Accuracy

The main dimensions of the bearings conform to DIN 635-1.

The dimensional and geometrical tolerances correspond to tolerance class PN to DIN 620-2.

Radial internal clearance of bearings with cylindrical bore

The radial internal clearance corresponds to internal clearance group CN.

Radial internal clearance to DIN 620-4

Bore d mm		Radial internal clearance							
		C2 µm		CN µm		C3 µm		C4 µm	
over	incl.	min.	max.	min.	max.	min.	max.	min.	max.
–	30	2	9	9	17	17	28	28	40
30	40	3	10	10	20	20	30	30	45
40	50	3	13	13	23	23	35	35	50
50	65	4	15	15	27	27	40	40	55
65	80	5	20	20	35	35	55	55	75
80	100	7	25	25	45	45	65	65	90
100	120	10	30	30	50	50	70	70	95
120	140	15	35	35	55	55	80	80	110
140	160	20	40	40	65	65	95	95	125
160	180	25	45	45	70	70	100	100	130
180	225	30	50	50	75	75	105	105	135
225	250	35	55	55	80	80	110	110	140
250	280	40	60	60	85	85	115	115	145

Radial internal clearance of bearings with tapered bore

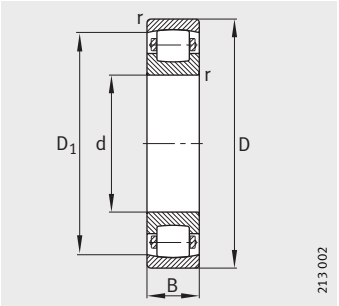
Bearings with a tapered bore have the internal clearance group C3.

Radial internal clearance to DIN 620-4

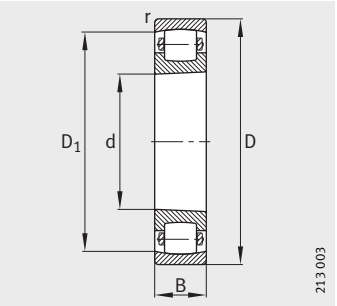
Bore d mm		Radial internal clearance							
		C2 µm		CN µm		C3 µm		C4 µm	
over	incl.	min.	max.	min.	max.	min.	max.	min.	max.
–	30	9	17	17	28	28	40	40	55
30	40	10	20	20	30	30	45	45	60
40	50	13	23	23	35	35	50	50	65
50	65	15	27	27	40	40	55	55	75
65	80	20	35	35	55	55	75	75	95
80	100	25	45	45	65	65	90	90	120
100	120	30	50	50	70	70	95	95	125
120	140	35	55	55	80	80	110	110	140
140	160	40	65	65	95	95	125	125	155
160	180	45	70	70	100	100	130	130	160
180	225	50	75	75	105	105	135	135	165
225	250	55	80	80	110	110	140	140	170
250	280	60	85	85	115	115	145	145	175

Barrel roller bearings

With cylindrical or tapered bore



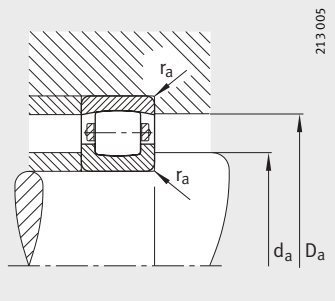
Cylindrical bore



Tapered bore
K = taper 1:12

Dimension table · Dimensions in mm

Designation	Mass	Dimensions				
	m	d	D	B	r	D_1
	≈kg				min.	≈
20204-TVP	0,114	**20**	47	14	1	39
20304-TVP	0,152	**20**	52	15	1,1	43,5
20205-K-TVP-C3	0,132	**25**	52	15	1	43,9
20205-TVP	0,134	**25**	52	15	1	43,9
20305-TVP	0,243	**25**	62	17	1,1	51,9
20206-K-TVP-C3	0,203	**30**	62	16	1	53
20206-TVP	0,207	**30**	62	16	1	53
20306-TVP	0,37	**30**	72	19	1,1	60,7
20207-K-TVP-C3	0,296	**35**	72	17	1,1	62,3
20207-TVP	0,301	**35**	72	17	1,1	62,3
20307-TVP	0,493	**35**	80	21	2,5	67,4
20208-K-TVP-C3	0,38	**40**	80	18	1,1	70,1
20208-TVP	0,386	**40**	80	18	1,1	70,1
20308-TVP	0,671	**40**	90	23	1,5	76,8
20209-K-TVP-C3	0,433	**45**	85	19	1,1	74,6
20209-TVP	0,441	**45**	85	19	1,1	74,6
20309-TVP	0,914	**45**	100	25	1,5	85,2
20210-K-TVP-C3	0,489	**50**	90	20	1,1	79,5
20210-TVP	0,499	**50**	90	20	1,1	79,5
20310-TVP	1,17	**50**	110	27	2	94,4
20211-K-TVP-C3	0,642	**55**	100	21	1,5	89,2
20211-TVP	0,653	**55**	100	21	1,5	89,2
20311-K-TVP-C3	1,49	**55**	120	29	2	101,7
20311-TVP	1,53	**55**	120	29	2	101,7
20212-K-TVP-C3	0,822	**60**	110	22	1,5	97,8
20212-TVP	0,836	**60**	110	22	1,5	97,8
20312-K-TVP-C3	1,89	**60**	130	31	2,1	111,2
20312-TVP	1,92	**60**	130	31	2,1	111,2
20213-K-TVP-C3	1,07	**65**	120	23	1,5	105,1
20213-TVP	1,08	**65**	120	23	1,5	105,1
20313-K-MB-C3	2,14	**65**	140	33	1,5	120,6
20313-MB	2,18	**65**	140	33	1,5	120,6

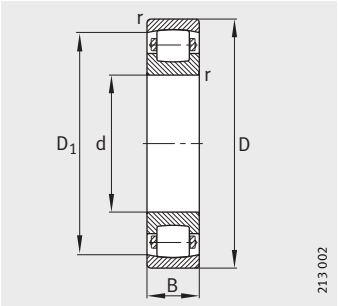


Mounting dimensions

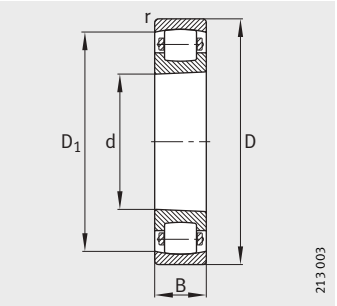
Mounting dimensions			Basic load ratings		Fatigue limit load	Limiting speed
d_a	D_a	r_a	dyn. C_r	stat. C_{0r}	C_{ur}	n_G
min.	max.	max.	N	N	N	min^{-1}
25,6	41,4	1	20 400	19 300	1 700	7 500
27	45	1	27 000	24 500	2 300	7 000
30,6	46,4	1	24 000	25 000	2 190	6 700
30,6	46,4	1	24 000	25 000	2 190	6 700
32	55	1	36 000	34 500	3 000	6 000
35,6	56,4	1	27 500	28 500	2 850	5 600
35,6	56,4	1	27 500	28 500	2 850	5 600
37	65	1	49 000	49 000	4 250	5 000
42	65	1	40 500	43 000	4 900	4 800
42	65	1	40 500	43 000	4 900	4 800
44	71	1,5	58 500	61 000	5 400	4 500
47	73	1	49 000	53 000	5 400	4 300
47	73	1	49 000	53 000	5 400	4 300
49	81	1,5	76 500	81 500	7 200	4 000
52	78	1	52 000	57 000	5 900	4 000
52	78	1	52 000	57 000	5 900	4 000
54	91	1,5	86 500	95 000	8 500	3 600
57	83	1	58 500	68 000	7 000	3 600
57	83	1	58 500	68 000	7 000	3 600
61	99	2	108 000	118 000	10 600	3 400
64	91	1,5	73 500	85 000	9 300	3 400
64	91	1,5	73 500	85 000	9 300	3 400
66	109	2	120 000	137 000	12 400	3 000
66	109	2	120 000	137 000	12 400	3 000
69	101	1,5	85 000	100 000	10 900	3 200
69	101	1,5	85 000	100 000	10 900	3 200
72	118	2,1	146 000	170 000	15 200	2 800
72	118	2,1	146 000	170 000	15 200	2 800
74	111	1,5	95 000	116 000	12 700	3 000
74	111	1,5	95 000	116 000	12 700	3 000
77	128	2,1	170 000	196 000	17 900	2 800
77	128	2,1	170 000	196 000	17 900	2 800

Barrel roller bearings

With cylindrical or tapered bore



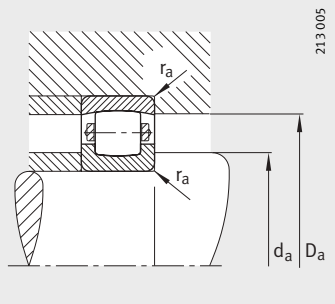
Cylindrical bore



Tapered bore
K = taper 1:12

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions				
	m	d	D	B	r	D_1
	≈kg				min.	≈
20214-TVP	1,17	**70**	125	24	1,5	111
20314-MB	3,15	**70**	150	35	2,1	128,7
20215-K-TVP-C3	1,25	**75**	130	25	1,5	115,9
20215-TVP	1,28	**75**	130	25	1,5	115,9
20315-MB	3,76	**75**	160	37	2,1	138,1
20216-K-TVP-C3	1,56	**80**	140	26	2	124,5
20216-TVP	1,58	**80**	140	26	2	124,5
20316-MB	4,58	**80**	170	39	2,1	147,5
20217-K-MB-C3	2,19	**85**	150	28	2	133,9
20217-MB	2,22	**85**	150	28	2	133,9
20317-MB	5,25	**85**	180	41	3	156,9
20218-K-MB-C3	2,68	**90**	160	30	2	143,8
20218-MB	2,72	**90**	160	30	2	143,8
20318-K-MB-C3	6,17	**90**	190	43	3	165,1
20318-MB	6,25	**90**	190	43	3	165,1
20219-MB	3,19	**95**	170	32	2,1	152,7
20319-MB	7,29	**95**	200	45	3	174,5
20220-K-MB-C3	3,9	**100**	180	34	2,1	160,8
20220-MB	3,96	**100**	180	34	2,1	160,8
20320-K-MB-C3	8,58	**100**	215	47	3	186,6
20320-MB	8,69	**100**	215	47	3	186,6
20221-MB	4,74	**105**	190	36	2,1	169,2
20222-K-MB-C3	5,45	**110**	200	38	2,1	178,6
20222-MB	5,53	**110**	200	38	2,1	178,6
20322-MB	11,6	**110**	240	50	3	208,1
20224-K-MB-C3	6,51	**120**	215	40	2,1	191,1
20224-MB	6,6	**120**	215	40	2,1	191,1
20324-MB	15,2	**120**	260	55	3	222,3
20226-K-MB-C3	7,21	**130**	230	40	3	205,7
20226-MB	7,31	**130**	230	40	3	205,7
20326-MB	18,4	**130**	280	58	4	240,3
20228-K-MB-C3	8,98	**140**	250	42	3	223,9
20228-MB	9,09	**140**	250	42	3	223,9
20328-MB	22,5	**140**	300	62	4	257,9

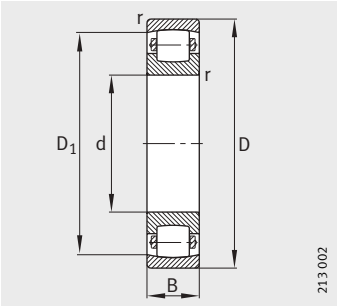


Mounting dimensions

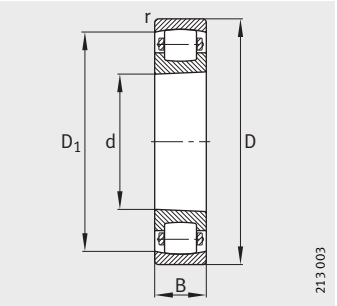
Mounting dimensions			Basic load ratings		Fatigue limit load	Limiting speed
d_a	D_a	r_a	dyn. C_r	stat. C_{0r}	C_{ur}	n_G
min.	max.	max.	N	N	N	min^{-1}
79	116	1,5	106 000	134 000	14 100	2 800
82	138	2,1	183 000	216 000	19 600	2 600
84	121	1,5	112 000	143 000	16 100	2 800
84	121	1,5	112 000	143 000	16 100	2 800
87	148	2,1	216 000	255 000	22 400	2 200
91	129	2	125 000	163 000	17 100	2 600
91	129	2	125 000	163 000	17 100	2 600
92	158	2,1	245 000	285 000	25 500	2 000
96	139	2	156 000	200 000	20 400	2 400
96	139	2	156 000	200 000	20 400	2 400
99	166	2,5	270 000	320 000	28 500	1 900
101	149	2	173 000	220 000	22 000	2 000
101	149	2	173 000	220 000	22 000	2 000
104	176	2,5	300 000	360 000	30 500	1 900
104	176	2,5	300 000	360 000	30 500	1 900
107	158	2,1	208 000	265 000	26 000	1 900
109	186	2,5	335 000	400 000	34 000	1 800
112	168	2,1	224 000	290 000	28 000	1 900
112	168	2,1	224 000	290 000	28 000	1 900
114	201	2,5	365 000	440 000	38 000	1 700
114	201	2,5	365 000	440 000	38 000	1 700
117	178	2,1	245 000	315 000	30 500	1 800
122	188	2,1	285 000	375 000	34 500	1 700
122	188	2,1	285 000	375 000	34 500	1 700
124	226	2,5	430 000	520 000	45 500	1 500
132	203	2,1	305 000	415 000	38 000	1 600
132	203	2,1	305 000	415 000	38 000	1 600
134	246	2,5	490 000	630 000	52 000	1 400
144	216	2,5	335 000	450 000	42 500	1 500
144	216	2,5	335 000	450 000	42 500	1 500
147	263	3	550 000	720 000	59 000	1 400
154	236	2,5	390 000	530 000	50 000	1 400
154	236	2,5	390 000	530 000	50 000	1 400
157	283	3	640 000	850 000	66 000	1 300

Barrel roller bearings

With cylindrical or tapered bore



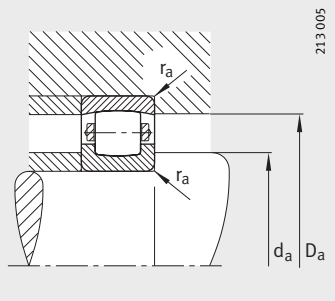
Cylindrical bore



Tapered bore
K = taper 1:12

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions				
	m	d	D	B	r	D_1
	≈kg				min.	≈
20230-K-MB-C3	11,6	**150**	270	45	3	238,6
20230-MB	11,7	**150**	270	45	3	238,6
20330-MB	26,9	**150**	320	65	4	275,8
20232-K-MB-C3	14,4	**160**	290	48	3	256,5
20232-MB	14,5	**160**	290	48	3	256,5
20234-MB	17,9	**170**	310	52	4	273,1
20236-MB	18,4	**180**	320	52	4	284,3
20238-MB	22,5	**190**	340	55	4	301,2
20240-MB	26,7	**200**	360	58	4	319
20244-MB	37,4	**220**	400	65	4	353,5
20248-MB	50,5	**240**	440	72	4	388
20252-MB	68,2	**260**	480	80	5	421,3

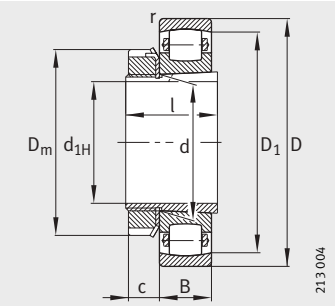


Mounting dimensions

Mounting dimensions			Basic load ratings		Fatigue limit load	Limiting speed
d_a	D_a	r_a	dyn. C_r	stat. C_{0r}	C_{ur}	n_G
min.	max.	max.	N	N	N	min^{-1}
164	256	2,5	430 000	610 000	55 000	1 300
164	256	2,5	430 000	610 000	55 000	1 300
167	303	3	720 000	950 000	74 000	1 200
174	276	2,5	500 000	720 000	64 000	1 200
174	276	2,5	500 000	720 000	64 000	1 200
187	293	3	570 000	830 000	70 000	1 100
197	303	3	585 000	850 000	74 000	1 000
207	323	3	640 000	950 000	81 000	950
217	343	3	735 000	1 080 000	91 000	950
237	383	3	880 000	1 320 000	109 000	850
257	423	3	1 060 000	1 600 000	129 000	750
280	460	4	1 270 000	1 930 000	148 000	700

Barrel roller bearings

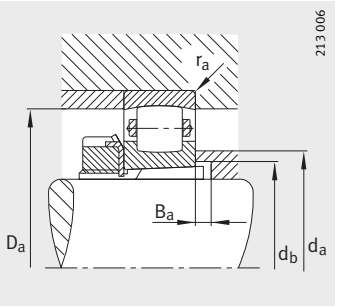
With adapter sleeve



With adapter sleeve

Dimension table · Dimensions in mm

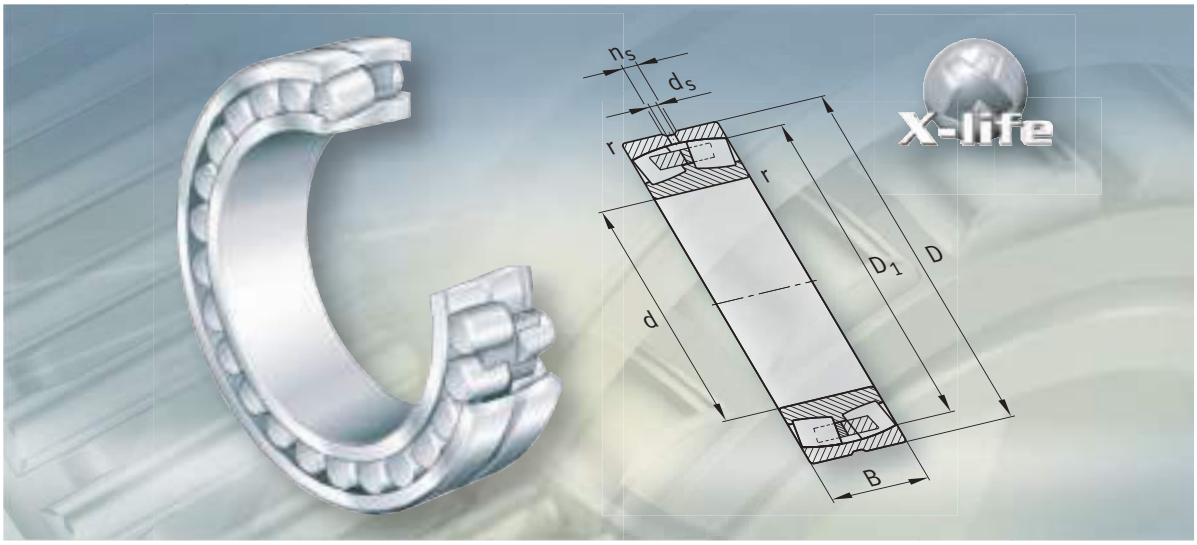
Designation		Mass m		Dimensions						
Bearing	Adapter sleeve	Bearing ≈kg	Adapter sleeve ≈kg	d_{1H}	d	D	B	r min.	D_1 ≈	D_m ≈
20205-K-TVP-C3	**H205**	0,132	0,069	**20**	25	52	15	1	43,9	38
20206-K-TVP-C3	**H206**	0,203	0,091	**25**	30	62	16	1	53	45
20207-K-TVP-C3	**H207**	0,296	0,129	**30**	35	72	17	1,1	62,3	57
20208-K-TVP-C3	**H208**	0,38	0,17	**35**	40	80	18	1,1	70,1	58
20209-K-TVP-C3	**H209**	0,433	0,216	**40**	45	85	19	1,1	74,6	65
20210-K-TVP-C3	**H210**	0,489	0,264	**45**	50	90	20	1,1	79,5	70
20211-K-TVP-C3	**H211**	0,642	0,292	**50**	55	100	21	1,5	89,2	75
20311-K-TVP-C3	**H311**	1,49	0,35	**50**	55	120	29	2	101,7	75
20212-K-TVP-C3	**H212**	0,822	0,325	**55**	60	110	22	1,5	97,8	80
20312-K-TVP-C3	**H312**	1,89	0,373	**55**	60	130	31	2,1	111,2	80
20213-K-TVP-C3	**H213**	1,07	0,393	**60**	65	120	23	1,5	105,1	92
20313-K-MB-C3	**H313**	2,14	0,452	**60**	65	140	33	1,5	120,6	92
20215-K-TVP-C3	**H215**	1,25	0,693	**65**	75	130	25	1,5	115,9	98
20216-K-TVP-C3	**H216**	1,56	0,876	**70**	80	140	26	2	124,5	105
20217-K-MB-C3	**H217**	2,19	0,995	**75**	85	150	28	2	133,9	110
20218-K-MB-C3	**H218**	2,68	1,17	**80**	90	160	30	2	143,8	126
20318-K-MB-C3	**H318**	6,17	1,36	**80**	90	190	43	3	165,1	126
20220-K-MB-C3	**H220**	3,9	1,48	**90**	100	180	34	2,1	160,8	130
20320-K-MB-C3	**H320**	8,58	1,69	**90**	100	215	47	3	186,6	130
20222-K-MB-C3	**H222**	5,45	1,9	**100**	110	200	38	2,1	178,6	145
20224-K-MB-C3	**H3024**	6,51	1,95	**110**	120	215	40	2,1	191,1	145
20226-K-MB-C3	**H3026**	7,21	2,9	**115**	130	230	40	3	205,7	155
20228-K-MB-C3	**H3028**	8,98	3,25	**125**	140	250	42	3	223,9	165
20230-K-MB-C3	**H3030**	11,6	3,98	**135**	150	270	45	3	238,6	180
20232-K-MB-C3	**H3032**	14,4	5,33	**140**	160	290	48	3	256,5	190



Mounting dimensions

		Mounting dimensions					Basic load ratings		Fatigue limit load	Limiting speed
l	c	d_a max.	D_a max.	d_b min.	B_a min.	r_a max.	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}
26	9	33	46,4	28	6	1	24 000	25 000	2 190	6 700
27	9	39	56,4	33	5	1	27 500	28 500	2 850	5 600
29	10	45	65	38	5	1	40 500	43 000	4 900	4 800
31	11	51	73	43	5	1	49 000	53 000	5 400	4 300
33	12	56	78	48	5	1	52 000	57 000	5 900	4 000
35	13	61	83	53	5	1	58 500	68 000	7 000	3 600
37	13	68	91	60	6	1,5	73 500	85 000	9 300	3 400
45	13	72	109	60	6	2	120 000	137 000	12 400	3 000
38	13	73	101	64	6	1,5	85 000	100 000	10 900	3 200
47	13	78	118	65	5	2,1	146 000	170 000	15 200	2 800
40	14	80	111	70	5	1,5	95 000	116 000	12 700	3 000
50	14	84	128	70	5	2,1	170 000	196 000	17 900	2 800
43	15	90	121	80	5	1,5	112 000	143 000	16 100	2 800
46	17	96	129	85	5	2	125 000	163 000	17 100	2 600
50	18	102	139	90	6	2	156 000	200 000	20 400	2 400
52	18	108	149	95	6	2	173 000	220 000	22 000	2 000
65	18	113	176	96	6	2,5	300 000	360 000	30 500	1 900
58	20	120	168	106	7	2,1	224 000	290 000	28 000	1 900
71	20	127	201	108	7	2,5	365 000	440 000	38 000	1 700
63	21	132	188	116	7	2,1	285 000	375 000	34 500	1 700
72	22	143	203	127	13	2,1	305 000	415 000	38 000	1 600
80	23	154	216	137	20	2,5	335 000	450 000	42 500	1 500
82	24	166	236	147	19	2,5	390 000	530 000	50 000	1 400
87	26	181	256	158	19	2,5	430 000	610 000	55 000	1 300
93	28	193	276	168	20	2,5	500 000	720 000	64 000	1 200

FAG



Spherical roller bearings

Spherical roller bearings

Product overview Spherical roller bearings

With cylindrical bore

222, 223, 230, 231, 232, 233..-A, 239, 240, 241

X-life grade

213..-E1, 222..-E1, 223..-E1, 230..-E1, 230..-E1A, 231..-E1, 231..-E1A, 232..-E1, 232..-E1A, 240..-E1, 241..-E1

With tapered bore

222..-K, 223..-K, 230..-K, 231..-K, 232..-K, 239..-K, 240..-K30, 241..-K30

X-life grade

213..-E1-K, 222..-E1-K, 223..-E1-K, 230..-E1-K, 230..-E1A-K, 231..-E1(A)-K, 232..-E1(A)-K, 240..-E1-K30, 241..-E1-K30

With adapter sleeve

222..-K + H, 223..-K + H, 230..-K + H, 231..-K + H, 232..-K + H, 239..-K + H

X-life grade

213..-E1-K + H, 222..-E1-K + H, 223..-E1-K + H, 230..-E1(A)-K + H, 231..-E1(A)-K + H, 232..-E1(A)-K + H

With extraction sleeve

222..-K + AH, 223..-K + AH, 230..-K + AH, 231..-K + AH, 232..-K + AH, 239..-K + AH, 240..-K30 + AH, 241..-K30 + AH

X-life grade

213..-E1-K + AH, 222..-E1-K + AH, 223..-E1-K + AH, 230..-E1(A)-K + AH, 231..-E1(A)-K + AH, 232..-E1(A)-K + AH, 240..-E1-K30 + AH, 241..-E1-K30 + AH

Spherical roller bearings

Features

Spherical roller bearings are double row, self-retaining units comprising solid outer rings with a concave raceway, solid inner rings and barrel rollers with cages.
The inner rings have cylindrical or tapered bores.

The symmetrical barrel rollers orient themselves freely on the concave outer ring raceway. As a result, shaft flexing and misalignment of the bearing seats are compensated, see Compensation of angular misalignments, page 515.

Radial and axial load capacity

Spherical roller bearings can support axial forces in both directions and high radial forces. They are designed for very high load carrying capacity and, since they have the maximum possible number of large and particularly long barrel rollers, are also suitable for the heaviest loads. Due to the narrow osculation between the rollers and raceways, uniform stress distribution is achieved in the bearing.

X-life

Many sizes of spherical roller bearings are classified as X-life products. These bearings do not have a central rib on the inner ring and therefore have longer barrel rollers as well as improved kinematics, optimised surfaces and are made from higher performance materials. As a result, the basic dynamic load rating and, under identical operating conditions, the basic rating life of the bearings is significantly improved. In certain applications, this means that a smaller bearing arrangement can be designed.

X-life spherical roller bearings have the suffix E1 and are indicated in the dimension tables.

With cylindrical bore

Spherical roller bearings of all series are available with inner rings having a cylindrical bore.

With tapered bore

Spherical roller bearings are also available, with the exception of series 233..-A, with inner rings having a tapered bore.
Bearings with the suffix K have a bore taper 1:12, bearings of series 240 and 241 have a bore taper 1:30 and the suffix K30.

With adapter sleeve or extraction sleeve

Spherical roller bearings with a tapered bore are also available with an adapter sleeve, locknut and tab washer. Adapter and extraction sleeves must be ordered in addition to the bearing.

Sealing/lubrication

Spherical roller bearings are not sealed and not greased. They can be lubricated using oil or grease.

Most spherical roller bearings have a circumferential groove and three lubrication holes in the outer ring for lubrication. In bearings of series 239, 240 and 241 with an outside diameter < 320 mm, this can be identified by the suffix S.

Bearings of series 213 with a bore diameter up to 35 mm do not have either a lubrication groove or lubrication holes.

Caution! If shafts with a vertical axis are supported using spherical roller bearings, particular attention must be paid to ensuring the reliable provision of lubricant. In such cases, oil lubrication should be used.

Compensation of angular misalignments

Spherical roller bearings compensate for angular misalignments. The permissible adjustment angle is given in the table for loads $P < 0{,}1 \cdot C_r$.

The adjustment angles are permissible under the following conditions:

- constant angular deviation (static angular misalignment)
- rotating inner ring.

Bearing series and adjustment angle

Series	Adjustment angle °
213..-E1, 222, 222..-E1, 230, 230..-E1(E1A), 239, 240, 240..-E1	1,5
223, 223..-E1, 231, 231..-E1(E1A), 232, 232..-E1(E1A), 233..-A, 241, 241..-E1	2

If the outer ring rotates, the inner ring undergoes tumbling motion or the load or adjustment angle is larger than stated in the table, the angular adjustment facility is smaller. If such applications are present, please contact us.

Operating temperature

Spherical roller bearings are dimensionally stable up to +200 °C. Bearings with metal cages can be used at operating temperatures from −30 °C to +200 °C.

Caution! Bearings with cages made from glass fibre reinforced polyamide are suitable up to +120 °C.

Cages

The standard cages for spherical roller bearings are shown in the table Cage/bore code, page 516.

Spherical roller bearings with a rigid central rib on the inner ring (design without suffix E1) have solid cages or sheet metal cages made from brass. The bearings with sheet metal cages do not have a cage suffix.

In bearings with the suffix MB, the solid brass cages are guided on the inner ring, while bearings with the suffix MA are guided on the outer ring. Bearings with the suffix M have a solid brass cage guided by the rollers.

With X-life grade

Bearings of series 222..-E1 and 223..-E1 without a cage suffix have sheet steel cages. The two cage halves are retained by a guiding ring in the outer ring. In bearings of series 223..-E1, all the cage parts are protected against wear by surface hardening or coating.

The other E1 design bearings have solid cages made from glass fibre reinforced polyamide 66 with the suffix TVPB or solid brass cages with the suffix M.

Caution! Check the chemical resistance of polyamide to synthetic greases and lubricants with EP additives.

Aged oil and additives in the oil can impair the operating life of plastic cages at high temperatures.

The oil change intervals must be observed.

Spherical roller bearings

Cage/bore code

Series	Sheet metal cage made from		Solid cage made from			
	Steel	Brass	Poly-amide	Brass		
				Guided by rollers	Guidance on inner ring	Guidance on outer ring
	Bore code					
213..-E1	08 to 18	–	04 to 07 19 to 22	–	–	–
222	–	–	–	–	from 38	–
222..-E1	up to 36	–	–	–	–	–
223	–	–	–	–	from 32	–
223..-A (T41A)	–	–	–	–	–	from 32
223..-E1	up to 30	–	–	–	–	–
223..-E1 (T41A)	up to 30	–	–	–	–	–
230	–	–	–	–	from 44	–
230..-E1	–	–	up to 40	–	–	–
230..-E1A	–	–	–	up to 40	–	–
231	–	–	–	–	from 40	–
231..-E1	–	–	up to 38	–	–	–
231..-E1A	–	–	–	up to 38	–	–
232	–	–	–	–	from 38	–
232..-E1	–	–	up to 36	–	–	–
232..-E1A	–	–	–	up to 36	–	–
233..-A (T41A)	–	–	–	–	–	from 20
239	–	–	–	–	from 36	–
240	–	–	–	–	from 24	–
240..-E1	–	–	up to 32	–	–	–
241	–	up to 88	–	–	from 92	–
241..-E1	–	–	up to 28	–	–	–

Suffixes

Suffixes for available designs: see table.

Available designs

Suffix	Description
A	Modified internal construction
B	Modified internal construction
E1	Increased capacity design
K	Tapered bore, taper 1:12
K30	Tapered bore, taper 1:30
M	Solid brass cage, guided by rollers
MA	Solid brass cage, guidance on outer ring
MB	Solid brass cage, guidance on inner ring
S	Lubrication groove and lubrication holes in outer ring
T41A	For oscillating load with restricted diameter tolerances, radial internal clearance C4
TVPB	Solid window cage made from glass fibre reinforced polyamide, guidance on inner ring

Design and safety guidelines

Equivalent dynamic bearing load

For bearings under dynamic loading, the following applies:

Load ratio	Equivalent dynamic load
$\frac{F_a}{F_r} \leqq e$	$P = F_r + Y_1 \cdot F_a$
$\frac{F_a}{F_r} > e$	$P = 0{,}67 \cdot F_r + Y_2 \cdot F_a$

P N
Equivalent dynamic bearing load for combined load
F_a N
Axial dynamic bearing load
F_r N
Radial dynamic bearing load
e, Y_1, Y_2 –
Factors from dimension tables.

Equivalent static bearing load

For bearings under static loading, the following applies:

$$P_0 = F_{0r} + Y_0 \cdot F_{0a}$$

P_0 N
Equivalent static bearing load for combined load
F_{0a} N
Axial static bearing load
F_{0r} N
Radial static bearing load
Y_0 –
Factor from dimension tables.

Axial load carrying capacity

Spherical roller bearings are suitable for axial loads. If very high loads occur in combination with very high speeds, the increased friction and bearing temperature must be taken into consideration.

Minimum load

The minimum load on the spherical roller bearings should be:

- $P = 0{,}02 \cdot C_r$
- $P = 0{,}015 \cdot C_r$ for bearings of E1 design.

Speed

Caution! The limiting speeds n_G in the dimension tables must be observed.

Mounting dimensions

In bearings without the suffix E1 or with E1A, the mounting dimensions must be not less than D_1 according to the dimension tables.

X-life bearings

In bearings with the suffix E1, the mounting dimensions must be not less than D_1 and not more than d_2 according to the dimension tables.

Location of bearings with tapered bore

Bearings with a tapered inner ring bore are:

- located directly on a tapered shaft seat
- located on cylindrical shaft seats by means of adapter sleeves or
- located on cylindrical shaft seats by means of extraction sleeves.

If high axial forces occur, a support ring can be used for adapter sleeves. For fitting, the support ring dimensions in the dimension table must be observed.

Reduced radial internal clearance in fitting

When bearings with a tapered bore are fitted, there is a reduction in the radial internal clearance. The values given in the table ensure firm seating on the shaft, table Reduction in radial internal clearance/displacement on taper 1:12 or 1:30, page 518 and page 519.

Reduction in radial internal clearance and displacement on taper 1:12

Nominal bearing bore diameter d mm		Reduction in radial internal clearance mm		Displacement on taper 1:12				Control value for minimum radial internal clearance after fitting		
				Shaft mm		Sleeve mm		CN mm	C3 mm	C4 mm
over	incl.	min.	max.	min.	max.	min.	max.	min.	min.	min.
24	30	0,015	0,02	0,3	0,35	0,3	0,4	0,015	0,02	0,035
30	40	0,02	0,025	0,35	0,4	0,35	0,45	0,015	0,025	0,04
40	50	0,025	0,03	0,4	0,45	0,45	0,5	0,02	0,03	0,05
50	65	0,03	0,04	0,45	0,6	0,5	0,7	0,025	0,035	0,055
65	80	0,04	0,05	0,6	0,75	0,7	0,85	0,025	0,04	0,07
80	100	0,045	0,06	0,7	0,9	0,75	1	0,035	0,05	0,08
100	120	0,05	0,07	0,7	1,1	0,8	1,2	0,05	0,065	0,1
120	140	0,065	0,09	1,1	1,4	1,2	1,5	0,055	0,08	0,11
140	160	0,075	0,1	1,2	1,6	1,3	1,7	0,055	0,09	0,13
160	180	0,08	0,11	1,3	1,7	1,4	1,9	0,06	0,1	0,15
180	200	0,09	0,13	1,4	2	1,5	2,2	0,07	0,1	0,16
200	225	0,1	0,14	1,6	2,2	1,7	2,4	0,08	0,12	0,18
225	250	0,11	0,15	1,7	2,4	1,8	2,6	0,09	0,13	0,2
250	280	0,12	0,17	1,9	2,6	2	2,9	0,1	0,14	0,22
280	315	0,13	0,19	2	3	2,2	3,2	0,11	0,15	0,24
315	355	0,15	0,21	2,4	3,4	2,6	3,6	0,12	0,17	0,26
355	400	0,17	0,23	2,6	3,6	2,9	3,9	0,13	0,19	0,29
400	450	0,2	0,26	3,1	4,1	3,4	4,4	0,13	0,2	0,31
450	500	0,21	0,28	3,3	4,4	3,6	4,8	0,16	0,23	0,35
500	560	0,24	0,32	3,7	5	4,1	5,4	0,17	0,25	0,36
560	630	0,26	0,35	4	5,4	4,4	5,9	0,2	0,29	0,41
630	710	0,3	0,4	4,6	6,2	5,1	6,8	0,21	0,31	0,45
710	800	0,34	0,45	5,3	7	5,8	7,6	0,23	0,35	0,51
800	900	0,37	0,5	5,7	7,8	6,3	8,5	0,27	0,39	0,57

Reduction in radial internal clearance and displacement on taper 1:30

Nominal bearing bore diameter d mm		Reduction in radial internal clearance mm		Displacement on taper 1:30				Control value for minimum radial internal clearance after fitting		
				Shaft mm		Sleeve mm		CN mm	C3 mm	C4 mm
over	incl.	min.	max.	min.	max.	min.	max.	min.	min.	min.
24	30	0,015	0,02	–	–	–	–	0,015	0,02	0,035
30	40	0,02	0,025	–	–	–	–	0,015	0,025	0,04
40	50	0,025	0,03	–	–	–	–	0,02	0,03	0,05
50	65	0,03	0,04	–	–	–	–	0,025	0,035	0,055
65	80	0,04	0,05	–	–	–	–	0,025	0,04	0,07
80	100	0,045	0,06	1,7	2,2	1,8	2,4	0,035	0,05	0,08
100	120	0,05	0,07	1,9	2,7	2	2,8	0,05	0,065	0,1
120	140	0,065	0,09	2,7	3,5	2,8	3,6	0,055	0,08	0,11
140	160	0,075	0,1	3	4	3,1	4,2	0,055	0,09	0,13
160	180	0,08	0,11	3,2	4,2	3,3	4,6	0,06	0,1	0,15
180	200	0,09	0,13	3,5	4,5	3,6	5	0,07	0,1	0,16
200	225	0,1	0,14	4	5,5	4,2	5,7	0,08	0,12	0,18
225	250	0,11	0,15	4,2	6	4,6	6,2	0,09	0,13	0,2
250	280	0,12	0,17	4,7	6,7	4,8	6,9	0,1	0,14	0,22
280	315	0,13	0,19	5	7,5	5,2	7,7	0,11	0,15	0,24
315	355	0,15	0,21	6	8,2	6,2	8,4	0,12	0,17	0,26
355	400	0,17	0,23	6,5	9	6,8	9,2	0,13	0,19	0,29
400	450	0,2	0,26	7,7	10	8	10,4	0,13	0,2	0,31
450	500	0,21	0,28	8,2	11	8,4	11,2	0,16	0,23	0,35
500	560	0,24	0,32	9,2	12,5	9,6	12,8	0,17	0,25	0,36
560	630	0,26	0,35	10	13,5	10,4	14	0,2	0,29	0,41
630	710	0,3	0,4	11,5	15,5	12	16	0,21	0,31	0,45
710	800	0,34	0,45	13,3	17,5	13,6	18	0,23	0,35	0,51
800	900	0,37	0,5	14,3	19,5	14,8	20	0,27	0,39	0,57

Spherical roller bearings

Accuracy

The main dimensions of the bearings conform to DIN 635-2.

The dimensional and geometrical tolerances of the bearings correspond to tolerance class PN to DIN 620-2.

Restricted tolerance according to specification T41A: see following table. In bearings with a tapered bore, only the outside diameter has the restricted tolerance range.

Restricted tolerance according to specification T41A

Inner ring			Outer ring		
Nominal bearing bore diameter Dimensions in mm		Deviation Δ_{dmp} Tolerances in µm	Nominal outside diameter Dimensions in mm		Deviation Δ_{Dmp} Tolerances in µm
over	incl.		over	incl.	
30	50	0 −7	80	150	−5 −13
50	80	0 −9	150	180	−5 −18
80	120	0 −12	180	315	−10 −23
120	180	0 −15	315	400	−13 −28
180	250	0 −18	400	500	−13 −30
250	315	0 −21	500	630	−15 −35

Radial internal clearance of bearings with cylindrical bore

The radial internal clearance corresponds to internal clearance group CN.

Radial internal clearance of bearings with cylindrical bore to DIN 620-4

Bore d mm		Radial internal clearance C2 µm		CN µm		C3 µm		C4 µm	
over	incl.	min.	max.	min.	max.	min.	max.	min.	max.
18	24	10	20	20	35	35	45	45	60
24	30	15	25	25	40	40	55	55	75
30	40	15	30	30	45	45	60	60	80
40	50	20	35	35	55	55	75	75	100
50	65	20	40	40	65	65	90	90	120
65	80	30	50	50	80	80	110	110	145
80	100	35	60	60	100	100	135	135	180
100	120	40	75	75	120	120	160	160	210
120	140	50	95	95	145	145	190	190	240
140	160	60	110	110	170	170	220	220	280
160	180	65	120	120	180	180	240	240	310
180	200	70	130	130	200	200	260	260	340
200	225	80	140	140	220	220	290	290	380
225	250	90	150	150	240	240	320	320	420
250	280	100	170	170	260	260	350	350	460
280	315	110	190	190	280	280	370	370	500
315	355	120	200	200	310	310	410	410	550
355	400	130	220	220	340	340	450	450	600
400	450	140	240	240	370	370	500	500	660
450	500	140	260	260	410	410	550	550	720
500	560	150	280	280	440	440	600	600	780
560	630	170	310	310	480	480	650	650	850
630	710	190	350	350	530	530	700	700	920
710	800	210	390	390	580	580	770	770	1010
800	900	230	430	430	650	650	860	860	1120

Radial internal clearance of bearings with tapered bore

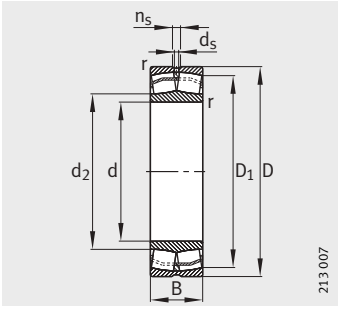
The radial internal clearance corresponds to internal clearance group CN.

Radial internal clearance of bearings with tapered bore to DIN 620-4

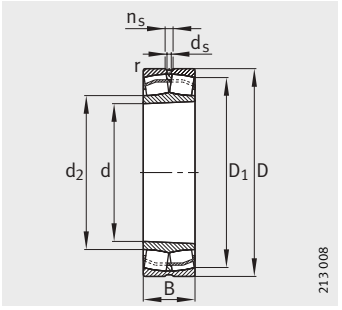
Bore d mm		Radial internal clearance							
		C2 µm		CN µm		C3 µm		C4 µm	
over	incl.	min.	max.	min.	max.	min.	max.	min.	max.
18	24	15	25	25	35	35	45	45	60
24	30	20	30	30	40	40	55	55	75
30	40	25	35	35	50	50	65	65	85
40	50	30	45	45	60	60	80	80	100
50	65	40	55	55	75	75	95	95	120
65	80	50	70	70	95	95	120	120	150
80	100	55	80	80	110	110	140	140	180
100	120	65	100	100	135	135	170	170	220
120	140	80	120	120	160	160	200	200	260
140	160	90	130	130	180	180	230	230	300
160	180	100	140	140	200	200	260	260	340
180	200	110	160	160	220	220	290	290	370
200	225	120	180	180	250	250	320	320	410
225	250	140	200	200	270	270	350	350	450
250	280	150	220	220	300	300	390	390	490
280	315	170	240	240	330	330	430	430	540
315	355	190	270	270	360	360	470	470	590
355	400	210	300	300	400	400	520	520	650
400	450	230	330	330	440	440	570	570	720
450	500	260	370	370	490	490	630	630	790
500	560	290	410	410	540	540	680	680	870
560	630	320	460	460	600	600	760	760	980
630	710	350	510	510	670	670	850	850	1090
710	800	390	570	570	750	750	960	960	1220
800	900	440	640	640	840	840	1070	1070	1370

Spherical roller bearings

With cylindrical or tapered bore



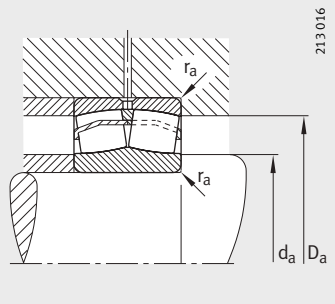
E1 design
Cylindrical bore



Tapered bore
K = taper 1:12

Dimension table · Dimensions in mm

Designation		Mass	Dimensions							
	X-life	m ≈kg	d	D	B	r min.	D_1 ≈	d_2 ≈	d_s	n_s
21304-E1-TVPB	**XL**	0,16	**20**	52	15	1,1	43	28,9	–	–
22205-E1-K	**XL**	0,175	**25**	52	18	1	44,5	31,3	3,2	4,8
22205-E1	**XL**	0,18	**25**	52	18	1	44,5	31,3	3,2	4,8
21305-E1-TVPB	**XL**	0,254	**25**	62	17	1,1	51	35,2	–	–
22206-E1-K	**XL**	0,269	**30**	62	20	1	53,7	37,9	3,2	4,8
22206-E1	**XL**	0,275	**30**	62	20	1	53,7	37,9	3,2	4,8
21306-E1-TVPB	**XL**	0,386	**30**	72	19	1,1	59,9	41,5	–	–
22207-E1-K	**XL**	0,425	**35**	72	23	1,1	62,5	43,8	3,2	4,8
22207-E1	**XL**	0,434	**35**	72	23	1,1	62,5	43,8	3,2	4,8
21307-E1-K-TVPB	**XL**	0,496	**35**	80	21	1,5	66,6	47,4	–	–
21307-E1-TVPB	**XL**	0,503	**35**	80	21	1,5	66,6	47,4	–	–
22208-E1-K	**XL**	0,517	**40**	80	23	1,1	70,4	48,6	3,2	4,8
22208-E1	**XL**	0,528	**40**	80	23	1,1	70,4	48,6	3,2	4,8
21308-E1	**XL**	0,701	**40**	90	23	1,5	80,8	59,7	3,2	4,8
21308-E1-K	**XL**	0,702	**40**	90	23	1,5	80,8	59,7	3,2	4,8
22308-E1-K	**XL**	1,03	**40**	90	33	1,5	76	52,4	3,2	4,8
22308-E1	**XL**	1,05	**40**	90	33	1,5	76	52,4	3,2	4,8
22308-E1-T41A	**XL**	1,05	**40**	90	33	1,5	76	52,4	3,2	4,8
22209-E1-K	**XL**	0,577	**45**	85	23	1,1	75,6	54,8	3,2	4,8
22209-E1	**XL**	0,589	**45**	85	23	1,1	75,6	54,8	3,2	4,8
21309-E1-K	**XL**	0,845	**45**	100	25	1,5	89,8	67,3	3,2	4,8
21309-E1	**XL**	0,845	**45**	100	25	1,5	89,8	67,3	3,2	4,8
22309-E1-K	**XL**	1,36	**45**	100	36	1,5	84,7	58,9	3,2	6,5
22309-E1	**XL**	1,39	**45**	100	36	1,5	84,7	58,9	3,2	6,5
22309-E1-T41A	**XL**	1,39	**45**	100	36	1,5	84,7	58,9	3,2	6,5
22210-E1-K	**XL**	0,608	**50**	90	23	1,1	80,8	59,7	3,2	4,8
22210-E1	**XL**	0,622	**50**	90	23	1,1	80,8	59,7	3,2	4,8
21310-E1-K	**XL**	1,28	**50**	110	27	2	89,8	67,3	3,2	4,8
21310-E1	**XL**	1,28	**50**	110	27	2	89,8	67,3	3,2	4,8
22310-E1-K	**XL**	1,86	**50**	110	40	2	92,6	63	3,2	6,5
22310-E1	**XL**	1,9	**50**	110	40	2	92,6	63	3,2	6,5
22310-E1-T41A	**XL**	1,9	**50**	110	40	2	92,6	63	3,2	6,5
22211-E1-K	**XL**	0,825	**55**	100	25	1,5	89,8	67,3	3,2	4,8
22211-E1	**XL**	0,851	**55**	100	25	1,5	89,8	67,3	3,2	4,8
21311-E1-K	**XL**	1,19	**55**	120	29	2	98,3	71,4	3,2	6,5
21311-E1	**XL**	1,19	**55**	120	29	2	98,3	71,4	3,2	6,5

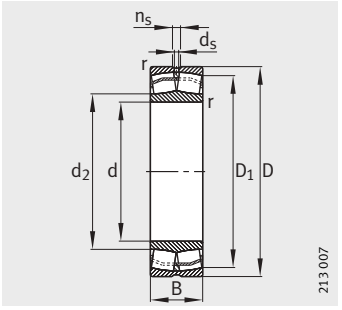


Mounting dimensions

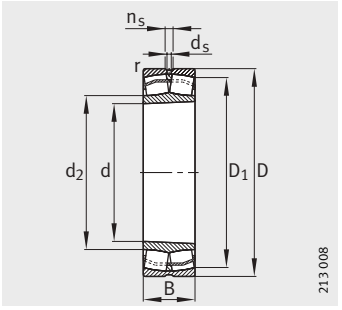
Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	r_a	dyn. C_r	stat. C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
min.	max.	max.	N	N					N	min^{-1}	min^{-1}
27	45	1	40 500	33 500	0,3	2,25	3,34	2,2	3 700	15 000	10 100
30,6	46,4	1	48 000	42 500	0,34	1,98	2,94	1,93	4 800	17 000	9 500
30,6	46,4	1	48 000	42 500	0,34	1,98	2,94	1,93	4 800	17 000	9 500
32	55	1	52 000	43 000	0,28	2,43	3,61	2,37	4 750	13 000	8 700
35,6	54,6	1	64 000	57 000	0,31	2,15	3,2	2,1	6 900	13 000	8 100
35,6	56,4	1	64 000	57 000	0,31	2,15	3,2	2,1	6 900	13 000	8 100
37	65	1	72 000	63 000	0,27	2,49	3,71	2,43	7 000	11 000	7 500
42	65	1	88 000	81 500	0,31	2,16	3,22	2,12	9 400	11 000	7 300
42	65	1	88 000	81 500	0,31	2,16	3,22	2,12	9 400	11 000	7 300
44	71	1,5	83 000	73 500	0,26	2,55	3,8	2,5	8 100	9 500	7 000
44	71	1,5	83 000	73 500	0,26	2,55	3,8	2,5	8 100	9 500	7 000
47	73	1	102 000	90 000	0,28	2,41	3,59	2,35	11 800	10 000	6 400
47	73	1	102 000	90 000	0,28	2,41	3,59	2,35	11 800	10 000	6 400
49	81	1,5	108 000	106 000	0,24	2,81	4,19	2,75	14 300	9 500	6 100
49	81	1,5	108 000	106 000	0,24	2,81	4,19	2,75	14 300	9 500	6 100
49	81	1,5	156 000	150 000	0,36	1,86	2,77	1,82	13 100	7 500	5 800
49	81	1,5	156 000	150 000	0,36	1,86	2,77	1,82	13 100	7 500	5 800
49	81	1,5	156 000	150 000	0,36	1,86	2,77	1,82	13 100	7 500	5 800
52	78	1	104 000	98 000	0,26	2,62	3,9	2,56	12 700	10 000	5 800
52	78	1	104 000	98 000	0,26	2,62	3,9	2,56	12 700	10 000	5 800
54	91	1,5	129 000	129 000	0,23	2,92	4,35	2,86	17 300	8 500	5 500
54	91	1,5	129 000	129 000	0,23	2,92	4,35	2,86	17 300	8 500	5 500
54	91	1,5	186 000	183 000	0,36	1,9	2,83	1,86	16 100	6 700	5 300
54	91	1,5	186 000	183 000	0,36	1,9	2,83	1,86	16 100	6 700	5 300
54	91	1,5	186 000	183 000	0,36	1,9	2,83	1,86	16 100	6 700	5 300
57	83	1	108 000	106 000	0,24	2,81	4,19	2,75	14 300	9 500	5 300
57	83	1	108 000	106 000	0,24	2,81	4,19	2,75	14 300	9 500	5 300
61	99	2	129 000	129 000	0,23	2,92	4,35	2,86	17 300	8 500	5 300
61	99	2	129 000	129 000	0,23	2,92	4,35	2,86	17 300	8 500	5 300
61	99	2	228 000	224 000	0,36	1,86	2,77	1,82	20 300	6 000	4 950
61	99	2	228 000	224 000	0,36	1,86	2,77	1,82	20 300	6 000	4 950
61	99	2	228 000	224 000	0,36	1,86	2,77	1,82	20 300	6 000	4 950
64	91	1,5	129 000	129 000	0,23	2,92	4,35	2,86	17 300	8 500	4 850
64	91	1,5	129 000	129 000	0,23	2,92	4,35	2,86	17 300	8 500	4 850
66	109	2	170 000	166 000	0,24	2,84	4,23	2,78	21 200	6 300	4 950
66	109	2	170 000	166 000	0,24	2,84	4,23	2,78	21 200	6 300	4 950

Spherical roller bearings

With cylindrical or tapered bore



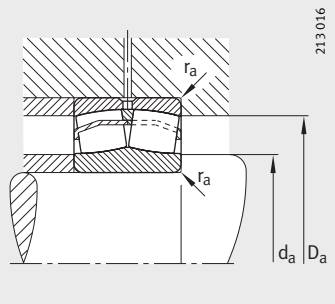
E1 design
Cylindrical bore



Tapered bore
K = taper 1:12

Dimension table (continued) · Dimensions in mm

Designation		Mass	Dimensions							
	X-life	m ≈kg	d	D	B	r min.	D_1 ≈	d_2 ≈	d_s	n_s
22311-E1-K	**XL**	2,22	**55**	120	43	2	101,4	68,9	3,2	6,5
22311-E1-K-T41A	**XL**	2,22	**55**	120	43	2	101,4	68,9	3,2	6,5
22311-E1	**XL**	2,27	**55**	120	43	2	101,4	68,9	3,2	6,5
22311-E1-T41A	**XL**	2,27	**55**	120	43	2	101,4	68,9	3,2	6,5
22212-E1-K	**XL**	1,09	**60**	110	28	1,5	98,7	71,4	3,2	6,5
22212-E1	**XL**	1,12	**60**	110	28	1,5	98,7	71,4	3,2	6,5
21312-E1-K	**XL**	1,78	**60**	130	31	2,1	112,5	84,4	3,2	6,5
21312-E1	**XL**	1,78	**60**	130	31	2,1	112,5	84,4	3,2	6,5
22312-E1-K	**XL**	2,83	**60**	130	46	2,1	110,1	74,8	3,2	6,5
22312-E1-K-T41A	**XL**	2,83	**60**	130	46	2,1	110,1	74,8	3,2	6,5
22312-E1	**XL**	2,89	**60**	130	46	2,1	110,1	74,8	3,2	6,5
22312-E1-T41A	**XL**	2,89	**60**	130	46	2,1	110,1	74,8	3,2	6,5
22213-E1-K	**XL**	1,52	**65**	120	31	1,5	107,3	79,1	3,2	6,5
22213-E1	**XL**	1,55	**65**	120	31	1,5	107,3	79,1	3,2	6,5
21313-E1-K	**XL**	2,42	**65**	140	33	2,1	126,8	94,9	3,2	6,5
21313-E1	**XL**	2,42	**65**	140	33	2,1	126,8	94,9	3,2	6,5
22313-E1-K	**XL**	3,49	**65**	140	48	2,1	119,3	83,2	4,8	9,5
22313-E1-K-T41A	**XL**	3,49	**65**	140	48	2,1	119,3	83,2	4,8	9,5
22313-E1	**XL**	3,57	**65**	140	48	2,1	119,3	83,2	4,8	9,5
22313-E1-T41A	**XL**	3,57	**65**	140	48	2,1	119,3	83,2	4,8	9,5
22214-E1-K	**XL**	1,61	**70**	125	31	1,5	112,5	84,4	3,2	6,5
22214-E1	**XL**	1,65	**70**	125	31	1,5	112,5	84,4	3,2	6,5
21314-E1-K	**XL**	3	**70**	150	35	2,1	126,2	94,9	3,2	6,5
21314-E1	**XL**	3	**70**	150	35	2,1	126,2	94,9	3,2	6,5
22314-E1-K	**XL**	4,12	**70**	150	51	2,1	128	86,7	4,8	9,5
22314-E1-K-T41A	**XL**	4,12	**70**	150	51	2,1	128	86,7	4,8	9,5
22314-E1	**XL**	4,21	**70**	150	51	2,1	128	86,7	4,8	9,5
22314-E1-T41A	**XL**	4,21	**70**	150	51	2,1	128	86,7	4,8	9,5
22215-E1-K	**XL**	1,68	**75**	130	31	1,5	117,7	89,8	3,2	6,5
22215-E1	**XL**	1,72	**75**	130	31	1,5	117,7	89,8	3,2	6,5
21315-E1-K	**XL**	2,86	**75**	160	37	2,1	135,2	99,7	3,2	6,5
21315-E1	**XL**	2,86	**75**	160	37	2,1	135,2	99,7	3,2	6,5
22315-E1-K	**XL**	5,06	**75**	160	55	2,1	136,3	92,4	4,8	9,5
22315-E1-K-T41A	**XL**	5,06	**75**	160	55	2,1	136,3	92,4	4,8	9,5
22315-E1	**XL**	5,18	**75**	160	55	2,1	136,3	92,4	4,8	9,5
22315-E1-T41A	**XL**	5,18	**75**	160	55	2,1	136,3	92,4	4,8	9,5

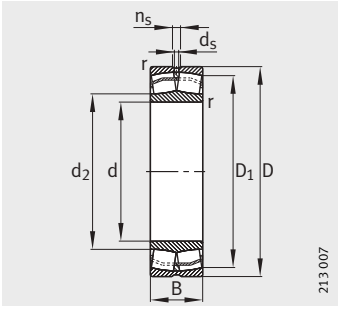


Mounting dimensions

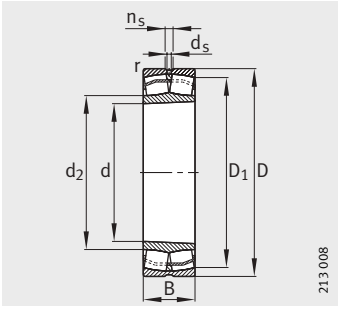
Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	r_a	dyn. C_r	stat. C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
min.	max.	max.	N	N					N	min^{-1}	min^{-1}
66	109	2	265 000	260 000	0,36	1,89	2,81	1,84	23 900	5 600	4 650
66	109	2	265 000	260 000	0,36	1,89	2,81	1,84	23 900	5 600	4 650
66	109	2	265 000	260 000	0,36	1,89	2,81	1,84	23 900	5 600	4 650
66	109	2	265 000	260 000	0,36	1,89	2,81	1,84	23 900	5 600	4 650
69	101	1,5	170 000	166 000	0,24	2,84	4,23	2,78	21 200	7 500	4 650
69	101	1,5	170 000	166 000	0,24	2,84	4,23	2,78	21 200	7 500	4 650
72	118	2,1	212 000	228 000	0,23	2,95	4,4	2,89	28 000	6 300	4 500
72	118	2,1	212 000	228 000	0,23	2,95	4,4	2,89	28 000	6 300	4 500
72	118	2,1	310 000	310 000	0,35	1,91	2,85	1,87	28 000	5 000	4 300
72	118	2,1	310 000	310 000	0,35	1,91	2,85	1,87	28 000	5 000	4 300
72	118	2,1	310 000	310 000	0,35	1,91	2,85	1,87	28 000	5 000	4 300
72	118	2,1	310 000	310 000	0,35	1,91	2,85	1,87	28 000	5 000	4 300
74	111	1,5	200 000	208 000	0,24	2,81	4,19	2,75	25 500	6 700	4 400
74	111	1,5	200 000	208 000	0,24	2,81	4,19	2,75	25 500	6 700	4 400
77	128	2,1	250 000	270 000	0,22	3,14	4,67	3,07	34 000	5 000	4 200
77	128	2,1	250 000	270 000	0,22	3,14	4,67	3,07	34 000	5 000	4 200
77	128	2,1	355 000	365 000	0,34	2	2,98	1,96	32 500	4 800	3 950
77	128	2,1	355 000	365 000	0,34	2	2,98	1,96	32 500	4 800	3 950
77	128	2,1	355 000	365 000	0,34	2	2,98	1,96	32 500	4 800	3 950
77	128	2,1	355 000	365 000	0,34	2	2,98	1,96	32 500	4 800	3 950
79	116	1,5	212 000	228 000	0,23	2,95	4,4	2,89	28 000	6 300	4 100
79	116	1,5	212 000	228 000	0,23	2,95	4,4	2,89	28 000	6 300	4 100
82	138	2,1	250 000	270 000	0,22	3,14	4,67	3,07	34 000	5 000	4 100
82	138	2,1	250 000	270 000	0,22	3,14	4,67	3,07	34 000	5 000	4 100
82	138	2,1	390 000	390 000	0,34	2	2,98	1,96	36 500	4 500	3 850
82	138	2,1	390 000	390 000	0,34	2	2,98	1,96	36 500	4 500	3 850
82	138	2,1	390 000	390 000	0,34	2	2,98	1,96	36 500	4 500	3 850
82	138	2,1	390 000	390 000	0,34	2	2,98	1,96	36 500	4 500	3 850
84	121	1,5	216 000	236 000	0,22	3,1	4,62	3,03	29 500	6 300	3 900
84	121	1,5	216 000	236 000	0,22	3,1	4,62	3,03	29 500	6 300	3 900
87	148	2,1	305 000	325 000	0,22	3,04	4,53	2,97	38 500	4 800	3 850
87	148	2,1	305 000	325 000	0,22	3,04	4,53	2,97	38 500	4 800	3 850
87	148	2,1	440 000	450 000	0,34	1,99	2,96	1,94	40 500	4 300	3 650
87	148	2,1	440 000	450 000	0,34	1,99	2,96	1,94	40 500	4 300	3 650
87	148	2,1	440 000	450 000	0,34	1,99	2,96	1,94	40 500	4 300	3 650
87	148	2,1	440 000	450 000	0,34	1,99	2,96	1,94	40 500	4 300	3 650

Spherical roller bearings

With cylindrical or tapered bore



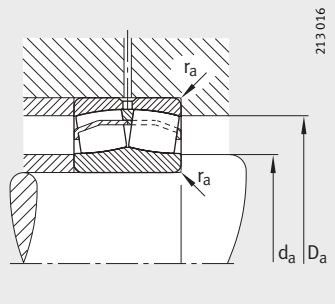
E1 design
Cylindrical bore



Tapered bore
K = taper 1:12

Dimension table (continued) · Dimensions in mm

Designation		Mass	Dimensions							
	X-life	m ≈kg	d	D	B	r min.	D_1 ≈	d_2 ≈	d_s	n_s
22216-E1-K	**XL**	2,08	**80**	140	33	2	126,8	94,9	3,2	6,5
22216-E1	**XL**	2,13	**80**	140	33	2	126,8	94,9	3,2	6,5
21316-E1-K	**XL**	2,65	**80**	170	39	2,1	135,4	99,8	3,2	6,5
21316-E1	**XL**	2,65	**80**	170	39	2,1	135,4	99,7	3,2	6,5
22316-E1-K	**XL**	6,05	**80**	170	58	2,1	145,1	98,3	4,8	9,5
22316-E1-K-T41A	**XL**	6,05	**80**	170	58	2,1	145,1	98,3	4,8	9,5
22316-E1	**XL**	6,27	**80**	170	58	2,1	145,1	98,3	4,8	9,5
22316-E1-T41A	**XL**	6,27	**80**	170	58	2,1	145,1	98,3	4,8	9,5
22217-E1-K	**XL**	2,59	**85**	150	36	2	135,4	99,7	3,2	6,5
22217-E1	**XL**	2,65	**85**	150	36	2	135,4	99,7	3,2	6,5
21317-E1-K	**XL**	5,37	**85**	180	41	3	143,9	106,1	4,8	9,5
21317-E1	**XL**	5,37	**85**	180	41	3	143,9	106,1	4,8	9,5
22317-E1	**XL**	7,06	**85**	180	60	3	154,2	104,4	4,8	9,5
22317-E1-T41A	**XL**	7,06	**85**	180	60	3	154,2	104,4	4,8	9,5
22317-E1-K	**XL**	7,06	**85**	180	60	3	154,2	104,4	4,8	9,5
22317-E1-K-T41A	**XL**	7,06	**85**	180	60	3	154,2	104,4	4,8	9,5
22218-E1-K	**XL**	3,35	**90**	160	40	2	143,9	106,1	3,2	6,5
22218-E1	**XL**	3,43	**90**	160	40	2	143,9	106,1	3,2	6,5
23218-E1-K-TVPB	**XL**	4,08	**90**	160	52,4	2	140	104,1	3,2	6,5
23218-E1-TVPB	**XL**	4,27	**90**	160	52,4	2	140	104,1	3,2	6,5
23218-E1A-K-M	**XL**	4,34	**90**	160	52,4	2	140	–	3,2	6,5
21318-E1-K	**XL**	6,26	**90**	190	43	3	152,7	112,6	4,8	9,5
21318-E1	**XL**	6,26	**90**	190	43	3	152,7	112,6	4,8	9,5
22318-E1-K	**XL**	8,33	**90**	190	64	3	162,5	110,2	6,3	12,2
22318-E1-K-T41A	**XL**	8,33	**90**	190	64	3	162,5	110,2	6,3	12,2
22318-E1	**XL**	8,51	**90**	190	64	3	162,5	110,2	6,3	12,2
22318-E1-T41A	**XL**	8,51	**90**	190	64	3	162,5	110,2	6,3	12,2
22219-E1-K	**XL**	4,04	**95**	170	43	2,1	152,7	112,6	4,8	9,5
22219-E1	**XL**	4,13	**95**	170	43	2,1	152,7	112,6	4,8	9,5
21319-E1-K-TVPB	**XL**	6,53	**95**	200	45	3	169,4	124,3	4,8	9,5
21319-E1-TVPB	**XL**	6,63	**95**	200	45	3	169,4	124,3	4,8	9,5
22319-E1-K	**XL**	9,46	**95**	200	67	3	171,2	116	6,3	12,2
22319-E1-K-T41A	**XL**	9,46	**95**	200	67	3	171,2	116	6,3	12,2
22319-E1	**XL**	9,69	**95**	200	67	3	171,2	116	6,3	12,2
22319-E1-T41A	**XL**	9,69	**95**	200	67	3	171,2	116	6,3	12,2
23120-E1-K-TVPB	**XL**	4,06	**100**	165	52	2	146,3	113,9	3,2	6,5

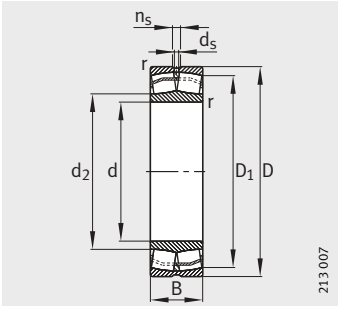


Mounting dimensions

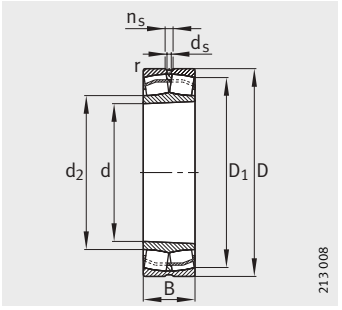
Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	r_a	dyn. C_r	stat. C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
min.	max.	max.	N	N					N	min^{-1}	min^{-1}
91	129	2	250 000	270 000	0,22	3,14	4,67	3,07	34 000	5 600	3 700
91	129	2	250 000	270 000	0,22	3,14	4,67	3,07	34 000	5 600	3 700
92	158	2,1	305 000	325 000	0,22	3,04	4,53	2,97	38 500	4 800	3 750
92	158	2,1	305 000	325 000	0,22	3,04	4,53	2,97	38 500	4 800	3 750
92	158	2,1	500 000	510 000	0,34	1,99	2,96	1,94	45 000	4 300	3 450
92	158	2,1	500 000	510 000	0,34	1,99	2,96	1,94	45 000	4 300	3 450
92	158	2,1	500 000	510 000	0,34	1,99	2,96	1,94	45 000	4 300	3 450
92	158	2,1	500 000	510 000	0,34	1,99	2,96	1,94	45 000	4 300	3 450
96	139	2	305 000	325 000	0,22	3,04	4,53	2,97	38 500	5 300	3 550
96	139	2	305 000	325 000	0,22	3,04	4,53	2,97	38 500	5 300	3 550
99	166	2,5	345 000	375 000	0,23	2,9	4,31	2,83	42 500	4 800	3 550
99	166	2,5	345 000	375 000	0,23	2,9	4,31	2,83	42 500	4 800	3 550
99	166	2,5	540 000	560 000	0,33	2,04	3,04	2	50 000	4 000	3 300
99	166	2,5	540 000	560 000	0,33	2,04	3,04	2	50 000	4 000	3 300
99	166	2,5	540 000	560 000	0,33	2,04	3,04	2	50 000	4 000	3 300
99	166	2,5	540 000	560 000	0,33	2,04	3,04	2	50 000	4 000	3 300
101	149	2	345 000	375 000	0,23	2,9	4,31	2,83	42 500	4 800	3 500
101	149	2	345 000	375 000	0,23	2,9	4,31	2,83	42 500	4 800	3 500
101	149	2	440 000	520 000	0,31	2,2	3,27	2,15	48 500	4 300	2 700
101	149	2	440 000	520 000	0,31	2,2	3,27	2,15	48 500	4 300	2 700
101	149	2	440 000	520 000	0,31	2,2	3,27	2,15	48 500	4 300	2 700
104	176	2,5	380 000	415 000	0,24	2,87	4,27	2,8	47 000	4 500	3 450
104	176	2,5	380 000	415 000	0,24	2,87	4,27	2,8	47 000	4 500	3 450
104	176	2,5	610 000	630 000	0,33	2,03	3,02	1,98	55 000	3 600	3 100
104	176	2,5	610 000	630 000	0,33	2,03	3,02	1,98	55 000	3 600	3 100
104	176	2,5	610 000	630 000	0,33	2,03	3,02	1,98	55 000	3 600	3 100
104	176	2,5	610 000	630 000	0,33	2,03	3,02	1,98	55 000	3 600	3 100
107	158	2,1	380 000	415 000	0,24	2,87	4,27	2,8	47 000	4 500	3 400
107	158	2,1	380 000	415 000	0,24	2,87	4,27	2,8	47 000	4 500	3 400
109	186	2,5	430 000	455 000	0,22	3,04	4,53	2,97	47 500	4 000	3 300
109	186	2,5	430 000	455 000	0,22	3,04	4,53	2,97	47 500	4 000	3 300
109	186	2,5	670 000	695 000	0,33	2,03	3,02	1,98	60 000	3 000	2 900
109	186	2,5	670 000	695 000	0,33	2,03	3,02	1,98	60 000	3 000	2 900
109	186	2,5	670 000	695 000	0,33	2,03	3,02	1,98	60 000	3 000	2 900
109	186	2,5	670 000	695 000	0,33	2,03	3,02	1,98	60 000	3 000	2 900
111	154	2	450 000	570 000	0,28	2,37	3,53	2,32	52 000	4 300	2 800

Spherical roller bearings

With cylindrical or tapered bore



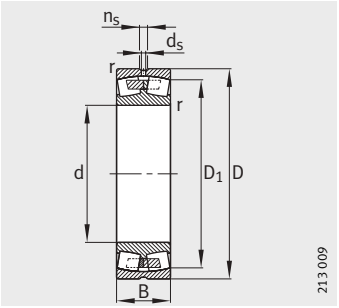
E1 design
Cylindrical bore



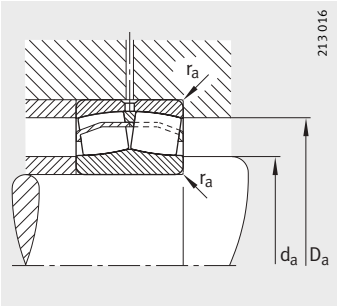
Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

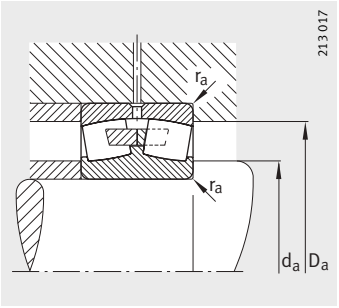
Designation		Mass	Dimensions							
	X-life	m ≈kg	d	D	B	r min.	D_1 ≈	d_2 ≈	d_s	n_s
23120-E1-TVPB	**XL**	4,22	**100**	165	52	2	146,3	113,9	3,2	6,5
23120-E1A-K-M	**XL**	4,23	**100**	165	52	2	146,3	–	3,2	6,5
23120-E1A-M	**XL**	4,37	**100**	165	52	2	146,3	–	3,2	6,5
22220-E1-K	**XL**	4,91	**100**	180	46	2,1	161,4	119	4,8	9,5
22220-E1	**XL**	4,96	**100**	180	46	2,1	161,4	119	4,8	9,5
23220-E1-K-TVPB	**XL**	6,13	**100**	180	60,3	2,1	156,7	116,7	4,8	9,5
23220-E1-TVPB	**XL**	6,32	**100**	180	60,3	2,1	156,7	116,7	4,8	9,5
23220-E1A-K-M	**XL**	6,33	**100**	180	60,3	2,1	156,7	–	4,8	9,5
23220-E1A-M	**XL**	6,45	**100**	180	60,3	2,1	156,7	–	4,8	9,5
21320-E1-K-TVPB	**XL**	8,08	**100**	215	47	3	182	132	4,8	9,5
21320-E1-TVPB	**XL**	8,19	**100**	215	47	3	182	132	4,8	9,5
22320-E1	**XL**	13,1	**100**	215	73	3	184,7	130,2	6,3	12,2
22320-E1-T41A	**XL**	13,1	**100**	215	73	3	184,7	130,2	6,3	12,2
22320-E1-K	**XL**	13,1	**100**	215	73	3	184,7	130,2	6,3	12,2
22320-E1-K-T41A	**XL**	13,1	**100**	215	73	3	184,7	130,2	6,3	12,2
23320-AS-MA-T41A	–	15,5	**100**	215	82,6	3	179,5	–	4,8	9,5
23022-E1-TVPB	**XL**	3,55	**110**	170	45	2	154,6	123,7	3,2	6,5
23022-E1A-M	**XL**	3,67	**110**	170	45	2	154,6	–	3,2	6,5
23122-E1-K-TVPB	**XL**	4,95	**110**	180	56	2	160	124,6	4,8	9,5
23122-E1A-K-M	**XL**	5,1	**110**	180	56	2	160	–	4,8	9,5
23122-E1-TVPB	**XL**	5,31	**110**	180	56	2	160	124,6	4,8	9,5
23122-E1A-M	**XL**	5,51	**110**	180	56	2	160	–	4,8	9,5
24122-E1-K30-TVPB	**XL**	6,69	**110**	180	69	2	154,8	125,1	3,2	6,5
24122-E1-TVPB	**XL**	6,85	**110**	180	69	2	154,8	125,1	3,2	6,5
22222-E1-K	**XL**	6,82	**110**	200	53	2,1	178,7	129,4	4,8	9,5
22222-E1	**XL**	6,99	**110**	200	53	2,1	178,7	129,4	4,8	9,5
23222-E1-K-TVPB	**XL**	8,82	**110**	200	69,8	2,1	172,7	129,1	4,8	9,5
23222-E1-TVPB	**XL**	9,18	**110**	200	69,8	2,1	172,7	129,1	4,8	9,5
23222-E1A-K-M	**XL**	9,32	**110**	200	69,8	2,1	172,7	–	4,8	9,5
23222-E1A-M	**XL**	9,54	**110**	200	69,8	2,1	172,7	–	4,8	9,5
21322-E1-K-TVPB	**XL**	10,9	**110**	240	50	3	202,5	146,4	6,3	12,2
21322-E1-TVPB	**XL**	11,1	**110**	240	50	3	202,5	146,4	6,3	12,2
22322-E1-K	**XL**	17,4	**110**	240	80	3	204,9	143,1	8	15
22322-E1-K-T41A	**XL**	17,4	**110**	240	80	3	204,9	143,1	8	15
22322-E1	**XL**	17,7	**110**	240	80	3	204,9	143,1	8	15
22322-E1-T41A	**XL**	17,7	**110**	240	80	3	204,9	143,1	8	15



With central rib
Cylindrical bore



Mounting dimensions
E1 design

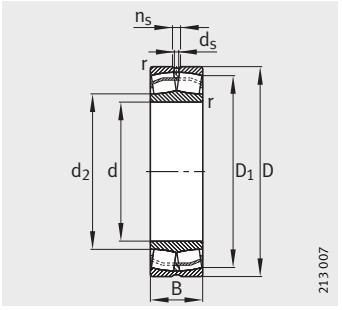


Mounting dimensions
With central rib

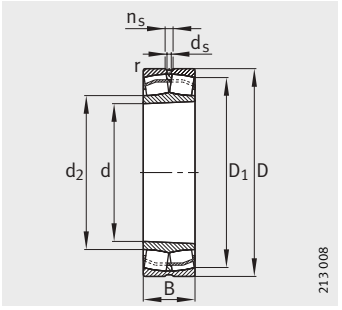
Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	r_a	dyn. C_r	stat. C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
min.	max.	max.	N	N					N	min^{-1}	min^{-1}
111	154	2	450 000	570 000	0,28	2,37	3,53	2,32	52 000	4 300	2 800
111	154	2	450 000	570 000	0,28	2,37	3,53	2,32	52 000	4 300	2 800
111	154	2	450 000	570 000	0,28	2,37	3,53	2,32	52 000	4 300	2 800
112	168	2,1	430 000	475 000	0,24	2,84	4,23	2,78	52 000	4 300	3 300
112	168	2,1	430 000	475 000	0,24	2,84	4,23	2,78	52 000	4 300	3 300
112	168	2,1	550 000	655 000	0,31	2,15	3,2	2,1	60 000	3 600	2 470
112	168	2,1	550 000	655 000	0,31	2,15	3,2	2,1	60 000	3 600	2 470
112	168	2,1	550 000	655 000	0,31	2,15	3,2	2,1	60 000	3 600	2 470
112	168	2,1	550 000	655 000	0,31	2,15	3,2	2,1	60 000	3 600	2 470
114	201	2,5	490 000	530 000	0,22	3,14	4,67	3,07	61 000	3 600	3 100
114	201	2,5	490 000	530 000	0,22	3,14	4,67	3,07	61 000	3 600	3 100
114	201	2,5	815 000	915 000	0,33	2,03	3,02	1,98	75 000	3 000	2 550
114	201	2,5	815 000	915 000	0,33	2,03	3,02	1,98	75 000	3 000	2 550
114	201	2,5	815 000	915 000	0,33	2,03	3,02	1,98	75 000	3 000	2 550
114	201	2,5	815 000	915 000	0,33	2,03	3,02	1,98	75 000	3 000	2 550
114	201	2,5	680 000	900 000	0,43	1,57	2,34	1,53	69 000	2 800	–
118,8	161,2	2	400 000	530 000	0,23	2,9	4,31	2,83	52 000	4 300	3 050
118,8	161,2	2	400 000	530 000	0,23	2,9	4,31	2,83	52 000	4 300	3 050
121	169	2	530 000	680 000	0,28	2,39	3,56	2,34	61 000	4 000	2 600
121	169	2	530 000	680 000	0,28	2,41	3,59	2,35	61 000	4 000	2 600
121	169	2	530 000	680 000	0,28	2,39	3,56	2,34	61 000	4 000	2 600
121	169	2	530 000	680 000	0,28	2,41	3,59	2,35	61 000	4 000	2 600
121	169	2	620 000	900 000	0,35	1,94	2,88	1,89	67 000	2 600	1 820
121	169	2	620 000	900 000	0,35	1,94	2,88	1,89	67 000	2 600	1 820
122	188	2,1	550 000	600 000	0,25	2,71	4,04	2,65	62 000	4 000	3 100
122	188	2,1	550 000	600 000	0,25	2,71	4,04	2,65	62 000	4 000	3 100
122	188	2,1	710 000	865 000	0,33	2,06	3,06	2,01	72 000	3 000	2 150
122	188	2,1	710 000	865 000	0,33	2,06	3,06	2,01	72 000	3 000	2 150
122	188	2,1	710 000	865 000	0,33	2,06	3,06	2,01	72 000	3 000	2 150
122	188	2,1	710 000	865 000	0,33	2,06	3,06	2,01	72 000	3 000	2 150
124	226	2,5	600 000	640 000	0,21	3,24	4,82	3,16	69 000	3 000	2 750
124	226	2,5	600 000	640 000	0,21	3,24	4,82	3,16	69 000	3 000	2 750
124	226	2,5	950 000	1 060 000	0,33	2,07	3,09	2,03	91 000	2 600	2 250
124	226	2,5	950 000	1 060 000	0,33	2,07	3,09	2,03	91 000	2 600	2 250
124	226	2,5	950 000	1 060 000	0,33	2,07	3,09	2,03	91 000	2 600	2 250
124	226	2,5	950 000	1 060 000	0,33	2,07	3,09	2,03	91 000	2 600	2 250

Spherical roller bearings

With cylindrical or tapered bore



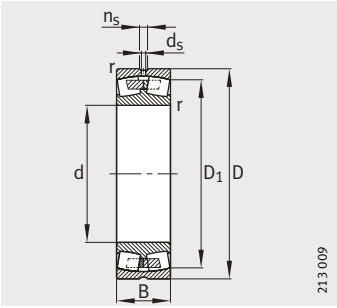
E1 design
Cylindrical bore



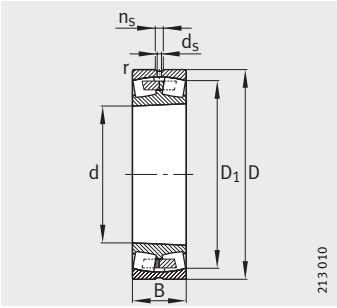
Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

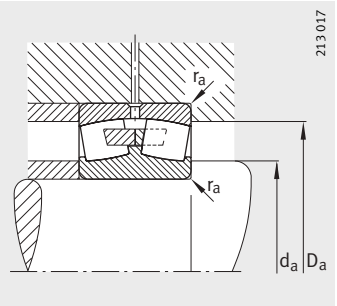
Designation		Mass	Dimensions							
	X-life	m ≈kg	d	D	B	r min.	D_1 ≈	d_2 ≈	d_s	n_s
23322-AS-MA-T41A	–	21,3	**110**	240	92,1	3	199,6	–	6,3	12,2
23024-E1-K-TVPB	**XL**	3,67	**120**	180	46	2	164,7	133	3,2	6,5
23024-E1-TVPB	**XL**	3,86	**120**	180	46	2	164,7	133	3,2	6,5
23024-E1A-K-M	**XL**	4,09	**120**	180	46	2	164,7	–	3,2	6,5
23024-E1A-M	**XL**	4,17	**120**	180	46	2	164,7	–	3,2	6,5
24024-S-K30-MB	–	5,35	**120**	180	60	2	159,8	–	3,2	6,5
24024-S-MB	–	5,46	**120**	180	60	2	159,8	–	3,2	6,5
24024-E1-TVPB	**XL**	5,65	**120**	180	60	2	160	132	3,2	6,5
24024-E1-K30-TVPB	**XL**	6,11	**120**	180	60	2	160	132	3,2	6,5
23124-E1-K-TVPB	**XL**	7,06	**120**	200	62	2	177,4	136,2	4,8	9,5
23124-E1-TVPB	**XL**	7,39	**120**	200	62	2	177,4	136,2	4,8	9,5
23124-E1A-K-M	**XL**	7,57	**120**	200	62	2	177,4	–	4,8	9,5
23124-E1A-M	**XL**	7,7	**120**	200	62	2	177,4	–	4,8	9,5
24124-E1-K30-TVPB	**XL**	11,5	**120**	200	80	2	170,6	136,3	3,2	6,5
24124-E1-TVPB	**XL**	11,6	**120**	200	80	2	170,6	136,3	3,2	6,5
22224-E1	**XL**	8,84	**120**	215	58	2,1	192	141,8	6,3	12,2
22224-E1-K	**XL**	8,84	**120**	215	58	2,1	192	141,8	6,3	12,2
23224-E1-K-TVPB	**XL**	11,1	**120**	215	76	2,1	185,5	139	4,8	9,5
23224-E1A-K-M	**XL**	11,4	**120**	215	76	2,1	185,5	–	4,8	9,5
23224-E1-TVPB	**XL**	11,5	**120**	215	76	2,1	185,5	139	4,8	9,5
23224-E1A-M	**XL**	12,1	**120**	215	76	2,1	185,5	–	4,8	9,5
22324-E1-K	**XL**	22,1	**120**	260	86	3	222,4	150,7	8	15
22324-E1-K-T41A	**XL**	22,1	**120**	260	86	3	222,4	150,7	8	15
22324-E1	**XL**	22,5	**120**	260	86	3	222,4	150,8	8	15
22324-E1-T41A	**XL**	22,5	**120**	260	86	3	222,4	150,8	8	15
23324-AS-MA-T41A	–	29,1	**120**	260	106	3	213,9	–	6,3	12,2
23026-E1-K-TVPB	**XL**	5,42	**130**	200	52	2	182,3	145,9	4,8	9,5
23026-E1-TVPB	**XL**	5,61	**130**	200	52	2	182,3	145,9	4,8	9,5
23026-E1A-K-M	**XL**	5,7	**130**	200	52	2	182,3	–	4,8	9,5
23026-E1A-M	**XL**	5,96	**130**	200	52	2	182,3	–	4,8	9,5
24026-S-MB	–	7,97	**130**	200	69	2	175,6	–	3,2	6,5
24026-E1-K30-TVPB	**XL**	7,57	**130**	200	69	2	176,9	144,7	3,2	6,5
24026-E1-TVPB	**XL**	7,72	**130**	200	69	2	176,9	144,7	3,2	6,5
23126-E1-K-TVPB	**XL**	7,82	**130**	210	64	2	187,3	146	4,8	9,5
23126-E1A-K-M	**XL**	8,1	**130**	210	64	2	187,3	–	4,8	9,5
23126-E1-TVPB	**XL**	8,11	**130**	210	64	2	187,3	146	4,8	9,5



With central rib
Cylindrical bore



Tapered bore
K = taper 1:12, K30 = taper 1:30

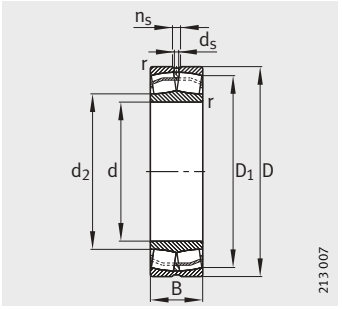


Mounting dimensions

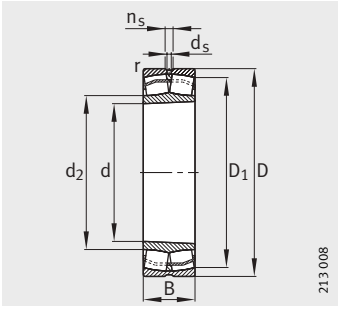
Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	r_a	dyn. C_r	stat. C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
min.	max.	max.	N	N					N	min^{-1}	min^{-1}
124	226	2,5	830 000	1 080 000	0,43	1,57	2,34	1,53	86 000	2 600	–
128,8	171,2	2	430 000	585 000	0,22	3,04	4,53	2,97	58 000	4 300	2 850
128,8	171,2	2	430 000	585 000	0,22	3,04	4,53	2,97	58 000	4 300	2 850
128,8	171,2	2	430 000	585 000	0,22	3,04	4,53	2,97	58 000	4 300	2 850
128,8	171,2	2	430 000	585 000	0,22	3,04	4,53	2,97	58 000	4 300	2 850
128,8	171,2	2	405 000	710 000	0,32	2,09	3,11	2,04	40 000	2 600	2 380
128,8	171,2	2	405 000	710 000	0,32	2,09	3,11	2,04	40 000	2 600	2 380
128,8	171,2	2	540 000	800 000	0,29	2,3	3,42	2,25	72 000	3 000	2 290
128,8	171,2	2	540 000	800 000	0,29	2,3	3,42	2,25	72 000	3 000	2 290
131	189	2	630 000	800 000	0,28	2,39	3,56	2,34	73 000	3 400	2 330
131	189	2	630 000	800 000	0,28	2,39	3,56	2,34	73 000	3 400	2 330
131	189	2	630 000	800 000	0,28	2,39	3,56	2,34	73 000	3 400	2 330
131	189	2	630 000	800 000	0,28	2,39	3,56	2,34	73 000	3 400	2 330
131	189	2	780 000	1 120 000	0,37	1,84	2,74	1,8	85 000	2 200	1 610
131	189	2	780 000	1 120 000	0,37	1,84	2,74	1,8	85 000	2 200	1 610
132	203	2,1	640 000	735 000	0,25	2,71	4,04	2,65	71 000	3 400	2 800
132	203	2,1	640 000	735 000	0,25	2,71	4,04	2,65	71 000	3 400	2 800
132	203	2	815 000	1 020 000	0,33	2,03	3,02	1,98	80 000	2 800	1 940
132	203	2	815 000	1 020 000	0,33	2,03	3,02	1,98	80 000	2 800	1 940
132	203	2	815 000	1 020 000	0,33	2,03	3,02	1,98	80 000	2 800	1 940
132	203	2	815 000	1 020 000	0,33	2,03	3,02	1,98	80 000	2 800	1 940
134	246	2,5	1 080 000	1 160 000	0,33	2,06	3,06	2,01	103 000	2 600	2 080
134	246	2,5	1 080 000	1 160 000	0,33	2,06	3,06	2,01	103 000	2 600	2 080
134	246	2,5	1 080 000	1 160 000	0,33	2,06	3,06	2,01	103 000	2 600	2 080
134	246	2,5	1 080 000	1 160 000	0,33	2,06	3,06	2,01	103 000	2 600	2 080
134	246	2,5	1 020 000	1 430 000	0,45	1,5	2,23	1,46	103 000	2 400	–
138,8	191,2	2	540 000	735 000	0,23	2,95	4,4	2,89	70 000	3 600	2 650
138,8	191,2	2	540 000	735 000	0,23	2,95	4,4	2,89	70 000	3 600	2 650
138,8	191,2	2	540 000	735 000	0,23	2,95	4,4	2,89	70 000	3 600	2 650
138,8	191,2	2	540 000	735 000	0,23	2,95	4,4	2,89	70 000	3 600	2 650
138,8	191,2	2	500 000	900 000	0,34	1,99	2,96	1,94	53 000	2 600	2 140
138,8	191,2	2	680 000	1 020 000	0,31	2,21	3,29	2,16	85 000	2 600	2 050
138,8	191,2	2	680 000	1 020 000	0,31	2,21	3,29	2,16	85 000	2 600	2 050
141	199	2	680 000	900 000	0,28	2,45	3,64	2,39	79 000	3 000	2 130
141	199	2	680 000	900 000	0,28	2,45	3,64	2,39	79 000	3 000	2 130
141	199	2	680 000	900 000	0,28	2,45	3,64	2,39	79 000	3 000	2 130

Spherical roller bearings

With cylindrical or tapered bore



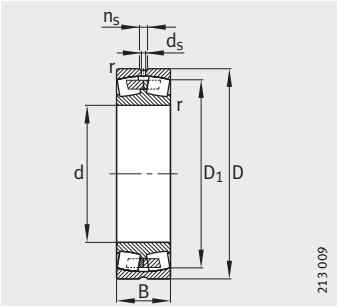
E1 design
Cylindrical bore



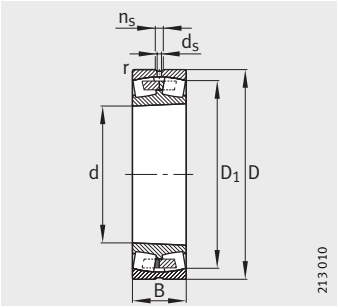
Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

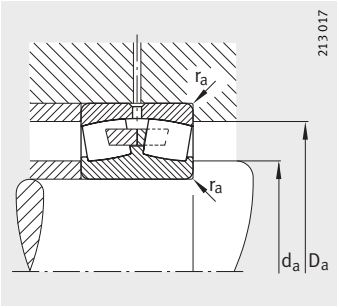
Designation		Mass	Dimensions							
	X-life	m ≈kg	d	D	B	r min.	D_1 ≈	d_2 ≈	d_s	n_s
23126-E1A-M	**XL**	8,45	**130**	210	64	2	187,3	–	4,8	9,5
24126-E1-K30-TVPB	**XL**	10,1	**130**	210	80	2	181,1	146,4	3,2	6,5
24126-E1-TVPB	**XL**	10,6	**130**	210	80	2	181,1	146,4	3,2	6,5
22226-E1-K	**XL**	10,9	**130**	230	64	3	205	151,7	6,3	12,2
22226-E1	**XL**	11,3	**130**	230	64	3	205	151,7	6,3	12,2
23226-E1-K-TVPB	**XL**	12,6	**130**	230	80	3	199,3	150	4,8	9,5
23226-E1-TVPB	**XL**	13,4	**130**	230	80	3	199,3	150	4,8	9,5
23226-E1A-K-M	**XL**	13,6	**130**	230	80	3	199,3	–	4,8	9,5
23226-E1A-M	**XL**	14	**130**	230	80	3	199,3	–	4,8	9,5
22326-E1-K	**XL**	27,4	**130**	280	93	4	239,5	162,2	9,5	17,7
22326-E1-K-T41A	**XL**	27,4	**130**	280	93	4	239,5	162,2	9,5	17,7
22326-E1	**XL**	28	**130**	280	93	4	239,5	162,2	9,5	17,7
22326-E1-T41A	**XL**	28	**130**	280	93	4	239,5	162,2	9,5	17,7
23326-AS-MA-T41A	–	35,2	**130**	280	112	4	232,1	–	6,3	12,2
23028-E1-K-TVPB	**XL**	5,81	**140**	210	53	2	192,3	155,4	4,8	9,5
23028-E1A-K-M	**XL**	6	**140**	210	53	2	192,3	–	4,8	9,5
23028-E1-TVPB	**XL**	6,04	**140**	210	53	2	192,3	155,4	4,8	9,5
23028-E1A-M	**XL**	6,45	**140**	210	53	2	192,3	–	4,8	9,5
24028-S-K30-MB	–	8,38	**140**	210	69	2	186,4	–	3,2	6,5
24028-S-MB	–	8,52	**140**	210	69	2	186,4	–	3,2	6,5
24028-E1-K30-TVPB	**XL**	7,96	**140**	210	69	2	187,2	154,2	3,2	6,5
24028-E1-TVPB	**XL**	8,15	**140**	210	69	2	187,2	154,2	3,2	6,5
23128-E1A-K-M	**XL**	7,78	**140**	225	68	2,1	201	–	4,8	9,5
23128-E1-K-TVPB	**XL**	9,46	**140**	225	68	2,1	201	157,1	4,8	9,5
23128-E1-TVPB	**XL**	9,81	**140**	225	68	2,1	201	157,1	4,8	9,5
23128-E1A-M	**XL**	10,4	**140**	225	68	2,1	201	–	4,8	9,5
24128-E1-K30-TVPB	**XL**	11,8	**140**	225	85	2,1	194,4	157	4,8	9,5
24128-E1-TVPB	**XL**	12,8	**140**	225	85	2,1	194,4	157	4,8	9,5
22228-E1-K	**XL**	13,7	**140**	250	68	3	223,4	164,9	6,3	12,2
22228-E1	**XL**	14,2	**140**	250	68	3	223,4	164,9	6,3	12,2
23228-E1-K-TVPB	**XL**	17,1	**140**	250	88	3	216	162	6,3	12,2
23228-E1A-K-M	**XL**	17,6	**140**	250	88	3	216	–	6,3	12,2
23228-E1-TVPB	**XL**	17,7	**140**	250	88	3	216	162	6,3	12,2
23228-E1A-M	**XL**	18,3	**140**	250	88	3	216	–	6,3	12,2
22328-E1-K	**XL**	34,4	**140**	300	102	4	255,7	173,5	9,5	17,7
22328-E1-K-T41A	**XL**	34,4	**140**	300	102	4	255,7	173,5	9,5	17,7



With central rib
Cylindrical bore



Tapered bore
K = taper 1:12, K30 = taper 1:30

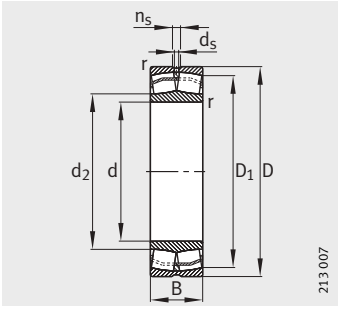


Mounting dimensions

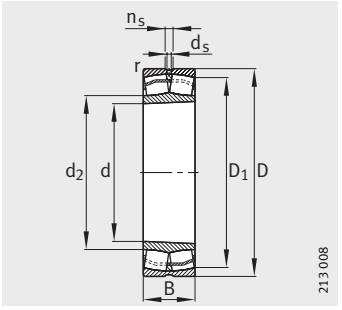
Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	r_a	dyn. C_r	stat. C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
min.	max.	max.	N	N					N	min^{-1}	min^{-1}
141	199	2	680 000	900 000	0,28	2,45	3,64	2,39	79 000	3 000	2 130
141	199	2	815 000	1 200 000	0,34	1,96	2,92	1,92	93 000	2 200	1 480
141	199	2	815 000	1 200 000	0,34	1,96	2,92	1,92	93 000	2 200	1 480
144	216	2,5	750 000	900 000	0,26	2,62	3,9	2,56	79000	3 000	2 550
144	216	2,5	750 000	900 000	0,26	2,62	3,9	2,56	79 000	3 000	2 550
144	216	2,5	900 000	1 140 000	0,33	2,07	3,09	2,03	89 000	2 600	1 780
144	216	2,5	900 000	1 140 000	0,33	2,07	3,09	2,03	89 000	2 600	1 780
144	216	2,5	900 000	1 140 000	0,33	2,07	3,09	2,03	89 000	2 600	1 780
144	216	2,5	900 000	1 140 000	0,33	2,07	3,09	2,03	89 000	2 600	1 780
147	263	3	1 250 000	1 370 000	0,33	2,06	3,06	2,01	117 000	2 400	1 870
147	263	3	1 250 000	1 370 000	0,33	2,06	3,06	2,01	117 000	2 400	1 870
147	263	3	1 250 000	1 370 000	0,33	2,06	3,06	2,01	117 000	2 400	1 870
147	263	3	1 250 000	1 370 000	0,33	2,06	3,06	2,01	117 000	2 400	1 870
147	263	3	1 160 000	1 600 000	0,45	1,51	2,25	1,48	108 000	2 200	–
148,8	201,2	2	570 000	800 000	0,22	3,07	4,57	3	76 000	3 600	2 440
148,8	201,2	2	570 000	800 000	0,22	3,07	4,57	3	76 000	3 600	2 440
148,8	201,2	2	570 000	800 000	0,22	3,07	4,57	3	76 000	3 600	2 440
148,8	201,2	2	570 000	800 000	0,22	3,07	4,57	3	76 000	3 600	2 440
148,8	201,2	2	510 000	915 000	0,32	2,1	3,13	2,06	56 000	2 400	2 000
148,8	201,2	2	510 000	915 000	0,32	2,1	3,13	2,06	56 000	2 400	2 000
148,8	201,2	2	720 000	1 100 000	0,29	2,33	3,47	2,28	93 000	2 600	1 880
148,8	201,2	2	720 000	1 100 000	0,29	2,33	3,47	2,28	93 000	2 600	1 880
152	213	2,1	765 000	1 020 000	0,27	2,49	3,71	2,43	88 000	2 800	1 960
152	213	2,1	765 000	1 020 000	0,27	2,49	3,71	2,43	88 000	2 800	1 960
152	213	2,1	765 000	1 020 000	0,27	2,49	3,71	2,43	88 000	2 800	1 960
152	213	2,1	765 000	1 020 000	0,27	2,49	3,71	2,43	88 000	2 800	1 960
152	213	2,1	930 000	1 370 000	0,34	1,98	2,94	1,93	104 000	2 000	1 340
152	213	2,1	930 000	1 370 000	0,34	1,98	2,94	1,93	104 000	2 000	1 340
154	236	2,5	880 000	1 040 000	0,25	2,67	3,97	2,61	97 000	2 400	2 320
154	236	2,5	880 000	1 040 000	0,25	2,67	3,97	2,61	97 000	2 400	2320
154	236	2,5	1 080 000	1 400 000	0,33	2,04	3,04	2	112 000	2 400	1 580
154	236	2,5	1 080 000	1 400 000	0,33	2,04	3,04	2	112 000	2 400	1 580
154	236	2,5	1 080 000	1 400 000	0,33	2,04	3,04	2	112 000	2 400	1 580
154	236	2,5	1 080 000	1 400 000	0,33	2,04	3,04	2	112 000	2 400	1 580
157	283	3	1 460 000	1 630 000	0,34	2	2,98	1,96	132 000	2 200	1 700
157	283	3	1 460 000	1 630 000	0,34	2	2,98	1,96	132 000	2 200	1 700

Spherical roller bearings

With cylindrical or tapered bore



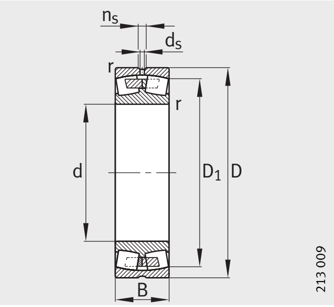
E1 design
Cylindrical bore



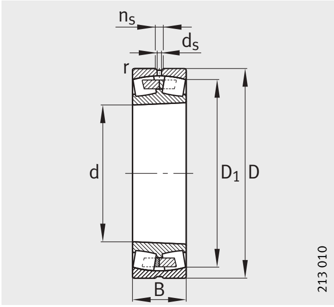
Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

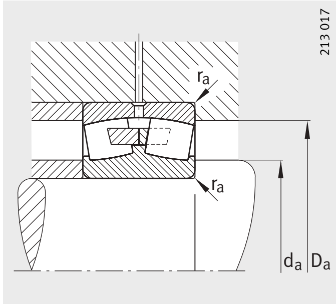
Designation		Mass	Dimensions							
	X-life	m ≈kg	d	D	B	r min.	D_1 ≈	d_2 ≈	d_s	n_s
22328-E1	**XL**	35,1	**140**	300	102	4	255,7	173,5	9,5	17,7
22328-E1-T41A	**XL**	35,1	**140**	300	102	4	255,7	173,5	9,5	17,7
23328-AS-MA-T41A	–	40,9	**140**	300	118	4	249,2	–	6,3	12,2
23030-E1-K-TVPB	**XL**	7,29	**150**	225	56	2,1	206,3	166,6	4,8	9,5
23030-E1A-K-M	**XL**	7,33	**150**	225	56	2,1	206,3	–	4,8	9,5
23030-E1-TVPB	**XL**	7,63	**150**	225	56	2,1	206,3	166,6	4,8	9,5
23030-E1A-M	**XL**	7,83	**150**	225	56	2,1	206,3	–	4,8	9,5
24030-S-MB	–	10,4	**150**	225	75	2,1	199,1	–	4,8	9,5
24030-S-K30-MB	–	10,7	**150**	225	75	2,1	199,1	–	4,8	9,5
24030-E1-K30-TVPB	**XL**	10	**150**	225	75	2,1	200,2	165,2	4,8	9,5
24030-E1-TVPB	**XL**	10,2	**150**	225	75	2,1	200,2	165,2	4,8	9,5
23130-E1-K-TVPB	**XL**	14,5	**150**	250	80	2,1	220,8	170,1	6,3	12,2
23130-E1-TVPB	**XL**	15	**150**	250	80	2,1	220,8	170,2	6,3	12,2
23130-E1A-K-M	**XL**	15,8	**150**	250	80	2,1	220,8	–	6,3	12,2
23130-E1A-M	**XL**	16,2	**150**	250	80	2,1	220,8	–	6,3	12,2
24130-BS-K30	–	19	**150**	250	100	2,1	211,3	–	4,8	9,5
24130-BS	–	20	**150**	250	100	2,1	211,3	–	4,8	9,5
22230-E1-K	**XL**	17,8	**150**	270	73	3	240,8	177,9	8	15
22230-E1	**XL**	18,2	**150**	270	73	3	240,8	177,9	8	15
23230-E1-K-TVPB	**XL**	22,3	**150**	270	96	3	232,6	174	6,3	12,2
23230-E1A-K-M	**XL**	22,9	**150**	270	96	3	232,6	–	6,3	12,2
23230-E1-TVPB	**XL**	22,9	**150**	270	96	3	232,6	174	6,3	12,2
23230-E1A-M	**XL**	23,7	**150**	270	96	3	232,6	–	6,3	12,2
22330-E1-K	**XL**	41,2	**150**	320	108	4	273,2	185,3	9,5	17,7
22330-E1-K-T41A	**XL**	41,2	**150**	320	108	4	273,2	185,3	9,5	17,7
22330-E1	**XL**	42,2	**150**	320	108	4	273,2	185,3	9,5	17,7
22330-E1-T41A	**XL**	42,2	**150**	320	108	4	273,2	185,3	9,5	17,7
23330-A-MA-T41A	–	49,8	**150**	320	128	4	264,5	–	8	15
23032-E1-K-TVPB	**XL**	8,67	**160**	240	60	2,1	219,9	177	6,3	12,2
23032-E1-TVPB	**XL**	8,97	**160**	240	60	2,1	219,9	177,5	6,3	12,2
23032-E1A-K-M	**XL**	9,42	**160**	240	60	2,1	219,9	–	6,3	12,2
23032-E1A-M	**XL**	9,71	**160**	240	60	2,1	219,9	–	6,3	12,2
24032-S-K30-MB	–	12,8	**160**	240	80	2,1	211,2	–	4,8	9,5
24032-S-MB	–	13	**160**	240	80	2,1	211,2	–	4,8	9,5
24032-E1-K30-TVPB	**XL**	11,8	**160**	240	80	2,1	213,6	176	4,8	9,5
24032-E1-TVPB	**XL**	12,3	**160**	240	80	2,1	213,6	176	4,8	9,5



With central rib
Cylindrical bore

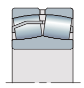


Tapered bore
K = taper 1:12, K30 = taper 1:30



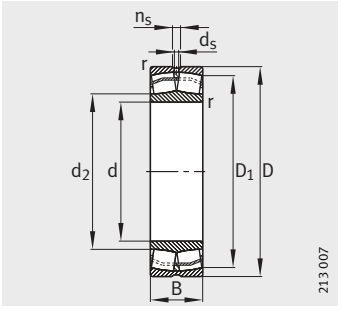
Mounting dimensions

Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	r_a	dyn. C_r	stat. C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
min.	max.	max.	N	N					N	min^{-1}	min^{-1}
157	283	3	1 460 000	1 630 000	0,34	2	2,98	1,96	132 000	2 200	1 700
157	283	3	1 460 000	1 630 000	0,34	2	2,98	1,96	132 000	2 200	1 700
157	283	3	1 270 000	1 800 000	0,43	1,57	2,34	1,53	123 000	2 000	–
160,2	214,8	2,1	630 000	880 000	0,22	3,1	4,62	3,03	85 000	3 400	2 260
160,2	214,8	2,1	630 000	880 000	0,22	3,1	4,62	3,03	85 000	3 400	2 260
160,2	214,8	2,1	630 000	880 000	0,22	3,1	4,62	3,03	85 000	3 400	2 260
160,2	214,8	2,1	630 000	880 000	0,22	3,1	4,62	3,03	85 000	3 400	2 260
160,2	214,8	2,1	620 000	1 140 000	0,33	2,06	3,06	2,01	67 000	2 200	1 800
160,2	214,8	2,1	620 000	1 140 000	0,33	2,06	3,06	2,01	67 000	2 200	1 800
160,2	214,8	2,1	815 000	1 250 000	0,29	2,32	3,45	2,26	105 000	2 400	1 740
160,2	214,8	2,1	815 000	1 250 000	0,29	2,32	3,45	2,26	105 000	2 400	1 740
162	238	2,1	1 000 000	1 320 000	0,29	2,32	3,45	2,26	143 000	2 600	1 760
162	238	2,1	1 000 000	1 320 000	0,29	2,32	3,45	2,26	143 000	2 600	1 760
162	238	2,1	1 000 000	1 320 000	0,29	2,32	3,45	2,26	143 000	2 600	1 760
162	238	2,1	1 000 000	1 320 000	0,29	2,32	3,45	2,26	143 000	2 600	1 760
162	238	2,1	915 000	1 560 000	0,4	1,68	2,5	1,64	100 000	2 000	1 260
162	238	2,1	915 000	1 560 000	0,4	1,68	2,5	1,64	100 000	2 000	1 260
164	256	2,5	1 000 000	1 220 000	0,25	2,69	4	2,63	111 000	2 600	2 110
164	256	2,5	1 000 000	1 220 000	0,25	2,69	4	2,63	111 000	2 600	2 110
164	256	2,5	1 270 000	1 660 000	0,33	2,02	3	1,97	129 000	2 200	1 420
164	256	2,5	1 270 000	1 660 000	0,33	2,02	3	1,97	129 000	2 200	1 420
164	256	2,5	1 270 000	1 660 000	0,33	2,02	3	1,97	129 000	2 200	1 420
164	256	2,5	1 270 000	1 660 000	0,33	2,02	3	1,97	129 000	2 200	1 420
167	303	3	1 630 000	1 860 000	0,33	2,02	3	1,97	147 000	2 000	1 550
167	303	3	1 630 000	1 860 000	0,33	2,02	3	1,97	147 000	2 000	1 550
167	303	3	1 630 000	1 860 000	0,33	2,02	3	1,97	147 000	2 000	1 550
167	303	3	1 630 000	1 860 000	0,33	2,02	3	1,97	147 000	2 000	1 550
167	303	3	1 500 000	2 120 000	0,44	1,52	2,26	1,49	135 000	2 000	–
170,2	229,8	2,1	720 000	1 020 000	0,22	3,1	4,62	3,03	94 000	2 800	2 090
170,2	229,8	2,1	720 000	1 020 000	0,22	3,1	4,62	3,03	94 000	2 800	2 090
170,2	229,8	2,1	720 000	1 020 000	0,22	3,1	4,62	3,03	94 000	2 800	2 090
170,2	229,8	2,1	720 000	1 020 000	0,22	3,1	4,62	3,03	94 000	2 800	2 090
170,2	229,8	2,1	670 000	1 250 000	0,32	2,09	3,11	2,04	71 000	2 000	1 680
170,2	229,8	2,1	670 000	1 250 000	0,32	2,09	3,11	2,04	71 000	2 000	1 680
170,2	229,8	2,1	915 000	1 430 000	0,29	2,3	3,42	2,25	117 000	2 200	1 600
170,2	229,8	2,1	915 000	1 430 000	0,29	2,3	3,42	2,25	117 000	2 200	1 600

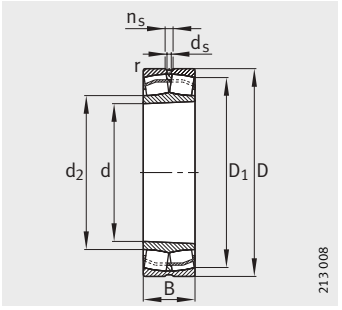


Spherical roller bearings

With cylindrical or tapered bore



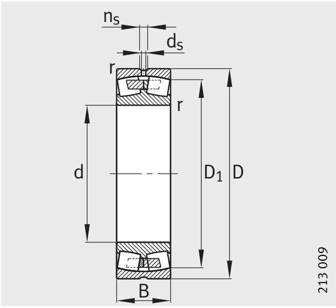
E1 design
Cylindrical bore



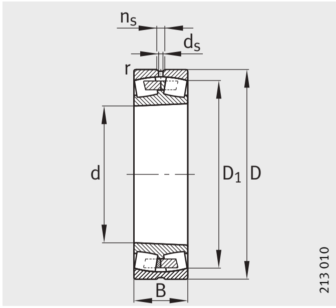
Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

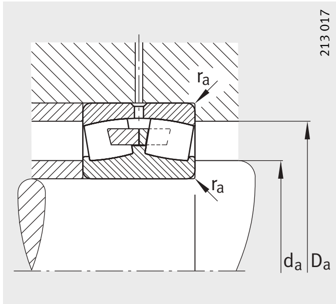
Designation		Mass	Dimensions							
	X-life	m ≈kg	d	D	B	r min.	D_1 ≈	d_2 ≈	d_s	n_s
23132-E1-K-TVPB	**XL**	18,4	**160**	270	86	2,1	238,3	183,2	8	15
23132-E1A-K-M	**XL**	18,6	**160**	270	86	2,1	238,3	–	8	15
23132-E1-TVPB	**XL**	19,1	**160**	270	86	2,1	238,3	183,2	8	15
23132-E1A-M	**XL**	20	**160**	270	86	2,1	238,3	–	8	15
24132-BS	–	23	**160**	270	109	2,1	230,2	–	4,8	9,5
24132-BS-K30	–	25	**160**	270	109	2,1	230,2	–	4,8	9,5
22232-E1-K	**XL**	22,4	**160**	290	80	3	258,2	190,9	8	15
22232-E1	**XL**	23,3	**160**	290	80	3	258,2	190,9	8	15
23232-E1-K-TVPB	**XL**	27,7	**160**	290	104	3	249,3	186,7	8	15
23232-E1A-K-M	**XL**	28,5	**160**	290	104	3	249,3	–	8	15
23232-E1-TVPB	**XL**	28,6	**160**	290	104	3	249,3	186,7	8	15
23232-E1A-M	**XL**	29,8	**160**	290	104	3	249,3	–	8	15
22332-K-MB	–	50,1	**160**	340	114	4	288,3	–	9,5	17,7
22332-MB	–	51,1	**160**	340	114	4	288,3	–	9,5	17,7
22332-A-MA-T41A	–	52,4	**160**	340	114	4	288,3	–	9,5	17,7
23332-A-MA-T41A	–	61,3	**160**	340	136	4	280,6	–	9,5	17,7
23034-E1-K-TVPB	**XL**	11,9	**170**	260	67	2,1	237,2	189,8	6,3	12,2
23034-E1A-K-M	**XL**	12	**170**	260	67	2,1	237,2	–	6,3	12,2
23034-E1-TVPB	**XL**	12,3	**170**	260	67	2,1	237,2	189,8	6,3	12,2
23034-E1A-M	**XL**	13	**170**	260	67	2,1	237,2	–	6,3	12,2
24034-BS-K30-MB	–	16,8	**170**	260	90	2,1	228,8	–	4,8	9,5
24034-BS-MB	–	17,6	**170**	260	90	2,1	228,8	–	4,8	9,5
23134-E1A-K-M	**XL**	19,5	**170**	280	88	2,1	248,1	–	8	15
23134-E1-K-TVPB	**XL**	19,9	**170**	280	88	2,1	248,1	193,4	8	15
23134-E1-TVPB	**XL**	20,7	**170**	280	88	2,1	248,1	193,4	8	15
23134-E1A-M	**XL**	22,1	**170**	280	88	2,1	248,1	–	8	15
24134-BS-K30	–	25	**170**	280	109	2,1	239,6	–	4,8	9,5
24134-BS	–	25,8	**170**	280	109	2,1	239,6	–	4,8	9,5
22234-E1-K	**XL**	27,1	**170**	310	86	4	275,4	199,8	9,5	17,7
22234-E1	**XL**	27,8	**170**	310	86	4	275,4	199,8	9,5	17,7
23234-E1-K-TVPB	**XL**	33,1	**170**	310	110	4	267,4	199,8	8	15
23234-E1A-K-M	**XL**	34,6	**170**	310	110	4	267,4	–	8	15
23234-E1-TVPB	**XL**	34,9	**170**	310	110	4	267,4	199,8	8	15
23234-E1A-M	**XL**	36,5	**170**	310	110	4	267,4	–	8	15
22334-K-MB	–	56,9	**170**	360	120	4	304,2	–	9,5	17,7
22334-A-MA-T41A	–	59,5	**170**	360	120	4	304,2	–	9,5	17,7



With central rib
Cylindrical bore

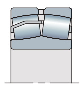


Tapered bore
K = taper 1:12, K30 = taper 1:30



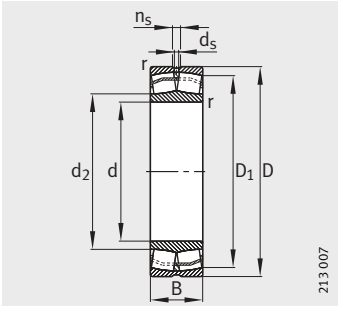
Mounting dimensions

Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	r_a	dyn. C_r	stat. C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
min.	max.	max.	N	N					N	min^{-1}	min^{-1}
172	258	2,1	1 160 000	1 560 000	0,29	2,32	3,45	2,26	164 000	2 400	1 590
172	258	2,1	1 160 000	1 560 000	0,29	2,32	3,45	2,26	164 000	2 400	1 590
172	258	2,1	1 160 000	1 560 000	0,29	2,32	3,45	2,26	164 000	2 400	1 590
172	258	2,1	1 160 000	1 560 000	0,29	2,32	3,45	2,26	164 000	2 400	1 590
172	258	2,1	1 060 000	1 800 000	0,41	1,65	2,46	1,61	106 000	2 000	1 150
172	258	2,1	1 060 000	1 800 000	0,41	1,65	2,46	1,61	106 000	2 000	1 150
174	276	2,5	1 140 000	1 400 000	0,26	2,64	3,93	2,58	125 000	2 600	1 960
174	276	2,5	1 140 000	1 400 000	0,26	2,64	3,93	2,58	125 000	2 600	1 960
174	276	2,5	1 460 000	1 900 000	0,34	2	2,98	1,96	146 000	2 200	1 310
174	276	2,5	1 460 000	1 900 000	0,34	2	2,98	1,96	146 000	2 200	1 310
174	276	2,5	1 460 000	1 900 000	0,34	2	2,98	1,96	146 000	2 200	1 310
174	276	2,5	1 460 000	1 900 000	0,34	2	2,98	1,96	146 000	2 200	1 310
177	323	3	1 430 000	1 900 000	0,37	1,8	2,69	1,76	121 000	2 000	1 490
177	323	3	1 430 000	1 900 000	0,37	1,8	2,69	1,76	121 000	2 000	1 490
177	323	3	1 430 000	1 900 000	0,37	1,8	2,69	1,76	136 000	2 000	1 490
177	323	3	1 660 000	2 320 000	0,44	1,54	2,3	1,51	152 000	2 000	–
180,2	249,8	2,1	880 000	1 220 000	0,23	2,98	4,44	2,92	146 000	2 600	1 940
180,2	249,8	2,1	880 000	1 220 000	0,23	2,98	4,44	2,92	146 000	2 600	1 940
180,2	249,8	2,1	880 000	1 220 000	0,23	2,98	4,44	2,92	146 000	2 600	1 940
180,2	249,8	2,1	880 000	1 220 000	0,23	2,98	4,44	2,92	146 000	2 600	1 940
180,2	249,8	2,1	850 000	1 560 000	0,34	2	2,97	1,95	96 000	2 000	1 530
180,2	249,8	2,1	850 000	1 560 000	0,34	2	2,97	1,95	96 000	2 000	1 530
182	268	2,1	1 220 000	1 700 000	0,28	2,37	3,53	2,32	174 000	2 400	1 480
182	268	2,1	1 220 000	1 700 000	0,28	2,37	3,53	2,32	174 000	2 400	1 480
182	268	2,1	1 220 000	1 700 000	0,28	2,37	3,53	2,32	174 000	2 400	1 480
182	268	2,1	1 220 000	1 700 000	0,28	2,37	3,53	2,32	174 000	2 400	1 480
182	268	2,1	1 060 000	1 830 000	0,39	1,73	2,58	1,69	98 000	1 800	1 100
182	268	2,1	1 060 000	1 830 000	0,39	1,73	2,58	1,69	98 000	1 800	1 100
187	293	3	1 320 000	1 560 000	0,26	2,6	3,87	2,54	139 000	2 400	1 830
187	293	3	1 320 000	1 560 000	0,26	2,6	3,87	2,54	139 000	2 400	1 830
187	293	3	1 630 000	2 160 000	0,33	2,03	3,02	1,98	163 000	2 000	1 190
187	293	3	1 630 000	2 160 000	0,33	2,03	3,02	1,98	163 000	2 000	1 190
187	293	3	1 630 000	2 160 000	0,33	2,03	3,02	1,98	163 000	2 000	1 190
187	293	3	1 630 000	2 160 000	0,33	2,03	3,02	1,98	163 000	2 000	1 190
187	343	3	1 600 000	2 120 000	0,37	1,83	2,72	1,79	134 000	1 800	1 380
187	343	3	1 600 000	2 120 000	0,37	1,83	2,72	1,79	144 000	1 800	1 380

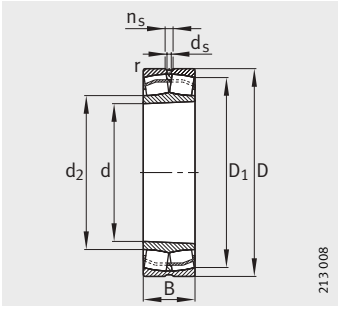


Spherical roller bearings

With cylindrical or tapered bore



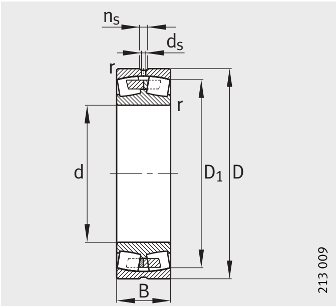
E1 design
Cylindrical bore



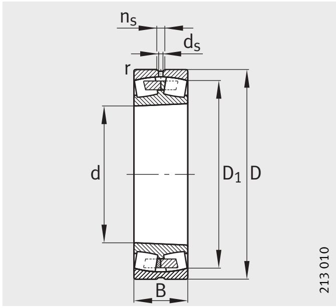
Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

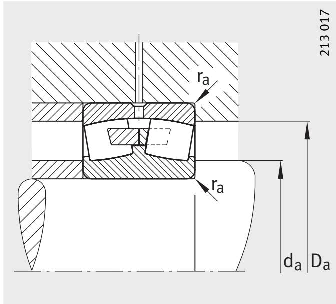
Designation		Mass	Dimensions							
	X-life	m ≈kg	d	D	B	r min.	D_1 ≈	d_2 ≈	d_s	n_s
22334-MB	–	59,5	**170**	360	120	4	304,2	–	9,5	17,7
23936-S-K-MB	–	7,76	**180**	250	52	2	230,9	–	4,8	9,5
23936-S-MB	–	7,96	**180**	250	52	2	230,9	–	4,8	9,5
23036-E1-K-TVPB	**XL**	15,6	**180**	280	74	2,1	254,3	201,8	8	15
23036-E1-TVPB	**XL**	15,9	**180**	280	74	2,1	254,3	201,8	8	15
23036-E1A-K-M	**XL**	16	**180**	280	74	2,1	254,3	–	8	15
23036-E1A-M	**XL**	16,8	**180**	280	74	2,1	254,3	–	8	15
24036-BS-K30-MB	–	22,3	**180**	280	100	2,1	244,2	–	4,8	9,5
24036-BS-MB	–	22,6	**180**	280	100	2,1	244,2	–	4,8	9,5
23136-E1A-K-M	**XL**	25,5	**180**	300	96	3	264,8	–	8	15
23136-E1-K-TVPB	**XL**	25,9	**180**	300	96	3	264,8	204,1	8	15
23136-E1A-M	**XL**	26,1	**180**	300	96	3	264,8	–	8	15
23136-E1-TVPB	**XL**	27,3	**180**	300	96	3	264,8	204,1	8	15
24136-BS-K30	–	31,8	**180**	300	118	3	253,7	–	6,3	12,2
24136-BS	–	32,2	**180**	300	118	3	253,7	–	6,3	12,2
22236-E1-K	**XL**	28,5	**180**	320	86	4	285,9	211,3	9,5	17,7
22236-E1	**XL**	29,2	**180**	320	86	4	285,9	211,3	9,5	17,7
23236-E1-K-TVPB	**XL**	36	**180**	320	112	4	277,3	210,6	8	15
23236-E1A-K-M	**XL**	37	**180**	320	112	4	277,3	–	8	15
23236-E1-TVPB	**XL**	37,2	**180**	320	112	4	277,3	210,6	8	15
23236-E1A-M	**XL**	38,5	**180**	320	112	4	277,3	–	8	15
22336-A-MA-T41A	–	71,7	**180**	380	126	4	323,4	–	12,5	23,5
22336-K-MB	–	66,7	**180**	380	126	4	323,4	–	12,5	23,5
22336-MB	–	69	**180**	380	126	4	323,4	–	12,5	23,5
23938-S-MB	–	8,43	**190**	260	52	2	240,2	–	4,8	9,5
23038-E1-K-TVPB	**XL**	16,3	**190**	290	75	2,1	264,5	211,9	8	15
23038-E1-TVPB	**XL**	17,2	**190**	290	75	2,1	264,5	211,9	8	15
23038-E1A-K-M	**XL**	17,7	**190**	290	75	2,1	264,5	–	8	15
23038-E1A-M	**XL**	18,3	**190**	290	75	2,1	264,5	–	8	15
24038-BS-K30-MB	–	24,2	**190**	290	100	2,1	255	–	4,8	9,5
24038-BS-MB	–	24,5	**190**	290	100	2,1	255	–	4,8	9,5
23138-E1-K-TVPB	**XL**	30,3	**190**	320	104	3	281,6	217	8	15
23138-E1-TVPB	**XL**	32	**190**	320	104	3	281,6	217	8	15
23138-E1A-K-M	**XL**	32,4	**190**	320	104	3	281,6	–	8	15
23138-E1A-M	**XL**	33,9	**190**	320	104	3	281,6	–	8	15
24138-B-K30	–	41,5	**190**	320	128	3	270	–	6,3	12,2



With central rib
Cylindrical bore

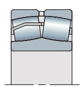


Tapered bore
K = taper 1:12, K30 = taper 1:30



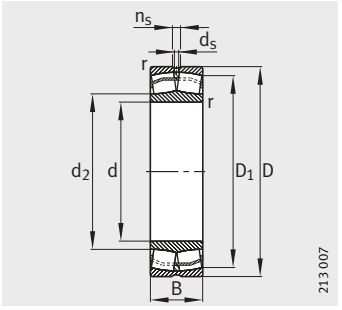
Mounting dimensions

Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	r_a	dyn. C_r	stat. C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
min.	max.	max.	N	N					N	min^{-1}	min^{-1}
187	343	3	1 600 000	2 120 000	0,37	1,83	2,72	1,79	134 000	1 800	1 380
188,8	241,2	2	440 000	850 000	0,2	3,42	5,09	3,34	57 000	2 200	2 320
188,8	241,2	2	440 000	850 000	0,2	3,42	5,09	3,34	57 000	2 200	2 320
190,2	269,8	2,1	1 040 000	1 460 000	0,23	2,9	4,31	2,83	170 000	2 600	1 790
190,2	269,8	2,1	1 040 000	1 460 000	0,23	2,9	4,31	2,83	170 000	2 600	1 790
190,2	269,8	2,1	1 040 000	1 460 000	0,23	2,9	4,31	2,83	170 000	2 600	1 790
190,2	269,8	2,1	1 040 000	1 460 000	0,23	2,9	4,31	2,83	170 000	2 600	1 790
190,2	269,8	2,1	1 000 000	1 830 000	0,36	1,9	2,83	1,86	106 000	1 800	1 420
190,2	269,8	2,1	1 000 000	1 830 000	0,36	1,9	2,83	1,86	106 000	1 800	1 420
194	286	2,5	1 430 000	1 960 000	0,29	2,32	3,45	2,26	196 000	2 200	1 370
194	286	2,5	1 430 000	1 960 000	0,29	2,32	3,45	2,26	196 000	2 200	1 370
194	286	2,5	1 430 000	1 960 000	0,29	2,32	3,45	2,26	196 000	2 200	1 370
194	286	2,5	1 430 000	1 960 000	0,29	2,32	3,45	2,26	196000	2 200	1 370
194	286	2,5	1 250 000	2 200 000	0,4	1,68	2,5	1,64	136 000	1 700	980
194	286	2,5	1 250 000	2 200 000	0,4	1,68	2,5	1,64	136 000	1 700	980
197	303	3	1 370 000	1 660 000	0,25	2,71	4,04	2,65	148 000	2 400	1 720
197	303	3	1 370 000	1 660 000	0,25	2,71	4,04	2,65	148 000	2 400	1 720
197	303	3	1 700 000	2 360 000	0,33	2,07	3,09	2,03	173 000	2 000	1 110
197	303	3	1 700 000	2 360 000	0,33	2,07	3,09	2,03	173 000	2 000	1 110
197	303	3	1 700 000	2 360 000	0,33	2,07	3,09	2,03	173 000	2 000	1 110
197	303	3	1 700 000	2 360 000	0,33	2,07	3,09	2,03	173 000	2 000	1 110
197	363	3	1 700 000	2 240 000	0,37	1,83	2,72	1,79	229 000	1 500	1 280
197	363	3	1 760 000	2 360 000	0,37	1,83	2,72	1,79	209 000	1 500	1 280
197	363	3	1 760 000	2 360 000	0,37	1,83	2,72	1,79	209 000	1 500	1 280
198,8	251,2	2	465 000	900 000	0,18	3,66	5,46	3,58	65 000	2 000	2 180
200,2	279,8	2,1	1 080 000	1 560 000	0,23	2,98	4,44	2,92	180 000	2 400	1 690
200,2	279,8	2,1	1 080 000	1 560 000	0,23	2,98	4,44	2,92	180 000	2 400	1 690
200,2	279,8	2,1	1 080 000	1 560 000	0,23	2,98	4,44	2,92	180 000	2 400	1 690
200,2	279,8	2,1	1 080 000	1 560 000	0,23	2,98	4,44	2,92	180 000	2 400	1 690
200,2	279,8	2,1	1 040 000	1 960 000	0,34	2	2,98	1,96	110 000	1 700	1 320
200,2	279,8	2,1	1 040 000	1 960 000	0,34	2	2,98	1,96	110 000	1 700	1 320
204	306	2,5	1 600 000	2 240 000	0,3	2,28	3,39	2,23	218 000	2 000	1 270
204	306	2,5	1 600 000	2 240 000	0,3	2,28	3,39	2,23	218 000	2 000	1 270
204	306	2,5	1 600 000	2 240 000	0,3	2,28	3,39	2,23	218 000	2 000	1 270
204	306	2,5	1 600 000	2 240 000	0,3	2,28	3,39	2,23	218 000	2 000	1 270
204	306	2,5	1 400 000	2 500 000	0,41	1,66	2,47	1,62	145 000	1 500	910

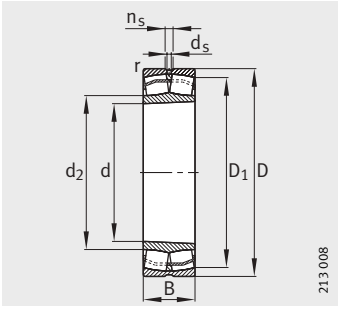


Spherical roller bearings

With cylindrical or tapered bore



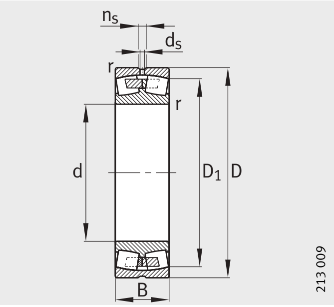
E1 design
Cylindrical bore



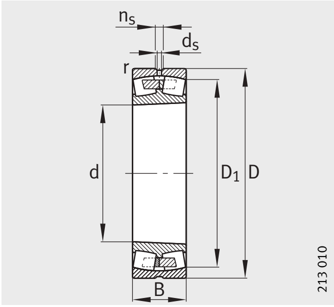
Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

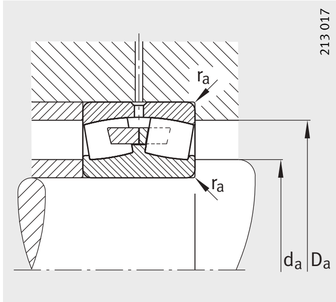
Designation		Mass	Dimensions							
	X-life	m ≈kg	d	D	B	r min.	D_1 ≈	d_2 ≈	d_s	n_s
24138-B	–	42,2	**190**	320	128	3	270	–	6,3	12,2
22238-K-MB	–	36,2	**190**	340	92	4	296	–	9,5	17,7
22238-MB	–	37	**190**	340	92	4	296	–	9,5	17,7
23238-B-K-MB	–	46	**190**	340	120	4	291,2	–	9,5	17,7
23238-B-MB	–	48,4	**190**	340	120	4	291,2	–	9,5	17,7
22338-K-MB	–	77,3	**190**	400	132	5	338,2	–	12,5	23,5
22338-A-MA-T41A	–	80,5	**190**	400	132	5	338,2	–	12,5	23,5
22338-MB	–	80,5	**190**	400	132	5	338,2	–	12,5	23,5
23338-A-MA-T41A	–	97,1	**190**	400	155	5	331,6	–	9,5	17,7
23940-S-K-MB	–	11,5	**200**	280	60	2,1	256,9	–	6,3	12,2
23940-S-MB	–	11,8	**200**	280	60	2,1	256,9	–	6,3	12,2
23040-E1-K-TVPB	**XL**	20,8	**200**	310	82	2,1	281,6	223,4	8	15
23040-E1A-K-M	**XL**	21,4	**200**	310	82	2,1	281,6	–	8	15
23040-E1-TVPB	**XL**	21,5	**200**	310	82	2,1	281,6	223,4	8	15
23040-E1A-M	**XL**	22,8	**200**	310	82	2,1	281,6	–	8	15
24040-BS-K30-MB	–	30	**200**	310	109	2,1	270,8	–	6,3	12,2
24040-BS-MB	–	30,4	**200**	310	109	2,1	270,8	–	6,3	12,2
23140-B-K-MB	–	41,7	**200**	340	112	3	293,3	–	9,5	17,7
23140-B-MB	–	43	**200**	340	112	4	293,3	–	9,5	17,7
24140-B-K30	–	51,6	**200**	340	140	3	285,9	–	6,3	12,2
24140-B	–	52,4	**200**	340	140	3	285,9	–	6,3	12,2
22240-B-K-MB	–	42,3	**200**	360	98	4	312	–	9,5	17,7
22240-B-MB	–	44,2	**200**	360	98	4	312	–	9,5	17,7
23240-B-K-MB	–	55,8	**200**	360	128	4	307,5	–	9,5	17,7
23240-B-MB	–	60,5	**200**	360	128	4	307,5	–	9,5	17,7
22340-K-MB	–	89,5	**200**	420	138	5	357,4	–	12,5	23,5
22340-MB	–	91	**200**	420	138	5	357,4	–	12,5	23,5
22340-A-MA-T41A	–	92,4	**200**	420	138	5	357,4	–	12,5	23,5
23340-A-MA-T41A	–	108	**200**	420	165	5	350,2	–	9,5	17,7
23944-S-MB	–	12,3	**220**	300	60	2,1	277,4	–	6,3	12,2
23944-S-K-MB	–	12,3	**220**	300	60	2,1	277,4	–	6,3	12,2
23044-K-MB	–	29,9	**220**	340	90	3	301,8	–	8	15
23044-MB	–	31,7	**220**	340	90	3	301,8	–	8	15
24044-B-K30-MB	–	38,9	**220**	340	118	3	297,4	–	6,3	12,2
24044-B-MB	–	39,5	**220**	340	118	3	297,4	–	6,3	12,2
23144-B-K-MB	–	52	**220**	370	120	4	319,2	–	9,5	17,7



With central rib
Cylindrical bore

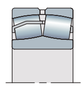


Tapered bore
K = taper 1:12, K30 = taper 1:30



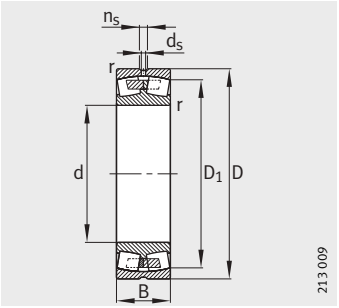
Mounting dimensions

Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	r_a	dyn. C_r	stat. C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
min.	max.	max.	N	N					N	min^{-1}	min^{-1}
204	306	2,5	1 400 000	2 500 000	0,41	1,66	2,47	1,62	145 000	1 500	910
207	323	3	1 200 000	1 830 000	0,28	2,39	3,56	2,34	122 000	1 800	1 620
207	323	3	1 200 000	1 830 000	0,28	2,39	3,56	2,34	122 000	1 800	1 620
207	323	3	1 560 000	2 600 000	0,36	1,86	2,77	1,82	156 000	1 700	1 040
207	323	3	1 560 000	2 600 000	0,36	1,86	2,77	1,82	156 000	1 700	1 040
210	380	4	1 860 000	2 500 000	0,37	1,83	2,72	1,79	213 000	1 500	1 220
210	380	4	1 860 000	2 500 000	0,37	1,83	2,72	1,79	173 000	1 500	1 220
210	380	4	1 860 000	2 500 000	0,37	1,83	2,72	1,79	213 000	1 500	1 220
210	380	4	2 200 000	3 200 000	0,43	1,57	2,34	1,53	223 000	1 400	–
210,2	269,8	2,1	550 000	1 080 000	0,2	3,42	5,09	3,34	71 000	2 000	2 110
210,2	269,8	2,1	550 000	1 080 000	0,2	3,42	5,09	3,34	71 000	2 000	2 110
210,2	299,8	2,1	1 270 000	1 800 000	0,23	2,9	4,31	2,83	203 000	2 400	1 580
210,2	299,8	2,1	1 270 000	1 800 000	0,23	2,9	4,31	2,83	203 000	2 400	1 580
210,2	299,8	2,1	1 270 000	1 800 000	0,23	2,9	4,31	2,83	203 000	2 400	1 580
210,2	299,8	2,1	1 270 000	1 800 000	0,23	2,9	4,31	2,83	203 000	2 400	1 580
210,2	299,8	2,1	1 200 000	2 280 000	0,35	1,94	2,88	1,89	122 000	1 500	1 220
210,2	299,8	2,1	1 200 000	2 280 000	0,35	1,94	2,88	1,89	122 000	1 500	1 220
214	326	2,5	1 320 000	2 280 000	0,35	1,95	2,9	1,91	131 000	1 700	1 240
214	326	2,5	1 320 000	2 280 000	0,35	1,95	2,9	1,91	131 000	1 700	1 240
214	326	2,5	1 700 000	3 000 000	0,42	1,62	2,42	1,59	190 000	1 400	810
214	326	2,5	1 700 000	3 000 000	0,42	1,62	2,42	1,59	190 000	1 400	810
217	343	3	1 320 000	2 000 000	0,29	2,35	3,5	2,3	123 000	1 700	1 530
217	343	3	1 320 000	2 000 000	0,29	2,35	3,5	2,3	123 000	1 700	1 530
217	343	3	1 660 000	2 750 000	0,37	1,83	2,72	1,79	163 000	1 500	1 000
217	343	3	1 660 000	2 750 000	0,37	1,83	2,72	1,79	163 000	1 500	1 000
220	400	4	2 080 000	2 800 000	0,36	1,87	2,79	1,83	189 000	1 400	1 130
220	400	4	2 080 000	2 800 000	0,36	1,87	2,79	1,83	189 000	1 400	1 130
220	400	4	2 080 000	2 800 000	0,36	1,87	2,79	1,83	189 000	1 400	1 130
220	400	4	2 450 000	3 600 000	0,43	1,55	2,31	1,52	238 000	1 300	–
230,2	289,8	2,1	600 000	1 250 000	0,18	3,76	5,59	3,67	72 000	1 800	1 880
230,2	289,8	2,1	600 000	1 250 000	0,18	3,76	5,59	3,67	72 000	1 800	1 880
232,4	327,6	2,5	1 060 000	1 900 000	0,26	2,55	3,8	2,5	132 000	1 700	1 470
232,4	327,6	2,5	1 060 000	1 900 000	0,26	2,55	3,8	2,5	132 000	1 700	1 470
232,4	327,6	2,5	1 400 000	2 700 000	0,34	1,96	2,92	1,92	139 000	1 300	1 080
232,4	327,6	2,5	1 400 000	2 700 000	0,34	1,96	2,92	1,92	139 000	1 300	1 080
237	353	3	1 630 000	2 900 000	0,33	2,03	3,02	1,98	165 000	1 400	1 070

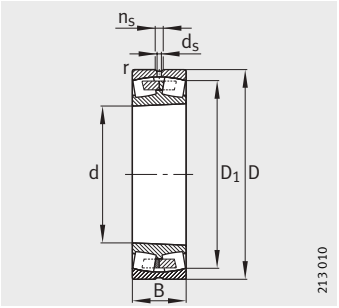


Spherical roller bearings

With cylindrical or tapered bore



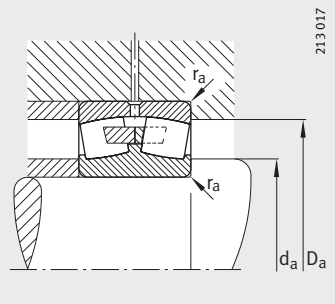
With central rib
Cylindrical bore



Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions						
	m	d	D	B	r	D_1	d_s	n_s
	≈kg				min.	≈		
23144-B-MB	54,5	**220**	370	120	4	319,2	9,5	17,7
24144-B-K30	64,4	**220**	370	150	4	311,7	6,3	12,2
24144-B	65,6	**220**	370	150	4	311,7	6,3	12,2
22244-B-K-MB	59,6	**220**	400	108	4	348,7	9,5	17,7
22244-B-MB	61,5	**220**	400	108	4	348,7	9,5	17,7
23244-K-MB	79	**220**	400	144	4	337,6	9,5	17,7
23244-MB	81,1	**220**	400	144	4	337,6	9,5	17,7
22344-K-MB	114	**220**	460	145	5	391,2	12,5	23,5
22344-A-MA-T41A	119	**220**	460	145	5	391,2	12,5	23,5
22344-MB	119	**220**	460	145	5	391,2	12,5	23,5
23948-K-MB	13,4	**240**	320	60	2,1	297,8	6,3	12,2
23948-MB	13,9	**240**	320	60	2,1	297,8	6,3	12,2
23048-K-MB	31,9	**240**	360	92	3	322,1	8	15
23048-MB	34,8	**240**	360	92	3	322,1	8	15
24048-B-K30-MB	43,2	**240**	360	118	3	318,9	6,3	12,2
24048-B-MB	43,6	**240**	360	118	3	318,9	6,3	12,2
23148-B-K-MB	65,3	**240**	400	128	4	346,2	9,5	17,7
23148-B-MB	67,3	**240**	400	128	4	346,2	9,5	17,7
24148-B-K30	78,7	**240**	400	160	4	338	6,3	12,2
24148-B	80,7	**240**	400	160	4	338	6,3	12,2
22248-B-K-MB	81,2	**240**	440	120	4	380,7	12,5	23,5
22248-B-MB	83,4	**240**	440	120	4	380,7	12,5	23,5
23248-B-K-MB	105	**240**	440	160	4	371	12,5	23,5
23248-B-MB	111	**240**	440	160	4	371	12,5	23,5
22348-K-MB	145	**240**	500	155	5	420	12,5	23,5
22348-MB	151	**240**	500	155	5	420	12,5	23,5
23952-K-MB	22,4	**260**	360	75	2,1	330,5	8	15
23952-MB	24,1	**260**	360	75	2,1	330,5	8	15
23052-K-MB	46,2	**260**	400	104	4	357,2	9,5	17,7
23052-MB	49,3	**260**	400	104	4	357,2	9,5	17,7
24052-B-K30-MB	64,5	**260**	400	140	4	349,1	6,3	12,2
24052-B-MB	67,2	**260**	400	140	4	349,1	6,3	12,2
23152-K-MB	89,6	**260**	440	144	4	379,7	9,5	17,7
23152-MB	92,5	**260**	440	144	4	379,7	9,5	17,7
24152-B-K30	112	**260**	440	180	4	370,3	8	15
24152-B	114	**260**	440	180	4	370,3	8	15

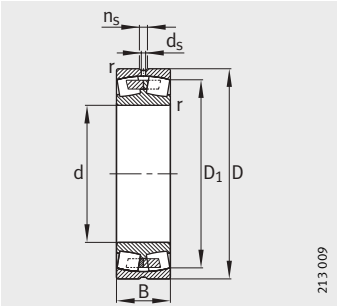


Mounting dimensions

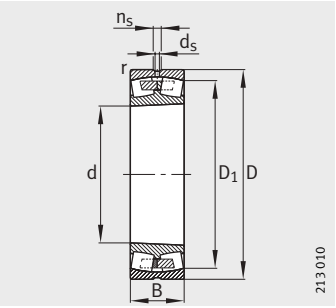
Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	r_a	dyn. C_r	stat. C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
min.	max.	max.	N	N					N	min^{-1}	min^{-1}
237	353	3	1 630 000	2 900 000	0,33	2,03	3,02	1,98	165 000	1 400	1 070
237	353	3	1 900 000	3 450 000	0,41	1,63	2,43	1,6	197 000	1 300	730
237	353	3	1 900 000	3 450 000	0,41	1,63	2,43	1,6	197 000	1 300	730
237	383	3	1 630 000	2 450 000	0,29	2,35	3,5	2,3	153 000	1 400	1 340
237	383	3	1 630 000	2 450 000	0,29	2,35	3,5	2,3	153 000	1 400	1 340
237	383	3	2 040 000	3 450 000	0,37	1,83	2,72	1,79	181 000	1 400	860
237	383	3	2 040 000	3 450 000	0,37	1,83	2,72	1,79	181 000	1 400	860
240	440	4	2 320 000	3 350 000	0,35	1,95	2,9	1,91	217 000	1 300	980
240	440	4	2 320 000	3 350 000	0,35	1,95	2,9	1,91	217 000	1 300	980
240	440	4	2 320 000	3 350 000	0,35	1,95	2,9	1,91	217 000	1 300	980
250,2	309,8	2,1	640 000	1 370 000	0,17	4,05	6,04	3,96	93 000	1 500	1 700
250,2	309,8	2,1	640 000	1 370 000	0,17	4,05	6,04	3,96	93 000	1 500	1 700
252,4	347,6	2,5	1 160 000	2 200 000	0,25	2,74	4,08	2,68	130 000	1 400	1 320
252,4	347,6	2,5	1 160 000	2 200 000	0,25	2,74	4,08	2,68	130 000	1 400	1 320
252,4	347,6	2,5	1 500 000	2 900 000	0,32	2,1	3,13	2,06	150 000	1 300	980
252,4	347,6	2,5	1 500 000	2 900 000	0,32	2,1	3,13	2,06	150 000	1 300	980
257	383	3	1 860 000	3 250 000	0,33	2,06	3,06	2,01	177 000	1 300	970
257	383	3	1 860 000	3 250 000	0,33	2,06	3,06	2,01	177 000	1 300	970
257	383	3	2 120 000	3 900 000	0,41	1,66	2,47	1,62	231 000	1 200	660
257	383	3	2 120 000	3 900 000	0,41	1,66	2,47	1,62	231 000	1 200	660
257	423	3	1 960 000	3 050 000	0,29	2,35	3,5	2,3	184 000	1 300	1 190
257	423	3	1 960 000	3 050 000	0,29	2,35	3,5	2,3	184 000	1 300	1 190
257	423	3	2 450 000	4 250 000	0,37	1,8	2,69	1,76	231 000	1 300	750
257	423	3	2 450 000	4 250 000	0,37	1,8	2,69	1,76	231 000	1 300	750
260	480	4	2 650 000	3 900 000	0,35	1,95	2,9	1,91	249 000	1 500	870
260	480	4	2 650 000	3 900 000	0,35	1,95	2,9	1,91	249 000	1 500	870
270,2	349,8	2,1	930 000	1 930 000	0,19	3,54	5,27	3,46	108 000	1 400	1 610
270,2	349,8	2,1	930 000	1 930 000	0,19	3,54	5,27	3,46	108 000	1 400	1 610
274,6	385,4	3	1 500 000	2 800 000	0,26	2,64	3,93	2,58	154 000	1 300	1 170
274,6	385,4	3	1 500 000	2 800 000	0,26	2,64	3,93	2,58	154 000	1 300	1 170
274,6	385,4	3	1 900 000	3 800 000	0,35	1,94	2,88	1,89	204 000	1 100	870
274,6	385,4	3	1 900 000	3 800 000	0,35	1,94	2,88	1,89	204 000	1 100	870
277	423	3	2 200 000	4 000 000	0,33	2,03	3,02	1,98	213 000	1 200	860
277	423	3	2 200 000	4 000 000	0,33	2,03	3,02	1,98	213 000	1 200	860
277	423	3	2 700 000	5 100 000	0,42	1,61	2,4	1,58	315 000	1 100	550
277	423	3	2 700 000	5 100 000	0,42	1,61	2,4	1,58	315 000	1 100	550

Spherical roller bearings

With cylindrical or tapered bore



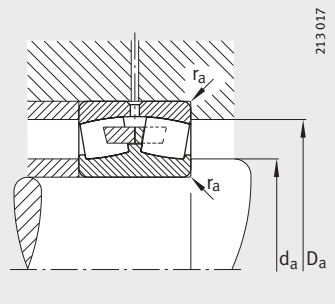
With central rib
Cylindrical bore



Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions						
	m	d	D	B	r	D_1	d_s	n_s
	≈kg				min.	≈		
22252-B-K-MB	106	**260**	480	130	5	415,3	12,5	23,5
22252-B-MB	110	**260**	480	130	5	415,3	12,5	23,5
23252-B-K-MB	136	**260**	480	174	5	405,4	12,5	23,5
23252-B-MB	144	**260**	480	174	5	405,4	12,5	23,5
22352-K-MB	177	**260**	540	165	6	452,1	12,5	23,5
22352-MB	181	**260**	540	165	6	452,1	12,5	23,5
23956-K-MB	24,7	**280**	380	75	2,1	350	8	15
23956-MB	25,5	**280**	380	75	2,1	350	8	15
23056-B-K-MB	50,3	**280**	420	106	4	376,5	9,5	17,7
23056-B-MB	52,9	**280**	420	106	4	376,5	9,5	17,7
24056-B-K30-MB	69,7	**280**	420	140	4	369,5	6,3	12,2
24056-B-MB	70,8	**280**	420	140	4	369,5	6,3	12,2
23156-B-K-MB	96,4	**280**	460	146	5	401,4	9,5	17,7
23156-B-MB	99,5	**280**	460	146	5	401,4	9,5	17,7
24156-B-K30	118	**280**	460	180	5	392,8	8	15
24156-B	119	**280**	460	180	5	392,8	8	15
22256-B-K-MB	110	**280**	500	130	5	435,2	12,5	23,5
22256-B-MB	113	**280**	500	130	5	435,2	12,5	23,5
23256-K-MB	153	**280**	500	176	5	426,3	12,5	23,5
23256-MB	157	**280**	500	176	5	426,3	12,5	23,5
22356-K-MB	224	**280**	580	175	6	489,3	12,5	23,5
22356-MB	233	**280**	580	175	6	489,3	12,5	23,5
23960-B-K-MB	39,1	**300**	420	90	3	384,6	9,5	17,7
23960-B-MB	40,6	**300**	420	90	3	384,6	9,5	17,7
23060-K-MB	72,2	**300**	460	118	4	412,6	9,5	17,7
23060-MB	73,8	**300**	460	118	4	412,6	9,5	17,7
24060-B-K30-MB	97,7	**300**	460	160	4	401,5	8	15
24060-B-MB	102	**300**	460	160	4	401,5	8	15
23160-B-K-MB	123	**300**	500	160	5	434,7	9,5	17,7
23160-B-MB	134	**300**	500	160	5	434,7	9,5	17,7
24160-B-K30	158	**300**	500	200	5	424,4	8	15
24160-B	159	**300**	500	200	5	424,4	8	15
22260-K-MB	136	**300**	540	140	5	468,8	12,5	23,5
22260-MB	142	**300**	540	140	5	468,8	12,5	23,5
23260-K-MB	192	**300**	540	192	5	458,7	12,5	23,5
23260-MB	198	**300**	540	192	5	458,7	12,5	23,5

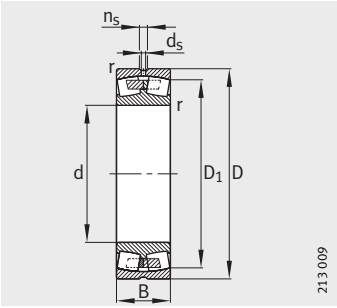


Mounting dimensions

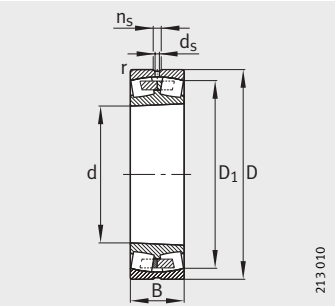
Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	r_a	dyn. C_r	stat. C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
min.	max.	max.	N	N					N	min^{-1}	min^{-1}
280	460	4	2 240 000	3 450 000	0,29	2,32	3,45	2,26	217 000	1 100	1 080
280	460	4	2 240 000	3 450 000	0,29	2,32	3,45	2,26	217 000	1 100	1 080
280	460	4	2 900 000	4 900 000	0,37	1,8	2,69	1,76	270 000	1 100	680
280	460	4	2 900 000	4 900 000	0,37	1,8	2,69	1,76	270 000	1 100	680
286	514	5	3 000 000	4 400 000	0,34	2	2,98	1,96	290 000	1 100	790
286	514	5	3 000 000	4 400 000	0,34	2	2,98	1,96	290 000	1 100	790
290,2	369,8	2,1	965 000	2 040 000	0,18	3,76	5,59	3,67	129 000	1 300	1 470
290,2	369,8	2,1	965 000	2 040 000	0,18	3,76	5,59	3,67	129 000	1 300	1 470
294,6	405,4	3	1 560 000	3 000 000	0,25	2,74	4,08	2,68	156 000	1 300	1 080
294,6	405,4	3	1 560 000	3 000 000	0,25	2,74	4,08	2,68	156 000	1 300	1 080
294,6	405,4	3	2 000 000	4 000 000	0,33	2,04	3,04	2	225 000	1 100	810
294,6	405,4	3	2 000 000	4 000 000	0,33	2,04	3,04	2	225 000	1 100	810
300	440	4	2 360 000	4 400 000	0,32	2,12	3,15	2,07	241 000	1 100	790
300	440	4	2 360 000	4 400 000	0,32	2,12	3,15	2,07	241 000	1 100	790
300	440	4	2 700 000	5 200 000	0,39	1,71	2,54	1,67	365 000	1 000	520
300	440	4	2 700 000	5 200 000	0,39	1,71	2,54	1,67	365 000	1 000	520
300	480	4	2 360 000	3 650 000	0,28	2,43	3,61	2,37	238 000	1 100	1 010
300	480	4	2 360 000	3 650 000	0,28	2,43	3,61	2,37	238 000	1 100	1 010
300	480	4	3 000 000	5 300 000	0,36	1,86	2,77	1,82	260 000	1 100	630
300	480	4	3 000 000	5 300 000	0,36	1,86	2,77	1,82	260 000	1 100	630
306	554	5	3 550 000	5 400 000	0,33	2,03	3,02	1,98	335 000	950	680
306	554	5	3 550 000	5 400 000	0,33	2,03	3,02	1,98	335 000	950	680
312,4	407,6	2,5	1 270 000	2 650 000	0,2	3,42	5,09	3,34	166 000	1 200	1 400
312,4	407,6	2,5	1 270 000	2 650 000	0,2	3,42	5,09	3,34	166 000	1 200	1 400
314,6	445,4	3	1 960 000	3 650 000	0,25	2,69	4	2,63	223 000	1 100	980
314,6	445,4	3	1 960 000	3 650 000	0,25	2,69	4	2,63	223 000	1 100	980
314,6	445,4	3	2 500 000	5 200 000	0,35	1,95	2,9	1,91	300 000	1 000	710
314,6	445,4	3	2 500 000	5 200 000	0,35	1,95	2,9	1,91	300 000	1 000	710
320	480	4	2 650 000	4 900 000	0,33	2,06	3,06	2,01	270 000	1 100	730
320	480	4	2 650 000	4 900 000	0,33	2,06	3,06	2,01	270 000	1 100	730
320	480	4	3 250 000	6 300 000	0,4	1,67	2,49	1,63	540 000	900	460
320	480	4	3 250 000	6 300 000	0,4	1,67	2,49	1,63	540 000	900	460
320	520	4	2 750 000	4 400 000	0,27	2,47	3,67	2,41	300 000	1 000	900
320	520	4	2 750 000	4 400 000	0,27	2,47	3,67	2,41	300 000	1 000	900
320	520	4	3 450 000	6 200 000	0,37	1,83	2,72	1,79	300 000	1 000	560
320	520	4	3 450 000	6 200 000	0,37	1,83	2,72	1,79	300 000	1 000	560

Spherical roller bearings

With cylindrical or tapered bore



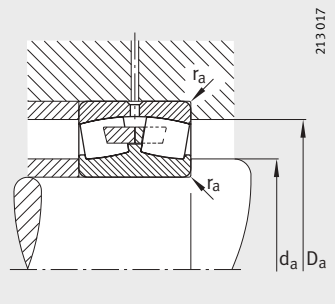
With central rib
Cylindrical bore



Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions						
	m	d	D	B	r	D_1	d_s	n_s
	≈kg				min.	≈		
23964-K-MB	41	**320**	440	90	3	406,2	9,5	17,7
23964-MB	41,8	**320**	440	90	3	406,2	9,5	17,7
23064-K-MB	77,1	**320**	480	121	4	432,6	9,5	17,7
23064-MB	79,9	**320**	480	121	4	432,6	9,5	17,7
24064-B-K30-MB	103	**320**	480	160	4	424	8	15
24064-B-MB	107	**320**	480	160	4	424	8	15
23164-K-MB	159	**320**	540	176	5	466,2	12,5	23,5
23164-MB	170	**320**	540	176	5	466,2	12,5	23,5
24164-B-K30	197	**320**	540	218	5	456,1	9,5	17,7
24164-B	204	**320**	540	218	5	456,1	9,5	17,7
22264-K-MB	166	**320**	580	150	5	503,5	12,5	23,5
22264-MB	177	**320**	580	150	5	503,5	12,5	23,5
23264-K-MB	229	**320**	580	208	5	489,6	12,5	23,5
23264-MB	242	**320**	580	208	5	489,6	12,5	23,5
23968-MB	47,8	**340**	460	90	3	426,7	9,5	17,7
23068-K-MB	101	**340**	520	133	5	464,6	12,5	23,5
23068-MB	105	**340**	520	133	5	464,6	12,5	23,5
24068-B-K30-MB	143	**340**	520	180	5	457,1	9,5	17,7
24068-B-MB	146	**340**	520	180	5	457,1	9,5	17,7
23168-B-K-MB	203	**340**	580	190	5	499,5	12,5	23,5
23168-B-MB	215	**340**	580	190	5	499,5	12,5	23,5
24168-B-K30	260	**340**	580	243	5	481,1	9,5	17,7
24168-B	266	**340**	580	243	5	481,1	9,5	17,7
23268-B-K-MB	291	**340**	620	224	6	521,2	12,5	23,5
23268-B-MB	309	**340**	620	224	6	521,2	12,5	23,5
23972-K-MB	45	**360**	480	90	3	447,1	9,5	17,7
23972-MB	46,5	**360**	480	90	3	447,1	9,5	17,7
23072-K-MB	107	**360**	540	134	5	485,2	12,5	23,5
23072-MB	112	**360**	540	134	5	485,2	12,5	23,5
24072-B-MB	138	**360**	540	180	5	478,5	9,5	17,7
23172-K-MB	217	**360**	600	192	5	520	12,5	23,5
23172-MB	230	**360**	600	192	5	520	12,5	23,5
24172-B-K30	275	**360**	600	243	5	503,6	9,5	17,7
24172-B	279	**360**	600	243	5	503,6	9,5	17,7
23272-B-K-MB	328	**360**	650	232	6	548,3	12,5	23,5
23272-B-MB	347	**360**	650	232	6	548,3	12,5	23,5

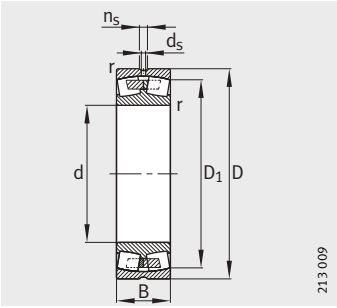


Mounting dimensions

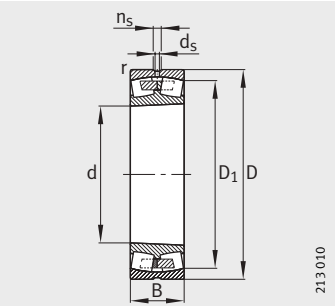
Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	r_a	dyn. C_r	stat. C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
min.	max.	max.	N	N					N	min^{-1}	min^{-1}
332,4	427,6	2,5	1 320 000	2 750 000	0,19	3,62	5,39	3,54	202 000	1 100	1 300
332,4	427,6	2,5	1 320 000	2 750 000	0,19	3,62	5,39	3,54	202 000	1 100	1 300
334,6	465,4	3	2 040 000	4 000 000	0,25	2,74	4,08	2,68	243 000	1 100	910
334,6	465,4	3	2 040 000	4 000 000	0,25	2,74	4,08	2,68	243 000	1 100	910
334,6	465,4	3	2 600 000	5 400 000	0,33	2,06	3,06	2,01	360 000	950	660
334,6	465,4	3	2 600 000	5 400 000	0,33	2,06	3,06	2,01	360 000	950	660
340	520	4	3 200 000	6 000 000	0,34	1,98	2,94	1,93	305 000	950	650
340	520	4	3 200 000	6 000 000	0,34	1,98	2,94	1,93	305 000	950	650
340	520	4	3 800 000	7 350 000	0,41	1,65	2,46	1,61	530 000	850	415
340	520	4	3 800 000	7 350 000	0,41	1,65	2,46	1,61	530 000	850	415
340	560	4	3 050 000	4 900 000	0,27	2,47	3,67	2,41	345 000	950	840
340	560	4	3 050 000	4 900 000	0,27	2,47	3,67	2,41	345 000	950	840
340	560	4	3 900 000	6 950 000	0,37	1,8	2,69	1,76	330 000	950	520
340	560	4	3 900 000	6 950 000	0,37	1,8	2,69	1,76	330 000	950	520
352,4	447,6	2,5	1 370 000	3 000 000	0,18	3,85	5,73	3,76	199 000	1 100	1 210
358	502	4	2 360 000	4 550 000	0,25	2,69	4	2,63	285 000	1 000	850
358	502	4	2 360 000	4 550 000	0,25	2,69	4	2,63	285 000	1 000	850
358	502	4	3 100 000	6 550 000	0,34	1,98	2,94	1,93	530 000	850	600
358	502	4	3 100 000	6 550 000	0,34	1,98	2,94	1,93	530 000	850	600
360	560	4	3 650 000	6 950 000	0,34	1,98	2,94	1,93	570 000	900	590
360	560	4	3 650 000	6 950 000	0,34	1,98	2,94	1,93	570 000	900	590
360	560	4	4 400 000	8 500 000	0,43	1,56	2,32	1,53	680 000	800	380
360	560	4	4 400 000	8 500 000	0,43	1,56	2,32	1,53	680 000	800	380
366	594	5	4 500 000	8 150 000	0,38	1,78	2,65	1,74	650 000	850	470
366	594	5	4 500 000	8 150 000	0,38	1,78	2,65	1,74	650 000	850	470
372,4	467,6	2,5	1 430 000	3 200 000	0,17	4,05	6,04	3,96	209 000	1 000	1 130
372,4	467,6	2,5	1 430 000	3 200 000	0,17	4,05	6,04	3,96	209 000	1 000	1 130
378	522	4	2 450 000	4 800 000	0,25	2,74	4,08	2,68	295 000	950	800
378	522	4	2 450 000	4 800 000	0,25	2,74	4,08	2,68	295 000	950	800
378	522	4	3 250 000	6 800 000	0,33	2,06	3,06	2,01	530 000	800	570
380	580	4	3 800 000	7 350 000	0,33	2,06	3,06	2,01	360 000	850	560
380	580	4	3 800 000	7 350 000	0,33	2,06	3,06	2,01	360 000	850	560
380	580	4	4 500 000	9 000 000	0,41	1,63	2,43	1,6	550 000	750	355
380	580	4	4 500 000	9 000 000	0,41	1,63	2,43	1,6	550 000	750	355
386	624	5	4 900 000	9 150 000	0,38	1,78	2,65	1,74	720 000	800	425
386	624	5	4 900 000	9 150 000	0,38	1,78	2,65	1,74	720 000	800	425

Spherical roller bearings

With cylindrical or tapered bore



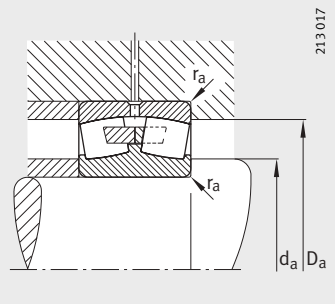
With central rib
Cylindrical bore



Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions						
	m	d	D	B	r	D_1	d_s	n_s
	≈kg				min.	≈		
23976-K-MB	66,3	**380**	520	106	4	477,6	9,5	17,7
23976-MB	68,5	**380**	520	106	4	477,6	9,5	17,7
23076-B-K-MB	113	**380**	560	135	5	505,6	12,5	23,5
23076-B-MB	117	**380**	560	135	5	505,6	12,5	23,5
24076-B-K30-MB	155	**380**	560	180	5	499	9,5	17,7
24076-B-MB	158	**380**	560	180	5	499	9,5	17,7
23176-K-MB	226	**380**	620	194	5	539,6	12,5	23,5
23176-MB	241	**380**	620	194	5	539,6	12,5	23,5
24176-B-K30	277	**380**	620	243	5	525,8	9,5	17,7
24176-B	279	**380**	620	243	5	525,8	9,5	17,7
23276-B-K-MB	367	**380**	680	240	6	576,4	12,5	23,5
23276-B-MB	390	**380**	680	240	6	576,4	12,5	23,5
23980-B-K-MB	68,2	**400**	540	106	4	499	9,5	17,7
23980-B-MB	72,9	**400**	540	106	4	499	9,5	17,7
23080-K-MB	143	**400**	600	148	5	540,5	12,5	23,5
23080-MB	151	**400**	600	148	5	540,5	12,5	23,5
24080-B-K30-MB	196	**400**	600	200	5	530,9	12,5	23,5
24080-B-MB	198	**400**	600	200	5	530,9	12,5	23,5
23180-B-K-MB	261	**400**	650	200	6	567,2	12,5	23,5
23180-B-MB	270	**400**	650	200	6	567,2	12,5	23,5
24180-B-K30	312	**400**	650	250	6	553,5	12,5	23,5
24180-B	326	**400**	650	250	6	553,5	12,5	23,5
23280-B-K-MB	442	**400**	720	256	6	609,8	12,5	23,5
23280-B-MB	469	**400**	720	256	6	609,8	12,5	23,5
23984-K-MB	78	**420**	560	106	4	519,5	9,5	17,7
23984-MB	80,5	**420**	560	106	4	519,5	9,5	17,7
23084-B-K-MB	155	**420**	620	150	5	560,7	12,5	23,5
23084-B-MB	162	**420**	620	150	5	560,7	12,5	23,5
24084-B-K30-MB	214	**420**	620	200	5	550,2	12,5	23,5
24084-B-MB	217	**420**	620	200	5	550,2	12,5	23,5
23184-K-MB	339	**420**	700	224	6	605,4	12,5	23,5
23184-MB	360	**420**	700	224	6	605,4	12,5	23,5
24184-B-K30	407	**420**	700	280	6	590,3	12,5	23,5
24184-B	442	**420**	700	280	6	590,3	12,5	23,5
23284-B-K-MB	537	**420**	760	272	7,5	642,2	12,5	23,5
23284-B-MB	558	**420**	760	272	7,5	642,2	12,5	23,5

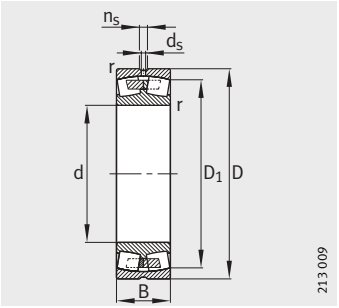


Mounting dimensions

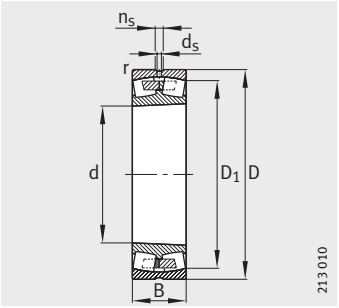
Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	r_a	dyn. C_r	stat. C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
min.	max.	max.	N	N					N	min^{-1}	min^{-1}
394,6	505,4	3	1 760 000	4 000 000	0,19	3,58	5,33	3,5	265 000	950	1 090
394,6	505,4	3	1 760 000	4 000 000	0,19	3,58	5,33	3,5	265 000	950	1 090
398	542	4	2 550 000	5 300 000	0,24	2,84	4,23	2,78	430 000	900	740
398	542	4	2 550 000	5 300 000	0,24	2,84	4,23	2,78	430 000	900	740
398	542	4	3 350 000	7 200 000	0,31	2,15	3,2	2,1	580 000	750	530
398	542	4	3 350 000	7 200 000	0,31	2,15	3,2	2,1	580 000	750	530
400	600	4	4 050 000	8 150 000	0,32	2,12	3,15	2,07	385 000	800	510
400	600	4	4 050 000	8 150 000	0,32	2,12	3,15	2,07	385 000	800	510
400	600	4	4 650 000	9 500 000	0,39	1,71	2,54	1,67	770 000	700	330
400	600	4	4 650 000	9 500 000	0,39	1,71	2,54	1,67	770 000	700	330
406	654	5	5 300 000	9 800 000	0,37	1,8	2,69	1,76	780 000	750	400
406	654	5	5 300 000	9 800 000	0,37	1,8	2,69	1,76	780 000	750	400
414,6	525,4	3	1 830 000	4 150 000	0,18	3,71	5,52	3,63	275 000	900	1 030
414,6	525,4	3	1 830 000	4 150 000	0,18	3,71	5,52	3,63	275 000	900	1 030
418	582	4	3 050 000	6 200 000	0,24	2,79	4,15	2,73	365 000	800	680
418	582	4	3 050 000	6 200 000	0,24	2,79	4,15	2,73	365 000	800	680
418	582	4	3 900 000	8 500 000	0,33	2,06	3,06	2,01	670 000	700	485
418	582	4	3 900 000	8 500 000	0,33	2,06	3,06	2,01	670 000	700	485
426	624	5	4 250 000	8 500 000	0,31	2,15	3,2	2,1	670 000	750	490
426	624	5	4 250 000	8 500 000	0,31	2,15	3,2	2,1	670 000	750	490
426	624	5	5 100 000	10 400 000	0,39	1,72	2,56	1,68	790 000	670	305
426	624	5	5 100 000	10 400 000	0,39	1,72	2,56	1,68	790 000	670	305
426	694	5	5 700 000	10 800 000	0,38	1,78	2,65	1,74	820 000	700	375
426	694	5	5 700 000	10 800 000	0,38	1,78	2,65	1,74	820 000	700	375
434,6	545,4	3	1 900 000	4 500 000	0,18	3,85	5,73	3,76	300 000	850	970
434,6	545,4	3	1 900 000	4 500 000	0,18	3,85	5,73	3,76	300 000	850	970
438	602	4	3 150 000	6 550 000	0,24	2,84	4,23	2,78	395 000	800	650
438	602	4	3 150 000	6 550 000	0,24	2,84	4,23	2,78	395 000	800	650
438	602	4	4 000 000	8 800 000	0,32	2,13	3,17	2,08	710 000	670	460
438	602	4	4 000 000	8 800 000	0,32	2,13	3,17	2,08	710 000	670	460
446	674	5	5 000 000	9 650 000	0,33	2,03	3,02	1,98	465 000	700	460
446	674	5	5 000 000	9 650 000	0,33	2,03	3,02	1,98	465 000	700	460
446	674	5	6 200 000	12 700 000	0,4	1,67	2,49	1,63	980 000	630	270
446	674	5	6 200 000	12 700 000	0,4	1,67	2,49	1,63	980 000	630	270
452	728	6	6 550 000	12 200 000	0,38	1,77	2,64	1,73	930 000	670	345
452	728	6	6 550 000	12 200 000	0,38	1,77	2,64	1,73	930 000	670	345

Spherical roller bearings

With cylindrical or tapered bore



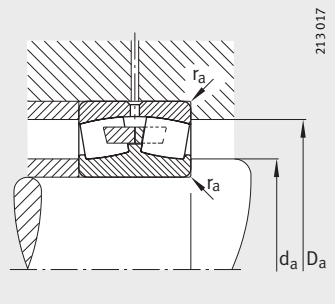
With central rib
Cylindrical bore



Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions						
	m	d	D	B	r	D_1	d_s	n_s
	≈kg				min.	≈		
23988-K-MB	98,3	**440**	600	118	4	552,8	12,5	23,5
23988-MB	101	**440**	600	118	4	552,8	12,5	23,5
23088-K-MB	177	**440**	650	157	6	586,8	12,5	23,5
23088-MB	190	**440**	650	157	6	586,8	12,5	23,5
24088-B-K30-MB	247	**440**	650	212	6	575,6	12,5	23,5
24088-B-MB	250	**440**	650	212	6	575,6	12,5	23,5
23188-K-MB	378	**440**	720	226	6	626	12,5	23,5
23188-MB	381	**440**	720	226	6	626	12,5	23,5
24188-B-K30	451	**440**	720	280	6	612,4	12,5	23,5
24188-B	453	**440**	720	280	6	612,4	12,5	23,5
23288-B-K-MB	586	**440**	790	280	7,5	669,3	12,5	23,5
23288-B-MB	615	**440**	790	280	7,5	669,3	12,5	23,5
23992-B-K-MB	103	**460**	620	118	4	573,3	12,5	23,5
23992-B-MB	111	**460**	620	118	4	573,3	12,5	23,5
23092-B-K-MB	204	**460**	680	163	6	612,2	12,5	23,5
23092-B-MB	208	**460**	680	163	6	612,2	12,5	23,5
24092-B-MB	282	**460**	680	218	6	603,3	12,5	23,5
23192-K-MB	420	**460**	760	240	7,5	661,4	12,5	23,5
23192-MB	447	**460**	760	240	7,5	661,4	12,5	23,5
24192-B-K30-MB	578	**460**	760	300	7,5	642,8	12,5	23,5
24192-B-MB	582	**460**	760	300	7,5	642,8	12,5	23,5
23292-K-MB	699	**460**	830	296	7,5	701,6	12,5	23,5
23292-MB	700	**460**	830	296	7,5	701,6	12,5	23,5
23996-B-K-MB	121	**480**	650	128	5	598,8	12,5	23,5
23996-B-MB	126	**480**	650	128	5	598,8	12,5	23,5
23096-K-MB	208	**480**	700	165	6	632,6	12,5	23,5
23096-MB	222	**480**	700	165	6	632,6	12,5	23,5
24096-B-K30-MB	289	**480**	700	218	6	625,4	12,5	23,5
24096-B-MB	291	**480**	700	218	6	625,4	12,5	23,5
23196-K-MB	470	**480**	790	248	7,5	688,3	12,5	23,5
23196-MB	508	**480**	790	248	7,5	688,3	12,5	23,5
24196-B-K30-MB	700	**480**	790	308	7,5	669,9	12,5	23,5
23296-K-MB	806	**480**	870	310	7,5	734,8	12,5	23,5
23296-MB	830	**480**	870	310	7,5	734,8	12,5	23,5
239/500-K-MB	124	**500**	670	128	5	619,3	12,5	23,5
239/500-MB	132	**500**	670	128	5	619,3	12,5	23,5

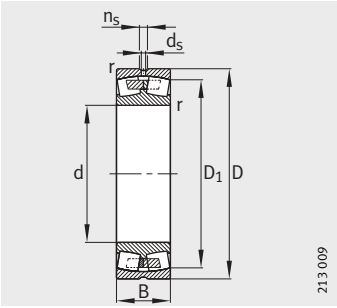


Mounting dimensions

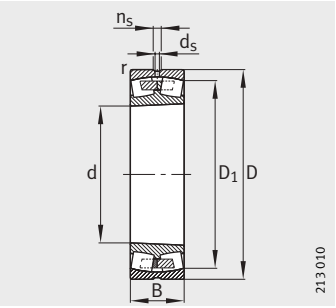
Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	r_a	dyn. C_r	stat. C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
min.	max.	max.	N	N					N	min^{-1}	min^{-1}
454,6	585,4	3	2 240 000	5 200 000	0,18	3,66	5,46	3,58	295 000	800	930
454,6	585,4	3	2 240 000	5 200 000	0,18	3,66	5,46	3,58	295 000	800	930
463	627	5	3 400 000	7 100 000	0,24	2,84	4,23	2,78	405 000	750	610
463	627	5	3 400 000	7 100 000	0,24	2,84	4,23	2,78	405 000	750	610
463	627	5	4 300 000	9 650 000	0,32	2,12	3,15	2,07	750 000	630	435
463	627	5	4 300 000	9 650 000	0,32	2,12	3,15	2,07	750 000	630	435
466	694	5	5 200 000	10 400 000	0,32	2,1	3,13	2,06	485 000	700	430
466	694	5	5 200 000	10 400 000	0,32	2,1	3,13	2,06	485 000	700	430
466	694	5	6 400 000	13 200 000	0,38	1,76	2,62	1,72	1 020 000	600	255
466	694	5	6 400 000	13 200 000	0,38	1,76	2,62	1,72	1 020 000	600	255
472	758	6	7 100 000	13 400 000	0,37	1,8	2,69	1,76	990 000	630	320
472	758	6	7 100 000	13 400 000	0,37	1,8	2,69	1,76	990 000	630	320
474,6	605,4	3	2 280 000	5 400 000	0,18	3,85	5,73	3,76	370 000	750	880
474,6	605,4	3	2 280 000	5 400 000	0,18	3,85	5,73	3,76	370 000	750	880
483	657	5	3 650 000	7 650 000	0,24	2,84	4,23	2,78	440 000	700	580
483	657	5	3 650 000	7 650 000	0,24	2,84	4,23	2,78	440 000	700	580
483	657	5	4 750 000	10 600 000	0,31	2,16	3,22	2,12	710 000	630	405
492	728	6	5 850 000	11 600 000	0,32	2,12	3,15	2,07	530 000	630	400
492	728	6	5 850 000	11 600 000	0,32	2,12	3,15	2,07	530 000	630	400
492	728	6	7 500 000	15 600 000	0,39	1,73	2,58	1,69	1 160 000	560	228
492	728	6	7 500 000	15 600 000	0,39	1,73	2,58	1,69	1 160 000	560	228
492	798	6	7 800 000	15 000 000	0,37	1,8	2,69	1,76	620 000	600	295
492	798	6	7 800 000	15 000 000	0,37	1,8	2,69	1,76	620 000	600	295
498	632	4	2 550 000	6 000 000	0,18	3,76	5,59	3,67	460 000	700	860
498	632	4	2 550 000	6 000 000	0,18	3,76	5,59	3,67	460 000	700	860
503	677	5	3 800 000	8 150 000	0,23	2,9	4,31	2,83	455 000	670	550
503	677	5	3 800 000	8 150 000	0,23	2,9	4,31	2,83	455 000	670	550
503	677	5	4 900 000	11 200 000	0,3	2,25	3,34	2,2	830 000	600	380
503	677	5	4 900 000	11 200 000	0,3	2,25	3,34	2,2	830 000	600	380
512	758	6	6 300 000	12 700 000	0,32	2,12	3,15	2,07	570 000	630	375
512	758	6	6 300 000	12 700 000	0,32	2,12	3,15	2,07	570 000	630	375
512	758	6	8 000 000	16 600 000	0,39	1,75	2,61	1,71	1 190 000	560	215
512	838	6	8 800 000	17 000 000	0,37	1,83	2,72	1,79	700 000	600	270
512	838	6	8 800 000	17 000 000	0,37	1,83	2,72	1,79	700 000	600	270
518	652	4	2 600 000	6 300 000	0,17	3,9	5,81	3,81	400 000	670	810
518	652	4	2 600 000	6 300 000	0,17	3,9	5,81	3,81	400 000	670	810

Spherical roller bearings

With cylindrical or tapered bore



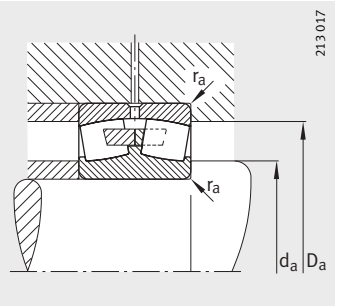
With central rib
Cylindrical bore



Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions						
	m	d	D	B	r	D_1	d_s	n_s
	≈kg				min.	≈		
230/500-B-K-MB	219	**500**	720	167	6	653,5	12,5	23,5
230/500-B-MB	233	**500**	720	167	6	653,5	12,5	23,5
240/500-B-MB	297	**500**	720	218	6	645,8	12,5	23,5
231/500-B-K-MB	556	**500**	830	264	7,5	720,9	12,5	23,5
231/500-B-MB	588	**500**	830	264	7,5	720,9	12,5	23,5
241/500-B-K30-MB	717	**500**	830	325	7,5	701,8	12,5	23,5
241/500-B-MB	725	**500**	830	325	7,5	701,8	12,5	23,5
239/530-K-MB	146	**530**	710	136	5	656,4	12,5	23,5
239/530-MB	160	**530**	710	136	5	656,4	12,5	23,5
230/530-K-MB	291	**530**	780	185	6	703,7	12,5	23,5
230/530-MB	321	**530**	780	185	6	703,7	12,5	23,5
240/530-B-MB	415	**530**	780	250	6	691,9	12,5	23,5
231/530-K-MB	643	**530**	870	272	7,5	756,3	12,5	23,5
241/530-B-K30-MB	845	**530**	870	335	7,5	739,1	12,5	23,5
239/560-B-K-MB	169	**560**	750	140	5	693,4	12,5	23,5
239/560-B-MB	181	**560**	750	140	5	693,4	12,5	23,5
230/560-B-K-MB	339	**560**	820	195	6	741,5	12,5	23,5
230/560-B-MB	358	**560**	820	195	6	741,5	12,5	23,5
240/560-B-MB	468	**560**	820	258	6	731,2	12,5	23,5
231/560-K-MB	737	**560**	920	280	7,5	800,2	12,5	23,5
231/560-MB	760	**560**	920	280	7,5	800,2	12,5	23,5
241/560-B-K30-MB	974	**560**	920	355	7,5	785	12,5	23,5
239/600-B-K-MB	210	**600**	800	150	5	740,5	12,5	23,5
239/600-B-MB	224	**600**	800	150	5	740,5	12,5	23,5
230/600-B-K-MB	388	**600**	870	200	6	791,9	12,5	23,5
230/600-B-MB	409	**600**	870	200	6	791,9	12,5	23,5
240/600-B-MB	540	**600**	870	272	6	773,3	12,5	23,5
231/600-K-MB	901	**600**	980	300	7,5	852,6	12,5	23,5
231/600-MB	929	**600**	980	300	7,5	852,6	12,5	23,5
241/600-B-K30-MB	1 170	**600**	980	375	7,5	833	12,5	23,5
241/600-B-MB	1 180	**600**	980	375	7,5	833	12,5	23,5
239/630-B-K-MB	283	**630**	850	165	6	784,5	12,5	23,5
239/630-B-MB	292	**630**	850	165	6	784,5	12,5	23,5
230/630-B-MB	496	**630**	920	212	7,5	834,3	12,5	23,5
230/630-B-K-MB	502	**630**	920	212	7,5	834,3	12,5	23,5
240/630-B-K30-MB	649	**630**	920	290	7,5	817,9	12,5	23,5

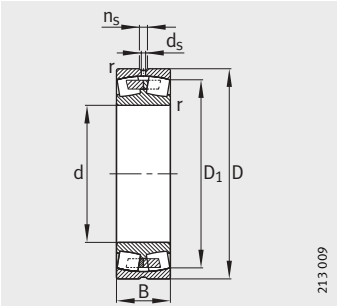


Mounting dimensions

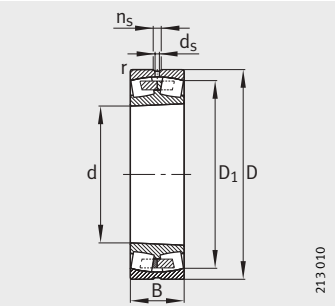
Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	r_a	dyn. C_r	stat. C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
min.	max.	max.	N	N					N	min^{-1}	min^{-1}
523	697	5	3 900 000	8 500 000	0,22	3,01	4,48	2,94	510 000	670	520
523	697	5	3 900 000	8 500 000	0,22	3,01	4,48	2,94	510 000	670	520
523	697	5	4 900 000	11 200 000	0,29	2,32	3,45	2,26	850 000	560	370
532	798	6	7 100 000	14 300 000	0,32	2,1	3,13	2,06	990 000	600	345
532	798	6	7 100 000	14 300 000	0,32	2,1	3,13	2,06	990 000	600	345
532	798	6	8 650 000	18 300 000	0,39	1,73	2,58	1,69	1 340 000	530	200
532	798	6	8 650 000	18 300 000	0,39	1,73	2,58	1,69	1 340 000	530	200
548	692	4	2 850 000	6 800 000	0,18	3,85	5,73	3,76	385 000	630	770
548	692	4	2 850 000	6 800 000	0,18	3,85	5,73	3,76	385 000	630	770
553	757	5	4 400 000	9 500 000	0,22	3,04	4,53	2,97	540 000	600	490
553	757	5	4 400 000	9 500 000	0,22	3,04	4,53	2,97	540 000	600	490
553	757	5	6 000 000	13 700 000	0,31	2,15	3,2	2,1	910 000	530	335
562	838	6	7 350 000	15 300 000	0,32	2,12	3,15	2,07	670 000	560	325
562	838	6	9 500 000	20 000 000	0,38	1,77	2,64	1,73	1 450 000	500	184
578	732	4	3 100 000	7 650 000	0,17	3,95	5,88	3,86	570 000	600	720
578	732	4	3 100 000	7 650 000	0,17	3,95	5,88	3,86	570 000	600	720
583	797	5	5 100 000	11 000 000	0,23	2,95	4,4	2,89	740 000	560	450
583	797	5	5 100 000	11 000 000	0,23	2,95	4,4	2,89	740 000	560	450
583	797	5	6 400 000	14 600 000	0,31	2,2	3,27	2,15	1 050 000	500	315
592	888	6	8 150 000	16 600 000	0,31	2,21	3,29	2,16	750 000	530	300
592	888	6	8 150 000	16 600 000	0,31	2,21	3,29	2,16	750 000	530	300
592	888	6	10 600 000	22 400 000	0,38	1,77	2,64	1,73	1 600 000	480	169
618	782	4	3 450 000	8 650 000	0,17	3,95	5,88	3,86	630 000	560	670
618	782	4	3 450 000	8 650 000	0,17	3,95	5,88	3,86	630 000	560	670
623	847	5	5 700 000	12 500 000	0,22	3,07	4,57	3	890 000	530	405
623	847	5	5 700 000	12 500 000	0,22	3,07	4,57	3	890 000	530	405
623	847	5	7 100 000	16 600 000	0,31	2,21	3,29	2,16	1 200 000	630	290
632	948	6	9 000 000	19 300 000	0,31	2,2	3,27	2,15	810 000	500	270
632	948	6	9 000 000	19 300 000	0,31	2,2	3,27	2,15	810 000	500	270
632	948	6	11 600 000	26 000 000	0,38	1,79	2,67	1,75	1 780 000	450	149
632	948	6	11 600 000	26 000 000	0,38	1,79	2,67	1,75	1 780 000	450	149
653	827	5	4 050 000	9 800 000	0,18	3,8	5,66	3,72	710 000	530	650
653	827	5	4 050 000	9 800 000	0,18	3,8	5,66	3,72	710 000	530	650
658	892	6	6 300 000	13 700 000	0,22	3,01	4,48	2,94	890 000	500	385
658	892	6	6 300 000	13 700 000	0,22	3,01	4,48	2,94	890 000	500	385
658	892	6	8 000 000	19 000 000	0,31	2,21	3,29	2,16	1 350 000	480	265

Spherical roller bearings

With cylindrical or tapered bore



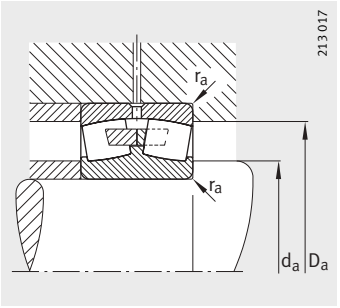
With central rib
Cylindrical bore



Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions						
	m	d	D	B	r	D_1	d_s	n_s
	≈kg				min.	≈		
240/630-B-MB	660	**630**	920	290	7,5	817,9	12,5	23,5
241/630-B-K30-MB	1 360	**630**	1 030	400	7,5	872,2	12,5	23,5
239/670-B-K-MB	310	**670**	900	170	6	831,5	12,5	23,5
239/670-B-MB	320	**670**	900	170	6	831,5	12,5	23,5
230/670-B-K-MB	590	**670**	980	230	7,5	888,7	12,5	23,5
230/670-B-MB	600	**670**	980	230	7,5	888,7	12,5	23,5
241/670-B-K30-MB	1 540	**670**	1 090	412	7,5	929,4	12,5	23,5
239/710-K-MB	336	**710**	950	180	6	877,5	12,5	23,5
239/710-MB	355	**710**	950	180	6	877,5	12,5	23,5
230/710-B-K-MB	650	**710**	1 030	236	7,5	938,8	12,5	23,5
230/710-B-MB	674	**710**	1 030	236	7,5	938,8	12,5	23,5
240/710-B-K30-MB	873	**710**	1 030	315	7,5	921,6	12,5	23,5
241/710-B-K30-MB	1 820	**710**	1 150	438	9,5	982	12,5	23,5
241/710-B-MB	1 830	**710**	1 150	438	9,5	982	12,5	23,5
239/750-K-MB	394	**750**	1 000	185	6	923,2	12,5	23,5
239/750-MB	426	**750**	1 000	185	6	923,2	12,5	23,5
230/750-K-MB	792	**750**	1 090	250	7,5	990,9	12,5	23,5
230/750-MB	806	**750**	1 090	250	7,5	990,9	12,5	23,5
240/750-B-K30-MB	1 070	**750**	1 090	335	7,5	976,2	12,5	23,5
239/800-B-K-MB	490	**800**	1 060	195	6	983,7	12,5	23,5
239/800-B-MB	506	**800**	1 060	195	6	983,7	12,5	23,5
230/800-K-MB	861	**800**	1 150	258	7,5	1 050,9	12,5	23,5
230/800-MB	899	**800**	1 150	258	7,5	1 050,9	12,5	23,5
240/800-B-MB	1 200	**800**	1 150	345	7,5	1 034,1	12,5	23,5
239/850-K-MB	554	**850**	1 120	200	6	1 039,9	12,5	23,5
239/850-MB	579	**850**	1 120	200	6	1 039,9	12,5	23,5
240/850-B-K30-MB	1 420	**850**	1 220	365	7,5	1 092,9	12,5	23,5
239/900-K-MB	641	**900**	1 180	206	6	1 098,8	12,5	23,5
239/900-MB	653	**900**	1 180	206	6	1 098,8	12,5	23,5

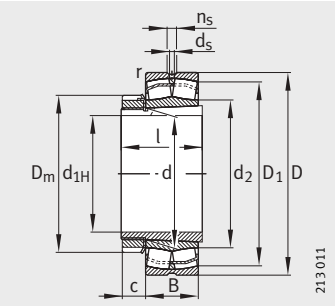


Mounting dimensions

Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	r_a	dyn. C_r	stat. C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
min.	max.	max.	N	N					N	min^{-1}	min^{-1}
658	892	6	8 000 000	19 000 000	0,31	2,21	3,29	2,16	1 350 000	480	265
662	998	6	12 900 000	29 000 000	0,38	1,78	2,65	1,74	1 960 000	450	138
693	877	5	4 300 000	10 600 000	0,17	3,95	5,88	3,86	750 000	500	600
693	877	5	4 300 000	10 600 000	0,17	3,95	5,88	3,86	750 000	500	600
698	952	6	7 200 000	16 000 000	0,22	3,01	4,48	2,94	1 100 000	480	350
698	952	6	7 200 000	16 000 000	0,22	3,01	4,48	2,94	1 100 000	480	350
702	1058	6	14 000 000	31 500 000	0,37	1,83	2,72	1,79	2 120 000	430	127
733	927	5	4 800 000	12 000 000	0,18	3,85	5,73	3,76	720 000	480	570
733	927	5	4 800 000	12 000 000	0,18	3,85	5,73	3,76	720 000	480	570
738	1002	6	7 650 000	17 000 000	0,22	3,07	4,57	3	1 140 000	480	330
738	1002	6	7 650 000	17 000 000	0,22	3,07	4,57	3	1 140 000	480	330
738	1002	6	9 500 000	22 800 000	0,3	2,26	3,37	2,21	1 550 000	430	226
750	1110	8	15 600 000	35 500 000	0,38	1,79	2,67	1,75	2 340 000	400	116
750	1110	8	15 600 000	35 500 000	0,38	1,79	2,67	1,75	2 340 000	400	116
773	977	5	5 200 000	12 900 000	0,17	3,95	5,88	3,86	790 000	480	540
773	977	5	5 200 000	12 900 000	0,17	3,95	5,88	3,86	790 000	480	540
778	1062	6	8 500 000	19 000 000	0,22	3,01	4,48	2,94	1 010 000	450	305
778	1062	6	8 500 000	19 000 000	0,22	3,01	4,48	2,94	1 010 000	450	305
778	1062	6	10 800 000	26 000 000	0,3	2,26	3,37	2,21	1 730 000	400	206
823	1037	5	5 850 000	15 000 000	0,17	4,05	6,04	3,96	1 010 000	450	500
823	1037	5	5 850 000	15 000 000	0,17	4,05	6,04	3,96	1 010 000	450	500
828	1122	6	9 300 000	21 200 000	0,22	3,07	4,57	3	1 430 000	430	280
828	1122	6	9 300 000	21 200 000	0,22	3,07	4,57	3	1 430 000	430	280
828	1122	6	11 600 000	28 500 000	0,29	2,33	3,47	2,28	1 810 000	360	189
873	1097	5	6 300 000	16 300 000	0,16	4,11	6,12	4,02	960 000	430	465
873	1097	5	6 300 000	16 300 000	0,16	4,11	6,12	4,02	960 000	430	465
878	1192	6	12 900 000	32 000 000	0,29	2,33	3,47	2,28	2 060 000	480	173
923	1157	5	6 550 000	17 300 000	0,16	4,28	6,37	4,19	1 010 000	400	440
923	1157	5	6 550 000	17 300 000	0,16	4,28	6,37	4,19	1 010 000	400	440

Spherical roller bearings

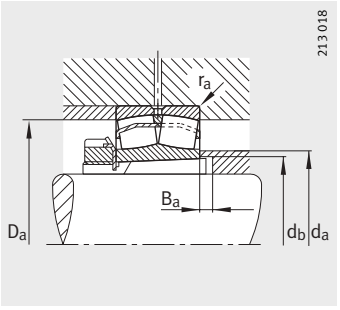
With adapter sleeve



E1 design

Dimension table · Dimensions in mm

Designation			Mass m		Dimensions											
Bearing	X-life	Adapter sleeve	Bearing ≈kg	Adapter sleeve ≈kg	d_{1H}	d	D	B	r min.	D_1 ≈	d_2 ≈	d_s	n_s	D_m	l	c ≈
22205-E1-K	**XL**	**H305**	0,175	0,075	**20**	25	52	18	1	44,5	31,3	3,2	4,8	38	29	9
22206-E1-K	**XL**	**H306**	0,269	0,099	**25**	30	62	20	1	53,7	37,9	3,2	4,8	45	31	9
22207-E1-K	**XL**	**H307**	0,425	0,147	**30**	35	72	23	1,1	62,5	43,8	3,2	4,8	57	35	10
21307-E1-K-TVPB	**XL**	**H307**	0,496	0,147	**30**	35	80	21	1,5	66,6	47,4	–	–	57	35	10
22208-E1-K	**XL**	**H308**	0,517	0,185	**35**	40	80	23	1,1	70,4	48,6	3,2	4,8	58	36	11
21308-E1-K	**XL**	**H308**	0,702	0,185	**35**	40	90	23	1,5	80,8	59,7	3,2	4,8	58	36	11
22308-E1-K	**XL**	**H2308**	1,03	0,222	**35**	40	90	33	1,5	76	52,4	3,2	4,8	58	46	11
22209-E1-K	**XL**	**H309**	0,577	0,246	**40**	45	85	23	1,1	75,6	54,8	3,2	4,8	65	39	12
21309-E1-K	**XL**	**H309**	0,845	0,246	**40**	45	100	25	1,5	89,8	67,3	3,2	4,8	65	39	12
22309-E1-K	**XL**	**H2309**	1,36	0,283	**40**	45	100	36	1,5	84,7	58,9	3,2	6,5	65	50	12
22210-E1-K	**XL**	**H310**	0,608	0,301	**45**	50	90	23	1,1	80,8	59,7	3,2	4,8	70	42	13
21310-E1-K	**XL**	**H310**	1,28	0,301	**45**	50	110	27	2	89,8	67,3	3,2	4,8	70	42	13
22310-E1-K	**XL**	**H2310**	1,86	0,353	**45**	50	110	40	2	92,6	63	3,2	6,5	70	55	13
22211-E1-K	**XL**	**H311**	0,825	0,35	**50**	55	100	25	1,5	89,8	67,3	3,2	4,8	75	45	13
21311-E1-K	**XL**	**H311**	1,19	0,35	**50**	55	120	29	2	98,3	71,4	3,2	6,5	75	45	13
22311-E1-K	**XL**	**H2311**	2,22	0,426	**50**	55	120	43	2	101,4	68,9	3,2	6,5	75	59	13
22311-E1-K-T41A	**XL**	**H2311**	2,22	0,426	**50**	55	120	43	2	101,4	68,9	3,2	6,5	75	59	13
22212-E1-K	**XL**	**H312**	1,09	0,373	**55**	60	110	28	1,5	98,7	71,4	3,2	6,5	80	47	13
21312-E1-K	**XL**	**H312**	1,78	0,373	**55**	60	130	31	2,1	112,5	84,4	3,2	6,5	80	47	13
22312-E1-K	**XL**	**H2312**	2,83	0,464	**55**	60	130	46	2,1	110,1	74,8	3,2	6,5	80	62	13
22312-E1-K-T41A	**XL**	**H2312**	2,83	0,464	**55**	60	130	46	2,1	110,1	74,8	3,2	6,5	80	62	13
22213-E1-K	**XL**	**H313**	1,52	0,452	**60**	65	120	31	1,5	107,3	79,1	3,2	6,5	92	50	14
21313-E1-K	**XL**	**H313**	2,42	0,452	**60**	65	140	33	2,1	126,8	94,9	3,2	6,5	92	50	14
22313-E1-K	**XL**	**H2313**	3,49	0,553	**60**	65	140	48	2,1	119,3	83,2	4,8	9,5	92	65	14
22313-E1-K-T41A	**XL**	**H2313**	3,49	0,553	**60**	65	140	48	2,1	119,3	83,2	4,8	9,5	92	65	14
22214-E1-K	**XL**	**H314**	1,61	0,715	**60**	70	125	31	1,5	112,5	84,4	3,2	6,5	92	52	14
21314-E1-K	**XL**	**H314**	3	0,715	**60**	70	150	35	2,1	126,2	94,9	3,2	6,5	92	52	14
22314-E1-K	**XL**	**H2314**	4,12	0,895	**60**	70	150	51	2,1	128	86,7	4,8	9,5	98	68	14
22314-E1-K-T41A	**XL**	**H2314**	4,12	0,895	**60**	70	150	51	2,1	128	86,7	4,8	9,5	98	68	14
22215-E1-K	**XL**	**H315**	1,68	0,826	**65**	75	130	31	1,5	117,7	89,8	3,2	6,5	104	55	15
21315-E1-K	**XL**	**H315**	2,86	0,826	**65**	75	160	37	2,1	135,2	99,7	3,2	6,5	104	55	15
22315-E1-K	**XL**	**H2315**	5,06	1,05	**65**	75	160	55	2,1	136,3	92,4	4,8	9,5	98	73	15
22315-E1-K-T41A	**XL**	**H2315**	5,06	1,05	**65**	75	160	55	2,1	136,3	92,4	4,8	9,5	98	73	15

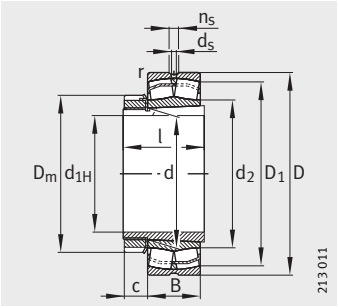


Mounting dimensions

Mounting dimensions					Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	d_b	B_a	r_a	dyn. C_r	stat. C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
max.	max.	min.	min.	max.	N	N					N	min^{-1}	min^{-1}
31	46,4	28	5	1	48 000	42 500	0,34	1,98	2,94	1,93	4 800	17 000	9 500
37	54,6	33	5	1	64 000	57 000	0,31	2,15	3,2	2,1	6 900	13 000	8 100
43	65	39	5	1	88 000	81 500	0,31	2,16	3,22	2,12	9 400	11 000	7 300
47	71	39	8	1,5	83 000	73 500	0,26	2,55	3,8	2,5	8 100	9 500	7 000
48	73	44	5	1	102 000	90 000	0,28	2,41	3,59	2,35	11 800	10 000	6 400
59	81	44	5	1,5	108 000	106 000	0,24	2,81	4,19	2,75	14 300	9 500	6 100
52	81	45	5	1,5	156 000	150 000	0,36	1,86	2,77	1,82	13 100	7 500	5 800
54	78	50	8	1	104 000	98 000	0,26	2,62	3,9	2,56	12 700	10 000	5 800
67	91	50	5	1,5	129 000	129 000	0,23	2,92	4,35	2,86	17 300	8 500	5 500
58	91	50	5	1,5	186 000	183 000	0,36	1,9	2,83	1,86	16 100	6 700	5 300
59	83	55	10	1	108 000	106 000	0,24	2,81	4,19	2,75	14 300	9 500	5 300
67	99	55	5	2	129 000	129 000	0,23	2,92	4,35	2,86	17 300	8 500	5 300
63	99	56	5	2	228 000	224 000	0,36	1,86	2,77	1,82	20 300	6 000	4 950
67	91	60	10	1,5	129 000	129 000	0,23	2,92	4,35	2,86	17 300	8 500	4 850
71	109	60	6	2	170 000	166 000	0,24	2,84	4,23	2,78	21 200	6 300	4 950
67	109	61	6	2	265 000	260 000	0,36	1,89	2,81	1,84	23 900	5 600	4 650
67	109	61	6	2	265 000	260 000	0,36	1,89	2,81	1,84	23 900	5 600	4 650
71	101	65	8	1,5	170 000	166 000	0,24	2,84	4,23	2,78	21 200	7 500	4 650
84	118	65	5	2,1	212 000	228 000	0,23	2,95	4,4	2,89	28 000	6 300	4 500
74	118	66	5	2,1	310 000	310 000	0,35	1,91	2,85	1,87	28 000	5 000	4 300
74	118	66	5	2,1	310 000	310 000	0,35	1,91	2,85	1,87	28 000	5 000	4 300
79	111	70	8	1,5	200 000	208 000	0,24	2,81	4,19	2,75	25 500	6 700	4 400
94	128	70	5	2,1	250 000	270 000	0,22	3,14	4,67	3,07	34 000	5 000	4 200
83	128	72	5	2,1	355 000	365 000	0,34	2	2,98	1,96	32 500	4 800	3 950
83	128	72	5	2,1	355 000	365 000	0,34	2	2,98	1,96	32 500	4 800	3 950
84	116	75	11	1,5	212 000	228 000	0,23	2,95	4,4	2,89	28 000	6 300	4 100
94	138	75	6	2,1	250 000	270 000	0,22	3,14	4,67	3,07	34 000	5 000	4 100
86	138	77	5	2,1	390 000	390 000	0,34	2	2,98	1,96	36 500	4 500	3 850
86	138	77	5	2,1	390 000	390 000	0,34	2	2,98	1,96	36 500	4 500	3 850
89	121	80	12	1,5	216 000	236 000	0,22	3,1	4,62	3,03	29 500	6 300	3 900
99	148	80	5	2,1	305 000	325 000	0,22	3,04	4,53	2,97	38 500	4 800	3 850
92	148	82	5	2,1	440 000	450 000	0,34	1,99	2,96	1,94	40 500	4 300	3 650
92	148	82	5	2,1	440 000	450 000	0,34	1,99	2,96	1,94	40 500	4 300	3 650

Spherical roller bearings

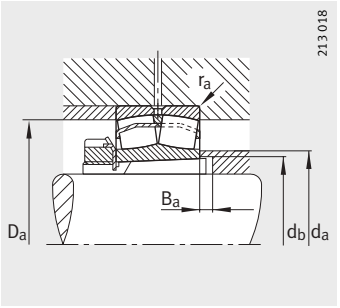
With adapter sleeve



E1 design

Dimension table (continued) · Dimensions in mm

Designation			Mass m		Dimensions											
Bearing	X-life	Adapter sleeve	Bearing ≈kg	Adapter sleeve ≈kg	d_{1H}	d	D	B	r min.	D_1 ≈	d_2 ≈	d_s	n_s	D_m	l	c ≈
22216-E1-K	**XL**	**H316**	2,08	1,01	**70**	80	140	33	2	126,8	94,9	3,2	6,5	105	59	17
21316-E1-K	**XL**	**H316**	2,65	1,01	**70**	80	170	39	2,1	135,4	99,8	3,2	6,5	105	59	17
22316-E1-K	**XL**	**H2316**	6,05	1,27	**70**	80	170	58	2,1	145,1	98,3	4,8	9,5	105	78	17
22316-E1-K-T41A	**XL**	**H2316**	6,05	1,27	**70**	80	170	58	2,1	145,1	98,3	4,8	9,5	105	78	17
22217-E1-K	**XL**	**H317**	2,59	1,16	**75**	85	150	36	2	135,4	99,7	3,2	6,5	110	63	18
21317-E1-K	**XL**	**H317**	5,37	1,16	**75**	85	180	41	3	143,9	106,1	4,8	9,5	110	63	18
22317-E1-K	**XL**	**H2317**	7,06	1,44	**75**	85	180	60	3	154,2	104,4	4,8	9,5	110	82	18
22317-E1-K-T41A	**XL**	**H2317**	7,06	1,44	**75**	85	180	60	3	154,2	104,4	4,8	9,5	110	82	18
22218-E1-K	**XL**	**H318**	3,35	1,36	**80**	90	160	40	2	143,9	106,1	3,2	6,5	126	65	18
23218-E1A-K-M	**XL**	**H2318**	4,34	1,68	**80**	90	160	52,4	2	140	–	3,2	6,5	126	86	18
23218-E1-K-TVPB	**XL**	**H2318**	4,08	1,68	**80**	90	160	52,4	2	140	104,1	3,2	6,5	126	86	18
21318-E1-K	**XL**	**H318**	6,26	1,36	**80**	90	190	43	3	152,7	112,6	4,8	9,5	126	65	18
22318-E1-K	**XL**	**H2318**	8,33	1,68	**80**	90	190	64	3	162,5	110,2	6,3	12,2	126	86	18
22318-E1-K-T41A	**XL**	**H2318**	8,33	1,68	**80**	90	190	64	3	162,5	110,2	6,3	12,2	126	86	18
22219-E1-K	**XL**	**H319**	4,04	1,51	**85**	95	170	43	2,1	152,7	112,6	4,8	9,5	125	68	19
21319-E1-K-TVPB	**XL**	**H319**	6,53	1,51	**85**	95	200	45	3	169,4	124,3	4,8	9,5	125	68	19
22319-E1-K	**XL**	**H2319**	9,46	1,89	**85**	95	200	67	3	171,2	116	6,3	12,2	133	90	19
22319-E1-K-T41A	**XL**	**H2319**	9,46	1,89	**85**	95	200	67	3	171,2	116	6,3	12,2	133	90	19
23120-E1A-K-M	**XL**	**H3120**	4,23	1,78	**90**	100	165	52	2	146,3	–	3,2	6,5	130	76	20
23120-E1-K-TVPB	**XL**	**H3120**	4,06	1,78	**90**	100	165	52	2	146,3	113,9	3,2	6,5	130	76	20
22220-E1-K	**XL**	**H320**	4,91	1,69	**90**	100	180	46	2,1	161,4	119	4,8	9,5	130	71	20
23220-E1A-K-M	**XL**	**H2320**	6,33	2,17	**90**	100	180	60,3	2,1	156,7	–	4,8	9,5	142	97	20
23220-E1-K-TVPB	**XL**	**H2320**	6,13	2,17	**90**	100	180	60,3	2,1	156,7	116,7	4,8	9,5	142	97	20
21320-E1-K-TVPB	**XL**	**H320**	8,08	1,69	**90**	100	215	47	3	182	132	4,8	9,5	130	71	20
22320-E1-K	**XL**	**H2320**	13,1	2,17	**90**	100	215	73	3	184,7	130,2	6,3	12,2	142	97	20
22320-E1-K-T41A	**XL**	**H2320**	13,1	2,17	**90**	100	215	73	3	184,7	130,2	6,3	12,2	142	97	20
23122-E1A-K-M	**XL**	**H3122**	5,1	2,23	**100**	110	180	56	2	160	–	4,8	9,5	154	81	21
23122-E1-K-TVPB	**XL**	**H3122**	4,95	2,23	**100**	110	180	56	2	160	124,6	4,8	9,5	154	81	21
22222-E1-K	**XL**	**H322**	6,82	2,15	**100**	110	200	53	2,1	178,7	129,4	4,8	9,5	154	77	21
23222-E1A-K-M	**XL**	**H2322**	9,32	2,74	**100**	110	200	69,8	2,1	172,7	–	4,8	9,5	154	105	21
23222-E1-K-TVPB	**XL**	**H2322**	8,82	2,74	**100**	110	200	69,8	2,1	172,7	129,1	4,8	9,5	154	105	21
21322-E1-K-TVPB	**XL**	**H322**	10,9	2,15	**100**	110	240	50	3	202,5	146,4	6,3	12,2	154	77	21
22322-E1-K	**XL**	**H2322**	17,4	2,74	**100**	110	240	80	3	204,9	143,1	8	15	154	105	21
22322-E1-K-T41A	**XL**	**H2322**	17,4	2,74	**100**	110	240	80	3	204,9	143,1	8	15	154	105	21

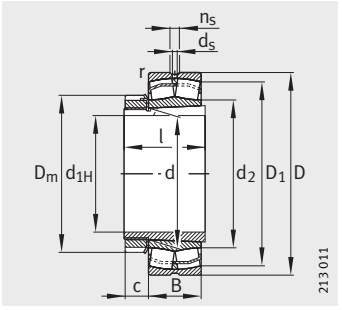


Mounting dimensions

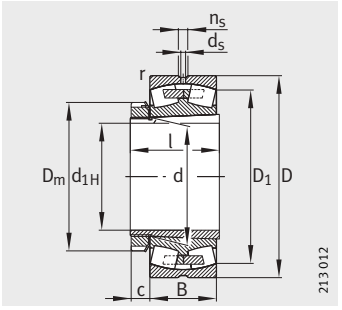
Mounting dimensions					Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	d_b	B_a	r_a	dyn. C_r	stat. C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
max.	max.	min.	min.	max.	N	N					N	min^{-1}	min^{-1}
94	129	85	12	2	250 000	270 000	0,22	3,14	4,67	3,07	34 000	5 600	3 700
99	158	85	5	2,1	305 000	325 000	0,22	3,04	4,53	2,97	38 500	4 800	3 750
98	158	88	5	2,1	500 000	510 000	0,34	1,99	2,96	1,94	45 000	4 300	3 450
98	158	88	5	2,1	500 000	510 000	0,34	1,99	2,96	1,94	45 000	4 300	3 450
99	139	91	12	2	305 000	325 000	0,22	3,04	4,53	2,97	38 500	5 300	3 550
106	166	91	6	2,5	345 000	375 000	0,23	2,9	4,31	2,83	42 500	4 800	3 550
104	166	94	6	2,5	540 000	560 000	0,33	2,04	3,04	2	50 000	4 000	3 300
104	166	94	6	2,5	540 000	560 000	0,33	2,04	3,04	2	50 000	4 000	3 300
106	149	96	10	2	345 000	375 000	0,23	2,9	4,31	2,83	42 500	4 800	3 500
107	149	100	18	2	440 000	520 000	0,31	2,2	3,27	2,15	48 500	4 300	2 700
104	149	100	18	2	440 000	520 000	0,31	2,2	3,27	2,15	48 500	4 300	2 700
112	176	96	6	2,5	380 000	415 000	0,24	2,87	4,27	2,8	47 000	4 500	3 450
110	176	100	6	2,5	610 000	630 000	0,33	2,03	3,02	1,98	55 000	3 600	3 100
110	176	100	6	2,5	610 000	630 000	0,33	2,03	3,02	1,98	55 000	3 600	3 100
112	158	102	9	2,1	380 000	415 000	0,24	2,87	4,27	2,8	47 000	4 500	3 400
124	186	102	7	2,5	430 000	455 000	0,22	3,04	4,53	2,97	47 500	4 000	3 300
115	186	105	7	2,5	670 000	695 000	0,33	2,03	3,02	1,98	60 000	3 000	2 900
115	186	105	7	2,5	670 000	695 000	0,33	2,03	3,02	1,98	60 000	3 000	2 900
115	154	107	7	2	450 000	570 000	0,28	2,37	3,53	2,32	52 000	4 300	2 800
113	154	107	7	2	450 000	570 000	0,28	2,37	3,53	2,32	52 000	4 300	2 800
118	168	108	8	2,1	430 000	475 000	0,24	2,84	4,23	2,78	52 000	4 300	3 300
120	168	110	19	2,1	550 000	655 000	0,31	2,15	3,2	2,1	60 000	3 600	2 470
116	168	110	19	2,1	550 000	655 000	0,31	2,15	3,2	2,1	60 000	3 600	2 470
131	201	108	7	2,5	490 000	530 000	0,22	3,14	4,67	3,07	61 000	3 600	3 100
129	201	110	7	2,5	815 000	915 000	0,33	2,03	3,02	1,98	75 000	3 000	2 550
129	201	110	7	2,5	815 000	915 000	0,33	2,03	3,02	1,98	75 000	3 000	2 550
127	169	117	7	2	530 000	680 000	0,28	2,41	3,59	2,35	61 000	4 000	2 600
124	169	117	7	2	530 000	680 000	0,28	2,39	3,56	2,34	61 000	4 000	2 600
129	188	118	6	2,1	550 000	600 000	0,25	2,71	4,04	2,65	62 000	4 000	3 100
130	188	121	17	2,1	710 000	865 000	0,33	2,06	3,06	2,01	72 000	3 000	2 150
129	188	121	17	2,1	710 000	865 000	0,33	2,06	3,06	2,01	72 000	3 000	2 150
146	226	118	9	2,5	600 000	640 000	0,21	3,24	4,82	3,16	69 000	3 000	2 750
135	226	121	7	2,5	950 000	1 060 000	0,33	2,07	3,09	2,03	91 000	2 600	2 250
135	226	121	7	2,5	950 000	1 060 000	0,33	2,07	3,09	2,03	91 000	2 600	2 250

Spherical roller bearings

With adapter sleeve



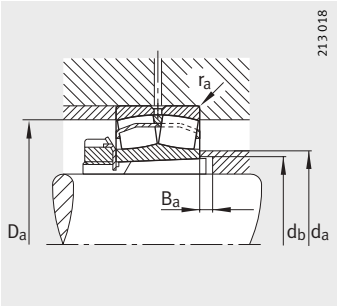
E1 design



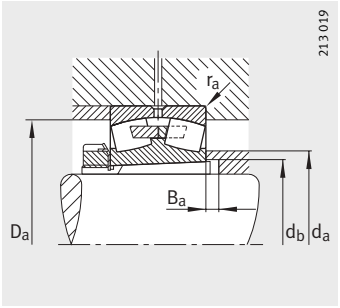
With central rib

Dimension table (continued) · Dimensions in mm

Designation			Mass m		Dimensions											
Bearing	X-life	Adapter sleeve	Bearing ≈kg	Adapter sleeve ≈kg	d_{1H}	d	D	B	r min.	D_1 ≈	d_2 ≈	d_s	n_s	D_m	l	c ≈
23024-E1A-K-M	**XL**	**H3024**	4,09	1,95	**110**	120	180	46	2	164,7	–	3,2	6,5	145	72	22
23024-E1-K-TVPB	**XL**	**H3024**	3,67	1,95	**110**	120	180	46	2	164,7	133	3,2	6,5	145	72	22
23124-E1A-K-M	**XL**	**H3124**	7,57	2,61	**110**	120	200	62	2	177,4	–	4,8	9,5	155	88	22
23124-E1-K-TVPB	**XL**	**H3124**	7,06	2,61	**110**	120	200	62	2	177,4	136,2	4,8	9,5	155	88	22
22224-E1-K	**XL**	**H3124**	8,84	2,61	**110**	120	215	58	2,1	192	141,8	6,3	12,2	155	88	22
23224-E1A-K-M	**XL**	**H2324**	11,4	3,18	**110**	120	215	76	2,1	185,5	–	4,8	9,5	155	112	22
23224-E1-K-TVPB	**XL**	**H2324**	11,1	3,18	**110**	120	215	76	2,1	185,5	139	4,8	9,5	155	112	22
22324-E1-K	**XL**	**H2324**	22,1	3,18	**110**	120	260	86	3	222,4	150,7	8	15	155	112	22
22324-E1-K-T41A	**XL**	**H2324**	22,1	3,18	**110**	120	260	86	3	222,4	150,7	8	15	155	112	22
23026-E1A-K-M	**XL**	**H3026**	5,7	2,9	**115**	130	200	52	2	182,3	–	4,8	9,5	155	80	23
23026-E1-K-TVPB	**XL**	**H3026**	5,42	2,9	**115**	130	200	52	2	182,3	145,9	4,8	9,5	155	80	23
23126-E1A-K-M	**XL**	**H3126**	8,1	3,63	**115**	130	210	64	2	187,3	–	4,8	9,5	175	92	23
23126-E1-K-TVPB	**XL**	**H3126**	7,82	3,63	**115**	130	210	64	2	187,3	146	4,8	9,5	175	92	23
22226-E1-K	**XL**	**H3126**	10,9	3,63	**115**	130	230	64	3	205	151,7	6,3	12,2	175	92	23
23226-E1A-K-M	**XL**	**H2326**	13,6	4,61	**115**	130	230	80	3	199,3	–	4,8	9,5	165	121	23
23226-E1-K-TVPB	**XL**	**H2326**	12,6	4,61	**115**	130	230	80	3	199,3	150	4,8	9,5	165	121	23
22326-E1-K	**XL**	**H2326**	27,4	4,61	**115**	130	280	93	4	239,5	162,2	9,5	17,7	165	121	23
22326-E1-K-T41A	**XL**	**H2326**	27,4	4,61	**115**	130	280	93	4	239,5	162,2	9,5	17,7	165	121	23
23028-E1A-K-M	**XL**	**H3028**	6	3,25	**125**	140	210	53	2	192,3	–	4,8	9,5	165	82	24
23028-E1-K-TVPB	**XL**	**H3028**	5,81	3,25	**125**	140	210	53	2	192,3	155,4	4,8	9,5	165	82	24
23128-E1A-K-M	**XL**	**H3128**	7,78	4,33	**125**	140	225	68	2,1	201	–	4,8	9,5	180	97	24
23128-E1-K-TVPB	**XL**	**H3128**	9,46	4,33	**125**	140	225	68	2,1	201	157,1	4,8	9,5	180	97	24
22228-E1-K	**XL**	**H3128**	13,7	4,33	**125**	140	250	68	3	223,4	164,9	6,3	12,2	180	97	24
23228-E1A-K-M	**XL**	**H2328**	17,6	5,6	**125**	140	250	88	3	216	–	6,3	12,2	180	131	24
23228-E1-K-TVPB	**XL**	**H2328**	17,1	5,6	**125**	140	250	88	3	216	162	6,3	12,2	180	131	24
22328-E1-K	**XL**	**H2328**	34,4	5,6	**125**	140	300	102	4	255,7	173,5	9,5	17,7	180	131	24
22328-E1-K-T41A	**XL**	**H2328**	34,4	5,6	**125**	140	300	102	4	255,7	173,5	9,5	17,7	180	131	24
23030-E1A-K-M	**XL**	**H3030**	7,33	3,98	**135**	150	225	56	2,1	206,3	–	4,8	9,5	180	87	26
23030-E1-K-TVPB	**XL**	**H3030**	7,29	3,98	**135**	150	225	56	2,1	206,3	166,6	4,8	9,5	180	87	26
23130-E1A-K-M	**XL**	**H3130**	15,8	5,49	**135**	150	250	80	2,1	220,8	–	6,3	12,2	195	111	26
23130-E1-K-TVPB	**XL**	**H3130**	14,5	5,49	**135**	150	250	80	2,1	220,8	170,1	6,3	12,2	195	111	26
22230-E1-K	**XL**	**H3130**	17,8	5,49	**135**	150	270	73	3	240,8	177,9	8	15	195	111	26
23230-E1A-K-M	**XL**	**H2330**	22,9	6,71	**135**	150	270	96	3	232,6	–	6,3	12,2	195	139	26
23230-E1-K-TVPB	**XL**	**H2330**	22,3	6,71	**135**	150	270	96	3	232,6	174	6,3	12,2	195	139	26
22330-E1-K	**XL**	**H2330**	41,2	6,71	**135**	150	320	108	4	273,2	185,3	9,5	17,7	195	139	26
22330-E1-K-T41A	**XL**	**H2330**	41,2	6,71	**135**	150	320	108	4	273,2	185,3	9,5	17,7	195	139	26



Mounting dimensions
E1 design

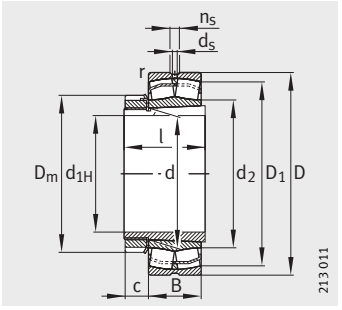


Mounting dimensions
With central rib

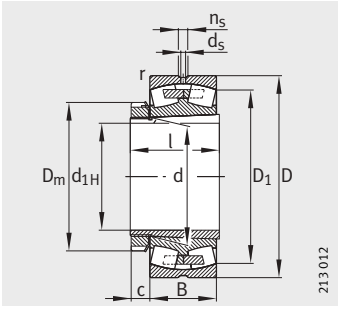
Mounting dimensions					Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	d_b	B_a	r_a	dyn. C_r	stat. C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
max.	max.	min.	min.	max.	N	N					N	min^{-1}	min^{-1}
133	171,2	127	7	2	430 000	585 000	0,22	3,04	4,53	2,97	58 000	4 300	2 850
133	171,2	127	7	2	430 000	585 000	0,22	3,04	4,53	2,97	58 000	4 300	2 850
139	189	128	7	2	630 000	800 000	0,28	2,39	3,56	2,34	73 000	3 400	2 330
136	189	128	7	2	630 000	800 000	0,28	2,39	3,56	2,34	73 000	3 400	2 330
141	203	128	11	2,1	640 000	735 000	0,25	2,71	4,04	2,65	71 000	3 400	2 800
141	203	131	17	2	815 000	1 020 000	0,33	2,03	3,02	1,98	80 000	2 800	1 940
139	203	131	17	2	815 000	1 020 000	0,33	2,03	3,02	1,98	80 000	2 800	1 940
150	246	131	7	2,5	1 080 000	1 160 000	0,33	2,06	3,06	2,01	103 000	2 600	2 080
150	246	131	7	2,5	1 080 000	1 160 000	0,33	2,06	3,06	2,01	103 000	2 600	2 080
146	191,2	137	8	2	540 000	735 000	0,23	2,95	4,4	2,89	70 000	3 600	2 650
145	191,2	137	8	2	540 000	735 000	0,23	2,95	4,4	2,89	70 000	3 600	2 650
149	199	138	8	2	680 000	900 000	0,28	2,45	3,64	2,39	79 000	3 000	2 130
145	199	138	8	2	680 000	900 000	0,28	2,45	3,64	2,39	79 000	3 000	2 130
151	216	138	8	2,5	750 000	900 000	0,26	2,62	3,9	2,56	79 000	3 000	2 550
152	216	142	21	2,5	900 000	1 140 000	0,33	2,07	3,09	2,03	89 000	2 600	1 780
150	216	142	21	2,5	900 000	1 140 000	0,33	2,07	3,09	2,03	89 000	2 600	1 780
162	263	142	8	3	1 250 000	1 370 000	0,33	2,06	3,06	2,01	117 000	2 400	1 870
162	263	142	8	3	1 250 000	1 370 000	0,33	2,06	3,06	2,01	117 000	2 400	1 870
155	201,2	147	8	2	570 000	800 000	0,22	3,07	4,57	3	76 000	3 600	2 440
155	201,2	147	8	2	570 000	800 000	0,22	3,07	4,57	3	76 000	3 600	2 440
159	213	149	8	2,1	765 000	1 020 000	0,27	2,49	3,71	2,43	88 000	2 800	1 960
157	213	149	8	2,1	765 000	1 020 000	0,27	2,49	3,71	2,43	88 000	2 800	1 960
164	236	149	8	2,5	880 000	1 040 000	0,25	2,67	3,97	2,61	97 000	2 400	2 320
162	236	152	22	2,5	1 080 000	1 400 000	0,33	2,04	3,04	2	112 000	2 400	1 580
162	236	152	22	2,5	1 080 000	1 400 000	0,33	2,04	3,04	2	112 000	2 400	1 580
169	283	152	8	3	1 460 000	1 630 000	0,34	2	2,98	1,96	132 000	2 200	1 700
169	283	152	8	3	1 460 000	1 630 000	0,34	2	2,98	1,96	132 000	2 200	1 700
166	214,8	158	8	2,1	630 000	880 000	0,22	3,1	4,62	3,03	85 000	3 400	2 260
166	214,8	158	8	2,1	630 000	880 000	0,22	3,1	4,62	3,03	85 000	3 400	2 260
170	238	160	8	2,1	1 000 000	1 320 000	0,29	2,32	3,45	2,26	143 000	2 600	1 760
170	238	160	8	2,1	1 000 000	1 320 000	0,29	2,32	3,45	2,26	143 000	2 600	1 760
177	256	160	15	2,5	1 000 000	1 220 000	0,25	2,69	4	2,63	111 000	2 600	2 110
174	256	163	20	2,5	1 270 000	1 660 000	0,33	2,02	3	1,97	129 000	2 200	1 420
174	256	163	20	2,5	1 270 000	1 660 000	0,33	2,02	3	1,97	129 000	2 200	1 420
185	303	163	8	3	1 630 000	1 860 000	0,33	2,02	3	1,97	147 000	2 000	1 550
185	303	163	8	3	1 630 000	1 860 000	0,33	2,02	3	1,97	147 000	2 000	1 550

Spherical roller bearings

With adapter sleeve



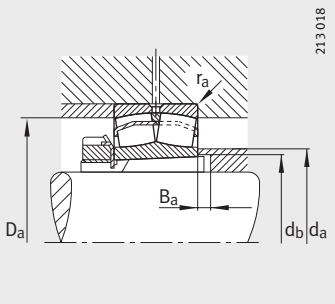
E1 design



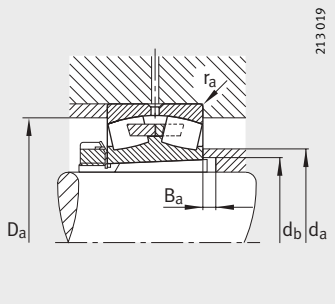
With central rib

Dimension table (continued) · Dimensions in mm

Designation			Mass m		Dimensions											
Bearing	X-life	Adapter sleeve	Bearing ≈kg	Adapter sleeve ≈kg	d_{1H}	d	D	B	r min.	D_1 ≈	d_2 ≈	d_s	n_s	D_m	l	c ≈
23032-E1A-K-M	**XL**	**H3032**	9,42	5,33	**140**	160	240	60	2,1	219,9	–	6,3	12,2	190	93	28
23032-E1-K-TVPB	**XL**	**H3032**	8,67	5,33	**140**	160	240	60	2,1	219,9	177	6,3	12,2	190	93	28
23132-E1A-K-M	**XL**	**H3132**	18,6	7,57	**140**	160	270	86	2,1	238,3	–	8	15	210	119	28
23132-E1-K-TVPB	**XL**	**H3132**	18,4	7,57	**140**	160	270	86	2,1	238,3	183,2	8	15	210	119	28
22232-E1-K	**XL**	**H3132**	22,4	7,57	**140**	160	290	80	3	258,2	190,9	8	15	210	119	28
23232-E1A-K-M	**XL**	**H2332**	28,5	9,1	**140**	160	290	104	3	249,3	–	8	15	210	147	28
23232-E1-K-TVPB	**XL**	**H2332**	27,7	9,1	**140**	160	290	104	3	249,3	186,7	8	15	210	147	28
22332-K-MB	–	**H2332**	50,1	9,1	**140**	160	340	114	4	288,3	–	9,5	17,7	210	147	28
23034-E1A-K-M	**XL**	**H3034**	12	6,13	**150**	170	260	67	2,1	237,2	–	6,3	12,2	211	101	29
23034-E1-K-TVPB	**XL**	**H3034**	11,9	6,13	**150**	170	260	67	2,1	237,2	189,8	6,3	12,2	211	101	29
23134-E1A-K-M	**XL**	**H3134**	19,5	8,35	**150**	170	280	88	2,1	248,1	–	8	15	220	122	29
23134-E1-K-TVPB	**XL**	**H3134**	19,9	8,35	**150**	170	280	88	2,1	248,1	193,4	8	15	220	122	29
22234-E1-K	**XL**	**H3134**	27,1	8,35	**150**	170	310	86	4	275,4	199,8	9,5	17,7	220	122	29
23234-E1A-K-M	**XL**	**H2334**	34,6	10,2	**150**	170	310	110	4	267,4	–	8	15	232	154	29
23234-E1-K-TVPB	**XL**	**H2334**	33,1	10,2	**150**	170	310	110	4	267,4	199,8	8	15	232	154	29
22334-K-MB	–	**H2334**	56,9	10,2	**150**	170	360	120	4	304,2	–	9,5	17,7	232	154	29
23936-S-K-MB	–	**H3936**	7,76	6,25	**160**	180	250	52	2	230,9	–	4,8	9,5	210	87	30
23036-E1A-K-M	**XL**	**H3036**	16	7,01	**160**	180	280	74	2,1	254,3	–	8	15	221	109	30
23036-E1-K-TVPB	**XL**	**H3036**	15,6	7,01	**160**	180	280	74	2,1	254,3	201,8	8	15	221	109	30
23136-E1A-K-M	**XL**	**H3136**	25,5	9,46	**160**	180	300	96	3	264,8	–	8	15	230	131	30
23136-E1-K-TVPB	**XL**	**H3136**	25,9	9,46	**160**	180	300	96	3	264,8	204,1	8	15	230	131	30
22236-E1-K	**XL**	**H3136**	28,5	9,46	**160**	180	320	86	4	285,9	211,3	9,5	17,7	230	131	30
23236-E1A-K-M	**XL**	**H2336**	37	11,4	**160**	180	320	112	4	277,3	–	8	15	230	161	30
23236-E1-K-TVPB	**XL**	**H2336**	36	11,4	**160**	180	320	112	4	277,3	210,6	8	15	230	161	30
22336-K-MB	–	**H2336**	66,7	11,4	**160**	180	380	126	4	323,4	–	12,5	23,5	230	161	30
23038-E1A-K-M	**XL**	**H3038**	17,7	7,66	**170**	190	290	75	2,1	264,5	–	8	15	220	112	31
23038-E1-K-TVPB	**XL**	**H3038**	16,3	7,66	**170**	190	290	75	2,1	264,5	211,9	8	15	220	112	31
23138-E1A-K-M	**XL**	**H3138**	32,4	10,8	**170**	190	320	104	3	281,6	–	8	15	252	141	31
23138-E1-K-TVPB	**XL**	**H3138**	30,3	10,8	**170**	190	320	104	3	281,6	217	8	15	252	141	31
22238-K-MB	–	**H3138**	36,2	10,8	**170**	190	340	92	4	296	–	9,5	17,7	252	141	31
23238-B-K-MB	–	**H2338**	46	12,7	**170**	190	340	120	4	291,2	–	9,5	17,7	240	169	31
22338-K-MB	–	**H2338**	77,3	12,7	**170**	190	400	132	5	338,2	–	12,5	23,5	240	169	31



Mounting dimensions
E1 design

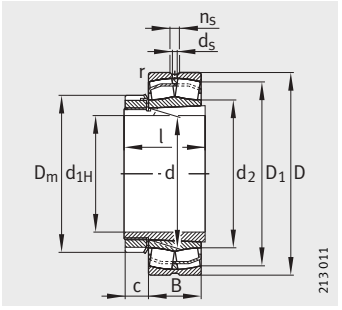


Mounting dimensions
With central rib

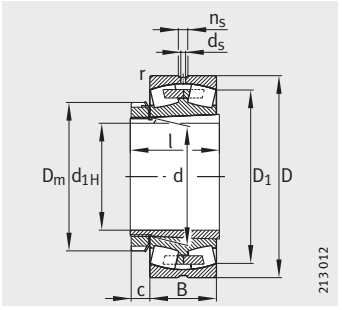
Mounting dimensions					Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	d_b	B_a	r_a	dyn. C_r	stat. C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
max.	max.	min.	min.	max.	N	N					N	min^{-1}	min^{-1}
177	229,8	168	8	2,1	720 000	1 020 000	0,22	3,1	4,62	3,03	94 000	2 800	2 090
177	229,8	168	8	2,1	720 000	1 020 000	0,22	3,1	4,62	3,03	94 000	2 800	2 090
183	258	170	8	2,1	1 160 000	1 560 000	0,29	2,32	3,45	2,26	164 000	2 400	1 590
183	258	170	8	2,1	1 160 000	1 560 000	0,29	2,32	3,45	2,26	164 000	2 400	1 590
190	276	170	14	2,5	1 140 000	1 400 000	0,26	2,64	3,93	2,58	125 000	2 600	1 960
186	276	174	18	2,5	1 460 000	1 900 000	0,34	2	2,98	1,96	146 000	2 200	1 310
186	276	174	18	2,5	1 460 000	1 900 000	0,34	2	2,98	1,96	146 000	2 200	1 310
191	323	174	8	3	1 430 000	1 900 000	0,37	1,8	2,69	1,76	121 000	2 000	1 490
190	249,8	179	8	2,1	880 000	1 220 000	0,23	2,98	4,44	2,92	146 000	2 600	1 940
189	249,8	179	8	2,1	880 000	1 220 000	0,23	2,98	4,44	2,92	146 000	2 600	1 940
193	268	180	8	2,1	1 220 000	1 700 000	0,28	2,37	3,53	2,32	174 000	2 400	1 480
193	268	180	8	2,1	1 220 000	1 700 000	0,28	2,37	3,53	2,32	174 000	2 400	1 480
199	293	180	10	3	1 320 000	1 560 000	0,26	2,6	3,87	2,54	139 000	2 400	1 830
199	293	185	18	3	1 630 000	2 160 000	0,33	2,03	3,02	1,98	163 000	2 000	1 190
199	293	185	18	3	1 630 000	2 160 000	0,33	2,03	3,02	1,98	163 000	2 000	1 190
204	343	185	8	3	1 600 000	2 120 000	0,37	1,83	2,72	1,79	134 000	1 800	1 380
198	241,2	188	8	2	440 000	850 000	0,2	3,42	5,09	3,34	57 000	2 200	2 320
201	269,8	189	8	2,1	1 040 000	1 460 000	0,23	2,9	4,31	2,83	170 000	2 600	1 790
201	269,8	189	8	2,1	1 040 000	1 460 000	0,23	2,9	4,31	2,83	170 000	2 600	1 790
204	286	180	8	2,5	1 430 000	1 960 000	0,29	2,32	3,45	2,26	196 000	2 200	1 370
204	286	191	8	2,5	1 430 000	1 960 000	0,29	2,32	3,45	2,26	196 000	2 200	1 370
211	303	191	18	3	1 370 000	1 660 000	0,25	2,71	4,04	2,65	148 000	2 400	1 720
210	303	195	22	3	1 700 000	2 360 000	0,33	2,07	3,09	2,03	173 000	2 000	1 110
210	303	195	22	3	1 700 000	2 360 000	0,33	2,07	3,09	2,03	173 000	2 000	1 110
217	363	195	8	3	1 760 000	2 360 000	0,37	1,83	2,72	1,79	209 000	1 500	1 280
211	279,8	199	9	2,1	1 080 000	1 560 000	0,23	2,98	4,44	2,92	180 000	2 400	1 690
211	279,8	199	9	2,1	1 080 000	1 560 000	0,23	2,98	4,44	2,92	180 000	2 400	1 690
216	306	202	9	2,5	1 600 000	2 240 000	0,3	2,28	3,39	2,23	218 000	2 000	1 270
216	306	202	9	2,5	1 600 000	2 240 000	0,3	2,28	3,39	2,23	218 000	2 000	1 270
223	323	202	21	3	1 200 000	1 830 000	0,28	2,39	3,56	2,34	122 000	1 800	1 620
222	323	206	21	3	1 560 000	2 600 000	0,36	1,86	2,77	1,82	156 000	1 700	1 040
228	380	206	9	4	1 860 000	2 500 000	0,37	1,83	2,72	1,79	213 000	1 500	1 220

Spherical roller bearings

With adapter sleeve



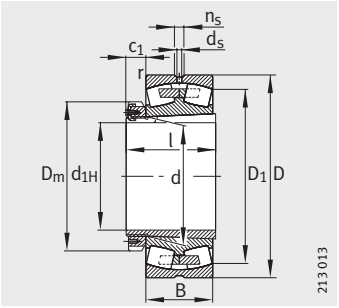
E1 design



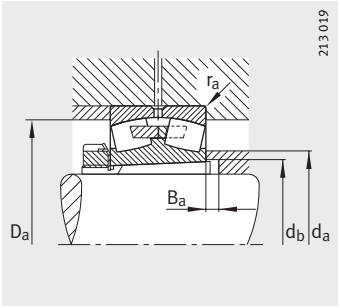
With central rib

Dimension table (continued) · Dimensions in mm

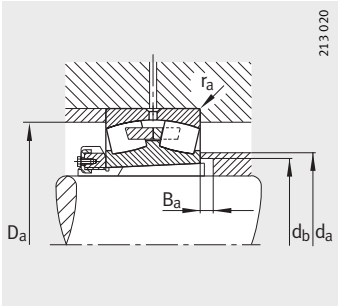
Designation			Mass m		Dimensions										
Bearing	X-life	Adapter sleeve	Bearing ≈kg	Adapter sleeve ≈kg	d_{1H}	d	D	B	r min.	D_1 ≈	d_2	d_s	n_s	D_m	l
23940-S-K-MB	–	**H3940**	11,5	7,82	**180**	200	280	60	2,1	256,9	–	6,3	12,2	240	98
23040-E1A-K-M	**XL**	**H3040**	21,4	9,22	**180**	200	310	82	2,1	281,6	–	8	15	240	120
23040-E1-K-TVPB	**XL**	**H3040**	20,8	9,22	**180**	200	310	82	2,1	281,6	223,4	8	15	240	120
23140-B-K-MB	–	**H3140**	41,7	12,1	**180**	200	340	112	3	293,3	–	9,5	17,7	250	150
22240-B-K-MB	–	**H3140**	42,3	12,1	**180**	200	360	98	4	312	–	9,5	17,7	250	150
23240-B-K-MB	–	**H2340**	55,8	14	**180**	200	360	128	4	307,5	–	9,5	17,7	250	176
22340-K-MB	–	**H2340**	89,5	14	**180**	200	420	138	5	357,4	–	12,5	23,5	250	176
23944-S-K-MB	–	**H3944**	12,3	8,27	**200**	220	300	60	2,1	277,4	–	6,3	12,2	260	96
23044-K-MB	–	**H3044X**	29,9	10,4	**200**	220	340	90	3	301,8	–	8	15	260	126
23144-B-K-MB	–	**H3144X**	52	15,4	**200**	220	370	120	4	319,2	–	9,5	17,7	292	161
22244-B-K-MB	–	**H3144X**	59,6	15,4	**200**	220	400	108	4	348,7	–	9,5	17,7	292	161
23244-K-MB	–	**H2344X**	79	17,5	**200**	220	400	144	4	337,6	–	9,5	17,7	280	186
22344-K-MB	–	**H2344X**	114	17,5	**200**	220	460	145	5	391,2	–	12,5	23,5	280	186
23948-K-MB	–	**H3948**	13,4	10,9	**220**	240	320	60	2,1	297,8	–	6,3	12,2	290	101
23048-K-MB	–	**H3048**	31,9	13,4	**220**	240	360	92	3	322,1	–	8	15	290	133
23148-B-K-MB	–	**H3148X**	65,3	18,1	**220**	240	400	128	4	346,2	–	9,5	17,7	312	172
22248-B-K-MB	–	**H3148X**	81,2	18,1	**220**	240	440	120	4	380,7	–	12,5	23,5	312	172
23248-B-K-MB	–	**H2348X**	105	20,6	**220**	240	440	160	4	371	–	12,5	23,5	300	199
22348-K-MB	–	**H2348X**	145	20,6	**220**	240	500	155	5	420	–	12,5	23,5	300	199
23952-K-MB	–	**H3952**	22,4	13,1	**240**	260	360	75	2,1	330,5	–	8	15	310	116
23052-K-MB	–	**H3052X**	46,2	15,6	**240**	260	400	104	4	357,2	–	9,5	17,7	310	145
23152-K-MB	–	**H3152X**	89,6	22,9	**240**	260	440	144	4	379,7	–	9,5	17,7	330	190
22252-B-K-MB	–	**H3152X**	106	22,9	**240**	260	480	130	5	415,3	–	12,5	23,5	330	190
23252-B-K-MB	–	**H2352X**	136	25,1	**240**	260	480	174	5	405,4	–	12,5	23,5	330	211
22352-K-MB	–	**H2352X**	177	25,1	**240**	260	540	165	6	452,1	–	12,5	23,5	330	211
23956-K-MB	–	**H3956**	24,7	15	**260**	280	380	75	2,1	350	–	8	15	330	121
23056-B-K-MB	–	**H3056**	50,3	18	**260**	280	420	106	4	376,5	–	9,5	17,7	330	152
23156-B-K-MB	–	**H3156X**	96,4	25,4	**260**	280	460	146	5	401,4	–	9,5	17,7	362	195
22256-B-K-MB	–	**H3156X**	110	25,4	**260**	280	500	130	5	435,2	–	12,5	23,5	362	195
23256-K-MB	–	**H2356X**	153	28,8	**260**	280	500	176	5	426,3	–	12,5	23,5	350	224
22356-K-MB	–	**H2356X**	224	28,8	**260**	280	580	175	6	489,3	–	12,5	23,5	350	224
23960-B-K-MB	–	**H3960**	39,1	20,3	**280**	300	420	90	3	384,6	–	9,5	17,7	360	140
23060-K-MB	–	**H3060**	72,2	23,2	**280**	300	460	118	4	412,6	–	9,5	17,7	360	168
23160-B-K-MB	–	**H3160**	123	29,9	**280**	300	500	160	5	434,7	–	9,5	17,7	380	208
22260-K-MB	–	**H3160**	136	29,9	**280**	300	540	140	5	468,8	–	12,5	23,5	380	208
23260-K-MB	–	**H3260**	192	34,1	**280**	300	540	192	5	458,7	–	12,5	23,5	380	240



With central rib
Locknut with retaining bracket



Mounting dimensions
With central rib

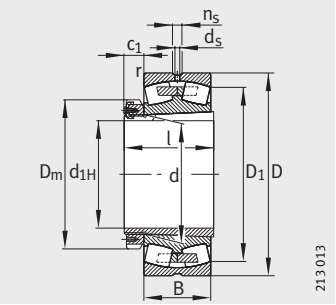


With central rib
Locknut with retaining bracket

		Mounting dimensions					Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
c	c_1	d_a	D_a	d_b	B_a	r_a	dyn. C_r	stat. C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
≈	≈	max.	max.	min.	min.	max.	N	N					N	min^{-1}	min^{-1}
32	–	220	269,8	210	9	2,1	550 000	1 080 000	0,2	3,42	5,09	3,34	71 000	2 000	2 110
32	–	223	299,8	210	10	2,1	1 270 000	1 800 000	0,23	2,9	4,31	2,83	203 000	2 400	1 580
32	–	223	299,8	210	10	2,1	1 270 000	1 800 000	0,23	2,9	4,31	2,83	203 000	2 400	1 580
32	–	231	326	212	10	2,5	1 320 000	2 280 000	0,35	1,95	2,9	1,91	131 000	1 700	1 240
32	–	234	343	212	24	3	1 320 000	2 000 000	0,29	2,35	3,5	2,3	123 000	1 700	1 530
32	–	237	343	216	20	3	1 660 000	2 750 000	0,37	1,83	2,72	1,79	163 000	1 500	1 000
32	–	240	400	216	10	4	2 080 000	2 800 000	0,36	1,87	2,79	1,83	189 000	1 400	1 130
–	40	241	289,8	230	9	2,1	600 000	1 250 000	0,18	3,76	5,59	3,67	72 000	1 800	1 880
–	40	247	327,6	231	12	2,5	1 060 000	1 900 000	0,26	2,55	3,8	2,5	132 000	1 700	1 470
35	–	253	353	233	10	3	1 630 000	2 900 000	0,33	2,03	3,02	1,98	165 000	1 400	1 070
35	–	258	383	233	22	3	1 630 000	2 450 000	0,29	2,35	3,5	2,3	153 000	1 400	1 340
35	–	259	383	236	11	3	2 040 000	3 450 000	0,37	1,83	2,72	1,79	181 000	1 400	860
35	–	272	440	236	10	4	2 320 000	3 350 000	0,35	1,95	2,9	1,91	217 000	1 300	980
–	45	261	309,8	250	11	2,1	640 000	1 370 000	0,17	4,05	6,04	3,96	93 000	1 500	1 700
–	45	268	347,6	251	11	2,5	1 160 000	2 200 000	0,25	2,74	4,08	2,68	130 000	1 400	1 320
37	–	276	383	254	11	3	1 860 000	3 250 000	0,33	2,06	3,06	2,01	177 000	1 300	970
37	–	283	423	254	19	3	1 960 000	3 050 000	0,29	2,35	3,5	2,3	184 000	1 300	1 190
37	–	284	423	257	6	3	2 450 000	4 250 000	0,37	1,8	2,69	1,76	231 000	1 300	750
37	–	296	480	257	11	4	2 650 000	3 900 000	0,35	1,95	2,9	1,91	249 000	1 500	870
–	45	285	349,8	270	11	2,1	930 000	1 930 000	0,19	3,54	5,27	3,46	108 000	1 400	1 610
–	45	291	385,4	272	13	3	1 500 000	2 800 000	0,26	2,64	3,93	2,58	154 000	1 300	1 170
39	–	302	423	276	11	3	2 200 000	4 000 000	0,33	2,03	3,02	1,98	213 000	1 200	860
39	–	308	460	276	25	4	2 240 000	3 450 000	0,29	2,32	3,45	2,26	217 000	1 100	1 080
39	–	309	460	278	2	4	2 900 000	4 900 000	0,37	1,8	2,69	1,76	270 000	1 100	680
39	–	322	514	278	11	5	3 000 000	4 400 000	0,34	2	2,98	1,96	290 000	1 100	790
–	49	303	369,8	290	12	2,1	965 000	2 040 000	0,18	3,76	5,59	3,67	129 000	1 300	1 470
–	49	310	405,4	292	12	3	1 560 000	3 000 000	0,25	2,74	4,08	2,68	156 000	1 300	1 080
39	–	321	440	296	12	4	2 360 000	4 400 000	0,32	2,12	3,15	2,07	241 000	1 100	790
39	–	324	480	296	28	4	2 360 000	3 650 000	0,28	2,43	3,61	2,37	238 000	1 100	1 010
41	–	329	480	299	11	4	3 000 000	5 300 000	0,36	1,86	2,77	1,82	260 000	1 100	630
41	–	349	554	299	12	5	3 550 000	5 400 000	0,33	2,03	3,02	1,98	335 000	950	680
–	53	329	407,6	311	12	2,5	1 270 000	2 650 000	0,2	3,42	5,09	3,34	166 000	1 200	1 400
–	53	337	445,4	313	12	3	1 960 000	3 650 000	0,25	2,69	4	2,63	223 000	1 100	980
–	53	347	480	318	12	4	2 650 000	4 900 000	0,33	2,06	3,06	2,01	270 000	1 100	730
–	53	352	520	318	32	4	2 750 000	4 400 000	0,27	2,47	3,67	2,41	300 000	1 000	900
–	53	353	520	321	12	4	3 450 000	6 200 000	0,37	1,83	2,72	1,79	300 000	1 000	560

Spherical roller bearings

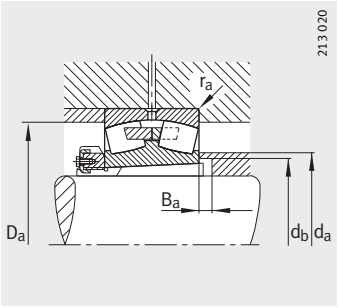
With adapter sleeve



With central rib
Locknut with retaining bracket

Dimension table (continued) · Dimensions in mm

Designation		Mass m		Dimensions										
Bearing	Adapter sleeve	Bearing ≈kg	Adapter sleeve ≈kg	d_{1H}	d	D	B	r min.	D_1 ≈	d_s	n_s	D_m	l	c_1 ≈
23964-K-MB	**H3964**	41	21,5	**300**	320	440	90	3	406,2	9,5	17,7	380	140	56
23064-K-MB	**H3064**	77,1	25,1	**300**	320	480	121	4	432,6	9,5	17,7	380	171	56
23164-K-MB	**H3164**	159	34,8	**300**	320	540	176	5	466,2	12,5	23,5	400	226	56
22264-K-MB	**H3164**	166	34,8	**300**	320	580	150	5	503,5	12,5	23,5	400	226	56
23264-K-MB	**H3264**	229	39,3	**300**	320	580	208	5	489,6	12,5	23,5	400	258	56
23068-K-MB	**H3068**	101	29,3	**320**	340	520	133	5	464,6	12,5	23,5	400	187	57
23168-B-K-MB	**H3168**	203	49,5	**320**	340	580	190	5	499,5	12,5	23,5	440	254	70
23268-B-K-MB	**H3268**	291	54,9	**320**	340	620	224	6	521,2	12,5	23,5	440	288	70
23972-K-MB	**H3972**	45	27,1	**340**	360	480	90	3	447,1	9,5	17,7	420	144	57
23072-K-MB	**H3072**	107	30,9	**340**	360	540	134	5	485,2	12,5	23,5	420	188	57
23172-K-MB	**H3172**	217	54,3	**340**	360	600	192	5	520	12,5	23,5	460	259	73
23272-B-K-MB	**H3272**	328	61,1	**340**	360	650	232	6	548,3	12,5	23,5	460	299	73
23976-K-MB	**H3976**	66,3	32,4	**360**	380	520	106	4	477,6	9,5	17,7	450	164	62
23076-B-K-MB	**H3076**	113	36,5	**360**	380	560	135	5	505,6	12,5	23,5	450	193	62
23176-K-MB	**H3176**	226	60,9	**360**	380	620	194	5	539,6	12,5	23,5	490	264	75
23276-B-K-MB	**H3276**	367	69,3	**360**	380	680	240	6	576,4	12,5	23,5	490	310	75
23980-B-K-MB	**H3980**	68,2	38,5	**380**	400	540	106	4	499	9,5	17,5	470	168	66
23080-K-MB	**H3080**	143	42,3	**380**	400	600	148	5	540,5	12,5	23,5	470	210	66
23180-B-K-MB	**H3180**	261	69,6	**380**	400	650	200	6	567,2	12,5	23,5	520	272	81
23280-B-K-MB	**H3280**	442	80,5	**380**	400	720	256	6	609,8	12,5	23,5	520	328	81
23984-K-MB	**H3984**	78	37,5	**400**	420	560	106	4	519,5	9,5	17,7	490	168	66
23084-B-K-MB	**H3084X**	155	44,6	**400**	420	620	150	5	560,7	12,5	23,5	490	212	66
23184-K-MB	**H3184**	339	84,5	**400**	420	700	224	6	605,4	12,5	23,5	540	304	89
23284-B-K-MB	**H3284**	537	94,8	**400**	420	760	272	7,5	642,2	12,5	23,5	540	352	89
23988-K-MB	**H3988**	98,3	58,3	**410**	440	600	118	4	552,8	12,5	23,5	520	189	75
23088-K-MB	**H3088**	177	67	**410**	440	650	157	6	586,8	12,5	23,5	520	228	75
23188-K-MB	**H3188**	378	103	**410**	440	720	226	6	626	12,5	23,5	560	307	89
23288-B-K-MB	**H3288**	586	125	**410**	440	790	280	7,5	669,3	12,5	23,5	560	361	89
23992-B-K-MB	**H3992**	103	64,7	**430**	460	620	118	4	573,3	12,5	23,5	540	189	75
23092-B-K-MB	**H3092**	204	71,6	**430**	460	680	163	6	612,2	12,5	23,5	540	234	75
23192-K-MB	**H3192**	420	120	**430**	460	760	240	7,5	661,4	12,5	23,5	580	326	94
23292-K-MB	**H3292**	699	137	**430**	460	830	296	7,5	701,6	12,5	23,5	580	382	94
23996-B-K-MB	**H3996**	121	70,2	**450**	480	650	128	5	598,8	12,5	23,5	560	200	75
23096-K-MB	**H3096**	208	75,3	**450**	480	700	165	6	632,6	12,5	23,5	560	237	75
23196-K-MB	**H3196**	470	135	**450**	480	790	248	7,5	688,3	12,5	23,5	620	335	94
23296-K-MB	**H3296**	806	154	**450**	480	870	310	7,5	734,8	12,5	23,5	620	397	94

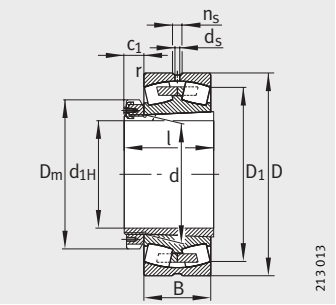


Mounting dimensions

Mounting dimensions					Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	d_b	B_a	r_a	dyn. C_r	stat. C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
max.	max.	min.	min.	max.	N	N					N	min^{-1}	min^{-1}
349	427,6	332	12	2,5	1 320 000	2 750 000	0,19	3,62	5,39	3,54	202 000	1 100	1 300
357	465,4	334	13	3	2 040 000	4 000 000	0,25	2,74	4,08	2,68	243 000	1 100	910
369	520	338	13	4	3 200 000	6 000 000	0,34	1,98	2,94	1,93	305 000	950	650
378	560	338	39	4	3 050 000	4 900 000	0,27	2,47	3,67	2,41	345 000	950	840
378	560	343	13	4	3 900 000	6 950 000	0,37	1,8	2,69	1,76	330 000	950	520
382	502	355	14	4	2 360 000	4 550 000	0,25	2,69	4	2,63	285 000	1 000	850
395	560	360	14	4	3 650 000	6 950 000	0,34	1,98	2,94	1,93	570 000	900	590
402	594	364	14	5	4 500 000	8 150 000	0,38	1,78	2,65	1,74	650 000	850	470
389	467,6	372	14	2,5	1 430 000	3 200 000	0,17	4,05	6,04	3,96	209 000	1 000	1 130
402	522	375	14	4	2 450 000	4 800 000	0,25	2,74	4,08	2,68	295 000	950	800
416	580	380	14	4	3 800 000	7 350 000	0,33	2,06	3,06	2,01	360 000	850	560
424	624	385	14	5	4 900 000	9 150 000	0,38	1,78	2,65	1,74	720 000	800	425
415	505,4	393	15	3	1 760 000	4 000 000	0,19	3,58	5,33	3,5	265 000	950	1 090
422	542	396	15	4	2 550 000	5 300 000	0,24	2,84	4,23	2,78	430 000	900	740
436	600	401	15	4	4 050 000	8 150 000	0,32	2,12	3,15	2,07	385 000	800	510
447	654	405	15	5	5 300 000	9 800 000	0,37	1,8	2,69	1,76	780 000	750	400
435	525,4	413	15	3	1 830 000	4 150 000	0,18	3,71	5,52	3,63	275 000	900	1 030
448	582	417	15	4	3 050 000	6 200 000	0,24	2,79	4,15	2,73	365 000	800	680
457	624	421	15	5	4 250 000	8 500 000	0,31	2,15	3,2	2,1	670 000	750	490
473	694	427	15	5	5 700 000	10 800 000	0,38	1,78	2,65	1,74	820 000	700	375
455	545,4	433	15	3	1 900 000	4 500 000	0,18	3,85	5,73	3,76	300 000	850	970
468	602	437	16	4	3 150 000	6 550 000	0,24	2,84	4,23	2,78	395 000	800	650
483	674	443	16	5	5 000 000	9 650 000	0,33	2,03	3,02	1,98	465 000	700	460
495	728	449	16	6	6 550 000	12 200 000	0,38	1,77	2,64	1,73	930 000	670	345
482	585,4	454	17	3	2 240 000	5 200 000	0,18	3,66	5,46	3,58	295 000	800	930
488	627	458	17	5	3 400 000	7 100 000	0,24	2,84	4,23	2,78	405 000	750	610
504	694	463	17	5	5 200 000	10 400 000	0,32	2,1	3,13	2,06	485 000	700	430
516	758	469	17	6	7 100 000	13 400 000	0,37	1,8	2,69	1,76	990 000	630	320
500	605,4	474	17	3	2 280 000	5 400 000	0,18	3,85	5,73	3,76	370 000	750	880
509	657	478	17	5	3 650 000	7 650 000	0,24	2,84	4,23	2,78	440 000	700	580
533	728	484	17	6	5 850 000	11 600 000	0,32	2,12	3,15	2,07	530 000	630	400
541	798	490	17	6	7 800 000	15 000 000	0,37	1,8	2,69	1,76	620 000	600	295
523	632	496	18	4	2 550 000	6 000 000	0,18	3,76	5,59	3,67	460 000	700	860
529	677	499	18	5	3 800 000	8 150 000	0,23	2,9	4,31	2,83	455 000	670	550
554	758	505	18	6	6 300 000	12 700 000	0,32	2,12	3,15	2,07	570 000	630	375
568	838	512	18	6	8 800 000	17 000 000	0,37	1,83	2,72	1,79	700 000	600	270

Spherical roller bearings

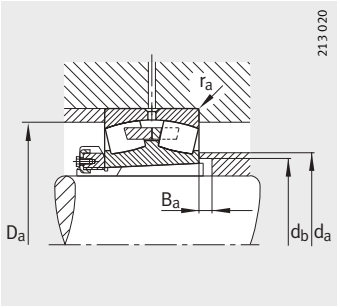
With adapter sleeve



With central rib

Dimension table (continued) · Dimensions in mm

Designation		Mass m		Dimensions										
Bearing	Adapter sleeve	Bearing ≈kg	Adapter sleeve ≈kg	d_{1H}	d	D	B	r min.	D_1 ≈	d_s	n_s	D_m	l	c_1 ≈
239/500-K-MB	**H39/500**	124	74,3	**470**	500	670	128	5	619,3	12,5	23,5	580	208	83
230/500-B-K-MB	**H30/500**	219	84,5	**470**	500	720	167	6	653,5	12,5	23,5	580	247	83
231/500-B-K-MB	**H31/500**	556	143	**470**	500	830	264	7,5	720,9	12,5	23,5	630	356	99
239/530-K-MB	**H39/530**	146	89,3	**500**	530	710	136	5	656,4	12,5	23,5	630	216	89
230/530-K-MB	**H30/530**	291	103	**500**	530	780	185	6	703,7	12,5	23,5	630	265	89
231/530-K-MB	**H31/530**	643	160	**500**	530	870	272	7,5	756,3	12,5	23,5	670	364	102
239/560-B-K-MB	**H39/560**	169	95,8	**530**	560	750	140	5	693,4	12,5	23,5	650	227	96
230/560-B-K-MB	**H30/560**	339	113	**530**	560	820	195	6	741,5	12,5	23,5	650	282	96
231/560-K-MB	**H31/560**	737	183	**530**	560	920	280	7,5	800,2	12,5	23,5	710	377	107
239/600-B-K-MB	**H39/600**	210	129	**560**	600	800	150	5	740,5	12,5	23,5	700	239	96
230/600-B-K-MB	**H30/600**	388	149	**560**	600	870	200	6	791,9	12,5	23,5	700	289	96
231/600-K-MB	**H31/600**	901	233	**560**	600	980	300	7,5	852,6	12,5	23,5	750	399	107
239/630-B-K-MB	**H39/630**	283	123	**600**	630	850	165	6	784,5	12,5	23,5	730	254	96
230/630-B-K-MB	**H30/630**	502	140	**600**	630	920	212	7,5	834,3	12,5	23,5	730	301	96
239/670-B-K-MB	**H39/670**	310	166	**630**	670	900	170	6	831,5	12,5	23,5	780	264	101
230/670-B-K-MB	**H30/670**	590	194	**630**	670	980	230	7,5	888,7	12,5	23,5	780	324	101
239/710-K-MB	**H39/710**	336	201	**670**	710	950	180	6	877,5	12,5	23,5	830	286	111
230/710-B-K-MB	**H30/710**	650	229	**670**	710	1 030	236	7,5	938,8	12,5	23,5	830	342	111
239/750-K-MB	**H39/750**	394	215	**710**	750	1 000	185	6	923,2	12,5	23,5	870	291	111
230/750-K-MB	**H30/750**	792	250	**710**	750	1 090	250	7,5	990,9	12,5	23,5	870	356	111
239/800-B-K-MB	**H39/800**	490	263	**750**	800	1 060	195	6	983,7	12,5	23,5	920	303	111
230/800-K-MB	**H30/800**	861	306	**750**	800	1 150	258	7,5	1 050,9	12,5	23,5	920	366	111
239/850-K-MB	**H39/850**	554	300	**800**	850	1 120	200	6	1 039,9	12,5	23,5	980	308	112
239/900-K-MB	**H39/900**	641	327	**850**	900	1 180	206	6	1 098,8	12,5	23,5	1 030	326	112

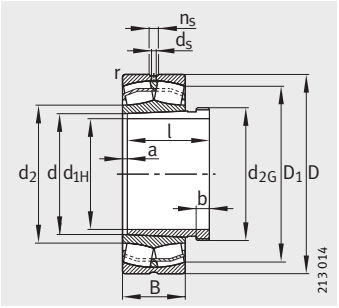


Mounting dimensions

Mounting dimensions					Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	d_b	B_a	r_a	dyn. C_r	stat. C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
max.	max.	min.	min.	max.	N	N					N	min^{-1}	min^{-1}
543	652	516	18	4	2 600 000	6 300 000	0,17	3,9	5,81	3,81	400 000	670	810
550	697	519	18	5	3 900 000	8 500 000	0,22	3,01	4,48	2,94	510 000	670	520
578	798	527	18	6	7 100 000	14 300 000	0,32	2,1	3,13	2,06	990 000	600	345
576	692	546	18	4	2 850 000	6 800 000	0,18	3,85	5,73	3,76	385 000	630	770
589	757	550	18	5	4 400 000	9 500 000	0,22	3,04	4,53	2,97	540 000	600	490
609	838	558	18	6	7 350 000	15 300 000	0,32	2,12	3,15	2,07	670 000	560	325
609	732	577	18	4	3 100 000	7 650 000	0,17	3,95	5,88	3,86	570 000	600	720
619	797	581	18	5	5 100 000	11 000 000	0,23	2,95	4,4	2,89	740 000	560	450
644	888	589	18	6	8 150 000	16 600 000	0,31	2,21	3,29	2,16	750 000	530	300
653	782	618	20	4	3 450 000	8 650 000	0,17	3,95	5,88	3,86	630 000	560	670
661	847	622	20	5	5 700 000	12 500 000	0,22	3,07	4,57	3	890 000	530	405
693	948	629	20	6	9 000 000	19 300 000	0,31	2,2	3,27	2,15	810 000	500	270
688	827	649	20	5	4 050 000	9 800 000	0,18	3,8	5,66	3,72	710 000	530	650
696	892	653	20	6	6 300 000	13 700 000	0,22	3,01	4,48	2,94	890 000	500	385
730	877	689	20	5	4 300 000	10 600 000	0,17	3,95	5,88	3,86	750 000	500	600
741	952	694	20	6	7 200 000	16 000 000	0,22	3,01	4,48	2,94	1 100 000	480	350
770	927	730	22	5	4 800 000	12 000 000	0,18	3,85	5,73	3,76	720 000	480	570
785	1 002	735	23	6	7 650 000	17 000 000	0,22	3,07	4,57	3	1 140 000	480	330
810	977	771	23	5	5 200 000	12 900 000	0,17	3,95	5,88	3,86	790 000	480	540
828	1 062	776	23	6	8 500 000	19 000 000	0,22	3,01	4,48	2,94	1 010 000	450	305
865	1 037	822	25	5	5 850 000	15 000 000	0,17	4,05	6,04	3,96	1 010 000	450	500
879	1 122	828	25	6	9 300 000	21 200 000	0,22	3,07	4,57	3	1 430 000	430	280
917	1 097	873	25	5	6 300 000	16 300 000	0,16	4,11	6,12	4,02	960 000	430	465
972	1 157	923	27	5	6 550 000	17 300 000	0,16	4,28	6,37	4,19	1 010 000	400	440

Spherical roller bearings

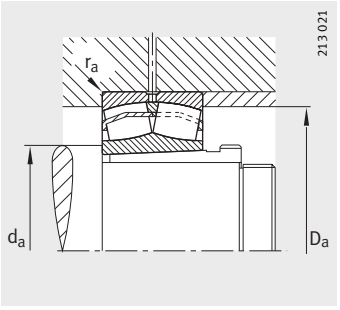
With extraction sleeve



E1 design

Dimension table · Dimensions in mm

Designation			Mass m		Dimensions										
Bearing	X-life	Extraction sleeve	Bearing ≈kg	Extraction sleeve ≈kg	d_{1H}	d	D	B	r min.	D_1 ≈	d_2 ≈	d_s	n_s	a ≈	b
22208-E1-K	**XL**	**AH308**	0,517	0,089	**35**	40	80	23	1,1	70,4	48,6	3,2	4,8	3	6
21308-E1-K	**XL**	**AH308**	0,702	0,089	**35**	40	90	23	1,5	80,8	59,7	3,2	4,8	3	6
22308-E1-K	**XL**	**AH2308**	1,03	0,128	**35**	40	90	33	1,5	76	52,4	3,2	4,8	3	7
22209-E1-K	**XL**	**AH309**	0,577	0,108	**40**	45	85	23	1,1	75,6	54,8	3,2	4,8	3	6
21309-E1-K	**XL**	**AH309**	0,845	0,108	**40**	45	100	25	1,5	89,8	67,3	3,2	4,8	3	6
22309-E1-K	**XL**	**AH2309**	1,36	0,163	**40**	45	100	36	1,5	84,7	58,9	3,2	6,5	3	7
22210-E1-K	**XL**	**AHX310**	0,608	0,138	**45**	50	90	23	1,1	80,8	59,7	3,2	4,8	3	7
21310-E1-K	**XL**	**AHX310**	1,28	0,138	**45**	50	110	27	2	89,8	67,3	3,2	4,8	3	7
22310-E1-K	**XL**	**AHX2310**	1,86	0,213	**45**	50	110	40	2	92,6	63	3,2	6,5	3	9
22211-E1-K	**XL**	**AHX311**	0,825	0,164	**50**	55	100	25	1,5	89,8	67,3	3,2	4,8	3	7
21311-E1-K	**XL**	**AHX311**	1,19	0,164	**50**	55	120	29	2	98,3	71,4	3,2	6,5	3	7
22311-E1-K	**XL**	**AHX2311**	2,22	0,255	**50**	55	120	43	2	101,4	68,9	3,2	6,5	3	10
22311-E1-K-T41A	**XL**	**AHX2311**	2,22	0,255	**50**	55	120	43	2	101,4	68,9	3,2	6,5	3	10
22212-E1-K	**XL**	**AHX312**	1,09	0,195	**55**	60	110	28	1,5	98,7	71,4	3,2	6,5	3	8
21312-E1-K	**XL**	**AHX312**	1,78	0,195	**55**	60	130	31	2,1	112,5	84,4	3,2	6,5	3	8
22312-E1-K	**XL**	**AHX2312**	2,83	0,3	**55**	60	130	46	2,1	110,1	74,8	3,2	6,5	3	11
22312-E1-K-T41A	**XL**	**AHX2312**	2,83	0,3	**55**	60	130	46	2,1	110,1	74,8	3,2	6,5	3	11
22213-E1-K	**XL**	**AH313G**	1,52	0,224	**60**	65	120	31	1,5	107,3	79,1	3,2	6,5	3	8
21313-E1-K	**XL**	**AH313G**	2,42	0,224	**60**	65	140	33	2,1	126,8	94,9	3,2	6,5	3	8
22313-E1-K	**XL**	**AH2313G**	3,49	0,4	**60**	65	140	48	2,1	119,3	83,2	4,8	9,5	3	12
22313-E1-K-T41A	**XL**	**AH2313G**	3,49	0,4	**60**	65	140	48	2,1	119,3	83,2	4,8	9,5	3	12
22214-E1-K	**XL**	**AH314G**	1,61	0,25	**65**	70	125	31	1,5	112,5	84,4	3,2	6,5	4	8
21314-E1-K	**XL**	**AH314G**	3	0,25	**65**	70	150	35	2,1	126,2	94,9	3,2	6,5	4	8
22314-E1-K	**XL**	**AHX2314G**	4,12	0,407	**65**	70	150	51	2,1	128	86,7	4,8	9,5	4	12
22314-E1-K-T41A	**XL**	**AHX2314G**	4,12	0,407	**65**	70	150	51	2,1	128	86,7	4,8	9,5	4	12
22215-E1-K	**XL**	**AH315G**	1,68	0,284	**70**	75	130	31	1,5	117,7	89,8	3,2	6,5	4	8
21315-E1-K	**XL**	**AH315G**	2,86	0,284	**70**	75	160	37	2,1	135,2	99,7	3,2	6,5	4	8
22315-E1-K	**XL**	**AHX2315G**	5,06	0,5	**70**	75	160	55	2,1	136,3	92,4	4,8	9,5	4	12
22315-E1-K-T41A	**XL**	**AHX2315G**	5,06	0,5	**70**	75	160	55	2,1	136,3	92,4	4,8	9,5	4	12
22216-E1-K	**XL**	**AH316**	2,08	0,366	**75**	80	140	33	2	126,8	94,9	3,2	6,5	4	8
21316-E1-K	**XL**	**AH316**	2,65	0,366	**75**	80	170	39	2,1	135,4	99,8	3,2	6,5	4	8
22316-E1-K	**XL**	**AHX2316**	6,05	0,6	**75**	80	170	58	2,1	145,1	98,3	4,8	9,5	4	12
22316-E1-K-T41A	**XL**	**AHX2316**	6,05	0,6	**75**	80	170	58	2,1	145,1	98,3	4,8	9,5	4	12

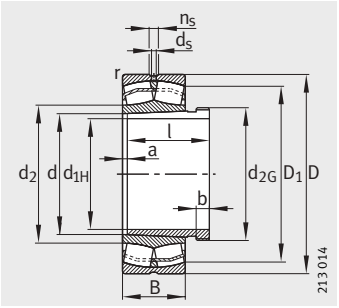


Mounting dimensions

		Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
Thread d_{2G}	l	d_a	D_a	r_a	C_r	C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
		min.	max.	max.	N	N					N	min^{-1}	min^{-1}
M45X1,5	29	47	73	1	102 000	90 000	0,28	2,41	3,59	2,35	11 800	10 000	6 400
M45X1,5	29	49	81	1,5	108 000	106 000	0,24	2,81	4,19	2,75	14 300	9 500	6 100
M45X1,5	40	49	81	1,5	156 000	150 000	0,36	1,86	2,77	1,82	13 100	7 500	5 800
M50X1,5	31	52	78	1	104 000	98 000	0,26	2,62	3,9	2,56	12 700	10 000	5 800
M50X1,5	31	54	91	1,5	129 000	129 000	0,23	2,92	4,35	2,86	17 300	8 500	5 500
M50X1,5	44	54	91	1,5	186 000	183 000	0,36	1,9	2,83	1,86	16 100	6 700	5 300
M55X2	35	57	83	1	108 000	106 000	0,24	2,81	4,19	2,75	14 300	9 500	5 300
M55X2	35	61	99	2	129 000	129 000	0,23	2,92	4,35	2,86	17 300	8 500	5 300
M55X2	50	61	99	2	228 000	224 000	0,36	1,86	2,77	1,82	20 300	6 000	4 950
M60X2	37	64	91	1,5	129 000	129 000	0,23	2,92	4,35	2,86	17 300	8 500	4 850
M60X2	37	66	109	2	170 000	166 000	0,24	2,84	4,23	2,78	21 200	6 300	4 950
M60X2	54	66	109	2	265 000	260 000	0,36	1,89	2,81	1,84	23 900	5 600	4 650
M60X2	54	66	109	2	265 000	260 000	0,36	1,89	2,81	1,84	23 900	5 600	4 650
M65X2	40	69	101	1,5	170 000	166 000	0,24	2,84	4,23	2,78	21 200	7 500	4 650
M65X2	40	72	118	2,1	212 000	228 000	0,23	2,95	4,4	2,89	28 000	6 300	4 500
M65X2	58	72	118	2,1	310 000	310 000	0,35	1,91	2,85	1,87	28 000	5 000	4 300
M65X2	58	72	118	2,1	310 000	310 000	0,35	1,91	2,85	1,87	28 000	5 000	4 300
M70X2	42	74	111	1,5	200 000	208 000	0,24	2,81	4,19	2,75	25 500	6 700	4 400
M70X2	42	77	128	2,1	250 000	270 000	0,22	3,14	4,67	3,07	34 000	5 000	4 200
M70X2	61	77	128	2,1	355 000	365 000	0,34	2	2,98	1,96	32 500	4 800	3 950
M70X2	61	77	128	2,1	355 000	365 000	0,34	2	2,98	1,96	32 500	4 800	3 950
M75X2	43	79	116	1,5	212 000	228 000	0,23	2,95	4,4	2,89	28 000	6 300	4 100
M75X2	43	82	138	2,1	250 000	270 000	0,22	3,14	4,67	3,07	34 000	5 000	4 100
M75X2	64	82	138	2,1	390 000	390 000	0,34	2	2,98	1,96	36 500	4 500	3 850
M75X2	64	82	138	2,1	390 000	390 000	0,34	2	2,98	1,96	36 500	4 500	3 850
M80X2	45	84	121	1,5	216 000	236 000	0,22	3,1	4,62	3,03	29 500	6 300	3 900
M80X2	45	87	148	2,1	305 000	325 000	0,22	3,04	4,53	2,97	38 500	4 800	3 850
M80X2	68	87	148	2,1	440 000	450 000	0,34	1,99	2,96	1,94	40 500	4 300	3 650
M80X2	68	87	148	2,1	440 000	450 000	0,34	1,99	2,96	1,94	40 500	4 300	3 650
M90X2	48	91	129	2	250 000	270 000	0,22	3,14	4,67	3,07	34 000	5 600	3 700
M90X2	48	92	158	2,1	305 000	325 000	0,22	3,04	4,53	2,97	38 500	4 800	3 750
M90X2	71	92	158	2,1	500 000	510 000	0,34	1,99	2,96	1,94	45 000	4 300	3 450
M90X2	71	92	158	2,1	500 000	510 000	0,34	1,99	2,96	1,94	45 000	4 300	3 450

Spherical roller bearings

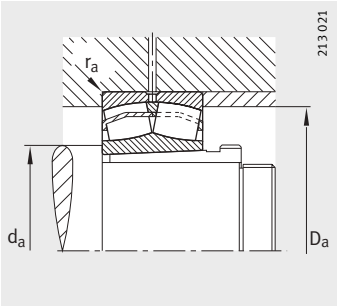
With extraction sleeve



E1 design

Dimension table (continued) · Dimensions in mm

Designation			Mass m		Dimensions										
Bearing	X-life	Extraction sleeve	Bearing ≈kg	Extraction sleeve ≈kg	d_{1H}	d	D	B	r min.	D_1 ≈	d_2 ≈	d_s	n_s	a ≈	b
22217-E1-K	**XL**	**AHX317**	2,59	0,43	**80**	85	150	36	2	135,4	99,7	3,2	6,5	4	9
21317-E1-K	**XL**	**AHX317**	5,37	0,43	**80**	85	180	41	3	143,9	106,1	4,8	9,5	4	9
22317-E1-K	**XL**	**AHX2317**	7,06	0,7	**80**	85	180	60	3	154,2	104,4	4,8	9,5	4	13
22317-E1-K-T41A	**XL**	**AHX2317**	7,06	0,7	**80**	85	180	60	3	154,2	104,4	4,8	9,5	4	13
22218-E1-K	**XL**	**AHX318**	3,35	0,466	**85**	90	160	40	2	143,9	106,1	3,2	6,5	4	9
23218-E1A-K-M	**XL**	**AHX3218**	4,34	0,6	**85**	90	160	52,4	2	140	–	3,2	6,5	4	10
23218-E1-K-TVPB	**XL**	**AHX3218**	4,08	0,6	**85**	90	160	52,4	2	140	104,1	3,2	6,5	4	10
21318-E1-K	**XL**	**AHX318**	6,26	0,466	**85**	90	190	43	3	152,7	112,6	4,8	9,5	4	9
22318-E1-K	**XL**	**AHX2318**	8,33	0,8	**85**	90	190	64	3	162,5	110,2	6,3	12,2	4	14
22318-E1-K-T41A	**XL**	**AHX2318**	8,33	0,8	**85**	90	190	64	3	162,5	110,2	6,3	12,2	4	14
22219-E1-K	**XL**	**AHX319**	4,04	0,54	**90**	95	170	43	2,1	152,7	112,6	4,8	9,5	4	10
21319-E1-K-TVPB	**XL**	**AHX319**	6,53	0,54	**90**	95	200	45	3	169,4	124,3	4,8	9,5	4	10
22319-E1-K	**XL**	**AHX2319**	9,46	0,894	**90**	95	200	67	3	171,2	116	6,3	12,2	4	16
22319-E1-K-T41A	**XL**	**AHX2319**	9,46	0,894	**90**	95	200	67	3	171,2	116	6,3	12,2	4	16
23120-E1A-K-M	**XL**	**AHX3120**	4,23	0,654	**95**	100	165	52	2	146,3	–	3,2	6,5	4	11
23120-E1-K-TVPB	**XL**	**AHX3120**	4,06	0,654	**95**	100	165	52	2	146,3	113,9	3,2	6,5	4	11
22220-E1-K	**XL**	**AHX320**	4,91	0,595	**95**	100	180	46	2,1	161,4	119	4,8	9,5	4	10
23220-E1A-K-M	**XL**	**AHX3220**	6,33	0,765	**95**	100	180	60,3	2,1	156,7	–	4,8	9,5	4	11
23220-E1-K-TVPB	**XL**	**AHX3220**	6,13	0,765	**95**	100	180	60,3	2,1	156,7	116,7	4,8	9,5	4	11
21320-E1-K-TVPB	**XL**	**AHX320**	8,08	0,595	**95**	100	215	47	3	182	132	4,8	9,5	4	10
22320-E1-K	**XL**	**AHX2320**	13,1	1,01	**95**	100	215	73	3	184,7	130,2	6,3	12,2	4	16
22320-E1-K-T41A	**XL**	**AHX2320**	13,1	1,01	**95**	100	215	73	3	184,7	130,2	6,3	12,2	4	16
23122-E1A-K-M	**XL**	**AHX3122**	5,1	0,774	**105**	110	180	56	2	160	–	4,8	9,5	4	11
23122-E1-K-TVPB	**XL**	**AHX3122**	4,95	0,774	**105**	110	180	56	2	160	124,6	4,8	9,5	4	11
24122-E1-K30-TVPB	**XL**	**AH24122**	6,69	0,725	**105**	110	180	69	2	154,8	125,1	3,2	6,5	9	13
22222-E1-K	**XL**	**AHX3122**	6,82	0,774	**105**	110	200	53	2,1	178,7	129,4	4,8	9,5	4	11
23222-E1A-K-M	**XL**	**AHX3222A**	9,32	0,974	**105**	110	200	69,8	2,1	172,7	–	4,8	9,5	4	11
23222-E1-K-TVPB	**XL**	**AHX3222A**	8,82	0,974	**105**	110	200	69,8	2,1	172,7	129,1	4,8	9,5	4	11
21322-E1-K-TVPB	**XL**	**AHX322**	10,9	0,663	**105**	110	240	50	3	202,5	146,4	6,3	12,2	4	12
22322-E1-K	**XL**	**AHX2322G**	17,4	1,24	**105**	110	240	80	3	204,9	143,1	8	15	4	16
22322-E1-K-T41A	**XL**	**AHX2322G**	17,4	1,24	**105**	110	240	80	3	204,9	143,1	8	15	4	16

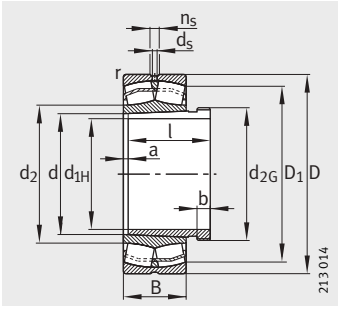


Mounting dimensions

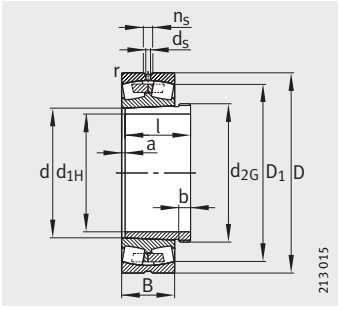
		Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
Thread d_{2G}	l	d_a min.	D_a max.	r_a max.	C_r N	C_{0r} N	e	Y_1	Y_2	Y_0	C_{ur} N	n_G min^{-1}	n_B min^{-1}
M95X2	52	96	139	2	305 000	325 000	0,22	3,04	4,53	2,97	38 500	5 300	3 550
M95X2	52	99	166	2,5	345 000	375 000	0,23	2,9	4,31	2,83	42 500	4 800	3 550
M95X2	74	99	166	2,5	540 000	560 000	0,33	2,04	3,04	2	50 000	4 000	3 300
M95X2	74	99	166	2,5	540 000	560 000	0,33	2,04	3,04	2	50 000	4 000	3 300
M100X2	53	101	149	2	345 000	375 000	0,23	2,9	4,31	2,83	42 500	4 800	3 500
M100X2	63	101	149	2	440 000	520 000	0,31	2,2	3,27	2,15	48 500	4 300	2 700
M100X2	63	101	149	2	440 000	520 000	0,31	2,2	3,27	2,15	48 500	4 300	2 700
M100X2	53	104	176	2,5	380 000	415 000	0,24	2,87	4,27	2,8	47 000	4 500	3 450
M100X2	79	104	176	2,5	610 000	630 000	0,33	2,03	3,02	1,98	55 000	3 600	3 100
M100X2	79	104	176	2,5	610 000	630 000	0,33	2,03	3,02	1,98	55 000	3 600	3 100
M105X2	57	107	158	2,1	380 000	415 000	0,24	2,87	4,27	2,8	47 000	4 500	3 400
M105X2	57	109	186	2,5	430 000	455 000	0,22	3,04	4,53	2,97	47 500	4 000	3 300
M105X2	85	109	186	2,5	670 000	695 000	0,33	2,03	3,02	1,98	60 000	3 000	2 900
M105X2	85	109	186	2,5	670 000	695 000	0,33	2,03	3,02	1,98	60 000	3 000	2 900
M110X2	64	111	154	2	450 000	570 000	0,28	2,37	3,53	2,32	52 000	4 300	2 800
M110X2	64	111	154	2	450 000	570 000	0,28	2,37	3,53	2,32	52 000	4 300	2 800
M110X2	59	112	168	2,1	430 000	475 000	0,24	2,84	4,23	2,78	52 000	4 300	3 300
M110X2	73	112	168	2,1	550 000	655 000	0,31	2,15	3,2	2,1	60 000	3 600	2 470
M110X2	73	112	168	2,1	550 000	655 000	0,31	2,15	3,2	2,1	60 000	3 600	2 470
M110X2	59	114	201	2,5	490 000	530 000	0,22	3,14	4,67	3,07	61 000	3 600	3 100
M110X2	90	114	201	2,5	815 000	915 000	0,33	2,03	3,02	1,98	75 000	3 000	2 550
M110X2	90	114	201	2,5	815 000	915 000	0,33	2,03	3,02	1,98	75 000	3 000	2 550
M120X2	68	121	169	2	530 000	680 000	0,28	2,41	3,59	2,35	61 000	4 000	2 600
M120X2	68	121	169	2	530 000	680 000	0,28	2,39	3,56	2,34	61 000	4 000	2 600
M115X2	82	121	169	2	620 000	900 000	0,35	1,94	2,88	1,89	67 000	2 600	1 820
M120X2	68	122	188	2,1	550 000	600 000	0,25	2,71	4,04	2,65	62 000	4 000	3 100
M120X2	82	122	188	2,1	710 000	865 000	0,33	2,06	3,06	2,01	72 000	3 000	2 150
M120X2	82	122	188	2,1	710 000	865 000	0,33	2,06	3,06	2,01	72 000	3 000	2 150
M120X2	63	124	226	2,5	600 000	640 000	0,21	3,24	4,82	3,16	69 000	3 000	2 750
M120X2	98	124	226	2,5	950 000	1 060 000	0,33	2,07	3,09	2,03	91 000	2 600	2 250
M120X2	98	124	226	2,5	950 000	1 060 000	0,33	2,07	3,09	2,03	91 000	2 600	2 250

Spherical roller bearings

With extraction sleeve



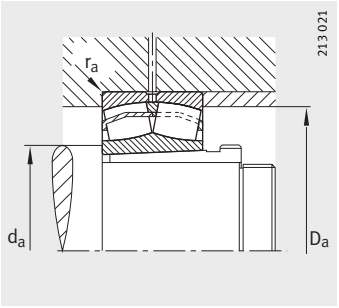
E1 design



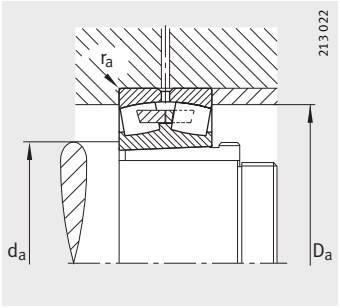
With central rib

Dimension table (continued) · Dimensions in mm

Designation			Mass m		Dimensions										
Bearing	X-life	Extraction sleeve	Bearing ≈kg	Extraction sleeve ≈kg	d_{1H}	d	D	B	r min.	D_1 ≈	d_2 ≈	d_s	n_s	a ≈	b
23024-E1A-K-M	**XL**	**AHX3024**	4,09	0,741	**115**	120	180	46	2	164,7	–	3,2	6,5	4	13
23024-E1-K-TVPB	**XL**	**AHX3024**	3,67	0,741	**115**	120	180	46	2	164,7	133	3,2	6,5	4	13
24024-E1-K30-TVPB	**XL**	**AH24024**	6,11	0,694	**115**	120	180	60	2	160	132	3,2	6,5	9	13
24024-S-K30-MB	–	**AH24024**	5,35	0,694	**115**	120	180	60	2	159,8	–	3,2	6,5	9	13
23124-E1A-K-M	**XL**	**AHX3124**	7,57	0,954	**115**	120	200	62	2	177,4	–	4,8	9,5	4	12
23124-E1-K-TVPB	**XL**	**AHX3124**	7,06	0,954	**115**	120	200	62	2	177,4	136,2	4,8	9,5	4	12
24124-E1-K30-TVPB	**XL**	**AH24124**	11,5	1	**115**	120	200	80	2	170,6	136,3	3,2	6,5	9	13
22224-E1-K	**XL**	**AHX3124**	8,84	0,954	**115**	120	215	58	2,1	192	141,8	6,3	12,2	4	12
23224-E1A-K-M	**XL**	**AHX3224A**	11,4	1,2	**115**	120	215	76	2,1	185,5	–	4,8	9,5	4	13
23224-E1-K-TVPB	**XL**	**AHX3224A**	11,1	1,2	**115**	120	215	76	2,1	185,5	139	4,8	9,5	4	13
22324-E1-K	**XL**	**AHX2324G**	22,1	1,5	**115**	120	260	86	3	222,4	150,7	8	15	4	17
22324-E1-K-T41A	**XL**	**AHX2324G**	22,1	1,5	**115**	120	260	86	3	222,4	150,7	8	15	4	17
23026-E1A-K-M	**XL**	**AHX3026**	5,7	0,916	**125**	130	200	52	2	182,3	–	4,8	9,5	4	14
23026-E1-K-TVPB	**XL**	**AHX3026**	5,42	0,916	**125**	130	200	52	2	182,3	145,9	4,8	9,5	4	19
24026-E1-K30-TVPB	**XL**	**AH24026**	7,57	0,875	**125**	130	200	69	2	176,9	144,7	3,2	6,5	10	14
23126-E1A-K-M	**XL**	**AHX3126**	8,1	1,1	**125**	130	210	64	2	187,3	–	4,8	9,5	4	12
23126-E1-K-TVPB	**XL**	**AHX3126**	7,82	1,1	**125**	130	210	64	2	187,3	146	4,8	9,5	4	12
24126-E1-K30-TVPB	**XL**	**AH24126**	10,1	1,12	**125**	130	210	80	2	181,1	146,4	3,2	6,5	10	14
22226-E1-K	**XL**	**AHX3126**	10,9	1,1	**125**	130	230	64	3	205	151,7	6,3	12,2	4	12
23226-E1A-K-M	**XL**	**AHX3226G**	13,6	1,5	**125**	130	230	80	3	199,3	–	4,8	9,5	4	15
23226-E1-K-TVPB	**XL**	**AHX3226G**	12,6	1,5	**125**	130	230	80	3	199,3	150	4,8	9,5	4	15
22326-E1-K	**XL**	**AHX2326G**	27,4	1,8	**125**	130	280	93	4	239,5	162,2	9,5	17,7	4	19
22326-E1-K-T41A	**XL**	**AHX2326G**	27,4	1,8	**125**	130	280	93	4	239,5	162,2	9,5	17,7	4	19
23028-E1A-K-M	**XL**	**AHX3028**	6	1,01	**135**	140	210	53	2	192,3	–	4,8	9,5	5	14
23028-E1-K-TVPB	**XL**	**AHX3028G**	5,81	1,01	**135**	140	210	53	2	192,3	155,4	4,8	9,5	5	14
24028-E1-K30-TVPB	**XL**	**AH24028**	7,96	0,944	**135**	140	210	69	2	187,2	154,2	3,2	6,5	10	14
24028-S-K30-MB	–	**AH24028**	8,38	0,944	**135**	140	210	69	2	186,4	–	3,2	6,5	10	14
23128-E1A-K-M	**XL**	**AHX3128**	7,78	1,28	**135**	140	225	68	2,1	201	–	4,8	9,5	5	14
23128-E1-K-TVPB	**XL**	**AHX3128**	9,46	1,28	**135**	140	225	68	2,1	201	157,1	4,8	9,5	5	14
24128-E1-K30-TVPB	**XL**	**AH24128**	11,8	1,28	**135**	140	225	85	2,1	194,4	157	4,8	9,5	10	14
22228-E1-K	**XL**	**AHX3128**	13,7	1,28	**135**	140	250	68	3	223,4	164,9	6,3	12,2	5	14
23228-E1A-K-M	**XL**	**AHX3228G**	17,6	1,72	**135**	140	250	88	3	216	–	6,3	12,2	5	15
23228-E1-K-TVPB	**XL**	**AHX3228G**	17,1	1,72	**135**	140	250	88	3	216	162	6,3	12,2	5	15
22328-E1-K	**XL**	**AHX2328G**	34,4	2,21	**135**	140	300	102	4	255,7	173,5	9,5	17,7	5	20
22328-E1-K-T41A	**XL**	**AHX2328G**	34,4	2,21	**135**	140	300	102	4	255,7	173,5	9,5	17,7	5	20



Mounting dimensions
E1 design

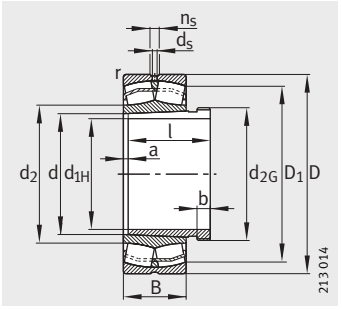


Mounting dimensions
With central rib

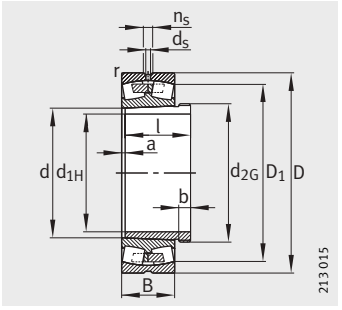
		Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
Thread d_{2G}	l	d_a	D_a	r_a	C_r	C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
		min.	max.	max.	N	N					N	min^{-1}	min^{-1}
M130X2	60	128,8	171,2	2	430 000	585 000	0,22	3,04	4,53	2,97	58 000	4 300	2 850
M130X2	60	128,8	171,2	2	430 000	585 000	0,22	3,04	4,53	2,97	58 000	4 300	2 850
M125X2	73	128,8	171,2	2	540 000	800 000	0,29	2,3	3,42	2,25	72 000	3 000	2 290
M125X2	73	128,8	171,2	2	405 000	710 000	0,32	2,09	3,11	2,04	40 000	2 600	2 380
M130X2	75	131	189	2	630 000	800 000	0,28	2,39	3,56	2,34	73 000	3 400	2 330
M130X2	75	131	189	2	630 000	800 000	0,28	2,39	3,56	2,34	73 000	3 400	2 330
M130X2	93	131	189	2	780 000	1 120 000	0,37	1,84	2,74	1,8	85 000	2 200	1 610
M130X2	75	132	203	2,1	640 000	735 000	0,25	2,71	4,04	2,65	71 000	3 400	2 800
M130X2	90	132	203	2,1	815 000	1 020 000	0,33	2,03	3,02	1,98	80 000	2 800	1 940
M130X2	90	132	203	2,1	815 000	1 020 000	0,33	2,03	3,02	1,98	80 000	2 800	1 940
M130X2	105	134	246	2,5	1 080 000	1 160 000	0,33	2,06	3,06	2,01	103 000	2 600	2 080
M130X2	105	134	246	2,5	1 080 000	1 160 000	0,33	2,06	3,06	2,01	103 000	2 600	2 080
M140X2	67	138,8	191,2	2	540 000	735 000	0,23	2,95	4,4	2,89	70 000	3 600	2 650
M140X2	67	138,8	191,2	2	540 000	735 000	0,23	2,95	4,4	2,89	70 000	3 600	2 650
M135X2	83	138,8	191,2	2	680 000	1 020 000	0,31	2,21	3,29	2,16	85 000	2 600	2 050
M140X2	78	141	199	2	680 000	900 000	0,28	2,45	3,64	2,39	79 000	3 000	2 130
M140X2	78	141	199	2	680 000	900 000	0,28	2,45	3,64	2,39	79 000	3 000	2 130
M140X2	94	141	199	2	815 000	1 200 000	0,34	1,96	2,92	1,92	93 000	2 200	1 480
M140X2	78	144	216	2,5	760 000	900 000	0,26	2,62	3,9	2,56	79 000	3 000	2 550
M140X2	98	144	216	2,5	900 000	1 140 000	0,33	2,07	3,09	2,03	89 000	2 600	1 780
M140X2	98	144	216	2,5	900 000	1 140 000	0,33	2,07	3,09	2,03	89 000	2 600	1 780
M140X2	115	147	263	3	1 250 000	1 370 000	0,33	2,06	3,06	2,01	117 000	2 400	1 870
M140X2	115	147	263	3	1 250 000	1 370 000	0,33	2,06	3,06	2,01	117 000	2 400	1 870
M150X2	68	148,8	201,2	2	570 000	800 000	0,22	3,07	4,57	3	76 000	3 600	2 440
M150X2	68	148,8	201,2	2	570 000	800 000	0,22	3,07	4,57	3	76 000	3 600	2 440
M145X2	83	148,8	201,2	2	720 000	1 100 000	0,29	2,33	3,47	2,28	93 000	2 600	1 880
M145X2	83	148,8	201,2	2	510 000	915 000	0,32	2,1	3,13	2,06	56 000	2 400	2 000
M150X2	83	152	213	2,1	765 000	1 020 000	0,27	2,49	3,71	2,43	88 000	2 800	1 960
M150X2	83	152	213	2,1	765 000	1 020 000	0,27	2,49	3,71	2,43	88 000	2 800	1 960
M150X2	99	152	213	2,1	930 000	1 370 000	0,34	1,98	2,94	1,93	104 000	2 000	1 340
M150X2	83	154	236	2,5	880 000	1 040 000	0,25	2,67	3,97	2,61	97 000	2 400	2 320
M150X2	104	154	236	2,5	1 080 000	1 400 000	0,33	2,04	3,04	2	112 000	2 400	1 580
M150X2	104	154	236	2,5	1 080 000	1 400 000	0,33	2,04	3,04	2	112 000	2 400	1 580
M150X2	125	157	283	3	1 460 000	1 630 000	0,34	2	2,98	1,96	132 000	2 200	1 700
M150X2	125	157	283	3	1 460 000	1 630 000	0,34	2	2,98	1,96	132 000	2 200	1 700

Spherical roller bearings

With extraction sleeve



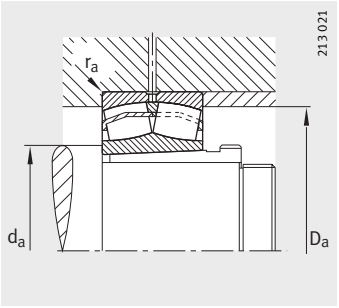
E1 design



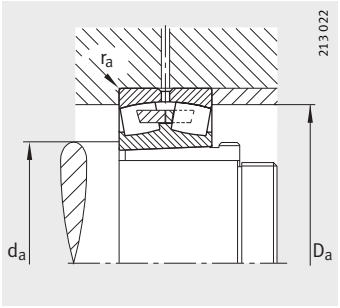
With central rib

Dimension table (continued) · Dimensions in mm

Designation			Mass m		Dimensions										
Bearing	X-life	Extraction sleeve	Bearing ≈kg	Extraction sleeve ≈kg	d_{1H}	d	D	B	r min.	D_1 ≈	d_2 ≈	d_s	n_s	a ≈	b
23030-E1A-K-M	**XL**	**AHX3030**	7,33	1,15	**145**	150	225	56	2,1	206,3	–	4,8	9,5	5	15
23030-E1-K-TVPB	**XL**	**AHX3030**	7,29	1,15	**145**	150	225	56	2,1	206,3	166,6	4,8	9,5	5	15
24030-E1-K30-TVPB	**XL**	**AH24030**	10	1,1	**145**	150	225	75	2,1	200,2	165,2	4,8	9,5	11	15
24030-S-K30-MB	–	**AH24030**	10,7	1,1	**145**	150	225	75	2,1	199,1	–	4,8	9,5	11	15
23130-E1A-K-M	**XL**	**AHX3130G**	15,8	1,64	**145**	150	250	80	2,1	220,8	–	6,3	12,2	5	15
23130-E1-K-TVPB	**XL**	**AHX3130G**	14,5	1,64	**145**	150	250	80	2,1	220,8	170,1	6,3	12,2	5	15
24130-BS-K30	–	**AH24130**	19	1,61	**145**	150	250	100	2,1	211,3	–	4,8	9,5	11	15
22230-E1-K	**XL**	**AHX3130G**	17,8	1,64	**145**	150	270	73	3	240,8	177,9	8	15	5	15
23230-E1A-K-M	**XL**	**AHX3230G**	22,9	2,07	**145**	150	270	96	3	232,6	–	6,3	12,2	5	17
23230-E1-K-TVPB	**XL**	**AHX3230G**	22,3	2,07	**145**	150	270	96	3	232,6	174	6,3	12,2	5	17
22330-E1-K	**XL**	**AHX2330G**	41,2	2,6	**145**	150	320	108	4	273,2	185,3	9,5	17,7	5	24
22330-E1-K-T41A	**XL**	**AHX2330G**	41,2	2,6	**145**	150	320	108	4	273,2	185,3	9,5	17,7	5	24
23032-E1A-K-M	**XL**	**AH3032**	9,42	2,04	**150**	160	240	60	2,1	219,9	–	6,3	12,2	5	16
23032-E1-K-TVPB	**XL**	**AH3032**	8,67	2,04	**150**	160	240	60	2,1	219,9	177	6,3	12,2	5	16
24032-E1-K30-TVPB	**XL**	**AH24032**	11,8	2,27	**150**	160	240	80	2,1	213,6	176	4,8	9,5	11	15
24032-S-K30-MB	–	**AH24032**	12,8	2,27	**150**	160	240	80	2,1	211,2	–	4,8	9,5	11	15
23132-E1A-K-M	**XL**	**AH3132A**	18,6	2,87	**150**	160	270	86	2,1	238,3	–	8	15	5	16
23132-E1-K-TVPB	**XL**	**AH3132A**	18,4	2,87	**150**	160	270	86	2,1	238,3	183,2	8	15	5	16
24132-BS-K30	–	**AH24132**	25	3,02	**150**	160	270	109	2,1	230,2	–	4,8	9,5	11	15
22232-E1-K	**XL**	**AH3132A**	22,4	2,87	**150**	160	290	80	3	258,2	190,9	8	15	5	16
23232-E1A-K-M	**XL**	**AH3232G**	28,5	3,6	**150**	160	290	104	3	249,3	–	8	15	6	20
23232-E1-K-TVPB	**XL**	**AH3232G**	27,7	3,6	**150**	160	290	104	3	249,3	186,7	8	15	6	20
22332-K-MB	–	**AH2332G**	50,1	4,24	**150**	160	340	114	4	288,3	–	9,5	17,7	6	24
23034-E1A-K-M	**XL**	**AH3034**	12	2,43	**160**	170	260	67	2,1	237,2	–	6,3	12,2	5	17
23034-E1-K-TVPB	**XL**	**AH3034**	11,9	2,43	**160**	170	260	67	2,1	237,2	189,8	6,3	12,2	5	17
24034-BS-K30-MB	–	**AH24034**	16,8	2,7	**160**	170	260	90	2,1	228,8	–	4,8	9,5	11	16
23134-E1A-K-M	**XL**	**AH3134A**	19,5	3,09	**160**	170	280	88	2,1	248,1	–	8	15	5	16
23134-E1-K-TVPB	**XL**	**AH3134A**	19,9	3,09	**160**	170	280	88	2,1	248,1	193,4	8	15	5	16
24134-BS-K30	–	**AH24134**	25	3,25	**160**	170	280	109	2,1	239,6	–	4,8	9,5	11	16
22234-E1-K	**XL**	**AH3134A**	27,1	3,09	**160**	170	310	86	4	275,4	199,8	9,5	17,7	5	16
23234-E1A-K-M	**XL**	**AH3234G**	34,6	4,25	**160**	170	310	110	4	267,4	–	8	15	6	24
23234-E1-K-TVPB	**XL**	**AH3234G**	33,1	4,25	**160**	170	310	110	4	267,4	199,8	8	15	6	24
22334-K-MB	–	**AH2334G**	56,9	4,76	**160**	170	360	120	4	304,2	–	9,5	17,7	6	24



Mounting dimensions
E1 design

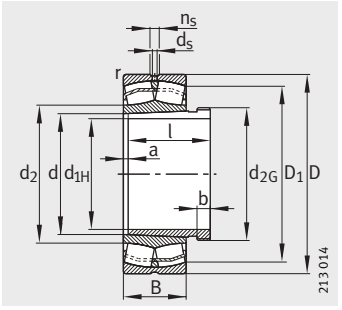


Mounting dimensions
With central rib

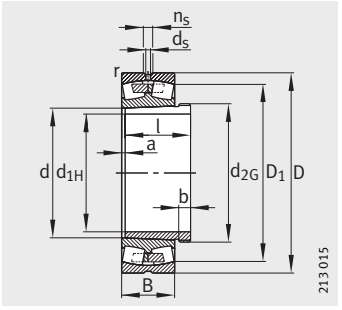
		Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
Thread d_{2G}	l	d_a	D_a	r_a	C_r	C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
		min.	max.	max.	N	N					N	min^{-1}	min^{-1}
M160X3	72	160,2	214,8	2,1	630 000	880 000	0,22	3,1	4,62	3,03	85 000	3 400	2 260
M160X3	72	160,2	214,8	2,1	630 000	880 000	0,22	3,1	4,62	3,03	85 000	3 400	2 260
M155X3	90	160,2	214,8	2,1	815 000	1 250 000	0,29	2,32	3,45	2,26	105 000	2 400	1 740
M155X3	90	160,2	214,8	2,1	620 000	1 140 000	0,33	2,06	3,06	2,01	67 000	2 200	1 800
M160X3	96	162	238	2,1	1 000 000	1 320 000	0,29	2,32	3,45	2,26	143 000	2 600	1 760
M160X3	96	162	238	2,1	1 000 000	1 320 000	0,29	2,32	3,45	2,26	143 000	2 600	1 760
M160X3	115	162	238	2,1	915 000	1 560 000	0,4	1,68	2,5	1,64	100 000	2 000	1 260
M160X3	96	164	256	2,5	1 000 000	1 220 000	0,25	2,69	4	2,63	111 000	2 600	2 110
M160X3	114	164	256	2,5	1 270 000	1 660 000	0,33	2,02	3	1,97	129 000	2 200	1 420
M160X3	114	164	256	2,5	1 270 000	1 660 000	0,33	2,02	3	1,97	129 000	2 200	1 420
M160X3	135	167	303	3	1 630 000	1 860 000	0,33	2,02	3	1,97	147 000	2 000	1 550
M160X3	135	167	303	3	1 630 000	1 860 000	0,33	2,02	3	1,97	147 000	2 000	1 550
M170X3	77	170,2	229,8	2,1	720 000	1 020 000	0,22	3,1	4,62	3,03	94 000	2 800	2 090
M170X3	77	170,2	229,8	2,1	720 000	1 020 000	0,22	3,1	4,62	3,03	94 000	2 800	2 090
M170X3	95	170,2	229,8	2,1	915 000	1 430 000	0,29	2,3	3,42	2,25	117 000	2 200	1 600
M170X3	95	170,2	229,8	2,1	670 000	1 250 000	0,32	2,09	3,11	2,04	71 000	2 000	1 680
M170X3	103	172	258	2,1	1 160 000	1 560 000	0,29	2,32	3,45	2,26	164 000	2 400	1 590
M170X3	103	172	258	2,1	1 160 000	1 560 000	0,29	2,32	3,45	2,26	164 000	2 400	1 590
M170X3	124	172	258	2,1	1 060 000	1 800 000	0,41	1,65	2,46	1,61	106 000	2 000	1 150
M170X3	103	174	276	2,5	1 140 000	1 400 000	0,26	2,64	3,93	2,58	125 000	2 600	1 960
M170X3	124	174	276	2,5	1 460 000	1 900 000	0,34	2	2,98	1,96	146 000	2 200	1 310
M170X3	124	174	276	2,5	1 460 000	1 900 000	0,34	2	2,98	1,96	146 000	2 200	1 310
M170X3	140	177	323	3	1 430 000	1 900 000	0,37	1,8	2,69	1,76	121 000	2 000	1 490
M180X3	85	180,2	249,8	2,1	880 000	1 220 000	0,23	2,98	4,44	2,92	146 000	2 600	1 940
M180X3	85	180,2	249,8	2,1	880 000	1 220 000	0,23	2,98	4,44	2,92	146 000	2 600	1 940
M180X3	106	180,2	249,8	2,1	850 000	1 560 000	0,34	2	2,97	1,95	96 000	2 000	1 530
M180X3	104	182	268	2,1	1 220 000	1 700 000	0,28	2,37	3,53	2,32	174 000	2 400	1 480
M180X3	104	182	268	2,1	1 220 000	1 700 000	0,28	2,37	3,53	2,32	174 000	2 400	1 480
M180X3	125	182	268	2,1	1 060 000	1 830 000	0,39	1,73	2,58	1,69	98 000	1 800	1 100
M180X3	104	187	293	3	1 320 000	1 560 000	0,26	2,6	3,87	2,54	139 000	2 400	1 830
M180X3	134	187	293	3	1 630 000	2 160 000	0,33	2,03	3,02	1,98	163 000	2 000	1 190
M180X3	134	187	293	3	1 630 000	2 160 000	0,33	2,03	3,02	1,98	163 000	2 000	1 190
M180X3	146	187	343	3	1 600 000	2 120 000	0,37	1,83	2,72	1,79	134 000	1 800	1 380

Spherical roller bearings

With extraction sleeve



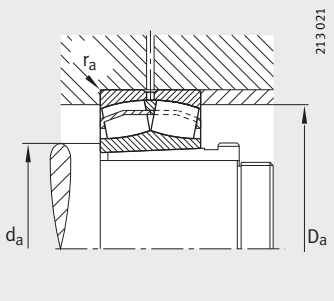
E1 design



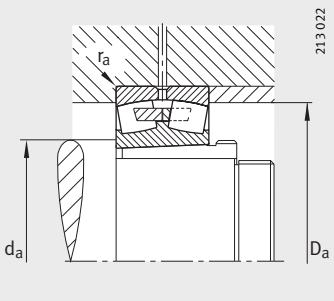
With central rib

Dimension table (continued) · Dimensions in mm

Designation			Mass m		Dimensions										
Bearing	X-life	Extraction sleeve	Bearing ≈kg	Extraction sleeve ≈kg	d_{1H}	d	D	B	r min.	D_1 ≈	d_2 ≈	d_s	n_s	a ≈	b
23936-S-K-MB	–	**AH3936**	7,76	1,91	**170**	180	250	52	2	230,9	–	4,8	9,5	5	13
23036-E1A-K-M	**XL**	**AH3036**	16	2,84	**170**	180	280	74	2,1	254,3	–	8	15	6	17
23036-E1-K-TVPB	**XL**	**AH3036**	15,6	2,84	**170**	180	280	74	2,1	254,3	201,8	8	15	6	17
24036-BS-K30-MB	–	**AH24036**	22,3	3,18	**170**	180	280	100	2,1	244,2	–	4,8	9,5	11	16
23136-E1A-K-M	**XL**	**AH3136A**	25,5	3,77	**170**	180	300	96	3	264,8	–	8	15	6	19
23136-E1-K-TVPB	**XL**	**AH3136A**	25,9	3,77	**170**	180	300	96	3	264,8	204,1	8	15	6	19
24136-BS-K30	–	**AH24136**	31,8	3,72	**170**	180	300	118	3	253,7	–	6,3	12,2	11	16
22236-E1-K	**XL**	**AH2236G**	28,5	3,3	**170**	180	320	86	4	285,9	211,3	9,5	17,7	5	17
23236-E1A-K-M	**XL**	**AH3236G**	37	4,8	**170**	180	320	112	4	277,3	–	8	15	6	25
23236-E1-K-TVPB	**XL**	**AH3236G**	36	4,8	**170**	180	320	112	4	277,3	210,6	8	15	6	25
22336-K-MB	–	**AH2336G**	66,7	5,4	**170**	180	380	126	4	323,4	–	12,5	23,5	6	26
23038-E1A-K-M	**XL**	**AH3038G**	17,7	3,16	**180**	190	290	75	2,1	264,5	–	8	15	6	18
23038-E1-K-TVPB	**XL**	**AH3038G**	16,3	3,16	**180**	190	290	75	2,1	264,5	211,9	8	15	6	18
24038-BS-K30-MB	–	**AH24038**	24,2	3,46	**180**	190	290	100	2,1	255	–	4,8	9,5	13	18
23138-E1A-K-M	**XL**	**AH3138G**	32,4	4,4	**180**	190	320	104	3	281,6	–	8	15	6	20
23138-E1-K-TVPB	**XL**	**AH3138G**	30,3	4,4	**180**	190	320	104	3	281,6	217	8	15	6	20
24138-B-K30	–	**AH24138**	41,5	4,37	**180**	190	320	128	3	270	–	6,3	12,2	13	18
22238-K-MB	–	**AH2238G**	36,2	3,8	**180**	190	340	92	4	296	–	9,5	17,7	5	18
23238-B-K-MB	–	**AH3238G**	46	5,3	**180**	190	340	120	4	291,2	–	9,5	17,7	7	25
22338-K-MB	–	**AH2338G**	77,3	6,04	**180**	190	400	132	5	338,2	–	12,5	23,5	7	26
23940-S-K-MB	–	**AH3940**	11,5	2,62	**190**	200	280	60	2,1	256,9	–	6,3	12,2	6	16
23040-E1A-K-M	**XL**	**AH3040G**	21,4	3,57	**190**	200	310	82	2,1	281,6	–	8	15	6	19
23040-E1-K-TVPB	**XL**	**AH3040G**	20,8	3,57	**190**	200	310	82	2,1	281,6	223,4	8	15	6	19
24040-BS-K30-MB	–	**AH24040**	30	3,93	**190**	200	310	109	2,1	270,8	–	6,3	12,2	13	18
23140-B-K-MB	–	**AH3140**	41,7	5,5	**190**	200	340	112	3	293,3	–	9,5	17,7	6	21
24140-B-K30	–	**AH24140**	51,6	5	**190**	200	340	140	3	285,9	–	6,3	12,2	13	18
22240-B-K-MB	–	**AH2240**	42,3	4,73	**190**	200	360	98	4	312	–	9,5	17,7	5	19
23240-B-K-MB	–	**AH3240**	55,8	6,59	**190**	200	360	128	4	307,5	–	9,5	17,7	7	24
22340-K-MB	–	**AH2340**	89,5	7,6	**190**	200	420	138	5	357,4	–	12,5	23,5	7	30



Mounting dimensions
E1 design

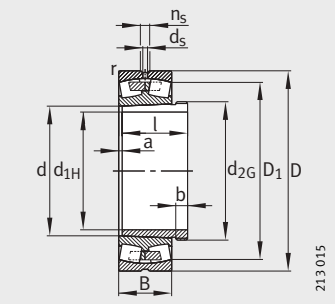


Mounting dimensions
With central rib

		Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
Thread d_{2G}	l	d_a min.	D_a max.	r_a max.	C_r N	C_{0r} N	e	Y_1	Y_2	Y_0	C_{ur} N	n_G min^{-1}	n_B min^{-1}
M190X3	66	188,8	241,2	2	440 000	850 000	0,2	3,42	5,09	3,34	57 000	2 200	2 320
M190X3	92	190,2	269,8	2,1	1 040 000	1 460 000	0,23	2,9	4,31	2,83	170 000	2 600	1 790
M190X3	92	190,2	269,8	2,1	1 040 000	1 460 000	0,23	2,9	4,31	2,83	170 000	2 600	1 790
M190X3	116	190,2	269,8	2,1	1 000 000	1 830 000	0,36	1,9	2,83	1,86	106 000	1 800	1 420
M190X3	116	194	286	2,5	1 430 000	1 960 000	0,29	2,32	3,45	2,26	196 000	2 200	1 370
M190X3	116	194	286	2,5	1 430 000	1 960 000	0,29	2,32	3,45	2,26	196 000	2 200	1 370
M190X3	134	194	286	2,5	1 250 000	2 200 000	0,4	1,68	2,5	1,64	136 000	1 700	980
M190X3	105	197	303	3	1 370 000	1 660 000	0,25	2,71	4,04	2,65	148 000	2 400	1 720
M190X3	140	197	303	3	1 700 000	2 360 000	0,33	2,07	3,09	2,03	173 000	2 000	1 110
M190X3	140	197	303	3	1 700 000	2 360 000	0,33	2,07	3,09	2,03	173 000	2 000	1 110
M190X3	154	197	363	3	1 760 000	2 360 000	0,37	1,83	2,72	1,79	209 000	1 500	1 280
M200X3	96	200,2	279,8	2,1	1 080 000	1 560 000	0,23	2,98	4,44	2,92	180 000	2 400	1 690
M200X3	96	200,2	279,8	2,1	1 080 000	1 560 000	0,23	2,98	4,44	2,92	180 000	2 400	1 690
M200X3	118	200,2	279,8	2,1	1 040 000	1 960 000	0,34	2	2,98	1,96	110 000	1 700	1 320
M200X3	125	204	306	2,5	1 600 000	2 240 000	0,3	2,28	3,39	2,23	218 000	2 000	1 270
M200X3	125	204	306	2,5	1 600 000	2 240 000	0,3	2,28	3,39	2,23	218 000	2 000	1 270
M200X3	146	204	306	2,5	1 400 000	2 500 000	0,41	1,66	2,47	1,62	145 000	1 500	910
M200X3	112	207	323	3	1 200 000	1 830 000	0,28	2,39	3,56	2,34	122 000	1 800	1 620
M200X3	145	207	323	3	1 560 000	2 600 000	0,36	1,86	2,77	1,82	156 000	1 700	1 040
M200X3	160	210	380	4	1 860 000	2 500 000	0,37	1,83	2,72	1,79	213 000	1 500	1 220
Tr210X4	77	210,2	269,8	2,1	550 000	1 080 000	0,2	3,42	5,09	3,34	71 000	2 000	2 110
Tr210X4	102	210,2	299,8	2,1	1 270 000	1 800 000	0,23	2,9	4,31	2,83	203 000	2 400	1 580
Tr210X4	102	210,2	299,8	2,1	1 270 000	1 800 000	0,23	2,9	4,31	2,83	203 000	2 400	1 580
Tr210X4	127	210,2	299,8	2,1	1 200 000	2 280 000	0,35	1,94	2,88	1,89	122 000	1 500	1 220
Tr220X4	134	214	326	2,5	1 320 000	2 280 000	0,35	1,95	2,9	1,91	131 000	1 700	1 240
Tr210X4	158	214	326	2,5	1 700 000	3 000 000	0,42	1,62	2,42	1,59	190 000	1 400	810
Tr220X4	118	217	343	3	1 320 000	2 000 000	0,29	2,35	3,5	2,3	123 000	1 700	1 530
Tr220X4	153	217	343	3	1 660 000	2 750 000	0,37	1,83	2,72	1,79	163 000	1 500	1 000
Tr220X4	170	220	400	4	2 080 000	2 800 000	0,36	1,87	2,79	1,83	189 000	1 400	1 130

Spherical roller bearings

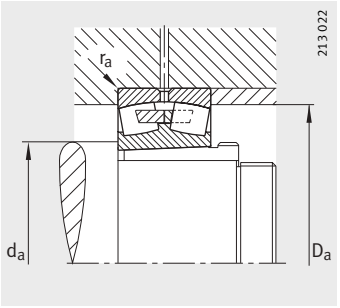
With extraction sleeve



With central rib

Dimension table (continued) · Dimensions in mm

Designation		Mass m		Dimensions									
Bearing	Extraction sleeve	Bearing ≈kg	Extraction sleeve ≈kg	d_{1H}	d	D	B	r min.	D_1 ≈	d_s	n_s	a ≈	b
23944-S-K-MB	**AH3944**	12,3	4,74	**200**	220	300	60	2,1	277,4	6,3	12,2	6	16
23044-K-MB	**AH3044G**	29,9	7,13	**200**	220	340	90	3	301,8	8	15	6	20
24044-B-K30-MB	**AH24044**	38,9	8,11	**200**	220	340	118	3	297,4	6,3	12,2	14	18
23144-B-K-MB	**AH3144**	52	10,4	**200**	220	370	120	4	319,2	9,5	17,7	6	23
24144-B-K30	**AH24144**	64,4	3,61	**200**	220	370	150	4	311,7	6,3	12,2	14	20
22244-B-K-MB	**AH2244**	59,6	9,1	**200**	220	400	108	4	348,7	9,5	17,7	6	20
23244-K-MB	**AH2344**	79	13,6	**200**	220	400	144	4	337,6	9,5	17,7	8	30
22344-K-MB	**AH2344**	114	13,6	**200**	220	460	145	5	391,2	12,5	23,5	8	30
23948-K-MB	**AH3948**	13,4	5,29	**220**	240	320	60	2,1	297,8	6,3	12,2	6	16
23048-K-MB	**AH3048**	31,9	8,8	**220**	240	360	92	3	322,1	8	15	7	21
24048-B-K30-MB	**AH24048**	43,2	8,87	**220**	240	360	118	3	318,9	6,3	12,2	15	20
23148-B-K-MB	**AH3148**	65,3	12,2	**220**	240	400	128	4	346,2	9,5	17,7	7	25
24148-B-K30	**AH24148**	78,7	12,4	**220**	240	400	160	4	338	6,3	12,2	15	20
22248-B-K-MB	**AH2248**	81,2	11,2	**220**	240	440	120	4	380,7	12,5	23,5	6	21
23248-B-K-MB	**AH2348**	105	15,6	**220**	240	440	160	4	371	12,5	23,5	8	30
22348-K-MB	**AH2348**	145	15,6	**220**	240	500	155	5	420	12,5	23,5	8	30
23952-K-MB	**AH3952G**	22,4	7,58	**240**	260	360	75	2,1	330,5	8	15	6	18
23052-K-MB	**AH3052**	46,2	10,7	**240**	260	400	104	4	357,2	9,5	17,7	7	23
24052-B-K30-MB	**AH24052**	64,5	11,8	**240**	260	400	140	4	349,1	6,3	12,2	16	20
23152-K-MB	**AH3152G**	89,6	15,1	**240**	260	440	144	4	379,7	9,5	17,7	7	26
24152-B-K30	**AH24152**	112	15,4	**240**	260	440	180	4	370,3	8	15	16	22
22252-B-K-MB	**AH2252G**	106	13,3	**240**	260	480	130	5	415,3	12,5	23,5	6	23
23252-B-K-MB	**AH2352G**	136	18,7	**240**	260	480	174	5	405,4	12,5	23,5	8	30
22352-K-MB	**AH2352G**	177	18,7	**240**	260	540	165	6	452,1	12,5	23,5	8	30
23956-K-MB	**AH3956G**	24,7	8,19	**260**	280	380	75	2,1	350	8	15	6	18
23056-B-K-MB	**AH3056**	50,3	11,9	**260**	280	420	106	4	376,5	9,5	17,7	8	24
24056-B-K30-MB	**AH24056**	69,7	12,4	**260**	280	420	140	4	369,5	6,3	12,2	17	22
23156-B-K-MB	**AH3156G**	96,4	17,6	**260**	280	460	146	5	401,4	9,5	17,7	8	28
24156-B-K30	**AH24156**	118	16,6	**260**	280	460	180	5	392,8	8	15	17	22
22256-B-K-MB	**AH2256G**	110	14,4	**260**	280	500	130	5	435,2	12,5	23,5	8	24
23256-K-MB	**AH2356G**	153	21	**260**	280	500	176	5	426,3	12,5	23,5	8	30
22356-K-MB	**AH2356G**	224	21	**260**	280	580	175	6	489,3	12,5	23,5	8	30

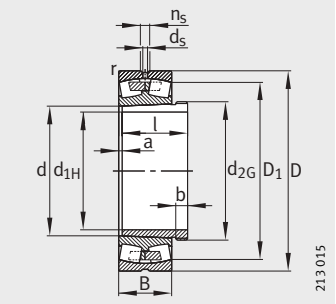


Mounting dimensions

		Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
Thread d_{2G}	l	d_a min.	D_a max.	r_a max.	C_r N	C_{0r} N	e	Y_1	Y_2	Y_0	C_{ur} N	n_G min^{-1}	n_B min^{-1}
Tr230X4	77	230,2	289,8	2,1	600 000	1 250 000	0,18	3,76	5,59	3,67	72 000	1 800	1 880
Tr230X4	111	232,4	327,6	2,5	1 060 000	1 900 000	0,26	2,55	3,8	2,5	132 000	1 700	1 470
Tr230X4	138	232,4	327,6	2,5	1 400 000	2 700 000	0,34	1,96	2,92	1,92	139 000	1 300	1 080
Tr240X4	145	237	353	3	1 630 000	2 900 000	0,33	2,03	3,02	1,98	165 000	1 400	1 070
Tr230X4	170	237	353	3	1 900 000	3 450 000	0,41	1,63	2,43	1,6	197 000	1 300	730
Tr240X4	130	237	383	3	1 630 000	2 450 000	0,29	2,35	3,5	2,3	153 000	1 400	1 340
Tr240X4	181	237	383	3	2 040 000	3 450 000	0,37	1,83	2,72	1,79	181 000	1 400	860
Tr240X4	181	240	440	4	2 320 000	3 350 000	0,35	1,95	2,9	1,91	217 000	1 300	980
Tr250X4	77	250,2	309,8	2,1	640 000	1 370 000	0,17	4,05	6,04	3,96	93 000	1 500	1 700
Tr260X4	116	252,4	347,6	2,5	1 160 000	2 200 000	0,25	2,74	4,08	2,68	130 000	1 400	1 320
Tr250X4	138	252,4	347,6	2,5	1 500 000	2 900 000	0,32	2,1	3,13	2,06	150 000	1 300	980
Tr260X4	154	257	383	3	1 860 000	3 250 000	0,33	2,06	3,06	2,01	177 000	1 300	970
Tr260X4	180	257	383	3	2 120 000	3 900 000	0,41	1,66	2,47	1,62	231 000	1 200	660
Tr260X4	144	257	423	3	1 960 000	3 050 000	0,29	2,35	3,5	2,3	184 000	1 300	1 190
Tr260X4	189	257	423	3	2 450 000	4 250 000	0,37	1,8	2,69	1,76	231 000	1 300	750
Tr260X4	189	260	480	4	2 650 000	3 900 000	0,35	1,95	2,9	1,91	249 000	1 500	870
Tr280X4	94	270,2	349,8	2,1	930 000	1 930 000	0,19	3,54	5,27	3,46	108 000	1 400	1 610
Tr280X4	128	274,6	385,4	3	1 500 000	2 800 000	0,26	2,64	3,93	2,58	154 000	1 300	1 170
Tr270X4	162	274,6	385,4	3	1 900 000	3 800 000	0,35	1,94	2,88	1,89	204 000	1 100	870
Tr280X4	172	277	423	3	2 200 000	4 000 000	0,33	2,03	3,02	1,98	213 000	1 200	860
Tr280X4	202	277	423	3	2 700 000	5 100 000	0,42	1,61	2,4	1,58	315 000	1 100	550
Tr280X4	155	280	460	4	2 240 000	3 450 000	0,29	2,32	3,45	2,26	217 000	1 100	1 080
Tr280X4	205	280	460	4	2 900 000	4 900 000	0,37	1,8	2,69	1,76	270 000	1 100	680
Tr280X4	205	286	514	5	3 000 000	4 400 000	0,34	2	2,98	1,96	290 000	1 100	790
Tr300X4	94	290,2	369,8	2,1	965 000	2 040 000	0,18	3,76	5,59	3,67	129 000	1 300	1 470
Tr300X4	131	294,6	405,4	3	1 560 000	3 000 000	0,25	2,74	4,08	2,68	156 000	1 300	1 080
Tr290X4	162	294,6	405,4	3	2 000 000	4 000 000	0,33	2,04	3,04	2	225 000	1 100	810
Tr300X4	175	300	440	4	2 360 000	4 400 000	0,32	2,12	3,15	2,07	241 000	1 100	790
Tr300X4	202	300	440	4	2 700 000	5 200 000	0,39	1,71	2,54	1,67	365 000	1 000	520
Tr300X4	155	300	480	4	2 360 000	3 650 000	0,28	2,43	3,61	2,37	238 000	1 100	1 010
Tr300X4	212	300	480	4	3 000 000	5 300 000	0,36	1,86	2,77	1,82	260 000	1 100	630
Tr300X4	212	306	554	5	3 550 000	5 400 000	0,33	2,03	3,02	1,98	335 000	950	680

Spherical roller bearings

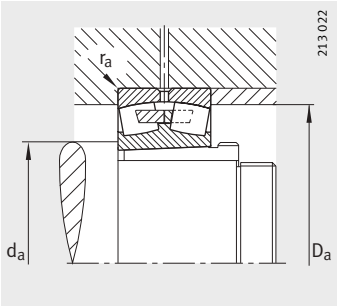
With extraction sleeve



With central rib

Dimension table (continued) · Dimensions in mm

Designation		Mass m		Dimensions									
Bearing	Extraction sleeve	Bearing ≈kg	Extraction sleeve ≈kg	d_{1H}	d	D	B	r min.	D_1 ≈	d_s	n_s	a ≈	b
23960-B-K-MB	**AH3960G**	39,1	10,7	**280**	300	420	90	3	384,6	9,5	17,7	7	21
23060-K-MB	**AH3060**	72,2	14,3	**280**	300	460	118	4	412,6	9,5	17,7	8	26
24060-B-K30-MB	**AH24060**	97,7	15,3	**280**	300	460	160	4	401,5	8	15	18	24
23160-B-K-MB	**AH3160G**	123	19,9	**280**	300	500	160	5	434,7	9,5	17,7	8	30
24160-B-K30	**AH24160**	158	20	**280**	300	500	200	5	424,4	8	15	18	24
22260-K-MB	**AH2260G**	136	17,2	**280**	300	540	140	5	468,8	12,5	23,5	8	26
23260-K-MB	**AH3260G**	192	24,6	**280**	300	540	192	5	458,7	12,5	23,5	8	34
23964-K-MB	**AH3964G**	41	11,4	**300**	320	440	90	3	406,2	9,5	17,7	7	21
23064-K-MB	**AH3064G**	77,1	15,8	**300**	320	480	121	4	432,6	9,5	17,7	8	27
24064-B-K30-MB	**AH24064**	103	16,6	**300**	320	480	160	4	424	8	15	18	24
23164-K-MB	**AH3164G**	159	23,6	**300**	320	540	176	5	466,2	12,5	23,5	8	31
24164-B-K30	**AH24164**	197	23,4	**300**	320	540	218	5	456,1	9,5	17,7	18	24
22264-K-MB	**AH2264G**	166	19,8	**300**	320	580	150	5	503,5	12,5	23,5	10	27
23264-K-MB	**AH3264G**	229	28,9	**300**	320	580	208	5	489,6	12,5	23,5	8	36
23068-K-MB	**AH3068G**	101	18,6	**320**	340	520	133	5	464,6	12,5	23,5	9	28
24068-B-K30-MB	**AH24068**	143	21,7	**320**	340	520	180	5	457,1	9,5	17,7	19	26
23168-B-K-MB	**AH3168G**	203	27,6	**320**	340	580	190	5	499,5	12,5	23,5	9	33
24168-B-K30	**AH24168**	260	27,9	**320**	340	580	243	5	481,1	9,5	17,7	19	26
23268-B-K-MB	**AH3268G**	291	33,7	**320**	340	620	224	6	521,2	12,5	23,5	9	38
23972-K-MB	**AH3972G**	45	12,8	**340**	360	480	90	3	447,1	9,5	17,7	7	21
23072-K-MB	**AH3072G**	107	20,4	**340**	360	540	134	5	485,2	12,5	23,5	9	30
23172-K-MB	**AH3172G**	217	29,9	**340**	360	600	192	5	520	12,5	23,5	9	35
24172-B-K30	**AH24172**	275	29,6	**340**	360	600	243	5	503,6	9,5	17,7	20	26
23272-B-K-MB	**AH3272G**	328	37,5	**340**	360	650	232	6	548,3	12,5	23,5	9	40
23976-K-MB	**AH3976G**	66,3	16	**360**	380	520	106	4	477,6	9,5	17,7	8	22
23076-B-K-MB	**AH3076G**	113	22,1	**360**	380	560	135	5	505,6	12,5	23,5	10	31
24076-B-K30-MB	**AH24076**	155	23,7	**360**	380	560	180	5	499	9,5	17,7	20	28
23176-K-MB	**AH3176G**	226	32,2	**360**	380	620	194	5	539,6	12,5	23,5	10	36
24176-B-K30	**AH24176**	277	31,3	**360**	380	620	243	5	525,8	9,5	17,7	20	28
23276-B-K-MB	**AH3276G**	367	41,5	**360**	380	680	240	6	576,4	12,5	23,5	10	42
23980-B-K-MB	**AH3980G**	68,2	16,9	**380**	400	540	106	4	499	9,5	17,7	8	22
23080-K-MB	**AH3080G**	143	25,4	**380**	400	600	148	5	540,5	12,5	23,5	10	33
24080-B-K30-MB	**AH24080**	196	27,1	**380**	400	600	200	5	530,9	12,5	23,5	20	28
23180-B-K-MB	**AH3180G**	261	35,3	**380**	400	650	200	6	567,2	12,5	23,5	10	38
24180-B-K30	**AH24180**	312	34,3	**380**	400	650	250	6	553,5	12,5	23,5	20	28
23280-B-K-MB	**AH3280G**	442	47,4	**380**	400	720	256	6	609,8	12,5	23,5	10	44

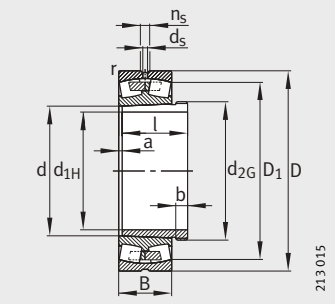


Mounting dimensions

		Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
Thread d_{2G}	l	d_a	D_a	r_a	C_r	C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
		min.	max.	max.	N	N					N	min^{-1}	min^{-1}
Tr320X5	112	312,4	407,6	2,5	1 270 000	2 650 000	0,2	3,42	5,09	3,34	166 000	1 200	1 400
Tr320X5	145	314,6	445,4	3	1 960 000	3 650 000	0,25	2,69	4	2,63	223 000	1 100	980
Tr310X4	184	314,6	445,4	3	2 500 000	5 200 000	0,35	1,95	2,9	1,91	300 000	1 000	710
Tr320X5	192	320	480	4	2 650 000	4 900 000	0,33	2,06	3,06	2,01	270 000	1 100	730
Tr320X5	224	320	480	4	3 250 000	6 300 000	0,4	1,67	2,49	1,63	540 000	900	460
Tr320X5	170	320	520	4	2 750 000	4 400 000	0,27	2,47	3,67	2,41	300 000	1 000	900
Tr320X5	228	320	520	4	3 450 000	6 200 000	0,37	1,83	2,72	1,79	300 000	1 000	560
Tr340X5	112	332,4	427,6	2,5	1 320 000	2 750 000	0,19	3,62	5,39	3,54	202 000	1 100	1 300
Tr340X5	149	334,6	465,4	3	2 040 000	4 000 000	0,25	2,74	4,08	2,68	243 000	1 100	910
Tr330X5	184	334,6	465,4	3	2 600 000	5 400 000	0,33	2,06	3,06	2,01	360 000	950	660
Tr340X5	209	340	520	4	3 200 000	6 000 000	0,34	1,98	2,94	1,93	305 000	950	650
Tr340X5	242	340	520	4	3 800 000	7 350 000	0,41	1,65	2,46	1,61	530 000	850	415
Tr340X5	180	340	560	4	3 050 000	4 900 000	0,27	2,47	3,67	2,41	345 000	950	840
Tr340X5	246	340	560	4	3 900 000	6 950 000	0,37	1,8	2,69	1,76	330 000	950	520
Tr360X5	162	358	502	4	2 360 000	4 550 000	0,25	2,69	4	2,63	285 000	1 000	850
Tr360X5	206	358	502	4	3 100 000	6 550 000	0,34	1,98	2,94	1,93	530 000	850	600
Tr360X5	225	360	560	4	3 650 000	6 950 000	0,34	1,98	2,94	1,93	570 000	900	590
Tr360X5	269	360	560	4	4 400 000	8 500 000	0,43	1,56	2,32	1,53	680 000	800	380
Tr360X5	264	366	594	5	4 500 000	8 150 000	0,38	1,78	2,65	1,74	650 000	850	470
Tr380X5	112	372,4	467,6	2,5	1 430 000	3 200 000	0,17	4,05	6,04	3,96	209 000	1 000	1 130
Tr380X5	167	378	522	4	2 450 000	4 800 000	0,25	2,74	4,08	2,68	295 000	950	800
Tr380X5	229	380	580	4	3 800 000	7 350 000	0,33	2,06	3,06	2,01	360 000	850	560
Tr380X5	269	380	580	4	4 500 000	9 000 000	0,41	1,63	2,43	1,6	550 000	750	355
Tr380X5	274	386	624	5	4 900 000	9 150 000	0,38	1,78	2,65	1,74	720 000	800	425
Tr400X5	130	394,6	505,4	3	1 760 000	4 000 000	0,19	3,58	5,33	3,5	265 000	950	1 090
Tr400X5	170	398	542	4	2 550 000	5 300 000	0,24	2,84	4,23	2,78	430 000	900	740
Tr400X5	208	398	542	4	3 350 000	7 200 000	0,31	2,15	3,2	2,1	580 000	750	530
Tr400X5	232	400	600	4	4 050 000	8 150 000	0,32	2,12	3,15	2,07	385 000	800	510
Tr400X5	271	400	600	4	4 650 000	9 500 000	0,39	1,71	2,54	1,67	770 000	700	330
Tr400X5	284	406	654	5	5 300 000	9 800 000	0,37	1,8	2,69	1,76	780 000	750	400
Tr420X5	130	414,6	525,4	3	1 830 000	4 150 000	0,18	3,71	5,52	3,63	275 000	900	1 030
Tr420X5	183	418	582	4	3 050 000	6 200 000	0,24	2,79	4,15	2,73	365 000	800	680
Tr420X5	228	418	582	4	3 900 000	8 500 000	0,33	2,06	3,06	2,01	670 000	700	485
Tr420X5	240	426	624	5	4 250 000	8 500 000	0,31	2,15	3,2	2,1	670 000	750	490
Tr420X5	278	426	624	5	5 100 000	10 400 000	0,39	1,72	2,56	1,68	790 000	670	305
Tr420X5	302	426	694	5	5 700 000	10 800 000	0,38	1,78	2,65	1,74	820 000	700	375

Spherical roller bearings

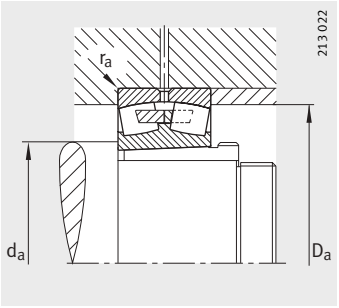
With extraction sleeve



With central rib

Dimension table (continued) · Dimensions in mm

Designation		Mass m		Dimensions									
Bearing	Extraction sleeve	Bearing ≈kg	Extraction sleeve ≈kg	d_{1H}	d	D	B	r min.	D_1 ≈	d_s	n_s	a ≈	b
23984-K-MB	**AH3984G**	78	17,8	**400**	420	560	106	4	519,5	9,5	17,7	8	22
23084-B-K-MB	**AH3084G**	155	27,2	**400**	420	620	150	5	560,7	12,5	23,5	10	34
24084-B-K30-MB	**AH24084**	214	29	**400**	420	620	200	5	550,2	12,5	23,5	22	30
23184-K-MB	**AH3184G**	339	42,3	**400**	420	700	224	6	605,4	12,5	23,5	10	40
24184-B-K30	**AH24184**	407	40,3	**400**	420	700	280	6	590,3	12,5	23,5	22	30
23284-B-K-MB	**AH3284G**	537	54	**400**	420	760	272	7,5	642,2	12,5	23,5	10	46
23988-K-MB	**AH3988**	98,3	21,2	**420**	440	600	118	4	552,8	12,5	23,5	8	25
23088-K-MB	**AHX3088G**	177	30,1	**420**	440	650	157	6	586,8	12,5	23,5	11	35
24088-B-K30-MB	**AH24088**	247	31,9	**420**	440	650	212	6	575,6	12,5	23,5	22	30
23188-K-MB	**AHX3188G**	378	45,3	**420**	440	720	226	6	626	12,5	23,5	11	42
24188-B-K30	**AH24188**	451	42,3	**420**	440	720	280	6	612,4	12,5	23,5	22	30
23288-B-K-MB	**AHX3288G**	586	58,8	**420**	440	790	280	7,5	669,3	12,5	23,5	11	48
23992-B-K-MB	**AH3992**	103	22,5	**440**	460	620	118	4	573,3	12,5	23,5	8	25
23092-B-K-MB	**AHX3092G**	204	33,1	**440**	460	680	163	6	612,2	12,5	23,5	11	37
23192-K-MB	**AHX3192G**	420	50,8	**440**	460	760	240	7,5	661,4	12,5	23,5	11	43
24192-B-K30-MB	**AH24192**	578	47,4	**440**	460	760	300	7,5	642,8	12,5	23,5	23	32
23292-K-MB	**AHX3292G**	699	66,2	**440**	460	830	296	7,5	701,6	12,5	23,5	11	50
23996-B-K-MB	**AH3996**	121	25,7	**460**	480	650	128	5	598,8	12,5	23,5	9	28
23096-K-MB	**AHX3096G**	208	35,2	**460**	480	700	165	6	632,6	12,5	23,5	12	38
24096-B-K30-MB	**AH24096**	289	36,6	**460**	480	700	218	6	625,4	12,5	23,5	23	32
23196-K-MB	**AHX3196G**	470	55,5	**460**	480	790	248	7,5	688,3	12,5	23,5	12	45
24196-B-K30-MB	**AH24196**	700	53,1	**460**	480	790	308	7,5	669,9	12,5	23,5	25	35
23296-K-MB	**AHX3296G**	806	73,3	**460**	480	870	310	7,5	734,8	12,5	23,5	12	52
239/500-K-MB	**AH39/500**	124	27,7	**480**	500	670	128	5	619,3	12,5	23,5	10	32
230/500-B-K-MB	**AHX30/500**	219	42,5	**480**	500	720	167	6	653,5	12,5	23,5	12	40
231/500-B-K-MB	**AHX31/500**	556	71,3	**480**	500	830	264	7,5	720,9	12,5	23,5	12	47
241/500-B-K30-MB	**AH241/500**	717	60,5	**480**	500	830	325	7,5	701,8	12,5	23,5	25	37
239/530-K-MB	**AH39/530**	146	43,4	**500**	530	710	136	5	656,4	12,5	23,5	10	37
230/530-K-MB	**AH30/530A**	291	61,8	**500**	530	780	185	6	703,7	12,5	23,5	12	45
231/530-K-MB	**AH31/530A**	643	93,4	**500**	530	870	272	7,5	756,3	12,5	23,5	12	53
241/530-B-K30-MB	**AH241/530**	845	89	**500**	530	870	335	7,5	739,1	12,5	23,5	25	40
239/560-B-K-MB	**AH39/560**	169	47	**530**	560	750	140	5	693,4	12,5	23,5	10	37
230/560-B-K-MB	**AH30/560A**	339	68,6	**530**	560	820	195	6	741,5	12,5	23,5	12	45
231/560-K-MB	**AH31/560A**	737	102	**530**	560	920	280	7,5	800,2	12,5	23,5	12	55
241/560-B-K30-MB	**AH241/560**	974	101	**530**	560	920	355	7,5	785	12,5	23,5	28	45

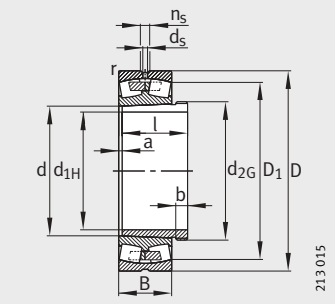


Mounting dimensions

		Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
Thread d_{2G}	l	d_a	D_a	r_a	C_r	C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
		min.	max.	max.	N	N					N	min^{-1}	min^{-1}
Tr440X5	130	434,6	545,4	3	1 900 000	4 500 000	0,18	3,85	5,73	3,76	300 000	850	970
Tr440X5	186	438	602	4	3 150 000	6 550 000	0,24	2,84	4,23	2,78	395 000	800	650
Tr440X5	230	438	602	4	4 000 000	8 800 000	0,32	2,13	3,17	2,08	710 000	670	460
Tr440X5	266	446	674	5	5 000 000	9 650 000	0,33	2,03	3,02	1,98	465 000	700	460
Tr440X5	310	446	674	5	6 200 000	12 700 000	0,4	1,67	2,49	1,63	980 000	630	270
Tr440X5	321	452	728	6	6 550 000	12 200 000	0,38	1,77	2,64	1,73	930 000	670	345
Tr460X5	145	454,6	585,4	3	2 240 000	5 200 000	0,18	3,66	5,46	3,58	295 000	800	930
Tr460X5	194	463	627	5	3 400 000	7 100 000	0,24	2,84	4,23	2,78	405 000	750	610
Tr460X5	242	463	627	5	4 300 000	9 650 000	0,32	2,12	3,15	2,07	750 000	630	435
Tr460X5	270	466	694	5	5 200 000	10 400 000	0,32	2,1	3,13	2,06	485 000	700	430
Tr460X5	310	466	694	5	6 400 000	13 200 000	0,38	1,76	2,62	1,72	1 020 000	600	255
Tr460X5	330	472	758	6	7 100 000	13 400 000	0,37	1,8	2,69	1,76	990 000	630	320
Tr480X5	145	474,6	605,4	3	2 280 000	5 400 000	0,18	3,85	5,73	3,76	370 000	750	880
Tr480X5	202	483	657	5	3 650 000	7 650 000	0,24	2,84	4,23	2,78	440 000	700	580
Tr480X5	285	492	728	6	5 850 000	11 600 000	0,32	2,12	3,15	2,07	530 000	630	400
Tr480X5	332	492	728	6	7 500 000	15 600 000	0,39	1,73	2,58	1,69	1 160 000	560	228
Tr480X5	349	492	798	6	7 800 000	15 000 000	0,37	1,8	2,69	1,76	620 000	600	295
Tr500X5	158	498	632	4	2 550 000	6 000 000	0,18	3,76	5,59	3,67	460 000	700	860
Tr500X5	205	503	677	5	3 800 000	8 150 000	0,23	2,9	4,31	2,83	455 000	670	550
Tr500X5	250	503	677	5	4 900 000	11 200 000	0,3	2,25	3,34	2,2	830 000	600	380
Tr500X5	295	512	758	6	6 300 000	12 700 000	0,32	2,12	3,15	2,07	570 000	630	375
Tr500X5	343	512	758	6	8 000 000	16 600 000	0,39	1,75	2,61	1,71	1 190 000	560	215
Tr500X5	364	512	838	6	8 800 000	17 000 000	0,37	1,83	2,72	1,79	700 000	600	270
Tr520X6	162	518	652	4	2 600 000	6 300 000	0,17	3,9	5,81	3,81	400 000	670	810
Tr540X6	209	523	697	5	3 900 000	8 500 000	0,22	3,01	4,48	2,94	510 000	670	520
Tr550X6	313	532	798	6	7 100 000	14 300 000	0,32	2,1	3,13	2,06	990 000	600	345
Tr520X6	362	532	798	6	8 650 000	18 300 000	0,39	1,73	2,58	1,69	1 340 000	530	200
Tr550X6	175	548	692	4	2 850 000	6 800 000	0,18	3,85	5,73	3,76	385 000	630	770
Tr560X6	230	553	757	5	4 400 000	9 500 000	0,22	3,04	4,53	2,97	540 000	600	490
Tr560X6	325	562	838	6	7 350 000	15 300 000	0,32	2,12	3,15	2,07	670 000	560	325
Tr550X6	375	562	838	6	9 500 000	20 000 000	0,38	1,77	2,64	1,73	1 450 000	500	184
Tr580X6	180	578	732	4	3 100 000	7 650 000	0,17	3,95	5,88	3,86	570 000	600	720
Tr590X6	240	583	797	5	5 100 000	11 000 000	0,23	2,95	4,4	2,89	740 000	560	450
Tr590X6	335	592	888	6	8 150 000	16 600 000	0,31	2,21	3,29	2,16	750 000	530	300
Tr580X6	400	592	888	6	10 600 000	22 400 000	0,38	1,77	2,64	1,73	1 600 000	480	169

Spherical roller bearings

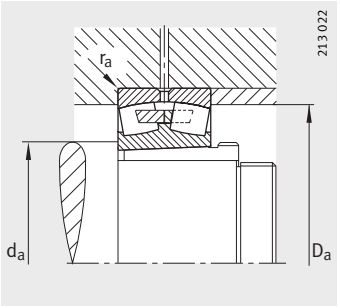
With extraction sleeve



With central rib

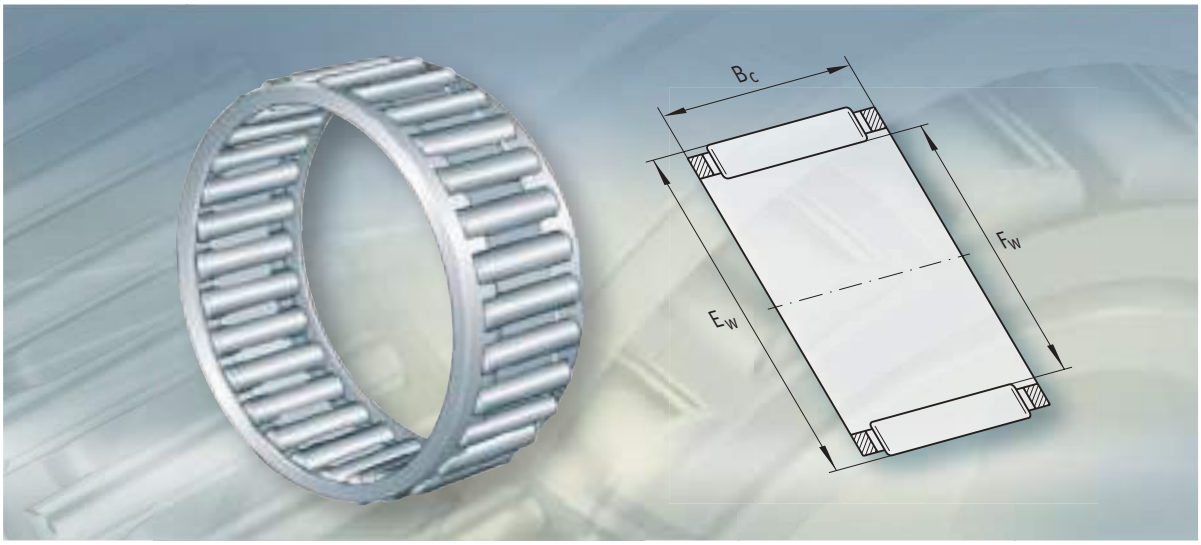
Dimension table (continued) · Dimensions in mm

Designation		Mass m		Dimensions									
Bearing	Extraction sleeve	Bearing ≈kg	Extraction sleeve ≈kg	d_{1H}	d	D	B	r min.	D_1 ≈	d_s	n_s	a ≈	b
239/600-B-K-MB	**AH39/600**	210	55,6	**570**	600	800	150	5	740,5	12,5	23,5	10	38
230/600-B-K-MB	**AH30/600A**	388	75,6	**570**	600	870	200	6	791,9	12,5	23,5	14	45
231/600-K-MB	**AH31/600A**	901	118	**570**	600	980	300	7,5	852,6	12,5	23,5	14	55
241/600-B-K30-MB	**AH241/600**	1 170	118	**570**	600	980	375	7,5	833	12,5	23,5	30	50
239/630-B-K-MB	**AH39/630**	283	64,7	**600**	630	850	165	6	784,5	12,5	23,5	12	40
230/630-B-K-MB	**AH30/630A**	502	87,8	**600**	630	920	212	7,5	834,3	12,5	23,5	14	46
240/630-B-K30-MB	**AH240/630**	649	95,1	**600**	630	920	290	7,5	817,9	12,5	23,5	30	45
241/630-B-K30-MB	**AH241/630**	1 360	133	**600**	630	1 030	400	7,5	872,2	12,5	23,5	30	50
239/670-B-K-MB	**AH39/670**	310	88	**630**	670	900	170	6	831,5	12,5	23,5	12	41
230/670-B-K-MB	**AH30/670A**	590	125	**630**	670	980	230	7,5	888,7	12,5	23,5	14	50
241/670-B-K30-MB	**AH241/670**	1 540	184	**630**	670	1 090	412	7,5	929,4	12,5	23,5	30	55
239/710-K-MB	**AH39/710**	336	102	**670**	710	950	180	6	877,5	12,5	23,5	12	43
230/710-B-K-MB	**AH30/710A**	650	136	**670**	710	1 030	236	7,5	938,8	12,5	23,5	16	50
240/710-B-K30-MB	**AH240/710**	873	153	**670**	710	1 030	315	7,5	921,6	12,5	23,5	33	50
241/710-B-K30-MB	**AH241/710**	1 820	209	**670**	710	1 150	438	9,5	982	12,5	23,5	26	45
239/750-K-MB	**AH39/750**	394	110	**710**	750	1 000	185	6	923,2	12,5	23,5	12	44
230/750-K-MB	**AH30/750A**	792	156	**710**	750	1 090	250	7,5	990,9	12,5	23,5	16	50
240/750-B-K30-MB	**AH240/750**	1 070	170	**710**	750	1 090	335	7,5	976,2	12,5	23,5	35	50
239/800-B-K-MB	**AH39/800**	490	146	**750**	800	1 060	195	6	983,7	12,5	23,5	12	45
230/800-K-MB	**AH30/800A**	861	200	**750**	800	1 150	258	7,5	1 050,9	12,5	23,5	18	50
239/850-K-MB	**AH39/850**	554	165	**800**	850	1 120	200	6	1 039,9	12,5	23,5	12	50
240/850-B-K30-MB	**AH240/850**	1 420	252	**800**	850	1 220	365	7,5	1 092,9	12,5	23,5	40	53
239/900-K-MB	**AH39/900**	641	180	**850**	900	1 180	206	6	1 098,8	12,5	23,5	12	51



Mounting dimensions

		Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
Thread d_{2G}	l	d_a	D_a	r_a	C_r	C_{0r}	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
		min.	max.	max.	N	N					N	min^{-1}	min^{-1}
Tr625X6	192	618	782	4	3 450 000	8 650 000	0,17	3,95	5,88	3,86	630 000	560	670
Tr630X6	245	623	847	5	5 700 000	12 500 000	0,22	3,07	4,57	3	890 000	530	405
Tr630X6	355	632	948	6	9 000 000	19 300 000	0,31	2,2	3,27	2,15	810 000	500	270
Tr625X6	425	632	948	6	11 600 000	26 000 000	0,38	1,79	2,67	1,75	1 780 000	450	149
Tr655X6	210	653	827	5	4 050 000	9 800 000	0,18	3,8	5,66	3,72	710 000	530	650
Tr670X6	258	658	892	6	6 300 000	13 700 000	0,22	3,01	4,48	2,94	890 000	500	385
Tr655X6	335	658	892	6	8 000 000	19 000 000	0,31	2,21	3,29	2,16	1 350 000	480	265
Tr655X6	450	662	998	6	12 900 000	29 000 000	0,38	1,78	2,65	1,74	1 960 000	450	138
Tr695X6	216	693	877	5	4 300 000	10 600 000	0,17	3,95	5,88	3,86	750 000	500	600
Tr710X7	280	698	952	6	7 200 000	16 000 000	0,22	3,01	4,48	2,94	1 100 000	480	350
Tr710X7	467	702	1 058	6	14 000 000	31 500 000	0,37	1,83	2,72	1,79	2 120 000	430	127
Tr740X7	228	733	927	5	4 800 000	12 000 000	0,18	3,85	5,73	3,76	720 000	480	570
Tr750X7	286	738	1 002	6	7 650 000	17 000 000	0,22	3,07	4,57	3	1 140 000	480	330
Tr740X7	365	738	1 002	6	9 500 000	22 800 000	0,3	2,26	3,37	2,21	1 550 000	430	226
Tr740X7	483	750	1 110	8	15 600 000	35 500 000	0,38	1,79	2,67	1,75	2 340 000	400	116
Tr780X7	234	773	977	5	5 200 000	12 900 000	0,17	3,95	5,88	3,86	790 000	480	540
Tr800X7	300	778	1 062	6	8 500 000	19 000 000	0,22	3,01	4,48	2,94	1 010 000	450	305
Tr800X7	385	778	1 062	6	10 800 000	26 000 000	0,3	2,26	3,37	2,21	1 730 000	400	206
Tr830X7	245	823	1 037	5	5 850 000	15 000 000	0,17	4,05	6,04	3,96	1 010 000	450	500
Tr850X7	308	828	1 122	6	9 300 000	21 200 000	0,22	3,07	4,57	3	1 430 000	430	280
Tr880X7	258	873	1 097	5	6 300 000	16 300 000	0,16	4,11	6,12	4,02	960 000	430	465
Tr900X7	418	878	1 192	6	12 900 000	32 000 000	0,29	2,33	3,47	2,28	2 060 000	480	173
Tr930X8	265	923	1 157	5	6 550 000	17 300 000	0,16	4,28	6,37	4,19	1 010 000	400	440



Needle roller and cage assemblies

Needle roller and cage assemblies

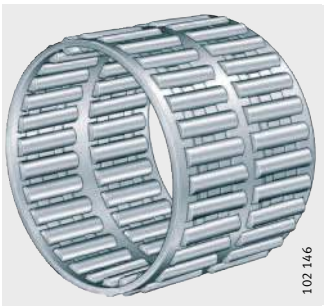
Product overview Needle roller and cage assemblies

Single row

K

Double row

K..-ZW



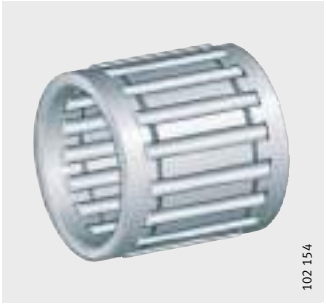
Other products

Needle roller and cage assemblies for crank pin bearing arrangements

KZK

Needle roller and cage assemblies for piston pin bearing arrangements

KBK



Needle roller and cage assemblies

Features

Needle roller and cage assemblies are single or double row units comprising cages and needle rollers. The single row design is based on DIN 5 405-1.

Very small cross-section height

Since the radial section height of needle roller and cage assemblies corresponds to the needle roller diameter, they permit bearing arrangements with a very small radial design envelope.
They have high load carrying capacity, are suitable for high speeds and are particularly easy to fit.

If the raceways are produced to high geometrical accuracy, bearing arrangements with high runout accuracy can be achieved.

The radial internal clearance can be influenced by the needle roller sort as well as by the shaft and housing tolerances.

Needle roller and cage assemblies require a hardened and ground raceway on the shaft and in the housing.

Double row

Double row needle roller and cage assemblies are only available in particular enveloping circle diameters F_W. These are indicated by the suffix ZW.

Needle rollers

Needle roller and cage assemblies are supplied with standard needle roller sorts according to the table. A needle roller and cage assembly contains needle rollers of one sort only. The sort is printed on the packaging and is colour coded according to the table.

The sorts are indicated by the upper and lower deviation (in µm), the maximum diameter tolerance is 2 µm, see table.
Every two neighbouring sorts are matched as sort pairs.

Standard needle roller sorts

Sort pair Colour code	Needle roller sorts µm
Red	0 –2 / –1 –3
Blue	–2 –4 / –3 –5
White (grey)	–4 –6 / –5 –7

Special needle roller sorts

The following sort pairs are available as special designs in accordance with the table.

Needle roller sorts

Sort pair Colour code	Needle roller sorts µm
Green	–6 –8 / –7 –9
Yellow	–8 –10 / –9 –11

Operating temperature

Needle roller and cage assemblies with plastic cage can be used at operating temperatures from –20 °C to +120 °C.

Cages

Needle roller and cage assemblies are available with plastic cages and sheet steel cages. Plastic cages have the suffix TV and are only available in particular sizes.

Other products

Needle roller and cage assemblies are also available in designs for connecting rod bearing arrangements:

- series KZK for crank pin bearing arrangements
- series KBK for piston pin bearing arrangements.

These needle roller and cage assemblies are described in detail in Technical Product Information TPI 94.

Needle roller and cage assemblies

Suffixes

Suffixes for available designs: see table.

Available designs

Suffix	Description
TV	Cage made from glass fibre reinforced polyamide 66[1)]
ZW	Double row design[2)]

1) Bearings with plastic cage: see dimension table.

2) Available in particular sizes only.

Design and safety guidelines

Raceway design

Where needle roller and cage assemblies are to be used, the housing bore and the shaft raceway must be hardened and ground. The surface hardness of the raceways must be 670 HV + 170 HV and the hardening depth CHD or Rht must be sufficiently large.

Design of raceways: see table and section Design of bearing arrangements, from page 154.

Raceway design

Shaft diameter Nominal dimension mm		Bore tolerance	Shaft tolerance Operating clearance			Roughness	Round-ness	Paral-lelism
over	incl.		Small	Normal	Large	max.	max.	max.
–	80	G6	j5	h5	g6	R_a0,2 (R_z1)	25% of diameter tolerance	50%
		H6	h5	g5	f6			
80	120	G6	h5	g5	f6	R_a0,3 (R_z1,6)		
120	–	G6	h5	g5	f6	R_a0,4 (R_z2,5)		
		H6	–	f5	e6			

Raceway width

The raceway width must be at least equal to the cage width B_c (B_c is produced with a minus (–) tolerance); for B_c, see dimension tables. The axial location distance should therefore be toleranced to H12, *Figure 1*.

Caution! The axial running surfaces for the needle roller and cage assemblies must be precision machined (R_a2 recommended) and resistant to wear.

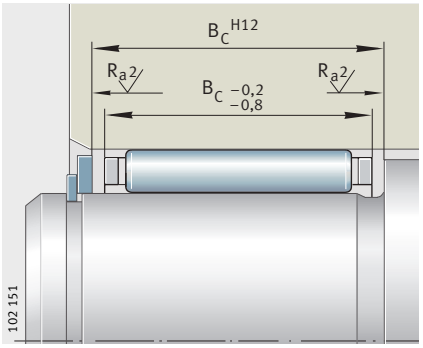


Figure 1
Raceway width and axial running surfaces

Axial location

Caution! Needle roller and cage assemblies must be axially located.

Needle roller and cage assemblies must be located by means of snap rings or an appropriate adjacent construction design, *Figure 1* and *Figure 2*.

If location is by means of a snap ring or retaining ring, a washer must be arranged in front of the ring. It must be ensured that there is sufficient interference between the retaining ring and washer.

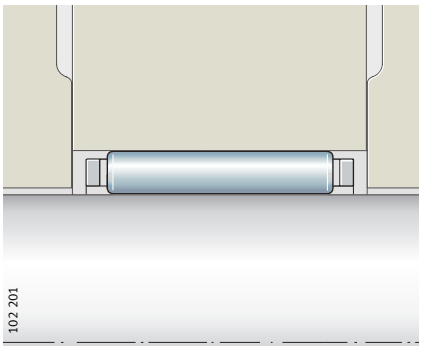


Figure 2
Axial location by adjacent construction

Accuracy

The width of the needle roller and cage assembly $B_{c\,-0,8}^{\;-0,2}$ corresponds to DIN 5 405-1.
B_c: see dimension tables.

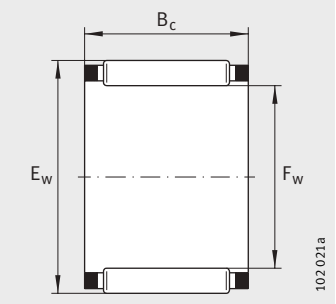
Radial internal clearance

A radial internal clearance of C2 to CN is achieved with standard needle roller sorts if the shaft and housing tolerances are in accordance with the table Raceway design, page 592.

If the actual values are on the plus side, a radial internal clearance of 0 can be achieved.

Needle roller and cage assemblies

Single row



K

Dimension table · Dimensions in mm

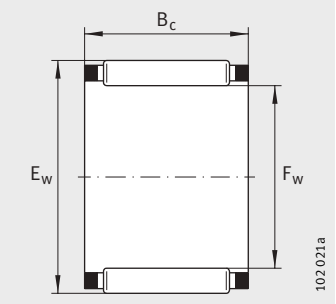
Designation	Mass	Dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
	m	F_w	E_w	B_c	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	n_B
	≈g				N	N	N	min^{-1}	min^{-1}
K3X5X7-TV	0,3	**3**	5	7	1 540	1 290	152	50 000	78 000
K3X5X9-TV	0,4	**3**	5	9	1 710	1 480	188	50 000	80 000
K3X6X7-TV	0,4	**3**	6	7	1 430	970	109	47 000	75 000
K4X7X7-TV	0,5	**4**	7	7	1 740	1 270	145	42 500	59 000
K4X7X10-TV	0,7	**4**	7	10	2 330	1 840	236	42 500	59 000
K5X8X8-TV	0,7	**5**	8	8	2 350	1 920	237	39 000	48 000
K5X8X10-TV	0,9	**5**	8	10	3 000	2 650	350	39 000	47 000
K6X9X8-TV	0,8	**6**	9	8	2 600	2 280	285	36 500	41 000
K6X9X10-TV	1,1	**6**	9	10	3 350	3 150	420	36 500	40 000
K6X10X13-TV	1,9	**6**	10	13	3 800	3 100	395	35 500	40 000
K7X9X7-TV	0,6	**7**	9	7	1 730	1 770	215	35 500	40 000
K7X10X8-TV	0,9	**7**	10	8	2 850	2 650	330	34 500	36 000
K7X10X10-TV	1	**7**	10	10	3 650	3 600	485	34 500	35 000
K8X11X8-TV	1	**8**	11	8	3 100	3 000	375	32 500	32 000
K8X11X10-TV	1,2	**8**	11	10	3 950	4 100	560	32 500	31 000
K8X11X13-TV	1,7	**8**	11	13	5 100	5 800	790	32 500	30 500
K8X12X10-TV	2	**8**	12	10	5 000	4 700	560	31 500	29 000
K9X12X10-TV	1,5	**9**	12	10	4 500	5 000	680	31 000	27 500
K9X12X13-TV	2,1	**9**	12	13	5 900	7 100	970	31 000	27 000
K10X13X10-TV	1,6	**10**	13	10	4 750	5 500	750	29 500	24 900
K10X13X13-TV	2,3	**10**	13	13	6 200	7 800	1 060	29 500	24 400
K10X13X16-TV	2,9	**10**	13	16	7 100	9 300	1 310	29 500	24 600
K10X14X10-TV	2,5	**10**	14	10	5 800	6 000	720	29 000	23 500
K10X14X13-TV	4,6	**10**	14	13	7 500	8 400	1 020	29 000	23 000
K10X16X12-TV	5,5	**10**	16	12	8 100	7 200	1 000	27 500	21 800
K12X15X10-TV	2,9	**12**	15	10	4 900	6 100	830	27 000	21 500
K12X15X13-TV	2,3	**12**	15	13	6 400	8 500	1 170	27 000	21 100
K12X16X13-TV	5,5	**12**	16	13	8 000	9 400	1 150	26 500	19 900
K12X17X13-TV	4,9	**12**	17	13	9 600	10 400	1 330	26 500	18 800
K12X18X12-TV	6	**12**	18	12	10 000	9 900	1 400	26 000	18 100

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
	m	F_w	E_w	B_c	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	n_B
	≈g				N	N	N	min^{-1}	min^{-1}
K14X18X10	4	**14**	18	10	7 100	8 500	1 060	25 000	17 300
K14X18X13	6,5	**14**	18	13	8 200	10 100	1 320	25 000	17 700
K14X18X15-TV	5	**14**	18	15	9 500	12 300	1 540	25 000	17 400
K14X18X17	8	**14**	18	17	10 800	14 400	1 890	25 000	17 300
K14X20X12	8,5	**14**	20	12	10 300	10 600	1 490	24 300	16 200
K15X18X17-TV	4,6	**15**	18	17	8 000	12 100	1 730	24 600	17 700
K15X19X10	5	**15**	19	10	7 500	9 200	1 140	24 300	16 200
K15X19X13	7	**15**	19	13	8 500	10 900	1 420	24 300	16 600
K15X19X17	9,5	**15**	19	17	11 300	15 600	2 040	24 300	16 200
K15X20X13	7	**15**	20	13	9 900	11 500	1 430	23 900	15 900
K15X21X15	11	**15**	21	15	14 300	16 400	2 210	23 600	14 700
K15X21X21	17	**15**	21	21	19 400	24 300	3 300	23 600	14 400
K16X20X10	5,5	**16**	20	10	7 800	9 900	1 230	23 600	15 200
K16X20X13	7,5	**16**	20	13	8 900	11 800	1 530	23 600	15 600
K16X20X17	10	**16**	20	17	11 700	16 800	2 190	23 600	15 200
K16X22X12	10	**16**	22	12	11 500	12 500	1 780	22 900	14 300
K16X22X16	12	**16**	22	16	14 800	17 500	2 390	22 900	14 100
K16X22X20	17	**16**	22	20	18 300	22 800	3 050	22 900	14 000
K16X24X20	22	**16**	24	20	21 400	23 500	2 950	22 400	13 200
K17X21X10	5,5	**17**	21	10	8 100	10 600	1 310	22 900	14 400
K17X21X13	6,5	**17**	21	13	10 400	14 600	1 810	22 900	14 100
K17X21X17	9,5	**17**	21	17	12 200	17 900	2 350	22 900	14 400
K18X22X10	6	**18**	22	10	8 400	11 300	1 400	22 400	13 600
K18X22X13	8	**18**	22	13	9 200	12 700	1 650	22 400	14 200
K18X22X17	11	**18**	22	17	12 100	18 000	2 360	22 400	13 900
K18X24X12	12	**18**	24	12	12 800	14 900	2 120	21 800	12 700
K18X24X13	13	**18**	24	13	13 100	15 300	1 990	21 800	12 900
K18X24X20	18	**18**	24	20	20 200	27 000	3 550	21 800	12 400
K18X25X22	23	**18**	25	22	23 100	29 000	3 750	21 600	12 200
K19X23X13	8	**19**	23	13	9 500	13 500	1 760	21 800	13 500
K19X23X17	11	**19**	23	17	12 500	19 200	2 500	21 800	13 200

Needle roller and cage assemblies

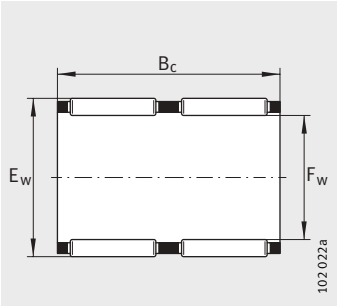
Single row and double row



K

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
	m	F_w	E_w	B_c	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	n_B
	≈g				N	N	N	min^{-1}	min^{-1}
K20X24X10	6,5	**20**	24	10	8 900	12 600	1 570	21 300	12 400
K20X24X13	9	**20**	24	13	9 800	14 300	1 860	21 300	12 800
K20X24X17	12	**20**	24	17	12 900	20 400	2 650	21 300	12 500
K20X26X12	11	**20**	26	12	13 400	16 200	2 310	20 900	11 700
K20X26X13	12	**20**	26	13	14 400	17 900	2 330	20 900	11 600
K20X26X17	16	**20**	26	17	19 200	26 000	3 300	20 900	11 200
K20X26X20	19	**20**	26	20	21 100	29 000	3 850	20 900	11 400
K20X28X16	20	**20**	28	16	19 800	22 400	3 000	20 400	11 100
K20X28X20	27	**20**	28	20	23 900	28 500	3 600	20 400	11 100
K20X28X25	32	**20**	28	25	30 500	39 000	5 300	20 400	10 800
K20X30X30	49	**20**	30	30	35 500	41 500	5 500	19 600	10 800
K21X25X13	9	**21**	25	13	10 100	15 100	1 970	20 900	12 300
K22X26X10	7,5	**22**	26	10	9 100	13 400	1 670	20 400	11 500
K22X26X13	9,5	**22**	26	13	10 400	15 900	2 080	20 400	11 800
K22X26X17	12	**22**	26	17	13 700	22 700	3 000	20 400	11 500
K22X28X17	18	**22**	28	17	19 400	27 000	3 450	19 600	10 500
K22X29X16	16	**22**	29	16	20 000	25 500	3 350	19 200	10 300
K22X30X15-TV	18	**22**	30	15	20 100	23 400	3 050	18 800	10 200
K22X32X24	43	**22**	32	24	34 000	40 000	4 900	18 100	9 700
K23X35X16-TV	29	**23**	35	16	24 500	23 900	2 950	16 900	9 500
K24X28X10	8,5	**24**	28	10	9 600	14 800	1 840	18 800	10 600
K24X28X13	10	**24**	28	13	11 000	17 600	2 290	18 800	10 800
K24X28X17	13	**24**	28	17	14 500	25 000	3 300	18 800	10 600
K24X30X17	19	**24**	30	17	19 500	27 500	3 500	18 100	10 000
K24X30X31-ZW	32	**24**	30	31	27 500	43 500	5 800	18 100	10 400



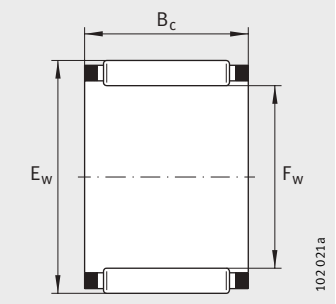
K..-ZW

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
	m	F_w	E_w	B_c	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	n_B
	≈g				N	N	N	min^{-1}	min^{-1}
K25X29X10	8,5	**25**	29	10	9 900	15 400	1 930	18 100	10 200
K25X29X13	11	**25**	29	13	11 300	18 400	2 400	18 100	10 400
K25X29X17	14	**25**	29	17	14 900	26 000	3 450	18 100	10 200
K25X30X17	16	**25**	30	17	18 700	30 000	3 850	17 800	9 600
K25X30X20	18	**25**	30	20	21 700	36 500	4 850	17 800	9 500
K25X30X26-ZW	19	**25**	30	26	21 400	35 500	4 500	17 800	10 400
K25X31X17	19	**25**	31	17	19 600	28 500	3 600	17 500	9 600
K25X31X21	20	**25**	31	21	24 700	38 000	5 100	17 500	9 400
K25X32X16	21	**25**	32	16	20 800	27 500	3 750	17 200	9 400
K25X33X20	33	**25**	33	20	28 500	38 000	4 850	16 900	9 000
K25X33X24	39	**25**	33	24	34 000	47 000	6 300	16 900	8 900
K25X35X30	65	**25**	35	30	47 000	62 000	8 300	16 300	8 500
K26X30X13	11	**26**	30	13	11 600	19 200	2 500	17 500	10 100
K26X30X17	15	**26**	30	17	15 200	27 500	3 600	17 500	9 800
K26X30X22-ZW	12	**26**	30	22	15 700	28 500	3 550	17 500	10 400
K28X33X13	13	**28**	33	13	15 300	24 200	3 100	16 100	9 800
K28X33X17	17	**28**	33	17	19 700	33 500	4 250	16 100	8 700
K28X34X17	24	**28**	34	17	21 800	33 500	4 300	15 800	8 600
K28X35X16	24	**28**	35	16	21 500	29 500	3 950	15 600	8 700
K28X35X18	27	**28**	35	18	24 000	34 000	4 700	15 600	8 600
K28X40X25	70	**28**	40	25	45 500	55 000	6 600	14 400	7 700
K30X34X13	14	**30**	34	13	12 300	21 700	2 850	15 300	8 900
K30X35X13	14	**30**	35	13	15 600	25 500	3 250	15 100	8 400
K30X35X17	19	**30**	35	17	19 600	34 000	4 300	15 100	8 300
K30X35X27	30	**30**	35	27	30 500	59 000	8 500	15 100	8 100
K30X37X16	27	**30**	37	16	23 100	33 500	4 450	14 600	8 000
K30X37X18	30	**30**	37	18	26 000	38 500	5 300	14 600	8 000
K30X40X18	48	**30**	40	18	32 000	40 000	5 000	14 000	7 600
K30X40X30	73	**30**	40	30	49 000	69 000	9 200	14 000	7 500

Needle roller and cage assemblies

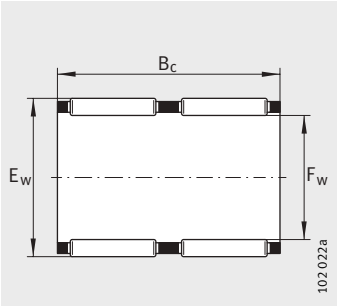
Single row and double row



K

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
	m	F_w	E_w	B_c	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	n_B
	≈g				N	N	N	min^{-1}	min^{-1}
K32X37X13	18	**32**	37	13	15 500	25 500	3 300	14 200	8 100
K32X37X17	19	**32**	37	17	19 900	35 500	4 500	14 200	7 900
K32X37X27	30	**32**	37	27	30 000	60 000	8 500	14 200	7 800
K32X38X20	30	**32**	38	20	26 500	45 000	6 000	14 000	7 700
K32X39X16	37	**32**	39	16	23 800	35 500	4 700	13 800	7 600
K32X39X18	31	**32**	39	18	26 500	41 000	5 600	13 800	7 500
K32X40X25	49	**32**	40	25	37 500	58 000	7 900	13 600	7 400
K32X40X42-ZW-TV	77	**32**	40	42	50 000	84 000	10 500	13 600	7 800
K32X46X32	119	**32**	46	32	66 000	84 000	11 100	12 600	6 700
K35X40X13	19	**35**	40	13	16 200	28 000	3 600	13 100	7 500
K35X40X17	21	**35**	40	17	20 800	38 500	4 900	13 100	7 400
K35X40X25	31	**35**	40	25	29 500	60 000	8 400	13 100	7 200
K35X40X27-TV	39	**35**	40	27	25 000	48 500	6 700	13 100	7 900
K35X42X16	34	**35**	42	16	24 400	37 500	5 000	12 700	7 100
K35X42X18	34	**35**	42	18	27 500	43 000	6 000	12 700	7 100
K35X42X20	37	**35**	42	20	30 000	49 000	6 200	12 700	7 000
K35X42X30	67	**35**	42	30	39 000	68 000	9 400	12 700	7 200
K35X45X20	56	**35**	45	20	37 000	50 000	6 500	12 300	6 800
K35X45X30	80	**35**	45	30	53 000	79 000	10 500	12 300	6 700
K37X42X17	22	**37**	42	17	22 400	43 000	5 500	12 400	6 900
K38X43X17	29	**38**	43	17	20 500	38 500	4 850	12 100	7 000
K38X43X27	43	**38**	43	27	31 500	68 000	9 600	12 100	6 800
K38X46X20	47	**38**	46	20	35 500	57 000	7 200	11 700	6 300
K38X46X32	76	**38**	46	32	55 000	99 000	14 200	11 700	6 200
K39X44X26-ZW	45	**39**	44	26	27 500	56 000	7 100	11 800	7 000



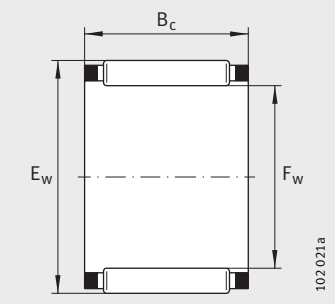
K..-ZW

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
	m	F_w	E_w	B_c	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	n_B
	≈g				N	N	N	min^{-1}	min^{-1}
K40X45X13	22	**40**	45	13	17 600	32 500	4 200	11 500	6 600
K40X45X17	31	**40**	45	17	21 400	41 500	5 200	11 500	6 700
K40X45X27	46	**40**	45	27	33 000	73 000	10 300	11 500	6 500
K40X47X18	39	**40**	47	18	29 500	50 000	6 900	11 300	6 300
K40X47X20	42	**40**	47	20	32 500	57 000	7 200	11 300	6 200
K40X48X20	49	**40**	48	20	36 000	59 000	7 500	11 100	6 100
K42X47X13	18	**42**	47	13	17 800	33 500	4 350	11 000	6 400
K42X47X17	32	**42**	47	17	21 700	43 000	5 400	11 000	6 400
K42X47X30-ZW	54	**42**	47	30	33 500	76 000	10 000	11 000	6 400
K42X50X20	53	**42**	50	20	35 000	57 000	7 300	10 700	6 000
K43X48X17	30	**43**	48	17	21 600	43 000	5 400	10 800	6 300
K43X48X27	50	**43**	48	27	33 500	75 000	10 700	10 800	6 200
K45X50X17	34	**45**	50	17	22 500	46 000	5 800	10 300	6 100
K45X50X27	51	**45**	50	27	34 500	80 000	11 400	10 300	5 900
K45X52X18	42	**45**	52	18	31 500	57 000	7 900	10 100	5 700
K45X53X20	55	**45**	53	20	39 000	67 000	8 700	10 000	5 500
K45X53X21	60	**45**	53	21	38 500	67 000	8 600	10 000	5 600
K45X53X28	81	**45**	53	28	52 000	98 000	13 700	10 000	5 400
K45X59X18-TV	72	**45**	59	18	44 000	54 000	6 900	9 400	5 400
K45X59X32	148	**45**	59	32	73 000	103 000	13 800	9 400	5 300
K47X52X17	35	**47**	52	17	23 300	49 000	6 100	9 900	5 800
K47X52X27	51	**47**	52	27	35 000	83 000	11 800	9 900	5 700

Needle roller and cage assemblies

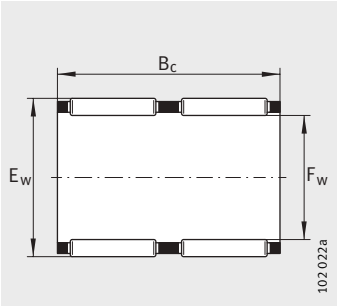
Single row and double row



K

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
	m	F_w	E_w	B_c	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	n_B
	≈g				N	N	N	min^{-1}	min^{-1}
K50X55X13,5	30	**50**	55	13,5	18 200	36 500	4 600	9 300	5 700
K50X55X17	35	**50**	55	17	22 100	47 000	7 300	9 300	5 700
K50X55X20	43	**50**	55	20	26 500	60 000	7 800	9 300	5 500
K50X55X30	65	**50**	55	30	39 000	97 000	13 900	9 300	5 400
K50X57X18	47	**50**	57	18	33 500	63 000	8 800	9 200	5 200
K50X58X20	75	**50**	58	20	35 500	62 000	8 800	9 100	5 400
K50X58X25	90	**50**	58	25	44 000	81 000	10 800	9 100	5 300
K52X57X12	24	**52**	57	12	18 000	36 500	4 600	9 000	5 400
K55X60X20	40	**55**	60	20	28 500	66 000	8 600	8 500	5 100
K55X60X27	60	**55**	60	27	38 000	97 000	13 600	8 500	4 950
K55X60X30	71	**55**	60	30	41 000	108 000	15 400	8 500	4 950
K55X62X18	52	**55**	62	18	35 500	70 000	9 800	8 400	4 750
K55X63X20	67	**55**	63	20	40 000	74 000	9 500	8 300	4 800
K55X63X25	80	**55**	63	25	51 000	101 000	13 700	8 300	4 700
K55X63X32	102	**55**	63	32	62 000	130 000	18 600	8 300	4 650
K58X65X18	52	**58**	65	18	35 000	70 000	9 800	8 000	4 650
K58X65X36-ZW	127	**58**	65	36	49 000	107 000	14 600	8 000	5 100
K60X65X20	52	**60**	65	20	29 500	72 000	9 300	7 800	4 750
K60X65X30	77	**60**	65	30	42 500	116 000	16 600	7 800	4 650
K60X66X33-ZW	104	**60**	66	33	46 000	112 000	15 100	7 800	4 800
K60X66X40-ZW	116	**60**	66	40	58 000	151 000	19 900	7 800	4 650
K60X68X20	71	**60**	68	20	43 500	85 000	11 000	7 700	4 400
K60X68X23	94	**60**	68	23	49 500	101 000	13 500	7 700	4 350
K60X68X25	89	**60**	68	25	53 000	111 000	15 200	7 700	4 350
K60X68X30-ZW	129	**60**	68	30	44 500	88 000	11 300	7 700	4 950
K60X75X42	240	**60**	75	42	118 000	199 000	27 000	7 300	4 050
K62X70X40-ZW	174	**62**	70	40	66 000	146 000	20 500	7 400	4 550
K64X70X16	53	**64**	70	16	28 000	60 000	8 100	7 300	4 500



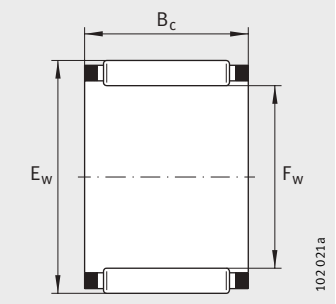
K..-ZW

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
	m	F_w	E_w	B_c	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	n_B
	≈g				N	N	N	min^{-1}	min^{-1}
K65X70X20	56	**65**	70	20	30 500	77 000	10 000	7 300	4 450
K65X70X30	83	**65**	70	30	44 000	124 000	17 800	7 300	4 350
K65X73X23	108	**65**	73	23	46 000	94 000	12 200	7 100	4 300
K65X73X30	141	**65**	73	30	57 000	123 000	17 100	7 100	4 300
K68X74X20	71	**68**	74	20	35 500	84 000	11 000	6 900	4 200
K68X74X30	100	**68**	74	30	46 500	118 000	16 900	6 900	4 300
K68X74X35-ZW	120	**68**	74	35	48 500	125 000	17 200	6 900	4 450
K70X76X20	71	**70**	76	20	36 000	86 000	11 300	6 700	4 100
K70X76X30	110	**70**	76	30	52 000	139 000	20 100	6 700	4 000
K70X78X30	148	**70**	78	30	60 000	135 000	18 800	6 600	4 000
K72X80X20	98	**72**	80	20	41 500	85 000	11 900	6 400	4 050
K73X79X20	75	**73**	79	20	37 000	90 000	11 800	6 400	4 000
K75X81X20	79	**75**	81	20	37 500	94 000	12 300	6 300	3 850
K75X81X30	114	**75**	81	30	52 000	143 000	20 400	6 300	3 850
K75X83X23	124	**75**	83	23	50 000	109 000	14 200	6 200	3 800
K75X83X30	147	**75**	83	30	62 000	143 000	20 000	6 200	3 800
K75X83X35-ZW	182	**75**	83	35	63 000	147 000	19 900	6 200	3 950
K75X83X40-ZW	211	**75**	83	40	73 000	177 000	25 000	6 200	3 900
K80X86X20	60	**80**	86	20	38 500	98 000	12 900	5 900	3 700
K80X88X30	138	**80**	88	30	71 000	176 000	25 000	5 800	3 400
K80X88X40-ZW	227	**80**	88	40	76 000	192 000	27 000	5 800	3 700
K80X88X46-ZW	260	**80**	88	46	88 000	231 000	30 000	5 800	3 650
K85X92X20	102	**85**	92	20	44 500	108 000	15 100	5 500	3 450
K90X97X20	109	**90**	97	20	45 000	113 000	15 800	5 200	3 300
K90X98X27	150	**90**	98	27	61 000	150 000	20 300	5 200	3 300
K90X98X30	172	**90**	98	30	68 000	172 000	24 000	5 200	3 300
K95X103X30	165	**95**	103	30	69 000	180 000	25 000	4 950	3 150
K95X103X40-ZW	266	**95**	103	40	83 000	228 000	32 500	4 950	3 200

Needle roller and cage assemblies

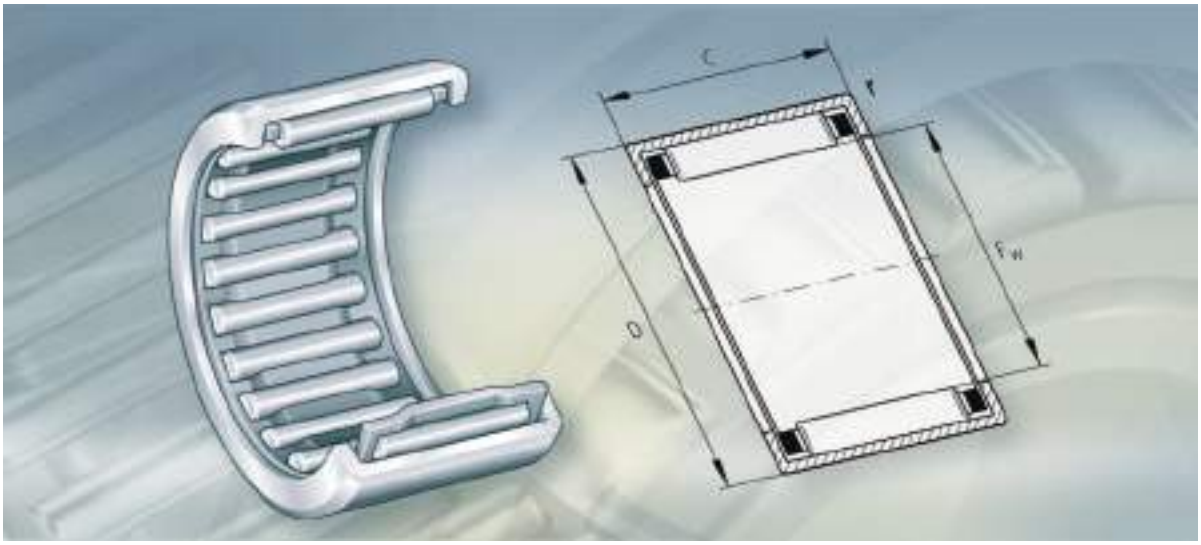
Single row



K

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
	m	F_w	E_w	B_c	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	n_B
	≈g				N	N	N	min^{-1}	min^{-1}
K100X107X21	120	**100**	107	21	48 000	127 000	17 600	4 750	3 100
K100X108X27	185	**100**	108	27	57 000	143 000	18 900	4 700	3 200
K100X108X30	180	**100**	108	30	71 000	188 000	26 000	4 700	3 050
K105X112X21	129	**105**	112	21	47 500	127 000	17 400	4 500	3 000
K110X117X24	172	**110**	117	24	56 000	158 000	19 800	4 300	2 850
K110X118X30	217	**110**	118	30	78 000	219 000	29 500	4 300	2 750
K115X123X27	200	**115**	123	27	63 000	170 000	21 600	4 100	2 850
K120X127X24	165	**120**	127	24	59 000	174 000	21 400	3 950	2 650
K125X133X35	275	**125**	133	35	86 000	260 000	34 500	3 800	2 600
K130X137X24	170	**130**	137	24	61 000	186 000	22 300	3 650	2 500
K135X143X35	300	**135**	143	35	91 000	290 000	37 500	3 550	2 390
K145X153X26	262	**145**	153	26	74 000	225 000	27 000	3 300	2 280
K150X160X46	570	**150**	160	46	147 000	470 000	60 000	3 150	2 100
K155X163X26	265	**155**	163	26	75 000	236 000	28 000	3 100	2 180
K160X170X46	550	**160**	170	46	152 000	510 000	63 000	2 950	1 970
K165X173X26	320	**165**	173	26	81 000	265 000	30 500	2 900	2 030
K175X183X32	400	**175**	183	32	99 000	350 000	41 500	2 750	1 930
K185X195X37	607	**185**	195	37	128 000	425 000	48 500	2 600	1 840
K195X205X37	620	**195**	205	37	133 000	450 000	51 000	2 450	1 760
K210X220X42	740	**210**	220	42	154 000	560 000	63 000	2 280	1 590
K220X230X42	790	**220**	230	42	158 000	590 000	66 000	2 180	1 510
K240X250X42	850	**240**	250	42	164 000	630 000	69 000	2 000	1 390
K265X280X50	1810	**265**	280	50	255 000	860 000	91 000	1 800	1 160



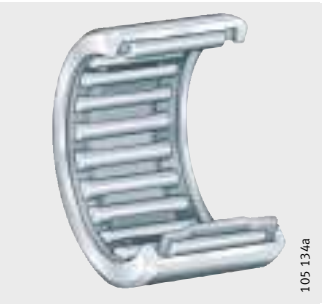
Drawn cup needle roller bearings with open ends
Drawn cup needle roller bearings with closed end

Drawn cup needle roller bearings

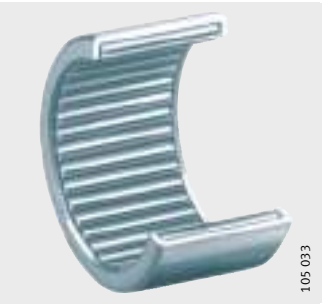
Drawn cup needle roller bearing with open ends

With cage or full complement

HK

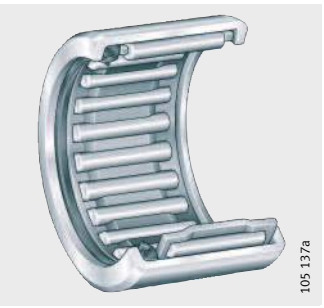


HN

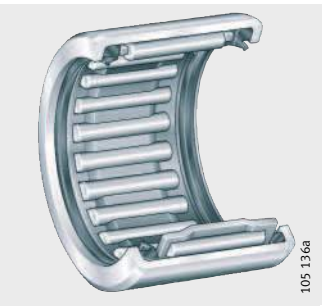


With cage
Lip seals

HK..-RS



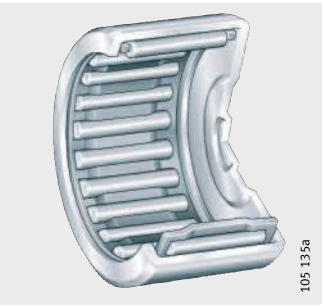
HK..-2RS



Drawn cup needle roller bearings with closed end

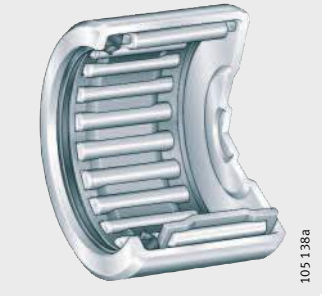
With cage

BK



With cage
Lip seals

BK..-RS



Drawn cup needle roller bearings

Features

Drawn cup needle roller bearings with open ends and with closed end are complete units comprising thin-walled, drawn cup outer rings and needle roller and cage assemblies. Drawn cup needle roller bearings are also available in a full complement design. The majority of the bearings are of a single row design.

Drawn cup needle roller bearings are available in open and sealed designs. Open designs correspond to DIN 618-1/ISO 3 245. In order to support axial forces, the bearings can also be combined with axial needle roller bearings AXW.

Particularly low cross-section height

Due to the thin-walled outer cup and the design without an inner ring, drawn cup needle roller bearings have extremely small radial dimensions. They have high load carrying capacity, are suitable for high speeds and are particularly easy to fit. If axial means of location such as shoulders, snap rings etc. are not used, the housing bore can be produced easily and particularly economically.

Double row designs have a lubrication hole and the suffix ZW.

Drawn cup needle roller bearings require a hardened and ground bearing raceway on the shaft. If the shaft cannot be used as a raceway, they can be combined with inner rings IR or LR. Suitable inner rings: see pages starting 690.

Drawn cup needle roller bearings with open ends

Drawn cup needle roller bearings HK are open on both sides.

Sealing/lubricant

Sealed drawn cup needle roller bearings with open ends correspond to DIN 618-2. They have lip seals on one or both sides and are therefore protected against contamination and spray water. They are greased using a lithium complex soap grease to GA08.

Drawn cup needle roller bearings with closed end

Drawn cup needle roller bearings BK are closed at one end. They are thus suitable for closing off the shaft ends of bearing arrangements. This gives protection against injury by rotating shafts and protects the bearing against contamination and moisture.

Depending on the size, the base is either smooth or lock-beaded (stiffened). Due to the profiled base design, low axial guidance forces can be supported.

Sealing/lubricant

Sealed drawn cup roller bearings with closed end have lip seals and are therefore protected against contamination and spray water. They are greased using a lithium complex soap grease to GA08.

Full complement drawn cup needle roller bearings with open ends

Full complement drawn cup needle roller bearings with open ends comprise thin-walled drawn outer rings and needle rollers without any mechanical means of needle retention. The needle rollers are secured for transport and fitting by means of a special grease (DIN 51825–K1/2K–30). However, this does not have adequate long term lubrication capacity. Relubrication is therefore recommended as appropriate after fitting.

For maximum load carrying capacity

Since full complement drawn cup needle roller bearings have the maximum number of needle rollers, they therefore offer extremely high load carrying capacity within a very small design envelope. However, their use at high speeds is restricted.

Drawn cup needle roller bearings

Operating temperature

Drawn cup needle roller bearings without seals can be used at operating temperatures from –25 °C to +140 °C.

Caution! Sealed drawn cup needle roller bearings are suitable for operating temperatures from –20 °C to +100 °C, restricted by the seal material.

Drawn cup needle roller bearings with plastic cages are suitable for operating temperatures from –25 °C to +120 °C.

Cages

With a few exceptions, drawn cup needle roller bearings have sheet steel cages. Plastic cages are indicated in the dimension tables by the suffix TV.

Special designs

The following special designs are available by agreement (see also the table Suffixes):

- unsealed bearings, greased using lithium complex soap grease to GA08
- bearings with lubrication holes – suffix AS1 – from size HK0609. Suffixes for available designs: see dimension tables.

Special bearings

In addition to the catalogue designs, special designs are available by agreement:

- in the enveloping circle range from 2 mm to 100 mm
- for special noise requirements, with special noise testing.

Universal joint bearings

For universal joints, universal joint bearings of series BU and BBU are available by agreement.

Suffixes

Suffixes for available designs: see table.

Available designs

Suffix	Description	Design
AS1	With lubrication hole from HK0609	Special design
RS	Contact seal on one side	Standard
GA08	Unsealed, greased bearings for operating temperatures from –25 °C to +140 °C	Special design
TV	Cage made from glass fibre reinforced polyamide 66	Standard
ZW	Double row	Standard
2RS	Contact seals on both sides	Standard

Design and safety guidelines

Raceway for bearings without inner ring

Where bearings without an inner ring are to be used, the rolling element raceway on the shaft must be hardened and ground. The surface hardness must be at least 670 HV, the hardening depth CHD or Rht must be sufficiently large.

Shaft and housing design: see the table and section Design of bearing arrangements, page 125.

Caution! In order to utilise the load carrying capacity of the bearings to the full, rigid support must be provided for the thin-walled outer ring.

Note the recommended bore tolerance according to the table for the shaft raceway/housing bore.

Tolerances for shaft raceway/ housing bore

Housing material		Shaft tolerance for bearings without inner ring	Bore tolerance
Steel or cast iron		h6	N6
Light metal	Al		R6
	Mg		S6

Surface for shaft raceway/ housing bore

Surface quality	Shaft raceway for bearings without inner ring	Housing bore
Roughness max.	R_a0,2 (R_z1)	R_a0,8 (R_z4)
Roughness	IT 3	IT 5/2
Parallelism	IT 3	IT 5/2

Static load safety factor

$$S_0 = \frac{C_{0r}}{P_0}$$

S_0 –
Static load safety factor

C_{0r} N
Basic static load rating according to dimension tables

P_0 N
Equivalent static bearing load.

Caution! In order to achieve sufficiently smooth running, a static load safety factor $S_0 \geqq 3$ is necessary.

Speeds

Caution! The speeds in the dimension tables are valid for oil lubrication. If grease lubrication is used, 60% of the stated value is permissible.

Radial location

Drawn cup needle roller bearings are pressed into the housing bore and require no further axial location.

Drawn cup needle roller bearings

Installation with fitting mandrel

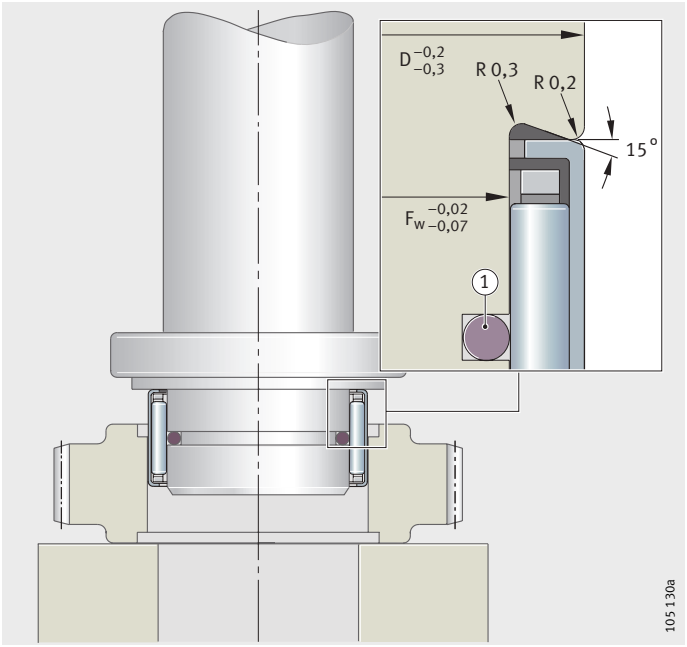
The bearings should be installed using a special fitting mandrel, *Figure 1*. The shoulder of the fitting mandrel should rest on the bearing end face marked with the designation.

A round section seal ① should be used to retain the bearing. The length and oversize of the round section seal must be matched by the customer to the dimensions and mass of the bearing.

Before installation, the bearings should be lubricated with grease, if grease lubrication is to be used.

Caution! Do not tilt drawn cup bearings during fitting.

Forces occurring during the fitting process are dependent on several variables. The fitting situation should be arranged so that the bearing rib on the end face is not deformed.



① Round section seal

Figure 1
Installation using a fitting mandrel

Accuracy

The main bearing dimensions conform to DIN 618/ISO 3 245.

The thin-walled outer rings adopt the dimensional and geometrical accuracy of the housing bore.

Enveloping circle

In the case of bearings without inner ring, the enveloping circle dimension F_w is used instead of the radial internal clearance.

The enveloping circle is the inner inscribed circle of the needle rollers in clearance-free contact with the outer raceway.

Once fitted, the enveloping circle diameter F_w is approximately in tolerance zone F8 (assuming bore tolerances according to the table, page 609).

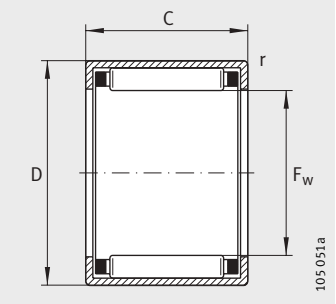
The enveloping circle is determined in accordance with the inspection dimensions in the table; see table Inspection dimensions for drawn cup needle roller bearings.

Caution! Bearings intended for enveloping circle measurement should not be repeatedly pushed in and out of the gauge. Bearings which have been checked in the ring gauge should not be used again.

Inspection dimensions for drawn cup needle roller bearings

Enveloping circle diameter F_w mm	Bearing outside diameter D mm	Ring gauge bore Actual dimension mm	Enveloping circle diameter Upper deviation µm	Enveloping circle diameter Lower deviation µm
3	6,5	6,484	+24	+6
4	8	7,984	+28	+10
5	9	8,984	+28	+10
6	10	9,984	+28	+10
7	11	10,980	+31	+13
8	12	11,980	+31	+13
9	13	12,980	+31	+13
10	14	13,980	+31	+13
12	16	15,980	+34	+16
12	18	17,980	+34	+16
13	19	18,976	+34	+16
14	20	19,976	+34	+16
15	21	20,976	+34	+16
16	22	21,976	+34	+16
17	23	22,976	+34	+16
18	24	23,976	+34	+16
20	26	25,976	+41	+20
22	28	27,976	+41	+20
25	32	31,972	+41	+20
28	35	34,972	+41	+20
30	37	36,972	+41	+20
32	39	38,972	+50	+25
35	42	41,972	+50	+25
40	47	46,972	+50	+25
45	52	51,967	+50	+25
50	58	57,967	+50	+25
55	63	62,967	+60	+30
60	68	67,967	+60	+30

Drawn cup needle roller bearings with open ends
Drawn cup needle roller bearings with closed end

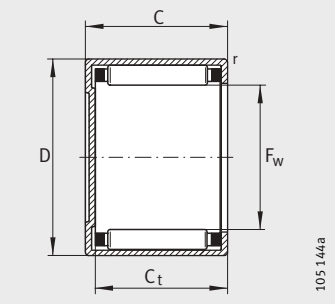


HK

Dimension table · Dimensions in mm

Drawn cup needle roller bearings with open ends		**Drawn cup needle roller bearing with closed end**		Dimensions				
Designation	Mass m ≈g	Designation	Mass m ≈g	F_w	D	C –0,3	C_t min.	r min.
+ **HK0306-TV**	1	+ **BK0306**	1	**3**	6,5	6	5,2	0,3
+ **HK0408**	2	+ **BK0408**	2,1	**4**	8	8	6,4	0,3
+ **HK0509**	2	+ **BK0509**	2,1	**5**	9	9	7,4	0,4
+ **HK0606**	1,5	–	–	**6**	10	6	–	0,4
+ **HK0608**	2,1	–	–	**6**	10	8	–	0,4
HK0609	2,5	**BK0609**	2,6	**6**	10	9	7,4	0,4
HK0709	2,6	**BK0709**	2,9	**7**	11	9	7,4	0,4
HK0808	2,7	**BK0808**	3	**8**	12	8	6,4	0,4
HK0810	3	**BK0810**	3,4	**8**	12	10	8,4	0,4
HK0908	3	–	–	**9**	13	8	–	0,4
HK0910	4	**BK0910**	4,3	**9**	13	10	8,4	0,4
HK0912	4,6	**BK0912**	4,9	**9**	13	12	10,4	0,4
HK1010	4,1	**BK1010**	4,3	**10**	14	10	8,4	0,4
HK1012	4,8	**BK1012**	5	**10**	14	12	10,4	0,4
HK1015	6	**BK1015**	6,2	**10**	14	15	13,4	0,4
HK1210	4,6	**BK1210**	5,2	**12**	16	10	8,4	0,4
HK1212	9	**BK1212**	10	**12**	18	12	9,3	0,8
HK1312	10	**BK1312**	11	**13**	19	12	9,3	0,8
HK1412	10,5	**BK1412**	12	**14**	20	12	9,3	0,8
HK1512	11	**BK1512**	13	**15**	21	12	9,3	0,8
HK1516	15	**BK1516**	17	**15**	21	16	13,3	0,8
HK1522-ZW	20	–	–	**15**	21	22	–	0,8
HK1612	12	**BK1612**	14	**16**	22	12	9,3	0,8
HK1616	16	**BK1616**	18	**16**	22	16	13,3	0,8
HK1622-ZW	22	**BK1622-ZW**	24	**16**	22	22	19,3	0,8
HK1712	12	–	–	**17**	23	12	–	0,8
HK1812	13	**BK1812**	15	**18**	24	12	9,3	0,8
HK1816	18	**BK1816**	20	**18**	24	16	13,3	0,8
HK2010	12	–	–	**20**	26	10	–	0,8
HK2012	14	–	–	**20**	26	12	–	0,8
HK2016	19	**BK2016**	22	**20**	26	16	13,3	0,8
HK2020	24	**BK2020**	27	**20**	26	20	17,3	0,8
HK2030-ZW	35	–	–	**20**	26	30	–	0,8

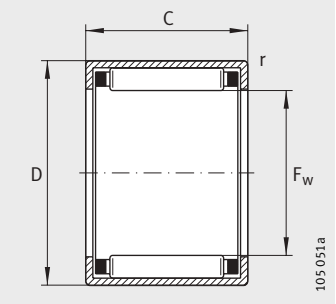
+ Not available with lubrication hole.



BK

Basic load ratings		Fatigue limit load	Limiting speed	Reference speed	Suitable inner rings (to be ordered separately)	
dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	n_B min^{-1}	LR Designation	IR Designation
1 230	840	113	46 000	49 500	–	–
1 780	1 310	114	41 000	38 500	–	–
2 400	1 990	239	38 000	32 000	–	–
1 610	1 220	167	35 000	28 500	–	–
2 030	1 650	184	35 000	28 500	–	–
2 850	2 600	310	35 000	27 000	–	–
3 100	2 950	355	31 000	24 000	–	–
2 750	2 600	290	28 000	21 800	–	–
3 800	3 950	500	28 000	21 200	–	**IR5X8X12**
3 550	3 750	440	25 500	19 000	–	–
4 250	4 650	600	25 500	19 000	–	–
5 300	6 300	860	25 500	18 700	–	**IR6X9X12**
4 400	5 100	650	23 300	17 400	**LR7X10X10,5**	**IR7X10X10,5**
5 500	6 800	930	23 300	17 100	–	**IR7X10X12**
6 800	8 800	1 210	23 300	17 000	–	**IR7X10X16**
4 950	6 200	800	20 000	14 800	**LR8X12X10,5**	**IR8X12X10,5**
6 500	7 300	860	18 700	13 800	**LR8X12X12,5**	**IR8X12X12,5**
6 800	7 900	940	17 500	12 900	**LR10X13X12,5**	**IR10X13X12,5**
7 100	8 500	1 010	16 500	12 100	–	**IR10X14X13**
7 900	9 400	1 150	15 600	11 400	**LR12X15X12,5**	**IR12X15X12,5**
10 500	14 400	1 780	15 600	11 200	**LR12X15X16,5**	**IR12X15X16,5**
13 400	19 500	2 380	15 600	11 200	**LR12X15X22,5**	**IR12X15X22,5**
7 600	9 700	1 160	14 700	10 900	–	**IR12X16X13**
10 900	15 300	1 900	14 700	10 600	–	**IR12X16X16**
13 100	19 400	2 320	14 700	10 700	–	**IR12X16X22**
7 900	10 300	1 230	14 000	10 300	–	–
8 100	10 900	1 300	13 300	9 800	**LR15X18X12,5**	–
11 600	17 300	2 140	13 300	9 600	**LR15X18X16,5**	**IR15X18X16,5**
6 400	8 200	1 040	12 200	9 300	–	–
8 600	12 100	1 450	12 200	9 000	–	**IR15X20X13**
12 700	20 100	2 500	12 200	8 700	**LR17X20X16,5**	**IR17X20X16,5**
15 700	26 000	3 500	12 200	8 600	**LR17X20X20,5**	**IR17X20X20,5**
21 800	40 000	5 000	12 200	8 600	**LR17X20X30,5**	**IR17X20X30,5**

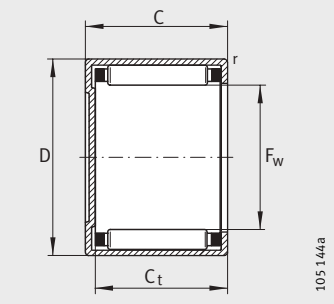
Drawn cup needle roller bearings with open ends
Drawn cup needle roller bearings with closed end



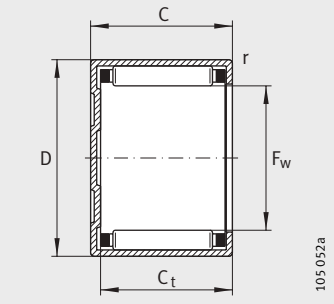
HK

Dimension table (continued) · Dimensions in mm

Drawn cup needle roller bearings with open ends		**Drawn cup needle roller bearing with closed end**		Dimensions				
Designation	Mass m ≈g	Designation	Mass m ≈g	F_w	D	C –0,3	C_t min.	r min.
HK2210	13	–	–	**22**	28	10	–	0,8
HK2212	15	**BK2212**	18	**22**	28	12	9,3	0,8
HK2216	21	**BK2216**	24	**22**	28	16	13,3	0,8
HK2220	26	–	–	**22**	28	20	–	0,8
HK2512	20	–	–	**25**	32	12	–	0,8
HK2516	27	**BK2516**	32	**25**	32	16	13,3	0,8
HK2520	33	**BK2520**	38	**25**	32	20	17,3	0,8
HK2526	44	**BK2526**	48	**25**	32	26	23,3	0,8
HK2538-ZW	64	**BK2538-ZW**	68	**25**	32	38	35,3	0,8
HK2816	29	–	–	**28**	35	16	–	0,8
HK2820	36	–	–	**28**	35	20	–	0,8
HK3012	23	**BK3012**	28	**30**	37	12	9,3	0,8
HK3016	31	**BK3016**	38	**30**	37	16	13,3	0,8
HK3020	39	**BK3020**	47	**30**	37	20	17,3	0,8
HK3022	42	–	–	**30**	37	22	–	0,8
HK3026	51	**BK3026**	58	**30**	37	26	23,3	0,8
HK3038-ZW	76	**BK3038-ZW**	84	**30**	37	38	35,3	0,8
HK3220	40,6	–	–	**32**	39	20	–	0,8
HK3224	49	–	–	**32**	39	24	–	0,8
HK3512	27	–	–	**35**	42	12	–	0,8
HK3516	36	–	–	**35**	42	16	–	0,8
HK3520	44	**BK3520**	53	**35**	42	20	17,3	0,8
HK4012	30	–	–	**40**	47	12	–	0,8
HK4016	39	–	–	**40**	47	16	–	0,8
HK4020	54	**BK4020**	62	**40**	47	20	17,3	0,8
HK4512	33	–	–	**45**	52	12	–	0,8
HK4516	46	–	–	**45**	52	16	–	0,8
HK4520	56	**BK4520**	72	**45**	52	20	17,3	0,8
HK5020	70	–	–	**50**	58	20	–	0,8
HK5025	90	–	–	**50**	58	25	–	0,8
HK5520	74	–	–	**55**	63	20	–	0,8
HK5528	105	–	–	**55**	63	28	–	0,8
HK6012	49	–	–	**60**	68	12	–	0,8
HK6020	81	–	–	**60**	68	20	–	0,8
HK6032	136	–	–	**60**	68	32	–	0,8



BK with $F_w < 25$ mm

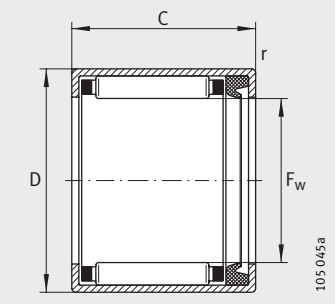


BK with $F_w \geqq 25$ mm

Basic load ratings		Fatigue limit load	Limiting speed	Reference speed	Suitable inner rings (to be ordered separately)	
dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	n_B min^{-1}	LR Designation	IR Designation
7 500	10 500	1 360	11 200	8 400	–	–
9 100	13 400	1 600	11 200	8 300	–	**IR17X22X13**
13 400	22 100	2 800	11 200	8 000	–	**IR17X22X16**
16 500	29 000	3 850	11 200	7 900	–	**IR17X22X23**
11 000	15 200	1 990	9 800	7 300	**LR20X25X12,5**	–
15 600	24 000	3 150	9 800	7 100	**LR20X25X16,5**	**IR20X25X17**
19 900	33 000	4 200	9 800	7 000	**LR20X25X20,5**	**IR20X25X20,5**
25 500	45 000	6 200	9 800	6 900	**LR20X25X26,5**	**IR20X25X26,5**
34 000	66 000	8 400	9 800	6 900	**LR20X25X38,5**	**IR20X25X38,5**
16 400	26 500	3 450	8 900	6 500	–	**IR22X28X17**
20 900	36 000	4 650	8 900	6 400	**LR22X28X20,5**	**IR22X28X20,5**
12 100	18 200	2 390	8 400	6 300	**LR25X30X12,5**	–
17 200	29 000	3 750	8 400	6 100	**LR25X30X16,5**	**IR25X30X17**
22 000	39 500	5 100	8 400	6 000	**LR25X30X20,5**	**IR25X30X20,5**
24 800	46 000	6 100	8 400	5 900	–	–
28 000	54 000	7 400	8 400	5 900	**LR25X30X26,5**	**IR25X30X26,5**
37 500	79 000	10 100	8 400	5 900	**LR25X30X38,5**	**IR25X30X38,5**
23 000	42 500	5 500	7 900	5 700	**LR28X32X20**	–
27 500	54 000	7 300	7 900	5 600	–	–
13 100	21 300	2 800	7 300	5 500	**LR30X35X12,5**	–
18 700	33 500	4 400	7 300	5 400	**LR30X35X16,5**	**IR30X35X17**
23 800	46 000	5 900	7 300	5 300	**LR30X35X20,5**	**IR30X35X20,5**
14 000	24 300	3 200	6 400	4 950	**LR35X40X12,5**	–
20 000	38 500	5 000	6 400	4 800	**LR35X40X16,5**	**IR35X40X17**
25 500	52 000	6 800	6 400	4 750	**LR35X40X20,5**	**IR35X40X20,5**
14 900	27 500	3 600	5 800	4 500	–	–
21 300	43 000	5 700	5 800	4 400	**LR40X45X16,5**	**IR40X45X17**
27 000	59 000	7 600	5 800	4 300	**LR40X45X20,5**	**IR40X45X20,5**
31 000	63 000	8 200	5 200	3 950	**LR45X50X20,5**	–
38 500	84 000	11 700	5 200	3 900	**LR45X50X25,5**	**IR45X50X25,5**
31 500	67 000	8 700	4 750	3 650	**LR50X55X20,5**	–
44 000	103 000	14 700	4 750	3 600	–	–
17 400	32 000	4 250	4 400	3 650	–	–
33 500	75 000	9 800	4 400	3 400	–	–
53 000	135 000	19 700	4 400	3 300	–	–

Drawn cup needle roller bearings with open ends
Drawn cup needle roller bearings with closed end

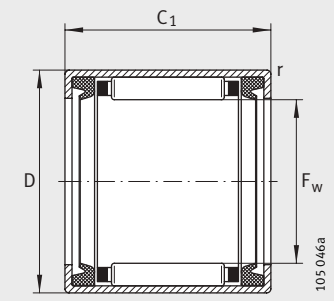
Sealed



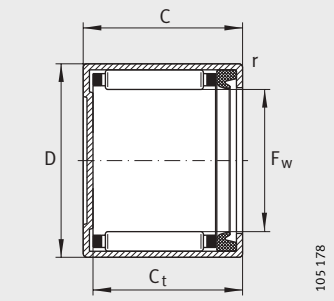
HK..-RS

Dimension table · Dimensions in mm

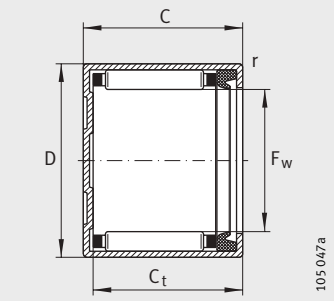
Drawn cup needle roller bearings with open ends				**Drawn cup needle roller bearing with closed end**		Dimensions			
Sealed on one side		Sealed on both sides		Sealed					
Designation	Mass m ≈g	Designation	Mass m ≈g	Designation	Mass m ≈g	F_w	D	C –0,3	C_1 –0,3
–	–	**HK0810-2RS**	3,2	–	–	**8**	12	–	10
HK0810-RS	3	**HK0812-2RS**	3,3	–	–	**8**	12	10	12
HK0812-RS	3,1	–	–	–	–	**8**	12	12	–
–	–	**HK1012-2RS**	4,3	–	–	**10**	14	–	12
HK1012-RS	4,2	**HK1014-2RS**	4,6	**BK1012-RS**	4,3	**10**	14	12	14
–	–	**HK1214-2RS**	8	–	–	**12**	16	–	14
HK1214-RS	10	**HK1216-2RS**	11	–	–	**12**	18	14	16
HK1414-RS	12	**HK1416-2RS**	13	**BK1414-RS**	13	**14**	20	14	16
HK1514-RS	12	**HK1516-2RS**	15	–	–	**15**	21	14	16
HK1518-RS	16	**HK1520-2RS**	18	–	–	**15**	21	18	20
HK1614-RS	13	**HK1616-2RS**	14	**BK1614-RS**	15	**16**	22	14	16
–	–	**HK1620-2RS**	18	–	–	**16**	22	–	20
HK1814-RS	14	**HK1816-2RS**	15	–	–	**18**	24	14	16
–	–	**HK2016-2RS**	18	–	–	**20**	26	–	16
HK2018-RS	21	**HK2020-2RS**	23	**BK2018-RS**	24	**20**	26	18	20
HK2214-RS	16	**HK2216-2RS**	18	–	–	**22**	28	14	16
HK2218-RS	24	**HK2220-2RS**	26	–	–	**22**	28	18	20
–	–	**HK2516-2RS**	27	–	–	**25**	32	–	16
HK2518-RS	29	**HK2520-2RS**	31	**BK2518-RS**	34	**25**	32	18	20
–	–	**HK2524-2RS**	40	–	–	**25**	32	–	24
–	–	**HK2530-2RS**	47	–	–	**25**	32	–	30
HK2818-RS	31	**HK2820-2RS**	34	–	–	**28**	35	18	20
–	–	**HK3016-2RS**	31	–	–	**30**	37	–	16
HK3018-RS	37	**HK3020-2RS**	36	–	–	**30**	37	18	20
–	–	**HK3024-2RS**	44	–	–	**30**	37	–	24
–	–	**HK3516-2RS**	32	–	–	**35**	42	–	16
HK3518-RS	39	**HK3520-2RS**	41	–	–	**35**	42	18	20
–	–	**HK4016-2RS**	37	–	–	**40**	47	–	16
HK4018-RS	45	**HK4020-2RS**	48	–	–	**40**	47	18	20
HK4518-RS	50	**HK4520-2RS**	54	–	–	**45**	52	18	20
HK5022-RS	76	**HK5024-2RS**	81	–	–	**50**	58	22	24



HK..-2RS



BK..-RS with $F_w < 25$ mm

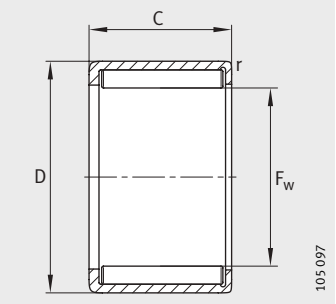


BK..-RS with $F_w \geqq 25$ mm

		Basic load ratings		Fatigue limit load	Limiting speed	Suitable inner rings (to be ordered separately)		
C_t	r	dyn. C_r	stat. C_{0r}	C_{ur}	n_G grease	For HK..-RS and HK..-2RS		For BK..-RS, LR, IR
min.	min.	N	N	N	min^{-1}	LR Designation	IR Designation	Designation
–	0,4	2 180	1 930	265	28 000	–	–	–
–	0,4	2 750	2 600	290	28 000	–	–	–
–	0,4	3 800	3 950	500	28 000	–	–	–
–	0,4	3 200	3 350	380	23 300	–	–	–
–	0,4	4 400	5 100	650	23 300	–	–	–
–	0,4	4 950	6 200	800	20 000	–	–	–
–	0,8	6 500	7 300	860	18 700	–	–	–
11,3	0,8	7 100	8 500	1 010	16 500	–	–	–
–	0,8	7 800	9 800	1 190	15 600	**LR12X15X16,5**	**IR12X15X16,5**	**LR12X15X12,5**
–	0,8	10 500	14 400	1 780	15 600	–	–	–
11,3	0,8	7 600	9 700	1 160	14 700	–	**IR12X16X20**	**IR12X16X13**
–	0,8	10 900	15 300	1 900	14 700	–	–	–
–	0,8	8 100	10 900	1 300	13 300	**LR15X18X16,5**	**IR15X18X16,5**	–
–	0,8	8 600	12 100	1 450	12 200	**LR17X20X16,5**	**IR17X20X16,5**	–
15,3	0,8	12 700	20 100	2 500	12 200	**LR17X20X20,5**	**IR17X20X20,5**	**LR17X20X16,5**
–	0,8	9 100	13 400	1 600	11 200	–	**IR17X22X16**	–
–	0,8	13 400	22 100	2 800	11 200	–	**IR17X22X23**	–
–	0,8	11 000	15 200	1 990	9 800	**LR20X25X16,5**	**IR20X25X17**	–
15,3	0,8	15 600	24 000	3 150	9 800	**LR20X25×20,5**	**IR20X25X20,5**	**LR20X25X16,5**
–	0,8	19 900	33 000	4 200	9 800	–	–	–
–	0,8	25 500	45 000	6 200	9 800	–	**IR20X25X30**	–
–	0,8	16 400	26 500	3 450	8 900	**LR22X28X20,5**	**IR22X28X20,5**	–
–	0,8	12 100	18 200	2 390	8 400	**LR25X30X16,5**	**IR25X30X17**	–
–	0,8	17 200	29 000	3 750	8 400	**LR25X30X20,5**	**IR25X30X20,5**	–
–	0,8	22 000	39 500	5 100	8 400	–	–	–
–	0,8	13 100	21 300	2 800	7 300	**LR30X35X16,5**	**IR30X35X17**	–
–	0,8	18 700	33 500	4 400	7 300	**LR30X35X20,5**	**IR30X35X20,5**	–
–	0,8	14 000	24 300	3 200	6 400	**LR35X40X16,5**	**IR35X40X17**	–
–	0,8	20 000	38 500	5 000	6 400	**LR35X40X20,5**	**IR35X40X20,5**	–
–	0,8	21 300	43 000	5 700	5 800	**LR40X45X20,5**	**IR40X45X20,5**	–
–	0,8	31 000	63 000	8 200	5 200	**LR45X50X25,5**	**IR45X50X25,5**	–

Drawn cup needle roller bearings with open ends

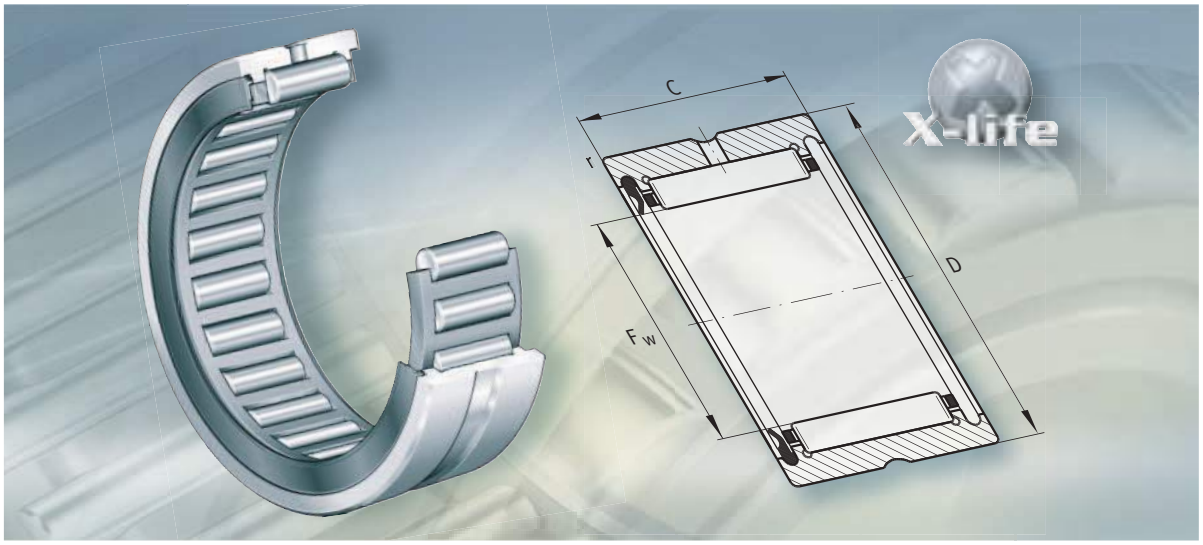
Full complement needle roller set



HN

Dimension table · Dimensions in mm

Designation	Mass	Dimensions				Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
	m	F_w	D	C	r	dyn. C_r	stat. C_{0r}	C_{ur}	n_G grease	n_B
	≈g				min.	N	N	N	min^{-1}	min^{-1}
HN1010	4,6	**10**	14	10	0,4	7 200	11 100	1 540	10 000	13 300
HN1210	5,3	**12**	16	10	0,4	8 000	13 400	1 850	8 600	11 300
HN1212	10,5	**12**	18	12	0,8	10 200	15 200	1 950	8 000	10 800
HN1412	12	**14**	20	12	0,8	11 000	17 500	2 260	7 100	9 500
HN1516	14	**15**	21	16	0,8	15 400	27 500	3 600	6 700	8 700
HN1612	13	**16**	22	12	0,8	12 000	20 300	2 600	6 300	8 400
HN1816	20	**18**	24	16	0,8	17 000	32 500	4 250	5 700	7 500
HN2016	22	**20**	26	16	0,8	18 100	36 500	4 750	5 200	6 800
HN2020	29,5	**20**	26	20	0,8	22 400	48 000	6 600	5 200	6 700
HN2520	39,6	**25**	32	20	0,8	28 000	59 000	7 900	4 200	5 500
HN2820	44	**28**	35	20	0,8	30 000	67 000	9 000	3 800	4 950
HN3520	54	**35**	42	20	0,8	33 500	83 000	11 100	3 100	4 100
HN4020	60,5	**40**	47	20	0,8	36 000	95 000	12 700	2 750	3 650
HN4520	66	**45**	52	20	0,8	38 500	108 000	14 500	2 470	3 300
HN4525	85	**45**	52	25	0,8	47 000	139 000	19 500	2 470	3 250
HN5020	85,3	**50**	58	20	0,8	44 500	119 000	16 200	2 220	3 000
HN5025	107	**50**	58	25	0,8	54 000	152 000	21 700	2 220	2 950



Machined needle roller bearings

Needle roller bearings with ribs
Needle roller bearings without ribs
Aligning needle roller bearings
Combined needle roller bearings
Inner rings

Machined needle roller bearings

X-life

Needle roller bearings with ribs

622

In needle roller bearings with ribs, the outer ring and the needle roller and cage assembly form a self-retaining unit. These bearings with low radial height and high load capacity are highly suitable for designs with limited radial space. The bearings are available with and without inner rings and in sealed and open versions.

Bearings without an inner ring are the best solution for bearing arrangements where the shaft can be hardened and ground.

Needle roller bearings with inner ring are used if the shaft cannot be configured as a rolling bearing raceway.

X-life

Needle roller bearings without ribs

656

Needle roller bearings without ribs on the outer ring are not self-retaining. This means that the outer ring, needle roller and cage assembly and inner ring can be fitted independently of each other. This makes fitting of the bearings considerably easier.

The bearings are available with and without inner rings and in single and double row versions. Bearings without an inner ring are used if the shaft can be hardened and ground.

X-life

Aligning needle roller bearings

668

Aligning needle roller bearings have a raceway ring with a spherical outside surface and a concave support ring. As a result, they can compensate for static misalignment of the bearing axis by up to 3°, but are not suitable for supporting swivel or wobble type motion.

The bearings are available with and without inner ring. Bearings without an inner ring are used if the shaft can be hardened and ground.

X-life

Combined needle roller bearings

674

Combined needle roller bearings are radial bearings with an axial component capable of supporting loads. Combined needle roller bearings are used as semi-locating or locating bearings. They do not permit any skewing between the shaft and housing.

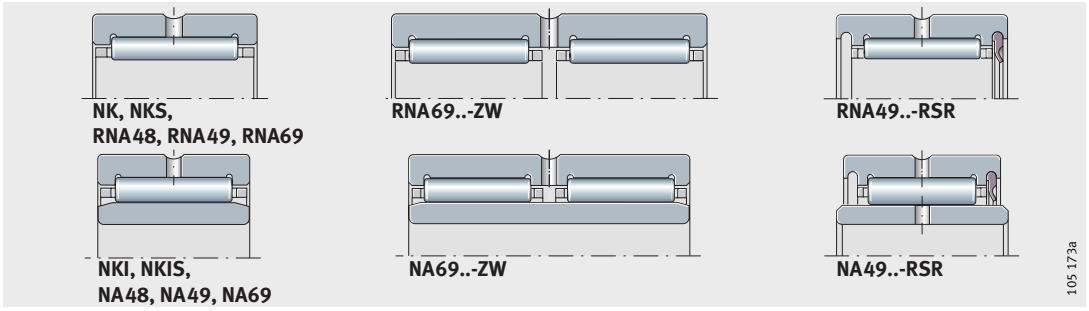
The bearings are available with and without inner ring. Bearings without an inner ring are used if the shaft can be hardened and ground.

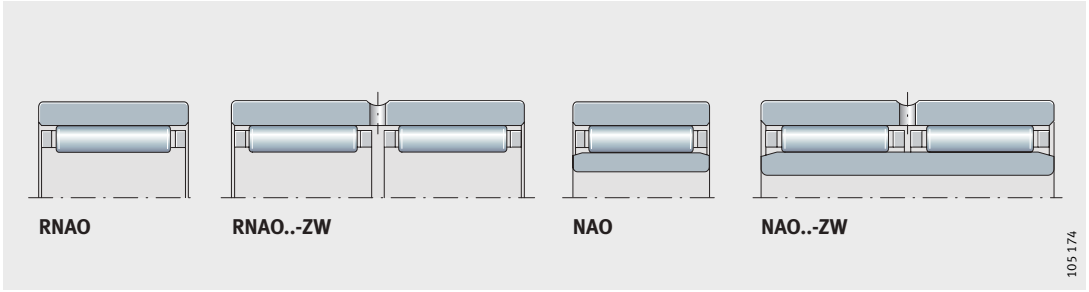
Inner rings

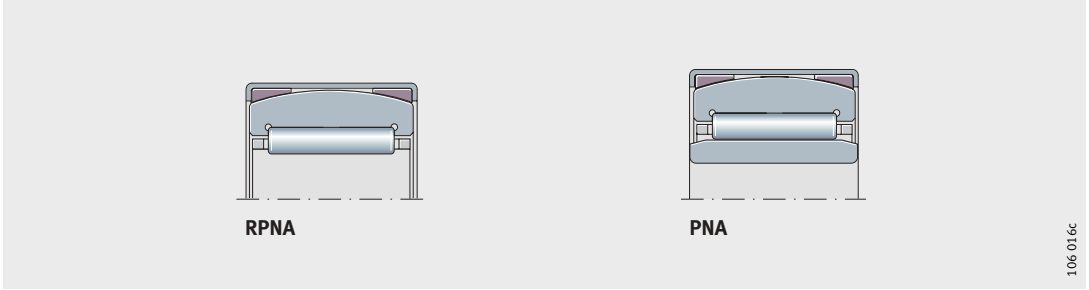
690

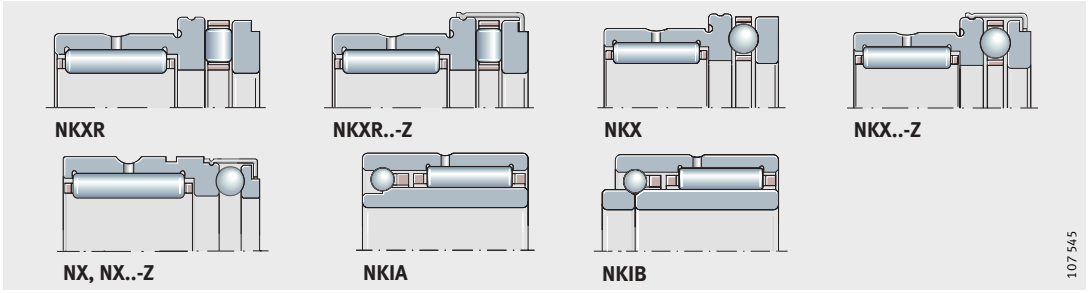
Inner rings are used as raceways for rolling elements or seal lips where the shaft is unsuitable for this purpose.

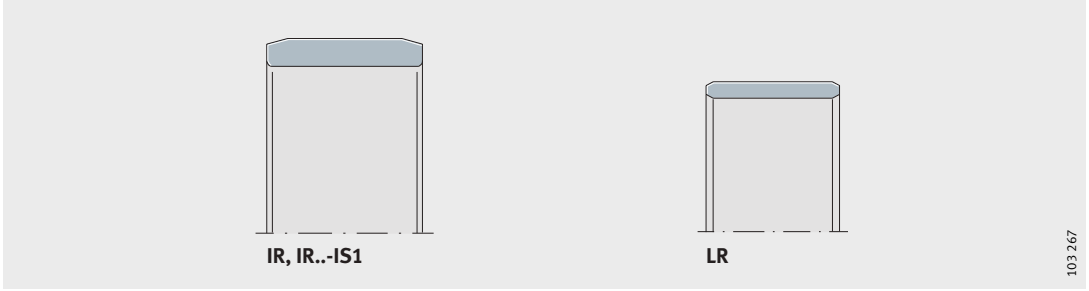
Where there is considerable axial displacement between the shaft and housing, wider inner rings can be used.

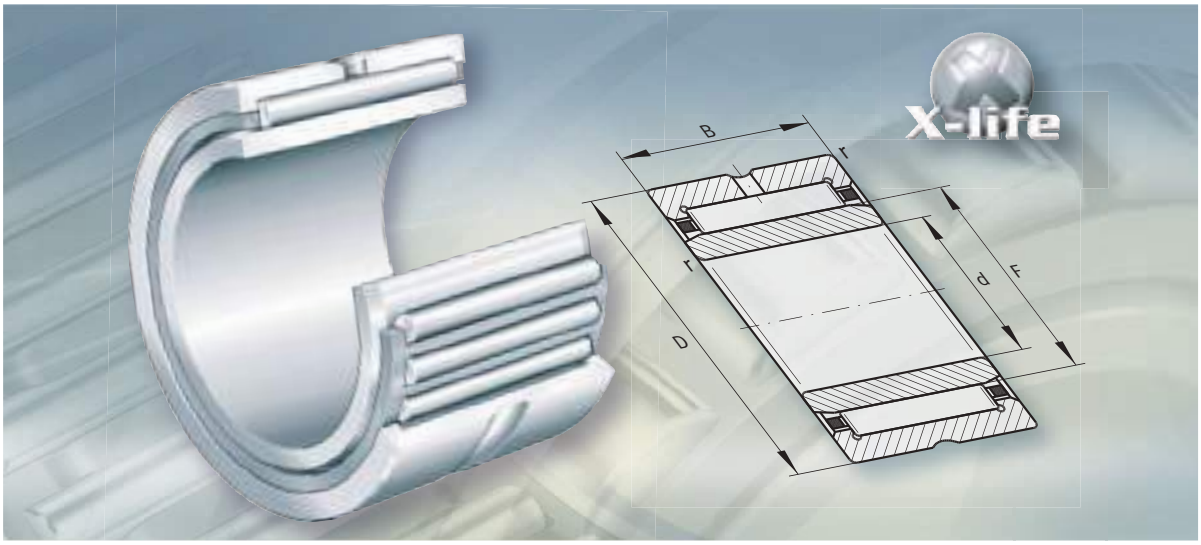

NK, NKS,
RNA48, RNA49, RNA69
RNA69..-ZW
RNA49..-RSR
NKI, NKIS,
NA48, NA49, NA69
NA69..-ZW
NA49..-RSR
105 173a


RNAO
RNAO..-ZW
NAO
NAO..-ZW
105 174


RPNA
PNA
106 016c


NKXR
NKXR..-Z
NKX
NKX..-Z
NX, NX..-Z
NKIA
NKIB
107 545


IR, IR..-IS1
LR
103 267

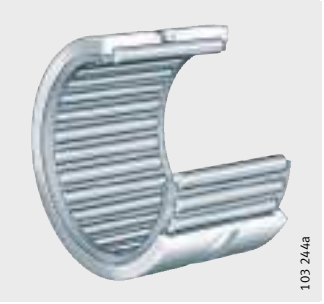


Needle roller bearings with ribs

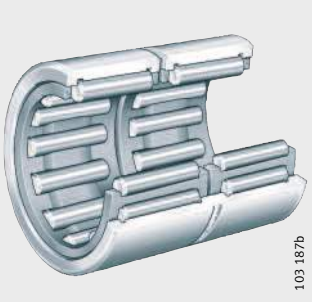
Needle roller bearings with ribs

Without inner ring
Single row and double row

NK, NKS, RNA48, RNA49, RNA69

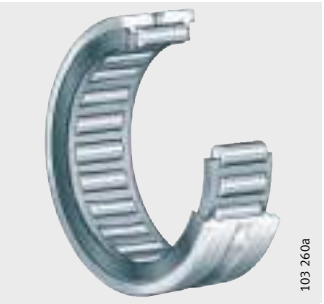


RNA69..-ZW



Lip seals

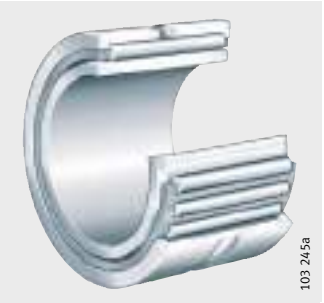
RNA49..-RSR



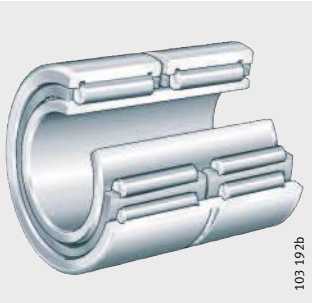
RNA49..-2RSR

With inner ring
Single row and double row

NKI, NKIS, NA48, NA49, NA69

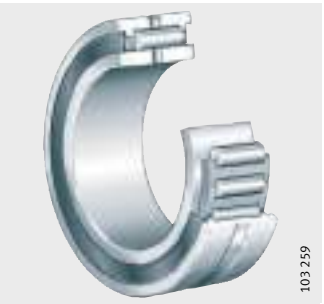


NA69..-ZW

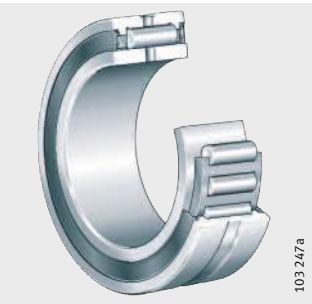


Lip seals

NA49..-RSR



NA49..-2RSR



Needle roller bearings with ribs

Features

Needle roller bearings with ribs are single or double row units comprising machined outer rings with ribs, needle roller and cage assemblies and removable inner rings.
The bearings are available in open and sealed designs.

X-life

Needle roller bearings with ribs are X-life bearings. In these bearings, the raceways have optimised roughness and geometrical accuracy. This gives higher load carrying capacity and longer life.

Needle roller bearings without inner ring

Bearings without inner ring have particularly compact radial dimensions. However, they require a shaft raceway that is hardened and ground.

Bearings RNA69 are double row units with $F_w \geqq 40$ mm.

Sealing/lubricant

Bearings RNA49..-RSR are sealed on one side and bearings RNA49..-2RSR on both sides by contact seals. They are greased using a lithium complex soap grease to GA08 and can be lubricated.

For lubrication, the bearings have a lubrication groove and lubrication hole in the outer ring, with the exception of:
NK with $F_w \leqq 10$ mm.

Needle roller bearings with inner ring

Bearings with inner ring are used if the shaft cannot be configured as a rolling bearing raceway.

Bearings NA69 are double row units with $d \geqq 32$ mm.

Sealing/lubricant

Bearings NA49..-RSR are sealed on one side and bearings NA49..-2RSR on both sides by contact seals. They are greased using a lithium complex soap grease to GA08 and can be lubricated.

For lubrication, the bearings have a lubrication groove and lubrication hole in the outer ring, with the exception of:
NKI with $d \leqq 7$ mm.

Displacement of the inner ring

The standard inner ring allows axial displacement within the values “s” stated in the dimension tables. Where larger displacements occur, the standard ring can be replaced by a wider inner ring IR. Inner rings: see page 690.

Operating temperature

Unsealed bearings can be used at operating temperatures from –20 °C to +120 °C.

Caution! Sealed needle roller bearings are suitable for operating temperatures from –20 °C to +100 °C, restricted by the grease and seal material.

Cages

The cages are made from sheet steel or plastic.
Plastic cages have the suffix TV.

Caution! Before using bearings with plastic cages, check the compatibility of the lubricant used with the cage material (PA66-GF/H).

Needle roller bearings with ribs

Suffixes

Suffixes for the available designs: see table.

Available designs

Suffixes	Description	Design
C3	Radial internal clearance larger than normal	Special design[1]
P5	High dimensional and geometrical accuracy	Special design[1]
RSR	Contact seal on one side	Standard
TV[2]	Cage made from glass fibre reinforced polyamide 66	Standard
ZW[3]	Double row	Standard
2RSR	Contact seals on both sides	Standard

1) Available by agreement.

2) Bearings with plastic cage: see dimension tables.

3) Dependent on size.

Design and safety guidelines

Raceway for bearings without inner ring

Where bearings without an inner ring are to be used, the rolling element raceway on the shaft must be hardened and ground. The surface hardness of the raceway must be 670 HV + 170 HV, the hardening depth CHD or Rht must be sufficiently large.

Raceway design

Shaft diameter Nominal dimension mm		Shaft tolerance Operating clearance			Roughness max.	Roundness max.	Parallelism max.
over	incl.	Small	Normal	Large			
–	65	k5	h5	g6	R_a0,1 (R_z0,4)	IT3	IT3
65	80	k5	h5	f6			
80	120	k5	g5	f6	R_a0,15 (Rz0,63)		
120	160	k5	g5	f6	R_a0,2 (R_z1)		
160	180	k5	g5	e6			
180	200	j5	g5	e6			
200	250	j5	f6	e6			
250	315	h5	f6	e6			
315	415	g5	f6	d6			

Caution! The values apply to housing tolerances up to K7. For tighter housing bores, the operating clearance should be checked by either calculation or measurement.

Minimum radial load

In order to ensure operation without slippage, the bearings must be subjected to a minimum radial load $F_{r\,min}$. This applies in particular to high speed bearings since, if the radial load is insufficient or not present, damaging sliding motion may occur between the rolling elements and raceways. In continuous operation, a minimum radial load of the order of $C_r/P < 50$ is necessary.

Speeds

Caution! The limiting speeds n_G for series RNA49..-RSR (2RSR) and NA49..-RSR (2RSR) are valid for grease lubrication.

Sealing rings/ wider inner rings

Sealing rings of series G, GR and SD are matched to the bearing dimensions and can be combined with wider inner rings IR. The outer surface of the inner rings can be used as the sliding surface for seal lips.

Sealing rings: see publication GSD, inner rings: see page 690.

Radial location

Needle roller bearings with inner ring are radially located by means of a close fit on the shaft and in the housing.

Axial location

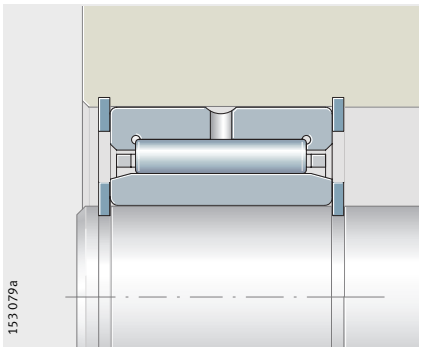
In order to prevent lateral creep of the bearing rings, they must be located by means of physical locking, *Figure 1* and *Figure 2*.

The abutting shoulders (shaft/housing) should be sufficiently high and perpendicular to the bearing axis.

The transition from the bearing seating to the abutting shoulder must be designed with rounding to DIN 5 418 or an undercut to DIN 509. Note the minimum chamfer dimensions r as given in the dimension tables.

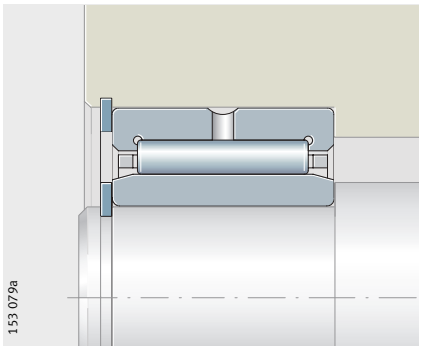
The overlap between the snap rings and the end faces of the bearing rings must be sufficiently large.

Maximum inner ring chamfer dimensions to DIN 620-6 must be taken into consideration.



NKI

Figure 1
Axial location by snap rings



NKI

Figure 2
Axial location by snap rings and abutting shoulders

Fitting instruction

Caution!

Combined needle roller bearings are not self-retaining. Since the individual bearing parts are matched to each other, the parts of bearings of identical size must not be interchanged during fitting.

Accuracy

The dimensional and geometrical tolerances correspond to tolerance class PN to DIN 620.

Radial internal clearance

Bearings with inner ring have a radial internal clearance of CN.

Radial internal clearance to DIN 620-4

Bore d mm		Radial internal clearance			
		CN µm		C3 µm	
over	incl.	min.	max.	min.	max.
–	24	20	45	35	60
24	30	20	45	35	60
30	40	25	50	45	70
40	50	30	60	50	80
50	65	40	70	60	90
65	80	40	75	65	100
80	100	50	85	75	110
100	120	50	90	85	125
120	140	60	105	100	145
140	160	70	120	115	165
160	180	75	125	120	170
180	200	90	145	140	195
200	225	105	165	160	220
225	250	110	175	170	235
250	280	125	195	190	260
280	315	130	205	200	275
315	355	145	225	225	305
355	400	190	280	280	370
400	450	210	310	310	410
450	500	220	330	330	440

Enveloping circle

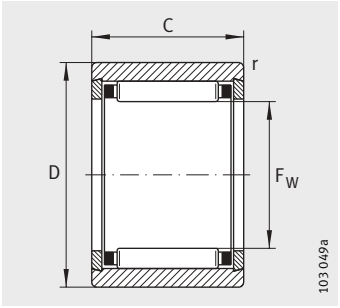
In the case of bearings without inner ring, the enveloping circle dimension F_w is used instead of the radial internal clearance.

The enveloping circle is the inner inscribed circle of the needle rollers in clearance-free contact with the outer raceway.

For bearings before fitting, the enveloping circle F_w is in the tolerance zone F6.

Needle roller bearings

Without inner ring

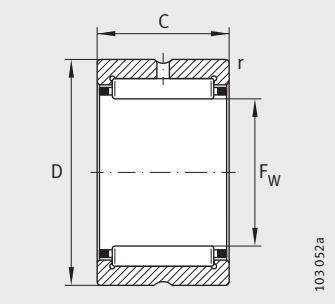


NK ($F_w \leqq 10$ mm)

Dimension table · Dimensions in mm

Designation				Mass	Dimensions			
			X-life	m ≈g	F_w	D	C	r min.
NK5/10-TV[1]	–	–	**XL**	3,1	**5**	10	10	0,15
NK5/12-TV[1]	–	–	**XL**	3,7	**5**	10	12	0,15
NK6/10-TV[1]	–	–	**XL**	4,7	**6**	12	10	0,15
NK6/12-TV[1]	–	–	**XL**	5,7	**6**	12	12	0,15
NK7/10-TV[1]	–	–	**XL**	6,9	**7**	14	10	0,3
NK7/12-TV[1]	–	–	**XL**	8,2	**7**	14	12	0,3
NK8/12-TV[1]	–	–	**XL**	8,7	**8**	15	12	0,3
NK8/16-TV[1]	–	–	**XL**	12	**8**	15	16	0,3
NK9/12-TV[1]	–	–	**XL**	10,3	**9**	16	12	0,3
NK9/16-TV[1]	–	–	**XL**	12,8	**9**	16	16	0,3
NK10/12-TV[1]	–	–	**XL**	10,1	**10**	17	12	0,3
NK10/16-TV[1]	–	–	**XL**	13,3	**10**	17	16	0,3
NK12/12	–	–	**XL**	12,1	**12**	19	12	0,3
NK12/16	–	–	**XL**	15,9	**12**	19	16	0,3
NK14/16	–	–	**XL**	20,7	**14**	22	16	0,3
NK14/20	–	–	**XL**	25,5	**14**	22	20	0,3
–	**RNA4900**	–	**XL**	16,5	**14**	22	13	0,3
NK15/16	–	–	**XL**	21,8	**15**	23	16	0,3
NK15/20	–	–	**XL**	26,6	**15**	23	20	0,3
NK16/16	–	–	**XL**	22,4	**16**	24	16	0,3
NK16/20	–	–	**XL**	28,4	**16**	24	20	0,3
–	**RNA4901**	–	**XL**	17,4	**16**	24	13	0,3
–	–	**RNA6901**	**XL**	31	**16**	24	22	0,3
NK17/16	–	–	**XL**	23,7	**17**	25	16	0,3
NK17/20	–	–	**XL**	29,8	**17**	25	20	0,3
NK18/16	–	–	**XL**	24,9	**18**	26	16	0,3
NK18/20	–	–	**XL**	31,4	**18**	26	20	0,3
NK19/16	–	–	**XL**	26,1	**19**	27	16	0,3
NK19/20	–	–	**XL**	32,2	**19**	27	20	0,3

[1] With closing rings, without lubrication hole and groove.

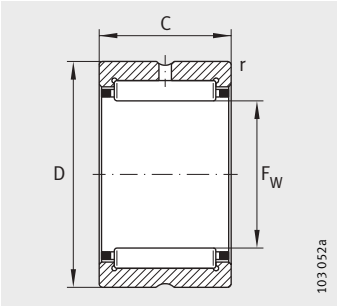


NK ($F_W \geqq 12$ mm),
RNA49, RNA69

Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	n_B min^{-1}
2 650	1 920	295	36 500	43 500
3 400	2 650	435	36 500	42 500
2 950	2 280	355	33 500	35 500
3 800	3 150	520	33 500	35 000
3 250	2 650	410	31 000	30 000
4 150	3 600	600	31 000	29 500
4 450	4 100	690	29 500	27 000
5 800	5 800	970	29 500	26 500
5 100	5 000	840	28 500	24 200
6 600	7 100	1 190	28 500	23 900
5 300	5 500	930	27 000	22 300
7 000	7 800	1 310	27 000	22 000
7 200	7 100	1 280	25 500	19 000
10 100	11 000	1 920	25 500	18 400
11 400	11 500	2 100	23 600	16 100
14 500	15 600	2 700	23 600	15 900
9 600	9 200	1 630	23 600	15 400
12 100	12 700	2 320	22 900	15 200
15 400	17 200	3 000	22 900	14 900
12 800	13 900	2 550	22 400	14 300
16 300	18 800	3 250	22 400	14 000
10 600	10 900	1 940	22 400	13 500
18 100	21 600	3 800	22 400	12 600
13 500	15 000	2 750	21 800	13 600
17 100	20 400	3 550	21 800	13 300
14 100	16 200	3 000	21 300	12 900
17 900	22 000	3 850	21 300	12 600
14 700	17 400	3 200	20 900	12 300
18 700	23 600	4 150	20 900	12 000

Needle roller bearings

Without inner ring



NK, NKS, RNA49, RNA69

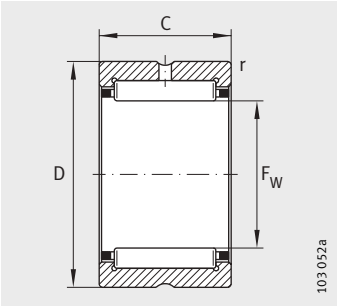
Dimension table (continued) · Dimensions in mm

Designation					Mass	Dimensions			
				X-life	m ≈g	F_w	D	C	r min.
NK20/16	–	–	–	**XL**	27	**20**	28	16	0,3
NK20/20	–	–	–	**XL**	33,9	**20**	28	20	0,3
–	**RNA4902**	–	–	**XL**	21,7	**20**	28	13	0,3
–	–	**RNA6902**	–	**XL**	39,7	**20**	28	23	0,3
–	–	–	**NKS20**	**XL**	48,7	**20**	32	20	0,6
NK21/16	–	–	–	**XL**	28,1	**21**	29	16	0,3
NK21/20	–	–	–	**XL**	35,2	**21**	29	20	0,3
NK22/16	–	–	–	**XL**	30	**22**	30	16	0,3
NK22/20	–	–	–	**XL**	37	**22**	30	20	0,3
–	**RNA4903**	–	–	**XL**	22,2	**22**	30	13	0,3
–	–	**RNA6903**	–	**XL**	42,4	**22**	30	23	0,3
–	–	–	**NKS22**	**XL**	61,5	**22**	35	20	0,6
NK24/16	–	–	–	**XL**	31,9	**24**	32	16	0,3
NK24/20	–	–	–	**XL**	40	**24**	32	20	0,3
–	–	–	**NKS24**	**XL**	65,5	**24**	37	20	0,6
NK25/16	–	–	–	**XL**	32,6	**25**	33	16	0,3
NK25/20	–	–	–	**XL**	42	**25**	33	20	0,3
–	**RNA4904**	–	–	**XL**	52,3	**25**	37	17	0,3
–	–	**RNA6904**	–	**XL**	100	**25**	37	30	0,3
–	–	–	**NKS25**	**XL**	68,1	**25**	38	20	0,6
NK26/16	–	–	–	**XL**	34	**26**	34	16	0,3
NK26/20	–	–	–	**XL**	42	**26**	34	20	0,3
NK28/20	–	–	–	**XL**	52,2	**28**	37	20	0,3
NK28/30	–	–	–	**XL**	82	**28**	37	30	0,3
–	**RNA49/22**	–	–	**XL**	50,2	**28**	39	17	0,3
–	–	**RNA69/22**	–	**XL**	98	**28**	39	30	0,3
–	–	–	**NKS28**	**XL**	83,6	**28**	42	20	0,6
NK29/20-TV	–	–	–	**XL**	50	**29**	38	20	0,3
NK29/30	–	–	–	**XL**	84,3	**29**	38	30	0,3
NK30/20-TV	–	–	–	**XL**	61	**30**	40	20	0,3
NK30/30-TV	–	–	–	**XL**	92,4	**30**	40	30	0,3
–	**RNA4905**	–	–	**XL**	61	**30**	42	17	0,3
–	–	**RNA6905**	–	**XL**	112	**30**	42	30	0,3
–	–	–	**NKS30**	**XL**	104	**30**	45	22	0,6

Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	n_B min^{-1}
14 600	17 500	3 200	20 400	11 900
18 600	23 800	4 150	20 400	11 600
12 000	13 600	2 430	20 400	10 800
19 500	25 500	4 450	20 400	10 600
26 000	25 000	4 400	18 800	10 700
15 200	18 700	3 450	19 600	11 400
19 300	25 500	4 450	19 600	11 100
15 800	19 900	3 650	18 800	10 900
20 000	27 000	4 700	18 800	10 700
12 400	14 600	2 600	18 800	9 900
21 100	29 000	5 100	18 800	9 500
27 500	28 000	4 900	17 200	9 700
16 900	22 300	4 100	17 500	10 100
21 400	30 500	5 300	17 500	9 800
29 500	31 000	5 400	16 100	9 100
16 800	22 400	4 150	16 900	9 800
21 300	30 500	5 300	16 900	9 600
23 700	25 500	4 600	15 800	8 900
40 500	51 000	9 100	15 800	8 500
31 000	33 500	5 800	15 600	8 700
17 300	23 600	4 350	16 300	9 500
22 000	32 000	5 600	16 300	9 300
24 800	34 000	5 900	15 100	8 600
37 000	57 000	10 500	15 100	8 400
26 000	29 500	5 300	14 600	8 000
42 000	55 000	9 900	14 600	7 800
32 500	36 500	6 400	14 000	7 900
27500	39 000	6 800	14 600	8 500
37 000	57 000	10 600	14 600	8 100
28 000	41 000	7 200	14 600	8 200
42 000	69 000	12 700	14 000	7 500
26 500	31 500	5 700	13 600	7 400
44 000	59 000	10 600	13 600	7 200
36 500	40 000	6 900	13 100	7 600

Needle roller bearings

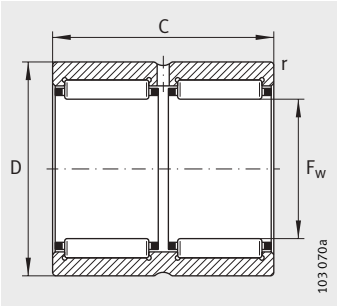
Without inner ring



NK, NKS, RNA49, RNA69

Dimension table (continued) · Dimensions in mm

Designation					Mass	Dimensions			
				X-life	m ≈g	F_w	D	C	r min.
NK32/20-TV	–	–	–	**XL**	64	**32**	42	20	0,3
NK32/30	–	–	–	**XL**	102	**32**	42	30	0,3
–	**RNA49/28**	–	–	**XL**	73,2	**32**	45	17	0,3
–	–	**RNA69/28**	–	**XL**	135	**32**	45	30	0,3
–	–	–	**NKS32**	**XL**	110	**32**	47	22	0,6
NK35/20-TV	–	–	–	**XL**	69,4	**35**	45	20	0,3
NK35/30-TV	–	–	–	**XL**	106	**35**	45	30	0,3
–	**RNA4906**	–	–	**XL**	69,4	**35**	47	17	0,3
–	–	**RNA6906**	–	**XL**	126	**35**	47	30	0,3
–	–	–	**NKS35**	**XL**	118	**35**	50	22	0,6
NK37/20	–	–	–	**XL**	77	**37**	47	20	0,3
NK37/30	–	–	–	**XL**	113	**37**	47	30	0,3
–	–	–	**NKS37**	**XL**	123	**37**	52	22	0,6
NK38/20	–	–	–	**XL**	79,4	**38**	48	20	0,3
NK38/30	–	–	–	**XL**	116	**38**	48	30	0,3
NK40/20-TV	–	–	–	**XL**	78	**40**	50	20	0,3
NK40/30	–	–	–	**XL**	125	**40**	50	30	0,3
–	**RNA49/32**	–	–	**XL**	89,1	**40**	52	20	0,6
–	–	**RNA69/32-ZW**	–	**XL**	162	**40**	52	36	0,6
–	–	–	**NKS40**	**XL**	129	**40**	55	22	0,6
NK42/20	–	–	–	**XL**	85,8	**42**	52	20	0,3
NK42/30	–	–	–	**XL**	130	**42**	52	30	0,3
–	**RNA4907**	–	–	**XL**	107	**42**	55	20	0,6
–	–	**RNA6907-ZW**	–	**XL**	193	**42**	55	36	0,6
NK43/20	–	–	–	**XL**	86	**43**	53	20	0,3
NK43/30	–	–	–	**XL**	133	**43**	53	30	0,3
–	–	–	**NKS43**	**XL**	139	**43**	58	22	0,6
NK45/20-TV	–	–	–	**XL**	85,3	**45**	55	20	0,3
NK45/30-TV	–	–	–	**XL**	132	**45**	55	30	0,3
–	–	–	**NKS45**	**XL**	145	**45**	60	22	0,6
NK47/20	–	–	–	**XL**	94,5	**47**	57	20	0,3
NK47/30	–	–	–	**XL**	142	**47**	57	30	0,3
–	**RNA4908**	–	–	**XL**	140	**48**	62	22	0,6
–	–	**RNA6908-ZW**	–	**XL**	256	**48**	62	40	0,6

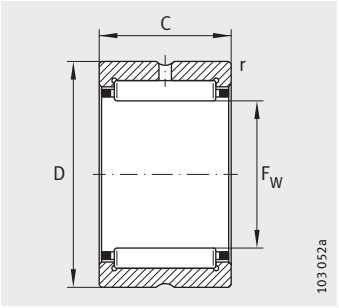


RNA69..-ZW

Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	n_B min^{-1}
29 500	44 500	7 800	13 200	7 700
39 000	63 000	11 700	13 200	7 500
27 500	33 500	6 100	12 700	6 900
45 500	63 000	11 400	12 700	6 700
38 000	43 500	7 400	12 400	7 200
31 000	48 500	8 500	12 300	6 800
46 000	81 000	15 000	12 300	6 600
28 500	35 500	6 400	12 000	6 400
49 000	71 000	12 900	12 000	6 100
39 500	47 000	8 000	11 500	6 700
28 000	43 500	7 600	11 700	6 900
42 000	73 000	13 500	11 700	6 600
41 500	50 000	8 600	11 000	6 400
29 000	45 000	7 900	11 400	6 700
43 000	76 000	14 000	11 400	6 500
33 500	56 000	9 800	10 900	6 100
44 000	79 000	14 600	10 900	6 200
34 500	47 500	8 900	10 700	6 000
53 000	82 000	15 100	10 700	6 000
42 500	54 000	9 200	10 300	6 100
30 000	49 000	8 600	10 400	6 200
44 500	82 000	15 200	10 400	6 000
35 500	50 000	9 400	10 100	5 600
54 000	86 000	15 900	10 100	5 700
30 500	51 000	8 900	10 200	6 000
45 500	85 000	15 800	10 200	5 900
44 000	57 000	9 800	9 700	5 800
35 000	62 000	10 800	9 800	5 600
52 000	103 000	19 100	9 800	5 400
45 500	60 000	10 400	9 300	5 600
32 500	56 000	9 900	9 400	5 600
48 500	94 000	17 500	9 400	5 400
48 500	67 000	11 500	8 900	5 000
74 000	116 000	19 400	8 900	5 100

Needle roller bearings

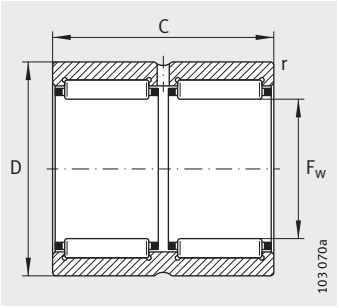
Without inner ring



NK, NKS, RNA49

Dimension table (continued) · Dimensions in mm

Designation					Mass	Dimensions			
				X-life	m ≈g	F_w	D	C	r min.
NK50/25-TV	–	–	–	**XL**	146	**50**	62	25	0,6
NK50/35-TV	–	–	–	**XL**	207	**50**	62	35	0,6
–	–	–	**NKS50**	**XL**	157	**50**	65	22	1
–	**RNA4909**	–	–	**XL**	182	**52**	68	22	0,6
–	–	**RNA6909-ZW**	–	**XL**	338	**52**	68	40	0,6
NK55/25	–	–	–	**XL**	180	**55**	68	25	0,6
NK55/35	–	–	–	**XL**	250	**55**	68	35	0,6
–	–	–	**NKS55**	**XL**	221	**55**	72	22	1
–	**RNA4910**	–	–	**XL**	163	**58**	72	22	0,6
–	–	**RNA6910-ZW**	–	**XL**	310	**58**	72	40	0,6
NK60/25-TV	–	–	–	**XL**	170	**60**	72	25	0,6
NK60/35	–	–	–	**XL**	258	**60**	72	35	0,6
–	–	–	**NKS60**	**XL**	335	**60**	80	28	1,1
–	**RNA4911**	–	–	**XL**	255	**63**	80	25	1
–	–	**RNA6911-ZW**	–	**XL**	470	**63**	80	45	1
NK65/25	–	–	–	**XL**	221	**65**	78	25	0,6
NK65/35	–	–	–	**XL**	310	**65**	78	35	0,6
–	–	–	**NKS65**	**XL**	356	**65**	85	28	1,1
NK68/25	–	–	–	**XL**	241	**68**	82	25	0,6
NK68/35	–	–	–	**XL**	338	**68**	82	35	0,6
–	**RNA4912**	–	–	**XL**	275	**68**	85	25	1
–	–	**RNA6912-ZW**	–	**XL**	488	**68**	85	45	1
NK70/25	–	–	–	**XL**	260	**70**	85	25	0,6
NK70/35	–	–	–	**XL**	370	**70**	85	35	0,6
–	–	–	**NKS70**	**XL**	380	**70**	90	28	1,1
–	**RNA4913**	–	–	**XL**	312	**72**	90	25	1
–	–	**RNA6913-ZW**	–	**XL**	580	**72**	90	45	1
NK73/25	–	–	–	**XL**	302	**73**	90	25	1
NK73/35	–	–	–	**XL**	428	**73**	90	35	1
NK75/25	–	–	–	**XL**	315	**75**	92	25	1
NK75/35	–	–	–	**XL**	445	**75**	92	35	1
–	–	–	**NKS75**	**XL**	402	**75**	95	28	1,1

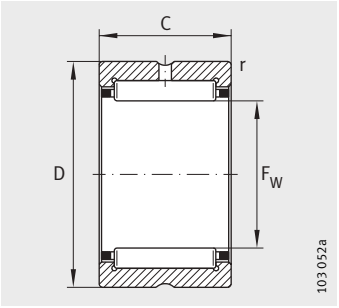


RNA69..-ZW

Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	n_B min^{-1}
48 500	87 000	14 800	8 800	5 000
67 000	132 000	23 900	8 800	4 900
48 000	67 000	11 500	8 500	5 100
51 000	73 000	12 600	8 200	4 550
79 000	127 000	21 400	8 200	4 600
45 500	82 000	14 000	8 000	4 850
60 000	118 000	21 300	8 000	4 800
51 000	74 000	12 700	7 700	4 700
53 000	80 000	13 800	7 500	4 100
82 000	139 000	23 400	7 500	4 150
53 000	103 000	17 500	7 400	4 350
63 000	130 000	23 500	7 400	4 500
71 000	98 000	17 300	7 000	4 350
65 000	100 000	17 300	6 900	3 900
102 000	176 000	30 000	6 900	3 900
50 000	98 000	16 700	6 900	4 250
66 000	142 000	25 500	6 900	4 200
75 000	108 000	19 100	6 500	4 100
49 500	89 000	15 200	6 500	4 250
70 000	139 000	25 500	6 500	4 100
68 000	108 000	18 800	6 400	3 600
106 000	191 000	32 500	6 400	3 600
50 000	92 000	15 700	6 300	4 100
71 000	144 000	26 500	6 300	4 000
77 000	113 000	20 000	6 100	3 900
69 000	112 000	19 500	6 000	3 400
108 000	198 000	33 500	6 000	3 400
60 000	100 000	17 500	6 000	3 900
85 000	156 000	27 000	6 000	3 750
61 000	104 000	18 200	5 900	3 800
87 000	162 000	28 000	5 900	3 700
81 000	123 000	21 900	5 800	3 700

Needle roller bearings

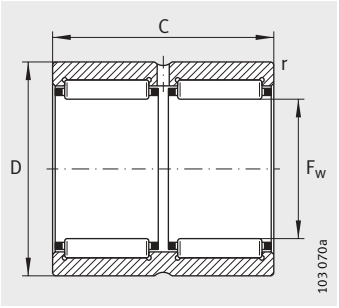
Without inner ring



NK, RNA49

Dimension table (continued) · Dimensions in mm

Designation				Mass	Dimensions			
			X-life	m ≈g	F_w	D	C	r min.
NK80/25	–	–	**XL**	301	**80**	95	25	1
NK80/35	–	–	**XL**	425	**80**	95	35	1
–	**RNA4914**	–	**XL**	460	**80**	100	30	1
–	–	**RNA6914-ZW**	**XL**	857	**80**	100	54	1
NK85/25	–	–	**XL**	425	**85**	105	25	1
NK85/35	–	–	**XL**	600	**85**	105	35	1
–	**RNA4915**	–	**XL**	489	**85**	105	30	1
–	–	**RNA6915-ZW**	**XL**	935	**85**	105	54	1
NK90/25	–	–	**XL**	450	**90**	110	25	1
NK90/35	–	–	**XL**	630	**90**	110	35	1
–	**RNA4916**	–	**XL**	516	**90**	110	30	1
–	–	**RNA6916-ZW**	**XL**	987	**90**	110	54	1
NK95/26	–	–	**XL**	490	**95**	115	26	1
NK95/36	–	–	**XL**	680	**95**	115	36	1
NK100/26	–	–	**XL**	515	**100**	120	26	1
NK100/36	–	–	**XL**	715	**100**	120	36	1
–	**RNA4917**	–	**XL**	657	**100**	120	35	1,1
–	–	**RNA6917-ZW**	**XL**	1 200	**100**	120	63	1,1
NK105/26	–	–	**XL**	540	**105**	125	26	1
NK105/36	–	–	**XL**	713	**105**	125	36	1
–	**RNA4918**	–	**XL**	745	**105**	125	35	1,1
–	–	**RNA6918-ZW**	**XL**	1 330	**105**	125	63	1,1
NK110/30	–	–	**XL**	650	**110**	130	30	1,1
NK110/40	–	–	**XL**	830	**110**	130	40	1,1
–	**RNA4919**	–	**XL**	719	**110**	130	35	1,1
–	–	**RNA6919-ZW**	**XL**	1 460	**110**	130	63	1,1

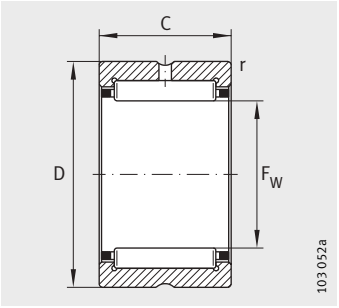


RNA69..-ZW

Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	n_B min^{-1}
63 000	119 000	19 600	5 600	3 600
89 000	184 000	32 500	5 600	3 450
95 000	156 000	27 500	5 400	3 200
145 000	265 000	47 500	5 400	3 250
78 000	123 000	21 700	5 200	3 350
111 000	193 000	34 500	5 200	3 250
97 000	162 000	28 500	5 200	3 050
147 000	275 000	49 500	5 200	3 050
81 000	132 000	23 300	4 900	3 200
116 000	208 000	37 000	4 900	3 100
101 000	174 000	30 500	4 900	2 850
153 000	300 000	53 000	4 900	2 850
83 000	137 000	24 000	4 650	3 150
121 000	223 000	39 500	4 650	2 950
86 000	146 000	25 000	4 450	3 000
125 000	237 000	41 500	4 450	2 850
125 000	237 000	41 500	4 450	2 650
188 000	400 000	71 000	4 450	2 700
89 000	155 000	26 500	4 250	2 900
129 000	250 000	43 500	4 250	2 750
129 000	250 000	43 500	4 250	2 500
195 000	425 000	74 000	4 250	2 700
111 000	210 000	35 500	4 100	2 700
143 000	290 000	50 000	4 100	2 650
131 000	260 000	44 500	4 100	2 410
197 000	440 000	76 000	4 100	2 450

Needle roller bearings

Without inner ring



RNA49, RNA48

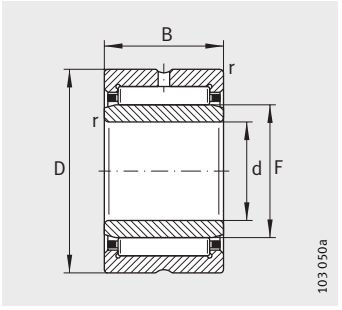
Dimension table (continued) · Dimensions in mm

Designation			Mass	Dimensions			
		X-life	m ≈g	F_w	D	C	r min.
RNA4920	–	**XL**	1 150	**115**	140	40	1,1
–	**RNA4822**	**XL**	670	**120**	140	30	1
RNA4922	–	**XL**	1 240	**125**	150	40	1,1
–	**RNA4824**	**XL**	730	**130**	150	30	1
RNA4924	–	**XL**	1 860	**135**	165	45	1,1
–	**RNA4826**	**XL**	990	**145**	165	35	1,1
RNA4926	–	**XL**	2 210	**150**	180	50	1,5
–	**RNA4828**	**XL**	1 050	**155**	175	35	1,1
RNA4928	–	**XL**	2 350	**160**	190	50	1,5
–	**RNA4830**	**XL**	1 600	**165**	190	40	1,1
–	**RNA4832**	**XL**	1 700	**175**	200	40	1,1
–	**RNA4834**	**XL**	2 540	**185**	215	45	1,1
–	**RNA4836**	**XL**	2 680	**195**	225	45	1,1
–	**RNA4838**	**XL**	3 210	**210**	240	50	1,5
–	**RNA4840**	**XL**	3 350	**220**	250	50	1,5
–	**RNA4844**	**XL**	3 620	**240**	270	50	1,5
–	**RNA4848**	**XL**	5 400	**265**	300	60	2
–	**RNA4852**	**XL**	5 800	**285**	320	60	2
–	**RNA4856**	**XL**	9 300	**305**	350	69	2
–	**RNA4860**	**XL**	12 700	**330**	380	80	2,1
–	**RNA4864**	**XL**	13 400	**350**	400	80	2,1
–	**RNA4868**	**XL**	14 000	**370**	420	80	2,1
–	**RNA4872**	**XL**	14 800	**390**	440	80	2,1
–	**RNA4876**	**XL**	26 000	**415**	480	100	2,1

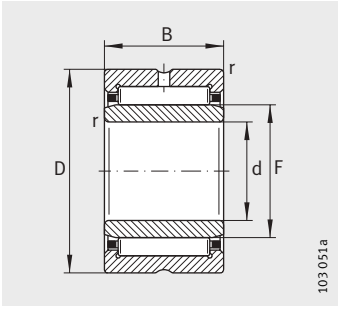
Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	n_B min^{-1}
144 000	270 000	45 500	3 850	2 500
106 000	216 000	36 000	3 750	2 220
149 000	290 000	47 500	3 550	2 290
112 000	239 000	39 000	3 500	2 030
205 000	390 000	64 000	3 250	2 110
134 000	310 000	48 500	3 150	1 920
229 000	470 000	74 000	2 950	1 970
136 000	325 000	50 000	2 950	1 800
237 000	500 000	78 000	2 800	1 810
172 000	400 000	62 000	2 750	1 750
181 000	435 000	66 000	2 600	1 630
209 000	510 000	75 000	2 450	1 550
219 000	550 000	80 000	2 330	1 430
255 000	690 000	100 000	2 180	1 290
260 000	720 000	102 000	2 090	1 220
275 000	790 000	110 000	1 920	1 080
400 000	1 080 000	150 000	1 730	940
415 000	1 160 000	158 000	1 620	860
510 000	1 300 000	175 000	1 500	810
700 000	1 770 000	235 000	1 380	710
710 000	1 850 000	242 000	1 310	660
730 000	1 940 000	249 000	1 240	620
740 000	2 020 000	255 000	1 180	580
1 130 000	2 900 000	370 000	1 090	500

Needle roller bearings

With inner ring



NKI (d ≦ 7 mm)

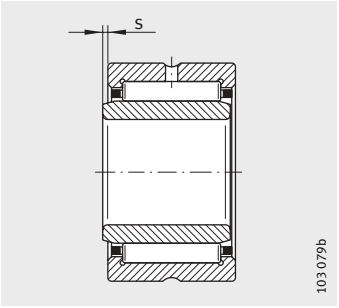


NKI (d ≧ 9 mm), NKIS, NA49, NA69 (d ≦ 30 mm)

Dimension table · Dimensions in mm

Designation					Mass	Dimensions		
				X-life	m ≈g	d	F	D
NKI5/12-TV[1]	–	–	–	**XL**	11,5	**5**	8	15
NKI5/16-TV[1]	–	–	–	**XL**	15,3	**5**	8	15
NKI6/12-TV[1]	–	–	–	**XL**	13,5	**6**	9	16
NKI6/16-TV[1]	–	–	–	**XL**	17,4	**6**	9	16
NKI7/12-TV[1]	–	–	–	**XL**	13,7	**7**	10	17
NKI7/16-TV[1]	–	–	–	**XL**	18,2	**7**	10	17
NKI9/12	–	–	–	**XL**	16,6	**9**	12	19
NKI9/16	–	–	–	**XL**	21,9	**9**	12	19
NKI10/16	–	–	–	**XL**	29,4	**10**	14	22
NKI10/20	–	–	–	**XL**	37,1	**10**	14	22
–	**NA4900**	–	–	**XL**	23	**10**	14	22
NKI12/16	–	–	–	**XL**	33,3	**12**	16	24
NKI12/20	–	–	–	**XL**	41,9	**12**	16	24
–	**NA4901**	–	–	**XL**	26	**12**	16	24
–	–	**NA6901**	–	**XL**	46	**12**	16	24
NKI15/16	–	–	–	**XL**	38,8	**15**	19	27
NKI15/20	–	–	–	**XL**	48,7	**15**	19	27
–	**NA4902**	–	–	**XL**	34	**15**	20	28
–	–	**NA6902**	–	**XL**	63,6	**15**	20	28
–	–	–	**NKIS15**	**XL**	92	**15**	22	35
NKI17/16	–	–	–	**XL**	42,4	**17**	21	29
NKI17/20	–	–	–	**XL**	53,4	**17**	21	29
–	**NA4903**	–	–	**XL**	37	**17**	22	30
–	–	**NA6903**	–	**XL**	72	**17**	22	30
–	–	–	**NKIS17**	**XL**	98	**17**	24	37

[1] With closing rings, without lubrication hole and groove.

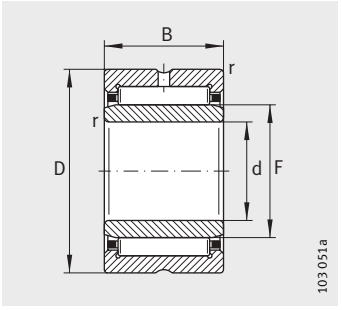


2) Axial displacement “s”

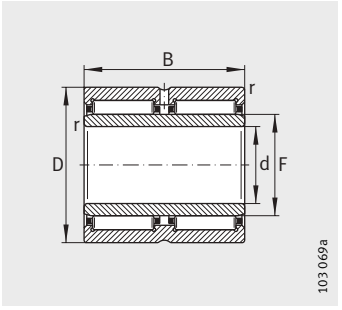
			Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
B	r	s[2)]	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	n_B
	min.		N	N	N	min^{-1}	min^{-1}
12	0,3	1,5	4 450	4 100	690	31 500	29 500
16	0,3	2	5 800	5 800	970	31 500	29 500
12	0,3	1,5	5 100	5 000	840	30 000	26 500
16	0,3	2	6 600	7 100	1 190	30 000	26 000
12	0,3	1,5	5 300	5 500	930	29 000	24 100
16	0,3	2	7 000	7 800	1 310	29 000	23 800
12	0,3	1,5	7 200	7 100	1 280	26 500	22 200
16	0,3	2	10 100	11 000	1 920	26 500	19 500
16	0,3	0,5	11 400	11 500	2 100	25 000	17 300
20	0,3	0,5	14 500	15 600	2 700	25 000	17 000
13	0,3	0,5	9 600	9 200	1 630	25 000	17 300
16	0,3	0,5	12 800	13 900	2 550	23 600	15 200
20	0,3	0,5	16 300	18 800	3 250	23 600	14 900
13	0,3	0,5	10 600	10 900	1 940	23 600	14 900
22	0,3	1	18 100	21 600	3 800	23 600	13 900
16	0,3	0,5	14 700	17 400	3 200	21 800	12 800
20	0,3	0,5	18 700	23 600	4 150	21 800	12 600
13	0,3	0,5	12 000	13 600	2 430	21 600	12 000
23	0,3	1	19 500	25 500	4 450	21 600	11 700
20	0,6	0,5	27 500	28 000	4 900	19 600	10 300
16	0,3	0,5	15 200	18 700	3 450	20 900	11 800
20	0,3	0,5	19 300	25 500	4 450	20 900	11 600
13	0,3	0,5	12 400	14 600	2 600	20 600	10 900
23	0,3	1	21 100	29 000	5 100	20 600	10 500
20	0,6	0,5	29 500	31 000	5 400	18 100	9 500

Needle roller bearings

With inner ring



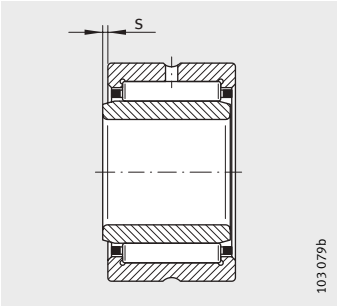
NKI, NKIS, NA49, NA69 (d ≦ 30 mm)



NA69..-ZW

Dimension table (continued) · Dimensions in mm

Designation					Mass	Dimensions		
				X-life	m ≈g	d	F	D
NKI20/16	–	–	–	**XL**	49	**20**	24	32
NKI20/20	–	–	–	**XL**	61	**20**	24	32
–	**NA4904**	–	–	**XL**	75,2	**20**	25	37
–	–	**NA6904**	–	**XL**	141	**20**	25	37
–	–	–	**NKIS20**	**XL**	129	**20**	28	42
NKI22/16	–	–	–	**XL**	52	**22**	26	34
NKI22/20	–	–	–	**XL**	65,4	**22**	26	34
–	**NA49/22**	–	–	**XL**	80	**22**	28	39
–	–	**NA69/22**	–	**XL**	150	**22**	28	39
NKI25/20-TV	–	–	–	**XL**	75,8	**25**	29	38
NKI25/30	–	–	–	**XL**	124	**25**	29	38
–	**NA4905**	–	–	**XL**	88	**25**	30	42
–	–	**NA6905**	–	**XL**	161	**25**	30	42
–	–	–	**NKIS25**	**XL**	162	**25**	32	47
NKI28/20-TV	–	–	–	**XL**	92,4	**28**	32	42
NKI28/30	–	–	–	**XL**	146	**28**	32	42
–	**NA49/28**	–	–	**XL**	97,7	**28**	32	45
–	–	**NA69/28**	–	**XL**	182	**28**	32	45
NKI30/20-TV	–	–	–	**XL**	108	**30**	35	45
NKI30/30-TV	–	–	–	**XL**	165	**30**	35	45
–	**NA4906**	–	–	**XL**	101	**30**	35	47
–	–	**NA6906**	–	**XL**	192	**30**	35	47
–	–	–	**NKIS30**	**XL**	184	**30**	37	52
NKI32/20	–	–	–	**XL**	118	**32**	37	47
NKI32/30	–	–	–	**XL**	180	**32**	37	47
–	**NA49/32**	–	–	**XL**	158	**32**	40	52
–	–	**NA69/32-ZW**	–	**XL**	288	**32**	40	52
NKI35/20-TV	–	–	–	**XL**	122	**35**	40	50
NKI35/30	–	–	–	**XL**	193	**35**	40	50
–	**NA4907**	–	–	**XL**	170	**35**	42	55
–	–	**NA6907-ZW**	–	**XL**	310	**35**	42	55
–	–	–	**NKIS35**	**XL**	220	**35**	43	58

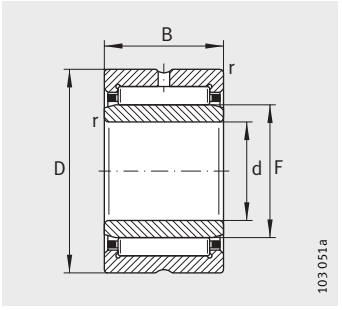


[1] Axial displacement “s”

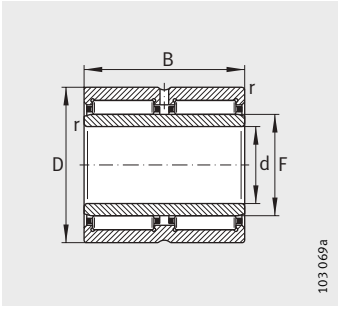
			Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
B	r	s[1]	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	n_B
	min.		N	N	N	min^{-1}	min^{-1}
16	0,3	0,5	16 900	22 300	4 100	18 800	10 400
20	0,3	0,5	21 400	30 500	5 300	18 800	10 200
17	0,3	0,8	23 700	25 500	4 600	17 200	9 600
30	0,3	1	40 500	51 000	9 100	17 200	9 200
20	0,6	0,5	32 500	36 500	6 400	15 800	8 300
16	0,3	0,5	17 300	23 600	4 350	17 500	9 800
20	0,3	0,5	22 000	32 000	5 600	17 500	9 500
17	0,3	0,8	26 000	29 500	5 300	16 100	8 700
30	0,3	0,5	42 000	55 000	9 900	16 100	8 500
20	0,3	1	27 500	39 000	6 800	15 600	8 300
30	0,3	1,5	37 000	57 000	10 600	15 600	8 400
17	0,3	0,8	26 500	31 500	5 700	14 600	7 900
30	0,3	1	44 000	59 000	10 600	14 600	7 700
22	0,6	1	38 000	43 500	7 400	13 600	7 400
20	0,3	1	29 500	44 500	7 800	14 000	7 500
30	0,3	1,5	39 000	63 000	11 700	14 000	7 600
17	0,3	0,8	27 500	33 500	6 100	13 400	7 200
30	0,3	1	45 500	63 000	11 400	13 400	7 000
20	0,3	0,5	31 000	48 500	8 500	13 100	7 000
30	0,3	1	46 000	81 000	15 000	13 100	6 700
17	0,3	0,8	28 500	35 500	6 400	12 700	6 800
30	0,3	1	49 000	71 000	12 900	12 700	6 400
22	0,6	1	41 500	50 000	8 600	12 000	6 600
20	0,3	0,5	28 000	43 500	7 600	12 400	7 000
30	0,3	1	42 000	73 000	13 500	12 400	6 800
20	0,6	0,8	34 500	47 500	8 900	11 700	6 500
36	0,6	0,5	53 000	82 000	15 100	11 700	6 500
20	0,3	0,5	33 500	56 000	9 800	11 500	6 200
30	0,3	1	44 000	79 000	14 600	11 500	6 300
20	0,6	0,8	35 500	50 000	9 400	10 900	6 000
36	0,6	0,5	54 000	86 000	15 900	10 900	6 100
22	0,6	0,5	44 000	57 000	9 800	10 500	5 900

Needle roller bearings

With inner ring



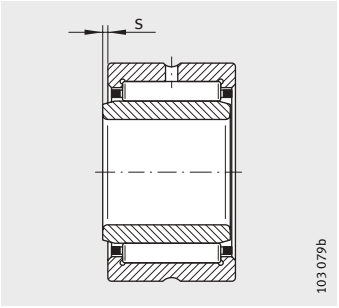
NKI, NKIS, NA49



NA69..-ZW

Dimension table (continued) · Dimensions in mm

Designation					Mass	Dimensions		
				X-life	m ≈g	d	F	D
NKI38/20	–	–	–	**XL**	136	**38**	43	53
NKI38/30	–	–	–	**XL**	207	**38**	43	53
NKI40/20-TV	–	–	–	**XL**	136	**40**	45	55
NKI40/30-TV	–	–	–	**XL**	216	**40**	45	55
–	**NA4908**	–	–	**XL**	230	**40**	48	62
–	–	**NA6908-ZW**	–	**XL**	430	**40**	48	62
–	–	–	**NKIS40**	**XL**	281	**40**	50	65
NKI42/20	–	–	–	**XL**	148	**42**	47	57
NKI42/30	–	–	–	**XL**	222	**42**	47	57
NKI45/25-TV	–	–	–	**XL**	217	**45**	50	62
NKI45/35-TV	–	–	–	**XL**	308	**45**	50	62
–	**NA4909**	–	–	**XL**	271	**45**	52	68
–	–	**NA6909-ZW**	–	**XL**	495	**45**	52	68
–	–	–	**NKIS45**	**XL**	336	**45**	55	72
NKI50/25	–	–	–	**XL**	270	**50**	55	68
NKI50/35	–	–	–	**XL**	379	**50**	55	68
–	**NA4910**	–	–	**XL**	274	**50**	58	72
–	–	**NA6910-ZW**	–	**XL**	515	**50**	58	72
–	–	–	**NKIS50**	**XL**	518	**50**	60	80
NKI55/25-TV	–	–	–	**XL**	255	**55**	60	72
NKI55/35	–	–	–	**XL**	379	**55**	60	72
–	**NA4911**	–	–	**XL**	393	**55**	63	80
–	–	**NA6911-ZW**	–	**XL**	780	**55**	63	80
–	–	–	**NKIS55**	**XL**	558	**55**	65	85
NKI60/25	–	–	–	**XL**	394	**60**	68	82
NKI60/35	–	–	–	**XL**	553	**60**	68	82
–	**NA4912**	–	–	**XL**	426	**60**	68	85
–	–	**NA6912-ZW**	–	**XL**	808	**60**	68	85
–	–	–	**NKIS60**	**XL**	560	**60**	70	90

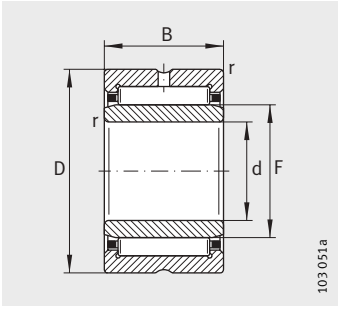


[1] Axial displacement “s”

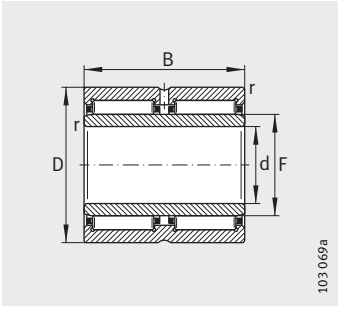
			Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
B	r	s[1]	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	n_B
	min.		N	N	N	min^{-1}	min^{-1}
20	0,3	0,5	30 500	51 000	8 900	10 800	6 200
30	0,3	1	45 500	85 000	15 800	10 800	6 000
20	0,3	0,5	35 000	62 000	10 800	10 300	5 600
30	0,3	1	52 000	103 000	19 100	10 300	5 500
22	0,6	1	48 500	67 000	11 500	9 600	5 300
40	0,6	0,5	74 000	116 000	19 400	9 600	5 400
22	1	0,5	48 000	67 000	11 500	9 300	5 200
20	0,3	0,5	32 500	56 000	9 900	9 900	5 700
30	0,3	1	48 500	94 000	17 500	9 900	5 500
25	0,6	1,5	48 500	87 000	14 800	9 200	5 100
35	0,6	2	67 000	132 000	23 900	9 200	4 950
22	0,6	1	51 000	73 000	12 600	8 700	4 750
40	0,6	0,5	79 000	127 000	21 400	8 700	4 850
22	1	0,5	51 000	74 000	12 700	8 400	4 750
25	0,6	1,5	45 500	82 000	14 000	8 300	4 900
35	0,6	2	60 000	118 000	21 300	8 300	4 850
22	0,6	1	53 000	80 000	13 800	8 000	4 350
40	0,6	0,5	82 000	139 000	23 400	8 000	4 400
28	1,1	2	71 000	98 000	17 300	7 500	4 450
25	0,6	1,5	47 500	90 000	15 400	7 700	4 600
35	0,6	2	63 000	130 000	23 500	7 700	4 550
25	1	1,5	65 000	100 000	17 300	7 300	4 100
45	1	1,5	102 000	176 000	30 000	7 300	4 100
28	1,1	2	75 000	108 000	22 200	7 000	4 150
25	0,6	1	49 500	89 000	15 200	6 900	4 300
35	0,6	1	70 000	139 000	25 500	6 900	4 150
25	1	1,5	68 000	108 000	18 800	6 800	3 750
45	1	1,5	106 000	191 000	32 500	6 800	3 750
28	1,1	2	77 000	113 000	23 400	6 500	3 950

Needle roller bearings

With inner ring



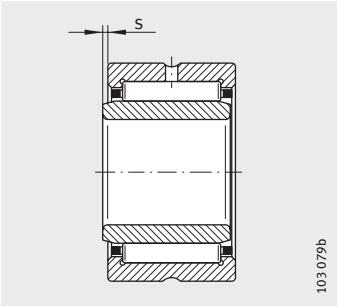
NKI, NKIS, NA49



NA69..-ZW

Dimension table (continued) · Dimensions in mm

Designation				X-life	Mass m ≈g	Dimensions d	F	D
NKI65/25	–	–	–	**XL**	467	**65**	73	90
NKI65/35	–	–	–	**XL**	659	**65**	73	90
–	**NA4913**	–	–	**XL**	456	**65**	72	90
–	–	**NA6913-ZW**	–	**XL**	833	**65**	72	90
–	–	–	**NKIS65**	**XL**	641	**65**	75	95
NKI70/25	–	–	–	**XL**	521	**70**	80	95
NKI70/35	–	–	–	**XL**	737	**70**	80	95
–	**NA4914**	–	–	**XL**	728	**70**	80	100
–	–	**NA6914-ZW**	–	**XL**	1 340	**70**	80	100
NKI75/25	–	–	–	**XL**	641	**75**	85	105
NKI75/35	–	–	–	**XL**	908	**75**	85	105
–	**NA4915**	–	–	**XL**	775	**75**	85	105
–	–	**NA6915-ZW**	–	**XL**	1 450	**75**	85	105
NKI80/25	–	–	–	**XL**	677	**80**	90	110
NKI80/35	–	–	–	**XL**	959	**80**	90	110
–	**NA4916**	–	–	**XL**	878	**80**	90	110
–	–	**NA6916-ZW**	–	**XL**	1 522	**80**	90	110
NKI85/26	–	–	–	**XL**	743	**85**	95	115
NKI85/36	–	–	–	**XL**	1 040	**85**	95	115
–	**NA4917**	–	–	**XL**	1 250	**85**	100	120
–	–	**NA6917-ZW**	–	**XL**	2 200	**85**	100	120
NKI90/26	–	–	–	**XL**	778	**90**	100	120
NKI90/36	–	–	–	**XL**	1 090	**90**	100	120
–	**NA4918**	–	–	**XL**	1 312	**90**	105	125
–	–	**NA6918-ZW**	–	**XL**	2 310	**90**	105	125
NKI95/26	–	–	–	**XL**	816	**95**	105	125
NKI95/36	–	–	–	**XL**	1 145	**95**	105	125
–	**NA4919**	–	–	**XL**	1 371	**95**	110	130
–	–	**NA6919-ZW**	–	**XL**	2 500	**95**	110	130

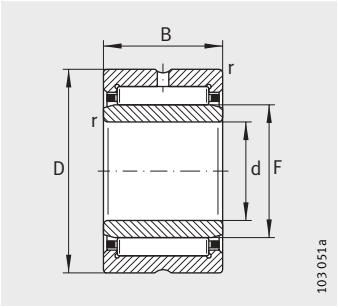


[1] Axial displacement “s”

			Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
B	r	s[1]	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	n_B
	min.		N	N	N	min^{-1}	min^{-1}
25	1	1	60 000	100 000	17 500	6 300	3 950
35	1	1	85 000	156 000	27 000	6 300	3 800
25	1	1,5	69 000	112 000	19 500	6 300	3 500
45	1	1,5	108 000	198 000	33 500	6 300	3 550
28	1,1	2	81 000	123 000	25 500	6 100	3 700
25	1	0,8	63 000	119 000	19 600	5 900	3 600
35	1	0,8	89 000	184 000	32 500	5 900	3 500
30	1	1,5	95 000	156 000	27 500	5 800	3 350
54	1	1	145 000	265 000	47 500	5 800	3 400
25	1	1	78 000	123 000	23 500	5 400	3 400
35	1	1	111 000	193 000	40 000	5 400	3 250
30	1	1,5	97 000	162 000	28 500	5 400	3 150
54	1	1	147 000	275 000	49 500	5 400	3 200
25	1	1	81 000	132 000	27 500	5 200	3 250
35	1	1	116 000	208 000	43 000	5 200	3 100
30	1	1,5	101 000	174 000	30 500	5 200	2 950
54	1	1	153 000	300 000	53 000	5 200	3 000
26	1	1,5	83 000	137 000	28 000	4 900	3 150
36	1	1,5	121 000	223 000	46 000	4 900	3 000
35	1,1	1	125 000	237 000	41 500	4 800	2 800
63	1,1	1	188 000	400 000	71 000	4 800	2 850
26	1	1,5	86 000	146 000	29 500	4 650	3 050
36	1	1,5	125 000	237 000	48 000	4 650	2 850
35	1,1	1	129 000	250 000	43 500	4 550	2 650
63	1,1	1	195 000	425 000	74 000	4 550	2 700
26	1	1,5	89 000	155 000	31 000	4 450	2 900
36	1	1,5	129 000	250 000	50 000	4 450	2 750
35	1,1	1	131 000	260 000	44 500	4 350	2 550
63	1,1	1	197 000	440 000	76 000	4 350	2 600

Needle roller bearings

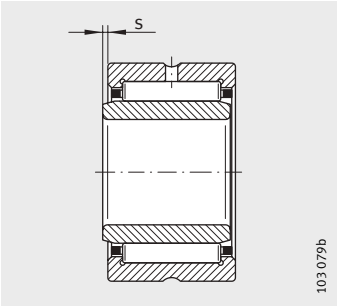
With inner ring



NKI, NA49, NA48

Dimension table (continued) · Dimensions in mm

Designation				Mass	Dimensions		
			X-life	m ≈g	d	F	D
NKI100/30	–	–	**XL**	990	**100**	110	130
NKI100/40	–	–	**XL**	1 330	**100**	110	130
–	**NA4920**	–	**XL**	1 900	**100**	115	140
–	**NA4922**	–	**XL**	2 070	**110**	125	150
–	–	**NA4822**	**XL**	1 080	**110**	120	140
–	**NA4924**	–	**XL**	2 860	**120**	135	165
–	–	**NA4824**	**XL**	1 170	**120**	130	150
–	**NA4926**	–	**XL**	3 900	**130**	150	180
–	–	**NA4826**	**XL**	1 810	**130**	145	165
–	**NA4928**	–	**XL**	4 150	**140**	160	190
–	–	**NA4828**	**XL**	1 920	**140**	155	175
–	–	**NA4830**	**XL**	2 720	**150**	165	190
–	–	**NA4832**	**XL**	2 890	**160**	175	200
–	–	**NA4834**	**XL**	3 960	**170**	185	215
–	–	**NA4836**	**XL**	4 200	**180**	195	225
–	–	**NA4838**	**XL**	5 610	**190**	210	240

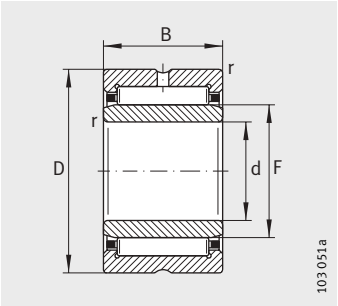


[1] Axial displacement “s”

			Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
B	r	s[1]	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	n_B
	min.		N	N	N	min^{-1}	min^{-1}
30	1,1	1,5	111 000	210 000	41 500	4 250	2 700
40	1,1	2	143 000	290 000	58 000	4 250	2 650
40	1,1	2	144 000	270 000	45 500	4 100	2 600
40	1,1	2	149 000	290 000	47 500	3 750	2 400
30	1	0,8	106 000	216 000	36 000	3 900	2 300
45	1,1	2	205 000	390 000	64 000	3 450	2 200
30	1	0,8	112 000	239 000	39 000	3 650	2 090
50	1,5	1,5	229 000	470 000	74 000	3 150	2 080
35	1,1	1	134 000	310 000	48 500	3 300	2 000
50	1,5	1,5	237 000	500 000	78 000	2 950	1 920
35	1,1	1	136 000	325 000	50 000	3 100	1 870
40	1,1	1,5	172 000	400 000	62 000	2 900	1 810
40	1,1	1,5	181 000	435 000	66 000	2 700	1 680
45	1,1	1,5	209 000	510 000	75 000	2 550	1 610
45	1,1	1,5	219 000	550 000	80 000	2 420	1 490
50	1,5	1,5	255 000	690 000	100 000	2 280	1 350

Needle roller bearings

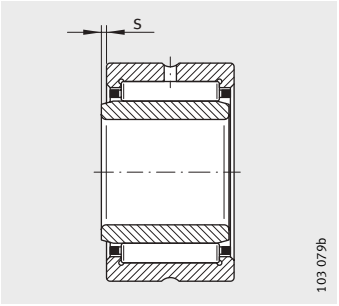
With inner ring



NA48

Dimension table (continued) · Dimensions in mm

Designation		Mass	Dimensions					
	X-life	m ≈g	d	F	D	B	r min.	s[1)]
NA4840	**XL**	5 840	**200**	220	250	50	1,5	1,5
NA4844	**XL**	6 380	**220**	240	270	50	1,5	1,5
NA4848	**XL**	10 000	**240**	265	300	60	2	2
NA4852	**XL**	10 600	**260**	285	320	60	2	2
NA4856	**XL**	15 300	**280**	305	350	69	2	2,5
NA4860	**XL**	21 800	**300**	330	380	80	2,1	2
NA4864	**XL**	23 000	**320**	350	400	80	2,1	2
NA4868	**XL**	24 200	**340**	370	420	80	2,1	2
NA4872	**XL**	25 600	**360**	390	440	80	2,1	2
NA4876	**XL**	42 600	**380**	415	480	100	2,1	2

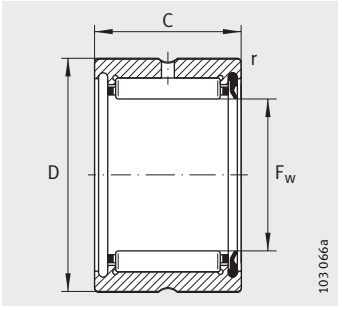


[1] Axial displacement “s”

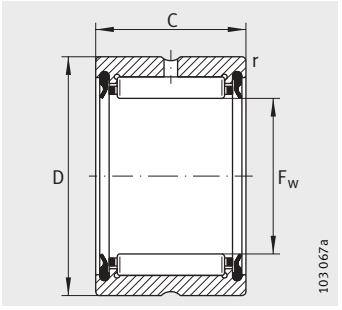
Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	n_B min^{-1}
260 000	720 000	102 000	2 180	1 270
275 000	790 000	110 000	2 000	1 130
400 000	1 080 000	150 000	1 810	990
415 000	1 160 000	158 000	1 690	890
510 000	1 300 000	175 000	1 560	840
700 000	1 770 000	235 000	1 440	730
710 000	1 850 000	242 000	1 360	680
730 000	1 940 000	249 000	1 290	640
740 000	2 020 000	255 000	1 230	600
1 130 000	2 900 000	370 000	1 140	520

Needle roller bearings

Without inner ring, sealed



RNA49..-RSR



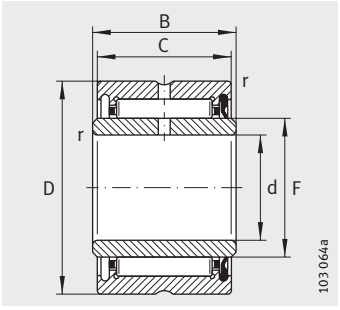
RNA49..-2RSR

Dimension table · Dimensions in mm

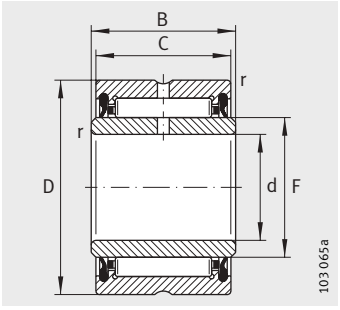
Designation			Mass	Dimensions				Basic load ratings		Fatigue limit load	Limiting speed
		X-life	m	F_w	D	C	r	dyn. C_r	stat. C_{0r}	C_{ur}	n_G grease
			≈g				min.	N	N	N	min^{-1}
RNA4900-RSR	**RNA4900-2RSR**	**XL**	16	**14**	22	13	0,3	7 700	6 900	1 360	13 000
RNA4901-RSR	**RNA4901-2RSR**	**XL**	18	**16**	24	13	0,3	8 600	8 300	1 630	12 000
RNA4902-RSR	**RNA4902-2RSR**	**XL**	21,5	**20**	28	13	0,3	9 700	10 300	2 040	10 000
RNA4903-RSR	**RNA4903-2RSR**	**XL**	23	**22**	30	13	0,3	10 000	11 000	2 180	9 000
RNA4904-RSR	**RNA4904-2RSR**	**XL**	56	**25**	37	17	0,3	19 500	19 900	3 750	7 500
RNA4905-RSR	**RNA4905-2RSR**	**XL**	60	**30**	42	17	0,3	21 800	24 200	4 550	6 500
RNA4906-RSR	**RNA4906-2RSR**	**XL**	69	**35**	47	17	0,3	23 900	28 500	5 400	5 500
RNA4907-RSR	**RNA4907-2RSR**	**XL**	107	**42**	55	20	0,6	29 500	39 500	7 200	4 800
RNA4908-RSR	**RNA4908-2RSR**	**XL**	154	**48**	62	22	0,6	41 000	53 000	8 800	4 200
RNA4909-RSR	**RNA4909-2RSR**	**XL**	157	**52**	68	22	0,6	43 000	59 000	9 700	3 900
RNA4910-RSR	**RNA4910-2RSR**	**XL**	160	**58**	72	22	0,6	45 000	64 000	10 600	3 500

Needle roller bearings

With inner ring, sealed



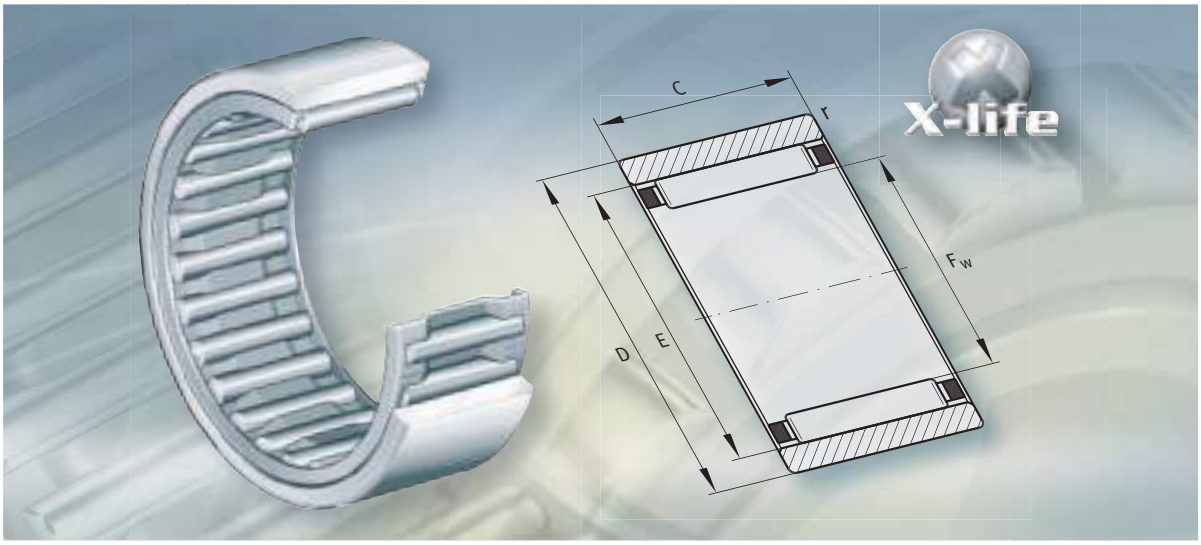
NA49..-RSR



NA49..-2RSR

Dimension table · Dimensions in mm

Designation			Mass	Dimensions						Basic load ratings		Fatigue limit load	Limiting speed
		X-life	m ≈g	d	F	D	C	B	r min.	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G grease min^{-1}
NA4900-RSR	**NA4900-2RSR**	**XL**	24,5	**10**	14	22	13	14	0,3	7 700	6 900	1 360	13 000
NA4901-RSR	**NA4901-2RSR**	**XL**	27,5	**12**	16	24	13	14	0,3	8 600	8 300	1 630	12 000
NA4902-RSR	**NA4902-2RSR**	**XL**	37	**15**	20	28	13	14	0,3	9 700	10 300	2 040	10 000
NA4903-RSR	**NA4903-2RSR**	**XL**	40	**17**	22	30	13	14	0,3	10 000	11 000	2 180	9 000
NA4904-RSR	**NA4904-2RSR**	**XL**	80	**20**	25	37	17	18	0,3	19 500	19 900	3 750	7 500
NA4905-RSR	**NA4905-2RSR**	**XL**	89,5	**25**	30	42	17	18	0,3	21 800	24 200	4 550	6 500
NA4906-RSR	**NA4906-2RSR**	**XL**	104	**30**	35	47	17	18	0,3	23 900	28 500	5 400	5 500
NA4907-RSR	**NA4907-2RSR**	**XL**	175	**35**	42	55	20	21	0,6	29 500	39 500	7 200	4 800
NA4908-RSR	**NA4908-2RSR**	**XL**	252	**40**	48	62	22	23	0,6	41 000	53 000	8 800	4 200
NA4909-RSR	**NA4909-2RSR**	**XL**	290	**45**	52	68	22	23	0,6	43 000	59 000	9 700	3 900
NA4910-RSR	**NA4910-2RSR**	**XL**	295	**50**	58	72	22	23	0,6	45 000	64 000	10 600	3 500



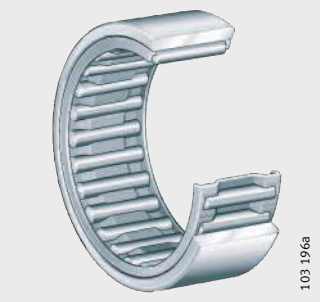
Needle roller bearings without ribs

Needle roller bearings without ribs

Without inner ring

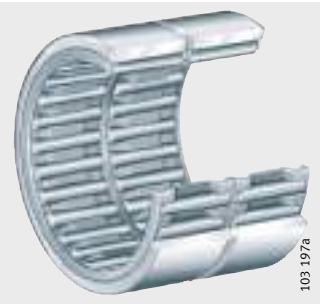
Single row

RNAO



Double row

RNAO..-ZW-ASR1



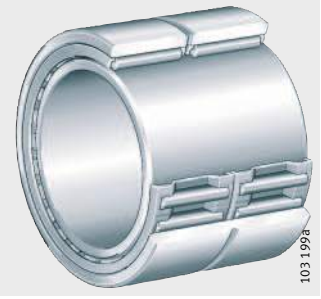
With inner ring

Single row

NAO

Double row

NAO..-ZW-ASR1



Needle roller bearings without ribs

Features

Needle roller bearings without ribs are single or double row units comprising machined outer rings without ribs, needle roller and cage assemblies and removable inner rings.

The bearings are not self-retaining. This means that the outer ring, needle roller and cage assembly and inner ring can be fitted independently of each other.

X-life

Needle roller bearings without ribs are X-life bearings. In these bearings, the raceways have optimised roughness and geometrical accuracy. This gives higher load carrying capacity and longer life.

Sealing/lubricant

Needle roller bearings without ribs are not sealed and not greased.

Double row bearings can be lubricated via a lubrication groove and lubrication hole in the outer ring.
These bearings have the suffix ZW-ASR1.

Needle roller bearings without inner ring

Bearings RNAO have particularly compact radial dimensions. However, they require a shaft raceway that is hardened and ground.

The needle roller and cage assembly can be fitted either together with the outer ring or with the shaft. It can also be subsequently slid between the outer ring and shaft.

The double row design is indicated by the suffix ZW, the lubrication hole and lubrication groove are indicated by the suffix ASR1.

Needle roller bearings with inner ring

Bearings NAO are used if the shaft cannot be configured as a rolling bearing raceway.

The needle roller and cage assembly can be fitted either together with the outer ring or with the inner ring. It can also be subsequently slid between the outer ring and inner ring.

Bearings with a lubrication hole in the inner ring have the suffix IS1.

The double row design is indicated by the suffix ZW, the lubrication hole and lubrication groove in the outer ring are indicated by the suffix ASR1.

Displacement of the inner ring

The standard inner ring allows axial displacement within the values “s” stated in the dimension tables. Where larger displacements occur, the standard ring can be replaced by a wider inner ring IR. Inner rings: see page 690.

Needle roller bearings without ribs

Operating temperature

Bearings with plastic cage can be used at operating temperatures from –20 °C to +120 °C.

Cages

The cages are made from sheet steel or plastic.
Plastic cages have the suffix TV.

Suffixes

Suffixes for the available designs: see table.

Available designs

Suffix	Description
ASR1[2)]	Lubrication hole and lubrication groove in outer ring
IS1[2)]	Lubrication hole in inner ring
TV[1)2)]	Cage made from glass fibre reinforced polyamide 66
ZW[2)]	Double row

1) Bearings with plastic cage: see dimension tables.

2) Dependent on size.

Design and safety guidelines

Raceway for bearings without inner ring

Where bearings without an inner ring are to be used, the rolling element raceway on the shaft must be hardened and ground.
The surface hardness of the raceway must be 670 HV + 170 HV and the hardening depth CHD or Rht must be sufficiently large.

Raceway design

Shaft-diameter Nominal dimension mm		Shaft tolerance Operating clearance			Roughness max.	Round-ness max.	Parallelism max.
over	incl.	Small	Normal	Large			
–	65	k5	h5	g6	R_a0,1 (R_z0,4)	IT3	IT3
65	80	k5	h5	f6			
80	120	k5	g5	f6	R_a0,15 (R_z0,63)		

Caution! The values apply to housing tolerances up to K7.
For tighter housing bores, the operating clearance should be checked by either calculation or measurement.

Minimum radial load

In order to ensure operation without slippage, the bearings must be subjected to a minimum radial load $F_{r\,min}$. This applies in particular to high speed bearings since, if the radial load is insufficient or not present, damaging sliding motion may occur between the rolling elements and raceways. In continuous operation, a minimum radial load of the order of $C_r/P < 50$ is necessary.

Sealing rings/ wider inner rings

Sealing rings of series G, GR and SD are matched to the bearing dimensions and can be combined with wider inner rings IR.
The outer surface of the inner rings can be used as the sliding surface for seal lips.

Sealing rings: see publication GSD, inner rings: see page 690.

Caution! Sealing rings must not be used as running surfaces for the cage.

Axial guidance of needle roller and cage assemblies

In bearings without ribs, the needle roller and cage assemblies must be axially guided on lateral, burr-free running surfaces, see dimension tables.

Caution! The axial running surfaces for the cage must be precision machined (R_a 2) and resistant to wear. Note the mounting dimensions in the dimension tables.

Radial location

Needle roller bearings with inner ring are radially located by means of a close fit on the shaft and in the housing.

Axial location

In order to prevent lateral creep of the bearing rings, they must be located by means of physical locking.

The abutting shoulders (shaft/housing) should be sufficiently high and perpendicular to the bearing axis.

The transition from the bearing seating to the abutting shoulder must have rounding to DIN 5 418 or an undercut to DIN 509. Note the minimum chamfer dimensions r in the dimension tables.

The overlap between the snap rings and the end faces of the bearing rings must be sufficiently large.

Maximum inner ring chamfer dimensions to DIN 620-6 must be taken into consideration.

Fitting note

Caution! Needle roller bearings without ribs are not self-retaining. Since the individual parts are matched to each other, parts of bearings of equal size must not be interchanged during fitting.

Accuracy

The dimensional and geometrical tolerances correspond to tolerance class PN to DIN 620.

Radial internal clearance

Bearings with inner ring have a radial internal clearance of CN.

Radial internal clearance to DIN 620-4

Bore d mm		Radial internal clearance CN µm	
over	incl.	min.	max.
–	24	20	45
24	30	20	45
30	40	25	50
40	50	30	60
50	65	40	70
65	80	40	75
80	100	50	85
100	120	50	90

Enveloping circle

In the case of bearings without inner ring, the enveloping circle dimension F_w is used instead of the radial internal clearance.

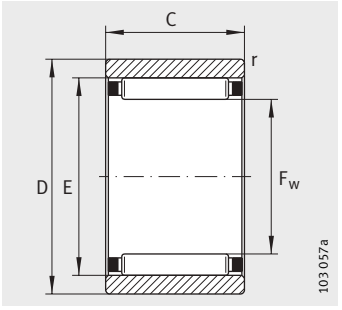
The enveloping circle is the inner inscribed circle of the needle rollers in clearance-free contact with the outer raceway.

For bearings before fitting, the enveloping circle F_w is in the tolerance zone F6.

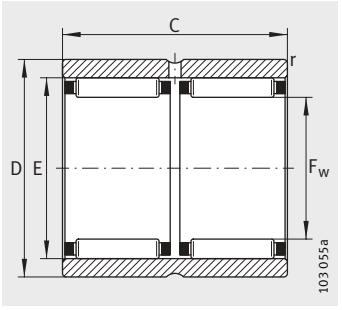
Caution! If the enveloping circle diameter must be in tolerance zone F6, the parts as delivered (outer ring/needle roller and cage assembly matched pair) must not be interchanged with other matched pairs.

Needle roller bearings without ribs

Without inner ring



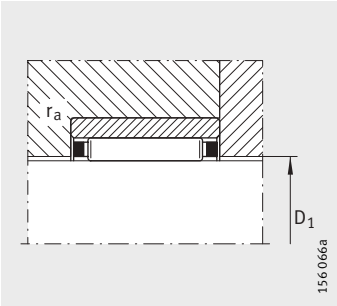
RNAO



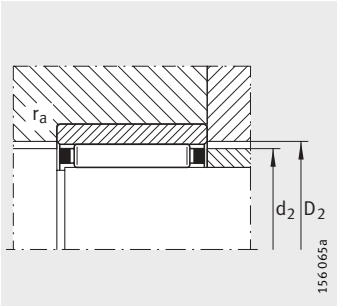
RNAO..-ZW-ASR1

Dimension table · Dimensions in mm

Designation		Mass	Dimensions					Mounting dimensions	
	X-life	m ≈g	F_w	D	C	E	r min.	D_1	d_2
RNAO5X10X8-TV	**XL**	3	**5**	10	8	8	0,15	5,3	7,7
RNAO6X13X8-TV	**XL**	6	**6**	13	8	9	0,3	6,3	8,7
RNAO7X14X8-TV	**XL**	6	**7**	14	8	10	0,3	7,3	9,7
RNAO8X15X10-TV	**XL**	8	**8**	15	10	11	0,3	8,3	10,7
RNAO10X17X10-TV	**XL**	10	**10**	17	10	13	0,3	10,3	12,7
RNAO12X22X12-TV	**XL**	19	**12**	22	12	18	0,3	12,3	17,6
RNAO15X23X13	**XL**	20	**15**	23	13	19	0,3	15,4	18,6
RNAO16X24X13	**XL**	21	**16**	28	12	20	0,3	16,4	19,6
RNAO16X28X12	**XL**	32	**16**	28	12	22	0,3	16,4	21,6
RNAO17X25X13	**XL**	22	**17**	25	13	21	0,3	17,4	20,6
RNAO18X30X24-ZW-ASR1	**XL**	69	**18**	30	24	24	0,3	18,4	23,6
RNAO20X28X13	**XL**	25	**20**	28	13	24	0,3	20,4	23,6
RNAO20X28X26-ZW-ASR1	**XL**	50	**20**	28	26	24	0,3	20,4	23,6
RNAO20X32X12	**XL**	38	**20**	32	12	26	0,3	20,4	25,6
RNAO22X30X13	**XL**	27	**22**	30	13	26	0,3	22,4	25,6
RNAO22X35X16	**XL**	59	**22**	35	16	29	0,3	22,4	28,4
RNAO25X35X17	**XL**	53	**25**	35	17	29	0,3	25,6	28,4
RNAO25X35X26-ZW-ASR1	**XL**	76	**25**	35	26	29	0,3	25,6	28,4
RNAO25X37X16	**XL**	60	**25**	37	16	32	0,3	25,6	31,4
RNAO30X40X17	**XL**	60	**30**	40	17	35	0,3	30,6	34,4
RNAO30X42X16	**XL**	59	**30**	42	16	37	0,3	30,6	36,4
RNAO30X42X32-ZW-ASR1	**XL**	137	**30**	42	32	37	0,3	30,6	36,4
RNAO35X45X13	**XL**	53	**35**	45	13	40	0,3	35,6	39,4
RNAO35X45X17	**XL**	69	**35**	45	17	40	0,3	35,6	39,4
RNAO35X45X26-ZW-ASR1	**XL**	91	**35**	45	26	40	0,3	35,6	39,4
RNAO35X47X16	**XL**	78	**35**	47	16	42	0,3	35,6	41,4
RNAO35X47X18	**XL**	89	**35**	47	16	42	0,3	35,6	41,4
RNAO35X47X32-ZW-ASR1	**XL**	156	**35**	47	32	42	0,3	35,6	41,4



Axial guidance of needle roller and cage assembly in housing

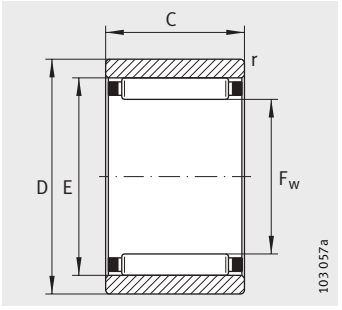


Axial guidance of needle roller and cage assembly on shaft

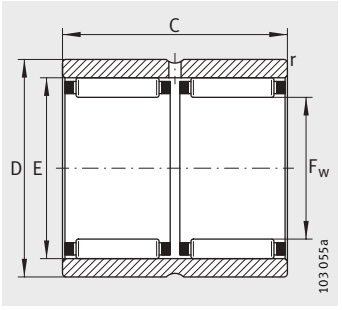
		Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
D_2	r_a	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	n_B
	max.	N	N	N	min^{-1}	min^{-1}
8,3	0,1	2 650	1 920	295	37 000	60 000
9,3	0,3	2 950	2 280	355	32 000	55 000
10,3	0,3	3 250	2 650	410	31 000	48 000
11,3	0,3	4 450	4 100	690	29 000	41 000
13,3	0,3	5 300	5 500	930	27 000	33 000
18,3	0,3	11 300	9 900	1 740	24 000	23 000
19,3	0,3	9 700	10 900	1 760	22 900	15 000
20,3	0,3	10 100	11 800	1 890	22 400	14 200
22,3	0,3	13 000	12 500	2 210	21 300	12 600
21,3	0,3	11 700	14 600	2 240	21 800	13 000
24,5	0,3	24 800	30 000	5 300	20 400	17 300
24,3	0,3	11 100	14 300	2 310	20 400	11 900
24,3	0,3	19 000	28 500	4 600	20 000	16 000
26,5	0,3	15 100	16 200	2 850	18 800	10 500
26,3	0,3	11 800	15 900	2 550	18 800	10 900
29,5	0,3	22 600	25 500	4 200	17 200	9 400
29,5	0,3	16 800	26 000	4 250	16 300	9 300
29,5	0,3	21 900	37 000	5 900	16 000	13 000
32,5	0,3	23 800	28 000	4 650	15 800	8 700
35,5	0,3	22 100	34 000	5 300	14 000	7 800
37,5	0,3	26 000	33 500	5 500	13 600	7 600
37,5	0,3	45 000	67 000	11 100	14 000	10 000
40,5	0,3	18 300	28 000	4 550	12 300	7 100
40,5	0,3	23 500	38 500	6 100	12 300	7 000
40,5	0,3	31 500	56 000	8 900	12 000	9 000
42,5	0,3	27 500	37 500	6 200	12 000	6 800
42,5	0,3	31 000	43 000	7 400	12 000	6 700
42,5	0,3	47 500	75 000	12 400	12 000	9 000

Needle roller bearings without ribs

Without inner ring



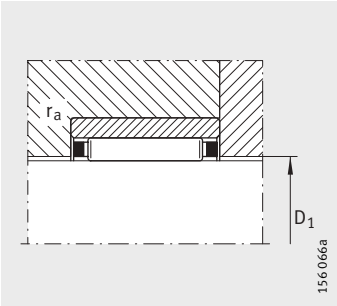
RNAO



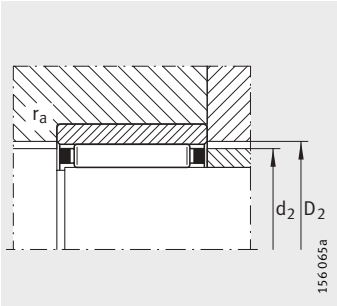
RNAO..-ZW-ASR1

Dimension table (continued) · Dimensions in mm

Designation		Mass	Dimensions					Mounting dimensions	
	X-life	m ≈g	F_w	D	C	E	r min.	D_1	d_2
RNAO40X50X17	**XL**	74	**40**	50	17	45	0,3	40,6	44,4
RNAO40X50X34-ZW-ASR1	**XL**	152	**40**	50	34	45	0,3	40,6	44,4
RNAO40X55X20	**XL**	145	**40**	55	20	47	0,3	40,6	46,2
RNAO40X55X40-ZW-ASR1	**XL**	275	**40**	55	40	48	0,3	40,6	47,2
RNAO45X55X17	**XL**	83	**45**	55	17	50	0,3	45,6	49,2
RNAO45X62X40-ZW-ASR1	**XL**	377	**45**	62	40	53	0,3	45,6	52,2
RNAO50X62X20	**XL**	140	**50**	62	20	55	0,3	50,6	54,2
RNAO50X65X20	**XL**	168	**50**	65	20	58	0,3	50,6	57,2
RNAO50X65X40-ZW-ASR1	**XL**	355	**50**	65	40	58	0,6	50,6	57,2
RNAO55X68X20	**XL**	166	**55**	68	20	60	0,6	55,8	59,4
RNAO60X78X20	**XL**	255	**60**	78	20	68	1	60,8	67,2
RNAO60X78X40-ZW-ASR1	**XL**	435	**60**	78	40	68	1	60,8	67,2
RNAO65X85X30	**XL**	464	**65**	85	30	73	1	66	72,2
RNAO70X90X30	**XL**	499	**70**	90	30	78	1	71	77,2
RNAO80X100X30	**XL**	580	**80**	100	30	88	1	81	87,2
RNAO90X105X26	**XL**	373	**90**	105	26	98	1	91	97,2
RNAO90X110X30	**XL**	610	**90**	110	30	98	1	91	97,2
RNAO100X120X30	**XL**	694	**100**	120	30	108	1	101	107,2



Axial guidance of needle roller and cage assembly in housing

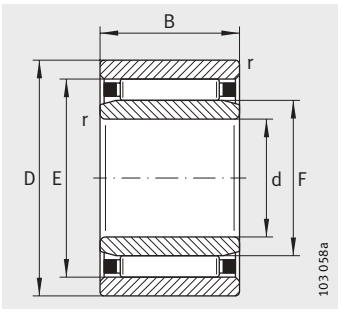


Axial guidance of needle roller and cage assembly on shaft

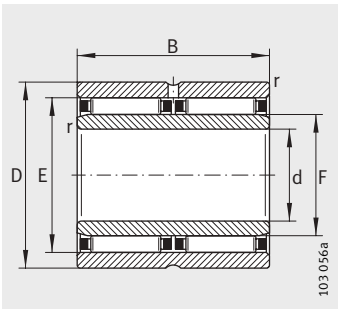
		Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
D_2	r_a max.	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	n_B min^{-1}
45,5	0,3	24 200	41 500	6 400	10 900	6 400
45,5	0,3	41 500	83 000	12 900	11 000	7 000
47,5	0,3	37 000	57 000	8 900	10 300	5 800
47,5	0,3	70 000	118 000	18 700	10 000	7 500
50,5	0,3	25 500	46 000	7 100	9 800	5 800
53,5	0,3	76 000	135 000	21 500	9 000	7 000
55,8	0,3	30 000	60 000	9 600	8 800	5 300
58,5	0,3	40 500	62 000	10 800	8 500	5 100
58,5	0,6	69 000	124 000	21 700	8 500	6 500
60,8	0,6	32 000	66 000	10 700	8 000	4 850
68,8	1	49 500	85 000	13 600	7 100	4 150
68,8	1	85 000	171 000	27 500	7 000	5 500
73,8	1	64 000	123 000	21 100	6 500	4 000
78,8	1	68 000	135 000	23 200	6 100	3 750
89	1	80 000	176 000	31 000	5 400	3 250
99	1	69 000	150 000	25 000	5 000	3 200
99	1	76 000	172 000	29 500	4 900	3 100
109	1	80 000	188 000	32 000	4 500	3 700

Needle roller bearings without ribs

With inner ring



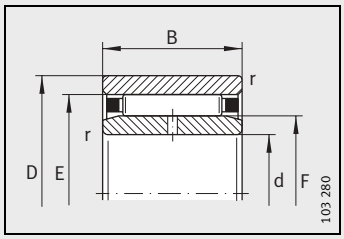
NAO



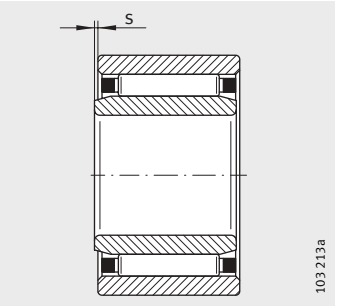
NAO..-ZW-ASR1

Dimension table · Dimensions in mm

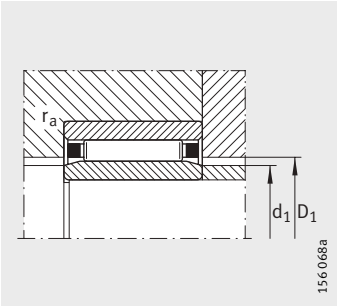
Designation		Mass	Dimensions						
	X-life	m ≈g	d	D	B	F	E	r min.	$s^{1)}$
NAO6X17X10-TV-IS1	**XL**	14	**6**	17	10	10	13	0,3	0,5
NAO9X22X12-TV	**XL**	23,5	**9**	22	12	12	18	0,3	0,5
NAO12X24X13	**XL**	30	**12**	24	13	16	20	0,3	0,5
NAO12X28X12-IS1	**XL**	40	**12**	28	12	16	22	0,3	0,5
NAO15X28X13	**XL**	29	**15**	28	13	20	24	0,3	0,5
NAO15X32X12-IS1	**XL**	50	**15**	32	12	20	26	0,3	0,5
NAO17X30X13	**XL**	42	**17**	30	13	22	26	0,3	0,5
NAO17X35X16	**XL**	78	**17**	35	16	22	29	0,3	0,5
NAO20X35X17	**XL**	76	**20**	35	17	25	29	0,3	0,5
NAO20X37X16	**XL**	82	**20**	37	16	25	32	0,3	0,5
NAO25X40X17	**XL**	88	**25**	40	17	30	35	0,3	0,8
NAO25X42X16-IS1	**XL**	86	**25**	42	16	30	37	0,3	0,8
NAO25X42X32-ZW-ASR1	**XL**	190	**25**	43	32	30	37	0,3	0,8
NAO30X45X17	**XL**	102	**30**	45	17	35	40	0,3	0,8
NAO30X45X26-ZW-ASR1	**XL**	157	**30**	45	26	35	40	0,3	0,8
NAO30X47X16	**XL**	109	**30**	47	16	35	42	0,3	0,8
NAO30X47X18	**XL**	119	**30**	47	18	35	42	0,3	0,8
NAO35X50X17	**XL**	113	**35**	50	17	40	45	0,3	0,8
NAO35X55X20	**XL**	190	**35**	55	20	40	47	0,3	0,8
NAO40X55X17	**XL**	127	**40**	55	17	45	50	0,3	0,8
NAO50X68X20-IS1	**XL**	230	**50**	68	20	55	60	0,6	1
NAO70X100X30	**XL**	850	**70**	100	30	80	88	1	1
NAO80X110X30	**XL**	920	**80**	110	30	90	98	1	1
NAO90X120X30	**XL**	1 044	**90**	120	30	100	108	1	1



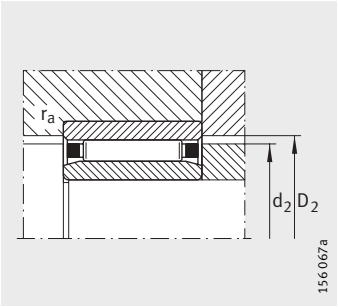
NAO..-IS1



[1] Axial displacement “s”

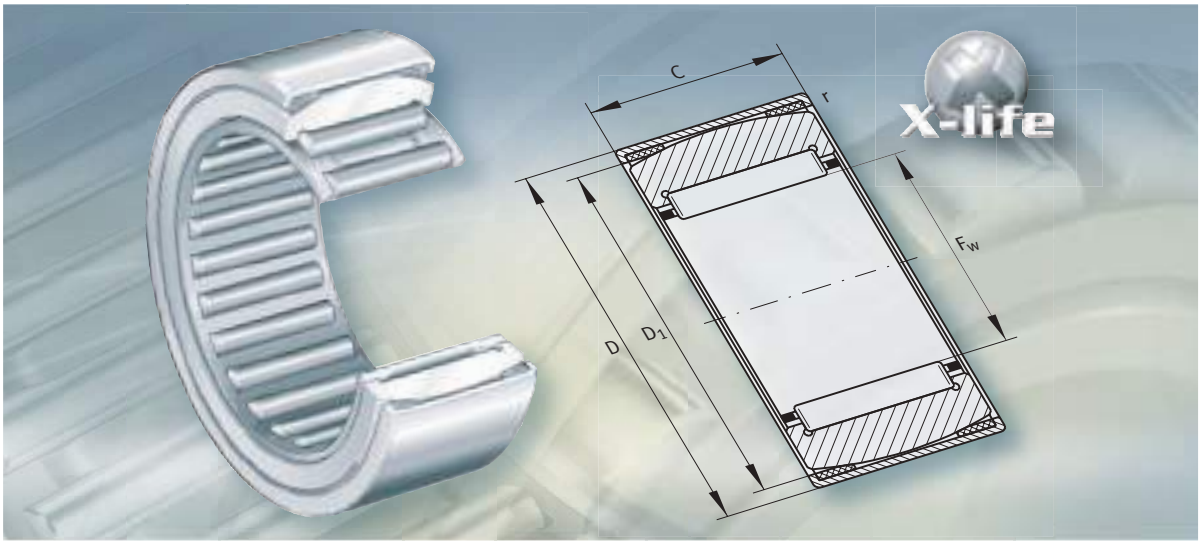


Axial guidance of needle roller and cage assembly in housing



Axial guidance of needle roller and cage assembly on shaft

Mounting dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
d_1	D_1	d_2	D_2	r_a max.	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	n_B min^{-1}
9,7	10,3	12,7	13,3	0,3	5 300	5 500	930	29 000	28 000
11,7	12,3	17,6	18,3	0,3	11 300	9 900	1 740	25 000	21 000
15,7	16,4	19,6	20,3	0,3	10 100	11 800	1 890	24 000	18 000
15,7	16,4	21,6	22,3	0,3	13 000	12 500	2 210	22 000	17 000
19,7	20,4	23,6	24,3	0,3	11 100	14 300	2 310	22 000	14 000
19,7	20,4	25,6	26,5	0,3	15 100	16 200	2 850	21 000	13 000
21,5	22,4	25,6	26,3	0,3	11 800	15 900	2 550	21 000	13 000
21,5	22,4	28,4	29,5	0,3	22 600	25 500	4 200	19 000	12 000
24,5	25,6	28,4	29,5	0,3	16 800	26 000	4 250	18 000	12 000
24,5	25,6	31,4	32,5	0,3	23 800	28 000	4 650	17 000	11 000
29,5	30,6	34,4	35,5	0,3	22 100	34 000	5 300	15 000	9 500
29,5	30,6	36,4	37,5	0,3	26 000	33 500	5 500	15 000	9 000
29,5	30,6	36,4	37,5	0,3	45 000	67 000	11 100	15 000	9 000
34,5	35,6	39,4	40,5	0,3	23 500	38 500	6 100	13 000	8 500
34,5	35,6	39,4	40,5	0,3	31 500	56 000	8 900	13 000	8 500
34,5	35,6	41,4	42,5	0,3	27 500	37 500	6 200	13 000	8 000
34,5	35,6	41,4	42,5	0,3	31 000	43 000	7 400	13 000	8 000
39,5	40,6	44,4	45,5	0,3	24 200	41 500	6 400	12 000	7 500
39,5	40,6	46,2	47,5	0,3	37 000	57 000	8 900	11 000	7 500
44,5	45,6	49,2	50,5	0,3	25 500	46 000	7 100	10 000	7 000
54,5	55,8	59,2	60,8	0,6	32 000	66 000	10 700	8 500	6 000
79,3	81	87,2	89	1	80 000	176 000	31 000	6 000	3 900
89,3	91	97,2	99	1	76 000	172 000	29 500	5 000	3 800
99,3	101	107,2	109	1	80 000	188 000	32 000	4 700	3 500



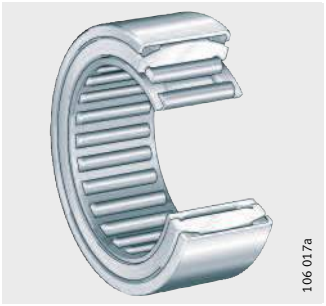
Aligning needle roller bearings

Aligning needle roller bearings

Product overview Aligning needle roller bearings

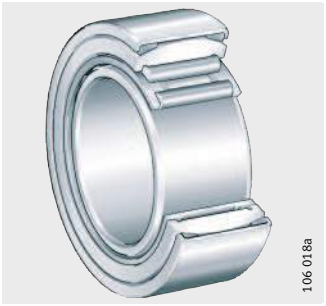
Without inner ring

RPNA



With inner ring

PNA



Aligning needle roller bearings

Features

Aligning needle roller bearings are units comprising drawn outer cups, plastic support rings with a concave inner profile, outer rings with a spherical outside surface, needle roller and cage assemblies and removable inner rings.

The bearings can compensate static misalignments and can thus tolerate misalignment of the shaft relative to the housing; see Compensation of misalignments.

Aligning needle roller bearings are firmly seated in the housing bore. The bore can therefore be produced easily and economically.

X-life

Aligning needle roller bearings are X-life bearings. In these bearings, the raceways have optimised roughness and geometrical accuracy. This gives higher load carrying capacity and longer life.

Sealing/lubricant

Aligning needle roller bearings are unsealed and are not supplied greased. They can be lubricated with grease or oil.

Needle roller bearings with/ without inner ring

Bearings RPNA do not have an inner ring and are therefore particularly compact. However, they require a raceway that is hardened and ground.

Bearings PNA have an inner ring. They are used if the shaft cannot be configured as a rolling bearing raceway.

Displacement of the inner ring

The standard inner ring allows axial displacement within the values “s” stated in the dimension tables. Where larger displacements occur, the standard ring can be replaced by a wider inner ring IR. Inner rings: see page 690.

Operating temperature

Caution! Aligning needle roller bearings are suitable for operating temperatures from –20 °C to +100 °C; this is limited by the plastic support rings.

Cages

The bearings have sheet steel cages.

Design and safety guidelines

Compensation of misalignments

Due to the spherical outer ring and the concave support ring, aligning needle roller bearings can compensate static shaft mislignments of up to 3°.

Caution! The bearings must not be used to support swivel or tumbling motion. During adjustment motion between the outer cup and the ring, a breakaway torque occurs.

In order that adjustment motion can take place, the tolerances for the housing bore according to the table must be observed.

Raceway for bearings without inner ring

Where bearings without an inner ring are to be used, the rolling element raceway on the shaft must be hardened and ground. The surface hardness of the raceway must be 670 HV + 170 HV and the hardening depth CHD or Rht must be sufficiently large.

Aligning needle roller bearings

Tolerances for shaft raceway/ housing bore

Housing material	Shaft tolerance for bearings without inner ring	Bore tolerance
Steel or cast iron	h6	N6
Light metal		R6

Surface for shaft raceway/ housing bore

Surface quality	Shaft raceway for bearings without inner ring	Housing bore
Roughness max.	R_a0,1 (R_z0,4)	R_a0,8 (R_z4)
Roundness max.	IT3	IT 5/2
Parallelism max.	IT3	IT 5/2

Minimum radial load

In order to ensure operation without slippage, the bearings must be subjected to a minimum radial load $F_{r\,min}$. This applies in particular to high speed bearings since, if the radial load is insufficient or not present, damaging sliding motion may occur between the rolling elements and raceways. For continuous operation, therefore, a ratio $C_r/P < 50$ is necessary.

Speeds

The speeds n_G in the dimension tables are valid for oil lubrication.

Caution! With grease lubrication, the permissible value is taken as 60% of the value given in the table.

Radial and axial location

Aligning needle roller bearings are firmly seated in the housing bore. No further axial location is required.

Caution! Aligning needle roller bearings are not self-retaining. Since the individual bearing parts are matched to each other, the parts of bearings of identical size must not be interchanged during fitting.

Installation with fitting mandrel

Due to the drawn outer cup, the bearings must be fitted using a special pressing mandrel: see the section Drawn cup needle roller bearings, page 610. The marked side of the bearing should be in contact with the flange of the mandrel. A toroidal ring on the mandrel holds the bearing securely on the mandrel.

Accuracy

The dimensional and geometrical tolerances are in accordance with PN to DIN 620, apart from the outside diameter and width of the outer cup. The width has a tolerance of ±0,5 mm.

Radial internal clearance

Bearings with inner ring have a radial internal clearance of CN.

Radial internal clearance to DIN 620-4

Bore d mm		Radial internal clearance CN µm	
over	incl.	min.	max.
–	24	20	45
24	30	20	45
30	40	25	50
40	50	30	60

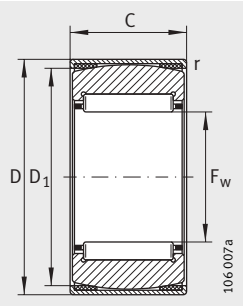
Enveloping circle

In the case of bearings without inner ring, the enveloping circle dimension F_w is used instead of the radial internal clearance.

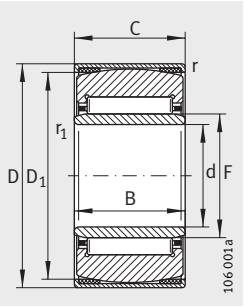
The enveloping circle is the inner inscribed circle of the needle rollers in clearance-free contact with the outer raceway. For bearings before fitting, the enveloping circle F_w is in the tolerance zone F6.

Aligning needle roller bearings

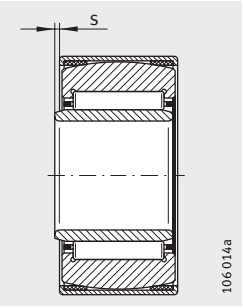
With or without inner ring



RPNA



PNA



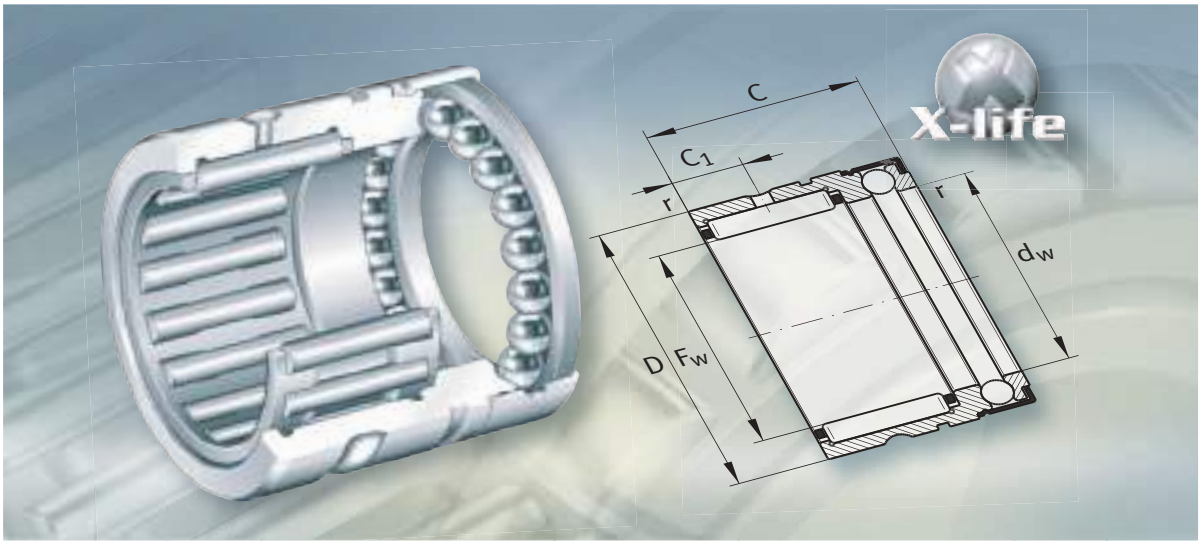
[1] Axial displacement “s”

Dimension table · Dimensions in mm

Designation		Mass	Dimensions					Basic load ratings		Fatigue limit load	Limiting speed
	X-life	m	F_w	D	C	D_1	r	dyn. C_r	stat. C_{0r}	C_{ur}	n_G
		≈g			±0,5		min.	N	N	N	min^{-1}
RPNA15/28	**XL**	32	**15**	28	12	24,5	0,8	7 800	7 900	1 430	24 000
RPNA18/32	**XL**	52	**18**	32	16	27	0,8	14 100	16 200	3 000	22 000
RPNA20/35	**XL**	62	**20**	35	16	30,5	0,8	14 600	17 500	3 200	21 000
RPNA25/42	**XL**	109	**25**	42	20	36,5	0,8	21 300	30 500	5 300	18 000
RPNA28/44	**XL**	112	**28**	44	20	38,5	0,8	24 800	34 000	5 900	16 000
RPNA30/47	**XL**	125	**30**	47	20	42	0,8	25 500	36 000	6 300	15 000
RPNA35/52	**XL**	131	**35**	52	20	47,5	0,8	27 500	41 500	7 300	13 000
RPNA40/55	**XL**	141	**40**	55	20	50,5	0,8	29 500	47 000	8 300	11 000
RPNA45/62	**XL**	176	**45**	62	20	58	0,8	31 000	53 000	9 300	10 000

Dimension table · Dimensions in mm

Designation		Mass	Dimensions									Basic load ratings		Fatigue limit load	Limiting speed
	X-life	m	d	F	D	C	B	D_1	r	r_1	s[1]	dyn. C_r	stat. C_{0r}	C_{ur}	n_G
		≈g				±0,5			min.	min.	min.	N	N	N	min^{-1}
PNA12/28	**XL**	37	**12**	15	28	12	12	24,5	0,8	0,3	0,5	7 800	7 900	1 430	24 000
PNA15/32	**XL**	62	**15**	18	32	16	16	27	0,8	0,3	0,5	14 100	16 200	3 000	22 000
PNA17/35	**XL**	73	**17**	20	35	16	16	30,5	0,8	0,3	0,5	14 600	17 500	3 200	21 000
PNA20/42	**XL**	136	**20**	25	42	20	20	36,5	0,8	0,3	0,5	21 300	30 500	5 300	18 000
PNA22/44	**XL**	145	**22**	28	44	20	20	38,5	0,8	0,3	0,5	24 800	34 000	5 900	16 000
PNA25/47	**XL**	157	**25**	30	47	20	20	42	0,8	0,3	0,5	25 500	36 000	6 300	15 000
PNA30/52	**XL**	181	**30**	35	52	20	20	47,5	0,8	0,3	0,5	27 500	41 500	7 300	13 000
PNA35/55	**XL**	177	**35**	40	55	20	20	50,5	0,8	0,3	0,5	29 500	47 000	8 300	11 000
PNA40/62	**XL**	227	**40**	45	62	20	20	58	0,8	0,3	0,5	31 000	53 000	9 300	10 000



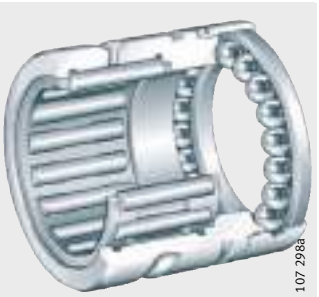
Combined needle roller bearings

Combined needle roller bearings

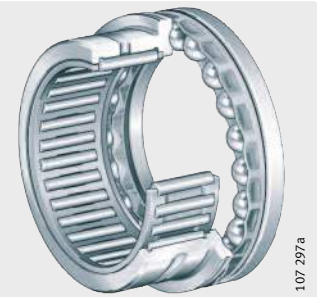
Needle roller/ axial deep groove ball bearings

Without inner ring
With or without end cap

NX, NX..-Z



NKX., NKX..-Z



Needle roller/ axial cylindrical roller bearings

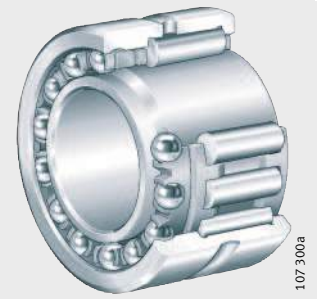
Without inner ring
With or without end cap

NKXR, NKXR..-Z

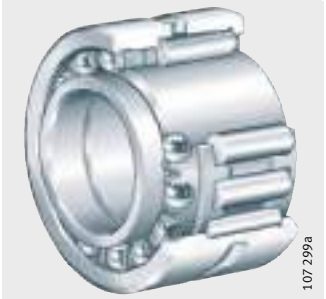
Needle roller/ angular contact ball bearings

With inner ring

NKIA



NKIB



Combined needle roller bearings

Features

Combined needle roller bearings are units comprising radial needle roller bearings with a rolling bearing component capable of supporting axial loads.

Radial and axial load carrying capacity

The bearings can support high radial forces as well as axial forces in one direction, while NKIB bearings can support axial forces from both directions, and are used as locating or semi-locating bearings, *Figure 1*.

X-life

Combined needle roller bearings are X-life bearings. In these bearings, the raceways have optimised roughness and geometrical accuracy. This gives higher load carrying capacity and longer life.

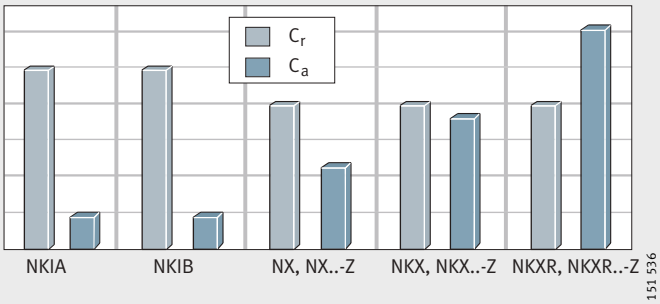


Figure 1
Dynamic load carrying capacity C_r and C_a

Needle roller/axial deep groove ball bearings

These bearings do not have an inner ring. Bearings without inner ring have particularly compact radial dimensions.
However, they require a shaft raceway that is hardened and ground.

Bearings NX and NX..-Z have a full complement axial ball bearing component and end caps.

Bearings NKX (NAXK to DIN 5 429-1) and NKX..-Z (NAXK..-Z to DIN 5 429-1) have an axial bearing component comprising a ball and cage assembly with a sheet steel or plastic cage. Series NKX..-Z also has an end cap on the axial bearing component.

Sealing/lubricant

For lubrication, the bearings have a lubrication groove and lubrication hole in the outer ring.

Series NX and NKX are lubricated with oil. The end cap in series NX has lubrication holes.

Series NX..-Z and NKX..-Z are lubricated with grease. The axial bearing component is greased using a lithium complex soap grease to GA08. The end caps do not have lubrication holes.

Combined needle roller bearings

Needle roller/ axial cylindrical roller bearings

These bearings do not have an inner ring. Bearings without inner ring have particularly compact radial dimensions.
However, they require a shaft raceway that is hardened and ground.

Bearings NKXR (NAXR to DIN 5 429-1) and NKXR..-Z (NAXR..-Z to DIN 5 429-1) have an axial bearing component comprising a roller and cage assembly with a plastic cage; NKXR..-Z also has an end cap on the axial bearing component.

Sealing/lubricant

For lubrication, the bearings have a lubrication groove and lubrication hole in the outer ring.

Series NKXR is lubricated with oil.

Series NKXR..-Z is lubricated with grease. The axial bearing component is greased using a lithium complex soap grease to GA08. The end cap does not have lubrication holes.

Needle roller/ angular contact ball bearings

Combined bearings NKIA and NKIB have an inner ring.

Series NKIA corresponds to DIN 5 429-2. It can support axial loads from one direction.

Bearings NKIB have one narrow inner ring and one wide inner ring. The axial bearing component has a plastic ball cage. At the point where the inner rings join, there is a shoulder on both sides for guidance of the ball and cage assembly. As a result, these bearings are also suitable for supporting axial forces alternating in direction. The bearings guide the shaft with an axial clearance of 0,08 mm to 0,25 mm.

Sealing/lubricant

Bearings NKIA and NKIB can be lubricated with grease or oil. For lubrication, the outer ring has a lubrication groove and a lubrication hole.

Operating temperature

The bearings can be used at operating temperatures from –20 °C to +120 °C.

Cages

Bearings with plastic cage are indicated by the suffix TV in the dimension tables.

Suffixes

Suffixes for the available designs: see table.

Available designs

Suffix	Description
TV[1)]	Cage made from glass fibre reinforced polyamide 66
Z	Bearing with end cap, axial bearing component greased with lithium complex soap grease to GA08

1) Bearings with plastic cage: see dimension tables.

Design and safety guidelines

Raceway for bearings without inner ring

Where bearings without an inner ring are to be used, the rolling element raceway on the shaft must be hardened and ground. The surface hardness of the raceway must be 670 HV + 170 HV and the hardening depth CHD or Rht must be sufficiently large.

Tolerances for shaft raceway/ housing bore

Series	Shaft tolerance		Bore tolerance
	for bearings without inner ring	for bearings with inner ring	
NKIA, NKIB	–	k6	M6
NX, NKX, NKXR	k6	k6	K6, M6 for rigid bearing arrangements

Caution! For bearings NKIA, NKIB, the shaft tolerance must not be greater than k6 and the bore tolerance must not be less than M6.

Surface for shaft raceway/ housing bore

Surface quality	Shaft raceway		Housing bore
	for bearings without inner ring	for bearings with inner ring	
Roughness max.	R_a0,1 (R_z0,4)	–	–
Roundness max.	IT3	IT 4/2	IT 5/2
Parallelism max.	IT3	IT 4	IT 4

If the shaft cannot be configured as a raceway, inner rings of series IR or LR can be used. The inner rings must be ordered separately. Inner rings: see page 690.

Support of axial forces

The axial bearing component must be preloaded to 1% of the axial basic static load rating C_{0a}. The basic load ratings C_{0a} are stated in the dimension tables.

Needle roller/ axial deep groove ball bearings, needle roller/ axial cylindrical roller bearings

In order to support axial forces, the bearing must be abutted by means of snap rings on the outer ring or a housing shoulder. If there is little distance between the shaft centres, the snap rings should be shortened. Snap rings WR and SW are available from trade outlets.

If the bearings are to support axial forces from alternating directions, two bearings must be fitted opposed to each other. The unloaded bearing must be axially preloaded, for example by means of springs. This allows compensation of thermal expansion.

In order to avoid double fits on NKX and NKXR, the axial bearing component should be free in the housing (outside diameter D_1 or D_2 +0,5 mm min.).

Combined needle roller bearings

Needle roller/ angular contact ball bearings

Bearings NKIA can support axial forces in one direction, bearings NKIB can support axial forces in both directions.

If bearings NKIA are to support axial forces from alternating directions, two bearings must be fitted opposed to each other, *Figure 2*.

In the case of NKIB, the wide and narrow inner ring must be axially clamped against each other. The narrow inner ring has a larger bore diameter. This results in an interference fit if a shaft tolerance of k6 is used.

Axial static load safety factor

Caution! The axial load must not exceed 25% of the radial load.

The axial static load safety factor S_0 must be $>$ 1,5.

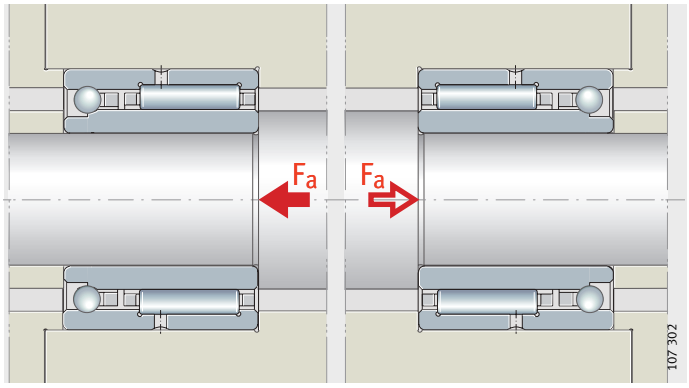


Figure 2
NKIA, two bearings fitted opposed to each other

Minimum radial load

In order to ensure operation without slippage, the bearings must be subjected to a minimum radial load $F_{r\,min}$. This applies in particular to high speed bearings since, if the radial load is insufficient or not present, damaging sliding motion may occur between the rolling elements and raceways. In continuous operation, a minimum radial load of the order of $C_r/P < 50$ is necessary.

Speeds

The speeds n_G in the dimension tables are valid for oil lubrication.

Caution! With grease lubrication, the permissible value is taken as 60% of the value given in the table. For NKXR, NKXR..-Z, NKIA, NKIB, the reference speed n_B is given in the dimension tables. In order to calculate the thermally safe speed n_{per}, bearings NKXR(Z) must be regarded as axial bearings and NKIA, NKIB as radial bearings.

Radial location

Combined needle roller bearings with inner ring are radially located by means of a close fit on the shaft and in the housing.

Axial location

In order to prevent lateral creep of the bearing rings, they must be located by means of physical locking.

The abutting shoulders (shaft, housing) should be sufficiently high and perpendicular to the bearing axis.

The transition from the bearing seating to the abutting shoulder must be designed with rounding to DIN 5 418 or an undercut to DIN 509. Note the minimum chamfer dimensions r as given in the dimension tables.

The overlap between the snap rings and the end faces of the bearing rings must be sufficiently large.

Maximum inner ring chamfer dimensions to DIN 620-6 must be taken into consideration.

Fitting note

Caution!

Combined needle roller bearings are not self-retaining. Since the individual bearing parts are matched to each other, the parts of bearings of identical size must not be interchanged during fitting.

Lubrication

Before operation, the radial component should be greased using a grease of equivalent quality to that used in the axial component.

In order to determine the relubrication interval, values must be calculated separately for the axial and radial component and the lower value should be used.

Accuracy

The dimensional and geometrical tolerances correspond to tolerance class PN to DIN 620. This excludes bearings NKIB, the bore d_1 of the narrow inner ring and the width (–0,3 mm) over both inner rings as well as bearings NKX and NKXR for the diameters D_1, D_2.

Radial internal clearance

Bearings with inner ring have a radial internal clearance of CN.

Radial internal clearance to DIN 620-4

Bore d mm		Radial internal clearance CN µm	
over	incl.	min.	max.
–	24	20	45
24	30	20	45
30	40	25	50
40	50	30	60
50	65	40	70
65	80	40	75
80	100	50	85

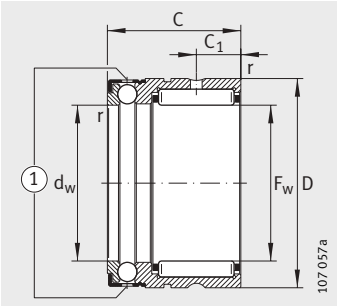
Enveloping circle

In the case of bearings without inner ring, the enveloping circle dimension F_w is used instead of the radial internal clearance.

The enveloping circle is the inner inscribed circle of the needle rollers in clearance-free contact with the outer raceway. For bearings before fitting, the enveloping circle F_w is in the tolerance zone F6.

Needle roller/
axial deep groove ball bearings

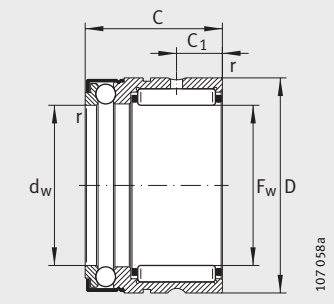
Without inner ring



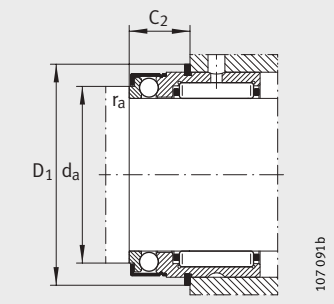
NX
① Oil lubrication holes

Dimension table · Dimensions in mm

Designation				Dimensions						Mounting dimensions			
For oil lubrication	For grease lubrication	X-life	Mass m ≈g	F_w	D	C –0,25	C_1	d_w E8	r min.	C_2	D_1	d_a	r_a max.
NX7-TV	**NX7-Z-TV**	**XL**	14	**7**	14	18	4,7	7	0,3	10	16,5	9,6	0,3
NX10	**NX10-Z**	**XL**	25	**10**	19	18	4,7	10	0,3	10	21,9	14,6	0,3
NX12	**NX12-Z**	**XL**	28	**12**	21	18	4,7	12	0,3	10	23,7	16,6	0,3
NX15	**NX15-Z**	**XL**	48	**15**	24	28	8	15	0,3	12,2	26,5	19	0,3
NX17	**NX17-Z**	**XL**	53	**17**	26	28	8	17	0,3	12,2	28,5	21	0,3
NX20	**NX20-Z**	**XL**	68	**20**	30	28	8	20	0,3	12,2	33,6	25	0,3
NX25	**NX25-Z**	**XL**	115	**25**	37	30	8	25	0,3	14,2	40,4	31,6	0,3
NX30	**NX30-Z**	**XL**	130	**30**	42	30	10	30	0,3	14,2	45,1	36,5	0,3
NX35	**NX35-Z**	**XL**	160	**35**	47	30	10	35	0,3	14,2	50,1	40,5	0,3



NX..-Z

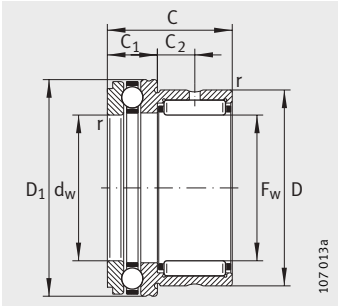


Mounting dimensions
Snap ring in outer ring

Basic load ratings				Fatigue limit load		Limiting speed	Recommended inner rings Designation	Suitable snap rings
radial		axial		C_{ur}	C_{ua}	n_G		
dyn. C_r N	stat. C_{0r} N	dyn. C_a N	stat. C_{0a} N	N	N	min^{-1}		
3 250	2 650	3 150	4 300	410	190	15 000	–	**WR14, SW14**
6 000	3 700	4 600	7 200	720	320	11 000	**IR6X10X10-IS1**	**WR19, SW19**
5 400	4 300	4 850	8 200	830	365	9 500	**IR8X12X10-IS1**	**WR21, SW21**
12 100	12 700	5 600	10 400	2 320	460	8 000	**IR12X15X16**	**WR24, SW24**
13 500	15 000	5 800	11 500	2 750	510	7 500	**IR14X17X17**	**WR26, SW26**
14 600	17 500	7 000	14 700	3 200	650	6 500	**IR17X20X16**	**WR30, SW30**
16 800	22 400	11 100	24 300	4 150	1 080	4 900	**IR20X25X16-IS1**	**WR37, SW37**
25 500	36 000	11 700	28 000	6 300	1 230	4 300	**IR25X30X20**	**WR42, SW42**
27 500	41 500	12 400	32 500	7 300	1 440	3 700	**IR30X35X20**	**WR47, SW47**

Needle roller/
axial deep groove ball bearings

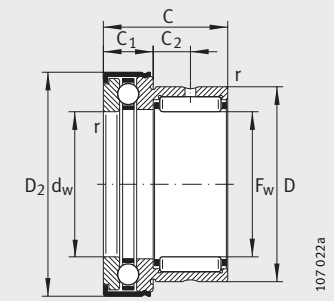
Without inner ring
With or without end cap



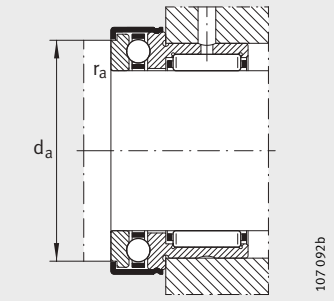
NKX

Dimension table · Dimensions in mm

Without end cap Designation		Designation to DIN 5 429	Mass	With end cap Designation		Designation to DIN 5 429	Mass	Dimensions					
	X-life		m ≈g		X-life		m ≈g	F_w	D	D_1 max.	D_2 max.	C −0,2	C_1 −0,2
NKX10-TV	**XL**	NAXK10TN	34	**NKX10-Z-TV**	**XL**	NAXK10ZTN	36	**10**	19	24,1	25,2	23	9
NKX12	**XL**	NAXK12	38	**NKX12-Z**	**XL**	NAXK12Z	40	**12**	21	26,1	27,2	23	9
NKX15	**XL**	NAXK15	44	**NKX15-Z**	**XL**	NAXK15Z	47	**15**	24	28,1	29,2	23	9
NKX17	**XL**	NAXK17	53	**NKX17-Z**	**XL**	NAXK17Z	55	**17**	26	30,1	31,2	25	9
NKX20	**XL**	NAXK20	83	**NKX20-Z**	**XL**	NAXK20Z	90	**20**	30	35,1	36,2	30	10
NKX25	**XL**	NAXK25	125	**NKX25-Z**	**XL**	NAXK25Z	132	**25**	37	42,1	43,2	30	11
NKX30	**XL**	NAXK30	141	**NKX30-Z**	**XL**	NAXK30Z	148	**30**	42	47,1	48,2	30	11
NKX35	**XL**	NAXK35	163	**NKX35-Z**	**XL**	NAXK35Z	168	**35**	47	52,1	53,2	30	12
NKX40	**XL**	NAXK40	200	**NKX40-Z**	**XL**	NAXK40Z	208	**40**	52	60,1	61,2	32	13
NKX45	**XL**	NAXK45	252	**NKX45-Z**	**XL**	NAXK45Z	265	**45**	58	65,2	66,5	32	14
NKX50	**XL**	NAXK50	280	**NKX50-Z**	**XL**	NAXK50Z	300	**50**	62	70,2	71,5	35	14
NKX60	**XL**	NAXK60	360	**NKX60-Z**	**XL**	NAXK60Z	380	**60**	72	85,2	86,5	40	17
NKX70	**XL**	NAXK70	500	**NKX70-Z**	**XL**	NAXK70Z	520	**70**	85	95,2	96,5	40	18



NKX..-Z

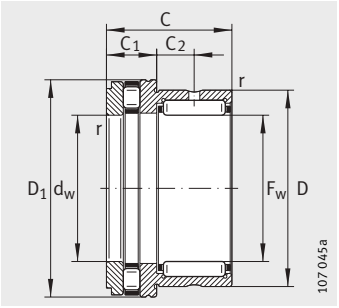


Mounting dimensions

			Mounting dimensions		Basic load ratings				Fatigue limit load		Limiting speed	Recommended inner rings Designation
C_2	d_w	r	d_a	r_a	radial		axial		C_{ur}	C_{ua}	n_G	
					dyn. C_r	stat. C_{0r}	dyn. C_a	stat. C_{0a}				
	E8	min.		max.	N	N	N	N	N	N	min^{-1}	
6,5	10	0,3	19,7	0,3	7 000	7 800	10 000	14 000	1 310	670	12 400	**IR7X10X16**
6,5	12	0,3	21,7	0,3	10 100	11 000	10 300	15 400	1 920	740	10 900	**IR9X12X16**
6,5	15	0,3	23,7	0,3	12 100	12 700	10 500	16 800	2 320	810	9 200	**IR12X15X16**
8	17	0,3	25,7	0,3	13 500	15 000	10 800	18 200	2 750	870	8 400	**IR14X17X17**
10,5	20	0,3	30,7	0,3	18 600	23 800	14 300	24 700	4 150	1 190	7 200	**IR17X20X20**
9,5	25	0,6	37,7	0,6	21 300	30 500	19 600	37 500	5 300	1 790	5 800	**IR20X25X20**
9,5	30	0,6	42,7	0,6	25 500	36 000	20 400	42 000	6 300	2 030	5 000	**IR25X30X20**
9	35	0,6	47,7	0,6	27 500	41 500	21 200	47 000	7 300	2 270	4 400	**IR30X35X20**
10	40	0,6	55,7	0,6	29 500	47 000	27 000	63 000	8 300	3 000	3 900	**IR35X40X20**
9	45	0,6	60,5	0,6	31 000	53 000	28 000	69 000	9 300	3 350	3 500	**IR40X45X20**
10	50	0,6	65,5	0,6	43 000	74 000	29 000	75 000	12 700	3 650	3 200	**IR45X50X25**
12	60	1	80,5	1	47 500	90 000	41 500	113 000	15 400	5 400	2 750	**IR50X60X25**
11	70	1	90,5	1	50 000	92 000	43 000	127 000	15 700	6 100	2 320	**IR60X70X25**

Needle roller/
axial cylindrical roller bearings

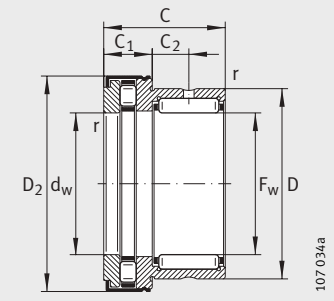
Without inner ring
With or without end cap



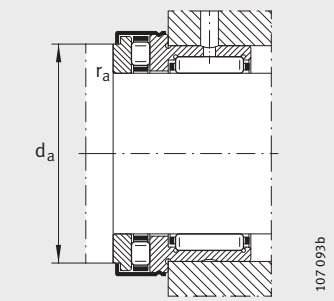
NKXR

Dimension table · Dimensions in mm

Without end cap Designation		Designation to DIN 5 429	Mass	With end cap Designation		Designation to DIN 5 429	Mass	Dimensions				
	X-life		m ≈g		X-life		m ≈g	F_w	D	D_1 max.	D_2 max.	C −0,25
NKXR15	**XL**	NAXR15	42	**NKXR15-Z**	**XL**	NAXR15Z	45	**15**	24	28,1	29,2	23
NKXR17	**XL**	NAXR17	50	**NKXR17-Z**	**XL**	NAXR17Z	53	**17**	26	30,1	31,2	25
NKXR20	**XL**	NAXR20	80	**NKXR20-Z**	**XL**	NAXR20Z	84	**20**	30	35,1	36,2	30
NKXR25	**XL**	NAXR25	120	**NKXR25-Z**	**XL**	NAXR25Z	125	**25**	37	42,1	43,2	30
NKXR30	**XL**	NAXR30	135	**NKXR30-Z**	**XL**	NAXR30Z	141	**30**	42	47,1	48,2	30
NKXR35	**XL**	NAXR35	157	**NKXR35-Z**	**XL**	NAXR35Z	165	**35**	47	52,1	53,2	30
NKXR40	**XL**	NAXR40	204	**NKXR40-Z**	**XL**	NAXR40Z	214	**40**	52	60,1	61,2	32
NKXR45	**XL**	NAXR45	244	**NKXR45-Z**	**XL**	NAXR45Z	260	**45**	58	65,2	66,5	32
NKXR50	**XL**	NAXR50	268	**NKXR50-Z**	**XL**	NAXR50Z	288	**50**	62	70,2	71,5	35



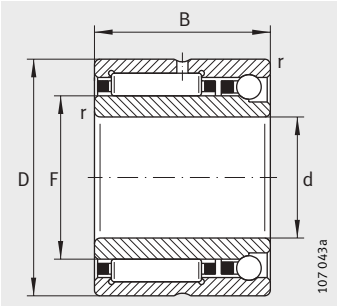
NKXR..-Z



Mounting dimensions

				Mounting dimensions		Basic load ratings				Fatigue limit load		Limiting speed	Reference speed	Recommended inner rings Designation
						radial		axial						
C_1	C_2	d_w	r	d_a	r_a	dyn. C_r	stat. C_{0r}	dyn. C_a	stat. C_{0a}	C_{ur}	C_{ua}	n_G	n_B	
–0,2		E8	min.		max.	N	N	N	N	N	N	min^{-1}	min^{-1}	
9	6,5	15	0,3	23,7	0,3	12 100	12 700	14 400	28 500	2 320	4 000	9 200	6 500	**IR12X15X16**
9	8	17	0,3	25,7	0,3	13 500	15 000	15 900	33 500	2 750	4 650	8 400	5 500	**IR14X17X17**
10	10,5	20	0,3	30,7	0,3	18 600	23 800	24 900	53 000	4 150	7 300	7 200	4 200	**IR17X20X20**
11	9,5	25	0,6	37,7	0,6	21 300	30 500	33 500	76 000	5 300	7 100	5 800	3 400	**IR20X25X20**
11	9,5	30	0,6	42,7	0,6	25 500	36 000	35 500	86 000	6 300	8 000	5 000	2 900	**IR25X30X20**
12	9	35	0,6	47,7	0,6	27 500	41 500	39 000	101 000	7 300	9 500	4 400	2 500	**IR30X35X20**
13	10	40	0,6	55,7	0,6	29 500	47 000	56 000	148 000	8 300	14 500	3 900	2 000	**IR35X40X20**
14	9	45	0,6	60,6	0,6	31 000	53 000	59 000	163 000	9 300	16 000	3 500	1 900	**IR40X45X20**
14	10	50	0,6	65,5	0,6	43 000	74 000	61 000	177 000	12 700	17 400	3 200	1 700	**IR45X50X25**

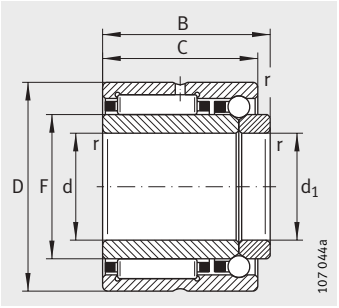
Needle roller/
angular contact ball bearings



NKIA
Single direction

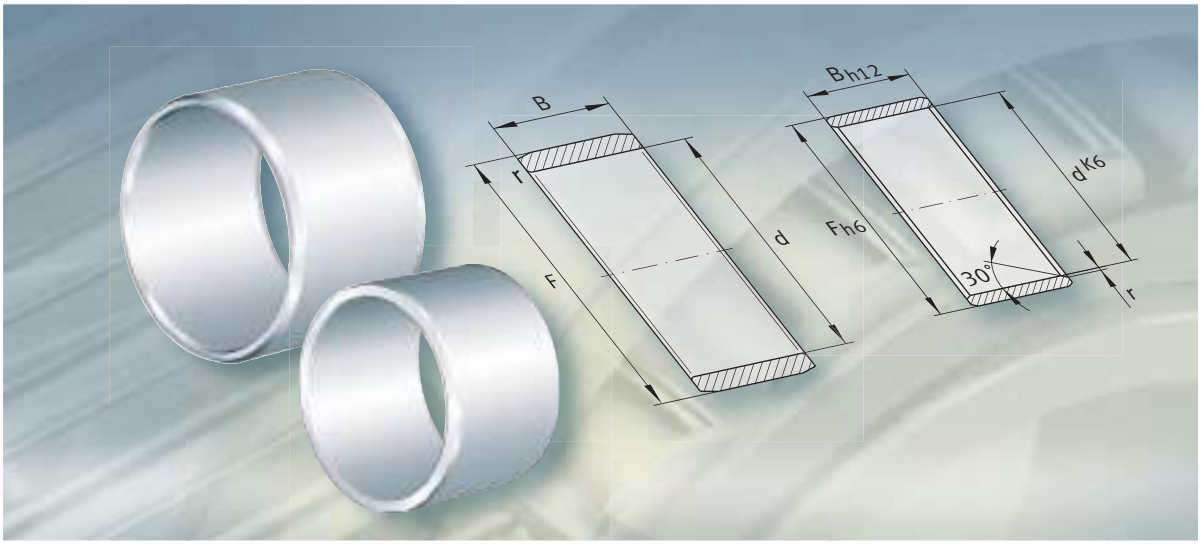
Dimension table · Dimensions in mm

Designation		Mass	Dimensions						Basic load ratings	
		m	d	F	D	B	C	r	radial	
	X-life	≈g						min.	dyn. C_r N	stat. C_{0r} N
NKIA5901	**XL**	40	**12**	16	24	16	–	0,3	10 600	10 900
NKIB5901	**XL**	43	**12**	16	24	17,5	16	0,3	10 600	10 900
NKIA5902	**XL**	50	**15**	20	28	18	–	0,3	12 000	13 600
NKIB5902	**XL**	52	**15**	20	28	20	18	0,3	12 000	13 600
NKIA5903	**XL**	56	**17**	22	30	18	–	0,3	12 400	14 600
NKIB5903	**XL**	58	**17**	22	30	20	18	0,3	12 400	14 600
NKIA5904	**XL**	103	**20**	25	37	23	–	0,3	23 700	25 500
NKIB5904	**XL**	107	**20**	25	37	25	23	0,3	23 700	25 500
NKIA59/22	**XL**	118	**22**	28	39	23	–	0,3	26 000	29 500
NKIB59/22	**XL**	122	**22**	28	39	25	23	0,3	26 000	29 500
NKIA5905	**XL**	130	**25**	30	42	23	–	0,3	26 500	31 500
NKIB5905	**XL**	134	**25**	30	42	25	23	0,3	26 500	31 500
NKIA5906	**XL**	147	**30**	35	47	23	–	0,3	28 500	35 500
NKIB5906	**XL**	151	**30**	35	47	25	23	0,3	28 500	35 500
NKIA5907	**XL**	243	**35**	42	55	27	–	0,6	35 500	50 000
NKIB5907	**XL**	247	**35**	42	55	30	27	0,6	35 500	50 000
NKIA5908	**XL**	315	**40**	48	62	30	–	0,6	48 500	67 000
NKIB5908	**XL**	320	**40**	48	62	34	30	0,6	48 500	67 000
NKIA5909	**XL**	375	**45**	52	68	30	–	0,6	51 000	73 000
NKIB5909	**XL**	380	**45**	52	68	34	30	0,6	51 000	73 000
NKIA5910	**XL**	380	**50**	58	72	30	–	0,6	53 000	80 000
NKIB5910	**XL**	385	**50**	58	72	34	30	0,6	53 000	80 000
NKIA5911	**XL**	550	**55**	63	80	34	–	1	65 000	100 000
NKIB5911	**XL**	555	**55**	63	80	38	34	1	65 000	100 000
NKIA5912	**XL**	590	**60**	68	85	34	–	1	68 000	108 000
NKIB5912	**XL**	595	**60**	68	85	38	34	1	68 000	108 000
NKIA5913	**XL**	635	**65**	72	90	34	–	1	69 000	112 000
NKIB5913	**XL**	640	**65**	72	90	38	34	1	69 000	112 000
NKIA5914	**XL**	980	**70**	80	100	40	–	1	95 000	156 000
NKIB5914	**XL**	985	**70**	80	100	45	40	1	95 000	156 000



NKIB
Double direction

		Fatigue limit load		Limiting speed	Reference speed
axial		C_{ur}	C_{ua}	n_G	n_B
dyn. C_a	stat. C_{0a}				
N	N	N	N	min^{-1}	min^{-1}
2 700	3 450	1 940	152	23 600	21 000
2 700	3 450	1 940	152	23 600	21 000
2 900	4 200	2 430	186	21 600	17 000
2 900	4 200	2 430	186	21 600	17 000
3 150	4 900	2 600	216	20 600	15 000
3 150	4 900	2 600	216	20 600	15 000
4 900	7 400	4 600	330	17 200	14 000
4 900	7 400	4 600	330	17 200	14 000
5 300	8 600	5 300	380	16 100	12 000
5 300	8 600	5 300	380	16 100	12 000
5 400	9 300	5 700	410	14 600	12 000
5 400	9 300	5 700	410	14 600	12 000
5 900	11 200	6 400	495	12 700	10 000
5 900	11 200	6 400	495	12 700	10 000
7 400	14 900	9 400	660	10 900	9 000
7 400	14 900	9 400	660	10 900	9 000
9 200	19 400	11 500	860	9 600	7 500
9 200	19 400	11 500	860	9 600	7 500
9 600	21 400	12 600	950	8 700	7 000
9 600	21 400	12 600	950	8 700	7 000
10 100	24 300	13 800	1 080	8 000	6 500
10 100	24 300	13 800	1 080	8 000	6 500
12 100	29 500	17 300	1 300	7 300	6 000
12 100	29 500	17 300	1 300	7 300	6 000
12 400	32 000	18 800	1 510	6 800	5 500
12 400	32 000	18 800	1 510	6 800	5 500
12 800	34 000	19 500	1 410	6 300	5 500
12 800	34 000	19 500	1 410	6 300	5 500
16 800	44 500	27 500	1 970	5 800	4 900
16 800	44 500	27 500	1 970	5 800	4 900



Inner rings

Inner rings

Product overview Inner rings

Precision machined

IR

With lubrication hole

IR..-IS1

Ground

LR

Inner rings

Features

Inner rings are made from hardened rolling bearing steel and have precision machined or ground raceways.

They are used where:

- the shaft cannot be used as a raceway for needle roller and cage assemblies, drawn cup needle roller bearings with open ends or with closed end and needle roller bearings
- needle roller bearings must be combined with wider inner rings in order to allow larger axial displacements of the shaft in relation to the housing
- optimum running surfaces are required for seal lips.

Inner rings, precision machined

Inner rings IR have a precision machined raceway.
Chamfers on the end faces allow easy insertion into the bearing and prevent damage to the seal lips of the bearing.
Inner rings are available with and without a lubrication hole.
Rings with a lubrication hole in the inner ring have the suffix IS1.

Inner rings, ground

Inner rings LR have a ground raceway. The end faces are turned and the edges are broken.

These rings have larger tolerances than the rings IR. They are thus suitable for applications that allow larger width tolerances and less demanding requirements for axial runout.

Machining allowance on raceway

Inner rings are available as a special design with a machining allowance z on the raceway (suffix VGS). The size of the allowance is dependent on the raceway diameter.

Machining allowance

Raceway diameter F mm		Machining allowance z mm	Preground raceway diameter F_{VGS}
over	incl.		
–	50	0,1	$F_{VGS} = F + z$ (tolerance h7)
50	80	0,15	
80	180	0,2	
180	250	0,25	
250	315	0,3	
315	400	0,35	
400	500	0,4	

Suffixes

Suffixes for the available designs: see table.

Available designs

Suffix	Description	Design
C3, C4	Radial internal clearance larger than normal	Special design[1)]
C2	Radial internal clearance smaller than normal	Special design[1)]
EGS	Surface ground free from spiral marks for rotary shaft seals to DIN 3 760 and DIN 3 761	Special design[1)]
IS1	With one lubrication hole	Special design[1)]
VGS	With machining allowance z on raceway[2)]	Special design[1)]

1) Available by agreement.

2) See table Machining allowance on raceway.

Inner rings

Design and safety guidelines

Axial location

In order to prevent lateral creep of the bearing rings, they must be located by means of physical locking.

The abutting shoulders on the shaft should be sufficiently high and perpendicular to the bearing axis.

The transition from the bearing seating to the abutting shoulder must be designed with rounding to DIN 5 418 or an undercut to DIN 509. Note the minimum chamfer dimensions r as given in the dimension tables.

The overlap between the snap rings and the end faces of the bearing rings must be sufficiently large.

Maximum inner ring chamfer dimensions to DIN 620-6 must be taken into consideration.

Accuracy

Standard tolerances to DIN 620

The dimensional and geometrical tolerances of inner rings IR correspond to tolerance class PN to DIN 620.

Radial internal clearance

When combined with INA needle roller bearings, inner rings have an internal clearance of CN.

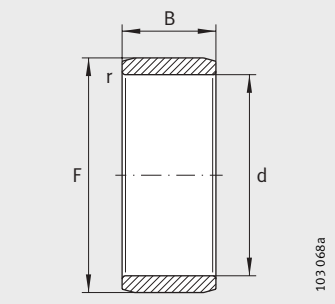
When combined with INA drawn cup needle roller bearings with open ends or closed end, inner rings have a radial internal clearance of C2 or C3 depending on the raceway diameter.

Radial internal clearance to DIN 620-4

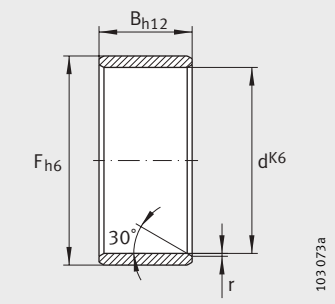
Bore d mm		Radial internal clearance							
		C2 µm		CN µm		C3 µm		C4 µm	
over	incl.	min.	max.	min.	max.	min.	max.	min.	max.
–	24	0	25	20	45	35	60	50	75
24	30	0	25	20	45	35	60	50	75
30	40	5	30	25	50	45	70	60	85
40	50	5	35	30	60	50	80	70	100
50	65	10	40	40	70	60	90	80	110
65	80	10	45	40	75	65	100	90	125
80	100	15	50	50	85	75	110	105	140
100	120	15	55	50	90	85	125	125	165
120	140	15	60	60	105	100	145	145	190
140	160	20	70	70	120	115	165	165	215
160	180	25	75	75	125	120	170	170	220
180	200	35	90	90	145	140	195	195	250
200	225	45	105	105	165	160	220	220	280
225	250	45	110	110	175	170	235	235	300
250	280	55	125	125	195	190	260	260	330
280	315	55	130	130	205	200	275	275	350
315	355	65	145	145	225	225	305	305	385
355	400	100	190	190	280	280	370	370	460
400	450	110	210	210	310	310	410	410	510

Inner rings

Without lubrication hole



IR



LR

Dimension table · Dimensions in mm

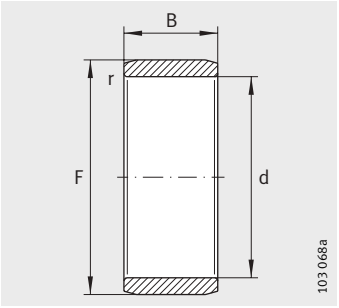
Designation	Mass	Dimensions				Tolerance of raceway F µm	
	m	d	F	B	r		
	≈g				min.	upper	lower
IR5X8X12	2,8	**5**	8	12	0,3	–7	–23
IR5X8X16	3,7	**5**	8	16	0,3	–7	–23
IR6X9X12	3	**6**	9	12	0,3	–7	–23
IR6X9X16	4,3	**6**	9	16	0,3	–7	–23
IR7X10X10,5	3,1	**7**	10	10,5	0,3	–7	–23
LR7X10X10,5	3,1	**7**	10	10,5	0,3	–	–
IR7X10X12	3,6	**7**	10	12	0,3	–7	–23
IR7X10X16	4,9	**7**	10	16	0,3	–7	–23
IR8X12X10,5	5	**8**	12	10,5	0,3	–4	–18
LR8X12X10,5	5	**8**	12	10,5	0,3	–	–
IR8X12X12,5	5,9	**8**	12	12,5	0,3	–4	–18
LR8X12X12,5	5	**8**	12	12,5	0,3	–	–
IR9X12X12	4,4	**9**	12	12	0,3	–4	–18
IR9X12X16	6	**9**	12	16	0,3	–4	–18
IR10X13X12,5	5,2	**10**	13	12,5	0,3	–4	–18
LR10X13X12,5	5,2	**10**	13	12,5	0,3	–	–
IR10X14X13	7,4	**10**	14	13	0,3	–4	–18
IR10X14X16	9,2	**10**	14	16	0,3	–4	–18
IR10X14X20	11,5	**10**	14	20	0,3	–4	–18
IR12X15X12	5,7	**12**	15	12	0,3	–4	–18
IR12X15X12,5	6,1	**12**	15	12,5	0,3	–4	–18
LR12X15X12,5	6,1	**12**	15	12,5	0,3	–	–
IR12X15X16	7,6	**12**	15	16	0,3	–4	–18
IR12X15X16,5	8,1	**12**	15	16,5	0,3	–4	–18
LR12X15X16,5	8,1	**12**	15	16,5	0,3	–	–
IR12X15X22,5	10,9	**12**	15	22,5	0,3	–4	–18
LR12X15X22,5	10,9	**12**	15	22,5	0,3	–	–
IR12X16X13	8,5	**12**	16	13	0,3	–4	–18
IR12X16X16	10,7	**12**	16	16	0,3	–4	–18
IR12X16X20	13,5	**12**	16	20	0,3	–4	–18
IR12X16X22	14,9	**12**	16	22	0,3	–4	–18
IR14X17X17	9,5	**14**	17	17	0,3	–4	–18

Dimension table (continued) · Dimensions in mm

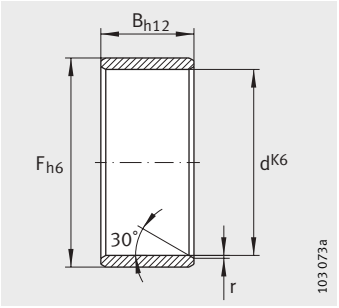
Designation	Mass	Dimensions				Tolerance of raceway F µm	
	m	d	F	B	r		
	≈g				min.	upper	lower
LR15X18X12,5	7,2	**15**	18	12,5	0,3	–	–
IR15X18X16	9,4	**15**	18	16	0,3	–4	–18
IR15X18X16,5	9,8	**15**	18	16,5	0,3	–4	–18
LR15X18X16,5	9,8	**15**	18	16,5	0,3	–	–
IR15X19X16	12,9	**15**	19	16	0,3	0	–12
IR15X19X20	16,3	**15**	19	20	0,3	0	–12
IR15X20X13	13,5	**15**	20	13	0,3	0	–12
IR15X20X23	24,4	**15**	20	23	0,3	0	–12
IR17X20X16	10,6	**17**	20	16	0,3	0	–12
IR17X20X16,5	11,1	**17**	20	16,5	0,3	0	–12
LR17X20X16,5	11,1	**17**	20	16,5	0,3	–	–
IR17X20X20	13,5	**17**	20	20	0,3	0	–12
IR17X20X20,5	13,8	**17**	20	20,5	0,3	0	–12
LR17X20X20,5	13,8	**17**	20	20,5	0,3	–	–
IR17X20X30,5	20,6	**17**	20	30,5	0,3	0	–12
LR17x20X30,5	20,6	**17**	20	30,5	0,3	–	–
IR17X21X16	15	**17**	21	16	0,3	0	–12
IR17X21X20	18	**17**	21	20	0,3	0	–12
IR17X22X13	14,9	**17**	22	13	0,3	0	–12
IR17X22X16	18,4	**17**	22	16	0,3	0	–12
IR17X22X23	27,1	**17**	22	23	0,3	0	–12
IR17X24X20	33,8	**17**	24	20	0,6	0	–12

Inner rings

Without lubrication hole



IR



LR

Dimension table (continued) · Dimensions in mm

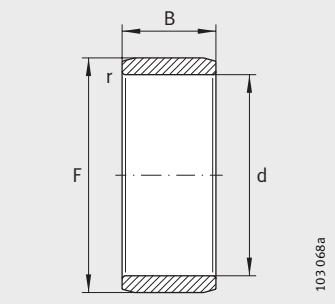
Designation	Mass	Dimensions				Tolerance of raceway F µm	
	m	d	F	B	r		
	≈g				min.	upper	lower
IR20X24X16	15	**20**	24	16	0,3	0	–12
IR20X24X20	21,3	**20**	24	20	0,3	0	–12
LR20X25X12,5	16,3	**20**	25	12,5	0,3	–	–
LR20X25X16,5	21,7	**20**	25	16,5	0,3	–	–
IR20X25X17	25	**20**	25	17	0,3	0	–12
IR20X25X20	27,5	**20**	25	20	0,3	0	–12
IR20X25X20,5	27,4	**20**	25	20,5	0,3	0	–12
LR20X25X20,5	27,4	**20**	25	20,5	0,3	–	–
IR20X25X26,5	38	**20**	25	26,5	0,3	0	–12
LR20X25X26,5	38	**20**	25	26,5	0,3	–	–
IR20X25X30	40,4	**20**	25	30	0,3	0	–12
IR20X25X38,5	52,5	**20**	25	38,5	0,3	0	–12
LR20X25X38,5	52,5	**20**	25	38,5	0,3	–	–
IR20X28X20	45,2	**20**	28	20	0,6	0	–12
IR22X26X16	18,2	**22**	26	16	0,3	0	–12
IR22X26X20	23	**22**	26	20	0,3	0	–12
IR22X28X17	29,5	**22**	28	17	0,3	0	–12
IR22X28X20	35	**22**	28	20	0,3	0	–12
IR22X28X20,5	36	**22**	28	20,5	0,3	0	–12
LR22X28X20,5	36	**22**	28	20,5	0,3	–	–
IR22X28X30	54,4	**22**	28	30	0,3	0	–12

Dimension table (continued) · Dimensions in mm

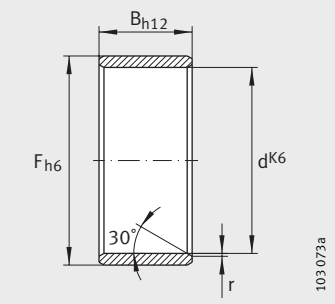
Designation	Mass	Dimensions				Tolerance of raceway F µm	
	m	d	F	B	r		
	≈g				min.	upper	lower
IR25X29X20	25,9	**25**	29	20	0,3	0	–12
IR25X29X30	39,3	**25**	29	30	0,3	0	–12
LR25X30X12,5	20	**25**	30	12,5	0,3	–	–
LR25X30X16,5	26,7	**25**	30	16,5	0,3	–	–
IR25X30X20	27,4	**25**	30	17	0,3	0	–12
IR25X30X20	32,8	**25**	30	20	0,3	0	–12
IR25X30X20,5	33,4	**25**	30	20,5	0,3	0	–12
LR25X30X20,5	33,4	**25**	30	20,5	0,3	–	–
IR25X30X26,5	46	**25**	30	26,5	0,3	0	–12
LR25X30X26,5	46	**25**	30	26,5	0,3	–	–
IR25X30X30	53	**25**	30	30	0,3	0	–12
IR25X30X32	56	**25**	30	32	0,3	0	–12
IR25X30X38,5	64,5	**25**	30	38,5	0,3	0	–12
LR25X30X38,5	64,5	**25**	30	38,5	0,3	–	–
IR25X32X22	52,5	**25**	32	22	0,6	+5	–4
IR28X32X17	24,5	**28**	32	17	0,3	+5	–4
IR28X32X20	28,5	**28**	32	20	0,3	+5	–4
IR28X32X30	43,5	**28**	32	30	0,3	+5	–4
LR30x35X12,5	23,3	**30**	35	12,5	0,3	–	–
IR30X35X13	25	**30**	35	13	0,3	+5	–4
IR30X35X16	34	**30**	35	16	0,3	+5	–4
LR30X35X16,5	31,4	**30**	35	16,5	0,3	–	–
IR30X35X17	36	**30**	35	17	0,3	+5	–4
IR30X35X20	39	**30**	35	20	0,3	+5	–4
IR30X35X20,5	39,7	**30**	35	20,5	0,3	+5	–4
LR30X35X20,5	39,7	**30**	35	20,5	0,3	–	–
IR30X35X26	50,4	**30**	35	26	0,3	+5	–4
IR30X35X30	58,5	**30**	35	30	0,3	+5	–4
IR30X37X18	50	**30**	37	18	0,6	+5	–4
IR30X37X22	61,6	**30**	37	22	0,6	+5	–4
IR32X37X20	42	**32**	37	20	0,3	0	–9
IR32x37X30	62	**32**	37	30	0,3	0	–9
IR32X40X20	68	**32**	40	20	0,6	0	–9
IR32X40X36	124	**32**	40	36	0,6	0	–9
IR33X37X13	21,9	**33**	37	13	0,3	0	–9

Inner rings

Without lubrication hole



IR



LR

Dimension table (continued) · Dimensions in mm

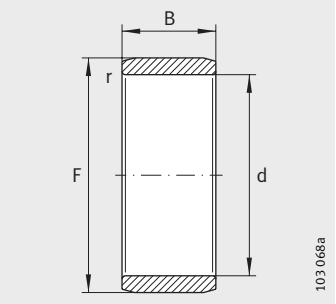
Designation	Mass	Dimensions				Tolerance of raceway F µm	
	m	d	F	B	r		
	≈g				min.	upper	lower
LR35X40X12,5	27,2	**35**	40	12,5	0,3	–	–
LR35X40X16,5	37,4	**35**	40	16,5	0,3	–	–
IR35X40X17	37,8	**35**	40	17	0,3	0	–9
IR35X40X20	44,2	**35**	40	20	0,3	0	–9
IR35X40X20,5	46,1	**35**	40	20,5	0,3	0	–9
LR35X40X20,5	46,1	**35**	40	20,5	0,3	–	–
IR35X40X30	67,1	**35**	40	30	0,3	0	–9
IR35X42X36	117	**35**	42	36	0,6	0	–9
IR35X43X22	82	**35**	43	22	0,6	0	–9
IR38X43X20	48,1	**38**	43	20	0,3	0	–9
IR38X43X30	73,6	**38**	43	30	0,3	0	–9
LR40X45X16,5	41,4	**40**	45	16,5	0,3	–	–
IR40X45X17	42,5	**40**	45	17	0,3	0	–9
IR40X45X20	50,8	**40**	45	20	0,3	0	–9
IR40X45X20,5	51,8	**40**	45	20,5	0,3	0	–9
LR40X45X20,5	51,8	**40**	45	20,5	0,3	–	–
IR40X45X30	84	**40**	45	30	0,3	0	–9
IR40X48X22	91,6	**40**	48	22	0,6	0	–9
IR40X48X40	170	**40**	48	40	0,6	0	–9
IR40X50X22	118	**40**	50	22	1	0	–9
IR42X47X20	52,8	**42**	47	20	0,3	–5	–19
IR42X47X30	81	**42**	47	30	0,3	–5	–19
LR45X50X20,5	58,8	**45**	50	20,5	0,3	–	–
IR45X50X25	70,8	**45**	50	25	0,6	–5	–19
IR45X50X25,5	75,1	**45**	50	25,5	0,3	–5	–19
LR45X50X25,5	75,1	**45**	50	25,5	0,3	–	–
IR45X50X35	101	**45**	50	35	0,6	–5	–19
IR45X52X22	89	**45**	52	22	0,6	0	–11
IR45X52X40	164	**45**	52	40	0,6	0	–11
IR45X55X22	129	**45**	55	22	1	0	–11
LR50X55X20,5	64,1	**50**	55	20,5	0,6	–	–
IR50X55X25	78	**50**	55	25	0,6	0	–11
IR50X55X35	112	**50**	55	35	0,6	0	–11

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions				Tolerance of raceway F µm	
	m	d	F	B	r		
	≈g				min.	upper	lower
IR50X58X22	115	**50**	58	22	0,6	0	–11
IR50X58X40	208	**50**	58	40	0,6	0	–11
IR50X60X25	162	**50**	60	25	1	0	–11
IR50X60X28	181	**50**	60	28	1,1	0	–11
IR55X60X25	85,5	**55**	60	25	0,6	–10	–21
IR55X60X35	121	**55**	60	35	0,6	–10	–21
IR55X63X25	141	**55**	63	25	1	–10	–21
IR55X63X45	256	**55**	63	45	1	–10	–21
IR55X65X28	198	**55**	65	28	1,1	–10	–21
IR60X68X25	152	**60**	68	25	1	–10	–21
IR60X68X35	213	**60**	68	35	0,6	–10	–21
IR60X68X45	276	**60**	68	45	1	–10	–21
IR60X70X25	195	**60**	70	25	1	–10	–21
IR60X70X28	215	**60**	70	28	1,1	–10	–21
IR65X72X25	141	**65**	72	25	1	–10	–21
IR65X72X45	259	**65**	72	45	1	–10	–21
IR65X73X25	164	**65**	73	25	1	–10	–21
IR65X73X35	231	**65**	73	35	1	–10	–21
IR65X75X28	229	**65**	75	28	1,1	–10	–21
IR70X80x25	221	**70**	80	25	1	–10	–26
IR70X80X30	267	**70**	80	30	1	–10	–26
IR70X80X35	312	**70**	80	35	1	–10	–26
IR70X80X54	488	**70**	80	54	1	–10	–26
IR75X85X25	238	**75**	85	25	1	–4	–17
IR75X85X30	287	**75**	85	30	1	–4	–17
IR75X85X35	336	**75**	85	35	1	–4	–17
IR75X85X54	520	**75**	85	54	1	–4	–17
IR80X90X25	253	**80**	90	25	1	–4	–17
IR80X90X30	304	**80**	90	30	1	–4	–17
IR80X90X35	355	**80**	90	35	1	–4	–17
IR80X90X54	556	**80**	90	54	1	–4	–17
IR85X95X26	277	**85**	95	26	1	–14	–27
IR85X95X36	388	**85**	95	36	1	–14	–27
IR85X100X35	582	**85**	100	35	1,1	–14	–27
IR85X100X63	1 054	**85**	100	63	1,1	–14	–27

Inner rings

Without lubrication hole



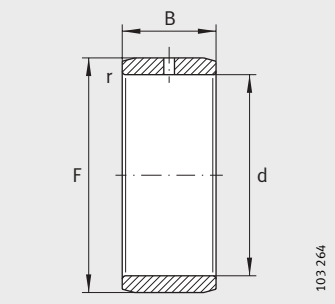
IR

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions				Tolerance of raceway F	
	m	d	F	B	r	µm	
	≈g				min.	upper	lower
IR90X100X26	294	**90**	100	26	1	−14	−27
IR90X100X30	340	**90**	100	30	1	−14	−27
IR90X100X36	406	**90**	100	36	1	−14	−27
IR90X105X35	610	**90**	105	35	1,1	−14	−27
IR90X105X63	1 110	**90**	105	63	1,1	−14	−27
IR95X105X26	313	**95**	105	26	1	−14	−27
IR95X105X36	431	**95**	105	36	1	−14	−27
IR95X110X35	657	**95**	110	35	1,1	−14	−27
IR95X110X63	1 170	**95**	110	63	1,1	−14	−27
IR100X110X30	350	**100**	110	30	1,1	−14	−27
IR100X110X40	505	**100**	110	40	1,1	−14	−27
IR100X115X40	797	**100**	115	40	1,1	−14	−27
IR110X120X30	409	**110**	120	30	1	−14	−32
IR110X125X40	840	**110**	125	40	1,1	−7	−22
IR120X130X30	442	**120**	130	30	1	−7	−22
IR120X135X45	1 044	**120**	135	45	1,1	−7	−22
IR130X145X35	855	**130**	145	35	1,1	−17	−37
IR130X150X50	1 690	**130**	150	50	1,5	−17	−37
IR140X155X35	917	**140**	155	35	1,1	−17	−37
IR140X160X50	1 800	**140**	160	50	1,5	−17	−37
IR150X165X40	1 122	**150**	165	40	1,1	−27	−52
IR160X175X40	1 200	**160**	175	40	1,1	−27	−52
IR170X185X45	1 441	**170**	185	45	1,1	−25	−46
IR180X195X45	1 510	**180**	195	45	1,1	−25	−46
IR190X210X50	2 410	**190**	210	50	1,5	−40	−66
IR200X220X50	2 518	**200**	220	50	1,5	−40	−66
IR220X240X50	2 753	**220**	240	50	1,5	−55	−86
IR240X265X60	4 600	**240**	265	60	2	−55	−86
IR260X285X60	4 980	**260**	285	60	2	−69	−107
IR280X305X69	6 100	**280**	305	69	2	−69	−107
IR300X330X80	9 200	**300**	330	80	2,1	−69	−107
IR320X350X80	9 800	**320**	350	80	2,1	−83	−127
IR340X370X80	10 200	**340**	370	80	2,1	−83	−127
IR360X390X80	10 900	**360**	390	80	2,1	−128	−182
IR380X415X100	16 700	**380**	415	100	2,1	−122	−172

Inner rings

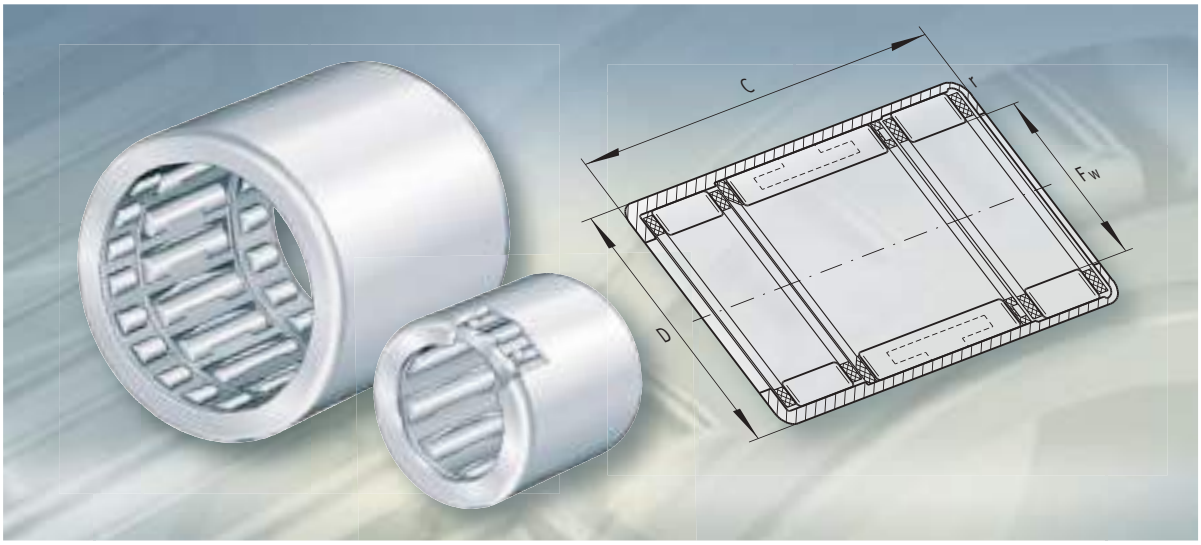
With lubrication hole



IR..-IS1

Dimension table · Dimensions in mm

Designation	Mass	Dimensions				Tolerance of raceway F	
	m	d	F	B	r	µm	
	≈g				min.	upper	lower
IR6X10X10-IS1	3,7	**6**	10	10	0,3	–7	–23
IR8X12X10-IS1	4,8	**8**	12	10	0,3	–4	–18
IR10X14X12-IS1	7,3	**10**	14	12	0,3	–4	–18
IR12X16X12-IS1	7,9	**12**	16	12	0,3	–4	–18
IR15X20X12-IS1	12,2	**15**	20	12	0,3	0	–12
IR20X25X16-IS1	24	**20**	25	16	0,3	0	–12
IR25X30X16-IS1	25,7	**25**	30	16	0,3	0	–12
IR30X38X20-IS1	77	**30**	38	20	0,6	+5	–4
IR35X42X20-IS1	63,9	**35**	42	20	0,6	0	–9
IR40X50X20-IS1	106	**40**	50	20	1	0	–9
IR45X55X20-IS1	117	**45**	55	20	1	0	–11
IR50X55X20-IS1	62,5	**50**	55	20	0,6	0	–11
IR50X60X20-IS1	128	**50**	60	20	1	0	–11



Drawn cup roller clutches

Drawn cup roller clutches

Product overview Drawn cup roller clutches

Without bearing arrangement

With and without knurling
With steel springs

HF

HF..-R

With and without knurling
With plastic springs

HF..-KF

HF..-KFR

With bearing arrangement

With and without knurling
With steel springs

HFL

HFL..-R

With and without knurling
With plastic springs

HFL..-KF

HFL..-KFR

Drawn cup roller clutches

Features

Drawn cup roller clutches are one-way clutches comprising thin-walled, drawn outer rings with ramps on the inside diameter, plastic cages, pressure springs and needle rollers. They can transmit torques in one direction and are radially compact. The roller clutches are available with and without bearing arrangements.

Drawn cup roller clutches give very precise indexing, since the individual spring loading of the needle rollers ensures continuous contact between the shaft, needle rollers and ramps. They allow high indexing frequencies due to their low mass and the resulting low moment of inertia of the clamping elements. They also have a low overrunning frictional torque.

Drawn cup roller clutches can be used in various applications such as indexing clutches, back-stopping clutches and overrunning clutches. In these cases, the drawn cup roller clutch performs an overrunning or locking function.

Sealing/lubricant

Drawn cup roller clutches are greased using a lithium soap grease to GA26. For applications with oil lubrication, roller clutches are available without greasing. These roller clutches are coated with a preservative.

In many cases, the initial greasing is sufficient to last the operating life of the roller clutches.

Drawn cup roller clutches without bearing arrangement

Drawn cup roller clutches HF are roller clutches without a bearing arrangement. They can only transmit torques.

Caution!

In the case of drawn cup roller clutches without a bearing arrangement, concentricity to the shaft axis must be secured by additional rolling bearings or drawn cup roller clutches with a bearing arrangement must be used.

Without knurling/with knurling

Drawn cup roller clutches HF have steel pressure springs, roller clutches HF..KF have plastic pressure springs.

Roller clutches with a knurled outside surface have the suffix R and are suitable for use with plastic housings.

Drawn cup roller clutches with bearing arrangement

Drawn cup roller clutches HFL are roller clutches with a bearing arrangement. Due to the integrated rolling or plain bearings, they can support torques as well as additional radial forces.

Without knurling/with knurling

Drawn cup roller clutches HFL have steel pressure springs, roller clutches HFL..KF have plastic pressure springs.

Roller clutches with a knurled outside surface have the suffix R and are suitable for use with plastic housings.

Operating temperature

Caution!

Due to the grease used, drawn cup roller clutches are suitable for operating temperatures from –10 °C to +70 °C.

Suffixes

Suffixes for available designs: see table.

Available designs

Suffixes	Description	Design
–	Steel springs	Standard
KF	Plastic springs	Standard
R	Knurled outside surface	Standard
RR	Drawn cup roller clutch with Corrotect® coating	Special design[1)]

1) Available by agreement.

Drawn cup roller clutches

Design and safety guidelines

Caution! Drawn cup roller clutches should not be used if a malfunction could lead to personal injury.

New applications, especially those involving extreme conditions, should first be verified by tests.

Correct functioning can only be guaranteed if there is only a small concentricity defect between the support bearing and the shaft.

Retention for transport

Drawn cup roller clutches are normally packed individually in the case of small quantities.

Where larger quantities are involved, drawn cup roller clutches are placed in a specific orientation in blister packaging and delivered in this form. The blister packaging serves to retain the parts in position during transport.

Limiting load

Caution! In the case of drawn cup roller clutches with plain bearings, the product calculated from the actual speed n and radial load F_r must not exceed the value stated for the limiting load $(F_r \cdot n)_{max}$. The operating limits are determined by the limiting speeds stated in the dimension tables and the permissible radial load.

Indexing frequency and indexing accuracy

In order not to overload the roller clutch, the inertia of the entire system must be taken into consideration. The high indexing accuracy is due to the individual spring loading of the needle rollers, which ensures continuous contact between the shaft, needle rollers and clamping surface.

The indexing accuracy is influenced by the indexing frequency, lubrication, fitting tolerances, adjacent construction, elastic deformation of the adjacent parts and the drive method, either through the shaft or the housing. Optimum accuracy is achieved if the drive is via the shaft.

Transmissible torque

Transmission of torque requires a rigid housing. The transmissible torque is therefore dependent on the shaft and housing material, the shaft hardness, the wall thickness of the housing and the shaft and housing tolerances.

Caution! When calculating the torque, the maximum drive torque and the moment of inertia of the masses during acceleration must be taken into consideration.

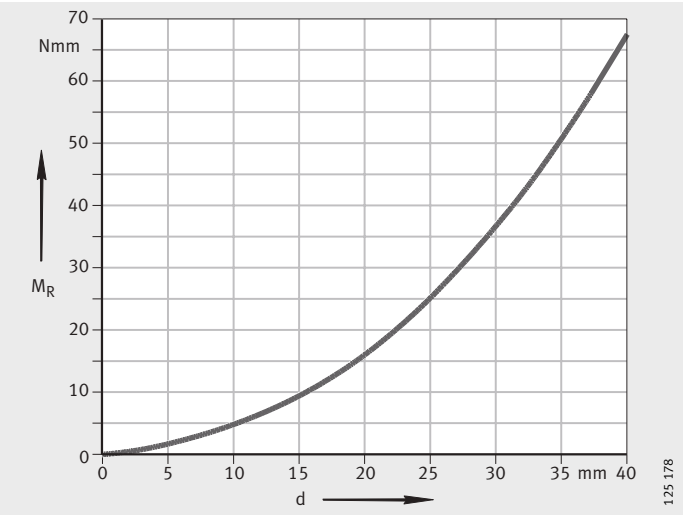
Frictional energy

The frictional torque curve is shown in *Figure 1*.

The frictional energy during idling is dependent on whether the shaft or the outer ring is rotating, *Figure 2*.

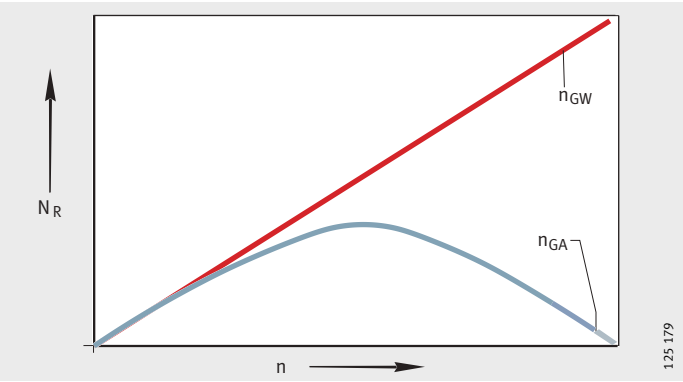
If the outer ring rotates, the frictional energy increases at first as the speed increases but then decreases gradually due to centrifugal force until it approaches zero.

At this speed, there is no longer any frictional contact between the needle rollers and the shaft. Due to the increasing centrifugal force, the needle rollers lift from the shaft.



M_R = frictional torque during idling
d = shaft diameter

Figure 1
Frictional torque during idling, as a function of shaft diameter



n = speed
N_R = frictional energy during idling
n_{GA} = limiting speed with rotating outer ring
n_{GW} = limiting speed with rotating shaft

Figure 2
Frictional energy during idling, as a function of speed

Speeds

Caution!

The limiting speeds n_{GW} and n_{GA} in the dimension tables are valid for oil and grease lubrication.

The limiting speed n_{GW} is valid for a rotating shaft.

The limiting speed n_{GA} is valid for a rotating outer ring.

Drawn cup roller clutches

Housing design

The accuracy of the locating bore essentially determines the geometrical accuracy of the drawn cup and thus the functioning of the clutch.

Housing bore

The housing bore should have a chamfer of 15°. The bore tolerances should be in accordance with the table and have a surface quality of R_a0,8.

The cylindricity tolerance of the housing bore in metal housings should be within the tolerance grade IT 5/2.

Bore tolerances

Series	Springs	Bore Housing material		
		Steel Cast iron	Light metal	Max. bore in plastic[2]
HF, HFL	Steel	N6 (N7)[1]	R6 (R7)[1]	–
HF..-KF, HFL..-KF	Plastic	N7	R7	–
HF..-R, HFL..-R	Steel	–	–	$D_{-0,05}$
HF..-KFR, HFL..-KFR	Plastic	–	–	$D_{-0,05}$
HFL0606-KFR, HFL0806-KFR	Plastic	–	–	$D_{-0,05}$

[1] The values in brackets can be used if the actual torque is up to 50% of the permissible torque $M_{d\,per}$ (see dimension tables).

[2] Guide values dependent on the plastic used. Outside diameter D: see dimension tables.

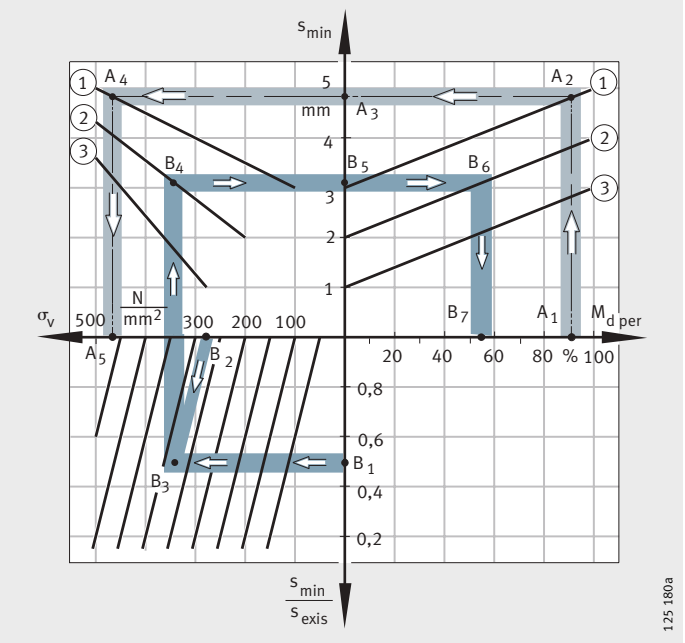
Minimum wall thickness – metal and plastic housings

For metal housings, the minimum wall thickness is determined according to *Figure 3*. Calculation examples: see page 707.

Caution!

The comparative stress σ_V must not exceed the yield stress of the housing material.

For plastic housings, drawn cup roller clutches with a partially or fully knurled outside surface should be used.



① HF2520 to HF3520, HFL2530 to HFL3530
② HF1216 to HF2016, HFL1226 to HFL2026
③ Up to HF1012, up to HFL1220

$M_{d\,per}$ = permissible torque
σ_V = comparative stress
s_{min} = minimum wall thickness
s_{min}/s_{exis} = ratio of wall thicknesses

Figure 3
Minimum wall thicknesses of metal housings, as a function of torque

Calculation example

Calculation example A

Lines A_1 to A_4, *Figure 3*:

Given:

- Drawn cup roller clutch HF3020
- Permissible torque $M_{d\ per}$ = 90 Nm
- Torque M_d = 81 Nm
  (= 90% of permissible torque $M_{d\ per}$)
- Metal housing.

Required:

- Minimum wall thickness s_{min} and comparative stress σ_v.

Result:

- s_{min} = 4,8 mm and σ_v = 460 N/mm^2.

Calculation example B

Lines B_1 to B_7, *Figure 3*:

Given:

- Drawn cup roller clutch HF1416
- Permissible torque $M_{d\ per}$ = 17,3 Nm
- Ratio of wall thicknesses s_{min}/s_{exis} = 0,5
- Permissible housing stress $R_{p0,2}$ = 280 N/mm^2
- Metal housing.

Required:

- Minimum wall thickness s_{min} and transmissible torque M_d.

Result:

- s_{min} = 3,1 mm and M_d = 9,6 Nm.

Shaft design

The raceway on the shaft must be hardened and ground. The surface hardness of the raceway must be 670 HV + 170 HV, the hardening depth CHD or Rht must be sufficiently large (CHD ≧ 0,3 mm).

The end face of the shaft must be chamfered to approx. 1 mm and 15°.

Shaft design: see table Shaft tolerances.

Shaft tolerances

Series	Springs	Shaft			
		Tolerances	Roughness max.	Roundness max.	Parallelism max.
HF, HFL	Steel	h5 (h6)[1]	R_a0,4 (R_z2)	25% of diameter tolerance	25% of diameter tolerance
HF..-KF, HFL..-KF	Plastic	h8			
HF..-R, HFL..-R	Steel	h5 (h6)[1]			
HF..-KFR, HFL..-KFR	Plastic	h8			
HFL0606-KFR, HFL0806-KFR	Plastic	h9			

[1] The values in brackets can be used if the actual torque is up to 50% of the permissible torque $M_{d\ per}$ (see dimension tables).

Drawn cup roller clutches

Axial location

Drawn cup roller clutches are pressed into the housing bore and require no further axial location (if the recommendations in the table Bore tolerances, page 706 are observed).

Sealing of the bearing position

If there is a risk of contamination, sealing rings of series G or SD should be fitted. The sealing rings are matched to the dimensions of the roller clutches and can be combined with wider inner rings IR.

Lubrication

In order to ensure optimum function, different lubricants may be required. The suitability of the lubricant must be verified by tests.

For general applications (mixed operation involving locking and overrunning), the INA initial greasing has proved effective.

For applications in which one operating condition (overrunning or locking) is heavily predominant, a special greasing should be used. In this case, please contact us.

It is not possible to calculate the grease operating life or lubrication interval for drawn cup roller clutches.

Caution! If drawn cup roller clutches are to be relubricated, only oil lubrication should be used or lubrication should be changed to oil.

For temperatures < -10 °C and speeds $> 0{,}7\ n_G$, a lubricant recommendation should be requested.

For temperatures over +70 °C, oil lubrication should be used. The oil level should such that, when the roller clutch is stationary and the axis is horizontal, it is immersed approx. $^1/_3$ in the oil bath.

Suitable oils are CL and CLP to DIN 51 517 or HL and HLP to DIN 51 524. Viscosity classes: see table.

Viscosity classes

Operating temperature	Viscosity class
+15 °C to +30 °C	ISO VG 10
+15 °C to +90 °C	ISO VG 32
+60 °C to +120 °C	ISO VG 100

Installation using a fitting mandrel

Caution! Drawn cup roller clutches should only be fitted in the locating bore using a special fitting mandrel, see Drawn cup needle roller bearings, page 610. Note the clamping direction of the roller clutch. The clamping direction is indicated by an arrow on the end face.

Guidelines for fitting

Drawn cup roller clutches should be protected against dust, contaminants and moisture. Contaminants can impair the function and operating life of roller clutches.

Caution! Pressing-in forces must never be directed through the rolling elements. Roller clutches should not be tilted during fitting.

Accuracy

The thin-walled outer rings adopt the dimensional and geometrical accuracy of the housing bore.

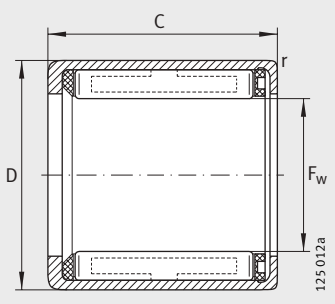
Enveloping circle

In roller clutches with a rolling bearing arrangement, the enveloping circle diameter F_w of the fitted bearings (in a heavy-section ring gauge) is approximately in tolerance zone F8 (for values according to table, Bore tolerances, page 706 and Shaft tolerances, page 707).

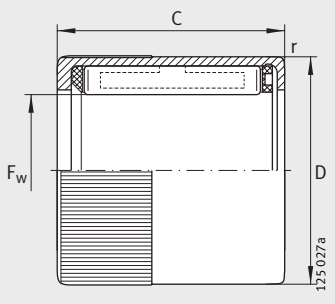
The enveloping circle is the inner inscribed circle of the support bearing needle rollers in clearance-free contact with the outer raceway.

Drawn cup roller clutches

Without
bearing arrangement
With or without knurling



HF, HF..-KF



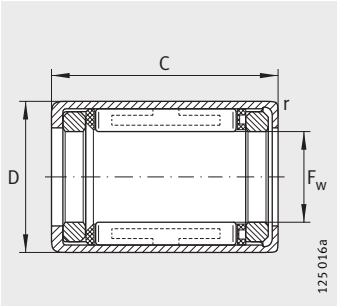
HF..-R, HF..-KFR
With knurling

Dimension table · Dimensions in mm

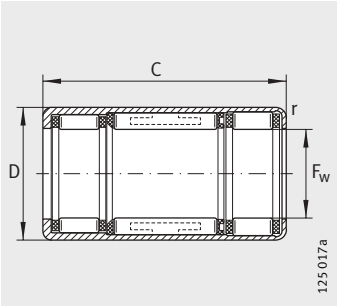
Spring design		Mass	Dimensions				Permissible torque	Limiting speeds		Drawn cup needle roller bearings for radial bearing arrangement
Plastic springs	Steel springs	m	F_w	D	C	r	$M_{d\ per}$	n_{GW}	n_{GA}	
Designation	Designation	≈g			–0,3	min.	Nm	min^{-1}	min^{-1}	Designation
HF0306-KF	–	1	**3**	6,5	6	0,3	0,18	45 000	8 000	**HK0306-TV**
HF0306-KFR	–	1	**3**	6,5	6	0,3	0,06	45 000	8 000	**HK0306-TV**
HF0406-KF	–	1	**4**	8	6	0,3	0,34	34 000	8 000	**HK0408**
HF0406-KFR	–	1	**4**	8	6	0,3	0,1	34 000	8 000	**HK0408**
HF0612-KF	**HF0612**	3	**6**	10	12	0,3	1,76	23 000	13 000	**HK0608**
HF0612-KFR	**HF0612-R**	3	**6**	10	12	0,3	0,6	23 000	13 000	**HK0608**
HF0812-KF	**HF0812**	3,5	**8**	12	12	0,3	3,15	17 000	12 000	**HK0808**
HF0812-KFR	**HF0812-R**	3,5	**8**	12	12	0,3	1	17 000	12 000	**HK0808**
HF1012-KF	**HF1012**	4	**10**	14	12	0,3	5,3	14 000	11 000	**HK1010**
–	**HF1216**	11	**12**	18	16	0,3	12,2	11 000	8 000	**HK1212**
–	**HF1416**	13	**14**	20	16	0,3	17,3	9 500	8 000	**HK1412**
–	**HF1616**	14	**16**	22	16	0,3	20,5	8 500	7 500	**HK1612**
–	**HF1816**	16	**18**	24	16	0,3	24,1	7 500	7 500	**HK1812**
–	**HF2016**	17	**20**	26	16	0,3	28,5	7 000	6 500	**HK2010**
–	**HF2520**	30	**25**	32	20	0,3	66	5 500	5 500	**HK2512**
–	**HF3020**	36	**30**	37	20	0,3	90	4 500	4 500	**HK3012**
–	**HF3520**	40	**35**	42	20	0,3	121	3 900	3 900	**HK3512**

Drawn cup roller clutches

With bearing arrangement
With or without knurling



HFL, HFL..-KF, with plain bearing arr. (HFL0308-KF, HFL0408-KF, HFL0615-KF, HFL0615)



HFL, HFL..-KF, with rolling bearing arr. ($F_w \geqq 8$ mm and $C \geqq 22$ mm) and HFL0822-KFR, HFL0822-R

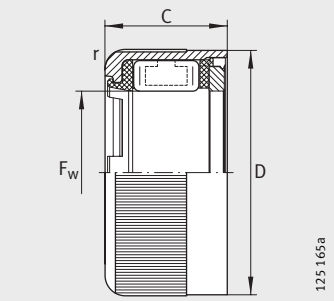
Dimension table (continued) · Dimensions in mm

Spring design		Mass	Dimensions				Permissible torque
Plastic springs	Steel springs	m	F_w	D	C	r	$M_{d\ per}$
Designation	Designation	≈g			–0,3	min.	Nm
HFL0308-KF	–	1,4	**3**	6,5	8	0,3	0,18
HFL0308-KFR	–	1,4	**3**	6,5	8	0,3	0,06
HFL0408-KF	–	1,6	**4**	8	8	0,3	0,34
HFL0408-KFR	–	1,6	**4**	8	8	0,3	0,1
HFL0606-KFR	–	1	**6**	10	6	0,3	0,5
HFL0615-KF	**HFL0615**	4	**6**	10	15	0,3	1,76
HFL0615-KFR	**HFL0615-R**	4	**6**	10	15	0,3	0,6
HFL0806-KFR	–	2	**8**	12	6	0,3	0,7
HFL0822-KF	**HFL0822**	7	**8**	12	22	0,3	3,15
HFL0822-KFR	**HFL0822-R**	7	**8**	12	22	0,3	1
–	**HFL1022**	8	**10**	14	22	0,3	5,3
–	**HFL1226**	18	**12**	18	26	0,3	12,2
–	**HFL1426**	20	**14**	20	26	0,3	17,3
–	**HFL1626**	22	**16**	22	26	0,3	20,5
–	**HFL1826**	25	**18**	24	26	0,3	24,1
–	**HFL2026**	27	**20**	26	26	0,3	28,5
–	**HFL2530**	44	**25**	32	30	0,3	66
–	**HFL3030**	51	**30**	37	30	0,3	90
–	**HFL3530**	58	**35**	42	30	0,3	121

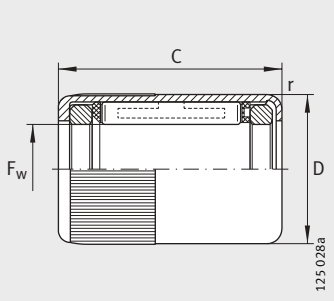
1) Caution!
Drawn cup roller clutches with plain bearings: During operation, the product of the actual speed n and the radial load F_r must not exceed the stated operating limit $(F_r \cdot n)_{max}$.
The operating limits are determined by the limiting speeds stated and the permissible radial load.

2) Drawn cup roller clutches with rolling bearings.

3) No arrow on end face.

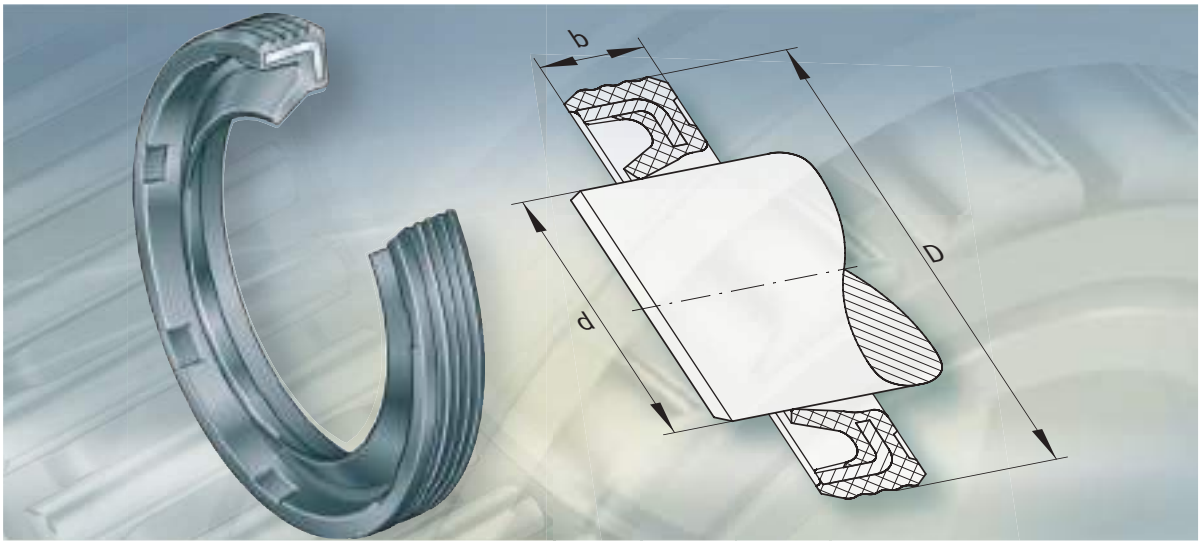


HFL0606-KFR[3], HFL0806-KFR[3]



HFL0308-KFR, HFL0408-KFR, HFL0615-R, HFL0615-KFR

Limiting speeds		Permissible radial load[1]	Limiting load $(F_r \cdot n)_{max}$[1]	Basic load ratings[2]		Fatigue limit load
n_{GW}	n_{GA}	$F_{r\,max}$		dyn. C_r	stat. C_{0r}	C_{ur}
min^{-1}	min^{-1}	N	N/min	N	N	N
45 000	8 000	60	16 000	–	–	–
45 000	8 000	60	16 000	–	–	–
34 000	8 000	80	16 000	–	–	–
34 000	8 000	80	16 000	–	–	–
23 000	13 000	40	4 200	–	–	–
23 000	13 000	110	18 000	–	–	–
23 000	13 000	110	18 000	–	–	–
17 000	12 000	54	4 200	–	–	–
17 000	12 000	–	–	3 650	3 950	550
17 000	12 000	–	–	3 650	3 950	550
14 000	11 000	–	–	3 950	4 500	630
11 000	8 000	–	–	6 300	6 700	920
9 500	8 000	–	–	6 800	7 800	1 080
8 500	7 500	–	–	7 400	9 000	1 250
7 500	7 500	–	–	8 000	10 200	1 420
7 000	6 500	–	–	8 500	11 400	1 590
5 500	5 500	–	–	10 600	14 000	1 900
4 500	4 500	–	–	11 600	16 900	2 290
3 900	3 900	–	–	12 200	18 800	2 550



Sealing rings

Sealing rings

Product overview Sealing rings

Single lip

G

With external steel reinforcement

GR

Double lip

SD

Sealing rings

Features

Sealing rings are designed as contact seals. They protect the bearing position against contamination, spray water and the excessive loss of grease.

Sealing rings are matched to the low radial dimensions of drawn cup needle roller bearings and needle roller bearings. They are very easy to fit, since they are simply pressed into the housing bore.

Sealing rings allow circumferential speeds at the seal lip of up to 10 m/s, depending on the surface quality of the shaft.

Sealing rings, single lip

Sealing rings G and GR are single lip seals made from synthetic NBR elastomer (coloured green).

The design GR is suitable for shaft diameters up to 7 mm and has an external steel reinforcement for stiffening purposes.

Sealing rings G are suitable for shaft diameters over 8 mm and have a rubber-encased steel reinforcement with a rubber wave profile for stiffening purposes. This provides good sealing on the outside diameter. At the same time, it also reduces the forces required for fitting.

Sealing rings, double lip

Sealing rings SD have a contact lip and a non-contact dust shield lip facing the shaft (on the marked side). They comprise two plastic components.

The seal carrier is made from reinforced polyamide (coloured black), while the seal lip area is made from thermoplastic PU elastomer (coloured green).

Sealing rings SD can also be used as wipers on shafts with axial motion. Stroke speeds up to 3 m/s are possible, dependent on the condition of the shaft.

Operating temperature

The permissible operating temperature is dependent on the interaction between the medium and the temperature and its effect on the sealing ring material. The suitability of the sealing rings should be checked by tests as extremes of operation are approached.

Caution!

Sealing rings G and GR are suitable for operating temperatures from –30 °C to +110 °C, depending on the medium acting on the sealing ring.

Sealing rings SD are suitable for operating temperatures from –30 °C to +110 °C, depending on the medium acting on the sealing ring.

Suffixes

Suffixes for available designs: see table.

Available designs

Suffixes	Description	Design
FPM	Sealing rings G and GR for temperatures from –20 °C to +160 °C or circumferential speeds up to 16 m/s	Special design[1)]

1) Available by agreement.

Further information

Further information on sealing rings and the basic principles of sealing ring technology is given in publication GSD.

Sealing rings

Design and safety guidelines

Resistance/leakage

Sealing rings are resistant to undoped lubricants with a mineral oil base. For other media, please check the resistance of the sealing rings.

Low leakage rates are possible (grease or fluid film). The sealing effect is aided by a grease collar.

Sealing lip orientation

A sealing lip facing outwards protects the bearing against ingress of contaminants, *Figure 1*, ①. A sealing lip facing inwards prevents egress of lubricant from the bearing, *Figure 1*, ②.

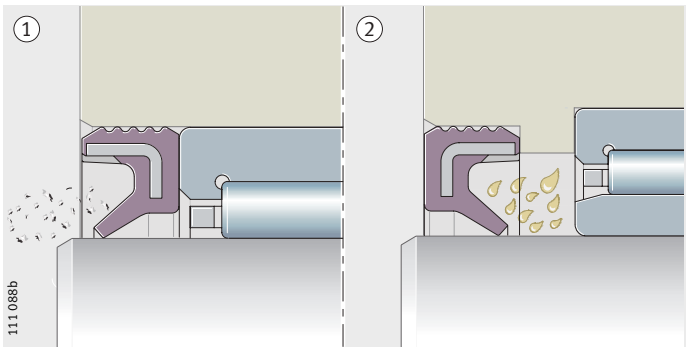


Figure 1
① Sealing lip facing outwards
② Sealing lip facing inwards

Shaft and housing design

The sliding surface for the sealing lips must be free from cracks and damage such as impact points, scratches, cracks, rust, raised areas.

Tolerances and surface quality

Sealing ring	Shaft movement	Bore tolerance	Shaft		
			Tolerance	Roughness	Hardness
G, GR, SD	Rotation only	G7 to R7	g7 to k7	$0,2 \leqq R_a \leqq 0,8$	55 HRC or 600 HV
SD	Axial motion			$R_a 0,3$	

In order to protect the sealing lips during fitting, the shaft ends and the housing bore should be chamfered in accordance with DIN 3 761, see table and *Figure 2*.

Chamfer dimensions

Chamfer	D ≦ 30 mm	D > 30 mm	d ≦ 30 mm	d > 30 mm
v min.	0,3	1% of D	–	–
w min.	–	–	0,3	0,5

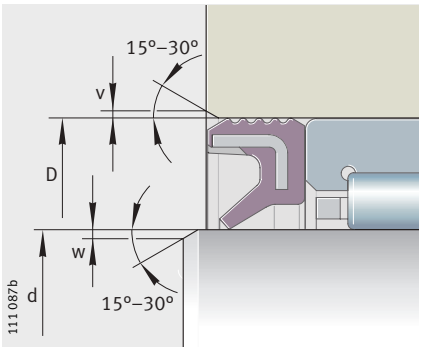
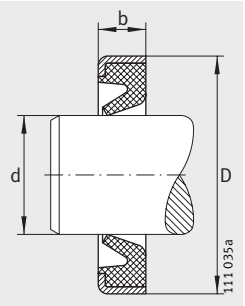
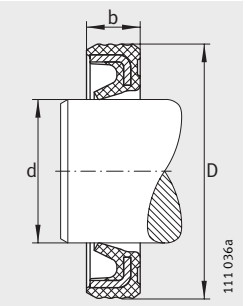


Figure 2
Chamfers on housing bore and shaft end

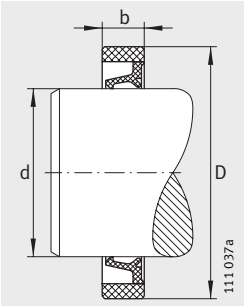
Sealing rings



GR (d ≦ 7 mm)



G (d ≧ 8 mm)



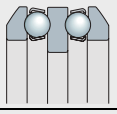
SD

Dimension table · Dimensions in mm

Single lip NBR elastomer		Double lip Plastic		Dimensions		
Designation	Mass m ≈g	Designation	Mass m ≈g	d	D	b +0,4 −0,2
GR4X8X2	0,2	–	–	**4**	8	2
GR5X9X2	0,2	–	–	**5**	9	2
GR5X10X2	0,2	–	–	**5**	10	2
GR6X10X2	0,2	–	–	**6**	10	2
GR6X12X2	0,4	–	–	**6**	12	2
GR7X11X2	0,3	–	–	**7**	11	2
GR7X14X2	0,5	–	–	**7**	14	2
G8X12X3	0,4	–	–	**8**	12	3
G8X15X3	0,7	**SD8X15X3**	0,3	**8**	15	3
G9X13X3	0,5	–	–	**9**	13	3
G9X16X3	0,7	–	–	**9**	16	3
G10X14X3	0,5	–	–	**10**	14	3
G10X17X3	0,9	**SD10X17X3**	0,4	**10**	17	3
G12X16X3	0,6	–	–	**12**	16	3
G12X18X3	0,9	**SD12X18X3**	0,4	**12**	18	3
G12X19X3	1	**SD12X19X3**	0,5	**12**	19	3
G13X19X3	0,9	–	–	**13**	19	3
G14X20X3	1	**SD14X20X3**	0,5	**14**	20	3
G14X21X3	1,1	–	–	**14**	21	3
G14X22X3	1,3	**SD14X22X3**	0,7	**14**	22	3
G15X21X3	1	**SD15X21X3**	0,5	**15**	21	3
G15X23X3	1,3	**SD15X23X3**	0,7	**15**	23	3
G16X22X3	1,3	**SD16X22X3**	0,6	**16**	22	3
G16X24X3	1,3	**SD16X24X3**	0,7	**16**	24	3
G16X25X3	1,6	–	–	**16**	25	3
G17X23X3	1,3	**SD17X23X3**	0,6	**17**	23	3
G17X25X3	1,5	**SD17X25X3**	0,8	**17**	25	3
G18X24X3	1,2	**SD18X24X3**	0,6	**18**	24	3
G18X26X4	1,8	**SD18X26X4**	1,1	**18**	26	4
G19X27X4	2	**SD19X27X4**	1,1	**19**	27	4
G20X26X4	1,8	**SD20X26X4**	0,8	**20**	26	4
G20X28X4	2,1	**SD20X28X4**	1,1	**20**	28	4
G21X29X4	2,2	–	–	**21**	29	4

Dimension table (continued) · Dimensions in mm

Single lip NBR elastomer		Double lip Plastic		Dimensions		
Designation	Mass m ≈g	Designation	Mass m ≈g	d	D	b +0,4 −0,2
G22X28X4	1,8	**SD22X28X4**	0,9	**22**	28	4
G22X30X4	2,2	**SD22X30X4**	1,3	**22**	30	4
G24X32X4	2,5	–	–	**24**	32	4
G25X32X4	2,3	**SD25X32X4**	1,3	**25**	32	4
G25X33X4	2,5	**SD25X33X4**	1,3	**25**	33	4
G25X35X4	2,6	**SD25X35X4**	1,9	**25**	35	4
G26X34X4	2,6	**SD26X34X4**	1,4	**26**	34	4
G28X35X4	2,4	**SD28X35X4**	1,3	**28**	35	4
G28X37X4	3,1	–	–	**28**	37	4
G29X38X4	3,2	–	–	**29**	38	4
G30X37X4	2,7	**SD30X37X4**	1,3	**30**	37	4
G30X40X4	3,6	**SD30X40X4**	2,1	**30**	40	4
G32X42X4	3,7	**SD32X42X4**	2,4	**32**	42	4
G32X45X4	5,1	–	–	**32**	45	4
G35X42X4	3	**SD35X42X4**	1,5	**35**	42	4
G35X45X4	4,1	**SD35X45X4**	2,5	**35**	45	4
G37X47X4	4	**SD37X47X4**	2,7	**37**	47	4
G38X48X4	4,4	**SD38X48X4**	2,8	**38**	48	4
G40X47X4	3,3	**SD40X47X4**	1,7	**40**	47	4
G40X50X4	4,6	**SD40X50X4**	2,9	**40**	50	4
G40X52X5	4,8	**SD40X52X5**	4,5	**40**	52	5
G42X52X4	4,7	**SD42X52X4**	3	**42**	52	4
G43X53X4	4,8	–	–	**43**	53	4
G45X52X4	3,8	**SD45X52X4**	1,9	**45**	52	4
G45X55X4	5,2	**SD45X55X4**	3,2	**45**	55	4
G50X58X4	4,5	**SD50X58X4**	2,4	**50**	58	4
G50X62X5	10,4	**SD50X62X5**	5,5	**50**	62	5
G55X63X5	7,1	–	–	**55**	63	5
G70X78X5	9	–	–	**70**	78	5



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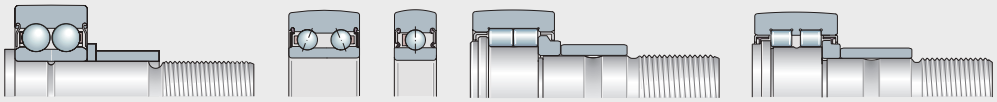

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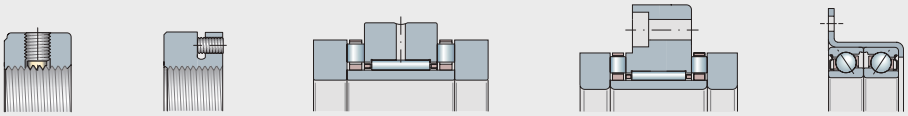

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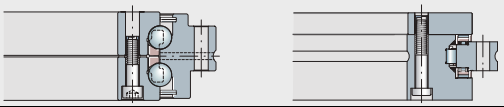

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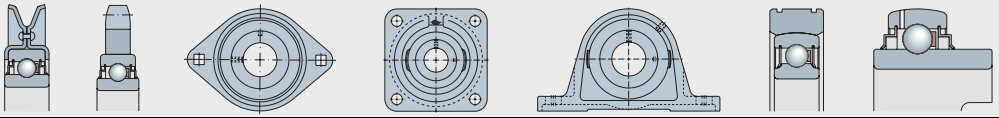

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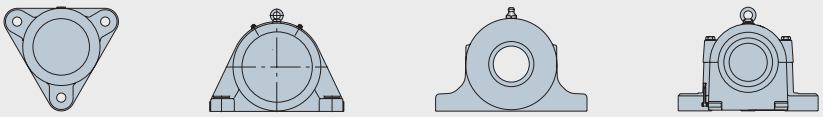

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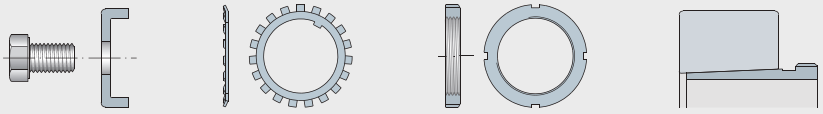

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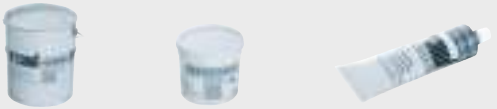

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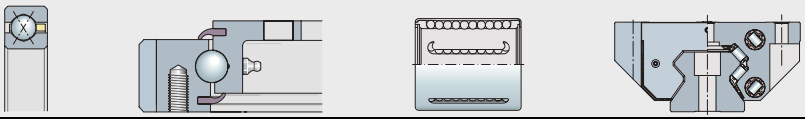

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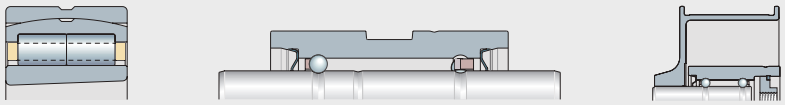

191 585

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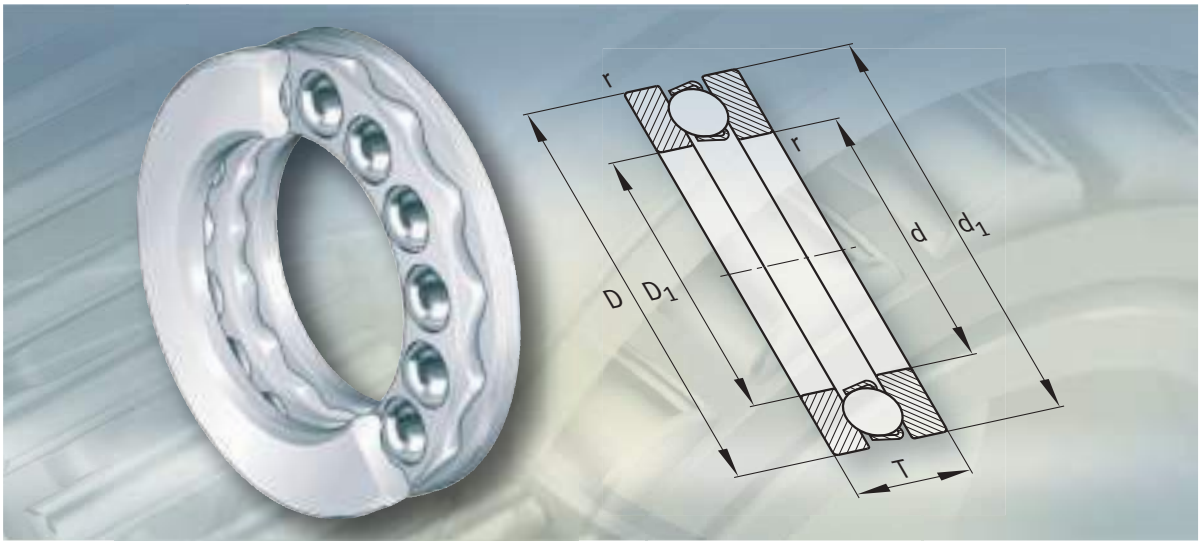


Axial deep groove ball bearings

Axial deep groove ball bearings

Single direction

With flat housing locating washer

511, 512
513, 514

With spherical housing locating washer
Without and with seating washer

532
533

532 + U2
533 + U3

Double direction

With flat housing locating washers

522
523

With spherical housing locating washers
Without and with seating washers

542
543

542 + U2
543 + U3

Axial deep groove ball bearings

Features

Axial deep groove ball bearings comprise shaft locating washers, housing locating washers and ball and cage assemblies.
The bearings are not self-retaining; the ball and cage assembly and bearing washers can therefore be fitted separately.

In addition to the series with flat washers, series are also available with spherical housing locating washers for the compensation of static angular misalignment. These designs are normally used in conjunction with seating washers.

Axial deep groove ball bearings are available in single and double direction designs. Both designs can support high axial forces but cannot be subjected to radial loads.

Single direction bearings

Single direction axial deep groove ball bearings can support axial forces in one direction.

Bearings of series 511, 512, 513 and 514 have a flat housing locating washer. They do not permit angular misalignment or skewing between the shaft and housing.

Angular adjustment facility

Bearings of series 532 and 533 have a spherical housing locating washer. With an appropriate housing design and in conjunction with seating washers U2 and U3, they allow angular adjustment and can therefore compensate static misalignments between the shaft and housing.

Double direction bearings

Double direction axial deep groove ball bearings can support axial forces in both directions.

Bearings of series 522 and 523 have two flat housing locating washers and do not allow angular adjustment.

Angular adjustment facility

Bearings of series 542 and 543 have spherical housing locating washers. With an appropriate housing design and in conjunction with seating washers U2 and U3, they allow angular adjustment and can therefore compensate static misalignments between the shaft and housing.

Operating temperature

Axial deep groove ball bearings can be used at operating temperatures from –30 °C to +150 °C, restricted by the lubricant.

Cages

Bearings with sheet steel cages do not have a cage suffix.
Solid brass window cages are indicated by the suffix MP, see table Suffixes, page 724.

The cage design as a function of the bore code is shown in the table Cage/bore code.

Cage/bore code

Series	Sheet steel cage	Solid brass cage
	Bore code	
511	up to 28	from 30
512	up to 28	from 30
513	up to 20	from 22
514	up to 11	from 12
522	up to 28	from 30
523	up to 20	from 22
532	up to 28	from 30
533	up to 20	from 22
542	all	–
543	up to 20	22

Axial deep groove ball bearings

Suffixes

Suffixes for available designs: see table.

Available designs

Suffix	Description	Design
MP	Solid brass window cage, ball-guided	Standard
P5	Higher accuracy to tolerance class P5	Special design[1)]
P6	Higher accuracy to tolerance class P6	Special design[1)]

1) Available by agreement.

Design and safety guidelines

Equivalent dynamic bearing load

Axial deep groove ball bearings can support axial forces only.
The following applies:

$$P = F_a$$

P N
Equivalent dynamic bearing load
F_a N
Axial dynamic bearing load.

Equivalent static bearing load

Axial deep groove ball bearings can support axial forces only.
The following applies:

$$P_0 = F_{0a}$$

P_0 N
Equivalent static bearing load
F_{0a} N
Axial static bearing load.

Minimum axial load

At higher speeds, detrimental sliding movements can occur between the rolling elements and the raceways due to centrifugal forces and gyroscopic moments. In order to avoid this, the bearings must be subjected to a minimum load $F_{a\,min}$. This can be achieved by means of preloading – for example using springs.

The minimum load factor A is given in the dimension tables.
For n_{max}, the maximum operating speed must be used.

$$F_{a\,min} = A \cdot \left(\frac{n_{max}}{1000} \right)^2$$

$F_{a\,min}$ N
Minimum axial load
A –
Minimum load factor according to dimension tables
n_{max} min^{-1}
Maximum operating speed.

Speeds

ISO 15 312 does not give thermal reference speeds for these bearings.

Caution! The dimension tables only state limiting speeds n_G.
These values are for oil lubrication and must not be exceeded.

Design of adjacent parts

The shoulders on the adjacent construction (shaft/housing) must be sufficiently high that the shaft and housing locating washers are supported over at least half their height.

The abutting shoulders should be rigid, flat and perpendicular to the axis of rotation.

The maximum values for the radii r_a and the diameters of the abutment surfaces d_a, D_a are indicated in the dimension tables.

Locating bore tolerance

The tolerance of the locating bore is dependent on the running accuracy to be achieved. For normal running accuracy, the tolerance should be in the tolerance zone E8, for high running accuracy it should be in the tolerance zone H6.

Shaft tolerances

For single direction bearings, the shaft tolerance should be j6, for double direction bearings the shaft tolerance should be k6.

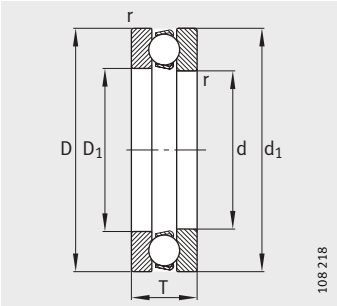
Accuracy

The dimensional and geometrical tolerances correspond to tolerance class PN to DIN 620-3.

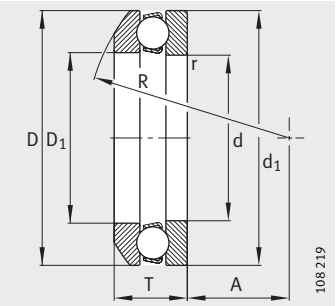
The main dimensions for single direction bearings and seating washers conform to ISO 104/DIN 711, for double direction bearings they conform to DIN 715.

Axial deep groove ball bearings

Single direction



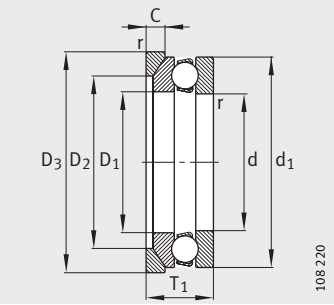
511, 512, 513, 514



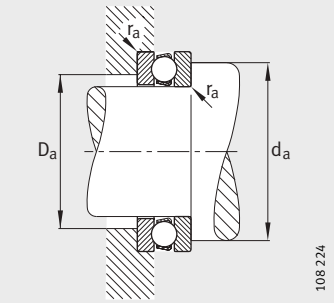
532, 533
Spherical housing locating washer

Dimension table · Dimensions in mm

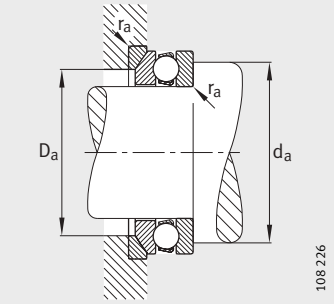
Designation		Mass m		Dimensions								
Bearing	Seating washer	Bearing ≈kg	Seating washer ≈kg	d	D	T	D_1	d_1	r min.	R	A	D_2
51100	–	0,018	–	**10**	24	9	11	24	0,3	–	–	–
51200	–	0,029	–	**10**	26	11	12	26	0,6	–	–	–
53200	–	0,028	–	**10**	26	11,6	12	26	0,6	22	8,5	–
53200	**U200**	0,028	0,01	**10**	26	11,6	12	26	0,6	22	8,5	18
51101	–	0,021	–	**12**	26	9	13	26	0,3	–	–	–
51201	–	0,032	–	**12**	28	11	14	28	0,6	–	–	–
53201	–	0,03	–	**12**	28	11,4	14	28	0,6	25	11,5	–
53201	**U201**	0,03	0,012	**12**	28	11,4	14	28	0,6	25	11,5	20
51102	–	0,024	–	**15**	28	9	16	28	0,3	–	–	–
51202	–	0,043	–	**15**	32	12	17	32	0,6	–	–	–
53202	–	0,046	–	**15**	32	13,3	17	32	0,6	28	12	–
53202	**U202**	0,046	0,014	**15**	32	13,3	17	32	0,6	28	12	24
51103	–	0,024	–	**17**	30	9	18	30	0,3	–	–	–
51203	–	0,05	–	**17**	35	12	19	35	0,6	–	–	–
53203	–	0,052	–	**17**	35	13,2	19	35	0,6	32	16	–
53203	**U203**	0,052	0,015	**17**	35	13,2	19	35	0,6	32	16	26
51104	–	0,037	–	**20**	35	10	21	35	0,3	–	–	–
51204	–	0,082	–	**20**	40	14	22	40	0,6	–	–	–
53204	–	0,081	–	**20**	40	14,7	22	40	0,6	36	18	–
53204	**U204**	0,081	0,021	**20**	40	14,7	22	40	0,6	36	18	30
51105	–	0,055	–	**25**	42	11	26	42	0,6	–	–	–
51205	–	0,114	–	**25**	47	15	27	47	0,6	–	–	–
53205	–	0,121	–	**25**	47	16,7	27	47	0,6	40	19	–
53205	**U205**	0,121	0,032	**25**	47	16,7	27	47	0,6	40	19	36
51305	–	0,154	–	**25**	52	18	27	52	1	–	–	–
53305	–	0,203	–	**25**	52	19,8	27	52	1	45	21	–
53305	**U305**	0,203	0,044	**25**	52	19,8	27	52	1	45	21	38
51405	–	0,295	–	**25**	60	24	27	60	1	–	–	–



532, 533
Spherical housing locating washer, seating washer U2, U3



Mounting dimensions

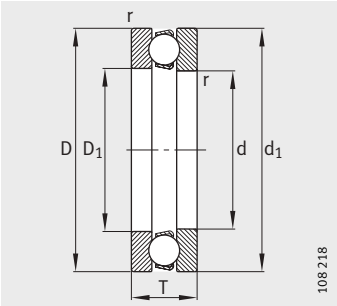


Mounting dimensions

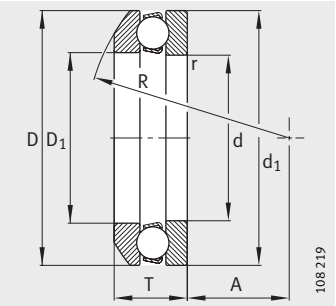
			Mounting dimensions			Basic load ratings		Fatigue limit load	Minimum load factor	Limiting speed
D_3	C	T_1	d_a	D_a	r_a	dyn. C_a	stat. C_{0a}	C_{ua}	A	n_G
			min.	max.	max.	N	N	N		min^{-1}
–	–	–	18	16	0,3	10 000	14 000	620	0,001	13 000
–	–	–	20	16	0,6	12 700	17 000	760	0,002	11 000
–	–	–	20	18	0,6	12 700	17 000	760	0,002	11 000
28	3,5	13	20	18	0,6	12 700	17 000	760	0,002	11 000
–	–	–	20	18	0,3	10 400	15 300	690	0,001	13 000
–	–	–	22	18	0,6	13 200	19 000	840	0,002	10 000
–	–	–	22	20	0,6	13 200	19 000	840	0,002	10 000
30	3,5	13	22	20	0,6	13 200	19 000	840	0,002	10 000
–	–	–	23	20	0,3	10 600	16 600	750	0,002	12 000
–	–	–	25	22	0,6	16 600	25 000	1 100	0,004	9 000
–	–	–	25	24	0,6	16 600	25 000	1 100	0,004	9 000
35	4	15	25	24	0,6	16 600	25 000	1 100	0,004	9 000
–	–	–	25	22	0,3	11 400	19 600	870	0,002	11 000
–	–	–	28	24	0,6	17 300	27 500	1 210	0,004	8 500
–	–	–	28	26	0,6	17 300	27 500	1 210	0,004	8 500
38	4	15	28	26	0,6	17 300	27 500	1 210	0,004	8 500
–	–	–	29	26	0,3	15 000	26 500	1 180	0,004	9 500
–	–	–	32	28	0,6	22 400	37 500	1 660	0,01	7 500
–	–	–	32	30	0,6	22 400	37 500	1 660	0,01	7 500
42	5	17	32	30	0,6	22 400	37 500	1 660	0,01	7 500
–	–	–	35	32	0,6	18 000	35 500	1 570	0,006	9 000
–	–	–	38	34	0,6	28 000	50 000	2 220	0,01	6 700
–	–	–	38	36	0,6	28 000	50 000	2 220	0,013	6 700
50	5,5	19	38	36	0,6	28 000	50 000	2 220	0,013	6 700
–	–	–	41	36	1	34 500	55 000	2 450	0,019	5 300
–	–	–	41	38	1	34 500	55 000	2 450	0,019	5 300
55	6	22	41	38	1	34 500	55 000	2 450	0,019	5 300
–	–	–	46	39	1	45 500	67 000	2 950	0,032	4 500

Axial deep groove ball bearings

Single direction



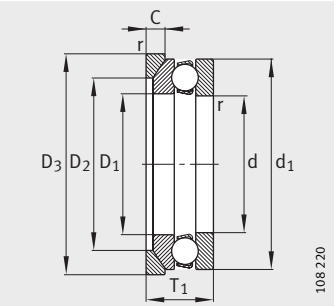
511, 512, 513, 514



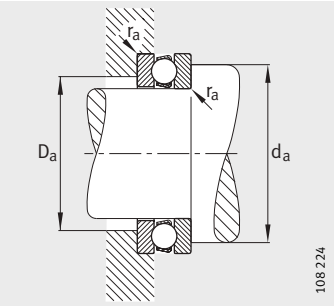
532, 533
Spherical housing locating washer

Dimension table (continued) · Dimensions in mm

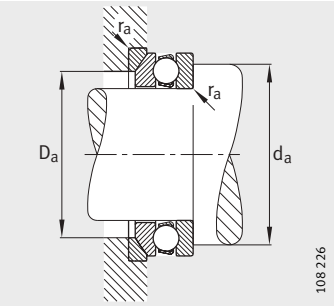
Designation		Mass m		Dimensions								
Bearing	Seating washer	Bearing ≈kg	Seating washer ≈kg	d	D	T	D_1	d_1	r min.	R	A	D_2
51106	–	0,063	–	**30**	47	11	32	47	0,6	–	–	–
51206	–	0,136	–	**30**	52	16	32	52	0,6	–	–	–
53206	–	0,147	–	**30**	52	17,8	32	52	0,6	45	22	–
53206	**U206**	0,147	0,038	**30**	52	17,8	32	52	0,6	45	22	42
51306	–	0,244	–	**30**	60	21	32	60	1	–	–	–
53306	–	0,303	–	**30**	60	22,6	32	60	1	50	22	–
53306	**U306**	0,303	0,056	**30**	60	22,6	32	60	1	50	22	45
51406	–	0,49	–	**30**	70	28	32	70	1	–	–	–
51107	–	0,08	–	**35**	52	12	37	52	0,6	–	–	–
51207	–	0,198	–	**35**	62	18	37	62	1	–	–	–
53207	–	0,265	–	**35**	62	19,9	37	62	1	50	24	–
53207	**U207**	0,265	0,057	**35**	62	19,9	37	62	1	50	24	48
51307	–	0,351	–	**35**	68	24	37	68	1	–	–	–
53307	–	0,437	–	**35**	68	25,6	37	68	1	56	24	–
53307	**U307**	0,437	0,083	**35**	68	25,6	37	68	1	56	24	52
51407	–	0,709	–	**35**	80	32	37	80	1,1	–	–	–
51108	–	0,114	–	**40**	60	13	42	60	0,6	–	–	–
51208	–	0,257	–	**40**	68	19	42	68	1	–	–	–
53208	–	0,259	–	**40**	68	20,3	42	68	1	56	28,5	–
53208	**U208**	0,259	0,071	**40**	68	20,3	42	68	1	56	28,5	55
51308	–	0,536	–	**40**	78	26	42	78	1	–	–	–
53308	–	0,561	–	**40**	78	28,5	42	78	1	64	28	–
53308	**U308**	0,561	0,12	**40**	78	28,5	42	78	1	64	28	60
51408	–	1,03	–	**40**	90	36	42	90	1,1	–	–	–
51109	–	0,087	–	**45**	65	14	47	65	0,6	–	–	–
51209	–	0,279	–	**45**	73	20	47	73	1	–	–	–
53209	–	0,278	–	**45**	73	21,3	47	73	1	56	26	–
53209	**U209**	0,278	0,088	**45**	73	21,3	47	73	1	56	26	60
51309	–	0,612	–	**45**	85	28	47	85	1	–	–	–
53309	–	0,783	–	**45**	85	30,1	47	85	1	64	25	–
53309	**U309**	0,783	0,173	**45**	85	30,1	47	85	1	64	25	65
51409	–	1,36	–	**45**	100	39	47	100	1,1	–	–	–



532, 533
Spherical housing locating washer, seating washer U2, U3



Mounting dimensions

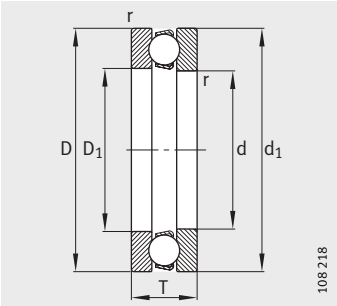


Mounting dimensions

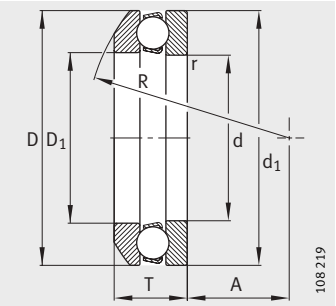
			Mounting dimensions			Basic load ratings		Fatigue limit load	Minimum load factor	Limiting speed
D_3	C	T_1	d_a	D_a	r_a	dyn. C_a	stat. C_{0a}	C_{ua}	A	n_G
			min.	max.	max.	N	N	N		min^{-1}
–	–	–	40	37	0,6	19 000	40 000	1 770	0,009	8 000
–	–	–	43	39	0,6	25 000	46 500	2 040	0,01	6 300
–	–	–	43	42	0,6	25 000	46 500	2 040	0,01	6 300
55	5,5	20	43	42	0,6	25 000	46 500	2 040	0,01	6 300
–	–	–	48	42	1	38 000	65 500	2 850	0,028	5 000
–	–	–	48	45	1	38 000	65 500	2 850	0,028	5 000
62	7	25	48	45	1	38 000	65 500	2 850	0,028	5 000
–	–	–	54	46	1	69 500	112 000	5 000	0,075	3 800
–	–	–	45	42	0,6	20 000	46 500	2 060	0,011	7 500
–	–	–	51	46	1	35 500	67 000	3 000	0,028	5 300
–	–	–	51	48	1	35 500	67 000	3 000	0,028	5 300
65	7	22	51	48	1	35 500	67 000	3 000	0,028	5 300
–	–	–	55	48	1	50 000	88 000	3 900	0,05	4 500
–	–	–	55	52	1	50 000	88 000	3 900	0,05	4 500
72	7,5	28	55	52	1	50 000	88 000	3 900	0,05	4 500
–	–	–	62	53	1	76 500	127 000	5 600	0,11	3 600
–	–	–	52	48	0,6	27 000	63 000	2 750	0,02	6 300
–	–	–	57	51	1	46 500	98 000	4 300	0,05	4 800
–	–	–	57	55	1	46 500	98 000	4 300	0,05	4 800
72	7	23	57	55	1	46 500	98 000	4 300	0,05	4 800
–	–	–	63	55	1	61 000	112 000	5 000	0,08	4 000
–	–	–	63	60	1	61 000	112 000	5 000	0,08	4 000
82	8,5	31	63	60	1	61 000	112 000	5 000	0,08	4 000
–	–	–	70	60	1	96 500	170 000	7 500	0,18	3 400
–	–	–	57	53	0,6	28 000	69 500	3 050	0,024	6 000
–	–	–	62	56	1	39 000	80 000	3 550	0,043	4 800
–	–	–	62	60	1	39 000	80 000	3 550	0,043	4 800
78	7,5	24	62	60	1	39 000	80 000	3 550	0,043	4 800
–	–	–	69	61	1	75 000	140 000	6 300	0,12	3 600
–	–	–	69	65	1	75 000	140 000	6 300	0,12	3 600
90	10	33	69	65	1	75 000	140 000	6 300	0,12	3 600
–	–	–	78	67	1	122 000	220 000	9 800	0,3	3 000

Axial deep groove ball bearings

Single direction



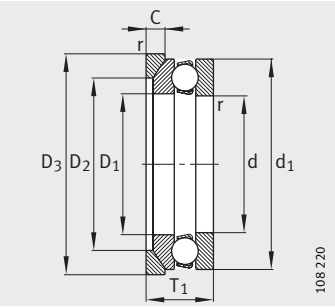
511, 512, 513, 514



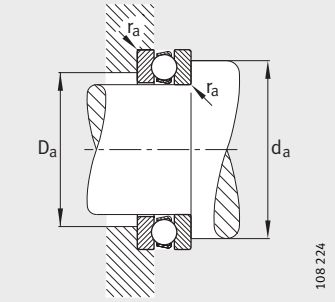
532, 533
Spherical housing locating washer

Dimension table (continued) · Dimensions in mm

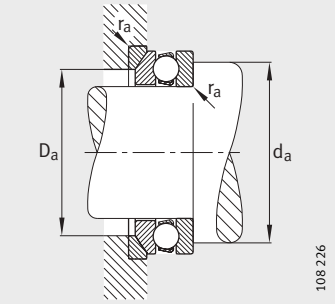
Designation		Mass m		Dimensions								
Bearing	Seating washer	Bearing ≈kg	Seating washer ≈kg	d	D	T	D_1	d_1	r min.	R	A	D_2
51110	–	0,151	–	**50**	70	14	52	70	0,6	–	–	–
51210	–	0,346	–	**50**	78	22	52	78	1	–	–	–
53210	–	0,341	–	**50**	78	23,5	52	78	1	64	32,5	–
53210	**U210**	0,341	0,098	**50**	78	23,5	52	78	1	64	32,5	62
51310	–	0,932	–	**50**	95	31	52	95	1,1	–	–	–
53310	–	0,97	–	**50**	95	34,3	52	95	1,1	72	28	–
53310	**U310**	0,97	0,225	**50**	95	34,3	52	95	1,1	72	28	72
51410	–	1,81	–	**50**	110	43	52	110	1,5	–	–	–
51111	–	0,208	–	**55**	78	16	57	78	0,6	–	–	–
51211	–	0,382	–	**55**	90	25	57	90	1	–	–	–
53211	–	0,609	–	**55**	90	27,3	57	90	1	72	35	–
53211	**U211**	0,609	0,152	**55**	90	27,3	57	90	1	72	35	72
51311	–	1,3	–	**55**	105	35	57	105	1,1	–	–	–
53311	–	1,38	–	**55**	105	39,3	57	105	1,1	80	30	–
53311	**U311**	1,38	0,277	**55**	105	39,3	57	105	1,1	80	30	80
51411	–	2,83	–	**55**	120	48	57	120	1,5	–	–	–
51112	–	0,278	–	**60**	85	17	62	85	1	–	–	–
51212	–	0,649	–	**60**	95	26	62	95	1	–	–	–
53212	–	0,655	–	**60**	95	28	62	95	1	72	32,5	–
53212	**U212**	0,655	0,165	**60**	95	28	62	95	1	72	32,5	78
51312	–	1,36	–	**60**	110	35	62	110	1,1	–	–	–
53312	–	1,41	–	**60**	110	38,3	62	110	1,1	90	41	–
53312	**U312**	1,41	0,31	**60**	110	38,3	62	110	1,1	90	41	85
51412-MP	–	3,51	–	**60**	130	51	62	130	1,5	–	–	–
51113	–	0,3	–	**65**	90	18	67	90	1	–	–	–
51213	–	0,684	–	**65**	100	27	67	100	1	–	–	–
53213	–	0,855	–	**65**	100	28,7	67	100	1	80	40	–
53213	**U213**	0,855	0,184	**65**	100	28,7	67	100	1	80	40	82
51313	–	1,39	–	**65**	115	36	67	115	1,1	–	–	–
53313	–	1,78	–	**65**	115	39,4	67	115	1,1	90	38,5	–
53313	**U313**	1,78	0,338	**65**	115	39,4	67	115	1,1	90	38,5	90
51413-MP	–	4,47	–	**65**	140	56	68	140	2	–	–	–



532, 533
Spherical housing locating washer, seating washer U2, U3



Mounting dimensions

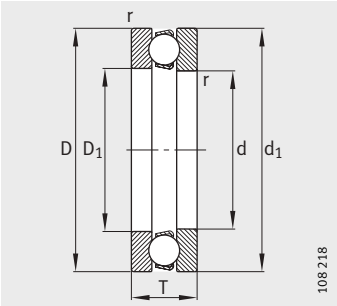


Mounting dimensions

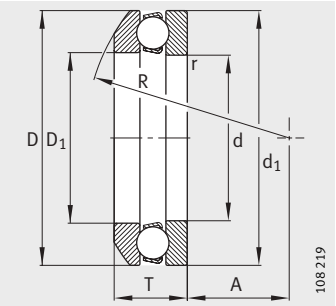
			Mounting dimensions			Basic load ratings		Fatigue limit load	Minimum load factor	Limiting speed
D_3	C	T_1	d_a min.	D_a max.	r_a max.	dyn. C_a N	stat. C_{0a} N	C_{ua} N	A	n_G min^{-1}
–	–	–	62	58	0,6	29 000	75 000	3 300	0,03	5 600
–	–	–	67	61	1	50 000	106 000	4 700	0,07	4 300
–	–	–	67	62	1	50 000	106 000	4 700	0,07	4 300
82	7,5	26	67	62	1	50 000	106 000	4 700	0,07	4 300
–	–	–	77	68	1	86 500	170 000	7 500	0,18	3 400
–	–	–	77	72	1	86 500	170 000	7 500	0,18	3 400
100	11	37	77	72	1	86 500	170 000	7 500	0,18	3 400
–	–	–	86	74	1,5	137 000	255 000	11 400	0,4	2 800
–	–	–	69	64	0,6	30 500	75 000	3 300	0,036	5 300
–	–	–	76	69	1	61 000	134 000	6 100	0,11	3 800
–	–	–	76	72	1	61 000	134 000	6 100	0,11	3 800
95	9	30	76	72	1	61 000	134 000	6 100	0,11	3 800
–	–	–	85	75	1	102 000	208 000	9 000	0,26	3 200
–	–	–	85	80	1	102 000	208 000	9 000	0,26	3 200
110	11,5	42	85	80	1	102 000	208 000	9 000	0,26	3 200
–	–	–	94	81	1,5	180 000	360 000	19 000	0,67	2 600
–	–	–	75	70	1	41 500	112 000	5 000	0,063	4 800
–	–	–	81	74	1	62 000	140 000	6 200	0,12	3 800
–	–	–	81	78	1	62 000	140 000	6 200	0,12	3 800
100	9	31	81	78	1	62 000	140 000	6 200	0,12	3 800
–	–	–	90	80	1	100 000	208 000	9 000	0,28	3 200
–	–	–	90	85	1	100 000	208 000	9 000	0,28	3 200
115	11,5	42	90	85	1	100 000	208 000	9 000	0,28	3 200
–	–	–	102	88	1,5	200 000	400 000	21 300	1	2 200
–	–	–	80	75	1	38 000	100 000	4 400	0,063	4 500
–	–	–	86	79	1	64 000	150 000	6 600	0,14	3 600
–	–	–	86	82	1	64 000	150 000	6 600	0,14	3 600
105	9	32	86	82	1	64 000	150 000	6 600	0,14	3 600
–	–	–	95	85	1	106 000	220 000	9 700	0,32	3 000
–	–	–	95	90	1	106 000	220 000	9 700	0,32	3 000
120	12,5	43	95	90	1	106 000	220 000	9 700	0,32	3 000
–	–	–	110	95	2	216 000	450 000	23 500	1,1	2 000

Axial deep groove ball bearings

Single direction



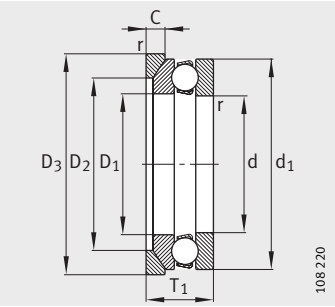
511, 512, 513, 514



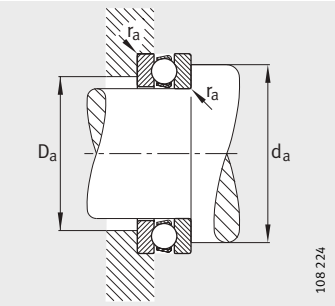
532, 533
Spherical housing locating washer

Dimension table (continued) · Dimensions in mm

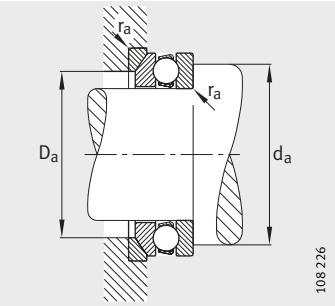
Designation		Mass m		Dimensions								
Bearing	Seating washer	Bearing ≈kg	Seating washer ≈kg	d	D	T	D_1	d_1	r min.	R	A	D_2
51114	–	0,352	–	**70**	95	18	72	95	1	–	–	–
51214	–	0,727	–	**70**	105	27	72	105	1	–	–	–
53214	–	0,903	–	**70**	105	28,8	72	105	1	80	38	–
53214	**U214**	0,903	0,187	**70**	105	28,8	72	105	1	80	38	88
51314	–	1,9	–	**70**	125	40	72	125	1,1	–	–	–
53314	–	2,09	–	**70**	125	44,2	72	125	1,1	100	43	–
53314	**U314**	2,09	0,408	**70**	125	44,2	72	125	1,1	100	43	98
51414-MP	–	5,49	–	**70**	150	60	73	150	2	–	–	–
51115	–	0,365	–	**75**	100	19	77	100	1	–	–	–
51215	–	0,819	–	**75**	110	27	77	110	1	–	–	–
53215	–	1,01	–	**75**	110	28,3	77	110	1	90	49	–
53215	**U215**	1,01	0,21	**75**	110	28,3	77	110	1	90	49	92
51315	–	2,59	–	**75**	135	44	77	135	1,5	–	–	–
53315	–	3,19	–	**75**	135	48,1	77	135	1,5	100	37	–
53315	**U315**	3,19	0,544	**75**	135	48,1	77	135	1,5	100	37	105
51415-MP	–	6,82	–	**75**	160	65	78	160	2	–	–	–
51116	–	0,384	–	**80**	105	19	82	105	1	–	–	–
51216	–	0,908	–	**80**	115	28	82	115	1	–	–	–
53216	–	0,903	–	**80**	115	29,5	82	115	1	90	46	–
53216	**U216**	0,903	0,218	**80**	115	29,5	82	115	1	90	46	98
51316	–	2,69	–	**80**	140	44	82	140	1,5	–	–	–
53316	–	2,75	–	**80**	140	47,6	82	140	1,5	112	50	–
53316	**U316**	2,75	0,57	**80**	140	47,6	82	140	1,5	112	50	110
51416-MP	–	7,95	–	**80**	170	68	83	170	2,1	–	–	–
51117	–	0,404	–	**85**	110	19	87	110	1	–	–	–
51217	–	1,21	–	**85**	125	31	88	125	1	–	–	–
53217	–	1,22	–	**85**	125	33,1	88	125	1	100	52	–
53217	**U217**	1,22	0,29	**85**	125	33,1	88	125	1	100	52	105
51317	–	3,48	–	**85**	150	49	88	150	1,5	–	–	–
53317	–	3,51	–	**85**	150	53,1	88	150	1,5	112	43	–
53317	**U317**	3,51	0,803	**85**	150	53,1	88	150	1,5	112	43	115
51417-MP	–	9,3	–	**85**	180	72	88	177	2,1	–	–	–



532, 533
Spherical housing locating washer, seating washer U2, U3



Mounting dimensions

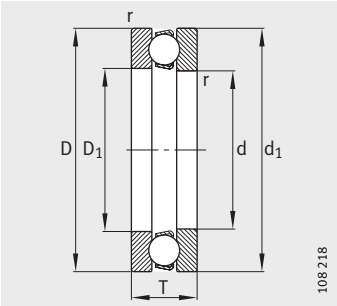


Mounting dimensions

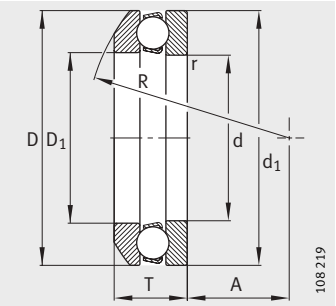
			Mounting dimensions			Basic load ratings		Fatigue limit load	Minimum load factor	Limiting speed
D_3	C	T_1	d_a	D_a	r_a	dyn. C_a	stat. C_{0a}	C_{ua}	A	n_G
			min.	max.	max.	N	N	N		min^{-1}
–	–	–	85	80	1	40 000	110 000	4 850	0,075	4 300
–	–	–	91	84	1	65 500	160 000	7 000	0,16	3 600
–	–	–	91	88	1	65 500	160 000	7 000	0,16	3 600
110	9	32	91	88	1	65 500	160 000	7 000	0,16	3 600
–	–	–	103	92	1	134 000	290 000	12 900	0,5	2 800
–	–	–	103	98	1	134 000	290 000	12 900	0,5	2 800
130	13	48	103	98	1	134 000	290 000	12 900	0,5	2 800
–	–	–	118	102	2	236 000	500 000	25 500	1,4	1 900
–	–	–	90	85	1	44 000	122 000	5 500	0,095	4 000
–	–	–	96	89	1	67 000	170 000	7 500	0,18	3 400
–	–	–	96	92	1	67 000	170 000	7 500	0,18	3 400
115	9,5	32	96	92	1	67 000	170 000	7 500	0,18	3 400
–	–	–	111	99	1,5	163 000	360 000	15 400	0,75	2 400
–	–	–	111	105	1,5	163 000	360 000	15 400	0,75	2 400
140	15	52	111	105	1,5	163 000	360 000	15 400	0,75	2 400
–	–	–	126	109	2	250 000	560 000	27 000	1,8	1 800
–	–	–	95	90	1	45 000	129 000	5 700	0,1	4 000
–	–	–	101	94	1	75 000	190 000	8 500	0,22	3 400
–	–	–	101	98	1	75 000	190 000	8 500	0,22	3 400
120	10	33	101	98	1	75 000	190 000	8 500	0,22	3 400
–	–	–	116	104	1,5	160 000	360 000	15 100	0,8	2 400
–	–	–	116	110	1,5	160 000	360 000	15 100	0,8	2 400
145	15	52	116	110	1,5	160 000	360 000	15 100	0,8	2 400
–	–	–	134	116	2,1	270 000	620 000	29 000	2,2	1 700
–	–	–	100	95	1	45 500	134 000	6 000	0,11	3 800
–	–	–	109	101	1	98 000	250 000	10 900	0,38	3 000
–	–	–	109	105	1	98 000	250 000	10 900	0,38	3 000
130	11	37	109	105	1	98 000	250 000	10 900	0,38	3 000
–	–	–	124	111	1,5	186 000	415 000	16 700	1,1	2 200
–	–	–	124	115	1,5	186 000	415 000	16 700	1,1	2 200
155	17,5	58	124	115	1,5	186 000	415 000	16 700	1,1	2 200
–	–	–	142	123	2,1	290 000	680 000	32 000	2,8	1 700

Axial deep groove ball bearings

Single direction



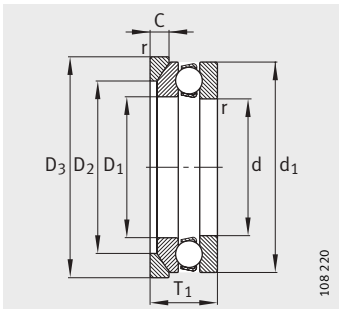
511, 512, 513, 514



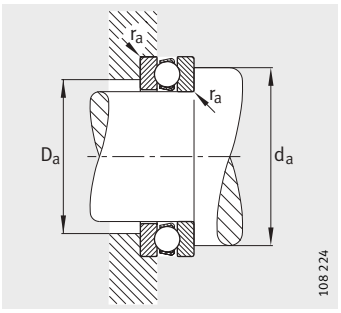
532, 533
Spherical housing locating washer

Dimension table (continued) · Dimensions in mm

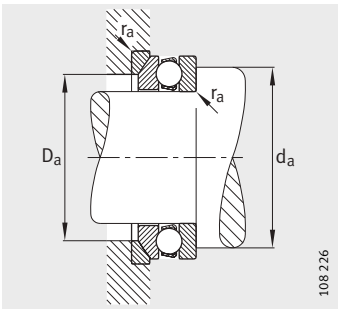
Designation		Mass m		Dimensions								
Bearing	Seating washer	Bearing ≈kg	Seating washer ≈kg	d	D	T	D_1	d_1	r min.	R	A	D_2
51118	–	0,617	–	**90**	120	22	92	120	1	–	–	–
51218	–	1,66	–	**90**	135	35	93	135	1,1	–	–	–
53218	–	1,7	–	**90**	135	38,5	93	135	1,1	100	45	–
53218	**U218**	1,7	0,425	**90**	135	38,5	93	135	1,1	100	45	110
51318	–	3,75	–	**90**	155	50	93	155	1,5	–	–	–
53318	–	3,81	–	**90**	155	54,6	93	155	1,5	112	40	–
53318	**U318**	3,81	0,83	**90**	155	54,6	93	155	1,5	112	40	120
51418-MP	–	11,1	–	**90**	190	77	93	187	2,1	–	–	–
51120	–	1,26	–	**100**	135	25	102	135	1	–	–	–
51220	–	2,21	–	**100**	150	38	103	150	1,1	–	–	–
53220	–	2,23	–	**100**	150	40,9	103	150	1,1	112	52	–
53220	**U220**	2,23	0,507	**100**	150	40,9	103	150	1,1	112	52	125
51320	–	4,94	–	**100**	170	55	103	170	1,5	–	–	–
53320	–	4,99	–	**100**	170	59,2	103	170	1,5	125	46	–
53320	**U320**	4,99	0,95	**100**	170	59,2	103	170	1,5	125	46	135
51420-MP	–	14,8	–	**100**	210	85	103	205	3	–	–	–
51122	–	1,45	–	**110**	145	25	112	145	1	–	–	–
51222	–	2,28	–	**110**	160	38	113	160	1,1	–	–	–
53222	–	2,24	–	**110**	160	40,2	113	160	1,1	125	65	–
53222	**U222**	2,24	0,56	**110**	160	40,2	113	160	1,1	125	65	135
51322-MP	–	7,85	–	**110**	190	63	113	187	2	–	–	–
53322-MP	–	7,85	–	**110**	190	67,2	113	187	2	140	51	–
53322-MP	**U322**	7,85	1,28	**110**	190	67,2	113	187	2	140	51	150
51422-MP	–	19,9	–	**110**	230	95	113	225	3	–	–	–
51124	–	1,54	–	**120**	155	25	122	155	1	–	–	–
51224	–	2,66	–	**120**	170	39	123	170	1,1	–	–	–
53224	–	2,58	–	**120**	170	40,8	123	170	1,1	125	61	–
53224	**U224**	2,58	0,65	**120**	170	40,8	123	170	1,1	125	61	145
51324-MP	–	9,3	–	**120**	210	70	123	205	2,1	–	–	–
53324-MP	–	9,18	–	**120**	210	74,1	123	205	2,1	160	63	–
53324-MP	**U324**	9,18	2,02	**120**	210	74,1	123	205	2,1	160	63	165
51424-MP	–	25,1	–	**120**	250	102	123	245	4	–	–	–



532, 533
Spherical housing locating washer, seating washer U2, U3



Mounting dimensions

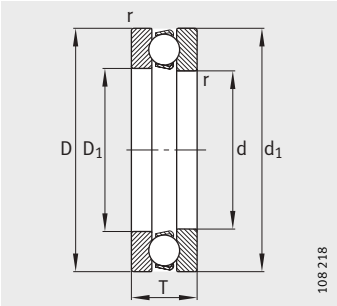


Mounting dimensions

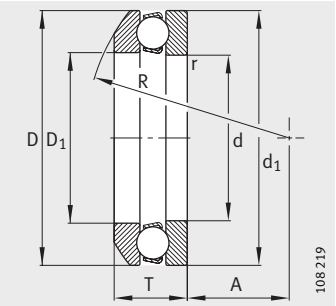
			Mounting dimensions			Basic load ratings		Fatigue limit load	Minimum load factor	Limiting speed
D_3	C	T_1	d_a min.	D_a max.	r_a max.	dyn. C_a N	stat. C_{0a} N	C_{ua} N	A	n_G min^{-1}
–	–	–	108	102	1	45 500	140 000	6 100	0,13	3 800
–	–	–	117	108	1	118 000	300 000	12 300	0,53	2 800
–	–	–	117	110	1	118 000	300 000	12 300	0,53	2 800
140	13,5	42	117	110	1	118 000	300 000	12 300	0,53	2 800
–	–	–	129	116	1,5	193 000	455 000	17 700	1,2	2 000
–	–	–	129	120	1,5	193 000	455 000	17 700	1,2	2 000
160	18	59	129	120	1,5	193 000	455 000	17 700	1,2	2 000
–	–	–	150	130	2,1	305 000	750 000	34 000	3,4	1 600
–	–	–	121	114	1	85 000	270 000	13 000	0,36	3 200
–	–	–	130	120	1	122 000	320 000	14 400	0,67	2 600
–	–	–	130	125	1	122 000	320 000	14 400	0,67	2 600
155	14	45	130	125	1	122 000	320 000	14 400	0,67	2 600
–	–	–	142	128	1,5	240 000	585 000	21 900	1,9	1 900
–	–	–	142	135	1,5	240 000	585 000	21 900	1,9	1 900
175	18	64	142	135	1,5	240 000	585 000	21 900	1,9	1 900
–	–	–	166	144	2,5	365 000	965 000	41 000	5,3	1 500
–	–	–	131	124	1	86 500	290 000	13 400	0,43	3 200
–	–	–	140	130	1	134 000	365 000	16 000	0,85	2 400
–	–	–	140	135	1	134 000	365 000	16 000	0,85	2 400
165	14	45	140	135	1	134 000	365 000	16 000	0,85	2 400
–	–	–	158	142	2	280 000	750 000	27 000	3	1 700
–	–	–	158	150	2	280 000	750 000	27 000	3	1 700
195	20,5	72	158	150	2	280 000	750 000	27 000	3	1 700
–	–	–	182	158	2,5	415 000	1 140 000	46 500	7,5	1 300
–	–	–	141	134	1	90 000	310 000	13 900	0,48	3 000
–	–	–	150	140	1	134 000	390 000	14 200	0,95	2 200
–	–	–	150	145	1	134 000	390 000	14 200	0,95	2 200
175	15	46	150	145	1	134 000	390 000	14 200	0,95	2 200
–	–	–	174	156	2,1	325 000	915 000	31 500	4,5	1 600
–	–	–	174	165	2,1	325 000	915 000	31 500	4,5	1 600
220	22	80	174	165	2,1	325 000	915 000	31 500	4,5	1 600
–	–	–	198	172	3	425 000	1 220 000	47 500	9	1 200

Axial deep groove ball bearings

Single direction



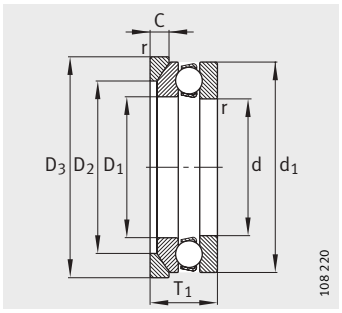
511, 512, 513



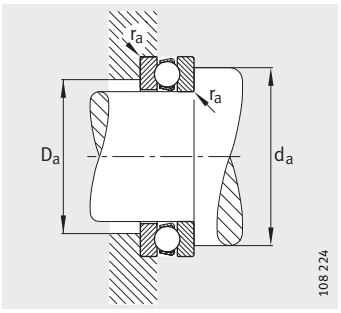
532, 533
Spherical housing locating washer

Dimension table (continued) · Dimensions in mm

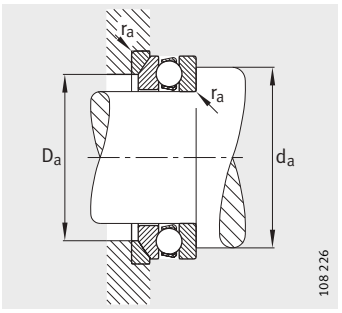
Designation		Mass m		Dimensions								
Bearing	Seating washer	Bearing ≈kg	Seating washer ≈kg	d	D	T	D_1	d_1	r min.	R	A	D_2
51126	–	2,28	–	**130**	170	30	132	170	1	–	–	–
51226	–	3,96	–	**130**	190	45	133	187	1,5	–	–	–
53226	–	3,9	–	**130**	190	47,9	133	187	1,5	140	67	–
53226	**U226**	3,9	0,9	**130**	190	47,9	133	187	1,5	140	67	160
51326-MP	–	13	–	**130**	225	75	134	220	2,1	–	–	–
51128	–	2,51	–	**140**	180	31	142	178	1	–	–	–
51228	–	4,3	–	**140**	200	46	143	197	1,5	–	–	–
53228	–	4,25	–	**140**	200	48,6	143	197	1,5	160	87	–
53228	**U228**	4,25	1,22	**140**	200	48,6	143	197	1,5	160	87	170
51328-MP	–	15,6	–	**140**	240	80	144	235	2,1	–	–	–
51130-MP	–	2,17	–	**150**	190	31	152	188	1	–	–	–
51230-MP	–	6,08	–	**150**	215	50	153	212	1,5	–	–	–
53230-MP	–	5,95	–	**150**	215	53,3	153	212	1,5	160	79	–
53230-MP	**U230**	5,95	1,69	**150**	215	53,3	153	212	1,5	160	79	180
51330-MP	–	16,2	–	**150**	250	80	154	245	2,1	–	–	–
53330-MP	–	12,8	–	**150**	250	83,7	154	245	2,1	200	89,5	–
53330-MP	**U330**	12,8	3,1	**150**	250	83,7	154	245	2,1	200	89,5	200
51132-MP	–	2,29	–	**160**	200	31	162	198	1	–	–	–
51232-MP	–	6,53	–	**160**	225	51	163	222	1,5	–	–	–
53232-MP	–	6,45	–	**160**	225	54,7	163	222	1,5	160	74	–
53232-MP	**U232**	6,45	1,81	**160**	225	54,7	163	222	1,5	160	74	190
51332-MP	–	21,2	–	**160**	270	87	164	265	3	–	–	–
51134-MP	–	3,08	–	**170**	215	34	172	213	1,1	–	–	–
51234-MP	–	8,12	–	**170**	240	55	173	237	1,5	–	–	–
53234-MP	–	7,91	–	**170**	240	58,7	173	237	1,5	180	91	–
53234-MP	**U234**	7,91	2,14	**170**	240	58,7	173	237	1,5	180	91	200
51334-MP	–	22,2	–	**170**	280	87	174	275	3	–	–	–



532, 533
Spherical housing locating washer, seating washer U2, U3



Mounting dimensions

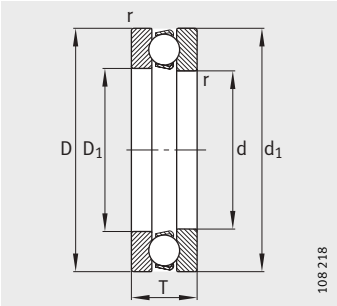


Mounting dimensions

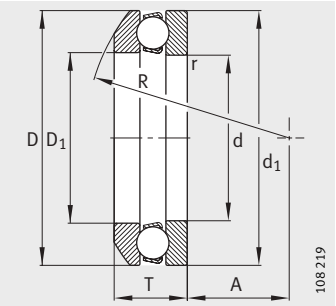
			Mounting dimensions			Basic load ratings		Fatigue limit load	Minimum load factor	Limiting speed
D_3	C	T_1	d_a min.	D_a max.	r_a max.	dyn. C_a N	stat. C_{0a} N	C_{ua} N	A	n_G min^{-1}
–	–	–	154	146	1	112 000	390 000	17 200	0,75	2 800
–	–	–	166	154	1,5	183 000	540 000	18 900	1,7	1 900
–	–	–	166	160	1,5	183 000	540 000	18 900	1,7	1 900
195	17	53	166	160	1,5	183 000	540 000	18 900	1,7	1 900
–	–	–	187	168	2,1	360 000	1 060 000	35 000	6	1 500
–	–	–	164	156	1	112 000	400 000	16 900	0,85	2 600
–	–	–	176	164	1,5	190 000	570 000	19 200	1,9	1 900
–	–	–	176	170	1,5	190 000	570 000	19 200	1,9	1 900
210	17	55	176	170	1,5	190 000	570 000	19 200	1,9	1 900
–	–	–	200	180	2,1	405 000	1 250 000	40 000	8	1 400
–	–	–	174	166	1	110 000	400 000	16 700	0,9	2 400
–	–	–	189	176	1,5	236 000	735 000	24 200	2,8	1 800
–	–	–	189	180	1,5	236 000	735 000	24 200	2,8	1 800
225	20,5	60	189	180	1,5	236 000	735 000	24 200	2,8	1 800
–	–	–	210	190	2,1	415 000	1 340 000	41 500	9,5	1 400
–	–	–	210	200	2,1	415 000	1 340 000	41 500	9,5	1 400
260	26	92	210	200	2,1	415 000	1 340 000	41 500	9,5	1 400
–	–	–	184	176	1	112 000	430 000	17 200	1	2 200
–	–	–	199	186	1,5	240 000	765 000	24 700	3,2	1 700
–	–	–	199	190	1,5	240 000	765 000	24 700	3,2	1 700
235	21	61	199	190	1,5	240 000	765 000	24 700	3,2	1 700
–	–	–	226	204	2,5	465 000	1 560 000	47 000	13	1 200
–	–	–	197	188	1	132 000	500 000	19 400	1,4	2 000
–	–	–	212	198	1,5	285 000	930 000	28 500	4,5	1 600
–	–	–	212	200	1,5	285 000	930 000	28 500	4,5	1 600
250	21,5	65	212	200	1,5	285 000	930 000	28 500	4,5	1 600
–	–	–	236	214	2,5	465 000	1 560 000	46 000	13	1 200

Axial deep groove ball bearings

Single direction



511, 512, 513



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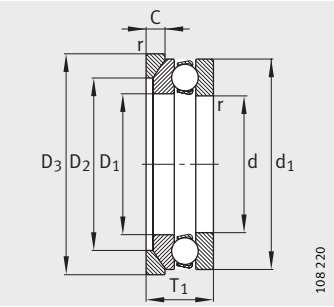
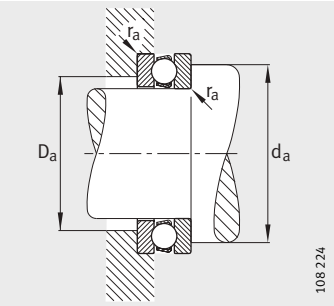
Spherical housing locating washer

Dimension table (continued) · Dimensions in mm

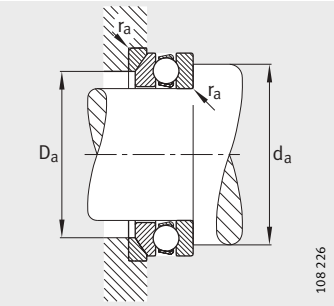
Designation		Mass m		Dimensions								
Bearing	Seating washer	Bearing ≈kg	Seating washer ≈kg	d	D	T	D_1	d_1	r min.	R	A	D_2
51136-MP	–	3,06	–	**180**	225	34	183	222	1,1	–	–	–
51236-MP	–	8,56	–	**180**	250	56	183	245	1,5	–	–	–
53236-MP	–	8,19	–	**180**	250	58,2	183	245	1,5	200	112	–
53236-MP	**U236**	8,19	1,25	**180**	250	58,2	183	245	1,5	200	112	210
51336-MP	–	24,8	–	**180**	300	95	184	295	3	–	–	–
51138-MP	–	3,94	–	**190**	240	37	193	237	1,1	–	–	–
51238-MP	–	11,6	–	**190**	270	62	194	265	2	–	–	–
53238-MP	–	11,5	–	**190**	270	65,7	195	265	2	200	98	–
53238-MP	**U238**	11,5	2,65	**190**	270	65,7	195	265	2	200	98	230
51338-MP	–	31,9	–	**190**	320	105	195	315	4	–	–	–
51140-MP	–	4,12	–	**200**	250	37	203	247	1,1	–	–	–
51240-MP	–	12	–	**200**	280	62	204	275	2	–	–	–
51340-MP	–	40,9	–	**200**	340	110	205	335	4	–	–	–
51144-MP	–	4,54	–	**220**	270	37	223	267	1,1	–	–	–
51244-MP	–	13,1	–	**220**	300	63	224	295	2	–	–	–
51148-MP	–	7,41	–	**240**	300	45	243	297	1,5	–	–	–
51248-MP	–	22,9	–	**240**	340	78	244	335	2,1	–	–	–
51152-MP	–	7,89	–	**260**	320	45	263	317	1,5	–	–	–
51252-MP	–	24,8	–	**260**	360	79	264	355	2,1	–	–	–
51156-MP	–	12	–	**280**	350	53	283	347	1,5	–	–	–
51256-MP	–	23,7	–	**280**	380	80	284	375	2,1	–	–	–
51160-MP	–	17,1	–	**300**	380	62	304	376	2	–	–	–
51260-MP	–	41,8	–	**300**	420	95	304	415	3	–	–	–
51164-MP	–	18,5	–	**320**	400	63	324	396	2	–	–	–
51264-MP	–	44,6	–	**320**	440	95	325	435	3	–	–	–



532
Spherical housing locating washer, seating washer U2



Mounting dimensions

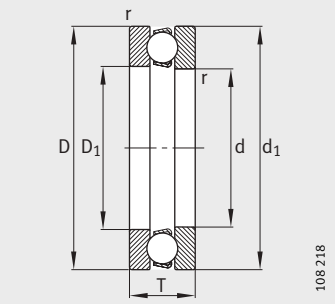


Mounting dimensions

			Mounting dimensions			Basic load ratings		Fatigue limit load	Minimum load factor	Limiting speed
D_3	C	T_1	d_a min.	D_a max.	r_a max.	dyn. C_a N	stat. C_{0a} N	C_{ua} N	A	n_G min^{-1}
–	–	–	207	198	1	134 000	530 000	20 100	1,5	2 000
–	–	–	222	208	1,5	305 000	1 040 000	31 500	5,3	1 600
–	–	–	222	210	1,5	305 000	1 040 000	31 500	5,3	1 600
260	21,5	66	222	210	1,5	305 000	1 040 000	31 500	5,3	1 600
–	–	–	252	228	2,5	520 000	1 830 000	52 000	18	1 100
–	–	–	220	210	1	170 000	655 000	23 200	2,4	1 800
–	–	–	238	222	2	335 000	1 160 000	34 500	7	1 500
–	–	–	238	230	2	335 000	1 160 000	34 500	7	1 500
280	23	73	238	230	2	335 000	1 160 000	34 500	7	1 500
–	–	–	268	242	3	600 000	2 200 000	61 000	26	1 000
–	–	–	230	220	1	170 000	655 000	22 700	2,4	1 800
–	–	–	248	232	2	340 000	1 220 000	35 000	8	1 400
–	–	–	284	256	3	620 000	2 400 000	65 000	30	950
–	–	–	250	240	1	176 000	735 000	24 500	3	1 700
–	–	–	268	252	2	355 000	1 340 000	36 500	9,5	1 300
–	–	–	276	264	1,5	232 000	965 000	31 000	5	1 600
–	–	–	300	280	2,1	465 000	1 860 000	48 000	18	1 100
–	–	–	296	284	1,5	236 000	1 020 000	31 500	5,6	1 500
–	–	–	320	300	2,1	490 000	2 040 000	52 000	22	1 000
–	–	–	322	308	1,5	315 000	1 340 000	40 500	10	1 300
–	–	–	340	320	2,1	490 000	2 160 000	53 000	24	950
–	–	–	348	332	2	365 000	1 600 000	46 000	14	1 200
–	–	–	372	348	2,5	585 000	2 700 000	63 000	38	850
–	–	–	368	352	2	375 000	1 700 000	47 500	16	1 100
–	–	–	392	368	2,5	600 000	2 800 000	64 000	43	850

Axial deep groove ball bearings

Single direction



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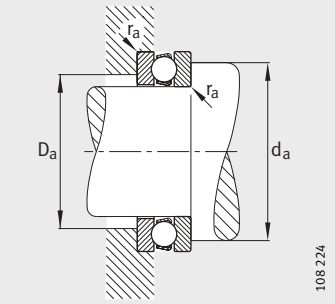
Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions					
	m	d	D	T	D_1	d_1	r
	≈kg						min.
51168-MP	19,9	**340**	420	64	344	416	2
51268-MP	47,6	**340**	460	96	345	455	3
51172-MP	21,5	**360**	440	65	364	436	2
51272-MP	70,4	**360**	500	110	365	495	4
51176-MP	22,4	**380**	460	65	384	456	2
51180-MP	23,5	**400**	480	65	404	476	2
51184-MP	24,4	**420**	500	65	424	495	2
51192-MP	37,2	**460**	560	80	464	555	2,1
511/500-MP	44,9	**500**	600	80	505	595	2,1
511/530-MP	55,9	**530**	640	85	535	635	3
511/560-MP	58,8	**560**	670	85	565	665	3

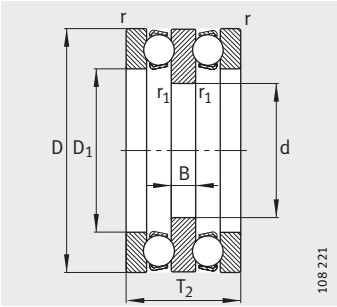


Mounting dimensions

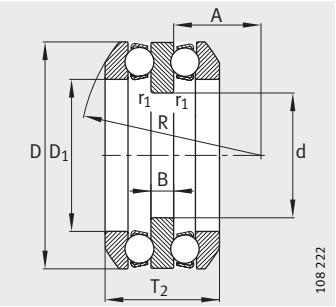
Mounting dimensions			Basic load ratings		Fatigue limit load	Minimum load factor	Limiting speed
d_a	D_a	r_a	dyn. C_a	stat. C_{0a}	C_{ua}	A	n_G
min.	max.	max.	N	N	N		min^{-1}
388	372	2	380 000	1 800 000	49 000	18	1 000
412	388	2,5	620 000	3 050 000	67 000	50	800
408	392	2	405 000	2 000 000	45 000	22	1 000
444	416	3	720 000	3 650 000	79 000	70	700
428	412	2	430 000	2 240 000	48 500	24	950
448	432	2	440 000	2 320 000	49 500	28	900
468	452	2	440 000	2 450 000	51 000	30	900
520	500	2,1	530 000	3 100 000	61 000	50	800
560	540	2,1	550 000	3 350 000	63 000	56	750
596	574	2,5	620 000	3 900 000	73 000	80	670
626	604	2,5	630 000	4 150 000	74 000	85	670

Axial deep groove ball bearings

Double direction



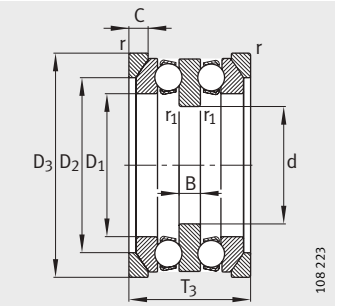
522, 523



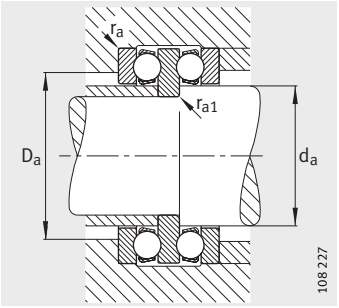
542, 543
Spherical housing locating washers

Dimension table · Dimensions in mm

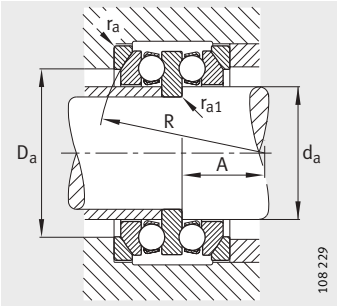
Designation		Mass m		Dimensions							
Bearing	Seating washer	Bearing ≈kg	Seating washer ≈kg	d	D	T_2	D_1	B	r min.	r_1 min.	R
52202	–	0,076	–	**10**	32	22	17	5	0,6	0,3	–
52204	–	0,145	–	**15**	40	26	22	6	0,6	0,3	–
52205	–	0,215	–	**20**	47	28	27	7	0,6	0,3	–
54205	–	0,221	–	**20**	47	31,4	27	7	0,6	0,3	40
54205	**U205**	0,221	0,032	**20**	47	31,4	27	7	0,6	0,3	40
52305	–	0,291	–	**20**	52	34	27	8	1	0,3	–
54305	–	0,303	–	**20**	52	37,6	27	8	1	0,3	45
54305	**U305**	0,303	0,044	**20**	52	37,6	27	8	1	0,3	45
52206	–	0,236	–	**25**	52	29	32	7	0,6	0,3	–
54206	–	0,269	–	**25**	52	32,6	32	7	0,6	0,3	45
54206	**U206**	0,269	0,038	**25**	52	32,6	32	7	0,6	0,3	45
52306	–	0,435	–	**25**	60	38	32	9	1	0,3	–
54306	–	0,553	–	**25**	60	41,2	32	9	1	0,3	50
54306	**U306**	0,553	0,056	**25**	60	41,2	32	9	1	0,3	50
52207	–	0,371	–	**30**	62	34	37	8	1	0,3	–
54207	–	0,749	–	**30**	62	37,8	37	8	1	0,3	50
54207	**U207**	0,749	0,057	**30**	62	37,8	37	8	1	0,3	50
52307	–	0,63	–	**30**	68	44	37	10	1	0,3	–
54307	–	0,802	–	**30**	68	47,2	37	10	1	0,3	56
54307	**U307**	0,802	0,083	**30**	68	47,2	37	10	1	0,3	56
52208	–	0,509	–	**30**	68	36	42	9	1	0,6	–
54208	–	0,513	–	**30**	68	38,6	42	9	1	0,6	56
54208	**U208**	0,513	0,071	**30**	68	38,6	42	9	1	0,6	56
52308	–	1,02	–	**30**	78	49	42	12	1	0,6	–
52209	–	0,539	–	**35**	73	37	47	9	1	0,6	–
54209	–	0,537	–	**35**	73	39,6	47	9	1	0,6	56
54209	**U209**	0,537	0,088	**35**	73	39,6	47	9	1	0,6	56
52309	–	1,15	–	**35**	85	52	47	12	1	0,6	–
54309	–	2,15	–	**35**	85	56,2	47	12	1	0,6	64
54309	**U309**	2,15	0,173	**35**	85	56,2	47	12	1	0,6	64



542, 543
Spherical housing locating washers, seating washers U2, U3



Mounting dimensions

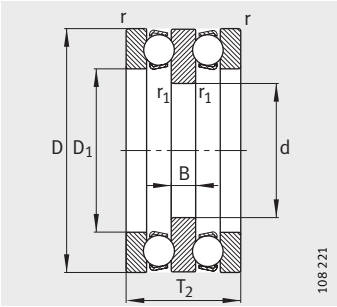


Mounting dimensions

					Mounting dimensions				Basic load ratings		Fatigue limit load	Minimum load factor	Limiting speed
A	D_2	D_3	C	T_3	d_a	D_a max.	r_a max.	r_{a1} max.	dyn. C_a N	stat. C_{0a} N	C_{ua} N	A	min^{-1}
–	–	–	–	–	15	22	0,6	0,3	16 600	25 000	1 100	0,003	9 000
–	–	–	–	–	20	28	0,6	0,3	22 400	37 500	1 660	0,01	7 500
–	–	–	–	–	25	34	0,6	0,3	28 000	50 000	2 220	0,013	6 700
16,5	–	–	–	–	25	36	0,6	0,3	28 000	50 000	2 220	0,013	6 700
16,5	36	50	5,5	36	25	36	0,6	0,3	28 000	50 000	2 220	0,013	6 700
–	–	–	–	–	25	36	1	0,3	34 500	55 000	2 450	0,019	5 300
18	–	–	–	–	25	38	1	0,3	34 500	55 000	2 450	0,019	5 300
18	38	55	6	42	25	38	1	0,3	34 500	55 000	2 450	0,019	5 300
–	–	–	–	–	30	39	0,6	0,3	25 000	46 500	2 040	0,01	6 300
20	–	–	–	–	30	42	0,6	0,3	25 000	46 500	2 040	0,01	6 300
20	42	55	5,5	37	30	42	0,6	0,3	25 000	46 500	2 040	0,01	6 300
–	–	–	–	–	30	42	1	0,3	38 000	65 500	2 850	0,028	5 000
19,5	–	–	–	–	30	45	1	0,3	38 000	65 500	2 850	0,028	5 000
19,5	45	62	7	46	30	45	1	0,3	38 000	65 500	2 850	0,028	5 000
–	–	–	–	–	35	46	1	0,3	35 500	67 000	3 000	0,028	5 300
21	–	–	–	–	35	48	1	0,3	35 500	67 000	3 000	0,028	5 300
21	48	65	7	42	35	48	1	0,3	35 500	67 000	3 000	0,028	5 300
–	–	–	–	–	35	48	1	0,3	50 000	88 000	3 900	0,05	4 500
21	–	–	–	–	35	52	1	0,3	50 000	88 000	3 900	0,05	4 500
21	52	72	7,5	52	35	52	1	0,3	50 000	88 000	3 900	0,05	4 500
–	–	–	–	–	40	51	1	0,6	46 500	98 000	4 300	0,05	4 800
25	–	–	–	–	40	55	1	0,6	46 500	98 000	4 300	0,05	4 800
25	55	72	7	44	40	55	1	0,6	46 500	98 000	4 300	0,05	4 800
–	–	–	–	–	40	55	1	0,6	61 000	112 000	5 000	0,08	4 000
–	–	–	–	–	45	56	1	0,6	39 000	80 000	3 550	0,043	4 800
23	–	–	–	–	45	60	1	0,6	39 000	80 000	3 550	0,043	4 800
23	60	78	7,5	45	45	60	1	0,6	39 000	80 000	3 550	0,043	4 800
–	–	–	–	–	45	61	1	0,6	75 000	140 000	6 300	0,12	3 600
21	–	–	–	–	45	65	1	0,6	75 000	140 000	6 300	0,12	3 600
21	65	90	10	62	45	65	1	0,6	75 000	140 000	6 300	0,12	3 600

Axial deep groove ball bearings

Double direction



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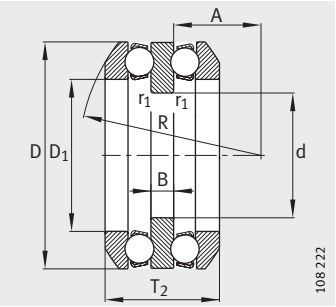
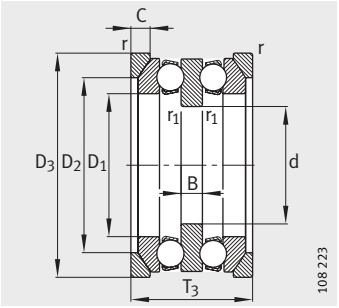


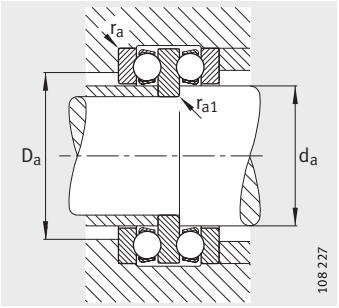
542, 543
Spherical housing locating washers

Dimension table (continued) · Dimensions in mm

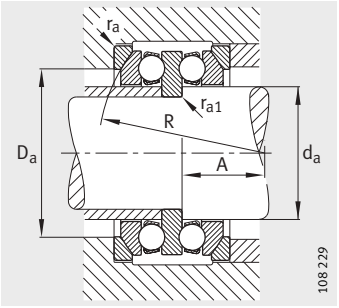
Designation		Mass m		Dimensions							
Bearing	Seating washer	Bearing ≈kg	Seating washer ≈kg	d	D	T_2	D_1	B	r min.	r_1 min.	R
52210	–	0,635	–	**40**	78	39	52	9	1	0,6	–
54210	–	0,625	–	**40**	78	42	52	9	1	0,6	64
54210	**U210**	0,625	0,098	**40**	78	42	52	9	1	0,6	64
52310	–	1,76	–	**40**	95	58	52	14	1,1	0,6	–
54310	–	1,84	–	**40**	95	64,6	52	14	1,1	0,6	72
54310	**U310**	1,84	0,225	**40**	95	64,6	52	14	1,1	0,6	72
52211	–	0,571	–	**45**	90	45	57	10	1	0,6	–
54211	–	1,02	–	**45**	90	49,6	57	10	1	0,6	72
54211	**U211**	1,02	0,152	**45**	90	49,6	57	10	1	0,6	72
52311	–	2,37	–	**45**	105	64	57	15	1,1	0,6	–
54311	–	2,53	–	**45**	105	72,6	57	15	1,1	0,6	80
54311	**U311**	2,53	0,277	**45**	105	72,6	57	15	1,1	0,6	80
52212	–	1,12	–	**50**	95	46	62	10	1	0,6	–
54212	–	1,17	–	**50**	95	50	62	10	1	0,6	72
54212	**U212**	1,17	0,165	**50**	95	50	62	10	1	0,6	72
52312	–	2,49	–	**50**	110	64	62	15	1,1	0,6	–
54312	–	2,59	–	**50**	110	70,6	62	15	1,1	0,6	90
54312	**U312**	2,59	0,31	**50**	110	70,6	62	15	1,1	0,6	90
52213	–	1,19	–	**55**	100	47	67	10	1	0,6	–
52313	–	2,5	–	**55**	115	65	67	15	1,1	0,6	–
52214	–	1,3	–	**55**	105	47	72	10	1	1	–
52314	–	3,55	–	**55**	125	72	72	16	1,1	1	–
54314	–	3,77	–	**55**	125	80,4	72	16	1,1	1	100
54314	**U314**	3,77	0,408	**55**	125	80,4	72	16	1,1	1	100
52215	–	1,48	–	**60**	110	47	77	10	1	1	–
54215	–	1,87	–	**60**	110	49,6	77	10	1	1	90
54215	**U215**	1,87	0,21	**60**	110	49,6	77	10	1	1	90
52315	–	4,72	–	**60**	135	79	77	18	1,5	1	–
54315	–	5,92	–	**60**	135	87,2	77	18	1,5	1	100
54315	**U315**	5,92	0,544	**60**	135	87,2	77	18	1,5	1	100
52216	–	1,55	–	**65**	115	48	82	10	1	1	–
54216	–	1,6	–	**65**	115	51	82	10	1	1	90
54216	**U216**	1,6	0,218	**65**	115	51	82	10	1	1	90
52316	–	4,82	–	**65**	140	79	82	18	1,5	1	–
54316	–	4,93	–	**65**	140	86,2	82	18	1,5	1	112
54316	**U316**	4,93	0,57	**65**	140	86,2	82	18	1,5	1	112



542, 543
Spherical housing locating washers, seating washers U2, U3



Mounting dimensions

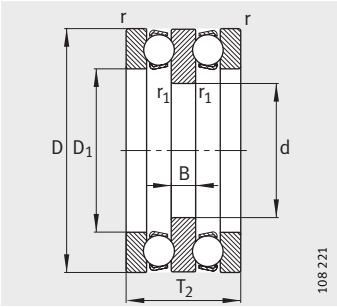


Mounting dimensions

					Mounting dimensions				Basic load ratings		Fatigue limit load	Minimum load factor	Limiting speed
A	D_2	D_3	C	T_3	d_a	D_a max.	r_a max.	r_{a1} max.	dyn. C_a N	stat. C_{0a} N	C_{ua} N	A	min^{-1}
–	–	–	–	–	50	61	1	0,6	50 000	106 000	4 700	0,07	4 300
30,5	–	–	–	–	50	62	1	0,6	50 000	106 000	4 700	0,07	4 300
30,5	62	82	7,5	47	50	62	1	0,6	50 000	106 000	4 700	0,07	4 300
–	–	–	–	–	50	68	1	0,6	86 500	170 000	7 500	0,18	3 400
23	–	–	–	–	50	72	1	0,6	86 500	170 000	7 500	0,18	3 400
23	72	100	11	70	50	72	1	0,6	86 500	170 000	7 500	0,18	3 400
–	–	–	–	–	55	69	1	0,6	61 000	134 000	6 100	0,11	3 800
32,5	–	–	–	–	55	72	1	0,6	61 000	134 000	6 100	0,11	3 800
32,5	72	95	9	55	55	72	1	0,6	61 000	134 000	6 100	0,11	3 800
–	–	–	–	–	55	75	1	0,6	102 000	208 000	9 000	0,26	3 200
25,5	–	–	–	–	55	80	1	0,6	102 000	208 000	9 000	0,26	3 200
25,5	80	110	11,5	78	55	80	1	0,6	102 000	208 000	9 000	0,26	3 200
–	–	–	–	–	60	74	1	0,6	62 000	140 000	6 200	0,12	3 800
30,5	–	–	–	–	60	78	1	0,6	62 000	140 000	6 200	0,12	3 800
30,5	78	100	9	56	60	78	1	0,6	62 000	140 000	6 200	0,12	3 800
–	–	–	–	–	60	80	1	0,6	100 000	208 000	9 000	0,28	3 200
36,5	–	–	–	–	60	85	1	0,6	100 000	208 000	9 000	0,28	3 200
36,5	85	115	11,5	78	60	85	1	0,6	100 000	208 000	9 000	0,28	3 200
–	–	–	–	–	65	79	1	0,6	64 000	150 000	6 600	0,14	3 600
–	–	–	–	–	65	85	1	0,6	106 000	220 000	9 700	0,32	3 000
–	–	–	–	–	70	84	1	1	65 500	160 000	7 000	0,16	3 600
–	–	–	–	–	70	92	1	1	134 000	290 000	12 900	0,5	2 800
39	–	–	–	–	70	98	1	1	134 000	290 000	12 900	0,5	2 800
39	98	130	13	88	70	98	1	1	134 000	290 000	12 900	0,5	2 800
–	–	–	–	–	75	89	1	1	67 000	170 000	7 500	0,18	3 400
47,5	–	–	–	–	75	92	1	1	67 000	170 000	7 500	0,18	3 400
47,5	92	115	9,5	57	75	92	1	1	67 000	170 000	7 500	0,18	3 400
–	–	–	–	–	75	99	1,5	1	163 000	360 000	15 400	0,75	2 400
32,5	–	–	–	–	75	105	1,5	1	163 000	360 000	15 400	0,75	2 400
32,5	105	140	15	95	75	105	1,5	1	163 000	360 000	15 400	0,75	2 400
–	–	–	–	–	80	94	1	1	75 000	190 000	8 500	0,22	3 400
45	–	–	–	–	80	98	1	1	75 000	190 000	8 500	0,22	3 400
45	98	120	10	58	80	98	1	1	75 000	190 000	8 500	0,22	3 400
–	–	–	–	–	80	104	1,5	1	160 000	360 000	15 100	0,8	2 400
45,5	–	–	–	–	80	110	1,5	1	160 000	360 000	15 100	0,8	2 400
45,5	110	145	15	95	80	110	1,5	1	160 000	360 000	15 100	0,8	2 400

Axial deep groove ball bearings

Double direction



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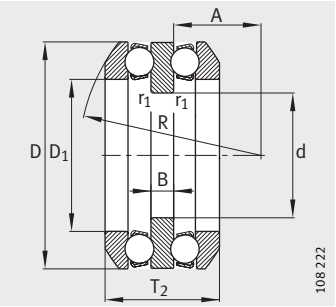
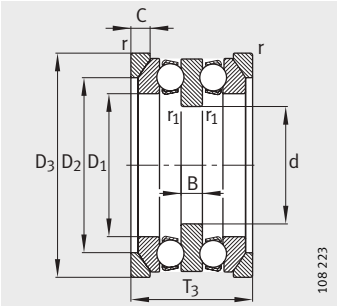


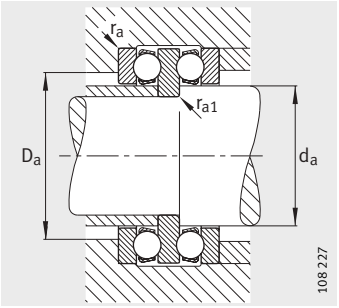
542, 543
Spherical housing locating washers

Dimension table (continued) · Dimensions in mm

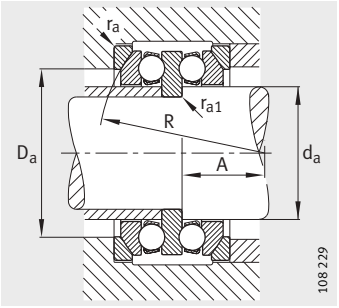
Designation		Mass m		Dimensions							
Bearing	Seating washer	Bearing ≈kg	Seating washer ≈kg	d	D	T_2	D_1	B	r min.	r_1 min.	R
52217	–	2,23	–	**70**	125	55	88	12	1	1	–
54217	–	2,25	–	**70**	125	59,2	88	12	1	1	100
54217	**U217**	2,25	0,29	**70**	125	59,2	88	12	1	1	100
52317	–	6,21	–	**70**	150	87	88	19	1,5	1	–
54317	–	6,27	–	**70**	150	95,2	88	19	1,5	1	112
54317	**U317**	6,27	0,803	**70**	150	95,2	88	19	1,5	1	112
52218	–	3,05	–	**75**	135	62	93	14	1,1	1	–
54218	–	3,11	–	**75**	135	69	93	14	1,1	1	100
54218	**U218**	3,11	0,425	**75**	135	69	93	14	1,1	1	100
52318	–	6,62	–	**75**	155	88	93	19	1,5	1	–
54318	–	6,74	–	**75**	155	97,2	93	19	1,5	1	112
54318	**U318**	6,74	0,83	**75**	155	97,2	93	19	1,5	1	112
52220	–	3,83	–	**85**	150	67	103	15	1,1	1	–
54220	–	3,87	–	**85**	150	72,8	103	15	1,1	1	112
54220	**U220**	3,87	0,507	**85**	150	72,8	103	15	1,1	1	112
52320	–	8,71	–	**85**	170	97	103	21	1,5	1	–
54320	–	8,81	–	**85**	170	105,4	103	21	1,5	1	125
54320	**U320**	8,81	0,95	**85**	170	105,4	103	21	1,5	1	125
52222	–	4,06	–	**95**	160	67	113	15	1,1	1	–
52322-MP	–	14	–	**95**	190	110	113	24	2	1	–
54322-MP	–	14	–	**95**	190	118,4	113	24	2	1	140
54322-MP	**U322**	14	1,28	**95**	190	118,4	113	24	2	1	140
52224	–	4,82	–	**100**	170	68	123	15	1,1	1,1	–
52324-MP	–	16,8	–	**100**	210	123	123	27	2,1	1,1	–
52226	–	7,26	–	**110**	190	80	133	18	1,5	1,1	–
52326-MP	–	22	–	**110**	225	130	134	30	2,1	1,1	–
52228	–	7,78	–	**120**	200	81	143	18	1,5	1,1	–
52328-MP	–	28,3	–	**120**	240	140	144	31	2,1	1,1	–
52230-MP	–	10,7	–	**130**	215	89	153	20	1,5	1,1	–
52330-MP	–	29,4	–	**130**	250	140	154	31	2,1	1,1	–
52232-MP	–	12,2	–	**140**	225	90	163	20	1,5	1,1	–
52234-MP	–	14	–	**150**	240	97	173	21	1,5	1,1	–



542, 543
Spherical housing locating washers, seating washers U2, U3



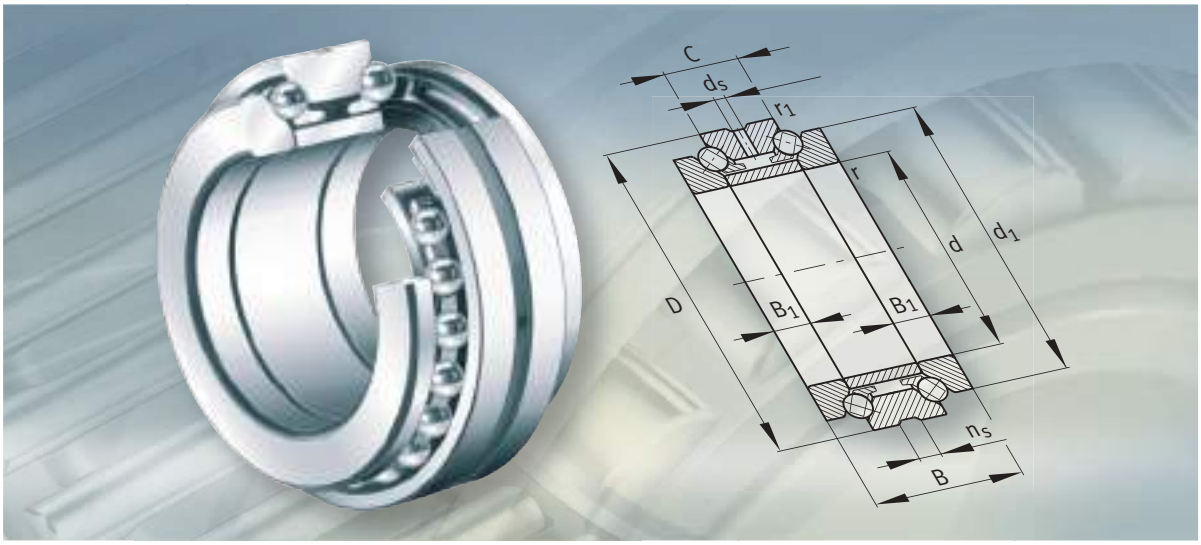
Mounting dimensions



Mounting dimensions

					Mounting dimensions				Basic load ratings		Fatigue limit load	Minimum load factor	Limiting speed
A	D_2	D_3	C	T_3	d_a	D_a max.	r_a max.	r_{a1} max.	dyn. C_a N	stat. C_{0a} N	C_{ua} N	A	min^{-1}
–	–	–	–	–	85	101	1	1	98 000	250 000	10 900	0,38	3 000
49,5	–	–	–	–	85	105	1	1	98 000	250 000	10 900	0,38	3 000
49,5	105	130	11	67	85	105	1	1	98 000	250 000	10 900	0,38	3 000
–	–	–	–	–	85	111	1,5	1	186 000	415 000	16 700	1,1	2 200
39	–	–	–	–	85	115	1,5	1	186 000	415 000	16 700	1,1	2 200
39	115	155	17,5	105	85	115	1,5	1	186 000	415 000	16 700	1,1	2 200
–	–	–	–	–	90	108	1	1	118 000	300 000	12 300	0,53	2 800
42	–	–	–	–	90	110	1	1	118 000	300 000	12 300	0,53	2 800
42	110	140	13,5	76	90	110	1	1	118 000	300 000	12 300	0,53	2 800
–	–	–	–	–	90	116	1,5	1	193 000	455 000	17 700	1,2	2 000
36,5	–	–	–	–	90	120	1,5	1	193 000	455 000	17 700	1,2	2 000
36,5	120	160	18	106	90	120	1,5	1	193 000	455 000	17 700	1,2	2 000
–	–	–	–	–	100	120	1	1	122 000	320 000	14 400	0,67	2 600
49	–	–	–	–	100	125	1	1	122 000	320 000	14 400	0,67	2 600
49	125	155	14	81	100	125	1	1	122 000	320 000	14 400	0,67	2 600
–	–	–	–	–	100	128	1,5	1	240 000	585 000	21 900	1,9	1 900
42	–	–	–	–	100	135	1,5	1	240 000	585 000	21 900	1,9	1 900
42	135	175	18	115	100	135	1,5	1	240 000	585 000	21 900	1,9	1 900
–	–	–	–	–	110	130	1	1	134 000	365 000	16 000	0,85	2 400
–	–	–	–	–	110	142	2	1	280 000	750 000	27 000	3	1 700
47	–	–	–	–	110	150	2	1	280 000	750 000	27 000	3	1 700
47	150	195	20,5	128	110	150	2	1	280 000	750 000	27 000	3	1 700
–	–	–	–	–	120	140	1	1	134 000	390 000	14 200	0,95	2 200
–	–	–	–	–	120	156	2,1	1	325 000	915 000	31 500	4,5	1 600
–	–	–	–	–	130	154	1,5	1	183 000	540 000	18 900	1,7	1 900
–	–	–	–	–	130	168	2,1	1	360 000	1 060 000	35 000	6	1 500
–	–	–	–	–	140	164	1,5	1	190 000	570 000	19 200	1,9	1 900
–	–	–	–	–	140	180	2,1	1	405 000	1 250 000	40 000	8	1 400
–	–	–	–	–	150	176	1,5	1	236 000	735 000	24 200	2,8	1 800
–	–	–	–	–	150	190	2,1	1	415 000	1 340 000	41 500	9,5	1 400
–	–	–	–	–	160	186	1,5	1	240 000	765 000	24 700	3,2	1 700
–	–	–	–	–	170	198	1,5	1	285 000	930 000	28 500	4,5	1 600

FAG



Axial angular contact ball bearings

Axial angular contact ball bearings

Product overview Axial angular contact ball bearings

Double direction

2344, 2347

Axial angular contact ball bearings

Features

Double direction axial angular contact ball bearings are precision bearings without self-retention and with restricted tolerances to class SP. They comprise solid shaft locating washers, a spacer ring, a housing locating washer and ball and cage assemblies with solid brass cages. The bearing parts are matched to each other and can be fitted separately, but must not be interchanged with parts from bearings of the same size.

High axial load carrying capacity

The contact angle is 60°. As a result, these highly rigid axial angular contact ball bearings can support high axial forces in both directions.

The double direction precision bearings are therefore particularly suitable for precision spindle bearing arrangements in machine tools. In this case, the axial angular contact ball bearing is combined with a double row cylindrical roller bearing with a tapered bore, which supports the radial forces.

Two designs

Axial angular contact ball bearings are available in two designs. Series 2344 can be fitted on the small diameter of the shaft taper and series 2347 on the large diameter.

These series have the same nominal outside diameter as cylindrical roller bearings NN30..-AS-K. However, the outside diameter tolerance is designed to give a loose fit when the seats of the axial angular contact ball bearing and the cylindrical roller bearing are machined together. Guide values for the machining tolerances of the bearing seats are given in the publication Super Precision Bearings AC 41 130.

Sealing/lubrication

The bearings are not sealed and not greased. They can be lubricated using oil or grease. Higher speeds can be achieved with oil lubrication. In order to allow oil to flow between the two rows of balls, the housing locating washer has a lubrication groove and lubrication holes.

At high speeds, overlubrication of the radial bearing can be prevented if the installation space is separated between the axial angular contact ball bearing and the cylindrical roller bearing.

Operating temperature

Axial angular contact ball bearings can be used at operating temperatures from –30 °C to +150 °C, restricted by the lubricant.

Cages

Each row of rolling elements has a ball-guided solid brass cage. The cage is indicated by the suffix M and, together with the lubrication, has a considerable influence on the speed suitability of the bearing.

Suffixes

Suffixes for available designs: see table.

Available designs

Suffix	Description	Design
M	Solid brass cage, ball-guided	Standard
SP	Restricted tolerance class SP	Standard
UP	Restricted tolerance class UP	Special design[1)]

1) Available by agreement.

Axial angular contact ball bearings

Design and safety guidelines

Equivalent dynamic bearing load

Axial angular contact ball bearings, installed adjacent to a cylindrical roller bearing, support axial forces only:

$$P = F_a$$

P N
Equivalent dynamic bearing load
F_a N
Axial dynamic bearing load.

Equivalent static bearing load

Axial angular contact ball bearings, installed adjacent to a cylindrical roller bearing, support axial forces only:

$$P_0 = F_{0a}$$

P_0 N
Equivalent static bearing load
F_{0a} N
Axial static bearing load.

Static load safety factor

In order to achieve sufficiently smooth running of the bearings, a static load safety factor $S_0 \geqq 2{,}5$ is required:

$$S_0 = \frac{C_{0a}}{P_0}$$

S_0 –
Static load safety factor
C_{0a} N
Basic static load rating according to dimension tables
P_0 N
Equivalent static bearing load.

Speeds

Double direction axial angular contact ball bearings are suitable for high speeds. Under certain circumstances, the high values may not be achieved if the cylindrical roller bearing arranged adjacent to the axial angular contact ball bearing is preloaded.

Caution! The limiting speeds n_G given in the dimension tables are valid for lubrication with grease or for minimal quantity lubrication with oil and must not be exceeded.

Preload

The preload is determined by the spacer ring arranged between the two shaft locating washers.

Mounting dimensions

The maximum values for the radii r_a and the diameters of the abutment surfaces d_a, D_a are indicated in the dimension tables.

Accuracy

The dimensional and geometrical tolerances correspond to the Schaeffler Group tolerance class SP.

Tolerances for shaft locating washer

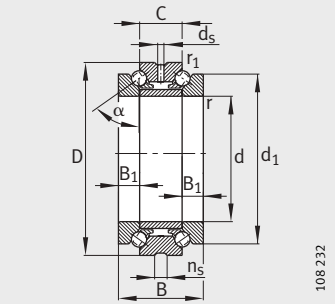
Bore d mm		Bore deviation Δ_{dmp} µm		Variation V_{dp} µm	Wall thickness S_i µm	Width deviation Δ_{Hs} µm	
over	incl.	min.	max.			min.	max.
18	30	−8	0	6	3	−150	+50
30	50	−10	0	8	3	−200	+75
50	80	−12	0	9	4	−250	+100
80	120	−15	0	11	4	−300	+125
120	180	−18	0	14	5	−350	+150
180	250	−22	0	17	5	−400	+175
250	315	−25	0	19	7	−450	+200
315	400	−30	0	22	7	−600	+250
400	500	−35	0	26	9	−750	+300

Tolerances for housing locating washer

Outside diameter D mm		Deviation of outside diameter Δ_{Dmp} µm		Variation V_{Dp} µm	Wall thickness variation S_e µm
over	incl.	min.	max.		
50	80	−43	−24	6	The wall thickness variation S_e for the housing locating washer is identical to S_i for the shaft locating washer
80	120	−50	−28	8	
120	180	−58	−33	9	
180	250	−66	−37	10	
250	315	−73	−41	12	
315	400	−82	−46	13	
400	500	−90	−50	15	
500	630	−99	−55	16	

Axial angular contact ball bearings

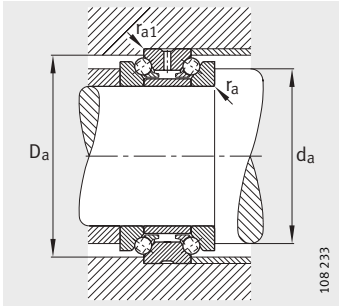
Double direction



2344, 2347
Contact angle α = 60°

Dimension table · Dimensions in mm

Designation	Mass	Dimensions							
	m	d	D	B	C	d_1	B_1	r	r_1
	≈kg							min.	min.
234406-M-SP	0,297	**30**	55	32	16	47	8	1	0,15
234706-M-SP	0,232	**32**	55	32	16	47	8	1	0,15
234407-M-SP	0,318	**35**	62	34	17	53	8,5	1	0,15
234707-M-SP	0,302	**37**	62	34	17	53	8,5	1	0,15
234408-M-SP	0,39	**40**	68	36	18	58,5	9	1	0,15
234708-M-SP	0,371	**42**	68	36	18	58,5	9	1	0,15
234409-M-SP	0,486	**45**	75	38	19	65	9,5	1	0,15
234709-M-SP	0,472	**47**	75	38	19	65	9,5	1	0,15
234410-M-SP	0,485	**50**	80	38	19	70	9,5	1	0,15
234710-M-SP	0,408	**52**	80	38	19	70	9,5	1	0,15
234411-M-SP	0,944	**55**	90	44	22	78	11	1,1	0,3
234711-M-SP	0,884	**57**	90	44	22	78	11	1,1	0,3
234412-M-SP	0,884	**60**	95	44	22	83	11	1,1	0,3
234712-M-SP	0,852	**62**	95	44	22	83	11	1,1	0,3
234413-M-SP	0,898	**65**	100	44	22	88	11	1,1	0,3
234713-M-SP	0,862	**67**	100	44	22	88	11	1,1	0,3
234414-M-SP	1,22	**70**	110	48	24	97	12	1,1	0,3
234714-M-SP	1,16	**73**	110	48	24	97	12	1,1	0,3
234415-M-SP	1,22	**75**	115	48	24	102	12	1,1	0,3
234715-M-SP	1,22	**78**	115	48	24	102	12	1,1	0,3
234416-M-SP	1,79	**80**	125	54	27	110	13,5	1,1	0,3
234716-M-SP	1,69	**83**	125	54	27	110	13,5	1,1	0,3
234417-M-SP	1,85	**85**	130	54	27	115	13,5	1,1	0,3
234717-M-SP	1,77	**88**	130	54	27	115	13,5	1,1	0,3
234418-M-SP	2,45	**90**	140	60	30	123	15	1,5	0,3
234718-M-SP	2,35	**93**	140	60	30	123	15	1,5	0,3
234419-M-SP	2,55	**95**	145	60	30	128	15	1,5	0,3
234719-M-SP	2,45	**98**	145	60	30	128	15	1,5	0,3
234420-M-SP	2,66	**100**	150	60	30	133	15	1,5	0,3
234720-M-SP	2,54	**103**	150	60	30	133	15	1,5	0,3
234421-M-SP	3,41	**105**	160	66	33	142	16,5	2	0,6
234721-M-SP	3,24	**109**	160	66	33	142	16,5	2	0,6

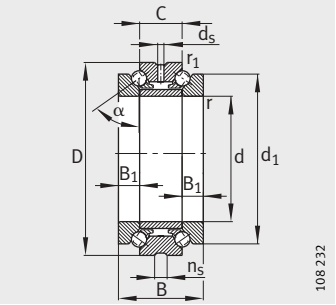


Mounting dimensions

		Mounting dimensions				Basic load ratings		Fatigue limit load	Limiting speeds	
d_s	n_s	d_a h12	D_a H12	r_a max.	r_{a1} max.	dyn. C_a N	stat. C_{0a} N	C_{ua} N	n_G grease min^{-1}	n_G oil min^{-1}
3,2	4,8	40,5	50,5	1	0,15	15 300	36 000	3 250	11 000	16 000
3,2	4,8	40,5	50,5	1	0,15	15 300	36 000	3 250	11 000	16 000
3,2	4,8	46,5	57	1	0,15	18 900	47 000	4 250	9 500	14 000
3,2	4,8	46,5	57	1	0,15	18 900	47 000	4 250	9 500	14 000
3,2	4,8	51,5	63,5	1	0,15	22 900	59 000	5 300	8 500	12 000
3,2	4,8	51,5	63,5	1	0,15	22 900	59 000	5 300	8 500	12 000
3,2	4,8	57,5	70	1	0,15	25 000	67 000	6 000	7 500	10 000
3,2	4,8	57,5	70	1	0,15	25 000	67 000	6 000	7 500	10 000
3,2	4,8	62,5	75	1	0,15	26 000	72 000	6 500	7 000	9 500
3,2	4,8	62,5	75	1	0,15	26 000	72 000	6 500	7 000	9 500
3,2	6,5	69	84,5	1	0,3	36 500	99 000	8 900	6 300	8 500
3,2	6,5	69	84,5	1	0,3	36 500	99 000	8 900	6 300	8 500
3,2	6,5	74	89,5	1	0,3	36 000	98 000	8 900	6 000	8 000
3,2	6,5	74	89,5	1	0,3	36 000	98 000	8 900	6 000	8 000
3,2	6,5	79	94,5	1	0,3	38 500	111 000	10 000	5 600	7 500
3,2	6,5	79	94,5	1	0,3	38 500	111 000	10 000	5 600	7 500
3,2	6,5	86,5	103,5	1	0,3	46 000	134 000	12 100	5 300	7 000
3,2	6,5	86,5	103,5	1	0,3	46 000	134 000	12 100	5 300	7 000
3,2	6,5	91,5	108,5	1	0,3	47 500	144 000	12 900	5 000	6 700
3,2	6,5	91,5	108,5	1	0,3	47 500	144 000	12 900	5 000	6 700
3,2	6,5	98,5	117	1	0,3	56 000	175 000	15 500	4 500	6 000
3,2	6,5	98,5	117	1	0,3	56 000	175 000	15 500	4 500	6 000
4,8	9,5	103,5	122	1	0,3	57 000	181 000	15 600	4 500	6 000
4,8	9,5	103,5	122	1	0,3	57 000	181 000	15 600	4 500	6 000
4,8	9,5	110,5	130,5	1,5	0,3	66 000	213 000	17 700	4 000	5 300
4,8	9,5	110,5	130,5	1,5	0,3	66 000	213 000	17 700	4 000	5 300
4,8	9,5	115,5	135,5	1,5	0,3	66 000	219 000	17 900	4 000	5 300
4,8	9,5	115,5	135,5	1,5	0,3	66 000	219 000	17 900	4 000	5 300
4,8	9,5	120,5	140,5	1,5	0,3	67 000	226 000	18 100	3 800	5 000
4,8	9,5	120,5	140,5	1,5	0,3	67 000	226 000	18 100	3 800	5 000
4,8	9,5	128	150	2	0,6	74 000	250 000	19 500	3 600	4 800
4,8	9,5	128	150	2	0,6	74 000	250 000	19 500	3 600	4 800

Axial angular contact ball bearings

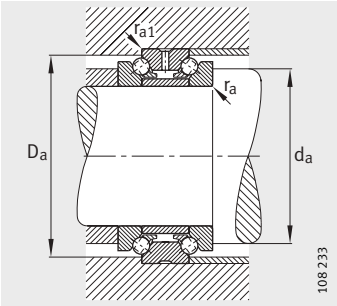
Double direction



2344, 2347
Contact angle α = 60°

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions							
	m	d	D	B	C	d_1	B_1	r	r_1
	≈kg							min.	min.
234422-M-SP	4,75	**110**	170	72	36	150	18	2	0,6
234722-M-SP	4,51	**114**	170	72	36	150	18	2	0,6
234424-M-SP	4,72	**120**	180	72	36	160	18	2	0,6
234724-M-SP	4,46	**124**	180	72	36	160	18	2	0,6
234426-M-SP	6,86	**130**	200	84	42	177	21	2	0,6
234726-M-SP	6,52	**135**	200	84	42	177	21	2	0,6
234428-M-SP	8,78	**140**	210	84	42	187	21	2,1	0,6
234728-M-SP	8,07	**145**	210	84	42	187	21	2,1	0,6
234430-M-SP	9,21	**150**	225	90	45	200	22,5	2,1	0,6
234730-M-SP	8,79	**155**	225	90	45	200	22,5	2,1	0,6
234432-M-SP	11,1	**160**	240	96	48	212	24	2,1	0,6
234732-M-SP	10,7	**165**	240	96	48	212	24	2,1	0,6
234434-M-SP	15,3	**170**	260	108	54	230	27	2,1	0,6
234734-M-SP	14,6	**176**	260	108	54	230	27	2,1	0,6
234436-M-SP	20,5	**180**	280	120	60	248	30	2,1	0,6
234736-M-SP	19,6	**187**	280	120	60	248	30	2,1	0,6
234438-M-SP	24,1	**190**	290	120	60	258	30	2,1	0,6
234738-M-SP	21,2	**197**	290	120	60	258	30	2,1	0,6
234440-M-SP	30,9	**200**	310	132	66	274	33	2,1	0,6
234740-M-SP	28,6	**207**	310	132	66	274	33	2,1	0,6
234444-M-SP	36,9	**220**	340	144	72	304	36	3	1,1
234744-M-SP	35,3	**228**	340	144	72	304	36	3	1,1
234448-M-SP	38,9	**240**	360	144	72	322	36	3	1,1
234748-M-SP	37,2	**248**	360	144	72	322	36	3	1,1
234452-M-SP	56,5	**260**	400	164	82	354	41	4	1,5
234752-M-SP	54,1	**269**	400	164	82	354	41	4	1,5
234456-M-SP	57,1	**280**	420	164	82	374	41	4	1,5
234756-M-SP	54,5	**289**	420	164	82	374	41	4	1,5
234460-M-SP	90,7	**300**	460	190	95	406	47,5	4	1,5
234760-M-SP	86,5	**310**	460	190	95	406	47,5	4	1,5
234464-M-SP	90,3	**320**	480	190	95	426	47,5	4	1,5
234764-M-SP	86,5	**330**	480	190	95	426	47,5	4	1,5

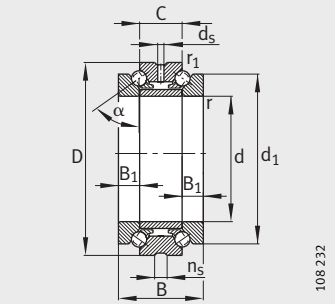


Mounting dimensions

		Mounting dimensions				Basic load ratings		Fatigue limit load	Limiting speeds	
d_s	n_s	d_a h12	D_a H12	r_a max.	r_{a1} max.	dyn. C_a N	stat. C_{0a} N	C_{ua} N	n_G grease min^{-1}	n_G oil min^{-1}
4,8	9,5	134,5	160	2	0,6	98 000	325 000	24 400	3 400	4 500
4,8	9,5	134,5	160	2	0,6	98 000	325 000	24 400	3 400	4 500
4,8	9,5	144,5	170	2	0,6	101 000	345 000	25 000	3 200	4 300
4,8	9,5	144,5	170	2	0,6	101 000	345 000	25 000	3 200	4 300
6,3	12,2	159	188	2	0,6	128 000	440 000	30 500	2 800	3 800
6,3	12,2	159	188	2	0,6	128 000	440 000	30 500	2 800	3 800
6,3	12,2	169	198	2,1	0,6	132 000	470 000	31 500	2 600	3 600
6,3	12,2	169	198	2,1	0,6	132 000	470 000	31 500	2 600	3 600
8	15	181	211,5	2,1	0,6	142 000	520 000	34 000	2 600	3 600
8	15	181	211,5	2,1	0,6	142 000	520 000	34 000	2 600	3 600
8	15	192,5	226	2,1	0,6	168 000	600 000	38 000	2 400	3 400
8	15	192,5	226	2,1	0,6	168 000	600 000	38 000	2 400	3 400
8	15	206,5	245	2,1	0,6	207 000	740 000	45 500	2 200	3 200
8	15	206,5	245	2,1	0,6	207 000	740 000	45 500	2 200	3 200
8	15	221	263	2,1	0,6	235 000	840 000	49 500	2 000	3 000
8	15	221	263	2,1	0,6	235 000	840 000	49 500	2 000	3 000
8	15	231	273	2,1	0,6	244 000	900 000	52 000	1 900	2 800
8	15	231	273	2,1	0,6	244 000	900 000	52 000	1 900	2 800
8	15	245	291,5	2,1	0,6	285 000	1 060 000	59 000	1 800	2 600
8	15	245	291,5	2,1	0,6	285 000	1 060 000	59 000	1 800	2 600
9,5	17,7	269	318	2,5	1	340 000	1 330 000	71 000	1 600	2 200
9,5	17,7	269	318	2,5	1	340 000	1 330 000	71 000	1 600	2 200
9,5	17,7	289	338	2,5	1	350 000	1 420 000	73 000	1 500	2 000
9,5	17,7	289	338	2,5	1	350 000	1 420 000	73 000	1 500	2 000
9,5	17,7	317,5	374,5	3	1,5	400 000	1 680 000	83 000	1 400	1 900
9,5	17,7	317,5	374,5	3	1,5	400 000	1 680 000	83 000	1 400	1 900
9,5	17,7	337,5	394,5	3	1,5	415 000	1 790 000	86 000	1 300	1 800
9,5	17,7	337,5	394,5	3	1,5	415 000	1 790 000	86 000	1 300	1 800
9,5	17,7	366	428,5	3	1,5	480 000	2 170 000	99 000	1 200	1 700
9,5	17,7	366	428,5	3	1,5	480 000	2 170 000	99 000	1 200	1 700
9,5	17,7	386	448,5	3	1,5	495 000	2 310 000	103 000	1 200	1 700
9,5	17,7	386	448,5	3	1,5	495 000	2 310 000	103 000	1 200	1 700

Axial angular contact ball bearings

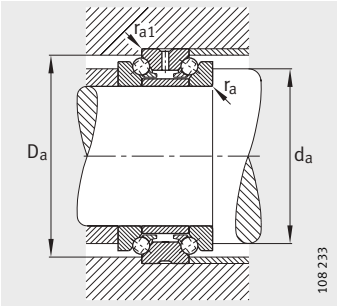
Double direction



2344, 2347
Contact angle α = 60 °

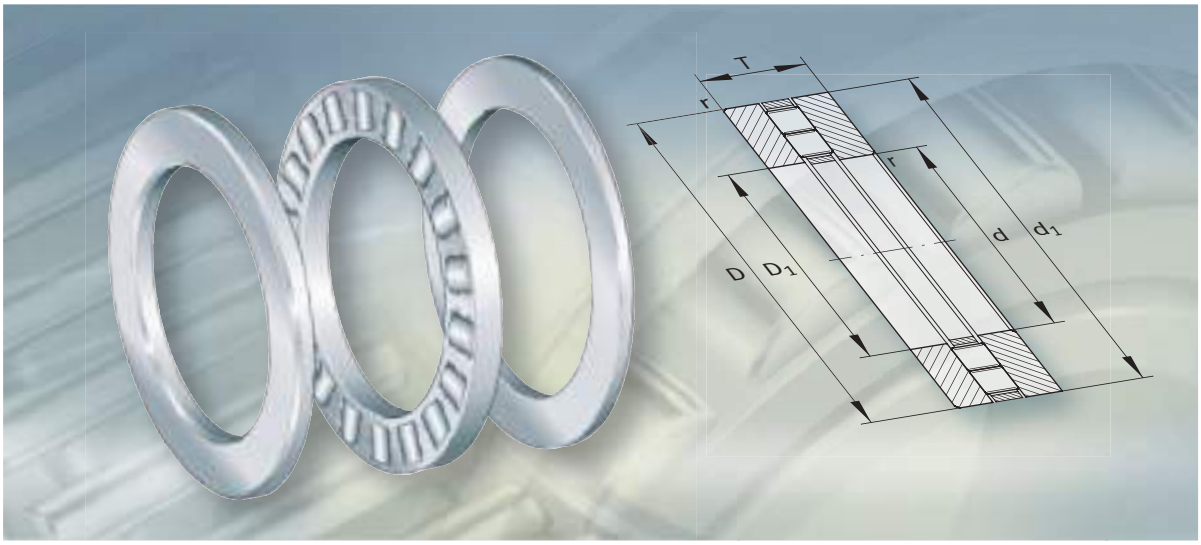
Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions							
	m	d	D	B	C	d_1	B_1	r	r_1
	≈kg							min.	min.
234468-M-SP	122	**340**	520	212	106	459	53	4	1,5
234768-M-SP	117	**350**	520	212	106	459	53	4	1,5
234472-M-SP	128	**360**	540	212	106	479	53	4	1,5
234772-M-SP	123	**370**	540	212	106	479	53	4	1,5
234476-M-SP	133	**380**	560	212	106	499	53	4	1,5
234776-M-SP	128	**390**	560	212	106	499	53	4	1,5
234480-M-SP	198	**400**	600	236	118	532	59	5	2
234780-M-SP	187	**410**	600	236	118	532	59	5	2



Mounting dimensions

		Mounting dimensions				Basic load ratings		Fatigue limit load	Limiting speeds	
d_s	n_s	d_a h12	D_a H12	r_a max.	r_{a1} max.	dyn. C_a N	stat. C_{0a} N	C_{ua} N	n_G grease min^{-1}	n_G oil min^{-1}
9,5	17,7	413	485,5	3	1,5	580 000	2 850 000	124 000	1 100	1 600
9,5	17,7	413	485,5	3	1,5	580 000	2 850 000	124 000	1 100	1 600
9,5	17,7	433	505,5	3	1,5	590 000	2 950 000	125 000	1 000	1 500
9,5	17,7	433	505,5	3	1,5	590 000	2 950 000	125 000	1 000	1 500
9,5	17,7	453	525,5	3	1,5	610 000	3 150 000	130 000	1 000	1 500
9,5	17,7	453	525,5	3	1,5	610 000	3 150 000	130 000	1 000	1 500
9,5	17,7	480	561,5	4	2	680 000	3 650 000	147 000	900	1 300
9,5	17,7	480	561,5	4	2	680 000	3 650 000	147 000	900	1 300



Axial cylindrical roller bearings
Axial cylindrical roller and cage assemblies
Axial bearing washers

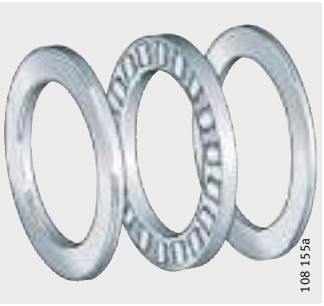
Axial cylindrical roller bearings, roller and cage assemblies, bearing washers

Axial cylindrical roller bearings, roller and cage assemblies, bearing washers

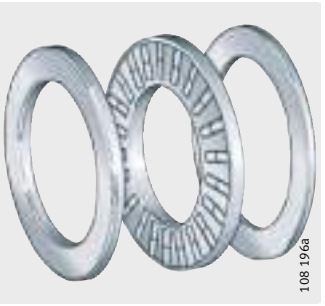
Axial cylindrical roller bearings

Single row and double row

811, 812



893, 894

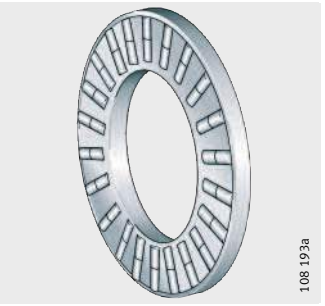


Axial cylindrical roller and cage assemblies

Single row and double row

K811, K812

K893, K894



Housing locating washers
Shaft locating washers

GS811, GS812
GS893, GS894

WS811, WS812
WS893, WS894

Bearing washers

LS

Axial cylindrical roller bearings, roller and cage assemblies, bearing washers

Features

Axial cylindrical roller bearings

Axial cylindrical roller bearings comprise axial cylindrical roller and cage assemblies K, housing locating washers GS and shaft locating washers WS.

Bearings 811, 812 are single row bearings and correspond to DIN 722/ISO 104, bearings 893, 894 are double row bearings and correspond to DIN 616/ISO 104.

The cages are made from plastic or brass.
Plastic cages have the suffix TV, brass cages have the suffix M.

The bearings have very low axial section height, high load capacity, high rigidity and can support axial forces in one direction.

Axial cylindrical roller and cage assemblies

The cage assemblies comprise axial cages and one or two rows of cylindrical rollers. The diameter series 1, 2, 3, 4 correspond to DIN 616/ISO 104.

The cages are made from plastic or brass.

The cage assemblies have very low axial section height, high load capacity and high rigidity. They can support axial forces in one direction and act as a non-locating bearing in a radial direction.

Axial cage assemblies are combined with shaft or housing locating washers or are integrated directly in the adjacent construction.
If they are used without axial bearing washers, the raceway must be produced as a rolling bearing raceway.

Housing locating washers

Housing locating washers are produced by machining, the outside surface is ground and the running surface is precision machined. The diameter series 1, 2, 3, 4 correspond to DIN 616/ISO 104. They are centred on their outer edge and are combined with axial cage assemblies if the adjacent surface cannot be used as a raceway.

Shaft locating washers

Shaft locating washers are produced by machining, the bore is ground and the running surface is precision machined. The diameter series 1, 2, 3, 4 correspond to DIN 616/ISO 104. They are centred on their inner edge and are combined with axial cage assemblies if the adjacent surface cannot be used as a raceway.

Bearing washers

Bearing washers can be used as housing and shaft locating washers. The bore and outside surface are turned, the running surface is ground. Bearing washers can be used with axial cylindrical roller and cage assemblies K811 and axial needle roller bearings AXK.

Operating temperature

Axial cylindrical roller bearings and axial cylindrical roller and cage assemblies can be used at operating temperatures from –30 °C to +150 °C.

Caution! Bearings with plastic cages (suffix TV) are suitable up to +120 °C.

Suffixes

Suffixes for available designs: see table.

Available designs

Suffix	Description	Design
M[1)]	Brass cage	Standard
TV[1)]	Plastic cage made from glass fibre reinforced polyamide 66	Standard
P5	High dimensional and geometrical accuracy	Special design[2)]

1) Depending on series and size.

2) By agreement for axial bearing washers GS, WS.

Axial cylindrical roller bearings, roller and cage assemblies, bearing washers

Design and safety guidelines

Design of adjacent parts

Axial bearing washers must always be fully supported on their entire abutment surface. The abutting shoulders should be rigid, flat and perpendicular to the axis of rotation.

Radial cage running surfaces should be precision machined and resistant to wear (R_z4 ($R_a0{,}8$)).

Caution! If axial cylindrical roller and cage assemblies run directly on the adjacent construction, the running surfaces must be produced as rolling bearing raceways. The surface hardness of the raceway must be 670 HV +170 HV and the hardening depth CHD or Rht must be sufficiently large.

Tolerances for shaft and housing bore

The tolerances for the housing bore and shaft must be applied in accordance with the table.

Housing bore and shaft tolerances

Bearing component		Shaft tolerance	Bore tolerance
K811, K812, K893, K894	Guided on shaft	h8	–
GS811, GS812, GS893, GS894	–	–	H9
WS811, WS812, WS893, WS894	–	h8	–
LS	As housing locating washer	Clear of shaft	H9
	As shaft locating washer	h8	Clear of housing

Limiting speed

The limiting speeds n_G given in the dimension tables are for oil lubrication.

Caution! With grease lubrication, the permissible value is 25% of the value given in the table.

Minimum axial load

A minimum axial load $F_{a\,min}$ according to the formula must be applied.

$$F_{a\,min} = 0{,}0005 \cdot C_{0a} + k_a \left(\frac{C_{0a} \cdot n}{10^8} \right)^2$$

$F_{a\,min}$ N
Minimum axial load

k_a –
Factor for determining the minimum load: see table

C_{0a} N
Basic static load rating

n min^{-1}
Speed.

Factor k_a for determining the minimum load

Series	k_a
K811	1,4
K812	0,9
K893	0,7
K894	0,5

Orientation of washers

Caution! Axial washers should be fitted with the raceway facing towards the rolling elements.

Accuracy

The dimensional and geometrical tolerances of axial bearing washers GS and WS are in accordance with tolerance class PN to DIN 620.

The bore, external and height tolerances of the bearing components are shown in the table and *Figure 1*.

Tolerances for bearing components

Series	Tolerance					
	Bore		Outside diameter		Height	
K811, K812, K893, K894	D_{c1}	E11[1)]	D_c	a13[1)]	D_w	to DIN 5 402-1
GS811, GS812, GS893, GS894	D_1	–	D	to DIN 620	B	h11
WS811, WS812, WS893, WS894	d	to DIN 620	d_1	–	B	h11
LS	d	E12[1)]	D	a12[1)]	B	h11

1) Deviation from mean diameter.

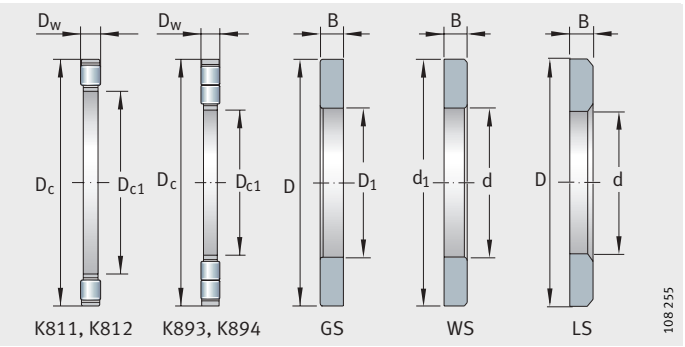
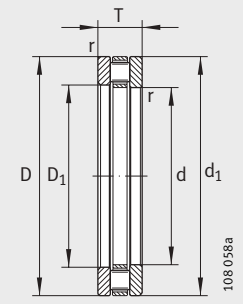
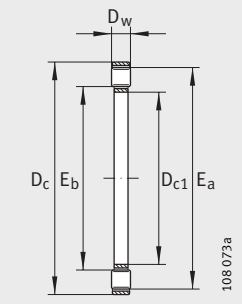


Figure 1
Axial bearing washers

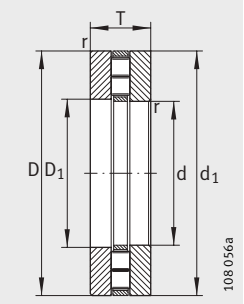
Axial cylindrical roller bearings



811, 812



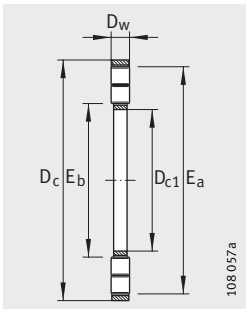
K811, K812



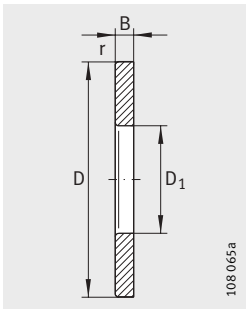
893, 894

Dimension table · Dimensions in mm

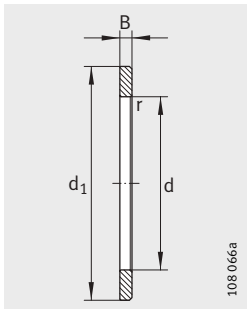
Axial cylindrical roller bearings					**Axial cylindrical roller bearing and cage assembly**		**Axial bearing washers**			
Complete bearings				Mass m	Designation	Mass m	Housing locating washer	Shaft locating washer	Bearing washer	Mass m
Designation				≈kg		≈kg	Designation	Designation	Designation	≈kg
81102-TV	–	–	–	0,024	**K81102-TV**	0,006	**GS81102**	**WS81102**	**LS1528**	0,008
81103-TV	–	–	–	0,027	**K81103-TV**	0,009	**GS81103**	**WS81103**	**LS1730**	0,009
81104-TV	–	–	–	0,037	**K81104-TV**	0,013	**GS81104**	**WS81104**	**LS2035**	0,012
81105-TV	–	–	–	0,053	**K81105-TV**	0,015	**GS81105**	**WS81105**	**LS2542**	0,019
81106-TV	–	–	–	0,057	**K81106-TV**	0,017	**GS81106**	**WS81106**	**LS3047**	0,02
–	**81206-TV**	–	–	0,123	**K81206-TV**	0,033	**GS81206**	**WS81206**	–	0,045
–	–	**89306-TV**	–	0,24	**K89306-TV**	0,04	**GS89306**	**WS89306**	–	0,095
81107-TV	–	–	–	0,073	**K81107-TV**	0,019	**GS81107**	**WS81107**	**LS3552**	0,027
–	**81207-TV**	–	–	0,195	**K81207-TV**	0,043	**GS81207**	**WS81207**	–	0,076
–	–	**89307-TV**	–	0,34	**K89307-TV**	0,053	**GS89307**	**WS89307**	–	0,134
81108-TV	–	–	–	0,105	**K81108-TV**	0,031	**GS81108**	**WS81108**	**LS4060**	0,037
–	**81208-TV**	–	–	0,249	**K81208-TV**	0,081	**GS81208**	**WS81208**	–	0,084
–	–	**89308-TV**	–	0,484	**K89308-TV**	0,098	**GS89308**	**WS89308**	–	0,193
81109-TV	–	–	–	0,13	**K81109-TV**	0,035	**GS81109**	**WS81109**	**LS4565**	0,047
–	**81209-TV**	–	–	0,287	**K81209-TV**	0,085	**GS81209**	**WS81209**	–	0,101
–	–	**89309-TV**	–	0,615	**K89309-TV**	0,121	**GS89309**	**WS89309**	–	0,247
81110-TV	–	–	–	0,14	**K81110-TV**	0,038	**GS81110**	**WS81110**	**LS5070**	0,051
–	**81210-TV**	–	–	0,356	**K81210-TV**	0,098	**GS81210**	**WS81210**	–	0,129
–	–	**89310-TV**	–	0,887	**K89310-TV**	0,175	**GS89310**	**WS89310**	–	0,356
81111-TV	–	–	–	0,218	**K81111-TV**	0,045	**GS81111**	**WS81111**	**LS5578**	0,082
–	**81211-TV**	–	–	0,568	**K81211-TV**	0,166	**GS81211**	**WS81211**	–	0,201
–	–	**89311-TV**	–	1,18	**K89311-TV**	0,195	**GS89311**	**WS89311**	–	0,485
81112-TV	–	–	–	0,266	**K81112-TV**	0,082	**GS81112**	**WS81112**	**LS6085**	0,092
–	**81212-TV**	–	–	0,642	**K81212-TV**	0,176	**GS81212**	**WS81212**	–	0,233
–	–	**89312-TV**	–	1,26	**K89312-TV**	0,21	**GS89312**	**WS89312**	–	0,517
–	–	–	**89412-TV**	2,818	**K89412-TV**	0,538	**GS89412**	**WS89412**	–	1,115



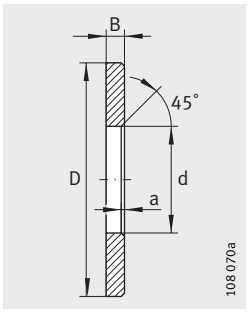
K893, K894



GS811, GS812,
GS893, GS894



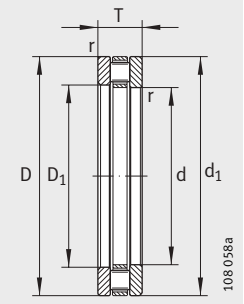
WS811, WS812,
WS893, WS894



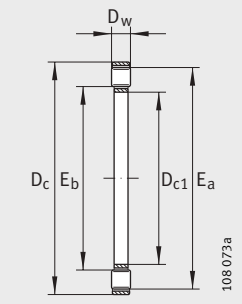
LS

Dimensions								Raceway dimensions		Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
D_{c1} d	D_1	D_c D	d_1	T	D_w	B	a r	E_b	E_a	dyn. C_a	stat. C_{0a}	C_{ua}	n_G	n_B
							min.			N	N	N	min^{-1}	min^{-1}
15	16	28	28	9	3,5	2,75	0,3	16	27	14 400	28 500	4 000	13 400	6 300
17	18	30	30	9	3,5	2,75	0,3	18	29	15 900	33 500	4 650	12 300	5 400
20	21	35	35	10	4,5	2,75	0,3	21	34	24 900	53 000	7 300	10 500	4 300
25	26	42	42	11	5	3	0,6	26	41	33 500	76 000	7 100	8 600	3 500
30	32	47	47	11	5	3	0,6	31	46	35 500	86 000	8 000	7 500	3 050
30	32	52	52	16	7,5	4,25	0,6	31	50	64 000	141 000	14 100	7 000	2 650
30	32	60	60	18	5,5	6,25	1	33	59	69 000	197 000	18 900	6 400	2 600
35	37	52	52	12	5	3,5	0,6	36	51	39 000	101 000	9 500	6 600	2 600
35	37	62	62	18	7,5	5,25	1	39	58	80 000	199 000	20 000	5 900	2 320
35	37	68	68	20	6	7	1	38	67	80 000	237 000	23 200	5 600	2 390
40	42	60	60	13	6	3,5	0,6	42	58	56 000	148 000	14 500	5 800	2 190
40	42	68	68	19	9	5	1	43	66	107 000	265 000	23 300	5 300	1 860
40	42	78	78	22	7	7,5	1	44	77	122 000	385 000	39 000	4 900	1 780
45	47	65	65	14	6	4	0,6	47	63	59 000	163 000	16 000	5 200	1 970
45	47	73	73	20	9	5,5	1	48	70	105 000	265 000	23 300	4 900	1 820
45	47	85	85	24	7,5	8,25	1	49	83	139 000	445 000	44 500	4 450	1 620
50	52	70	70	14	6	4	0,6	52	68	61 000	177 000	17 400	4 800	1 810
50	52	78	78	22	9	6,5	1	53	75	117 000	315 000	27 500	4 500	1 550
50	52	95	95	27	8	9,5	1,1	56	92	167 000	560 000	58 000	3 950	1 460
55	57	78	78	16	6	5	0,6	57	77	90 000	300 000	31 000	4 350	1 330
55	57	90	90	25	11	7	1	59	85	154 000	405 000	38 500	3 950	1 510
55	57	105	105	30	9	10,5	1,1	61	103	184 000	600 000	52 000	3 600	1 490
60	62	85	85	17	7,5	4,75	1	62	82	103 000	315 000	32 000	3 950	1 360
60	62	95	95	26	11	7,5	1	64	91	172 000	480 000	45 500	3 700	1 300
60	62	110	110	30	9	10,5	1,1	66	108	196 000	670 000	58 000	3 400	1 350
60	62	130	130	42	14	14	1,5	65	126	390 000	1 220 000	121 000	3 050	1 080

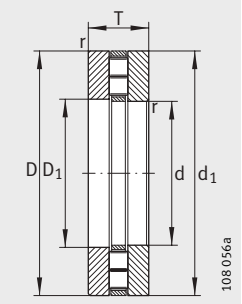
Axial cylindrical roller bearings



811, 812



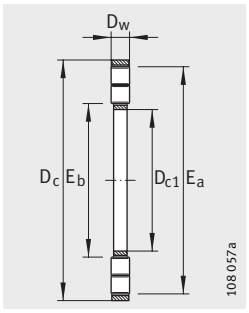
K811, K812



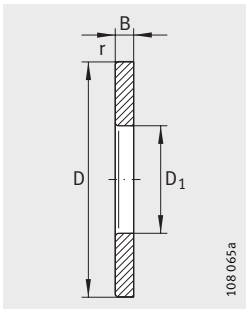
893, 894

Dimension table (continued) · Dimensions in mm

Axial cylindrical roller bearings					Axial cylindrical roller bearing and cage assembly		Axial bearing washers			
Complete bearings				Mass m	Designation	Mass m	Housing locating washer	Shaft locating washer	Bearing washer	Mass m
Designation				≈kg		≈kg	Designation	Designation	Designation	≈kg
81113-TV	–	–	–	0,31	**K81113-TV**	0,09	**GS81113**	**WS81113**	**LS6590**	0,11
–	**81213-TV**	–	–	0,721	**K81213-TV**	0,185	**GS81213**	**WS81213**	–	0,268
–	–	**89313-TV**	–	1,33	**K89313-TV**	0,21	**GS89313**	**WS89313**	–	0,535
–	–	–	**89413-TV**	3,52	**K89413-TV**	0,72	**GS89413**	**WS89413**	–	1,4
81114-TV	–	–	–	0,332	**K81114-TV**	0,092	**GS81114**	**WS81114**	**LS7095**	0,12
–	**81214-TV**	–	–	0,768	**K81214-TV**	0,212	**GS81214**	**WS81214**	–	0,278
–	–	**89314-TV**	–	1,82	**K89314-TV**	0,29	**GS89314**	**WS89314**	–	0,8
–	–	–	**89414-TV**	4,18	**K89414-TV**	0,76	**GS89414**	**WS89414**	–	1,73
81115-TV	–	–	–	0,393	**K81115-TV**	0,096	**GS81115**	**WS81115**	**LS75100**	0,136
–	**81215-TV**	–	–	0,8	**K81215-TV**	0,195	**GS81215**	**WS81215**	–	0,293
–	–	**89315-TV**	–	2,23	**K89315-TV**	0,375	**GS89315**	**WS89315**	–	0,97
–	–	–	**89415-M**	5,96	**K89415-M**	1,78	**GS89415**	**WS89415**	–	2,09
81116-TV	–	–	–	0,4	**K81116-TV**	0,095	**GS81116**	**WS81116**	**LS80105**	0,144
–	**81216-TV**	–	–	0,9	**K81216-TV**	0,234	**GS81216**	**WS81216**	–	0,333
–	–	**89316-TV**	–	2,37	**K89316-TV**	0,42	**GS89316**	**WS89316**	–	1,02
–	–	–	**89416-M**	7,04	**K89416-M**	2,04	**GS89416**	**WS89416**	–	2,5
81117-TV	–	–	–	0,42	**K81117-TV**	0,118	**GS81117**	**WS81117**	**LS85110**	0,151
–	**81217-TV**	–	–	1,26	**K81217-TV**	0,28	**GS81217**	**WS81217**	–	0,49
–	–	**89317-M**	–	3,39	**K89317-M**	0,93	**GS89317**	**WS89317**	–	1,23
–	–	–	**89417-M**	8,65	**K89417-M**	2,71	**GS89417**	**WS89417**	–	2,97
81118-TV	–	–	–	0,62	**K81118-TV**	0,15	**GS81118**	**WS81118**	**LS90120**	0,225
–	**81218-TV**	–	–	1,77	**K81218-TV**	0,54	**GS81218**	**WS81218**	–	0,614
–	–	**89318-M**	–	3,63	**K89318-M**	0,97	**GS89318**	**WS89318**	–	1,33
–	–	–	**89418-M**	9,94	**K89418-M**	3,04	**GS89418**	**WS89418**	–	3,45
81120-TV	–	–	–	0,95	**K81120-TV**	0,25	**GS81120**	**WS81120**	**LS100135**	0,35
–	**81220-TV**	–	–	2,2	**K81220-TV**	0,6	**GS81220**	**WS81220**	–	0,8
–	–	**89320-M**	–	4,56	**K89320-M**	1,18	**GS89320**	**WS89320**	–	1,69
–	–	–	**89420-M**	13,4	**K89420-M**	3,92	**GS89420**	**WS89420**	–	4,75



K893, K894



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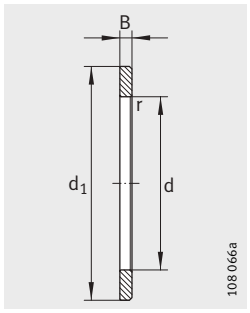
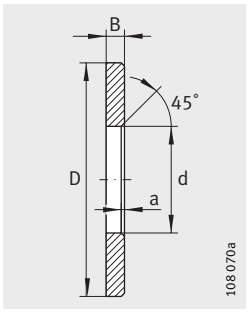
GS893, GS894



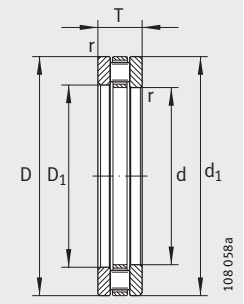
WS811, WS812,
WS893, WS894



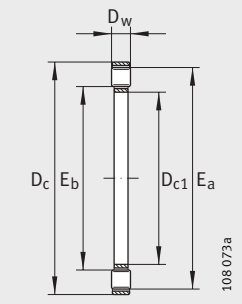
LS

Dimensions								Raceway dimensions		Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
D_{c1} d	D_1	D_c D	d_1	T	D_w	B	a r	E_b	E_a	dyn. C_a	stat. C_{0a}	C_{ua}	n_G	n_B
							min.			N	N	N	min^{-1}	min^{-1}
65	67	90	90	18	7,5	5,25	1	67	87	107 000	340 000	34 000	3 700	1 260
65	67	100	100	27	11	8	1	69	96	177 000	500 000	48 000	3 500	1 240
65	67	115	115	30	9	10,5	1,1	71	113	194 000	670 000	58 000	3 200	1 330
65	68	140	140	45	15	15	2	70	135	445 000	1 410 000	139 000	2 800	1 000
70	72	95	95	18	7,5	5,25	1	72	92	111 000	365 000	36 500	3 500	1 170
70	72	105	105	27	11	8	1	74	102	187 000	550 000	53 000	3 300	1 130
70	72	125	125	34	10	12	1,1	76	123	239 000	830 000	74 000	2 950	1 200
70	73	150	150	48	16	16	2	76	147	475 000	1 500 000	148 000	2 600	1 000
75	77	100	100	19	7,5	5,75	1	78	97	107 000	350 000	35 500	3 300	1 190
75	77	110	110	27	11	8	1	79	106	172 000	500 000	48 000	3 100	1 210
75	77	135	135	36	11	12,5	1,5	81	132	285 000	1 010 000	92 000	2 750	1 080
75	78	160	160	51	17	17	2	82	156	500 000	1 580 000	150 000	2 450	1 000
80	82	105	105	19	7,5	5,75	1	83	102	106 000	350 000	35 500	3 100	1 170
80	82	115	115	28	11	8,5	1	84	112	201 000	630 000	60 000	2 950	990
80	82	140	140	36	11	12,5	1,5	86	137	305 000	1 110 000	99 000	2 600	990
80	83	170	170	54	18	18	2,1	88	165	560 000	1 770 000	169 000	2 300	950
85	87	110	110	19	7,5	5,75	1	87	108	112 000	385 000	39 000	2 950	1 070
85	88	125	125	31	12	9,5	1	90	119	217 000	660 000	64 000	2 750	1 060
85	88	150	150	39	12	13,5	1,5	93	146	325 000	1 140 000	104 000	2 450	1 030
85	88	180	180	58	19	19,5	2,1	93	175	620 000	1 980 000	188 000	2 170	900
90	92	120	120	22	9	6,5	1	93	117	141 000	465 000	40 000	2 750	1 070
90	93	135	135	35	14	10,5	1,1	95	129	290 000	890 000	88 000	2 550	910
90	93	155	155	39	12	13,5	1,5	98	151	335 000	1 200 000	108 000	2 350	980
90	93	190	190	60	20	20	2,1	99	185	680 000	2 200 000	207 000	2 060	850
100	102	135	135	25	11	7	1	104	131	199 000	650 000	59 000	2 450	920
100	103	150	150	38	15	11,5	1,1	107	142	340 000	1 080 000	104 000	2 300	840
100	103	170	170	42	13	14,5	1,5	109	166	380 000	1 400 000	122 000	2 130	910
100	103	210	210	67	22	22,5	3	111	205	850 000	2 850 000	265 000	1 860	720

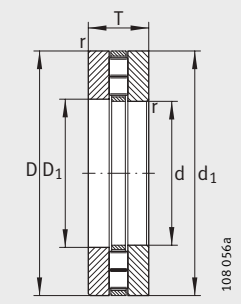
Axial cylindrical roller bearings



811, 812



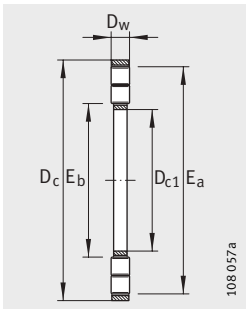
K811, K812



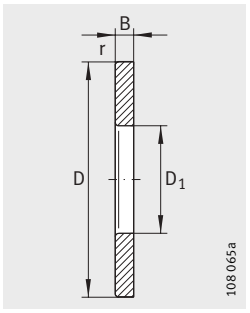
893, 894

Dimension table (continued) · Dimensions in mm

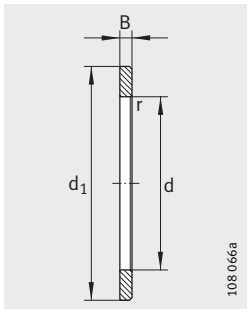
Axial cylindrical roller bearings					Axial cylindrical roller bearing and cage assembly		Axial bearing washers			
Complete bearings				Mass m	Designation	Mass m	Housing locating washer	Shaft locating washer	Bearing washer	Mass m
Designation				≈kg		≈kg	Designation	Designation	Designation	≈kg
81122-TV	–	–	–	1,04	**K81122-TV**	0,27	**GS81122**	**WS81122**	**LS110145**	0,385
–	**81222-TV**	–	–	2,29	**K81222-TV**	0,53	**GS81222**	**WS81222**	–	0,88
–	–	**89322-M**	–	6,7	**K89322-M**	1,83	**GS89322**	**WS89322**	–	2,44
–	–	–	**89422-M**	17,4	**K89422-M**	5,11	**GS89422**	**WS89422**	–	6,15
81124-TV	–	–	–	1,12	**K81124-TV**	0,29	**GS81124**	**WS81124**	**LS120155**	0,415
–	**81224-TV**	–	–	2,54	**K81224-TV**	0,58	**GS81224**	**WS81224**	–	0,98
–	–	**89324-M**	–	9,44	**K89324-M**	2,64	**GS89324**	**WS89324**	–	3,4
–	–	–	**89424-M**	21,9	**K89424-M**	6,37	**GS89424**	**WS89424**	–	7,7
81126-TV	–	–	–	1,67	**K81126-TV**	0,38	**GS81126**	**WS81126**	**LS130170**	0,643
–	**81226-TV**	–	–	3,98	**K81226-TV**	0,92	**GS81226**	**WS81226**	–	1,53
–	–	**89326-M**	–	11,2	**K89326-M**	2,09	**GS89326**	**WS89326**	–	4,045
–	–	–	**89426-M**	27,1	**K89426-M**	7,96	**GS89426**	**WS89426**	–	9,5
81128-TV	–	–	–	1,9	**K81128-TV**	0,4	**GS81128**	**WS81128**	**LS140180**	0,749
–	**81228-M**	–	–	5,07	**K81228-M**	1,8	**GS81228**	**WS81228**	–	1,635
–	–	**89328-M**	–	13,2	**K89328-M**	2,57	**GS89328**	**WS89328**	–	4,8
–	–	–	**89428-M**	29,8	**K89428-M**	8,53	**GS89428**	**WS89428**	–	10,6
81130-TV	–	–	–	2,2	**K81130-TV**	0,43	**GS81130**	**WS81130**	**LS150190**	0,796
–	**81230-M**	–	–	7,17	**K81230-M**	2,81	**GS81230**	**WS81230**	–	2,18
–	–	**89330-M**	–	13,9	**K89330-M**	3,75	**GS89330**	**WS89330**	–	5,06
–	–	–	**89430-M**	35,4	**K89430-M**	10,4	**GS89430**	**WS89430**	–	12,5
81132-TV	–	–	–	2,12	**K81132-TV**	0,44	**GS81132**	**WS81132**	**LS160200**	0,842
–	**81232-M**	–	–	7,6	**K81232-M**	3,01	**GS81232**	**WS81232**	–	2,3
–	–	–	**89432-M**	42	**K89432-M**	12,4	**GS89432**	**WS89432**	–	14,8
81134-TV	–	–	–	2,41	**K81134-TV**	0,66	**GS81134**	**WS81134**	–	1,1
–	**81234-M**	–	–	9,3	**K81234-M**	3,5	**GS81234**	**WS81234**	–	2,9
–	–	–	**89434-M**	51,9	**K89434-M**	14,9	**GS89434**	**WS89434**	–	18,5



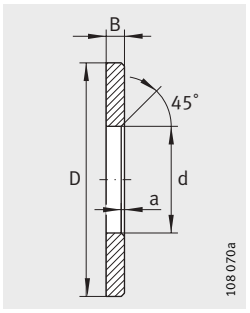
K893, K894



GS811, GS812,
GS893, GS894



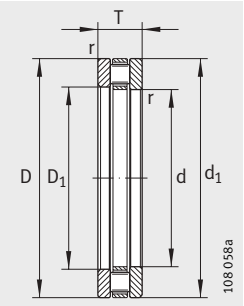
WS811, WS812,
WS893, WS894



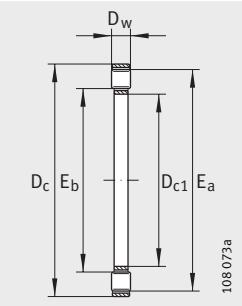
LS

Dimensions								Raceway dimensions		Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
D_{c1} d	D_1	D_c D	d_1	T	D_w	B	a r	E_b	E_a	dyn. C_a	stat. C_{0a}	C_{ua}	n_G	n_B
							min.			N	N	N	min^{-1}	min^{-1}
110	112	145	145	25	11	7	1	114	141	207 000	700 000	62 000	2 260	850
110	113	160	160	38	15	11,5	1,1	117	152	325 000	1 030 000	98 000	2 130	860
110	113	190	190	48	15	16,5	2	120	185	500 000	1 870 000	166 000	1 920	790
110	113	230	230	73	24	24,5	3	121	223	1 000 000	3 400 000	315 000	1 690	640
120	122	155	155	25	11	7	1	124	151	214 000	760 000	65 000	2 090	780
120	123	170	170	39	15	12	1,1	127	162	340 000	1 120 000	104 000	1 990	790
120	123	210	210	54	17	18,5	2,1	132	205	640 000	2 420 000	210 000	1 750	690
120	123	250	250	78	26	26	4	133	243	1 160 000	4 000 000	365 000	1 560	580
130	132	170	170	30	12	9	1	135	165	250 000	900 000	79 000	1 920	760
130	133	190	187	45	19	13	1,5	137	181	480 000	1 520 000	143 000	1 800	710
130	134	225	225	58	18	20	2,1	141	219	710 000	2 700 000	237 000	1 620	650
130	134	270	270	85	28	28,5	4	145	263	1 330 000	4 600 000	405 000	1 440	530
140	142	180	178	31	12	9,5	1	145	175	260 000	960 000	83 000	1 800	710
140	143	200	197	46	19	13,5	1,5	151	195	455 000	1 450 000	133 000	1 690	730
140	144	240	240	60	19	20,5	2,1	152	234	820 000	3 200 000	275 000	1 520	570
140	144	280	280	85	28	28,5	4	155	273	1 380 000	4 950 000	430 000	1 370	490
150	152	190	188	31	12	9,5	1	155	185	270 000	1 020 000	86 000	1 690	660
150	153	215	212	50	21	14,5	1,5	162	210	590 000	1 940 000	175 000	1 580	650
150	154	250	250	60	19	20,5	2,1	162	244	840 000	3 350 000	285 000	1 440	510
150	154	300	300	90	30	30	4	167	293	1 570 000	5 700 000	495 000	1 280	445
160	162	200	198	31	12	9,5	1	165	195	260 000	990 000	82 000	1 600	670
160	163	225	222	51	21	15	1,5	171	219	600 000	2 030 000	181 000	1 500	610
160	164	320	320	95	32	31,5	5	179	313	1 780 000	6 500 000	560 000	1 200	410
170	172	215	213	34	14	10	1,1	176	209	360 000	1 380 000	116 000	1 500	570
170	173	240	237	55	22	16,5	1,5	184	233	680 000	2 340 000	207 000	1 400	600
170	174	340	340	103	34	34,5	5	191	333	1 990 000	7 400 000	640 000	1 130	375

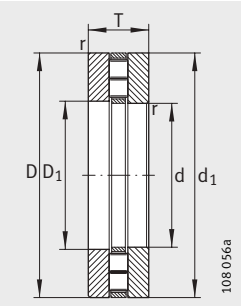
Axial cylindrical roller bearings



811, 812



K811, K812



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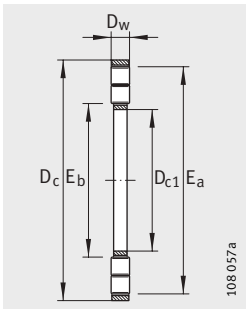
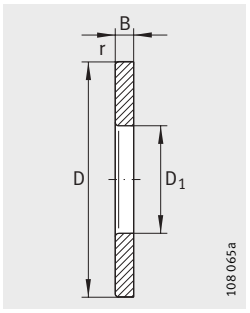
Dimension table (continued) · Dimensions in mm

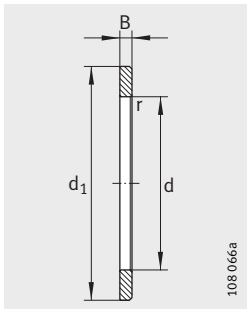
Axial cylindrical roller bearings				Axial cylindrical roller bearing and cage assembly		Axial bearing washers		
Complete bearings			Mass m	Designation	Mass m	Housing locating washer	Shaft locating washer	Mass m
Designation			≈kg		≈kg	Designation	Designation	≈kg
81136-M	–	–	3,3	**K81136-M**	1,46	**GS81136**	**WS81136**	1,12
–	**81236-M**	–	9,9	**K81236-M**	3,67	**GS81236**	**WS81236**	3,13
–	–	**89436-M**	60	**K89436-M**	17,6	**GS89436**	**WS89436**	21,3
81138-M	–	–	4,74	**K81138-M**	1,84	**GS81138**	**WS81138**	1,45
–	**81238-M**	–	12,8	**K81238-M**	5,17	**GS81238**	**WS81238**	3,835
–	–	**89438-M**	72,1	**K89438-M**	20,9	**GS89438**	**WS89438**	25,6
81140-M	–	–	4,95	**K81140-M**	1,93	**GS81140**	**WS81140**	1,51
–	**81240-M**	–	14,2	**K81240-M**	5,4	**GS81240**	**WS81240**	4,41
–	–	**89440-M**	82,6	**K89440-M**	24	**GS89440**	**WS89440**	29,3
81144-M	–	–	5,22	**K81144-M**	2,04	**GS81144**	**WS81144**	1,59
–	**81244-M**	–	15,3	**K81244-M**	5,8	**GS81244**	**WS81244**	4,75
–	–	**89444-M**	90,1	**K89444-M**	25,7	**GS89444**	**WS89444**	32,2
81148-M	–	–	8,45	**K81148-M**	3,32	**GS81148**	**WS81148**	2,57
–	**81248-M**	–	26,2	**K81248-M**	9,94	**GS81248**	**WS81248**	8,15
–	–	**89448-M**	95,9	**K89448-M**	27,3	**GS89448**	**WS89448**	34,3
81152-M	–	–	9,08	**K81152-M**	3,55	**GS81152**	**WS81152**	2,765
–	**81252-M**	–	28,6	**K81252-M**	10,8	**GS81252**	**WS81252**	8,9
–	–	**89452-M**	125	**K89452-M**	36,8	**GS89452**	**WS89452**	44,25
81156-M	–	–	12,6	**K81156-M**	5,31	**GS81156**	**WS81156**	3,65
–	**81256-M**	–	31	**K81256-M**	11,5	**GS81256**	**WS81256**	9,75
–	–	**89456-M**	159	**K89456-M**	47,5	**GS89456**	**WS89456**	55,6
81160-M	–	–	19,4	**K81160-M**	7,6	**GS81160**	**WS81160**	5,92
–	**81260-M**	–	48,25	**K81260-M**	17,8	**GS81260**	**WS81260**	15,2
–	–	**89460-M**	170	**K89460-M**	49,8	**GS89460**	**WS89460**	60,15
81164-M	–	–	20,7	**K81164-M**	8,04	**GS81164**	**WS81164**	6,35
–	–	**89464-M**	203	**K89464-M**	80,3	**GS89464**	**WS89464**	61,5



K893, K894

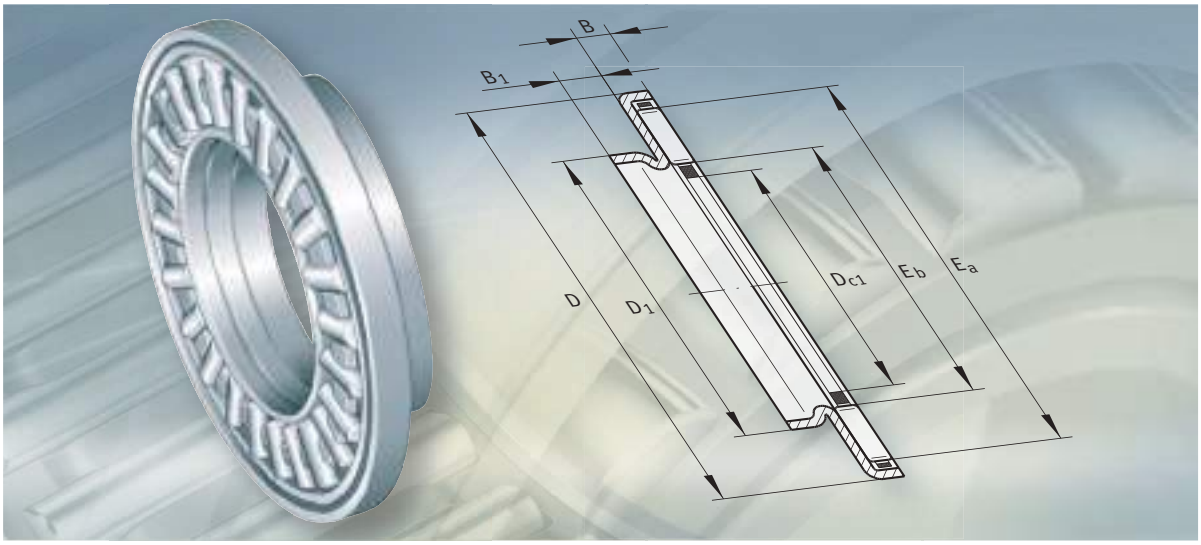


GS811, GS812,
GS893, GS894



WS811, WS812,
WS893, WS894

Dimensions								Raceway dimensions		Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
D_{c1} d	D_1	D_c D	d_1	T	D_w	B	a r min.	E_b	E_a	dyn. C_a N	stat. C_{0a} N	C_{ua} N	n_G min^{-1}	n_B min^{-1}
180	183	225	222	34	14	10	1,1	186	220	340 000	1 300 000	107 000	1 420	590
180	183	250	247	56	22	17	1,5	194	243	690 000	2 440 000	213 000	1 340	580
180	184	360	360	109	36	36,5	5	200	351	2 210 000	8 200 000	690 000	1 070	360
190	193	240	237	37	15	11	1,1	198	234	385 000	1 500 000	123 000	1 340	570
190	194	270	267	62	26	18	2	205	263	880 000	3 000 000	270 000	1 250	530
190	195	380	380	115	38	38,5	5	212	371	2 450 000	9 200 000	770 000	1 100	330
200	203	250	247	37	15	11	1,1	208	244	390 000	1 550 000	125 000	1 280	530
200	204	280	277	62	26	18	2	215	273	900 000	3 150 000	280 000	1 200	485
200	205	400	400	122	40	41	5	224	391	2 700 000	10 200 000	840 000	960	315
220	223	270	267	37	15	11	1,1	228	264	420 000	1 730 000	137 000	1 180	470
220	224	300	297	63	26	18,5	2	236	294	940 000	3 450 000	295 000	1 110	435
220	225	420	420	122	40	41	6	244	411	2 900 000	11 500 000	940 000	900	270
240	243	300	297	45	18	13,5	1,5	253	294	600 000	2 500 000	199 000	1 070	440
240	244	340	335	78	32	23	2,1	263	333	1 370 000	5 000 000	425 000	990	395
240	245	440	440	122	40	41	6	264	431	3 000 000	12 200 000	980 000	850	250
260	263	320	317	45	18	13,5	1,5	272	314	620 000	2 650 000	205 000	990	390
260	264	360	355	79	32	23,5	2,1	281	351	1 440 000	5 400 000	455 000	930	355
260	265	480	480	132	44	44	6	286	468	3 600 000	14 700 000	1 160 000	780	224
280	283	350	347	53	22	15,5	1,5	294	344	860 000	3 650 000	285 000	910	345
280	284	380	375	80	32	24	2,1	301	371	1 460 000	5 600 000	465 000	870	335
280	285	520	520	145	48	48,5	6	309	508	4 200 000	17 600 000	1 360 000	720	199
300	304	380	376	62	25	18,5	2	316	372	1 060 000	4 500 000	355 000	850	330
300	304	420	415	95	38	28,5	3	329	412	1 930 000	7 300 000	600 000	800	305
300	305	540	540	145	48	48,5	6	329	528	4 350 000	18 500 000	1 420 000	690	188
320	324	400	396	63	25	19	2	336	392	1 100 000	4 750 000	370 000	800	290
320	325	580	575	155	68	43,5	7,5	343	566	5 500 000	19 900 000	1 430 000	640	185



Axial needle roller and cage assemblies
Axial bearing washers
Axial needle roller bearings

Axial needle roller and cage assemblies, washers, axial needle roller bearings

Product overview

Axial needle roller and cage assemblies, washers, axial needle roller bearings

Axial needle roller and cage assemblies

AXK

Axial bearing washers

AS

Axial needle roller bearings

With centring spigot

AXW

Other products

AX

Axial needle roller and cage assemblies, washers, axial needle roller bearings

Features

Axial needle roller and cage assemblies

Axial needle roller and cage assemblies AXK correspond to DIN 5 405-2. They comprise plastic or metal axial cages with integral needle rollers and have a very low axial section height.

The cage assemblies can support high axial forces in one direction. Radial loads must be supported by separate means.

Axial needle roller and cage assemblies require hardened and ground running surfaces as a raceway.

Axial bearing washers

Axial bearing washers AS are punched, through hardened, polished and suitable for use as shaft or housing locating washers. They correspond to DIN 5 405-3 and are suitable for use with axial needle roller and cage assemblies AXK.

These washers are suitable for use where the adjacent machine part is unhardened but is sufficiently rigid and geometrically accurate.

Axial needle roller bearings

Axial needle roller bearings AXW are units comprising axial needle roller and cage assemblies AXK and axial bearing washers with centring spigot. They can be combined with drawn cup needle roller bearings with open ends or with closed end, and with needle roller bearings.

The running surface for the needle roller and cage assembly must be hardened and ground.

Operating temperature

Needle roller and cage assemblies and needle roller bearings with plastic cage are suitable for operating temperatures from –20 °C to +120 °C.

Cages

Cage assemblies with a plastic cage have the suffix TV.

Suffixes

Suffixes for available designs: see table.

Available designs

Suffixes	Description	Design
TV[1)]	Plastic cage made from glass fibre reinforced polyamide 66	Standard
RR	Corrosion-resistant design, with Corrotect® plating	Special design[2)]

1) Axial needle roller and cage assemblies with plastic cage: see dimension table.

2) Available by agreement.

Other products

Axial needle roller bearings are available in a special range with two raceways in various sizes; see Technical Publication API 18.

Axial needle roller and cage assemblies, washers, axial needle roller bearings

Design and safety guidelines

Axial bearing washers AS must always be fully supported on their entire abutment surface.

The abutment shoulders should be rigid, flat and perpendicular to the axis of rotation.

Running surfaces

Radial cage running surfaces should be precision machined and resistant to wear, $R_a0{,}8$ (R_z4).

Raceways for axial needle roller and cage assemblies should be precision machined and resistant to wear:

- raceway hardness 58 HRC to 64 HRC
- hardening depth Rht $\geqq 140 \cdot D_W/R_{p0,2}$
  - Rht, hardening depth in mm
  - D_W, rolling element diameter in mm
  - $R_{p0,2}$, proof stress in N/mm^2
- roughness $R_a0{,}2$ (R_z1)
- raceway dimensions E_a and E_b according to the dimension table must be observed
- runout tolerances to ISO tolerance grade IT 5, for special requirements to IT 4, in relation to the inside diameter of the cage assemblies (D_{c1}) must be observed.

Tolerances for shaft and housing bore

If axial needle roller bearings AXW are combined with drawn cup needle roller bearings or machined needle roller bearings, the same tolerances must be selected for the housing bore on the centring spigot as for the radial bearings.

Housing bore and shaft tolerances

Bearing component		Shaft tolerance	Bore tolerance
AXK	Guided on shaft	h8	–
AS	As housing locating washer	Clear of shaft	H9
	As shaft locating washer	h8	Clear of housing

Speeds

Caution!

The limiting speeds n_G given in the dimension tables for AXK and AXW are for oil lubrication.

With grease lubrication, the permissible value is 25% of the value given in the table. Higher speeds may be possible by agreement.

Minimum axial load

A minimum axial load $F_{a\,min}$ according to the formula must be applied.

$$F_{a\,min} = 0{,}0005 \cdot C_{0a} + k_a \left(\frac{C_{0a} \cdot n}{10^8} \right)^2$$

$F_{a\,min}$ N
Minimum axial load

k_a –
Factor for determining the minimum load; $k_a = 3$

C_{0a} N
Basic static load rating, axial

n min^{-1}
Speed.

Orientation of washers

Axial bearing washers AS are suitable as raceways on both sides.

Accuracy
Tolerances for bearing components

Tolerances for bearing components: see table and *Figure 1*.

The diameter sort tolerance of the needle rollers in the axial needle roller and cage assembly AXK is 2 µm.

Axial bearing washers AS match themselves to the accuracy of the contact surface. They are flat under a minimum concentric load of 200 N.

Tolerances

Series	Bore		Outside diameter		Height	
		Tolerance		Tolerance		Tolerance
AXK	D_{c1}	E12	D_c	c13	D_W	–0,01 mm
AXW	D_{c1}	E12	–	–	B	–0,2 mm
AS	d	E13	D	e13	B_1	±0,05 mm

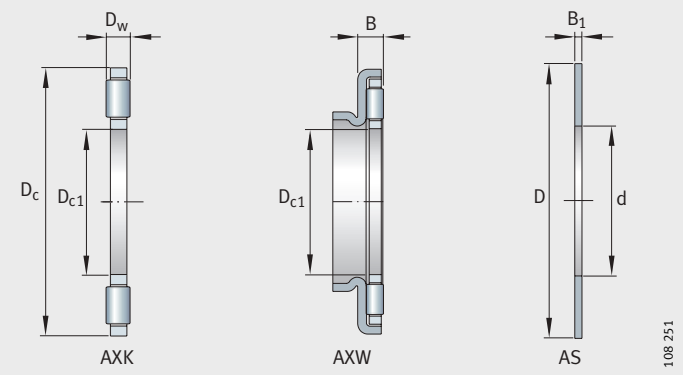
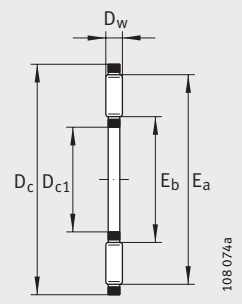


Figure 1
Bearing components

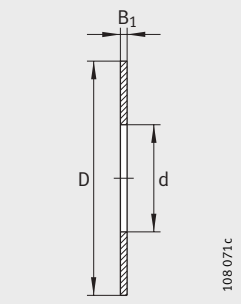
Axial needle roller and cage assemblies Axial bearing washers



AXK

Dimension table · Dimensions in mm

Axial needle roller and cage assemblies		**Axial bearing washers**		Dimensions			
Designation	Mass m ≈g	Designation	Mass m ≈g	D_{c1}/d	D_c/D	D_w	B_1
AXK0414-TV	0,7	**AS0414**	1	**4**	14	2	1
AXK0515-TV	0,8	**AS0515**	1	**5**	15	2	1
AXK0619-TV	1	**AS0619**	2	**6**	19	2	1
AXK0821-TV	2	**AS0821**	2	**8**	21	2	1
AXK1024	3	**AS1024**	3	**10**	24	2	1
AXK1226	3	**AS1226**	3	**12**	26	2	1
AXK1528	4	**AS1528**	3	**15**	28	2	1
AXK1730	4	**AS1730**	4	**17**	30	2	1
AXK2035	5	**AS2035**	5	**20**	35	2	1
AXK2542	7	**AS2542**	7	**25**	42	2	1
AXK3047	8	**AS3047**	8	**30**	47	2	1
AXK3552	10	**AS3552**	9	**35**	52	2	1
AXK4060	16	**AS4060**	12	**40**	60	3	1
AXK4565	18	**AS4565**	13	**45**	65	3	1
AXK5070	20	**AS5070**	14	**50**	70	3	1
AXK5578	28	**AS5578**	18	**55**	78	3	1
AXK6085	33	**AS6085**	22	**60**	85	3	1
AXK6590	35	**AS6590**	24	**65**	90	3	1
AXK7095	60	**AS7095**	25	**70**	95	4	1
AXK75100	61	**AS75100**	27	**75**	100	4	1
AXK80105	63	**AS80105**	28	**80**	105	4	1
AXK85110	67	**AS85110**	29	**85**	110	4	1
AXK90120	86	**AS90120**	39	**90**	120	4	1
AXK100135	104	**AS100135**	50	**100**	135	4	1
AXK110145	122	**AS110145**	55	**110**	145	4	1
AXK120155	131	**AS120155**	59	**120**	155	4	1
AXK130170	205	**AS130170**	65	**130**	170	5	1
AXK140180	219	**AS140180**	79	**140**	180	5	1
AXK150190	232	**AS150190**	84	**150**	190	5	1
AXK160200	246	**AS160200**	89	**160**	200	5	1

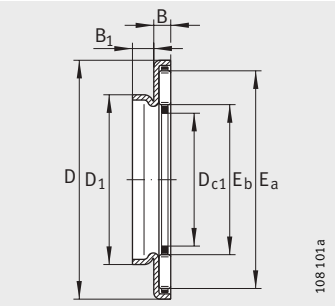


AS

Raceway dimensions		Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
E_b	E_a	dyn. C_a N	stat. C_{0a} N	C_{ua} N	n_G min^{-1}	n_B min^{-1}
5	13	4 400	8 000	940	21 400	14 900
6	14	4 750	9 200	1 070	20 500	13 000
7	18	6 800	15 500	1 580	18 800	10 800
9	20	7 800	19 400	1 970	17 700	8 800
12	23	9 200	25 500	2 500	16 900	7 400
14	25	9 900	29 000	2 850	15 200	6 500
17	27	11 300	36 000	3 600	13 400	5 100
19	29	11 900	39 500	3 950	12 300	4 600
22	34	13 100	46 500	4 750	10 500	4 350
29	41	14 700	58 000	5 900	8 600	3 850
34	46	16 300	70 000	7 100	7 500	3 200
39	51	17 800	81 000	8 300	6 600	2 800
45	58	28 000	114 000	11 800	5 800	2 440
50	63	30 000	128 000	13 300	5 200	2 170
55	68	32 000	143 000	14 800	4 800	1 950
60	76	38 000	186 000	20 300	4 350	1 780
65	83	44 500	234 000	26 500	3 950	1 590
70	88	46 500	255 000	28 500	3 700	1 470
74	93	54 000	255 000	26 500	3 500	1 430
79	98	55 000	265 000	28 000	3 300	1 350
84	103	56 000	280 000	29 500	3 100	1 280
89	108	58 000	290 000	30 500	2 950	1 220
94	118	73 000	405 000	44 500	2 750	1 120
105	133	91 000	560 000	58 000	2 450	980
115	143	97 000	620 000	63 000	2 260	890
125	153	102 000	680 000	68 000	2 090	810
136	167	133 000	840 000	75 000	1 920	760
146	177	138 000	900 000	79 000	1 800	710
156	187	143 000	960 000	82 000	1 690	660
166	197	148 000	1 020 000	86 000	1 600	620

Axial needle roller bearings

With centring spigot



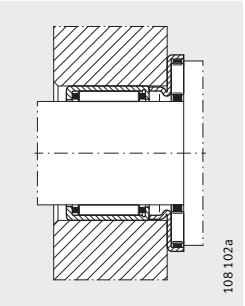
AXW

Dimension table · Dimensions in mm

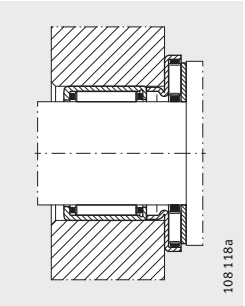
Designation	Mass	Dimensions					Raceway dimensions		Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
	m	D_{c1}	D_1	D	B	B_1	E_b	E_a	dyn. C_a	stat. C_{0a}	C_{ua}	n_G	n_B
	≈g								N	N	N	min^{-1}	min^{-1}
AXW10	8,3	**10**	14	27	3,2	3	12	23	9 200	25 500	2 500	15 600	8 300
AXW12	9,1	**12**	16	29	3,2	3	14	25	9 900	29 000	2 850	14 000	7 300
AXW15	10	**15**	21	31	3,2	3,5	17	27	11 300	36 000	3 600	12 500	5 800
AXW17	11	**17**	23	33	3,2	3,5	19	29	11 900	39 500	3 950	11 500	5 300
AXW20	14	**20**	26	38	3,2	3,5	22	34	13 100	46 500	4 750	9 900	4 900
AXW25	20	**25**	32	45	3,2	4	29	41	14 700	58 000	5 900	8 200	4 250
AXW30	22	**30**	37	50	3,2	4	34	46	16 300	70 000	7 100	7 200	3 600
AXW35	27	**35**	42	55	3,2	4	39	51	17 800	81 000	8 300	6 400	3 100
AXW40	39	**40**	47	63	4,2	4	45	58	28 000	114 000	11 800	5 600	2 700
AXW45	43	**45**	52	68	4,2	4	50	63	30 000	128 000	13 300	5 100	2 400
AXW50	49	**50**	58	73	4,2	4,5	55	68	32 000	143 000	14 800	4 700	2 160

[1] Dimensions for axial bearing washers AS, for drawn cup needle roller bearings with open ends, drawn cup needle roller bearings with open end and needle roller bearings: see corresponding product section.

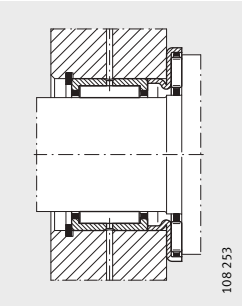
Combination with radial needle roller bearings



AXW with HK



AXW with AS and HK

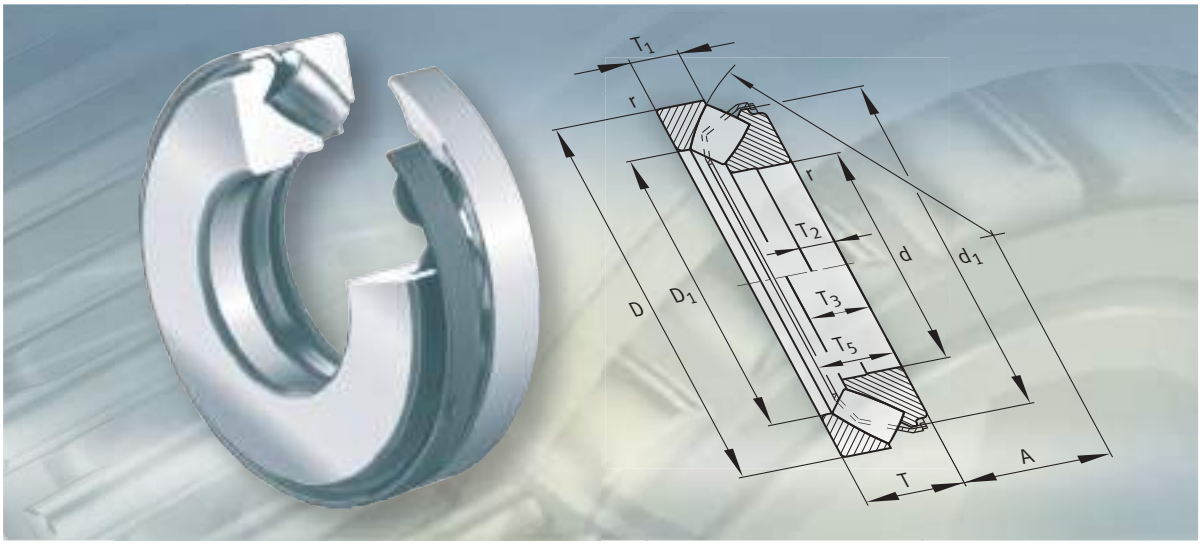


AXW with NK, NKS, RNA49, RNA69

Combination with drawn cup needle roller bearings with open ends, drawn cup needle roller bearings with closed end and with needle roller bearings

Designation					
AS	HK Drawn cup needle roller bearing with open ends[1)]	HK..-RS Drawn cup needle roller bearing with open ends[1)]	BK Drawn cup needle roller bearing with closed end[1)]	NK, NKS, RNA49, RNA69 Needle roller bearings[1)]	NKI, NKIS, NA49, NA69 Needle roller bearings[1)]
AS1024	HK1010, HK1012	–	BK1010, BK1012	NK7/10TV	–
–	HK1015	–	BK1015	NK7/12TV	–
AS1226	HK1210	–	BK1210	NK9/12TV	NKI6/12TV
–	–	–	–	NK9/16TV	NKI6/16TV
AS1528	HK1512, HK1516	HK1514-RS	BK1512, BK1516	–	–
–	HK1522-ZW	–	–	–	–
AS1730	HK1712	–	–	NK15/16, NK15/20	–
AS2035	HK2012, HK2016	HK2018-RS	BK2016	NK18/16, NK18/20	–
–	HK2020	–	BK2020	–	–
–	HK2030-ZW	–	–	–	–
AS2542	HK2512, HK2516	HK2518-RS	–	NK24/16, NK24/20	NKI20/16
–	HK2520, HK2526	–	BK2520, BK2526	NKS20	NKI20/20
–	HK2538-ZW	–	BK2538-ZW	–	–
AS3047	HK3012, HK3016	HK3018-RS	BK3012, BK3016	NK28/20, NK28/30	NA4904
–	HK3020, HK3026	–	BK3020, BK3026	NKS 24	NA6904
–	HK3038-ZW	–	BK3038-ZW	RNA4904, RNA6904	–
AS3552	HK3512, HK3516	HK3518-RS	–	NK32/20, NK32/30	NKIS20, NA4905
–	HK3520	–	BK3520	NKS28	NA6905
–	–	–	–	RNA4905, RNA6905	NKI28/20 NKI28/30
AS4060	HK4012, HK4016	HK4018-RS	–	NK37/20, NK37/30	NKIS25, NA4906
–	HK4020	–	BK4020	NKS32	NA6906
–	–	–	–	RNA4906, RNA6906	NKI32/20
–	–	–	–	–	NKI32/30
AS4565	HK4516, HK4520	HK4518-RS	BK4520	NK42/20, NK42/30	NKIS30
–	–	–	–	NKS37	NA49/32
–	–	–	–	RNA49/32, RNA69/32	NA69/32
AS5070	HK5020, HK5025	HK5022-RS	–	NKS43	NKIS35

FAG



Axial spherical roller bearings

Axial spherical roller bearings

Increased capacity design

292..-E, 293..-E, 294..-E

Axial spherical roller bearings

Features

Axial spherical roller bearings are single row, self-aligning roller bearings. They comprise solid shaft and housing locating washers and asymmetrical barrel rollers with cages. The cage holds the roller and cage assembly and the shaft locating washer together. The bearings can be dismantled. As a result, the bearing components can be fitted separately.

Axial and radial load capacity

Axial spherical roller bearings can support very high axial loads and allow relatively high speeds. Since the raceways are inclined relative to the bearing axis, the bearings can also support radial loads. Radial loading: see page 788.

Sealing/lubrication

Axial spherical roller bearings are not sealed and not greased. They must be lubricated using oil.

Compensation of angular misalignments

Axial spherical roller bearings can be swivelled about their central position by a few degrees, see table Permissible skewing. As a result, they permit skewing between the housing and shaft locating washer and can thus compensate misalignments, shaft deflections and housing deformations.

The adjustment angles in the table are permissible under the following conditions:

- P or $P_0 \leqq 0{,}05 \cdot C_{0a}$
- constant angular deviation (static angular misalignment)
- rotating shaft locating washer.

The lower values are valid for large bearings.

Permissible skewing

Series	Permissible skewing[1)]
292..-E	1° to 1,5°
293..-E	1,5° to 2,5°
294..-E	2° to 3°

1) If the housing locating washer rotates or the shaft locating washer undergoes tumbling motion, the angular adjustment facility is smaller.

Operating temperature

Axial spherical roller bearings can be used at operating temperatures from –30 °C to +150 °C, restricted by the lubricant.

Cages

The standard cages for axial spherical roller bearings are shown in the table Cage/bore code.

Bearings with solid brass cages have the suffix MB. The other bearings have sheet steel cages and do not have a cage suffix.

Cage/bore code

Series	Sheet steel cage Bore code	Solid brass cage
292..-E	–	all
293..-E	up to 64	from 68
294..-E	up to 68	from 72

Suffixes

Suffixes for available designs: see table.

Available designs

Suffix	Description
E	Increased capacity design
MB	Solid brass cage

Axial spherical roller bearings

Design and safety guidelines

Equivalent dynamic bearing load

For bearings under dynamic loading, the following applies:

$$P = F_a + 1,2 \cdot F_r$$

P N
Equivalent dynamic bearing load for combined load

F_a N
Axial dynamic bearing load

F_r N
Radial dynamic bearing load.

Radial load

Caution!

The radial bearing load must not exceed 55% of the axial load: $F_r \leqq 0,55 \cdot F_a$.

Equivalent static bearing load

For bearings under static loading, the following applies:

$$P_0 = F_{0a} + 2,7 \cdot F_{0r}$$

P_0 N
Equivalent static bearing load for combined load

F_{0a} N
Axial static bearing load

F_{0r} N
Radial static bearing load.

Radial load

Caution!

The radial bearing load must not exceed 55% of the axial load: $F_{0r} \leqq 0,55 \cdot F_{0a}$.

Static load safety factor

For the static load safety factor S_0, the following values must be observed:

Static load safety factor

Static load safety factor S_0	Conditions
$S_0 \geqq 8$	Axial support by the abutting shoulders in accordance with the bearing tables (d_a and D_a)
$S_0 \geqq 6$	Full axial support of the housing and shaft locating washers by the entire mating surface, dimensions D_1 and d_1 (see dimension table)
$S_0 \geqq 4$	Full axial support, dimensions D_1 and d_1 (see dimension table) together with good radial support of the housing locating washer (housing tolerance K7)

Minimum axial load

At higher speeds, harmful sliding movement can occur between the rolling elements and raceways due to centrifugal forces and gyroscopic moments. To avoid this, the bearings must be subjected to a minimum load $F_{a\,min}$ according to the formula. The minimum load can be applied by preloading.

$$F_{a\,min} = \frac{C_{0a}}{1400} + A\left(\frac{D \cdot T \cdot n}{10^6}\right)^2$$

$F_{a\,min}$ N
Minimum axial load

C_{0a} N
Basic static load rating, see dimension table

A –
Factor dependent on the series, see table

D mm
Outside diameter of housing locating washer

T mm
Total height

n min^{-1}
Maximum speed.

Factor dependent on series

Series	Factor A
292..-E	2,7
293..-E	3,1
294..-E	2,1

Speeds

Caution!

The limiting speeds n_G given in the dimension tables must not be exceeded. The values are for oil lubrication.

The reference speeds n_B were calculated according to ISO 15 312.

Design of adjacent parts

The abutting shoulders should be rigid, flat and perpendicular to the axis of rotation.

A recess of diameter $D_{b\,min}$ according to the dimension table must be provided above the housing locating washer in the housing bore. Otherwise, the rollers will foul the housing when the shaft swivels.

Tolerances for shaft and housing

The runout tolerances of the abutting shoulders should be to IT5 or better. The tolerances for the shaft and locating bore must be applied in accordance with the table.

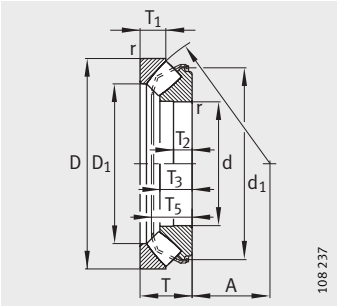
Shaft/housing tolerances

Adjacent part	Load type	Operating conditions	Tolerance
Shaft	Combined load	Point load for shaft locating washer	j6
		Circumferential load for shaft locating washer, shaft diameter up to 200 mm	j6 (k6)
		Circumferential load for shaft locating washer, shaft diameter from 200 mm	k6 (m6)
Housing	Axial load	Normal load	E8
		High load	G7
	Combined load	Point load for housing locating washer	H7
		Circumf. load for housing locating washer	K7

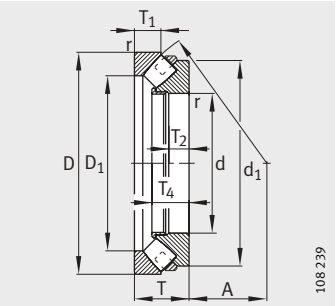
Accuracy

The main dimensions of the bearings conform to ISO 104 and DIN 728. The dimensional and geometrical tolerances correspond to tolerance class PN to DIN 620-3.

Axial spherical roller bearings



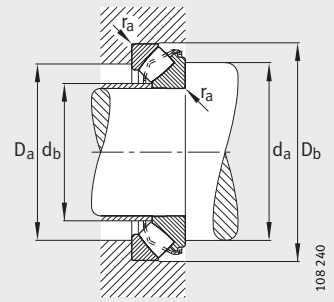
293..-E, 294..-E



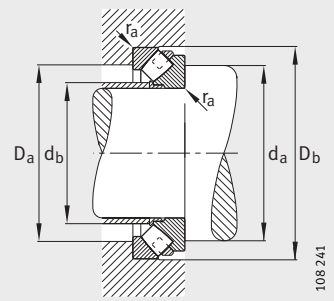
292..-E-MB

Dimension table · Dimensions in mm

Designation	Mass	Dimensions											
	m	d	D	T	D_1	d_1	r	T_1	T_2	T_3	T_4	T_5	A
	≈kg						min.						
29412-E	2,23	**60**	130	42	88	115	1,5	20	15	27	–	36	38
29413-E	3,03	**65**	140	45	94	125	2	21	16	29,5	–	38	42
29414-E	3,71	**70**	150	48	102	135	2	23	17	31	–	40	44
29415-E	4,4	**75**	160	51	108	140	2	24	18	33,5	–	43	47
29416-E	5,28	**80**	170	54	116	150	2,1	26	19	35	–	45	50
29317-E	2,54	**85**	150	39	111	135	1,5	19	14	24,5	–	33	50
29417-E	5,89	**85**	180	58	123	160	2,1	28	21	37	–	48	54
29318-E	2,65	**90**	155	39	115	140	1,5	19	14	24,5	–	33	52
29418-E	7,38	**90**	190	60	130	170	2,1	29	22	39	–	50	56
29320-E	3,38	**100**	170	42	129	155	1,5	20,8	15	26	–	36	58
29420-E	10	**100**	210	67	142	185	3	32	24	43	–	55	62
29322-E	5,04	**110**	190	48	142	175	2	23	17	30,3	–	41	64
29422-E	13,1	**110**	230	73	158	205	3	35	26	47	–	60	69
29324-E	6,9	**120**	210	54	158	190	2,1	26	19	34	–	46	70
29424-E	16,3	**120**	250	78	172	220	4	37	28	50,5	–	64	74
29326-E	8,49	**130**	225	58	169	205	2,1	28	21	36,5	–	49	76
29426-E	19	**130**	270	85	187	240	4	41	31	54	–	69	81
29328-E	9,87	**140**	240	60	181	220	2,1	29	22	38,5	–	51	82
29428-E	21,9	**140**	280	85	194	250	4	41	31	54	–	69	86
29330-E	10,5	**150**	250	60	192	230	2,1	29	22	38	–	51	87
29430-E	26,9	**150**	300	90	211	270	4	44	32	58	–	74	92
29332-E	13,6	**160**	270	67	206	245	3	32	24	42	–	56	92
29432-E	31,6	**160**	320	95	224	285	5	45	34	60,5	–	78	99
29334-E	14,2	**170**	280	67	215	255	3	32	24	42	–	57	96
29434-E	39,2	**170**	340	103	239	305	5	50	37	65,5	–	84	104
29336-E	18,4	**180**	300	73	230	275	4	35	26	46	–	61	103
29436-E	46,2	**180**	360	109	253	320	5	52	39	69,5	–	89	110
29338-E	22,8	**190**	320	78	243	295	4	38	28	49	–	66	110
29438-E	54,9	**190**	380	115	268	340	5	55	41	73	–	94	117
29240-E-MB	8,15	**200**	280	48	236	265	2	24	17	29	45	–	108
29340-E	28	**200**	340	85	258	310	4	41	31	53,5	–	71	116
29440-E	64,7	**200**	400	122	282	360	5	59	44	77	–	99	122
29244-E-MB	9,18	**220**	300	48	254	285	2	24	17	30	35	–	117
29344-E	29,9	**220**	360	85	279	330	4	41	31	53	–	71	125
29444-E	67,4	**220**	420	122	303	375	6	58	44	76,5	–	99	132



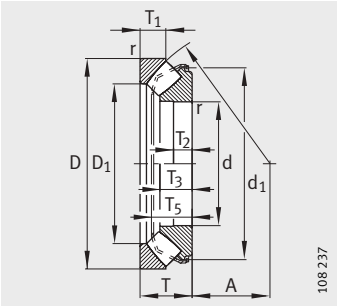
Mounting dimensions
293..-E, 294..-E



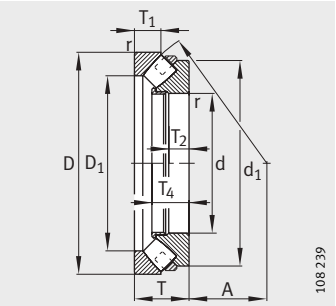
Mounting dimensions
292..-E-MB

Mounting dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	D_b	d_b	r_a	dyn. C_a	stat. C_{0a}	C_{ua}	n_G	n_B
min.	max.	min.	max.	max.	N	N	N	min^{-1}	min^{-1}
90	107	133	70	1,5	335 000	900 000	65 000	3 600	2 750
100	115	143	73	2	380 000	1 020 000	77 000	3 400	2 650
105	124	153	80	2	430 000	1 200 000	87 000	3 000	2 480
115	132	163	86	2	490 000	1 370 000	100 000	2 800	2 280
120	141	173	91	2,1	550 000	1 560 000	110 000	2 800	2 170
115	129	153	93	1,5	345 000	1 060 000	72 000	3 400	2 210
130	150	183	97	2,1	600 000	1 730 000	122 000	2 600	2 090
118	135	158	99	1,5	355 000	1 100 000	74 000	3 400	2 130
135	158	193	103	2,1	670 000	1 930 000	134 000	2 400	2 010
132	148	173	109	1,5	405 000	1 340 000	91 000	3 000	1 930
150	175	214	112	2,5	830 000	2 450 000	167 000	2 200	1 800
145	165	193	119	2	530 000	1 700 000	112 000	2 600	1 850
165	192	234	125	2,5	950 000	2 800 000	189 000	2 000	1 710
160	182	213	132	2,1	640 000	2 080 000	135 000	2 400	1 680
180	210	254	135	3	1 120 000	3 350 000	224 000	1 800	1 550
170	195	228	141	2,1	720 000	2 360 000	154 000	2 200	1 600
195	227	275	151	3	1 250 000	3 900 000	255 000	1 700	1 440
185	208	244	152	2,1	800 000	2 700 000	175 000	2 000	1 510
205	237	285	158	3	1 290 000	4 050 000	265 000	1 700	1 370
195	220	254	163	2,1	815 000	2 850 000	179 000	2 000	1 420
220	253	306	171	3	1 460 000	4 800 000	305 000	1 500	1 250
210	236	274	174	2,5	965 000	3 350 000	210 000	2 000	1 330
230	271	326	181	4	1 660 000	5 300 000	335 000	1 400	1 180
220	247	284	184	2,5	1 000 000	3 450 000	217 000	1 800	1 270
245	288	346	191	4	1 860 000	6 000 000	385 000	1 300	1 110
235	263	304	193	2,5	1 180 000	4 150 000	255 000	1 500	1 180
260	305	366	202	4	2 080 000	6 800 000	430 000	1 300	1 020
250	281	325	206	3	1 320 000	4 650 000	285 000	1 500	1 140
275	322	386	214	4	2 320 000	7 500 000	470 000	1 200	970
235	258	284	211	2	655 000	2 650 000	152 000	2 000	1 260
265	298	348	215	3	1 530 000	5 300 000	325 000	1 400	1 060
290	338	406	225	4	2 550 000	8 500 000	510 000	1 100	920
260	277	304	229	2	720 000	3 150 000	173 000	2 000	1 130
285	316	368	235	3	1 560 000	5 600 000	335 000	1 400	980
310	360	428	243	5	2 600 000	8 500 000	520 000	1 100	860

Axial spherical roller bearings



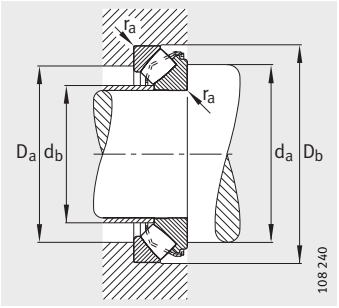
293..-E, 294..-E



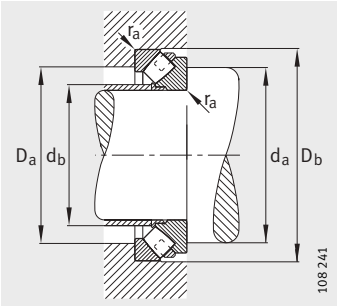
292..-E-MB, 293..-E-MB, 294..-E-MB

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions											
	m	d	D	T	D_1	d_1	r	T_1	T_2	T_3	T_4	T_5	A
	≈kg						min.						
29248-E-MB	16,1	**240**	340	60	282	320	2,1	30	22	38	44	–	130
29348-E	32,5	**240**	380	85	299	350	4	41	31	53	–	71	135
29448-E	73,5	**240**	440	122	321	400	6	59	44	78	–	99	142
29252-E-MB	17	**260**	360	60	302	340	2,1	30	22	38	44	–	139
29352-E	45,2	**260**	420	95	327	385	5	45	34	61	–	79	148
29452-E	93,6	**260**	480	132	353	435	6	64	48	83	–	107	154
29256-E-MB	19,2	**280**	380	60	322	360	2,1	30	22	38	44	–	150
29356-E	48,8	**280**	440	95	346	405	5	46	34	61	–	79	158
29456-E	121	**280**	520	145	380	470	6	68	52	92	–	118	166
29260-E-MB	28,6	**300**	420	73	353	395	3	38	26	44	51	–	162
29360-E	66,4	**300**	480	109	378	440	5	50	39	69	–	90	168
29460-E	129	**300**	540	145	398	490	6	70	52	93	–	118	175
29264-E-MB	30,3	**320**	440	73	372	415	3	38	26	44,5	51	–	172
29364-E	71	**320**	500	109	396	465	5	53	39	68	–	90	180
29464-E	158	**320**	580	155	432	525	7,5	75	56	97	–	126	191
29268-E-MB	32	**340**	460	73	391	435	3	37	26	45	52	–	183
29368-E-MB	98,9	**340**	540	122	426	500	5	59	44	75	85	–	192
29468-E	200	**340**	620	170	458	560	7,5	82	61	106	–	138	201
29272-E-MB	46,5	**360**	500	85	423	475	4	44	31	51	59	–	194
29372-E-MB	103	**360**	560	122	446	520	5	59	44	75	86	–	202
29472-E-MB	219	**360**	640	170	475	580	7,5	82	61	108	121	–	210
29276-E-MB	48,4	**380**	520	85	440	490	4	42	31	53	81	–	202
29376-E-MB	132	**380**	600	132	474	555	6	63	48	83	94	–	216
29476-E-MB	248	**380**	670	175	500	610	7,5	85	63	111	124	–	230
29280-E-MB	51,2	**400**	540	85	460	510	4	42	31	53,5	62	–	212
29380-E-MB	137	**400**	620	132	493	575	6	64	48	83	94	–	225
29480-E-MB	294	**400**	710	185	530	645	7,5	89	67	117	131	–	236
29284-E-MB	73,4	**420**	580	95	489	550	5	46	34	60,5	70	–	225
29384-E-MB	157	**420**	650	140	520	600	6	68	50	85	97	–	235
29484-E-MB	305	**420**	730	185	550	665	7,5	89	67	117	132	–	244
29288-E-MB	74	**440**	600	95	506	570	5	49	34	61	70	–	235
29388-E-MB	176	**440**	680	145	548	630	6	70	52	87	100	–	245
29488-E-MB	393	**440**	780	206	585	710	9,5	100	74	128	144	–	260
29292-E-MB	76,3	**460**	620	95	528	590	5	46	34	61	70	–	245
29392-E-MB	203	**460**	710	150	567	660	6	72	54	94,5	108	–	257
29492-E-MB	407	**460**	800	206	605	730	9,5	100	74	128	144	–	272



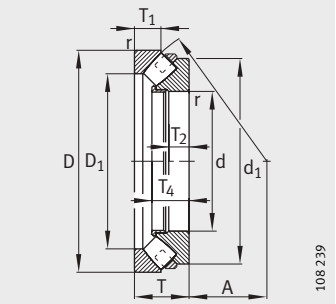
Mounting dimensions
293..-E, 294..-E



Mounting dimensions
292..-E-MB, 293..-E-MB,
294..-E-MB

Mounting dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	D_b	d_b	r_a	dyn. C_a	stat. C_{0a}	C_{ua}	n_G	n_B
min.	max.	min.	max.	max.	N	N	N	min^{-1}	min^{-1}
285	311	344	251	2,1	1 040 000	4 500 000	249 000	1 700	1 040
300	337	390	256	3	1 630 000	6 100 000	355 000	1 400	890
330	381	448	265	5	2 700 000	9 500 000	570 000	1 100	790
305	331	365	272	2,1	1 060 000	4 750 000	260 000	1 700	960
330	372	430	277	4	2 040 000	7 650 000	445 000	1 200	810
360	419	488	291	5	3 100 000	11 000 000	650 000	1 000	730
325	351	385	291	2,1	1 120 000	5 100 000	270 000	1 500	890
350	394	450	298	4	2 120 000	8 300 000	470 000	1 200	750
390	446	530	310	5	3 650 000	12 900 000	750 000	900	670
355	386	426	317	2,5	1 430 000	6 550 000	345 000	1 400	830
380	429	490	320	4	2 550 000	9 650 000	540 000	1 100	700
410	471	550	326	5	3 900 000	14 000 000	810 000	900	620
375	406	450	336	2,5	1 500 000	6 950 000	360 000	1 300	770
400	449	510	340	4	2 650 000	10 600 000	580 000	1 100	660
435	507	590	354	6	4 300 000	15 600 000	890 000	800	590
395	427	470	353	2,5	1 560 000	7 350 000	385 000	1 300	730
430	484	550	364	4	3 250 000	12 900 000	750 000	950	600
465	541	630	373	6	5 200 000	19 000 000	1 070 000	750	530
420	461	510	380	3	1 900 000	8 800 000	455 000	1 200	700
450	504	572	384	4	3 350 000	13 400 000	720 000	900	570
485	560	650	391	6	5 400 000	20 400 000	1 130 000	750	495
440	480	530	395	3	2 080 000	9 650 000	495 000	1 100	650
480	538	612	404	5	3 900 000	16 000 000	860 000	850	530
510	587	682	415	6	5 850 000	22 400 000	1 220 000	700	465
460	500	550	415	3	2 120 000	10 200 000	510 000	1 100	610
500	557	634	424	5	4 000 000	16 600 000	880 000	850	510
540	622	722	441	6	6 400 000	25 000 000	1 330 000	670	440
490	534	590	437	4	2 650 000	12 500 000	620 000	1 000	580
525	585	664	447	5	4 300 000	18 000 000	940 000	800	475
560	643	742	455	6	6 700 000	26 000 000	1 390 000	630	420
510	554	610	458	4	2 650 000	13 400 000	660 000	1 000	550
548	614	695	470	5	4 550 000	19 000 000	990 000	750	460
595	684	794	486	8	7 650 000	30 000 000	1 570 000	600	395
530	575	632	477	4	2 700 000	13 400 000	660 000	950	530
575	638	726	487	5	5 000 000	21 200 000	1 120 000	700	440
615	704	815	502	8	7 800 000	31 000 000	1 620 000	600	380

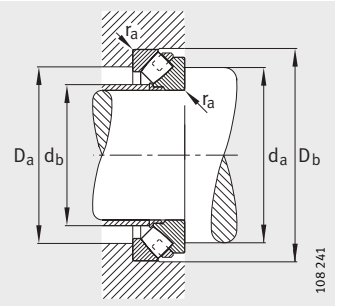
Axial spherical roller bearings



292..-E-MB, 293..-E-MB,
294..-E-MB

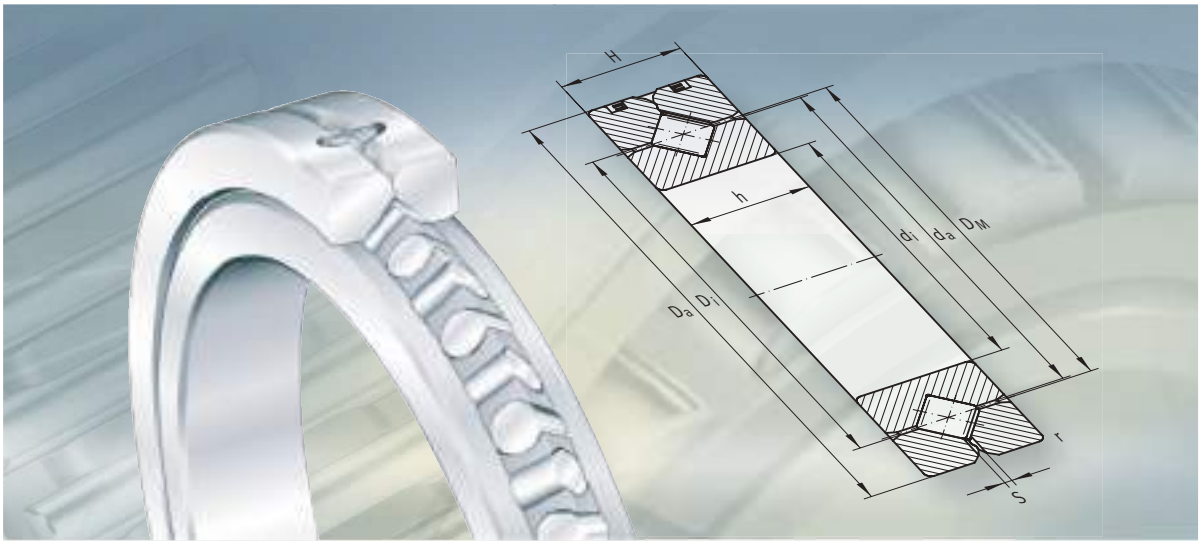
Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions										
	m	d	D	T	D_1	d_1	r	T_1	T_2	T_3	T_4	A
	≈kg						min.					
29296-E-MB	90,9	**480**	650	103	556	620	5	55	37	62	71	259
29396-E-MB	208	**480**	730	150	587	675	6	72	54	94	107	270
29496-E-MB	511	**480**	850	224	630	770	9,5	108	81	142	159	280
292/500-E-MB	93,5	**500**	670	103	574	640	5	55	37	63	72	268
293/500-E-MB	216	**500**	750	150	610	700	6	74	54	92	105	280
294/500-E-MB	525	**500**	870	224	654	790	9,5	107	81	142	160	290
292/530-E-MB	110	**530**	710	109	612	675	5	57	39	64	74	288
293/530-E-MB	266	**530**	800	160	646	745	7,5	76	58	101,5	116	295
294/530-E-MB	621	**530**	920	236	690	840	9,5	114	85	150,5	169	309
292/560-E-MB	131	**560**	750	115	642	715	5	60	41	71	111	302
294/560-E-MB	733	**560**	980	250	729	890	12	120	90	163	182	328
292/600-E-MB	154	**600**	800	122	688	760	5	65	44	71,5	82	321
294/600-E-MB	839	**600**	1 030	258	782	940	12	127	93	162	182	347
292/630-E-MB	195	**630**	850	132	724	805	6	67	48	82	94	338
294/630-E-MB	1 030	**630**	1 090	280	820	995	12	136	101	176,5	198	365
292/670-E-MB	228	**670**	900	140	773	855	6	74	50	81	93	364
294/710-E-MB	1 420	**710**	1 220	308	916	1 115	15	150	111	198	221	415
292/750-E-MB	299	**750**	1 000	150	861	955	6	81	54	88	100	406
293/750-E-MB	716	**750**	1 120	224	909	1 045	9,5	108	81	140	159	415
292/800-E-MB	341	**800**	1 060	155	915	1 010	7,5	81	56	96	110	426
293/800-E-MB	801	**800**	1 180	230	961	1 100	9,5	112	83	145,5	165	440
293/850-E-MB	933	**850**	1 250	243	1 021	1 165	12	118	87	152	173	468



Mounting dimensions

Mounting dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	D_b	d_b	r_a	dyn. C_a	stat. C_{0a}	C_{ua}	n_G	n_B
min.	max.	min.	max.	max.	N	N	N	min^{-1}	min^{-1}
555	603	662	508	4	2 800 000	14 600 000	700 000	900	510
593	660	746	507	5	5 200 000	22 400 000	1 160 000	700	410
645	744	865	521	8	9 300 000	36 500 000	1 920 000	530	350
575	622	682	527	4	2 900 000	15 300 000	740 000	900	490
615	683	768	532	5	5 100 000	22 800 000	1 160 000	700	400
670	765	886	542	8	9 300 000	37 500 000	1 930 000	530	340
611	661	722	560	4	3 100 000	16 300 000	770 000	850	465
650	724	818	561	6	6 000 000	26 500 000	1 350 000	630	375
700	810	937	573	8	10 200 000	41 500 000	2 160 000	500	320
645	697	762	586	4	3 650 000	19 300 000	910 000	800	435
750	860	997	606	10	11 800 000	49 000 000	2 480 000	480	290
690	744	814	633	4	3 800 000	20 400 000	960 000	750	410
800	900	1 055	653	10	12 200 000	52 000 000	2 600 000	450	275
730	789	864	657	5	4 800 000	25 500 000	1 180 000	670	375
840	960	1 115	681	10	14 000 000	58 500 000	2 850 000	430	260
775	836	915	710	5	4 900 000	26 000 000	1 190 000	630	365
925	1 073	1 250	768	12	17 300 000	75 000 000	3 600 000	400	224
863	930	1 017	798	5	5 600 000	32 000 000	1 410 000	600	325
915	1 015	1 142	795	8	10 800 000	51 000 000	2 420 000	450	255
918	987	1 078	837	6	6 550 000	37 500 000	1 640 000	530	295
970	1 070	1 202	842	8	11 800 000	57 000 000	2 700 000	450	232
1 028	1 137	1 273	896	10	12 900 000	64 000 000	2 900 000	430	215



Crossed roller bearings

Crossed roller bearings

Dimension series 18

SX

Crossed roller bearings

Features

Crossed roller bearings SX are bearings for high precision applications, whose dimensions conform to ISO dimension series 18 to DIN 616. They comprise outer rings, inner rings, rolling elements and plastic spacers. The outer ring is split and is held together by three retaining rings.

Rollers in X arrangement

Due to the X arrangement of the cylindrical rollers, these bearings can support axial forces from both directions as well as radial forces, tilting moment loads and any combination of loads by means of a single bearing position. As a result, designs involving two bearing positions can be reduced to a single bearing position, *Figure 1*, *Figure 2*.

Crossed roller bearings are very rigid, have high running accuracy and are supplied with normal clearance, low clearance or preload. Preloaded bearings have the suffix VSP.

The bearing outer rings are easily fixed to the adjacent construction using clamping rings.

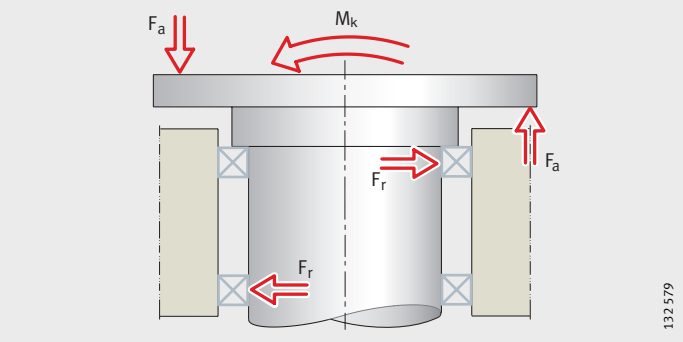


Figure 1
Bearing arrangement with two bearing positions

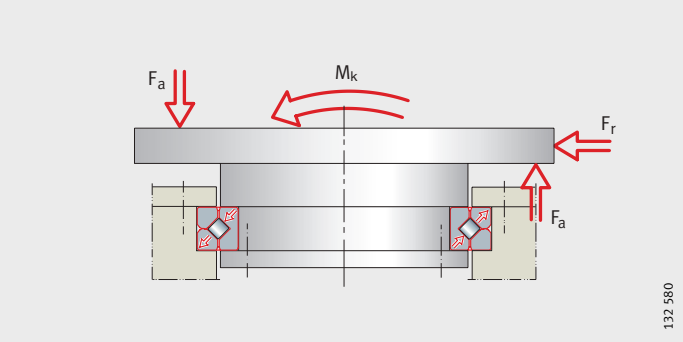


Figure 2
Bearing arrangement with one crossed roller bearing SX

Circumferential speed

The circumferential speed depends on the variant of the bearing (normal clearance or preloaded) and on the lubrication (grease or oil), see table Circumferential speed.

Normal clearance	Preload	Circumferential speed
Oil lubrication	–	up to 8 m/s ($n \cdot D_M = 152\,800$)
Grease lubrication	–	up to 4 m/s ($n \cdot D_M = 76\,400$)
–	Oil lubrication	up to 4 m/s ($n \cdot D_M = 76\,400$)
–	Grease lubrication	up to 2 m/s ($n \cdot D_M = 38\,200$)

Crossed roller bearings

Corrosion-resistant

Crossed roller bearings are also available in a corrosion-resistant version with the INA special plating Corrotect®.
These bearings have the suffix RR.

Sealing/lubricant

The bearings are not sealed. If sealing of the bearing position is necessary, this can be freely designed as part of the adjacent construction.

Crossed roller bearings are supplied preserved with oil. Bearings should be lubricated before being put into operation.

For grease lubrication, a high quality lithium soap grease DIN 51825–KP2N–20 is suitable, for example Arcanol LOAD220.

For oil lubrication, suitable oils are type CLP to DIN 51517 or HLP to DIN 51524 of viscosity class ISO VG 10 to 100.

Operating temperature

Crossed roller bearings are suitable for operating temperatures from –30 °C to +80 °C.

Suffixes

Suffixes for available designs: see table.

Available designs

Suffixes	Description	Design
RR	Corrosion-resistant design, with Corrotect® plating	Special design[1)]
RLO	Low clearance	Standard
VSP	Preloaded	Standard

1) Available by agreement.

Design and safety guidelines

Static load carrying capacity

Crossed roller bearings that undergo rotary motion only infrequently, undergo slow swivel motion, rotate only slowly or are subjected to load while stationary are dimensioned on the basis of their static load carrying capacity.

The size of a statically loaded crossed roller bearing can therefore be checked in approximate terms using the basic static load ratings C_0 and the static limiting load diagrams.

Checking the static load carrying capacity

It can be checked in approximate terms if the load arrangement is in accordance with *Figure 3* and all the requirements relating to clamping rings, location, fitting and lubrication are fulfilled.

Caution!

Where load arrangements are more complex or the conditions are not fulfilled, please contact us.

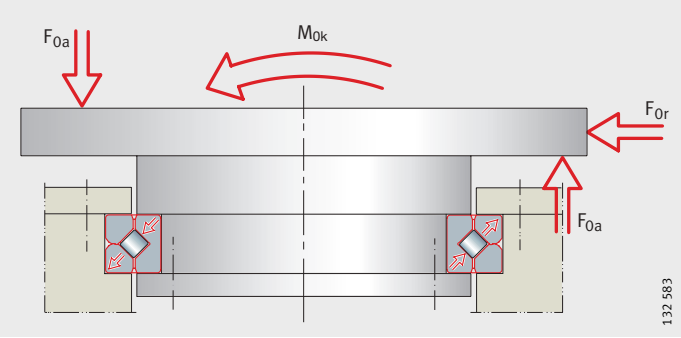


Figure 3
Load arrangement

In order to check the static load carrying capacity, the following equivalent static operating values must be determined:

- the equivalent static bearing load F_{0q}
- the equivalent static tilting moment load M_{0q}.

Checking is possible for applications with or without radial load.

Determining the equivalent static bearing load without radial load

If only axial and tilting moment loads are present, the following apply:

$$F_{0q} \triangleq F_{0a} \cdot f_A \cdot f_S$$

$$M_{0q} \triangleq M_{0k} \cdot f_A \cdot f_S$$

F_{0q} kN
Equivalent axial bearing load (static)

F_{0a} kN
Static axial bearing load

f_A –
Application factor, see table, page 804

f_S –
Factor for additional safety, see page 804

M_{0q} kNm
Equivalent tilting moment load (static)

M_{0k} kNm
Static tilting moment load.

Using the values for F_{0q} and M_{0q}, determine the load point in the static limiting load diagram Raceway, see dimension tables.

In addition to the raceway, the dimensioning of the fixing screws must also be checked.

The static limiting load diagrams for the raceway and the fixing screws are indicated in the dimension tables.

Caution! The load point must be below the raceway curve.

Determining the equivalent static bearing load with radial load

Caution! Radial loads can only be taken into consideration if the radial load F_{0r} is smaller than the basic static radial load rating C_{0r} according to the dimension table.

The equivalent static bearing load with radial load is determined as follows:

- Calculate the load eccentricity parameter ϵ using the formula.
- Determine the static radial load factor f_{0r}. To do this:
  - determine the ratio F_{0r}/F_{0a} in *Figure 4* or *Figure 5*
  - from the ratio F_{0r}/F_{0a} and ϵ, determine the static radial load factor f_{0r} from *Figure 4* or *Figure 5*.
- Determine the application factor f_A according to the table, page 804, and the safety factor f_S if required.
- Calculate the equivalent axial bearing load F_{0q} and the equivalent tilting moment load M_{0q} according to the formulae.
- Using the values for F_{0q} and M_{0q}, determine the load point in the static limiting load diagram Raceway (see dimension tables).

Caution! The load point must be below the raceway curve.

$$\epsilon = \frac{2000 \cdot M_{0k}}{F_{0a} \cdot D_M}$$

$$F_{0q} = F_{0a} \cdot f_A \cdot f_S \cdot f_{0r}$$

$$M_{0q} = M_{0k} \cdot f_A \cdot f_S \cdot f_{0r}$$

ϵ –
Load eccentricity parameter

M_{0k} kNm
Static tilting moment load

F_{0a} kN
Static bearing load (axial)

D_M mm
Rolling element pitch circle diameter, see dimension table

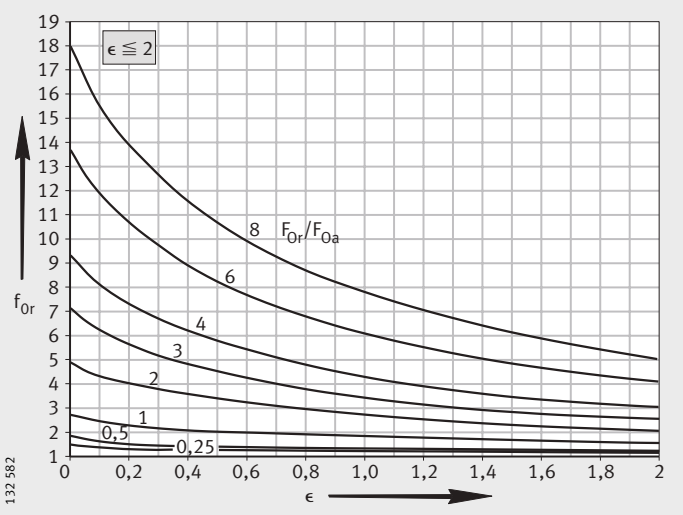
F_{0q} kN
Equivalent bearing load (static)

f_A –
Application factor, see table, page 804

f_S –
Factor for additional safety, see page 804

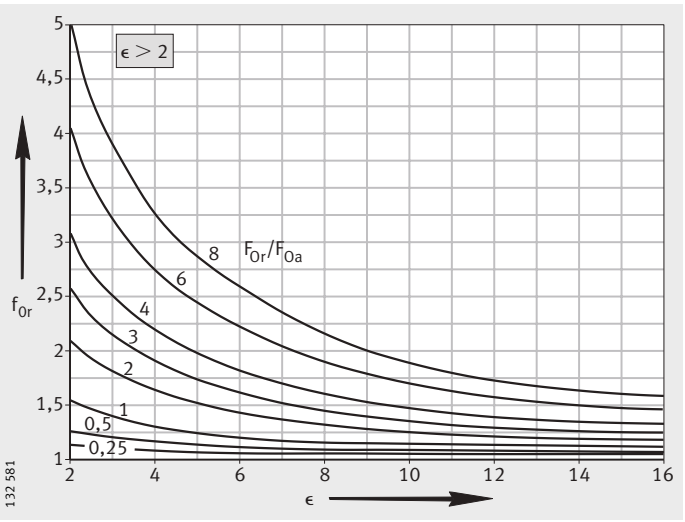
f_{0r} –
Static radial load factor, see *Figure 4* and *Figure 5*, page 803

M_{0q} kNm
Equivalent tilting moment load (static).



f_{0r} = static radial load factor
ϵ = load eccentricity parameter; $\epsilon \leqq 2$

Figure 4
Static radial load factor



f_{0r} = static radial load factor
ϵ = load eccentricity parameter; $\epsilon > 2$

Figure 5
Static radial load factor

Crossed roller bearings

Application factors

The application factors f_A in the table are empirical values. They take account of the most important requirements, e.g. the type and severity of operation, rigidity, running accuracy.

If the precise requirements of an application are known, the values may be altered accordingly.

Caution! Application factors < 1 must not be used.

A large proportion of applications can be statically calculated using a factor of 1 – such as bearings for gearboxes and rotary tables.

In addition to static calculation, the life should also always be checked, see Dynamic load carrying capacity.

Application factors f_A

Application	Operating/ requirement criteria	Application factor f_A
Robots	Rigidity	1,25
Antennae	Accuracy	1,5
Machine tools	Accuracy	1,5
Measuring equipment	Smooth running	2
Medical equipment	Smooth running	1,5

Safety factors

The factor for additional safety is $f_S = 1$.

It is not normally necessary to factor in any additional safety in calculation.

Caution! In special cases, such as approval specifications, internal specifications, requirements stipulated by inspection bodies etc., the appropriate safety factor should be used.

Dynamic load carrying capacity

Dynamically loaded crossed roller bearings – i.e. bearings undergoing predominantly rotary motion – are dimensioned in accordance with their dynamic load carrying capacity.

The size of a dynamically loaded bearing can therefore be checked in approximate terms using the basic dynamic load ratings C and the basic rating life L or L_h.

Determining the basic rating life

The life formulae for L and L_h are only valid:

- with a load arrangement in accordance with *Figure 6*
- if all the requirements are fulfilled in relation to location (the bearing rings must be rigid or firmly connected to the adjacent construction), fitting, lubrication and sealing
- if the load and speed can be regarded as constant during operation. If the load and speed are not constant, equivalent operating values can be determined that will result in the same fatigue conditions as the actual loads (see Equivalent operating values)
- if the load ratio is $F_r/F_a \leqq 8$.

Caution! If more complex load arrangements are present, if the ratio is $F_r/F_a > 8$ or if the conditions differ from those stated, please contact us.

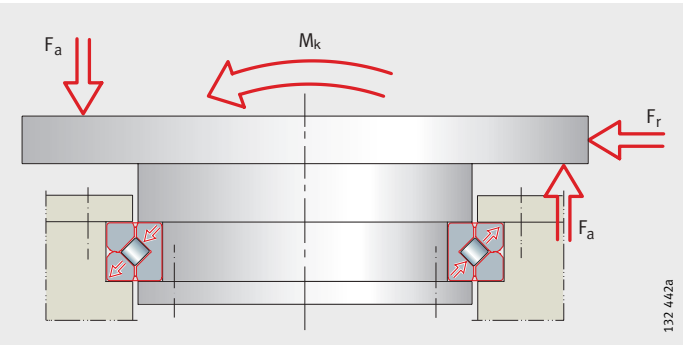


Figure 6
Load arrangement

Determining the basic rating life for bearings subjected to combined loads

For bearings subjected to combined loads – bearings with axial, radial and tilting moment loads – the life L and L_h is calculated as follows:

- Calculate the load eccentricity parameter ϵ according to the formula, page 806.
- Determine the ratio of the dynamic radial bearing load F_r to the dynamic axial bearing load F_a (F_r/F_a).
- Based on the values for ϵ and the ratio F_r/F_a, determine the dynamic load factor k_F, *Figure 7*, page 807.
- Calculate the equivalent dynamic bearing load $P_{axial} = k_F \cdot F_a$ according to the formula, page 806.
- Enter the equivalent dynamic bearing load P_{axial} and the basic dynamic axial load rating C_a in the life formulae L and L_h and calculate the life, page 806.

  If swivel operation is present, enter the operating speed n calculated according to the formula in the life formula L_h, page 806.

Determining the basic rating life for bearings subjected to radial loads only

For slewing rings subjected to radial loads only, the following values are entered in the life formulae for L and L_h:

- instead of the equivalent dynamic axial bearing load P_{axial}, the equivalent dynamic radial bearing load P_{radial} (i.e. F_r)
  - $P_{radial} = F_r$
- the basic dynamic radial load rating C_r.

$$\epsilon = \frac{2000 \cdot M_K}{F_a \cdot D_M}$$

$$P_{axial} = k_F \cdot F_a$$

$$L = \left(\frac{C_a}{P_{axial}}\right)^p \text{ or } L = \left(\frac{C_r}{P_{radial}}\right)^p$$

$$L_h = \frac{16666}{n} \cdot \left(\frac{C_a}{P_{axial}}\right)^p \text{ or } L_h = \frac{16666}{n} \cdot \left(\frac{C_r}{P_{radial}}\right)^p$$

$$n = n_{osc} \cdot \frac{\gamma}{90°}$$

ϵ –
Load eccentricity parameter

M_k kNm
Dynamic tilting moment load

F_a kN
Dynamic bearing load (axial)

D_M mm
Rolling element pitch circle diameter, see dimension table

P_{axial} kN
Equivalent dynamic axial bearing load.
For bearings subjected to radial load only, enter P_{radial}

k_F –
Dynamic load factor, see *Figure 7*

L 10^6 revolutions
Basic rating life in millions of revolutions

C_a, C_r kN
Basic dynamic axial or radial load rating according to dimension table.
For bearings subjected to radial load only, enter C_r

p –
Life exponent for crossed roller bearings: p = 10/3

L_h h
Basic rating life in operating hours

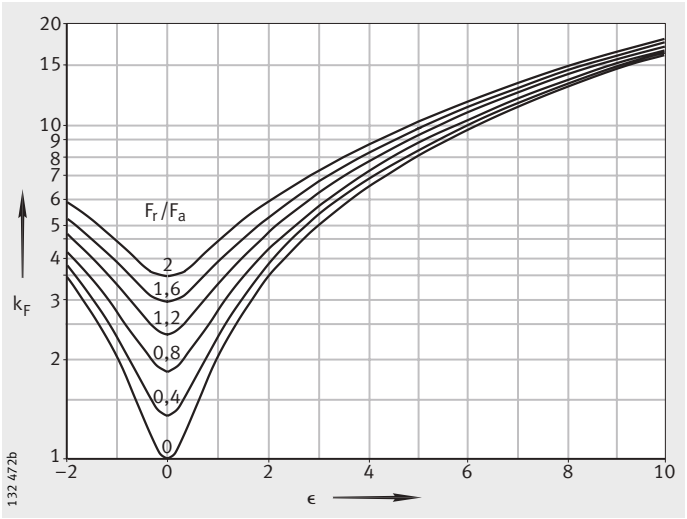
n min^{-1}
Operating speed

n_{osc} min^{-1}
Frequency of to and fro movement

γ °
Half of swivel angle

P_{radial} kN
Equivalent dynamic radial bearing load

F_r kN
Dynamic bearing load (radial).



k_F = dynamic load factor
ϵ = load eccentricity parameter

Figure 7
Dynamic load factor

Load carrying capacity of fixing screws

In addition to the raceway, the load carrying capacity of the fixing screws must also be checked. This is based on the information in the section Static load carrying capacity, page 800.

The load carrying capacity of the fixing screws can be checked if the following conditions are fulfilled:

- the criteria in the section Static load carrying capacity are fulfilled
- the screws are tightened as specified using a torque wrench
  – screw tightening factor $\alpha_A = 1,6$.
  tightening torques according to table, page 812 and page 813.
- the permissible contact pressure is not exceeded
- screws of the recommended size, quantity and grade are used.

Indicator of load carrying capacity

The load carrying capacity of the screws is described by:

- the curves in the limiting load diagrams for fixing screws in the dimension tables
- the maximum permissible radial load $F_{r\,per}$ (friction locking).

The screw curves are shown in the static limiting load diagrams Fixing screws. The curves are based on screws of grade 10.9, tightened to 90% of their proof stress including the torsion content.

If screws of grade 8.8 or 12.9 are used, the equivalent static loads F_{0q} and M_{0q} (see Static load carrying capacity, page 801), must be converted using the following factors:

- grade 8.8 ($F_{0q}\times 1,65$, $M_{0q}\times 1,65$)
- grade 12.9 ($F_{0q}\times 0,8$, $M_{0q}\times 0,8$).

Checking the static load carrying capacity of the screws

The static load carrying capacity of the screw is limited by its proof stress.

Static load carrying capacity for applications with and without radial load

Determine the equivalent static bearing loads F_{0q} and M_{0q}.

Using the values for F_{0q} and M_{0q}, determine the load point in the static limiting load diagram Fixing screws according to the dimension table. The load point must be below the appropriate screw curve.

Influence of radial load on the static load carrying capacity of the screws

If radial loads occur in uncentred bearing rings, the screw connections must prevent displacement of the bearing rings on the adjacent construction.

In order to check this:

- multiply the radial bearing load by an application factor f_A according to the table, page 804
- compare the values determined with the maximum permissible radial load $F_{r\ per}$.

Caution! The maximum permissible radial load $F_{r\ per}$ of the fixing screws is dependent on their friction locking and not on the radial load carrying capacity of the bearing.

If the radial load on the bearing is higher than the friction locking of the fixing screws or very high radial loads are present ($F_r/F_a > 4$), please contact us.

Checking the dynamic load carrying capacity of the screws

The dynamic load carrying capacity of the screws corresponds to the fatigue strength of the screw.

Dynamic load carrying capacity

Based on the dynamic loads present, the equivalent loads F_{0q} and M_{0q} are determined.

Instead of the application factor f_A, the operating load must always be increased by the following factor:

- grade 8.8 (factor 1,8)
  grade 10.9 (factor 1,6)
  grade 12.9 (factor 1,5).

Check the load carrying capacity in the static limiting load diagram Fixing screws, see dimension tables.

Caution! The load point must be below the appropriate screw curve.

Shaft and housing tolerances for normal applications

For normal applications, sufficient tolerances are K7 for the housing and h7 for the shaft, see tables Fitting tolerances.

Shaft and housing tolerances for precision applications

In precision applications, the bearing seat in the housing should be designed to tolerance K6 and the bearing seat on the shaft to h6, see tables Fitting tolerances.

Fitting tolerances for the shaft

Nominal dimension range		Nominal deviations			
>	≦	h6		h7	
mm	mm	upper µm	lower µm	upper µm	lower µm
65	80	0	−19	0	−30
80	100	0	−22	0	−35
100	120	0	−22	0	−35
120	140	0	−25	0	−40
140	160	0	−25	0	−40
160	180	0	−25	0	−40
180	200	0	−29	0	−46
200	225	0	−29	0	−46
225	250	0	−29	0	−46
250	280	0	−32	0	−52
280	315	0	−32	0	−52
315	355	0	−36	0	−57
355	400	0	−36	0	−57
400	450	0	−40	0	−63
450	500	0	−40	0	−63

Fitting tolerances for the housing bore

Nominal dimension range		Nominal deviations			
>	≦	K6		K7	
mm	mm	upper µm	lower µm	upper µm	lower µm
80	100	+4	−18	+10	−25
100	120	+4	−18	+10	−25
120	140	+4	−21	+12	−28
140	160	+4	−21	+12	−28
160	180	+4	−21	+12	−28
180	200	+5	−24	+13	−33
200	225	+5	−24	+13	−33
225	250	+5	−24	+13	−33
250	280	+5	−27	+16	−36
280	315	+5	−27	+16	−36
315	355	+7	−29	+17	−40
355	400	+7	−29	+17	−40
400	450	+8	−32	+18	−45
450	500	+8	−32	+18	−45
500	560	0	−44	0	−70
560	630	0	−44	0	−70

Crossed roller bearings

Location using clamping rings

For location of crossed roller bearings SX, clamping rings have proved effective, *Figure 8*, page 811.

Caution! Bearing rings must always be rigidly and uniformly supported over their entire circumference and width.

The thickness of the clamping rings and mounting flanges must not be less than the minimum thickness, table Mounting dimensions, *Figure 8*.

Counterbores to DIN 74, type J, for screws to DIN 6 912 are permissible. For deeper counterbores, the thickness of the clamping ring s must be increased by the additional counterbore depth.

For mounting dimensions, see table and *Figure 8*, for minimum strength of the clamping rings, see section Minimum strength.

Bearing seat depth

In order that the clamping rings retain the bearing securely, the bearing seat depth t must be in accordance with the table, table Mounting dimensions and *Figure 8*.

Caution! The depth of the bearing seat influences the bearing clearance and the rotational resistance.

Preloaded bearings (suffix VSP) have a considerably higher rotational resistance.

If particular requirements for rotational resistance apply, the depth t must be produced to match the relevant height of the bearing ring. It has proved useful to tolerance the depth t to deviations that are the same as or further restricted compared to the dimension h in the dimension tables. For safety, internal tests should in any case be carried out.

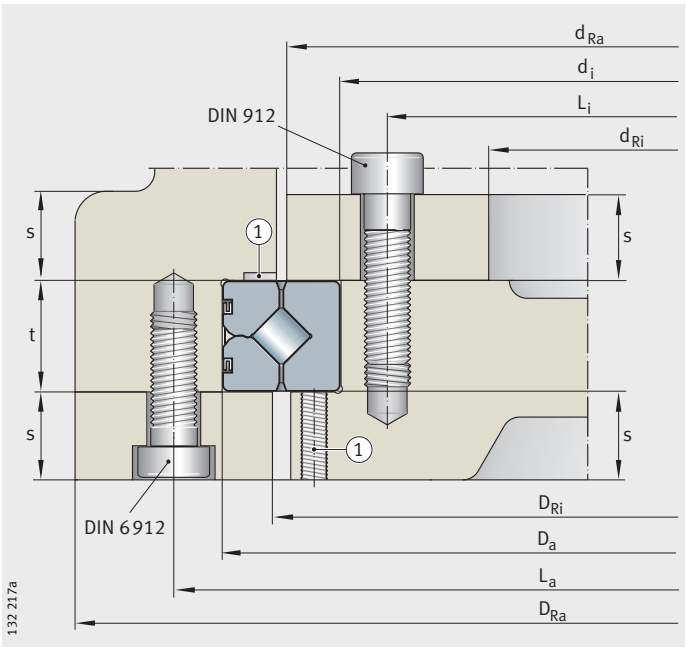
Minimum strength of clamping rings

For screws of grade 10.9, the minimum strength under the screw heads or nuts must be 500 N/mm^2. Washers are not necessary for these screws.

For fixing screws of grade 12.9, the minimum strength must not be less than 850 N/mm^2 or quenched and tempered washers must be used under the screw heads or nuts.

Mounting dimensions

Designation	Mounting dimensions									
	d_i h7 (h6)	D_a K7 (K6)	t	s min.	d_{RA}	d_{Ri}	D_{Ri}	D_{Ra}	L_i max.	L_a min.
SX011814	70	90	$10^{-0,005}_{-0,015}$	8	78	42	82	118	60	100
SX011818	90	115	$13^{-0,005}_{-0,020}$	10	100	61	104	144	80	125
SX011820	100	125	$13^{-0,005}_{-0,020}$	10	110	71	114	154	90	135
SX011824	120	150	$16^{-0,005}_{-0,025}$	12	132	84	138	186	108	162
SX011828	140	175	$18^{-0,005}_{-0,030}$	14	154	94	160	221	124	191
SX011832	160	200	$20^{-0,02}_{-0,05}$	15	177	111	183	249	144	216
SX011836	180	225	$22^{-0,02}_{-0,05}$	17	199	121	205	284	160	245
SX011840	200	250	$24^{-0,02}_{-0,06}$	18	221	139	229	311	180	270
SX011848	240	300	$28^{-0,02}_{-0,06}$	21	226	166	274	374	216	324
SX011860	300	380	$38^{-0,04}_{-0,10}$	29	335	201	345	479	268	412
SX011868	340	420	$38^{-0,04}_{-0,10}$	29	375	241	385	519	308	452
SX011880	400	500	$46^{-0,04}_{-0,10}$	35	445	275	455	625	360	540
SX0118/500	500	620	$56^{-0,04}_{-0,10}$	42	554	350	566	700	452	668



① Slots, threaded extraction holes or similar for dismantling purposes

Figure 8

Clamping rings, bearing seat depth, mounting dimensions

Fixing screws

For location of the bearing or clamping rings, screws of grade 10.9 are suitable, see table Fixing screws.

Caution! Any deviations from the recommended size, grade and quantity of screws will considerably reduce the load carrying capacity and operating life of the bearings.

For screws of grade 12.9, observe the minimum strength of the clamping rings or use quenched and tempered washers.

Fixing screws

Crossed roller bearing	Fixing screws Grade 10.9		Tightening torque
	Size	Quantity	M_A Nm
SX011814	M5	18	7
SX011818	M5	24	7
SX011820	M5	24	7
SX011824	M6	24	11,7
SX011828	M8	24	27,8
SX011832	M8	24	27,8
SX011836	M10	24	55,6
SX011840	M10	24	55,6
SX011848	M12	24	98,4
SX011860	M16	24	247
SX011868	M16	24	247
SX011880	M20	24	481
SX0118/500	M24	24	831

Securing of screws

Normally, the screws are adequately secured by the correct preload. If regular shock loads or vibrations occur, however, additional securing of the screws may be necessary.

Caution! Not every method of securing screws is suitable for crossed roller bearings.

Never use spring washers or split washers.

General information on securing of screws is given in DIN 25 201, and securing by means of adhesive in particular is described in DIN 25 203, issued 1992.

If these are to be used, please consult the relevant companies.

Tightening torques M_A for torque-controlled tightening of set screws

Fixing screw	Clamping cross-section A_s mm²	Core cross-section A_{d3} mm²	Tightening torque M_A[1] in Nm for grade 8.8	10.9	12.9
M4	8,78	7,75	2,25	3,31	3,87
M5	14,2	12,7	4,61	6,77	7,92
M6	20,1	17,9	7,8	11,5	13,4
M8	36,6	32,8	19,1	28	32,8
M10	58	52,3	38	55,8	65,3
M12	84,3	76,2	66,5	97,7	114
M14	115	105	107	156	183
M16	157	144	168	246	288
M18	192	175	229	336	394
M20	245	225	327	481	562
M22	303	282	450	661	773
M24	353	324	565	830	972

[1] $\overline{M_A}$ to VDI Guideline 2 230 (July 1986) for $\mu_K = 0{,}08$ and $\mu_G = 0{,}12$.

Assembly preload forces F_M for torque-controlled tightening of set screws

Fixing screw	Clamping cross-section A_s mm²	Core cross-section A_{d3} mm²	Assembly preload force F_M[1] in kN for grade 8.8	10.9	12.9
M4	8,78	7,75	4,05	5,95	6,96
M5	14,2	12,7	6,63	9,74	11,4
M6	20,1	17,9	9,36	13,7	16,1
M8	36,6	32,8	17,2	25,2	29,5
M10	58	52,3	27,3	40,2	47
M12	84,3	76,2	39,9	58,5	68,5
M14	115	105	54,7	80,4	94,1
M16	157	144	75,3	111	129
M18	192	175	91,6	134	157
M20	245	225	118	173	202
M22	303	282	147	216	253
M24	353	324	169	249	291

[1] $\overline{F_M}$ according to VDI Guideline 2 230 (July 1986) for $\mu_G = 0{,}12$.

Crossed roller bearings

Fitting of crossed roller bearings

The bores and edges of the adjacent components must be free from burrs. The support surfaces for the bearing rings must be clean.

Lightly oil or grease the bearing seat and locating surfaces on the adjacent construction.

Lightly oil the thread of the fixing screws in order to prevent varying friction factors (do not oil or grease screws that will be secured by means of adhesive).

Caution!

Ensure that all adjacent components and lubrication ducts are free from cleaning agents, solvents and washing emulsions.
The bearing seating surfaces can rust or the raceway system can become contaminated.

Assembly forces must only be applied to the bearing ring to be fitted; they must never be directed through the rolling elements or seals. Direct blows on the bearing rings must be avoided.

Bearing rings should be located consecutively and without external load.

The outer ring is split and is held together by three retaining rings ①, *Figure 9*. Never apply tensile loads to the retaining rings.

Locating the outer bearing ring

Fitting of the ring, see *Figure 9*:

- Insert or press the bearing ② into the external adjacent construction ③ with the outer ring first
- Position the external clamping ring ④
- Insert the fixing screws ⑤ in the clamping ring and tighten in steps up to the specified tightening torque M_A
  - tighten the screws in a crosswise sequence in order to prevent unacceptable fluctuations in the screw tensioning forces
  - tightening torques M_A for fixing screws: see tables, page 813.

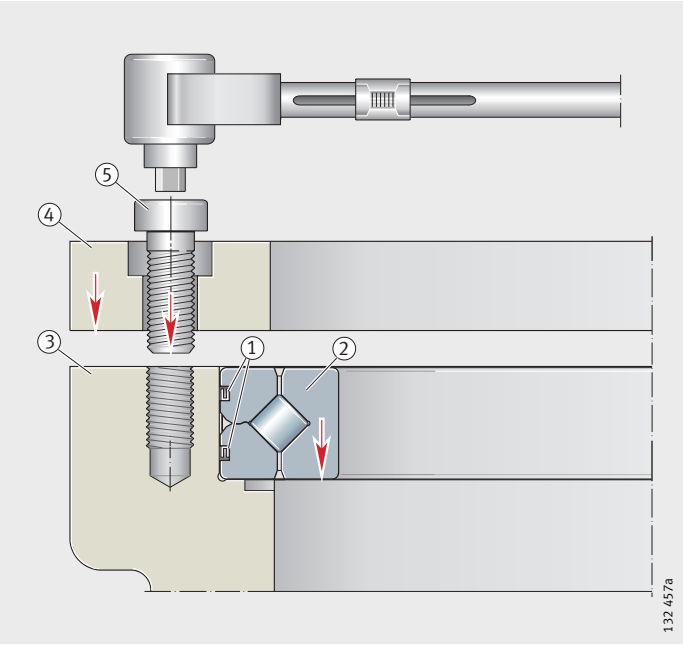


Figure 9
Locating the outer bearing ring

Locating the inner bearing ring

Fitting of the ring, see *Figure 10*:

- Insert the bearing ② into the internal adjacent construction ⑥
- Position the internal clamping ring ⑦
- Insert the fixing screws ⑧ in the clamping ring and tighten in steps up to the specified tightening torque M_A
  - tighten the screws in a crosswise sequence in order to prevent unacceptable fluctuations in the screw tensioning forces.

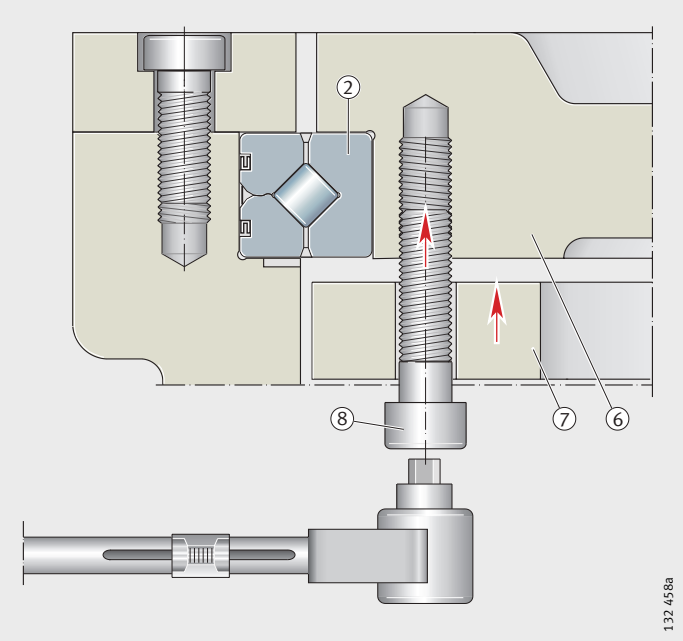


Figure 10
Locating the inner bearing ring

Checking operation

Once assembly is complete, the operation of the fitted crossed roller bearing must be checked.

Caution! If the bearing runs irregularly or roughly, or the temperature in the bearing shows an unusual increase, dismantle and check the bearing and reassemble the bearing in accordance with the fitting guidelines described.

Accuracy

The dimensional and geometrical tolerances are based on DIN 620-2 and DIN 620-3 and are within the range P6 to P5.

The main dimensions conform to DIN 616, dimension series 18.

Crossed roller bearings

Dimension table · Dimensions in mm

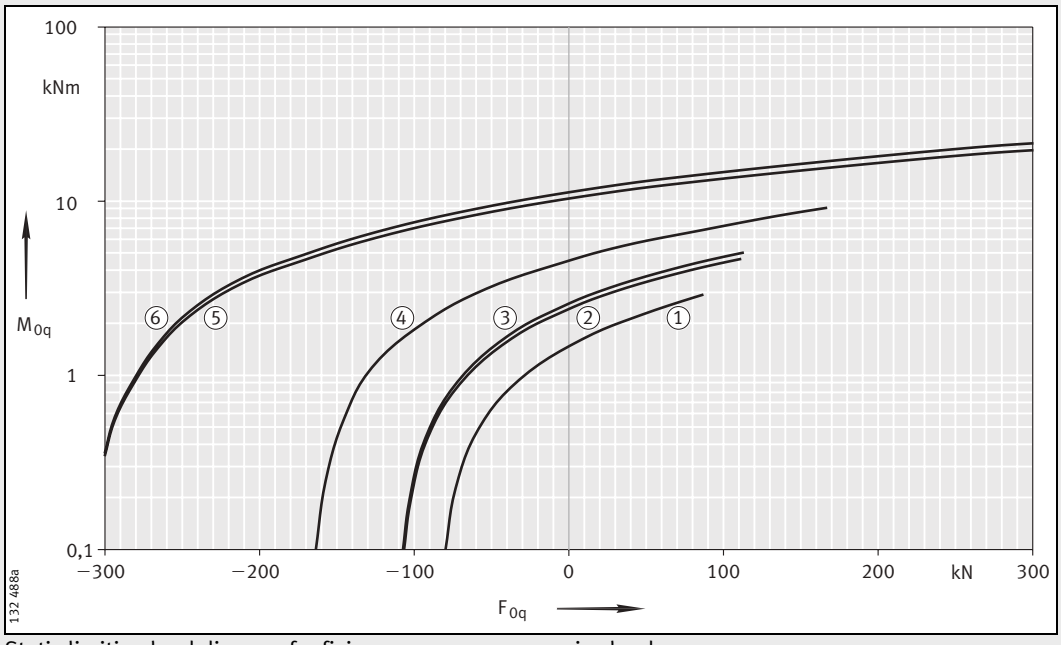
Designation	No.[1]	Mass	Dimensions									Running accuracy	
		m	D_M	d_i	D_a	H[2]	h[2]	d_a	D_i	r	S[3]	radial	axial
		≈kg		K6	h6		E8			min.			
SX011814	①	0,3	80	$\mathbf{70^{+0,004}_{-0,015}}$	$90_{-0,022}$	10±0,10	$10_{-0,01}$	79,5	80,5	0,6	1,2	0,010	0,010
SX011818	②	0,4	102	$\mathbf{90^{+0,004}_{-0,018}}$	$115_{-0,022}$	13±0,12	$13_{-0,01}$	101,5	102,5	1	1,2	0,010	0,010
SX011820	③	0,5	112	$\mathbf{100^{+0,004}_{-0,018}}$	$125_{-0,025}$	13±0,12	$13_{-0,01}$	111,5	112,5	1	1,2	0,010	0,010
SX011824	④	0,8	135	$\mathbf{120^{+0,004}_{-0,018}}$	$150_{-0,025}$	16±0,12	$16_{-0,01}$	134,4	135,5	1	1,5	0,010	0,010
SX011828	⑤	1,1	157	$\mathbf{140^{+0,004}_{-0,021}}$	$175_{-0,025}$	18±0,12	$18_{-0,01}$	156,3	157,7	1,1	1,5	0,015	0,010
SX011832	⑥	1,7	180	$\mathbf{160^{+0,004}_{-0,021}}$	$200_{-0,029}$	20±0,12	$20_{-0,025}$	179,2	180,8	1,1	1,5	0,015	0,010

1) Curve in the static limiting load load diagram for the raceway and fixing screws.

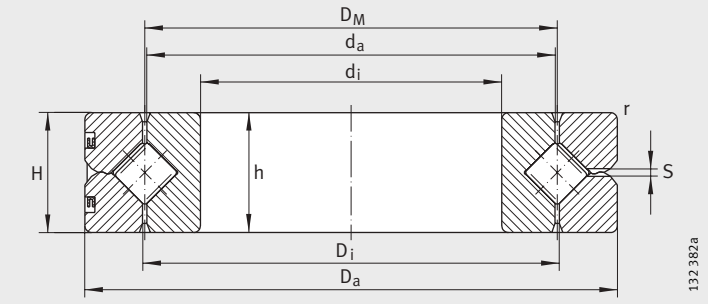
2) H: section height of bearing,
h: height of individual ring.

3) Lubrication hole: 3 holes spaced evenly about the circumference.

4) Basic load ratings, radial: for radial loads only.

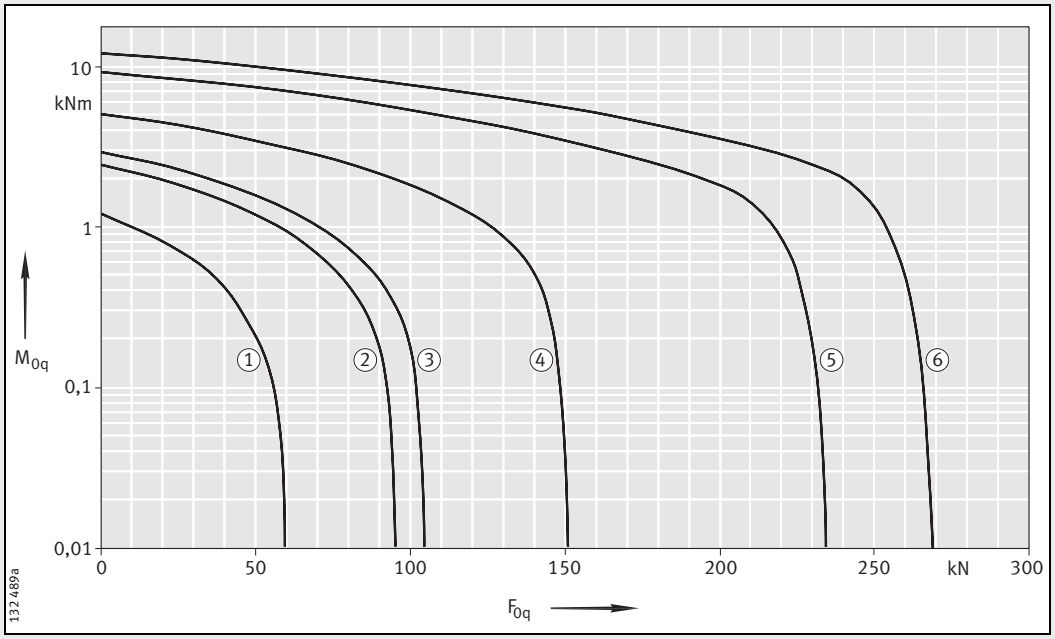


Static limiting load diagram for fixing screws – compressive load



SX

Normal clearance				Low clearance RLO		Preload VSP		Basic load ratings				Limiting speeds				Dimensions identical to ISO dimension series 18
Radial clearance		Axial tilting clearance		Radial clearance	Preload			axial		radial[4]		With normal clearance		With preload		
								dyn. C_a	stat. C_{0a}	dyn. C_r	stat. C_{0r}	n_G oil	n_G grease	n_G oil	n_G grease	
min.	max.	min.	max.	max.	max.	min.	max.	kN	kN	kN	kN	min^{-1}	min^{-1}	min^{-1}	min^{-1}	
0,003	0,015	0,006	0,03	0,003	0,006	0,003	0,015	18	60	12	30	1 910	955	955	475	618 14
0,003	0,015	0,006	0,03	0,003	0,006	0,003	0,015	26	96	17	47	1 500	750	750	375	618 18
0,005	0,020	0,010	0,04	0,004	0,008	0,005	0,020	28	106	18	52	1 360	680	680	340	818 20
0,005	0,020	0,010	0,04	0,004	0,008	0,005	0,020	41	153	26	75	1 130	565	565	280	618 24
0,005	0,020	0,010	0,04	0,004	0,008	0,005	0,020	64	237	41	116	975	485	485	240	618 28
0,005	0,020	0,010	0,04	0,004	0,008	0,005	0,020	69	272	44	133	850	425	425	210	618 32



Static limiting load diagram for raceway – compressive load

Dimension table (continued) · Dimensions in mm

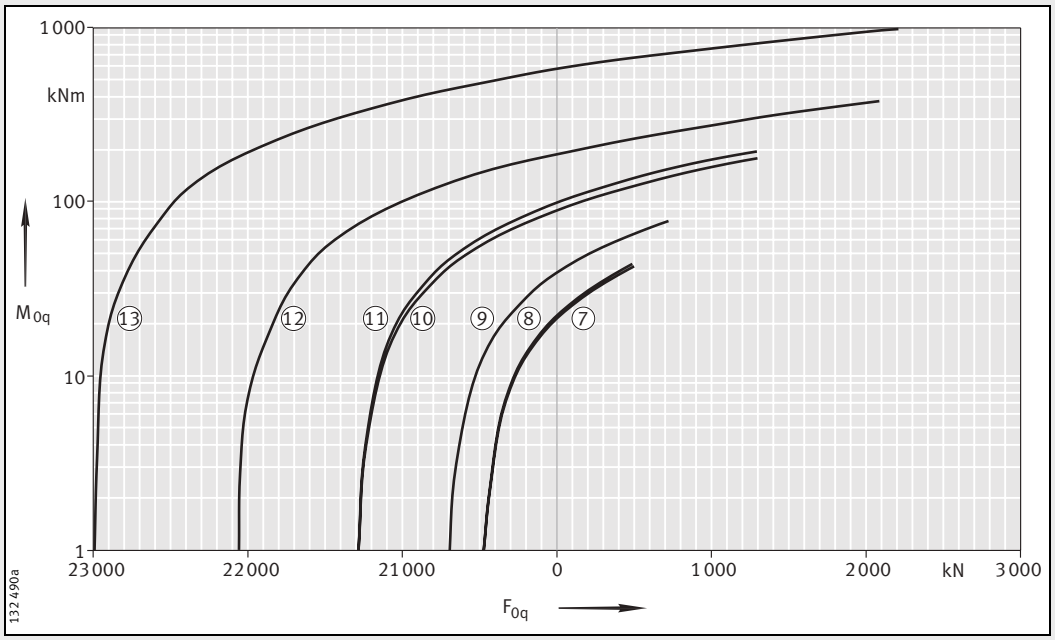
Designation	No.[1]	Mass	Dimensions									Running accuracy	
		m	D_M	d_i	D_a	H[2]	h[2]	d_a	D_i	r	S[3]	radial	axial
		≈kg		K6	h6		E8			min.			
SX011836	⑦	2,3	202	$\mathbf{180}^{+0,004}_{-0,021}$	$225_{-0,029}$	$22\pm0,13$	$22_{-0,025}$	201,2	202,8	1,1	2	0,015	0,010
SX011840	⑧	3,1	225	$\mathbf{200}^{+0,004}_{-0,024}$	$250_{-0,029}$	$24\pm0,13$	$24_{-0,025}$	224,2	225,8	1,5	2	0,015	0,010
SX011848	⑨	5,3	270	$\mathbf{240}^{+0,005}_{-0,024}$	$300_{-0,032}$	$28\pm0,13$	$28_{-0,025}$	269,2	270,8	2	2	0,020	0,010
SX011860	⑩	12	340	$\mathbf{300}^{+0,005}_{-0,027}$	$380_{-0,036}$	$38\pm0,14$	$38_{-0,05}$	339,2	340,8	2,1	2,5	0,020	0,010
SX011868	⑪	13,5	380	$\mathbf{340}^{+0,007}_{-0,029}$	$420_{-0,040}$	$38\pm0,14$	$38_{-0,05}$	379,2	380,8	2,1	2,5	0,025	0,010
SX011880	⑫	24	450	$\mathbf{400}^{+0,007}_{-0,029}$	$500_{-0,040}$	$46\pm0,15$	$46_{-0,05}$	449	451	2,1	2,5	0,030	0,010
SX0118/500	⑬	44	560	$\mathbf{500}^{+0,008}_{-0,032}$	$620_{-0,044}$	$56\pm0,16$	$56_{-0,05}$	558,8	561,2	3	2,5	0,040	0,010

1) Curve in the static limiting load load diagram for the raceway and fixing screws.

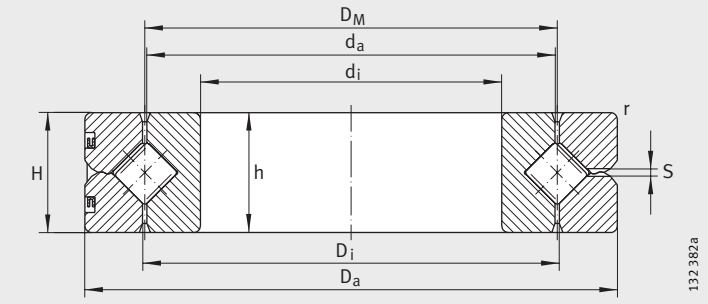
2) H: section height of bearing,
h: height of individual ring.

3) Lubrication hole: 3 holes spaced evenly about the circumference.

4) Basic load ratings, radial: for radial loads only.

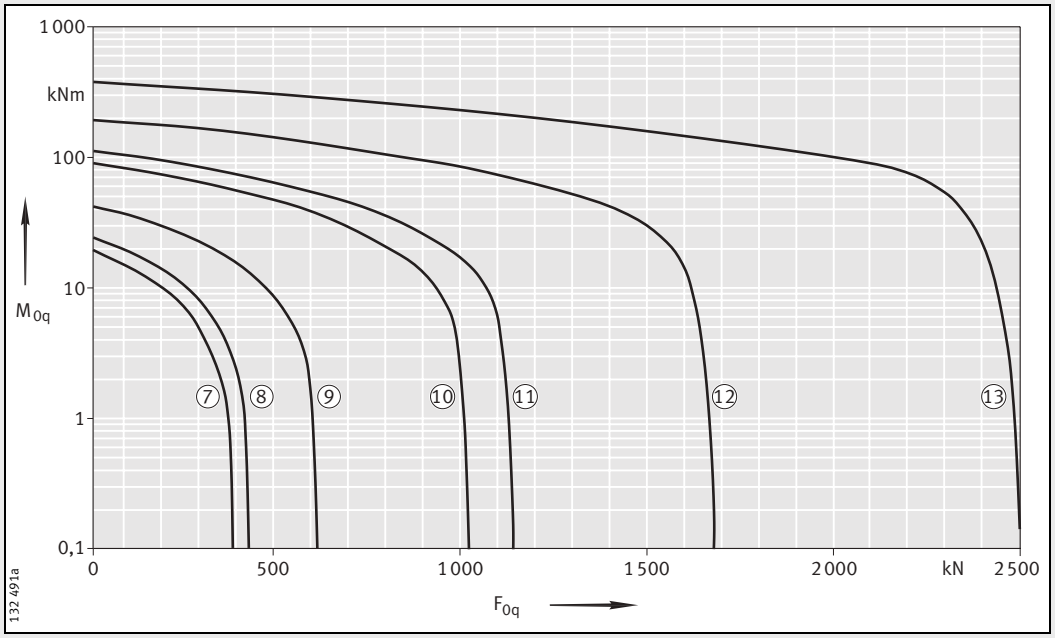


Static limiting load diagram for fixing screws – compressive load

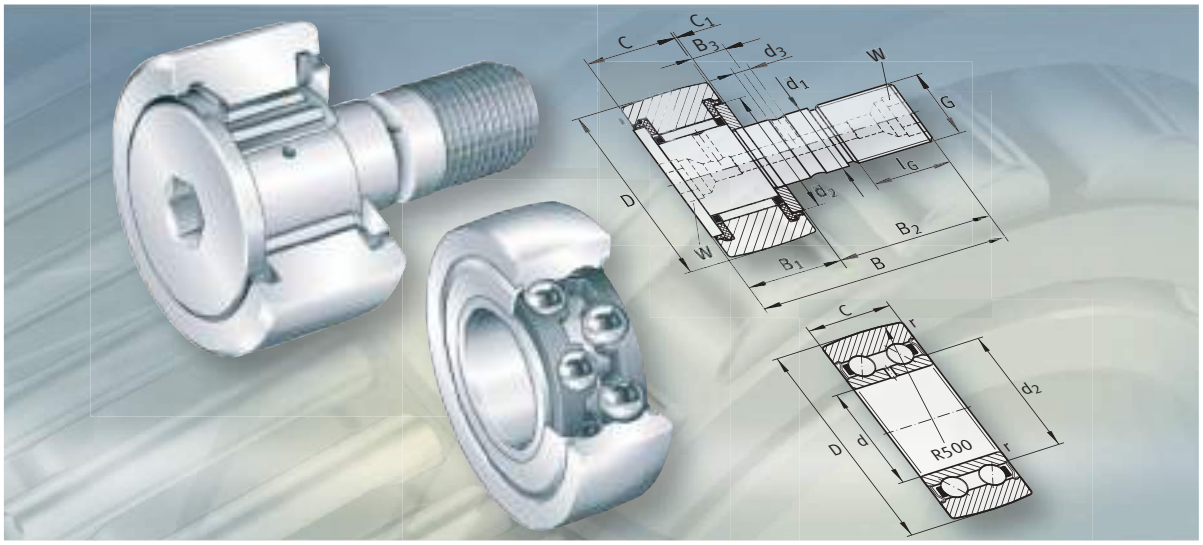


SX

Normal clearance				Low clearance RLO		Preload VSP		Basic load ratings				Limiting speeds				Dimensions identical to ISO dimension series 18
Radial clearance		Axial tilting clearance		Radial clearance	Preload			axial		radial[4)]		With normal clearance		With preload		
								dyn. C_a	stat. C_{0a}	dyn. C_r	stat. C_{0r}	n_G oil	n_G grease	n_G oil	n_G grease	
min.	max.	min.	max.	max.	max.	min.	max.	kN	kN	kN	kN	min^{-1}	min^{-1}	min^{-1}	min^{-1}	
0,005	0,025	0,010	0,05	0,005	0,010	0,005	0,025	98	381	63	187	755	375	375	185	618 36
0,005	0,025	0,010	0,05	0,005	0,010	0,005	0,025	106	425	68	208	680	340	340	170	618 40
0,010	0,030	0,020	0,06	0,005	0,010	0,005	0,025	149	612	95	300	565	280	280	140	618 48
0,010	0,040	0,020	0,08	0,005	0,010	0,005	0,025	245	1 027	156	504	450	225	225	110	618 60
0,010	0,040	0,020	0,08	0,005	0,010	0,005	0,025	265	1 148	167	563	400	200	200	100	618 68
0,010	0,050	0,020	0,10	0,005	0,010	0,005	0,025	385	1 699	244	833	340	170	170	85	618 80
0,015	0,060	0,030	0,12	0,006	0,012	0,005	0,030	560	2 538	355	1 244	275	135	135	65	618/500



Static limiting load diagram for raceway – compressive load



Track rollers

Yoke type track rollers
Stud type track rollers
Ball bearing track rollers

Track rollers

Yoke type track rollers are ready-to-fit needle and cylindrical roller bearings with a particularly thick-walled outer ring and are used in cam gears, bed ways, conveying equipment, linear guidance systems etc. In addition to high radial loads, they can also support axial loads which are due, for example, to slight misalignment defects, skewed running or brief contact running impacts.

Yoke type track rollers are available with and without axial guidance of the outer ring and in both sealed and open versions.

The outside surface of the outer rings is crowned and corresponds in the majority of designs to the optimised INA profile. In these bearings, the Hertzian pressure, edge load under tilting and wear of the mating track are reduced and the operating life of the mating track is increased.

Yoke type track rollers are mounted on a shaft or stud and are supplied with or without an inner ring.

Stud type track rollers correspond in their design to yoke type track rollers with axial guidance but, in place of the inner ring, they have a heavy-section roller stud. The stud has a fixing thread and, in most cases, a hexagonal socket on both ends. It is also available with a shrink-fitted eccentric collar. Due to the eccentric collar, the outside surface of the outer ring can be adjusted to match the mating track on the adjacent construction.

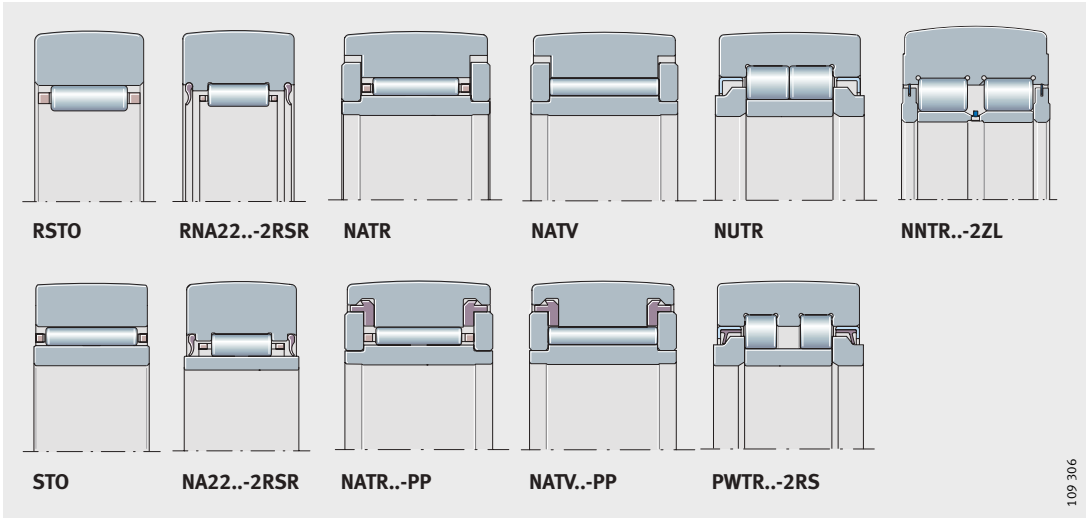
Stud type track rollers are available with labyrinth, gap or contact seals.

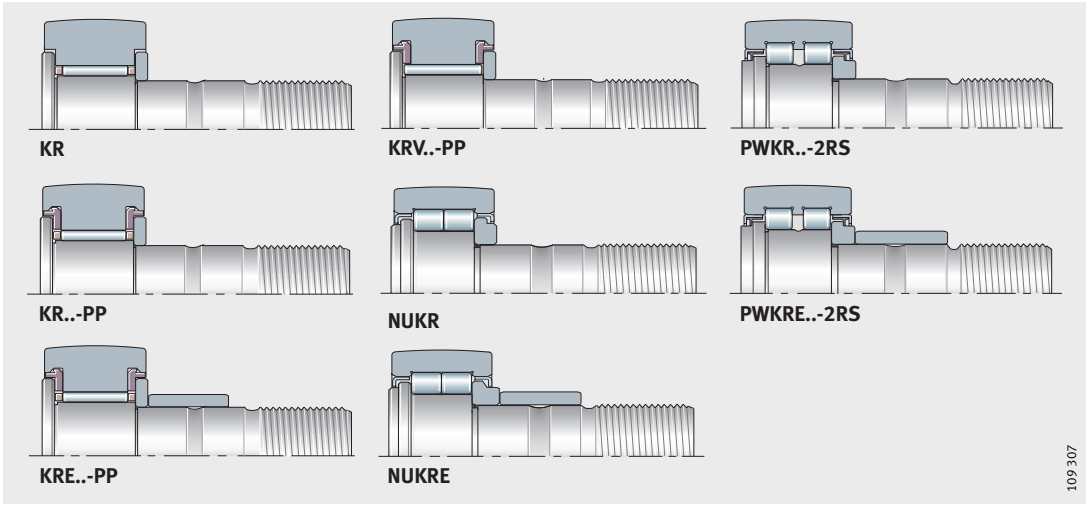
The outside surface of the outer rings is crowned and corresponds in the majority of designs to the optimised INA profile.

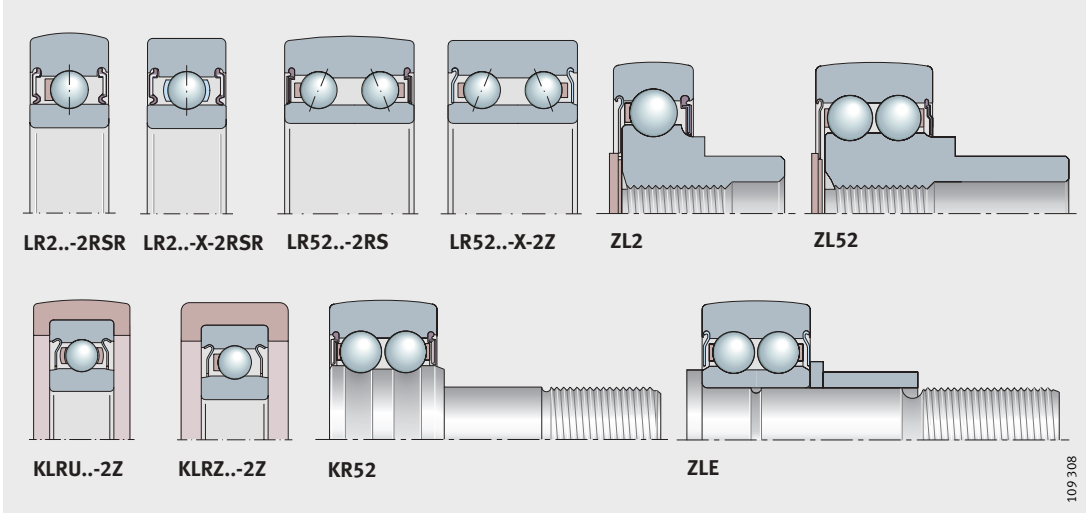
These track rollers correspond in their design to deep groove or angular contact ball bearings but have thick-walled outer rings with a crowned outside surface. They can support high radial forces as well as axial forces in both directions. The bearings are sealed.

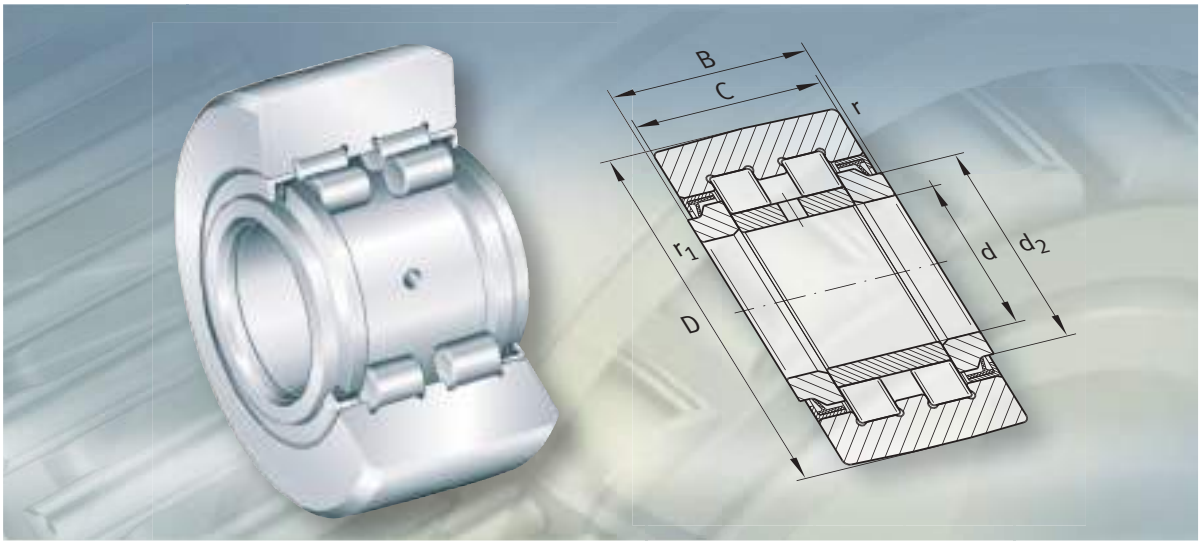
Ball bearing track rollers are available with and without a stud and with a plastic tyre.

Track rollers without a stud are mounted on a shaft or stud. Track rollers with a plastic tyre are used if the bearings are required to run with particularly low noise.


RSTO
RNA22..-2RSR
NATR
NATV
NUTR
NNTR..-2ZL
STO
NA22..-2RSR
NATR..-PP
NATV..-PP
PWTR..-2RS
109 306


KR
KRV..-PP
PWKR..-2RS
KR..-PP
NUKR
PWKRE..-2RS
KRE..-PP
NUKRE
109 307


LR2..-2RSR
LR2..-X-2RSR
LR52..-2RS
LR52..-X-2Z
ZL2
ZL52
KLRU..-2Z
KLRZ..-2Z
KR52
ZLE
109 308



Yoke type track rollers
Stud type track rollers

Yoke type track rollers
Stud type track rollers

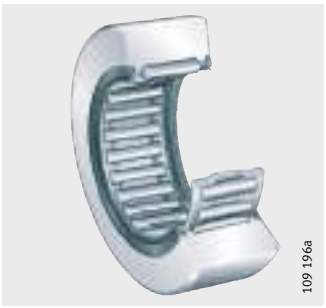
Product overview Yoke type track rollers

Without axial guidance
Without inner ring

RSTO

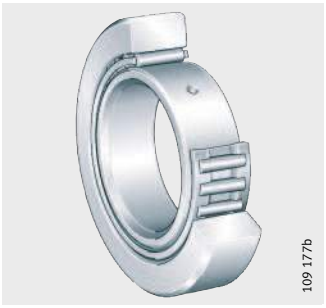
Lip seals

RNA22..-2RSR



With inner ring

STO



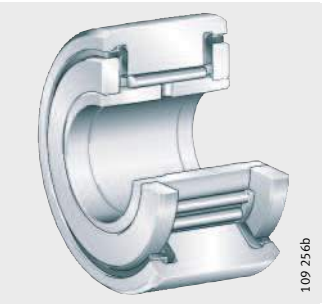
Lip seals

NA22..-2RSR

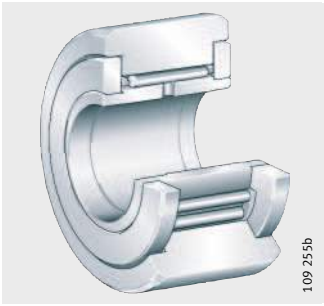
With axial guidance
With cage

Plastic axial plain washers/ gap seals

NATR..-PP



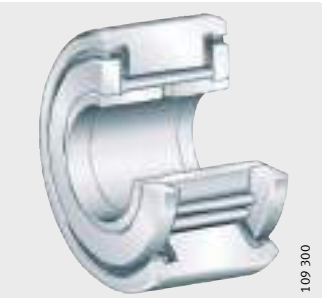
NATR



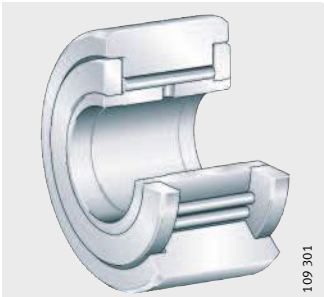
Full complement needle roller set

Plastic axial plain washers/ gap seals

NATV..-PP



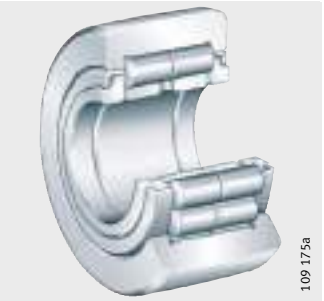
NATV



Full complement cylindrical roller set

Labyrinth seals

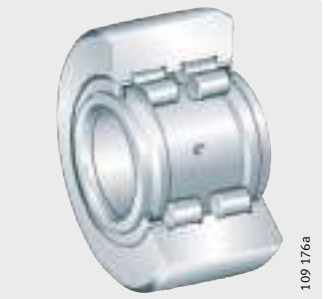
NUTR



Full complement cylindrical roller set, with central rib

Protected lip seals/ sealing shields with lamellar ring

PWTR..-2RS



NNTR..-2ZL

Yoke type track rollers

Features

Yoke type track rollers are single or double row units mounted on shafts or studs. They comprise thick-walled outer rings with a profiled outside surface and needle roller and cage assemblies or full complement needle roller or cylindrical roller sets.

Yoke type track rollers can support high radial loads as well as axial loads arising from slight misalignment and skewed running; they are suitable for cam gears, bed ways, conveying equipment etc.

The bearings are available with and without an inner ring and in both sealed and open versions.

Outside surface profile of the outer ring

Yoke type track rollers with a crowned outside surface are predominantly used since they are often inclined in relation to the mating track and edge stresses must be avoided.

The radius of curvature of the outside surface is R = 500 mm.

In series NNTR..-2ZL, the radius is indicated in the dimension table.

In series NATR..-PP, NATV..-PP, NUTR and PWTR..-2RS, the outside surface has the optimised INA profile.

In yoke type track rollers with this curvature profile, *Figure 1* to *Figure 6*, page 834 and page 835:

- the Hertzian pressure is lower
- edge loading under tilting is lower
- wear of the mating track is reduced
- the operating life of the mating track is extended.

Yoke type track rollers without inner ring

Yoke type track rollers RSTO and RNA22..-2RSR do not have an inner ring. They are particularly compact but require a hardened and ground raceway on the shaft or stud.

Series RSTO is not self-retaining. The outer ring, needle roller and cage assembly and inner ring can therefore be fitted independently.

With cage/ axial guidance of outer ring

Yoke type track rollers RSTO and RNA22..-2RSR have a cage. These designs do not have axial guidance of the outer ring. Axial guidance of the outer ring and needle roller and cage assembly must be provided in the adjacent component; see Adjacent construction for yoke type track rollers, page 846.

Sealing/lubricant

Yoke type track rollers RSTO are not sealed, series RNA22..-2RSR has lip seals on both sides.

They are greased using a lithium complex soap grease to GA08.

Yoke type track rollers with inner ring

These yoke type track rollers are used if the shaft or stud does not have a hardened and ground raceway.

Series STO is not self-retaining. This means that the outer ring, needle roller and cage assembly and inner ring can be fitted independently of each other.

With cage/ with full complement needle roller set/ with full complement cylindrical roller set

Yoke type track rollers STO, NA22..-2RSR, NATR and NATR..-PP have a cage. Series NATV and NATV..-PP have a full complement needle roller set, yoke type track rollers NUTR, PWTR..-2RS and NNTR..-2ZL have a full complement cylindrical roller set.

Bearings without a cage have the largest possible number of rolling elements and therefore have particularly high load carrying capacity. Due to the kinematic conditions, however, the speeds achievable with these bearings are somewhat lower than those achievable with the cage-guided yoke type track rollers.

Axial guidance of outer ring

Series STO and NA22..-2RSR do not have axial guidance of the outer ring. This must be provided in the adjacent construction; see Adjacent construction for yoke type track rollers, page 846.

In NATR and NATV, axial guidance is provided by contact washers and plain washers. In NUTR, the outer ring is guided by the rolling elements, in PWTR..-2RS and NNTR..-2ZL this function is performed by the central rib and the rolling elements.

With anti-corrosion protection

Series PWTR..-2RS-RR is protected against corrosion by the INA special plating Corrotect®, see page 859.

Sealing/lubricant

Yoke type track rollers STO are not sealed.
Series NA22..-2RSR has lip seals, PWTR..-2RS has protected lip seals on both sides.

NATR..-PP and NATV..-PP have three-stage seals with plastic axial plain washers. NATR, NATV have gap seals, NUTR has labyrinth seals and NNTR..-2ZL has sealing shields with lamellar rings.

In the three-stage concept, there is a gap seal between the plastic axial plain washer and the outer ring and a labyrinth seal between the formed seal lip and the undercut in the outer ring.

The disc spring shape of the axial plain washers gives a preloaded contact seal as the third stage. It also provides axial sliding contact between the outer ring and contact washers, thus reducing wear and grease consumption.

They are greased using a lithium complex soap grease to GA08 and can be lubricated via the inner ring.

Operating temperature

Yoke type track rollers have an operating temperature range from –30 °C to +140 °C. In sealed bearings (suffixes 2RS and 2RSR) and bearings with a plastic cage (suffix TV), the temperature range is restricted to between –30 °C and +120 °C.
Note the information on the operating temperature range in Technical Principles, Lubrication.

Caution!

Yoke type track rollers NATR..-PP and NATV..-PP are suitable for operating temperatures from –30 °C to +100 °C, restricted by the grease and seal material.

Suffixes

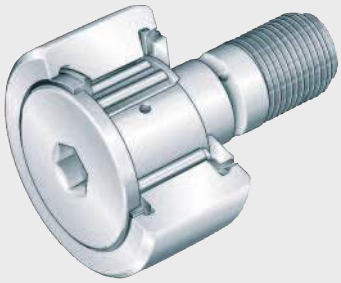
Suffixes for the available designs: see table.

Available designs

Suffix	Description
PP	Plastic axial plain washer with formed seal lip on both sides of the yoke type track roller, giving a three-stage seal
RR	Corrosion-resistant design with INA special plating Corrotect®
TV	Plastic cage
2RS	Protected lip seal on both sides of the yoke type track roller
2RSR	Radial contact lip seal on both sides of the yoke type track roller
2ZL	Sealing shield with lamellar rings on both sides of the track roller

Without eccentric collar
With cage
Plastic axial plain washers/ gap seals

KR..-PP
KR



Full complement needle roller set
Plastic axial plain washers

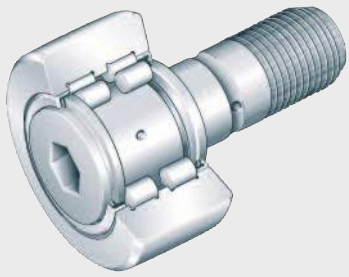
KRV..-PP

Full complement cylindrical roller set
Labyrinth seals

NUKR

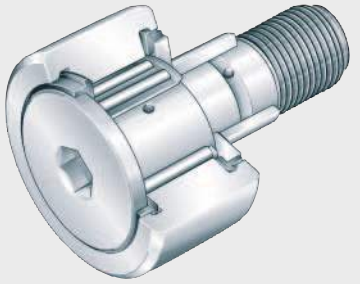
Full complement cylindrical roller set, with central rib
Protected lip seals

PWKR..-2RS



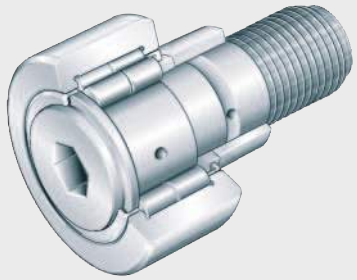
With eccentric collar
With cage
Plastic axial plain washers

KRE..-PP



Full complement cylindrical roller set
Labyrinth seals

NUKRE



Full complement cylindrical roller set, with central rib
Protected lip seals

PWKRE..-2RS

Stud type track rollers

Features

Stud type track rollers comprise thick-walled outer rings with a profiled outside surface, heavy-section roller studs with a fixing thread, contact washers and needle roller and cage assemblies or single or double row full complement needle roller or cylindrical roller sets.

They can support high radial loads as well as axial loads arising from slight misalignment and skewed running; they are suitable for cam gears, bed ways, conveying equipment etc.

The bearings are available in several designs as well as with or without an eccentric collar.

Outside surface profile of the outer ring

Stud type track rollers with a crowned outside surface are predominantly used since they are often inclined in relation to the mating track and edge stresses must be avoided.

In series KR, the radius of curvature is R = 500 mm.

In series KR..-PP, KRE..-PP, KRV..-PP, NUKR, NUKRE, PWKR..-2RS and PWKRE..-2RS, the outside surface has the optimised INA profile.

In stud type track rollers with this curvature profile, *Figure 1* to *Figure 6*, page 834 and page 835:

- the Hertzian pressure is lower
- edge loading under tilting is lower
- wear of the mating track is reduced
- the operating life of the mating track is extended.

Stud type track rollers without eccentric collar

Stud type track rollers without an eccentric collar do not have a defined adjustment facility in relation to the mating track on the adjacent construction.

With cage/ with full complement needle roller set/ with full complement cylindrical roller set

Stud type track rollers KR and KR..-PP have a cage, the design KRV..-PP has a full complement needle roller set. Series NUKR and PWKR..-2RS have a full complement cylindrical roller set.

Stud type track rollers without a cage have the largest possible number of rolling elements and therefore have particularly high load carrying capacity. Due to the kinematic conditions, however, the speeds achievable with these bearings are somewhat lower than those achievable with the cage-guided stud type track rollers.

Axial guidance of outer ring

In series KR, KR..-PP and KRV..-PP, axial guidance is provided by the contact flange and contact washers.

The outer rings of series NUKR and PWKR..-2RS are guided by the rolling elements and central rib.

With anti-corrosion protection

Series PWKR..-2RS-RR is protected against corrosion by the INA special plating Corrotect®, see page 859.

Sealing/lubricant

The stud type track rollers are sealed on both sides. Series KR has gap seals, KR..-PP has a three-stage seal with plastic axial plain washers having formed seal lips on both sides of the bearing, NUKR has labyrinth seals and PWKR..-2RS has protected lip seals.

Description of the three-stage PP seal: see page 829.

They are greased using a lithium complex soap grease to GA08 and can be lubricated via the roller stud.

Stud type track rollers with eccentric collar

Designs with an eccentric collar can be adjusted by means of a hexagonal socket on the flange/thread side of the roller stud. The outer ring outside surface can thus be adjusted against the mating track; this allows less accurate manufacturing tolerances on the adjacent construction. Furthermore, this gives improved load distribution when using several stud type track rollers and also allows preloaded linear systems to be easily realised.

The highest point of the eccentric collar is indicated by the position of the INA logo and the eccentricity e is stated in the dimension tables.

With cage/ with full complement cylindrical roller set

Stud type track rollers KRE..-PP have a cage. Series NUKRE and PWKRE..-2RS have a full complement cylindrical roller set.

Stud type track rollers without a cage have the largest possible number of rolling elements and therefore have particularly high load carrying capacity. Due to the kinematic conditions, however, the speeds achievable with these bearings are somewhat lower than those achievable with the cage-guided stud type track rollers.

Axial guidance of outer ring

In series KRE..-PP, axial guidance is provided by the contact rib and contact washers. The outer rings of series NUKRE and PWKRE..-2RS are axially guided by the rolling elements and central rib.

Sealing/lubricant

The stud type track rollers are sealed on both sides. Series KRE..-PP has a three-stage seal with plastic axial plain washers having formed lips on both sides of the bearing, NUKRE has labyrinth seals and PWKRE..-2RS has protected lip seals.

Description of the three-stage PP seal: see page 829.

They are greased using a lithium complex soap grease to GA08 and can be lubricated via the roller stud.

Caution! The eccentric collar covers the radial lubrication hole in the shank. Relubrication must therefore be carried out via the end faces.

Operating temperature

Stud type track rollers have an operating temperature range from –30 °C to +140 °C. In sealed bearings (suffix 2RS), the temperature range is restricted to between –30 °C and +120 °C.
Note the information on the operating temperature range in Technical Principles, Lubrication.

Caution! Stud type track rollers KR..-PP, KRV..-PP and KRE..-PP are suitable for operating temperatures from –30 °C to +100 °C, restricted by the lubricant and seal material.

Suffixes

Suffixes for the available designs: see table.

Available designs

Suffix	Description
PP	Plastic axial plain washer with formed seal lip on both sides of the stud type track roller, giving a three-stage seal
RR	Corrosion-resistant design with INA special plating Corrotect®
SK	Hexagonal socket only on the flange-side end face. No relubrication facility
2RS	Protected lip seal on both sides of the stud type track roller

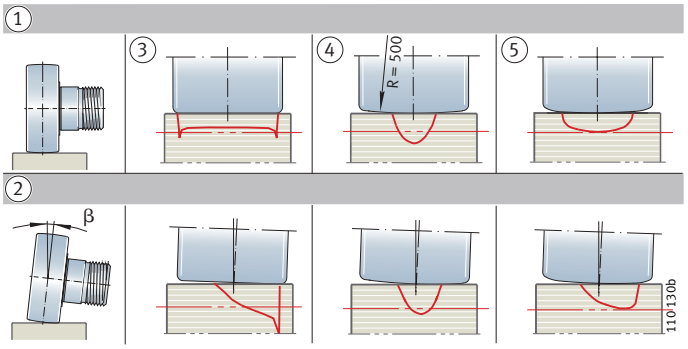
Yoke type track rollers
Stud type track rollers

Advantages of the optimised INA profile

- Lower maximum Hertzian pressure under tilting, *Figure 1* and *Figure 2*.
- Higher basic rating life of the outer ring and mating track, *Figure 3*.
- Reduced wear between the outer ring outside surface and mating track, *Figure 4* and *Figure 5*.
- Increased rigidity of outer ring contact, *Figure 6*.

Hertzian pressure curve

Comparison: Cylindrical profile/profile R = 500 mm; optimised INA profile ($C_{r\,w}/P_r = 5$), *Figure 1*.

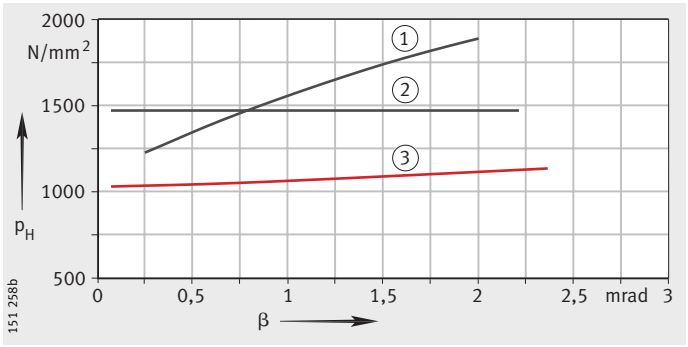


① Untilted running, β = 0 mrad
② Tilted running, β = 3 mrad
③ Cylindrical profile
④ Profile R = 500
⑤ Optimised INA profile

Figure 1
Hertzian pressure curve

Max. Hertzian pressure

Stud type track roller NUKR80, radial load $F_r = 13\,800$ N ($C_{r\,w}/P_r = 5$), *Figure 2*.

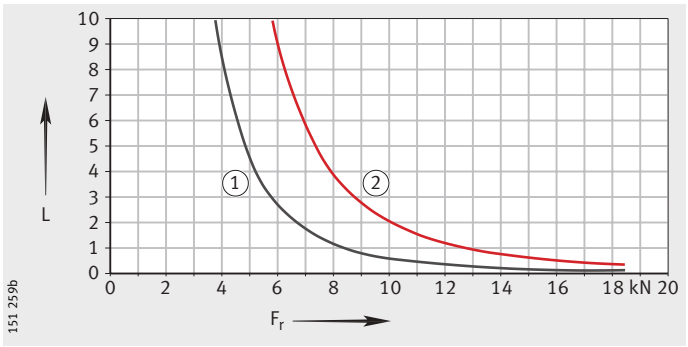


① Cylindrical profile
② Profile R = 500
③ Optimised INA profile
p_H = max. Hertzian pressure
β = tilt angle

Figure 2
Max. Hertzian pressure

Basic rating life of mating track

Yoke type track roller NUTR15, mating track made from 42CrMo4V, hardness 350 HV, *Figure 3*.

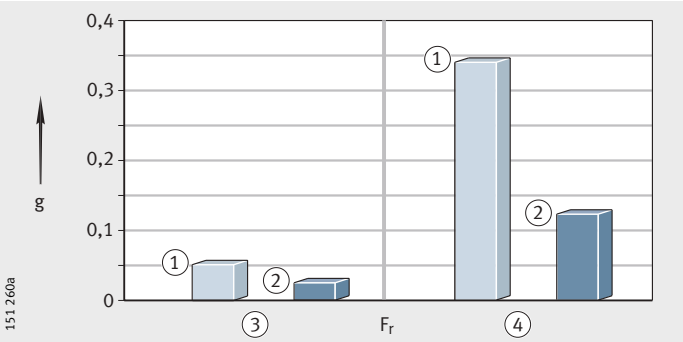


① Crowned outer ring, R = 500
② Optimised INA profile
L = basic rating life [millions of overrolling motions]
F_r = load

Figure 3
Basic rating life of the mating track

Wear of mating track

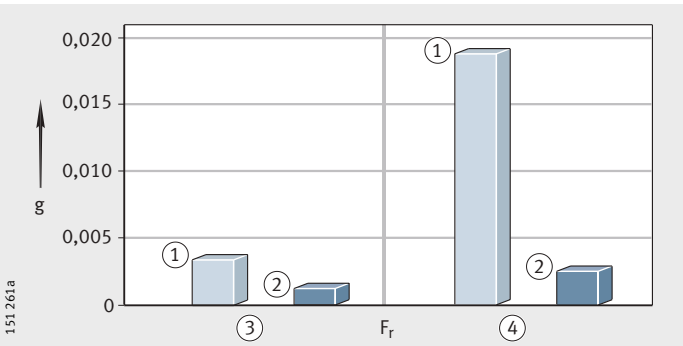
Mating track made from GGG–50.
Mean value from several test runs after 360 000 overrolling motions, *Figure 4*.



① Outer ring with R = 500
② Optimised INA profile
③ Low load F_r
④ High load F_r
g = wear

Figure 4
Wear of mating track

Mating track made from 58CrV4.
Mean value from several test runs after 8 000 000 overrolling motions, *Figure 5*.

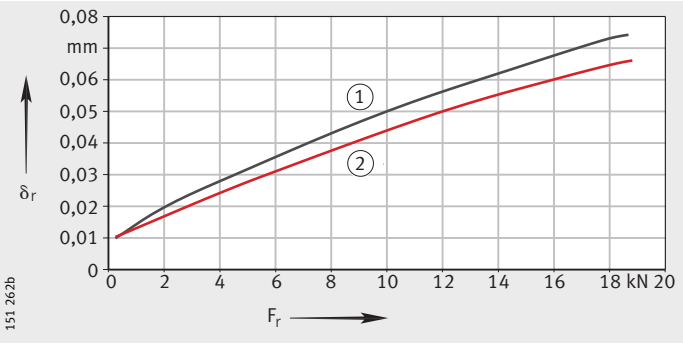


① Outer ring with R = 500
② Optimised INA profile
③ Low load F_r
④ High load F_r
g = wear

Figure 5
Wear of mating track

Rigidity in outer ring contact

Yoke type track roller NUTR15, radial deflection of outer ring and rolling element set, *Figure 6*.



① Crowned outer ring, R = 500
② Optimised INA profile
δ_r = radial deflection
F_r = load

Figure 6
Rigidity in outer ring contact

Yoke type track rollers
Stud type track rollers

Design and safety guidelines

Installation as yoke or stud type track roller

The thick-walled outer rings of yoke and stud type track rollers can support high radial loads. If these track rollers are used on a flat mating track, the outer rings undergo elastic deformation, *Figure 7*.

Compared to rolling bearings supported in a housing bore, track rollers have the following characteristics:

- modified load distribution in the bearing.
  This is taken into consideration by the effective load ratings $C_{r\,w}$ and $C_{0r\,w}$ used in life calculation.
- bending stresses in the outer ring. These are taken into consideration by the permissible radial loads $F_{r\,per}$ and $F_{0r\,per}$.
  The bending stresses must not exceed the permissible strength values of the material.

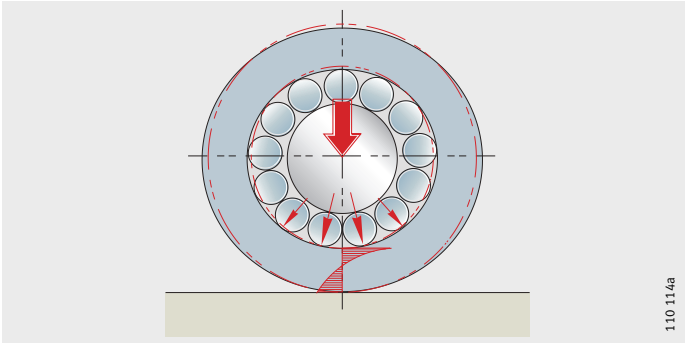


Figure 7
Deformation of the outer ring when used against a flat mating track

Permissible dynamic radial load

For bearings under dynamic – rotating – load, the effective dynamic load rating $C_{r\,w}$ is used. $C_{r\,w}$ is used to calculate the basic rating life.

Caution! The permissible dynamic radial load $F_{r\,per}$ must not be exceeded. If a value for $F_{r\,per}$ is not given, the basic dynamic load rating $C_{r\,w}$ is used as a substitute. The radial load acting on the bearing must not exceed this value.

If the basic static load rating $C_{0r\,w}$ is lower than the basic dynamic load rating $C_{r\,w}$, then $C_{0r\,w}$ applies.

Permissible static radial load

For bearings under static load – stationary or with only infrequent rotary motion – the effective static load rating $C_{0r\,w}$ applies. $C_{0r\,w}$ is used to calculate the static load safety factor S_0.

Caution! The permissible static radial load $F_{0r\,per}$ must not be exceeded. If no value for $F_{0r\,per}$ is given, the basic static load rating $C_{0r\,w}$ is used as a substitute. The radial load acting on the bearing must not exceed this value.

In addition to the permissible radial load of the bearing, the permissible radial load of the mating track must also be taken into consideration (Design of mating track, page 848).

Load carrying capacity and life

The methods for calculating the rating life are:

- the basic rating life to DIN ISO 281
- the adjusted basic rating life to DIN ISO 281
- the expanded calculation of the adjusted reference life to DIN ISO 281-4.

These methods are described in Technical Principles, Load carrying capacity and life.

For yoke type track rollers, stud type track rollers and yoke type track rollers based on balls, the following values must be replaced:

- $C_r = C_{r\,w}$
  effective dynamic load rating, see page 836
- $C_{0r} = C_{0r\,w}$
  effective static load rating, see page 836
- $C_{ur} = C_{ur\,w}$
  fatigue limit load as track roller according to the dimension tables.

Other formulae for calculating the basic rating life

$$L_s = 0{,}0314 \cdot D \cdot \left(\frac{C_{r\,w}}{P_r} \right)^p$$

or

$$L_h = 26{,}18 \cdot \frac{D}{H \cdot n_{osc}} \cdot \left(\frac{C_{r\,w}}{P_r} \right)^p$$

or

$$L_h = 52{,}36 \cdot \frac{D}{\bar{v}} \cdot \left(\frac{C_{r\,w}}{P_r} \right)^p$$

L_s 10^5m
Basic rating life in 10^5 metres

L_h h
Basic rating life in operating hours

$C_{r\,w}$ N
Effective dynamic load rating.
$C_{r\,w}$ is that load of constant magnitude and direction which a sufficiently large group of apparently identical track rollers can endure for a basic rating life of one million revolutions

P_r N
Equivalent dynamic load (radial load)

p –
Life exponent:
p = 3 for yoke and stud type track rollers based on balls
p = 10/3 for yoke and stud type track rollers based on needle or cylindrical rollers

n min^{-1}
Operating speed

D mm
Outside diameter of track roller

H m
Single stroke length for reciprocating motion

n_{osc} min^{-1}
Number of return strokes per minute

$\bar{v}$ m/min
Mean travel velocity.

Yoke type track rollers
Stud type track rollers

Operating life

The operating life is the life actually achieved by a rolling bearing. This can deviate significantly from the calculated basic rating life.

This may be due to wear and/or fatigue as a result of:

- deviating operating conditions
- misalignment between the track roller and mating track
- insufficient or excessive operating clearance
- contamination of the track roller
- inadequate lubrication
- excessive operating temperature
- oscillating bearing motion with a very small pivoting angle – false brinelling
- wear between the outer ring outside surface and the mating track
- high vibration and false brinelling
- very high shock loads – leading to static overloading
- prior damage during installation.

Due to the variety of installation and operating conditions, it is not possible to precisely predetermine the operating life. The most reliable way of arriving at a close estimate is by comparison with similar applications.

Static load safety factor

The parameter for the static load is the static load safety factor S_0. It indicates the security against impermissible permanent deformation of the bearing:

$$S_0 = \frac{C_{0r\,w}}{F_{0r}}$$

S_0 –
Static load safety factor

$C_{0r\,w}$ N
Effective static load rating: see dimension tables

F_{0r} N
Maximum radial load on track roller.

Track rollers are regarded as highly loaded at a static load safety factor of $S_0 < 8$.

Caution! Static load safety factors of $S_0 < 1$ cause plastic deformation of the rolling elements and the raceway, which can impair smooth running. This is only permissible for bearings with small rotary motions or in secondary applications.

For a static load safety factor $S_0 < 2$, please contact us.

Minimum load

In order to ensure that the outer ring is driven and no slippage occurs or the track roller does not lift from the mating track, track rollers must be subjected to a minimum load in dynamic operation.

Caution! In general, the minimum load is calculated using the ratio $C_{0r\,w}/F_r < 60$.

Skewed running

Skewed running leads to additional axial load on the rolling bearing and axial slippage in the rolling contact between the outer ring and mating track, *Figure 8*. Depending on the skewed running angle α and lubrication, wear may occur in this case.

A complete loss of adhesive friction between the outer ring and raceway with correspondingly severe wear is to be expected with a skewed running angle $\alpha \geqq 1{,}4 \cdot 10^{-4} \cdot p_H$ (°) or $\alpha \geqq 2{,}5 \cdot 10^{-3} \cdot p_H$ (mrad).

α ° or mrad
Skewed running angle

p_H N/mm²
Hertzian pressure according to the nomogram, page 849.

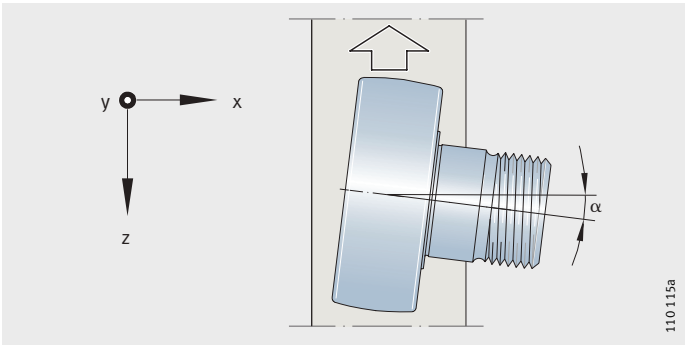


Figure 8
Skewed running angle α

Tilting

If tilting occurs during running, increased edge stresses occur, especially in track rollers with cylindrical outer rings.

Track rollers with a crowned outer ring are less sensitive to tilting and should therefore be used in preference to track rollers with a cylindrical outer ring.

In practice, track rollers with cylindrical outside surfaces and tilting angles of $\beta > 0{,}1°$ (1,7 mrad) and track rollers with crowned outside surfaces and tilting angles of $\beta > 0{,}25°$ (4,4 mrad) have proved suspectible to damage, *Figure 9*.

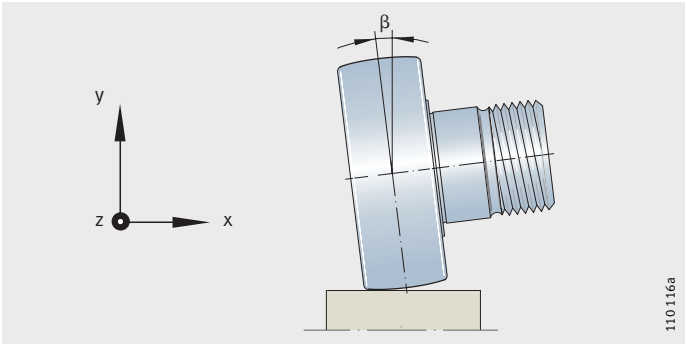


Figure 9
Tilting angle β

Yoke type track rollers
Stud type track rollers

Speeds

The maximum permissible speed for track rollers is largely determined by the permissible operating temperature of the rolling bearings.

The temperature thus depends on the type of bearing, the load, the lubrication conditions and the cooling conditions.

Speed during continuous operation

The speeds $n_{D\,G}$ in the dimension tables are guide values. They were determined for:

- grease lubrication
- loads during continuous operation of $< 0{,}05 \cdot C_{0r\,w}$
- skewed running angles of $\alpha < 0{,}03°$ ($< 0{,}5$ mrad)
- ambient temperatures of +20 °C
- outer ring temperatures of +70 °C
- lubricated mating track
- no external axial load.

The speed must be reduced if the following apply:

- loads higher than $0{,}05 \cdot C_{0r\,w}$
- additional axial forces – skewed running
- insufficient heat dissipation.

Higher speeds can be achieved with intermittent operation and oil impulse lubrication.

Speed with lip seals

The speed of track rollers with lip seals is additionally restricted by the permissible sliding speed at the seal lip.

Frictional torque

The frictional torque M_R of a track roller depends on many influencing factors such as load, speed and track roller type, as well as the lubrication conditions and seal friction.
Due to the wide range of these influencing factors, the frictional torque can only be calculated approximately.

For track rollers without contact seals, the frictional torque can be calculated under normal operating conditions and moderate speed range using the following formula:

$$M_R = f \cdot F_r \cdot \frac{d_M}{2}$$

M_R Nmm
Frictional torque of track roller
f –
Coefficient of friction, see table
F_r N
Radial load
d_M mm
Mean bearing diameter (d + D)/2 of the track roller.

Caution!

The values in the table Coefficient of friction f are valid for track rollers under radial load and without seals.

If sealed track rollers are used, higher values must be expected.

Additional axial forces – e.g. under large skewed running angles – can lead to a substantial increase in the values, especially in the case of track rollers based on needle rollers. Track rollers based on balls can support axial loads without a significant change in friction.

Coefficient of friction f

Type of track roller	Coefficient f
Ball bearing, single row	0,0015 to 0,002
Ball bearing, double row	0,002 to 0,003
Cylindrical roller bearing, full complement	0,002 to 0,003
Needle roller bearing with cage	0,003 to 0,004
Needle roller bearing, full complement	0,005 to 0,007

Displacement resistance

When a track roller rolls on a track, it must overcome not only the friction within the bearing but also the rolling friction between the outer ring and the track.

The displacement resistance F_v is determined according to the following formula:

$$F_v = \frac{2 \cdot (f_R \cdot F_r + M_R)}{D}$$

F_v N
Displacement resistance
f_R mm
Coefficient of rolling friction for tracks made from hardened steel:
f_R = 0,05 mm
F_r N
Radial load
M_R Nmm
Frictional torque of track roller
D mm
Outside diameter of track roller, see dimension tables.

Yoke type track rollers
Stud type track rollers

Lubrication

Yoke and stud type track rollers based on ball bearings are greased using a lithium soap grease with a mineral oil base to GA13.

For yoke and stud type track rollers based on needle and cylindrical rollers, a lithium complex soap grease with a mineral oil base and EP additives to GA08 is used.

Greases for initial greasing: see Technical Principles, Lubrication.

Arcanol rolling bearing greases for relubrication

Arcanol grease	Designation to DIN 51825	Type of grease	Track roller
LOAD220	KP2N–20	Lithium-calcium soap grease with mineral oil base	Yoke and stud type track rollers based on needle and cylindrical rollers
MULTI3	K3N–30	Lithium soap grease with mineral oil base	Yoke and stud type track rollers based on balls

Two contact zones in track rollers

For track rollers, two contact zones must be lubricated and considered separately:

- the rolling elements and the rolling element raceway
- the outside surface of the track roller and the mating track.

The contact zone between the rolling elements and the rolling element raceway is covered in Technical Principles, Lubrication.

Lubrication of mating track

For lubrication of the mating track, all lubricants suitable for rolling bearing lubrication may be used. However, there are applications in which the mating track must not be lubricated.

Caution! If the contact point cannot be lubricated, wear must be anticipated, especially under high loads and at high speeds.

Oil lubrication

For oil lubrication, oils of type CLP to DIN 51517 are recommended.

Grease lubrication

For grease lubrication, lithium soap greases to DIN 51825 should be used. Relubrication intervals can only be determined under operating conditions.

Relubrication must be carried out at the latest when fretting corrosion first occurs – this can be identified by a reddish discolouration of the mating track or the outer ring.

Solid lubricants/ anti-friction coatings

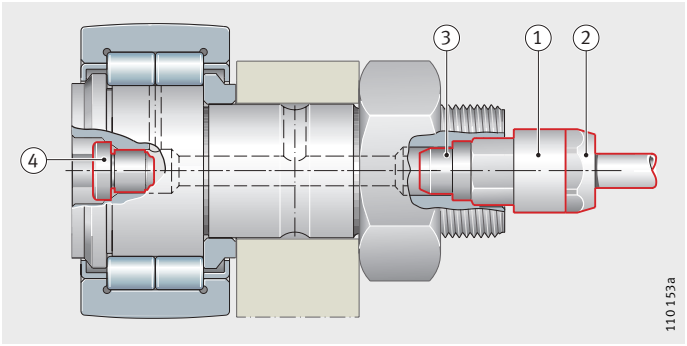
These materials can also be used for lubrication. However, these only provides effective lubrication for a significantly shorter period than oil or grease lubrication under high traverse speeds or speeds.

Central lubrication adapter for stud type track rollers

If a central lubrication system is to be used, a patented central lubrication adapter can be used to connect the standard roller stud of stud type track rollers with hexagonal sockets on both sides, *Figure 10*. This comprises a connection adapter with a hexagonal end and a rapid-fit connection cartridge.

The connection adapter is connected to the roller stud on one end of the stud type track roller by replacing the funnel type lubrication nipple with the fitting cylinder. The hexagonal end prevents rotation of the adapter. The other end of the stud type track roller is closed off using the supplied funnel type lubrication nipple, *Figure 10*.

The connection adapter has an M10×1 internal thread. This is used for screw mounting and sealing of the rapid-fit connection cartridge. The rapid-fit connection cartridge gives rigid retention and sealing of the plastic tube. It is therefore not necessary to screw the pipe and adapter onto each other.



① Connection adapter with M10×1 internal thread
② Rapid-fit connection cartridge
③ Fitting cylinder
④ Funnel type lubrication nipple

Figure 10
Central lubrication adapter/ funnel type lubrication nipple

Dimensions of adapter: see table and *Figure 11*.

Dimensions of adapter

Central lubrication adapter Designation	W	L	l_1 max.	l_2	l_3 approx.	For polyamide pipe DIN 73 378 $d_1 \times s_{nom}$ [1]
AP8	8	27	16	22	4	4×0,75
AP10	10	27	15	22	5	4×0,75
AP14	14	25	8	20	6	4×0,75

[1] Hard PA pipes should preferably be used.
Note the operating limits in DIN 73 378 and the manufacturer's guidance.
Maximum excess pressure for pipes made from PA 11/12 at +23 °C:
31 bar to 62 bar. Maximum excess pressure when using other screw-in connectors: 80 bar.

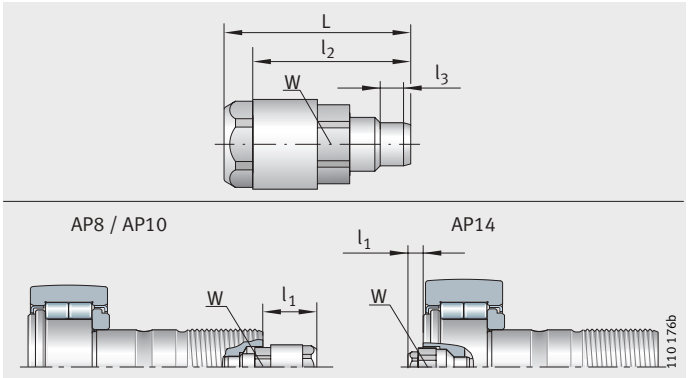


Figure 11
Central lubrication adapter – dimensions

Yoke type track rollers
Stud type track rollers

Simplified calculation of relubrication intervals

The table Allocation to stud type track rollers shows the relubrication quantity for central lubrication using flowable grease and its conversion to the number of relubrication impulses for conventional metering nipple sizes.

The data are valid for a lithium soap flowable grease with EP additives and mineral oil base of classes ISO VG 100 to ISO VG 220 and NLGI classes 00 or 000.

Allocation to stud type track rollers

Series[1]	Outside diameter D mm	Central lubrication adapter	Re-lubrication quantity g[2]	Relubrication impulses for metering nipple of size	
				30 mm^3	50 mm^3
NUKR/NUKRE	35 and 40	AP8	1,1	40	24
	47 and 52	AP10	2,4	89	53
	62 to 90	AP14	7,3	271	163
KR/KRE	35 and 40	AP8	1,2	44	27
	47 and 52	AP10	1,6	60	36
	62 to 90	AP14	6	222	133
KRV/KRVE	35 and 40	AP8	0,7	26	16
	47 and 52	AP10	1	37	22
	62 to 90	AP14	3,2	120	72

1) For stud type track rollers with hexagonal socket on both sides.

2) Relubrication quantity and relubrication intervals for central lubrication using flowable grease for the majority of applications.
Note the quantity required to fill the feed lines.

Relubrication periods

The approximate relubrication periods for single shift operation and a majority of load cases are shown in the table Relubrication period for calculation of relubrication intervals.

The number of relubrication impulses derived from the table Allocation to stud type track rollers should be evenly distributed within these periods.

Relubrication period for calculation of relubrication intervals[1]

Load ratio C_{0rw}/P_r	Maximum operating speed n_{max} in % of $n_{D\,G}$			
	10	25	50	100
$5 > C_{0rw}/P_r \geqq 3$	6 months	–	–	–
$10 > C_{0rw}/P_r \geqq 5$	1 year	4 months	1 month	–
$C_{0rw}/P_r \geqq 10$	1 year	8 months	2 months	14 days

1) The data are valid for single shift operation; the relubrication quantity and relubrication intervals are valid for the majority of applications.
They are based on approximate calculation of the relubrication interval t_{fR}; for relubrication interval see Technical Principles, Lubrication.

Periods in single shift operation

Months	Weeks	Working days	Working hours
1/2	2	10	80
1	4	20	160
2	8	40	320
4	16	80	640
6	24	120	960
8	32	160	1280
12	48	240	1920

Fitting of central lubrication adapter

The unused relubrication hole in the roller stud must be closed off using the funnel type lubrication nipple supplied.

Caution! Only the lubrication nipples supplied should be used.

The central lubrication adapter should preferably be pressed in using a lever press under low, uniform pressure or, if necessary, carefully driven with a plastic hammer using light blows into the unused hexagonal socket bore of the roller stud;
note the press-in depth l_3 and position of the hexagon, *Figure 11* and table Dimensions of adapter, page 843.

Fit the stud type track roller. Cut the plastic pipe straight across and insert it into the cartridge until it stops.

Caution! Only use polyamide pipe to DIN 73 378. Check the seating of the pipe. Note maximum pressures, maximum temperatures and minimum bending radius. Maximum pipe length to distributor approx. 1 m.

Yoke type track rollers
Stud type track rollers

Adjacent construction for yoke type track rollers

For stud type track rollers without an inner ring, the rolling element raceway on the shaft or stud must be hardened and ground. The surface hardness must be 670 HV + 170 HV, the hardening depth CHD or Rht must be sufficiently large.

Design of shaft or stud: see table Tolerances and surface for the shaft or stud raceway.

Tolerances and surface for the shaft or stud raceway

Diameter tolerance of shafts or studs		Roughness	Roundness	Parallelism
Without inner ring	With inner ring	max.	max.	max.
k5	g6 (with point load)	R_a0,4 (R_z2)	25% of diameter tolerance	50% of diameter tolerance

Location of yoke type track rollers without axial guidance

For yoke type track rollers without axial guidance, the outer ring and needle roller and cage assembly must be laterally guided, *Figure 12*. The axial contact surfaces for the outer rings must be precision machined, wear-resistant and lubricated (R_a2 recommended).

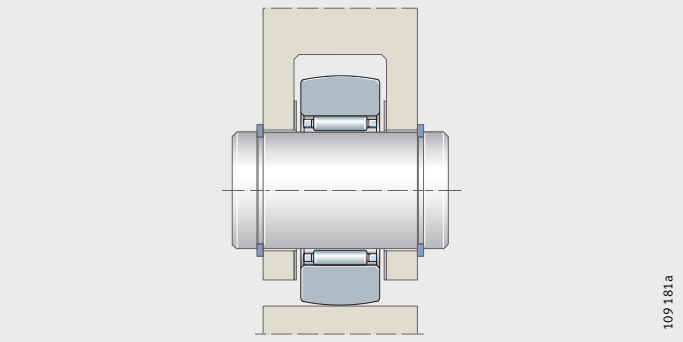


Figure 12
Lateral guidance of outer ring and needle roller and cage assembly

Location of yoke type track rollers with axial guidance

Yoke type track rollers with axial guidance must be axially clamped in place. The thrust washers must be axially supported if axial loads occur. The dimension d_2 according to the dimension table must be observed, *Figure 13*.

Yoke type track rollers NATR and NATV can be located using conventional fasteners such as snap rings, *Figure 13*.

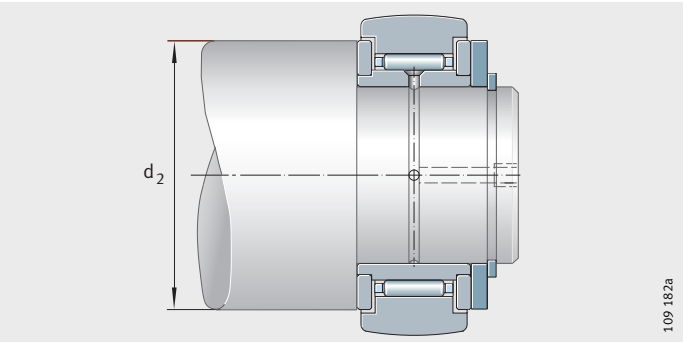


Figure 13
Location by snap rings

For NNTR..-2ZL, NUTR, PWTR..-2RS, the inner ring and thrust washer must be axially located, *Figure 14*.

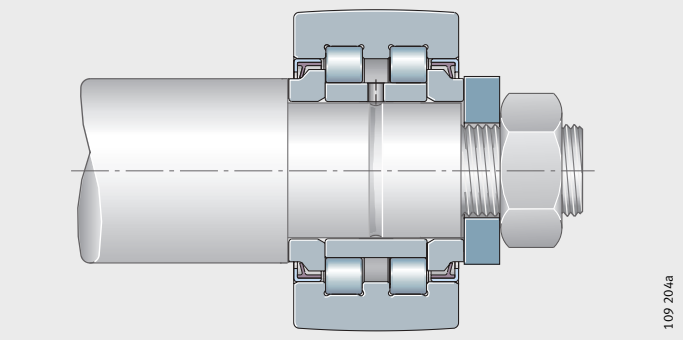


Figure 14
Clamping of inner ring and thrust washer

Adjacent construction for stud type track rollers

The bore tolerance H7 produces a clearance fit since the stud tolerance is h7 for studs without eccentric collar and h9 for studs with eccentric collar.

The locating surfaces for stud type track rollers must be flat, perpendicular and of sufficient height. The strength of the nut locating surface must be sufficiently high. The dimension must not be less than the dimension d_2 in the dimension tables.

The entry chamfer on the locating bore must not be more than 0,5×45°.

Axial location

Stud type track rollers must be axially secured using a hexagonal nut. The nuts – grade 8 to ISO 4 032 (M6, M8) or ISO 8 673 – are not included in delivery; the nuts must be ordered separately.

If heavy vibration occurs, the stud type track rollers can be located using self-locking nuts to DIN 985 or special locking washers.

Caution!

For self-locking nuts, the higher tightening torque must be observed – the advice given by the nut manufacturer must be followed.

Position of lubrication hole

The position of the radial lubrication hole is indicated by the INA logo, *Figure 15*. This must not be positioned in the loaded zone.

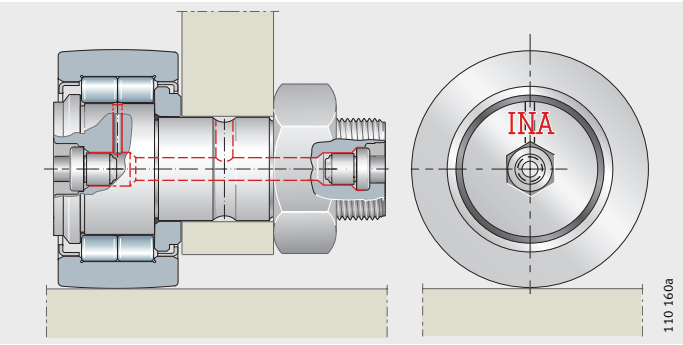


Figure 15
Position of lubrication hole

Yoke type track rollers
Stud type track rollers

Design of mating track

When designing the mating track – material (strength), heat treatment, surface – the Hertzian pressure p_H must be taken into consideration. It is dependent on the load, the contact geometry (point contact or line contact) and the modulus of elasticity of the materials.

Nomogram

The Hertzian pressure pH can be derived from the nomogram, *Figure 17*, or can be calculated.

The nomogram is valid for mating tracks made from steel. For mating tracks made from other materials see table Correction factor k, page 850.

Other conditions:

- Point contact
- Radius of curvature R = 500; radius of curvature R > 500, see page 850
- Mating track flat in the direction of the track roller axis
- Signs according to *Figure 16*.

Example

- Stud type track roller NUKR35 with optimised INA profile, D = 35 mm
- Outer ring width C = 18 mm
- Load F_r = 2 500 N
- Cam plate, radius r_L = 80 mm.

Curvature sum

$$\frac{1}{r_L}+\frac{2}{D}=\frac{1}{80}+\frac{2}{35}=0{,}07\ \text{mm}^{-1}$$

p_{H500} = 1 250 N/mm²

$$p_{H\,\text{opt. INA profile}} \approx 1250\,\text{N/mm}^2 \cdot k_{pH}$$

= 1 250 N/mm² · 0,85
= 1 063 N/mm²
(1 025 N/mm² from calculation program BEARINX®), k_{PH} see page 850.

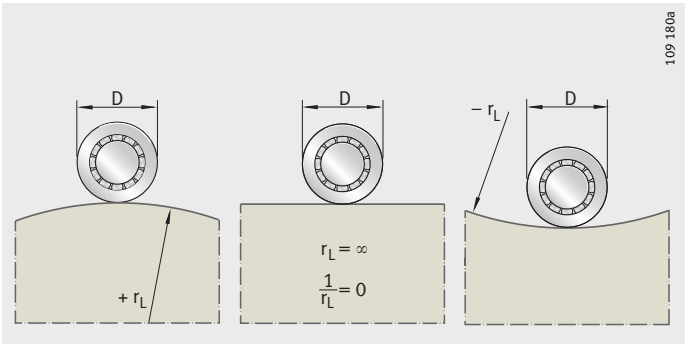


Figure 16
Raceway radii and signs

F_r N
Radial load
D mm
Outside diameter of the yoke/stud type track roller
r_L mm
Raceway radius (*Figure 16*)
p_H N/mm²
Hertzian pressure.

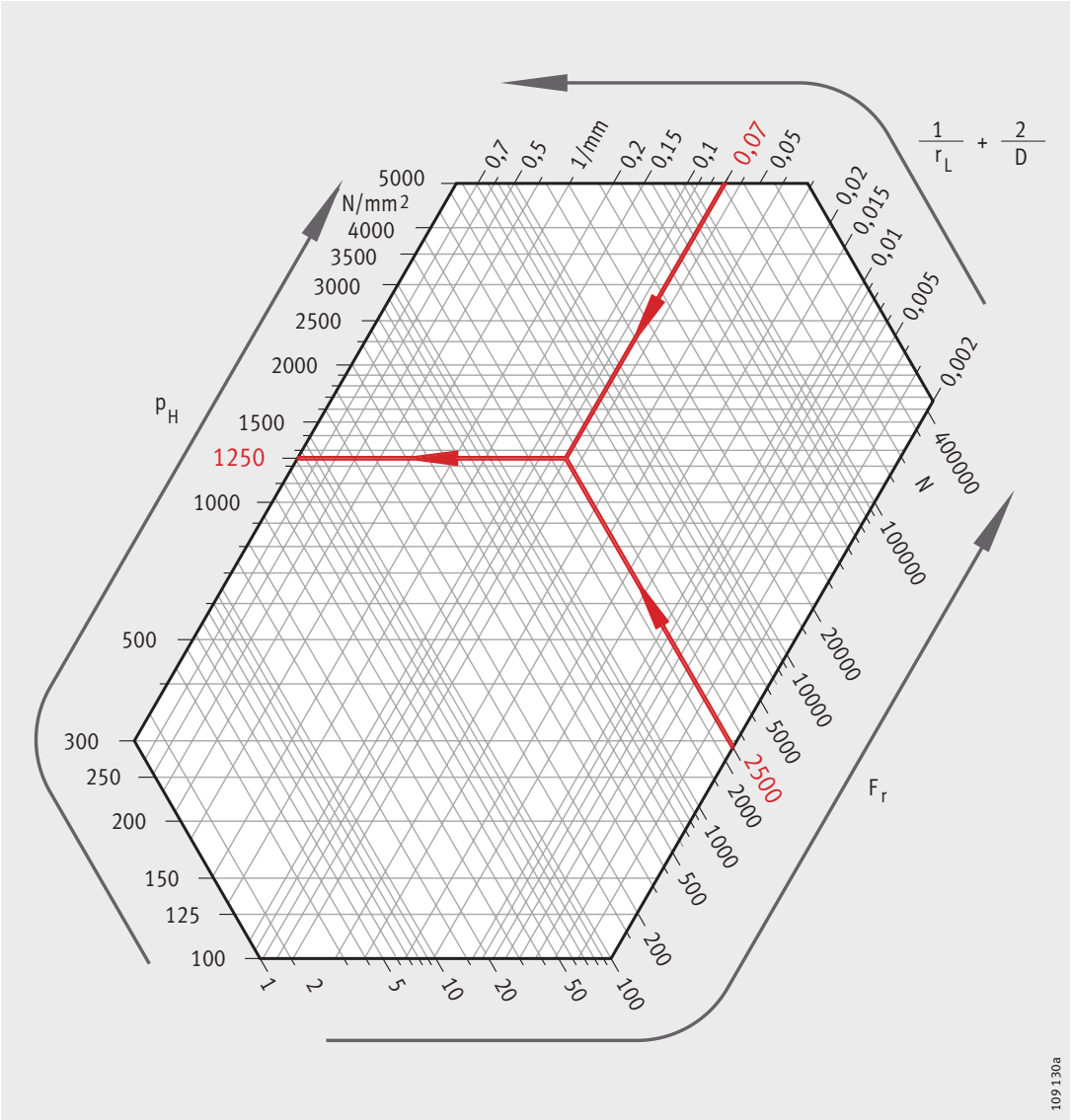


Figure 17
Nomogram for determining Hertzian pressure
Calculation example (red)

Yoke type track rollers
Stud type track rollers

Track rollers with optimised INA profile

For the optimised INA profile, the following calculation provides sufficiently precise values; for k_{pH} see table Pressure factor:

$$p_{H\,opt.\,INA\,profile} \approx k_{pH} \cdot p_{H500}$$

Pressure factor k_{pH}

Outer ring width C mm	Pressure factor k_{pH}
10 incl. 15	1
over 15 incl. 20	0,85
over 20 incl. 30	0,83
over 30 incl. 35	0,8

Curvature radius R > 500

For R > 500 mm, the following applies:

$$p_{HR} = p_{H500} \cdot \left(\frac{500}{R}\right)^{0,185}$$

Materials for mating track

The mating track is subjected to high load during overrolling. This produces high Hertzian contact pressures. The strength and surface hardness of the material must be matched to this load.

For raceways subjected to high loads, through hardened steels, case hardened steels and steels for flame or induction hardening are recommended.

For raceways subjected to low loads, construction steels and cast steel or cast iron materials can be used:

$$p_H = k \cdot p_H\,(\text{steel/steel})$$

p_H N/mm²
Max. Hertzian pressure

k –
Correction factor for mating track material.

Correction factor k

Material	Correction factor for	
	Point contact	Line contact
GG-20	0,74	0,8
GG-30	0,81	0,85
GG-40	0,85	0,88
GGG-40	0,92	0,94
GGG-60	0,94	0,96
GGG-80	0,96	0,97

Guide values for permissible Hertzian pressure

Selection of materials – guide values for permissible Hertzian pressure – is shown in the table Materials/guide values.
The values were determined on steel test samples with achieved loadings of 10^7.

Based on calculation of the load carrying capacity of rolling bearings, this gives:

- $p_{Hstat.}$
  for predominantly static load
- $p_{Hdyn.}$
  for predominantly dynamic load.

Materials/guide values

Material		Hertzian pressure		Proof stress of material
		$p_{Hstat.}$ N/mm²	$p_{Hdyn.}$ N/mm²	$R_{p0,2}$ N/mm²
Cast iron	GG-15	850	340	120
	GG-20	1 050	420	150
	GG-25	1 200	480	190
	GG-30	1 350	540	220
	GG-35	1 450	580	250
	GG-40	1 500	600	280
Spheroidal graphite cast iron	GGG-40	1 000	490	250
	GGG-50	1 150	560	320
	GGG-60	1 400	680	380
	GGG-70	1 550	750	440
	GGG-80	1 650	800	500
Cast steel	GS-38	780	380	200
	GS-45	920	450	230
	GS-52	1 050	510	260
	GS-60	1 250	600	300
	GS-62	1 300	630	350
	GS-70	1 450	700	420
Construction steel	St 37-2	690	340	235
	St 44–2	860	420	275
	St 52-3	980	480	355
Quenched and tempered steel	C 45 V	1 400	670	500
	Cf 53 V	1 450	710	520
	Cf 56 V	1 550	760	550
	C 60 V	1 600	780	580
	46 Cr 2 V	1 750	850	650
	42 CrMo 4 V	2 000	980	900
	50 CrV 4 V	2 000	980	900
Hardened steel	100 Cr 6 H	4 000	1 500	1 900
	16 MnCr 5 E	4 000	1 500	770
	Cf 53 Hl	4 000	1 500	730
	Cf 56 Hl	4 000	1 500	760

Yoke type track rollers
Stud type track rollers

Hardenable materials

The following materials with a purity level corresponding to that of alloyed construction steels may be used:

- Through hardening steels to ISO 683-17, e.g. 100Cr6.
  In special cases, surface hardening of these rolling bearing steels is possible.
- Case hardening steels to
  ISO 683-17, e.g. 17MnCr5 or EN 10 084, e.g. 16MnCr5.
  In addition to the hardenability, the core strength must also be taken into consideration. For case hardening, a fine grained hardening structure and a case hardening depth CHD according to the formula below is necessary.
- Steels for flame or induction hardening to
  ISO 683-17, e.g. Cf54 or DIN 17 212, e.g. Cf53.
  For flame or induction hardening, only the parts of the machine component to be used as raceways must be hardened.
  The material should be quenched and tempered before hardening. The effective hardening depth Rht is determined using the formula below.

Heat treatment of the mating track

The following apply for hardened mating tracks:

- a surface hardness of 670 HV + 170 HV
- a hardening depth CHD or Rht according to the following formulae
  - in accordance with DIN 50190, the depth of the hardened surface zone at which there is still a hardness of 550 HV
- hardness curves presented in schematic form in *Figure 18* and *Figure 19*
- a hardening depth of ≧ 0,3 mm.

The formulae are based on the hardness curves normally achieved with professional heat treatment.

Case hardening:

$$CHD \geqq 2{,}73 \cdot 10^{-5} \cdot \frac{p_H}{\left(\frac{1}{r_L} + \frac{2}{D}\right)}$$

Flame and induction hardening:

$$Rht \geqq 10^{-5} \cdot \frac{\left(4{,}4 \cdot \frac{{p_H}^2}{R_{p0,2}} - 3{,}5 \cdot p_H\right)}{\left(\frac{1}{r_L} + \frac{2}{D}\right)}$$

p_H N/mm²
Max. Hertzian pressure

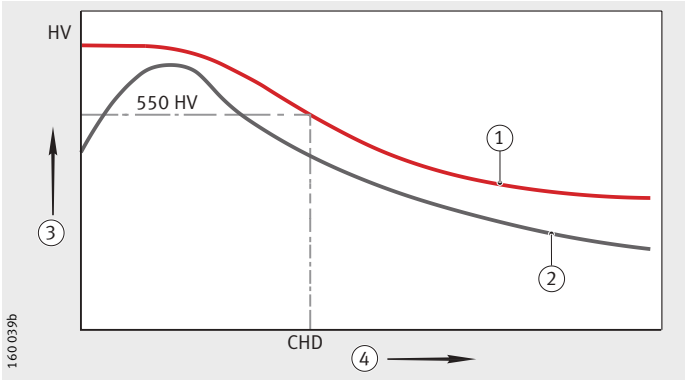
CHD mm
Case hardening depth

Rht mm
Effective hardening depth

D mm
Outside diameter of track roller, see dimension tables

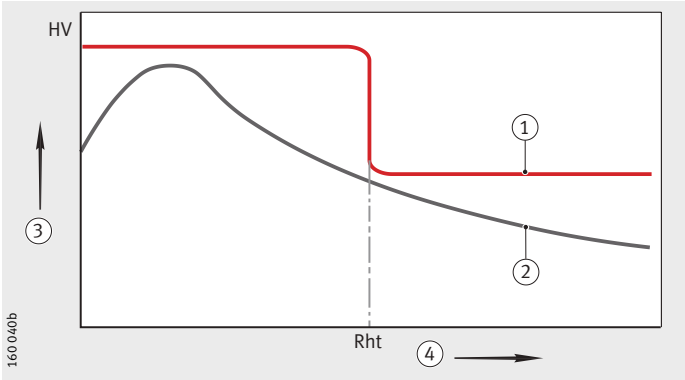
$R_{p0,2}$ N/mm²
Proof stress of mating track material, see table, page 851

r_L mm
Radius of mating track –
the raceway must be flat in the direction of the track roller axis, see also *Figure 16*, page 848.



① Case hardening
② Required hardness
③ Hardness
④ Distance from surface
CHD = case hardening depth with hardness 550 HV

Figure 18
Case hardening depth CHD – hardness curve



① Flame or induction hardening
② Required hardness
③ Hardness
④ Distance from surface
Rht = effective hardening depth

Figure 19
Effective hardening depth Rht – hardness curve

INA guideways as mating tracks

These guideways are ready-to-fit units from the INA linear range.

They are to the appropriate grade Q20 for yoke and stud type track rollers and correspond to the dimensions of standard profiles:

- parallelism 20 μm/m
- surface quality R_a0,8
- hardness 58 HRC to 62 HRC
- angular misalignment between the raceways max. 1 mrad (1 μm/mm)
- deviations of the guideway cross-section +0,015/+0,05
- length tolerance of the individual guideway +1 mm/m.

Enquiries

Please direct enquiries to:

- **Schaeffler KG**
  Linear Technology Division
  66406 Homburg (Saar)
  Internet www.ina.com
  E-Mail info.linear@schaeffler.com
  Telephone 0180 5003872
  Fax 0180 5003873

Protection of mating track

Caution! The mating track should be protected against contamination – covers or if necessary wipers, for example made from felt, should be placed ahead of the track roller, *Figure 20*.

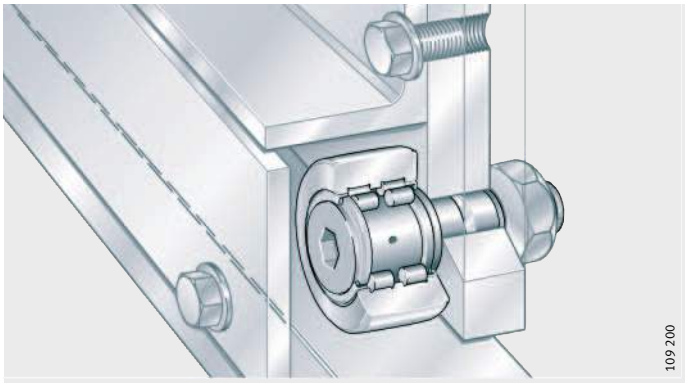


Figure 20
Protection of mating track against contamination

Fitting

Track rollers are precision machine elements. These products must be very carefully handled before and during fitting. Their trouble-free operation depends largely on the care taken during fitting.

The assembly area must be kept clean and free from dust.

Caution! Protect bearings from dust, contaminants and moisture. Contaminants have a detrimental influence on the running and operating life of rolling bearings.

Do not cool the bearings excessively. Moisture due to condensation can lead to corrosion in the bearings and bearing seats.

Check the seat of the axis for dimensional and geometrical accuracy and cleanliness.

Lightly oil the bearing ring seating surfaces or rub with solid lubricant.

After fitting, charge ungreased rolling bearings with lubricant. Check the correct functioning of the bearing arrangement.

Fitting tools

- Induction heaters;
  note the manufacturer's guidance on grease and seals
- Heating cupboard; heating up to +80 °C
- Mechanical or hydraulic press;
  use fitting sleeves that cover the whole circumference of the bearing ring end faces
- Hammer and fitting sleeve;
  blows should only be applied concentrically to the sleeve.

Caution! Fitting forces must never be directed through the rolling elements. Direct blows on the bearing rings must be avoided. It must be ensured that the seals are not damaged during fitting.

Guidelines for dismantling

Dismantling should be taken into consideration in the original design of the bearing position.

If the bearing is to be reused:

- do not apply direct blows to the bearing rings
- do not apply dismantling forces through the rolling elements
- carefully clean the bearings after dismantling
- do not use a concentrated or "hard" flame.

Fitting and dismantling of yoke type track rollers (needle and cylindrical roller types)

If the tolerances are unfavourable, the yoke type track roller should be pressed onto the shaft or stud using a press, *Figure 21*.

The inner ring must be fitted such that the pressing-in force is distributed uniformly on the end face of the inner ring.

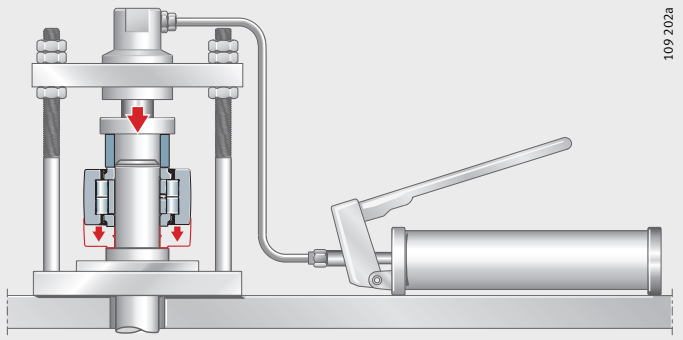


Figure 21
Fitting a yoke type track roller using a press – yoke type track roller NUTR

The bearing should be fitted such that the lubrication holes are positioned in the unloaded zone. For yoke type track rollers PWTR and NNTR, there is no need for defined positioning of the lubrication hole.

Yoke type track rollers NUTR, PWTR and NNTR should be axially secured as instructed; example according to *Figure 22*.

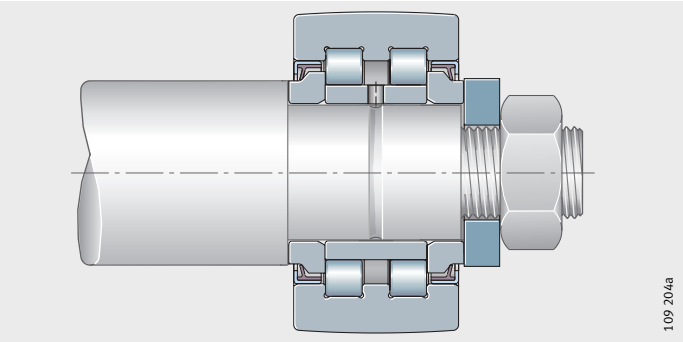


Figure 22
Axial location – yoke type track roller PWTR..-2RS

Fitting and dismantling of stud type track rollers (needle and cylindrical roller types)

The stud type track roller should be fitted using a press if possible (similar to *Figure 21*).

Caution! Blows on the flange of the roller stud must be avoided.

The position of the lubrication hole is indicated by the INA logo. It must not lie in the loaded zone, see *Figure 15*, page 847.

Drive fit lubrication nipple for stud type track rollers

Stud type track rollers are supplied with loose drive fit lubrication nipples that must be pressed in correctly before fitting the bearings.

Caution!

Only these lubrication nipples should be used, see *Figure 23* and table Drive fit lubrication nipples.

If relubrication is to be carried out via the locating bore, the axial lubrication holes in the stud type track roller must be closed off using the lubrication nipples before fitting, *Figure 23*.

For lubrication, only needle-point nozzles with an opening angle of max. 60° should be used.

Central lubrication adapter for stud type track rollers: see page 843.

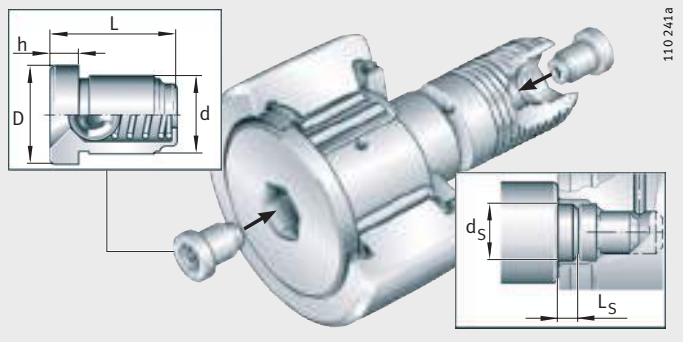


Figure 23
Stud type track roller KR..-PP with drive fit lubrication nipple and dimensions for pressing mandrel

Drive fit lubrication nipples

Lubrication nipple	Dimensions in mm						Suitable for outside diameter D
	D	d	L	h	d_s ±0,1	L_s	
NIPA1	6	4	6	1,5[1)]	–	–	16 and 19
NIPA1×4,5	4,7	4	4,5	1	4,5	5	22 to 32
NIPA2×7,5	7,5	6	7,5	2	7,5	6	35 to 52
NIPA3×9,5	10	8	9,5	3	10	9	62 to 90

1) Projection of lubrication nipple, see page 869, figure bottom left.

Axial location of stud type track rollers

Stud type track rollers must be axially secured using a hexagon nut.

The slot or hexagonal socket on the ends of the roller stud can be used to hold the bearing by means of a key while tightening the fixing nut and to adjust the eccentric collar, *Figure 24*.

Caution! It is absolutely essential that the tightening torque for the fixing nuts as specified in the dimension table is adhered to. It is only in this way that the permissible radial load can be ensured.

If the tightening torque cannot be adhered to, an interference fit is required.

If heavy vibration occurs, self-locking nuts to DIN 985 or special locking washers can be used.

Caution! For self-locking nuts, the higher tightening torque must be observed – the advice given by the nut manufacturer must be followed.

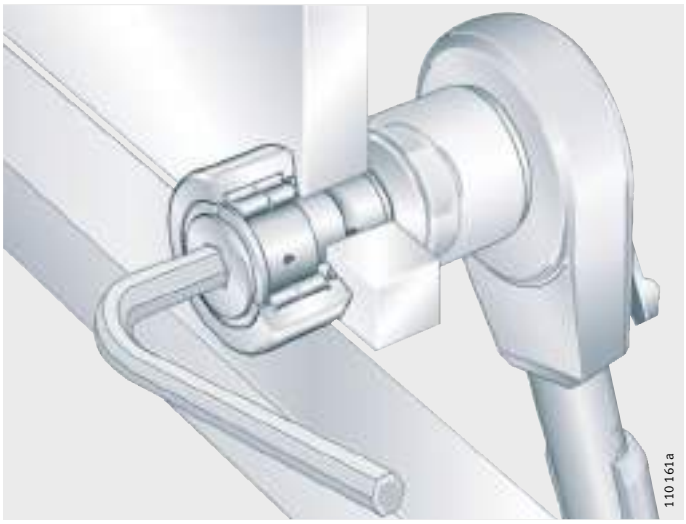


Figure 24
Holding the bearing using an Allen key

Stud type track rollers with eccentric collar

The highest point on the eccentric collar is indicated by the INA logo, see *Figure 15*, page 847.

Yoke type track rollers
Stud type track rollers

Initial operation/relubrication

Stud type track rollers have a lubrication hole for relubrication:

- on the flange side of the roller stud
- on the thread-side end face – from an outside diameter of 22 mm
- on the shank of the roller stud – from an outside diameter of 30 mm with an additional lubrication groove.

Caution! Stud type track rollers with an eccentric collar cannot be relubricated via the shank. The eccentric collar covers the lubrication hole.

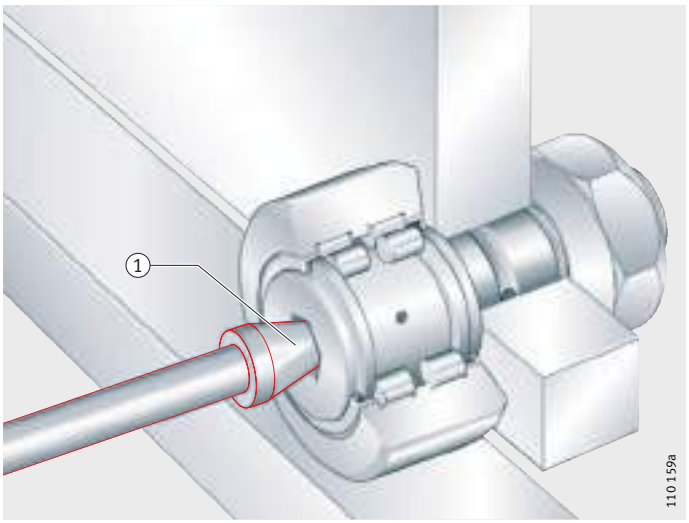
For lubrication, only grease guns with needle-point nozzles having an opening angle of max. 60°, *Figure 25* should be used.

Before initial operation, the lubrication holes and feed pipes must be filled with grease in order to ensure corrosion protection and lubrication can be carried out at the same time.

Relubrication of yoke and stud type track rollers may present difficulties if a rolling element is located over the radial lubrication hole. Relubrication should therefore be carried out with the bearing still warm from operation and rotating if safe to do so, before the bearing comes to rest if safe to do so and before extended breaks in operation.

The grease used for relubrication should be the same as that used for initial greasing; if a different grease is to be used, its miscibility and compatibility must be checked, see page 842.

Relubrication should continue until a fresh collar of grease appears at the seal gaps. Old grease must be able to leave the bearing unhindered.



① Needle-point nozzle, opening angle ≦ 60°

Figure 25
Relubrication using a grease gun

Anti-corrosion protection by Corrotect® plating

Track rollers are often subjected to aggressive media. In such applications, corrosion protection is therefore a decisive factor in achieving a long operating life of the bearings.

In principle, corrosion-resistant steels may be used for track rollers. In many applications, however, the INA special plating Corrotect® is more cost-effective. For a comprehensive description of the plating, see Technical Principles, Anti-corrosion protection, page 104.

Corrotect® is an extremely thin, electroplated surface coating – coating thickness 0,5 µm to 3 µm.

The coating is effective against moisture, contaminated water, salt spray and weakly alkaline and weakly acidic cleaning agents.

Yoke type track rollers PWTR and stud type track rollers PWKR with the suffix RR are coated as standard with Corrotect®. Other yoke and stud type track rollers with Corrotect® plating are treated as special designs.

Figure 26 shows an uncoated stud type track roller after a salt spray test, *Figure 27* shows a stud type track roller with Corrotect® coating after the salt spray test.

Fitting of coated track rollers

In order to reduce the press-in force required, the surface of the parts should be lightly greased – the tolerances are increased by the thickness of the plating.

Caution!

Before fitting, the compatibility of track rollers with Corrotect® plating with the media concerned should be checked.

Figure 26
NUKR52 without plating after salt spray test

Figure 27
PWKR52-2RS-RR with Corrotect® plating after salt spray test

Yoke type track rollers
Stud type track rollers

Accuracy

The dimensional and geometrical tolerances correspond to tolerance class PN in accordance with DIN 620, for KR(E) and KRV to ISO 7 063.

The following deviations from DIN 620 apply:

- the diameter tolerance of the profiled outside surface 0/–0,05 mm
- for NNTR, the diameter tolerance to h10
- for NATR, NATV, NUTR, PWTR..-2RS, the width tolerance B to h12
- for NATR, NATV, the roundness of the inner ring
- for stud type track rollers, the tolerance of the shank diameter to h7 and the eccentric collar diameter to h9.

For PWTR..-2RS-RR and PWKR..-2RS-RR , the tolerances are increased by the thickness of the INA special plating Corrotect®.

Radial internal clearance

The radial internal bearing clearance corresponds approximately to class C2, for STO and NA22..-2RSR to class CN.

Radial internal clearance to DIN 620-4

Bore d mm		Radial internal clearance							
		CN µm		C3 µm		C4 µm		C2 µm	
over	incl.	min.	max.	min.	max.	min.	max.	min.	max.
–	24	20	45	35	60	50	75	0	25
24	30	20	45	35	60	50	75	0	25
30	40	25	50	45	70	60	85	5	30
40	50	30	60	50	80	70	100	5	35
50	65	40	70	60	90	80	110	10	40
65	80	40	75	65	100	90	125	10	45
80	100	50	85	75	110	105	140	15	50
100	120	50	90	85	125	125	165	15	55
120	140	60	105	100	145	145	190	15	60

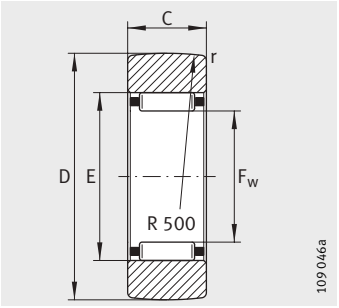
Enveloping circle

For RSTO and RNA22..-2RSR, the needle roller enveloping circle F_w is in the tolerance zone F6.

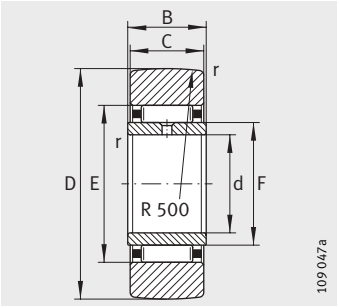
The enveloping circle is the inner inscribed circle of the needle rollers in clearance-free contact with the adjacent construction.

Yoke type track rollers

Without axial guidance



RSTO



STO

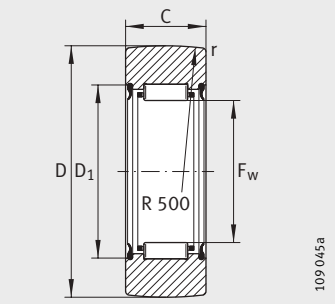
Dimension table · Dimensions in mm

Without inner ring Desig-nation	Mass m ≈g	With inner ring Desig-nation	Mass m ≈g	Dimensions D	d	C	B	F[1)] F_w	E	r min.	Basic load ratings dyn. $C_{r\,w}$ N	stat. $C_{0r\,w}$ N	Fatigue limit load $C_{ur\,w}$ N	Speed $n_{D\,G}$ min^{-1}
RSTO5-TV	8,5	–	–	**16**	–	7,8	–	7	10	0,3	2 550	2 550	310	16 000
RSTO6-TV	12,5	**STO6-TV**	17	**19**	6	9,8	10	10	13	0,3	3 750	4 750	570	10 000
RSTO8-TV	21	**STO8-TV**	26	**24**	8	9,8	10	12	15	0,3	4 200	5 400	700	8 000
RSTO10	42	**STO10**	49	**30**	10	11,8	12	14	20	0,3	8 400	9 200	1 170	5 500
RSTO12	49	**STO12**	57	**32**	12	11,8	12	16	22	0,3	9 000	10 100	1 300	4 500
RSTO15	50	**STO15**	63	**35**	15	11,8	12	20	26	0,3	9 100	10 700	1 370	3 300
RSTO17	88	**STO17**	107	**40**	17	15,8	16	22	29	0,3	14 200	17 700	2 190	2 800
RSTO20	130	**STO20**	152	**47**	20	15,8	16	25	32	0,3	16 200	21 500	2 700	2 400
RSTO25	150	**STO25**	177	**52**	25	15,8	16	30	37	0,3	16 400	22 900	2 850	1 800
RSTO30	255	**STO30**	308	**62**	30	19,8	20	38	46	0,6	23 300	34 500	3 950	1 300
RSTO35	375	**STO35**	441	**72**	35	19,8	20	42	50	0,6	25 500	40 000	4 650	1 100
RSTO40	420	**STO40**	530	**80**	40	19,8	20	50	58	1	23 900	39 000	4 950	850
RSTO45	453	**STO45**	576	**85**	45	19,8	20	55	63	1	25 500	43 000	5 000	750
RSTO50	481	**STO50**	617	**90**	50	19,8	20	60	68	1	26 000	46 000	5 400	650

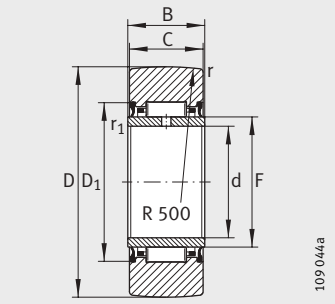
1) F = Raceway diameter of the inner ring,
F_w = Needle roller enveloping circle in tolerance zone F6.

Yoke type track rollers

Without axial guidance, sealed



RNA22..-2RSR



NA22..-2RSR

Dimension table · Dimensions in mm

Without inner ring Designation	Mass	Dimensions								Basic load ratings		Fatigue limit load	Speed
	m	D	d	C	B	$F^{1)}$ F_w	D_1	r	r_1	dyn. $C_{r\,w}$	stat. $C_{0r\,w}$	$C_{ur\,w}$	$n_{D\,G}$
	≈g						min.	min.	min.	N	N	N	min^{-1}
RNA22/6-2RSR	18	**19**	6	11,8	12	10	16	0,3	0,3	3 900	3 650	520	9 000
RNA22/8-2RSR	29	**24**	8	11,8	12	12	18	0,3	0,3	4 800	4 800	860	7 000
RNA2200-2RSR	52	**30**	10	13,8	14	14	20	0,6	0,3	7 000	8 000	1 170	5 500
RNA2201-2RSR	57	**32**	12	13,8	14	16	22	0,6	0,3	7 500	9 000	1 030	4 700
RNA2202-2RSR	60	**35**	15	13,8	14	20	26	0,6	0,3	7 600	9 500	1 380	3 400
RNA2203-2RSR	94	**40**	17	15,8	16	22	28	1	0,3	9 900	13 700	1 870	3 000
RNA2204-2RSR	152	**47**	20	17,8	18	25	33	1	0,3	15 200	18 300	2 600	2 300
RNA2205-2RSR	179	**52**	25	17,8	18	30	38	1	0,3	15 700	19 900	2 850	1 800
RNA2206-2RSR	284	**62**	30	19,8	20	35	43	1	0,3	18 400	25 500	3 300	1 400
RNA2207-2RSR	432	**72**	35	22,7	23	42	50	1,1	0,6	23 000	35 500	4 800	1 100
RNA2208-2RSR	530	**80**	40	22,7	23	48	57	1,1	0,6	27 500	40 500	5 000	850

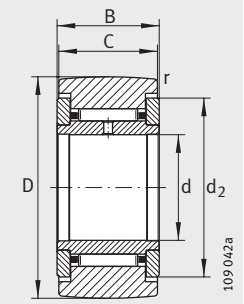
Dimension table · Dimensions in mm

With inner ring Designation	Mass	Dimensions								Basic load ratings		Fatigue limit load	Speed
	m	D	d	C	B	$F^{1)}$ F_w	D_1	r	r_1	dyn. $C_{r\,w}$	stat. $C_{0r\,w}$	$C_{ur\,w}$	$n_{D\,G}$
	≈g						min.	min.	min.	N	N	N	min^{-1}
NA22/6-2RSR	22	**19**	6	11,8	12	10	16	0,3	0,3	3 900	3 650	520	9 000
NA22/8-2RSR	34	**24**	8	11,8	12	12	18	0,3	0,3	4 800	4 800	860	7 000
NA2200-2RSR	60	**30**	10	13,8	14	14	20	0,6	0,3	7 000	8 000	1 170	5 500
NA2201-2RSR	67	**32**	12	13,8	14	16	22	0,6	0,3	7 500	9 000	1 030	4 700
NA2202-2RSR	75	**35**	15	13,8	14	20	26	0,6	0,3	7 600	9 500	1 380	3 400
NA2203-2RSR	112	**40**	17	15,8	16	22	28	1	0,3	9 900	13 700	1 870	3 000
NA2204-2RSR	177	**47**	20	17,8	18	25	33	1	0,3	15 200	18 300	2 600	2 300
NA2205-2RSR	209	**52**	25	17,8	18	30	38	1	0,3	15 700	19 900	2 850	1 800
NA2206-2RSR	324	**62**	30	19,8	20	35	43	1	0,3	18 400	25 500	3 300	1 400
NA2207-2RSR	505	**72**	35	22,7	23	42	50	1,1	0,6	23 000	35 500	4 800	1 100
NA2208-2RSR	628	**80**	40	22,7	23	48	57	1,1	0,6	27 500	40 500	5 000	850
NA2210-2RSR	690	**90**	50	22,7	23	58	68	1,1	0,6	28 000	42 500	5 300	650

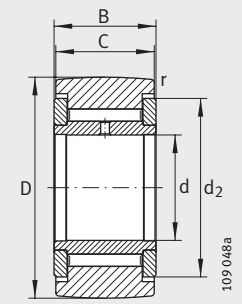
1) $\overline{F}$ = Raceway diameter of the inner ring,
F_w = Needle roller enveloping circle in tolerance zone F6.

Yoke type track rollers

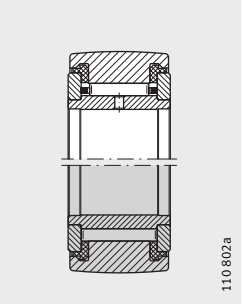
With axial guidance



NATR
(R = 500 mm)



NATV
(R = 500 mm)



NATR..-PP (optimised
NATV..-PP INA profile)

Dimension table · Dimensions in mm

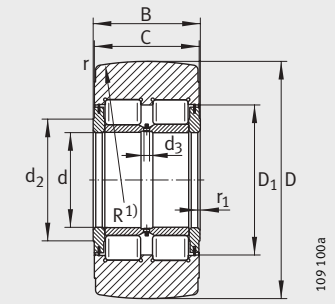
Designation[1]	Mass	Designation[2]	Mass	Dimensions						Basic load ratings		Fatigue limit load	Speed
	m		m	D	d	B	C	d_2	r	dyn. C_{rw}	stat. C_{0rw}	C_{urw}	n_{DG}
	≈g		≈g						min.	N	N	N	min^{-1}
NATR5	14	**NATR5-PP**	14	**16**	5	12	11	12,5	0,15	3 150	3 300	415	14 000
NATV5	15	**NATV5-PP**	15	**16**	5	12	11	12,5	0,15	4 900	6 500	860	3 800
NATR6	20	**NATR6-PP**	19	**19**	6	12	11	15	0,15	3 500	3 900	485	11 000
NATV6	21	**NATV6-PP**	21	**19**	6	12	11	15	0,15	5 400	7 900	1 040	3 100
NATR8	41	**NATR8-PP**	38	**24**	8	15	14	19	0,3	5 500	6 400	810	7 500
NATV8	42	**NATV8-PP**	41	**24**	8	15	14	19	0,3	7 800	11 400	1 430	2 500
NATR10	64	**NATR10-PP**	61	**30**	10	15	14	23	0,6	6 800	8 400	1 070	5 500
NATV10	65	**NATV10-PP**	64	**30**	10	15	14	23	0,6	9 500	14 600	1 840	2 100
NATR12	71	**NATR12-PP**	66	**32**	12	15	14	25	0,6	6 900	8 800	1 720	4 500
NATV12	72	**NATV12-PP**	69	**32**	12	15	14	25	0,6	9 700	15 400	1 950	1 800
NATR15	104	**NATR15-PP**	95	**35**	15	19	18	27,6	0,6	9 800	14 100	1 700	3 600
NATV15	109	**NATV15-PP**	101	**35**	15	19	18	27,6	0,6	12 800	23 000	2 900	1 600
NATR17	144	**NATR17-PP**	139	**40**	17	21	20	31,5	1	10 900	15 500	1 850	2 900
NATV17	152	**NATV17-PP**	147	**40**	17	21	20	31,5	1	14 800	26 500	3 050	1 400
NATR20	246	**NATR20-PP**	236	**47**	20	25	24	36,5	1	15 500	25 500	3 000	2 400
NATV20	254	**NATV20-PP**	245	**47**	20	25	24	36,5	1	20 600	42 000	5 200	1 300
NATR25	275	**NATR25-PP**	271	**52**	25	25	24	41,5	1	15 400	26 500	3 010	1 800
NATV25	285	**NATV25-PP**	281	**52**	25	25	24	41,5	1	20 500	44 000	5 400	1 000
NATR30	470	**NATR30-PP**	444	**62**	30	29	28	51	1	23 400	38 500	4 650	1 300
NATV30	481	**NATV30-PP**	468	**62**	30	29	28	51	1	30 500	62 000	7 800	850
–	–	**NATR35-PP**	547	**72**	35	29	28	58	1,1	25 000	44 000	5 300	1 000
–	–	**NATV35-PP**	630	**72**	35	29	28	58	1,1	33 000	71 000	8 900	750
–	–	**NATR40-PP**	795	**80**	40	32	30	66	1,1	32 500	58 000	7 000	850
–	–	**NATV40-PP**	832	**80**	40	32	30	66	1,1	41 000	88 000	11 000	650
–	–	**NATR50-PP**	867	**90**	50	32	30	76	1,1	31 500	59 000	7 100	650
–	–	**NATV50-PP**	969	**90**	50	32	30	76	1,1	40 000	92 000	11 600	550

[1] Bearings with gap seals and radius of curvature of R = 500 mm.

[2] Bearings with plastic axial plain washer and optimised INA profile.
Permissible operating temperature: –30 °C to +100 °C (continuous operation).

Yoke type track rollers

With axial guidance,
sealed



NNTR..-2ZL

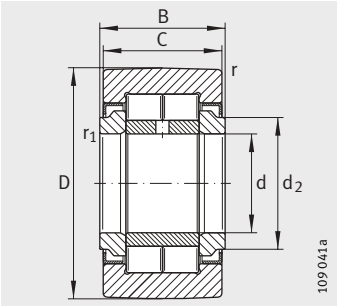
Dimension table · Dimensions in mm

Designation[1]	Mass	Dimensions						Mounting dimensions			Number of lubrication holes	Basic load ratings		Speed
	m	D	d	B	C	r	r_1	d_2	D_1	d_3		dyn. C_{rw}	stat. C_{0rw}	n_{DG}
	≈kg					min.	min.					N	N	min^{-1}
NNTR50X130X65-2ZL	5,2	**130**	50	65	63	3	2	63	80	3	3	192 000	250 000	1 100
NNTR55X140X70-2ZL	6,4	**140**	55	70	68	3	2	73	91	4	3	223 000	300 000	850
NNTR60X150X75-2ZL	7,8	**150**	60	75	73	3	2	78	97	4	3	255 000	350 000	800
NNTR65X160X75-2ZL	8,8	**160**	65	75	73	3	2	82	103	5	3	275 000	370 000	700
NNTR70X180X85-2ZL	13	**180**	70	85	83	3	2	92	115	5	3	350 000	490 000	600
NNTR80X200X90-2ZL	16,8	**200**	80	90	88	4	2	102	127	5	3	410 000	580 000	500
NNTR90X220X100-2ZL	22,5	**220**	90	100	98	4	2,5	119	146	5	3	495 000	720 000	400
NNTR100X240X105-2ZL	28	**240**	100	105	103	4	2,5	132	160	6	6	560 000	830 000	340
NNTR110X260X115-2ZL	35,6	**260**	110	115	113	4	2,5	143	174	6	6	670 000	1 020 000	300
NNTR120X290X135-2ZL	52,8	**290**	120	135	133	4	3	155	191	8	6	890 000	1 370 000	260
NNTR130X310X146-2ZL	65,2	**310**	130	146	144	5	3	165	204	8	6	1 020 000	1 600 000	240

[1] Radius of curvature R = 10 000 for NNTR50X130X65-2ZL to NNTR110X260X115-2ZL
R = 15 000 for NNTR120X290X135-2ZL and NNTR130X310X146-2ZL.

Yoke type track rollers

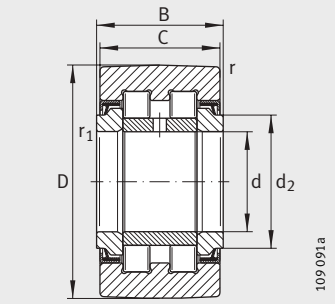
With axial guidance,
sealed



NUTR
(optimised INA profile)

Dimension table · Dimensions in mm

Designation	Mass	Dimensions							Basic load ratings				Fatigue limit load	Speed
	m	D	d	B	C	d_2	r	r_1	dyn. $C_{r\,w}$	stat. $C_{0r\,w}$	dyn. $F_{r\,per}$	stat. $F_{0r\,per}$	$C_{ur\,w}$	$n_{D\,G}$
	≈g						min.	min.	N	N	N	N	N	min^{-1}
NUTR15	99	**35**	15	19	18	20	0,6	0,3	15 000	16 800	8 600	16 800	2 220	6 500
PWTR15-2RS	99	**35**	15	19	18	20	0,6	0,3	11 600	11 300	9 400	11 300	1 780	6 000
NUTR17	147	**40**	17	21	20	22	1	0,5	18 400	22 600	13 100	22 600	2 900	5 500
PWTR17-2RS	147	**40**	17	21	20	22	1	0,5	13 200	13 800	13 800	13 800	2 200	5 000
NUTR1542	158	**42**	15	19	18	20	0,6	0,3	18 100	21 900	21 900	21 900	2 900	6 500
PWTR1542-2RS	158	**42**	15	19	18	20	0,6	0,3	13 500	14 100	14 100	14 100	2 230	6 000
NUTR1747	220	**47**	17	21	20	22	1	0,5	21 300	28 000	28 000	28 000	3 600	5 500
PWTR1747-2RS	220	**47**	17	21	20	22	1	0,5	14 800	16 400	16 400	16 400	2 600	5 000
NUTR20	245	**47**	20	25	24	27	1	0,5	28 000	35 000	16 400	33 000	4 400	4 200
PWTR20-2RS	245	**47**	20	25	24	27	1	0,5	23 200	25 500	18 300	25 500	3 600	3 800
NUTR2052	321	**52**	20	25	24	27	1	0,5	31 500	41 000	38 500	41 000	5 200	4 200
PWTR2052-2RS	321	**52**	20	25	24	27	1	0,5	25 500	29 500	29 500	29 500	4 150	3 800
NUTR25	281	**52**	25	25	24	31	1	0,5	29 000	37 500	17 300	34 500	4 700	4 200
PWTR25-2RS	281	**52**	25	25	24	31	1	0,5	24 200	28 000	19 300	28 000	3 900	3 800
NUTR2562	450	**62**	25	25	24	31	1	0,5	35 500	50 000	50 000	50 000	6 300	4 200
PWTR2562-2RS	450	**62**	25	25	24	31	1	0,5	29 000	36 000	36 000	36 000	5 000	3 800
NUTR30	465	**62**	30	29	28	38	1	0,5	40 000	50 000	23 500	46 500	6 300	2 600
PWTR30-2RS	465	**62**	30	29	28	38	1	0,5	35 000	39 500	25 500	39 500	5 400	2 200



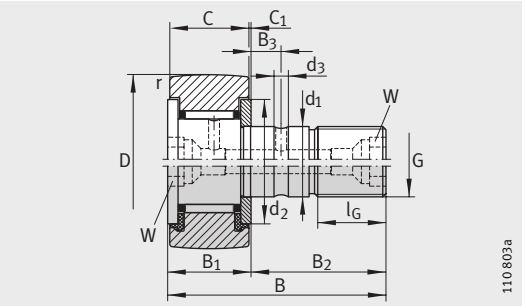
PWTR..-2RS
(optimised INA profile)

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions							Basic load ratings				Fatigue limit load	Speed
	m	D	d	B	C	d_2	r	r_1	dyn. $C_{r\,w}$	stat. $C_{0r\,w}$	dyn. $F_{r\,per}$	stat. $F_{0r\,per}$	$C_{ur\,w}$	$n_{D\,G}$
	≈g						min.	min.	N	N	N	N	N	min^{-1}
NUTR3072	697	**72**	30	29	28	38	1	0,5	47 500	64 000	64 000	64 000	8 100	2 600
PWTR3072-2RS	697	**72**	30	29	28	38	1	0,5	41 000	49 000	49 000	49 000	6 700	2 200
NUTR35	630	**72**	35	29	28	44	1,1	0,6	44 500	60 000	32 000	60 000	7 600	2 100
PWTR35-2RS	630	**72**	35	29	28	44	1,1	0,6	38 500	46 500	34 500	46 500	6 300	1 800
NUTR3580	836	**80**	35	29	28	44	1,1	0,6	51 000	72 000	72 000	72 000	9 100	2 100
PWTR3580-2RS	836	**80**	35	29	28	44	1,1	0,6	43 500	55 000	55 000	55 000	7 500	1 800
NUTR40	816	**80**	40	32	30	50,5	1,1	0,6	55 000	75 000	30 500	60 000	9 400	1 600
PWTR40-2RS	816	**80**	40	32	30	50,5	1,1	0,6	44 500	53 000	35 000	53 000	7 100	1 500
NUTR45	883	**85**	45	32	30	55,2	1,1	0,6	56 000	78 000	31 500	61 000	9 700	1 400
PWTR45-2RS	883	**85**	45	32	30	55,2	1,1	0,6	45 000	55 000	36 000	55 000	7 400	1 300
NUTR4090	1 129	**90**	40	32	30	50,5	1,1	0,6	66 000	95 000	84 000	95 000	11 900	1 600
PWTR4090-2RS	1 129	**90**	40	32	30	50,5	1,1	0,6	52 000	66 000	66 000	66 000	8 800	1 500
NUTR50	950	**90**	50	32	30	59,8	1,1	0,6	57 000	81 000	32 000	62 000	10 100	1 300
PWTR50-2RS	950	**90**	50	32	30	59,8	1,1	0,6	45 500	57 000	37 000	57 000	7 700	1 100
NUTR45100	1 396	**100**	45	32	30	55,2	1,1	0,6	71 000	107 000	106 000	107 000	13 300	1 400
PWTR45100-2RS	1 396	**100**	45	32	30	55,2	1,1	0,6	56 000	74 000	74 000	74 000	9 900	1 300
NUTR50110	1 690	**110**	50	32	30	59,8	1,1	0,6	76 000	120 000	120 000	120 000	14 900	1 300
PWTR50110-2RS	1 690	**110**	50	32	30	59,8	1,1	0,6	59 000	82 000	82 000	82 000	11 000	1 100

Needle roller stud type track rollers

With axial guidance



from D = 22 mm KR (R = 500 mm)
KR..-PP (optimised INA profile)

Dimension table · Dimensions in mm

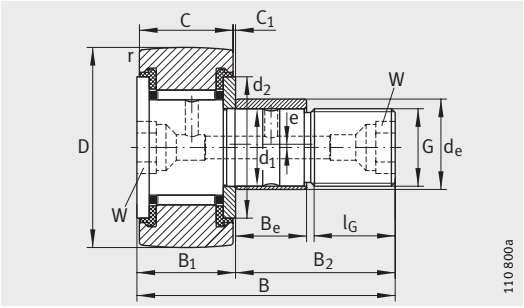
Designation	Mass	With eccentric collar Designation	Mass	Dimensions										
	m		m	D	d_1	B	B_1	B_2	B_3	C	C_1	r	d_2	d_3
	≈g		≈g		h7		max.					min.		
KR16[3]	19	–	–	**16**	6	28	12,2	16	–	11	0,6	0,15	12,5	–
KR16-PP[3]	18	**KRE16-PP**[3]	20	**16**	6	28	12,2	16	–	11	0,6	0,15	12,5	–
KR16-SK-PP[4]	19	–	–	**16**	6	28	12,2	16	–	11	0,6	0,15	12,5	–
KRV16-PP[3]	19	–	–	**16**	6	28	12,2	16	–	11	0,6	0,15	12,5	–
KR19[3]	29	–	–	**19**	8	32	12,2	20	–	11	0,6	0,15	15	–
KR19-PP[3]	29	**KRE19-PP**[3]	32	**19**	8	32	12,2	20	–	11	0,6	0,15	15	–
KR19-SK-PP[4]	29	–	–	**19**	8	32	12,2	20	–	11	0,6	0,15	15	–
KRV19-PP[3]	31	–	–	**19**	8	32	12,2	20	–	11	0,6	0,15	15	–
KR22	45	–	–	**22**	10	36	13,2	23	–	12	0,6	0,3	17,5	–
KR22-PP	43	**KRE22-PP**	47	**22**	10	36	13,2	23	–	12	0,6	0,3	17,5	–
KRV22-PP	45	–	–	**22**	10	36	13,2	23	–	12	0,6	0,3	17,5	–
KR26	59	–	–	**26**	10	36	13,2	23	–	12	0,6	0,3	17,5	–
KR26-PP	57	**KRE26-PP**	62	**26**	10	36	13,2	23	–	12	0,6	0,3	17,5	–
KRV26-PP	59	–	–	**26**	10	36	13,2	23	–	12	0,6	0,3	17,5	–
KR30	92	–	–	**30**	12	40	15,2	25	6	14	0,6	0,6	23	3
KR30-PP	88	**KRE30-PP**	93	**30**	12	40	15,2	25	6	14	0,6	0,6	23	3
KRV30-PP	91	–	–	**30**	12	40	15,2	25	6	14	0,6	0,6	23	3
KR32	103	–	–	**32**	12	40	15,2	25	6	14	0,6	0,6	23	3
KR32-PP	98	**KRE32-PP**	104	**32**	12	40	15,2	25	6	14	0,6	0,6	23	3
KRV32-PP	101	–	–	**32**	12	40	15,2	25	6	14	0,6	0,6	23	3

1) Drive fit lubrication nipples are supplied loose. Only these lubrication nipples should be used.

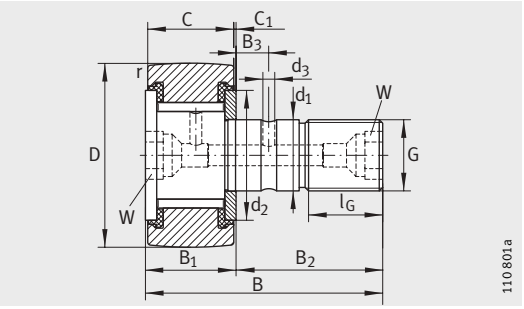
2) Nominal dimension for hexagonal socket.

3) Relubrication hole only on the flange-side end face with slot for countertensioning during fitting.

4) Hexagonal socket only on the flange-side end face. No relubrication facility.

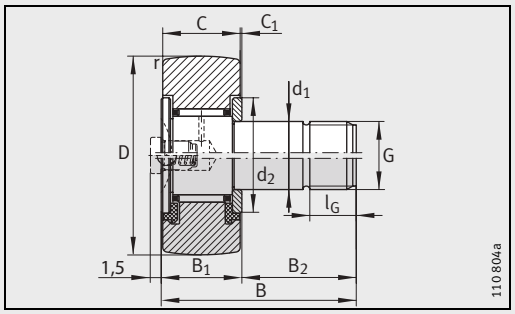


from D = 22 mm KRE..-PP (optimised INA profile)

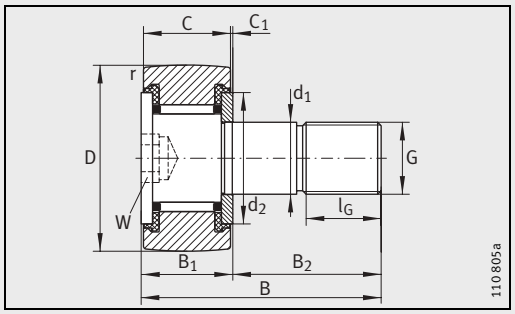


from D = 22 mm KRV..-PP (optimised INA profile)

G	l_G	W[2]	Eccentric collar			Drive fit lubrication nipple[1]	Nut tightening torque	Basic load ratings		Fatigue limit load	Speed
			d_e h9	B_e	e		M_A Nm	dyn. C_{rw} N	stat. C_{0rw} N	C_{urw} N	n_{DG} min^{-1}
M6(X1)	8	–	–	–	–	NIPA1	3	3 150	3 300	415	14 000
M6(X1)	8	–	9	7	0,5	NIPA1	3	3 150	3 300	415	14 000
M6(X1)	8	4	–	–	–	–	3	3 150	3 300	415	14 000
M6(X1)	8	–	–	–	–	NIPA1	3	4 900	6 500	860	3 800
M8(X1,25)	10	–	–	–	–	NIPA1	8	3 500	3 900	485	11 000
M8(X1,25)	10	–	11	9	0,5	NIPA1	8	3 500	3 900	485	11 000
M8(X1,25)	10	4	–	–	–	–	8	3 500	3 900	485	11 000
M8(X1,25)	10	–	–	–	–	NIPA1	8	5 400	7 900	1 040	3 100
M10X1	12	5	–	–	–	NIPA1X4,5	15	4 500	5 200	650	8 000
M10X1	12	5	13	10	0,5	NIPA1X4,5	15	4 500	5 200	650	8 000
M10X1	12	5	–	–	–	NIPA1X4,5	15	6 200	9 100	1 110	2 600
M10X1	12	5	–	–	–	NIPA1X4,5	15	5 100	6 200	770	8 000
M10X1	12	5	13	10	0,5	NIPA1X4,5	15	5 100	6 200	770	8 000
M10X1	12	5	–	–	–	NIPA1X4,5	15	7 300	11 300	1 380	2 600
M12X1,5	13	6	–	–	–	NIPA1X4,5	22	6 800	8 400	1 070	5 500
M12X1,5	13	6	15	11	0,5	NIPA1X4,5	22	6 800	8 400	1 070	5 500
M12X1,5	13	6	–	–	–	NIPA1X4,5	22	9 500	14 600	1 840	2 100
M12X1,5	13	6	–	–	–	NIPA1X4,5	22	7 100	8 900	1 140	5 500
M12X1,5	13	6	15	11	0,5	NIPA1X4,5	22	7 100	8 900	1 140	5 500
M12X1,5	13	6	–	–	–	NIPA1X4,5	22	10 000	15 800	1 990	2 100



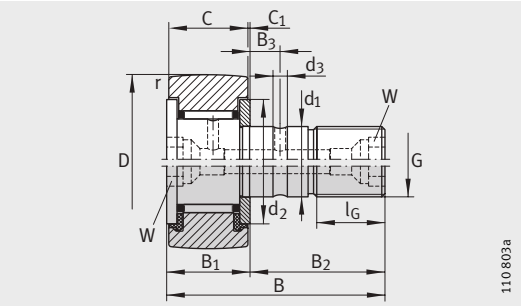
KR16, KR19
KR16-PP, KR19-PP (KRV16-PP, KRV19-PP)



KR16-SK-PP, KR19-SK-PP

Needle roller stud type track rollers

With axial guidance



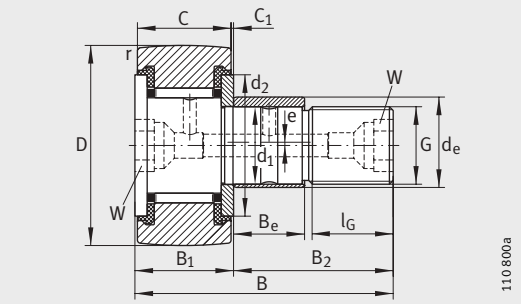
KR (R = 500 mm)
KR..-PP (optimised INA profile)

Dimension table (continued) · Dimensions in mm

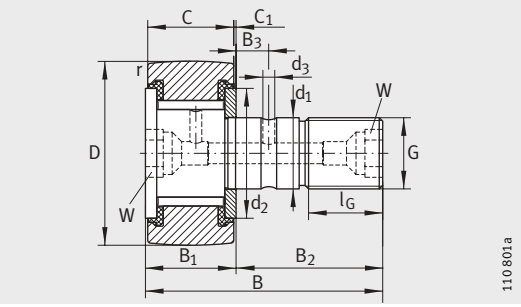
Designation	Mass	With eccentric collar Designation	Mass	Dimensions										
	m		m	D	d_1	B	B_1	B_2	B_3	C	C_1	r	d_2	d_3
	≈g		≈g		h7		max.					min.		
KR35	173	–	–	**35**	16	52	19,6	32,5	8	18	0,8	0,6	27,6	3
KR35-PP	164	**KRE35-PP**	177	**35**	16	52	19,6	32,5	8	18	0,8	0,6	27,6	3
KRV35-PP	166	–	–	**35**	16	52	19,6	32,5	8	18	0,8	0,6	27,6	3
KR40	247	–	–	**40**	18	58	21,6	36,5	8	20	0,8	1	31,5	3
KR40-PP	239	**KRE40-PP**	255	**40**	18	58	21,6	36,5	8	20	0,8	1	31,5	3
KRV40-PP	247	–	–	**40**	18	58	21,6	36,5	8	20	0,8	1	31,5	3
KR47-PP	381	**KRE47-PP**	400	**47**	20	66	25,6	40,5	9	24	0,8	1	36,5	4
KRV47-PP	390	–	–	**47**	20	66	25,6	40,5	9	24	0,8	1	36,5	4
KR52-PP	454	**KRE52-PP**	473	**52**	20	66	25,6	40,5	9	24	0,8	1	36,5	4
KRV52-PP	463	–	–	**52**	20	66	25,6	40,5	9	24	0,8	1	36,5	4
KR62-PP	770	**KRE62-PP**	798	**62**	24	80	30,6	49,5	11	29	0,8	1	44	4
KRV62-PP	787	–	–	**62**	24	80	30,6	49,5	11	29	0,8	1	44	4
KR72-PP	1 010	**KRE72-PP**	1 038	**72**	24	80	30,6	49,5	11	29	0,8	1,1	44	4
KRV72-PP	1 027	–	–	**72**	24	80	30,6	49,5	11	29	0,8	1,1	44	4
KR80-PP	1 608	**KRE80-PP**	1 665	**80**	30	100	37	63	15	35	1	1,1	53	4
KRV80-PP	1 636	–	–	**80**	30	100	37	63	15	35	1	1,1	53	4
KR90-PP	1 975	**KRE90-PP**	2 032	**90**	30	100	37	63	15	35	1	1,1	53	4
KRV90-PP	2003	–	–	**90**	30	100	37	63	15	35	1	1,1	53	4

1) Drive fit lubrication nipples are supplied loose. Only these lubrication nipples should be used.

2) Nominal dimension for hexagonal socket.
Suitable central lubrication adapter for connection to a central lubrication system, see page 843.



KRE..-PP (optimised INA profile)

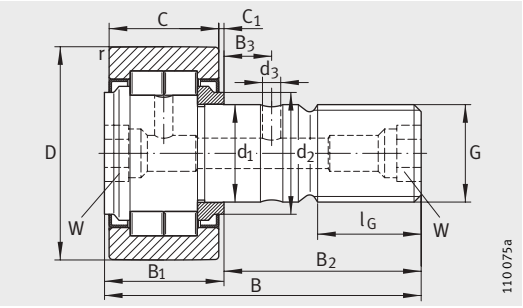


KRV..-PP (optimised INA profile)

						Drive fit lubrication nipple[1]	Nut tightening torque	Basic load ratings		Fatigue limit load	Speed
G	l_G	W[2]	Eccentric collar				M_A	dyn. C_{rw}	stat. C_{0rw}	C_{urw}	n_{DG}
			d_e h9	B_e	e		Nm	N	N	N	min^{-1}
M16X1,5	17	8	–	–	–	NIPA2X7,5	58	9 800	14 100	1 700	3 600
M16X1,5	17	8	20	14	1	NIPA2X7,5	58	9 800	14 100	1 700	3 600
M16X1,5	17	8	–	–	–	NIPA2X7,5	58	12 800	23 000	2 900	1 600
M18X1,5	19	8	–	–	–	NIPA2X7,5	87	10 900	15 500	1 850	2 900
M18X1,5	19	8	22	16	1	NIPA2X7,5	87	10 900	15 500	1 850	2 900
M18X1,5	19	8	–	–	–	NIPA2X7,5	87	14 800	26 500	3 050	1 400
M20X1,5	21	10	24	18	1	NIPA2X7,5	120	15 500	25 500	3 000	2 400
M20X1,5	21	10	–	–	–	NIPA2X7,5	120	20 600	42 000	5 200	1300
M20X1,5	21	10	24	18	1	NIPA2X7,5	120	16 700	29 000	3 400	2 400
M20X1,5	21	10	–	–	–	NIPA2X7,5	120	22 600	48 000	5 900	1 300
M24X1,5	25	14	28	22	1	NIPA3X9,5	220	26 500	48 000	6 100	1 900
M24X1,5	25	14	–	–	–	NIPA3X9,5	220	34 000	75 000	9 800	1 100
M24X1,5	25	14	28	22	1	NIPA3X9,5	220	28 000	53 000	6 700	1 900
M24X1,5	25	14	–	–	–	NIPA3X9,5	220	36 500	85 000	11 100	1 100
M30X1,5	32	14	35	29	1,5	NIPA3X9,5	450	39 000	77 000	9 900	1 300
M30X1,5	32	14	–	–	–	NIPA3X9,5	450	49 500	117 000	15 300	850
M30X1,5	32	14	35	29	1,5	NIPA3X9,5	450	41 000	83 000	10 600	1 300
M30X1,5	32	14	–	–	–	NIPA3X9,5	450	52 000	129 000	16 900	850

Cylindrical roller stud type track rollers

With axial guidance



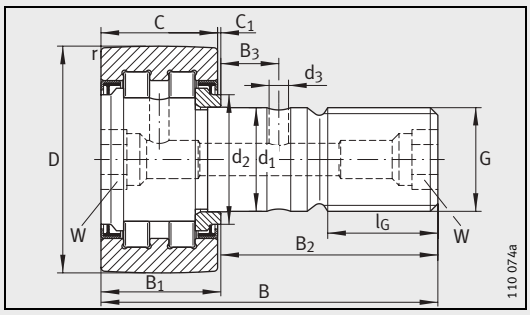
NUKR (optimised INA profile)

Dimension table · Dimensions in mm

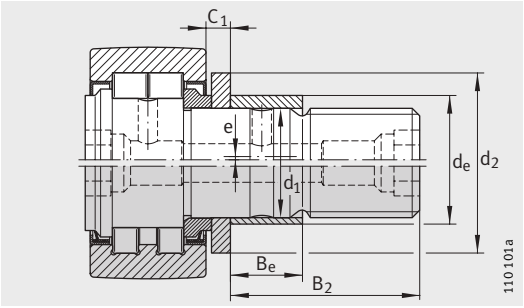
Designation	Mass	With eccentric collar Designation	Mass	Dimensions											
	m		m	D	d_1	B	B_1	B_2	B_3	C	C_1	r	d_2	d_3	G
	≈g		≈g		h7		max.					min.			
NUKR35	164	–	–	**35**	16	52	19,6	32,5	7,8	18	0,8	0,6	20	3	M16X1,5
–	–	**NUKRE35**	177	**35**	16	52	22,6	29,5	–	18	3,8	0,6	27,6	–	M16X1,5
PWKR35-2RS	164	–	–	**35**	16	52	19,6	32,5	7,8	18	0,8	0,6	20	3	M16X1,5
–	–	**PWKRE35-2RS**	177	**35**	16	52	22,6	29,5	–	18	3,8	0,6	27,6	–	M16X1,5
NUKR40	242	–	–	**40**	18	58	21,6	36,5	8	20	0,8	1	22	3	M18X1,5
–	–	**NUKRE40**	258	**40**	18	58	24,6	33,5	–	20	3,8	1	30	–	M18X1,5
PWKR40-2RS	242	–	–	**40**	18	58	21,6	36,5	8	20	0,8	1	22	3	M18X1,5
–	–	**PWKRE40-2RS**	258	**40**	18	58	24,6	33,5	–	20	3,8	1	30	–	M18X1,5
NUKR47	380	**NUKRE47**	400	**47**	20	66	25,6	40,5	9	24	0,8	1	27	4	M20X1,5
PWKR47-2RS	380	**PWKRE47-2RS**	400	**47**	20	66	25,6	40,5	9	24	0,8	1	27	4	M20X1,5
NUKR52	450	**NUKRE52**	470	**52**	20	66	25,6	40,5	9	24	0,8	1	31	4	M20X1,5
PWKR52-2RS	450	**PWKRE52-2RS**	470	**52**	20	66	25,6	40,5	9	24	0,8	1	31	4	M20X1,5
NUKR62	795	**NUKRE62**	824	**62**	24	80	30,6	49,5	11	28	1,3	1	38	4	M24X1,5
PWKR62-2RS	795	**PWKRE62-2RS**	824	**62**	24	80	30,6	49,5	11	28	1,3	1	38	4	M24X1,5
NUKR72	1 020	**NUKRE72**	1 050	**72**	24	80	30,6	49,5	11	28	1,3	1,1	44	4	M24X1,5
PWKR72-2RS	1 020	**PWKRE72-2RS**	1 050	**72**	24	80	30,6	49,5	11	28	1,3	1,1	44	4	M24X1,5
NUKR80	1 600	**NUKRE80**	1 670	**80**	30	100	37	63	15	35	1	1,1	47	4	M30X1,5
PWKR80-2RS	1 600	**PWKRE80-2RS**	1 670	**80**	30	100	37	63	15	35	1	1,1	47	4	M30X1,5
NUKR90	1 960	**NUKRE90**	2 020	**90**	30	100	37	63	15	35	1	1,1	47	4	M30X1,5
PWKR90-2RS	1 960	**PWKRE90-2RS**	2 020	**90**	30	100	37	63	15	35	1	1,1	47	4	M30X1,5

1) Drive fit lubrication nipples are supplied loose. Only these lubrication nipples should be used.

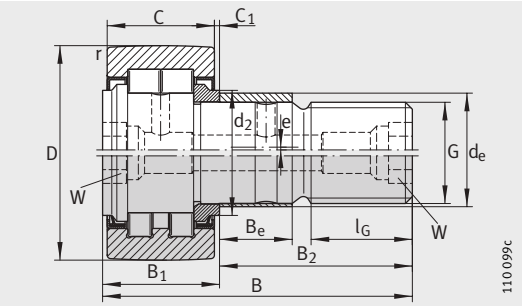
2) Nominal dimension for hexagonal socket. Suitable central lubrication adapter for connection to a central lubrication system, see page 843.



PWKR..-2RS (optimised INA profile)

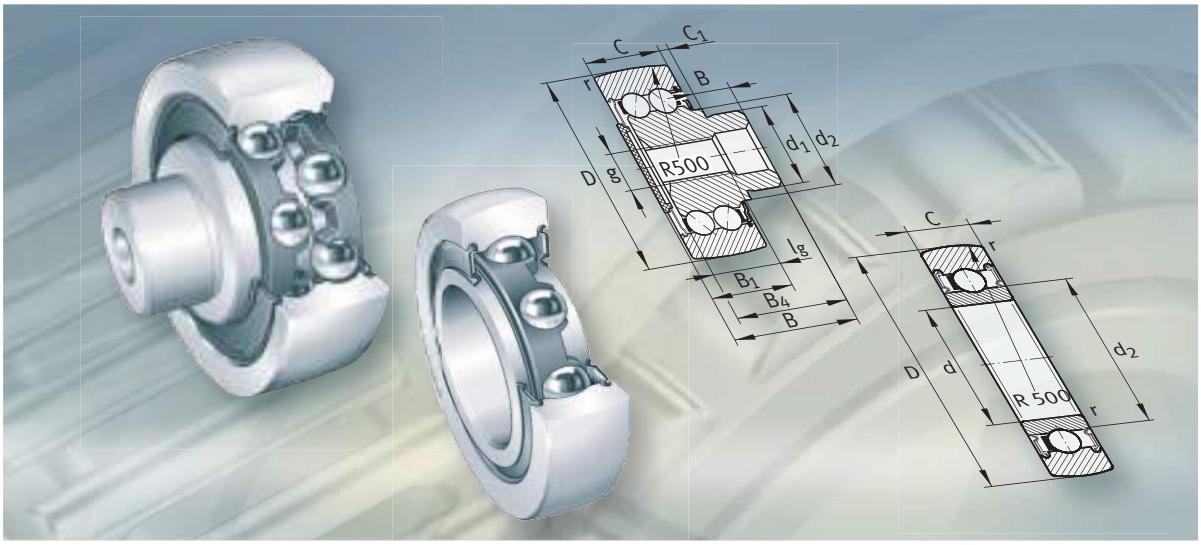


NUKRE35/NUKRE40
PWKRE35..-2RS/PWKRE40..-2RS
(optimised INA profile)



NUKRE
PWKRE..-2RS
(optimised INA profile)

					Drive fit lubrication nipple[1]	Nut tightening torque	Basic load ratings				Fatigue limit load	Speed
l_G	$W^{2)}$	Eccentric collar				M_A	dyn.	stat.	dyn.	stat.	$C_{ur\,w}$	$n_{D\,G}$
		d_e h9	B_e	e		Nm	$C_{r\,w}$ N	$C_{0r\,w}$ N	$F_{r\,per}$ N	$F_{0r\,per}$ N	N	min^{-1}
17	8	–	–	–	NIPA2X7,5	58	15 000	16 800	8 600	16 800	2 220	6 500
17	8	20	12	1	NIPA2X7,5	58	15 000	16 800	8 600	16 800	2 220	6 500
17	8	–	–	–	NIPA2X7,5	58	11 600	11 300	9 400	11 300	1 780	6 000
17	8	20	12	1	NIPA2X7,5	58	11 600	11 300	9 400	11 300	1 780	6 000
19	8	–	–	–	NIPA2X7,5	87	18 400	22 600	13 100	22 600	2 900	5 500
19	8	22	14	1	NIPA2X7,5	87	18 400	22 600	13 100	22 600	2 900	5 500
19	8	–	–	–	NIPA2X7,5	87	13 200	13 800	13 800	13 800	2 200	5 000
19	8	22	14	1	NIPA2X7,5	87	13 200	13 800	13 800	13 800	2 200	5 000
21	10	24	18	1	NIPA2X7,5	120	28 000	35 000	16 400	33 000	4 400	4 200
21	10	24	18	1	NIPA2X7,5	120	23 200	25 500	18 300	25 500	3 600	3 800
21	10	24	18	1	NIPA2X7,5	120	29 000	37 500	17 300	34 500	4 700	4 200
21	10	24	18	1	NIPA2X7,5	120	24 200	28 000	19 300	28 000	3 900	3 800
25	14	28	22	1	NIPA3X9,5	220	40 000	50 000	23 500	46 500	6 300	2 600
25	14	28	22	1	NIPA3X9,5	220	35 000	39 500	25 500	39 500	5 400	2 200
25	14	28	22	1	NIPA3X9,5	220	44 500	60 000	32 000	60 000	7 600	2 600
25	14	28	22	1	NIPA3X9,5	220	38 500	46 500	46 500	46 500	6 300	2 200
32	14	35	29	1,5	NIPA3X9,5	450	69 000	98 000	47 500	96 000	12 100	1 800
32	14	35	29	1,5	NIPA3X9,5	450	56 000	70 000	53 000	70 000	9 100	1 800
32	14	35	29	1,5	NIPA3X9,5	450	79 000	117 000	77 000	117 000	14 400	1 800
32	14	35	29	1,5	NIPA3X9,5	450	63 000	82 000	82 000	82 000	10 700	1 800



Ball bearing track rollers

Ball bearing track rollers

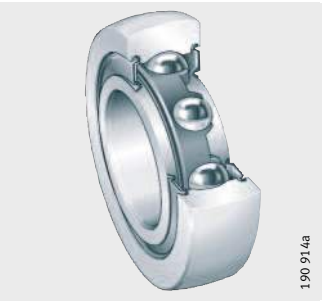
Product overview

Yoke type track rollers, stud type track rollers

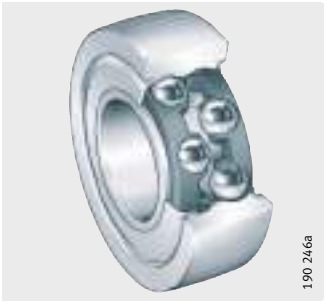
Yoke type track rollers

Single row and double row
Lip seals/
sealing shields

LR6, LR60, LR2



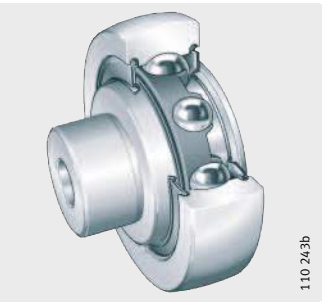
LR50, LR52, LR53



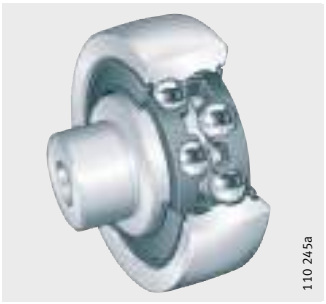
Stud type track rollers

Single row and double row
Without eccentric collar
Lip seals/
sealing shield and cover

ZL2..-DRS

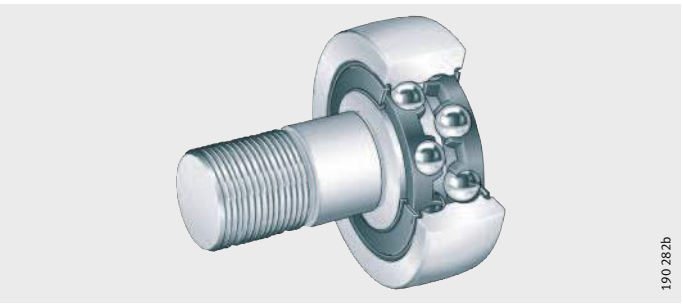


ZL52..-DRS



Lip seals

KR52..-2RS



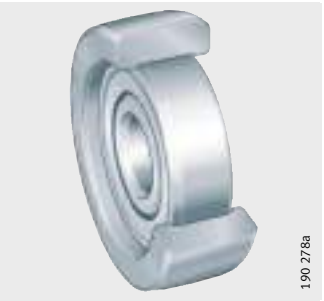
With eccentric collar/
sealing shields

ZLE52..-2Z

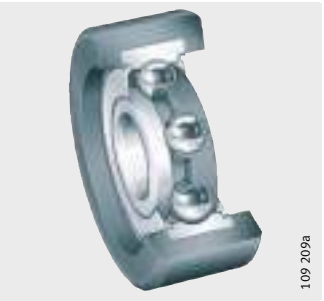
Track rollers with plastic outer tyre

Cylindrical or crowned outside surface
Lip seals/ sealing shields

KLRU



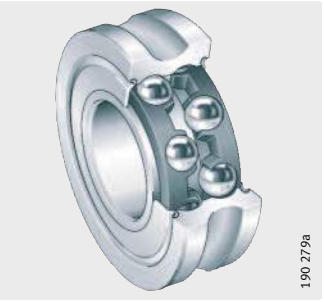
KLRZ



Other products

Track rollers with profiled outer ring

LFR5



Ball bearing track rollers

Features

Ball bearing track rollers are self-retaining, single or double row units with particularly thick-walled outer rings. In addition to high radial forces, these bearings can also support axial forces in both directions.

The outer rings have a crowned or cylindrical outside surface. Designs with a crowned outside surface are used where they are inclined in relation to the mating track and edge stresses must be avoided.

Ball bearing track rollers are available with an inner ring, with a stud and with a plastic tyre on the outer ring.

Yoke type track rollers

Yoke type track rollers have outer rings with a crowned or cylindrical outside surface, inner rings and ball and cage assemblies with plastic cages. They are similar in construction to deep groove or angular contact ball bearings and are mounted on shafts or studs.

Yoke type track rollers LR6, LR60 and LR2 are single row units, LR50, LR52 and LR53 are double row units.

Outer ring outside surface profile

Yoke type track rollers with a crowned outside surface have a curvature radius of R = 500 mm.

Yoke type track rollers with a cylindrical outside surface have the suffix X.

With anti-corrosion protection

For applications requiring increased protection against corrosion, yoke type track rollers with the INA special plating Corrotect® are available by agreement as a special design.
For further information on Corrotect®, see page 859.

Sealing/lubricant

Yoke type track rollers with the suffix 2RSR have lip seals on both sides. In some sizes, RS seals are fitted for reasons of space.

Double row yoke type track rollers with the suffix 2Z have sealing shields on both sides, bearings with the suffix 2RS have lip seals on both sides.

The yoke type track rollers are greased using a lithium soap grease to GA13. Double row yoke type track rollers can in some cases be relubricated via the inner ring.

Stud type track rollers with or without eccentric collar

Stud type track rollers have outer rings with a crowned outside surface, heavy-section roller studs and ball and cage assemblies with plastic cages. The stud type track rollers are available with and without an eccentric collar.

For ease of fitting, the roller stud has a thread or a threaded bore. For countertensioning during fitting, there is a slot, hexagonal socket or a flat area on the external thread.

Track rollers ZL2 are single row units, track rollers ZL52, ZLE52 and KR52 are double row units.

Outer ring outside surface profile

The stud type track rollers have a curvature radius of R = 500 mm.

Without eccentric collar

Stud type track rollers without an eccentric collar are suitable for applications where a defined requirement for adjustment in relation to the mating track on the adjacent construction is not required.

With eccentric collar

Stud type track rollers ZLE52 have an eccentric collar.
The eccentric collar can be used to set the outside surface of the outer ring clearance-free against the mating track. This gives optimum geometrical locking between the track roller and mating track. Furthermore, larger manufacturing tolerances can be tolerated in the adjacent construction. In addition, more uniform load distribution is achieved when using more than one stud type track roller.

For countertensioning during fitting, this series has flat areas on both sides of the roller stud.

Sealing/lubricant

Stud type track rollers ZL2 and ZL52 have lip seals on the stud side and the suffix DRS. The opposite side can be sealed using the plastic cover supplied.

Series KR52 is sealed on both sides by lip seals and has the suffix 2RS.

Stud type track rollers ZLE52 have sealing shields on both sides and the suffix 2Z.

The stud type track rollers are greased using a lithium soap grease to GA13, ZLE52 can be lubricated via the roller stud.

Track rollers with plastic outer tyre

Track rollers KLRU and KLRZ comprise single row deep groove ball bearings with a shrink-fitted polyamide outer ring (PA). Polyamide can tolerate higher specific contact pressures than elastomer and is relatively resistant to abrasion.

These track rollers are mounted on shafts or studs and are used where low loads are present and the bearings are required to run particularly quietly.

Outer ring outside surface profile

Track rollers KLRU have an outer ring with a crowned outside surface. The curvature radius is indicated in the dimension table.

Series KLRZ has a cylindrical outside surface.

Maximum radial load
Caution!

The maximum radial load is determined by the permissible contact pressure; $F_{r\,per}$ must not be exceeded.

Sealing/lubricant

The track rollers have gap seals on both sides with the suffix 2Z or lip seals with the suffix 2RSR.

They are greased using a lithium soap grease to GA13 and cannot be relubricated.

Ball bearing track rollers

Operating temperature

Track rollers are suitable for a temperature range from –20 °C to +120 °C, restricted by the grease, cage material and sealing ring material. Note the information on operating temperature range in Technical Principles, Lubrication.

Caution! Track rollers with plastic tyre KLRU and KLRZ are suitable for operating temperatures from –20 °C to +80 °C, restricted by the grease, cage material, sealing ring material and the plastic tyre.

Suffixes

Suffixes for the available designs: see table.

Available designs

Suffix	Description	Design
DRS	Lip seal on the stud side	Standard
RR	Corrosion-resistant design with INA special plating Corrotect®	Special design
X	Cylindrical outer ring	Standard
2RS	Lip seals on both sides giving axial sealing action	Standard
2RSR	Lip seals on both sides giving radial sealing action	Standard
2Z	Sealing shields on both sides	Standard

Other products

INA also supplies profiled track rollers LFR5 in which the outer ring has a gothic arch profile.

These profiled track rollers are preferably used with a shaft or circular section mating track.

Enquiries

Please direct enquiries to:

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Linear Technology Division
66406 Homburg (Saar)
Internet www.ina.com
E-Mail info.linear@schaeffler.com
Telephone 0180 5003872
Fax 0180 5003873

Design and safety guidelines

Caution!

For reliable and problem-free operation of track rollers, it is essential that attention is paid to the following items:

- Installation as yoke or stud type track roller, page 836
- Permissible dynamic or static radial load, page 836
- Load carrying capacity and life, page 837
- Operating life, page 838
- Minimum load, page 838
- Skewed running and tilting, page 839
- Speeds, page 840
- Lubrication, page 842.

Adjacent construction for yoke type track rollers

Yoke type track rollers LR can be axially clamped or located by means of conventional fasteners – such as snap rings.

The abutment surfaces for the bearings must be flat and perpendicular. Due to the contact pressure occurring, the actual dimension must not be less than the dimension d_2 according to the dimension tables.

Shaft tolerances

In general, track rollers have point load on the inner ring.
In order to ensure adequate support and to substantially avoid fretting corrosion, shaft tolerances to h6 are suitable.

Adjacent construction for stud type track rollers

Caution!

Stud type track rollers ZL and KR must be axially clamped.

The abutment surfaces for the nut must have sufficently high strength and the tightening torque M_A for the fixing nut given in the dimension table must be observed. The roller stud can only transmit the permissible radial load if the correct tightening torque is applied.

If the tightening torque cannot be adhered to, an interference fit is required.

The abutment surfaces for the track rollers must be flat and perpendicular. Due to the contact pressure occurring, the actual dimension must not be less than the dimension d_2 according to the dimension table.

The entry chamfer on the locating bore must not be more than 0,5×45°.

Bore tolerance

For the locating bore, tolerances according to the table Stud and bore tolerances are suitable.

Stud and bore tolerances

Series	Tolerance	
	Shank	Bore (recommended)
ZL2	r6	H7
ZL52	r6	H7
KR52	h7	H7
ZLE52	h9	H7

Ball bearing track rollers

Fitting

If the tolerances are unfavourable, the yoke type track roller should be pressed onto the shaft or stud using a press, *Figure 1*.

The inner ring must be fitted such that the pressing-in force is distributed uniformly on the end face of the inner ring.

Caution! Fitting forces must never be directed through the rolling elements. Ensure that the seals are not damaged.

The yoke type track rollers must be secured axially.

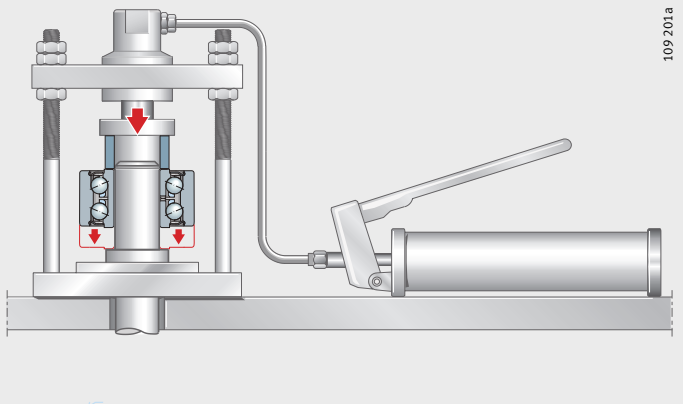


Figure 1
Pressing the yoke type track roller on using a fitting press

Stud type track rollers

Stud type track rollers are fitted and dismantled by methods to those used for yoke type track rollers, *Figure 2*.

Caution! The tightening torques given in the dimension table must be observed. It is only in this way that the permissible radial load can be ensured.

Screws and nuts of grade 8.8 or better must be used.

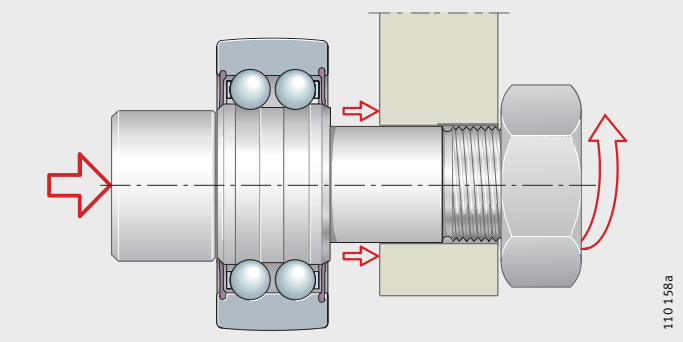


Figure 2
Fitting of stud type track roller

Accuracy

The dimensional and geometrical tolerances correspond to tolerance class PN to DIN 620.

In a deviation from DIN 620, the diameter tolerance of the profiled outside surface is –0,05 mm.

Stud tolerance for stud type track rollers and bore tolerances, see table Stud and bore tolerances, page 881.

Radial internal clearance

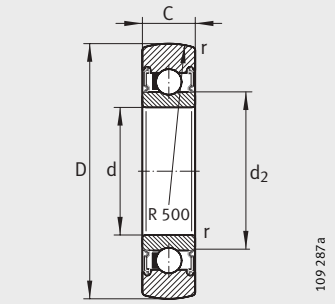
The radial internal clearance corresponds to class CN.

Radial internal clearance to DIN 620-4

Bore		Radial internal clearance									
d mm		C2 µm		CN µm		C3 µm		C4 µm		C5 µm	
over	incl.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
2,5	10	0	7	2	13	8	23	14	29	20	37
10	18	0	9	3	18	11	25	18	33	25	45
18	24	0	10	5	20	13	28	20	36	28	48
24	30	1	11	5	20	13	28	23	41	30	53
30	40	1	11	6	20	15	33	28	46	40	64
40	50	1	11	6	23	18	36	30	51	45	73
50	65	1	15	8	28	23	43	38	61	55	90

Yoke type track rollers

Single row



LR6..-2RSR, LR2..-2RSR,
LR2..-X-2RSR[1)]

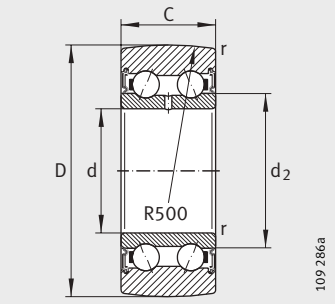
Dimension table · Dimensions in mm

Designation	Mass	Dimensions					Basic load ratings		Fatigue limit load	Speed
	m	D	d	C	d_2	r	dyn. $C_{r\,w}$	stat. $C_{0r\,w}$	$C_{ur\,w}$	$n_{D\,G}$
	≈g					min.	N	N	N	min^{-1}
LR604-2RSR	10	**13**	4	4	6,1	0,2	870	350	14,5	24 000
LR605-2RSR	10	**16**	5	5	7,5	0,2	1 220	510	21,1	23 000
LR606-2RSR	10	**19**	6	6	8,7	0,3	1 830	790	32,5	22 000
LR607-2RSR	10	**22**	7	6	9	0,3	2 130	880	35,5	20 000
LR608-2RSR	20	**24**	8	7	10	0,3	2 750	1 240	52	19 000
LR6000-2RSR	20	**28**	10	8	14,6	0,3	3 650	2 490	157	17 000
LR6001-2RSR	30	**30**	12	8	16,6	0,3	3 850	2 750	173	16 000
LR200-2RS	50	**32**	10	9	15,4	0,6	4 400	2 150	89	13 000
LR200-X-2RS[1)]	50	**32**	10	9	15,4	0,6	4 400	2 150	89	13 000
LR201-2RSR	50	**35**	12	10	18,3	0,6	5 600	2 700	112	12 000
LR201-X-2RSR[1)]	50	**35**	12	10	18,3	0,6	5 600	2 700	112	12 000
LR202-2RSR	70	**40**	15	11	21	0,6	6 600	3 350	133	11 000
LR202-X-2RSR[1)]	70	**40**	15	11	21	0,6	6 600	3 350	133	11 000
LR203-2RSR	110	**47**	17	12	24	0,6	8 500	4 450	185	9 000
LR203-X-2RSR[1)]	110	**47**	17	12	24	0,6	8 500	4 450	185	9 000
LR204-2RSR	150	**52**	20	14	29	1	10 600	5 700	238	8 000
LR204-X-2RSR[1)]	150	**52**	20	14	29	1	10 600	5 700	238	8 000
LR205-2RSR	230	**62**	25	15	33,5	1	12 500	7 100	290	7 000
LR205-X-2RSR[1)]	230	**62**	25	15	33,5	1	12 500	7 100	290	7 000
LR206-2RS	330	**72**	30	16	37,4	1	16 600	9 700	400	5 500
LR206-X-2RS[1)]	330	**72**	30	16	37,4	1	16 600	9 700	400	5 500
LR207-2RS	400	**80**	35	17	42,4	1,1	20 400	12 100	500	4 500
LR207-X-2RS[1)]	400	**80**	35	17	42,4	1,1	20 400	12 100	500	4 500
LR209-2RS	500	**90**	45	19	53,2	1,1	22 400	13 700	560	3 600
LR209-X-2RS[1)]	500	**90**	45	19	53,2	1,1	22 400	13 700	560	3 600

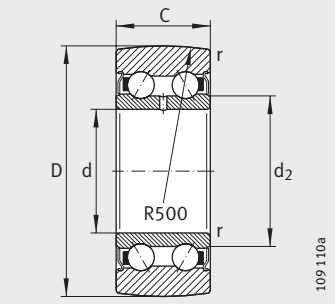
[1)] Track roller with cylindrical outside surface.

Yoke type track rollers

Double row



LR50..-2RSR



LR52..-2Z,
LR52..-X-2Z[1)]

Dimension table · Dimensions in mm

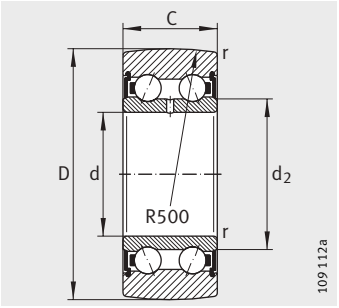
Designation	Mass	Dimensions					Basic load ratings		Fatigue limit load	Speed
	m	D	d	C	d_2	r	dyn. C_{rw}	stat. C_{0rw}	C_{urw}	n_{DG}
	≈g				min.		N	N	N	min^{-1}
LR50/5-2RSR	10	**17**	5	7	8,2	0,2	1 690	940	39	12 000
LR50/6-2RSR	20	**19**	6	9	9,3	0,3	2 700	1 370	56	11 000
LR50/7-2RSR	20	**22**	7	10	10,5	0,3	3 350	1 720	70	10 000
LR50/8-2RSR[2)]	30	**24**	8	11	10,5	0,3	4 300	2 390	99	10 000
LR5000-2RS	30	**28**	10	12	13,5	0,3	4 800	2 850	118	9 000
LR5001-2RS	30	**30**	12	12	15,5	0,3	5 100	3 100	128	8 500
LR5200-2Z	70	**32**	10	14	15,4	0,6	6 800	4 100	170	11 000
LR5200-X-2Z[1)]	70	**32**	10	14	15,4	0,6	6 800	4 100	170	11 000
LR5200-2RS	70	**32**	10	14	15,4	0,6	6 800	4 100	170	8 000
LR5002-2RS	50	**35**	15	13	20,4	0,3	6 600	4 150	172	7 000
LR5201-2Z	80	**35**	12	15,9	17,1	0,6	8 700	5 200	215	10 000
LR5201-X-2Z[1)]	80	**35**	12	15,9	17,1	0,6	8 700	5 200	215	10 000
LR5201-2RS	80	**35**	12	15,9	17,1	0,6	8 700	5 200	215	7 500
LR5003-2RS	70	**40**	17	14	21,6	0,3	7 800	5 300	218	6 000
LR5202-2Z	110	**40**	15	15,9	20	0,6	10 000	6 300	260	10 000
LR5202-X-2Z[1)]	110	**40**	15	15,9	20	0,6	10 000	6 300	260	10 000
LR5202-2RS	110	**40**	15	15,9	20	0,6	10 000	6 300	260	7 000

[1)] Track roller with cylindrical outside surface.

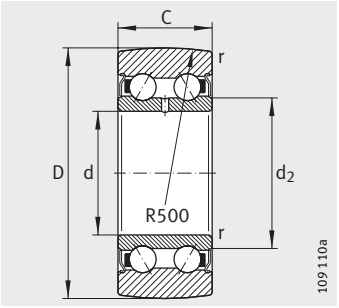
[2)] Without lubrication hole.

Yoke type track rollers

Double row



LR50..-2RS, LR52..-2RS, LR53..-2RS



LR52..-2Z, LR53..-2Z, LR52..-X-2Z[1)]

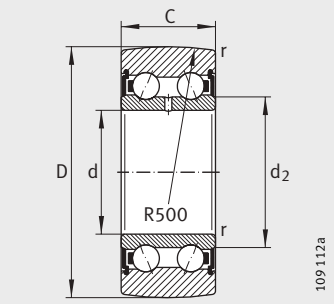
Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions					Basic load ratings		Fatigue limit load	Speed
	m	D	d	C	d_2	r	dyn. C_{rw}	stat. C_{0rw}	C_{urw}	n_{DG}
	≈g					min.	N	N	N	min^{-1}
LR5004-2RS	120	**47**	20	16	25,2	0,6	11 700	7 700	315	5 500
LR5203-2Z	170	**47**	17	17,5	22,5	0,6	12 800	8 300	345	7 500
LR5203-X-2Z[1)]	170	**47**	17	17,5	22,5	0,6	12 800	8 300	345	7 500
LR5203-2RS	170	**47**	17	17,5	22,5	0,6	12 800	8 300	345	5 500
LR5005-2RS	150	**52**	25	16	29,8	0,6	11 800	8 200	335	4 700
LR5204-2Z	230	**52**	20	20,6	26,5	1	16 200	10 700	440	7 000
LR5204-X-2Z[1)]	230	**52**	20	20,6	26,5	1	16 200	10 700	440	7 000
LR5204-2RS	230	**52**	20	20,6	26,5	1	16 200	10 700	440	5 000
LR5303-2RS	210	**52**	17	22,2	23,5	1	17 600	11 300	465	4 700
LR5006-2RS	250	**62**	30	19	35,5	1	16 100	11 900	495	4 000
LR5205-2Z	340	**62**	25	20,6	30,3	1	18 800	13 200	540	6 500
LR5205-X-2Z[1)]	340	**62**	25	20,6	30,3	1	18 800	13 200	540	6 500
LR5205-2RS	340	**62**	25	20,6	30,3	1	18 800	13 200	540	4 500
LR5304-2Z	340	**62**	20	22,2	29	1,1	21 600	14 800	620	6 500
LR5304-2RS	340	**62**	20	22,2	29	1,1	21 600	14 800	620	4 500
LR5007-2RS	300	**68**	35	20	41,7	1	17 900	13 300	550	4 300

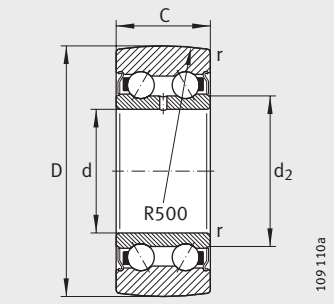
[1)] Track roller with cylindrical outside surface.

Yoke type track rollers

Double row



LR52..-2RS, LR53..-2RS



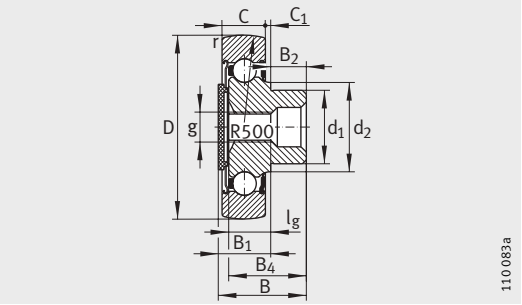
LR52..-2Z, LR53..-2Z, LR52..-X-2Z[1)]

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions					Basic load ratings			Fatigue limit load	Speed
	m	D	d	C	d_2	r	dyn. $C_{r\,w}$	stat. $C_{0r\,w}$	$F_{r\,per}$	$C_{ur\,w}$	$n_{D\,G}$
	≈g					min.	N	N	N	N	min^{-1}
LR5206-2Z	510	**72**	30	23,8	37,4	1	25 000	18 000	–	740	5 000
LR5206-X-2Z[1)]	510	**72**	30	23,8	37,4	1	25 000	18 000	–	740	5 000
LR5206-2RS	510	**72**	30	23,8	37,4	1	25 000	18 000	–	740	3 500
LR5305-2Z	500	**72**	25	25,4	34,4	1,1	28 000	19 900	–	830	5 500
LR5305-2RS	500	**72**	25	25,4	34,4	1,1	28 000	19 900	–	830	3 900
LR5207-2Z	660	**80**	35	27	42,4	1,1	31 000	22 800	–	940	3 900
LR5207-X-2Z[1)]	660	**80**	35	27	42,4	1,1	31 000	22 800	–	940	3 900
LR5207-2RS	660	**80**	35	27	42,4	1,1	31 000	22 800	–	940	2 800
LR5306-2Z	670	**80**	30	30,2	41,4	1,1	36 000	25 500	–	1 060	4 300
LR5306-2RS	670	**80**	30	30,2	41,4	1,1	36 000	25 500	–	1 060	3 100
LR5208-2Z	750	**85**	40	30,2	48,4	1,1	35 000	26 000	20 800	1 070	3 500
LR5208-X-2Z[1)]	750	**85**	40	30,2	48,4	1,1	35 000	26 000	20 800	1 070	3 500
LR5208-2RS	750	**85**	40	30,2	48,4	1,1	35 000	26 000	20 800	1 070	2 500
LR5307-2Z	970	**90**	35	34,9	47,7	1,5	44 000	32 500	–	1 350	3 600
LR5307-2RS	970	**90**	35	34,9	47,7	1,5	44 000	32 500	–	1 350	2 500
LR5308-2Z	1 200	**100**	40	36,5	52,4	1,5	55 000	40 500	–	1 690	3 300
LR5308-2RS	1 200	**100**	40	36,5	52,4	1,5	55 000	40 500	–	1 690	2 300

[1)] Track roller with cylindrical outside surface.

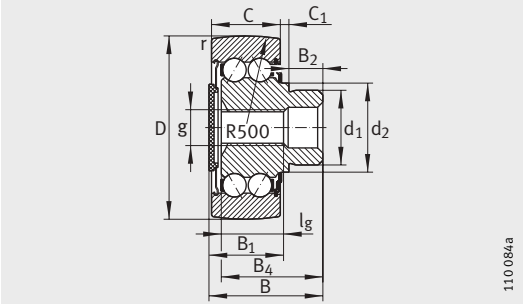
Stud type track rollers



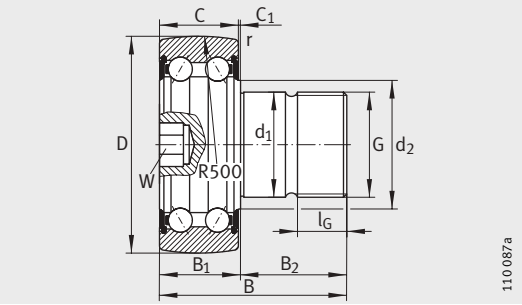
ZL2..-DRS

Dimension table · Dimensions in mm

Designation	Mass	Dimensions										
	m	D	d_1	B	B_1	B_2	B_4	C	C_1	d_2	r	G
	≈g				max.						min.	
ZL5201-DRS	90	**35**	14	33,2	19,5	14	31	15,9	2,6	17,1	0,6	–
KR5201-2RS	120	**35**	12	49,2	17	32,5	–	15,9	0,8	17,1	0,6	M12X1,5
ZL202-DRS	80	**40**	16	23,8	14	10	21,5	11	2	20	0,6	–
ZL5202-DRS	120	**40**	16	36,2	20,5	16	34	15,9	3,5	20	0,6	–
KR5202-2RS	190	**40**	16	53,2	17	36,5	–	15,9	0,8	20	0,6	M16X1,5
ZL203-DRS	120	**47**	18	26,5	14,5	12	24,5	12	2	22,9	0,6	–
ZL5203-DRS	190	**47**	18	39,5	21,5	18	37,5	17,5	3,5	22,9	0,6	–
KR5203-2RS	290	**47**	18	58,8	18,5	40,5	–	17,5	0,8	22,9	0,6	M18X1,5
ZL204-DRS	170	**52**	20	30,7	17	14	28,5	14	2	26,8	1	–
ZL5204-DRS	250	**52**	20	45,3	25,5	20	43	20,6	4	26,8	1	–
KR5204-2RS	380	**52**	20	63,6	22,5	41,5	–	20,6	1,5	26,8	1	M20X1,5
ZL205-DRS	250	**62**	25	33,8	18	16	31	15	2	30,3	1	–
ZL5205-DRS	380	**62**	25	50,4	25,5	25	47,5	20,6	4	30,3	1	–
KR5205-2RS	580	**62**	24	70,9	21,5	49,5	–	20,6	0,8	30,3	1	M24X1,5
ZL5206-DRS	550	**72**	30	59	29	30	56,5	23,8	4,5	37,3	1	–
KR5206-2RS	800	**72**	24	74,1	25	49,5	–	23,8	0,8	37,3	1	M24X1,5
ZL5207-DRS	710	**80**	35	69,2	33,5	36	66,5	27	5,5	42,4	1,1	–
KR5207-2RS	1 200	**80**	30	91	28	63	–	27	1	42,4	1,1	M30X1,5



ZL52..-DRS

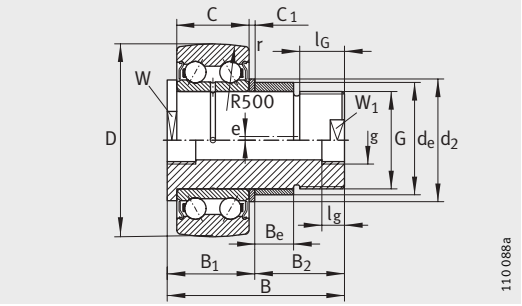


KR52..-2RS

				Tightening torque	Basic load ratings		Fatigue limit load	Speed
l_G	g	l_g	W	M_A	dyn. C_{rw}	stat. C_{0rw}	C_{urw}	n_{DG}
				Nm	N	N	N	min^{-1}
–	M8	14	–	–	8 700	5 200	260	7 500
17	–	–	6	45	8 700	5 200	260	7 500
–	M8	15	–	–	6 600	3 350	139	8 500
–	M8	15	–	–	10 000	6 300	320	7 000
19	–	–	8	70	10 000	6 300	320	7 000
–	M8	16	–	–	8 500	4 450	185	6 500
–	M8	15	–	–	12 800	8 400	425	5 500
21	–	–	8	115	12 800	8 400	425	5 500
–	M10	18	–	–	10 600	5 700	238	6 000
–	M10	18	–	–	16 100	10 700	540	5 000
21	–	–	10	160	16 100	10 700	540	5 000
–	M10	19	–	–	12 500	7 100	290	5 500
–	M10	18	–	–	18 800	13 300	670	4 500
25	–	–	10	290	18 800	13 200	660	4 500
–	M16	20	–	–	25 000	18 100	910	3 500
25	–	–	10	290	25 000	18 100	910	3 500
–	M16	20	–	–	31 000	22 800	1 160	2 800
32	–	–	12	600	31 000	22 800	1 160	2 800

Stud type track rollers

With eccentric collar



ZLE52..-2Z

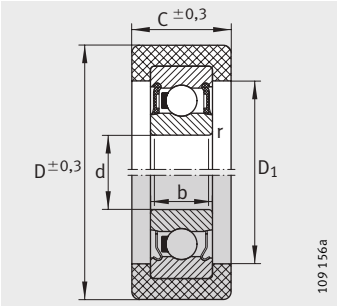
Dimension table · Dimensions in mm

Designation	Mass	Dimensions										
	m	D	d_e	B	B_1	B_2	C	C_1	d_2	r	W	W_1
	≈g				max.					min.		
ZLE5201-2Z	250	**35**	18	65,5	20,5	45	15,9	2	25	0,6	15	9
ZLE5202-2Z	350	**40**	22	66,5	21,5	45	15,9	2,5	27	0,6	17	10
ZLE5204-2Z	460	**52**	24	76	26	50	20,6	2,5	30	1	22	17
ZLE5205-2Z	640	**62**	24	88	32	56	20,6	8	30	1	22	17
ZLE5207-2Z	1 300	**80**	35	99	35	64	27	3	45	1,1	40	27

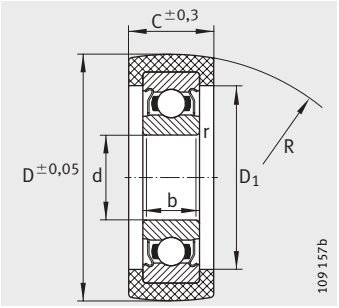
						Tightening torque	Basic load ratings		Fatigue limit load	Speed
e	B_e	g	l_g	G	l_G	M_A	dyn. $C_{r\,w}$	stat. $C_{0r\,w}$	$C_{ur\,w}$	$n_{D\,G}$
					min.	Nm	N	N	N	min^{-1}
1	18	M6	6	M12X1,5	24	30	8 700	5 200	260	10 000
1	16	M8X1	8	M14	25	40	10 000	6 300	320	10 000
1	18	M8X1	8	M20X1,5	29	150	16 200	10 700	540	7 000
1	25	M8X1	8	M20X1,5	28	150	18 800	13 200	670	6 500
1,5	29	M8X1	8	M30X1,5	32	540	31 000	22 800	1 160	3 900

Track rollers

With plastic outer tyre



KLRZ..-2RSR
KLRZ..-2Z

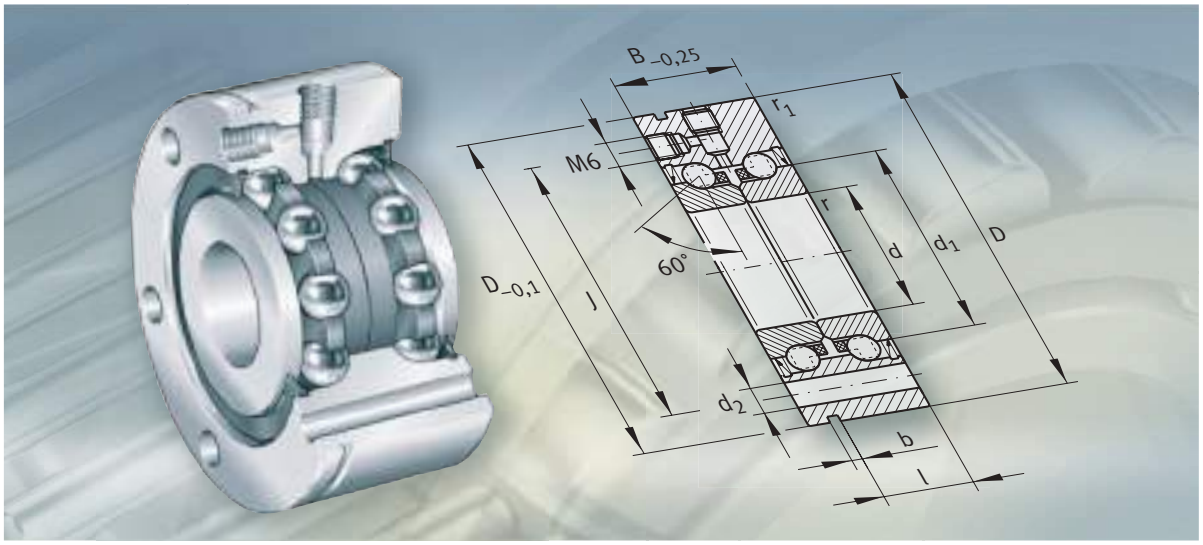


KLRU..-2Z

Dimension table · Dimensions in mm

Designation	Mass	Dimensions							Basic load ratings of track roller[1]	Deep groove ball bearing fitted	Basic load ratings of deep groove ball bearing	
	m	D	d	C	b	D_1	R	r	$F_{r\,per}$		dyn. C_r	stat. C_{0r}
	≈g							min.	N		N	N
KLRU08X28X11-2Z	16	**27,5**	8	11	7	20	500	0,3	250	608-2Z	3 200	1 250
KLRZ10X30X10-2Z	50	**30**	10	10	8	24	–	0,3	250	6000-2Z	4 600	1 970
KLRU12X35X12-2Z	30	**34,8**	12	12	8	26	300	0,3	340	6001-2Z	5 100	2 370
KLRZ12X41X16-2RSR	50	**41**	12	16	10	29,5	–	0,6	500	6201-2RSR	7 100	3 100
KLRU12X47X20-2Z	45	**46,8**	12	20	10	28,5	300	0,6	500	6201-2Z	7 100	3 100
KLRU15X47X20-2Z	50	**46,8**	15	20	11	31,5	300	0,6	500	6202-2Z	7 700	3 500

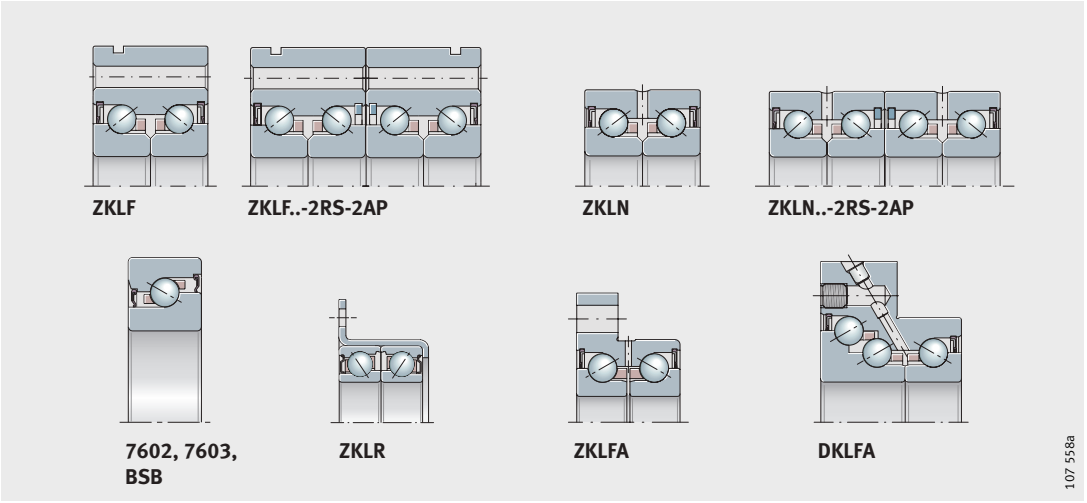
[1] Valid for installation as track roller.
The values apply for operating temperatures up to max. +40 °C.

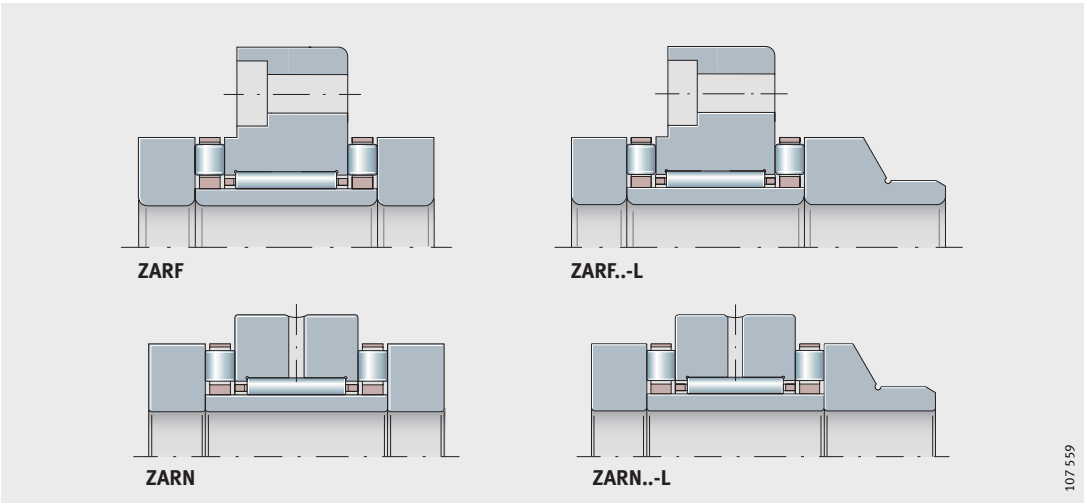


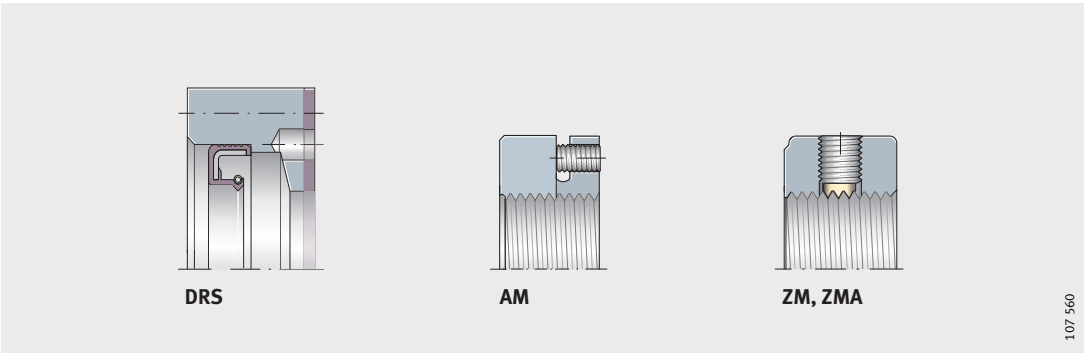
Bearings for screw drives

Axial angular contact ball bearings
Needle roller/axial cylindrical roller bearings
Seal carrier assemblies
Precision locknuts

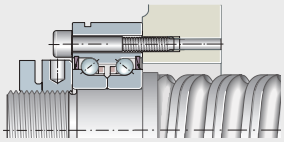
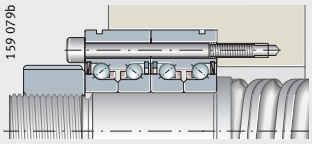
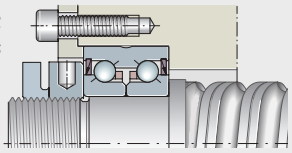
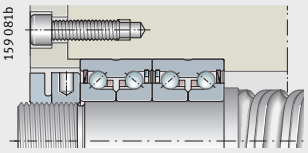
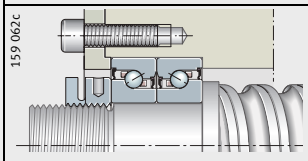
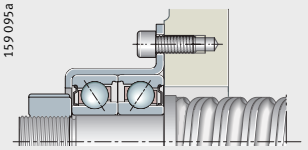
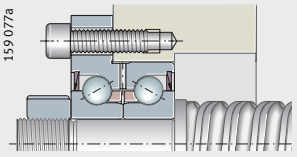
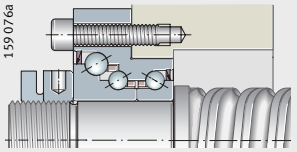
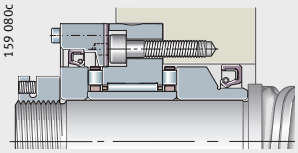
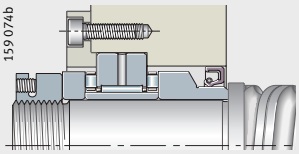
Bearings for screw drives


ZKLF
ZKLF..-2RS-2AP
ZKLN
ZKLN..-2RS-2AP
7602, 7603,
BSB
ZKLR
ZKLFA
DKLFA
107 558a


ZARF
ZARF..-L
ZARN
ZARN..-L
107 559


DRS
AM
ZM, ZMA
107 560

Matrix for preselection of bearings

Application	Series		
For standard applications	159 078c		**ZKLF..-2Z** **ZKLF..-2RS** **ZKLF..-2RS-PE**
	159 079b		**ZKLF..-2RS-2AP**
	159 075b		**ZKLN..-2Z** **ZKLN..-2RS** **ZKLN..-2RS-PE**
	159 081b		**ZKLN..-2RS-2AP**
	159 062c		**7602** **7602-2RS** **7603** **7603-2RS** **BSB** **BSB-2RS**
For special applications	159 095a		**ZKLR..-2Z** **ZKLR..-2RS**
	159 077a		**ZKLFA..-2Z** **ZKLFA..-2RS**
	159 076a		**DKLFA..-2RS**
For applications requiring very high accuracy and rigidity	159 080c		**ZARF (L)**
	159 074b		**ZARN (L)**

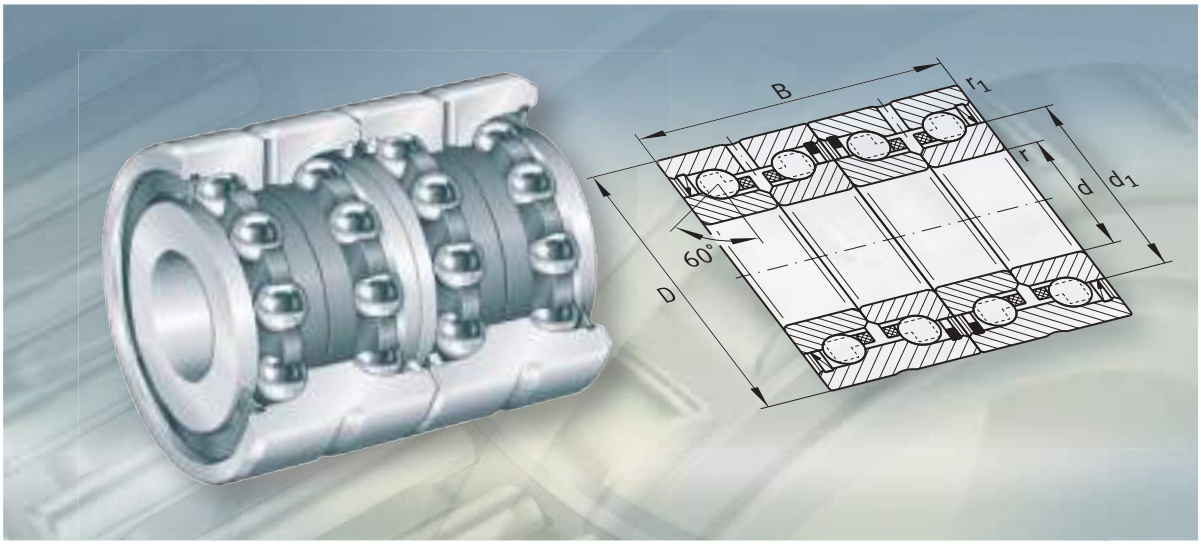
Definition of symbols

+++	very good
++	good
+	satisfactory
–	sufficient

Caution!

This selection matrix is a general overview for preliminary assessment of whether bearings can be considered for the required purpose. For the specific application, the data in the product sections and the technical principles must always be taken into consideration.

Features	Characteristics					
	High runout accuracy	High speeds and low friction	High rigidity and load carrying capacity	Work on adjacent construction and mounting	Low lubricant consumption	For description, see page
– Outer ring for flange mounting – Gap seals or contact seals on both sides – Greased, with relubrication facility – Most economical type of screw drive bearing arrangement	++ ++ +	+++ ++ ++	+ + +	+++ +++ +++	++ ++ ++	**902**
– As ZKLF, but in matched pair – Significantly higher load carrying capacity and rigidity than ZKLF	++	++	++	++	++	**903**
– Gap seals or contact seals on both sides – Greased, with relubrication facility – Easier to fit than single row bearings, e.g. for plummer block housings	++ ++ +	+++ ++ ++	+ + +	+ + +	++ ++ ++	**904**
– As ZKLN, but in matched pair – Significantly higher load carrying capacity and rigidity than ZKLN	++	++	++	+	++	**904**
– Open or sealed on both sides – Highly suitable for mounting in pairs to form wide range of contact angle combinations	++ ++ ++ ++ ++ ++	+++ ++ +++ ++ +++ ++	+ + + + + +	– – – – – –	++ ++ ++ ++ ++ ++	**906**
– Particularly economical alternative to solutions with individual ball bearings – Gap seals or contact seals on both sides – Simple to fit – For applications with comparatively low loads, but high positional accuracy	+ +	+++ ++	– –	+++ +++	++ ++	**907**
– Outer ring for flange mounting – Stepped outer ring with flattened areas on both sides – Gap seals or contact seals on both sides	++ ++	+++ ++	+ +	+++ +++	++ ++	**908**
– Higher load capacity on one side – Outer ring for flange mounting – Sealed on both sides – For vertical axes – For locating/locating bearing arrangements	+	++	++	+++	++	**908**
– Outer ring for flange mounting – Very high accuracy, rigidity and load carrying capacity – Bearing prepared for sealing	+++	+	+++	+	–	**953**
– Very high accuracy, rigidity and load carrying capacity – Bearing prepared for sealing	+++	+	+++	–	–	**954**



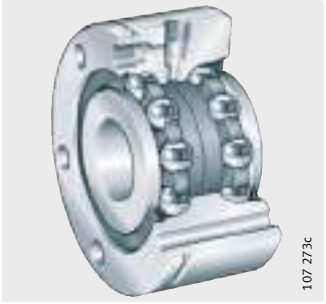
Axial angular contact ball bearings

Axial angular contact ball bearings

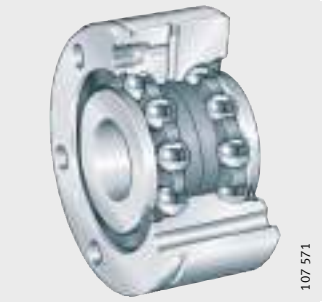
Double row, for screw mounting

Lip seals or gap seals

ZKLF..-2RS, ZKLF..-2Z

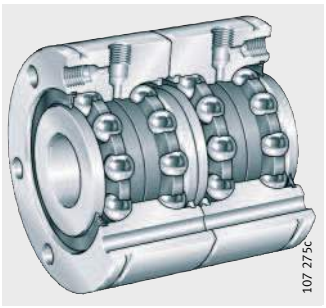


ZKLF..-2RS-PE



Matched pair

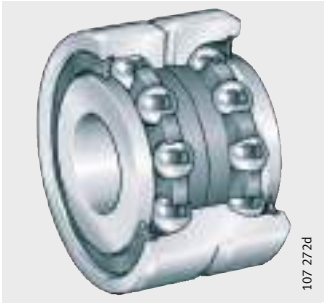
ZKLF..-2RS-2AP



Double row, not for screw mounting

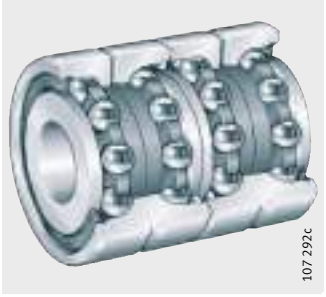
Lip seals or gap seals

ZKLN..-2RS, ZKLN..-2Z
ZKLN..-2RS-PE



Matched pair

ZKLN..-2RS-2AP



Single row, for matching in pairs

Without/with lip seals

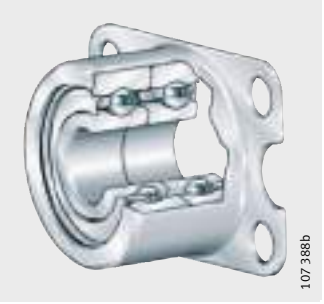
7602, 7603, BSB

7602..-2RS, 7603..-2RS, BSB..-2RS

Double row angular contact ball bearing unit, for screw mounting

Lip seals or gap seals

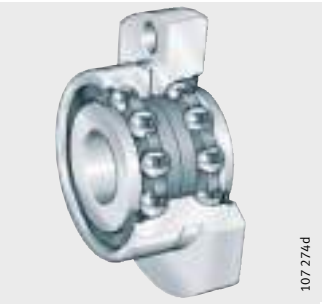
ZKLR..-2RS
ZKLR..-2Z



Double or triple row, flange with flattened areas, for screw mounting

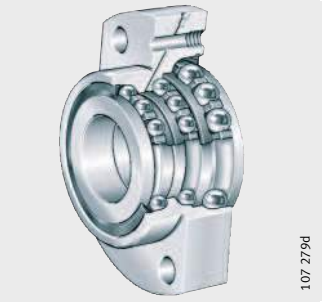
Double row
Lip seals or gap seals

ZKLFA..-2RS
ZKLFA..-2Z



Triple row
Lip seals

DKLFA..-2RS



Axial angular contact ball bearings

Features

Screw drive bearing arrangements are subjected to requirements that often cannot be optimally fulfilled by the design construction of conventional bearings. For the design of bearing arrangements for the highly dynamic operating conditions in screw drives that have high accuracy, high load carrying capacity, high rigidity, low friction, are easy to fit and maintenance-free or low-maintenance, there is a wide range of INA/FAG axial angular contact ball bearings.
With this well thought-out product range, ideal application-specific solutions can be found to all the technical and economic demands placed on the bearing arrangements of screw drives.

Single row and multi-row designs

Axial angular contact ball bearings are available as single, double or triple row ready-to-fit units. They are self-retaining and comprise thick-walled, geometrically stable outer rings, ball and cage assemblies and one-piece or two-piece inner rings. In several series, the outer ring has through holes for simple flange mounting to the adjacent construction.

The bearing rings are matched to each other such that a defined preload is achieved when the rings are clamped in place using a precision locknut.

Radial and axial load carrying capacity

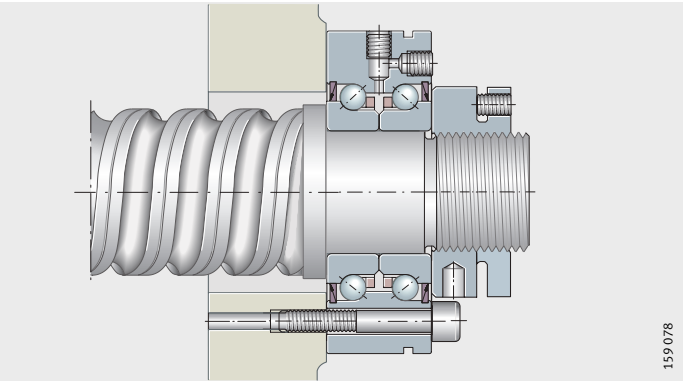
Due to the contact angle of 60°, the bearings can support not only radial forces but high axial forces as well.

Double row axial angular contact ball bearings, for screw mounting

Axial angular contact ball bearings ZKLF are screw mounted directly on the adjacent construction or in a radial locating bore, *Figure 1* and *Figure 2*. The cover that would otherwise be required and the associated matching work can therefore be dispensed with.

In order to aid removal of the bearings from a locating bore, the outer ring has a circumferential extraction slot.

Relubrication is facilitated by radial and axial threaded connectors with detachable grub screws.



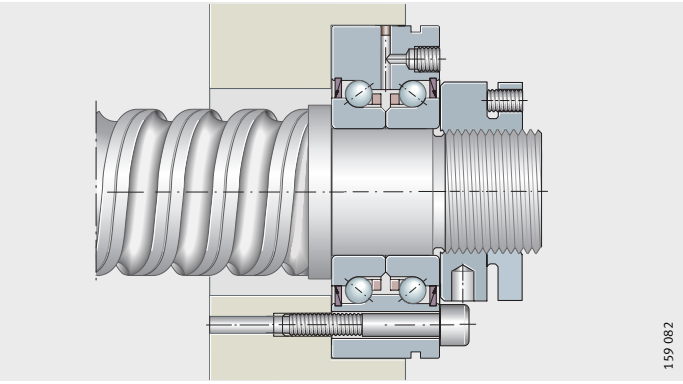
ZKLF..-2RS
ZKLF..-2Z

Figure 1
Outer ring screw mounted on flat adjacent construction, preloaded using locknut

With less stringent tolerances

Axial angular contact ball bearings ZKLF..-2RS-PE correspond to series ZKLF but have a runout tolerance within P5 to DIN 620, less stringent diameter tolerances and the suffix PE.
They are used where a lower positional accuracy is acceptable. As a result, the adjacent construction does not need to be as accurate with these bearings.

Relubrication is facilitated by an axial threaded connector. The radial lubrication duct is firmly closed off.



ZKLF..-2RS-PE

Figure 2
Outer ring screw mounted in bore, preloaded using locknut

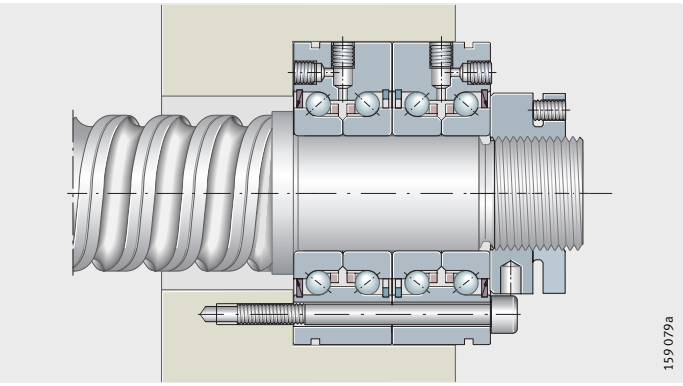
Heavy series

Axial angular contact ball bearings ZKLF..-2RS and ZKLF..-2Z are also available in a heavy series. For the same shaft diameter, they have a larger cross-section and thus higher basic load ratings.

Matched pairs

Bearings of series ZKLF..-2RS-2AP comprise a matched pair of bearings ZKLF..-2RS, *Figure 3*. The individual bearings are matched to each other.

Matched bearings have an arrow marking on the outside surface of the outer rings. When the bearings are arranged correctly, the lip seals face outwards. During fitting, the hole pattern of the two bearings must match, not the marking.



ZKLF..-2RS-2AP

Figure 3
Matched pair, outer ring screw mounted in bore, preloaded using locknut

Sealing/lubricant

Bearings with the suffix 2RS have lip seals and highly effective sealing.

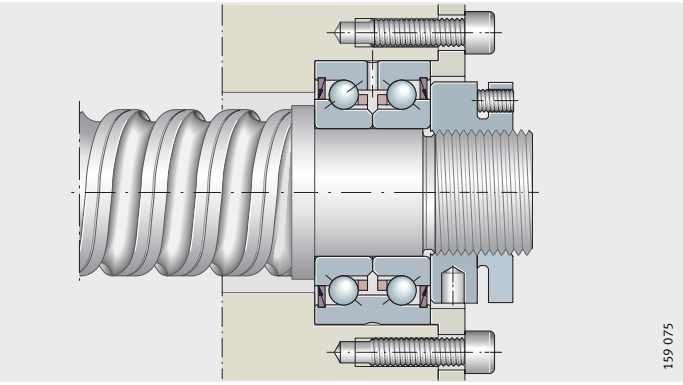
Bearings with the suffix 2Z are sealed using gap seals and are suitable for higher speeds.

The bearings are greased using a lithium soap grease to GA28 and can be lubricated via the lubrication connectors in the outer ring. For the majority of applications, the initial greasing is sufficient for the whole bearing operating life.

Axial angular contact ball bearings

Double row axial angular contact ball bearings, not for screw mounting

Axial angular contact ball bearings ZKLN are mounted in a housing bore, *Figure 4*. The bearing outer ring is axially located by a cover.



ZKLN..-2RS
ZKLN..-2Z

Figure 4
Outer ring located using cover, preloaded using locknut

With less stringent tolerances

Axial angular contact ball bearings ZKLN..-2RS-PE correspond to series ZKLN but have a runout tolerance within P5 to DIN 620, less stringent diameter tolerances and the suffix PE.
They are used where a lower positional accuracy is acceptable. As a result, the adjacent construction does not need to be as accurate with these bearings.

Heavy series

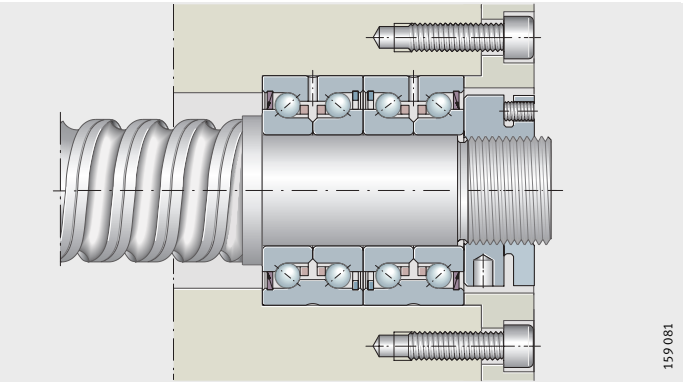
Axial angular contact ball bearings ZKLN..-2RS and ZKLN..-2Z are also available in a heavy series. For the same shaft diameter, they have a larger cross-section and thus higher basic load ratings.

Matched pairs

Bearings of series ZKLN..-2RS-2AP comprise a matched pair of bearings ZKLN..-2RS, *Figure 5*. The individual bearings are matched to each other.

Matched bearings have an arrow marking on the outside surface of the outer rings. When the bearings are arranged correctly, the lip seals face outwards.

The bearing outer rings are axially clamped by a cover, *Figure 5*.



ZKLN..-2RS-2AP

Figure 5
Matched pair, outer rings located using cover, preloaded using locknut

Sealing/lubricant

Bearings with the suffix 2RS have lip seals and highly effective sealing.

Bearings with the suffix 2Z are sealed using gap seals and are suitable for higher speeds.

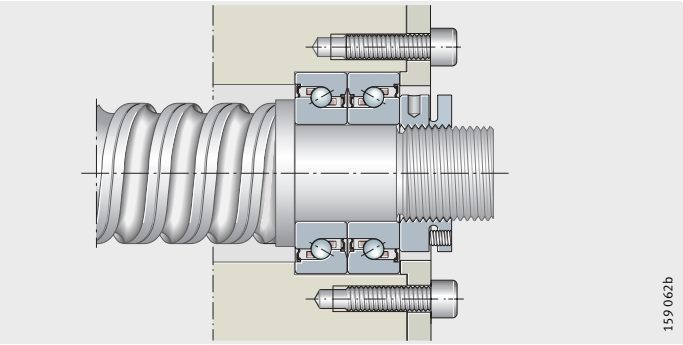
The bearings are greased using a lithium soap grease to GA28 and can be lubricated via a lubrication slot and lubrication holes in the outer ring. For the majority of applications, the initial greasing is sufficient for the whole bearing operating life.

Axial angular contact ball bearings

Single row axial angular contact ball bearings, for combination in pairs

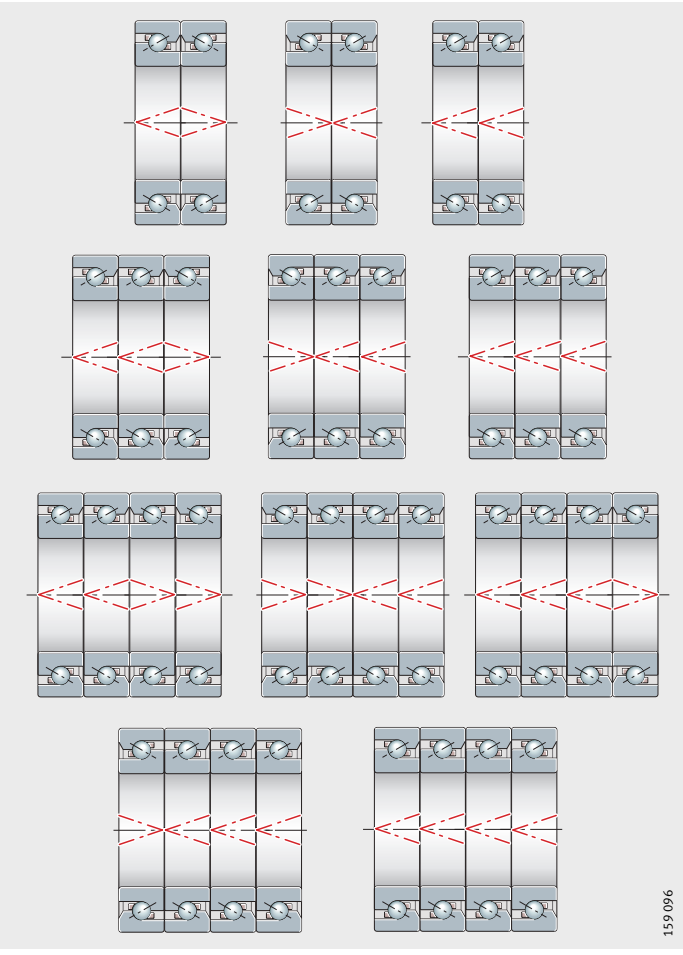
Bearings 7602, 7603 and BSB are designed as universal bearings, *Figure 6* and *Figure 7*.

They can be combined in a wide range of sets for different requirements, *Figure 7*.



7602..-2RS, 7603..-2RS, BSB..-2RS

Figure 6
Single row axial angular contact ball bearings, two-bearing set in O arrangement



7602, 7603, BSB

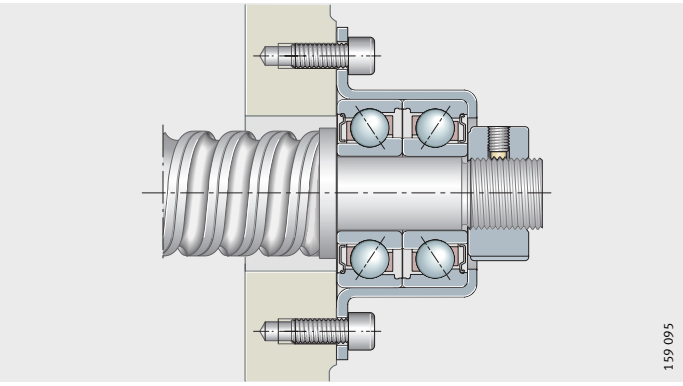
Figure 7
Set combinations

Sealing/lubricant

Single row axial angular contact ball bearings are not sealed and are not supplied greased. However, some sizes are fitted with seals. These bearings are greased for life with Arcanol L55.

Angular contact ball bearing unit, for screw mounting

Angular contact ball bearing units ZKLR are low-cost bearings and therefore particularly economical. They comprise a deep drawn sheet steel housing with an integral matched pair of angular contact ball bearings in an X arrangement, *Figure 8*. The housing is plated with Corrotect® and is thus protected against rust.
The ball bearings are sealed on both sides by lip seals or gap seals. The bearing assembly is preloaded clearance-free.



ZKLR..-2RS
ZKLR..-2Z

Figure 8
Angular contact ball bearing unit

Particularly easy to fit

The units are particularly easy to fit.
They:

- are directly flange mounted, for example on the milled face of the adjacent construction. This eliminates the need for precise, costly fits and additional flange covers for seating and axial location of the bearings
- require no additional parts for location of the bearings in the housing
- reduce errors in fitting due to the smaller number of components compared to conventional solutions
- are self-aligning by means of the screw drive nut during fitting. This effectively eliminates any warping due to misalignment of the bearing seats
- have a defined preload. It is not necessary to preload the bearing during fitting as is usually the case with screw drive bearing arrangements
- require only clearance-free axial location on the threaded spindle.

Sealing/lubricant

Bearings with the suffix 2RS have lip seals and highly effective sealing. Bearings with the suffix 2Z are sealed using gap seals and are suitable for higher speeds. The bearings are greased using a lithium soap grease to DIN 51825–K2N–40.

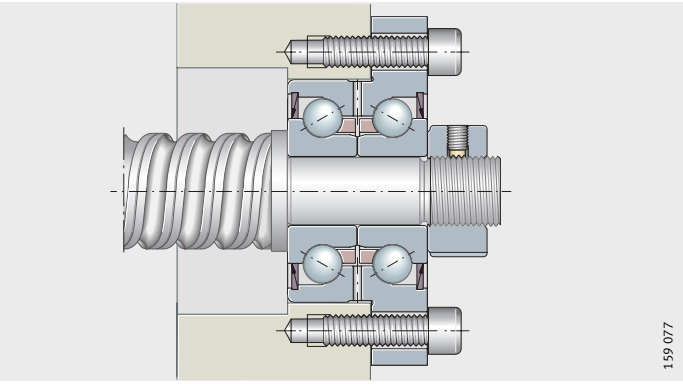
Areas of application

The units are highly suitable, due to their dimensions and design, for space-saving and simple bearing arrangements in highly dynamic screw drives, for example:

- in inspection and measuring equipment
- in small machine tools
- in medical and laboratory equipment
- in precision engineering and electronic components manufacture
- where complete units will give a simpler bearing arrangement.

Double row axial angular contact ball bearings with flange, for screw mounting

Series ZKLFA has a stepped outer ring. It can therefore be screw mounted easily on the adjacent construction, *Figure 9*.
The flange has flattened areas on both sides, so the radial design envelope in the adjacent construction can be kept very small.



ZKLFA..-2RS
ZKLFA..-2Z

Figure 9
Outer ring screw mounted on adjacent construction, preloaded using locknut

Sealing/lubricant

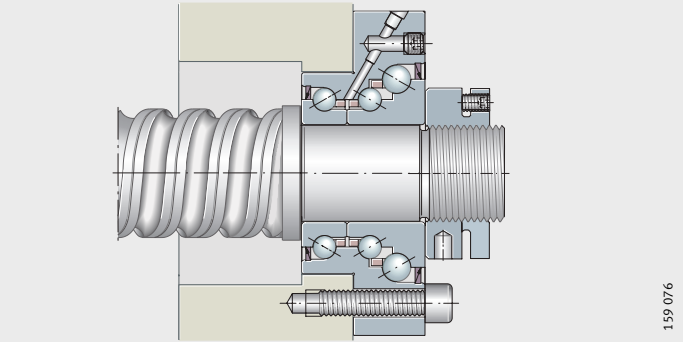
Bearings with the suffix 2RS have lip seals and highly effective sealing. Bearings with the suffix 2Z are sealed using gap seals and are suitable for higher speeds.

The bearings are greased using a lithium soap grease to GA28 and can be lubricated via a lubrication slot and lubrication holes in the outer ring. For the majority of applications, the initial greasing is sufficient for the whole bearing operating life.

Triple row axial angular contact ball bearings with flange, for screw mounting

Axial angular contact ball bearings DKLFA..-2RS have, in addition to two rows of balls with a contact angle of 60° in an O arrangement, an extra row of balls, *Figure 10*. Due to this additional row, the bearings can support higher axial loads in one direction.

Due to the stepped outer ring, the bearings can be easily flange mounted on the adjacent construction. The flange has flattened areas on both sides. As a result, it requires only a small design envelope in the adjacent construction.



DKLFA..-2RS

Figure 10
Outer ring screw mounted on adjacent construction, preloaded using locknut

Caution! In order to make full use of the load carrying capacity of bearings DKLFA..-2RS, their design requires that they are subjected to continuous load in the main load direction. They are therefore used mainly in screw drives with a locating/locating bearing arrangement and tensioned spindles or in vertically arranged screw drive bearing arrangements.

For design of the bearing arrangement, please contact us.

Sealing/lubricant

The bearings have lip seals on both sides.

They are greased using a lithium soap grease to GA28. If necessary, lubrication can be carried out via a threaded connector for central lubrication systems on the flange side.

Caution! For calculation of relubrication intervals based on a stated load spectrum (speed, load, operating duration, environmental conditions), please contact us.

Operating temperature

Sealed axial angular contact ball bearings are suitable for operating temperatures from –30 °C to +120 °C, restricted by the grease, the seal material and the plastic cages in the ball and cage assemblies.

Caution! The operating temperature influences the dynamic bearing characteristics. The values given in the dimension table are based on a room temperature of +20 °C.

Cages

The axial angular contact ball bearings have plastic cages. The cage design is not indicated in the suffix.

In series 7602, 7603 and BSB, the polyamide cages are indicated by the suffix TVP/T.

Suffixes

Suffixes for the available designs: see table.

Available designs

Suffix	Description
PE	Less stringent bearing design
T, TVP	Polyamide cage, guided by balls
2AP	Axial angular contact ball bearings, matched pair (ZKLN, ZKLF)
2RS	Contact seals on both sides
2Z	Gap seals on both sides

Design and safety guidelines

Basic rating life

The decisive factors in determining the bearing size are the basic rating life, the static load safety factor and the axial limiting load. The basic rating life L and L_h are calculated as follows:

$$L = \left(\frac{C}{P}\right)^p$$

$$L_h = \frac{16666}{n} \cdot \left(\frac{C}{P}\right)^p$$

L — 10^6 revolutions
Basic rating life in millions of revolutions

L_h — h
Basic rating life in operating hours

C_r, C_a — N
Basic dynamic radial or axial load rating according to dimension table
C_r is valid for a contact angle $\alpha \leqq 45°$, C_a is valid for a contact angle $\alpha > 45°$

P — N
Equivalent dynamic bearing load

p — –
Life exponent p = 3

n — min^{-1}
Operating speed.

Resultant and equivalent bearing load P for ZKLR

Bearing unit Designation	Factor P
ZKLR0624-2Z	$P = 140 + 0{,}13\ F_a^{1,4} + 0{,}003 \cdot F_r^{1,9}$
ZKLR0828-2Z	$P = 210 + 0{,}28\ F_a^{1,27} + 0{,}002 \cdot F_r^{1,9}$
ZKLR1035-2Z	$P = 240 + 0{,}47\ F_a^{1,17} + 0{,}0015 \cdot F_r^{1,9}$
ZKLR1244-2RS	$P = 580 + 0{,}046\ F_a^{1,3} + 0{,}076 \cdot F_r^{1,28}$
ZKLR1547-2RS	$P = 540 + 0{,}011\ F_a^{1,5} + 0{,}022 \cdot F_r^{1,45}$
ZKLR2060-2RS	$P = 960 + 0{,}0082\ F_a^{1,5} + 0{,}017 \cdot F_r^{1,45}$

Static limiting load diagrams for ZKLR

The easy-to-use static limiting load diagrams allow quick verification of the bearing size of series ZKLR – as a function of the axial and radial operating load, *Figure 21* to *Figure 23*, page 916. The decisive requirement is that the intersection between the axial and radial load must be below the limit line.

Example: If the operating loads F_a and F_r are below the limit line, the bearing size is suitable for the application,
see example *Figure 23*, page 916.

Resultant and equivalent bearing load P for ZKLN, ZKLF, ZKLFA, DKLFA, BSB, 7602, 7603

The bearings are axially preloaded to a defined value if the recommended precision locknuts are used and the correct nut tightening torque is applied. The resultant axial bearing load $F_{a\,res}$ is determined from the axial operating load F_{aB} and taking account of the axial preload according to *Figure 11* to *Figure 15*, page 912 and page 913. For series 7602, 7603 and BSB, the $F_{a\,res}$ diagrams are based on two-bearing sets in an O or X arrangement, *Figure 7*, page 906. For calculation of other set combinations, please contact us.

Caution! A load in excess of the limit value will lead to the rolling element row without load lifting off the raceway. As a result, higher wear will occur under rapid acceleration. For extreme moment loads and statically overdefined systems (locating/locating bearing arrangements), please contact us. The calculation program BEARINX® can give a precise design in this case.

Axial and radial operating loads

Under purely axial load, $P = F_{a\,res}$. If additional radial operating loads are present, the equivalent bearing load P must be calculated using the following formula:

$$P = X \cdot F_r + Y \cdot F_{a\,res}$$

The values X and Y are given in the following table:

Factors X and Y

Load ratio	Factor	
	X	Y
$\frac{F_{a\,res}}{F_r} \leqq 2{,}17$	1,9	0,55
$\frac{F_{a\,res}}{F_r} > 2{,}17$	0,92	1

Load varying in steps

If the load values vary in steps, the equivalent load P and speed n are calculated using the following formulae (q = time duration %):

$$P = \sqrt[p]{\frac{q_1 \cdot n_1 \cdot P_1^{\,p} + \ldots + q_z \cdot n_z \cdot P_z^{\,p}}{q_1 \cdot n_1 + \ldots + q_z \cdot n_z}}$$

$$n = \frac{q_1 \cdot n_1 + \ldots + q_z \cdot n_z}{100}$$

Static load safety factor

The static load safety factor S_0 indicates the security against impermissible permanent deformations in the bearing.

It is determined using the following formula:

$$S_0 = \frac{C_0}{P_0}$$

S_0 –
Static load safety factor

C_{0r}, C_{0a} N
Basic static radial or axial load rating according to dimension table
C_{0r} is valid for a contact angle $\alpha \leqq 45°$, C_{0a} is valid for a contact angle $\alpha > 45°$

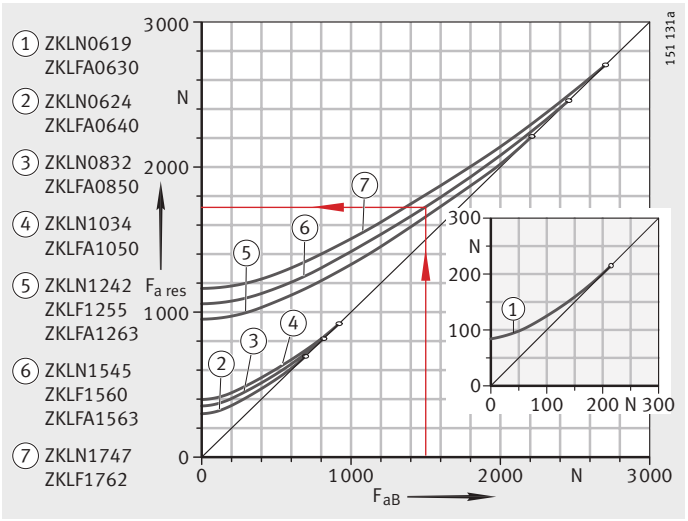
P_0 N
Maximum static load of bearing.

Caution! In machine tools, $S_0 \geqq 4$.

Resultant bearing load – diagrams

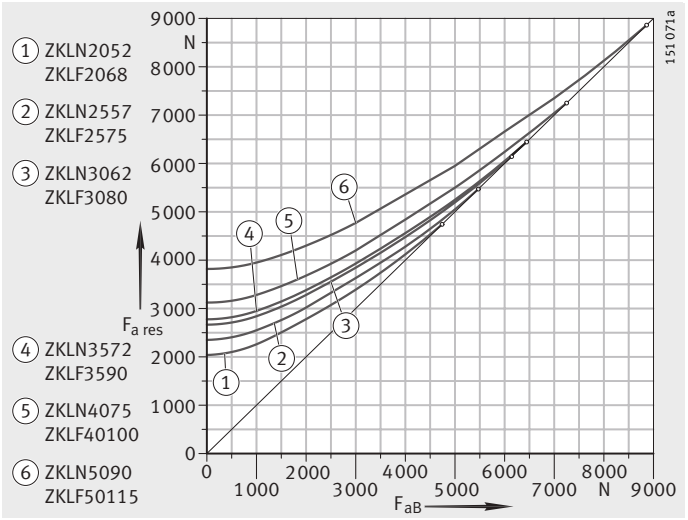
Example 1
Bearing ZKLN1545
Axial operating load F_{aB} = 1,5 kN
$F_{a\,res}$ = approx. 1,75 kN
Loading by operating load and preload
F_{aB} = operating load
$F_{a\,res}$ = resultant bearing load
° = limit value

Figure 11
Resultant bearing load
ZKLN, ZKLF and ZKLFA,
up to d = 17 mm



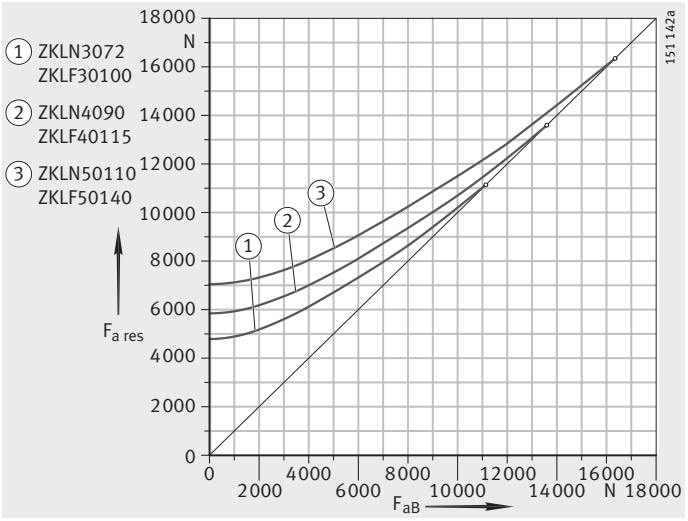
F_{aB} = operating load
$F_{a\,res}$ = resultant bearing load
° = limit value

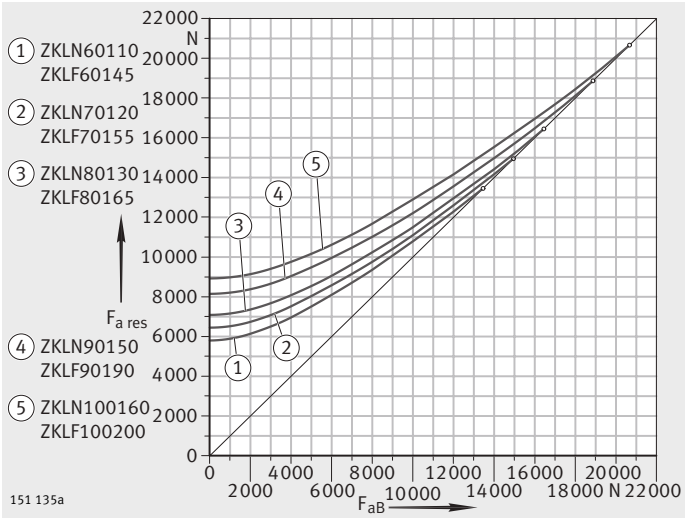
Figure 12
Resultant bearing load
ZKLN, ZKLF,
from d = 20 mm to 50 mm



F_{aB} = operating load
$F_{a\,res}$ = resultant bearing load
° = limit value

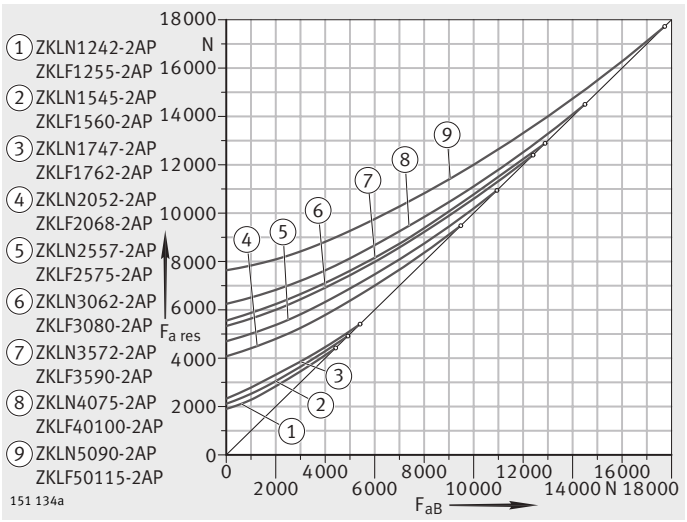
Figure 13
Resultant bearing load
ZKLN, ZKLF, heavy series





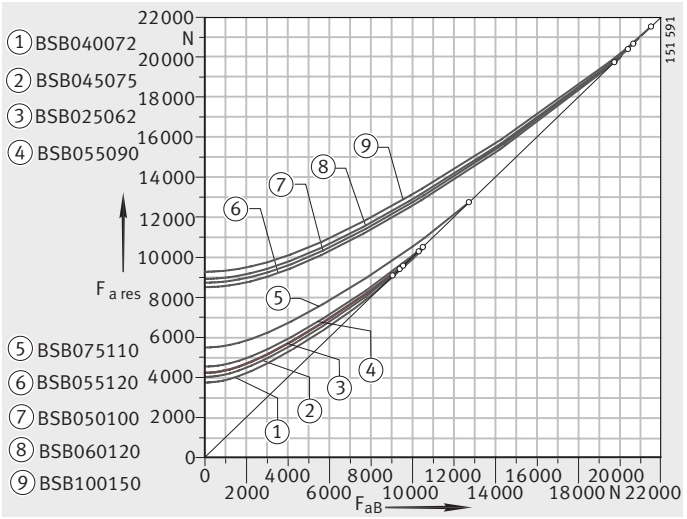
F_{aB} = operating load
$F_{a\,res}$ = resultant bearing load
° = limit value

Figure 14
Resultant bearing load
ZKLN, ZKLF, from d = 60 mm



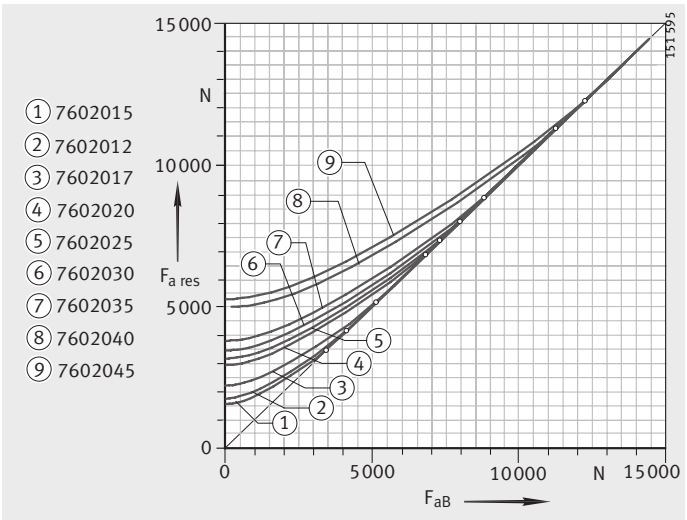
F_{aB} = operating load
$F_{a\,res}$ = resultant bearing load
° = limit value

Figure 15
Resultant bearing load
ZKLN..-2AP and ZKLF..-2AP



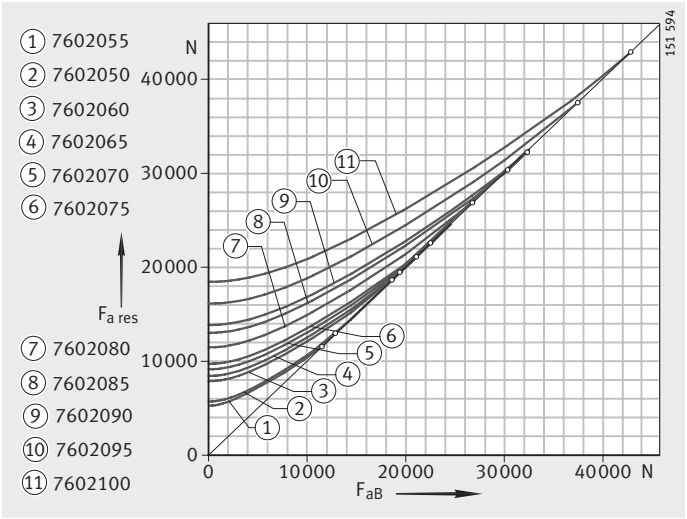
F_{aB} = operating load
$F_{a\,res}$ = resultant bearing load
° = limit value

Figure 16
Resultant bearing load
BSB



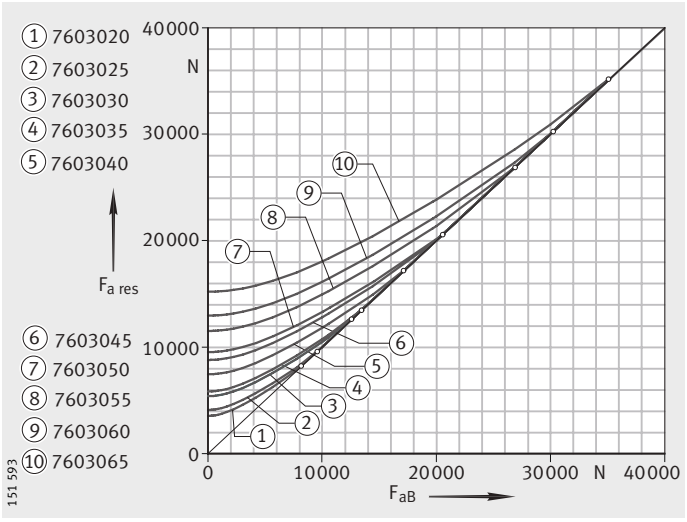
F_{aB} = operating load
$F_{a\,res}$ = resultant bearing load
° = limit value

Figure 17
Resultant bearing load
7602012 to 7602045



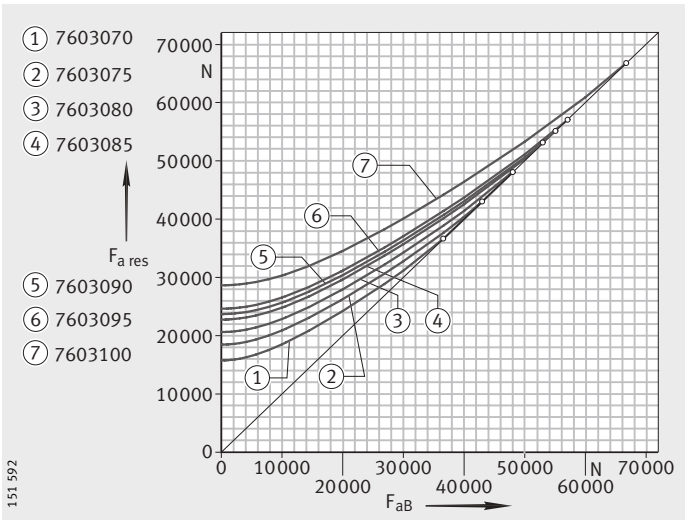
F_{aB} = operating load
$F_{a\,res}$ = resultant bearing load
° = limit value

Figure 18
Resultant bearing load
7602050 to 7602100



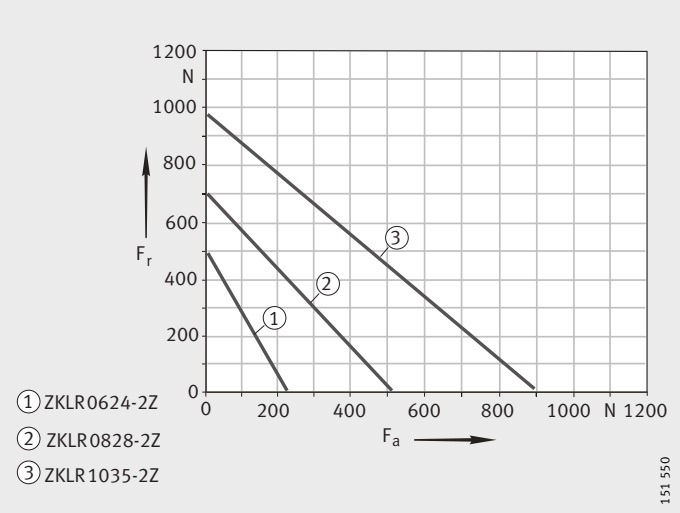
F_{aB} = operating load
$F_{a\,res}$ = resultant bearing load
° = limit value

Figure 19
Resultant bearing load
7603020 to 7603065



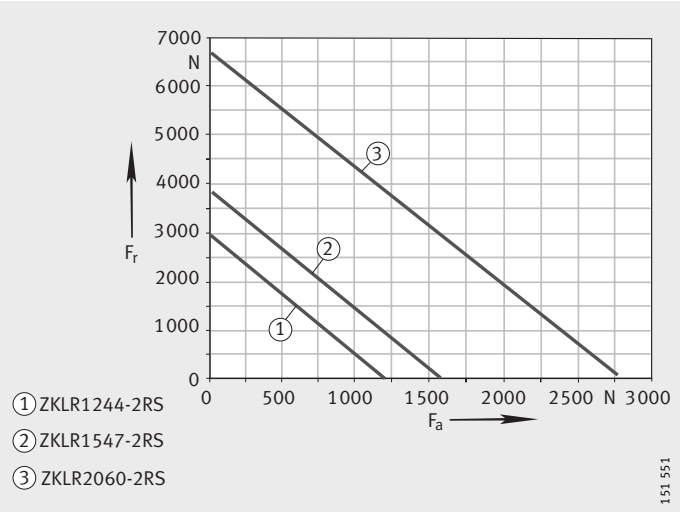
F_{aB} = operating load
$F_{a\,res}$ = resultant bearing load
° = limit value

Figure 20
Resultant bearing load
7603070 to 7603100



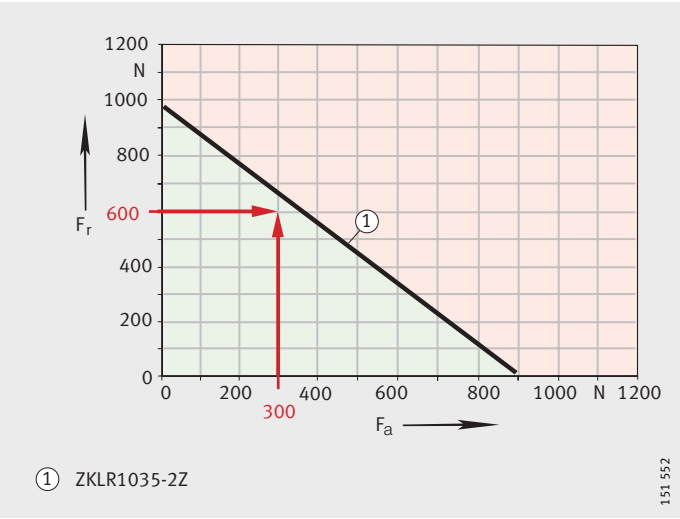
F_r = radial load
F_a = axial load

Figure 21
Static limiting load diagrams ZKLR



F_r = radial load
F_a = axial load

Figure 22
Static limiting load diagrams ZKLR



F_r = 600 N
F_a = 300 N
Bearing is suitable in static terms since the intersection F_a/F_r is below the limit line.

Figure 23
Static limiting load diagram – example ZKLR1035-2Z

Maximum radial load on screw connections for ZKLF

If bearings of series ZKLF are screw mounted on a flat adjacent construction, the maximum radial load that can be supported by the screw connections must be taken into consideration.

If the screws used are as stated in the dimension tables to DIN EN ISO 4 762, the maximum radial load that can be supported before the outer ring moves is restricted to approx. $0{,}1 \times C_{0a}$.
If the outer ring is additionally bonded in place, for example using Loctite 638, the maximum radial load that can be supported increases to approx. $0{,}5 \times C_{0a}$.

If the maximum radial loads that can be supported (without any axial load content) are considered in relation to the rolling element set, it can be seen that:

- With a static load safety factor of $S_0 \geqq 4$ as required for machine tools, the load that can be supported by the screw connections of the outer ring is in any case greater than the radial load restricted by the rolling element set.

This means that (at least in theory) radial loads can be supported that, in relation to the rolling element set, will lead to a static load safety factor of $S_0 \leqq 1$ (incipient plastic deformation of rolling elements), if the outer ring is additionally bonded in place.

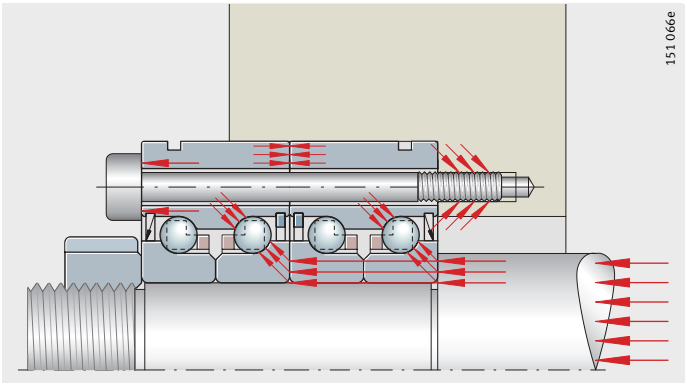
This means that, under normal design criteria and with the decisive static load safety factor for the corresponding areas of application (e.g. $S_0 = 4$ for machine tools), the rolling element set is always the decisive criterion.

Permissible static axial load for ZKLF

For bearings of series ZKLF, the permissible static axial load in the direction of the screw connections, *Figure 24*, is:

$$P_{0\,per} \leqq \frac{C_{0a}}{2}$$

The basic static axial load rating C_{0a} is stated in the dimension tables.



ZKLF

Figure 24
Static axial load in the direction of the screw connections

Design of adjacent construction

The adjacent construction (the shaft and housing) must be designed in accordance with the data in the dimension tables.

The abutment diameters for the shaft and housing shoulders d_a and D_a must be in accordance with the dimension tables.

Caution! D_a and d_a are recommended minimum abutment diameters. If these values are not used, the rib diameter d_1 according to the dimension table must be observed.

Matched bearings

In matched bearing pairs of series ZKLN and ZKLF, the depth of the housing bore must be defined such that the outer ring of the outermost bearing is radially supported to at least $^1/_4$ of its width.

Speeds

The limiting speeds n_G given in the dimension tables are based on the following conditions:

- bearing preloaded, no external operating load
- operating duration 25%
- max. equilibrium temperature +50 °C.

Under favourable environmental influences, a bearing with gap seals (suffix 2Z) can be used instead of contact seals. The limiting speed of these bearings is approximately twice that of axial angular contact ball bearings with contact seals.

Friction

In most applications, preloading of bearings by means of the locknut tightening torque gives sufficiently accurate setting values. The reference here is the tightening torque M_A according to the dimension table in conjunction with an INA precision locknut.

The frictional torque M_{RL} given in the dimension tables is a guide value. The frictional torques are based, for bearings of series ZKLN, ZKLF, ZKLFA, DKLFA, 7602..-2RS, 7603..-2RS, BSB..-2RS and ZKLR on grease lubrication, measured at a speed of n = 5 min^{-1}.

For unsealed bearings of series 7602, 7603 and BSB, the frictional torque M_{RL} is based on lightly oiled raceways.

For dimensioning of the drive, the starting frictional torque and the frictional torque at high speeds of 2 to 3×M_{RL} must be taken into consideration.

Seal friction

In axial angular contact ball bearings with contact seals (suffix 2RS), the extent of seal friction must not be neglected. Sealing influences the limiting speeds.

Frictional energy

The frictional energy N_R of the bearings can be calculated as follows:

$$N_R = \frac{M_{RL} \cdot n}{9{,}55}$$

N_R	Frictional energy	W
M_{RL}	Bearing frictional torque	Nm
n	Operating speed.	min^{-1}

In any analysis of the thermal balance, the various operating speeds n_i must be taken into consideration with their time durations q_i.

Lubrication

Bearings for screw drives can be lubricated with grease or oil. In machine tools, however, the mean bearing temperature should not exceed +50 °C. If this is the case, a lubrication method without heat dissipation such as grease lubrication or oil impulse lubrication can be selected.

Caution! For higher bearing temperatures and unsealed bearings, recirculating oil lubrication should be used.

Grease lubrication

Bearings with a relubrication facility of series ZKLN, ZKLF, ZKLFA and DKLFA are greased with a lithium soap grease to GA28 and are preferably run with grease lubrication. In most cases, the initial greasing is sufficient for the whole operating life of the bearing.

Under certain application conditions, relubrication may be necessary. In this case, Arcanol MULTITOP is suitable. The initial greasing is compatible with greases with a mineral oil base.

For checking by calculation of the grease operating life or relubrication interval, please contact us.

Relubrication interval

The relubrication intervals cannot be determined precisely in advance. They are dependent to a significant extent on the operating conditions and the environmental influences such as temperature, contamination, dust, water, etc.

Caution! Bearings must always be relubricated:

- before and after long stoppage periods
- in conditions of high humidity
- within the defined lubrication intervals as stated in the technical proposal letter.

For the following conditions, please contact us:

- if the bearings are stationary
- vibrations
- very small oscillating movements.

Relubrication quantity

If bearings of series ZKLN, ZKLF, ZKLFA and DKLFA must be relubricated due to the application conditions, please contact us regarding the relubrication quantities.

Oil lubrication

Other lubrication methods such as oil impulse lubrication or recirculating oil lubrication are also possible. For oil lubrication, good results have been obtained with oils CLP to DIN 51 517 and HLP to DIN 51 524 in classes ISO VG 32 to ISO VG 100.

If oil impulse lubrication is intended for series ZKLN and ZKLF, gap seals are advantageous. They prevent contamination entering the bearing and allow oil to leave the bearing. This prevents overlubrication.

Mounting guidelines

Caution!

Bearings should only be fitted and dismantled in accordance with the Fitting and Maintenance Manual TPI 100. This TPI is available upon request.

During fitting of bearings, mounting forces should be applied only to the bearing ring to be fitted. Mounting forces must never be directed through the rolling elements or sealing rings.

The characteristics of the bearings are only valid when used in combination with INA precision locknuts and the associated tightening torques given in the dimension tables.

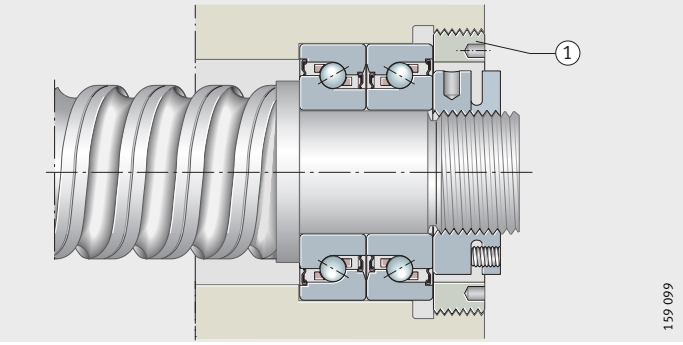
Axial angular contact ball bearings are self-retaining and the individual bearing components are matched to each other. The inner rings must not removed from the bearing during fitting and dismantling. If individual bearing components are removed from the bearing, please contact us before carrying out any reassembly.

Location of outer ring using ring nut for 7602, 7603, BSB

Axial angular contact ball bearings 7602, 7603 and BSB must be located clearance-free in the housing and on the shaft and must be axially preloaded during fitting. The axial preload force must be distributed evenly over the circumference in order to avoid deformation of the raceways.

Outer rings are axially tensioned to the preload force given in the dimension table by means of a ring nut (not supplied), *Figure 25*. The ring nut must be secured against loosening (e.g. using Loctite 638).

Ring nuts with a runout of max. 5 µm apply the preload force evenly over the bearing rings and should therefore be used in preference to location by means of a cover.



① Ring nut
7602, **7603**, **BSB**

Figure 25
Two-bearing set in O arrangement, locknut, ring nut

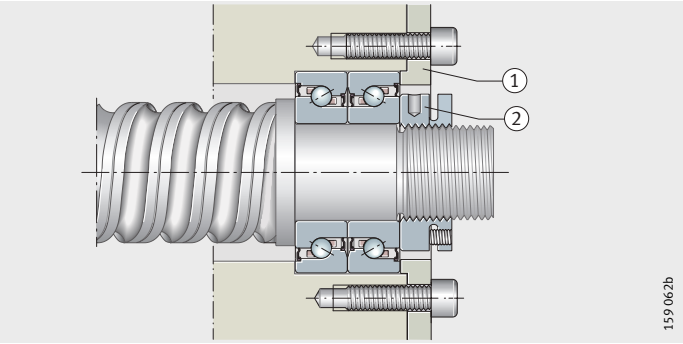
Location of outer ring using a cover

Clamping of the outer rings using a cover and cap screws leads to deformation of the raceways, *Figure 26*. In order to minimise the deformation and achieve the calculated life:

- the cover should be designed with adequate rigidity
- the number of fixing screws should be selected in accordance with the load but at least four should be used
- the screws should be tightened in a cross-wise sequence in four stages (finger tight, 40%, 70%, 100% of M_A).

Caution!

Observe the axial preload force in the dimension table. If other values are used, this will influence the bearing preload, bearing friction and heat generation in the bearing position.



① Cover
② Locknut
7602, 7603, BSB

Figure 26
Two-bearing set in O arrangement, locknut, cover

Location of inner ring using locknut

Axial angular contact ball bearings must be axially preloaded during fitting by means of a precision locknut.

When preloading the bearings by means of the bearing inner rings using the recommended precision locknut, the tightening torques given in the dimension tables must be observed. The tightening torques for the individual bearing sizes are only valid for the INA precision locknuts listed.

The preload force for series DKLFA is determined specifically on the basis of the operating conditions (load spectrum). Please contact us.

In order to counteract settling, it is recommended that the locknut should initially be tightened to twice the tightening torque M_A and then relieved of load again. It should only then be tightened again to the stated tightening torque M_A. Finally, the precision locknut should be secured against rotation by the torque-controlled tightening of the set screws.

The characteristics of the bearings are only valid if the preload forces specified in the dimension tables are observed.
The tightening torques for INA precision locknuts required for this purpose are also given in the dimension tables.

Caution!

If other suitable locknuts are used, the manufacturer's guidance on calculation of the necessary tightening torque should be observed.

Only locknuts with a minimum accuracy of the end face to the thread of 5 µm should be used.

Fixing screws

The fixing screws for the outer ring must be tightened in a crosswise sequence. They may be loaded up to 70% of their elastic limit.

If the bearing outer ring is supported by an additional housing cover, it must be ensured that the fixing screws are sufficiently well dimensioned.

Axial angular contact ball bearings

Fitting of angular contact ball bearing units

Angular contact ball bearing units ZKLR require no additional preload after fitting. They can often therefore be located on the spindle simply by means of clearance-free clamping.

Caution!

The type of axial location depends on the load to be supported.

The adjacent construction can be a milled flat face or, if necessary, even an unmachined screw mounting surface without radial centring.

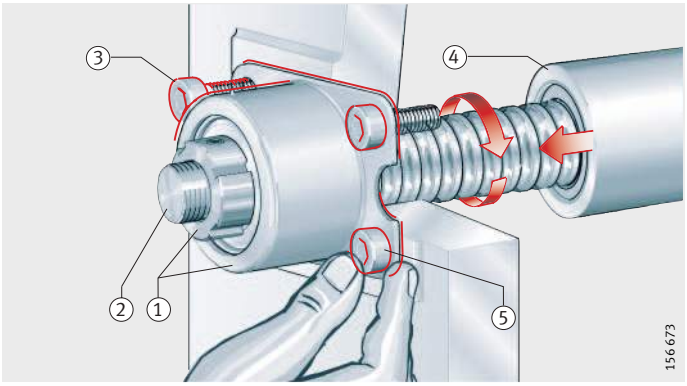
Fitting

Locate the bearing unit using a locknut ① or clearance-free clamping on the threaded spindle ②, *Figure 27*.

Screw mount the bearing unit on the adjacent construction; tighten the screws only finger tight ③.

Move the screw drive nut ④ towards the bearing unit (the position of the screw drive is the datum for the linear guidance system, the nut serves as a functional element for alignment). The bearing will align itself to the optimum radial position (due to the constraining forces exerted by the datum).

Screw the bearing unit to the adjacent construction using the tightening torque specified in the assembly drawing ⑤.

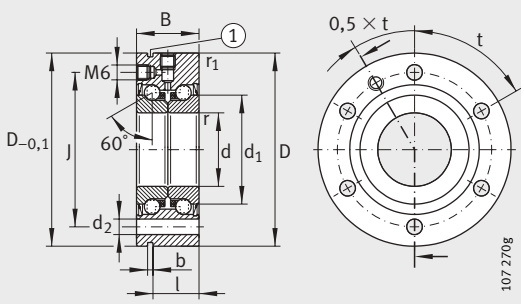


① Locknut
② Threaded spindle
③ Tightening of fixing screws finger tight
④ Screw drive nut
⑤ Tightening of fixing screws
ZKLR

Figure 27
Fitting of bearing unit

Axial angular contact ball bearings

For screw mounting



ZKLF..-2RS, ZKLF..-2Z, (d ≦ 50 mm)
① Extraction slot
Pitch t: see dimension table

Dimension table · Dimensions in mm

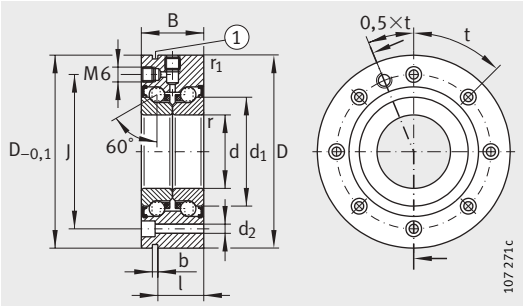
Designation	Mass	Dimensions										Mounting dimensions		Fixing screws[1] DIN 912-10.9	
	m	d	D	B	d_1	r	r_1	J	d_2	b	l	D_a	d_a	Size	Quantity
	≈kg			–0,25		min.	min.					max.	min.		
ZKLF1255-2RS	0,37	**12**$_{-0,005}$	55$_{-0,01}$	25	25	0,3	0,6	42	6,8	3	17	33	16	M6	3
ZKLF1255-2Z	0,37	**12**$_{-0,005}$	55$_{-0,01}$	25	25	0,3	0,6	42	6,8	3	17	33	16	M6	3
ZKLF1560-2RS	0,43	**15**$_{-0,005}$	60$_{-0,01}$	25	28	0,3	0,6	46	6,8	3	17	35	20	M6	3
ZKLF1560-2Z	0,43	**15**$_{-0,005}$	60$_{-0,01}$	25	28	0,3	0,6	46	6,8	3	17	35	20	M6	3
ZKLF1762-2RS	0,45	**17**$_{-0,005}$	62$_{-0,01}$	25	30	0,3	0,6	48	6,8	3	17	37	23	M6	3
ZKLF1762-2Z	0,45	**17**$_{-0,005}$	62$_{-0,01}$	25	30	0,3	0,6	48	6,8	3	17	37	23	M6	3
ZKLF2068-2RS	0,61	**20**$_{-0,005}$	68$_{-0,01}$	28	34,5	0,3	0,6	53	6,8	3	19	43	25	M6	4
ZKLF2068-2Z	0,61	**20**$_{-0,005}$	68$_{-0,01}$	28	34,5	0,3	0,6	53	6,8	3	19	43	25	M6	4
ZKLF2575-2RS	0,72	**25**$_{-0,005}$	75$_{-0,01}$	28	40,5	0,3	0,6	58	6,8	3	19	48	32	M6	4
ZKLF2575-2Z	0,72	**25**$_{-0,005}$	75$_{-0,01}$	28	40,5	0,3	0,6	58	6,8	3	19	48	32	M6	4
ZKLF3080-2RS	0,78	**30**$_{-0,005}$	80$_{-0,01}$	28	45,5	0,3	0,6	63	6,8	3	19	53	40	M6	6
ZKLF3080-2Z	0,78	**30**$_{-0,005}$	80$_{-0,01}$	28	45,5	0,3	0,6	63	6,8	3	19	53	40	M6	6
ZKLF30100-2RS[3]	1,63	**30**$_{-0,005}$	100$_{-0,01}$	38	51	0,3	0,6	80	8,8	3	30	64	47	M8	8
ZKLF30100-2Z	1,63	**30**$_{-0,005}$	100$_{-0,01}$	38	51	0,3	0,6	80	8,8	3	30	64	47	M8	8
ZKLF3590-2RS	1,13	**35**$_{-0,005}$	90$_{-0,01}$	34	52	0,3	0,6	75	8,8	3	25	62	45	M8	4
ZKLF3590-2Z	1,13	**35**$_{-0,005}$	90$_{-0,01}$	34	52	0,3	0,6	75	8,8	3	25	62	45	M8	4
ZKLF40100-2RS	1,46	**40**$_{-0,005}$	100$_{-0,01}$	34	58	0,3	0,6	80	8,8	3	25	67	50	M8	4
ZKLF40100-2Z	1,46	**40**$_{-0,005}$	100$_{-0,01}$	34	58	0,3	0,6	80	8,8	3	25	67	50	M8	4
ZKLF40115-2RS[3]	2,2	**40**$_{-0,005}$	115$_{-0,01}$	46	65	0,6	0,6	94	8,8	3	36	80	56	M8	12
ZKLF40115-2Z[3]	2,2	**40**$_{-0,005}$	115$_{-0,01}$	46	65	0,6	0,6	94	8,8	3	36	80	56	M8	12
ZKLF50115-2RS	1,86	**50**$_{-0,005}$	115$_{-0,01}$	34	72	0,3	0,6	94	8,8	3	25	82	63	M8	6
ZKLF50115-2Z	1,86	**50**$_{-0,005}$	115$_{-0,01}$	34	72	0,3	0,6	94	8,8	3	25	82	63	M8	6
ZKLF50140-2RS[3]	4,7	**50**$_{-0,005}$	140$_{-0,01}$	54	80	0,6	0,6	113	11	3	45	98	63	M10	12
ZKLF50140-2Z[3]	4,7	**50**$_{-0,005}$	140$_{-0,01}$	54	80	0,6	0,6	113	11	3	45	98	63	M10	12
ZKLF60145-2Z	4,3	**60**$_{-0,005}$	145$_{-0,015}$	45	85	0,6	0,6	120	8,8	3	35	100	82	M8	8
ZKLF70155-2Z	4,9	**70**$_{-0,008}$	155$_{-0,015}$	45	85	0,6	0,6	130	8,8	3	35	110	92	M8	8
ZKLF80165-2Z	5,3	**80**$_{-0,008}$	165$_{-0,015}$	45	105	0,6	0,6	140	8,8	3	35	120	102	M8	8
ZKLF90190-2Z	8,7	**90**$_{-0,008}$	190$_{-0,015}$	55	120	0,6	0,6	165	11	3	45	138	116	M10	8
ZKLF100200-2Z	9,3	**100**$_{-0,008}$	200$_{-0,015}$	55	132	0,6	0,6	175	11	3	45	150	128	M10	8

[1] Tightening torque of fixing screws according to manufacturer's data.
Screws are not included in the delivery.

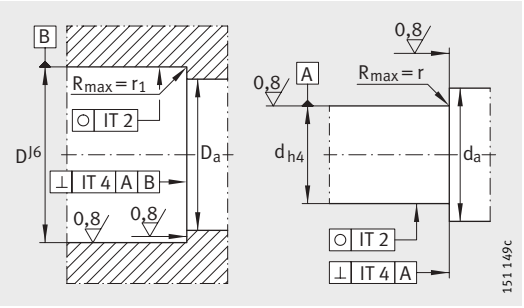
[2] Mass moment of inertia for rotating inner ring.

[3] Heavy series.

[4] Only valid in conjunction with INA precision locknuts.



ZKLF..-2Z, (60 mm ≦ d ≦ 100 mm)
① Extraction slot
Pitch t: see dimension table

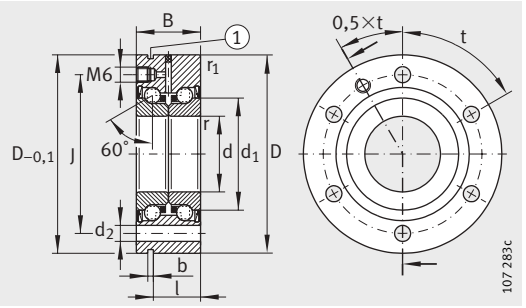


Design of adjacent construction

Pitch	Basic load ratings axial		Limiting speed	Bearing frictional torque	Rigidity axial	Tilting rigidity	Mass moment of inertia[2]	Axial runout	Recommended INA locknut; to be ordered separately			
t	dyn. C_a	stat. C_{0a}	n_G grease	M_{RL}	c_{aL}	c_{kL}	M_m		Designation		Tightening torque[4]	Axial preload force
Quantity X t	N	N	min^{-1}	Nm	N/µm	Nm/mrad	kg · cm^2	µm			M_A Nm	N
3X120°	16900	24700	3800	0,16	375	50	0,068	2	**ZM12**	–	8	5038
3X120°	16900	24700	7600	0,08	375	50	0,068	2	**ZM12**	–	8	5038
3X120°	17900	28000	3500	0,2	400	65	0,102	2	**ZM15**	**AM15**	10	5484
3X120°	17900	28000	7000	0,1	400	65	0,102	2	**ZM15**	**AM15**	10	5484
3X120°	18800	31000	3300	0,24	450	80	0,132	2	**ZM17**	**AM17**	15	7157
3X120°	18800	31000	6600	0,12	450	80	0,132	2	**ZM17**	**AM17**	15	7157
4X 90°	26000	47000	3000	0,3	650	140	0,273	2	**ZM20**	**AM20**	18	9079
4X 90°	26000	47000	5400	0,15	650	140	0,273	2	**ZM20**	**AM20**	18	9079
4X 90°	27500	55000	2600	0,4	750	200	0,486	2	**ZM25**	**AM25**	25	9410
4X 90°	27500	55000	4700	0,2	750	200	0,486	2	**ZM25**	**AM25**	25	9410
6X 60°	29000	64000	2200	0,5	850	300	0,73	2,5	**ZM30**	**AM30**	32	10451
6X 60°	29000	64000	4300	0,25	850	300	0,73	2,5	**ZM30**	**AM30**	32	10451
8X 45°	59000	108000	2100	0,8	950	400	1,91	2,5	**ZMA30/52**	**AM30**	65	19509
8X 45°	59000	108000	4000	0,4	950	400	1,91	2,5	**ZMA30/52**	**AM30**	65	19509
4X 90°	41000	89000	2000	0,6	900	400	1,51	2,5	**ZM35**	**AM35/58**	40	10770
4X 90°	41000	89000	3800	0,3	900	400	1,51	2,5	**ZM35**	**AM35/58**	40	10770
4X 90°	43000	101000	1800	0,7	1000	550	2,26	2,5	**ZM40**	**AM40**	55	13412
4X 90°	43000	101000	3300	0,35	1000	550	2,26	2,5	**ZM40**	**AM40**	55	13412
12X 30°	72000	149000	1600	1,3	1200	750	5,5	2,5	**ZMA40/62**	**AM40**	110	25185
12X 30°	72000	149000	3100	0,65	1200	750	5,5	2,5	**ZMA40/62**	**AM40**	110	25815
6X 60°	46500	126000	1500	0,9	1250	1000	5,24	2,5	**ZM50**	**AM50**	85	17009
6X 60°	46500	126000	3000	0,45	1250	1000	5,24	2,5	**ZM50**	**AM50**	85	17009
12X 30°	113000	250000	1200	2,6	1400	1500	15,2	2,5	**ZMA50/75**	**AM50**	150	29436
12X 30°	113000	250000	2500	1,3	1400	1500	15,2	2,5	**ZMA50/75**	**AM50**	150	29436
8X 45°	84000	214000	3000	1	1300	1650	13,7	3	**ZMA60/98**	**AM60**	100	17893
8X 45°	88000	241000	2800	1,2	1450	2250	19,8	3	**ZMA70/110**	**AM70**	130	19717
8X 45°	91000	265000	2700	1,4	1600	3000	27,6	3	**ZMA80/120**	**AM80**	160	20604
8X 45°	135000	395000	2300	2,3	1700	4400	59,9	3	**ZMA90/130**	**AM90**	200	25198
8X 45°	140000	435000	2150	2,6	1900	5800	85,3	3	**ZMA100/140**	**AM100**	250	28760

Axial angular contact ball bearings

For screw mounting
Less stringent tolerances



ZKLF..-2RS-PE
① Extraction slot
Pitch t: see dimension table

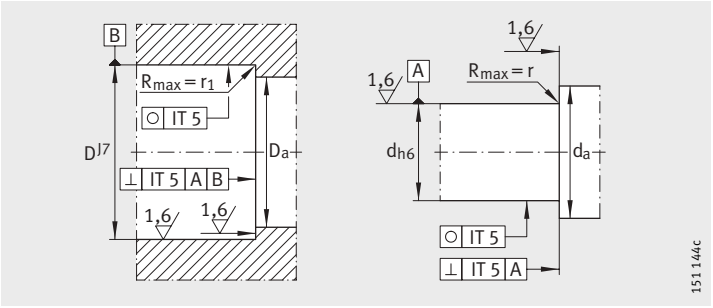
Dimension table · Dimensions in mm

Designation	Mass	Dimensions										Mounting dimensions		Fixing screws[1] DIN 912-10.9	
	m	d	D	B	d_1	r	r_1	J	d_2	b	l	D_a	d_a	Size	Quantity
	≈kg	–0,01		–0,25		min.	min.					max.	min.		
ZKLF1255-2RS-PE	0,37	**12**	$55_{-0,013}$	25	25	0,3	0,6	42	6,8	3	17	33	16	M6	3
ZKLF1560-2RS-PE	0,43	**15**	$60_{-0,013}$	25	28	0,3	0,6	46	6,8	3	17	35	20	M6	3
ZKLF1762-2RS-PE	0,45	**17**	$62_{-0,013}$	25	30	0,3	0,6	48	6,8	3	17	37	23	M6	3
ZKLF2068-2RS-PE	0,61	**20**	$68_{-0,013}$	28	34,5	0,3	0,6	53	6,8	3	19	43	25	M6	4
ZKLF2575-2RS-PE	0,72	**25**	$75_{-0,013}$	28	40,5	0,3	0,6	58	6,8	3	19	48	32	M6	4
ZKLF3080-2RS-PE	0,78	**30**	$80_{-0,013}$	28	45,5	0,3	0,6	63	6,8	3	19	53	40	M6	6
ZKLF3590-2RS-PE	1,13	**35**	$90_{-0,015}$	34	52	0,3	6,8	75	8,8	3	25	62	45	M8	4
ZKLF40100-2RS-PE	1,46	**40**	$100_{-0,015}$	34	58	0,3	6,8	80	8,8	3	25	67	50	M8	4
ZKLF50115-2RS-PE	1,86	**50**	$115_{-0,015}$	34	72	0,3	6,8	94	8,8	3	25	82	63	M8	6

1) Tightening torque of fixing screws according to manufacturer's data.
Screws are not included in the delivery.

2) Mass moment of inertia for rotating inner ring.

3) Only valid in conjunction with INA precision locknuts.

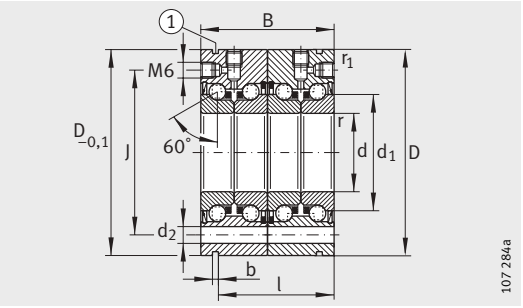


Design of adjacent construction

Pitch	Basic load ratings axial		Limiting speed	Bearing frictional torque	Rigidity axial	Tilting rigidity	Mass moment of inertia[2]	Axial runout	Recommended INA locknut; to be ordered separately			
t	dyn. C_a	stat. C_{0a}	n_G grease	M_{RL}	c_{aL}	c_{kL}	M_m		Designation		Tightening torque[3]	Axial preload force
Quantity X t	N	N	min^{-1}	Nm	N/µm	Nm/mrad	kg · cm^2	µm			M_A Nm	N
3X120°	16 900	24 700	3800	0,16	375	50	0,068	5	**ZM12**	–	8	5 038
3X120°	17 900	28 000	3500	0,2	400	65	0,102	5	**ZM15**	**AM15**	10	5 484
3X120°	18 800	31 000	3300	0,24	450	80	0,132	5	**ZM17**	**AM17**	15	7 157
4X 90°	26 000	47 000	3000	0,3	650	140	0,273	5	**ZM20**	**AM20**	18	9 079
4X 90°	27 500	55 000	2600	0,4	750	200	0,486	5	**ZM25**	**AM25**	25	9 410
6X 60°	29 000	64 000	2200	0,5	850	300	0,73	5	**ZM30**	**AM30**	32	10 451
4X 90°	41 000	89 000	2000	0,6	900	400	1,51	5	**ZM35**	**AM35/58**	40	10 770
4X 90°	43 000	101 000	1800	0,7	1000	550	2,26	5	**ZM40**	**AM40**	55	13 412
6X 60°	46 500	126 000	1500	0,9	1250	1000	5,24	5	**ZM50**	**AM50**	85	17 009

Axial angular contact ball bearings

For screw mounting
Matched pair



ZKLF..-2RS-2AP
① Extraction slot

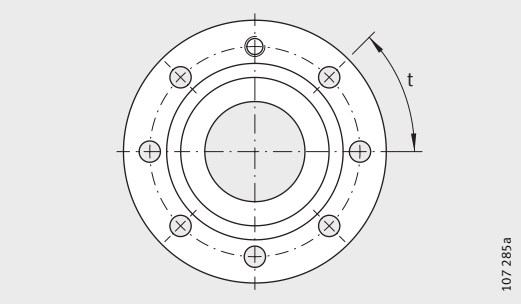
Dimension table · Dimensions in mm

Designation	Mass	Dimensions										Mounting dimensions		Fixing screws[1] DIN 912-10.9	
	m	d	D	B	d_1	r	r_1	J	d_2	l	b	D_a	d_a		
	≈kg	–0,005	–0,010	–0,50		min.	min.					max.	min.	Size	Quantity
ZKLF1762-2RS-2AP	0,9	**17**	62	50	30	0,3	0,6	48	6,8	42	3	37	23	M6X60	5
ZKLF2068-2RS-2AP	1,22	**20**	68	56	34,5	0,3	0,6	53	6,8	47	3	43	25	M6X70	7
ZKLF2575-2RS-2AP	1,44	**25**	75	56	40,5	0,3	0,6	58	6,8	47	3	48	32	M6X70	7
ZKLF3080-2RS-2AP	1,56	**30**	80	56	45,5	0,3	0,6	63	6,8	47	3	53	40	M6X70	11
ZKLF3590-2RS-2AP	2,26	**35**	90	68	52	0,3	0,6	75	8,8	59	3	62	45	M8X80	7
ZKLF40100-2RS-2AP	2,92	**40**	100	68	58	0,3	0,6	80	8,8	59	3	67	50	M8X80	7
ZKLF50115-2RS-2AP	3,72	**50**	115	68	72	0,3	0,6	94	8,8	59	3	82	63	M8X80	11

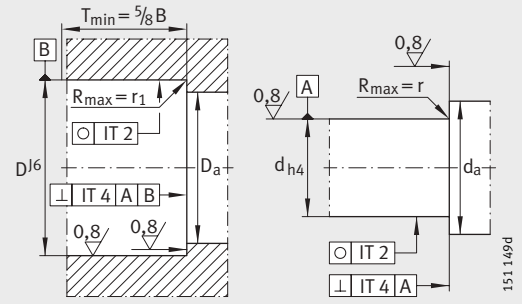
1) Tightening torque of fixing screws according to manufacturer's data.
Screws are not included in the delivery.

2) Mass moment of inertia for rotating inner ring.

3) Only valid in conjunction with INA precision locknuts.



Hole pattern
Pitch t: see dimension table

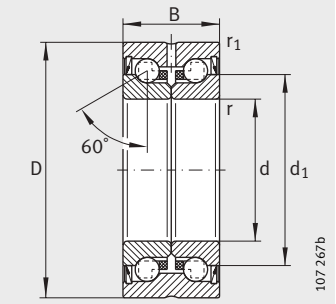


Design of adjacent construction

Pitch	Basic load ratings axial		Limiting speed	Bearing frictional torque	Rigidity axial	Tilting rigidity	Mass moment of inertia[2]	Axial runout	Recommended INA locknut; to be ordered separately			
t	dyn. C_a	stat. C_{0a}	n_G grease	M_{RL}	c_{aL}	c_{kL}	M_m		Designation		Tightening torque[3]	Axial preload force
Quantity X t	N	N	min^{-1}	Nm	N/µm	Nm/mrad	kg · cm^2	µm			M_A Nm	N
6X60°	30 500	62 000	3300	0,36	800	200	0,264	2	**ZM17**	**AM17**	15	7 157
8X45°	42 000	94 000	3000	0,45	1150	320	0,564	2	**ZMA20/38**	**AM20**	18	9 079
8X45°	44 500	111 000	2600	0,6	1300	450	0,972	2	**ZMA25/45**	**AM25**	25	9 410
12X30°	47 500	127 000	2200	0,75	1500	620	1,46	2,5	**ZMA30/52**	**AM30**	32	10 451
8X45°	66 000	177 000	2000	0,9	1600	900	3,02	2,5	**ZMA35/58**	**AM35/58**	40	10 770
8X45°	70 000	202 000	1800	1,05	1750	1200	4,52	2,5	**ZMA40/62**	**AM40**	55	13 412
12X30°	76 000	250 000	1500	1,35	2200	2250	10,48	2,5	**ZMA50/75**	**AM50**	85	17 009

Axial angular contact ball bearings

Not for screw mounting



ZKLN..-2RS
ZKLN..-2Z

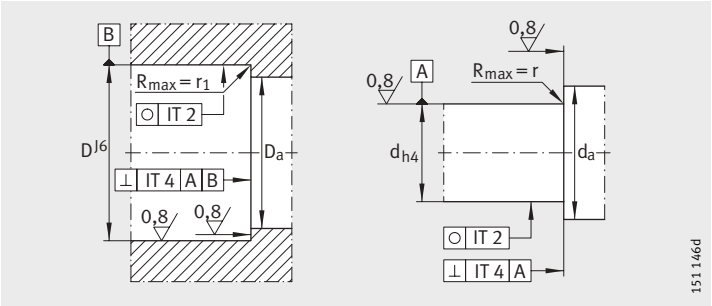
Dimension table · Dimensions in mm

Designation	Mass	Dimensions						Mounting dimensions		Basic load ratings axial	
	m	d	D	B	d_1	r	r_1	D_a	d_a	dyn. C_a	stat. C_{0a}
	≈kg	–0,005	–0,010	–0,25		min.	min.	max.	min.	N	N
ZKLN0619-2Z	0,02	**6** $^{+0,002}_{-0,003}$	19	12	12	0,3	0,3	16	9	4 900	6 100
ZKLN0624-2RS	0,03	**6** $^{+0,002}_{-0,003}$	24	15	14	0,3	0,6	19	9	6 900	8 500
ZKLN0624-2Z	0,03	**6** $^{+0,002}_{-0,003}$	24	15	14	0,3	0,6	19	9	6 900	8 500
ZKLN0832-2RS	0,09	**8**	32	20	19	0,3	0,6	26	11	12 500	16 300
ZKLN0832-2Z	0,09	**8**	32	20	19	0,3	0,6	26	11	12 500	16 300
ZKLN1034-2RS	0,1	**10**	34	20	21	0,3	0,6	28	14	13 400	18 800
ZKLN1034-2Z	0,1	**10**	34	20	21	0,3	0,6	28	14	13 400	18 800
ZKLN1242-2RS	0,2	**12**	42	25	25	0,3	0,6	33	16	17 000	24 700
ZKLN1242-2Z	0,2	**12**	42	25	25	0,3	0,6	33	16	17 000	24 700
ZKLN1545-2RS	0,21	**15**	45	25	28	0,3	0,6	35	20	17 900	28 000
ZKLN1545-2Z	0,21	**15**	45	25	28	0,3	0,6	35	20	17 900	28 000
ZKLN1747-2RS	0,22	**17**	47	25	30	0,3	0,6	37	23	18 800	31 000
ZKLN1747-2Z	0,22	**17**	47	25	30	0,3	0,6	37	23	18 800	31 000
ZKLN2052-2RS	0,31	**20**	52	28	34,5	0,3	0,6	43	25	26 000	47 000
ZKLN2052-2Z	0,31	**20**	52	28	34,5	0,3	0,6	43	26	26 000	47 000
ZKLN2557-2RS	0,34	**25**	57	28	40,5	0,3	0,6	48	32	27 500	55 000
ZKLN2557-2Z	0,34	**25**	57	28	40,5	0,3	0,6	48	32	27 500	55 000
ZKLN3062-2RS	0,39	**30**	62	28	45,5	0,3	0,6	53	40	29 000	64 000
ZKLN3062-2Z	0,39	**30**	62	28	45,5	0,3	0,6	53	40	29 000	64 000
ZKLN3072-2RS[2)]	0,72	**30**	72	38	51	0,3	0,6	64	47	59 000	108 000
ZKLN3072-2Z[2)]	0,72	**30**	72	38	51	0,3	0,6	64	47	59 000	108 000
ZKLN3572-2RS	0,51	**35**	72	34	52	0,3	0,6	62	45	41 000	89 000
ZKLN3572-2Z	0,51	**35**	72	34	52	0,3	0,6	62	45	41 000	89 000

1) Mass moment of inertia for rotating inner ring.

2) Heavy series.

3) Only valid in conjunction with INA precision locknuts.

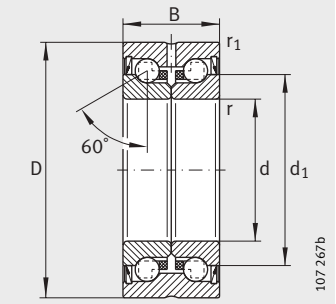


Design of adjacent construction

Limiting speed	Bearing frictional torque	Rigidity axial	Tilting rigidity	Mass moment of inertia[1]	Axial runout	Recommended INA locknut; to be ordered separately			
						Designation		Tightening torque[3]	Axial preload force
n_G grease	M_{RL}	c_{aL}	c_{kL}	M_m				M_A	
min^{-1}	Nm	N/µm	Nm/mrad	kg · cm^2	µm			Nm	N
14000	0,01	150	4	0,0019	2	**ZM06**	–	2	916
6800	0,04	200	8	0,0044	2	**ZM06**	–	2	2404
12000	0,02	200	8	0,0044	2	**ZM06**	–	2	2404
5100	0,08	250	20	0,02	2	**ZM08**	–	4	2216
9500	0,04	250	20	0,02	2	**ZM08**	–	4	2216
4600	0,12	325	25	0,029	2	**ZM10**	–	6	4891
8600	0,06	325	25	0,029	2	**ZM10**	–	6	4891
3800	0,16	375	50	0,068	2	**ZM12**	–	8	5038
7600	0,08	375	50	0,068	2	**ZM12**	–	8	5038
3500	0,2	400	65	0,102	2	**ZM15**	**AM15**	10	5484
7000	0,1	400	65	0,102	2	**ZM15**	**AM15**	10	5484
3300	0,24	450	80	0,132	2	**ZM17**	**AM17**	15	7157
6600	0,12	450	80	0,132	2	**ZM17**	**AM17**	15	7157
3000	0,3	650	140	0,273	2	**ZM20**	**AM20**	18	9079
5400	0,15	650	140	0,273	2	**ZM20**	**AM20**	18	9079
2600	0,4	750	200	0,486	2	**ZM25**	**AM25**	25	9410
4700	0,2	750	200	0,486	2	**ZM25**	**AM25**	25	9410
2200	0,5	850	300	0,73	2,5	**ZM30**	**AM30**	32	10451
4300	0,25	850	300	0,73	2,5	**ZM30**	**AM30**	32	10451
2100	0,8	950	400	1,91	2,5	**ZMA30/52**	**AM30**	65	19509
4000	0,4	950	400	1,91	2,5	**ZMA30/52**	**AM30**	65	19509
2000	0,6	900	400	1,51	2,5	**ZM35**	**AM35/58**	40	10770
3800	0,3	900	400	1,51	2,5	**ZM35**	**AM35/58**	40	10770

Axial angular contact ball bearings

Not for screw mounting



ZKLN..-2RS
ZKLN..-2Z

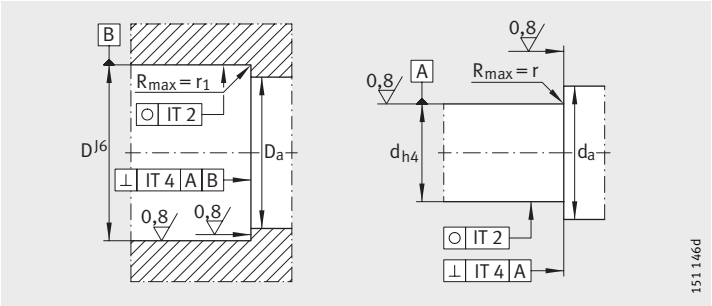
Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions						Mounting dimensions		Basic load ratings axial	
	m	d	D	B	d_1	r	r_1	D_a	d_a	dyn. C_a	stat. C_{0a}
	≈kg			–0,25		min.	min.	max.	min.	N	N
ZKLN4075-2RS	0,61	**40**$_{-0,005}$	75$_{-0,01}$	34	58	0,3	0,6	67	50	43 000	101 000
ZKLN4075-2Z	0,61	**40**$_{-0,005}$	75$_{-0,01}$	34	58	0,3	0,6	67	50	43 000	101 000
ZKLN4090-2RS[2]	0,95	**40**$_{-0,005}$	90$_{-0,01}$	46	65	0,6	0,6	80	56	72 000	149 000
ZKLN4090-2Z[2]	0,95	**40**$_{-0,005}$	90$_{-0,01}$	46	65	0,6	0,6	80	56	72 000	149 000
ZKLN5090-2RS	0,88	**50**$_{-0,005}$	90$_{-0,01}$	34	72	0,3	0,6	82	63	46 500	126 000
ZKLN5090-2Z	0,88	**50**$_{-0,005}$	90$_{-0,01}$	34	72	0,3	0,6	82	63	46 500	126 000
ZKLN50110-2RS[2]	2,5	**50**$_{-0,005}$	110$_{-0,01}$	54	80	0,6	0,6	98	63	113 000	250 000
ZKLN50110-2Z[2]	2,5	**50**$_{-0,005}$	110$_{-0,01}$	54	80	0,6	0,6	98	63	113 000	250 000
ZKLN60110-2Z	2,2	**60**$_{-0,008}$	110$_{-0,015}$	45	85	0,6	0,6	100	82	84 000	214 000
ZKLN70120-2Z	2,4	**70**$_{-0,008}$	120$_{-0,015}$	45	95	0,6	0,6	110	92	88 000	241 000
ZKLN80130-2Z	2,7	**80**$_{-0,008}$	130$_{-0,015}$	45	105	0,6	0,6	120	102	91 000	265 000
ZKLN90150-2Z	4,5	**90**$_{-0,008}$	150$_{-0,015}$	55	120	0,6	0,6	138	116	135 000	395 000
ZKLN100160-2Z	4,9	**100**$_{-0,008}$	160$_{-0,015}$	55	132	0,6	0,6	150	128	140 000	435 000

1) Mass moment of inertia for rotating inner ring.

2) Heavy series.

3) Only valid in conjunction with INA precision locknuts.

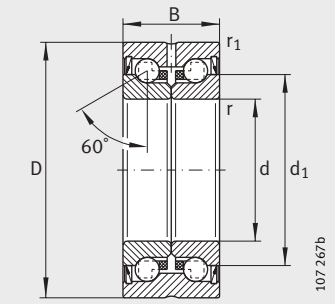


Design of adjacent construction

Limiting speed	Bearing frictional torque	Rigidity axial	Tilting rigidity	Mass moment of inertia[1]	Axial runout	Recommended INA locknut; to be ordered separately			
						Designation		Tightening torque[3]	Axial preload force
n_G grease	M_{RL}	c_{aL}	c_{kL}	M_m				M_A	
min^{-1}	Nm	N/µm	Nm/mrad	$kg \cdot cm^2$	µm			Nm	N
1800	0,7	1000	550	2,26	2,5	**ZM40**	**AM40**	55	13412
3300	0,35	1000	550	2,26	2,5	**ZM40**	**AM40**	55	13412
1600	1,3	1200	750	5,5	2,5	**ZMA40/62**	**AM40**	110	25185
3100	0,65	1200	750	5,5	2,5	**ZMA40/62**	**AM40**	110	25185
1500	0,9	1250	1000	5,24	2,5	**ZM50**	**AM50**	85	17009
3000	0,45	1250	1000	5,24	2,5	**ZM50**	**AM50**	85	17009
1200	2,6	1400	1500	15,2	2,5	**ZMA50/75**	**AM50**	150	29436
2500	1,3	1400	1500	15,2	2,5	**ZMA50/75**	**AM50**	150	29436
3000	1	1300	1650	13,7	3	**ZMA60/98**	**AM60**	100	17893
2800	1,2	1450	2250	19,8	3	**ZMA70/110**	**AM70**	130	19171
2700	1,4	1600	3000	27,6	3	**ZMA80/120**	**AM80**	160	20604
2300	2,3	1700	4400	59,9	3	**ZMA90/130**	**AM90**	200	25198
2150	2,6	1900	5800	85,3	3	**ZMA100/140**	**AM100**	250	28760

Axial angular contact ball bearings

Not for screw mounting
Less stringent tolerances



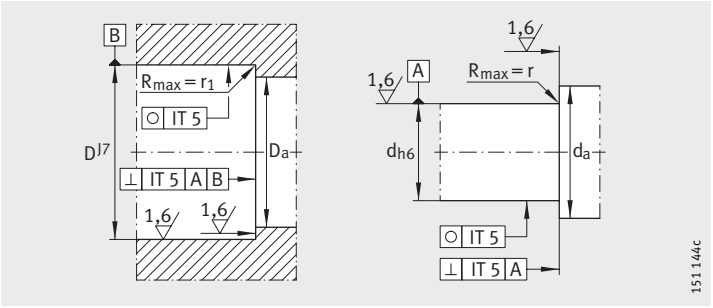
ZKLN..-2RS-PE

Dimension table · Dimensions in mm

Designation	Mass	Dimensions						Mounting dimensions		Basic load ratings axial	
	m	d	D	B	d_1	r	r_1	D_a	d_a	dyn. C_a	stat. C_{0a}
	≈kg	–0,01		–0,25		min.	min.	max.	min.	N	N
ZKLN0624-2RS-PE	0,03	**6**	$24_{-0,01}$	15	14	0,3	0,6	19	9	6 900	8 500
ZKLN1034-2RS-PE	0,1	**10**	$34_{-0,011}$	20	21	0,3	0,6	28	14	13 400	18 800
ZKLN1242-2RS-PE	0,2	**12**	$42_{-0,011}$	25	25	0,3	0,6	33	16	16 900	24 700
ZKLN1545-2RS-PE	0,21	**15**	$45_{-0,011}$	25	28	0,3	0,6	35	20	17 900	28 000
ZKLN1747-2RS-PE	0,22	**17**	$47_{-0,011}$	25	30	0,3	0,6	37	23	18 800	31 000
ZKLN2052-2RS-PE	0,31	**20**	$52_{-0,013}$	28	34,5	0,3	0,6	43	25	26 000	47 000
ZKLN2557-2RS-PE	0,34	**25**	$57_{-0,013}$	28	40,5	0,3	0,6	48	32	27 500	55 000
ZKLN3062-2RS-PE	0,39	**30**	$62_{-0,013}$	28	45,5	0,3	0,6	53	40	29 000	64 000
ZKLN3572-2RS-PE	0,51	**35**	$72_{-0,013}$	34	52	0,3	0,6	62	45	41 000	89 000
ZKLN5090-2RS-PE	0,88	**50**	$90_{-0,015}$	34	72	0,3	0,6	82	63	46 500	126 000

1) Mass moment of inertia for rotating inner ring.

2) Only valid in conjunction with INA precision locknuts.

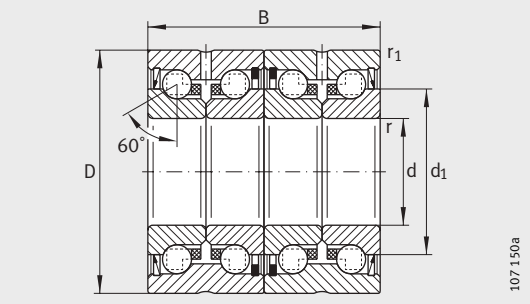


Design of adjacent construction

Limiting speed	Bearing frictional torque	Rigidity axial	Tilting rigidity	Mass moment of inertia[1]	Axial runout	Recommended INA locknut; to be ordered separately			
						Designation		Tightening torque[2]	Axial preload force
n_G grease	M_{RL}	c_{aL}	c_{kL}	M_m				M_A	
min^{-1}	Nm	N/µm	Nm/mrad	kg · cm^2	µm			Nm	N
6800	0,04	200	8	0,0044	5	**ZM06**	–	2	2404
4600	0,12	325	25	0,029	5	**ZM10**	–	6	4891
3800	0,16	375	50	0,068	5	**ZM12**	–	8	5038
3500	0,2	400	65	0,102	5	**ZM15**	**AM15**	10	5484
3300	0,24	450	80	0,132	5	**ZM17**	**AM17**	15	7157
3000	0,3	650	140	0,273	5	**ZM20**	**AM20**	18	9079
2600	0,4	750	200	0,486	5	**ZM25**	**AM25**	25	9410
2200	0,5	850	300	0,73	5	**ZM30**	**AM30**	32	10451
2000	0,6	900	400	1,51	5	**ZM35**	**AM35/38**	40	10770
1500	0,9	1250	1000	5,24	5	**ZM50**	**AM50**	85	17009

Axial angular contact ball bearings

Not for screw mounting
Matched pair



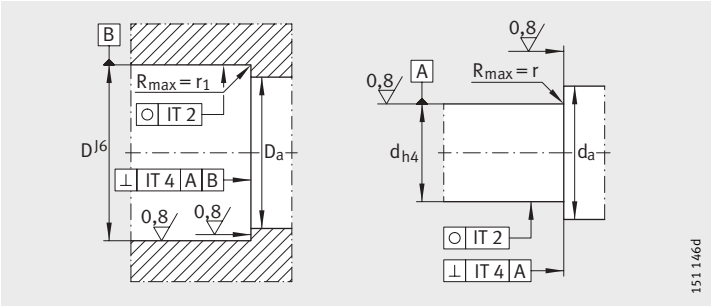
ZKLN..-2RS-2AP

Dimension table · Dimensions in mm

Designation	Mass	Dimensions						Mounting dimensions		Basic load ratings axial	
	m	d	D	B	d_1	r	r_1	D_a	d_a	dyn. C_a	stat. C_{0a}
	≈kg	–0,005	–0,01	–0,5		min.	min.	max.	min.	N	N
ZKLN1747-2RS-2AP	0,44	**17**	47	50	30	0,3	0,6	37	23	30 500	62 000
ZKLN2052-2RS-2AP	0,62	**20**	52	56	34,5	0,3	0,6	43	25	42 000	94 000
ZKLN2557-2RS-2AP	0,68	**25**	57	56	40,5	0,3	0,6	48	32	44 500	111 000
ZKLN3062-2RS-2AP	0,78	**30**	62	56	45,5	0,3	0,6	53	40	47 500	127 000
ZKLN3572-2RS-2AP	1,02	**35**	72	68	52	0,3	0,6	62	45	66 000	177 000
ZKLN4075-2RS-2AP	1,22	**40**	75	68	58	0,3	0,6	67	50	70 000	202 000
ZKLN5090-2RS-2AP	1,76	**50**	90	68	72	0,3	0,6	82	63	76 000	250 000

1) Mass moment of inertia for rotating inner ring.

2) Only valid in conjunction with INA precision locknuts.

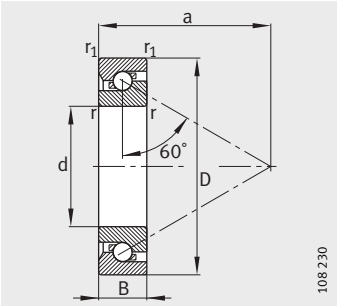


Design of adjacent construction

Limiting speed	Bearing frictional torque	Rigidity axial	Tilting rigidity	Mass moment of inertia[1]	Axial runout	Recommended INA locknut; to be ordered separately			
						Designation		Tightening torque[2]	Axial preload force
n_G grease	M_{RL}	c_{aL}	c_{kL}	M_m				M_A	
min^{-1}	Nm	N/µm	Nm/mrad	kg · cm^2	µm			Nm	N
3300	0,36	800	200	0,264	2	**ZM17**	**AM17**	15	7157
3000	0,45	1150	320	0,546	2	**ZMA20/38**	**AM20**	18	9079
2600	0,6	1300	450	0,972	2	**ZMA25/45**	**AM25**	25	9410
2200	0,75	1500	620	1,46	2,5	**ZMA30/52**	**AM30**	32	10451
2000	0,9	1600	900	3,02	2,5	**ZMA35/58**	**AM35/58**	40	10770
1800	1,05	1750	1200	4,52	2,5	**ZMA40/62**	**AM40**	55	13412
1500	1,35	2200	2250	10,48	2,5	**ZMA50/75**	**AM50**	85	17009

Axial angular contact ball bearings

Single direction
Unsealed



7602, 7603, BSB

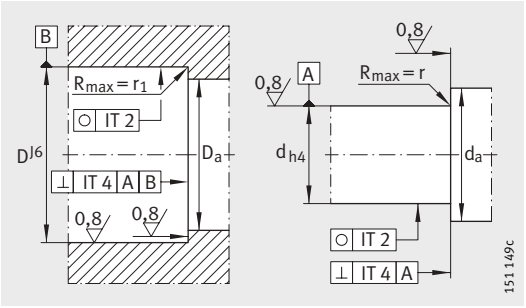
Dimension table · Dimensions in mm

Designation	Mass	Dimensions					Mounting dimensions		Basic load ratings axial	
	m	d	D	B	r, r_1	a	D_a H12	d_a h12	stat. C_a	dyn. C_{0a}
	≈kg				min.	≈			N	N
7602012-TVP	0,042	**$12_{-0,004}$**	$32_{-0,006}$	$10_{-0,08}$	0,6	24	27	17	12 200	20 700
7602015-TVP	0,052	**$15_{-0,004}$**	$36_{-0,006}$	$11_{-0,08}$	0,6	27,5	30	20,5	13 100	24 700
7602017-TVP	0,074	**$17_{-0,004}$**	$40_{-0,006}$	$12_{-0,08}$	0,6	31	34,5	23	17 200	32 500
7602020-TVP	0,139	**$20_{-0,005}$**	$47_{-0,006}$	$14_{-0,12}$	1	36	39,5	27,5	19 100	38 000
BSB020047T	0,13	**$20_{-0,005}$**	$47_{-0,006}$	$15_{-0,12}$	1	36,5	39,5	27,5	20 800	43 000
7603020-TVP	0,17	**$20_{-0,005}$**	$52_{-0,007}$	$15_{-0,12}$	1,1	39,5	43,5	30,5	25 500	53 000
7602025-TVP	0,147	**$25_{-0,005}$**	$52_{-0,007}$	$15_{-0,12}$	1	41	45	32	23 200	50 000
BSB025062-T	0,24	**$25_{-0,005}$**	$62_{-0,007}$	$15_{-0,12}$	1	46,5	52	38	29 500	68 000
7603025-TVP	0,275	**$25_{-0,005}$**	$62_{-0,007}$	$17_{-0,12}$	1,1	47,5	52	38	29 500	68 000
BSB030062-T	0,22	**$30_{-0,005}$**	$62_{-0,007}$	$15_{-0,12}$	1	47,5	52,5	39,5	27 500	66 000
7602030-TVP	0,232	**$30_{-0,005}$**	$62_{-0,007}$	$16_{-0,12}$	1	48	52,5	39,5	27 500	66 000
7603030-TVP	0,409	**$30_{-0,005}$**	$72_{-0,007}$	$19_{-0,12}$	1,1	55,5	61	45	36 500	89 000
BSB035072-T	0,3	**$35_{-0,006}$**	$72_{-0,007}$	$15_{-0,12}$	1	54	60,5	46,5	31 500	81 000
7602035-TVP	0,339	**$35_{-0,006}$**	$72_{-0,007}$	$17_{-0,12}$	1,1	55	60,5	46,5	31 500	81 000
7603035-TVP	0,546	**$35_{-0,006}$**	$80_{-0,007}$	$21_{-0,12}$	1,5	61,5	67	51	38 000	100 000
BSB040072-T	0,26	**$40_{-0,006}$**	$72_{-0,007}$	$15_{-0,12}$	1	56	62,5	49	29 500	82 000
7602040-TVP	0,418	**$40_{-0,006}$**	$80_{-0,007}$	$18_{-0,12}$	1,1	62,5	69,5	53,5	39 000	106 000
BSB040090-T	0,65	**$40_{-0,006}$**	$90_{-0,008}$	$20_{-0,12}$	1,5	67	75,5	56,5	52 000	138 000
7603040-TVP	0,751	**$40_{-0,006}$**	$90_{-0,008}$	$23_{-0,12}$	1,5	68,5	75,5	56,5	52 000	138 000
BSB045075-T	0,26	**$45_{-0,006}$**	$75_{-0,007}$	$15_{-0,12}$	1	59,5	68	52	30 000	85 000
7602045-TVP	0,488	**$45_{-0,006}$**	$85_{-0,008}$	$19_{-0,12}$	1,1	66	73	57	39 500	111 000
BSB045100-T	0,81	**$45_{-0,006}$**	$100_{-0,008}$	$20_{-0,12}$	1,5	75	85,5	64,5	62 000	172 000
7603045-TVP	0,992	**$45_{-0,006}$**	$100_{-0,008}$	$25_{-0,12}$	1,5	77,5	85,5	64,5	62 000	172 000
7602050-TVP	0,557	**$50_{-0,006}$**	$90_{-0,008}$	$20_{-0,12}$	1,1	71,5	79	63	41 000	122 000
BSB050100-T	0,75	**$50_{-0,006}$**	$100_{-0,008}$	$20_{-0,12}$	1,5	75	85,5	64,5	62 000	172 000
7603050-TVP	1,29	**$50_{-0,006}$**	$110_{-0,008}$	$27_{-0,12}$	2	85,5	94	72	72 000	203 000
BSB055090-T	0,38	**$55_{-0,007}$**	$90_{-0,008}$	$15_{-0,15}$	1,0	70,5	80	65	33 500	98 000
7602055-TVP	0,74	**$55_{-0,007}$**	$100_{-0,008}$	$21_{-0,15}$	1,5	77,5	85,5	69,5	42 000	132 000
BSB055120-T	1,2	**$55_{-0,007}$**	$120_{-0,008}$	$20_{-0,15}$	2,0	86	97,5	77	63 000	188 000
7603055-TVP	1,67	**$55_{-0,007}$**	$120_{-0,008}$	$29_{-0,15}$	2	91,5	101	77	85 000	255 000

1) Valid for matched pair of bearings in O or X arrangement.

2) Valid for individual bearing with stated preload force, bearing lightly oiled.

3) Only valid in conjunction with INA precision locknuts.

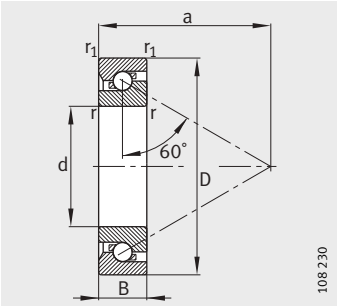


Design of adjacent construction

Limiting speed	Bearing frictional torque[2]	Rigidity[1] axial	Axial runout	Recommended INA locknut; to be ordered separately			
				Designation		Tightening torque[3]	Axial preload force
n_G grease	M_{RL}	c_{aL}				M_A	
min^{-1}	Nm	N/µm	µm			Nm	N
8 000	0,015	476	2	**ZM12**	**AM12**	8	5 676
6 700	0,02	516	2	**ZM15**	**AM15**	10	5 777
6 000	0,03	596	2	**ZM17**	**AM17**	15	7 888
5 000	0,05	703	2	**ZM20**	**AM20**	18	8 387
5 600	0,05	703	2	**ZM20**	**AM20**	18	8 387
4 500	0,06	787	2	**ZM20**	**AM20**	25	9 423
4 500	0,065	772	2	**ZM25**	**AM25**	25	9 341
4 300	0,085	917	2	**ZM25**	**AM25**	40	11 837
3 800	0,085	917	2	**ZM25**	**AM25**	40	11 837
4 200	0,085	893	2	**ZM30**	**AM30**	32	10 200
3 800	0,085	893	2	**ZM30**	**AM30**	32	10 200
3 200	0,13	1073	2	**ZM30**	**AM30**	55	13 517
3 700	0,115	1020	2	**ZM35**	**AM35**	40	11 064
3 200	0,115	1020	2	**ZM35**	**AM35**	40	11 064
3 000	0,17	1192	2	**ZM35**	**AM35**	65	12 781
3 500	0,115	1016	2	**ZM40**	**AM40**	40	11 214
2 800	0,17	1190	2	**ZM40**	**AM40**	55	12 943
3 100	0,225	1292	2	**ZM40**	**AM40**	110	20 710
2 600	0,225	1292	2	**ZM40**	**AM40**	110	20 710
3 300	0,13	1072	2	**ZM45**	**AM45**	50	9 799
2 600	0,19	1247	2	**ZM45**	**AM45**	65	14 970
2 700	0,3	1473	2	**ZM45**	**AM45**	120	19 287
2 200	0,3	1473	2	**ZM45**	**AM45**	120	19 287
2 400	0,23	1360	2	**ZM50**	**AM50**	85	16 535
2 700	0,33	1473	2	**ZM50**	**AM50**	120	17 670
2 000	0,36	1601	2	**ZM50**	**AM50**	150	28 928
2 800	0,19	1246	3	**ZM55**	**AM55**	60	11 369
2 200	0,25	1394	3	**ZM55**	**AM55**	85	15 647
2 400	0,36	1553	3	**ZM55**	**AM55**	110	16 361
1 900	0,46	1723	3	**ZM55**	**AM55**	130	31 446

Axial angular contact ball bearings

Single direction
Unsealed

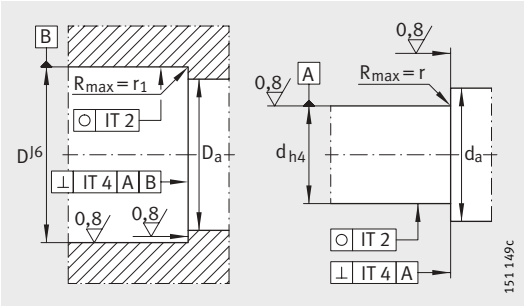


7602, 7603, BSB

Dimension table (continued) · Dimensions in mm

Designation[4]	Mass	Dimensions					Mounting dimensions	
	m	d	D	B	r, r_1	a	D_a H12	d_a h12
	≈kg				min.	≈		
7602060-TVP	0,94	**60$_{-0,007}$**	110$_{-0,008}$	22$_{-0,15}$	1,5	86	96	77
BSB060120-T	1,1	**60$_{-0,007}$**	120$_{-0,009}$	22$_{-0,15}$	1,5	88	100,5	79,5
7603060-TVP	2,08	**60$_{-0,007}$**	130$_{-0,009}$	31$_{-0,15}$	2,1	98	107,5	82,5
7602065-TVP	1,19	**65$_{-0,007}$**	120$_{-0,009}$	23$_{-0,15}$	1,5	92,5	103	84
7603065-TVP	2,58	**65$_{-0,007}$**	140$_{-0,009}$	33$_{-0,15}$	2,1	107,5	118,5	91,5
7602070-TVP	1,3	**70$_{-0,007}$**	125$_{-0,009}$	24$_{-0,15}$	1,5	96,5	108	87
7603070-TVP	3,16	**70$_{-0,007}$**	150$_{-0,009}$	35$_{-0,15}$	2,1	113	124,5	95,5
BSB075110-T	0,47	**75$_{-0,007}$**	110$_{-0,008}$	15$_{-0,15}$	1,5	87,5	99,5	85
7602075-TVP	1,42	**75$_{-0,007}$**	130$_{-0,009}$	25$_{-0,15}$	1,5	102,5	114,5	93,5
7603075-TVP	3,74	**75$_{-0,007}$**	160$_{-0,01}$	37$_{-0,15}$	2,1	123	135,5	105,5
7602080-TVP	1,72	**80$_{-0,007}$**	140$_{-0,009}$	26$_{-0,15}$	2	109	122	100
7603080-TVP	4,5	**80$_{-0,007}$**	170$_{-0,01}$	39$_{-0,15}$	2,1	129,5	143	111
7602085-TVP	2,17	**85$_{-0,008}$**	150$_{-0,009}$	28$_{-0,2}$	2	117	131	107
7603085-TVP	5,24	**85$_{-0,008}$**	180$_{-0,01}$	41$_{-0,2}$	3	136	151	116
7602090-TVP	2,67	**90$_{-0,008}$**	160$_{-0,01}$	30$_{-0,2}$	2	124	138,5	113,5
7603090-TVP	6,18	**90$_{-0,008}$**	190$_{-0,011}$	43$_{-0,2}$	3	142,5	157,5	122,5
7602095-TVP	3,25	**95$_{-0,008}$**	170$_{-0,01}$	32$_{-0,2}$	2,1	131	146,5	119,5
7603095-TVP	7,22	**95$_{-0,008}$**	200$_{-0,011}$	45$_{-0,2}$	3	150	165	130
BSB100150-T	1,4	**100$_{-0,008}$**	150$_{-0,009}$	22,5$_{-0,2}$	2	119,5	135	114,5
7602100-TVP	3,9	**100$_{-0,008}$**	180$_{-0,01}$	34$_{-0,2}$	2,1	138	154,5	125,5
7603100-TVP	8,78	**100$_{-0,008}$**	215$_{-0,011}$	47$_{-0,2}$	3	161	178	140

1) Valid for matched pair of bearings in O or X arrangement.
2) Valid for individual bearing with stated preload force, bearing lightly oiled.
3) Only valid in conjunction with INA precision locknuts.
4) Available by agreement.

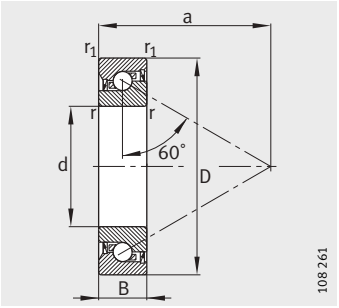


Design of adjacent construction

Basic load ratings axial		Limiting speed	Bearing frictional torque[2]	Rigidity[1] axial	Axial runout	Recommended INA locknut; to be ordered separately			
dyn. C_a	stat. C_{0a}	n_G grease	M_{RL}	c_{aL}		Designation		Tightening torque[3] M_A	Axial preload force
N	N	min^{-1}	Nm	N/µm	µm			Nm	N
58 000	183 000	2 000	0,35	1623	3	**ZM60**	**AM60**	100	17 273
64 000	196 000	2 300	0,38	1623	3	**ZM60**	**AM60**	120	15 356
92 000	270 000	1 800	0,54	1840	3	**ZM60**	**AM60**	150	27 145
60 000	197 000	1 800	0,41	1753	3	**ZM65**	**AM65**	110	18 203
106 000	330 000	1 600	0,7	2052	3	**ZM65**	**AM65**	150	27 725
68 000	220 000	1 800	0,44	1753	3	**ZM70**	**AM70**	115	19 632
117 000	360 000	1 600	0,76	2108	3	**ZM70**	**AM70**	180	30 071
37 000	133 000	2 300	0,29	1534	3	**ZM75**	**AM75**	140	12 357
70 000	236 000	1 600	0,48	1888	3	**ZM75**	**AM75**	160	19 819
132 000	425 000	1 400	0,92	2335	3	**ZM75**	**AM75**	200	32 191
81 000	275 000	1 500	0,6	2047	3	**ZM80**	**AM80**	160	21 867
144 000	465 000	1 400	1,1	2466	3	**ZM80**	**AM80**	220	33 617
95 000	340 000	1 400	0,76	2209	3	**ZM85**	**AM85**	250	23 249
169 000	550 000	1 300	1,25	2539	3	**ZM85**	**AM85**	280	36 911
102 000	365 000	1 400	0,79	2275	3	**ZM90**	**AM90**	250	24 552
172 000	580 000	1 200	1,3	2654	3	**ZM90**	**AM90**	300	37 503
116 000	410 000	1 300	0,95	2435	3	–	–	–	27 457
175 000	600 000	1 200	1,45	2770	3	–	–	–	38 299
73 000	265 000	1 800	0,6	2052	3	**ZM100**	**AM100**	200	16 937
128 000	465 000	1 200	1,1	2594	3	**ZM100**	**AM100**	255	28 724
201 000	700 000	1 100	1,7	2965	3	**ZM100**	**AM100**	305	45 106

Axial angular contact ball bearings

Single direction
Sealed on both sides



7602..-2RS, 7603..-2RS,
BSB..-2RS

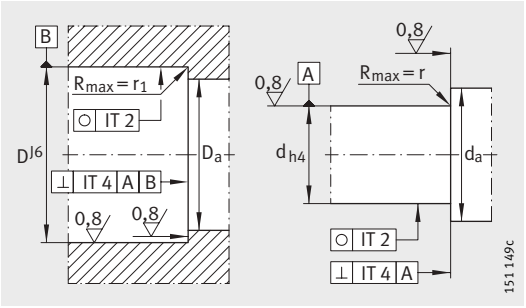
Dimension table · Dimensions in mm

Designation	Mass	Dimensions					Mounting dimensions	
	m	d	D	B	r, r_1	a	D_a H12	d_a h12
	≈kg				min.	≈		
7602012-2RS-TVP	0,042	**12**$_{-0,004}$	32$_{-0,006}$	10$_{-0,08}$	0,6	24	27	17
7602015-2RS-TVP	0,052	**15**$_{-0,004}$	35$_{-0,006}$	11$_{-0,08}$	0,6	27,5	30	20,5
7602020-2RS-TVP	0,12	**20**$_{-0,005}$	47$_{-0,006}$	14$_{-0,12}$	1	36	39,5	27,5
7603020-2RS-TVP	0,17	**20**$_{-0,005}$	52$_{-0,007}$	15$_{-0,12}$	1,1	36,5	43,5	30,5
7602025-2RS-TVP	0,15	**25**$_{-0,005}$	52$_{-0,007}$	15$_{-0,12}$	1	41	45	32
BSB025062-2RS-T	0,24	**25**$_{-0,005}$	62$_{-0,007}$	15$_{-0,12}$	1	46,5	52	38
7603025-2RS-TVP	0,27	**25**$_{-0,005}$	62$_{-0,007}$	17$_{-0,12}$	1,1	47,5	52	38
BSB030062-2RS-T	0,22	**30**$_{-0,005}$	62$_{-0,007}$	15$_{-0,12}$	1	47,5	52,5	39,5
7602030-2RS-TVP	0,23	**30**$_{-0,005}$	62$_{-0,007}$	16$_{-0,12}$	1	48	52,5	39,5
BSB035072-2RS-T	0,3	**35**$_{-0,006}$	72$_{-0,007}$	15$_{-0,12}$	1	54	60,5	46,5
BSB040072-2RS-T	0,26	**40**$_{-0,006}$	72$_{-0,007}$	15$_{-0,12}$	1	56	62,5	49

1) Valid for matched pair of bearings in O or X arrangement.

2) Valid for individual bearing with stated preload force, bearing lightly oiled.

3) Only valid in conjunction with INA precision locknuts.

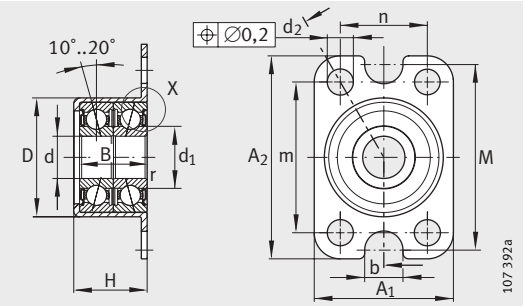


Design of adjacent construction

Basic load ratings axial		Limiting speed	Bearing frictional torque[2]	Rigidity[1] axial	Axial runout	Recommended INA locknut; to be ordered separately			
dyn. C_a	stat. C_{0a}	n_G grease	M_{RL}	c_{aL}		Designation		Tightening torque[3] M_A	Axial preload force
N	N	min^{-1}	Nm	N/µm	µm			Nm	N
12 200	20 700	8 000	0,018	476	2	**ZM12**	**AM12**	8	5 676
13 100	24 700	6 700	0,024	516	2	**ZM15**	**AM15**	10	5 777
19 100	38 000	5 000	0,06	703	2	**ZM20**	**AM20**	18	8 387
25 500	53 000	4 500	0,07	787	2	**ZM20**	**AM20**	18	8 387
23 200	50 000	3 800	0,08	772	2	**ZM25**	**AM25**	25	9 341
29 500	68 000	4 300	0,1	917	2	**ZM25**	**AM25**	40	11 837
29 500	68 000	3 800	0,1	917	2	**ZM25**	**AM25**	40	11 837
27 500	66 000	4 200	0,1	893	2	**ZM30**	**AM30**	32	10 200
27 500	66 000	3 800	0,1	893	2	**ZM30**	**AM30**	32	10 200
31 500	81 000	3 700	0,14	1020	2	**ZM35**	**AM35**	40	11 064
29 500	82 000	3 500	0,14	1016	2	**ZM40**	**AM40**	40	11 214

Angular contact ball bearing units

For screw mounting



ZKLR0624-2Z, ZKLR0828-2Z

Dimension table · Dimensions in mm

Designation	Mass	Dimensions												
	m	d	A_1	A_2	D	B	d_1	r	d_2	b	m	n	M	H
	≈kg				+0,03 −0,01	−0,25		min.						−0,5
ZKLR0624-2Z	23	**6**$_{-0,008}$	24	35	20,5	12	10,4	0,3	4,5	6,6	26	15	32	13
ZKLR0828-2Z	30	**8**$_{-0,008}$	28	35	23,9	14	11,8	0,3	4,5	6,6	26	20	35	15,5
ZKLR1035-2Z	50	**10**$_{-0,008}$	35	35	28,14	16	14,7	0,3	4,5	–	26	26	–	17,5
ZKLR1244-2RS	120	**12**$_{-0,007}$	44	50	35,45	20	16,6	0,3	6,6	–	38	32	–	22
ZKLR1547-2RS	140	**15**$_{-0,007}$	47	51	38,45	22	18	0,3	6,6	–	39	35	–	24
ZKLR2060-2RS	300	**20**$_{-0,008}$	60	60	50,45	28	24,4	0,3	6,6	–	47	47	–	30

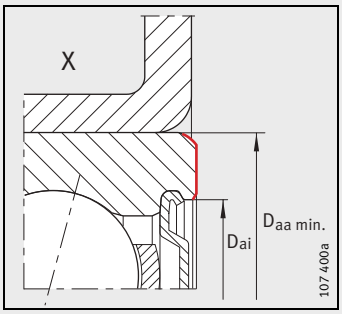
1) Tightening torque for the fixing screws as recommended by the manufacturer. Screws must be ordered separately.

2) Mass moment of inertia for rotating inner ring.

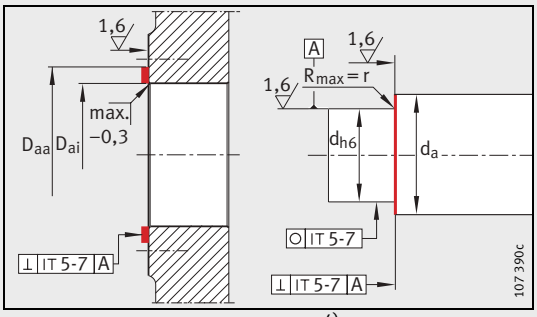
3) The locknut is only used to axially locate the bearing unit. It has no influence on the bearing preload.

4) Stated geometrical tolerances only required in diameter area between D_{ai} and D_{aa}.

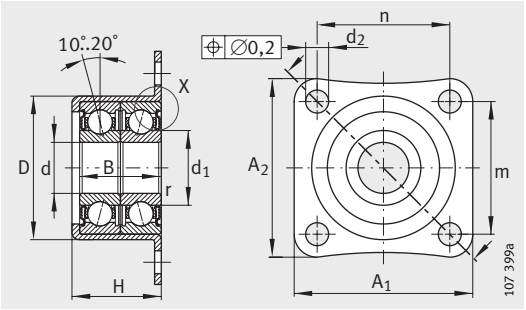
5) Only valid in conjunction with INA precision locknuts.



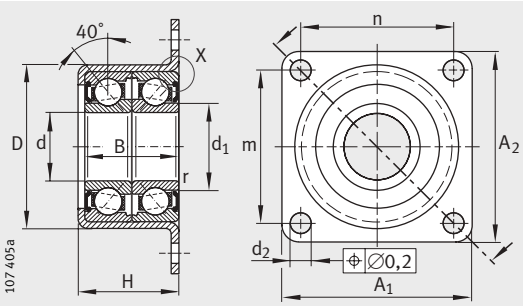
Axial abutment area of outer ring



Design of adjacent construction[4]



ZKLR1035-2Z

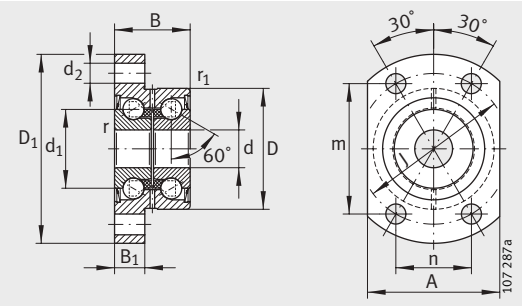


ZKLR1244-2RS, ZKLR1547-2RS, ZKLR2060-2RS

			Fixing screws DIN 912[1]		Basic load ratings				Bearing frictional torque	Rigidity axial	Mass moment of inertia[2]	Recommended INA locknut; to be ordered separately[3]	
					radial		axial					Designation	Tightening torque[5]
d_a	D_{ai}	D_{aa}			dyn. C_r	stat. C_{0r}	dyn. C_a	stat. C_{0a}	M_{RL}	c_{aL}	M_m		M_A
		min.	Size	Quantity	N	N	N	N	Nm	N/µm	kg · cm²		Nm
8	16	19	M4 M6	4 2	3 850	1 870	1 340	1 250	0,04	17	0,0014	**ZM06**	2
10,4	18	22	M4 M6	4 2	4 900	2 280	1 810	1 520	0,08	20	0,0028	**ZM08**	4
12,4	22	26	M4	4	7 400	3 600	2 550	2 420	0,12	26	0,0075	**ZM10**	6
14	27	32	M6	4	13 600	8 500	13 200	17 900	0,16	200	0,0102	**ZM12**	8
17,5	29	35	M6	4	16 700	10 700	16 400	22 400	0,2	130	0,0178	**ZM15**	10
24	39	47	M6	4	28 000	19 100	27 500	40 000	0,3	250	0,263	**ZM20**	18

Double row axial angular contact ball bearings with flange

For screw mounting



ZKLFA..-2RS, ZKLFA..-2Z

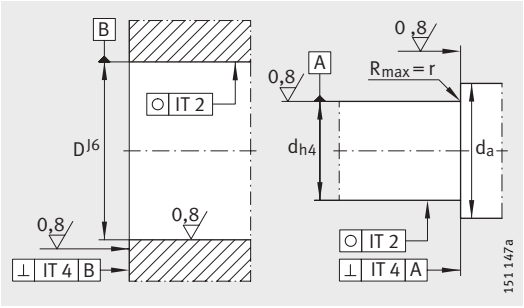
Dimension table · Dimensions in mm

Designation	Mass	Dimensions													Mounting dimensions	
	m	d	D	B	d_1	D_1	r	r_1	B_1	d_2	m	J	n	A	d_a	
	≈kg	–0,005	–0,01	–0,25			min.	min.							min.	max.
ZKLFA0630-2Z	0,05	**6**	19	12	12	30	0,3	0,3	5	3,5	21	24	12	22	9	15
ZKLFA0640-2RS	0,08	**6**	24	15	14	40	0,3	0,6	6	4,5	27,5	32	16	27	9	18
ZKLFA0640-2Z	0,08	**6**	24	15	14	40	0,3	0,6	6	4,5	27,5	32	16	27	9	18
ZKLFA0850-2RS	0,17	**8**	32	20	19	50	0,3	0,6	8	5,5	34,5	40	20	35	11	25
ZKLFA0850-2Z	0,17	**8**	32	20	19	50	0,3	0,6	8	5,5	34,5	40	20	35	11	25
ZKLFA1050-2RS	0,18	**10**	32	20	21	50	0,3	0,6	8	5,5	34,5	40	20	35	14	27
ZKLFA1050-2Z	0,18	**10**	32	20	21	50	0,3	0,6	8	5,5	34,5	40	20	35	14	27
ZKLFA1263-2RS	0,3	**12**	42	25	25	63	0,3	0,6	10	6,8	46	53	26,5	45	16	31
ZKLFA1263-2Z	0,3	**12**	42	25	25	63	0,3	0,6	10	6,8	46	53	26,5	45	16	31
ZKLFA1563-2RS	0,31	**15**	42	25	28	63	0,3	0,6	10	6,8	46	53	26,5	45	20	34
ZKLFA1563-2Z	0,31	**15**	42	25	28	63	0,3	0,6	10	6,8	46	53	26,5	45	20	34

1) Tightening torque for the fixing screws as recommended by the manufacturer. Screws must be ordered separately.

2) Mass moment of inertia for rotating inner ring.

3) Only valid in conjunction with INA precision locknuts.



Design of adjacent construction

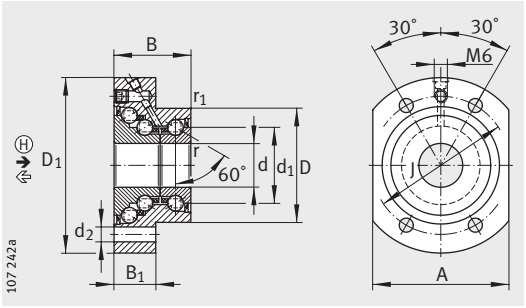
Fixing screws[1] DIN 912-10.9		Basic load ratings axial		Limiting speed	Bearing frictional torque	Rigidity axial	Tilting rigidity	Mass moment of inertia[2]	Axial runout	Recommended INA locknut; to be ordered separately			
		dyn. C_a	stat. C_{0a}	n_G grease	M_{RL}	c_{aL}	c_{kL}	M_m		Designation		Tightening torque[3]	Axial preload force
Size	Quantity	N	N	min^{-1}	Nm	N/µm	Nm/mrad	kg · cm^2	µm			M_A Nm	N
M3	4	4 900	6 100	14 000	0,01	150	4	0,0019	2	**ZM06**	–	2	916
M4	4	6 900	8 500	6 800	0,04	200	8	0,0044	2	**ZM06**	–	2	2 404
M4	4	6 900	8 500	12 000	0,02	200	8	0,0044	2	**ZM06**	–	2	2 404
M5	4	12 500	16 300	5 100	0,08	250	20	0,02	2	**ZM08**	–	4	2 216
M5	4	12 500	16 300	9 500	0,04	250	20	0,02	2	**ZM08**	–	4	2 216
M5	4	13 400	18 800	4 600	0,12	325	25	0,029	2	**ZM10**	–	6	4 891
M5	4	13 400	18 800	8 600	0,06	325	25	0,029	2	**ZM10**	–	6	4 891
M6	4	16 900	24 700	3 800	0,16	375	50	0,068	2	**ZM12**	–	8	5 038
M6	4	16 900	24 700	7 600	0,08	375	50	0,068	2	**ZM12**	–	8	5 038
M6	4	17 600	28 000	3 500	0,2	400	65	0,102	2	**ZM15**	**AM15**	10	5 484
M6	4	17 900	28 000	7 000	0,1	400	65	0,102	2	**ZM15**	**AM15**	10	5 484

Triple row axial angular contact ball bearings with flange

For screw mounting

Caution!

The bearings require continuous load in the main load direction Ⓗ.



DKLFA..-2RS (d ≦ 20 mm)

Dimension table · Dimensions in mm

Designation	Mass	Dimensions											Mounting dimensions	
	m	d	D	B	d_1	D_1	r	r_1	B_1	d_2	J	A	d_a	
	≈kg	–0,010	–0,013	–0,25			min.	min.					min.	max.
DKLFA1575-2RS	0,53	**15**	45	32	28	75	0,3	0,6	18	6,8	58	55	20	35
DKLFA2080-2RS	0,7	**20**	52	35	34,5	80	0,3	0,6	19	6,8	63	62	25	43
DKLFA2590-2RS	0,9	**25**	57	38	40,5	90	0,3	0,6	22	8,8	75	70	32	48
DKLFA30100-2RS	1	**30**	62	38	45,5	100	0,3	0,6	22	8,8	80	72	40	53
DKLFA30110-2RS[3]	2,5	**30**	75	56	51	110	0,3	0,6	35	8,8	95	85	47	64
DKLFA40115-2RS	1,5	**40**	72	42	58	115	0,3	0,6	23	8,8	94	90	50	67
DKLFA40140-2RS[3]	4,2	**40**	90	60	65	140	0,3	0,6	35	11	118	110	56	80

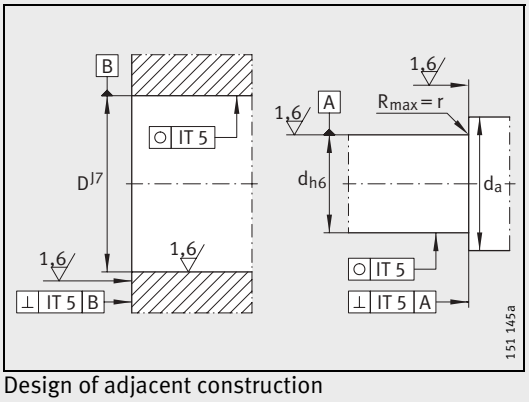
1) Tightening torque for the fixing screws as recommended by the manufacturer. Screws must be ordered separately.

2) Mass moment of inertia for rotating inner ring.

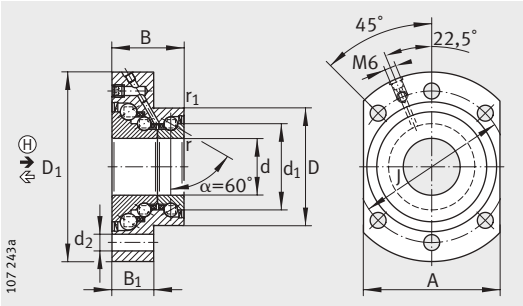
3) Heavy series.

INA locknuts (accessories)

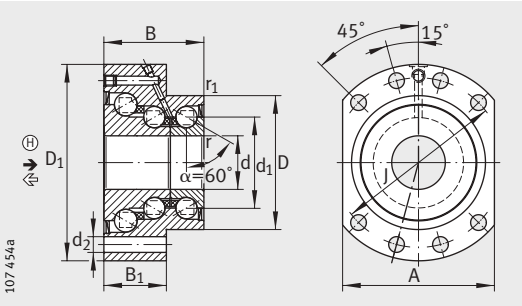
Triple row angular contact ball bearing Designation	Recommended INA locknut; to be ordered separately Designation		
	①		②
DKLFA1575-2RS	**AM15**	**ZMA15/33**	**ZM17**
DKLFA2080-2RS	**AM20**	**ZMA20/38**	**ZM25**
DKLFA2590-2RS	**AM25**	**ZMA25/45**	**AM30**
DKLFA30100-2RS	**AM30**	**ZMA30/52**	**ZM35**
DKLFA30110-2RS	**AM30/65**	–	**ZM35**
DKLFA40115-2RS	**AM40**	**ZMA40/62**	**ZM45**
DKLFA40140-2RS	**AM40/85**	–	**ZM45**



Design of adjacent construction

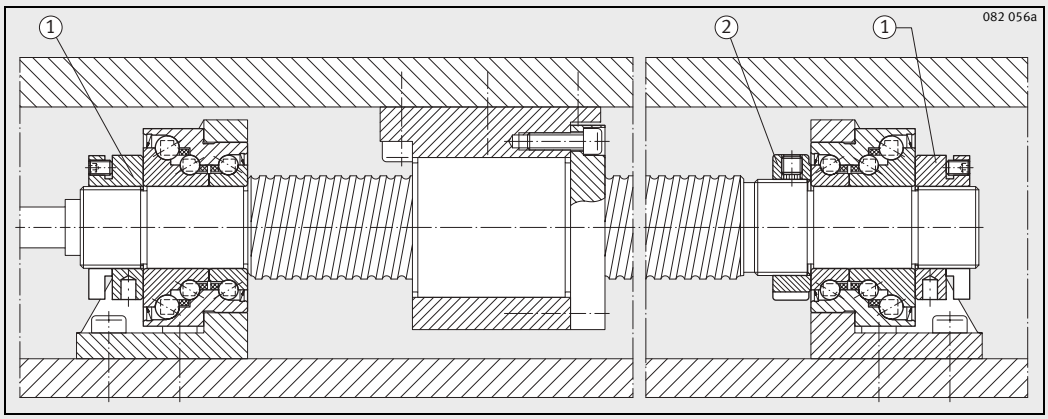


DKLFA..-2RS (d ≧ 25 mm)

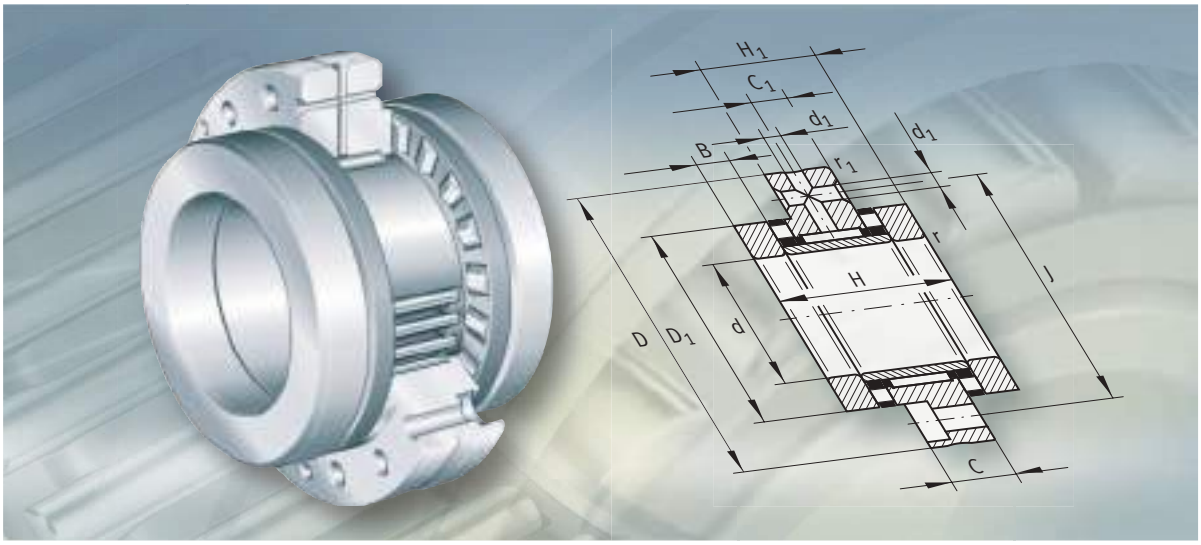


DKLFA..-2RS
Heavy series

Fixing screws[1] DIN 912-10.9		Basic load ratings				Limiting speed	Bearing frictional torque	Rigidity	Rigidity	Tilting rigidity	Mass moment of inertia[2]	Axial runout
		axial ⇐		axial Ⓗ ➔				axial ⇐	axial ➔			
		dyn. C_a	stat. C_{0a}	dyn. C_a	stat. C_{0a}	n_G grease	M_{RL}	c_{aL}	c_{aL}	c_{kL}	M_m	
Size	Quantity	N	N	N	N	min^{-1}	Nm	N/μm	N/μm	Nm/mrad	kg · cm^2	μm
M6	4	17 900	28 000	37 000	83 000	2600	0,35	500	950	140	0,278	5
M6	4	26 000	47 000	44 500	110 000	2200	0,45	750	1100	260	0,553	5
M8	6	27 500	55 000	52 000	144 000	2000	0,6	850	1200	370	1,12	5
M8	6	29 000	64 000	55 000	165 000	1800	0,75	900	1400	500	1,7	5
M8	8	59 000	108 000	106 000	250 000	1 600	1,5	1 300	1 600	650	3,23	5
M8	6	43 000	101 000	73 000	227 000	1500	1	1100	1700	1000	4,23	5
M10	8	72 000	149 000	126 000	363 000	1 200	2,5	1 800	2 000	1 370	9,32	5



Ball screw drive spindle with locating bearing arrangement on both sides
For meaning of circled numbers, see accessories table, page 948



Needle roller/
axial cylindrical roller bearings

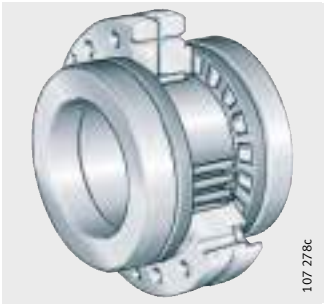
Needle roller/ axial cylindrical roller bearings

Product overview

Needle roller/ axial cylindrical roller bearings

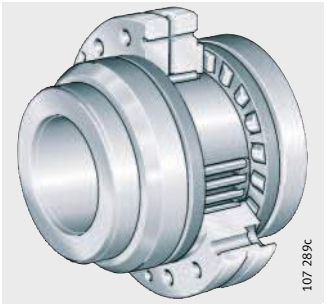
For screw mounting

ZARF



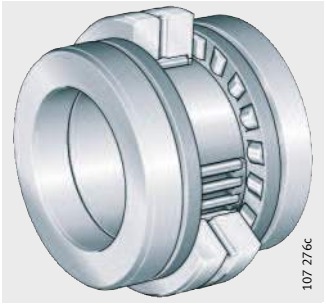
With extended shaft locating washer

ZARF..-L



Not for screw mounting

ZARN



With extended shaft locating washer

ZARN..-L

Needle roller/
axial cylindrical roller bearings

Features

Needle roller/axial cylindrical roller bearings comprise an outer ring with radial and axial raceways, two shaft locating washers, an inner ring, a radial needle roller and cage assembly and two axial cylindrical roller and cage assemblies. The bearings are available in versions for screw mounting and not for screw mounting.

Radial and axial load carrying capacity

In addition to radial forces, the bearings can also support axial forces from both directions and tilting moments.

Preload/internal clearance

The outer ring, inner ring and axial cages are matched to each other such that the bearing is axially clearance-free after preloading by means of an INA precision locknut.
The radial internal clearance is C2 according to DIN 620.

Needle roller/axial cylindrical roller bearings, for screw mounting

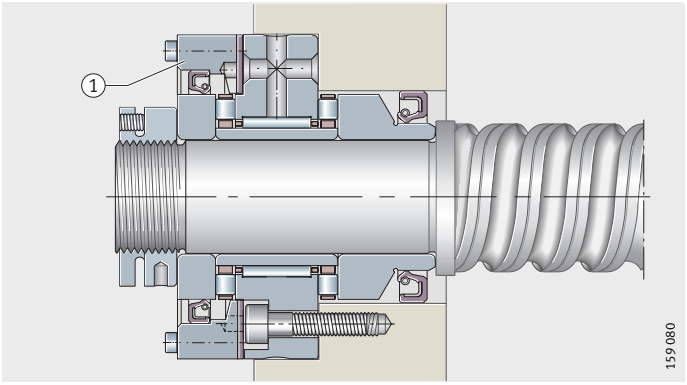
Needle roller/axial cylindrical roller bearings ZARF(L) have holes in the outer ring. These are used for screw mounting directly on the adjacent construction or in a radial locating bore, *Figure 1*.

Due to screw mounting of the outer ring, the cover that would otherwise be required and the matching work can therefore be dispensed with.

The bearings are preloaded against the shaft shoulder by means of a precision locknut AM or ZM(A).

With seal carrier assembly

In the interests of a simpler design, a seal carrier assembly DRS, *Figure 1*, ①, is recommended. The seal carrier assembly is centred on the outer ring and seals the bearing against outside influences.



① Seal carrier assembly DRS

ZARF..-L

Figure 1
With DRS
Outer ring screw mounted in bore, preloaded using locknut. Stepped shaft locating washer with sealing ring

With extended shaft locating washer

ZARF..-L has an extended and stepped shaft locating washer, *Figure 1*. These series are used in preference where the shaft locating washers are not adequately supported axially by the shaft shoulder or the bearing unit cannot be sealed on the outside surface of the normal shaft locating washer due to space conditions in the adjacent construction.

Heavy series

ZARF(L) is also available in a heavy series.

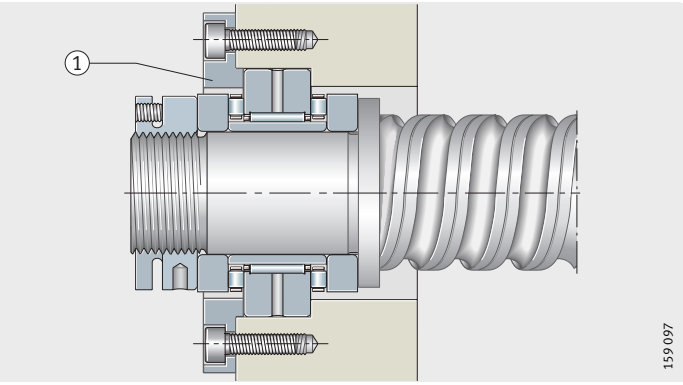
The heavy series has a larger cross-section for the same shaft diameter and therefore higher basic load ratings.

Needle roller/ axial cylindrical roller bearings

Needle roller/axial cylindrical roller bearings, not for screw mounting

Series ZARN(L) is mounted in a housing bore and the outer ring is located using a cover, *Figure 2*.

The bearings are preloaded against the shaft shoulder by means of a precision locknut AM or ZM(A).



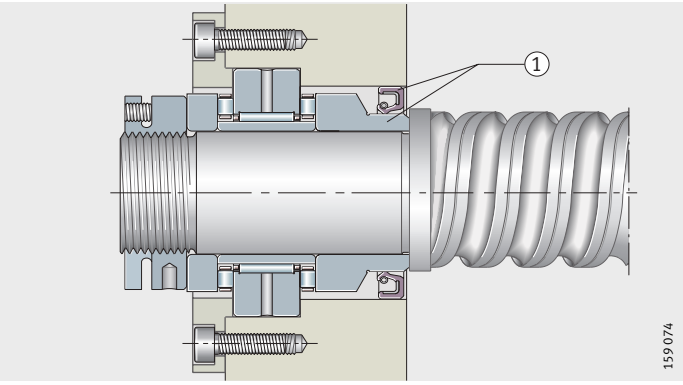
① Cover
ZARN

Figure 2
Outer ring located using cover, preloaded using locknut

With extended shaft locating washer

ZARN..-L has an extended and stepped shaft locating washer, *Figure 3*.

This series is used in preference where the shaft locating washer is not adequately supported axially by the shaft shoulder or the bearing unit cannot be sealed on the outside surface of the normal shaft locating washer due to space conditions in the adjacent construction.



① Extended, stepped shaft locating washer with seal
ZARN..-L

Figure 3
Outer ring located using cover, preloaded using locknut. Stepped shaft locating washer with sealing ring

Heavy series

ZARN(L) is also available in a heavy series.

The heavy series has a larger cross-section for the same shaft diameter and therefore higher basic load ratings.

Operating temperature

The bearings are suitable for operating temperatures from –30 °C to +120 °C.

Suffixes

Suffixes for the available designs: see table.

Available designs

Suffix	Description
L	Extended, stepped shaft locating washer
TV	Cages made from glass fibre reinforced polyamide 66

Design and safety guidelines

Basic rating life

The decisive factors in determining the bearing size are the basic rating life, the static load safety factor and the axial limiting load. The basic rating life L and L_h are calculated as follows:

$$L = \left(\frac{C}{P}\right)^p$$

$$L_h = \frac{16666}{n} \cdot \left(\frac{C}{P}\right)^p$$

L — 10^6 revolutions
Basic rating life in millions of revolutions

L_h — h
Basic rating life in operating hours

C_r, C_a — N
Basic dynamic radial or axial load rating according to dimension table

P — N
Equivalent dynamic bearing load

p — –
Life exponent p = 10/3

n — min^{-1}
Operating speed.

Resultant and equivalent bearing load

The resultant axial bearing load $F_{a\,res}$ is determined from the axial operating load F_{aB} and taking account of the axial preload, *Figure 4* to *Figure 6*, page 956.

Under purely axial load, $P = F_{a\,res}$. If additional radial operating loads are present, these must be calculated separately using the radial basic load ratings.

The limit values up to which the axial load can be supported clearance-free are shown, *Figure 4* to *Figure 6*.

Caution! A load in excess of the limit value will lead to the rolling element row without load lifting off the raceway. As a result, higher wear will occur under rapid acceleration. For extreme moment loads and statically overdefined systems (locating/locating bearing arrangements), please contact us. The calculation program BEARINX® can give a precise design in this case.

Load varying in steps

If the load values vary in steps, the equivalent load P and speed n are calculated using the following formulae (q = time duration %):

$$P = \sqrt[p]{\frac{q_1 \cdot n_1 \cdot P_1^{\,p} + \ldots + q_z \cdot n_z \cdot P_z^{\,p}}{q_1 \cdot n_1 + \ldots + q_z \cdot n_z}}$$

$$n = \frac{q_1 \cdot n_1 + \ldots + q_z \cdot n_z}{100}$$

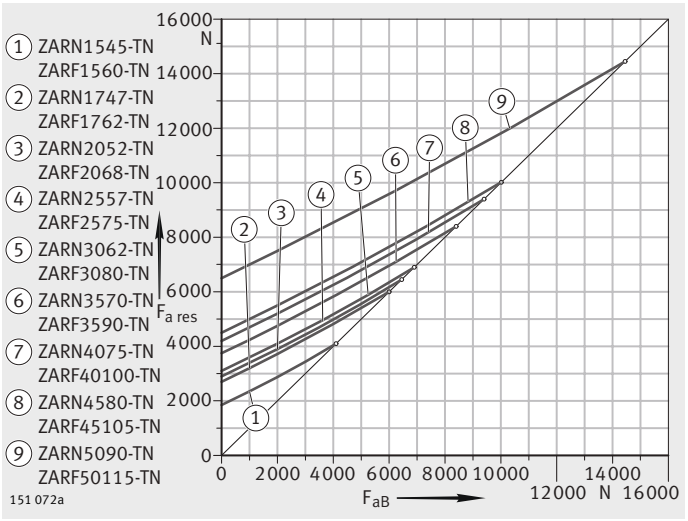
Static load safety factor

The static load safety factor S_0 is calculated using the following formula (see also page 911):

$$S_0 = \frac{C_0}{P_0}$$

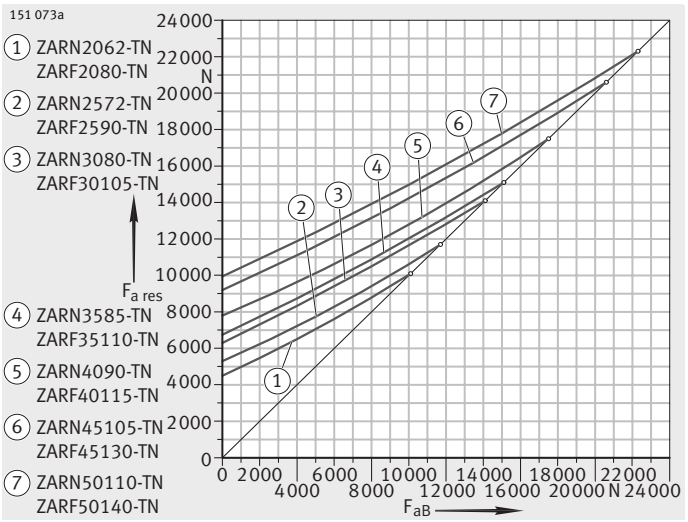
Caution! In machine tools, S_0 should be $\geqq 4$.

Resultant bearing load – diagrams



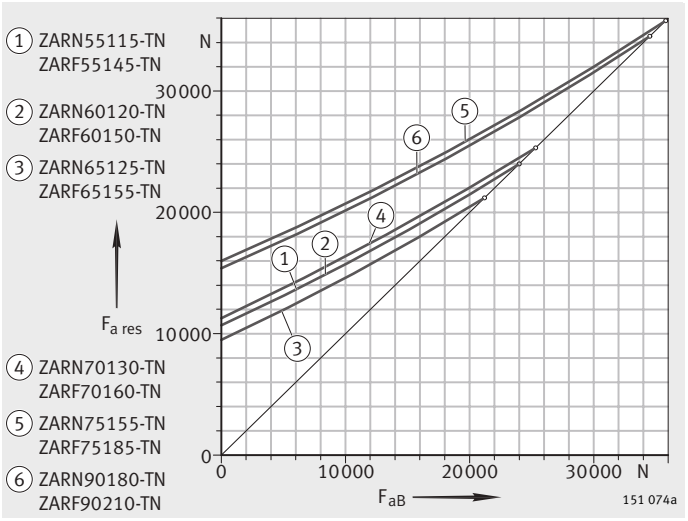
F_{aB} = operating load
$F_{a\,res}$ = resultant bearing load
° = limit value

Figure 4
Resultant bearing load
ZARN, ZARF, heavy series



F_{aB} = operating load
$F_{a\,res}$ = resultant bearing load
° = limit value

Figure 5
Resultant bearing load
ZARN, ZARF,
heavy series up to d = 50 mm



F_{aB} = operating load
$F_{a\,res}$ = resultant bearing load
° = limit value

Figure 6
Resultant bearing load
ZARN, ZARF,
heavy series from d = 55 mm

Design of adjacent construction

The adjacent construction (the shaft and housing) must be designed in accordance with the data in the dimension tables.

The abutment diameters for the shaft and housing shoulders d_a and D_a must be in accordance with the dimension tables.

Caution! The permissible contact pressure for the adjacent construction must be observed.

Examples of possible lubricant feeds: see *Figure 7* and *Figure 8*, page 958.

Sealing of the bearing position

The bearings are sealed, *Figure 1*, page 953:

- in the direction of the spindle by a rotary shaft seal on the outside surface machined free from spiral marks of the extended shaft locating washer (ZARN...L, ZARF...L)
- in the direction of the drive by the seal carrier assembly DRS.

Speeds

The limiting speeds n_G given in the dimension tables are based on the following conditions:

- bearing preloaded, no external operating load
- operating duration 25%
- max. equilibrium temperature +50 °C.

Caution! The limiting speeds n_G are valid for oil lubrication with adequate cooling.

Friction

In most applications, preloading of bearings by means of the locknut tightening torque gives sufficiently accurate setting values. The reference here is the tightening torque M_A according to the dimension tables in conjunction with an INA precision locknut.

The frictional torque M_{RL} given in the dimension tables is a guide value. It is based on lightly oiled bearings, measured at a speed of $n = 5\ min^{-1}$.

For dimensioning of the drive, the starting frictional torque and the frictional torque at high speeds of 2 to $3 \times M_{RL}$ must be taken into consideration.

Frictional torque and bearing preload

For applications in which the frictional torque is decisive (e.g. temperature development, frictional torque compensation between different bearing positions, etc.), it is recommended that the bearing preload should be set in accordance with the bearing frictional torque M_{RL}.

Frictional energy

The frictional energy N_R of the bearings can be calculated as follows:

$$N_R = \frac{M_{RL} \cdot n}{9{,}55}$$

N_R	W	Frictional energy
M_{RL}	Nm	Bearing frictional torque
n	min^{-1}	Operating speed.

In any analysis of the thermal balance, the various operating speeds n_i must be taken into consideration with their time durations q_i.

Needle roller/
axial cylindrical roller bearings

Lubrication

Needle roller/axial cylindrical roller bearings can be relubricated via the outer ring. They are supplied with oil-based or dry preservative and should preferably be lubricated with oil.

Good results have been obtained with oils CLP to DIN 51 517 and HLP to DIN 51 524 of classes ISO VG 32 to ISO VG 100.

Relubrication for grease lubrication

Relubrication should be carried out with the bearing rotating and still warm from operation in order to achieve good replacement and distribution of grease.

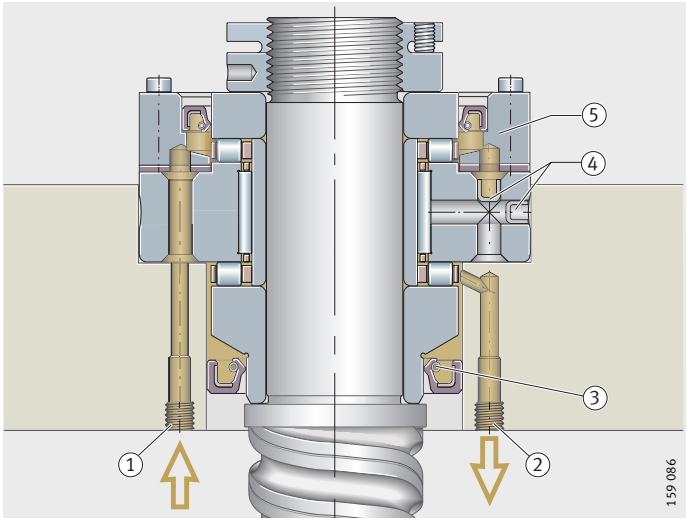
The relubrication interval and quantity can only be determined under operating conditions since it is not possible to calculate all the influences in advance. Relubrication: see Fitting and Maintenance Manual TPI 100.

Caution! Where a vertical axis of rotation is used in conjunction with automatic lubrication systems, the lubrication impulse should be selected such that the supply to the upper axial bearing is sufficient.

Lubricant feed

Examples of lubricant feeds for ZARF(L) are shown in *Figure 7*, *Figure 8*.

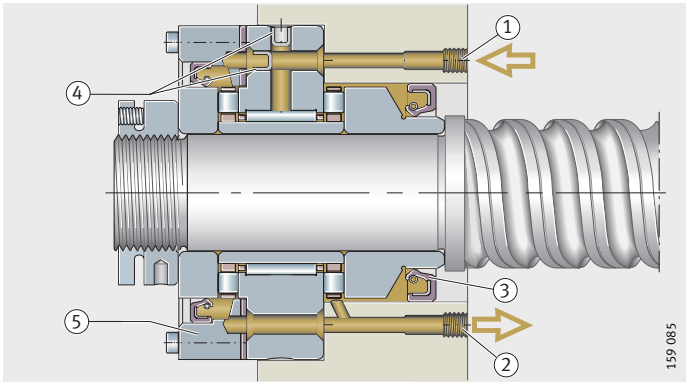
Caution! Before initial operation, it must be ensured that all raceways are adequately supplied with lubricant.



① Oil inlet
② Oil outlet
③ Rotary shaft seal
④ Cover
⑤ Seal carrier assembly

ZARF..-L

Figure 7
Lubricant feed for vertical mounting position



① Oil inlet
② Oil outlet
③ Rotary shaft seal
④ Cover
⑤ Seal carrier assembly

ZARF..-L

Figure 8
Lubricant feed for horizontal mounting position

Mounting guidelines

Caution!

Bearings should only be fitted and dismantled in accordance with Fitting and Maintenance Manual TPI 100. This TPI is available upon request.

During fitting of bearings, mounting forces should be applied only to the bearing ring to be fitted. Mounting forces must never be directed through the rolling elements.

The characteristics of the bearings are only valid when used in combination with INA precision locknuts and the associated tightening torques given in the dimension tables.

ZARN and ZARF are not self-retaining. The individual bearing components are matched to each other. The individual parts of different bearings must not be interchanged during fitting.

Setting the axial preload

Caution!

The preload in the axial component of ZARF (L) bearings is decisive for the function. It must therefore be set with sufficient accuracy.

Since direct force measurement of these values in fitting is not cost-effective, the axial preload is set indirectly using the following methods:

- either by means of the tightening torque M_A of the precision locknut. The frictional torque may deviate from the value given in the dimension table
- or by means of the bearing frictional torque M_{RL}.

Preloading by locknut

Needle roller/axial cylindrical roller bearings must be axially preloaded during fitting by means of a precision locknut.

When preloading the bearing unit by means of the bearing inner rings using the recommended precision locknut, the tightening torques given in the dimension tables must be observed or the preload must be set using the bearing frictional torque given in the dimension tables. The tightening torques given for the individual bearing sizes are only valid for the INA precision locknuts listed.

In order to counteract settling, it is recommended that the locknut should initially be tightened to twice the tightening torque M_A and then relieved of load again. It should only then be tightened again to the stated tightening torque M_A. Finally, the precision locknut should be secured against rotation by the torque-controlled tightening of the set screws.

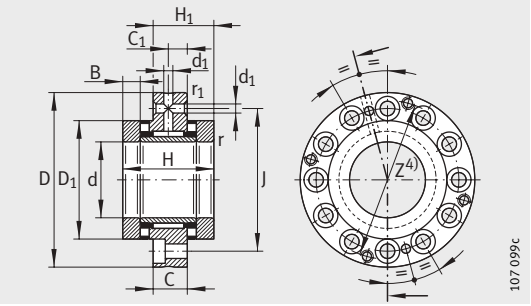
Fixing screws

The fixing screws for the outer ring must be tightened in a crosswise sequence. They may be loaded up to 70% of their elastic limit.

If the bearing outer ring is supported by an additional housing cover, it must be ensured that the fixing screws are sufficiently well dimensioned.

Needle roller/ axial cylindrical roller bearings

Light series
For screw mounting



ZARF

Dimension table · Dimensions in mm

Designation	Mass	Dimensions																	
	m	d	D	H	H_1	H_2	H_3	C	C_1	D_1	D_2	D_3	B	B_1	B_2	r	r_1	d_1	J
	≈kg															min.	min.		
ZARF1560-TV	0,42	**15**	60	40	26	–	–	14	8	35	–	–	7,5	–	–	0,3	0,6	3,2	46
ZARF1560-L-TV	0,45	**15**	60	–	–	53	39	14	8	35	24	34	7,5	20,5	11	0,3	0,6	3,2	46
ZARF1762-TV	0,49	**17**	62	43	27,5	–	–	14	8	38	–	–	9	–	–	0,3	0,6	3,2	48
ZARF1762-L-TV	0,52	**17**	62	–	–	57	41,5	14	8	38	28	38	9	23	11	0,3	0,6	3,2	48
ZARF2068-TV	0,56	**20**	68	46	29	–	–	14	8	42	–	–	10	–	–	0,3	0,6	3,2	53
ZARF2068-L-TV	0,61	**20**	68	–	–	60	43	14	8	42	30	40	10	24	11	0,3	0,6	3,2	53
ZARF2575-TV	0,78	**25**	75	50	33	–	–	18	10	47	–	–	10	–	–	0,3	0,6	3,2	58
ZARF2575-L-TV	0,84	**25**	75	–	–	65	48	18	10	47	36	45	10	25	11	0,3	0,6	3,2	58
ZARF3080-TV	0,85	**30**	80	50	33	–	–	18	10	52	–	–	10	–	–	0,3	0,6	3,2	63
ZARF3080-L-TV	0,9	**30**	80	–	–	65	48	18	10	52	40	50	10	25	11	0,3	0,6	3,2	63

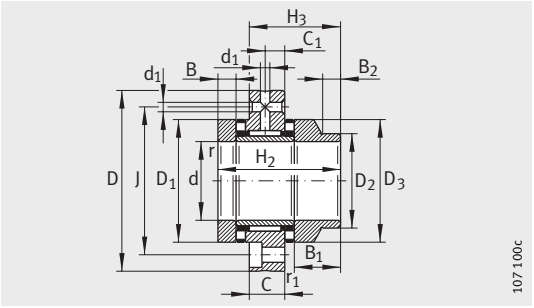
1) If rotary shaft seals are used, the outside diameter of the sealing ring must be taken into consideration.

2) Tightening torque of fixing screws according to manufacturer's data.
Screws are not included in the delivery.

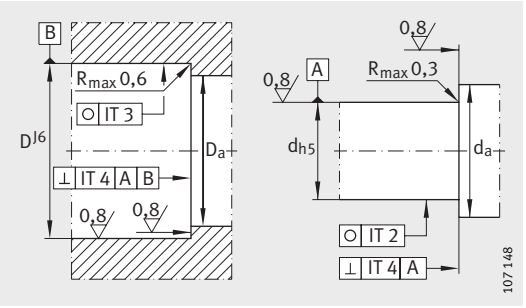
3) Mass moment of inertia for rotating inner ring.

4) Mounting dimension for seal carrier assembly DRS.
Seal carrier assemblies: see page 979 and page 983.

5) Only valid in conjunction with INA precision locknuts.



ZARF..-L



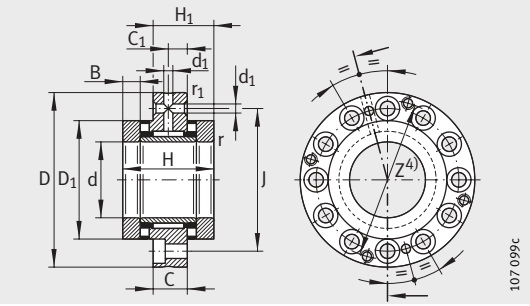
Design of adjacent construction

Mounting dimensions[1]		Basic load ratings				Limiting speeds		Bearing frictional torque	Rigidity axial	Tilting rigidity	Mass moment of inertia[3]	Axial runout
		axial		radial								
D_a	d_a	dyn. C_a	stat. C_{0a}	dyn. C_r	stat. C_{0r}	n_G oil	n_G grease	M_{RL}	c_{aL}	c_{kL}	M_m	
max.	min.	N	N	N	N	min^{-1}	min^{-1}	Nm	N/µm	Nm/mrad	kg · cm^2	µm
36	28	24 900	53 000	13 000	17 500	8 500	2 200	0,35	1 400	110	0,24	1
36	22	24 900	53 000	13 000	17 500	8 500	2 200	0,35	1 400	110	0,274	1
39	28	26 000	57 000	14 000	19 900	7 800	2 100	0,4	1 600	160	0,373	1
39	26	26 000	57 000	14 000	19 900	7 800	2 100	0,4	1 600	160	0,464	1
43	33	33 500	76 000	14 900	22 400	7 000	2 000	0,5	1 800	230	0,615	1
43	28	33 500	76 000	14 900	22 400	7 000	2 000	0,5	1 800	230	0,683	1
48	39	35 500	86 000	22 600	36 000	6 000	1 900	0,55	1 900	350	0,989	1
48	34	35 500	86 000	22 600	36 000	6 000	1 900	0,55	1 900	350	1,15	1
53	44	39 000	101 000	24 300	41 500	5 500	1 800	0,65	2 200	520	1,46	1
53	38	39 000	101 000	24 300	41 500	5 500	1 800	0,65	2 200	520	1,7	1

Designation	Recommended INA locknut; to be ordered separately				Rotary shaft seal to DIN 3 760; to be ordered separately	Fixing screws[2] DIN 912-10.9	
	Designation		Tightening torque[5]	Axial preload force			
			M_A Nm	N		Size	Quantity
ZARF1560-TV	**ZMA15/33**	**AM15**	10	6 506	–	M6	6
ZARF1560-L-TV	**ZMA15/33**	**AM15**	10	6 506	24X35X7	M6	6
ZARF1762-TV	**ZM17**	**AM17**	12	7 078	–	M6	6
ZARF1762-L-TV	**ZM17**	**AM17**	12	7 078	28X40X7	M6	6
ZARF2068-TV	**ZMA20/38**	**AM20**	18	9 376	–	M6	8
ZARF2068-L-TV	**ZMA20/38**	**AM20**	18	9 376	30X42X7	M6	8
ZARF2575-TV	**ZMA25/45**	**AM25**	25	10 470	–	M6	8
ZARF2575-L-TV	**ZMA25/45**	**AM25**	25	10 470	36X47X7	M6	8
ZARF3080-TV	**ZMA30/52**	**AM30**	32	11 091	–	M6	12
ZARF3080-L-TV	**ZMA30/52**	**AM30**	32	11 091	40X52X7	M6	12

Needle roller/ axial cylindrical roller bearings

Light series
For screw mounting



ZARF

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions																
	m	d	D	H	H_1	H_2	H_3	C	C_1	D_1	D_2	D_3	B	B_1	B_2	r	r_1	d_1	J
	≈kg															min.	min.		
ZARF3590-TV	1,12	**35**	90	54	35	–	–	18	10	60	–	–	11	–	–	0,3	0,6	3,2	73
ZARF3590-L-TV	1,25	**35**	90	–	–	70	51	18	10	60	45	58	11	27	12	0,3	0,6	3,2	73
ZARF40100-TV	1,35	**40**	100	54	35	–	–	18	10	65	–	–	11	–	–	0,3	0,6	3,2	80
ZARF40100-L-TV	1,45	**40**	100	–	–	70	51	18	10	65	50	63	11	27	12	0,3	0,6	3,2	80
ZARF45105-TV	1,7	**45**	105	60	40	–	–	22,5	12,5	70	–	–	11,5	–	–	0,3	0,6	6	85
ZARF45105-L-TV	1,85	**45**	105	–	–	75	55	22,5	12,5	70	56	68	11,5	26,5	12	0,3	0,6	6	85
ZARF50115-TV	2,1	**50**	115	60	40	–	–	22,5	12,5	78	–	–	11,5	–	–	0,3	0,6	6	94
ZARF50115-L-TV	2,45	**50**	115	–	–	78	58	22,5	12,5	78	60	78	11,5	29,5	12	0,3	0,6	6	94

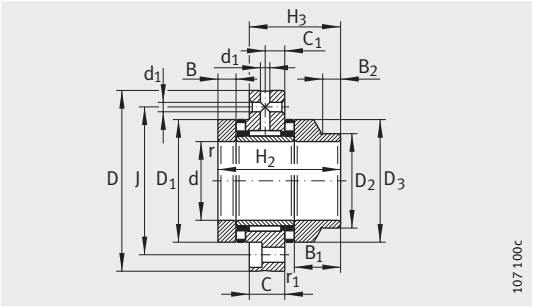
1) If rotary shaft seals are used, the outside diameter of the sealing ring must be taken into consideration.

2) Tightening torque of fixing screws according to manufacturer's data.
Screws are not included in the delivery.

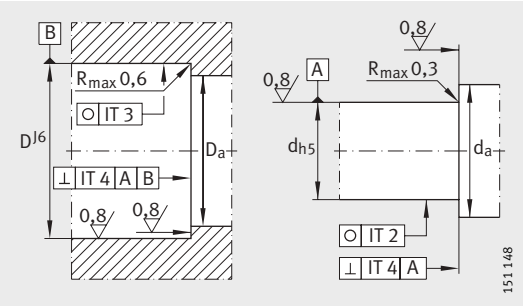
3) Mass moment of inertia for rotating inner ring.

4) Mounting dimension for seal carrier assembly DRS.
Seal carrier assemblies: see page 979 and page 983.

5) Only valid in conjunction with INA precision locknuts.



ZARF..-L



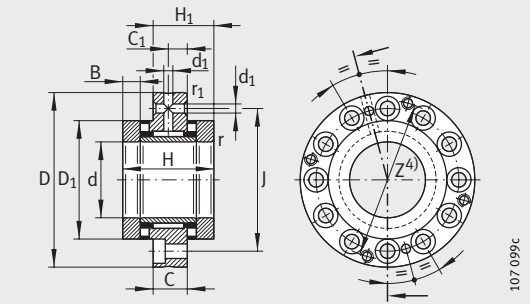
Design of adjacent construction

Mounting dimensions[1]		Basic load ratings				Limiting speeds		Bearing frictional torque	Rigidity axial	Tilting rigidity	Mass moment of inertia[3]	Axial runout
		axial		radial								
D_a	d_a	dyn. C_a	stat. C_{0a}	dyn. C_r	stat. C_{0r}	n_G oil	n_G grease	M_{RL}	c_{aL}	c_{kL}	M_m	
max.	min.	N	N	N	N	min^{-1}	min^{-1}	Nm	N/µm	Nm/mrad	kg · cm^2	µm
61	50	56 000	148 000	26 000	47 000	4 800	1 700	0,9	2 600	740	2,8	1
61	43	56 000	148 000	26 000	47 000	4 800	1 700	0,9	2 600	740	3,21	1
66	55	59 000	163 000	27 500	53 000	4 400	1 600	1	2 800	1 030	3,78	1
66	48	59 000	163 000	27 500	53 000	4 400	1 600	1	2 800	1 030	4,35	1
71	60	61 000	177 000	38 000	74 000	4 000	1 500	1,2	3 000	1 340	5,33	1
71	54	61 000	177 000	38 000	74 000	4 000	1 500	1,2	3 000	1 340	6,03	1
79	67	90 000	300 000	40 000	82 000	3 600	1 200	2,2	4 800	2 470	8,42	1
79	58	90 000	300 000	40 000	82 000	3 600	1 200	2,2	4 800	2 470	10,46	1

Designation	Recommended INA locknut; to be ordered separately				Rotary shaft seal to DIN 3 760; to be ordered separately	Fixing screws[2] DIN 912-10.9	
	Designation		Tightening torque[5]	Axial preload force			
			M_A Nm	N		Size	Quantity
ZARF3590-TV	**ZMA35/58**	**AM35/58**	42	12 486	–	M6	12
ZARF3590-L-TV	**ZMA35/58**	**AM35/58**	42	12 486	45X60X8	M6	12
ZARF40100-TV	**ZMA40/62**	**AM40**	55	14 240	–	M8	8
ZARF40100-L-TV	**ZMA40/62**	**AM40**	55	14 240	50X65X8	M8	8
ZARF45105-TV	**ZMA45/68**	**AM45**	65	15 765	–	M8	8
ZARF45105-L-TV	**ZMA45/68**	**AM45**	65	15 765	56X70X8	M8	8
ZARF50115-TV	**ZMA50/75**	**AM50**	85	18 410	–	M8	12
ZARF50115-L-TV	**ZMA50/75**	**AM50**	85	18 410	60X80X8	M8	12

Needle roller/ axial cylindrical roller bearings

Heavy series
For screw mounting



ZARF

Dimension table · Dimensions in mm

Designation	Mass	Dimensions															
	m	d	D	H	H_1	H_2	H_3	C	C_1	D_1	D_2	D_3	B	B_1	B_2	r	r_1
	≈kg															min.	min.
ZARF2080-TV	1,1	**20**	80	60	38	–	–	18	10	52	–	–	12,5	–	–	0,3	0,6
ZARF2080-L-TV	1,22	**20**	80	–	–	75	53	18	10	52	40	50	12,5	27,5	11	0,3	0,6
ZARF2590-TV	1,6	**25**	90	60	38	–	–	18	10	62	–	–	12,5	–	–	0,3	0,6
ZARF2590-L-TV	1,75	**25**	90	–	–	75	53	18	10	62	48	60	12,5	27,5	11	0,3	0,6
ZARF30105-TV	1,95	**30**	105	66	41	–	–	18	10	68	–	–	14	–	–	0,3	0,6
ZARF30105-L-TV	2,15	**30**	105	–	–	82	57	18	10	68	52	66	14	30	12	0,3	0,6
ZARF35110-TV	1,6	**35**	110	66	41	–	–	18	10	73	–	–	14	–	–	0,3	0,6
ZARF35110-L-TV	1,85	**35**	110	–	–	82	57	18	10	73	60	73	14	30	12	0,3	0,6
ZARF40115-TV	2,7	**40**	115	75	47,5	–	–	22,5	12,5	78	–	–	16	–	–	0,3	0,6
ZARF40115-L-TV	3	**40**	115	–	–	93	65,5	22,5	12,5	78	60	78	16	34	12	0,3	0,6
ZARF45130-TV	3,9	**45**	130	82	51	–	–	22,5	12,5	90	–	–	17,5	–	–	0,3	0,6
ZARF45130-L-TV	4,3	**45**	130	–	–	103	72	22,5	12,5	90	70	88	17,5	38,5	14	0,3	0,6

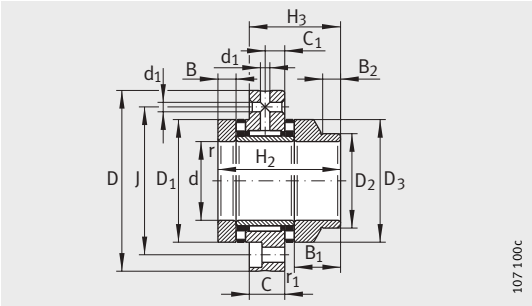
1) If rotary shaft seals are used, the outside diameter of the sealing ring must be taken into consideration.

2) Tightening torque of fixing screws according to manufacturer's data.
Screws are not included in the delivery.

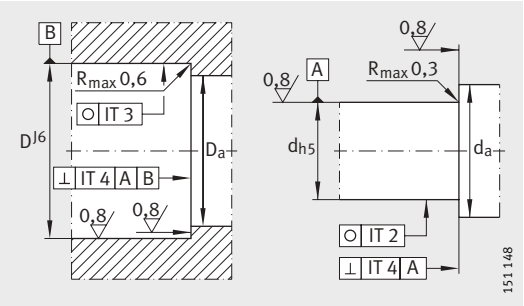
3) Mass moment of inertia for rotating inner ring.

4) Mounting dimension for seal carrier assembly DRS.
Seal carrier assemblies: see page 979 and page 983.

5) Only valid in conjunction with INA precision locknuts.



ZARF..-L



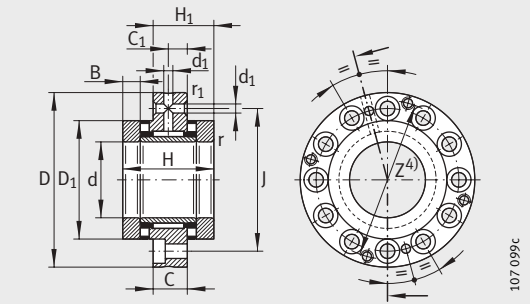
Design of adjacent construction

		Mounting dimensions[1]		Basic load ratings				Limiting speeds		Bearing frictional torque	Rigidity axial	Tilting rigidity	Mass moment of inertia[3]	Axial runout
				axial		radial								
d_1	J	Da	d_a	dyn. C_a	stat. C_{0a}	dyn. C_r	stat. C_{0r}	n_G oil	n_G grease	M_{RL}	c_{aL}	c_{kL}	M_m	
		max.	min.	N	N	N	N	min^{-1}	min^{-1}	Nm	N/µm	Nm/ mrad	kg · cm^2	µm
3,2	63	53	38	64 000	141 000	22 600	36 000	6 000	1 500	1,3	2 300	400	1,98	1
3,2	63	53	38	64 000	141 000	22 600	36 000	6 000	1 500	1,3	2 300	400	2,27	1
3,2	73	63	45	80 000	199 000	24 300	41 500	4 900	1 400	1,6	3 000	800	3,88	1
3,2	73	63	45	80 000	199 000	24 300	41 500	4 900	1 400	1,6	3 000	800	4,51	1
3,2	85	69	52	107 000	265 000	26 000	47 000	4 400	1 300	2,1	3 300	1 100	6,53	1
3,2	85	69	50	107 000	265 000	26 000	47 000	4 400	1 300	2,1	3 300	1 100	7,43	1
3,2	88	74	60	105 000	265 000	27 500	53 000	4 000	1 250	2,3	2 500	1 300	8,47	1
3,2	88	74	58	105 000	265 000	27 500	53 000	4 000	1 250	2,3	3 500	1 300	10,4	1
6	94	79	65	117 000	315 000	38 000	74 000	3 700	1 200	2,5	3 800	1 800	13,3	1
6	94	79	58	117 000	315 000	38 000	74 000	3 700	1 200	2,5	3 800	1 800	15,5	1
6	105	91	70	154 000	405 000	40 000	82 000	3 300	1 150	3,5	4 000	2 100	23,7	1
6	105	91	68	154 000	405 000	40 000	82 000	3 300	1 150	3,5	4 000	2 100	28,1	1

Designation	Recommended INA locknut; to be ordered separately				Rotary shaft seal to DIN 3 760; to be ordered separately	Fixing screws[2] DIN 912-10.9	
	Designation		Tightening torque[5] M_A Nm	Axial preload force N		Size	Quantity
ZARF2080-TV	**ZMA20/52**	**AM20**	38	18 448	–	M6	12
ZARF2080-L-TV	**ZMA20/52**	**AM20**	38	18 448	40X52X7	M6	12
ZARF2590-TV	**ZMA25/58**	**AM25**	55	20 790	–	M6	12
ZARF2590-L-TV	**ZMA25/58**	**AM25**	55	20 790	48X62X8	M6	12
ZARF30105-TV	**ZMA30/65**	**AM30**	75	24 287	–	M8	12
ZARF30105-L-TV	**ZMA30/65**	**AM30**	75	24 287	52X68X8	M8	12
ZARF35110-TV	**ZMA35/70**	**AM35**	100	27 480	–	M8	12
ZARF35110-L-TV	**ZMA35/70**	**AM35**	100	27 480	60X75X8	M8	12
ZARF40115-TV	**ZMA40/75**	**AM40**	120	29 834	–	M8	12
ZARF40115-L-TV	**ZMA40/75**	**AM40**	120	29 834	60X80X8	M8	12
ZARF45130-TV	**ZMA45/85**	**AM45**	150	33 549	–	M8	12
ZARF45130-L-TV	**ZMA45/85**	**AM45**	150	33 549	70X90X10	M8	12

Needle roller/ axial cylindrical roller bearings

Heavy series
For screw mounting



ZARF

Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions																	
	m	d	D	H	H_1	H_2	H_3	C	C_1	D_1	D_2	D_3	B	B_1	B_2	r	r_1	d_1	J
	≈kg															min.	min.		
ZARF50140-TV	4,2	**50**	140	82	51	–	–	22,5	12,5	95	–	–	17,5	–	–	0,3	0,6	6	113
ZARF50140-L-TV	4,65	**50**	140	–	–	103	72	22,5	12,5	95	75	93	17,5	38,5	14	0,3	0,6	6	113
ZARF55145-TV	4,5	**55**	145	82	51	–	–	22,5	12,5	100	–	–	17,5	–	–	0,3	0,6	6	118
ZARF55145-L-TV	5	**55**	145	–	–	103	72	22,5	12,5	100	80	98	17,5	38,5	14	0,3	0,6	6	118
ZARF60150-TV	4,7	**60**	150	82	51	–	–	22,5	12,5	105	–	–	17,5	–	–	0,3	0,6	6	123
ZARF60150-L-TV	5,35	**60**	150	–	–	103	72	22,5	12,5	105	90	105	17,5	38,5	16	0,3	0,6	6	123
ZARF65155-TV	5,1	**65**	155	82	51	–	–	22,5	12,5	110	–	–	17,5	–	–	0,3	0,6	6	128
ZARF65155-L-TV	5,7	**65**	155	–	–	103	72	22,5	12,5	110	90	108	17,5	38,5	16	0,3	0,6	6	128
ZARF70160-TV	5,2	**70**	160	82	51	–	–	22,5	12,5	115	–	–	17,5	–	–	0,3	0,6	6	133
ZARF70160-L-TV	5,95	**70**	160	–	–	103	72	22,5	12,5	115	100	115	17,5	38,5	16	0,3	0,6	6	133
ZARF75185-TV	9,4	**75**	185	100	62	–	–	27	15	135	–	–	21	–	–	0,3	1	6	155
ZARF75185-L-TV	10,6	**75**	185	–	–	125	87	27	15	135	115	135	21	46	16	0,3	1	6	155
ZARF90210-TV	13,7	**90**	210	110	69,5	–	–	32	17,5	160	–	–	22,5	–	–	0,3	1	8	180
ZARF90210-L-TV	15,1	**90**	210	–	–	135	94,5	32	17,5	160	130	158	22,5	47,5	16	0,3	1	8	180

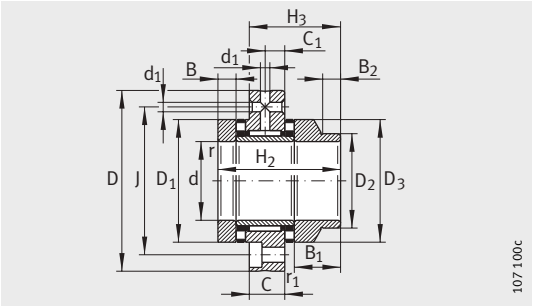
1) If rotary shaft seals are used, the outside diameter of the sealing ring must be taken into consideration.

2) Tightening torque of fixing screws according to manufacturer's data.
Screws are not included in the delivery.

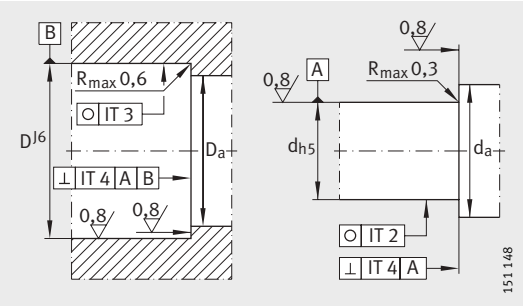
3) Mass moment of inertia for rotating inner ring.

4) Mounting dimension for seal carrier assembly DRS.
Seal carrier assemblies: see page 979 and page 983.

5) Only valid in conjunction with INA precision locknuts.



ZARF..-L



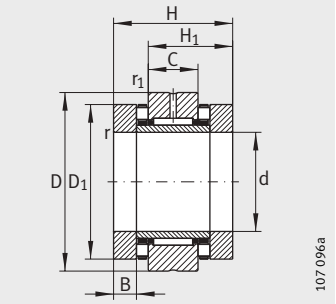
Design of adjacent construction

Mounting dimensions[1]		Basic load ratings				Limiting speeds		Bearing frictional torque	Rigidity axial	Tilting rigidity	Mass moment of inertia[3]	Axial runout
		axial		radial								
Da	d_a	dyn. C_a	stat. C_{0a}	dyn. C_r	stat. C_{0r}	n_G oil	n_G grease	M_{RL}	c_{aL}	c_{kL}	M_m	
max.	min.	N	N	N	N	min^{-1}	min^{-1}	Nm	N/µm	Nm/mrad	kg · cm^2	µm
96	75	172 000	480 000	42 000	90 000	3 100	1 100	3,8	4 600	2 900	29,8	1
96	73	172 000	480 000	42 000	90 000	3 100	1 100	3,8	4 600	2 900	35,3	1
101	85	177 000	500 000	44 000	98 000	2 900	1 000	4	4 900	3 600	36,1	1
101	78	177 000	500 000	44 000	98 000	2 900	1 000	4	4 900	3 600	43	1
106	90	187 000	550 000	44 500	92 000	2 700	950	4,2	5 300	4 300	43,8	1
106	88	187 000	550 000	44 500	92 000	2 700	950	4,2	5 300	4 300	54,5	1
111	97	172 000	500 000	54 000	104 000	2 600	900	4	4 800	4 000	51	1
111	88	172 000	500 000	54 000	104 000	2 600	900	4	4 800	4 000	60,1	1
116	100	201 000	630 000	56 000	119 000	2 400	800	4,8	5 800	6 000	62,2	1
116	98	201 000	630 000	56 000	119 000	2 400	800	4,8	5 800	6 000	77,3	1
136	113	290 000	890 000	72 000	132 000	2 100	700	8	6 600	8 500	149	2
136	110	290 000	890 000	72 000	132 000	2 100	700	8	6 600	8 500	188	2
161	130	325 000	1 030 000	98 000	210 000	1 800	700	10,5	7 700	14 500	312	2
161	125	325 000	1 030 000	98 000	210 000	1 800	700	10,5	7 700	14 500	372	2

Designation	Recommended INA locknut; to be ordered separately				Rotary shaft seal to DIN 3 760; to be ordered separately	Fixing screws[2] DIN 912-10.9	
	Designation		Tightening torque[5] M_A Nm	Axial preload force N		Size	Quantity
ZARF50140-TV	**ZMA50/92**	**AM50**	180	37 109	–	M10	12
ZARF50140-L-TV	**ZMA50/92**	**AM50**	180	37 109	75X95X10	M10	12
ZARF55145-TV	**ZMA55/98**	**AM55**	220	40 772	–	M10	12
ZARF55145-L-TV	**ZMA55/98**	**AM55**	220	40 772	80X100X10	M10	12
ZARF60150-TV	**ZMA60/98**	**AM60**	250	42 190	–	M10	12
ZARF60150-L-TV	**ZMA60/98**	**AM60**	250	42 190	90X110X12	M10	12
ZARF65155-TV	**ZMA65/105**	**AM65**	270	41 778	–	M10	12
ZARF65155-L-TV	**ZMA65/105**	**AM65**	270	41 778	90X110X12	M10	12
ZARF70160-TV	**ZMA70/110**	**AM70**	330	47 692	–	M10	12
ZARF70160-L-TV	**ZMA70/110**	**AM70**	330	47 692	100X120X12	M10	12
ZARF75185-TV	**ZMA75/125**	**AM75**	580	76 339	–	M12	12
ZARF75185-L-TV	**ZMA75/125**	**AM75**	580	76 339	115X140X12	M12	12
ZARF90210-TV	**ZMA90/155**	**AM90**	960	102 468	–	M12	16
ZARF90210-L-TV	**ZMA90/155**	**AM90**	960	102 468	130X160X12	M12	16

Needle roller/axial cylindrical roller bearings

Light series



ZARN

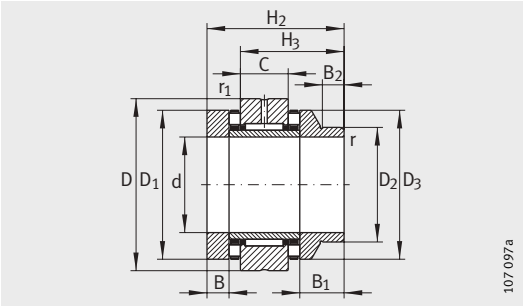
Dimension table · Dimensions in mm

Designation	Mass	Dimensions														
	m	d	D	H	H_1	H_2	H_3	C	D_1	D_2	D_3	B	B_1	B_2	r	r_1
	≈kg														min.	min.
ZARN1545-TV	0,34	**15**	45	40	28	–	–	16	35	–	–	7,5	–	–	0,3	0,6
ZARN1545-L-TV	0,37	**15**	45	–	–	53	41	16	35	24	34	7,5	20,5	11	0,3	0,6
ZARN1747-TV	0,37	**17**	47	43	29,5	–	–	16	38	–	–	9	–	–	0,3	0,6
ZARN1747-L-TV	0,41	**17**	47	–	–	57	43,5	16	38	28	38	9	23	11	0,3	0,6
ZARN2052-TV	0,41	**20**	52	46	31	–	–	16	42	–	–	10	–	–	0,3	0,6
ZARN2052-L-TV	0,46	**20**	52	–	–	60	45	16	42	30	40	10	24	11	0,3	0,6
ZARN2557-TV	0,53	**25**	57	50	35	–	–	20	47	–	–	10	–	–	0,3	0,6
ZARN2557-L-TV	0,59	**25**	57	–	–	65	50	20	47	36	45	10	25	11	0,3	0,6
ZARN3062-TV	0,6	**30**	62	50	35	–	–	20	52	–	–	10	–	–	0,3	0,6
ZARN3062-L-TV	0,75	**30**	62	–	–	65	50	20	52	40	50	10	25	11	0,3	0,6

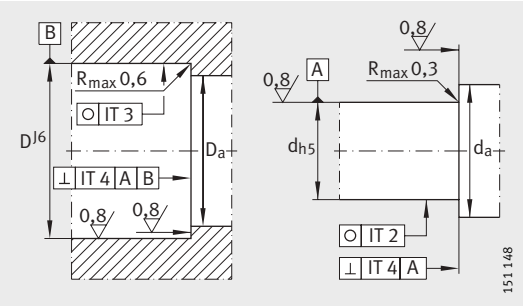
1) If rotary shaft seals are used, the outside diameter of the sealing ring must be taken into consideration.

2) Mass moment of inertia for rotating inner ring.

3) Only valid in conjunction with INA precision locknuts.



ZARN..-L



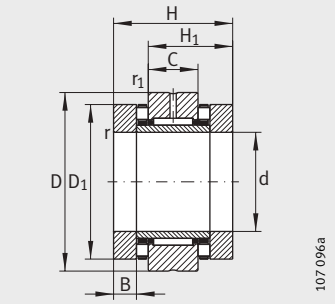
Design of adjacent construction

Mounting dimensions[1]		Basic load ratings				Limiting speeds		Bearing frictional torque	Rigidity axial	Tilting rigidity	Mass moment of inertia[2]	Axial runout
		axial		radial								
D_a	d_a	dyn. C_a	stat. C_{0a}	dyn. C_r	stat. C_{0r}	n_G oil	n_G grease	M_{RL}	c_{aL}	c_{kL}	M_m	
max.	min.	N	N	N	N	min^{-1}	min^{-1}	Nm	N/µm	Nm/ mrad	kg · cm^2	µm
36	28	24 900	53 000	13 000	17 500	8 500	2 200	0,35	1 400	110	0,24	1
36	22	24 900	53 000	13 000	17 500	8 500	2 200	0,35	1 400	110	0,274	1
39	28	26 000	57 000	14 000	19 900	7 800	2 100	0,4	1 600	160	0,373	1
39	26	26 000	57 000	14 000	19 900	7 800	2 100	0,4	1 600	160	0,464	1
43	33	33 500	76 000	14 900	22 400	7 000	2 000	0,5	1 800	230	0,615	1
43	28	33 500	76 000	14 900	22 400	7 000	2 000	0,5	1 800	230	0,683	1
48	39	35 500	86 000	22 600	36 000	6 000	1 900	0,55	1 900	350	0,989	1
48	34	35 500	86 000	22 900	36 000	6 000	1 900	0,55	1 900	350	1,15	1
53	44	39 000	101 000	24 300	41 500	5 500	1 800	0,65	2 200	520	1,46	1
53	38	39 000	101 000	24 300	41 500	5 500	1 800	0,65	2 200	520	1,7	1

Designation	Recommended INA locknut; to be ordered separately				Rotary shaft seal to DIN 3 760; to be ordered separately
	Designation		Tightening torque[3] M_A Nm	Axial preload force N	
ZARN1545-TV	**ZMA15/33**	**AM15**	10	6 506	–
ZARN1545-L-TV	**ZMA15/33**	**AM15**	10	6 506	24X35X7
ZARN1747-TV	**ZM17**	**AM17**	12	7 078	–
ZARN1747-L-TV	**ZM17**	**AM17**	12	7 078	28X40X7
ZARN2052-TV	**ZMA20/38**	**AM20**	18	9 376	–
ZARN2052-L-TV	**ZMA20/38**	**AM20**	18	9 376	30X42X7
ZARN2557-TV	**ZMA25/45**	**AM25**	25	10 470	–
ZARN2557-L-TV	**ZMA25/45**	**AM25**	25	10 470	36X47X7
ZARN3062-TV	**ZMA30/52**	**AM30**	32	11 091	–
ZARN3062-L-TV	**ZMA30/52**	**AM30**	32	11 091	40X52X7

Needle roller/axial cylindrical roller bearings

Light series



ZARN

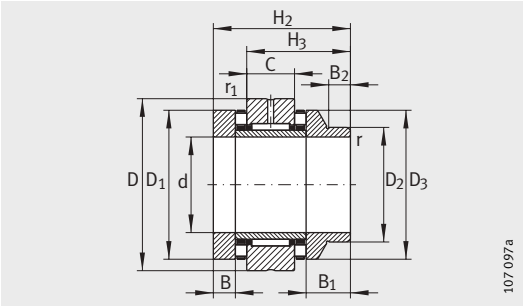
Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions														
	m	d	D	H	H_1	H_2	H_3	C	D_1	D_2	D_3	B	B_1	B_2	r	r_1
	≈kg														min.	min.
ZARN3570-TV	0,8	**35**	70	54	37	–	–	20	60	–	–	11	–	–	0,3	0,6
ZARN3570-L-TV	0,93	**35**	70	–	–	70	53	20	60	45	58	11	27	12	0,3	0,6
ZARN4075-TV	0,9	**40**	75	54	37	–	–	20	65	–	–	11	–	–	0,3	0,6
ZARN4075-L-TV	1	**40**	75	–	–	70	53	20	65	50	63	11	27	12	0,3	0,6
ZARN4580-TV	1,12	**45**	80	60	42,5	–	–	25	70	–	–	11,5	–	–	0,3	0,6
ZARN4580-L-TV	1,27	**45**	80	–	–	75	57,5	25	70	56	68	11,5	26,5	12	0,3	0,6
ZARN5090-TV	1,43	**50**	90	60	42,5	–	–	25	78	–	–	11,5	–	–	0,3	0,6
ZARN5090-L-TV	1,78	**50**	90	–	–	78	60,5	25	78	60	78	11,5	29,5	12	0,3	0,6

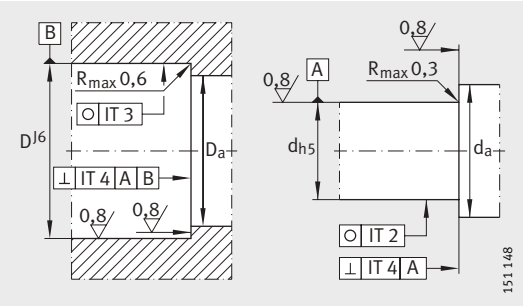
1) If rotary shaft seals are used, the outside diameter of the sealing ring must be taken into consideration.

2) Mass moment of inertia for rotating inner ring.

3) Only valid in conjunction with INA precision locknuts.



ZARN..-L



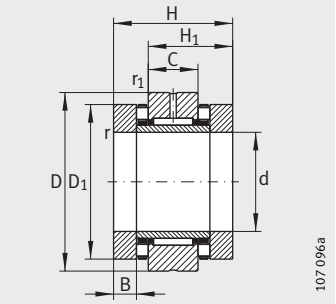
Design of adjacent construction

Mounting dimensions[1]		Basic load ratings				Limiting speeds		Bearing frictional torque	Rigidity axial	Tilting rigidity	Mass moment of inertia[2]	Axial runout
		axial		radial								
D_a	d_a	dyn. C_a	stat. C_{0a}	dyn. C_r	stat. C_{0r}	n_G oil	n_G grease	M_{RL}	c_{aL}	c_{kL}	M_m	
max.	min.	N	N	N	N	min^{-1}	min^{-1}	Nm	N/µm	Nm/ mrad	kg · cm^2	µm
61	50	56 000	148 000	26 000	47 000	4 800	1 700	0,9	2 600	740	2,8	1
61	43	56 000	148 000	26 000	47 000	4 800	1 700	0,9	2 600	740	3,21	1
66	55	59 000	163 000	27 500	53 000	4 400	1 600	1	2 800	1 030	3,78	1
66	48	59 000	163 000	27 500	53 000	4 400	1 600	1	2 800	1 030	4,35	1
71	60	61 000	177 000	38 000	74 000	4 000	1 500	1,2	3 000	1 340	5,33	1
71	54	61 000	177 000	38 000	74 000	4 000	1 500	1,2	3 000	1 340	6,03	1
79	67	90 000	300 000	40 000	82 000	3 600	1 200	2,2	4 800	2 470	8,42	1
79	58	90 000	300 000	40 000	82 000	3 600	1 200	2,2	4 800	2 470	10,46	1

Designation	Recommended INA locknut; to be ordered separately				Rotary shaft seal to DIN 3 760; to be ordered separately
	Designation		Tightening torque[3] M_A Nm	Axial preload force N	
ZARN3570-TV	**ZMA35/58**	**AM35/58**	42	12 486	–
ZARN3570-L-TV	**ZMA35/58**	**AM35/58**	42	12 486	45X60X8
ZARN4075-TV	**ZMA40/62**	**AM40**	55	14 240	–
ZARN4075-L-TV	**ZMA40/62**	**AM40**	55	14 240	50X65X8
ZARN4580-TV	**ZMA45/68**	**AM45**	65	15 765	–
ZARN4580-L-TV	**ZMA45/68**	**AM45**	65	15 765	56X70X8
ZARN5090-TV	**ZMA50/75**	**AM50**	85	18 410	–
ZARN5090-L-TV	**ZMA50/75**	**AM50**	85	18 410	60X80X8

Needle roller/axial cylindrical roller bearings

Heavy series



ZARN

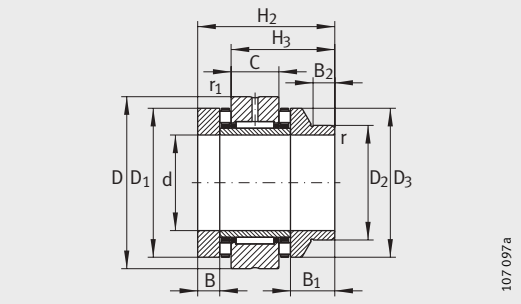
Dimension table · Dimensions in mm

Designation	Mass	Dimensions														
	m	d	D	H	H_1	H_2	H_3	C	D_1	D_2	D_3	B	B_1	B_2	r	r_1
	≈kg														min.	min.
ZARN2062-TV	0,87	**20**	62	60	40	–	–	20	52	–	–	12,5	–	–	0,3	0,6
ZARN2062-L-TV	0,99	**20**	62	–	–	75	55	20	52	40	50	12,5	27,5	11	0,3	0,6
ZARN2572-TV	1,17	**25**	72	60	40	–	–	20	62	–	–	12,5	–	–	0,3	0,6
ZARN2572-L-TV	1,32	**25**	72	–	–	75	55	20	62	48	60	12,5	27,5	11	0,3	0,6
ZARN3080-TV	1,5	**30**	80	66	43	–	–	20	68	–	–	14	–	–	0,3	0,6
ZARN3080-L-TV	1,7	**30**	80	–	–	82	59	20	68	52	66	14	30	12	0,3	0,6
ZARN3585-TV	1,65	**35**	85	66	43	–	–	20	73	–	–	14	–	–	0,3	0,6
ZARN3585-L-TV	1,8	**35**	85	–	–	82	59	20	73	60	73	14	30	12	0,3	0,6
ZARN4090-TV	2,09	**40**	90	75	50	–	–	25	78	–	–	16	–	–	0,3	0,6
ZARN4090-L-TV	2,39	**40**	90	–	–	93	68	25	78	60	78	16	34	12	0,3	0,6
ZARN45105-TV	3,02	**45**	105	82	53,5	–	–	25	90	–	–	17,5	–	–	0,3	0,6
ZARN45105-L-TV	3,42	**45**	105	–	–	103	74,5	25	90	70	88	17,5	38,5	14	0,3	0,6
ZARN50110-TV	3,3	**50**	110	82	53,5	–	–	25	95	–	–	17,5	–	–	0,3	0,6
ZARN50110-L-TV	3,75	**50**	110	–	–	103	74,5	25	95	75	93	17,5	38,5	14	0,3	0,6

1) If rotary shaft seals are used, the outside diameter of the sealing ring must be taken into consideration.

2) Mass moment of inertia for rotating inner ring.

3) Only valid in conjunction with INA precision locknuts.



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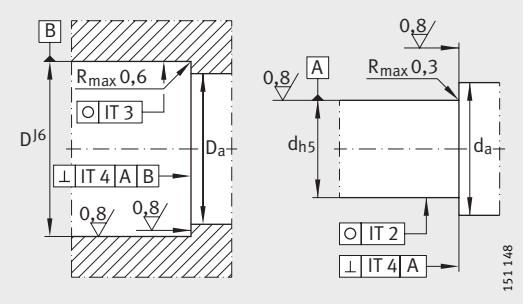


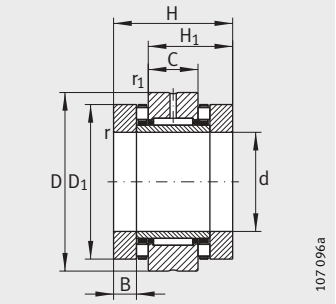
Design of adjacent construction

Mounting dimensions[1]		Basic load ratings				Limiting speeds		Bearing frictional torque	Rigidity axial	Tilting rigidity	Mass moment of inertia[2]	Axial runout
		axial		radial								
D_a	d_a	dyn. C_a	stat. C_{0a}	dyn. C_r	stat. C_{0r}	n_G oil	n_G grease	M_{RL}	c_{aL}	c_{kL}	M_m	
max.	min.	N	N	N	N	min^{-1}	min^{-1}	Nm	N/µm	Nm/mrad	kg · cm^2	µm
53	38	64 000	141 000	22 600	36 000	6 000	1 500	1,3	2 300	400	1,98	1
53	38	64 000	141 000	26 600	36 000	6 000	1 500	1,3	2 300	400	2,27	1
63	45	80 000	199 000	24 300	41 500	4 900	1 400	1,6	3 000	800	3,88	1
63	45	80 000	199 000	24 300	41 500	4 900	1 400	1,6	3 000	800	4,51	1
69	52	107 000	265 000	26 000	47 000	4 400	1 300	2,1	3 300	1 100	6,53	1
69	50	107 000	265 000	26 000	47 000	4 400	1 300	2,1	3 300	1 100	7,43	1
74	60	105 000	265 000	27 500	53 000	4 000	1 250	2,3	3 500	1 300	8,47	1
74	58	105 000	265 000	27 500	53 000	4 000	1 250	2,3	3 500	1 300	10,4	1
79	65	117 000	315 000	38 000	74 000	3 700	1 200	2,5	3 800	1 800	13,3	1
79	58	117 000	315 000	38 000	74 000	3 700	1 200	2,5	3 800	1 800	15,5	1
91	70	154 000	405 000	40 000	82 000	3 300	1 150	3,5	4 000	2 100	23,7	1
91	68	154 000	405 000	40 000	82 000	3 300	1 150	3,5	4 000	2 100	28,1	1
96	75	172 000	480 000	42 000	90 000	3 100	1 100	3,8	4 600	2 900	29,8	1
96	73	172 000	480 000	42 000	90 000	3 100	1 100	3,8	4 600	2 900	35,3	1

Designation	Recommended INA locknut; to be ordered separately				Rotary shaft seal to DIN 3 760; to be ordered separately
	Designation		Tightening torque[3] M_A Nm	Axial preload force N	
ZARN2062-TV	**ZMA20/52**	**AM20**	38	18 448	–
ZARN2062-L-TV	**ZMA20/52**	**AM20**	38	18 448	40X52X7
ZARN2572-TV	**ZMA25/58**	**AM25**	55	20 790	–
ZARN2572-L-TV	**ZMA25/58**	**AM25**	55	20 790	48X62X8
ZARN3080-TV	**ZMA30/65**	**AM30**	75	24 287	–
ZARN3080-L-TV	**ZMA30/65**	**AM30**	75	24 287	52X68X8
ZARN3585-TV	**ZMA35/70**	**AM35**	100	27 480	–
ZARN3585-L-TV	**ZMA35/70**	**AM35**	100	27 480	60X75X8
ZARN4090-TV	**ZMA40/75**	**AM40**	120	29 834	–
ZARN4090-L-TV	**ZMA40/75**	**AM40**	120	29 834	60X80X8
ZARN45105-TV	**ZMA45/85**	**AM45**	150	33 549	–
ZARN45105-L-TV	**ZMA45/85**	**AM45**	150	33 549	70X90X10
ZARN50110-TV	**ZMA50/92**	**AM50**	180	37 109	–
ZARN50110-L-TV	**ZMA50/92**	**AM50**	180	37 109	75X95X10

Needle roller/axial cylindrical roller bearings

Heavy series



ZARN

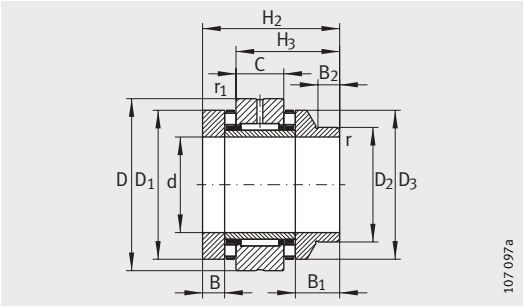
Dimension table (continued) · Dimensions in mm

Designation	Mass	Dimensions														
	m	d	D	H	H_1	H_2	H_3	C	D_1	D_2	D_3	B	B_1	B_2	r	r_1
	≈kg														min.	min.
ZARN55115-TV	3,5	**55**	115	82	53,5	–	–	25	100	–	–	17,5	–	–	0,3	0,6
ZARN55115-L-TV	4	**55**	115	–	–	103	74,5	25	100	80	98	17,5	38,5	14	0,3	0,6
ZARN60120-TV	3,7	**60**	120	82	53,5	–	–	25	105	–	–	17,5	–	–	0,3	0,6
ZARN60120-L-TV	4,85	**60**	120	–	–	103	74,5	25	105	90	105	17,5	38,5	16	0,3	0,6
ZARN65125-TV	4	**65**	125	82	53,5	–	–	25	110	–	–	17,5	–	–	0,3	0,6
ZARN65125-L-TV	4,6	**65**	125	–	–	103	74,5	25	110	90	108	17,5	38,5	16	0,3	0,6
ZARN70130-TV	4,1	**70**	130	82	53,5	–	–	25	115	–	–	17,5	–	–	0,3	0,6
ZARN70130-L-TV	4,85	**70**	130	–	–	103	74,5	25	115	100	115	17,5	38,5	16	0,3	0,6
ZARN75155-TV	7,9	**75**	155	100	65	–	–	30	135	–	–	21	–	–	0,3	1
ZARN75155-L-TV	9,1	**75**	155	–	–	125	90	30	135	115	135	21	46	16	0,3	1
ZARN90180-TV	11,8	**90**	180	110	72,5	–	–	35	160	–	–	22,5	–	–	0,3	1
ZARN90180-L-TV	13,2	**90**	180	–	–	135	97,5	35	160	130	158	22,5	47,5	16	0,3	1

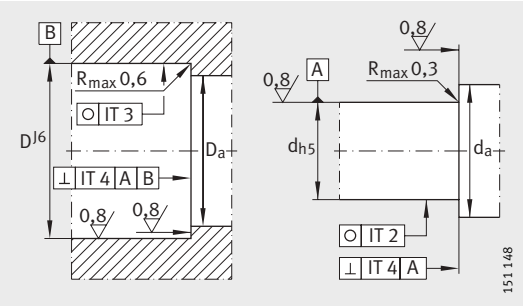
1) If rotary shaft seals are used, the outside diameter of the sealing ring must be taken into consideration.

2) Mass moment of inertia for rotating inner ring.

3) Only valid in conjunction with INA precision locknuts.



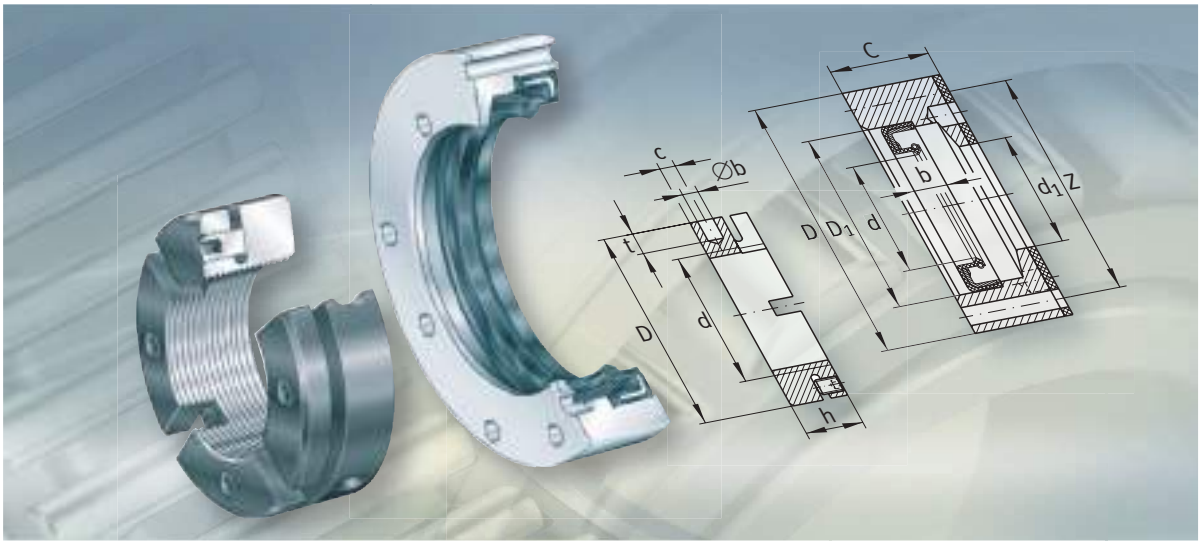
ZARN..-L



Design of adjacent construction

Mounting dimensions[1]		Basic load ratings				Limiting speeds		Bearing frictional torque	Rigidity axial	Tilting rigidity	Mass moment of inertia[2]	Axial runout
		axial		radial								
D_a	d_a	dyn. C_a	stat. C_{0a}	dyn. C_r	stat. C_{0r}	n_G oil	n_G grease	M_{RL}	c_{aL}	c_{kL}	M_m	
max.	min.	N	N	N	N	min^{-1}	min^{-1}	Nm	N/µm	Nm/mrad	kg · cm^2	µm
101	85	177 000	500 000	44 000	98 000	2 900	1 000	4	4 900	3 600	36,1	1
101	78	177 000	500 000	44 000	98 000	2 900	1 000	4	4 900	3 600	43	1
106	90	187 000	550 000	44 500	92 000	2 700	950	4,2	5 300	4 300	43,8	1
106	88	187 000	550 000	44 500	92 000	2 700	950	4,2	5 300	4 300	54,5	1
111	97	172 000	500 000	54 000	104 000	2 600	900	4	4 800	4 000	51	1
111	88	172 000	500 000	54 000	104 000	2 600	900	4	4 800	4 000	60,1	1
116	100	201 000	630 000	56 000	119 000	2 400	800	4,8	5 800	6 000	62,2	1
116	98	201 000	630 000	56 000	119 000	2 400	800	4,8	5 800	6 000	77,3	1
136	113	290 000	890 000	72 000	132 000	2 100	700	8	6 600	8 500	149	2
136	110	290 000	890 000	72 000	132 000	2 100	700	8	6 600	8 500	188	2
161	130	325 000	1 030 000	98 000	210 000	1 800	700	10,5	7 700	14 500	312	2
161	125	325 000	1 030 000	98 000	210 000	1 800	700	10,5	7 700	14 500	372	2

Designation	Recommended INA locknut; to be ordered separately				Rotary shaft seal to DIN 3 760; to be ordered separately
	Designation		Tightening torque[3] M_A Nm	Axial preload force N	
ZARN55115-TV	**ZMA55/98**	**AM55**	220	40 772	–
ZARN55115-L-TV	**ZMA55/98**	**AM55**	220	40 772	80X100X10
ZARN60120-TV	**ZMA60/98**	**AM60**	250	42 190	–
ZARN60120-L-TV	**ZMA60/98**	**AM60**	250	42 190	90X110X12
ZARN65125-TV	**ZMA65/105**	**AM65**	270	41 778	–
ZARN65125-L-TV	**ZMA65/105**	**AM65**	270	41 778	90X110X12
ZARN70130-TV	**ZMA70/110**	**AM70**	330	47 692	–
ZARN70130-L-TV	**ZMA70/110**	**AM70**	330	47 692	100X120X12
ZARN75155-TV	**ZMA75/125**	**AM75**	580	76 339	–
ZARN75155-L-TV	**ZMA75/125**	**AM75**	580	76 339	115X140X12
ZARN90180-TV	**ZMA90/155**	**AM90**	960	102 246	–
ZARN90180-L-TV	**ZMA90/155**	**AM90**	960	102 246	130X160X12



Seal carrier assemblies
Precision locknuts

Seal carrier assemblies
Precision locknuts

Product overview

Seal carrier assemblies
Precision locknuts

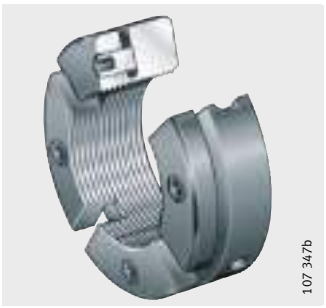
Seal carrier assemblies

DRS

Precision locknuts

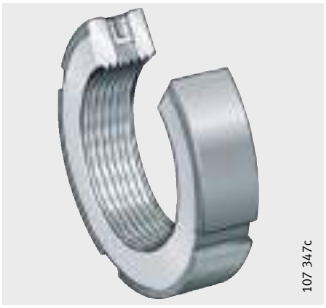
For axial locking

AM



For radial locking

ZM, ZMA



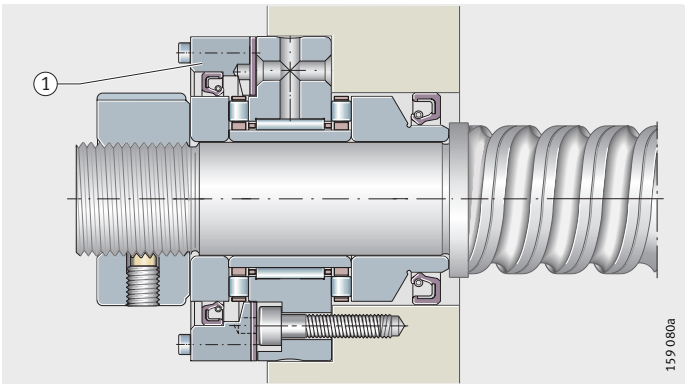
Seal carrier assemblies
Precision locknuts

Features

Seal carrier assemblies

Seal carrier assemblies DRS are screw mounted to the outer ring of needle roller/axial cylindrical roller bearings ZARF(L) and precisely centred in this position, *Figure 1*, ①. They seal the bearings against outside influences.

The sealing elements are supplied as a complete kit and comprise a seal carrier with an integral rotary shaft seal, a gasket and hexagonal socket cap screws for fixing the carrier to the central washer of the bearing.



① Seal carrier assembly DRS

DRS
ZMA
ZARF..-L

Figure 1
Needle roller/ axial cylindrical roller bearing, seal carrier assembly, locknut

Operating temperature

Seal carrier assemblies are suitable for operating temperatures from –30 °C to +120 °C, restricted by the seal material.

Seal carrier assemblies
Precision locknuts

Precision locknuts

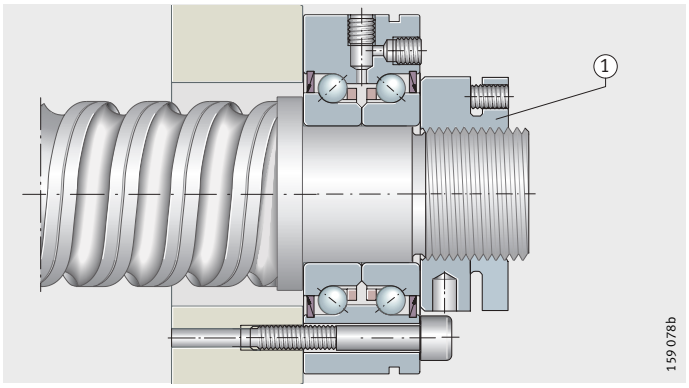
Precision locknuts are used where high axial forces must be supported and high runout accuracy and rigidity are required, *Figure 2*, ①, *Figure 3*, ①.

The thread and the axial face of the locknut in contact with the rolling bearing are produced in a single clamping operation. This allows very high runout accuracy to be achieved.

Locknuts are available in the designs AM, ZM and ZMA. If handled correctly, they can be reused several times.

Axial locking by segments

Locknuts of series AM are divided into several segments for applying the locking forces. When the hexagonal socket set screws are tightened, the segments are elastically deformed. As a result, the thread flanks of the segments are pressed against the flanks of the shaft thread and give a high frictional force that acts to prevent loosening of the nut. The runout of the nut is not affected by this method of locking.



① Precision locknut AM

AM
ZKLF..-2RS

Figure 2

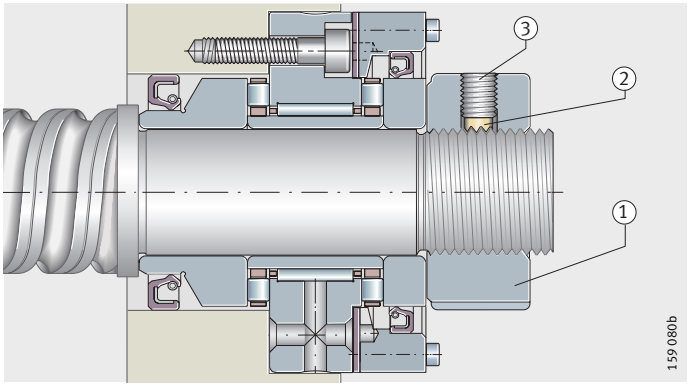
Axial angular contact ball bearing ZKLF with locknut

Locking by radial locking pegs

Locknuts ZM and ZMA are secured against rotation by means of two radially acting locking pegs, *Figure 3*, ①.
ZMA is the heavy series.

The locking pegs are manufactured together with the internal thread of the locknut. They mesh in the thread of the shaft without affecting the runout or damaging the thread, *Figure 3*, ②.

The locking pegs are secured by set screws with a hexagonal socket arranged concentrically over the locking pegs, *Figure 3*, ③.



① Precision locknut ZMA
② Locking peg
③ Set screw

DRS
ZMA
ZARF..-L

Figure 3

Needle roller/ axial cylindrical roller bearing ZARF with seal carrier assembly, locknut

Design and safety guidelines

Shaft threads for the precision locknuts must be precision machined; see table.

Recommended shaft thread

Shaft thread	
Tolerance class “medium”	Tolerance class “fine”
6g DIN 13 T21-24	4h DIN 13 T21-24

Caution! The journal thread must support the locknut over its whole width.

Breakaway torque

The breakaway torques M_L given in the dimension tables are based on a locknut tightened against a rigid shaft shoulder to the reference tightening torque M_{AL} and secured.

Ultimate axial load

The ultimate axial loads F_{aB} are valid for a journal thread with a tolerance of 6g or better and a minimum strength of 700 N/mm^2.

For dynamic loading, the permissible value can be taken as 75% of the ultimate axial load F_{aB}.

Fitting and dismantling

Caution! For the fitting and dismantling of bearings and precision locknuts, the information in Fitting and Maintenance Manual TPI 100 must be observed.

Locknuts must be fully screwed onto the shaft thread.

Precision locknuts with axial locking

Locknuts AM can be tightened using a hook wrench to DIN 1810B that engages in four, six or eight holes around the circumference.

The set screws are then tightened in a crosswise sequence to the specified tightening torque M_m using an Allan key. Dismantling is carried out by uniformly loosening set screws of all segments in order to prevent a single segment being left tensioned.

Caution! Tightening by means of just one segment is not permissible. For tightening, an adapter of series AMS can be used that ensures uniform loading of all segments. The adapter AMS must be ordered separately, see dimension table, page 985.

For tightening using the adapter AMS, a hook wrench to DIN 1810A or to DIN 1810B can be used.

If precision locknuts AM are fitted using the adapter AMS, a maximum tightening torque of twice the value given in the dimension table for the bearing is permissible.

Segments can be axially deformed if the set screws are not tightened uniformly in a crosswise sequence or the locknut AM is not fully screwed onto the shaft thread. The specified tightening torque M_m according to the dimension table must be observed.

Seal carrier assemblies
Precision locknuts

Precision locknuts with radial locking

Locknuts ZM and ZMA can be tightened using a hook wrench to DIN 1810A that engages in one of the four slots around the circumference.

The two set screws are then tightened alternately to the specified tightening torque M_m using an Allan key; for M_m, see dimension tables for the bearings.

For dismantling, the two set screws are first loosened and the locking pegs loosened by light impacts with a plastic hammer on the outside surface of the locknut (in the vicinity of the screw holes).

The locknut can then be easily unscrewed without damaging the journal thread.

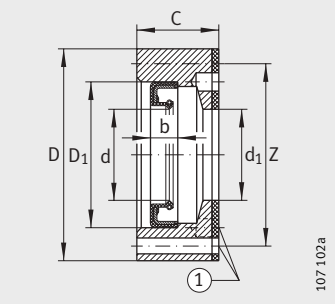
Accuracy

The accuracy of the precision locknuts is shown in the table.

Runout/thread

Axial runout Thread/axial face µm	Metric ISO thread “fine”
5	5H, DIN 13 T21-24

Seal carrier assemblies



DRS[1)]
① 4 holes, offset by 90°

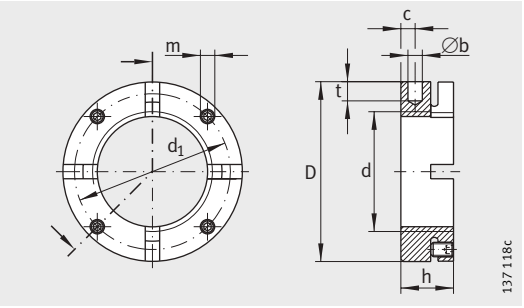
Dimension table · Dimensions in mm

Designation	Mass	Dimensions				Rotary shaft seal				Corresponding bearing in standard or L design
	m	D	C	d_1	Z[2)]	d	D_1	b	Socket head screws DIN 912	
	≈kg								each 4 pieces	Designation
DRS1560	0,16	60	14	35	52,4	35	45	7	M3X20	**ZARF1560-TV**
DRS1762	0,18	62	15,5	38	54,4	38	47	7	M3X25	**ZARF1762-TV**
DRS2068	0,11	68	17	42	60,4	42	55	8	M3X25	**ZARF2068-TV**
DRS2080	0,2	80	22	52	73,4	52	68	8	M3X30	**ZARF2080-TV**
DRS2575	0,16	75	17	47	67,4	47	62	6	M3X25	**ZARF2575-TV**
DRS2590	0,3	90	22	62	81	62	75	10	M3X30	**ZARF2590-TV**
DRS3080	0,15	80	17	52	73,4	52	68	8	M3X25	**ZARF3080-TV**
DRS30105	0,35	105	25	68	95	68	85	10	M4X35	**ZARF30105-TV**
DRS3590	0,15	90	19	60	80	60	72	8	M4X30	**ZARF3590-TV**
DRS35110	0,3	110	25	73	101	73	95	10	M3X30	**ZARF35110-TV**
DRS40100	0,25	100	19	65	90	65	80	8	M4X30	**ZARF40100-TV**
DRS40115	0,5	115	27,5	78	106	78	100	10	M3X35	**ZARF40115-TV**
DRS45105	0,3	105	20	70	95	70	85	8	M4X30	**ZARF45105-TV**
DRS45130	0,7	130	31	90	120	90	110	12	M4X40	**ZARF45130-TV**
DRS50115	0,2	115	20	78	106	78	100	10	M3X30	**ZARF50115-TV**
DRS50140	0,8	140	30	95	127,5	95	115	13	M5X40	**ZARF50140-TV**
DRS55145	0,9	145	30	100	132,5	100	120	12	M5X40	**ZARF55145-TV**
DRS60150	0,9	150	30	105	137,5	105	125	12	M5X40	**ZARF60150-TV**
DRS65155	1	155	30	110	142,5	110	130	12	M5X40	**ZARF65155-TV**
DRS70160	1	160	30	115	147,5	115	135	13	M5X40	**ZARF70160-TV**
DRS75185	1,8	185	36	135	172,5	135	160	15	M5X50	**ZARF75185-TV**
DRS90210	2,7	210	38	160	194	160	180	15	M5X50	**ZARF90210-TV**

1) The seal carrier assembly is supplied as a kit comprising:
– seal carrier
– rotary shaft seal
– flange seal
– socket head screws.

2) Four holes offset by 90°.

Precision locknuts



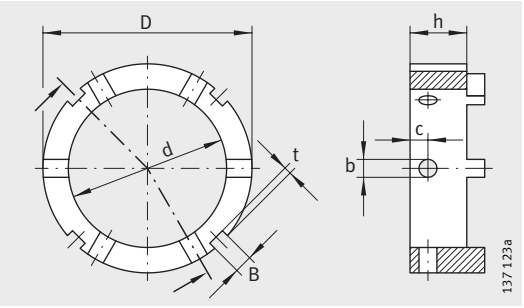
AM15 to AM40 with 4 segments
AM45 to AM90 with 6 segments
AM100 to AM130 with 8 segments

Dimension table · Dimensions in mm

Designation	Nut thread	Mass	Dimensions							Grub screw	Locknut[1]			
										Tightening torque	Axial rupture load	Tightening torque	Reference tightening torque	Mass moment of inertia
		m	D	h	b	t	d_1	c	m	M_m	F_{aB}	M_L at	M_{AL}	M_M
	d	≈kg			H11					Nm	N	Nm	Nm	kg · cm²
AM15	**M15X1**	0,06	30	18	4	5	24	5	M5	3	100 000	20	10	0,09
AM17	**M17X1**	0,07	32	18	4	5	26	5	M5	3	120 000	25	15	0,11
AM20	**M20X1**	0,13	38	18	4	6	31	5	M6	5	145 000	45	18	0,23
AM25	**M25X1,5**	0,16	45	20	5	6	38	6	M6	5	205 000	60	25	0,49
AM30	**M30X1,5**	0,20	52	20	5	7	45	6	M6	5	250 000	70	32	0,86
AM30/65	**M30X1,5**	0,50	65	30	6	8	45	6	M6	5	400 000	70	32	2,8
AM35/58	**M35X1,5**	0,23	58	20	5	7	51	6	M6	5	280 000	90	40	1,3
AM35	**M35X1,5**	0,33	65	22	6	8	58	6	M6	5	330 000	100	40	2,4
AM40	**M40X1,5**	0,30	65	22	6	8	58	6	M6	5	350 000	120	55	2,3
AM40/85	**M40X1,5**	0,75	85	32	6	8	58	6	M6	5	570 000	120	55	7,6
AM45	**M45X1,5**	0,34	70	22	6	8	63	6	M6	5	360 000	220	65	2,9
AM50	**M50X1,5**	0,43	75	25	6	8	68	8	M6	5	450 000	280	85	4,3
AM55	**M55X2**	0,60	85	26	6	8	75	8	M8	15	520 000	320	95	7,7
AM60	**M60X2**	0,65	90	26	6	8	80	8	M8	15	550 000	365	100	9,4
AM65	**M65X2**	0,83	100	26	8	10	88	8	M8	15	560 000	400	120	14,6
AM70	**M70X2**	0,79	100	28	8	10	90	9	M8	15	650 000	450	130	14,7
AM75	**M75X2**	1,23	115	30	8	10	102	10	M10	20	750 000	610	150	29
AM80	**M80X2**	0,93	110	30	8	10	98	10	M10	20	670 000	770	160	21,3
AM85	**M85X2**	0,97	115	30	8	10	102	10	M10	20	690 000	930	180	24,8
AM90	**M90X2**	1,53	130	32	8	10	118	13	M10	20	900 000	1 100	200	48
AM100	**M100X2**	1,12	130	30	8	10	118	10	M10	20	740 000	1 200	250	38
AM110	**M110X2**	1,22	140	30	8	10	128	10	M10	20	770 000	1 300	250	48
AM120	**M120X2**	1,56	155	30	8	10	142	10	M10	20	880 000	1 450	250	75
AM130	**M130X2**	1,67	165	30	8	10	152	10	M10	20	900 000	1 600	250	92

[1] Note!
If precision locknuts AM are fitted using the adapter AMS,
a maximum tightening torque of twice the value given in the dimension table for the bearing is permissible.

Adapters

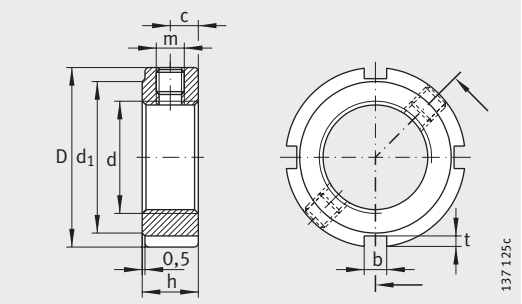


AMS

Dimension table · Dimensions in mm

Designation	Mass	Dimensions							For precision locknuts
	m ≈kg	D	h	d	b H11	c	B	t	
AMS20	0,047	32	14	22	4	5	4	2	**AM15, AM17, AM20**
AMS30	0,093	45	15	35	5	5	5	2	**AM25, AM30, AM35/58, AM30/65**
AMS40	0,217	65	16	45	6	6	6	2,5	**AM35, AM40**
AMS50	0,245	70	19	53	6	6	6	2,5	**AM45, AM50**
AMS60	0,37	85	20	65	6	6	7	3	**AM55, AM60**
AMS70	0,615	98	25	75	8	10	8	3,5	**AM65, AM70**
AMS80	0,755	110	25	85	8	10	8	3,5	**AM75, AM80, AM85**
AMS90	1,215	130	25	95	8	10	10	4	**AM90**
AMS110	0,74	130	25	110	8	10	10	4	**AM100, AM110**
AMS130	1,485	155	25	130	8	10	12	5	**AM120, AM130**

Precision locknuts



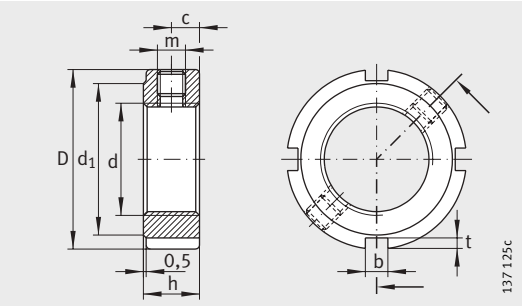
ZM, ZMA

Dimension table · Dimensions in mm

Designation	Thread	Mass	Dimensions							Grub screw	Locknut			
										Tightening torque	Axial rupture load	Tightening torque	Reference tightening torque	Mass moment of inertia
		m	D	h	b	t	d_1	c	m	M_m	F_{aB}	M_L at	M_{AL}	M_M
		≈kg								Nm	N	Nm	Nm	kg · cm^2
ZM06	**M6X0,5**	0,01	16	8	3	2	11	4	M4	1	17 000	20	2	0,004
ZM08[1]	**M8X0,75**	0,01	16	8	3	2	11	4	M4	1	23 000	25	4	0,004
ZM10[1]	**M10X1**	0,01	18	8	3	2	14	4	M4	1	31 000	30	6	0,006
ZM12	**M12X1**	0,015	22	8	3	2	18	4	M4	1	38 000	30	8	0,013
ZM15	**M15X1**	0,018	25	8	3	2	21	4	M4	1	50 000	30	10	0,021
ZMA15/33	**M15X1**	0,08	33	16	4	2	28	8	M5	3	106 000	30	10	0,14
ZM17	**M17X1**	0,028	28	10	4	2	23	5	M5	3	57 000	30	15	0,401
ZM20	**M20X1**	0,035	32	10	4	2	27	5	M5	3	69 000	40	18	0,068
ZMA20/38	**M20X1**	0,12	38	20	5	2	33	10	M5	3	174 000	40	18	0,297
ZMA20/52	**M20X1**	0,32	52	25	5	2	47	12,5	M5	3	218 000	40	18	1,38
ZM25	**M25X1,5**	0,055	38	12	5	2	33	6	M6	5	90 000	60	25	0,157
ZMA25/45	**M25X1,5**	0,16	45	20	5	2	40	10	M6	5	211 000	60	25	0,572
ZMA25/58	**M25X1,5**	0,43	58	28	6	2,5	52	14	M6	5	305 000	60	25	2,36
ZM30	**M30X1,5**	0,075	45	12	5	2	40	6	M6	5	112 000	70	32	0,304
ZMA30/52	**M30X1,5**	0,22	52	22	5	2	47	11	M6	5	270 000	70	32	1,1
ZMA30/65	**M30X1,5**	0,55	65	30	6	2,5	59	15	M6	5	390 000	70	32	3,94
ZM35	**M35X1,5**	0,099	52	12	5	2	47	6	M6	5	134 000	80	40	0,537
ZMA35/58	**M35X1,5**	0,26	58	22	6	2,5	52	11	M6	5	300 000	80	40	1,66
ZMA35/70	**M35X1,5**	0,61	70	30	6	2,5	64	15	M6	5	460 000	80	40	5,2
ZM40	**M40X1,5**	0,14	58	14	6	2,5	52	7	M6	5	157 000	95	55	0,945
ZMA40/62	**M40X1,5**	0,27	62	22	6	2,5	56	11	M8	15	310 000	95	55	2,07
ZMA40/75	**M40X1,5**	0,67	75	30	6	2,5	69	15	M8	15	520 000	95	55	6,72
ZM45	**M45X1,5**	0,17	65	14	6	2,5	59	7	M6	5	181 000	110	65	1,48
ZMA45/68	**M45X1,5**	0,35	68	24	6	2,5	62	12	M8	15	360 000	110	65	3,2
ZMA45/85	**M45X1,5**	0,92	85	32	7	3	78	16	M8	15	630 000	110	65	11,9
ZM50	**M50X1,5**	0,19	70	14	6	2,5	64	7	M6	5	205 000	130	85	1,92
ZMA50/75	**M50X1,5**	0,43	75	25	6	2,5	68	12,5	M8	15	415 000	130	85	4,89
ZMA50/92	**M50X1,5**	1,06	92	32	8	3,5	84	16	M8	15	680 000	130	85	16,1
ZM55	**M55X2**	0,23	75	16	7	3	68	8	M6	5	229 000	150	95	2,77
ZMA55/98	**M55X2**	1,17	98	32	8	3,5	90	16	M8	15	620 000	150	95	20,5

[1] When clamped, the grub screw protrudes by approx. 0,5 mm.

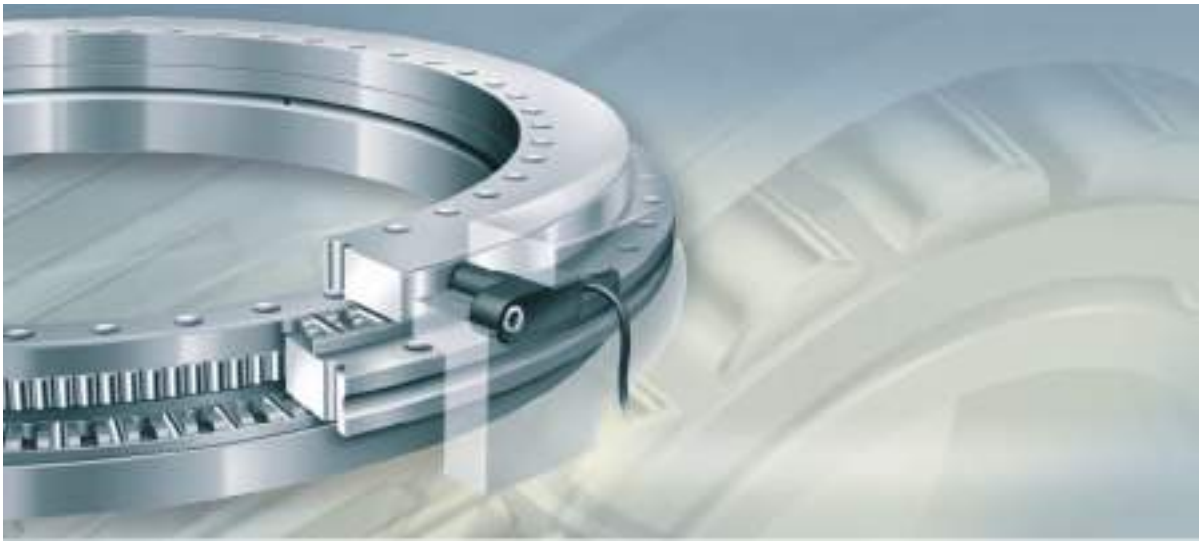
Precision locknuts



ZM, ZMA

Dimension table (continued) · Dimensions in mm

Designation	Thread	Mass	Dimensions							Grub screw	Locknut			
										Tightening torque	Axial rupture load	Tightening torque	Reference tightening torque	Mass moment of inertia
		m	D	h	b	t	d_1	c	m	M_m	F_{aB}	M_L at	M_{AL}	M_M
		≈kg								Nm	N	Nm	Nm	kg · cm^2
ZM60	**M60X2**	0,25	80	16	7	3	73	8	M6	5	255 000	180	100	3,45
ZMA60/98	**M60X2**	1,07	98	32	8	3,5	90	16	M8	15	680 000	180	100	19,6
ZM65	**M65X2**	0,27	85	16	7	3	78	8	M6	5	280 000	200	120	4,24
ZMA65/105	**M65X2**	1,21	105	32	8	3,5	97	16	M8	15	750 000	200	120	25,6
ZM70	**M70X2**	0,36	92	18	8	3,5	85	9	M8	15	305 000	220	130	6,61
ZMA70/110	**M70X2**	1,4	110	35	8	3,5	102	17,5	M8	15	810 000	220	130	33
ZM75	**M75X2**	0,4	98	18	8	3,5	90	9	M8	15	331 000	260	150	8,41
ZMA75/125	**M75X2**	2,11	125	38	8	3,5	117	19	M8	15	880 000	260	150	62,2
ZM80	**M80X2**	0,46	105	18	8	3,5	95	9	M8	15	355 000	285	160	11,2
ZMA80/120	**M80X2**	1,33	120	35	8	4	105	17,5	M8	15	810 000	285	160	44,6
ZM85	**M85X2**	0,49	110	18	8	3,5	102	9	M8	15	385 000	320	190	13,1
ZM90	**M90X2**	0,7	120	20	10	4	108	10	M8	15	410 000	360	200	21,8
ZMA90/130	**M90X2**	2,01	130	38	10	4	120	19	M8	15	910 000	360	200	64,1
ZMA90/155	**M90X2**	3,36	155	38	10	4	146	19	M8	15	1 080 000	360	200	150
ZM100	**M100X2**	0,77	130	20	10	4	120	10	M8	15	465 000	425	250	28,6
ZMA100/140	**M100X2**	2,23	140	38	12	5	128	19	M10	20	940 000	425	250	82,8
ZM105	**M105X2**	1,05	140	22	12	5	126	11	M10	20	495 000	475	300	44,5
ZM110	**M110X2**	1,09	145	22	12	5	133	11	M10	20	520 000	510	350	50,1
ZM115	**M115X2**	1,13	150	22	12	5	137	11	M10	20	550 000	550	400	56,2
ZM120	**M120X2**	1,28	155	24	12	5	138	12	M10	20	580 000	600	450	68,4
ZM125	**M125X2**	1,33	160	24	12	5	148	12	M10	20	610 000	640	500	76,1
ZM130	**M130X2**	1,36	165	24	12	5	149	12	M10	20	630 000	700	550	84,3
ZM140	**M140X2**	1,85	180	26	14	6	160	13	M12	38	690 000	800	600	133
ZM150	**M150X2**	2,24	195	26	14	6	171	13	M12	38	750 000	900	650	188



High precision bearings for combined loads

Axial/radial bearings
Axial angular contact ball bearings
Axial/radial bearings
with integral angular measuring system

High precision bearings for combined loads

Axial/radial bearings

Axial/radial bearings are double direction axial bearings for screw mounting, with a radial guidance bearing. These ready-to-fit, pregreased units are very rigid, have high load carrying capacity and run with particularly high accuracy. They can support radial forces, axial forces from both directions and tilting moments free from clearance. The bearings are available in several series.

For applications with low speeds and small operating durations – such as indexing tables and swivel type milling heads – series YRT is generally the most suitable.

Where comparatively lower friction and high speeds are required, RTC bearings can be used. For higher requirements in accuracy, these bearings are also available with restricted axial runout accuracy.

For the bearing arrangements of direct drive axes, there is the series YRT_{Speed}. Due to their high limiting speeds and very low, uniform frictional torque across the whole speed range, these bearings are particularly suitable for combination with torque motors.

Axial angular contact ball bearings

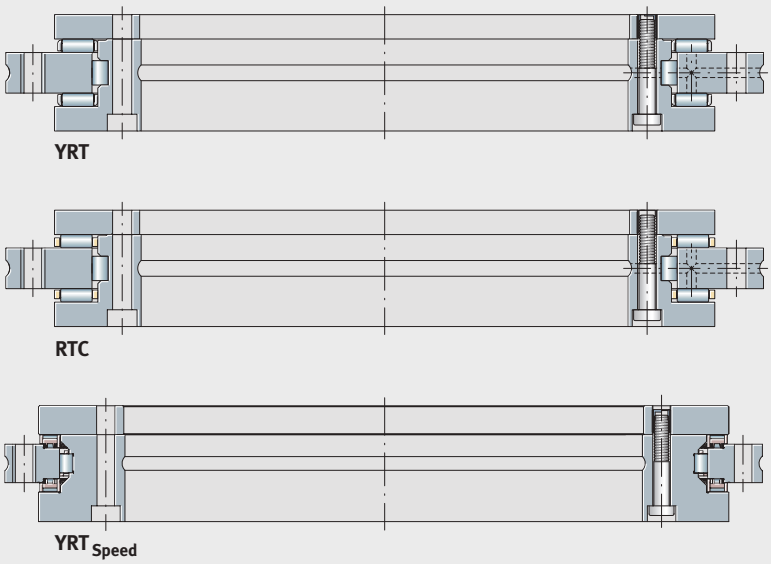
Axial angular contact ball bearings ZKLDF are low-friction, ready-to-fit, pregreased bearing units with high accuracy for very high speeds, high axial and radial loads and high demands on tilting rigidity.

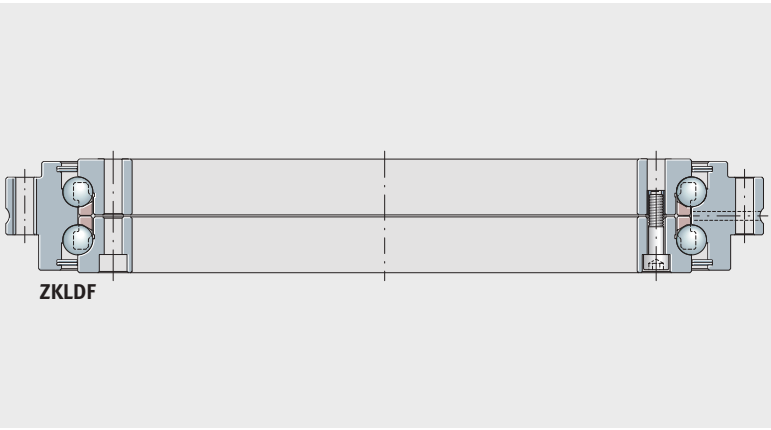
Axial angular contact ball bearings are particularly suitable for precision applications involving combined loads. Their preferred areas of use are bearing arrangements in rotary tables, milling, grinding and honing heads as well as measurement and testing equipment.

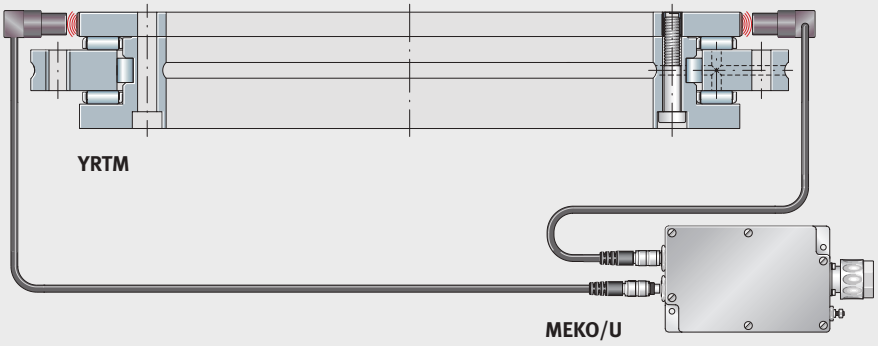
Axial/radial bearings with integral angular measuring system

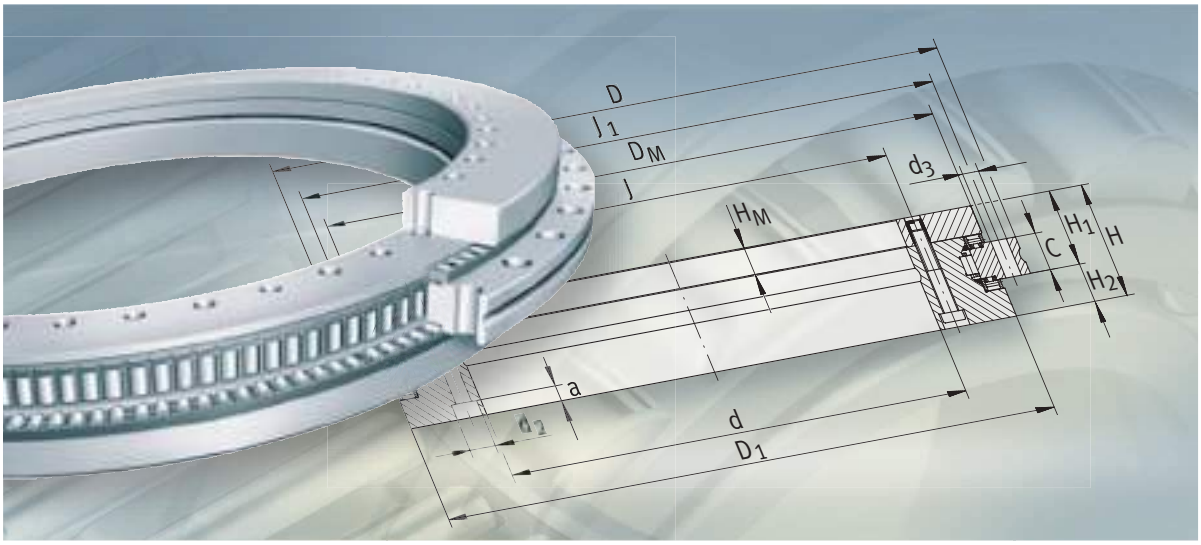
Axial/radial bearings with integral measuring system YRTM correspond in mechanical terms to series YRT but are additionally fitted with an angular measuring system. The measuring system can measure angles to an accuracy of a few angular seconds by non-contact, magneto-resistive means.

The unit comprises an axial/radial bearing with a dimensional scale and a MEKO/U electronic measuring system. The electronic measuring system consists of two measuring heads and an electronic evaluation system.


YRT
RTC
YRT Speed
107 584


ZKLDF
107 585


YRTM
MEKO/U
107 586



Axial/radial bearings
Axial angular contact ball bearings

Axial/radial bearings
Axial angular contact ball bearings

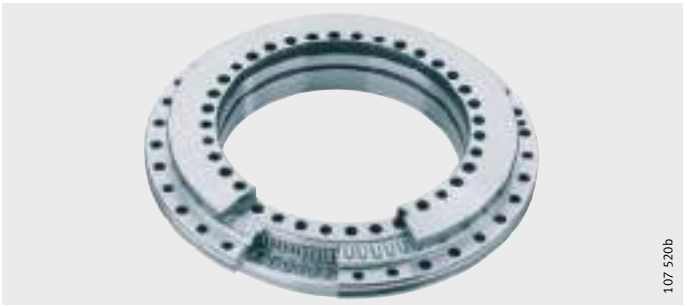
Product overview

Axial/radial bearings
Axial angular contact ball bearings

Axial/radial bearings

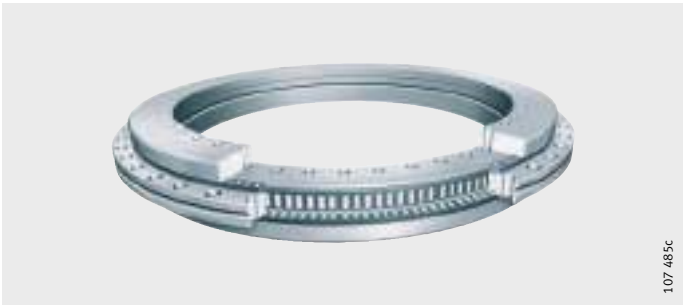
YRT

RTC



For higher speeds

YRT_{Speed}



Axial angular contact ball bearings

ZKLDF

Axial/radial bearings
Axial angular contact ball bearings

Features

Axial/radial bearings YRT, RTC and YRT_{Speed} and axial angular contact ball bearings ZKLDF are ready-to-fit high precision bearings for high precision applications with combined loads.
They can support radial loads, axial loads from both sides and tilting moments without clearance and are particularly suitable for bearing arrangements for running accuracy, such as rotary tables, face plates, milling heads and reversible clamps.

Due to the fixing holes in the bearing rings, the units are very easy to fit.

The bearings are radially and axially preloaded after fitting.

The mounting dimensions of all series are identical.

With angular measuring system

Axial/radial bearings are also available with an angular measuring system. The measuring system can measure angles to an accuracy of a few angular seconds by non-contact, magneto-resistive means, see page 1020.

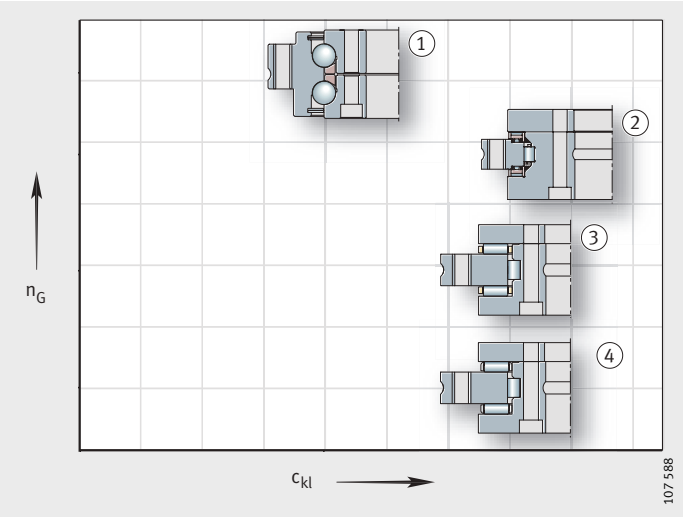
Areas of application

For standard applications with low speeds and small operating durations – such as indexing tables and swivel type milling heads – series YRT is generally the most suitable, *Figure 1*. These bearings are available in two axial and radial runout accuracies.

Where comparatively lower friction and higher speeds are required, RTC bearings can be used, *Figure 1*. For higher requirements in accuracy, these bearings are also available with restricted axial runout accuracy.

For the bearing arrangements of direct drive axes, there is the series YRT_{Speed}. Due to their high limiting speeds and very low, uniform frictional torque across the whole speed range, these bearings are particularly suitable for combination with torque motors, *Figure 1*.

Axial angular contact ball bearings ZKLDF are particularly suitable for high speed applications with long operating duration, *Figure 1*. They are characterised by high tilting rigidity, low friction and low lubricant consumption.



① ZKLDF
② YRT_{Speed}
③ RTC
④ YRT
n_G = limiting speed
c_{kl} = tilting rigidity

Figure 1
Speed and tilting rigidity – comparison

Axial/radial bearings
Axial angular contact ball bearings

Axial/radial bearings

Axial/radial bearings YRT, RTC and YRT_{Speed} have an axial component and a radial component.

The axial component comprises an axial needle roller or cylindrical roller and cage assembly, an outer ring, L-section ring and shaft locating washer and is axially preloaded after fitting.

The radial component is a full complement (YRT, RTC) or cage-guided, preloaded cylindrical roller set. The outer ring, L-section ring and shaft locating washer have fixing holes.

The unit is located by means of retaining screws for transport and safe handling.

Sealing/lubricant

Axial/radial bearings are supplied without seals.

Bearings of series YRT and YRT_{Speed} are greased using a lithium complex soap grease to GA08 and can be lubricated via the outer ring and L-section ring.

Bearings of series RTC are greased with Arcanol MULTITOP.

Axial angular contact ball bearings

Axial angular contact ball bearings ZKLDF comprise a single-piece outer ring, a two-piece inner ring and two ball and cage assemblies with a contact angle of 60°. The outer ring and inner ring have fixing holes for screw mounting of the bearing on the adjacent construction.

The unit is located by means of retaining screws for transport and safe handling.

Sealing/lubricant

Axial angular contact ball bearings have sealing shields on both sides. They are greased using a barium complex soap grease to DIN 51825–KPE2K–30 and can be lubricated via the outer ring.

Operating temperature

Axial/radial bearings and axial angular contact ball bearings are suitable for operating temperatures from –30 °C to +120 °C.

Suffixes

Suffixes and additional text for available designs: see table.

Available designs

Suffixes	Description	Design
H_1 ...	Reduced tolerance on mounting dimension H_1 (postscript: H_1 with tolerance ± ...) Restricted tolerance value according to table, page 1010	Special design[1)]
H_2 ...	Reduced tolerance on mounting dimension H_2 (postscript: H_2 with tolerance ± ...) Restricted tolerance value according to table, page 1010	Special design[1)]
–	Axial and radial runout tolerances restricted by 50% (additional text: axial/radial runout 50%)	Special design[1)]

1) Available by agreement.

Design and safety guidelines

Basic rating life

The load carrying capacity and life must be checked for the radial and axial bearing component.

Please contact us in relation to checking of the basic rating life. The speed, load and operating duration must be given.

Static load safety factor

The static load safety factor S_0 indicates the security against impermissible permanent deformations in the bearing.

It is determined as follows:

$$S_0 = \frac{C_{0r}}{F_{0r}} \text{ or } \frac{C_{0a}}{F_{0a}}$$

S_0 –
Static load safety factor

C_{0r}, C_{0a} N
Basic static load rating according to dimension tables

F_{0r}, F_{0a} N
Maximum static load on the radial or axial bearing.

Caution! In machine tools and similar areas of application, S_0 should be > 4.

Static limiting load diagrams

The static limiting load diagrams can be used:

- for rapid checking of the selected bearing size under predominantly static load
- for calculation of the tilting moment M_k that can be supported by the bearing in addition to the axial load.

The limiting load diagrams are based on a rolling element set with a static load safety factor $S_0 \geqq 4$, as well as the screw and bearing ring strength.

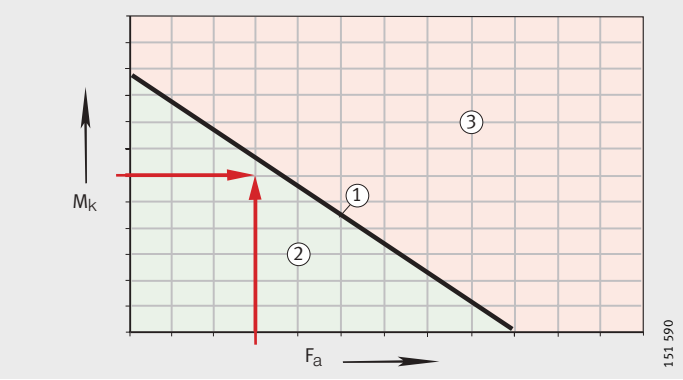
Caution! The static limiting load must not be exceeded when dimensioning the bearing arrangement. Example: see *Figure 2*.

Axial/radial bearings

The static limiting load diagrams for YRT, YRTS and RTC are shown in *Figure 3*, page 998 to *Figure 9*, page 1000.

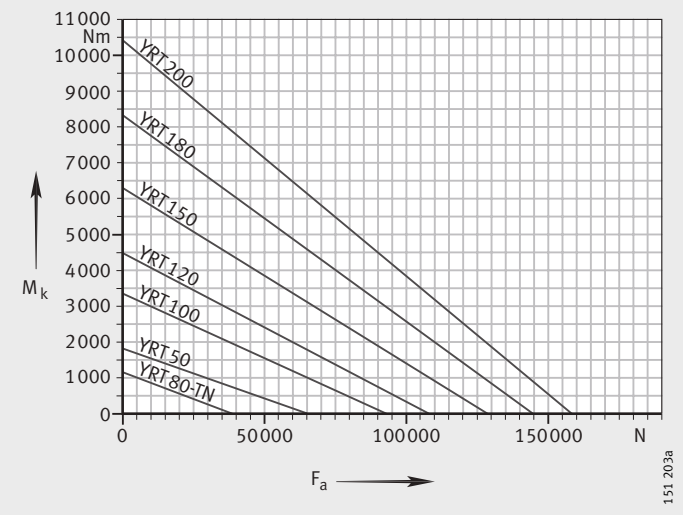
Axial angular contact ball bearings

The static limiting load diagrams for the series ZKLDF are shown in *Figure 10* and *Figure 11*, page 1001.



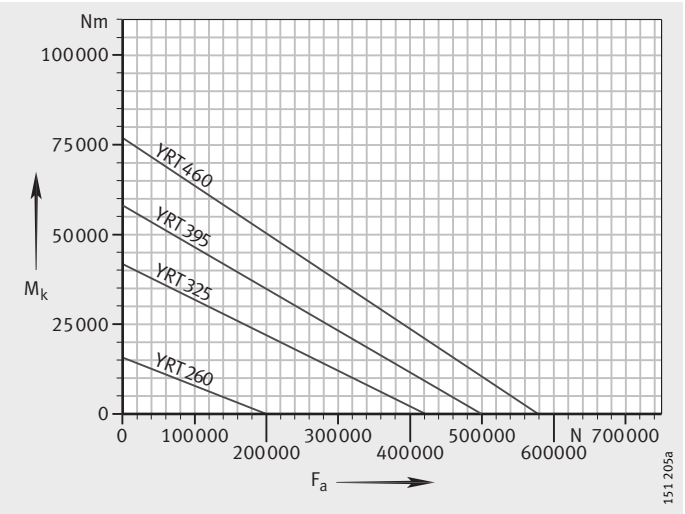
① Bearing/size
② Permissible range
③ Impermissible range
M_k = max. tilting moment
F_a = axial load

Figure 2
Static limiting load diagram – example



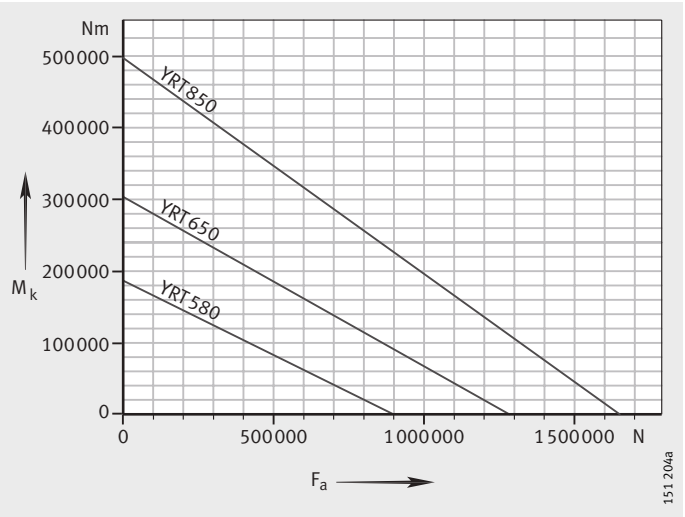
M_k = max. tilting moment
F_a = axial load

Figure 3
Static limiting load diagram – YRT50 to YRT200



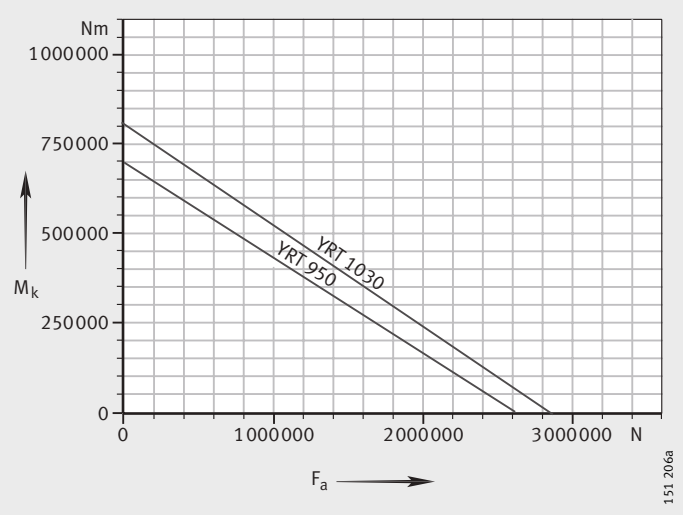
M_k = max. tilting moment
F_a = axial load

Figure 4
Static limiting load diagram – YRT260 to YRT460



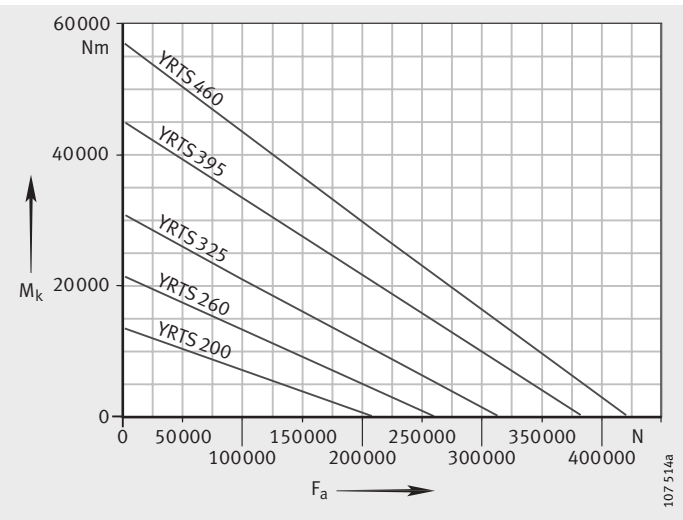
M_k = max. tilting moment
F_a = axial load

Figure 5
Static limiting load diagram – YRT580 to YRT850



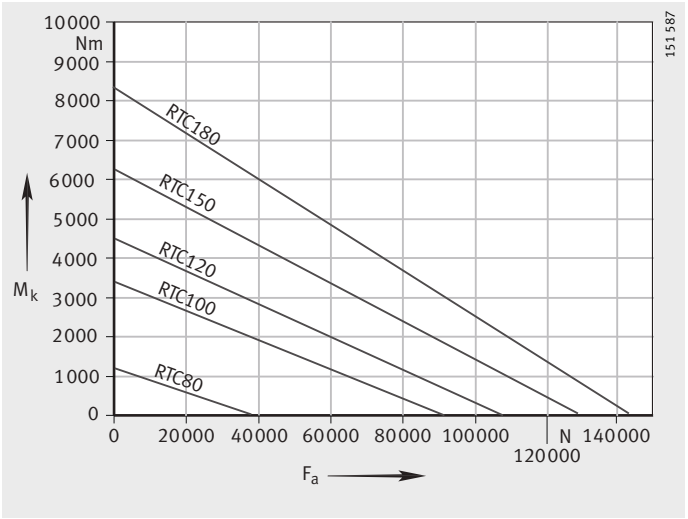
M_k = max. tilting moment
F_a = axial load

Figure 6
Static limiting load diagram – YRT950 and YRT1030



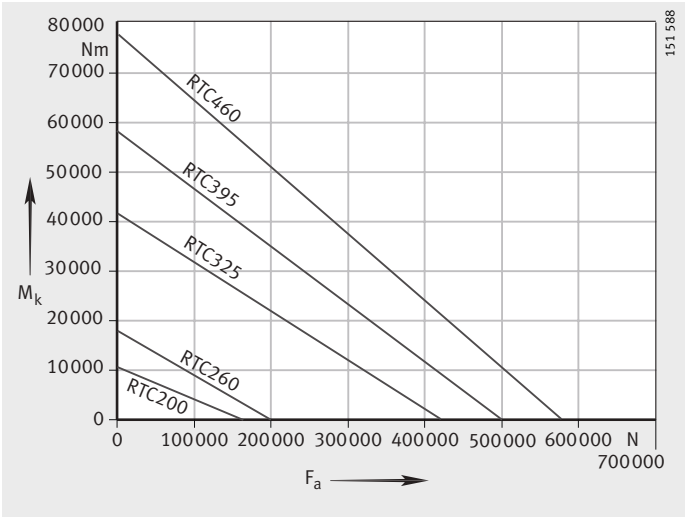
M_k = max. tilting moment
F_a = axial load

Figure 7
Static limiting load diagram – $YRT_{Speed}200$ to $YRT_{Speed}460$



M_k = max. tilting moment
F_a = axial load

Figure 8
Static limiting load diagram – RTC80 to RTC180



M_k = max. tilting moment
F_a = axial load

Figure 9
Static limiting load diagram – RTC200 to RTC460