

# Thrust Bearings



Single direction thrust ball bearings

Thrust spherical roller bearings

Thrust bearings are designed primarily to support axial loads at contact angles between 30° and 90°. Similar to radial bearings, thrust bearing designs may incorporate balls or rollers as rolling elements.

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

With thrust bearings, it is necessary to supply an axial preload in order to prevent slipping between the bearing's rolling elements and raceways.

For more detailed information, please refer to section "8.3 Bearing preload."

## 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 washers (shaft washer and housing washer), and the normal contact angle is 90°. Axial loads can be supported in only one direction, and radial loads cannot be accommodated. These bearings are not suitable for high speed operation.

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



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

Table 1 Standard cage types for single direction thrust ball bearings

Cage type	Resin cage	Pressed cage	Machined cage
Bearing series			
511	51100 ~51107	51108 ~51152	51156 ~511/530
512	51200 ~51207	51208 ~51224	51226 ~51260
513	—	51305 ~51320	51322 ~51340
514	—	51405 ~51415	51416 ~51420

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



## 2. Thrust spherical roller bearings

Just like spherical roller bearings, the center of the spherical surface for thrust spherical roller bearings is the point where the raceway surface of the housing raceway washer meets the center axis of the bearing. Since thrust spherical roller 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 1/60 to 1/30, although this will vary depending upon the bearing's dimension series.

These bearings use machined copper alloy cages and a guide sleeve for the cage is attached to the inner ring. These bearings have a high axial load capacity, and can accommodate some radial load when the ring is axially loaded. It is necessary to operate these bearings where the load condition meets  $F_r / F_a \leq 0.55$ .

**The design for spherical thrust bearings is such that lubricant cannot enter the gap between the cage and the guide sleeve.**

Therefore, oil lubrication should be used, even in low speed operation.

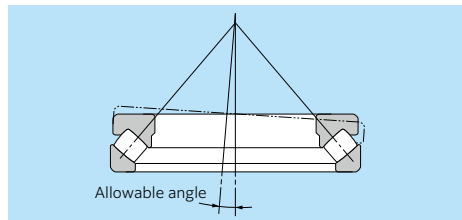


Fig. 2 Thrust spherical roller bearings

## 3. Thrust cylindrical roller 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 that conform to dimension series 11, 12 and 93 prescribed in JIS, as well as other special dimensions.

While thrust cylindrical roller bearings are only able to receive axial loads, the axial loads can be heavy due to the high axial rigidity of the bearing. For series 811, 812, and 893, the dimension tables are listed section "E. Needle roller bearings." Bearings with dimensions not listed in the dimension tables are also manufactured. Contact NTN Engineering for more information.

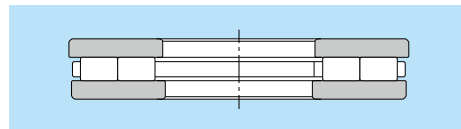


Fig. 3 Double row thrust cylindrical roller bearings

## 4. Thrust tapered roller 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.

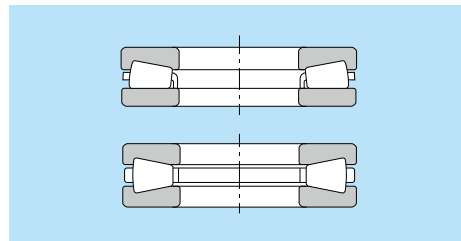
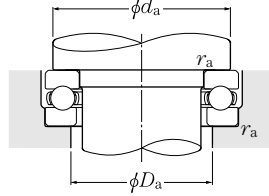
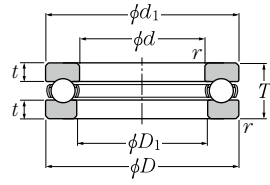


Fig. 4 Thrust tapered roller bearings

# Thrust Ball Bearings



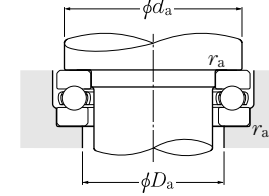
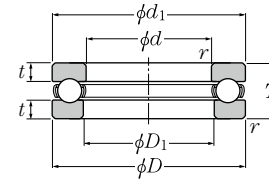
Dynamic equivalent axial load  
 $P_a = F_a$   
 Static equivalent axial load  
 $P_{0a} = F_a$

d 10 ~ 50mm

Boundary dimensions mm	Basic load rating		Fatigue load limit kN $C_u$	Allowable speed		Bearing numbers	Dimensions			Installation-related dimensions			Mass kg (approx.)			
	dynamic $C_a$	static $C_{0a}$		Grease lubrication	Oil lubrication		mm	mm	mm	mm	mm	mm				
d	D	T	$r_{s \min}^1)$	$C_a$	$C_{0a}$	$C_u$	Grease lubrication	Oil lubrication	$d_{1s \max}^2)$	$D_{1s \min}^3)$	t	Min.	Max.	Max.	(approx.)	
10	24	9	0.3	10.0	14.0	0.630	6 700	9 500	51100	24	11	2.5	18	16	0.3	0.021
	26	11	0.6	12.7	17.1	0.770	5 800	8 300	51200	26	12	3.3	20	16	0.6	0.03
12	26	9	0.3	10.3	15.4	0.695	6 400	9 200	51101	26	13	2.5	20	18	0.3	0.023
	28	11	0.6	13.2	19.0	0.860	5 600	8 000	51201	28	14	3.3	22	18	0.6	0.034
15	28	9	0.3	10.5	16.8	0.755	6 200	8 800	51102	28	16	2.5	23	20	0.3	0.024
	32	12	0.6	16.6	24.8	1.12	5 000	7 100	51202	32	17	3.5	25	22	0.6	0.046
17	30	9	0.3	10.8	18.2	0.820	6 000	8 500	51103	30	18	2.5	25	22	0.3	0.026
	35	12	0.6	17.2	27.3	1.23	4 800	6 800	51203	35	19	3.5	28	24	0.6	0.054
20	35	10	0.3	14.2	24.7	1.12	5 200	7 500	51104	35	21	2.5	29	26	0.3	0.04
	40	14	0.6	22.3	37.5	1.70	4 100	5 900	51204	40	22	4.1	32	28	0.6	0.081
25	42	11	0.6	19.6	37.0	1.68	4 600	6 500	51105	42	26	3	35	32	0.6	0.06
	47	15	0.6	27.8	50.5	2.28	3 700	5 300	51205	47	27	4.3	38	34	0.6	0.111
	52	18	1	35.5	61.5	2.77	3 200	4 600	51305	52	27	5	41	36	1	0.176
	60	24	1	55.5	89.5	4.05	2 600	3 700	51405	60	27	6.9	46	39	1	0.33
30	47	11	0.6	20.4	42.0	1.90	4 300	6 200	51106	47	32	3	40	37	0.6	0.069
	52	16	0.6	29.3	58.0	2.63	3 400	4 900	51206	52	32	5	43	39	0.6	0.139
	60	21	1	43.0	78.5	3.55	2 800	3 900	51306	60	32	6.4	48	42	1	0.269
	70	28	1	72.5	126	5.65	2 200	3 200	51406	70	32	8.3	54	46	1	0.516
35	52	12	0.6	20.4	44.5	2.02	3 900	5 600	51107	52	37	3.5	45	42	0.6	0.085
	62	18	1	39.0	78.0	3.55	2 900	4 200	51207	62	37	5.2	51	46	1	0.215
	68	24	1	55.5	105	4.75	2 400	3 500	51307	68	37	7.2	55	48	1	0.383
	80	32	1.1	87.0	155	7.00	1 900	2 800	51407	80	37	9.6	62	53	1	0.759
40	60	13	0.6	26.9	63.0	2.84	3 500	5 000	51108	60	42	3.8	52	48	0.6	0.125
	68	19	1	47.0	98.5	4.45	2 700	3 900	51208	68	42	5.5	57	51	1	0.276
	78	26	1	69.0	135	6.05	2 200	3 100	51308	78	42	7.6	63	55	1	0.548
	90	36	1.1	112	205	9.25	1 700	2 500	51408	90	42	10.7	70	60	1	1.08
45	65	14	0.6	27.9	69.0	3.10	3 200	4 600	51109	65	47	4	57	53	0.6	0.148
	73	20	1	47.5	105	4.75	2 600	3 700	51209	73	47	6	62	56	1	0.317
	85	28	1	80.0	163	7.35	2 000	2 900	51309	85	47	8.3	69	61	1	0.684
	100	39	1.1	130	242	10.9	1 600	2 200	51409	100	47	11.6	78	67	1	1.43
50	70	14	0.6	28.8	75.5	3.40	3 100	4 500	51110	70	52	4	62	58	0.6	0.161
	78	22	1	48.5	111	5.05	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  $d_1$ .  
 3) Smallest allowable dimension for housing washer inner dimension  $D_1$ .

# Thrust Ball Bearings



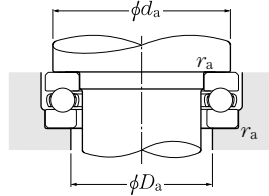
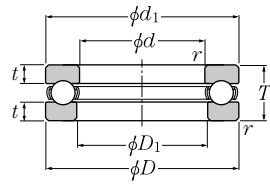
Dynamic equivalent axial load  
 $P_a = F_a$   
 Static equivalent axial load  
 $P_{0a} = F_a$

d 50 ~ 90mm

Boundary dimensions mm	Basic load rating		Fatigue load limit kN $C_u$	Allowable speed		Bearing numbers <sup>4)</sup>	Dimensions			Installation-related dimensions			Mass kg (approx.)			
	dynamic $C_a$	static $C_{0a}$		Grease lubrication	Oil lubrication		mm	mm	mm	mm	mm	mm				
d	D	T	$r_{s \min}^1)$	$C_a$	$C_{0a}$	$C_u$	Grease lubrication	Oil lubrication	$d_{1s \max}^2)$	$D_{1s \min}^3)$	t	Min.	Max.	Max.	(approx.)	
50	95	31	1.1	96.5	202	9.10	1 800	2 600	51310	95	52	9.2	77	68	1	0.951
	110	43	1.5	148	283	12.8	1 400	2 000	51410A	110	52	12.9	86	74	1.5	1.9
55	78	16	0.6	35.0	93.0	4.20	2 800	4 000	51111	78	57	5	69	64	0.6	0.226
	90	25	1	69.5	159	7.15	2 100	3 000	51211	90	57	7.5	76	69	1	0.608
	105	35	1.1	119	246	11.1	1 600	2 300	51311	105	57	10.2	85	75	1	1.29
	120	48	1.5	178	360	16.2	1 300	1 800	51411	120	57	14.8	94	81	1.5	2.52
60	85	17	1	41.5	113	5.10	2 600	3 700	51112	85	62	5	75	70	1	0.296
	95	26	1	73.5	179	8.05	2 000	2 800	51212	95	62	8	81	74	1	0.676
	110	35	1.1	123	267	12.0	1 600	2 300	51312	110	62	10.2	90	80	1	1.37
	130	51	1.5	214	435	19.7	1 200	1 700	51412	130	62	15.3	102	88	1.5	3.12
65	90	18	1	41.5	117	5.30	2 400	3 500	51113	90	67	5.5	80	75	1	0.338
	100	27	1	75.0	189	8.50	1 900	2 700	51213	100	67	8.4	86	79	1	0.767
	115	36	1.1	128	287	13.0	1 500	2 200	51313	115	67	10.7	95	85	1	1.51
	140	56	2	232	495	22.0	1 100	1 600	51413	140	68	17.2	110	95	2	3.96
70	95	18	1	43.0	127	5.70	2 400	3 400	51114	95	72	5.5	85	80	1	0.356
	105	27	1	76.0	199	8.95	1 800	2 600	51214	105	72	8.4	91	84	1	0.793
	125	40	1.1	148	340	15.3	1 400	2 000	51314	125	72	12	103	92	1	2.01
	150	60	2	250	555	23.8	1 000	1 500	51414	150	73	18.6	118	102	2	4.86
75	100	19	1	44.5	136	6.15	2 200	3 200	51115	100	77	6	90	85	1	0.399
	110	27	1	77.5	209	9.40	1 800	2 600	51215	110	77	8.4	96	89	1	0.874
	135	44	1.5	171	395	17.4	1 300	1 800	51315	135	77	13.4	111	99	1.5	2.61
	160	65	2	269	615	25.6	940	1 400	51415	160	78	20.4	125	110	2	5.97
80	105	19	1	44.5	141	6.35	2 200	3 100	51116	105	82	6	95	90	1	0.422
	115	28	1	78.5	218	9.85	1 700	2 400	51216	115	82	8.9	101	94	1	0.916
	140	44	1.5	176	425	18.2	1 200	1 800	51316	140	82	13.4	116	104	1.5	2.72
	170	68	2.1	270	620	25.0	890	1 300	51416	170	83	21.3	133	117	2	7.77
85	110	19	1	46.0	150	6.80	2 100	3 000	51117	110	87	6	100	95	1	0.444
	125	31	1	95.5	264	11.6	1 600	2 200	51217	125	88	9.8	109	101	1	1.25
	150	49	1.5	206	490	20.3	1 100	1 600	51317	150	88	15	124	111	1.5	3.52
	180	72	2.1	288	685	26.8	840	1 200	* 51417	177	88	22.7	141	124	2	9.17
90	120	22	1	59.5	190	8.35	1 900	2 700	51118	120	92	7	108	102	1	0.687
	135	35	1.1	117	325	13.9	1 400	2 000	51218	135	93	11.2	117	108	1	1.7
	155	50	1.5	213	525	21.3	1 100	1 600	51318	155	93	15.5	129	116	1.5	3.74
	190	77	2.1	305	750	28.6	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  $D_1$ . 4) 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.

# Thrust Ball Bearings



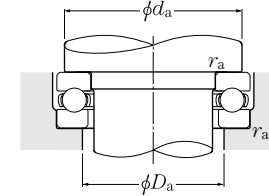
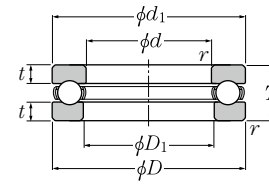
Dynamic equivalent axial load  
 $P_a = F_a$   
 Static equivalent axial load  
 $P_{0a} = F_a$

d 100 ~ 200mm

	Boundary dimensions			Basic load rating		Fatigue load limit	Allowable speed		Bearing numbers <sup>4)</sup>	Dimensions			Installation-related dimensions			Mass
	d	D	T	dynamic	static		Grease lubrication	Oil lubrication		mm	mm	mm	mm	mm	mm	
			$r_{s \min}^{1)}$	$C_a$	$C_{0a}$	$C_u$				$d_{1s \max}^{2)}$	$D_{1s \min}^{3)}$	t	Min.	Max.	Max.	(approx)
<b>100</b>	135	25	1	85.0	268	11.2	1 700	2 400	<b>51120</b>	135	102	7.5	121	114	1	0.987
	150	38	1.1	147	410	16.6	1 300	1 800	<b>51220</b>	150	103	11.7	130	120	1	2.29
	170	55	1.5	237	595	23.1	990	1 400	<b>51320</b>	170	103	17.3	142	128	1.5	4.88
	210	85	3	370	970	35.0	710	1 000	* <b>51420</b>	205	103	26.6	165	145	2.5	14.7
<b>110</b>	145	25	1	87.0	288	11.5	1 600	2 300	<b>51122</b>	145	112	7.5	131	124	1	1.07
	160	38	1.1	153	450	17.5	1 200	1 800	<b>51222</b>	160	113	11.7	140	130	1	2.46
	190	63	2	267	705	25.9	870	1 200	* <b>51322</b>	187	113	20	158	142	2	7.67
<b>120</b>	155	25	1	89.0	310	11.8	1 500	2 200	<b>51124</b>	155	122	7.5	141	134	1	1.11
	170	39	1.1	154	470	17.7	1 200	1 700	<b>51224</b>	170	123	12.2	150	140	1	2.71
	210	70	2.1	296	805	28.3	780	1 100	* <b>51324</b>	205	123	22.3	173	157	2	10.8
<b>130</b>	170	30	1	104	350	13.0	1 300	1 900	<b>51126</b>	170	132	9	154	146	1	1.73
	190	45	1.5	191	565	20.2	1 000	1 500	* <b>51226</b>	187	133	13.9	166	154	1.5	4.22
	225	75	2.1	330	960	32.5	720	1 000	* <b>51326</b>	220	134	24.2	186	169	2	12.7
<b>140</b>	180	31	1	107	375	13.4	1 300	1 800	* <b>51128</b>	178	142	9.5	164	156	1	1.9
	200	46	1.5	193	595	20.6	980	1 400	* <b>51228</b>	197	143	14.4	176	164	1.5	4.77
	240	80	2.1	350	1 050	34.5	670	960	* <b>51328</b>	235	144	26	199	181	2	15.3
<b>150</b>	190	31	1	109	400	13.9	1 200	1 800	* <b>51130</b>	188	152	10	174	166	1	2
	215	50	1.5	227	720	24.0	900	1 300	* <b>51230</b>	212	153	15.8	189	176	1.5	5.87
	250	80	2.1	360	1 130	36.0	660	940	* <b>51330</b>	245	154	26	209	191	2	16.1
<b>160</b>	200	31	1	112	425	14.4	1 200	1 700	* <b>51132</b>	198	162	10	184	176	1	2.1
	225	51	1.5	223	720	23.3	870	1 200	* <b>51232</b>	222	163	16.3	199	186	1.5	6.32
	270	87	3	450	1 470	45.0	600	860	* <b>51332</b>	265	164	27	225	205	2.5	20.7
<b>170</b>	215	34	1.1	134	510	16.7	1 100	1 600	* <b>51134</b>	213	172	10.5	197	188	1	2.77
	240	55	1.5	261	835	26.3	810	1 200	* <b>51234</b>	237	173	17.3	212	198	1.5	7.81
	280	87	3	465	1 570	47.5	590	840	* <b>51334</b>	275	174	27	235	215	2.5	21.6
<b>180</b>	225	34	1.1	135	525	16.7	1 100	1 500	* <b>51136</b>	222	183	10.5	207	198	1	2.92
	250	56	1.5	266	875	26.9	780	1 100	* <b>51236</b>	247	183	17.8	222	208	1.5	8.34
	300	95	3	490	1 700	49.5	540	780	* <b>51336</b>	295	184	29.7	251	229	2.5	27.5
<b>190</b>	240	37	1.1	170	655	20.2	980	1 400	* <b>51138</b>	237	193	11	220	210	1	3.75
	270	62	2	310	1 060	31.5	710	1 000	* <b>51238</b>	267	194	19.6	238	222	2	11.3
	320	105	4	545	1 950	55.0	500	710	* <b>51338</b>	315	195	33.5	266	244	3	35

**200** 250 37 1.1 172 675 20.4 960 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  $D_1$ . 4) 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.

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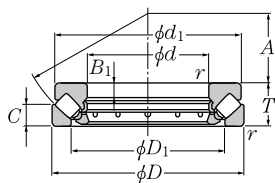


Dynamic equivalent axial load  
 $P_a = F_a$   
 Static equivalent axial load  
 $P_{0a} = F_a$

d 200 ~ 530mm

	Boundary dimensions			Basic load rating		Fatigue load limit	Allowable speed		Bearing numbers <sup>4)</sup>	Dimensions			Installation-related dimensions			Mass
	d	D	T	dynamic	static		Grease lubrication	Oil lubrication		mm	mm	mm	mm	mm	mm	
			$r_{s \min}^{1)}$	$C_a$	$C_{0a}$	$C_u$				$d_{1s \max}^{2)}$	$D_{1s \min}^{3)}$	t	Min.	Max.	Max.	(approx)
<b>200</b>	280	62	2	315	1 110	32.0	700	990	* <b>51240</b>	277	204	19.6	248	232	2	11.8
	340	110	4	595	2 220	61.0	470	670	* <b>51340</b>	335	205	34.7	282	258	3	41.8
<b>220</b>	270	37	1.1	177	740	21.3	920	1 300	* <b>51144</b>	267	223	11.5	250	240	1	4.27
	300	63	2	325	1 210	34.0	660	950	* <b>51244</b>	297	224	20.1	268	252	2	13
<b>240</b>	300	45	1.5	228	935	25.6	780	1 100	* <b>51148</b>	297	243	14	276	264	1.5	6.87
	340	78	2.1	415	1 650	44.0	550	790	* <b>51248</b>	335	244	25	299	281	2	22.4
<b>260</b>	320	45	1.5	232	990	26.2	750	1 100	* <b>51152</b>	317	263	14	296	284	1.5	7.38
	360	79	2.1	440	1 810	46.5	530	760	* <b>51252</b>	355	264	24.9	319	301	2	24.2
<b>280</b>	350	53	1.5	305	1 270	32.5	650	940	* <b>51156</b>	347	283	16	322	308	1.5	11.8
	380	80	2.1	460	1 970	49.0	510	730	* <b>51256</b>	375	284	25.4	339	321	2	26.1
<b>300</b>	380	62	2	355	1 560	38.0	580	820	* <b>51160</b>	376	304	19.5	348	332	2	17.2
	420	95	3	590	2 680	63.5	440	630	* <b>51260</b>	415	304	29.7	371	349	2.5	40.6
<b>320</b>	400	63	2	365	1 660	39.5	550	790	* <b>51164</b>	396	324	20	368	352	2	18.4
<b>340</b>	420	64	2	375	1 760	40.5	530	760	* <b>51168</b>	416	344	20.5	388	372	2	19.7
<b>360</b>	440	65	2	380	1 860	42.0	510	730	* <b>51172</b>	436	364	21	408	392	2	21.1
<b>380</b>	460	65	2	380	1 910	42.0	500	710	* <b>51176</b>	456	384	21	428	412	2	22.3
<b>400</b>	480	65	2	390	2 010	43.5	480	690	* <b>51180</b>	476	404	21	448	432	2	23.3
<b>420</b>	500	65	2	395	2 110	44.5	470	670	* <b>51184</b>	495	424	21	468	452	2	24.4
<b>440</b>	540	80	2.1	515	2 850	58.0	400	580	* <b>51188</b>	535	444	26	499	481	2	40
<b>460</b>	560	80	2.1	525	3 000	60.0	390	560	* <b>51192</b>	555	464	26	519	501	2	41.6
<b>480</b>	580	80	2.1	525	3 100	60.5	380	550	* <b>51196</b>	575	484	29.5	539	521	2	43.3
<b>500</b>	600	80	2.1	575	3 400	65.5	370	540	<b>511/500</b>	595	504	25	559	541	2	45
<b>530</b>	640	85	3	645	4 000	74.5	350	500	<b>511/530</b>	635	534	26	595	575	2.5	55.8

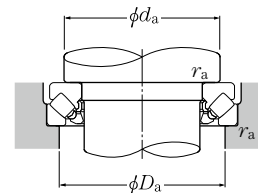
1) Smallest allowable dimension for chamfer dimension r. 2) Maximum allowable dimension for shaft washer outer dimension  $d_1$ . 3) Smallest allowable dimension for housing washer inner dimension  $D_1$ . 4) Bearing numbers marked "\*" signify bearings where the bearing shaft washer outer diameter is 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.



d 60 ~ 160mm

d	Boundary dimensions mm			Basic load rating		Fatigue load limit kN C <sub>u</sub>	Allowable speed min <sup>-1</sup> Oil lubrication	Bearing numbers	Dimensions mm				
	D	T	r <sub>s min</sub> <sup>1)</sup>	dynamic kN C <sub>a</sub>	static kN C <sub>0a</sub>				D <sub>1</sub>	d <sub>1</sub>	B <sub>1</sub>	C	A
60	130	42	1.5	315	805	68.5	2 600	29412	89	123	15	20	38
65	140	45	2	370	945	75.5	2 400	29413	96	133	16	21	42
70	150	48	2	405	1 040	87.5	2 200	29414	103	142	17	23	44
75	160	51	2	465	1 190	102	2 100	29415	109	152	18	24	47
80	170	54	2.1	510	1 380	102	1 900	29416	117	162	19	26	50
85	150	39	1.5	295	820	78.5	2 300	29317	114	143.5	13	19	50
	180	58	2.1	545	1 480	118	1 800	29417	125	170	21	28	54
90	155	39	1.5	320	915	84.0	2 300	29318	117	148.5	13	19	52
	190	60	2.1	610	1 680	121	1 700	29418	132	180	22	29	56
100	170	42	1.5	385	1 160	96.0	2 100	29320	129	163	14	20.8	58
	210	67	3	760	2 130	156	1 500	29420	146	200	24	32	62
110	190	48	2	495	1 500	120	1 800	29322	143	182	16	23	64
	230	73	3	940	2 620	193	1 400	29422	162	220	26	35	69
120	210	54	2.1	595	1 770	151	1 600	29324	159	200	18	26	70
	250	78	4	1 080	3 050	212	1 300	29424	174	236	29	37	74
130	225	58	2.1	685	2 100	168	1 500	29326	171	215	19	28	76
	270	85	4	1 200	3 550	232	1 200	29426	189	255	31	41	81
140	240	60	2.1	760	2 360	182	1 400	29328	183	230	20	29	82
	280	85	4	1 240	3 750	252	1 200	29428	199	268	31	41	86
150	215	39	1.5	380	1 340	122	1 800	29230	178	208	14	19	82
	250	60	2.1	750	2 390	191	1 400	29330	194	240	20	29	87
	300	90	4	1 430	4 350	280	1 100	29430	214	285	32	44	92
160	225	39	1.5	400	1 460	126	1 700	29232	188	219	14	19	86
	270	67	3	915	2 860	223	1 300	29332	208	260	24	32	92
	320	95	5	1 670	5 150	320	1 000	29432	229	306	34	45	99

1) Smallest allowable dimension for chamfer dimension r.



Dynamic equivalent axial load

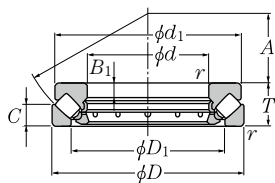
$$P_a = F_a + 1.2F_r$$

Static equivalent axial load

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

Provided that  $\frac{F_r}{F_a} \leq 0.55$  only.

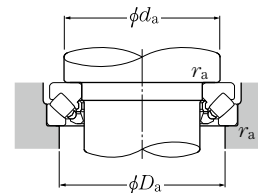
Installation-related dimensions			Mass kg (approx.)
d <sub>a</sub> Min.	mm D <sub>a</sub> Max.	r <sub>as</sub> Max.	
90	108	1.5	2.78
100	115	2	3.44
105	125	2	4.19
115	132	2	5.07
120	140	2	6.09
115	135	1.5	2.94
130	150	2	7.2
120	140	1.5	3.08
135	157	2	8.38
130	150	1.5	3.94
150	175	2.5	11.5
145	165	2	5.78
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



*a* 170 ~ 320mm

	Boundary dimensions mm				Basic load rating		Fatigue load limit kN <i>C<sub>u</sub></i>	Allowable speed min <sup>-1</sup> Oil lubrication	Bearing numbers	Dimensions mm				
	<i>d</i>	<i>D</i>	<i>T</i>	<i>r<sub>s min</sub></i> <sup>1)</sup>	dynamic kN <i>C<sub>a</sub></i>	static <i>C<sub>0a</sub></i>				<i>D<sub>1</sub></i>	<i>d<sub>1</sub></i>	<i>B<sub>1</sub></i>	<i>C</i>	<i>A</i>
<b>170</b>	240	42	1.5	475	1 770	146	1 600	<b>29234</b>	198	233	15	20	92	
	280	67	3	950	3 050	238	1 200	<b>29334</b>	216	270	23	32	96	
	340	103	5	1840	5 750	345	940	<b>29434</b>	243	324	37	50	104	
<b>180</b>	250	42	1.5	500	1 920	160	1 600	<b>29236</b>	208	243	15	20	97	
	300	73	3	1 110	3 600	272	1 100	<b>29336</b>	232	290	25	35	103	
	360	109	5	2 050	6 200	400	890	<b>29436</b>	255	342	39	52	110	
<b>190</b>	270	48	2	585	2 230	184	1 400	<b>29238</b>	223	262	15	24	104	
	320	78	4	1 280	4 250	294	1 100	<b>29338</b>	246	308	27	38	110	
	380	115	5	2 230	6 800	430	840	<b>29438</b>	271	360	41	55	117	
<b>200</b>	280	48	2	595	2 300	183	1 400	<b>29240</b>	236	271	15	24	108	
	340	85	4	1 420	4 600	330	980	<b>29340</b>	261	325	29	41	116	
	400	122	5	2 490	7 650	465	790	<b>29440</b>	286	380	43	59	122	
<b>220</b>	300	48	2	620	2 480	198	1 300	<b>29244</b>	254	292	15	24	117	
	360	85	4	1 540	5 200	360	940	<b>29344</b>	280	345	29	41	125	
	420	122	6	2 560	8 100	505	760	<b>29444</b>	308	400	43	58	132	
<b>240</b>	340	60	2.1	890	3 600	271	1 100	<b>29248</b>	283	330	19	30	130	
	380	85	4	1 530	5 250	390	910	<b>29348</b>	300	365	29	41	135	
	440	122	6	2 680	8 700	530	740	<b>29448</b>	326	420	43	59	142	
<b>260</b>	360	60	2.1	960	3 950	296	1 100	<b>29252</b>	302	350	19	30	139	
	420	95	5	1 910	6 800	445	810	<b>29352</b>	329	405	32	45	148	
	480	132	6	3 050	10 000	610	670	<b>29452</b>	357	460	48	64	154	
<b>280</b>	380	60	2.1	975	4 050	245	1 000	<b>29256</b>	323	370	19	30	150	
	440	95	5	2 010	7 250	480	790	<b>29356</b>	348	423	32	46	158	
	520	145	6	3 700	12 400	710	610	<b>29456</b>	387	495	52	68	166	
<b>300</b>	420	73	3	1 330	5 350	385	870	<b>29260</b>	353	405	21	38	162	
	480	109	5	2 380	8 250	580	700	<b>29360</b>	379	460	37	50	168	
	540	145	6	3 850	13 200	735	590	<b>29460</b>	402	515	52	70	175	
<b>320</b>	440	73	3	1 400	5 800	415	840	<b>29264</b>	372	430	21	38	172	
	500	109	5	2 470	8 800	605	680	<b>29364</b>	399	482	37	53	180	
	580	155	7.5	4 100	14 200	820	550	<b>29464</b>	435	555	55	75	191	

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



Dynamic equivalent axial load

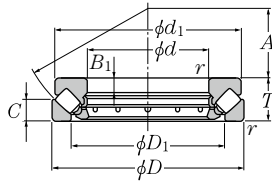
$$P_a = F_a + 1.2F_r$$

Static equivalent axial load

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

Provided that  $\frac{F_r}{F_a} \leq 0.55$  only.

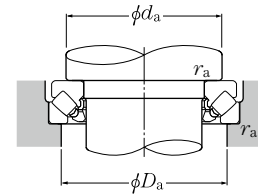
Installation-related dimensions mm			Mass kg (approx.)
<i>d<sub>a</sub></i> Min.	<i>D<sub>a</sub></i> Max.	<i>r<sub>as</sub></i> Max.	
201	218	1.5	6.02
220	245	2.5	16.6
245	285	4	45
211	228	1.5	6.27
235	260	2.5	21.2
260	300	4	52.9
225	245	2	8.8
250	275	3	26
275	320	4	62
235	255	2	9.14
265	295	3	31.9
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



d 340 ~ 500mm

	Boundary dimensions mm			Basic load rating		Fatigue load limit kN $C_u$	Allowable speed min <sup>-1</sup> Oil lubrication	Bearing numbers	Dimensions mm				
	d	D	T	$r_{s \min}^{1)}$	dynamic kN $C_a$				static $C_{0a}$	$D_1$	$d_1$	$B_1$	C
<b>340</b>	460	73	3	1 380	5 800	395	820	<b>29268</b>	395	445	21	37	183
	540	122	5	2 950	10 700	695	610	<b>29368</b>	428	520	41	59	192
	620	170	7.5	4 900	17 500	925	500	<b>29468</b>	462	590	61	82	201
<b>360</b>	500	85	4	1 680	7 050	480	720	<b>29272</b>	423	485	25	44	194
	560	122	5	3 000	11 100	915	590	<b>29372</b>	448	540	41	59	202
	640	170	7.5	5 000	18 500	950	490	<b>29472</b>	480	610	61	82	210
<b>380</b>	520	85	4	1 770	7 650	505	700	<b>29276</b>	441	505	27	42	202
	600	132	6	3 550	13 300	835	550	<b>29376</b>	477	580	44	63	216
	670	175	7.5	5 450	19 700	1 060	470	<b>29476</b>	504	640	63	85	230
<b>400</b>	540	85	4	1 800	7 950	525	680	<b>29280</b>	460	526	27	42	212
	620	132	6	3 750	14 500	865	530	<b>29380</b>	494	596	44	64	225
	710	185	7.5	6 050	22 100	1 140	440	<b>29480</b>	534	680	67	89	236
<b>420</b>	580	95	5	2 330	10 400	670	620	<b>29284</b>	489	564	30	46	225
	650	140	6	4 000	15 500	925	500	<b>29384</b>	520	626	48	68	235
	730	185	7.5	6 100	22 800	1 190	430	<b>29484</b>	556	700	67	89	244
<b>440</b>	600	95	5	2 390	10 900	695	600	<b>29288</b>	508	585	30	49	235
	680	145	6	4 200	16 400	965	480	<b>29388</b>	548	655	49	70	245
	780	206	9.5	7 100	26 200	1 340	390	<b>29488</b>	588	745	74	100	260
<b>460</b>	620	95	5	2 390	11 000	900	590	<b>29292</b>	530	605	30	46	245
	710	150	6	4 700	18 500	1060	460	<b>29392</b>	567	685	51	72	257
	800	206	9.5	7 350	27 900	1390	380	<b>29492</b>	608	765	74	100	272
<b>480</b>	650	103	5	2 670	12 000	760	550	<b>29296</b>	556	635	33	55	259
	730	150	6	4 700	18 700	1 100	450	<b>29396</b>	590	705	51	72	270
	850	224	9.5	8 350	31 500	1 490	350	<b>29496</b>	638	810	81	108	280
<b>500</b>	670	103	5	2 830	13 000	810	530	<b>292/500</b>	574	654	33	55	268
	750	150	6	4 750	19 300	1 140	440	<b>293/500</b>	611	725	51	74	280
	870	224	9.5	8 450	33 000	1 610	340	<b>294/500</b>	661	830	81	107	290

1) Smallest allowable dimension for chamfer dimension r.



Dynamic equivalent axial load

$$P_a = F_a + 1.2 F_r$$

Static equivalent axial load

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

Provided that  $\frac{F_r}{F_a} \leq 0.55$  only.

Installation-related dimensions mm			Mass kg (approx.)
$d_a$ Min.	$D_a$ Max.	$r_{as}$ Max.	
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