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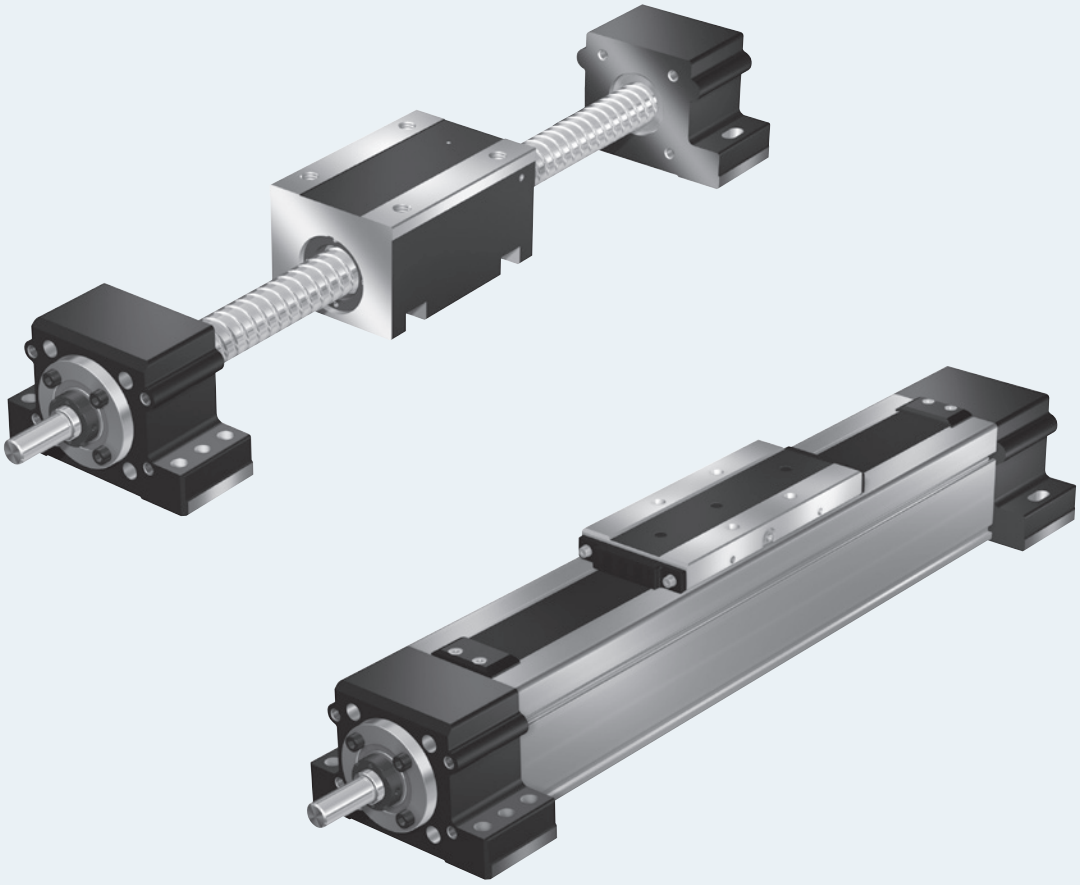
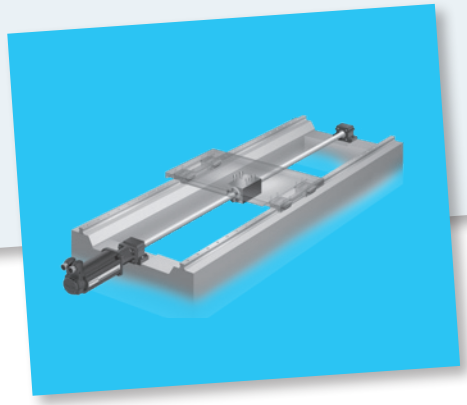
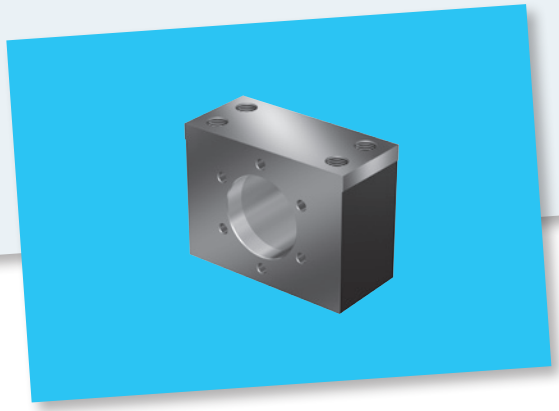
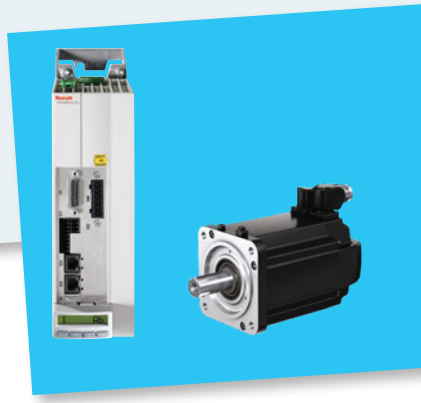
rexroth
A Bosch Company

Drive units AOK, AGK









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Identification system for short product names

Short product name
Short product names are used to identify the product family, size, version and product generation of Rexroth linear motion axes.

Example		A	O	K	-	032	-	N N	-	1
System	= Drive unit (**A**)									
Type	= **O**pen **C**losed									
Drive	= Ball screw assembly (**K**)									
Size	= 020 / **032** / 040									
Version	= Standard version (**N**)									
Generation	= Product generation **1**									

Changes/additions at a glance

- Increase of the dynamic load capacities (ball screw assembly)
- "Configuration, order" table revised (new MS2N servo motors)
- "MS2N servo motors" section supplemented

This edition (2022-10) is currently only available as PDF.

Contents

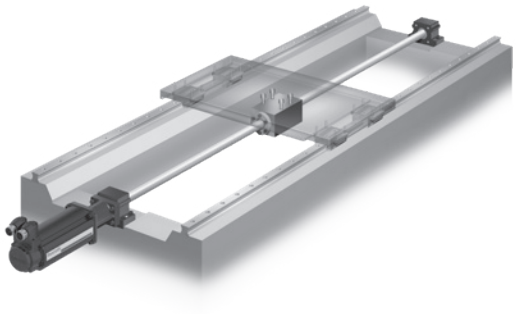
R999001326/2024-01, **Bosch Rexroth AG**

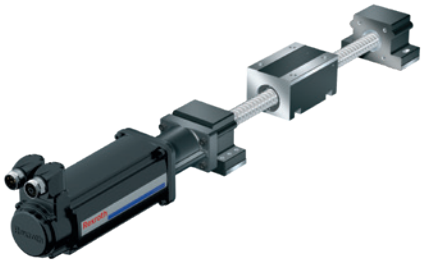
AOK/AGK product description

AOK and AGK drive units consist of Rexroth's proven ball screw drive (**BASA** - **BA**ll **S**crew **A**ssembly), which with nut housings and pillow block units make it into a ready-to-install drive axis. When combined with an external linear guide, this drive unit becomes a fully functional linear motion axis for a variety of applications.

Advantages

- Each available in three sizes with freely configurable lengths up to 5600 mm
- Variable lengths and versions thanks to configuration with numerous options
- Technical data for the entire unit, e.g., maximum permissible drive torque, speed, etc.
- Nameplate with technical start-up parameters
- High positioning accuracy and repeatability due to ball screw drive with zero-backlash, preloaded nut system
- When paired with Rexroth linear guides, they offer design engineers full design freedom for every application.





Drive units are available complete with motor, controller and control system.
For more information, see the "Motors" section

Application areas

Drive units can be used in many ways as a drive axis for linear motion and positioning tasks in the application areas and industries below.

Possible applications

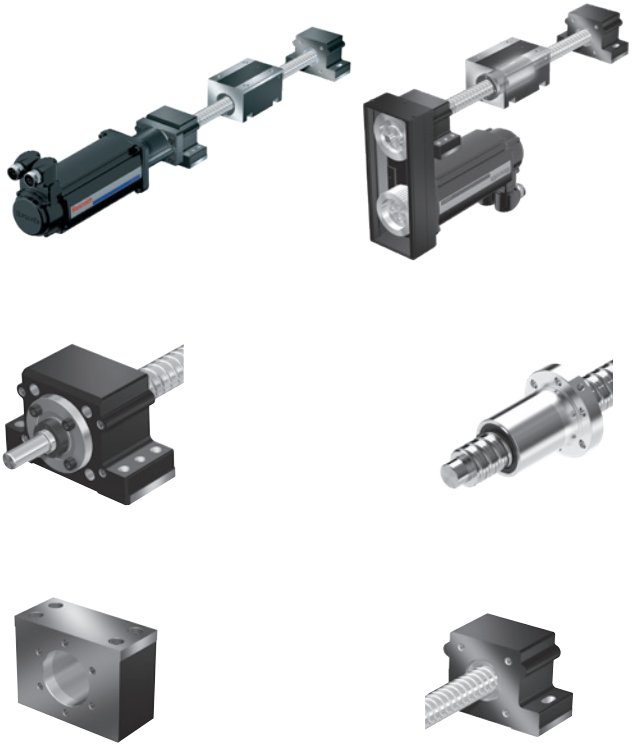
- Pick and place
- Handling systems
- Placement systems, palletizers
- Machine tool feed units
- Inspection and analysis systems
- Feed units in transfer lines
- Motion units

Possible industries

- Handling and assembly
- Electronics and semiconductors
- Automotive suppliers and manufacturers
- Robotics and automation
- Special-purpose machinery
- Packaging technology
- Plastics processing
- Textiles

AOK drive units
open type

- Quick drive unit assembly and easy alignment thanks to machined reference edges on the nut housing and pillow block
- Available with and without floating bearings
- Motor attachment with flange and coupling or belt side drive
- Rexroth servo motor (MS2N/MSM)

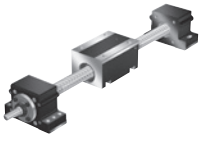


AGK drive units
closed type

- Rapid mounting and easy alignment of the drive unit due to the machined reference edge on the pillow block housing
- Optimal sealing with aluminum profile and steel or polyurethane sealing strip
- Traveling screw supports for maximum speeds in horizontal operation
- Motor attachment with flange and coupling or belt side drive
- Rexroth servo motor (MS2N/MSM)

AGK with screw support SPU

Overview

Drive unit	Type	Type	Max. parameter	Size		
				-020	-032	-040
	AOK	open	L_{max} (mm)	3 000	4 000	5 000
			Dynamic load capacity C (N)	15 480	34 200	54 000
	AGK	closed	L_{max} (mm)	3 000	5 000	5 600
			Dynamic load capacity C (N)	15 480	34 200	54 000

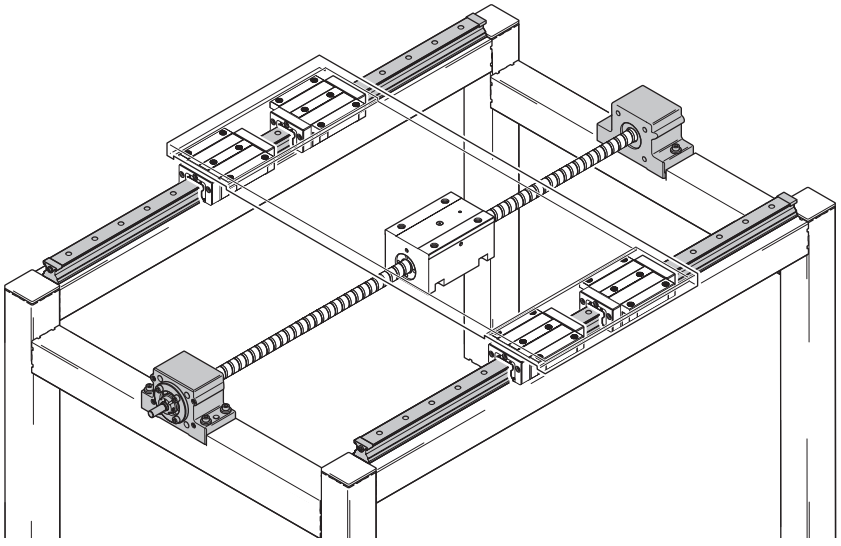
AOK/AGK product description

Notes on applications

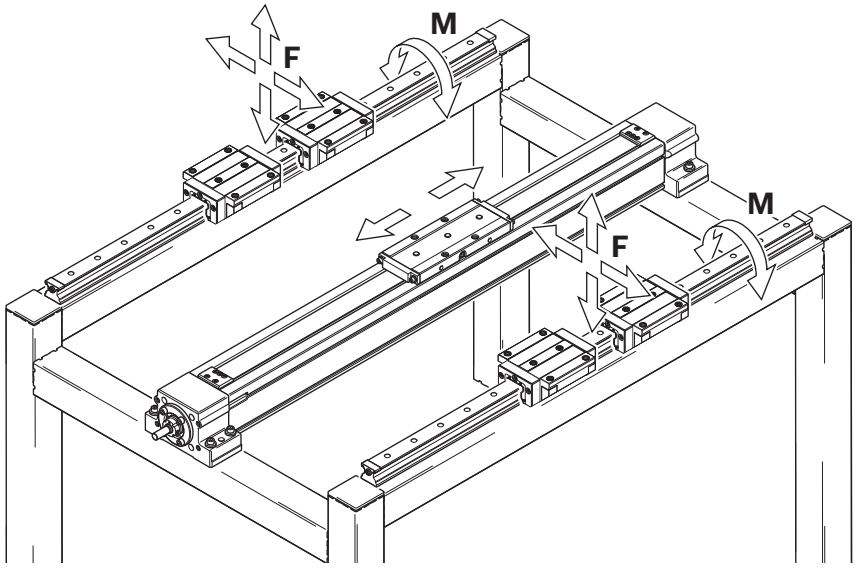
AOK and AGK drive units are designed for drive tasks only and can only absorb axial forces.
When using a drive unit, always make sure to include adequate, separate linear guides that can handle the structure being moved as well as the resulting reaction forces and torques.
This results in a linear motion unit (e.g. table top) that can be moved automatically thanks to an AOK or AGK drive unit.

Examples

Example of basic motion unit structure with table top and AOK drive unit



In this example, two separate linear guides, each with two runner blocks, absorb forces and torques so that when moving the structure only axial forces act on the drive unit (here AGK).



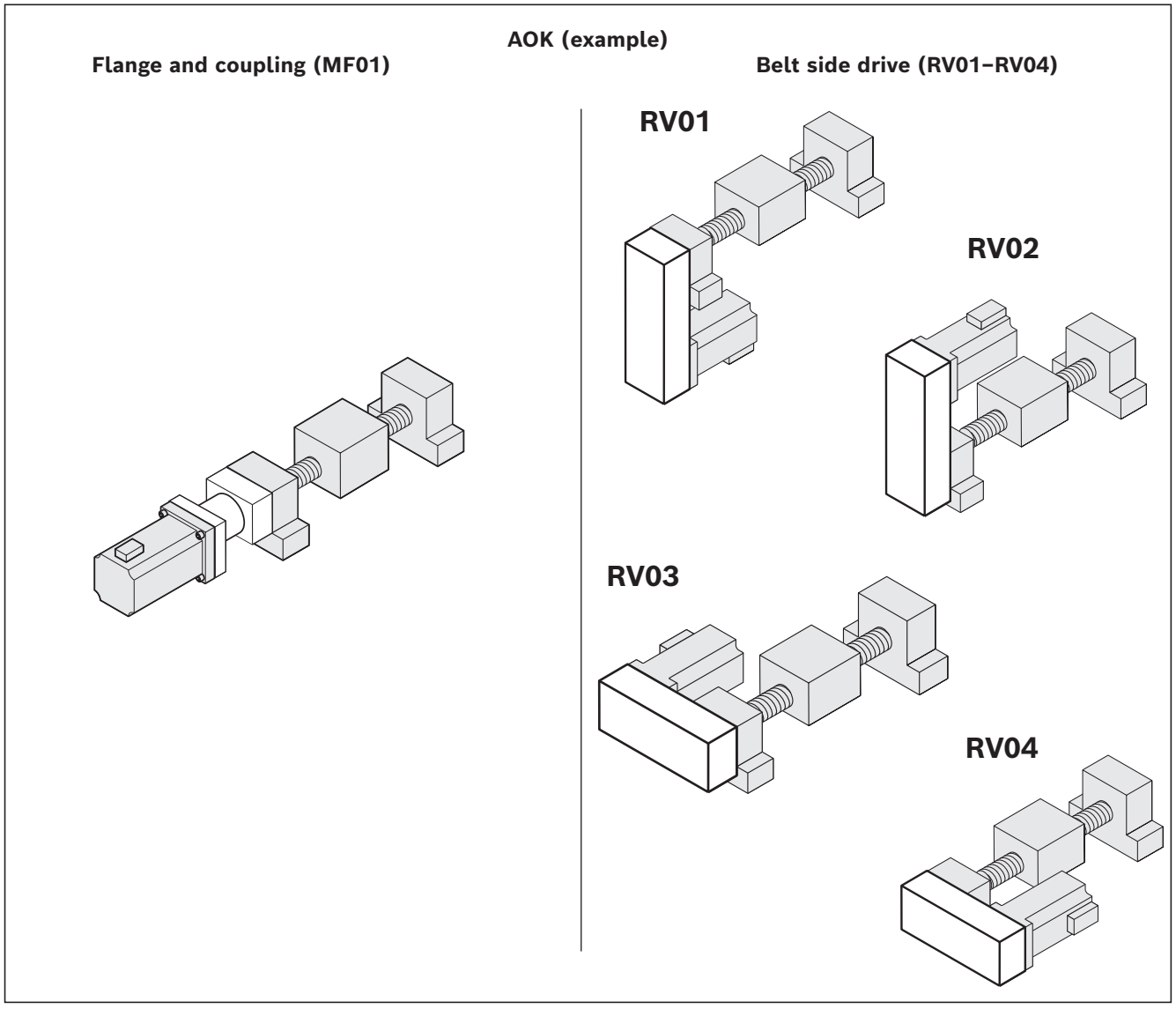
⚠ **Follow the assembly instructions and installation tolerances in the "Attachments and accessories" section!**

Form of delivery

Drive units come ready-mounted.

Motor attachment

If a combination of motor and motor attachment has been selected, then the components are attached as shown in the figure, which also shows the location of the motor connector.
Motor attachments ordered without a motor must be assembled by the customer.
All required instructions and parameters for professional assembly are included.



Available options

Switches and sockets with plugs are included in delivery (installation required).

Lubrication

Drive units delivered with initial greasing.
For further information, see the "Lubrication" section.

Documentation

Each drive unit delivered with appropriate documentation.

Product description

Features

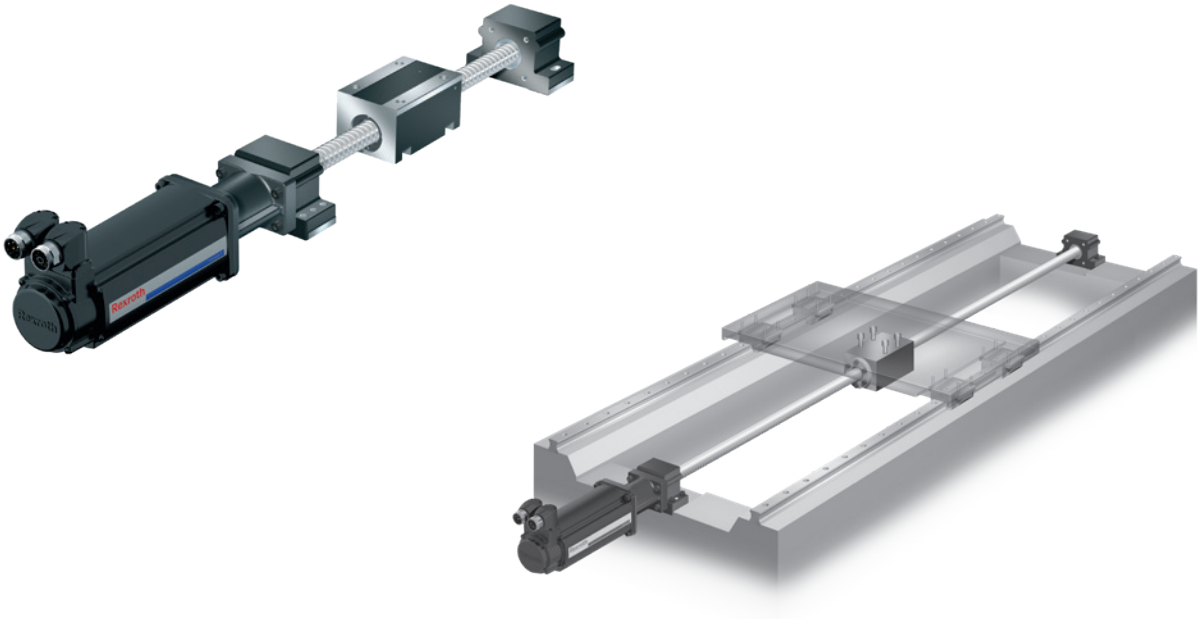
- AOK drive units in open format are ready-to-install drive axes consisting of a ball screw drive with nuts and pillow blocks, as well as an optional nut housing
- Three coordinated sizes available in any length up to L_{max}
- A version with fixed and floating bearing or fixed bearing only is also available
- Driven by a precision ball screw drive in rolled design in accordance with DIN 69051
  - Screws in tolerance grade T5 or T7 available
  - Various nut versions available depending on size and lead
  - Three different preloads available (C1, C2 and C3)
- Pillow blocks available in aluminum or steel
- High travel speeds thanks to large leads with high precision over long lengths
- Nuts can be optionally selected with front lube unit for longer lubrication intervals

Further highlights

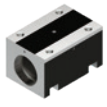
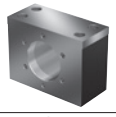
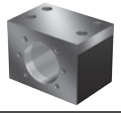
- Flexible thanks to selectable options
- Easy motor attachment via locating feature and threads
- Clearly structured technical data for the complete unit as a "linear motion system without guideway"
- Nameplate with parameters for easy start-up

Attachments

- Motor attachments with flange and coupling or via a belt side drive
- Motor attachment kits according to customer specification
- Maintenance-free servo motors with selectable brake and integrated feedback



Ball screw drive component overview

Components		Short product name	Description
Version		Fixed/floating bearing	With pillow block housings on fixed or floating bearing end
		Fixed bearing only	With pillow block housings on fixed bearing end only
Nut		ZEM-E	Cylindrical single nut (only with MGA nut housing)
		FEM-E-S	Single nut with flange (Rexroth mounting dimensions)
		FEP-E-S	
		FEM-E-B	Single nut with flange (mounting dimensions similar to DIN 69051, Part 5)
Front lube unit		VSE	Front lube unit (VSE) for long-term, maintenance-free operation of the ball screw drive. (only available in combination with nut with initial greasing)
Nut housing		MGA	Aluminum nut housing, compatible with cylindrical single nut ZEM-E
		MGS	Steel nut housing, suitable for single nut with flange FEM-E-S / FEP-E-S
		MGD	Steel nut housing, suitable for single nut with flange FEM-E-B

Nut preload

Preload classes	Definition
C1	Moderate preload
C2	Medium preload
C3	High preload

Precision screw accuracy

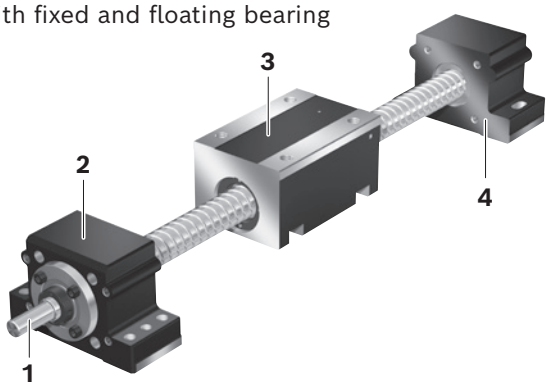
Tolerance grade	Permissible travel deviation over 300 mm (v300p)
T5	23 µm / 300 mm
T7	52 µm / 300 mm

For further information, see the "Screw drive" catalog.

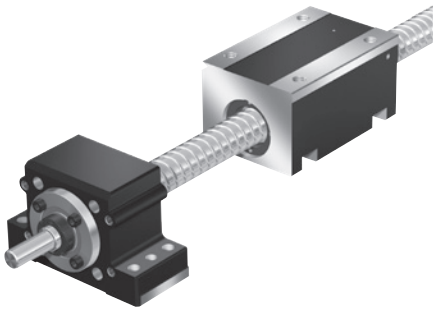
Structural design

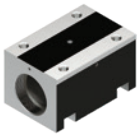
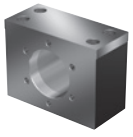
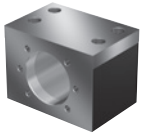
1 Ball screw assembly
2 Pillow block on fixed bearing end (drive side)
3 Housing with nut
4 Pillow block on floating bearing end

With fixed and floating bearing



With fixed bearing only



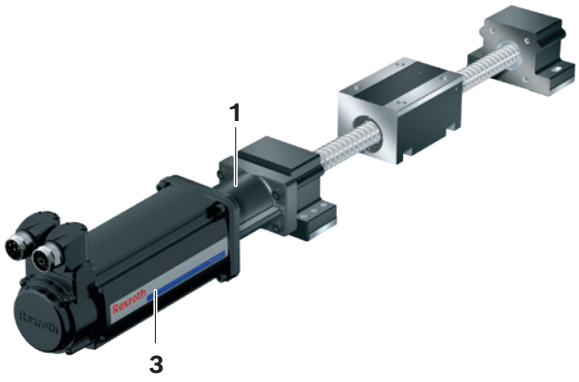
Nut	ZEM-E 	FEM-E-S / FEP-E-S 	FEM-E-B 
can be combined with*			
Nut housing	MGA 	MGS 	MGD 

* Only the combination options in the "Configuration and ordering" tables are valid.

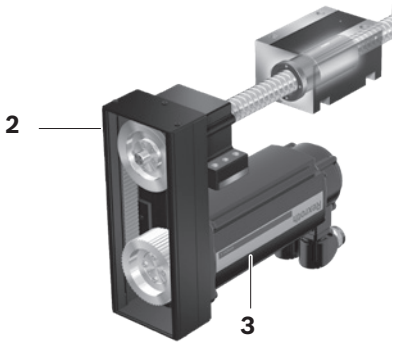
Motor attachment

Attachments:
1 Flange and coupling
2 Belt side drive
3 Motor

Flange and coupling

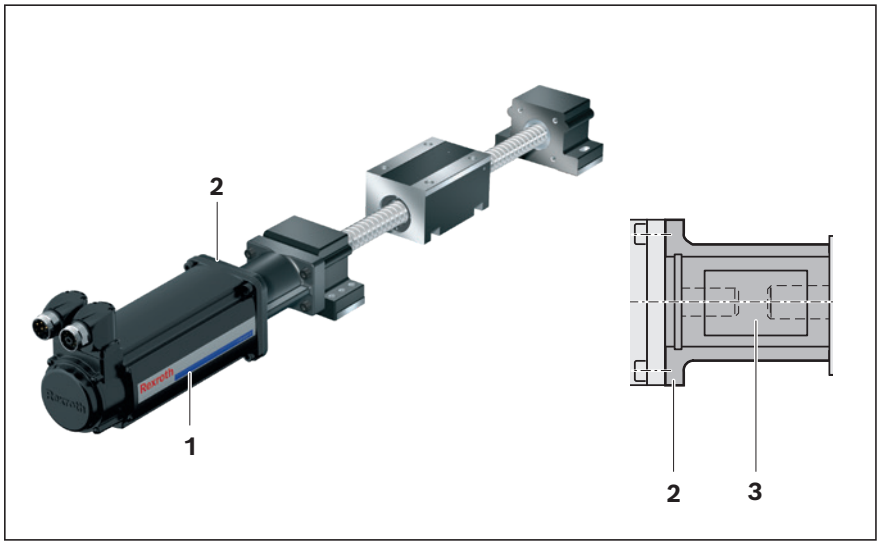


Belt side drive



Motor attachment with flange and coupling

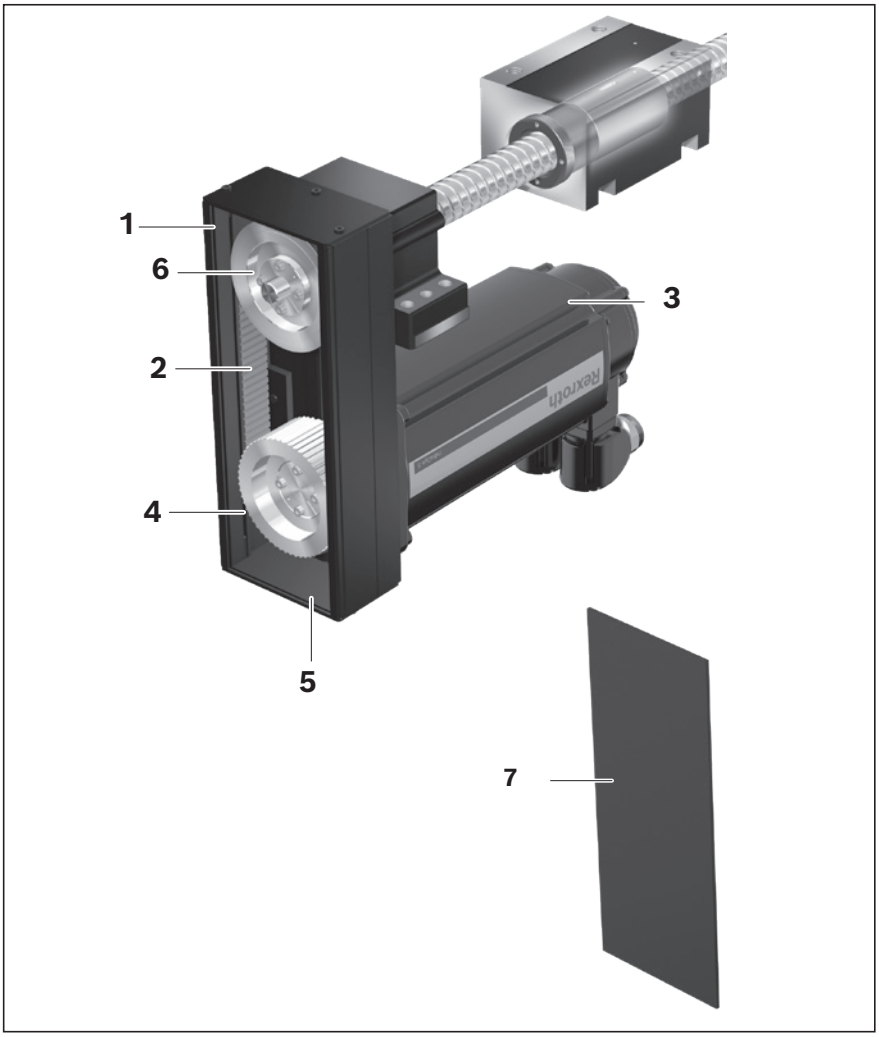
A motor can be attached to all drive units via flange and coupling. The flange secures the motor to the drive unit and serves as a closed housing for the coupling.
The coupling transmits the motor drive torque to the drive unit's drive shaft free of distortive stresses.
Our standard couplings compensate for the system's thermal expansion.



1 Motor
2 Flange
3 Coupling

Structural design belt side drive

All drive units can be attached to the motor by a belt side drive. This makes the total length shorter than when attaching the motor with flange and coupling.
The space-saving, closed pulley housing serves as protection for the belt and as a motor bracket.
Various gear ratios are also available (depending on size):
– i = 1
– i = 2
The belt side drive can be mounted in four different directions:
– below, above (RV01 and RV02)
– left, right (RV03 and RV04)



1 Pulley housing made of anodized aluminum profile
2 Toothed belt
3 Motor
4 Belt pulley
5 Cover
6 Belt pulleys attached using tensioning units
7 Belt side drive cover panel

Technical data

See the "Calculation" section.

General technical data

AOK	BASA	Dynamic load capacity C				Min. travel range	Max. length		Additional length		Nut length	
											Nut	
		ZEM-E[2]	FEM-E-S/ FEP-E-S[1]	FEM-E-B	Fixed bearing		Fixed/ floating bearing	Fixed bearing only	Fixed/ floating bearing	Fixed bearing only	FEM-E-S FEP-E-S[1]	FEM-E-B
	d_0 x P (mm)	(N)	(N)	(N)	(N)	s_{min} (mm)	L_{max} (mm)	L_{max} (mm)	L_{ad} (mm)	L_{ad} (mm)	L_c (mm)	L_c (mm)
AOK-020	20 x 5	15 480	15 480	15 480	17 000	100	3 000	750	120	70	40	40
	20 x 10	15 210	15 210	15 210							60	60
	20 x 20	14 400	14 400	14 400							57	77
	20 x 40[1]	12 600	12 600	–							57	–
AOK-032	32 x 5	23 310	23 310	23 310	26 000	150	4 000	1 500	128	74	48	48
	32 x 10	34 200	34 200	34 200							77	77
	32 x 20	21 240	14 580	21 240							64	84
	32 x 32	21 060	14 490	21 060							88	120
AOK-040	40 x 5	31 410	31 410	31 410	29 000	180	5 000	2 000	160	90	54	54
	40 x 10	54 000	54 000	54 000							70	70
	40 x 20	40 950	40 950	40 950							88	88
	40 x 40	39 960	27 540	39 960							102	142

Mass calculation (without motor attachment, without motor)

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

[1] Mutternausführung ZEM-E nur in Verbindung mit Gehäuse MGA verfügbar

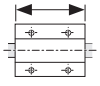
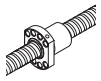
Drive data

AOK	BASA	Constant mass moment of inertia						
		Nut		Nut and housing				
		FEM-E-S FEP-E-S[1]	FEM-E-B	ZEM-E + MGA	FEM-E-S/ FEP-E-S[1] + MGS	FEM-E-B + MGD		
	d_0 x P (mm)	$k_{J\,fix}$ (kgmm²)	$k_{J\,fix}$ (kgmm²)	$k_{J\,fix}$ (kgmm²)	$k_{J\,fix}$ (kgmm²)	$k_{J\,fix}$ (kgmm²)	$k_{J\,var}$ (kgmm)	$k_{J\,m}$ (mm²)
AOK-020	20 x 5	15.5	15.6	16.3	16.2	16.3	0.1004	0.6333
	20 x 10	16.3	16.4	19.3	18.9	19.4	0.1004	2.5330
	20 x 20	21.4	20.3	31.6	33.4	32.3	0.1004	10.1321
	20 x 40[1]	36.0	–	73.1	83.8	–	0.1004	40.5285
AOK-032	32 x 5	129.9	129.9	131.6	131.0	131.4	0.7117	0.6333
	32 x 10	131.3	131.6	137.8	135.8	137.4	0.7117	2.5330
	32 x 20	139.9	138.6	163.6	163.8	161.6	0.7117	10.1321
	32 x 32	165.8	160.9	217.5	227.2	219.8	0.7117	25.9382
AOK-040	40 x 5	374.8	375.0	378.3	376.3	377.3	1.7827	0.6333
	40 x 10	340.7	340.4	353.4	349.8	349.6	1.6068	2.5330
	40 x 20	353.0	352.0	401.7	389.4	388.6	1.6068	10.1321
	40 x 40	482.9	425.0	597.3	733.7	571.3	1.6068	40.5285

[1] Nut version FEP-E-S only available with BASA 20x40

[2] Nut version ZEM-E only available with housing MGA

Short product names ➠ "Service and information/abbreviations" section

Nut and housing length			Moved mass of system					Mass constants				
			Nut		Nut and housing			Fixed/floating bearing		Fixed bearing only		
ZEM-E + MGA	FEM-E-S/ FEP-E-S[1] + MGS	FEM-E-B + MGD	FEM-E-S FEP-E-S[1]	FEM-E-B	ZEM-E + MGA	FEM-E-S/ FEP-E-S[1] + MGS	FEM-E-B + MGD	Aluminum	Steel	Aluminum	Steel	
												
L_c (mm)	L_c (mm)	L_c (mm)	m_{ca} (kg)	m_{ca} (kg)	m_{ca} (kg)	m_{ca} (kg)	m_{ca} (kg)	$k_{g\ fix}$ (kg)	$k_{g\ fix}$ (kg)	$k_{g\ fix}$ (kg)	$k_{g\ fix}$ (kg)	$k_{g\ var}$ (kg/mm)
100	52	67	0.28	0.31	1.55	1.33	1.49	3.13	7.03	1.89	3.77	0.0021
100	60	67	0.36	0.40	1.57	1.41	1.58					
100	78	77	0.60	0.49	1.61	1.78	1.67					
100	63	–	0.51	–	1.42	1.69	–					
150	63	83	0.54	0.62	3.33	2.29	2.89	4.14	9.65	2.48	4.91	0.0056
150	77	83	0.72	0.84	3.27	2.47	3.11					
150	75	84	1.02	0.90	3.36	3.39	3.17					
150	114	120	1.40	1.21	3.39	3.77	3.48					
180	75	95	0.71	1.03	6.23	3.08	4.64	6.86	14.98	4.12	7.68	0.0088
180	80	95	1.29	1.19	6.29	4.88	4.80					
180	88	95	1.54	1.44	6.34	5.13	5.05					
180	151	142	3.59	2.16	6.41	9.78	5.77					

Length calculation

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

Effective stroke

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

Example for length calculation ➠
"Service and information/project planning/calculation" section and "Order example" section.

Frictional torque		Maximum permissible acceleration	Maximum drive torque	Maximum speed
Fixed/floating bearing or fixed bearing only for preload class				
C1	C2 or C3			
M_{Rs} (Nm)	M_{Rs} (Nm)	a_{max} (m/s^2)	M_P (Nm)	v_{max} (m/s)
0.6	0.7	39.8	See graphs	See graphs
0.6	0.7	50.0		
0.6	0.7	50.0		
0.5	–	50.0		
1.1	1.3	17.9		
1.2	1.5	30.7		
1.1	1.3	50.0		
1.1	1.3	50.0		
1.7	2.1	12.2		
1.9	2.5	16.8		
1.8	2.3	33.0		
1.8	2.3	50.0		

Technical data

See the "Calculation" section.

Drive data for motor attachment with belt side drive

AOK	Motor	BASA (mm) d_0 x P	up to L[2] (mm) Fixed/ floating bearing	Fixed bearing only	M_{sd}[1] (Nm) i = 1	i = 2	J_{sd} (10^{-6} kgm²) i = 1	i = 2	M_{Rsd} (Nm)	m_{sd} (kg)	F (mm)	B_t i = 1	i = 2
AOK-020	MSM041B MS2N04	20 x 5	1 500	300	6.00	–	240	–	0.40	1.24	88	16 AT5	–
		20 x 10	1 900	400	7.90								
		20 x 20	2 600	600	7.94								
		20 x 40	2 200	500	7.94								
	MS2N05	20 x 5	1 500	300	6.00	–	1 420	–	0.45	3.20	116	25 AT5	–
		20 x 10	1 900	400	7.90								
		20 x 20	2 500	600	8.70								
		20 x 40	2 100	500	8.90								
AOK-032	MS2N06	32 x 5	2 500	600	19.10	9.55	1 400	260	0.50	3.20	116	25 AT5	32 AT5
		32 x 10	3 400	700	19.21	12.30							
		32 x 20	4 000	1 100	19.21	12.30							
		32 x 32	4 000	1 500	19.21	12.30							
AOK-040	MS2N07	40 x 5	3 500	800	25.60	12.80	7 780	1 260	0.60	8.60	160	50 AT10	50 AT10
		40 x 10	3 000	700	51.20	25.60							
		40 x 20	3 100	700	99.30	49.65							
		40 x 40	4 400	1 100	99.30	49.65							

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

[2] For greater lengths, the permissible drive torque is determined from the variable-length value M_p of the drive unit in accordance with the graph ➠ "Service and information/calculation principles" section.

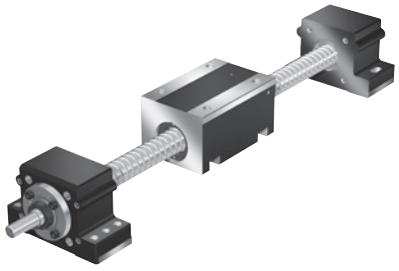
Drive data for motor attachment with flange and coupling

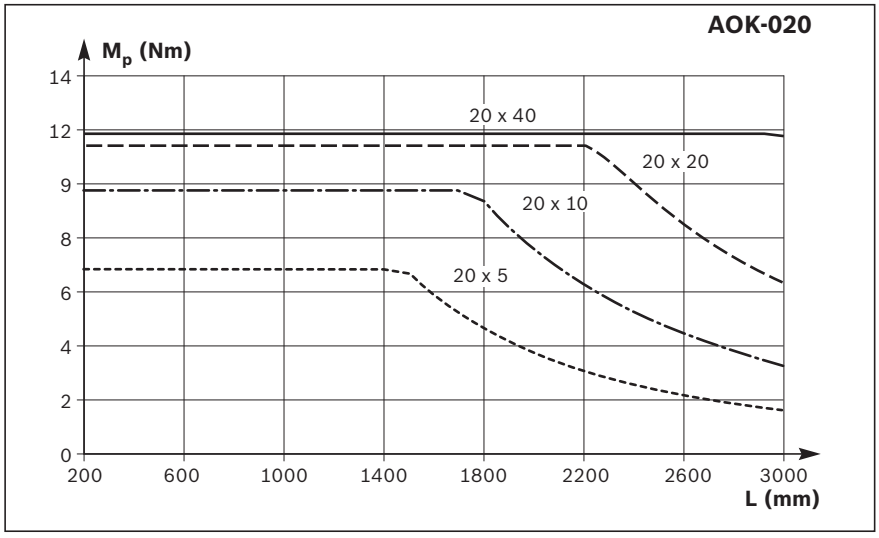
AOK	Motor	Coupling M_{cN} (Nm)	J_c (10^{-6} kgm²)	Flange and coupling m_{fc} (kg)
AOK-020	MSM041B	14.5	63	0.85
	MS2N04	19.0	57	0.55
	MS2N05	50.0	210	2.00
AOK-032	MS2N06	50.0	210	1.80
AOK-040	MS2N07	115.0	390	2.70

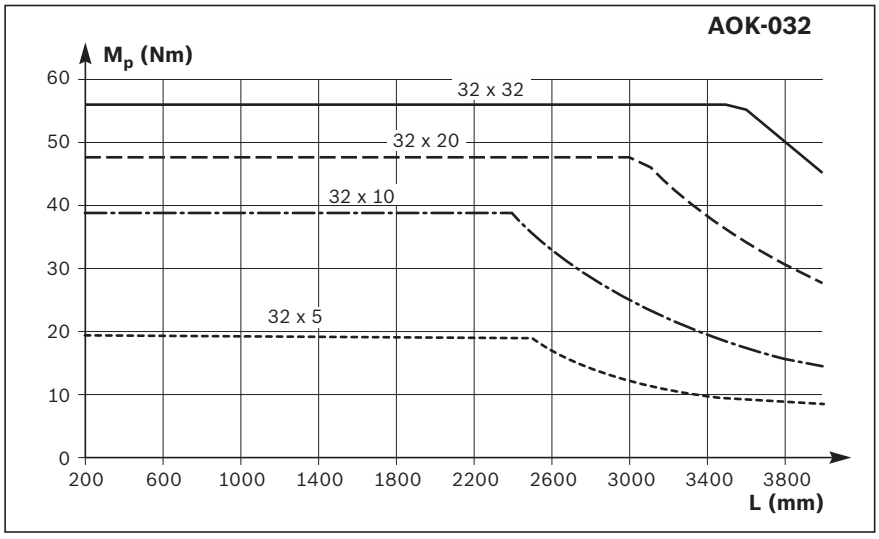
Short product names ➠ "Service and information/abbreviations" section

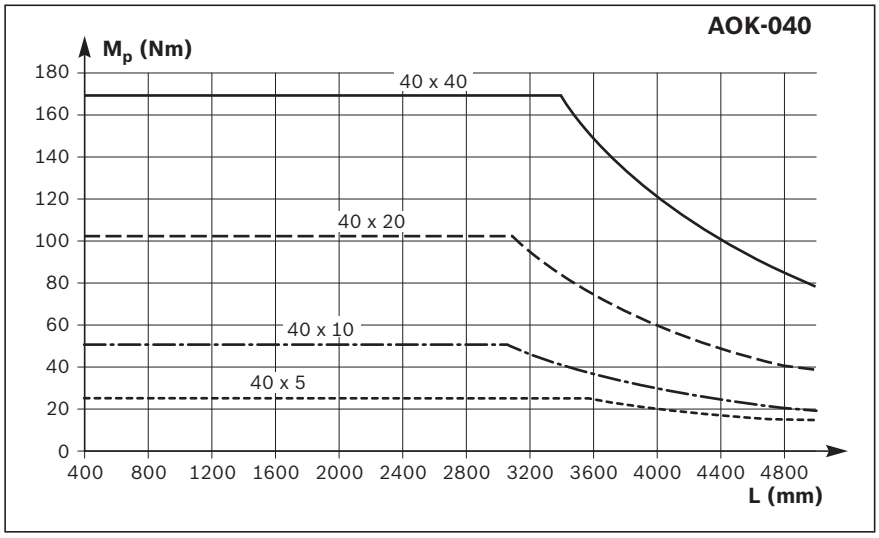
Technical data

Permissible drive torque M_P with fixed and floating bearing

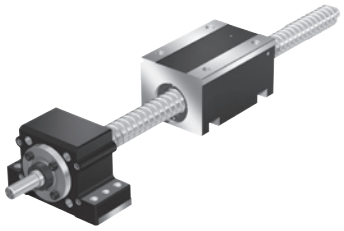


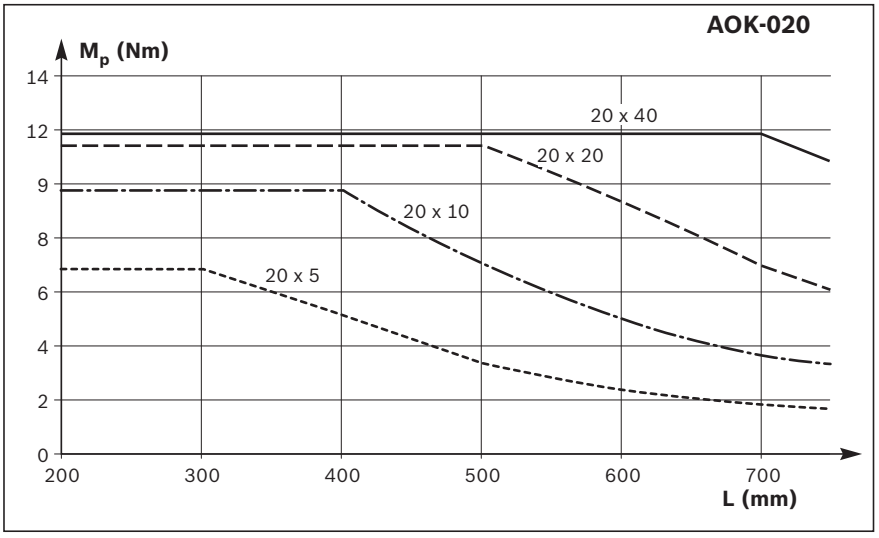


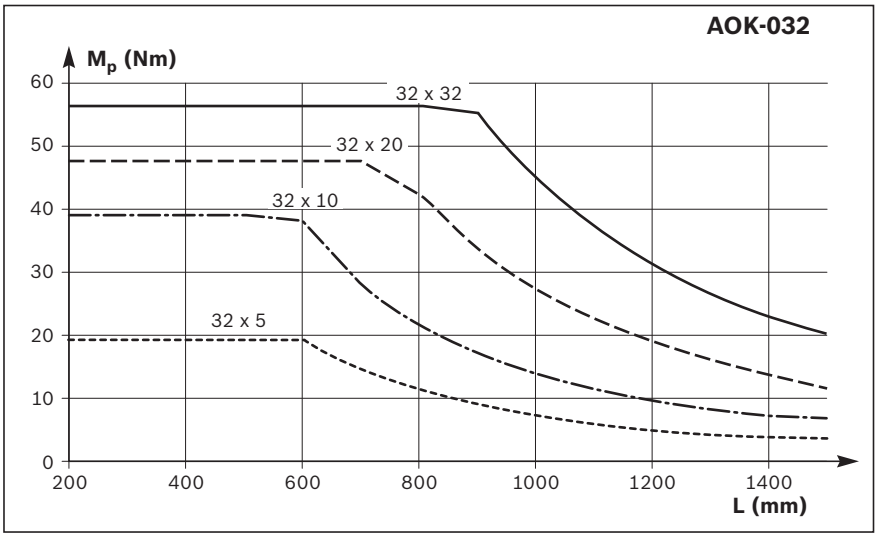


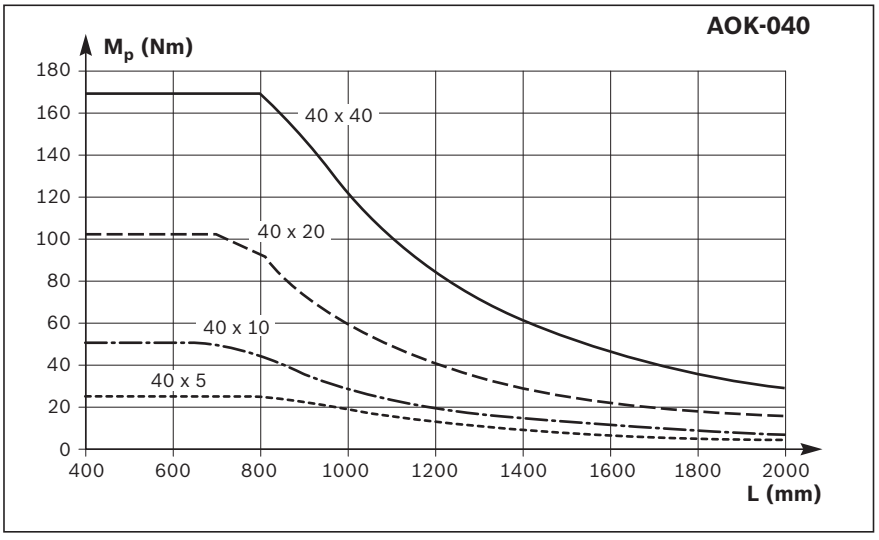


Permissible drive torque M_P with fixed bearing only









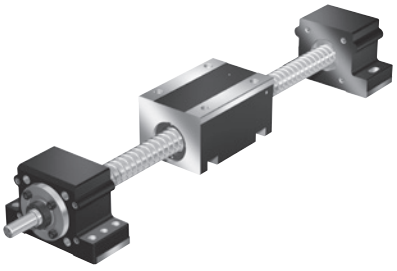
Note

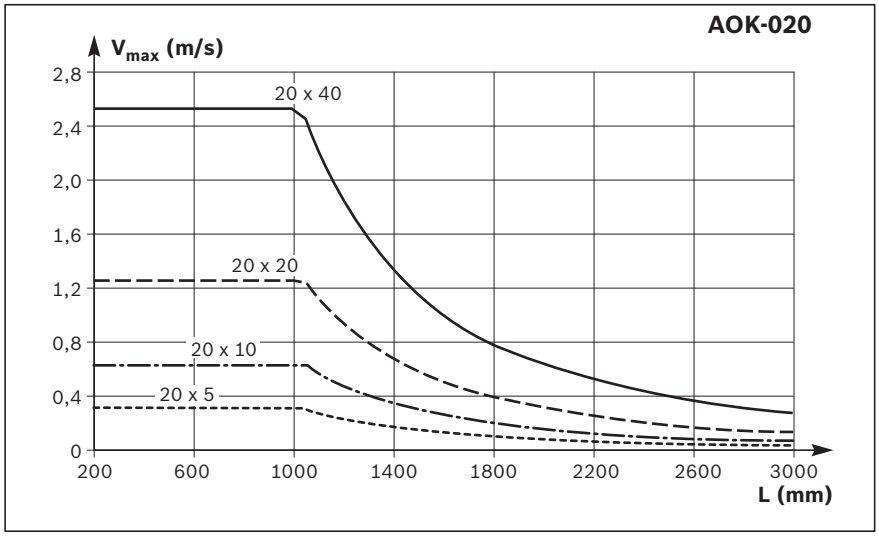
The values shown for M_p apply under the following conditions:

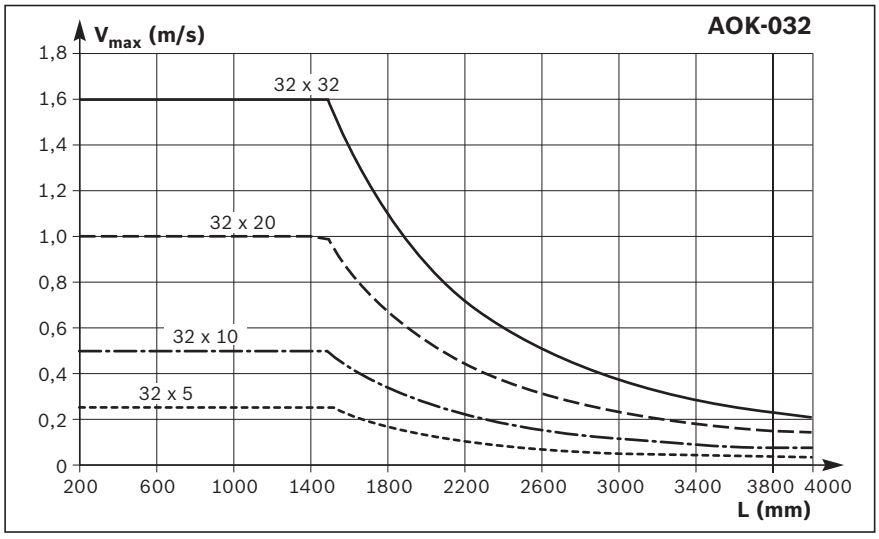
– No radial load on screw journal

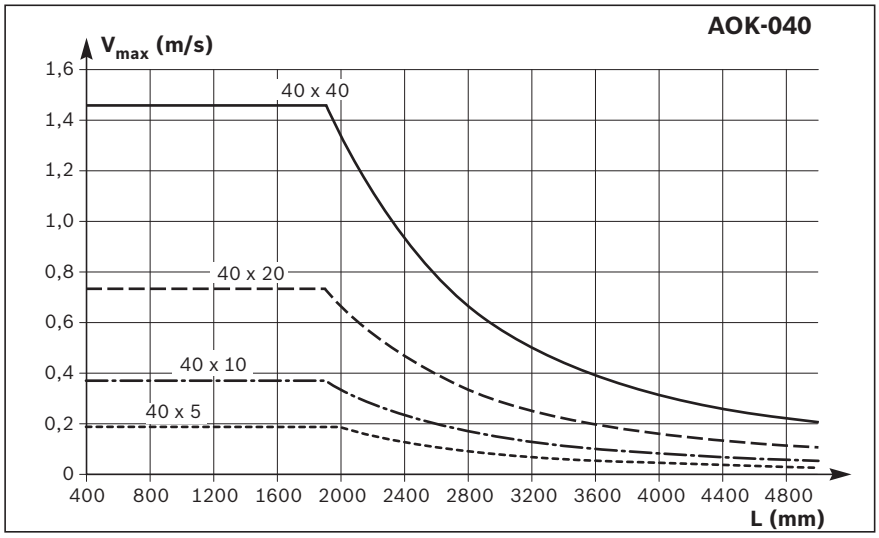
Technical data

Permissible speed v_{max} with fixed and floating bearing

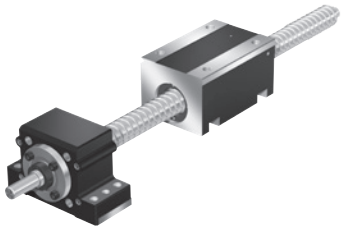


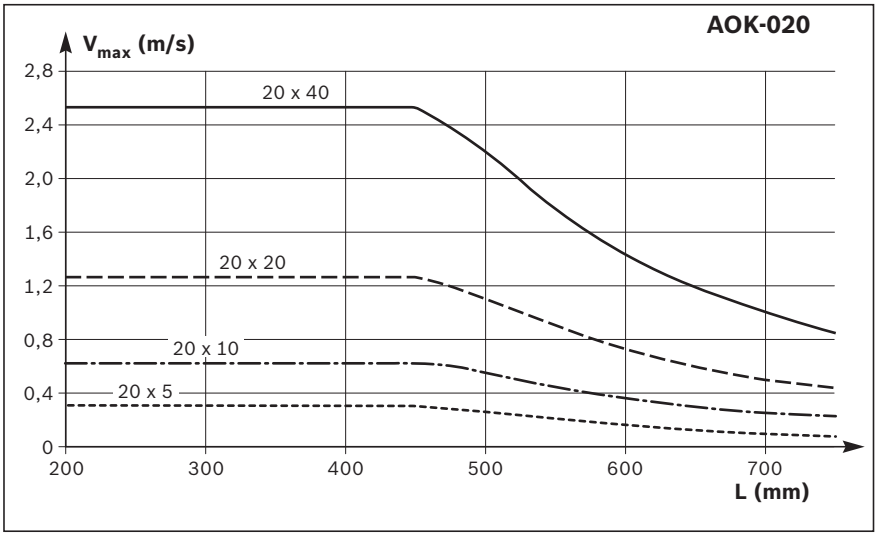


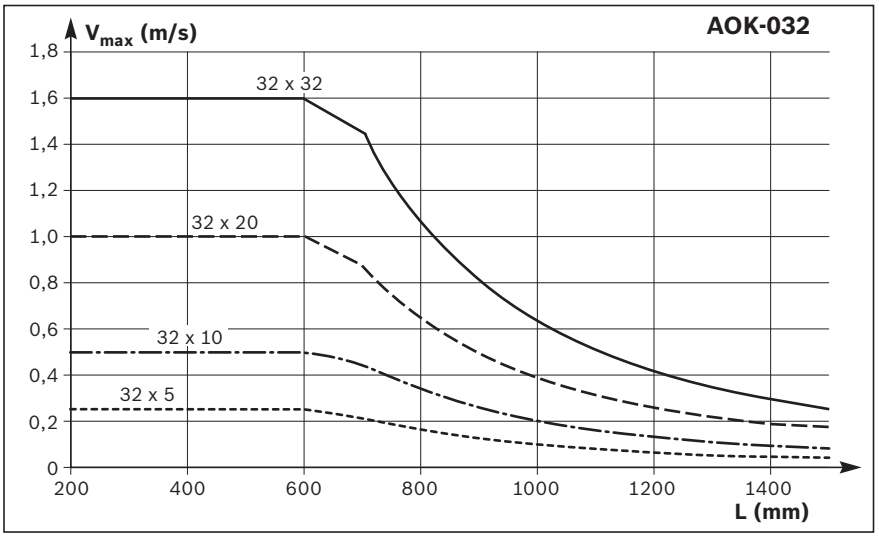


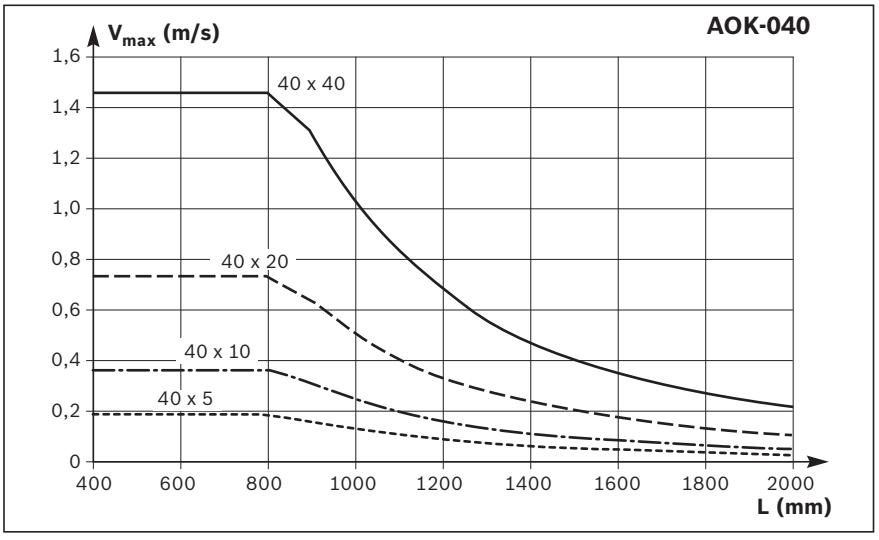


Permissible speed v_{max} with fixed bearing only



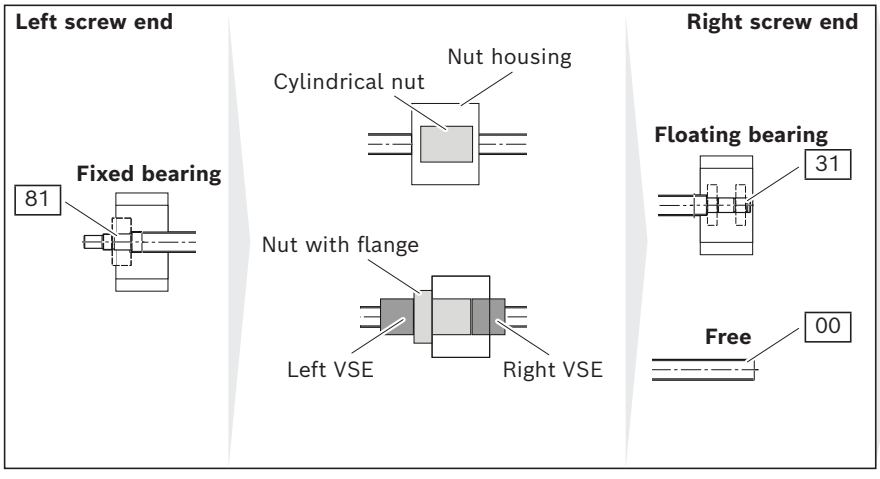


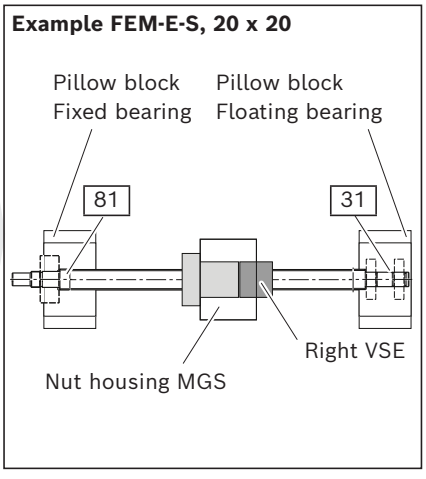




AOK-020 Configuration and ordering

Short product name, length: AOK-020-NN-1, ... mm	Drive BASA Nut	Size d_0 x P 20 x 5	20 x 10	20 x 20	20 x 40	Tolerance grade		Standard seal	Lubrication With initial greasing	Left VSE	Right VSE	Preload class C1 (moderate)	C2 (medium)	C3 (high)	Screw ends Left	Right
Fixed and floating bearing	ZEM-E	01	04	02	–	T5	T7	1	1	–	–	3	6	2	81	31
		–	–	–	03											
	FEM-E-S	11	–	–	–	T5	T7	1	1	2	3	3	6	2	81	31
		–	13	–	–					–	–					
		–	–	12	–					2	3					
	FEP-E-S	–	–	–	33	T5	T7	1	1	–	–	3	6	2	81	31
	FEM-E-B	21	–	–	–	T5	T7	1	1	2	3	3	6	2	81	31
		–	23	–	–					–	–					
		–	–	22	–					2	3					
Version with fixed bearing only	ZEM-E	06	09	07	–	T5	T7	1	1	–	–	3	6	2	81	00
		–	–	–	08											
	FEM-E-S	16	–	–	–	T5	T7	1	1	2	–	3	6	2	81	00
		–	18	–	–					–	–					
		–	–	17	–					2	–					
	FEP-E-S	–	–	–	38	T5	T7	1	1	–	–	3	6	2	81	00
	FEM-E-B	26	–	–	–	T5	T7	1	1	2	–	3	6	2	81	00
		–	28	–	–					–	–					
		–	–	27	–					2	–					



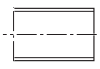


Length calculation ➠ "Technical data" section
Order example ➠ "Service and information/ordering" section

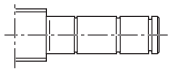
Pillow block		Nut housing			Motor attachment			Motor[2]						Documentation	
								Motor code	2 cable		1 cable				
Aluminum	Steel	Without	With	Type		i =	Attachment kit[1]		Without brake	With brake	Without brake	With brake	Motor connector position	Standard report	Measurement report
02	12	–	01	MGA	Without flange OF01	–	–	00	–				–	01	03 Lead deviation
		–	02												
02	12	00	11	MGS											
		00	14												
		00	12												
02	12	00	13		With flange MF01	–	06	MSM041B-0300	140	141	–	–	000		
02	12	00	21	MGD			03	MS2N04-B0BTN	209	210	211	212			
		00	23					MS2N04-C0BTN	213	214	215	216	090		
		00	22					MS2N04-D0BQN	217	218	219	220			
01	11	–	01	MGA			04	MS2N05-B0BTN	221	222	223	224	180		
		–	12					MS2N05-C0BTN	225	226	227	228			
01	11	00	11	MGS				MS2N05-D0BRN	229	230	231	232	270		
		00	14												
		00	12												
01	11	00	13		With belt side drive RV01 RV02 RV03 RV04	1	32	MSM041B-0300	140	141	–	–	000		
01	11	00	21	MGD			30	MS2N04-B0BTN	209	210	211	212			
		00	23					MS2N04-C0BTN	213	214	215	216	090		
		00	22					MS2N04-D0BQN	217	218	219	220	180		
							23	MS2N05-C0BTN	225	226	227	228			
								MS2N05-D0BRN	229	230	231	232	270		

Screw ends

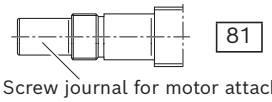
Free end



Floating bearing end



Fixed bearing end (motor attachment)

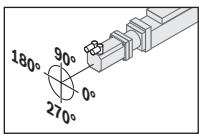


[1] Attachment kit also available without motor (when ordering: enter "00" for motor)
[2] Recommended motor (motor data and type designations ➠ "Motors" section)

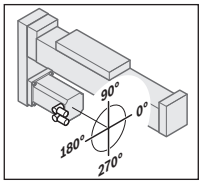
Flange	Motor connector position			
	0°	90°	180°	270°
MF01	000	090 ★	180	270

Belt side drive	Motor connector position			
	0°	90°	180°	270°
RV01	000	–	180	270 ★
RV02	000	090 ★	180	–
RV03	000 ★	090	–	270
RV04	–	090	180 ★	270

★ standard delivery



Example: Flange MF01 Motor connector position 90°



Example: Belt side drive RV01 Motor connector position 180°

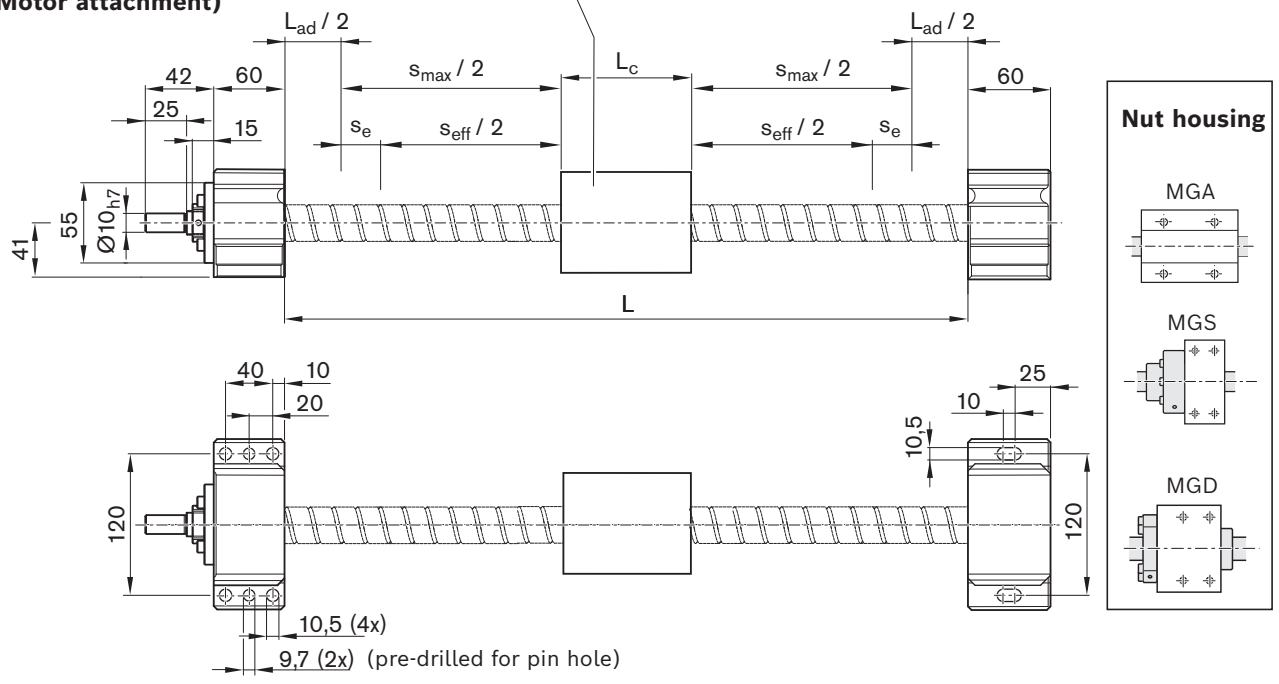
AOK-020 Dimensional drawings

All dimensions are given in mm. Drawings not to scale.
Straightness and flatness tolerance in accordance with DIN EN 12020-02

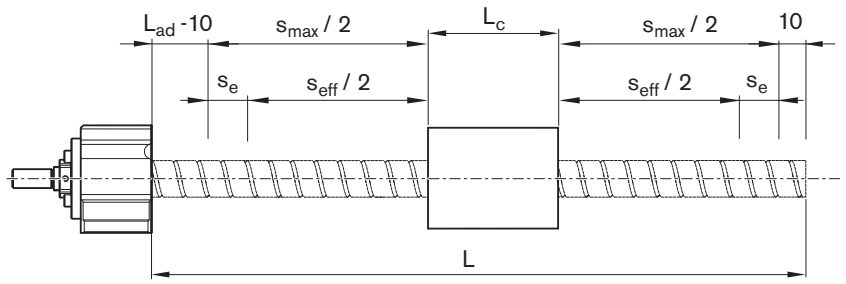
Nut / nut and housing
See "Components and ordering" option table for selection
See corresponding dimension drawings for dimensions

Fixed bearing end (Motor attachment)

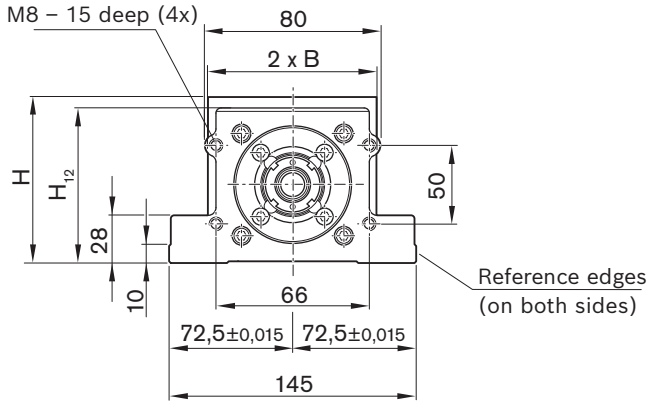
Floating bearing end

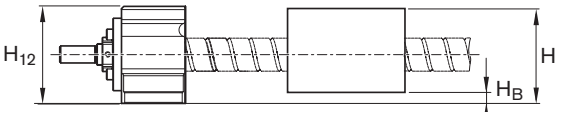


Nut housing



Without floating bearing





Nut and housing dimension drawings

Figure 1 (MGA)

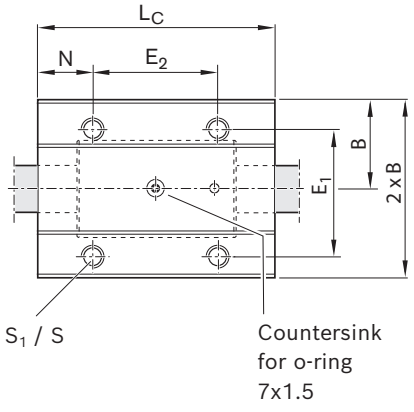


Figure 2 (MGS, MGD)

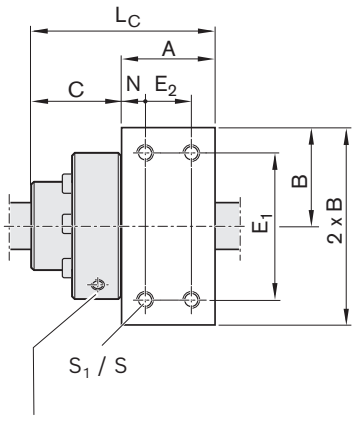
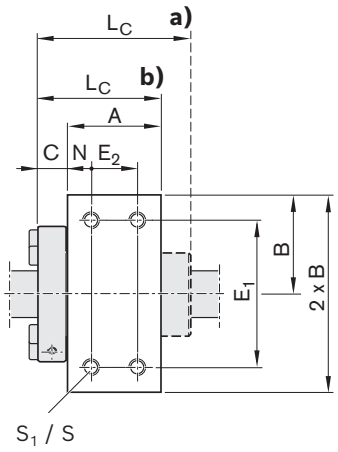
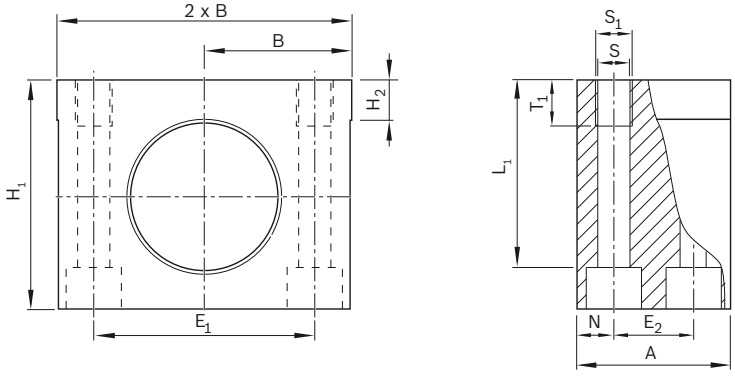


Figure 3 a) / Figure 3 b) (MGS, MGD)



Dimension drawing for all nut housings (Figure 1, 2, 3)

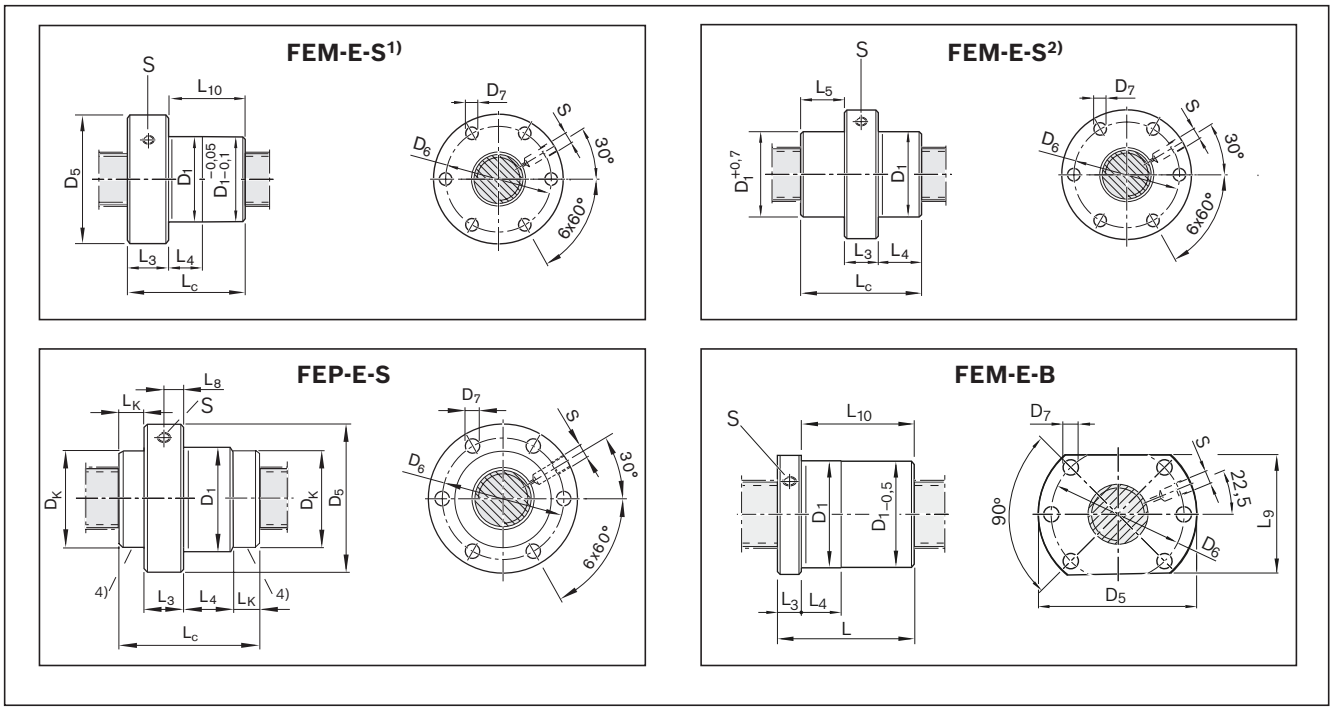


S_1 = 4x thread
S = 4x drill hole

AOK-020 d_0 x P	Nut	Nut housing	Figure	Dimensions (mm) A	B ±0.01	C	E_1	E_2	H	H_1	H_2	H_{12} ±0.15	H_B	L_c	L_1	N	S_1	S	T_1
20 x 5	ZEM-E	MGA	1	–	37.5	–	55	60	85	75			10	100	63	20	M10	8.6	
	FEM-E-S	MGS	3 b)	40	37.5	12	$56^{\pm0.1}$	$20^{\pm0.1}$	73	62			11	52	51	10	M10	8.4	
	FEM-E-B	MGD	3 b)	55	37.5	12	$55^{\pm0.1}$	$23^{\pm0.1}$	69	56			13	67	45	22	M10	8.4	
20 x 10	ZEM-E	MGA	1	–	37.5	–	55	60	85	75			10	100	63	20	M10	8.6	
	FEM-E-S	MGS	3 a)	40	37.5	12	$56^{\pm0.1}$	$20^{\pm0.1}$	73	62			11	60	51	10	M10	8.4	
	FEM-E-B	MGD	3 b)	55	37.5	12	$55^{\pm0.1}$	$23^{\pm0.1}$	69	56	10	81	13	67	45	22	M10	8.4	15
20 x 20	ZEM-E	MGA	1	–	37.5	–	55	60	85	75			10	100	63	20	M10	8.6	
	FEM-E-S	MGS	2	40	42.5	38	$63^{\pm0.1}$	$20^{\pm0.1}$	75	65			10	78	54	10	M10	8.4	
	FEM-E-B	MGD	3 a)	55	37.5	12	$55^{\pm0.1}$	$23^{\pm0.1}$	69	56			13	77	45	22	M10	8.4	
20 x 40	ZEM-E	MGA	1	–	37.5	–	55	60	85	75			10	100	63	20	M10	8.6	
	FEP-E-S	MGS	2	40	42.5	23	$63^{\pm0.1}$	$20^{\pm0.1}$	75	65			10	63	54	10	M10	8.4	

L_{ad} = additional length (➠ "Technical data" section)

AOK-020 Nut dimension drawings



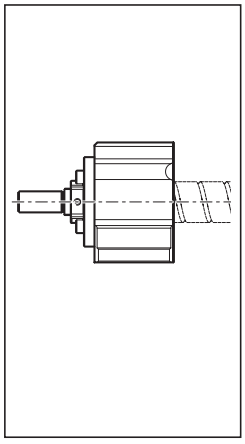
AOK-020 d_0 x P	Nut	Dimensions (mm) D_1 (g6)	D_5	D_6	D_7	D_K	L_C	L_3	L_4	L_5	L_8	L_9	L_{10}	L_K	S[3]
20 x 5	FEM-E-S[1]	33	58	45	6.6	–	40	12	10.0	–	–	–	28	–	M6
	FEM-E-B	36	58	47	6.6	–	40	12	10.0	–	–	44	28	–	M6
20 x 10	FEM-E-S[1]	33	58	45	6.6	–	60	12	16.0	18.5	–	–	48	–	M6
	FEM-E-B	36	58	47	6.6	–	60	12	16.0	–	–	44	48	–	M6
20 x 20	FEM-E-S[2]	38	63	50	6.6	–	57	20	18.5	18.5	–	–	–	–	M6
	FEM-E-B	36	58	47	6.6	–	77	12	25.0	–	–	44	65	–	M6
20 x 40	FEP-E-S	38	63	50	6.6	37.5	$57^{\pm 0.5}$	12	23.0	–	8	–	–	11	M6

3) Lube hole (S) (in flange center on FEM-E-S, FEM-E-B); lube port version: Flat surface $L_3 \leq 15$ mm, countersink $L_3 > 15$ mm;
4) Plastic recirculation cap

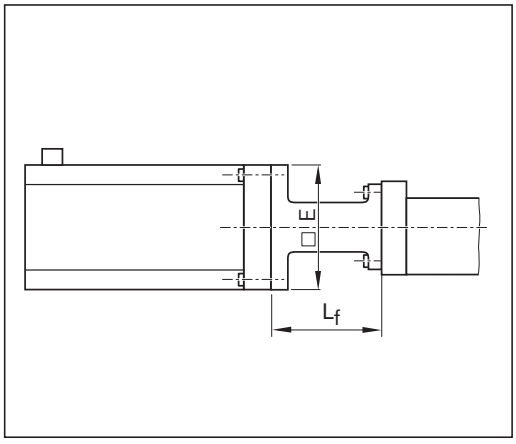
Motor attachment dimension drawings

Version

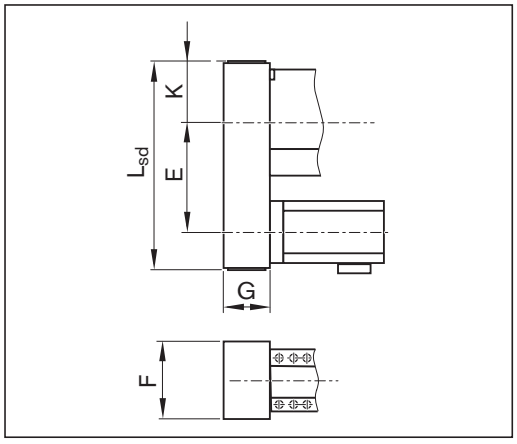
OF01



MF01



RV01, RV02, RV03, RV04



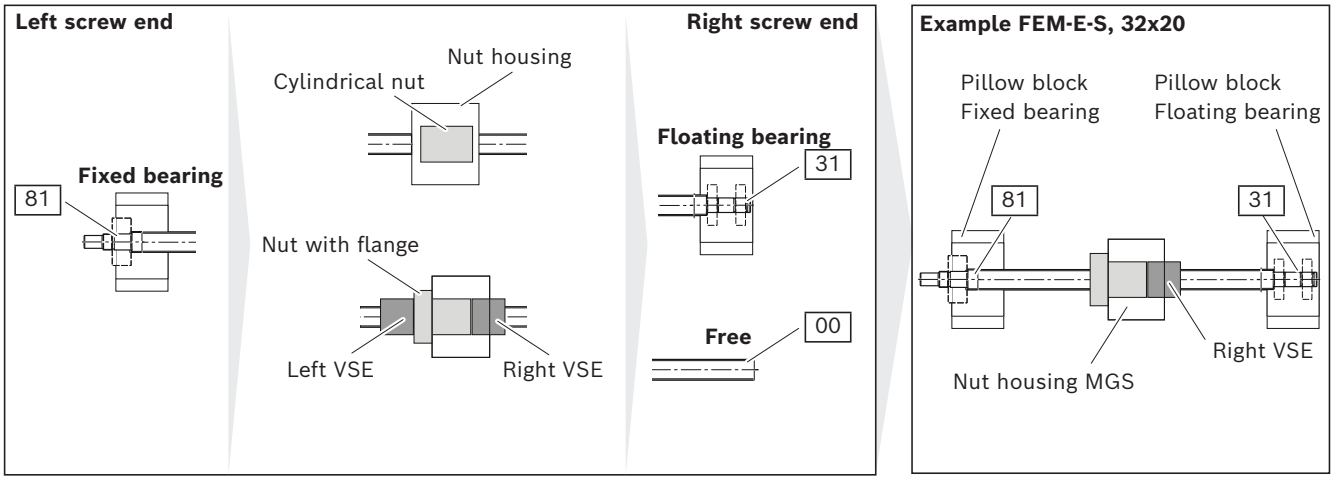
Version	**Motor code**	**Dimensions** (mm)	
		L_f	**□E**
MF01	MSM041B	90	see dimension □ **A** ➠ "Motors" section
	MS2N04-B0BTN		
	MS2N04-C0BTN		
	MS2N04-D0BQN		
	MS2N05-B0BTN	115	
	MS2N05-C0BTN		
	MS2N05-D0BRN		

Version	**Motor code**	**Dimensions** (mm)				
		E i = 1	**F**	**G**	**K**	**L_{sd} i = 1**
RV01, RV02, RV03, RV04	MSM041B	122.5	88	51	47.5	231
	MS2N04-B0BTN					
	MS2N04-C0BTN					
	MS2N04-D0BQN					
	MS2N05-C0BTN	155.0	116	66	56.0	287
	MS2N05-D0BRN					

Further information on motors ➠ "Motors" section

AOK-032 Configuration and ordering

Short product name, length: AOK-032-NN-1, ... mm	Drive BASA Nut	Size d_0 x P 32 x 5	32 x 10	32 x 20	32 x 32	Tolerance grade		Standard seal	Lubrication With initial greasing	Left VSE	Right VSE	Preload class C1 (moderate)	C2 (medium)	C3 (high)	Screw ends Left	Right
Fixed and floating bearing	ZEM-E	01	02	03	04	T5	T7	1	1	–	–	3	6	2	81	31
	FEM-E-S	11	–	–	–	T5	T7	1	1	2	3	3	6	2	81	31
		–	12	–	–											
		–	–	13	–											
		–	–	–	14											
	FEM-E-B	21	–	–	–	T5	T7	1	1	2	3	3	6	2	81	31
		–	22	–	–											
		–	–	23	–											
		–	–	–	24											
Version with fixed bearing only	ZEM-E	06	07	08	09	T5	T7	1	1	–	–	3	6	2	81	00
	FEM-E-S	16	–	–	–	T5	T7	1	1	2	–	3	6	2	81	00
		–	17	–	–											
		–	–	18	–											
		–	–	–	19											
	FEM-E-B	26	–	–	–	T5	T7	1	1	2	–	3	6	2	81	00
		–	27	–	–											
				28												
		–	–	–	29											

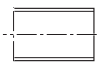


Length calculation ➠ "Technical data" section
Order example ➠ "Service and information/ordering" section

Pillow block		Nut housing			Motor attachment			Motor[2]						Documentation	
								Motor code	2 cable		1 cable		Motor connector position		
Aluminum	Steel	ithout	With	Type		i =	Attachment kit[1]		Without brake	With brake	Without brake	With brake		Standard report	Measurement report
02	12	–	01	MGA	Without flange OF01	–	–	00	–				–	01	03 Lead deviation
02	12	00	11	MGS	With flange MF01	–	06	MS2N06-B1BNN	233	234	235	236	000		
		00	13					MS2N06-C0BTN	237	238	239	240	090		
		00	12					MS2N06-D0BRN	241	242	243	244	180		
		00	14					MS2N06-D1BNN	245	246	247	248	270		
02	12	00	21	MGD											
		00	22												
		00	23												
		00	24												
01	11	–	01	MGA	With belt side drive RV01 RV02	1	23	MS2N06-B1BNN	233	234	235	236	000		
01	11	00	11	MGS				MS2N06-D1BNN	245	246	247	248	090		
		00	13												
		00	12												
		00	14												
01	11	00	21	MGD	RV03 RV04	2	24	MS2N06-B1BNN	233	234	235	236	180		
		00	22												
		00	23					MS2N06-C0BTN	237	238	239	240	270		
		00	24												

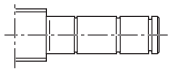
Screw ends

Free end



00

Floating bearing end



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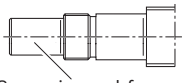
Fixed bearing end (motor attachment)



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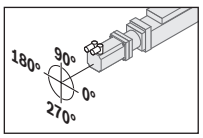
Screw journal for motor attachment

[1] Attachment kit also available without motor (when ordering: enter "00" for motor)
[2] Recommended motor (motor data and type designations ➠ "Motors" section)

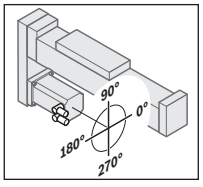
Flange	Motor connector position			
	0°	90°	180°	270°
MF01	000	090 ★	180	270

Belt side drive	Motor connector position			
	0°	90°	180°	270°
RV01	000	–	180	270 ★
RV02	000	090 ★	180	–
RV03	000 ★	090	–	270
RV04	–	090	180 ★	270

★ standard delivery



Example: Flange MF01 Motor connector position 90°

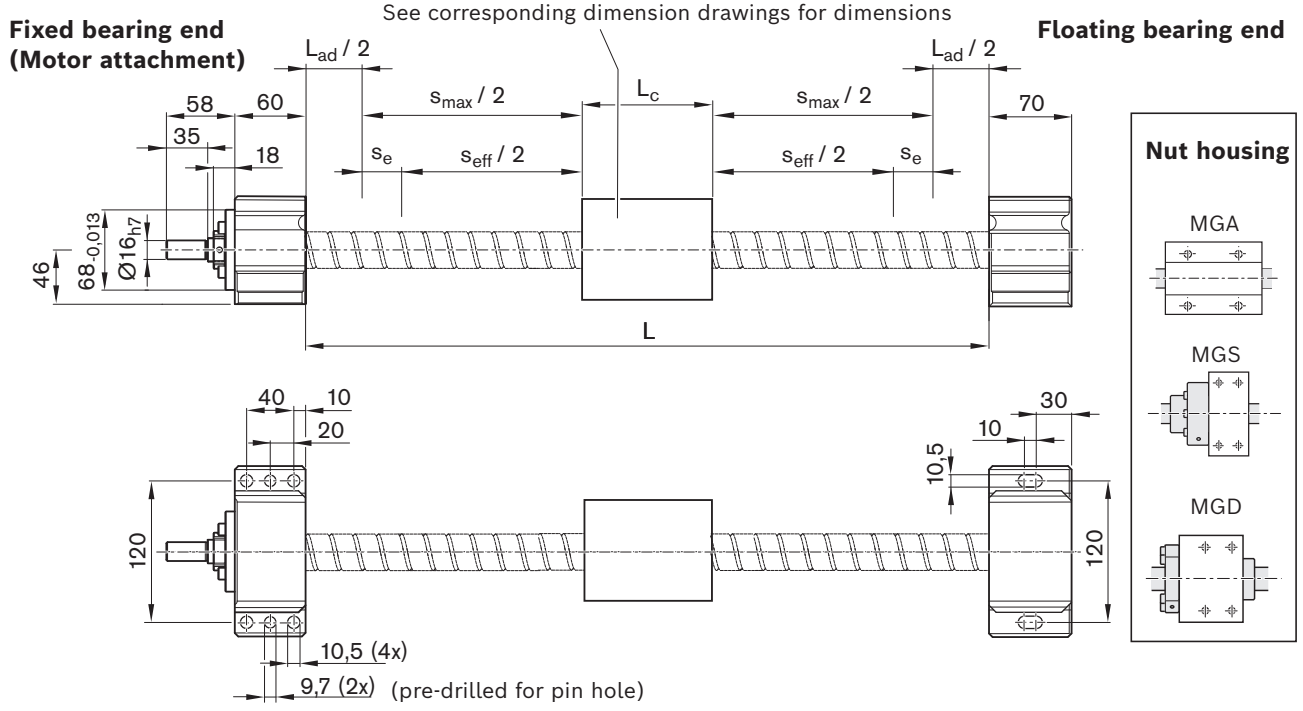


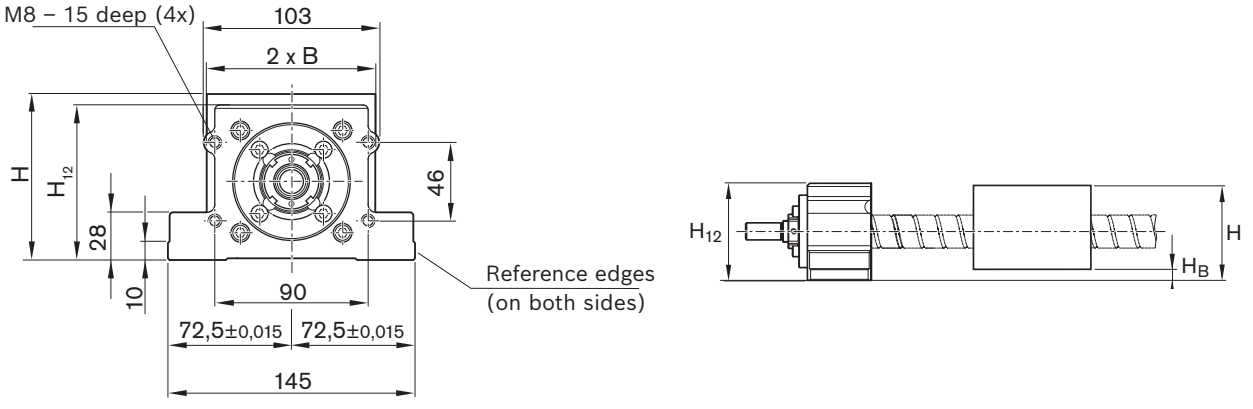
Example: Belt side drive RV01 Motor connector position 180°

AOK-032 Dimensional drawings

All dimensions are given in mm. Drawings not to scale.
Straightness and flatness tolerance in accordance with DIN EN 12020-02

Nut / nut and housing
See "Components and ordering" option table for selection
See corresponding dimension drawings for dimensions





Nut and housing dimension drawings

Figure 1 (MGA)

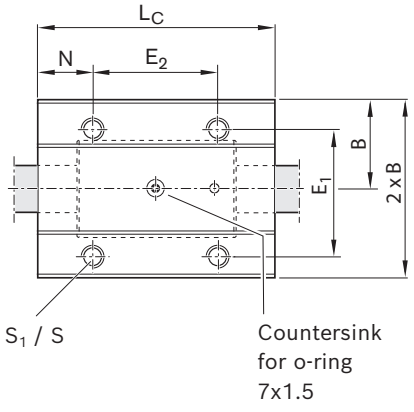


Figure 2 (MGS, MGD)

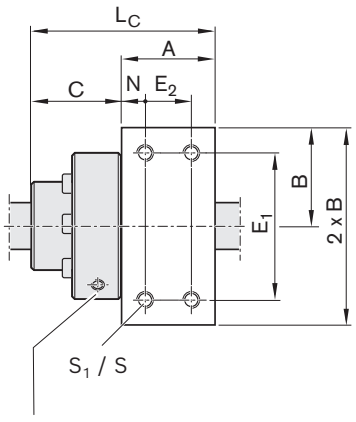
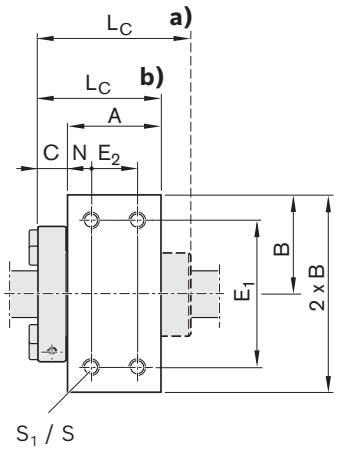
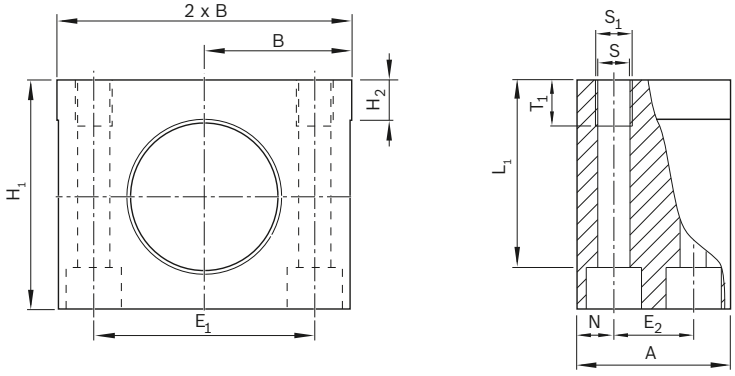


Figure 3 a) / Figure 3 b) (MGS, MGD)



Dimension drawing for all nut housings (Figure 1, 2, 3)

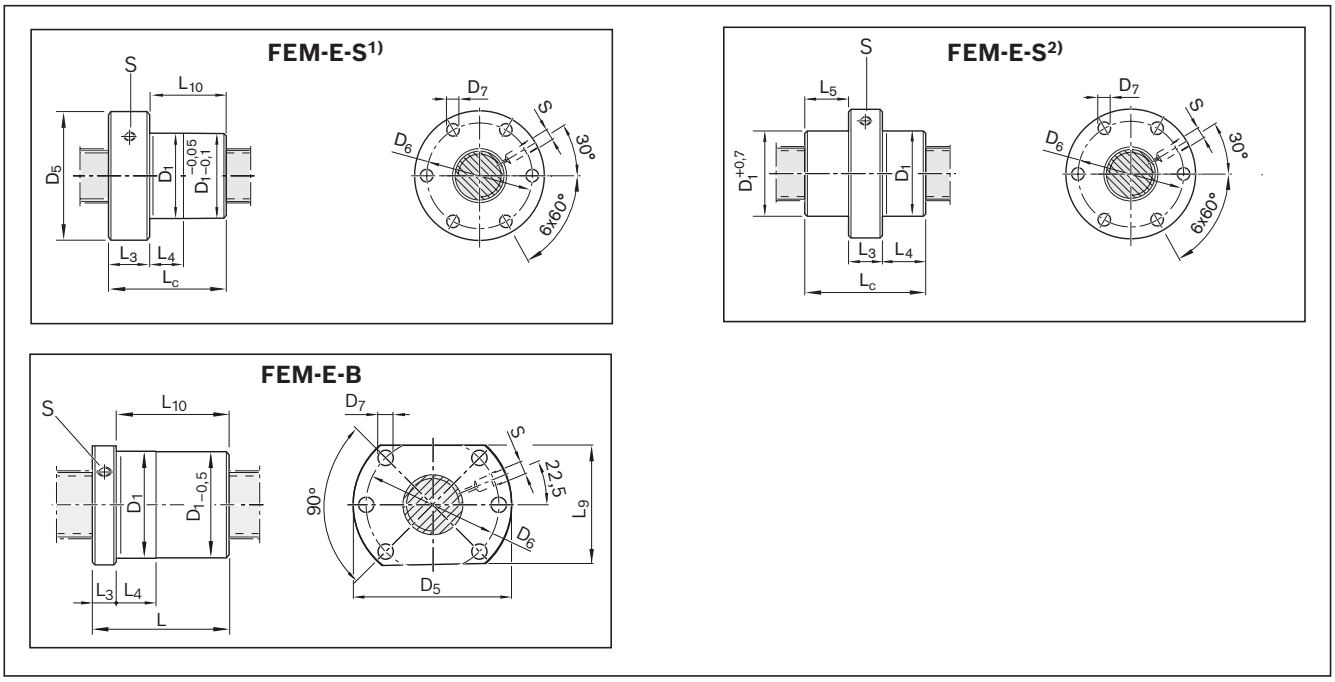


S_1 = 4x thread
S = 4x drill hole

AOK-032 d_0 x P	Nut	Nut housing	Figure	Dimensions (mm) A	B ±0.01	C	E_1	E_2	H	H_1	H_2	H_{12} ±0.15	H_B	L_c	L_1	N	S_1	S	T_1
32 x 5	ZEM-E	MGA	1	–	50	–	75	100	95	80	10	91	15	150	66	25	M12	10.5	18
	FEM-E-S	MGS	3 b)	50	47.5	13	$72^{\pm0.1}$	$26^{\pm0.1}$	84	75			9	63	61	12	M12	10.5	15
	FEM-E-B	MGD	3 b)	70	50	13	$75^{\pm0.1}$	$30^{\pm0.1}$	81	70			11	83	52	27	M16	13.0	20
32 x 10	ZEM-E	MGA	1	–	50	–	75	100	95	80			15	150	66	25	M12	10.5	18
	FEM-E-S	MGS	3 a)	50	47.5	13	$72^{\pm0.1}$	$26^{\pm0.1}$	84	75			9	77	61	15	M12	10.5	15
	FEM-E-B	MGD	3 b)	70	50	13	$75^{\pm0.1}$	$30^{\pm0.1}$	81	70			11	83	52	27	M16	13.0	20
32 x 20	ZEM-E	MGA	1	–	50	–	75	100	95	80	12		15	150	66	25	M12	10.5	18
	FEM-E-S	MGS	3 b)	60	52.5	15	$82^{\pm0.1}$	$30^{\pm0.1}$	88	82			6	75	64	15	M16	13.0	20
	FEM-E-B	MGD	3 a)	70	50	13	$75^{\pm0.1}$	$30^{\pm0.1}$	81	70			11	84	52	27	M16	13.0	20
32 x 32	ZEM-E	MGA	1	–	50	–	75	100	95	80			15	150	66	25	M12	10.5	18
	FEM-E-S	MGS	2	60	52.5	54	$82^{\pm0.1}$	$30^{\pm0.1}$	88	82			6	114	64	15	M16	13.0	20
	FEM-E-B	MGD	3 a)	70	50	13	$75^{\pm0.1}$	$30^{\pm0.1}$	81	70			11	120	52	27	M16	13.0	20

L_{ad} = additional length (➠ "Technical data" section)

AOK-032 Nut dimension drawings



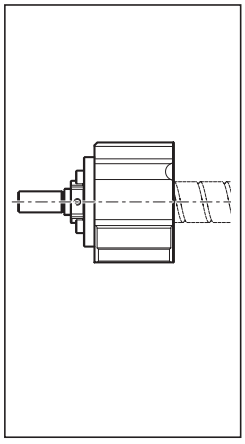
AOK-032	Nut	Dimensions (mm)										
d_0 x P		D_1 (g6)	D_5	D_6	D_7	L_C	L_3	L_4	L_5	L_9	L_{10}	S[3]
32 x 5	FEM-E-S[1]	48	73	60	6.6	48	13	10	–	–	35	M6
	FEM-E-B	50	80	65	9.0	48	13	10	–	62	35	M6
32 x 10	FEM-E-S[1]	48	73	60	6.6	77	13	16	–	–	64	M6
	FEM-E-B	50	80	65	9.0	77	13	16	–	62	64	M6
32 x 20	FEM-E-S[1]	56	80	60	6.6	64	15	25	–	–	49	M6
	FEM-E-B	50	80	65	9.0	84	13	25	–	62	71	M6
32 x 32	FEM-E-S[2]	56	80	60	6.6	88	20	34	34	–	–	M6
	FEM-E-B	50	80	65	9.0	120	13	40	–	62	107	M6

[3] Lube hole (S) (in flange center on FEM-E-S, FEM-E-B); lube port version: Flat surface $L_3 \leq 15$ mm, countersink $L_3 > 15$ mm;

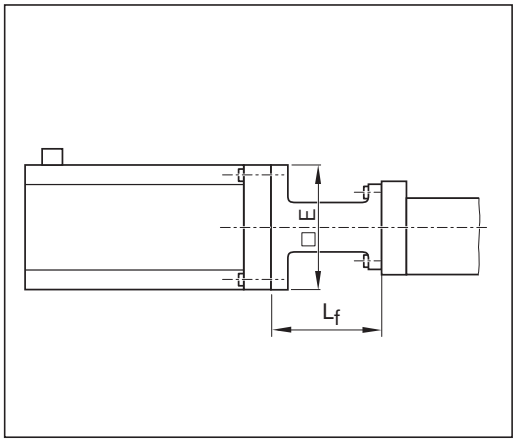
Motor attachment dimension drawings

Version

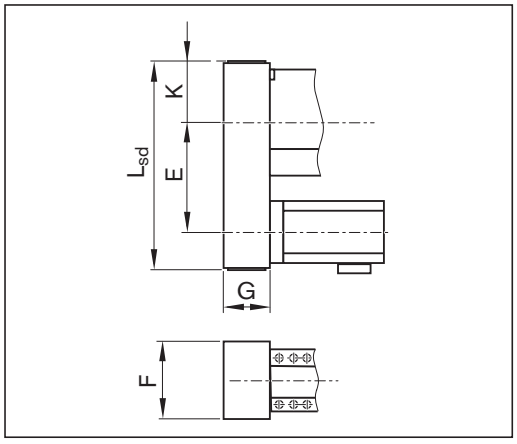
OF01



MF01



RV01, RV02, RV03, RV04



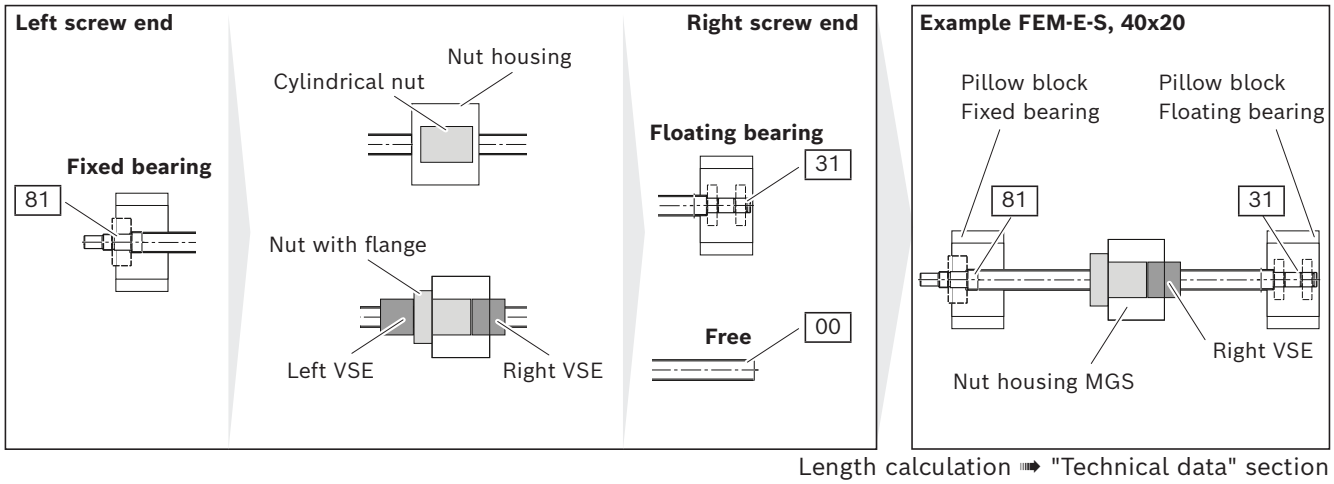
Version	**Motor code**	**Dimensions** (mm)	
		L_f	**□E**
MF01	MS2N06-B1BNN MS2N06-C0BTN MS2N06-D0BRN MS2N06-D1BNN	125	see dimension □ **A** ➠ "Motors" section

Version	**Motor code**	**Dimensions** (mm)						
		E		**F**	**G**	**K**	**L_{sd}**	
		i = 1	**i = 2**				**i = 1**	**i = 2**
RV01, RV02, RV03, RV04	MS2N06-B1BNN	165	–	116	66	59	300	–
	MS2N06-C0BTN	–	162				–	300
	MS2N06-D1BNN	165	–				300	–

Further information on motors ➠ "Motors" section

AOK-040 Configuration and ordering

Short product name, length: AOK-040-NN-1, ... mm	Drive BASA Nut	Size d_0 x P 40 x 5	40 x 10	40 x 20	40 x 40	Tolerance grade		Seal Standard	Lubrication With initial greasing	Left VSE	Right VSE	Preload class C1 (moderate)	C2 (medium)	C3 (high)	Screw ends Left	Right
Fixed and floating bearing	ZEM-E	01	02	03	04	T5	T7	1	1	–	–	3	6	2	81	31
	FEM-E-S	11	–	–	–	T5	T7	1	1	2	3	3	6	2	81	31
			12													
		–	–	13	–											
					14											
	FEM-E-B	21	–	–	–	T5	T7	1	1	2	3	3	6	2	81	31
			22													
				23												
					24											
Version with fixed bearing only	ZEM-E	06	07	08	09	T5	T7	1	1	–	–	3	6	2	81	00
	FEM-E-S	16	–	–	–	T5	T7	1	1	2	–	3	6	2	81	00
			17													
		–	–	18	–											
					19											
	FEM-E-B	26	–	–	–	T5	T7	1	1	2	–	3	6	2	81	00
			27													
				28												
					29											

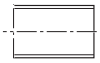


Length calculation ➠ "Technical data" section
Order example ➠ "Service and information/ordering" section

Pillow block		Nut housing			Motor attachment			Motor[2]						Documentation	
								Motor code	2 cables		1 cable				
Aluminum	Steel	Without	With	Type		i =	Attachment kit[1]		Without brake	With brake	Without brake	With brake	Motor connector position	Standard report	Measurement report
02	12	–	01	MGA	Without flange OF01	–	–	00	–				–	01	03 Lead deviation
02	12	00	11	MGS											
		00	12												
		00	14												
		00	13												
02	12	00	21	MGD	With flange MF01	–	003	MS2N07-B1BNN	253	254	255	256	000		
		00	22					MS2N07-C0BQN	257	258	259	260	090		
		00	23					MS2N07-C1BRN	261	262	263	264	180		
		00	24					MS2N07-D1BNN	267	268	269	270	270		
01	11	–	01	MGA	With belt side drive RV01 RV02	1	025	MS2N07-B1BNN	253	254	255	256	000		
								MS2N07-C0BQN	257	258	259	260			
								MS2N07-C1BRN	261	262	263	264	090		
								MS2N07-D1BNN	267	268	269	270			
01	11	00	11	MGS											
		00	12												
		00	14												
		00	13												
01	11	00	21	MGD	RV03 RV04	2	026	MS2N07-B1BNN	253	254	255	256	180		
		00	22					MS2N07-C0BQN	257	258	259	260			
		00	23					MS2N07-C1BRN	261	262	263	264	270		
		00	24					MS2N07-D1BNN	267	268	269	270			

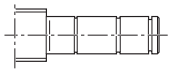
Screw ends

Free end



00

Floating bearing end



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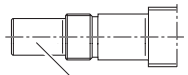
Fixed bearing end (motor attachment)



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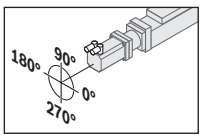
Screw journal for motor attachment

[1] Attachment kit also available without motor (when ordering: enter "00" for motor)
[2] Recommended motor (motor data and type designations ➠ "Motors" section)

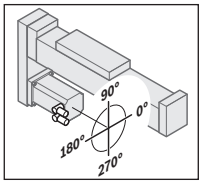
Flange	Motor connector position			
	0°	90°	180°	270°
MF01	000	090 ★	180	270

Belt side drive	Motor connector position			
	0°	90°	180°	270°
RV01	000	–	180	270 ★
RV02	000	090 ★	180	–
RV03	000 ★	090	–	270
RV04	–	090	180 ★	270

★ standard delivery



Example: Flange MF01 Motor connector position 90°



Example: Belt side drive RV01 Motor connector position 180°

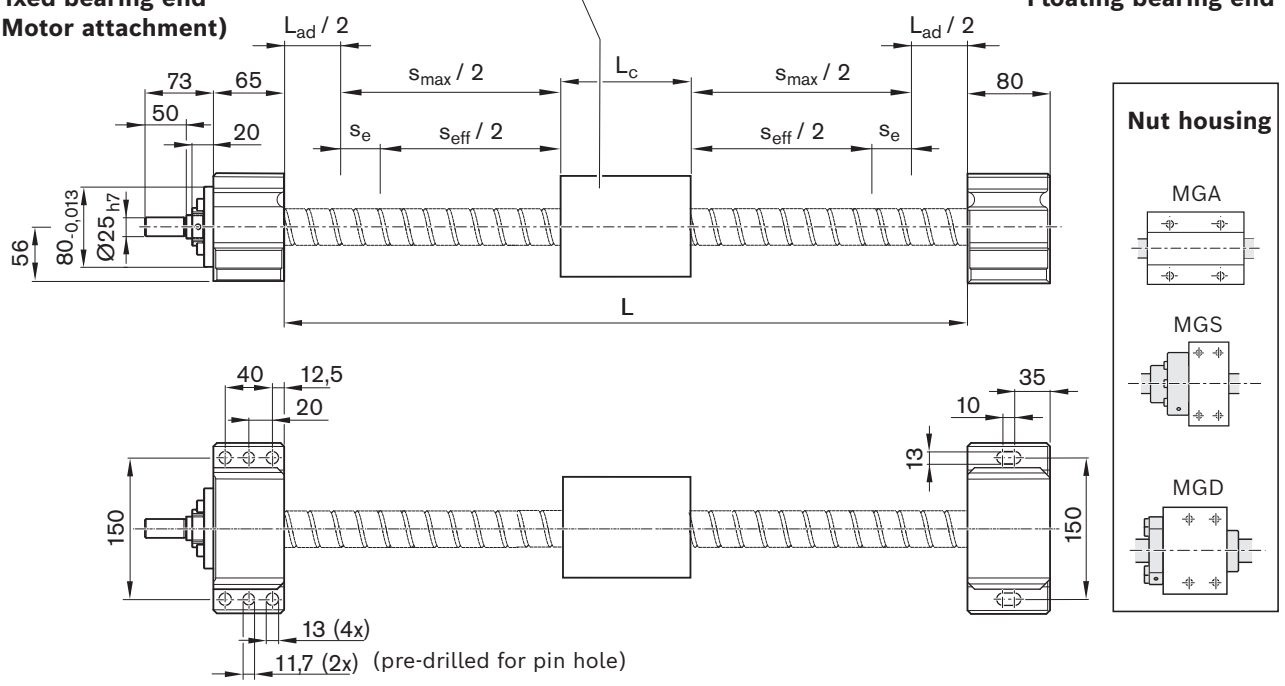
AOK-040 Dimensional drawings

All dimensions are given in mm. Drawings not to scale.
Straightness and flatness tolerance in accordance with DIN EN 12020-02

Nut / nut and housing
See "Components and ordering" option table for selection
See corresponding dimension drawings for dimensions

Fixed bearing end (Motor attachment)

Floating bearing end

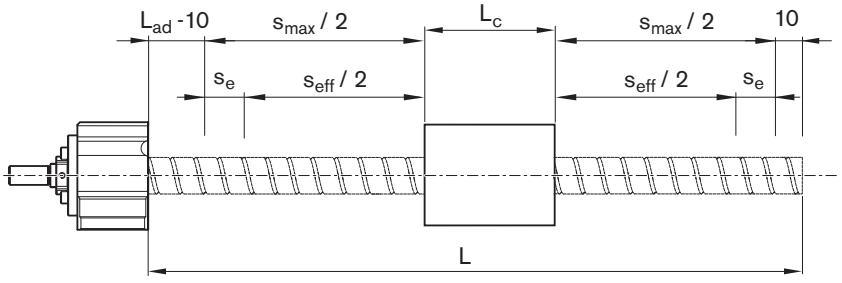


Nut housing

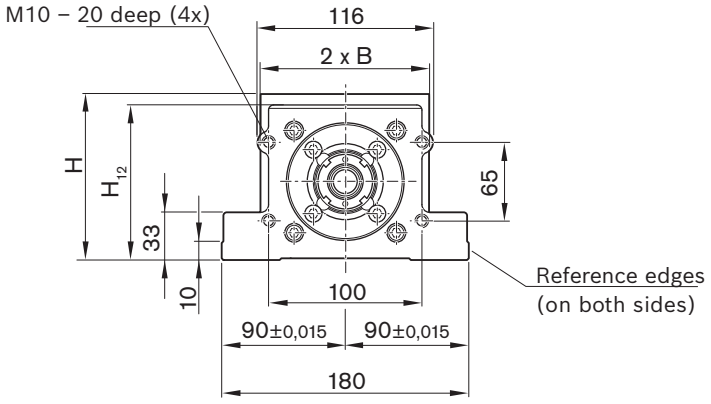
MGA

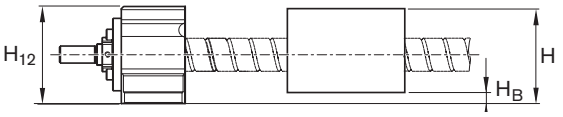
MGS

MGD



Without floating bearing





Nut and housing dimension drawings

Figure 1 (MGA)

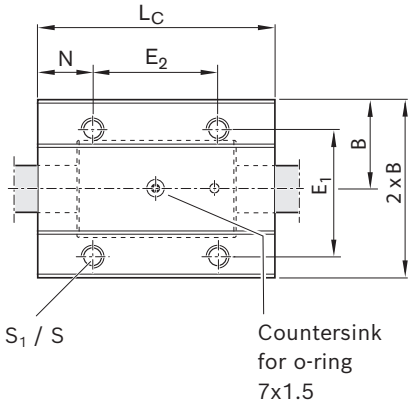


Figure 2 (MGS, MGD)

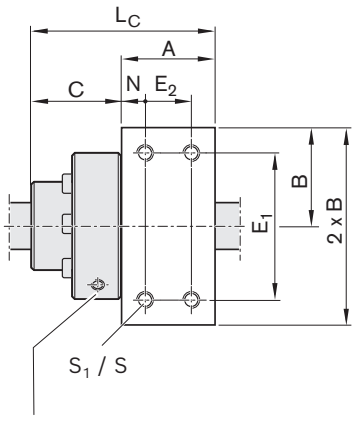
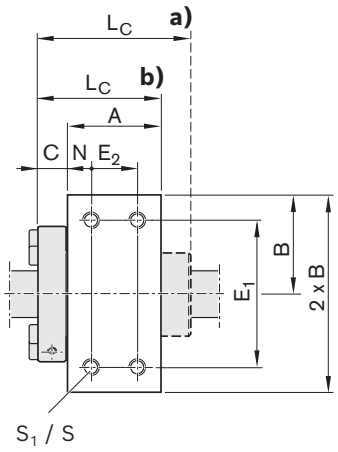
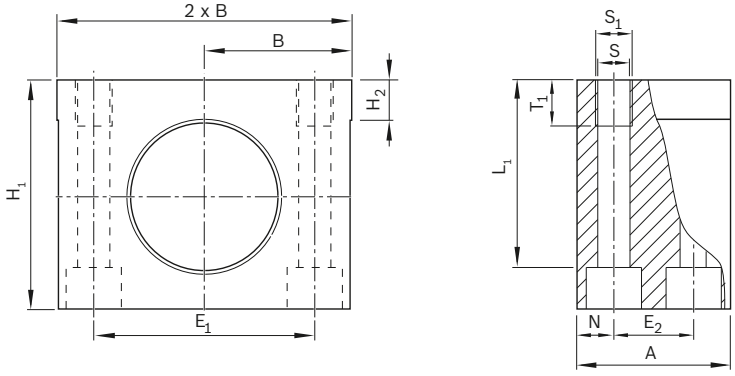


Figure 3 a) / Figure 3 b) (MGS, MGD)



Dimension drawing for all nut housings (Figure 1, 2, 3)

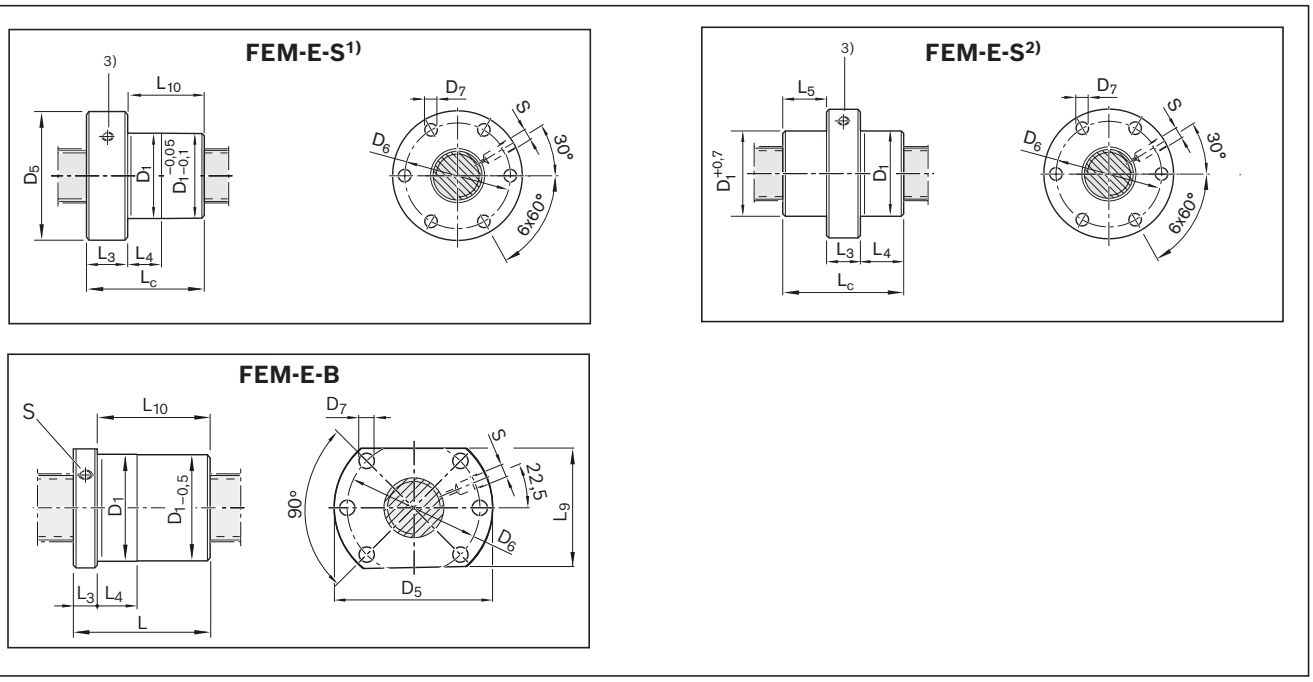


S_1 = 4x thread
S = 4x drill hole

AOK-040 d_0 x P	Nut	Nut housing	Figure	Dimensions (mm) A	B ±0.01	C	E_1	E_2	H	H_1	H_2	H_{12} ±0.15	H_B	L_c	L_1	N	S_1	S	T_1
40 x 5	ZEM-E	MGA	1	–	60	–	90	120	115	105	12	111	10	180	86.0	30	M16	14.5	24
	FEM-E-S	MGS	3 b)	60	52.5	13	$82^{\pm0.1}$	$30^{\pm0.1}$	98	82			16	75	64.0	15	M16	13.0	20
	FEM-E-B	MGD	3 b)	80	60	13	$90^{\pm0.1}$	$35^{\pm0.1}$	98	84			14	95	64.5	31	M18	15.0	25
40 x 10	ZEM-E	MGA	1	–	60	–	90	120	115	105			10	180	86.0	30	M16	14.5	24
	FEM-E-S	MGS	3 b)	65	60	13	$93^{\pm0.1}$	$35^{\pm0.1}$	106	98			8	80	79.0	15	M18	15.0	25
	FEM-E-B	MGD	3 b)	80	60	13	$90^{\pm0.1}$	$35^{\pm0.1}$	98	84			14	95	64.5	31	M18	15.0	25
40 x 20	ZEM-E	MGA	1	–	60	–	90	120	115	105			10	180	86.0	30	M16	14.5	24
	FEM-E-S	MGS	3 a)	65	60	15	$93^{\pm0.1}$	$35^{\pm0.1}$	106	98			8	88	79.0	15	M18	15.0	25
	FEM-E-B	MGD	3 b)	80	60	13	$90^{\pm0.1}$	$35^{\pm0.1}$	98	84			14	95	64.5	31	M18	15.0	25
40 x 40	ZEM-E	MGA	1	–	60	–	90	120	115	105			10	180	86.0	30	M16	14.5	24
	FEM-E-S	MGS	2	80	70	54	$108^{\pm0.1}$	$46^{\pm0.1}$	114	113			1	151	92.0	17	M20	17.0	30
	FEM-E-B	MGD	3 a)	80	60	13	$90^{\pm0.1}$	$35^{\pm0.1}$	98	84			14	142	64.5	31	M18	15.0	25

L_{ad} = additional length (➠ "Technical data" section)

AOK-040 Nut dimension drawings



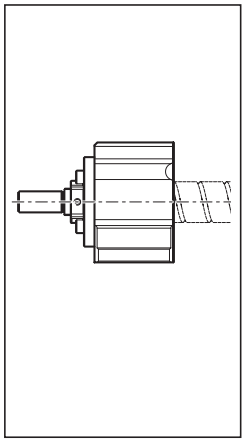
AOK-040	Nut	Dimensions (mm)										
d_0 x P		D_1 (g6)	D_5	D_6	D_7	L_C	L_3	L_4	L_5	L_9	L_{10}	S[3]
40 x 5	FEM-E-S[1]	56	80	68	6.6	54	15	10	–	–	39	M8x1
	FEM-E-B	63	93	78	9.0	54	15	10		70	39	M8x1
40 x 10	FEM-E-S[1]	63	95	78	9.0	70	15	16	–	–	55	M8x1
	FEM-E-B	63	93	78	9.0	70	15	16		70	55	M8x1
40 x 20	FEM-E-S[1]	63	95	78	9.0	88	15	25	–	–	73	M8x1
	FEM-E-B	63	93	78	9.0	88	15	25	–	70	73	M8x1
40 x 40	FEM-E-S[2]	72	110	90	11.0	102	40	31	31	–	–	M8x1
	FEM-E-B	63	93	78	9.0	142	15	45	–	70	127	M8x1

[3] Lube hole (S) (in flange center on FEM-E-S, FEM-E-B)
Lube port version: Flat surface $L_3 \leq 15$ mm, countersink $L_3 > 15$ mm;

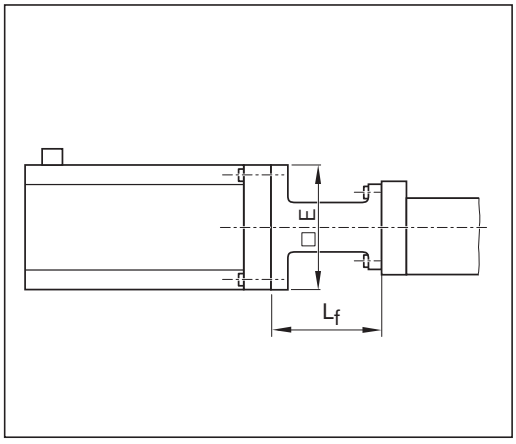
Motor attachment dimension drawings

Version

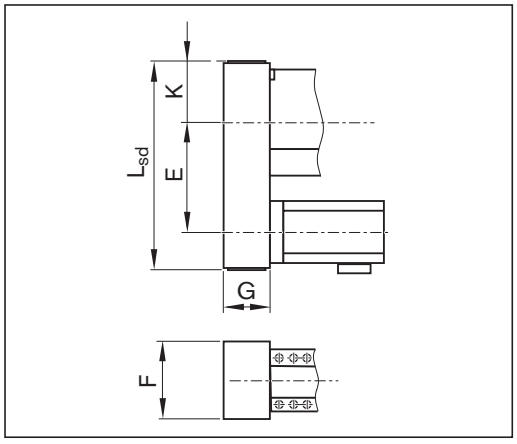
OF01



MF01



RV01, RV02, RV03, RV04



Version	Motor code	Dimensions (mm)	
		L_f	□E
MF01	MS2N07-B1BNN	140	see dimension □ **A** ➠ "Motors" section
	MS2N07-C0BQN		
	MS2N07-C1BRN		
	MS2N07-D1BNN		

Version	Motor code	Dimensions (mm)						
		E		F	G	K	L_{sd}	
		i = 1	i = 2				i = 1	i = 2
RV01, RV02, RV03, RV04	MS2N07-B1BNN	240	238	160	90	77	409	409
	MS2N07-C0BQN							
	MS2N07-C1BRN							
	MS2N07-D1BNN							

Further information on motors ➠ "Motors" section

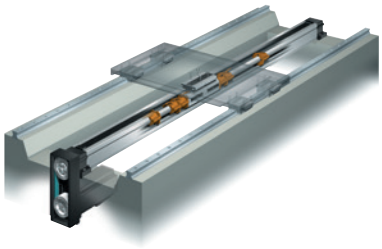
Product description

Features
- AGK drive units in closed format are ready-to-install drive axes consisting of ball screw drive, nut housings and pillow blocks, as well as a protective aluminum profile with cover strip as an enclosure
- Three coordinated sizes available in any length up to L_{max}
- The BASA is optimally protected by the protective profile with steel or polyurethane sealing strip
- Driven by zero-backlash, preloaded, precision ball screw drive in rolled design, in accordance with DIN 69051 in tolerance grade T5 or T7
- High travel speeds thanks to large leads with high precision over long lengths
- Optional traveling screw supports to use in horizontal mounting positions for max. speeds over longer lengths

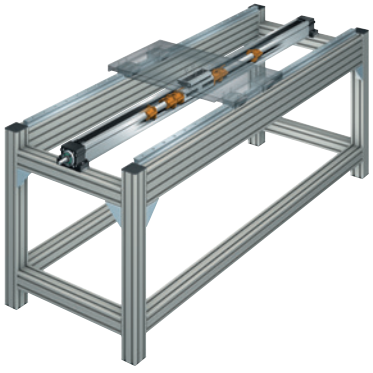
Further highlights
- Flexible thanks to selectable options
- Easy motor attachment via locating feature and threads
- Clearly structured technical data for the complete unit as "Linear axes without guideway"
- Nameplate with parameters for easy start-up

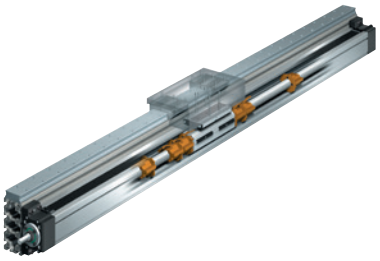
Attachments
- Motor attachments with flange and coupling or via a belt side drive
- Motor attachment kits according to customer specification
- Maintenance-free servo motors with selectable brake and integrated feedback
- Switches (magnetic sensor), switch activation without additional switching lug
- Socket and plug

Installation examples



The table is supported symmetrically on two rail guides with four runner blocks. The nut housing of the ball screw drive is located at the top.



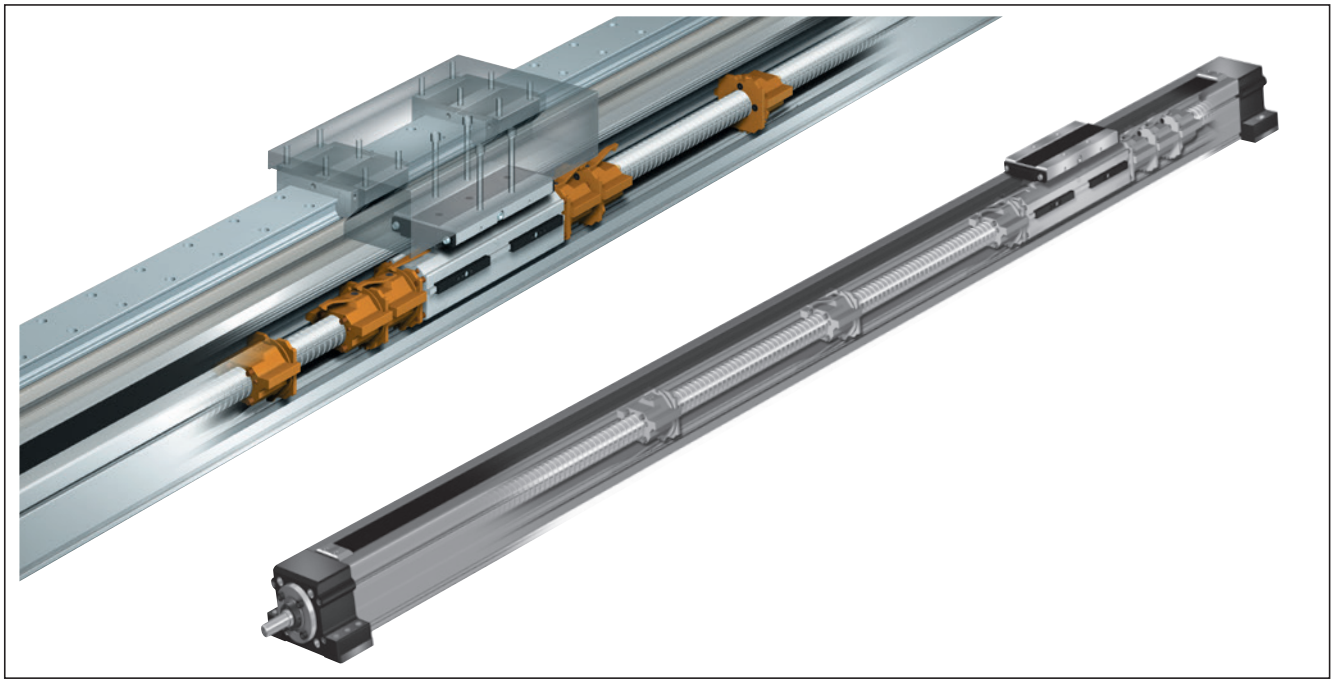


Depending on the application requirements, the nut housing can also be on the side instead of the top.

SPU product description

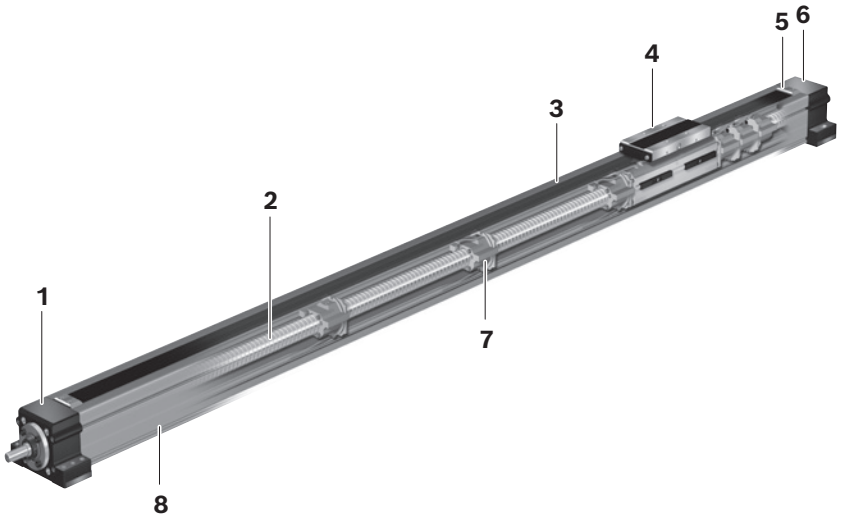
Patented screw support (SPU)
The screw support (SPU) offers the following advantages:
- Screw supports can be selected as a standard option
- Maximum speed over long lengths
- Guideway of the screw supports in protective profile
- Elastomer buffer provides cushioning between carriage and screw support
- Screw supports are maintenance-free
- Covered screw supports

⚠ **Screw support designed for horizontal operation only.**
As the length of screw-driven linear axes increases, the distance between screw supports increases. As the unsupported length increases, undesirable screw oscillation causes the resonance range to be reached more quickly, reducing rotary speed/maximum permissible speed accordingly.
The traveling screw supports are located at defined support points to reduce the length of screw that is unsupported. The result is consistently high speeds over long lengths.



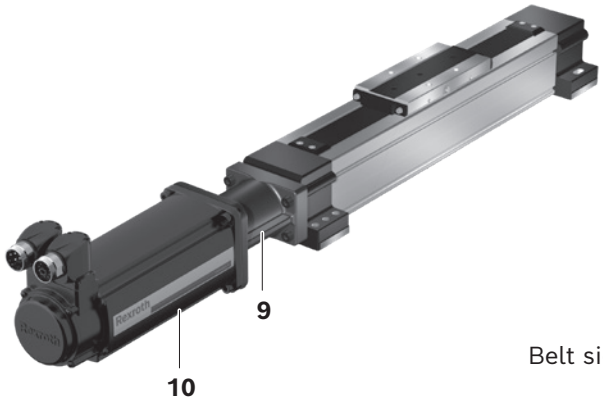
Structural design

1 Pillow block (fixed bearing)
2 Ball screw assembly with zero-backlash, cylindrical single nut
3 Steel or plastic sealing strip
4 Nut housing
5 Strip fixing
6 Pillow block (floating bearing)
7 Screw support (SPU)
8 Protective profile

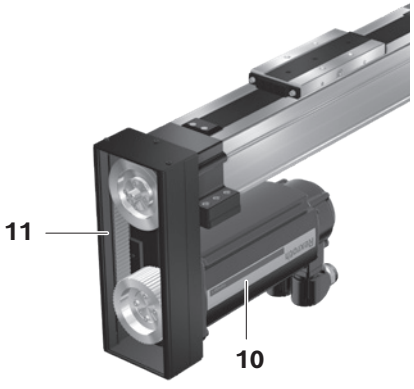


Motor attachment
9 Flange and coupling
10 Servo motor
11 Belt side drive

Flange and coupling



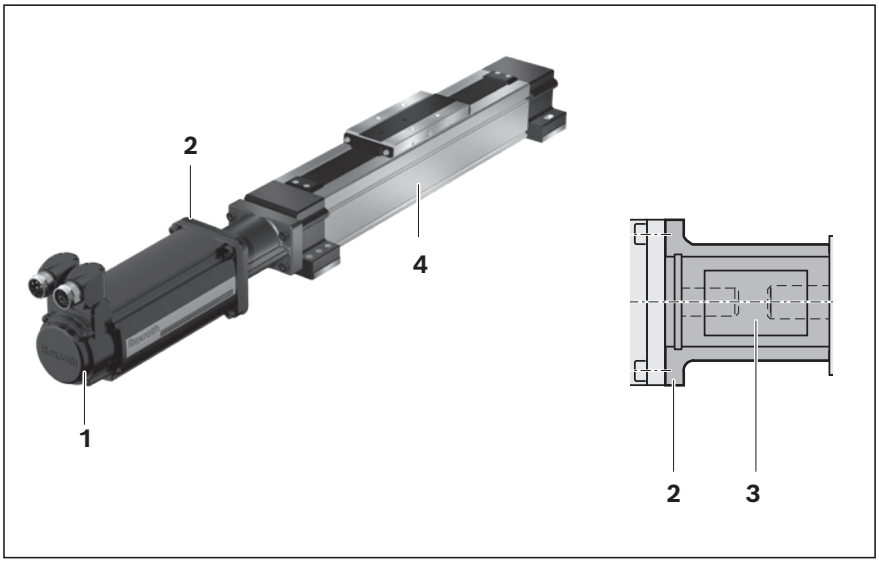
Belt side drive



Motor attachment with flange and coupling

A motor can be attached to all drive units via flange and coupling. The flange secures the motor to the drive unit and serves as a closed housing for the coupling.
The coupling transmits the motor drive torque to the drive unit's drive shaft free of distortive stresses.
Our standard couplings compensate for the system's thermal expansion.

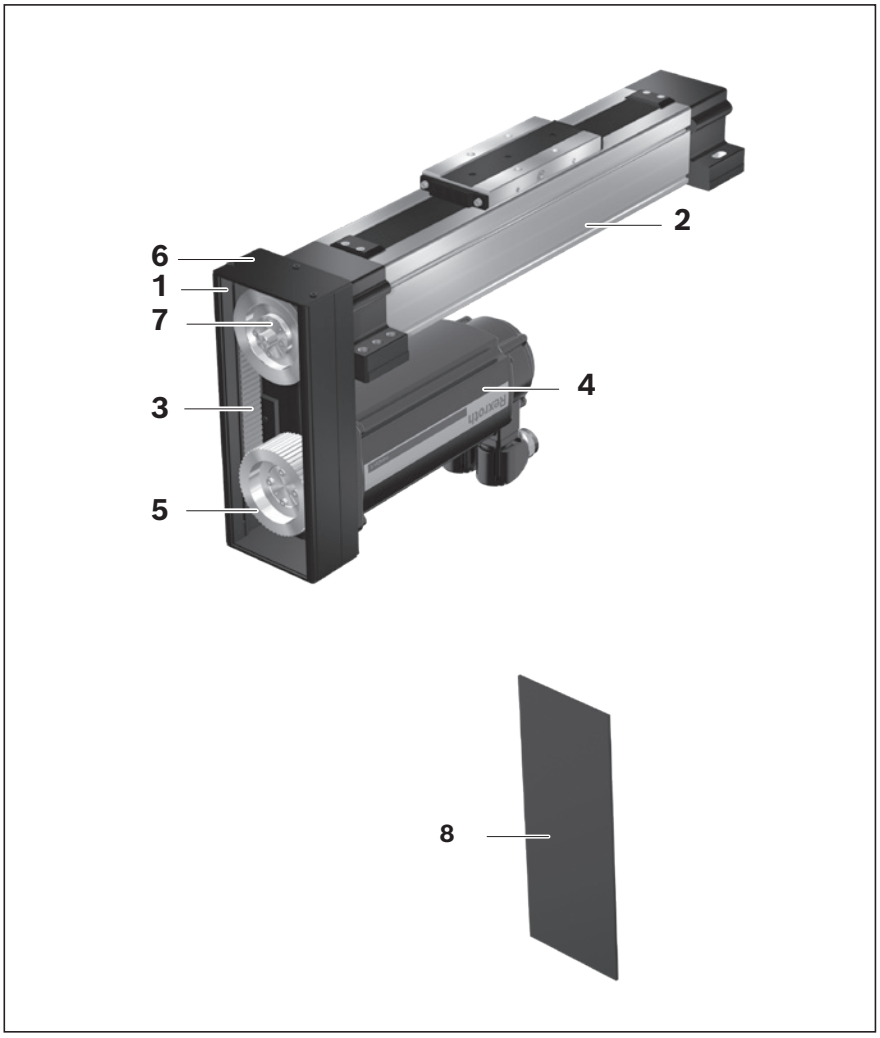
1 Motor
2 Flange
3 Coupling
4 Drive unit



Structural design belt side drive

All drive units can be attached to the motor by a belt side drive. This makes the total length shorter than when attaching the motor with flange and coupling.
The space-saving, closed pulley housing serves as protection for the belt and as a motor bracket.
Various gear ratios are also available (depending on size):
– i = 1
– i = 2
The belt side drive can be mounted in four different directions:
– below, above (RV01 and RV02)
– left, right (RV03 and RV04)

1 Pulley housing made of anodized aluminum profile
2 Drive unit
3 Toothed belt
4 Motor
5 Belt pulley
6 Cover
7 Belt pulleys attached using tensioning units
8 Cover plate



Technical data

See the "Calculation" section.

General technical data

AGK	BASA	Dynamic characteristics Dynamic load capacity C		Min. travel range	Max. length	Additional length with number of SPU				Nut housing length	Moved mass of system	Mass constants	
		Nut	Fixed bearing			Without	1	2	3				
	d_0 x P (mm)	(N)	(N)	s_{min} (mm)	L_{max} (mm)	L_{ad} (mm)				L_c (mm)	m_{ca} (kg)	$k_{g\ fix}$ (kg)	$k_{g\ var}$ (kg/mm)
AGK-020	20 x 5	15 480	17 000	100	3 000	86	201	326	451	204	2.50	3.50	0.0062
	20 x 10	15 210											
	20 x 20	14 400											
	20 x 40	12 600											
AGK-032	32 x 5	23 310	26 000	150	5 000	86	201	326	451	204	3.50	4.70	0.0099
	32 x 10	34 200											
	32 x 20	21 240											
	32 x 32	21 060											
AGK-040	40 x 5	31 410	29 000	180	5 600	86	201	326	451	264	6.60	7.70	0.0160
	40 x 10	54 000											
	40 x 20	40 950											
	40 x 40	39 960											

Mass calculation of linear motion system
(without motor attachment, without motor)

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

Length calculation

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

Example for length calculation ➠ "Service and information/project planning/ calculation" section and "Order example" section.

Effective stroke

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

Drive data

AGK	BASA	Constant mass moment of inertia			Frictional torque with number of SPU				Max. permissible acceleration	Max. drive torque	Max. speed
					Without	1	2	3			
	d_0 x P (mm)	$k_{J\ fix}$ (kgmm²)	$k_{J\ var}$ (kgmm)	$k_{J\ m}$ (mm²)	M_{Rs} (Nm)				a_{max} (m/s²)	M_P (Nm)	v_{max} (m/s)
AGK-020	20 x 5	16.9	0.1004	0.633	0.6	0.6	0.7	0.7	39.8	See graphs	See graphs
	20 x 10	21.7	0.1004	2.533	0.7	0.7	0.8	0.8	50.0		
	20 x 20	40.7	0.1004	10.132	0.7	0.8	0.9	1.0	50.0		
	20 x 40	116.7	0.1004	40.5285	0.8	1.0	1.2	1.4	50.0		
AGK-032	32 x 5	131.7	0.7117	0.633	1.1	1.2	1.2	1.2	17.9		
	32 x 10	138.4	0.7117	2.533	1.2	1.3	1.4	1.4	30.7		
	32 x 20	165.0	0.6668	10.132	1.3	1.4	1.5	1.6	50.0		
	32 x 32	220.3	0.6668	25.938	1.3	1.5	1.7	1.9	50.0		
AGK-040	40 x 5	378.5	1.783	0.633	1.8	1.8	1.8	1.9	12.2		
	40 x 10	354.1	1.607	2.533	2.0	2.1	2.2	2.2	16.8		
	40 x 20	404.3	1.607	10.132	2.0	2.1	2.3	2.5	33.0		
	40 x 40	604.9	1.607	40.528	2.2	2.5	2.8	3.2	50.0		

Drive data for motor attachment via belt side drive

AGK	Motor	BASA (mm) d_0 x P	up to L[2] (mm)	M_{sd}[1] (Nm) i = 1	M_{sd}[1] (Nm) i = 2	J_{sd} (10^{-6} kgm²) i = 1	J_{sd} (10^{-6} kgm²) i = 2	M_{Rsd} (Nm)	m_{sd} (kg)	F (mm)	B_t i = 1	B_t i = 2
AGK-020	MSM041B MS2N04	20 x 5	1600	6.00	–	240	–	0.40	1.24	88	16 AT5	–
		20 x 10	2000	7.90								
		20 x 20	2700	7.94								
		20 x 40	3000	7.94								
	MS2N05	20 x 5	1600	6.00	–	1420	–	0.45	3.20	116	25 AT5	–
		20 x 10	2000	7.90								
		20 x 20	2600	8.70								
		20 x 40	3000	8.90								
AGK-032	MS2N06	32 x 5	2500	19.10	9.55	1400	260	0.50	3.20	116	25 AT5	32 AT5
		32 x 10	3000	19.21	12.30							
		32 x 20	4200	19.21	12.30							
		32 x 32	5000	19.21	12.30							
AGK-040	MS2N07	40 x 5	3600	25.60	12.80	7780	1260	0.60	8.60	160	50 AT10	50 AT10
		40 x 10	3100	51.20	25.60							
		40 x 20	3100	99.30	49.65							
		40 x 40	4400	99.30	49.65							

[1] Values for M_{sd} do not factor in motor torque.
[2] For greater lengths, the permissible drive torque is determined from the variable-length value M_p of the drive unit in accordance with the graph ➠"Calculation principles" section.

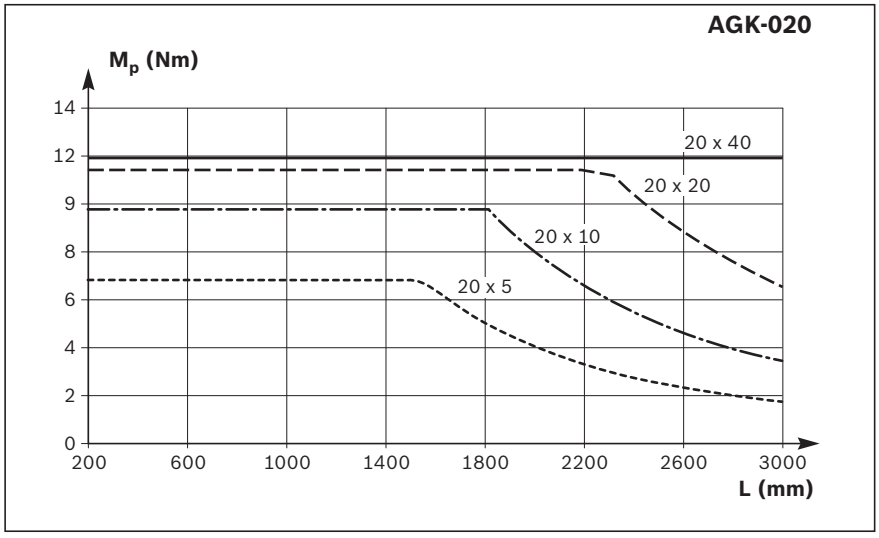
Drive data for motor attachment via flange and coupling

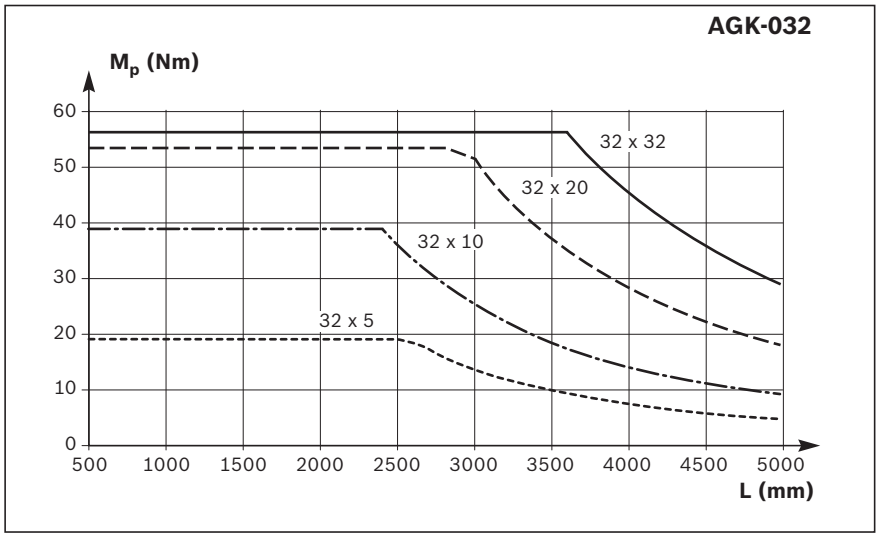
AGK	Motor	Coupling M_{cN} (Nm)	Coupling J_c (10^{-6} kgm²)	Flange and coupling m_{fc} (kg)
AGK-020	MSM041B	14.5	63	0.85
	MS2N04	19.0	57	0.55
	MS2N05	50.0	210	2.00
AGK-032	MS2N06	50.0	210	1.80
AGK-040	MS2N07	115.0	390	2.70

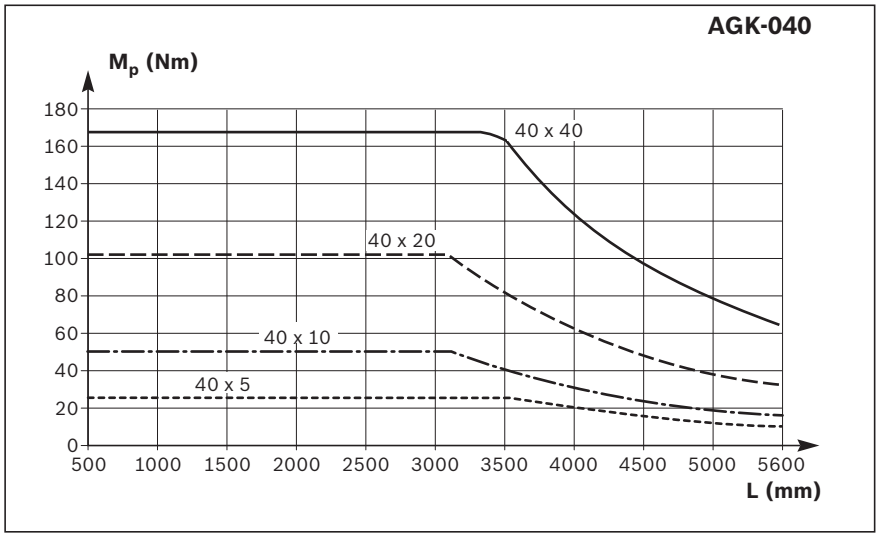
Technical data

Permissible drive torque M_P

The values shown for M_p apply under the following conditions:
– No radial load on screw journal

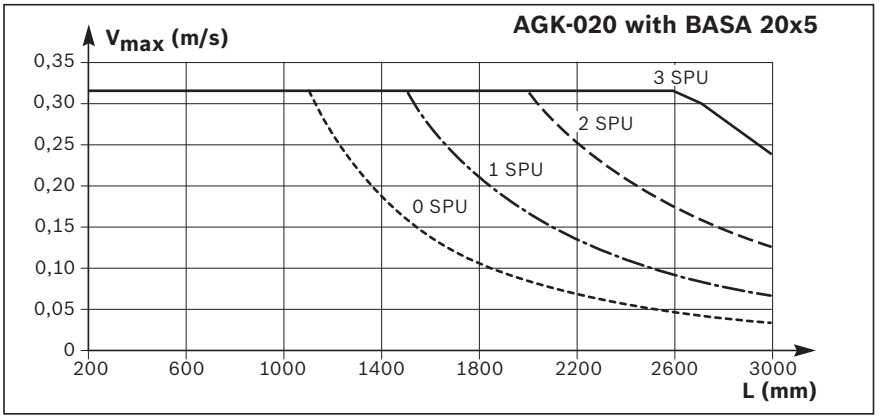


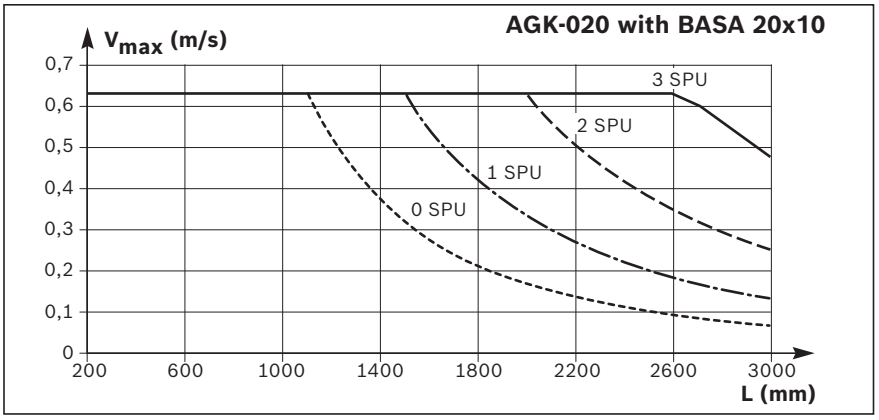


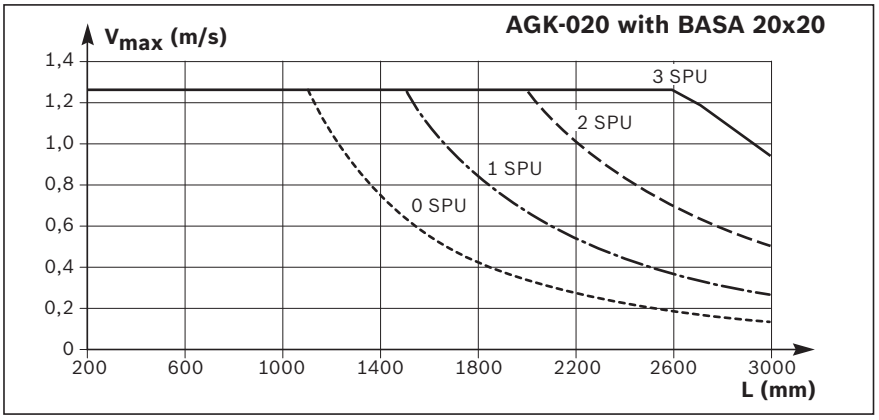


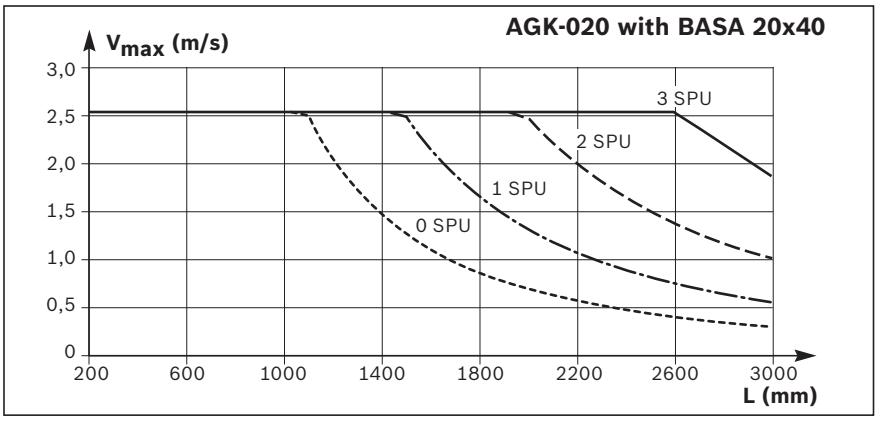
Permissible speed v_{max}

SPU = screw support





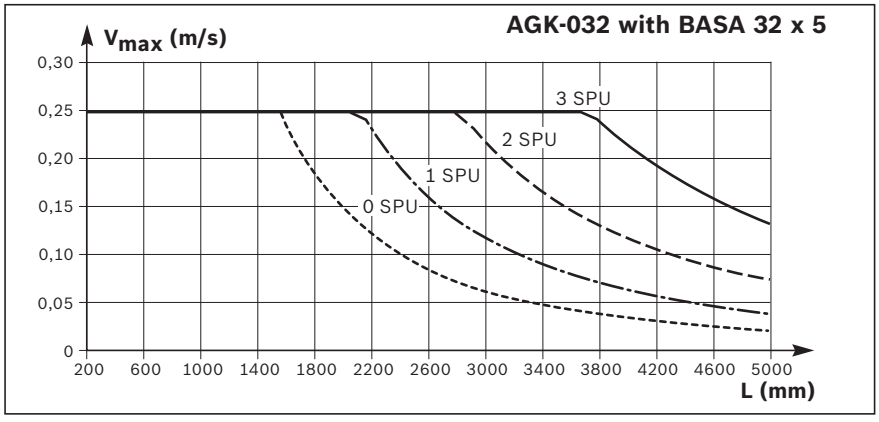


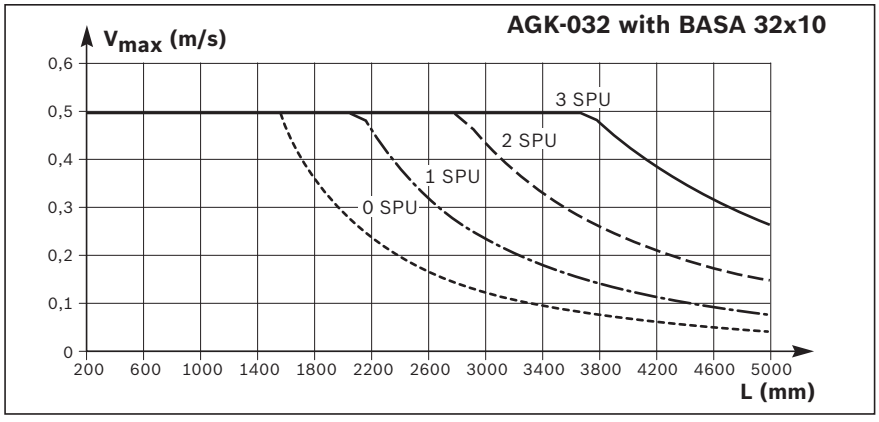


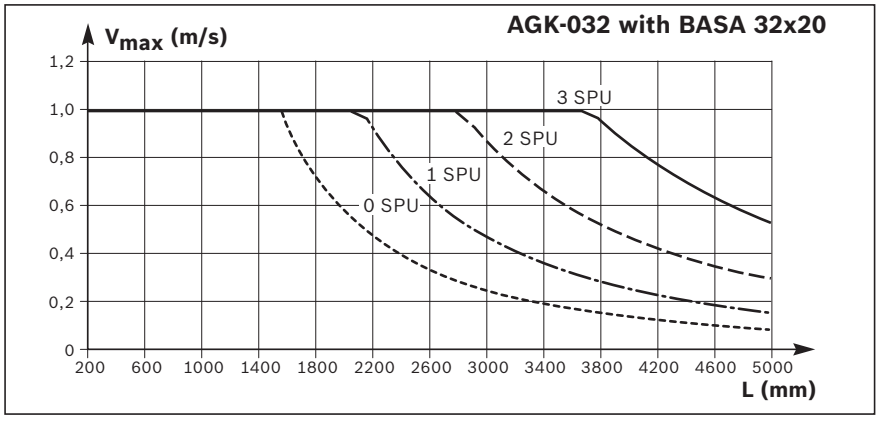
Technical data

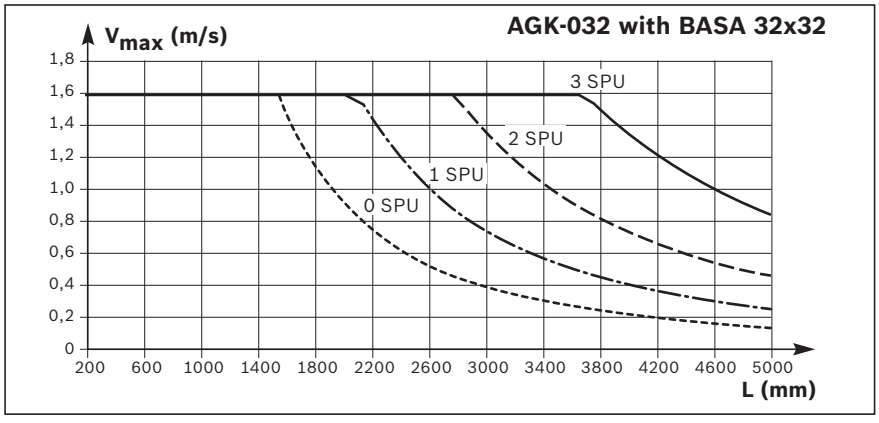
Permissible speed v_{max}

SPU = screw support





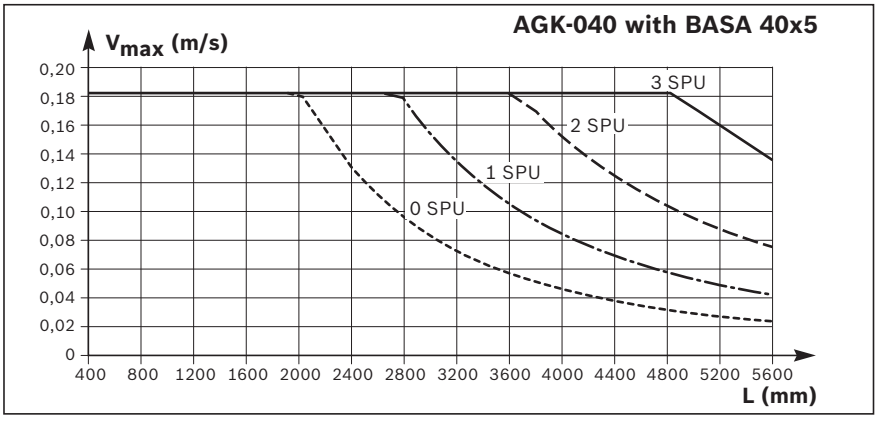


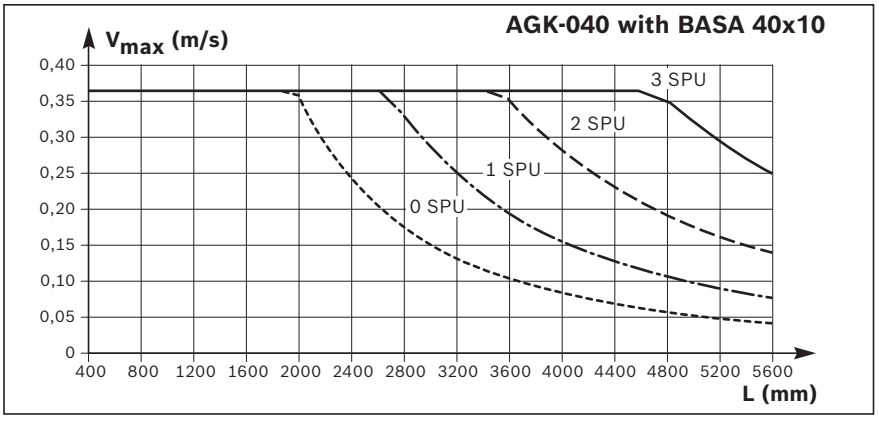


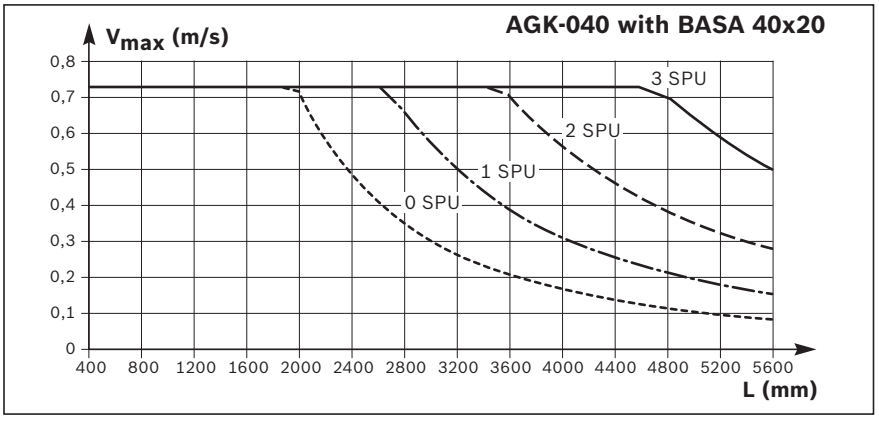
.

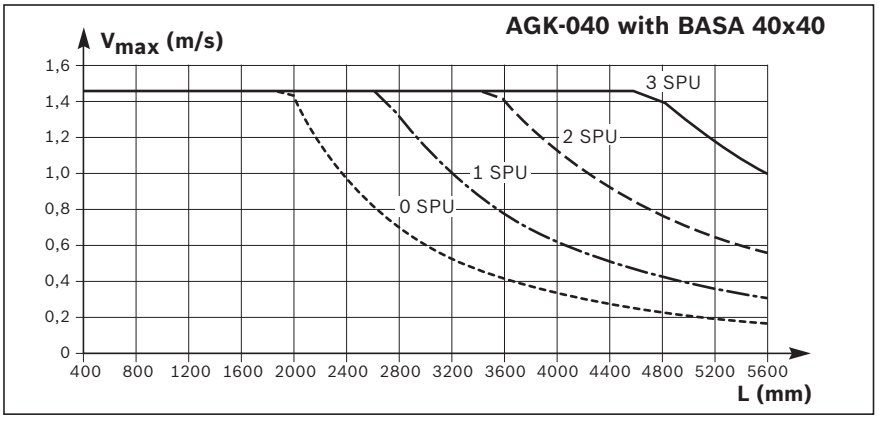
Permissible speed v_{max}

SPU = screw support









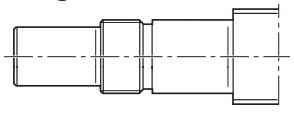
AGK-020 Configuration and ordering

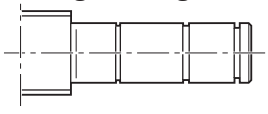
Short product name, length AGK-020-NN-1, ... mm	Drive BASA									Screw ends		Pillow block	Nut housing without SPU	Nut housing with SPU			Nut housing Mounting orientation
	Nut	BASA size d_0 x P				Tolerance grade	Seal	Lubrication	Preload class	Left (fixed bearing)	Right (floating bearing)	Aluminum		Number SPU per end[3]			
		20 x 5	20 x 10	20 x 20	20 x 40		Standard	With initial greasing	C1 (moderate)					1	2	3	
	 ZEM-E	01	04	02	03	T5 T7	1	1	3	81	31	02	01	11	12	13	 MR01 Left  MR02 Top  MR03 Right

Length calculation ➠ "Technical data" section
Order example ➠ "Service and information/ordering" section

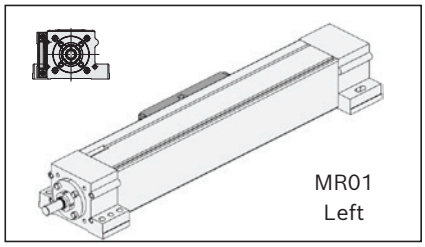
BASA = Ball screw assembly
d_0 = Ball screw assembly nominal diameter (mm)
P = Lead (mm)
SPU = Screw support

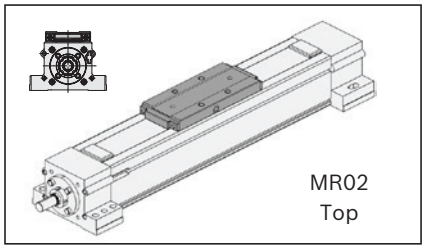
Screw ends:

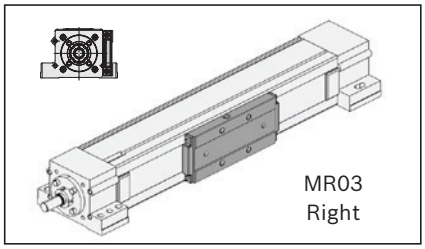
Fixed bearing end (left)
81


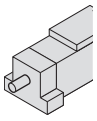
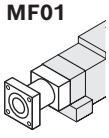
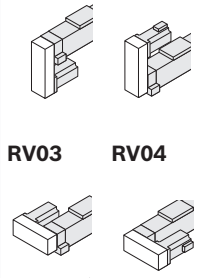
Floating bearing end (right)
31


Nut housing Mounting orientation



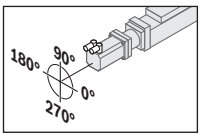




Motor attachment			i=	Attachment kit[1]	Motor[2] Motor code	2 cable Without brake	2 cable With brake	1 cable Without brake	1 cable With brake	Motor connector position	Cover Steel	Cover PU	Switch/ socket-plug	Documentation Standard report	Documentation Measurement report
Without flange	OF01		–	–	00	–				–	01	02	Without sensor Without socket-plug 00	01	02 frictional torque 03 lead deviation
With flange	MF01		–	06	MSM041B-0300	140	141	–	–	000			**Magnetic sensor**		
				03	MS2N04-B0BTN	209	210	211	212						
					MS2N04-C0BTN	213	214	215	216	090					
					MS2N04-D0BQN	217	218	219	220						
				04	MS2N05-B0BTN	221	222	223	224	180					
					MS2N05-C0BTN	225	226	227	228						
					MS2N05-D0BRN	229	230	231	232	270					
With belt side drive	RV01 RV02 RV03 RV04		1	32	MSM041B-0300	140	141	–	–	000			REED sensor 21		
				30	MS2N04-B0BTN	209	210	211	212	090			Hall sensor PNP NC 22		
					MS2N04-C0BTN	213	214	215	216						
					MS2N04-D0BQN	217	218	219	220	180			Socket-plug 17		
				23	MS2N05-C0BTN	225	226	227	228						
					MS2N05-D0BRN	229	230	231	232	270					

[1] Attachment kit also available without motor (when ordering: enter "00" for motor)
[2] Recommended motor (motor data and type designations ➠ "Motors" section)
[3] SPUs always have the same number on each side of the nut housing, example: 3 SPUs (option 13) mean a total 6 SPUs (3 left and 3 right)

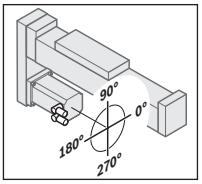
Flange	Motor connector position 0°	90°	180°	270°
MF01	000	090 ★	180	270



Example:
Flange MF01
Motor connector position 90°

Belt side drive	Motor connector position 0°	90°	180°	270°
RV01	000	–	180	270 ★
RV02	000	090 ★	180	–
RV03	000 ★	090	–	270
RV04	–	090	180 ★	270

★ standard delivery

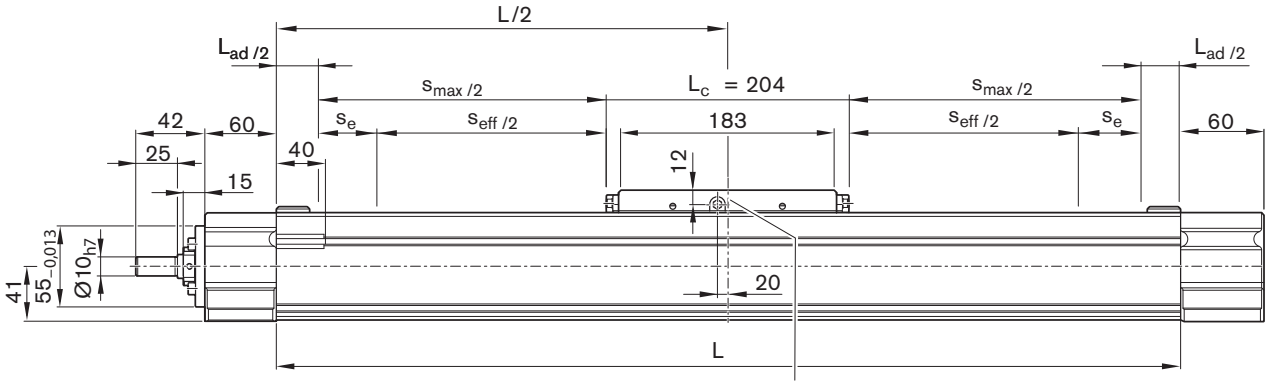


Example:
Belt side drive RV01
Motor connector position 180°

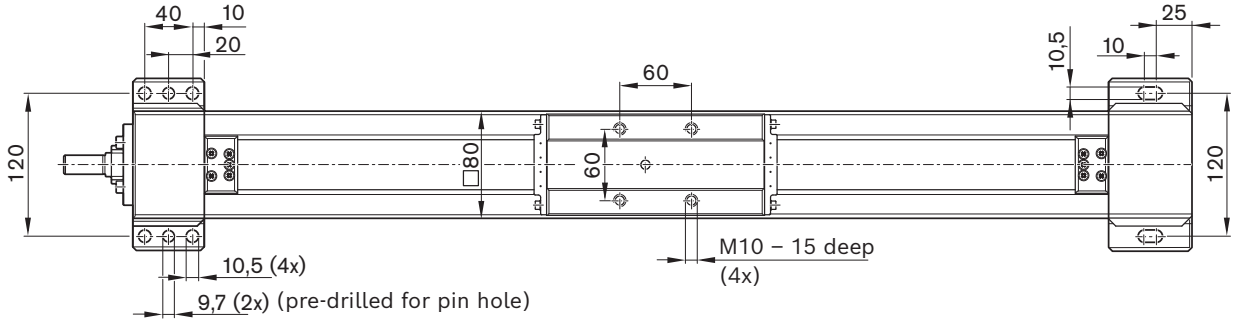
AGK-020 Dimensional drawings

All dimensions are given in mm. Drawings not to scale.
Straightness and flatness tolerance in accordance with DIN EN 12020-02

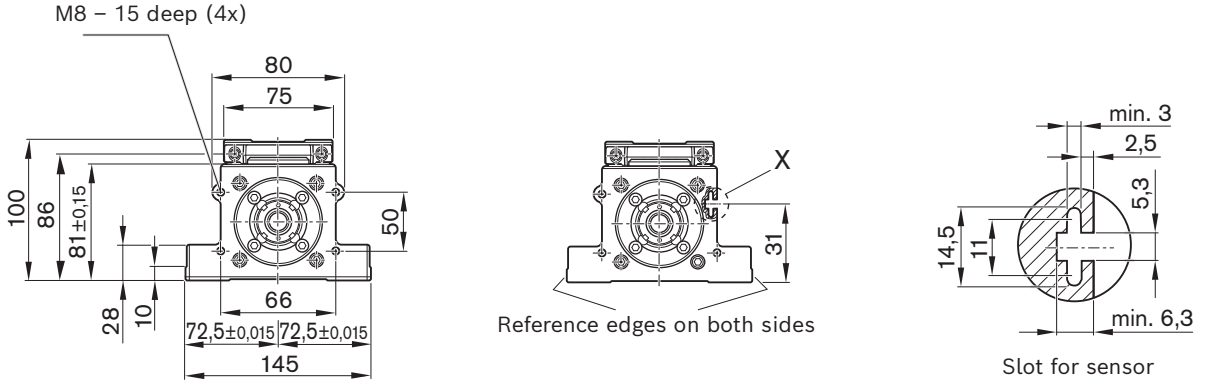
Fixed bearing end **Floating bearing end**



Lubrication hole on both sides of nut housing.
DIN 3405-A M6 funnel-type lube nipple



L_{ad} = additional length (➠ "Technical data" section)



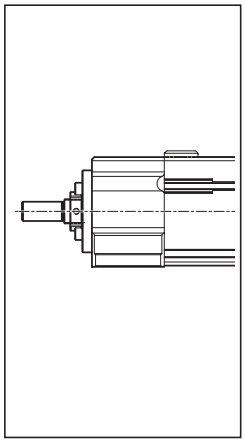
Reference edges on both sides

Slot for sensor

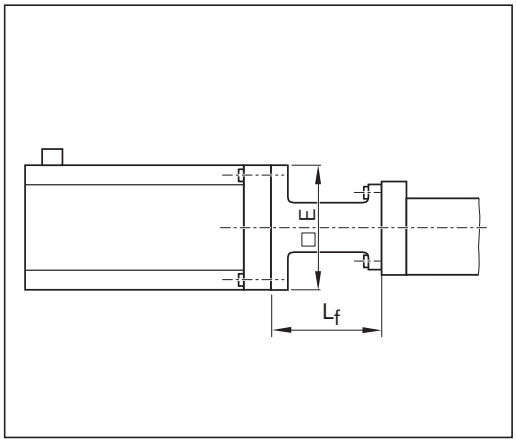
Motor attachment dimension drawings

Version

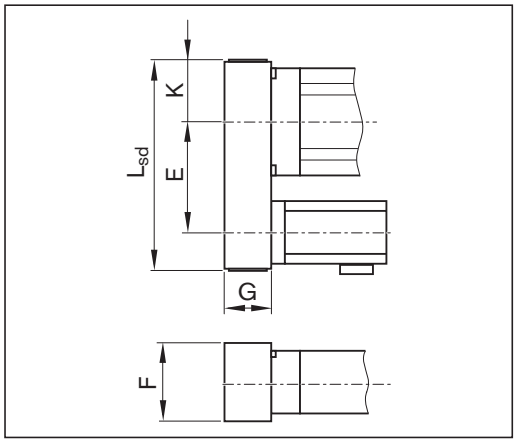
OF01



MF01



RV01, RV02, RV03, RV04



Version	**Motor code**	**Dimensions** (mm)	
		L_f	**□E**
MF01	MSM 041B	90	see dimension □ **A** ➠ "Motors" section
	MS2N04-B0BTN		
	MS2N04-C0BTN		
	MS2N04-D0BQN		
	MS2N05-B0BTN	115	
	MS2N05-C0BTN		
	MS2N05-D0BRN		

Version	**Motor code**	**Dimensions** (mm)				
		E **i = 1**	**F**	**G**	**K**	**L_{sd}** **i = 1**
RV01, RV02, RV03, RV04	MSM 041B	122.5	88	51	47.5	231
	MS2N04-B0BTN					
	MS2N04-C0BTN					
	MS2N04-D0BQN					
	MS2N05-C0BTN	155.0	116	66	56.0	287
	MS2N05-D0BRN					

Further information on motors ➠ "Motors" section

AGK-032 Configuration and ordering

Short product name, length AGK-032-NN-1, ... mm	Drive BASA											Screw ends		Pillow block	Nut housing without SPU	Nut housing with SPU			Nut housing Mounting orientation
	Nut	BASA size d_0 x P				Tolerance grade	Seal	Lubrication	Preload class							Number SPU per end[3]			
		32 x 5	32 x 10	32 x 20	32 x 32		Standard	With initial greasing	C1 (moderate)			Left (fixed bearing)	Right (floating bearing)	Aluminum		1	2	3	
	 ZEM-E	01	02	03	04	T5 T7	1	1	3			81	31	02	01	11	12	13	 MR01 Left  MR02 Top  MR03 Right

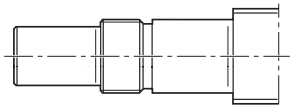
Length calculation ➠ "Technical data" section
Order example ➠ "Service and information/ordering" section

BASA = Ball screw assembly
d_0 = Ball screw assembly nominal diameter (mm)
P = Lead (mm)
SPU = Screw support

Screw ends:

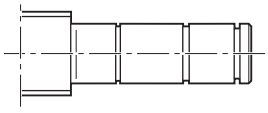
Fixed bearing end (left)

81

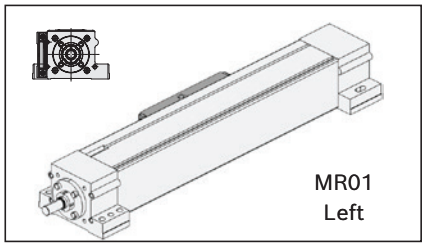


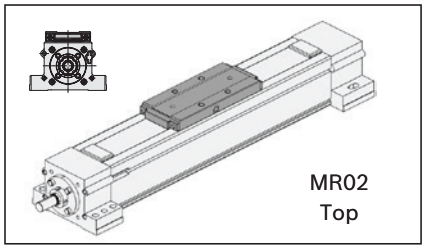
Floating bearing end (right)

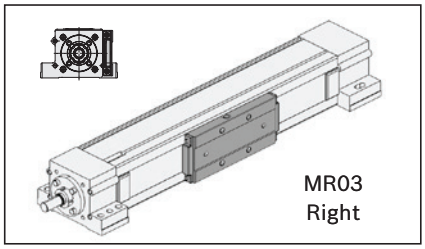
31

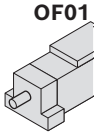
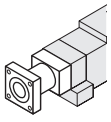
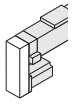


Nut housing Mounting orientation



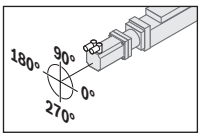




Motor attachment		i=	Attachment kit[1]	Motor[2] Motor code	2 cable Without brake	2 cable With brake	1 cable Without brake	1 cable With brake	Motor connector position	Cover Steel	Cover PU	Switch/ socket-plug	Documentation Standard report	Documentation Measurement report
Without flange	OF01 	–	–	00	–				–	01	02	Without sensor Without socket-plug 00	01	02 frictional torque 03 lead deviation
	MF01 	–	03	MS2N06-B1BNN	233	234	235	236	000			**Magnetic sensor**		
				MS2N06-C0BTN	237	238	239	240	090					
				MS2N06-D0BRN	241	242	243	244	180					
				MS2N06-D1BNN	245	246	247	248	270					
With belt side drive	RV01  RV02 	1	023	MS2N06-B1BNN	233	234	235	236	000			REED sensor 21		
				MS2N06-D1BNN	245	246	247	248	090			Hall sensor PNP NC 22		
	RV03  RV04 	2	024	MS2N06-B1BNN	233	234	235	236	180			Socket-plug 17		
				MS2N06-C0BTN	237	238	239	240	270					

[1] Attachment kit also available without motor (when ordering: enter "00" for motor)
[2] Recommended motor (motor data and type designations ➠ "Motors" section)
[3] SPUs always have the same number on each side of the nut housing, example: 3 SPUs (option 13) mean a total 6 SPUs (3 left and 3 right)

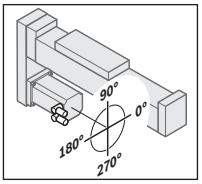
Flange	Motor connector position 0°	90°	180°	270°
MF01	000	090 ★	180	270



Example:
Flange MF01
Motor connector position 90°

Belt side drive	Motor connector position 0°	90°	180°	270°
RV01	000	–	180	270 ★
RV02	000	090 ★	180	–
RV03	000 ★	090	–	270
RV04	–	090	180 ★	270

★ standard delivery

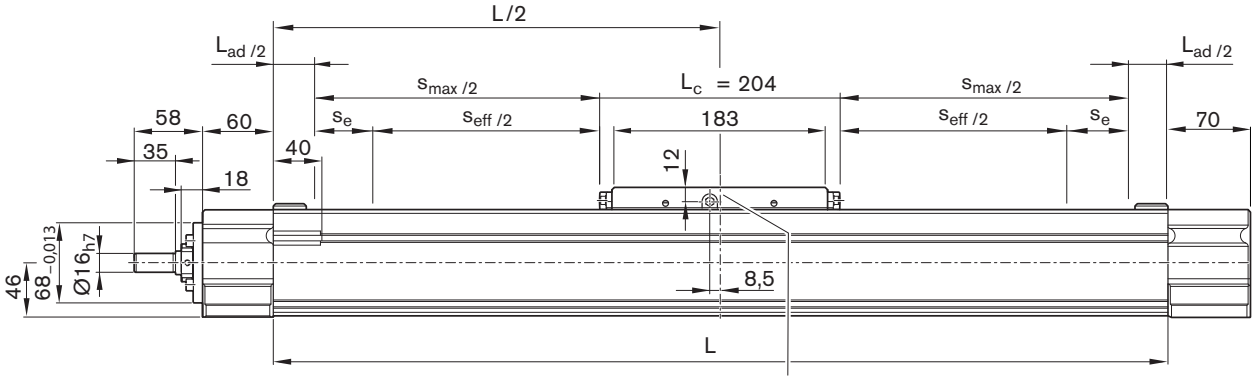


Example:
Belt side drive RV01
Motor connector position 180°

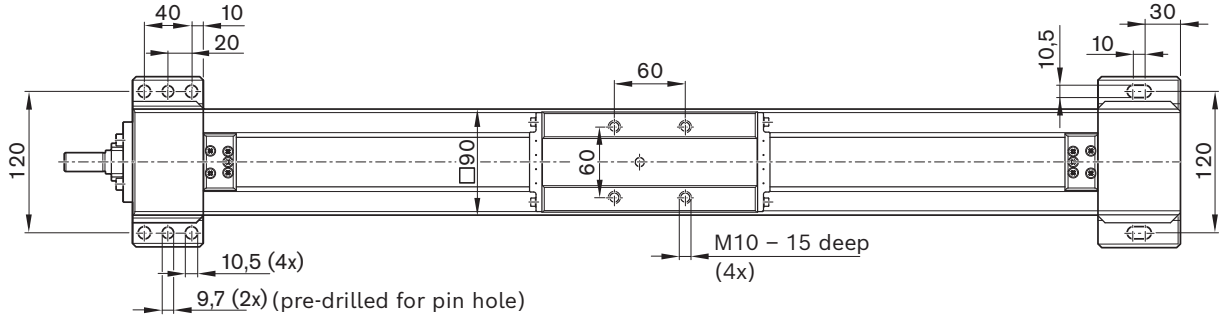
AGK-032 Dimensional drawings

All dimensions are given in mm. Drawings not to scale.
Straightness and flatness tolerance in accordance with DIN EN 12020-02

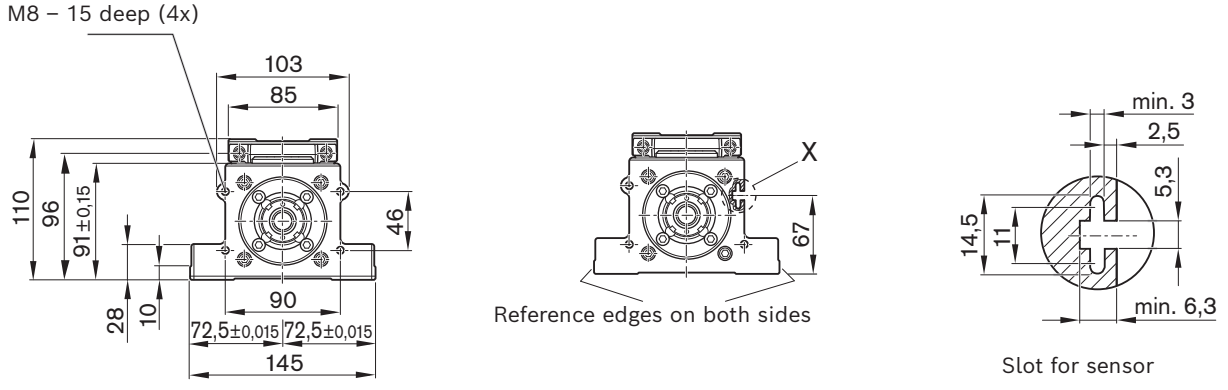
Fixed bearing end **Floating bearing end**



Lubrication hole on both sides of nut housing.
DIN 3405-A M6 funnel-type lube nipple



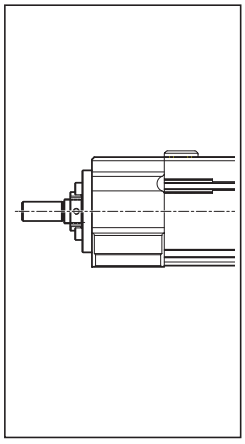
L_{ad} = additional length (see "Technical data" section)



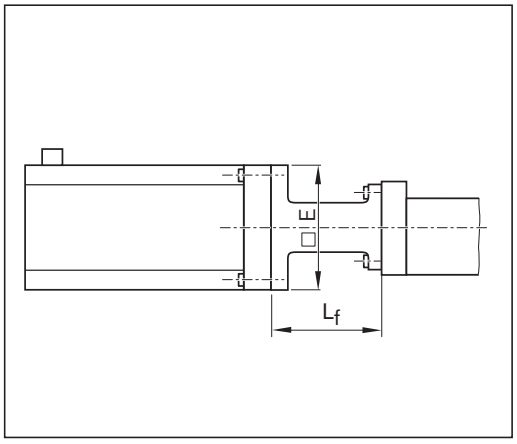
Motor attachment dimension drawings

Version

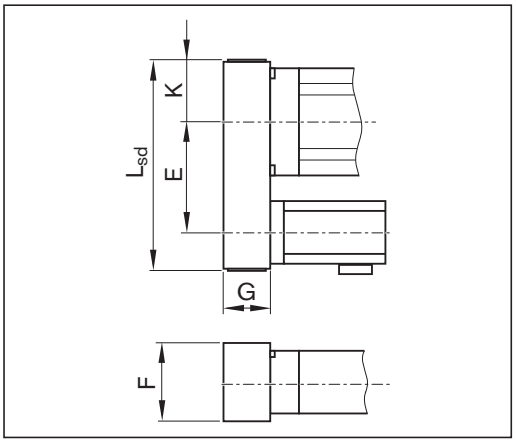
OF01



MF01



RV01, RV02, RV03, RV04



Version	**Motor code**	**Dimensions** (mm)	
		L_f	**□E**
MF01	MS2N06-B1BNN	125	see dimension □ **A** ➠ "Motors" section
	MS2N06-C0BTN		
	MS2N06-D0BRN		
	MS2N06-D1BNN		

Version	**Motor code**	**Dimensions** (mm)						
		E		**F**	**G**	**K**	**L_{sd}**	
		i = 1	**i = 2**				**i = 1**	**i = 2**
RV01, RV02, RV03, RV04	MS2N06-B1BNN	165	–	116	66	59	300	–
	MS2N06-C0BTN	–	162				–	300
	MS2N06-D1BNN	165	–				300	–

Further information on motors ➠ "Motors" section

AGK-040 Configuration and ordering

Short product name, length AGK-040-NN-1, ... mm	Drive BASA Nut	BASA size d_0 x P 40 x 5	40 x 10	40 x 20	40 x 40	Tolerance grade	Seal Standard	Lubrication With initial greasing	Preload class C1 (moderate)	Screw ends Left (fixed bearing)	Right (floating bearing)	Pillow block Aluminum	Nut housing without SPU	Nut housing with SPU Number SPU per end[3] 1	2	3	Nut housing Mounting orientation
	 ZEM-E	01				T5 T7	1	1	3	81	31	02	01	11	12	13	 MR01 Left  MR02 Top  MR03 Right
			02	03	04	T5 T7	1	1	3	81	31	02	01	21	22	23	

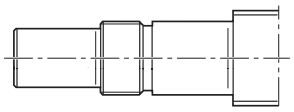
Length calculation ➠ "Technical data" section
Order example ➠ "Service and information/ordering" section

BASA = Ball screw assembly
d_0 = Ball screw assembly nominal diameter (mm)
P = Lead (mm)
SPU = Screw support

Screw ends:

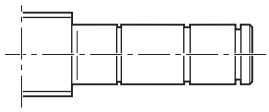
Fixed bearing end (left)

81

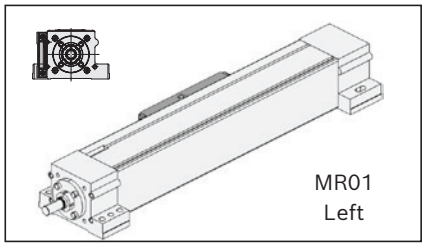


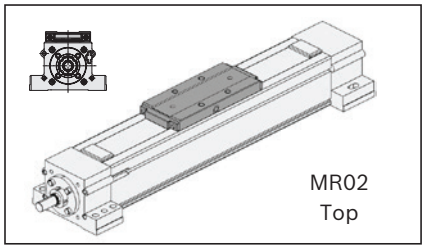
Floating bearing end (right)

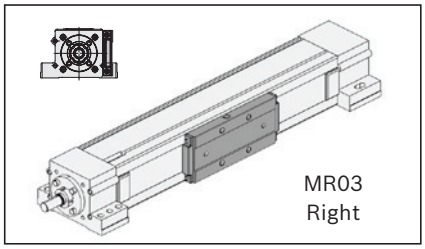
31



Nut housing Mounting orientation



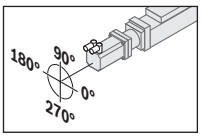




Motor attachment		i=	Attachment kit[1]	Motor[2] Motor code	2 cable Without brake	2 cable With brake	1 cable Without brake	1 cable With brake	Motor connector position	Cover Steel	Cover PU	Switch/ socket-plug	Documentation Standard report	Documentation Measurement report
Without flange	OF01	–	–	00	–				–	01	02	Without sensor Without socket-plug 00	01	02 frictional torque 03 lead deviation
	OF01		03	MS2N07-B1BNN	253	254	255	256	000					
				MS2N07-C0BQN	257	258	259	260	090					
				MS2N07-C1BRN	261	262	263	264	180					
				MS2N07-D1BNN	267	268	269	270	270					
With belt side drive	RV01 RV02	1	025	MS2N07-B1BNN	253	254	255	256	000			**Magnetic sensor**		
				MS2N07-C0BQN	257	258	259	260						
				MS2N07-C1BRN	261	262	263	264	090			REED sensor 21		
				MS2N07-D1BNN	267	268	269	270				Hall sensor PNP NC 22		
	RV03 RV04	2	026	MS2N07-B1BNN	253	254	255	256	180			Socket-plug 17		
				MS2N07-C0BQN	257	258	259	260						
				MS2N07-C1BRN	261	262	263	264	270					
				MS2N07-D1BNN	267	268	269	270						

[1] Attachment kit also available without motor (when ordering: enter "00" for motor)
[2] Recommended motor (motor data and type designations ➠ "Motors" section)
[3] SPUs always have the same number on each side of the nut housing, example: 3 SPUs (option 13) mean a total 6 SPUs (3 left and 3 right)

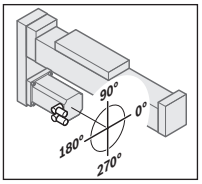
Flange	Motor connector position			
	0°	90°	180°	270°
MF01	000	090 ★	180	270



Example:
Flange MF01
Motor connector position 90°

Belt side drive	Motor connector position			
	0°	90°	180°	270°
RV01	000	–	180	270 ★
RV02	000	090 ★	180	–
RV03	000 ★	090	–	270
RV04	–	090	180 ★	270

★ standard delivery



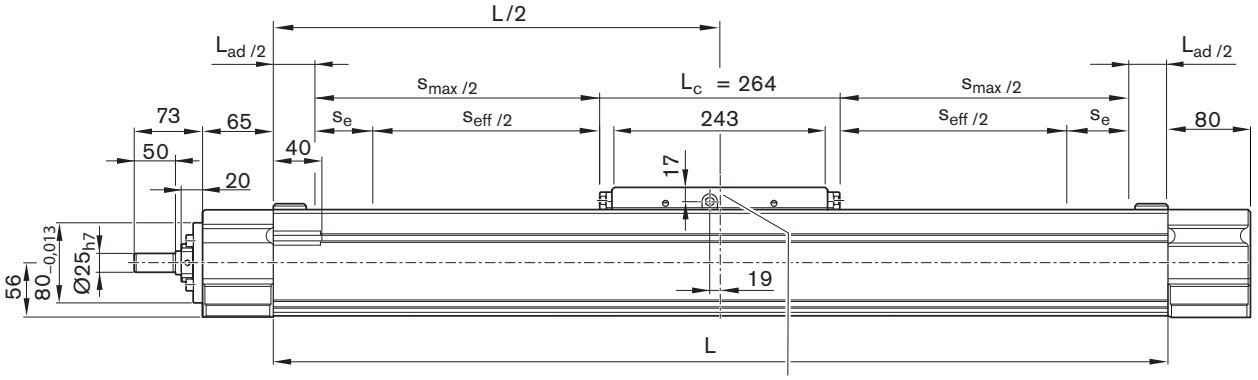
Example:
Belt side drive RV01
Motor connector position 180°

AGK-040 Dimensional drawings

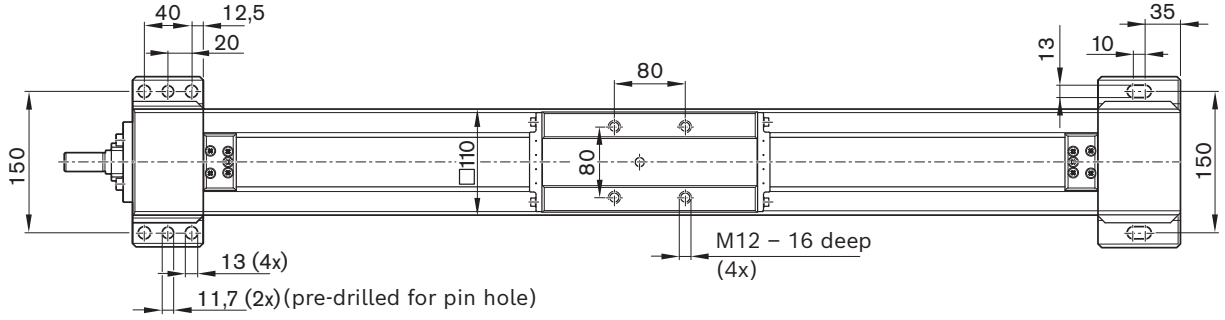
All dimensions are given in mm. Drawings not to scale.
Straightness and flatness tolerance in accordance with DIN EN 12020-02

Fixed bearing end

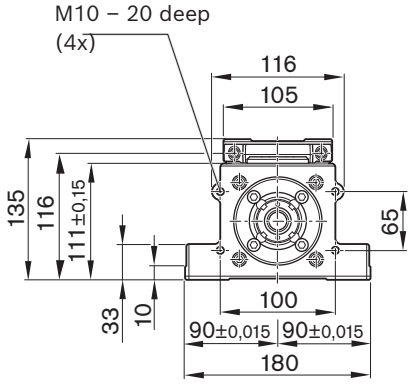
Floating bearing end

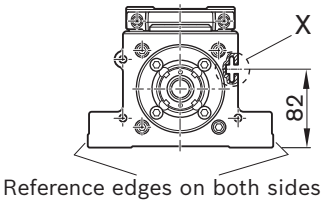


Lubrication hole on both sides of nut housing.
DIN 3405-A M6 funnel-type lube nipple

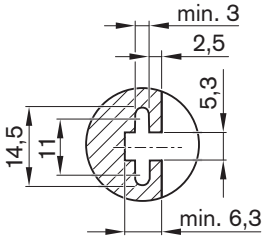


L_{ad} = additional length (see "Technical data" section)





Reference edges on both sides

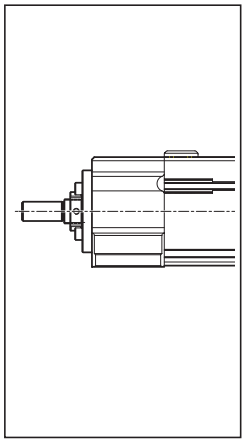


Slot for sensor

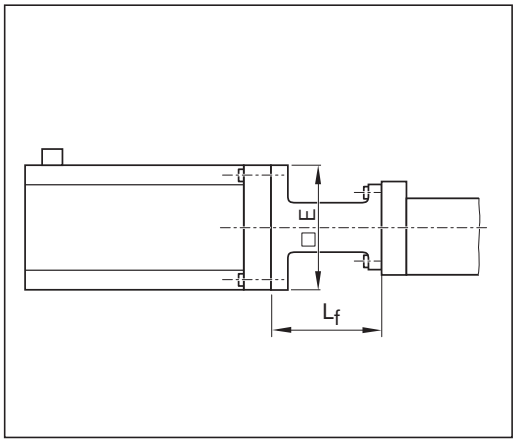
Motor attachment dimension drawings

Version

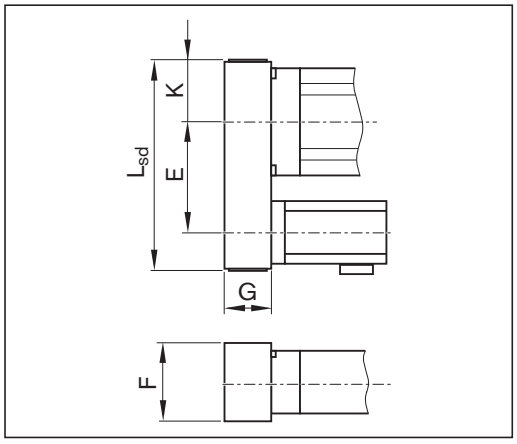
OF01



MF01



RV01, RV02, RV03, RV04



Version	**Motor code**	**Dimensions** (mm)	
		L_f	**□E**
MF01	MS2N07-B1BNN	140	see dimension □ **A** ➠ "Motors" section
	MS2N07-C0BQN		
	MS2N07-C1BRN		
	MS2N07-D1BNN		

Version	**Motor code**	**Dimensions** (mm)						
		E		**F**	**G**	**K**	**L_{sd}**	
		i = 1	**i = 2**				**i = 1**	**i = 2**
RV01, RV02, RV03, RV04	MS2N07-B1BNN	240	238	160	90	77	409	409
	MS2N07-C0BQN							
	MS2N07-C1BRN							
	MS2N07-D1BNN							

Further information on motors ➠ "Motors" section

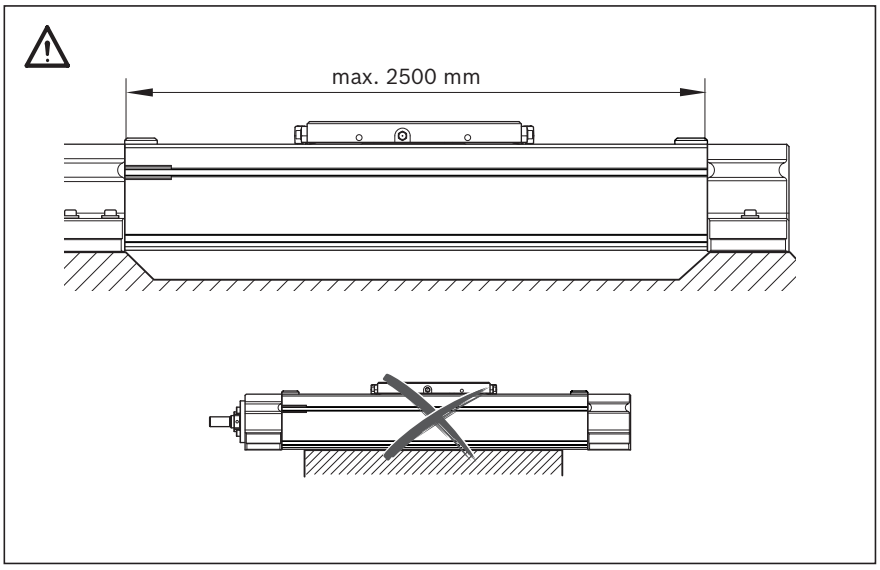
AGK fastening instructions

Fastening drive unit to customer-built attachment

Drive unit fastening points

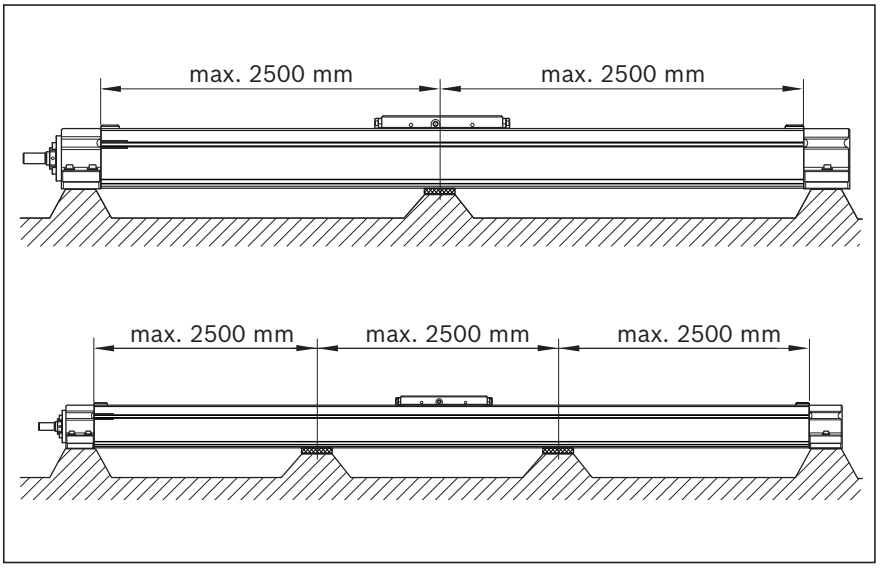
⚠ **Fasten drive unit to both pillow blocks only. The protective profile is not a load-bearing part and cannot transmit any forces.**

For more information on fastening, see "Instructions for AGK drive unit"



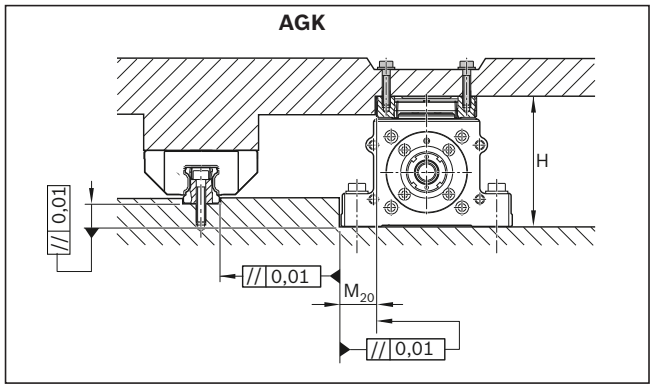
Provide supports for the protective profile
The protective profile may sag under its dead weight.
This is why supports should be installed for the protective profile over open lengths of more than 2 500 mm.
- Spacing between the support points: Max. 2500 mm
- The mounting bases for the protective profile supports and the pillow blocks should be on the same level.

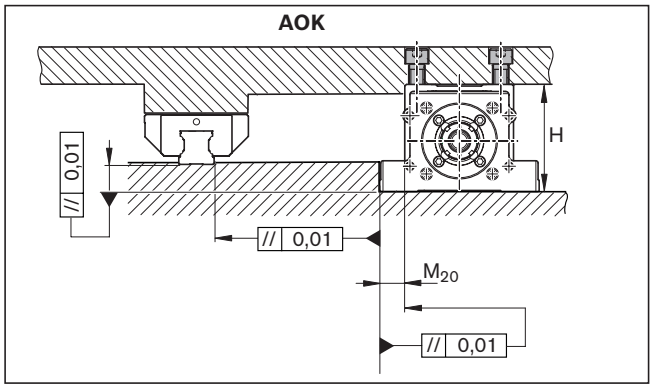
When the drive unit is in operation, the protective profile lifts as the drive carriage passes over it, then sinks back down onto the supporting surface.
Provide cushioning material on the surfaces of the protective profile supports, e.g., foam rubber pads.



AGK/AOK installation tolerances

Parallelism of customer-built attachments, pillow blocks and rail guides





	Dimensions (mm)	
	H $^{\pm 0.01}$	**M_{20}** $^{\pm 0.01}$
AGK-020	100	35.0
AGK-032	110	30.0
AGK-040	135	37.5

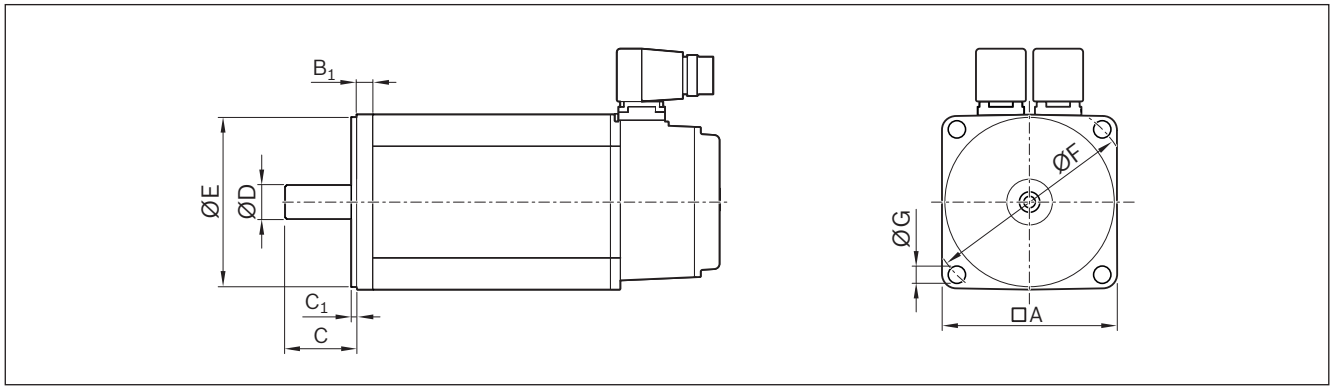
AOK-020	**Nut**	**Nut housing**	**Dimensions** (mm)	
d_0 x P			**H** $^{\pm 0.01}$	**M_{20}** $^{\pm 0.01}$
20 x 5	ZEM-E	MGA	85	35
	FEM-E-S	MGS	73	35
	FEM-E-B	MGD	69	35
20 x 10	ZEM-E	MGA	85	35
	FEM-E-S	MGS	73	35
	FEM-E-B	MGD	69	35
20 x 20	ZEM-E	MGA	85	35
	FEM-E-S	MGS	75	30
	FEM-E-B	MGD	69	35
20 x 40	ZEM-E	MGA	85	35
	FEP-E-S	MGS	75	30

AOK-032	**Nut**	**Nut housing**	**Dimensions** (mm)	
d_0 x P			**H** $^{\pm 0.01}$	**M_{20}** $^{\pm 0.01}$
32 x 5	ZEM-E	MGA	95	22.5
	FEM-E-S	MGS	84	25
	FEM-E-B	MGD	81	22.5
32 x 10	ZEM-E	MGA	95	22.5
	FEM-E-S	MGS	84	25
	FEM-E-B	MGD	81	22.5
32 x 20	ZEM-E	MGA	95	22.5
	FEM-E-S	MGS	88	20
	FEM-E-B	MGD	81	22.5
32 x 32	ZEM-E	MGA	95	22.5
	FEM-E-S	MGS	88	20
	FEM-E-B	MGD	81	22.5

AOK-040	**Nut**	**Nut housing**	**Dimensions** (mm)	
d_0 x P			**H** $^{\pm 0.01}$	**M_{20}** $^{\pm 0.01}$
40 x 5	ZEM-E	MGA	115	30
	FEM-E-S	MGS	98	37.5
	FEM-E-B	MGD	98	30
40 x 10	ZEM-E	MGA	115	30
	FEM-E-S	MGS	106	30
	FEM-E-B	MGD	98	30
40 x 20	ZEM-E	MGA	115	30
	FEM-E-S	MGS	106	30
	FEM-E-B	MGD	98	30
40 x 40	ZEM-E	MGA	115	30
	FEM-E-S	MGS	114	20
	FEM-E-B	MGD	98	30

Motor attachment kits according to customer specification

The motor of linear motion systems with ball screw assembly is attached by either an attachment kit with flange and coupling (MF) or a belt side drive (RV).
The available combinations are shown in the "Configuration and ordering" selection tables for each size.
In addition to motor attachment kits for Rexroth motors, attachment kits for motors according to customer specification can also be ordered. In order to determine the appropriate attachment kit, the connection geometry of the motor is crucial. Characteristics required to clearly determine motor geometry are shown below.

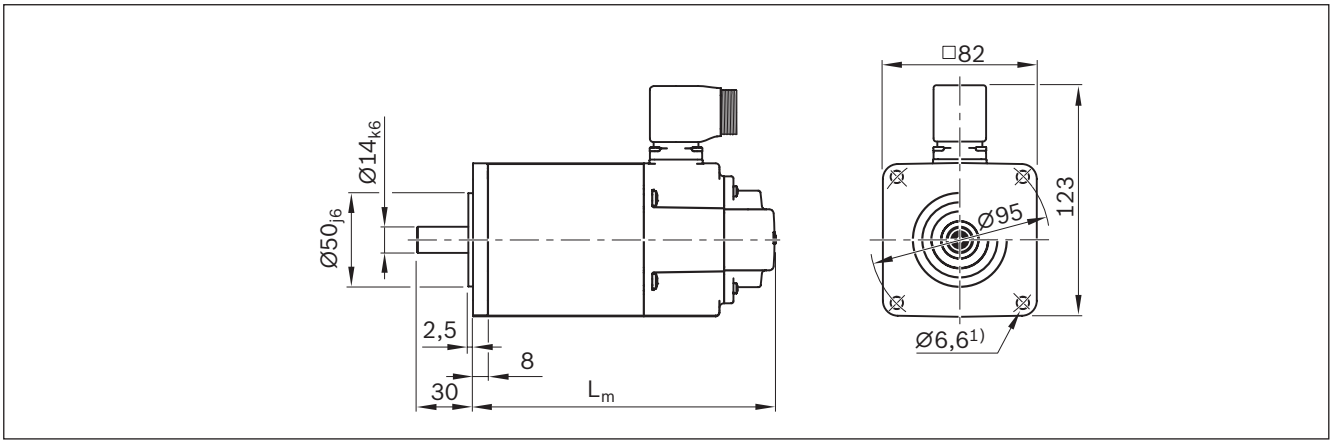


The dimensions queried result in a unique "motor geometry code":

□□ – □□ – □□□ – □□□ – □□□ – M□□ – □□□ – □□□

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

Example illustration of servo motor IndraDyn S Type MS2N04



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

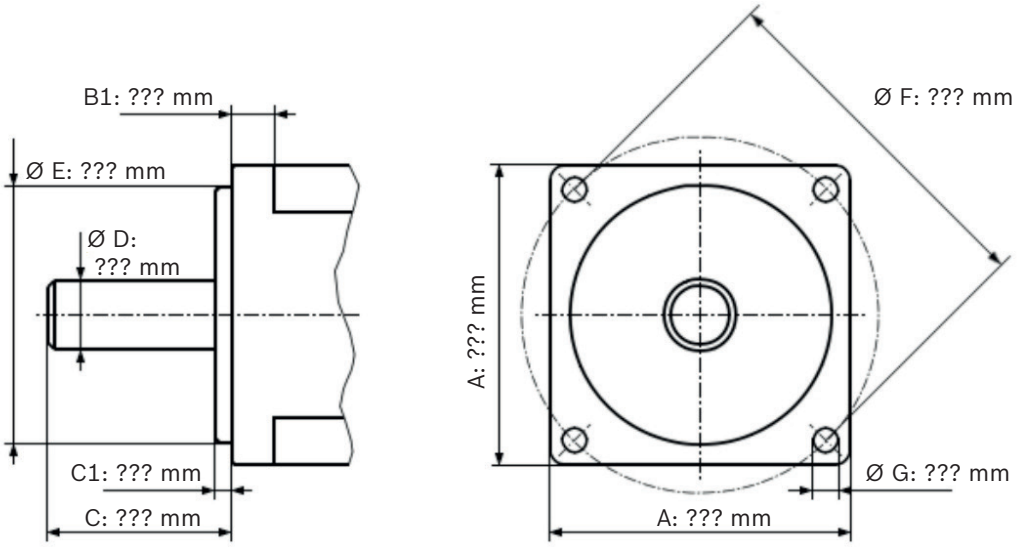
[1)] The drill hole Ø 6.6 mm results in the type designation M06 for the geometry motor code (nominal thread diameter mounting screw M6).

Motor attachment kits for motors according to customer specification can be selected using the online configurator in the eShop. To do this, select the "mechanical interface" and "motors according to customer specification" option.

Dimensions customer motor

Motor manufacturer

Motor type

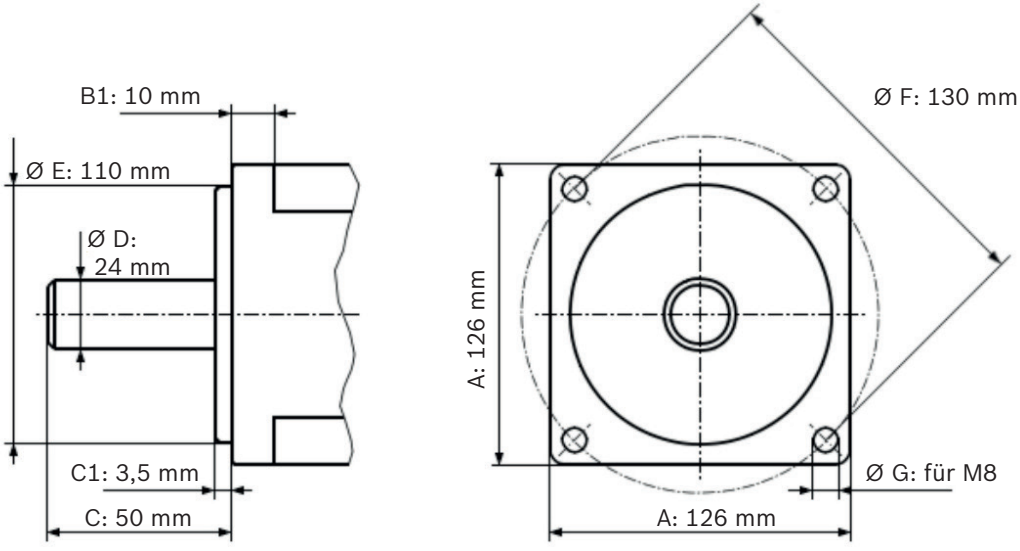


Example

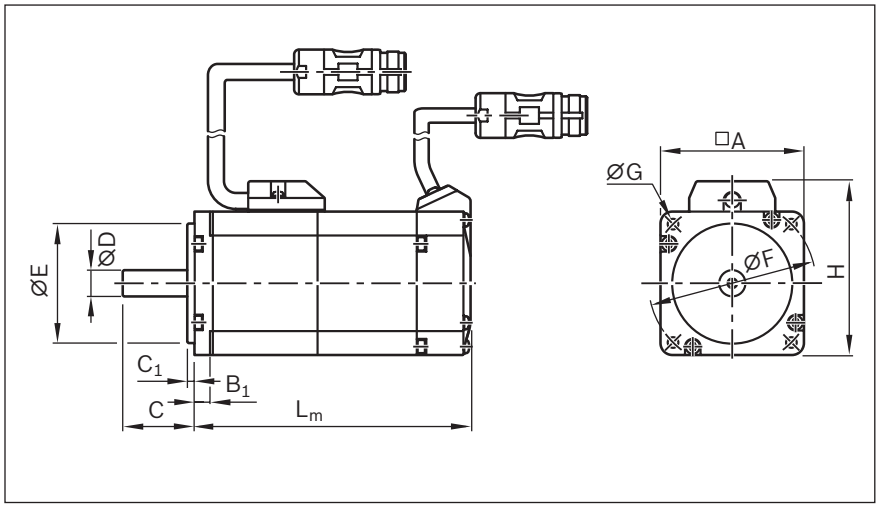
Dimensions customer motor

Motor manufacturer Siemens

Motor type 1FK706



IndraDyn S - MSM servo motors



Motor code	Dimensions (mm)											
	□A	B_1	C	C_1	ø D	ø E	ø F	ø G	H	L_m Holding brake		
										Without	With	
MSM 019B-0300	38	6.0	25	3	8	30	45	3.4	51	92.0	122.0	
MSM 031B-0300	60	6.5	30	3	11	50	70	4.5	73	79.0	115.5	
MSM 031C-0300	60	6.5	30	3	14	50	70	4.5	73	98.5	135.0	
MSM 041B-0300	80	8.0	35	3	19	70	90	6.0	93	112.0	149.0	

Version:

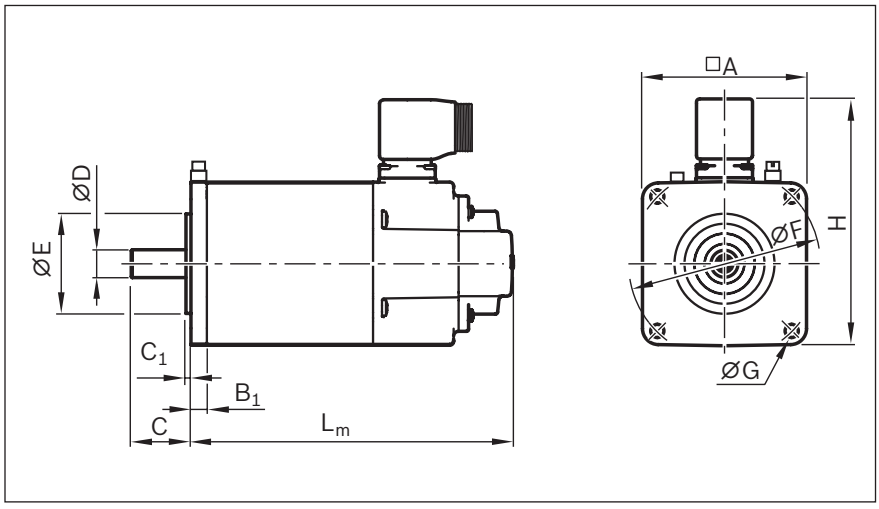
- Plain shaft without shaft seal
- M5 multi-turn absolute encoder (20-bit, absolute encoder function only available with backup battery)
- Cooling: Natural convection
- IP54 rating (shaft: IP40)
- With or without holding brake
- M17 metal round connector

Note

Motors are available with control units and controllers. You can find more information on motors and control systems in the Rexroth catalogs on drive technology at www.boschrexroth.com.

Motor data										Type code	Material number
n_{max} (min^{-1})	M_0 (Nm)	M_{max} (Nm)	M_{br} (Nm)	J_m (kgm^2)	J_{br} (kgm^2)	m_m (kg)	mbr (kg)	Motor connection 1 / 2 cables	Holding brake		
5 000	0.32	0.95	0.29	0.0000051	0.0000002	0.47	0.21	2	N	MSM 019B-0300-NN-M5-MH0	R911344211
									Y	MSM 019B-0300-NN-M5-MH1	R911344212
5 000	0.64	1.91	1.27	0.0000140	0.0000018	0.82	0.48	2	N	MSM 031B-0300-NN-M5-MH0	R911344213
									Y	MSM 031B-0300-NN-M5-MH1	R911344214
5 000	1.30	3.80	1.27	0.0000260	0.0000018	1.20	0.50	2	N	MSM 031C-0300-NN-M5-MH0	R911344215
									Y	MSM 031C-0300-NN-M5-MH1	R911344216
4 500	2.40	7.10	2.45	0.0000870	0.0000075	2.30	0.80	2	N	MSM 041B-0300-NN-M5-MH0	R911344217
									Y	MSM 041B-0300-NN-M5-MH1	R911344218

IndraDyn S - MS2N servo motors



Motor schematic

Dimensions / motor data

Motor code	Dimensions (mm)											
	□A	B_1	C	C_1	ø D_{k6}	ø E_{j7}	ø F	ø G	H		L_m	
									Cable		Holding brake	
									2	1	Without	With
MS2N04-B0BTN	82	8	30	2.5	14	50	95	6.6	108	123	162	194.5
MS2N04-C0BTN	82	8	30	2.5	14	50	95	6.6	108	123	194	226.5
MS2N04-D0BQN	82	8	30	2.5	14	50	95	6.6	108	123	226	258.5
MS2N05-B0BTN	98	9	40	3	19	95	115	9	124	139	188	218
MS2N05-C0BTN	98	9	40	3	19	95	115	9	124	139	224	254
MS2N05-D0BRN	98	9	40	3	19	95	115	9	124	139	260	290

Version

- Plain shaft without shaft seal ring
- Multi-turn encoder
- Standard encoder (B) in conjunction with 2-cable connector (Hiperface interface)
- Advanced encoder (B) in conjunction with 1-cable connector (AcuroLink interface)
- IP64 rating
- With or without holding brake
- Special ground connection terminal near motor flange (used as needed)

Notes:

Motors are available with control units and controllers. You can find more information on motors and control systems in the Rexroth catalogs on drive technology at www.boschrexroth.com.

Motor data								Motor connection 1 / 2 cables	Holding brake	Type code	Material number
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)				
6 000	1.75	5.9	5.0	0.000070	0.000040	2.7	0.7	2	N	MS2N04-B0BTN-BMDH0-NNNNE-NN	R911384525
								2	Y	MS2N04-B0BTN-BMDH1-NNNNE-NN	R911384526
								1	N	MS2N04-B0BTN-CMSH0-NNNNE-NN	R911384527
								1	Y	MS2N04-B0BTN-CMSH1-NNNNE-NN	R911384528
6 000	2.80	12.0	5.0	0.000110	0.000050	3.7	0.7	2	N	MS2N04-C0BTN-BMDH0-NNNNE-NN	R911384529
								2	Y	MS2N04-C0BTN-BMDH1-NNNNE-NN	R911384530
								1	N	MS2N04-C0BTN-CMSH0-NNNNE-NN	R911384531
								1	Y	MS2N04-C0BTN-CMSH1-NNNNE-NN	R911384532
6 000	3.85	18.1	5.0	0.000160	0.000040	4.7	0.7	2	N	MS2N04-D0BQN-BMDH0-NNNNE-NN	R911384533
								2	Y	MS2N04-D0BQN-BMDH1-NNNNE-NN	R911384534
								1	N	MS2N04-D0BQN-CMSH0-NNNNE-NN	R911384535
								1	Y	MS2N04-D0BQN-CMSH1-NNNNE-NN	R911384536
6 000	3.75	10.6	10.0	0.000170	0.000110	4.0	1.1	2	N	MS2N05-B0BTN-BMDH0-NNNNE-NN	R911384539
								2	Y	MS2N05-B0BTN-BMDH1-NNNNE-NN	R911384540
								1	N	MS2N05-B0BTN-CMSH0-NNNNE-NN	R911384542
								1	Y	MS2N05-B0BTN-CMSH1-NNNNE-NN	R911384543
6 000	6.10	20.8	10.0	0.000290	0.000110	5.9	1.1	2	N	MS2N05-C0BTN-BMDH0-NNNNE-NN	R911384544
								2	Y	MS2N05-C0BTN-BMDH1-NNNNE-NN	R911384545
								1	N	MS2N05-C0BTN-CMSH0-NNNNE-NN	R911384546
								1	Y	MS2N05-C0BTN-CMSH1-NNNNE-NN	R911384547
6 000	7.90	31.3	10.0	0.000400	0.000110	7.3	1.1	2	N	MS2N05-D0BRN-BMDH0-NNNNE-NN	R911384548
								2	Y	MS2N05-D0BRN-BMDH1-NNNNE-NN	R911384549
								1	N	MS2N05-D0BRN-CMSH0-NNNNE-NN	R911384550
								1	Y	MS2N05-D0BRN-CMSH1-NNNNE-NN	R911384551

IndraDyn S - MS2N servo motors

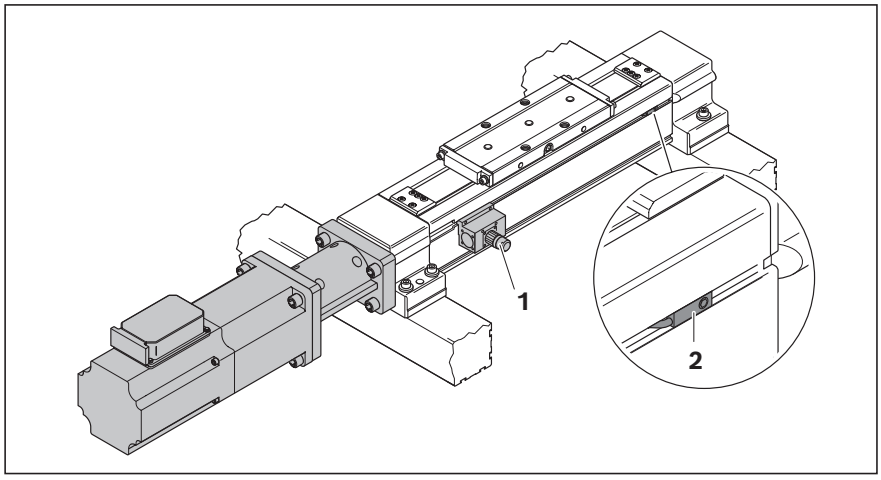
Dimensions / motor data

Motor code	Dimensions (mm)											
	□A	B_1	C	C_1	⌀ D_{k6}	⌀ E_{j7}	⌀ F	⌀ G	H		L_m	
									Cable		Brake	
									2	1	Without	With
MS2N06-B1BNN	116	14	50	3	24	95	130	9	156	156	164	201
MS2N06-C0BTN	116	14	50	3	24	95	130	9	156	156	184	202
MS2N06-D0BRN	116	14	50	3	24	95	130	9	156	156	224	261
MS2N06-D1BNN	116	14	50	3	24	95	130	9	156	156	224	261
MS2N07-B1BNN	140	18	58	4	32	130	165	11	180	180	176	230
MS2N07-C0BQN	140	18	58	4	32	130	165	11	180	180	205	259
MS2N07-C1BRN	140	18	58	4	32	130	165	11	180	180	205	259
MS2N07-D1BNN	140	18	58	4	32	130	165	11	180	180	263	317

Motor data								Motor connection 1 / 2 cables	Holding brake	Type code	Material number
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)				
6 000	3.25	9.5	10.0	0.000480	0.000110	5.1	1.1	2	N	MS2N06-B1BNN-BMUH0-NNNNE-NN	R911384927
								2	Y	MS2N06-B1BNN-BMUH1-NNNNE-NN	R911384928
								1	N	MS2N06-B1BNN-CMSH0-NNNNE-NN	R911384929
								1	Y	MS2N06-B1BNN-CMSH1-NNNNE-NN	R911384930
6 000	6.00	16.0	10.0	0.000390	0.000110	6.4	1.0	2	N	MS2N06-C0BTN-BMUH0-NNNNE-NN	R911384931
								2	Y	MS2N06-C0BTN-BMUH1-NNNNE-NN	R911384932
								1	N	MS2N06-C0BTN-CMSH0-NNNNE-NN	R911384933
								1	Y	MS2N06-C0BTN-CMSH1-NNNNE-NN	R911384934
6 000	9.70	32.0	15.0	0.000650	0.000140	9.0	1.5	2	N	MS2N06-D0BRN-BMUH0-NNNNE-NN	R911384935
								2	Y	MS2N06-D0BRN-BMUH2-NNNNE-NN	R911384936
								1	N	MS2N06-D0BRN-CMSH0-NNNNE-NN	R911384937
								1	Y	MS2N06-D0BRN-CMSH2-NNNNE-NN	R911384938
6 000	9.00	38.4	15.0	0.001400	0.000140	9.0	1.5	2	N	MS2N06-D1BNN-BMUH0-NNNNE-NN	R911384939
								2	Y	MS2N06-D1BNN-BMUH2-NNNNE-NN	R911384940
								1	N	MS2N06-D1BNN-CMSH0-NNNNE-NN	R911384941
								1	Y	MS2N06-D1BNN-CMSH2-NNNNE-NN	R911384942
6 000	7.40	21.0	20.0	0.001970	0.000260	9.5	2.0	2	N	MS2N07-B1BNN-BMUH0-NNNNE-NN	R911384949
								2	Y	MS2N07-B1BNN-BMUH1-NNNNE-NN	R911384950
								1	N	MS2N07-B1BNN-CMSH0-NNNNE-NN	R911384951
								1	Y	MS2N07-B1BNN-CMSH1-NNNNE-NN	R911384952
6 000	12.8	35.7	20.0	0.001200	0.000260	12.0	2.0	2	N	MS2N07-C0BQN-BMUH0-NNNNE-NN	R911384953
								2	Y	MS2N07-C0BQN-BMUH1-NNNNE-NN	R911384954
								1	N	MS2N07-C0BQN-CMSH0-NNNNE-NN	R911384955
								1	Y	MS2N07-C0BQN-CMSH1-NNNNE-NN	R911384956
6 000	11.50	42.2	20.0	0.003050	0.000260	12.0	2.0	2	N	MS2N07-C1BRN-BMUH0-NNNNE-NN	R911384957
								2	Y	MS2N07-C1BRN-BMUH1-NNNNE-NN	R911384958
								1	N	MS2N07-C1BRN-CMSH0-NNNNE-NN	R911384959
								1	Y	MS2N07-C1BRN-CMSH1-NNNNE-NN	R911384960
6 000	18.90	84.8	36.0	0.005290	0.000410	17.5	2.5	2	N	MS2N07-D1BNN-BMUH0-NNNNE-NN	R911384963
								2	Y	MS2N07-D1BNN-BMUH2-NNNNE-NN	R911384964
								1	N	MS2N07-D1BNN-CMSH0-NNNNE-NN	R911384965
								1	Y	MS2N07-D1BNN-CMSH2-NNNNE-NN	R911384966

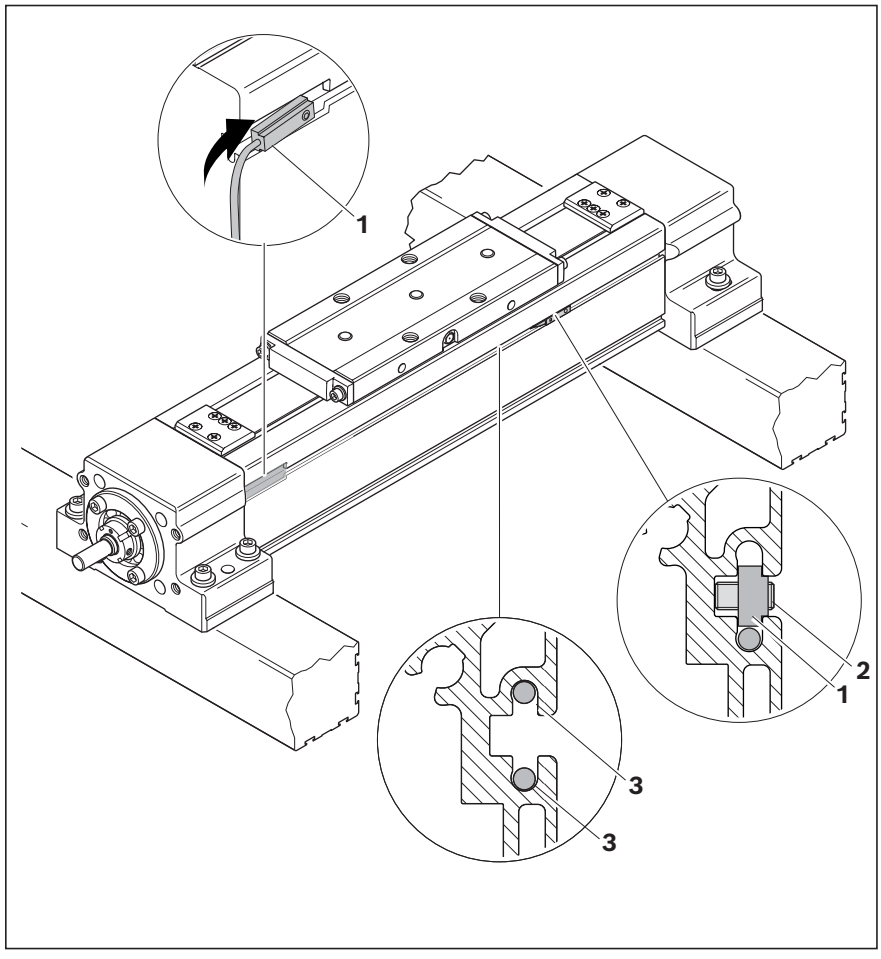
AGK switch mounting arrangements

Switching system overview



1 Socket and plug
2 Magnetic field sensor

Switch mounting



1 Switch (magnetic field sensor) with potted cable
2 Set screw for securing
3 Cable
The switch activator is a magnet integrated in the nut housing (no switching angle required).
The switch activation points can be positioned anywhere along the stroke.

Version
– Hall sensor (PNP NC) or
– Reed sensor (changeover)
See "Sensors" section for technical data.

Instruction for mounting

- Insert the sensor (**1**) with set screw (**2**) outwards in the upper T-slot of the housing.
- Set the switching point and fix the sensor with set screw (**2**).
- Press the signal line (**3**) into the upper or lower cable line of the T-slot, thereby fixing it.

See instructions for more specific information on installation and switching positions.

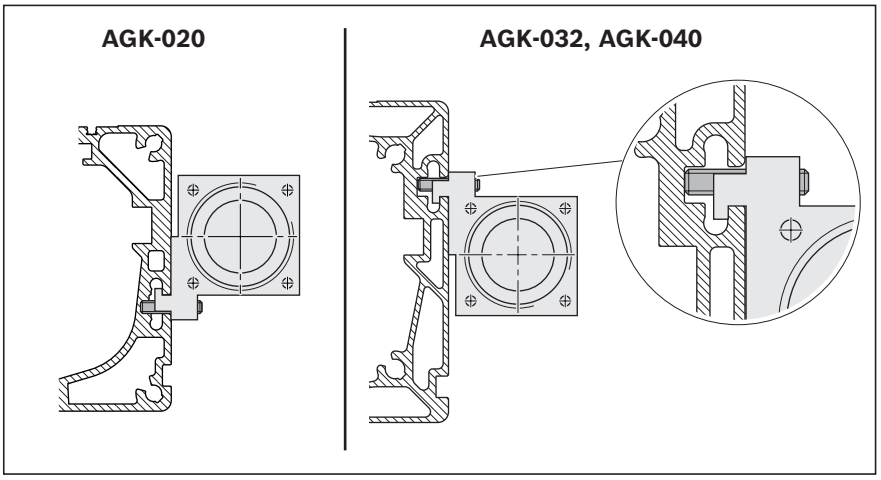
Socket-plug mounting

Mounting position

Various socket and plug arrangements are possible depending on requirements.
See "Sockets and plugs" section for technical data.

Securing socket to AGK protective profile

- AGK-020:
  Attach socket in lower T-slot of protective profile and secure with two set screws.
- AGK-032, AGK-040:
  Attach socket to upper T-slot of protective profile and secure with two set screws.



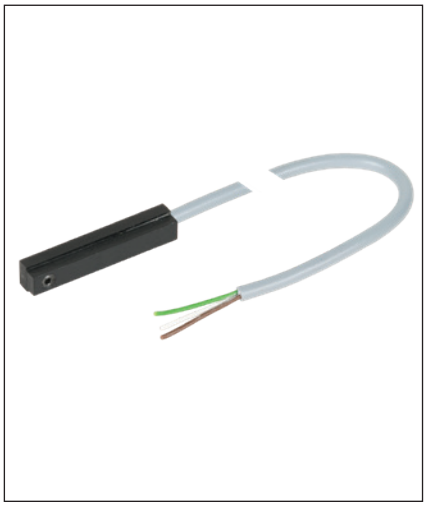
Switches and attachments

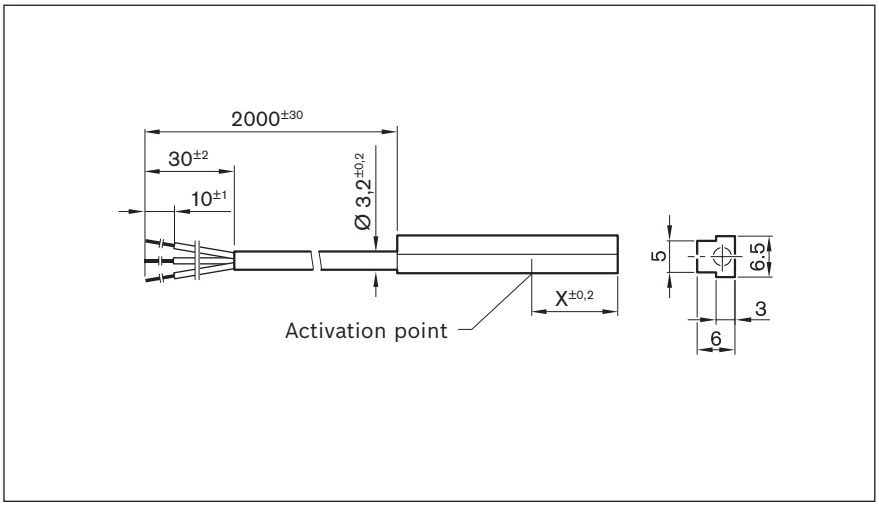
Description	Switching function		Option number[1]	Material number
Socket-plug	–		17	R117500153
Magnetic sensor	REED	Changeover contact (NC: C+NC; NO:C+NO)	21	R347600903
	Hall	PNP / normally closed (NC)	22	R347601003
	Hall	PNP / normally open (NO)	nv[2]	R347601203
	Hall	NPN / normally closed (NC)	nv[2]	R347601303
	Hall	NPN / normally open (NO)	nv[2]	R347601403

[1] From "Components and ordering" table
[2] Option not available. Switch only available as accessory with part number

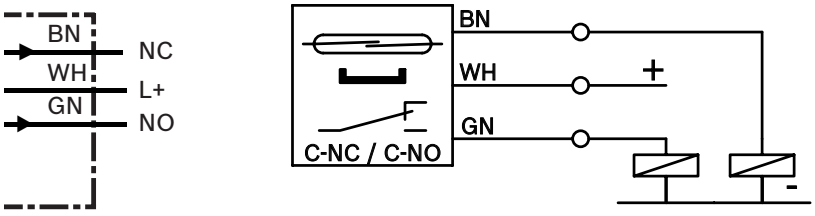
Sensors

Magnetic sensor with free cable end

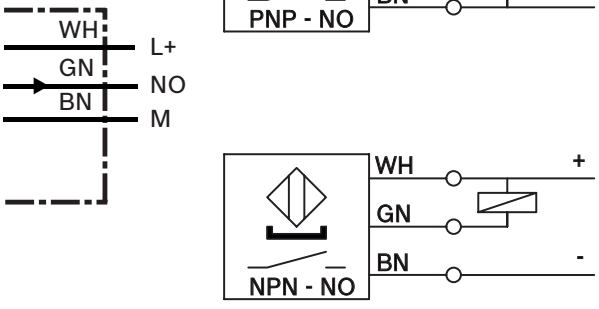




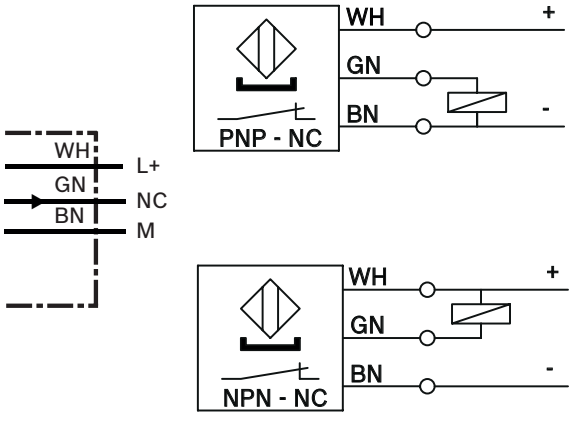
R347600903



R347601203
R347601403



R347601003
R347601303



Material number R347600903

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

Material numbers R347601003 / R347601203 / R347601403 / R347601303

Use	Limit switch	Reference switch	Limit switch	Reference switch
Material number	R347601003	R347601203	R347601303	R347601403
Name	H14118	H15637	H15638	H15080
Functional principle	magnetic			
Operating voltage	3.8 - 30 V DC			
Load current	≤ 20 mA			
Switching function	Hall PNP NC	Hall PNP NO	Hall NPN/NC	Hall NPN/NO
Activation point dimension "X"	13.65 mm			

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

Connection type	Cable 2.0 m, 3-pin
Galvanized connection ends	4
Function indicator	–
Short-circuit protection	–
Reverse polarity protection	–
Switch-on suppression	–
Switching frequency	2.5 kHz
Pulse elongation (off delay)	–
Max. permissible starting speed	2 m/s
Suitable for drag chains*	–
Torsion-resistant*	–
Welding spark-resistant*	–
Cable cross-section*	3x0.14 mm^2
Cable diameter D	3.2 ±0.20 mm
Static bending radius*	–
Dynamic bending radius*	–
Bending cycles*	–
Max. permissible travel speed*	–
Max. permissible acceleration*	–
Ambient temperature	–40°C to +85°C
Protection type	IP66
MTTFd (per EN ISO 13849-1)	–
Certifications and approvals**	–

*) Technical data only for built-in sensor connection line.

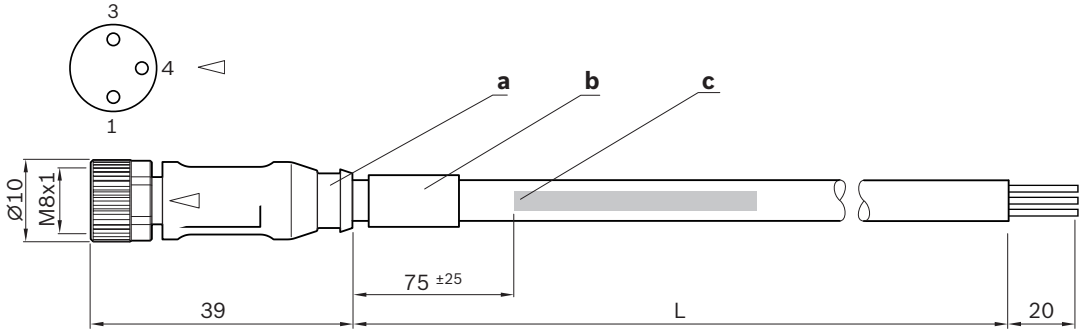
The available extension cables offer even better performance, e.g., when using a cable drag chain (see following pages).

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

Extensions

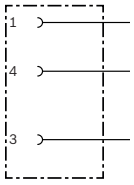
Assembled on one end

Dimensional drawing



Connection diagram

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

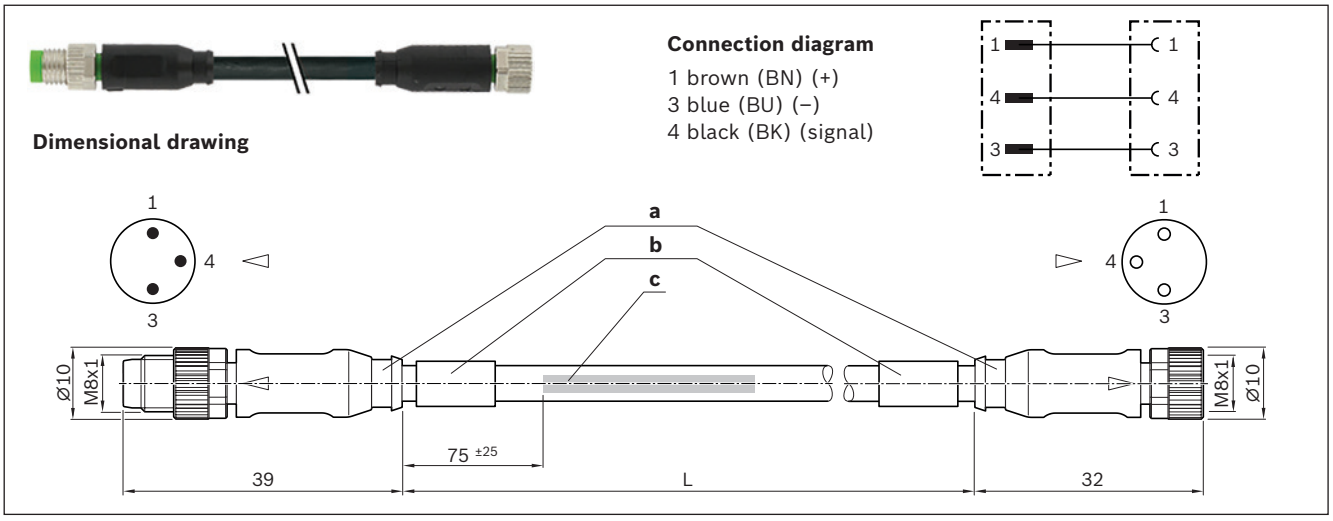


Material numbers

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

a) Contour for 6.5 mm corrugated tube (inner diameter)
b) Cable grommet
c) Cable printing per printing specification

Assembled on both ends



Material numbers

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

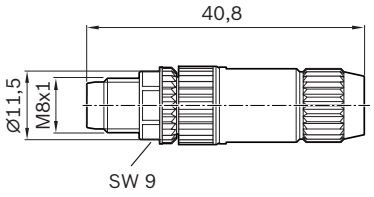
Technical data for extensions pre-assembled on one or two sides

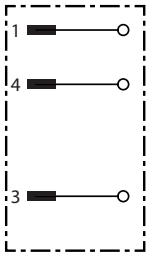
Function indicator	–
Operating voltage indicator	–
Operating voltage	10–30 V DC
Type of cable	PUR black
Suitable for drag chains	✓
Torsion-resistant	✓
Weld spark-resistant	✓
Cable cross-section	3x0.25 mm²
Cable diameter D	4.1 ±0.2 mm
Static bending radius	≥ 5xD
Dynamic bending radius	≥ 10xD
Bending cycles	> 10 mil.
Max. permissible travel speed	3.3 m/s for 5 m travel distance (typ.), up to 5 m/s for 0.9 m travel distance
Max. permissible acceleration	≤ 30 m/s²
Ambient temperature fixed ext.	–40°C to +85°C
Ambient temperature flexible ext.	–25°C to +85°C
Protection type	IP68
Certifications and approvals	CE, cULus LISTED, CSA C US, PG, RoHS

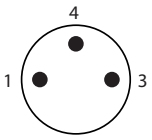
a) Contour for 6.5 mm corrugated tube (inner diameter)
b) Cable grommet
c) Cable printing per printing specification

Plugs

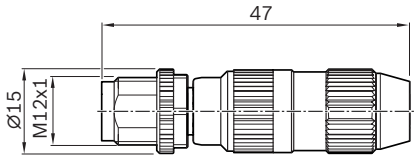
R901388333

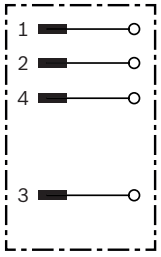


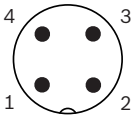




R901388352





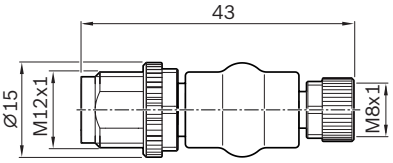


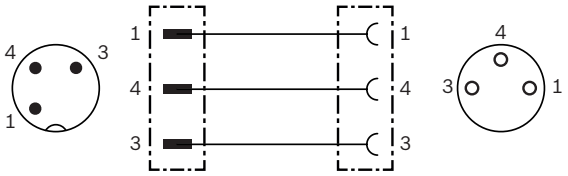
Material numbers/technical data		
Use	Male connector, single	
Material number	R901388333	R901388352
Name	7000-08331-0000000	7000-12491-0000000
Version	straight	
Operating current per contact	max. 4 A	
Operating voltage	max. 32 V AC/DC	
Connection type	Male connector, straight, M8x1, 3-pin Insulation displacement, self-locking screw thread	Male connector, straight, M12x1, 4-pin Insulation displacement, self-locking screw thread
Function indicator	-	
Operating voltage indicator	-	
Connection cross-section	0.14...0.34 mm²	
Ambient temperature	–25°C to +85°C	
Protection type	IP67 (inserted and locked)	
Certifications and approvals		

Adapters

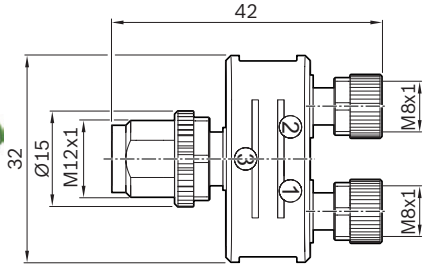
Dimensional drawing **Connection diagram**

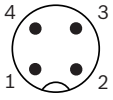
R911344591

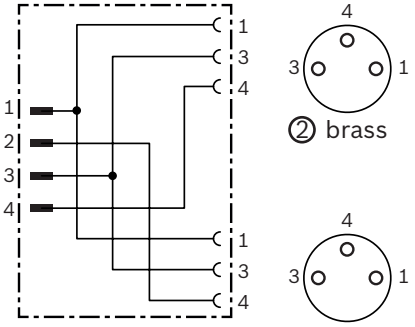




R911344592







Material numbers/technical data

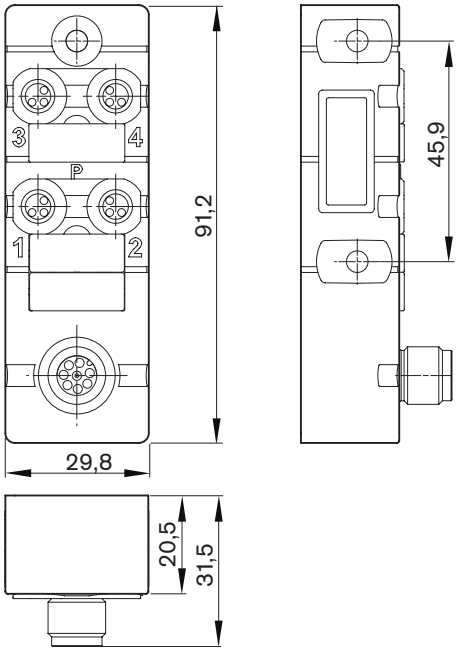
Use	Adapters	Adapter or distributor
Material number	R911344591	R911344592
Name	7000-42201-0000000	7000-41211-0000000
Version	straight for 1 sensor	straight, for 1 - 2 sensors
Operating current per contact	max. 4 A	
Operating voltage	max. 32 V AC/DC	
Connection type 1	M8x1 3-pole straight female connector self-locking screw thread	2 X straight female connectors, M8x1, 3-pin self-locking screw thread
Connection type 2	Male connector, straight, M12x1, 3-pin, self-locking screw thread	Male connector, straight, M12x1, 4-pin self-locking screw thread
Function indicator	–	
Operating voltage indicator	–	
Connection cross-section	–	
Ambient temperature	–25°C to +85°C	
Protection type	IP67 (inserted and locked)	
Certifications and approvals	RoHS	cULus LISTED, RoHS

Passive distributor

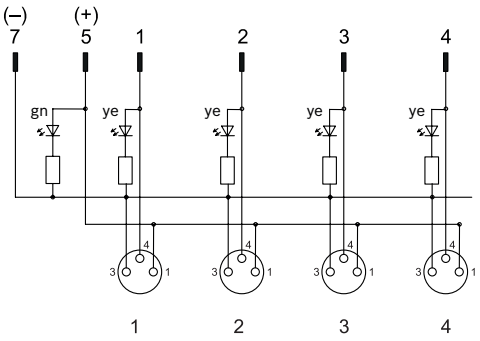

R901425737


R901429917

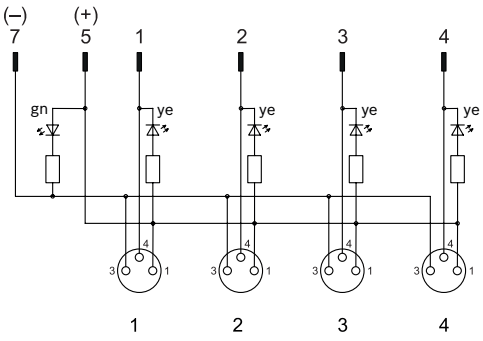

R911344592



R901425737



R901429917



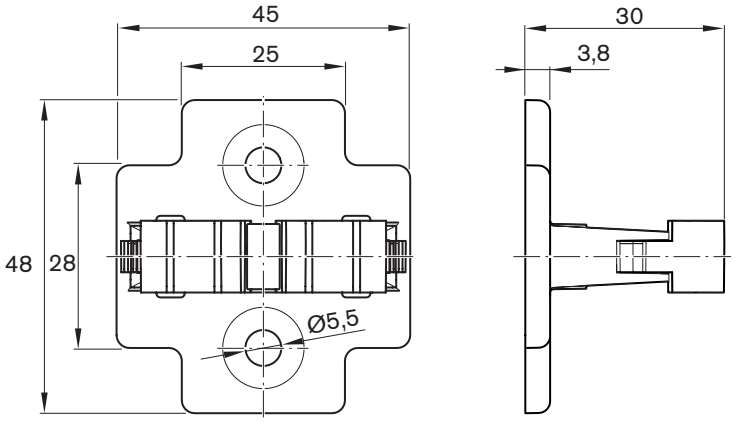
Material numbers/technical data

Use	Passive distributor		
Material number	R901425737	R901429917	R911344592
Name	8000-84070-0000000	8000-84071-0000000	For technical data and dimensional drawings, see adapter
Version	straight, for 1 - 4 sensors		
Operating current per contact	max. 2 A		
Operating voltage	24 V DC		
Switching logic	PNP	NPN	
Connection type 1	4x female connector, straight, M8x1, 3-pin self-locking screw thread		
Connection type 2	Straight plug, M12x1, 8-pin, IDC, self-locking screw thread		
Function indicator	✓		
Operating voltage indicator	✓		
Connection cross-section	–		
Ambient temperature	–20 °C to +70 °C		
Protection type	IP67 (inserted and locked)		
Certifications and licenses	c UL us LISTED, RoHS		

Accessories for passive distributors

Retainer plate

Screw plug



Material numbers/technical data

Use	For passive distributor R911344592	For passive distributors R901425737/ R901429917
Retainer plate	R913047341	–
Name	7000-99061-0000000	–
Set	1 unit	–
Screw plug	–	R913047322
Name	–	3858627
Set	–	10 units

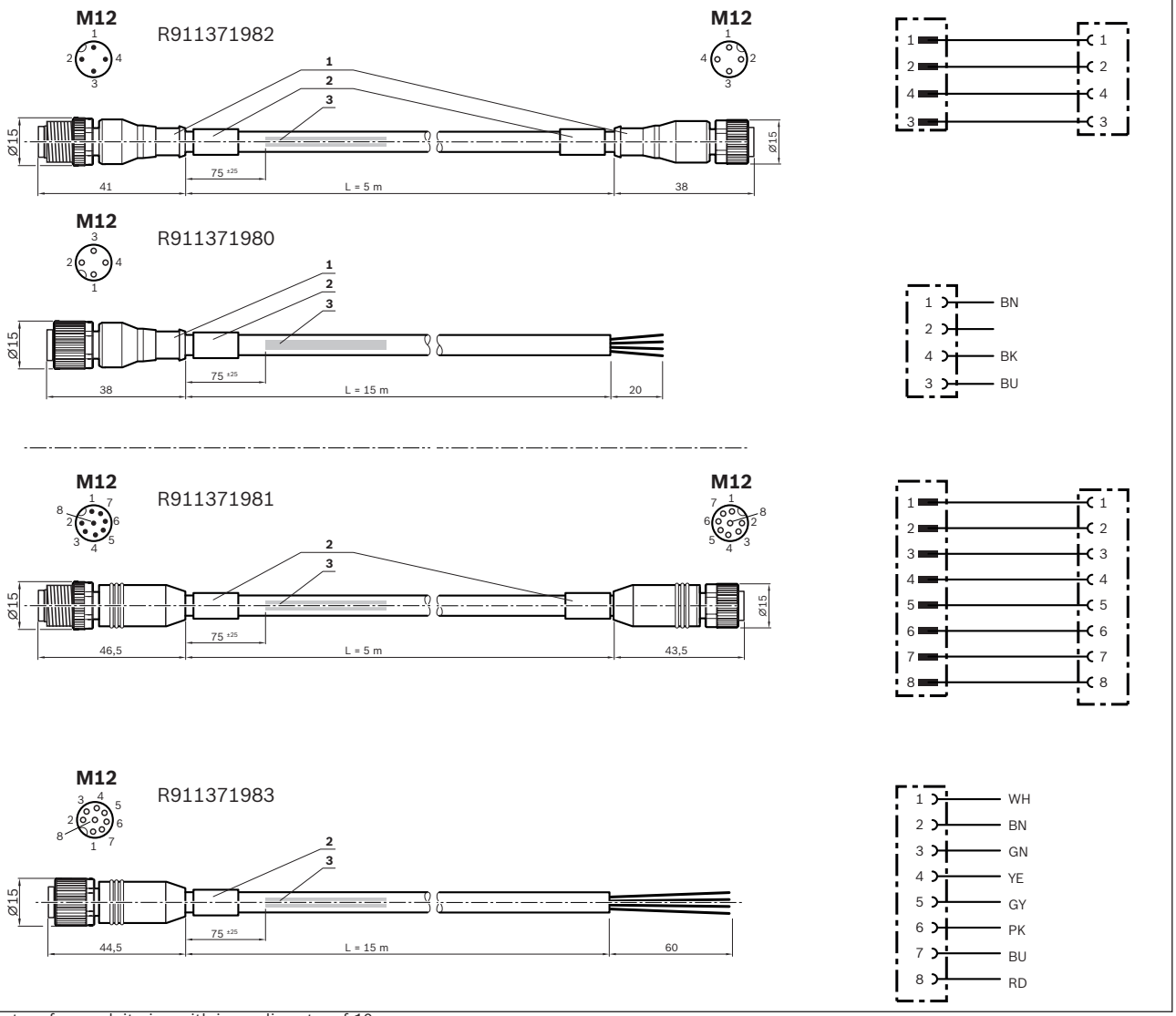
Extensions for Passive Distributors

R911371982

R911371981

R911371980

R911371983

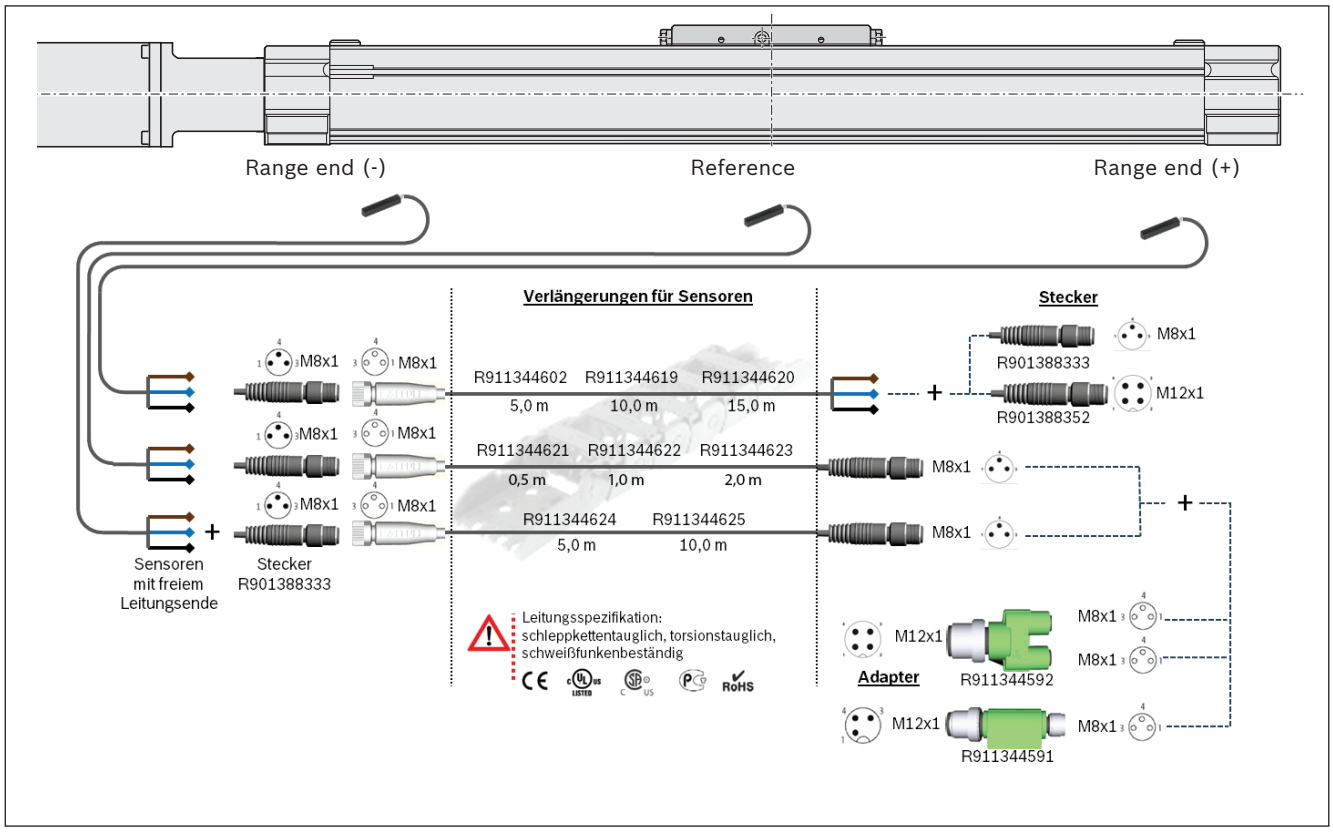


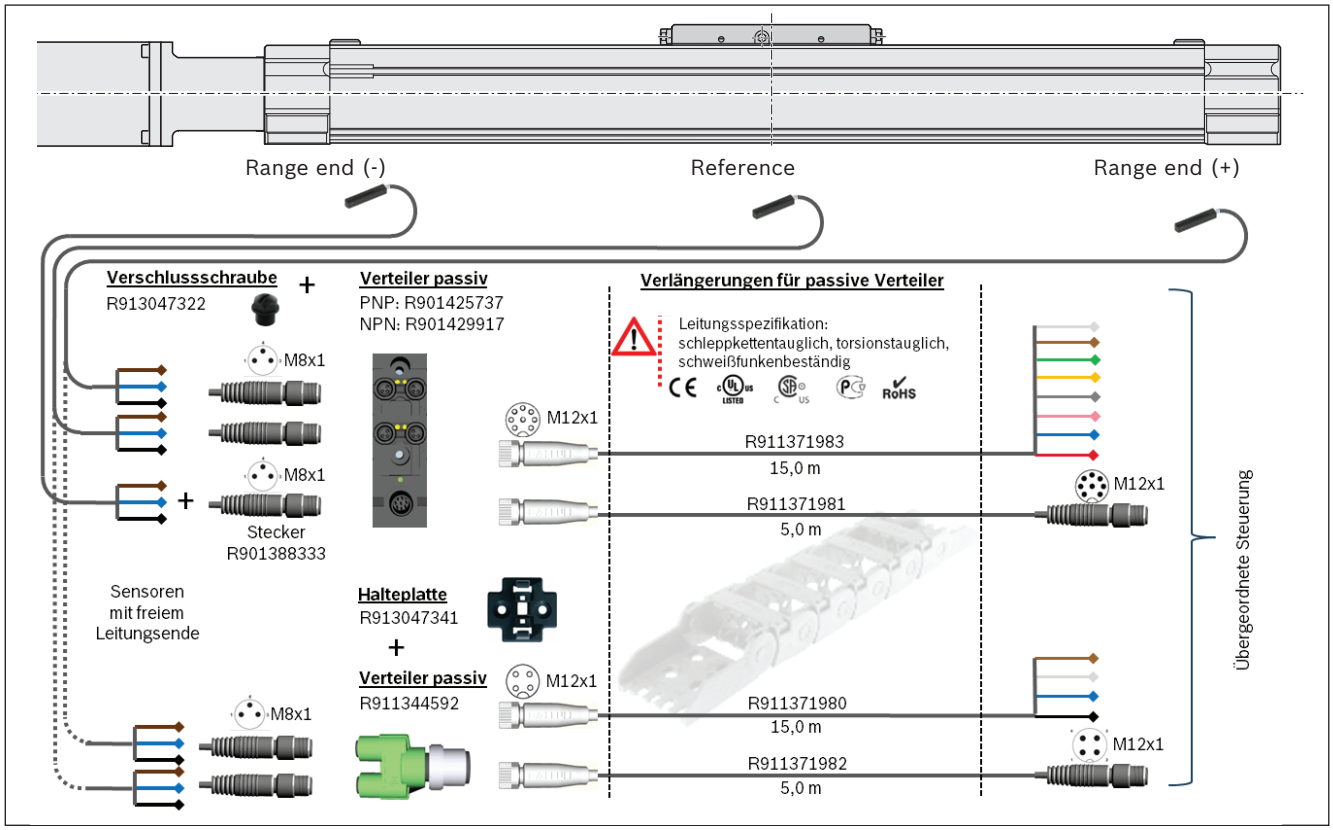
[1] Contour for conduit pipe with inner diameter of 10
[2] Cable grommet
[3] Cable print per ordering specification 7000-08001

Material numbers/technical data

Use	Extension cable for passive distributor R911344592		Extension cable for passive distributors R901425737 / R901429917	
Material number	R911371982	R911371980	R911371981	R911371983
Name	7000-40021-6540500	7000-12221-6541500	7000-48001-3770500	7000-17041-3771500
Length	5.0 m	15.0 m	5.0 m	15.0 m
Connection type 1	Female connector, straight, M12x1, 4-pin		Female connector, straight, M12x1, 8-pin	
Connection type 2	Straight plug, M12x1, 4-pin	Unassembled cable end	Straight plug, M12x1, 8-pin	Unassembled cable end
Function indicator	–			
Operating voltage indicator	–			
Type of cable	PUR black		PUR gray	
Operating voltage	30 V AC/DC			
Operating current per contact	max. 4 A per contact		max. 2 A per contact	
Suitable for drag chains	✓			
Torsion-resistant	✓			
Weld spark-resistant	✓			
Cable cross-section	4x0.34 mm^2		8x0.34 mm^2	
Cable diameter D	4.7 +/– 0.2 mm		6.2 +/– 0.3 mm	
Static bending radius	≧ 5 x D			
Dynamic bending radius	≧ 10 x D			
Bending cycles	> 10 mil.			
Max. permissible travel speed	3.3 m/s for 5 m travel distance (typ.), up to 5 m/s for 0.9 m travel distance			
Max. permissible acceleration	<= 30 m/s^2			
Ambient temperature fixed ext.	–40 °C to +80 °C (90 °C max. 10,000 h)			
Ambient temperature flexible ext.	–25 °C to +80 °C (90 °C max. 10,000 h)			
Protection type	IP67 (inserted and locked)			
Certifications and licenses	CE, cULus LISTED, CSA US, PG, RoHS			

Combination examples

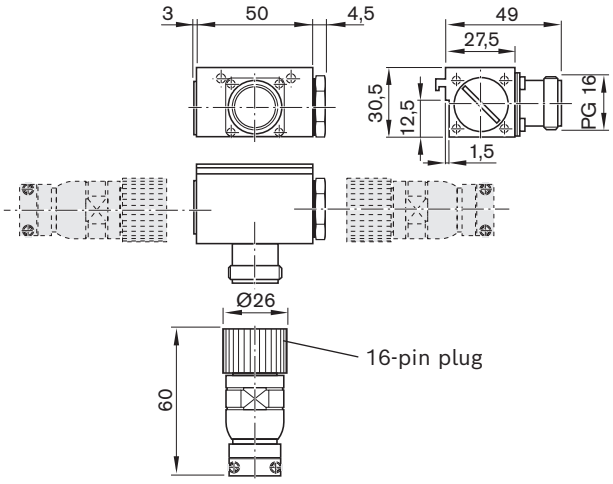


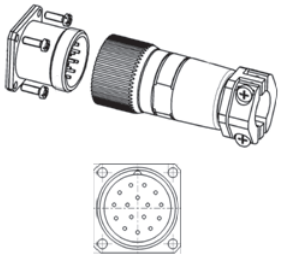


Socket and plug

Attach the socket on the side with the magnetic sensors. The socket and plug are not pre-wired. The variable sliding attachment allows switching positions to be optimized during start-up. The plug can be mounted in three directions.

R117500153





Use	Socket and plug
Material number	R117500153
Name	for AGK-020 -032 -040
Version	angled, for suspension in the lateral slot of the linear motion system
Operating current per contact	max. 8 A
Operating voltage	150 V AC/DC
Connection type 1	Straight plug, 16-pin, soldered connection
Connection type 2	Coupling / flange socket, 16-pin, soldered connection
Cable bushing **Housing**	1 seal with bore 2x5.5 mm, 1x3.5 mm 1 adaptable seal, max. 14 mm diameter incl. cap and dummy plug
Cable bushing, plug	Gland with pull relief
Connection cross-section	0.14...1 mm
Cable diameter	10...14 mm
Ambient temperature	-20 °C to +125 °C
Protection type	–
Certifications and licenses	–

Operating conditions

Normal operating conditions

Ambient temperature with Rexroth servo motor	0 °C ... 40 °C, loss of performance above 40 °C
Ambient temperature for mechanical system (no dropping below dew point)	-10 °C ... 60 °C
Stroke s_{min} [1)]	See "Technical data" tables
Soiling	not permissible

1) Minimum stroke to ensure a reliable lubrication distribution.

Required and supplementary documentation

For further instructions and information, please refer to the documentation for this product.

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

We would also be happy to send you the documents that you want.

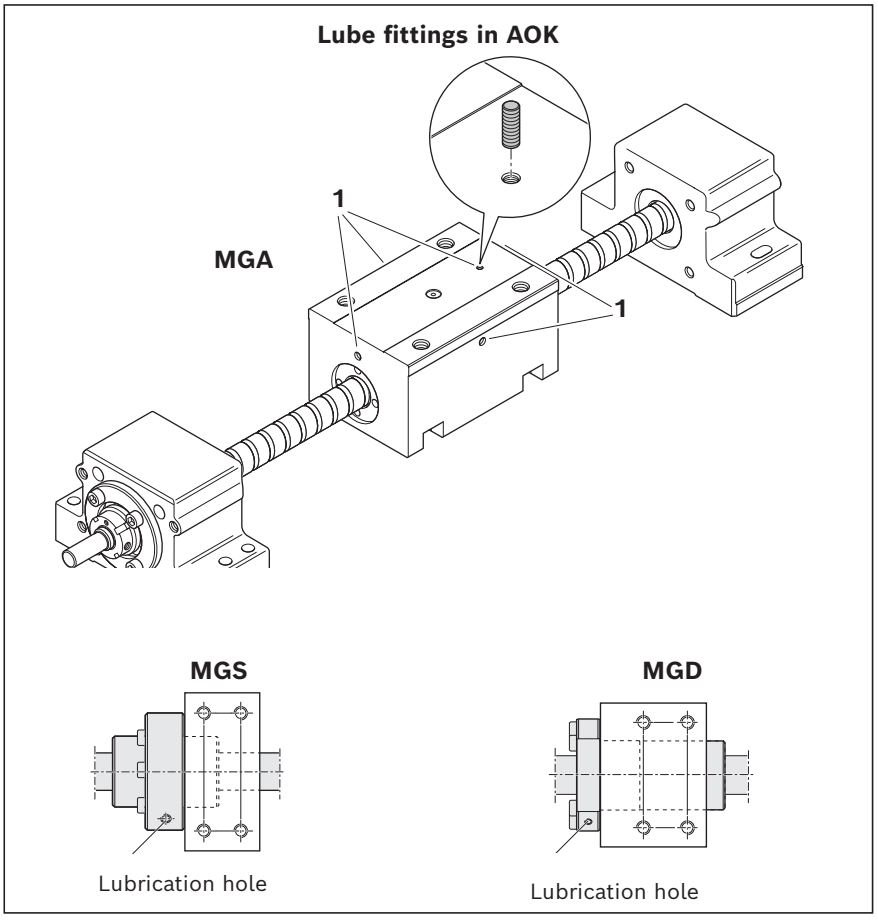
If you are unsure about using this product, please contact Bosch Rexroth.

Lubrication

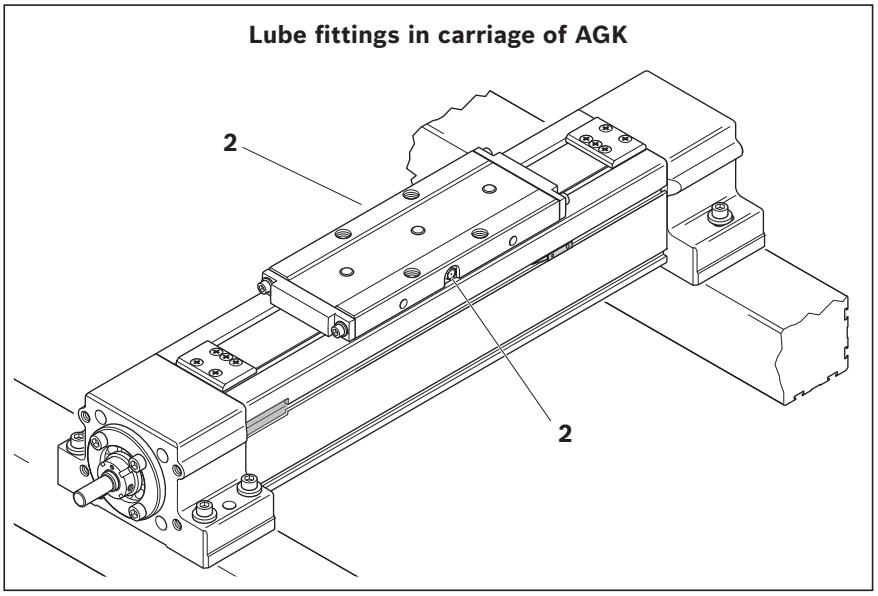
Lube fittings

AOK
Housing MGA has 1 lube fitting (**1**) on each side.
Lubrication through one of the 5 lube fittings is adequate.

The nuts in all other version are lubricated.
See dimensional drawings for location of lubrication hole.



AGK
The carriage has 1 funnel-type lube nipple (2) on each side.
Lubrication through only one of the 2 lube nipples is sufficient.



Lubrication

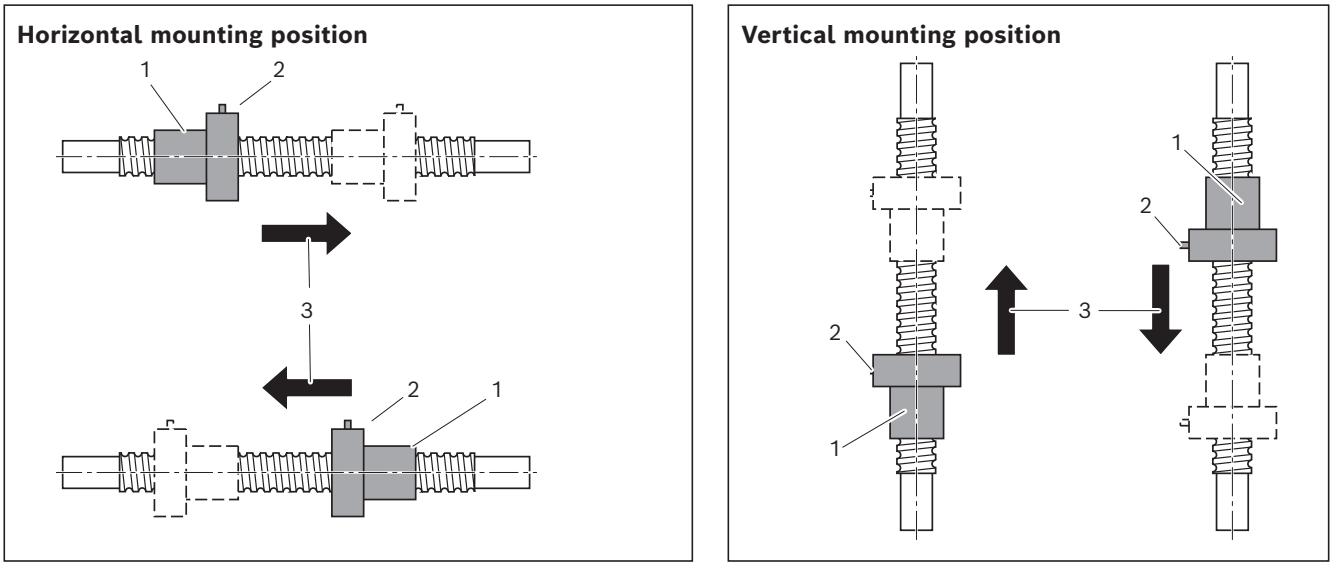
Overview

The ball screw drives in the drive units come with initial greasing standard. Basic lubrication with Dynalub 510 grease lubricant (see "Grease lubrication" section for lubricant properties)

The following lubrication procedures are generally permissible for relubrication and are also described in separate sections.
- Grease lubrication
  with grease guns or progressive lubrication systems
- Liquid grease lubrication
  with single-line piston distributor systems
- Oil lubrication
  with single-line piston distributor systems

Follow the positioning and travel instructions in the figure below when relubricating the ball screw drive nuts regardless of which of the above lubrication procedures is used.

Positioning and travel instructions



1 Position of the nut during lubricating procedure
2 Flange with lube fitting (if installed horizontally, the fitting should be as close to the top as possible)
3 Direction of travel after lubrication. Travel ≥ s_{min} (see "Technical data" tables).

Basic information on lubrication intervals:

The lubrication intervals in the following sections are based on a load ratio of F_m/C. The load ratio describes the quotient of average load F_m and dynamic load rating C (see "Calculation" section).
Lubrication intervals depend on load and are calculated in revolutions for the BASA based on the characteristic curve graph for the type of lubrication. Revolutions can be converted into km depending on lead.
Lubrication intervals are constant up to a load ratio of 0.2, so they can also be taken directly from the relubrication quantities and intervals tables. For higher load ratios, lubrication intervals have to be determined accordingly. Due to aging, relubrication should occur no less than every 2 years, even under normal operating conditions, regardless of application-specific lubrication intervals.

Notes:

Caution: Do not use lubricants with solid particles (e.g., graphite or MoS_2 additives).

If other lubricants are used than specified in the following sections, they may cause reduced relubrication intervals, loss of short-stroke and load-carrying performance, and chemical reactions between plastics, lubricants and anti-corrosion agents.

For strokes less than or equal to travel S_{min} (as per "Technical data" tables), executing a longer stroke ("lubricating stroke") according to positioning and travel instructions and reducing lubrication intervals are recommended.

Short stroke:

A short stroke is when the stroke is less than $S_{min}/2$

Effect of short stroke on service life:	Short strokes increase the number of time a rolling load passes over each point in the load zone, which reduces service life.
Effect of short stroke on lubrication:	Short strokes mean the ball does not make a full turn in the nut. This makes it impossible for an adequate grease film to form, which can result in premature wear.

Please contact one of our regional centers for short-stroke applications, since their effects on service life and lubrication require separate assessment.
You can find your local contact person at: www.boschrexroth.com/contact

Please contact us for applications in extreme conditions (e.g., heavy contamination, vibrations, impact load, corrosive media, etc.), since a separate assessment is necessary and a custom lubrication recommendation may be required.

Lubrication

Grease lubrication

with grease guns or progressive lubrication systems

Grease lubricant: We recommend using Dynalub 510 with the following properties:
- NLGI grade 2 lithium-based high-performance grease in accordance with DIN 51818 (KP2K-20 according to DIN 51825)
- Good water resistance
- Corrosion protection
- Temperature range: –20 to +80 °C

You can download product and safety data sheets from our website at www.boschrexroth.com.

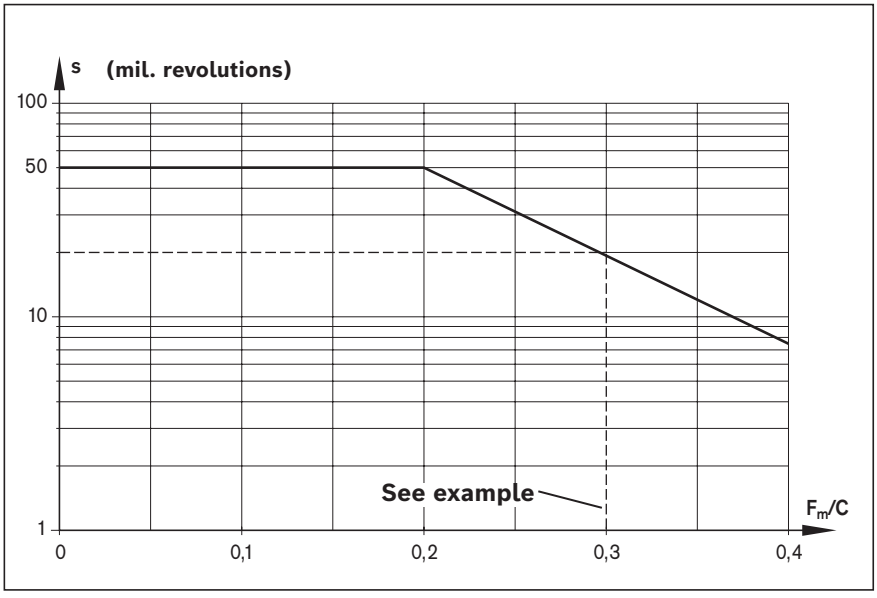
When using progressive lubrication systems, make sure all the lines and distributors (including the connection to the BASA nut) are filled before relubrication.

Grease lubrication			
Size	**BASA d_0xP**	**Relubrication quantity ZEM-E / FEM-E-S / FEP-E-S / FEM-E-B (cm^3)**	**Relubrication interval Based on load ratio Fm/C ≤ 0.2 (km)**
AOK-020 AGK-020	20x5	1.0	250
	20x10	1.5	500
	20x20	2.4	1 000
	20x40	1.8	2 000
AOK-032 AGK-032	32x5	2.2	250
	32x10	3.1	500
	32x20	3.6	1 000
	32x32	5.5	1 600
AOK-040 AGK-040	40x5	3.0	250
	40x10	6.7	500
	40x20	8.7	1 000
	40x40	14.3	2 000

The load ratio F_m/C is the quotient of the average load F_m and the dynamic load rating C (see "Calculation").

Graph for determining load-based lubrication intervals for grease lubrication using grease guns or progressive lubrication systems

This applies to the following conditions:
- Dynalub 510 grease lubricant or, alternatively, Castrol Longtime PD 2, Elkalub GLS 135/N2
- No exposure to media
- Ambient temperature: T = 20 to 30 °C



s = Relubrication interval in mil. revolutions (10^6 revs)
C = Dynamic load capacity (N)
F_m = Average load (N)
d_0 = Nominal diameter (mm)

Conversion of lubrication interval s from millions of revolutions to kilometers:

$$\text{s in kilometers} = \frac{\text{s in millions (Revs)} \cdot \text{lead P (mm)}}{10^6}$$

Example:
AOK-032, BASA 32x20,
From application: Load ratio $F_m/C = 0.3$
Taken from graph, with P = 20 mm and $F_m/C = 0.3$: 20 • 10^6 revs

$$\text{s in kilometers} = \frac{20 \cdot 10^6 \text{ (revs)} \cdot 20 \text{ (mm)}}{10^6} = 400 \text{ km}$$

Lubrication

Liquid grease lubrication

With single-line piston distributor systems

Grease lubricant

We recommend using Dynalub 520 with the following properties:
– Lithium-based, high-performance grease of NLGI grade 00 in accordance with DIN 51818 (GP00K-20 in accordance with DIN 51826)
– Good water resistance
– Corrosion protection
– Temperature range: -20 to +80 °C

You can download product and safety data sheets from our website at www.boschrexroth.com.

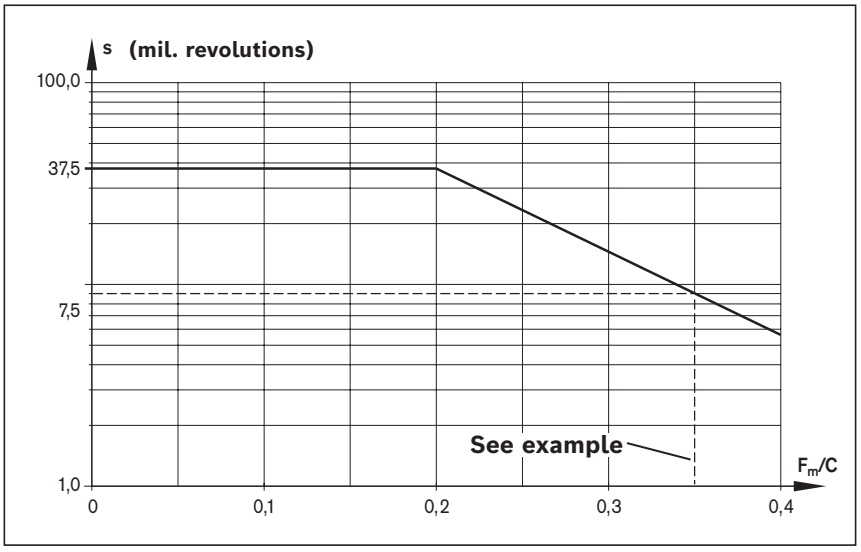
When using single-line distributor systems, always make sure all lines and the piston distributors (including the connection to the BASA nut) are filled before relubrication.
The pulse count that is needed for this is the integer quotient of the relubrication quantity according to the table and the piston distributor size. Make sure the piston distributor size is at least 0.03 cm^3. The lubricating cycle time is then the result of dividing the lubrication interval by the determined pulse count.

Liquid grease lubrication

Size	BASA d_0xP	Relubrication quantity ZEM-E / FEM-E-S / FEP-E-S / FEM-E-B (cm^3)	Relubrication interval Based on load ratio Fm/C ≤ 0.2 (km)
AOK-020 AGK-020	20x5	1.0	188
	20x10	1.5	375
	20x20	2.4	750
	20x40	1.8	1 500
AOK-032 AGK-032	32x5	2.2	188
	32x10	3.1	375
	32x20	3.6	750
	32x32	5.5	1 200
AOK-040 AGK-040	40x5	3.0	188
	40x10	6.7	375
	40x20	8.7	750
	40x40	14.3	1 500

The load ratio F_m/C is the quotient of the average load F_m and the dynamic load rating C (see "Calculation").

Graph for determining load-based lubrication intervals for liquid grease lubrication using single-line piston distributor systems



This applies to the following conditions:

- Dynalub 520 grease lubricant or, alternatively,
  Castrol Longtime PD 00,
  Elkalub GLS 135/N00
- No exposure to media
- Ambient temperature:
  T = 20 to 30 °C

s = Relubrication interval in mil. revolutions (10^6 revs)
C = Dynamic load capacity (N)
F_m = Average load (N)
d_0 = Nominal diameter (mm)

Conversion of lubrication interval s from millions of revolutions to kilometers:

$$\text{s in kilometers} = \frac{\text{s in millions (Revs)} \cdot \text{lead P (mm)}}{10^6}$$

Example:
AOK-032, BASA 32x10,
From application: Load ratio $F_m/C = 0.35$
Taken from graph, with P = 10 mm and $F_m/C = 0.35$: $10 \cdot 10^6$ revs

$$\text{s in kilometers} = \frac{10 \cdot 10^6 \text{ (revs)} \cdot 20 \text{ (mm)}}{10^6} = 100 \text{ km}$$

Note:
We recommend using piston distributors from SKF. These should be installed as close as possible to the lube fitting of the nut. Long lines and small line diameters should be avoided, and the lines should be laid on an upward slant.
If other consumers are connected to the single-line lubrication system, the weakest link in the chain determines the lubrication cycle time.
Pumping or storage tanks for the lubricant should be fitted either with a stirrer or a follower piston to guarantee the flow of lubricant (to avoid funneling in the tank).

Lubrication

Oil lubrication

With single-line piston distributor systems

Lubricant oil

We recommend using Shell Tonna S 220, which has the following properties:
– Special demulsifying oil CLP or CGLP as per DIN 51517-3 for machine bed tracks and tool guides
– A blend of highly refined mineral oils and additives
– Can be used even when mixed with significant quantities of metalworking fluids

When using single-line distributor systems, always make sure all lines and the piston distributors (including the connection to the BASA nut) are filled before relubrication.
The pulse count that is needed for this is the integer quotient of the relubrication quantity according to the table and the piston distributor size. Make sure the piston distributor size is at least 0.03 cm^3. The lubricating cycle time is then the result of dividing the lubrication interval by the determined pulse count.

Oil lubrication				
Size	**BASA d_0xP**	**Relubrication quantity ZEM-E / FEM-E-S / FEP-E-S / FEM-E-B (cm^3)**	**Relubrication interval Based on load ratio Fm/C ≤ 0.2 (km)**	**Time (h)**
AOK-020 AGK-020	20x5	0.06	5	10
	20x10	0.06	10	
	20x20	0.06	20	
	20x40	0.06	40	
AOK-032 AGK-032	32x5	0.06	5	
	32x10	0.06	10	
	32x20	0.06	20	
	32x32	0.06	32	
AOK-040 AGK-040	40x5	0.40	5	
	40x10	0.40	10	
	40x20	0.40	20	
	40x40	0.40	40	

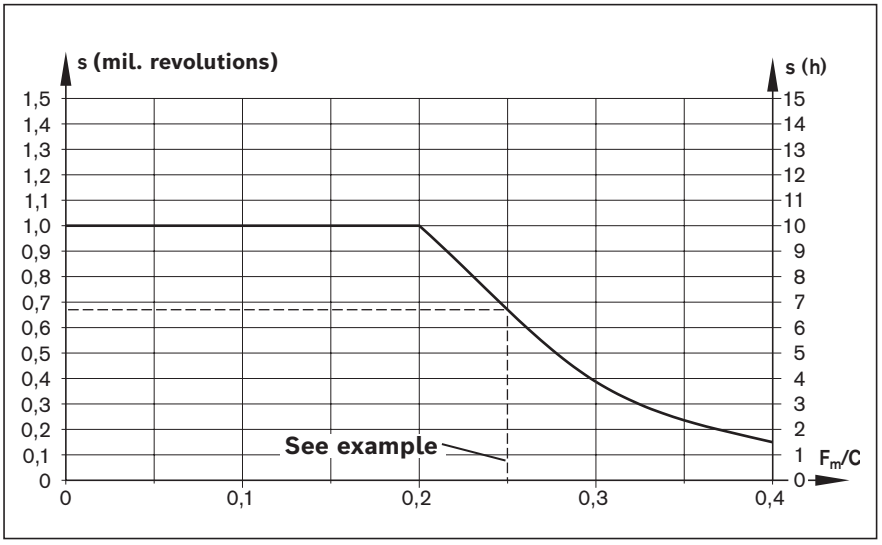
The load ratio F_m/C is the quotient of the average load F_m and the dynamic load rating C (see "Calculation").

The lubrication interval s is defined either by millions of revolutions or operating time in km or hours. The value reached first defines the lubricating interval.

Graph for determining load-based lubrication intervals for oil lubrication using single-line piston distributor systems.

This applies to the following conditions:
– Lubricant oil is Shell Tonna S 220
– No exposure to media
– Ambient temperature:
  T = 20 to 30 °C

s = Relubrication interval
C = Dynamic load capacity (N)
F_m = Average load (N)
d_0 = Nominal diameter (mm)



Conversion of lubrication interval s from millions of revolutions to kilometers:

$$\text{s in kilometers} = \frac{\text{s in millions (Revs)} \cdot \text{lead P (mm)}}{10^6}$$

Example:
AOK-020, BASA 20x20,
From application: Load ratio F_m/C = 0.25
Taken from graph, with P = 20 mm and F_m/C = 0.25: $0.65*10^6$ revs

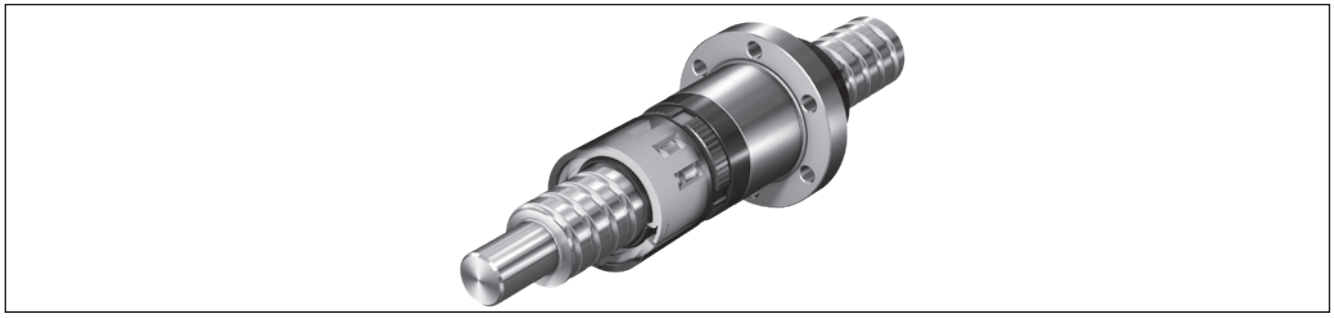
$$\text{s in kilometers} = \frac{0.65 \cdot 10^6 \text{ (revs)} \cdot 20 \text{ (mm)}}{10^6} = 13 \text{ km}$$

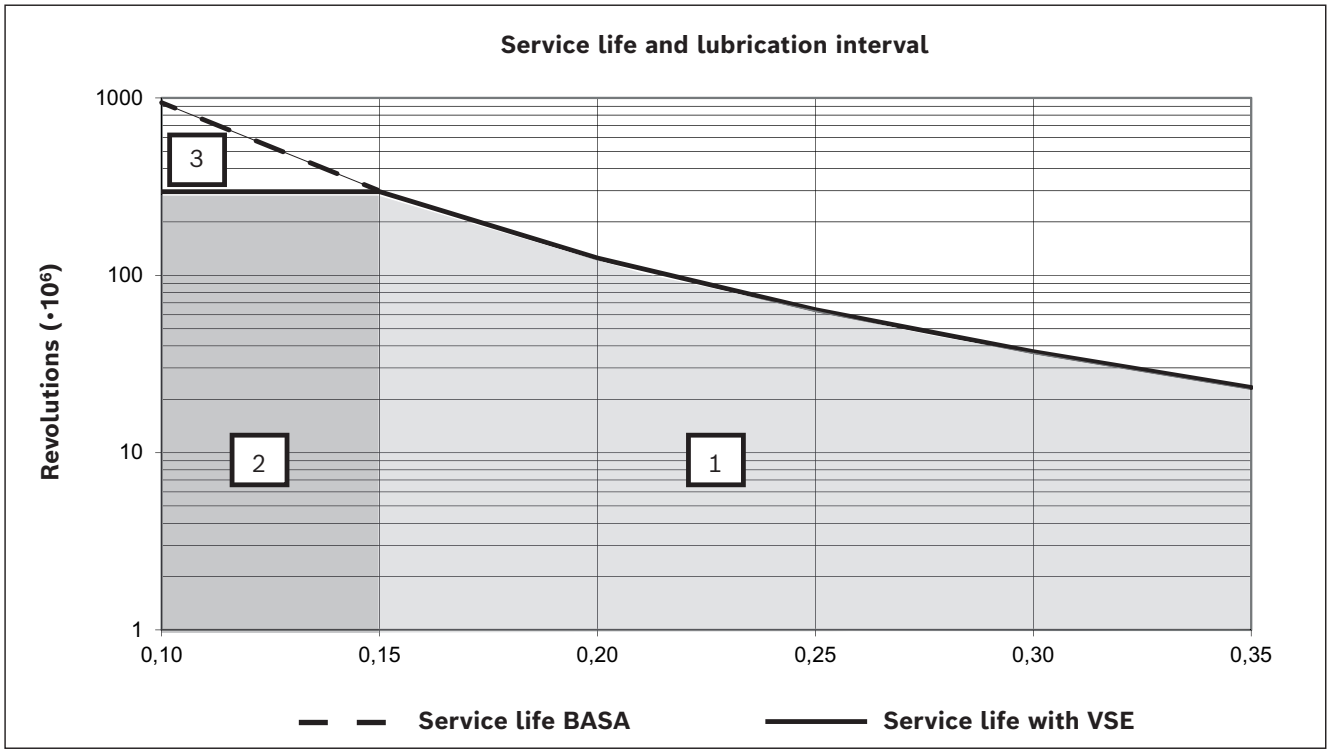
Note:
We recommend using piston distributors from SKF. These should be installed as close as possible to the lube fitting of the nut. Long lines and small line diameters should be avoided, and the lines should be laid on an upward slant.
If other consumers are connected to the single-line lubrication system, the weakest link in the chain determines the lubrication cycle time.

Lubrication

Front lube unit (VSE)

If a VSE is selected (not available with all versions), it comes ready-mounted with a pre-greased nut for excellent travel performance without relubricating. The VSE is designed to ensure long-term, maintenance-free operation of the ball screw drive. The effective life of a Rexroth VSE is the same as the theoretical service life curve of the ball screw drive for travel up to 300 mil. revolutions without relubrication.





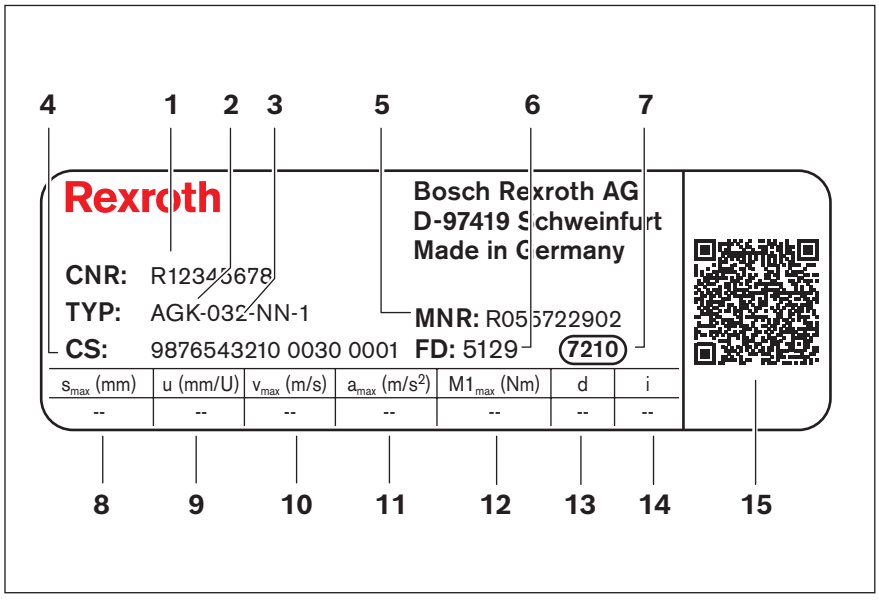
1 Lifelong lubrication:
For load ratios of $0.15 \leq F_m/C \leq 0.35$ (graph area 1), the readable revolutions correspond to the theoretical service life of the BASA and the effective life of the VSE. This means the BASA is lubricated for life.

2 Maintenance-free up to 300 x 10^6 revolutions:
For load ratios $F_m/C < 0.15$ (graph area 2), the ball screw drive is maintenance-free up to 300 mil. revolutions. The VSE will continue to lubricate past the interval up to this limit.

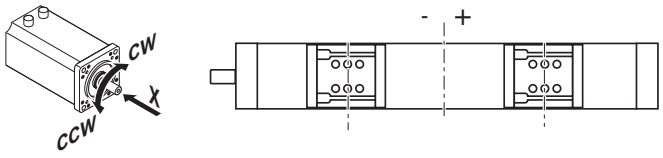
3 Relubrication required:
After 300 mil. revolutions (graph area 3), the nut should be relubricated as usual. The VSE does not have to beemoved, however it will no longer continue to lubricate past the interval.

Parameterization (start-up)

The nameplate contains reference information on the production of the linear motion system as well as technical start-up parameters.



1	CNR	Customer's material number
2	TYP	Short product name
3	032	Size
4	CS	Customer information
5	MNR	Material number
6	FD	Date of manufacture
7	7210	Manufacturing location
8	s_{max}	Maximum travel range
9	u	Feed constant without motor attachment
10	v_{max}	Maximum speed
11	a_{max}	Maximum acceleration rate
12	$M1_{max}$	Maximum drive torque at motor journal
13	d	Direction of motor rotation to move in positive (+) direction CW = clockwise CCW = counterclockwise



14	i	Gear ratio
15		QR code

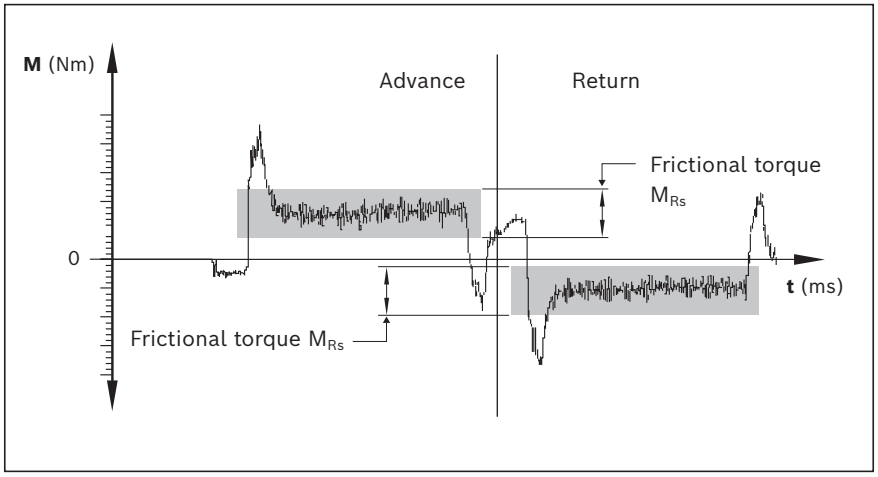
Documentation

Standard report
Option 01

The standard report contains:
- Confirmation of proper mechanical and electrical function
- Confirmation of version as per order confirmation
- Technical delivery information as per nameplate

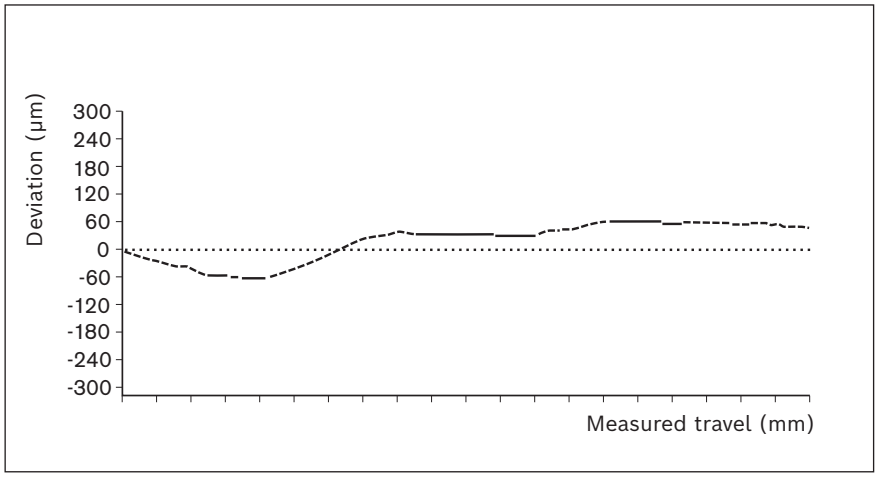
Measurement of frictional torque of complete system (for AGK)
Option 02 (includes option 01)

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



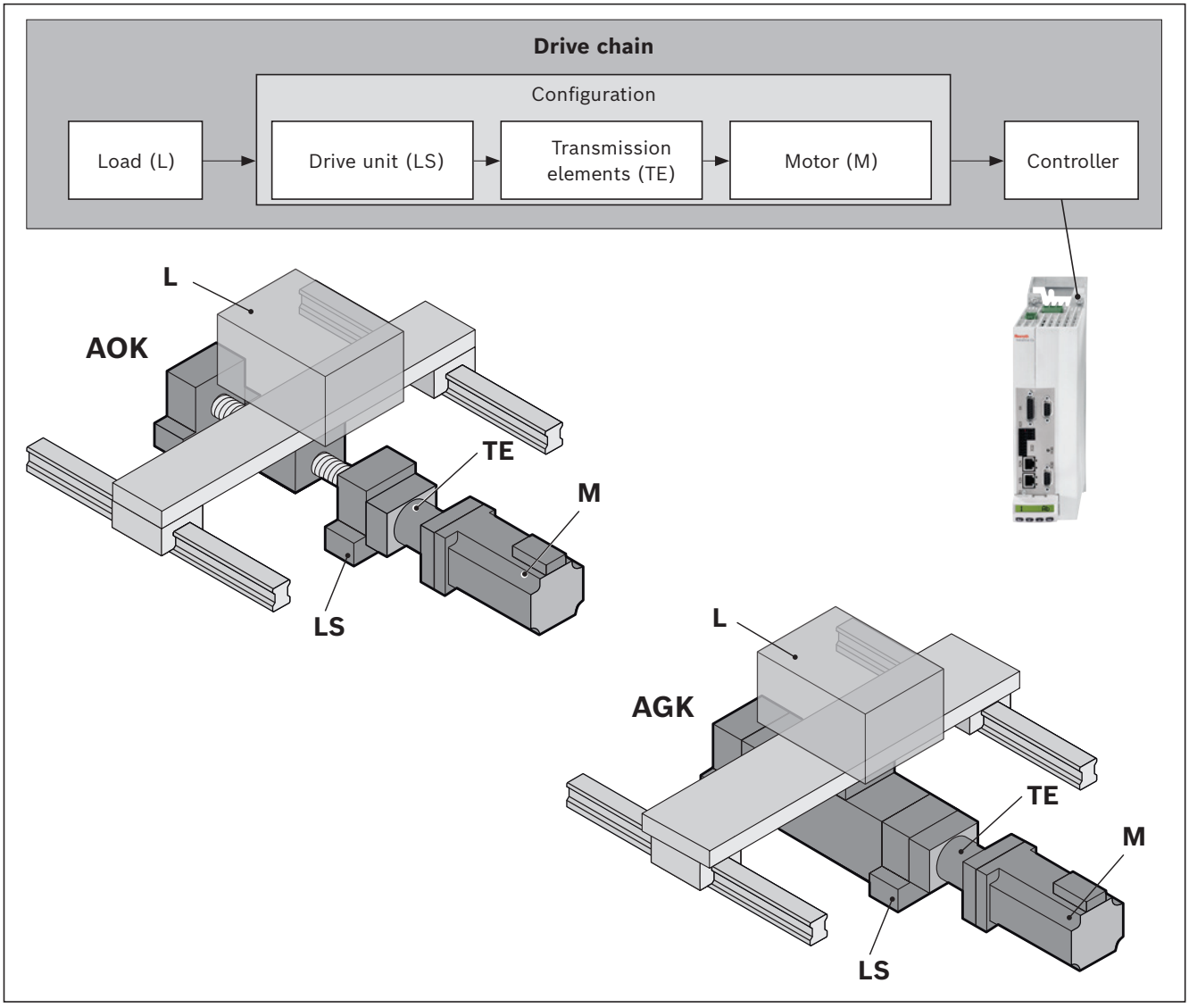
Lead deviation of the ball screw drive
Option 03 (includes option 01)

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



AOK/AGK project planning/calculation

AOK/AGK calculation principles



The correct dimensioning and assessment of an application requires structured consideration of the drive chain as a whole.
The basic element of the drive chain is the configuration comprising the drive unit, the transmission element (coupling or belt side drive) and the motor, which can be ordered in this constellation as per the catalog.

Drive unit service life

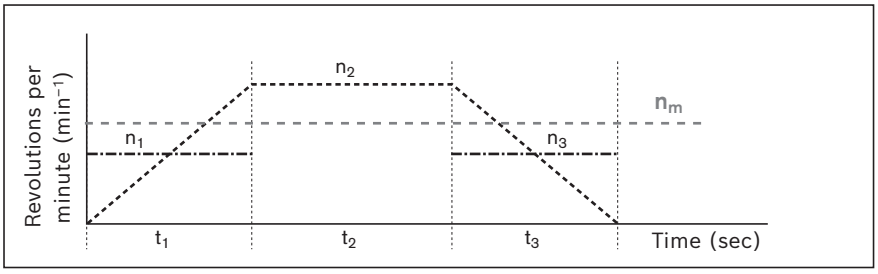
The service life of the rolling bearing points contained in a drive unit can be calculated using the formulas given below. In a drive unit with ball screw drive, the rolling bearing points that are relevant for the service life are the linear guide, the ball screw drive (nut), and the fixed bearing.

⚠ **Whichever independently calculated service life is shorter, that of the ball screw drive or of the fixed bearing, is then used as the estimated service life of the drive unit.**

Service life of ball screw assembly or the fixed bearing

Under variable operating conditions (variable rotary speed and load), the means $\mathbf{F_m}$ and $\mathbf{n_m}$ have to be used when calculating the service life.

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



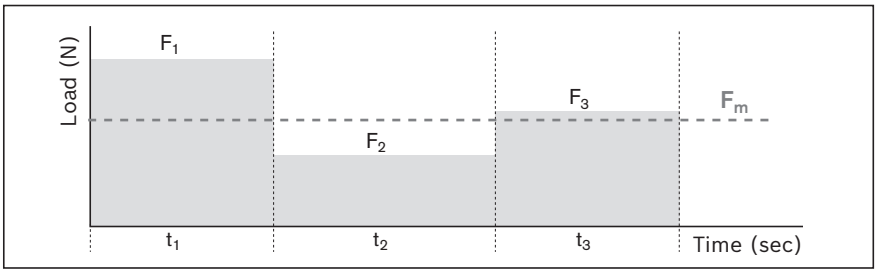
$$n_m = \frac{|n_1| \cdot t_1 + |n_2| \cdot t_2 + \ldots + |n_n| \cdot t_n}{t_{total}}$$

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

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

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

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



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

Nominal life

Nominal life in revolutions:

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

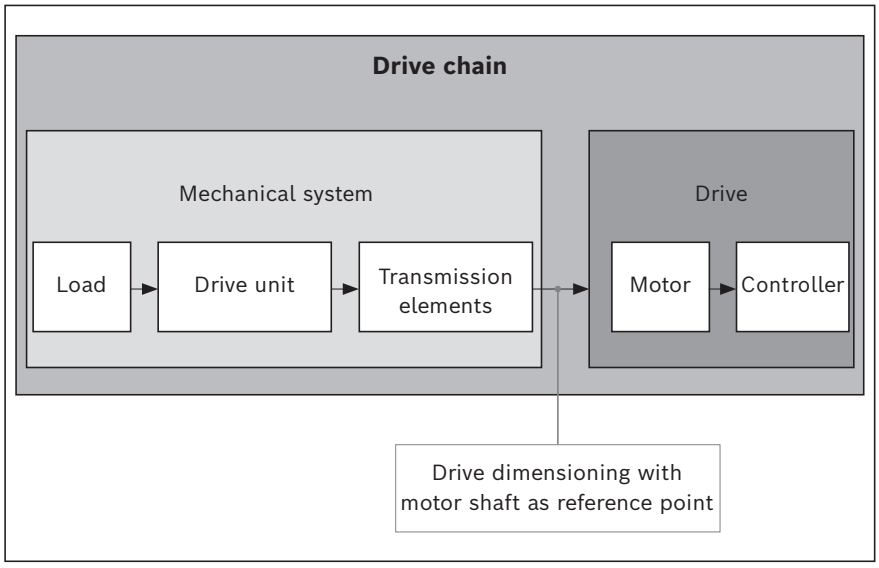
Nominal life in hours:

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

AOK/AGK drive dimensioning

Basic principles

For drive dimensioning, the drive chain can be divided into the mechanical system and drive system.
The **mechanical system** includes the drive unit and transmission elements components (belt side drive, coupling), and the load to be carried.
The electric **drive** is a motor-controller combination with corresponding performance data.
The dimensioning of the electric drive is done taking the motor shaft as a reference point.
For drive dimensioning, limits must be taken into account as well as base values. The limits must not be exceeded in order to avoid damaging the mechanical components.



Technical data and formula symbols for the mechanical system

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

		Mechanical system			
		Load	Drive unit	Transmission elements	
				Coupling	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 speed	**(m/s)**	–	v_{max} [4]	–	–
Max. permissible drive torque	**(Nm)**	–	M_p [4]	M_{cN} [3]	M_{sd} [3]

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

Drive dimensioning with motor shaft as reference point

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

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

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

Frictional torque M_R

For motor attachment via flange and coupling

$$M_R = M_{Rs}$$

For motor attachment via belt side drive

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

Mass moment of inertia J_{ex}

For motor attachment via flange and coupling

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

For motor attachment via belt side drive

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

Determination of the mass moment of inertia of the drive unit

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

Determination of translatory mass moment of inertia of external load

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

AOK/AGK drive dimensioning

Maximum permissible speed v_{mech}
The lowest of all the values for the maximum permissible speed of all mechanical components contained in the drive chain determines the maximum permissible speed of the mechanical system which has to be taken into consideration as the upper limit for the drive when dimensioning the motor. By design, the maximum permissible speed or rotary speed of the drive unit with ball screw drive will always be less than that of the other components in the mechanical system, such as the coupling or belt side drive, meaning it is the maximum permissible speed of the mechanical system.

Maximum permissible speed

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

Maximum permissible rotary speed
For motor attachment via flange and coupling

$$n_{mech} = \frac{v_{mech} \cdot 1\,000 \cdot 60}{P}$$

For motor attachment via belt side drive

$$n_{mech} = \frac{v_{mech} \cdot i \cdot 1\,000 \cdot 60}{P}$$

Maximum permissible drive torque M_{mech}
The lowest (minimum) of all the values for permissible drive torque of all mechanical components contained in the drive chain 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 flange and coupling

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

For motor attachment via belt side drive

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

⚠ **When considering the complete drive train (mechanical system + motor/controller), the maximum torque of the motor can lie below the maximum value for the mechanical system (M_{mech}) and thus limit the maximum permissible drive torque of the overall drive chain.**
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 permissible value for the mechanical system.

Pre-selecting the motor

The following conditions can be used as a general guide for pre-selecting the motor.

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

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

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

Ratio of mass moments of inertia

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

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

Application area	V
Handling	≤ 6.0
Processing	≤ 1.5

Condition 3:
Estimation of the ratio of the static load moment to the continuous torque of the motor. The torque ratio must be less than or equal to an empirical value of 0.6. This condition roughly factors in the missing dynamic characteristics of an exact motion profile with the required motor torques.

Torque ratio

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

Static load moment

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

Weight moment
For vertical mounting position only!
For motor attachment via flange and coupling: i = 1

$$M_g = \frac{P \cdot (m_{ex} + m_{ca}) \cdot g}{2\,000 \cdot \pi \cdot i}$$

In the ➠"Configuration and ordering" section, standardized configurations that include motor attachment and motor can be created for various drive unit sizes by selecting options. By checking the above conditions, it is possible to see whether a standard motor selected in a particular configuration will generally be of a suitable size for the specific application.

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

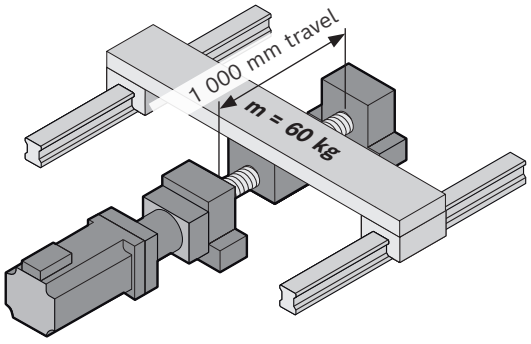
AOK sample calculation

Given data

An object weighing 60 kg needs to be moved horizontally 1 000 mm at a max. speed of 0.6 m/s. The object travels over a separate linear guide whose friction force is 200 N. The following was selected based on the technical data and the installation space:

AOK drive unit-032:

- Nut version FEM-E-S with nut housing MGS
- Nut with preload class factor C1 (moderate preload)
- Motor attachment with belt side drive
  i = 2
- with MS2N06-B1BNN motor without brake



Estimation of length L

(For an initial estimate, the greatest possible lead, thus the length, is calculated, since the permissible speed can decrease as length increases.)

	L	$= s_{max} + L_c + L_{ad}$
Excess travel:	s_e	$= 2 \cdot P = 2 \cdot 32 = 64$ mm
Max. travel:	s_{max}	$= s_{eff} + 2 \cdot s_e$
		$= 1\,000 + 2 \cdot 64 = 1\,128$ mm
Length:	L	$= 1\,128 + 114 + 128 = 1\,370$ mm

Selection of the ball screw assembly

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

Permissible ball screw assembly according to the "Permissible speed" graph at v = 0.6 m/s and L = 1 370 mm:

BASA 32 x 32 and BASA 32 x 20

Selected ball screw assembly (lower lead):

BASA 32 x 20

Maximum permissible speed for BASA 32 x 20 from graph:

$v_{max} = 1.0$ m/s

Calculation of length L

(for selected BASA)

Excess travel:	s_e	$= 2 \cdot P = 2 \cdot 20 = 40$ mm
Max. travel:	s_{max}	$= s_{eff} + 2 \cdot s_e$
		$= 1\,000 + 2 \cdot 40 = 1\,080$ mm
Length:	L	$= 1\,080 + 114 + 128 = 1\,322$ mm

Frictional torque M_R

(Motor attachment with belt side drive)

	M_R	$= M_{Rsd} + (M_{Rs} + M_{Rad})/i$
Separate guideway:	M_{Rad}	$= (P \cdot F_R)/(2\,000 \cdot \pi)$
		$= (20 \cdot 200)/(2\,000 \cdot \pi)$
		$= 0.64$ Nm
Drive unit:	M_{Rs}	$= 0.71$ Nm
Belt side drive:	M_{Rsd}	$= 0.50$ Nm (i = 2)
Frictional torque:	M_R	$= 0.50 + (0.71 + 0.64)/2 = 1.175$ Nm

Mass moment of inertia J_{ex}

(Motor attachment with belt side drive)

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

Belt side drive: $J_{sd} = 260 \cdot 10^{-6}\ kgm^2$

Drive unit:
$J_s = (k_{J\,fix} + k_{J\,var} \cdot L) \cdot 10^{-6}$
$= (163.8 + 0.7117 \cdot 1\,322) \cdot 10^{-6}$
$= 1{,}104.67 \cdot 10^{-6}\ kgm^2$

External load:
$J_t = m_{ex} \cdot k_{J\,m} \cdot 10^{-6}$
$= 60 \cdot 10{,}1321 \cdot 10^{-6}$
$= 607.93 \cdot 10^{-6}\ kgm^2$

Mass moment of inertia:
$J_{ex} = 260 \cdot 10^{-6} + \frac{(1\,104.67 \cdot 10^{-6} + 607.93 \cdot 10^{-6})}{2^2}$
$= 688.15 \cdot 10^{-6}\ kgm^2$

Maximum permissible rotary speed n_{mech}

(Motor attachment with belt side drive)
Limit for mechanical system

$$n_{mech} = \frac{(v_{mech} \cdot i \cdot 1\,000 \cdot 60)}{P}$$

Max. permissible speed: $v_{mech} = v_{max} = 1\ m/s$

Max. permissible rotary speed:
$n_{mech} = \frac{(1 \cdot 2 \cdot 1\,000 \cdot 60)}{20}$
$= 6\,000\ min^{-1}$

Maximum rotary speed of the application n_{mech}

(Motor attachment with belt side drive)
Application tolerance

Speed: $v_{mech} = 0.6\ m/s$

Rotary speed:
$n_{mech} = \frac{0.6 \cdot 2 \cdot 1\,000 \cdot 60}{20}$
$= 3\,600\ min^{-1}$

AOK sample calculation

Maximum permissible drive torque M_{mech}

(Motor attachment with belt side drive)
Limit for mechanical system

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

Belt side drive: M_{sd} = 12.3 Nm (gear ratio i = 2 for MS2N06)

Drive unit: M_p = 47 Nm

Drive torque: M_{mech} = Minimum (12.3; $\frac{47}{2}$)

= Minimum (12.3; 23.5)

= 12.3 Nm

Motor preselection check

Selected motor:
MS2N06-B1BNN without brake

Condition 1:

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

6 000 ≥ 3 600 condition met – motor selection OK

Condition 2:

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

Motor inertia: $J_m = 480 \cdot 10^{-6}$ kgm²

Brake moment of inertia: $J_{br} = 0 \cdot 10^{-6}$ kgm² (without brake)

Moment of inertia ratio: $V = \frac{688.15 \cdot 10^{-6}}{(480 \cdot 10^{-6} + 0 \cdot 10^{-6})}$

= 1.43

Handling condition: $V \leq 6$

1.43 ≤ 6 condition met – motor selection OK

Condition 3:

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

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

= 1.175 Nm

Continuous torque of the motor: M_0 = 3.25 Nm

Torque ratio: $\frac{1.175}{3.25}$ = 0.36

0.36 ≤ 0.6 condition met – motor selection OK

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

Result

AOK-032 drive unit

Length:	L =	1 322 mm,
Max. travel:	s_{max} =	1 080 mm
Carriage length:	L_{ca} =	114 mm
Ball screw assembly:	Nominal diameter:	d_0 = 32 mm
	Lead:	P = 20 mm

Motor attachment with belt side drive, gear ratio i = 2
Motor preselection: MS2N06-B1BNN without brake

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

When doing this, the following data must be considered:

Frictional torque:	M_R = 1.175 Nm
Mass moment of inertia:	J_{ex} = 688.15 · 10^{-6} kgm^2
Speed:	v_{mech} = 0.6 m/s (n_{mech} = 3 600 min^{-1})
Drive torque limit:	M_{mech} = 12.3 Nm

➠ The motor torque must be limited to 12.3 Nm on the drive side!

Acceleration limit:	a_{max} = 50 m/s^2
Limit for speed:	v_{max} = 1 m/s (n_{mech} = 6 000 min^{-1})

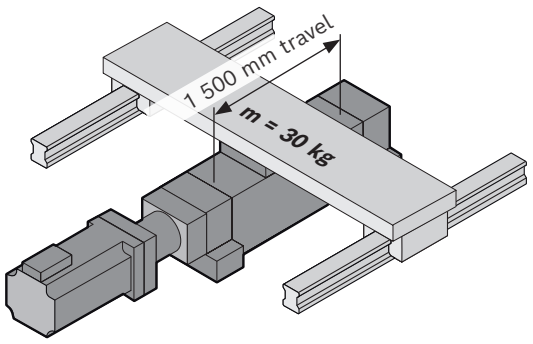
Besides the preferred type MS2N06-B1BNN, other motors with identical connection dimensions can be adapted while taking care not to exceed the calculated limit values.

AGK sample calculation

Given data

An object weighing 30 kg needs to be moved horizontally 1 500 mm at a max. speed of 0.3 m/s.
The object travels over a separate linear guide whose friction force is 100 N. The following was selected based on the technical data and the installation space:

AGK-020 drive unit:
- Motor attachment with flange and coupling
- with motor MS2N04-D0BQN without brake



Estimation of length L

(For an initial estimate, the greatest possible lead, thus the length, is calculated, since the permissible speed can decrease as length increases.)

	L	= $s_{max} + L_c + L_{ad}$
Excess travel:	s_e	= $2 \cdot P = 2 \cdot 40 = 80$ mm
Max. travel:	s_{max}	= $s_{eff} + 2 \cdot s_e$
		= $1\,500 + 2 \cdot 80 = 1\,660$ mm
Length:	L	= $1\,660 + 204 + 86 = 1\,950$ mm

Selection of the ball screw assembly

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

Permissible ball screw assembly according to the "Permissible speed" graph at v = 0.3 m/s and L = 1 950 mm:

BASA 20 x 40 and BASA 20 x 20

Selected ball screw assembly (lower lead):

BASA 20 x 20

Maximum permissible speed for BASA 20 x 20 from graph:

v_{max} = 0.4 m/s

Calculation of length L

(for selected BASA)

Excess travel:	s_e	= $2 \cdot P = 2 \cdot 20 = 40$ mm
Max. travel:	s_{max}	= $s_{eff} + 2 \cdot s_e$
		= $1\,500 + 2 \cdot 40 = 1\,580$ mm
Length:	L	= $1\,580 + 204 + 86 = 1\,870$ mm

Frictional torque M_R

(Motor attachment with flange and coupling)

	M_R	= $M_{Rs} + M_{Rad}$
Separate guideway:	M_{Rad}	= $(P \cdot F_R)/(2\,000 \cdot \pi)$
		= $(20 \cdot 100)/(2\,000 \cdot \pi)$
		= 0.32 Nm
Drive unit:	M_{Rs}	= 0.60 Nm
Frictional torque:	M_R	= 0.60 + 0.32 = 0.92 Nm

Mass moment of inertia J_{ex}

(Motor attachment with flange and coupling)

	J_{ex}	$= J_s + J_t + J_c$
Coupling:	J_c	$= 57 \cdot 10^{-6}$ kgm²
Drive unit:	J_s	$= (k_{J\,fix} + k_{J\,var} \cdot L) \cdot 10^{-6}$
		$= (40.7 + 0.1004 \cdot 1\,870) \cdot 10^{-6}$
		$= 228.45 \cdot 10^{-6}$ kgm²
External load:	J_t	$= m_{ex} \cdot k_{J\,m} \cdot 10^{-6}$
		$= 30 \cdot 10{,}1321 \cdot 10^{-6}$
		$= 303.96 \cdot 10^{-6}$ kgm²
Mass moment of inertia:	J_{ex}	$= 228.45 \cdot 10^{-6} + 303.96 \cdot 10^{-6} + 57 \cdot 10^{-6}$
		$= 589.41 \cdot 10^{-6}$ kgm²

Maximum permissible rotary speed n_{mech}

(Motor attachment with flange and coupling)
Limit for mechanical system

	n_{mech} =	$\frac{(v_{mech} \cdot 1\,000 \cdot 60)}{P}$
Max. permissible speed:	v_{mech} =	$v_{max} = 0.4$ m/s
Max. permissible rotary speed:	n_{mech} =	$\frac{(0.4 \cdot 1\,000 \cdot 60)}{20}$
	=	1 200 min⁻¹

Maximum rotary speed of the application n_{mech}

(Motor attachment with flange and coupling)
Application tolerance

Speed:	v_{mech} =	0.3 m/s
Rotary speed:	n_{mech} =	$\frac{0.3 \cdot 1000 \cdot 60}{20}$
	=	900 min⁻¹

AGK sample calculation

Maximum permissible drive torque M_{mech}

(Motor attachment with flange and coupling)
Limit for mechanical system

M_{mech} = Minimum (M_{cN}; M_p)
Coupling: M_{cN} = 19 Nm (for MS2N04)
Drive unit: M_p = 11.5 Nm
Drive torque: M_{mech} = Minimum (19; 11.5)
= 11.5 Nm

Motor preselection check

Selected motor:
MS2N04-D0BQN without brake

Condition 1:

Rotary speed: $n_{max} \geq n_{mech}$
6 000 ≥ 900 condition met – motor selection OK

Condition 2:

Mass moment of inertia ratio: $V = \frac{J_{ex}}{J_m + J_{br}}$
Motor inertia: $J_m = 160 \cdot 10^{-6}$ kgm²
Brake moment of inertia: $J_{br} = 0 \cdot 10^{-6}$ kgm² (without brake)
Moment of inertia ratio: $V = \frac{589.41 \cdot 10^{-6}}{(160 \cdot 10^{-6} + 0 \cdot 10^{-6})}$
= 3.68
Handling condition: $V \leq 6$
3.68 ≤ 6 condition met – motor selection OK

Condition 3:

Torque ratio: $\frac{M_{stat}}{M_0} \leq 0.6$
Static load moment: $M_{stat} = M_R + M_g$ (installed horizontally $M_g = 0$)
= 0.92 Nm
Continuous torque of the motor: M_0 = 3.85 Nm
Torque ratio: $\frac{0.92}{3.85} = 0.23$
0.23 ≤ 0.6 condition met – motor selection OK

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

Result

AGK-020 drive unit

Length:	L	= 1 870 mm,
Max. travel:	s_{max}	= 1 580 mm
Carriage length:	L_c	= 204 mm
Ball screw assembly:	Nominal diameter: d_0	= 20 mm
	Lead:	P = 20 mm

Motor attachment via flange and coupling
Motor preselection: MS2N04-D0BQN without brake

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

When doing this, the following data must be considered:

Frictional torque:	M_R	= 0.92 Nm
Mass moment of inertia:	J_{ex}	= $589.41 \cdot 10^{-6}$ kgm^2
Speed:	v_{mech}	= 0.3 m/s (n_{mech} = 900 min^{-1})
Drive torque limit:	M_{mech}	= 11.5 Nm

➠ The motor torque must be limited to 11.5 Nm on the drive side!

Acceleration limit:	a_{max}	= 50 m/s^2
Limit for speed:	v_{max}	= 0.4 m/s (n_{mech} = 1 200 min^{-1})

Besides the preferred type MS2N04-D0BQN, other motors with identical connection dimensions can be adapted while taking care not to exceed the calculated limit values.

Abbreviations

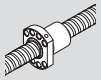
Code/ index	Name	Unit
a	Acceleration	(m/s^2)
a_{max}	Maximum acceleration rate	(m/s^2)
BASA	Ball screw assembly	(–)
B_t	Belt type	(–)
c_{spe}	Specific spring rate	(N)
C_{gw}	Dynamic load capacity, guideway	(N)
C_{bs}	Dynamic load capacity for ball screw assembly	(N)
C_{fb}	Dynamic load capacity for fixed bearing	(N)
d_0	Nominal diameter of ball screw assembly	(mm)
d_3	Belt pulley diameter	(mm)
f_w	Load factor	(–)
F_n	Axial load of the ball screw assembly	(N)
F_{eff}	Effective equivalent axial load	(N)
F_{bp}	Max. belt drive transmission force	(N)
F_{comb}	Combined equivalent bearing load	(N)
F_{mbs}	Dynamic equivalent load on bearing of the ball screw assembly	(N)
F_{mgw}	Dynamic equivalent load on bearing of the guideway	(N)
F_n	Axial load of the ball screw assembly	(N)
$F_{t\ perm}$	Belt elasticity limit	(N)
F_y	Load due to a resulting force in the y-direction	(N)
$F_{y\ max}$	Maximum dynamic load in y-direction	(N)
F_z	Load due to a resulting force in the z-direction	(N)
$F_{z\ max}$	Maximum dynamic load in z-direction	(N)
g	Gravitational acceleration (= 9.81)	(m/s^2)
i	Gear ratio	(–)
I_y	Planar moment of inertia about the y-axis	(cm^4)
I_z	Planar moment of inertia about the z-axis	(cm^4)
J_{br}	Mass moment of inertia of the motor brake	(kgm^2)
J_c	Mass moment of inertia of coupling	(kgm^2)
J_{dc}	Mass moment of inertia of drive train	(kgm^2)
J_{ex}	Mass moment of inertia of the mechanical system	(kgm^2)
J_{ge}	Mass moment of inertia of gear about the motor journal	(kgm^2)
J_m	Mass moment of inertia of motor	(kgm^2)
J_s	Mass moment of inertia of linear motion system	(kgm^2)
J_{sd}	Mass moment of inertia of belt side drive about the motor journal	(kgm^2)
J_t	Translative mass moment of inertia of external load based on the linear motion system screw journal	(kgm^2)

Code/ index	Name	Unit
$k_{g\ fix}$	Constant for fixed portion of mass	(kg)
$k_{g\ var}$	Constant for variable-length portion of mass	(kg/mm)
$k_{J\ fix}$	Constant for fixed portion of mass moment of inertia	($kgmm^2$)
$k_{J\ m}$	Constant for mass-specific portion of mass moment of inertia	(mm^2)
$k_{J\ var}$	Constant for variable-length portion of mass moment of inertia	(kgmm)
L	Length of the linear motion system	(mm)
L_{ad}	Additional length	(mm)
L_c	Length nut/length nut and housing	(mm)
L_{ca}	Carriage length	(mm)
L_{bs}	Nominal life (Ball screw assembly, fixed bearing)	(min^{-1})
L_{hbs}	Nominal life (Ball screw assembly, fixed bearing)	(h)
L_{gw}	Nominal life of the guideway	(m)
L_{hgw}	Nominal life of the guideway	(h)
L_W	Center-to-center distance between carriages	(mm)
m_{br}	Holding brake mass	(kg)
m_{ca}	Moved mass of system of carriage	(kg)
m_{ex}	Moved external load	(kg)
m_{fc}	Mass of flange and coupling	(kg)
m_m	Mass of the motor	(kg)
m_s	Mass of the linear system (without attachments)	(kg)
m_{sd}	Mass of the timing belt side drive	(kg)
M_0	Continuous motor torque	(Nm)
M_{cN}	Nominal coupling torque	(Nm)
M_g	Weight moment at motor journal	(Nm)
M_{ge}	Maximum permissible acceleration torque of the gear (on the output drive)	(Nm)
M_L	Dynamic longitudinal moment load capacity	(Nm)
M_m	Equivalent dynamic torque	(Nm)
M_{max}	Max. possible motor torque	(Nm)
M_{mech}	Maximum permissible drive torque for mechanical system	(Nm)
M_p	Maximum permissible drive torque (at drive journal)	(Nm)
M_R	Frictional torque at motor journal	(Nm)
M_{Rge}	Frictional torque of gear at motor journal	(Nm)
M_{Rs}	Frictional torque of system	(Nm)
M_{Rsd}	Friction moment of belt side drive at motor journal	(Nm)
M_{sd}	Maximum permissible drive torque of the belt side drive	(Nm)
M_{stat}	Static load moment	(Nm)
M_t	Dynamic torsional moment load capacity	(Nm)
M_x	Dynamic torsional moment around the x-axis	(Nm)

Code/ index	Name	Unit
$M_{x\ max}$	Maximum permissible torsional moment around the x-axis	(Nm)
M_y	Dynamic torsional moment around the y-axis	(Nm)
$M_{y\ max}$	Maximum permissible torsional moment around the y-axis	(Nm)
M_z	Dynamic torsional moment around the z-axis	(Nm)
$M_{z\ max}$	Maximum permissible torsional moment around the z-axis	(Nm)
n	Rotary speed of the ball screw assembly	(min^{-1})
$n_1, n_2, ... n_n$	Rotary speed in acceleration and braking phases	(min^{-1})
$n_{A1\ ...\ n}$	Starting speed in Phase 1–n	(min^{-1})
$n_{E1\ ...\ n}$	Ending speed in Phase 1–n	(min^{-1})
n_{ge}	Maximum permissible rotary speed of the gear	(min^{-1})
n_m	Average rotary speed of the ball screw assembly	(min^{-1})
n_{mech}	Maximum permissible rotary speed for mechanical system	(min^{-1})
n_{max}	Max. motor speed	(min^{-1})
n_p	Maximum permissible rotary speed of the linear motion system	(min^{-1})
P	Screw lead/ball screw assembly	(mm)
P_{app}	Effective power in application	(W)
Keyway	Keyway	(–)
$q_{t1..n}$	Time step of the phases	(%)
s_a	Acceleration travel	(mm)
s_e	Excess travel	(mm)
s_{eff}	Effective stroke	(mm)
s_{min}	Min. travel range	(mm)
s_{max}	Maximum travel	(mm)
SPU	Screw support	(–)
t_a	Acceleration/braking time	(s)
$t_1, t_2, ... t_n$	Time for phases 1 ... n	(s)
t_{total}	Sum of time steps	(s)
u	Feed constant	(mm/rev)
$v_1, v_2, ... v_n$	Speed in phase 1 ... n	(m/s)
v_{max}	Maximum permissible speed	(m/s)
v_{mech}	Maximum permissible linear speed of mechanical system	(m/s)
v_{mgw}	Average linear speed of the guideway	(m/s)
V	Ratio of mass moments of inertia of drive chain and motor	(–)
z_1	Application point of the effective force	(mm)
π	Pi	(–)

Order example
AOK-032

Configuration and ordering

Short product name, length: AOK-032-NN-1, ... mm	Drive BASA Nut	Size d_0 x P 32 x 5	32 x 10	32 x 20	32 x 32	Tolerance grade		Standard seal	Lubrication With initial greasing	Left VSE	Right VSE	Preload class C1 (moderate)	C2 (medium)	C3 (high)	Screw ends Left	Right
Fixed and floating bearing	ZEM-E 	01	02	03	04	T5	T7	1	1	–	–	3	6	2	81	31
	FEM-E-S 	11	–	–	–	T5	T7	1	1	2	3	3	6	2	81	31
		–	12	–	–											
		–	–	13	–											
		–	–	–	14											
	FEM-E-B 	21	–	–	–	T5	T7	1	1	2	3	3	6	2	81	31
		–	22	–	–											
		–	–	23	–											
		–	–	–	24											
Version with fixed bearing only	ZEM-E															

= Selection area mark after version is chosen
☐ = Selected option to be entered in the order form (following pages).

AOK length calculation

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

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

d_0 = Screw diameter (mm)
P = Lead (mm)
L_c = nut length/nut and housing length (mm)

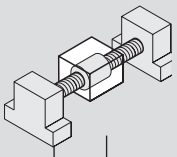
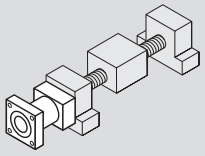
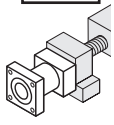
Max. travel: s_{max} = 1 000 mm
Drive: BASA 32 x 10 (d_0 x P)
Nut length/nut and housing length: L_c = 77 mm
Additional length: L_{ad} = 128 mm

L = 1 000 + 77 + 128
L = 1 205 mm

Excess travel:
Excess travel must be greater than braking distance.
The acceleration travel can be adopted as the guideline value for the braking distance.

See also "Service and information/project planning/calculation"

AGK length calculation: Same as for AOK drive unit, except: L_c = length of nut with housing

Pillow block		Nut housing			Motor attachment				Motor[2]						Documentation	
									Motor code					Motor connector position		
Aluminum	Steel	ithout	With	Type			i =	Attachment kit[1]		2 cable		1 cable			Standard report	Measurement report
										Without brake	With brake	Without brake	With brake			
02	12	–	01	MGA 	Without flange	OF01 	–	–	00	–				–		
02	12	00	11	MGS 	With flange	MF01 	–	06	MS2N06-B1BNN	233	234	235	236	000	01	03
		00	13						MS2N06-C0BTN	237	238	239	240	090		
		00	12						MS2N06-D0BRN	241	242	243	244	180		
		00	14						MS2N06-D1BNN	245	246	247	248	270		
02	12	00	21	MGD 												
		00	22													
		00	23													
		00	24													
				MGA												

Ordering data	Option	Description
Drive unit (short product name)	AOK-032-NN-1, 1205 mm	Open drive unit (AOK-032), length = 1 205 mm
Basic version		Version with fixed and floating bearing
Ball screw assembly	12	BASA 32x10 with single nut with flange FEM-E-S
Tolerance grade	T7	Tolerance grade T7
Seal	1	Standard seal
Lubrication	1	Preserved and with initial greasing
Preload class C1	3	moderate preload
Left screw end type	81	Type 81
Right screw end type	31	Type 31
Pillow block	02	Fixed and floating bearing (Aluminum)
Nut housing	13	MGS (32x10)
Version	MF01	Flange/coupling for motor attachment as per MF01 illustration
Motor attachment	06	Flange/coupling for motor MS2N06
Motor	236	Motor MS2N06-B1BNN, 1 cable, with brake
Documentation	01	Standard final testing

The order information for the AGK drive unit has the same format as the AOK drive unit

Inquiry/order form

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

Order example Rexroth – AOK drive units

Ordering data	Option	Description
Drive unit (short product name)	AOK-032-NN-1, 1000 mm	Open drive unit (AOK-032), length = 1 000 mm
Basic version		Version with fixed and floating bearing
Ball screw assembly	12	BASA 32x10 with single nut with flange FEM-E-S
Tolerance grade	T7	Tolerance grade T7
Seal	1	Standard seal
Lubrication	1	Preserved and with initial greasing
Preload class	3	C1 (moderate preload)
Left screw end type	81	Type 81
Right screw end type	31	Type 31
Pillow block	02	Fixed and floating bearing (Aluminum)
Nut housing	13	MGS (32x10)
Version	MF01	Flange/coupling for motor attachment as per MF01 illustration
Motor attachment	06	Flange/coupling for motor MS2N06
Motor	236	Motor MS2N06-B1BNN, 1 cable, with brake
Documentation	01	Standard final testing

To be completed by customer: Inquiry ☐ / Order ☐

Drive unit
(Short product name): _____, length _____ mm

Ball screw assembly = ☐☐
Tolerance grade = T☐
Seal = ☐☐
Lubrication = ☐☐
Preload = ☐☐
Left screw end type = ☐☐
Right screw end type = ☐☐
Pillow block = ☐☐
Nut housing = ☐☐
Version = ☐☐☐☐
Motor attachment = ☐☐
└ Motor geometry code[1)] └ ☐☐-☐☐-☐☐☐-☐☐☐-☐☐☐-M☐☐-☐☐☐-☐☐☐
Motor = ☐☐
Documentation = ☐☐

[1)] Only required for "attachment kits for motors according to customer specification", see page 62.

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

From

Company: _____ Name: _____
Address: _____ Department: _____
_____ Phone: _____
_____ Telefax: _____

Order example Rexroth – AGK drive units

Ordering data	Option	Description
Drive unit (short product name)	AGK-032-NN-1, 1000 mm	AGK-032 drive unit, length = 1000 mm closed type
Ball screw assembly	01	BASA 32x10 with cylindrical single nut ZEM-E
Tolerance grade	T5	Tolerance grade T5
Seal	1	Standard seal
Lubrication	1	Preserved and with initial greasing
Preload class	3	C1 (moderate preload)
Left screw end type	81	Type 81
Right screw end type	31	Type 31
Pillow block	02	Fixed and floating bearing (Aluminum)
Nut housing	01	Nut housing without SPU (screw supports)
Nut housing mounting orientation	MR02	Top
Version	RV04	with belt side drive on right as per RV04 illustration
Motor attachment	23	Belt side drive i=1 for motor MS2N06
Motor	236	Motor MS2N06-B1BNN, 1 cable, with brake
Cover	01	Protective profile and steel strip
Switch 1	21	REED sensor (delivered as separate part)
Switch 2	21	REED sensor (delivered as separate part)
Switch 3	22	HALL sensor, PNP NC (delivered as separate part)
Socket-plug	17	Socket-plug (delivered as separate part)
Documentation	01	Standard final testing

To be completed by customer: Inquiry ☐ / Order ☐

Drive unit

(Short product name): _____, length _____ mm

Ball screw assembly	=	☐☐
Tolerance grade	=	T☐
Seal	=	☐☐
Lubrication	=	☐☐
Preload	=	☐☐
Left screw end type	=	☐☐
Right screw end type	=	☐☐
Pillow block	=	☐☐
Nut housing	=	☐☐
Nut housing mounting orientation	=	MR☐☐
Version	=	☐☐☐☐
Motor attachment	=	☐☐
└ Motor geometry code[1)]		└ ☐☐-☐☐-☐☐☐-☐☐☐-☐☐☐-Ⓜ☐☐-☐☐☐-☐☐☐
Motor	=	☐☐
Cover	=	☐☐
Switch 1	=	☐☐
Switch 2	=	☐☐
Switch 3	=	☐☐
Socket-plug	=	☐☐
Documentation	=	☐☐

[1)] Only required for "attachment kits for motors according to customer specification", see page 62.

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

Comments:

From

Company: _____ Name: _____

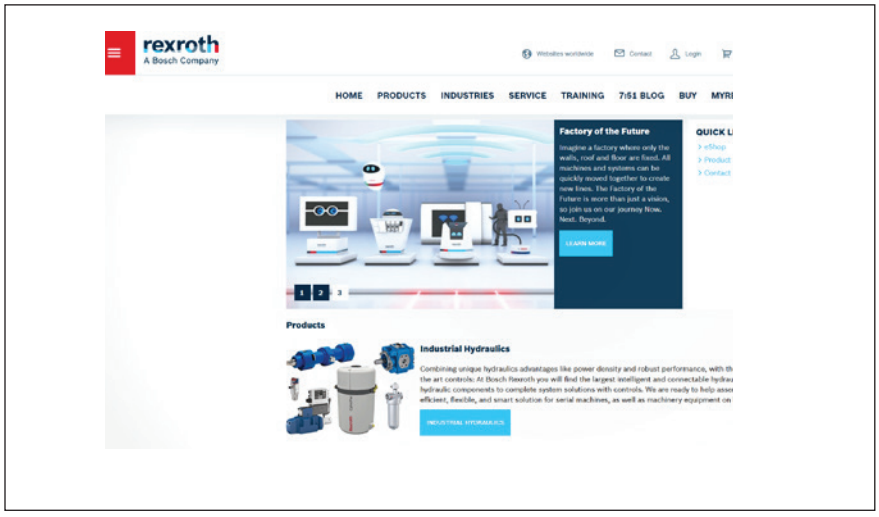
Address: _____ Department: _____

_____ Phone: _____

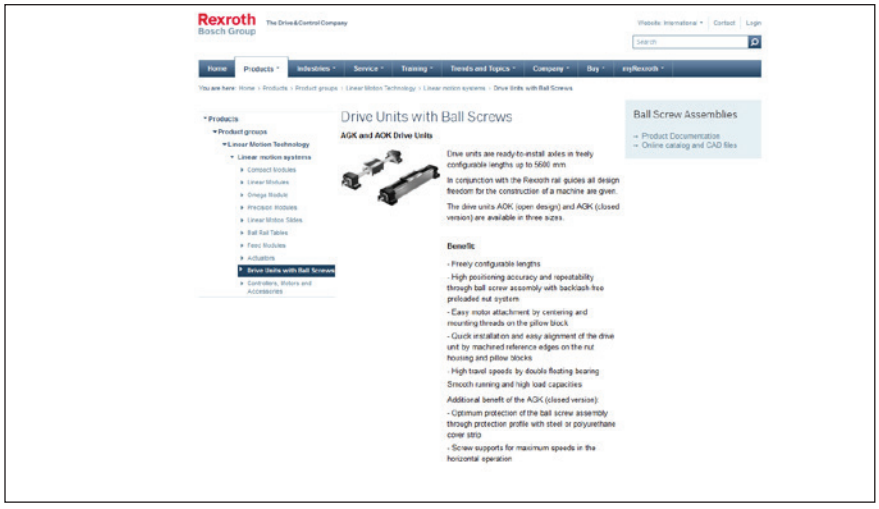
_____ Telefax: _____

Further information

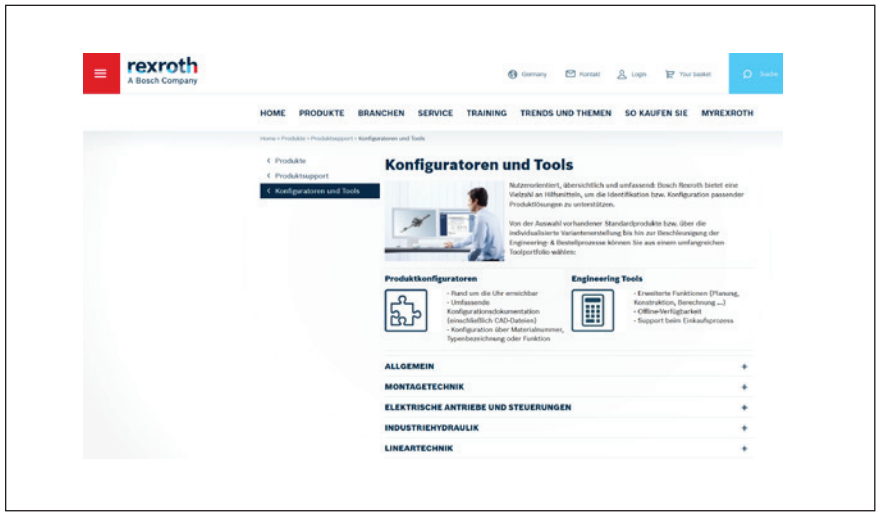
Bosch Rexroth homepage:



Product information Drive units:



Configurators and tools:



Notes

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97424 Schweinfurt, Germany
www.boschrexroth.com

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

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