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Tapered Roller Bearings - Radial - Metric Design ANSI/ABMA 19.1:2011



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Tapered Roller Bearings — Radial Metric Design

CONTENTS

SECTION	PAGE
1. Scope	1
2. Part Numbering Systems.....	1
2.1 Reference Part Numbers	1
2.2 Existing Numbering Systems	1
3. Symbols and Nomenclature.....	2
3.1 Inner and Outer Ring Chamfer Dimensions	3
4. Boundary Dimensions	4
4.1 General	4
4.2 Cage Axial Clearance	4
4.3 Bearing Assembly Types	4
4.4 Spacers	4
5. Tolerances	27
5.1 General	27
5.2 Component Effective Width (stand) gauging and Overall Bearing Width Tolerance.....	27
5.3 Tolerance Classes	29
5.4 Tolerance Symbols	30
6. Fitting Practices.....	44
6.1 General	44
6.2 Surface Finish of Bearing Seats.....	44
6.3 Definition of Operating Characteristics	44
6.4 Backings.....	44
Appendix	
Appendix A – Part Numbering Systems of Metric Tapered Roller Bearings	52

LIST OF TABLES

TABLE NUMBER	PAGE
1. Bearing Assembly Types	4
BOUNDARY DIMENSIONS	
2. Type TS	5
3. Type TSF	14
4. Type TDO	19
5. Type 2TS	23
TOLERANCE TABLES	
6. Class K	31
7. Class N	34
8. Class C	36
9. Class B	39
10. Class A	41
11. Outer Ring Flange OD	43
12. RECOMMENDED FITTING PRACTICES	
Industrial	45
Automotive	51

LIST OF FIGURES

FIGURE NUMBER	PAGE
1. Single Outer Ring, High Effective Width, Back face, Non-flanged	28
2. Single Outer Ring, Low Effective Width, Back face, Non-flanged	28
3. Single Outer Ring, High Effective Width, Back face, Flanged	28
4. Single Outer Ring, Low Effective Width, Back face, Flanged	28
5. Double Outer Ring, High Effective Width, Adjacent face	28
6. Double Outer Ring, Low Effective Width, Adjacent face	28
7. Single Inner Ring, High Effective Width, Back face	28
8. Single Inner Ring, Low Effective Width, Back face	28

Tapered Roller Bearings — Radial Metric Design

1. SCOPE

This standard covers metric design radial tapered roller bearings of various types, part numbering systems, boundary dimensions, tolerances, and fitting practices. Tapered roller thrust bearings are covered in a separate ABMA standard.

General ABMA standards which apply to various types of bearings should be consulted for tolerance definitions, gauging practices, mounting accessories, and method of evaluating load ratings.

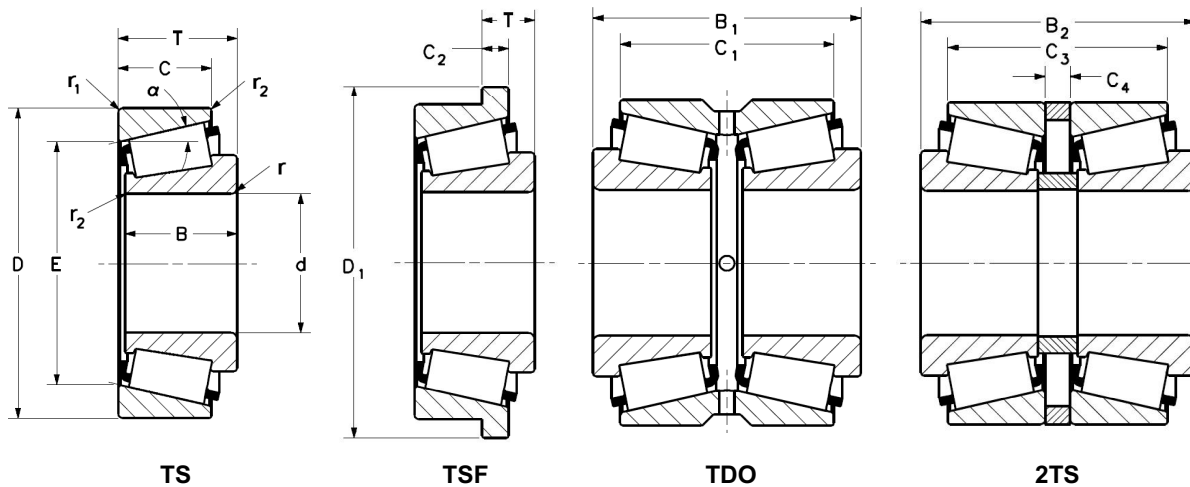
2. PART NUMBERING SYSTEMS

2.1 Reference Part Numbers. Bearings contained in the Boundary Dimension Tables (2-5) of this standard are identified with the reference part numbers and ISO Dimension Series designations described in Appendix A.

2.1.1 Individual Component Part Numbers. Unlike other bearing types, tapered roller bearing inner and outer rings are individually numbered. The inner ring is assembled with rollers and a cage, and when used with an outer ring, makes a complete bearing assembly. Both inner and outer ring part numbers are required to identify a complete bearing assembly. The inner ring number followed by the outer ring number is the preferred practice.

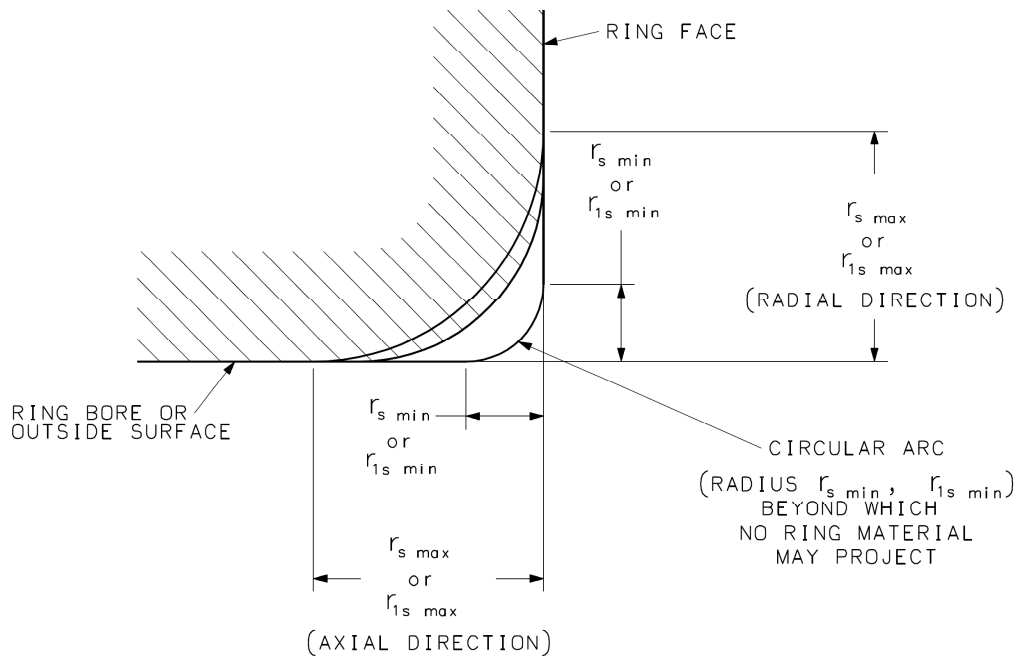
2.2 Existing Numbering Systems. Bearing manufacturers have used various part numbering systems. For reference purposes the more commonly used systems are described in Appendix A.

3. SYMBOLS AND NOMENCLATURE



- B = inner ring width, single-row bearing
- B_1 = bearing width, double-row TDO bearing
- B_2 = bearing width, double-row 2TS bearing
- C = outer ring width, single-row bearing
- C_1 = width of double outer ring
- C_2 = width of outer ring flange
- C_3 = width over two single outer rings and spacer of a double-row 2TS bearing
- C_4 = width of outer ring spacer
- D = outside diameter of outer ring
- D_1 = outside diameter of outer ring flange
- d = bore diameter of inner ring
- E = inside diameter of outer ring back face
- r = chamfer dimension of inner ring back face
- r_1 = chamfer dimension of outer ring back face
- r_2 = chamfer dimension of inner ring and outer ring front face
- T = bearing width, single-row TS or TSF bearing
- α = contact angle

3.1 INNER AND OUTER RING CHAMFER DIMENSIONS



$r_{s \min}$ = smallest permissible single chamfer dimension of inner ring back face

$r_{s \max}$ = largest permissible single chamfer dimension of inner ring back face

$r_{1s \min}$ = smallest permissible single chamfer dimension of outer ring back face

$r_{1s \max}$ = largest permissible single chamfer dimension of outer ring back face

In order to ensure that tapered roller bearing chamfers are compatible with the dimensions of parts which come into contact with the rolling bearings, values of the chamfer dimension limits, of which the minimum limit is of primary interest to the bearing user and application designer, are required.

The exact shape of the chamfer surface is not specified, but its contour in an axial plane shall not be allowed to project beyond the imaginary circular arc, of radius $r_{s \min}$ or $r_{1s \min}$ tangential to the ring face and the bore or outside cylindrical surface of the ring.

The largest single shaft and housing radius must not exceed the smallest single chamfer dimension of the inner or outer ring.

No values are given in this standard for the inner ring and outer ring front face chamfer dimension r_2 , however, the front face corners shall not be sharp.

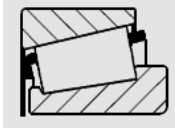
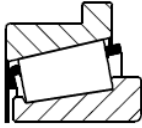
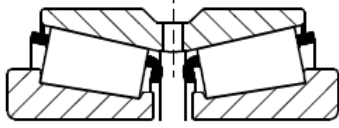
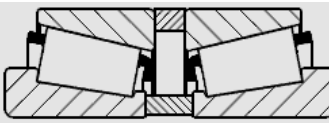
4. BOUNDARY DIMENSIONS

4.1 General. The bearings covered in the Boundary Dimension Tables (2-5) are a combination of those in common use, bearings from ISO 355, and bearings to meet anticipated future needs. The tables are designed to minimize the number of metric design tapered roller bearings, yet satisfy present and future needs of bearing users. These tables do not contain any indication as to availability of bearings.

4.2 Cage Axial Clearance. Bearing mounting designs must afford adequate clearance for the cage. It should be noted that often the small end of the cage extends beyond the faces of the inner and outer ring.

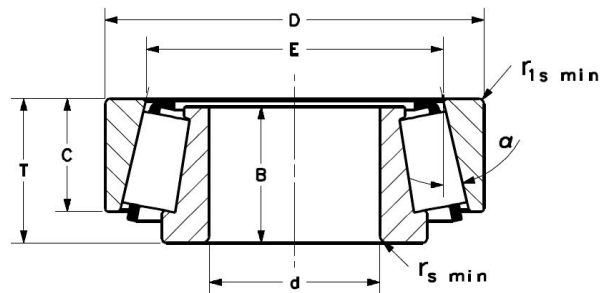
4.3 Bearing Assembly Types. The following table shows the types of tapered roller bearing assemblies which appear in the Boundary Dimension Tables, with a brief description and a typical illustration of each type. Other types of single row, two row, and four row tapered roller bearing assemblies, with or without spacers, are available. Individual bearing manufacturers should be consulted for further details.

**TABLE 1
BEARING ASSEMBLY TYPES**

Bearing type	Description	Boundary dimension table	
TS	Single row, straight bore.	2	
TSF	Single row, straight bore, flanged outer ring.	3	
TDO	Double row, straight bore, two single inner rings, one double outer ring with lubrication groove and holes.	4	
2TS	Double row, straight bore, two single inner rings, two single outer rings.	5	

4.4 Spacers. Type 2TS bearing assemblies included in the boundary dimension tables of this standard are shown with spacers. Type TDO bearing assemblies included in this standard can be furnished by the manufacturer with inner ring spacers. Spacers are made of both hardened and unhardened steel of numerous configurations. Consult individual manufacturers for availability. When these types of bearings are fitted with spacers, they are furnished as pre-set assemblies in which the spacers have been finished to size to establish a pre-determined axial clearance within each bearing assembly. Therefore component parts from one assembly are not interchangeable with similar assemblies even if made by the same manufacturer. Because spacer assemblies are pre-set by the manufacturer, spacers are generally not sold separately.

TABLE 2 - Sheet 1 of 9
TYPE TS BOUNDARY DIMENSIONS



Dimensions shown in millimeters

Bore d	OD D	Width T	Reference Part Numbers		ISO Dimension Series	Inner Ring		Outer Ring		Inside Diameter E	Contact Angle α
			Inner Ring	Outer Ring		Minimum Radius ^a $r_{1s \min}$	Width B	Minimum Radius ^a $r_{1s \min}$	Width C		
15	42	14.25	X30302	Y30302	2FB	1	13	1	11	33.272	10° 45' 29"
17	40	13.25	X30203	Y30203	2DB	1	12	1	11	31.408	12° 57' 10"
17	40	17.25	X32203	Y32203	2DD	1	16	1	14	31.17	11° 45'
17	47	15.25	X30303	Y30303	2FB	1	14	1	12	37.42	10° 45' 29"
17	47	20.25	X32303	Y32303	2FD	1	19	1	16	36.09	10° 45' 29"
20	37	12	X32904	Y32904	2BD	0.3	12	0.3	9	29.621	12°
20	42	15	X32004X	Y32004X	3CC	0.6	15	0.6	12	32.781	14°
20	45	14	JP2049	JP2010	4DB	1	14	1	10	35.679	16° 40'
20	45	17	JD2049	JD2010	2DC	1	17.5	1	13.5	35.815	12°
20	47	15.25	X30204	Y30204	2DB	1	14	1	12	37.304	12° 57' 10"
20	47	19.25	X32204	Y32204	2DD	1	18	1	15	35.81	12° 28'
20	47	19.25	X32204-B	Y32204-B	5DD	1	18	1	15	33.708	19°
20	50	22	JF2049	JF2010	2ED	2	22	1.5	18.5	38.063	12° 30'
20	52	16.25	X30304	Y30304	2FB	1.5	15	1.5	13	41.318	11° 18' 36"
20	52	22.25	X32304	Y32304	2FD	1.5	21	1.5	18	39.518	11° 18' 36"
22	40	12	X329/22	Y329/22	2BC	0.3	12	0.3	9	32.665	12°
22	44	15	X320/22X	Y320/22X	3CC	0.6	15	0.6	11.5	34.708	14° 50'
22	47	14	JP2249	JP2210	4CB	1	14	1	10	37.443	17° 30'
22	47	17	JD2249	JD2210	2CC	1	17.5	1	13.5	37.542	12° 35'
22	52	22	JF2249	JF2210	2ED	2	22	1.5	18.5	40.548	12° 14'
25	42	12	X32905	Y32905	2BD	0.3	12	0.3	9	34.608	12°
25	47	15	X32005X	Y32005X	4CC	0.6	15	0.6	11.5	37.393	16°
25	47	17	X33005	Y33005	2CE	0.6	17	0.6	14	38.278	10° 55'
25	50	14	JP2549	JP2510	4CB	1	14	1	10	40.025	18° 45'
25	50	17	JD2549	JD2510	2CC	1.5	17.5	1	13.5	40.205	13° 30'
25	52	16.25	X30205	Y30205	3CC	1	15	1	13	41.135	14° 02' 10"
25	52	19.25	X32205	Y32205	2CD	1	18	1	16	41.331	13° 30'
25	52	19.25	X32205-B	Y32205-B	5CD	1	18	1	15	37.555	21° 15'
25	52	22	X33205	Y33205	2DE ^b	1	22	1	18	40.441	13° 10'
25	58	26	JF2549	JF2510	2EE	2	26	1.5	21	44.805	12° 30'
25	62	18.25	X30305	Y30305	2FB	1.5	17	1.5	15	50.637	11° 18' 36"
25	62	18.25	X31305	Y31305	7FB	1.5	17	1.5	13	44.13	28° 48' 39"
25	62	25.25	X32305	Y32305	2FD	1.5	24	1.5	20	48.637	11° 18' 36"
28	45	12	X329/28	Y329/28	2BD	0.3	12	0.3	9	37.639	12°
28	52	16	X320/28X	Y320/28X	4CC	1	16	1	12	41.991	16°
28	55	15	JP2849	JP2810	4CB	1	14.5	1	11	44.597	17° 30'
28	55	19	JD2849	JD2810	2CD	1.5	19.5	1.5	15.5	44.888	12° 10'
28	58	20.25	X322/28-B	Y322/28-B	5DD	1	19	1	16	42.436	20° 34'
28	58	24	X332/28	Y332/28	2DE	1	24	1	19	45.846	12° 45'
28	65	27	JF2849	JF2810	2ED	2	27	2	22	50.33	12° 45'

TABLE 2 - Sheet 2 of 9
TYPE TS BOUNDARY DIMENSIONS

Dimensions shown in millimeters

Bore d	OD D	Width T	Reference Part Numbers		ISO Dimension Series	Inner Ring		Outer Ring		Inside Diameter E	Contact Angle α
			Inner Ring	Outer Ring		Minimum Radius ^a r_s min	Width B	Minimum Radius ^a r_{1s} min	Width C		
30	47	12	X32906	Y32906	2BD	0.3	12	0.3	9	39.617	12°
30	55	17	X32006X	Y32006X	4CC	1	17	1	13	44.438	16°
30	55	20	X33006	Y33006	2CE	1	20	1	16	45.283	11°
30	58	19	JD3049	JD3010	2CD	1.5	19.5	1.5	15.5	47.309	12° 50'
30	60	17	JP3049	JP3010	4CB	1	16.5	1	12.5	48.465	17° 30'
30	62	17.25	X30206	Y30206	3DB	1	16	1	14	49.99	14° 02' 10"
30	62	21.25	X32206	Y32206	3DC	1	20	1	17	48.982	14° 02' 10"
30	62	21.25	X32206-B	Y32206-B	5DC	1	20	1	17	46.389	20° 34'
30	62	25	X33206	Y33206	2DE	1	25	1	19.5	49.524	12° 50'
30	68	29	JF3049	JF3010	2EE	2	29	2	24	52.696	12° 28'
30	72	20.75	X30306	Y30306	2FB	1.5	19	1.5	16	58.287	11° 51' 35"
30	72	20.75	X31306	Y31306	7FB	1.5	19	1.5	14	51.771	28° 48' 39"
30	72	28.75	X32306	Y32306	2FD	1.5	27	1.5	23	55.767	11° 51' 35"
30	72	28.75	X32306-B	Y32306-B	5FD	1.5	27	1.5	23	50.518	20°
32	52	14	X329/32	Y329/32	2BD	0.6	15	0.6	10	44.261	12°
32	58	17	X320/32X	Y320/32X	4CC	1	17	1	13	46.708	16° 50'
32	62	21	JD3249	JD3210	2CD	1.5	21	1.5	17	50.554	12° 30'
32	65	18	JP3249	JP3210	4DB	1	17.5	1	13.5	52.418	17° 30'
32	65	18.25	X302/32	Y302/32	3DB	1	17	1	15	52.5	14°
32	65	22	X322/32-B	Y322/32-B	5DC	1	21.5	1	17	48.523	20°
32	65	26	X332/32	Y332/32	2DE	1	26	1	20.5	51.791	13°
32	72	29	JF3249	JF3210	2ED	2	29	2	24	56.151	12° 41' 30"
32	75	29.75	X323/32-B	Y323/32-B	5FD	1.5	28	1.5	23	53.594	20°
35	55	14	X32907	Y32907	2BD	0.6	14	0.6	11.5	47.22	11°
35	62	18	X32007X	Y32007X	4CC	1	18	1	14	50.51	16° 50'
35	62	21	X33007	Y33007	2CE	1	21	1	17	51.32	11° 30'
35	68	23	JD3549	JD3510	2DD	2	23	2	18.5	55.4	12° 35'
35	70	19	JP3549	JP3510	4DB	1	18	1	14	57.138	16° 49' 30"
35	72	18.25	X30207	Y30207	3DB	1.5	17	1.5	15	58.844	14° 02' 10"
35	72	24.25	X32207	Y32207	3DC	1.5	23	1.5	19	57.087	14° 02' 10"
35	72	24.25	X32207-B	Y32207-B	5DC	1.5	23	1.5	19	53.052	21° 10'
35	72	28	X33207	Y33207	2DE	1.5	28	1.5	22	57.186	13° 15'
35	78	33	JF3549	JF3510	2EE ^b	2.5	32.5	2	27	61.925	12° 12'
35	80	22.75	X30307	Y30307	2FB	2	21	1.5	18	65.769	11° 51' 35"
35	80	22.75	X31307	Y31307	7FB	2	21	1.5	15	58.861	28° 48' 39"
35	80	32.75	X32307	Y32307	2FE	2	31	1.5	25	62.829	11° 51' 35"
35	80	32.75	X32307-B	Y32307-B	5FE	2	31	1.5	25	57.011	20°
40	62	15	X32908	Y32908	2BC	0.6	15	0.6	12	53.388	10° 55'
40	68	19	X32008X	Y32008X	3CD	1	19	1	14.5	56.897	14° 10'
40	68	22	X33008	Y33008	2BE ^b	1	22	1	18	57.29	10° 40'
40	75	19	JP4049	JP4010	4CB	1	18	1	14	61.526	18° 10' 30"
40	75	24	JD4049	JD4010	2CD	2	24	2	19.5	62.155	12° 0' 7"
40	75	26	X33108	Y33108	2CE	1.5	26	1.5	20.5	61.169	13° 20'
40	80	19.75	X30208	Y30208	3DB	1.5	18	1.5	16	65.73	14° 02' 10"
40	80	24.75	X32208	Y32208	3DC	1.5	23	1.5	19	64.715	14° 02' 10"
40	80	24.75	X32208-B	Y32208-B	5DC	1.5	23	1.5	19	61.438	20°
40	80	27	JT4049	JT4010	5DD	4	26.5	2	21.5	58.963	20° 43' 30"
40	80	32	X33208	Y33208	2DE	1.5	32	1.5	25	63.405	13° 25'
40	85	33	JF4049	JF4010	2EE	2.5	32.5	2	28	66.612	12° 55'
40	90	25.25	X30308	Y30308	2FB	2	23	1.5	20	72.703	12° 57' 10"
40	90	25.25	X31308	Y31308	7FB	2	23	1.5	17	66.984	28° 48' 39"
40	90	35.25	X32308	Y32308	2FD	2	33	1.5	27	69.253	12° 57' 10"
40	90	35.25	X32308-B	Y32308-B	5FD	2	33	1.5	27	63.708	20°

TABLE 2 - Sheet 3 of 9
TYPE TS BOUNDARY DIMENSIONS

Dimensions shown in millimeters

Bore	OD	Width	Reference		ISO	Inner Ring		Outer Ring			
			Part Numbers			Minimum Radius ^a	Width	Minimum Radius ^a	Width	Inside Diameter	Contact Angle
			Inner Ring	Outer Ring							
d	D	T			Series	r _s min	B	r _{1s} min	C	E	α
45	68	15	X32909	Y32909	2BC	0.6	15	0.6	12	58.852	12°
45	75	20	X32009X	Y32009X	3CC	1	20	1	15.5	63.248	14° 40'
45	75	24	X33009	Y33009	2CE	1	24	1	19	63.116	11° 05'
45	80	24	JD4549	JD4510	2CD	2	24	2	19.5	66.615	13°
45	80	26	X33109	Y33109	3CE	1.5	26	1.5	20.5	65.7	14° 20'
45	85	20.75	X30209	Y30209	3DB	1.5	19	1.5	16	70.44	15° 06' 34"
45	85	21	JP4549	JP4510	4DB	2	20	2	15.5	70.252	16° 5' 30"
45	85	24.75	X32209	Y32209	3DC	1.5	23	1.5	19	69.61	15° 06' 34"
45	85	24.75	X32209-B	Y32209-B	5DC	1.5	23	1.5	19	66.138	21° 35'
45	85	32	X33209	Y33209	3DE	1.5	32	1.5	25	68.075	14° 25'
45	90	32	JT4549	JT4510	5ED	4	31	2	26	66.466	20°
45	95	29	JW4549	JW4510	7FC	2.5	26.5	2.5	20	67.061	30°
45	95	36	JF4549	JF4510	2ED ^o	2.5	35	2.5	30	75.712	12° 09'
45	100	27.25	X30309	Y30309	2FB	2	25	1.5	22	81.78	12° 57' 10"
45	100	27.25	X31309	Y31309	7FB	2	25	1.5	18	75.107	28° 48' 39"
45	100	38.25	X32309	Y32309	2FD	2	36	1.5	30	78.33	12° 57' 10"
45	100	38.25	X32309-B	Y32309-B	5FD	2	36	1.5	30	71.639	20°
50	72	15	X32910	Y32910	2BC	0.6	15	0.6	12	62.748	12° 50'
50	80	20	X32010X	Y32010X	3CC	1	20	1	15.5	67.841	15° 45'
50	80	24	X33010	Y33010	2CE	1	24	1	19	67.775	11° 55'
50	82	21.5	JLM104948	JLM104910	2CC	3	21.5	0.5	17	70.594	11° 30'
50	84	22	JLM704649	JLM704610	4CC	3.5	22	1.5	17.5	69.283	16° 15'
50	85	24	JD5049	JD5010	2CD	2	24	2	19.5	70.969	13° 52'
50	85	26	X33110	Y33110	3CE	1.5	26	1.5	20	70.214	15° 20'
50	90	21	JP5049	JP5010	4DB	2	20	2	15.5	74.87	18° 04' 30"
50	90	21.75	X30210	Y30210	3DB	1.5	20	1.5	17	75.078	15° 38' 32"
50	90	24.75	X32210	Y32210	3DC	1.5	23	1.5	19	74.226	15° 38' 32"
50	90	24.75	X32210-B	Y32210-B	5DC	1.5	23	1.5	18	72.169	21° 20'
50	90	28	JM205149	JM205110	2DD	3	28	2.5	23	74.538	12° 22'
50	90	28	JM205149A	JM205110	-	5	28	2.5	23	74.538	12° 22'
50	90	32	X33210	Y33210	3DE	1.5	32	1.5	24.5	72.727	15° 25'
50	100	36	JF5049	JF5010	2ED	2.5	35	2.5	30	79.996	12° 51'
50	100	36	JT5049	JT5010	5ED	4	34.5	2	29	74.391	19° 27' 30"
50	105	32	JW5049	JW5010	7FC	3	29	3	22	74.245	30°
50	105	37	JHM807045	JHM807010	4FD	3	36	2.5	29	80.243	18°
50	105	41	JN5049	JN5010	4FE	4	40	2.5	34	78.494	16° 41'
50	110	29.25	X30310	Y30310	2FB	2.5	27	2	23	90.633	12° 57' 10"
50	110	29.25	X31310	Y31310	7FB	2.5	27	2	19	82.747	28° 48' 39"
50	110	42.25	X32310	Y32310	2FD	2.5	40	2	33	86.263	12° 57' 10"
50	110	42.25	X32310-B	Y32310-B	5FD	2.5	40	2	33	78.582	20°
55	80	17	X32911	Y32911	2BC	1	17	1	14	69.503	11° 39'
55	85	18	JC5549	JC5510	2CC	2	18.5	2	14	73.586	12° 49'
55	90	23	JLM506849	JLM506810	3CB ^o	1.5	23	0.5	18.5	75.417	15°
55	90	23	X32011X	Y32011X	3CC	1.5	23	1.5	17.5	76.505	15° 10'
55	90	27	X33011	Y33011	2CE	1.5	27	1.5	21	76.656	11° 45'
55	95	21	JP5549	JP5510	4CB	2	20	2	15.5	80.79	16° 33'
55	95	27	JD5549	JD5510	2CD	2	27	2	21.5	80.106	12° 4' 30"
55	95	29	JM207049	JM207010	2DD ^o	1.5	29	2.5	23.5	79.593	12° 35'
55	95	29	JM207049A	JM207010	-	6	29	2.5	23.5	79.593	12° 35'
55	95	30	X33111	Y33111	3CE	1.5	30	1.5	23	78.893	14°
55	100	22.75	X30211	Y30211	3DB	2	21	1.5	18	84.197	15° 06' 34"
55	100	26.75	X32211	Y32211	3DC	2	25	1.5	21	82.837	15° 06' 34"
55	100	30	JS-5549	JS-5510	5DD	4	28.5	2.5	24	77.839	20°
55	100	35	X33211	Y33211	3DE	2	35	1.5	27	81.24	14° 5' 5"
55	105	36	JT5549	JT5510	5ED	4	34.5	2.5	29	78.283	20° 32' 30"
55	110	39	JF5549	JF5510	2ED ^o	2.5	39	2.5	32	88.446	13°
55	110	39	JH307749	JH307710	-	3	39	2.5	32	88.446	13°
55	115	34	JW5549	JW5510	7FC	3	31	3	23.5	81.787	30°
55	115	44	JN5549	JN5510	4FE	5	42	2.5	37	86.683	16° 15'
55	120	31.5	X30311	Y30311	2FB	2.5	29	2	25	99.146	12° 57' 10"
55	120	31.5	X31311	Y31311	7FB	2.5	29	2	21	89.563	28° 48' 39"
55	120	45.5	X32311	Y32311	2FD	2.5	43	2	35	94.316	12° 57' 10"
55	120	45.5	X32311-B	Y32311-B	5FD	2.5	43	2	35	86.3	20°

TABLE 2 - Sheet 4 of 9
TYPE TS BOUNDARY DIMENSIONS

Dimensions shown in millimeters

Bore	OD	Width	Reference Part Numbers		ISO Dimension Series	Inner Ring		Outer Ring		Inside Diameter	Contact Angle
						Minimum Radius ^a	Width	Minimum Radius ^a	Width		
			Inner Ring	Outer Ring		r _s min	B	r _{1s} min	C	E	α
60	85	17	X32912	Y32912	2BC	1	17	1	14	74.185	12° 27'
60	90	18	JC6049	JC6010	2CC	2	18.5	2	14	78.249	13° 3' 30"
60	95	23	X32012X	Y32012X	4CC	1.5	23	1.5	17.5	80.634	16°
60	95	24	JLM508748	JLM508710	3CD	5	24	2.5	19	80.256	15°
60	95	27	X33012	Y33012	2CE	1.5	27	1.5	21	80.422	12° 20'
60	100	21	JP6049	JP6010	4CB	2	20	2	15.5	85.256	17° 30'
60	100	27	JD6049	JD6010	2CD	2	27	2	21.5	84.587	13° 27'
60	100	30	X33112	Y33112	3CE	1.5	30	1.5	23	83.522	14° 50'
60	110	23.75	X30212	Y30212	3EB	2	22	1.5	19	91.876	15° 06' 34"
60	110	29.75	X32212	Y32212	3EC	2	28	1.5	24	90.236	15° 06' 34"
60	110	34	JS-6049	JS-6010	5DD ^b	4	32	2.5	27	85.698	19° 30'
60	110	38	X33212	Y33212	3EE	2	38	1.5	29	89.032	15° 05'
60	115	39	JT6049	JT6010	5ED	4	38	2.5	31	87.309	19° 32'
60	115	40	JF6049	JF6010	2FE	2.5	39	2.5	33	93.46	12° 30'
60	125	37	JW6049	JW6010	7FC	3	33.5	3	26	89.849	28° 39'
60	125	48	JN6049	JN6010	4FE	5	46	2.5	40	94.207	16° 15'
60	130	33.5	X30312	Y30312	2FB	3	31	2.5	26	107.769	12° 57' 10"
60	130	33.5	X31312	Y31312	7FB	3	31	2.5	22	98.236	28° 48' 39"
60	130	48.5	X32312	Y32312	2FD	3	46	2.5	37	102.939	12° 57' 10"
60	130	48.5	X32312-B	Y32312-B	5FD	3	46	2.5	37	94.2	20°
65	90	17	X32913	Y32913	2BC	1	17	1	14	78.849	13° 15'
65	100	22	JC6549	JC6510	2CC	2	22	2	17.5	87.433	12° 10' 30"
65	100	23	X32013X	Y32013X	4CC	1.5	23	1.5	17.5	85.567	17°
65	100	27	X33013	Y33013	2CE	1.5	27	1.5	21	85.257	13° 05'
65	105	21	JP6549	JP6510	4CB	2	20	2	15.5	89.709	18° 27'
65	105	24	JLM710949	JLM710910	4CD ^b	3	23	1	18.5	88.892	16° 50'
65	110	28	JM511946	JM511910	3DC	3	28	2.5	22.5	91.897	15°
65	110	31	JD6549	JD6510	2DD	2	31	2	25	93.09	12° 27'
65	110	34	X33113	Y33113	3DE	1.5	34	1.5	26.5	91.653	14° 30'
65	115	34	JS-6549	JS-6510	5DD	4	32	2.5	27	89.829	20° 30'
65	120	24.75	X30213	Y30213	3EB	2	23	1.5	20	101.934	15° 06' 34"
65	120	32.75	X32213	Y32213	3EC	2	31	1.5	27	99.484	15° 06' 34"
65	120	39	JH211749	JH211710	2ED	3	38.5	2.5	32	98.572	12° 40'
65	120	39	JH211749A	JH211710	-	7	38.5	2.5	32	98.572	12° 40'
65	120	39	JT6549	JT6510	5ED	4	38	2.5	31	91.214	20° 28'
65	120	41	X33213	Y33213	3EE	2	41	1.5	32	97.863	14° 35'
65	125	43	JF6549	JF6510	2FD	2.5	42	2.5	35	102.378	12°
65	130	37	JW6549	JW6510	7FC	3	33.5	3	26	93.445	30°
65	135	52	JN6549	JN6510	3FE	5	51	3	43	102.611	15° 5' 30"
65	140	36	X30313	Y30313	2GB	3	33	2.5	28	116.846	12° 57' 10"
65	140	36	X31313	Y31313	7GB	3	33	2.5	23	106.359	28° 48' 39"
65	140	51	X32313	Y32313	2GD	3	48	2.5	39	111.786	12° 57' 10"
65	140	51	X32313-B	Y32313-B	5GD	3	48	2.5	39	102.319	20°
70	100	20	X32914	Y32914	2BC	1	20	1	16	88.59	11° 53'
70	105	22	JC7049	JC7010	2CC	2	22	2	17.5	92.004	12° 49' 30"
70	110	21	JP7049	JP7010	4CB	2	20	2	15.5	95.533	17° 05'
70	110	25	X32014X	Y32014X	4CC	1.5	25	1.5	19	93.633	16° 10'
70	110	26	JLM813049	JLM813010	4CD ^b	1	25	2.5	20.5	91.539	18°
70	110	31	X33014	Y33014	2CE	1.5	31	1.5	25.5	95.021	10° 45'
70	115	29	JM612949	JM612910	4DC ^b	3	29	2.5	23	96.479	16°
70	120	34	JD7049	JD7010	2DD	2	33	2	27	101.343	12° 22'
70	120	37	X33114	Y33114	3DE	2	37	1.5	29	99.733	14° 10'
70	125	26.25	X30214	Y30214	3EB	2	24	1.5	21	105.748	15° 38' 32"
70	125	33.25	X32214	Y32214	3EC	2	31	1.5	27	103.765	15° 38' 32"
70	125	37	JS-7049	JS-7010	5DD ^b	4	34.5	2.5	30	98.1	19° 34'
70	125	41	X33214	Y33214	3EE	2	41	1.5	32	102.275	15° 1' 5"
70	130	42	JT7049	JT7010	5ED	4	40	2.5	34	100.186	19° 11'
70	130	43	JF7049	JF7010	2ED	3	42	2.5	35	106.766	12° 31' 30"
70	130	43	JF7049A	JF7010	-	7	42	2.5	35	106.766	12° 31' 30"
70	140	39	JW7049	JW7010	7FC	3	35.5	3	27	101.717	30°
70	140	52	JN7049	JN7010	4FE	5	51	3	43	106.644	16° 3' 4' 30"
70	150	38	X30314	Y30314	2GB	3	35	2.5	30	125.244	12° 57' 10"
70	150	38	X31314	Y31314	7GB	3	35	2.5	25	113.449	28° 48' 39"
70	150	54	X32314	Y32314	2GD	3	51	2.5	42	119.724	12° 57' 10"
70	150	54	X32314-B	Y32314-B	5GD	3	51	2.5	42	110.219	20°

TABLE 2 - Sheet 5 of 9
TYPE TS BOUNDARY DIMENSIONS

Dimensions shown in millimeters

Bore	OD	Width	Reference Part Numbers		ISO Dimension Series	Inner Ring		Outer Ring			Contact Angle
						Minimum Radius ^a	Width	Minimum Radius ^a	Width	Inside Diameter	
			Inner Ring	Outer Ring		r _s min	B	r _{1s} min	C	E	α
75	105	20	X32915	Y32915	2BC	1	20	1	16	93.223	12°31'
75	115	21	JP7549	JP7510	4CB	2	20	2	15.5	100.019	17°55'
75	115	25	JC7549	JC7510	2CC	2	25	2	20	100.414	12°
75	115	25	X32015X	Y32015X	4CC	1.5	25	1.5	19	98.358	17°
75	115	25	JLM714149	JLM714110	-	3	25	2.5	19	98.356	17°
75	115	31	X33015	Y33015	2CE	1.5	31	1.5	25.5	99.4	11°15'
75	120	31	JM714249	JM714210	4CD	3	29.5	2.5	25	99.926	16°30'
75	120	31	JM714249A	JM714210	-	6	29.5	2.5	25	99.926	16°30'
75	125	34	JD7549	JD7510	2DD	2.5	33	2	27	105.786	12°55'
75	125	37	X33115	Y33115	3DE	2	37	1.5	29	104.358	14°50'
75	130	27.25	X30215	Y30215	4DB	2	25	1.5	22	110.408	16°10' 20"
75	130	33.25	X32215	Y32215	4DC	2	31	1.5	27	108.932	16°10' 20"
75	130	37	JS-7549	JS-7510	5DD	4	34.5	2.5	30	102.199	20°26'
75	130	41	X33215	Y33215	3EE ^o	2	41	1.5	31	106.675	15°55'
75	135	42	JT7549	JT7510	5ED	5	40	2.5	34	104.21	20°
75	135	43	JF7549	JF7510	2ED	3	42	2.5	35	111.153	13°03'
75	145	51	JH415647	JH415610	2FE	3	51	2.5	42	117.744	13°34'
75	145	52	JN7549	JN7510	3FE	5	51	3	43	112.507	15°57'
75	150	42	JW7549	JW7510	7FC	3	38	3	29	108.847	30°
75	160	40	X30315	Y30315	2GB	3	37	2.5	31	134.097	12°57' 10"
75	160	40	X31315	Y31315	7GB	3	37	2.5	26	122.122	28°48' 39"
75	160	58	X32315	Y32315	2GD	3	55	2.5	45	127.887	12°57' 10"
75	160	58	X32315-B	Y32315-B	5GD	3	55	2.5	45	117.465	20°
80	110	20	X32916	Y32916	2BC	1	20	1	16	97.974	13°10'
80	120	25	JC8049	JC8010	2CC	2	25	2	20	105.003	12°33' 30"
80	125	24	JP8049	JP8010	4CB	2	22.5	2	17.5	108.745	16°46'
80	125	29	X32016X	Y32016X	3CC	1.5	29	1.5	22	107.334	15°45'
80	125	36	X33016	Y33016	2CE	1.5	36	1.5	29.5	107.75	10°30'
80	130	34	JD8049	JD8010	2DD	2.5	33	2	27	110.475	13°30'
80	130	35	JM515649	JM515610	3DD	3	34	2.5	28.5	108.958	14°31'
80	130	37	X33116	Y33116	3DE	2	37	1.5	29	108.97	15°30'
80	135	37	JS-8049	JS-8010	5DD	4	34.5	2.5	30	108.128	19°36'
80	140	28.25	X30216	Y30216	3EB	2.5	26	2	22	119.169	15°38' 32"
80	140	35.25	X32216	Y32216	3EC	2.5	33	2	28	117.466	15°38' 32"
80	140	42	JT8049	JT8010	5ED	5	40	3	34	108.199	20°49'
80	140	46	X33216	Y33216	3EE	2.5	46	2	35	114.582	15°50'
80	145	46	JF8049	JF8010	2ED	3	45	2.5	38	120.366	12°02'
80	150	52	JN8049	JN8010	4FE	5	51	3	43	116.58	16°33'
80	160	45	JW8049	JW8010	7FC	3	41	3	31	115.93	30°
80	170	42.5	X30316	Y30316	2GB	3	39	2.5	33	143.174	12°57' 10"
80	170	42.5	X31316	Y31316	7GB	3	39	2.5	27	129.213	28°48' 39"
80	170	61.5	X32316	Y32316	2GD	3	58	2.5	48	136.504	12°57' 10"
80	170	61.5	X32316-B	Y32316-B	5GD	3	58	2.5	48	125.001	20°
85	120	23	X32917	Y32917	2BC ^o	1.5	23	1.5	18	106.599	12°18'
85	125	25	JC8549	JC8510	2CC	2.5	25	2	20	109.65	13°07' 30"
85	130	24	JP8549	JP8510	4CB	2	22.5	2	17.5	113.315	17°30'
85	130	29	X32017X	Y32017X	4CC	1.5	29	1.5	22	111.788	16°25'
85	130	30	JM716648	JM716610	-	6	29	2.5	24	110.063	16°30'
85	130	30	JM716649	JM716610	-	3	29	2.5	24	110.063	16°30'
85	130	36	X33017	Y33017	2CE	1.5	36	1.5	29.5	112.838	11°
85	135	34	JD8549	JD8510	2DD	2.5	33	2	28	115.904	13°02'
85	140	37	JS-8549	JS-8510	5DD	4	34.5	3	30	112.385	20°24'
85	140	39	JHM516849	JHM516810	3DD	3	38	2.5	31.5	116.301	15°11'
85	140	41	X33117	Y33117	3DE	2.5	41	2	32	117.097	15°10'
85	145	42	JT8549	JT8510	5ED	5	40	3	34	115.106	19°16'
85	150	30.5	X30217	Y30217	3EB	2.5	28	2	24	126.685	15°38' 32"
85	150	38.5	X32217	Y32217	3EC	2.5	36	2	30	124.97	15°38' 32"
85	150	46	JF8549	JF8510	2ED	3	46	3	38	124.965	12°30'
85	150	46	JH217249	JH217210	-	3	46	2.5	38	124.962	12°30'
85	150	49	X33217	Y33217	3EE	2.5	49	2	37	122.894	15°35'
85	160	55	JN8549	JN8510	3FE	5	54	3	45	126.101	15°43'
85	170	48	JW8549	JW8510	7FC	4	45	4	33	125.628	28°04' 30"
85	180	44.5	X30317	Y30317	2GB	4	41	3	34	150.433	12°57' 10"
85	180	44.5	X31317	Y31317	7GB	4	41	3	28	137.403	28°48' 39"
85	180	63.5	X32317	Y32317	2GD	4	60	3	49	144.223	12°57' 10"
85	180	63.5	X32317-B	Y32317-B	5GD	4	60	3	49	132.736	20°

TABLE 2 - Sheet 6 of 9
TYPE TS BOUNDARY DIMENSIONS

Dimensions shown in millimeters

Bore	OD	Width	Reference Part Numbers		ISO Dimension Series	Inner Ring		Outer Ring		Inside Diameter	Contact Angle
						Minimum Radius ^a	Width	Minimum Radius ^a	Width		
			Inner Ring	Outer Ring		r _s min	B	r _{1s} min	C	E	α
90	125	23	X32918	Y32918	2BC ^o	1.5	23	1.5	18	111.282	12° 51'
90	135	24	JP9049	JP9010	4CB	2	22.5	2	17.5	117.895	18° 14'
90	135	28	JC9049	JC9010	2CC	2.5	27.5	2	23	119.139	12° 01' 30"
90	140	32	X32018X	Y32018X	3CC	2	32	1.5	24	119.948	15° 45'
90	140	34	JD9049	JD9010	2CD	2.5	33	2.5	28	121.86	12° 02' 30"
90	140	39	X33018	Y33018	2CE	2	39	1.5	32.5	122.363	10° 10'
90	145	35	JM718149	JM718110	4DC	3	34	2.5	27	122.392	16° 30'
90	145	35	JM718149A	JM718110	-	6	34	2.5	27	122.392	16° 30'
90	145	37	JS-9049	JS-9010	5DD	4	34.5	3	30	118.567	19° 16'
90	150	42	JT9049	JT9010	5ED ^o	5	40	3	34	119.254	20°
90	150	45	X33118	Y33118	3DE	2.5	45	2	35	125.283	14° 50'
90	155	44	JHM318448	JHM318410	2EC ^o	3	44	2.5	35.5	130.944	12° 48' 40"
90	155	46	JF9049	JF9010	2ED	3	46	3	38	130.206	12° 17'
90	160	32.5	X30218	Y30218	3FB	2.5	30	2	26	134.901	15° 38' 32"
90	160	42.5	X32218	Y32218	3FC	2.5	40	2	34	132.615	15° 38' 32"
90	160	55	X33218	Y33218	3FE	2.5	55	2	42	129.82	15° 40'
90	165	47	JF10039	JF10010	2FC	3	46	3	39	140.251	12°
90	165	55	JN9049	JN9010	4FE	5	54	3	45	130.224	16° 15'
90	175	48	JW9049	JW9010	7FC	4	45	4	33	129.385	29° 02' 30"
90	190	46.5	X30318	Y30318	2GB	4	43	3	36	159.061	12° 57' 10"
90	190	46.5	X31318	Y31318	7GB	4	43	3	30	145.527	28° 48' 39"
90	190	57.15	JHH221436	JHH221413	2GC	8	57.531	3.3	46.038	157.96	12° 35'
90	190	67.5	X32318	Y32318	2GD	4	64	3	53	151.701	12° 57' 10"
95	130	23	X32919	Y32919	2BC ^o	1.5	23	1.5	18	116.082	13° 25'
95	140	24	JP9549	JP9510	4CB	2	22.5	2	17.5	123.776	16° 51'
95	140	28	JC9549	JC9510	2CC	2.5	27.5	2.5	23	123.797	12° 30'
95	145	24	JP10044	JP10010	-	3	22.5	3	17.5	128.389	17° 30'
95	145	32	X32019X	Y32019X	4CC	2	32	1.5	24	124.927	16° 25'
95	145	34	JD9549	JD9510	2CD	2.5	33	2.5	28	126.419	12° 30'
95	145	39	X33019	Y33019	2CE	2	39	1.5	32.5	126.346	10° 30'
95	150	35	JM719149	JM719113	4DC	3	34	2.5	27	125.409	16° 25'
95	150	37	JS-9549	JS-9510	5DD	4	34.5	3	30	122.832	20°
95	155	42	JT9549	JT9510	5ED ^o	5	40	3	34	123.374	20° 44'
95	160	46	JF9549	JF9510	2ED	3	46	3	38	134.711	12° 43'
95	160	49	X33119	Y33119	3EE	2.5	49	2	38	133.24	14° 35'
95	170	34.5	X30219	Y30219	3FB	3	32	2.5	27	143.385	15° 38' 32"
95	170	45.5	X32219	Y32219	3FC	3	43	2.5	37	140.259	15° 38' 32"
95	170	55	JN9549	JN9510	4FE	5	54	3	45	134.331	16° 47'
95	170	58	X33219	Y33219	3FE	3	58	2.5	44	138.642	15° 15'
95	180	49	JW9549	JW9510	7FC	4	45	4	33	133.033	30°
95	200	49.5	X30319	Y30319	2GB	4	45	3	38	165.861	12° 57' 10"
95	200	49.5	X31319	Y31319	7GB	4	45	3	32	151.584	28° 48' 39"
95	200	71.5	X32319	Y32319	2GD	4	67	3	55	160.318	12° 57' 10"
100	140	25	X32920	Y32920	2CC	1.5	25	1.5	20	125.717	12° 23'
100	145	24	JP10049	JP10010	4CB	3	22.5	3	17.5	128.389	17° 30'
100	145	28	JC10049	JC10010	2DC ^o	2.5	27.5	2.5	23	128.448	12° 58' 30"
100	150	32	X32020X	Y32020X	4CC	2	32	1.5	24	129.269	17°
100	150	34	JD10049	JD10010	2CD	2.5	33	2.5	28	130.992	12° 57' 30"
100	150	39	X33020	Y33020	2CE	2	39	1.5	32.5	130.323	10° 50'
100	155	36	JM720249	JM720210	4DC	3	35	2.5	28	130.754	17° 30'
100	155	37	JS-10049	JS-10010	5DD	5	34.5	3	30	127.221	20° 44'
100	160	41	JHM720249	JHM720210	4DD	3	40	2.5	32	133.441	17° 25'
100	160	42	JT10049	JT10010	5ED ^o	5	40	3	34	130.033	19° 20'
100	165	47	JF10049	JF10010	2EE	3	46	3	39	140.251	12°
100	165	52	X33120	Y33120	3EE	2.5	52	2	40	137.129	15° 10'
100	175	55	JN10049	JN10010	4FE	6	54	3	45	140.655	16°
100	180	37	X30220	Y30220	3FB	3	34	2.5	29	151.31	15° 38' 32"
100	180	49	X32220	Y32220	3FC	3	46	2.5	39	148.184	15° 38' 32"
100	180	63	X33220	Y33220	3FE	3	63	2.5	48	145.949	15° 05'
100	190	52	JW10049	JW10010	7FC	4	47	4	35	140.384	30°
100	215	51.5	X30320	Y30320	2GB	4	47	3	39	178.578	12° 57' 10"
100	215	56.5	X31320X	Y31320X	7GB	4	51	3	35	162.739	28° 48' 39"
100	215	66.675	JHH224333	JHH224315	2GC	7	66.675	3.3	53.975	177.891	12° 15'
100	215	77.5	X32320	Y32320	2GD	4	73	3	60	171.65	12° 57' 10"

TABLE 2 - Sheet 7 of 9
TYPE TS BOUNDARY DIMENSIONS

Dimensions shown in millimeters

Bore	OD	Width	Reference		ISO	Inner Ring		Outer Ring			
			Part Numbers			Minimum Radius ^a	Width	Minimum Radius ^a	Width	Inside Diameter	Contact Angle
			Inner Ring	Outer Ring							
d	D	T			Series	r _{s min}	B	r _{1s min}	C	E	α
105	145	25	X32921	Y32921	2CC	1.5	25	1.5	20	130.359	12° 51'
105	150	24	JP10549	JP10510	4CB	3	22.5	3	17.5	132.982	18° 09'
105	155	33	JC10549	JC10510	2CD	2.5	31.5	2.5	27	137.045	12° 17' 30"
105	160	35	X32021X	Y32021X	4DC	2.5	35	2	26	137.685	16° 30'
105	160	37	JS-10549	JS-10510	5DD	5	34.5	3	30	133.284	19° 40'
105	160	38	JD10549	JD10510	2DD	3	37	2.5	31	139.734	12° 17' 30"
105	160	43	X33021	Y33021	2DE	2.5	43	2	34	139.304	10° 40'
105	170	47	JF10549	JF10510	2EE	3	46	3	39	145.104	12° 18' 30"
105	175	56	X33121	Y33121	3EE	2.5	56	2	44	144.427	15° 05'
105	180	55	JN10549	JN10510	4EE	6	54	3	45	144.884	16° 30'
105	190	39	X30221	Y30221	3FB	3	36	2.5	30	159.795	15° 38' 32"
105	190	53	X32221	Y32221	3FC	3	50	2.5	43	155.269	15° 38' 32"
105	190	68	X33221	Y33221	3FE	3	68	2.5	52	153.622	15°
105	200	54	JW10549	JW10510	7FC	4	49	4	37	147.838	30°
105	225	53.5	X30321	Y30321	2GB	4	49	3	41	186.752	12° 57' 10"
105	225	58	X31321X	Y31321X	7GB	4	53	3	36	170.724	28° 48' 39"
105	225	81.5	X32321	Y32321	2GD	4	77	3	63	179.359	12° 57' 10"
110	150	25	X32922	Y32922	2CC	1.5	25	1.5	20	135.182	13° 20'
110	160	27	JP11049	JP11010	4CB	3	25.5	3	19.5	142.292	16° 24'
110	160	33	JC11049	JC11010	2CD	2.5	31.5	2.5	27	141.607	12° 42' 30"
110	165	38	JD11049	JD11010	2DD	3	37	2.5	31	144.376	12° 42' 30"
110	170	38	X32022X	Y32022X	4DC	2.5	38	2	29	146.29	16°
110	170	47	X33022	Y33022	2DE	2.5	47	2	37	146.265	10° 50'
110	175	47	JF11049	JF11010	2EE ^b	4	46	3	39	149.543	12° 41' 30"
110	180	56	X33122	Y33122	3EE	2.5	56	2	43	149.127	15° 35'
110	190	58	JN11049	JN11010	3FE	6	57	3	47	154.133	15° 48'
110	200	41	X30222	Y30222	3FB	3	38	2.5	32	168.548	15° 38' 32"
110	200	56	X32222	Y32222	3FC	3	53	2.5	46	164.022	15° 38' 32"
110	210	57	JW11049	JW11010	7GC	4	51	4	39	157.271	28° 25'
110	240	54.5	X30322	Y30322	2GB	4	50	3	42	199.925	12° 57' 10"
110	240	63	X31322X	Y31322X	7GB	4	57	3	38	182.014	28° 48' 39"
110	240	84.5	X32322	Y32322	2GD	4	80	3	65	192.071	12° 57' 10"
115	165	28	JLM722948	JLM722912	4CC	3.3	27	3	21	142.481	17°
120	165	29	X32924	Y32924	2CC	1.5	29	1.5	23	148.464	13° 05'
120	170	27	JP12049	JP12010	4CB	3	25	3	19.5	151.495	17° 30'
120	175	36	JC12049	JC12010	2DC ^b	2.5	35	2.5	29	155.479	12° 08'
120	180	38	X32024X	Y32024X	4DC	2.5	38	2	29	155.239	17°
120	180	41	JD12049	JD12010	2DD	3	40	2.5	33	158.233	12° 08' 30"
120	180	48	X33024	Y33024	2DE	2.5	48	2	38	154.777	11° 30'
120	190	50	JF12049	JF12010	2EE	4	49	3	41	163.635	12° 09' 30"
120	200	58	JN12049	JN12010	4FE	6	57	3	47	162.59	16° 42'
120	200	62	X33124	Y33124	3FE	2.5	62	2	48	166.144	14° 50'
120	215	43.5	X30224	Y30224	4FB	3	40	2.5	34	181.257	16° 10' 20"
120	215	61.5	X32224	Y32224	4FD	3	58	2.5	50	174.825	16° 10' 20"
120	220	57	JW12049	JW12010	7FC	4	51	4	39	164.848	30°
120	260	59.5	X30324	Y30324	2GB	4	55	3	46	214.892	12° 57' 10"
120	260	68	X31324X	Y31324X	7GB	4	62	3	42	197.022	28° 48' 39"
120	260	90.5	X32324	Y32324	2GD	4	86	3	69	207.039	12° 57' 10"
130	180	32	X32926	Y32926	2CC	2	32	1.5	25	161.652	12° 45'
130	185	29	JP13049	JP13010	4CB	3	27	3	21	165.002	17° 30'
130	185	36	JC13049	JC13010	2DC ^b	3	35	2.5	29	164.714	12° 52'
130	190	41	JD13049	JD13010	2DD	3	40	2.5	33	167.414	12° 51' 30"
130	200	45	X32026X	Y32026X	4EC	2.5	45	2	34	172.043	16° 10'
130	200	50	JF13049	JF13010	2DE ^b	4	49	3	41	172.653	12° 50' 30"
130	200	55	X33026	Y33026	2EE	2.5	55	2	43	172.017	12° 50'
130	210	58	JN13049	JN13010	3EE	6	57	4	47	174.091	15° 50' 30"
130	230	43.75	X30226	Y30226	4FB	4	40	3	34	196.42	16° 10' 20"
130	230	57	JW13049	JW13010	7FC	5	51	5	39	175.117	30°
130	230	67.75	X32226	Y32226	4FD	4	64	3	54	187.088	16° 10' 20"
130	280	63.75	X30326	Y30326	2GB	5	58	4	49	232.028	12° 57' 10"
130	280	72	X31326X	Y31326X	7GB	5	66	4	44	211.753	28° 48' 39"

TABLE 2 - Sheet 8 of 9
TYPE TS BOUNDARY DIMENSIONS

Dimensions shown in millimeters

Bore	OD	Width	Reference		ISO	Inner Ring		Outer Ring			
			Part Numbers			Minimum Radius ^a	Width	Minimum Radius ^a	Width	Inside Diameter	Contact Angle
			Inner Ring	Outer Ring							
d	D	T			Series	r _s min	B	r _{1s} min	C	E	α
140	190	32	X32928	Y32928	2CC	2	32	1.5	25	171.032	13°30'
140	195	29	JP14049	JP14010	4CB	3	27	3	21	174.512	18°32'
140	200	39	JC14049	JC14010	2DC	3	38	2.5	31	179.234	12°
140	205	44	JD14049	JD14010	2DD	3	43	2.5	36	181.645	12°
140	210	45	X32028X	Y32028X	4DC	2.5	45	2	34	180.72	17°
140	210	56	X33028	Y33028	2DE	2.5	56	2	44	180.353	13°30'
140	215	53	JF14049	JF14010	2ED	4	52	3	44	187.051	12°
140	220	58	JN14049	JN14010	4EE	6	57	4	47	182.746	16°39' 30"
140	240	57	JW14049	JW14010	7FC	5	52	5	39	187.175	28°37'
140	250	45.75	X30228	Y30228	4FB	4	42	3	36	212.27	16°10' 20"
140	250	71.75	X32228	Y32228	4FD	4	68	3	58	204.046	16°10' 20"
140	300	67.75	X30328	Y30328	2GB	5	62	4	53	247.91	12°57' 10"
140	300	77	X31328X	Y31328X	7GB	5	70	4	47	227.999	28°48' 39"
150	210	32	JP15049	JP15010	4DB	3	30	3	23	188.281	17°04'
150	210	38	X32930	Y32930	2DC	2.5	38	2	30	187.926	12°20'
150	215	44	JD15049	JD15010	2DD	3	43	3	36	190.81	12°37'
150	225	48	X32030X	Y32030X	4EC	3	48	2.5	36	193.674	17°
150	225	53	JF15049	JF15010	2ED	4	52	4	44	196.097	12°35' 30"
150	225	59	X33030	Y33030	2EE	3	59	2.5	46	194.26	13°40'
150	235	61	JN15049	JN15010	3EE	6	59	4	50	196.798	15°53'
150	250	57	JW15049	JW15010	7FC	5	52	5	39	195.041	30°
150	270	49	X30230	Y30230	4GB	4	45	3	38	227.408	16°10' 20"
150	270	77	X32230	Y32230	4GD	4	73	3	60	219.157	16°10' 20"
150	320	72	X30330	Y30330	2GB	5	65	4	55	265.955	12°57' 10"
150	320	82	X31330X	Y31330X	7GB	5	75	4	50	244.244	28°48' 39"
160	220	32	JP16049	JP16010	4DB	3	30	3	23	197.895	17°57' 30"
160	220	38	X32932	Y32932	2DC	2.5	38	2	30	197.962	13°
160	225	44	JD16049	JD16010	2DD	3	43	3	36	200.146	13°14' 30"
160	235	53	JF16049	JF16010	2ED	4	52	4	44	205.257	13°11' 30"
160	240	46	JM734445	JM734410	4EB ^o	3	44.5	2.5	37	209.765	16°15'
160	240	51	X32032X	Y32032X	4EC	3	51	2.5	38	207.209	17°
160	245	61	JN16049	JN16010	4EE	6	59	4	50	205.576	16°37'
160	290	52	X30232	Y30232	4GB	4	48	3	40	244.958	16°10' 20"
160	290	84	X32232	Y32232	4GD	4	80	3	67	234.942	16°10' 20"
160	340	75	X30332	Y30332	2GB	5	68	4	58	282.751	12°57' 10"
170	230	32	JP17049	JP17010	4DB	3	30	3	23	208.314	17°06'
170	230	39	JHM534149	JHM534110	3DD ^b	3	38	2.5	31	206.562	14°20'
170	230	38	X32934	Y32934	3DC	2.5	38	2	30	206.564	14°20'
170	235	44	JD17049	JD17010	2DD	3	43	3	36	211.345	12°13' 30"
170	240	46	JM734449	JM734410	4DD	3	44.5	2.5	37	209.765	16°15'
170	245	53	JF17049	JF17010	2ED ^b	5	52	4	44	216.61	12°14'
170	255	61	JN17049	JN17010	3EE	6	59	4	50	216.949	15°55'
170	260	57	X32034X	Y32034X	4EC	3	57	2.5	43	223.031	16°30'
170	310	57	X30234	Y30234	4GB	5	52	4	43	262.483	16°10' 20"
170	310	91	X32234	Y32234	4GD	5	86	4	71	251.873	16°10' 20"
170	360	80	X30334	Y30334	2GB	5	72	4	62	299.991	12°57' 10"
180	240	32	JP18049	JP18010	4DB	3	30	3	23	217.699	17°54'
180	240	39	JC18049	JC18010	2DC	3	38	3	31	218.311	12°47'
180	245	44	JD18049	JD18010	2DD	3	43	3	36	220.684	12°46' 30"
180	250	45	X32936	Y32936	4DC	2.5	45	2	34	218.571	17°45'
180	250	47	JM736149	JM736110	4DD	3	45	2.5	37	218.569	17°45'
180	255	53	JF18049	JF18010	2ED ^b	5	52	4	44	225.875	12°46'
180	265	61	JN18049	JN18010	4EE	6	59	4	50	225.723	16°35'
180	280	64	X32036X	Y32036X	3FD	3	64	2.5	48	239.898	15°45'
180	320	57	X30236	Y30236	4GB	5	52	4	43	270.928	16°41' 57"
180	320	91	X32236	Y32236	4GD	5	86	4	71	259.938	16°41' 57"

TABLE 2 - Sheet 9 of 9
TYPE TS BOUNDARY DIMENSIONS

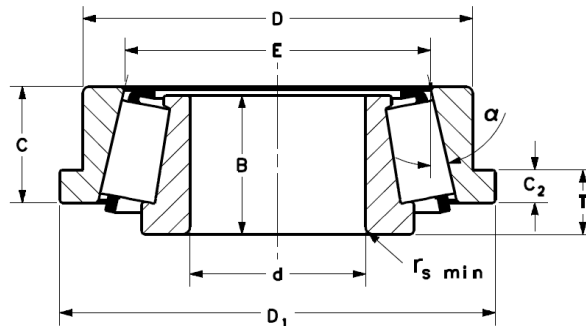
Dimensions shown in millimeters

Bore	OD	Width	Reference		ISO	Inner Ring		Outer Ring			
			Part Numbers			Minimum Radius ^a	Width	Minimum Radius ^a	Width	Inside Diameter	Contact Angle
			Inner Ring	Outer Ring							
d	D	T			Series	r _s min	B	r _{1s} min	C	E	α
190	255	41	JC19049	JC19010	2DC	3	40	3	33	232.395	12° 15'
190	260	37	JP19049	JP19010	4DB	3	34	3	27	234.451	16° 46'
190	260	45	X32938	Y32938	4DC	2.5	45	2	34	228.578	17° 39'
190	260	46	JM738249	JM738210	4DD	3	44	2.5	36.5	228.577	17° 39'
190	260	46	JM738249A	JM738210	-	8	44	2.5	36.5	228.577	17° 39'
190	260	47	JD19049	JD19010	2DD	4	46	3	38	234.615	12° 15'
190	270	56	JF19049	JF19010	2ED	5	55	4	46	240.017	12° 15' 30"
190	280	64	JN19049	JN19010	3EE	6	62	4	52	239.995	15° 58' 30"
190	290	64	X32038X	Y32038X	4FD	3	64	2.5	48	249.853	16° 25'
190	340	60	X30238	Y30238	4GB	5	55	4	46	291.083	16° 10' 20"
190	340	97	X32238	Y32238	4GD	5	92	4	75	279.024	16° 10' 20"
200	265	41	JC20049	JC20010	2DC	3	40	3	33	241.71	12° 45'
200	270	37	JP20049	JP20010	4DB	3	34	3	27	244.35	17° 30'
200	270	47	JD20049	JD20010	2DD	4	46	3	38	244.043	12° 45'
200	280	51	X32940	Y32940	3EC	3	51	2.5	39	249.698	14° 45'
200	280	56	JF20049	JF20010	2ED	5	55	4	46	249.3	12° 44' 30"
200	290	64	JN20049	JN20010	4EE	6	62	4	52	248.588	16° 34'
200	300	65	JHM840449	JHM840410	-	3.5	62	2.5	51	253.055	19° 10'
200	310	70	X32040X	Y32040X	4FD	3	70	2.5	53	266.039	16°
200	360	64	X30240	Y30240	4GB	5	58	4	48	307.196	16° 10' 20"
200	360	104	X32240	Y32240	3GD	5	98	4	82	294.88	15° 10'
220	285	41	JC22049	JC22010	2DC	4	40	3	33	262.657	12°
220	290	37	JP22049	JP22010	4DB	3	34	3	27	263.12	18° 54'
220	290	47	JD22049	JD22010	2DD	4	46	3	38	265.261	12°
220	300	51	X32944	Y32944	3EC	3	51	2.5	39	267.685	15° 50'
220	300	56	JF22049	JF22010	2ED	5	55	4	46	270.389	12° 04' 30"
220	340	76	X32044X	Y32044X	4FD	4	76	3	57	292.464	16°
240	305	41	JC24049	JC24010	2DC	4	40	3	33	281.653	12° 53'
240	310	47	JD24049	JD24010	2DD	4	46	3	38	284.085	12° 52'
240	320	42	JP24049	JP24010	4EB	3	39	3	30	291.676	16° 56'
240	320	51	X32948	Y32948	4EC	3	51	2.5	39	286.952	17°
240	320	57	JF24049	JF24010	2EE	6	56	4	46	289.075	12° 55' 30"
240	360	76	X32048X	Y32048X	4FD	4	76	3	57	310.356	17°
260	325	41	JC26049	JC26010	2DC	4	40	4	33	300.661	13° 46'
260	330	47	JD26049	JD26010	2DD	4	46	4	38	303.004	13° 44' 30"
260	340	42	JP26049	JP26010	4DB	3	39	3	30	310.497	18° 04'
260	340	57	JF26049	JF26010	2DE	6	56	4	46	310.322	12° 07' 30"
260	360	63.5	X32952	Y32952	3EC	3	63.5	2.5	48	320.783	15° 10'
260	400	87	X32052X	Y32052X	4FC	5	87	4	65	344.432	16° 10'
280	360	57	JF28049	JF28010	2DE	6	56	5	46	329.164	12° 52' 30"
280	370	48	JP28049	JP28010	4EB	3	44	3	34	337.067	17° 30'
280	380	63.5	X32956	Y32956	4EC	3	63.5	2.5	48	339.778	16° 05'
280	420	87	X32056X	Y32056X	4FC	5	87	4	65	361.811	17°
300	400	52	JP30049	JP30010	4EB	3	49	3	37	364.238	17°
300	420	76	X32960	Y32960	3FD	4	76	3	57	374.706	14° 45'
300	460	100	X32060X	Y32060X	4GD	5	100	4	74	395.676	16° 10'
320	420	53	JP32049	JP32010	4EB	3	49	3	38	382.798	17° 55'
320	440	76	X32964	Y32964	3FD	4	76	3	57	393.406	15° 30'
320	480	100	X32064X	Y32064X	4GD	5	100	4	74	415.64	17°
340	460	76	X32968	Y32968	4FD	4	76	3	57	412.043	16° 15'
360	480	76	X32972	Y32972	4FD	4	76	3	57	430.612	17°

^a The largest single shaft and housing radius must not exceed the smallest single chamfer dimension (inner or outer ring)

^b ISO Dimension Series deviates from the rules in Appendix A.

TABLE 3 — Sheet 1 of 5
TYPE TSF BOUNDARY DIMENSIONS



Dimensions shown in millimeters

Bore d	OD D	Width T	Reference Part Numbers		ISO Dimension Series	Inner Ring		Outer Ring				
			Inner Ring	Outer Ring		Minimum Radius ^a r _{s min}	Width B	Width C	Flange OD D ₁	Flange Width C ₂	Inside Diameter E	Contact Angle α
15	42	6.25	X30302	Y30302R	2FB	1	13	11	46	3	33.272	10°45' 29"
17	40	5.25	X30203	Y30203R	2DB	1	12	11	44	3	31.408	12°57' 10"
17	40	6.25	X32203	Y32203R	2DD	1	16	14	44	3	31.17	11°45'
17	47	6.25	X30303	Y30303R	2FB	1	14	12	51	3	37.42	10°45' 29"
17	47	8.25	X32303	Y32303R	2FD	1	19	16	51	4	36.09	10°45' 29"
20	42	6	X32004X	Y32004XR	3CC	0.6	15	12	46	3	32.781	14°
20	45	7	JP2049	JP2010-B	4DB	1	14	10	49	3	35.679	16° 40'
20	47	6.25	X30204	Y30204R	2DB	1	14	12	51	3	37.304	12°57' 10"
20	47	7.25	X32204	Y32204R	2DD	1	18	15	51	3	35.81	12°28'
20	52	6.75	X30304	Y30304R	2FB	1.5	15	13	57	3.5	41.318	11°18' 36"
20	52	8.75	X32304	Y32304R	2FD	1.5	21	18	57	4.5	39.518	11°18' 36"
22	44	6.5	X320/22X	Y320/22XR	3CC	0.6	15	11.5	48	3	34.708	14°50'
22	47	7	JP2249	JP2210-B	4CB	1	14	10	51	3	37.443	17° 30'
25	47	6.5	X32005X	Y32005XR	4CC	0.6	15	11.5	51	3	37.393	16°
25	50	7	JP2549	JP2510-B	4CB	1	14	10	54	3	40.025	18° 45'
25	52	6.75	X30205	Y30205R	3CC	1	15	13	57	3.5	41.135	14°02' 10"
25	52	6.75	X32205	Y32205R	2CD	1	18	16	57	3.5	41.331	13°30'
25	62	7.25	X30305	Y30305R	2FB	1.5	17	15	67	4	50.637	11°18' 36"
25	62	9.25	X31305	Y31305R	7FB	1.5	17	13	67	4	44.13	28°48' 39"
25	62	10.25	X32305	Y32305R	2FD	1.5	24	20	67	5	48.637	11°18' 36"
28	52	7	X320/28X	Y320/28XR	4CC	1	16	12	56	3	41.991	16°
28	55	7	JP2849	JP2810-B	4CB	1	14.5	11	59	3	44.597	17°30'
30	55	7	X32006X	Y32006XR	4CC	1	17	13	59	3	44.438	16°
30	60	7.5	JP3049	JP3010-B	4CB	1	16.5	12.5	64	3	48.465	17°30'
30	62	6.75	X30206	Y30206R	3DB	1	16	14	67	3.5	49.99	14°02' 10"
30	62	8.25	X32206	Y32206R	3DC	1	20	17	67	4	48.982	14°02' 10"
30	62	10	X33206	Y33206R	2DE	1	25	19.5	67	4.5	49.524	12°50'
30	72	8.75	X30306	Y30306R	2FB	1.5	19	16	77	4	58.287	11°51' 35"
30	72	10.75	X31306	Y31306R	7FB	1.5	19	14	77	4	51.771	28°48' 39"
30	72	11.75	X32306	Y32306R	2FD	1.5	27	23	77	6	55.767	11°51' 35"
32	58	7	X320/32X	Y320/32XR	4CC	1	17	13	62	3	46.708	16°50'
32	65	6.75	X302/32	Y302/32R	3DB	1	17	15	70	3.5	52.5	14°
32	65	7.5	JP3249	JP3210-B	4DB	1	17.5	13.5	69	3	52.418	17°30'
32	65	10	X332/32	Y332/32R	2DE	1	26	20.5	70	4.5	51.791	13°

TABLE 3 — Sheet 2 of 5
TYPE TSF BOUNDARY DIMENSIONS

Dimensions shown in millimeters

						Inner Ring		Outer Ring				
Bore	OD	Width	Reference Part Numbers		ISO Dimension Series	Minimum Radius ^a	Width	Width	Flange OD	Flange Width	Inside Diameter	Contact Angle
d	D	T	Inner Ring	Outer Ring		r _s min	B	C	D ₁	C ₂	E	α
35	62	7	X32007X	Y32007XR	4CC	1	18	14	66	3	50.51	16° 50'
35	70	8	JP3549	JP3510-B	4DB	1	18	14	75	3	57.138	16° 49' 30"
35	72	7.25	X30207	Y30207R	3DB	1.5	17	15	77	4	58.844	14° 02' 10"
35	72	9.75	X32207	Y32207R	3DC	1.5	23	19	77	4.5	57.087	14° 02' 10"
35	72	11	X33207	Y33207R	2DE	1.5	28	22	77	5	57.186	13° 15'
35	80	9.25	X30307	Y30307R	2FB	2	21	18	85	4.5	65.769	11° 51' 35"
35	80	12.25	X31307	Y31307R	7FB	2	21	15	85	4.5	58.861	28° 48' 39"
35	80	13.75	X32307	Y32307R	2FE	2	31	25	85	6	62.829	11° 51' 35"
40	68	8	X32008X	Y32008XR	3CD	1	19	14.5	72	3.5	56.897	14° 10'
40	75	8	JP4049	JP4010-B	4CB	1	18	14	80	3	61.526	18° 10' 30"
40	75	10	X33108	Y33108R	2CE	1.5	26	20.5	80	4.5	61.169	13° 20'
40	80	7.75	X30208	Y30208R	3DB	1.5	18	16	85	4	65.73	14° 02' 10"
40	80	10.25	X32208	Y32208R	3DC	1.5	23	19	85	4.5	64.715	14° 02' 10"
40	80	12	X33208	Y33208R	2DE	1.5	32	25	85	5	63.405	13° 25'
40	90	9.75	X30308	Y30308R	2FB	2	23	20	95	4.5	72.703	12° 57' 10"
40	90	12.75	X31308	Y31308R	7FB	2	23	17	95	4.5	66.984	28° 48' 39"
40	90	14.25	X32308	Y32308R	2FD	2	33	27	95	6	69.253	12° 57' 10"
45	75	8	X32009X	Y32009XR	3CC	1	20	15.5	79	3.5	63.248	14° 40'
45	75	9.5	X33009	Y33009R	2CE	1	24	19	79	4.5	63.116	11° 05'
45	80	10	X33109	Y33109R	3CE	1.5	26	20.5	85	4.5	65.7	14° 20'
45	85	8.5	JP4549	JP4510-B	4DB	2	20	15.5	90	3	70.252	16° 55' 30"
45	85	8.75	X30209	Y30209R	3DB	1.5	19	16	90	4	70.44	15° 06' 34"
45	85	10.25	X32209	Y32209R	3DC	1.5	23	19	90	4.5	69.61	15° 06' 34"
45	85	12	X33209	Y33209R	3DE	1.5	32	25	90	5	68.075	14° 25'
45	100	10.25	X30309	Y30309R	2FB	2	25	22	106	5	81.78	12° 57' 10"
45	100	14.25	X31309	Y31309R	7FB	2	25	18	106	5	75.107	28° 48' 39"
45	100	15.25	X32309	Y32309R	2FD	2	36	30	106	7	78.33	12° 57' 10"
50	80	8	X32010X	Y32010XR	3CC	1	20	15.5	84	3.5	67.841	15° 45'
50	80	9.5	X33010	Y33010R	2CE	1	24	19	84	4.5	67.775	11° 55'
50	85	11	X33110	Y33110R	3CE	1.5	26	20	90	5	70.214	15° 20'
50	90	8.5	JP5049	JP5010-B	4DB	2	20	15.5	95	3	74.87	18° 04' 30"
50	90	8.75	X30210	Y30210R	3DB	1.5	20	17	95	4	75.078	15° 38' 32"
50	90	10.25	X32210	Y32210R	3DC	1.5	23	19	95	4.5	74.226	15° 38' 32"
50	90	13	X33210	Y33210R	3DE	1.5	32	24.5	95	5.5	72.727	15° 25'
50	110	11.25	X30310	Y30310R	2FB	2.5	27	23	116	5	90.633	12° 57' 10"
50	110	15.25	X31310	Y31310R	7FB	2.5	27	19	116	5	82.747	28° 48' 39"
50	110	17.25	X32310	Y32310R	2FD	2.5	40	33	116	8	86.263	12° 57' 10"
55	90	9.5	X32011X	Y32011XR	3CC	1.5	23	17.5	94	4	76.505	15° 10'
55	90	11	X33011	Y33011R	2CE	1.5	27	21	94	5	76.656	11° 45'
55	95	8.5	JP5549	JP5510-B	4CB	2	20	15.5	100	3	80.79	16° 33'
55	95	11.5	JM207049	JM207010-B	2DD	1.5	29	23.5	100	6	79.593	12° 35'
55	95	12	X33111	Y33111R	3CE	1.5	30	23	101	5	78.893	14°
55	100	9.25	X30211	Y30211R	3DB	2	21	18	106	4.5	84.197	15° 06' 34"
55	100	10.75	X32211	Y32211R	3DC	2	25	21	106	5	82.837	15° 06' 34"
55	100	14	X33211	Y33211R	3DE	2	35	27	106	6	81.24	14° 55'
55	120	12	X30311	Y30311R	2FB	2.5	29	25	127	5.5	99.146	12° 57' 10"
55	120	16	X31311	Y31311R	7FB	2.5	29	21	127	5.5	89.563	28° 48' 39"
55	120	18.5	X32311	Y32311R	2FD	2.5	43	35	127	8	94.316	12° 57' 10"
60	95	9.5	X32012X	Y32012XR	4CC	1.5	23	17.5	99	4	80.634	16°
60	95	11	X33012	Y33012R	2CE	1.5	27	21	99	5	80.422	12° 20'
60	100	8.5	JP6049	JP6010-B	4CB	2	20	15.5	105	3	85.256	17° 30'
60	100	12	X33112	Y33112R	3CE	1.5	30	23	106	5	83.522	14° 50'
60	110	9.25	X30212	Y30212R	3EB	2	22	19	116	4.5	91.876	15° 06' 34"
60	110	10.75	X32212	Y32212R	3EC	2	28	24	116	5	90.236	15° 06' 34"
60	110	16	X33212	Y33212R	3EE	2	38	29	116	7	89.032	15° 05'
60	130	13	X30312	Y30312R	2FB	3	31	26	137	5.5	107.769	12° 57' 10"
60	130	17	X31312	Y31312R	7FB	3	31	22	137	5.5	98.236	28° 48' 39"
60	130	19.5	X32312	Y32312R	2FD	3	46	37	137	8	102.939	12° 57' 10"