WBW BEARINGS

THRUST BEARING

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Based different rolling element, the thrust bearing can be thrust ball bearings and thrust roller 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."
There are four types of thrust bearings:

Single direction thrust ball bearings

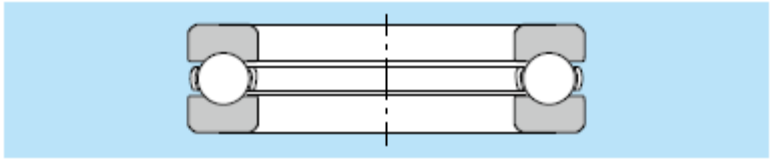


Fig. 1 Single direction thrust ball bearing (example of pressed cage)

Thrust spherical roller bearings

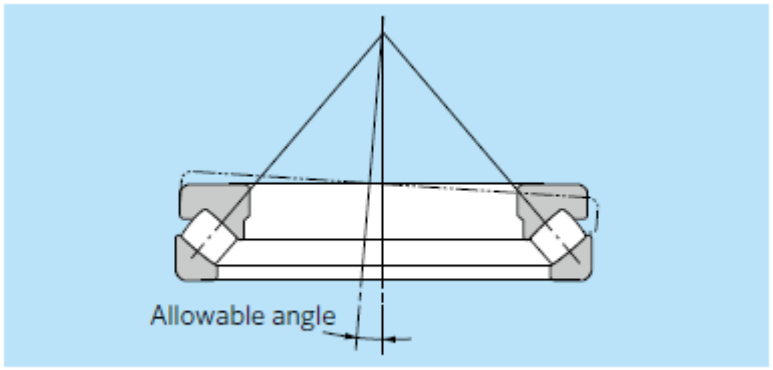


Fig. 2 Thrust spherical roller bearings

Thrust cylindrical roller bearings

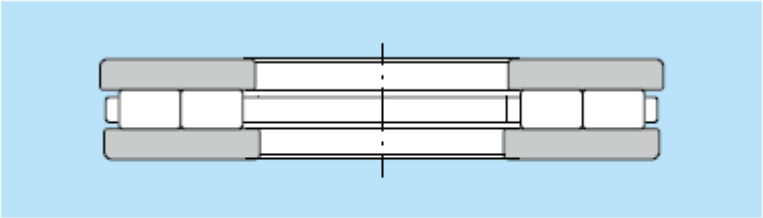


Fig. 3 Double row thrust cylindrical roller bearings

Thrust tapered roller bearings

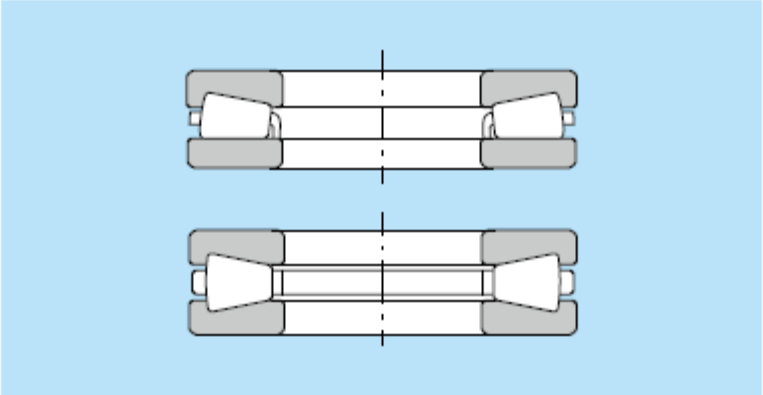
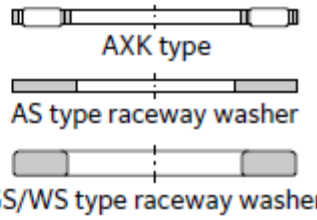
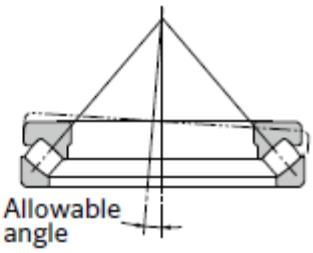


Fig. 4 Thrust tapered roller bearings

Table 1.8 Types of thrust bearings

Type	Single direction thrust ball bearing	Needle roller thrust bearings
Structure		
	Thrust cylindrical roller bearing	Thrust self-aligning roller bearing
		

How to fit the thrust bearing ?

Fitting dimensions for thrust bearings For thrust bearings, it is necessary to make the raceway washer back face sufficiently wide in relation to load and rigidity. Consequently, fitting dimensions from the dimension tables should be adopted. (Figs. 14.2 and 14.3) For this reason, shaft and abutment heights will be larger than for radial bearings. (Refer to dimension tables for all thrust bearing fitting dimensions.)

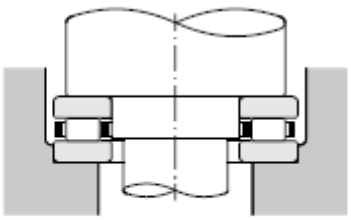


Fig. 14.2

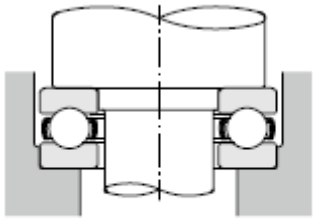


Fig. 14.3

Cages used for single direction thrust ball bearings:

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Table 1 Standard cage types for single direction thrust ball bearings

Cage type / Bearing series	Resin cage	Pressed cage	Machined cage
			
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.

Table 7.3 Standard fits for thrust bearings (JIS Class 0 and 6)

Table 7.3 (1) Shaft fits

Bearing type	Load conditions		Fit	Shaft diameter mm Over Incl.	Tolerance class
All thrust bearings	Centered axial load only		Transition fit	Overall shaft diameter	js6 or h6
Self-aligning roller thrust bearing	Combined load	Static inner ring load	Transition fit	Overall shaft diameter	js6
		Rotating inner ring load or Indeterminate load	Transition fit Tight fit	Up to 200 400 to 200 400 or more	k6 or js6 m6 or k6 n6 or m6

Table 7.3 (2) Housing fits

Bearing type	Load conditions		Fit	Tolerance class	Remarks
All thrust bearings	Centered axial load only		Loose fit	Select a tolerance class that will provide clearance between outer ring and housing.	
Self-aligning roller thrust bearing	Combined load	Static outer ring load		H8	Greater accuracy required with thrust ball bearings
				H7	——
		Indeterminate load or Rotating outer ring load	Transition fit	K7	Normal operating conditions
				M7	For relatively large radial loads

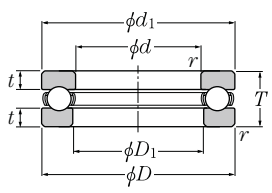
Note: All values and fits listed in the above tables are for cast iron or steel housings.

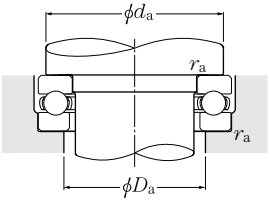
Table 6.2 Comparison of tolerance classifications of national standards

Standard	Applicable standard	Accuracy class					Bearing type
Japanese industrial standard (JIS)	JIS B 1514-1	Class 0, 6	Class 6	Class 5	Class 4	Class 2	Radial bearings
	JIS B 1514-2	Class 0	Class 6	Class 5	Class 4	—	Thrust bearings
International Organization for Standardization (ISO)	ISO 492	Normal class Class 6X	Class 6	Class 5	Class 4	Class 2	Radial bearings
	ISO 199	Normal Class	Class 6	Class 5	Class 4	—	Thrust bearings
	ISO 578	Class 4	—	Class 3	Class 0	Class 00	Tapered roller bearings (Inch series)
	ISO 1224	—	—	Class 5A	Class 4A	—	Precision instrument bearings
Deutsches Institut fur Normung (DIN)	DIN 620	P0	P6	P5	P4	P2	All types
American National Standards Institute (ANSI) American Bearing Manufacturer's Association (ABMA)	ANSI/ABMA Std.20 1)	ABEC-1 RBEC-1	ABEC-3 RBEC-3	ABEC-5 RBEC-5	ABEC-7	ABEC-9	Radial bearings (excluding tapered roller bearings)
	ANSI/ABMA Std.19.1	Class K	Class N	Class C	Class B	Class A	Tapered roller bearings (Metric series)
	ANSI/ABMA Std.19	Class 4	Class 2	Class 3	Class 0	Class 00	Tapered roller bearings (Inch series)

1) "ABEC" is applied to ball bearings and "RBEC" to roller bearings.
Note: 1. JIS B 1514 series, ISO492, 199, and DIN620 have the same specification level.
2. The tolerance and allowance of JIS B 1514 series are slightly different from those of ABMA standards.

Bearing damage	Damaged parts	Causes														
		Handling		Bearing periphery			Lubrication		Load			Speed			Bearing selection	
		Poor storage condition/ vibration during transportation	Improper handling/ installation	Insufficient accuracy of shaft/housing	Infiltration of bearing by foreign matter (insufficient sealing performance)	Temperature (heat effect)	Lubricant (insufficient/ improper quality)	Lubrication method (insufficient)	Excessively large impact load/preload	Excessively large moment	Excessively small load	High speed/ rapid acceleration and deceleration	Large vibration	Swinging/vibration/ standstill	Excessively large/ small clearance	Excessively large/ small interference
Flaking (separation)	Raceway surface/ rolling element surface		○	○	○	○	○	○	○	○					○	
Seizure	Raceway/ rolling element/cage		○			○	○	○	○	○		○			○	
Cracks/chips	Raceway/rolling element		○	○			○		○	○						○
Cage damage	Rivets break or become loose		○		○		○	○	○	○		○	○			
Rolling path skewing	Raceway surface		○	○											○	
Smearing/ scuffing	Raceway surface/ rolling element surface/ rib surface/ roller end surface		○		○		○	○	○		○					
Rust/ corrosion	Rust on a part of or the entire surface of the rolling element pitch	○	○		○		○	○								
Fretting	Red rust on fitting surface		○						○				○			
	Brinelling indentations form on the raceway of the rolling element pitch	○					○	○						○		○
Wear	Raceway surface/ rolling element surface/ rib surface/ roller end surface		○		○		○	○								
Electrolytic corrosion	Pits form on the raceway. The pits gradually grow into ripples.		○													
Dents and scratches	Raceway surface/ rolling element surface		○		○				○	○						
Creeping	Fitting surface		○	○		○			○							○
Speckles and discoloration	Raceway surface/ rolling element surface				○		○	○								
Peeling	Raceway surface/ rolling element surface				○		○	○								



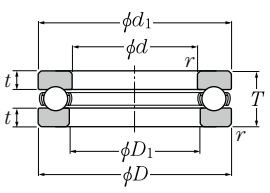


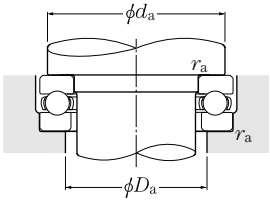
Dynamic equivalent axial load
$P_a = F_a$
Static equivalent axial load
$P_{0a} = F_a$

d 10 ～ 50mm

d	D	T	$r_{s\,min}$ [1]	Basic load rating dynamic C_a kN	Basic load rating static C_{0a} kN	Fatigue load limit C_u kN	Allowable speed min^{-1} Grease lubrication	Allowable speed min^{-1} Oil lubrication	Bearing numbers	Dimensions mm $d_{1s\,max}$ [2]	Dimensions mm $D_{1s\,min}$ [3]	Dimensions mm t	Installation-related dimensions mm d_a Min.	Installation-related dimensions mm D_a Max.	Installation-related dimensions mm r_{as} Max.	Mass kg (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.



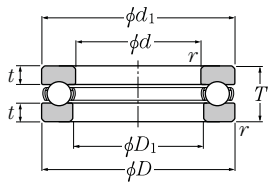


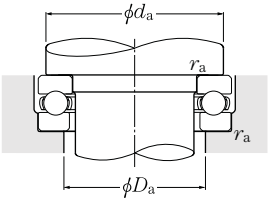
Dynamic equivalent axial load
$P_a = F_a$
Static equivalent axial load
$P_{0a} = F_a$

d 50 ～ 90mm

d	D	T	$r_{s\,min}$ [1]	Basic load rating dynamic C_a kN	Basic load rating static C_{0a} kN	Fatigue load limit C_u kN	Allowable speed min^{-1} Grease lubrication	Allowable speed min^{-1} Oil lubrication	Bearing numbers [4]	Dimensions mm $d_{1s\,max}$ [2]	Dimensions mm $D_{1s\,min}$ [3]	Dimensions mm t	Installation-related dimensions mm d_a Min.	Installation-related dimensions mm D_a Max.	Installation-related dimensions mm r_{as} Max.	Mass kg (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.



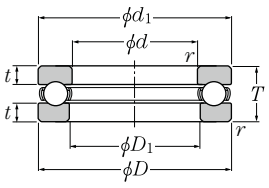


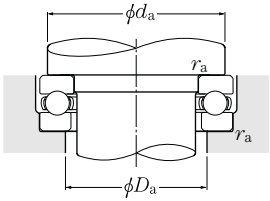
Dynamic equivalent axial load
$P_a = F_a$
Static equivalent axial load
$P_{0a} = F_a$

d 100 ～ 200mm

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



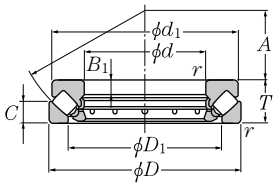


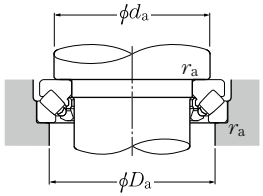
Dynamic equivalent axial load
$P_a = F_a$
Static equivalent axial load
$P_{0a} = F_a$

d 200 ～ 530mm

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





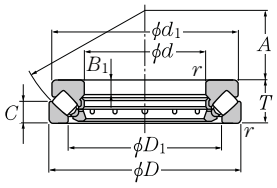
Dynamic equivalent axial load
$P_a = F_a + 1.2F_r$
Static equivalent axial load
$P_{0a} = F_a + 2.7F_r$
Provided that $\frac{F_r}{F_a} \leqq 0.55$ only.

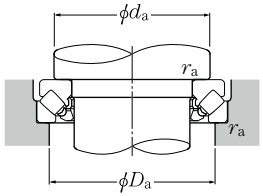
d 60 ~ 160mm

Boundary dimensions mm				Basic load rating dynamic kN	static kN	Fatigue load limit kN	Allowable speed min⁻¹ Oil lubrication	Bearing numbers	Dimensions mm				
d	D	T	$r_{s\,min}$[1]	C_a	C_{0a}	C_u			D_1	d_1	B_1	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

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

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 $\frac{F_r}{F_a} \leqq 0.55$ only.

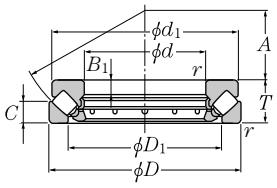
d 170 ～ 320mm

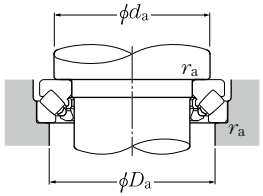
Boundary dimensions mm				Basic load rating dynamic kN	Basic load rating static kN	Fatigue load limit kN	Allowable speed min⁻¹ Oil lubrication	Bearing numbers	Dimensions mm				
d	D	T	$r_{s\,min}$[1]	C_a	C_{0a}	C_u			D_1	d_1	B_1	C	A
170	240	42	1.5	475	1 770	146	1 600	**29234**	198	233	15	20	92
	280	67	3	950	3 050	238	1 200	**29334**	216	270	23	32	96
	340	103	5	1840	5 750	345	940	**29434**	243	324	37	50	104
180	250	42	1.5	500	1 920	160	1 600	**29236**	208	243	15	20	97
	300	73	3	1 110	3 600	272	1 100	**29336**	232	290	25	35	103
	360	109	5	2 050	6 200	400	890	**29436**	255	342	39	52	110
190	270	48	2	585	2 230	184	1 400	**29238**	223	262	15	24	104
	320	78	4	1 280	4 250	294	1 100	**29338**	246	308	27	38	110
	380	115	5	2 230	6 800	430	840	**29438**	271	360	41	55	117
200	280	48	2	595	2 300	183	1 400	**29240**	236	271	15	24	108
	340	85	4	1 420	4 600	330	980	**29340**	261	325	29	41	116
	400	122	5	2 490	7 650	465	790	**29440**	286	380	43	59	122
220	300	48	2	620	2 480	198	1 300	**29244**	254	292	15	24	117
	360	85	4	1 540	5 200	360	940	**29344**	280	345	29	41	125
	420	122	6	2 560	8 100	505	760	**29444**	308	400	43	58	132
240	340	60	2.1	890	3 600	271	1 100	**29248**	283	330	19	30	130
	380	85	4	1 530	5 250	390	910	**29348**	300	365	29	41	135
	440	122	6	2 680	8 700	530	740	**29448**	326	420	43	59	142
260	360	60	2.1	960	3 950	296	1 100	**29252**	302	350	19	30	139
	420	95	5	1 910	6 800	445	810	**29352**	329	405	32	45	148
	480	132	6	3 050	10 000	610	670	**29452**	357	460	48	64	154
280	380	60	2.1	975	4 050	245	1 000	**29256**	323	370	19	30	150
	440	95	5	2 010	7 250	480	790	**29356**	348	423	32	46	158
	520	145	6	3 700	12 400	710	610	**29456**	387	495	52	68	166
300	420	73	3	1 330	5 350	385	870	**29260**	353	405	21	38	162
	480	109	5	2 380	8 250	580	700	**29360**	379	460	37	50	168
	540	145	6	3 850	13 200	735	590	**29460**	402	515	52	70	175
320	440	73	3	1 400	5 800	415	840	**29264**	372	430	21	38	172
	500	109	5	2 470	8 800	605	680	**29364**	399	482	37	53	180
	580	155	7.5	4 100	14 200	820	550	**29464**	435	555	55	75	191

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

1) Smallest allowable dimension for chamfer dimension r.

Thrust Spherical Roller Bearings WBW





Dynamic equivalent axial load
$P_a = F_a + 1.2F_r$
Static equivalent axial load
$P_{0a} = F_a + 2.7F_r$
Provided that $\frac{F_r}{F_a} \leqq 0.55$ only.

d 340 ～ 500mm

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

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

1) Smallest allowable dimension for chamfer dimension r.

Thrust Spherical Roller Bearings WBW