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July 2024

प्रारंभिक मसौदा

शुंडाकार रोलर बियरिंग्स के लिए विशिष्टि

(IS 12102 *का पहला पुनरीक्षण*)

Preliminary Draft

Specification for Tapered Roller Bearings

(*First revision of* IS 12102)

ICS 21.100.20

Bearings Sectional Committee, PGD 13	Last date for Comment: 07 Sep. 2024

NATIONAL FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft was finalized by the Bearings Sectional Committee and had been approved by the Production and General Engineering Division Council.

This standard was first published in 1987. This revision has been taken up to incorporate feedback gained through experience and other developments taken at international level in this field.

In this revision, the following changes have been made:

a)
b)
c)

In the formulation of this standard, considerable assistance has been derived from …….

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*).’ The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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Draft Indian Standard

SPECIFICATION FOR TAPERED ROLLER BEARINGS

(*First revision of* IS 12102)

1 SCOPE

This standard covers metric design radial tapered roller bearings of various types, part numbering systems, boundary dimensions, tolerances. It also specifies the flange dimensions of flanged outer rings for a selection of these bearings. A series designation for each bearing is also specified.

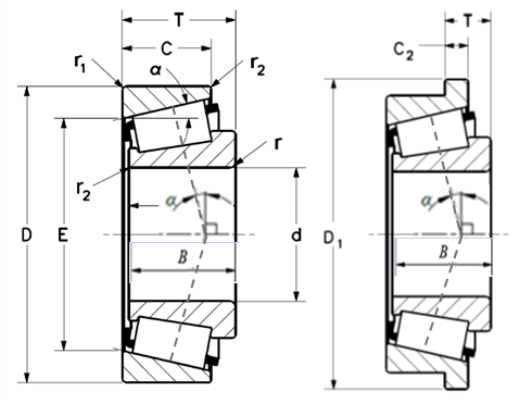
2 NORMATIVE REFERENCES

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

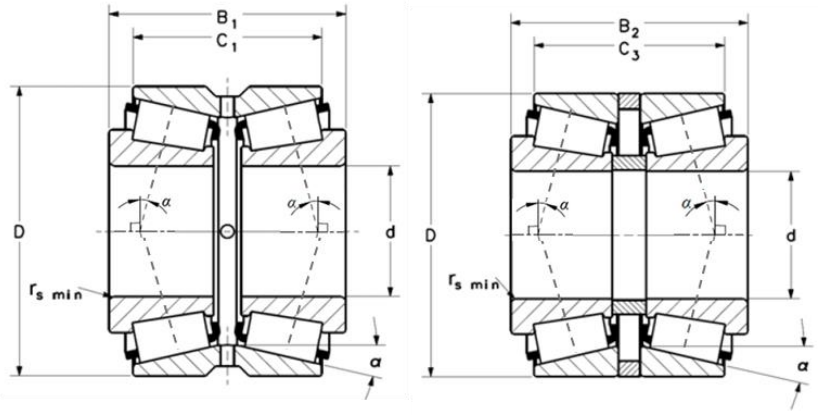
IS No./Other Publications	*Title*
IS 3073 : 1967	Assessment of surface roughness
IS 4397 : 1972	Cold-rolled carbon steel strips for ball and roller bearing cages/retainers — Specification (*second revision*)
IS 4398 : 1994	Carbon-chromium steel for the manufacture of balls, rollers and bearing races - Specification (*second revision*)
IS 5692 : 2024 / ISO 492 : 2023	Rolling bearings — Radial bearings — Geometrical product specifications (GPS) and tolerances values (*third revision*)
IS 5934 : 1999 / ISO 582 : 1995	Rolling bearings — Chamfer dimensions — Maximum values — Specification (*second revision*)
IS 7461:2024 / ISO 355 : 2019	Rolling bearings — Tapered roller bearings — Boundary dimensions and series designations (*fourth revision*)
PGD 13 (24061) / ISO 15241 : 2012	Rolling bearings — Symbols for physical quantities

3 SYMBOLS AND NOMENCLATURE

For the purposes of this document, the symbols given in ISO 15241 and the following apply. The symbols shown in Fig. 1 and the values given in Tables 5 to 8 denote nominal dimensions unless specified otherwise.



1) SINGLE ROW TRB 2) SINGLE ROW TRB WITH FLANGED OUTER RING



3) DOUBLE ROW TRB (2TS) 4) DOUBLE ROW TRB (TDO)

FIG. 1 SYMBOLS FOR TAPERED ROLLER BEARINGS

Key

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

4 SERIES DESIGNATION

a) Each bearing whose dimensions are given in this standard is referred to a dimension series. The dimension series is designated by a combination of three symbols, for example 2AC.

1) The first symbol is a numeric character, which represents a range of contact angles: contact angle series.
2) The second symbol is an alphabetic character, which represents a range of numeric values for the outside diameter to bore relationship: diameter series.
3) The third symbol is an alphabetic character, which represents a range of numeric values for the width to height relationship of a single-row bearing: width series.

b) The designations for the standardized bearings conform generally with the angle ranges and the numeric values for the relationships given in Table 1 to 3. In some cases, an exception has been made to avoid the condition that the same designation be used for two different bearings with the same bore diameter.

c) The series designations shown in this clause shall not be applied to bearings other than those specified in **5.3**.

Table 1 Designation of Contact Angle Series
(*Clause* 4 and 5.1)

Sl. No.	**Designation of contact angle series**	**α**	
		>	≤
1.	1	Reserved for future use	
2.	2	10°	13° 52’
3.	3	13° 52’	15° 59’
4.	4	15° 59’	18° 55’
5.	5	18° 55’	23°
6.	6	23°	27°
7.	7	27°	30°

Table 2 Designation of Diameter Series
(*Clause* 4 and 5.1)

Sl. No.	**Designation of diameter series**	$\frac{D}{d^{0.77}}$	
		>	≤
1.	1	Reserved for future use	
2.	2	10°	13° 52’

3.	3	13° 52’	15° 59’
4.	4	15° 59’	18° 55’
5.	5	18° 55’	23°
6.	6	23°	27°
7.	7	27°	30°

Table 3 Designation of Width Series
(*Clause* 4 and 5.1)

Sl. No.	**Designation of width series**	$\frac{T}{(D-d)^{0.95}}$	
		>	≤
1.	A	Reserved for future use	
2.	B	0.5	0.68
3.	C	0.68	0.8
4.	D	0.8	0.88
5.	E	0.88	1

5 BOUNDARY DIMENSIONS

5.1 Reference Part Numbers

Bearings contained in the Boundary Dimension of this standard are identified with the reference part numbers and ISO Dimension Series designations described in Table 1 to 3.

5.1.1 *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.

5.2 Inner and Outer Ring Chamfer Dimensions

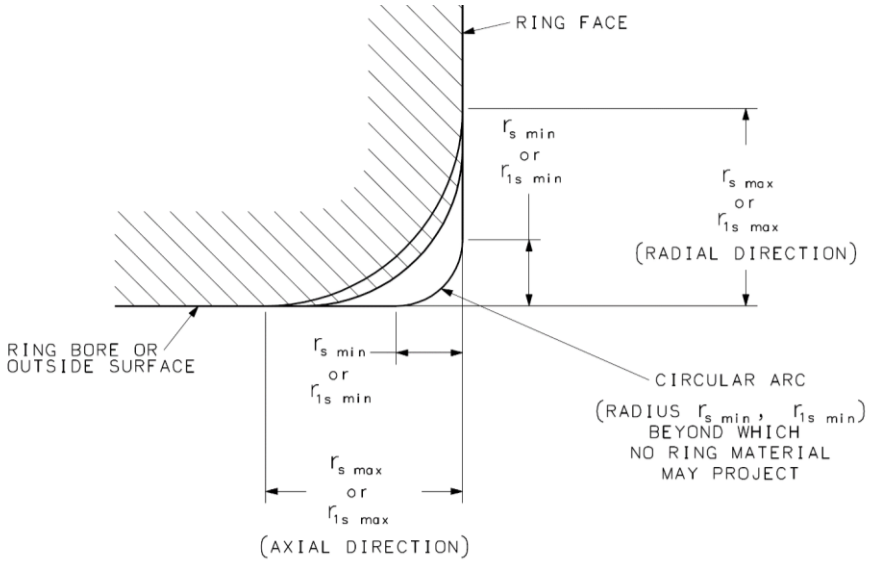


FIG. 2 INNER AND OUTER RING CHAMFER DIMENSIONS

Key

$r_{s\ min}$ - 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.

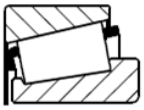
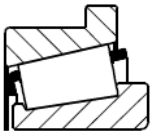
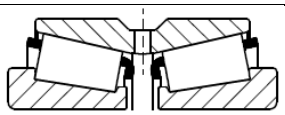
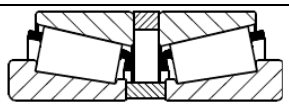
5.3 General

The dimensions of rolling bearings shall conform to IS 7461.

The bearing and subunit boundary dimensions given in Tables 5 to 8 are grouped by contact angle series and then listed in ascending order of bore, outside diameter and bearing width. Tolerances for the dimensions are given in IS 5692. Maximum chamfer dimensions are given in IS 5934.

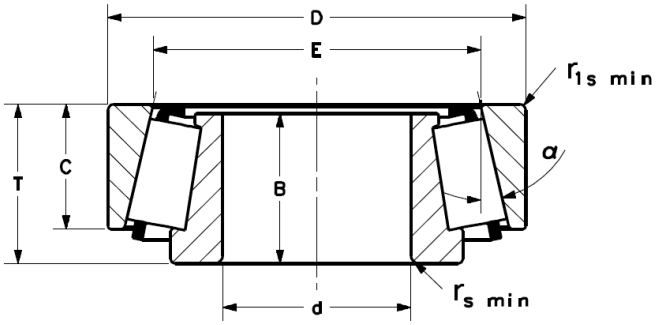
No values are given in this standard for the inner ring and outer ring front face chamfer dimension, r_2, however, the front face corners shall not be sharp.

Table 4 Types of Bearings Included

Sl. No.	Type	Description	Table	Bearing Schematic
1.	TS	Single Row, Straight Bore.	5	
2.	TSF	Single Row, Straight Bore, Flanged Outer ring.	6	
3.	TDO	Double Row, Straight Bore, Two Single Inner Rings, One Double outer ring With Lubrication Groove and Holes.	7	
4.	2TS	Double Row, Straight Bore, Two Single Inner Rings, Two Single Outer Rings.	8	

5.3.1 *Single-Row Tapered Roller Bearings*

Table 5 Type TS Boundary Dimensions (Sheet 1 of 9)
(*Clause* 5.3)



Bore	OD	Width	Reference Part Numbers		ISO Dimension Series	Inner Ring		Outer Ring			
			Inner Ring	Outer Ring		Minimum Radius [a]	Width	Minimum Radius [a]	Width	Inside Diameter	Contact Angle
d	D	T				$r_{s\ min}$	B	$r_{1s\ min}$	C	E	α
15	42	14.25	X30302	Y30302	2FB	1	13	1	11	32.272	10° 45'29"

17	40	13.25	X302 03	Y302 03	2DB	1	12	1	11	31.408	12° 57' 10"
17	40	17.25	X322 03	Y322 03	2DD	1	16	1	14	31.17	11° 45'
17	47	15.25	X303 03	Y303 03	2FB	1	14	1	12	37.42	10° 45' 29"
17	47	20.25	X323 03	Y323 03	2FD	1	19	1	16	36.09	10° 45'29"
20	37	12	X329 04	Y329 04	2BD	0.3	12	0.3	9	29.621	12°
20	42	15	X320 04X	Y320 04X	3CC	0.6	15	0.6	12	32.781	14°
20	45	14	JP204 9	JP201 0	4DB	1	14	1	10	35,679	16° 40'
20	45	17	JD20 49	JD20 10	2DC	1	17.5	1	13.5	35,815	12°
20	47	15.25	X302 04	Y302 04	2DB	1	14	1	12	37.304	12° 57' 10"
20	47	19.25	X322 04-B	Y322 04-B	5DD	1	18	1	15	33.708	19°
20	47	19.25	X322 04	Y322 04	2DD	1	18	1	15	35.81	12° 28'
20	50	22	JF204 9	JF201 0	2ED	2	22	1.5	18.5	38.063	12° 30'
20	52	16.25	X303 04	Y303 04	2FB	1.5	15	1.5	13	41.318	11° 18'36"
20	52	22.25	X323 04	Y323 04	2FD	1.5	21	1.5	18	39.518	11° 36"
22	40	12	X329/ 22	Y 329/2 2	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	JP224 9	JP221 0	4CB	1	14	1	10	37.443	17° 30'
22	47	17	JD22 49	JD22 10	2CC	1	17.5	1	13.5	37.542	12° 35'
22	52	22	JF224 9	JF221 0	2ED	2	22	1.5	18.5	40.548	12° 14'
25	42	12	X329 05	Y329 05	2BD	0.3	12	0.3	9	34.608	12°
25	47	15	X320 05X	Y320 05X	4CC	0.6	15	0.6	11.5	37.393	16°
25	47	17	X330 05	Y330 05	2CE	0.6	17	0.6	14	38.278	10° 55'
25	50	14	JP254 9	JP251 0	4CB	1	14	1	10	40.025	18° 45'

25	50	17	JD25 49	JD25 10	2CC	1.5	17.5	1	13.5	40.205	13° 30'
25	52	16.25	X302 05	Y302 05	3CC	1	15	1	13	41.135	14° 02'10"
25	52	19.25	X322 05-B	Y322 05-B	5CD	1	18	1	15	37.555	21° 15'
25	52	19.25	X322 05	Y322 05	2CD	1	18	1	16	41.331	13° 30'
25	52	22	X332 05	Y332 05	2DE	1	22	1	18	40.441	13° 10'
25	58	26	JF254 9	JF251 0	2EE	2	26	1.5	21	44.805	12° 30'
25	62	18.25	X313 05	Y313 05	7FB	1.5	17	1.5	13	44.13	28° 48' 39"
25	62	18.28	X303 05	Y303 05	2FB	1.5	17	1.5	15	50.637	11° 18'36"
25	62	25.25	X323 05	Y323 05	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	JP284 9	JP281 0	4CB	1	14.5	1	11	44.597	17° 30'
28	55	19	JD28 49	JD28 10	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	Y 332/2 8	2DE	1	24	1	19	45.846	12° 45'
28	65	27	JF284 9	JF281 0	2ED	2	27	2	22	50.33	12° 45'

Table 5 Type TS Boundary Dimensions (Sheet 2 of 9)

(*Clause* 5.3)

Bore	OD	Width	Reference Part Numbers		ISO Dimension Series	Inner Ring		Outer Ring			
			Inner Ring	Outer Ring		Minimum Radius [a]	Width	Minimum Radius [a]	Width	Inside Diameter	Contact Angle
d	D	T				$r_{s\ min}$	B	$r_{1s\ min}$	C	E	α
30	47	12	X329 06	Y329 06	2BD	0.3	12	0.3	9	39.617	12°
30	55	17	X320 06X	Y320 06X	4CC	1	17	1	13	44.438	16°

30	55	20	X330 06	Y330 06	2CE	1	20	1	16	45.283	11°
30	58	19	JD30 49	JD30 10	2CD	1.5	19.5	1.5	15.5	47.309	12° 50'
30	60	17 000	JP304 9	JP301 0	4CB	10	16.5	1	12.5	48.465	17° 30'
30	62	17.25	X302 06	Y302 06	3DB	1	16	1	14	49.99	14° 02' 10"
30	62	21.25	X322 06	Y322 06	3DC	1	20	1	17	48.982	14° 02' 10"
30	62	21.25	X322 06-B	Y322 06-B	5DC	1	20	1	17	46.389	20° 34'
30	62	25	X332 06	Y332 06	2DE	1	25	1	19.5	49.524	12° 50'
30	68	29	JF304 9	JF301 0	2EE	2	29	2	24	52.696	12° 28'
30	72	20.75	X303 06	Y303 06	2FB	1.5	19	1.5	16	58.287	11° 51' 35"
30	72	20.75	X313 06	Y313 06	7FB	1.5	19	1.5	14	51.771	28° 48' 39"
30	72	28.75	X323 06-B	Y323 06-B	5FD	1.5	27	1.5	23	50.518	20°
30	72	28.75	X323 06	Y323 06	2FD	1.5	27	1.5	23	55.767	11° 51' 35"
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	JD32 49	JD32 10	2CD	1.5	21	1.5	17	50.554	12° 30'
32	65	18	JP324 9	JP321 0	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	JF324 9	JF321 0	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	X329 07	Y329 07	2BD	0.6	14	0.6	11.5	47.22	11°
35	62	18	X320 07X	Y320 07X	4CC	1	18	1	14	50.51	16°50'

35	62	21	X330 07	Y330 07	2CE	1	21	1	17	51.32	11° 30'
35	68	23	JD35 49	JD35 10	2DD	2	23	2	18.5	55.4	12° 35'
35	70	19	JP354 9	JP351 0	4DB	1	18	1	14	57.138	16° 49' 30"
35	72	18.25	X302 07	Y302 07	3DB	1.5	17	1.5	15	58.844	14° 02' 10"
35	72	24.25	X322 07	Y322 07	3DC	1.5	23	1.5	19	57.087	14° 02' 10"
35	72	24.25	X322 07-B	Y322 07-B	5DC	1.5	23	1.5	19	53.052	21° 10'
35	72	28	X332 07	Y332 07	2DE	1.5	28	1.5	22	57.186	13° 15'
35	80	22.75	X303 07	Y303 07	2FB	2	21	1.5	18	65.769	11° 51' 35"
35	80	22.75	X313 07	Y313 07	7FB	2	21	1.5	15	58.861	28° 48'39"
35	80	32.75	X323 07	Y323 07	2FE	2	31	1.5	25	62.829	11° 51'35"
35	80	32.75	X323 07-B	Y323 07-B	5FE	2	31	1.5	25	57.011	20°
35	78	33	JF354 9	JF351 0	2EE	2.5	32.5	2	27	61.925	12° 12'
40	62	15	X329 08	Y329 08	2BC	0.6	15	0.6	12	53.388	10° 55'
40	68	19	X320 08X	Y320 08X	3CD	1	19	1	14.5	56.897	14° 10'
40	68	22	X330 08	Y330 08	2BE	1	22	1	18	57.29	10° 40'
40	75	19	JP404 9	JP401 0	4CB	1	18	1	14	61.526	18° 10' 30"
40	75	24	JP404 9	JD40 10	2CD	2	24	2	19.5	62.155	12° 07
40	75	26	X331 08	Y331 08	2CE	1.5	26	1.5	20.5	61.169	13° 20'
40	80	19.75	X302 08	Y302 08	3DB	1.5	18	1.5	16	65.73	14° 02' 10"
40	80	24.75	X322 08	Y322 08	3DC	1.5	23	1.5	19	64.715	14° 02' 10"
40	80	24.75	X322 08-B	Y322 08-B	5DC	1.5	23	1.5	19	61.438	20°
40	80	27	JT404 9	JT401 0	5DD	4	26.5	2	21.5	58.963	20° 43'30"
40	80	32	X332 08	Y332 08	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	32.25	X32308-B	Y32308-B	5FD	2	33	1.5	27	63.708	20°
40	90	35.25	X32308	Y32308	2FD	2	33	1.5	27	69.253	12° 57' 10"

Table 5 Type TS Boundary Dimensions (Sheet 3 of 9)

(*Clause* 5.3)

Bore	OD	Width	Reference Part Numbers		ISO Dimension Series	Inner Ring		Outer Ring			
			Inner Ring	Outer Ring		Minimum Radius [a]	Width	Minimum Radius [a]	Width	Inside Diameter	Contact Angle
d	D	T				$r_{s\ min}$	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° 55'30"
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	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	2DD	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	JT5049	JT5010	5ED	4	34.5	2	29	74.391	19° 27'30'
50	100	36	JF5049	JF5010	2ED	2.5	35	2.5	30	79.996	12° 51'
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	X32011X	Y32011X	3CC	1.5	23	1.5	17.5	76.505	15° 10'
55	90	23	JLM506849	JLM506910	3CB	1.5	23	0.5	18.5	75.417	15°
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° 43'30"
55	95	29	JM207049A	JM207010	2DD	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	95	29	JM207049	JM207010	2DD	1.5	29	2.5	23.5	79.593	12° 35'
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° 55'
55	105	36	JT5549	JT5510	5ED	4	34.5	2.5	29	78.283	20° 32' 30"
55	110	39	JF5549	JF5510	2ED	2.5	39	2.5	32	88.446	13°
55	110	39	JH307749	JH307710	2ED	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 5 Type TS Boundary Dimensions (Sheet 4 of 9)

(*Clause* 5.3)

Bore	OD	Width	Reference Part Numbers		ISO Dimension Series	Inner Ring		Outer Ring			
						Minimum Radius [a]	Width	Minimum Radius [a]	Width	Inside Diameter	Contact Angle
d	D	T	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° 38' 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	Y 30212	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	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	2EE	2.5	39	2.5	33	93.46	12° 30'

60	125	37	JW 6049	JW60 10	7FC	3	33.5	3	26	89.849	28° 39'
60	125	48	JN60 49	JN60 10	4FE	5	46	2.5	40	94.207	16° 15'
60	130	33.5	X303 12	Y303 12	2FB	3	31	2.5	26	107.769	12° 57 10"
60	130	33.5	X313 12	Y313 12	7FB	3	31	2.5	22	98.236	28° 48'39"
60	130	48.5	X323 12	Y323 12	2FD	3	46	2.5	37	102.939	12° 10"
60	130	48.5	X323 12-B	Y323 12-B	5FD	3	46	2.5	37	94.2	20°
65	90	17	X329 13	Y329 13	2BC	1	17	1	14	78.849	13° 15'
65	100	22	JC65 49	JC65 10	2CC	2	22	2	17.5	87.433	12° 10' 30'
65	100	23	X320 13X	Y320 13X	4CC	1.5	23	1.5	17.5	85.567	17°
65	100	27	X330 13	Y330 13	2CE	1.5	27	1.5	21	85.257	13° 05'
65	105	21	JP654 9	JP651 0	4CB	2	20	2	15.5	89.709	18° 27'
65	105	24	JLM7 10949	JLM7 10910	4CD	3	23	1	18.5	88.892	16° 50'
65	110	28	JM51 1946	JM51 1910	3DC	3	28	2.5	22.5	91.897	15°
65	110	31	JD65 49	JD65 10	2DD	2	31	2	25	93.09	12° 27'
65	110	34	X331 13	Y331 13	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	X302 13	Y302 13	3EB	2	23	1.5	20	101.934	15° 06' 34"
65	120	32.75	X322 13	Y322 13	3EC	2	31	1.5	27	99.484	15° 06' 34"
65	120	39	JT654 9	JT651 0	5ED	4	38	2.5	31	91.214	20° 28'
65	120	39	JH21 1749	JH21 1710	2ED	3	38.5	2.5	32	98.572	12° 40'
65	120	39	JH21 1749 A	JH21 1710	2ED	7	38.5	2.5	32	98.572	12° 40'
65	120	41	X332 13	Y332 13	3EE	2	41	1.5	32	97.863	14° 35'
65	125	43	JF654 9	JF651 0	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° 55' 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	X323 13-B	Y323 13-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	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	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	4	34.5	2.5	30	98.1	19° 34'
70	125	41	X33214	Y33214	3EE	2	41	1.5	32	102.275	15° 15'
70	130	42	JT7049	JT7010	5ED	4	40	2.5	34	100.186	19° 11'
70	130	43	JT7049	JF7010	2ED	3	42	2.5	35	106.766	12° 31' 30"
70	130	43	JT7049A	JF7010	2ED	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	JN70 49	JN70 10	4FE	5	51	3	43	106.644	16° 34' 30"
70	150	38	X303 14	Y303 14	2GB	3	35	2.5	30	125.244	12° 57'10"
70	150	38	X313 14	Y313 14	7GB	3	35	2.5	25	113.449	28° 48' 39"
70	150	54	X323 14	Y323 14	2GD	3	51	2.5	42	119.724	12° 57' 10"
70	150	54	X323 14-B	Y323 14-B	5GD	3	51	2.5	42	110.219	20°

Table 5 Type TS Boundary Dimensions (Sheet 5 of 9)

(*Clause* 5.3)

Bore	OD	Width	Reference Part Numbers		ISO Dimension Series	Inner Ring		Outer Ring			
			Inner Ring	Outer Ring		Minimum Radius [a]	Width	Minimum Radius [a]	Width	Inside Diameter	Contact Angle
d	D	T				$r_{s\ min}$	B	$r_{1s\ min}$	C	E	α
75	105	20	X329 15	Y329 15	2BC	1	20	1	16	93.223	12° 31'
75	115	21	JP754 9	JP751 0	4CB	2	20	2	15.5	100.019	17°55'
75	115	25	JC75 49	JC75 10	2CC	2	25	2	20	100.414	12°
75	115	25	X320 15X	Y320 15X	4CC	1.5	25	1.5	19	98.358	17°
75	115	25	JLM7 14149	JLM7 14110	4CC	3	25	2.5	19	93 358	17°
75	115	31	X330 15	Y330 15	2CE	1.5	31	1.5	25.5	99.4	11° 15'
75	120	31	JM71 4249	JM71 4210	4CD	3	29.5	2.5	25	99.926	16° 30'
75	120	31	JM71 4249 A	JM71 4210	4CD	6	29.5	2.5	25	99.926	16° 30'
75	125	34	JD75 49	JD75 10	2DD	2.5	33	2	27	105.786	12° 55'
75	125	37	X331 15	Y331 15	3DE	2	37	1.5	29	104.358	14° 50'
75	130	27.25	X302 15	Y302 15	4DB	2	25	1.5	22	110.408	16° 10'20"
75	130	33.25	X322 15	Y322 15	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	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	X323 15-B	Y323 15-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° 38'3
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	X323 16-B	Y323 16-B	5GD	3	58	2.5	48	125.001	20°
85	120	23	X32917	Y32917	2BC	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	JH217249	JH217210	2ED	3	46	2.5	38	124.962	12° 30'

85	150	46	JF8549	JF8510	2ED	3	46	3	38	124.965	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° 4' 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-B	Y32317-B	5GD	4	60	3	49	132.736	20°

Table 5 Type TS Boundary Dimensions (Sheet 6 of 9)

(*Clause* 5.3)

Bore	OD	Width	Reference Part Numbers		ISO Dimension Series	Inner Ring		Outer Ring			
			Inner Ring	Outer Ring		Minimum Radius [a]	Width	Minimum Radius [a]	Width	Inside Diameter	Contact Angle
d	D	T				$r_{s\ min}$	B	$r_{1s\ min}$	C	E	α
90	125	23	X32918	Y32918	2BC	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	4DC	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	5	40	3	34	119.254	20°

90	150	45	X331 18	Y331 18	3DE	2.5	45	2	35	125.283	14°50'
90	155	44	JHM3 18448	JHM3 18410	2EC	3	44	2.5	35.5	130.944	12° 48' 40"
90	155	46	JF904 9	JF901 0	2ED	3	46	3	38	130.206	12° 17'
90	160	32.5	X302 18	Y302 18	3FB	2.5	30	2	26	134.901	15° 38'32"
90	160	42.5	X322 18	Y322 18	3FC	2.5	40	2	34	132.615	15° 38'32"
90	160	55	X332 18	Y332 18	3FE	2.5	55	2	42	129.82	15° 40'
90	165	47	JF100 39	JF100 10	2EE	3	46	3	39	140.251	12°
90	165	55	JN90 49	JN90 10	4FE	5	54	3	45	130.224	16° 15'
90	175	48	JW90 49	JW90 10	7FC	4	45	4	33	129.385	29° 02'30"
90	190	46.5	X303 18	Y303 18	2GB	4	43	3	36	159.061	12° 57'10
90	190	46.5	X313 18	Y313 18	7GB	4	43	3	30	145.527	28° 48'39"
90	190	57.15	JHH2 21436	JHH2 21413	2GC	8	57.531	3.3	46.038	157.96	12° 35'
90	190	67.5	X323 18	Y323 18	2GD	4	64	3	53	151.701	12° 57'10"
95	130	23	X329 19	Y329 19	2BC	1.5	23	1.5	18	116.082	13° 25'
95	140	24	JP954 9	JP951 0	4CB	2	22.5	2	17.5	123.776	16°51'
95	140	28	JC95 49	JC95 10	2CC	2.5	27.5	2.5	23	123.797	12° 30'
95	145	24	JP100 44	JP100 10	4CB	3	22.5	3	17.5	128.389	17° 30
95	145	32	X320 19X	Y320 19X	4CC	2	32	1.5	24	124.927	16°25
95	145	34	JD95 49	JD95 10	2CD	2.5	33	2.5	28	126.419	12°.30'
95	145	39	X330 19	Y330 19	2CE	2	39	1.5	32.5	126.346	10° 30'
95	150	35	JM71 9149	JM71 9113	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	JT954 9	JT951 0	5ED	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	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	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° 15' 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 5 Type TS Boundary Dimensions (Sheet 7 of 9)

(*Clause* 5.3)

Bore	OD	Width	Reference Part Numbers		ISO Dimension Series	Inner Ring		Outer Ring			
			Inner Ring	Outer Ring		Minimum Radius [a]	Width	Minimum Radius [a]	Width	Inside Diameter	Contact Angle
d	D	T				$r_{s\ min}$	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	X302 21	Y302 21	3FB	3	36	2.5	30	159.795	15° 38'32"
105	190	53	X322 21	Y322 21	3FC	3	50	2.5	43	155.269	15° 38' 32"
105	190	68	X332 21	Y332 21	3FE	3	68	2.5	52	153.622	15°
105	200	54	JW10 549	JW10 510	7FC	4	49	4	37	147.838	30°
105	225	53.5	X303 21	Y303 21	2GB	4	49	3	41	186.752	12° 57'10"
105	225	58	X313 21X	Y313 21X	7GB	4	53	3	36	170.724	28° 48'39"
105	225	81.5	X323 21	Y323 21	2GD	4	77	3	63	179.359	12° 57'10"
110	150	25	X329 22	Y329 22	2CC	1.5	25	1.5	20	135.182	13° 20'
110	160	27	-	-	4CB	3	25.5	3	19.5	142.292	16° 24'
110	160	33	-	-	2CD	2.5	31.5	2.5	27	141.607	12° 42' 30"
110	165	38	-	-	2DD	3	37	2.5	31	144.376	12° 42' 30"
110	170	38	X320 22X	Y320 22X	4DC	2.5	38	2	29	146.29	16°
110	170	47	X330 22	Y330 22	2DE	2.5	47	2	37	146.265	10° 50'
110	175	47		-	2EE	4	46	3	39	149.543	12° 41'30
110	180	56	X331 22	Y331 22	3EE	2.5	56	2	43	149.127	15° 35'
110	190	58		-	3FE	6	57	3	47	154.133	15° 48'
110	200	41	X302 22	Y302 22	3FB	3	38	2.5	32	168.548	15° 38' 32"
110	200	56	X322 22	Y322 22	3FC	3	53	2.5	46	164.022	15° 38'
110	210	57	JW11 049	JW11 010	7GC	4	51	4	39	157.271	28° 25'
110	240	54.5	X303 22	Y303 22	2GB	4	50	3	42	199.925	12° 57' 10"
110	240	63	X313 22X	Y313 22X	7GB	4	57	3	38	182.014	28° 48'39"
110	240	84.5	X323 22	Y323 22	2GD	4	80	3	65	192.071	12° 57'10"
115	165	28	JLM7 22948	JLM7 22912	4CC	3.3	27	3	21	142.481	17°
120	165	29	X329 24	Y329 24	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	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	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	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	JW13 049	JW13 010	7FC	5	51	5	39	175.117	30°
130	230	67.75	X322 26	Y322 26	4FD	4	64	3	54	187.088	16° 10' 20"
130	280	63.75	X303 26	Y303 26	2GB	5	58	4	49	232.028	12° 57' 10"
130	280	72	X313 26X	Y313 26X	7GB	5	66	4	44	211.753	28° 48' 39"

Table 5 Type TS Boundary Dimensions (Sheet 8 of 9)

(*Clause* 5.3)

Bore	OD	Width	Reference Part Numbers		ISO Dimension Series	Inner Ring		Outer Ring			
			Inner Ring	Outer Ring		Minimum Radius [a]	Width	Minimum Radius [a]	Width	Inside Diameter	Contact Angle
d	D	T				$r_{s\ min}$	B	$r_{1s\ min}$	C	E	α
140	190	32	X329 28	Y329 28	2CC	2	32	1.5	25	171.032	13° 30'
140	195	29	JP140 49	JP140 10	4CB	3	27	3	21	174.512	18° 32'
140	200	39	JC14 049	JC14 010	2DC	3	38	2.5	31	179.234	12°
140	205	44	JD14 049	JD14 010	2DD	3	43	2.5	36	181.645	12°
140	210	45	X320 28X	Y320 28X	4DC	2.5	45	2	34	180.72	17°
140	210	56	X330 28	Y330 28	2DE	2.5	56	2	44	180.353	13° 30'
140	215	53	JF140 49	JF140 10	2ED	4	52	3	44	187.051	12°
140	220	58	JN14 049	JN14 010	4EE	6	57	4	47	182.745	16° 39' 30"
140	240	57	JW14 049	JW14 010	7FC	5	52	5	39	187.175	28° 37'
140	250	45.75	X302 28	Y302 28	4FB	4	42	3	36	212.27	16° 10'20"
140	250	71.75	X322 28	Y322 28	4FD	4	68	3	58	204.046	16° 10' 20"
140	300	67.75	X303 28	Y303 28	2GB	5	62	4	53	247.91	12° 57' 10"
140	300	77	X313 28X	Y313 28X	7GB	5	70	4	47	227.999	28° 48' 39"
150	210	32	JP150 49	JP150 10	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° 0'20"
150	270	77	X32230	Y32230	4GD	4	73	3	60	219.157	16° 0'20"
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	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	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	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	X302234	Y302234	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	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 5 Type TS Boundary Dimensions (Sheet 9 of 9)

(*Clause* 5.3)

Bore	OD	Width	Reference Part Numbers			Inner Ring		Outer Ring			
						Minimum Radius [a]	Width	Minimum Radius [a]	Width	Inside Diameter	Contact Angle

d	D	T	Inner Ring	Outer Ring	ISO Dimension Series	$r_{s\ min}$	B	$r_{1s\ min}$	C	E	α
190	255	41	JC19 049	JC19 010	2DC	3	40	3	33	232.395	12° 15'
190	260	37	JP190 49	JP190 10	4DB	3	34	3	27	234.451	16° 46'
190	260	45	X329 38	Y329 38	4DC	2.5	45	2	34	228.578	17° 39"
190	260	46	JM73 8249	JM73 8210	4DD	3	44	2.5	36.5	228.577	17° 39'
190	260	46	JM73 8249 A	JM73 8210	4DD	8	44	2.5	36.5	228.577	17° 39'
190	260	47	JD19 049	JD19 010	2DD	4	46	3	38	234.615	12° 15'
190	270	56	JF190 49	JF190 10	2ED	5	55	4	46	240.017	12° 15'30"
190	280	64	JN19 049	JN19 010	3EE	6	62	4	52	239.995	15° 58'30"
190	290	64	X320 38X	Y320 38X	4FD	3	64	2.5	48	249.853	16° 25'
190	340	60	X302 38	Y302 38	4GB	5	55	4	46	291.083	16° 10' 20"
190	340	97	X322 38	Y322 38	4GD	5	92	4	75	279.024	16° 10'20"
200	265	41	JC20 049	JC20 010	2DC	3	40	3	33	241.71	12° 45'
200	270	37	JP200 49	JP200 10	4DB	3	34	3	27	244.35	17° 30'
200	270	47	JD20 049	JD20 010	2DD	4	46	3	38	244.043	12° 45'
200	280	51	X329 40	Y329 40	3EC	3	51	2.5	39	249.698	14° 45'
200	280	56	JF200 49	JF200 10	2ED	5	55	4	46	249.3	12° 44'30"
200	290	64	JN20 049	JN20 010	4EE	6	62	4	52	248.588	16° 34'
200	300	65	JHM8 40449	JHM8 40410	-	3.5	62	2.5	51	253.055	19° 10'
200	310	70	X320 40X	Y320 40X	4FD	3	70	2.5	53	266.039	16°
200	360	64	X362 40	Y362 40	4GB	5	58	4	48	307.196	16° 10'20"
200	360	104	X322 40	Y322 40	3GD	5	98	4	82	294.88	15° 10'

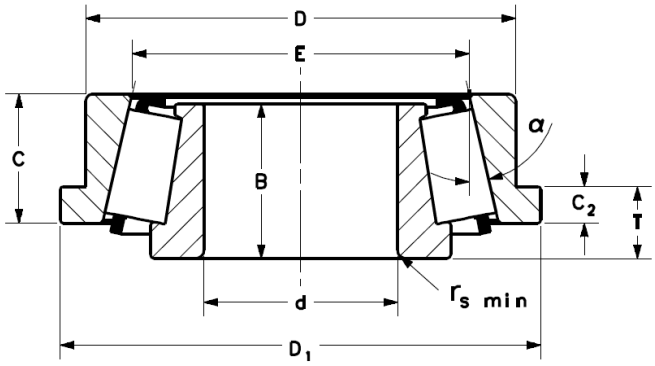
220	285	41	JC22 043	JC22 010	2DC	4	40	3	33	262.657	12°
220	290	37	JP220 49	JP220 10	4DB	3	34	3	27	263.12	18° 54'
220	290	47	JD22 049	JD22 049	2DD	4	46	3	38	265.261	12°
220	300	51	X329 44	Y329 44	3EC	3	51	2.5	39	267.685	15° 50'
220	300	56	JF220 49	JF220 10	2ED	5	55	4	46	270.389	12° 04'30"
220	340	76	X320 44X	Y320 44X	4FD	4	76	3	57	292.464	16°
240	305	41	JC24 049	JC24 010	2DC	4	40	3	33	281.653	12° 53'
240	310	47	JD24 049	JD24 010	2DD	4	46	3	38	284.085	12° 52'
240	320	42	JP240 49	JP240 10	4EB	3	39	3	30	291.676	16°56'
240	320	51	X329 48	Y329 48	4EC	3	51	2.5	39	286.952	17°
240	320	57	JF240 49	JF240 10	2EE	6	56	4	46	289.075	12° 55' 30"
240	360	76	X320 48X	Y320 48X	4FD	4	76	3	57	310.356	17°
260	325	41	JC26 049	JC26 010	2DC	4	40	4	33	300.661	13° 46'
260	330	47	JD26 049	JD26 010	2DD	4	46	4	38	303.004	13° 44'30"
260	340	42	JP260 49	JP260 10	4DB	3	39	3	30	310.497	18° 04'
260	340	57	JF260 49	JF260 10	2DE	6	56	4	46	310.322	12° 07' 30"
260	360	63.5	X329 52	Y329 52	3EC	3	63.5	2.5	48	320.783	15° 10'
260	400	87	X320 52X	Y320 52X	4FC	5	87	4	65	344.432	16° 10'
280	360	57	JF280 49	JF280 10	2DE	6	56	5	46	329.164	12° 52 30"
280	370	48	JP280 49	JP280 10	4EB	3	44	3	34	337.067	17° 30'
280	380	63.5	X329 56	Y329 56	4EC	3	63.5	2.5	48	339.778	16° 05'
280	420	87	X320 56X	Y320 56X	4FC	5	87	4	65	361.811	17°
300	400	52	JP300 49	JP300 10	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°3 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).

5.3.2 *Flanged outer rings for tapered roller bearings*

Table 6 Type TSF Boundary Dimensions (Sheet 1 of 5)
(*Clause* 5.3)



Bore	OD	Width	Reference Part Numbers		ISO Dimension Series	Inner Ring		Outer Ring				
						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	D1	C2	E	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	X32205	Y32205R	2CD	1	18	16	57	3.5	41.331	13° 30'
25	52	6.75	X30205	Y30205R	3CC	1	15	13	57	3.5	41.135	14° 02' 10"
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 6 Type TSF Boundary Dimensions (Sheet 2 of 5)

(*Clause* 5.3)

Bore	OD	Width	Reference Part Numbers		ISO Dimension Series	Inner Ring		Outer Ring				
						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	D1	C2	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'
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'

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'
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'
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	2DDa	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 o 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"

Table 6 Type TSF Boundary Dimensions (Sheet 3 of 5)

(*Clause* 5.3)

Bore	OD	Width	Reference Part Numbers		ISO Dimension Series	Inner Ring		Outer Ring				
						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	D1	C2	E	α
65	100	9.5	X32013X	Y32013XR	4CC	1.5	23	17.5	104	4	85,567	17°
65	100	11	X33013	Y33013R	2CE	1.5	27	21	104	5	85.257	13°0
65	105	8.5	JP6549	JP6510-B	4CB	2	20	15.5	111	3	89.709	18° 27'
65	110	13	X33113	Y33113R	3DE	1.5	34	26.5	116	5.5	91.653	14° 30'
65	120	9.25	X30213	Y30213R	3EB	2	23	20	127	4.5	101.934	15° 06' 34"
65	120	11.75	X32213	Y32213R	3EC	2	31	27	127	6	99.484	15° 06' 34"
65	120	16	X33213	Y33213R	3EE	2	41	32	127	7	97.863	14° 35'
65	140	14	X30313	Y30313R	2GB	3	33	28	147	6	116.846	12° 57' 10"
65	140	19	X31313	Y313133	7GB	3	33	23	147	6	88.892	12° 57' 10"
65	140	20	X32313	Y32313R	2GD	3	48	39	147	8	111.786	12° 57' 10"
70	110	8.5	JP7049	JP7010-B	4CB	2	20	15.5	116	3	95.533	17°05'
70	110	10.5	X32014X	Y32014XR	4CC	1.5	25	19	116	4.5	93.633	16° 10'
70	110	10.5	X33014	Y330134	2CE	1.5	31	25.5	116	5	95.021	10° 45'
70	120	14	X33114	Y331134	3DE	2	37	29	127	6	99.733	14° 10'
70	125	11	X30214	Y302134	3EB	2	24	21	132	5	89.709	15° 38' 32"
70	125	13	X32214	Y322134	3EC	2	31	27	133	6	89.709	12°27'

70	125	16	X33214	Y33214	3EE	2	41	32	132	7	102.275	15° 15'
70	150	13	X31314	Y31314	7GB	3	35	25	158	7	88.892	12° 57' 10"
70	150	14	X30314	Y30314	2GB	3	35	30	158	7	88.892	12° 57' 10"
70	150	22	X32314	Y32314	2GD	3	51	42	160	10	88.892	15° 55' 30"
75	115	8.5	JP7549	JP7510-B	4CB	2	20	15.5	121	3	100.019	17° 55'
75	115	10.5	X32015X	Y32015X	4CC	1.5	25	19	121	4.5	98.358	17°
75	115	10.5	X33015	Y33015	2CE	1.5	31	25.5	121	5	99.4	11° 15'
75	115	11	JLM714149	JLM714110-B	4CC	3	25	19	122	5	98.356	17°
75	125	14	X33115	Y33115	3DE	2	37	29	132	6	104.358	14°50'
75	130	10.25	X30215	Y30215	4DB	2	25	22	137	5	101.934	16°10'
75	130	13	X32215	Y32215	4DC	2	31	27	138	6	101.934	15° 06' 34"
75	130	17	X33215	Y33215	3EE	2	41	31	137	7	106.675	15° 55'
75	160	18	X30315	Y30315	2GB	3	37	31	168	10	91.897	14°10'
75	160	18	X31315	Y31315	7GB	3	37	26	168	7	98.572	14°10'
75	160	22	X32315	Y32315	2GD	3	55	45	170	9	98.572	12° 57' 10"
80	125	10.5	JP8049	JP8010-B	4CB	2	22.5	17.5	132	4	108.745	16°46'
80	125	12	X32016X	Y32016X	3CC	1.5	29	22	131	5	107.334	15° 45'
80	125	12	X33016	Y33016	2CE	1.5	36	29.5	131	5.5	107.75	10° 30'
80	130	13.5	JM515649	JM515610-B	3DD	3	34	28.5	136.5	7	108.958	14°31'
80	130	14	X33116	Y33116	3DE	2	37	29	137	6	108.97	15° 30'
80	140	10.25	X30216	Y30216	3EB	2.5	26	22	147	5	102.378	15° 38' 32"
80	140	19	X33216	Y33216	3EE	2.5	46	35	147	8	114.582	15° 50'
80	170	14	X31316	Y31316	7GB	3	39	27	179	7	93.445	12° 57' 10"

80	170	16.5	X30316	Y303116	2GB	3	39	33	178	7	98.572	12° 57' 10"
80	170	24.5	X32316	Y323116	2GD	3	58	48	179	11	98.572	12° 57' 10"
85	130	10.5	JP8549	JP8510-B	4CB	2	22.5	17.5	137	4	113.315	17° 30'
85	130	11.5	JM716648	JM716610-B	4CD	6	29	24	135.5	5.5	110.063	16° 30'
85	130	11.5	JM716649	JM716610-B	4CD	3	29	24	135.5	5.5	110.063	16° 30'
85	130	12	X32017X	Y32017X	4CC	1.5	29	22	136	5	111.788	16° 25'
85	130	12	X33017	Y33017	2CE	1.5	36	29.5	136	5.5	112.838	11°
85	140	16	X33117	Y33117	3DE	2.5	41	32	147	7	117.097	15° 10'
85	150	14	X32217	Y32217	3EC	2.5	36	30	158	7	105.786	10° 30'
85	150	11	X30217	Y30217	3EB	2.5	28	24	158	5	105.786	15° 38' 32"
85	150	21	X33217	Y33217	3EE	2.5	49	37	158	9	122.894	15° 35'
85	180	15.25	X31317	Y31317	7GB	4	41	28	190	8	98.1	15° 15'
85	180	16	X30317	Y30317	2GB	4	41	34	190	8	98.1	15° 15'
85	180		X32317	Y32317	2GD	-	-	-	-	-	-	-

Table 6 Type TSF Boundary Dimensions (Sheet 4 of 5)

(*Clause* 5.3)

Bore	OD	Width	Reference Part Numbers		ISO Dimension Series	Inner Ring		Outer Ring				
						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	D1	C2	E	α
90	135	10.5	JP9049	JP9010-B	4CB	2	22.5	17.5	142	4	117.895	18° 14'
90	140	12.5	X33018	Y33018	2CE	2	39	32.5	146	6	122.363	10° 10'
90	140	13.5	X32018X	Y32018X	3CC	2	32	24	146	5.5	119.948	15° 45'
90	150	18	X33118	Y33118	3DE	2.5	45	35	158	8	125.283	14°50'

90	160	17	X32218	Y32218	3FC	2.5	40	34	170	9	105.786	19° 11'
90	160	20	X30218	Y30218	3FB	2.5	30	26	168	6	105.786	15° 38' 32"
90	160	23	X33218	Y33218	3FE	2.5	55	42	168	10	129.82	15° 40'
90	190	15	X31318	Y31318	7GB	4	43	30	200	8	98.1	12° 57' 10"
90	190	18.5	X30318	Y30318	2GB	4	43	36	200	8	98.1	12° 57'10"
90	190	25.5	X32318	Y32318	2GD	4	64	53	200	11	98.1	12° 57' 10"
95	140	10.5	JP9549	JP9510-B	4CB	2	22.5	17.5	147	4	123.776	16°51'
95	145	10.5	JP10044	JP10010-B	4CB	3	22.5	17.5	152	4	128.389	17° 30'
95	145	12.5	X33019	Y33019	2CE	2	39	32.5	151	6	126.346	10° 30'
95	145	13.5	X32019X	Y32019X	4CC	2	32	24	151	5.5	124.927	16° 25'
95	160	20	X33119	Y33119	3EE	2.5	49	38	168	9	133.24	14° 35'
95	170	13	X30219	Y30219	3FB	3	32	27	178	6	96.479	15° 45'
95	170	20	X32219	Y32219	3FC	3	43	37	180	8	96.479	12° 57'10"
95	170	24	X33219	Y33219	3FE	3	58	44	179	10	138.642	15° 15'
95	200	16	X30319	Y30319	2GB	4	45	38	210	8	98.1	12° 02'
95	200	17	X31319	Y31319	7GB	4	45	32	210	8	98.1	12° 02'
95	200	27.5	X32319	Y32319	2GD	4	67	55	210	11	98.1	2° 57' 10"
100	145	10.5	JP10049	JP10010-B	4CB	3	22.5	17.5	152	4	128.389	17° 30'
100	150	12.5	X33020	Y33020	2CE	2	39	32.5	156	6	130.323	10° 50'
100	150	13.5	X32020X	Y32020X	4CC	2	32	24	156	5.5	129.269	17°
100	165	21	X33120	Y33120	3EE	2.5	52	40	173	9	137.129	15° 10'
100	180	15	X30220	Y30220	3FB	3	34	29	188	7	106.766	14° 31'
100	180	17	X32220	Y32220	3FC	3	46	39	190	9	106.766	15°50'

100	180	25	X33220	Y33220	3FE	3	63	48	190	10	145.949	15°05'
100	215	17	X31320X	Y31320X	7GB	4	51	35	225	9	100.186	16° 34' 30"
100	215	17	X30320	Y30320	2GB	4	47	39	225	9	98.1	30°
100	215	29.5	X32320	Y32320	2GD	4	73	60	225	12	98.1	12° 57' 10"
105	150	10.5	JP10549	JP10510-B	4CB	3	22.5	17.5	157	4	132.982	18° 09'
105	160	15.5	X32021X	Y32021X	4DC	2.5	35	26	168	6.5	137.685	16° 30'
105	160	16.5	X33021	Y33021	2DE	2.5	43	34	168	7.5	139.304	10°40'
105	175	21	X33121	Y33121	3EE	2.5	56	44	184	9	144.427	15° 05'
105	190	14	X30221	Y30221	3FB	3	36	30	198	6	101.717	10° 30'
105	190	19	X32221	Y32221	3FC	3	50	43	200	10	101.717	15° 38'32"
105	190	27	X33221	Y33221	3FE	3	68	52	200	11	153.622	15°
105	225	20	X31321X	Y31321X	7GB	4	53	36	236	9.5	102.199	28° 48'39"
105	225	22	X30321	Y30321	2GB	4	49	41	236	9.5	100.186	15° 35'
105	225	30.5	X32321	Y32321	2GD	4	77	63	236	12	102.199	12° 57'10"
110	160	12.5	JP11049	JP11010-B	4CB	3	25.5	19.5	167	5	142.292	16° 24'
110	170	15.5			4FC	2.5	38	29	178	6.5	146.29	16°
110	170	14.5	X32022X	Y32022X	4DC	2.5	38	29	178	6.5	105.786	30°
110	170	18.5	X33022	Y33022	2DE	2.5	47	37	178	8.5	146.265	10° 50'
110	180	22	X33122	Y33122	3EE	2.5	56	43	190	9	149.127	15° 35'
110	200	19	X30222	Y30222	3FB	3	38	32	210	10	119.724	30°
110	200	23	X32222	Y32222	3FC	3	53	46	212	13	110.219	28° 48' 39"
110	240	17.5	X31322X	Y31322X	7GB	4	57	38	251	9.5	102.199	15° 48'
110	240	21.5	X30322	Y30322	2GB	4	50	42	251	9.5	102.199	15° 38'32"
110	240	31.5	X32322	Y32322	2GD	4	80	65	251	12	102.199	12° 57' 10"

115	165	12.5	JLM7 22948	JLM72 2912-B	4CC	3.3	27	21	172	5.5	142.481	17°

Table 6 Type TSF Boundary Dimensions (Sheet 5 of 5)

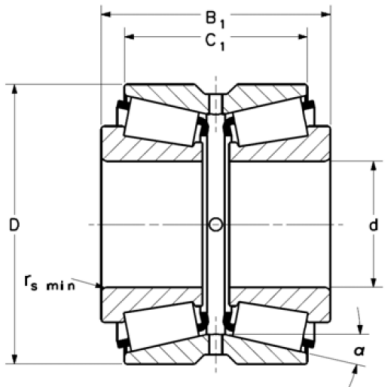
(*Clause* 5.3)

Bore	OD	Width	Reference Part Numbers		ISO Dimension Series	Inner Ring		Outer Ring				
						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	D1	C2	E	α
120	170	12.5	JP12049	JP12010-B	4CB	3	25	19.5	177	5	151.495	17° 30'
120	180	15.5	X32024X	Y32024X	4DC	2.5	38	29	188	6.5	155.239	17°
120	180	18.5	X33024	Y33024	2DE	2.5	48	38	188	8.5	154.777	11° 30'
120	200	24	X33124	Y33124	3FE	2.5	62	48	210	10	166.144	14°50'
120	215	16	X30224	Y30224	4FB	3	40	34	225	8	93 358	20°
120	215	22.5	X32224	Y32224	4FD	3	58	50	225	11	99.926	12° 57'10"
120	260	20	X31324X	Y31324X	7GB	4	62	42	272	11	102.199	14°50
120	260	21	X30324	Y30324	2GB	4	55	46	272	11	102.199	12° 57' 10"
120	260	34.5	X32324	Y32324	2GD	4	86	69	272	13	102.199	12° 57' 10"
130	185	13	JP13049	JP13010-B	4CB	3	27	21	192	5	165.002	17° 30'
130	200	19	X32026X	Y32026X	4EC	2.5	45	34	208	8	172.043	16° 10'
130	200	21	X33026	Y33026	2EE	2.5	55	43	208	9	172.017	12° 50'
130	230	16	X30226	Y30226	4FB	4	40	34	241	8	102.199	20°
130	230	24.75	X32226	Y32226	4FD	4	64	54	241	11	102.199	12° 57' 10"
140	195	13	JP14049	JP14010-B	4CB	3	27	21	202	5	174.512	18° 32'
140	210	19	X32028X	Y32028X	4DC	2.5	45	34	218	8	180.72	17°
140	210	21	X33028	Y33028	2DE	2.5	56	44	218	9	180.353	13° 30'

140	250	19.5	X302 28	Y3022 8	4FB	4	42	36	260	9	102.199	13°03
140	250	25.75	X322 28	Y3222 8	4FD	4	68	58	262	12	102.199	15°
150	210	15	JP150 49	JP1501 0-B	4DB	3	30	23	218	6	188.281	17° 04'
150	225	20.5	X320 30X	Y3203 0X	4EC	3	48	36	233	8.5	193.674	17°
150	225	23	X330 30	Y3303 0	2EE	3	59	46	233	10	194.26	13° 40'
150	270	17	X302 30	Y3023 0	4GB	4	45	38	282	9	102.199	12° 02'
150	270	29.5	X322 30	Y3223 0	4GD	4	73	60	282	12	102.199	12° 57' 10"
160	220	15	JP160 49	JP1601 0-B	4DB	3	30	23	228	6	197.895	17°57'
160	240	22	X320 32X	Y3203 2X	4EC	3	51	38	248	9	207.209	17°
170	230	15	JP170 49	JP1701 0-B	4DB	3	30	23	238	6	208.314	17°06'
170	260	24			4EC	3	57	43	268	10	223.031	16° 30'
180	240	15	JP180 49	JP1801 0-B	4DB	3	30	23	248	6	217.698	17°54'
180	280	27	X320 36X	Y3203 6X	3FD	3	64	48	292	11	239.898	15° 54'
190	260	17	JP190 49	JP1901 0-B	4DB	3	34	27	268	7	234.451	16°46'
200	270	17	JP200 49	JP2001 0-B	4DB	3	34	27	278	7	244.35	17° 30'
220	290	17	JP220 49	JP2201 0-B	4DB	3	34	27	298	7	263.12	18° 54'
240	320	20	JP240 49	JP2401 0-B	4EB	3	39	30	330	8	291.676	16° 56'
260	340	20	JP260 49	JP2601 0-B	4DB	3	39	30	350	8	310.499	18° 04'
280	370	23	JP280 49	JP2801 0-B	4EB	3	44	34	380	9	337 067	17° 30'
300	400	25	JP300 49	JP3001 0-B	4EB	3	49	37	410	10	364.238	17°
320	420	25	JP320 49	JP3201 0-B	4EB	3	49	38	432	10	382.798	17° 55'

5.3.3 *Double-Row Tapered Roller Bearings:*

Table 7 Type TDO Boundary Dimensions (Sheet 1 of 4)
(*Clause* 5.3)



Bore	OD	Width Over Inner Rings	Outer Ring Width	Reference Part Numbers		ISO Dimension Series	Minimum Radius [a]	Contact Angle
				Inner Ring	Outer Ring			
d	D	B1	C1				$r_{s\ min}$	α
20	42	34	28	X32004X	Y32004XD	3CC	0.6	14°
20	45	39	32	JD2049	JD2010D	2DC	1	12°
20	50	50	43	JF2049	JF2010D	2ED	2	12° 30'
22	44	34	27	X320/22X	Y320/22XD	3CC	0.6	14°50'
22	47	39	32	JD2249	JD2210D	2CC	1	12° 35'
22	52	50	43	JF2249	JF2210D	2ED	2	12° 14'
25	47	34	27	X32005X	Y32005XD	4CC	0.6	16°
25	50	39	32	JD2549	JD2510D	2CC	1.5	13° 30'
25	58	58	48	JF2549	JF2510D	2EE	2	2° 30'
25	62	42	31.5	X31305	Y31305D	7FB	1.5	28° 48' 39"
28	52	37	29	X320/28X	Y320/28XD	4CC	1	16°
28	55	43	36	JD2849	JD2810D	2CD	1.5	12° 10'
28	65	61	51	JF2849	JF2810D	2ED	2	12°45'
30	55	39	31	X32006X	Y32006XD	4CC	1	16°
30	58	44	37	JD3049	JD3010D	2CD	1.5	12° 50'
30	68	65	55	JF3049	JF3010D	2EE	2	12°28'
30	72	47	33.5	X31306	Y31306D	7FB	1.5	28° 48' 39"
32	58	39	31	X320/32X	Y320/32XD	4CC	1	16°50'
32	62	47	39	JD3249	JD3210D	2CD	1.5	30
32	72	65	55	JF3249	JF3210D	2ED	2	12° 41'30"
35	62	41	33	X32007X	Y32007XD	4CC	1	16° 50'
35	68	51	42	JD3549	JD3510D	2DD	2	12° 35'
35	78	73	61	JF3549	JF3510D	2EE	2.5	2° 12'
35	80	51	35.5	X31307	Y31307D	7FB	2	28° 48' 39"
40	68	44	35	X32008X	Y32008XD	3CD	1	14°10'
40	75	53	44	JD4049	JD4010D	2CD	2	12°07'
40	85	73	63	JF4049	JF4010D	2EE	2.5	12° 55'
40	90	56	39.5	X31308	Y31308D	7FB	2	28° 48' 39"
45	75	46	37	X32009X	Y32009XD	3CC	1	14° 40'
45	80	53	44	JD4549	JD4510D	2CD	2	13°
45	95	63	45	JW4549	JW4510D	7FC	2.5	30°

45	95	79	67	JF4549	JF4510D	2ED	2.5	12° 09'
45	100	60	41.5	X31309	Y31309D	7FB	2	28° 48' 39"
50	80	46	37	X32010X	Y32010XD	3CC	1	15° 45'
50	85	53	44	JD5049	JD5010D	2CD	2	13° 52'
50	100	79	67	JF5049	JF5010D	2ED	2.5	12° 51'
50	105	69	49	JW5049	JW5010D	7FC	3	30°
50	105	88	74	JN5049	JN5010D	4FE	4	16° 41'
50	110	64	43.5	X31310	Y31310D	7FB	2.5	28° 48' 39"

Table 7 Type TDO Boundary Dimensions (Sheet 2 of 4)

(*Clause* 5.3)

Bore	OD	Width Over Inner Rings	Outer Ring Width	Reference Part Numbers		ISO Dimension Series	Minimum Radius [a]	Contact Angle
				Inner Ring	Outer Ring			
d	D	B1	C1				$r_{s\ min}$	α
55	85	41	33	JC5549	JC5510D	2CC	2	12°49'
55	90	52	41	X32011X	Y32011XD	3CC	1.5	15°10'
55	95	60	49	JD5549	JD5510D	2CD	2	12° 43' 30"
55	110	87	73	JF5549	JF5510D	2ED	2.5	13°
55	115	73	52	JW5549	JW5510D	7FC	3	30°
55	115	95	81	JN5549	JN5510D	4FE	5	16° 15'
55	120	70	49	X31311	Y31311D	7FB	2.5	28° 48' 39"
60	90	42	34	JC6049	JC6010D	2CC	2	13° 38' 30"
60	95	52	41	X32012X	Y32012XD	4CC	1.5	16°
60	100	60	49	JD6049	JD6010D	2CD	2	13°27'
60	115	88	74	JF6049	JF6010D	2EE	2.5	12° 30'
60	125	79	57	JW6049	JW6010D	7FC	3	28°39'
60	130	74	51	X31312	Y31312D	7FB	3	28° 39'
60	125	104	88	JN6049	JN6010D	4FE	5	16° 15'
65	100	50	41	JC6549	JC6510D	2CC	2	12° 10' 30"
65	100	52	41	X32013X	Y32013XD	4CC	1.5	17°
65	110	70	58	JD6549	JD6510D	2DD	2	12°27'
65	125	95	79	JF6549	JF6510D	2FD	2.5	12°
65	130	79	57	JW6549	JW6510D	7FC	3	30°
65	140	79	53	X31313	Y31313D	7GB	3	30°
65	135	112	94	JN6549	JN6510D	3FE	5	15° 55' 30"
70	105	50	41	JC7049	JC7010D	2CC	2	12° 49' 30"
70	110	57	45	X32014X	Y32014XD	4CC	1.5	16° 10'
70	120	76	62	JD7049	JD7010D	2DD	2	12° 22'
70	130	95	79	JF7049	JF7010D	2ED	3	12° 31' 30"
70	130	95	79	JF7049A	JF7010D	2ED	7	12° 31'30"
70	140	83	59	JW7049	JW7010D	7FC	3	30°
70	150	83	57	X31314	Y31314D	7GB	3	30°
70	140	112	94	JN7049	JN7010D	4FE	5	16° 34' 30"
75	115	56	46	JC7549	JC7510D	2CC	2	12°
75	115	58	46	X32015X	Y32015XD	4CC	1.5	17°

75	125	76	62	JD7549	JD7510D	2DD	2.5	12°55'
75	135	95	79	JF7549	JF7510D	2ED	3	13°03'
75	145	112	94	JN7549	JN7510D	3FE	5	19°57'
75	150	89	63	JW7549	JW7510D	7FC	3	30°
75	160	88	60	X31315	Y31315D	7GB	3	30°
80	120	56	46	JC8049	JC8010D	2CC	2	12° 33' 30"
80	125	66	52	X32016X	Y32016XD	3CC	1.5	15° 45'
80	130	76	62	JD8049	JD8010D	2DD	2.5	13°30'
80	145	104	88	JF8049	JF8010D	2ED	3	12°.02'
80	150	112	94	JN8049	JN8010D	4FE	5	16° 33'
80	160	95	67	JW8049	JW8010D	7FC	3	30°
80	170	94	63	X31316	Y31316D	7GB	3	30°
85	125	58	48	JC8549	JC8510D	2CC	2.5	13° 07' 30"
85	130	67	53	X32017X	Y32017XD	4CC	1.5	16°25'
85	135	76	64	JD8549	JD8510D	2DD	2.5	13° 02'
85	150	104	88	JF8549	JF8510D	2ED	3	12° 30'
85	160	118	98	JN8549	JN8510D	3FE	5	15°43'
85	170	102	72	JW8549	JW8510D	7FC	4	28° 04'30"
85	180	99	66	X31317	Y31317D	7GB	4	28° 04'30"
90	135	64	54	JC9049	JC9010D	2CC	2.5	12° 01' 30"
90	140	73	57	X32018X	Y32018XD	3CC	2	15°45'
90	140	76	64	JD9049	JD9010D	2CD	2.5	12° 02' 30"
90	155	104	88	JF9049	JF9010D	2ED	3	12°17'
90	165	104	88	JF10039	JF10010D	2FC	3	12°
90	165	120	100	JN9049	JN9010D	4FE	5	16° 15'
90	175	102	72	JW9049	JW9010D	7FC	4	29° 02' 30"
90	190	103	70	X31318	Y31318D	7GB	4	29° 02' 30"

Table 7 Type TDO Boundary Dimensions (Sheet 3 of 4)

(*Clause* 5.3)

Bore	OD	Width Over Inner Rings	Outer Ring Width	Reference Part Numbers		ISO Dimension Series	Minimum Radius [a]	Contact Angle
				Inner Ring	Outer Ring			
d	D	B1	C1				$r_{s\ min}$	α
95	140	64	54	JC9549	JC9510D	2CC	2.5	12°30'
95	145	73	57	X32019X	Y32019XD	4CC	2	16°25'
95	145	76	64	JD9549	JD9510D	2CD	2.5	12° 30'
95	160	104	88	JF9549	JF9510D	2ED	3	12°43'
95	170	120	100	JN9549	JN9510D	4FE	5	16°47'
95	180	104	72	JW9549	JW9510D	7FC	4	30°
95	200	109	74	X31319	Y31319D	7GB	4	30°
100	145	64	54	JC10049	JC10010D	2DC	2.5	12° 58' 30"
100	150	73	57	X32020X	Y32020XD	4CC	2	17°
100	150	76	64	JD10049	JD10010D	2CD	2.5	12° 57' 30"
100	165	104	88	JF10049	JF10010D	2EE	3	12°
100	175	120	100	JN10049	JN10010D	4FE	6	16°

100	190	110	76	JW 10049	JW10010D	7FC	4	30°
100	215	124	81	X31320X	Y31320XD	7GB	4	30°
105	155	74	62	JC10549	JC10510D	2CD	2.5	12° 17' 30"
105	160	80	62	X32021X	Y32021XD	4DC	2.5	16° 30"
105	160	84	70	JD10549	JD10510D	2DD	3	12° 17' 30"
105	170	104	88	JF10549	JF10510D	2EE	3	12° 30"
105	180	120	100	JN10549	JN10510D	4EE	6	16° 30'
105	200	114	80	JW 10549	JW10510D	7FC	4	30°
105	225	127	83	X31321X	Y31321XD	7GB	4	30°
110	160	74	62	JC11049	JC11010D	2CD	2.5	°24'30"
110	165	84	70	JD11049	JD11010D	2DD	3	12° 42' 30"
110	170	86	68	X32022X	Y32022XD	4DC	2.5	16°
110	175	104	88	JF11049	JF11010D	2EE	4	2° 41' 30"
110	190	126	104	JN11049	JN11010D	3FE	6	15°48'
110	210	120	84	JW11049	JW11010D	7GC	4	28°25'
110	240	137	87	X31322X	Y31322XD	7GB	4	28° 48' 39"
120	175	82	68	JC12049	JC12010D	2DC	2.5	12°08'
120	180	88	70	X32024X	Y32024XD	4DC	2.5	17°
120	180	92	76	JD12049	JD12010D	2DD	3	12° 08' 30"
120	190	110	92	JF12049	JF12010D	2EE	4	12° 09' 30"
120	200	126	104	JN12049	JN12010D	4FE	6	16°42'
120	220	120	84	JW 12049	JW12010D	7FC	4	30°
120	260	148	96	X31324X	Y31324XD	7GB	4	30°
130	185	82	68	JC13049	JC13010D	2DC	3	12°52'
130	190	92	76	JD13049	JD13010D	2DD	3	12° 51' 30"
130	200	102	80	X32026X	Y32026XD	4EC	2.5	16°10'
130	200	110	92	JF13049	JF13010D	2DE	4	12° 50' 30"
130	210	126	104	JN13049	JN13010D	3EE	6	15° 50' 30"
130	230	120	84	JW 13049	JW130100	7FC	5	30°
130	280	156	100	X31326X	Y31326XD	7GB	5	30°
140	200	88	72	JC14049	JC14010D	2DC	3	12°
140	205	98	82	JD14049	JD14010D	2DD	3	12°
140	210	104	82	X32028X	Y32028XD	4DC	2.5	17°
140	215	116	98	JF14049	JF14010D	2ED	4	12°
140	220	126	104	JN14049	JN14010D	4EE	5	16° 39' 30"
140	240	120	84	JW 14049	JW14010D	7FC	5	28° 37'
140	300	168	108	X31328X	Y31328XD	7GB	5	28° 37'
150	215	98	82	JD15049	JD15010D	2DD	3	12° 37'
150	225	110	86	X32030X	Y32030XD	4EC	3	17°
150	225	116	98	JF15049	JF15010D	2ED	4	12° 35' 30"
150	235	132	110	JN15049	JN15010D	3EE	6	15° 53'
150	250	120	84	JW 15049	JW15010D	7FC	5	30°
150	320	178	114	X31330X	Y31330XD	7GB	5	30°
160	225	98	82	JD16049	JD16010D	2DD	3	13° 14' 30"
160	235	116	98	JF16049	JF16010D	2ED	4	13° 11'30"
160	240	116	90	X32032X	Y32032XD	4EC	3	17°

160	245	132	110	JN16049	JN16010D	4EE	6	16°37'

Table 7 Type TDO Boundary Dimensions (Sheet 4 of 4)

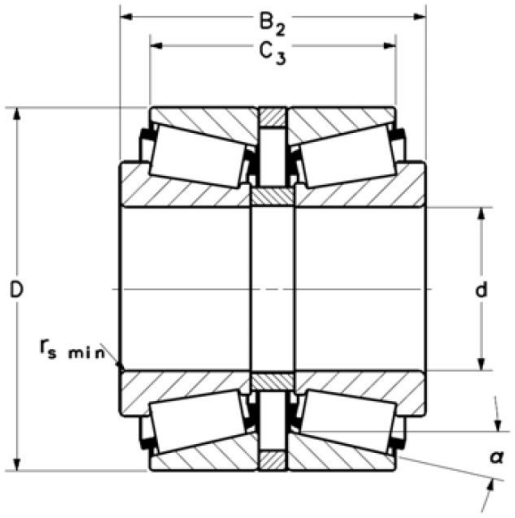
(*Clause* 5.3)

Bore	OD	Width Over Inner Rings	Outer Ring Width	Reference Part Numbers		ISO Dimension Series	Minimum Radius [a]	Contact Angle
d	D	B1	C1	Inner Ring	Outer Ring		$r_{s\ min}$	α
170	235	98	82	JD17049	JD17010D	2DD	3	12° 13' 30"
170	245	116	98	JF17049	JF17010D	2ED	5	12° 14'
170	255	132	110	JN17049	JN17010D	3EE	6	15° 55'
170	260	128	100	X32034X	Y32034XD	4EC	3	16° 30'
180	240	88	72	JC18049	JC18010D	2DC	3	12° 47'
180	245	98	82	JD18049	JD18010D	2DD	3	12° 46' 30"
180	255	116	98	JF18049	JF18010D	2ED	5	12° 46'
180	265	132	110	JN18049	JN18010D	4EE	6	16° 35'
180	280	142	110	X32036X	Y32036XD	3FD	3	15° 45'
190	255	92	76	JC19049	JC19010D	2DC	3	12° 15'
190	260	104	86	JD19049	JD19010D	2DD	4	12° 15'
190	270	124	104	JF19049	JF19010D	2ED	5	12° 15'30"
190	280	140	116	JN19049	JN19010D	3EE	6	15° 58' 30"
190	290	142	110	X32038X	Y32038XD	4FD	3	16° 25'
200	265	92	76	JC20049	JC20010D	2DC	3	12° 45'
200	270	104	86	JD20049	JD20010D	2DD	4	12°45'
200	280	124	104	JF20049	JF20010D	2ED	5	12° 44 30"
200	290	140	116	JN20049	JN20010D	4EE	6	16° 34'
200	310	154	120	X32040X	Y32040XD	4FD	3	16°
220	285	92	76	JC22049	JC22010D	2DC	4	12°
220	290	104	86	JD22049	JD22010D	2DD	4	12°
220	300	124	104	JF22049	JF22010D	2ED	5	12° 04' 30"
220	340	166	128	X32044X	Y32044XD	4FD	4	16°
240	305	92	76	JC24049	JC24010D	2DC	4	12°53'
240	310	104	86	JD24049	JD24010D	2DD	4	12°52'
240	320	126	104	JF24049	JF24010D	2EE	6	12° 55' 30"
240	360	166	128	X32048X	Y32048XD	4FD	4	17°
260	325	92	76	JC26049	JC26010D	2DC	4	13° 46'
260	330	104	86	JD26049	JD26010D	2DD	4	13° 44' 30"
260	340	126	104	JF26049	JF26010D	2DE	6	12° 07' 30'
260	400	190	146	X32052X	Y32052XD	4FC	5	16° 10'
280	360	126	104	JF28049	JF28010D	2DE	6	12° 52' 30"
280	420	190	146	X32056X	Y32056XD	4FC	5	17°
300	460	220	168	X32060X	Y32060XD	4GD	5	16° 10'
320	480	220	168	X32064X	Y32064XD	4GD	5	17°

5.3.4 *Two TS - Tapered Roller Bearings*

Table 8 Type 2TS Boundary Dimensions (Sheet 1 of 4)

(*Clause* 5.3)



Bore	OD	Width Over Inner Rings	Width Over Outer Rings	Reference Part Numbers				ISO Dimension Series	Minimum Radius [a]	Contact Angle
				Inner Ring	Outer Ring	Inner Ring Spacer [b]	Inner Ring Spacer [c]			
d	D	B2	C3						$r_{s\ min}$	α
20	42	34	28	X32004X	Y32004X	JX2004A	JYH4204R	3CC	0.6	14°
20	45	39	32	JD2049	JD2010	JX2004A	JYH4505R	2DC	1	12°
20	50	50	43	JF2049	JF2010	JX2006A	JYH5006R	2ED	2	12° 30'
22	44	34	27	X320/22X	Y320/22X	JX2204A	JYH4404R	3CC	0.6	14°50'
22	47	39	32	JD2249	JD2210	JX2204A	JYH4705R	2CC	1	12° 35'
22	52	50	43	JF2249	JF2210	JX2206A	JYH5206R	2ED	2	12° 14'
25	47	34	27	X32005X	Y32005X	JX2504A	JYH4704R	4CC	0.6	16°
25	50	39	32	JD2549	JD2510	JX2504A	JYH5005R	2CC	1.5	13° 30'
25	58	58	48	JF2549	JF2510	JX2506A	JYH5806R	2EE	2	12° 30'
25	62	42	31.5	X31305	Y31305	JX2508A	JYH6206R	7FB	1.5	28° 48' 39"
28	52	37	29	X320/28X	Y320/28X	JX2805A	JYH5205R	4CC	1	16°
28	55	43	36	JD2849	JD2810	JX2804A	JYH5505R	2CD	1.5	12° 10'
28	65	61	51	JF2849	JF2810	JX2807A	JYH6507R	2ED	2	12° 45'
30	55	39	31	X32006X	Y32006X	JX3005A	JYH5505R	4CC	1	16°
30	58	44	37	JD3049	JD3010	JX3005A	JYH5806R	2CD	1.5	12°50'
30	68	65	55	JF3049	JF3010	JX3007A	JYH6807R	2EE	2	12° 28'
30	72	47	33.5	X31306	Y31306	JX3009A	JYH7206R	7FB	1.5	28° 48' 39"
32	58	39	31	X320/32X	Y320/32X	JX3205A	JYH5805R	4CC	1	16° 50'
32	62	47	39	JD3249	JD3210	JX3205A	JYH6205R	2CD	1.5	12° 30'
32	72	65	55	JF3249	JF3210	JX3207A	JYH7207R	2ED	2	12° 41' 30"
35	62	41	33	X32007X	Y32007X	JX3505A	JYH6205R	4CC	1	16° 50'
35	68	51	42	JD3549	JD3510	JX3505A	JYH6805R	2DD	2	12° 35'
35	78	73	61	JF3549	JF3510	JX3508A	JYH7807R	2EE	2.5	12° 12'

35	80	51	35.5	X31307	Y31307	JX3509A	JYH8006R	7FB	2	28° 48' 39"
40	68	44	35	X32008X	Y32008X	JX4006A	JYH6806R	3CD	1	14° 10'
40	75	53	44	JD4049	JD4010	JX4005A	JYH7505R	2CD	2	12° 07'
40	85	73	63	JF4049	JF4010	JX4008A	JYH8507R	2EE	2.5	12° 55'
40	90	56	39.5	X31308	Y31308	JX4010A	JYH9006R	7FB	2	28° 48' 39"
45	75	46	37	X32009X	Y32009X	JX4506A	JYH7506R	3CC	1	14° 40'
45	80	53	44	JD4549	JD4510	JX4505A	JYH8005R	2CD	2	13°
45	95	63	45	JW4549	JW4510	JX4510A	JYH9505R	7FC	2.5	30°
45	95	79	67	JF4549	JF4510	JX4509A	JYH9507R	2ED	2.5	12°09'
45	100	60	41.5	X31309	Y31309	JX4510A	JYH10006R	7FB	2	28° 48' 39"
50	80	46	37	X32010X	Y32010X	JX5006A	JYH8006R	3CC	1	15° 45'
50	85	53	44	JD5049	JD5010	JX5005A	JYH8505R	2CD	2	13° 52'
50	100	79	67	JF5049	JF5010	JX5006A	JYH10007R	2ED	2.5	12° 51'
50	105	69	49	JW5049	JW5010	JX5011A	JYH10505R	7FC	3	30°
50	105	88	74	JN5049	JN5010	JX5008A	JYH10506R	4FE	4	16° 41'
50	110	64	43.5	X31310	Y31310	JX5010A	JYH11006R	7FB	2.5	28° 48' 39"

Table 8 Type 2TS Boundary Dimensions (Sheet 2 of 4)

(*Clause* 5.3)

Bore	OD	Width Over Inner Rings	Width Over Outer Rings	Reference Part Numbers				ISO Dimension Series	Minimum Radius [a]	Contact Angle
				Inner Ring	Outer Ring	Inner Ring Spacer [b]	Inner Ring Spacer [c]			
d	D	B2	C3						$r_{s\ min}$	α
55	85	41	33	JC5549	JC5510	JX5504A	JYH8505R	2CC	2	12° 49'
55	90	52	41	X32011X	Y32011X	JX5506A	JYH9006R	3CC	1.5	15° 10'
55	95	60	49	JD5549	JD5510	JX5506A	JYH9506R	2CD	2	12° 42'30"
55	110	87	73	JF5549	JF5510	JX5509A	JYH11009R	2ED	2.5	13°
55	115	73	52	JW5549	JW5510	JX5511A	JWH11505R	7FC	3	30°
55	115	95	81	JN5549	JN5510	JX5511A	JWH11507R	4FE	5	16°15'
55	120	70	49	X31311	Y31311	JX5512A	JWH12007R	7FB	2.5	28° 48' 39"
60	90	42	34	JC6049	JC6010	JX6005A	JY9006R	2CC	2	13° 38' 30"
60	95	52	41	X32012X	Y32012X	JX6006A	JYH9506R	4CC	1.5	16°
60	100	60	49	JD6049	JD6010	JX6006A	JYH10006R	2CD	2	13° 27'

60	115	88	74	JF6049	JF6010	JX6010A	JYH11508R	2EE	2.5	12° 30'
60	125	79	57	JW6049	JW6010	JX6012A	JYH12505R	7FC	3	28°39'
60	125	104	88	JN6049	JN6010	JX6012A	JYH12508R	4FE	5	16° 15'
60	130	74	51	X31312	Y31312	JX6012A	JYH13007R	7FB	3	28°39'
65	100	50	41	JC6549	JC6510	JX6506A	JYH10006R	2CC	2	12° 10' 30"
65	100	52	41	X32013X	Y32013X	JX6506A	JYH10006R	4CC	1.5	17°
65	110	70	58	JD6549	JD6510	JX6508A	JYH11008R	2DD	2	12°27'
65	125	95	79	JF6549	JF6510	JX6511A	JYH12509R	2FD	2.5	12°
65	130	79	57	JW6549	JW6510	JX6512A	JYH13005R	7FC	3	30°
65	135	112	94	JN6549	JN6510	JX6510A	JYH13508R	3FE	5	15° 55' 30"
65	140	79	53	X31313	Y31313	JX6513A	JYH14007R	7GB	3	30°
70	105	50	41	JC7049	JC7010	JX7006A	JYH10506R	2CC	2	49'30"
70	110	57	45	X32014X	Y32014X	JX7007A	JYH11007R	4CC	1.5	16° 10'
70	120	76	62	JD7049	JD7010	JX7010A	JYH12008R	2DD	2	12° 22'
70	130	95	79	JF7049	JF7010	JX7011A	JYH13009R	2ED	3	12° 31' 30"
70	130	95	79	JF7049A	JF7010	JX7011A	JYH13009R	2ED	7	12° 31' 30"
70	140	83	59	JW7049	JW7010	JX7012A	JYH14005R	7FC	3	30°
70	140	112	94	JN7049	JN7010	JX7010A	JYH14008R	4FE	5	16° 34' 30"
70	150	83	57	X31314	Y31314	JX7013A	JYH15007R	7GB	3	30°
75	115	56	46	JC7549	JC7510	JX7506A	JYH11506R	2CC	2	12°
75	115	58	46	X32015X	Y32015X	JX7508A	JYH11508R	4CC	1.5	17°
75	125	76	62	JD7549	JD7510	JX7510A	JYH12508R	2DD	2.5	12° 55'
75	135	95	79	JF7549	JF7510	JX7511A	JYH13509R	2ED	3	13°03'

75	145	112	94	JN7549	JN7510	JX7510A	JYH14508R	3FE	5	15°57'
75	150	89	63	JW7549	JW7510	JX7513A	JYH15005R	7FC	3	30°
75	160	88	60	X31315	Y31315	JX7514A	JYH16008R	7GB	3	30°
80	120	56	46	JC8049	JC8010	JX8006A	JYH12006R	2CC	2	12° 33' 30"
80	125	66	52	X32016X	Y32016X	JX8008A	JYH12508R	3CC	1.5	15°45'
80	130	76	62	JD8049	JD8010	JX8010A	JYH13008R	2DD	2.5	13°3
80	145	104	88	JF8049	JF8010	JX8014A	JYH14512R	2ED	3	12° 02'
80	150	112	94	JN8049	JN8010	JX8010A	JYH15008R	4FE	5	16° 33'
80	160	95	67	JW8049	JW8010	JX8013A	JYH16005R	7FC	3	30°
80	170	94	63	X31316	Y31316	JX8016A	JYH17009R	7GB	3	30°
85	125	58	48	JC8549	JC8510	JX8508A	JYH12508R	2CC	2.5	13° 07' 30"
85	130	67	53	X32017X	Y32017X	JX8509A	JYH13009R	4CC	1.5	16°
85	135	76	64	JD8549	JD8510	JX8510A	JYH13508R	2DD	2.5	13° 02'
85	150	104	88	JF8549	JF8510	JX8512A	JYH15012R	2ED	3	12° 30'
85	160	118	98	JN8549	JN8510	JX8510A	JYH16008R	3FE	5	15° 43'
85	170	102	72	JW8549	JW8510	JX8512A	JYH17006R	7FC	4	28° 30"
85	180	99	66	X31317	Y31317	JX8517A	JYH18010R	7GB	4	28° 04' 30"
90	135	64	54	JC9049	JC9010	JX9009A	JYH13508R	2CC	2.5	12° 01' 30"
90	140	73	57	X32018X	Y32018X	JX9009A	JYH14009R	3CC	2	15° 45'
90	140	76	64	JD9049	JD9010	JX9010A	JYH14008R	2CD	2.5	12° 20"
90	155	104	88	JF9049	JF9010	JX9012A	JYH15512R	2ED	3	12° 17
90	165	104	88	JF10039	JF10010	JX9012A	JYH16510R	2EE	3	12°
90	165	120	100	JN9049	JN9010	JX9012A	JYH16510R	4FE	5	16° 15'

90	175	102	72	JW9049	JW9010	JX9012A	JYH17506 R	7FC	4	29° 02' 30"
90	190	103	70	X31318	Y31318	JX9017A	JYH19010 R	7GB	4	29° 02' 30"

Table 8 Type 2TS Boundary Dimensions (Sheet 3 of 4)

(*Clause* 5.3)

Bore	OD	Width Over Inner Rings	Width Over Outer Rings	Reference Part Numbers				ISO Dimension Series	Minimum Radius [a]	Contact Angle
				Inner Ring	Outer Ring	Inner Ring Spacer [b]	Inner Ring Spacer [c]			
d	D	B2	C3						$r_{s\ min}$	α
95	140	64	54	JC9549	JC9510	JX9509A	JYH14008 R	2CC	2.5	12° 30
95	145	73	57	X32019X	Y32019X	JX9509A	JYH14509 R	4CC	2	16°25'
95	145	76	64	JD9549	JD9510	JX9510A	JYH14508 R	2CD	2.5	12° 30'
95	160	104	88	JF9549	JF9510	JX9512A	JYH16512 R	2ED	3	12°43'
95	170	120	100	JN9549	JN9510	JX9512A	JYH17010 R	4FE	5	16°47'
95	180	104	72	JW9549	JW9510	JX9514A	JYH18006 R	7FC	4	30°
95	200	109	74	X31319	Y31319	JX9519A	JYH20010 R	7GB	4	30°
100	145	64	54	JC10049	JC10010	JX10009 A	JYH14508 R	2DC	2.5	12° 58' 30"
100	150	73	57	X32020X	Y32020X	JX10009 A	JYH15009 R	4CC	2	17°
100	150	76	64	JD10049	JD10010	JX10010 A	JYH15008 R	2CD	2.5	12° 57' 30"
100	165	104	88	JF10049	JF10010	JX10012 A	JYH16510 R	2EE	3	12°
100	175	120	100	JN10049	JN10010	JX10012 A	JYH17510 R	4FE	6	16°
100	190	110	76	JW10049	JW10010	JX10016 A	JYH19006 R	7FC	4	30°
100	215	124	81	X31320X	Y31320X	JX10022 A	JYH21511 R	7GB	4	30°
105	155	74	62	JC10549	JC10510	JX10511 A	JYH15508 R	2CD	2.5	12° 17' 30"
105	160	80	62	X32021X	Y 32021X	JX10510 A	JYH16010 R	4DC	2.5	16° 30'

105	160	84	70	JD10549	JD10510	JX10510 A	JYH16008 R	2DD	3	12° 17'30"
105	170	104	88	JF10549	JF10510	JX10512 A	JYH17010 R	2EE	3	12° 18'30"
105	180	120	100	JN10549	JN10510	JX10512 A	JYH18010 R	4EE	6	16° 30"'
105	200	114	80	JW10549	JW10510	JX10516 A	JYH20006 R	7FC	4	30°
105	225	127	83	X31321X	Y31321X	JX10521 A	JYH22511 R	7GB	4	30°
110	160	74	62	JC11049	JC11010	JX11011 A	JYH16008 R	2CD	2.5	12° 42' 30"
110	165	84	70	JD11049	JD11010	JX11010 A	JYH16508 R	2DD	3	12° 42'30"
110	170	86	68	X32022X	Y 32022X	JX11010 A	JYH17010 R	4FC	2.5	16°
110	175	104	88	JF11049	JF11010	JX11012 A	JYH17510 R	2EE	4	12° 11'30"
110	190	126	104	JN11049	JN11010	JX11012 A	JYH19010 R	3FE	6	15° 48'
110	210	120	84	JW11049	JW11010	JX11018 A	JYH21006 R	7GC	4	28° 25'
110	240	137	87	X31322X	Y31322X	JX11023 A	JYH24011 R	7GB	4	28° 48' 39"
120	175	82	68	JC12049	JC12010	JX12012 A	JYH17510 R	2DC	2.5	12° 08'
120	180	88	70	X32024X	Y 32024X	JX12012 A	JYH18012 R	4DC	2.5	17°
120	180	92	76	JD12049	JD12010	JX12012 A	JYH18010 R	2DD	3	12° 08'30"
120	190	110	92	JF12049	JF12010	JX12012 A	JYH19010 R	2EE	4	12° 09' 30"
120	200	126	104	JN12049	JN12010	JX12012 A	JYH20010 R	4FE	6	16° 42'
120	220	120	84	JW12049	JW12010	JX12018 A	JYH22006 R	7FC	4	30°
120	260	148	96	X31324X	Y31324X	JX12024 A	JYH26012 R	7GB	4	30°
130	185	82	68	JC13049	JC13010	JX13012 A	JYH18510 R	2DC	3	12° 52'
130	190	92	76	JD13049	JD13010	JX13012 A	JYH19010 R	2DD	3	12° 1' 30"
130	200	102	80	X32026X	Y32026X	JX13012 A	JYH20012 R	4EC	2.5	16° 10'
130	200	110	92	JF13049	JF13010	JX13012 A	JYH20010 R	2DE	4	12° 50' 30"

130	210	126	104	JN13049	JN13010	JX13012 A	JYH21010 R	3EE	6	15° 50' 30"
130	230	120	84	JW13049	JW13010	JX13018 A	JYH23006 R	7FC	5	30° 0'
130	280	156	100	X31326X	Y31326X	JX13024 A	JYH28012 R	7GB	5	30°
140	200	88	72	JC14049	JC14010	JX14012 A	JYH20010 R	2DC	3	12°
140	205	98	82	JD14049	JD14010	JX14012 A	JYH20510 R	2DD	3	12°
140	210	104	82	X32028X	Y32028X	JX14014 A	JYH21014 R	4DC	2.5	17°
140	215	116	98	JF14049	JF14010	JX14012 A	JYH21510 R	2ED	4	12°
140	220	126	104	JN14049	JN14010	JX14012 A	JYH22010 R	4EE	6	16° 39' 30"
140	240	120	84	JW14049	JW14010	JX14016 A	JYH24006 R	7FC	5	28° 37'
140	300	168	108	X31328X	Y31328X	JX14028 A	JYH30014 R	7GB	5	28°37'
150	215	98	82	JD15049	JD15010	JX15014 A	JYH21510 R	2DD	3	12° 37'
150	225	110	86	X32030X	Y32030X	JX15014 A	JYH22514 R	4EC	3	17°
150	225	116	98	JF15049	JF15010	JX15012 A	JYH22510 R	2ED	4	12° 35'30"
150	235	132	110	JN15049	JN15010	JX15014 A	JYH23510 R	3EE	6	15° 53'
150	250	120	84	JW15049	JW15010	JX15016 A	JYH25006 R	7FC	5	30°
150	320	178	114	X31330X	Y31330X	JX15028 A	JYH32014 R	7GB	5	30°
160	225	98	82	JD16049	JD16010	JX16012 A	JYH22510 R	2DD	3	13° 14' 30"
160	235	116	98	JF16049	JF16010	JX16012 A	JYH23510 R	2ED	4	13° 11'30"
160	240	116	90	X32032X	Y32032X	JX16014 A	JYH24014 R	4EC	3	17°
160	245	132	110	JN16049	JN16010	JX16014 A	JYH24510 R	4EE	6	16° 37'

Table 8 Type 2TS Boundary Dimensions (Sheet 4 of 4)

(*Clause* 5.3)

Bore	OD	Width Over	Width Over	Reference Part Numbers			

d	D	Inner Rings B2	Outer Rings C3	Inner Ring	Outer Ring	Inner Ring Spacer [b]	Inner Ring Spacer [c]	ISO Dimension Series	Minimum Radius [a] $r_{s\ min}$	Contact Angle α
170	235	98	82	JD17049	JD17010	JX17012A	JYH23510R	2DD	3	12° 13' 30"
170	245	116	98	JF17049	JF17010	JX17012A	JYH24510R	2ED	5	12° 14'
170	255	132	110	JN17049	JN17010	JX17014A	JYH25510R	3EE	6	15° 55'
170	260	128	100	X32034X	Y32034X	JX17014A	JYH26014R	4EC	3	16° 30'
180	240	88	72	JC18049	JC18010	JX18012A	JYH24010R	2DC	3	12° 47'
180	245	98	82	JD18049	JD18010	JX18012A	JYH24510R	2DD	3	12° 46' 30"
180	255	116	98	JF18049	JF18010	JX18012A	JYH25510R	2ED	5	12° 46'
180	265	132	110	JN18049	JN18010	JX18014A	JYH26510R	4EE	6	16° 35'
180	280	142	110	X32036X	Y32036X	JX18014A	JYH28014R	3FD	3	15° 45'
190	255	92	76	JC19049	JC19010	JX19012A	JYH25510R	2DC	3	12° 15'
190	260	104	86	JD19049	JD19010	JX19012A	JYH26010R	2DD	4	12° 15'
190	270	124	104	JF19049	JF19010	JX19014A	JYH27012R	2ED	5	12° 15' 30"
190	280	140	116	JN19049	JN19010	JX19016A	JYH28012R	3EE	6	15° 58' 30"
190	290	142	110	X32038X	Y32038X	JX19014A	JYH29014R	4FD	3	16° 25'
200	265	92	76	JC20049	JC20010	JX20012A	JYH26510R	2DC	3	12° 45'
200	270	104	86	JD20049	JD20010	JX20012A	JYH27010R	2DD	4	12° 45'
200	280	124	104	JF20049	JF20010	JX20014A	JYH28012R	2ED	5	12° 44'30"
200	290	140	116	JN20049	JN20010	JX20016A	JYH29012R	4EE	6	16° 34'
200	310	154	120	X32040X	Y32040X	JX20014A	JYH31014R	4FD	3	16°
220	285	92	76	JC22049	JC22010	JX22012A	JYH28510R	2DC	4	12°
220	290	104	86	JD22049	JD22010	JX22012A	JYH29010R	2DD	4	12°

220	300	124	104	JF22049	JF22010	JX22014 A	JYH30012 R	2ED	5	12° 04'30"
220	340	166	128	X32044X	Y32044X	JX22014 A	JYH34014 R	4FD	4	16°
240	305	92	76	JC24049	JC24010	JX24012 A	JYH30510 R	2DC	4	12°53'
240	310	104	86	JD24049	JD24010	JX24012 A	JYH31010 R	2DD	4	12° 52'
240	320	126	104	JF24049	JF24010	JX24014 A	JYH32012 R	2EE	6	12° 55' 30"
240	360	166	128	X32048X	Y32048X	JX24014 A	JYH36014 R	4FD	4	17°
260	325	92	76	JC26049	JC26010	JX26012 A	JYH32510 R	2DC	4	13° 46'
260	330	104	86	JD26049	JD26010	JX26012 A	JYH33010 R	2DD	4	13° 44' 30"
260	340	126	104	JF26049	JF26010	JX26014 A	JYH34012 R	2DE	4	12° 07 30"
260	400	190	146	X32052X	Y32052X	JX26016 A	JYH40010 R	4FC	5	16° 10'
280	360	126	104	JF28049	JF28010	JX28014 A	JYH36012 R	2DE	6	12° 52' 30"
280	420	190	146	X32056X	Y32056X	JX28016 A	JYH42016 R	4FC	5	17°
300	460	220	168	X32060X	Y32060X	JX30020 A	JYH46020 R	4GD	5	16° 10'
320	480	220	168	X32064X	Y32064X	JX32020 A	JYH48020 R	4GD	5	17°

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

[b] The inner ring spacer part numbers shown represent fitted width, solid type spacers. Other spacer types may be available, consult a bearing manufacturer.

[c] The outer ring spacer part numbers shown represent fixed width, solid type spacers. Other spacer types may be available, consult a bearing manufacturer.

6 MATERIALS

6.1 Rollers and bearing races shall be made from materials conforming to IS 4398 : 1972 'Carbon-chromium steel for the manufacture of balls, rollers and bearing races - Specification (*second revision*)' or IS 5489 : 1975 'Specification for carburizing steels for use in bearing industry (*first revision*)', as applicable (withdrawn).

6.2 When bearings are to be supplied with cages, these shall be according to the manufacturer's design unless specified otherwise by the purchaser. Cold-rolled carbon steel strip for manufacture of cages shall conform to IS 4397.

6.3 Hardness

6.3.1 The hardness of the inner and outer rings races shall be Minimum 58 *HRC.*

6.3.2 There shall be no impression of the test cone on the load bearing surface.

NOTE — For applications where bainite hardening is specified, the minimum hardness shall be 57 *HRC.*

7. TOLERANCES

7.1 General

The Tolerance Tables (9-13) of this standard contain tolerance limits for the boundary dimensions, runouts and effective widths for metric tapered roller bearings. General tolerance definitions and gauging practices are shown in Fig. 3 to 10. Specific terminology used for tapered roller bearings is defined in the following paragraphs.

7.2 Component Effective Width (Stand) Gauging and Overall Bearing Width Tolerance

7.2.1 *Outer Ring Effective Width*

Outer ring effective width is a measure of the variation in outer ring raceway size and taper which is checked by measuring the axial location of the reference surface of a master plug or other type gauge with respect to the reference face of the outer ring.

7.2.1.1 *Single outer ring – non flanged*

Effective width is measured at the outer ring back face for single outer rings. For examples of high and low back face effective widths of a single outer ring, *see* Fig. 3 and 4.

7.2.1.2 *Single outer ring – flanged*

For single flanged outer rings, effective width is measured at the back face of the flange. For examples of high and low effective widths for a single flanged outer ring *see* Fig. 5 and 6.

7.2.1.3 *Double outer ring*

The TDO bearing width tolerances shown in Tables 9-13 consider that the effective width of each double outer ring raceway is measured to the adjacent face. The TDO bearing width tolerances therefore include the effect of the outer ring width tolerance ($\Delta C1s$). If double outer ring effective width is measured by another method, compensation for deviations in outer ring width may be required. For examples of high and low effective widths for a double outer ring *see* Fig. 7 and 8.

7.2.2 *Inner Subunit Effective Width*

Inner subunit effective width is a measure of the variation in inner ring raceway size and taper and roller diameter and taper which is checked by measuring the axial location of the reference surface of a master outer ring or other type gauge with respect to the reference face of the inner ring.

7.2.2.1 *Single inner subunit*

Effective width is measured at the inner ring back face for single inner rings. For examples of high and low effective widths at the back face of single inner subunits using a master outer ring *see* Fig. 9 and 10.

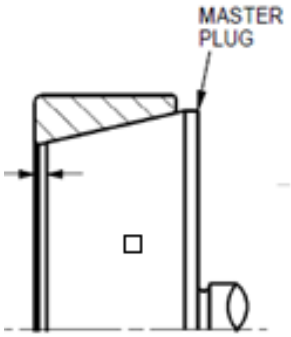


FIG. 3 HIGH EFFECTIVE WIDTH BACK FACE

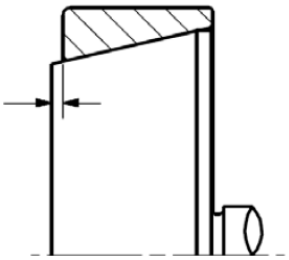


FIG. 4 LOW EFFECTIVE WIDTH BACK FACE

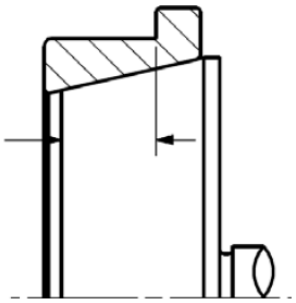


FIG.5 HIGH EFFECTIVE WIDTH BACK FACE

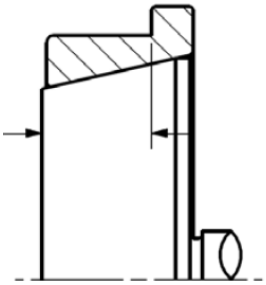


FIG. 6 LOW EFFECTIVE WIDTH BACK FACE

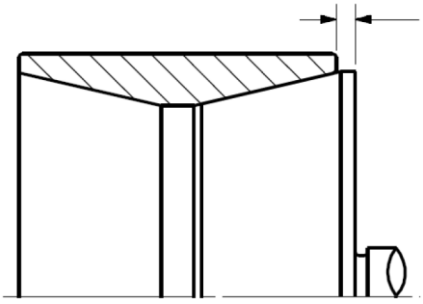


FIG. 7 HIGH EFFECTIVE WIDTH ADJACENT FACE

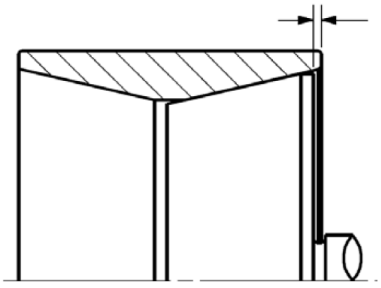


FIG. 8 LOW EFFECTIVE WIDTH ADJACENT FACE

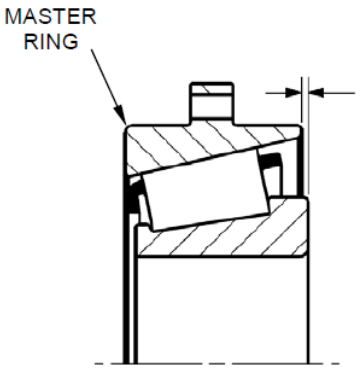


FIG. 9 HIGH EFFECTIVE WIDTH BACK FACE

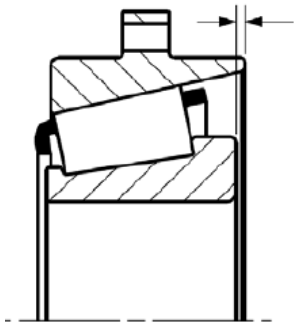


FIG. 10 LOW EFFECTIVE WIDTH BACK FACE

7.2.3 *Overall Bearing Width Tolerance*

7.2.3.1 *Single row bearings – TS*

Overall bearing width tolerance for TS bearings is the permissible variation on the distance from the inner ring back face to the outer ring back face.

7.2.3.2 *Single row bearings – TSF*

Overall bearing width tolerance for TSF bearings is the permissible variation on the distance from the inner ring back face to the back face of the outer ring flange.

7.2.3.3 *Double row bearings*

For types TDO and 2TS, the overall bearing width tolerance is the permissible variation on the distance from one inner ring back face to the opposite inner ring back face. For double row bearings, the overall bearing width tolerance does not include any increase in width over the inner rings caused by an inner ring spacer set to provide axial clearance within the bearing assembly.

7.3 Tolerance Class Designation

Bore diameter tolerances given apply to basically cylindrical bores. This section, which consists of up to four symbols, is used to designate a standardized tolerance class other than the normal class. For metric system bearings the classes are:

7.3.1 *Standard Class – Normal and 6X*

Class 6X provides tighter control of inner and outer ring width, effective width and assembled bearing width compared to Normal class.

7.3.2 *Precision Class – 5, 4, and 2*
7.3.3

In general, these classes provide increasingly tighter control of parameters relating to inner ring bore, outer ring OD, and runouts, with class 2 having the highest level of precision.

Symbols		*Tolerance Class*
None	-	Normal according to IS 5692 : 2024
/P6X	-	6X according to IS 5692 : 2024
/P5	-	5 according to IS 5692 : 2024
/P4	-	4 according to IS 5692 : 2024
/P2	-	2 according to IS 5692 : 2024

The appropriate tolerance class for a particular bearing application is determined by the resultant function of the application or the desired accuracy of the end product, or both. The appropriate class for an application should be selected with the aid of a bearing manufacturer.

7.4 Tolerance Symbols

Δ_{Bs} - Deviation of a single inner ring width
Δ_{B1s} - Deviation of the actual (assembled) double-row TDO bearing width
Δ_{B2s} - Deviation of the actual (assembled) double-row 2TS bearing width
Δ_{Cs} - Deviation of a single outer ring width
Δ_{C1s} - Deviation of a double outer ring width
Δ_{C4s} - Deviation of an outer ring spacer width in a double-row 2TS bearing
Δ_{dmp} - Deviation of mean bore diameter in a single plane (for a basically tapered bore, Δ_{dmp} refers to the theoretical small end of the bore)
Δ_{ds} - Deviation of a single bore diameter
V_{dsp} - Variation of bore diameter in a single plane
V_{dmp} - Variation of mean bore diameter (this applies only to a basically cylindrical bore)
Δ_{Dmp} - Deviation of mean outside diameter in a single plane
Δ_{Ds} - Deviation of a single outside diameter
V_{Dsp} - Variation of outside diameter in a single plane
V_{Dmp} - Variation of mean outside diameter
Δ_{D1s} - Deviation of a single outside diameter of outer ring flange
K_{ia} - Radial runout of inner ring of assembled bearing
K_{ea} - Radial runout of outer ring of assembled bearing
S_d - Perpendicularity of inner ring face with respect to the bore
S_D - Perpendicularity of outer ring outside surface with respect to the face
S_{D1} - Perpendicularity of outer ring outside surface with respect to the flange back face
S_{ia} - Axial runout of inner ring of assembled bearing
S_{ea} - Axial runout of outer ring of assembled bearing
S_{ea1} - Axial runout of outer ring flange back face of assembled bearing
Δ_{Ts} - Deviation of the actual (assembled) single-row TS or TSF bearing width

Δ_{T1s} - Deviation of the actual effective width of inner subunit

Δ_{T2s} - Deviation of the actual effective width of outer ring

8 BEARING TOLERANCE — CLASS NORMAL

Table 9a Inner Ring Bore and Radial Runout

(*Clause* 7.1, 7.2.1.3 and 9)

DEVIATION – Shown in micrometers

Inner Ring Bore		TS, TSF, TDO and 2TS				
d mm		Δ_{dmp}		V_{dsp}	V_{dmp}	K_{ia}
over	incl	high	low	max	max	max
0	10	0	-12	12	9	15
10	18	0	-12	12	9	15
18	30	0	-12	12	9	18
30	50	0	-12	12	9	20
50	80	0	-15	15	11	25
80	120	0	-20	20	15	30
120	180	0	-25	25	19	35
180	250	0	-30	30	23	50
250	315	0	-35	35	26	60
315	400	0	-40	40	30	70
400	500	0	-45	45	34	80
500	630	0	-60	60	40	90
630	800	0	-75	75	45	100
800	1000	0	-100	100	55	115
1000	1250	0	-125	125	65	130
1250	1600	0	-160	160	80	150
1600	2000	0	-200	200	100	170

Table 9b Outer Ring OD and Radial Runout

(*Clause* 7.1, 7.2.1.3 and 9)

DEVIATION – Shown in micrometers

Inner Ring OD		TS, TSF, TDO and 2TS				
D mm		Δ_{Dmp}		V_{Dsp}	V_{Dmp}	K_{ea}
over	incl	high	low	max	max	max
0	18	0	-12	12	9	18
18	30	0	-12	12	9	18
30	50	0	-14	14	11	20
50	80	0	-16	16	12	25
80	120	0	-18	18	14	35
120	150	0	-20	20	15	40
150	180	0	-25	25	19	45
180	250	0	-30	30	23	50

250	315	0	-35	35	26	60
315	400	0	-40	40	30	70
400	500	0	-45	45	34	80
500	630	0	-50	60	38	100
630	800	0	-75	80	55	120
800	1000	0	-100	100	75	140
1000	1250	0	-125	130	90	160
1250	1600	0	-160	170	100	180
1600	2000	0	-200	210	110	200
2000	2500	0	-250	265	120	220

NOTE — The tolerances for the outside diameter D1 of an outer ring flange are shown in Table 14.

8.1 Width — Inner rings, outer rings, single-row bearings and single-row subunits — Tolerance class — Normal

Table 9c

(*Clause* 7.1 and 7.2.1.3)

DEVIATION – Shown in micrometers

Inner Ring Bore		TS, TSF, TDO and 2TS								TS and TSF	
d mm		Δ_{Bs}		Δ_{Cs} Δ_{C1s}		Δ_{T1s}		Δ_{T2s}		Δ_{Ts}	
over	incl	high	low	high	low	high	low	over	incl	high	low
0	10	0	-120	0	-120	+100	0	+100	0	+200	0
10	18	0	-120	0	-120	+100	0	+100	0	+200	0
18	30	0	-120	0	-120	+100	0	+100	0	+200	0
30	50	0	-120	0	-120	+100	0	+100	0	+200	0
50	80	0	-150	0	-150	+100	0	+100	0	+200	0
80	120	0	-200	0	-200	+100	-100	+100	-100	+200	-200
120	180	0	-250	0	-250	+150	-150	+200	-100	+350	-250
180	250	0	-300	0	-300	+150	-150	+200	-100	+350	-250
250	315	0	-350	0	-350	+150	-150	+200	-100	+350	-250
315	400	0	-400	0	-400	+200	-200	+200	-200	+400	-400
400	500	0	-450	0	-450	+225	-225	+225	-225	+450	-450
500	630	0	-500	0	-500	*	*	*	*	+500	-500
630	800	0	-750	0	-750	*	*	*	*	+600	-600
800	1000	0	-1000	0	-1000	*	*	*	*	+750	-750
1000	1250	0	-1250	0	-1250	*	*	*	*	+900	-900
1250	1600	0	-1600	0	-1600	*	*	*	*	+1050	-1050
1600	2000	0	-2000	0	-2000	*	*	*	*	+1200	-1200

* These sizes are available as matched assemblies only.

8.2 Width — Double Row Bearings - Tolerance class — Normal

Table 9d

(*Clause* 7.1 and 7.2.1.3)

DEVIATION – Shown in micrometers

Inner Ring Bore		TDO		2TS			
d mm		Δ_{B1s}[a]		Δ_{C4s}		Δ_{B2s}[b]	
over	incl	high	low	high	low	high	low
0	10	+400	-120	+25	-25	+425	-25
10	18	+400	-120	+25	-25	+425	-25
18	30	+400	-120	+25	-25	+425	-25
30	50	+400	-120	+25	-25	+425	-25
50	80	+400	-150	+25	-25	+425	-25
80	120	+400	-600	+25	-25	+425	-425
120	180	+700	-750	+25	-25	+725	-525
180	250	+700	-800	+25	-25	+725	-525
250	315	+700	-850	+25	-25	+725	-525
315	400	+800	-1200	+25	-25	+825	-825
400	500	+900	-1350	+25	-25	+925	-925
500	630	+900	-1400	+25	-25	+1025	-1025
630	800	+1000	-1750	+25	-25	+1225	-1225
800	1000	+1000	-2000	+25	-25	+1525	-1525
1000	1250	+1200	-2450	+25	-25	+1825	-1825
1250	1600	+1200	-2800	+25	-25	+2125	-2125
1600	2000	+1400	-3400	+25	-25	+2425	-2425

[a] The TDO bearing width tolerances shown do not include the lateral clearance within the bearing assembly.

[b] The 2TS bearing width tolerances shown do not include the lateral clearance within the bearing assembly. These 2TS bearing width tolerances are valid for assemblies where the outer ring spacer is held to the specified width tolerance and the inner ring spacer width is adjusted to obtain the required lateral clearance within the bearing assembly.

9 BEARING TOLERANCE — CLASS 6X

The diameter tolerances and radial run-out for inner and outer rings of this tolerance class are the same as those given in Table 9a and 9b for the normal class.

9.1 Width — Inner rings, outer rings, single-row bearings and single-row subunits — Tolerance class 6X

Table 10a

(*Clause* 7.1 and 7.2.1.3)

DEVIATION – Shown in micrometers

Inner Ring Bore		TS, TSF, TDO and 2TS								TS and TSF	
d mm		Δ_{Bs}		Δ_{Cs} Δ_{C1s}		Δ_{T1s}		Δ_{T2s}		Δ_{Ts}	
over	incl	high	low	high	low	high	low	high	low	high	low
0	10	0	-50	0	-100	+50	0	+50	0	+100	0
10	18	0	-50	0	-100	+50	0	+50	0	+100	0
18	30	0	-50	0	-100	+50	0	+50	0	+100	0
30	50	0	-50	0	-100	+50	0	+50	0	+100	0
50	80	0	-50	0	-100	+50	0	+50	0	+100	0
80	120	0	-50	0	-100	+50	0	+50	0	+100	0
120	180	0	-50	0	-100	+50	0	+100	0	+150	0
180	250	0	-50	0	-100	+50	0	+100	0	+150	0
250	315	0	-50	0	-100	+100	0	+100	0	+200	0
315	400	0	-50	0	-100	+100	0	+100	0	+200	0
400	500	0	-50	0	-100	+100	0	+100	0	+200	0

9.2 Width – Double Row Bearings - Tolerance class 6X

Table 10b

(*Clause* 7.1 and 7.2.1.3)

DEVIATION – Shown in micrometers

Inner Ring Bore		TDO		2TS			
d mm		Δ_{B1s}[a]		Δ_{C4s}		Δ_{B2s}[b]	
over	incl	high	low	high	low	high	low
0	10	+200	-100	+25	-25	+225	-25
10	18	+200	-100	+25	-25	+225	-25
18	30	+200	-100	+25	-25	+225	-25
30	50	+200	-100	+25	-25	+225	-25
50	80	+200	-100	+25	-25	+225	-25
80	120	+200	-100	+25	-25	+225	-25
120	180	+300	-100	+25	-25	+325	-25
180	250	+300	-100	+25	-25	+325	-25
250	315	+400	-100	+25	-25	+425	-25
315	400	+400	-100	+25	-25	+425	-25
400	500	+400	-100	+25	-25	+425	-25

[a] The TDO bearing width tolerances shown do not include the lateral clearance within the bearing assembly.

[b] The 2TS bearing width tolerances shown do not include the lateral clearance within the bearing assembly. These 2TS bearing width tolerances are valid for assemblies where the outer ring spacer is held to the specified width tolerance and the inner ring spacer width is adjusted to obtain the required lateral clearance within the bearing assembly.

10 INNER RING — TOLERANCE CLASS 5

Table 11a Inner Ring Bore and Radial Runout

(*Clause* 7.1 and 7.2.1.3)

DEVIATION – Shown in micrometers

Inner Ring Bore		TS, TSF, TDO and 2TS					
d mm		Δ_{dmp}		V_{dsp}	V_{dmp}	K_{ia}	S_d
over	incl	high	max	max	max	max	max
0	10	0	-7	5	5	5	7
10	18	0	-7	5	5	5	7
18	30	0	-8	6	5	5	8
30	50	0	-10	8	5	6	8
50	80	0	-12	9	6	7	8
80	120	0	-15	11	8	8	9
120	180	0	-18	14	9	11	10
180	250	0	-22	17	11	13	11
250	315	0	-25	19	13	13	13
315	400	0	-30	23	15	15	15
400	500	0	-35	28	17	20	17
500	630	0	-40	35	20	25	20
630	800	0	-50	45	25	30	25
800	1000	0	-60	60	30	37	30
1000	1250	0	-75	75	37	45	40
1250	1600	0	-90	90	45	55	50

Table 11b Outer Ring OD and Radial Runout

(*Clause* 7.1 and 7.2.1.3)

DEVIATION – Shown in micrometers

Outer Ring OD		TS, TSF, TDO and 2TS*					
D mm		Δ_{Dmp}		V_{Dsp}	V_{Dmp}	K_{ea}	S_D[a] S_{D1}
over	incl	high	low	max	max	max	max
0	18	0	-8	6	5	6	8
18	30	0	-8	6	5	6	8
30	50	0	-9	7	5	7	8
50	80	0	-11	8	6	8	8
80	120	0	-13	10	7	10	9
120	150	0	-15	11	8	11	10
150	180	0	-18	14	9	13	10
180	250	0	-20	15	10	15	11
250	315	0	-25	19	13	18	13
315	400	0	-28	22	14	20	13

400	500	0	-33	26	17	24	17
500	630	0	-38	30	20	30	20
630	800	0	-45	38	25	36	25
800	1000	0	-60	50	30	43	30
1000	1250	0	-80	65	38	52	38
1250	1600	0	-100	90	50	62	50
1600	2000	0	-125	120	65	73	65

*Does not apply to bearings with a flanged outer ring.

NOTE — The tolerances for the outside diameter D1 of an outer ring flange are shown in Table 14.

10. 1 Width — Inner rings, outer rings, single-row bearings and single-row subunits — Tolerance class 5

Table 11c

(*Clause* 7.1 and 7.2.1.3)

DEVIATION – Shown in micrometers

Inner Ring Bore		TS, TSF, TDO and 2TS								TS and TSF	
d mm		Δ_{Bs}		Δ_{Cs} Δ_{C1s}		Δ_{T1s}		Δ_{T2s}		Δ_{Ts}	
over	incl	high	low	high	low	high	low	high	low	high	low
0	10	0	-200	0	-200	+100	-100	+100	-100	+200	-200
10	18	0	-200	0	-200	+100	-100	+100	-100	+200	-200
18	30	0	-200	0	-200	+100	-100	+100	-100	+200	-200
30	50	0	-240	0	-240	+100	-100	+100	-100	+200	-200
50	80	0	-300	0	-300	+100	-100	+100	-100	+200	-200
80	120	0	-400	0	-400	+100	-100	+100	-100	+200	-200
120	180	0	-500	0	-500	+150	-150	+200	-100	+350	-250
180	250	0	-600	0	-600	+150	-150	+200	-100	+350	-250
250	315	0	-700	0	-700	+150	-150	+200	-100	+350	-250
315	400	0	-800	0	-800	+200	-200	+200	-200	+400	-400
400	500	0	-900	0	-900	+225	-225	+225	-225	+450	-450
500	630	0	-1100	0	-1100	*	*	*	*	+500	-500
630	800	0	-1600	0	-1600	*	*	*	*	+600	-600
800	1000	0	-2000	0	-2000	*	*	*	*	+750	-750
1000	1250	0	-2000	0	-2000		*		*	+750	-750
1250	1600	0	-2000	0	-2000	*	*	*	*	+900	-900

* These sizes are available as matched assemblies only.

10.2 Width — Double Row Bearings - Tolerance class 5

Table 11d

(*Clause* 7.1 and 7.2.1.3)

DEVIATION – Shown in micrometers

Inner Ring Bore		TDO		2TS			
d mm		Δ_{B1s}[a]		Δ_{C4s}		Δ_{B2s}[b]	
over	incl	high	low	high	low	high	low
0	10	+400	-600	+25	-25	+425	-425
10	18	+400	-600	+25	-25	+425	-425
18	30	+400	-600	+25	-25	+425	-425
30	50	+400	-640	+25	-25	+425	-425
50	80	+400	-700	+25	-25	+425	-425
80	120	+400	-800	+25	-25	+425	-425
120	180	+700	-1000	+25	-25	+725	-525
180	250	+700	-1100	+25	-25	+725	-525
250	315	+700	-1200	+25	-25	+725	-525

[a] The TDO bearing width tolerances shown do not include the lateral clearance within the bearing assembly.

[b] The 2TS bearing width tolerances shown do not include the lateral clearance within the bearing assembly. These 2TS bearing width tolerances are valid for assemblies where the outer ring spacer is held to the specified width tolerance and the inner ring spacer width is adjusted to obtain the required lateral clearance within the bearing assembly.

11 INNER RING — TOLERANCE CLASS 4

Table 12a Inner Ring Bore, Radial and Axial Runout

(*Clause* 7.1 and 7.2.1.3)

DEVIATION – Shown in micrometers

Inner Ring Bore		TS, TSF, TDO and 2TS						
d mm		Δ_{dmp} Δ_{ds}		V_{dsp}	V_{dmp}	K_{ia}	S_d	S_{ia}
over	incl	high	low	max	max	max	max	max
0	10	0	-5	4	4	3	3	3
10	18	0	-5	4	4	3	3	3
18	30	0	-6	5	4	3	4	4
30	50	0	-8	6	5	4	4	4
50	80	0	-9	7	5	4	5	4
80	120	0	-10	8	5	5	5	5
120	180	0	-13	10	7	6	6	7
180	250	0	-15	11	8	8	7	8
250	315	0	-18	12	9	9	8	9

Table 12b Outer Ring OD, Radial and Axial Runout

(*Clause* 7.1 and 7.2.1.3)

DEVIATION – Shown in micrometers

Outer Ring OD		TS, TSF, TDO and 2TS*							
D mm		Δ_{Dmp} Δ_{Ds}		V_{Dsp}	V_{Dmp}	K_{ea}	S_D[a] S_{D1}	S_{ea}[a]	S_{ea1}
over	incl	high	low	max	max	max	max	max	max
0	18	0	-6	5	4	4	4	5	7
18	30	0	-6	5	4	4	4	5	7
30	50	0	-7	5	5	5	4	5	7
50	80	0	-9	7	5	5	4	5	7
80	120	0	-10	8	5	6	5	6	8
120	150	0	-11	8	6	7	5	7	10
150	180	0	-13	10	7	8	5	8	11
180	250	0	-15	11	8	10	7	10	14
250	315	0	-18	14	9	11	8	10	14
315	400	0	-20	15	10	13	10	13	18

*Does not apply to bearings with a flanged outer ring.

NOTE —The tolerances for the outside diameter D1 of an outer ring flange are shown in Table 14.

11.1 Width — Inner rings, outer rings, single-row bearings and single-row subunits — Tolerance class 4

Table 12c

(*Clause* 7.1 and 7.2.1.3)

DEVIATION – Shown in micrometers

Inner Ring Bore		TS, TSF, TDO and 2TS								TS and TSF	
d mm		Δ_{Bs}		Δ_{Cs} Δ_{C1s}		Δ_{T1s}		Δ_{T2s}		Δ_{Ts}	
over	incl	high	low	high	low	high	low	high	low	high	low
0	10	0	-200	0	-200	+100	-100	+100	-100	+200	-200
10	18	0	-200	0	-200	+100	-100	+100	-100	+200	-200
18	30	0	-200	0	-200	+100	-100	+100	-100	+200	-200
30	50	0	-240	0	-240	+100	-100	+100	-100	+200	-200
50	80	0	-300	0	-300	+100	-100	+100	-100	+200	-200
80	120	0	-400	0	-400	+100	-100	+100	-100	+200	-200
120	180	0	-500	0	-500	+150	-150	+200	-100	+350	-250
180	250	0	-600	0	-600	+150	-150	+200	-100	+350	-250
250	315	0	-700	0	-700	+150	-150	+200	-100	+350	-250

11.2 Width – Double Row Bearings - Tolerance class 4

Table 12d

(*Clause* 7.1 and 7.2.1.3)

DEVIATION – Shown in micrometers

Inner Ring Bore		TDO		2TS			
d mm		Δ_{B1s}[a]		Δ_{C4s}		Δ_{B2s}[b]	
over	incl	high	low	high	low	high	low
0	10	+400	-600	+25	-25	+425	-425
10	18	+400	-600	+25	-25	+425	-425
18	30	+400	-600	+25	-25	+425	-425
30	50	+400	-640	+25	-25	+425	-425
50	80	+400	-700	+25	-25	+425	-425
80	120	+400	-800	+25	-25	+425	-425
120	180	+700	-1000	+25	-25	+725	-525
180	250	+700	-1100	+25	-25	+725	-525
250	315	+700	-1200	+25	-25	+725	-525

[a] The TDO bearing width tolerances shown do not include the lateral clearance within the bearing assembly.

b The 2TS bearing width tolerances shown do not include the lateral clearance within the bearing assembly. These 2TS bearing width tolerances are valid for assemblies where the outer ring spacer is held to the specified width tolerance and the inner ring spacer width is adjusted to obtain the required lateral clearance within the bearing assembly.

12 BEARING TOLERANCE — CLASS 2

Table 13a Inner Ring Bore, Radial and Axial Runout

(*Clause* 7.1 and 7.2.1.3)

DEVIATION – Shown in micrometers

Inner Ring Bore		TS, TSF, TDO and 2TS						
d mm		Δ_{dmp} Δ_{ds}		V_{dsp}	V_{dmp}	K_{ia}	S_d	S_{ia}
over	incl	high	low	max	max	max	max	max
0	10	0	-4	2.5	1.5	2	1.5	2
10	18	0	-4	2.5	1.5	2	1.5	2
18	30	0	-4	2.5	1.5	2.5	1.5	2.5
30	50	0	-5	3	2	2.5	2	2.5
50	80	0	-5	4	2	3	2	3
80	120	0	-6	5	2.5	3	2.5	3
120	180	0	-7	7	3.5	4	3.5	4
180	250	0	-8	7	4	5	5	5
250	315	0	-8	8	5	6	5.5	6

Table 13b Outer Ring OD, Radial and Axial Runout

(*Clause* 7.1 and 7.2.1.3)

DEVIATION – Shown in micrometers

Outer Ring OD		TS, TSF, TDO and 2TS*							
D mm		Δ_{Dmp} Δ_{Ds}		V_{Dsp}	V_{Dmp}	K_{ea}	S_D[a] S_{D1}	S_{ea}[a]	S_{ea1}
over	incl	high	low	max	max	max	max	max	max
0	18	0	-5	4	2.5	2.5	1.5	2.5	4
18	30	0	-5	4	2.5	2.5	1.5	2.5	4
30	50	0	-5	4	2.5	2.5	2	2.5	4
50	80	0	-6	4	2.5	4	2.5	4	6
80	120	0	-6	5	3	5	3	5	7
120	150	0	-7	5	3.5	5	3.5	5	7
150	180	0	-7	7	4	5	4	5	7
180	250	0	-8	8	5	7	5	7	10
250	315	0	-9	8	5	7	6	7	10
315	400	0	-10	10	6	8	7	8	11

*Does not apply to bearings with a flanged outer ring.

NOTE — The tolerances for the outside diameter D1 of an outer ring flange are shown in Table 14.

12.1 Width — Inner rings, outer rings, single-row bearings and single-row subunits — Tolerance class 2

Table 13c

(*Clause* 7.1 and 7.2.1.3)

DEVIATION – Shown in micrometers

Inner Ring Bore		TS, TSF, TDO and 2TS								TS and TSF	
d mm		Δ_{Bs}		Δ_{Cs} Δ_{C1s}		Δ_{T1s}		Δ_{T2s}		Δ_{Ts}	
over	incl	high	low	high	low	high	low	high	low	high	low
0	10	0	-200	0	-200	+100	-100	+100	-100	+200	-200
10	18	0	-200	0	-200	+100	-100	+100	-100	+200	-200
18	30	0	-200	0	-200	+100	-100	+100	-100	+200	-200
30	50	0	-240	0	-240	+100	-100	+100	-100	+200	-200
50	80	0	-300	0	-300	+100	-100	+100	-100	+200	-200
80	120	0	-400	0	-400	+100	-100	+100	-100	+200	-200
120	180	0	-500	0	-500	+100	-100	+100	-150	+200	-250
180	250	0	-600	0	-600	+100	-150	+100	-150	+200	-300
250	315	0	-700	0	-700	+100	-150	+100	-150	+200	-300

12.2 Width — Double Row Bearings - Tolerance class 2

Table 13d

(*Clause* 7.1 and 7.2.1.3)

DEVIATION – Shown in micrometers

Inner Ring Bore		TDO		2TS			
d mm		Δ_{B1s}[a]		Δ_{C4s}		Δ_{B2s}[b]	
over	incl	high	low	high	low	high	low
0	10	+400	-600	+25	-25	+425	-425
10	18	+400	-600	+25	-25	+425	-425
18	30	+400	-600	+25	-25	+425	-425
30	50	+400	-640	+25	-25	+425	-425
50	80	+400	-700	+25	-25	+425	-425
80	120	+400	-800	+25	-25	+425	-425
120	180	+400	-1000	+25	-25	+425	-525
180	250	+400	-1200	+25	-25	+425	-625
250	315	+400	-1300	+25	-25	+425	-625

[a] The TDO bearing width tolerances shown do not include the lateral clearance within the bearing assembly.

[b] The 2TS bearing width tolerances shown do not include the lateral clearance within the bearing assembly. These 2TS bearing width tolerances are valid for assemblies where the outer ring spacer is held to the specified width tolerance and the inner ring spacer width is adjusted to obtain the required lateral clearance within the bearing assembly.

13 OUTER RING FLANGES — (ALL CLASSES)

13.1 Flange Outside Diameter Limit Deviations

Table 14

(*Clause* 8, 10, 11 and 12)

DEVIATION – Shown in micrometers

Flange OD		Δ_{D1s}			
D_1 mm		Locating Flange		Non-Locating Flange	
over	incl	high	low	high	low
0	10	0	-36	+220	-36
10	18	0	-43	+270	-43
18	30	0	-52	+330	-52
30	50	0	-62	+390	-62
50	80	0	-74	+460	-74
80	120	0	-87	+540	-87
120	180	0	-100	+630	-100
180	250	0	-115	+720	-115
250	315	0	-130	+810	-130

315	400	0	-140	+890	-140
400	500	0	-155	+970	-155
500	630	0	-175	+1100	-175
630	800	0	-200	+1250	-200
800	1000	0	-230	+1400	-230
1000	1250	0	-260	+1650	-260
1250	1600	0	-310	+1950	-310
1600	2000	0	-370	+2300	-370
2000	2500	0	-440	+2800	-440

ANNEX A
Metric Tapered Roller Bearings

A-1 SPACER PART NUMBERING SYSTEM.

The following describes a part numbering system for spacers which consists of four (4) sections as follows: General arrangement of part numbering system with examples;

Metric Component Designator	Component Designator	Dimension Designator		Spacer type Designator
		Bore or OD (mm)	Width (mm)	
J		100	15	A
J	XH	90	09	BBF
J	Y	190	20	R
J	YH	1150	33	TSR

A-1.1 Metric Component Designator

A "J" indicates a metric designated bearing component.

A-1.2 Component Designator

The component designator consists of one or two letters as follows:

X - Inner ring spacer, fitted width
Y - Outer ring spacer, fitted width
XH - Inner ring spacer, fixed width
YH - Outer ring spacer, fixed width

A-1.3 Dimension Designator

The dimension designator consists of four to six digits.

The first two, three, or four digits represent the nominal bearing bore (mm) for inner ring spacers or the nominal bearing OD (mm) for outer ring spacers.

The last two digits represent the nominal spacer width rounded to the nearest millimeter.

Exception: If there is more than one spacer with the same dimension designator because two different nominal spacer widths will round to the same millimeter value, the last two digits for the second dimension designator do not represent the nominal width in millimeters. Instead, the last two digits of these dimension designators are 99, 98, 97, etc. Therefore, whenever these digits form a number from 90 through 99, they may or may not represent the nominal spacer width.

A-1.4 Spacer Type Designator

The spacer type designator consists of one to three letters as follows:

Inner Ring Spacers	Description	Outer Ring Spacers

A	Solid	R
AA	Oil Holes	S
AI	Oil Holes and Groove	Q
AH	Solid, Hardened	RH
BB	Rectangular Slots and Stepped	P
BBF	Semi-Circular Slots and Stepped	
BH	Rectangular Slots and Hardened	
CH	Rectangular Slots, Hardened, with Pilot	
K	Snap Ring	K
	Solid with Snap Ring Step	RSR
	Semi-Circular Slots with Snap Ring Step	TSR

A-2 SURFACE FINISH

The outer surface, bore and the sides of rolling bearings shall have the following maximum values of surface roughness when measured in accordance with IS 3073 :

Nominal Diameter (mm)		Permissible Mean Surface Roughness (R_a) (μm)								
Above Up to		Bore			Outside Surface			Sides		
		Tolerance Grade			Tolerance Grade			Tolerance Grade		
		P0, P6	P5	P4	P0, P6	P5	P4	P0, P6	P5	P4
-	120	0.80	0.80	0.32	0.80	0.80	0.32	0 80	0.80	0.32
120	250	1.25	0.80	0.80	0.80	0.80	0.32	1 25	0 80	0.80
250	400	1.25	1.25	-	1.25	1.25	0.80	1.25	1.25	0.80
400	-	1.25	1.25	-	1.25	1 25	-	1.25	1.25	-

A-3 PROTECTION AGAINST CORROSION

A-3.1 The type of protection against corrosion shall be decided by the manufacturer depending on the packing material used. Under proper storage conditions, the anti-corrosive treatment shall be effective for at least 12 months to ensure a satisfactory functioning of the rolling bearings, unless otherwise required by the purchaser.

A-3.1.1 For proper storage conditions, the purchaser may consult the manufacturer.

A-4 PRODUCT PACKING

Rolling bearings treated as in A-3.1 should be packed individually and several pieces may be packed together in suitable containers depending on the size. The packing shall be such as to protect the contents from external influences.

The bearing components shall be handled and packaged in a manner that does not cause damage or distortion to the parts.