

STAR – Precision Ball Screw Assemblies

End Bearings and Nut Housings

STAR – Linear Motion Technology

Ball Rail Systems

Standard Rail Systems
Rail Systems with Aluminium Runner Blocks
Super Rail Systems
Wide Rail Systems
Supplementary Parts

Miniature Rail Systems
Cam Roller Guides

Roller Rail Systems

Linear Bushings and Shafts

Linear Bushings
Linear Sets
Shafts
Shaft Support Rails
Shaft Support Blocks

Ball Transfer Units
Other Engineering Components

Precision Ball Screw Assemblies

Linear Motion Systems

Linear Motion Slides

- Ball Screw
- Toothed Belt

Linear Modules

- Ball Screw
- Toothed Belt
- Gear Rack
- Linear Motor
- Pneumatic Drive

Compact Modules

- Ball Screw

Ball Rail Tables

- Ball Screw
- Linear Motor

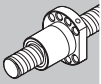
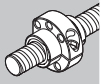
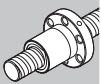
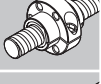

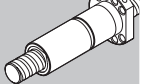
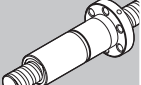


ALU-STAR Profile System
Controllers, Motors, Electrical Accessories,
Electric Cylinders

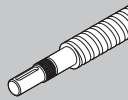
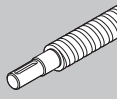
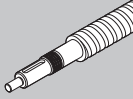
STAR – Precision Ball Screw Assemblies

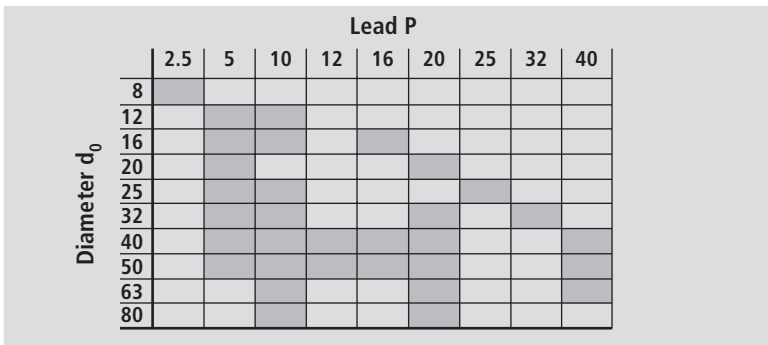
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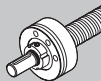
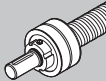
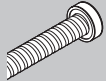
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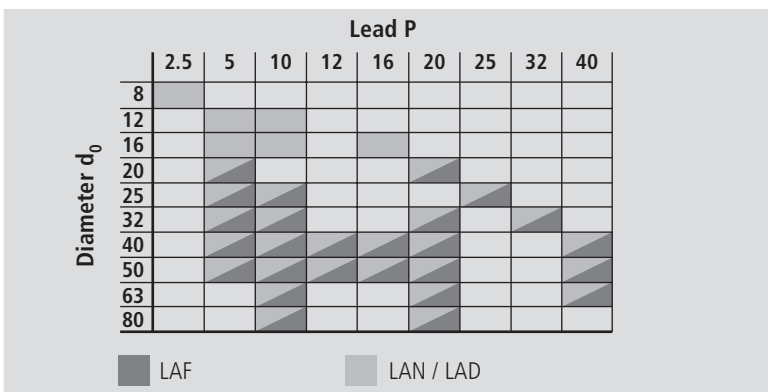
Product Overview

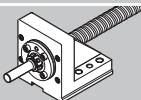
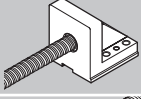
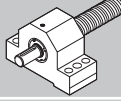
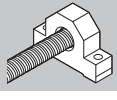
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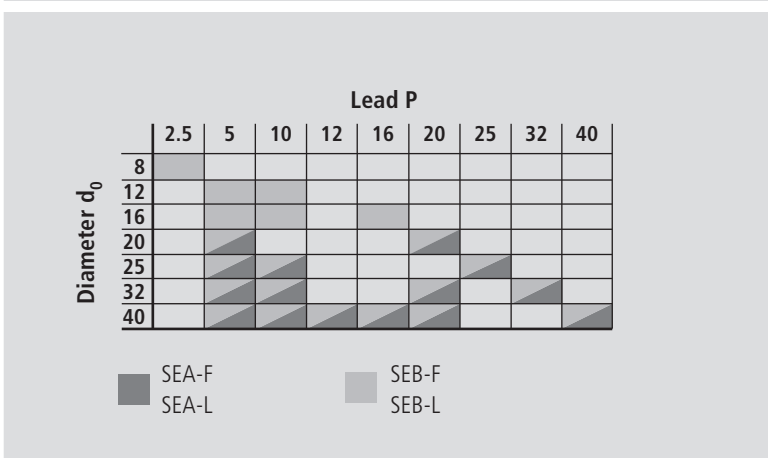
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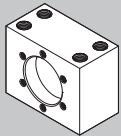
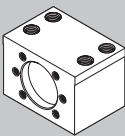


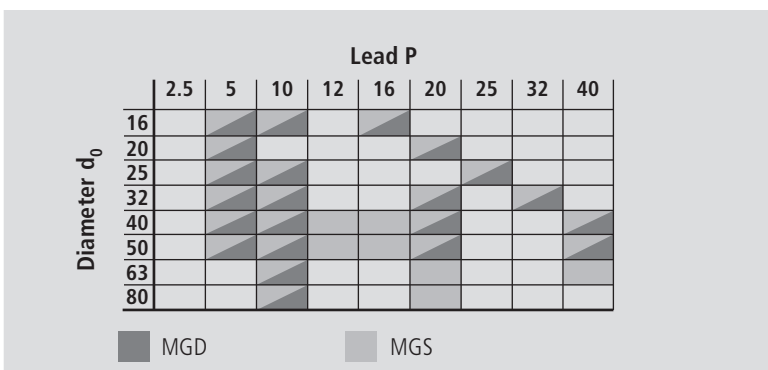
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STAR – Precision Ball Screw Assemblies

Product Overview

As simple as it is to describe the elementary function of a precision ball screw assembly, in practice you are faced with variety of types and applications.

Affordable system design is now easier than ever:

New products have made the catalogue grow in size.

On the following pages you will find the various elements for you to choose from, complete with order specifications and examples.

A further new development is the **WINKGT calculation software** for designing and calculating precision ball screw assemblies. Written to run under the **Windows NT** operating system, it is available on CD-ROM for you to perform your own calculations.

Alternatively, you can arrange for Rexroth STAR to produce a design calculation on your behalf. To do so, simply complete and return the inquiry form, see "Inquiry / Order Form", on page 103.

For over 20 years, Precision Ball Screw Assemblies have been a core product group within the STAR range.

The related standards (DIN 69 051 and ISO 3408) are fully supported by Rexroth STAR. For every STAR nut with flange in this catalog you will therefore find a corresponding design with DIN mounting dimensions.

STAR – Precision Ball Screw Assemblies provide technical designers with diverse solutions for positioning and transport tasks:

- complete ball screw assemblies with precision-rolled or ground thread screws combined with any of the available single or double nuts
- precision-rolled screws of optional length, with soft-annealed ends and ground-thread ECO screws in grid lengths for end machining by the customer
- single nuts supplied on a mounting tube; all single nuts in the version with reduced backlash can be easily mounted by the customer. In addition, the adjustable-preload single nut allows the customer to perform preload adjustment in-house.
- matching nut housings and end bearings

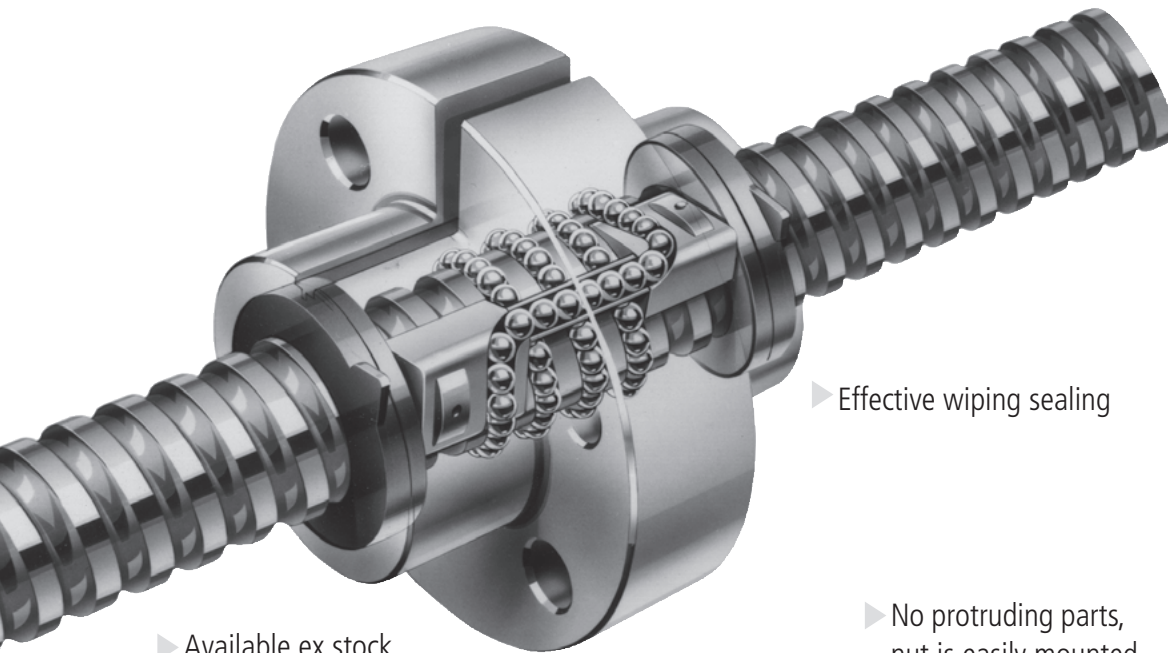
Precision-rolled **screws** are manufactured independently of customers orders. Our large world-wide stocks guarantee a fast response. Availability is one advantage, low prices another.

To perform particularly demanding positioning tasks we have developed a measuring system for integration in the rails of ball and roller rail systems (Catalog R.82 350). The linear measuring system in the rail then replaces the positioning information in the ball screw. This way we are able to achieve a maximum of flexibility in design and a maximum of precision in operation. Each **nut** is manufactured with the same technology, enabling it to be used in the high-precision range too. Nuts are available ex stock from a large cataloged range covering different mounting dimensions and technical details.



▶ Short nut length

▶ Particularly smooth motion due to the tangential lift-off of the balls from the raceway within a single, fully enclosed ball circuit in the nut

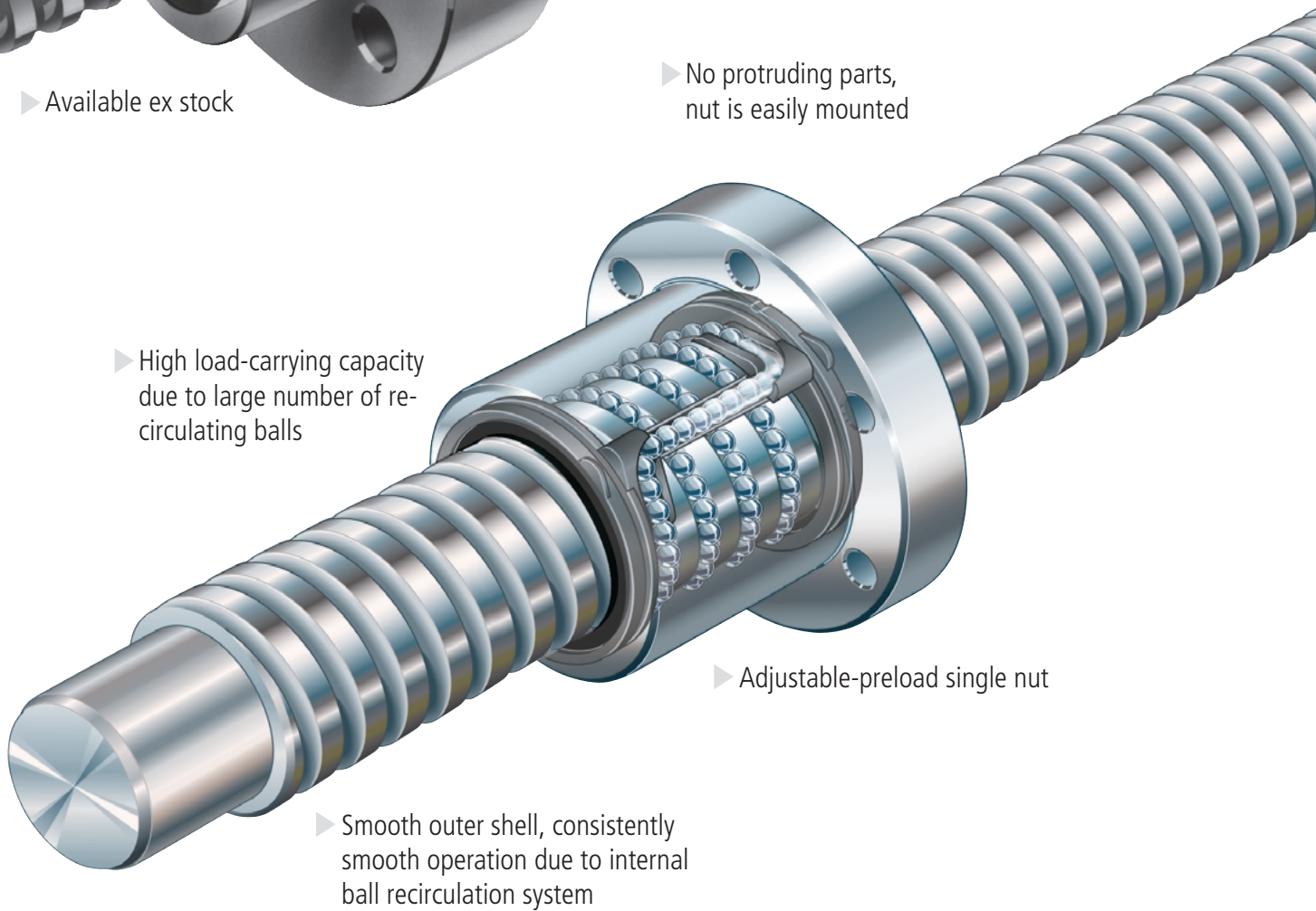


▶ Effective wiping sealing

▶ Available ex stock

▶ No protruding parts, nut is easily mounted

▶ High load-carrying capacity due to large number of recirculating balls



▶ Adjustable-preload single nut

▶ Smooth outer shell, consistently smooth operation due to internal ball recirculation system

STAR – Precision Ball Screw Assemblies

Product Overview

STAR – Precision Ball Screw Assemblies with end bearings

STAR – Precision Ball Screw Assemblies are available with various fixed and floating bearing units complete with matching slotted nuts.

STAR precision pillow block units to match the bearings enable:

- Easy installation due to the variable of fixture options and reference edges
- Use of premachined pin holes provides increased mounting accuracy

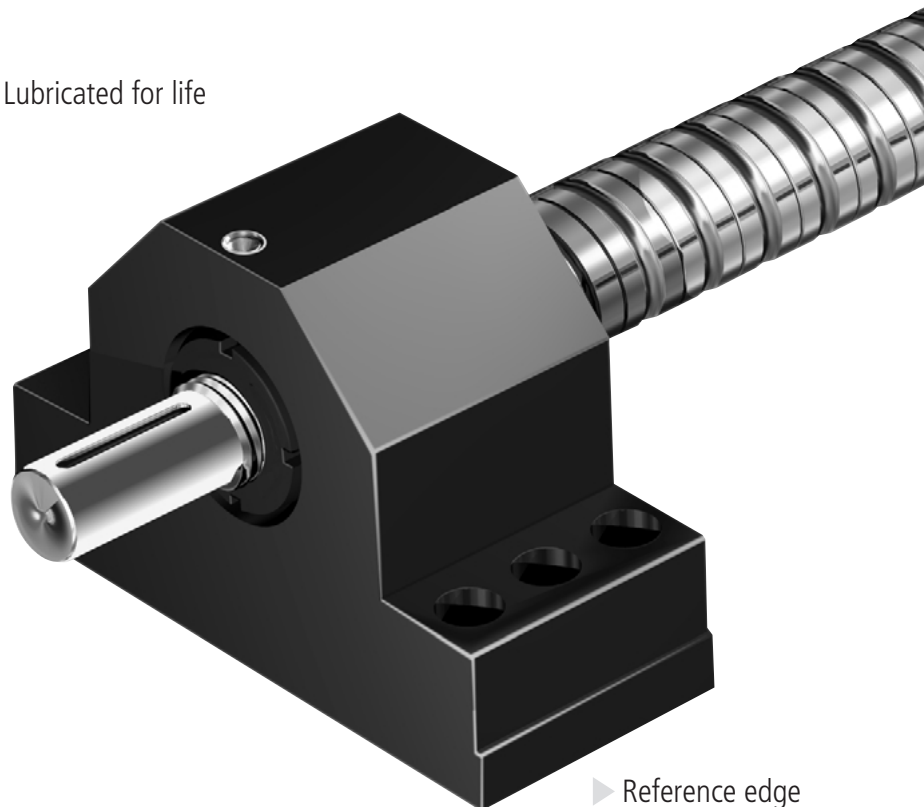
SEA units were recently added to supplement the range of pillow block units.

STAR – Precision Ball Screw Assemblies with nut housing

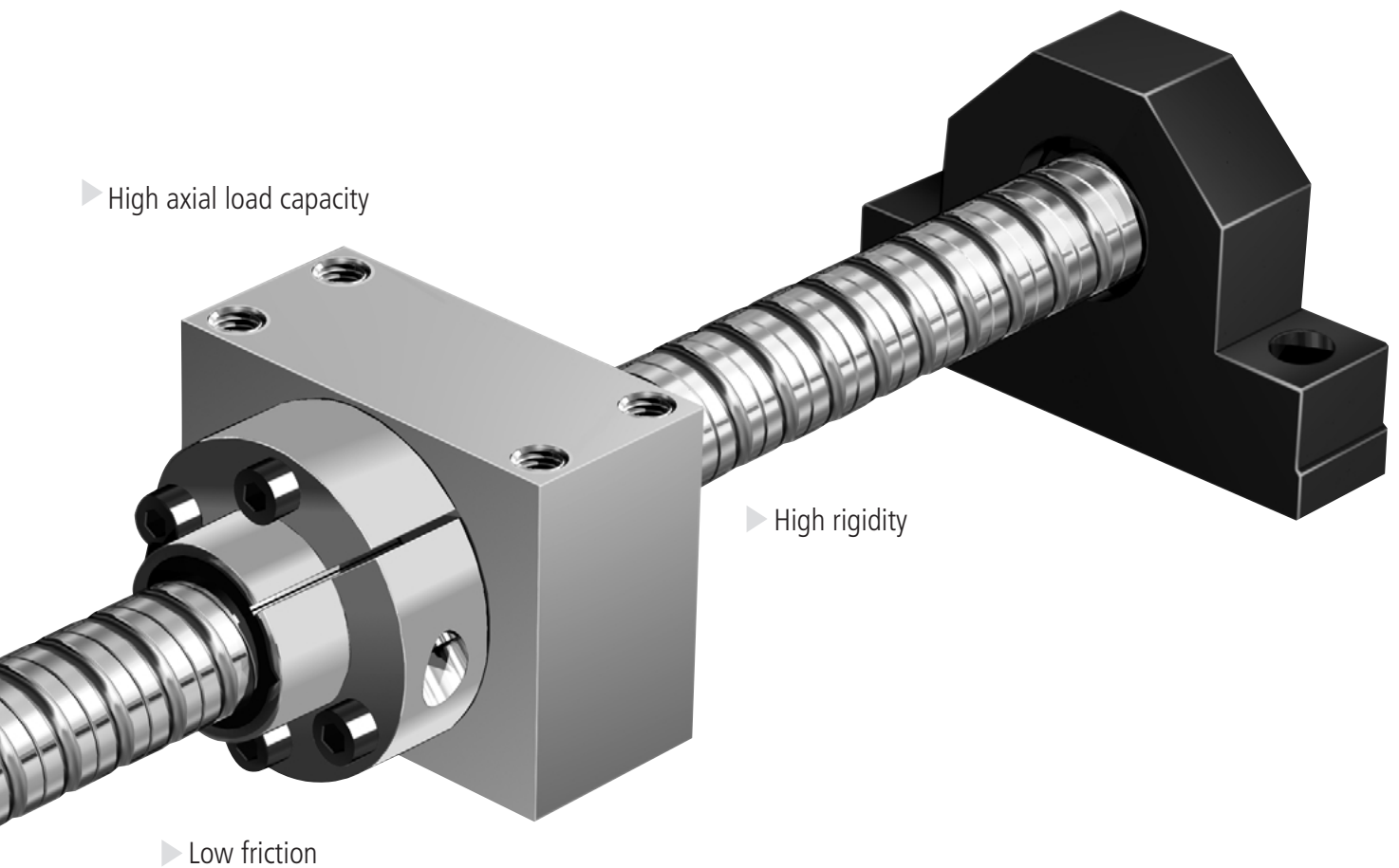
Housings for various flanged nuts complete the ready-to-mount STAR product range.

▶ Available ex stock

▶ Lubricated for life



▶ Reference edge



Definition of a precision ball screw assembly

DIN 69 051, Part 1 defines a ball screw as follows:

An assembly comprising a ball screw shaft and a ball nut which is capable of converting rotary motion into linear motion vice versa. The rolling elements of the assembly are balls.

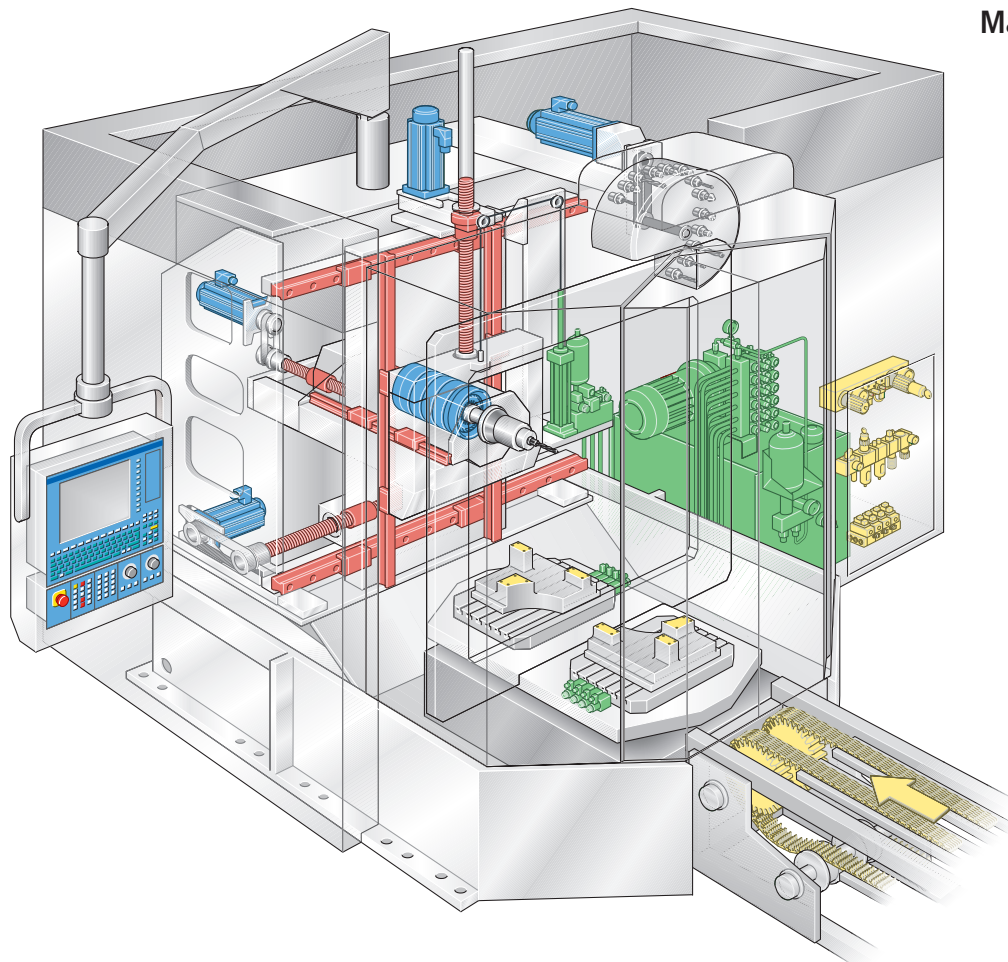
It is used to convert a rotary movement into a linear movement or vice versa.

STAR – Precision Ball Screw Assemblies

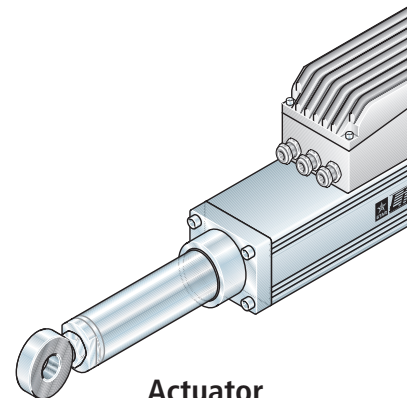
Application Examples

STAR – Precision Ball Screw Assemblies have been successfully implemented worldwide in the following areas:

- Cutting machine tools
- Forming machine tools
- Automation and handling
- Woodworking
- Electrical and electronics
- Printing and paper
- Injection molding machines
- Food and packaging industry
- Medical equipment
- Textile industry
- etc.

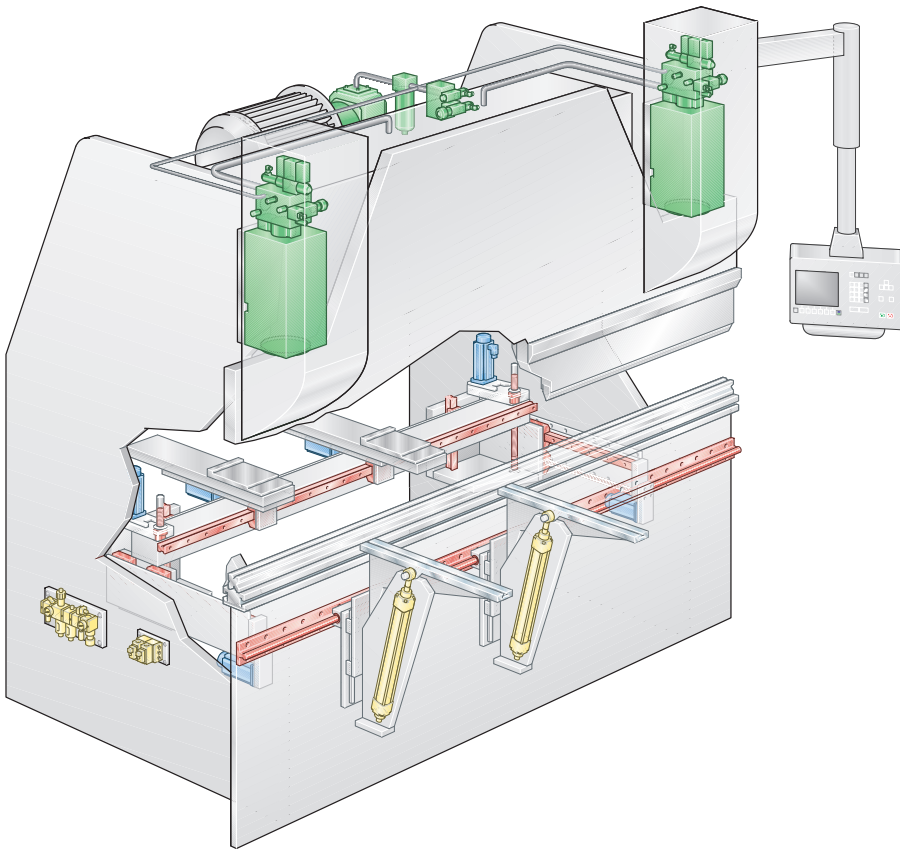


Machining center

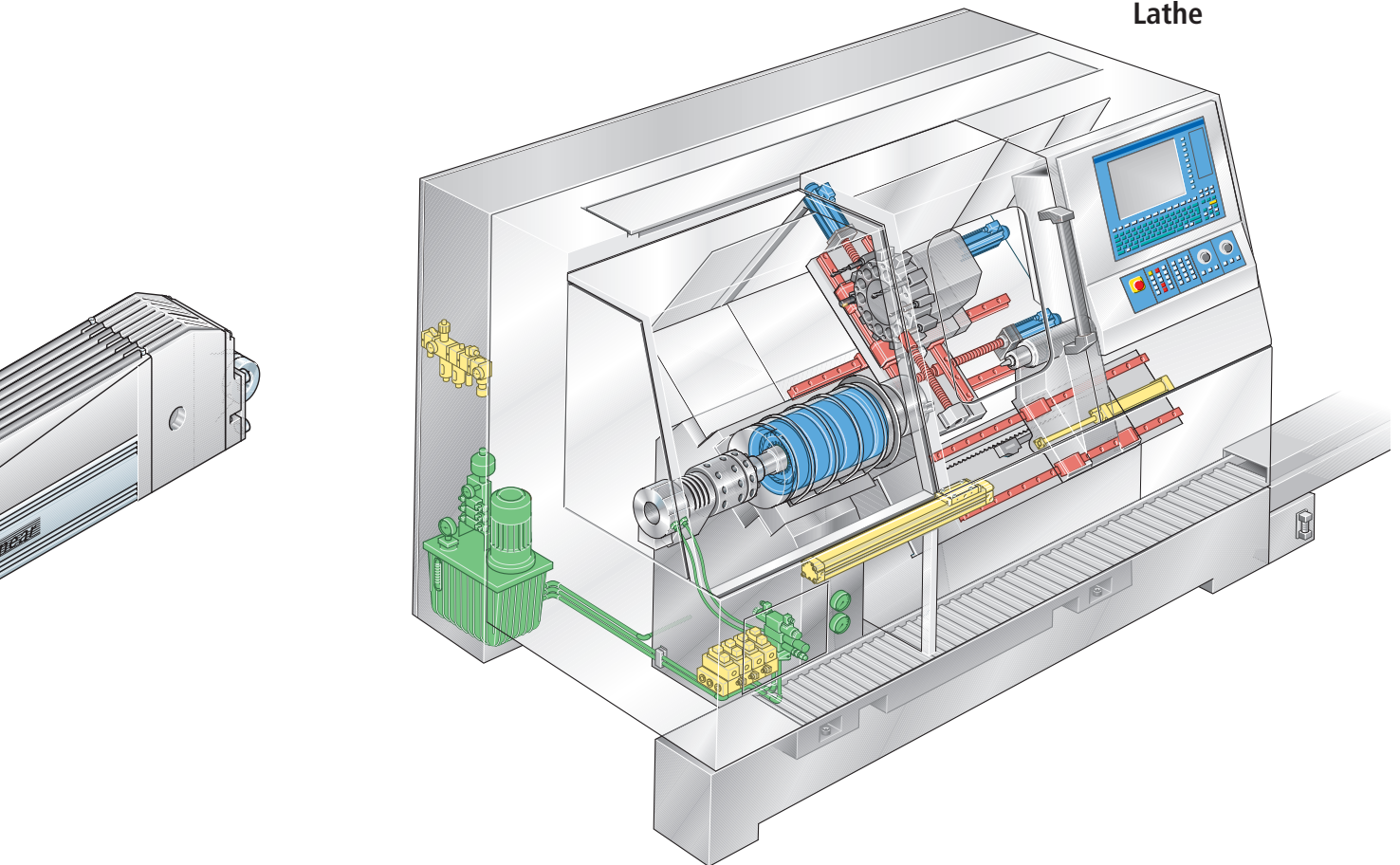


Actuator

Folding press



Lathe



STAR – Precision Ball Screw Assemblies

Inquiries and Orders

A special feature of this new catalog edition is a new system of order code.

All nuts, screws and end machining details can now be defined with the order code.

We have taken account of all former selection criteria as well as adding new ones. The diversity of possible combinations is limitless.

Attention is focused in particular on the definition of end machining details. For many design versions there is a prepared definition, providing you with a suitable solution for practically every application.

If you wish to send us an inquiry, simply complete the last page of the catalog.

If no drawing is available yet, please specify your wishes using the variable order code in the structure stipulated.

Should you already have a drawing available as a CAD file (in Pro/E20, AutoCAD/Genius 14 or DXF formats), you can send us the data by e-mail (see the back cover of the catalog for our e-mail address).

If the drawing exists on paper only, you can of course send it to us by conventional mail.

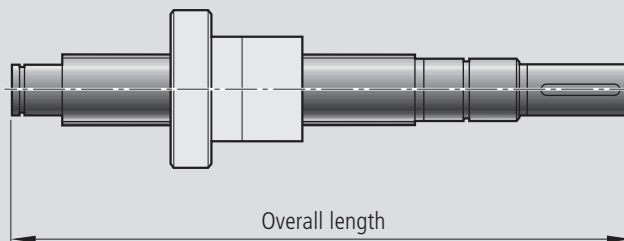
Each customer-specific precision ball screw assembly is issued with an ID number when an order is placed. If you have any subsequent queries, you need only quote this ID number.

Nominal diameters, leads

Nominal diameter d_0	Lead P								
	2.5	5	10	12	16	20	25	32	40
8									
12									
16									
20									
25									
32									
40									
50									
63									
80									

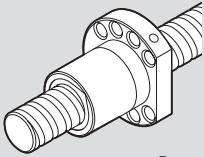
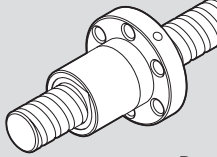
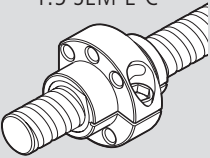
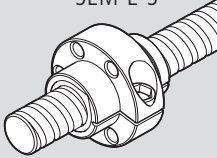
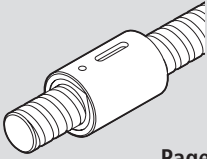
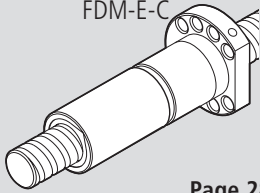
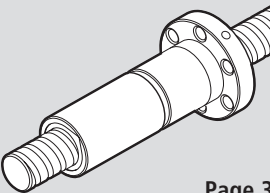
Precision-ground screws > \varnothing 80 mm available upon request

Overall lengths



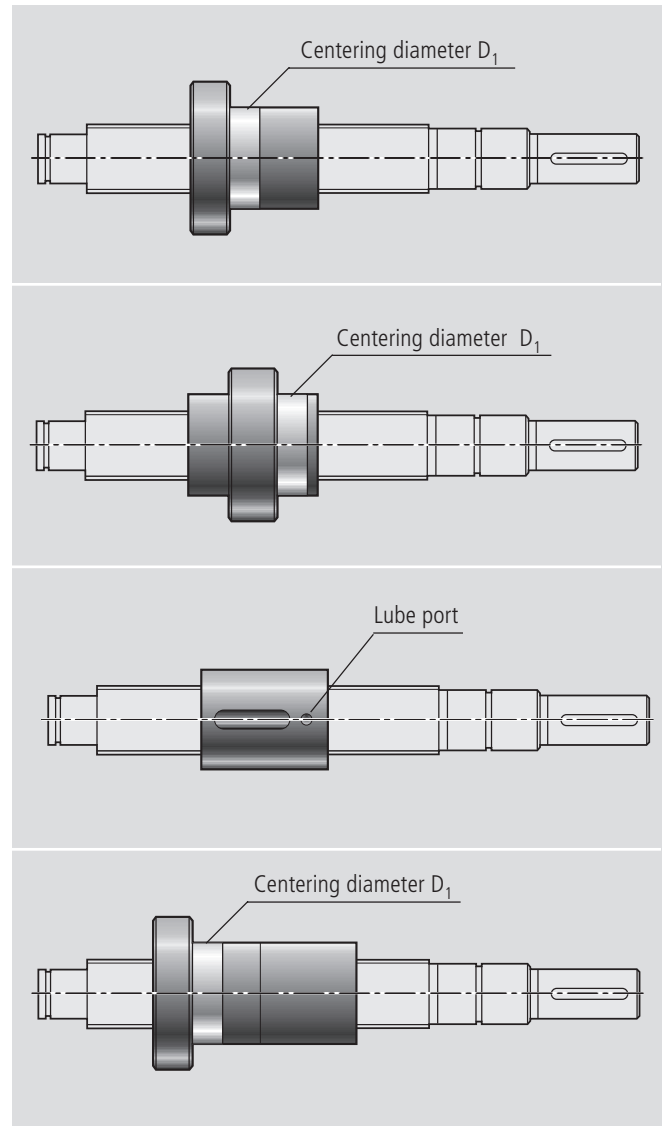
Nut types

All nuts can be combined with all screws and all end machining options. The various versions and forms are shown below.

<p>Single nut with flange 1502-DIN 69 051, T.5 FEM-E-C</p>  <p>Page 18</p>	<p>Single nut with flange 1502-/1512-/1532- FEM-E-S</p>  <p>Page 22</p>
<p>Adjustable-preload single nut, 1512-DIN 69 051, T.5 SEM-E-C</p>  <p>Page 20</p>	<p>Adjustable-preload single nut, 1512-/1532-/1552- SEM-E-S</p>  <p>Page 24</p>
<p>Cylindrical single nut 1512-/1532- ZEM-E-S</p>  <p>Page 26</p>	
<p>Double nut with flange 1502-DIN 69 051, T.5 FDM-E-C</p>  <p>Page 28</p>	<p>Double nut with flange 1502- FDM-E-S</p>  <p>Page 30</p>

Mounting direction of nut types

The following four drawings show the position of the left and right screw end.

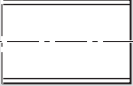
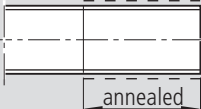
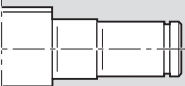
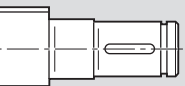
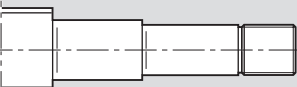
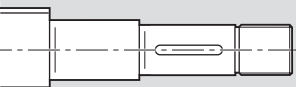

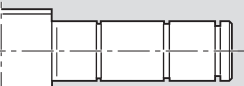
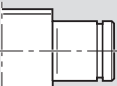
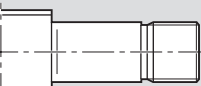
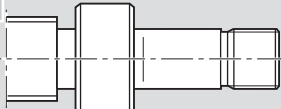
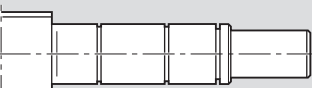
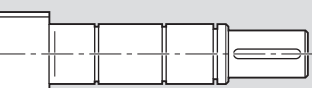
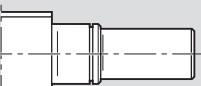
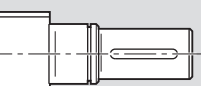
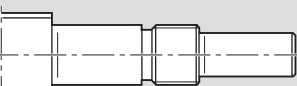
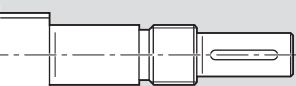
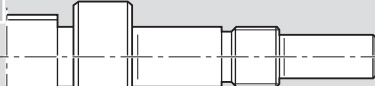
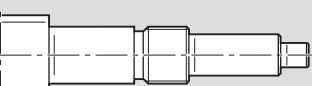
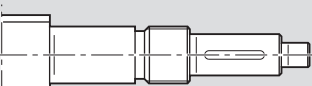
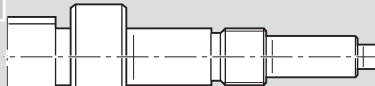
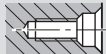
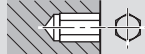


N.B.: The centering diameter on a nut with flange and the lube port on a cylindrical nut points to the right end of the screw.

STAR – Precision Ball Screw Assemblies

Inquiries and Orders

Screw ends, forms for a left or right screw end

Basic version	with keyway	annealed
00  Not annealed Page 41		99  annealed Page 40
01  Page 42	02  Page 42	
11  Page 44	12  Page 44	
21  Page 46		
31  Page 48		
41  Page 50		End friction welded, only 8 x 2.5R
51  Page 52		53  Page 52
61  Page 54	62  Page 54	
71  Page 56	72  Page 56	
81  Page 58	82  Page 58	83  Page 58
91  Page 60	92  Page 60	93  Page 60
Machining of end face	Z centering hole DIN 332-D 	S hex socket 

Order Code

Precision Ball Screw Assembly	SEM-E-S	20 x 5R x 3-4	1	2	T7	R	81Z120	41Z120	1250	1	1
Screw	S	20 x 5R x 3	X	X	T7	R	81Z120	41Z120	1250	1	0
Nut type	<p>FEM-E-C Single nut with flange to DIN 69 051, Part 5</p> <p>FEM-E-S Single nut with flange of STAR form</p> <p>SEM-E-C Adjustable-preload single nut to DIN 69 051, Part 5</p> <p>SEM-E-S Adjustable-preload single nut of STAR form</p> <p>ZEM-E-S Cylindrical single nut of STAR form</p> <p>FDM-E-C Double nut with flange to DIN 69 051, Part 5</p> <p>FDM-E-S Double nut with flange of STAR form</p>										
Size	<p>Nominal diameter (mm) _____</p> <p>Lead (mm) _____</p> <p>Direction of lead R ... right, L ... left _____</p> <p>Ball diameter (mm) _____</p> <p>Number of ball track turns in the nut _____</p>										
Seal	0 ... none 1 ... standard seal		2* ... reinforced seal X ... not possible								
Preload	0 ... standard backlash 1 ... reduced backlash 2** ... 5% (single nut) 3 ... 2% (single nut) standard		4 ... 10% (double nut) 5 ... 7% (double nut) X ... not possible								
Precision	P1 P3 P5 ground-thread screw (P5) T5 T7 T9 precision-rolled screw										
Screw	R ... precision-rolled S ... ground-thread										
Left screw end	<p>Form _____</p> <p>Option _____</p> <p>Version _____</p> <p>Z ... centering to DIN 332-D</p> <p>S ... hex socket</p> <p>K ... none</p>										
Right screw end	see left screw end										
Overall length (mm)											
Documentation	0 ... standard (acceptance test report!) -is always supplied 1 ... lead test report					2 ... torque test report 3 ... lead and torque test report					
Lubrication	0 ... Preserved					1 ... Preserved and nut with basic grease					

* only for d_0 25 to 40 of the precision-rolled version; note higher frictional torque!

** only for d_0 16 to 63

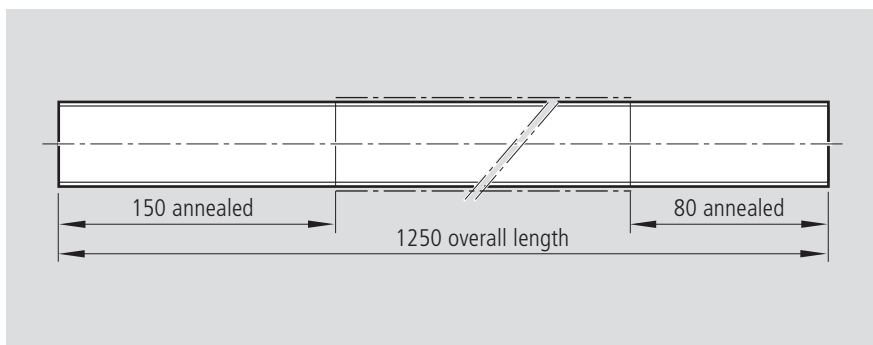
N.B.: It is also possible, to process inquiries based on a customer's drawings.

STAR – Precision Ball Screw Assemblies

Inquiries and Orders - Special Cases

Screw with annealed ends

For **machining of screw ends** by the customer.



Screw	S	20 x 5R x 3	X X	T7	R	99 K150	99K080	1250	1	0
Screw Size										
Precision										
Screw:	R...rolled									
left screw end	Form									
	Option	- - K...none								
	Annealed length (mm)									
right screw end	see left screw end									
Overall length (mm)										
Documentation:	0, 1 ... see page 15									
Lubrication:	0 ... Preserved									

Ball screw with annealed ends

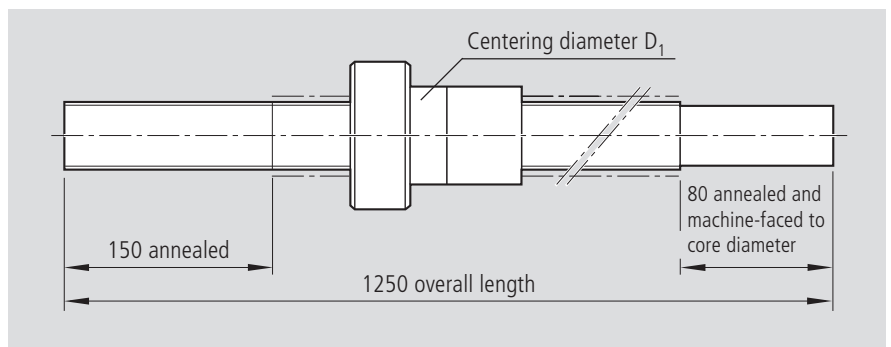
For **machining of the screw ends** by the customer.

Nut with preload

The nut is delivered already mounted. A mounting tube is supplied for dismantling.

Nut without preload

The nut and screw are delivered unassembled.



Mounting direction

N.B.: The centering diameter (or lube port on a cylindrical nut) points to the machine-faced, right-hand end of the screw. The shorter screw end is machine-faced to core diameter for mounting reasons.

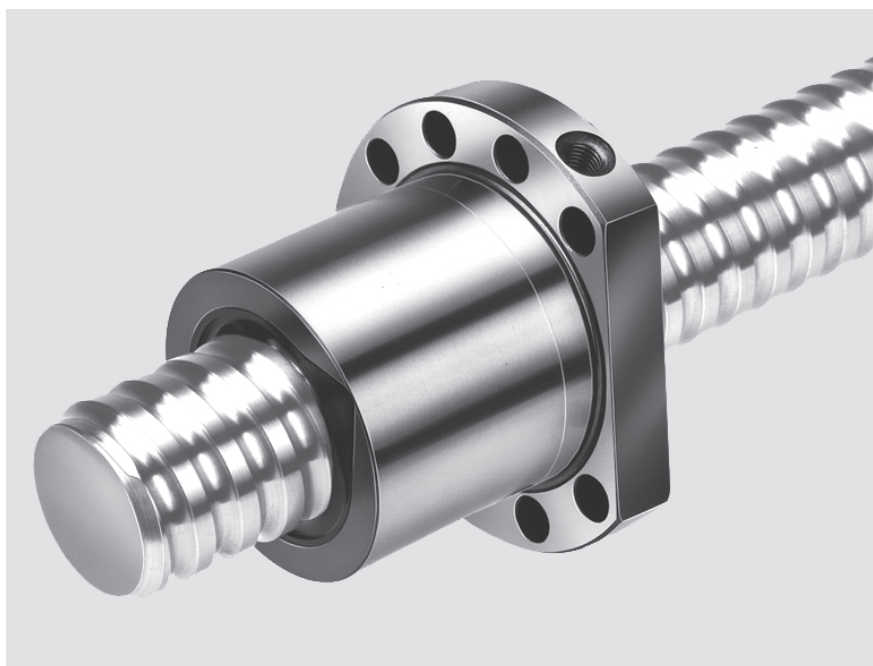
Ball screw	FEM-E-S	20 x 5R x 3-4	1	2	T7	R	99 K150	99K080	1250	1	1
Nut type											
Size											
Seal											
Preload											
Precision											
Screw:		R...rolled									
Left screw end		Form									
		Option - - K...none									
		Annealed length (mm)									
Right screw		see left screw end									
Overall length (mm)											
Documentation:		0, 1, 2, 3 ... see Page 15									
Lubrication:		0 ... Preserved								1 ... Preserved and nut with basic grease	

STAR – Precision Ball Screw Assemblies

Single Nut with Flange FEM-E-C

Mounting dimensions to
DIN 69 051, Part 5

Flange type C



Order code:

FEM-E-C 20 x 5R x 3-4 1 2 T7 R 82Z120 41Z120 1250 1 0

d_0 = nominal diameter

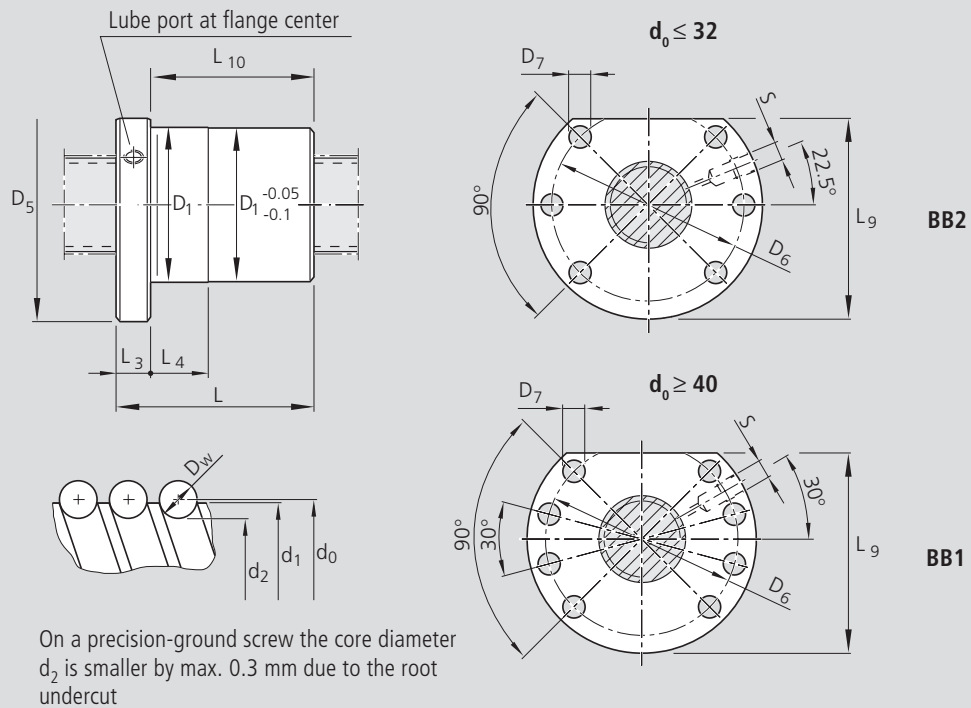
P = Lead

(R = right-hand, L = left-hand)

D_w = ball diameter

i = number of ball track turns

Size $d_0 \times P \times D_w - i$	Part number	Load ratings	
		dyn. C (N)	stat. C_0 (N)
16 x 5R x 3 - 4	1502-0-1065	12300	16100
16 x 10R x 3 - 3	1502-0-4085	9600	12300
16 x 16R x 3 - 3	1502-0-6065	9300	12000
20 x 5R x 3 - 4	1502-1-1085	14300	21500
20 x 20R x 3.5 - 3	1502-1-7065	13300	18800
25 x 5R x 3 - 4	1502-2-1085	15900	27200
25 x 10R x 3 - 4	1502-2-4085	15700	27000
25 x 25R x 3.5 - 3	1502-2-8065	14700	23300
32 x 5R x 3.5 - 4	1502-3-1085	21600	40000
32 x 10R x 3.969 - 5	1502-3-4086	31700	58300
32 x 20R x 3.969 - 3	1502-3-7065	19700	33700
32 x 32R x 3.969 - 3	1502-3-9065	19500	34000
40 x 5R x 3.5 - 5	1502-4-1086	29100	64100
40 x 10R x 6 - 4	1502-4-4085	50000	86400
40 x 12R x 6 - 4	1502-4-5065	49900	86200
40 x 16R x 6 - 4	1502-4-6065	49700	85900
40 x 20R x 6 - 3	1502-4-7085	37900	62800
40 x 40R x 6 - 3	1502-4-9065	37000	62300
50 x 5R x 3.5 - 5	1502-5-1086	32000	81300
50 x 10R x 6 - 6	1502-5-4086	79700	166500
50 x 12R x 6 - 6	1502-5-5066	79600	166400
50 x 16R x 6 - 6	1502-5-6066	79400	166000
50 x 20R x 6.5 - 5	1502-5-7086	75700	149700
50 x 40R x 6.5 - 3	1502-5-9065	46500	85900
63 x 10R x 6 - 6	1502-6-4086	88800	214300
63 x 20R x 6.5 - 5	1502-6-7086	83900	190300
63 x 40R x 6.5 - 3	1502-6-9065	53400	114100
80 x 10R x 6.5 - 6	1502-7-4086	108400	291700
80 x 20R x 9 - 6	1502-7-7086	170900	403900
80 x 20R x 12.7 - 6	1502-7-7066	262700	534200
100 x 10R x 6.5 - 6	1502-8-4066	119500	371900
100 x 20R x 12.7 - 6	1502-8-7066	295100	686400
125 x 10R x 6.5 - 6	1502-9-4066	130600	468700
125 x 20R x 12.7 - 6	1502-9-7066	326500	870400



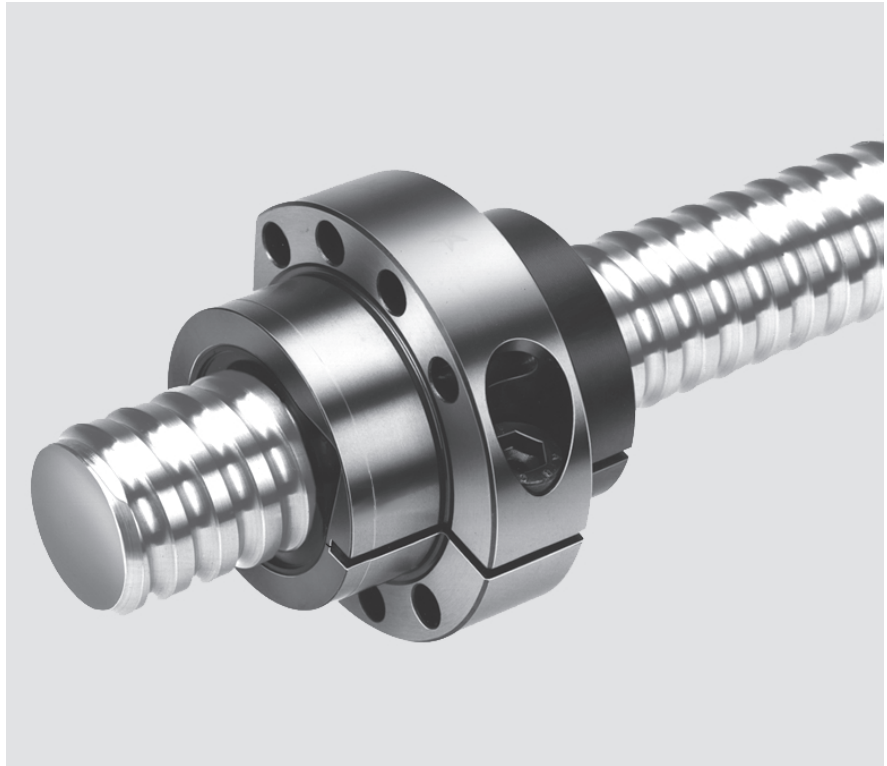
Dimensions (mm)													Weight
d_1	d_2	D_1 g6	D_5	Hole pattern	D_6	D_7	L	L_3	L_4	L_9	L_{10}	S	m (kg)
15.0	12.9	28	48	BB2	38	5.5	38	12	10	44.0	26	M6	0.19
15.0	12.9	28	48	BB2	38	5.5	45	12	16	44.0	33	M6	0.21
15.0	12.9	28	48	BB2	38	5.5	61	12	20	44.0	49	M6	0.26
19.0	16.9	36	58	BB2	47	6.6	40	12	10	51.0	28	M6	0.31
19.3	16.7	36	58	BB2	47	6.6	77	12	25	51.0	65	M6	0.49
24.0	21.9	40	62	BB2	51	6.6	45	12	10	55.0	33	M6	0.36
24.0	21.9	40	62	BB2	51	6.6	64	12	20	55.0	52	M6	0.47
24.0	21.4	40	62	BB2	51	6.6	95	12	30	55.0	83	M6	0.63
31.0	28.4	50	80	BB2	65	9.0	48	13	10	71.0	35	M6	0.62
31.0	27.9	50	80	BB2	65	9.0	77	13	16	71.0	64	M6	0.84
31.0	27.9	50	80	BB2	65	9.0	84	13	25	71.0	71	M6	0.90
31.0	27.9	50	80	BB2	65	9.0	120	13	40	71.0	107	M6	1.21
39.0	36.4	63	93	BB1	78	9.0	54	15	10	81.5	39	M8x1	1.03
38.0	33.8	63	93	BB1	78	9.0	70	15	16	81.5	55	M8x1	1.19
38.0	33.8	63	93	BB1	78	9.0	75	15	25	81.5	60	M8x1	1.27
38.0	33.8	63	93	BB1	78	9.0	90	15	25	81.5	75	M8x1	1.51
38.0	33.8	63	93	BB1	78	9.0	88	15	40	81.5	73	M8x1	1.44
38.0	33.8	63	93	BB1	78	9.0	142	15	45	81.5	127	M8x1	2.16
49.0	46.4	75	110	BB1	93	11.0	54	15	10	97.5	39	M8x1	1.39
48.0	43.8	75	110	BB1	93	11.0	90	18	16	97.5	72	M8x1	2.14
48.0	43.8	75	110	BB1	93	11.0	105	18	25	97.5	87	M8x1	2.38
48.0	43.8	75	110	BB1	93	11.0	128	18	25	97.5	110	M8x1	2.75
48.0	43.4	75	110	BB1	93	11.0	132	18	25	97.5	114	M8x1	2.73
48.0	43.4	75	110	BB1	93	11.0	149	18	45	97.5	131	M8x1	3.04
61.0	56.8	90	125	BB1	108	11.0	90	22	16	110.0	68	M8x1	2.56
61.0	56.4	95	135	BB1	115	13.5	132	22	25	117.5	110	M8x1	4.51
61.0	56.4	95	135	BB1	115	13.5	149	22	45	117.5	127	M8x1	5.04
78.0	73.3	105	145	BB1	125	13.5	95	22	16	127.5	73	M8x1	3.40
77.0	70.8	125	165	BB1	145	13.5	160	25	25	147.5	135	M8x1	9.95
76.0	67.0	125	165	BB1	145	13.5	170	25	25	147.5	145	M8x1	10.20
98.0	93.4	125	165	BB1	145	13.5	95	25	16	147.5	70	M8x1	4.40
96.0	87.1	150	202	BB1	176	17.5	170	30	25	178.5	140	M8x1	14.30
123.0	118.0	150	202	BB1	176	17.5	95	25	16	178.5	70	M8x1	5.65
121.0	112.0	170	222	BB1	196	17.5	170	40	25	198.5	130	M8x1	16.10

STAR – Precision Ball Screw Assemblies

Adjustable-Preload Single Nut SEM-E-C

Mounting dimensions to
DIN 69 051, Part 5

Flange type C

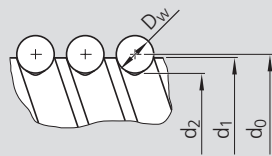
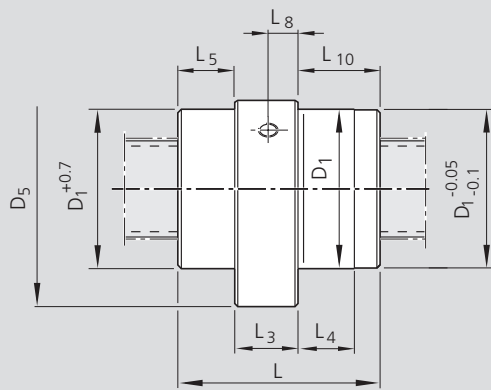


Order code:

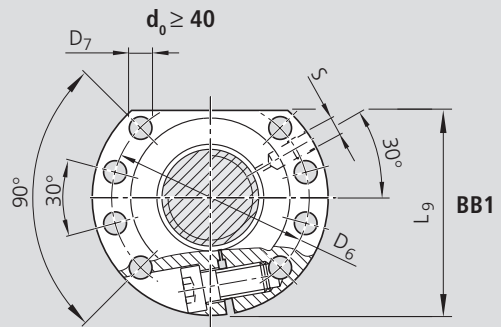
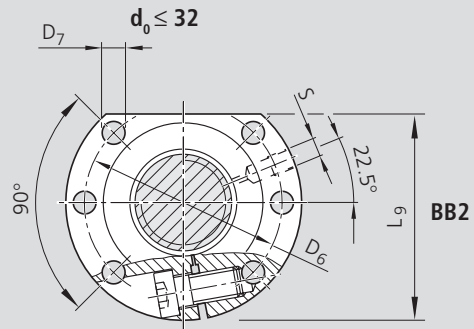
SEM-E-C 20 x 5R x 3-4 1 2 T7 R 82Z120 41Z120 1250 1 0

d_0 = nominal diameter
 P = lead
 (R = right-hand, L = left-hand)
 D_w = ball diameter
 i = number of ball track turns

Size $d_0 \times P \times D_w - i$	Part number	Load ratings	
		dyn. C (N)	stat. C_0 (N)
16 x 5R x 3 - 4	1512-0-1055	12300	16100
16 x 10R x 3 - 3	1512-0-4075	9600	12300
16 x 16R x 3 - 3	1512-0-6055	9300	12000
20 x 5R x 3 - 4	1512-1-1075	14300	21500
20 x 20R x 3.5 - 3	1512-1-7055	13300	18800
25 x 5R x 3 - 4	1512-2-1075	15900	27200
25 x 10R x 3 - 4	1512-2-4075	15700	27000
25 x 25R x 3.5 - 3	1512-2-8055	14700	23300
32 x 5R x 3.5 - 4	1512-3-1075	21600	40000
32 x 10R x 3.969 - 5	1512-3-4075	31700	58300
32 x 20R x 3.969 - 3	1512-3-7055	19700	33700
32 x 32R x 3.969 - 3	1512-3-9055	19500	34000
40 x 5R x 3.5 - 5	1512-4-1075	29100	64100
40 x 10R x 6 - 4	1512-4-4075	50000	86400
40 x 12R x 6 - 4	1512-4-5055	49900	86200
40 x 20R x 6 - 3	1512-4-7075	37900	62800
40 x 40R x 6 - 3	1512-4-9055	37000	62300
50 x 5R x 3.5 - 5	1512-5-1075	32000	81300
50 x 10R x 6 - 6	1512-5-4075	79700	166500
50 x 12R x 6 - 6	1512-5-5055	79600	166400
50 x 20R x 6.5 - 5	1512-5-7076	75700	149700
50 x 40R x 6.5 - 3	1512-5-9055	46500	85900
63 x 10R x 6 - 6	1512-6-4075	88800	214300
63 x 20R x 6.5 - 5	1512-6-7076	83900	190300
63 x 40R x 6.5 - 3	1512-6-9055	53400	114100
80 x 10R x 6.5 - 6	1512-7-4075	108400	291700
80 x 20R x 9 - 6	1512-7-7075	170900	403900
80 x 20R x 12.7 - 6	1512-7-7055	262700	534200



N.B.: On a precision-ground screw the core diameter d_2 is smaller by max. 0.3 mm due to the root undercut.

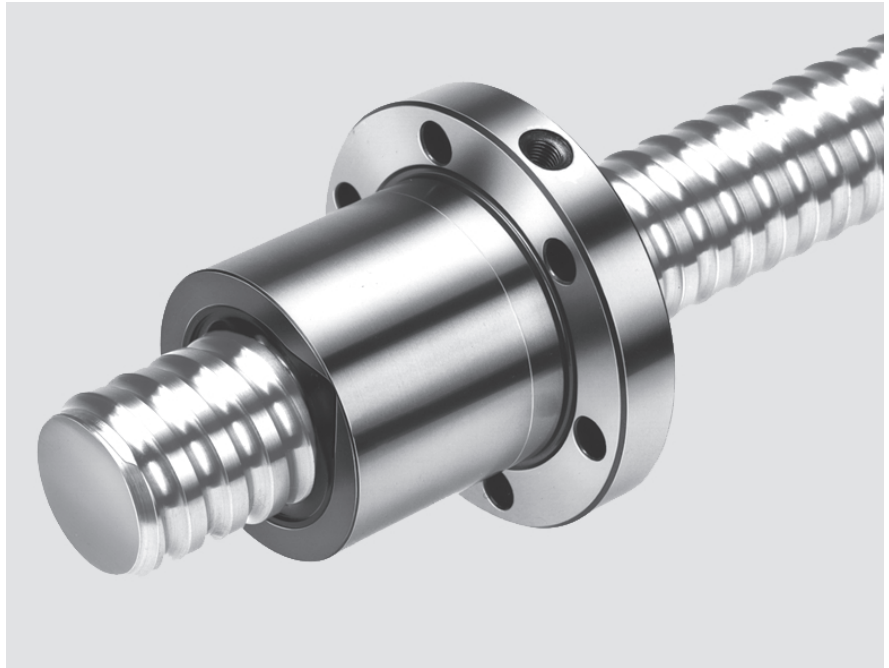


Dimensions (mm)																Weight
d_1	d_2	D_1 f9	D_5	Hole pattern	D_6	D_7	L	L_3	L_4	L_5	L_9	L_{10}	S	L_8	m (Kg)	
15.0	12.9	28	48	BB2	38	5.5	38	15	10	11.5	44	11.5	M6	7.1	0.20	
15.0	12.9	28	48	BB2	38	5.5	45	15	15	15	44	15	M6	11	0.22	
15.0	12.9	28	48	BB2	38	5.5	61	15	20	23	44	23	M6	10	0.29	
19.0	16.9	36	58	BB2	47	6.6	40	15	10	12.5	51	12.5	M6	7.1	0.33	
19.3	16.7	36	58	BB2	47	6.6	77	20	25	28.5	51	28.5	M6	12.5	0.56	
24.0	21.9	40	62	BB2	51	6.6	45	20	10	12.5	55	12.5	M6	9.5	0.43	
24.0	21.9	40	62	BB2	51	6.6	64	20	16	22	55	22	M6	10	0.54	
24.0	21.4	40	62	BB2	51	6.6	95	25	30	35	55	35	M6	14	0.77	
31.0	28.4	50	80	BB2	65	9	48	20	10	14	71	14	M6	9.7	0.74	
31.0	27.9	50	80	BB2	65	9	77	20	16	28.5	71	28.5	M6	12.5	0.97	
31.0	27.9	50	80	BB2	65	9	84	20	25	32	71	32	M6	12.5	1.04	
31.0	27.9	50	80	BB2	65	9	120	20	40	50	71	50	M6	12.5	1.34	
39.0	36.4	63	93	BB1	78	9	54	25	10	14.5	81.5	14.5	M8x1	12	1.25	
38.0	33.8	63	93	BB1	78	9	70	25	16	22.5	81.5	22.5	M8x1	11.8	1.39	
38.0	33.8	63	93	BB1	78	9	75	25	25	25	81.5	25	M8x1	12.5	1.47	
38.0	33.8	63	93	BB1	78	9	88	25	25	31.5	81.5	31.5	M8x1	16.5	1.55	
38.0	33.8	63	93	BB1	78	9	142	40	45	51	81.5	51	M8x1	25	2.69	
49.0	46.4	75	110	BB1	93	11	54	25	10	14.5	97.5	14.5	M8x1	12	1.67	
48.0	43.8	75	110	BB1	93	11	90	30	16	30	97.5	30	M8x1	14.1	2.46	
48.0	43.8	75	110	BB1	93	11	105	30	25	37.5	97.5	37.5	M8x1	15	2.69	
48.0	43.4	75	110	BB1	93	11	132	30	25	51	97.5	51	M8x1	20	3.08	
48.0	43.4	75	110	BB1	93	11	149	30	45	59.5	97.5	59.5	M8x1	18	3.39	
61.0	56.8	90	125	BB1	108	11	90	30	16	30	110	30	M8x1	14	2.83	
61.0	56.4	95	135	BB1	115	13.5	132	30	25	51	117.5	51	M8x1	20	4.86	
61.0	56.4	95	135	BB1	115	13.5	149	30	45	59.5	117.5	59.5	M8x1	18	5.36	
78.0	73.3	105	145	BB1	125	13.5	95	30	16	32.5	127.5	32.5	M8x1	14	3.73	
77.0	70.8	125	165	BB1	145	13.5	160	50	25	55	147.5	55	M8x1	23.5	10.88	
76.0	67.0	125	165	BB1	145	13.5	170	50	25	60	147.5	60	M8x1	23.7	13.50	

STAR – Precision Ball Screw Assemblies

Single Nut with Flange FEM-E-S

STAR mounting dimensions

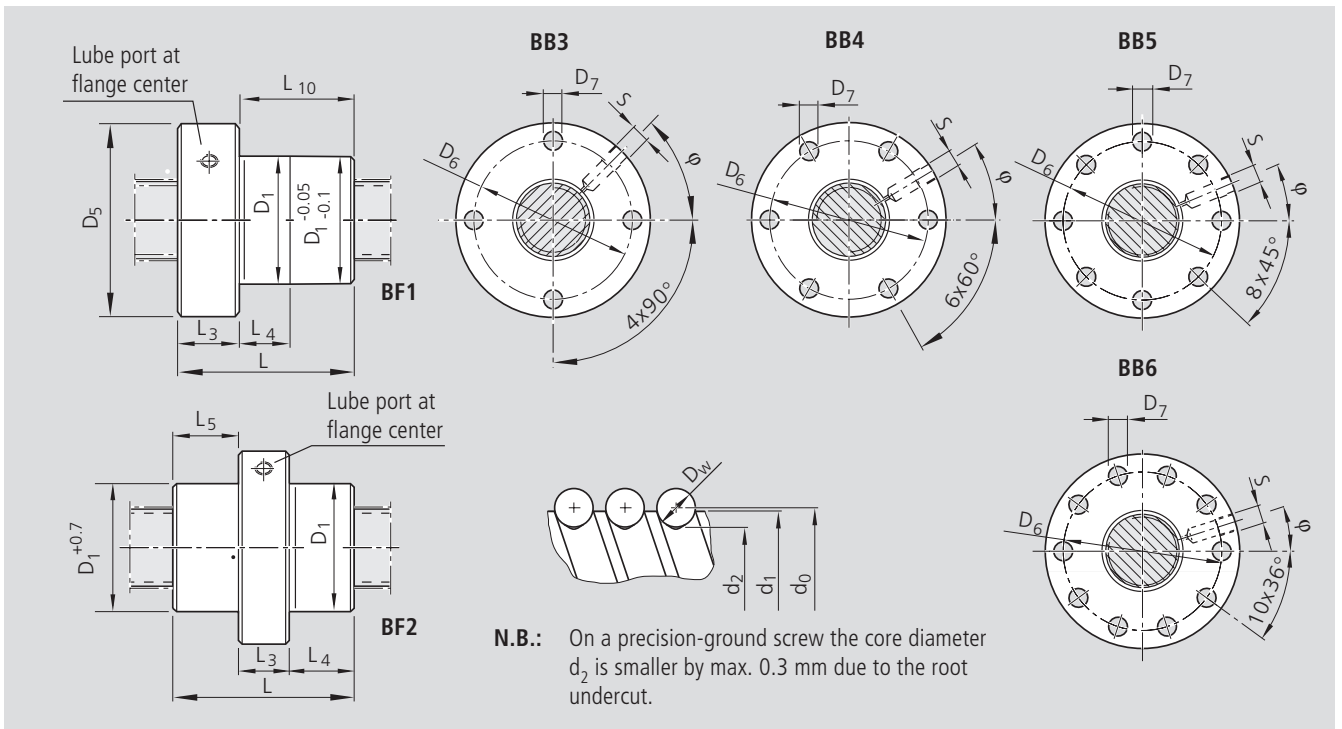


Order code:

FEM-E-S 20 x 5R x 3-4 1 2 T7 R 82Z120 41Z120 1250 1 0

- d_0 = nominal diameter
 P = lead
 (R = right-hand, L = left-hand)
 D_w = ball diameter
 i = number of ball track turns

Size $d_0 \times P \times D_w - i$	Part number	Load ratings	
		dyn. C (N)	stat. C_0 (N)
8 x 2.5R x 1.588 - 3	1532-2-3003	2200	2800
12 x 5R x 2 - 3	1532-4-6023	3800	5800
12 x 10R x 2 - 2	1532-4-9013	2500	3600
16 x 5R x 3 - 4	1512-0-1023	12300	16100
16 x 10R x 3 - 3	1512-0-4013	9600	12300
16 x 16R x 3 - 2	1512-0-6013	6300	7600
20 x 5R x 3 - 4	1512-1-1013	14300	21500
20 x 20R x 3.5 - 2	1512-1-7013	9100	12100
25 x 5R x 3 - 4	1512-2-1013	15900	27200
25 x 10R x 3 - 4	1512-2-4013	15700	27000
25 x 25R x 3.5 - 2	1512-2-8013	10100	15100
32 x 5R x 3.5 - 4	1512-3-1013	21600	40000
32 x 10R x 3.969 - 5	1512-3-4013	31700	58300
32 x 20R x 3.969 - 2	1512-3-7013	13500	21800
32 x 32R x 3.969 - 2	1512-3-9013	13400	22000
40 x 5R x 3.5 - 5	1512-4-1013	29100	64100
40 x 10R x 6 - 4	1512-4-4013	50000	86400
40 x 20R x 6 - 3	1512-4-7013	37900	62800
40 x 40R x 6 - 2	1512-4-9013	25500	40300
50 x 5R x 3.5 - 5	1512-5-1013	32000	81300
50 x 10R x 6 - 6	1512-5-4013	79700	166500
50 x 16R x 6 - 6	1512-5-6013	79400	166000
50 x 20R x 6.5 - 3	1512-5-7013	47900	87900
50 x 40R x 6.5 - 2	1512-5-9013	32100	55800
63 x 10R x 6 - 6	1512-6-4013	88800	214300
63 x 20R x 6.5 - 3	1512-6-7013	53200	112100
63 x 40R x 6.5 - 2	1512-6-9013	36900	74300
80 x 10R x 6.5 - 6	1512-7-4013	108400	291700
80 x 20R x 9 - 6	1512-7-7013	170900	403900
80 x 20R x 12.7 - 6	1512-7-7003	262700	534200
100 x 10R x 6.5 - 6	1502-8-4002	119500	371900
100 x 20R x 12.7 - 6	1502-8-7002	295100	686400
125 x 10R x 6.5 - 6	1502-9-4002	130600	468700
125 x 20R x 12.7 - 6	1502-9-7002	326500	870400



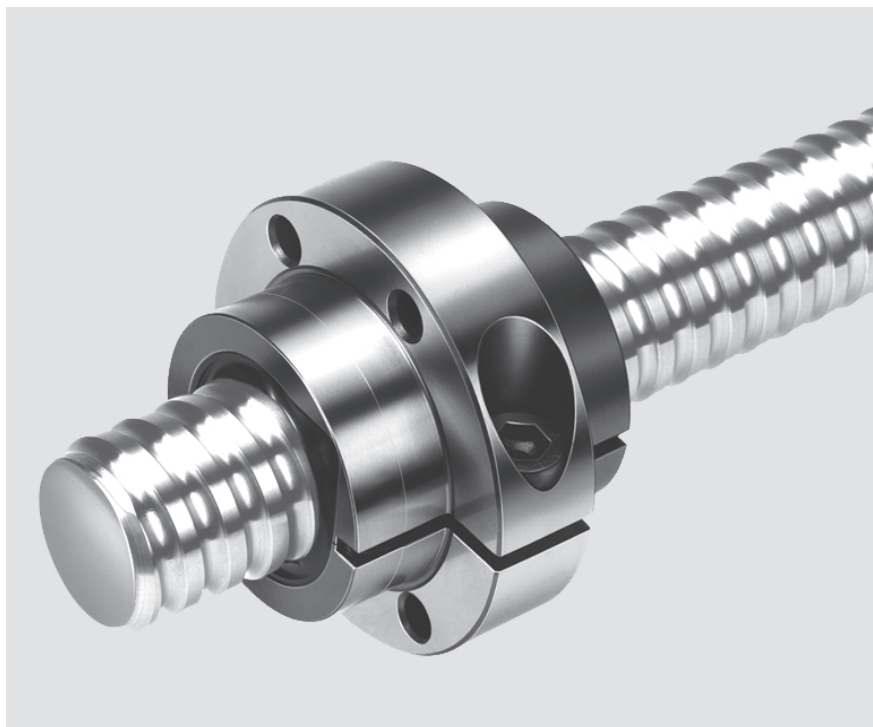
Dimensions (mm)																Weight
d_1	d_2	D_1 g6	D_5	Hole pattern	D_6	D_7	Type	L	L_3	L_4	L_5	L_{10}	S	ϕ (°)	L_8	m (Kg)
7.5	6.3	16	30	BB4	23	3.4	BF1	16	8	8	0	8	3.9	30	4	0.05
11.4	9.9	24	40	BB4	32	4.5	BF1	28	12	10	0	16	M6	330	6	0.12
11.4	9.9	24	40	BB4	32	4.5	BF1	33	12	16	0	21	M6	330	6	0.14
15.0	12.9	28	53	BB3	40	6.6	BF1	38	12	10	0	26	M6	45	6	0.24
15.0	12.9	28	53	BB3	40	6.6	BF1	45	12	16	0	33	M6	45	6	0.25
15.0	12.9	33	58	BB4	45	6.6	BF2	45	15	15	15	15	M6	30	7.5	0.39
19.0	16.9	33	58	BB4	45	6.6	BF1	40	12	10	0	28	M6	30	6	0.28
19.3	16.7	38	63	BB4	50	6.6	BF2	57	20	18.5	18.5	18.5	M6	30	10	0.60
24.0	21.9	38	63	BB4	50	6.6	BF1	45	12	10	0	33	M6	30	6	0.35
24.0	21.9	38	63	BB4	50	6.6	BF1	64	12	16	0	52	M6	30	6	0.44
24.0	21.4	48	73	BB4	60	6.6	BF2	70	25	22.5	22.5	22.5	M6	42	12.5	1.09
31.0	28.4	48	73	BB4	60	6.6	BF1	48	13	10	0	35	M6	30	6.5	0.54
31.0	27.9	48	73	BB4	60	6.6	BF1	77	13	16	0	64	M6	30	6.5	0.72
31.0	27.9	56	80	BB4	68	6.6	BF1	64	15	25	0	49	M6	30	7.5	1.02
31.0	27.9	56	80	BB4	68	6.6	BF2	88	20	34	34	34	M6	30	10	1.40
39.0	36.4	56	80	BB4	68	6.6	BF1	54	15	10	0	39	M8x1	30	7.5	0.71
38.0	33.8	63	95	BB4	78	9	BF1	70	15	16	0	55	M8x1	30	7.5	1.29
38.0	33.8	63	95	BB4	78	9	BF1	88	15	25	0	73	M8x1	30	7.5	1.54
38.0	33.8	72	110	BB4	90	11	BF2	102	40	31	31	31	M8x1	41	20	3.59
49.0	46.4	68	98	BB4	82	9	BF1	54	15	10	0	39	M8x1	30	7.5	1.02
48.0	43.8	72	110	BB4	90	11	BF1	90	18	16	0	72	M8x1	30	9	2.02
48.0	43.8	72	110	BB4	90	11	BF1	128	18	25	0	110	M8x1	30	9	2.58
48.0	43.4	85	125	BB4	105	11	BF1	92	22	25	0	70	M8x1	30	11	3.40
48.0	43.4	85	125	BB4	105	11	BF1	109	22	45	0	87	M8x1	30	11	3.87
61.0	56.8	85	125	BB4	105	11	BF1	90	22	16	0	68	M8x1	30	11	2.62
61.0	56.4	95	140	BB4	118	14	BF1	92	22	25	0	70	M8x1	30	11	3.71
61.0	56.4	95	140	BB4	118	14	BF1	109	22	45	0	87	M8x1	30	11	4.21
78.0	73.3	105	150	BB4	125	14	BF1	95	22	16	0	73	M8x1	30	11	3.78
77.0	70.8	125	180	BB5	152	18	BF1	160	25	25	0	135	M8x1	22.5	12.5	10.80
76.0	67.0	125	180	BB5	152	18	BF1	170	25	25	0	145	M8x1	22.5	12.5	11.00
98.0	93.4	125	180	BB5	152	18	BF1	95	25	16	0	70	M8x1	22.5	12.5	5.46
96.0	87.1	145	200	BB5	172	18	BF1	170	30	25	0	140	M8x1	22.5	15	14.50
123.0	118.0	150	210	BB5	180	18	BF1	95	30	16	0	65	M8x1	22.5	15	7.49
121.0	112.0	170	230	BB6	200	18	BF1	170	40	25	0	130	M8x1	18	20	19.00

STAR – Precision Ball Screw Assemblies

Adjustable-Preload Single Nut SEM-E-S

STAR mounting dimensions

Also available with left-hand thread in some versions.

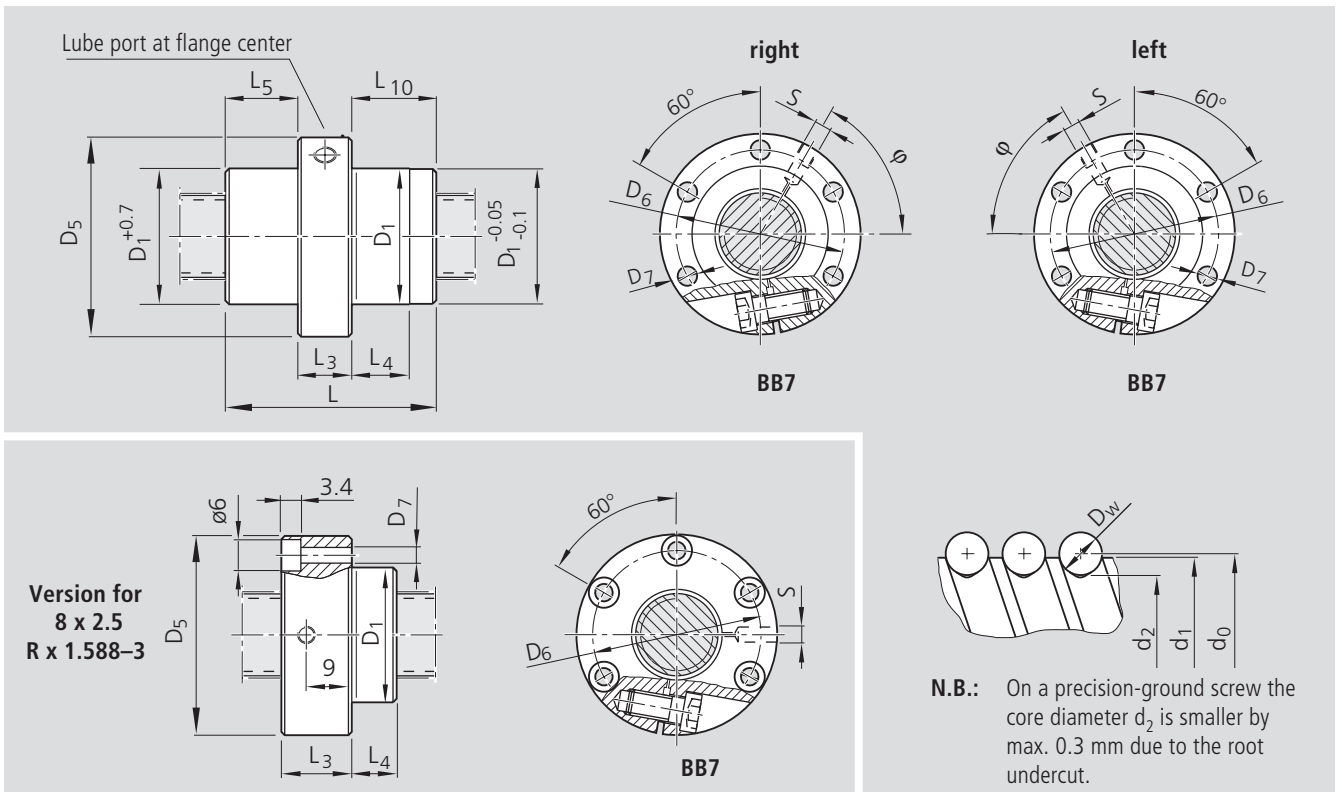


Order code

SEM-E-S 20 x 5R x 3-4 1 2 T7 R 82Z120 41Z120 1250 1 0

- d_0 = nominal diameter
 P = lead
 (R = right-hand, L = left-hand)
 D_w = ball diameter
 i = number of ball track turns

Size $d_0 \times P \times D_w - i$	Part number	Load rating	
		dyn. C (N)	stat. C_0 (N)
8 x 2.5R x 1.588 - 3	1532-2-3004	2200	2800
12 x 5R x 2 - 3	1532-4-6024	3800	5800
12 x 10R x 2 - 2	1532-4-9014	2500	3600
16 x 5R x 3 - 4	1512-0-1024	12300	16100
16 x 10R x 3 - 3	1512-0-4014	9600	12300
16 x 16R x 3 - 2	1512-0-6014	6300	7600
20 x 5R x 3 - 4	1512-1-1014	14300	21500
20 x 20R x 3.5 - 2	1512-1-7014	9100	12100
25 x 5R x 3 - 4	1512-2-1014	15900	27200
25 x 10R x 3 - 4	1512-2-4014	15700	27000
25 x 25R x 3.5 - 2	1512-2-8014	10100	15100
32 x 5R x 3.5 - 4	1512-3-1014	21600	40000
32 x 5L x 3.5 - 4	1552-3-1004	21600	40000
32 x 10R x 3.969 - 5	1512-3-4014	31700	58300
32 x 20R x 3.969 - 2	1512-3-7014	13500	21800
32 x 32R x 3.969 - 2	1512-3-9014	13400	22000
40 x 5R x 3.5 - 5	1512-4-1014	29100	64100
40 x 5L x 3.5 - 5	1552-4-1004	29100	64100
40 x 10R x 6 - 4	1512-4-4014	50000	86400
40 x 10L x 6 - 4	1552-4-4004	50000	86400
40 x 20R x 6 - 3	1512-4-7014	37900	62800
40 x 40R x 6 - 2	1512-4-9014	25500	40300
50 x 5R x 3.5 - 5	1512-5-1014	32000	81300
50 x 10R x 6 - 6	1512-5-4014	79700	166500
50 x 20R x 6.5 - 3	1512-5-7014	47900	87900
50 x 40R x 6.5 - 2	1512-5-9014	32100	55800
63 x 10R x 6 - 6	1512-6-4014	88800	214300
63 x 20R x 6.5 - 3	1512-6-7014	53200	112100
63 x 40R x 6.5 - 2	1512-6-9014	36900	74300
80 x 10R x 6.5 - 6	1512-7-4014	108400	291700
80 x 20R x 9 - 6	1512-7-7014	170900	403900
80 x 20R x 12.7 - 6	1512-7-7004	262700	534200

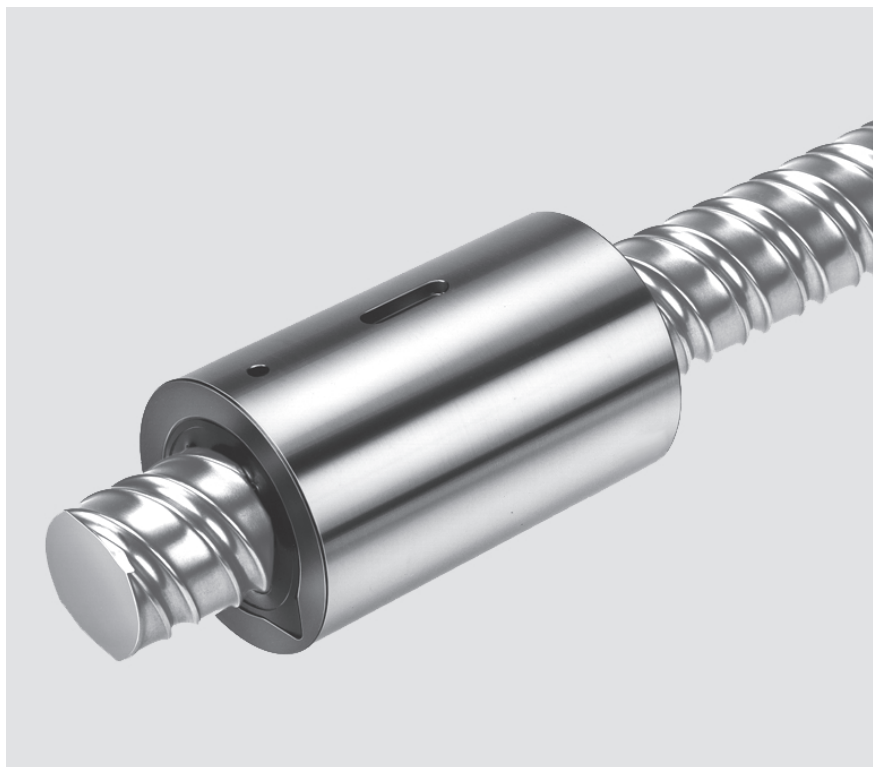


Dimensions (mm)														Weight
d_1	d_2	D_1 f9	D_5	Hole pattern	D_6	D_7	L	L_3	L_4	L_5	L_{10}	S	ϕ (°)	m (Kg)
7.5	6.3	16	30	BB7	23	3.4	16	13	3	0	3	3.9	0	0.06
11.4	9.9	24	40	BB7	32	4.5	28	12	8	8	8	M6	55	0.12
11.4	9.9	24	40	BB7	32	4.5	33	12	10.5	10.5	10.5	M6	55	0.13
15.0	12.9	28	53	BB7	40	6.6	38	15	10	11.5	11.5	M6	53	0.24
15.0	12.9	28	53	BB7	40	6.6	45	15	15	15	15	M6	180	0.25
15.0	12.9	33	58	BB7	45	6.6	45	15	15	15	15	M6	50	0.42
19.0	16.9	33	58	BB7	45	6.6	40	15	10	12.5	12.5	M6	56	0.31
19.3	16.7	38	63	BB7	50	6.6	57	20	18.5	18.5	18.5	M6	60	0.63
24.0	21.9	38	63	BB7	50	6.6	45	20	10	12.5	12.5	M6	60	0.44
24.0	21.9	38	63	BB7	50	6.6	64	20	16	22	22	M6	60	0.53
24.0	21.4	48	73	BB7	60	6.6	70	25	22.5	22.5	22.5	M6	48	1.13
31.0	28.4	48	73	BB7	60	6.6	48	20	10	14	14	M6	60	0.64
31.0	28.4	48	73	BB7	60	6.6	48	20	10	14	14	M6	59	0.64
31.0	27.9	48	73	BB7	60	6.6	77	20	16	28.5	28.5	M6	168	0.87
31.0	27.9	56	80	BB7	68	6.6	64	20	22	22	22	M6	60	1.14
31.0	27.9	56	80	BB7	68	6.6	88	20	34	34	34	M6	60	1.44
39.0	36.4	56	80	BB7	68	6.6	54	20	10	17	17	M8x1	65	0.87
39.0	36.4	56	80	BB7	68	6.6	54	20	10	17	17	M8x1	65	0.87
38.0	33.8	63	95	BB7	78	9	70	25	16	22.5	22.5	M8x1	57	1.53
38.0	33.8	63	95	BB7	78	9	70	25	16	22.5	22.5	M8x1	57	1.53
38.0	33.8	63	95	BB7	78	9	88	25	25	31.5	31.5	M8x1	180	1.77
38.0	33.8	72	110	BB7	90	11	102	40	31	31	31	M8x1	49	3.77
49.0	46.4	68	98	BB7	82	9	54	25	10	14.5	14.5	M8x1	67	1.23
48.0	43.8	72	110	BB7	90	11	90	30	16	30	30	M8x1	61	2.44
48.0	43.4	85	125	BB7	105	11	92	30	25	31	31	M8x1	180	3.94
48.0	43.4	85	125	BB7	105	11	109	30	39.5	39.5	39.5	M8x1	60	4.42
61.0	56.8	85	125	BB7	105	11	90	30	16	30	30	M8x1	65	2.94
61.0	56.4	95	140	BB7	118	14	92	30	25	31	31	M8x1	190	4.45
61.0	56.4	95	140	BB7	118	14	109	30	39.5	39.5	39.5	M8x1	70	4.95
78.0	73.3	105	150	BB7	125	14	95	30	16	32.5	32.5	M8x1	67	4.2
77.0	70.8	125	180	BB7	152	18	160	50	25	55	55	M8x1	60	13.79
76.0	67.0	125	180	BB7	152	18	170	50	25	60	60	M8x1	60	13.3

STAR – Precision Ball Screw Assemblies

Cylindrical Single Nut ZEM-E-S

STAR mounting dimensions

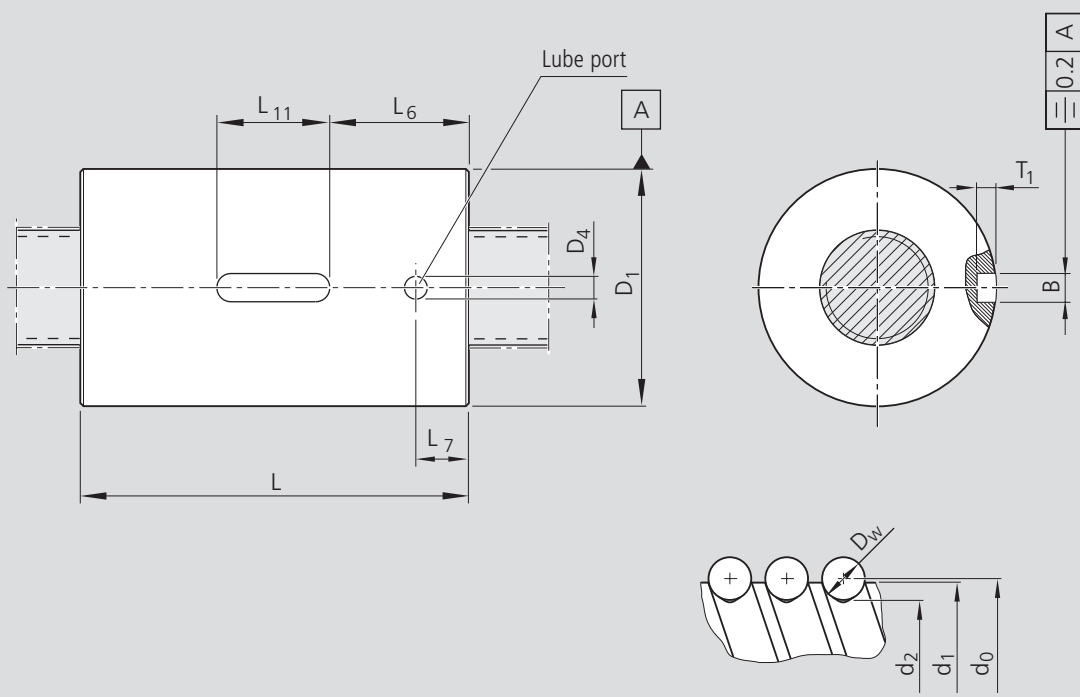


Order code:

ZEM-E-S 20 x 5R x 3-5 1 2 T7 R 82Z120 41Z120 1250 1 0

- d_0 = nominal diameter
 P = lead
 (R = right-hand, L = left-hand)
 D_w = ball diameter
 i = number of ball track turns

Size $d_0 \times P \times D_w - i$	Part number	Load ratings	
		dyn. C (N)	stat. C_0 (N)
8 x 2.5R x 1.588 - 3	1532-2-3002	2200	2800
12 x 5R x 2 - 3	1532-4-6032	3800	5800
12 x 10R x 2 - 2	1532-4-9022	2500	3600
16 x 5R x 3 - 4	1512-0-1022	12300	16100
16 x 10R x 3 - 3	1512-0-4012	9600	12300
16 x 16R x 3 - 2	1512-0-6012	6300	7600
20 x 5R x 3 - 5	1512-1-1012	17500	27300
20 x 20R x 3.5 - 2	1512-1-7012	9100	12100
25 x 5R x 3 - 4	1512-2-1012	15900	27200
25 x 10R x 3 - 4	1512-2-4012	15700	27000
25 x 25R x 3.5 - 2	1512-2-8012	10100	15100
25 x 25R x 3.5 - 3	1512-2-8052	14700	23300
32 x 5R x 3.5 - 4	1512-3-1012	21600	40000
32 x 10R x 3.969 - 5	1512-3-4012	31700	58300
32 x 20R x 3.969 - 2	1512-3-7012	13500	21800
32 x 20R x 3.969 - 3	1512-3-7052	19700	33700
32 x 32R x 3.969 - 2	1512-3-9012	13400	22000
32 x 32R x 3.969 - 3	1512-3-9052	19500	34000
40 x 5R x 3.5 - 5	1512-4-1012	29100	64100
40 x 10R x 6 - 4	1512-4-4012	50000	86400
40 x 20R x 6 - 3	1512-4-7012	37900	62800
40 x 40R x 6 - 2	1512-4-9012	25500	40300
40 x 40R x 6 - 3	1512-4-9052	37000	62300
50 x 5R x 3.5 - 5	1512-5-1012	32000	81300
50 x 10R x 6 - 6	1512-5-4012	79700	166500
50 x 20R x 6.5 - 3	1512-5-7012	47900	87900
63 x 10R x 6 - 6	1512-6-4012	88800	214300



N.B.: On a precision-ground screw the core diameter d_2 is smaller by max. 0.3 mm due to the root undercut.

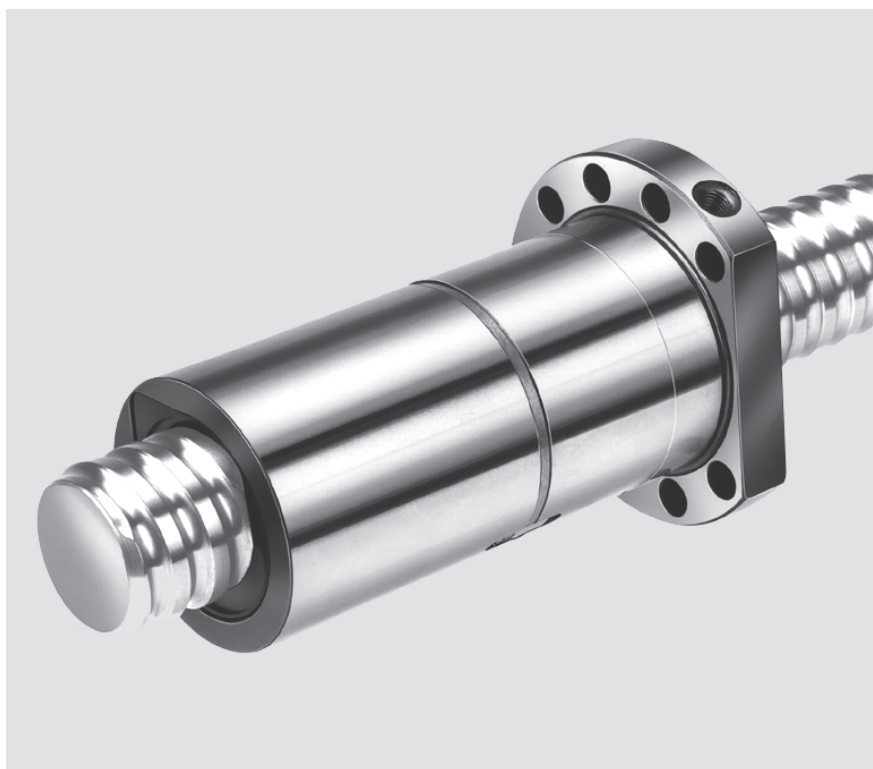
Dimensions (mm)											Weight
d_1	d_2	D_1 g6	D_4	L ± 0.1	L_6	L_7	L_{11} $+0.2$	B P9	T_1 $+0.1$	m (Kg)	
7.5	6.3	16	2	16	5	3.5	6	3	1.8	0.02	
11.4	9.9	24	2	28	8	3.5	12	5	3	0.06	
11.4	9.9	24	2	33	10.5	3.5	12	5	3	0.07	
15.0	12.9	28	4	35	14.5	9.5	12	5	3	0.09	
15.0	12.9	28	4	45	14.5	9.5	16	5	3	0.12	
15.0	12.9	33	4	45	14.5	9.5	16	5	3	0.20	
19.0	16.9	33	4	45	14.5	9.5	16	5	3	0.16	
19.3	16.7	38	4	64	22	9.5	20	5	3	0.34	
24.0	21.9	38	4	45	14.5	9.5	16	5	3	0.19	
24.0	21.9	38	4	64	22	9.5	20	5	3	0.28	
24.0	21.4	48	4	80	30	10.5	20	5	3	0.73	
24.0	21.4	40	4	95	37.5	10.5	20	5	3	0.50	
31.0	28.4	48	4	48	14	9.5	20	5	3	0.32	
31.0	27.9	48	4	77	28.5	9.5	20	5	3	0.50	
31.0	27.9	56	4	64	22	9.5	20	5	3	0.74	
31.0	27.9	50	4	84	32	9.5	20	5	3	0.66	
31.0	27.9	56	4	88	34	9.5	20	5	3	1.03	
31.0	27.9	50	4	120	50	9.5	20	5	3	0.97	
39.0	36.4	56	4	54	17	9.5	20	5	3	0.44	
38.0	33.8	63	4	70	25	14	20	5	3	0.88	
38.0	33.8	63	4	88	34	14	20	5	3	1.13	
38.0	33.8	72	4	113	46.5	14	20	5	3	2.23	
38.0	33.8	63	4	142	61	14	20	5	3	1.85	
49.0	46.4	68	4	54	17	9.5	20	5	3	0.62	
48.0	43.8	72	5	90	35	14	20	5	3	1.34	
48.0	43.4	85	5	92	30	14	32	6	3.5	2.39	
61.0	56.8	85	5	90	29	14	32	6	3.5	1.59	

STAR – Precision Ball Screw Assemblies

Double Nut with Flanger FDM-E-C

A Mounting dimensions
to DIN 69 051, Part 5

Flange type C

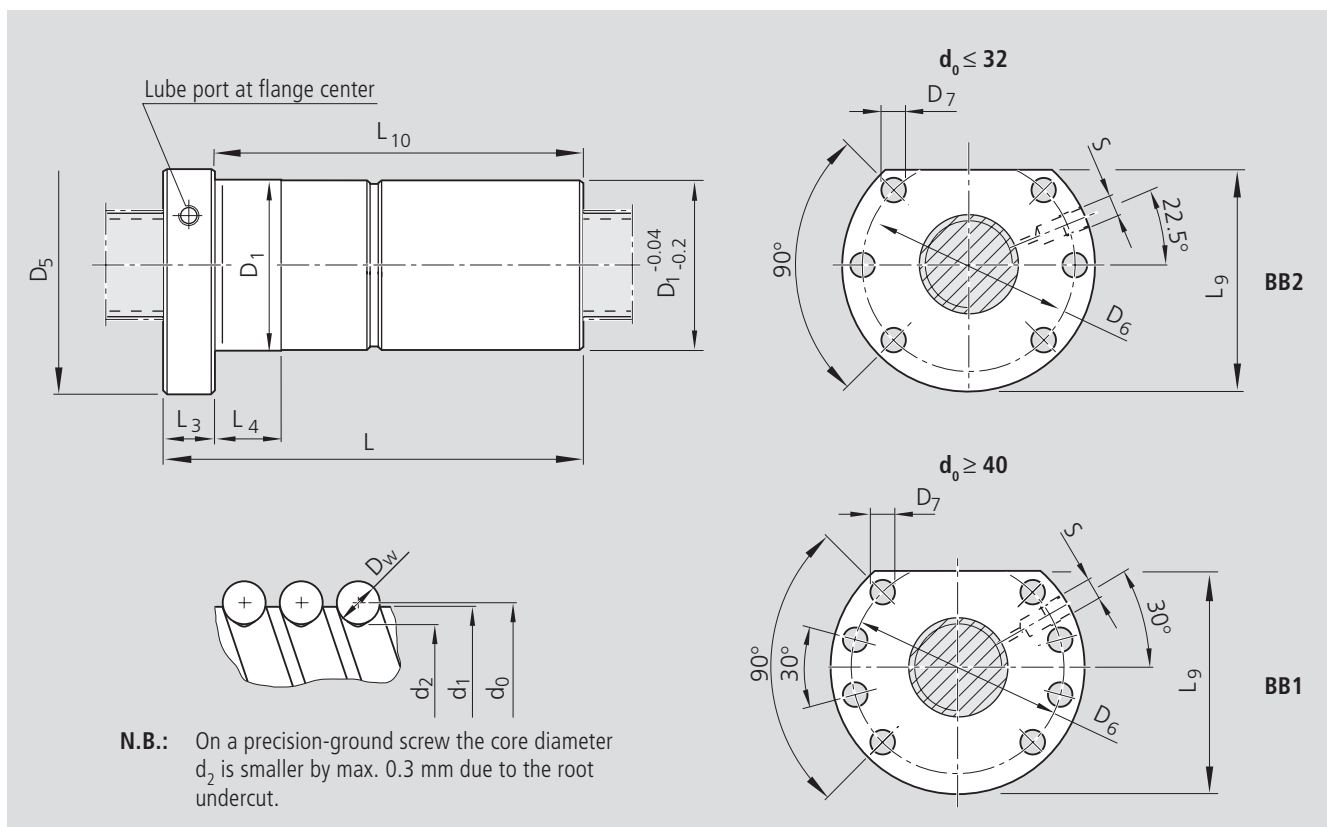


Order code:

FDM-E-C 20 x 5R x 3-4 1 2 T7 R 82Z120 41Z120 1250 1 0

d_0 = nominal diameter
 P = lead
 (R = right-hand, L = left-hand)
 D_w = ball diameter
 i = number of ball track turns

Size $d_0 \times P \times D_w - i$	Part number	Load ratings	
		dyn. C (N)	stat. C_0 (N)
16 x 5R x 3 - 4	1502-0-1075	12300	16100
20 x 5R x 3 - 4	1502-1-1055	14300	21500
25 x 5R x 3 - 4	1502-2-1055	15900	27200
25 x 10R x 3 - 4	1502-2-4055	15700	27000
32 x 5R x 3.5 - 4	1502-3-1055	21600	40000
32 x 10R x 3.969 - 5	1502-3-4076	31700	58300
40 x 5R x 3.5 - 5	1502-4-1056	29100	64100
40 x 10R x 6 - 4	1502-4-4075	50000	86400
40 x 10R x 6 - 6	1502-4-4076	72100	132200
40 x 20R x 6 - 3	1502-4-7075	37900	62800
50 x 5R x 3.5 - 5	1502-5-1056	32000	81300
50 x 10R x 6 - 4	1502-5-4075	55400	109000
50 x 10R x 6 - 6	1502-5-4076	79700	166500
50 x 20R x 6.5 - 5	1502-5-7076	75700	149700
63 x 10R x 6 - 4	1502-6-4075	61800	140500
63 x 10R x 6 - 6	1502-6-4076	88800	214300
63 x 20R x 6.5 - 5	1502-6-7076	83900	190300
80 x 10R x 6.5 - 6	1502-7-4056	108400	291700
80 x 20R x 9 - 6	1502-7-7076	170900	403900
80 x 20R x 12.7 - 6	1502-7-7056	262700	534200
100 x 10R x 6.5 - 6	1502-8-4056	119500	371900
100 x 20R x 12.7 - 6	1502-8-7056	295100	686400
125 x 10R x 6.5 - 6	1502-9-4056	130600	468700
125 x 20R x 12.7 - 6	1502-9-7056	326500	870400

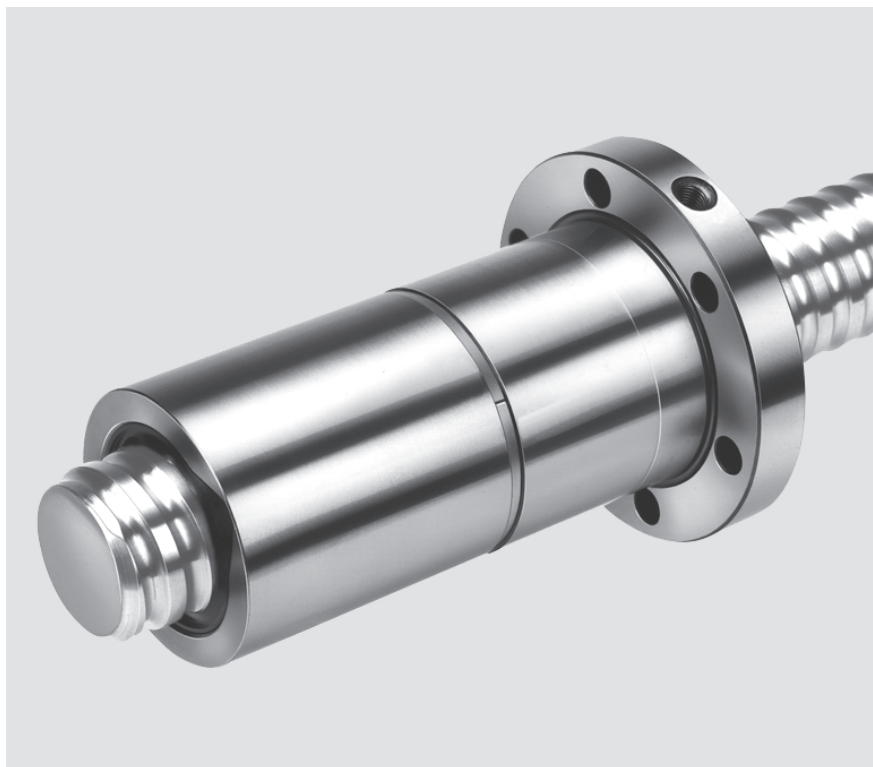


Dimensions (mm)														Weight
d_1	d_2	D_1 g6	D_5	Hole pattern	D_6	D_7	L	L_3	L_4	L_9	L_{10}	S	m (Kg)	
15.0	12.9	28	48	BB2	38	5.5	72	12	10	44	60	M6	0.29	
19.0	16.9	36	58	BB2	47	6.6	82	12	10	51	70	M6	0.53	
24.0	21.9	40	62	BB2	51	6.6	82	12	10	55	70	M6	0.57	
24.0	21.9	40	62	BB2	51	6.6	120	12	16	55	108	M6	0.77	
31.0	28.4	50	80	BB2	65	9	88	13	10	71	75	M6	0.96	
31.0	27.9	50	80	BB2	65	9	146	13	16	71	133	M6	1.34	
39.0	36.4	63	93	BB1	78	9	100	15	10	81.5	85	M8x1	1.68	
38.0	33.8	63	93	BB1	78	9	140	15	16	81.5	125	M8x1	2.15	
38.0	33.8	63	93	BB1	78	9	180	15	16	81.5	165	M8x1	2.73	
38.0	33.8	63	93	BB1	78	9	175	15	25	81.5	160	M8x1	2.56	
49.0	46.4	75	110	BB1	93	11	100	15	10	97.5	85	M8x1	2.25	
48.0	43.8	75	110	BB1	93	11	140	18	16	97.5	122	M8x1	2.97	
48.0	43.8	75	110	BB1	93	11	180	18	16	97.5	162	M8x1	3.73	
48.0	43.4	75	110	BB1	93	11	255	18	25	97.5	237	M8x1	4.93	
61.0	56.8	90	125	BB1	108	11	140	22	16	110	118	M8x1	4	
61.0	56.8	90	125	BB1	108	11	180	22	16	110	158	M8x1	4.45	
61.0	56.4	95	135	BB1	115	13.5	255	22	25	117.5	233	M8x1	8.21	
78.0	73.3	105	145	BB1	125	13.5	190	22	16	127.5	168	M8x1	5.93	
77.0	70.8	125	165	BB1	145	13.5	320	25	25	147.5	295	M8x1	17.77	
76.0	67.0	125	165	BB1	145	13.5	340	25	25	147.5	315	M8x1	19.4	
98.0	93.4	125	165	BB1	145	13.5	190	25	16	147.5	165	M8x1	7.35	
96.0	87.1	150	202	BB1	176	17.5	340	30	25	178.5	310	M8x1	24.6	
123.0	118.0	150	202	BB1	176	17.5	190	25	16	178.5	165	M8x1	9.38	
121.0	112.0	170	222	BB1	196	17.5	340	40	25	198.5	300	M8x1	29.7	

STAR – Precision Ball Screw Assemblies

Double Nut with Flange FDM-E-S

STAR mounting dimensions

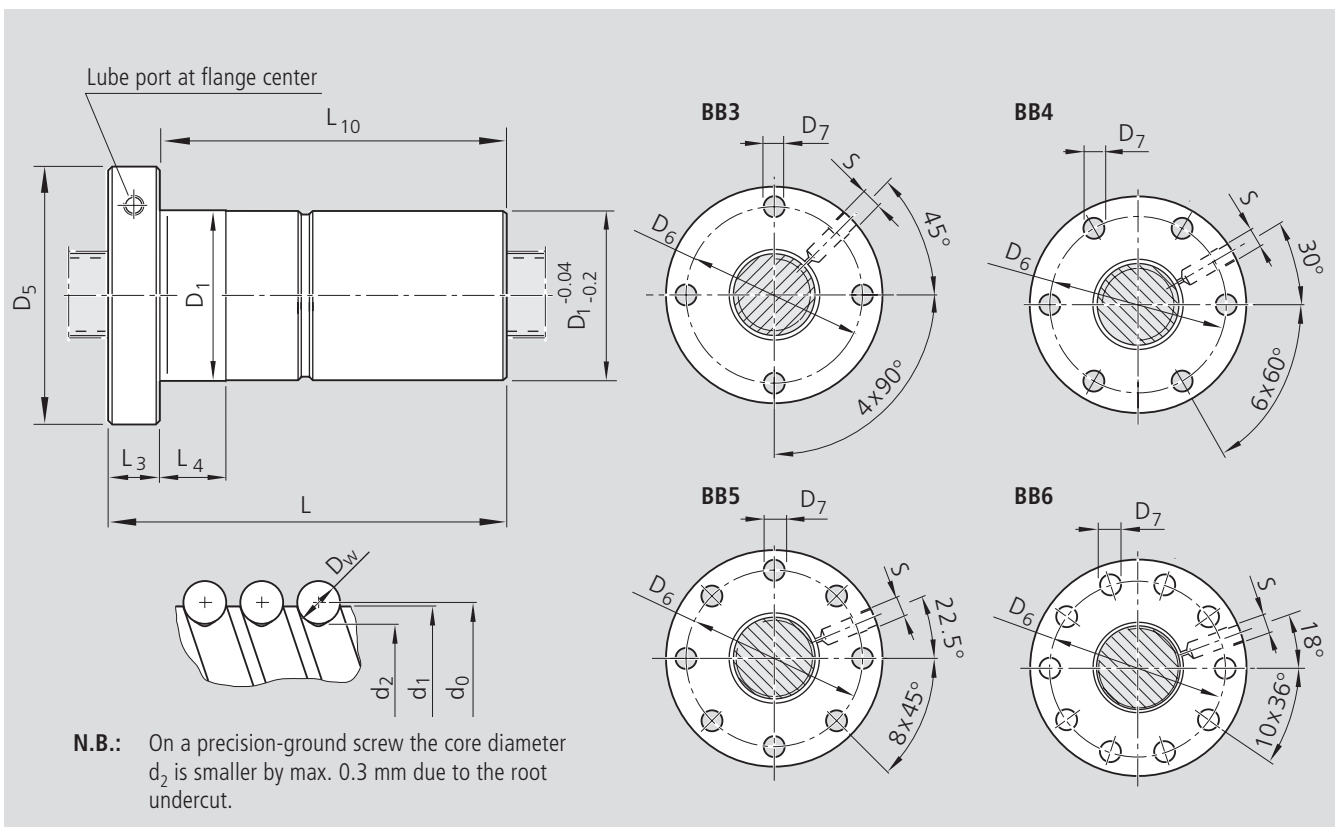


Order code:

FDM-E-S 20 x 5R x 3-4 1 2 T7 R 82Z120 41Z120 1250 1 0

- d_0 = nominal diameter
 P = lead
 (R = right-hand, L = left-hand)
 D_w = ball diameter
 i = number of ball track turns

Size $d_0 \times P \times D_w - i$	Part number	Load ratings	
		dyn. C (N)	stat. C_0 (N)
16 x 5R x 3 - 4	1502-0-1033	12300	16100
20 x 5R x 3 - 4	1502-1-1023	14300	21500
25 x 5R x 3 - 4	1502-2-1023	15900	27200
25 x 10R x 3 - 4	1502-2-4023	15700	27000
32 x 5R x 3.5 - 4	1502-3-1023	21600	40000
32 x 10R x 3.969 - 5	1502-3-4033	31700	58300
40 x 5R x 3.5 - 5	1502-4-1023	29100	64100
40 x 10R x 6 - 4	1502-4-4033	50000	86400
40 x 10R x 6 - 6	1502-4-4034	72100	132200
40 x 20R x 6 - 3	1502-4-7033	37900	62800
50 x 5R x 3.5 - 5	1502-5-1023	32000	81300
50 x 10R x 6 - 4	1502-5-4033	55400	109000
50 x 10R x 6 - 6	1502-5-4034	79700	166500
50 x 20R x 6.5 - 5	1502-5-7034	75700	149700
63 x 10R x 6 - 4	1502-6-4033	61800	140500
63 x 10R x 6 - 6	1502-6-4034	88800	214300
63 x 20R x 6.5 - 5	1502-6-7034	83900	190300
80 x 10R x 6.5 - 6	1502-7-4024	108400	291700
80 x 20R x 9 - 6	1502-7-7034	170900	403900
80 x 20R x 12.7 - 6	1502-7-7024	262700	534200
100 x 10R x 6.5 - 6	1502-8-4024	119500	371900
100 x 20R x 12.7 - 6	1502-8-7024	295100	686400
125 x 10R x 6.5 - 6	1502-9-4024	130600	468700
125 x 20R x 12.7 - 6	1502-9-7024	326500	870400



Dimensions (mm)												Weight
d_1	d_2	D_1 g6	D_5	Hole pattern	D_6	D_7	L	L_3	L_4	L_{10}	S	m (Kg)
15.0	12.9	28	53	BB3	40	7	72	12	10	60	M6	0.33
19.0	16.9	33	58	BB4	45	7	82	12	10	70	M6	0.45
24.0	21.9	38	63	BB4	50	7	82	12	10	70	M6	0.53
24.0	21.9	38	63	BB4	50	7	120	12	16	108	M6	0.70
31.0	28.4	48	73	BB4	60	7	88	13	10	75	M6	0.84
31.0	27.9	48	73	BB4	60	7	146	13	16	133	M6	1.22
39.0	36.4	56	80	BB4	68	7	100	15	10	85	M8x1	1.13
38.0	33.8	63	95	BB4	78	9	140	15	16	125	M8x1	2.25
38.0	33.8	63	95	BB4	78	9	180	15	16	165	M8x1	2.83
38.0	33.8	63	95	BB4	78	9	175	15	25	160	M8x1	2.66
49.0	46.4	68	98	BB4	82	9	100	15	10	85	M8x1	1.60
48.0	43.8	72	110	BB4	90	11	140	18	16	122	M8x1	2.74
48.0	43.8	72	110	BB4	90	11	180	18	16	162	M8x1	3.39
48.0	43.4	85	125	BB4	105	11	255	22	25	233	M8x1	6.71
61.0	56.8	85	125	BB4	105	11	140	22	16	118	M8x1	3.53
61.0	56.8	85	125	BB4	105	11	180	22	16	158	M8x1	4.32
61.0	56.4	95	140	BB4	118	14	255	22	25	233	M8x1	8.65
78.0	73.3	105	150	BB4	125	14	190	22	16	168	M8x1	6.35
77.0	70.8	125	180	BB5	152	18	320	25	25	295	M8x1	18.60
76.0	67.0	125	180	BB5	152	18	340	25	25	315	M8x1	20.20
98.0	93.4	125	180	BB5	152	18	190	25	16	165	M8x1	8.19
96.0	87.1	145	200	BB5	172	18	340	30	25	310	M8x1	24.50
123.0	118.0	150	210	BB5	180	18	190	30	16	160	M8x1	10.80
121.0	112.0	170	230	BB6	200	18	340	40	25	300	M8x1	31.00

STAR – Precision Ball Screw Assemblies

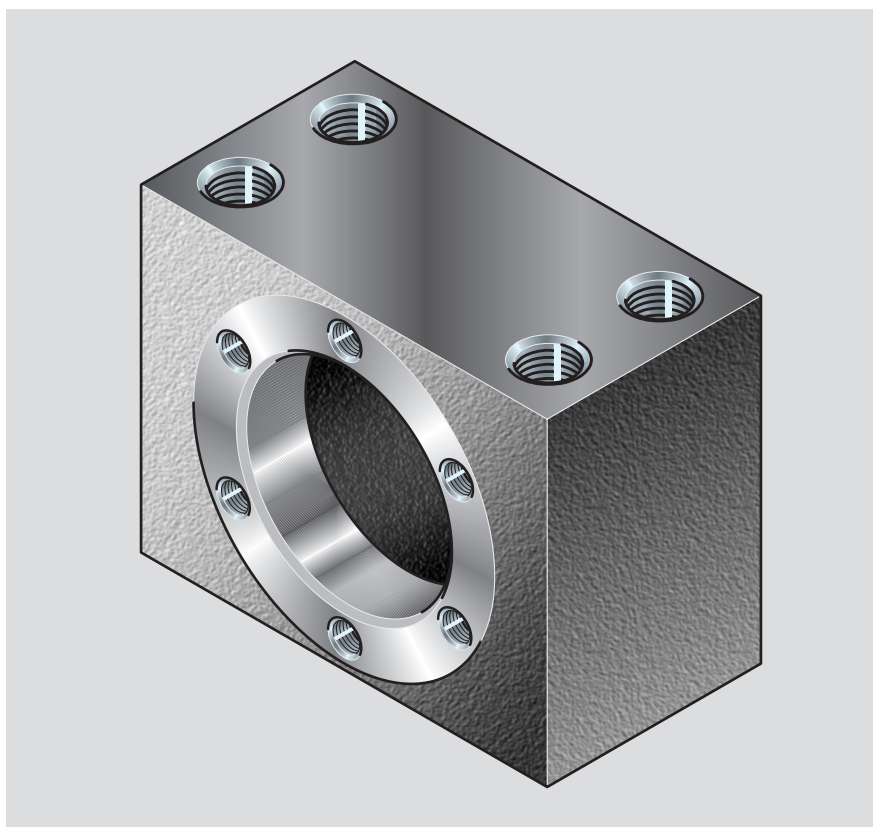
Nut Housing MGS

Nut housings MGS are designed for FEM-E-S, FDM-E-S and SEM-E-S.

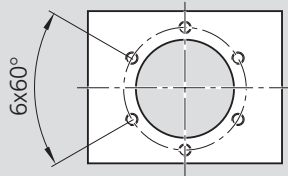
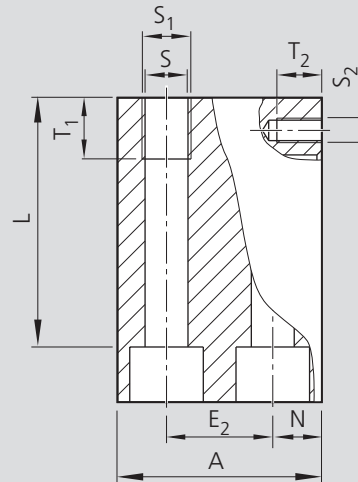
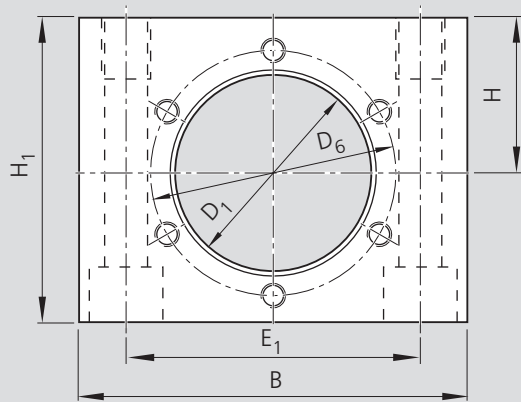
In addition to bolting, the housings should be locked in place by positive means (e.g. two pins with a diameter equal to that of the screws).

We recommend using screws with a strength class of 8.8.

► See "Mounting" on page 91 for tightening torques.

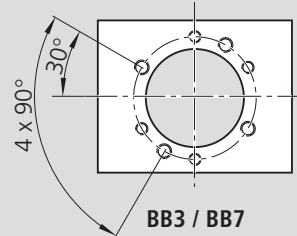


Size	Part number	
$d_0 \times P$		
16x5	1506-0-0010	
16x10	1506-0-0010	
16x16	1506-1-0010	
20x5	1506-1-0010	
20x20	1506-2-0010	
25x5	1506-2-0010	
25x10	1506-2-0010	
25x25	1506-3-0010	
32x5	1506-3-0010	
32x10	1506-3-0010	
32x20	1506-4-0010	
32x32	1506-4-0010	
40x5	1506-4-0010	
40x10	1506-4-0011	
40x20	1506-4-0011	
40x40	1506-5-0011	
50x5	1506-5-0010	
50x10	1506-5-0011	
50x20	1506-6-0010	
50x40	1506-6-0010	
63x10	1506-6-0010	
80x10	1506-7-0010	



BB4/BB7

for size 16x5/16x10



BB3/BB7

Dimensions (mm)

D ₁ H8	D ₆	A ¹⁾	B ¹⁾	H js7	H ₁ ¹⁾	E ₁	E ₂	N	S	S ₁	T ₁	S ₂	T ₂	Hole pattern FEM-E-S FDM-E-S	Hole pattern SEM-E-S	Hex socket cap. screw ISO 4762	Clamping length L	Weight (Kg)
28	40	40	70	28	55	52 ±0.1	20 ±0.1	10	8.4	M10	15	M6	10	BB3	BB7	M8	44	0.85
28	40	40	70	28	55	52 ±0.1	20 ±0.1	10	8.4	M10	15	M6	10	BB3	BB7	M8	44	0.85
33	45	40	75	32	62	56 ±0.1	20 ±0.1	10	8.4	M10	15	M6	10	BB4	BB7	M8	51	1.05
33	45	40	75	32	62	56 ±0.1	20 ±0.1	10	8.4	M10	15	M6	10	BB4	BB7	M8	51	1.05
38	50	40	85	34	65	63 ±0.1	20 ±0.1	10	8.4	M10	15	M6	10	BB4	BB7	M8	54	1.25
38	50	40	85	34	65	63 ±0.1	20 ±0.1	10	8.4	M10	15	M6	10	BB4	BB7	M8	54	1.25
38	50	40	85	34	65	63 ±0.1	20 ±0.1	10	8.4	M10	15	M6	10	BB4	BB7	M8	54	1.25
48	60	50	95	38	75	72 ±0.1	26 ±0.1	12	10.5	M12	15	M6	10	BB4	BB7	M10	61	1.8
48	60	50	95	38	75	72 ±0.1	26 ±0.1	12	10.5	M12	15	M6	10	BB4	BB7	M10	61	1.8
48	60	50	95	38	75	72 ±0.1	26 ±0.1	12	10.5	M12	15	M6	10	BB4	BB7	M10	61	1.8
56	68	60	105	42	82	82 ±0.1	30 ±0.1	15	13	M16	20	M6	12	BB4	BB7	M12	64	2.5
56	68	60	105	42	82	82 ±0.1	30 ±0.1	15	13	M16	20	M6	12	BB4	BB7	M12	64	2.5
56	68	60	105	42	82	82 ±0.1	30 ±0.1	15	13	M16	20	M6	12	BB4	BB7	M12	64	2.5
63	78	65	120	50	98	93 ±0.1	35 ±0.1	15	15	M18	25	M8	14	BB4	BB7	M14	79.5	3.7
63	78	65	120	50	98	93 ±0.1	35 ±0.1	15	15	M18	25	M8	14	BB4	BB7	M14	79.5	3.7
72	90	80	140	58	113	108 ±0.15	46 ±0.15	17	17	M20	30	M10	18	BB4	BB7	M16	92	6.3
68	82	65	130	52	101	100 ±0.15	35 ±0.15	15	15	M18	30	M8	14	BB4	BB7	M14	82.5	4.1
72	90	80	140	58	113	108 ±0.15	46 ±0.15	17	17	M20	30	M10	18	BB4	BB7	M16	92	6.3
85	105	80	150	65	128	121 ±0.15	46 ±0.15	17	17	M20	30	M10	18	BB4	BB7	M16	107	7.3
85	105	80	150	65	128	121 ±0.15	46 ±0.15	17	17	M20	30	M10	18	BB4	BB7	M16	107	7.3
85	105	80	150	65	128	121 ±0.15	46 ±0.15	17	17	M20	30	M10	18	BB4	BB7	M16	107	7.3
105	125	80	170	78	153	140 ±0.2	46 ±0.15	17	17	M20	30	M12	20	BB4	BB7	M16	132	9.4

1) Tolerance grades to DIN 1685-GTB 16

STAR – Precision Ball Screw Assemblies

Nut Housing MGD

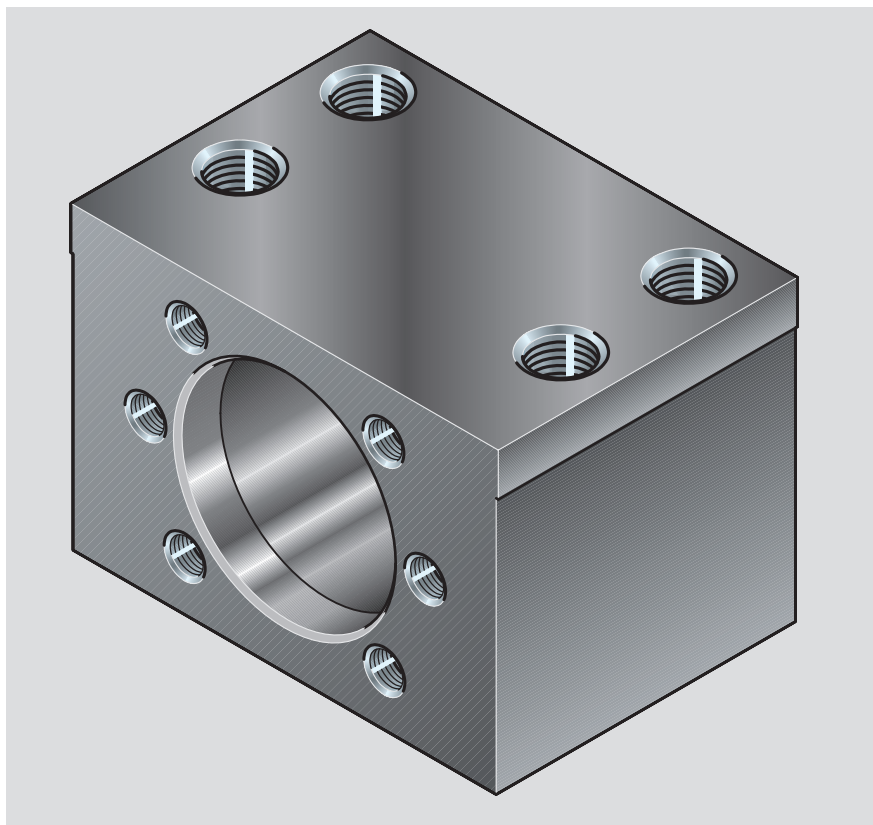
Nut housings MGD are designed for FEM-E-C, FDM-E-C and SEM-E-C.

In addition to bolting, the housings should be locked in place by positive means (e.g. two pins with a diameter equal to that of the screws).

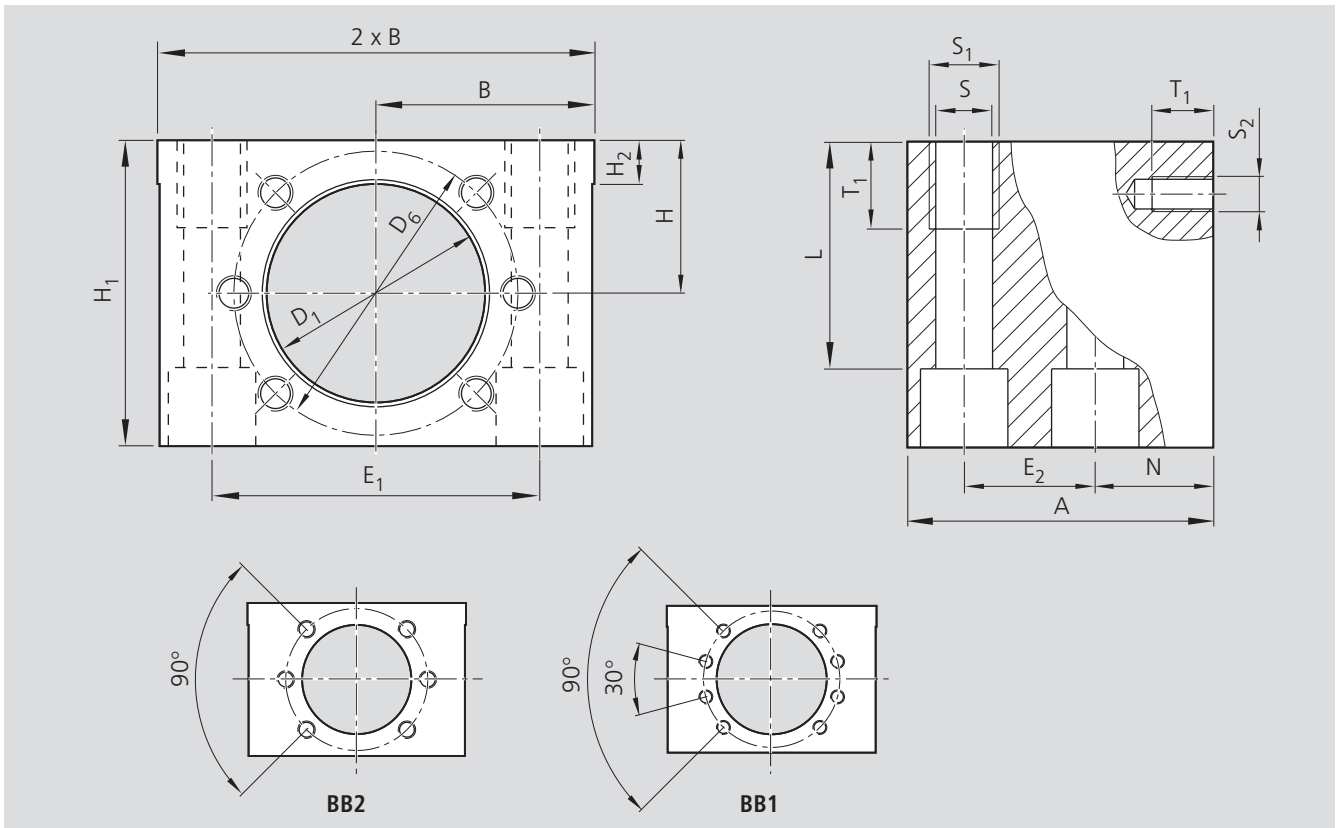
We recommend using screws with a strength class of 8.8.

➡ See "Mounting" on page 91 for tightening torques.

Reference edges are formed on both sides.



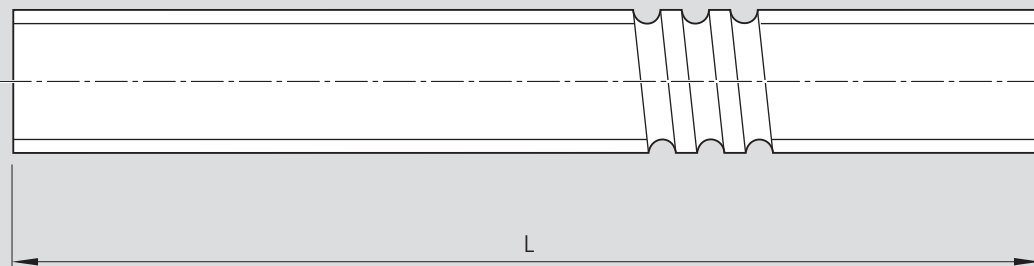
Size	Part number
d₀ x P	
16x5 16x10 16x16	1506-0-0050
20x5 20x20	1506-1-0050
25x5 25x10 25x25	1506-2-0050
32x5 32x10 32x20 32x32	1506-3-0050
40x5 40x10 40x12 40x16 40x20 40x40	1506-4-0050
50x5 50x10 50x12 50x16 50x20 50x40	1506-5-0050
63x10 63x20 63x40	1506-6-0050 1506-6-0051
80x10 80x20	1506-7-0050 1506-7-0051



Dimensions (mm)															Hole pattern	Hex socket cap. screw	Clamping length	Weight (Kg)
D ₁ H7	D ₆	A	B ±0.01	H ±0.01	H ₁	H ₂	E ₁	E ₂	N	S	S ₁	T ₁	S ₂	T ₂		ISO 4762	L	(Kg)
28	38	50	35	24	48	10	50 ±0.1	20 ±0.1	20	8.4	M10	15	M5	10	BB2	M8	37	0.91
36	47	55	37.5	28	56	10	55 ±0.1	23 ±0.1	22	8.4	M10	15	M6	11	BB2	M8	45	1.18
40	51	55	40	30	60	10	60 ±0.1	23 ±0.1	22	8.4	M10	15	M6	11	BB2	M8	49	1.33
50	65	70	50	35	70	10	75 ±0.1	30 ±0.1	27	13	M16	20	M8	14	BB2	M12	52	2.27
63	78	80	60	42	84	12	90 ±0.1	35 ±0.1	31	15	M18	25	M8	17	BB1	M14	65.5	3.61
75	93	95	70	48	96	12	110 ±0.15	45 ±0.15	34	17	M20	30	M10	17	BB1	M16	75	5.63
90	108	100	75	55	110	15	120 ±0.2	46 ±0.15	37	17	M20	30	M10	20	BB1	M16	89	6.72
95	115	100	80	58	116	15	130 ±0.2	46 ±0.15	37	17	M20	30	M12	20	BB1	M16	95	7.67
105	125	100	85	63	126	15	140 ±0.2	46 ±0.15	37	17	M20	30	M12	20	BB1	M16	105	8.60
125	145	100	95	73	146	15	160 ±0.2	46 ±0.15	37	17	M20	30	M12	22	BB1	M16	125	10.53

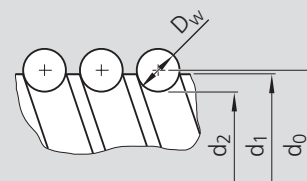
STAR – Precision Ball Screw Assemblies

Precision-Rolled Screws



Please state lengths in the "Inquiry / Order Form"

L = overall length



Order code:

S 20 x 5R x 3 X X T7 R 82K120 41Z120 1250 1 0

Size $d_0 \times P \times D_w$	Part number					Mass moment of inertia J_s (kgcm ² /m)	Maximum length		Weight (kg/m)
	Tolerance grade T_5	Tolerance grade T_7	Tolerance grade T_9	d_1 (mm)	d_2 (mm)		Stand- ard	on Request	
8x2.5Rx1.588	1531-2-3500	1531-2-3700	1531-2-3900	7.5	6.3	0.02			0.30
12x5Rx2	1531-4-6510	1531-4-6710	1531-4-6910	11.4	9.9	0.11			0.75
12x10Rx2	1531-4-9500	1531-4-9700	1531-4-9900	11.4	9.9	0.11			0.74
16x5Rx3	1511-0-1500	1511-0-1700	1511-0-1900	15	12.9	0.31	1500	2500	1.24
16x10Rx3	1511-0-4500	1511-0-4700	1511-0-4900	15	12.9	0.31			1.23
16x16Rx3	1511-0-6510	1511-0-6710	1511-0-6910	15	12.9	0.34			1.29
20x5Rx3	1511-1-1500	1511-1-1700	1511-1-1900	19	16.9	0.84			2.03
20x20Rx3.5	1511-1-7510	1511-1-7710	1511-1-7910	19.3	16.7	0.81			1.99
25x5Rx3	1511-2-1500	1511-2-1700	1511-2-1900	24	21.9	2.22	2500	5000	3.31
25x10Rx3	1511-2-4500	1511-2-4700	1511-2-4900	24	21.9	2.39			3.43
25x25Rx3.5	1511-2-8510	1511-2-8710	1511-2-8910	24	21.4	2.15			3.25
32x5Rx3.5	1511-3-1500	1511-3-1700	1511-3-1900	31	28.4	6.05			5.45
32x5Lx3.5	1551-3-1500	1551-3-1700	1551-3-1900	31	28.4	6.05			5.45
32x10Rx3.969	1511-3-4510	1511-3-4710	1511-3-4910	31	27.9	6.40	4500	5000	5.60
32x20Rx3.969	1511-3-7510	1511-3-7710	1511-3-7910	31	27.9	6.39			5.60
32x32Rx3.969	1511-3-9510	1511-3-9710	1511-3-9910	31	27.9	6.17			5.50
40x5Rx3.5	1511-4-1500	1511-4-1700	1511-4-1900	39	36.4	15.64			8.78
40x5Lx3.5	1551-4-1500	1551-4-1700	1551-4-1900	39	36.4	15.64			8.78
40x10Rx6	1511-4-4500	1511-4-4700	1511-4-4900	38	33.8	13.55	4500	7500	8.15
40x10Lx6	1551-4-4500	1551-4-4700	1551-4-4900	38	33.8	13.55			8.15
40x12Rx6	1511-4-5500	1511-4-5700	1511-4-5900	38	33.8	13.97			8.27
40x16Rx6	1511-4-6500	1511-4-6700	1511-4-6900	38	33.8	12.90			7.95
40x20Rx6	1511-4-7500	1511-4-7700	1511-4-7900	38	33.8	13.52			8.14
40x40Rx6	1511-4-9510	1511-4-9710	1511-4-9910	38	33.8	13.42	8.11		
50x5Rx3.5	1511-5-1500	1511-5-1700	1511-5-1900	49	46.4	40.03	4500	5000	14.05
50x10Rx6	1511-5-4500	1511-5-4700	1511-5-4900	48	43.8	35.71			13.25
50x12Rx6	1511-5-5500	1511-5-5700	1511-5-5900	48	43.8	36.58			13.41
50x16Rx6	1511-5-6500	1511-5-6700	1511-5-6900	48	43.8	34.37			13.00
50x20Rx6.5	1511-5-7510	1511-5-7710	1511-5-7910	48	43.3	34.50			13.01
50x40Rx6.5	1511-5-9510	1511-5-9710	1511-5-9910	48	43.3	34.34	4500	7500	12.98
63x10Rx6	1511-6-4500	1511-6-4700	1511-6-4900	61	56.8	95.82			21.72
63x20Rx6.5	1511-6-7510	1511-6-7710	1511-6-7910	61	56.3	93.29			21.42
63x40Rx6.5	1511-6-9510	1511-6-9710	1511-6-9910	61	56.3	93.08			21.40
80x10Rx6.5	1511-7-4500	1511-7-4700	1511-7-4900	78	73.3	256.86			35.58
80x20Rx9	1511-7-7510	1511-7-7710	1511-7-7910	77	70.8	211.27	32.14		

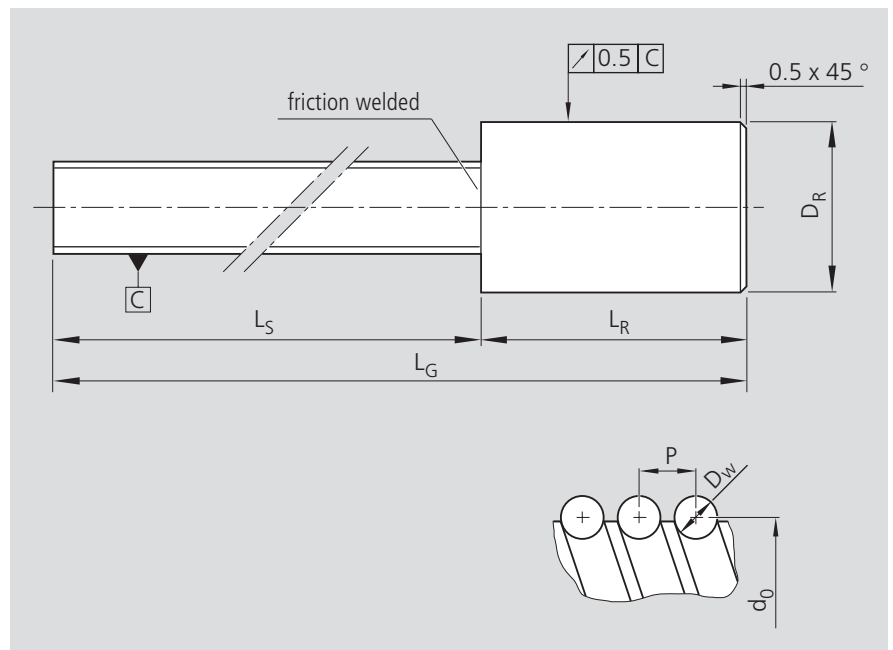
Friction-welded blanks made of precision-rolled screws

Friction-welded blanks consist of

- a precision-rolled screw part and
- an unmachined spigot.

The spigot is fitted to the one end by friction welding and is available in various sizes.

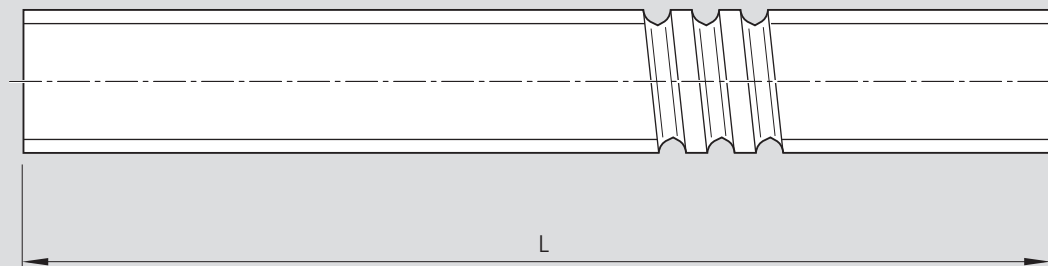
We have a solution to prevent problems arising from out of big end bearing diameters (e.g. visible thread grooves or axial contact faces which are too small for the locating bearing). Please ask.



Size $d_0 \times P \times D_w$	Tolerance grade	Dimensions (mm)			
		D_R	L_R +2	L_G	L_S
8x2.5Rx1.588	T5	14.25	100	1100	1000
12x5Rx2	T5	23.25	150	1250	1100
16x5Rx3	T5	30.35	200	1700	1500
16x10Rx3	T5	30.35	200	1700	1500
16x16Rx3	T5	30.35	200	1700	1500
20x5Rx3	T5	31.50	200	1700	1500
25x5Rx3	T5	36.60	200	1700	1500
25x10Rx3	T5	36.60	200	1700	1500
25x25Rx3.5	T5	36.60	200	1700	1500
32x5Rx3.5	T5	46.60	250	2050	1800
32x10Rx3.969	T5	46.60	250	2050	1800
32x20Rx3.969	T5	46.60	250	2050	1800
32x32Rx3.969	T5	46.60	250	2050	1800
40x10Rx6	T5	49.30	300	2300	2000
40x20Rx6	T5	49.30	300	2300	2000
50x10Rx6	T5	61.30	300	2300	2000

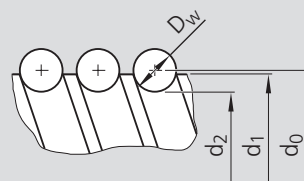
STAR – Precision Ball Screw Assemblies

Ground-Thread Screws



Please state lengths in the "Inquiry / Order Form"

L = overall length



Order code: **S** **20 x 5R x 3** **X X P5 S** **82K120** **41Z120** **1250** **1** **0**

Size $d_0 \times P \times D_w$	Tolerance grade P1	Part number Tolerance grade P3	Tolerance grade P5			Mass of moment of inertia J_s (kgcm ² /m)	maximum length		Weight (kg/m)
				d_1 (mm)	d_2 (mm)		available at short notice	on request	
8 x 2.5R x 1.588		1531- 2 -3300	1531- 2 -3500	7.5	6.2	0.02	800	1500	0.30
12 x 5R x 2		1531- 4 -6310	1531- 4 -6510	11.4	9.8	0.11	800	1500	0.75
12 x 10R x 2		1531- 4 -9300	1531- 4 -9500	11.4	9.8	0.12	800	1500	0.73
16 x 5R x 3	1501- 0 -1100	1501- 0 -1300	1501- 0 -1500	15	12.8	0.31	1000	3000	1.24
16 x 10R x 3	1501- 0 -4100	1501- 0 -4300	1501- 0 -4500	15	12.8	0.35	1000	3000	1.31
16 x 16R x 3	1501- 0 -6110	1501- 0 -6310	1501- 0 -6510	15	12.8	0.37	1000	3000	1.34
20 x 5R x 3	1501- 1 -1100	1501- 1 -1300	1501- 1 -1500	19	16.8	0.85	1200	3000	2.03
20 x 20R x 3.5	1501- 1 -7110	1501- 1 -7310	1501- 1 -7510	19.3	16.6	1.01	1200	3000	2.22
25 x 5R x 3	1501- 2 -1100	1501- 2 -1300	1501- 2 -1500	24	21.8	2.23	1500	5000	3.31
25 x 10R x 3	1501- 2 -4100	1501- 2 -4300	1501- 2 -4500	24	21.8	2.39	1500	5000	3.43
25 x 25R x 3.5	1501- 2 -8110	1501- 2 -8310	1501- 2 -8510	24	21.3	2.46	1500	5000	3.48
32 x 5R x 3.5	1501- 3 -1100	1501- 3 -1300	1501- 3 -1500	31	28.3	6.05	3000	5000	5.45
32 x 10R x 3.969	1501- 3 -4110	1501- 3 -4310	1501- 3 -4510	31	27.8	6.40	3000	5000	5.60
32 x 20R x 3.969	1501- 3 -7110	1501- 3 -7310	1501- 3 -7510	31	27.8	6.76	3000	5000	5.76
32 x 32R x 3.969	1501- 3 -9110	1501- 3 -9310	1501- 3 -9510	31	27.8	6.89	3000	5000	5.83
40 x 5R x 3.5	1501- 4 -1100	1501- 4 -1300	1501- 4 -1500	39	36.3	15.66	4000	5000	8.78
40 x 10R x 6	1501- 4 -4100	1501- 4 -4300	1501- 4 -4500	38	33.7	13.53	5000	8000	8.14
40 x 12R x 6	1501- 4 -5100	1501- 4 -5300	1501- 4 -5500	38	33.7	13.40	5000	8000	8.27
40 x 16R x 6	1501- 4 -6100	1501- 4 -6300	1501- 4 -6500	38	33.7	14.48	5000	8000	8.43
40 x 20R x 6	1501- 4 -7100	1501- 4 -7300	1501- 4 -7500	38	33.7	14.80	5000	8000	8.52
40 x 40R x 6	1501- 4 -9110	1501- 4 -9310	1501- 4 -9510	38	33.7	15.42	5000	8000	8.71
50 x 5R x 3.5	1501- 5 -1100	1501- 5 -1300	1501- 5 -1500	49	46.3	40.06	4000	5000	14.05
50 x 10R x 6	1501- 5 -4100	1501- 5 -4300	1501- 5 -4500	48	43.7	35.57	5000	8000	13.24
50 x 12R x 6	1501- 5 -5100	1501- 5 -5300	1501- 5 -5500	48	43.7	36.55	5000	8000	13.40
50 x 16R x 6	1501- 5 -6100	1501- 5 -6300	1501- 5 -6500	48	43.7	37.64	5000	8000	13.60
50 x 20R x 6.5	1501- 5 -7110	1501- 5 -7310	1501- 5 -7510	48	43.2	37.70	5000	8000	13.61
50 x 40R x 6.5	1501- 5 -9110	1501- 5 -9310	1501- 5 -9510	48	43.2	39.29	5000	8000	13.91
63 x 10R x 6	1501- 6 -4100	1501- 6 -4300	1501- 6 -4500	61	56.7	95.71	5000	8000	21.71
63 x 20R x 6.5	1501- 6 -7110	1501- 6 -7310	1501- 6 -7510	61	56.2	99.98	5000	8000	22.18
63 x 40R x 6.5	1501- 6 -9110	1501- 6 -9310	1501- 6 -9510	61	56.2	103.36	5000	8000	22.57
80 x 10R x 6.5	1501- 7 -4100	1501- 7 -4300	1501- 7 -4500	78	73.2	256.36	5000	8000	35.54
80 x 20R x 9	1501- 7 -7110	1501- 7 -7310	1501- 7 -7510	77	70.6	247.13	5000	8000	34.86
80 x 20R x 12.7	1501- 7 -7100	1501- 7 -7300	1501- 7 -7500	76	66.9	211.51	5000	8000	32.16
100 x 10R x 6.5	1501- 8 -4100	1501- 8 -4300	1501- 8 -4500	98	93.2	652.67	5000	8000	56.74
100 x 20R x 12.7	1501- 8 -7100	1501- 8 -7300	1501- 8 -7500	96	86.9	560.12	5000	8000	52.44
125 x 10R x 6.5	1501- 9 -4100	1501- 9 -4300	1501- 9 -4500	123	118.2	1574.25	5000	8000	90.02
125 x 20R x 12.7	1501- 9 -7100	1501- 9 -7300	1501- 9 -7500	121	111.9	1460.94	5000	8000	84.73

Area of application

The STAR – Ground-Thread Screw is the solution for high-precision applications.

Production

The conventional method of production for screws is to grind the ball track.

As a rule, STAR screws are manufactured to order complete with end machining.

Screws of class P3 and P1 are supplied as standard with a lead test report.

N.B.:

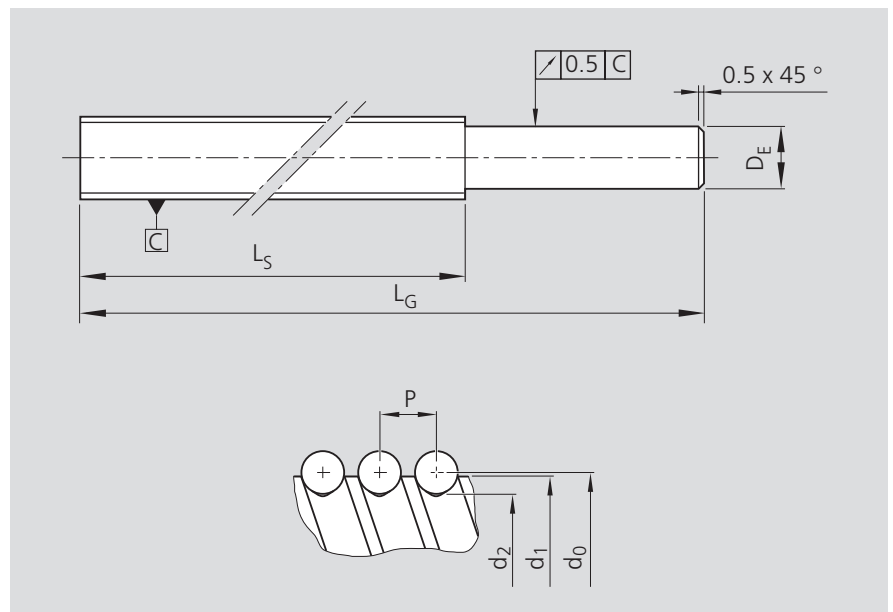
The part numbers listed in the table apply for a linear meter of screw without end machining. Screws with customer-specific end machining and a mounted nut are issued with their own ID numbers.

Ground-thread "ECO-Screws"

We keep stocks of screws in standard sizes and popular lengths in case you need delivery at extremely short notice, e.g. for repairs, as samples or for pre-series. These "ECO Screws" can be end-machined as required at short notice.

The number of standard sizes kept in stock is increased in accordance with inquiries. Please ask.

Please note that with very large end bearing diameters (bigger than d_2) the thread grooves may remain partly visible.



STAR – Precision Ball Screw Assemblies

Screw End Form 99, End Annealed

99

* Annealed length

Option (machining of end face)

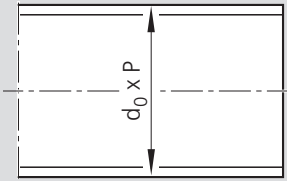
K	None
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Order code: SEM-E-S 20 x 5R x 3-4 X X T7 R **99K150** 82Z120 1250 1 0

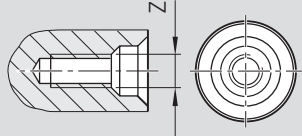
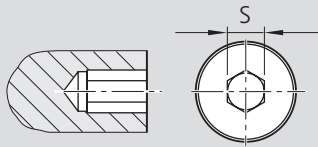
The annealed length can be selected independently of the screw size.

Screw End Form 00, End not Annealed, Machining of End Face

00



Option (machining of end face)

Z	
S	
K	None

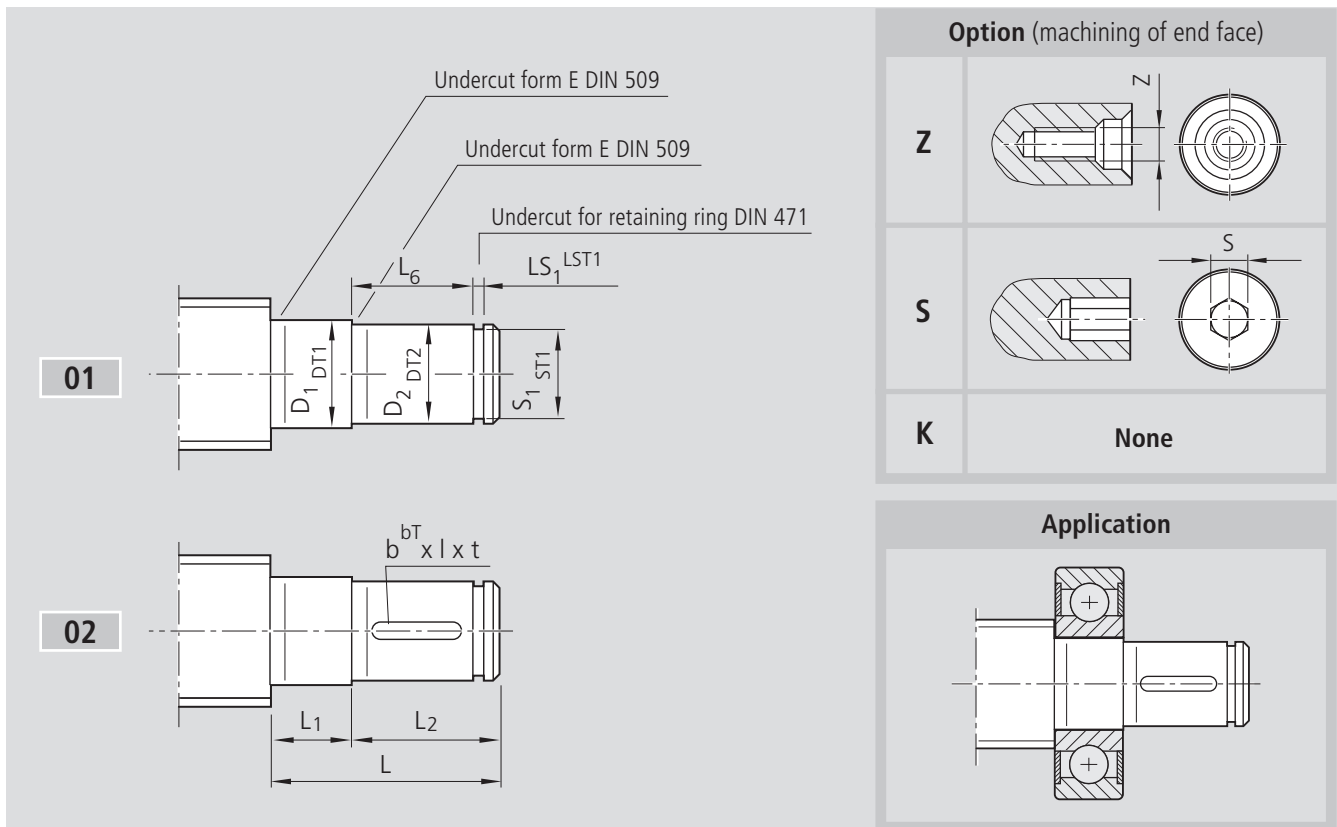
Order code:

SEM-E-S 20 x 5R x 3-4 X X T7 R 00Z200 82Z120 1250 1 0

Form	Version	Ball screw size Hex socket		Centering hole	Hex socket
		d_0	P	Z	S
00	080	8	2.5	–	–
	120	12	5/10	M3	4
	160	16	5/10/16	M4	5
	200	20	5/20	M6	8
	250	25	5/10/25	M8	10
	320	32	5/10/20/32	M10	12
	400	40	5/10/12/16/20/40	M12	14
	500	50	5/10/12/16/20/40	M16	17
	630	63	10/20/40	M20	17
800	80	10/20	M20	17	

STAR – Precision Ball Screw Assemblies

Screw End Form 01–02



Order code: SEM-E-S 20 x 5R x 3-4 X X T7 R 02Z120 82Z120 1250 1 0

Form	Version*	Ball screw size		Dimensions (mm)												Keyway to DIN 6885				Centering hole Z	Hex socket S
		d_0	P	L	D_1	DT1	L_1	D_2	DT2	L_2	L_6	S_1	ST1	LS_1	LST1	b	bT	l	t		
01	050	8	2.5	19	5	j6	5	4	h7	14	12	3.8	h10	0.50	H13					-	-
	060	12	5/10	24	6	j6	6	5	h7	18	16	4.8	h10	0.70	H13					-	-
	100	16	5/10/16	32	10	j6	9	8	h7	23	20	7.6	h10	1.10	H13					M3	-
	120	20	5/20	38	12	j6	10	10	h7	28	25	9.6	h10	1.10	H13					M3	4
	150	20	5/20	39	15	j6	11	12	h7	28	25	11.5	h11	1.10	H13					M4	4
	170	25	5/10/25	45	17	j6	12	15	h7	33	30	14.3	h11	1.10	H13					M5	4
	200	32	5/10/20/32	58	20	j6	14	18	h7	44	40	17.0	h11	1.30	H13					M6	5
	250	32	5/10/20/32	69	25	j6	15	22	h7	54	50	21.0	h11	1.30	H13					M8	6
	300	40	5/10/12/16/20/40	70	30	j6	16	28	h7	54	50	26.6	h12	1.60	H13					M10	10
	350	50	5/10/12/16/20/40	82	35	j6	17	32	h7	65	60	30.3	h12	1.60	H13					M12	10
	500	63	10/20/40	107	50	j6	20	48	h7	87	80	45.5	h12	1.85	H13					M16	17
600	80	10/20	109	60	j6	22	58	h7	87	80	55.0	h12	2.15	H13					M20	17	
02	100	16	5/10/16	32	10	j6	9	8	h7	23	20	7.6	h10	1.10	H13	2	P9	14	1.2	M3	-
	120	20	5/20	38	12	j6	10	10	h7	28	25	9.6	h10	1.10	H13	3	P9	20	1.8	M3	4
	150	20	5/20	39	15	j6	11	12	h7	28	25	11.5	h11	1.10	H13	4	P9	20	2.5	M4	4
	170	25	5/10/25	45	17	j6	12	15	h7	33	30	14.3	h11	1.10	H13	5	P9	25	3.0	M5	4
	200	32	5/10/20/32	58	20	j6	14	18	h7	44	40	17.0	h11	1.30	H13	6	P9	28	3.5	M6	5
	250	32	5/10/20/32	69	25	j6	15	22	h7	54	50	21.0	h11	1.30	H13	6	P9	36	3.5	M8	6
	300	40	5/10/12/16/20/40	70	30	j6	16	28	h7	54	50	26.6	h12	1.60	H13	8	P9	36	4.0	M10	10
	350	50	5/10/12/16/20/40	82	35	j6	17	32	h7	65	60	30.3	h12	1.60	H13	10	P9	40	5.0	M12	10
	500	63	10/20/40	107	50	j6	20	48	h7	87	80	45.5	h12	1.85	H13	14	P9	63	6.0	M16	17
600	80	10/20	109	60	j6	22	58	h7	87	80	55.0	h12	2.15	H13	16	P9	63	6.0	M20	17	

* The allocation of screw ends to the bearing is defined by the version.

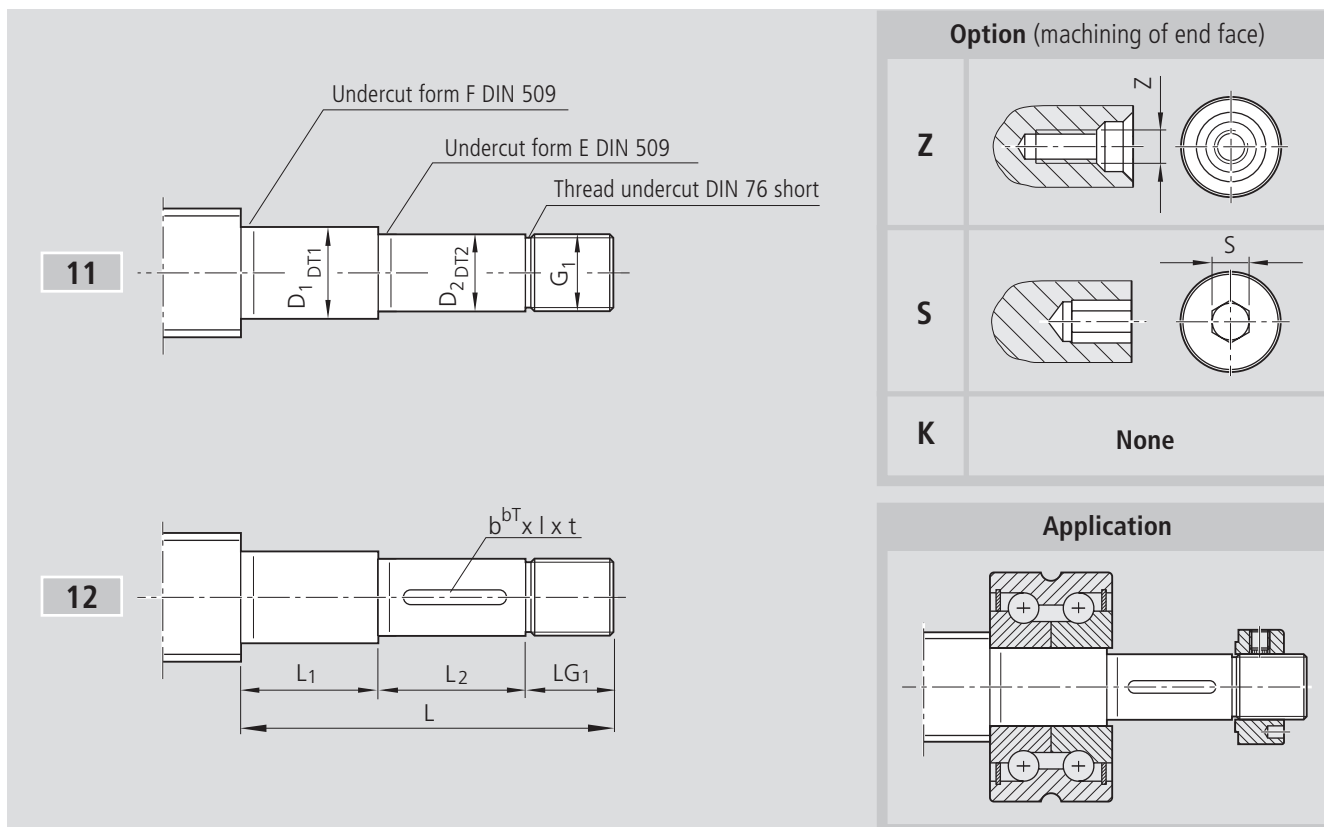
End Bearings for Screw Ends Form 01–02



Form	Version	Ball screw size		Deep-groove bearing to DIN 625		Retaining ring to DIN 471	
		d_0	P	Designation	Part number	Designation	Part number
01	050	8	2.5	625.2RS	8414-048-00	4x0.4	8410-765-00
	060	12	5/10	626.2RS	8414-043-00	5x0.6	8410-742-00
	100	16	5/10/16	6200.2RS	8414-049-00	8x0.8	8410-737-00
	120	20	5/20	6201.2RS	8414-042-00	10x1	8410-745-00
	150	20	5/20	6202.2RS	8414-074-00	12x1	8410-712-00
	170	25	5/10/25	6203.2RS	8414-050-00	15x1	8410-748-00
	200	32	5/10/20/32	6204.2RS	8414-038-00	18x1.2	8410-723-00
	250	32	5/10/20/32	6205.2RS	8414-063-00	22x1.2	8410-714-00
	300	40	5/10/12/16/20/40	6206.2RS	8414-051-00	28x1.5	8410-752-00
	350	50	5/10/12/16/20/40	6207.2RS	8414-075-00	32x1.5	8410-753-00
	500	63	10/20/40	6210.2RS	8414-077-00	48x1.75	8410-718-00
02	600	80	10/20	6212.2RS	8414-078-00	58x2	8410-728-00
	100	16	5/10/16	6200.2RS	8414-049-00	8x0.8	8410-737-00
	120	20	5/20	6201.2RS	8414-042-00	10x1	8410-745-00
	150	20	5/20	6202.2RS	8414-074-00	12x1	8410-712-00
	170	25	5/10/25	6203.2RS	8414-050-00	15x1	8410-748-00
	200	32	5/10/20/32	6204.2RS	8414-038-00	18x1.2	8410-723-00
	250	32	5/10/20/32	6205.2RS	8414-063-00	22x1.2	8410-714-00
	300	40	5/10/12/16/20/40	6206.2RS	8414-051-00	28x1.5	8410-752-00
	350	50	5/10/12/16/20/40	6207.2RS	8414-075-00	32x1.5	8410-753-00
	500	63	10/20/40	6210.2RS	8414-077-00	48x1.75	8410-718-00
	600	80	10/20	6212.2RS	8414-078-00	58x2	8410-728-00

STAR – Precision Ball Screw Assemblies

Screw Ends Form 11–12



Order code:

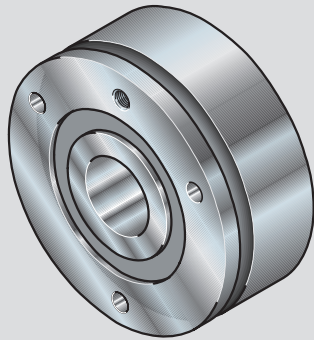
SEM-E-S | 20 x 5R x 3-4 | 1 | 2 | T7 | R | 12Z120 | 41Z120 | 1250 | 1 | 0

Form	Version*	Ball screw size		Dimensions (mm)									Keyway to DIN 6885				Centering hole	Hex socket	
		d_0	P	L	D_1	DT1	L_1	D_2	DT2	L_2	G_1	LG_1	b	bT	l	t			Z
11	100	16	5/10/16	48	10	h6	18	8	h7	20	M6x0.5	10						–	–
	120	20	5/20	60	12	h6	23	10	h7	25	M10x1	12						M3	4
	170	25	5/10/25	75	17	h6	23	15	h7	30	M15x1	22						M5	4
	200	32	5/10/20/32	88	20	h6	26	18	h7	40	M17x1	22						M5	5
	250	40	10/12/16/20/40	126	25	h6	54	22	h7	50	M20x1	22						M6	5
	300	40	5	101	30	h6	25	28	h7	50	M25x1.5	26						M8	8
	301	50	10/12/16/20/40	130	30	h6	54	28	h7	50	M25x1.5	26						M8	8
	350	50	5	118	35	h6	32	32	h7	60	M30x1.5	26						M10	10
	400	63	10/20/40	132	40	h6	44	38	h7	60	M35x1.5	28						M12	12
	500	80	10/20	160	50	h6	52	48	h7	80	M40x1.5	28						M16	12
12	100	16	5/10/16	48	10	h6	18	8	h7	20	M6x0.5	10	2	P9	14	1.2		–	–
	120	20	5/20	60	12	h6	23	10	h7	25	M10x1	12	3	P9	20	1.8		M3	4
	170	25	5/10/25	75	17	h6	23	15	h7	30	M15x1	22	5	P9	25	3		M5	4
	200	32	5/10/20/32	88	20	h6	26	18	h7	40	M17x1	22	6	P9	28	3.5		M5	5
	250	40	10/12/16/20/40	126	25	h6	54	22	h7	50	M20x1	22	6	P9	36	3.5		M6	5
	300	40	5	101	30	h6	25	28	h7	50	M25x1.5	26	8	P9	36	4		M8	8
	301	50	10/12/16/20/40	130	30	h6	54	28	h7	50	M25x1.5	26	8	P9	36	4		M8	8
	350	50	5	118	35	h6	32	32	h7	60	M30x1.5	26	10	P9	40	5		M10	10
	400	63	10/20/40	132	40	h6	44	38	h7	60	M35x1.5	28	10	P9	40	5		M12	12
	500	80	10/20	160	50	h6	52	48	h7	80	M40x1.5	28	14	P9	63	5.5		M16	12

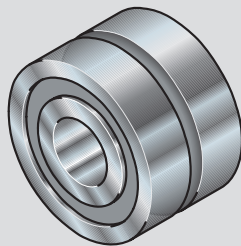
* The allocation of screw ends to the bearing is defined by the version.

End Bearings for Screw Ends Form 11–12

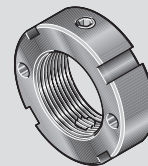
Angular contact thrust ball bearing LGF



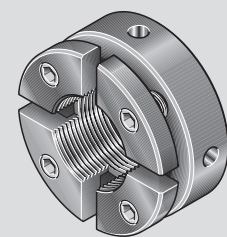
Angular contact thrust ball bearing LGN



Slotted nut
NMZ



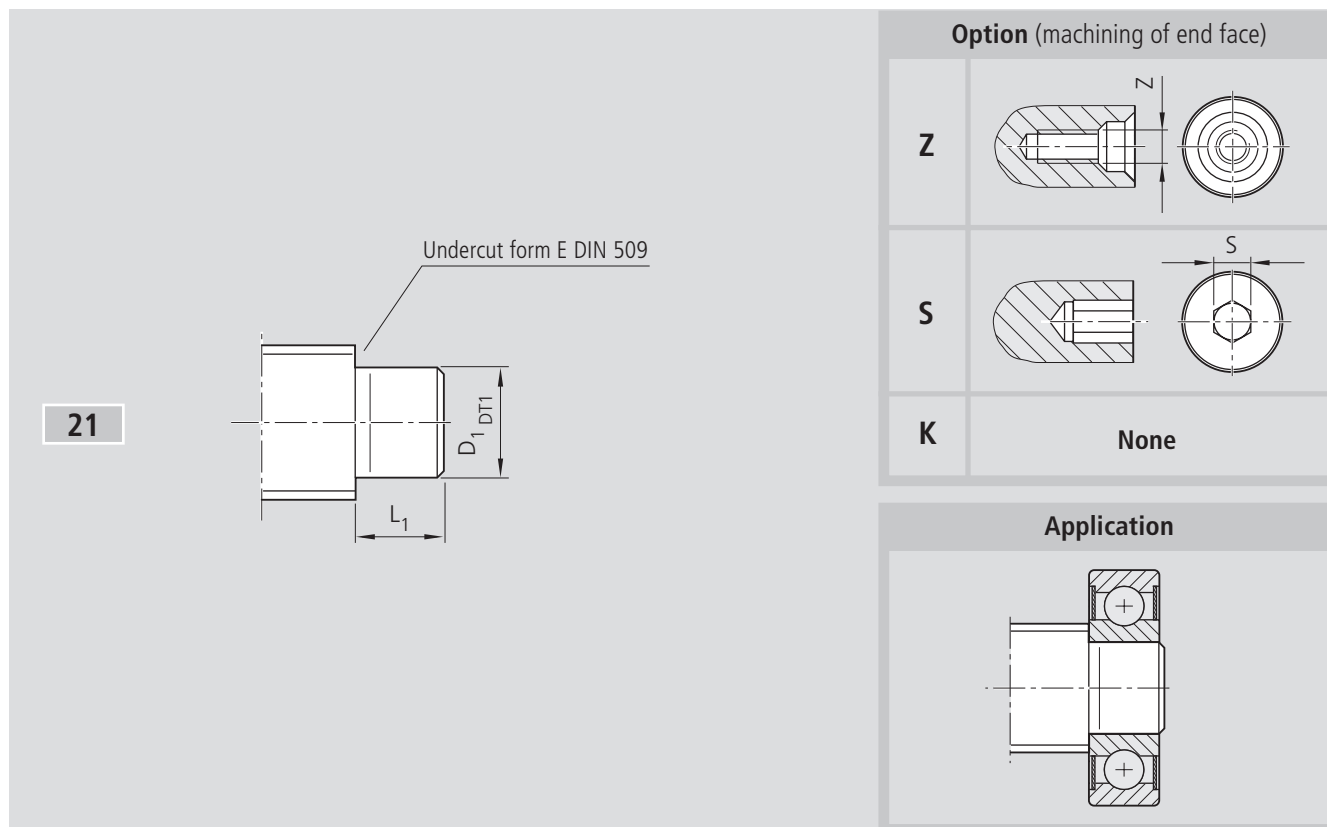
Slotted nut
NMA



Form	Version	Ball screw size		Angular contact thrust ball bearing				Slotted nut	
		d ₀	P	LGF		LGN		Designation	Part number
				Designation	Part number	Designation	Part number		
11	100	16	5/10/16	–	–	LGN-B-1034	8414-003-06	NMZ6x0.5	8446-001-04
	120	20	5/20	LGF-B-1255	8414-009-06	LGN-B-1242	8414-004-06	NMZ10x1	8446-002-04
	170	25	5/10/25	LGF-B-1762	8414-010-06	LGN-B-1747	8414-005-06	NMA15x1	8446-020-04
	200	32	5/10/20/32	LGF-B-2068	8414-001-06	LGN-B-2052	8414-006-06	NMA17x1	8446-014-04
	250	40	10/12/16/20/40	LGF-C-2575	8414-015-06	LGN-C-2557	8414-014-06	NMA20x1	8446-015-04
	300	40	5	LGF-B-3080	8414-011-06	LGN-B-3062	8414-007-06	NMA25x1.5	8446-011-04
	301	50	10/12/16/20/40	LGF-C-3080	8414-027-06	LGN-C-3062	8414-023-06	NMA25x1.5	8446-011-04
	350	50	5	LGF-B-3590	8414-026-06	LGN-B-3572	8414-022-06	NMA30x1.5	8446-016-04
	400	63	10/20/40	LGF-B-40115	8414-028-06	LGN-A-4090	8414-024-06	NMA35x1.5	8446-012-04
	500	80	10/20	LGF-A-50140	8414-029-06	LGN-A-50110	8414-025-06	NMA40x1.5	8446-018-04
12	100	16	5/10/16	–	–	LGN-B-1034	8414-003-06	NMZ6x0.5	8446-001-04
	120	20	5/20	LGF-B-1255	8414-009-06	LGN-B-1242	8414-004-06	NMZ10x1	8446-002-04
	170	25	5/10/25	LGF-B-1762	8414-010-06	LGN-B-1747	8414-005-06	NMA15x1	8446-020-04
	200	32	5/10/20/32	LGF-B-2068	8414-001-06	LGN-B-2052	8414-006-06	NMA17x1	8446-014-04
	250	40	10/12/16/20/40	LGF-B-2575	8414-015-06	LGN-C-2557	8414-014-06	NMA20x1	8446-015-04
	300	40	5	LGF-B-3080	8414-011-06	LGN-B-3062	8414-007-06	NMA25x1.5	8446-011-04
	301	50	10/12/16/20/40	LGF-C-3080	8414-027-06	LGN-C-3062	8414-023-06	NMA25x1.5	8446-011-04
	350	50	5	LGF-B-3590	8414-026-06	LGN-B-3572	8414-022-06	NMA30x1.5	8446-016-04
	400	63	10/20/40	LGF-A-50140	8414-028-06	LGN-A-4090	8414-024-06	NMA35x1.5	8446-012-04
	500	80	10/20	LGF-B-40115	8414-029-06	LGN-A-50110	8414-025-06	NMA40x1.5	8446-018-04

STAR – Precision Ball Screw Assemblies

Screw End Form 21

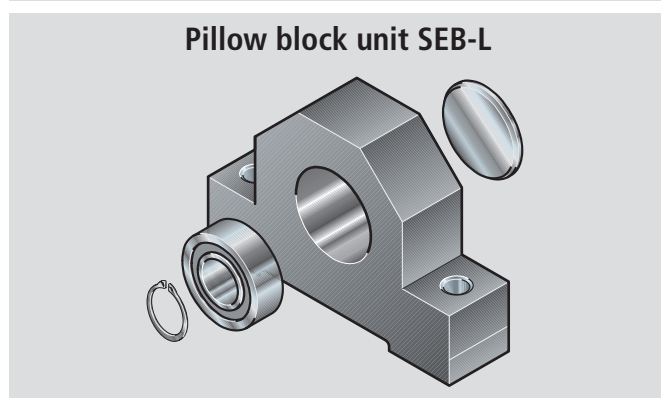
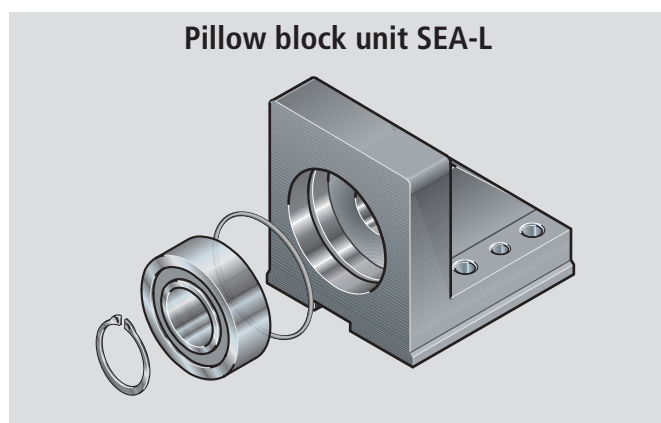


Order code: SEM-E-S 20 x 5R x 3-4 1 2 T7 R 21Z120 82Z120 1250 1 0

Form	Version*	Ball screw size		Dimensions (mm)			Centering hole	Hex socket
		d_0	P	D_1	DT1	L_1		
21	050	8	2.5	5	j6	5	-	-
	060	12	5/10	6	j6	6	-	-
	100	16	5/10/16	10	j6	9	M3	4
	120	20	5/20	12	j6	10	M4	4
	150	20	5/20	15	j6	11	M5	4
	170	25	5/10/25	17	j6	12	M6	5
	200	32	5/10/20/32	20	j6	14	M6	5
	250	32	5/10/20/32	25	j6	15	M10	8
	300	40	5 10/12/16/20/40	30	j6	16	M10	10
	350	50	5/10/12/16/20/40	35	j6	17	M12	12
	500	63	10/20/40	50	j6	20	M16	17
	600	80	10/20	60	j6	22	M20	17

* The allocation of screw ends to the bearing is defined by the version.

End Bearings for Screw Ends Form 21

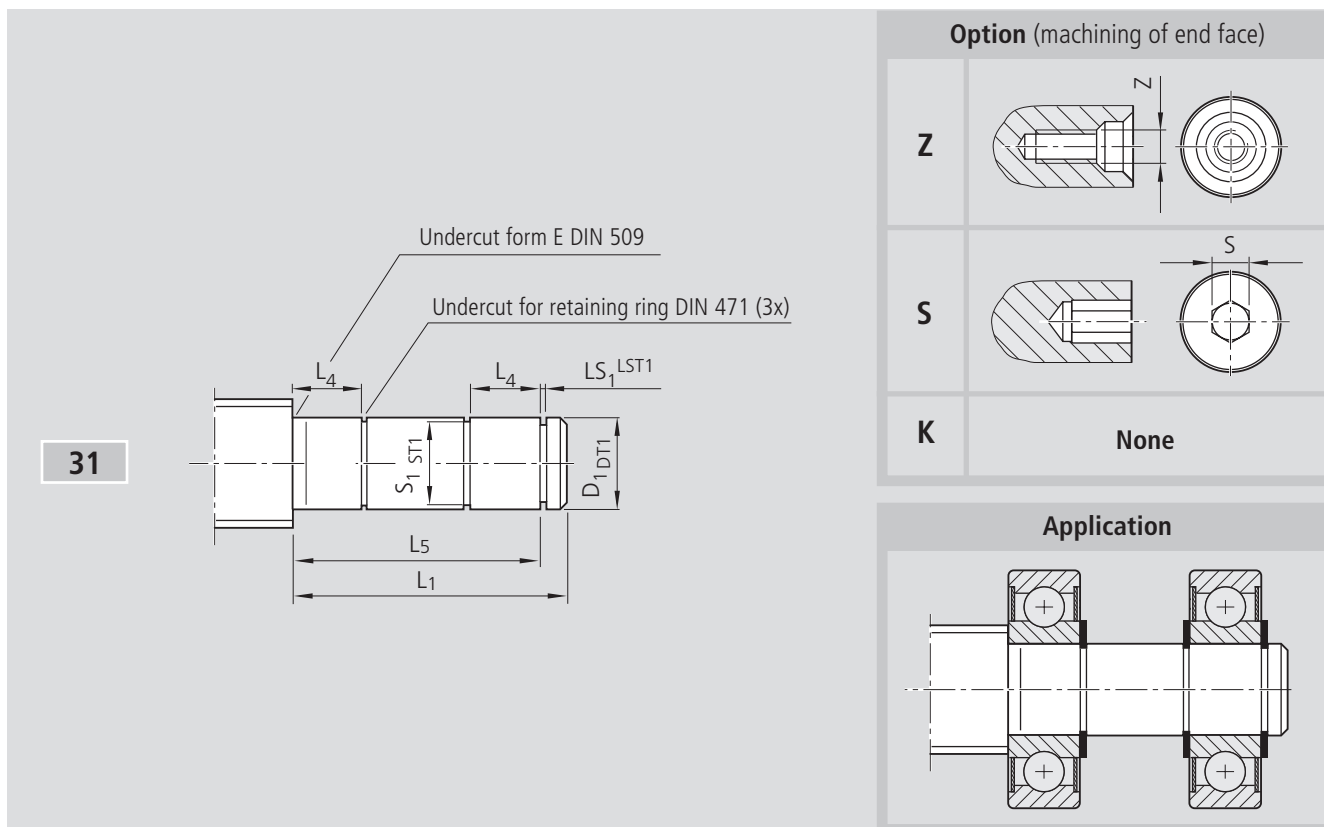


Form	Version	Ball screw size		Pillow block unit		Bearing LAD*
		d_0	P	SEA-L Part number	SEB-L Part number	Part number
21	050	8	2.5	–	1591-6-0500	1590-6-0500
	060	12	5/10	–	1591-6-0620	1590-6-0600
	100	16	5/10/16	–	1591-6-1020	1590-6-1000
	120	20	5/20	1593-6-1200	1591-6-1220	1590-6-1200
	150	20	5/20	–	–	1590-6-1500
	170	25	5/10/25	1593-6-1700	1591-6-1720	1590-6-1700
	200	32	5/10/20/32	1593-6-2000	1591-6-2020	1590-6-2000
	250	32	5/10/20/32	–	–	1590-6-2500
	300	40	5 10/12/16/20/40	1593-6-3000	1591-6-3020 1591-6-3010	1590-6-3000
	350	50	5/10/12/16/20/40	–	–	1590-6-3500
	500	63	10/20/40	–	–	1590-6-5000
	600	80	10/20	–	–	1590-6-6000

* Items delivered: 1 bearing, 2 retaining rings

STAR – Precision Ball Screw Assemblies

Screw End Form 31



Order code:

SEM-E-S 20 x 5R x 3-4 1 2 T7 R 31Z120 82Z120 1250 1 0

Form	Version*	Ball screw size		Dimensions (mm)									Centering hole	Hex socket
		d_0	P	D_1	DT1	L_1	L_4	L_5	S_1	ST1	LS_1	LST1		
31	050	8	2.5	5	j6	22	5	20	4.8	h10	0.70	H13	–	–
	060	12	5/10	6	j6	26	6	24	5.7	h10	0.80	H13	–	–
	100	16	5/10/16	10	j6	39	9	36	9.6	h10	1.10	H13	M3	4
	120	20	5/20	12	j6	43	10	40	11.5	h11	1.10	H13	M4	4
	150	20	5/20	15	j6	47	11	44	14.3	h11	1.10	H13	M5	4
	170	25	5/10/25	17	j6	51	12	48	16.2	h11	1.10	H13	M6	5
	200	32	5/10/20/32	20	j6	60	14	56	19.0	h11	1.30	H13	M6	5
	250	32	5/10/20/32	25	j6	64	15	60	23.9	h12	1.30	H13	M10	8
	300	40	5/10/12/16/20/40	30	j6	68	16	64	28.6	h12	1.60	H13	M10	10
	350	50	5/10/12/16/20/40	35	j6	73	17	68	33.0	h12	1.60	H13	M12	12
	500	63	10/20/40	50	j6	87	20	80	47.0	h12	2.15	H13	M16	17
600	80	10/20	60	j6	95	22	88	57.0	h12	2.15	H13	M20	17	

* The allocation of screw ends to the bearing is defined by the version.

End Bearings for Screw Ends Form 31

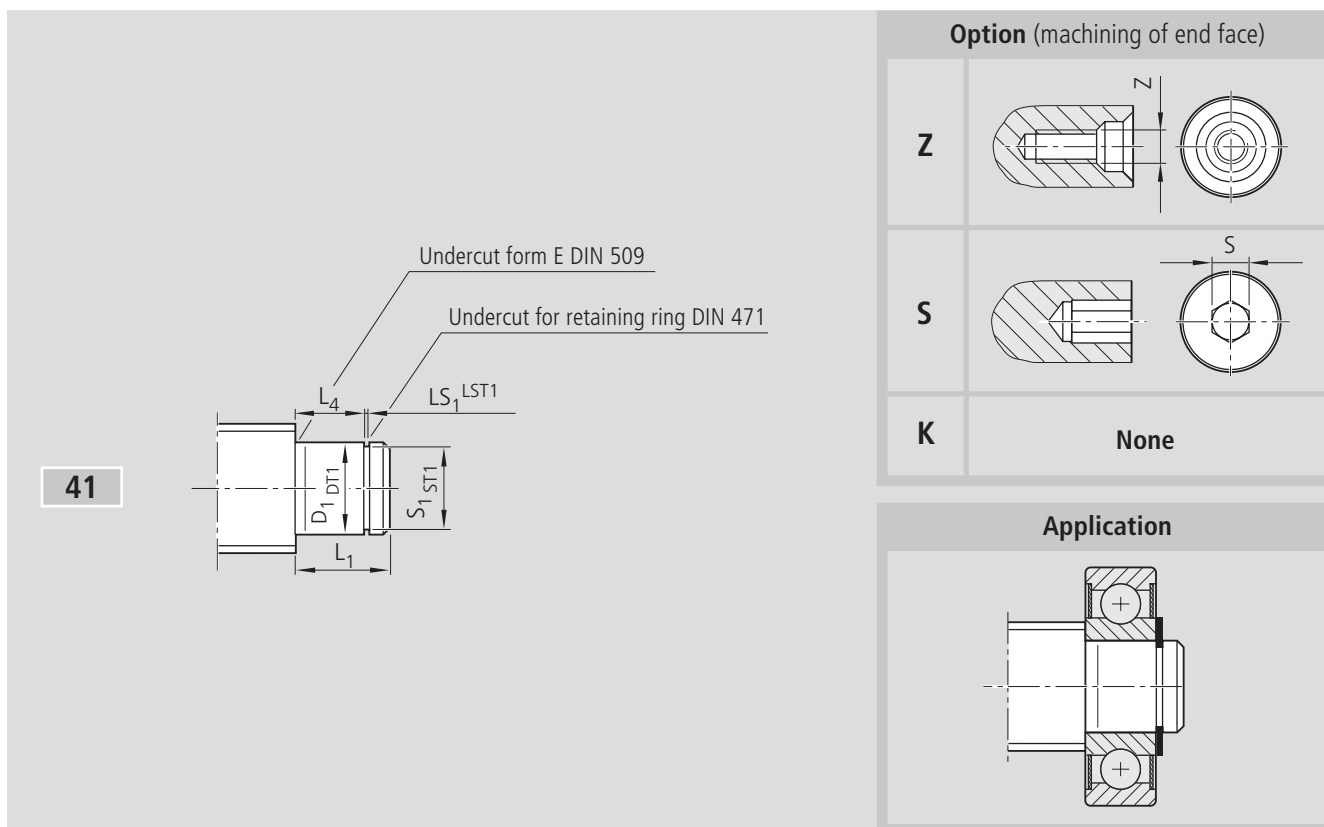


Form	Version	Ball screw size		Bearing LAD*
		d_0	P	Part number
31	050	8	2.5	1590-6-0500
	060	12	5/10	1590-6-0600
	100	16	5/10/16	1590-6-1000
	120	20	5/20	1590-6-1200
	150	20	5/20	1590-6-1500
	170	25	5/10/25	1590-6-1700
	200	32	5/10/20/32	1590-6-2000
	250	32	5/10/20/32	1590-6-2500
	300	40	5/10/12/16/20/40	1590-6-3000
	350	50	5/10/12/16/20/40	1590-6-3500
	500	63	10/20/40	1590-6-5000
	600	80	10/20	1590-6-6000

* Items delivered: 1 bearing, 2 retaining rings.
Two sets are required for applications with Form 31.

STAR – Precision Ball Screw Assemblies

Screw End Form 41

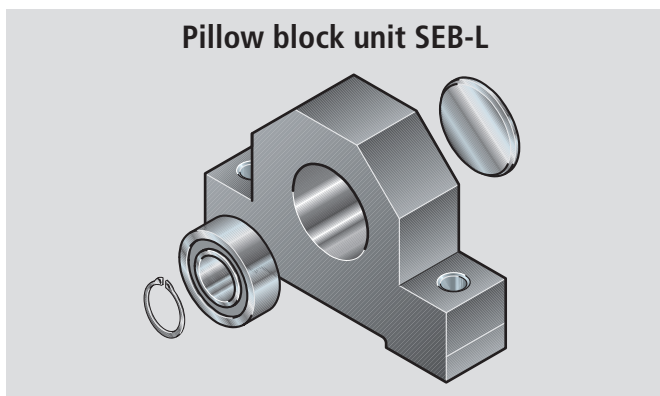
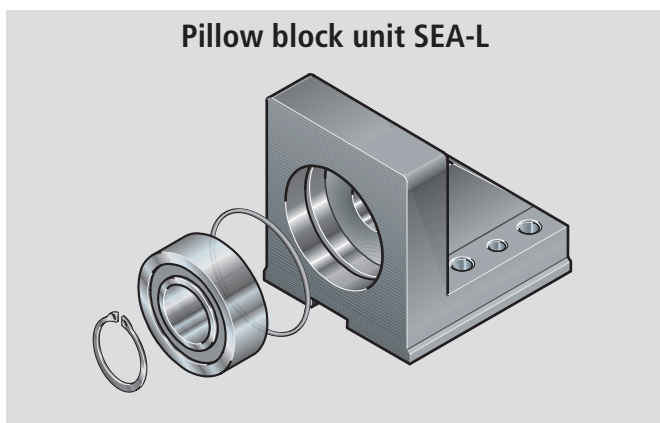


Order code: SEM-E-S 20 x 5R x 3-4 1 2 T7 R 41Z120 82Z120 1250 1 0

Form	Version*	Ball screw size		Dimensions (mm)								Centering hole	Hex socket
		d_0	P	D_1	DT1	L_1	L_4	S_1	ST1	LS_1	LST1		
41	050	8	2.5	5	j6	7	5	4.8	h10	0.70	H13	–	–
	060	12	5/10	6	j6	8	6	5.7	h10	0.80	H13	–	–
	100	16	5/10/16	10	j6	12	9	9.6	h10	1.10	H13	M3	4
	120	20	5/20	12	j6	13	10	11.5	h11	1.10	H13	M4	4
	150	20	5/20	15	j6	14	11	14.3	h11	1.10	H13	M5	4
	170	25	5/10/25	17	j6	15	12	16.2	h11	1.10	H13	M6	5
	200	32	5/10/20/32	20	j6	18	14	19.0	h11	1.30	H13	M6	5
	250	32	5/10/20/32	25	j6	19	15	23.9	h12	1.30	H13	M10	8
	300	40	5 10/12/16/20/40	30	j6	20	16	28.6	h12	1.6	H13	M10	10
	350	50	5/10/12/16/20/40	35	j6	22	17	33.0	h12	1.60	H13	M12	12
	500	63	10/20/40	50	j6	27	20	47.0	h12	2.15	H13	M16	17
	600	80	10/20	60	j6	29	22	57.0	h12	2.15	H13	M20	17

* The allocation of screw ends to the bearing is defined by the version.

End Bearings for Screw Ends Form 41

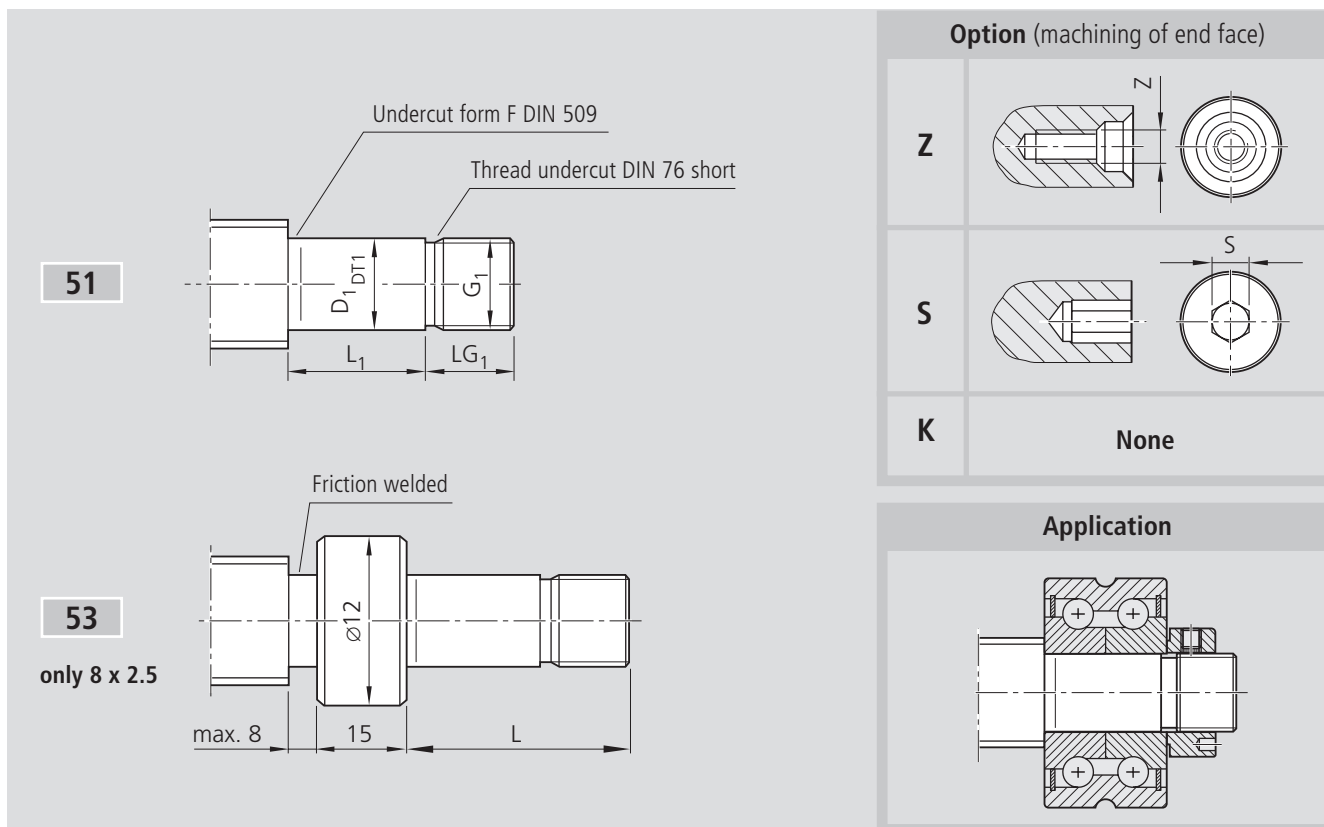


Form	Version	Ball screw size		Bearing LAD*	Pillow block unit	
		d_0	P	Part number	SEA-L Part number	SEB-L Part number
41	050	8	2.5	1590-6-0500	–	1591-6-0500
	060	12	5/10	1590-6-0600	–	1591-6-0620
	100	16	5/10/16	1590-6-1000	–	1591-6-1020
	120	20	5/20	1590-6-1200	1593-6-1200	1591-6-1220
	150	20	5/20	1590-6-1500	–	–
	170	25	5/10/25	1590-6-1700	1593-6-1700	1591-6-1720
	200	32	5/10/20/32	1590-6-2000	1593-6-2000	1591-6-2020
	250	32	5/10/20/32	1590-6-2500	–	–
	300	40	5 10/12/16/20/40	1590-6-3000	1593-6-3000	1591-6-3020 1593-6-3010
	350	50	5/10/12/16/20/40	1590-6-3500	–	–
	500	63	10/20/40	1590-6-5000	–	–
	600	80	10/20	1590-6-6000	–	–

* Items delivered: 1 bearing, 2 retaining rings

STAR – Precision Ball Screw Assemblies

Screw Ends Form 51–53

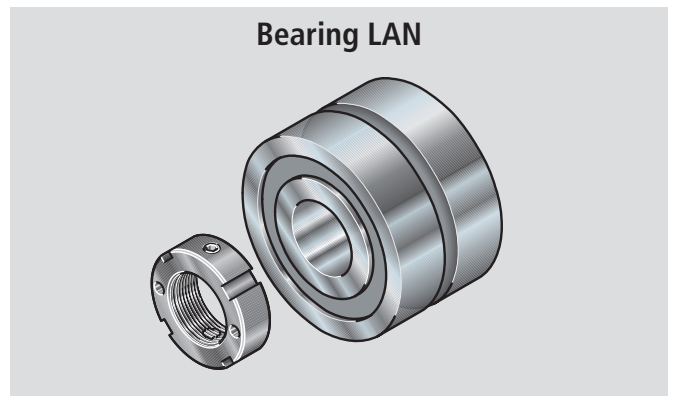
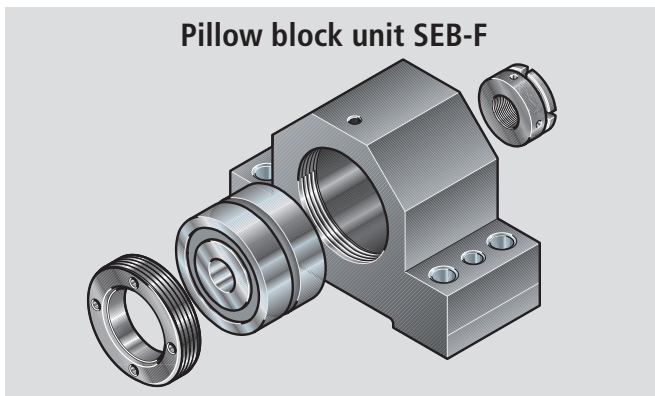
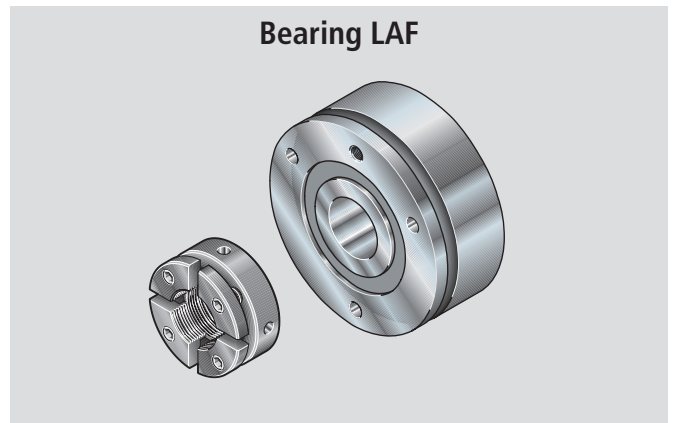
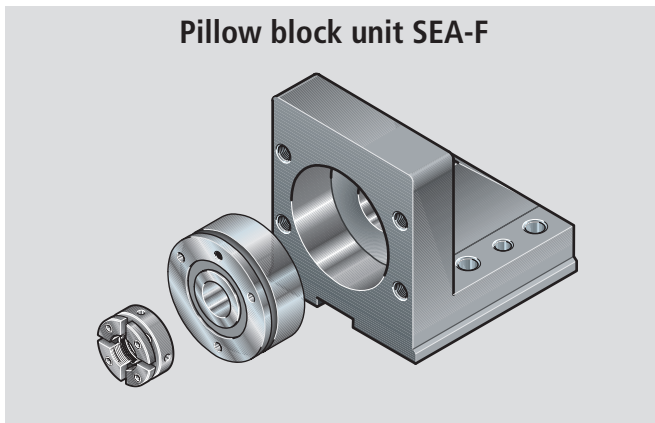


Order code: SEM-E-S 20 x 5R x 3-4 1 2 T7 R 51Z120 82Z120 1250 1 0

Form	Version*	Ball screw size		Dimensions (mm)						Centering hole	Hex socket
		d_0	P	L	D_1	DT1	L_1	G_1	LG_1		
51	060	12	5/10	24	6	h6	14	M6x0.5	10	–	–
	100	16	5/10/16	30	10	h6	18	M10x1	12	M3	4
	120	20	5/20	35	12	h6	23	M12x1	12	M4	4
	170	25	5/10/25	45	17	h6	23	M17x1	22	M5	5
	200	32	5/10/20/32	48	20	h6	26	M20x1	22	M6	5
	250	40	10/12/16/20/40	80	25	h6	54	M25x1.5	26	M8	8
	300	40	5 10/12/16/20/40	51	30	h6	25	M30x1.5	26	M10	10
	301	50	10/12/16/20/40	80	30	h6	54	M30x1.5	26	M10	10
	350	50	5	60	35	h6	32	M35x1.5	28	M12	12
	400	63	10/20/40	72	40	h6	44	M40x1.5	28	M16	12
500	80	10/20	84	50	h6	52	M50x1.5	32	M16	17	
53	060	8	2.5	24	6	h6	14	M6x0.5	10	–	–

* The allocation of screw ends to the bearing is defined by the version.

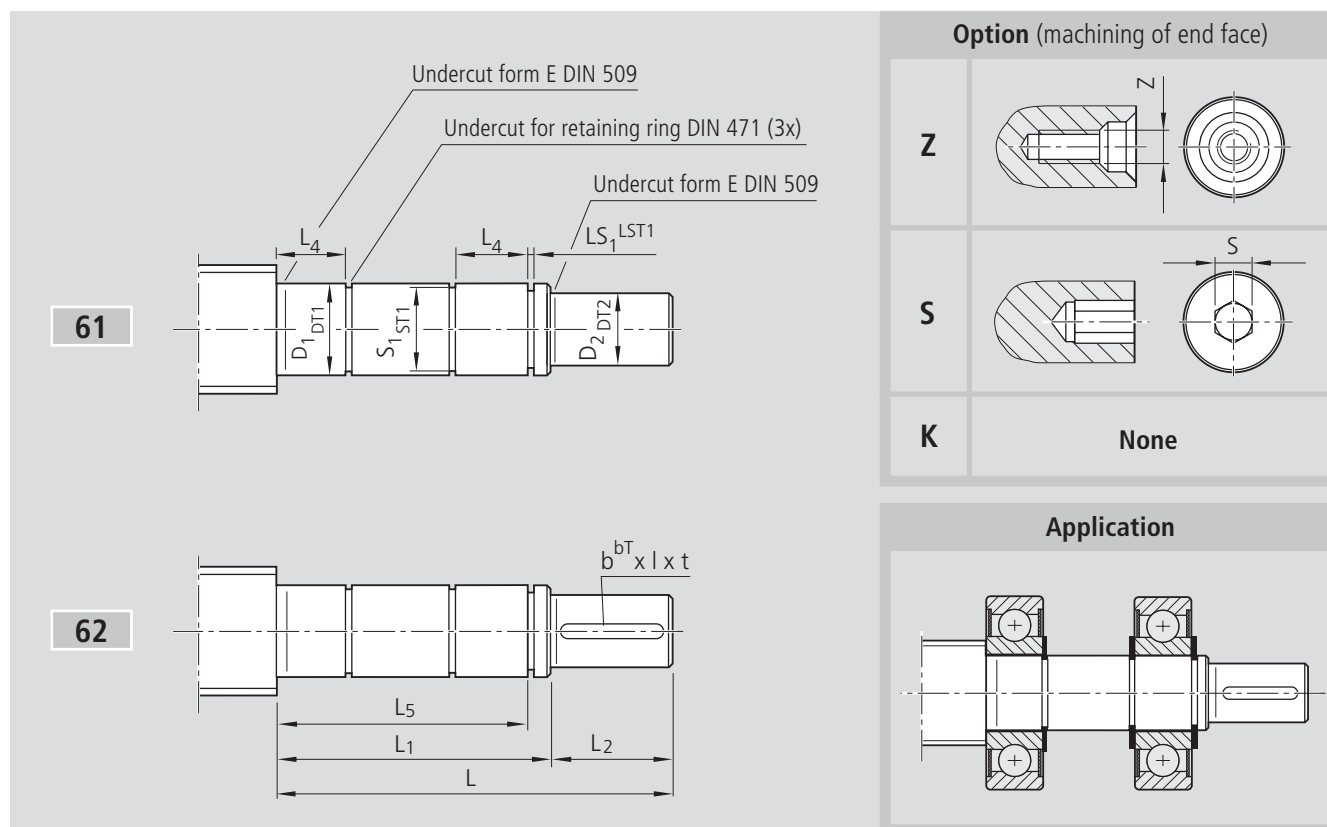
End Bearings for Screw Ends Form 51–53



Form	Version	Ball screw size		Pillow block unit		Bearing		Slotted nut used	
		d_0	P	SEA-F Part number	SEB-F Part number	LAF Part number	LAN Part number	NMZ	NMA
51	060	12	5/10	–	1591-1-0620	–	1590-1-0600	•	
	100	16	5/10/16	–	1591-1-1020	–	1590-1-1000	•	
	120	20	5/20	1593-0-1200	1591-1-1220	1590-0-1200	1590-1-1200	•	
	170	25	5/10/25	1593-0-1730	1591-1-1730	1590-0-1730	1590-1-1730		•
	200	32	5/10/20/32	1593-0-2030	1591-1-2030	1590-0-2030	1590-1-2030		•
	250	40	10/12/16/20/40	–	1591-1-2530	1590-3-2530	1590-2-2530		•
	300	40	5 10/12/16/20/40	1593-0-3030	1591-1-3030	1590-0-3030	1590-1-3030		•
	301	50	10/12/16/20/40	–	–	1590-3-3030	1590-2-3030		•
	350	50	5	–	–	1590-0-3530	1590-1-3530		•
	400	63	10/20/40	–	–	1590-0-4030	1590-1-4030		•
500	80	10/20	–	–	1590-0-5030	1590-1-5030		•	
53	060	8	2.5		1591-1-0600	–	1590-1-0600	•	

STAR – Precision Ball Screw Assemblies

Screw Ends Form 61–62

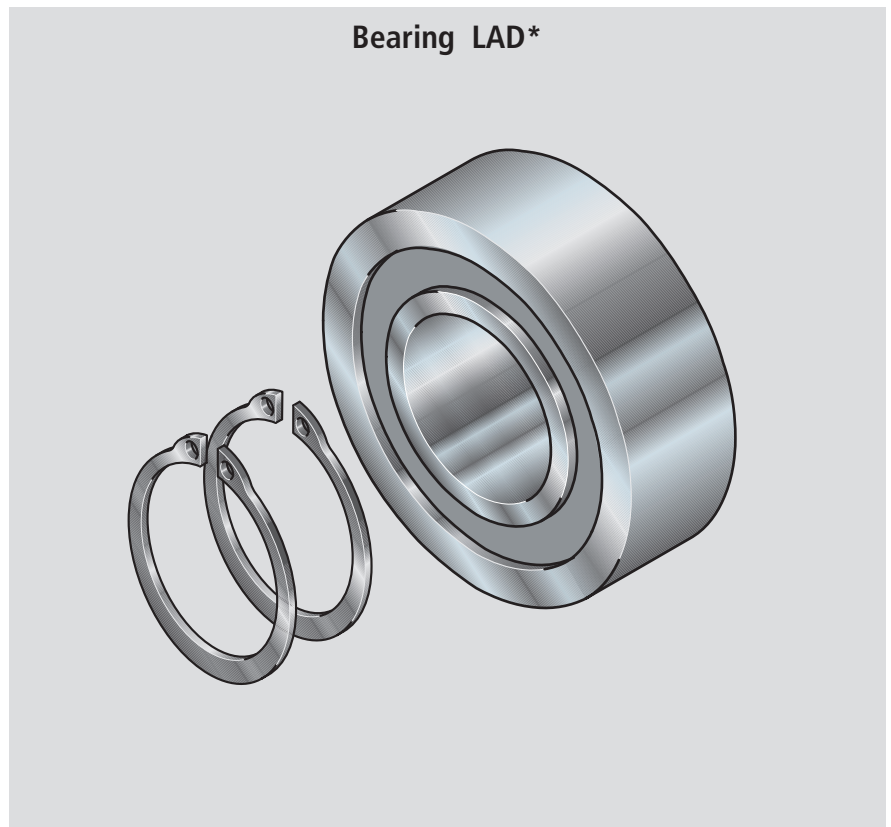


Order code: SEM-E-S 20 x 5R x 3-4 1 2 T7 R 62Z120 51Z120 1250 1 0

Form	Vers.*	Ball screw size		Dimensions (mm)													Keyway to DIN 6885				Centering hole Z	Hex socket S						
		d ₀	P	L	D ₁	DT ₁	L ₁	D ₂	DT ₂	L ₂	L ₄	L ₅	S ₁	ST ₁	LS ₁	LST ₁	b	b ^T	l	t								
61	050	8	2.5	34	5	j ₆	22	4	h ₇	12	5	20	4.8	h ₁₀	0.70	H ₁₃												
	060	12	5/10	42	6	j ₆	26	5	h ₇	16	6	24	5.7	h ₁₀	0.80	H ₁₃												
	100	16	5/10/16	59	10	j ₆	39	8	h ₇	20	9	36	9.6	h ₁₀	1.10	H ₁₃										M3		
	120	20	5/20	68	12	j ₆	43	10	h ₇	25	10	40	11.5	h ₁₁	1.10	H ₁₃										M3	4	
	150	20	5/20	72	15	j ₆	47	12	h ₇	25	11	44	14.3	h ₁₁	1.10	H ₁₃										M4	4	
	170	25	5/10/25	81	17	j ₆	51	15	h ₇	30	12	48	16.2	h ₁₁	1.10	H ₁₃										M5	4	
	200	32	5/10/20/32	100	20	j ₆	60	18	h ₇	40	14	56	19.0	h ₁₁	1.30	H ₁₃										M6	5	
	250	32	5/10/20/32	114	25	j ₆	64	22	h ₇	50	15	60	23.9	h ₁₂	1.30	H ₁₃										M8	6	
	300	40	5/10/12/16/20/40	118	30	j ₆	68	28	h ₇	50	16	64	28.6	h ₁₂	1.60	H ₁₃										M10	10	
	350	50	5/10/12/16/20/40	133	35	j ₆	73	32	h ₇	60	17	68	33.0	h ₁₂	1.60	H ₁₃										M12	10	
500	63	10/20/40	167	50	j ₆	87	48	h ₇	80	5	88	47.0	h ₁₂	2.15	H ₁₃										M16	17		
600	80	10/20	175	60	j ₆	95	58	h ₇	80	5	88	57.0	h ₁₂	2.15	H ₁₃										M20	17		
62	100	16	5/10/16	59	10	j ₆	39	8	h ₇	20	9	36	9.6	h ₁₀	1.10	H ₁₃	2	P9	14	1.2					M3			
	120	20	5/20	68	12	j ₆	43	10	h ₇	25	10	40	11.5	h ₁₁	1.10	H ₁₃	3	P9	20	1.8					M3	4		
	150	20	5/20	72	15	j ₆	47	12	h ₇	25	11	44	14.3	h ₁₁	1.10	H ₁₃	4	P9	20	2.5					M4	4		
	170	25	5/10/25	81	17	j ₆	51	15	h ₇	30	12	48	16.2	h ₁₁	1.10	H ₁₃	5	P9	25	3					M5	4		
	200	32	5/10/20/32	100	20	j ₆	60	18	h ₇	40	14	56	19.0	h ₁₁	1.30	H ₁₃	6	P9	28	3.5					M6	5		
	250	32	5/10/20/32	114	25	j ₆	64	22	h ₇	50	15	60	23.9	h ₁₂	1.30	H ₁₃	6	P9	36	3.5					M8	6		
	300	40	5/10/12/16/20/40	118	30	j ₆	68	28	h ₇	50	16	64	28.6	h ₁₂	1.60	H ₁₃	8	P9	36	4					M10	10		
	350	50	5/10/12/16/20/40	133	35	j ₆	73	32	h ₇	60	17	68	33.0	h ₁₂	1.60	H ₁₃	10	P9	40	5					M12	10		
500	63	10/20/40	167	50	j ₆	87	48	h ₇	80	20	N	47.0	h ₁₂	2.15	H ₁₃	14	P9	63	5.5					M16	17			
600	80	10/20	175	60	j ₆	95	58	h ₇	80	22	88	57.0	h ₁₂	2.15	H ₁₃	16	P9	63	6					M20	17			

* The allocation of screw ends to the bearing is defined by the version.

End Bearings for Screw Ends Form 61–62

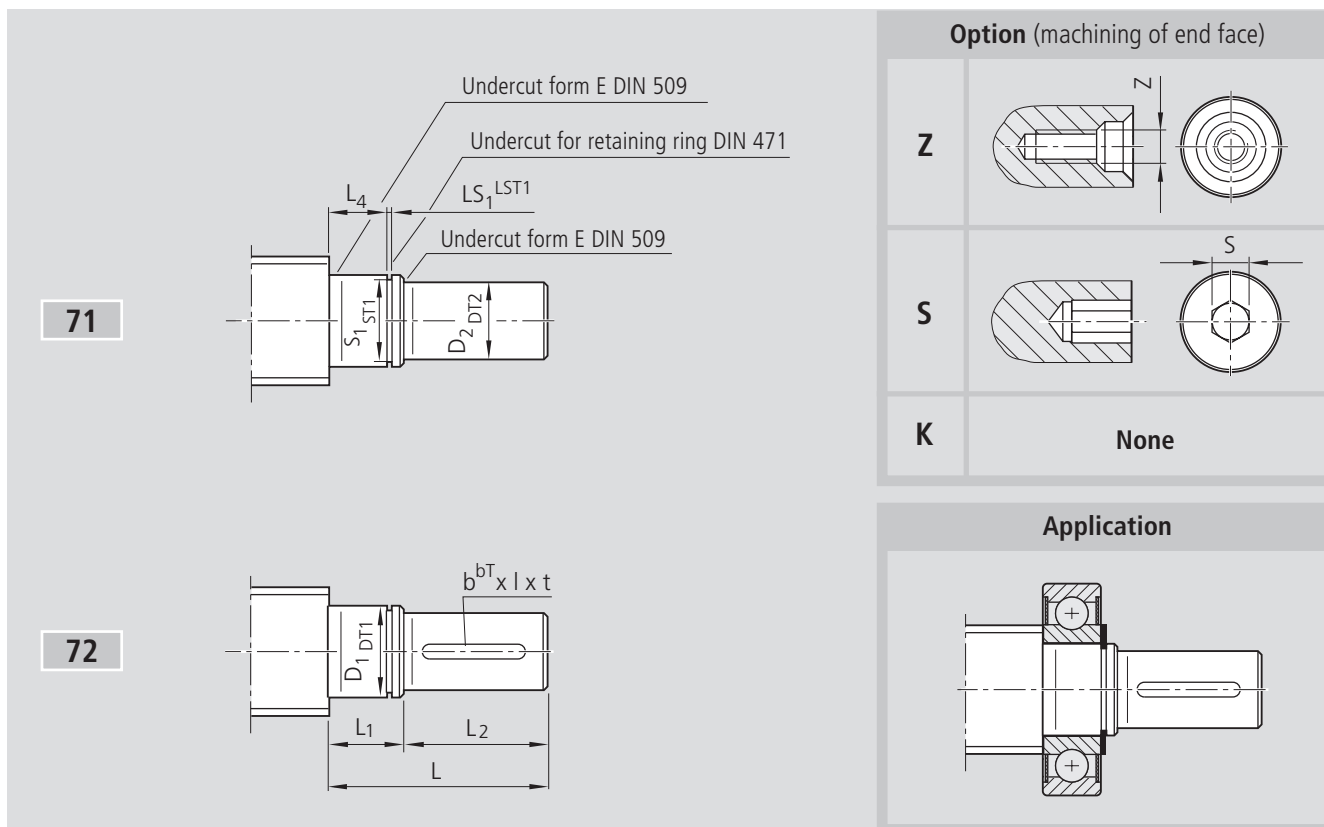


Form	Version	Ball screw size		Bearing LAD*
		d_0	P	Part number
61	050	8	2.5	1590-6-0500
	060	12	5/10	1590-6-0600
	100	16	5/10/16	1590-6-1000
	120	20	5/20	1590-6-1200
	150	20	5/20	1590-6-1500
	170	25	5/10/25	1590-6-1700
	200	32	5/10/20/32	1590-6-2000
	250	32	5/10/20/32	1590-6-2500
	300	40	5/10/12/16/20/40	1590-6-3000
	350	50	5/10/12/16/20/40	1590-6-3500
	500	63	10/20/40	1590-6-5000
	600	80	10/20	1590-6-6000
62	100	16	5/10/16	1590-6-1000
	120	20	5/20	1590-6-1200
	150	20	5/20	1590-6-1500
	170	25	5/10/25	1590-6-1700
	200	32	5/10/20/32	1590-6-2000
	250	32	5/10/20/32	1590-6-2500
	300	40	5/10/12/16/20/40	1590-6-3000
	350	50	5/10/12/16/20/40	1590-6-3500
	500	63	10/20/40	1590-6-5000
	600	80	10/20	1590-6-6000

* Items delivered: 1 bearing, 2 retaining rings.
Two sets are required for applications with Form 61-62.

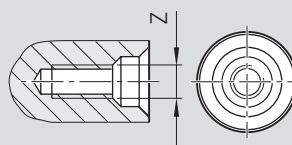
STAR – Precision Ball Screw Assemblies

Screw End Form 71–72

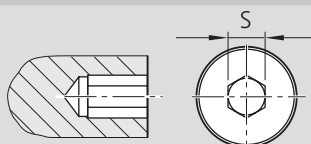


Option (machining of end face)

Z



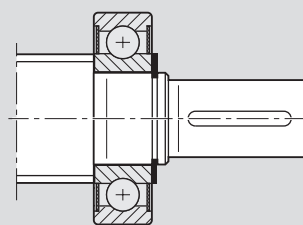
S



K

None

Application



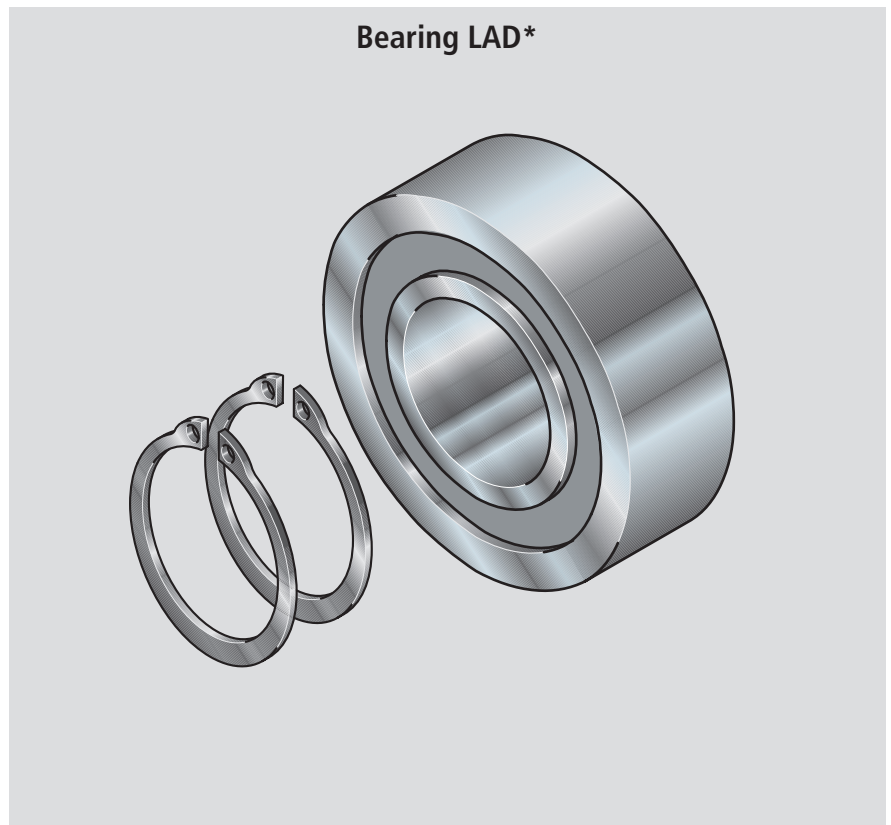
Order code:

SEM-E-S 20 x 5R x 3-4 1 2 T7 R 72Z120 51Z120 1250 1 0

Form	Version*	Ball screw size		Dimensions (mm)												Keyway to DIN 6885				Centering hole Z	iHex socket S				
		d ₀	P	L	D ₁	DT1	L ₁	D ₂	DT2	L ₂	L ₄	S ₁	ST1	LS ₁	LST1	b	bT	l	t						
71	050	8	2.5	19	5	j6	7	4	h7	12	5	4.8	h10	0.70	H13								-	-	
	060	12	5/10	24	6	j6	8	5	h7	16	6	5.7	h10	0.80	H13								-	-	
	100	16	5/10/16	32	10	j6	12	8	h7	20	9	9.6	h10	1.10	H13								M3	-	
	120	20	5/20	38	12	j6	13	10	h7	25	10	11.5	h11	1.10	H13								M3	4	
	150	20	5/20	39	15	j6	14	12	h7	25	11	14.3	h11	1.10	H13								M4	4	
	170	25	5/10/25	45	17	j6	15	15	h7	30	12	16.2	h11	1.10	H13									M5	4
	200	32	5/10/20/32	58	20	j6	18	18	h7	40	14	19.0	h11	1.30	H13									M6	5
	250	32	5/10/20/32	69	25	j6	19	22	h7	50	15	23.9	h12	1.30	H13									M8	6
	300	40	5/10/12/16/20/40	70	30	j6	20	28	h7	50	16	28.6	h12	1.60	H13									M10	10
	350	50	5/10/12/16/20/40	82	35	j6	22	32	h7	60	17	33.0	h12	1.60	H13									M12	10
72	500	63	10/20/40	107	50	j6	27	48	h7	80	20	47.0	h12	2.15	H13									M16	17
	600	80	10/20	109	60	j6	29	58	h7	80	22	57.0	h12	2.15	H13									M20	17
	100	16	5/10/16	32	10	j6	12	8	h7	20	9	9.6	h10	1.10	H13	2	P9	14	1.2				M3	-	
	120	20	5/20	38	12	j6	13	10	h7	25	10	11.5	h11	1.10	H13	3	P9	20	1.8				M3	4	
	150	20	5/20	39	15	j6	14	12	h7	25	11	14.3	h11	1.10	H13	4	P9	20	2.5				M4	4	
	170	25	5/10/25	45	17	j6	15	15	h7	30	12	16.2	h11	1.10	H13	5	P9	25	3				M5	4	
	200	32	5/10/20/32	58	20	j6	18	18	h7	40	14	19.0	h11	1.30	H13	6	P9	28	3.5				M6	5	
	250	32	5/10/20/32	69	25	j6	19	22	h7	50	15	23.9	h12	1.30	H13	6	P9	36	3.5				M8	6	
	300	40	5/10/12/16/20/40	70	30	j6	20	28	h7	50	16	28.6	h12	1.60	H13	8	P9	36	4				M10	10	
	350	50	5/10/12/16/20/40	82	35	j6	22	32	h7	60	17	33.0	h12	1.60	H13	10	P9	40	5				M12	10	

* The allocation of screw ends to the bearing is defined by the version.

End Bearings for Screw Ends Form 71–72

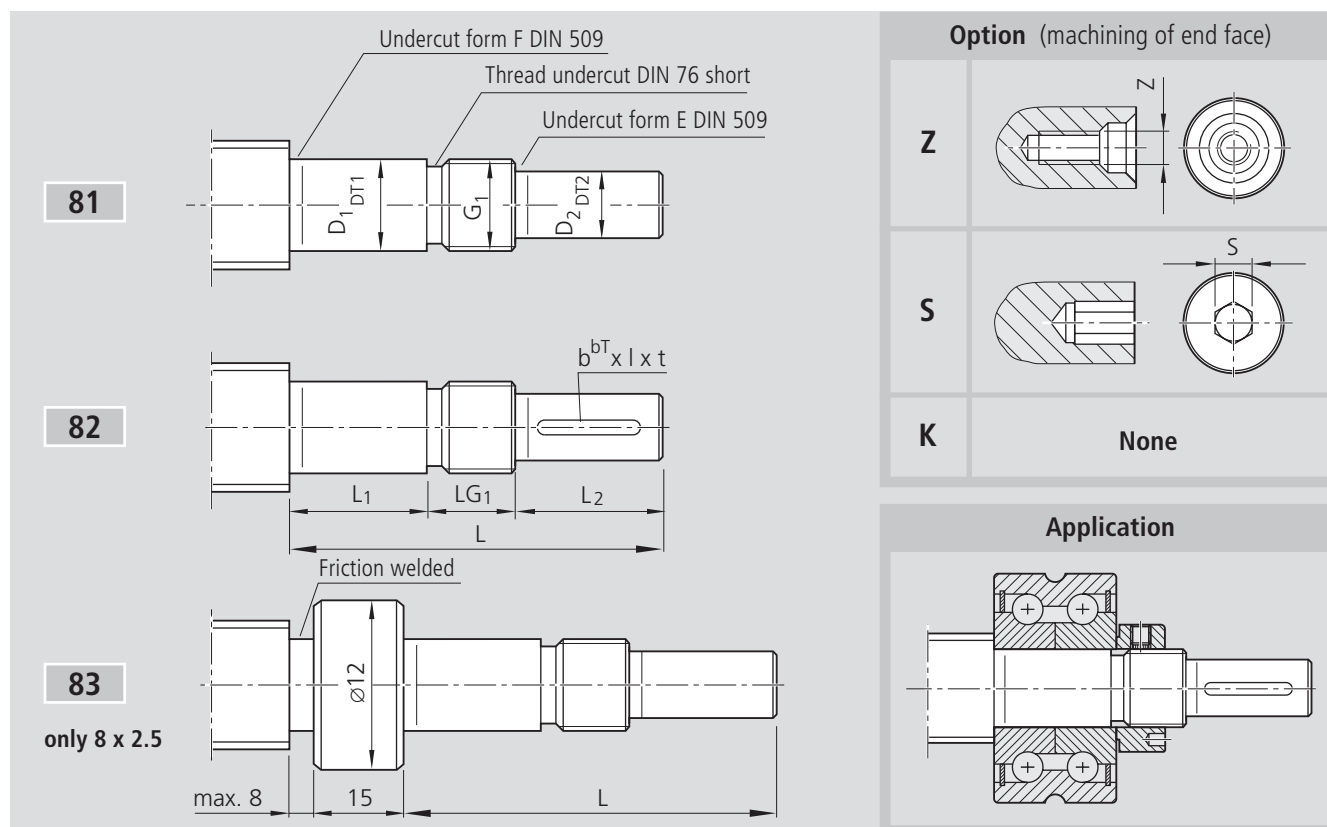


Form	Version	Ball screw size		Bearing LAD*
		d_0	P	Part number
71	050	8	2.5	1590-6-0500
	060	12	5/10	1590-6-0600
	100	16	5/10/16	1590-6-1000
	120	20	5/20	1590-6-1200
	150	20	5/20	1590-6-1500
	170	25	5/10/25	1590-6-1700
	200	32	5/10/20/32	1590-6-2000
	250	32	5/10/20/32	1590-6-2500
	300	40	5/10/12/16/20/40	1590-6-3000
	350	50	5/10/12/16/20/40	1590-6-3500
	500	63	10/20/40	1590-6-5000
72	100	16	5/10/16	1590-6-1000
	120	20	5/20	1590-6-1200
	150	20	5/20	1590-6-1500
	170	25	5/10/25	1590-6-1700
	200	32	5/10/20/32	1590-6-2000
	250	32	5/10/20/32	1590-6-2500
	300	40	5/10/12/16/20/40	1590-6-3000
	350	50	5/10/12/16/20/40	1590-6-3500
	500	63	10/20/40	1590-6-5000
	600	80	10/20	1590-6-6000

* Items delivered: 1 bearing, 2 retaining rings.

STAR – Precision Ball Screw Assemblies

Screw Ends Form 81–82–83

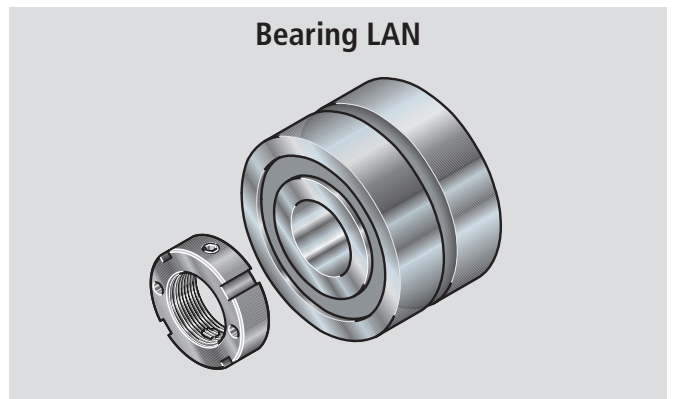
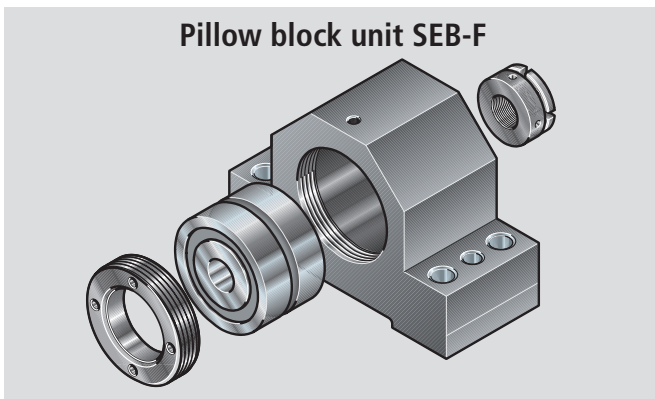
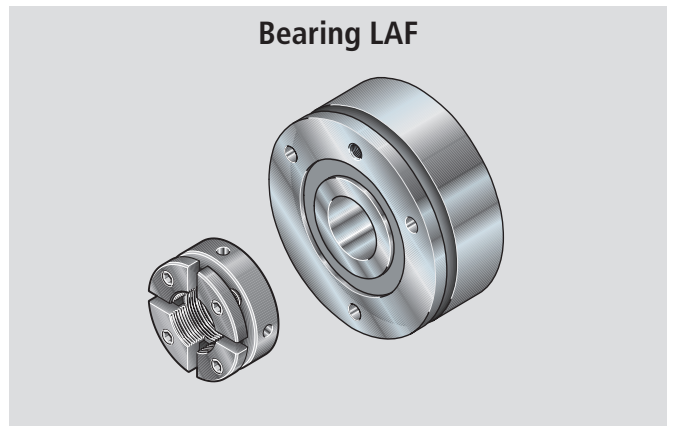
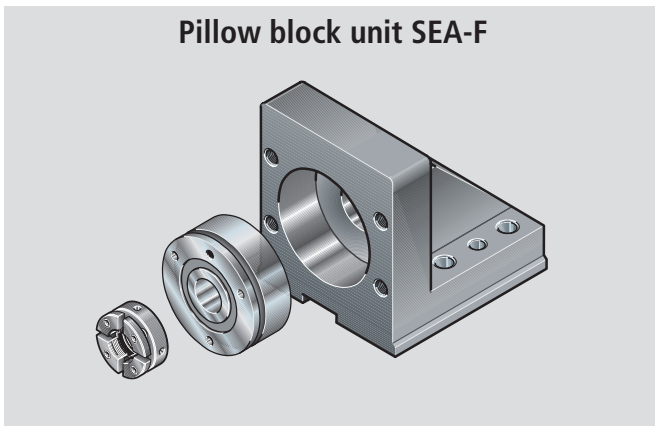


Order code: SEM-E-S | 20 x 5R x 3-4 | 1 | 2 | T7 | R | **82Z120** | 41Z120 | 1250 | 1 | 0

Form	Version*	Ball screw size		Dimensions (mm)									Keyway to DIN 6885				Centering hole Z	Hex socket S
		d ₀	P	L	D ₁	DT1	L ₁	D ₂	DT2	L ₂	G ₁	LG ₁	b	bT	l	t		
81	060	12	5/10	40	6	h6	14	5	h7	16	M6x0.5	10					-	-
	100	16	5/10/16	50	10	h6	18	8	h7	20	M10x1	12					M3	-
	120	20	5/20	60	12	h6	23	10	h7	25	M12x1	12					M3	4
	170	25	5/10/25	75	17	h6	23	15	h7	30	M17x1	22					M5	4
	200	32	5/10/20/32	88	20	h6	26	18	h7	40	M20x1	22					M6	5
	250	40	10/12/16/20/40	130	25	h6	54	22	h7	50	M25x1.5	26					M8	6
	300	40	5 10/12/16/20/40	101	30	h6	25	25	h7	50	M30x1.5	26					M10	8
	302	50	10/12/16/20/40	130	30	h6	54	25	h7	50	M30x1.5	26					M10	8
	350	50	5	110	35	h6	32	30	h7	50	M35x1.5	28					M10	10
	400	63	10/20/40	132	40	h6	44	36	h7	60	M40x1.5	28					M12	12
82	500	80	10/20	154	50	h6	52	40	h7	70	M50x1.5	32					M16	12
	100	16	5/10/16	50	10	h6	18	8	h7	20	M10x1	12	2	P9	14	1.2	M3	-
	120	20	5/20	60	12	h6	23	10	h7	25	M12x1	12	3	P9	20	1.8	M3	4
	170	25	5/10/25	75	17	h6	23	15	h7	30	M17x1	22	5	P9	25	3	M5	4
	200	32	5/10/20/32	88	20	h6	26	18	h7	40	M20x1	22	6	P9	28	3.5	M6	5
	250	40	10/12/16/20/40	130	25	h6	54	22	h7	50	M25x1.5	26	6	P9	36	3.5	M8	6
	300	40	5 10/12/16/20/40	101	30	h6	25	25	h7	50	M30x1.5	26	8	P9	36	4	M10	8
	302	50	10/12/16/20/40	130	30	h6	54	25	h7	50	M30x1.5	26	8	P9	36	4	M10	8
83	350	50	5	110	35	h6	32	30	h7	50	M35x1.5	28	8	P9	36	4	M10	10
	400	63	10/20/40	132	40	h6	44	36	h7	60	M40x1.5	28	10	P9	40	5	M12	12
	500	80	10/20	154	50	h6	52	40	h7	70	M50x1.5	32	12	P9	50	5	M16	12
	060	8	2.5	40	6	h6	14	5	h7	16	M6x0.5	10					-	-

* The allocation of screw ends to the bearing is defined by the version.

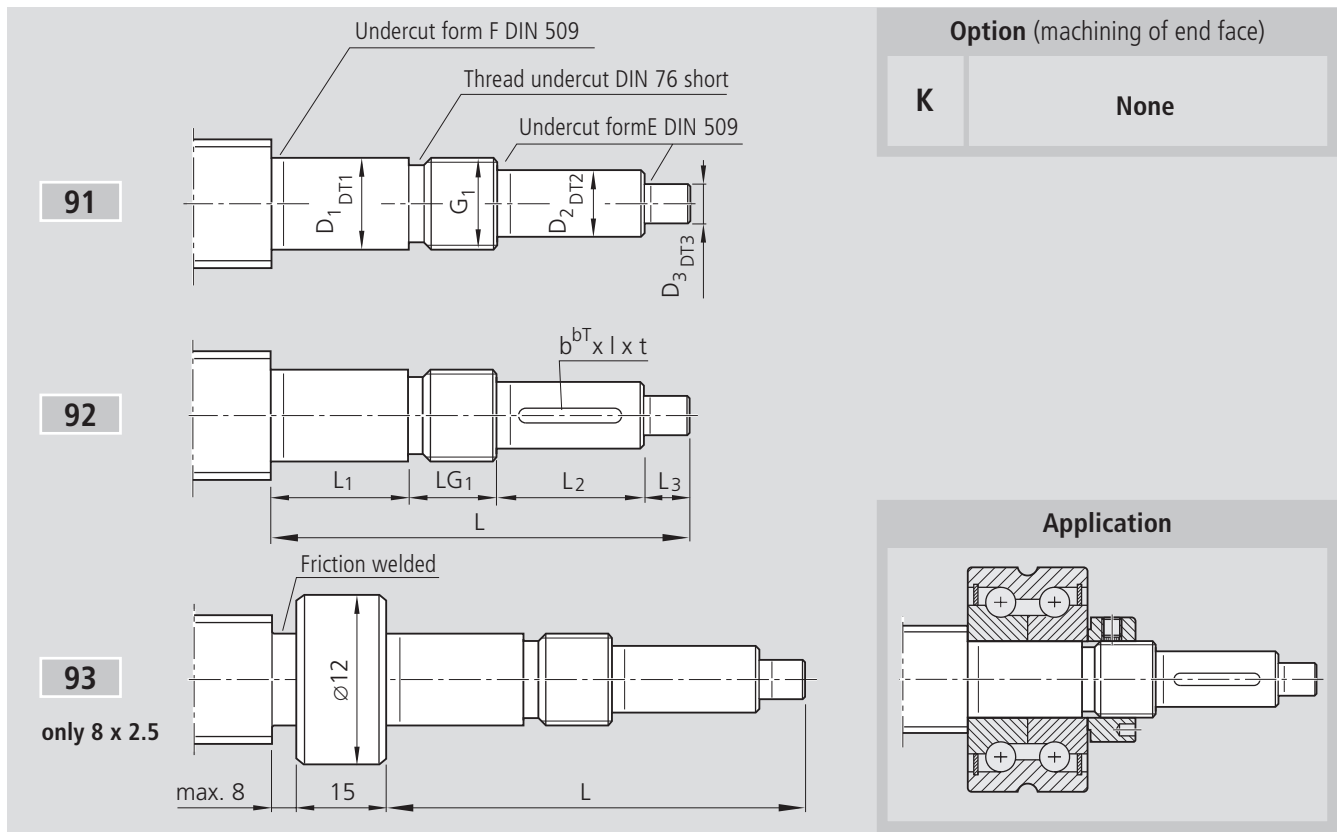
End Bearings for Screw Ends Form 81–82–83



Form	Version	Ball screw size		Pillow block unit		Bearing		Slotted nut used	
		d_0	P	SEA-F Part number	SEB-F Part number	LAF Part number	LAN Part number	NMZ	NMA
81	060	12	5/10	–	1591-1-0620	–	1590-1-0600	•	
	100	16	5/10/16	–	1591-1-1020	–	1590-1-1000	•	
	120	20	5/20	1593-0-1200	1591-1-1220	1590-0-1200	1590-1-1200	•	
	170	25	5/10/25	1593-0-1730	1591-1-1730	1590-0-1730	1590-1-1730		•
	200	32	5/10/20/32	1593-0-2030	1591-1-2030	1590-0-2030	1590-1-2030		•
	250	40	10/12/16/20/40	–	1591-1-2530	1590-3-2530	1590-2-2530		•
	300	40	5 10/12/16/20/40	1593-0-3030	1591-1-3030	1590-0-3030	1590-1-3030		•
	302	50	10/12/16/20/40	–	–	–	–		•
	350	50	5	–	–	1590-3-3030	1590-2-3030		•
	400	63	10/20/40	–	–	1590-0-3530	1590-1-3530		•
82	400	63	10/20/40	–	–	1590-0-4030	1590-1-4030		•
	500	80	10/20	–	–	1590-0-5030	1590-1-5030		•
	100	16	5/10/16	–	1591-1-1020	–	1590-1-1000	•	
	120	20	5/20	1593-0-1200	1591-1-1220	1590-0-1200	1590-1-1200	•	
	170	25	5/10/25	1593-0-1730	1591-1-1730	1590-0-1730	1590-1-1730		•
	200	32	5/10/20/32	1593-0-2030	1591-1-2030	1590-0-2030	1590-1-2030		•
	250	40	10/12/16/20/40	–	1591-1-2530	1590-3-2530	1590-2-2530		•
	300	40	5 10/12/16/20/40	1593-0-3030	1591-1-3030	1590-0-3030	1590-1-3030		•
83	302	50	10/12/16/20/40	–	–	1590-3-3030	1590-2-3030		•
	350	50	5	–	–	1590-0-3530	1590-1-3530		•
	400	63	10/20/40	–	–	1590-0-4030	1590-1-4030		•
	500	80	10/20	–	–	1590-0-5030	1590-1-5030		•
	060	8	2.5	–	1591-1-0600	–	1590-1-0600	•	

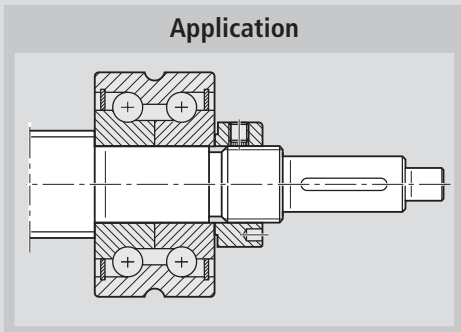
STAR – Precision Ball Screw Assemblies

Screw Ends Form 91–92–93



Option (machining of end face)

K	None
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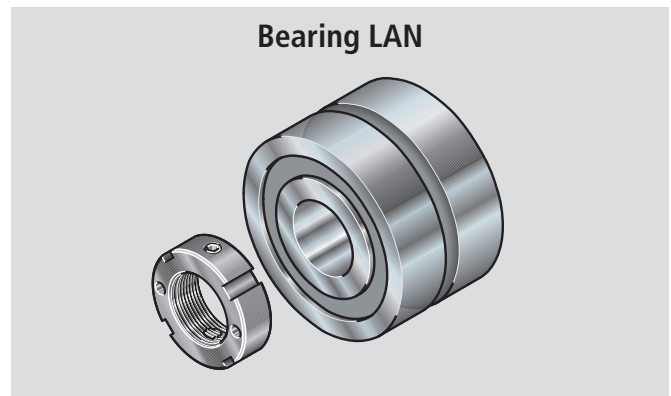
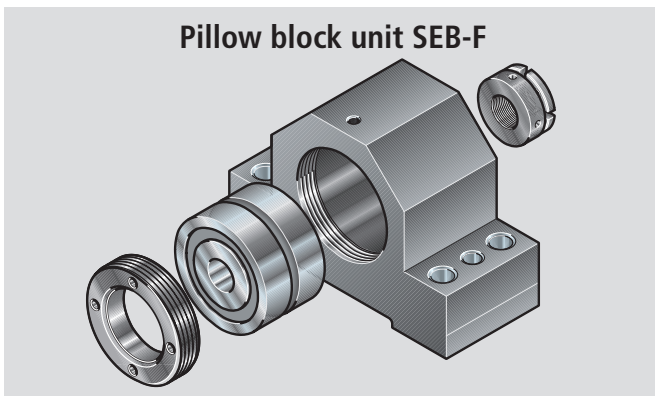
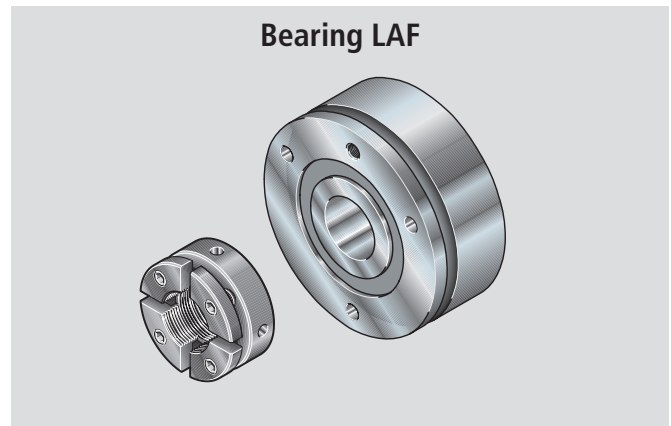
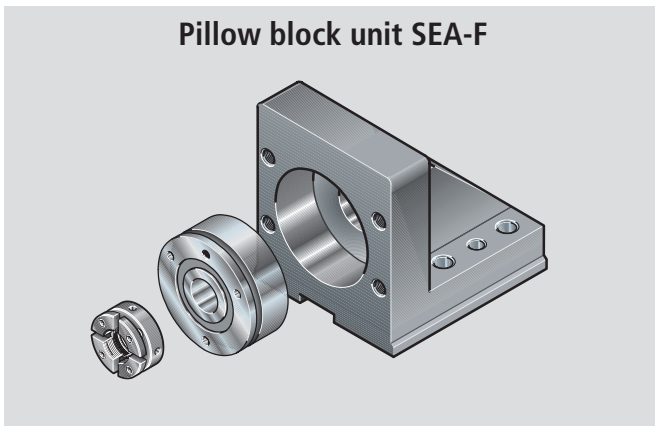
Order code: SEM-E-S | 20 x 5R x 3-4 | 1 | 2 | T7 | R | 92K120 | 41Z120 | 1250 | 1 | 0

Form	Version*	Ball screw size		Dimensions (mm)													Keyway to DIN 6885			
		d ₀	P	L	D ₁	DT1	L ₁	D ₂	DT2	L ₂	D ₃	DT3	L ₃	G ₁	LG ₁	b	bT	l	t	
91	060	12	5/10	50	6	h6	14	5	h7	16	4	h7	10	M6x0.5	10					
	100	16	5/10/16	60	10	h6	18	8	h7	20	4	h7	10	M10x1	12					
	120	20	5/20	75	12	h6	23	10	h7	25	6	h7	15	M12x1	12					
	170	25	5/10/25	90	17	h6	23	15	h7	30	6	h7	15	M17x1	22					
	200	32	5/10/20/32	103	20	h6	26	18	h7	40	6	h7	15	M20x1	22					
	250	40	10/12/16/20/40	145	25	h6	54	22	h7	50	6	h7	15	M25x1.5	26					
	300	40	5 10/12/16/20/40	116	30	h6	25	25	h7	50	6	h7	15	M30x1.5	26					
	301	50	10/12/16/20/40	145	30	h6	54	25	h7	50	6	h7	15	M30x1.5	26					
	350	50	5	125	35	h6	32	30	h7	50	6	h7	15	M35x1.5	28					
	400	63	10/20/40	147	40	h6	44	36	h7	60	6	h7	15	M40x1.5	28					
92	500	80	10/20	169	50	h6	52	40	h7	70	6	h7	15	M50x1.5	32					
	100	16	5/10/16	60	10	h6	18	8	h7	20	4	h7	10	M10x1	12	2	P9	14	1.2	
	120	20	5/20	75	12	h6	23	10	h7	25	6	h7	15	M12x1	12	3	P9	20	1.8	
	170	25	5/10/25	90	17	h6	23	15	h7	30	6	h7	15	M17x1	22	5	P9	25	3	
	200	32	5/10/20/32	103	20	h6	26	18	h7	40	6	h7	15	M20x1	22	6	P9	28	3.5	
	250	40	10/12/16/20/40	145	25	h6	54	22	h7	50	6	h7	15	M25x1.5	26	6	P9	36	3.5	
93	300	40	5 10/12/16/20/40	116	30	h6	25	25	h7	50	6	h7	15	M30x1.5	26	8	P9	36	4	
	301	50	10/12/16/20/40	145	30	h6	54	25	h7	50	6	h7	15	M30x1.5	26	8	P9	36	4	
	350	50	5	125	35	h6	32	30	h7	50	6	h7	15	M35x1.5	28	8	P9	36	4	
	400	63	10/20/40	147	40	h6	44	36	h7	60	6	h7	15	M40x1.5	28	10	P9	40	5	
	500	80	10/20	169	50	h6	52	40	h7	70	6	h7	15	M50x1.5	32	12	P9	50	5	

* The allocation of screw ends to the bearing is defined by the version.



End Bearings for Screw Ends Form 91–92–93



Form	Version	Ball screw size		Pillow block unit		Bearing		Slotted nut used	
		d_0	P	SEA-F Part number	SEB-F Part number	LAF Part number	LAN Part number	NMZ	NMA
91	060	12	5/10	–	1591-1-0620	–	1590-1-0600	•	
	100	16	5/10/16	–	1591-1-1020	–	1590-1-1000	•	
	120	20	5/20	1593-0-1200	1591-1-1220	1590-0-1200	1590-1-1200	•	
	170	25	5/10/25	1593-0-1730	1591-1-1730	1590-0-1730	1590-1-1730		•
	200	32	5/10/20/32	1593-0-2030	1591-1-2030	1590-0-2030	1590-1-2030		•
	250	40	10/12/16/20/40	–	1591-1-2530	1590-3-2530	1590-2-2530		•
	300	40	5 10/12/16/20/40	1591-0-3030	1591-1-3030	1590-0-3030	1590-1-3030		•
	301	50	10/12/16/20/40	–	–	1590-3-3030	1590-2-3030		•
	350	50	5	–	–	1590-0-3530	1590-1-3530		•
	400	63	10/20/40	–	–	1590-0-4030	1590-1-4030		•
92	100	16	5/10/16	–	1591-1-1020	–	1590-1-1000	•	
	120	20	5/20	1593-0-1200	1591-1-1220	1590-0-1200	1590-1-1200	•	
	170	25	5/10/25	1593-0-1730	1591-1-1730	1590-0-1730	1590-1-1730		•
	200	32	5/10/20/32	1593-0-2030	1591-1-2030	1590-0-2030	1590-1-2030		•
	250	40	10/12/16/20/40	–	1591-1-2530	1590-3-2530	1590-2-2530		•
	300	40	5 10/12/16/20/40	1591-0-3030	1591-1-3030	1590-0-3030	1590-1-3030		•
	301	50	10/12/16/20/40	–	–	1590-3-3030	1590-2-3030		•
	350	50	5	–	–	1590-0-3530	1590-1-3530		•
	400	63	10/20/40	–	–	1590-0-4030	1590-1-4030		•
	500	80	10/20	–	–	1590-0-5030	1590-1-5030		•
93	060	8	2.5	–	1591-1-0600	–	1590-1-0600	•	

STAR – Precision Ball Screw Assemblies

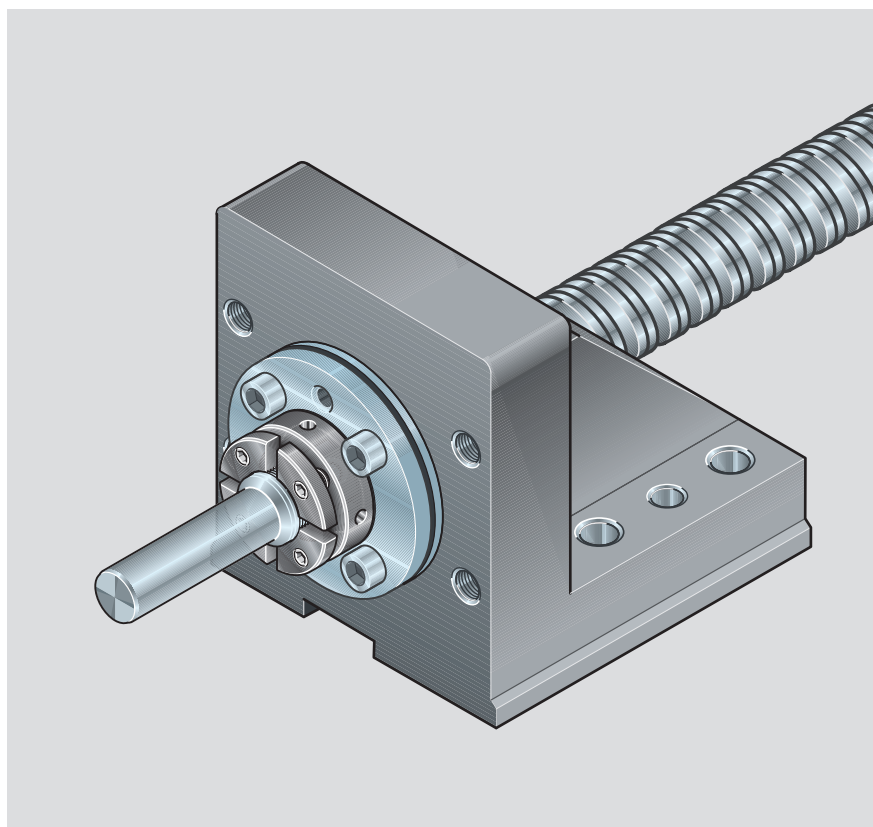
Pillow Block Unit SEA-F

Fixed bearing with angular contact thrust ball bearing LGF-B-...

The pillow block unit consists of:

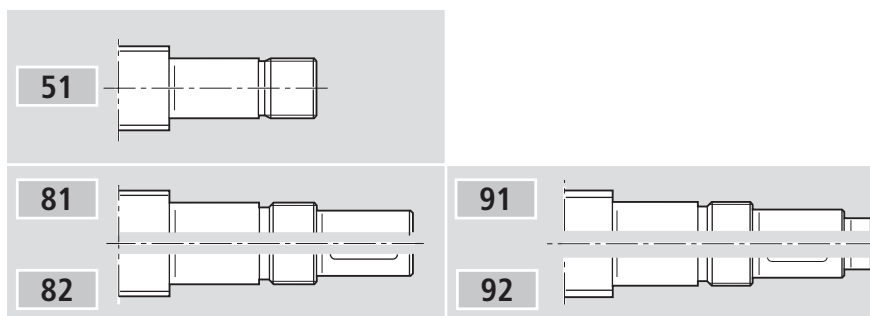
- precision pillow block housing with reference edges on two sides
- angular contact thrust ball bearing LGF...
- slotted nut NMA or NMZ

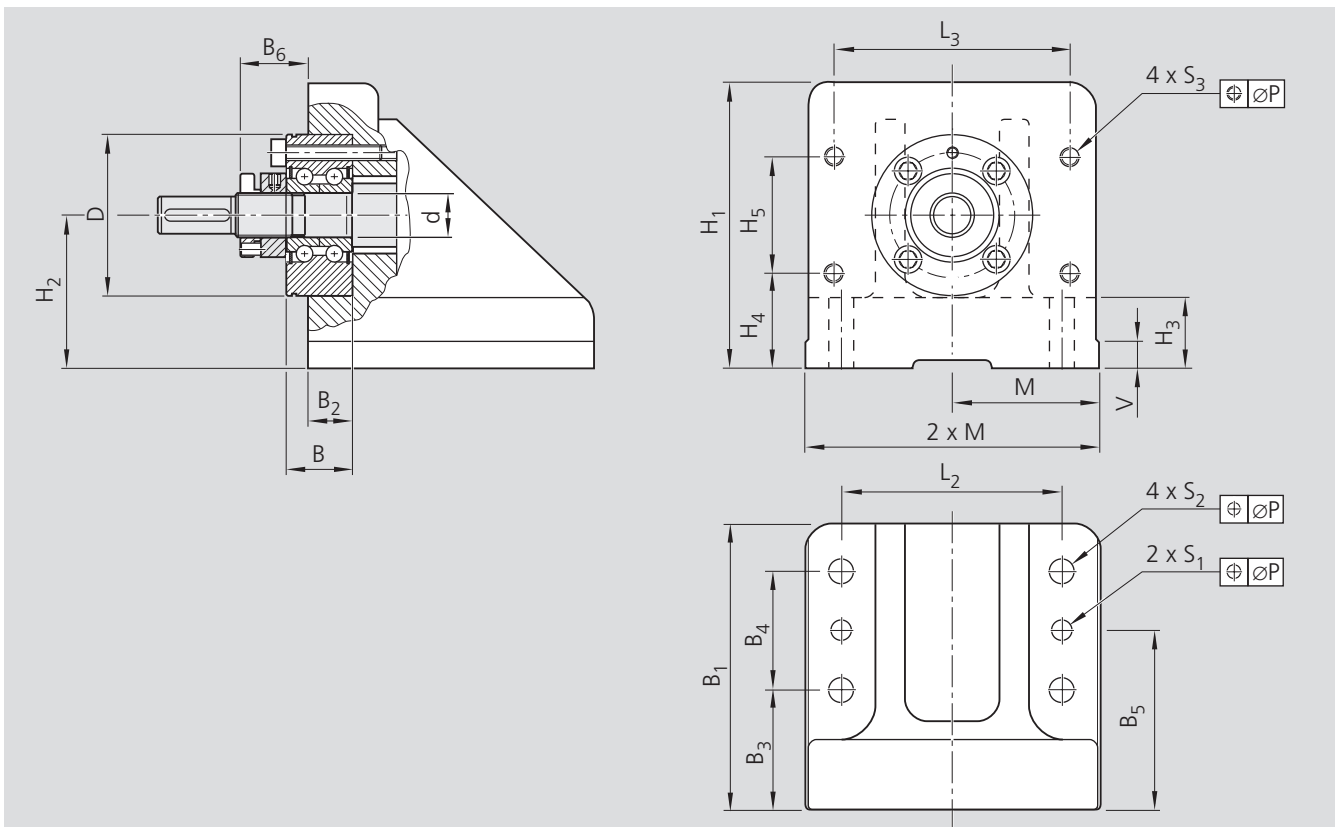
The nut is delivered unmounted.



Size $d_0 \times P$	Pillow block unit Part number Complete	Angular contact thrust ball bearing					Designation	Slotted nut		Weight Complete (Kg)
		Load ratings (axial)		Dimensions (mm)				M_A (Nm)	Designation	
		dyn. C (N)	stat. C_0 (N)	d	D	B				
20x5/20	1593-0-1200	17000	24700	12	55	25	LGF-B-1255	8.0	NMZ 12x1	0.98
25x5/10/25	1593-0-1730	18800	31000	17	62	25	LGF-B-1762	15.0	NMA 17x1	1.93
32x5/10/20/32	1593-0-2030	26000	47000	20	68	28	LGF-B-2068	18.0	NMA 20x1	2.16
40x5/10/12/16/20/40	1593-0-3030	29000	64000	30	80	28	LGF-B-3080	32.0	NMA 30x1.5	5.12

Suitable for screw end forms:





Dimensions (mm)

M ±0.015	L₂	L₃	H₁	H₂ ±0.02	H₃	H₄	H₅	B₁	B₂	B₃	B₄	B₅	B₆	V	S₁	S₂	S₃	P
82	65	66	80	47	20	22	50	80	17	35	35	52.5	16	8	5.7	7	M8	0.2
112	85	90	110	59	27	36	46	110	17	45	45	67.5	26	10	7.7	9	M8	0.2
112	85	90	110	59	27	36	46	110	20	45	45	67.5	26	10	7.7	9	M8	0.2
167	120	100	165	86.5	35	54	65	165	20	50	90	95	28	13	9.7	13	M10	0.2

STAR – Precision Ball Screw Assemblies

Pillow Block Unit SEA-L

Floating bearing with deep-Groove ball bearing to DIN 625

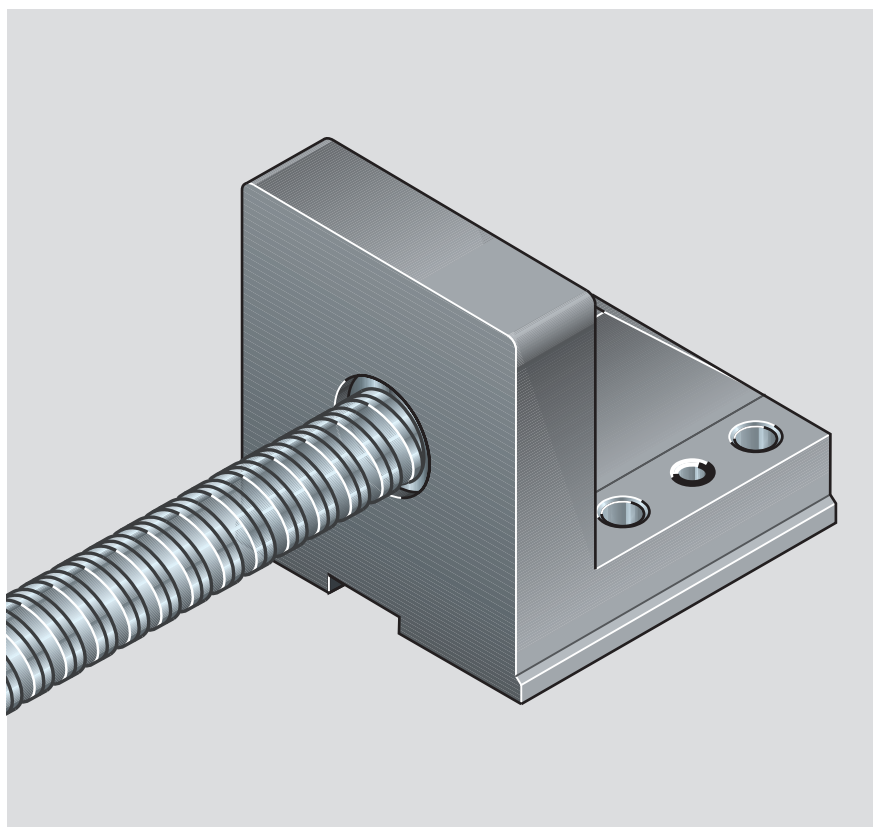
- The pillow block unit consists of:
- precision pillow block housing with reference edges on two sides
 - deep-groove ball bearing to DIN 625... .2RS
 - retaining ring to DIN 471
 - O-ring to DIN 3771

All parts are supplied unmounted.

Purpose of the O-ring stopper

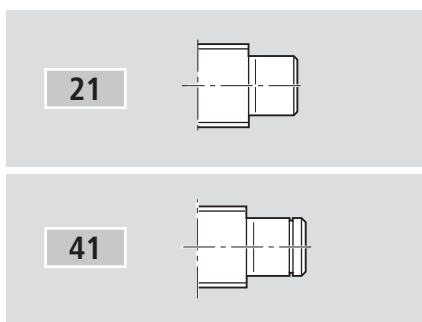
The floating bearing must be able to move in axial direction in order to compensate changes of screw length caused by thermal expansion.

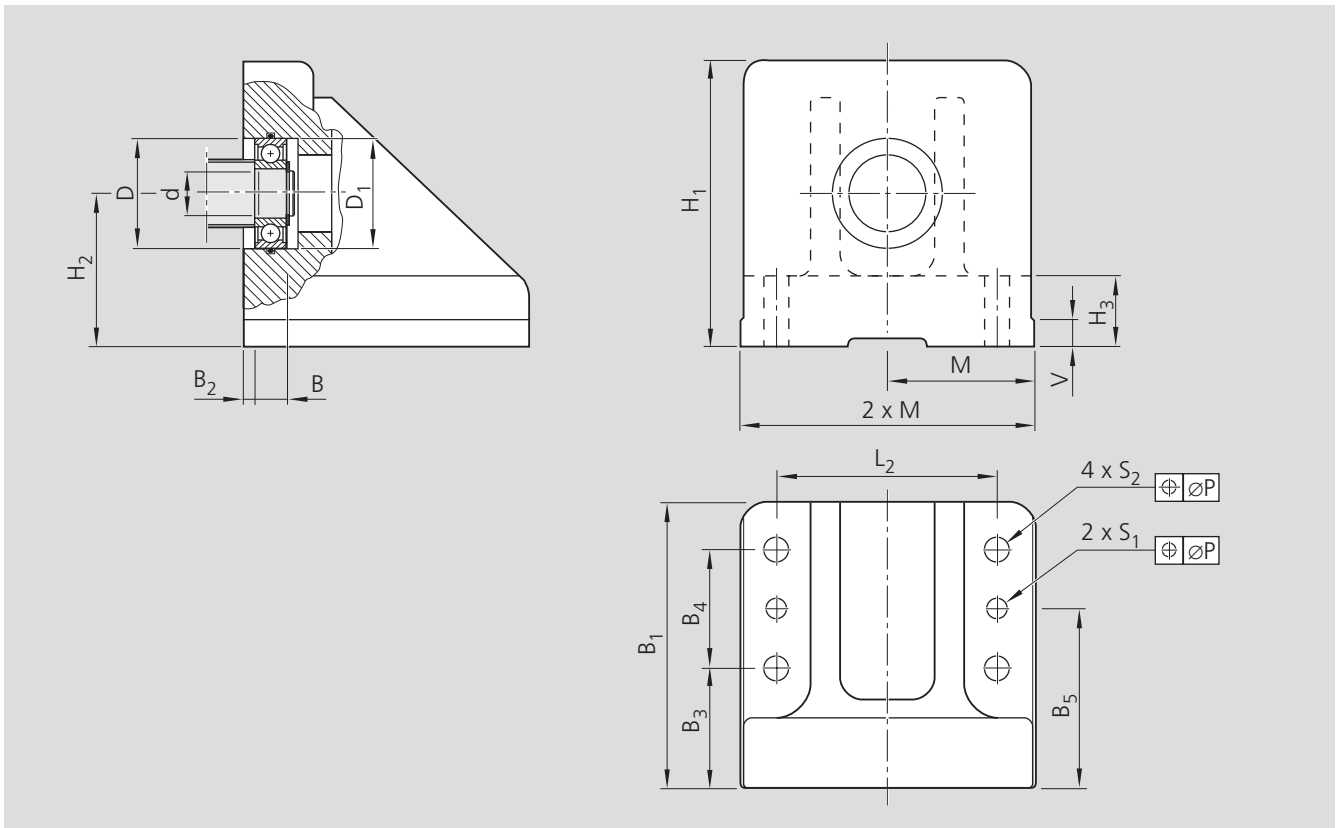
The O-ring prevents the bearing's outer ring turning as well (clearance in the bore).



Size $d_0 \times P$	Pillow block unit Part number Complete	Deep-groove ball bearing to DIN 625					Retaining ring to DIN 471	Weight complete (Kg)
		Load ratings (axial)		Dimensions (mm)				
		dyn. C (N)	stat. C ₀ (N)	d	D	B	Designation DIN 625...	
20x5/20	1593-6-1200	6950	2650	12	32	10	6201.2RS	12x1 0.71
25x5/10/25	1593-6-1700	9500	4150	17	40	12	6203.2RS	17x1 1.61
32x5/10/20/32	1593-6-2000	12700	5700	20	47	14	6204.2RS	20x1.2 1.62
40x5/10/12/16/20/40	1593-6-3000	19300	9800	30	62	16	6206.2RS	30x1.5 4.41

Suitable for screw end forms:





Dimensions (mm)

M ±0.015	L ₂	H ₁	H ₂ ±0.02	H ₃	B ₁	B ₂	B ₃	B ₄	B ₅	V	S ₁	S ₂	D ₁ H ₇	P
82	65	80	47	20	80	5	35	35	52.5	8	5.7	7	32	0.2
112	85	110	59	27	110	5	45	45	67.5	10	7.7	9	40	0.2
112	85	110	59	27	110	5	45	45	67.5	10	7.7	9	47	0.2
167	120	165	86.5	35	165	4.5	50	90	95	13	9.7	13	62	0.2

STAR – Precision Ball Screw Assemblies

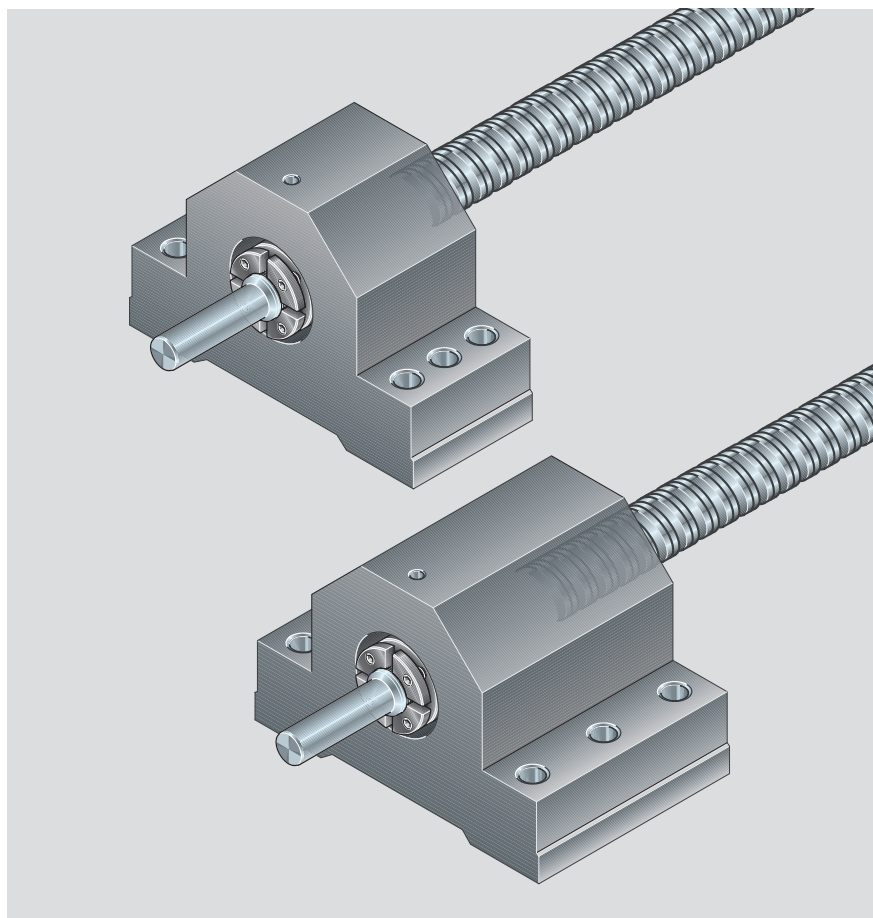
Pillow Block Unit SEB-F

Fixed bearing with angular contact thrust ball bearing
LGN-B-...
LGN-C-...

The pillow block unit consists of:

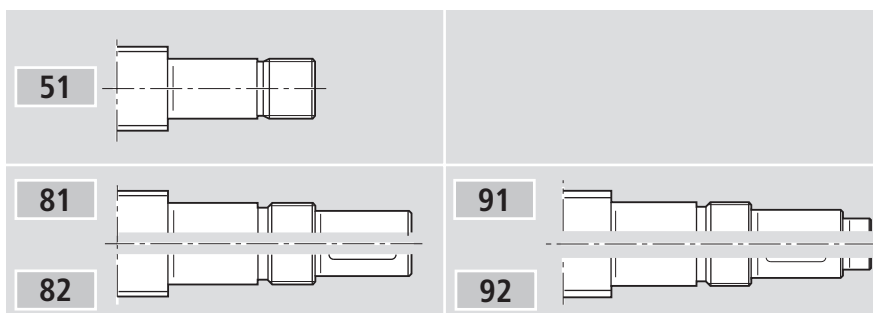
- precision pillow block housing with reference edges on two sides
- angular contact thrust ball bearing LGN
- slotted nut NMA or NMZ
- housing nut GR

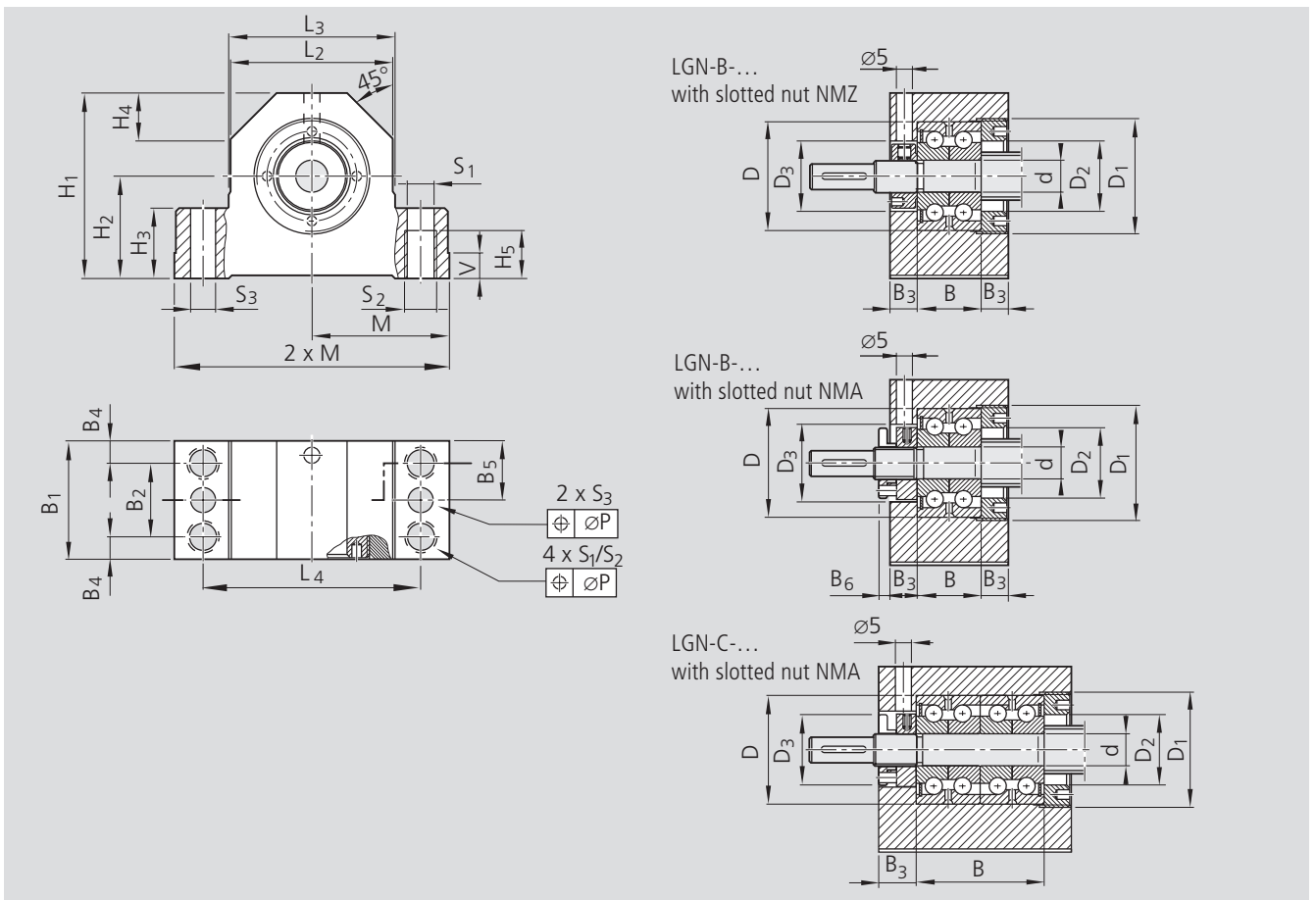
The slotted nut is supplied unmounted.



Size $d_0 \times P$	Pillow block unit Part number Complete	Angular contact thrust ball bearing			Slotted nut Designation	Weight complete (Kg)		
		Load ratings (axial) dyn. C (N)	stat. C ₀ (N)	Dimensions (mm) d D B			Designation	M _A (Nm)
8x2.5	1591-1-0600	6900	8500	6 24 15	LGN-B-0624	2.0	NMZ 6x0.5	0.38
12x5/10	1591-1-0620	6900	8500	6 24 15	LGN-B-0624	2.0	NMZ 6x0.5	0.38
16x5 16x10 16x16	1591-1-1020	13400	18800	10 34 20	LGN-B-1043	6.0	NMZ 10x1	0.87
20x5/20	1591-1-1220	17000	24700	12 42 25	LGN-B-1242	8.0	NMZ 12x1	1.12
25x5/10/25	1591-1-1720	18800	31000	17 47 25	LGN-B-1747	15.0	NMZ 17x1	1.65
	1591-1-1730						NMA 17x1	1.69
32x5/10/20/32	1591-1-2020	26000	47000	20 52 28	LGN-B-2052	18.0	NMZ 20x1	1.93
	1591-1-2030						NMA 20x1	2.03
40x10/12/16/20/40	1591-2-2530	44500	111000	25 57 56	LGN-C-2557	25.0	NMA 25x1.5	5.13
40x5	1591-1-3020	29000	64000	30 62 28	LGN-B-3062	32.0	NMZ 30x1.5	2.64
	1591-1-3030						NMA 30x1.5	2.77

Suitable for screw end forms:
for screws 8 x 2.5: Form 53, 83, 93





Dimensions (mm)

M js7	L ₂	L ₃	L ₄	H ₁ ±0.02	H ₂	H ₃	H ₄	H ₅	B ₁	B ₂	B ₃	B ₄	B ₅	B ₆	V	S ₁ H ₁₂	S ₂	S ₃	D ₁	D ₂	D ₃	P
31	-	38	50	34	18	13	8	9	32	16	8.5	8.0	16.0	-	6	5.3	M6	3.7	M26x1.5	16.5	18	0.10
31	36	38	50	41	22	13	10	9	32	16	8.5	8.0	16.0	-	6	5.3	M6	3.7	M26x1.5	16.5	18	0.10
43	50	52	68	58	32	22	14	15	37	23	8.5	7.0	18.5	-	8	8.4	M10	7.7	M36x1.5	22.0	27	0.15
47	58	60	77	64	34	22	16	15	42	25	8.5	8.5	21.0	-	8	8.4	M10	7.7	M45x1.5	28.0	32	0.15
54	64	66	88	72	39	27	18	18	46	29	10.5	8.5	23.0	- 7.5	10	10.5	M12	9.7	M50x1.5	31.0	36	0.20
56	68	70	92	77	42	27	19	18	49	29	10.5	10.0	24.5	- 7.5	10	10.5	M12	9.7	M55x1.5	36.0	42	0.20
63	82	80	105	98	58	32	23	21	89	62	20.5	13.5	44.5	-	12	12.6	M14	9.7	M62x1.5	43.0	48	0.20
63	78	80	105	90	50	32	22	21	53	32	12.5	10.5	26.5	- 7.5	12	12.6	M14	9.7	M65x1.5	47.0	53	0.20

STAR – Precision Ball Screw Assemblies

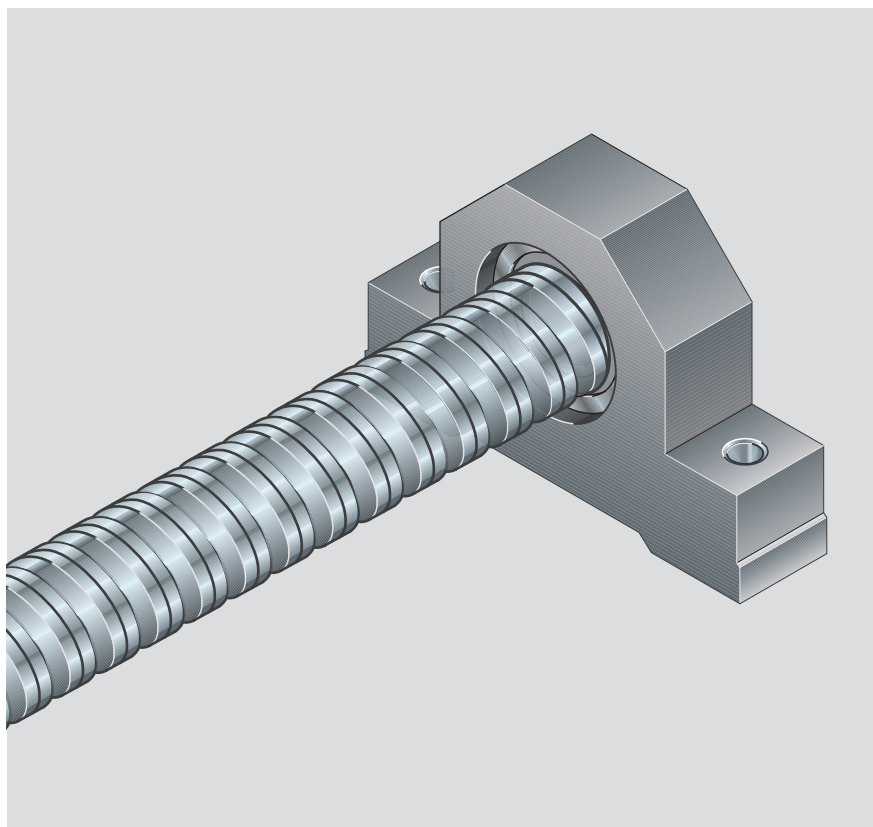
Pillow Block Unit SEB-L

Floating bearing with deep-groove ball bearing to DIN 625

The pillow block unit consists of:

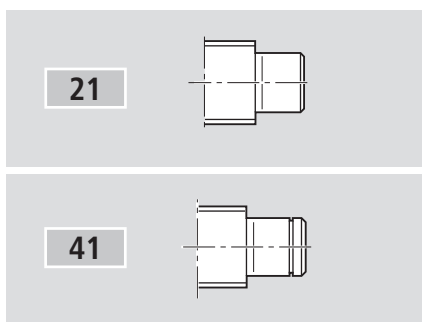
- precision pillow block housing with reference edge on one side
- deep-groove ball bearing to DIN 625-... -2RS
- retaining ring to DIN 471
- O-ring to DIN 471
- cover

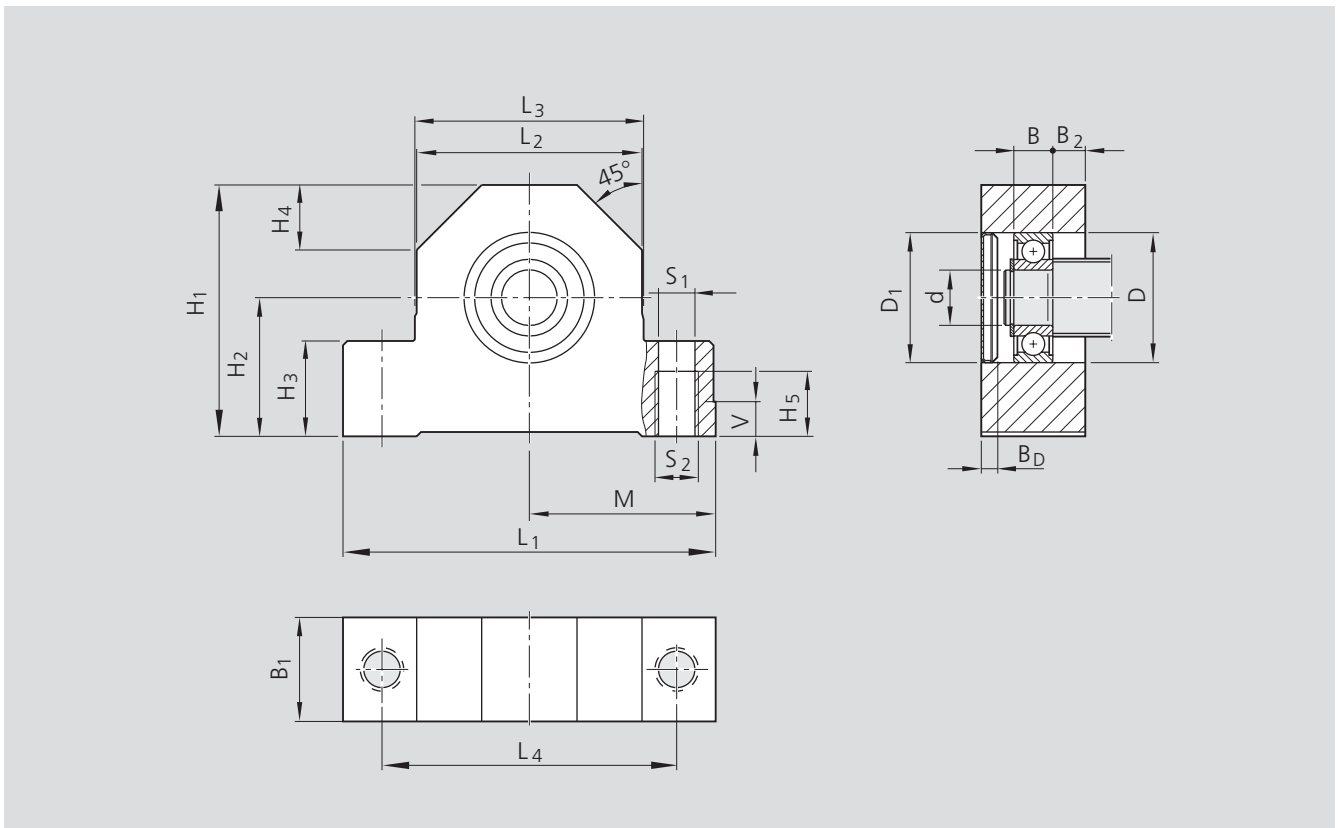
All parts are supplied unmounted.



Size $d_0 \times P$	Pillow block unit Part number Complete	Deep-groove ball bearing to DIN 625			Retaining ring			Weight complete (Kg)
		Load ratings (axial) dyn. C (N)	stat. C_0 (N)	Designation DIN 625...	Designation DIN 471	Dimensions (mm) d D B		
8x2.5	1591-6-0500	1900	590	625.2RS	5x0.6	5 16 5	0.14	
12x5/10	1591-6-0620	2450	900	626.2RS	6x0.7	6 19 6	0.18	
16x5/10/16	1591-6-1020	6000	2240	6200.2RS	10x1	10 30 9	0.54	
20x5/20	1591-6-1220	6950	2650	6201.2RS	12x1	12 32 10	0.73	
25x5/10/20	1591-6-1720	9500	4150	6203.2RS	17x1	17 40 12	0.96	
32x5/10/20/32	1591-6-2020	12700	5700	6204.2RS	20x1.2	20 47 14	1.24	
40x5	1591-6-3020	19300	9800	6206.2RS	30x1.5	30 62 16	1.66	
40x10/12/16/20/40	1591-6-3010	19300	9800	6206.2RS	30x1.5	30 62 16	1.82	

Suitable for screw end forms:





Dimensions (mm)																Cover
L ₁	L ₂	L ₃	L ₄	H ₁	H ₂ ±0.02	H ₃	H ₄	H ₅	B ₁	B ₂	M js7	V	S ₁ H ₁₂	S ₂	D ₁ J ₆	BD
62	-	38	50	34	18	13	11	9	13	4	31	6	5.3	M6	16	2.6
62	36	38	50	41	22	13	11	9	15	4.5	31	6	5.3	M6	19	2.6
86	50	52	68	58	32	22	15	15	24	7.5	43	8	8.4	M10	30	3.8
94	58	60	77	64	34	22	17	15	26	8	47	8	8.4	M10	32	3.8
108	64	66	88	72	39	27	19	18	28	8	54	10	10.5	M12	40	3.7
112	68	70	92	77	42	27	20	18	34	10	56	10	10.5	M12	47	4.8
126	78	80	105	90	50	32	23	21	38	11	63	12	12.6	M14	62	4.5
126	-	80	105	98	58	32	23	21	38	11	63	12	12.6	M14	62	4.5

STAR – Precision Ball Screw Assemblies

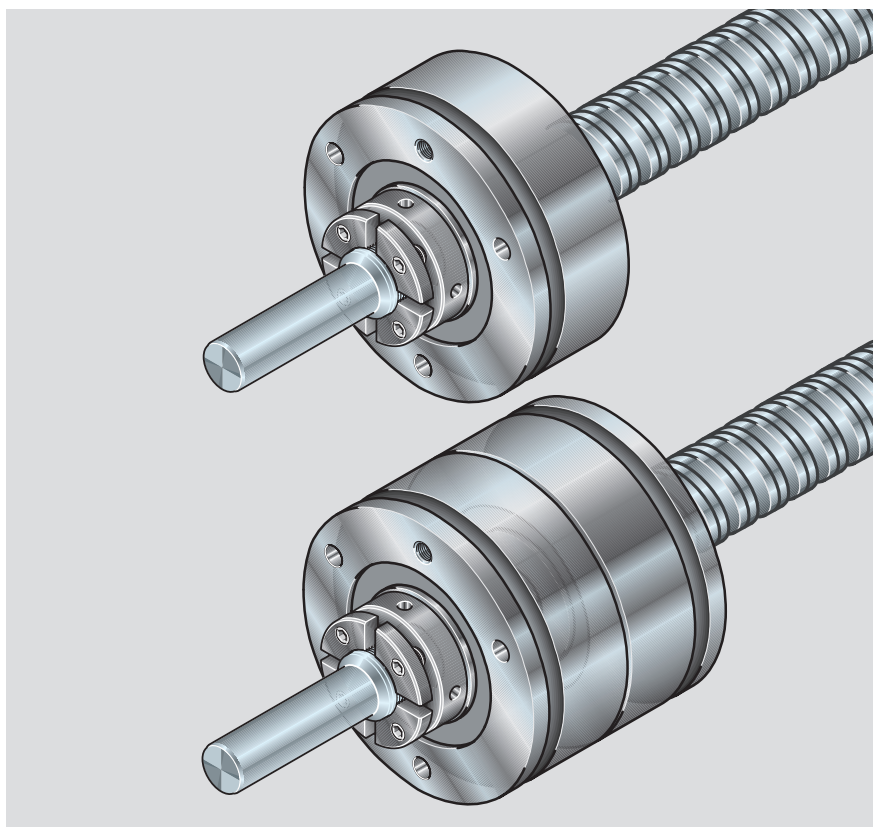
Bearing LAF

Fixed bearing with angular contact thrust ball bearing LGF

Double-thrust, screw-down,
Series LGF-B-...
LGF-A-...

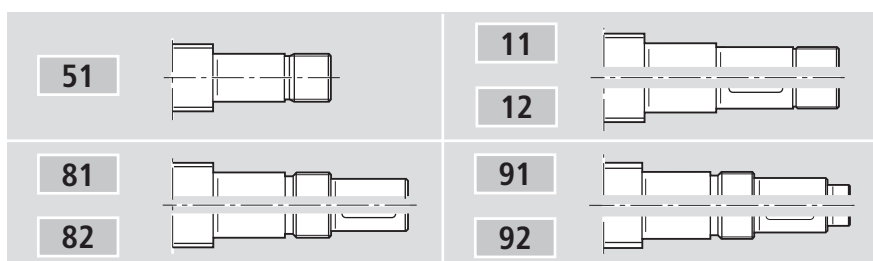
Double-thrust, screw-down,
Series LGF-C-...

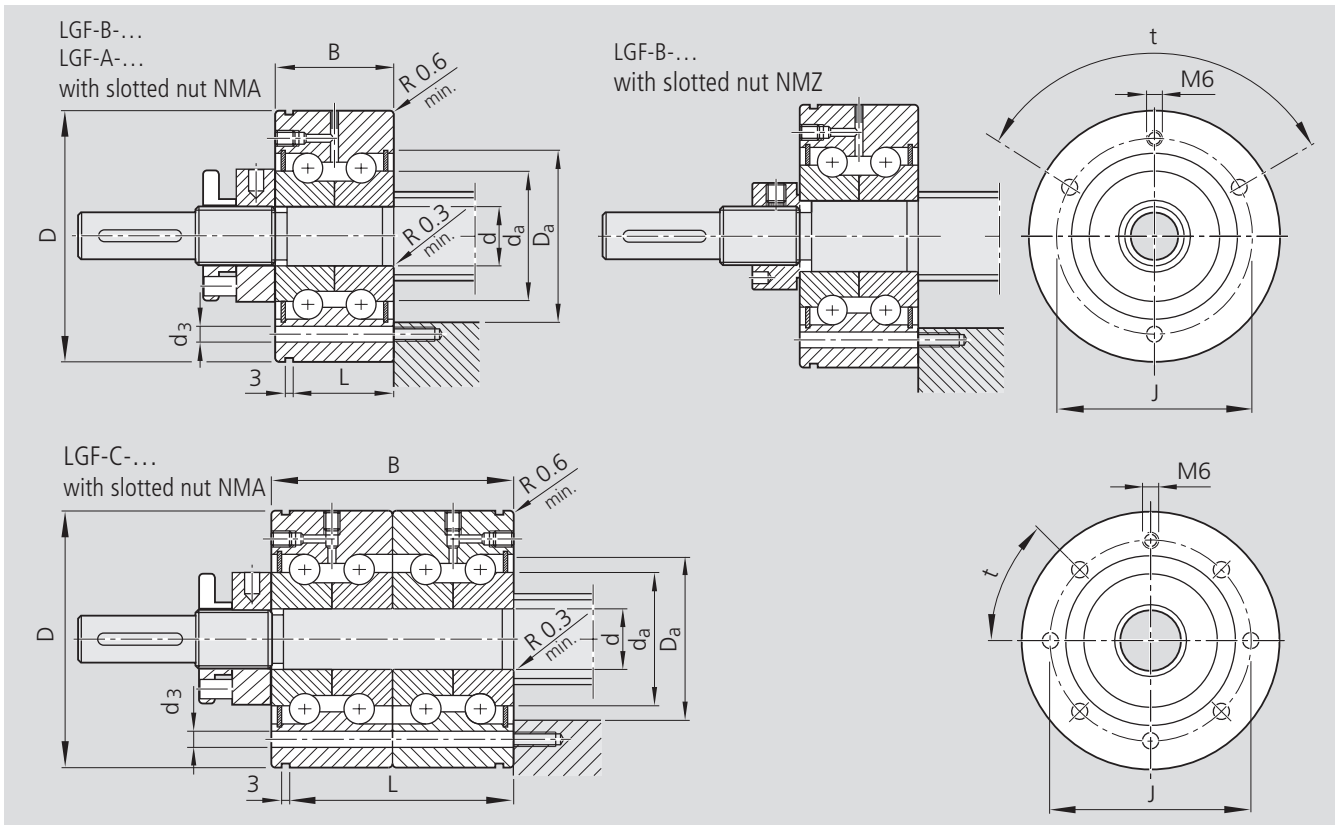
The fixed bearing consists of:
– angular contact thrust ball bearing LGF
– slotted nut NMA..., NMZ...



Size	Angular contact thrust ball bearing with slotted nut	Single parts				Load ratings	
		Angular contact thrust ball bearings		Slotted nut		dyn.	stat.
$d_0 \times P$	Part No.	Designation	Part No.	Designation	Part No.	C (N)	C ₀ (N)
20x5/20	1590-0-1200	LGF-B-1255	8414-009-06	NMZ 12x1	8446-003-04	17000	24700
25x5/10/25	1590-0-1700	LGF-B-1762	8414-010-06	NMZ 17x1	8446-004-04	18800	31000
	1590-0-1730			NMA 17x1	8446-014-04		
32x5/10/20/32	1590-0-2000	LGF-B-2068	8414-001-06	NMZ 20x1	8446-005-04	26000	47000
	1590-0-2030			NMA 20x1	8446-015-04		
40x5	1590-0-3000	LGF-B-3080	8414-011-06	NMZ 30x1.5	8446-006-04	29000	64000
	1590-0-3030			NMA 30x1.5	8446-016-04		
40x10/12/16/20/40	1590-3-2530	LGF-C-2575	8414-015-06	NMA 25x1.5	8446-011-04	44500	111000
50x5	1590-0-3530	LGF-B-3590	8414-026-06	NMA 35x1.5	8446-012-04	41000	89000
50x10/12/16/20/40	1590-3-3030	LGF-C-3080	8414-027-06	NMA 30x1.5	8446-016-04	47500	127000
63x10/20/40	1590-0-4030	LGF-B-40115	8414-028-06	NMA 40x1.5	8446-018-04	72000	149000
80x10/20	1590-0-5030	LGF-A-50140	8414-029-06	NMA 50x1.5	8446-019-04	113000	250000

Suitable for screw end forms:





Bearing friction torque with seal	Rigidity (axial)	Rigidity against tilting	Limit speed (grease)	Dimensions (mm)																Weight complete (Kg)
				nG min ⁻¹	Mounting dimensions										Quantity		t (°)			
					d	Tolerance	D	Tolerance	B	Tolerance	J	D _a		d _a		L		n	d ₃	
0.16	375	50	3800	12	-0.010	55	-0.013	25	-0.25	42	30	33	16	29	17	3	6.8	120	0.385	
0.24	450	80	3300	17	-0.010	62	-0.013	25	-0.25	48	34	37	23	33	17	3	6.8	120	0.485 0.520	
0.3	650	140	3000	20	-0.010	68	-0.013	28	-0.25	53	40	43	25	39	19	4	6.8	90	0.645 0.740	
0.5	850	300	2200	30	-0.010	80	-0.013	28	-0.25	63	50	53	40	49	19	6	6.8	60	0.855 0.980	
0.60	1300	450	2600	25	-0.005	75	-0.010	56	-0.05	58	45	48	32	44	47	8	6.5	45	1.600	
0.60	900	400	2000	35	-0.010	90	-0.013	34	-0.25	75	59	62	45	58	25	4	8.8	90	1.360	
0.75	1500	620	2200	30	-0.005	80	-0.010	56	-0.50	63	50	53	40	49	47	12	6.5	30	1.760	
1.3	1200	750	1600	40	-0.010	115	-0.013	46	-0.25	94	71	80	56	70	36	12	8.5	30	2.500	
2.6	1400	1500	1200	50	-0.010	140	-0.013	54	-0.25	113	88	100	63	87	45	12	10.5	30	5.130	

STAR – Precision Ball Screw Assemblies

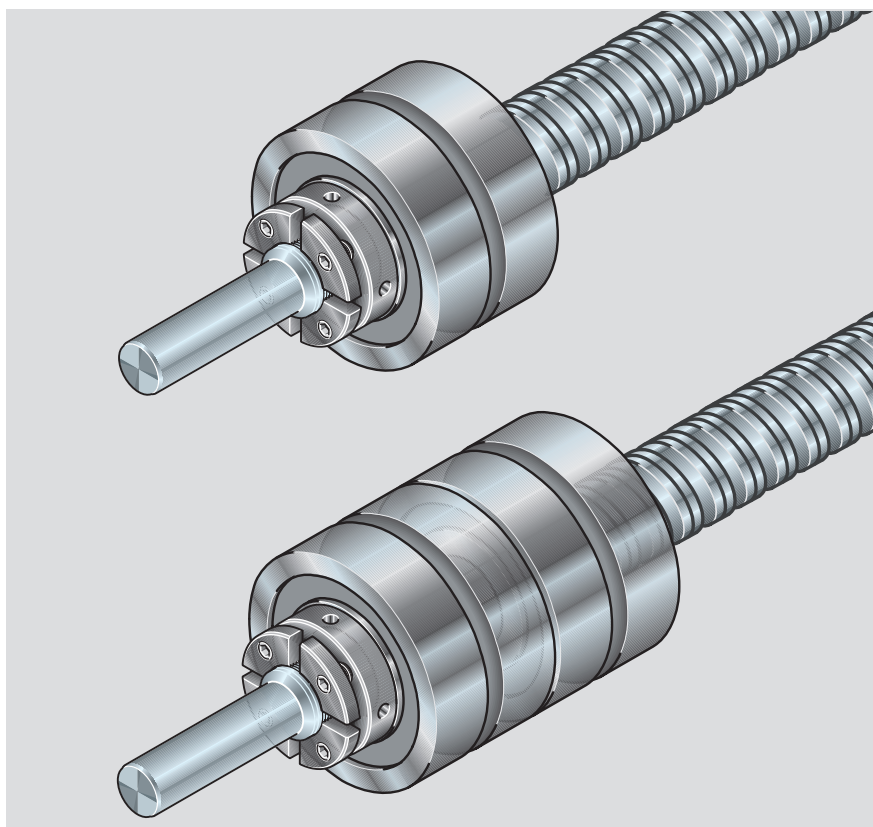
Bearing LAN

Fixed bearing with angular contact thrust ball bearing
LGN

Double-thrust,
Series LGN-B-...
LGN-A-...

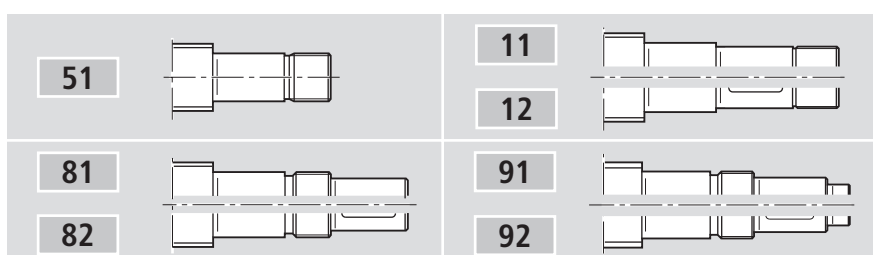
Double-thrust, in pairs, Series
LGN-C-...

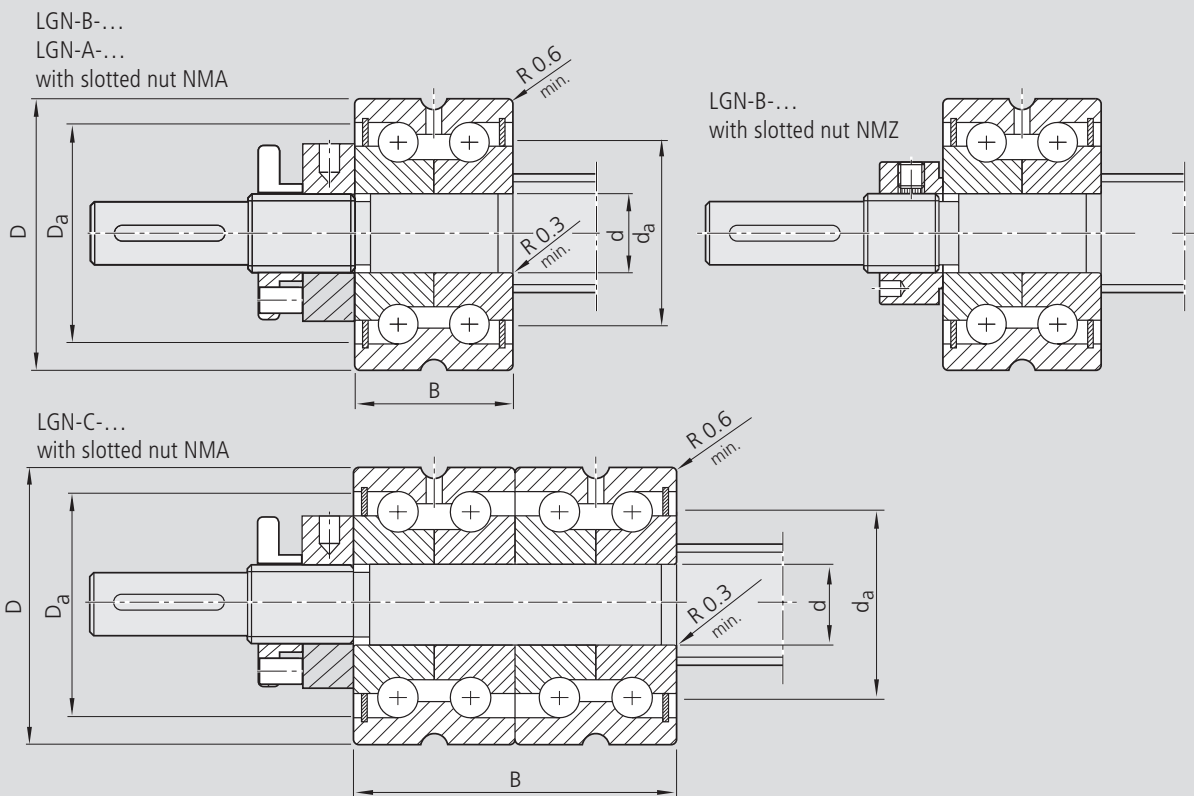
The fixed bearing consists of:
– angular contact thrust ball bearing LGN
– slotted nut NMA..., NMZ...



Size	Angular contact thrust ball bearing with slotted nut	Single parts				Load ratings	
		Angular contact thrust ball bearing		Slotted nut		dyn.	stat.
$d_0 \times P$	Part No.	Designation	Part No.	Designation	Part No.	C (N)	C ₀ (N)
8x2.5	1590-1-0600	LGN-B-0624	8414-002-06	NMZ 6x0.5	8446-001-04	6900	8500
12x5/10	1590-1-0600	LGN-B-0624	8414-002-06	NMZ 6x0.5	8446-001-04	6900	8500
16x5/10/16	1590-1-1000	LGN-B-1034	8414-003-06	NMZ 10x1	8446-002-04	13400	18800
20x5/20	1590-1-1200	LGN-B-1242	8414-004-06	NMZ 12x1	8446-003-04	17000	24700
25x5/10/25	1590-1-1700 1590-1-1730	LGN-B-1747	8414-005-06	NMZ 17x1 NMA 17x1	8446-004-04 8446-014-04	18800	31000
32x5/10/20/32	1590-1-2000 1590-1-2030	LGN-B-2052	8414-006-06	NMZ 20x1 NMA 20x1	8446-005-04 8446-015-04	26000	47000
40x5	1590-1-3000 1590-1-3030	LGN-B-3062	8414-007-06	NMZ 30x1.5 NMA 30x1.5	8446-006-04 8446-016-04	29000	64000
40x10/12/16/20/40	1590-2-2530	LGN-C-2557	8414-014-06	NMA 25x1.5	8446-011-04	44500	111000
50x5	1590-1-3530	LGN-B-3572	8414-022-06	NMA 35x1.5	8446-012-04	41000	89000
50x10/12/16/20/40	1590-2-3030	LGN-C-3062	8414-023-06	NMA 30x1.5	8446-016-04	47500	127000
63x10/20/40	1590-1-4030	LGN-A-4090	8414-024-06	NMA 40x1.5	8446-018-04	72000	149000
80x10/20	1590-1-5030	LGN-A-50110	8414-025-06	NMA 50x1.5	8446-019-04	113000	250000

Suitable for screw end form:
for screws 8 x 2.5: Form 53, 83, 93





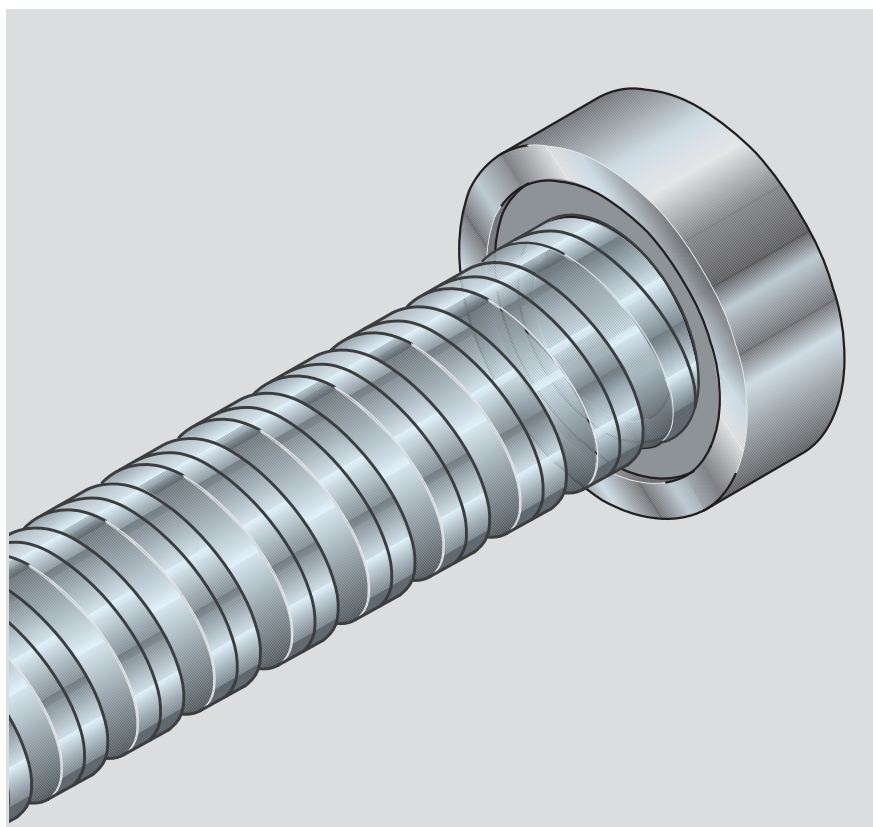
Bearing friction torque with seal	Rigidity (axial)	Rigidity against tilting	Limit speed (grease)	Dimensions (mm)										Weight complete (Kg)
				n_G	d	Tolerance	D	Tolerance	B	Tolerance	Mounting dimensions			
M_{RL} (Nm)	R_{aL} (N/mm)	R_{kI} (Nm/mrad)	n_G min ⁻¹	d	Tolerance	D	Tolerance	B	Tolerance	D_a min.	D_a max.	d_a min.	d_a max.	(Kg)
0.04	200	8	6800	6	+0.003 -0.005	24	-0.010	15	-0.25	16	19	9	15	0.040
0.04	200	8	6800	6	+0.003 -0.005	24	-0.010	15	-0.25	16	19	9	15	0.040
0.12	325	25	4600	10	+0.003 -0.005	34	-0.010	20	-0.25	25	28	14	24	0.110
0.16	375	50	3800	12	-0.010	42	-0.011	25	-0.25	30	33	16	29	0.215
0.24	450	80	3300	17	-0.010	47	-0.011	25	-0.25	34	37	23	33	0.248 0.290
0.3	650	140	3000	20	-0.010	52	-0.013	28	-0.25	40	43	25	39	0.345 0.440
0.5	850	300	2200	30	-0.010	62	-0.013	28	-0.25	50	53	40	49	0.465 0.590
0.60	1300	450	2600	25	-0.005	57	-0.010	56	-0.05	45	48	32	44	0.840
0.60	900	400	2000	35	-0.010	72	-0.013	34	-0.25	59	62	45	58	0.740
0.75	1500	620	2200	30	-0.005	62	-0.010	56	-0.50	50	53	40	49	0.980
1.3	1200	750	1600	40	-0.010	90	-0.013	46	-0.25	71	80	56	70	1.250
2.6	1400	1500	1200	50	-0.010	110	-0.013	54	-0.25	88	100	63	87	2.930

STAR – Precision Ball Screw Assemblies

Bearing LAD

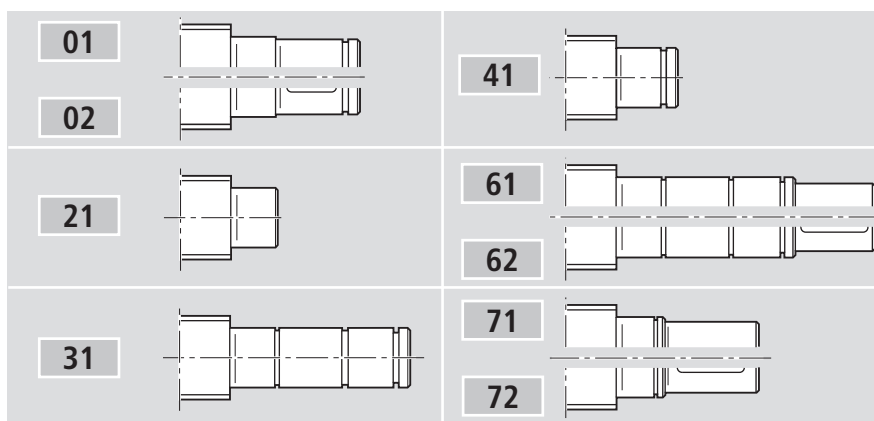
Floating bearing with deep-groove ball bearing

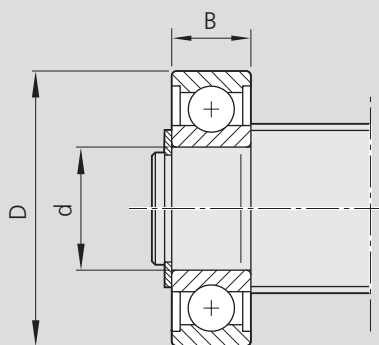
- The floating bearing consists of
- deep-groove ball bearing
DIN 625....2RS
 - retaining ring DIN 471 (2 pcs)



Size	Deep groove ball bearing with retaining ring	Single parts				Load ratings	
		Deep-groove ball bearing DIN 625		Retaining ring DIN 471		dyn.	stat.
		Part No.	Designation	Part No.	Designation	C (N)	C ₀ (N)
8x2.5	1590-6-0500	625.2RS	8414-048-00	5x0.6	8410-742-00	1900	590
12x5/10	1590-6-0600	626.2RS	8414-043-00	6x0.7	8410-736-00	2450	900
16x5/10/16	1590-6-1000	6200.2RS	8414-049-00	10x1	8410-745-00	6000	2240
20x5/20	1590-6-1200	6201.2RS	8414-042-00	12x1	8410-712-00	6950	2650
25x5/10/25	1590-6-1500	6202.2RS	8414-074-00	15x1	8410-748-00	7800	3250
32x5/10/20/32	1590-6-1700	6203.2RS	8414-050-00	17x1	8410-749-00	9500	4150
40x5/10/12/16/20/40	1590-6-2000	6204.2RS	8414-038-00	20x1.2	8410-735-00	12700	5700
50x5/10/12/16/20/40	1590-6-2500	6205.2RS	8414-063-00	25x1.2	8410-750-00	14300	6950
63x10/20/40	1590-6-3000	6206.2RS	8414-051-00	30x1.5	8410-724-00	19300	9800
80x10/20	1590-6-3500	6207.2RS	8414-075-00	35x1.5	8410-725-00	25500	13200
	1590-6-5000	6210.2RS	8414-077-00	50x2	8410-727-00	36500	20800
	1590-6-6000	6212.2RS	8414-078-00	60x2	8410-764-00	52000	31000

Suitable for screw end forms:





Dimensions (mm)			Weight complete (Kg)
d	D	B	
5	16	5	0.005
6	19	6	0.008
10	30	9	0.030
12	32	10	0.035
15	35	11	0.043
17	40	12	0.064
20	47	14	0.106
25	52	15	0.125
30	62	16	0.195
35	72	17	0.288
50	90	20	0.453
60	110	22	0.783

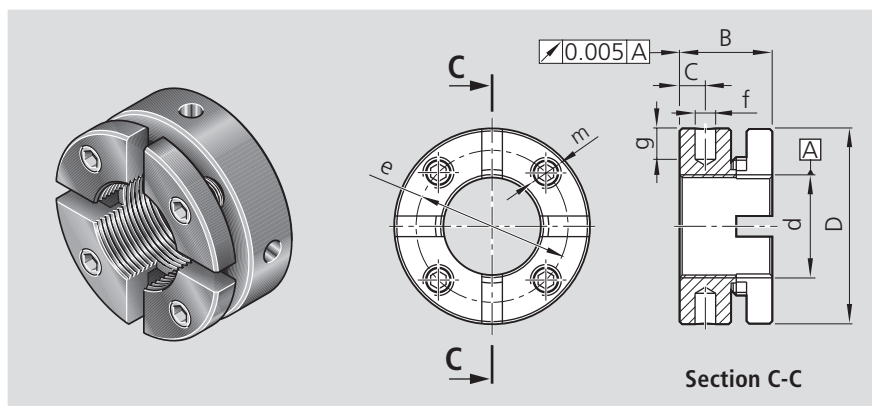
STAR – Precision Ball Screw Assemblies

Slotted Nuts and Housing Nuts

Slotted nuts NMA and NMZ for fixed bearings

Slotted nut NMA

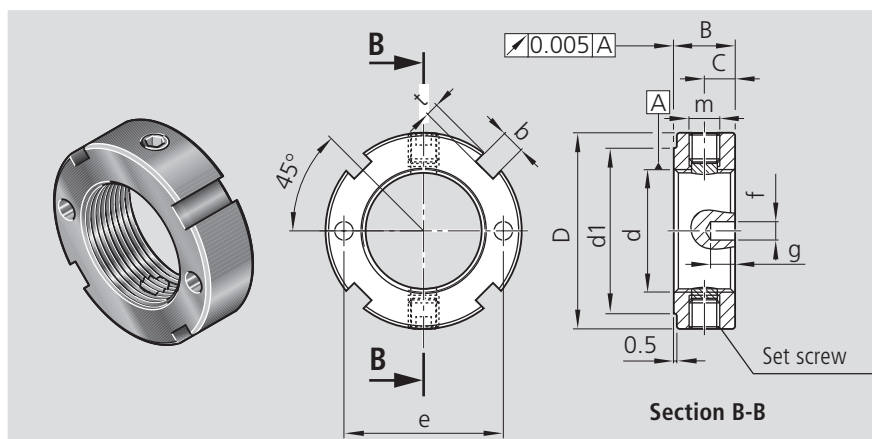
- for the highest loads
- for new designs
- for side drive with timing belt



Designation	Part No.	Dimensions (mm)								M_A (Nm)	F_{aB} (kN)	M_{AG} (Nm)	Weight (g)
		d	D	B	c	m	e	f	g				
NMA 15x1	8446-020-04	M15x1	30	18	5	M4	23	4	5	10	102	2	60
NMA 17x1	8446-014-04	M17x1	32	18	5	M4	26	4	5	15	120	2	70
NMA 20x1	8446-015-04	M20x1	38	18	5	M6	29.5	4	6	18	145	5	130
NMA 25x1.5	8446-011-04	M25x1.5	45	20	6	N6	35	5	6	25	205	5	160
NMA 30x1.5	8446-016-04	M30x1.5	52	20	6	M6	40	5	7	32	246	5	200
NMA 35x1.5	8446-012-04	M35x1.5	58	20	6	M6	48	5	7	40	282	5	230
NMA 40x1.5	8446-018-04	M40x1.5	65	22	6	M6	51	6	8	55	347	5	300
NMA 50x1.5	8446-019-04	M50x1.5	75	25	8	M6	62	6	8	85	450	5	430

Slotted nut NMZ

- for existing designs



Designation	Part number	Dimensions (mm)											M_A (Nm)	F_{aB} (kN)	M_{AG} (Nm)	Weight (g)
		d	D	B	d ₁	c	m	b	t	e	f	g				
NMZ 6x0.5	8446-001-04	M6x0.5	16	8	12	4	M4	3	2	11	2.5	3.5	2	17	1	10
NMZ 10x1	8446-002-04	M10x1	18	8	14	4	M4	3	2	14	2.5	3.5	6	31	1	10
NMZ 12x1	8446-003-04	M12x1	22	8	18	4	M4	3	2	17	2.5	3.5	8	38	1	15
NMZ 17x1	8446-004-04	M17x1	28	10	23	5	M5	4	2	22.5	3	4	15	57	3	28
NMZ 20x1	8446-005-04	M20x1	32	10	27	5	M5	4	2	26	3	4	18	69	3	35
NMZ 30x1.5	8446-006-04	M30x1.5	45	12	40	6	M6	5	2	37.5	4	5	32	112	5	75

M_A = tightening torque for slotted nut

F_{aB} = axial breaking load of slotted nut

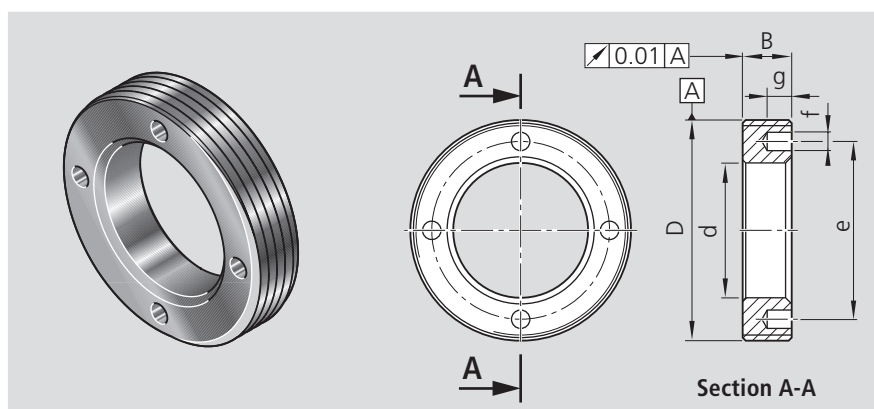
M_{AG} = tightening torque for set screw

Housing nut GR

- for angular contact thrust ball bearing LGN
- for single cylindrical nut ZEM-E-S

N.B.:

Use locking agent (e.g. Loctite 638) to secure against loosening.



Designation	Part number	Dimensions (mm)						Weight (g)
		D	d	B	e	f	g	
GR 18x1	1507-0-4033	M18x1	8.5	8	12.5	2.5	3	10
GR 23x1	1507-2-4035	M23x1	13	8	18	2.5	3	15
GR 26x1.5	1507-2-4022	M26x1.5	16.5	8	20.5	2.5	3	16.5
GR 30x1.5	1507-3-4034	M30x1.5	17	8	23	3	4	29
GR 36x1.5	1507-0-4023	M36x1.5	22	8	29	3	4	35
GR 40x1.5	1507-1-4003	M40x1.5	25	8	33	3	4	39.5
GR 45x1.5	1507-2-4004	M45x1.5	28	8	38	3	4	55
GR 50x1.5	1507-2-4025	M50x1.5	31	10	40	4	5	86
GR 55x1.5	1507-3-4005	M55x1.5	36	10	46	4	5	96
GR 58x1.5	1507-4-4032	M58x1.5	43	10	50	4	5	84
GR 60x1	1507-4-4028	M60x1	43	10	51	4	5	97
GR 62x1.5	1507-4-4029	M62x1.5	43	12	53	5	6	127
GR 65x1.5	1507-4-4026	M65x1.5	47	12	55	4	5	136
GR 70x1.5	1507-4-4006	M70x1.5	42	12	58	4	5	216
GR 78x2	1507-5-4007	M78x2	52	15	67	6	7	286
GR 92x2	1507-6-4009	M92x2	65	16	82	6	7	385
GR 112x2	1507-7-4011	M112x2	82	18	100	8	8	596

STAR – Precision Ball Screw Assemblies

General

DIN 69 051 Part 1 defines a ball screw as follows:

An assembly comprising a ball screw shaft and a ball nut and which is capable of converting rotary motion into linear motion and vice versa.

The rolling elements of the assembly are balls.

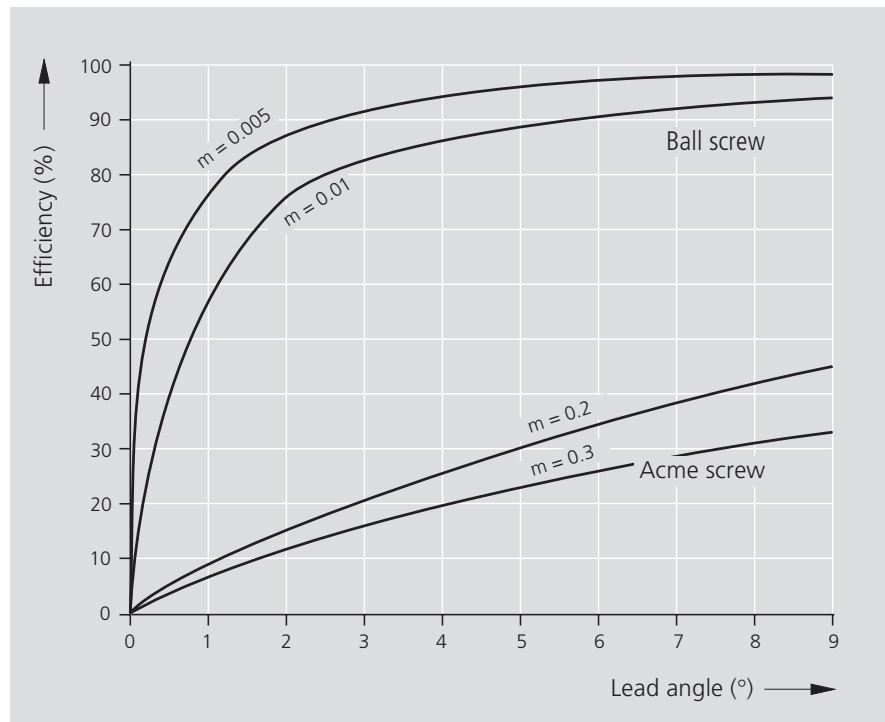
Advantages over the Acme screw drive

- The mechanical efficiency of an Acme screw drive is a maximum 50%, whereas a ball screw can reach a mechanical efficiency of up to 98%
- Higher life expectancy due to negligible wear during operation
- Less drive power required
- No stick-slip effect
- More precise positioning
- Higher travel speed
- Less heat-up

Due to their high mechanical efficiency, ball screws are in principle not self-locking.

Safety information

We recommend that a safety nut be installed for particularly critical applications in vertical set-ups. Please ask.



Selection criteria for ball screws

The following factors should be considered when selecting the ball screw for a given application:

- degree of accuracy required (lead deviation)
- in-service load conditions
- service life
- critical speed
- buckling load
- rigidity / permissible clearance or desired preload
- characteristic speed

The following points should be taken into consideration when selecting a ball screw assembly that is to be both cost-efficient and optimally designed:

- The lead is a decisive factor for the load-carrying capacity (depending on the maximum possible ball diameter) and the drive moment.
- The calculation of the service life should be based on average loads and average speeds, not on maximum values.
- In order for us to provide you with a customized solution, installation drawings or sketches of the nut environment should be enclosed with your inquiry.

N.B.:

Radial and eccentric forces relative to the screw must be avoided as they have a negative effect on the life and proper function of the ball screw.

Where special conditions of operation are involved, please ask.

Load-carrying capacities and service life

We calculate load-carrying capacities and service life in accordance with DIN 69 051, Part 4 and ISO 3408 - 4 (P5).

Basic static load rating C_0

The static load rating is an axial, concentrically acting force that induces a permanent deformation of $0.0001 \times$ the ball diameter between the ball and the ball raceway.

Basic dynamic load rating C

The dynamic load rating is an axial, concentrically acting force of constant magnitude and direction under which a representative sample of identical ball screws can achieve a nominal life of one million revolutions.

Service life

The nominal life is expressed by the number of revolutions (or number of operating hours at constant speed) that will be attained or exceeded by 90% of a representative sample of identical ball screws before the first signs of material fatigue become evident. The nominal life is designated as L or L_n , depending on whether it is specified in revolutions or hours.

Short strokes

During a short stroke the ball does not make a real turn. It is impossible therefore for an adequate lubricating film to form. The results can be premature wear.

In the chart the minimum required stroke (travel) for a 10% lower load rating is shown as a function of the number of turns and lead of the nut. Hence the most favorable range lies above each curve. It can help to arrange for occasional longer strokes, which are performed with simultaneous relubrication as "lubricating strokes".

Critical speed and buckling load

Critical speed and buckling load

The critical speed and buckling load can be checked using the corresponding charts.

For precise calculations see formula 12 15

➡ See "Design Calculation" on page 96 and 97

Characteristic speed $d_0 \cdot n$

STAR ball screws can be operated at very high speeds due to their internal ball recirculation system. Characteristic speeds of up to 150 000 are possible. Please ask.

$$d_0 \cdot n \leq 100\,000$$

d_0 = Nominal diameter (mm)
 n = speed (min^{-1})

Material, hardness

Our standard ball screw assemblies are made of high-quality, heat-treatable steel, carbon chrome alloy steels or case-hardened steels. The screw and nut raceways have a minimum Rockwell hardness of HRC 58. Ball screw assemblies made of corrosion-resistant steel (DIN 17230, EN 10088) are also available upon request. Unless otherwise specified, the screw ends are not hardened.

Sealing

Ball screws are precision assemblies that require protection against contamination. Flat protective covers and bellows type dust boots are particularly suitable for this purpose.

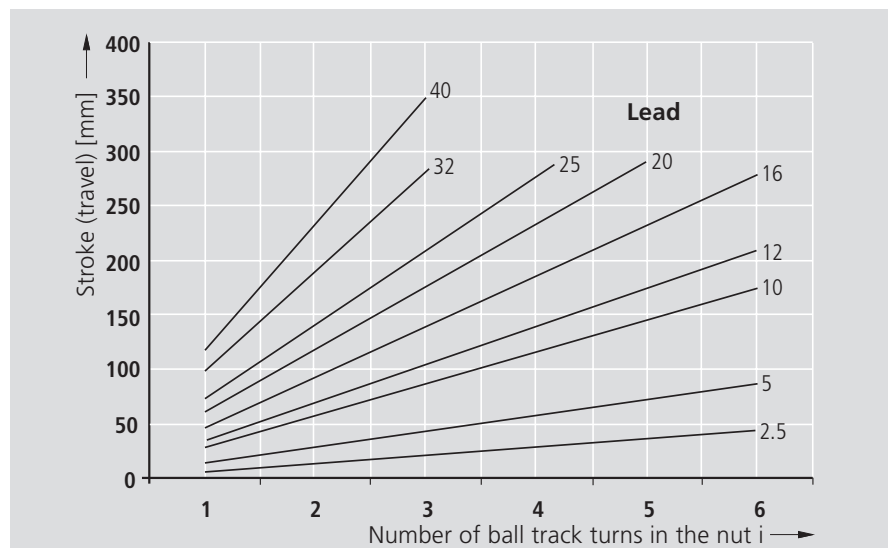
As there are many applications in which these methods do not provide sufficient protection, we have developed a wiper-type seal which, due to the extremely low friction between the lip edges and the screw, ensures an optimal sealing effect without noticeably reducing the high efficiency of the assembly.

We have therefore included these seals as standard features of our ball screw assemblies. At the customer's request, these seals can be omitted or special seals used in their place.

Permissible operating temperatures

Ball screws are suitable for continuous operation at temperatures up to 80°C with temporary peaks of 100°C (measurements taken on the outer shell of the nut).

Short stroke limit (load rating reduced by less than 10%)



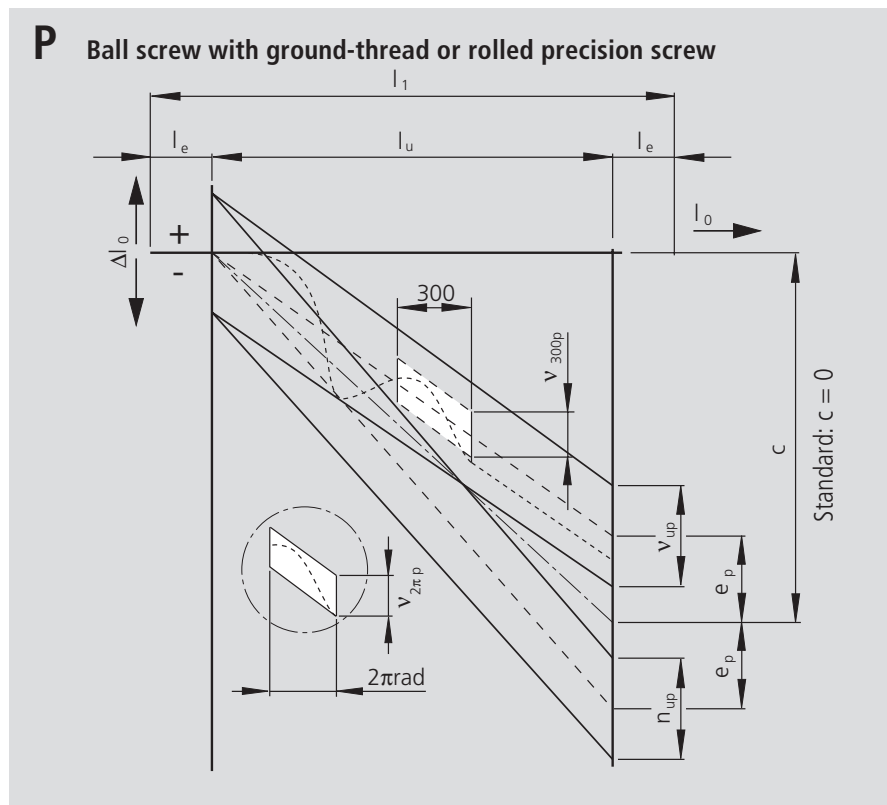
STAR – Precision Ball Screw Assemblies

Acceptance Conditions and Tolerance Grades

Permissible travel deviation

in accordance with DIN 69051, Part 3 and ISO 3408-3

Many values are significantly more accurate than those defined in DIN 69051, Part 3 and ISO 3408-3



l_u		P e_p (μm) Tolerance grade			P v_{up} (μm) Tolerance grade		
>	\leq	1	3	5	1	3	5
	315	6	12	23	6	12	23
315	400	7	13	25	6	12	25
400	500	8	15	27	7	13	26
500	630	9	16	30	7	14	29
630	800	10	18	35	8	16	31
800	1000	11	21	40	9	17	35
1000	1250	13	24	46	10	19	39
1250	1600	15	29	54	11	22	44
1600	2000	18	35	65	13	25	51
2000	2500	22	41	77	15	29	59
2500	3150	26	50	93	17	34	69
3150	4000	32	62	115	21	41	82
4000	5000	-	76	140	-	49	99
5000	6300	-	-	170	-	-	119

For STAR Precision Ball Screw Assemblies the following values apply in all cases for P and T

v_{300p} (μm) Tolerance grade				
1	3	5	7	9
6	12	23	52	130

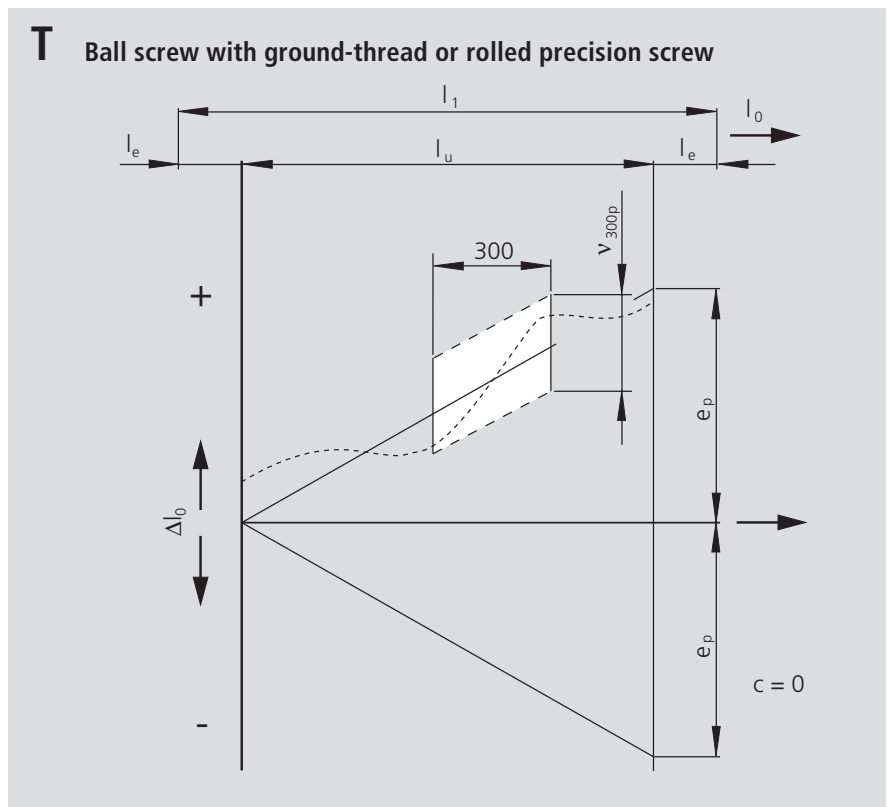
$v_{2\pi p}$ (μm) Tolerance grade				
1	3	5	7	9
4	6	8	10	10

Symbol definitions (excerpt):

- l_0 = nominal travel
- l_1 = thread length
- Δl_0 = travel deviation
- l_u = useful travel
- l_e = excess travel
- c = travel compensation for useful travel, defined by use (standard: $c = 0$)
- e_p = tolerance for actual mean travel deviation
- v_{up} = permissible travel variation within useful travel l_u
- v_{300p} = permissible travel deviation within 300 mm travel
- $v_{2\pi p}$ = permissible travel deviation within 1 revolution

Subindices:

- p = permissible
- a = actual



Improved values

Values are more accurate than those defined in DIN 69 051, Part 3 and ISO 3408-3 (tolerance reduced by half).

T

		e_p (μm)				
		Tolerance grade				
		1	3	5	7	9
$e_p' = \frac{l_u}{300} \cdot v_{300p}$						

Minimum number of measurements within 300 mm (measuring interval) and permissible excess travel.

Lead	Min. no. measurements for tolerance grades					l_{emax} (mm)
	1	3	5	7	9	
2.5	30	20	10	5	5	10
5	15	10	6	3	3	20
10	10	5	3	1	1	40
16	8	5	3	1	1	50
20	5	5	3	1	1	60
25	4	4	3	1	1	70
32	3	3	2	1	1	80
40	-	2	1	1	1	100

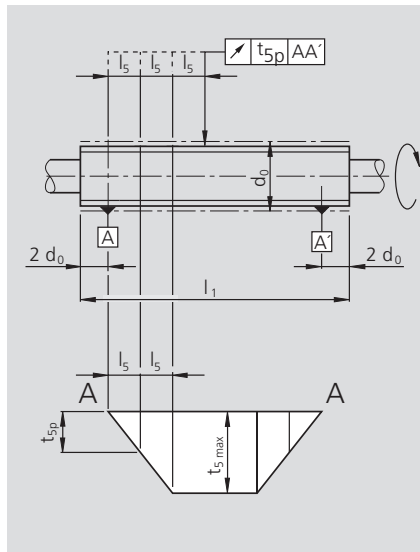
STAR – Precision Ball Screw Assemblies

Acceptance Conditions and Tolerance Grades

Run-outs and location deviations

based on DIN 69 051, Part 3 and ISO 3408-3

Radial run-out t_5 of the outer diameter of the ball screw shaft over the length l_5 used to determine the straightness in relation to AA'

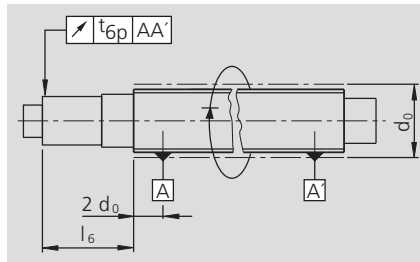


d ₀	l ₅	t _{5p} in μm für l ₅ for tolerance grade			
		1	3	5	7; 9
above 6	up to 12	80			
12	25	160			
25	50	315	20	25	32
50	100	630			
100	200	1250			

l ₁ /d ₀	above	up to	t _{5max} in μm for l ₁ ≥ 4l ₅ tolerance grade			
			1	3	5	7; 9
		40	40	50	64	80
40	60	60	75	96	120	
60	80	100	125	160	200	
80	100	160	200	256	320	

Radial run-out t_6 of the bearing diameter in relation to AA' for $l_6 \leq l$

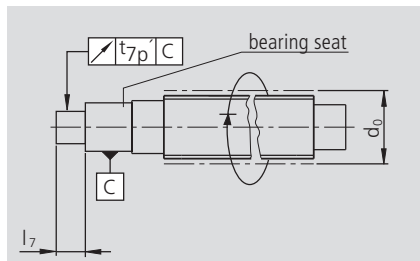
$$\text{Where } l_6 \leq l \text{ then } t_{6a} \leq t_{6a} \cdot \frac{l_{6a}}{l}$$



Nominal diameter	Ref. length	t _{6p} in μm for l ₆ ≤ l tolerance grade			
		1	3	5	7; 9
above 6	up to 20	80	10	12	20
20	50	125	12	16	25
50	125	200	16	20	25
125	200	315	-	25	25

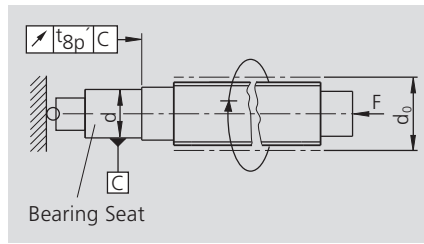
Coaxial deviation t_7' of the journal diameter of the ball screw shaft in relation to the bearing diameter for $l_7 \leq l$

$$\text{Where } l_7 > l \text{ then } t_{7a} \leq t_{7a} \cdot \frac{l_{7a}}{l}$$



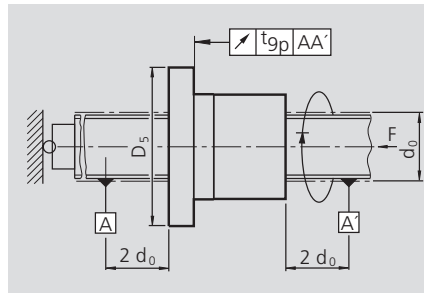
Nominal diameter	Ref. length	t _{7p'} in μm for l ₇ ≤ l for tolerance grade			
		1	3	5	7; 9
above 6	up to 20	80	5	5	6
20	50	125	5	5	6
50	125	200	6	6	7
125	200	315	-	8	12

Axial run-out t_{8p}' of the shaft (bearing) face of the ball screw shaft in relation to the bearing diameter.



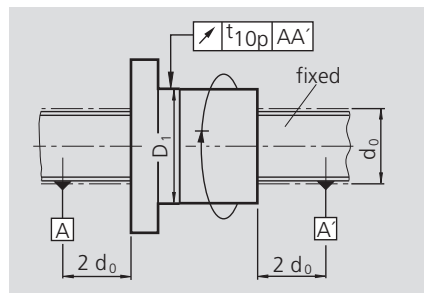
Nominal diameter- d_0		t_{8p}' in μm for tolerance grades		
above	up to	1	3	5; 7; 9
6	63	3	4	5
63	125	4	5	6
125	200	-	6	8

Axial run-out t_{9p} of the ball nut location face in relation to A and A' (for preloaded ball nuts only)



Flange diameter D_5		t_{9p} in μm for tolerance grades		
above	up to	1	3	5; 7; 9
16	32	10	12	16
32	63	12	16	20
63	125	16	20	25
125	250	20	25	32
250	500	-	32	40

Radial run-out t_{10p} of the outer diameter D1 of the ball nut in relation to A and A' (for preloaded and rotating ball nuts only) (fix screw against rotation)



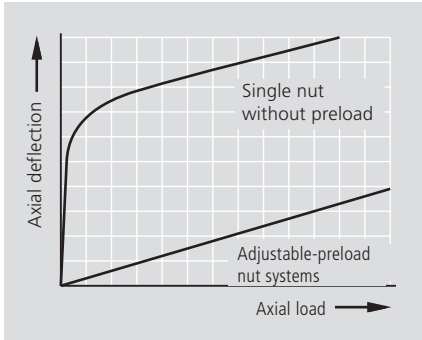
Outer diameter D_1		t_{10p} in mm for tolerance grades		
above	up to	1	3	5; 7; 9
16	32	10	12	16
32	63	12	16	20
63	125	16	20	25
125	250	20	25	32
250	500	-	32	40

STAR – Precision Ball Screw Assemblies

Preload and Rigidity

Nut System Preload

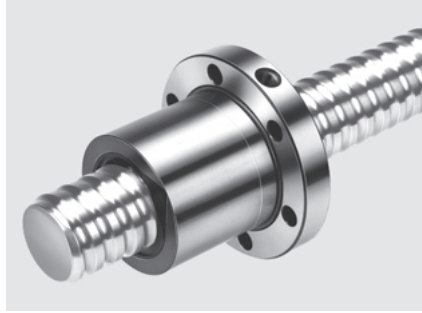
In addition to single nuts with reduced backlash, Rexroth STAR supplies preloaded or adjustable-preload nut systems.



The rigidity of these three types of STAR nut systems is approximately the same. This is because the adjustable-preload single nut and the preloaded single nut have a much more compact design and are thus only half as long as a double nut system. The screw is far less rigid than the nut unit (for details see "Overall axial rigidity ...").

Preloaded single nut

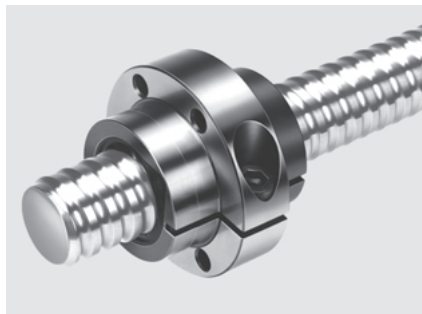
Single nuts can be preloaded to 2% or 5% of the basic dynamic load rating by means of optimized ball size selection.



Adjustable-preload single nut

The adjustable-preload single nut allows cost-efficient design techniques to be implemented in a large number of applications. The radial clearance and preload are adjusted radially via a slot approx. 0.1 mm wide → see "Mounting" on page 90.

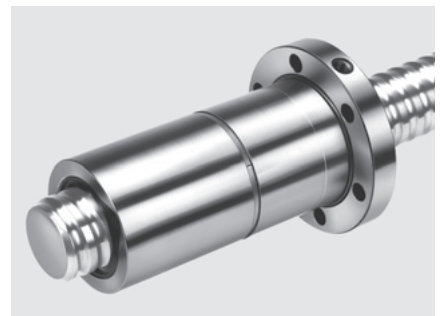
Depending on the application we will preload the nut system to 2% or 5% of the basic dynamic load rating. The maximum preload equals approx. 5% of the basic dynamic load rating.



Double nut

Tensioning two nuts against each other eliminates the inherent backlash of the ball screw, increases rigidity and thus improves positioning accuracy.

As excessive preload can cause a reduction in service life, we recommend that it not be more than 1/3 of the average operating load. Depending on the application we will preload the nut system to 7% or 10% of the basic dynamic load rating.



Overall Rigidity

The rigidity of a ball screw is also influenced by all adjoining parts such as bearings, housing bores, nut housings etc.

Overall axial rigidity R_{tot} of the ball screw

The overall axial rigidity R_{tot} is comprised of the component rigidity of the bearing R_{al} , the screw R_s and the nut R_{nu} and is calculated according to the formula:

$$\frac{1}{R_{tot}} = \frac{1}{R_{al}} + \frac{1}{R_s} + \frac{1}{R_{nu}} \quad 16$$

N.B.:

Please note that in most cases the rigidity R_s of the screw will be significantly lower than the rigidity R_{nu} of the nut unit. In an assembly with a diameter of 40 x 10, for example, the rigidity R_{nu} of the nut unit is 2 to 3 times higher than the rigidity R_s of a screw with a length of 500 mm.

Rigidity of the bearing R_{al}

The rigidity of the bearings corresponds to the values found in the bearing manufacturer's catalog.

See the corresponding tables for rigidity values.

Rigidity in the area of the nut unit R_{nu}

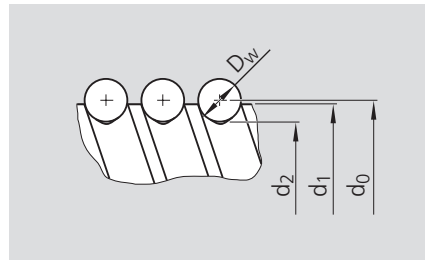
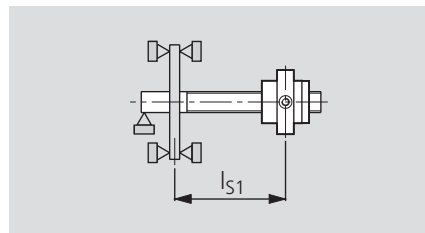
The rigidity in the area of the nut unit is calculated according to DIN 69051 (P1). See the corresponding tables for rigidity values.

Rigidity of the screw R_s

The rigidity of the screw R_{s1} depends on the type of bearing used.

See the corresponding tables for rigidity values.

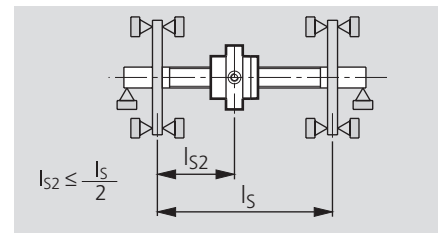
1. Ball screw shaft is fixed at one end.



$$R_{s1} = 165 \cdot \frac{(d_0 - 0.71 \cdot D_w)^2}{l_{s1}} \quad (\text{N}/\mu\text{m}) \quad 17$$

R_{s1} = Rigidity of the screw
 d_0 = Nominal diameter
 D_w = Ball diameter
 l_{s1} = distance between bearing and nut

2. Ball screw shaft is fixed at both ends.



$$R_{s1} = 165 \cdot \frac{(d_0 - 0.71 \cdot D_w)^2}{l_s - l_{s2}} \cdot \frac{l_s}{l_{s2}} \quad (\text{N}/\mu\text{m}) \quad 18$$

The lowest screw rigidity R_{s2min} occurs at the center of the screw ($l_{s2} = l_s/2$) and thus equals:

$$R_{s2min} = 660 \cdot \frac{d_0^2}{l_s} \quad (\text{N}/\mu\text{m}) \quad 19$$

R_{s1} = Rigidity of the screw
 d_0 = Nominal diameter
 D_w = Ball diameter
 l_s = distance between bearing and bearing
 l_{s2} = distance between bearing and nut

STAR – Precision Ball Screw Assemblies

Preload and Rigidity

Dynamic drag torque, preload and rigidity for screws with single nut

- T_{ta} = overall dynamic drag torque
 $T_{ta} = T_{pra} + T_{RD}$
 C = basic dynamic load rating
 C_0 = basic static load rating
 T_{RD} = dynamic drag torque of 2 seals
 R_s = rigidity of the screw
 R_{nu} = rigidity of the nut
 T_{pro} = dynamic drag torque without a seal

- d_o = nominal diameter
 P = lead
 D_w = ball diameter
 i = number of ball track turns

The dynamic drag torque indicates in practice the nut preloading.

N.B.:

Measurement of the dynamic load torque
 ► see "Mounting" on page 90.

Size $d_o \times P \times D_w - i$	Load ratings		Backlash of single nut		T_{RD}^* ca. (Nm)	R_s (N/($\mu\text{m}\cdot\text{m}$))
	dyn. C (N)	stat. C_0 (N)	standard (mm)	reduced (mm)		
8 x 2.5R x 1.588 - 3	2200	2800	0.02	0.010	0.015	8
12 x 5R x 2 - 3	3800	5800	0.02	0.010	0.030	18
12 x 10R x 2 - 2	2500	3600	0.02	0.010	0.030	18
16 x 5R x 3 - 4	12300	16100	0.04	0.020	0.080	32
16 x 10R x 3 - 3	9600	12300	0.04	0.020	0.080	32
16 x 16R x 3 - 2	6300	7600	0.04	0.020	0.080	32
16 x 16R x 3 - 3	9300	12000	0.04	0.020	0.080	32
20 x 5R x 3 - 4	14300	21500	0.04	0.020	0.100	53
20 x 5R x 3 - 5	17500	27300	0.04	0.020	0.100	53
20 x 20R x 3.5 - 2	9100	12100	0.04	0.020	0.120	52
20 x 20R x 3.5 - 3	13300	18800	0.04	0.020	0.120	52
25 x 5R x 3 - 4	15900	27200	0.04	0.020	0.120	86
25 x 10R x 3 - 4	15700	27000	0.04	0.020	0.150	86
25 x 25R x 3.5 - 2	10100	15100	0.04	0.020	0.200	84
25 x 25R x 3.5 - 3	14700	23300	0.04	0.020	0.200	84
32 x 5R x 3.5 - 4	21600	40000	0.04	0.020	0.250	144
32 x 5L x 3.5 - 4	21600	40000	0.04	0.020	0.250	144
32 x 10R x 3.969 - 5	31700	58300	0.04	0.020	0.250	141
32 x 20R x 3.969 - 2	13500	21800	0.04	0.020	0.250	141
32 x 20R x 3.969 - 3	19700	33700	0.04	0.020	0.250	141
32 x 32R x 3.969 - 2	13400	22000	0.04	0.020	0.250	141
32 x 32R x 3.969 - 3	19500	34000	0.04	0.020	0.250	141
40 x 5R x 3.5 - 5	29100	64100	0.04	0.020	0.400	232
40 x 5L x 3.5 - 5	29100	64100	0.04	0.020	0.400	232
40 x 10R x 6 - 4	50000	86400	0.07	0.035	0.400	211
40 x 10L x 6 - 4	50000	86400	0.07	0.035	0.400	211
40 x 12R x 6 - 4	49900	86200	0.07	0.035	0.400	211
40 x 16R x 6 - 4	49700	85900	0.07	0.035	0.400	211
40 x 20R x 6 - 3	37900	62800	0.07	0.035	0.400	211
40 x 40R x 6 - 2	25500	40300	0.07	0.035	0.400	211
40 x 40R x 6 - 3	37000	62300	0.07	0.035	0.400	211
50 x 5R x 3.5 - 5	32000	81300	0.04	0.020	0.500	373
50 x 10R x 6 - 6	79700	166500	0.07	0.035	0.600	345
50 x 12R x 6 - 6	79600	166400	0.07	0.035	0.600	345
50 x 16R x 6 - 6	79400	166000	0.07	0.035	0.600	345
50 x 20R x 6.5 - 3	47900	87900	0.07	0.035	0.600	340
50 x 20R x 6.5 - 5	75700	149700	0.07	0.035	0.600	340
50 x 40R x 6.5 - 2	32100	55800	0.07	0.035	0.600	340
50 x 40R x 6.5 - 3	46500	85900	0.07	0.035	0.600	340
63 x 10R x 6 - 6	88800	214300	0.07	0.035	0.700	569
63 x 20R x 6.5 - 3	53200	112100	0.07	0.035	1.200	563
63 x 20R x 6.5 - 5	83900	190300	0.07	0.035	1.200	563
63 x 40R x 6.5 - 2	36900	74300	0.07	0.035	1.200	563
63 x 40R x 6.5 - 3	53400	114100	0.07	0.035	1.200	563
80 x 10R x 6.5 - 6	108400	291700	0.07	0.035	1.400	938
80 x 20R x 9 - 6	170900	403900	0.09	0.045	2.200	894
80 x 20R x 12.7 - 6	262700	534200	0.11	0.055	2.200	832
100 x 10R x 6.5 - 6	119500	371900	0.07	0.035	2.200	1501
100 x 20R x 12.7 - 6	295100	686400	0.11	0.055	2.800	1366
125 x 10R x 6.5 - 6	130600	468700	0.07	0.035	3.600	2391
125 x 20R x 12.7 - 6	326500	870400	0.11	0.055	5.000	2220

* Values for T_{RD} in the table apply for a standard seal.
 T_{RD} is approx. twice as high for a reinforced seal.

	Screws with single nuts 2% preload		Screws with single nuts 5% preload							Screws with adjustable preload single nut diameter D_1 after adjustment (mm)			
	R_{nu} (N/ μ m)	T_{pr0} (Nm) Tolerance grade	R_{nu} (N/ μ m)	T_{pr0} (Nm) Tolerance grade						SEM-E-C		SEM-E-S	
				1		3 ; 5		7 ; 9		min.	max.	min.	max.
			max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
	70	0.004										15.987	15.953
	100	0.009										23.940	23.975
	60	0.006										23.940	23.975
	210	0.040	280	0.06	0.14	0.05	0.15	0.04	0.16	27.940	27.975	27.940	27.975
	160	0.030	220	0.05	0.11	0.04	0.12	0.03	0.12	27.940	27.975	27.940	27.975
	100	0.020	140	0.03	0.07	0.03	0.08	0.02	0.08	27.950	27.978	32.945	32.973
	160	0.030	210	0.04	0.10	0.04	0.11	0.03	0.12	27.950	27.978	32.945	32.973
	260	0.060	350	0.09	0.20	0.07	0.21	0.06	0.23	35.935	35.970	32.935	32.970
	330	0.070	440	0.11	0.25	0.09	0.26	0.07	0.28				
	130	0.040	180	0.05	0.13	0.05	0.14	0.04	0.15	35.945	35.973	37.945	37.973
	200	0.050	270	0.08	0.19	0.07	0.20	0.05	0.21	35.945	35.973	37.945	37.973
	310	0.080	410	0.12	0.28	0.10	0.30	0.08	0.32	39.935	39.970	37.935	37.970
	320	0.080	430	0.12	0.27	0.10	0.29	0.08	0.31	39.935	39.970	37.935	37.970
	160	0.050	210	0.08	0.18	0.06	0.19	0.05	0.20	39.945	39.973	47.945	47.973
	240	0.070	320	0.11	0.26	0.09	0.28	0.07	0.29	39.945	39.973	47.945	47.973
	380	0.140	500	0.26	0.43	0.24	0.45	0.21	0.48	49.935	49.970	47.935	47.970
	380	0.140	500	0.26	0.43	0.24	0.45	0.21	0.48	49.935	49.970	47.935	47.970
	500	0.200	670	0.38	0.63	0.36	0.66	0.30	0.71	49.935	49.970	47.935	47.970
	200	0.090	270	0.16	0.27	0.15	0.28	0.13	0.30	49.945	49.973	55.941	55.969
	300	0.130	410	0.24	0.39	0.22	0.41	0.19	0.44	49.945	49.973	55.941	55.969
	200	0.090	260	0.16	0.27	0.15	0.28	0.13	0.30	49.945	49.973	55.941	55.969
	300	0.120	400	0.23	0.39	0.22	0.41	0.19	0.44	49.945	49.973	55.941	55.969
	550	0.230	720	0.44	0.73	0.41	0.76	0.35	0.81	62.931	62.966	55.931	55.966
	550	0.230	720	0.44	0.73	0.41	0.76	0.35	0.81	62.931	62.966	55.931	55.966
	530	0.400	720	0.80	1.20	0.75	1.25	0.70	1.30	62.931	62.966	62.931	62.966
	530	0.400	720	0.80	1.20	0.75	1.25	0.70	1.30	62.931	62.966	62.931	62.966
	510	0.400	680	0.80	1.20	0.75	1.25	0.70	1.30	62.931	62.966		
	510	0.400	680	0.80	1.19	0.75	1.24	0.70	1.29				
	380	0.300	510	0.61	0.91	0.57	0.95	0.53	0.99	62.941	62.969	62.941	62.969
	240	0.200	330	0.38	0.64	0.36	0.66	0.31	0.71	62.941	62.969	71.941	71.969
	370	0.300	490	0.59	0.89	0.56	0.93	0.52	0.96	62.941	62.969	71.941	71.969
	640	0.320	830	0.64	0.96	0.60	1.00	0.56	1.04	74.931	74.966	67.931	67.966
	890	0.800	1180	1.59	2.39	1.49	2.49	1.39	2.59	74.931	74.966	71.931	71.966
	900	0.800	1190	1.59	2.39	1.49	2.49	1.39	2.59	74.931	74.966		
	910	0.790	1210	1.59	2.38	1.49	2.48	1.39	2.58				
	470	0.480	630	0.96	1.44	0.90	1.50	0.84	1.56	74.941	74.969	84.936	84.964
	780	0.760	1050	1.51	2.27	1.42	2.37	1.32	2.46	74.941	74.969	84.936	84.964
	300	0.320	410	0.64	0.96	0.60	1.00	0.56	1.04	74.941	74.969	84.936	84.964
	450	0.470	610	0.93	1.40	0.87	1.45	0.81	1.51	74.941	74.969	84.936	84.964
	1050	1.120	1380	2.38	3.22	2.24	3.36	2.10	3.50	89.926	89.961	84.926	84.961
	560	0.670	750	1.34	2.01	1.26	2.09	1.17	2.18	94.936	94.964	94.963	94.964
	930	1.060	1250	2.25	3.04	2.11	3.17	1.98	3.30	94.936	94.964	94.963	94.964
	380	0.460	510	0.93	1.39	0.87	1.45	0.81	1.51	94.936	94.964	94.963	94.964
	570	0.670	770	1.35	2.02	1.26	2.10	1.18	2.19	94.936	94.964	94.963	94.964
	1240	1.730	1610	3.69	4.99	3.47	5.20	3.25	5.42	104.926	104.961	104.926	104.961
	1410	2.730	1880	5.81	7.86	5.47	8.20	5.13	8.55	124.931	124.959	124.931	124.959
	1400	4.200	1870	8.93	12.08	8.41	12.61	7.88	13.14	124.931	124.959	124.931	124.959
	1430	2.390	1830	5.08	6.87	4.78	7.17	4.48	7.47				
	1680	5.900	2230	12.54	16.97	11.8	17.71	11.07	18.44				
	1600	3.270	2020	6.94	9.39	6.53	9.80	6.12	10.20				
	1970	8.160	2600	17.35	23.47	16.33	24.49	15.30	25.51				

STAR – Precision Ball Screw Assemblies

Preload and Rigidity

Dynamic drag torque, preload and rigidity for screws with double nut

T_{ta} = overall dynamic drag torque
 $T_{ta} = T_{pra} + T_{RD}$
 C = basic dynamic load rating
 C_0 = basic static load rating
 T_{RD} = dynamic drag torque of 2 seals
 R_S = rigidity of the screw
 R_{nu} = Steifigkeit der Mutter
 T_{pr0} = dynamic drag torque without a seal

d_o = nominal diameter
 P = lead
 D_w = ball diameter
 i = number of ball track turns

The dynamic drag torque indicates in practice the nut preloading.

N.B.:

Measurement of the dynamic load torque
 ➔ see "Mounting" on page 90.

Size $d_o \times P \times D_w - i$	Load ratings		T_{RD} ca.(Nm)	R_S (N/($\mu\text{m}\cdot\text{m}$))
	dyn. C (N)	stat. C_0 (N)		
16 x 5R x 3 - 4	12300	16100	0.08	32
20 x 5R x 3 - 4	14300	21500	0.10	53
25 x 5R x 3 - 4	15900	27200	0.12	86
25 x 10R x 3 - 4	15700	27000	0.15	86
32 x 5R x 3.5 - 4	21600	40000	0.25	144
32 x 10R x 3.969 - 5	31700	58300	0.25	141
40 x 5R x 3.5 - 5	29100	64100	0.40	232
40 x 10R x 6 - 4	50000	86400	0.40	211
40 x 10R x 6 - 6	72100	132200	0.40	211
40 x 20R x 6 - 3	37900	62800	0.40	211
50 x 5R x 3.5 - 5	32000	81300	0.50	373
50 x 10R x 6 - 4	55400	109000	0.60	345
50 x 10R x 6 - 6	79700	166500	0.60	345
50 x 20R x 6.5 - 5	75700	149700	0.60	340
63 x 10R x 6 - 4	61800	140500	0.70	569
63 x 10R x 6 - 6	88800	214300	0.70	569
63 x 20R x 6.5 - 5	83900	190300	1.20	563
80 x 10R x 6.5 - 6	108400	291700	1.40	938
80 x 20R x 9 - 6	170900	403900	2.20	894
80 x 20R x 12.7 - 6	262700	534200	2.20	832
100 x 10R x 6.5 - 6	119500	371900	2.00	1501
100 x 20R x 12.7 - 6	295100	686400	2.80	1366
125 x 10R x 6.5 - 6	130600	468700	3.60	2391
125 x 20R x 12.7 - 6	326500	870400	5.00	2220

	Screws with double nut 7% preload							Screws with double nut 10% preload						
	R _{nu} (N/μm)	T _{pr0} (Nm)						R _{nu} (N/μm)	T _{pr0} (Nm)					
		1		3 ; 5		7 ; 9			1		3 ; 5		7 ; 9	
		min.	max.	min.	max.	min.	max.		min.	max.	min.	max.	min.	max.
310	0.03	0.08	0.03	0.08	0.02	0.09	350	0.05	0.11	0.04	0.12	0.03	0.13	
390	0.05	0.11	0.04	0.12	0.03	0.13	430	0.07	0.16	0.06	0.17	0.05	0.18	
460	0.07	0.16	0.06	0.17	0.04	0.18	510	0.1	0.22	0.08	0.24	0.06	0.25	
470	0.07	0.15	0.05	0.16	0.04	0.18	530	0.09	0.22	0.08	0.24	0.06	0.25	
550	0.12	0.27	0.10	0.29	0.08	0.31	610	0.21	0.35	0.19	0.36	0.17	0.39	
750	0.21	0.36	0.20	0.37	0.17	0.4	830	0.3	0.51	0.28	0.53	0.24	0.57	
790	0.24	0.41	0.23	0.42	0.20	0.46	870	0.35	0.58	0.33	0.61	0.28	0.65	
810	0.42	0.70	0.39	0.73	0.34	0.78	910	0.64	0.96	0.60	1.00	0.56	1.04	
1120	0.65	0.97	0.61	1.01	0.57	1.05	1250	0.92	1.38	0.87	1.44	0.81	1.50	
570	0.32	0.53	0.3	0.55	0.25	0.59	630	0.49	0.73	0.45	0.76	0.42	0.79	
920	0.34	0.56	0.31	0.58	0.27	0.63	1010	0.51	0.77	0.48	0.80	0.45	0.83	
870	0.62	0.93	0.58	0.97	0.54	1.01	960	0.89	1.33	0.83	1.39	0.78	1.44	
1300	0.89	1.34	0.84	1.39	0.78	1.45	1450	1.28	1.91	1.20	1.99	1.12	2.07	
1170	0.85	1.27	0.79	1.32	0.74	1.38	1310	1.21	1.82	1.14	1.89	1.06	1.97	
1020	0.87	1.31	0.82	1.36	0.76	1.42	1120	1.25	1.87	1.17	1.95	1.09	2.02	
1520	1.25	1.88	1.17	1.96	1.10	2.04	1690	1.79	2.69	1.68	2.80	1.57	2.91	
1390	1.18	1.78	1.11	1.85	1.04	1.92	1560	1.69	2.54	1.59	2.64	1.48	2.75	
1770	1.94	2.91	1.82	3.04	1.7	3.16	1950	2.95	3.99	2.78	4.16	2.60	4.34	
2090	3.25	4.40	3.06	4.59	2.87	4.79	2330	4.65	6.29	4.38	6.56	4.10	6.84	
2070	5.00	6.77	4.71	7.06	4.41	7.36	2320	7.15	9.67	6.73	10.09	6.30	10.51	
2000	2.84	3.85	2.68	4.02	2.51	4.18	2190	4.06	5.50	3.82	5.74	3.59	5.98	
2460	7.02	9.50	6.61	9.92	6.20	10.33	2740	10.03	13.57	9.44	14.16	8.85	14.76	
2200	3.89	5.26	3.66	5.49	3.43	5.71	2390	5.55	7.51	5.22	7.84	4.90	8.16	
2860	9.71	13.14	9.14	13.71	8.57	14.28	3170	13.88	18.77	13.06	19.59	12.24	20.41	

STAR – Precision Ball Screw Assemblies

Mounting

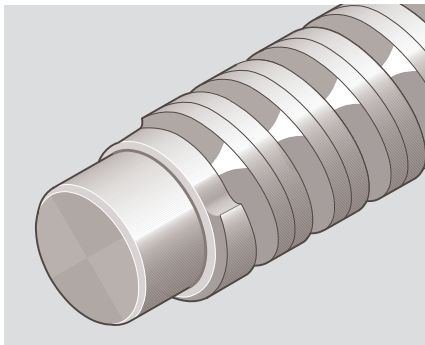
Nut mounting, general

- **preloaded single nut**
- **double nut**

These models are supplied with premounted nut units. The nut unit and screw may not be disassembled. Should this become necessary for any reason, please ask.

- **single nut with reduced backlash**
- **adjustable preload single nut**

The nut unit may only be mounted using a mounting arbor. The outer diameter of the arbor should be approx. 0.1 mm smaller than the root diameter of the screw. In most cases, the transport arbor on which the nuts are delivered may be used to mount the nut. The end of the screw thread must be chamfered in order to prevent damage to the seal and the internal components of the nut unit.



The various mounting steps are described below.

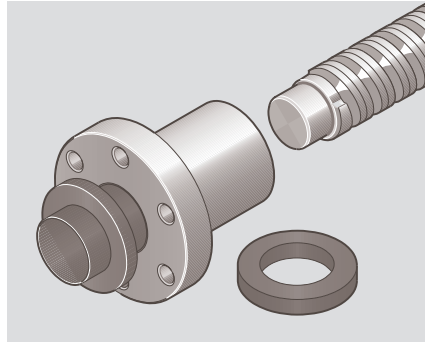
Proceed in reverse order when removing the nut from the screw. Take particular care not to damage the nut, screw or internal components, as this could result in the premature failure of the ball screw assembly.

Mounting instructions are supplied as standard along with every unit.

Mounting steps

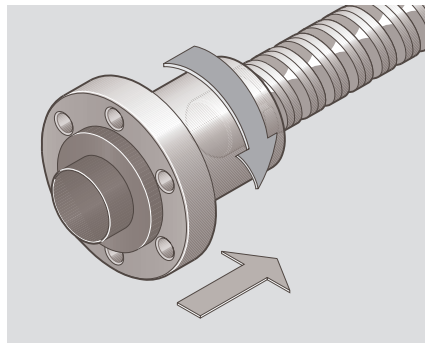
The nut is to be mounted as follows:

Remove the rubber ring from one end of the mounting arbor.

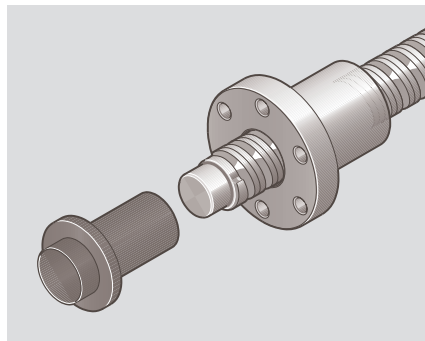


Push the mounting arbor with nut until it engages with the end of the thread.

The arbor must make contact with axial clearance.



Carefully turn the nut unit onto the thread, applying only light axial pressure.



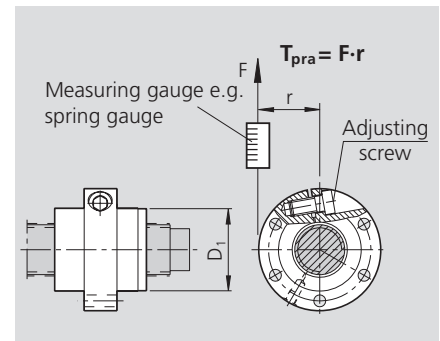
- **Setting the radial clearance or preload of adjustable-preload single nuts**

Measurement of the dynamic drag torque for SEM-E-C and SEM-E-S..

Using the adjusting screw, reduce the clearance of the nut mounted on the screw until the corresponding dynamic drag torque T_{pra} specified in the table [page 87](#), has been attained (ball screw lightly oiled).

Check this torque along the entire length of the thread; if the torque deviates from the value specified in the table at any point along the thread, adjust accordingly.

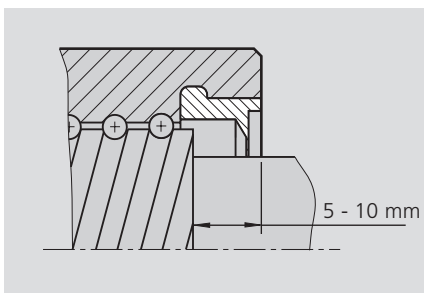
Once the torque has been properly adjusted, the centering diameter D_1 must correspond to the values specified in the table [page 87](#). Cover the head of the screw with a protective cap.



T_{pra} = currently measured dynamic drag torque

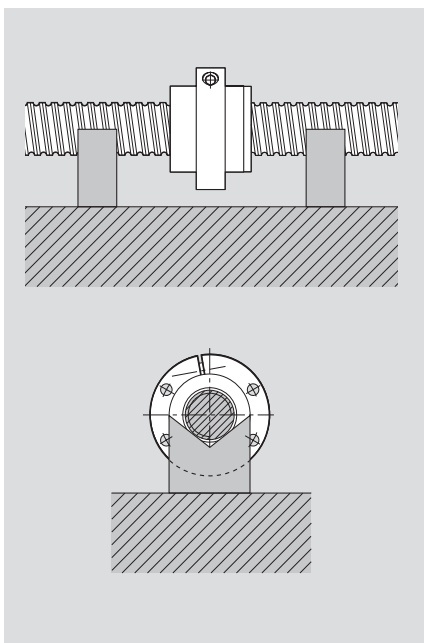
Inserting the wiper-type seal

Position the nut on the screw as illustrated in the diagram. Insert the wiper so that its projection is in the recess and press it in until it snaps into the groove. While turning the nut on the screw, watch the wiper lip carefully and straighten it if necessary by applying pressure to the end surface. Ensure that the lip is not damaged.



Storage

Ball screw assemblies are high-quality systems that must be treated with due care. In order to prevent damage and contamination, the elements should not be removed from the protective wrapping until immediately before installation. Once they have been removed from the packaging, they must be set down on V-shaped cradles.



Installation in the Machine

It is not normally necessary to remove the preservative coating before installation.

- If the ball screw is contaminated it must first be cleaned (see “Cleaning”) and reoiled.
- Push the nut unit into the mounting bore, taking care to avoid any impacts or misalignment.
- Tighten the mounting screws using a torque wrench if necessary. See table for the tightening torque that corresponds to the screw strength class.

Screw diameter (mm)	Tightening torque (Nm) strength class to DIN ISO 898:		
	8.8	10.9	12.9
M 3	1.3	1.8	2.1
M 4	2.7	3.8	4.6
M 6	9.5	13	16
M 8	23	32	39
M 10	46	64	77
M 12	80	110	135
M 16	195	275	330

Condition as delivered

STAR – Ball Screws are normally delivered with an initial supply of grease type Klüber Microlube GB 0 NLGI 0. Relubrication with grease or oil is thus possible in principle, but you will need to check that the lubricant used is compatible with the initial supply. The ball screws can also be supplied with only a preservative coating if preferred.

Important:

The selected lubricant must be in the nut before the machine is started.

Cleaning

Various cleaning agents can be used to degrease and wash the assembly:

- aqueous cleaning agents
- organic cleaning agents

Important:

Do not use trichloroethylene!

Immediately after cleaning, thoroughly dry all parts, then apply a preservative coating or anti-corrosion oil. In all cases, take care to observe the appropriate legal regulations (environmental protection, health and safety at work, etc.) as well as the specifications for the cleaning agent (e.g. handling).

STAR – Precision Ball Screw Assemblies

Lubrication

Standard lubrication practices for ball bearings also apply to ball screws. Lubricant loss is, however, greater than that of ball bearings due to the axial motion between the screw and the nut.

Oil lubrication

The influence of the temperature on the performance of the ball screw is very significant, as the thermal expansion of the ball screw interferes with the positioning accuracy of the assembly.

One of the advantages of oil lubrication over grease lubrication is therefore the minimized heat build-up of the ball screw, particularly at high speeds.

As a rule, commercially available mineral base oils used for ball bearings are suitable. The necessary viscosity depends on the speed, temperature and load conditions of the respective application (see DIN 51501, 51517, 51519 and GfT Worksheet 3).

Oils ranging from ISO VG 68 to approx. ISO VG 460 are used in practice. The high viscosity grades (e.g. ISO VG 460) should be preferred in general and particularly for slow running screws. A maximum relubrication interval of up to 10 operating hours can be attained with small quantities from the table along side.

Grease lubrication

The advantage of grease lubrication is that the ball screw can run long distances on one supply of grease. As a result, a lubricating system is not required in many cases. The amount of grease used should fill the nuts to approximately half of their capacity.

All commercially available ball bearing lubricating greases may be used. Read the lubricant manufacturer's specifications carefully! Never use greases with solid lubricant components (e.g. graphite or MoS₂).

Relubrication quantity and intervals for oil

d ₀	Initial oil supply V _e (ml)	Relubrication oil V _n (ml)/10h	Revolutions U (Mio)	Travel (km) with lead P =						
				5	10	16	20	25	32	40
8	0.300	0.030	1.3	7	13	21	26	33	42	52
12	0.300	0.030	1.3	7	13	21	26	33	42	52
16	0.300	0.030	1.3	7	13	21	26	33	42	52
20	0.600	0.060	1.0	5	10	16	20	25	32	40
25	0.600	0.060	1.0	5	10	16	20	25	32	40
32	0.600	0.060	1.0	5	10	16	20	25	32	40
40	2.000	0.400	1.0	5	10	16	20	25	32	40
50	4.000	0.800	1.0	5	10	16	20	25	32	40
63	4.000	0.800	1.0	5	10	16	20	25	32	40

d₀ = nominal diameter

Relubrication intervals for NLGI 2 greases

d ₀	Relubrication quantity, see table for NLGI 2 greases	Revolutions U (Mio)	travel (km) with lead P =						
			5	10	16	20	25	32	40
≤ 40		50	250	500	800	1000	1250	1600	2000
> 40		10	50	100	160	200	250	320	400

d₀ = nominal diameter

Limit conditions:

Load = ≤ 0.2 C
 n_{min} = 100 min⁻¹
 Temp_{max. nut} = 80 °C
 Temp_{continuous nut} = 60 °C

Set-up: - any
 Operating mode: - driven screw
 - no short stroking or hypercritical operation
 Sealing: - standard

Greases in accordance with DIN 51825 K2K and, for higher loads, KP2K of NLGI Class 2 according to DIN 51818 are recommended for the longest possible lubrication intervals. Tests have proven that greases of NLGI Class 00 achieve only about 50% of the running performance of Class 2 greases at high loads.

The lubrication interval depends on many factors such as the degree of contamination, operating temperature, load, etc. The following values can thus serve only as a guideline.

For NLGI 2-greases:

The nut has to be lubricated with lubricant via the lube port before the ball screw is started.

Relubrication quantities for NGLI 2 greases

Size $d_o \times P \times D_w - i$	Relubrication quantity of grease (g)			
	Single nut FEM-E-C / FEM-E-S / SEM-E-C SEM-E-S / ZEM-E-A / ZEM-E-S		Double nut FDM-E-C / FDM-E-S	
	Screw		Screw	
	rolled	ground	rolled	ground
8 x 2.5R x 1.588 - 3	0.1	0.1	-	-
12 x 5R x 2 - 3	0.3	0.3	-	-
12 x 10R x 2 - 2	0.3	0.3	-	-
16 x 5R x 3 - 4	0.6	0.6	1.7	1.7
16 x 10R x 3 - 3	0.8	0.7	-	-
16 x 16R x 3 - 2	0.9	0.8	-	-
16 x 16R x 3 - 3	1.1	1.0	-	-
20 x 5R x 3 - 4	0.9	0.9	2.7	2.7
20 x 5R x 3 - 5	1.0	1.0	-	-
20 x 20R x 3.5 - 2	1.7	1.3	-	-
20 x 20R x 3.5 - 3	2.2	1.6	-	-
25 x 5R x 3 - 4	1.4	1.4	3.2	3.2
25 x 10R x 3 - 4	1.7	1.7	3.8	3.8
25 x 25R x 3.5 - 2	2.4	1.9	-	-
25 x 25R x 3.5 - 3	3.1	2.4	-	-
32 x 5L x 3.5 - 4	2.3	2.3	-	-
32 x 5R x 3.5 - 4	2.0	2.0	4.5	4.5
32 x 6R x 3.5 - 4	2.0	2.0	-	-
32 x 10R x 3.969 - 5	2.8	2.8	6.0	6.0
32 x 20R x 3.969 - 2	2.5	2.2	-	-
32 x 20R x 3.969 - 3	3.2	2.8	-	-
32 x 32R x 3.969 - 2	3.7	2.8	-	-
32 x 32R x 3.969 - 3	4.9	3.7	-	-
40 x 5L x 3.5 - 5	3.1	3.1	-	-
40 x 5R x 3.5 - 5	2.7	2.7	6.9	6.9
40 x 8R x 3.5 - 4	2.7	2.7	-	-
40 x 10L x 6 - 4	6.0	6.0	-	-
40 x 10R x 6 - 4	6.0	6.0	15.1	15.1
40 x 10R x 6 - 6	7.3	7.3	17.7	17.7
40 x 12R x 6 - 4	6.1	6.1	-	-
40 x 16R x 6 - 4	8.3	6.9	19.3	16.5
40 x 20R x 6 - 3	7.8	6.8	18.5	16.4
40 x 40R x 6 - 2	9.4	7.4	-	-
40 x 40R x 6 - 3	12.9	10.1	-	-
50 x 10R x 6 - 4	8.0	8.0	19.7	19.7
50 x 10R x 6 - 6	9.7	9.7	23.0	23.0
50 x 12R x 6 - 6	10.4	10.4	-	-
50 x 16R x 6 - 6	14.6	12.1	-	-
50 x 20R x 6.5 - 3	11.4	9.7	-	-
50 x 20R x 6.5 - 5	15.6	13.1	31.3	26.3
50 x 40R x 6.5 - 2	13.9	10.7	-	-
50 x 40R x 6.5 - 3	18.6	14.1	-	-
63 x 10R x 6 - 4	9.0	9.0	23.0	23.0
63 x 10R x 6 - 6	11.0	11.0	27.0	27.0
63 x 20R x 6.5 - 3	13.9	11.7	-	-
63 x 20R x 6.5 - 5	19.2	16.0	39.4	33.0
63 x 40R x 6.5 - 2	17.0	13.0	-	-

STAR – Precision Ball Screw Assemblies

Design Calculations

Upon request, we can perform all calculations to your specifications.

➡ see "Design Calculation Service Form" on page 102

Average Speed and Average Load

- where the speed fluctuates, the average speed n_m is calculated as follows
- where the load fluctuates and the speed is constant, the average load F_m is calculated as follows:
- where both the load and the speed fluctuate, the average load F_m is calculated as follows:

Where the speed and load fluctuate, the service life must be calculated using the averages F_m and n_m .

$$n_m = \frac{q_1}{100} \cdot n_1 + \frac{q_2}{100} \cdot n_2 + \dots + \frac{q_n}{100} \cdot n_n \quad 1$$

n_m = average speed (min⁻¹)
 q = discrete time step (%)

$$F_m = \sqrt[3]{F_1^3 \cdot \frac{q_1}{100} + F_2^3 \cdot \frac{q_2}{100} + \dots + F_n^3 \cdot \frac{q_n}{100}} \quad 2$$

F_m = average load (N)
 q = discrete time step (%)

$$F_m = \sqrt[3]{F_1^3 \cdot \frac{n_1}{n_m} \cdot \frac{q_1}{100} + F_2^3 \cdot \frac{n_2}{n_m} \cdot \frac{q_2}{100} + \dots + F_n^3 \cdot \frac{n_n}{n_m} \cdot \frac{q_n}{100}} \quad 3$$

F_m = average load (N)
 q = discrete time step (%)
 n_m = average speed (min⁻¹)

L (service life in revolutions)

$$L = \left(\frac{C}{F_m} \right)^3 \cdot 10^6 \quad 4 \Rightarrow C = F_m \cdot \sqrt[3]{\frac{L}{10^6}} \quad 5 \Rightarrow F_m \cdot \frac{C}{\sqrt[3]{\frac{L}{10^6}}} \quad 6$$

L = service life (revolutions)
 F_m = average load (N)
 C = dynamic load rating (N)

Nominal Life

L_h (service life in hours)

$$L_h = \frac{L}{n_m \cdot 60} \quad 7$$

L_h = service life (h)
 L = service life (revolutions)
 n_m = average speed (min⁻¹)

$$\text{Machine service life} = L_h \cdot \frac{\text{Machine operating hours}}{\text{Ball screw operating hours}} \quad 8$$

Drive Torque and Drive Power

Drive torque M_{ta}

for conversion of rotary motion into linear motion:

$$M_{ta} = \frac{F \cdot P}{2000 \cdot \pi \cdot \eta} \quad 9$$

M_{ta} = drive torque (Nm)
 M_{te} = transmitted torque (Nm)
 F = operating load (N)
 P = lead (mm)
 η = mech. efficiency (ca. 0.9)
 η' = mech. efficiency (ca. 0.8)

Transmitted torque M_{te}

or conversion of linear motion into rotary motion:

$$M_{te} = \frac{F \cdot P \cdot \eta'}{2000 \cdot \pi} \quad 10$$

The dynamic drag torque must be taken into account for preloaded nuts.

Drive Power P_a

$$P_a = \frac{M_{ta} \cdot n}{9550} \quad 11$$

P_a = drive power (kW)
 M_{ta} = drive torque (Nm)
 n = speed (min⁻¹)

Calculation Example

Service life

Operating conditions

The service life of the machine should be 40,000 operating hours with the ball screw operating 60% of the time.

Proposed ball screw: 63 x 10

$F_1 = 50\,000\text{ N}$	at	$n_1 = 10\text{ min}^{-1}$	for	$q_1 = 6\%$	of the duty cycle
$F_2 = 25\,000\text{ N}$	at	$n_2 = 30\text{ min}^{-1}$	for	$q_2 = 22\%$	of the duty cycle
$F_3 = 8\,000\text{ N}$	at	$n_3 = 100\text{ min}^{-1}$	for	$q_3 = 47\%$	of the duty cycle
$F_4 = 2\,000\text{ N}$	at	$n_4 = 1\,000\text{ min}^{-1}$	for	$q_4 = 25\%$	of the duty cycle
					100 %

Calculation procedure

Average speed n_m

$$n_m = \frac{6}{100} \cdot 10 + \frac{22}{100} \cdot 30 + \frac{47}{100} \cdot 100 + \frac{25}{100} \cdot 1000 \quad 1$$

$$n_m = 304\text{ min}^{-1}$$

Average load F_m for variable load and variable speed.

$$F_m = \sqrt[3]{50000^3 \cdot \frac{10}{304} \cdot \frac{6}{100} + 25000^3 \cdot \frac{30}{304} \cdot \frac{22}{100} + 8000^3 \cdot \frac{100}{304} \cdot \frac{47}{100} + 2000^3 \cdot \frac{1000}{304} \cdot \frac{25}{100}}$$

$$F_m = 8757\text{ N} \quad 3$$

Required service life L
(revolutions)

The life L can be calculated by transposing the formulas 7 und 8 errechnet werden:

$$L = L_h \cdot n_m \cdot 60$$

$$L_h = \text{Machine operating hours} \cdot \frac{\text{Machine operating hours}}{\text{Ball screw operating hours}}$$

$$L_h = 40000 \cdot \frac{60}{100} = 24000\text{ h}$$

$$L = 24000 \cdot 304 \cdot 60 \quad L = 437\,760\,000\text{ revolutions}$$

Basic dynamic load rating C

$$C = 8757 \cdot \sqrt[3]{\frac{437\,760\,000}{10^6}} \quad 5 \quad C \approx 66492\text{ N}$$

Result and selection

The ball screw can now be selected from the Dimension Tables:

e.g. ball screw, size 63 x 10 R x 6-6, with preloaded single nut with flange FEM-E-S, basic dynamic load rating $C = 88\,800\text{ N}$, part no. 1512-6-4013.

Cross check

Service life of the selected ball screw in revolutions

$$L = \left[\frac{88\,800}{8757} \right]^3 \cdot 10^6 \quad 4 \quad L \approx 1042 \cdot 10^6\text{ revolutions}$$

Life L_h in hours

$$L_h = \frac{1042 \cdot 10^6}{304 \cdot 60} \quad 7$$

$$L_h \approx 57\,167\text{ hours}$$

The life of the selected ball screw assembly is thus greater than the required service life of 24,000 hours (including operating hours). A smaller ball screw could therefore be selected.

STAR – Precision Ball Screw Assemblies

Design Calculations

Critical Speed n_k

The critical speed n_k depends on the diameter of the screw, the type of end fixity and the free length l_n . No allowance may be made for guidance by a nut without preload.

The operating speed should not reach more than 80% of the critical speed.

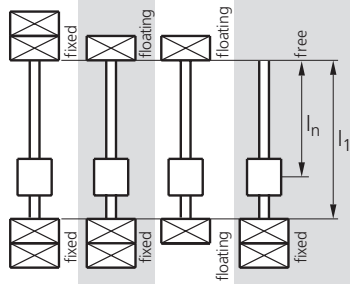
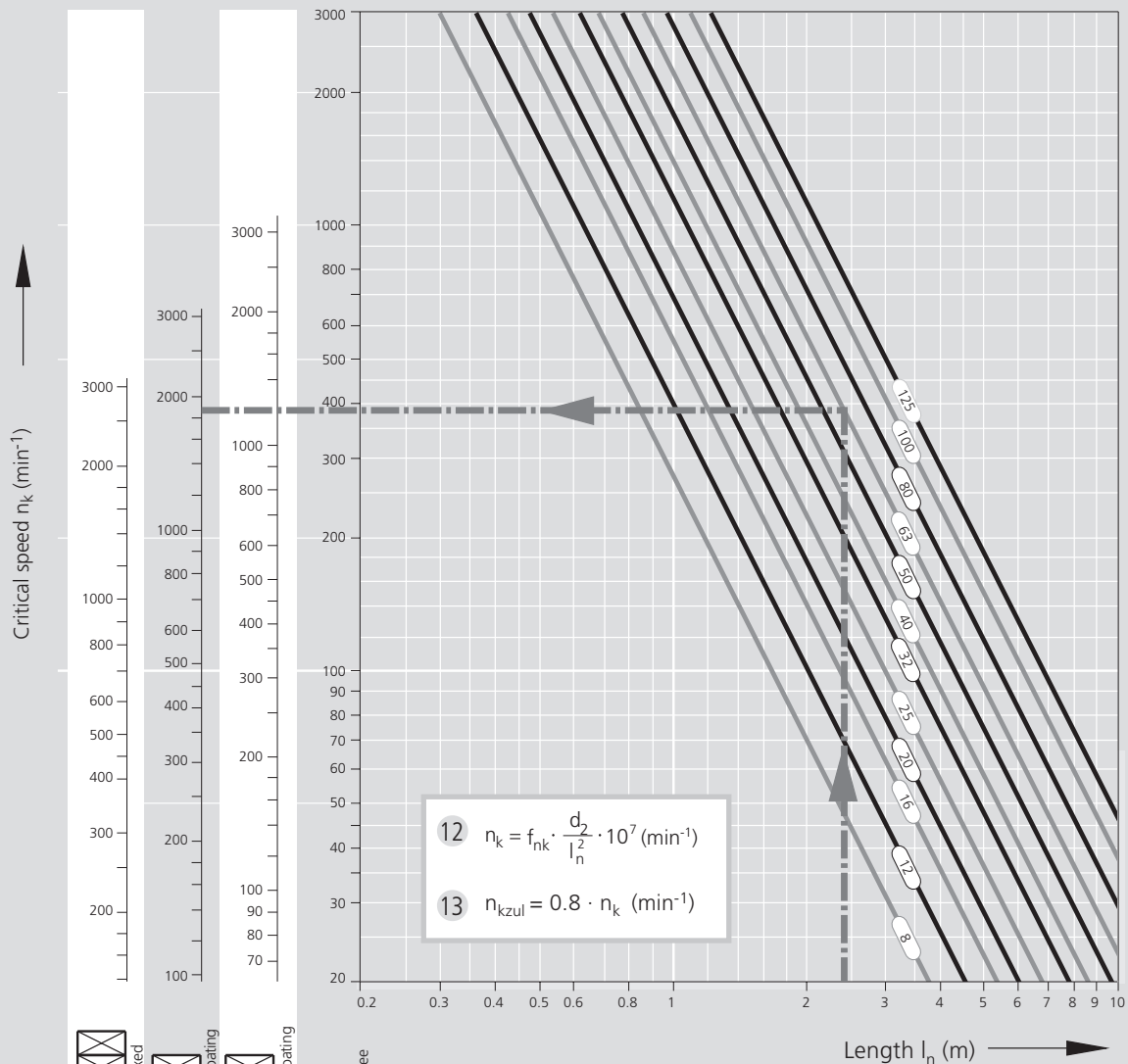
The characteristic speed is to be taken into account, see "General" on page 79.

Example

Screw diameter = 63 mm
 Length l_n = 2.4 m
 End fixity II (fixed - supported)

According to the graph, the critical speed is 1850 min^{-1} .
 The permissible operating speed is thus $1850 \text{ min}^{-1} \times 0.8 = 1480 \text{ min}^{-1}$.

The maximum operating speed in our calculation example of $n_4 = 1000 \text{ min}^{-1}$ is therefore below the permissible operating speed.



End fixity	I	II	III	IV
f_{nk} - value	27.4	18.9	12.1	4.3

- n_k = critical speed (min^{-1})
- n_{kzul} = permissible operating speed (min^{-1})
- f_{nk} = corrector value determined by bearing
- d_2 = root diameter (mm), see Dimension Tables
- l_n = critical length (mm) for preloaded nut systems
- l_1 = threaded length (mm)

Where $l_n = l_1$ for non-preloaded nut systems

Permissible axial load on screw F_k (buckling load)

The permissible axial load on the screw F_k depends on the diameter of the screw, the type of end fixity and the effective free

(unsupported) length l_k . A safety factor of $g \geq 2$ should be taken into consideration when determining the permissible axial load.

Example

Screw diameter = 63 mm,
lead = 10 mm,
Length l_k = 2.4 m
End fixity II (fixed - supported)

According to the graph, the theoretically permissible axial load is 360 kN. A permissible axial load on the screw of $360 \text{ kN} : 2 = 180 \text{ kN}$ is achieved when applying the safety factor 2. This therefore lies above the maximum operating load of $F_1 = 50 \text{ kN}$ used in our calculation example.

$$14 \quad F_k = f_{Fk} \cdot \frac{d_2^4}{l_k^2} \cdot 10^4 \text{ (N)}$$

$$15 \quad F_{kzul} = \frac{F_k}{2} \text{ (N)}$$

F_k = theoretically permissible axial load on screw

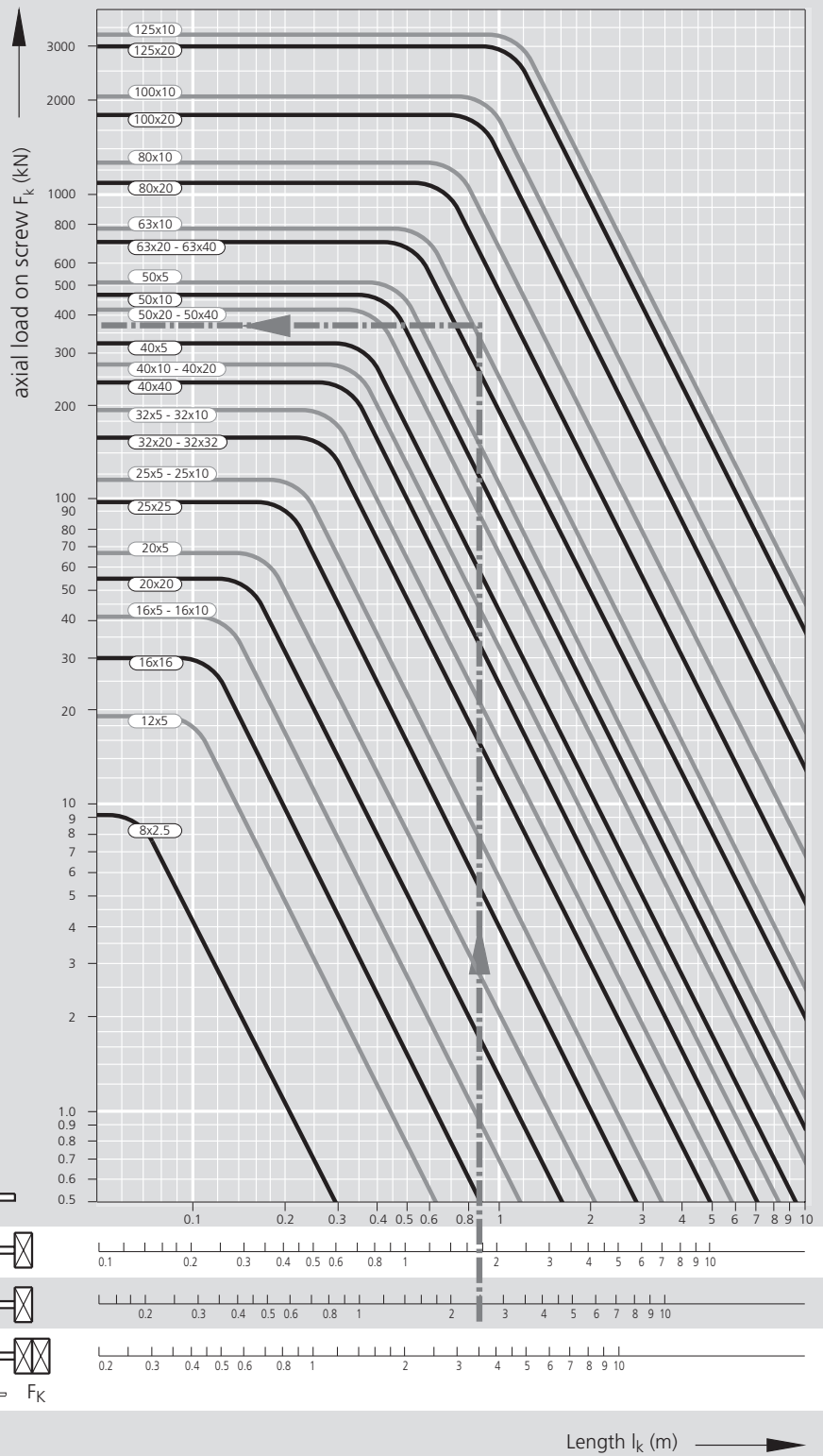
F_{kzul} = permissible axial load during operation

f_{Fk} = corrector value determined by bearing

d_2 = root diameter (mm)
see Dimension Tables

l_k = unsupported threaded length (mm)

f_{Fk} value	End fixity
2.6	IV
10.2	III
20.4	II
40.6	I



STAR – Precision Ball Screw Assemblies

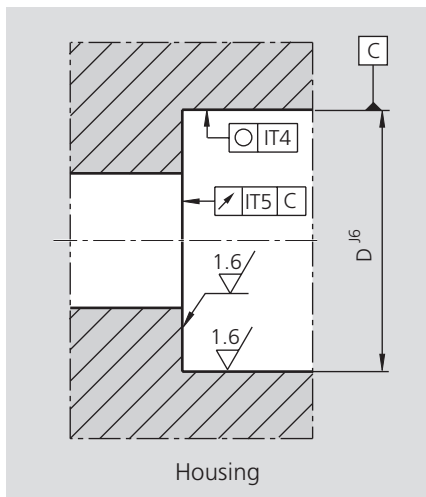
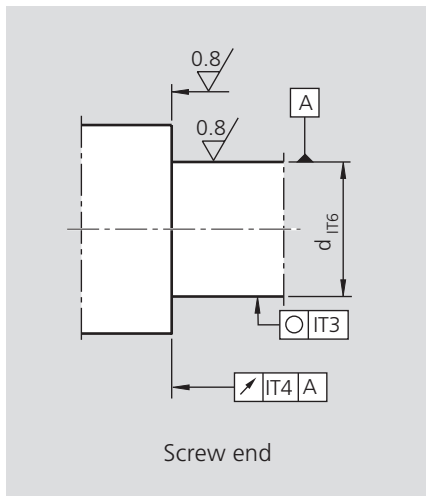
End Bearings, Design Notes, Mounting Instructions

Bearing Design

For customer-machined screw ends, please observe the design notes given for screw ends and housings.

For STAR screw end designs ➡ see “End Machining Details” starting on page 40.

Rexroth STAR delivers complete drive systems, including the end bearings. Calculations are performed with the formulas used in the antifriction bearing industry.



Accuracy

Series	Bore d (mm)	Axial runout	Radial clearance (μm)	Tolerance (μm)		
				Bore	Outer diameter ≤ 50 > 50	Width
LGF-B... LGN-B...	≤ 10	P5 to DIN 620	preloaded	+ 3 - 5	- 10	- 250
	> 10	P5 to DIN 620	preloaded	- 10	- 11 - 13	- 250
LGF-C... LGN-C...	≤ 25	2	preloaded	-5	-10	-500
	> 25	2.5				

Mounting

Angular contact thrust ball bearings and deep-groove ball bearings

When mounting the angular contact thrust ball bearings LGF and LGN, ensure that the mounting forces are exerted only on the bearing rings. Never apply mounting forces via the antifriction bearing elements or the seal rings! The two sections of the inner raceway may not be separated during assembly or disassembly for any reason!

Tighten the mounting screws for screw-down or flange-mounted bearings in cross-wise sequence. The mounting screws may be subjected only to tension amounting to a maximum of 70% of their yielding point. The screw-down (LGF) bearings have a groove on the cylindrical surface of the outer raceway for disassembly. The individual bearings of the bearing pair series LGF-C... and LGN-C... are marked on the cylindrical surfaces of the outer raceways (see diagram). The markings reveal the bearing sequence. The sealing rings should face outward after proper.

Slotted nut NMA, NMZ

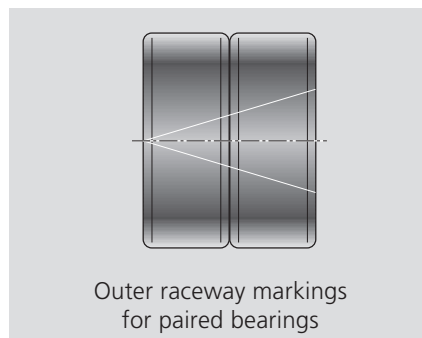
The bearings are preloaded by tightening the nuts.

In order to prevent settling phenomena, we recommend first tightening the slotted nut by twice the value of the tightening torque MA and then easing the load. Only then should the slotted nut be retightened to the specified tightening torque MA.

The two set screws are then alternately tightened using a hexagon socket wrench.

The components are disassembled in the reverse order, i.e. the set screws are to be removed before the slotted nut.

The slotted nuts can be used several times when properly assembled and disassembled by competent personnel. The inner raceways of the bearings are dimensioned in such a way as to achieve a defined bearing preload sufficient for most applications when the slotted nut is tightened (MA in accordance with Dimension Table).



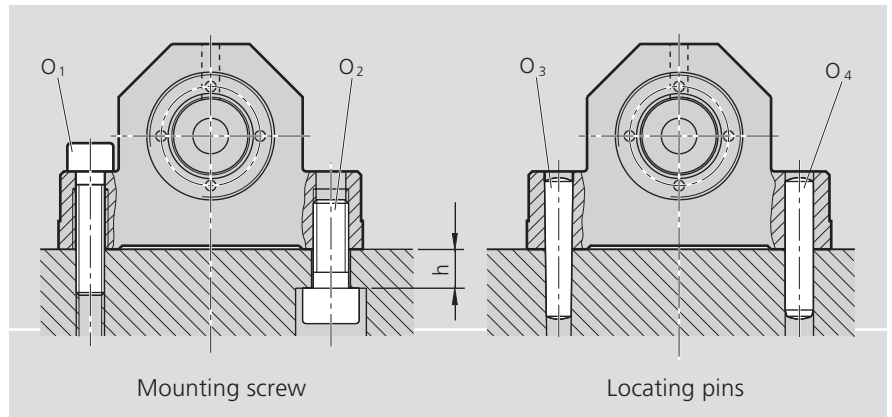
Lubrication, Mounting the Housing

Mounting the Housing SEB

Tighten the pillow block mounting screws in crosswise sequence.
 See table for tightening torque.
 The housing nut fixes the entire bearing unit in the housing.
 Use screws and pins to fix the housing nut in place.

Important:



Take care to align the screw and nut assembly, the bearings and the guideway precisely with one another.



Size d ₀ x P	h (mm)	O ₁ DIN 912	O ₂ DIN 912	O ₃ Tapered pin (hardened) O ₄ Straight pin (DIN 6325)
8 x 2.5	8	M5 x 20	M6 x 16	4 x 20
12 x 5	8	M5 x 20	M6 x 16	4 x 20
16 x 5	11	M8 x 35	M10 x 25	8 x 40
16 x 10	11	M8 x 35	M10 x 25	8 x 40
16 x 16	11	M8 x 35	M10 x 25	8 x 40
20 x 5	11	M8 x 35	M10 x 25	8 x 40
20 x 20	11	M8 x 35	M10 x 25	8 x 40
25 x 5	14	M10 x 40	M12 x 30	10 x 50
25 x 10	14	M10 x 40	M12 x 30	10 x 50
25 x 25	14	M10 x 40	M12 x 30	10 x 50
32 x 5	14	M10 x 40	M12 x 30	10 x 50
32 x 10	14	M10 x 40	M12 x 30	10 x 50
32 x 20	14	M10 x 40	M12 x 30	10 x 50
32 x 32	14	M10 x 40	M12 x 30	10 x 50
40 x 5	16	M12 x 50	M14 x 35	10 x 50
40 x 10	16	M12 x 50	M14 x 35	10 x 50
40 x 20	16	M12 x 50	M14 x 35	10 x 50
40 x 40	16	M12 x 50	M14 x 35	10 x 50

Lubrication of the end bearings

Bearings for ball screw assemblies are lubricated with grease for a lifetime of reliable service. It should be noted, however, that grease lubrication does not facilitate the dissipation of heat in the bearings. The bearing temperature should therefore not exceed 50°C, particularly in machine tool applications. Angular contact thrust bearings of the series LGF, LGN are lubricated for life with grease KPE2K to DIN 51825.

 Strength class of O ₁ ; O ₂	M5	M6	M8	M10	M12	M14	
 Nm	8.8	5.5	9.5	23	46	80	125
	12.9	9.5	16	39	77	135	215

STAR – Precision Ball Screw Assemblies

End Bearings, Calculation

Resulting and equivalent bearing loads

Angular contact thrust ball bearings are preloaded. The chart shows the resulting axial bearing load F_a as a function of preload and axial operating load F_{aB} zeigt das Diagramm.

If the system is primarily subject to axial operating loads, then $F = F_a$.

$\alpha = 60^\circ$	X	Y
$\frac{F_a}{F_r} \leq 2.17$	1.9	0.55
$\frac{F_a}{F_r} > 2.17$	0.92	1

α = pressure angle
X, Y = dimensionless factor
 F_a = resulting bearing load
 F_{aB} = operating load

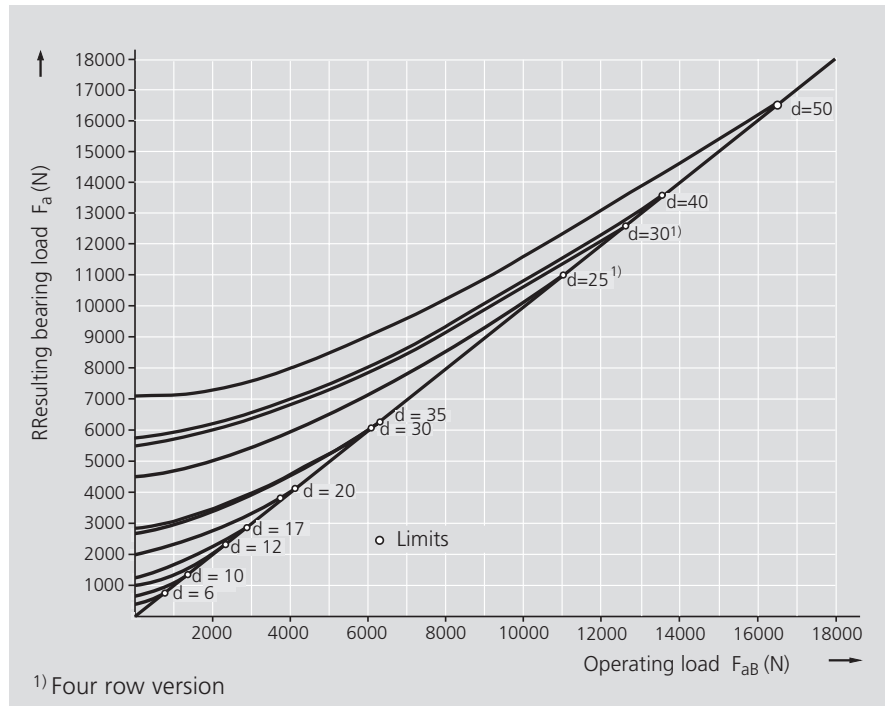
If the radial operating forces are not insignificant, the equivalent bearing loads are calculated according to formula 20.

Bearings for ball screw assemblies are also able to accommodate tilting moments. As a rule, the moments that usually occur due to the weight and drive motion of the screw do not need to be incorporated in the calculation of the equivalent bearing load.

$$F = X \cdot F_r + Y \cdot F_a \quad 20$$

F_r = radial bearing load (N)
 F_a = resulting axial bearing load (N)
 F = equivalent bearing load (N)

Internal preload limit and resulting bearing load



Average speed and average bearing load

If the bearing is subject to varying axial loads over time, the average axial bearing load can be calculated using formula 21. If the speed varies, apply formula 22. In these formulas, the q_i values represent the discrete time steps in %.

If the radial load F_{rm} varies, calculate the average radial load in the same manner.

$$F_{am} = \sqrt[3]{F_1^3 \cdot \frac{n_1}{n_m} \cdot \frac{q_1}{100} + F_2^3 \cdot \frac{n_2}{n_m} \cdot \frac{q_2}{100} + \dots + F_n^3 \cdot \frac{n_n}{n_m} \cdot \frac{q_n}{100}} \quad 21$$

$$n_m = \frac{q_1}{100} \cdot n_1 + \frac{q_2}{100} \cdot n_2 + \dots + \frac{q_n}{100} \cdot n_n \quad 22$$

F_{am} = resulting average axial load (N)
 q = time fraction (%)
 n_m = average speed (min^{-1})

Service life and load safety factor

Nominal life

The nominal life is calculated as follows:

$$L = \left[\frac{C}{F} \right]^3 \quad 23$$

$$L_h = \frac{16666}{n} \left[\frac{C}{F} \right]^3 \quad 24$$

L = nominal life (10⁶ revolutions)
 in millions of revolutions
 L_h = nominal life (h)
 in operating hours
 C = dynamic bearing load rating (N)
 n = average speed (min^{-1})
 F = equivalent bearing load (N)

Static load safety factor

The static load safety factor for machine tools should not be lower than 4.

$$S_0 = \frac{C_0}{F_0} \quad 25$$

S_0 = static load safety factor (-)
 C_0 = static load rating (N)
 F_0 = maximum static load (N)

Friction

The bearing friction torque M_{RL} is primarily dependent on the bearing preload. The influence of the operating load F_{aB} is insignificant as long as it does not exceed the limits at which the bearings have zero clearance. The bearing friction torque M_{RL} specified in the Dimension Tables applies to the preload generated by means of the slotted nut tightening torque R_{aL} . The bearing preload is selected so as to allow it to remain effective even at high operating loads and ensure that the bearing has zero clearance.

The bearing friction torque M_{RL} is measured at a speed of $n = 5 \text{ min}^{-1}$. The friction power loss N_{RL} of the bearing can be calculated using formula 26. The various operating speeds n_i must be incorporated in the heat balance as a function of their time fractions q_i .

$$N_{RL} = \frac{M_{RL} \cdot n}{9.55} \quad 26$$

N_{RL} = friction power loss (W)
 n = speed (min^{-1})
 M_{RL} = bearing friction torque (Nm)

Design Calculation Service Form

Application: New design

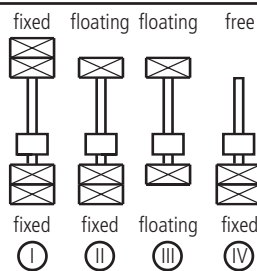
Revises design

Operating conditions

Loads	(N)	Speeds	(1/min)	Discrete time steps	(%)
F_1	=	at n_1	=	to q_1	=
F_2	=	at n_2	=	to q_2	=
F_3	=	at n_3	=	to q_3	=
F_4	=	at n_4	=	to q_4	=
F_5	=	at n_5	=	to q_5	=
F_6	=	at n_6	=	to q_6	=
Average load		Average speed		Sum of time steps	
F_m	=	n_m	=	Q	= 100%
Maximum static load:		N			

Required service life _____ Operating hours or _____ x 10^6 ball screw revolutions

Screw end fixed



Selected:

Installation conditions (enclose drawings/sketches if possible!)

Drawing enclosed

Type of lubrications

Operating temperature: _____ °C - min/max. / _____ °C

Exceptional operating conditions:

Sender

Company: _____
Address: _____

Name: _____
Department: _____
Phone: _____
Fax: _____

Inquiry/Order Form

N.B.: The processing of Inquiries / Orders based on customer drawings is also possible of course.

Example of an order

Ball screw assembly	SEM-E-S	20 x 5R x 3-4	1	2	T7	R	81Z120	41Z120	1250	1	1
Screw	S	20 x 5R x 3	X	X	T7	R	81Z120	41Z120	1250	1	0

Ball screw assembly		x x -									
Screw	S	x x -	X	X							

Ball screw assembly		x x -									
Screw	S	x x -	X	X							

Ball screw assembly		x x -									
Screw	S	x x -	X	X							

Comments:

Enclosures:

Drawing

Other

Quantity Order for..... units, per month, per year, per order or

Comments

Sender

OEM

User

Dealer

Company: _____

Name: _____

Address: _____

Department: _____

Phone: _____

Fax: _____

Great care has been taken during the compilation of this publication to ensure all the information contained is accurate. We accept no responsibility however for any damage resulting from incorrect or incomplete information contained.

For deliveries and other services in the course of commercial business, the general terms and conditions for supplies and services contained in the valid price lists and the confirmations of order apply.

As our products are constantly in the process of further development, they are subject to alteration without notice.



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End Bearings and Nut Housings
RE 83 301/12.99