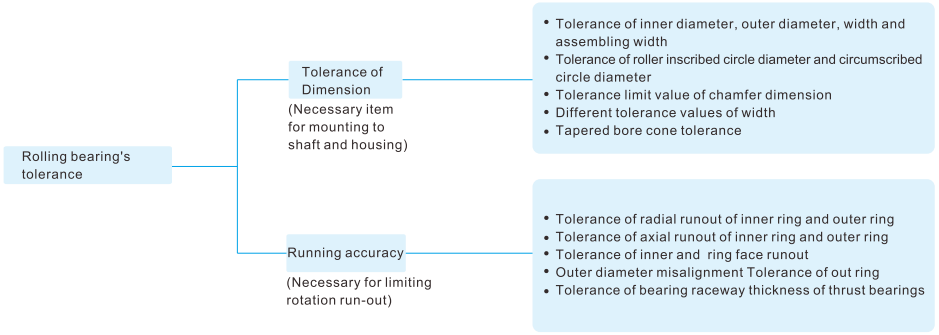
5 Bearing accuracy

Bearing accuracy mainly refers to dimension accuracy and running accuracy. International reference ISO standards respectively specify different accuracy class and tolerance and tolerance value of main dimensions. Bearing accuracy are respectively P0, P6 , P5 , P4 and P2 five class , whose accuracy increased. For general purpose Class 0 is enough, but when used for the conditions or situations listed in Table 5.1, Class 5 or higher accuracy is required..



See Table 5.2 for application standards and accuracy class of main bearing types.

Table 5.1 Use examples of precision bearing

Performance requirement	Application	Applicable accuracy class
Require bearing having high running accuracy	Stereo set, video machine shaft (video recorder, recorder)	P5、P4
	Radar, paraboloid fulcra	P4
	Machine tool spindles	P5、P4、P2
	Electronic computer, disc	P5、P4、P2
	Aluminum foil journal	P5
	Multiple level rolling mill block bearing	P4
High speed rotation	Supercharger	P5、P4
	Jet engine , peripheral machine	P5、P4
	Centrifugal separator	P5、P4
	Liquefied natural gas pump	P5
	Turbine molecular pump principal axes, protection bearing	P5、P4
	Machine tool spindles	P5、P4、P2
	Tensioner	P5、P4
Require small friction and friction variation	Controlling machine (sync motor, servomotor, whirligig gimbal mount)	P4
	Metering device	P5
	Machine tool spindles	P5、P4、P2

Table 5.2 Bearing type and accuracy class application

Bearing type			Applicable accuracy class				
Deep groove ball bearing			P0	P6	P5	P4	P2
Angular contact ball bearing			P0	P6	P5	P4	P2
Self-aligning ball bearing			P0	P6	P5	—	—
Cylindrical roller bearing			P0	P6	P5	P4	P2
Needle roller bearing			P0	P6	P5	—	—
Spherical roller bearing			P0	P6	P5	—	—
Tapered roller bearing		Metric series	P0, P6X	(P6)	P5	P4	—
		Inch series	ABMA Class 4	ABMA Class 2	ABMA Class 3	ABMA Class 0	ABMA Class 00
Thrust ball bearing			P0	P6	P5	P4	—
self-aligning thust ball bearing			P0	—	—	—	—
Corresponding standards	ISO(1)		Normal Class	Class 6	Class 5	Class 4	Class 2
	DIN(2)		P0	P6	P5	P4	P2
	JIS(3)		Class 0 Class 6x	Class 5	Class 4	Class 3	Class 2
	ANSI/ ABMA(4)	Ball bearing	ABEC 1	ABEC 3	ABEC 5 Class 5P	ABEC 7 Class 7P	ABEC 9 Class 9P
		Roller bearing	RBEC1	RBEC 3	RBEC5	—	—
		Tapered roller bearing	Class 4	Class 2	Class 3	Class 0	Class 00

Note: (1) International standard,
(2) Germany standard,
(3) Japanese Industrial Standards,
(4) American National Standards.

5.1 Tolerance class

See Table 5.3 ~ 5.7 for the dimensional accuracy and running accuracy of various bearings.

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Table 5.3 Tolerance of radial bearing(excluding tapered roller bearing)

1. Inner ring

Unit: μm

Bearing nominal bore diameter d (mm)		Single plane mean bore diameter deviation single plane (2) Δ_{dmp}					Single bore diameter deviation Δ_{ds}		Single radial plane bore diameter variation (2) V_{dsp}			Single radial plane bore diameter variation (2) V_{dsp}								Mean bore diameter variation (2) V_{dmp}				
		Class 0	Class 6	Class 5	Class 4	Class 2	Class 4 Diameter series	Class 2	Class 0 Diameter series			Class 6 Diameter series			Class 5 Diameter series		Class 4 Diameter series		Class 2	Class 0	Class 6	Class 5	Class 4	Class 2
							0, 1, 2, 3, 4		7, 8, 9	0, 1	2, 3, 4	7, 8, 9	0, 1	2, 3, 4	7, 8, 9	0, 1, 2, 3, 4	7, 8, 9	0, 1, 2, 3, 4						
Over	Up to	Upper lower	Upper lower	Upper lower	Upper lower	Upper lower	Upper lower	Upper lower	Max			Max			Max		Max		Max	Max	Max	Max	Max	Max
0.6(1)	2.5	0 −8	0 −7	0 −5	0 −4	0 −2.5	0 −4	0 −2.5	10	8	6	9	7	5	5	4	4	3	2.5	6	5	3	2	1.5
2.5	10	0 −8	0 −7	0 −5	0 −4	0 −2.5	0 −4	0 −2.5	10	8	6	9	7	5	5	4	4	3	2.5	6	5	3	2	1.5
10	18	0 −8	0 −7	0 −5	0 −4	0 −2.5	0 −4	0 −2.5	10	8	6	9	7	5	5	4	4	3	2.5	6	5	3	2	1.5
18	30	0 −10	0 −8	0 −6	0 −5	0 −2.5	0 −5	0 −2.5	13	10	8	10	8	6	6	5	5	4	2.5	8	6	3	2.5	1.5
30	50	0 −12	0 −10	0 −8	0 −6	0 −2.5	0 −6	0 −2.5	15	12	9	13	10	8	8	6	6	5	2.5	9	8	4	3	1.5
50	80	0 −15	0 −12	0 −9	0 −7	0 −4	0 −7	0 −4	19	19	11	15	15	9	9	7	7	5	4	11	9	5	3.5	2
80	120	0 −20	0 −15	0 −10	0 −8	0 −5	0 −8	0 −5	25	25	15	19	19	11	10	8	8	6	5	15	11	5	4	2.5
120	150	0 −25	0 −18	0 −13	0 −10	0 −7	0 −10	0 −7	31	31	19	23	23	14	13	10	10	8	7	19	14	7	5	3.5
150	180	0 −25	0 −18	0 −13	0 −10	0 −7	0 −10	0 −7	31	31	19	23	23	14	13	10	10	8	7	19	14	7	5	3.5
180	250	0 −30	0 −22	0 −15	0 −12	0 −8	0 −12	0 −8	38	38	23	28	28	17	15	12	12	9	8	23	17	8	6	4
250	315	0 −35	0 −25	0 −18	—	—	—	—	44	44	26	31	31	19	18	14	—	—	—	26	19	9	—	—
315	400	0 −40	0 −30	0 −23	—	—	—	—	50	50	30	38	38	23	23	18	—	—	—	30	23	12	—	—
400	500	0 −45	0 −35	—	—	—	—	—	56	56	34	44	44	26	—	—	—	—	—	34	26	—	—	—
500	630	0 −50	0 −40	—	—	—	—	—	63	63	38	50	50	30	—	—	—	—	—	38	30	—	—	—
630	800	0 −75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
800	1000	0 −100	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1000	1250	0 −125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1250	1600	0 −160	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1600	2000	0 −200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Note: (1) 0.6 mm is included in this dimension section.
(2) Applicable for bearings with cylindrical bores.

1 Inner ring (continuation)

Unit: μm

Bearing nominal bore diameter d (mm)		Single inner ring width deviation (Δ_{Bs}= (Δ_{Cs})					Inner ring (or outer ring) width variation(3) V_{Bs} (V_{Cs})						Radial run-out K_{ia}					Run-out face with bore S_d			Face run-out(3) with racyrray S_{ia}			Bearing nominal bore diameter d (mm)	
		Single bearing			Matched duplex bearing		Inner ring (or outer ring)																			
		Class 0 Class 6	Class 5 Class 4	Class 2	Class 0 Class 6	Class 5 Class 4	Class 0	Class 6	Class 5	Class 4	Class 2		Class 0	Class 6	Class 5	Class 4	Class 2	Class 5	Class 4	Class 2	Class 5	Class 4	Class 2		
Over	Up to	Upper Lower	Upper Lower	Upper Lower	Upper Lower	Upper Lower	Max	Max	Max	Max	Max		Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Over	Up to
0.6(1)	2.5	0 -40	0 -40	0 -40	—	0 -250	12	12	5	2.5	1.5		10	5	4	2.5	1.5	7	3	1.5	7	3	1.5	0.6	2.5
2.5	10	0 -120	0 -40	0 -40	0 -250	0 -250	15	15	5	2.5	1.5		10	6	4	2.5	1.5	7	3	1.5	7	3	1.5	2.5	10
10	18	0 -120	0 -80	0 -80	0 -250	0 -250	20	20	5	2.5	1.5		10	7	4	2.5	1.5	7	3	1.5	7	3	1.5	10	18
18	30	0 -120	0 -120	0 -120	0 -250	0 -250	20	20	5	2.5	1.5		13	8	4	3	2.5	8	4	1.5	8	4	1.5	18	30
30	50	0 -120	0 -120	0 -120	0 -250	0 -250	20	20	5	3	1.5		15	10	5	4	2.5	8	4	1.5	8	4	2.5	30	50
50	80	0 -150	0 -150	0 -150	0 -380	0 -250	25	25	6	4	1.5		20	10	5	4	2.5	8	5	1.5	8	5	2.5	50	80
80	120	0 -200	0 -200	0 -200	0 -380	0 -380	25	25	7	4	2.5		25	13	6	5	2.5	9	5	2.5	9	5	2.5	80	120
120	150	0 -250	0 -250	0 -250	0 -500	0 -380	30	30	8	5	2.5		30	18	8	6	2.5	10	6	2.5	10	7	2.5	120	150
150	180	0 -250	0 -250	0 -300	0 -500	0 -380	30	30	8	5	4		30	18	8	6	5	10	6	4	10	7	5	150	180
180	250	0 -300	0 -300	0 -350	0 -500	0 -500	30	30	10	6	5		40	20	10	8	5	11	7	5	13	8	5	180	250
250	315	0 -350	0 -350	—	0 -500	0 -500	35	35	13	—	—		50	25	13	—	—	13	—	—	15	—	—	250	315
315	400	0 -400	0 -400	—	0 -630	0 -630	40	40	15	—	—		60	30	15	—	—	15	—	—	20	—	—	315	400
400	500	0 -450	—	—	—	—	50	45	—	—	—		65	35	—	—	—	—	—	—	—	—	—	400	500
500	630	0 -500	—	—	—	—	60	50	—	—	—		70	40	—	—	—	—	—	—	—	—	—	500	630
630	800	0 -750	—	—	—	—	70	—	—	—	—		80	—	—	—	—	—	—	—	—	—	—	630	800
800	1000	0 -1000	—	—	—	—	80	—	—	—	—		90	—	—	—	—	—	—	—	—	—	—	800	1000
1000	1250	0 -1250	—	—	—	—	100	—	—	—	—		100	—	—	—	—	—	—	—	—	—	—	1000	1250
1250	1600	0 -1600	—	—	—	—	120	—	—	—	—		120	—	—	—	—	—	—	—	—	—	—	1250	1600
1600	2000	0 -2000	—	—	—	—	140	—	—	—	—		140	—	—	—	—	—	—	—	—	—	—	1600	2000

Note: (1) 0.6 mm is included in this dimension section.
(2) Applicable for bearings with cylindrical bores.
(3) Applicable for groove ball bearings.

Table 5.3 Tolerance of radial bearing (excluding tapered roller bearing)

2.Outer ring

Bearing nominal outerside diameter D (mm)		Single plane mean outerside diameter Δ_{Dmp}										single outside diameter deviation Δ_{Ds}				Single radial plane outer side diameter variation (2) V_{Dsp}				Single radial plane outerside diameter variation V_{Dsp}												Average outer diameter delta inside the plane (2) V_{Dmp}				
		Class 0		Class 6		Class 5		Class 4		Class 2		Class 4		Class 2		Class 0				Class 6				Class 5		Class 4		Class 2		Class 0	Class 6	Class 5	Class 4	Class 2
												Diameter series				Open type			Shielded type	Open bearing		Shielded type		Open type		Open type		Open bearing						
												0, 1, 2, 3, 4				Diameter series				Diameter series				Diameter series		Diameter series								
																7, 8, 9	0, 1	2, 3, 4	2, 3, 4	7, 8, 9	0, 1	2, 3, 4	0, 1, 2, 3, 4	7, 8, 9	0, 1, 2, 3, 4	7, 8, 9	0, 1, 2, 3, 4								
Over	Up to	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	MAX				Max				Max		Max		Max		Max	Max	Max	Max	Max
2.5 (1)	6	0	−8	0	−7	0	−5	0	−4	0	−2.5	0	−4	0	−2.5	10	8	6	10	9	7	5	9	5	4	4	3	2.5	6	5	3	2	1.5
6	18	0	−8	0	−7	0	−5	0	−4	0	−2.5	0	−4	0	−2.5	10	8	6	10	9	7	5	9	5	4	4	3	2.5	6	5	3	2	1.5
18	30	0	−8	0	−8	0	−6	0	−5	0	−4	0	−5	0	−4	12	9	7	12	10	8	6	10	6	5	5	4	4	7	6	3	2.5	2
30	50	0	−11	0	−9	0	−7	0	−6	0	−4	0	−6	0	−4	14	11	8	16	11	9	7	13	7	5	6	5	4	8	7	4	3	2
50	80	0	−13	0	−11	0	−9	0	−7	0	−4	0	−7	0	−4	16	13	10	20	14	11	8	16	9	7	7	5	4	10	8	5	3.5	2
80	120	0	−15	0	−13	0	−9	0	−8	0	−5	0	−8	0	−5	19	19	11	26	16	16	10	20	10	8	8	6	5	11	10	5	4	2.5
120	150	0	−18	0	−15	0	−11	0	−9	0	−5	0	−9	0	−5	23	23	14	30	19	19	11	25	11	8	9	7	5	14	11	6	5	2.5
150	180	0	−25	0	−18	0	−13	0	−10	0	−7	0	−10	0	−7	31	31	19	38	23	23	14	30	13	10	10	8	7	19	14	7	5	3.5
180	250	0	−30	0	−20	0	−15	0	−11	0	−8	0	−11	0	−8	38	38	23	—	25	25	15	—	15	11	11	8	8	23	15	8	6	4
250	315	0	−35	0	−25	0	−18	0	−13	0	−8	0	−13	0	−8	44	44	26	—	31	31	19	—	18	14	13	10	8	26	19	9	7	4
315	400	0	−40	0	−28	0	−20	0	−15	0	−10	0	−15	0	−10	50	50	30	—	35	35	21	—	20	15	15	11	10	30	21	10	8	5
400	500	0	−45	0	−33	0	−23	—		—		—		—		56	56	34	—	41	41	25	—	23	17	—	—	—	34	25	12	—	—
500	630	0	−50	0	−38	0	−28	—		—		—		—		63	63	38	—	48	48	29	—	28	21	—	—	—	38	29	14	—	—
630	800	0	−75	0	−45	0	−33	—		—		—		—		94	94	55	—	56	56	34	—	35	26	—	—	—	55	34	18	—	—
800	1000	0	−100	0	−60	—		—		—		—		—		125	125	75	—	75	75	45	—	—	—	—	—	—	75	45	—	—	—
1000	1250	0	−125	—		—		—		—		—		—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1250	1600	0	−160	—		—		—		—		—		—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1600	2000	0	−200	—		—		—		—		—		—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Note: (1) 2.5 mm is included in this dimension section.
(2) Applicable before the mounting or after the dismounting of the inner/outer snap ring.
(3) Applicable for ball bearings, such as deep groove ball bearing, radial-thrust ball bearing, etc.
(4) Only applicable for groove ball bearing.
(5) Not applicable for flanged outer ring bearing.

2 .Outer ring (continuation)

Unit: μm

Radial run-out K_{ea}					Variation of outside surface generatrix inclination with face S_D (5)			Axial run-out S_{ea} (3)			Width variation V_{cs} (4)			Bearing nominal outer diameter D (mm)	
Class 0	Class 6	Class 5	Class 4	Class 2	Class 5	Class 4	Class 2	Class 5	Class 4	Class 2	Class 5	Class 4	Class 2		
Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Over	Up to
15	8	5	3	1.5	8	4	1.5	8	5	1.5	5	2.5	1.5	2.5	6
15	8	5	3	1.5	8	4	1.5	8	5	1.5	5	2.5	1.5	6	18
15	9	6	4	2.5	8	4	1.5	8	5	2.5	5	2.5	1.5	18	30
20	10	7	5	2.5	8	4	1.5	8	5	2.5	5	2.5	1.5	30	50
25	13	8	5	4	8	4	1.5	10	5	4	6	3	1.5	50	80
35	18	10	6	5	9	5	2.5	11	6	5	8	4	2.5	80	120
40	20	11	7	5	10	5	2.5	13	7	5	8	5	2.5	120	150
45	23	13	8	5	10	5	2.5	14	8	5	8	5	2.5	150	180
50	25	15	10	7	11	7	4	15	10	7	10	7	4	180	250
60	30	18	11	7	13	8	5	18	10	7	11	7	5	250	315
70	35	20	13	8	13	10	7	20	13	8	13	8	7	315	400
80	40	23	—	—	15	—	—	23	—	—	15	—	—	400	500
100	50	25	—	—	18	—	—	25	—	—	18	—	—	500	630
120	60	30	—	—	20	—	—	30	—	—	20	—	—	630	800
140	75	—	—	—	—	—	—	—	—	—	—	—	—	800	1000
160	—	—	—	—	—	—	—	—	—	—	—	—	—	1000	1250
190	—	—	—	—	—	—	—	—	—	—	—	—	—	1250	1600
220	—	—	—	—	—	—	—	—	—	—	—	—	—	1600	2000

Note: Single width's deviation Δ_{cs}, 0, 6, 5, 4, 2 grade outer ring's width deviation are identical with the Δ_{bs} value of the same bearing inner diameter d) .

Table 5.4 Tolerance of tapered roller bearing (metric series)

1. Cone

Bearing nominal bore diameter d (mm)		single plane mean borediameter deviation Δ_{dmp}						Single bore diameter deviation Δ_{ds}		single plane mean boredia meter variation V_{dsp}			Diameter mean bore variation V_{dmp}				Radial run-out K_{ia}				Face run-out with bore S_d		Axial run-out S_{ia}
		Class 0 Class 6X		Class 5		Class 4		Class 4		Class 0 Class 6X	Class 5	Class 4	Class 0 Class 6X	Class 6	Class 5	Class 4	Class 0 Class 6X	Class 6	Class 5	Class 4	Class 5	Class 4	Class 4
Over	Up to	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max
10	18	0	−12	0	−7	0	−5	0	−5	12	5	4	9	5	5	4	15	7	3. 5	3	7	3	3
18	30	0	−12	0	−8	0	−6	0	−6	12	6	5	9	6	5	4	18	8	4	3	8	4	4
30	50	0	−12	0	−10	0	−8	0	−8	12	8	6	9	8	5	5	20	10	5	4	8	4	4
50	80	0	−15	0	−12	0	−9	0	−9	15	9	7	11	9	6	5	25	10	5	4	8	5	4
80	120	0	−20	0	−15	0	−10	0	−10	20	11	8	15	11	8	5	30	13	6	5	9	5	5
120	180	0	−25	0	−18	0	−13	0	−13	25	14	10	19	14	9	7	35	18	8	6	10	6	7
180	250	0	−30	0	−22	0	−15	0	−15	30	17	11	23	16	11	8	50	20	10	8	11	7	8
250	315	0	−35	0	−25	0	−18	0	−18	35	19	12	26	—	—	9	60	25	13	9	13	8	9
315	400	0	−40	0	−30	0	—	0	—	40	23	—	30	—	—	—	70	30	15	12	15	10	14
400	500	0	−45	0	−35	0	—	0	—	—	28	—	—	—	—	—	80	35	18	14	17	13	—
500	630	0	−60	0	−40	—	—	—	—	—	35	—	—	—	—	—	90	40	20	—	20	—	—
630	800	0	−75	0	−50	—	—	—	—	—	45	—	—	—	—	—	100	45	22	—	25	—	—

Remarks:

1. The tolerances of bearing inner diameter specified in this table are not applicable to the range within the 1.2times distance from ring profile chamfer dimension r(Max).
2. Tolerance and some tolerance values are subject to C&U.

2. Cup

Unit: μm

Bearing nominal outside diameter D (mm)		single plane mean outside Δ_{Dmp}						Single outside diameter deviation Δ_{Ds}		Single plane outside diameter variaton V_{Dsp}				Mean diameter delta outside variation V_{Dmp}				Radial run-out K_{ea}				Variation of outside surface generatrix indination with face S_D		Axial run-out S_{ea}
		Class 0 Class 6X		Class 5		Class 4		Class 4		Class 0 Class 6X	Class 6	Class 5	Class 4	Class 0 Class 6X	Class 6	Class 5	Class 4	Class 0 Class 6X	Class 6	Class 5	Class 4	Class 5	Class 4	Class 4
Over	Up to	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max
18	30	0	−12	0	−8	0	−6	0	−6	12	8	6	5	9	6	5	4	18	9	6	4	8	4	5
30	50	0	−14	0	−9	0	−7	0	−7	14	9	7	5	11	7	5	5	20	10	7	5	8	4	5
50	80	0	−16	0	−11	0	−9	0	−9	16	11	8	7	12	8	6	5	25	13	8	5	8	4	5
80	120	0	−18	0	−13	0	−10	0	−10	18	13	10	8	14	10	7	5	35	18	10	6	9	5	6
120	150	0	−20	0	−15	0	−11	0	−11	20	15	11	8	15	11	8	6	40	20	11	7	10	5	7
150	180	0	−25	0	−18	0	−13	0	−13	25	18	14	10	19	14	9	7	45	23	13	8	10	5	8
180	250	0	−30	0	−20	0	−15	0	−15	30	20	15	11	23	15	10	8	50	25	15	10	11	7	10
250	315	0	−35	0	−25	0	−18	0	−18	35	25	19	14	26	19	13	9	60	30	18	11	13	8	10
315	400	0	−40	0	−28	0	−20	0	−20	40	28	22	15	30	21	14	10	70	35	20	13	13	10	13
400	500	0	−45	0	−33	0	−23	0	−23	45	—	—	—	34	—	—	—	80	40	24	15	17	11	15
500	630	0	−50	0	−38	0	−28	0	−28	60	—	—	—	38	—	—	—	100	50	30	18	20	13	18
630	800	0	−75	0	−45	—		—		80	—	—	—	55	—	—	—	120	60	36	—	25	—	—
800	1000	0	−100	0	−60	—		—		100	—	—	—	75	—	—	—	140	75	43	—	30	—	—

Remarks:

1. The tolerances of bearing inner diameter specified in this table are not applicable to the range within the 1.2times distance from ring profile chamfer dimension r (Max).
2. Tolerance and some tolerance values are subject to C&U.

Table 5.4 Tolerance of tapered roller bearing (metric series) (continuation)

3. Width – cone, cup ,single-row bearing and component

Bearing nominal bore d (mm)		Cone width deviation Δ_{Bs}				Cup width deviation Δ_{cs}				Actual bearing width deviation Δ_{Ts}				Effective width deviation with cone sub-unit Δ_{T1s}				Effective cup su-unit deviation Δ_{T2s}				Bearing nominal bore diameter d (mm)	
		Class 0		Class 6X		Class 5 Class 4		Class 0		Class 6X		Class 5 Class 4		Class 0 Class 6X		Class 6X		Class 5 Class 4		Class 0		Class 6X			
Over	Up to	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Over	Up to
10	18	0	−120	0	−50	0	−200	0	−120	0	−100	0	−200	+200	0	+100	0	+200	−200	+100	0	+50	0	+100	0	+50	0	10	18
18	30	0	−120	0	−50	0	−200	0	−120	0	−100	0	−200	+200	0	+100	0	+200	−200	+100	0	+50	0	+100	0	+50	0	180	30
30	50	0	−120	0	−50	0	−240	0	−120	0	−100	0	−240	+200	0	+100	0	+200	−200	+100	0	+50	0	+100	0	+50	0	30	50
50	80	0	−150	0	−50	0	−300	0	−150	0	−100	0	−300	+200	0	+100	0	+200	−200	+100	0	+50	0	+100	0	+50	0	50	80
80	120	0	−200	0	−50	0	−400	0	−200	0	−100	0	−400	+200	−200	+100	0	+200	−200	+100	−100	+50	0	+100	−100	+50	0	80	120
120	180	0	−250	0	−50	0	−500	0	−250	0	−100	0	−500	+350	−250	+150	0	+350	−250	+150	−150	+50	0	+200	−100	+100	0	120	180
180	250	0	−300	0	−50	0	−600	0	−300	0	−100	0	−600	+350	−250	+150	0	+350	−250	+150	−150	+50	0	+200	−100	+100	0	180	250
250	315	0	−350	0	−50	0	−700	0	−350	0	−100	0	−700	+350	−250	+200	0	+350	−250	+150	−150	+100	0	+200	−100	+100	0	250	315
315	400	0	−400	0	−50	0	−800	0	−400	0	−100	0	−800	+400	−400	+200	0	+400	−400	+200	−200	+100	0	+200	−200	+100	0	315	400
400	500	0	−450	—		0	−900	0	−450	—		0	−900	+400	−400	—		+400	−400	+225	−225	+100		—		+100		400	500
500	630	0	−500	—		0	−1100	0	−500	—		0	−1100	+500	−500	—		+500	−500	—	—	—		—		—		500	630
630	800	0	−750	—		0	−1600	0	−750	—		0	−1600	+600	−600	—		+600	−600	—	—	—		—		—		630	800

Table 5.5 Tapered roller bearing tolerance (Inch system series)

1.Cone

Unit: μm

Bearing nominal bore diameter d mm (inch)		Single bore diameter deviation Δ_{ds}							
		Class 4		Class 3		Class 0		Class 00	
Over	Up to	Upper limit	Lower limit	Upper limit	Lower limit	Upper limit	Lower limit	Upper limit	Lower limit
—	76.200 (3)	+13	0	+13	0	+13	0	+8	0
76.200 (3)	266.700 (10.5)	+25	0	+13	0	+13	0	+8	0
266.700 (10.5)	304.800 (12)	+25	0	+13	0	+13	0	+8	0
304.800 (12)	609.600 (24)	+51	0	+25	0	—	—	—	—
609.600 (24)	914.400 (36)	+76	0	+38	0	—	—	—	—
914.400 (36)	1219.200(48)	+102	0	+51	0	—	—	—	—
1219.200(48)	—	+127	0	+76	0	—	—	—	—

2 Cup

Unit: μm

Bearing nominal outside diameter D mm (inch)		Single outside diameter deviation Δ_{Ds}							
		Class 4, 2		Class 3		Class 0		Class 00	
Over	Up to	Upper limit	Lower limit	Upper limit	Lower limit	Upper limit	Lower limit	Upper limit	Lower limit
—	266.700(10.5)	+25	0	+13	0	+13	0	+8	0
266.700(10.5)	304.800(12)	+25	0	+13	0	+13	0	+8	0
304.800(12)	609.600(24)	+51	0	+25	0	—	—	—	—
609.600(24)	914.400(36)	+76	0	+38	0	—	—	—	—
914.400(36)	1219.200(48)	+102	0	+51	0	—	—	—	—
1219.200(48)	—	+127	0	+76	0	—	—	—	—

Table 5.5 Tapered roller bearing tolerance(Inch system series)(Continuation)

3. Radial runout

Unit: μm

Bearing nominal outside diameter D mm (inch)		radial run-out of cone and cup K_{ia}, K_{ea}				
		Class 4	Class 2	Class 3	Class 0	Class 00
Over	Up to	Max	Max	Max	Max	Max
—	266.700(10.5)	51	38	8	4	2
266.700(10.5)	304.800(12)	51	38	8	4	2
304.800(12)	609.600(24)	51	38	18		
609.600(24)	914.400(36)	76	51	51	—	—
914.400(36)	—	76	—	76	—	—

4. Assembling width

Unit: μm

Bearing nominal bore diameter d mm (inch)		Bearing nominal outside diameter D mm (inch)		Assembling width deviation Δ_{Ts}					
				Class 4		Class 3		Class 0,00	
Over	Up to	Over	Up to	Upper limit	Lower limit	Upper limit	Lower limit	Upper limit	Lower limit
—	101.600(4)	—	—	+203	0	+203	-203	+203	-203
101.600(4)	266.700(10.5)	—	—	+356	-254	+203	-203	+203	-203
266.700(10.5)	304.800(12)	—	—	+356	-254	+203	-203	+203	-203
304.800(12)	609.600(24)	—	508.000(20)	+381	-381	+203	-203	—	—
304.800(12)	609.600(24)	508.000(20)	—	+381	-381	+381	-381	—	—
609.600(24)	—	—	—	+381	-381	+381	-381	—	—

Table 5.6 Tolerance of thrust ball bearing

1) Shaft washer and central washer

Unit: μm

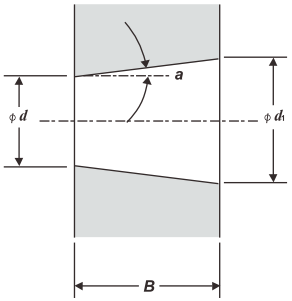
Bearing nominal bore diameter d or center of shaft or centrad d_2 mm		Diameter deviation inside Mean bore Δ_{dmp} or Δ_{d2mp}				Inner diameter delta inside single plane V_{dSp} Or V_{d2Sp}		Variation washer raceway to back face thickness S_i			
		Class 0 Class 6 Class 5		Class 4		Class 0 Class 6 Class 5	Class 4				
Over	Up to	Upper	Lower	Upper	Lower	MAX		Class 0	Class 6	Class 5	Class 4
—	18	0	-8	0	-7	6	5	10	5	3	2
18	30	0	-10	0	-8	8	6	10	5	3	2
30	50	0	-12	0	-10	9	8	10	6	3	2
50	80	0	-15	0	-12	11	9	10	7	4	3
80	120	0	-20	0	-15	15	11	15	8	4	3
120	180	0	-25	0	-18	19	14	15	9	5	4
180	250	0	-30	0	-22	23	17	20	10	5	4
250	315	0	-35	0	-25	26	19	25	13	7	5
315	400	0	-40	0	-30	30	23	30	15	7	5
400	500	0	-45	0	-35	34	26	30	18	9	6
500	630	0	-50	0	-40	38	30	35	21	11	7
630	800	0	-75	0	-50	—	—	40	25	13	8
800	1000	0	-100	0	—	—	—	45	30	15	—
1000	1250	0	-125	0	—	—	—	50	35	18	—

2) Housing washer

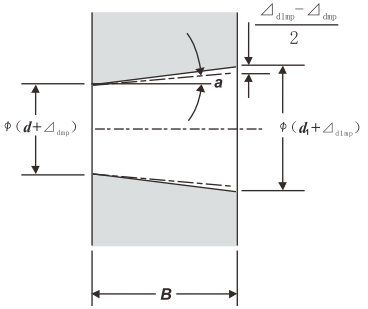
Unit: μm

Bearing nominal outside diameter D mm		Outside single plane mean diameter deviation Δ_{Dmp} or Δ_{D2mp}				Outer diameter delta inside single plane V_{DSp} or Δ_{D2Sp}		Washer of raceway to back face thickness variation S_e			
		Class 0 Class 6 Class 5		Class 4		Class 0 Class 6 Class 5	Class 4				
Over	Up to	Upper	Lower	Upper	Lower	MAX		Class 0	Class 6	Class 5	Class 4
—	18	0	-11	0	-7	8	5	Comform with the Si value of the same bearing shaft washer			
18	30	0	-13	0	-8	10	6				
30	50	0	-16	0	-9	12	7				
50	80	0	-19	0	-11	14	8				
80	120	0	-22	0	-13	17	10				
120	180	0	-25	0	-15	19	11				
180	250	0	-30	0	-20	23	15				
250	315	0	-35	0	-25	26	19				
315	400	0	-40	0	-28	30	21				
400	500	0	-45	0	-33	34	25				
500	630	0	-50	0	-38	38	29				
630	800	0	-75	0	-45	55	34				
800	1000	0	-125	0	—	75	—				
1000	1250	0	-160	0	—	—	—				

Table 5.7 Accuracy for tapered bore of radial bearings



Theoretical tapered bore



Tapered bore with single plane mean bore diameter deviation

Table 1 Tapered bore (Tapering 1:12) Unit: μm

Bearing nominal bore diameter d mm		Δ_{dmp}		$\Delta_{d1mp}-\Delta_{dmp}$		V_{dsp} (1)
Over	Up to	Upper	Lower	Upper	Lower	Max
–	10	+22	0	+15	0	9
10	18	+27	0	+18	0	11
18	30	+33	0	+21	0	13
30	50	+39	0	+25	0	16
50	80	+46	0	+30	0	19
80	120	+54	0	+35	0	22
120	180	+63	0	+40	0	40
180	250	+72	0	+46	0	46
250	315	+81	0	+52	0	52
315	400	+89	0	+57	0	57
400	500	+97	0	+63	0	63

Table 2 Tapered bore (Tapering 1:30)

Bearing nominal bore diameter d mm		Δ_{dmp}		$\Delta_{d1mp}-\Delta_{dmp}$		V_{dp} (1)
Over	Up to	Upper	Lower	Upper	Lower	Max
–	50	+15	0	+30	0	19
50	80	+15	0	+30	0	19
80	120	+20	0	+35	0	22
120	180	+25	0	+40	0	40
180	250	+30	0	+46	0	46
250	315	+35	0	+52	0	52
315	400	+40	0	+57	0	57
400	500	+45	0	+63	0	63
500	630	+50	0	+70	0	70

Note: (1) Applicable for any single radial planes with tapered bore; not applicable for diameter series 7 and 8.

Remarks:

1. Sign d1: Reference diameter at theoretical large end of tapered bore d1=d+ B/12;
2. △dmp: Single plane mean bore diameter deriation at theoretical small end of tapered bore;
3. △d1mp: Single plane mean bore diameter deriation at theoretical large end of tapered bore;
4. Vdsp: Bore diameter variation in a single radial plane;
5. B: Nominal inner ring width;
6. a : $\frac{1}{2}$ of nominal tapered angle of tapered bore;
   a=2° 23′ 9.4″
   =2.3859°
   =0.04164rad

Table 5.8 Radial bearing chamfer limit (Excluding tapered roller bearing) Unit: μm

Minimum allowable chamfer dimension of inner and outer ring r (Min) or r_1 (Min)	Bearing nominal bore diameter d		Maximum allowable chamfer dimension of inner and outer ring r (max) or r_1(max)		Reference
					Shaft and housing fillet radius r_a
	Over	Up to	Radial	Axial	Max
0.05	—	—	0.1	0.2	0.05
0.08	—	—	0.16	0.3	0.08
0.1	—	—	0.2	0.4	0.1
0.15	—	—	0.3	0.6	0.15
0.2	—	—	0.5	0.8	0.2
0.3	— 40	40 —	0.6 0.8	1 1	0.3
0.6	— 40	40 —	1 1.3	2 2	0.6
1	— 50	50 —	1.5 1.9	3 3	1
1.1	— 120	120 —	2 2.5	3.5 4	1
1.5	— 120	120 —	2.3 3	4 5	1.5
2	— 80 220	80 220 —	3 3.5 3.8	4.5 5 6	2
2.1	— 280	280 —	4 4.5	6.5 7	2
2.5	— 100 280	100 280 —	3.8 4.5 5	6 6 7	2
3	— 280	280 —	5 5.5	8 8	2.5
4	—	—	6.5	9	3
5	—	—	8	10	4
6	—	—	10	13	5
7.5	—	—	12.5	17	6
9.5	—	—	15	19	8
12	—	—	18	24	10
15	—	—	21	30	12
19	—	—	25	38	15

Note: 1) The minimum allowable dimension of chamfer r is written in the dimension table .

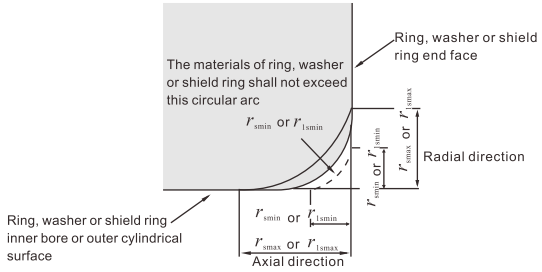


Table 5.9 Chamfer limit of tapered roller bearing (metric series) Unit: μm

Minimum allowable chamfer dimension of inner and outer ring r (Min) or r_1 (Min)	Bearing nominal bore diameter d		Maximum allowable chamfer dimension of inner and outer ring r (Max) or r_1 (Max)		Reference
					Shaft and housing chamfer radius r_a
	Over	Up to	Radial	Axial	Max
0.3	— 40	40 —	0.7 0.8	1 1	0.3
0.6	— 40	40 —	1.1 1.3	1.7 2	0.6
1	— 50	50 —	1.6 1.9	2.5 3	1
1.5	— 120 250	120 250 —	2.3 2.8 3.5	3 3.5 4	1.5
2	— 120 250	120 250 —	2.8 3.5 4	4 4.5 5	2
2.5	— 120 250	120 250 —	3.5 4 4.5	5 5.5 6	2
3	— 120 250 400	120 250 400 —	4 4.5 5 5.5	5.5 6.5 7 7.5	2
4	— 120 250 400	120 250 400 —	5 5.5 6 6.5	7 7.5 8 8.5	3
5	— 180	180 —	6.5 7.5	8 9	4
6	— 180	180 —	7.5 9	10 11	5

Note : The maximum radius of fillet of shaft and housing bore (r_{max}) shall not exceed the minimum allowable chamfer dimension (r_{min}) insingle directionof ring.

Table 5.10 Chamfer limit of thrust bearing Unit: μm

Minimum allowable chamfer dimension of inner ring (or central washer) and outer ring r(Min) or r_1 (Min)	Maximum allowable dimension of inner ring (or central washer) and outer ring r (Max) or r_1 (Max) In radial and axial direction	Chamfer angle radius of shaft or housing r_a (Max)
0.05 0.08 0.1	0.1 0.16 0.2	0.05 0.08 0.1
0.15 0.2 0.3	0.3 0.5 0.8	0.15 0.2 0.3
0.6 1 1.1	1.5 2.2 2.7	0.6 1 1
1.5 2 2.1	3.5 4 4.5	1.5 2 2
3 4 5	5.5 6.5 8	2.5 3 4
6 7.5 9.5	10 125 15	5 6 8
12 15 19	18 21 25	10 12 15

Remarks:
The limit dimensions specified in the table are applicable to:
1.Outer cylindrical chamfer of back face and housing washer;
2.Chamfer of back face and inner diameter surface;
3.Chamfer of back face and two-direction shaft in the shaft washer inner diameter surface.

Fillet radius of Shaft and housing

The maximum single chamfer dimension (r_{asmax}) of shaft and housing bore shall be greater than the minimum single chamfer dimension (r_{smin}) of corresponding ring or housing washer.