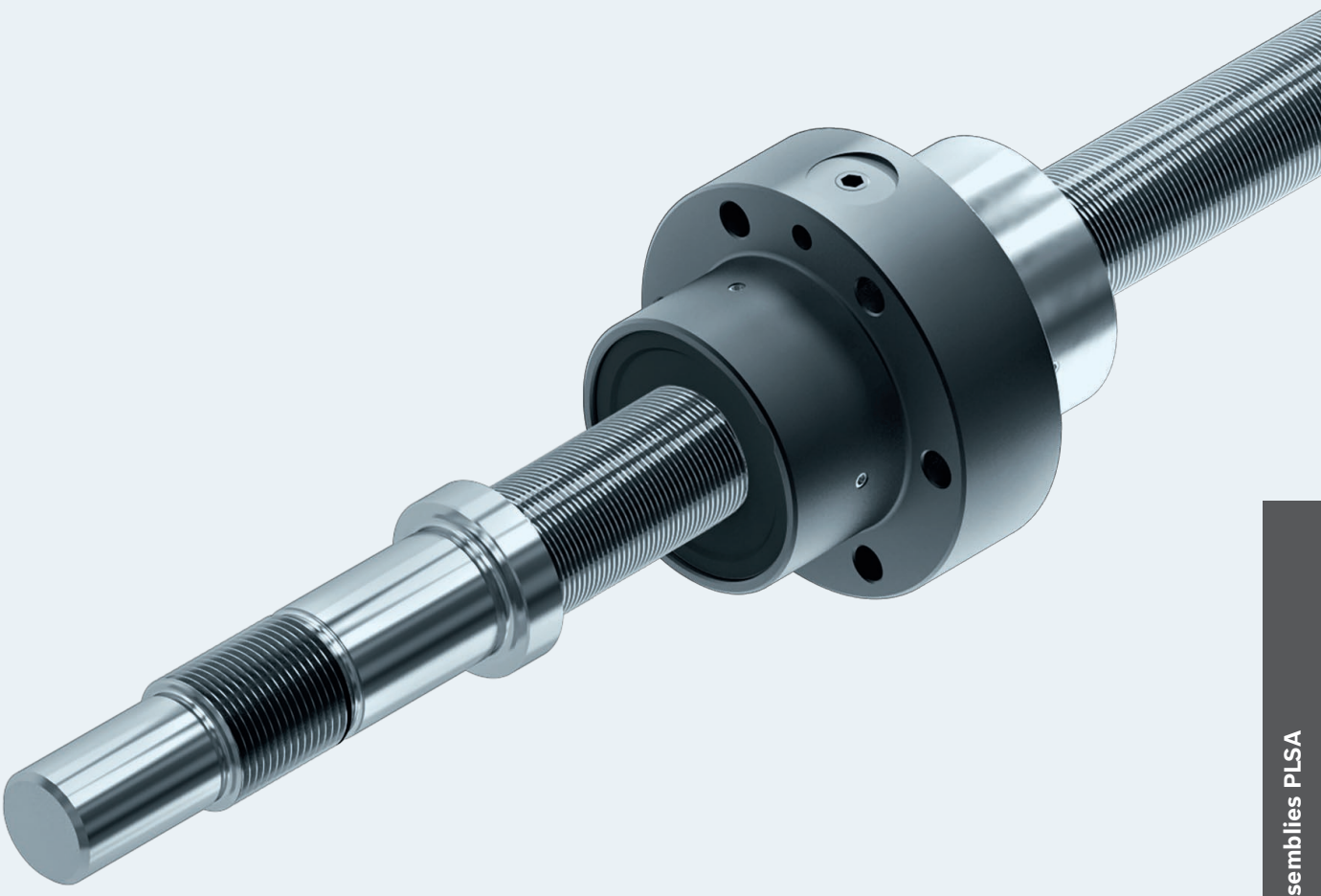
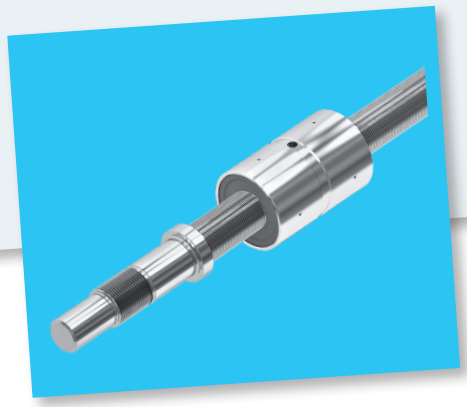
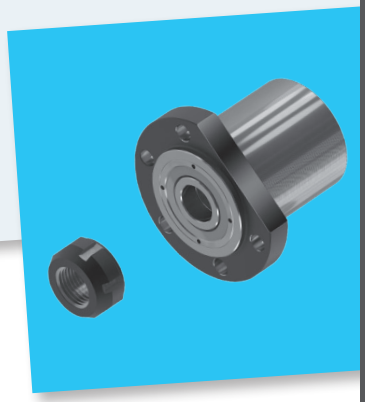
Planetary screw assemblies PLSA







R999001185/2023-09, **Bosch Rexroth AG**

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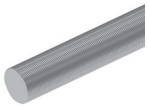
Precision screw PSR Tolerance grades T5, T7, T9		**204**
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	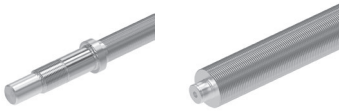	**210**
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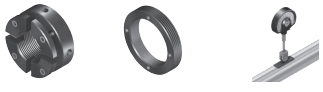
Measuring pads		**248**

Diameter d_0 (mm)	**Lead P** (mm)		
	5	**10**	**20**
20	X	–	–
25	X	X	–
30	X	X	–
39	X	X	–
48	X	X	–
60	–	X	X
75	–	X	X

Planetary screw assembly – definition

The planetary screw assembly PLSA is a complete cylindrical screw assembly with planets as the rolling elements. It serves to convert rotary motion into linear motion and vice versa.
The basic functioning of a planetary screw assembly is easy to describe, but the range of designs and the requirements for practical applications are many and varied.
Planetary screw assemblies are designed to transmit high forces and thus round off the upper end of the screw assembly product portfolio.
Planetary screw assemblies are drive technology screw assemblies in which threaded rollers (the planets) are housed in a threaded nut, their ends being lodged in discs with holes arranged around a pitch circle so that they rotate axially parallel to the special threaded screw, causing the nut to move linearly along the screw.

Rexroth planetary screw assemblies offer design engineers many opportunities to solve transport and positioning tasks with a driven screw. At Rexroth you will be sure to find exactly the kind of tailor-made products you need for special applications.

Structural design:
Both the screw and the nut have an identical multi-start profile with a flank angle of 90°.
The planets have journals at both ends, which are lodged in holes bored in the guide discs. The toothed ends of the planets engage with the internal gear rims of the nut. The planets have single-start threads and crowned flanks that roll without slipping along the nut threads.

At each end of the nut there are internally geared rims which engage with the external gearing on the planets. Guide discs inside the gear rims support the planets' journals and ensure that they are correctly spaced. The discs also prevent coarse dirt from working its way into the nut.

Versions:
- Cylindrical single nut with backlash or preload (ZEM-E-S)
- Single nut with flange with backlash or preload (FEM-E-S)

Precision screws PSR

Bosch Rexroth has a long tradition of manufacturing precision screws. Offered in many sizes and in unmatched quality, these have been an integral part of our ball screw assembly product range for years.

We have now transferred this tried and trusted manufacturing technology to the screws of our panetary screw assemblies.
For users, this results in many advantages, including the following:
- Identical quality to Rexroth ball screw assemblies
- Fast delivery
- Attractive prices thanks to cost-effective manufacturing

Benefits

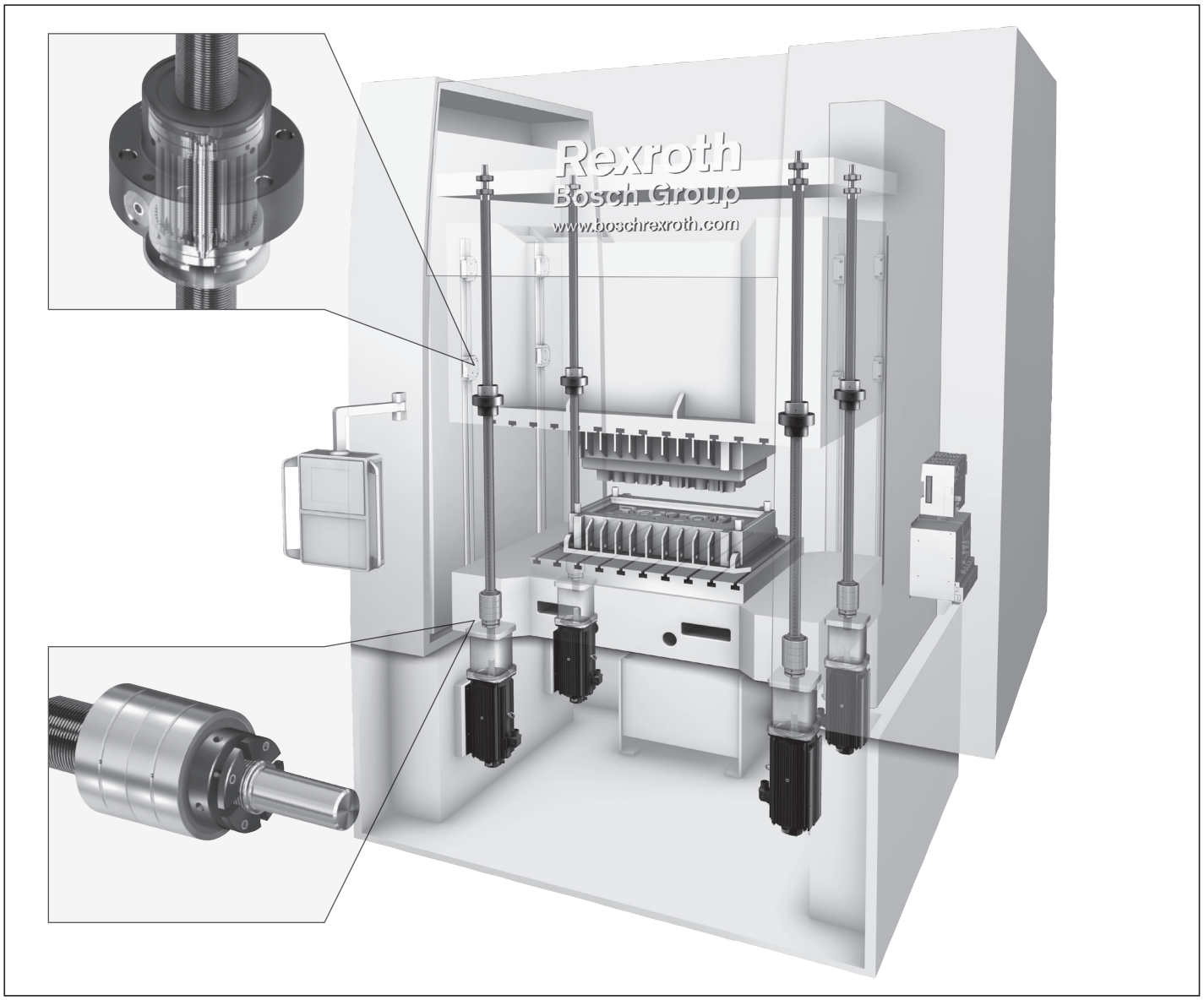
- Smooth functioning due to the principle of synchronized planets
- Very low noise
- High linear travel speeds
- Large number of contact points
- High load ratings
- High mechanical efficiency
- Long service life
- Compact design
- High power density
- Effective, wiping sealing
- Low lubricant consumption
- Pre-tensioned units available
- High positioning accuracy and repeatability

Sample applications

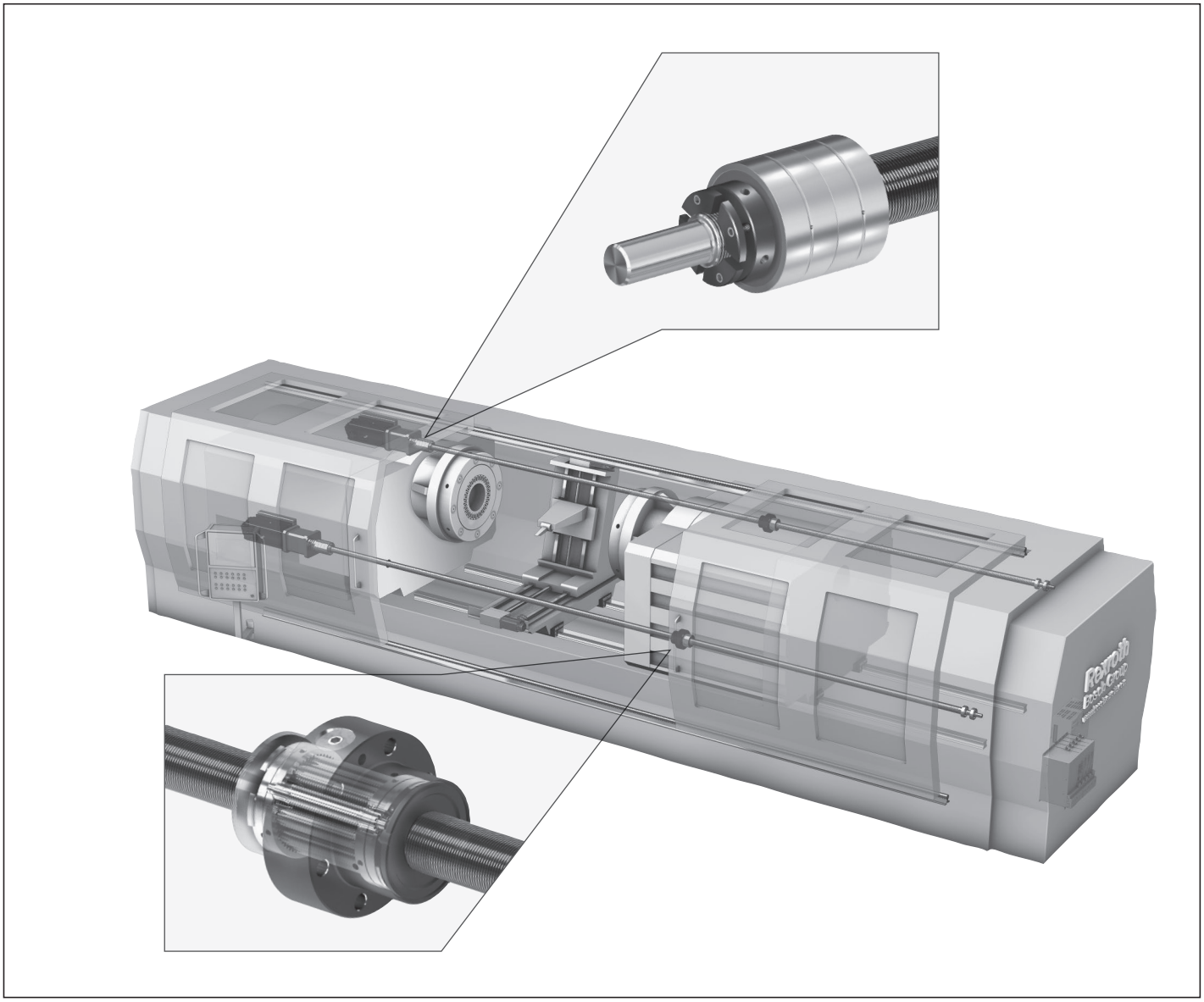
Rexroth planetary screw assemblies are used with great success in many different application areas:

- Plastic injection molding machines
- Machine tools
- Measuring and material testing machines
- Robots
- Automotive industry
- Aerospace industry
- Automation and handling
- Food and packaging industries
- Printing and paper industry
- Medical technology
- Cutting operations
- Forming operations
- Metals industry

Electric press



Friction welding machine



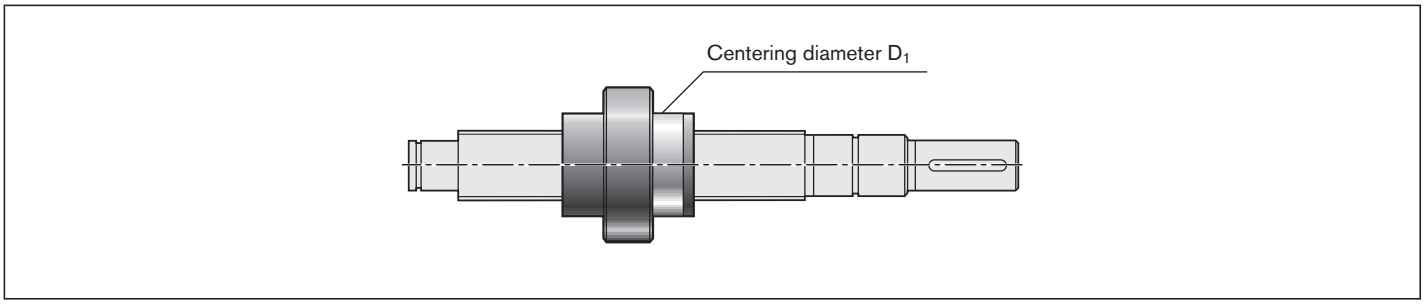
Identification system for short product names PLSA / ordering data

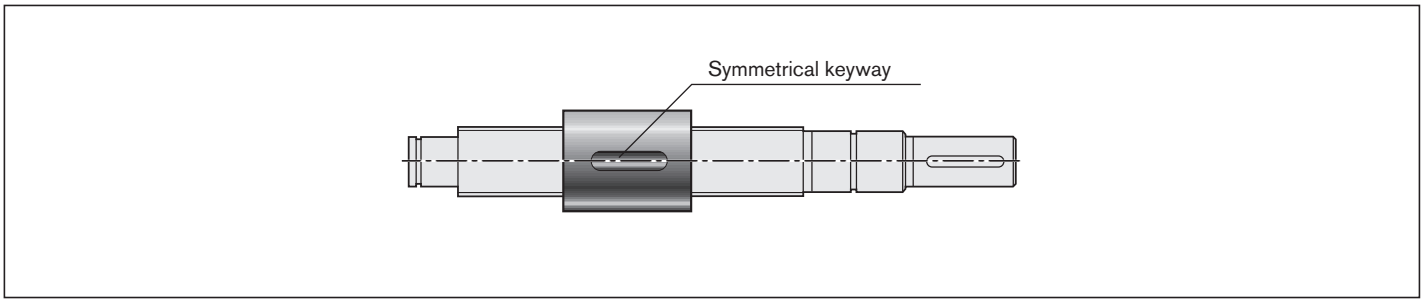
Planetary screw assembly	**PLSA**	**20 x 5 R**	**FEM-E-S**	**00**	**1**	**0**	**T7**	**R**	**812**	**Z**	**120**	**412**	**Z 120**	**1250**	**1**	**1**

Size	Nominal diameter (mm)	
	Lead (mm)	
	Direction of lead, **R** ... right	
Nut type	ZEM-E-S Cylindrical Single Nut	
	FEM-E-S Single nut with flange	
Nut rework	**00** ... no rework	
Sealing system	0 ... without	4 ... gap-type seal (standard)
	1 ... lip-type seal	5 ... Wiper
Preload classes	**0** ... C0 (standard backlash)	
	1 ... C2 (average preload)	
Accuracy	T5, **T7**, T9	
Screw	**R** ... Precision screw	
Left screw end	Form:	... standard form
	Option:	**Z**... centering as per DIN 332-D
		S... hex socket
		G... female thread
		K ... none
	Versions:	
Right screw end	... see left screw end	
Overall length [mm]		
Documentation	**1** ... standard (acceptance test report)	5 ... Two-point compensation
	2 ... torque test report	6 ... lead and torque test report
	3 ... lead test report	
Lubrication	**1** ... preserved and nut with basic greasing	
	2 ... preserved	

Mounting direction of nut types

Definition: The centering diameter on nuts with a flange points to the right end of the screw. The mounting direction for cylindrical nuts is freely selectable (symmetrical).





Overview of formats

ZEM-E-S

FEM-E-S

Abbreviations

C	=	dynamic load rating
C_0	=	static load rating
d_0 x P	=	size
d_0	=	nominal diameter
F_{aB}	=	axial breaking load of slotted nut
G	=	female thread
J_s	=	moment of inertia
n_G	=	limit speed (grease)
No.	=	part number
M_A	=	tightening torque of slotted nut
M_{AG}	=	tightening torque of set screw
M_{RL}	=	bearing friction torque with seal
M_p	=	Maximum permissible drive torque (condition: no radial load at drive journal)
R_{fb}	=	rigidity (axial)
R_{kl}	=	rigidity against tilting
P	=	lead (R = right-hand)
v_{max}	=	maximum speed
S	=	hex socket
Z	=	centering hole

Cylindrical single nut ZEM-E-S

- With standard seals
- Preload class: C0, C2
- For precision screws PSR in tolerance grade T5, T7, T9 (with backlash only)

Note: Delivered only as a complete unit

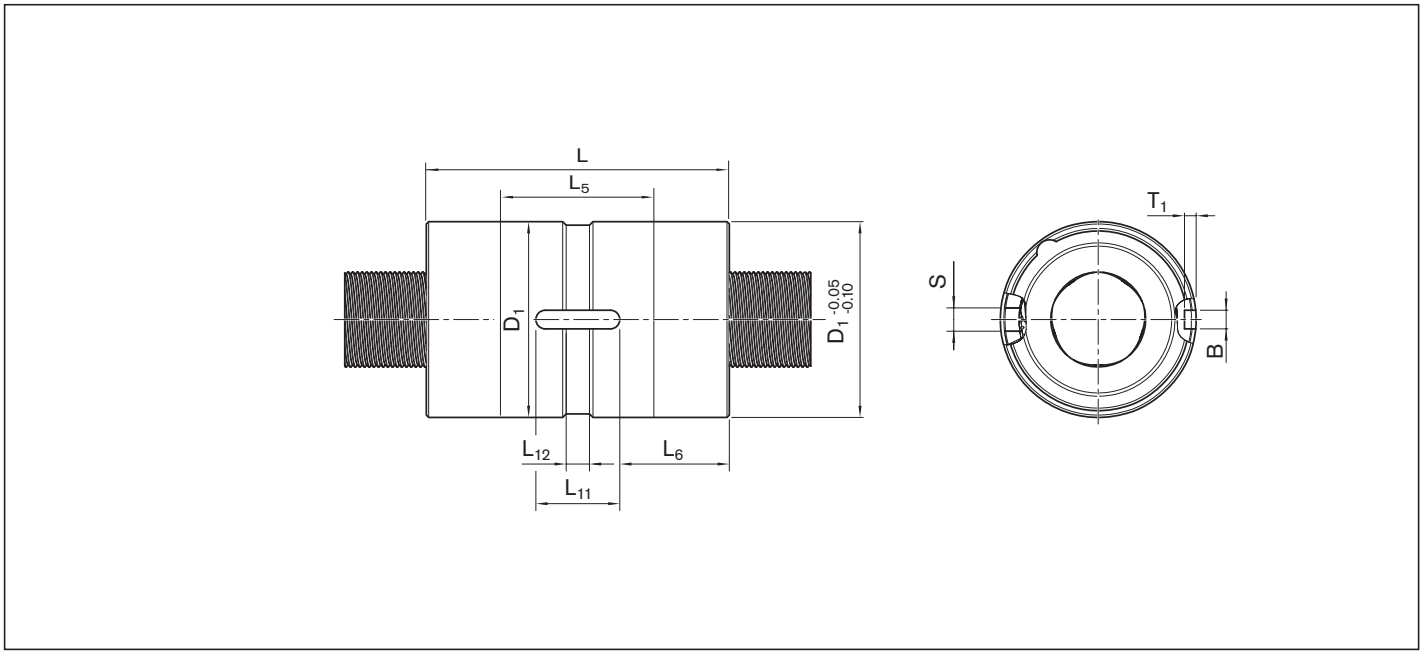
Ordering code PLSA:

PLSA	20 x 5R	ZEM-E-S	00	4	0	T7	R	822Z150	412Z120	1250	1	1

d_0 x P	no.	C [1] (kN)	C_0 [1] (kN)	v_{max} [2] (m/min)
20 x 5R	R157C A10 03	55	80	37.5
20 x 5R	R157C A10 13	55	80	37.5
25 x 5R	R157C 210 03	65	122	30.0
25 x 10R	R157C 230 03	74	118	60.0
30 x 5R	R157C 310 13	87	178	25.0
30 x 10R	R157C 330 03	101	174	50.0
39 x 5R	R157C 410 03	123	269	19.2
39 x 10R	R157C 430 03	145	271	38.4
48 x 5R	R157C 610 03	188	481	15.6
48 x 10R	R157C 630 03	220	475	31.2
60 x 10R	R157C 730 03	322	780	25.0
60 x 20R	R157C 770 03	375	786	50.0
75 x 10R	R157C 830 03	480	1,487	20.0
75 x 20R	R157C 870 03	544	1,496	40.0

1) The load ratings are valid for tolerance grade T5 only.
For other tolerance grades, please consider the correction factor f_{ac} on page 251.
2) See “Characteristic speed” on page 251 and “Critical speed n_{cr}” on page 270

For the codes, see the chapter entitled “Abbreviations”

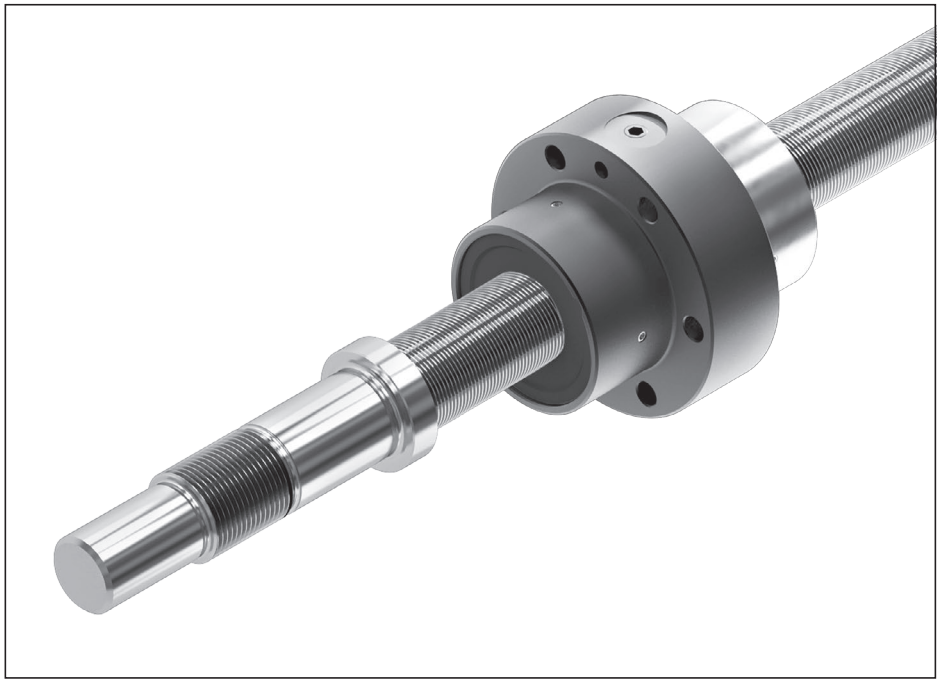


d_0 x P	(mm)									Mass
	B P9	$D_{1\ g6}$	L	L_5	L_6	L_{11} +0.2	L_{12}	T_1 +0.1	S	m (kg)
20 x 5R	4	42	65	34	23.5	18	5.0	2.5	2	0.62
20 x 5R	5	45	64	34	22.0	20	5.0	3.0	2	0.72
25 x 5R	6	53	78	50	26.5	25	5	3.5	5	0.72
25 x 10R	6	53	78	50	26.5	25	5	3.5	5	0.72
30 x 5R	6	64	85	53	26.5	32	5.0	3.5	5	1.25
30 x 10R	6	64	85	53	26.5	32	5.0	3.5	5	1.25
39 x 5R	8	80	100	64	30.0	40	7.0	4.0	5	2.00
39 x 10R	8	80	100	64	30.0	40	7.0	4.0	5	2.00
48 x 5R	8	100	127	87	41.0	45	7.0	4.0	5	4.20
48 x 10R	8	100	127	87	41.0	45	7.0	4.0	5	4.20
60 x 10R	10	122	152	99	53.5	45	10.5	5.0	5	6.82
60 x 20R	10	122	152	99	53.5	45	10.5	5.0	5	6.80
75 x 10R	10	150	191	129	64.0	63	10.5	5.0	5	14.00
75 x 20R	10	150	191	129	64.0	63	10.5	5.0	5	13.70

Single nut with flange FEM-E-S

- With standard seals
- Preload class: C0, C2
- For precision screws PSR in tolerance grade T5, T7, T9 (with backlash only)

Note: Delivered only as a complete unit



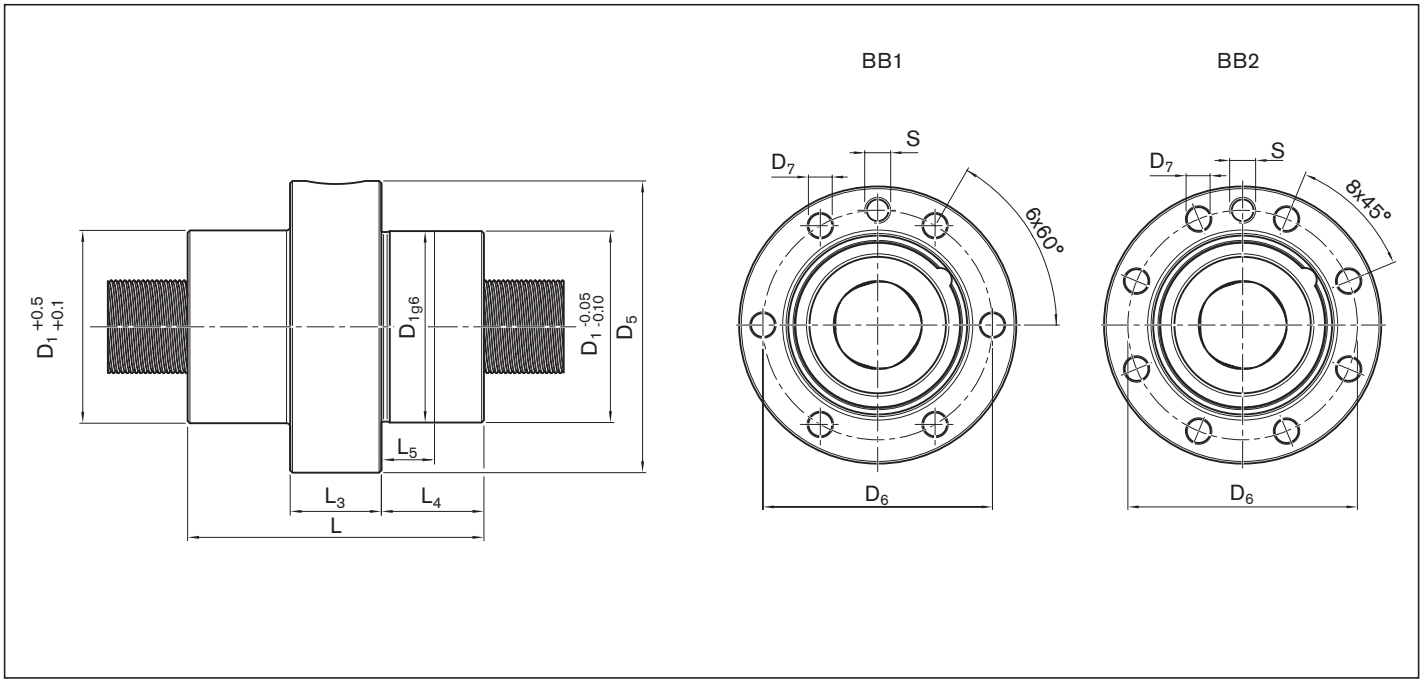
Ordering code PLSA:

PLSA	20 x 5R	FEM-E-S	00	4	0	T5	R	812Z150	412Z120	1100	1	1

d_0 x P	no.	C[1] (kN)	C_0[1] (kN)	v_{max}[2] (m/min)
20 x 5R	R157C A10 01	55	80	37.5
20 x 5R	R157C A10 11	55	80	37.5
25 x 5R	R157C 210 01	65	122	30.0
25 x 10R	R157C 230 01	74	118	60.0
30 x 5R	R157C 310 11	87	178	25.0
30 x 10R	R157C 330 01	101	174	50.0
39 x 5R	R157C 410 01	123	269	19.2
39 x 10R	R157C 430 01	145	271	38.4
48 x 5R	R157C 610 01	188	481	15.6
48 x 10R	R157C 630 01	220	475	31.2
60 x 10R	R157C 730 01	322	780	25.0
60 x 20R	R157C 770 01	375	786	50.0
75 x 10R	R157C 830 01	480	1,487	20.0
75 x 20R	R157C 870 01	544	1,496	40.0

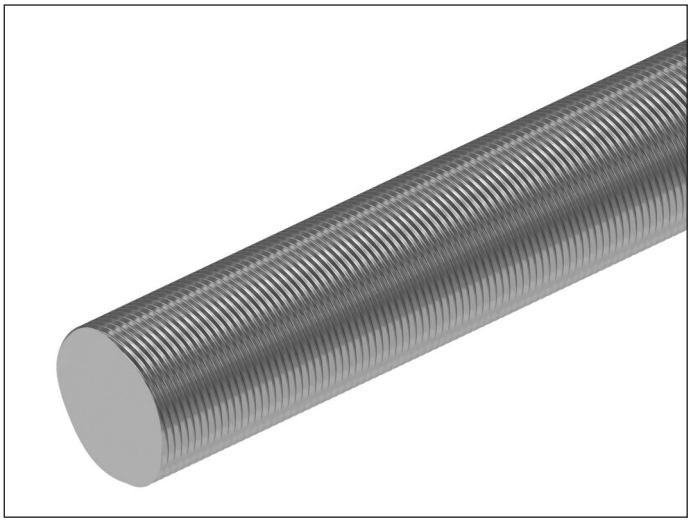
1) The load ratings are valid for tolerance grade T5 only.
For other tolerance grades, please consider the correction factor f_{ac} on Page 251.
2) See “Characteristic speed” on page 251 and “Critical speed n_{cr}” on page 270

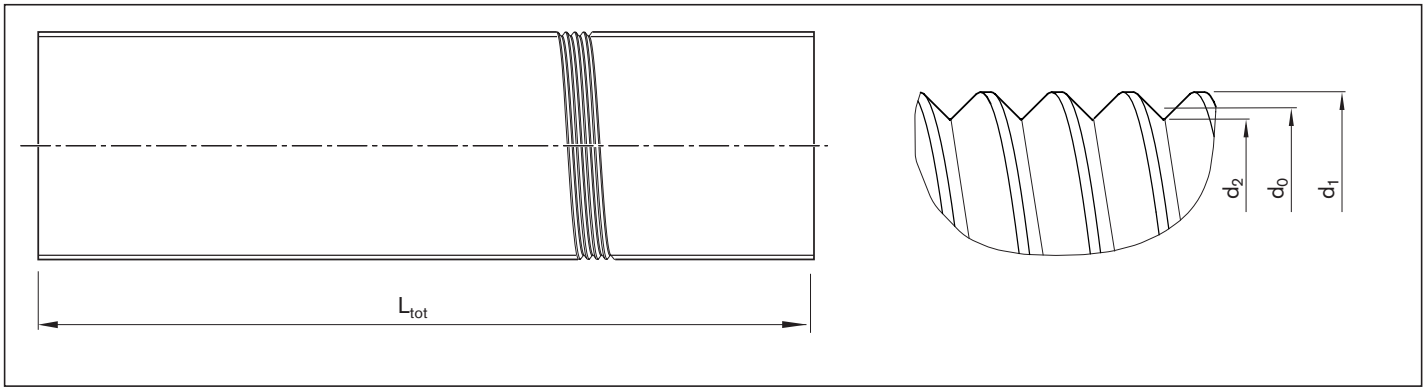
For the codes, see the chapter entitled “Abbreviations”



d_0 x P	(mm)										
	D_1	D_5	Hole pattern	L	D_6	D_7	L_3	L_4	L_5	S	**m** (kg)
20 x 5R	42	64	BB1	65	53	5.5	20.0	22.5	11.0	M6	0.65
20 x 5R	45	68	BB1	64	56	5.5	18.0	23.0	11.0	M6	0.75
25 x 5R	56	84	BB1	78	70	6.6	20.0	29.0	15.0	M6	1.34
25 x 10R	56	84	BB1	78	70	6.6	20.0	29.0	15.0	M6	1.34
30 x 5R	64	98	BB1	85	81	9.0	27.0	29.0	13.0	M6	2.10
30 x 10R	64	98	BB1	85	81	9.0	27.0	29.0	13.0	M6	2.10
39 x 5R	80	124	BB1	100	102	11.0	33.0	33.5	15.5	M6	3.70
39 x 10R	80	124	BB1	100	102	11.0	33.0	33.5	15.5	M6	3.70
48 x 5R	105	150	BB1	127	127	13.5	37.0	45.0	25.0	M8 x 1	7.60
48 x 10R	105	150	BB1	127	127	13.5	37.0	45.0	25.0	M8 x 1	7.60
60 x 10R	122	180	BB1	152	150	17.5	45.0	53.5	27.0	M8 x 1	11.30
60 x 20R	122	180	BB1	152	150	17.5	45.0	53.5	27.0	M8 x 1	11.30
75 x 10R	150	210	BB2	191	180	17.5	45.0	73.0	42.0	M8 x 1	19.40
75 x 20R	150	210	BB2	191	180	17.5	45.0	73.0	42.0	M8 x 1	20.20

Precision screw PSR





d_0 x P	(mm)					Mass
			Length		J_s	m
	d_1	d_2	Standard	on request	(kgcm²/m)	(kg/m)
20 x 5R	20.3	19.5	1,500	2,500	1.22	2.45
25 x 5R	25.3	24.1	3,000	5,000	2.99	3.85
25 x 10R	25.6	24.0			2.96	3.82
30 x 5R	30.3	29.5			6.21	5.54
30 x 10R	30.5	29.1			6.15	5.51
39 x 5R	39.3	38.5			17.64	9.36
39 x 10R	39.5	38.1			17.64	9.33
48 x 5R	48.3	47.5			40.88	14.21
48 x 10R	48.5	47.1			40.62	14.16
60 x 10R	60.5	59.1			99.38	22.15
60 x 20R	61.1	58.1			98.38	22.03
75 x 10R	75.5	74.1			243.37	34.67
75 x 20R	76.1	73.1			241.32	34.51

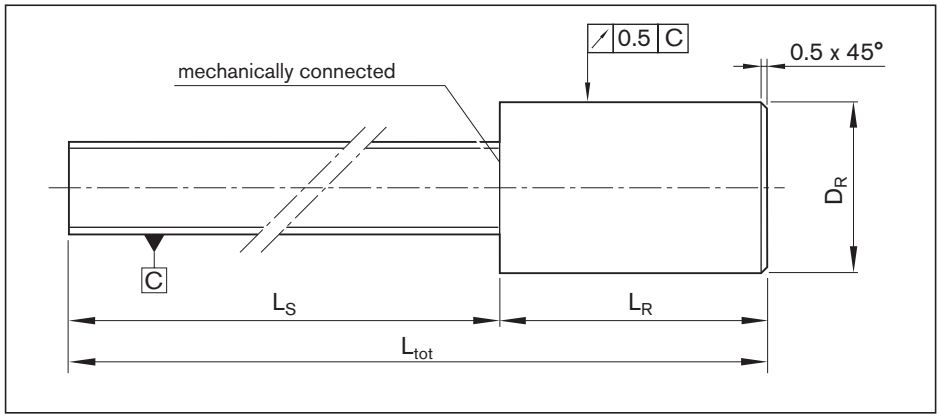
Precision screws PSR, with mechanically connected screw ends

These screws consist of
- a precision screw part and
- an unmachined spigot (as the screw journal).

The spigot is mechanically connected on one side and is available in different sizes.

To prevent problems arising when using big end bearing journals (for example, visible thread grooves or axial contact faces that are too small for the fixed bearing), we offer appropriate solutions.
Please consult us.

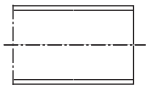
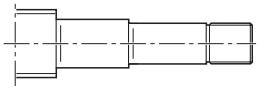
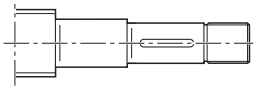
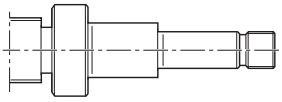
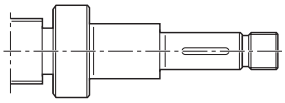
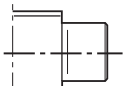
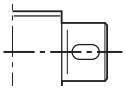
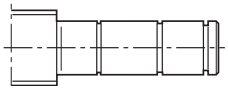
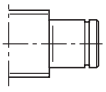
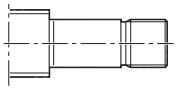
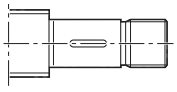
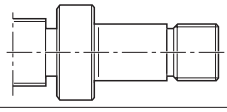
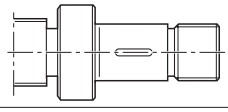
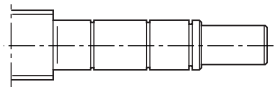
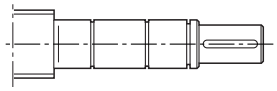
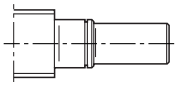
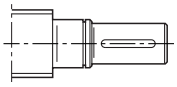
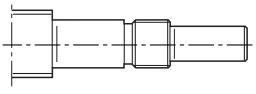
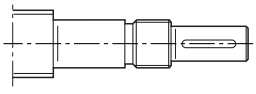
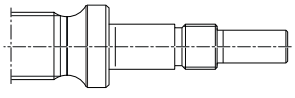
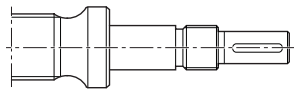
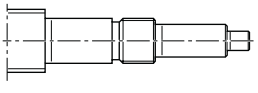
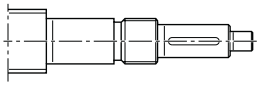
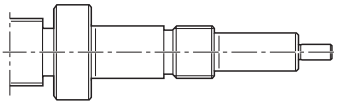
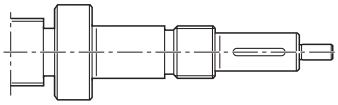
Separate delivery of a screw without end machining and without nut is not planned.



d_0 x P (mm)	Tolerance grade	(mm)			
		D_R −1	L_R +2	L_{tot}	L_S
20 x 5R	T5	36.40	200	1,700	1,500
25 x 5R/10R		36.40	200	1,700	1,500
30 x 5R/10R		46.10	250	2,050	1,800
39 x 5R/10R		76.25	400	2,300	1,900
48 x 5R/10R		80.40	400	2,300	1,900
60 x 10R/20R		98.30	600	3,500	2,900
75 x 10R/20R		110.40	600	3,500	2,900

Overview of screw ends:

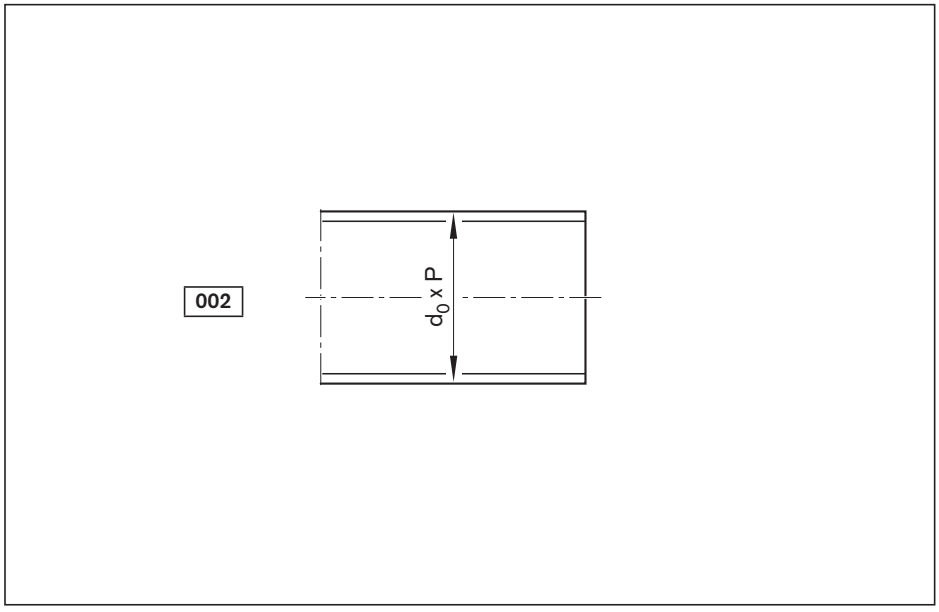
Screw ends, forms for a left or right screw end

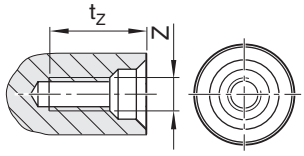
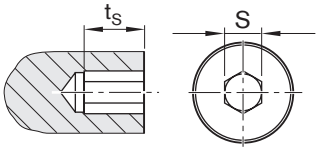
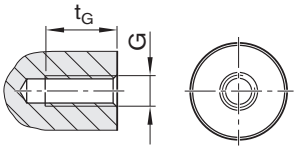
Basic version			with keyway		
002		Page 207			
112		Page 208	122		Page 208
132		Page 210	142		Page 210
212		Page 212	222		Page 212
312		Page 214			
412		Page 216			
512		page 218	522		page 218
532		page 220	542		page 220
612		page 222	622		page 222
712		page 224	722		page 224
812		Page 226	822		Page 226
832		Page 228	842		Page 228
912		page 230	922		page 230
932		page 232	942		page 232

Abbreviations

C	=	dynamic load rating
C_0	=	static load rating
d_0 x P	=	size
d_0	=	nominal diameter
F_{aB}	=	axial breaking load of slotted nut
G	=	female thread
n_G	=	limit speed (grease)
No.	=	part number
M_A	=	tightening torque of slotted nut
M_{AG}	=	tightening torque of set screw
M_{RL}	=	bearing friction torque with seal
M_p	=	maximum permissible drive torque (condition: no radial load at drive journal)
R_{fb}	=	rigidity (axial)
R_{kl}	=	rigidity against tilting
P	=	lead (R = right-hand)
S	=	hex socket
Z	=	centering hole

Form 002



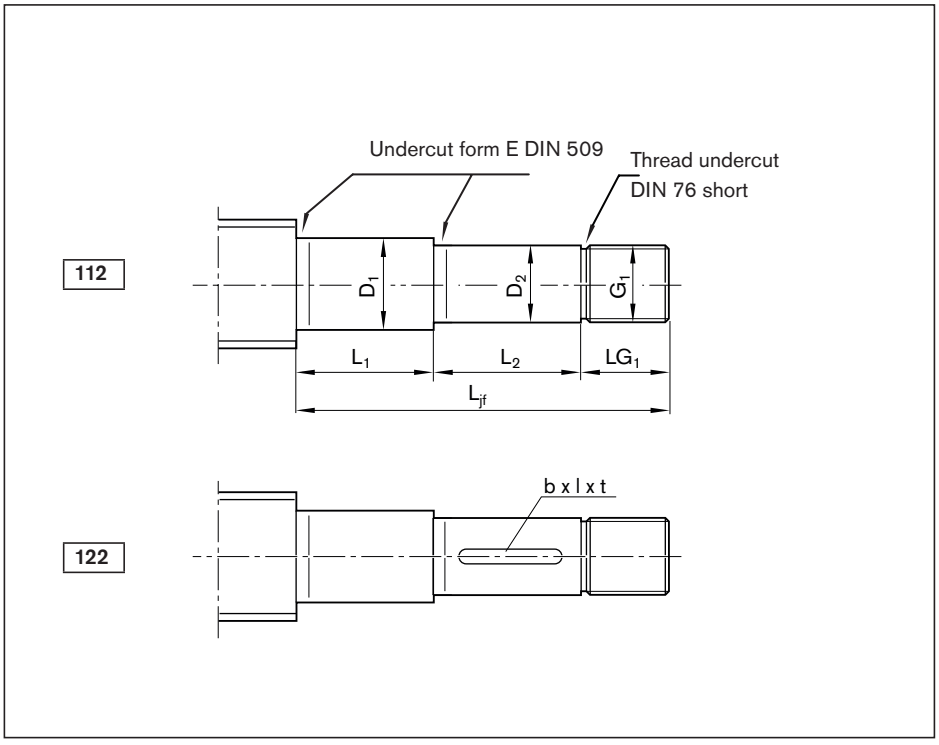
Option (machining of end face)	
K	None
Z	
S	
G	

Ordering data:

PLSA	20 x 5R	FEM-E-S	00	1	0	T7	R	002K200	822K150	1250	1	1

Form	Version	Size	(mm)					
		d_0 x P	Z	t_Z	S	t_S	G	t_G
002	**200**	**20 x 5**	M6	16.0	8	8	M6	9
	250	**25 x 5/10**	M8	19.0	10	10	M8	12
	300	**30 x 5/10**	M10	22.0	12	12	M10	15
	390	**39 x 5/10**	M12	28.0	14	14	M12	18
	480	**48 x 5/10**	M16	36.0	17	17	M16	24
	600	**60 x 10/20**	M20	42.0	17	17	M20	30
	750	**75 x 10/20**	M20	42.0	19	19	M24	36

Form 112, 122



Option (machining of end face)	
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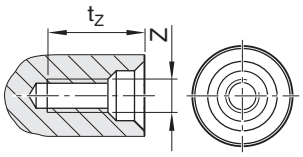
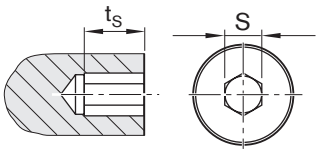
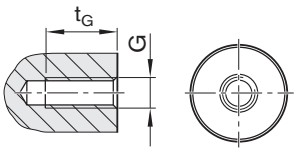
Z	
S	
G	

Ordering data:

PLSA	20 x 5R	FEM-E-S	00	1	0	T7	R	122Z151	412K120	1250	1	1

Form	Version[1]	Size	(mm)							DIN 6885[2] keyway								
		d_0 x P	L_{jf}	D_1 h6	L_1	D_2 h7	L_2	G_1	LG_1	b P9	l	t	Z	t_Z	S	t_S	G	t_G
112	**150**	**20x5**	60	15	23	12	25	M12x1	12	4	20	2.5	M4	10.0	4	4	M5	8
122[2]	**151**	**20x5**	87	15	50	12	25	M12x1	12	4	20	2.5	M4	10.0	4	4	M5	8
	170	**25x5**	100	17	48	15	30	M15x1	22	5	25	3,0	M5	12,5	4	4	M6	9
	170	**25x10**	100	17	48	15	30	M15x1	22	5	25	3,0	M5	12,5	4	4	M6	9
	171	**25x5**	106	17	54	15	30	M15x1	22	5	25	3.0	M5	12.5	4	4	M6	9
	171	**25x10**	106	17	54	15	30	M15x1	22	5	25	3.0	M5	12.5	4	4	M6	9
	200	**30x5**	116	20	54	18	40	M17x1	22	6	28	3.5	M6	16.0	5	5	M6	9
	200	**30x10**	116	20	54	18	40	M17x1	22	6	28	3.5	M6	16.0	5	5	M6	9
	201	**30x5**	120	20	58	18	40	M17x1	22	6	28	3.5	M6	16.0	5	5	M6	9
	201	**30x10**	120	20	58	18	40	M17x1	22	6	28	3.5	M6	16.0	5	5	M6	9
	300	**39x5**	130	30	54	28	50	M25x1.5	26	8	36	4.0	M10	22.0	8	8	M10	15
	300	**39x10**	130	30	54	28	50	M25x1.5	26	8	36	4.0	M10	22.0	8	8	M10	15
	301	**39x5**	150	30	74	28	50	M25x1.5	26	8	36	4.0	M10	22.0	8	8	M10	15
	301	**39x10**	150	30	74	28	50	M25x1.5	26	8	36	4.0	M10	22.0	8	8	M10	15
	350	**48x5**	152	35	66	32	60	M30x1.5	26	10	40	5.0	M10	22.0	10	10	M12	18
	350	**48x10**	152	35	66	32	60	M30x1.5	26	10	40	5.0	M10	22.0	10	10	M12	18
	351	**48x5**	168	35	82	32	60	M30x1.5	26	10	40	5.0	M10	22.0	10	10	M12	18
	351	**48x10**	168	35	82	32	60	M30x1.5	26	10	40	5.0	M10	22.0	10	10	M12	18
	450	**60x10**	186	45	98	42	60	M40x1.5	28	12	50	5.0	M16	36.0	12	12	M16	24
	450	**60x20**	186	45	98	42	60	M40x1.5	28	12	50	5.0	M16	36.0	12	12	M16	24
	600	**75x10**	234	60	122	58	80	M50x1.5	32	16	63	6.0	M16	36.0	17	17	M20	30
	600	**75x20**	234	60	122	58	80	M50x1.5	32	16	63	6.0	M16	36.0	17	17	M20	30

1) The allocation of screw ends to the bearing assemblies is clearly defined by the version.
2) Keyway with form 122 only
3) Under preparation

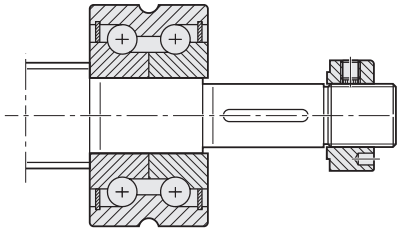
End bearings for screw ends form 112, 122

The bearing assemblies LAF, LAN, LAS consist of:
- 1 bearing
- 1 slotted nut

LAF

LAN

Application



Separate technical dimensioning of the permissible drive torque is absolutely necessary.

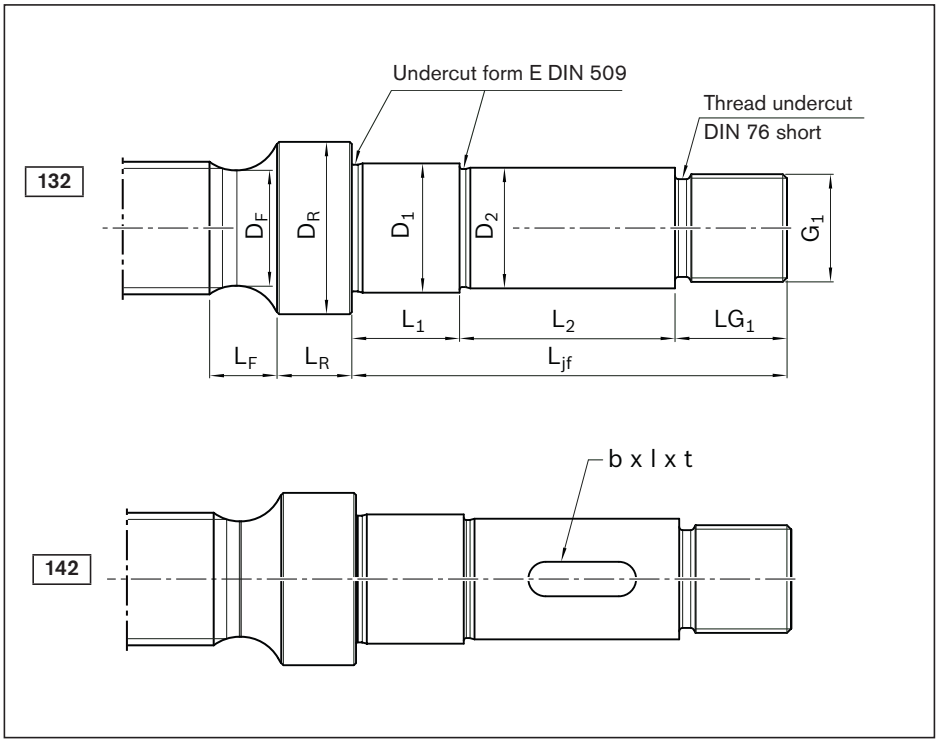
LAS

NMZ

	Version[1)]	M_p (Nm)	Bearing assembly		
			LAF Part number	LAN Part number	LAS Part number
	150	7.4	R159A 015 01	R159A 115 01	–
	151	7.4	–	–	R159A 415 01
	170	12.8	[3)]	[3)]	–
	170	19.9	[3)]	[3)]	–
	171	12.8	–	–	R159A 417 02
	171	19.9	–	–	R159A 417 02
	200	16.9	R159A 320 01	R159A 220 01	–
	200	27.4	R159A 320 01	R159A 220 01	–
	201	16.9	–	–	R159A 420 02
	201	27.4	–	–	R159A 420 02
	300	36.4	R1590 330 30	R1590 230 30	–
	300	64.4	R1590 330 30	R1590 230 30	–
	301	36.4	–	–	R159A 430 01
	301	64.4	–	–	R159A 430 01
	350	49.4	R159A 335 01	R159A 235 01	–
	350	90.6	R159A 335 01	R159A 235 01	–
	351	49.4	–	–	R159A 435 01
	351	90.6	–	–	R159A 435 01
	450	172.0	–	–	R159A 445 01
	450	289.0	–	–	R159A 445 01
	600	252.1	–	–	R159A 460 01
	600	443.2	–	–	R159A 460 01

For the codes, see the chapter entitled “Abbreviations”

Form 132, 142



Option (machining of end face)	
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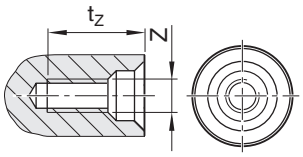
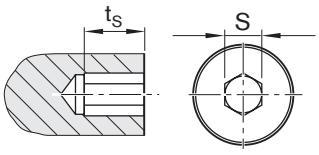
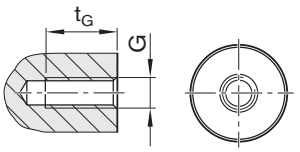
Z	
S	
G	

Ordering data:

PLSA	20 x 5R	FEM-E-S	00	1	0	T7	R	142Z250	312Z120	1250	1	1

Form	Version[1]	Size	(mm)										
		d_0 x P	L_{jf}	D_1 h6	L_1	D_2 h7	L_2	G_1	LG_1	D_R	L_R	D_F	L_F
132	**200**	**20x5**	116	20	54	18	40	M17x1	22	27	7	19.2	14.0
142[2]	**250**	**20x5**	159	25	87	22	50	M20x1	22	34	7	19.2	26.0
	251	**25x5**	138	25	66	22	50	M20x1	22	34	7	24.2	14.0
	252	**25x10**	138	25	66	22	50	M20x1	22	34	7	23.7	14.0
	253	**25x5**	159	25	87	22	50	M20x1	22	34	7	24.2	14.0
	254	**25x10**	159	25	87	22	50	M20x1	22	34	7	23.7	14.0
	300	**30x5**	150	30	74	28	50	M25x1.5	26	40	10	29.2	17.0
	301	**30x10**	150	30	74	28	50	M25x1.5	26	40	10	28.7	17.0
	350	**30x5**	194	35	108	32	60	M30x1.5	26	45	10	29.2	28.0
	351	**30x10**	194	35	108	32	60	M30x1.5	26	45	10	28.7	28.0
	400	**39x5**	178	40	90	38	60	M35x1.5	28	54	12	38.1	24.5
	401	**39x10**	178	40	90	38	60	M35x1.5	28	54	12	37.7	24.5
	500	**39x5**	245	50	137	48	80	M40x1.5	28	62	12	38.1	32.0
	501	**39x10**	245	50	137	48	80	M40x1.5	28	62	12	37.7	32.0
	502	**48x5**	214	50	106	48	80	M40x1.5	28	62	12	47.2	22.0
	503	**48x10**	214	50	106	48	80	M40x1.5	28	62	12	46.7	22.0
	650	**48x5**	312	65	178	62	100	M60x2	34	78	18	47.2	46.0
	651	**48x10**	312	65	178	62	100	M60x2	34	78	18	46.7	46.0
	700	**60x10**	272	70	138	68	100	M65x2	34	90	20	58.7	50.0
	701	**60x20**	272	70	138	68	100	M65x2	34	90	20	57.7	50.0
	652	**60x10**	312	65	178	62	100	M60x2	34	78	18	58.7	39.0
	653	**60x20**	312	65	178	62	100	M60x2	34	78	18	57.7	39.0
	900	**75x10**	327	90	169	88	120	M85x2	38	108	25	73.7	59.0
	901	**75x20**	327	90	169	88	120	M85x2	38	108	25	72.7	59.0
	902	**75x10**	391	90	233	88	120	M85x2	38	108	25	73.7	59.0
	903	**75x20**	391	90	233	88	120	M85x2	38	108	25	72.7	59.0

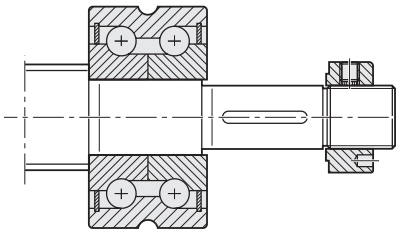
1) The allocation of screw ends to the bearing assemblies is clearly defined by the version.
2) Keyway with form 142 only

For the codes, see the chapter entitled “Abbreviations”

End bearings for screw ends form 132, 142

The bearing assemblies LAS, FEC-F consist of:
- 1 bearing
- 1 slotted nut

Application



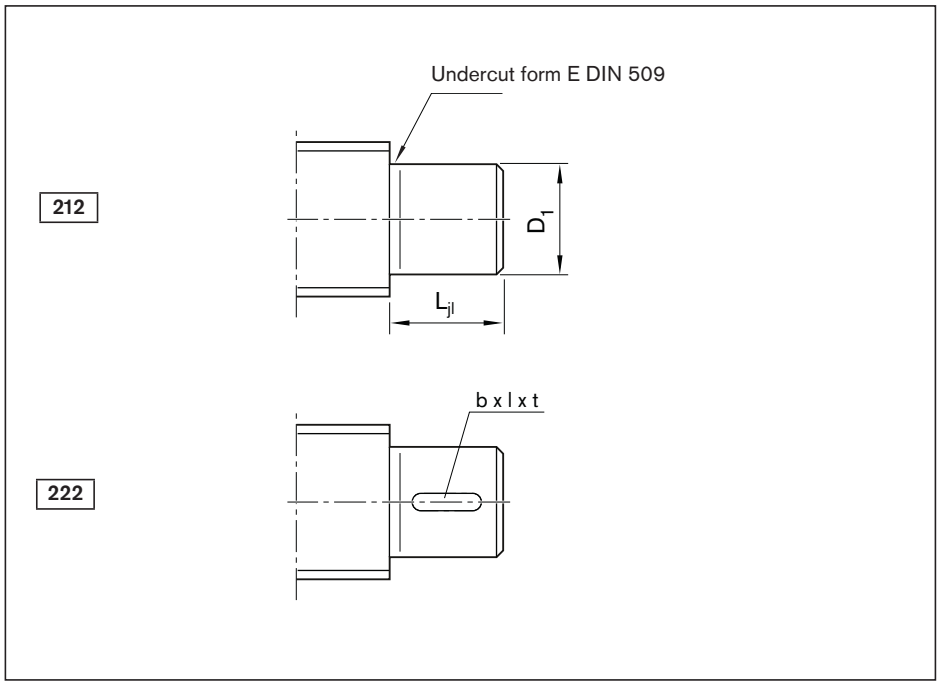
Separate technical dimensioning of the permissible drive torque is absolutely necessary.

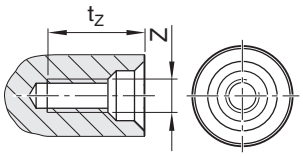
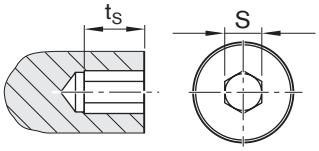
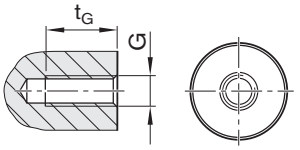
LAS

FEC-F

Version[1]	DIN 6885[2] keyway			Centering hole		Hex socket		Thread		M_p (Nm)	Bearing assembly	
	b P9	l	t	Z	t_Z	S	t_S	G	t_G		LAS Part number	FEC-F Part number
200	6	36	3.5	M6	16	5	5	M6	9	14.4	R159A 420 01	–
250	6	40	3.5	M6	16	5	5	M8	12	18.8	–	R159B 425 01
251	6	40	3.5	M6	16	5	5	M8	12	18.8	R159A 425 01	–
252	6	40	3.5	M6	16	5	5	M8	12	32.2	R159A 425 01	–
253	6	40	3.5	M6	16	5	5	M8	12	18.8	–	R159B 425 01
254	6	40	3.5	M6	16	5	5	M8	12	32.2	–	R159B 425 01
300	8	40	4.0	M10	22	8	8	M10	15	27.3	R159A 430 01	–
301	8	40	4.0	M10	22	8	8	M10	15	49.7	R159A 430 01	–
350	10	45	5.0	M10	22	10	10	M12	18	39.4	–	R159B 435 01
351	10	45	5.0	M10	22	10	10	M12	18	73.8	–	R159B 435 01
400	10	50	5.0	M12	28	12	12	M12	18	51.3	R159A 440 01	–
401	10	50	5.0	M12	28	12	12	M12	18	98.5	R159A 440 01	–
500	14	50	5.5	M16	36	12	12	M16	24	50.5	–	R159B 450 01
501	14	50	5.5	M16	36	12	12	M16	24	98.9	–	R159B 450 01
502	14	50	5.5	M16	36	12	12	M16	24	50.5	R159A 450 01	–
503	14	50	5.5	M16	36	12	12	M16	24	98.9	R159A 450 01	–
650	18	90	7.0	M20	42	19	19	M24	36	132.6	–	R159B 465 01
651	18	90	7.0	M20	42	19	19	M24	36	256.6	–	R159B 465 01
700	20	90	7.5	M20	42	19	19	M24	36	317.2	R159A 470 01	–
701	20	90	7.5	M20	42	19	19	M24	36	602.6	R159A 470 01	–
652	18	90	7.0	M20	42	19	19	M24	36	284.9	–	R159B 465 01
653	18	90	7.0	M20	42	19	19	M24	36	532.7	–	R159B 465 01
900	25	100	9.0	M20	42	19	19	M30	45	542.1	R159A 490 01	–
901	25	100	9.0	M20	42	19	19	M30	45	1054.6	R159A 490 01	–
902	25	100	9.0	M20	42	19	19	M30	45	542.1	–	R159B 490 01
903	25	100	9.0	M20	42	19	19	M30	45	1054.6	–	R159B 490 01

Form 212, 222



Option (machining of end face)	
K	None
Z	
S	
G	

Ordering data:

PLSA	20 x 5R	FEM-E-S	00	1	0	T7	R	222Z150	412Z120	1250	1	1

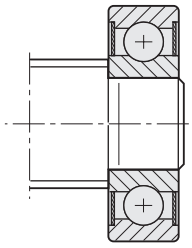
Form	Version[1]	Size	(mm)											Deep-groove ball bearing as per DIN 625[3]	
			L_{jl}	D_1	DIN 6885[2] keyway			Centering hole		Hex socket		Thread			
		d_0 x P		j6	b P9	l	t	Z	t_Z	S	t_S	G	t_G	Designation	Bearing assembly LAD Part number
212	**120**	**20 x 5**	13	12	4	8	2.5	M4	10.0	4	4	M5	8	6201.2RS	R3414 042 00
222[2]	**150**	**20 x 5**	15	15	5	10	3.0	M5	12.5	4	4	M6	9	6202.2RS	R3414 074 00
	170	**25 x 5/10**	15	17	5	10	3.0	M6	16.0	5	5	M6	9	6203.2RS	R3414 050 00
	200	**30 x 5/10**	24	20	6	14	3.5	M6	16.0	5	5	M8	12	6204.2RS	R3414 038 00
	250	**30 x 5/10**	28	25	8	18	4.0	M10	22.0	8	8	M10	15	6205.2RS	R3414 063 00
	300	**39 x 5/10**	28	30	8	18	4.0	M10	22.0	10	10	M12	18	6206.2RS	R3414 051 00
	350	**48 x 5/10**	32	35	10	22	5.0	M12	28.0	12	12	M12	18	6207.2RS	R3414 075 00
	500	**60 x 10/20**	46	50	14	36	5.5	M16	36.0	19	19	M20	30	6210.2RS	R3414 077 00
	600	**75 x 10/20**	60	60	18	50	7.0	M20	42.0	19	19	M24	36	6212.2RS	R3414 078 00

1) The allocation of screw ends to the bearing assemblies is clearly defined by the version.
2) Keyway with form 222 only
3) Deep groove ball bearing with form 212 only
4) Scope of delivery: 1 bearing, 2 retaining rings.

For the codes, see the chapter entitled “Abbreviations”

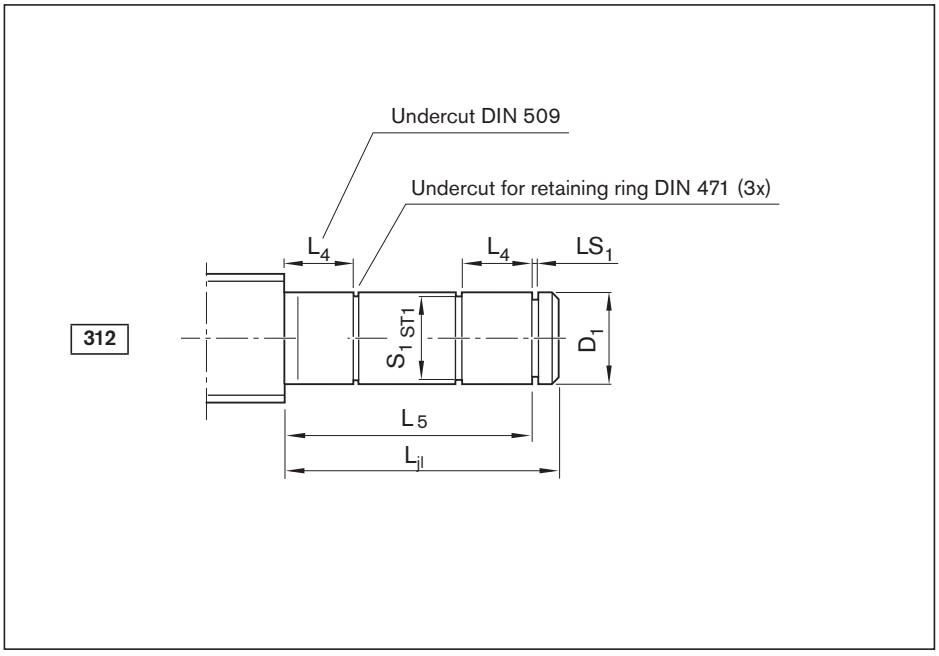
End bearings for screw ends in form 212

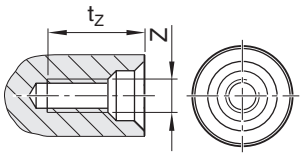
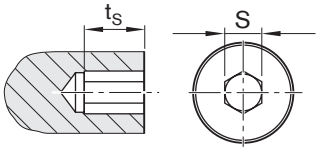
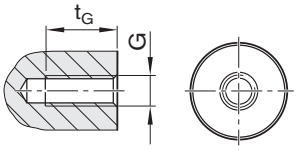
Application



Bearing assembly LAD[2)]

Form 312



Option (machining of end face)	
K	None
Z	
S	
G	

Ordering data:

PLSA	20 x 5R	FEM-E-S	00	1	0	T7	R	312Z120	822K150	1250	1	1

Form	Version[1]	Size	(mm)							Centering hole		Hex socket		Thread		Bearing assembly LAD
		d_0 x P	D_1 j6	L_{jl}	L_4	L_5	S_1	ST1	LS_1 H13	Z	t_Z	S	t_S	G	t_G	Part number
312	**120**	**20 x 5**	12	43	10	40	11.5	h11	1.10	M4	10.0	4	4	M5	8	R1590 612 00
	150	**20 x 5**	15	47	11	44	14.3	h11	1.10	M5	12.5	4	4	M6	9	R1590 615 00
	170	**25 x 5/10**	17	51	12	48	16.2	h11	1.10	M6	16.0	5	5	M6	9	R1590 617 00
	200	**30 x 5/10**	20	60	14	56	19.0	h11	1.30	M6	16.0	5	5	M8	12	R1590 620 00
	250	**30 x 5/10**	25	64	15	60	23.9	h12	1.30	M10	22.0	8	8	M10	15	R1590 625 00
	300	**39 x 5/10**	30	68	16	64	28.6	h12	1.60	M10	22.0	10	10	M12	18	R1590 630 00
	350	**48 x 5/10**	35	73	17	68	33.0	h12	1.60	M12	28.0	12	12	M12	18	R1590 635 00
	500	**60 x 10/20**	50	87	20	80	47.0	h12	2.15	M16	36.0	19	19	M20	30	R1590 650 00
	600	**75 x 10/20**	60	95	22	88	57.0	h12	2.15	M20	42.0	19	19	M24	36	R1590 660 00

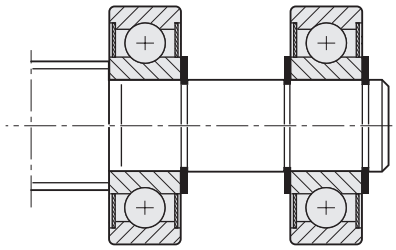
1) The allocation of screw ends to the bearing assemblies is clearly defined by the version.
Note: Form 312 with two floating bearings increases the critical speed, see “Critical speed n_{cr}” on page 270.

For the codes, see the chapter entitled “Abbreviations”

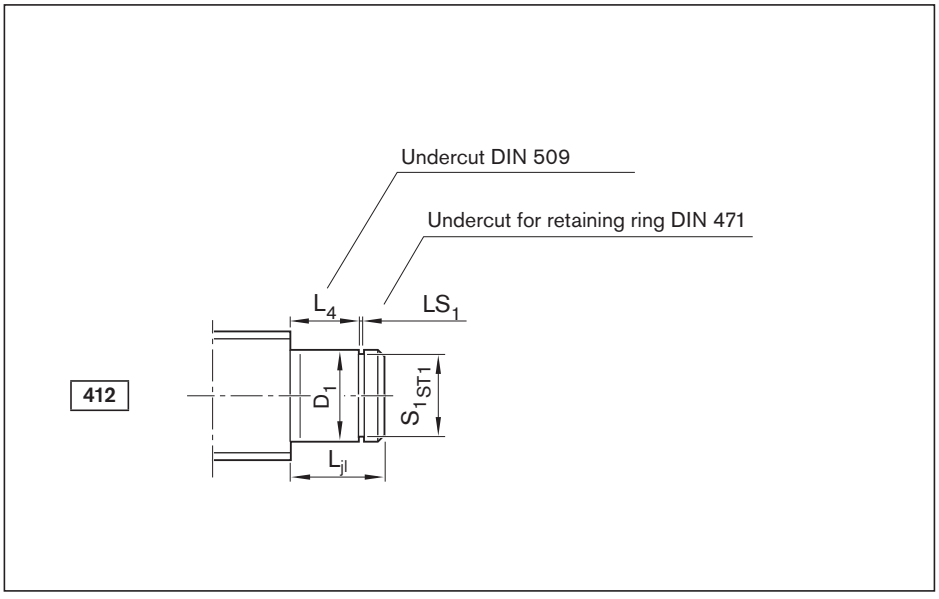
End bearings for screw ends in form 312

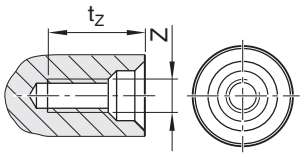
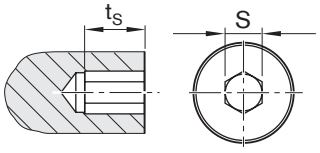
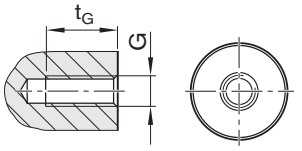
The bearing assembly LAD consists of:
– 1 bearing (2x required)
– 2 retaining rings

Application



Form 412



Option (machining of end face)	
K	None
Z	
S	
G	

Ordering data:

PLSA	20 x 5R	FEM-E-S	00	1	0	T7	R	412Z120	822K150	1250	1	1

Form	Version[1]	Size	(mm)						Centering hole		Hex socket		Thread		Bearing assembly LAD
		d_0 x P	D_1 j6	L_{il}	L_4	S_1	ST1	LS_1 H13	Z	t_Z	S	t_S	G	t_G	Part number
412	**120**	**20 x 5**	12	13	10	11.5	h11	1.10	M4	10.0	4	4	M5	8	R1590 612 00
	150	**20 x 5**	15	14	11	14.3	h11	1.10	M5	12.5	4	4	M6	9	R1590 615 00
	170	**25 x 5/10**	17	15	12	16,2	h11	1,10	M6	16,0	5	5	M6	9	R1590 617 00
	200	**30 x 5/10**	20	18	14	19.0	h11	1.30	M6	16.0	5	5	M8	12	R1590 620 00
	250	**30 x 5/10**	25	19	15	23.9	h12	1.30	M10	22.0	8	8	M10	15	R1590 625 00
	300	**39 x 5/10**	30	20	16	28.6	h12	1.60	M10	22.0	10	10	M12	18	R1590 630 00
	350	**48 x 5/10**	35	22	17	33.0	h12	1.60	M12	28.0	12	12	M12	18	R1590 635 00
	500	**60 x 10/20**	50	27	20	47.0	h12	2.15	M16	36.0	19	19	M20	30	R1590 650 00
	600	**75 x 10/20**	60	29	22	57.0	h12	2.15	M20	42.0	19	19	M24	36	R1590 660 00

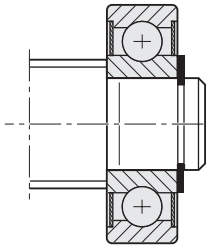
1) The allocation of screw ends to the bearing assemblies is clearly defined by the version.

For the codes, see the chapter entitled “Abbreviations”

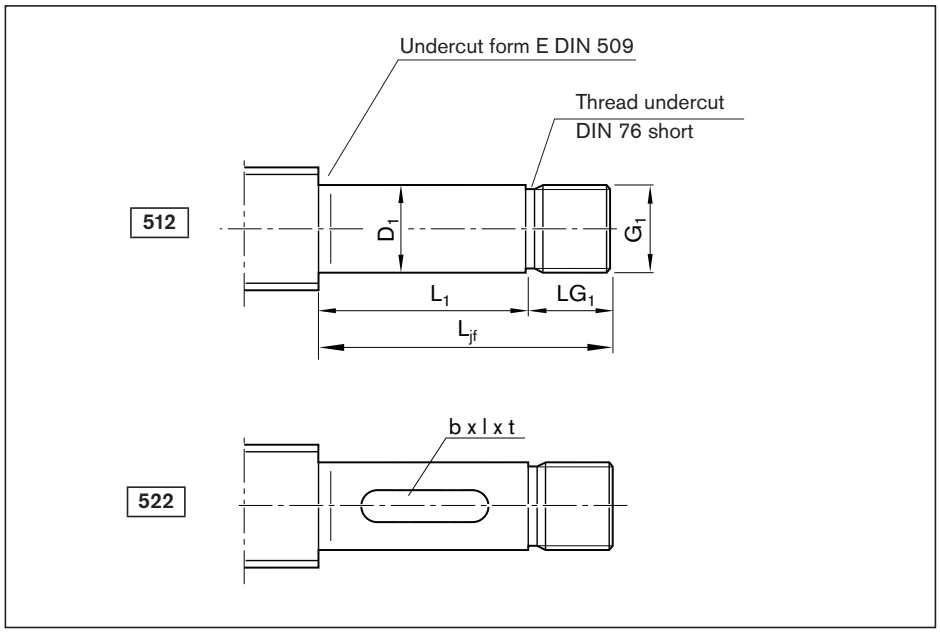
End bearings for screw ends in form 412

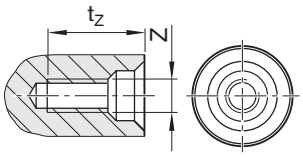
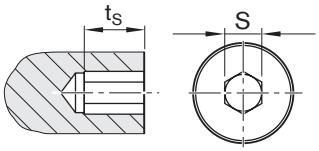
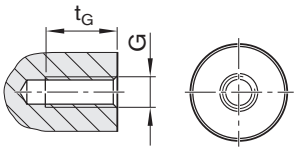
The bearing assembly LAD consists of:
- 1 bearing
- 2 retaining rings

Application



Form 512, 522



Option (machining of end face)	
K	None
Z	
S	
G	

Ordering data:

PLSA	20 x 5R	FEM-E-S	00	1	0	T7	R	512Z150	312Z120	1250	1	1

Form	Version[1]	Size	(mm)					DIN 6885[2] keyway			Centering hole		Hex socket		Thread	
		d_0 x P	L_{jf} h6	D_1	L_1	G_1	LG_1	b P9	l	t	Z	t_Z	S	t_S	G	t_G
512/ 522[2]	**150**	**20 x 5**	45	15	23	M15X1	22	5	14	3.0	M5	12.5	4	4	M6	9
	151	**20 x 5**	72	15	50	M15x1	22	5	25	3.0	M5	12.5	4	4	M6	9
	170	**25 x 5**	70	17	48	M17x1	22	5	25	3.0	M6	16.0	5	5	M6	9
		25 x 10	70	17	48	M17x1	22	5	25	3.0	M6	16.0	5	5	M6	9
	171	**25 x 5**	76	17	54	M17x1	22	5	25	3.0	M6	16.0	5	5	M6	9
		25 x 10	76	17	54	M17x1	22	5	25	3.0	M6	16.0	5	5	M6	9
	200	**30 x 5**	76	20	54	M20x1	22	6	28	3.5	M6	16.0	5	5	M8	12
		30 x 10	76	20	54	M20x1	22	6	28	3.5	M6	16.0	5	5	M8	12
	201	**30 x 5**	80	20	58	M20x1	22	6	28	3.5	M6	16.0	5	5	M8	12
		30 x 10	80	20	58	M20x1	22	6	28	3.5	M6	16.0	5	5	M8	12
	300	**39 x 5**	80	30	54	M30x1.5	26	8	36	4.0	M10	22.0	10	10	M12	18
		39 x 10	80	30	54	M30x1.5	26	8	36	4.0	M10	22.0	10	10	M12	18
	301	**39 x 5**	100	30	74	M30x1.5	26	8	36	4.0	M10	22.0	10	10	M12	18
		39 x 10	100	30	74	M30x1.5	26	8	36	4.0	M10	22.0	10	10	M12	18
	350	**48 x 5**	94	35	66	M35x1.5	28	10	40	5.0	M12	28.0	12	12	M12	18
		48 x 10	94	35	66	M35x1.5	28	10	40	5.0	M12	28.0	12	12	M12	18
	351	**48 x 5**	110	35	82	M35x1.5	28	10	40	5.0	M12	28.0	12	12	M12	18
		48 x 10	110	35	82	M35x1.5	28	10	40	5.0	M12	28.0	12	12	M12	18
	450	**60 x 10**	126	45	98	M45x1.5	28	14	63	5.5	M16	36.0	14	14	M16	24
		60 x 20	126	45	98	M45x1.5	28	14	63	5.5	M16	36.0	14	14	M16	24
	600	**75 x 10**	156	60	122	M60x2	34	18	80	7.0	M20	42.0	19	19	M24	36
		75 x 20	156	60	122	M60x2	34	18	80	7.0	M20	42.0	19	19	M24	36

1) The allocation of screw ends to the bearing assemblies is clearly defined by the version.
2) Keyway with form 522 only
3) Under preparation

For the codes, see the chapter entitled “Abbreviations”

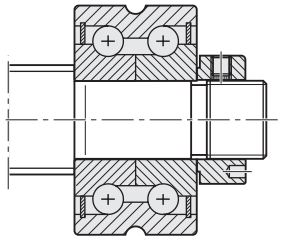
End bearings for screw ends in form 512

The bearing assemblies LAF, LAN, LAS consist of:
- 1 bearing
- 1 slotted nut

LAF

LAN

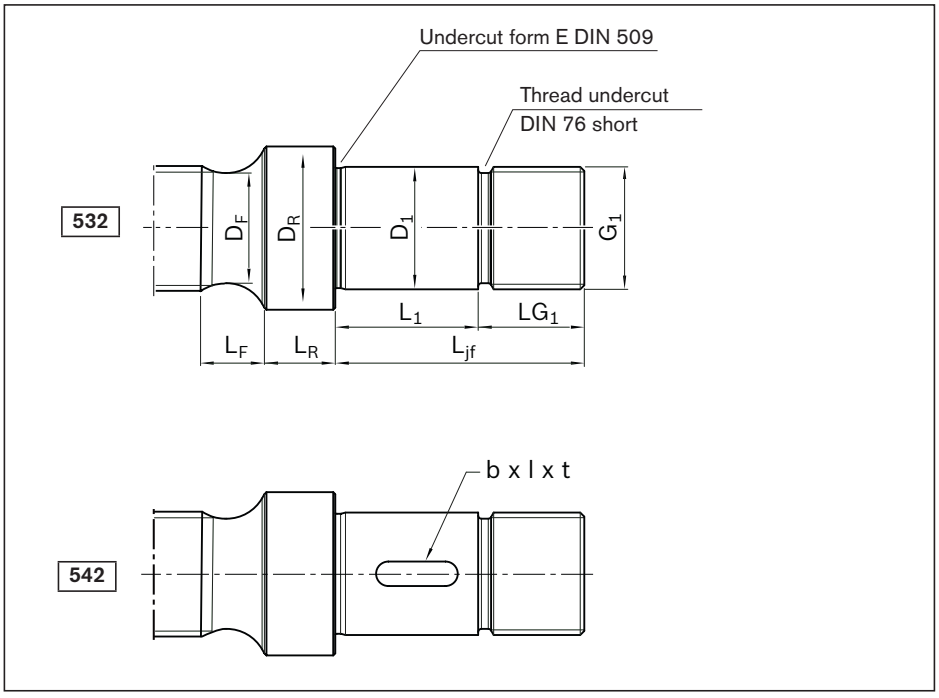
Application

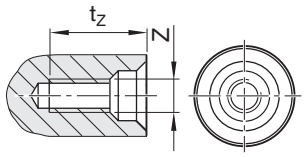
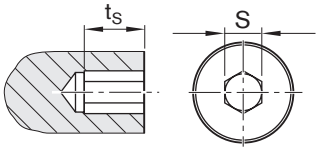
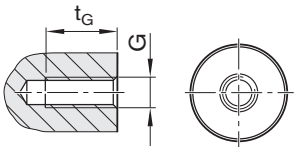


LAS

Version[1)]	Size	M_p (Nm)	Bearing assembly		
	d_0 x P		LAF Part number	LAN Part number	LAS Part number
150	20 x 5	12.1	R159A 015 01	R159A 115 01	–
151	20 x 5	12.1	–	–	R159A 415 01
170	25 x 5	15.9	[3)]	[3)]	–
	25 x 10	25.7	[3)]	[3)]	–
171	25 x 5	15.9	–	–	R159A 417 02
	25 x 10	25.7	–	–	R159A 417 02
200	30 x 5	21.8	R159A 320 01	R159A 220 01	–
	30 x 10	38.5	R159A 320 01	R159A 220 01	–
201	30 x 5	21.8	–	–	R159A 420 02
	30 x 10	38.5	–	–	R159A 420 02
300	39 x 5	45.7	R1590 330 30	R1590 230 30	–
	39 x 10	85.5	R1590 330 30	R1590 230 30	–
301	39 x 5	45.7	–	–	R159A 430 01
	39 x 10	85.5	–	–	R159A 430 01
350	48 x 5	62.0	R159A 335 01	R159A 235 01	–
	48 x 10	119.0	R159A 335 01	R159A 235 01	–
351	48 x 5	62.0	–	–	R159A 435 01
	48 x 10	119.0	–	–	R159A 435 01
450	60 x 10	178.2	–	–	R159A 445 01
	60 x 20	325.1	–	–	R159A 445 01
600	75 x 10	296.7	–	–	R159A 460 01
	75 x 20	573.8	–	–	R159A 460 01

Form 532, 542



Option (machining of end face)	
K	None
Z	
S	
G	

Ordering data:

PLSA	20 x 5R	FEM-E-S	00	1	0	T7	R	532Z200	412Z120	1250	1	1

Form	Version[1]	Size	(mm)									DIN 6885[2] keyway		
		d_0 x P	L_{jf}	D_1 h6	L_1	G_1	LG_1	D_R	L_R	D_F	L_F	b P9	l	t
532	**200**	**20 x 5**	76	20	54	M20x1	22	27	7	19.2	14.0	6	36	3.5
542[2]	**250**	**20 x 5**	113	25	87	M25x1.5	26	34	7	19.2	26.0	8	40	4.0
	252	**25 x 5**	92	25	66	M25x1.5	26	34	7	24.2	14.0	8	40	4.0
	253	**25 x 10**	92	25	66	M25x1.5	26	34	7	23.7	14.0	8	40	4.0
	254	**25 x 5**	113	25	87	M25x1.5	26	34	7	24.2	14.0	8	40	4.0
	255	**25 x 10**	113	25	87	M25x1.5	26	34	7	23.7	14.0	8	40	4.0
	300	**30 x 5**	100	30	74	M30x1.5	26	40	10	29.2	17.0	8	40	4.0
	301	**30 x 10**	100	30	74	M30x1.5	26	40	10	28.7	17.0	8	40	4.0
	350	**30 x 5**	136	35	108	M35x1.5	28	45	10	29.2	28.0	10	45	5.0
	351	**30 x 10**	136	35	108	M35x1.5	28	45	10	28.7	28.0	10	45	5.0
	400	**39 x 5**	118	40	90	M40x1.5	28	54	12	38.1	24.5	12	50	5.0
	401	**39 x 10**	118	40	90	M40x1.5	28	54	12	37.7	24.5	12	50	5.0
	500	**39 x 5**	169	50	137	M50x1.5	32	62	12	38.1	32.0	14	50	5.5
	501	**39 x 10**	169	50	137	M50x1.5	32	62	12	37.7	32.0	14	50	5.5
	502	**48 x 5**	138	50	106	M50x1.5	32	62	12	47.2	22.0	14	50	5.5
	503	**48 x 10**	138	50	106	M50x1.5	32	62	12	46.7	22.0	14	50	5.5
	650	**48 x 5**	212	65	178	M65x2	34	78	18	47.2	46.0	18	90	7.0
	651	**48 x 10**	212	65	178	M65x2	34	78	18	46.7	46.0	18	90	7.0
	700	**60 x 10**	174	70	138	M70x2	36	90	20	58.7	50.0	20	90	7.5
	701	**60 x 20**	174	70	138	M70x2	36	90	20	57.7	50.0	20	90	7.5
	652	**60 x 10**	212	65	178	M65x2	34	78	18	58.7	39.0	18	90	7.0
	653	**60 x 20**	212	65	178	M65x2	34	78	18	57.7	39.0	18	90	7.0
	900	**75 x 10**	209	90	169	M90x2	40	108	25	73.7	59.0	25	100	9.0
	901	**75 x 20**	209	90	169	M90x2	40	108	25	72.7	59.0	25	100	9.0
	902	**75 x 10**	273	90	233	M90x2	40	108	25	73.7	59.0	25	100	9.0
	903	**75 x 20**	273	90	233	M90x2	40	108	25	72.7	59.0	25	100	9.0

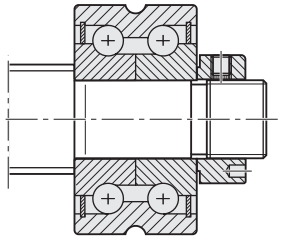
1) The allocation of screw ends to the bearing assemblies is clearly defined by the version.
2) Keyway with form 542 only

For the codes, see the chapter entitled “Abbreviations”

End bearings for screw ends in form 532

The bearing assemblies FEC-F, LAS consist of:
- 1 bearing
- 1 slotted nut

Application

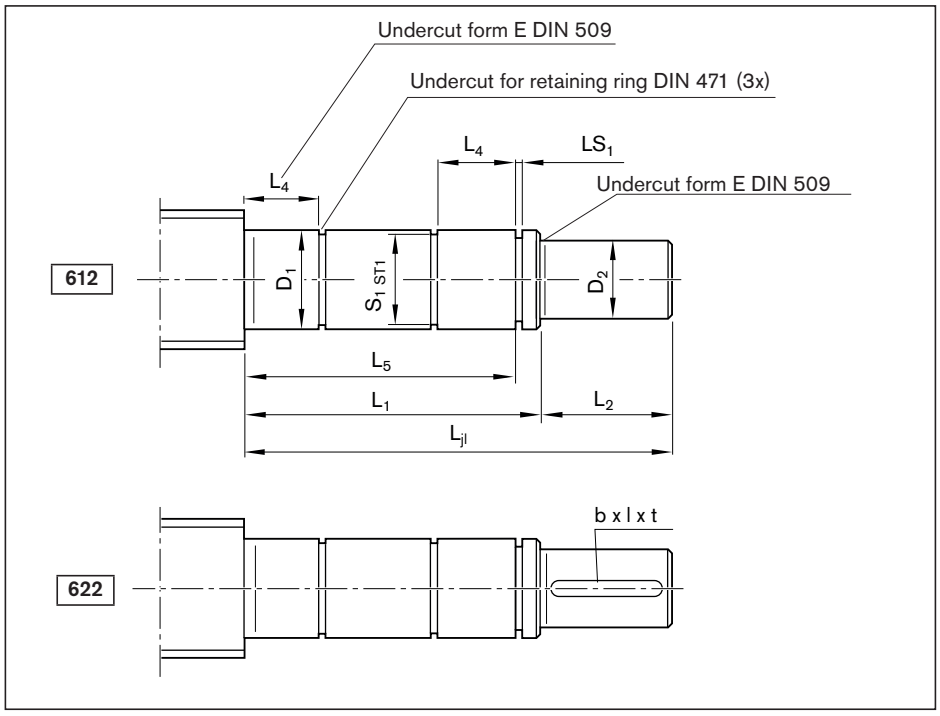


LAS

FEC-F

Version[1]	Centering hole		Hex socket		Thread		Mp (Nm)		Bearing assembly	
							Form		LAS	FEC-F
	Z	t_Z	S	t_S	G	t_G	532	542	Part number	Part number
200	M6	16	5	5	M6	9	22.7	22.0	R159A 420 01	–
250	M6	16	5	5	M8	12	29.2	29.2	–	R159B 425 01
252	M10	22	8	8	M10	15	33.0	33.0	R159A 425 01	–
253	M10	22	8	8	M10	15	59.9	59.9	R159A 425 01	–
254	M10	22	8	8	M10	15	33.0	33.0	–	R159B 425 01
255	M10	22	8	8	M10	15	59.9	59.9	–	R159B 425 01
300	M10	22	8	8	M10	15	45.3	45.3	R159A 430 01	–
301	M10	22	8	8	M10	15	84.9	84.9	R159A 430 01	–
350	M10	22	10	10	M12	18	54.3	54.3	–	R159B 435 01
351	M10	22	10	10	M12	18	110.1	110.1	–	R159B 435 01
400	M12	28	12	12	M12	18	79.2	79.2	R159A 440 01	–
401	M12	28	12	12	M12	18	154.2	154.2	R159A 440 01	–
500	M16	36	12	12	M16	24	91.1	91.1	–	R159B 450 01
501	M16	36	12	12	M16	24	175.4	175.4	–	R159B 450 01
502	M16	36	12	12	M16	24	110.7	110.7	R159A 450 01	–
503	M16	36	12	12	M16	24	217.4	217.4	R159A 450 01	–
650	M20	42	19	19	M24	36	132.6	132.6	–	R159B 465 01
651	M20	42	19	19	M24	36	256.6	256.6	–	R159B 465 01
700	M20	42	19	19	M24	36	385.3	385.3	R159A 470 01	–
701	M20	42	19	19	M24	36	721.6	721.6	R159A 470 01	–
652	M20	42	19	19	M24	36	373.5	373.5	–	R159B 465 01
653	M20	42	19	19	M24	36	701.3	701.3	–	R159B 465 01
900	M20	42	19	19	M30	45	596.7	596.7	R159A 490 01	–
901	M20	42	19	19	M30	45	1137.4	1137.4	R159A 490 01	–
902	M20	42	19	19	M30	45	596.7	596.7	–	R159B 490 01
903	M20	42	19	19	M30	45	1137.4	1137.4	–	R159B 490 01

Form 612, 622



Option (machining of end face)	
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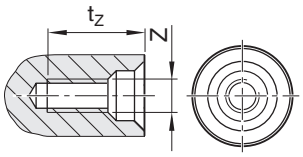
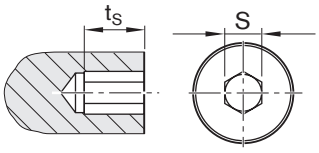
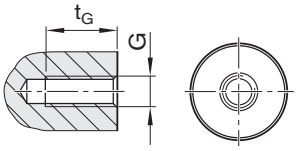
Z	
S	
G	

Ordering data:

PLSA	20 x 5R	FEM-E-S	00	1	0	T7	R	622Z150	822K150	1250	1	1

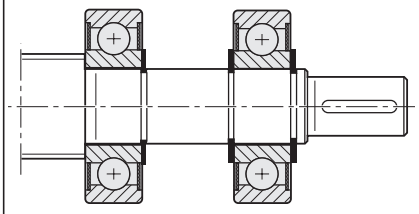
Form	Version[1]	Size	(mm)									
		d_0 x P	L_{jl}	D_1 j6	L_1	D_2 h7	L_2	L_4	L_5	S_1	ST1	LS_1 H13
612	120	20 x 5	68	12	43	10	25	10	40	11.5	h11	1.10
622[2]	150	20 x 5	72	15	47	12	25	11	44	14.3	h11	1.10
	170	25 x 5	81	17	51	15	30	12	48	16.2	h11	1.10
		25 x 10	81	17	51	15	30	12	48	16.2	h11	1.10
	200	30 x 5	100	20	60	18	40	14	56	19.0	h11	1.30
		30 x 10	100	20	60	18	40	14	56	19.0	h11	1.30
	250	30 x 5	114	25	64	22	50	15	60	23.9	h12	1.30
		30 x 10	114	25	64	22	50	15	60	23.9	h12	1.30
	300	39 x 5	118	30	68	28	50	16	64	28.6	h12	1.60
		39 x 10	118	30	68	28	50	16	64	28.6	h12	1.60
	350	48 x 5	133	35	73	32	60	17	68	33.0	h12	1.60
		48 x 10	133	35	73	32	60	17	68	33.0	h12	1.60
	500	60 x 10	167	50	87	48	80	20	80	47.0	h12	2.15
		60 x 20	167	50	87	48	80	20	80	47.0	h12	2.15
	600	75 x 10	175	60	95	58	80	22	88	57.0	h12	2.15
		75 x 20	175	60	95	58	80	22	88	57.0	h12	2.15

1) The allocation of screw ends to the bearing assemblies is clearly defined by the version.
Note: Form 312 with two floating bearings increases the critical speed, see “Critical speed n_{cr}” on page 270.
2) Keyway with form 622 only
3) Scope of delivery per assembly: 1 bearing, 2 retaining rings. Two assemblies are required for form 612-622.

For the codes, see the chapter entitled “Abbreviations”

End bearings for screw ends form 612, 622

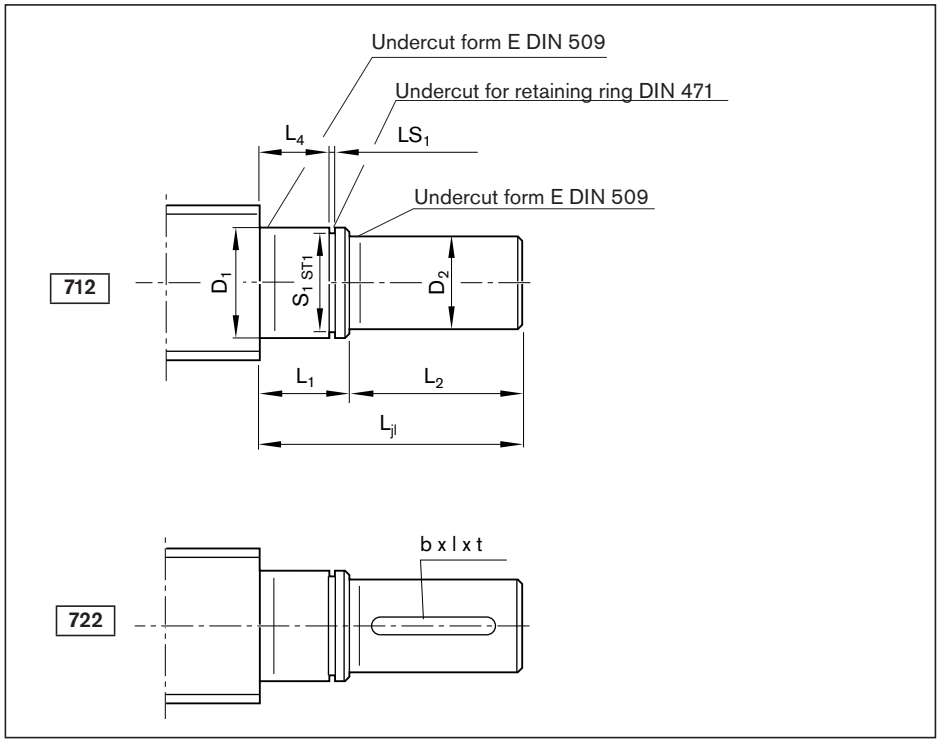
Application

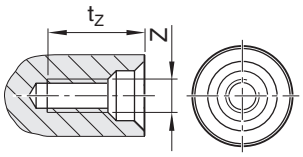
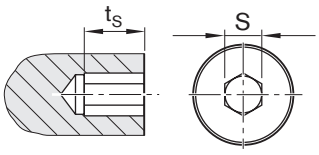
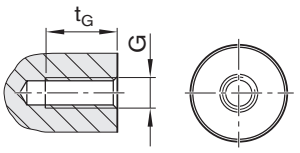


Bearing assembly LAD[3)]

Version[1)]	Size	DIN 6885[2)] keyway			Centering hole		Hex socket		Thread		M_p (Nm) Form		Bearing assembly
	d_0 x P	b P9	l	t	Z	t_Z	S	t_S	G	t_g	612	622	LAD[3)] Part number
120	**20 x 5**	3	20	1.8	M3	9.0	4	4	M4	6.0	16.2	12.7	R1590 612 00
150	**20 x 5**	4	20	2.5	M4	10.0	4	4	M5	8.0	29.1	21.6	R1590 615 00
170	**25 x 5**	5	25	3.0	M5	12.5	4	4	M6	9.0	40.2	40.2	R1590 617 00
	25 x 10	5	25	3.0	M5	12.5	4	4	M6	9.0	40.2	40.2	R1590 617 00
200	**30 x 5**	6	28	3.5	M6	16.0	5	5	M6	9.0	54.3	54.3	R1590 620 00
	30 x 10	6	28	3.5	M6	16.0	5	5	M6	9.0	61.4	61.4	R1590 620 00
250	**30 x 5**	6	36	3.5	M8	19.0	6	6	M8	12.0	54.3	54.3	R1590 625 00
	30 x 10	6	36	3.5	M8	19.0	6	6	M8	12.0	111.5	111.5	R1590 625 00
300	**39 x 5**	8	36	4.0	M10	22.0	10	10	M10	15.0	93.1	93.1	R1590 630 00
	39 x 10	8	36	4.0	M10	22.0	10	10	M10	15.0	173.8	173.8	R1590 630 00
350	**48 x 5**	10	40	5.0	M12	28.0	10	10	M12	18.0	137.4	137.4	R1590 635 00
	48 x 10	10	40	5.0	M12	28.0	10	10	M12	18.0	244.9	244.9	R1590 635 00
500	**60 x 10**	14	63	5.5	M16	36.0	17	17	M16	24.0	444.9	444.9	R1590 650 00
	60 x 20	14	63	5.5	M16	36.0	17	17	M16	24.0	610.1	610.1	R1590 650 00
600	**75 x 10**	16	63	6.0	M20	42.0	19	19	M20	30.0	692.8	692.8	R1590 660 00
	75 x 20	16	63	6.0	M20	42.0	19	19	M20	30.0	1040.4	1040.4	R1590 660 00

Form 712, 722



Option (machining of end face)	
K	None
Z	
S	
G	

Ordering data:

PLSA	20 x 5R	FEM-E-S	00	1	0	T7	R	712Z120	822K150	1250	1	1

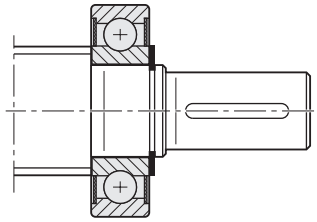
Form	Version[1]	Size	(mm)								
		d_0 x P	L_{jl}	D_1 j6	L_1	D_2 h7	L_2	L_4	S_1	ST1	LS_1 H13
712	**120**	**20 x 5**	38	12	13	10	25	10	11.5	h11	1.10
722[2]	**150**	**20 x 5**	39	15	14	12	25	11	14.3	h11	1.10
	170	**25 x 5**	45	17	15	15	30	12	16.2	h11	1.10
		25 x 10	45	17	15	15	30	12	16.2	h11	1.10
	200	**30 x 5**	58	20	18	18	40	14	19.0	h11	1.30
		30 x 10	58	20	18	18	40	14	19.0	h11	1.30
	250	**30 x 5**	69	25	19	22	50	15	23.9	h12	1.30
		30 x 10	69	25	19	22	50	15	23.9	h12	1.30
	300	**39 x 5**	70	30	20	28	50	16	28.6	h12	1.60
		39 x 10	70	30	20	28	50	16	28.6	h12	1.60
	350	**48 x 5**	82	35	22	32	60	17	33.0	h12	1.60
		48 x 10	82	35	22	32	60	17	33.0	h12	1.60
	500	**60 x 10**	107	50	27	48	80	20	47.0	h12	2.15
		60 x 20	107	50	27	48	80	20	47.0	h12	2.15
	600	**75 x 10**	109	60	29	58	80	22	57.0	h12	2.15
		75 x 20	109	60	29	58	80	22	57.0	h12	2.15

1) The allocation of screw ends to the bearing assemblies is clearly defined by the version.
2) Keyway with form 722 only
3) Scope of delivery per assembly: 1 bearing, 2 retaining rings.

For the codes, see the chapter entitled “Abbreviations”

End bearings for screw ends form 712, 722

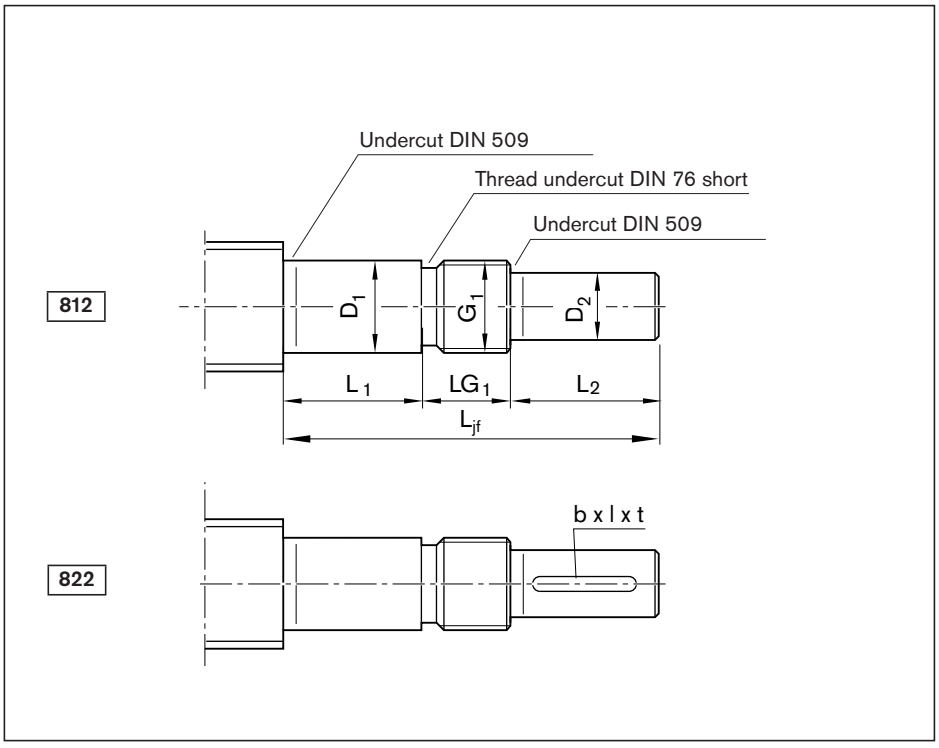
Application



Bearing assembly LAD[3)]

Version[1)]	Size	DIN 6885[2)] keyway			Centering hole		Hex socket		Thread		M_p (Nm) Form		Bearing assembly
	d_0 x P	b P9	l	t	Z	t_Z	S	t_S	G	t_G	712	722	LAD[2)] Part number
120	**20 x 5**	3	20	1.8	M3	9.0	4	4	M4	6	16.2	12.7	R1590 612 00
150	**20 x 5**	4	20	2.5	M4	10.0	4	4	M5	8	29.1	21.6	R1590 615 00
170	**25 x 5**	5	25	3.0	M5	12.5	4	4	M6	9	40.2	40.2	R1590 617 00
	25 x 10	5	25	3.0	M5	12.5	4	4	M6	9	40.2	40.2	R1590 617 00
200	**30 x 5**	6	28	3.5	M6	16.0	5	5	M6	9	54.3	54.3	R1590 620 00
	30 x 10	6	28	3.5	M6	16.0	5	5	M6	9	61.4	61.4	R1590 620 00
250	**30 x 5**	6	36	3.5	M8	19.0	6	6	M8	12	54.3	54.3	R1590 625 00
	30 x 10	6	36	3.5	M8	19.0	6	6	M8	12	111.5	111.5	R1590 625 00
300	**39 x 5**	8	36	4.0	M10	22.0	10	10	M10	15	93.1	93.1	R1590 630 00
	39 x 10	8	36	4.0	M10	22.0	10	10	M10	15	173.8	173.8	R1590 630 00
350	**48 x 5**	10	40	5.0	M12	28.0	10	10	M12	18	137.4	137.4	R1590 635 00
	48 x 10	10	40	5.0	M12	28.0	10	10	M12	18	244.9	244.9	R1590 635 00
500	**60 x 10**	14	63	5.5	M16	36.0	17	17	M16	24	444.9	444.9	R1590 650 00
	60 x 20	14	63	5.5	M16	36.0	17	17	M16	24	610.1	610.1	R1590 650 00
600	**75 x 10**	16	63	6.0	M20	42.0	19	19	M20	30	692.8	1142.4	R1590 660 00
	75 x 20	16	63	6.0	M20	42.0	19	19	M20	30	1040.4	1144.5	R1590 660 00

Form 812, 822



Option (machining of end face)	
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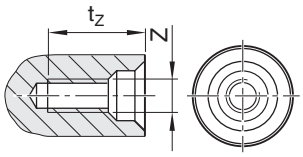
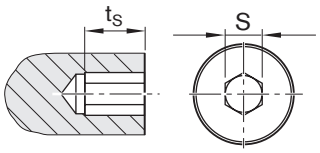
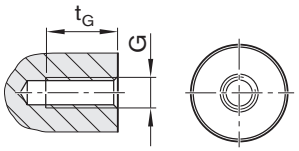
Z	
S	
G	

Ordering data:

PLSA	20 x 5R	FEM-E-S	00	1	0	T7	R	822Z150	412Z120	1250	1	1

Form	Version[1]	Size	(mm)							DIN 6885[2] keyway		
		d_0 x P	L_{jf}	D_1 h6	L_1	D_2 h7	L_2	G_1	LG_1	b P9	l	t
812	**150**	**20 x 5**	70	15	23	12	25	M15x1	22	4	20	2.5
822[2]	**153**	**20 x 5**	97	15	50	12	25	M15x1	22	4	20	2.5
	170	**25 x 5**	100	17	48	15	30	M17x1	22	5	25	3.0
		25 x 10	100	17	48	15	30	M17x1	22	5	25	3.0
	171	**25 x 5**	106	17	54	15	30	M17x1	22	5	25	3.0
		25 x 10	106	17	54	15	30	M17x1	22	5	25	3.0
	205	**30 x 5**	116	20	54	18	40	M20x1	22	6	28	3.5
		30 x 10	116	20	54	18	40	M20x1	22	6	28	3.5
	206	**30 x 5**	120	20	58	18	40	M20x1	22	6	28	3.5
		30 x 10	120	20	58	18	40	M20x1	22	6	28	3.5
	305	**39 x 5**	128	30	54	25	50	M30x1.5	24	8	36	4.0
		39 x 10	128	30	54	25	50	M30x1.5	24	8	36	4.0
	306	**39 x 5**	148	30	74	25	50	M30x1.5	24	8	36	4.0
		39 x 10	148	30	74	25	50	M30x1.5	24	8	36	4.0
	351	**48 x 5**	140	35	66	30	50	M35x1.5	24	8	36	4.0
		48 x 10	140	35	66	30	50	M35x1.5	24	8	36	4.0
	352	**48 x 5**	156	35	82	30	50	M35x1.5	24	8	36	4.0
		48 x 10	156	35	82	30	50	M35x1.5	24	8	36	4.0
	450	**60 x 10**	184	45	98	40	60	M45x1.5	26	12	50	5.0
		60 x 20	184	45	98	40	60	M45x1.5	26	12	50	5.0
	603	**75 x 10**	233	60	122	55	80	M60x2	31	16	63	6.0
		75 x 20	233	60	122	55	80	M60x2	31	16	63	6.0

1) The allocation of screw ends to the bearing assemblies is clearly defined by the version.
2) Keyway with form 822 only
3) Under preparation

For the codes, see the chapter entitled “Abbreviations”

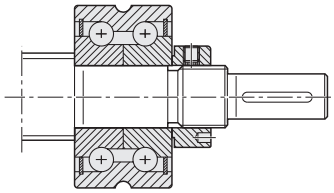
End bearings for screw ends form 812, 822

The bearing assemblies LAF, LAN, LAS consist of:
- 1 bearing
- 1 slotted nut

LAF

LAN

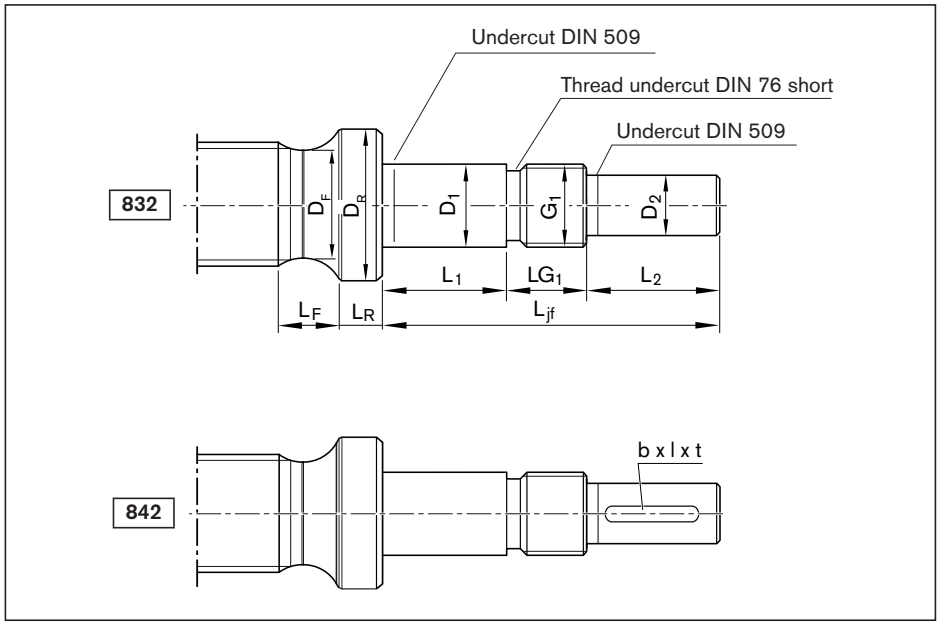
Application

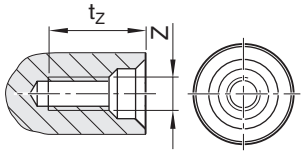
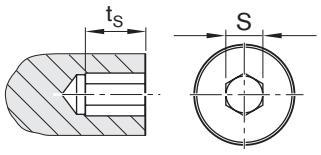
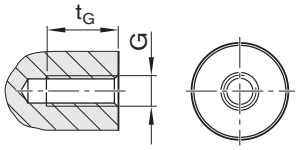


LAS

Version[1]	Size d_0 x P	Centering hole Z	t_Z	Hex socket S	t_S	Thread G	t_G	M_p (Nm)	Bearing assembly LAF Part number	LAN Part number	LAS Part number
150	**20 x 5R**	M4	10.0	4	4	M5	8	12.1	R159A 015 01	R159A 115 01	–
153	**20 x 5R**	M4	10.0	4	4	M5	8	12.1	–	–	R159A 415 01
170	**25 x 5**	M5	12.5	4	4	M6	9	15.9	[3]	[3]	–
	25 x 10	M5	12.5	4	4	M6	9	25.7	[3]	[3]	–
171	**25 x 5R**	M5	12.5	4	4	M6	9	15.9	–	–	R159A 417 02
	25 x 10R	M5	12.5	4	4	M6	9	25.7	–	–	R159A 417 02
205	**30 x 5R**	M6	16.0	5	5	M6	9	22.5	R159A 320 01	R159A 220 01	–
	30 x 10R	M6	16.0	5	5	M6	9	38.5	R159A 320 01	R159A 220 01	–
206	**30 x 5R**	M6	16.0	5	5	M6	9	22.5	–	–	R159A 420 02
	30 x 10R	M6	16.0	5	5	M6	9	38.5	–	–	R159A 420 02
305	**39 x 5R**	M10	22.0	8	8	M10	15	45.7	R1590 330 30	R1590 230 30	–
	39 x 10R	M10	22.0	8	8	M10	15	85.5	R1590 330 30	R1590 230 30	–
306	**39 x 5R**	M10	22.0	8	8	M10	15	45.7	–	–	R159A 430 01
	39 x 10R	M10	22.0	8	8	M10	15	85.5	–	–	R159A 430 01
351	**48 x 5R**	M10	22.0	10	10	M12	18	62.0	R159A 335 01	R159A 235 01	–
	48 x 10R	M10	22.0	10	10	M12	18	119.0	R159A 335 01	R159A 235 01	–
352	**48 x 5R**	M10	22.0	10	10	M12	18	62.0	–	–	R159A 435 01
	48 x 10R	M10	22.0	10	10	M12	18	119.0	–	–	R159A 435 01
450	**60 x 10R**	M16	36.0	12	12	M16	24	178.2	–	–	R159A 445 01
	60 x 20R	M16	36.0	12	12	M16	24	325.1	–	–	R159A 445 01
603	**75 x 10R**	M20	42.0	19	19	M20	30	296.7	–	–	R159A 460 01
	75 x 20R	M20	42.0	19	19	M20	30	573.8	–	–	R159A 460 01

Form 832, 842



Option (machining of end face)	
K	None
Z	
S	
G	

Ordering data:

PLSA	20 x 5R	FEM-E-S	00	1	0	T7	R	842Z201	312Z120	1250	1	1

Form	Version[1]	Size	(mm)											DIN 6885[2] keyway		
		d_0 x P	L_{jf}	D_1 h6	L_1	D_2 h7	L_2	G_1	LG_1	D_R	L_R	D_F	L_F	b P9	l	t
832	**201**	**20 x 5**	116	20	54	18	40	M20x1	22	27	7	19.2	14.0	6	36	3.5
842[2]	**251**	**20 x 5**	157	25	87	20	45	M25x1.5	25	34	7	19.2	26.0	6	40	3.5
	252	**25 x 5**	136	25	66	20	45	M25x1.5	25	34	7	24.2	14.0	6	40	3.5
	253	**25 x 10**	136	25	66	20	45	M25x1.5	25	34	7	24.2	14.0	6	40	3.5
	254	**25 x 5**	157	25	87	20	45	M25x1.5	25	34	7	23.7	14.0	6	40	3.5
	255	**25 x 10**	157	25	87	20	45	M25x1.5	25	34	7	23.7	14.0	6	40	3.5
	301	**30 x 5**	148	30	74	25	50	M30x1.5	24	40	10	29.2	17.0	8	40	4.0
	302	**30 x 10**	148	30	74	25	50	M30x1.5	24	40	10	28.7	17.0	8	40	4.0
	350	**30 x 5**	189	35	108	30	55	M35x1.5	26	45	10	29.2	28.0	8	45	4.0
	351	**30 x 10**	189	35	108	30	55	M35x1.5	26	45	10	28.7	28.0	8	45	4.0
	401	**39 x 5**	176	40	90	36	60	M40x1.5	26	54	12	38.1	24.5	10	50	5.0
	402	**39 x 10**	176	40	90	36	60	M40x1.5	26	54	12	37.7	24.5	10	50	5.0
	505	**39 x 5**	233	50	137	40	65	M50x1.5	31	62	12	38.1	32.0	12	50	5.0
	506	**39 x 10**	233	50	137	40	65	M50x1.5	31	62	12	37.7	32.0	12	50	5.0
	503	**48 x 5**	205	50	106	40	70	M50x1.5	29	62	12	47.2	22.0	12	50	5.0
	504	**48 x 10**	205	50	106	40	70	M50x1.5	29	62	12	46.7	22.0	12	50	5.0
	650	**48 x 5**	310	65	178	60	100	M65x2	32	78	18	47.2	46.0	18	90	7.0
	651	**48 x 10**	310	65	178	60	100	M65x2	32	78	18	46.7	46.0	18	90	7.0
	652	**60 x 10**	310	65	178	60	100	M65x2	32	78	18	58.7	39.0	18	90	7.0
	653	**60 x 20**	310	65	178	60	100	M65x2	32	78	18	57.7	39.0	18	90	7.0
	700	**60 x 10**	271	70	138	65	100	M70x2	33	90	20	58.7	50.0	18	90	7.0
	701	**60 x 20**	271	70	138	65	100	M70x2	33	90	20	57.7	50.0	18	90	7.0
	900	**75 x 10**	327	90	169	85	120	M90x2	38	108	25	73.7	59.0	22	100	9.0
	901	**75 x 20**	327	90	169	85	120	M90x2	38	108	25	72.7	59.0	22	100	9.0
	902	**75 x 10**	389	90	233	85	120	M90x2	36	108	25	73.7	59.0	22	100	9.0
	903	**75 x 20**	389	90	233	85	120	M90x2	36	108	25	72.7	59.0	22	100	9.0

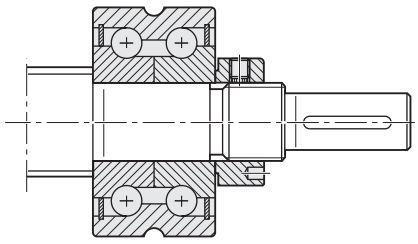
1) The allocation of screw ends to the bearing assemblies is clearly defined by the version.
2) Keyway with form 842 only

For the codes, see the chapter entitled “Abbreviations”

End bearings for screw ends form 832, 842

The bearing assemblies LAS, FEC-F consist of:
- 1 bearing
- 1 slotted nut

Application

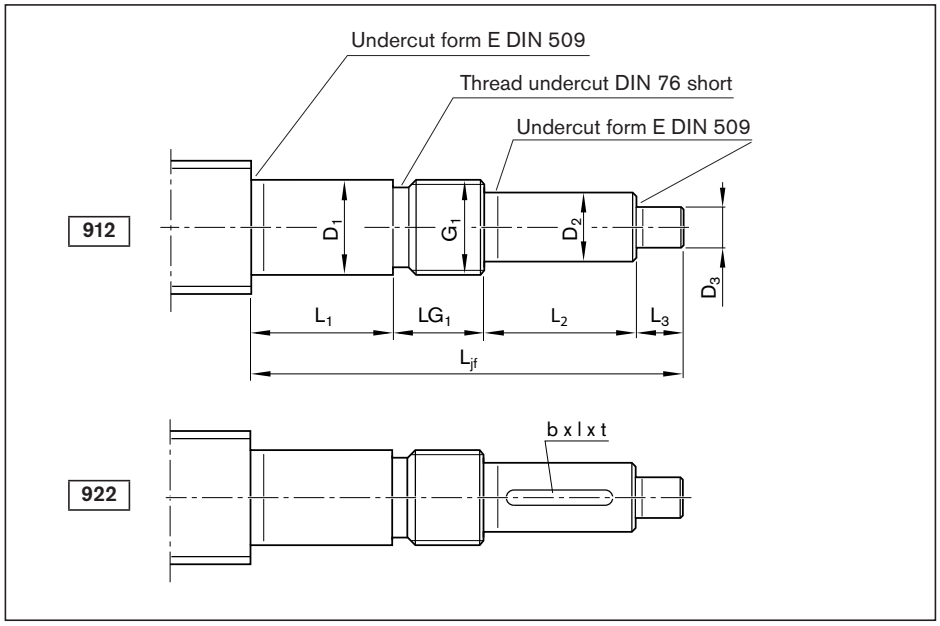


LAS

FEC-F

Version[1)]	Centering hole Z	t_Z	Hex socket S	t_S	Thread G	t_G	M_p (Nm)	Bearing assembly LAS Part number	FEC-F Part number
201	M6	16	5	5	M6	9	22.7	R159A 420 01	–
251	M6	16	5	5	M8	12	29.2	–	R159B 425 01
252	M6	16	5	5	M8	12	33.0	R159A 425 01	–
253	M6	16	5	5	M8	12	59.9	R159A 425 01	–
254	M6	16	5	5	M8	12	33.0	–	R159B 425 01
255	M6	16	5	5	M8	12	59.9	–	R159B 425 01
301	M10	22	8	8	M10	15	45.3	R159A 430 01	–
302	M10	22	8	8	M10	15	84.9	R159A 430 01	–
350	M10	22	10	10	M12	18	54.3	–	R159B 435 01
351	M10	22	10	10	M12	18	110.1	–	R159B 435 01
401	M12	28	12	12	M12	18	79.2	R159A 440 01	–
402	M12	28	12	12	M12	18	154.2	R159A 440 01	–
505	M16	36	12	12	M16	24	91.1	–	R159B 450 01
506	M16	36	12	12	M16	24	175.4	–	R159B 450 01
503	M16	36	12	12	M16	24	110.7	R159A 450 01	–
504	M16	36	12	12	M16	24	217.4	R159A 450 01	–
650	M20	42	19	19	M24	36	132.6	–	R159B 465 01
651	M20	42	19	19	M24	36	256.6	–	R159B 465 01
652	M20	42	19	19	M24	36	385.3	–	R159B 465 01
653	M20	42	19	19	M24	36	721.6	–	R159B 465 01
700	M20	42	19	19	M24	36	373.5	R159A 470 01	–
701	M20	42	19	19	M24	36	701.3	R159A 470 01	–
900	M20	42	19	19	M30	45	596.7	R159A 490 01	–
901	M20	42	19	19	M30	45	1137.4	R159A 490 01	–
902	M20	42	19	19	M30	45	596.7	–	R159B 490 01
903	M20	42	19	19	M30	45	1137.4	–	R159B 490 01

Form 912, 922



Option (machining of end face)	
K	None

Ordering data:

PLSA	20 x 5R	FEM-E-S	00	1	0	T7	R	922Z151	312Z120	1250	1	1

Form	Version[1]	Size	(mm)								
		d_0 x P	L_{jf}	D_1 h6	L_1	D_2 h7	L_2	D_3 h7	L_3	G_1	LG_1
912	**150**	**20 x 5**	85	15	23	12	25	6	15	M15X1	22
922[2]	**151**	**20 x 5**	112	15	50	12	25	6	15	M15x1	22
	170	**25 x 5**	115	17	48	15	30	6	15	M17x1	22
		25 x 10	115	17	48	15	30	6	15	M17x1	22
	171	**25 x 5**	121	17	54	15	30	6	15	M17x1	22
		25 x 10	121	17	54	15	30	6	15	M17x1	22
	200	**30 x 5**	131	20	54	18	40	6	15	M20x1	22
		30 x 10	131	20	54	18	40	6	15	M20x1	22
	201	**30 x 5**	135	20	58	18	40	6	15	M20x1	22
		30 x 10	135	20	58	18	40	6	15	M20x1	22
	300	**39 x 5**	143	30	54	25	50	6	15	M30x1.5	24
		39 x 10	143	30	54	25	50	6	15	M30x1.5	24
	301	**39 x 5**	163	30	74	25	50	6	15	M30x1.5	24
		39 x 10	163	30	74	25	50	6	15	M30x1.5	24
	350	**48 x 5**	155	35	66	30	50	6	15	M35x1.5	24
		48 x 10	155	35	66	30	50	6	15	M35x1.5	24
	351	**48 x 5**	171	35	82	30	50	6	15	M35x1.5	24
		48 x 10	171	35	82	30	50	6	15	M35x1.5	24
	450	**60 x 10**	199	45	98	40	60	6	15	M45x1.5	26
		60 x 20	199	45	98	40	60	6	15	M45x1.5	26
	600	**75 x 10**	248	60	122	55	80	6	15	M60x2	31
		75 x 20	248	60	122	55	80	6	15	M60x2	31

1) The allocation of screw ends to the bearing assemblies is clearly defined by the version.
2) Keyway with form 922 only
3) Under preparation

For the codes, see the chapter entitled “Abbreviations”

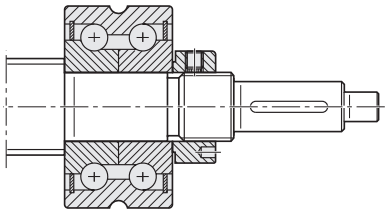
End bearings for screw ends form 912, 922

The bearing assemblies LAF, LAN, LAS consist of:
- 1 bearing
- 1 slotted nut

LAF

LAN

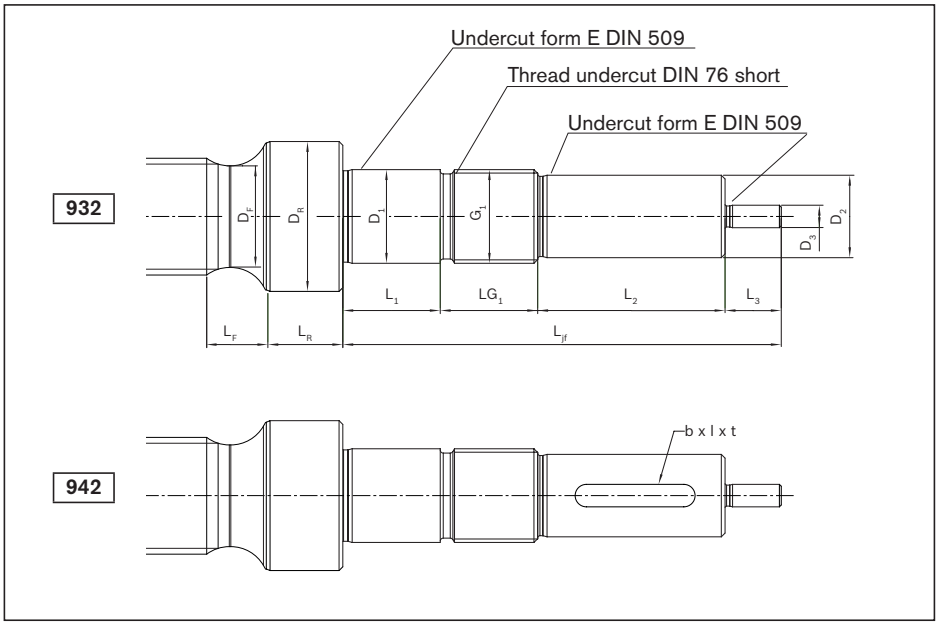
Application



LAS

Version[1]	Size	DIN 6885[2] keyway			M_p (Nm)	Bearing assembly		
						Pillow block unit	Bearing	
	d_0 x P	b	l	t		LAF	LAN	LAS
		P9				Part number	Part number	Part number
150	**20 x 5**	4	20	2.5	12.1	R159A 015 01	R159A 115 01	–
151	**20 x 5**	4	20	2.5	12.1	–	–	R159A 415 01
170	**25 x 5**	5	25	3.0	15.9	[3]	[3]	–
	25 x 10	5	25	3.0	25.7	[3]	[3]	–
171	**25 x 5**	5	25	3.0	15.9	–	–	R159A417 02
	25 x 10	5	25	3.0	25.7	–	–	R159A417 02
200	**30 x 5**	6	28	3.5	22.5	R159A 320 01	R159A 220 01	–
	30 x 10	6	28	3.5	38.5	R159A 320 01	R159A 220 01	–
201	**30 x 5**	6	28	3.5	22.5	–	–	R159A 420 02
	30 x 10	6	28	3.5	38.5	–	–	R159A 420 02
300	**39 x 5**	8	36	4.0	45.7	R1590 330 30	R1590 230 30	–
	39 x 10	8	36	4.0	85.5	R1590 330 30	R1590 230 30	–
301	**39 x 5**	8	36	4.0	45.7	–	–	R159A 430 01
	39 x 10	8	36	4.0	85.5	–	–	R159A 430 01
350	**48 x 5**	8	36	4.0	62.0	R159A 335 01	R159A 235 01	–
	48 x 10	8	36	4.0	119.0	R159A 335 01	R159A 235 01	–
351	**48 x 5**	8	36	4.0	62.0	–	–	R159A 435 01
	48 x 10	8	36	4.0	119.0	–	–	R159A 435 01
450	**60 x 10**	12	50	5.0	178.2	–	–	R159A 445 01
	60 x 20	12	50	5.0	325.1	–	–	R159A 445 01
600	**75 x 10**	16	63	6.0	296.7	–	–	R159A 460 01
	75 x 20	16	63	6.0	573.8	–	–	R159A 460 01

Form 932, 942



Option (machining of end face)	
K	None

Ordering data:

PLSA	20 x 5R	FEM-E-S	00	1	0	T7	R	942Z251	412Z120	1250	1	1

Form	Version[1]	Size	(mm)												
		d_0 x P	L_{jf}	D_1 h6	L_1	D_2 h7	L_2	D_3 h7	L_3	G_1	LG_1	D_R	L_R	D_F	L_F
932	**201**	**20 x 5**	131	20	54	18	40	6	15	M20x1	22	27	7	19.2	14.0
942[2]	**251**	**20 x 5**	172	25	87	20	45	6	15	M25x1.5	25	34	7	19.2	26.0
	252	**25 x 5**	151	25	66	20	45	6	15	M25x1.5	25	34	7	24.2	14.0
	253	**25 x 10**	151	25	66	20	45	6	15	M25x1.5	25	34	7	23.7	14.0
	254	**25 x 5**	172	25	87	20	45	6	15	M25x1.5	25	34	7	24.2	14.0
	255	**25 x 10**	172	25	87	20	45	6	15	M25x1.5	25	34	7	23.7	14.0
	301	**30 x 5**	163	30	74	25	50	6	15	M30x1.5	24	40	10	29.2	17.0
	302	**30 x 10**	163	30	74	25	50	6	15	M30x1.5	24	40	10	28.7	17.0
	350	**30 x 5**	204	35	108	30	55	6	15	M35x1.5	26	45	10	29.2	28.0
	351	**30 x 10**	204	35	108	30	55	6	15	M35x1.5	26	45	10	28.7	28.0
	401	**39 x 5**	191	40	90	36	60	6	15	M40x1.5	26	54	12	38.1	24.5
	402	**39 x 10**	191	40	90	36	60	6	15	M40x1.5	26	54	12	37.7	24.5
	505	**39 x 5**	248	50	137	40	65	6	15	M50x1.5	31	62	12	38.1	32.0
	506	**39 x 10**	248	50	137	40	65	6	15	M50x1.5	31	62	12	37.7	32.0
	503	**48 x 5**	220	50	106	40	70	6	15	M50x1.5	29	62	12	47.2	22.0
	504	**48 x 10**	220	50	106	40	70	6	15	M50x1.5	29	62	12	46.7	22.0
	650	**48 x 5**	325	65	178	60	100	6	15	M65x2	32	78	18	47.2	46.0
	651	**48 x 10**	325	65	178	60	100	6	15	M65x2	32	78	18	46.7	46.0
	700	**60 x 10**	286	70	138	65	100	6	15	M70x2	33	90	20	58.7	50.0
	701	**60 x 20**	286	70	138	65	100	6	15	M70x2	33	90	20	57.7	50.0
	652	**60 x 10**	325	65	178	60	100	6	15	M65x2	32	78	18	58.7	39.0
	653	**60 x 20**	325	65	178	60	100	6	15	M65x2	32	78	18	57.7	39.0
	900	**75 x 10**	342	90	169	85	120	6	15	M90x2	38	108	25	73.7	59.0
	901	**75 x 20**	342	90	169	85	120	6	15	M90x2	38	108	25	72.7	59.0
	902	**75 x 10**	404	90	233	85	120	6	15	M90x2	36	108	25	73.7	59.0
	903	**75 x 20**	404	90	233	85	120	6	15	M90x2	36	108	25	72.7	59.0

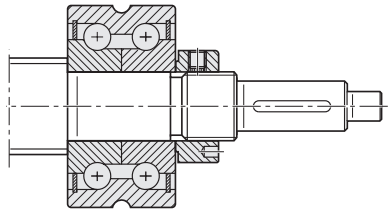
1) The allocation of screw ends to the bearing assemblies is clearly defined by the version.
2) Keyway with form 942 only

For the codes, see the chapter entitled “Abbreviations”

End bearings for screw ends form 932, 942

The bearing assemblies FEC-F, LAS consist of:
- 1 bearing
- 1 slotted nut

Application



LAS

FEC-F

Version[1]	Keyway as per DIN[2] 6885[2]			M_p (Nm)	Bearing assembly	
	b	l	t		LAS	FEC-F
	P9				Part number	Part number
201	6	36	3.5	22.7	R159A 420 01	–
251	6	40	3.5	29.2	–	R159B 425 01
252	6	40	3.5	33.0	R159A 425 01	–
253	6	40	3.5	59.9	R159A 425 01	–
254	6	40	3.5	33.0	–	R159B 425 01
255	6	40	3.5	59.9	–	R159B 425 01
301	8	40	4.0	45.3	R159A 430 01	–
302	8	40	4.0	84.9	R159A 430 01	–
350	8	45	4.0	54.3	–	R159B 435 01
351	8	45	4.0	110.1	–	R159B 435 01
401	10	50	5.0	79.2	R159A 440 01	–
402	10	50	5.0	154.2	R159A 440 01	–
505	12	50	5.0	91.1	–	R159B 450 01
506	12	50	5.0	175.4	–	R159B 450 01
503	12	50	5.0	110.7	R159A 450 01	–
504	12	50	5.0	217.4	R159A 450 01	–
650	18	90	7.0	132.6	–	R159B 465 01
651	18	90	7.0	256.6	–	R159B 465 01
700	18	90	7.0	385.3	R159A 470 01	–
701	18	90	7.0	721.6	R159A 470 01	–
652	18	90	7.0	373.5	–	R159B 465 01
653	18	90	7.0	701.3	–	R159B 465 01
900	22	100	9.0	596.7	R159A 49001	–
901	22	100	9.0	1137.4	R159A 49001	–
902	22	100	9.0	596.7	–	R159B 490 01
903	22	100	9.0	1137.4	–	R159B 490 01

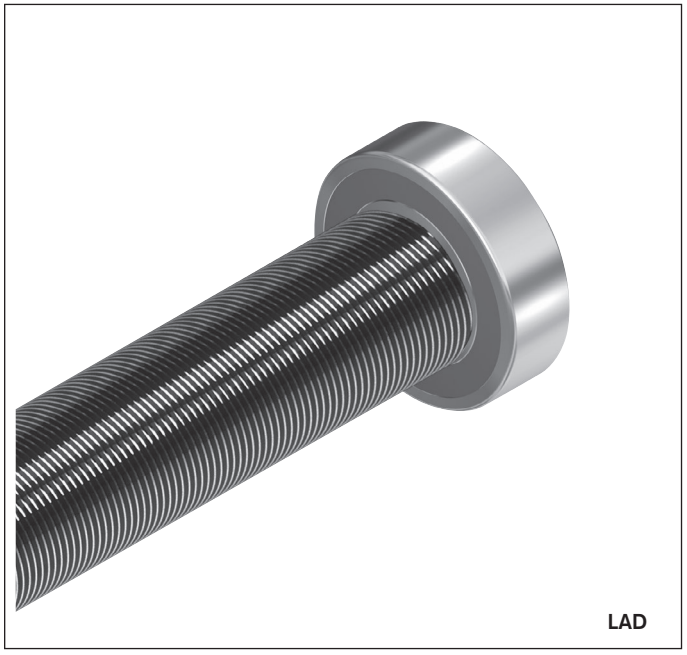
Overview

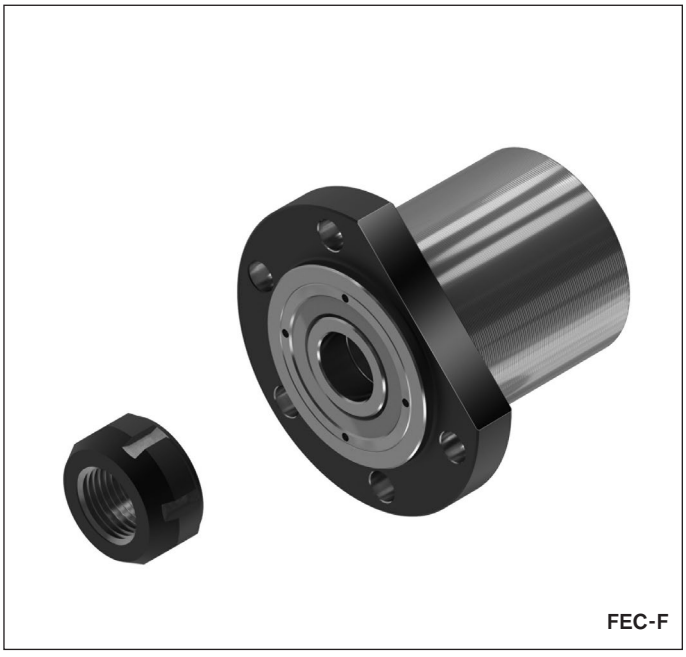
Rexroth offers an extensive range of accessories for planetary screw assemblies.
These include bearings and slotted nuts.
A reasonable ratio of the load capacities of the bearing and the planetary screw assembly should be taken into account when dimensioning. Further information is provided in this section.


LAF


LAN


LAS


LAD



FEC-F

NMA/GWR

Bearing assembly LAF

Fixed bearing with angular-contact thrust ball bearing LGF

Double-thrust, screw-on,
Series LGF-B-…
Double-thrust, screw-on,
Series LGF-C-…

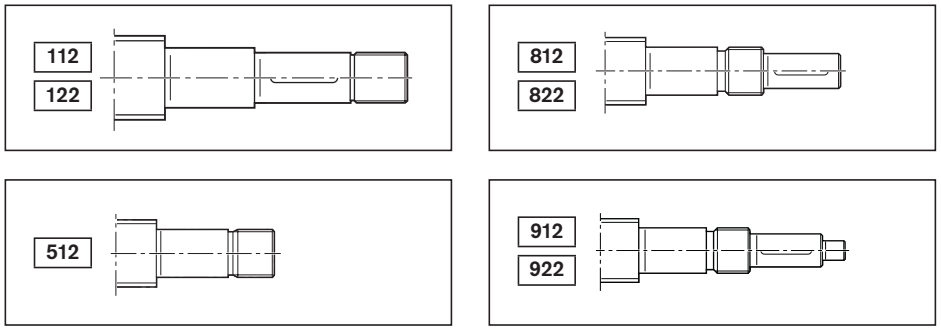
The bearing assembly consists of:
- angular-contact thrust ball bearing LGF (not available as a separate part)
- slotted nut NMA...

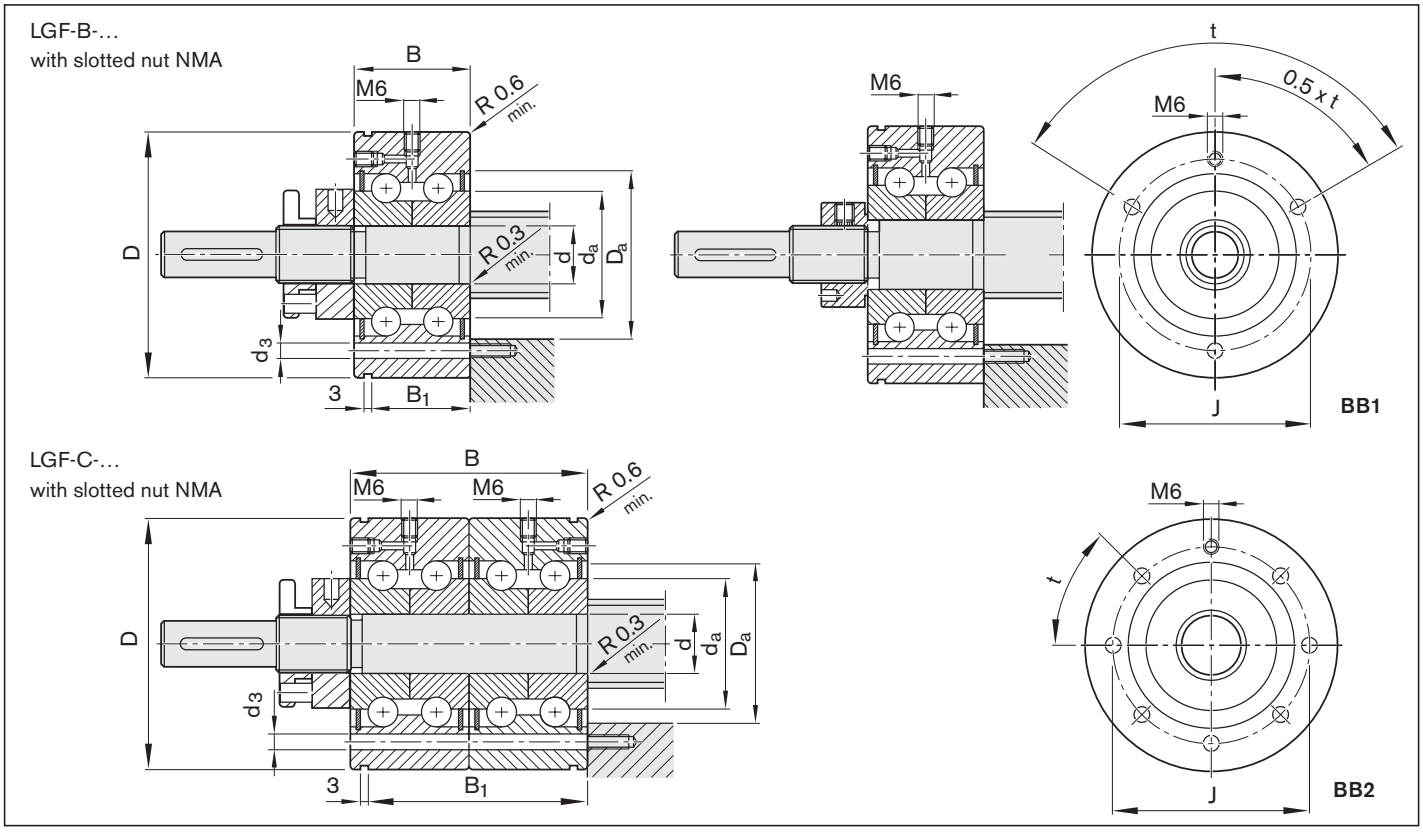
Separate technical dimensioning to determine the limit values is absolutely necessary for all attachments (e.g. pillow block units, bearing assembly, etc.)

d_0 x P	LAF Part number	LGF Abbreviation	NMA Abbreviation	NMA Part number	Weight complete **m** (kg)	C (N)	C_0 (N)	M_{RL} (Nm)	R_{fb} (N/µm)	R_{kl} (Nm/mrad)	n_G (min^{-1})
20 x 5	R159A 015 01	LGF-B-1560	NMA 15x1	R3446 020 04	0.49	17,900	28,000	0.20	400	65	3,500
30 x 5/10	R159A 320 01	LGF-C-2068	NMA 20x1	R3446 015 04	1.35	42,000	94,000	0.45	1,150	320	3,000
39 x 5/10	R1590 330 30	LGF-C-3080	NMA 30x1.5	R3446 016 04	1.76	47,500	127,000	0.75	1,500	620	2,200
48 x 5/10	R159A 335 01	LGF-C-3590	NMA 35x1.5	R3446 012 04	2.49	66,000	177,000	0.90	1,600	900	2,000

For the codes, see the chapter entitled “Abbreviations”

Suitable for screw ends: Form





d_0 x P	(mm)									Mounting holes			
	d	D	B	B_1	J	D_a		d_a		Number	d_3	t	Hole
						min	max	min	max		(mm)	(°)	pattern
20 x 5	15 $_{-0.010}$	60 $_{-0.013}$	25 $_{-0.25}$	17	46	32	35	20	31	3	6.8	120	BB1
30 x 5/10	20 $_{-0.005}$	68 $_{-0.010}$	56 $_{-0.50}$	47	53	40	43	25	39	7	6.8	45	BB2
39 x 5/10	30 $_{-0.005}$	80 $_{-0.010}$	56 $_{-0.50}$	47	63	50	53	40	49	11	6.8	30	BB2
48 x 5/10	35 $_{-0.005}$	90 $_{-0.010}$	68 $_{-0.50}$	59	75	59	62	45	58	7	8.8	45	BB2

Bearing assembly LAN

Fixed bearing with angular-contact thrust ball bearing LGN

Double-thrust,
series LGN-B-…
Double-thrust, in pairs,
series LGN-C-…

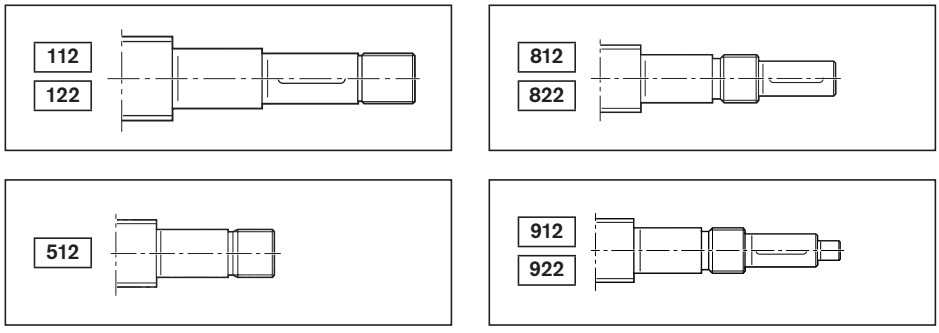
The bearing assembly consists of:
- angular-contact thrust ball bearing LGN (not available as a separate part)
- slotted nut NMA...

Separate technical dimensioning to determine the limit values is absolutely necessary for all attachments (e.g. pillow block units, bearing assembly, etc.)

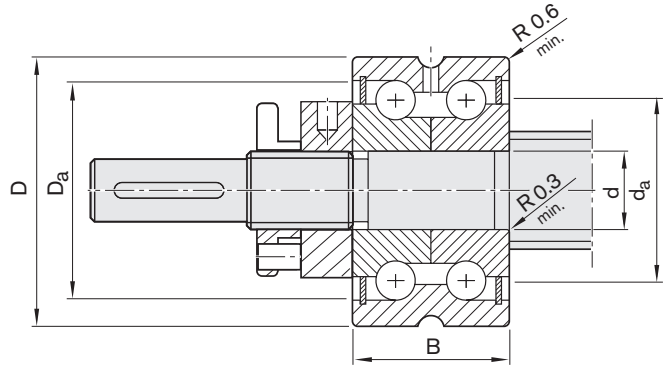
d_0 x P	LAN	LGN	NMA		Weight	C	C_0	M_{RL}	R_{fb}	R_{kl}	n_G
	Part number	Abbreviation	Abbreviation	Part number	complete m (kg)	(N)	(N)	(Nm)	(N/µm)	(Nm/mrad)	(min^{-1})
20 x 5	R159A 115 01	LGN-B-1545	NMA 15x1	R3446 020 04	0.27	17,900	28,000	0.20	400	65	3,500
30 x 5/10	R159A 220 01	LGN-C-2052	NMA 20x1	R3446 015 04	0.75	42,000	94,000	0.45	1,150	320	3,000
39 x 5/10	R1590 230 30	LGN-C-3062	NMA 30x1.5	R3446 016 04	0.98	47,500	127,000	0.75	1,500	620	2,200
48 x 5/10	R159A 235 01	LGN-C-3572	NMA 35x1.5	R3446 012 04	1.25	66,000	177,000	0.90	1,600	900	2,000

For the codes, see the chapter entitled “Abbreviations”

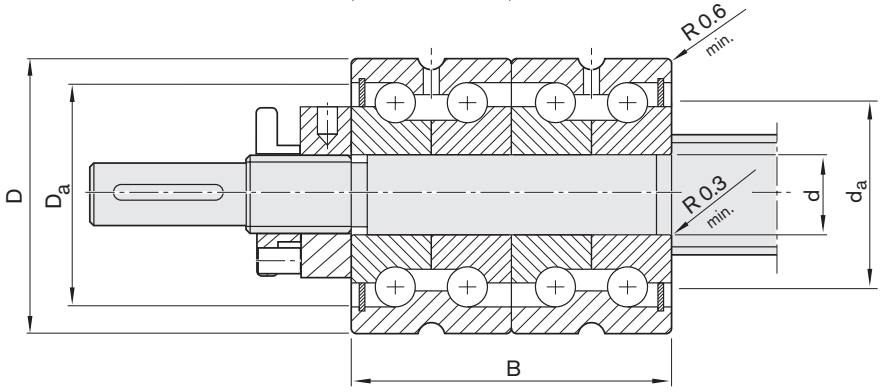
Suitable for screw ends: Form



LGN-B-…
with slotted nut NMA



LGN-C-…
with slotted nut NMA



d_0 x P	(mm)						
	d	D	B	D_a		d_a	
				min	max	min	max
20 x 5	15 $_{-0.010}$	45 $_{-0.01}$	25 $_{-0.25}$	32	35	20	31
30 x 5/10	20 $_{-0.005}$	52 $_{-0.01}$	56 $_{-0.50}$	40	43	25	39
39 x 5/10	30 $_{-0.005}$	62 $_{-0.01}$	56 $_{-0.50}$	50	53	40	49
48 x 5/10	35 $_{-0.005}$	72 $_{-0.01}$	68 $_{-0.50}$	59	62	45	58

Bearing assembly LAD

Floating bearing with deep-groove ball bearing

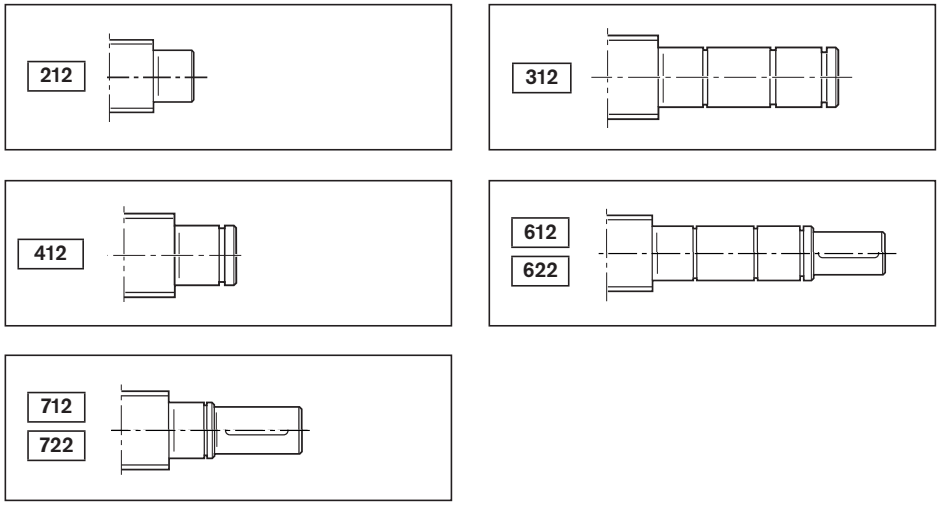
The bearing assembly consists of:
– deep-groove ball bearing as per DIN 625... .2RS
– retaining ring DIN 471 (2 pcs)

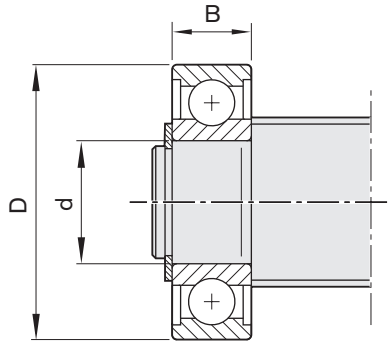
Separate technical dimensioning to determine the limit values is absolutely necessary for all attachments (e.g. pillow block units, bearing assembly, etc.)

d_0 x P	LAD	Single parts				Weight complete	C	C_0
		Deep-groove ball bearing DIN 625		Retaining ring DIN 471				
	Part number	Part number	Abbreviation	Abbreviation	Part number	m (kg)	(N)	(N)
20 x 5	R1590 612 00	6201.2RS	R3414 042 00	12x1	R3410 712 00	0.035	6,950	2,650
	R1590 615 00	6202.2RS	R3414 074 00	15x1	R3410 748 00	0.043	7,800	3,250
25 x 5/10	R1590 617 00	6203.2RS	R3414 050 00	17x1	R3410 749 00	0.064	9,500	4,150
30 x 5/10	R1590 620 00	6204.2RS	R3414 038 00	20x1.2	R3410 735 00	0.106	12,700	5,700
	R1590 625 00	6205.2RS	R3414 063 00	25x1.2	R3410 750 00	0.125	14,300	6,950
39 x 5/10	R1590 630 00	6206.2RS	R3414 051 00	30x1.5	R3410 724 00	0.195	19,300	9,800
48 x 5/10	R1590 635 00	6207.2RS	R3414 075 00	35x1.5	R3410 725 00	0.288	25,500	13,200
60 x 10/20	R1590 650 00	6210.2RS	R3414 077 00	50x2	R3410 727 00	0.453	36,500	20,800
75 x 10/20	R1590 660 00	6212.2RS	R3414 078 00	60x2	R3410 764 00	0.783	52,000	31,000

For the codes, see the chapter entitled “Abbreviations”

Suitable for screw ends: Form





d_0 x P	(mm)		
	d	D	B
20 x 5	12	32	10
	15	35	11
25 x 5/10	17	40	12
30 x 5/10	20	47	14
	25	52	15
39 x 5/10	30	62	16
48 x 5/10	35	72	17
60 x 10/20	50	90	20
75 x 10/20	60	110	22

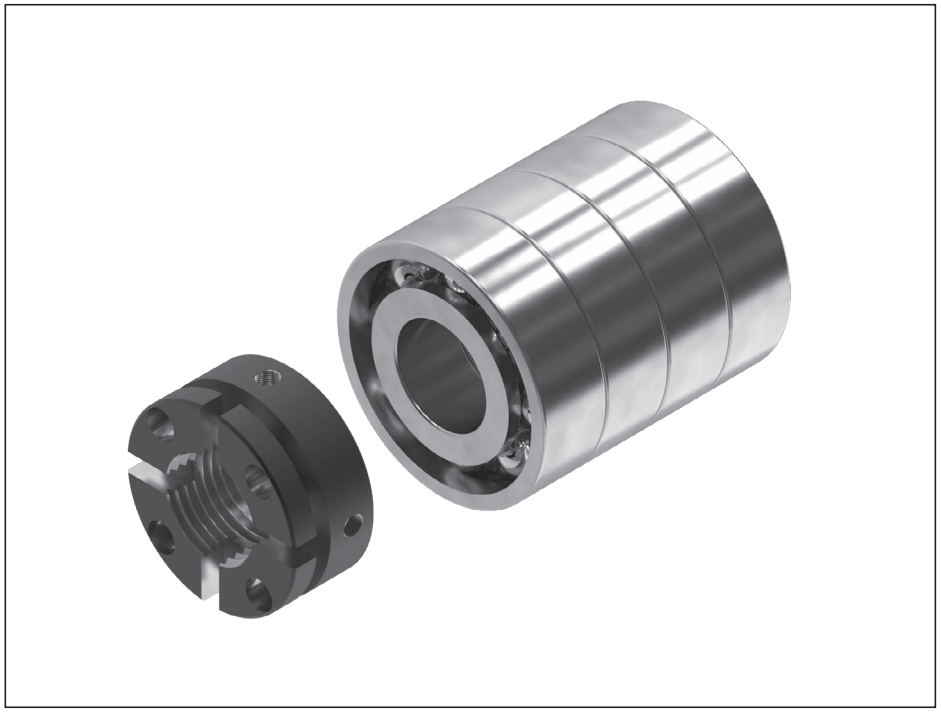
Bearing assembly LAS

Fixed bearing with angular-contact thrust ball bearing LGS

Double-thrust,
series LAS-E

The bearing assembly consists of:
- angular-contact thrust ball bearing LGS as per DIN 628 (not available as a separate part)
- slotted nut NMA...

Separate technical dimensioning to determine the limit values is absolutely necessary for all attachments (e.g. pillow block units, bearing assembly, etc.)

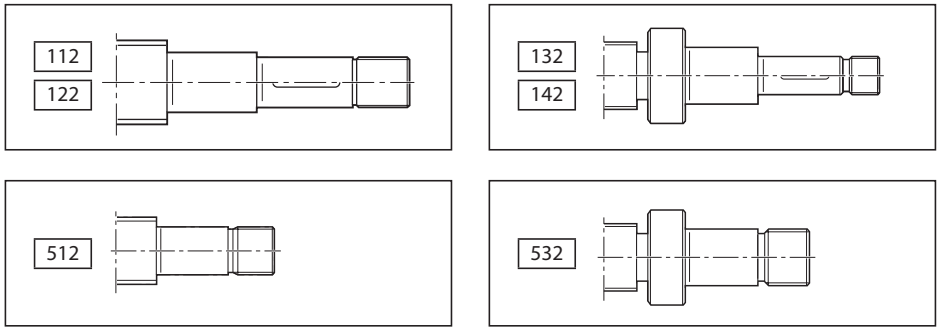


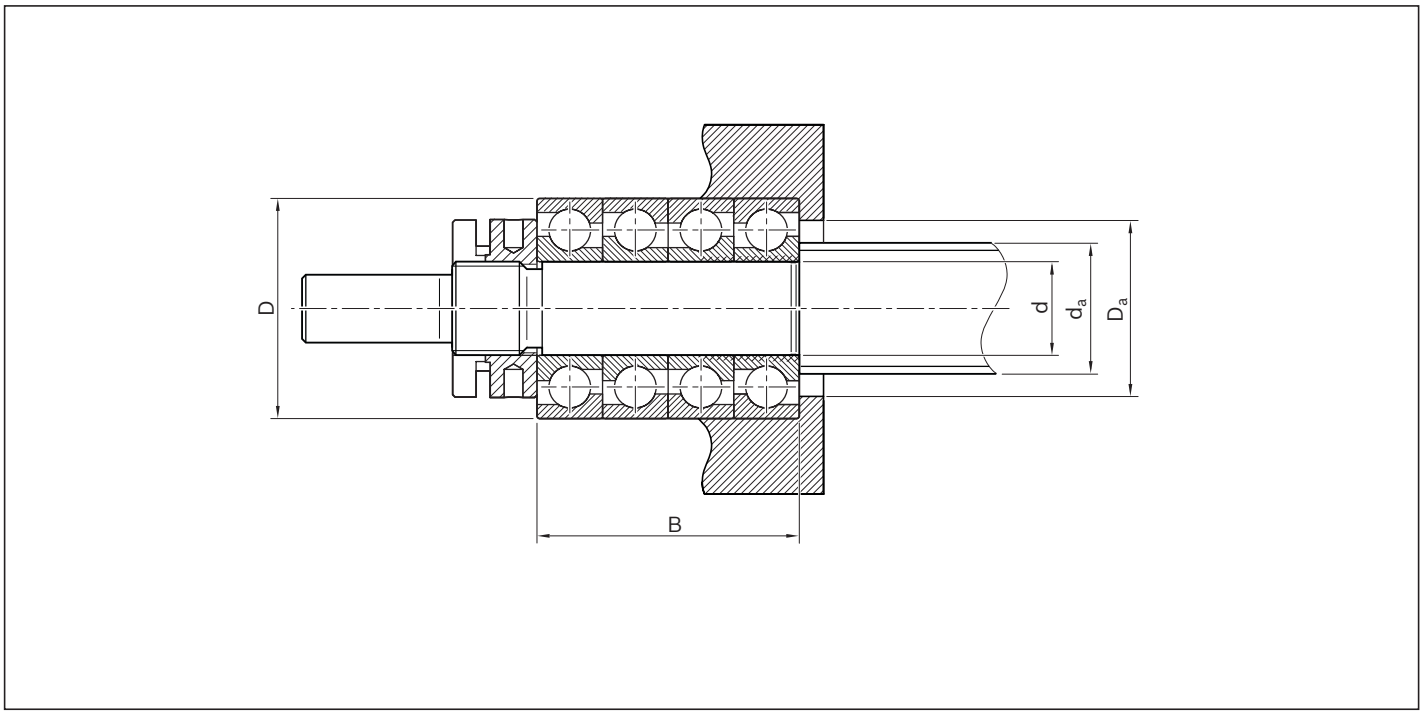
d_0 x P	LAS Part number	LGS Abbreviation	NMA Abbreviation	 Part number	Weight complete m (kg)	C (kN)	C_0 (kN)	n_G[1)] (min^{-1})
20 x 5	R159A 415 01	LGS-E-1542	NMA 15x1	R3446 020 04	0.39	37.1	51.5	9,000
	R159A 420 01	LGS-E-2047	NMA 20x1	R3446 015 04	0.57	39.9	63.8	8,550
35 x 5/10	R159A 417 02	LGS-E-1747	NMA 17x1	R3446 014 04	0.50	45.3	63.8	9,500
	R159A 425 01	LGS-E-2562	NMA 25x1.5	R3446 011 04	1.10	74.2	119.2	7,500
30 x 5/10	R159A 420 02	LGS-E-2052	NMA 20x1	R3446 015 04	0.73	54.2	80.0	8,100
	R159A 430 01	LGS-E-3072	NMA 30x1.5	R3446 016 04	1.68	98.3	163.1	5,850
39 x 5/10	R159A 430 01	LGS-E-3072	NMA 30x1.5	R3446 016 04	1.68	98.3	163.1	5,850
	R159A 440 01	LGS-E-4090	NMA 40x1.5	R3446 016 08	2.74	140.8	257.7	4,500
48 x 5/10	R159A 435 01	LGS-E-3580	NMA 35x1.5	R3446 012 04	2.19	109.4	188.4	4,950
	R159A 450 01	LGS-E-50110	NMA 50x1.5	R3446 019 04	4.95	208.8	392.3	3,600
60 x 10/20	R159A 445 01	LGS-E-45100	NMA 45x1.5	R9130 342 15	1.70	172.4	319.2	4,050
	R159A 470 01	LGS-E-70150	NMA 70x2	R9130 342 17	10.99	339.2	692.3	2,520
75 x 10/20	R159A 460 01	LGS-E-60130	NMA 60x2	R9130 342 16	7.49	272.5	534.6	3,015
	R159A 490 01	LGS-E-90190	NMA 90x2	R9163 113 51	21.45	473.1	1,123.0	2,025

1) Values as a guide for low bearing load, good heat dissipation and suitable lubricating greases with low consistency

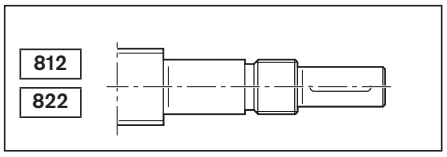
For the codes, see the chapter entitled "Abbreviations"

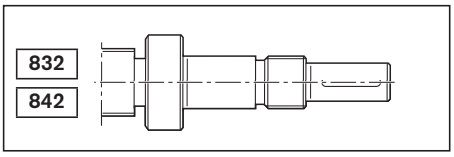
Suitable for screw ends: Form

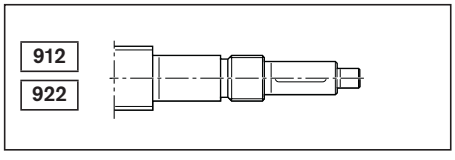


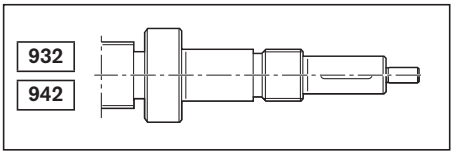


d_0 x P	(mm)						
	d	D	B	D_a		d_a	
				min	max	min	max
20 x 5	15 $_{-0.008}$	42 $_{-0.011}$	52	33.0	36.0	–	–
	20 $_{-0.010}$	47 $_{-0.011}$	56	36.0	41.0	25.6	35.0
25 x 5/10	17 $_{-0.008}$	47 $_{-0.008}$	56	36.2	41.1	22.6	35.2
	25 $_{-0.010}$	62 $_{-0.013}$	68	48.1	55.0	32.0	47.1
30 x 5/10	20 $_{-0.010}$	52 $_{-0.013}$	60	40.0	45.0	–	–
	30 $_{-0.010}$	72 $_{-0.013}$	76	56.5	65.0	37.0	55.5
39 x 5/10	30 $_{-0.010}$	72 $_{-0.013}$	76	56.5	65.0	–	–
	40 $_{-0.012}$	90 $_{-0.015}$	92	72.0	81.0	49.0	71.0
48 x 5/10	35 $_{-0.012}$	80 $_{-0.013}$	84	63.0	71.0	–	–
	50 $_{-0.012}$	110 $_{-0.015}$	108	89.0	100.0	61.0	88.0
60 x 10/20	45 $_{-0.012}$	100 $_{-0.015}$	100	81.0	91.0	–	–
	70 $_{-0.015}$	150 $_{-0.018}$	140	121.0	138.0	82.0	119.0
75 x 10/20	60 $_{-0.015}$	130 $_{-0.018}$	124	106.0	118.0	–	–
	90 $_{-0.020}$	190 $_{-0.030}$	172	153.0	176.0	104.0	150.0







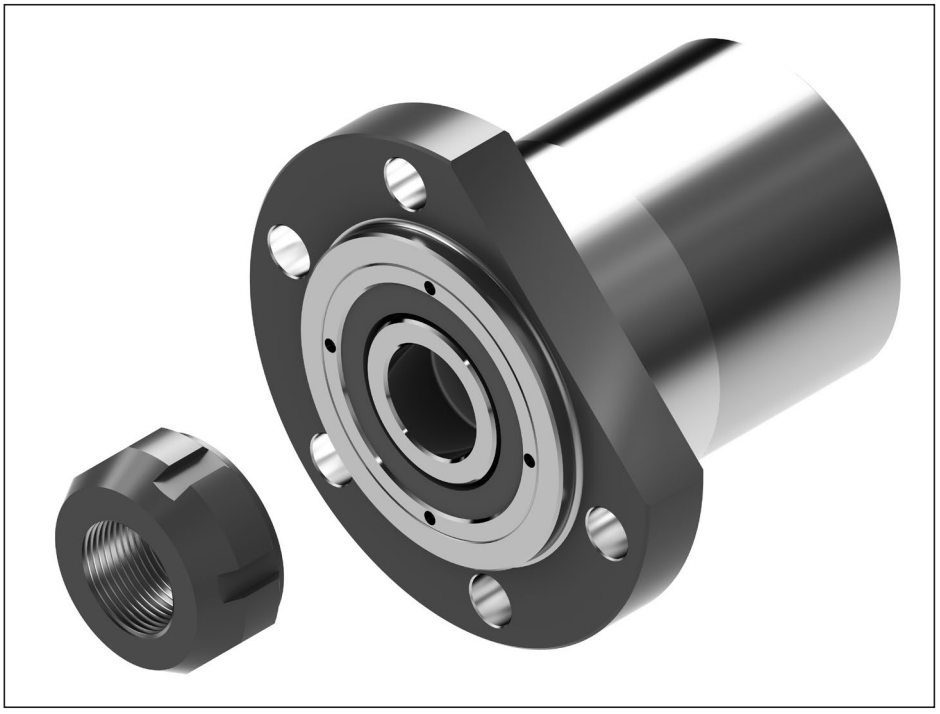


Bearing assembly FEC-F

Fixed bearing with angular-contact thrust ball bearing LGS

The bearing assembly consists of:
- precision flanged housing made of steel
- Angular-contact ball bearing LGS
- Slotted nut NMB

The slotted nut is delivered unmounted



Separate technical dimensioning to determine the limit values is absolutely necessary for all attachments (e.g. pillow block units, bearing assembly, etc.)

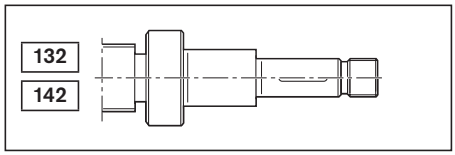
d_0 x P	FEC-F Part number	LGS Part number	NMB Part number	M_A[1] (Nm)	M_{AG} (Nm)	Weight complete m (kg)	C (kN)	C_0 (kN)	M_{RL}[2] (Nm)	R_{fb} (N/µm)	R_{kL} (Nm/mrad)	n_G[3] (min^{-1})
20 x 5	R159B 425 01	LGS-E-2562	NMB 25x1.5	38	8	3.5	74.2	119.2	1.10	450	160	6,900
25 x 5/10	R159B 425 01	LGS-E-2562	NMB 25x1.5	38	8	3.5	74.2	119.2	1.10	450	160	6,900
30 x 5/10	R159B 435 01	LGS-E-3580	NMB 35x1.5	65	8	6.0	109.4	188.4	1.10	600	715	4,950
39 x 5/10	R159B 450 01	LGS-E-50110	NMB 50x1.5	110	18	11.8	208.8	392.3	1.50	750	1,000	3,600
48 x 5/10	R159B 465 01	LGS-E-65140	NMB 65x2	200	18	27.0	305.3	615.4	2.00	1 250	3,200	2,835
60 x 10/20	R159B 465 01	LGS-E-65140	NMB 65x2	200	18	27.0	305.3	615.4	2.00	1 250	3,200	2,835
75 x 10/20	R159B 490 01	LGS-E-90190	NMB 90x2	300	35	53.4	473.1	1,123.0	2.30	1 500	7,500	2,025

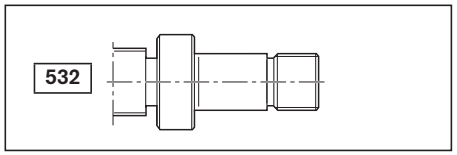
1) Assembly with hook wrench (DIN 1810)
2) Measured at 50 rpm
3) Values as a guide for low bearing load, good heat dissipation and suitable lubricating greases with low consistency

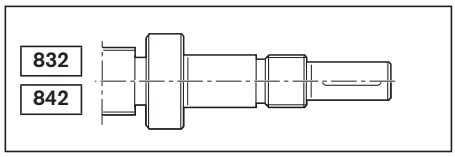
For the codes, see the “Abbreviations” on page 207.

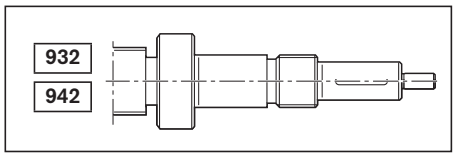
Values apply to bearing configuration 2 + 2.
Bearing configurations 3 + 1 or 1 + 3 are possible. Please consult us.

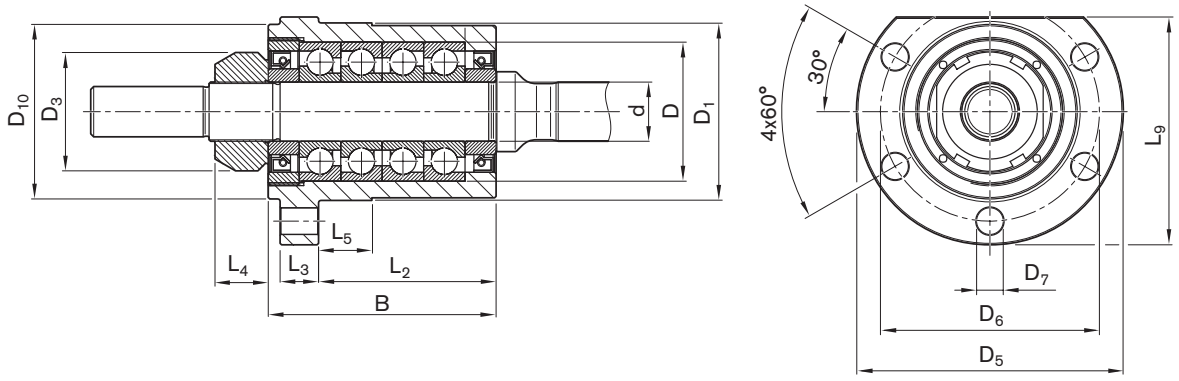
Suitable for screw ends: Form









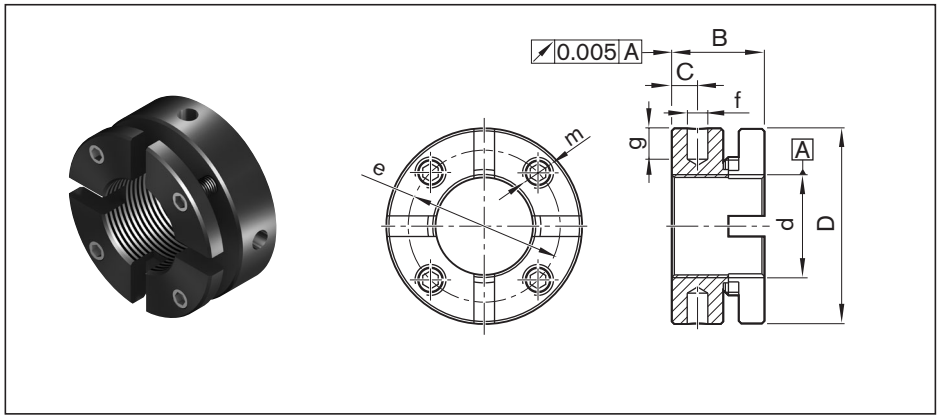


d_0 x P	(mm)													
	d	D	B	L2	L3	L4	L5	L9	D1 h7	D3	D5	D6	D7	D10
20 x 5	$25_{-0.010}$	$62_{-0.013}$	89	68.0	16	20	36.0	104.0	80	44	120	100	11.0	80
25 x 5/10	$25_{-0.010}$	$62_{-0.013}$	89	68.0	16	20	36.0	104.0	80	44	120	100	11.0	80
30 x 5/10	$35_{-0.012}$	$80_{-0.013}$	110	82.0	20	22	47.0	124.0	100	54	140	120	13.0	99
39 x 5/10	$50_{-0.012}$	$110_{-0.015}$	140	98.5	25	25	58.5	152.5	130	75	171	152	13.0	130
48 x 5/10	$65_{-0.015}$	$140_{-0.018}$	180	133.5	30	28	53.5	199.5	170	95	225	198	17.5	170
60 x 10/20	$65_{-0.015}$	$140_{-0.018}$	180	133.5	30	28	53.5	199.5	170	95	225	198	17.5	170
75 x 10/20	$90_{-0.020}$	$190_{-0.018}$	235	179.0	35	32	99.0	257.5	220	125	285	252	22.0	219

Slotted nuts NMA for fixed bearings

Slotted nut NMA

– For maximum vibratory loads
– NMA 15 to 40 with 4 segments
– NMA 45 to 90 with 6 segments



Abbreviation	Part number	(mm)								M_A	F_{aB}	M_{AG}	Mass
		d	D	B	c	m	e	f	g	(Nm)	(kN)	(Nm)	m (g)
NMA 15x1	R3446 020 04	M15x1	30	18	5	M5	24	4	5	10	100	3	60
NMA 17x1	R3446 014 04	M17x1	32	18	5	M5	26	4	5	15	120	3	70
NMA 20x1	R3446 015 04	M20x1	38	18	5	M6	31	4	6	18	145	5	130
NMA 25x1.5	R3446 011 04	M25x1.5	45	20	6	M6	38	5	6	25	205	5	160
NMA 30x1.5	R3446 016 04	M30x1.5	52	20	6	M6	45	5	7	32	250	5	200
NMA 35x1.5	R3446 012 04	M35x1.5	58	20	6	M6	51	5	7	40	280	5	230
NMA 40x1.5	R3446 018 04	M40x1.5	65	22	6	M6	58	6	8	55	350	5	300
NMA 45x1.5	R9130 342 15	M45x1.5	70	22	6	M6	63	6	8	65	360	5	340
NMA 50x1.5	R3446 019 04	M50x1.5	75	25	8	M6	68	6	8	85	450	5	430
NMA 60x2	R9130 342 16	M60x2.0	90	26	8	M8	80	6	8	100	550	15	650
NMA 70x2	R9130 342 17	M70x2.0	100	28	9	M8	90	8	10	130	650	15	790
NMA 90x2	R9163 113 51	M90x2.0	130	32	13	M10	118	8	10	200	900	20	1.530

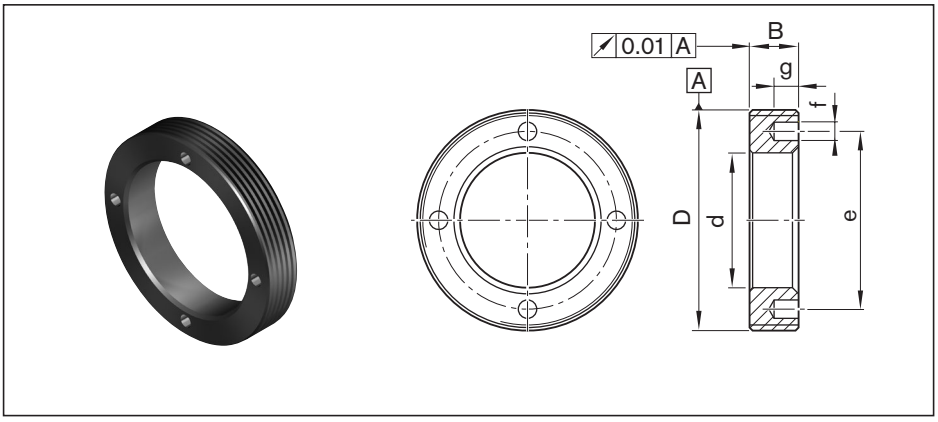
For the codes, see the chapter entitled “Abbreviations”

Ring nut GWR

– For angular-contact thrust ball bearing LGN

Attention:
Use a threadlocker (for example, Loctite 638) to secure against loosening

MA = Tightening torque for threaded ring



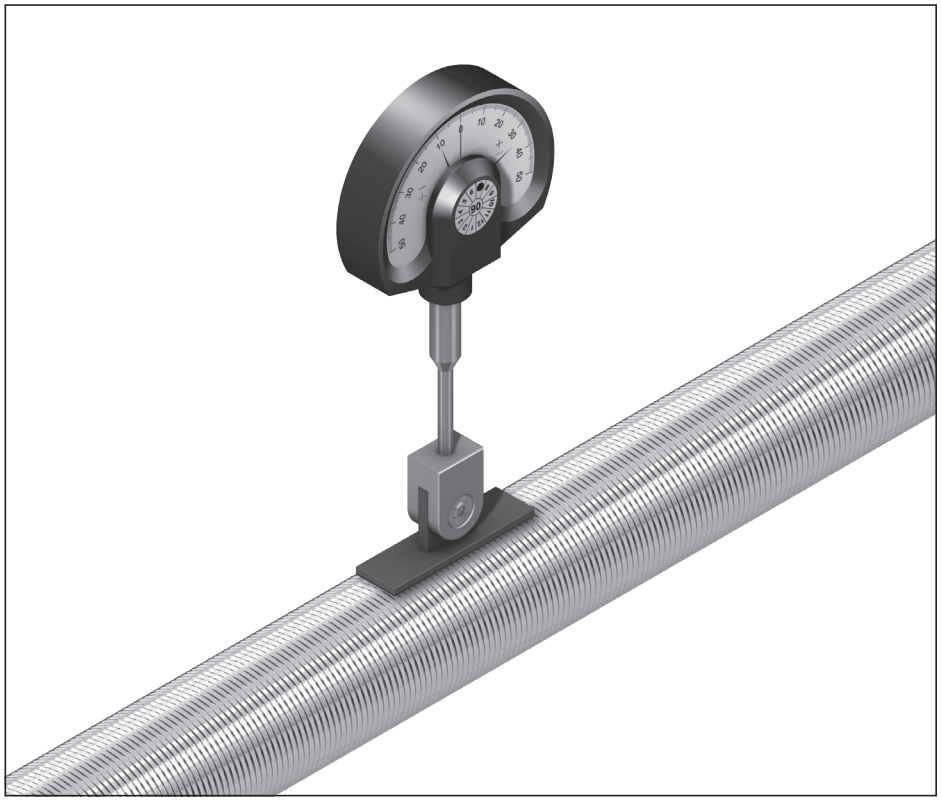
Abbreviation	Part number	(mm)						M_A	Mass
		D	d	B	e	f	g	(Nm)	m (g)
GWR 18x1	R1507 040 33	M18x1	8.5	8	12.5	2.5	3	6	10.0
GWR 23x1	R1507 240 35	M23x1	13.0	8	18.0	2.5	3	8	15.0
GWR 26x1,5	R1507 240 22	M26x1.5	16.5	8	20.5	2.5	3	10	16.5
GWR 30x1,5	R1507 340 34	M30x1.5	17.0	8	23.0	3.0	4	20	29.0
GWR 36x1,5	R1507 040 23	M36x1.5	22.0	8	29.0	3.0	4	25	35.0
GWR 40x1,5	R1507 140 03	M40x1.5	25.0	8	33.0	3.0	4	28	39.5
GWR 45x1,5	R1507 240 04	M45x1.5	28.0	8	38.0	3.0	4	30	55.0
GWR 50x1,5	R1507 240 25	M50x1.5	31.0	10	40.0	4.0	5	45	86.0
GWR 55x1,5	R1507 340 05	M55x1.5	36.0	10	46.0	4.0	5	50	96.0
GWR 58x1,5	R1507 440 32	M58x1.5	43.0	10	50.0	4.0	5	58	84.0
GWR 60x1	R1507 440 28	M60x1	43.0	10	51.0	4.0	5	60	97.0
GWR 62x1,5	R1507 440 29	M62x1.5	43.0	12	53.0	5.0	6	60	127.0
GWR 65x1,5	R1507 440 26	M65x1.5	47.0	12	55.0	4.0	5	70	136.0
GWR 70x1,5	R1507 440 06	M70x1.5	42.0	12	58.0	4.0	5	75	216.0
GWR 78x2	R1507 567 27	M78x2	54.0	15	67.0	6.0	7	90	286.0
GWR 92x2	R1507 640 09	M92x2	65.0	16	82.0	6.0	7	125	385.0
GWR 95x2	R1507 667 28	M95x2	68.0	16	82.0	6.0	7	130	425.0
GWR 112x2	R1507 740 11	M112x2	82.0	18	100.0	8.0	8	175	596.0
GWR 115x2	R1507 767 29	M115x2	85.0	18	100.0	8.0	8	200	664.0

Measuring pads

Alignment of the planetary screw assembly in the machine

Rexroth can provide a gauge with a self-aligning contact pad for easy alignment of the planetary screw assembly.

Two pads of different lengths are available which can be used depending on the screw lead:
- material no. R3305 131 19: length 33 mm
- material no. R3305 131 21: length 50 mm



Dial gauge not supplied as standard with the planetary screw assembly

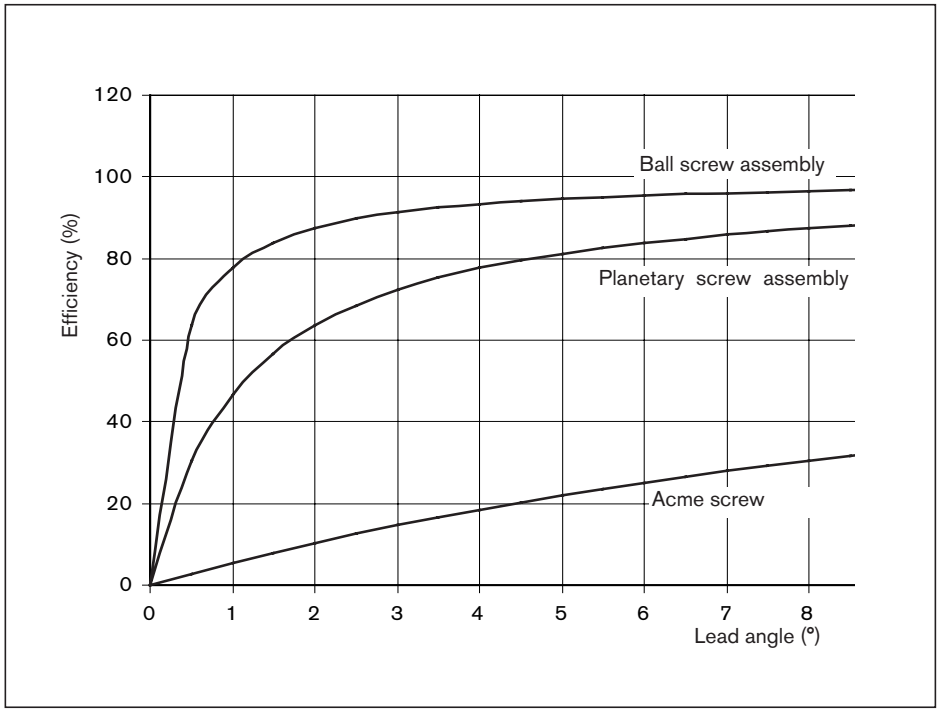
Technical notes

The degree of efficiency determines the torque required to convert the rotary motion into linear motion**.**

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

⚠ Safety information

For installation, customers should check whether separate protection against falling loads is required. Please consult us.



Advantages over the acme screw drive

- The maximum mechanical efficiency of an Acme screw drive is 50%, whereas a planetary screw assembly can achieve 90%, and a ball screw assembly 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

Selection criteria for planetary screw assemblies (extract)

The factors below should be considered when selecting the PLSA for a given application:

- degree of accuracy required (lead deviation)
- Load
- Service life
- critical speed
- buckling load
- rigidity/permissible clearance or desired preload
- characteristic speed (max. permissible linear speed)

⚠ Note

Radial and eccentric forces relative to the screw must be avoided, as they can affect the PLSA's performance and shorten its life. Where special conditions of use are involved, please consult us.

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

- 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.

Static load rating C_0

The static load rating is an axial, concentrically acting force that induces a permanent deformation of 0.0001 x the rolling element diameter.

Dynamic load rating C

The dynamic load rating is an axial, concentrically acting force of constant magnitude and direction under which 90% of a sufficiently large number of identical PLSAs can achieve a nominal service life of one million revolutions.

Correction factor for tolerance grades

The static load rating C_0 and the dynamic load rating C must be multiplied by the correction factor f_{ac} as appropriate for the specific tolerance grade of the screw.

Tolerance grade T	5	7	9
f_{ac}	1	0.9	0.8

Service life

The nominal service 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 planetary screw assemblies before the first signs of material fatigue become evident. The nominal life is designated as L or L_h h, depending on whether it is specified in revolutions or hours.
The nominal life calculation is based on optimal installation and environmental conditions. The service life may be shortened, for example, if the lubrication is affected by exposure to process media.

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 , in the section “Design Calculations”

Characteristic speed $d_0 \cdot n$

Rexroth PLSAs can be operated at very high speeds due to their structural design. Characteristic speeds of up to 150,000 are possible depending on the nut type. The characteristic speeds can be exceeded for short periods, please consult us.

$d_0 \cdot n \leq$ 150,000
d_0 = nominal diameter (mm)
n = speed (rpm)

The theoretically possible maximum linear speed v_{max} (m/min) is specified on the page featuring the relevant nut. Actually attainable speeds are heavily dependent among other factors on preload and duty cycle. They are generally restricted by the critical speed. (See “Design Calculations”).

Material, hardness

PLSA's 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. The screw ends are not hardened.

Technical notes

Sealing

PLSAs are precision assemblies that require protection against contamination. Flat protective covers, bellows-type dust boots or other enclosures are particularly suitable for this purpose. As there are some applications in which these methods do not provide sufficient protection, we have developed an additional gapless lip-type seal which ensures an optimal sealing effect and maintains high efficiency due to the low friction level. Our PLSAs can therefore be supplied with lip-type seals as an option.
At the customer's request, the seals can be omitted entirely.
To ensure that seals retain their functionality, dirt must be removed at regular intervals.

Short stroke
Short stroke applications = stroke ≤ nut length

Lubrication:
During a short stroke, the planets do not make a real turn. It is therefore impossible for an adequate lubricating film to form. This may result in premature wear.
To avoid this, it is sufficient to perform longer strokes at regular intervals with simultaneous relubrication as "lubricating strokes".

Load rating:
Short stroke applications will increase the number of times a rolling load passes over each point within the load zone.
This reduces the load rating.
Please consult us.

Permissible operating temperatures

Standard design PLSAs allow a continuous temperature of 60 °C (measured on the outer shell of the nut).

Permissible operating temperatures:
$-10\ °C \leq T_{operation} \leq 60\ °C$

Permissible bearing temperatures:
$-15\ °C \leq T_{bearing} \leq 80\ °C$

Applications with high-loading and/or rapid cycles can generate excessive heat. To prevent excessive heating, Bosch Rexroth recommends cooling the screw and/or the nut. Apart from this, we can offer solutions for uses at higher temperatures.

Bearing

When calculating the life expectancy of the overall system, the end bearings must be considered separately.

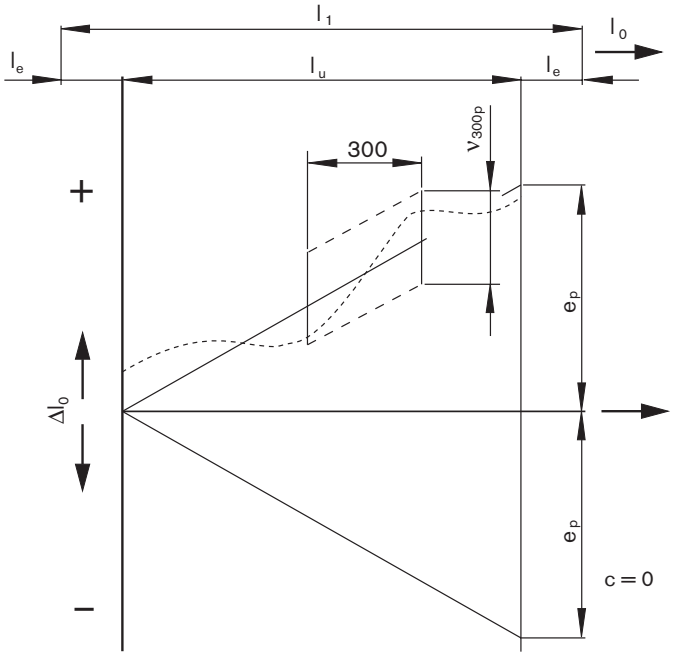
Acceptance conditions and tolerance grades

Permissible travel deviation
based on DIN ISO 3408-3

Symbol definitions:
(excerpt)

l_0 = nominal travel
l_1 = thread length
Δl_0 = travel deviation
l_u = useful travel
l_e = excess travel (the closer tolerances for travel and hardness do not apply here)
c = travel compensation (target travel deviation) (standard: c = 0)
e_p = tolerance mean target travel deviation
ν_{300p} = permissible travel deviation within 300 mm travel
$\nu_{2\pi p}$ = permissible travel deviation within one revolution

T PLSA with precision screw PSR



Useful travel l_u		Tolerance mean actual travel deviation e_p (µm) Tolerance grade		
>	≤	5	7	9
0	100	18	44	110
100	200	20	48	120
200	315	23	52	130
315		$e_p = \frac{l_u}{300} \cdot \nu_{300p}$		

For precision screws PSR the following values apply in all cases:

ν_{300p} (µm) Tolerance grade		
5	7	9
23	52	130

Non-usable length l_e
(Excess travel)

d_0 (mm)	l_e (mm)
20, 25, 30, 39	40
48, 60, 75	50

Minimum number of measurements within 300 mm (measuring interval) and excess travel to be taken into consideration.

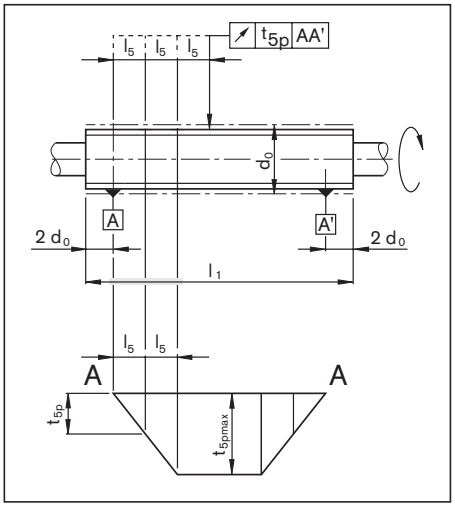
Lead P	Minimum number of measurements for tolerance grade		
(mm)	5	7	9
5	6	3	3
10	3	1	1
20	3	1	1

Acceptance conditions and tolerance grades

Run-outs and location deviations

based on DIN ISO 3408-3

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

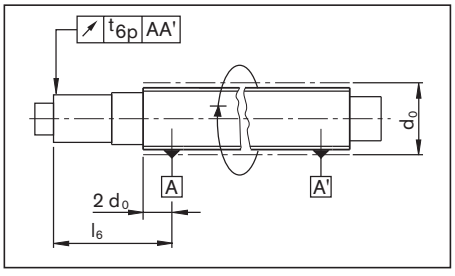


d_0		l_5	t_{5pmax} in µm for l_5 Tolerance grade		
>	≤		5	7	9
6	12	80	32	40	60
12	25	160			
25	50	315			
50	100	630			

l_1/d_0		t_{5pmax} in µm for $l_1 \geq 4l_5$ Tolerance grade		
>	≤	5	7	9
	40	64	80	120
40	60	96	120	180
60	80	160	200	300
80	100	256	320	480

Coaxial deviation t_6 of the bearing journal in relation to AA' where $\mathbf{l_6 \leq l}$.
Tabular value $\mathbf{t_{6p}}$ applies if $\mathbf{l_6}$ ≤ reference length **l**.

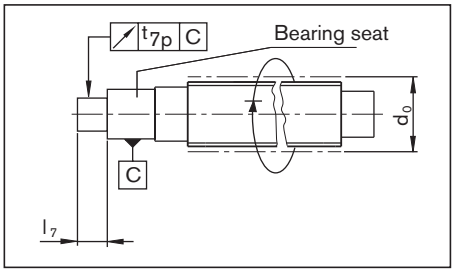
Where $l_6 > l$, then $t_{6a} \leq t_{6p} \cdot \frac{l_6}{l}$



d_0		Reference length l	t_{6p} in µm for $l_6 \leq l$ Tolerance grade		
>	≤		5	7	9
6	20	80	20	40	50
20	50	125	25	50	63
50	125	200	32	63	80

Coaxial deviation t_7 of the journal diameter of the screw in relation to the bearing diameter for $l_7 > l$.
Tabular value $\mathbf{t_{7p}}$ applies if $\mathbf{l_7}$ ≤ reference length **l**.

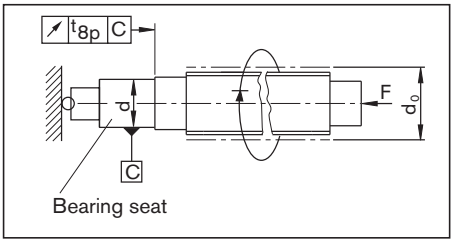
Where $l_7 > l$, then $t_{7a} \leq t_{7p} \cdot \frac{l_7}{l}$



d_0		Reference length l	t_{7p} in µm for $l_7 \leq l$ Tolerance grade		
>	≤		5	7	9
6	20	80	8	12	14
20	50	125	10	16	18
50	125	200	12	20	23

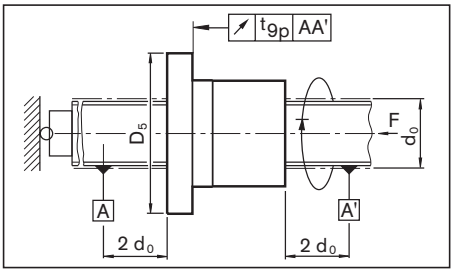
d_0 = nominal diameter

Axial run-out t_8 of the shaft (bearing) face of the screw in relation to the bearing diameter.



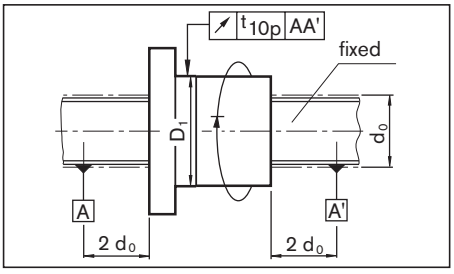
d_0		t_{8p} in µm for tolerance grade		
>	≤	5	7	9
6	63	5	6	8
63	125	6	8	10

Axial run-out t_9 of the nut location face in relation to **A** and **A'** (for preloaded ball nuts only).



Flange diameter D_5		t_{9p} in µm for tolerance grade	
>	≤	5	7
16	32	16	20
32	63	20	25
63	125	25	32
125	250	32	40

Radial run-out t_{10} of the outer diameter D_1 of the nut unit in relation to **A** and **A'** (for preloaded and rotating nuts only). Fix screw to prevent rotation before carrying out the measurement.

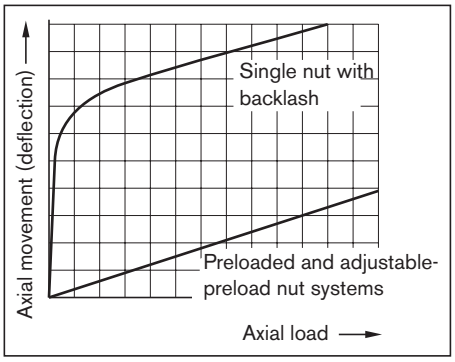


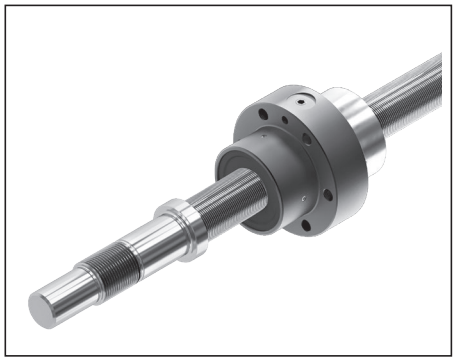
Outer diameter D_1		t_{10p} in µm for tolerance grade	
>	≤	5	7
16	32	16	20
32	63	20	25
63	125	25	32
125	250	32	40

Preload, rigidity, friction torques

Nut system preload

In addition to single nuts with reduced backlash, Rexroth supplies preloaded nut systems.





With preloaded nut systems, the deformation due to load cycling is significantly less than that of systems without preload.
Preloaded nut systems should therefore be used in applications requiring a high degree of rigidity.
The preload of the planetary screw assembly will decrease over time as a function of the load and the operating hours.
The screw is typically far less rigid than the nut unit (for details see “Overall axial rigidity...”).

Rigidity

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

Overall axial rigidity R_{bs} of the planetary screw assembly

The overall axial rigidity $\mathbf{R_{bs}}$ is made up of the component rigidity of the bearing $\mathbf{R_{fb}}$, the screw $\mathbf{R_S}$ and the nut unit$\mathbf{R_{nu}}$.

$$\frac{1}{R_{bs}} = \frac{1}{R_{fb}} + \frac{1}{R_S} + \frac{1}{R_{nu}} \qquad (16)$$

Rigidity of the bearing R_{fb}

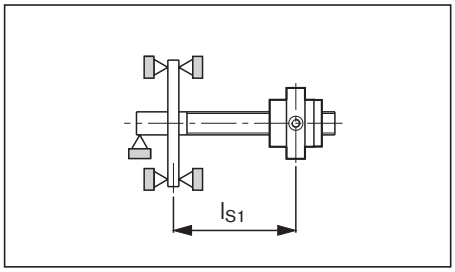
The rigidity of the bearings corresponds to the values found in the bearing manufacturer’s catalog. See the dimension tables in this catalog for the rigidity values of the bearings that Rexroth can provide.

Rigidity of the screw R_S

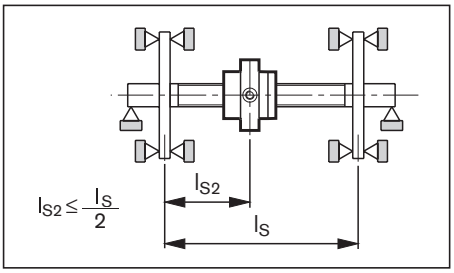
The rigidity of the screw $\mathbf{R_S}$ depends on the type of bearing used.
See the corresponding tables for rigidity values.

Note:
Please note that in most cases the rigidity $\mathbf{R_S}$ of the screw will be significantly lower than the rigidity $\mathbf{R_{nu}}$ of the nut unit.

1 PLSA shaft is fixed at one end



2 PLSA shaft is fixed at both ends



$R_S / R_{S1} / R_{S2}$ = rigidity of the screw (N/µm)
d_0 = nominal diameter (mm)
l_S = distance between bearing and bearing (mm)
l_{S2} = distance between bearing and nut (mm)

$$R_{S2} = 165 \cdot \frac{(d_0)^2}{l_{S2}} \cdot \frac{l_S}{l_S - l_{S2}} \ (N/\mu m) \quad (18)$$

The lowest screw rigidity occurs at the center of the screw R_{S2min} ($l_{S2} = l_S/2$) and thus equals:

$$R_{S1} = 165 \cdot \frac{(d_0)^2}{l_{S1}} \ (N/\mu m) \quad (17)$$

$$R_{S2min} = 660 \cdot \frac{(d_0)^2}{l_S} \ (N/\mu m) \quad (19)$$

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

See the corresponding tables for rigidity values.

Preload and rigidity

d_0 x P	Single nut FEM / ZEM backlash standard (mm)	(preload class C2) R_{nu} (N/µm) max.	T_{p0} (Nm) min.	T_{p0} (Nm) max.	R_S $\left(\frac{N \cdot m}{\mu m}\right)$
20 x 5	0,03	400	0.29	0.66	66
25 x 5		460	0.42	0.92	103
25 x 10		290	0.42	0.92	103
30 x 5		620	0.57	1.24	149
30 x 10		420	0.57	1.24	149
39 x 5		750	0.88	1.92	251
39 x 10		500	0.88	1.92	251
48 x 5		1,080	1.24	2.72	380
48 x 10		760	1.24	2.72	380
60 x 10		1,030	1.79	3.94	594
60 x 20		700	1.79	3.94	594
75 x 10		1,400	2.61	5.17	928
75 x 20		1,000	2.61	5.17	928

Frictional torque of the seals

Seal torque of the nuts

d_0 x P = size
R_S = rigidity of the screw
R_{nu} = rigidity of the nut
T_{RD} = dynamic drag torque of the 2 seals
T_{p0} = dynamic drag torque without seals
T_0 = overall dynamic drag torque
$T_0 = T_{p0} + T_{RD}$

d_0 x P	Dynamic drag torque T_{RD} approx. (Nm)	
	Lip seal	Gap-type seal/cover plate wiper
20 x 5	0.10	0
25 x 5/10	0.10	0
30 x 5/10	0.15	0
39 x 5/10	0.25	0
48 x 5/10	0.35	0
60 x 10/20	0.50	0
75 x 10/20	0.70	0

The values given for dynamic drag torque are proven practical indicators for the nut preloading.

Installation

Delivery condition

Rexroth PLSAs are normally delivered prelubricated with an initial supply of grease. Relubrication is possible, and cartridges and cans of this grease are available. If another lubricant is used, you will need to check that it is compatible with the initial lubrication grease.
In special cases, a ball screw assembly with only a preservative coating can be ordered and supplied via the appropriate ordering code.

⚠ Note

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

⚠ Note

In systems with a gap-type seal (Option 4), the user must additionally apply the stroke-dependent amount of grease. (See section on Lubrication).

Cleaning

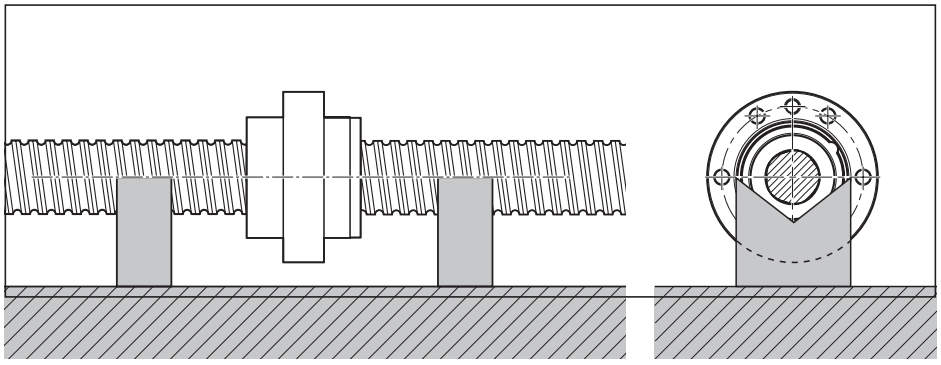
Various cleaning agents can be used to degrease and wash the assembly:
– aqueous cleaning agents
– organic cleaning agents

⚠ Note

Immediately after cleaning, thoroughly dry all parts and 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).

Storage

Planetary 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 planetary screw assembly is contaminated, it must first be cleaned (see “Cleaning”) and re-oiled
– Push the nut unit into the mounting bore, taking care to avoid any impact force or misalignment.
– Tighten the mounting screws using a torque wrench if necessary. Maximum tightening torque for the steel/steel material pairing ($R_m \geq 370$ N/mm^2), see table.
– For the steel/aluminum and aluminum/aluminum material pairings ($R_m \geq 280$ N/mm^2), the maximum tightening torques specified in the follow table apply.
When driving screws into aluminum, the length of thread engagement should be at least 1.5 times the screw diameter.

Tightening torques for fastening screws according to VDI 2230 where $\mu_G = \mu_K = 0.125$

Steel/aluminum and aluminum/aluminum material pairings			
Screw diameter (mm)	Tightening torque (Nm) Strength classes as per DIN ISO 898:		
	8.8	10.9	12.9
M3	1.2	1.2	1.2
M4	2.4	2.4	2.4
M5	4.8	4.8	4.8
M6	8.5	8.5	8.5
M8	20.0	20.0	20.0
M10	41.0	41.0	41.0
M12	70.0	70.0	70.0
M14	110.0	110.0	110.0
M16	175.0	175.0	175.0
M18	250.0	250.0	250.0
M20	345.0	345.0	345.0

Steel/steel material pairing			
Screw diameter (mm)	Tightening torque (Nm) Strength classes as per DIN ISO 898:		
	8.8	10.9	12.9
M3	1.3	1.8	2.1
M4	2.7	3.8	4.6
M5	5.5	8.0	9.5
M6	9.5	13.0	16.0
M8	23.0	32.0	39.0
M10	46.0	64.0	77.0
M12	80.0	110.0	135.0
M14	125.0	180.0	215.0
M16	195.0	275.0	330.0
M18	280.0	400.0	470.0
M20	390.0	560.0	650.0

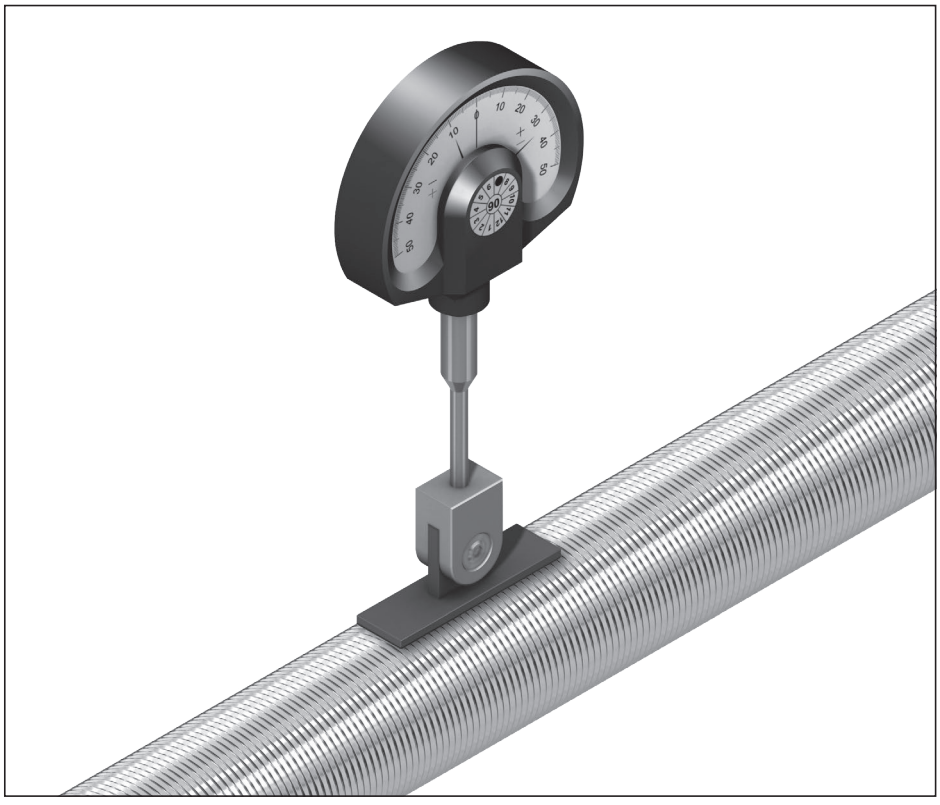
Mounting screws

⚠ **Always make sure the screws are secure where there are high screw loads!**

Alignment of the planetary screw assembly in the machine

Rexroth can provide a gauge with a self-aligning contact pad for easy alignment of the planetary screw assembly.
Two pads of different lengths are available which can be used depending on the screw lead:

- material no. R3305 131 19: length 33 mm
- material no. R3305 131 21: length 50 mm

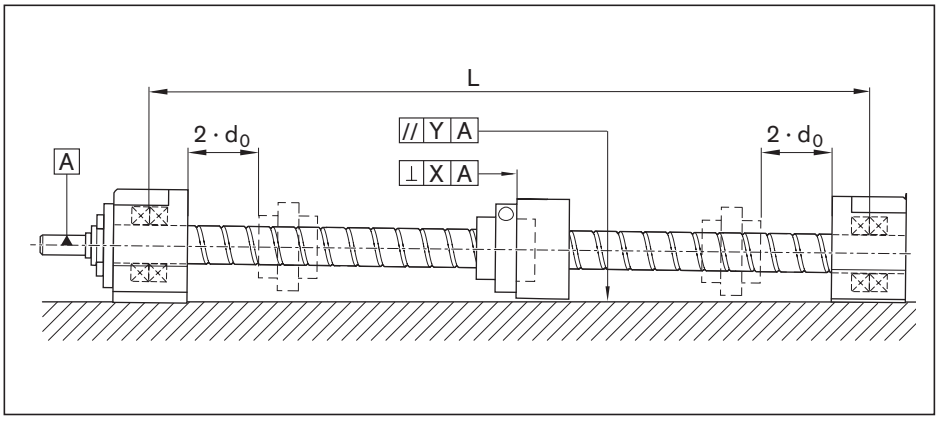


Dial gauge not supplied as standard with the planetary screw assembly

Installation tolerances

To ensure that a PLSA can actually achieve the calculated service life and performance, its system-related requirements and limitations must be taken into account at the design stage. Screw assemblies are not suitable for transferring radial forces and torques, such as may be caused by misalignments during installation. The following sections illustrate the most important principles for achieving designs that will be compatible with the screw drive system and its requirements.

When using PLSAs, the specified installation tolerances must be observed when designing and building the adjoining structures. The first basic principle is: The higher the PLSA's precision and preload, the more accurate the adjoining structures must be.
This applies in particular to applications in which the nut travels close up to the end bearings since, in this area, the risk of distortive stresses and therefore of additional loads is very high.



Parallelism offset and details of the rectangularity between the screw shaft axis and the location face of the nut housing.
L = distance between end bearings (mm)
d_0 = nominal diameter of screw (mm)
X = permissible deviation from rectangularity (mm)
The tolerance applies to a surface that must lie between two planes spaced at a distance X from each other which are perpendicular to the reference axis A.
Y = Permissible parallelism offset between the guide and the screw axis (mm)

The table shows the most important recommended tolerances for planetary screw assemblies as a function of the preload. These tolerances include the rectangularity of the nut housing (or adjoining structure) relative to the screw axis. The tolerances for parallelism between the guide and the screw axis must also be complied with.
Any alignment errors can lead to premature breakdown of the planetary screw assembly!

Option **Preload**	**X** (mm)	**Y** (mm)
Backlash	0.02	0.02
Preload	0.01	0.01

Lubrication

▶ All information on lubrication is based on test values and field experience and are recommendations from Bosch Rexroth..

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

⚠ If other lubricants are used, this may lead to a reduction in the relubrication intervals, the achievable travel in short-stroke applications, and the load capacities. Possible chemical interactions between the plastic materials, lubricants and preservative oils must also be taken into account.

⚠ If your application makes greater environmental demands (i.e. cleanroom, vacuum, foodstuff application, strong or aggressive metalworking fluids, or extreme temperatures) please contact us, since a special test, and possibly a special lubricant, will be required. Please have all information about your application to hand.

⚠ When using in other sectors, e.g.: food industry, clean room, vacuum etc. or at extreme temperatures, or if the lubrication is exposed to process media, the standard initial lubrication and anti-corrosion agents used prior to shipment may not be suitable, or they may be incompatible with the relubrication lubricant. In this case, please consult us in advance!

⚠ Even under normal operating conditions, the system must be relubricated at the latest after 2 years due to aging of the grease. Please note the reduced load ratings according to the technical notes.

▶ In general, you should not apply the grease all in one go; rather, apply several smaller amounts.

Grease lubrication

Planetary screw assemblies are designed to be lubricated with NLGI Class 2 grease. The advantage of grease lubrication is that the planetary screw assembly can run long distances on one supply of grease.

Lubricating grease

We recommend using Dynalub 510 with the following properties:
- NLGI grade 2 lithium-based high-performance grease as per DIN 51818 (KP2K-20 according to DIN 51825)
- Good water resistance
- Corrosion protection

Under conventional environmental conditions, this ground-fiber, homogeneous grease is ideally suited for the lubrication of linear elements:
- For loads of up to 50% C
- For short-stroke applications ≥ 1 mm
- For the permissible speed range for planetary screw assemblies

The product and material safety data sheets are available on our website at www.boschrexroth.de/brl

Material numbers for Dynalub 510:
- R3416 037 00 (cartridge 400 g)
- R3416 035 00 (hobbock 25 kg)

For more information on Dynalub 510, see Page 168.

Initial lubrication of the PLSA
(Basic lubrication)

Fully assembled PLSAs are prelubricated with Dynalub 510 before shipment. In versions without prelubrication, the initial lubrication quantities according to table 1 must be applied to the nut unit via the lube hole prior to commissioning. Please follow the described procedure.
In versions with a gap-type seal, the stroke-dependent lubrication quantity according to table 1 must additionally be applied when commissioning is carried out.

Relubrication of the planetary screw assemblies

Stroke > nut length L:
If the relubrication interval according to diagram 1 or diagram 2 has been reached, relubricate the amount stated in table 1.

Stroke < nut length L:
Carry out a lubricating stroke on a regular basis (if possible)! Reducing the relubrication interval according to table 1 by a factor of at least 3 means that the relubrication quantity can be reduced by the same factor. Please follow the described procedure.

d_0 x P	Lubricant quantity (cm^3)			
	Gap-type seal/cover plate wiper		Lip seal	
	Initial lubrication	Relubrication	Initial lubrication	Relubrication
20 x 5	$10 + L_s / 115$	$5 + L_s / 115$	10	5.0
25 x 5/10	$10 + L_s / 90$	$5 + L_s / 90$	10	5.0
30 x 5/10	$20 + L_s / 75$	$10 + L_s / 75$	20	10.0
39 x 5/10	$35 + L_s / 60$	$17{,}5 + L_s / 60$	35	17.5
48 x 5/10	$50 + L_s / 50$	$25 + L_s / 50$	50	25.0
60 x 10/20	$150 + L_s / 40$	$75 + L_s / 40$	150	75.0
75 x 10/20	$250 + L_s / 30$	$125 + L_s / 30$	250	125.0

table 1

L_s = stroke length (mm)
The nut is prelubricated; the stroke-dependent quantity of grease must be applied before the assembly is commissioned.
Apply the stated quantity of grease through the nut unit in several partial amounts. The nut unit must be moved through the full stroke during this process.
Conditions:
- Temperature ≤ 60 °C
- Relubrication interval applies as long as the lubricant is not spun off by the screw or removed.

Load-dependent relubrication intervals

s = relubrication interval (10^6 revs.)
F_m = equivalent dynamic axial load (N)
C = dynamic load capacity (N)
d_0 = nominal diameter (mm)

Relubrication interval for gap-type seal/wiper

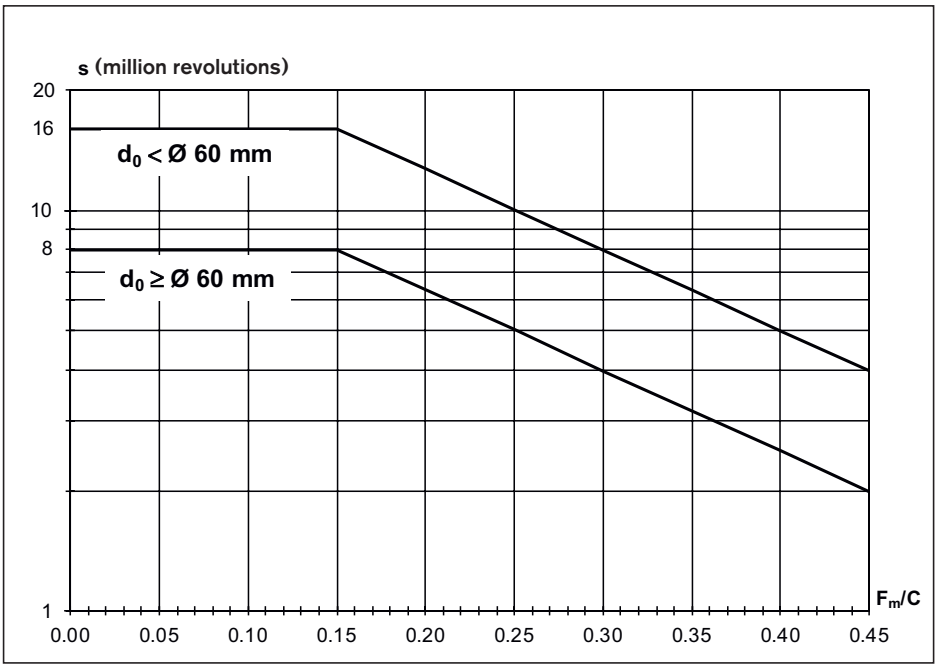


diagramm 1

Relubrication interval for lip-type seal

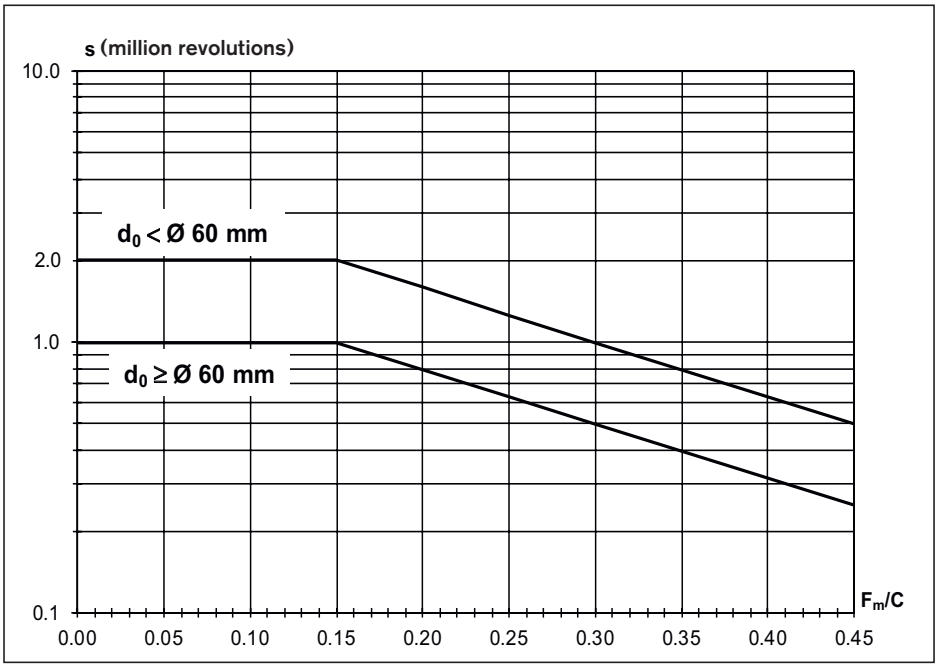


diagramm 2

Oil lubrication

Oil lubricant
We recommend using Shell Tonna S 220, which has the following properties:
– Special demulsifying oil CLP or CGLP as per DIN 51517-3 for machine bed tracks and tool guides
– A blend of highly refined mineral oils and additives
– Can be used even when mixed with significant quantities of metalworking fluids
We recommend using piston distributors from SKF. These should be installed as close as possible to the lube ports of the nut units. Long lines and small line diameters should be avoided, and the lines should be laid on an upward slant.

Initial lubrication of the PLSA
(Basic lubrication)
Fully assembled PLSAs are prelubricated with Dynalub 510 before shipment. In versions without prelubrication, the initial lubrication quantities according to table 3 must be applied to the nut unit via the lube hole.
Please follow the described procedure. When using single-line distributor systems, care should be taken that all lines and the piston distributors (including the connection to the nut unit) are filled before performing basic lubrication or relubrication.

Position specification
Lube hole: The connection should be at the top wherever possible (horizontal mounting orientation).

Relubrication of the planetary screw assemblies
Apply the relubrication quantity according to table 2 to the lube port when the specified relubrication interval has been reached.
The pulse count can be calculated as the quotient (rounded to the next whole figure) of the relubrication quantity and the piston distributor size.
The lubricant cycle time can then be obtained by dividing the relubrication interval by the calculated pulse count.

d_0 x P	Lubricant quantity (cm^3) Gap-type seal/cover plate wiper/ lip seal	
	Initial lubrication	Relubrication
20 x 5	2.7	1.4
25 x 5/10	3.0	1.5
30 x 5/10	3.5	1.8
39 x 5/10	12.0	6.0
48 x 5/10	20.0	10.0
60 x 10/20	50.0	25.0
75 x 10/20	80.0	40.0

table 2

Load-dependent relubrication intervals

Apply the oil quantity via the nut unit. The nut unit must be traversed during this process.
Conditions:
- Temperature ≤ 60 °C
- Relubrication interval applies as long as the lubricant is not spun off by the screw or removed.
- For gap-type seals / Wiper, horizontal mounting only.

Oil relubrication interval

s = relubrication interval (10^6 revs.)
F_m = equivalent dynamic axial load (N)
C = dynamic load capacity (N)
d_0 = nominal diameter (mm)

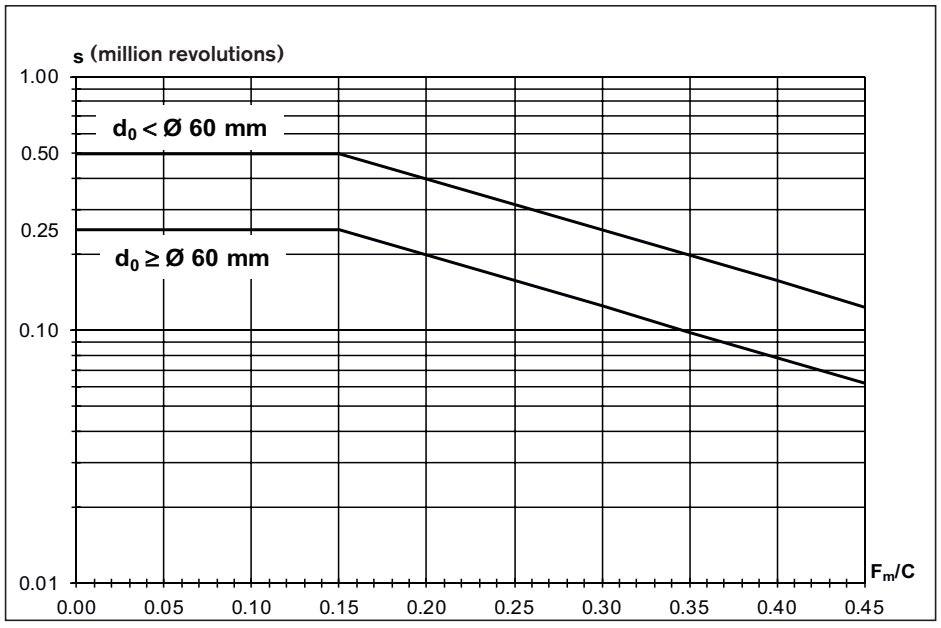


diagramm 3

Calculation

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

See section “Design Calculation Service Form” on page 276

Average speed and average load

Where the operating conditions vary (fluctuating speed and load), the service life must be calculated using the average values $\mathbf{F_m}$ and $\mathbf{n_m}$.

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

$$n_m = \frac{|n_1| \cdot q_{t1} + |n_2| \cdot q_{t2} + ... + |n_n| \cdot q_{tn}}{100\%} \quad (1)$$

The following applies to the effective equivalent bearing load:

$$|F_n| > 2.8 \cdot F_{pr} \qquad F_{eff\,n} = |F_n|$$

$$|F_n| \leq 2.8 \cdot F_{pr} \qquad F_{eff\,n} = \left(\frac{|F_n|}{2.8 \cdot F_{pr}} + 1 \right)^{\frac{3}{2}} \cdot F_{pr}$$

d_0 x P	F_{pr} (N)
20 x 5	1,180
25 x 5	1,580
25 x 10	1,010
30 x 5	1,840
30 x 10	1,470
39 x 5	2,290
39 x 10	1,960
48 x 5	2,700
48 x 10	2,410
60 x 10	2,910
60 x 20	2,320
75 x 10	3,800
75 x 20	3,000

– where the load fluctuates and the speed is constant, the equivalent dynamic axial load $\mathbf{F_m}$ is calculated as follows:

$$F_m = \sqrt[3]{\left|F_{eff\,1}\right|^3 \cdot \frac{q_{t1}}{100\%} + \left|F_{eff\,2}\right|^3 \cdot \frac{q_{t2}}{100\%} + ... + \left|F_{eff\,n}\right|^3 \cdot \frac{q_{tn}}{100\%}} \quad (2)$$

– Where both the load and the speed fluctuate, the equivalent dynamic axial load $\mathbf{F_m}$ is calculated as follows:

$$F_m = \sqrt[3]{\left|F_{eff\,1}\right|^3 \cdot \frac{|n_1|}{n_m} \cdot \frac{q_{t1}}{100\%} + \left|F_{eff\,2}\right|^3 \cdot \frac{|n_2|}{n_m} \cdot \frac{q_{t2}}{100\%} + ... + \left|F_{eff\,n}\right|^3 \cdot \frac{|n_n|}{n_m} \cdot \frac{q_{tn}}{100\%}} \quad (3)$$

$F_{eff\,1}$, $F_{eff\,2}$, ... $F_{eff\,n}$	=	effective equivalent axial load during phases 1 ... n	(N)
$F_{eff\,n}$	=	effective equivalent axial load during phase n	(N)
F_m	=	equivalent dynamic axial load	(N)
F_n	=	axial load during phase n	(N)
F_{pr}	=	internal axial load on the nut unit due to the preload	(N)
n_1, n_2, ... n_n	=	speeds in phases 1 ... n	(rpm)
n_m	=	average speed	(rpm)
q_{t1}, q_{t2}, ... q_{tn}	=	discrete time step in phases 1 ... n	(%)

Nominal service life

Service life in revolutions L

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

Service life in hours L_h

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

$$L_{h\ machine} = L_h \cdot \frac{DC_{machine}}{DC_{PLSA}} \quad (8)$$

Drive torque and drive power

Drive torque M_{ta}
for conversion of rotary motion into linear motion:

$$M_{ta} = \frac{F_L \cdot P}{2{,}000 \cdot \pi \cdot \eta} \quad (9)$$

$$M_{ta} \leq M_p$$

Transmitted torque M_{te}
for conversion of linear motion into rotary motion:

$$M_{te} = \frac{F_L \cdot P \cdot \eta'}{2{,}000 \cdot \pi} \quad (10)$$

$$M_{te} \leq M_p$$

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

Drive power P_a

$$P_a = \frac{M_{ta} \cdot n}{9{,}550} \quad (11)$$

C	=	dynamic load rating	(N)
$DC_{machine}$	=	duty cycle of the machine	(%)
DC_{PLSA}	=	duty cycle of the PLSA	(%)
F_L	=	thrust force	(N)
F_m	=	equivalent dynamic axial load	(N)
L	=	nominal service life in revolutions	(–)
L_h	=	nominal service life of the PLSA	(h)
$L_{h\ machine}$	=	nominal service life of the machine	(h)
M_p	=	maximum permissible drive torque	(Nm)
M_{te}	=	transmitted torque	(Nm)
M_{ta}	=	drive torque	(Nm)
n	=	speed	(rpm)
n_m	=	average speed	(rpm)
P	=	lead	(mm)
P_a	=	drive power	(kW)
η	=	mech. efficiency ($\eta \approx 0.8$)	(–)
η'	=	mech. efficiency ($\eta' \approx 0.7$)	(–)

⚠ With critical applications, you must pay attention to the information below.

Static load safety factor S_0
You must verify mathematically any structural design involving rolling contact with regard to the static load safety factor.

In this connection, $F_{0\ max}$ represents the maximum load amplitude that can occur, which can affect the screw drive.
It does not matter whether this load is exerted only for a short period.
It may represent the peak amplitude of an overall dynamic loading.
For design purposes, the data shown in the table applies.

$$S_0 = C_0 / (F_{0\ max}) \quad (12)$$

C_0 = Static load rating (N)
$F_{0\ max}$ = Maximum static load (N)
S_0 = Static load safety factor (-)

Design of the static load safety factor in relation to the operating conditions

Operating conditions	Static load safety factor S_0
Overhead arrangements and applications representing a high hazard potential	≥ 12
High dynamic load when at standstill, contamination.	8 - 12
Normal design of machinery and plant without full knowledge of the load parameters or connection details.	5 - 8
Full knowledge of all the load data. Vibration-free operation is ensured.	3 - 5

If there are health and safety hazards, protection against falling loads must be provided.

Calculation example service life

Proposed PLSA: 30 x 5, tolerance grade T5

Operating conditions
The service life of the machine should be 40,000 operating hours with the PLSA operating 60% of the time.

F_1	=	50,000 N	at	n_1	=	10 rpm	for q_1 =	6% of the duty cycle
F_2	=	25,000 N	at	n_2	=	30 rpm	for q_2 =	22% of the duty cycle
F_3	=	8,000 N	at	n_3	=	100 rpm	for q_3 =	47% of the duty cycle
F_4	=	2,000 N	at	n_4	=	1,000 rpm	for q_4 =	25% of the duty cycle
								100%

Calculation procedure

Average torque $\mathbf{n_m}$

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

$n_m = 304$ rpm

Equivalent dynamic axial load $\mathbf{F_m}$ for variable load and variable speed

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

$F_m = 8\ 757$ N

Required service life **L** (revolutions)
The service life **L** can be calculated by transposing formulas (7) and (8):

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

$$L_h = L_{h\ machine} \cdot \frac{DC_{PLSA}}{DC_{machine}}$$

$$L_h = 40{,}000 \cdot \frac{60}{100} = 24{,}000 \text{ h}$$

$$L = 24{,}000 \cdot 304 \cdot 60$$

$L = 437{,}760{,}000$ revolutions

Basic dynamic load rating **C**

$$C = 8\ 757 \cdot \sqrt[3]{\frac{437\ 760\ 000}{10^6}} \quad (5) \qquad C \approx 66\ 492 \text{ N}$$

Result and selection
Now a selection can be made from the dimension tables:

e.g. PLSA, size 30 x 5 R, with single nut with flange FEM-E-S, and screw in tolerance grade T5.
Dyn. load rating C = 87 KN.

Attention:
Take into account the dynamic load rating of the screw end bearing used!

⚠ **Take into account correction factor f_{ac} of the tolerance grade! See page 255.**

Cross-check
Now the following can be selected from the product tables:

Size 30 x 5 R

Backlash | **Preload**

FEM-E-S, with preload class C0
Load capacity Cdyn. = 87,000 N
Correction factor f_{ac} = 1.0
Cross-check
Service life of the selected ball screw drive in revolutions

$$L = \left(\frac{1.0 \cdot 87\,000}{8\,757}\right)^3 \cdot 10^6$$

$L \approx 981 \cdot 10^6$ revolutions

Service life in hours L_h

$$L_h = \frac{981 \cdot 10^6}{304 \cdot 60}$$

$L_h \approx 53{,}760$ hours

FEM-E-S, with preload class C2
Load capacity $C_{dyn.}$ = 87,000 N
Correction factor f_{ac} = 1.0
Cross-check
The following applies to the effective equivalent bearing load:

$$|F_n| > 2.8 \cdot F_{pr} \qquad F_{eff\,n} = |F_n|$$

$$|F_n| \leq 2.8 \cdot F_{pr} \qquad F_{eff\,n} = \left(\frac{|F_n|}{2.8 \cdot F_{pr}} + 1\right)^{\frac{3}{2}} \cdot F_{pr}$$

$F_{eff\,n}$ = effective equivalent axial load during phase n (N)
F_n = axial load during phase n (N)
F_{pr} = internal axial load on the nut unit due to the preload (N)

$2.8 \times F_{pr} = 2.8 \times 1.840\ N = 5152\ N$

- $F_1 = 50{,}000\ N > 5{,}152\ N \Rightarrow F_{eff1} = 50{,}000\ N$
- $F_2 = 25{,}000\ N > 5{,}152\ N \Rightarrow F_{eff2} = 25{,}000\ N$
- $F_3 = 8{,}000\ N > 5{,}152\ N \Rightarrow F_{eff3} = 8{,}000\ N$
- $F_4 = 2{,}000\ N < 5{,}152\ N \Rightarrow F_{eff4} = \left(\frac{2{,}000}{5{,}152} + 1\right)^{1.5} \cdot 1{,}840 \cdot N = 3{,}010\ N$

$$F_m = \sqrt[3]{|50000|^3 \cdot \frac{|10|}{304} \cdot \frac{6}{100} + |25000|^3 \cdot \frac{|30|}{304} \cdot \frac{22}{100} + |8000|^3 \cdot \frac{|100|}{304} \cdot \frac{47}{100} + |3010|^3 \cdot \frac{|1000|}{304} \cdot \frac{25}{100}}$$

$F_m = 8{,}826$ N

$$L = \left(\frac{1.0 \cdot 87{,}000}{8{,}826}\right)^3 \cdot 10^6 = 957 \cdot 10^6 \text{ revolutions}$$

$$L_h = \frac{957 \cdot 10^6}{304 \cdot 60} = 52{,}467 \text{ hours}$$

The service life of both PLSAs (with standard backlash/with standard preload) exceeds the required service life of 40,000 x 60% = 24,000 hours. The selection of a smaller PLSA is consequently possible, subject to a review of it being undertaken.

Critical speed n_{cr}

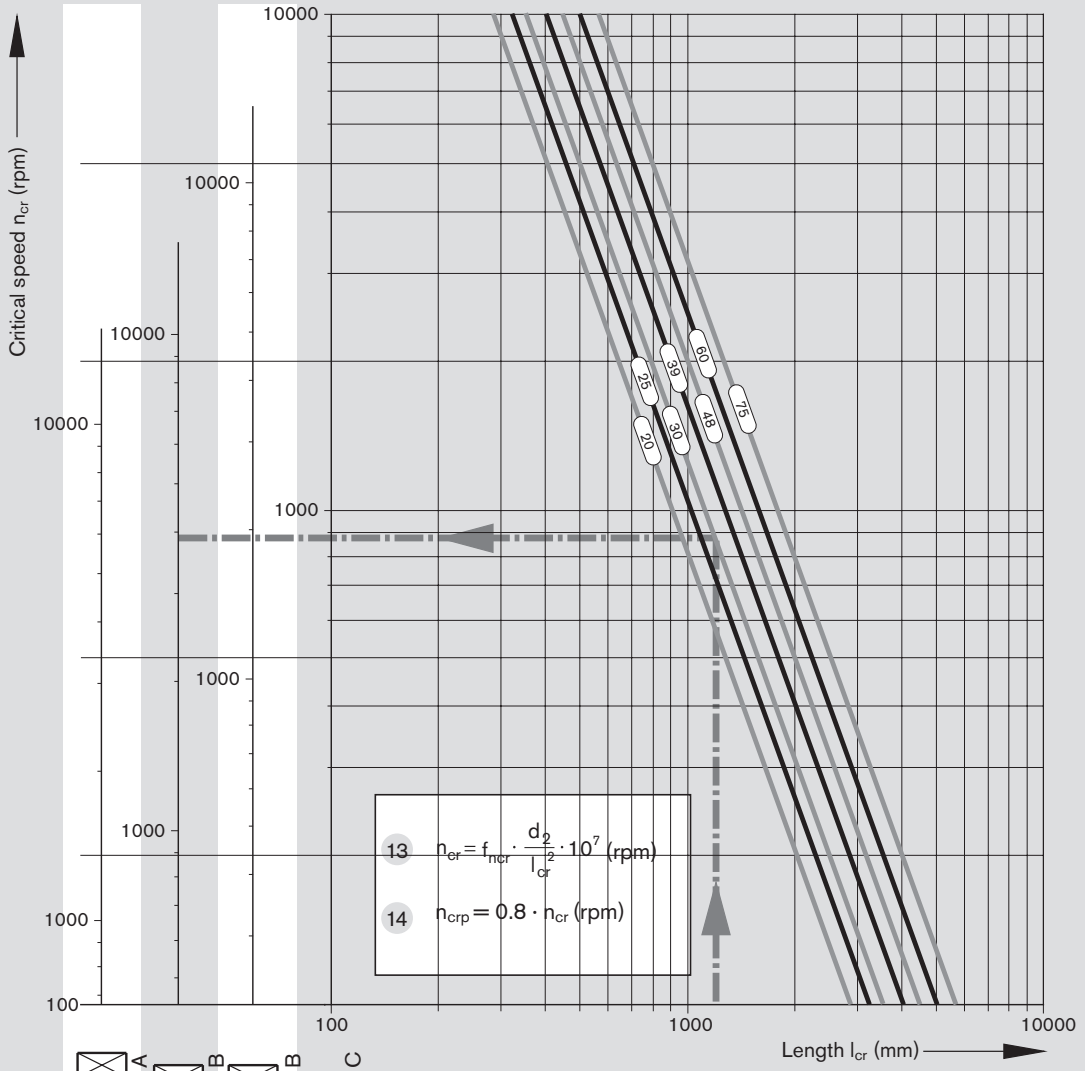
The critical speed n_{cr} depends on the diameter of the screw, the type of end fixity, and the free length l_{cr}. No allowance must be made for guidance by a nut with backlash. The operating speed should not reach more than 80% of the critical speed. The characteristic speed and the max. permissible linear speed must be taken into account, see “Technical Notes”.

Example

Screw diameter = 30 mm
Length l_c = 1,200 mm
End fixity II (fixed bearing - floating bearing)

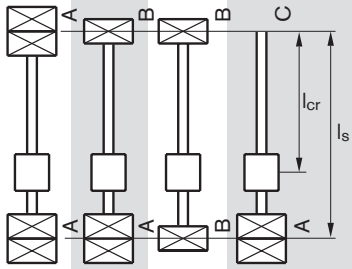
According to the graph, the critical speed is 3,900 rpm.
The permissible operating speed is 3,900 rpm x 0.8 = 3,120 rpm.

The maximum operating speed in our calculation example of n_4 = 1,000 rpm is therefore below the permissible operating speed.



End fixity:

A = fixed bearing
B = floating bearing
C = without bearing



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

n_{cr}	=	Critical speed	(rpm)
n_{crp}	=	Permissible operating speed	(rpm)
f_{ncr}	=	Coefficient determined by bearing	
d_2	=	Root diameter of screw (see dimension tables)	(mm)
l_{cr}	=	Critical length for preloaded nut systems	(mm)
l_s	=	Bearing - bearing distance	(mm)

For non-preloaded nut systems $l_cr = l_s$
For screw ends Form 312, 612, 622, the end fixity can be assumed to be “fixed”

Permissible axial load on screw F_c (buckling load)

The permissible axial load on the screw F_c depends on the diameter of the screw, the type of end fixity, and the effective unsupported length l_c.

A safety factor of $s \geq 2$ must be taken into consideration when determining the permissible axial load.

Example

Screw diameter = 30 mm,
Length l_c = 1,200 mm
End fixity IV (fixed bearing - floating bearing)

According to the graph, the theoretically permissible axial load is 115 kN.
Applying the safety factor 2 yields a permissible axial load on the screw in operation of 115 kN : 2 = 57.5 kN.

This therefore lies above the maximum operating load of F_1 = 50 kN used in our calculation example.
For more information on buckling, see next page.

15 $$F_c = f_{Fc} \cdot \frac{d_2^4}{l_c^2} \cdot 10^4 \text{ (N)}$$

16 $$F_{cp} = \frac{F_c}{2} \text{ (N)}$$

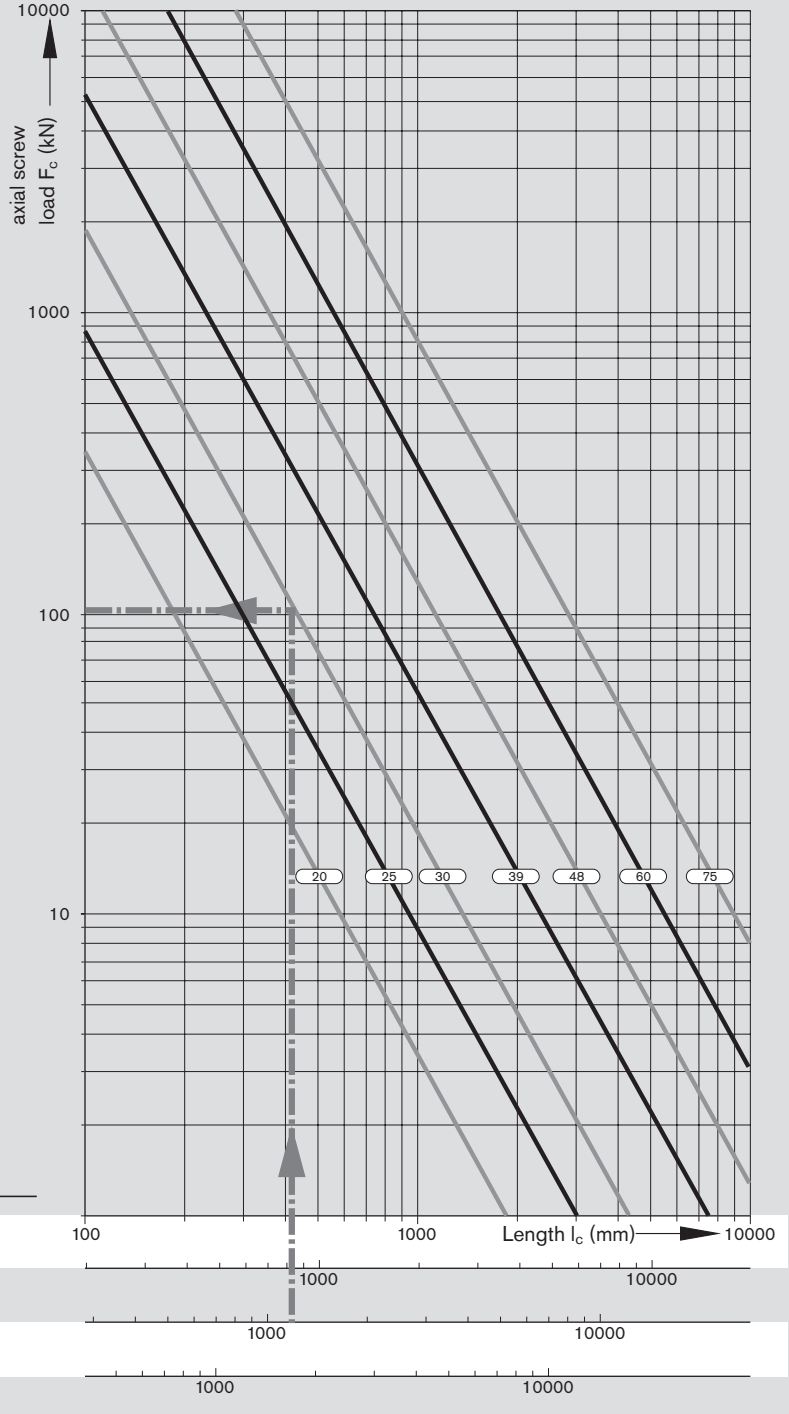
- F_c = Theoretically permissible axial load on screw
- F_{cp} = Permissible axial load on screw during operation (N)
- f_{Fc} = Corrector value determined by bearing
- d_2 = Root diameter of screw, see dimension tables (mm)
- l_c = unsupported thread length

End fixity:	coefficient f_{Fc}	
	nut fixed	nut floating
A – A A – B A – C	End fixity I 39.7	End fixity IV 20.3
B – B	End fixity II 20.3	End fixity V 9.9
A – C	End fixity III 2.5	
A – C		End fixity VI 2.5

End fixity:

A = fixed bearing
B = floating bearing
C = without bearing

f_{Fc} value	End fixity
2.5	III / VI
9.9	V
20.3	II / IV
39.7	I



Notes on buckling

The effective buckling length l_c of the screw is the maximum unsupported screw length in the direction of the force's flow between the nut unit and the fixed bearing (center-to-center distance) or between the nut unit and the screw end.

For buckling load calculations, the nut is taken into consideration as a bearing.

For "nut fixed," the following conditions must be met:
– zero-backlash nut,
– rigid attachment of the nut to the linear guide,
– the nut unit is not subjected to moment loads, i.e. a linear guide absorbs any arising moments,
– no distortive stresses due to external factors (for example, temperature).

If one or more of the conditions for "nut fixed" are not met, the appropriate coefficients for "nut floating" must be used instead.

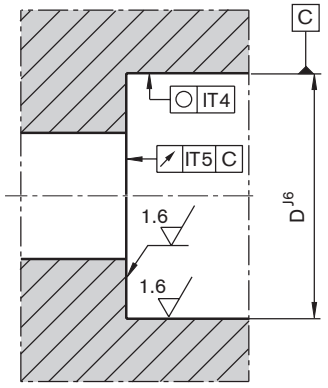
Case III occurs in applications with driven nuts, for example, when the nut is stationary and the screw rotates. The nut can then be regarded as a fixed bearing.
Case VI arises only when the nut unit is not supported by any linear guide.

End Bearings

Design notes, installation

Bearing design
For customer-machined screw ends, please consider the design notes given for screw ends and housings.
For Rexroth screw end designs, see "End Machining Details."
Rexroth delivers complete drive systems, including the end bearings. Calculations are performed with the formulas used in the antifriction bearing industry.

Housing



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 anti-friction 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 crosswise 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 Figure). The markings reveal the bearing sequence. The sealing rings should face outwards after proper mounting.

Outer raceway markings for paired bearings

Slotted nut

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 M_A and then easing the load. Only then should the slotted nut be retightened to the specified tightening torque M_A.

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 have 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 (M_A in accordance with Dimension Table).

Design Note

For counter holding the tightening torque MA of the slotted nut we recommend a wrench flat on the spindle or a hexagon socket on the end face of the spindle.

Lubrication of the end bearings

Bearings for planetary screw assemblies are in general lubricated with grease for a lifetime of reliable service. This does not apply to our LGS bearing which are unsealed and therefore unlubricated. It should be noted, 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. At higher temperatures circulating oil lubrication must be set up. Angular-contact thrust ball bearings of series LGF, LGN are lifetime-lubricated with KE2P-35 grease as per DIN 51825. For regreasing, the quantities stated in the table below can be applied via the lube ports provided on the bearings. Where there are pairs of bearings, please note that each bearing must be individually lubricated via the lube port. Each bearing must be lubricated with half the value shown in the table.The maximum interval can be assumed to be 350 million revolutions, in which case the larger of the two quantities should be used. As a rule, the initial grease quantity will therefore last for the entire service life of a planetary screw assembly.

Relubrication quantities for angular-contact thrust ball bearings LGF, LGN

Abbreviation		Quantity (cm^3) 1)		Abbreviation		Quantity (cm^3) 1)	
LGN-B-1545	LGF-B-1560	0.49	0.38				
				LGN-C-2052	LGF-C-2068	1.74	1.09
				LGN-C-3062	LGF-C-3080	2.17	1.30
				LGN-C-3572	LGF-C-3590	3.48	1.96

1) Shortened lubricating interval max. 10 M revolutions
2) Where there are pairs of bearings, lubricate each bearing via the lube port. Lubricate each bearing with half the value shown in the table.

Angular-contact thrust ball bearings of series LGS are unseald and therefor unlubricated. For initial greasing, the quantity stated in the table below is to be applied to each bearing.

Initial lubrication quantities for angular-contact thrust ball bearings

Abbreviation			Quantity (cm^3)
LGS-E-1542	LGS-E-1747	LGS-E-2047	3.26
LGS-E-2052			4.35
LGS-E-2562			5.43
LGS-E-3072			7.61
LGS-E-3580			8.70
LGS-E-4090			10.87
LGS-E-45100			13.04
LGS-E-50110			16.30
LGS-E-60130			21.74
LGS-E-70150			28.26
LGS-E-90190			44.57

Resulting and equivalent bearing loads

For angular-contact thrust ball bearings LGN and LGF6

Angular-contact thrust ball bearings are preloaded. The chart shows the resulting axial bearing load F_{ax} as a function of preload and axial operating load F_{Lax}.
For a purely axial load $F_{comb} = F_{ax}$.

$\alpha = 60°$	X	Y
$\frac{F_{ax}}{F_{rad}} \leq 2.17$	1.90	0.55
$\frac{F_{ax}}{F_{rad}} > 2.17$	0.92	1.00

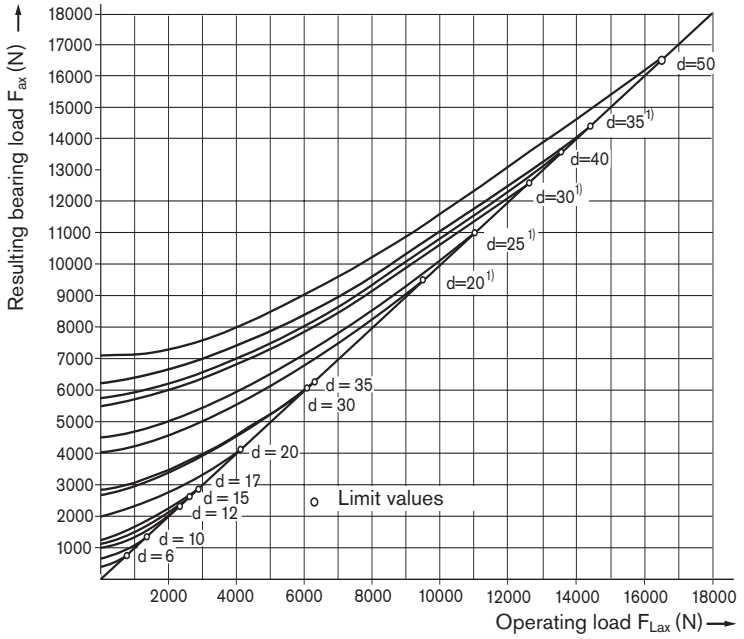
α = pressure angle
F_{ax} = resulting bearing load
F_{Lax} = operating load
X, Y = dimensionless factor

If the radial operating forces are not insignificant, the equivalent bearing loads are calculated according to formula 20.
Bearings for planetary screw assemblies are also able to accommodate tilting moments. The moments that usually occur due to the weight and drive motion of the screw do not generally need to be incorporated into the calculation of the equivalent bearing load.

$$F_{comb} = X \cdot F_{rad} + Y \cdot F_{ax} \quad (20)$$

F_{ax} = resulting axial bearing load (N)
F_{comb} = combined equivalent bearing load (N)
F_{rad} = radial bearing load (N)

Internal preload limit and resulting bearing load



1) Four row version

⚠ Separate technical dimensioning to determine the limit values is absolutely necessary for all attachments (e.g. pillow block units, bearing assembly, etc.)

Permissible static axial load for bearing series LGF

The permissible static axial load of LGF series bearings in screw-down direction is:

$$F_{0ax\ p} \leq \frac{C_0}{2}$$

The static axial load rating C_0 is stated in the Dimension Tables.

Average speed and average bearing load

When the bearing load varies in steps over a specific period of time 22, calculate the dynamic equivalent bearing load.
When the speed varies, use formula 23. In these formulas q_t denotes the discrete time steps for the individual phases in %.

$$F_m = \sqrt[3]{F_{comb1}^{\ 3} \cdot \frac{|n_1|}{n_m} \cdot \frac{q_{t1}}{100} + F_{comb2}^{\ 3} \cdot \frac{|n_2|}{n_m} \cdot \frac{q_{t2}}{100} + \ldots + F_{combn}^{\ 3} \cdot \frac{|n_n|}{n_m} \cdot \frac{q_{tn}}{100}} \quad 22$$

$$n_m = \frac{q_{t1}}{100} \cdot |n_1| + \frac{q_{t2}}{100} \cdot |n_2| + \ldots + \frac{q_{tn}}{100} \cdot |n_n| \quad 23$$

Service life and load safety factor

$$L = \left(\frac{C}{F_{comb}}\right)^3 \cdot 10^6 \quad 24$$

Nominal service life

The nominal service life is calculated as follows:

$$L_h = \frac{16\,666}{n_m} \cdot \left(\frac{C}{F_{comb}}\right)^3 \quad 25$$

Attention:
take the dynamic load rating of the nut into account!

Static load safety factor

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

$$S_0 = \frac{C_0}{F_{0max}} \quad 26$$

C	=	dynamic bearing load rating	(N)
$F_{0ax\ p}$	=	permissible static axial bearing load	(N)
F_{comb}	=	combined equivalent bearing load	(N)
$F_{comb1} \ldots F_{combn}$	=	combined equivalent axial load in phases 1 ... n	(N)
F_m	=	equivalent dynamic axial bearing load	(N)
L	=	nominal service life in revolutions	(–)
L_h	=	nominal service life in operating hours	(h)
$n_1 \ldots n_n$	=	speeds in phases 1 ... n	(rpm)
n_m	=	average speed	(rpm)
$q_{t1} \ldots q_{tn}$	=	discrete time steps in phases 1 ... n	(%)

Bosch Rexroth
Linear Motion Technology

97419 Schweinfurt / Germany

Company: _____
Contact: _____
E-mail: _____
Telephone: _____

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

Application

New design ☐ Revised design ☐

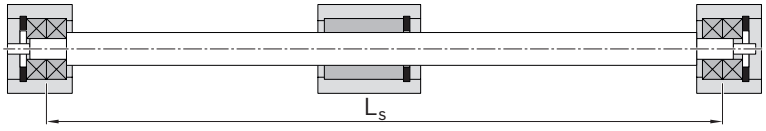
Operating conditions

Discrete time step parameters			or	Dynamic cycle parameters											
Discrete time steps (%)	**Speed** (1/min)	**Action of force x**	**Section**	**T1**	**T2**	**T3**	**T4**	**T5**	**T6**	**T7**	**T8**	**T9**	**T10**	**T11**	**T12**
T_1 =	n_1 =		**Path** (mm)												
T_2 =	n_2 =		**V** (m/s)												
T_3 =	n_3 =		**a** (m/s^2)												
T_4 =	n_4 =		**Time** (s)												
T_5 =	n_5 =		**Action of force x**												
T_6 =	n_6 =														

	F1	F2	F3	F4	F5	F6
Forces (N) =						
Mass (kg) =						
Max. stroke (mm) =						

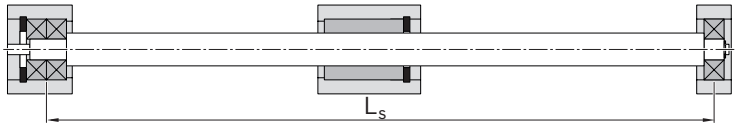
Bearing type

1. ☐ Tight



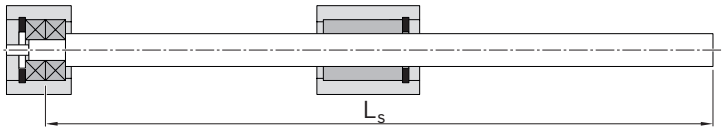
Tight

2. ☐ Tight



Loose

3. ☐ Tight



Free

Installation Position
Horizontal ☐
Vertikal ☐

Drawing enclosed (recommended) ☐

Delivery with bearing ☐

Required life: Operating temperature: °C Up to °C

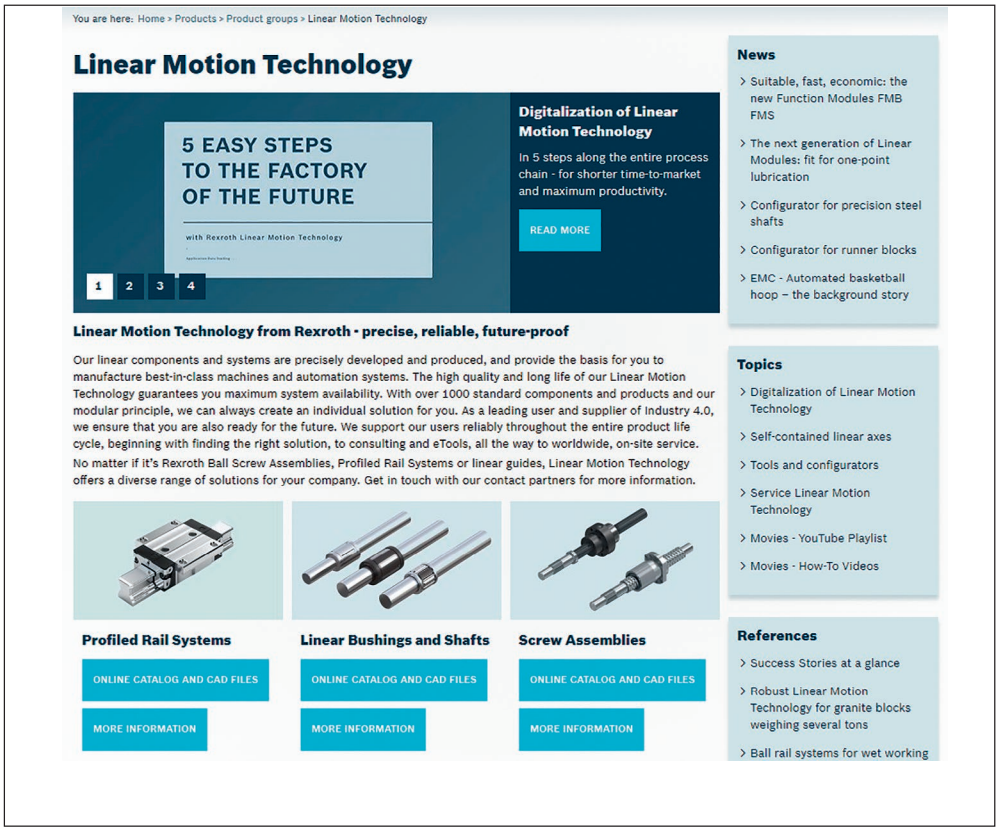
Type of lubrication:

Short description of the application / unusual operating conditions:

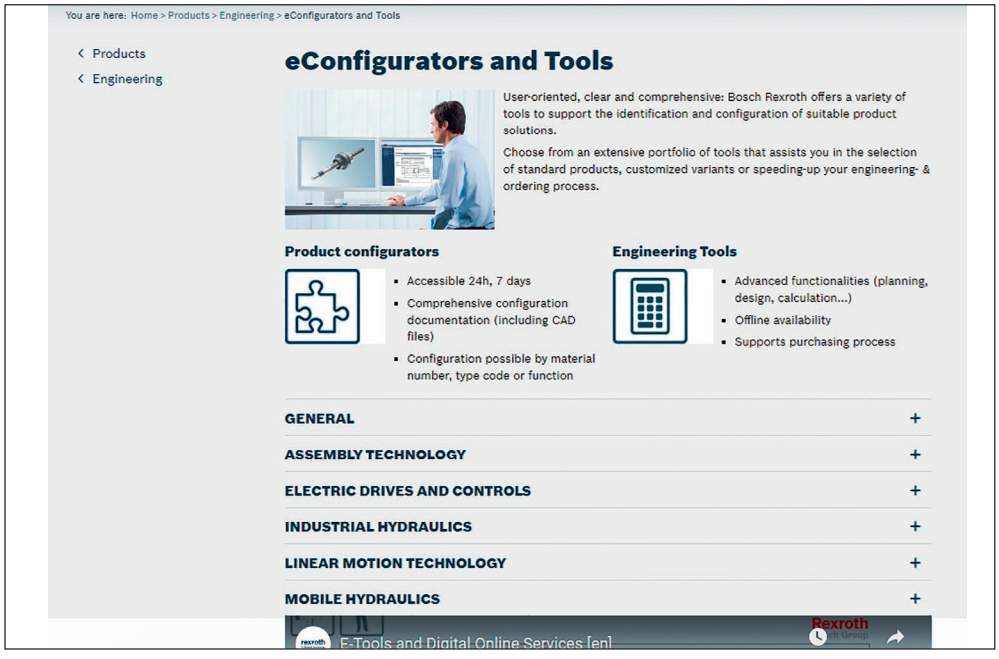
Visit out official homepage and use the provided configurators and our dimensioning program Linear Motion Designer free of charge.

Further information

Bosch Rexroth Linear Motion Technology homepage:
https://www.boschrexroth.com/en/xc/products/product-groups/linear-motion-technology/index

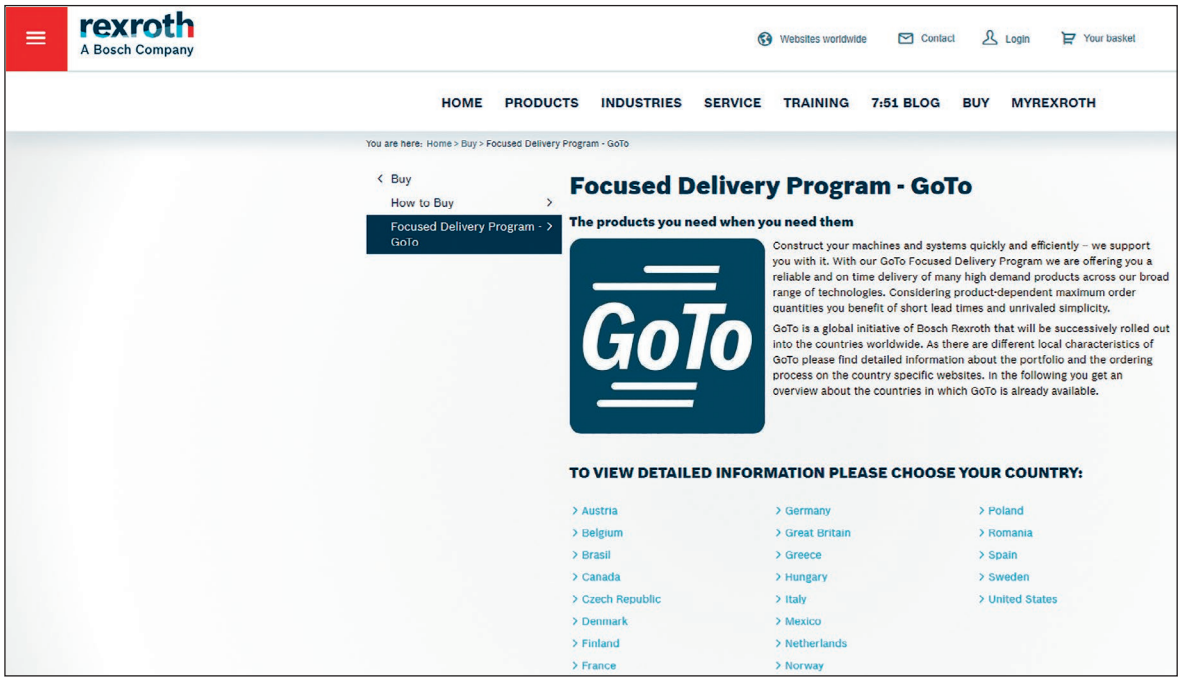


Configurators and tools
https://www.boschrexroth.com/en/xc/products/engineering/econfigurators-and-tools/econfigurators



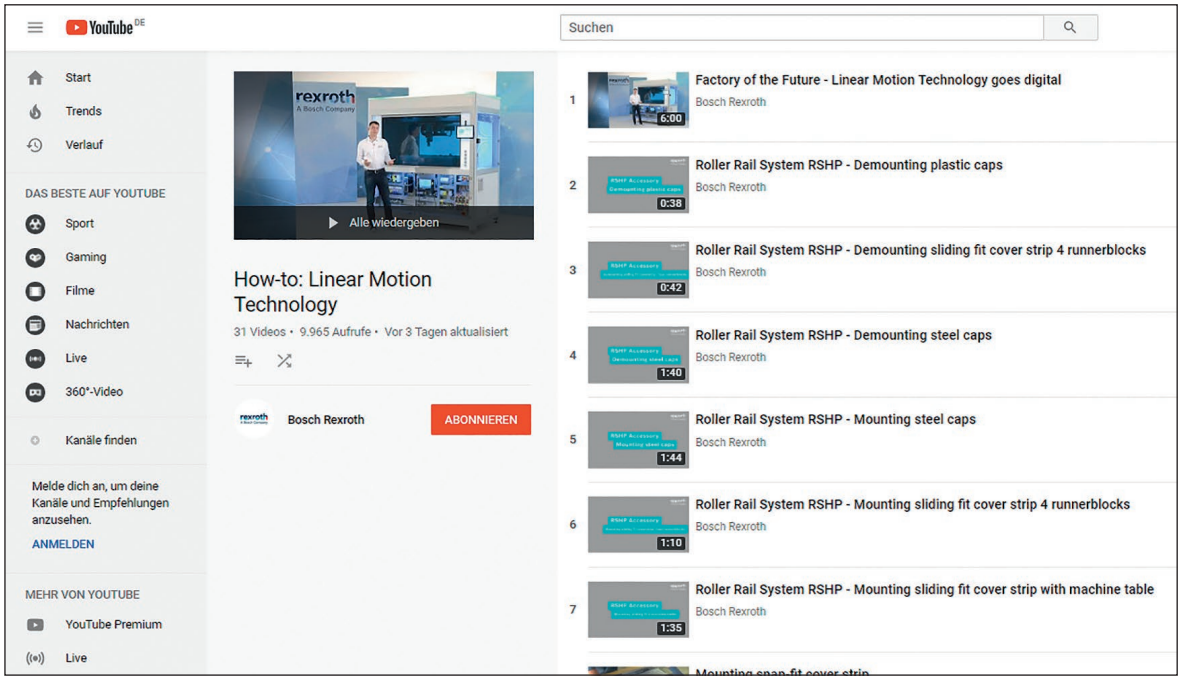
GoTo Europe

http://www.boschrexroth.com/goto



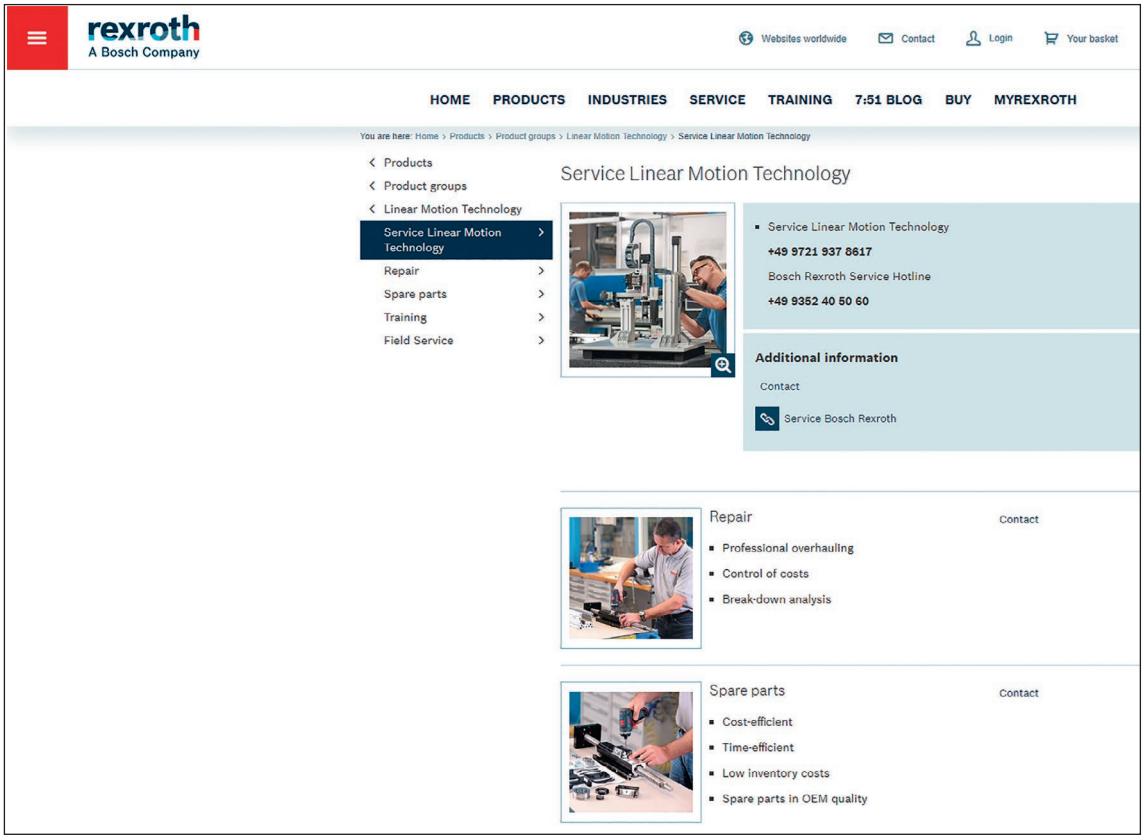
How-to: Linear Motion Technology

https://www.youtube.com/playlist?list=PLRO3LeFQeLyMF6evW4E7kR93JHzpJlV4r



Service

https://www.boschrexroth.com/en/xc/products/product-groups/linear-motion-technology/service-linear-motion-technology



rexroth
A Bosch Company

Bosch Rexroth AG
Ernst-Sachs-Straße 100
97424 Schweinfurt, Germany
Tel. +49 9721 937-0
Fax +49 9721 937-275
www.boschrexroth.com

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

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