7. Dimensional and Running Accuracy of Bearings

7-1 Specification of Tolerance Classes

Bearing is an important component mounted in the different parts of various machines, and its dimensional and running accuracies are the element of much importance in its production and usage.

The specifications of bearing's dimensional and running accuracies are contained in KS B 2014, and its measuring method in KS B 2015. And bearing's dimensional accuracies, which are of importance when mounted on a shaft or housing, relate to all tolerances of boundary dimensions, chamfer dimensions, and width variations, etc., and its running accuracies, which need to be considered when controlling the rotating elements, relates to all tolerances of radial runout, axial runout, side face runout, and inclination of outer diameter surface, etc.

Tolerances have been classified into KS Class 0(Normal tolerance class), and Class 6, Class 5, Class 4, and Class 2, increasing in the order of tighter tolerances, and these tolerances comply with the specifications of ISO. In addition to these Classes, there is another Class HW in between Classes 4 and 2, which has been specified and used just by KBC.

Classes of bearing tolerances for each type in accordance with KS Tolerance Classes as well as those of ISO and other industrial countries, are listed in Table 7-1.

7-2 Definition of Dimensional and Running Accuracy

Dimensional and running accuracies for bearings are designated as below, and their values are shown in Table 7-2 to 7-6.

7-2-1 Dimensional Accuracy

(1) Inner Ring

d Nominal bore diameter

d_s Single bore diameter

d_{mp} Single plane mean bore diameter; The arithmetical mean of the largest and the smallest single bore diameters measured in one radial plane.

Table 7-1 Bearing Types and Tolerance Classes

Bearing Type		Tolerance Class				
Radial Bearings(Except tapered roller bearings)		KS 0 Class	KS 6 Class	KS 5 Class	KS 4 Class	KS 2 Class
Tapered Roller Bearing	Metric Series		KS 0 Class	KS 6 Class	KS 5 Class	KS 4 Class
	Inch Series	AFBMA 4 Class	AFBMA 2 Class	AFBMA 3 Class	AFBMA 0 Class	
Thrust Ball Bearing		KS 0 Class	KS 6 Class	KS 5 Class	KS 4 Class	
Equivalent Classes of Other Countries	ISO	ISO NarmalClass	ISO 6 Class	SO 5 Class	ISO 4 Class	ISO 2 Class
	DIN	0 Class	6 Class	5 Class	4 Class	2 Class
	JIS	0 Class	6 Class	5 Class	4 Class	2 Class
	AFBMA Ball Bearing	ABEC 1	ABEC 3	ABEC 5	ABEC 7	ABEC 9
	Roller Bearing	RBEC 1	RBEC 3	RBEC 5		

Note :
ISO : International Organization for standardization
DIN : German Standards
JIS : Japanese Industrial Standards
AFBMA : Anti-Friction Bearing Manufacturers Association Standards in U.S.A.

Δ_{dmp} $= d_{mp} - d$

Single plane mean bore diameter deviation; The difference between a single plane mean bore diameter and the nominal bore diameter of a basically cylindrical bore.

Δ_{dmp} $= d_{mp} - d$

Deviation of a single bore diameter; The difference between a single bore diameter and the nominal bore diameter of a basically cylindrical bore.

V_{dp} Bore diameter variation in a single radial plane; The difference between the largest and the smallest of the single bore diameters in a single radial plane.

V_{dmp} $= d_{mpmax} - d_{mpmin}$

Mean bore diameter variation; The difference between the largest and the smallest of the single plane mean bore diameters of cylindrical bore.

(2) Outer Ring

D Nominal outside diameter

D_s Single outside diameter

D_{mp} Single plane mean outside diameter; The arithmetical mean of the largest and the smallest of the single outside diameters in one single radial plane.

Δ_{Dmp} $= D_{mp} - D$

Single plane mean outside diameter deviation; The difference between a single plane mean outside diameter and the nominal outside diameter of a basically cylindrical outside surface.

Δ_{Ds} $= D_s - D$

Deviation of a single outside diameter; The difference between a single outside diameter and the nominal outside diameter of a basically cylindrical outside surface.

V_{Dp} Outside diameter variation in a single radial plane; Difference between the largest and the smallest of the single outside diameters in a single radial plane.

V_{Dmp} $= D_{mpmax} - D_{mpmin}$

Mean outside diameter variation; The difference between the largest and the smallest of the mean outside diameters.

(3) Width and Height

B, C Nominal ring widths

B_s, C_s Single ring widths

Δ_{Bs} $= B_s - B, \Delta_{Cs} = C_s - C$

Deviation of a single ring width; The difference between a single ring width and the nominal ring width.

V_{Bs} $= B_{smax} - B_{smin}, V_{Cs} = C_{smax} - C_{smin}$

Ring width variation; The difference between the largest and the smallest of the single ring width of an individual ring.

T Nominal bearing width

T_s Actual bearing width(Tapered roller bearing); The distance between the points of intersection of the bearing axis and the two planes tangential to the actual ring faces designated to bound the width of a radial bearing ring where one inner ring face and one outer ring face are designated to bound the width.

T_{1s} Single overall width of inner ring(Tapered roller bearing); Single overall width of a tapered roller bearing with cone and master cup.

T_{2s} Single overall width of outer ring(Tapered roller bearing); Single overall width of a tapered roller bearing with master cone and cup.

Δ_{Ts} $= T_s - T, \Delta_{T1s} = T_{1s} - T_1, \Delta_{T2s} = T_{2s} - T_2$

Deviation of a single overall width of a tapered roller bearing from nominal dimensions. Deviations of a single overall width of a tapered roller bearing, single overall width of inner ring with cone and master cup, and single overall width of outer ring with master cone and cup, from each of

nominal single overall width, nominal single overall width with cone and master cup, and nominal single overall width with master cone and cup, respectively.

H Nominal height

H_s Single overall height ; Single overall height of thrust bearing

Δ_{Hs} $= H_s - H$

Deviation in height ; Deviation of single overall height of thrust bearing from its nominal height.

7-2-2 Running Accuracy

$K_{ia}(K_{ea})$ Radial runout of assemble bearing inner ring ; When radial bearing outer(inner) ring is fixed and inner(outer) ring is floating, the difference between the largest and smallest radial distances of locating outer(inner) ring is called as the radial runout of bearing inner(outer) ring, provided that raceway is in contact with the rolling element at the radial location of above mentioned point.

$S_{ia}(S_{ea})$ Axial runout ; To measure the axial runout, the outer(inner) ring has to be fixed perpendicular to the bearing central shaft, and then a measured load needs to be applied in the same direction as the central shaft of inner(outer) ring, and then a measuring instrument on the standard side of inner(outer) ring is placed, and then the inner(outer) ring is rotated for one full revolution. Then, the difference between the largest and smallest values shown on the scale is called as the axial runout.

S_d Side face runout of inner ring with reference to bore ; The difference between the largest and smallest axial distances from the side face to the plane perpendicular to the central shaft from the distance of a radius of mean raceway radius of inner ring in the direction from the inner ring's central shaft to the circumference, is called as the side face runout.

S_D Inclination variation of outside cylindrical surface; The largest value in total variation of outside cylindrical surface to any two points on both side surfaces of outer ring(They should be distanced by more than 1.2 times of chamfer dimension.)

S_i Shaft washer thickness variation(Thrust bearing); Difference between the largest and smallest distances from raceway middle to back face.

S_e Housing washer thickness variation(Thrust bearing); Difference between the largest and smallest distances from raceway middle to back face.

Table 7-2 Tolerances of Radial Bearing(Except Tapered Roller Bearings)

Inner Ring

Dimension(unit : mm)

Nominal Bore Diameter	Over	0.6[1]	2.5	10	18	30	50	80	120	150	180	250	315	400	500	630	800	1000
	Up to	2.5	10	18	30	50	80	120	150	180	250	315	400	500	630	800	1000	1250

Tolerance Class 0(Normal Tolerance)

Tolerance (unit : μm)

Bore, Cylindrical Deviation	Δ_{dmp}[3]	0 −8	0 −8	0 −8	0 −10	0 −12	0 −15	0 −20	0 −25	0 −25	0 −30	0 −35	0 −40	0 −45	0 −50	0 −75	0 −100	0 −125
Variation V_{dp}	Diameter Series 9	10	10	10	13	15	19	25	31	31	38	44	50	56	63			
	0 · 1	8	8	8	10	12	19	25	31	31	38	44	50	56	63			
	2 · 3 · 4	6	6	6	8	9	11	15	19	19	23	26	30	34	38			
Variation	V_{dmp}	6	6	6	8	9	11	15	19	19	23	26	30	34	38			
Width Deviation	Δ_{Bs}[4]	0 −40	0 −120	0 −120	0 −120	0 −120	0 −150	0 −200	0 −250	0 −250	0 −300	0 −350	0 −400	0 −450	0 −500	0 −750	0 −1000	0 −1250
WidthVariation	V_{Bs}	12	15	20	20	20	25	25	30	30	30	35	40	50	60	70	80	100
Radial Runout	K_{ia}	10	10	10	13	15	20	25	30	30	40	50	60	65	70	80	90	100

Tolerance Class P6

Deviation	Δ_{dmp}[3]	0 −7	0 −7	0 −7	0 −8	0 −10	0 −12	0 −15	0 −18	0 −18	0 −22	0 −25	0 −30	0 −35	0 −40			
Variation V_{dp}	Diameter Series 9	9	9	9	10	13	15	19	23	23	28	31	38	44	50			
	0 · 1	7	7	7	8	10	15	19	23	23	28	31	38	44	50			
	2 · 3 · 4	5	5	5	6	8	9	11	14	14	17	19	23	26	30			
Variation	V_{dmp}	5	5	5	6	8	9	11	14	14	17	19	23	26	30			
Width Deviation	Δ_{Bs}[4]	0 −40	0 −120	0 −120	0 −120	0 −120	0 −150	0 −200	0 −250	0 −300	0 −300	0 −350	0 −400	0 −450	0 −500			
Width Variation	V_{Bs}	12	15	20	20	20	25	25	30	30	30	35	40	45	50			
Radial Runout	K_{ia}	5	6	7	8	10	10	13	18	18	20	25	30	35	40			

Note The larger Δ_{dmp} and the smaller Δ_{dmp} in the table do not apply when the width of raceway face is within 1.2 times the maximum fillet radius.

Annotations[1]) Includes 0.6mm
[2]) Includes 2.5mm
[3]) Applies only to cylindrcal inner diameter bearings
[4]) Contact KBC for Δ_{Bs} and Δ_{Cs} of arranged bearings

Outer Ring

Dimension(unit:mm)

Nominal Outside Diameter	Over	2.5[2]	6	18	30	50	80	120	150	180	250	315	400	500	630	800	1000	1250	1600
	Up to	6	18	30	50	80	120	150	180	250	315	400	500	630	800	1000	1250	1600	2000

Tolerance Class 0(Normal Tolerance)

Tolerance(unit : μm)

Deviation	Δ_{Dmp}	0 −8	0 −8	0 −9	0 −11	0 −13	0 −15	0 −18	0 −25	0 −30	0 −35	0 −40	0 −45	0 −50	0 −75	0 −100	0 −125	0 −160	0 −200
Variation V_{Dp}	Diameter Series 9	10	10	12	14	16	19	23	31	38	44	50	56	63	94	125			
	0 · 1	8	8	9	11	13	19	23	31	38	44	50	56	63	94	125			
	2 · 3 · 4	6	6	7	8	10	11	14	19	23	26	30	34	38	55	75			
	Sealed Type Bearing 2 · 3 · 4 10	10	12	16	20	26	30	38											
Variation	V_{Dmp}	6	6	7	8	10	11	14	19	23	26	30	34	38	55	75			
Radial Runout	K_{ea}	15	15	15	20	25	35	40	45	50	60	70	80	100	120	140	160	190	220

The width tolerances Δ_{Cs} and V_{Cs} are same as Δ_{Bs} and V_{Bs} of inner ring, respectively.

Tolerance Class P6

Deviation	Δ_{Dmp}	0 −7	0 −7	0 −8	0 −9	0 −11	0 −13	0 −15	0 −18	0 −20	0 −25	0 −28	0 −33	0 −38	0 −45	0 −60			
Variation V_{Dp}	Diameter Series 9	9	9	10	11	14	16	19	23	25	31	35	41	48	56	75			
	0 · 1	7	7	8	9	11	16	19	23	25	31	35	41	48	56	75			
	2 · 3 · 4	5	5	6	7	8	10	11	14	15	19	21	25	29	34	45			
	Sealed Type Bearing 0·1·2·3·4	9	9	10	13	16	20	25	30										
Variation	V_{Dmp}	5	5	6	7	8	10	11	14	15	19	21	25	29	34	45			
Radial Runout	K_{ea}	8	8	9	10	13	18	20	23	25	30	35	40	50	60	75			

The width tolerances Δ_{Cs} and V_{Cs} are same as Δ_{Bs} and V_{Bs} of inner ring, respectively.

7. Dimensional and Running Accuracy of Bearings

Inner Ring

Dimension(unit : mm)

Nominal Bore Diameter	Over	0.6[1]	2.5	10	18	30	50	80	120	150	180	250	315
	Up to	2.5	10	18	30	50	80	120	150	180	250	315	400

Tolerance Class P5

Tolerance(unit: μm)

Deviation	Δ_{dmp}[3]	0 –5	0 –5	0 –5	0 –6	0 –8	0 –9	0 –10	0 –13	0 –13	0 –15	0 –18	0 –23
Variation V_{dp}	Diameter Series 9	5	5	5	6	8	9	10	13	13	15	18	23
	0·1·2·3·4	4	4	4	5	6	7	8	10	10	12	14	18
Variation	V_{dmp}	3	3	3	3	4	5	5	7	7	8	9	12
Width Dimension Deviation	Δ_{Bs}[5]	0 –40	0 –40	0 –80	0 –120	0 –120	0 –150	0 –200	0 –250	0 –250	0 –300	0 –350	0 –400
Width Variation	V_{Bs}	5	5	5	5	5	6	7	8	8	10	13	15
Radial Runout	K_{ia}	4	4	4	4	5	5	6	8	8	10	13	15
Side face Runout	S_d	7	7	7	8	8	8	9	10	10	11	13	15
Axial Runout	S_{ia}[6]	7	7	7	8	8	8	9	10	10	13	15	20

Tolerance Class P4

Deviation	Δ_{dmp}[3], Δ_{ds}[4]	0 –4	0 –4	0 –4	0 –5	0 –6	0 –7	0 –8	0 –10	0 –10	0 –12		
Variation V_{dp}	Diameter Deviation 9	4	4	4	5	6	7	8	10	10	12		
	0·1·2·3·4	3	3	3	4	5	5	6	8	8	9		
Variation	V_{dmp}	2	2.	2	2.5	3	3.5	4	5	5	6		
Width Variation	Δ_{Bs}[5]) –40	0 –40	0 –80	0 –120	0 –120	0 –150	0 –200	0 –250	0 –250	0 –300	0		
Width Variation	V_{Bs}	2.5	2.5	2.5	2.5	3	4	4	5	5	6		
Radial Runout	K_{ia}	2.5	2.5	2.5	3	4	4	5	6	8	8		
Side face Runout	S_d	3	3	3	4	4	5	5	6	6	7		
Axial Runout	S_{ia}[6]	3	3	3	4	4	5	5	7	7	8		

Note The larger Δ_{dmp} and the smaller Δ_{dmp} in the table do not apply when the width of raceway face is within 1.2 times the maximum fillet radius.

Annotations
1) Includes 0.6mm
2) Includes 2.5mm
3) applies only to cylindrcal inner diameter bearings.
4) these values of Δ_{ds} and Δ_{Ds} apply only to diameter series 0, 1, 2, 3, 4 and 4
5) Contact KBC for Δ_{Bs} and Δ_{Cs} of arranged bearings
6) Axial runout, S_{ia} applies to ball bearings (Except self-aligning ball bearings)

Outer Ring

Dimension (Unit : mm)

Nominal Outer Ring	Over	2.5[2]	6	18	30	50	80	120	150	180	250	315	400	500	630
	Up to	6	18	30	50	80	120	150	180	250	315	400	500	630	800

Tolerance Class P5

Tolerance(Unit : μm)

Deviation	V_{Dmp}	0 –5	0 –5	0 –6	0 –7	0 –9	0 –10	0 –11	0 –13	0 –15	0 –18	0 –20	0 –23	0 –28	0 –35
Variation V_{Dp}	Diameter Series 9	5	5	6	7	9	10	11	13	15	18	20	23	28	35
	0·1·2·3·4	4	4	5	5	7	8	8	10	11	14	15	17	21	26
Variation	V_{Dmp}	3	3	3	4	5	5	6	7	8	9	10	12	14	18
Width Variation	V_{Cs}	5	5	5	5	6	8	8	8	10	11	13	15	18	20
Radial Runout	K_{ea}	5	5	6	7	8	10	11	13	15	18	20	23	25	30
Inclination	S_D	8	8	8	8	8	9	10	10	11	13	13	15	18	20
Axial Runout	S_{ea}[6]	8	8	8	8	10	11	13	14	15	18	20	23	25	30

The width tolerances Δ_{Cs} and V_{Cs} are same as Δ_{Bs} and V_{Bs} of inner ring, respectively.

Tolerance Class P4

Dimension	Δ_{Dmp}	0 –4	0 –4	0 –4	0 –6	0 –7	0 –8	0 –9	0 –10	0 –11	0 –13	0 –15			
Dimension	Δ_{Ds}[4]	0 –4	0 –4	0 –5	0 –6	0 –7	0 –8	0 –9	0 –10	0 –11	0 –13	0 –15			
Variation V_{Dp}	Diameter Series 9	4	4	5	6	7	8	9	10	11	13	15			
	0·1·2·3·4	3	3	4	5	5	6	7	8	8	10	11			
Variation	V_{Dmp}	2	2	2.5	3	3.5	4	5	5	6	7	8			
Width Deviation	V_{Cs}	2.5	2.5	2.5	2.5	3	4	5	5	7	7	8			
Radial Runout	K_{ea}	3	3	4	5	5	6	7	8	10	11	13			
Inclination	S_D	4	4	4	4	4	5	5	5	7	8	10			
Axial Runout	S_{ea}[6]	5	5	5	5	5	6	7	8	10	10	13			

The width tolerances Δ_{Cs} and V_{Cs} are same as Δ_{Bs} and V_{Bs} of inner ring, respectively.

7. Dimensional and Running Accuracy of Bearings

Inner Ring

Dimension (Unit : mm)

Nominal Bore Diameter	Over	0.6[1]	2.5	10	18	30	50	80	120	150	180
	Up to	2.5	10	18	30	50	80	120	150	180	250

Tolerance Class HW

Tolerance (unit : μm)

Deviation	Δ_{dmp}[3]), Δ_{ds}[4])		0 –4	0 –4	0 –4	0 –4	0 –5				
Variation V_{dp}	Diameter Series 0·1·2·3·4		4	4	4	4	5				
Variation	V_{dmp}		2	2	2	2	2.5				
Width Deviation	Δ_{Bs}[5])		0 –40	0 –80	0 –120	0 –120	0 –125				
Width Variation	V_{Bs}		2	2	2	2	2				
Radial Runout	K_{ia}		2	2	2.5	2.5	2.5				
Side Face Runout	S_d		2	2	2	2	2				
Axial Runout	S_{ia}[6])		2	2	2.5	2.5	2.5				

Tolerance Class P2

Deviation	Δ_{dmp}[3]), Δ_{ds}[4])	0 –2.5	0 –2.5	0 –2.5	0 –2.5	0 –2.5	0 –4	0 –5	0 –7	0 –7	0 –8
Variation V_{dp}	Diameter Series 0·1·2·3·4	2.5	2.5	2.5	2.5	2.5	4	5	7	7	8
Variation	V_{dmp}	1.5	1.5	1.5	1.5	1.5	2	2.5	3.5	3.5	4
Width Deviation	Δ_{Bs}[5]) –40	0 –40	0 –80	0 –120	0 –120	0 –150	0 –200	0 –250	0 –250	0 –300	0
Width Variation	V_{Bs}	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	4	5
Radial Runout	K_{ia}	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5	5	5
Side Face Runout	S_d	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	4	5
Axial Runout	S_{ia}[6])	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5	5	5

Note The larger Δ_{dmp} and the smaller Δ_{dmp} in the table do not apply when the width of raceway face is within 1.2 times the maximum fillet radius.

Annotations
1) Includes 0.6mm
2) Includes 2.5mm
3) applies only to cylindrcal inner diameter bearings.
4) these values of Δ_{ds} and Δ_{Ds} apply only to diameter series 0, 1, 2, 3, 4 and 4
5) Contact KBC for Δ_{Bs} and Δ_{Cs} of arranged bearings
6) Axial runout, S_{ia} applies to ball bearings (Except self-aligning ball gearings

Outer Ring

Dimension(Unit : mm)

Nominal Outside Diameter		Over	2.5[2]	6	18	30	50	80	120	150	180	250	315
		Up to	6	18	30	50	80	120	150	180	250	315	400
Tolerance Class HW													
Deviation	Δ_{Dmp}, Δ_{Ds}[4]				0 –4	0 –4	0 –4	0 –5	0 –5				
Variation V_{Dp}	Diameter Series 0·1·2·3·4				4	4	4	5	5				
Variation	V_{Dmp}				2	2	2	2.5	2.5				
Width Variation	V_{Cs}				2	2	2	2.5	2.5				
Radial Runout	K_{ea}				2.5	2.5	4	5	5				
Inclination	S_D				2	2	2	2.5	2.5				
Axial Runout	S_{ea}[6]				2.5	2.5	4	5	5				

Tolerance(Unit : μm)

The width tolerances Δ_{Cs} and V_{Cs} are same as Δ_{Bs} and V_{Bs} of inner ring, respectively.

Tolerance Class P2

Deviation	Δ_{Dmp}, Δ_{Ds}[4]	0 –2.5	0 –2.5	0 –4	0 –4	0 –4	0 –5	0 –5	0 –7	0 –8	0 –8	0 –10
Variation V_{Dp}	Diameter Series 0·1·2·3·4	2.5	2.5	4	4	4	5	5	7	8	8	10
Variation	V_{Dmp}	1.5	1.5	2	2	2	2.5	2.5	3.5	4	4	5
Width Variation	V_{Cs}	1.5	1.5	2.5	2.5	4	5	5	5	7	7	8
Radial Runout	K_{ea}	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	4	5	7
Inclination	S_D	1.5	1.5	2.5	2.5	4	5	5	5	7	7	8
Axial Runout	S_{ea}[6]	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	4	5	7

The width tolerances Δ_{Cs} and V_{Cs} are same as Δ_{Bs} and V_{Bs} of inner ring, respectively.

Table 7-3 Tolerances of Metric Series Tapered Roller Bearing

Inner Ring

Dimension(Unit : mm)

Nominal Bore Diameter	Over	10	18	30	50	80	120	180	250	315	400	500	630
	up to	18	30	50	80	120	180	250	315	400	500	630	800

Tolerance Class 0(Normal Tolerance)

Tolerance(Unit : μm)

Deviation	Δ_{dmp}	0 –8	0 –10	0 –12	0 –15	0 –20	0 –25	0 –30	0 –35	0 –40	0 –45	0 –50	0 –75
Variation	V_{dp}	8	10	12	15	20	25	30	35	40			
	V_{dmp}	6	8	9	11	15	19	23	26	30			
Width Deviation	Δ_{Bs}	0 –120	0 –120	0 –120	0 –150	0 –200	0 –250	0 –300	0 –350	0 –400	0 –450	0 –500	0 –750
Radial Runout	K_{ia}	15	18	20	25	30	35	50	60	70	70	85	100
Width Deviation	Δ_{Ts}	+200 0	+200 0	+200 0	+200 0	+200 –200	+500 –250	+350 –250	+350 –250	+400 –400	+400 –400	+400 –500	+600 –600
	Δ_{T1s}	+100 0	+100 0	+100 0	+100 0	+100 –100	+150 –150	+150 –150	+150 –150	+200 –200			
	Δ_{T2s}	+100 0	+100 0	+100 0	+100 0	+100 –100	+200 –100	+200 –100	+200 –100	+200 –200			

Tolerance Class P6X

Deviation	Δ_{dmp}	0 –8	0 –10	0 –12	0 –15	0 –20	0 –25	0 –30	0 –35	0 –40	0 –45	0 –50	0 –75
Variation	V_{dp}	8	10	12	15	20	25	30	35	40			
	V_{dmp}	6	8	9	11	15	19	23	26	30			
Width Deviation	Δ_{Bs}	0 –50	0 –50	0 –50	0 –50	0 –50	0 –50	0 –50	0 –50	0 –50			
Radial Runout	K_{ia}	15	18	20	25	30	35	50	60	70	70	85	100
Width Deviation	Δ_{Ts}	+100 0	+100 0	+100 0	+100 0	+100 0	+150 0	+150 0	+200 0	+200 0			
	Δ_{T1s}	+50 0	+50 0	+50 0	+50 0	+50 0	+50 0	+50 0	+100 0	+100 0			
	Δ_{T2s}	+50 0	+50 0	+50 0	+50 0	+50 0	+100 0	+100 0	+100 0	+100 0			

Note : 1) The larger Δ_{dmp} and the smaller Δ_{dmp} in the table do not apply when the width of raceway face is within 1.2 times the maximum fillet radius.

2) A part of this Table complies with the specifications of KBC.

Outer Ring

Dimension (Unit : mm)

Nominal Outside Diameter	Over	18	30	50	80	120	150	180	250	315	400	500	630	800
	Up to	30	50	80	120	150	180	250	315	400	500	630	800	1000

Tolerance Class 0(Normal Tolerance)

Tolerance (Unit : μm)

Deviation	Δ_{Dmp}	0 –9	0 –11	0 –13	0 –15	0 –18	0 –25	0 –30	0 –35	0 –40	0 –45	0 –50	0 –75	0 –100
Variation	V_{Dp}	9	11	13	15	18	25	30	35	40	45	50		
	V_{Dmp}	7	8	10	11	14	19	23	26	30	34	38		
Width Deviation	Δ_{Cs}	The width tolerances Δ_{Cs} are same as Δ_{Bs} of inner ring, respectively.												
Radial Runout	K_{ea}	18	20	25	35	40	45	50	60	70	80	100	120	120

Tolerance Class P6X

Deviation	Δ_{Dmp}	0 –9	0 –11	0 –13	0 –15	0 –18	0 –25	0 –30	0 –35	0 –40	0 –45	0 –50	0 –75	0 –100
Variation	V_{Dp}	9	11	13	15	18	25	30	35	40	45	50		
	V_{Dmp}	7	8	10	11	14	19	23	26	30	34	38		
Width Devition	Δ_{Cs}	0 –100	0 –100	0 –100	0 –100	0 –100	0 –100	0 –100	0 –100	0 –100				
Radial Runout	K_{ea}	18	20	25	35	40	45	50	60	70	80	100	120	120

7. Dimensional and Running Accuracy of Bearings

Inner Ring

Dimension (Unit : mm)

Nominal Bore Diameter	Over	10	18	30	50	80	120	180	250	315	400	500	630
	Up to	18	30	50	80	120	180	250	315	400	500	630	800

Tolerance Class P6

Tolerance (Unit : μm)

Deviation	Δ_{dmp}	0 –7	0 –8	0 –10	0 –12	0 –15	0 –18	0 –22	0 –25	0 –30	0 –35	0 –40	0 –60
Variation	V_{dp}	7	8	10	12	15	18	22					
	V_{dmp}	5	6	8	9	11	14	16					
Width Variation	Δ_{Bs}	0 –120	0 –120	0 –120	0 –150	0 –200	0 –250	0 –300	0 –350	0 –400			
Radial Runout	K_{ia}	7	8	10	10	13	18	20	25	30	35	40	45
Width Deviation	Δ_{Ts}	+200 0	+200 0	+200 0	+200 0	+200 –200	+500 –250	+350 –250	+350 –250	+400 –400	+400 –400	+400 –500	+600 –600

Tolerance Class P5

Deviation	Δ_{dmp}, Δ_{ds}	0 –7	0 –8	0 –10	0 –12	0 –15	0 –18	0 –22	–25	–30	–35	–40	–60
Variation	V_{dp}	5	6	8	9	11	14	17					
	V_{dmp}	5	5	5	6	8	9	11					
Width Variation	Δ_{Bs}	0 –200	0 –200	0 –240	0 –300	0 –400	0 –500	0 –600	–700	–800	–800	–800	–800
Radial Runout	K_{ia}	3.5	4	5	5	6	8	10	13	15	18	20	22
Side Face Runout	S_d	7	8	8	8	9	10	11	13	15	19	22	27
Width Deviation	Δ_{Ts}	+200 –200	+200 –200	+200 –200	+200 –200	+200 –200	+350 –250	+350 –250	+350 –250	+400 –400	+400 –400	+500 –500	+600 –600

Note : 1. The larger Δ_{dmp} and the smaller Δ_{dmp} in the table do not apply when the width of raceway face is within 1.2 times the maximum fillet radius.
2. A part of this Table complies with the specifications of KBC.

Outer Ring

Dimension (Unit : mm)

Nominal Outside Diameter	Over	18	30	50	80	120	150	180	250	315	400	500	630	800
	Up to	30	50	80	120	150	180	250	315	400	500	630	800	1000

Tolerance Class P6

Variation (Unit : μm)

Deviation	Δ_{Dmp}	0 −8	0 −9	0 −11	0 −13	0 −15	0 −18	0 −20	0 −25	0 −28	0 −33	0 −38	0 −45	0 −60
Variation	V_{Dp}	8	9	11	13	15	18	20	25	28				
	V_{Dmp}	6	7	8	10	11	14	15	19	21				
Width Deviation	Δ_{Cs}	The width tolerances Δ_{Cs} are same as Δ_{Bs} of inner ring, respectively.												
Radial Runout	K_{ea}	9	10	13	18	20	23	25	30	35	40	50	60	75

Tolerance Class P5

Deviation	Δ_{Dmp}, Δ_{Ds}	0 −8	0 −9	0 −11	0 −13	0 −15	0 −18	0 −20	0 −25	0 −28	−33	−38	−45	−60
Variation	V_{Dp}	6	7	8	10	11	14	15	19	22				
	V_{Dmp}	5	5	6	7	8	9	10	13	14				
Width Deviation	Δ_{Cs}	The width tolerances Δ_{Cs} are same as Δ_{Bs} of inner ring, respectively.												
Radial Runout	K_{ea}	6	7	8	10	11	13	15	18	20	23	25	30	35
Inclination	S_D	8	8	8	9	10	10	11	13	13	15	18	20	23

Table 7-4 Tolerances of Inch Series Tapered Roller Bearings

Inner Ring

Dimension (Unit : mm)

Nominal Bore Diameter	Over / Up to	76.2	76.2 / 266.7	266.7 / 304.8	304.8 / 609.6	609.6 / 914.4	914.4 / 1219.2	1219.2
Tolerance Class AFBMA 4								
		Tolerance (Unit : μm)						
Deviation	Δ_{ds}	+13 / 0	+25 / 0	+25 / 0	+51 / 0	+76 / 0	+102 / 0	+127 / 0
Tolerance Class AFBMA 2								
Deviation	Δ_{ds}	+13 / 0	+25 / 0	+25 / 0	+51 / 0	+76 / 0	+102 / 0	+127 / 0
Tolerance Class AFBMA 3								
Deviation	Δ_{ds}	+13 / 0	+13 / 0	+13 / 0	+25 / 0	+28 / 0	+51 / 0	+76 / 0
Tolerance Class AFBMA 0								
Deviation	Δ_{ds}	+13 / 0	+13 / 0	+13 / 0	+25 / 0	+28 / 0	+51 / 0	+76 / 0

Deviation of Single Overall Width

Dimension (Unit : mm)

Nominal Bore Diameter	Over / Up to	101.6	101.6 / 304.8	304.8 / 609.6	609.6
Tolerance Class AFBMA 4					
		Tolerance (Unit : μm)			
Deviation	Δ_{Ts}	+203 / 0	+356 / –254	+381 / –381	+381 / –381
Tolerance Class AFBMA 2					
Deviation	Δ_{Ts}	+203 / 0	+203 / 0	+381 / –381	
Tolerance Class AFBMA 3					
Deviation	Δ_{Ts} D≤508mm In Case of	+203 / –203	+203 / –203	+203 / –203	+381 / –381
	D>508mm In Case of	+203 / –203	+203 / –203	+203 / –203	+381 / –381
Tolerance Class AFBMA 0					
Deviation	Δ_{Ts}	+203 / –203	+203 / –203		

Outer Ring

Dimension(Unit : mm)

Nominal outside Diameter	Over / Up to	266.7	266.7 304.8	304.8 609.6	609.6 914.4	914.4 1219.2	1219.2
Tolerance Class AFBMA 4							
		Tolerance(Unit : μm)					
Deviation	Δ_{Ds}	+25 0	+25 0	+51 0	+76 0	+102 0	+127 0
Radial Runout	K_{ia}, K_{ea}	51	51	51	76	76	76
Tolerance Class AFBMA 2							
Deviation	Δ_{Ds}	+25 0	+25 0	+51 0	+76 0	+102 0	+127 0
Radial Runout	K_{ia}, K_{ea}	38	38	38	51		
Tolerance Class AFBMA 3							
Deviation	Δ_{Ds}	+13 0	+13 0	+25 0	+38 0	+51 0	+76 0
Radial Runout	K_{ia}, K_{ea}	8	8	18	51	76	76
Tolerance Class AFBMA 0							
Deviation	Δ_{Ds}	+13 0	+13 0	+25 0	+38 0	+51 0	+76 0
Radial Runout	K_{ia}, K_{ea}	4	4				

Table 7-5 Tolerances of Thrust Ball Bearings(One Way Flat Washer Type)

Shaft Washer

Dimension(Unit : mm)

Nominal Bore Diameter	Over		18	30	50	80	120	180	250	315	400	500	630	800	1000
	Up to	18	30	50	80	120	180	250	315	400	500	630	800	1000	1250
Tolerance Class AFBMA 0															
Tolerance(Unit : μm)															
Deviation	Δ_{dmp}	0 −8	0 −10	0 −12	0 −15	0 −20	0 −25	0 −30	0 −35	0 −40	0 −45	0 −50	0 −75	0 −100	0 −125
Variation	V_{dp}	6	8	9	11	15	19	23	26	30	34	38			
Thickness Variation	S_i	10	10	10	10	15	15	20	25	30	30	35	40	45	50
Tolerance Class AFBMA P6															
Deviation	Δ_{dmp}	0 −8	0 −10	0 −12	0 −15	0 −20	0 −25	0 −30	0 −35	0 −40	0 −45	0 −50	0 −75	0 −100	0 −125
Variation	V_{dp}	6	8	9	11	15	19	23	26	30	34	38			
Thickness Variation	S_i	5	5	6	7	8	9	10	13	15	18	21	25	30	35
Tolerance Class AFBMA P5															
Deviation	Δ_{dmp}	0 −8	0 −10	0 −12	0 −15	0 −20	0 −25	0 −30	0 −35	0 −40	0 −45	0 −50	0 −75	0 −100	0 −125
Variation	V_{dp}	6	8	9	11	15	19	23	26	30	34	38			
Thickness Variation	S_i	3	3	3	4	4	5	5	7	7	9	11	13	15	18
Tolerance Class AFBMA P4															
Deviation	Δ_{dmp}	0 −7	0 −8	0 −10	0 −12	0 −15	0 −18	0 −22	0 −25	0 −30	0 −35	0 −40	0 −50		
Variation	V_{dp}	5	6	8	9	11	14	17	19	23	26	30			
Thickness Variation	S_i	2	2	2	3	3	4	4	5	5	6	7	8		

High

Dimension(Unit : mm)

Nominal Bore Diameter	Over		30	50	80	120	180	250	315
	Up to	30	50	80	120	180	250	315	400
Tolerance Class AFBMA 0....P4									
Tolerance(Unit : μm)									
Deviation	Δ_{Hs}	0 −75	0 −100	0 −125	0 −150	0 −175	0 −200	0 −225	0 −300

Housing Washer

Dimension(Unit : mm)

Nominal outside Diameter	Over / Up to	10 / 18	18 / 30	30 / 50	50 / 80	80 / 120	120 / 180	180 / 250	250 / 315	315 / 400	400 / 500	500 / 630	630 / 800	800 / 1000	1000 / 1250

Tolerance Class AFBMA 0

Tolerance(Unit : μm)

Deviation	Δ_{Dmp}	0 −11	0 −13	0 −16	0 −19	0 −22	0 −25	0 −30	0 −35	0 −40	0 −45	0 −50	0 −75	0 −100	0 −125
Variation	V_{Dp}	8	10	12	14	17	19	23	26	30	34	38	55	75	
Thickness Variation	S_e	Thickness variation S_e of housing washer is same as that of shaft washer S_i													

Tolerance Class AFBMA P6

Deviation	Δ_{Dmp}	0 −11	0 −13	0 −16	0 −19	0 −22	0 −25	0 −30	0 −35	0 −40	0 −45	0 −50	0 −75	0 −100	0 −125
Variation	V_{Dp}	8	10	12	14	17	19	23	26	30	34	38	55	75	
Thickness Variation	S_e	Thickness variation S_e of housing washer is same as that of shaft washer S_i													

Tolerance Class AFBMA P5

Deviation	Δ_{Dmp}	0 −11	0 −13	0 −16	0 −19	0 −22	0 −25	0 −30	0 −35	0 −40	0 −45	0 −50	0 −75	0 −100	0 −125
Variation	V_{Dp}	8	10	12	14	17	19	23	26	30	34	38	55	75	
Thickness Variation	S_e	Thickness variation S_e of housing washer is same as that of shaft washer S_i													

Tolerance Class AFBMA P4

Deviation	Δ_{Dmp}	0 −7	0 −8	0 −9	0 −11	0 −13	0 −15	0 −20	0 −25	0 −28	0 −33	0 −38	0 −45		
Variation	V_{Dp}	5	6	7	8	10	11	15	19	21	25	29	34		
Thickness Variation	S_e	Thickness variation S_e of housing washer is same as that of shaft washer S_i													

7. Dimensional and Running Accuracy of Bearings

Table 7-6 Tolerances of Chamfer Dimensions

Code

r_1, r_3	Radial Chamfer Dimension
r_2, r_4	Axial Chamfer Dimension

r_{min}*)	Min, Chamfer Dimension $r_{1min}, r_{2min}, r_{3min}, r_{4min}$
r_{1max}, r_{3max}	Max, Radial Chamfer Dimension
r_{2max}, r_{4max}	Min, Axial Chamfer Dimension

Chamfer Dimension of Radial Bearings(Except Tapered Roller Bearings)

Unit : mm

r_{min}		0.1	0.15	0.2	0.3		0.6		1		1.1		1.5	
Nominal Bore Diameter d	Over					40		40		50		120		120
	up to				40		40		50		120		120	
r_{1max}		0.2	0.3	0.5	0.6	0.8	1	1.3	1.5	1.9	2	2.5	2.3	3
r_{2max}		0.4	0.6	0.8	1	1	2	2	3	3	3.5	4	4	5

Chamfer Dimensions of Tapered Roller Bearings

Inner Ring

Unit : mm

r_{min}		0.3		0.6		1		1.5			2		
Nominal Bore Diameter d	Over		40		40		50		120	250		120	250
	up to	40		40		50		120	250		120	250	
r_{1max}		0.7	0.9	1.1	1.3	1.6	1.9	2.3	2.8	3.5	2.8	3.5	4
r_{2max}		1.4	1.6	1.7	2	2.5	3	3	3.5	4	4	4.5	5

Outer Ring

Unit : mm

r_{min}		0.3		0.6		1		1.5			2		
Nominal Outside Diameter D	Over		40		40		50		120	250		120	250
	up to	40		40		50		120	250		120	250	
r_{3max}		0.7	0.9	1.1	1.3	1.6	1.9	2.3	2.8	3.5	2.8	3.5	4
r_{4max}		1.4	1.6	1.7	2	2.5	3	3	3.5	4	4	4.5	5

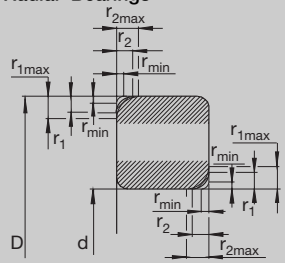
Chamfer Dimension of Thrust Bearings

Unit : mm

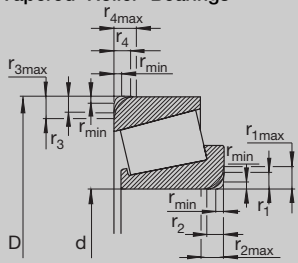
r_{min}	0.1	0.15	0.2	0.3	0.6	1	1.1	1.5	2	2.1	3	4	5	6	7.5	9.5	12	15	19
r_{1max}. r_{2max}	0.2	0.3	0.5	0.8	1.5	2.2	2.7	3.5	4	4.5	5.5	6.5	8	10	12.5	15	18	21	25

*) The Min, chamfer dimensions in accordance with ISO 582 and KS B 2013 are listed in the Dimension Tables
The dimensions of fillet radius of shaft and housing are determined by using these values.

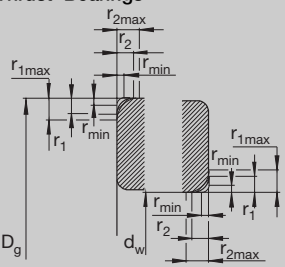
Radial Bearings



Tapered Roller Bearings



Thrust Bearings



2			2.1		2.5			3		4	5	6	7.5	9.5	12	15	19
80	80 220	220	280	280	100	100 280	280	280	280								
3	3.5	3.8	4	4.5	3.8	4.5	5	5	5.5	6.5	8	10	12.5	15	18	21	25
4.5	5	6	6.5	7	6	6	7	8	8	9	10	13	17	19	24	30	38

2.5			3				4				5		6	
120	120 250	250	120	120 250	250 400	400	120	120 250	250 400	400	180	180	180	180
3.5	4	4.5	4	4.5	5	5.5	5	5.5	6	6.5	6.5	7.5	7.5	9
5	5.5	6	5.5	6.5	7	7.5	7	7.5	8	8.5	8	9	10	11

2.5			3				4				5		6	
120	120 250	250	120	120 250	250 400	400	120	120 250	250 400	400	180	180	180	180
3.5	4	4.5	4	4.5	5	5.5	5	5.5	6	6.5	6.5	7.5	7.5	9
5	5.5	6	5.5	6.5	7	7.5	7	7.5	8	8.5	8	9	10	11

Chamfer Dimensions of Inch Series Tapered Roller Bearings (ISO 1123)

Inner Ring

Unit : mm

Nominal Bore Diameter D	Over	50.8	101.6	254
	Up to	50.8	101.6	

r_{min} (Refer to the Dimension Tables)

Tolerance : mm

r_{1max}	r_{min} +0.38	r_{min} +0.51	r_{min} +0.64
r_{2max}	r_{min} +0.89	r_{min} +1.27	r_{min} +1.78

Outer Ring

Unit : mm

Nominal Outside Diameter D	Over	101.6	168.3	266.7
	Up to	168.3	266.7	355.6

r_{min} (Refer to the Dimension Tables)

Tolerance : mm

r_{3max}	r_{min} +0.58	r_{min} +0.64	r_{min} +0.84	r_{min} +1.7
r_{4max}	r_{min} +1.07	r_{min} +1.17	r_{min} +1.35	r_{min} +1.7