INTERNATIONAL STANDARD

ISO 492

Fourth edition
2002-04-15

Rolling bearings — Radial bearings — Tolerances

Roulements — Roulements radiaux — Tolérances

Reference number
ISO 492:2002(E)

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Printed in Switzerland

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 492 was prepared by Technical Committee ISO/TC 4, *Rolling bearings*, Subcommittee SC 4, *Tolerances*.

This fourth edition cancels and replaces the third edition (ISO 492:1994), which has been technically revised.

Rolling bearings — Radial bearings — Tolerances

1 Scope

This International Standard specifies tolerances for boundary dimensions (except chamfer dimensions) and the running accuracy of radial rolling bearings specified in ISO 15, ISO 355 and ISO 8443.

This International Standard does not apply to certain radial bearings of particular types (e.g., drawn cup needle roller bearings) or for particular fields of application (e.g., airframe bearings and instrument precision bearings). Tolerances for such bearings are given in the relevant International Standards.

Chamfer dimension limits are given in ISO 582.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 15:1998, *Rolling bearings — Radial bearings — Boundary dimensions, general plan*

ISO 355:1977, *Rolling bearings — Metric tapered roller bearings — Boundary dimensions and series designations*

ISO 582:1995, *Rolling bearings — Chamfer dimensions — Maximum values*

IS0 1132-1:2000, *Rolling bearings — Tolerances — Part 1: Terms and definitions*

ISO 5593:1997, *Rolling bearings — Vocabulary*

ISO 8443:1999, *Rolling bearings — Radial ball bearings with flanged outer ring — Flange dimensions*

ISO 15241:2001, *Rolling bearings — Symbols for quantities*

3 Terms and definitions

For the purposes of this International Standard, the terms and definitions given in ISO 1132-1 and ISO 5593 apply.

4 Symbols

4.1 General

For the purposes of this International Standard, the symbols given in ISO 15241 and the following apply.

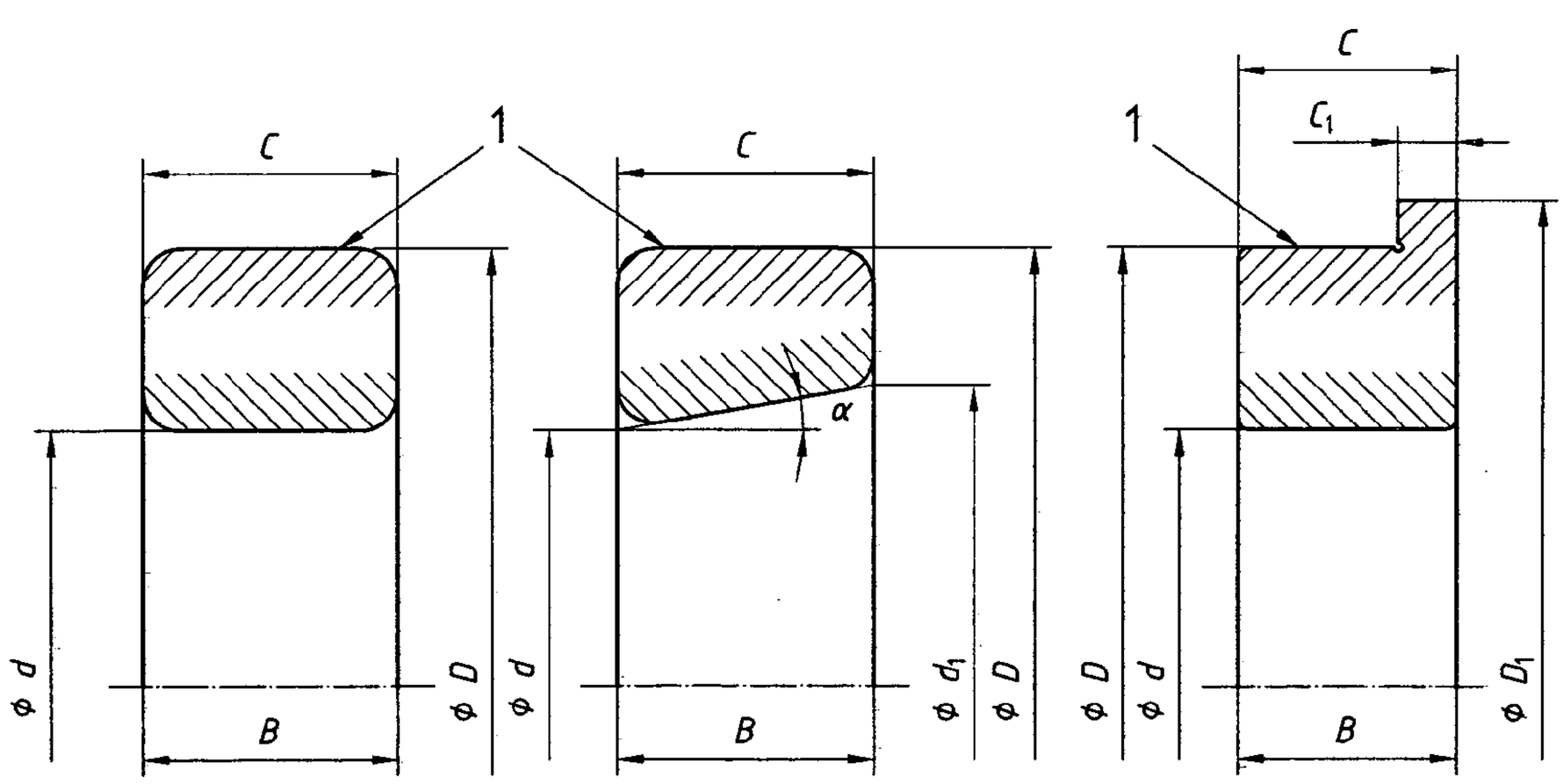
The symbols (except those for tolerances) shown in Figures 1 to 4 and the values given in Tables 1 to 26 denote nominal dimensions unless specified otherwise.

4.2 Symbols for boundary dimensions and running accuracy

See Figure 1 for symbols for the dimensions.

B	inner ring width
V_{Bs}	variation of inner ring width
Δ_{Bs}	deviation of a single inner ring width
C	outer ring width
C_1	outer ring flange width
V_{Cs}	variation of outer ring width
V_{C1s}	variation of outer ring flange width
Δ_{Cs}	deviation of a single outer ring width
Δ_{C1s}	deviation of a single outer ring flange width
d	bore diameter
d_1	diameter at the theoretical large end of a basically tapered bore
V_{dmp}	variation of mean bore diameter (this applies only to a basically cylindrical bore)
V_{dsp}	variation of bore diameter in a single plane
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
Δ_{d1mp}	deviation of mean bore diameter in a single plane at the theoretical large end of a basically tapered bore
D	outside diameter
D_1	outside diameter of outer ring flange
V_{Dmp}	variation of mean outside diameter
V_{Dsp}	variation of outside diameter in a single plane

Δ_{Ds}	deviation of a single outside diameter
Δ_{Dmp}	deviation of mean outside diameter in a single plane
Δ_{D1s}	deviation of a single outside diameter of outer ring flange
K_{ea}	radial runout of outer ring of assembled bearing
K_{ia}	radial runout of inner 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_{ea}	axial runout of outer ring of assembled bearing
S_{ea1}	axial runout of outer ring flange back face of assembled bearing
S_{ia}	axial runout of inner ring of assembled bearing
α	angle of taper (half the cone angle) of inner ring bore



Key

1 Bearing outside surface

Figure 1 — Symbols for boundary dimensions

4.3 Additional symbols for tapered roller bearings

See Figure 2.

T assembled bearing width

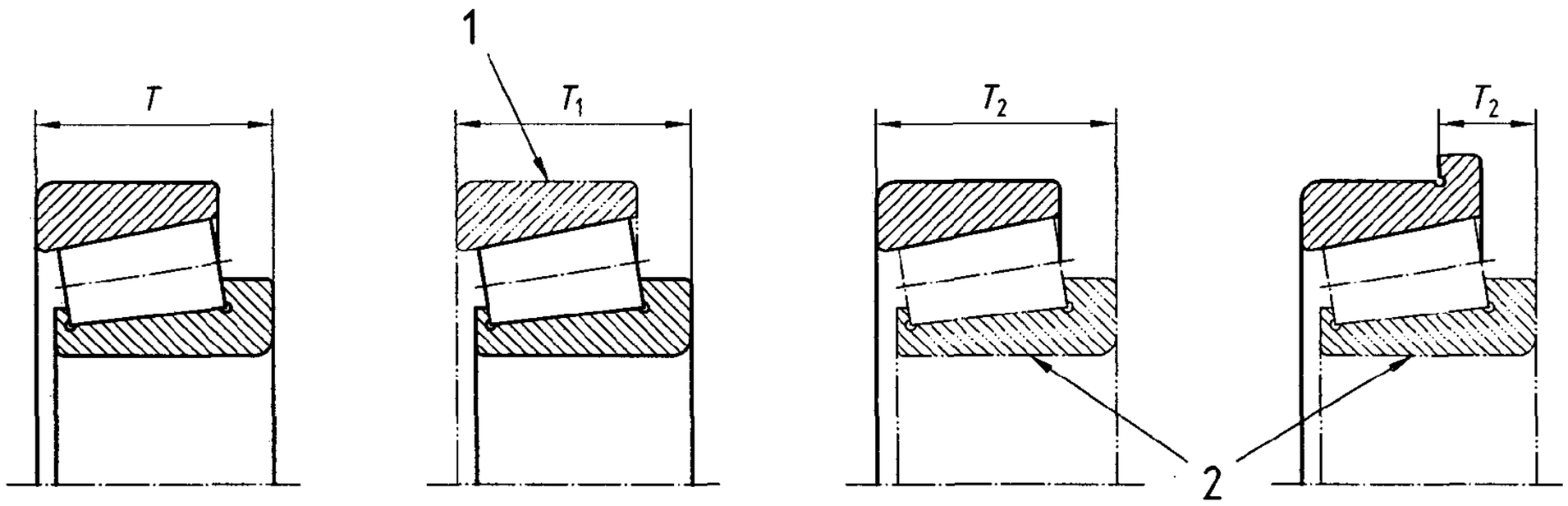
T_1 effective width of inner subunit

T_2 effective width of outer ring

Δ_{Ts} deviation of the actual (assembled) bearing width

Δ_{T1s} deviation of the actual effective width of inner subunit

Δ_{T2s} deviation of the actual effective width of outer ring



Key

1 Master outer ring

2 Master inner subunit

Figure 2 — Additional symbols for tapered roller bearings

5 Tolerances

5.1 Radial bearings except tapered roller bearings

5.1.1 General

The bore diameter tolerances given in this subclause apply to basically cylindrical bores. Tolerances for tapered bores are given in 5.4.

The diameter series referred to in Tables 1 to 8 are those defined in ISO 15.

5.1.2 Normal tolerance class

See Tables 1 and 2.

Table 1 — Inner ring

Tolerance values in micrometres

d mm		Δ_{dmp}		V_{dsp}			V_{dmp}	K_{ia}	Δ_{Bs}			V_{Bs}
				Diameter series					all	normal	modified [a]	
				9	0, 1	2, 3, 4						
>	⩽	high	low	max.			max.	max.	high	low		max.
—	0,6	0	– 8	10	8	6	6	10	0	– 40	—	12
0,6	2,5	0	– 8	10	8	6	6	10	0	– 40	—	12
2,5	10	0	– 8	10	8	6	6	10	0	– 120	– 250	15
10	18	0	– 8	10	8	6	6	10	0	– 120	– 250	20
18	30	0	– 10	13	10	8	8	13	0	– 120	– 250	20
30	50	0	– 12	15	12	9	9	15	0	– 120	– 250	20
50	80	0	– 15	19	19	11	11	20	0	– 150	– 380	25
80	120	0	– 20	25	25	15	15	25	0	– 200	– 380	25
120	180	0	– 25	31	31	19	19	30	0	– 250	– 500	30
180	250	0	– 30	38	38	23	23	40	0	– 300	– 500	30
250	315	0	– 35	44	44	26	26	50	0	– 350	– 500	35
315	400	0	– 40	50	50	30	30	60	0	– 400	– 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

[a] Applies to inner rings and outer rings of single bearings made for paired and stack assemblies. Also applies to inner rings with tapered bore with $d \geqslant 50$ mm.

Table 2 — Outer ring

Tolerance values in micrometres

D		Δ_{Dmp}		V_{Dsp} [a]				V_{Dmp} [a]	K_{ea}	Δ_{Cs}		V_{Cs}
				Open bearings			Capped bearings					
mm				Diameter series						Δ_{C1s} [b]		V_{C1s} [b]
				9	0, 1	2, 3, 4	2, 3, 4					
>	⩽	high	low	max.				max.	max.	high	low	max.
—	2,5	0	– 8	10	8	6	10	6	15			
2,5	6	0	– 8	10	8	6	10	6	15			
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	Identical to Δ_{Bs} and V_{Bs} of inner ring of the same bearing as the outer ring.		
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			

NOTE The tolerances for the outside diameter D_1 of an outer ring flange are given in Table 24.

[a] Applies before mounting and after removal of internal or external snap ring.

[b] Applies to groove ball bearings only.

5.1.3 Tolerance class 6

See Tables 3 and 4.

Table 3 — Inner ring

Tolerance values in micrometres

d mm		Δ_{dmp}		V_{dsp}			V_{dmp}	K_{ia}	Δ_{Bs}			V_{Bs}
				Diameter series								
				9	0, 1	2, 3, 4			all	normal	modified [a]	
>	⩽	high	low	max.			max.	max.	high	low		max.
—	0,6	0	– 7	9	7	5	5	5	0	– 40	—	12
0,6	2,5	0	– 7	9	7	5	5	5	0	– 40	—	12
2,5	10	0	– 7	9	7	5	5	6	0	– 120	– 250	15
10	18	0	– 7	9	7	5	5	7	0	– 120	– 250	20
18	30	0	– 8	10	8	6	6	8	0	– 120	– 250	20
30	50	0	– 10	13	10	8	8	10	0	– 120	– 250	20
50	80	0	– 12	15	15	9	9	10	0	– 150	– 380	25
80	120	0	– 15	19	19	11	11	13	0	– 200	– 380	25
120	180	0	– 18	23	23	14	14	18	0	– 250	– 500	30
180	250	0	– 22	28	28	17	17	20	0	– 300	– 500	30
250	315	0	– 25	31	31	19	19	25	0	– 350	– 500	35
315	400	0	– 30	38	38	23	23	30	0	– 400	– 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

[a] Applies to inner rings and outer rings of single bearings made for paired and stack assemblies. Also applies to inner rings with tapered bore with $d \geqslant 50$ mm.

Table 4 — Outer ring

Tolerance values in micrometres

D		Δ_{Dmp}		V_{Dsp} [a]				V_{Dmp} [a]	K_{ea}	Δ_{Cs}		V_{Cs}
				Open bearings			Capped bearings					
mm				Diameter series						Δ_{C1s} [b]		V_{C1s} [b]
				9	0, 1	2, 3, 4	0, 1, 2, 3, 4					
>	⩽	high	low	max.				max.	max.	high	low	max.
—	2,5	0	– 7	9	7	5	9	5	8			
2,5	6	0	– 7	9	7	5	9	5	8			
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	Identiqcal to Δ_{Bs} and V_{Bs} of inner ring of the same bearing as the outer ring.		
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			

NOTE The tolerances for the outside diameter D_1 of an outer ring flange are given in Table 24.

[a] Applies before mounting and after removal of internal or external snap ring.

[b] Applies to groove ball bearings only.

5.1.4 Tolerance class 5

See Tables 5 and 6.

Table 5 — Inner ring

Tolerance values in micrometres

d mm		Δ_{dmp}		V_{dsp}		V_{dmp}	K_{ia}	S_d	S_{ia} [a]	Δ_{Bs}			V_{Bs}
				Diameter series						all	normal	modified [b]	
				9	0, 1, 2, 3, 4								
>	⩽	high	low	max.		max.		max.		high	low		max.
—	0,6	0	– 5	5	4	3	4	7	7	0	– 40	– 250	5
0,6	2,5	0	– 5	5	4	3	4	7	7	0	– 40	– 250	5
2,5	10	0	– 5	5	4	3	4	7	7	0	– 40	– 250	5
10	18	0	– 5	5	4	3	4	7	7	0	– 80	– 250	5
18	30	0	– 6	6	5	3	4	8	8	0	– 120	– 250	5
30	50	0	– 8	8	6	4	5	8	8	0	– 120	– 250	5
50	80	0	– 9	9	7	5	5	8	8	0	– 150	– 250	6
80	120	0	– 10	10	8	5	6	9	9	0	– 200	– 380	7
120	180	0	– 13	13	10	7	8	10	10	0	– 250	– 380	8
180	250	0	– 15	15	12	8	10	11	13	0	– 300	– 500	10
250	315	0	– 18	18	14	9	13	13	15	0	– 350	– 500	13
315	400	0	– 23	23	18	12	15	15	20	0	– 400	– 630	15

[a] Applies to groove ball bearings only.

[b] Applies to inner rings and outer rings of single bearings made for paired and stack assemblies. Also applies to inner rings with tapered bore with $d \geqslant 50$ mm.

Table 6 — Outer ring

Tolerance values in micrometres

D mm		Δ_{Dmp}		V_{Dsp}		V_{Dmp}	K_{ea}	S_D [a] S_{D1} [b]	S_{ea} [a, b]	S_{ea1} [b]	Δ_{Cs} Δ_{C1s} [b]		V_{Cs} V_{C1s} [b]
				Diameter series									
				9	0, 1, 2, 3, 4								
>	⩽	high	low	max.		max.	max.	max.	max.	max.	high	low	max.
—	2,5	0	– 5	5	4	3	5	8	8	11			5
2,5	6	0	– 5	5	4	3	5	8	8	11			5
6	18	0	– 5	5	4	3	5	8	8	11			5
18	30	0	– 6	6	5	3	6	8	8	11			5
30	50	0	– 7	7	5	4	7	8	8	11			5
50	80	0	– 9	9	7	5	8	8	10	14	Identical to Δ_{Bs} of inner ring of the same bearing as the outer ring.		6
80	120	0	– 10	10	8	5	10	9	11	16			8
120	150	0	– 11	11	8	6	11	10	13	18			8
150	180	0	– 13	13	10	7	13	10	14	20			8
180	250	0	– 15	15	11	8	15	11	15	21			10
250	315	0	– 18	18	14	9	18	13	18	25			11
315	400	0	– 20	20	15	10	20	13	20	28			13
400	500	0	– 23	23	17	12	23	15	23	33			15
500	630	0	– 28	28	21	14	25	18	25	35			18
630	800	0	– 35	35	26	18	30	20	30	42			20

NOTE The tolerances for the outside diameter D_1 of an outer ring flange are given in Table 24.

[a] Does not apply to bearings with flanged outer ring.

[b] Applies to groove ball bearings only.

5.1.5 Tolerance class 4

See Tables 7 and 8.

Table 7 — Inner ring

Tolerance values in micrometres

d mm		Δ_{dmp} Δ_{ds} [a]		V_{dsp} Diameter series		V_{dmp}	K_{ia}	S_d	S_{ia} [b]	Δ_{Bs}			V_{Bs}
				9	0, 1, 2, 3, 4					all	normal	modified [c]	
>	⩽	high	low	max.		max.		max.		high	low		max.
—	0,6	0	– 4	4	3	2	2,5	3	3	0	– 40	– 250	2,5
0,6	2,5	0	– 4	4	3	2	2,5	3	3	0	– 40	– 250	2,5
2,5	10	0	– 4	4	3	2	2,5	3	3	0	– 40	– 250	2,5
10	18	0	– 4	4	3	2	2,5	3	3	0	– 80	– 250	2,5
18	30	0	– 5	5	4	2,5	3	4	4	0	– 120	– 250	2,5
30	50	0	– 6	6	5	3	4	4	4	0	– 120	– 250	3
50	80	0	– 7	7	5	3,5	4	5	5	0	– 150	– 250	4
80	120	0	– 8	8	6	4	5	5	5	0	– 200	– 380	4
120	180	0	– 10	10	8	5	6	6	7	0	– 250	– 380	5
180	250	0	– 12	12	9	6	8	7	8	0	– 300	– 500	6

[a] These deviations apply to diameter series 0, 1, 2, 3 and 4 only.

[b] Applies to groove ball bearings only.

[c] Applies to inner rings and outer rings of single bearings made for paired or stack assemblies.

Table 8 — Outer ring

Tolerance values in micrometres

D mm		Δ_{Dmp} Δ_{Ds} [a]		V_{Dsp} Diameter series		V_{Dmp}	K_{ea}	S_D [b] S_{D1} [c]	S_{ea} [b, c]	S_{ea1} [c]	Δ_{Cs} Δ_{C1s} [c]		V_{Cs} V_{C1s} [c]
				9	0, 1, 2, 3, 4								
>	⩽	high	low	max.		max.	max.	max.	max.	max.	high	low	max.
—	2,5	0	– 4	4	3	2	3	4	5	7			2,5
2,5	6	0	– 4	4	3	2	3	4	5	7			2,5
6	18	0	– 4	4	3	2	3	4	5	7			2,5
18	30	0	– 5	5	4	2,5	4	4	5	7			2,5
30	50	0	– 6	6	5	3	5	4	5	7	Identical to Δ_{Bs} of inner		2,5
50	80	0	– 7	7	5	3,5	5	4	5	7	ring of the		3
80	120	0	– 8	8	6	4	6	5	6	8	same bearing		4
120	150	0	– 9	9	7	5	7	5	7	10	as the outer		5
150	180	0	– 10	10	8	5	8	5	8	11	ring.		5
180	250	0	– 11	11	8	6	10	7	10	14			7
250	315	0	– 13	13	10	7	11	8	10	14			7
315	400	0	– 15	15	11	8	13	10	13	18			8

NOTE The tolerances for the outside diameter D_1 of an outer ring flange are given in Table 24.

[a] These deviations apply to diameter series 0, 1, 2, 3 and 4 only.

[b] Does not apply to bearings with flanged outer ring.

[c] Applies to groove ball bearings only.

5.1.6 Tolerance class 2

See Tables 9 and 10.

Table 9 — Inner ring

Tolerance values in micrometres

d mm		Δ_{dmp} Δ_{ds} [a]		V_{dsp} [a]	V_{dmp}	K_{ia}	S_d	S_{ia} [b]	Δ_{Bs}			V_{Bs}
									all	normal	modified [c]	
>	⩽	high	low	max.	max.	max.	max.	max.	high	low		max.
—	0,6	0	– 2,5	2,5	1,5	1,5	1,5	1,5	0	– 40	– 250	1,5
0,6	2,5	0	– 2,5	2,5	1,5	1,5	1,5	1,5	0	– 40	– 250	1,5
2,5	10	0	– 2,5	2,5	1,5	1,5	1,5	1,5	0	– 40	– 250	1,5
10	18	0	– 2,5	2,5	1,5	1,5	1,5	1,5	0	– 80	– 250	1,5
18	30	0	– 2,5	2,5	1,5	2,5	1,5	2,5	0	– 120	– 250	1,5
30	50	0	– 2,5	2,5	1,5	2,5	1,5	2,5	0	– 120	– 250	1,5
50	80	0	– 4	4	2	2,5	1,5	2,5	0	– 150	– 250	1,5
80	120	0	– 5	5	2,5	2,5	2,5	2,5	0	– 200	– 380	2,5
120	150	0	– 7	7	3,5	2,5	2,5	2,5	0	– 250	– 380	2,5
150	180	0	– 7	7	3,5	5	4	5	0	– 250	– 380	4
180	250	0	– 8	8	4	5	5	5	0	– 300	– 500	5

[a] Applies to diameter series 0, 1, 2, 3 and 4 only.

[b] Applies to groove ball bearings only.

[c] Applies to inner rings and outer rings of single bearings made for paired or stack assemblies.

Table 10 — Outer ring

Tolerance values in micrometres

D mm		Δ_{Dmp} Δ_{Ds} [a]		V_{Dsp} [a]	V_{Dmp}	K_{ea}	S_D [b] S_{D1} [c]	S_{ea} [b, c]	S_{ea1} [c]	Δ_{Cs} Δ_{C1s} [c]		V_{Cs} V_{C1s} [c]
>	⩽	high	low	max.	max.	max.	max.	max.	max.	high	low	max.
—	2,5	0	– 2,5	2,5	1,5	1,5	1,5	1,5	3			1,5
2,5	6	0	– 2,5	2,5	1,5	1,5	1,5	1,5	3			1,5
6	18	0	– 2,5	2,5	1,5	1,5	1,5	1,5	3			1,5
18	30	0	– 4	4	2	2,5	1,5	2,5	4			1,5
30	50	0	– 4	4	2	2,5	1,5	2,5	4	Identical to Δ_{Bs} of inner		1,5
50	80	0	– 4	4	2	4	1,5	4	6	ring of the		1,5
80	120	0	– 5	5	2,5	5	2,5	5	7	same bearing		2,5
120	150	0	– 5	5	2,5	5	2,5	5	7	as the outer		2,5
150	180	0	– 7	7	3,5	5	2,5	5	7	ring.		2,5
180	250	0	– 8	8	4	7	4	7	10			4
250	315	0	– 8	8	4	7	5	7	10			5
315	400	0	– 10	10	5	8	7	8	11			7

NOTE The tolerances for the outside diameter D_1 of an outer ring flange are given in Table 24.

[a] Applies to open and capped bearings of diameter series 0, 1, 2, 3 and 4 only.

[b] Does not apply to bearings with flanged outer ring.

[c] Applies to groove ball bearings only.

5.2 Tapered roller bearings

5.2.1 General

Bore diameter tolerances given in this subclause apply to basically cylindrical bores. Tolerances for tapered bores are given in 5.4.

5.2.2 Normal tolerance class

See Tables 11 to 13.

Table 11 — Inner ring

Tolerance values in micrometres

d mm		Δ_{dmp}		V_{dsp}	V_{dmp}	K_{ia}
>	⩽	high	low	max.	max.	max.
—	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	1 000	0	– 100	100	55	115
1 000	1 250	0	– 125	125	65	130
1 250	1 600	0	– 160	160	80	150
1 600	2 000	0	– 200	200	100	170

Table 12 — Outer ring

Tolerance values in micrometres

D mm		Δ_{Dmp}		V_{Dsp}	V_{Dmp}	K_{ea}
>	≤	high	low	max.	max.	max.
—	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	1 000	0	– 100	100	75	140
1 000	1 250	0	– 125	130	90	160
1 250	1 600	0	– 160	170	100	180
1 600	2 000	0	– 200	210	110	200
2 000	2 500	0	– 250	265	120	220

NOTE The tolerances for the outside diameter D_1 of an outer ring flange are given in Table 24.

Table 13 — Width — Inner rings, outer rings, single-row bearings and single-row subunits

Tolerance values in micrometres

d mm		Δ_{Bs}		Δ_{Cs}		Δ_{Ts}		Δ_{T1s}		Δ_{T2s}	
>	⩽	high	low	high	low	high	low	high	low	high	low
—	10	0	– 120	0	– 120	+ 200	0	+ 100	0	+ 100	0
10	18	0	– 120	0	– 120	+ 200	0	+ 100	0	+ 100	0
18	30	0	– 120	0	– 120	+ 200	0	+ 100	0	+ 100	0
30	50	0	– 120	0	– 120	+ 200	0	+ 100	0	+ 100	0
50	80	0	– 150	0	– 150	+ 200	0	+ 100	0	+ 100	0
80	120	0	– 200	0	– 200	+ 200	– 200	+ 100	– 100	+ 100	– 100
120	180	0	– 250	0	– 250	+ 350	– 250	+ 150	– 150	+ 200	– 100
180	250	0	– 300	0	– 300	+ 350	– 250	+ 150	– 150	+ 200	– 100
250	315	0	– 350	0	– 350	+ 350	– 250	+ 150	– 150	+ 200	– 100
315	400	0	– 400	0	– 400	+ 400	– 400	+ 200	– 200	+ 200	– 200
400	500	0	– 450	0	– 450	+ 450	– 450	+ 225	– 225	+ 225	– 225
500	630	0	– 500	0	– 500	+ 500	– 500	—	—	—	—
630	800	0	– 750	0	– 750	+ 600	– 600	—	—	—	—
800	1 000	0	– 1 000	0	– 1 000	+ 750	– 750	—	—	—	—
1 000	1 250	0	– 1 250	0	– 1 250	+ 900	– 900	—	—	—	—
1 250	1 600	0	– 1 600	0	– 1 600	+ 1 050	– 1 050	—	—	—	—
1 600	2 000	0	– 2 000	0	– 2 000	+ 1 200	– 1 200	—	—	—	—

5.2.3 Tolerance class 6 X

The diameter tolerances and radial runout for inner and outer rings of this tolerance class are the same as those given in Tables 11 and 12 for the normal class.

Width tolerances are given in Table 14.

Table 14 — Width — Inner rings, outer rings, single-row bearings and single-row subunits

Tolerance values in micrometres

d mm		Δ_{Bs}		Δ_{Cs}		Δ_{Ts}		Δ_{T1s}		Δ_{T2s}	
>	⩽	high	low	high	low	high	low	high	low	high	low
—	10	0	− 50	0	− 100	+ 100	0	+ 50	0	+ 50	0
10	18	0	− 50	0	− 100	+ 100	0	+ 50	0	+ 50	0
18	30	0	− 50	0	− 100	+ 100	0	+ 50	0	+ 50	0
30	50	0	− 50	0	− 100	+ 100	0	+ 50	0	+ 50	0
50	80	0	− 50	0	− 100	+ 100	0	+ 50	0	+ 50	0
80	120	0	− 50	0	− 100	+ 100	0	+ 50	0	+ 50	0
120	180	0	− 50	0	− 100	+ 150	0	+ 50	0	+ 100	0
180	250	0	− 50	0	− 100	+ 150	0	+ 50	0	+ 100	0
250	315	0	− 50	0	− 100	+ 200	0	+ 100	0	+ 100	0
315	400	0	− 50	0	− 100	+ 200	0	+ 100	0	+ 100	0
400	500	0	− 50	0	− 100	+ 200	0	+ 100	0	+ 100	0

5.2.4 Tolerance class 5

See Tables 15 to 17.

Table 15 — Inner ring

Tolerance values in micrometres

d mm		Δ_{dmp}		V_{dsp}	V_{dmp}	K_{ia}	S_d
>	≤	high	low	max.	max.	max.	max.
—	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	1 000	0	− 60	60	30	37	30
1 000	1 250	0	− 75	75	37	45	40
1 250	1 600	0	− 90	90	45	55	50

Table 16 — Outer ring

Tolerance values in micrometres

D mm		Δ_{Dmp}		V_{Dsp}	V_{Dmp}	K_{ea}	S_D [a] S_{D1}
>	≤	high	low	max.	max.	max.	max.
—	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	1 000	0	– 60	50	30	43	30
1 000	1 250	0	– 80	65	38	52	38
1 250	1 600	0	– 100	90	50	62	50
1 600	2 000	0	– 125	120	65	73	65

NOTE The tolerances for the outside diameter D_1 of an outer ring flange are given in Table 24.

[a] Does not apply to bearings with flanged outer ring.

Table 17 — Width — Inner rings, outer rings, single-row bearings and single-row subunits

Tolerance values in micrometres

d mm		Δ_{Bs}		Δ_{Cs}		Δ_{Ts}		Δ_{T1s}		Δ_{T2s}	
>	⩽	high	low	high	low	high	low	high	low	high	low
—	10	0	– 200	0	– 200	+ 200	– 200	+ 100	– 100	+ 100	– 100
10	18	0	– 200	0	– 200	+ 200	– 200	+ 100	– 100	+ 100	– 100
18	30	0	– 200	0	– 200	+ 200	– 200	+ 100	– 100	+ 100	– 100
30	50	0	– 240	0	– 240	+ 200	– 200	+ 100	– 100	+ 100	– 100
50	80	0	– 300	0	– 300	+ 200	– 200	+ 100	– 100	+ 100	– 100
80	120	0	– 400	0	– 400	+ 200	– 200	+ 100	– 100	+ 100	– 100
120	180	0	– 500	0	– 500	+ 350	– 250	+ 150	– 150	+ 200	– 100
180	250	0	– 600	0	– 600	+ 350	– 250	+ 150	– 150	+ 200	– 100
250	315	0	– 700	0	– 700	+ 350	– 250	+ 150	– 150	+ 200	– 100
315	400	0	– 800	0	– 800	+ 400	– 400	+ 200	– 200	+ 200	– 200
400	500	0	– 900	0	– 900	+ 450	– 450	+ 225	– 225	+ 225	– 225
500	630	0	– 1 100	0	– 1 100	+ 500	– 500	—	—	—	—
630	800	0	– 1 600	0	– 1 600	+ 600	– 600	—	—	—	—
800	1 000	0	– 2 000	0	– 2 000	+ 750	– 750	—	—	—	—
1 000	1 250	0	– 2 000	0	– 2 000	+ 750	– 750	—	—	—	—
1 250	1 600	0	– 2 000	0	– 2 000	+ 900	– 900	—	—	—	—

5.2.5 Tolerance class 4

See Tables 18 to 20.

Table 18 — Inner ring

Tolerance values in micrometres

d mm		Δ_{dmp} Δ_{ds}		V_{dsp}	V_{dmp}	K_{ia}	S_d	S_{ia}
>	⩽	high	low	max.	max.	max.	max.	max.
—	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 19 — Outer ring

Tolerance values in micrometres

D mm		Δ_{Dmp} Δ_{Ds}		V_{Dsp}	V_{Dmp}	K_{ea}	S_D [a] S_{D1}	S_{ea} [a]	S_{ea1}
>	⩽	high	low	max.	max.	max.	max.	max.	max.
—	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

NOTE The tolerances for the outside diameter D_1 of an outer ring flange are given in Table 24.

[a] Does not apply to bearings with flanged outer ring.

Table 20 — Width — Inner rings, outer rings, single-row bearings and single-row subunits

Tolerance values in micrometres

d mm		Δ_{Bs}		Δ_{Cs}		Δ_{Ts}		Δ_{T1s}		Δ_{T2s}	
>	⩽	high	low	high	low	high	low	high	low	high	low
—	10	0	– 200	0	– 200	+ 200	– 200	+ 100	– 100	+ 100	– 100
10	18	0	– 200	0	– 200	+ 200	– 200	+ 100	– 100	+ 100	– 100
18	30	0	– 200	0	– 200	+ 200	– 200	+ 100	– 100	+ 100	– 100
30	50	0	– 240	0	– 240	+ 200	– 200	+ 100	– 100	+ 100	– 100
50	80	0	– 300	0	– 300	+ 200	– 200	+ 100	– 100	+ 100	– 100
80	120	0	– 400	0	– 400	+ 200	– 200	+ 100	– 100	+ 100	– 100
120	180	0	– 500	0	– 500	+ 350	– 250	+ 150	– 150	+ 200	– 100
180	250	0	– 600	0	– 600	+ 350	– 250	+ 150	– 150	+ 200	– 100
250	315	0	– 700	0	– 700	+ 350	– 250	+ 150	– 150	+ 200	– 100

5.2.6 Tolerance class 2

See Tables 21 to 23.

Table 21 — Inner ring

Tolerance values in micrometres

d mm		Δ_{dmp} Δ_{ds}		V_{dsp}	V_{dmp}	K_{ia}	S_d	S_{ia}
>	⩽	high	low	max.	max.	max.	max.	max.
—	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 22 — Outer ring

Tolerance values in micrometres

D mm		Δ_{Dmp} Δ_{Ds}		V_{Dsp}	V_{Dmp}	K_{ea}	S_D [a] S_{D1}	S_{ea} [a]	S_{ea1}
>	⩽	high	low	max.	max.	max.	max.	max.	max.
—	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

NOTE The tolerances for the outside diameter D_1 of an outer ring flange are given in Table 24.

[a] Does not apply to bearings with flanged outer ring.

Table 23 — Width — Inner rings, outer rings, single-row bearings and single-row subunits

Tolerance values in micrometres

d mm		Δ_{Bs}		Δ_{Cs}		Δ_{Ts}		Δ_{T1s}		Δ_{T2s}	
>	⩽	high	low	high.	low	high	low	high	low	high	low
—	10	0	− 200	0	− 200	+ 200	− 200	+ 100	− 100	+ 100	− 100
10	18	0	− 200	0	− 200	+ 200	− 200	+ 100	− 100	+ 100	− 100
18	30	0	− 200	0	− 200	+ 200	− 200	+ 100	− 100	+ 100	− 100
30	50	0	− 240	0	− 240	+ 200	− 200	+ 100	− 100	+ 100	− 100
50	80	0	− 300	0	− 300	+ 200	− 200	+ 100	− 100	+ 100	− 100
80	120	0	− 400	0	− 400	+ 200	− 200	+ 100	− 100	+ 100	− 100
120	180	0	− 500	0	− 500	+ 200	− 250	+ 100	− 100	+ 100	− 150
180	250	0	− 600	0	− 600	+ 200	− 300	+ 100	− 150	+ 100	− 150
250	315	0	− 700	0	− 700	+ 200	− 300	+ 100	− 150	+ 100	− 150

5.3 Radial bearings, outer ring flanges

Flange outside diameter tolerances given in Table 24 apply to radial ball bearings and tapered roller bearings.

Table 24 — Flange outside diameter tolerances

Tolerance values in micrometres

D_1 mm		Δ_{D1s}			
		Locating flange		**Non-locating flange**	
>	⩽	high	low	high	low
—	6	0	− 36	+ 220	− 36
6	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	+ 1 100	− 175
630	800	0	− 200	+ 1 250	− 200
800	1 000	0	− 230	+ 1 400	− 230
1 000	1 250	0	− 260	+ 1 650	− 260
1 250	1 600	0	− 310	+ 1 950	− 310
1 600	2 000	0	− 370	+ 2 300	− 370
2 000	2 500	0	− 440	+ 2 800	− 440

5.4 Basically tapered bores, tapers 1:12 and 1:30

See Figures 3 and 4.

a) **For taper 1:12**

The taper angle (half the cone angle) is

$\alpha = 2° 23' 9{,}4'' = 2{,}385\ 94° = 0{,}041\ 643$ rad

The diameter at the theoretical large end of the bore is

$$d_1 = d + \frac{1}{12} B$$

b) **For taper 1:30**

The taper angle (half the cone angle) is

$\alpha = 0° 57' 17{,}4'' = 0{,}954\ 84° = 0{,}016\ 665$ rad

The diameter at the theoretical large end of the bore is

$$d_1 = d + \frac{1}{30} B$$

The tolerances for a tapered bore comprise:

— a mean diameter tolerance, given by limits for the mean diameter deviation at the theoretical small end of the bore, Δ_{dmp};

— a taper tolerance, given by limits for the difference between the mean diameter deviations at the two ends of the bore, $\Delta_{d1mp} - \Delta_{dmp}$;

— a tolerance for the diameter variation, V_{dsp}, given by a maximum value applying in any radial plane of the bore.

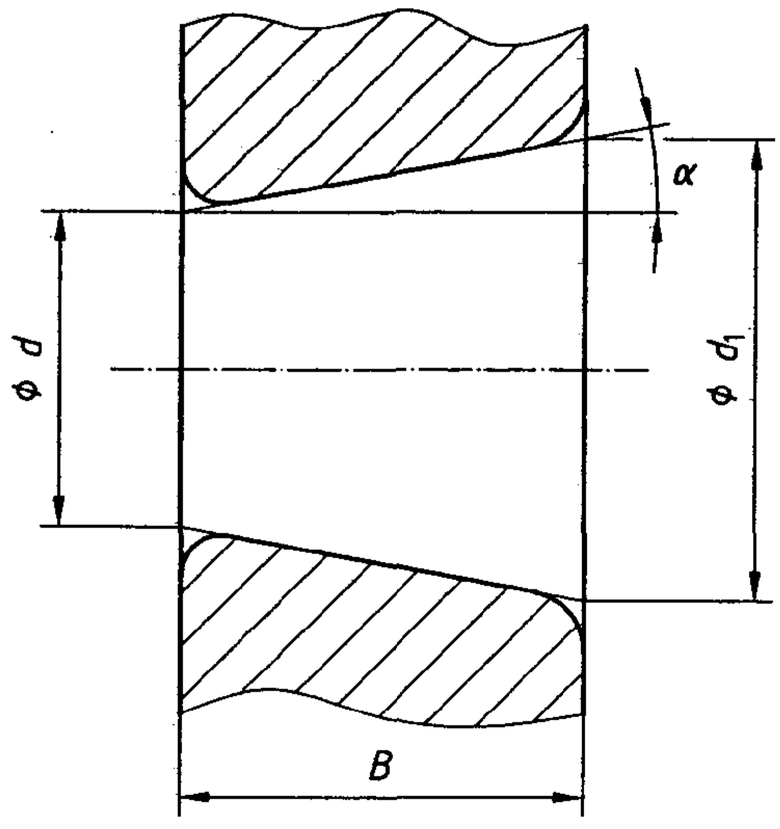


Figure 3 — Nominal tapered bore

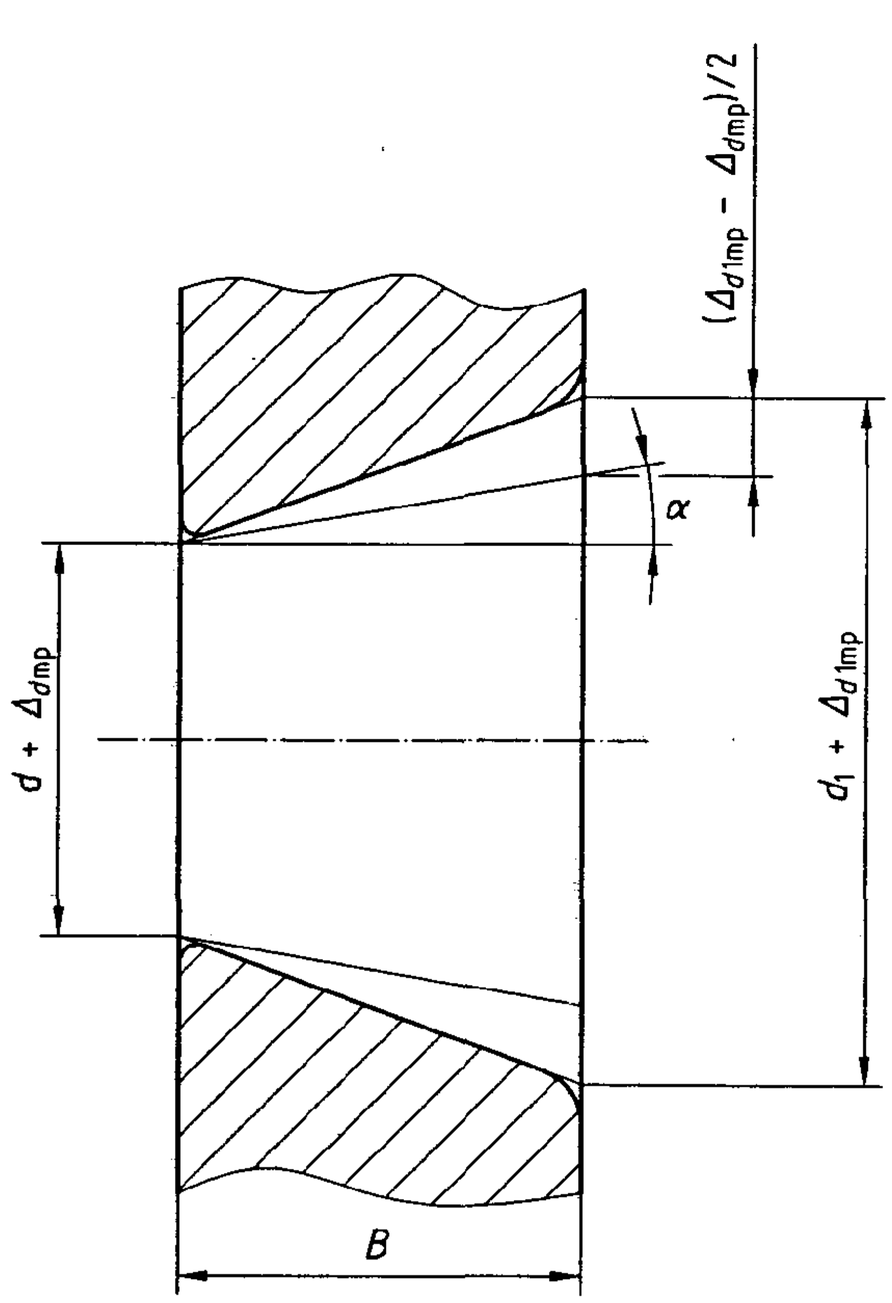


Figure 4 — Tapered bore with mean diameters and their deviations

Tolerances for tapered bores for normal tolerance class are given in Tables 25 and 26.

Table 25 — Tapered bore, taper 1:12

Tolerance values in micrometres

d mm		Δ_{dmp}		$\Delta_{d1mp} - \Delta_{dmp}$		V_{dsp} [a, b]
>	⩽	high	low	high	low	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
500	630	+ 110	0	+ 70	0	70
630	800	+ 125	0	+ 80	0	—
800	1 000	+ 140	0	+ 90	0	—
1 000	1 250	+ 165	0	+ 105	0	—
1 250	1 600	+ 195	0	+ 125	0	—

[a] Applies in any single radial plane of the bore.

[b] Does not apply to diameter series 7 and 8.

Table 26 — Tapered bore, taper 1:30

Tolerance values in micrometres

d mm		Δ_{dmp}		$\Delta_{d1mp} - \Delta_{dmp}$		V_{dsp} [a, b]
>	⩽	high	low	high	low	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

[a] Applies in any single radial plane of the bore.

[b] Does not apply to diameter series 7 and 8.

Bibliography

[1] ISO 286-1:1988, *ISO system of limits and fits — Part 1: Bases of tolerances, deviations and fits*

[2] ISO 286-2:1988, *ISO system of limits and fits — Part 2: Tables of standard tolerance grades and limit deviations for holes and shafts*

[3] ISO 1132-2:2001, *Rolling bearings — Tolerances — Part 2: Measuring and gauging principles and methods*

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