



● Thrust Bearings

NTN



Single direction thrust ball bearings

Spherical roller thrust bearings

These bearings are designed primarily to support axial loads at contact angles between 30° and 90°. Just as with radial bearings, these bearings differ according to the type of rolling element they use: there are thrust ball bearings that use balls and thrust roller bearings that use rollers.

The configuration and characteristics of each type of bearing are given.

With thrust bearings, it is necessary to supply an axial preload in order to prevent slipping movement between the bearing's rolling elements and raceways. For more detailed information on this point, please refer to the material concerning bearing preload on page A-62.

1. Single direction thrust ball bearings

As shown in **Fig. 1**, the steel balls of single direction thrust ball bearings are arranged between a pair of shaft housing washers (bearing shaft washer and housing shaft washer), and the normal contact angle is 90°. Axial loads can be

Table 1 Standard cage types for single direction thrust ball bearings

Bearing series	511	512	513	514
Molded resin cage	51100 ~51107	51200 ~51207	—	—
Pressed cage	51108 ~51152	51208 ~51224	51305 ~51320	51405 ~51415
Machined cage	51156 ~511530	51226 ~51260	51322 ~51340	51416 ~51420

Note: Due to their material properties, molded resin cages can not be used in applications where temperatures exceed 120°C.

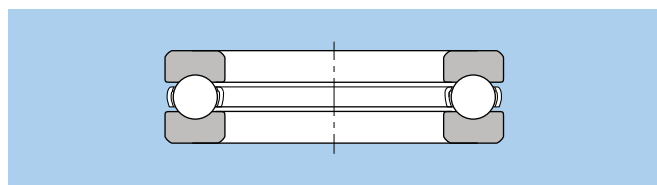


Fig. 1 Single direction thrust ball bearing (with pressed cage)

supported in only one direction, radial loads can not be accommodated, therefore these bearings are unsuitable for high speed operation.

Table 1 lists the standard cage types for single direction thrust ball bearings.

2. Spherical roller thrust bearings

Just like spherical roller bearings, the center of the spherical surface for spherical roller thrust bearings is the point where the raceway surface of the housing raceway washer meets the center axis of the bearing. Since spherical roller thrust bearings incorporate barrel-shaped rollers as rolling elements, they also have self-aligning properties. (See **Fig. 2**)

Under normal load conditions, the allowable misalignment is 1° to 2°, although this will vary depending upon the bearing's dimension series.

These bearings use machined copper alloy cages and a guide sleeve is attached to the inner ring to guide the cage. The axial load capacity of these bearings is high, and a certain amount of radial load can also be accommodated when the ring is in an axially loaded state. However, it is necessary to operate these bearings where the load condition meet $F_r/F_a \leq 0.55$.

These bearings have some spots where lubricant cannot enter such as the gap between the cage and guide sleeve. It is necessary to use oil lubrication even in low speed operation.

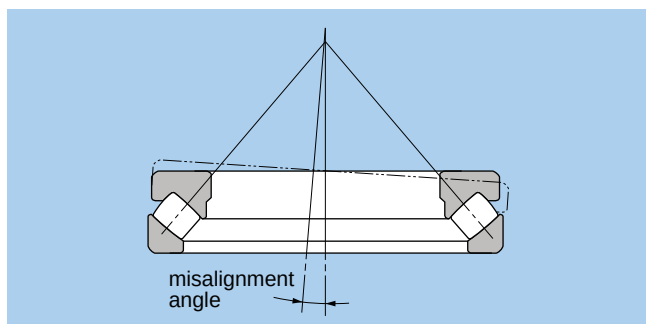


Fig. 2 Spherical roller thrust bearings

3. Cylindrical roller thrust bearings

Thrust bearings incorporating cylindrical rollers are available in single row, double row, triple row, and four row varieties. (See **Fig. 3**) NTN Engineering offers the 811, 812 and 893 series of standard series bearings that conform to dimension series 11, 12 and 93 prescribed in JIS, as well as other special dimensions.

Cylindrical roller thrust bearings are able to receive axial loads only, and have high axial rigidity which makes them well suited for heavy axial loads. Needle roller bearing information for series 811, 812, and 893 is also listed in the dimension tables.

Furthermore, bearings with dimensions not listed in the dimension tables are also manufactured. Contact **NTN Engineering** for more information.



Fig. 3 Double row cylindrical roller thrust bearings

4. Tapered roller thrust bearings

Although not listed in the dimension tables, tapered roller bearings like those in **Fig. 4** are also manufactured. Contact **NTN Engineering** for more detailed information.

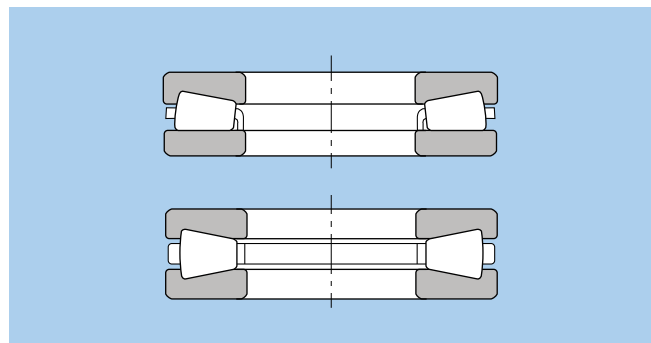


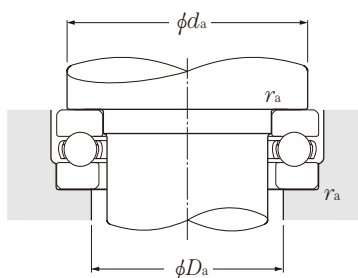
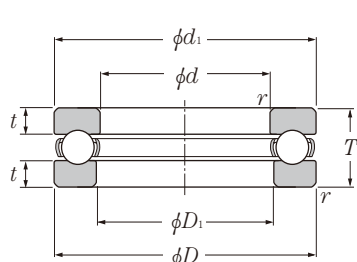
Fig. 4 Tapered roller thrust bearings





Single Direction Thrust Ball Bearings

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Equivalent bearing load

dynamic

$$P_a = F_a$$

static

$$P_{0a} = F_a$$

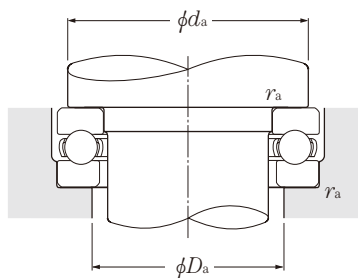
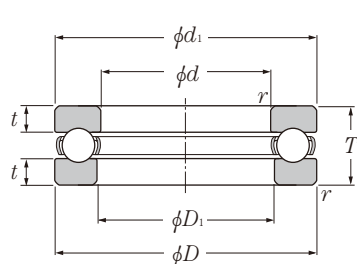
d 10 ~ 50mm

Boundary dimensions				Basic load ratings				Limiting speeds		Bearing numbers	Dimensions			Abutment and fillet dimensions			Mass
mm				dynamic	static	dynamic	static	min ⁻¹			mm			mm			kg
			¹⁾ <i>r</i> _{s min}	<i>C</i> _a	<i>C</i> _{oa}	<i>C</i> _a	<i>C</i> _{oa}	grease	oil		²⁾ <i>d</i> _{1s max}	³⁾ <i>D</i> _{1s min}		<i>d</i> _{a min}	<i>D</i> _{a max}	<i>r</i> _{as max}	(approx.)
10	24	9	0.3	10.0	14.0	1 020	1 420	6 700	9 500	51100	24	11	2.5	18	16	0.3	0.021
	26	11	0.6	12.7	17.1	1 290	1 740	5 800	8 300	51200	26	12	3.3	20	16	0.6	0.03
12	26	9	0.3	10.3	15.4	1 050	1 570	6 400	9 200	51101	26	13	2.5	20	18	0.3	0.023
	28	11	0.6	13.2	19.0	1 340	1 940	5 600	8 000	51201	28	14	3.3	22	18	0.6	0.034
15	28	9	0.3	10.5	16.8	1 070	1 710	6 200	8 800	51102	28	16	2.5	23	20	0.3	0.024
	32	12	0.6	16.6	24.8	1 690	2 530	5 000	7 100	51202	32	17	3.5	25	22	0.6	0.046
17	30	9	0.3	10.8	18.2	1 100	1 850	6 000	8 500	51103	30	18	2.5	25	22	0.3	0.026
	35	12	0.6	17.2	27.3	1 750	2 780	4 800	6 800	51203	35	19	3.5	28	24	0.6	0.054
20	35	10	0.3	14.2	24.7	1 450	2 520	5 200	7 500	51104	35	21	2.5	29	26	0.3	0.04
	40	14	0.6	22.3	37.5	2 270	3 850	4 100	5 900	51204	40	22	4.1	32	28	0.6	0.081
25	42	11	0.6	19.6	37.0	1 990	3 800	4 600	6 500	51105	42	26	3	35	32	0.6	0.06
	47	15	0.6	27.8	50.5	2 830	5 150	3 700	5 300	51205	47	27	4.3	38	34	0.6	0.111
	52	18	1	35.5	61.5	3 650	6 250	3 200	4 600	51305	52	27	5	41	36	1	0.176
	60	24	1	55.5	89.5	5 650	9 100	2 600	3 700	51405	60	27	6.9	46	39	1	0.33
30	47	11	0.6	20.4	42.0	2 080	4 300	4 300	6 200	51106	47	32	3	40	37	0.6	0.069
	52	16	0.6	29.3	58.0	2 990	5 950	3 400	4 900	51206	52	32	5	43	39	0.6	0.139
	60	21	1	43.0	78.5	4 350	8 000	2 800	3 900	51306	60	32	6.4	48	42	1	0.269
	70	28	1	72.5	126	7 400	12 800	2 200	3 200	51406	70	32	8.3	54	46	1	0.516
35	52	12	0.6	20.4	44.5	2 080	4 550	3 900	5 600	51107	52	37	3.5	45	42	0.6	0.085
	62	18	1	39.0	78.0	4 000	7 950	2 900	4 200	51207	62	37	5.2	51	46	1	0.215
	68	24	1	55.5	105	5 650	10 700	2 400	3 500	51307	68	37	7.2	55	48	1	0.383
	80	32	1.1	87.0	155	8 850	15 800	1 900	2 800	51407	80	37	9.6	62	53	1	0.759
40	60	13	0.6	26.9	63.0	2 740	6 400	3 500	5 000	51108	60	42	3.8	52	48	0.6	0.125
	68	19	1	47.0	98.5	4 800	10 000	2 700	3 900	51208	68	42	5.5	57	51	1	0.276
	78	26	1	69.0	135	7 050	13 700	2 200	3 100	51308	78	42	7.6	63	55	1	0.548
	90	36	1.1	112	205	11 500	20 900	1 700	2 500	51408	90	42	10.7	70	60	1	1.08
45	65	14	0.6	27.9	69.0	2 840	7 050	3 200	4 600	51109	65	47	4	57	53	0.6	0.148
	73	20	1	48.0	105	4 850	10 700	2 600	3 700	51209	73	47	6	62	56	1	0.317
	85	28	1	80.0	163	8 150	16 700	2 000	2 900	51309	85	47	8.3	69	61	1	0.684
	100	39	1.1	130	242	13 200	24 700	1 600	2 200	51409	100	47	11.6	78	67	1	1.43
50	70	14	0.6	28.8	75.5	2 930	7 700	3 100	4 500	51110	70	52	4	62	58	0.6	0.161
	78	22	1	48.5	111	4 950	11 400	2 400	3 400	51210	78	52	7	67	61	1	0.378

1) Smallest allowable dimension for chamfer dimension r. 2) Maximum allowable dimension for shaft washer outer dimension d₁.3) Smallest allowable dimension for housing washer inner dimension D₁.

Single Direction Thrust Ball Bearings

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Equivalent bearing load
dynamic

$$P_a = F_a$$

static

$$P_{0a} = F_a$$

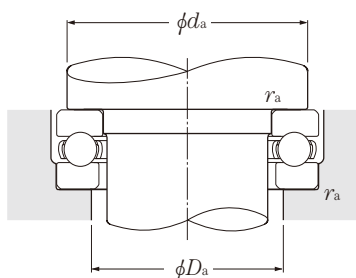
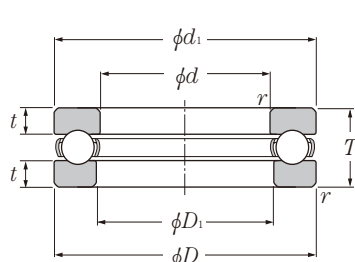
d 50 ~ 90mm

	Boundary dimensions				Basic load ratings				Limiting speeds		Bearing numbers	Dimensions			Abutment and fillet dimensions			Mass
	mm				dynamic	static	dynamic	static	grease	oil		mm			mm			
	d	D	T	$r_{s\min}^{1)}$	C_a	C_{0a}	C_a	C_{0a}				$d_{1s\max}^{2)}$	$D_{1s\min}^{3)}$	d_a min	D_a max	r_{as} max	(approx.)	
50	95	31	1.1	96.5	202	9 850	20 600	1 800	2 600	51310	95	52	9.2	77	68	1	0.951	
	110	43	1.5	148	283	15 100	28 800	1 400	2 000	51410A	110	52	12.9	86	74	1.5	1.9	
55	78	16	0.6	35.0	93.0	3 550	9 500	2 800	4 000	51111	78	57	5	69	64	0.6	0.226	
	90	25	1	69.5	159	7 100	16 200	2 100	3 000	51211	90	57	7.5	76	69	1	0.608	
	105	35	1.1	119	246	12 200	25 100	1 600	2 300	51311	105	57	10.2	85	75	1	1.29	
	120	48	1.5	178	360	18 200	36 500	1 300	1 800	51411	120	57	14.8	94	81	1.5	2.52	
60	85	17	1	41.5	113	4 200	11 500	2 600	3 700	51112	85	62	5	75	70	1	0.296	
	95	26	1	73.5	179	7 500	18 200	2 000	2 800	51212	95	62	8	81	74	1	0.676	
	110	35	1.1	123	267	12 600	27 200	1 600	2 300	51312	110	62	10.2	90	80	1	1.37	
	130	51	1.5	214	435	21 800	44 500	1 200	1 700	51412	130	62	15.3	102	88	1.5	3.12	
65	90	18	1	41.5	117	4 250	12 000	2 400	3 500	51113	90	67	5.5	80	75	1	0.338	
	100	27	1	75.0	189	7 650	19 200	1 900	2 700	51213	100	67	8.4	86	79	1	0.767	
	115	36	1.1	128	287	13 000	29 300	1 500	2 200	51313	115	67	10.7	95	85	1	1.51	
	140	56	2	232	495	23 600	50 500	1 100	1 600	51413	140	68	17.2	110	95	2	3.96	
70	95	18	1	43.0	127	4 400	12 900	2 400	3 400	51114	95	72	5.5	85	80	1	0.356	
	105	27	1	76.0	199	7 750	20 200	1 800	2 600	51214	105	72	8.4	91	84	1	0.793	
	125	40	1.1	148	340	15 100	34 500	1 400	2 000	51314	125	72	12	103	92	1	2.01	
	150	60	2	250	555	25 500	56 500	1 000	1 500	51414	150	73	18.6	118	102	2	4.86	
75	100	19	1	44.5	136	4 550	13 900	2 200	3 200	51115	100	77	6	90	85	1	0.399	
	110	27	1	77.5	209	7 900	21 300	1 800	2 600	51215	110	77	8.4	96	89	1	0.874	
	135	44	1.5	171	395	17 400	40 500	1 300	1 800	51315	135	77	13.4	111	99	1.5	2.61	
	160	65	2	269	615	27 400	63 000	940	1 400	51415	160	78	20.4	125	110	2	5.97	
80	105	19	1	44.5	141	4 550	14 400	2 200	3 100	51116	105	82	6	95	90	1	0.422	
	115	28	1	78.5	218	8 000	22 300	1 700	2 400	51216	115	82	8.9	101	94	1	0.916	
	140	44	1.5	176	425	18 000	43 000	1 200	1 800	51316	140	82	13.4	116	104	1.5	2.72	
	170	68	2.1	270	620	27 500	63 500	890	1 300	51416	170	83	21.3	133	117	2	7.77	
85	110	19	1	46.0	150	4 700	15 300	2 100	3 000	51117	110	87	6	100	95	1	0.444	
	125	31	1	95.5	264	9 700	26 900	1 600	2 200	51217	125	88	9.8	109	101	1	1.25	
	150	49	1.5	201	490	20 500	50 000	1 100	1 600	51317	150	88	15	124	111	1.5	3.52	
	180	72	2.1	288	685	29 400	70 000	840	1 200	* 51417	177	88	22.7	141	124	2	9.17	
90	120	22	1	59.5	190	6 100	19 400	1 900	2 700	51118	120	92	7	108	102	1	0.687	
	135	35	1.1	117	325	11 900	33 000	1 400	2 000	51218	135	93	11.2	117	108	1	1.7	
	155	50	1.5	198	490	20 200	50 000	1 100	1 600	51318	155	93	15.5	129	116	1.5	3.74	
	190	77	2.1	305	750	31 500	76 500	790	1 100	* 51418	187	93	24.5	149	131	2	11	

1) Smallest allowable dimension for chamfer dimension r . 2) Maximum allowable dimension for shaft washer outer dimension d_1 . 3) Smallest allowable dimension for housing washer inner dimension D_1 . Note: Bearing numbers marked " * " signify bearings where the bearing shaft washer outer diameter is smaller than the housing shaft washer outer diameter. Therefore when using these bearings, it is possible to use the housing bore as is, without providing a ground undercut on the outer diameter section of the bearing shaft washer as shown in the drawing.

Single Direction Thrust Ball Bearings

NTN



Equivalent bearing load

dynamic

$$P_a = F_a$$

static

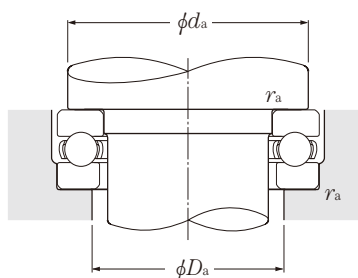
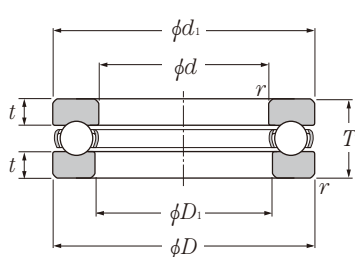
$$P_{0a} = F_a$$

d 100 ~ 200mm

Boundary dimensions				Basic load ratings				Limiting speeds		Bearing numbers	Dimensions			Abutment and fillet dimensions			Mass
mm				dynamic	static	dynamic	static	min ⁻¹			mm			mm			kg
			¹⁾ <i>r</i> _{s min}	<i>C</i> _a	<i>C</i> _{oa}	<i>C</i> _a	<i>C</i> _{oa}	grease	oil		<i>d</i> _{1s max} ²⁾	<i>D</i> _{1s min} ³⁾	<i>d</i> _{a min}	<i>D</i> _{a max}	<i>r</i> _{as max}	(approx.)	
100	135	25	1	85.0	268	8 700	27 300	1 700	2 400	51120	135	102	7.5	121	114	1	0.987
	150	38	1.1	147	410	14 900	42 000	1 300	1 800	51220	150	103	11.7	130	120	1	2.29
	170	55	1.5	237	595	24 100	60 500	990	1 400	51320	170	103	17.3	142	128	1.5	4.88
	210	85	3	370	970	37 500	99 000	710	1 000	* 51420	205	103	26.6	165	145	2.5	14.7
110	145	25	1	87.0	288	8 900	29 400	1 600	2 300	51122	145	112	7.5	131	124	1	1.07
	160	38	1.1	153	450	15 600	46 000	1 200	1 800	51222	160	113	11.7	140	130	1	2.46
	190	63	2	267	705	27 300	72 000	870	1 200	* 51322	187	113	20	158	142	2	7.67
120	155	25	1	89.0	310	9 100	31 500	1 500	2 200	51124	155	122	7.5	141	134	1	1.11
	170	39	1.1	154	470	15 700	48 000	1 200	1 700	51224	170	123	12.2	150	140	1	2.71
	210	70	2.1	296	805	30 000	82 500	780	1 100	* 51324	205	123	22.3	173	157	2	10.8
130	170	30	1	104	350	10 600	36 000	1 300	1 900	51126	170	132	9	154	146	1	1.73
	190	45	1.5	191	565	19 400	57 500	1 000	1 500	* 51226	187	133	13.9	166	154	1.5	4.22
	225	75	2.1	330	960	33 500	97 500	720	1 000	* 51326	220	134	24.2	186	169	2	12.7
140	180	31	1	107	375	10 900	38 500	1 300	1 800	* 51128	178	142	9.5	164	156	1	1.9
	200	46	1.5	193	595	19 700	60 500	980	1 400	* 51228	197	143	14.4	176	164	1.5	4.77
	240	80	2.1	350	1 050	35 500	107 000	670	960	* 51328	235	144	26	199	181	2	15.3
150	190	31	1	109	400	11 100	41 000	1 200	1 800	* 51130	188	152	10	174	166	1	2
	215	50	1.5	220	685	22 400	70 000	900	1 300	* 51230	212	153	15.8	189	176	1.5	5.87
	250	80	2.1	360	1 130	37 000	115 000	660	940	* 51330	245	154	26	209	191	2	16.1
160	200	31	1	112	425	11 400	43 500	1 200	1 700	* 51132	198	162	10	184	176	1	2.1
	225	51	1.5	223	720	22 800	73 000	870	1 200	* 51232	222	163	16.3	199	186	1.5	6.32
	270	87	3	450	1 470	45 500	150 000	600	860	* 51332	265	164	27	225	205	2.5	20.7
170	215	34	1.1	134	510	13 700	52 000	1 100	1 600	* 51134	213	172	10.5	197	188	1	2.77
	240	55	1.5	261	835	26 600	85 000	810	1 200	* 51234	237	173	17.3	212	198	1.5	7.81
	280	87	3	465	1 570	47 000	160 000	590	840	* 51334	275	174	27	235	215	2.5	21.6
180	225	34	1.1	135	525	13 700	54 000	1 100	1 500	* 51136	222	183	10.5	207	198	1	2.92
	250	56	1.5	266	875	27 100	89 000	780	1 100	* 51236	247	183	17.8	222	208	1.5	8.34
	300	95	3	490	1 700	50 000	174 000	540	780	* 51336	295	184	29.7	251	229	2.5	27.5
190	240	37	1.1	170	655	17 400	67 000	980	1 400	* 51138	237	193	11	220	210	1	3.75
	270	62	2	310	1 060	31 500	108 000	710	1 000	* 51238	267	194	19.6	238	222	2	11.3
	320	105	4	545	1 950	55 500	199 000	500	710	* 51338	315	195	33.5	266	244	3	35
200	250	37	1.1	172	675	17 500	69 000	960	1 400	* 51140	247	203	11.5	230	220	1	3.92

1) Smallest allowable dimension for chamfer dimension r . 2) Maximum allowable dimension for shaft washer outer dimension d_1 . 3) Smallest allowable dimension for housing washer inner dimension D_1 . Note: Bearing numbers marked " * " signify bearings where the bearing shaft washer outer diameter is smaller than the housing shaft washer outer diameter. Therefore when using these bearings, it is possible to use the housing bore as is, without providing a ground undercut on the outer diameter section of the bearing shaft washer as shown in the drawing.

Single Direction Thrust Ball Bearings



Equivalent bearing load
dynamic

$$P_a = F_a$$

static

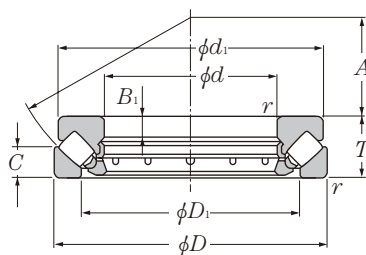
$$P_{0a} = F_a$$

d 200 ~ 530mm

Boundary dimensions				Basic load ratings				Limiting speeds		Bearing numbers	Dimensions			Abutment and fillet dimensions			Mass
mm				dynamic	static	dynamic	static	min ⁻¹			mm			mm			kg
				kN			kgf										
<i>d</i>	<i>D</i>	<i>T</i>	<i>r</i> _{s min} ¹⁾	<i>C</i> _a	<i>C</i> _{0a}	<i>C</i> _a	<i>C</i> _{0a}	grease	oil		<i>d</i> _{1s max} ²⁾	<i>D</i> _{1s min} ³⁾	<i>d</i> _{a min}	<i>D</i> _{a max}	<i>r</i> _{as max}	(approx.)	
200	280	62	2	315	1 110	32 000	113 000	700	990	* 51240	277	204	19.6	248	232	2	11.8
	340	110	4	595	2 220	61 000	227 000	470	670	* 51340	335	205	34.7	282	258	3	41.8
220	270	37	1.1	177	740	18 100	75 500	920	1 300	* 51144	267	223	11.5	250	240	1	4.27
	300	63	2	325	1 210	33 000	123 000	660	950	* 51244	297	224	20.1	268	252	2	13
240	300	45	1.5	228	935	23 200	95 000	780	1 100	* 51148	297	243	14	276	264	1.5	6.87
	340	78	2.1	415	1 650	42 500	168 000	550	790	* 51248	335	244	25	299	281	2	22.4
260	320	45	1.5	232	990	23 600	101 000	750	1 100	* 51152	317	263	14	296	284	1.5	7.38
	360	79	2.1	440	1 810	45 000	184 000	530	760	* 51252	355	264	24.9	319	301	2	24.2
280	350	53	1.5	305	1 270	31 000	130 000	650	940	* 51156	347	283	16	322	308	1.5	11.8
	380	80	2.1	460	1 970	47 000	201 000	510	730	* 51256	375	284	25.4	339	321	2	26.1
300	380	62	2	355	1 560	36 000	159 000	580	820	* 51160	376	304	19.5	348	332	2	17.2
	420	95	3	590	2 680	60 000	273 000	440	630	* 51260	415	304	29.7	371	349	2.5	40.6
320	400	63	2	365	1 660	37 000	169 000	550	790	* 51164	396	324	20	368	352	2	18.4
340	420	64	2	375	1 760	38 000	179 000	530	760	* 51168	416	344	20.5	388	372	2	19.7
360	440	65	2	380	1 860	39 000	190 000	510	730	* 51172	436	364	21	408	392	2	21.1
380	460	65	2	380	1 910	39 000	195 000	500	710	* 51176	456	384	21	428	412	2	22.3
400	480	65	2	390	2 010	40 000	205 000	480	690	* 51180	476	404	21	448	432	2	23.3
420	500	65	2	395	2 110	40 500	215 000	470	670	* 51184	495	424	21	468	452	2	24.4
440	540	80	2.1	515	2 850	52 500	291 000	400	580	* 51188	535	444	26	499	481	2	40
460	560	80	2.1	525	3 000	53 500	305 000	390	560	* 51192	555	464	26	519	501	2	41.6
480	580	80	2.1	525	3 100	54 000	315 000	380	550	* 51196	575	484	29.5	539	521	2	43.3
500	600	80	2.1	575	3 400	58 500	345 000	370	540	511/500	595	504	25	559	541	2	45
530	640	85	3	645	4 000	66 000	405 000	350	500	511/530	635	534	26	595	575	2.5	55.8

1) Smallest allowable dimension for chamfer dimension r . 2) Maximum allowable dimension for shaft washer outer diameter d_1 . 3) Smallest allowable dimension for housing washer inner dimension D_1 . Note: Bearing numbers marked " * " signify bearings where the bearing shaft washer outer diameter is smaller than the housing shaft washer outer diameter. Therefore when using these bearings, it is possible to use the housing bore as is, without providing a ground undercut on the outer diameter section of the bearing shaft washer as shown in the drawing.

Spherical Roller Thrust Bearings

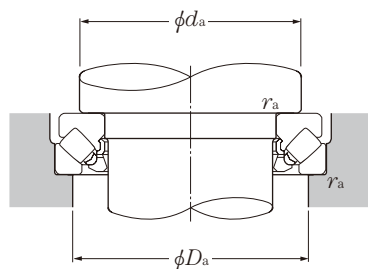


d 60 ~ 160mm

Boundary dimensions				Basic load ratings				Limiting	Bearing numbers	Dimensions				
mm				dynamic kN	static kN	dynamic kgf	static kgf	speeds min ⁻¹		mm				
<i>d</i>	<i>D</i>	<i>T</i>	<i>r</i> _{s min} ¹⁾	<i>C</i> _a	<i>C</i> _{oa}	<i>C</i> _a	<i>C</i> _{oa}	oil		<i>D</i> ₁	<i>d</i> ₁	<i>B</i> ₁	<i>C</i>	<i>A</i>
60	130	42	1.5	283	805	28 900	82 000	2 600	29412	89	123	15	20	38
65	140	45	2	330	945	33 500	96 500	2 400	29413	96	133	16	21	42
70	150	48	2	365	1 040	37 000	106 000	2 200	29414	103	142	17	23	44
75	160	51	2	415	1 190	42 500	122 000	2 100	29415	109	152	18	24	47
80	170	54	2.1	460	1 380	47 000	141 000	1 900	29416	117	162	19	26	50
85	150	39	1.5	265	820	27 000	84 000	2 300	29317	114	143.5	13	19	50
	180	58	2.1	490	1 480	50 000	151 000	1 800	29417	125	170	21	28	54
90	155	39	1.5	285	915	29 100	93 500	2 300	29318	117	148.5	13	19	52
	190	60	2.1	545	1 680	56 000	172 000	1 700	29418	132	180	22	29	56
100	170	42	1.5	345	1 160	35 500	118 000	2 100	29320	129	163	14	20.8	58
	210	67	3	685	2 130	69 500	217 000	1 500	29420	146	200	24	32	62
110	190	48	2	445	1 500	45 000	152 000	1 800	29322	143	182	16	23	64
	230	73	3	845	2 620	86 500	267 000	1 400	29422	162	220	26	35	69
120	210	54	2.1	535	1 770	54 500	181 000	1 600	29324	159	200	18	26	70
	250	78	4	975	3 050	99 000	310 000	1 300	29424	174	236	29	37	74
130	225	58	2.1	615	2 100	62 500	215 000	1 500	29326	171	215	19	28	76
	270	85	4	1 080	3 550	110 000	360 000	1 200	29426	189	255	31	41	81
140	240	60	2.1	685	2 360	70 000	241 000	1 400	29328	183	230	20	29	82
	280	85	4	1 110	3 750	114 000	385 000	1 200	29428	199	268	31	41	86
150	215	39	1.5	340	1 340	34 500	136 000	1 800	29230	178	208	14	19	82
	250	60	2.1	675	2 390	68 500	243 000	1 400	29330	194	240	20	29	87
	300	90	4	1 280	4 350	131 000	445 000	1 100	29430	214	285	32	44	92
160	225	39	1.5	360	1 460	36 500	149 000	1 700	29232	188	219	14	19	86
	270	67	3	820	2 860	84 000	292 000	1 300	29332	208	260	24	32	92
	320	95	5	1 500	5 150	153 000	525 000	1 000	29432	229	306	34	45	99

1) Smallest allowable dimension for chamfer dimension *r*.

Spherical Roller Thrust Bearings

**Equivalent bearing load****dynamic**

$$P_a = F_a + 1.2 F_r$$

static

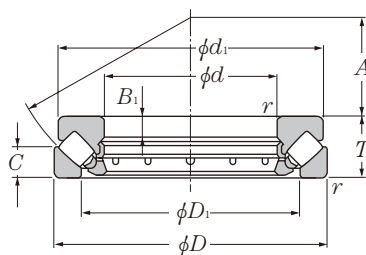
$$P_{0a} = F_a + 2.7 F_r$$

$$\text{when } \frac{F_r}{F_a} \leq 0.55$$

Abutment and fillet dimensions			Mass
d_a min	mm D_a max	r_{as} max	kg (approx.)
90	108	1.5	2.78
100	115	2	3.44
105	125	2	4.19
115	132	2	5.07
120	140	2	6.09
115	135	1.5	2.94
130	150	2	7.2
120	140	1.5	3.08
135	157	2	8.38
130	150	1.5	3.94
150	175	2.5	11.5
145	165	2	5.78
165	190	2.5	15
160	180	2	7.92
180	205	3	18.6
170	195	2	9.76
195	225	3	23.7
185	205	2	11.4
205	235	3	25.2
179	196	1.5	4.56
195	215	2	12
220	250	3	30.5
189	206	1.5	4.88
210	235	2.5	15.9
230	265	4	37



Spherical Roller Thrust Bearings

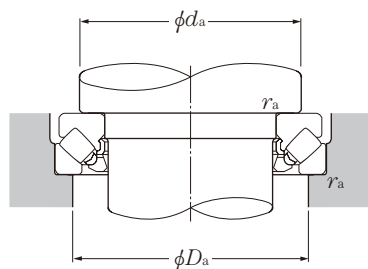


d 170 ~ 320mm

Boundary dimensions				Basic load ratings				Limiting	Bearing numbers	Dimensions				
mm				dynamic kN	static kN	dynamic kgf	static kgf	speeds min ⁻¹		mm				
d	D	T	r _{s min} ¹⁾	C _a	C _{oa}	C _a	C _{oa}	oil		D ₁	d ₁	B ₁	C	A
170	240	42	1.5	425	1 770	43 500	180 000	1 600	29234	198	233	15	20	92
	280	67	3	855	3 050	87 000	310 000	1 200	29334	216	270	23	32	96
	340	103	5	1 660	5 750	169 000	590 000	940	29434	243	324	37	50	104
180	250	42	1.5	450	1 920	45 500	196 000	1 600	29236	208	243	15	20	97
	300	73	3	995	3 600	102 000	365 000	1 100	29336	232	290	25	35	103
	360	109	5	1 840	6 200	188 000	635 000	890	29436	255	342	39	52	110
190	270	48	2	530	2 230	54 000	227 000	1 400	29238	223	262	15	24	104
	320	78	4	1 150	4 250	117 000	430 000	1 100	29338	246	308	27	38	110
	380	115	5	2 010	6 800	205 000	695 000	840	29438	271	360	41	55	117
200	280	48	2	535	2 300	54 500	234 000	1 400	29240	236	271	15	24	108
	340	85	4	1 280	4 600	131 000	470 000	980	29340	261	325	29	41	116
	400	122	5	2 230	7 650	228 000	780 000	790	29440	286	380	43	59	122
220	300	48	2	555	2 480	56 500	253 000	1 300	29244	254	292	15	24	117
	360	85	4	1 390	5 200	141 000	530 000	940	29344	280	345	29	41	125
	420	122	6	2 300	8 100	235 000	825 000	760	29444	308	400	43	58	132
240	340	60	2.1	825	3 600	84 000	365 000	1 100	29248	283	330	19	30	130
	380	85	4	1 380	5 250	140 000	535 000	910	29348	300	365	29	41	135
	440	122	6	2 400	8 700	245 000	885 000	740	29448	326	420	43	59	142
260	360	60	2.1	870	3 950	88 500	400 000	1 100	29252	302	350	19	30	139
	420	95	5	1 710	6 800	175 000	695 000	810	29352	329	405	32	45	148
	480	132	6	2 740	10 000	279 000	1 020 000	670	29452	357	460	48	64	154
280	380	60	2.1	875	4 050	89 000	415 000	1 000	29256	323	370	19	30	150
	440	95	5	1 800	7 250	184 000	740 000	790	29356	348	423	32	46	158
	520	145	6	3 350	12 400	340 000	1 270 000	610	29456	387	495	52	68	166
300	420	73	3	1 190	5 350	121 000	545 000	870	29260	353	405	21	38	162
	480	109	5	2 140	8 250	218 000	840 000	700	29360	379	460	37	50	168
	540	145	6	3 450	13 200	350 000	1 340 000	590	29460	402	515	52	70	175
320	440	73	3	1 260	5 800	128 000	595 000	840	29264	372	430	21	38	172
	500	109	5	2 220	8 800	226 000	895 000	680	29364	399	482	37	53	180
	580	155	7.5	3 700	14 200	375 000	1 440 000	550	29464	435	555	55	75	191

1) Smallest allowable dimension for chamfer dimension r.

Spherical Roller Thrust Bearings

**Equivalent bearing load****dynamic**

$$P_a = F_a + 1.2 F_r$$

static

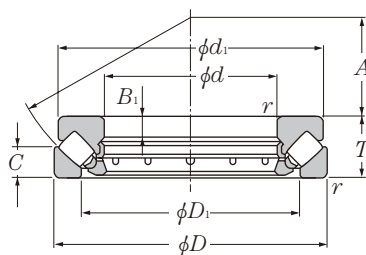
$$P_{0a} = F_a + 2.7 F_r$$

$$\text{when } \frac{F_r}{F_a} \leq 0.55$$

Abutment and fillet dimensions			Mass
d_a min	mm D_a max	r_{as} max	kg (approx.)
201	218	1.5	6.02
220	245	2.5	16.6
245	285	4	45
211	228	1.5	6.27
235	260	2.5	21.2
260	300	4	52.9
225	245	2	8.8
250	275	3	26
275	320	4	62
235	255	2	9.14
265	295	3	31.9
290	335	4	73.3
260	275	2	9.94
285	315	3	34.5
310	355	5	77.8
285	305	2	17.5
300	330	3	36.6
330	375	5	82.6
305	325	2	18.6
330	365	4	52
360	405	5	108
325	345	2	19.8
350	390	4	54.6
390	440	5	140
355	380	2.5	30.9
380	420	4	75.8
410	460	5	147
375	400	2.5	33.5
400	440	4	79.9
435	495	6	181



Spherical Roller Thrust Bearings

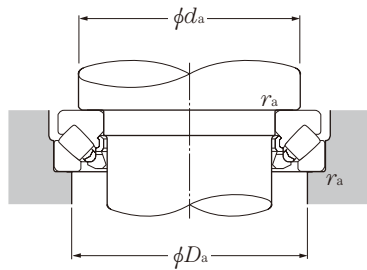


d 340 ~ 500mm

Boundary dimensions				Basic load ratings				Limiting	Bearing numbers	Dimensions				
mm				dynamic kN	static kN	dynamic kgf	static kgf	speeds min ⁻¹		mm				
d	D	T	r _{s min} ¹⁾	C _a	C _{oa}	C _a	C _{oa}	oil		D ₁	d ₁	B ₁	C	A
340	460	73	3	1 240	5 800	126 000	590 000	820	29268	395	445	21	37	183
	540	122	5	2 650	10 700	270 000	1 090 000	610	29368	428	520	41	59	192
	620	170	7.5	4 400	17 500	445 000	1 790 000	500	29468	462	590	61	82	201
360	500	85	4	1 510	7 050	154 000	720 000	720	29272	423	485	25	44	194
	560	122	5	2 710	11 100	276 000	1 130 000	590	29372	448	540	41	59	202
	640	170	7.5	4 500	18 500	460 000	1 890 000	490	29472	480	610	61	82	210
380	520	85	4	1 590	7 650	162 000	780 000	700	29276	441	505	27	42	202
	600	132	6	3 200	13 300	325 000	1 360 000	550	29376	477	580	44	63	216
	670	175	7.5	4 900	19 700	500 000	2 010 000	470	29476	504	640	63	85	230
400	540	85	4	1 620	7 950	165 000	810 000	680	29280	460	526	27	42	212
	620	132	6	3 400	14 500	345 000	1 480 000	530	29380	494	596	44	64	225
	710	185	7.5	5 450	22 100	555 000	2 250 000	440	29480	534	680	67	89	236
420	580	95	5	2 100	10 400	214 000	1 060 000	620	29284	489	564	30	46	225
	650	140	6	3 600	15 500	365 000	1 580 000	500	29384	520	626	48	68	235
	730	185	7.5	5 500	22 800	560 000	2 330 000	430	29484	556	700	67	89	244
440	600	95	5	2 150	10 900	219 000	1 110 000	600	29288	508	585	30	49	235
	680	145	6	3 800	16 400	385 000	1 680 000	480	29388	548	655	49	70	245
	780	206	9.5	6 400	26 200	650 000	2 670 000	390	29488	588	745	74	100	260
460	620	95	5	2 150	11 000	219 000	1 120 000	590	29292	530	605	30	46	245
	710	150	6	4 200	18 500	430 000	1 880 000	460	29392	567	685	51	72	257
	800	206	9.5	6 600	27 900	670 000	2 840 000	380	29492	608	765	74	100	272
480	650	103	5	2 400	12 000	245 000	1 220 000	550	29296	556	635	33	55	259
	730	150	6	4 200	18 700	430 000	1 910 000	450	29396	590	705	51	72	270
	850	224	9.5	7 500	31 500	765 000	3 200 000	350	29496	638	810	81	108	280
500	670	103	5	2 540	13 000	259 000	1 330 000	530	292/500	574	654	33	55	268
	750	150	6	4 300	19 300	435 000	1 970 000	440	293/500	611	725	51	74	280
	870	224	9.5	7 850	33 000	805 000	3 350 000	340	294/500	661	830	81	107	290

1) Smallest allowable dimension for chamfer dimension r.

Spherical Roller Thrust Bearings

**Equivalent bearing load****dynamic**

$$P_a = F_a + 1.2 F_r$$

static

$$P_{0a} = F_a + 2.7 F_r$$

$$\text{when } \frac{F_r}{F_a} \leq 0.55$$

Abutment and fillet dimensions			Mass
d_a min	mm D_a max	r_{as} max	kg (approx.)
395	420	2.5	34.4
430	470	4	107
465	530	6	230
420	455	3	50.5
450	495	4	112
485	550	6	240
440	475	3	53.4
480	525	5	143
510	575	6	267
460	490	3	55.8
500	550	5	148
540	610	6	321
490	525	4	76.6
525	575	5	172
560	630	6	333
510	545	4	79.6
550	600	5	195
595	670	8	428
530	570	4	82.8
575	630	5	221
615	690	8	443
555	595	4	98.6
595	650	5	228
645	730	8	552
575	615	4	102
615	670	5	235
670	750	8	569