

5. Bearing tolerances

Bearing tolerances have been internationally and nationally standardized in accordance with ISO 492, 199, 582, 1132.

Bearings are generally manufactured to the tolerance class P0. At request, they can also be manufactured to the tolerance classes P6, P6X, P5, P4 and P2. These bearings are used for special applications, such as very accurate shaft guidance or very high speeds.

The values of the limit deviations for these tolerance classes are given for:

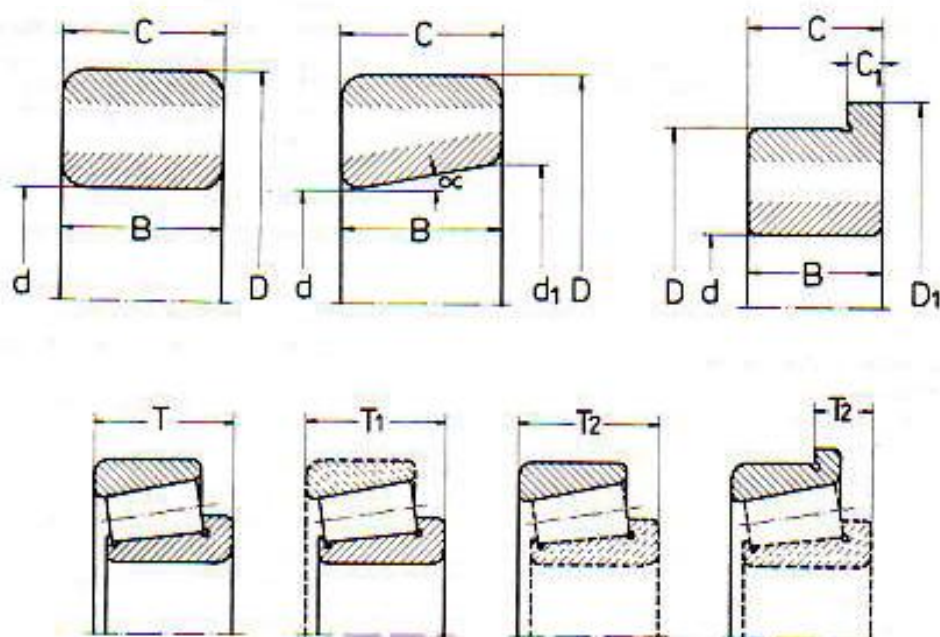
- the overall dimensions of:
 - deep groove ball bearings, angular contact ball bearings, self-aligning ball bearings, spherical roller bearings, cylindrical roller bearings, needle roller bearings, tapered roller bearings,
 - tapered roller bearings with metric(mm) and inch dimensions,
 - tapered bore bearings,
 - thrust ball bearings, angular contact thrust ball bearings, cylindrical roller thrust bearings, needle roller thrust bearings,
- mounting chamfer.

Symbols

d	- nominal bore diameter or shaft washer nominal bore diameter for thrust bearings
d_1	- nominal diameter at the theoretical large end of the tapered bore
d_2	- nominal bore diameter of the shaft washer for double direction thrust bearings
d_s	- deviation of single bore diameter
d_{psmax}	- maximum bore diameter, in a single radial plane
d_{psmin}	- minimum bore diameter, in a single radial plane
Δd_s	- deviation of a single bore diameter $\Delta d_s = d_s - d$
d_{mp}	- mean bore diameter, in a single radial plane $d_{mp} = (d_{psmax} + d_{psmin})/2$
Δd_{mp}	- deviation of the mean bore diameter in a single radial plane; or deviation of the mean diameter at the theoretical small end of the tapered bore, in case of tapered bore bearings; or deviation

	of the mean bore diameter of the shaft washer in a single radial plane for single direction thrust bearings $\Delta d_{mp} = d_{mp} - d$
d_{1mp}	- mean diameter at the large theoretical end of the tapered bore in a single plane.
Δd_{1mp}	- deviation of the mean diameter at the theoretical large end of the tapered bore $\Delta d_{1mp} = d_{1mp} - d$
Δd_{2mp}	- deviation of the mean bore diameter of the shaft washer for a double direction thrust bearing, in a single radial plane
V_{dp}	- bore diameter variation in a single radial plane; or bore diameter variation of the shaft washer in a single radial plane, for single direction thrust bearings $V_{dp} = d_{psmax} - d_{psmin}$
V_{d2p}	- bore diameter variation of the shaft washer for double direction thrust bearings, in a single radial plane
V_{dmp}	- mean bore diameter variation (valid only for cylindrical bore) $V_{dmp} = d_{mpmax} - d_{mpmin}$
α	- nominal half-angle of the tapered bore
D	- nominal outside diameter or housing washer nominal diameter
D_1	- nominal outside diameter of the outer ring rib
D_s	- single outside diameter
D_{psmax}	- maximum outside diameter in a single radial plane
D_{psmin}	- minimum outside diameter in a single radial plane
ΔD_s	- deviation of the single outside diameter $\Delta D_s = D_s - D$
D_{mp}	- mean outside diameter, in a single plane $D_{mp} = (D_{psmax} + D_{psmin})/2$
ΔD_{mp}	- deviation of the mean outside diameter in a single radial plane; or deviation of the mean diameter of housing washer in a single radial plane, for thrust bearings $\Delta D_{mp} = D_{mp} - D$
V_{Dp}	- outside diameter variation in a single radial plane; or housing washer diameter variation in a single radial plane for double direction thrust bearings $V_{Dp} = D_{psmax} - D_{psmin}$
V_{Dmp}	- mean outside diameter variation
B	- nominal width of the inner ring

B_s	- single width of the inner ring	S_d	- side face runout with reference to bore of the inner ring
ΔB_s	- inner ring single width deviation $\Delta B_s = B_s - B$	S_D	- variation in inclination of outside cylindrical surface to outer ring side face
V_{B_s}	- inner ring single width variation	S_{ia}	- side face runout of assembled inner ring with reference to raceway
C	- nominal width of the outer ring	S_{ea}	- side face runout of assembled outer ring with reference to raceway
C_s	- single width of the outer ring	S_i	- thickness variation measured from middle of raceway to back seating face of shaft washer
ΔC_s	- deviation of outer ring single width $\Delta C_s = C_s - C$	S_e	- thickness variation measured from middle of raceway to back face of housing washer
V_{C_s}	- single width variation of the outer ring $V_{C_s} = C_{smax} - C_{smin}$	ΔH_s	- deviation of mounting height of single direction thrust ball and roller bearings
T	- nominal width of tapered roller bearings	ΔH_{1s}	- deviation of mounting height of thrust ball bearings with sphered housing washer
T_s	- single width of tapered roller bearings	ΔH_{2s}	- deviation of mounting height of double direction thrust ball and roller bearings
ΔT_s	- deviation of the single width of taper roller bearings $\Delta T_s = T_s - T$	ΔH_{3s}	- deviation of mounting height of double direction thrust ball bearings with sphered housing washer
T_1	- nominal width of the inner ring and tapered roller assembly	ΔH_{4s}	- deviation of mounting height of spherical roller thrust bearings
T_{1s}	- single width of the inner ring and tapered roller assembly		
ΔT_{1s}	- deviation of the single width of inner ring and tapered roller assembly $\Delta T_{1s} = T_{1s} - T_1$		
T_2	- nominal width of the outer ring assembly		
T_{2s}	- single width of the outer ring assembly		
ΔT_{2s}	- deviation of the single width of outer ring assembly $\Delta T_{2s} = T_{2s} - T_2$		
K_{ia}	- radial runout of assembled bearing inner ring		
K_{ea}	- radial runout of assembled bearing outer ring		



Radial bearings (excepting tapered roller bearings) Tolerance class P0

Inner ring

Table 5.1

Table 3.1

Deviations μm												
d mm	Δd_{mp}		V_{dp}				V_{dmp}	K_{α}	ΔB_{α}			$V_{B_{\alpha}}$
			Diameter series			all			normal	modified ²⁾		
				7,8,9	0,1	2,3,4						
over	up to	high	low	max.	max.	max.	max.	max.	high	low	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	-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

1) This value included.

2) It refers to isolated bearing ring for paired mounting or stack mounting.

Outer ring

Table 5.2

Table 5.2

Deviations μm

D mm	ΔD_{mp}		$V_{Dp}^{3)}$				$V_{Dmp}^{3)}$		K_{α}	ΔC_{α}		$V C_{\alpha}$
			Open bearings			Shielded bearings ²⁾						
			Diameter series									
			7,8,9	0,1	2,3,4							
over	up to	high	low	max.	max.	max.	max.	max.	high	low	max.	
2,5 ¹⁾	6	0	-8	10	8	6	10	6	15	Values are identical to ΔB_{α} and $V B_{\alpha}$ for the inner ring 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	-16	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	-	-	-	-	-	180			
1 250	1 600	0	-160	-	-	-	-	-	190			
1 600	2 000	0	-200	-	-	-	-	-	220			
2 000	2 500	0	-250	-	-	-	-	-	250			

1) This value included.

2) For bearings of diameter series 7,8,9,0 and 1 values are not indicated.

3) Values are valid before mounting the snap ring or shields or after their dismounting.

Tolerance class P6

Inner ring

Deviations μm

Table 5.3

d mm	Δd_{mp}		V_{dp}			V_{dmp}	K_{ia}	ΔB_s		V_{Bs}		
			Diameter series 7,8,9 0,1 2,3,4					all	normal	modified ²⁾		
over	up to	high	low	max.	max.	max.	max.	max.	high	low	max.	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	8	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	-360	25
80	120	0	-15	19	19	11	11	13	0	-200	-360	25
120	180	0	-16	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

1) This value included.

2) If refers to isolated bearing ring for paired mounting or stack mounting.

Outer ring

Deviations μm

Table 5.4

Table 3.4

D mm	ΔD_{mp}		$V_{Dp}^{3)}$				$V_{Dmp}^{2)3)} K_{es}$	ΔC_s	$V C_s$			
			Open bearings		Shielded bearings							
			Diameter series									
			7,8,9	0,1	2,3,4	0,1,2,3,4						
over	up to	high	low	max.	max.	max.	max.	max.	max.	high	low	max.
2,5 ¹⁾	6	0	-7	9	7	5	9	5	8	Values are identical to ΔB_s and $V B_s$ for the inner ring		
6	18	0	-7	9	7	5	9	6	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	16			
120	150	0	-15	19	19	11	25	11	20			
150	180	0	-16	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			

1) This value included.

2) For bearings of diameter series 7,8 and 9 values are not indicated.

3) Values are valid before mounting the snap ring or shields or after their dismounting.

Tolerance class P5

Inner ring

Deviations μm

Table 5.5

d mm	Δd_{mp}		V_{dp}		V_{dmp}	K_{ia}	S_d	$S_{ia}^{2)}$	ΔB_s			V_{Bs}	
			Diameter series 7,8,9	0,1, 2,3,4					all	norm.	modi- fied ³⁾		
over	up to	sup	low	max.	max.	max.	max.	max.	high	low	low	max.	
0,6 ¹⁾	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	-8	8	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	-8	8	7	5	5	8	8	0	-150	-250	6
80	120	0	-10	10	8	5	6	9	9	0	-200	-360	7
120	180	0	-13	13	10	7	8	10	10	0	-250	-360	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	-25	25	18	12	15	15	20	0	-400	-630	15

1) This value included.

2) Applies only to ball bearings.

3) It refers to single bearing ring for paired mounting or stack mounting.

Outer ring

Deviations μm

Table 5.6

D mm	ΔD_{mp}		$V_{Dp}^{2)}$ Diameter series 7,8,9 0,1,2, 3,4		V_{Dmp}	K_{ea}	S_D	$S_{ea}^{3)}$	ΔC_s		V_{Cs}
									high	low	
over	up to	high	low	max.	max.	max.	max.	max.	high	low	max.
2,5 ¹⁾	6	0	-5	5	4	3	5	8	Identical to ΔB_s for the inner ring		5
6	18	0	-5	5	4	3	5	8			5
18	30	0	-8	6	5	3	6	8			5
30	50	0	-7	7	5	4	7	8			5
50	80	0	-9	9	7	5	8	8			6
80	120	0	-10	10	8	5	10	9			8
120	150	0	-11	11	8	6	11	10			8
150	180	0	-13	13	10	7	13	10			8
100	250	0	-15	15	11	8	15	11			10
250	315	0	-18	18	14	9	18	13			11
315	400	0	-20	20	15	10	20	13			13
400	500	0	-23	23	17	12	23	15			15
500	630	0	-28	28	21	14	25	18			18
630	800	0	-35	35	26	18	30	20			20

1) This value included.

2) Do not apply to shielded bearings.

3) Apply to ball bearings.

Tolerance class P4

Inner ring

Table 5.7

Deviations μm													
d mm	$\Delta_{\text{dmp}}, \Delta_{\text{ds}}^{2)}$			$V_{\text{dp}}^{3)}$		V_{dmp}	K_{ia}	S_{d}	$S_{\text{ia}}^{3)}$	Δ_{Bs}			V_{Bs}
				Diameter series						all	normal	modified ⁴⁾	
	over	up to	high	low	max.	max.	max.	max.	max.	high	low	low	max.
0,6 ¹⁾	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

1) This value included.

2) Apply only to bearings of diameter series 0,1,2,3,4.

3) Apply only to ball bearings.

4) It refers to single bearing ring for paired mounting or stack mounting.

Outer ring

Table 5.8

Deviations μm													
D mm	$\Delta_{\text{Dmp}}, \Delta_{\text{Ds}}^{2)}$			$V_{\text{Dp}}^{3)}$		V_{Dmp}	K_{ea}	S_{D}	$S_{\text{ea}}^{4)}$	Δ_{Cs}		V_{Cs}	
				Diameter series									
	over	up to	high	low	max.	max.	max.	max.	max.	high	low	max.	
2,5 ¹⁾	6	0	-4	4	3	2	3	4	5	Identical to Δ_{Bs} for the inner ring		2,5	
6	18	0	-4	4	3	2	3	4	5			2,5	
18	30	0	-5	5	4	2,5	4	4	5			2,5	
30	50	0	-6	6	5	3	5	4	5			2,5	
50	80	0	-7	7	5	3,5	5	4	5			3	
80	120	0	-8	8	6	4	6	5	6			4	
120	150	0	-8	8	7	5	7	5	7			5	
150	180	0	-10	10	8	5	8	5	8			5	
180	250	0	-11	11	8	6	10	7	10			7	
250	315	0	-13	13	10	7	11	8	10			7	
315	400	0	-15	15	11	8	13	10	13			8	

1) This value included.

2) Apply to bearings of diameter series 0,1,2,3 and 4.

3) Do not apply to sealed and shielded bearings.

4) Apply only to ball bearings.

Tolerance class P2

Inner ring

Table 5.9

Deviations μm												
d	$\Delta d_{\text{mp}} - \Delta d_{\text{s}}$			V_{dp}	V_{dmp}	K_{da}	S_{d}	$S_{\text{da}}^{2)}$	ΔB_{s}	V_{Bs}		
mm	over	up to	high	low	max.	max.	max.	max.	max.	high	low	max.
0,6 ¹⁾	2,5	0	-2,5	2,5	1,5	1,5	1,5	1,5	0	-40		1,5
2,5	10	0	-2,5	2,5	1,5	1,5	1,5	1,5	0	-40		1,5
10	18	0	-2,5	2,5	1,5	1,5	1,5	1,5	0	-80		1,5
18	30	0	-2,5	2,5	1,5	2,5	1,5	2,5	0	-120		1,5
30	50	0	-2,5	2,5	1,5	2,5	1,5	2,5	0	-120		1,5
50	80	0	-4	4	2	2,5	1,5	2,5	0	-150		1,5
80	120	0	-5	5	2,5	2,5	2,5	2,5	0	-200		2,5
120	150	0	-7	7	3,5	2,5	2,5	2,5	0	-250		2,5
150	180	0	-7	7	3,5	5	4	5	0	-300		4
180	250	0	-8	8	4	5	5	5	0	-350		5

1) This value included.

2) Apply only to ball bearings.

Outer ring

Table 5.10

Deviations μm												
D	$\Delta D_{\text{mp}} - \Delta D_{\text{s}}$			V_{Dp}	V_{Dmp}	K_{Da}	$S_{\text{D}}^{2)3)}$	$S_{\text{Da}}^{2)}$	ΔC_{s}	V_{Cs}		
mm	over	up to	high	low	max.	max.	max.	max.	max.	high	low	max.
2,5 ¹⁾	6	0	-2,5	2,5	1,5	1,5	1,5	1,5	Identical to ΔB_{s} for the inner- ring			1,5
6	18	0	-2,5	2,5	1,5	1,5	1,5	1,5				1,5
18	30	0	-4	4	2	2,5	1,5	2,5				1,5
30	50	0	-4	4	2	2,5	1,5	2,5				1,5
50	80	0	-4	4	2	4	1,5	4				1,5
80	120	0	-5	5	2,5	5	2,5	5				2,5
120	150	0	-5	5	2,5	5	2,5	5				2,5
150	180	0	-7	7	3,5	5	2,5	5				2,5
180	250	0	-8	8	4	7	4	7				4
250	315	0	-8	8	4	7	5	7				5
315	400	0	-10	10	5	8	7	8				7

1) This value included.

2) Do not apply to bearings with rib on the inner ring.

3) Apply only to ball bearings.

Tolerance class SP

Inner ring

Deviations μm

Tabelul 5.11

d mm	Cylindrical bore				Tapered bore											
	$\Delta_{\text{dmp}}, \Delta_{\text{ds}}$		V_{dp}		Δ_{ds}		V_{dp}		$\Delta_{\text{d1mp}} - \Delta_{\text{dmp}}$		Δ_{Bs}		V_{Bs}		K_{Is}	
over	up to	low	high	max.	low	high	max.	low	high	low	high	max.	max.	max.	max.	max.
-	18	-5	0	3	-	-	-	-	-	-100	0	5	3	8	8	8
18	30	-8	0	3	0	+10	3	0	+4	-100	0	5	3	8	8	8
30	50	-8	0	4	0	+12	4	0	+4	-120	0	5	4	8	8	8
50	80	-9	0	5	0	+15	5	0	+5	-150	0	8	4	8	8	8
80	120	-10	0	5	0	+20	5	0	+8	-200	0	7	5	8	8	8
120	180	-13	0	7	0	+25	7	0	+8	-250	0	8	8	10	10	10
180	250	-15	0	8	0	+30	8	0	+10	-300	0	10	8	11	13	13
250	315	-18	0	9	0	+35	9	0	+12	-350	0	13	10	13	15	15
315	400	-23	0	12	0	+40	12	0	+13	-400	0	15	12	15	20	20
400	500	-28	0	14	0	+45	14	0	+15	-450	0	25	12	18	23	23
500	630	-35	0	18	0	+50	18	0	+17	-500	-	30	15	20	25	25

Outer ring

Deviations μm

Table 5.12

D mm	$\Delta_{\text{Dmp}}, \Delta_{\text{Ds}}$		V_{Dp}		K_{Es}		S_{D}		S_{Es}		Δ_{Cs}		V_{Cs}	
over	up to	low	high	max.	max.	max.	max.	max.	max.	max.	max.	max.	max.	max.
30	50	-7	0	4	5	8	8	8	Identical to Δ_{Bs} and V_{Bs} for the inner ring					
50	80	-9	0	5	5	8	10	10						
80	120	-10	0	5	6	8	11	11						
120	150	-11	0	6	7	10	13	13						
150	180	-13	0	7	8	10	14	14						
180	250	-15	0	8	10	11	15	15						
250	315	-18	0	9	11	13	18	18						
315	400	-20	0	10	13	13	20	20						
400	500	-23	0	12	15	15	23	23						
500	600	-28	0	14	17	18	25	25						
630	800	-35	0	18	20	20	30	30						

Tolerance class UP

Inner ring

Deviations μm

Table 5.13

d mm	Cylindrical bore				Tapered bore								VBe	K _{Is}	S _d	S _{Is}
	Δdmp, Δds		Vdp	Δds	Vdp	Δdtmp, Δdmp		ΔBs								
over	up to	low	high	max.	low	high	max.	low	high	low	high	max.	max.	max.	max.	
—	18	-4	0	2	—	—	—	—	—	-25	0	1,5	1,5	2	3	
18	30	-5	0	3	0	+6	3	0	+2	-25	0	1,5	1,5	3	3	
30	50	-6	0	3	0	+8	3	0	+3	-30	0	2	2	3	3	
50	80	-7	0	4	0	+8	4	0	+3	-40	0	3	2	4	3	
80	120	-8	0	4	0	+10	4	0	+4	-50	0	3	3	4	4	
120	180	-10	0	5	0	+13	5	0	+5	-60	0	4	3	5	6	
180	250	-12	0	6	0	+15	6	0	+7	-75	0	5	4	6	7	
250	315	-18	0	9	0	+18	9	0	+8	-90	0	6	5	6	8	
315	400	-23	0	12	0	+23	12	0	+9	-100	0	8	6	8	9	
400	500	-28	0	14	0	+28	14	0	+10	-150	0	10	7	9	1	
500	630	-35	0	18	0	+35	18	0	+11	-200	0	12	8	12	1	

Outer ring

Deviations μm

Tabelul 5.14

D mm		$\Delta D_{mp}, \Delta D_S$		V_{Dp}	K_{es}	S_D	S_{es}	ΔC_s	$V C_s$
over	up to	low	high	max.	max.	max.	max.		
30	50	-5	0	3	3	2	4	Identical to ΔB_S and $V B_S$ for the inner ring	
50	80	-6	0	3	3	2	4		
80	120	-7	0	4	3	3	5		
120	150	-8	0	4	4	3	6		
150	180	-8	0	5	4	3	7		
180	250	-10	0	5	5	4	9		
250	315	-12	0	6	6	4	9		
315	400	-14	0	7	7	5	12		
400	500	-23	0	12	8	—	12		
500	630	-28	0	14	10	—	14		
630	800	-35	0	18	12	—	17		

5.2. Tapered roller bearings

Tolerance class P0 and P6X

Inner ring

Deviations μm

Table 5.15

d mm	Δd_{mp}		V_{dp}		V_{dmp}		K_{ia}
	over	up to	high	low	max.	max.	
10 ¹⁾	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	28	60	
315	400	0	-40	40	30	70	

1) This value included.

Outer ring

Deviations μm

Table 5.16

D mm	ΔD_{mp}		V_{Dp}		V_{Dmp}		K_{oe}
	over	up to	high	low	max.	max.	
18 ¹⁾	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	60	
250	315	0	-35	35	28	60	
315	400	0	-40	40	30	70	
400	500	0	-45	45	34	80	
500	630	0	-50	50	38	100	

1) This value included.

Note: Limit deviations of the diameter D_1 of the outer ring rib for bearings with ribs are in accordance with tolerance class h9, STAS 8100/2-88.

Tolerance class P0

Inner and outer ring

Deviations μm

Table 5.17

d mm	$\Delta B_s, \Delta C_s$		ΔT_s		$\Delta T1_s$		$\Delta T2_s$	
	over	up to	high	low	high	low	high	low
10 ¹⁾	18	0	-120	+200	0	+100	0	+100
18	30	0	-120	+200	0	+100	0	+100
30	50	0	-120	+200	0	+100	0	+100
50	80	0	-150	+200	0	+100	0	+100
80	120	0	-200	+200	-200	+100	-100	+100
120	180	0	-250	+350	-250	+150	-150	+200
180	250	0	-300	+350	-250	+150	-150	+200
250	315	0	-350	+350	-250	+150	-150	+200
315	400	0	-400	+400	-400	+200	-200	+200

1) This value included.

Tolerance class P6X

Inner and outer ring

Diameter limit deviations and radial runout of the inner and outer ring for this tolerance class are the same as those of tolerance class P0.

Deviations μm

Table 5.18

d mm	ΔB_s		ΔC_s		ΔT_s		$\Delta T1_s$		$\Delta T2_s$	
	over	up to	high	low	high	low	high	low	high	low
10 ¹⁾	18	0	-50	0	-100	+100	0	+50	0	+50
18	30	0	-50	0	-100	+100	0	+50	0	+50
30	50	0	-50	0	-100	+100	0	+50	0	+50
50	80	0	-50	0	-100	+100	0	+50	0	+50
80	120	0	-50	0	-100	+100	0	+50	0	+50
120	180	0	-50	0	-100	+150	0	+50	0	+100
180	250	0	-50	0	-100	+150	0	+50	0	+100
250	315	0	-50	0	-100	+200	0	+100	0	+100
315	400	0	-50	0	-100	+200	0	+100	0	+100

1) This value included.

Tolerance class P5

Inner ring

Table 5.19

Deviations μm											
d	Δd_{mp}		V_{dp}		V_{dmp}		K_{ls}	S_d	ΔB_s		ΔT_s
mm	over	up to	high	low	max.	max.	max.	max.	high	low	high low
10 ¹⁾	18	0	-7	5	5	5	5	7	0	-200	+200 -200
18	30	0	-8	8	5	5	5	8	0	-200	+200 -200
30	50	0	-10	8	5	6	6	8	0	-240	+200 -200
50	80	0	-12	9	6	7	7	9	0	-300	+200 -200
80	120	0	-15	11	8	8	8	9	0	-400	+200 -200
120	180	0	-18	14	9	11	11	10	0	-500	+350 -250
180	250	0	-22	17	11	13	13	11	0	-600	+350 -250

1) This value included.

Outer ring

Table 5.20

Deviations μm										
D	ΔD_{mp}		V_{Dp}		V_{Dmp}		K_{es}	S_D	ΔC_s	
mm	over	up to	high	low	max.	max.	max.	max.	high	low
18 ¹⁾	30	0	-8	6	5	6	6	8	Identical to ΔB_s for the inner ring	
30	50	0	-9	7	5	7	7	8		
50	80	0	-11	8	6	8	8	8		
80	120	0	-13	10	7	10	10	9		
120	150	0	-15	11	8	11	11	10		
150	180	0	-18	14	9	13	13	10		
180	250	0	-20	15	10	15	15	11		
250	315	0	-25	18	13	18	18	13		
315	400	0	-26	22	14	20	20	13		

1) This value included.

Note Limit deviations of diameter D_1 of the outer ring for bearings with ribs are in accordance with tolerance class h8, STAS 8100/2.

Tolerance class P4

Inner ring

Deviations μm

Table 5.21

d mm	$\Delta d_{mp}, \Delta d_s$			V_{dp}	V_{dmp}	K_{Ja}	S_d	S_{Ja}	ΔB_s		ΔT_s	
over	up to	high	low	max.	max.	max.	max.	max.	high	low	high	low
10 ¹⁾	18	0	-5	4	4	3	3	3	0	-200	+200	-200
18	30	0	-6	5	4	3	4	4	0	-200	+200	-200
30	50	0	-8	6	5	4	4	4	0	-240	+200	-200
50	80	0	-9	7	5	4	5	4	0	-300	+200	-200
80	120	0	-10	8	5	5	5	5	0	-400	+200	-200
120	180	0	-13	10	7	6	6	7	0	-600	+350	-250
180	250	0	-15	11	8	8	7	8	0	-600	+350	-250

1) This value included.

Outer ring

Deviations μm

Table 5.22

D mm		$\Delta D_{mp}, \Delta D_s$		V_{Dp}	V_{Dmp}	K_{es}	S_D	S_{es}	ΔC_s	
over	up to	high	low	max.	max.	max.	max.	max.	high	low
18	30	0	-8	5	4	4	4	5	Identical to ΔB_s for the inner ring	
30	50	0	-7	5	5	5	4	5		
50	80	0	-9	7	5	5	4	6		
80	120	0	-10	8	5	6	5	6		
120	150	0	-11	8	6	7	5	7		
150	180	0	-13	10	7	8	5	8		
180	250	0	-15	11	8	10	7	10		
250	315	0	-18	14	8	11	8	10		
315	400	0	-20	15	10	13	10	13		

1) This value included.

Note Limit deviations of diameter D_1 of the outer ring for bearings with ribs are in accordance with tolerance class h9, STAB 8100/3.

Tapered roller bearings, inch-metric sizes (AFBMA)

Inner ring— Δ_{dmp}

Deviations μm

Table 5.23

d mm		Tolerance classes									
		4		2		3		0		00	
over	up to	high	low	high	low	high	low	high	low	high	low
—	76,2	+13	0	+13	0	+13	0	+13	0	+8	0
76,2	266,7	+25	0	+25	0	+13	0	+13	0	+8	0
266,7	304,8	+25	0	+25	0	+13	0	+13	0	—	—
304,8	609,6	+51	0	+51	0	+25	0	—	—	—	—
609,6	914,4	+76	0	—	—	+38	0	—	—	—	—
914,4	1 219,2	+102	0	—	—	+51	0	—	—	—	—
1 219,2	—	+127	0	—	—	+76	0	—	—	—	—

Outer ring— Δ_{Dmp}

Deviations μm

Table 5.24

D mm		Tolerance classes									
		4		2		3		0		00	
over	up to	high	low	high	low	high	low	high	low	high	low
—	266,7	+25	0	+25	0	+13	0	+13	0	+8	0
266,7	304,8	+25	0	+25	0	+13	0	+13	0	—	—
304,8	609,6	+51	0	+51	0	+25	0	—	—	—	—
609,6	914,4	+76	0	+76	0	+38	0	—	—	—	—
914,4	1 219,2	+102	0	—	—	+51	0	—	—	—	—
1 219,2	—	+127	0	—	—	+76	0	—	—	—	—

Assembled bearing— K_{ia}, K_{es}

Deviations μm

Table 5.25

D mm		Tolerance classes				
		4	2	3	0	00
over	up to	max.	max.	max.	max.	max.
—	266,7	51	38	8	4	2
266,7	304,8	51	38	8	4	—
304,8	609,6	51	38	18	—	—
609,6	914,4	76	51	51	—	—
914,4	—	76	—	76	—	—

Assembled bearing $-\Delta_{T_0}$

Deviations μm

Table 5.26

d mm		D mm		Tolerance classes									
				4		2		3		0		00	
over	up to	over	up to	high	low	high	low	high	low	high	low	high	low
-	101,6	-	-	+203	-	+203	0	+203	-203	+203	-203	+203	-203
101,6	256,7	-	-	+356	-254	+203	0	+203	-203	+203	-203	+203	-203
256,7	304,8	-	-	+356	-254	+203	0	+203	-203	+203	-203	-	-
304,8	609,6	-	508,0	+381	-381	+381	-381	+203	-203	-	-	-	-
304,8	609,6	508,0	-	+381	-381	+381	-381	+381	-381	-	-	-	-
609,6	-	-	-	+381	-381	-	-	+381	-381	-	-	-	-

Inner roller ring - standard outer ring assembly $-\Delta_{T1_0}$

Deviations μm

Table 5.27

d mm		D mm		Tolerance classes									
				4		2		3		0		00	
over	up to	over	up to	high	low	high	low	high	low	high	low	high	low
-	101,6	-	-	+102	0	+102	0	+102	-102	+102	-102	+102	-102
101,6	304,8	-	-	+152	-152	+102	0	+102	-102	+102	-102	+102	-102
304,8	609,6	-	508,0	+178	-178	+178	-178	+102	-102	-	-	-	-
304,8	609,6	508,0	-	-	+178	-178	+178	-178	+178	-178	-	-	-
609,6	-	-	-	+178	-178	-	-	+178	-178	-	-	-	-

Outer ring with gauge inner ring assembly $-\Delta_{T2_0}$

Abateni in μm

Tabela 5.28

d mm		D mm		Tolerance classes									
				4		2		3		0		00	
over	up to	over	up to	high	low	high	low	high	low	high	low	high	low
-	101,6	-	-	+102	0	+102	0	+102	-102	+102	-102	+102	-102
101,6	304,8	-	-	+203	-102	+102	0	+102	-102	+102	-102	+102	-102
304,8	609,6	-	508,0	+203	-203	+203	-203	+102	-102	-	-	-	-
304,8	609,6	508,0	-	+203	-203	+203	-203	+203	-203	-	-	-	-
609,6	-	-	-	+203	-203	-	-	+203	-203	-	-	-	-

Tapered bore bearings Taper 1:12

Table 5.29

Deviations μm

d mm		Normal tolerance class P6 Δ_{dmp}			$\Delta_{d1mp} - \Delta_{dmp}$		Tolerance class P5 Δ_{dmp}		$V_{dp}^{1)}$ max.	$\Delta_{d1mp} - \Delta_{dmp}$	
		high	low	max.	high	low	high	low		high	low
over	up to										
18	30	+21	0	13	+21	0	+13	0	13	+13	0
30	50	+25	0	15	+25	0	+16	0	15	+16	0
50	80	+30	0	19	+30	0	+19	0	19	+19	0
80	120	+35	0	25	+35	0	+22	0	22	+22	0
120	180	+40	0	31	+40	0	+25	0	25	+25	0
180	250	+48	0	38	+48	0	+29	0	29	+29	0
250	315	+52	0	44	+52	0	+32	0	32	+32	0
315	400	+57	0	50	+57	0	+36	0	36	+36	0
400	500	+63	0	56	+63	0	+40	0	—	+40	0
500	630	+70	0	—	+70	0	+44	0	—	+44	0
630	800	+80	0	—	+80	0	+50	0	—	+50	0
800	1 000	+90	0	—	+90	0	+56	0	—	+56	0
1 000	1 250	+105	0	—	+105	0	+66	0	—	+66	0
1 250	1 600	+125	0	—	+125	0	+78	0	—	+78	0
1 600	2 000	+150	0	—	+150	0	+92	0	—	+92	0

1) Applies in all single radial planes of the bore.

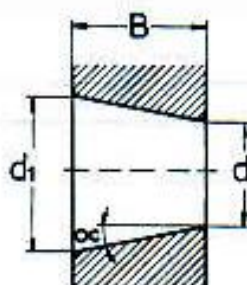
Taper 1:30

Table 5.30

Deviations μm

d mm		Normal tolerance class Δ_{dmp}			$\Delta_{d1mp} - \Delta_{dmp}$	
		high	low	max.	high	low
over	up to					
80	120	+20	0	25	+40	0
120	180	+25	0	31	+50	0
180	250	+30	0	38	+55	0
250	315	+35	0	44	+60	0
315	400	+40	0	50	+65	0
400	500	+45	0	56	+75	0
500	630	+50	0	63	+85	0
630	800	+75	0	—	+100	0
800	1 000	+100	0	—	+100	0
1 000	1 250	+125	0	—	+115	0
1 250	1 600	+160	0	—	+125	0
1 600	2 000	+200	0	—	+150	0

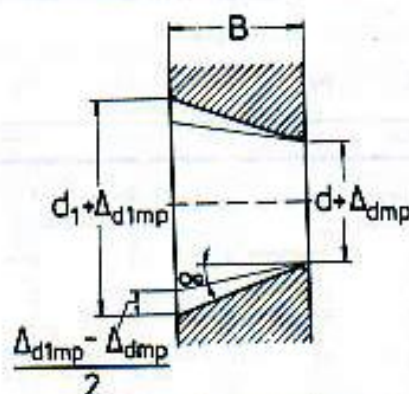
1) Applies in all singular planes.



Tapered bore
Half angle of taper, α

$\alpha = 2^\circ 23' 9,4''$ (taper 1:12)

$\alpha = 0^\circ 57' 17,4''$ (taper 1:30)



Nominal diameter, d_1 at the
theoretical large end of bore

$d_1 = d + \frac{1}{12} B$ (taper 1:12)

$d_1 = d + \frac{1}{30} B$ (taper 1:30)

Thrust bearings Shaft washer

Deviations μm

Table 5.31

d_1, d_2 mm		P0; P6; P5 Δd_{mp} Δd_{2mp}			P4; P2 Δd_{mp} Δd_{2mp}		
over	up to	high	low	max.	high	low	max.
—	18	0	-8	6	0	-7	5
18	30	0	-10	8	0	-8	6
30	50	0	-12	9	0	-10	8
50	80	0	-15	11	0	-12	9
80	120	0	-20	15	0	-15	11
120	180	0	-25	19	0	-18	14
180	250	0	-30	23	0	-22	17
250	315	0	-35	26	0	-25	19
315	400	0	-40	30	0	-30	23
400	500	0	-45	34	0	-35	26
500	630	0	-50	38	0	-40	30
630	800	0	-75	—	0	-50	—
800	1 000	0	-100	—	—	—	—
1 000	1 250	0	-125	—	—	—	—

Housing washer

Deviations μm

Table 5.32

D mm		P0; P6; P5 ΔD_{mp}			P4; P2 ΔD_{mp}		
over	up to	high	low	max.	high	low	max.
10 ¹⁾	18	0	-11	8	0	-7	5
18	30	0	-13	10	0	-8	6
30	50	0	-16	12	0	-9	7
50	80	0	-19	14	0	-11	8
80	120	0	-22	17	0	-13	10
120	180	0	-25	19	0	-15	11
180	250	0	-30	23	0	-20	15
250	315	0	-35	26	0	-25	19
315	400	0	-40	30	0	-28	21
400	500	0	-45	34	0	-33	25
500	630	0	-50	38	0	-38	29
630	800	0	-75	55	0	-45	34
800	1 000	0	-100	75	—	—	—
1 000	1 250	0	-125	—	—	—	—
1 250	1 600	0	-160	—	—	—	—

1) This value included.

Variation of shaft washer and housing washer thickness

Deviations μm

Table 5.33

d^* mm		S_1 P0	P6	P5	P4	P2	S_2 P0; P6; P5; P4; P2
over	up to	max.	max.	max.	max.	max.	max.
—	18	10	5	3	2	1	Identical to S_1 for the shaft washer
18	30	10	5	3	2	1,2	
30	50	10	6	3	2	1,5	
50	80	10	7	4	3	2	
80	120	15	8	4	3	2	
120	180	15	9	5	4	3	
180	250	20	10	5	4	3	
250	315	25	13	7	5	4	
315	400	30	15	7	5	4	
400	500	30	18	9	6	—	
500	630	35	21	11	7	—	
630	800	40	25	13	8	—	
800	1 000	45	30	15	—	—	
1 000	1 250	50	35	18	—	—	

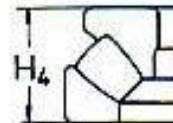
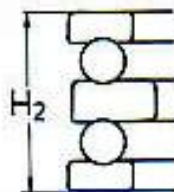
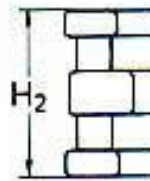
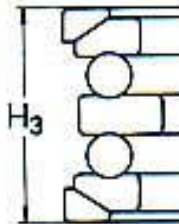
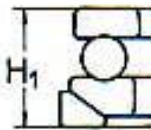
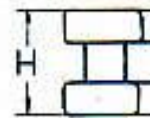
* The values of S_1 and S_2 admitted for double direction thrust bearings are equal to the corresponding values of the single direction thrust bearings and are functions of the bore diameter d , of the single direction bearings.

Assembled thrust bearings **Bearing height**

Deviations μm

Table 5.34

d mm		ΔH_s		ΔH_{1s}		ΔH_{2s}		ΔH_{3s}		ΔH_{4s}	
over	up to	high	low	high	low	high	low	high	low	high	low
—	30	+20	-250	+100	-250	+150	-400	+300	-400	+20	-300
30	50	+20	-250	+100	-250	+150	-400	+300	-400	+20	-300
50	90	+20	-300	+100	-300	+150	-500	+300	-500	+20	-400
90	120	+25	-300	+150	-300	+200	-500	+400	-500	+25	-400
120	190	+25	-400	+150	-400	+200	-600	+400	-600	+25	-500
180	250	+30	-400	+150	-400	+250	-600	+500	-600	+30	-500
250	315	+40	-400	+200	-400	+350	-700	+600	-700	+40	-700
315	400	+40	-500	+200	-500	+350	-700	+600	-700	+40	-700
400	500	+50	-500	+300	-500	+400	-900	+750	-900	+50	-900
500	630	+60	-600	+350	-600	+500	-1100	+900	-1100	+60	-1200
630	800	+70	-750	+400	-750	+600	-1300	+1100	-1300	+70	-1400
800	1 000	+80	-1000	+450	-1000	+700	-1500	+1300	-1500	+80	-1800
1 000	1 250	+100	-1400	+500	-1400	+800	-1800	+1600	-1800	+100	-2400



Angular contact thrust ball bearings, double direction **Tolerance class SP and UP**

Inner ring

Deviations μm

Table 5.35

d mm			SP Δ_{ds}		s_{ja}	UP Δ_{ds}		s_{ja}	SP and UP H_s	
	over	up to	high	low		high	low		high	low
0	18		+1	-8	3	0	-5	1,5	+50	-80
18	30		+1	-8	3	0	-6	1,5	+50	-80
30	50		+1	-11	3	0	-8	1,5	+60	-100
50	80		+2	-14	4	0	-9	2	+70	-120
80	120		+3	-18	4	0	-10	2	+85	-140
120	180		+3	-21	5	0	-13	3	+95	-180
180	250		+4	-26	5	0	-15	3	+120	-200

Outer ring

Deviations μm

Table 5.36

D mm			SP and UP Δ_{Ds}		Δ_{Cs}		s_{ja}
	over	up to	high	low	high	low	
30	50		-20	-27	0	-30	Identical to s_{ja} for the inner ring
50	80		-24	-33	0	-30	
80	120		-28	-38	0	-30	
120	150		-33	-44	0	-30	
150	180		-33	-46	0	-30	
180	250		-37	-52	0	-30	
250	315		-41	-58	0	-30	

Mounting chamfer dimension tolerances

Symbols:

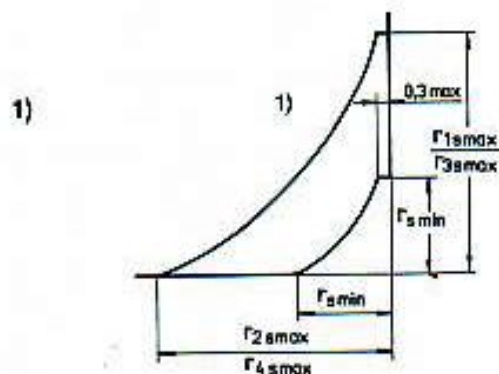
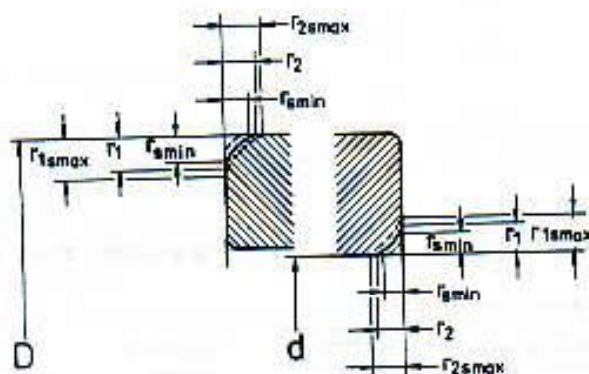
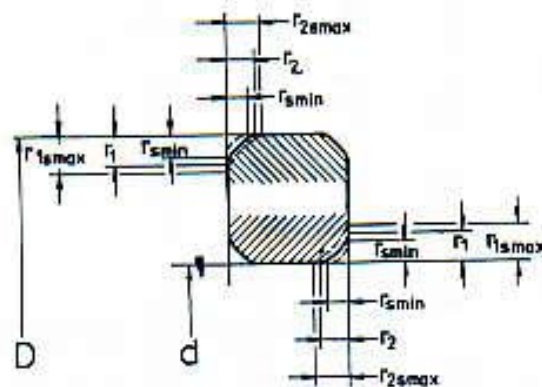
r_1, r_3 – chamfer dimension in radial direction,
 r_2, r_4 – chamfer dimension in axial direction,
 $r_{s \min}$ – general symbol for minimum limit of r_1, r_2, r_3, r_4 ,
 $r_{1s \max}, r_{3s \max}$ – maximum dimension in radial direction,
 $r_{2s \max}, r_{4s \max}$ – maximum dimension in axial direction.

Mounting chamfer dimension limits for radial and thrust bearings

Values in mm

Table 5.37

$r_{s \min}$	d		Radial bearings		Thrust bearings
	over	up to	r_{1s}, r_{3s} max.	r_{2s}, r_{4s} max.	r_{1s}, r_{2s} max.
0,1	–	–	0,2	0,4	0,2
0,15	–	–	0,3	0,6	0,3
0,2	–	–	0,5	0,8	0,5
0,3	–	40	0,6	1	0,8
	40	–	0,8	1	0,8
0,6	–	40	1	2	1,5
	40	–	1,3	2	1,5
1	–	50	1,5	3	2,2
	50	–	1,8	3	2,2
1,1	–	120	2	3,5	2,7
	120	–	2,5	4	2,7
1,5	–	120	2,3	4	3,5
	120	–	3	5	3,5
2	–	80	3	4,5	4
	220	–	3,8	6	4
	80	220	3,5	5	4
2,1	–	100	3,8	6	4,5
	–	280	4	8,5	4,5
	280	–	4,5	7	4,6
2,5	100	280	4,5	8	–
	280	–	5	7	–
3	–	280	5	8	5,5
	280	–	5,5	8	5,5
4	–	–	6,5	9	6,5
5	–	–	8	10	8
6	–	–	10	13	10
7,5	–	–	12,5	17	12,5
9,5	–	–	15	19	15
12	–	–	18	24	18
15	–	–	21	30	21
19	–	–	25	38	25



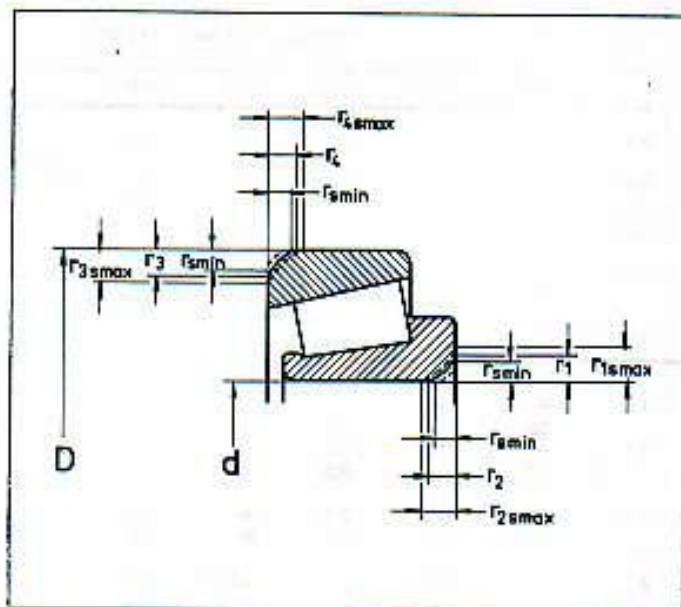
1) Only for $d < 30$ mm

Mounting chamfer dimension limits for tapered roller bearings

Values in mm

Table 5.38

r_s min.	d, D		r_{1s}, r_{3s} r_{2s}, r_{4s}	
	high	low	max.	max.
0,3	-	40	0,7	1,4
	40	-	0,9	1,8
0,6	-	40	1,1	1,7
	40	-	1,3	2
1	-	50	1,8	2,5
	50	-	1,9	3
1,5	-	120	2,3	3
	120	250	2,8	3,5
	250	-	3,5	4
2	-	120	2,8	4
	120	250	3,5	4,5
	250	-	4	5
	250	-	4,5	6
2,5	-	120	3,5	5
	120	250	4	5,5
3	-	120	4	5,5
	120	250	4,5	6,5
	250	400	5	7
	400	-	5,5	7,5
4	-	120	5	7
	120	250	5,5	7,5
	250	400	6	8
	400	-	6,5	8,5
5	-	180	6,5	8
	180	-	7,5	9
6	-	180	7,5	10
	180	-	9	11



Mounting chamfer dimension limits for tapered roller bearings (inch-metric sizes)

Values in mm

Table 5.39

Minimum values r_s min	Inner ring Nominal bore diameter		Maximum values		Outer ring Nominal outer diameter		Maximum values	
	d		r_{1s} max.	r_{2s} max.	D		r_{3s} max.	r_{4s} max.
	over	up to			over	up to		
See bearing tables	-	50,8	r_s min + 0,4	r_s min + 0,9	-	101,6	r_s min + 0,6	r_s min + 1,1
	50,8	101,6	r_s min + 0,5	r_s min + 1,3	101,6	188,3	r_s min + 0,6	r_s min + 1,2
	101,6	254	r_s min + 0,6	r_s min + 1,8	188,3	266,7	r_s min + 0,8	r_s min + 1,4
1	254	-	1,8	3	266,7	355,8	r_s min + 1,7	r_s min + 1,7
1,5	254	-	3,5	4	355,8	-	1,9	3
2,5	254	-	4,5	6	355,8	-	3,5	4
3	254	-	5,5	7,5	355,8	-	4,5	6
3,3	254	-	6,5	9	355,8	-	5,5	7,5
3,5	254	-	6,5	9	355,8	-	6,5	8
6,4	254	-	12,5	17	355,8	-	8,5	9
8,5	254	-	15	19	355,8	-	8,5	9
9,7	254	-	15	19	355,8	-	12,5	17
19	254	-	25	38	355,8	-	15	19
					355,8	-	25	38