Thrust bearings

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Thrust ball bearings

Definition and capabilities

Definition

Thrust ball bearings have a contact angle of 90° and are designed to withstand axial loads only. They must therefore often be associated with a radial bearing.

Single-direction ball thrust bearings withstand the axial load of a shaft in only one direction.

Thrust bearings are made of detachable elements: shaft-ring, housing-ring, ball-cage assembly.

Cages

Thrust bearings are equipped with a pressed steel cage.

Capabilities

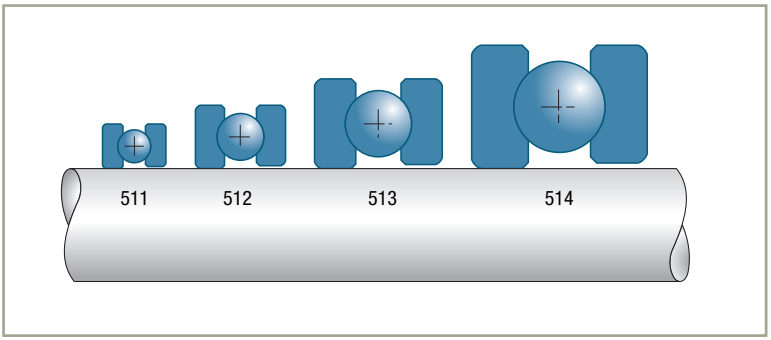
Loads and speeds

Can withstand axial loads only in one direction, and low speeds.

Misalignment

As the performance of a thrust bearing is related to the distribution of the load over the entire circumference, it is important to have virtually no misalignment between the shaft-ring and the housing-ring (misalignment angle less than 0.03°).

Series



Tolerances

In accordance with ISO 199 Standard, normal tolerance class.

Design criteria

Bearing life

Minimum dynamic axial load

To compensate for the effects of the centrifugal force being exerted on the balls, it is necessary to permanently exert on the thrusts an axial loading F_a whose minimal value F_{am} (in NR) is determined by the formula:

$$F_{am} = 10^{-14} (N \cdot C_0)^2$$

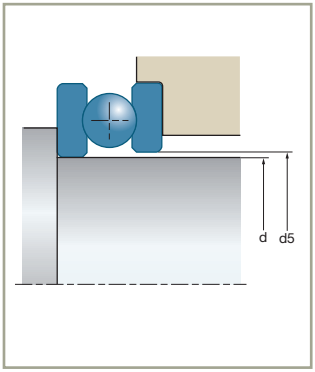
Maximum static axial capacity

This is defined by the basic static capacity C_0.

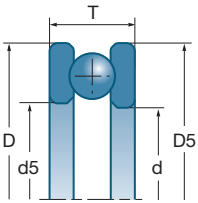
Installation/Assembly criteria

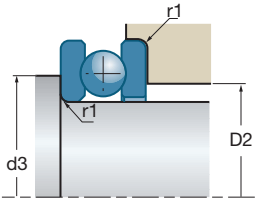
Fitting and adjustment

As the elements are detachable they are interchangeable. The shaftring is mounted on its seat with an interference fit. The housing-ring must be free to centre itself. To ease the correct position of the thrust bearing when fitting, the housing-ring has a bore diameter (d5) greater than that of the shaft-ring (d). If the axial load of the non-loaded thrust bearing is insufficient, a pre-load must be applied using springs to reach the minimum dynamic axial load defined above.



Thrust ball bearings *(continued)*

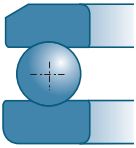




d		d5	D	D5	T	C	C_0
mm	References	mm	mm	mm	mm	10^3N	10^3N
10	51100	11	24	24	9	10.00	14.00
12	51101	13	26	26	9	10.30	15.40
15	51102 51202	16 17	28 32	28 32	9 12	10.50 15.70	16.80 24.40
17	51103 51203	18 19	30 35	30 35	9 12	11.30 16.20	19.60 26.60
20	51104 51204	21 22	35 40	35 40	10 14	15.00 22.30	26.60 37.70
25	51105 51205 51305 51405	26 27 27 27	42 47 52 60	42 47 52 60	11 15 18 24	18.10 27.80 35.70 55.50	35.50 50.50 61.50 89.40
30	51106 51206 51306 51406	32 32 32 32	47 52 60 70	47 52 60 70	11 16 21 28	18.80 29.40 42.70 72.70	39.90 58.20 78.70 126.00
35	51107 51207 51307 51407	37 37 37 37	52 62 68 80	52 62 68 80	12 18 24 32	20.10 39.10 55.50 86.90	46.60 78.20 105.00 155.00
40	51108 51208 51308	42 42 42	60 68 78	60 68 78	13 19 26	26.90 44.00 69.30	62.90 92.40 135.00
45	51109 51209 51309 51409	47 47 47 47	65 73 85 100	65 73 85 100	14 20 28 39	27.90 46.50 80.00 130.00	69.20 105.00 164.00 243.00
50	51110 51210	52 52	70 78	70 78	14 22	28.80 47.20	75.50 111.00
55	51111 51211 51311	57 57 57	78 90 105	78 90 105	16 25 35	34.80 69.40 119.00	93.20 159.00 246.00

Characteristics

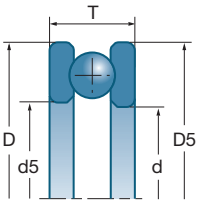
■ Thrust ball bearings with simple effect

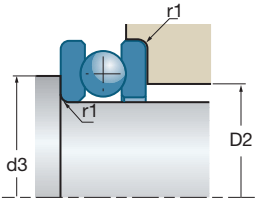


			d3 min	D2 max	r1 max	
References	rpm*	rpm*	mm	mm	mm	kg
51100	7900	10600	18	16	0.30	0.021
51101	7500	10000	20	18	0.30	0.023
51102 51202	7100 6000	9400 7900	23 25	20 22	0.30 0.60	0.025 0.042
51103 51203	7100 5600	9400 7500	25 28	22 24	0.30 0.60	0.025 0.050
51104 51204	6300 5000	8400 6700	29 32	26 28	0.30 0.60	0.038 0.078
51105 51205 51305 51405	5300 4500 3800 3200	7100 6000 5000 4200	35 38 41 46	32 34 36 39	0.60 0.60 1.00 1.00	0.058 0.110 0.167 0.340
51106 51206 51306 51406	5000 4000 3300 2700	6700 5300 4500 3500	40 43 48 54	37 39 42 46	0.60 0.60 1.00 1.00	0.065 0.133 0.270 0.530
51107 51207 51307 51407	4700 3500 2800 2200	6300 4700 3800 3000	45 51 55 62	42 46 48 53	0.60 1.00 1.00 1.10	0.081 0.203 0.377 0.790
51108 51208 51308	4200 3200 2700	5600 4200 3500	52 57 63	48 51 55	0.60 1.00 1.00	0.110 0.260 0.540
51109 51209 51309 51409	4000 3000 2400 1900	5300 4000 3200 2500	57 62 69 78	53 56 61 67	0.60 1.00 1.00 1.10	0.128 0.283 0.662 1.450
51110 51210	3800 2800	5000 3800	62 67	58 61	0.60 1.00	0.139 0.380
51111 51211 51311	3300 2500 1900	4500 3300 2500	69 76 85	64 69 75	0.60 1.00 1.10	0.220 0.590 1.350

* These are the speed limits according to the SNR concept (see pages 85 to 87).

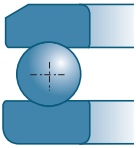
Thrust ball bearings *(continued)*





d		d5	D	D5	T	C	C_0
mm	References	mm	mm	mm	mm	10^3N	10^3N
60	51112 51312	62 62	85 110	85 110	17 35	41.40 124.00	113.00 270.00
65	51213 51313	67 67	100 115	100 115	27 36	74.90 128.00	189.00 287.00
70	51114 51214	72 72	95 105	95 105	18 27	43.10 76.10	127.00 199.00
75	51115 51215	77 77	100 110	100 110	19 27	44.50 77.30	136.00 209.00
80	51116 51216 51416	82 82 83	105 115 170	105 115 170	19 28 68	44.60 78.50 317.00	141.00 219.00 751.00
85	51117 51217	87 88	110 125	110 125	19 31	46.00 95.40	150.00 264.00
90	51118	92	120	120	22	59.70	190.00
100	51120	102	135	135	25	85.10	268.00
110	51122	112	145	145	25	87.30	288.00
120	51124	122	155	155	25	88.90	308.00
130	51126	132	170	170	30	119.00	406.00
150	51130	152	190	188	31	123.00	448.00
160	51132	162	200	198	31	125.00	476.00

Thrust ball bearings with simple effect *(continued)*



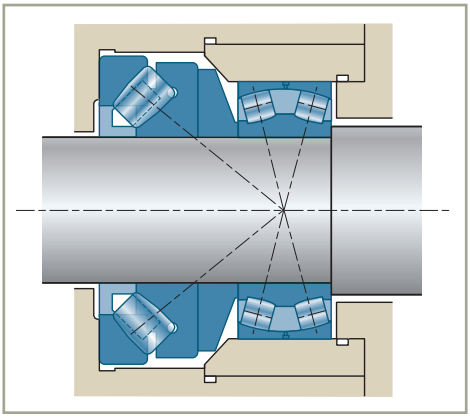
			d3 min	D2 max	r1 max	
References	rpm*	rpm*	mm	mm	mm	kg
51112 51312	3200 1900	4200 2500	75 90	70 80	1.00 1.10	0.257 1.450
51213 51313	2400 1800	3200 2400	86 95	79 85	1.00 1.10	0.729 1.550
51114 51214	2800 2200	3800 3000	85 91	80 84	1.00 1.00	0.354 0.783
51115 51215	2700 2200	3500 3000	90 96	85 89	1.00 1.00	0.398 0.827
51116 51216 51416	2700 2000 890	3500 2700 1200	95 101 133	90 94 116	1.00 1.00 2.10	0.430 0.908 7.300
51117 51217	2700 2000	3500 2700	100 109	95 101	1.00 1.00	0.442 1.300
51118	2000	2700	108	102	1.00	0.598
51120	2000	2700	121	114	1.00	0.974
51122	1900	2500	131	124	1.00	1.060
51124	1600	2100	141	134	1.00	1.140
51126	1400	1900	154	146	1.00	1.740
51130	1300	1800	174	166	1.00	2.000
51132	1300	1800	184	176	1.00	2.100

* These are the speed limits according to the SNR concept (see pages 85 to 87).

Spherical roller thrust bearings

Definition and capabilities

Definition



Spherical roller thrust bearings are made up of two detachable components: the shaft ring on which are mounted the cage and the spherical-tapered rolling elements, and the housing ring whose spherical raceway enables the bearing to swivel.

SNR Spherical roller thrust bearings are equipped with a a solid brass cage or sheet steel* centred (optimised E series) by a tube crimped in the bore of the shaft-washer. Eventually, SNR thrust bearings will be exclusively equipped with a sheet steel cage optimised E version.

When they are associated with a radial bearing (usually a double-row spherical roller bearing), their point of load application A must coincide with that of the bearing to permit self-alignment.

* Thrust bearings with metal sheet cage are interchangeable with competitors' designs.

Capabilities

Loads and speeds

- Very high axial load capacity
- Possibility of withstanding relatively high radial loads, of about half the value of the axial load, thanks to a high contact angle of about 50°
- Low speeds

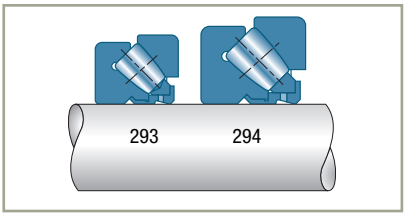
Misalignment

The self-alignment possibility provided by the spherical raceway of the housing-ring enables it to accept misalignment of about 3°. The misalignment may be limited, depending on the sealing system used.

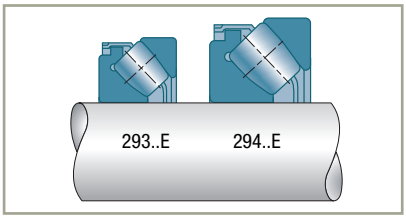
Bearing type	Permitted tilting
292...	2°
293...	2°30'
294...	3°

Series

Solid cage



Sheet steel cage



Tolerances

Spherical roller thrust bearings are manufactured in standard precision to the tolerances fixed for the ball thrust bearings (ISO 199).

Design criteria

■ **Bearing life**

■ **Minimum axial load**

To ensure smooth and slip-free rotation of the rollers, the thrust bearings must be subjected to a permanent minimum axial load F_{am} (in N) of:

$$F_{am} = 2 \cdot 10^{-16} (N \cdot C_0)^2$$

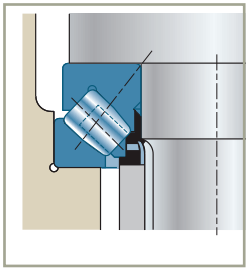
If the operating axial load is less than the minimum axial load, pre-load the thrust bearing with springs.

Installation/Assembly criteria

The elements are detachable and interchangeable.

The shaft-ring is interference-fitted on its seat. The other ring is centred in its housing if the thrust bearing is not associated with another radial bearing.

Conversely, if centring is secured by a radial bearing, the thrust bearing housing-ring must be free to centre itself.



■ **Lubrication**

Spherical roller thrust bearings usually have to work under very high loads needing oil lubrication.

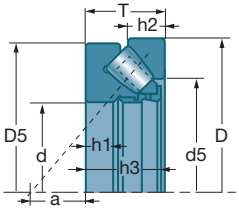
In view of the internal design of this type of thrust bearing, lubrication with grease can only be considered for low speeds of rotation and moderate loads.

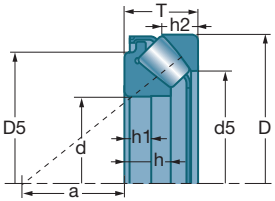
■ **Maximum permissible axial load on the cage centring tube**

In certain assemblies, because the mild-steel cage centring tube acts as a seat for a spacer-type washer, it must be checked that the axial thrust load does not exceed the values indicated below:

- 0.4 C_0 for thrust bearings 29300
- 0.5 C_0 for thrust bearings 29400

Spherical roller thrust bearings *(continued)*

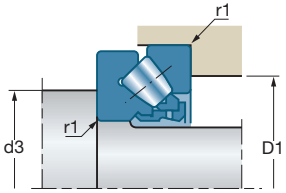


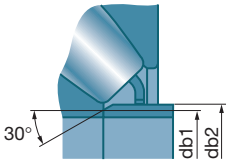


d		D	T	D5	d5	h	h1	h2	h3	a
mm	Références	mm	mm	mm	mm	mm	mm	mm	mm	mm
60	29412 E	130	42	88,0	112,3	27,0	15,0	20,5		38,0
65	29413 E	140	45	96,5	122,8	29,5	16,0	22,0		42,0
70	29414 E	150	48	105,0	131,6	31,0	17,0	23,0		44,0
75	29415 E	160	51	109,0	141,8	33,5	18,0	24,0		47,0
80	29416 E	170	54	117,0	150,8	35,0	19,0	24,0		50,0
85	29417 E	180	58	123,0	160,6	37,0	19,0	28,0		54,0
90	29418 E	190	60	130,0	170,8	39,0	22,0	29,0		56,0
100	29320 E 29420 E	170 210	42 67	128,0 144,5	149,9 189,8	26,2 43,0	15,0 24,0	20,5 32,0		58,0 62,0
110	29322 29322 E 29422 E	190 190 230	48 48 73	143,0 140,5 159,0	176,0 171,0 211,5	 30,3 47,0	16,0 16,0 27,0	23,0 23,0 35,0	45,5	64,0 64,0 69,0
120	29324 29424 E	210 250	54 78	157,5 173,0	194,0 227,8	 50,5	18,0 29,0	26,0 37,0	51,0	70,0 74,0
130	29326 29326 E 29426 E	225 225 270	58 58 85	170,0 165,7 188,0	205,0 199,7 245,4	 36,7 54,0	19,0 21,0 31,0	28,0 30,1 41,0	55,0	76,0 76,0 81,0
140	29328 29328 E 29428 E	240 240 280	60 60 85	183,0 178,8 196,5	219,0 213,7 254,0	 38,5 54,0	20,0 22,0 32,0	29,0 30,0 41,0	57,0	82,0 82,0 86,0
150	29330 29330 E 29430 E	250 250 300	60 60 90	193,0 189,6 209,5	229,0 222,5 273,0	 38,0 58,0	20,0 22,0 34,0	29,0 28,0 44,0	57,0	87,0 87,0 92,0
160	29332 29332 E 29432	270 270 320	67 67 95	207,0 202,3 226,0	248,0 243,6 306,0	 42,0	23,0 24,0 34,0	32,0 33,0 45,0	64,0 91,0	92,0 92,0 99,0

Characteristics

Spherical roller thrust bearings

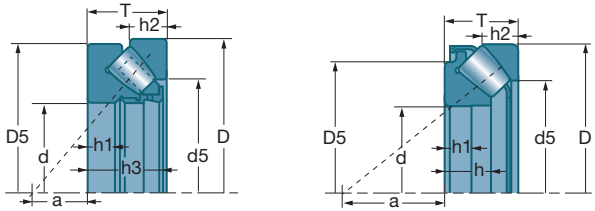




References	10^3N C	10^3N C_0	rpm*	d3 min mm	D1 max mm	r1 max mm	db1 max mm	db2 max mm	kg
29412 E	335	951	2500	90	107	1,5	67	67	2,47
29413 E	405	1157	2300	100	117	2.0	72	72	3.26
29414 E	440	1280	2200	105	125	2.0	77.5	77.5	3.98
29415 E	512	1502	2000	115	133	2.0	82.5	82.5	4.90
29416 E	607	1636	1900	120	141	2.1	88	88	5.68
29417 E	692	1945	1800	130	151	2.1	94	94	6.67
29418 E	703	2172	1700	135	158	2.1	99	99	7.77
29320 E 29420 E	436 865	1402 2578	2100 1500	130 150	147 175	1.5 3.0	107 110	107 110	3.65 10.80
29322 29322 E 29422 E	475 570 1022	1520 1760 3078	1900 1900 1400	145 145 165	166 164 193	2.0 2.0 3.0	 113 120.5	 119.5 129	5.48 5.40 13.50
29324 29424 E	600 1180	1960 3590	1700 1300	160 180	184 209	2.1 4.0	 132	 141	7.58 17.50
29326 29326 E 29426 E	680 765 1395	2230 2950 4300	1600 1500 1200	170 175 195	198 194 227	2.1 2.1 4.0	 138 142.5	 145 153	9.30 9.08 21.60
29328 29328 E 29428 E	750 850 1509	2500 3150 4686	1500 1400 1100	185 185 205	211 208 236	2.1 2.1 4.0	 148 153	 155 162	11.00 10.50 23.00
29330 29330 E 29430 E	770 863 1626	2650 3230 5241	1400 1400 1000	195 195 220	222 219 253	2.1 2.1 4.0	 158 163	 165 175	11.50 10.90 23.00
29332 29332 E 29432	890 1040 1510	3050 3980 5000	1300 1200 1000	210 210 230	239 235 274	3.0 3.0 5.0	 169	 176	15.20 14.40 37.30

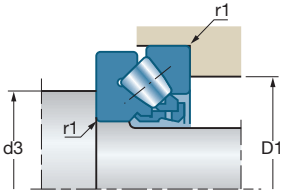
* These are the speed limits according to the SNR concept (see pages 85 to 87).

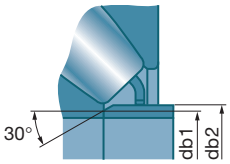
Spherical roller thrust bearings *(continued)*



d		D	T	D5	d5	h	h1	h2	h3	a
mm	Références	mm	mm	mm	mm	mm	mm	mm	mm	mm
170	29334	280	67	215,0	258,0		23,0	32,0	64,0	96,0
	29334 E	280	67	214,6	253,6	42,2	24,0	32,0		96,0
	29434	340	103	240,0	324,0		37,0	50,0	99,0	104,0
180	29336	300	73	231,0	277,0		25,0	35,0	69,0	103,0
	29336 E	300	73	228,3	270,4	46,0	26,0	35,5		103,0
	29436	360	109	255,0	342,0		39,0	52,0	105,0	110,0
190	29338 E	320	78	239,5	284,4	49,0	28,0	36,0		110,0
	29438	380	115	270,0	360,0		41,0	55,0	111,0	117,0
200	29340 E	340	85	253,6	302,8	53,5	29,0	40,0		110,0
	29440	400	122	284,0	380,0		43,0	59,0	117,0	122,0
220	29344 E	360	85	273,0	324,4	55,0	29,0	41,0		125,0
	29444	420	122	305,0	400,0		43,0	58,0	117,0	132,0
240	29348 E	380	85	294,8	343,7	54,0	29,0	40,5		135,0
	29448	440	122	321,0	420,0		43,0	59,0	117,0	142,0
260	29352 E	420	95	320,4	380,3	61,0	32,0	46,0		148,0
	29452	480	132	346,0	460,0		48,0	64,0	127,0	154,0
280	29356 E	440	95	342,1	401,7	62,0	32,0	45,0		158,0
	29456 E	520	145	370,0	468,9	95,0	52,0	70,0		166,0
300	29360 E	480	109	366,7	431,9	70,0	36,0	51,0		168,0
	29460 E	540	145	370,0	489,2	95,0	55,0	70,5		175,0
320	29364 E	500	109	387,0	456,1	68,0	37,0	53,0		180,0
	29464 E	580	155	422,0	525,6	102,0	55,0	74,5		191,0

Spherical roller thrust bearings *(continued)*





References	10^3N C	10^3N C_0	rpm*	d3 min mm	D1 max mm	r1 max mm	db1 max mm	db2 max mm	kg
29334	910	3200	1300	220	248	3.0			16.00
29334 E	1060	4100	1200	220	245	3.0	178	188	15.10
29434	1670	5500	950	245	291	5.0			43.70
29336	990	3500	1200	235	266	3.0			20.30
29336 E	1240	4810	1100	235	262	3.0	189	196	19.10
29436	1870	6300	900	260	307	5.0			52.00
29338 E	1437	4835	1100	250	280	4.0	200	209	23.30
29438	2030	6900	850	275	325	5.0			63.10
29340 E	1621	5475	1000	265	297	4.0	211	222	29.00
29440	2280	7800	800	290	343	5.0			69.00
29344 E	1744	6298	980	285	316	4.0	229	238	31.60
29444	2350	8300	750	310	364	6.0			74.00
29348 E	1786	6487	910	305	336	4.0	249	257	33.40
29448	2420	8700	700	330	383	6.0			83.00
29352 E	2238	8305	830	335	370	5.0	273	284	46.90
29452	2850	10300	660	360	419	6.0			105.00
29356 E	2211	8486	780	355	390	5.0	293	303	49.50
29456 E	4472	15751	620	395	446	6.0	300	319	127.00
29360 E	2650	11000	730	385	423	5.0	313	327	68.70
29460 E	4512	16458	580	415	465	6.0	319	339	133.00
29364 E	2850	10923	690	405	442	5.0	332	346	72.10
29464 E	5005	21200	540	450	500	7.5	344	366	164.00

* These are the speed limits according to the SNR concept (see pages 85 to 87).