

JIS

JAPANESE INDUSTRIAL STANDARD

Rolling bearings—Tolerances

JIS B 1514—1995

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In the event of any doubt arising,
the original Standard in Japanese is to be final authority.

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Rolling bearings — Tolerances

B 1514-1995

1. **Scope** This Japanese Industrial Standard specifies the tolerances and permissible values for the respective boundary dimensions and running accuracies of the rolling bearings (hereafter referred to as "bearings").

Further, the following tolerances and permissible values shall be specified in Annexes 1 to 3.

- (1) The tolerances and permissible values for the tapered bore of tapered bore radial bearings
- (2) The tolerances and permissible values for the flanges of flanged radial bearings
- (3) The permissible limit values of chamfer dimensions

- Remarks**
1. This Standard does not apply to the bearings of particular type (for example, drawn cup needle roller bearings) and the bearings for particular fields of application (for example, airframe bearings and instrument precision bearings).
 2. The tolerances and permissible values specified in this Standard shall be the values at a temperature of 20°C, as well as the values when each part of the bearing is not subjected to the stress at all caused by external forces including the measuring force and gravity.
 3. The standards cited in this Standard are given in the following:
 - JIS B 0104 Rolling bearings — Vocabulary
 - JIS B 1512 Rolling bearings — Boundary dimensions
 4. The International standards corresponding to this Standard are given in the following:
 - ISO 199:1979 Rolling bearings — Thrust ball bearings — Tolerances
 - ISO 492: 1994 Rolling bearings — Radial bearings — Tolerances
 - ISO 582: 1979 Rolling bearings — Metric series — Chamfer dimension limits

2. **Definitions** For the purposes of this Standard, the definitions given in JIS B 0104 and the following definitions apply:

- (1) master outer subunit The outer ring of which dimensional difference and shape deviation from the nominal dimension are negligible.
- (2) inner ring, cage and ball assembly master The inner ring, cage and ball assembly of which dimensional difference and shape deviation from the nominal dimension are negligible.

- (3) effective width of inner ring, cage and ball assembly The assembled bearing width when an inner ring, cage and ball assembly has been combined with the master outer subunit.
- (4) deviation of effective width of inner ring, cage and ball assembly The difference between the effective width and nominal effective width of the inner ring, cage and ball assembly.
- (5) effective width of outer ring The assembled bearing width when the outer ring has been assembled with the inner ring, cage and ball assembly.
- (6) deviation of effective width of outer ring The difference between the effective width and the nominal effective width of the outer ring.

3. Quantitative symbols The quantitative symbols used in this Standard shall be in accordance with the following:

(1) Dimensions (see Figs. 1 to 5)

- d : nominal bearing bore diameter
- d_2 : nominal bore diameter of central washer
- D : nominal bearing outside diameter
- B : nominal inner ring width or nominal height of central washer
- C : nominal outer ring width
- T : nominal assembled bearing width of single row tapered roller bearing or nominal bearing height of single-direction thrust bearing
- T_1 : nominal effective width of inner ring, cage and ball assembly of single row tapered roller bearing or nominal bearing height of double-direction thrust ball bearing
- T_2 : nominal effective width of outer ring of single row tapered roller bearing or nominal height between the housing washer and the central washer of the double-direction thrust ball bearing
- r : chamfer dimension of inner ring or outer ring (excluding single row tapered roller bearing) or chamfer dimension of shaft washer or housing washer
- r_1 : chamfer dimension of outer ring of single row tapered roller bearing or chamfer dimension of central washer

(2) Deviation

- Δ_{ds} : deviation of single bore diameter
- Δ_{dmp} : deviation of mean bore in plane
- Δ_{d2mp} : deviation of mean bore in plane of central washer
- Δ_{Ds} : deviation of single outside diameter
- Δ_{Dmp} : deviation of mean outside diameter in plane
- Δ_{Bs} : deviation of single inner ring width or deviation of height of central washer
- Δ_{Cs} : deviation of single outer ring width

- ΔT_s : deviation of actual bearing width of single row tapered roller bearing or deviation of actual bearing height of single-direction thrust bearing
- ΔT_{1s} : deviation of effective width of inner ring, cage and ball assembly of single row tapered roller bearing or deviation of actual bearing height of double-direction thrust ball bearing
- ΔT_{2s} : deviation of effective width of outer ring of single row tapered roller bearing or deviation of the height between the housing washer and the central washer of double-direction thrust ball bearings

(3) Variation of dimensions

- V_{dp} : variation of bore diameter in plane
- V_{d2p} : variation of bore diameter in plane of central washer
- V_{dmp} : variation of mean bore diameter in plane
- V_{Dp} : variation of outside diameter in plane
- V_{Dmp} : variation of mean outside diameter in plane
- V_{Bs} : variation of inner ring width
- V_{Cs} : variation of outer ring width

(4) Running accuracies

- K_{ia} : radial runout of assembled bearing inner ring
- S_{ia} : assembled bearing inner ring face runout with raceway
- S_d : face runout with bore
- K_{ea} : radial runout of assembled bearing outer ring
- S_{ea} : assembled bearing outer ring face runout with raceway
- S_D : variation of outside surface generatrix inclination with face
- S_1 : variation in thickness of raceway of shaft washer or central washer
- S_e : variation in thickness of raceway of housing washer

Fig. 1. Radial bearing
(excluding tapered roller bearing)

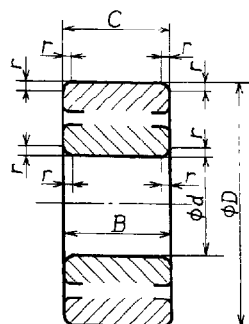


Fig. 2. Tapered roller bearing

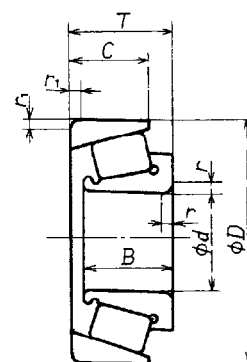


Fig. 3. Inner ring, cage and ball assembly and outer ring of single row tapered roller bearing

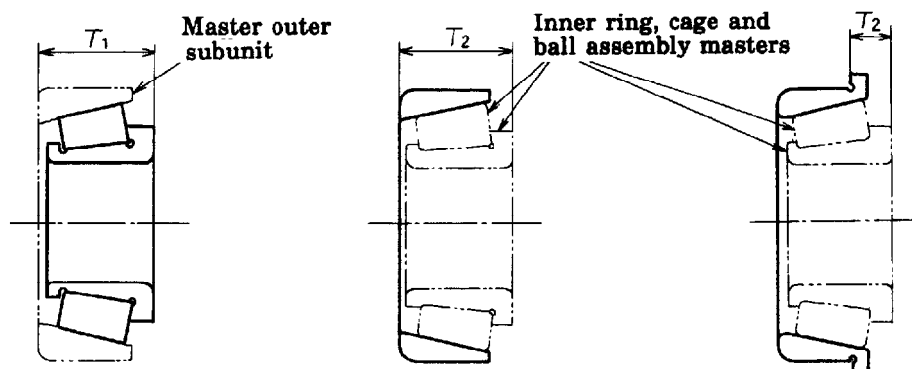


Fig. 4. Thrust ball bearings

Single-direction

Double-direction

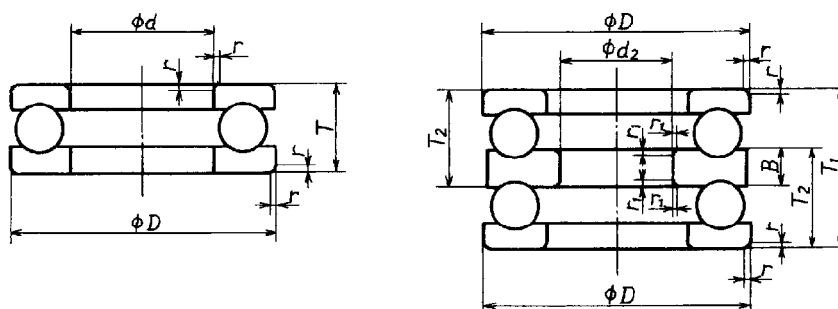
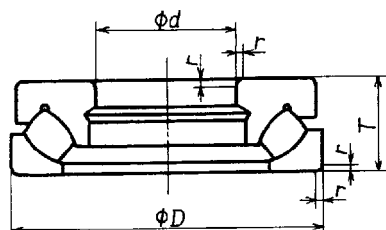


Fig. 5. Self-aligning thrust roller bearings



4. Tolerances and permissible values

4.1 Radial bearings (excluding tapered roller bearing) The tolerances and permissible values for the radial bearings (excluding tapered roller bearing) of class 0, class 6, class 5, class 4 and class 2 shall be in accordance with Attached Tables 1-1 to 1-5. However, the tolerances and permissible values relating to the bearing bore diameters of Attached Tables 1-1 to 1-5 shall apply to the cylindrical bore bearings.

Remarks: As to the diameter series 9, 0, 1, 2, 3 and 4 in Attached Tables 1-1 to 1-5, refer to Attached Tables 1-3 (Radial bearings of diameter series 9) to 1-8 (Radial bearings of diameter series 4) of JIS B 1512.

4.2 Tapered roller bearings The tolerances and permissible values of the tapered roller bearings of class 0, class 6X, class 6, class 5 and class 4 shall be in accordance with Attached Tables 2-1 to 2-4. However, the tolerances and permissible values relating to the bearing bore diameters of Attached Tables 2-1 to 2-4 shall apply to the cylindrical bore bearings.

4.3 Thrust ball bearings The tolerances and permissible values of the thrust ball bearings of class 0, class 6, class 5 and class 4 shall be in accordance with Attached Tables 3-1 and 3-2.

4.4 Self-aligning thrust roller bearings The tolerances and permissible values of the self-aligning thrust roller bearings of class 0 shall be in accordance with Attached Table 4.

Attached Table 1-1. Tolerances and permissible values of radial bearings of class 0 (excluding tapered roller bearing)

(1) Inner rings

Unit: μm

d (mm)		Δ_{dmp}		Diameter series			V_{dmp}	K_{la}	Single bearing		Matched bearing(*)		V_{Bs}	
				9	0, 1	2, 3, 4			Δ_{Bs}					
				V_{dp}										
Over	Or under	High	Low	Max.			Max.	Max.	High	Low	High	Low	Max.	
0.6 ⁽¹⁾	2.5	0	— 8	10	8	6	6	10	0	— 40	—	—	12	
2.5	10	0	— 8	10	8	6	6	10	0	— 120	0	— 250	15	
10	18	0	— 8	10	8	6	6	10	0	— 120	0	— 250	20	
18	30	0	— 10	13	10	8	8	13	0	— 120	0	— 250	20	
30	50	0	— 12	15	12	9	9	15	0	— 120	0	— 250	20	
50	80	0	— 15	19	19	11	11	20	0	— 150	0	— 380	25	
80	120	0	— 20	25	25	15	15	25	0	— 200	0	— 380	25	
120	180	0	— 25	31	31	19	19	30	0	— 250	0	— 500	30	
180	250	0	— 30	38	38	23	23	40	0	— 300	0	— 500	30	
250	315	0	— 35	44	44	26	26	50	0	— 350	0	— 500	35	
315	400	0	— 40	50	50	30	30	60	0	— 400	0	— 630	40	
400	500	0	— 45	56	56	34	34	65	0	— 450	—	—	50	
500	630	0	— 50	63	63	38	38	70	0	— 500	—	—	60	
630	800	0	— 75	—	—	—	—	80	0	— 750	—	—	70	
800	1 000	0	— 100	—	—	—	—	90	0	— 1 000	—	—	80	
1 000	1 250	0	— 125	—	—	—	—	100	0	— 1 250	—	—	100	
1 250	1 600	0	— 160	—	—	—	—	120	0	— 1 600	—	—	120	
1 600	2 000	0	— 200	—	—	—	—	140	0	— 2 000	—	—	140	

Notes (1) Dimension 0.6 mm shall be included in this dimensional range.

(2) These shall be applied to individual bearing rings manufactured as the matched bearings

Attached Table 1-1. (continued)

(2) Outer rings

Unit: μm

D (mm)		Δ_{Dmp}		Open bearing			Sealed bearing, shielded bearing	$V_{Dmp}^{(4)}$	K_{ea}	Δ_{Cs}		V_{Cs}		
				Diameter series										
				9	0, 1	2, 3, 4	2, 3, 4							
				$V_{Dp}^{(4)}$										
Over	Or under	High	Low	Max.				Max.	Max.	High	Low	Max.		
2.5 ⁽³⁾	6	0	— 8	10	8	6	10	6	15	Shall conform to the tolerance Δ_{Bs} on d of the same bearing.		Shall conform to the tolerance V_{Bs} on d of the same bearing.		
6	18	0	— 8	10	8	6	10	6	15					
18	30	0	— 9	12	9	7	12	7	15					
30	50	0	— 11	14	11	8	16	8	20					
50	80	0	— 13	16	13	10	20	10	25					
80	120	0	— 15	19	19	11	26	11	35					
120	150	0	— 18	23	23	14	30	14	40					
150	180	0	— 25	31	31	19	38	19	45					
180	250	0	— 30	38	38	23	—	23	50					
250	315	0	— 35	44	44	26	—	26	60					
315	400	0	— 40	50	50	30	—	30	70					
400	500	0	— 45	56	56	34	—	34	80					
500	630	0	— 50	63	63	38	—	38	100					
630	800	0	— 75	94	94	55	—	55	120					
800	1 000	0	—100	125	125	75	—	75	140					
1 000	1 250	0	—125	—	—	—	—	—	160					
1 250	1 600	0	—160	—	—	—	—	—	190					
1 600	2 000	0	—200	—	—	—	—	—	220					
2 000	2 500	0	—250	—	—	—	—	—	250					

Notes ⁽³⁾ Dimension 2.5 mm shall be included in this dimensional range.⁽⁴⁾ This shall be applied when no locating snap ring has been fitted.

Attached Table 1-2. Tolerances and permissible values
of radial bearings of class 6
(excluding tapered roller bearings)

(1) Inner rings

Unit: μm

d (mm)		Δ_{dmp}		Diameter series			V_{dmp}	K_{1a}	Single bearing		Matched bearing ⁽²⁾		V_{Bs}
				9	0, 1	2, 3, 4			Δ_{Bs}				
				V_{dp}									
Over	Or under	High	Low	Max.			Max.	Max.	High	Low	High	Low	Max.
0.6 ⁽¹⁾	2.5	0	— 7	9	7	5	5	5	0	— 40	—	—	12
2.5	10	0	— 7	9	7	5	5	6	0	—120	0	—250	15
10	18	0	— 7	9	7	5	5	7	0	—120	0	—250	20
18	30	0	— 8	10	8	6	6	8	0	—120	0	—250	20
30	50	0	—10	13	10	8	8	10	0	—120	0	—250	20
50	80	0	—12	15	15	9	9	10	0	—150	0	—380	25
80	120	0	—15	19	19	11	11	13	0	—200	0	—380	25
120	180	0	—18	23	23	14	14	18	0	—250	0	—500	30
180	250	0	—22	28	28	17	17	20	0	—300	0	—500	30
250	315	0	—25	31	31	19	19	25	0	—350	0	—500	35
315	400	0	—30	38	38	23	23	30	0	—400	0	—630	40
400	500	0	—35	44	44	26	26	35	0	—450	—	—	45
500	630	0	—40	50	50	30	30	40	0	—500	—	—	50

Notes ⁽¹⁾ Dimension 0.6 mm shall be included in this dimensional range.

⁽²⁾ These shall be applied to individual bearing rings manufactured as the matched bearings

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Attached Table 1-2. (continued)

(2) Outer rings

Unit: μm

D (mm)		Δ_{Dmp}		Open bearing		Sealed bearing, shielded bearing		$V_{Dmp}^{(*)}$	K_{ea}	Δ_{Cs}		V_{Cs}
				Diameter series								
				9	0, 1	2, 3, 4	0, 1, 2, 3, 4					
$V_{Dp}^{(*)}$												
Over	Or under	High	Low	Max.				Max.	Max.	High	Low	Max.
2.5 ⁽³⁾	6	0	— 7	9	7	5	9	5	8	Shall conform to the tolerance Δ_B , on d of the same bearing.		Shall conform to the tolerance V_B , on d of the same bearing.
6	18	0	— 7	9	7	5	9	5	8			
18	30	0	— 8	10	8	6	10	6	9			
30	50	0	— 9	11	9	7	13	7	10			
50	80	0	— 11	14	11	8	16	8	13			
80	120	0	— 13	16	16	10	20	10	18			
120	150	0	— 15	19	19	11	25	11	20			
150	180	0	— 18	23	23	14	30	14	23			
180	250	0	— 20	25	25	15	—	15	25			
250	315	0	— 25	31	31	19	—	19	30			
315	400	0	— 28	35	35	21	—	21	35			
400	500	0	— 33	41	41	25	—	25	40			
500	630	0	— 38	48	48	29	—	29	50			
630	800	0	— 45	56	56	34	—	34	60			
800	1 000	0	— 60	75	75	45	—	45	75			

Notes ⁽³⁾ Dimension 2.5 mm shall be included in this dimensional range.

⁽⁴⁾ This shall be applied when no locating snap ring has been fitted.

Attached Table 1-3. Tolerances and permissible values
of radial bearings of class 5

(1) Inner rings

Unit: μm

d (mm)		Δ_{dmp}		Diameter series		V_{dmp}	K_{1a}	S_d	$S_{1a}^{(5)}$	Single bearing		Matched bearing ^(*)		V_{Bs}
				9	0, 1, 2, 3, 4					Δ_{Bs}				
				V_{dp}										
Over	Or under	High	Low	Max.		Max.	Max.	Max.	Max.	High	Low	High	Low	Max.
0.6 ⁽¹⁾	2.5	0	— 5	5	4	3	4	7	7	0	— 40	0	— 250	5
2.5	10	0	— 5	5	4	3	4	7	7	0	— 40	0	— 250	5
10	18	0	— 5	5	4	3	4	7	7	0	— 80	0	— 250	5
18	30	0	— 6	6	5	3	4	8	8	0	— 120	0	— 250	5
30	50	0	— 8	8	6	4	5	8	8	0	— 120	0	— 250	5
50	80	0	— 9	9	7	5	5	8	8	0	— 150	0	— 250	6
80	120	0	— 10	10	8	5	6	9	9	0	— 200	0	— 380	7
120	180	0	— 13	13	10	7	8	10	10	0	— 250	0	— 380	8
180	250	0	— 15	15	12	8	10	11	13	0	— 300	0	— 500	10
250	315	0	— 18	18	14	9	13	13	15	0	— 350	0	— 500	13
315	400	0	— 23	23	18	12	15	15	20	0	— 400	0	— 630	15

Notes (1) Dimension 0.6 mm shall be included in this dimensional range.

(2) These shall be applied to individual bearing rings manufactured as the matched bearings.

(5) This shall be applied to the groove ball bearings such as deep groove ball bearings and angular contact ball bearings.