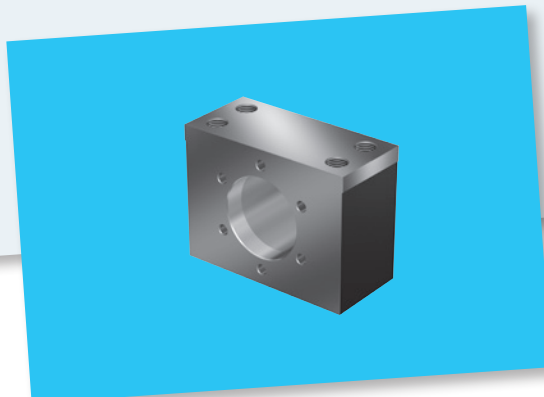
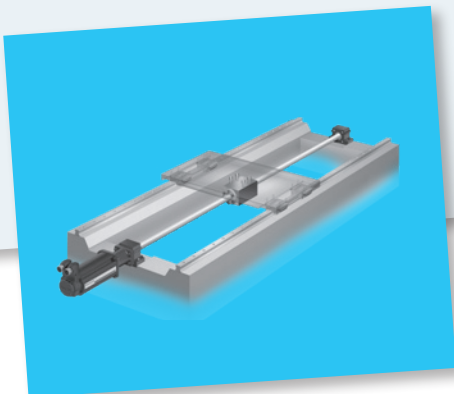
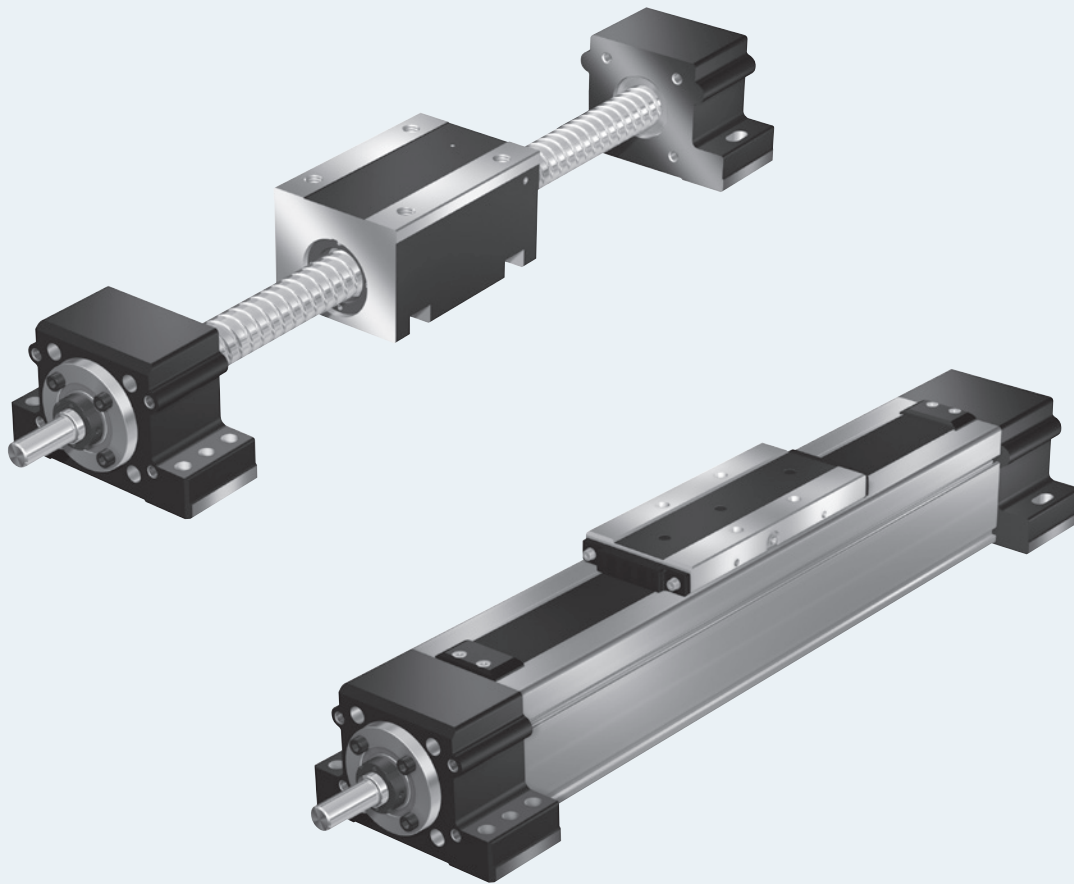


Drive units AOK, AGK



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 (<u>A</u>)										
Type	= <u>O</u> pen Closed										
Drive	= Ball screw assembly (<u>K</u>)										
Size	= 020 / <u>032</u> / 040										
Version	= Standard version (<u>N</u>)										
Generation	= Product generation <u>1</u>										

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.

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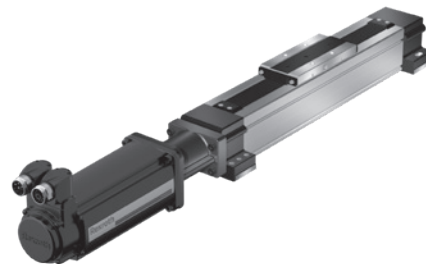
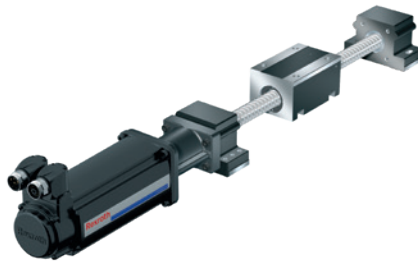
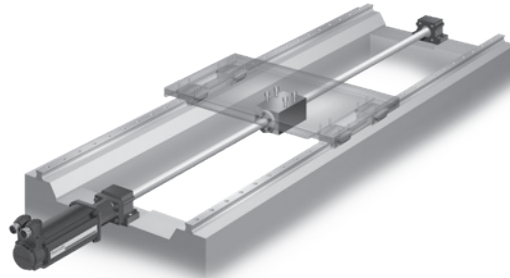
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AOK/AGK product description

AOK and AGK drive units consist of Rexroth's proven ball screw drive (**BASA - BALL Screw Assembly**), 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

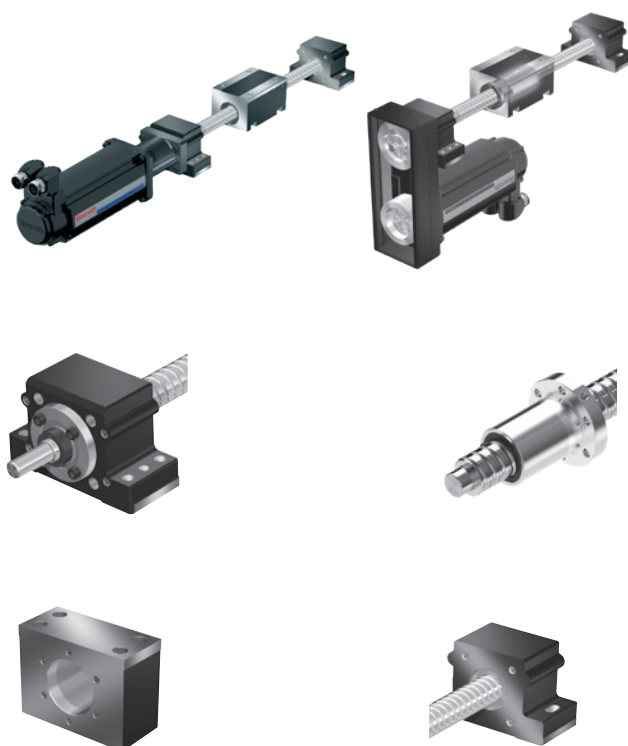
- Pick and place
- Handling systems
- Placement systems, palletizers
- Machine tool feed units
- Inspection and analysis systems
- Feed units in transfer lines
- Motion units

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)



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

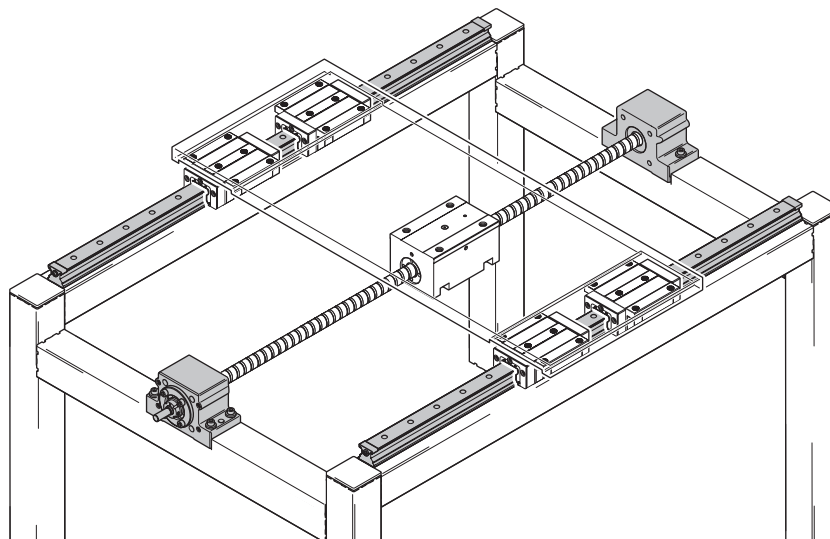
AOK and AGK drive units are designed for drive tasks only and can only absorb axial forces.

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.

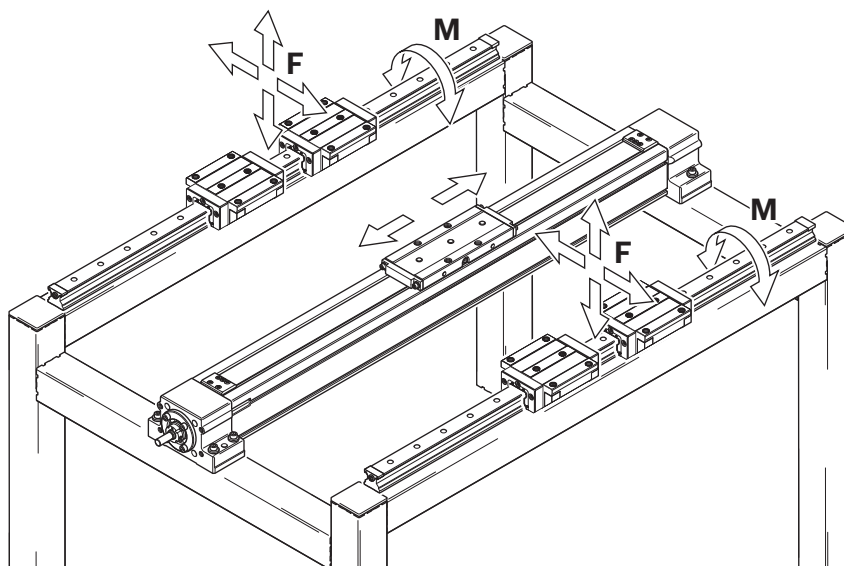
This results in a linear motion unit (e.g. table top) that can be moved automatically thanks to an AOK or AGK drive unit.

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

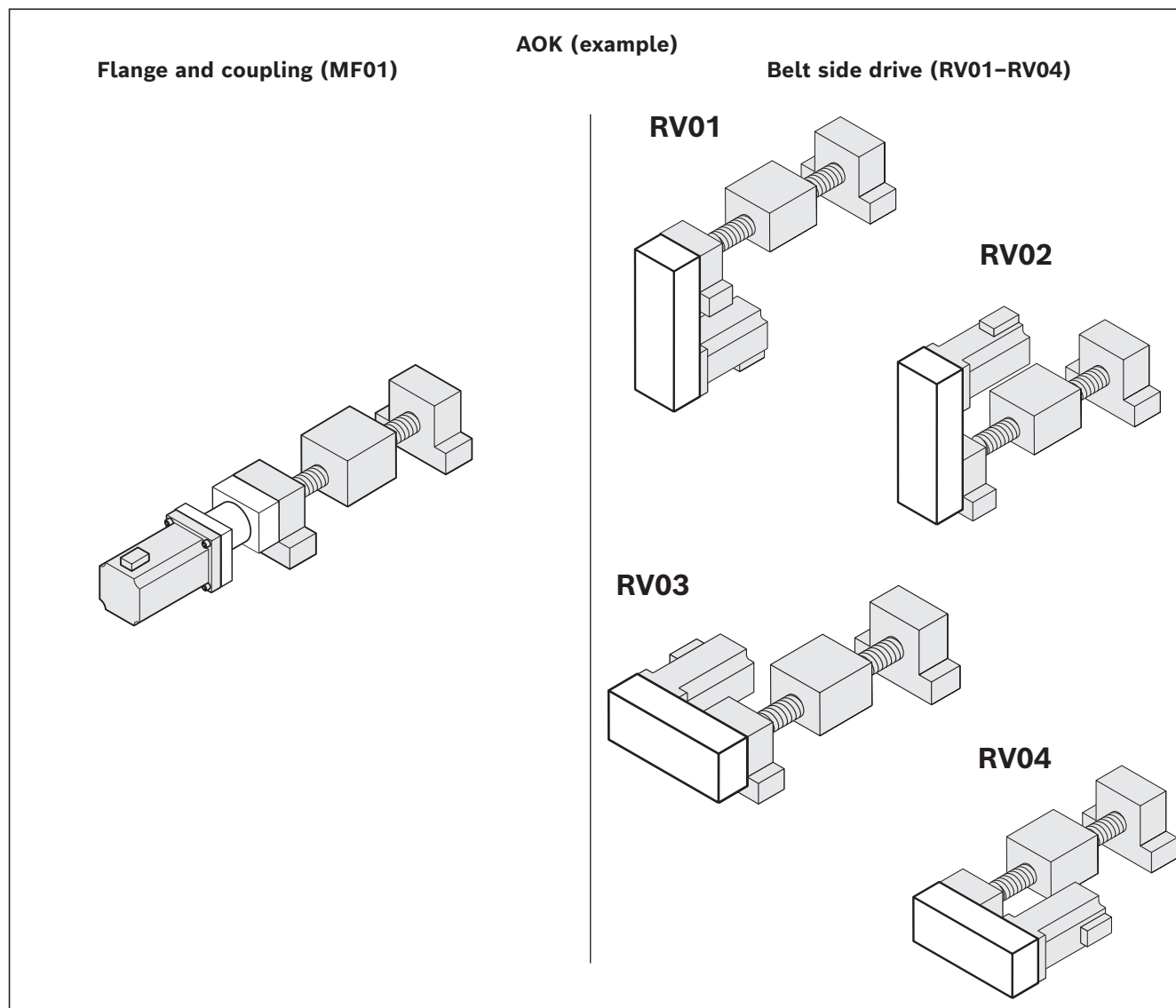
Drive units come ready-mounted.

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

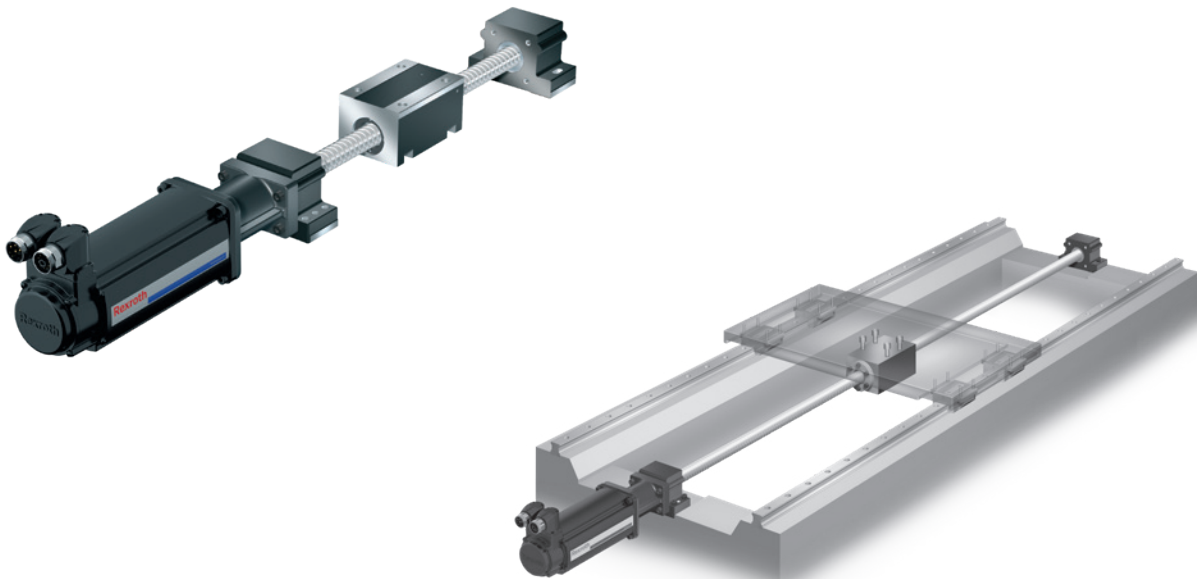
- AOK drive units in open format are ready-to-install drive axes consisting of a ball screw drive with nuts and pillow blocks, as well as an optional nut housing
- Three coordinated sizes available in any length up to $L_{\max}$
- A version with fixed and floating bearing or fixed bearing only is also 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

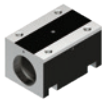
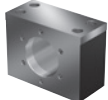
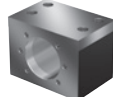
- Flexible thanks to selectable options
- Easy motor attachment via locating feature and threads
- Clearly structured technical data for the complete unit as a "linear motion system without guideway"
- Nameplate with parameters for easy start-up

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

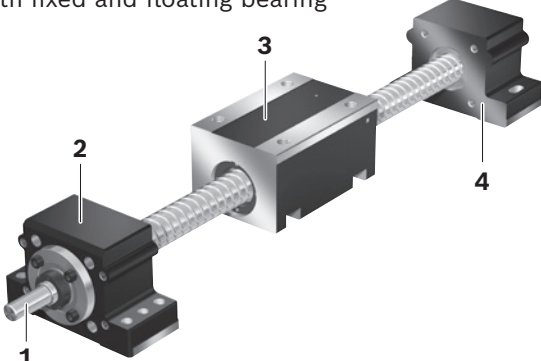
Tolerance grade	Permissible travel deviation over 300 mm (v300p)
T5	23 µm / 300 mm
T7	52 µm / 300 mm

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

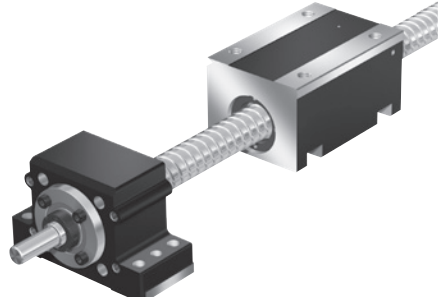
Structural design

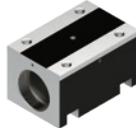
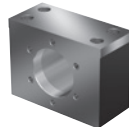
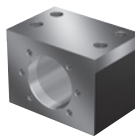
- 1 Ball screw assembly
- 2 Pillow block on fixed bearing end (drive side)
- 3 Housing with nut
- 4 Pillow block on floating bearing end

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 

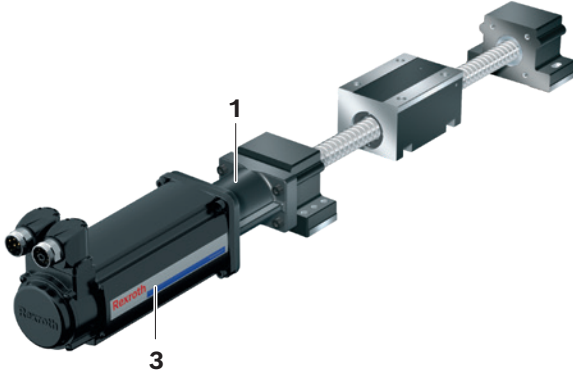
* Only the combination options in the "Configuration and ordering" tables are valid.

Motor attachment

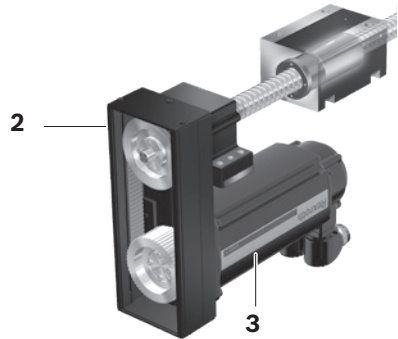
Attachments:

- 1 Flange and coupling
- 2 Belt side drive
- 3 Motor

Flange and coupling



Belt side drive

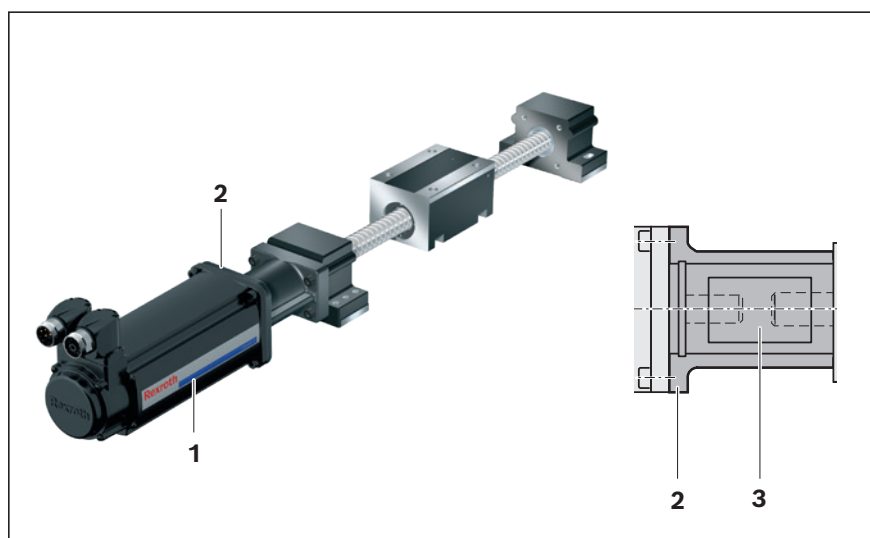


Motor attachment with flange and coupling

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.

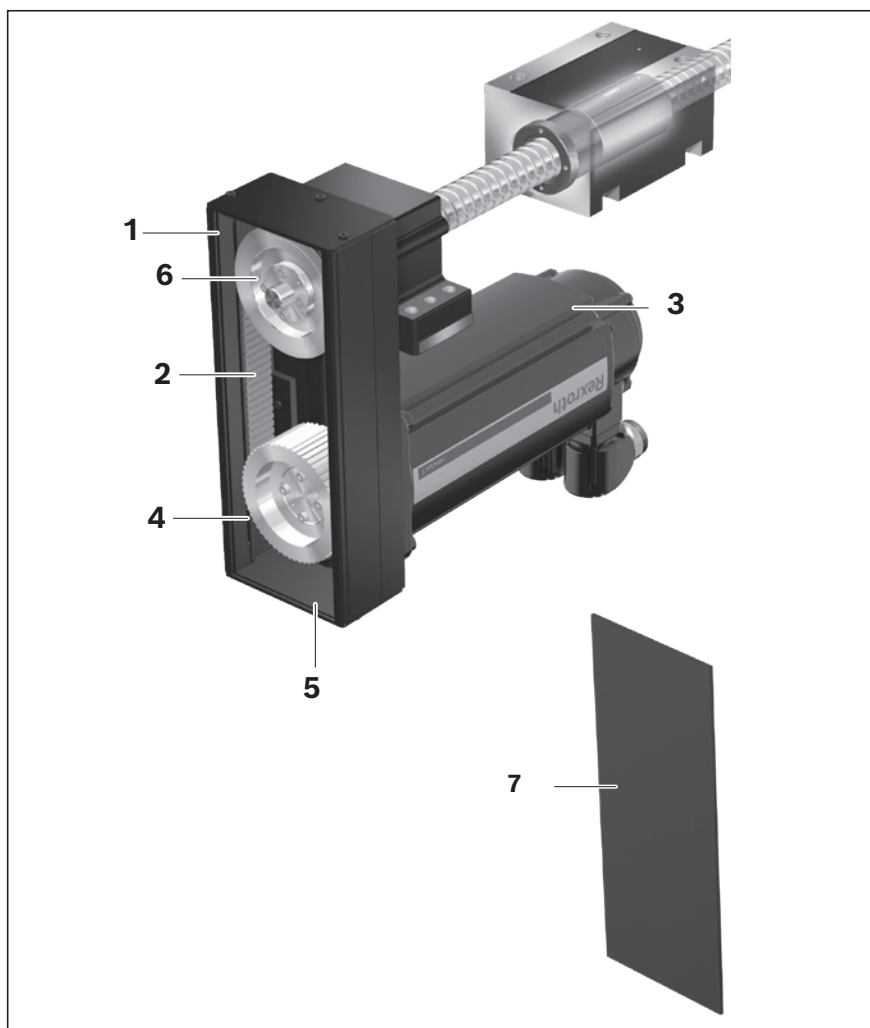
The space-saving, closed pulley housing serves as protection for the belt and as a motor bracket. Various gear ratios are also available (depending on size):

- $i = 1$
- $i = 2$

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		
		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	Nut		
											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)

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

¹⁾ Mutterausführung ZEM-E nur in Verbindung mit Gehäuse MGA verfügbar

Drive data

AOK	BASA	Constant mass moment of inertia							
		Nut FEM-E-S FEP-E-S ¹⁾	FEM-E-B	Nut and housing					
				ZEM-E + MGA	FEM-E-S/ FEP-E-S ¹⁾ + MGS	FEM-E-B + MGD			
	d ₀ x P (mm)	k _{J fix} (kgmm ²)	k _{J fix} (kgmm ²)	k _{J fix} (kgmm ²)	k _{J fix} (kgmm ²)	k _{J fix} (kgmm ²)	k _{J var} (kgmm)	k _{J m} (mm ²)	
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		$k_{g \text{ var}}$ (kg/mm)
	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)	$k_{g \text{ fix}}$ (kg)	$k_{g \text{ fix}}$ (kg)	$k_{g \text{ fix}}$ (kg)	$k_{g \text{ fix}}$ (kg)	
	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

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

Effective stroke

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

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)		M _{sd} ¹⁾		J _{sd}		M _{Rsd} (Nm)	m _{sd} (kg)	F (mm)	B _t	
			Fixed/ floating bearing	Fixed bearing only	i = 1	i = 2	i = 1	i = 2				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.

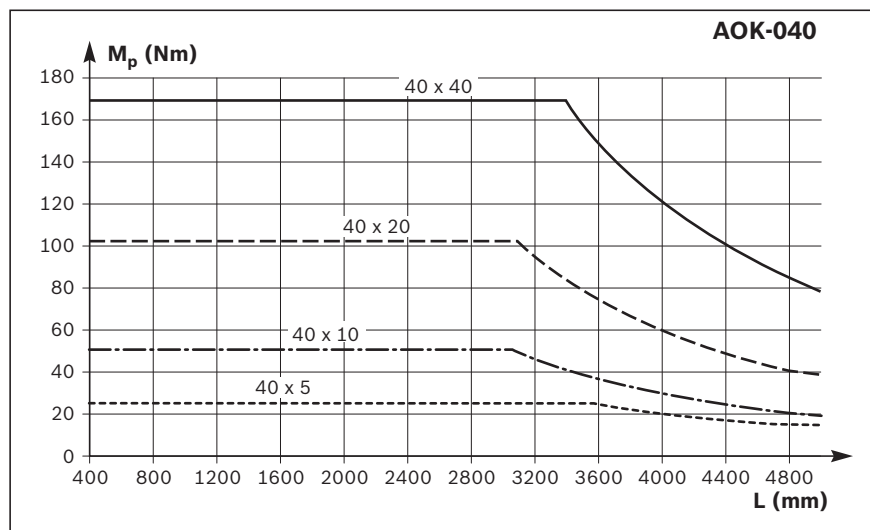
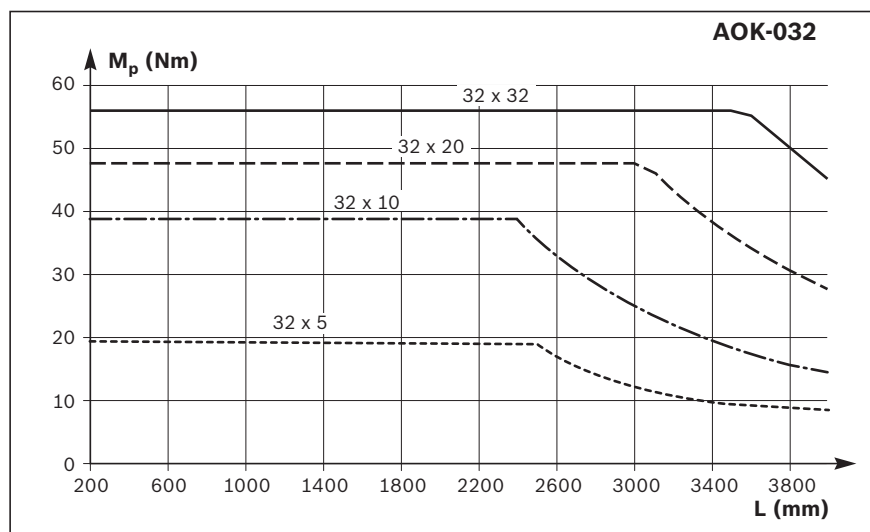
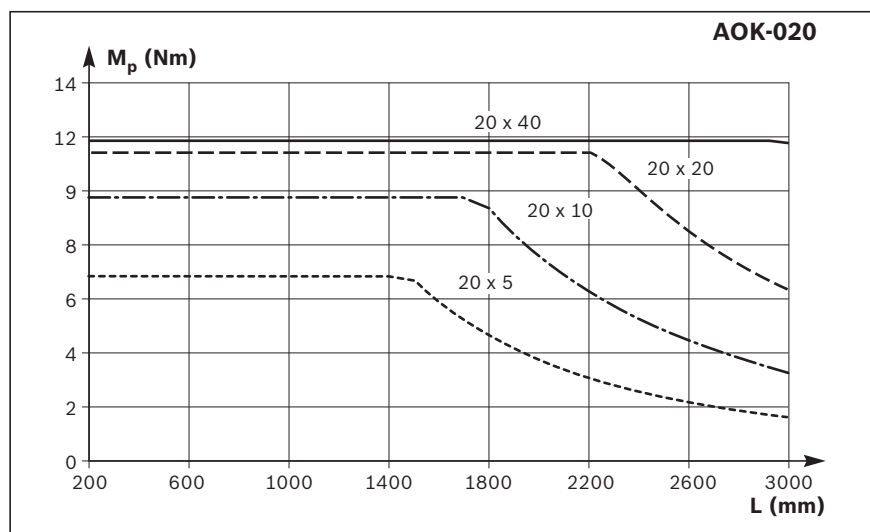
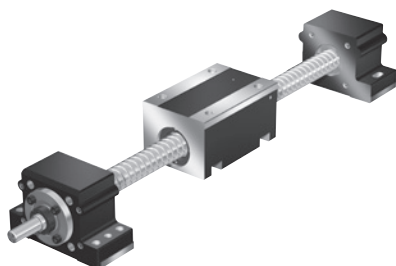
Drive data for motor attachment with flange and coupling

AOK	Motor	Coupling		Flange and coupling	
		M _{cN} (Nm)	J _c (10 ⁻⁶ kgm ²)	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	

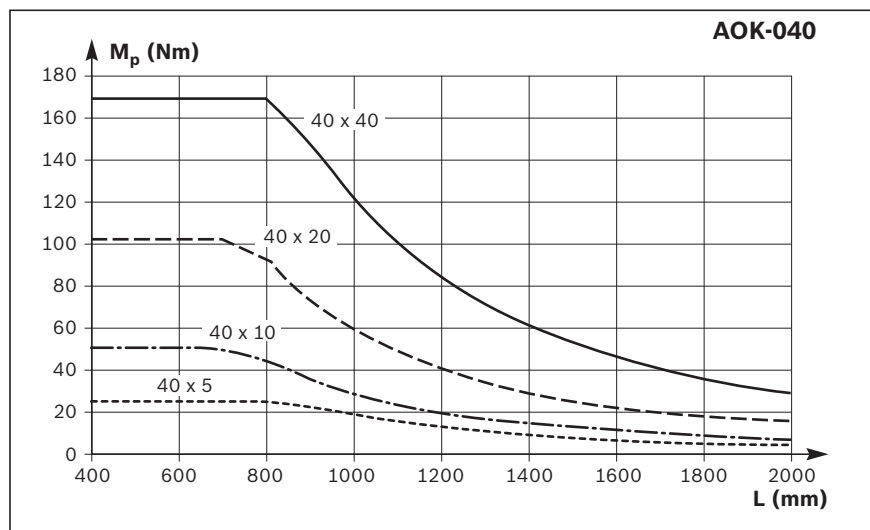
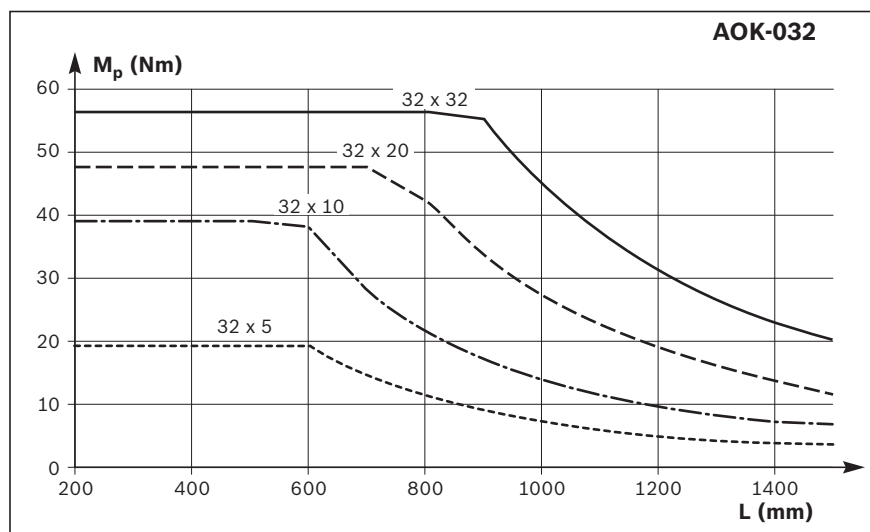
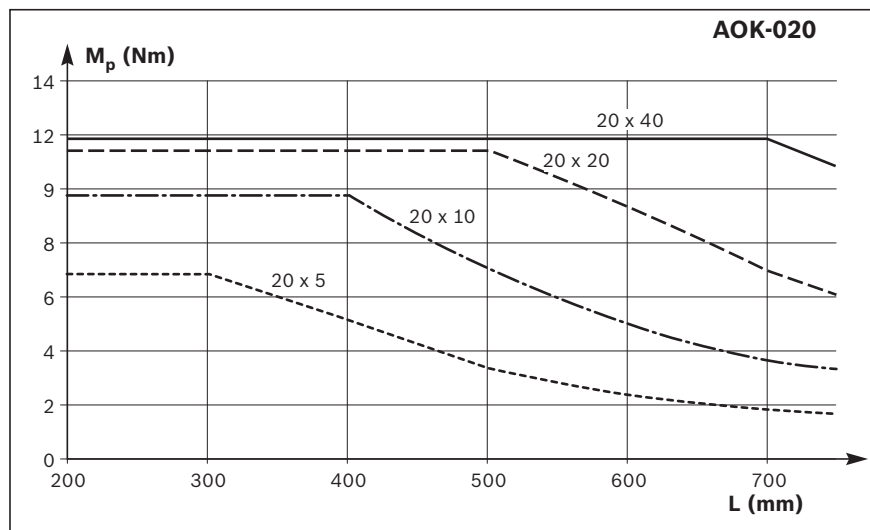
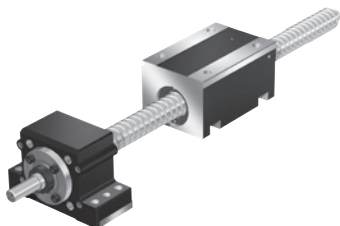
Short product names ➡ "Service and information/abbreviations" section

Technical data

Permissible drive torque M_p
with fixed and floating bearing



Permissible drive torque M_p with fixed bearing only



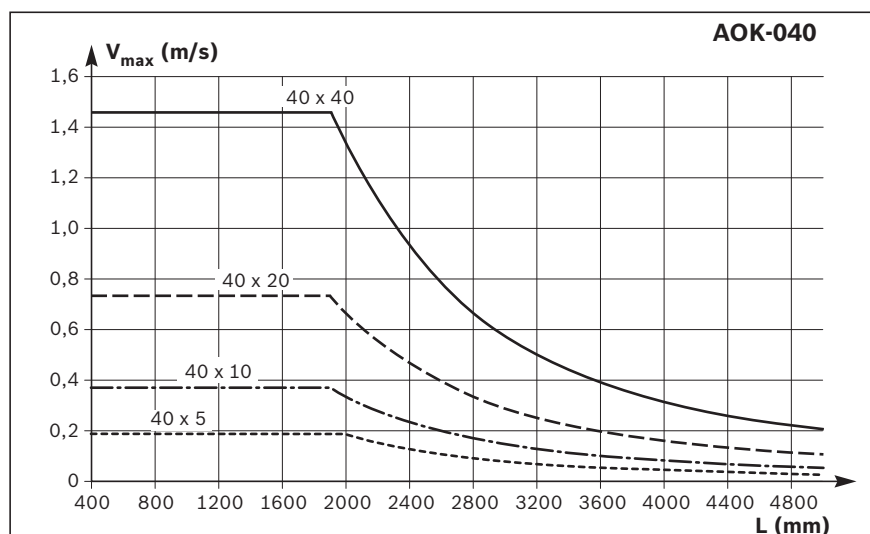
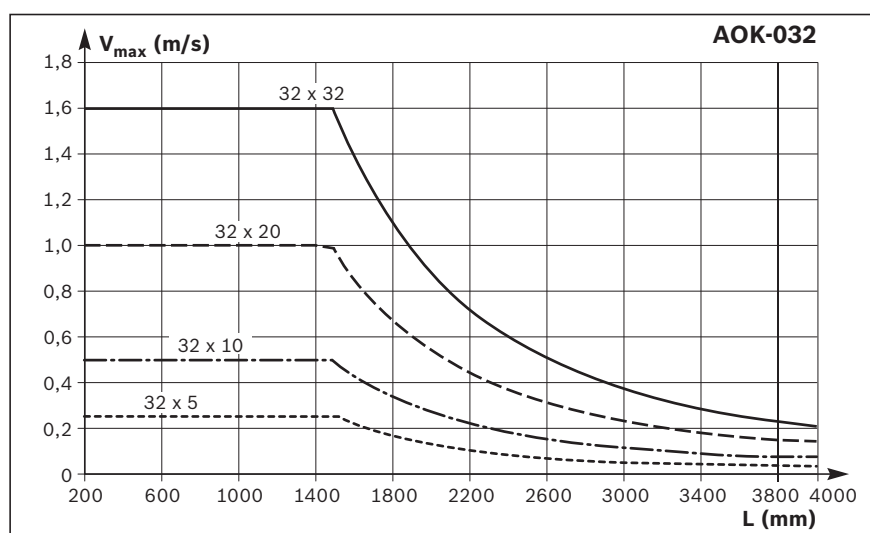
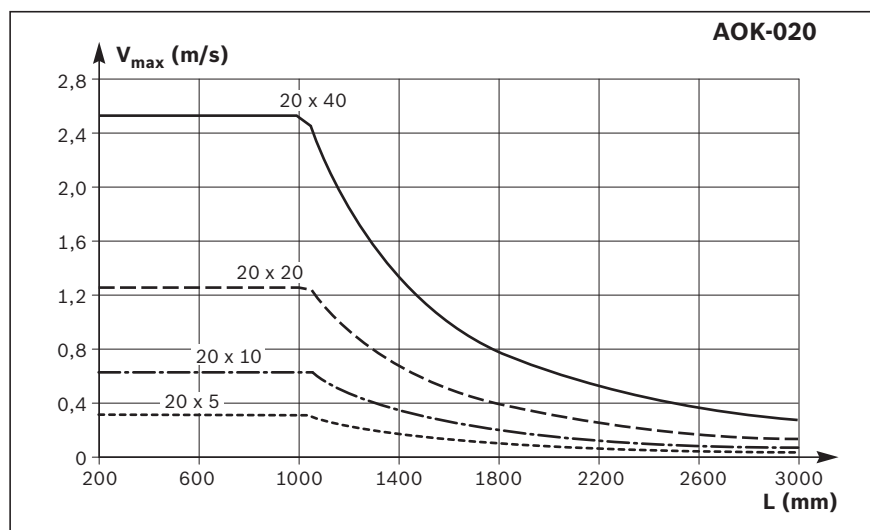
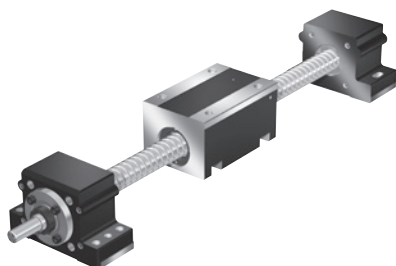
Note

The values shown for M_p apply under the following conditions:

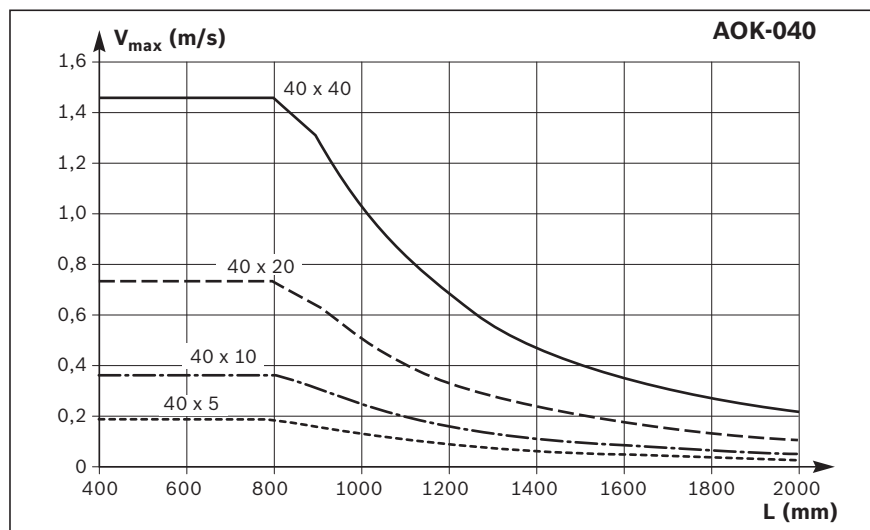
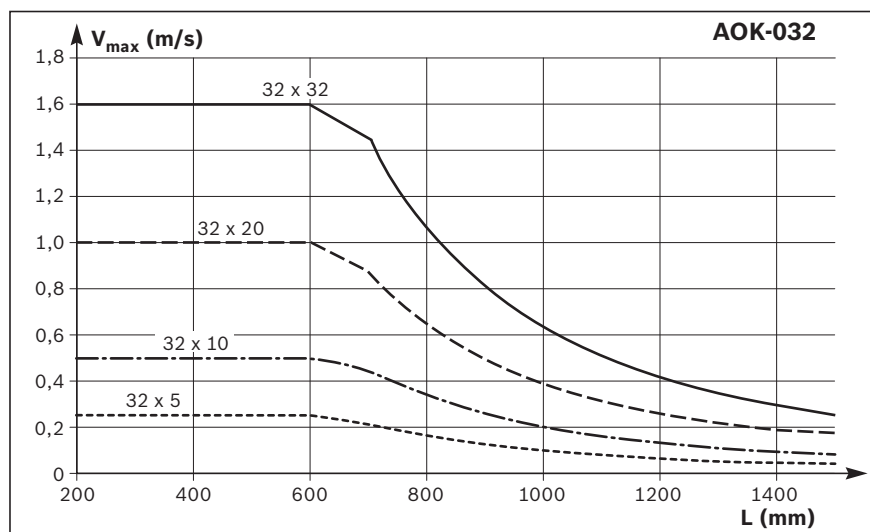
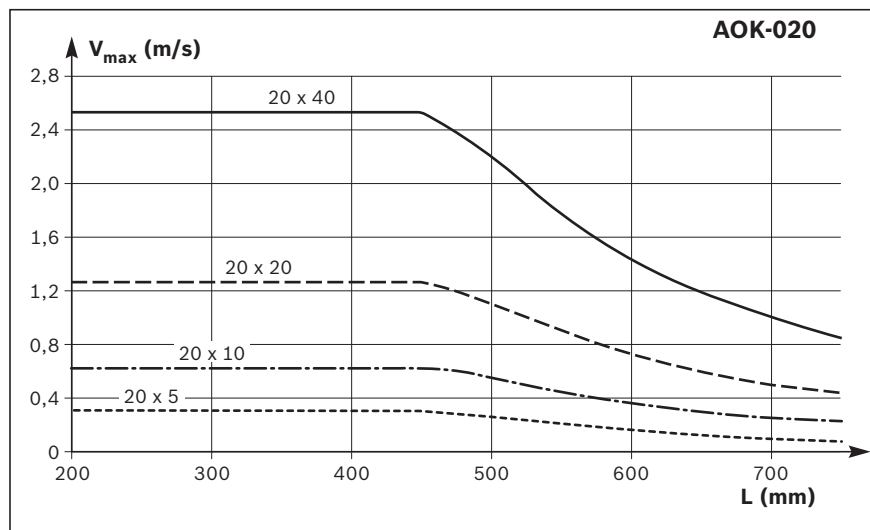
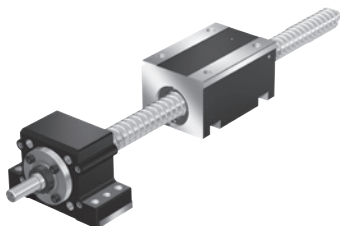
- No radial load on screw journal

Technical data

Permissible speed $v_{\max}$ with
fixed and floating bearing

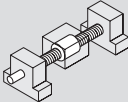


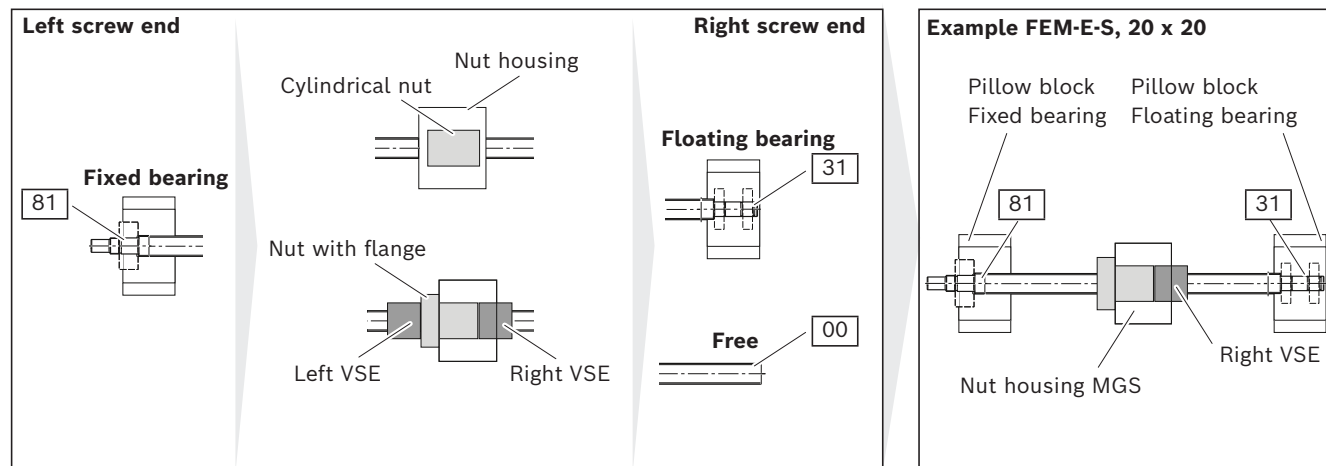
Permissible speed $v_{\max}$ with
fixed bearing only



AOK-020

Configuration and ordering

Short product name, length: AOK-020-NN-1, mm	Drive BASA															Screw ends	
		Nut	Size d ₀ x P				Tolerance grade	Standard seal	Lubrication			Preload class					
			20 x 5	20 x 10	20 x 20	20 x 40			With initial greasing	Left VSE	Right VSE	C1 (moderate)	C2 (medium)	C3 (high)	Left		
Fixed and floating bearing		01	04	02	–	T5	T7	1	1	–	–	3	6	2	81	31	
		–	–	–	03												
		11	–	–	–	T5	T7	1	1	2	3	3	6	2	81	31	
		–	13	–	–					–	–						
		–	–	12	–					2	3						
		–	–	–	33	T5	T7	1	1	–	–	3	6	2	81	31	
		21	–	–	–	T5	T7	1	1	2	3	3	6	2	81	31	
		–	23	–	–					–	–						
		–	–	22	–					2	3						
	Version with fixed bearing only		06	09	07	–	T5	T7	1	1	–	–	3	6	2	81	00
–			–	–	08												
		16	–	–	–	T5	T7	1	1	2	–	3	6	2	81	00	
		–	18	–	–					–	–						
		–	–	17	–					2	–						
		–	–	–	38	T5	T7	1	1	–	–	3	6	2	81	00	
		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	
	Aluminum	Steel	Without		Type			Attachment kit ¹⁾	Motor code	2 cable		1 cable		Motor connector position	Standard report	Measurement report
										Without brake	With brake	Without brake	With brake			
	02	12	–	01	MGA	Without flange	OF01	–	00	–		–		–		
			–	02												
			00	11	MGS											
	02	12	00	14		With flange	MF01	–	06	MSM041B-0300	140	141	–	–	000	01
			00	12						MS2N04-B0BTN	209	210	211	212		
			00	13						MS2N04-C0BTN	213	214	215	216		
			00	21	MGD					MS2N04-D0BQN	217	218	219	220		
	02	12	00	23						MS2N05-B0BTN	221	222	223	224		
			00	22						MS2N05-C0BTN	225	226	227	228		
			00	22						MS2N05-D0BRN	229	230	231	232		
	01	11	–	01	MGA	With belt side drive	RV01 RV02 RV03 RV04	1	32	MSM041B-0300	140	141	–	–	000	03
			–	12						MS2N04-B0BTN	209	210	211	212		
			00	11	MGS					MS2N04-C0BTN	213	214	215	216		
	01	11	00	14						MS2N04-D0BQN	217	218	219	220		
			00	12						MS2N05-C0BTN	225	226	227	228		
			00	13						MS2N05-D0BRN	229	230	231	232		
	01	11	00	21	MGD					MS2N05-C0BTN	225	226	227	228		
			00	23						MS2N05-D0BRN	229	230	231	232		
			00	22												

Screw ends

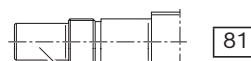
Free end



Floating bearing end



Fixed bearing end (motor attachment)



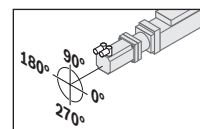
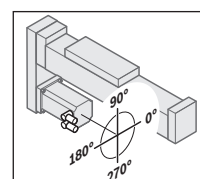
Screw journal for motor attachment

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

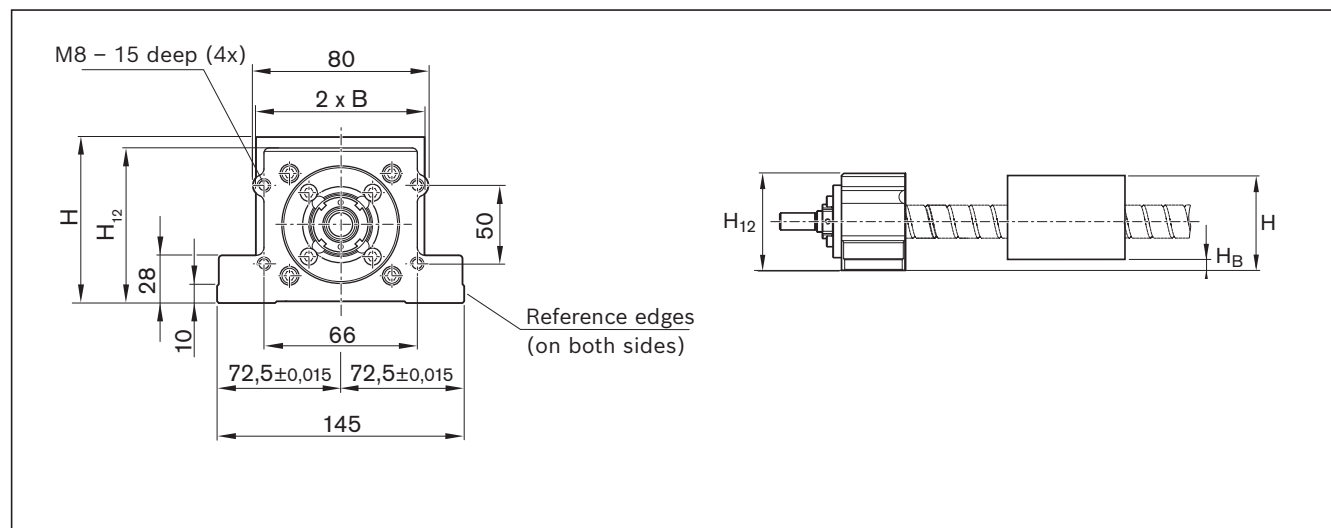
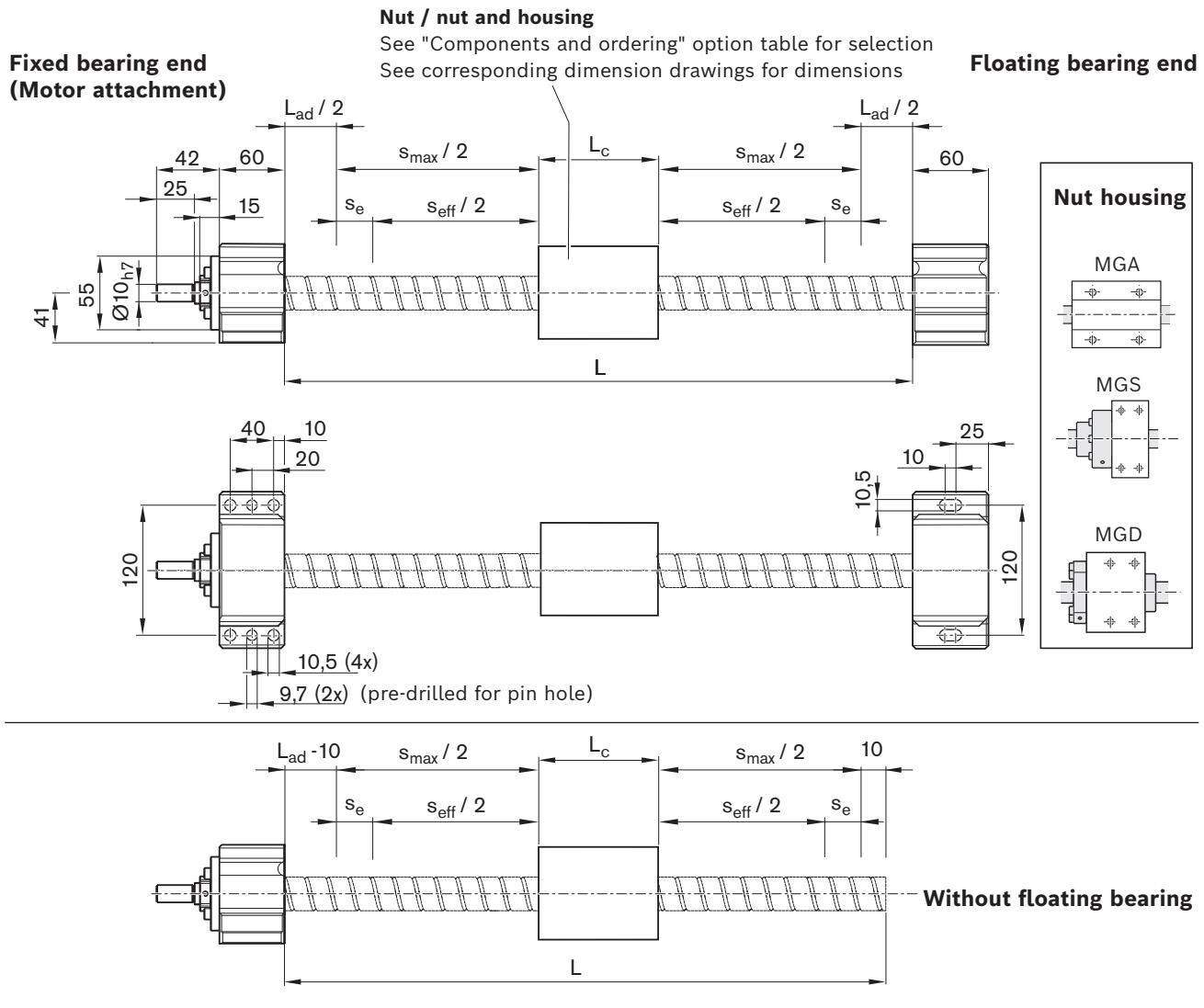
Example:
Flange MF01
Motor
connector
position 90°Example:
Belt side
drive RV01
Motor
connector
position 180°

AOK-020

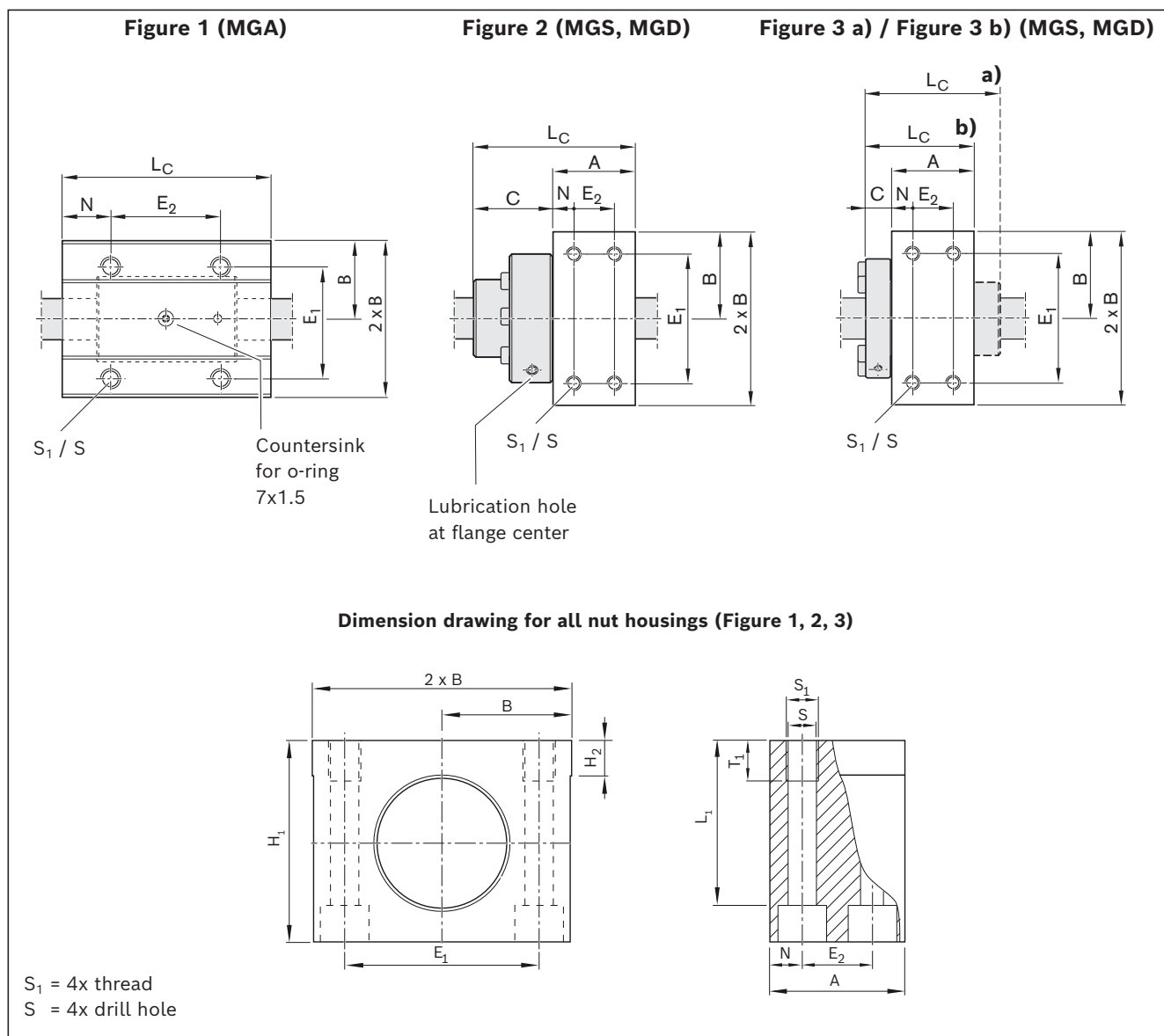
Dimensional drawings

All dimensions are given in mm. Drawings not to scale.

Straightness and flatness tolerance in accordance with DIN EN 12020-02



Nut and housing dimension drawings

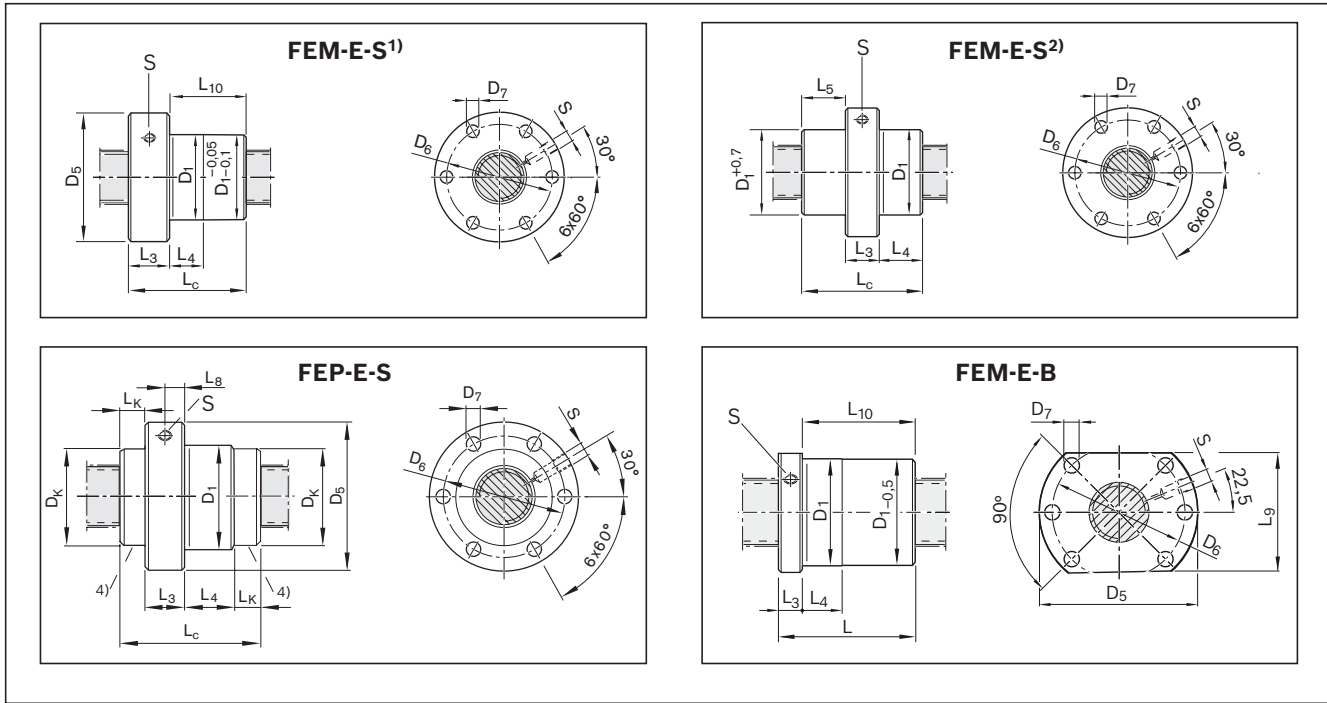


AOK-020 d _o x P	Nut	Nut housing	Figure	Dimensions (mm)																
				A	B ±0.01	C	E ₁	E ₂	H	H ₁	H ₂	H ₁₂ ±0.15	H _B	L _c	L ₁	N	S ₁	S	T	
20 x 5	ZEM-E	MGA	1	–	37.5	–	55	60	85	75	10	81	10	100	63	20	M10	8.6	15	
	FEM-E-S	MGS	3 b)	40	37.5	12	56±0.1	20±0.1	73	62			11	52	51	10	M10	8.4		
	FEM-E-B	MGD	3 b)	55	37.5	12	55±0.1	23±0.1	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±0.1	20±0.1	73	62			11	60	51	10	M10	8.4		
	FEM-E-B	MGD	3 b)	55	37.5	12	55±0.1	23±0.1	69	56			13	67	45	22	M10	8.4		
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±0.1	20±0.1	75	65			10	78	54	10	M10	8.4		
	FEM-E-B	MGD	3 a)	55	37.5	12	55±0.1	23±0.1	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±0.1	20±0.1	75	65	10	63	54	10	M10	8.4				

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

AOK-020

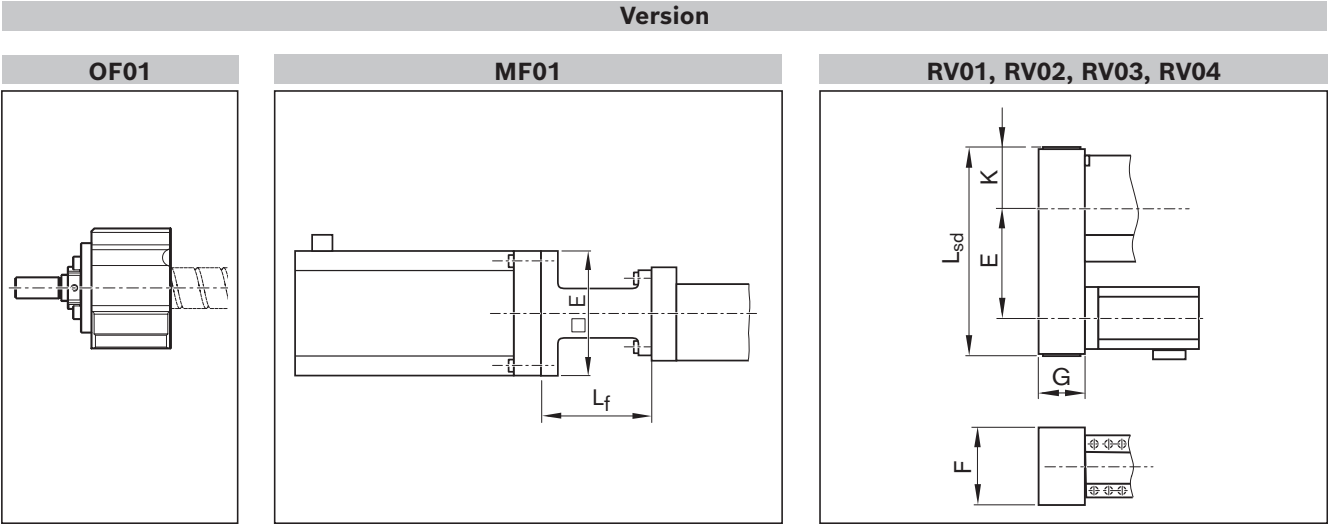
Nut dimension drawings



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 ^{±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 L₃ ≤ 15 mm, countersink L₃ > 15 mm;
4) Plastic recirculation cap

Motor attachment dimension drawings

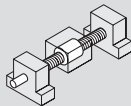


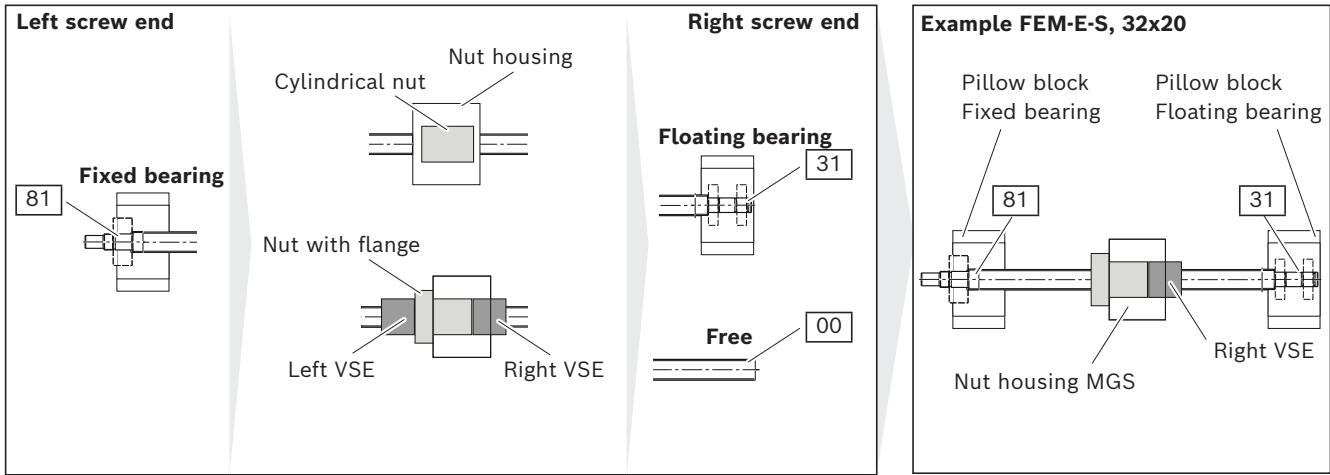
Version	Motor code	Dimensions (mm)	
		L _f	□E
MF01	MSM041B	90	see dimension □ A ➡ "Motors" section
	MS2N04-B0BTN		
	MS2N04-C0BTN		
	MS2N04-D0BQN		
	MS2N05-B0BTN	115	
	MS2N05-C0BTN		
	MS2N05-D0BRN		

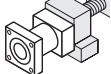
Version	Motor code	Dimensions (mm)				
		E i = 1	F	G	K	L _{sd} i = 1
RV01, RV02, RV03, RV04	MSM041B	122.5	88	51	47.5	231
	MS2N04-B0BTN					
	MS2N04-C0BTN					
	MS2N04-D0BQN					
	MS2N05-C0BTN	155.0	116	66	56.0	287
	MS2N05-D0BRN					

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				Tolerance grade		Standard seal	Lubrication			Preload class			Screw ends			
			32 x 5	32 x 10	32 x 20	32 x 32				With initial greasing	Left VSE	Right VSE	C1 (moderate)	C2 (medium)	C3 (high)			Left	Right
	Fixed and floating bearing		01	02	03	04	T5	T7	1	1	-	-	3	6	2	81	31		
			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		06	07	08	09	T5	T7	1	1	-	-	3	6	2	81	00	
				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													



	Pillow block		Nut housing		Motor attachment				Motor ²⁾								Documentation					
	Aluminum	Steel	Without	With	Type	Attachment kit ¹⁾	Motor code				2 cable		1 cable		Motor connector position	Standard report	Measurement report					
							Without brake	With brake	Without brake	With brake	Without brake	With brake										
	02	12	-	01		Without flange		-	-	00			-	-	01	03 Lead deviation						
	02	12	00	11		With flange		-	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																		
			00	22																		
			00	23																		
			00	24																		
	01	11	-	01						With belt side drive	 	1	23	MS2N06-B1BNN			233	234	235	236	000	
	01	11	00	11										MS2N06-D1BNN			245	246	247	248	090	
			00	13										 			2	24	MS2N06-B1BNN	233	234	235
			00	12											MS2N06-C0BTN	237			238	239	240	270
			00	14																		
	01	11	00	21																		
			00	22																		
			00	23																		
			00	24																		

Screw ends

Free end



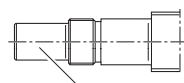
00

Floating bearing end



31

Fixed bearing end (motor attachment)



81

Screw journal for motor attachment

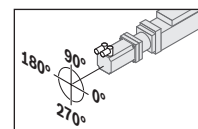
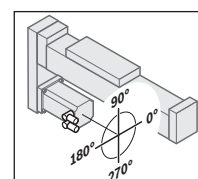
1) Attachment kit also available without motor (when ordering: enter "00" for motor)

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

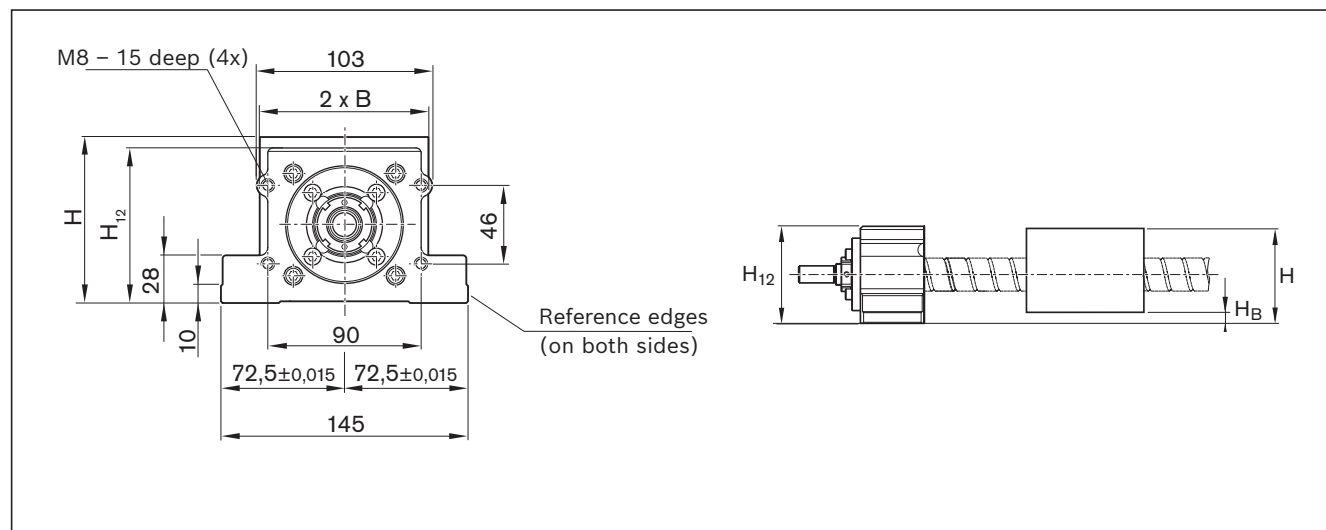
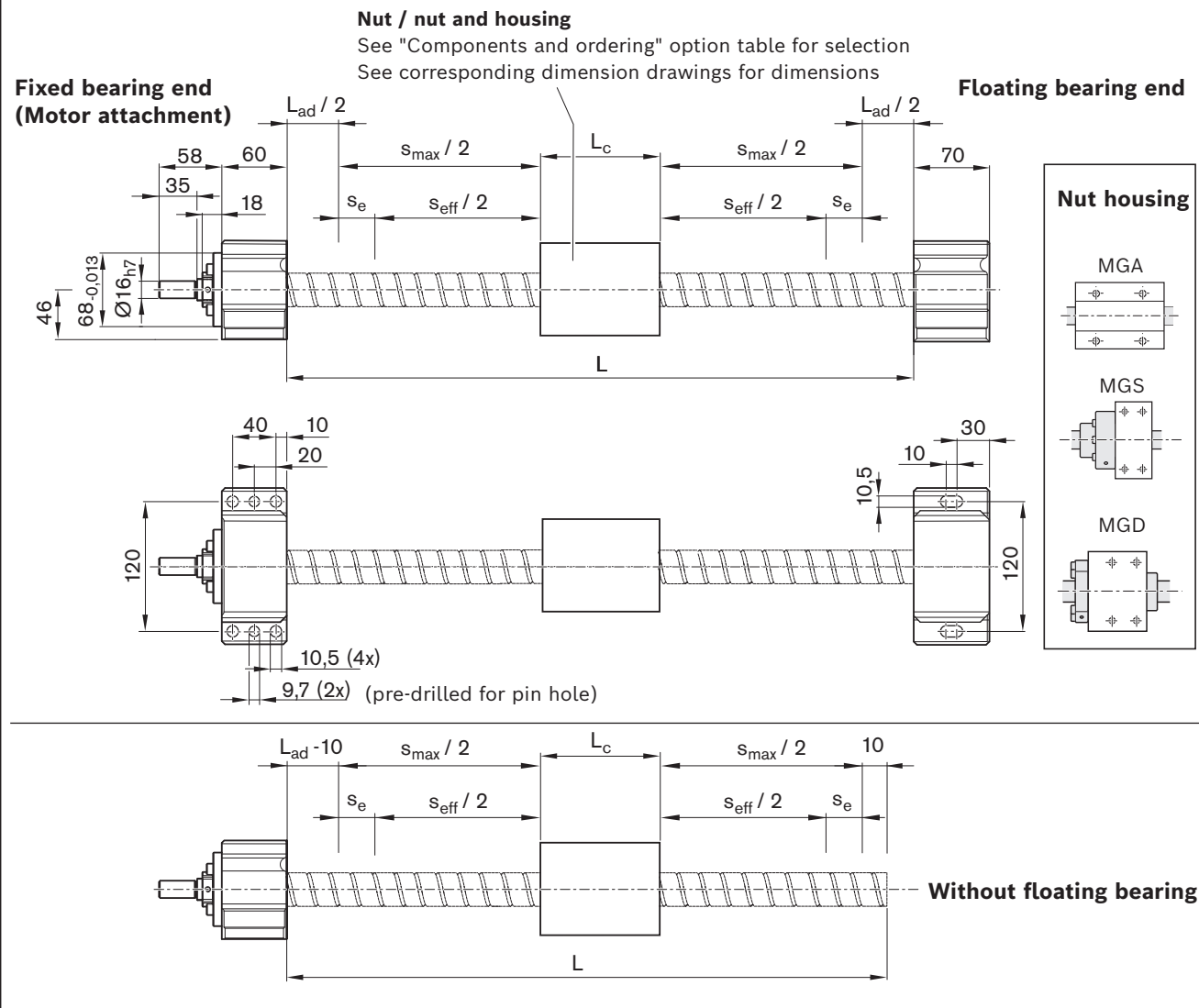
Example:
Flange MF01
Motor
connector
position 90°Example:
Belt side
drive RV01
Motor
connector
position 180°

AOK-032

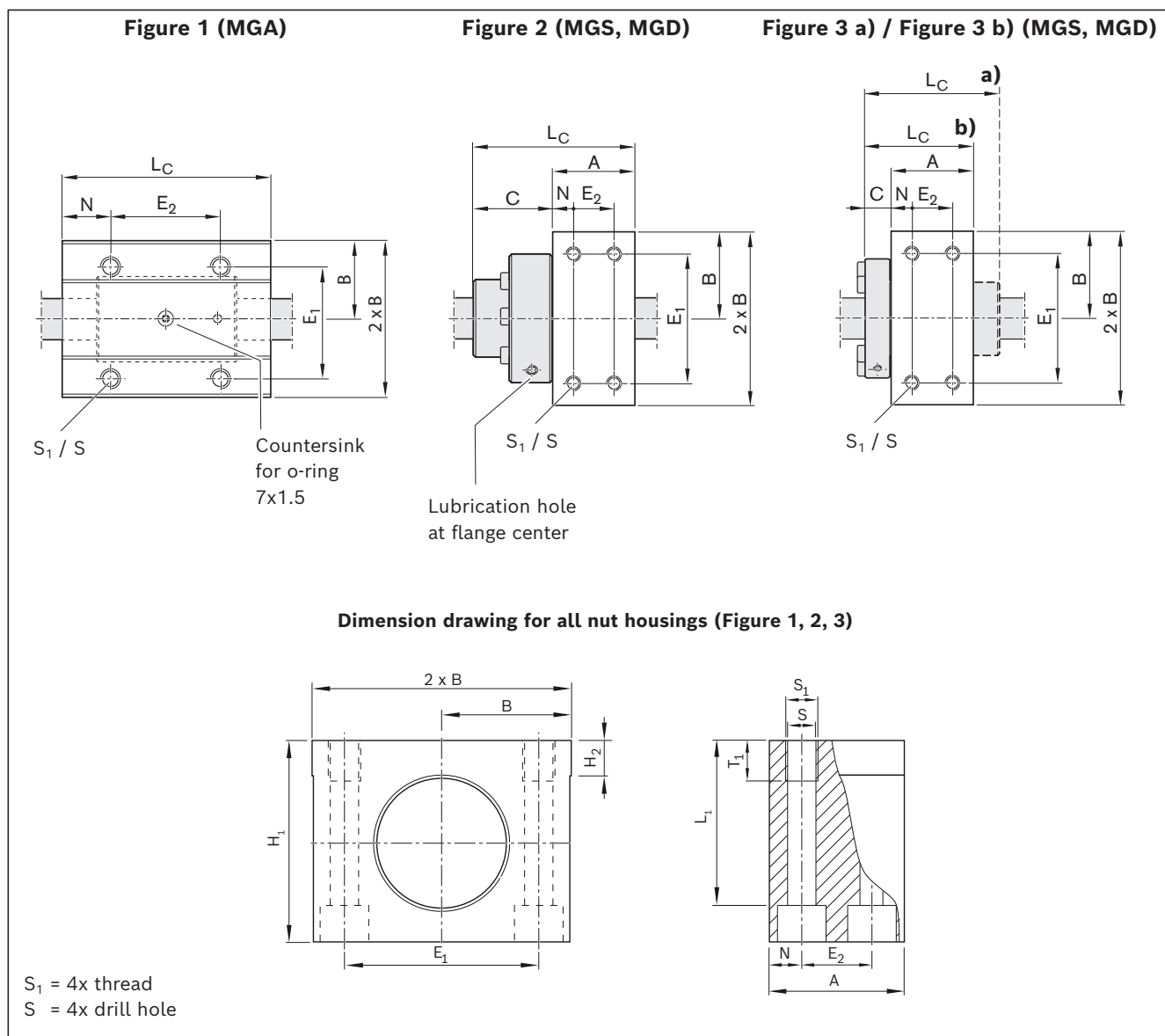
Dimensional drawings

All dimensions are given in mm. Drawings not to scale.

Straightness and flatness tolerance in accordance with DIN EN 12020-02



Nut and housing dimension drawings

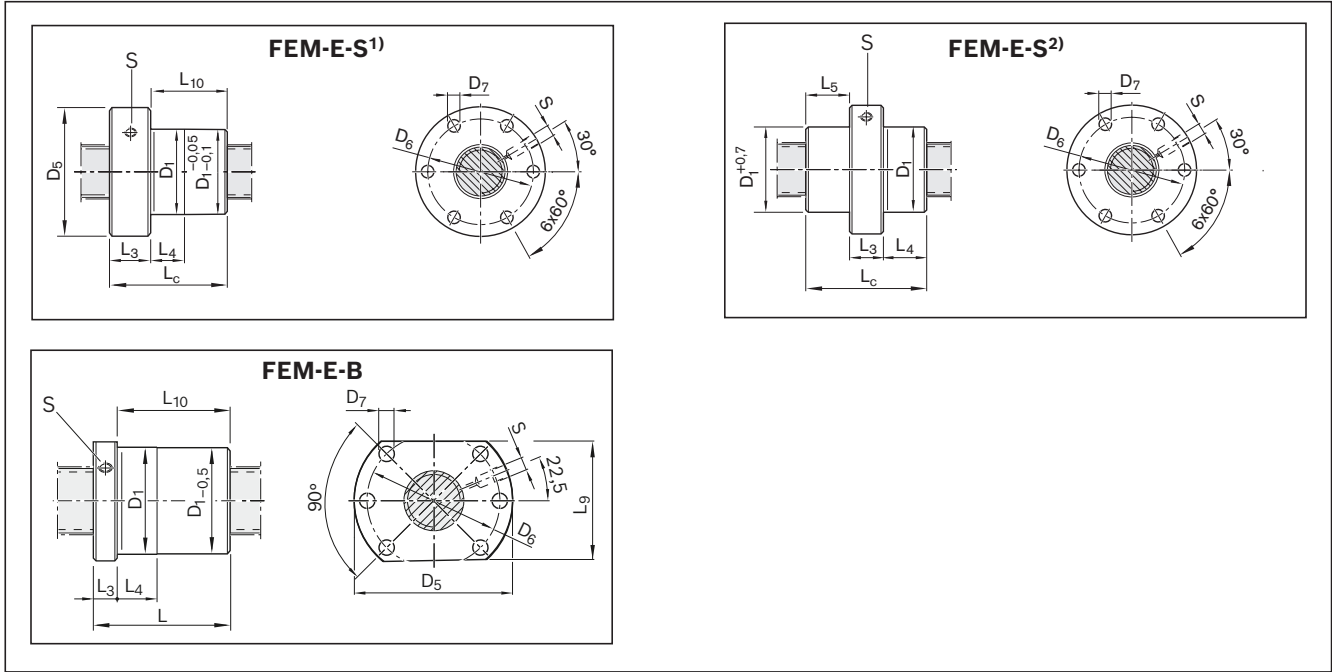


AOK-032 $d_0 \times P$	Nut	Nut housing	Figure	Dimensions (mm)															
				A	B	C	E_1	E_2	H	H_1	H_2	H_{12} ± 0.15	H_B	L_c	L_1	N	S_1	S	T_1
32 x 5	ZEM-E	MGA	1	—	50	—	75	100	95	80	10	91	15	150	66	25	M12	10.5	18
	FEM-E-S	MGS	3 b)	50	47.5	13	72 ± 0.1	26 ± 0.1	84	75			9	63	61	12	M12	10.5	15
	FEM-E-B	MGD	3 b)	70	50	13	75 ± 0.1	30 ± 0.1	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 ± 0.1	26 ± 0.1	84	75			9	77	61	15	M12	10.5	15
	FEM-E-B	MGD	3 b)	70	50	13	75 ± 0.1	30 ± 0.1	81	70			11	83	52	27	M16	13.0	20
32 x 20	ZEM-E	MGA	1	—	50	—	75	100	95	80	12	91	15	150	66	25	M12	10.5	18
	FEM-E-S	MGS	3 b)	60	52.5	15	82 ± 0.1	30 ± 0.1	88	82			6	75	64	15	M16	13.0	20
	FEM-E-B	MGD	3 a)	70	50	13	75 ± 0.1	30 ± 0.1	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 ± 0.1	30 ± 0.1	88	82			6	114	64	15	M16	13.0	20
	FEM-E-B	MGD	3 a)	70	50	13	75 ± 0.1	30 ± 0.1	81	70			11	120	52	27	M16	13.0	20

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

AOK-032

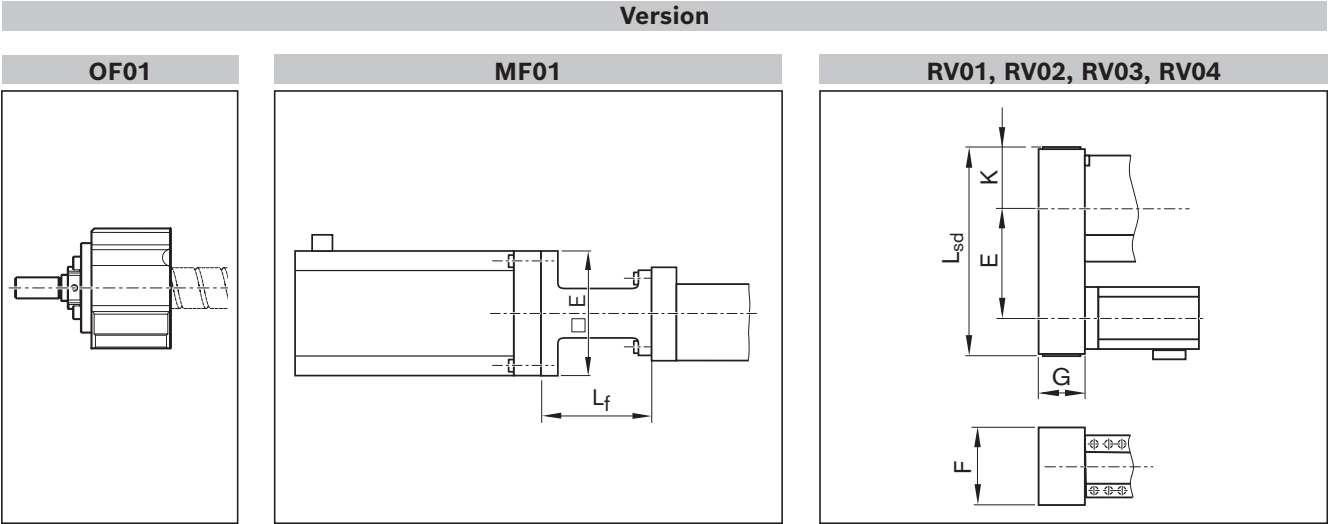
Nut dimension drawings



AOK-032 d ₀ x P	Nut	Dimensions (mm)										
		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



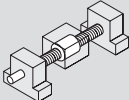
Version	Motor code	Dimensions (mm)	
		L _f	□E
MF01	MS2N06-B1BNN	125	see dimension □ A ➡ "Motors" section
	MS2N06-C0BTN		
	MS2N06-D0BRN		
	MS2N06-D1BNN		

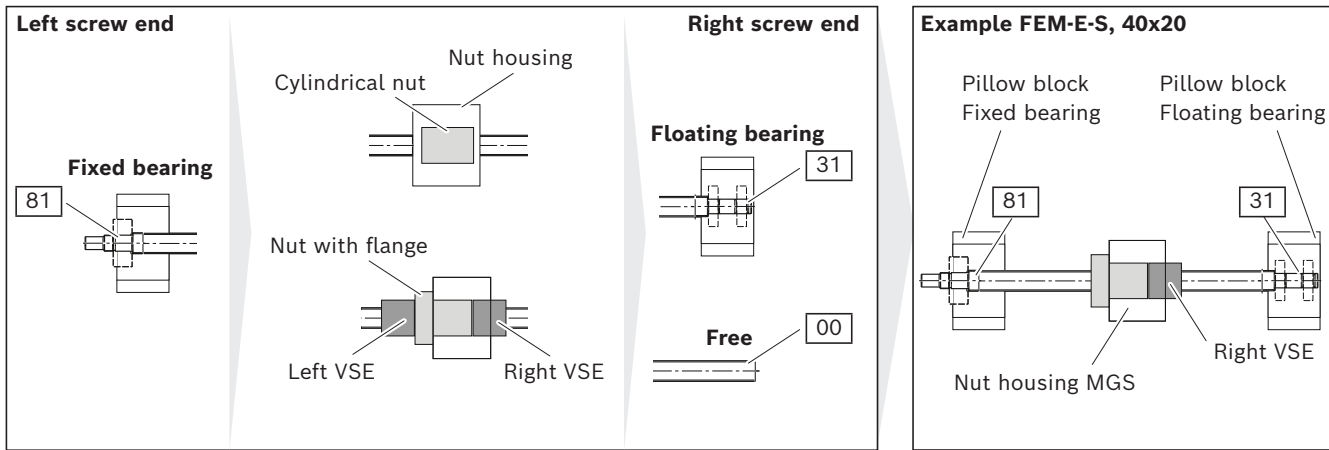
Version	Motor code	Dimensions (mm)						
		E		F	G	K	L _{sd}	
		i = 1	i = 2				i = 1	i = 2
RV01, RV02, RV03, RV04	MS2N06-B1BNN	165	–	116	66	59	300	–
	MS2N06-C0BTN	–	162				–	300
	MS2N06-D1BNN	165	–				300	–

Further information on motors ➡ "Motors" section

AOK-040

Configuration and ordering

Short product name, length: AOK-040-NN-1, mm	Drive BASA																		
		Nut	Size				Tolerance grade	Seal	Lubrication			Preload class			Screw ends				
			d ₀ x P						Standard	With initial greasing	Left VSE	Right VSE	C1 (moderate)	C2 (medium)	C3 (high)	Left	Right		
			40 x 5	40 x 10	40 x 20	40 x 40													
 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		
			-	-	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	
				-	-	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

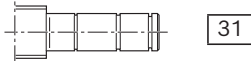
	Pillow block		Nut housing		Motor attachment		Motor ²⁾								Documentation		
	Aluminum	Steel	Without	With	Type	i	=	Attachment kit ¹⁾	Motor code				Motor connector position	Standard report	Measurement report		
									2 cables		1 cable						
									Without brake	With brake	Without brake	With brake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

Screw ends

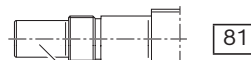
Free end



Floating bearing end



Fixed bearing end (motor attachment)

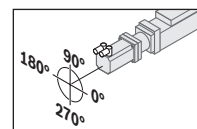


Screw journal for motor attachment

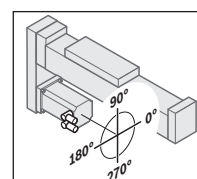
1) Attachment kit also available without motor (when ordering: enter "00" for motor)

2) Recommended motor (motor data and type designations → "Motors" section)

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

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

Example:
Belt side
drive RV01
Motor
connector
position 180°

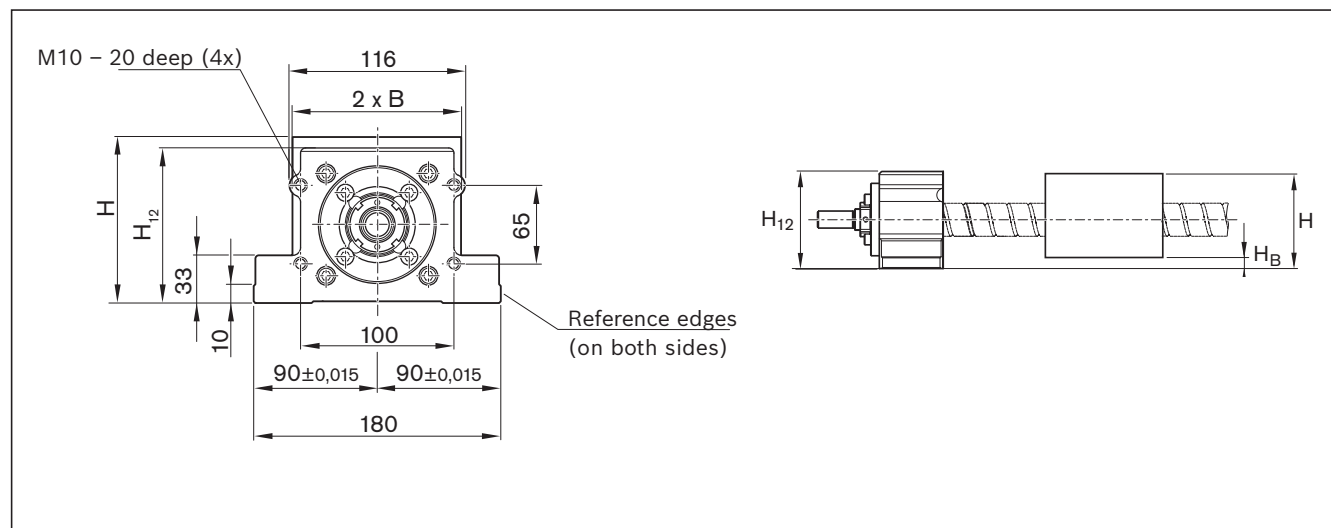
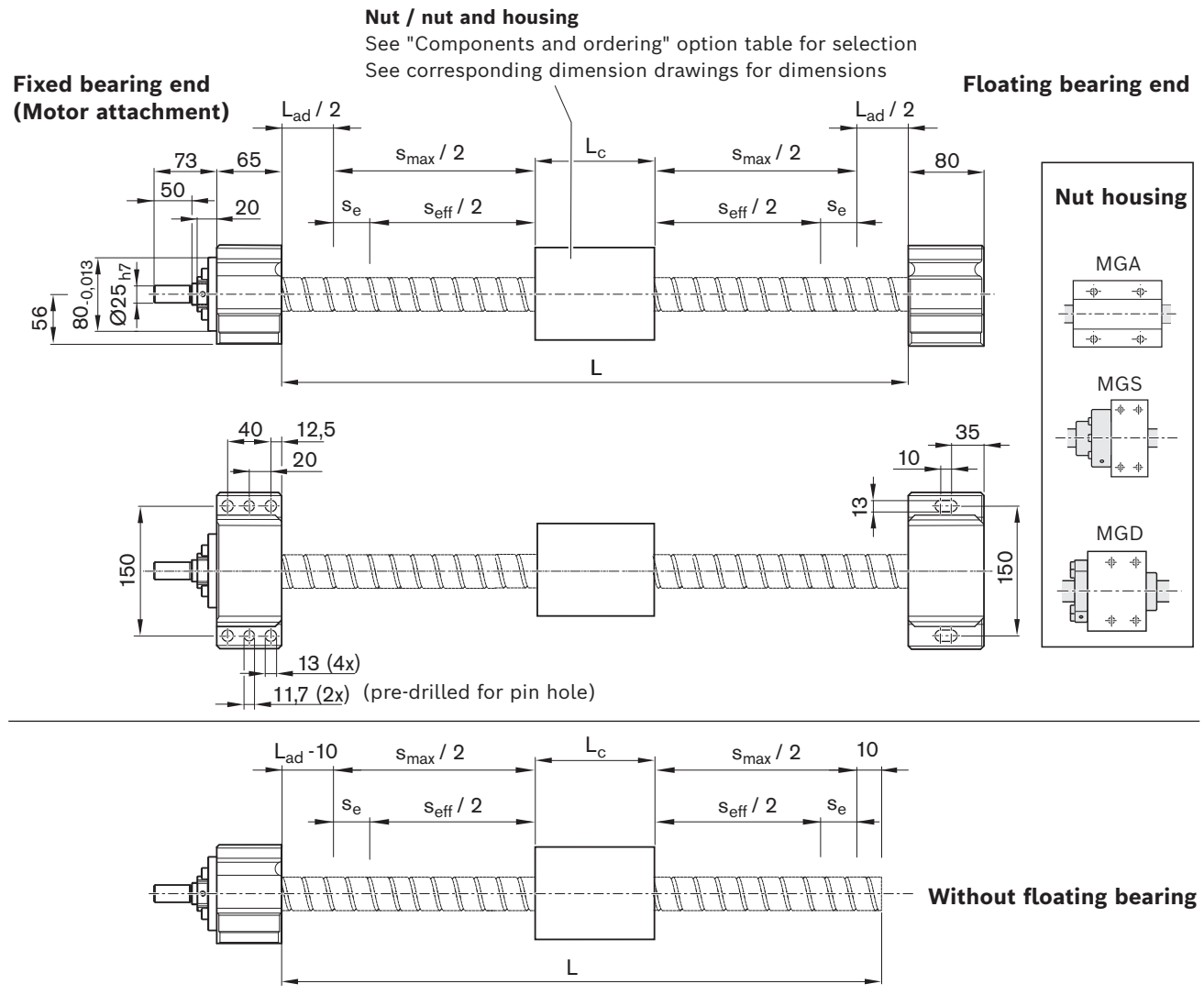
★ standard delivery

AOK-040

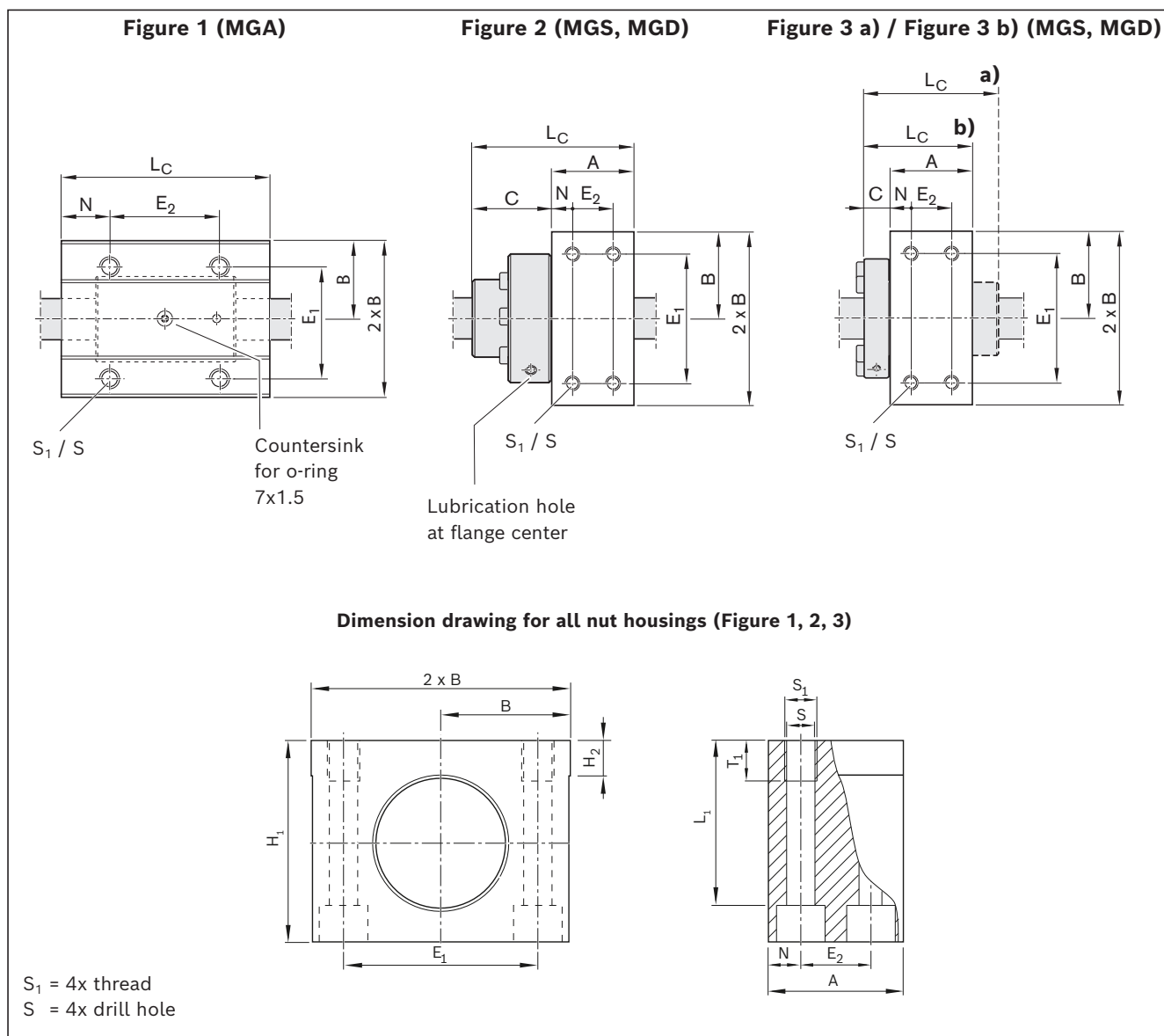
Dimensional drawings

All dimensions are given in mm. Drawings not to scale.

Straightness and flatness tolerance in accordance with DIN EN 12020-02



Nut and housing dimension drawings

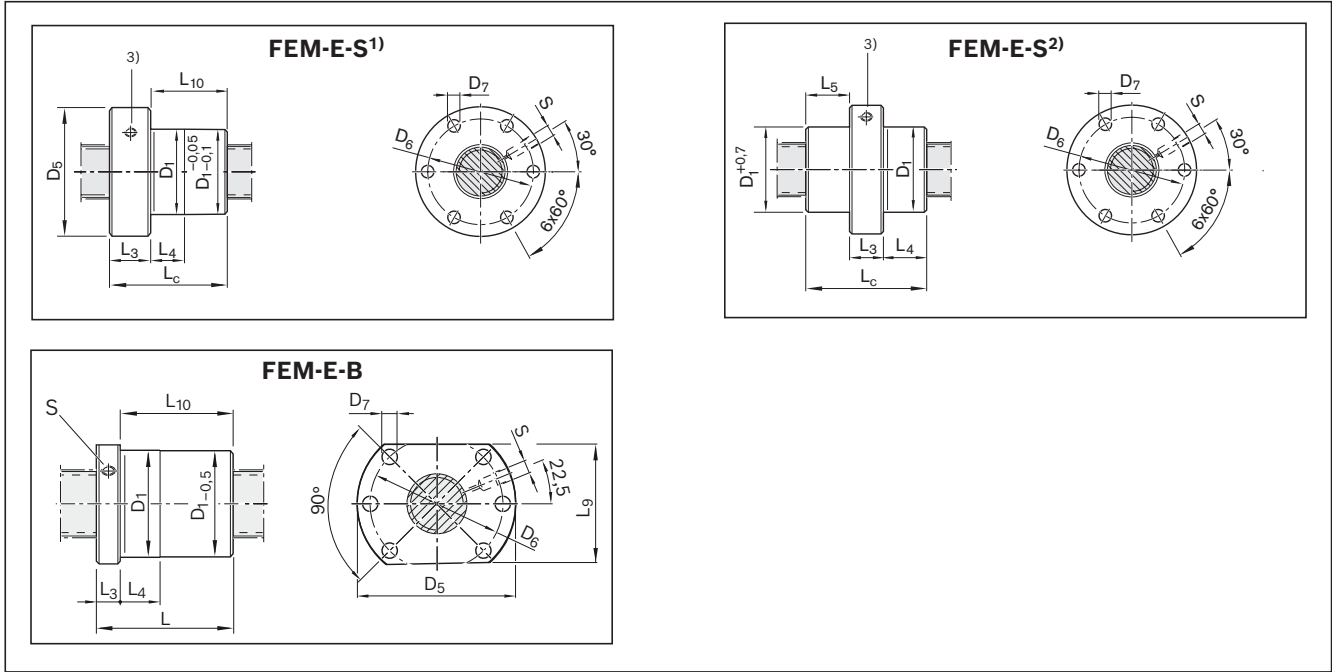


AOK-040 $d_o \times P$	Nut	Nut housing	Figure	Dimensions (mm)															
				A	B ± 0.01	C	E ₁	E ₂	H	H ₁	H ₂	H ₁₂ ± 0.15	H _B	L _c	L ₁	N	S ₁	S	T ₁
40 x 5	ZEM-E	MGA	1	–	60	–	90	120	115	105	12	111	10	180	86.0	30	M16	14.5	24
	FEM-E-S	MGS	3 b)	60	52.5	13	82 ± 0.1	30 ± 0.1	98	82			16	75	64.0	15	M16	13.0	20
	FEM-E-B	MGD	3 b)	80	60	13	90 ± 0.1	35 ± 0.1	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 ± 0.1	35 ± 0.1	106	98			8	80	79.0	15	M18	15.0	25
	FEM-E-B	MGD	3 b)	80	60	13	90 ± 0.1	35 ± 0.1	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 ± 0.1	35 ± 0.1	106	98			8	88	79.0	15	M18	15.0	25
	FEM-E-B	MGD	3 b)	80	60	13	90 ± 0.1	35 ± 0.1	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 ± 0.1	46 ± 0.1	114	113			1	151	92.0	17	M20	17.0	30
	FEM-E-B	MGD	3 a)	80	60	13	90 ± 0.1	35 ± 0.1	98	84			14	142	64.5	31	M18	15.0	25

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

AOK-040

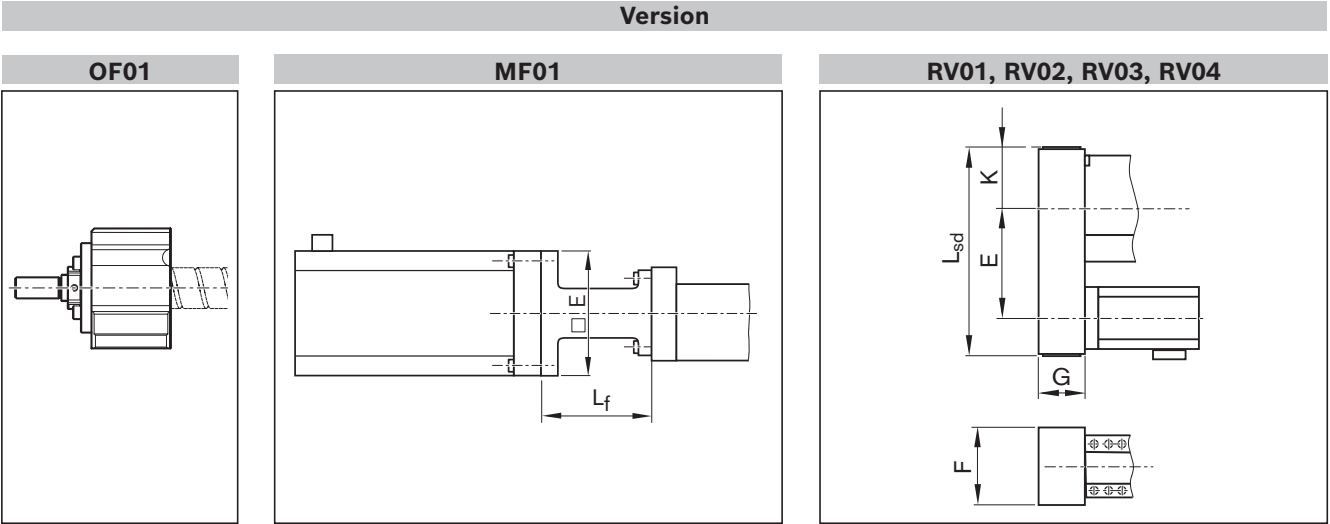
Nut dimension drawings



AOK-040 d ₀ x P	Nut	Dimensions (mm)										
		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 L₃ ≤ 15 mm, countersink L₃ > 15 mm;

Motor attachment dimension drawings



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

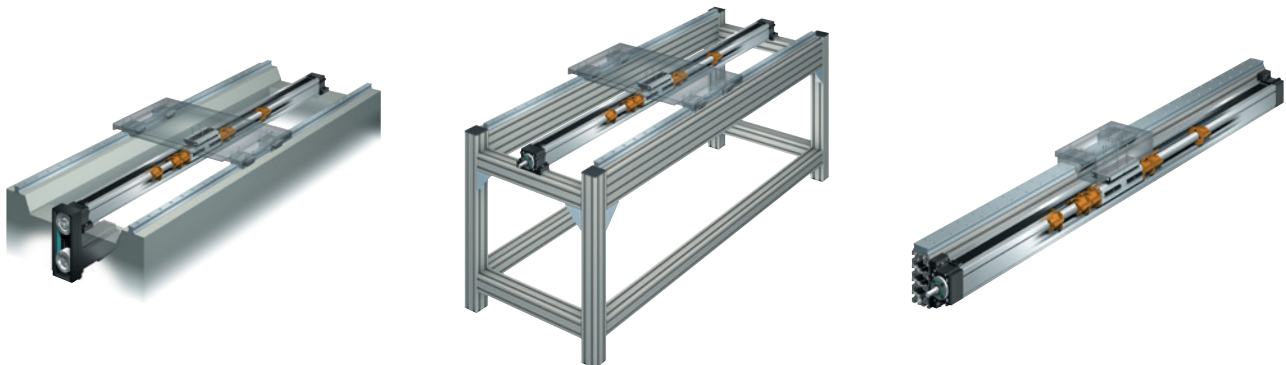
Further highlights

- 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)

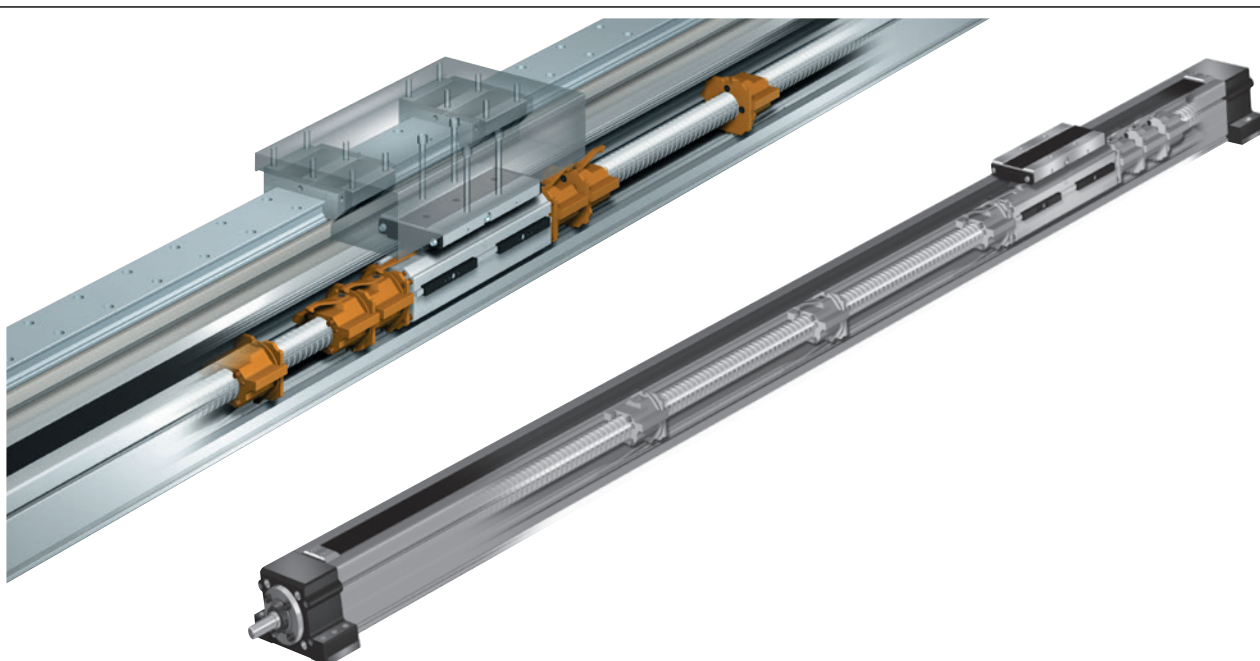
The screw support (SPU) offers the following advantages:

- 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.

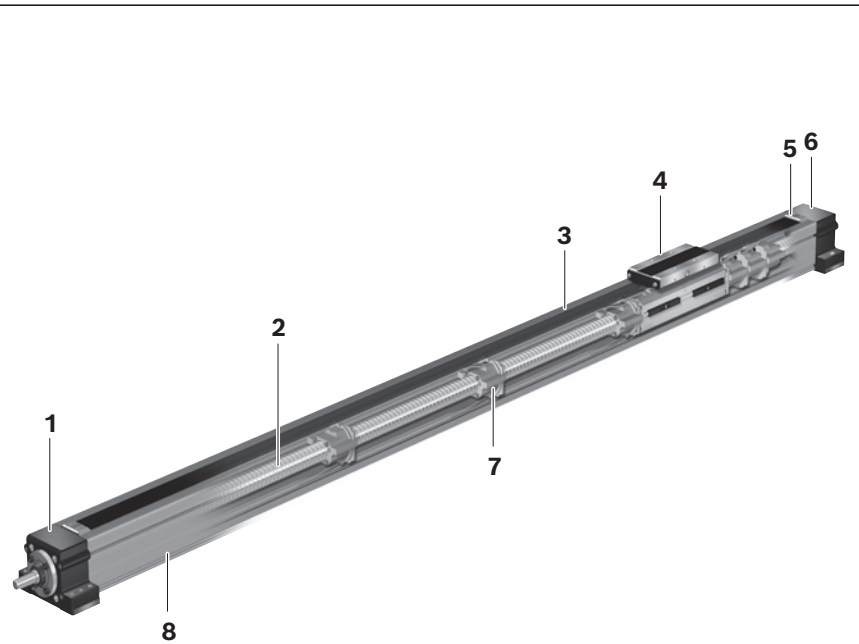
As the length of screw-driven linear axes increases, the distance between screw supports increases. As the unsupported length increases, undesirable screw oscillation causes the resonance range to be reached more quickly, reducing rotary speed/maximum permissible speed accordingly.

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

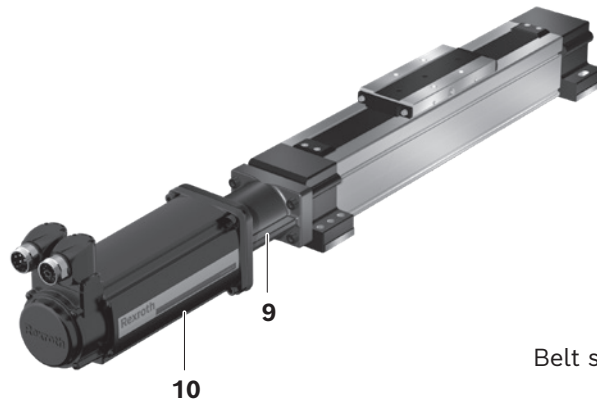
- 1 Pillow block (fixed bearing)
- 2 Ball screw assembly with zero-backlash, cylindrical single nut
- 3 Steel or plastic sealing strip
- 4 Nut housing
- 5 Strip fixing
- 6 Pillow block (floating bearing)
- 7 Screw support (SPU)
- 8 Protective profile



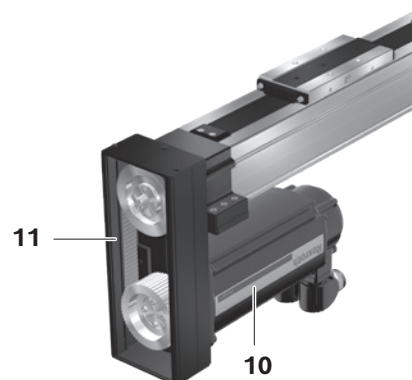
Motor attachment

- 9 Flange and coupling
- 10 Servo motor
- 11 Belt side drive

Flange and coupling



Belt side drive

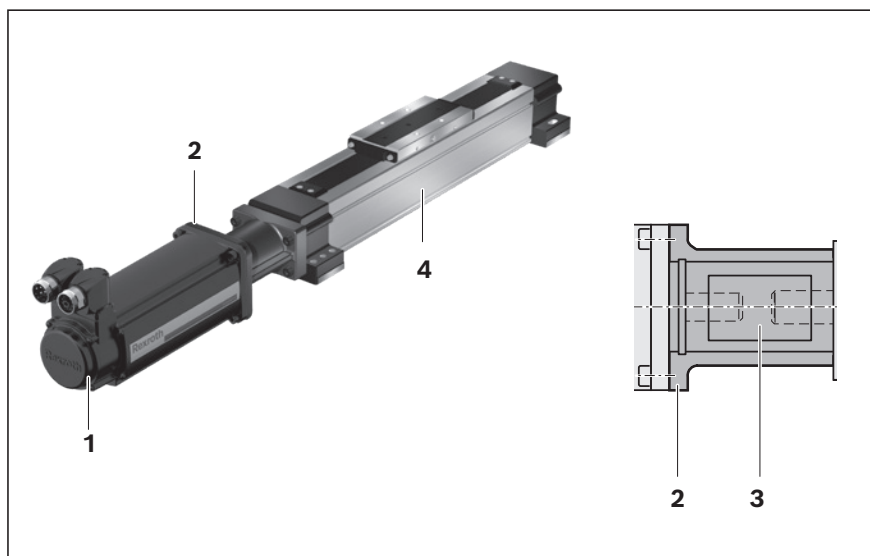


Motor attachment with flange and coupling

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

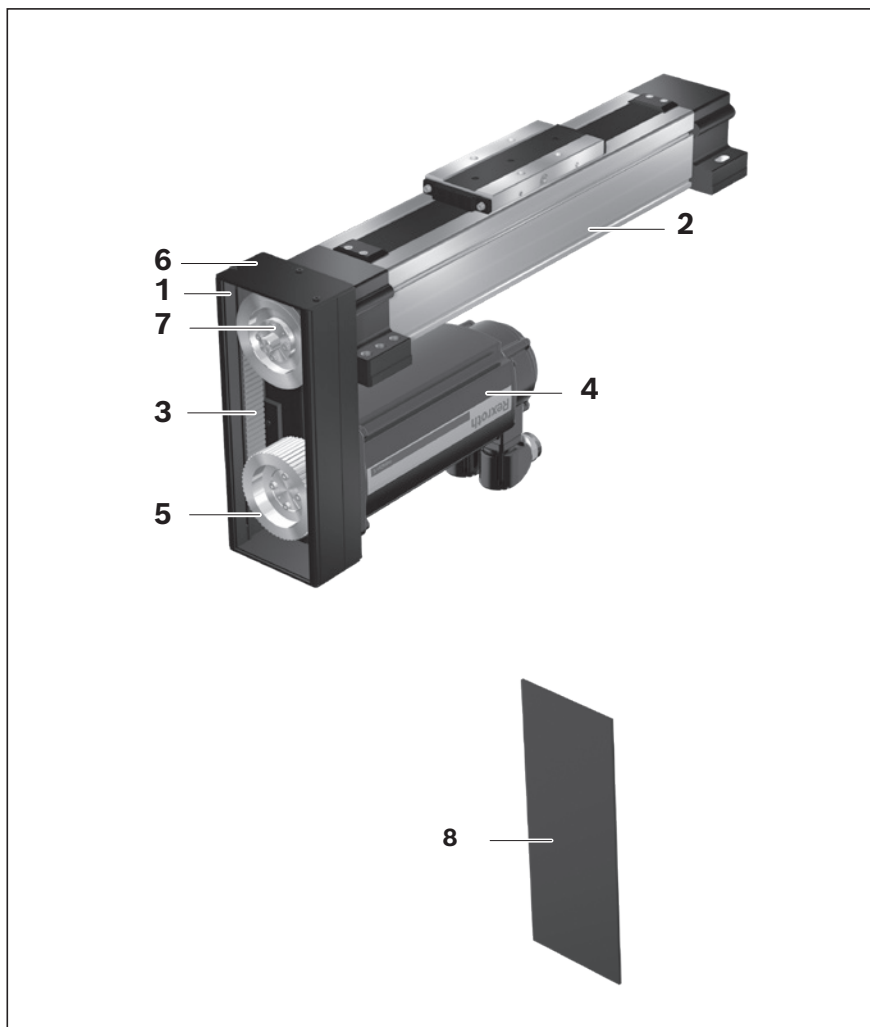
All drive units can be attached to the motor by a belt side drive. This makes the total length shorter than when attaching the motor with flange and coupling. The space-saving, closed pulley housing serves as protection for the belt and as a motor bracket. Various gear ratios are also available (depending 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		Min. travel range	Max. length	Additional length				Nut housing length	Moved mass of system	Mass constants			
		Dynamic load capacity C Nut	Fixed bearing			with number of SPU						L _c (mm)	m _{ca} (kg)	k _{g fix} (kg)	k _{g var} (kg/mm)
						Without 1 2 3									
						L _{ad} (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)

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

Length calculation

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

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

Effective stroke

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

Drive data

AGK	BASA	Constant mass moment of inertia			Frictional torque				Max. permissible acceleration	Max. drive torque	Max. speed	
		$d_0 \times P$ (mm)	$k_{J \text{ fix}}$ (kgmm ²)	$k_{J \text{ var}}$ (kgmm)	$k_{J \text{ m}}$ (mm ²)	with number of SPU						
						Without	1	2				3
					M_{Rs} (Nm)				a_{max} (m/s ²)	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)		J _{sd} (10 ⁻⁶ kgm ²)		M _{Rsd} (Nm)	m _{sd} (kg)	F (mm)	B _t	
				i = 1	i = 2	i = 1	i = 2				i = 1	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

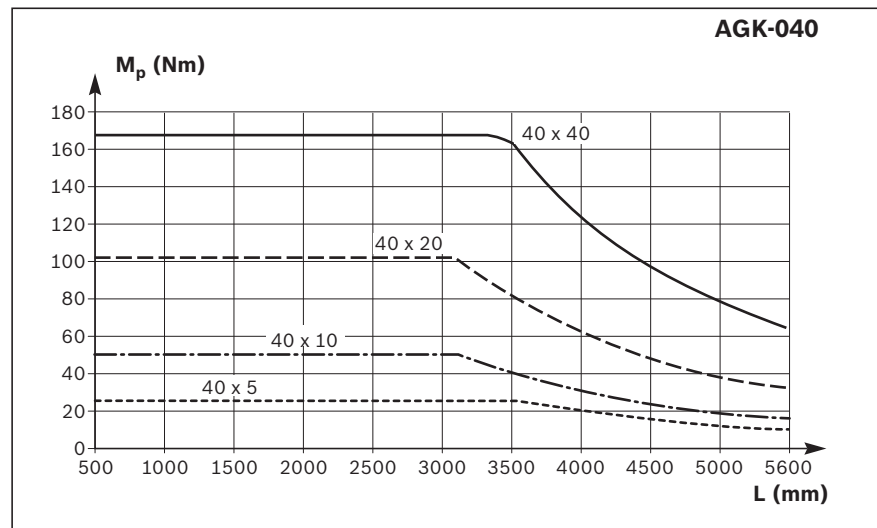
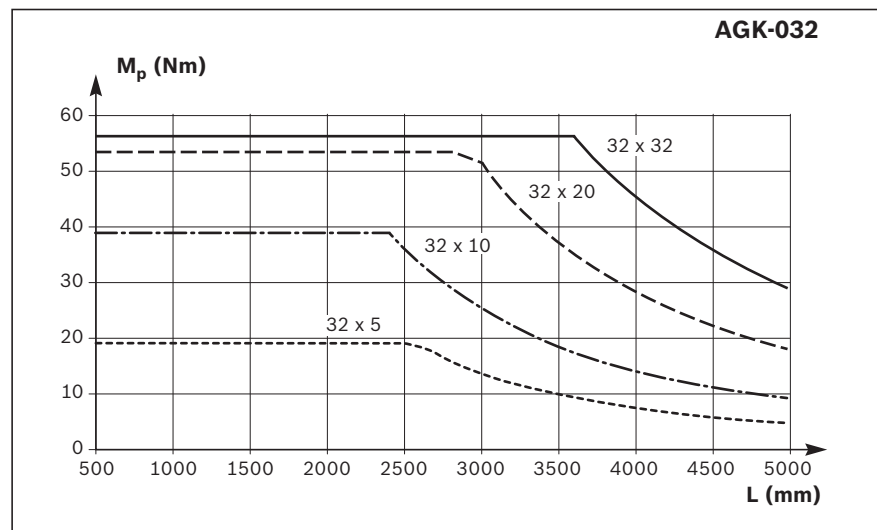
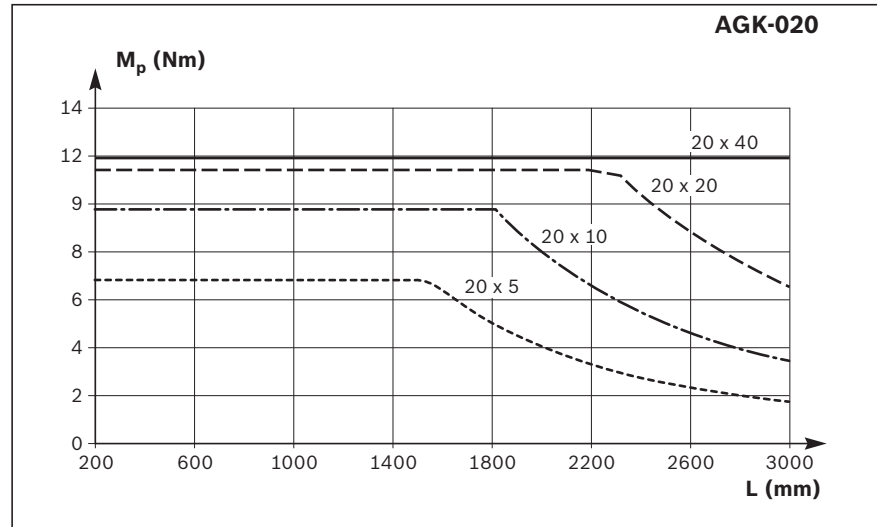
AGK	Motor	Coupling	M _{cn}		J _c		Flange and coupling
			(Nm)		(10 ⁻⁶ kgm ²)		m _{fc} (kg)
AGK-020	MSM041B		14.5		63		0.85
	MS2N04		19.0		57		0.55
	MS2N05		50.0		210		2.00
AGK-032	MS2N06		50.0		210		1.80
AGK-040	MS2N07		115.0		390		2.70

Technical data

Permissible drive torque M_p

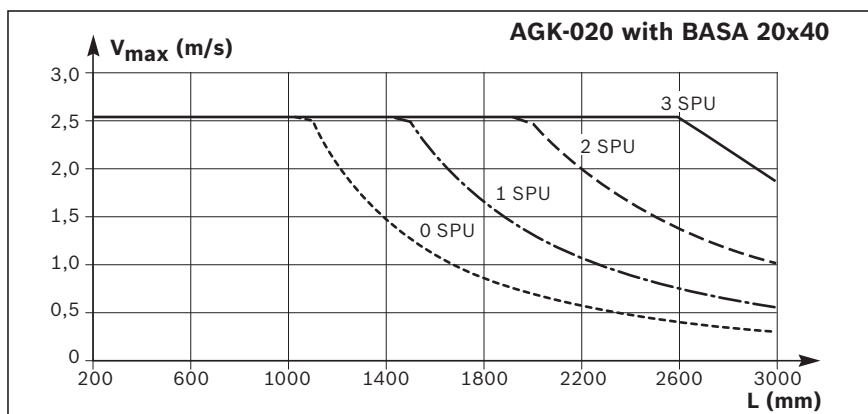
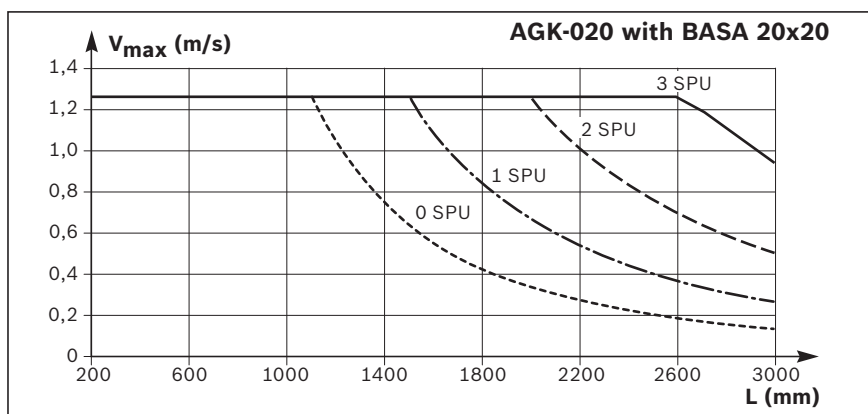
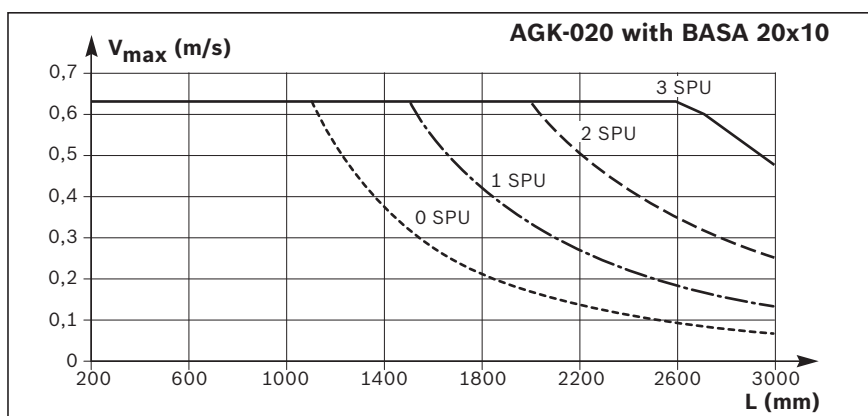
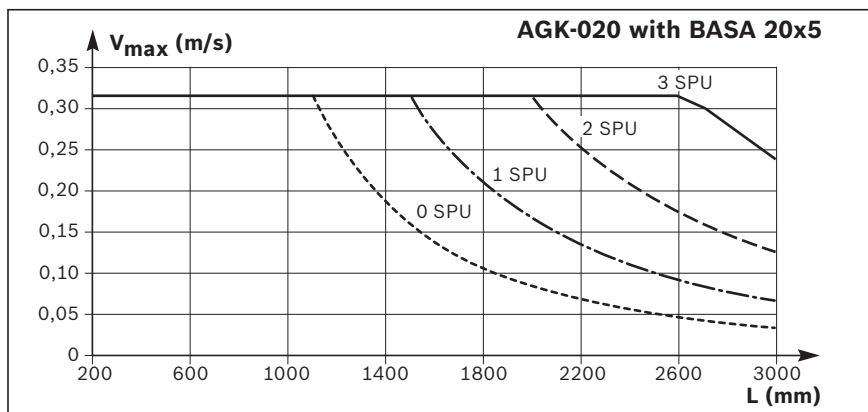
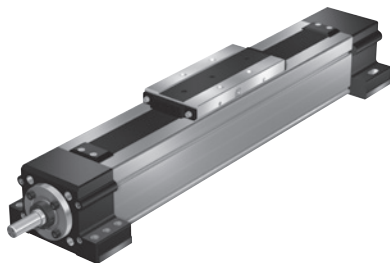
The values shown for M_p apply under the following conditions:

- No radial load on screw journal



Permissible speed $v_{\max}$

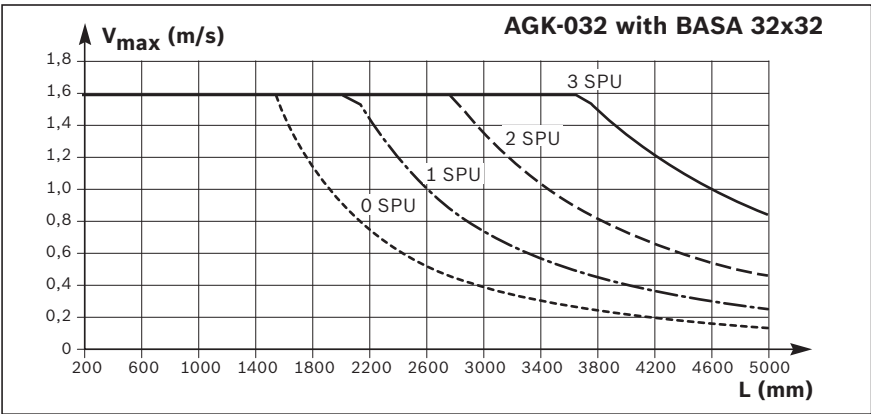
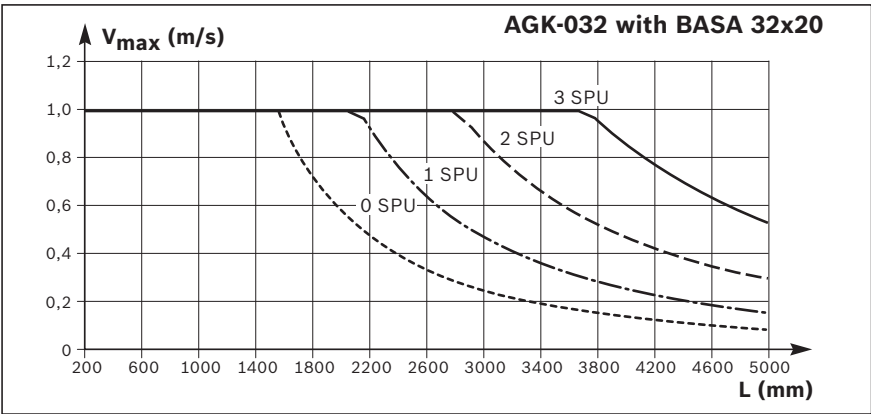
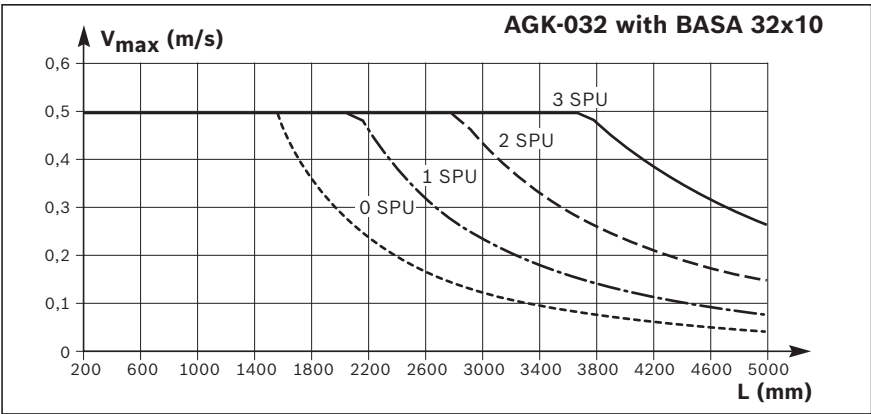
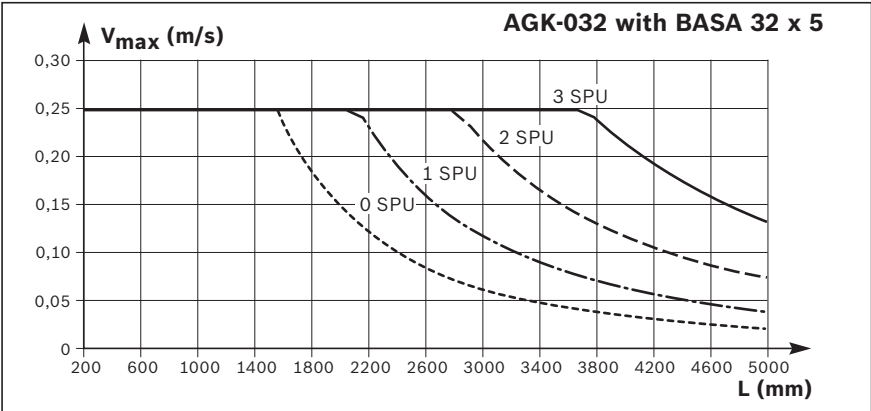
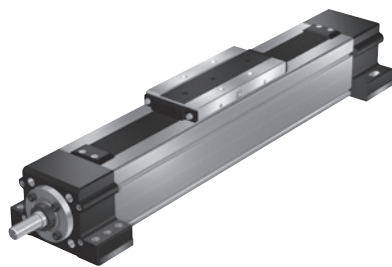
SPU = screw support



Technical data

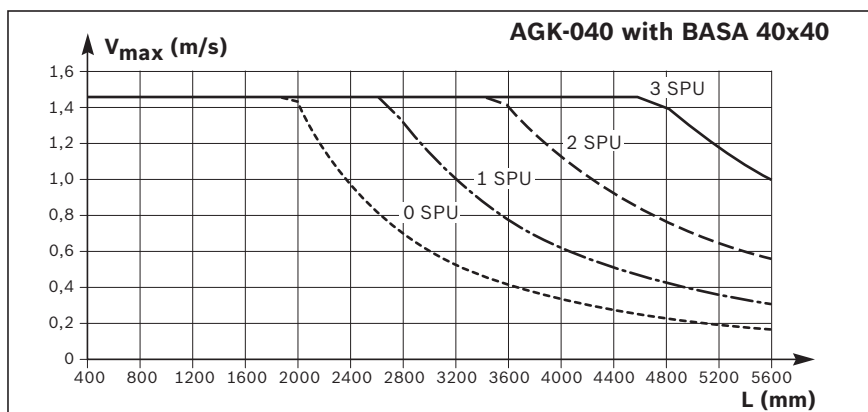
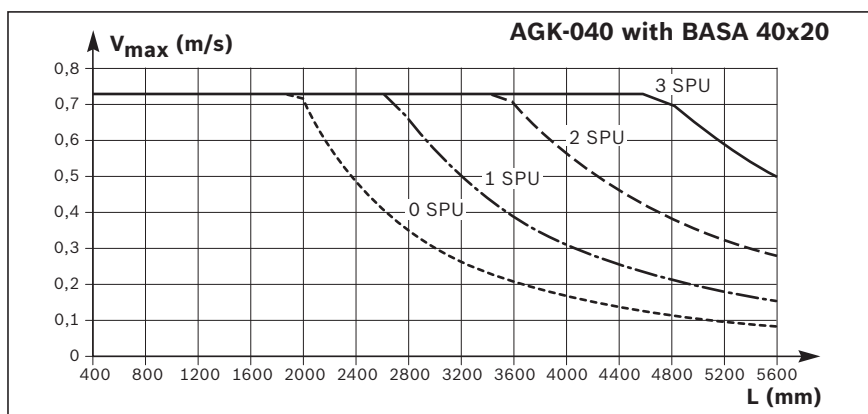
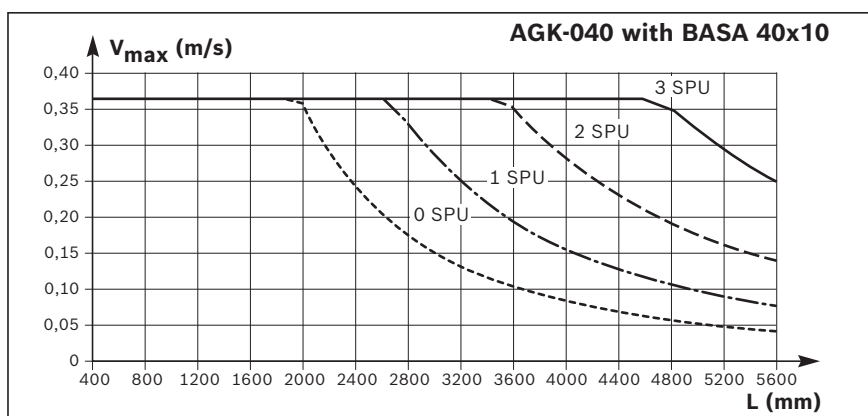
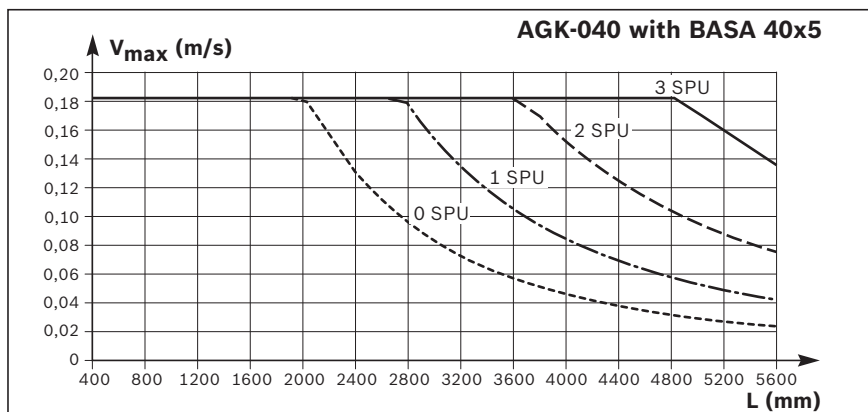
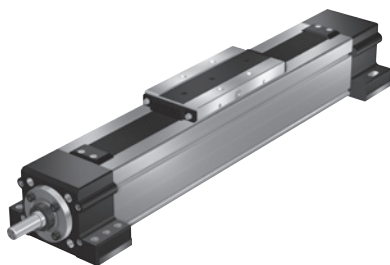
Permissible speed $v_{\max}$

SPU = screw support



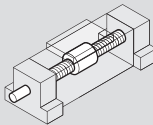
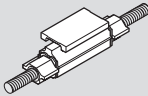
Permissible speed $v_{\max}$

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				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											Tolerance grade	Standard	With initial greasing
	 ZEM-E	01	04	02	03	T5 T7	1	1	3	81	31	02	01	11	12	13	 MR01 Left  MR02 Top  MR03 Right		

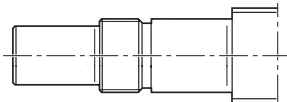
Length calculation ➡ "Technical data" section
Order example ➡ "Service and information/ordering" section

BASA = Ball screw assembly
d₀ = Ball screw assembly nominal diameter (mm)
P = Lead (mm)
SPU = Screw support

Screw ends:

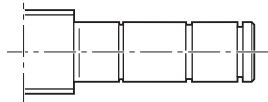
Fixed bearing end (left)

81

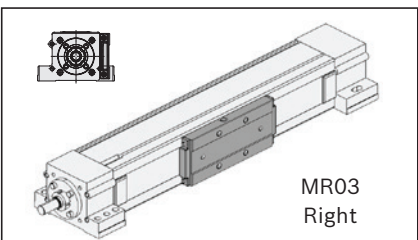
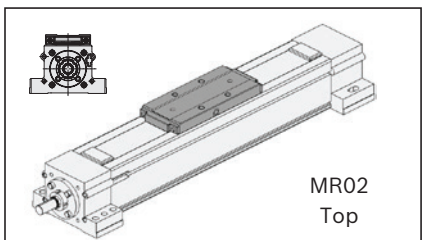
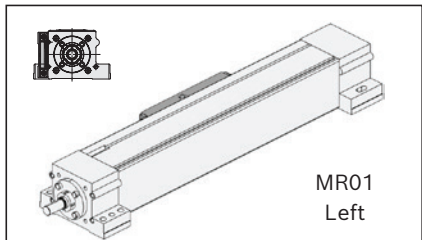


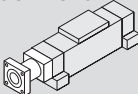
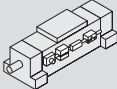
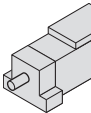
Floating bearing end (right)

31



Nut housing Mounting orientation



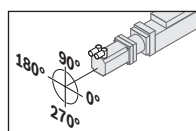
Motor attachment				Motor ²⁾								Cover		Switch/ socket-plug		Documentation			
				Motor code				2 cable		1 cable		Motor connector position							
				Attachment kit ¹⁾					Without brake	With brake	Without brake	With brake		Steel	PU			Standard report	Measurement report
	Without flange	OF01 	-	-	00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

1) Attachment kit also available without motor (when ordering: enter "00" for motor)

2) Recommended motor (motor data and type designations → "Motors" section)

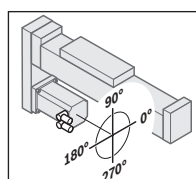
3) SPUs always have the same number on each side of the nut housing, example: 3 SPUs (option 13) mean a total 6 SPUs (3 left and 3 right)

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



Example:
Belt side drive RV01
Motor connector
position 180°

★ standard delivery

AGK-020

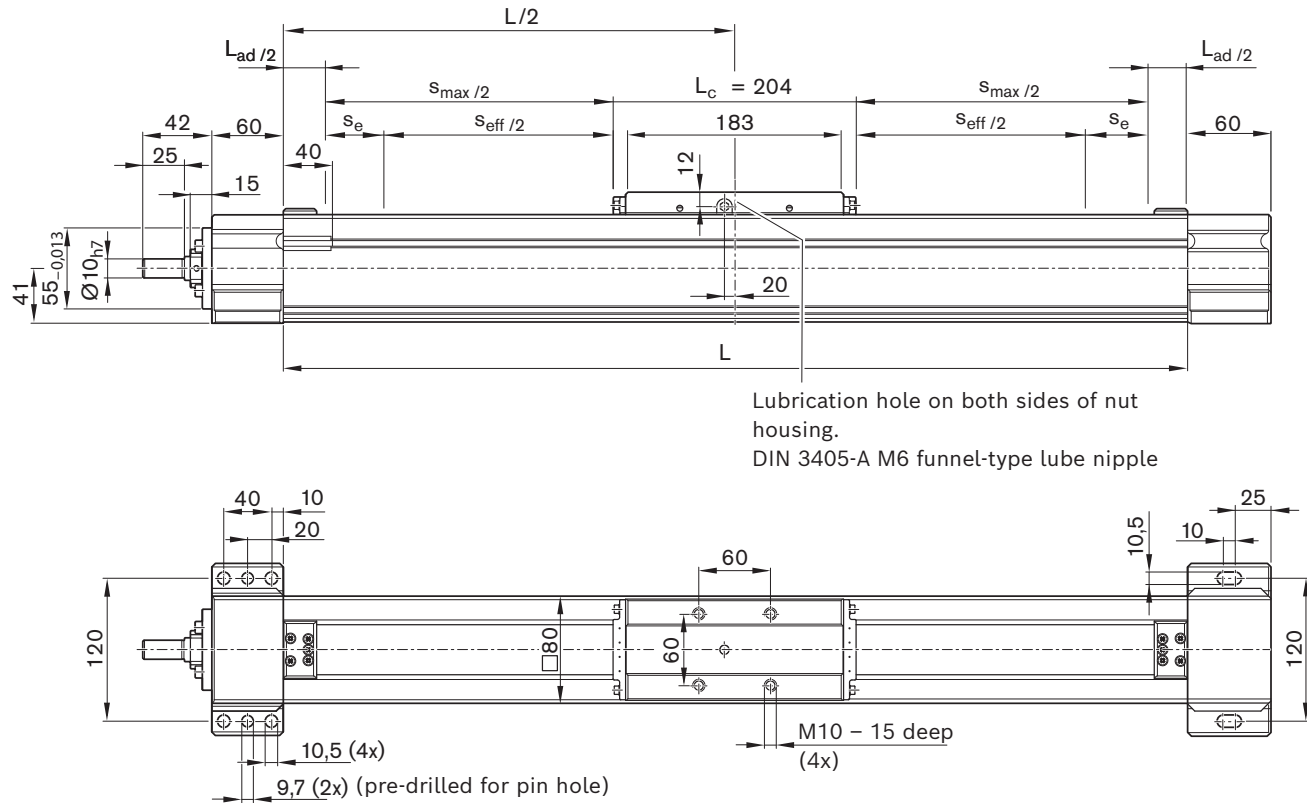
Dimensional drawings

All dimensions are given in mm. Drawings not to scale.

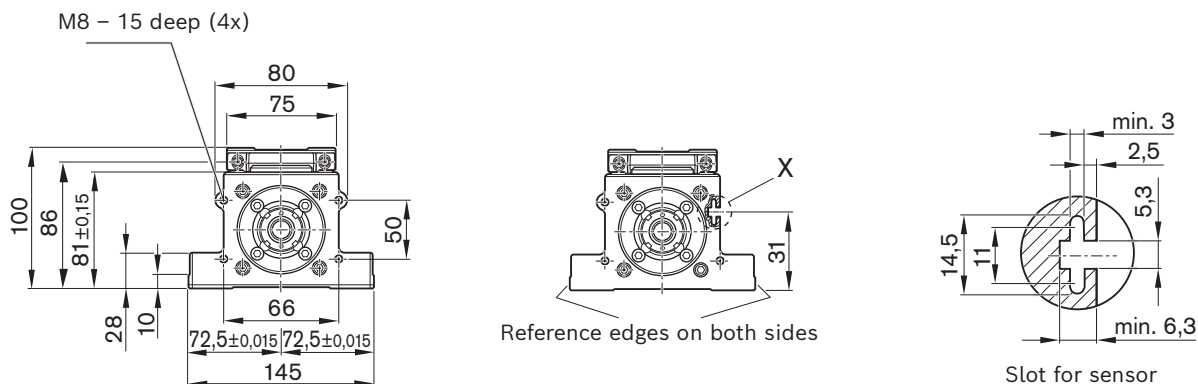
Straightness and flatness tolerance in accordance with DIN EN 12020-02

Fixed bearing end

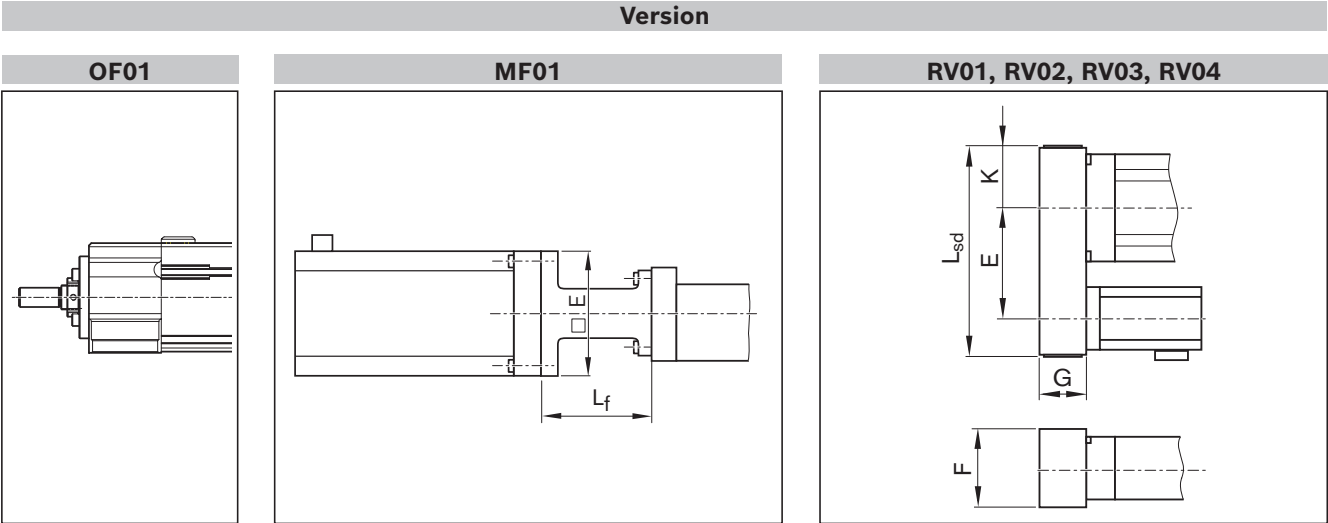
Floating bearing end



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



Motor attachment dimension drawings



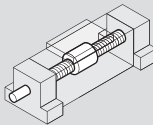
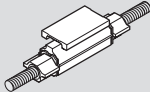
Version	Motor code	Dimensions (mm)	
		L _f	□E
MF01	MSM 041B	90	see dimension □ A ➡ "Motors" section
	MS2N04-B0BTN		
	MS2N04-C0BTN		
	MS2N04-D0BQN		
	MS2N05-B0BTN	115	
	MS2N05-C0BTN		
	MS2N05-D0BRN		

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

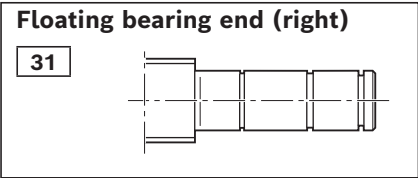
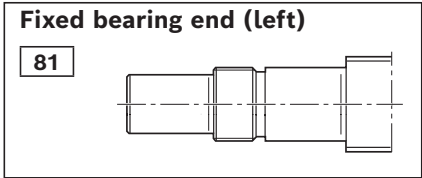
Configuration and ordering

Short product name, length AGK-032-NN-1, mm	Drive BASA											Pillow block	Nut housing without SPU 	Nut housing with SPU 			Nut housing Mounting orientation			
		Nut	BASA size d ₀ x P				Seal	Lubrication With initial greasing	Preload class C1 (moderate)	Screw ends				Number SPU per end ³⁾						
			32 x 5	32 x 10	32 x 20	32 x 32				Tolerance grade	Standard			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		

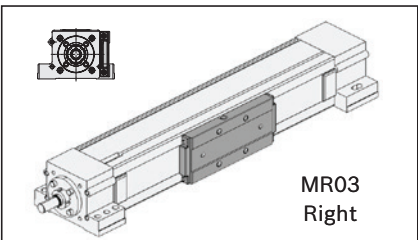
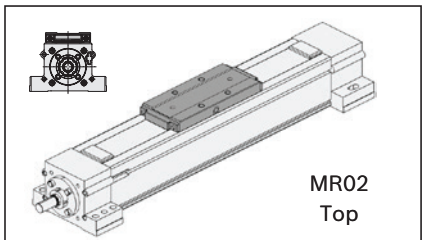
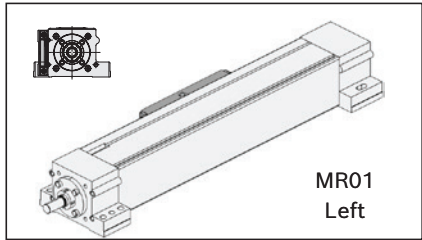
Length calculation ➡ "Technical data" section
Order example ➡ "Service and information/ordering" section

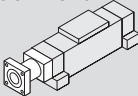
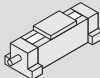
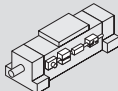
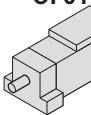
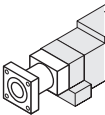
BASA = Ball screw assembly
d₀ = Ball screw assembly nominal diameter (mm)
P = Lead (mm)
SPU = Screw support

Screw ends:



Nut housing
Mounting orientation



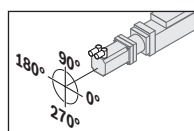
	Motor attachment			Motor ²⁾								Cover		Switch/ socket-plug	Documentation	
																
		i=	Attachment kit ¹⁾	Motor code	2 cable		1 cable		Motor connector position		Steel	PU		Standard report	Measurement report	
					Without brake	With brake	Without brake	With brake								
Without flange	OF01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

¹⁾ Attachment kit also available without motor (when ordering: enter "00" for motor)

²⁾ Recommended motor (motor data and type designations → "Motors" section)

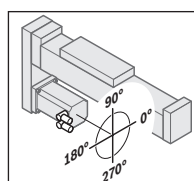
³⁾ SPU always have the same number on each side of the nut housing, example: 3 SPUs (option 13) mean a total 6 SPUs (3 left and 3 right)

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



Example:
Belt side drive RV01
Motor connector
position 180°

★ standard delivery

AGK-032

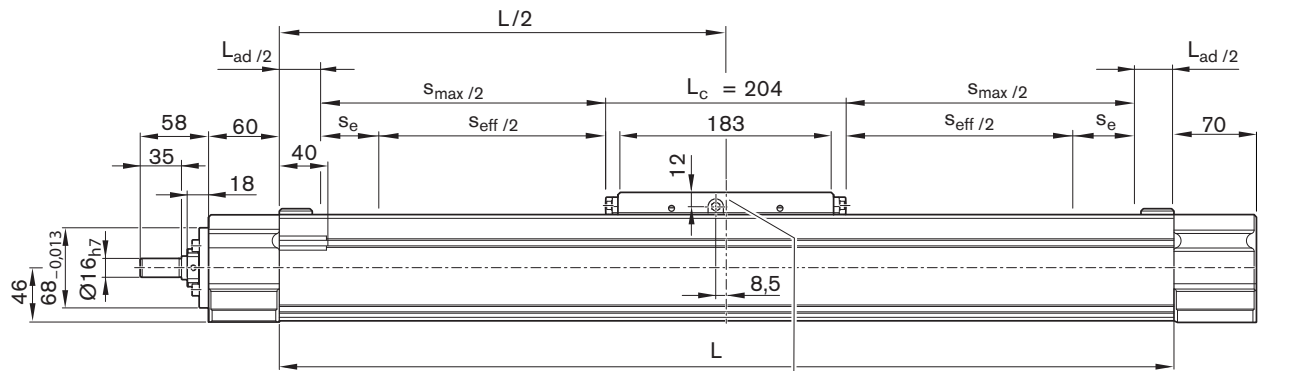
Dimensional drawings

All dimensions are given in mm. Drawings not to scale.

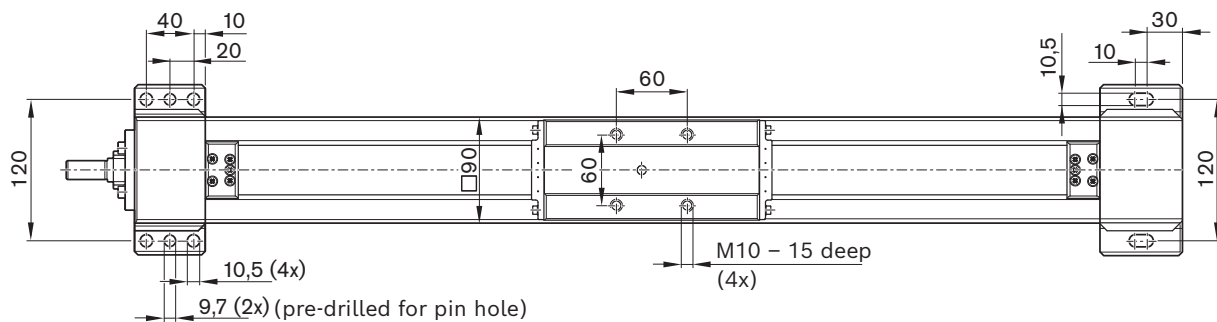
Straightness and flatness tolerance in accordance with DIN EN 12020-02

Fixed bearing end

Floating bearing end

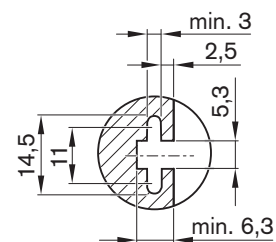
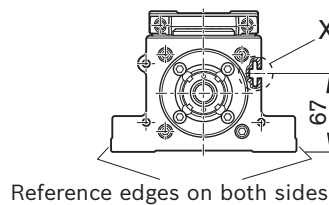
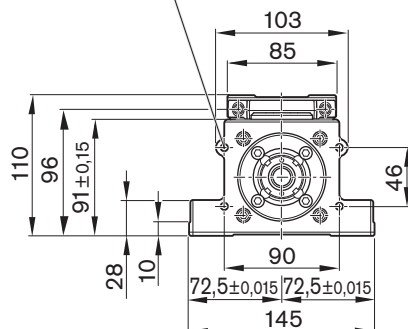


Lubrication hole on both sides of nut housing.
DIN 3405-A M6 funnel-type lube nipple

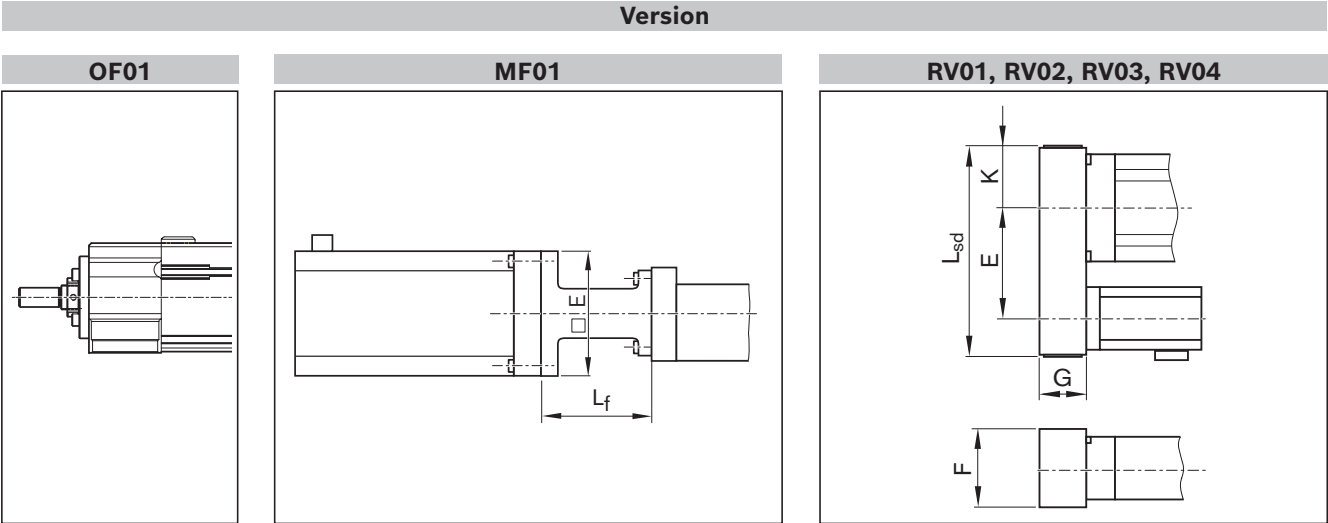


L_{ad} = additional length (see "Technical data" section)

M8 – 15 deep (4x)



Motor attachment dimension drawings



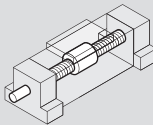
Version	Motor code	Dimensions (mm)	
		L _f	□E
MF01	MS2N06-B1BNN	125	see dimension □ A ➡ "Motors" section
	MS2N06-C0BTN		
	MS2N06-D0BRN		
	MS2N06-D1BNN		

Version	Motor code	Dimensions (mm)					
		E		F	G	K	L _{sd}
		i = 1	i = 2				
RV01, RV02, RV03, RV04	MS2N06-B1BNN	165	–	116	66	59	300
	MS2N06-C0BTN	–	162				–
	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							Screw ends		Pillow block	Nut housing without SPU 	Nut housing with SPU			Nut housing Mounting orientation							
		Nut	BASA size d ₀ x P				Seal					Lubrication	Preload class	Number SPU per end ³⁾								
			40 x 5	40 x 10	40 x 20	40 x 40		Tolerance grade	Standard					With initial greasing		C1 (moderate)	Left (fixed bearing)	Right (floating bearing)	Aluminum	1	2	3
	 ZEM-E	01				T5 T7	1	1	3	81	31	02	01	11	12	13	 MR01 Left					
																	 MR02 Top					
		02	03	04		T5 T7	1	1	3	81	31	02	01	21	22	23	 MR03 Right					

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

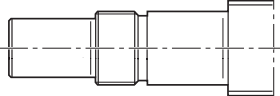
BASA = Ball screw assembly
d₀ = Ball screw assembly nominal diameter (mm)
P = Lead (mm)
SPU = Screw support

Screw ends:

Nut housing
Mounting orientation

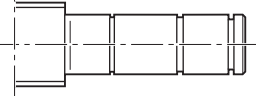
Fixed bearing end (left)

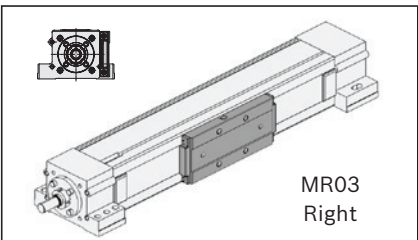
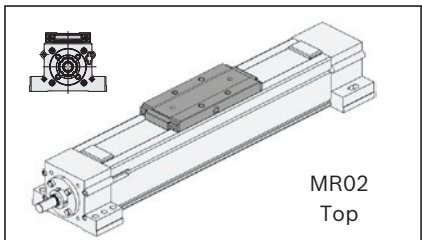
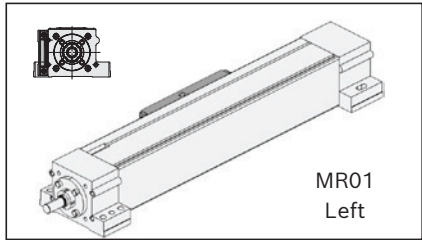
81

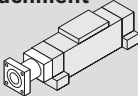
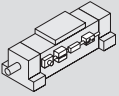
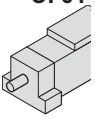
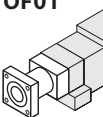
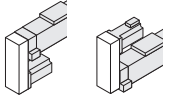
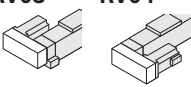


Floating bearing end (right)

31





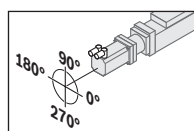
	Motor attachment			Motor ²⁾							Cover		Switch/ socket-plug	Documentation	
															
				Motor code	2 cable		1 cable		Motor connector position		Steel	PU		Standard report	Measurement report
		i=	Attachment kit ¹⁾		Without brake	With brake	Without brake	With brake							
Without flange	OF01 	-	-	00	-	-	-	-	-	-	01	02	Without sensor Without socket-plug Magnetic sensor REED sensor Hall sensor PNP NC Socket-plug	00	01
	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						
	RV01 RV02  RV03 RV04 	1	025	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						
		2	026	MS2N07-B1BNN	253	254	255	256	180						
				MS2N07-C0BQN	257	258	259	260	270						
				MS2N07-C1BRN	261	262	263	264							
				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)

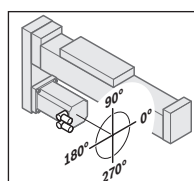
³⁾ SPU always have the same number on each side of the nut housing, example: 3 SPUs (option 13) mean a total 6 SPUs (3 left and 3 right)

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

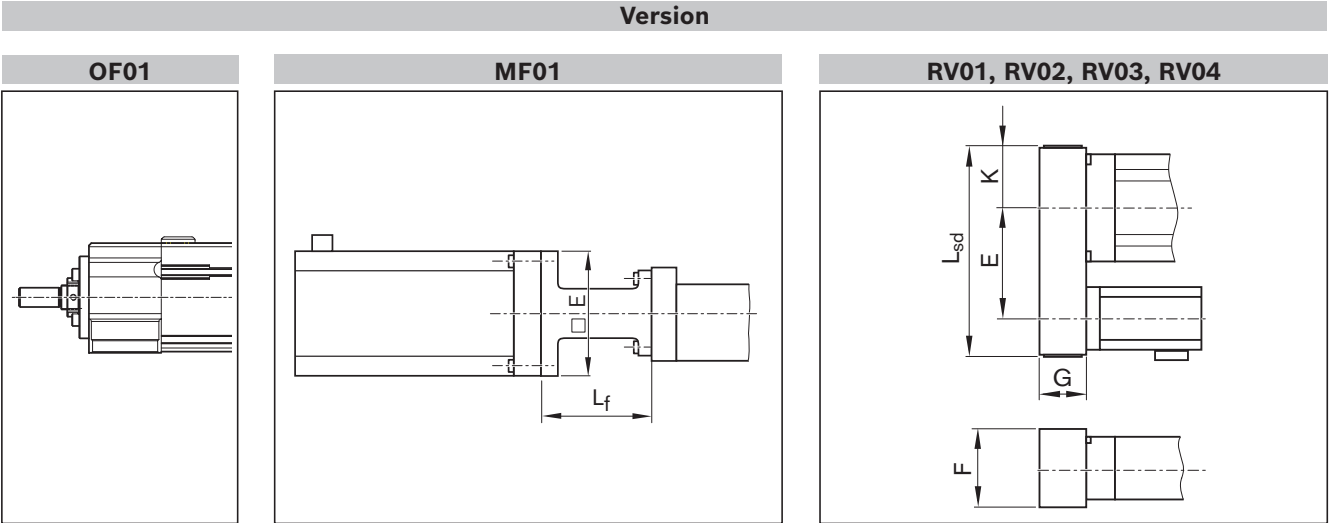


Example:
Belt side drive RV01
Motor connector
position 180°

★ standard delivery

Dimensional drawings

Motor attachment dimension drawings



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

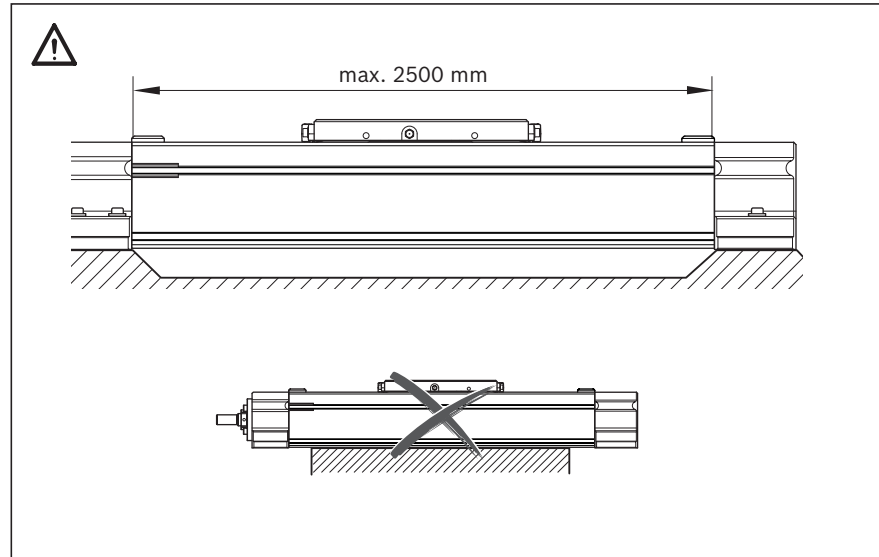
AGK fastening instructions

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"



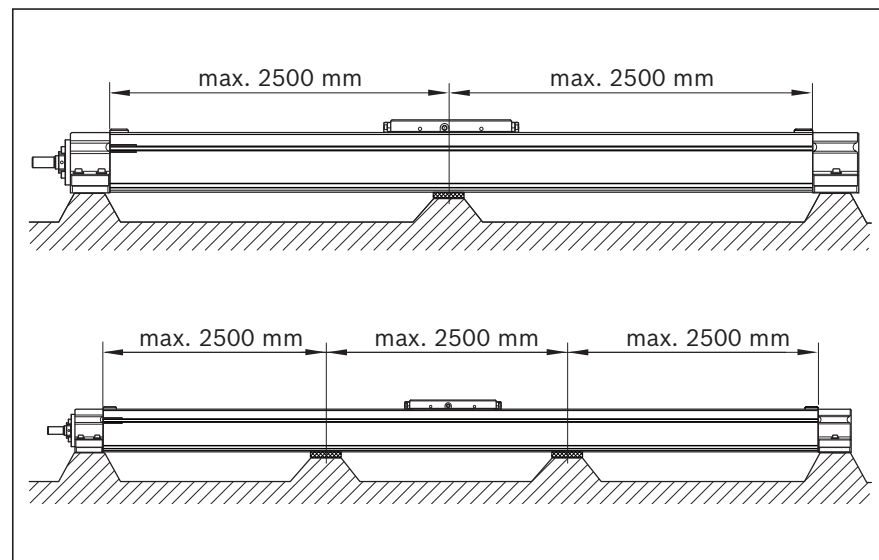
Provide supports for the protective profile

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 2500 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.

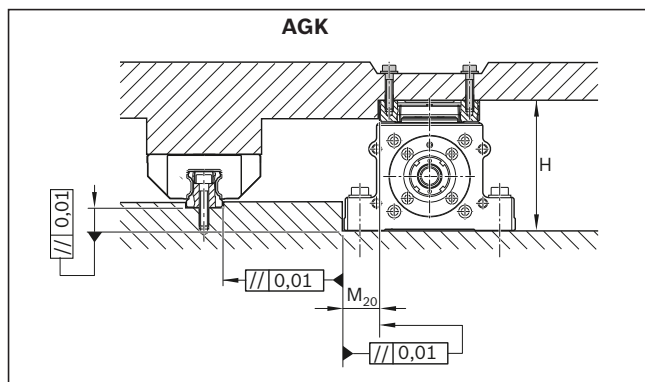
When the drive unit is in operation, the protective profile lifts as the drive carriage passes over it, then sinks back down onto the supporting surface.

Provide cushioning material on the surfaces of the protective profile supports, e.g., foam rubber pads.

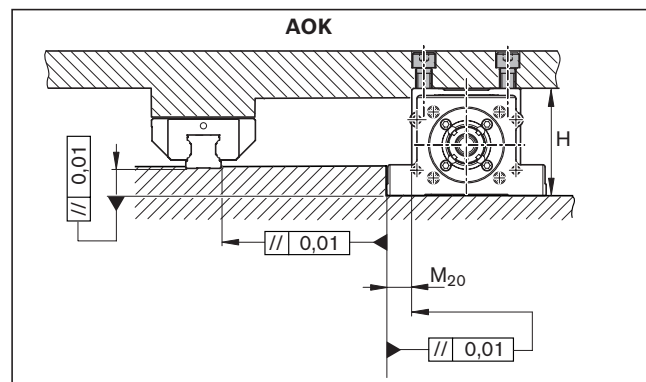


AGK/AOK installation tolerances

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



	Dimensions (mm)	
	H ± 0.01	M ₂₀ ± 0.01
AGK-020	100	35.0
AGK-032	110	30.0
AGK-040	135	37.5



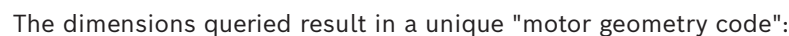
AOK-020 d ₀ x P	Nut	Nut housing	Dimensions (mm)	
			H ± 0.01	M ₂₀ ± 0.01
20 x 5	ZEM-E	MGA	85	35
	FEM-E-S	MGS	73	35
	FEM-E-B	MGD	69	35
20 x 10	ZEM-E	MGA	85	35
	FEM-E-S	MGS	73	35
	FEM-E-B	MGD	69	35
20 x 20	ZEM-E	MGA	85	35
	FEM-E-S	MGS	75	30
	FEM-E-B	MGD	69	35
20 x 40	ZEM-E	MGA	85	35
	FEM-E-S	MGS	75	30

AOK-032 d ₀ x P	Nut	Nut housing	Dimensions (mm)	
			H ± 0.01	M ₂₀ ± 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 d ₀ x P	Nut	Nut housing	Dimensions (mm)	
			H ± 0.01	M ₂₀ ± 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

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).

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.



ØD = Shaft diameter
C = Shaft length
ØE = Centering diameter
C₁ = Centering depth
ØF = Pitch diameter
ØG = Drill hole for mounting screw (specify thread diameter)
B₁ = Flange thickness
A = Flange edge dimension

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

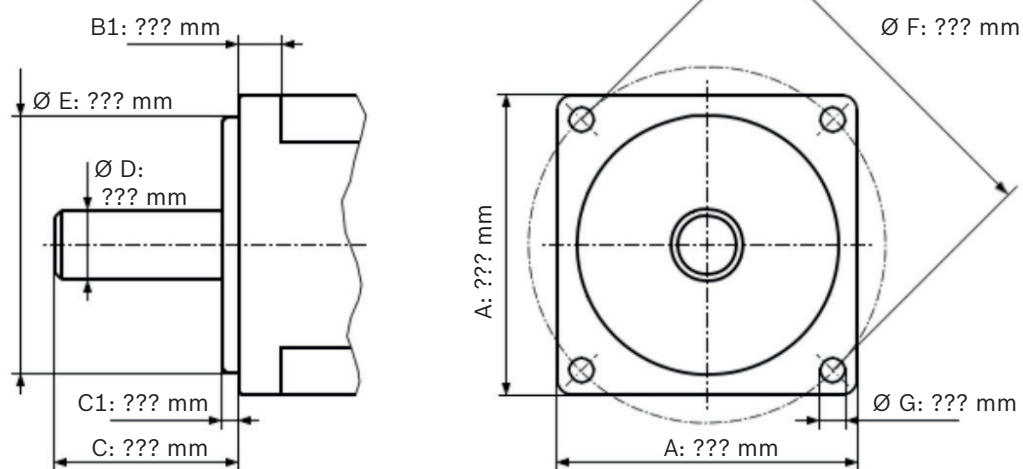
¹⁾ The drill hole Ø 6.6 mm results in the type designation M06 for the geometry motor code (nominal thread diameter mounting screw M6).

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 ▼

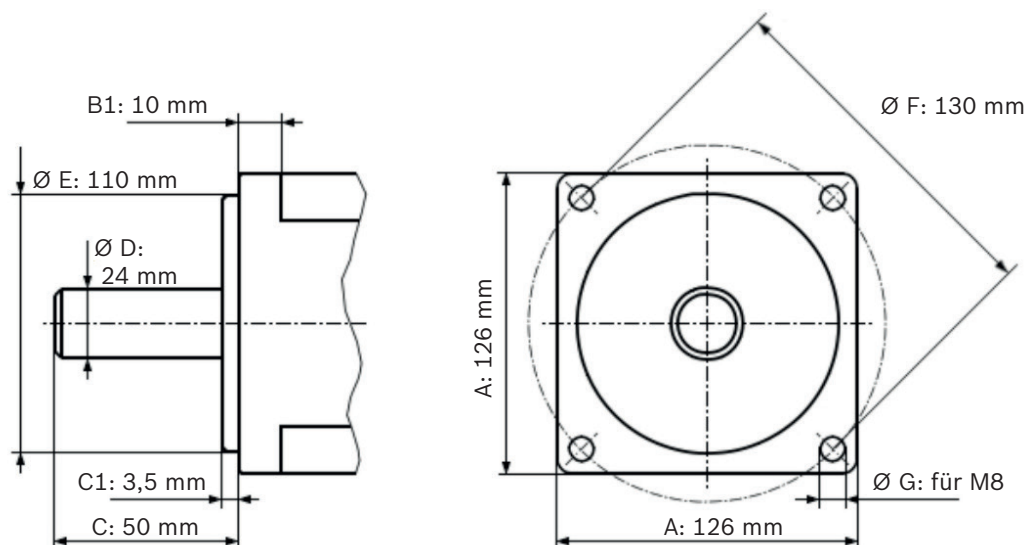


Example

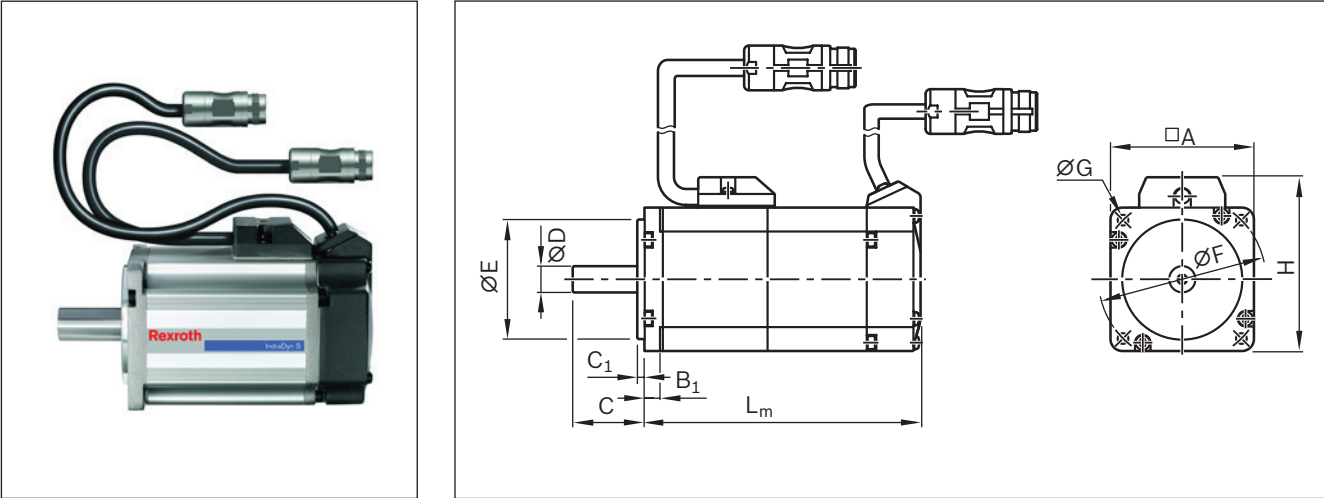
Dimensions customer motor

Motor manufacturer ▼

Motor type ▼



IndraDyn S - MSM servo motors



Motor code	Dimensions (mm)										L _m		
	□A	B ₁	C	C ₁	Ø D	Ø E	Ø F	Ø G	H	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:

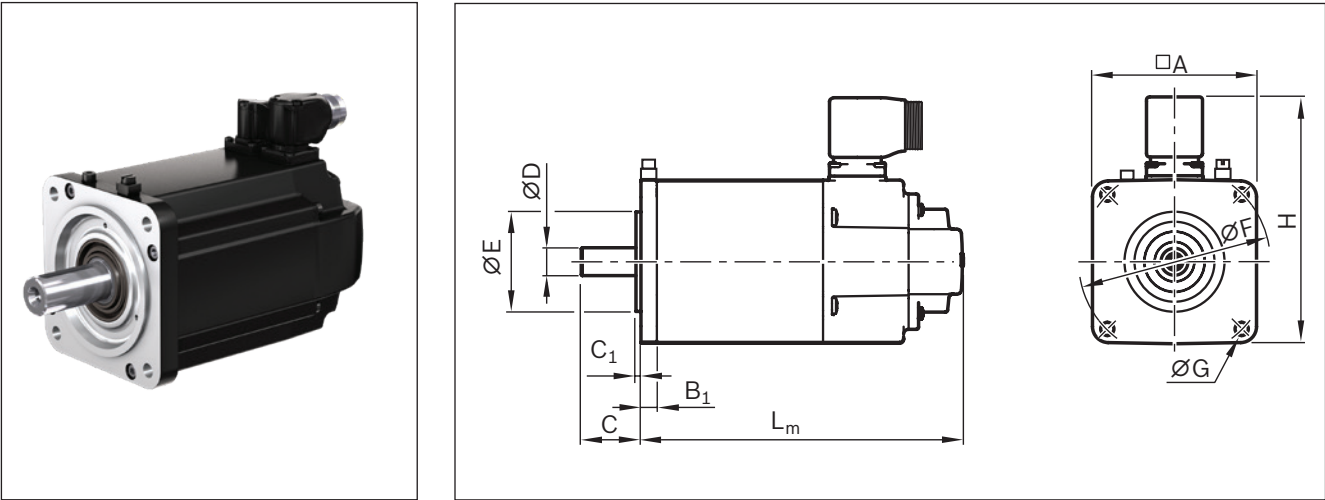
- ▶ Plain shaft without shaft seal
- ▶ M5 multi-turn absolute encoder (20-bit, absolute encoder function only available with backup battery)
- ▶ Cooling: Natural convection
- ▶ IP54 rating (shaft: IP40)
- ▶ With or without holding brake
- ▶ M17 metal round connector

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								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)				
	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)												L _m	
	□A	B ₁	C	C ₁	Ø D _{k6}	Ø E _{j7}	Ø F	Ø G	Cable		H			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

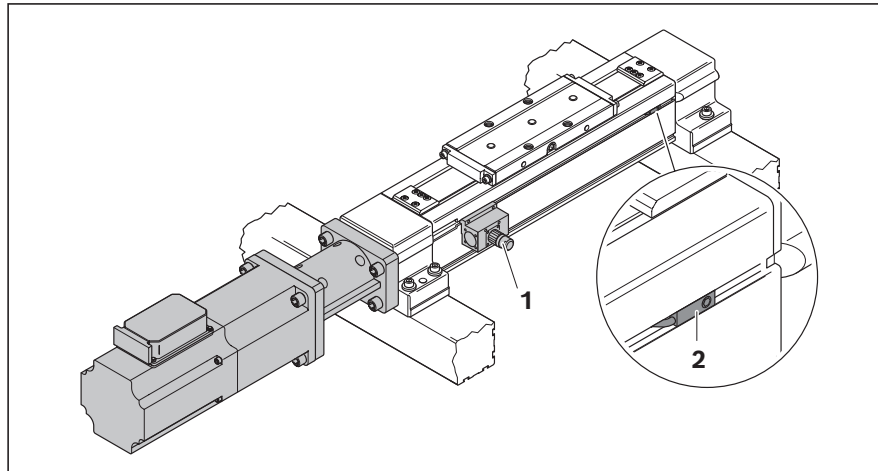
Motor code	Dimensions (mm)												
	□A	B ₁	C	C ₁	∅ D _{k6}	∅ E _{j7}	∅ F	∅ G	H		Brake		L _m
									Cable 2	1	Without	With	
MS2N06-B1BNN	116	14	50	3	24	95	130	9	156	156	164	201	
MS2N06-C0BTN	116	14	50	3	24	95	130	9	156	156	184	202	
MS2N06-D0BRN	116	14	50	3	24	95	130	9	156	156	224	261	
MS2N06-D1BNN	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.

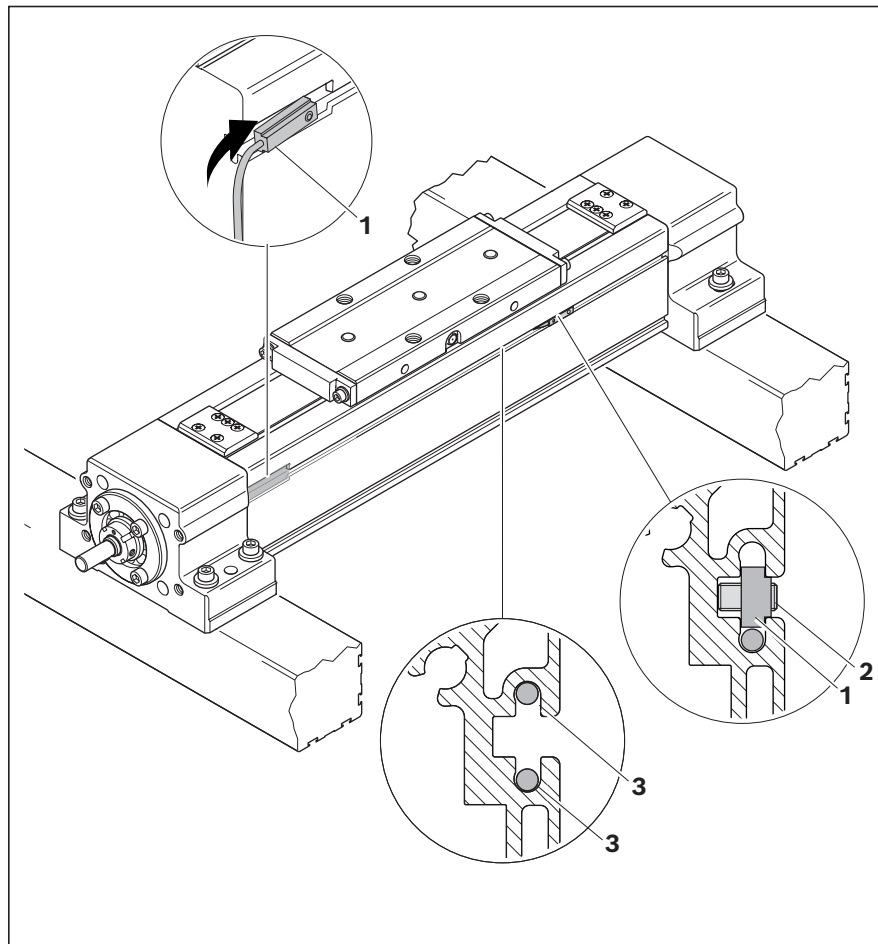
Version

- 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

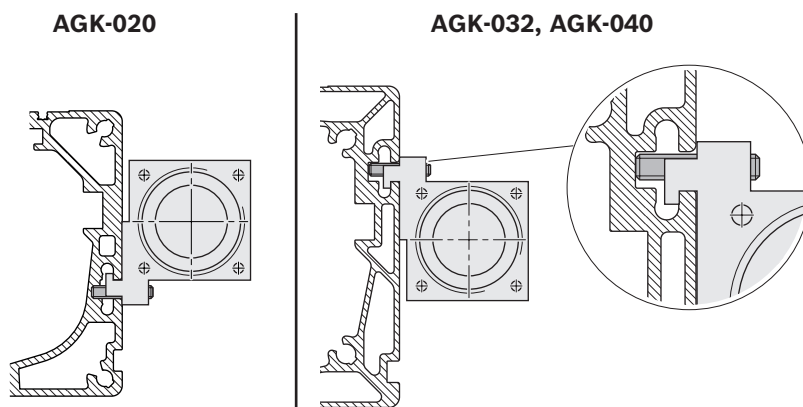
Mounting position

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

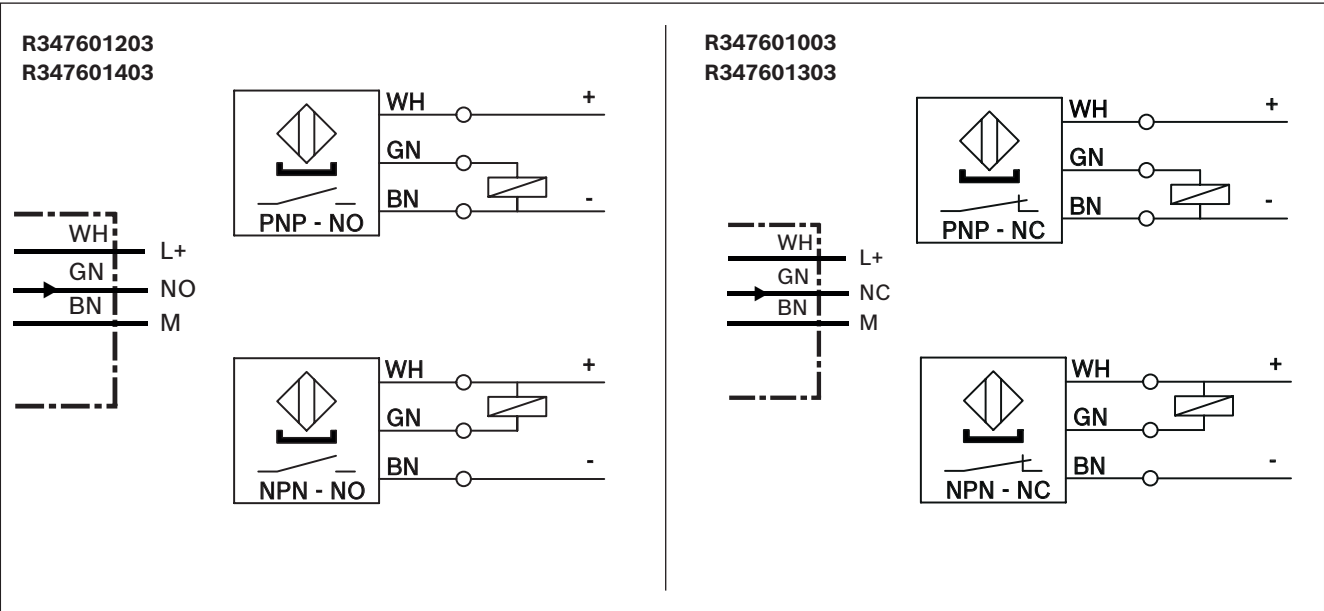
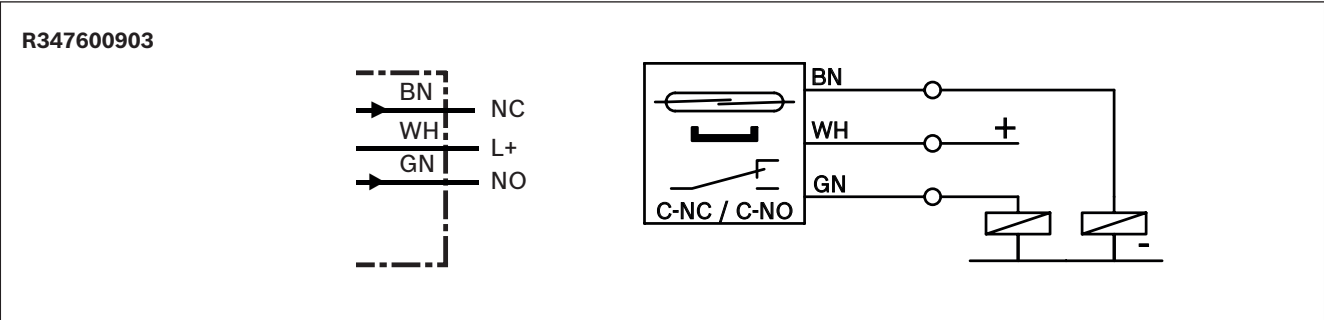
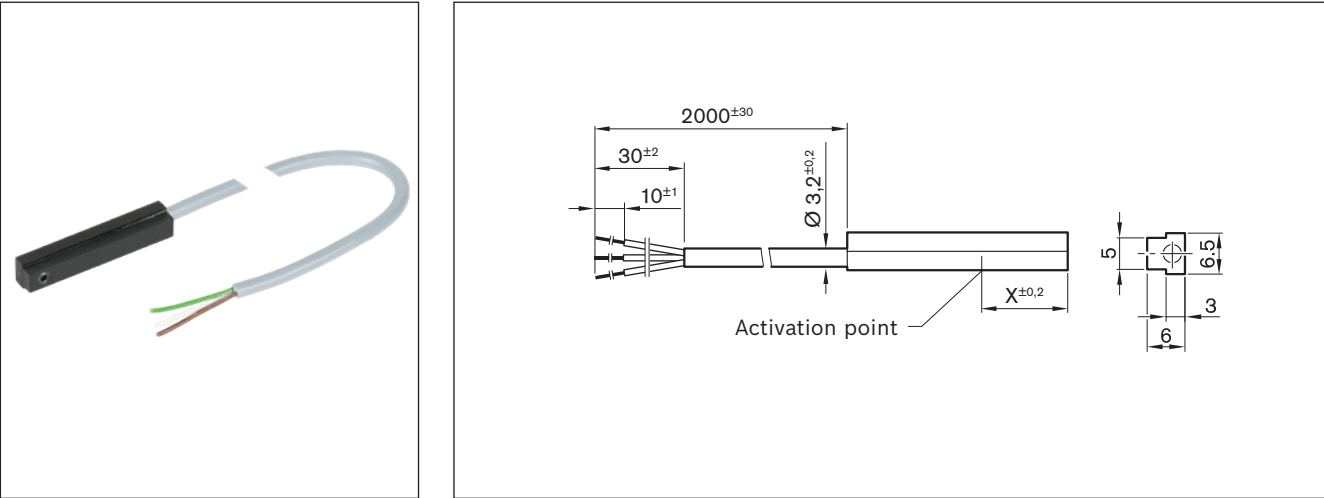
Description	Switching function		Option number ¹⁾	Material number
Socket-plug	—		17	R117500153
Magnetic sensor	REED	Changeover contact (NC: C+NC; NO:C+NO)	21	R347600903
	Hall	PNP / normally closed (NC)	22	R347601003
	Hall	PNP / normally open (NO)	nv ²⁾	R347601203
	Hall	NPN / normally closed (NC)	nv ²⁾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



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**	—

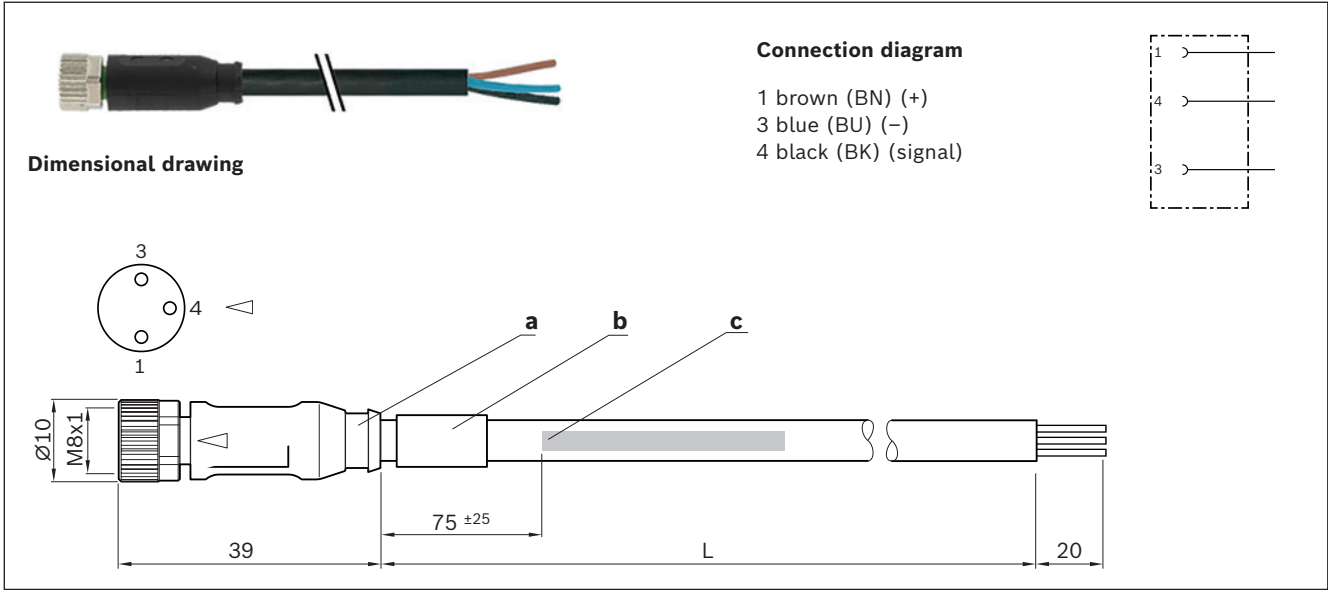
*) Technical data only for built-in sensor connection line.

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

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

Extensions

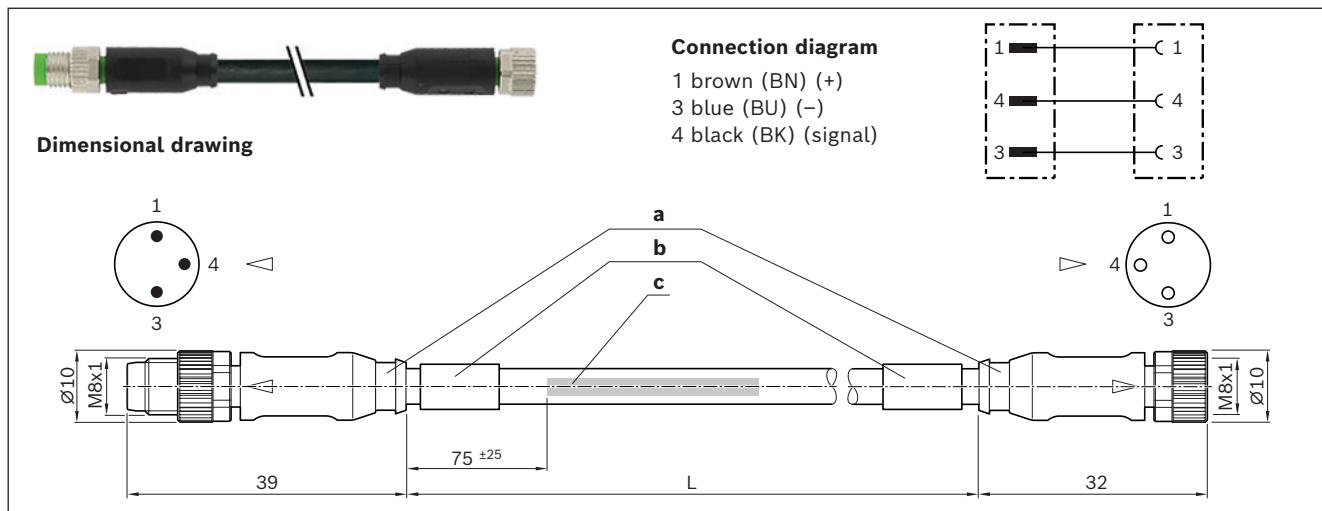
Assembled on one end



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 mm ²
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/s ²
Ambient temperature fixed ext.	–40°C to +85°C
Ambient temperature flexible ext.	–25°C to +85°C
Protection type	IP68
Certifications and approvals	    

a) Contour for 6.5 mm corrugated tube (inner diameter)

b) Cable grommet

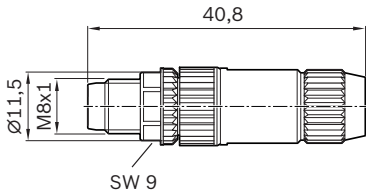
c) Cable printing per printing specification

Plugs

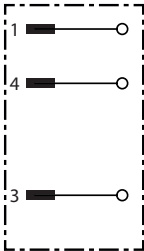


R901388333

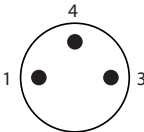
Dimensional drawing



Connection diagram



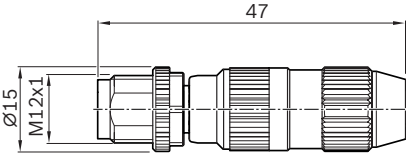
**View
Connector side**



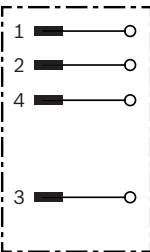


R901388352

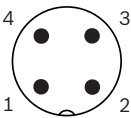
Dimensional drawing



Connection diagram

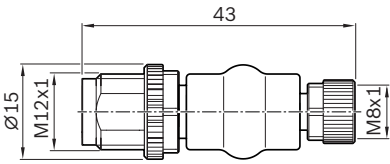
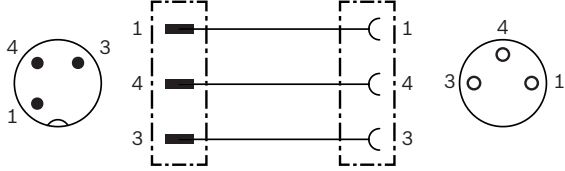
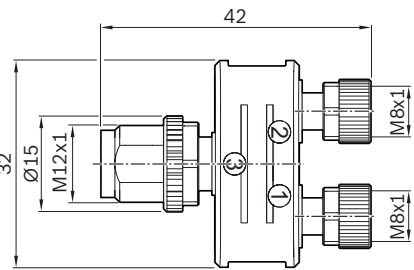
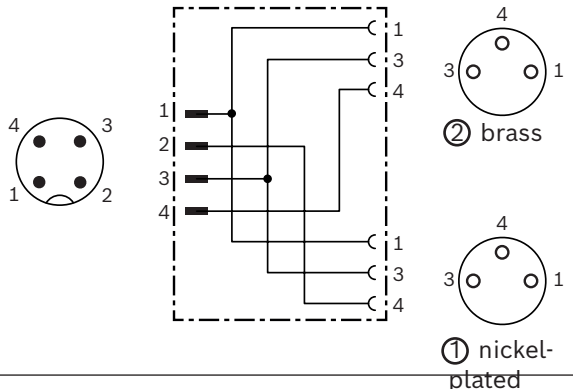


**View
Connector side**



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	  	

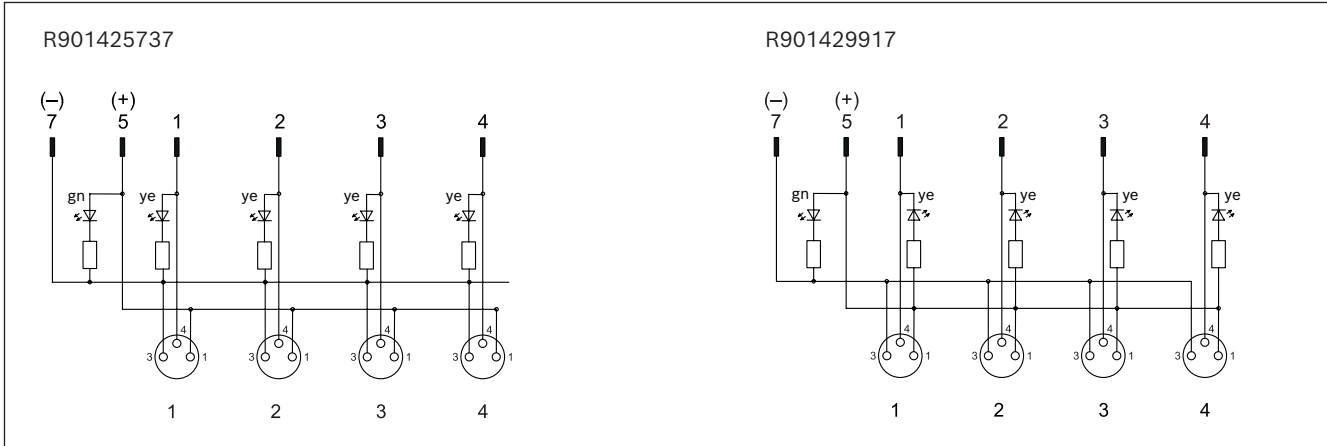
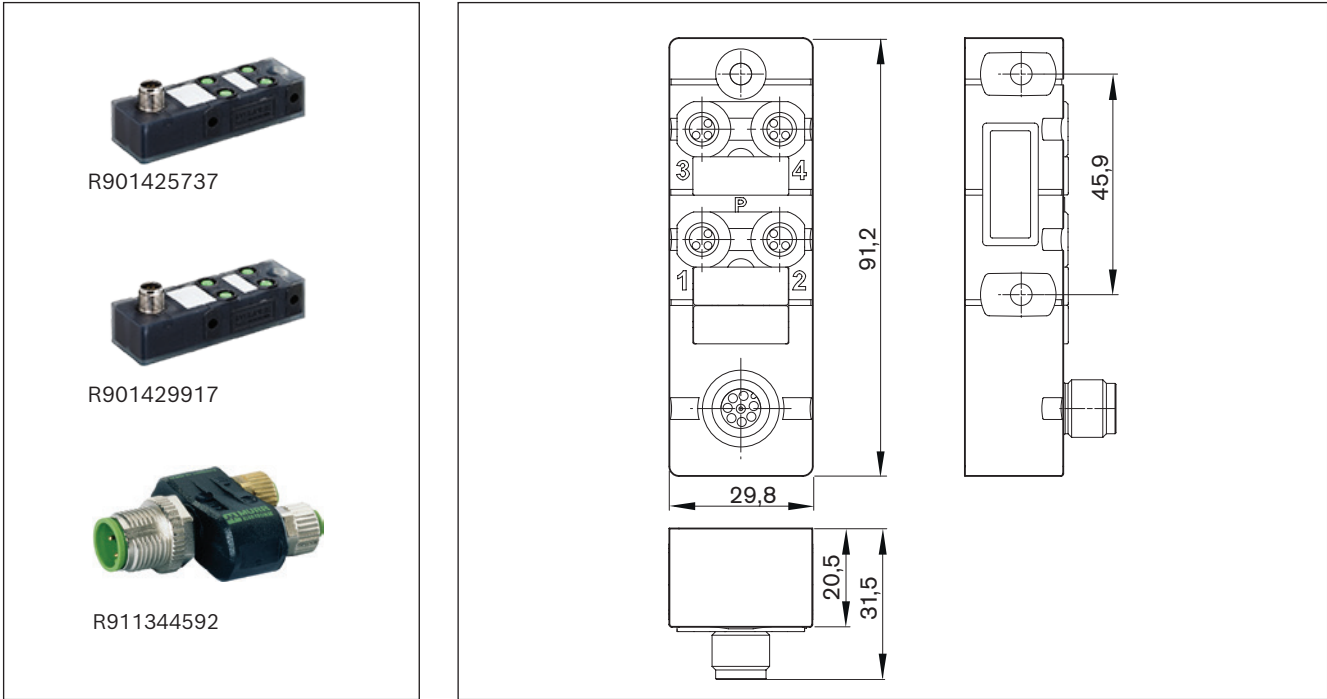
Adapters

	Dimensional drawing	Connection diagram
 R911344591		
 R911344592		 ② brass ① nickel-plated

Material numbers/technical data

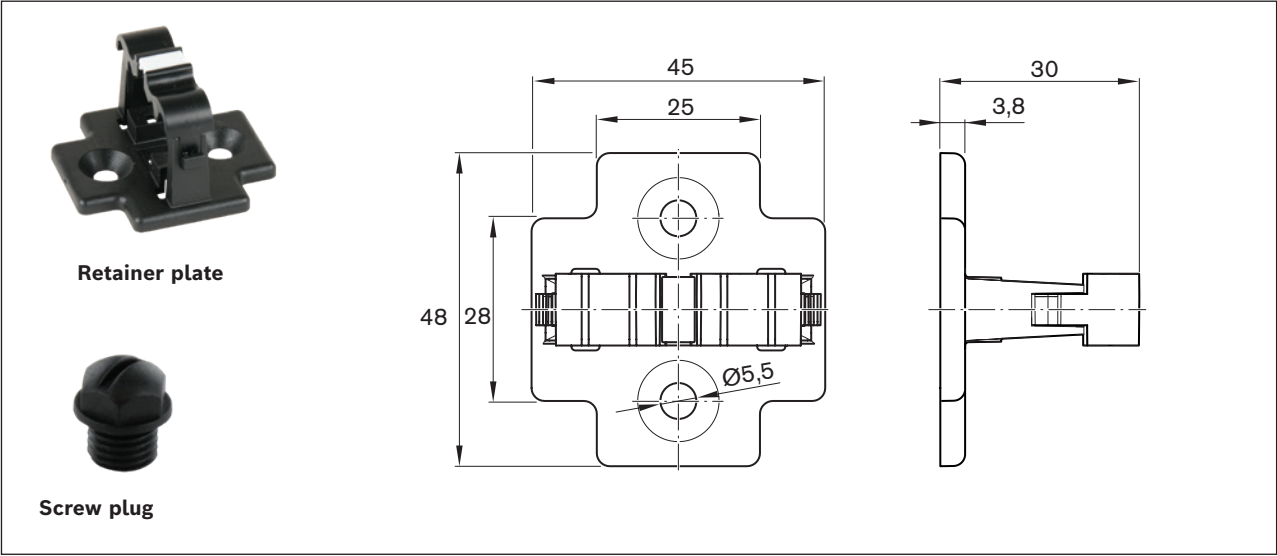
Use	Adapters	Adapter or distributor
Material number	R911344591	R911344592
Name	7000-42201-0000000	7000-41211-0000000
Version	straight for 1 sensor	straight, for 1 - 2 sensors
Operating current per contact	max. 4 A	
Operating voltage	max. 32 V AC/DC	
Connection type 1	M8x1 3-pole straight female connector 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		  

Passive distributor



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	  		

Accessories for passive distributors



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



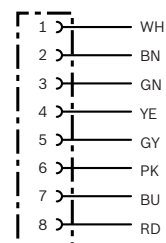
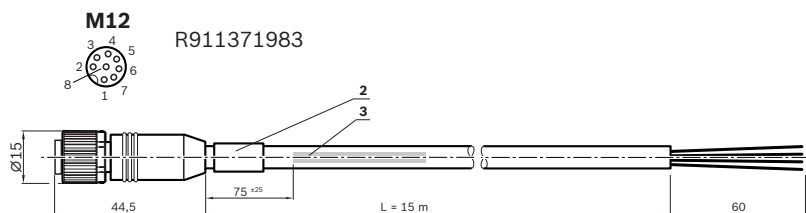
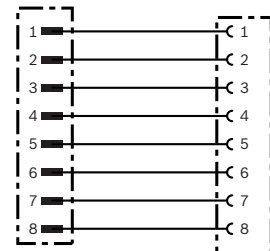
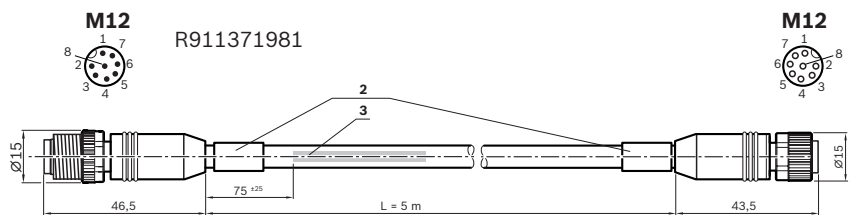
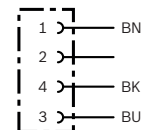
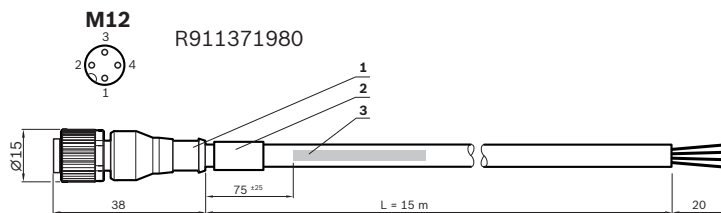
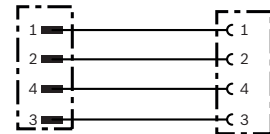
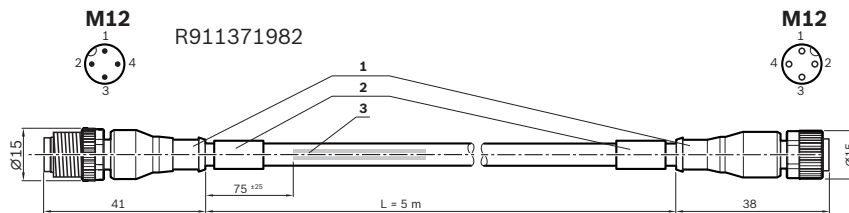
R911371981



R911371980



R911371983

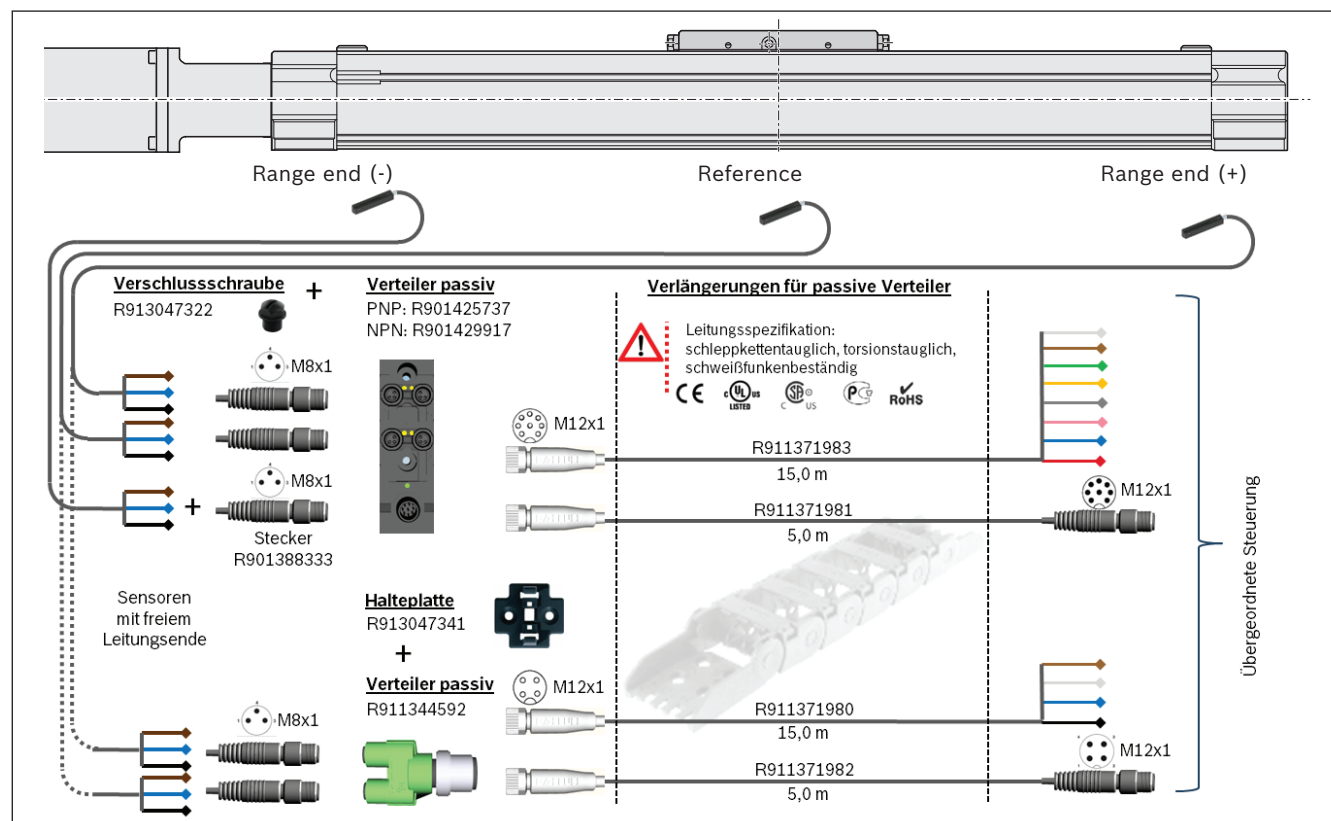
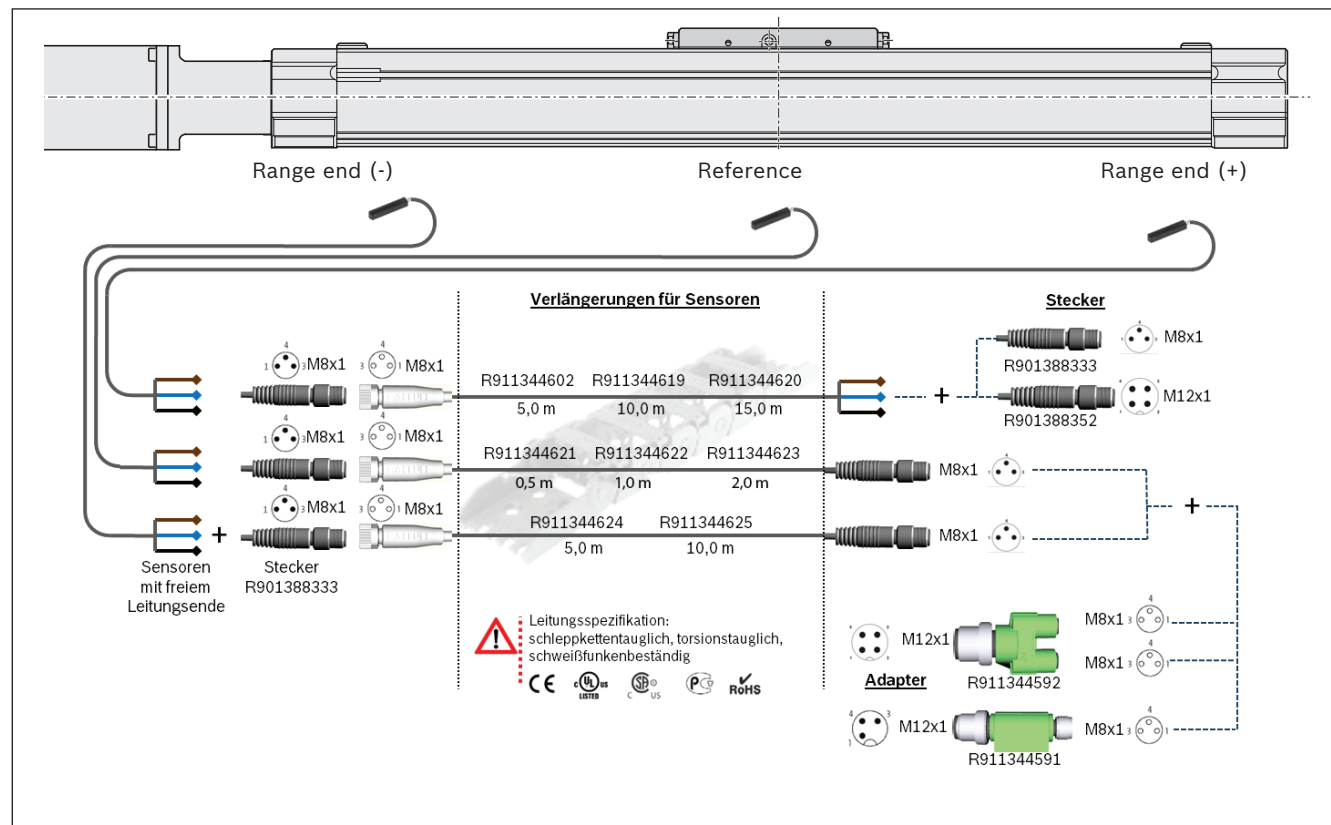


- 1) Contour for conduit pipe with inner diameter of 10
 2) Cable grommet
 3) Cable print per ordering specification 7000-08001

Material numbers/technical data

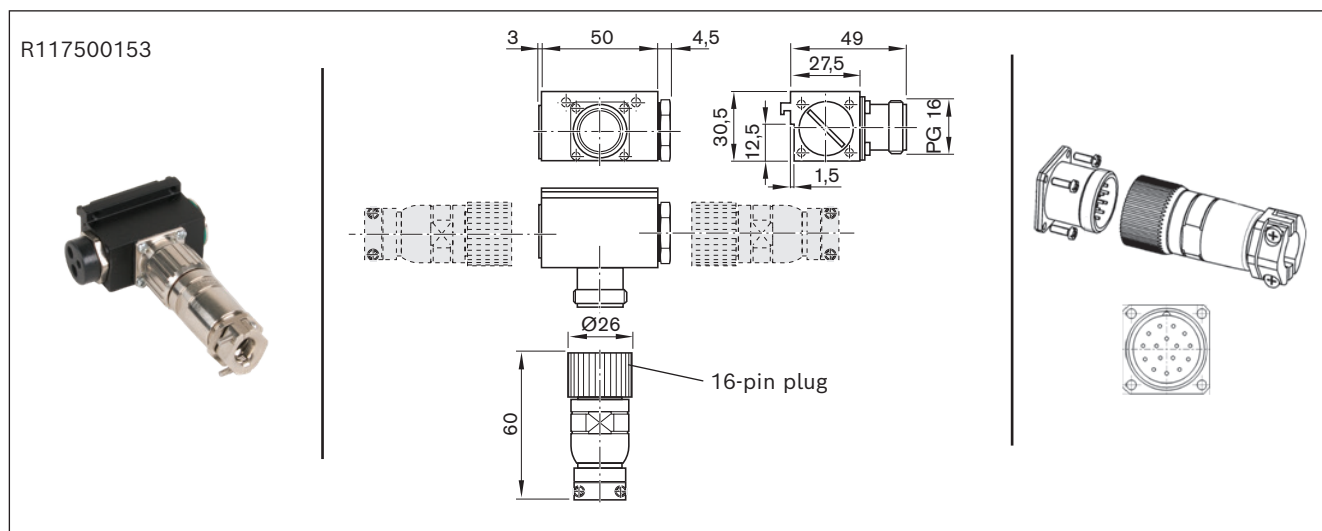
Use	Extension cable for passive distributor R911344592		Extension cable for passive distributors R901425737 / R901429917	
Material number	R911371982	R911371980	R911371981	R911371983
Name	7000-40021- 6540500	7000-12221- 6541500	7000-48001- 3770500	7000-17041- 3771500
Length	5.0 m	15.0 m	5.0 m	15.0 m
Connection 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				

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.



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	1 seal with bore 2x5.5 mm, 1x3.5 mm
Housing	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.

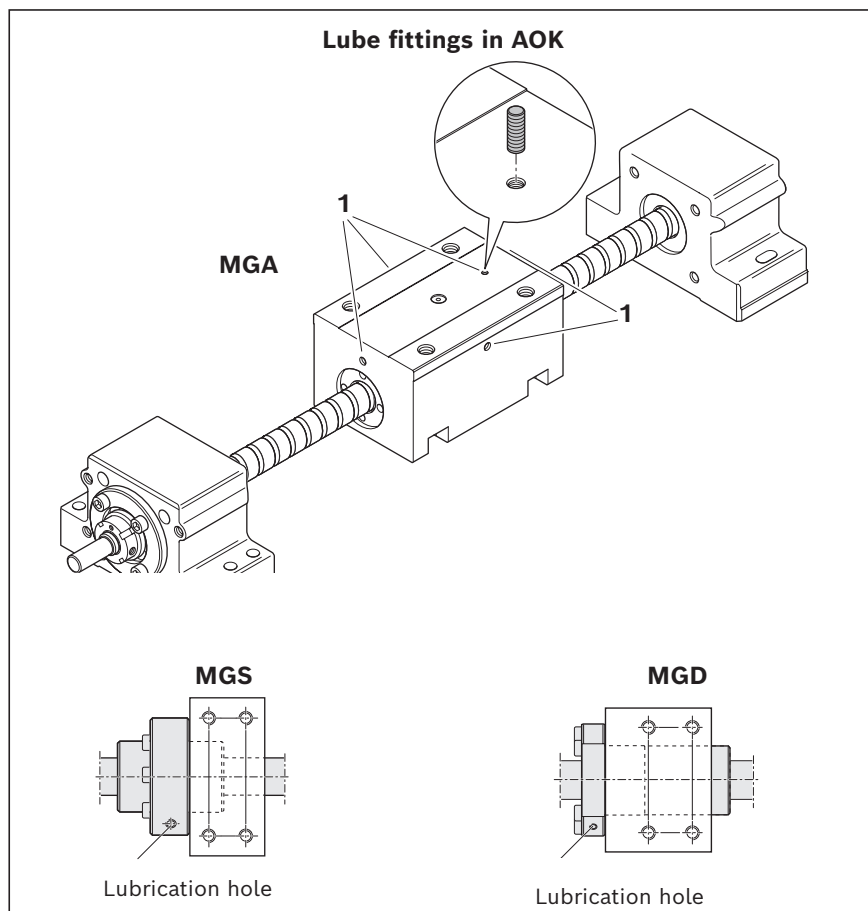
Lubrication

Lube fittings

AOK

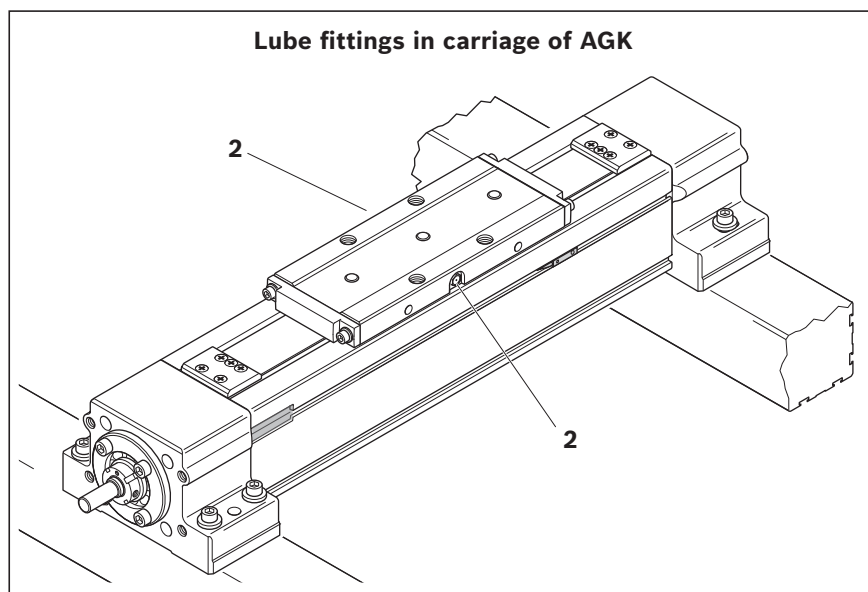
Housing MGA has 1 lube fitting (1) on each side.
Lubrication through one of the 5 lube fittings is adequate.

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

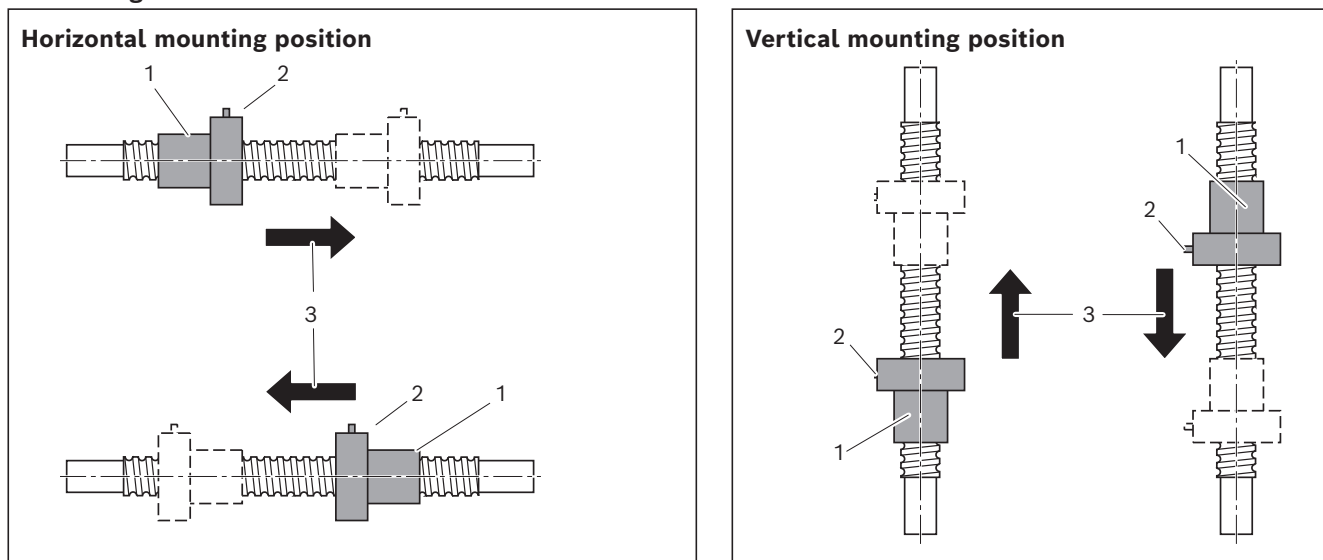
The ball screw drives in the drive units come with initial greasing standard. Basic lubrication with Dynalub 510 grease lubricant (see "Grease lubrication" section for lubricant properties)

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 $\geq s_{min}$ (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 MoS₂ 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 ₀ xP	Relubrication quantity ZEM-E / FEM-E-S / FEP-E-S / FEM-E-B (cm ³)	Relubrication interval Based on load ratio F _m /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

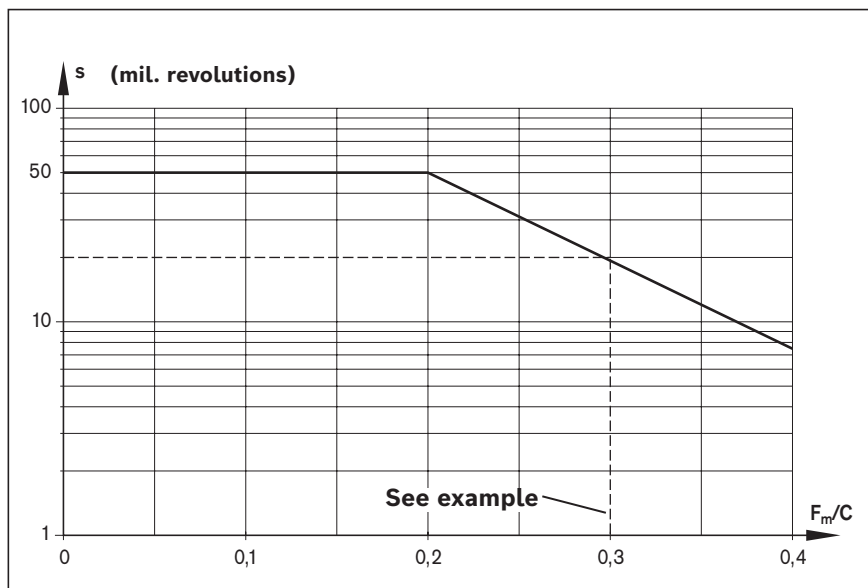
The load ratio F_m/C is the quotient of the average load F_m and the dynamic load rating C (see "Calculation").

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 $30\text{ }^{\circ}\text{C}$

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:

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

Example:

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

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

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 cm³. The lubricating cycle time is then the result of dividing the lubrication interval by the determined pulse count.

Liquid grease lubrication			
Size	BASA d _o xP	Relubrication quantity ZEM-E / FEM-E-S / FEP-E-S / FEM-E-B (cm³)	Relubrication interval Based on load ratio F _m /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

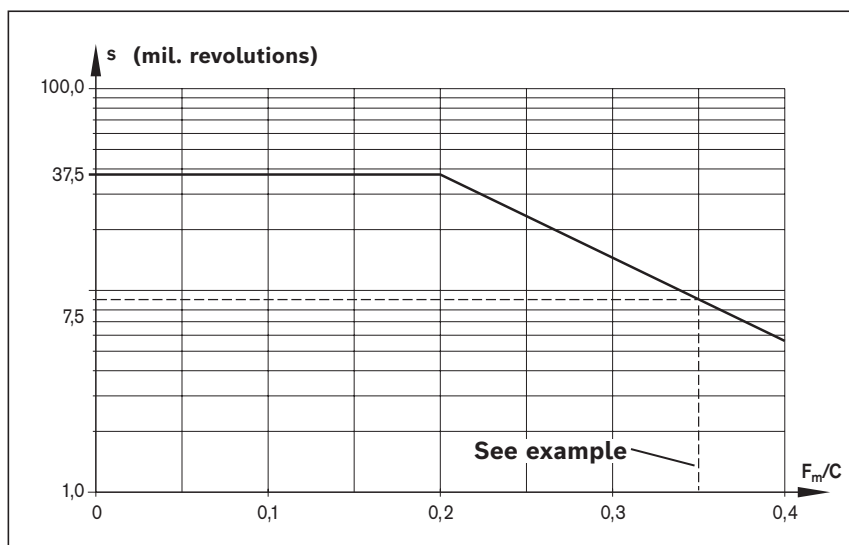
The load ratio F_m/C is the quotient of the average load F_m and the dynamic load rating C (see "Calculation").

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 $30\text{ }^{\circ}\text{C}$

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:

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

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

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

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 cm³. The lubricating cycle time is then the result of dividing the lubrication interval by the determined pulse count.

Oil lubrication				
Size	BASA d ₀ xP	Relubrication quantity ZEM-E / FEM-E-S / FEP-E-S / FEM-E-B (cm ³)	Relubrication interval Based on load ratio $F_m/C \leq 0.2$ (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").

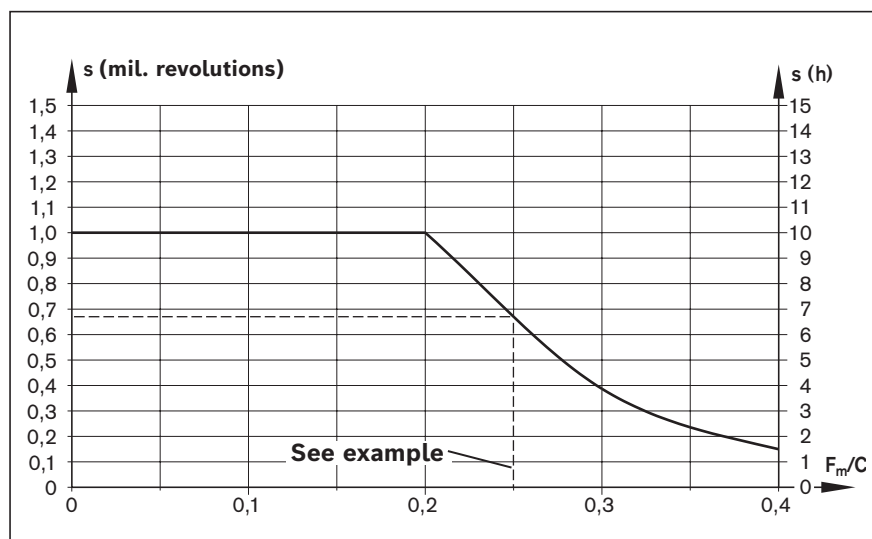
The lubrication interval s is defined either by millions of revolutions or operating time in km or hours. The value reached first defines the lubricating interval.

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)
d₀ = Nominal diameter (mm)



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

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

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 · 10⁶ revs

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

Note:

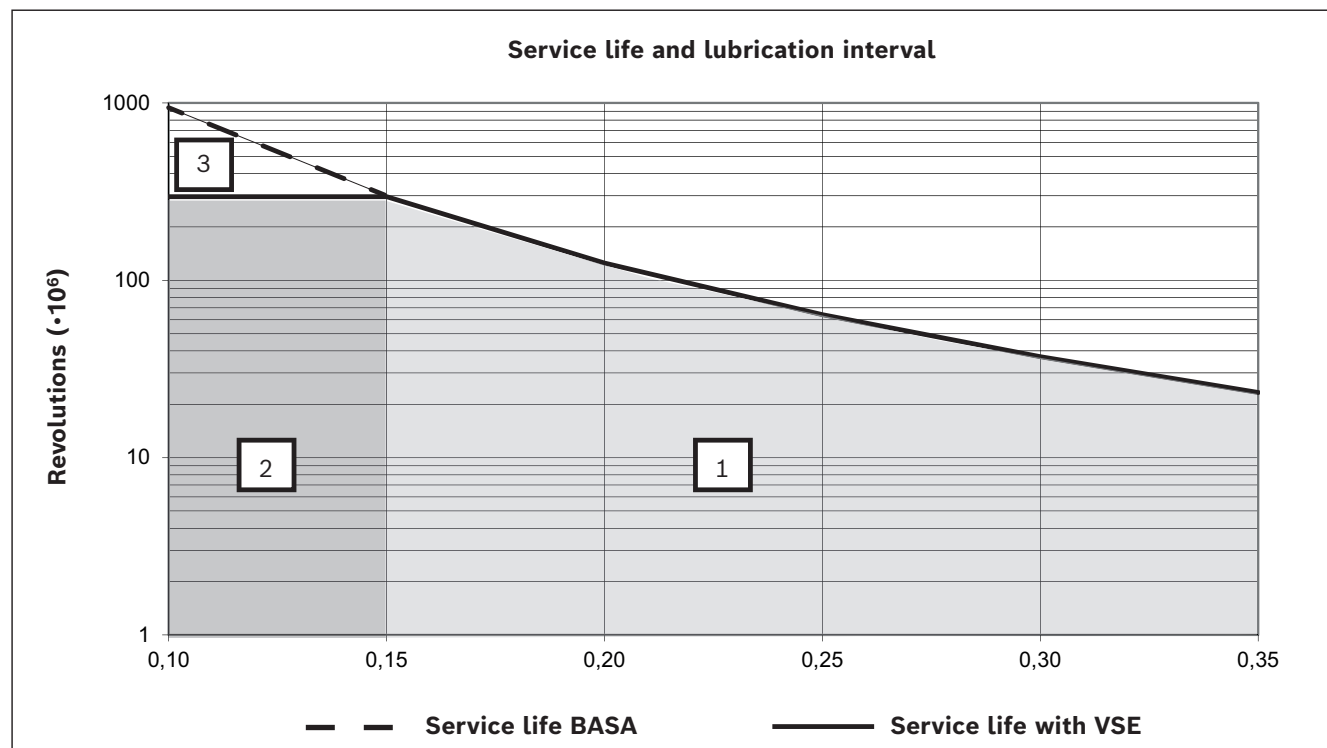
We recommend using piston distributors from SKF. These should be installed as close as possible to the lube fitting of the nut. Long lines and small line diameters should be avoided, and the lines should be laid on an upward slant.

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 300×10^6 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.

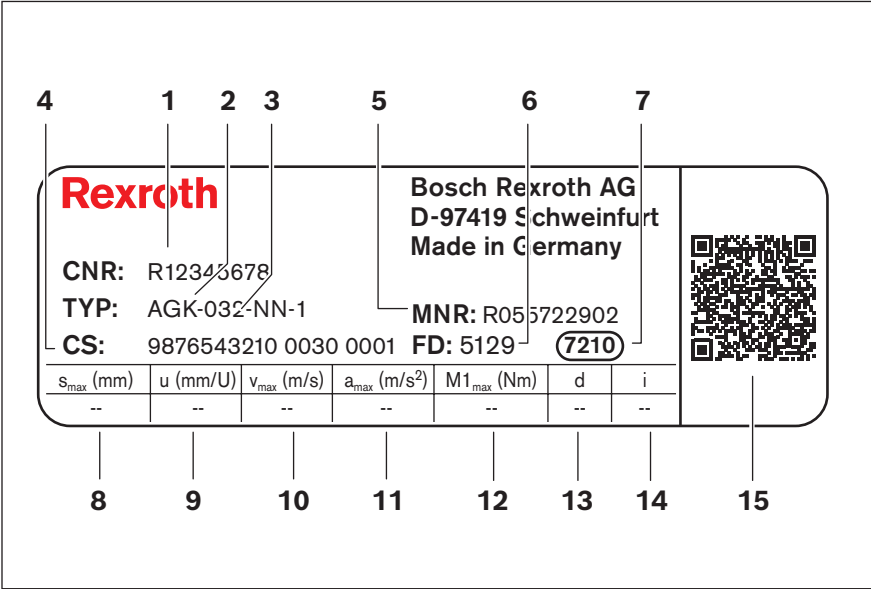
3

Relubrication required:

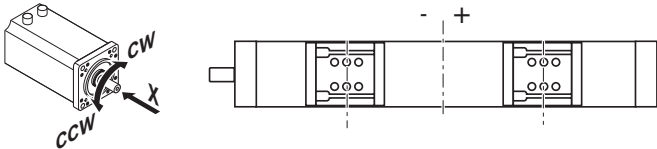
After 300 mil. revolutions (graph area 3), the nut should be relubricated as usual. The VSE does not have to be removed, however it will no longer continue to lubricate past the interval.

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

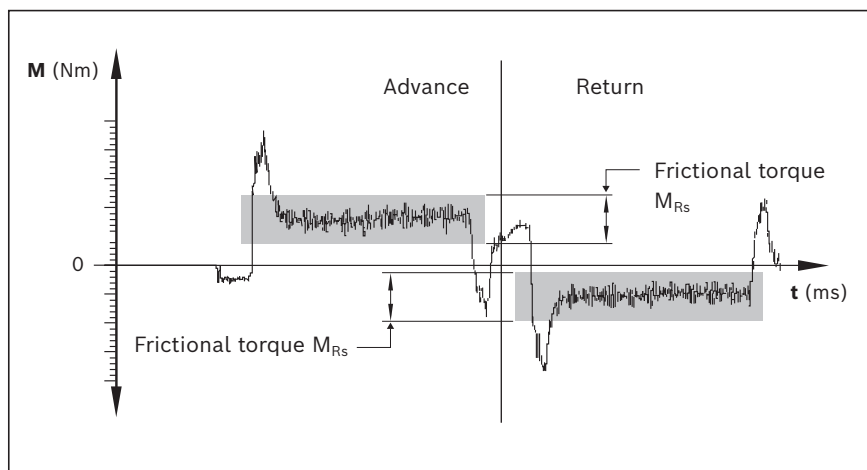
The standard report contains:

- 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)

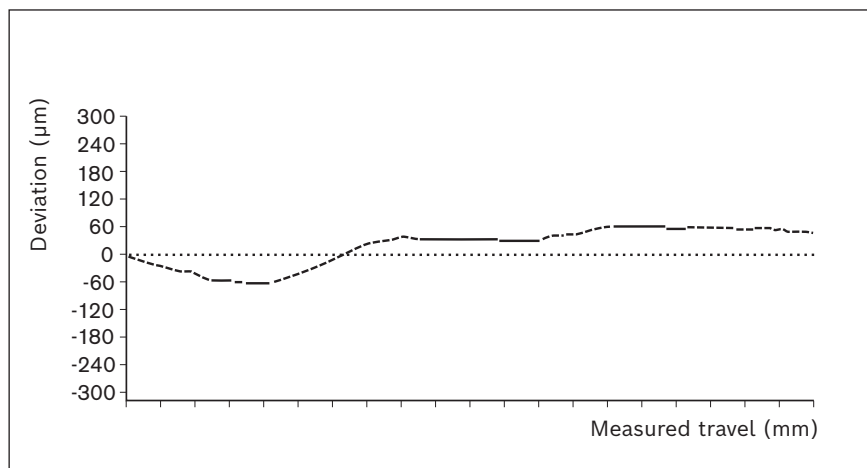
The moment of friction is measured over the entire travel range.



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

Calculation principles

Drive unit service life

Service life of ball screw assembly or the fixed bearing

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Drive dimensioning

Basic principles

Drive dimensioning with motor shaft as reference point

General motor preselection

AOK sample calculation

AGK sample calculation

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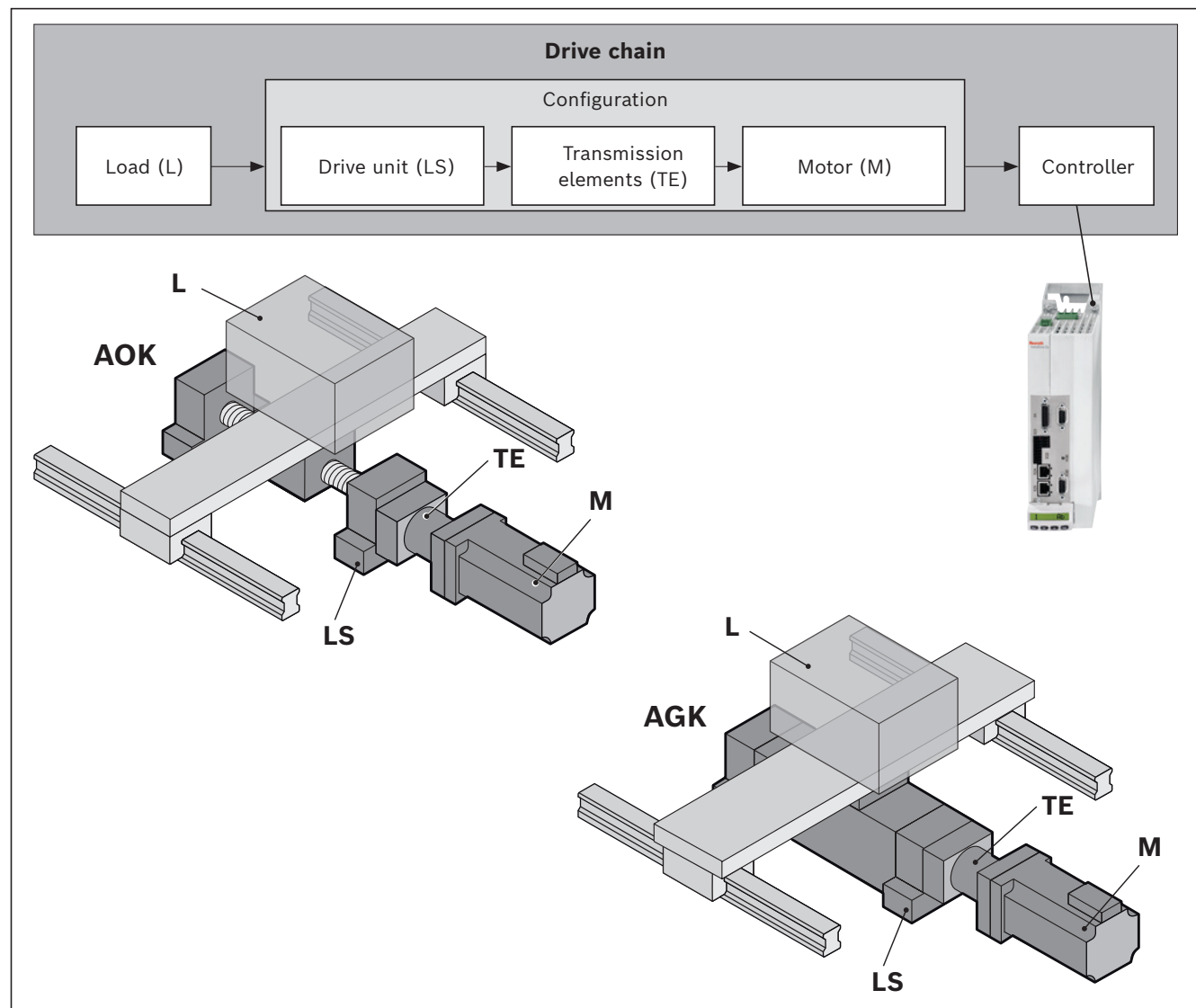
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AOK/AGK calculation principles



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

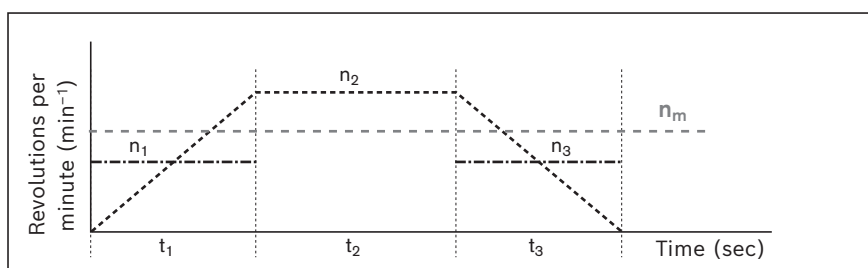
The service life of the rolling bearing points contained in a drive unit can be calculated using the formulas given below. In a drive unit with ball screw drive, the rolling bearing points that are relevant for the service life are the linear guide, the ball screw drive (nut), and the fixed bearing.

⚠ 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 F_m and n_m have to be used when calculating the service life.

If rotary speed varies, average rotary speed n_m is calculated as follows:



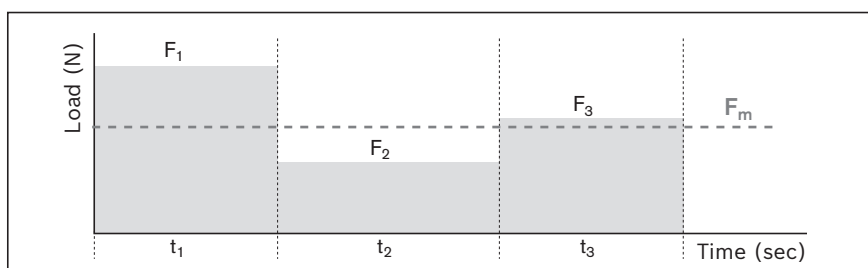
$$n_m = \frac{|n_1| \cdot t_1 + |n_2| \cdot t_2 + \dots + |n_n| \cdot t_n}{t_{\text{total}}}$$

$$t_{\text{total}} = t_1 + t_2 + \dots + t_n$$

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

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

When both the load and the rotary speed vary, the average load F_m is calculated as follows:



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

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

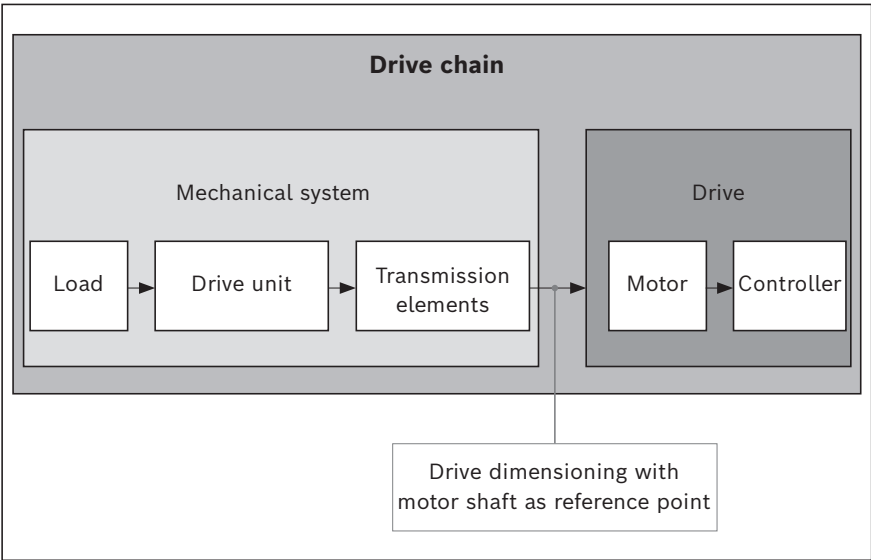
For drive dimensioning, the drive chain can be divided into the mechanical system and drive system.

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	(kgm ²)	$J_t^{1)}$	$J_s^{2)}$	$J_c^{3)}$	$J_{sd}^{3)}$
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

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

Determination of translatory mass moment of inertia of external load

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

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

$$v_{\text{mech}} = v_{\text{max}}$$

Maximum permissible rotary speed

For motor attachment via flange and coupling

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

For motor attachment via belt side drive

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

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

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

For motor attachment via belt side drive

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

⚠ 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).

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

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.

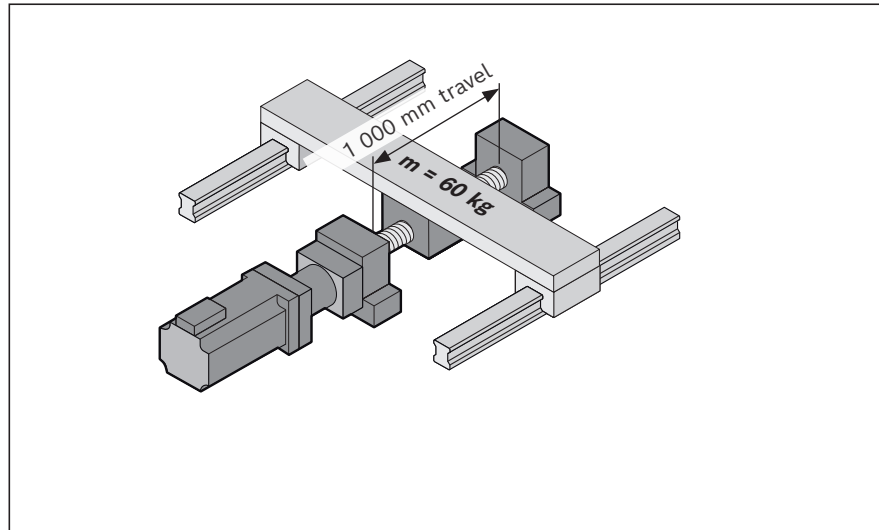
AOK sample calculation

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

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 $v = 0.6 \text{ m/s}$ and $L = 1\,370 \text{ mm}$:

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:

$$v_{\max} = 1.0 \text{ m/s}$$

Calculation of length L

(for selected BASA)

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

Frictional torque M_R

(Motor attachment with belt side drive)

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

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

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

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

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

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: $v_{mech} = v_{max} = 1 \text{ m/s}$

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

Maximum rotary speed of the application n_{mech}

(Motor attachment with belt side drive)
Application tolerance

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

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

AOK sample calculation

Maximum permissible drive torque M_{mech}

(Motor attachment with belt side drive)

Limit for mechanical system

$$\begin{aligned}
 M_{\text{mech}} &= \text{Minimum} \left(M_{\text{sd}}; \frac{M_p}{i} \right) \\
 \text{Belt side drive: } M_{\text{sd}} &= 12.3 \text{ Nm (gear ratio } i = 2 \text{ for MS2N06)} \\
 \text{Drive unit: } M_p &= 47 \text{ Nm} \\
 \text{Drive torque: } M_{\text{mech}} &= \text{Minimum} \left(12.3; \frac{47}{2} \right) \\
 &= \text{Minimum} (12.3; 23.5) \\
 &= 12.3 \text{ Nm}
 \end{aligned}$$

Motor preselection check

Selected motor:

MS2N06-B1BNN without brake

Condition 1:

$$\begin{aligned}
 \text{Rotary speed: } n_{\text{max}} &\geq n_{\text{mech}} \\
 6\,000 &\geq 3\,600 \text{ condition met – motor selection OK}
 \end{aligned}$$

Condition 2:

$$\begin{aligned}
 \text{Mass moment of inertia ratio: } V &= \frac{J_{\text{ex}}}{J_m + J_{\text{br}}} \\
 \text{Motor inertia: } J_m &= 480 \cdot 10^{-6} \text{ kgm}^2 \\
 \text{Brake moment of inertia: } J_{\text{br}} &= 0 \cdot 10^{-6} \text{ kgm}^2 \text{ (without brake)} \\
 \text{Moment of inertia ratio: } V &= \frac{688.15 \cdot 10^{-6}}{(480 \cdot 10^{-6} + 0 \cdot 10^{-6})} \\
 &= 1.43 \\
 \text{Handling condition: } V &\leq 6 \\
 1.43 &\leq 6 \text{ condition met – motor selection OK}
 \end{aligned}$$

Condition 3:

$$\begin{aligned}
 \text{Torque ratio: } \frac{M_{\text{stat}}}{M_0} &\leq 0.6 \\
 \text{Static load moment: } M_{\text{stat}} &= M_R + M_g \text{ (installed horizontally } M_g = 0) \\
 &= 1.175 \text{ Nm} \\
 \text{Continuous torque of the motor: } M_0 &= 3.25 \text{ Nm} \\
 \text{Torque ratio: } \frac{1.175}{3.25} &= 0.36 \\
 0.36 &\leq 0.6 \text{ condition met – motor selection OK}
 \end{aligned}$$

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

Result

AOK-032 drive unit

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

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: $M_R = 1.175\text{ Nm}$
 Mass moment of inertia: $J_{\text{ex}} = 688.15 \cdot 10^{-6}\text{ kgm}^2$
 Speed: $v_{\text{mech}} = 0.6\text{ m/s}$ ($n_{\text{mech}} = 3\,600\text{ min}^{-1}$)
 Drive torque limit: $M_{\text{mech}} = 12.3\text{ Nm}$
 ➡ The motor torque must be limited to 12.3 Nm on the drive side!
 Acceleration limit: $a_{\max} = 50\text{ m/s}^2$
 Limit for speed: $v_{\max} = 1\text{ m/s}$ ($n_{\text{mech}} = 6\,000\text{ min}^{-1}$)

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.

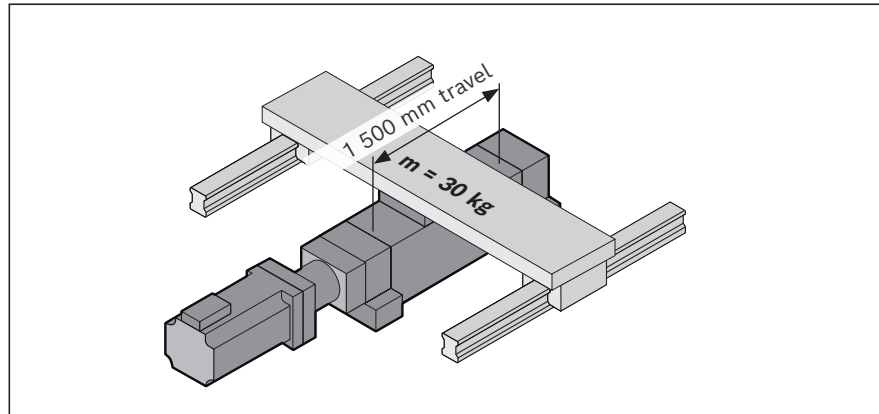
AGK sample calculation

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

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 $v = 0.3 \text{ m/s}$ and $L = 1\,950 \text{ mm}$:

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:

$$v_{\max} = 0.4 \text{ m/s}$$

Calculation of length L

(for selected BASA)

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

Frictional torque M_R

(Motor attachment with flange and coupling)

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

Mass moment of inertia J_{ex}

(Motor attachment with flange and coupling)

$$\begin{aligned}
 J_{ex} &= J_s + J_t + J_c \\
 \text{Coupling: } J_c &= 57 \cdot 10^{-6} \text{ kgm}^2 \\
 \text{Drive unit: } J_s &= (k_{J \text{ fix}} + k_{J \text{ var}} \cdot L) \cdot 10^{-6} \\
 &= (40.7 + 0.1004 \cdot 1\,870) \cdot 10^{-6} \\
 &= 228.45 \cdot 10^{-6} \text{ kgm}^2 \\
 \text{External load: } J_t &= m_{ex} \cdot k_{J \text{ m}} \cdot 10^{-6} \\
 &= 30 \cdot 10,1321 \cdot 10^{-6} \\
 &= 303.96 \cdot 10^{-6} \text{ kgm}^2 \\
 \text{Mass moment of inertia: } J_{ex} &= 228.45 \cdot 10^{-6} + 303.96 \cdot 10^{-6} + 57 \cdot 10^{-6} \\
 &= 589.41 \cdot 10^{-6} \text{ kgm}^2
 \end{aligned}$$

Maximum permissible rotary speed n_{mech}

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

$$\begin{aligned}
 n_{mech} &= \frac{(v_{mech} \cdot 1\,000 \cdot 60)}{P} \\
 \text{Max. permissible speed: } v_{mech} &= v_{max} = 0.4 \text{ m/s} \\
 \text{Max. permissible rotary speed: } n_{mech} &= \frac{(0.4 \cdot 1\,000 \cdot 60)}{20} \\
 &= 1\,200 \text{ min}^{-1}
 \end{aligned}$$

Maximum rotary speed of the application n_{mech}

(Motor attachment with flange and coupling)
Application tolerance

$$\begin{aligned}
 \text{Speed: } v_{mech} &= 0.3 \text{ m/s} \\
 \text{Rotary speed: } n_{mech} &= \frac{0.3 \cdot 1000 \cdot 60}{20} \\
 &= 900 \text{ min}^{-1}
 \end{aligned}$$

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:

$$\begin{aligned} \text{Rotary speed: } n_{\text{max}} &\geq n_{\text{mech}} \\ 6\,000 &\geq 900 \text{ condition met – motor selection OK} \end{aligned}$$

Condition 2:

$$\begin{aligned} \text{Mass moment of inertia ratio: } V &= \frac{J_{\text{ex}}}{J_{\text{m}} + J_{\text{br}}} \\ \text{Motor inertia: } J_{\text{m}} &= 160 \cdot 10^{-6} \text{ kgm}^2 \\ \text{Brake moment of inertia: } J_{\text{br}} &= 0 \cdot 10^{-6} \text{ kgm}^2 \text{ (without brake)} \\ \text{Moment of inertia ratio: } V &= \frac{589.41 \cdot 10^{-6}}{(160 \cdot 10^{-6} + 0 \cdot 10^{-6})} \\ &= 3.68 \\ \text{Handling condition: } V &\leq 6 \\ 3.68 &\leq 6 \text{ condition met – motor selection OK} \end{aligned}$$

Condition 3:

$$\begin{aligned} \text{Torque ratio: } \frac{M_{\text{stat}}}{M_0} &\leq 0.6 \\ \text{Static load moment: } M_{\text{stat}} &= M_{\text{R}} + M_{\text{g}} \text{ (installed horizontally } M_{\text{g}} = 0) \\ &= 0.92 \text{ Nm} \\ \text{Continuous torque} \\ \text{of the motor: } M_0 &= 3.85 \text{ Nm} \\ \text{Torque ratio: } \frac{0.92}{3.85} &= 0.23 \\ 0.23 &\leq 0.6 \text{ condition met – motor selection OK} \end{aligned}$$

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

Result**AGK-020 drive unit**

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

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: $M_R = 0.92\text{ Nm}$
 Mass moment of inertia: $J_{\text{ex}} = 589.41 \cdot 10^{-6}\text{ kgm}^2$
 Speed: $v_{\text{mech}} = 0.3\text{ m/s}$ ($n_{\text{mech}} = 900\text{ min}^{-1}$)
 Drive torque limit: $M_{\text{mech}} = 11.5\text{ Nm}$
 ➡ The motor torque must be limited to 11.5 Nm on the drive side!
 Acceleration limit: $a_{\max} = 50\text{ m/s}^2$
 Limit for speed: $v_{\max} = 0.4\text{ m/s}$ ($n_{\text{mech}} = 1\,200\text{ min}^{-1}$)

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

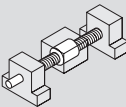
Code/ index	Name	Unit
a	Acceleration	(m/s ²)
a_{max}	Maximum acceleration rate	(m/s ²)
BASA	Ball screw assembly	(–)
B_t	Belt type	(–)
c_{spe}	Specific spring rate	(N)
C_{gw}	Dynamic load capacity, guideway	(N)
C_{bs}	Dynamic load capacity for ball screw assembly	(N)
C_{fb}	Dynamic load capacity for fixed bearing	(N)
d₀	Nominal diameter of ball screw assembly	(mm)
d₃	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)
M₀	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)
n₁, n₂, ... 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)
t₁, t₂, ... t_n	Time for phases 1 ... n	(s)
t_{total}	Sum of time steps	(s)
u	Feed constant	(mm/rev)
v₁, v₂, ... 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	(–)
z₁	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				Tolerance grade		Standard seal	Lubrication			Preload class			Screw ends		
			32 x 5	32 x 10	32 x 20	32 x 32				With initial greasing	Left VSE	Right VSE	C1 (moderate)	C2 (medium)	C3 (high)			Left
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

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

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

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

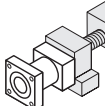
 $L = 1\,000 + 77 + 128$
 $L = 1\,205\text{ mm}$

d_0 = Screw diameter (mm)
 P = Lead (mm)
 L_c = nut length/nut and housing length (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	
	Aluminum	Steel	Without	With	Type	Attachment kit ¹⁾	Motor code				Motor connector position	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
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

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

[illegible]

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

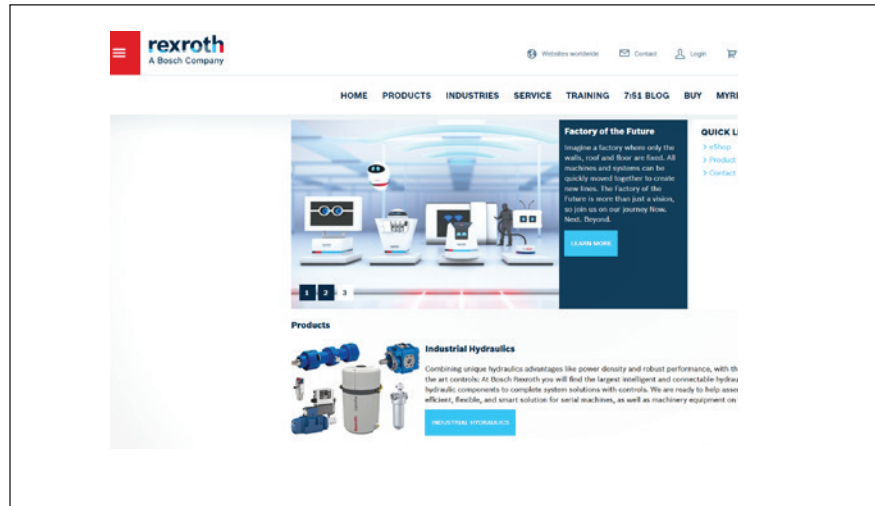
Quantity Acceptance of: _____ pcs, _____ per month, _____ per year, per order, or _____

Comments:

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

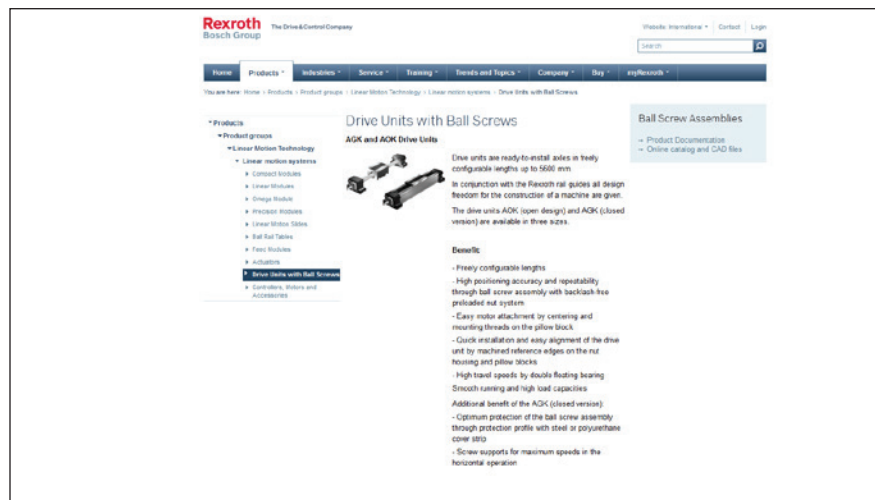
Further information

[Bosch Rexroth homepage:](#)

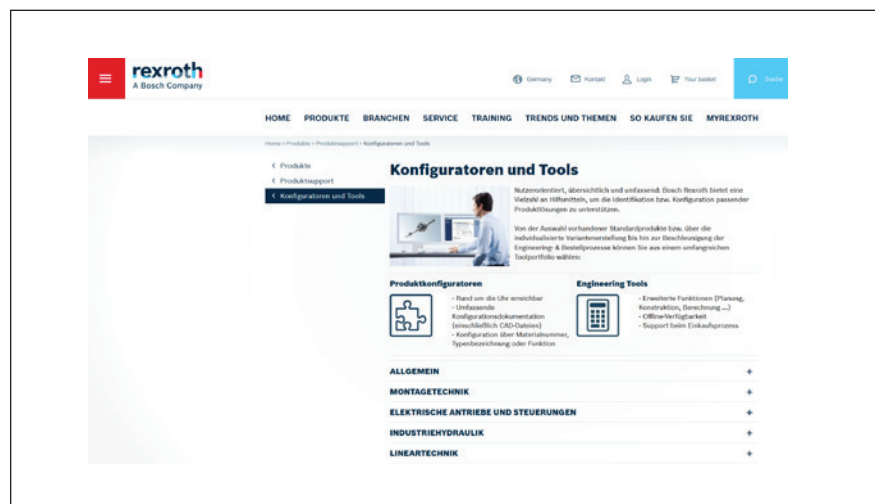


[Product information](#)

[Drive units:](#)



[Configurators and tools:](#)



Notes

Bosch Rexroth AG

Ernst-Sachs-Straße 100
97424 Schweinfurt, Germany
www.boschrexroth.com

Find your local contact person here:

www.boschrexroth.com/contact

