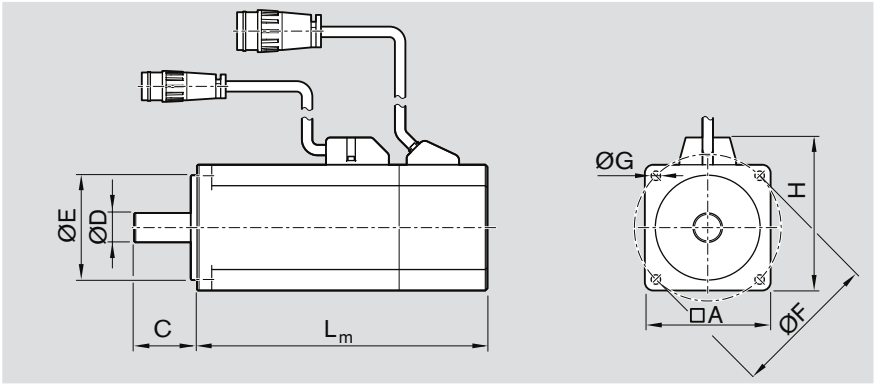
Recommended motor controller combinations

Motor	Controller
MSK 030C-0900	HCS 01.1E-W0005
MSK 040C-0600	HCS 01.1E-W0008
	HCS 01.1E-W0018
MSK 060C-0600	HCS 01.1E-W0028
MSK 076C-0450	with HNL01.1E

Motors

IndraDyn S Servo Motors MSM





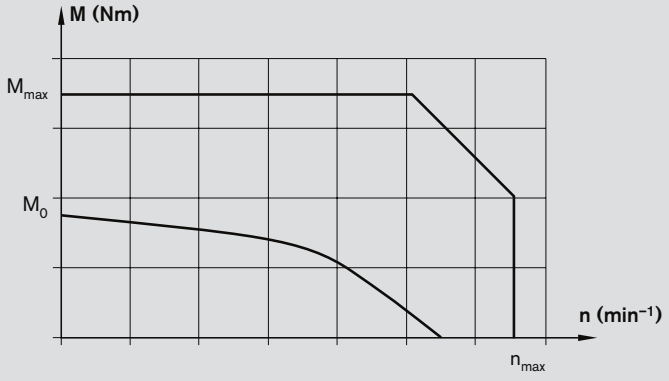
Motor	Dimensions (mm)								
	A	C	ØD	ØE	ØF	ØG	H	L_m	
								Without holding brake	With holding brake
MSM 031B-0300	60	30	11	50	70	4.5	73	79.0	115.5
MSM 031C-0300	60	30	14	50	70	4.5	73	98.5	135.0
MSM 041B-0300	80	35	19	70	90	6.0	93	112.0	149.0

Motor data

Motor	n_{max} (min^{-1})	M_0 (Nm)	M_{max} (Nm)	M_{br} (Nm)	J_m (kgm^2)	J_{br} (kgm^2)	m_m (kg)	m_{br} (kg)
MSM 031B-0300	5 000	0.64	1.91	1.27	0.0000140	0.0000018	0.82	0.48
MSM 031C-0300	5 000	1.30	3.80	1.27	0.0000260	0.0000018	1.20	0.50
MSM 041B-0300	4 500	2.40	7.10	2.45	0.0000870	0.0000075	2.30	0.80

J_{br} = mass moment of inertia of the holding brake
J_m = mass moment of inertia, motor
L_m = length of the motor
M_0 = standstill torque
M_{br} = holding torque of holding brake when switched off
M_{max} = maximum possible motor torque
n_{max} = maximum motor speed

Motor torque speed curve (schematic)



Option number[1)]	Motor	Part number	Version Holding brake		Type designation
			without	with	
106	**MSM 031B-0300**	R911325135	X		MSM031B-0300-NN-M0-CH0
107		R911325136		X	MSM031B-0300-NN-M0-CH1
108	**MSM 031C-0300**	R911325139	X		MSM031C-0300-NN-M0-CH0
109		R911325140		X	MSM031C-0300-NN-M0-CH1
110	**MSM 041B-0300**	R911325143	X		MSM041B-0300-NN-M0-CH0
111		R911325144		X	MSM041B-0300-NN-M0-CH1

1) From the “Components and Ordering” table

Specification:
- Plain shaft without shaft seal ring
- Multiturn absolute encoder M0 (absolute encoder functionality only possible with back-up battery)
- Cooling system: natural convection
- Protection class IP54 (casing)
- With or without holding brake

Note
The motors can be supplied complete with controllers and control units. For further motor types and more information on motors, controllers and control systems, please refer to the following Rexroth catalogs on drive technology:
- Drive System Rexroth IndraDrive, R999000018
- Rexroth IndraDyn S Synchronous Motors MSM, R911329338
- Rexroth IndraDrive C Drive Controllers, R911314904
- Rexroth IndraDrive Cs Drive Systems with HCS01, R911322209.

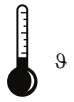
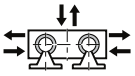
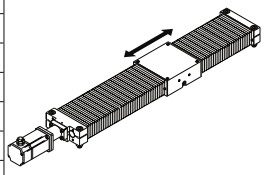
Recommended motor controller combinations

Motor	Controller
MSM 031B-0300	HCS 01.1E-W0006
MSM 031C-0300	HCS 01.1E-W0009
MSM 041B-0300	HCS 01.1E-W0013

Maintenance

Operating Conditions

Normal operating conditions

Ambient temperature must not fall below dew point		0 °C ... 40 °C	
Load		≤ 0.2 C	
Travel distance s_{min}	SGK/SOK 12-85	> 65 mm	
	SGK/SOK 16-100	> 70 mm	
	SGK/SOK 20-130	> 95 mm	
	SGK/SOK 25-160	> 135 mm	
	SGK/SOK 30-180	> 170 mm	
	SGK/SOK 40-230	> 190 mm	
	SGK/SOK 50-280	> 250 mm	
Contamination		Not permitted	

Design notes

⚠ **Moved parts:**
Safety devices and guards necessary

⚠ **For vertical installations:**
Arresting devices necessary to protect against falling loads

Intended use

The product is an assembly.
The product may be used in accordance with the technical documentation (product catalog) for the following purposes:
– for precise positioning in space.
The product is intended exclusively for professional use and not for private use.
Use for the intended purpose also includes the requirement that you must have read and understood the product documentation completely, in particular these “Safety instructions”.
The product is exclusively intended for incorporation into a final machine or a system or for assembly to other components for the purpose of building a final machine or a system.

Misuse

Use of the product in any other way than as described under “Intended use” is considered to be misuse and is therefore not permitted. If unsuitable products are installed or used in safety-relevant applications, this may lead to uncontrolled operating statuses in the application which can cause personal injury and/or damage to property.
The product may only be used in safety-relevant applications if this use has been expressly specified in the product documentation and is permitted, e.g. in zones with potentially explosive atmospheres or in safety-critical parts of a control system (functional safety).
Bosch Rexroth AG will not accept any liability for injury or damage caused by misuse of the product. The risks associated with any misuse of the product shall be borne by the user alone. Misuse of the product includes:
– the transport of persons

Lubrication

Lubrication notes: Basic lubrication is applied in-factory before shipment. Linear Motion Slides have been designed for lubrication with grease using a manual grease gun. The only maintenance required is lubricating the linear bushings and the ball screw assembly of the Linear Motion Slides.

Lubrication points

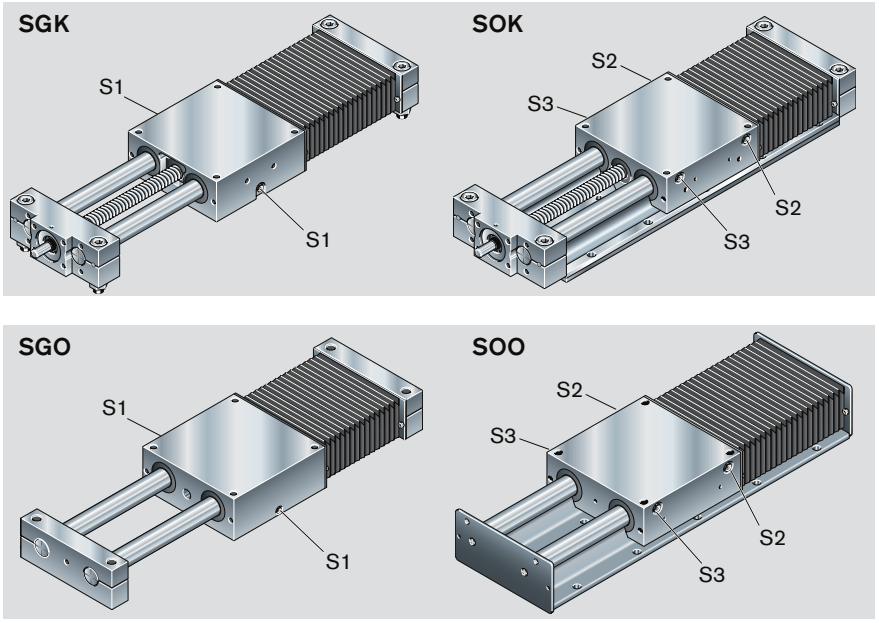
Lube nipples are provided on both sides of the carriage. Lubricating from one side only is sufficient.
In the open types SOK/SOO, lubricant must be applied through one each of the S2 and S3 lube nipples (see illustration).

S1 One-point lubrication
for closed types SGK/SGO

S2 Lube nipple
in open types SOK/SOO for the linear bushing pair on the floating bearing side, and – but only in SOK – also for the ball screw drive

S3 Lube nipple
in the open types SOK/SOO for the linear bushing pair on the fixed bearing side

Size	Lube nipple
12-85 … 20-130	DIN 3405 AM 6
25-160 … 50-280	DIN 3405 AM 8x1



Lubricants

⚠ **Linear Motion Slides have been designed for lubrication with grease only!**

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

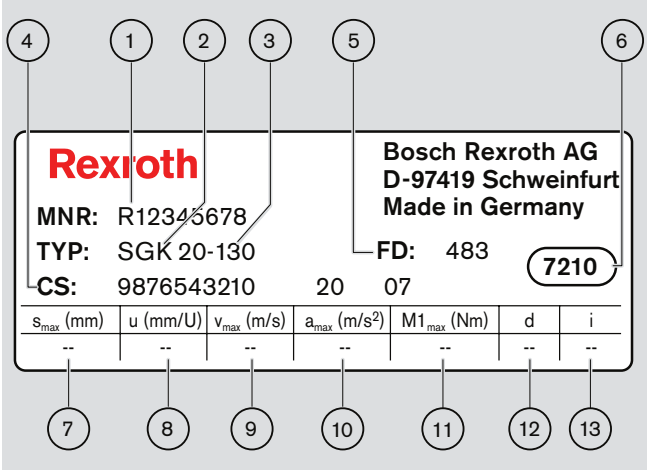
Lithium soap grease KP2K (DIN 51825) Consistency class NLGI 2 (DIN 51818)	Part number
We recommend: Dynalub 510 (Bosch Rexroth)	Cartridge (400 g) R341603700 Bucket (5 kg) R341603500
May also be used: Elkalub GLS 135 / N2 (Chemie-Technik) Castrol Longtime PD2 (Castrol)	

Size	Construction form		Relubrication quantity (g)		
	With drive unit	Without drive unit	S1	S2	S3
8 - 65		SGO	2.0	–	–
12 - 85	SGK		3.5	–	–
	SOK		–	3.9	2.6
		SGO	2.2	–	–
		SOO	–	2.6	2.6
16 - 100	SGK		6.0	–	–
	SOK		–	5.6	3.7
		SGO	4.1	–	–
		SOO	–	3.7	3.7
20 - 130	SGK		8.4	–	–
	SOK		–	9.8	6.5
		SGO	5.1	–	–
		SOO	–	6.5	6.5
25 - 160	SGK		9.8	–	–
	SOK		–	16.7	11.2
		SGO	4.3	–	–
		SOO	–	11.2	11.2
30 - 180	SGK		16.3	–	–
	SOK		–	25.1	16.7
		SGO	7.9	–	–
		SOO	–	16.7	16.7
40 - 230	SGK		35.8	–	–
	SOK		–	26.5	17.7
		SGO	27.0	–	–
		SOO	–	17.7	17.7
50 - 280	SGK		55.8	–	–
	SOK		–	69.8	46.5
		SGO	32.5	–	–
		SOO	–	46.5	46.5

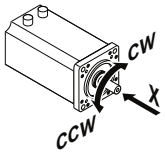
Parameterization (start-up)

Easy start-up thanks to integrated assistant
EasyWizard is an assistant that is integrated as a standard feature of Rexroth's engineering framework IndraWorks DS. It was designed to help users start-up the drives of linear systems easily, rapidly and safely. Starting up electromechanical axes often used to be a complicated, time-consuming and error-prone procedure. EasyWizard has changed all that – preconfigured data sets and equipment nameplates designed to dovetail with the assistant take the hassle out of getting your linear systems up and running.

Advantages
- Fast, simple and intuitive start-up
- Online help texts and supporting graphics guide you through the input fields
- Plausibility checks for free data input
- Suitable for all Rexroth linear systems
- Parameter input errors are minimized by having the data on the nameplate and in the Wizard input mask arranged in a similar order
- For system optimization after parameter input, the axis can be run in the test mode



1 Part number
2 Type designation
3 Size
4 Customer information
5 Date of manufacture
6 Manufacturing location
7 s_{max} – max. travel range (mm)
8 u – lead constant without gear unit (mm/rev)
9 v_{max} – max. linear speed without gear unit (m/s)
10 a_{max} – max. acceleration without gear unit (m/s^2)
11 $M1_{max}$ – max. drive torque at motor journal (Nm)
12 d – motor direction of rotation for travel in positive direction



CW – clockwise
CCW – counter clockwise

13 i – gear ratio

Documentation

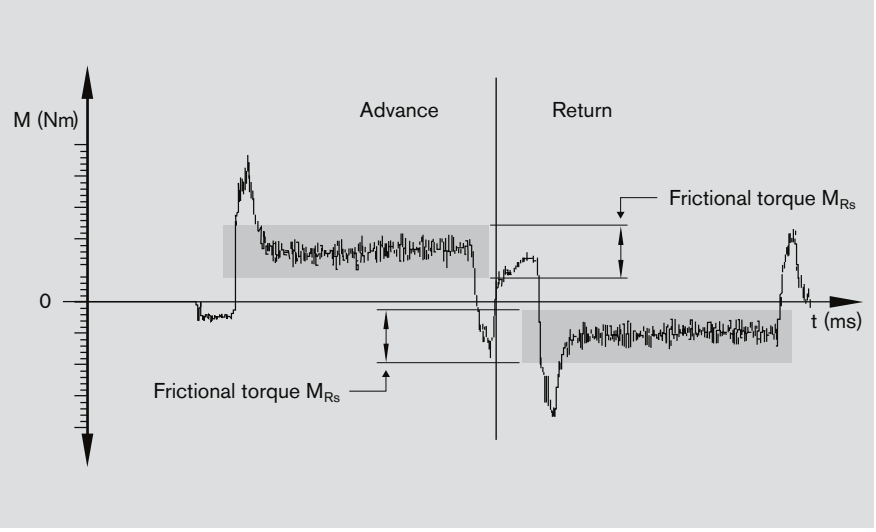
Standard report
Option 01

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. Each Linear Motion Slide is delivered complete with the relevant instructions for mounting and maintenance.

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

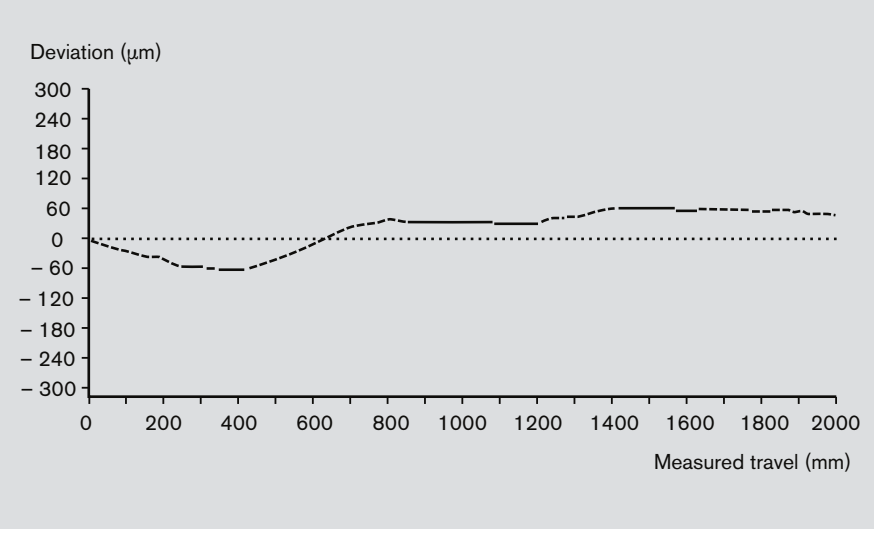
Frictional moment of complete system
Option 02

- All items contained in the standard report.
- Additionally, the moment of friction is measured over the entire travel range.



Lead deviation of ball screw for SGK and SOK
Option 03

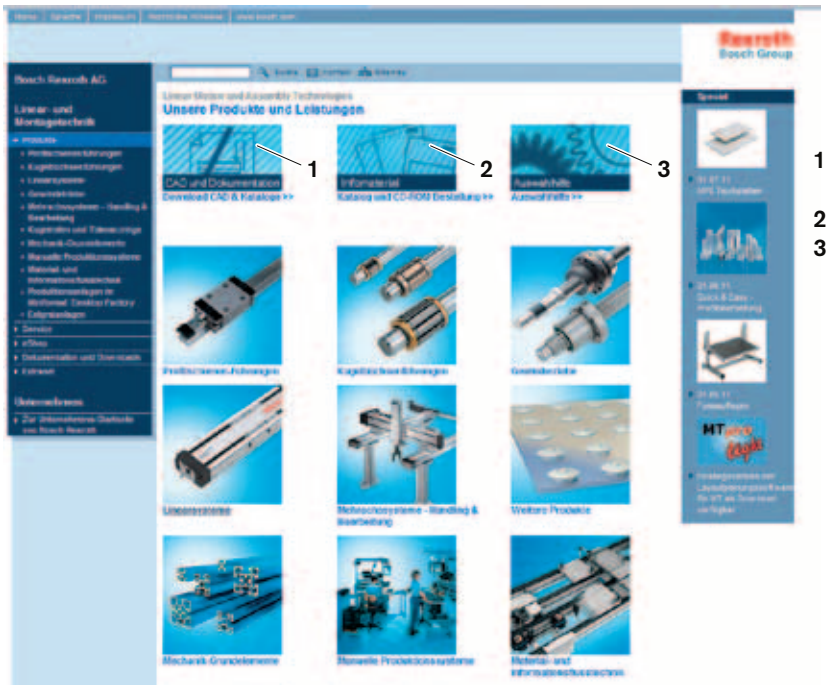
- All items contained in the standard report.
- In addition to graphical representation (see illustration), a measurement report is supplied in table form.



Further Information

Here you will find extensive information on products, eShop, safety engineering, and training and services offered.

Product information:
http://www.boschrexroth.com/dcl



1 Instructions and catalogs in PDF format and 3D CAD generator
2 Printed catalogs and other publications
3 Configurator

eShop:
http://www.boschrexroth.com/eshop

Safety engineering:
http://www.boschrexroth.com/machinesafety

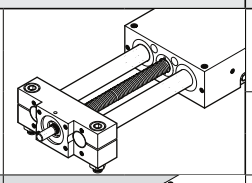
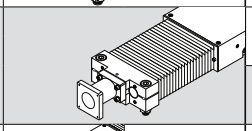
Training:
http://www.boschrexroth.com/training

Technical customer service:
http://www.boschrexroth.com/service

Inquiry/Order

Selection and Ordering Example

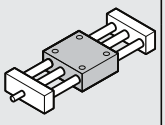
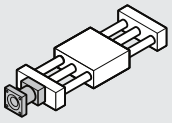
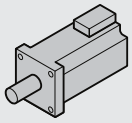
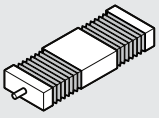
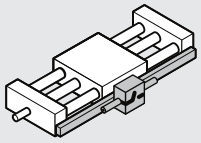
Based on the “Components and Ordering” table

		Slide	Part number, length R0261 .00 00, ... mm	Type	Guide: Standard shafts	Drive unit: Screw journal	Ball screw d_0 x P: 20 x 5	20 x 20	25 x 10	32 x 5	32 x 10	32 x 20	32 x 32
With ball screw, w/o motor mount		SGK 25-160	R0261 300 00	OF01	01	Ø10	01	02	04				
		SGK 30-180	R0261 400 00			Ø10[1)]	05	06	08				
		SGK 40-230	R0261 500 00		01	Ø16				01	02	03	04
		SGK 50-280	R0261 600 00			Ø16[1)]				05	06	07	08
With BS and motor mount		SGK 25-160	R0261 300 00	MF01	01	Ø10	01	02	04				
		SGK 30-180	R0261 400 00										
		[SGK 40-230]	[R0261 500 00]		[01]	Ø16				01	02	03	[04]
		SGK 50-280	R0261 600 00										
				RV01	01[6)]	Ø10	11	12	14				

= Highlighting of the selection area after deciding on the specific version

[ ] = Selected option to be entered into the “Inquiry/Order Form” at the end of this catalog

Ordering Data Option		Description
Linear Motion Slide, size	SGK 40-230	Closed-type linear motion slide SGK with ball screw drive, size 40-230
Part number, length	R0261 500 00, 1310 mm	Length 1310 mm
Type	MF01	Linear Motion Slide with motor mount and motor, as shown in diagram MF01
Guide	01	Standard shafts
Drive unit	04	Ball screw 32 x 32
Carriage	01	Standard carriage
Motor attachment	05	with attachment kit for motor
Motor	90	Motor MSK 060C with brake
Cover	01	Polyurethane bellows
1st switch	15	Mechanical switch
2nd switch	11	PNP NC
3rd switch	15	Mechanical switch
Cable duct	20	Cable duct (loose)
Socket-plug	17	Socket-plug on switch side
Switching cam	16	Switching cam for switch activation and profiled support
Documentation	03	Measurement report: Lead deviation for ball screw

Carriage	Motor attachment			Motor		Cover		Switches / Cable duct / Socket-plug	Documentation	
										
Standard	i =	Attachment kit[3]	for motor	Brake without	Brake with	PU bellows without	PU bellows with		Standard report	Measurement report[4]
01	–	00		00		00	01	**Without switches** **Without cable duct** 00 **Without socket and plug**	01	02
01	–	00		00						
01	–	03	MSK 040C	86	87			**Switches:** – PNP NC 11 – PNP NO 13 – Mechanical 15 **Ordering data:** Switch type		
		06	MSM 041B	74	75					
01	–	02	MSK 076C	–	93					
		05	MSK 060C	90	91					
	1	10	MSK 040C	86	87					
		20	MSM 041B	74	75					
	1.5	12	MSK 040C	86	87					
		22	MSM 041B	74	75					
		14	MSK 040C	74	75			**Cable duct[5]** 20		
		24	MSM 041B	86	87					
		16	MSK 040C	86	87			**Socket-plug** 17		
		26	MSM 041B	74	75					
		0						**Switching cam and profiled support for switches** 16		03
			MSK 060C	90	91					

Inquiry/Order

Inquiry/Order Form

Find your local contact person here:
www.boschrexroth.com/addresses

Rexroth – Linear Motion Slides

Ordering example

Ordering Data		Option	Description
Linear Motion Slide SGK 40-230			Linear Motion Slide designation
Part number R0261 500 00, 1310 mm			SGK 40-230, length = 1310 mm
Type	=	MF01	Linear Motion Slide with motor mount and motor, as shown in diagram MF01
Guide	=	01	Standard shafts
Drive unit	=	04	Ball screw size 32 x 32 (d_0 x P)
Carriage	=	01	Standard carriage
Motor attachment	=	05	with attachment kit for motor, gear ratio i = 1
Motor	=	90	Motor MSK 060C with brake
Cover	=	01	Polyurethane bellows
1st switch	=	15	Mechanical switch
2nd switch	=	11	PNP NC
3rd switch	=	15	Mechanical switch
Cable duct	=	20	Cable duct (loose)
Socket-plug	=	17	Socket-plug on switch side
Switching cam	=	16	Switching cam for switch activation and profiled support
Documentation	=	03	Measurement report: Lead deviation for ball screw

To be completed by customer: Inquiry ☐ / Order ☐
Linear Motion Slide_____
(Part number): R_____ _____ _____, length _____mm

Type	=	☐☐☐☐
Guide	=	☐☐
Drive unit	=	☐☐
Carriage	=	☐☐
Motor attachment	=	☐☐
Motor	=	☐☐
Cover	=	☐☐
1st switch	=	☐☐
2nd switch	=	☐☐
3rd switch	=	☐☐
Cable duct	=	☐☐
Socket-plug	=	☐☐
Switching cam	=	☐☐
Documentation	=	☐☐

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

Sender

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

Rexroth
Bosch Group

Subject to technical modifications

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