

3. Tolerance

The tolerances of the NTN bearing units are in accordance with the following JIS specifications:

3.1 Tolerances of ball bearings for the unit

The tolerances of ball bearings used in the unit are shown in the following tables, 3.1 to 3.5.

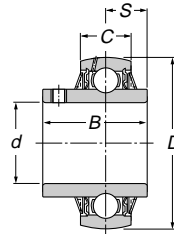


Table 3.1 (1) Cylindrical bore (UC, UCS, AS, ASS, UELS, AEL, AELS)

Unit: $\mu\text{m}/0.0001$ inch

Nominal bore diameter <i>d</i>				Cylindrical bore						Radial runout <i>K</i> _{1a} (max.)
over		incl.		Bore diameter				Width		
				Δd_{mp}		Δd_s		$\Delta B_s, \Delta C_s$		
mm	inch	mm	inch	Deviations		Deviations		Deviations		
				high	low	high	low	high	low	
10	0.3937	18	0.7087	+18	0	+22	-4	0	-120	15
				+ 7	0	+ 9	-2	0	- 47	6
18	0.7087	30	1.1811	+21	0	+25	-4	0	-120	18
				+ 8	0	+10	-2	0	- 47	7
30	1.1811	50	1.9685	+25	0	+30	-5	0	-120	20
				+10	0	+12	-2	0	- 47	8
50	1.9685	80	3.1496	+30	0	+36	-6	0	-150	25
				+12	0	+14	-2	0	- 59	10
80	3.1496	120	4.7244	+35	0	+42	-7	0	-200	30
				+14	0	+17	-3	0	- 79	12
120	4.7244	180	7.0866	+40	0	+48	-8	0	-250	35
				+16	0	+19	-3	0	- 98	14

Note: Symbols

Δd_{mp} : Mean bore diameter deviation Δd_s : Bore diameter deviation ΔB_s : Inner ring width deviation ΔC_s : Outer ring width deviation

Table 3.1 (2) Cylindrical bore (UR, AR, JEL, REL)

Unit: $\mu\text{m}/0.0001$ inch

Nominal bore diameter <i>d</i>				Cylindrical bore			
over		incl.		Δd_{mp}		Δd_s	
				Deviations		Deviations	
mm	inch	mm	inch	high	low	high	low
10	0.3937	18	0.7087	+13	0	+16	-3
				+ 5	0	+ 6	-1
18	0.7087	31.750	1.2500	+13	0	+16	-3
				+ 5	0	+ 6	-1
31.750	1.2500	50.800	2.0000	+13	0	+16	-3
				+ 5	0	+ 6	-1
50.800	2.0000	80	3.1496	+15	0	+19	-4
				+ 6	0	+ 8	-2

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Table 3.2 Tapered bore (UK, UKS) Unit: $\mu\text{m}/0.0001\text{inch}$

Nominal bore diameter d		Δd_{mp} Deviations		$\Delta d_{tmp} - \Delta d_{mp}$		$Vd_p^{(1)}$		
over		incl.		high	low	max.	min.	max.
mm	inch	mm	inch					
18	0.7087	30	1.1811	+21 +8	0 0	+21 +8	0 0	13 5
30	1.1811	50	1.9685	+25 +10	0 0	+25 +10	0 0	15 6
50	1.9685	80	3.1496	+30 +12	0 0	+30 +12	0 0	19 7
80	3.1496	120	4.7244	+35 +14	0 0	+35 +14	0 0	25 10
120	4.7244	180	7.0866	+40 +16	0 0	+40 +16	0 0	31 12

- 1) To be applied for all radial flat surfaces of tapered hole.
 Note: 1. To be applied for tapered holes of 1/12.
 2. Symbols of quantity or values.

d_1 : Basic diameter at the theoretical large end of the tapered hole

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

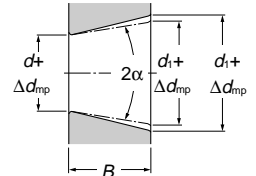
Δd_{mp} : Dimensional difference of the average bore diameter within the flat surface at the theoretical small-end of the tapered hole

Δd_{tmp} : Dimensional difference of the average bore diameter within the flat surface at the theoretical large-end of the tapered hole

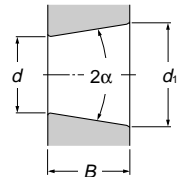
Vd_p : Inequality of the bore diameter within the flat surface

B : Nominal width of inner ring

α : Half of the nominal tapered angle of the tapered hole
 $\alpha = 2^\circ 23' 9.4''$
 $= 2.38594^\circ$
 $= 0.041643 \text{ rad}$



Tapered hole having dimensional difference of the average bore diameter within the flat surface.



Theoretical tapered hole

Table 3.3 Outer ring Unit: $\mu\text{m}/0.0001\text{inch}$

Nominal outside diameter D		Mean outside diameter deviation ΔD		Radial runout K_{ra} (max.)
over		incl.		(max.)
mm	inch	mm	inch	
30	1.1811	50	1.9685	0 -11 8
50	1.9685	80	3.1496	0 -13 10
80	3.1496	120	4.7244	0 -15 14
120	4.7244	150	5.9055	0 -18 16
150	5.9055	180	7.0866	0 -25 18
180	7.0866	250	9.8425	0 -30 20
250	9.8425	315	12.4016	0 -35 24

- Note: 1) The low deviation of outside diameter D_{mp} does not apply within the distance of 1/4 the width of the outer ring from the side.

Table 3.4 Distance S between radial plane passing through center of sphere of outer ring and side of inner ring.

Nominal outside diameter d		S Deviations ΔS_s			
over		incl.			
mm	inch	mm	inch	μm	0.0001inch
—	—	50	1.9685	± 200	± 79
50	1.9685	80	3.1496	± 250	± 98
80	3.1496	120	4.7244	± 300	± 118
120	4.7244	—	—	± 350	± 138

3.2 Tolerances of housings

Table 3.5 Spherical bore diameter of housings

Unit: $\mu\text{m}/0.0001$ inch

Nominal spherical bore diameter D_a				Tolerance class H7				Tolerance class J7			
over		incl.		ΔD_{amp} Deviations		ΔD_{as} Deviations		ΔD_{amp} Deviations		ΔD_{as} Deviations	
mm	inch	mm	inch	high	low	high	low	high	low	high	low
30	1.1811	50	1.9685	+25	0	+30	-5	+14	-11	+19	-16
				+10	0	+12	-2	+6	-4	+7	-6
50	1.9685	80	3.1496	+30	0	+36	-6	+18	-12	+24	-18
				+12	0	+14	-2	+7	-5	+9	-7
80	3.1496	120	4.7244	+35	0	+42	-7	+22	-13	+29	-20
				+14	0	+17	-3	+9	-5	+11	-8
120	4.7244	180	7.0866	+40	0	+48	-8	+26	-14	+34	-22
				+16	0	+19	-3	+10	-6	+13	-9
180	7.0866	250	9.8425	+46	0	+55	-9	+30	-16	+39	-25
				+18	0	+22	-4	+12	-6	+15	-10
250	9.8425	315	12.4016	+52	0	+62	-10	+36	-16	+46	-26
				+20	0	+24	-4	+14	-6	+18	-10

Note: 1) Symbols

DD_{amp} : Mean spherical bore diameter deviation

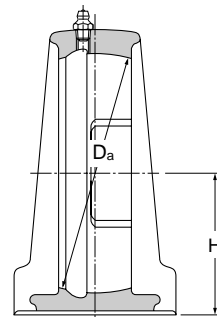
DD_{as} : Spherical bore diameter deviation

2) Dimensional tolerances for spherical bore diameter of housing are classified as H7 for clearance fit, and J7 for intermediate fit.

Table 3.6 Pillow block housings (P, HP, UP, PL)

Unit: $\mu\text{m}/0.0001$ inch

Housing numbers						H Deviations ΔH_s
P203	—	—	—	—	—	± 150 ± 59
P204	—	—	HP204	UP204	PL204	
P205	P305	PX05	HP205	UP205	PL205	
P206	P306	PX06	HP206	UP206	PL206	
P207	P307	PX07	HP207	UP207	PL207	
P208	P308	PX08	HP208	UP208	—	
P209	P309	PX09	HP209	UP209	PL209	
P210	P310	PX10	HP210	UP210	PL210	
P211	P311	PX11	—	—	—	
P212	P312	PX12	—	—	—	
P213	P313	PX13	—	—	—	± 200 ± 79
P214	P314	PX14	—	—	—	
P215	P315	PX15	—	—	—	
P216	P316	PX16	—	—	—	
P217	P317	PX17	—	—	—	
P218	P318	PX18	—	—	—	
—	P319	—	—	—	—	
—	P320	PX20	—	—	—	
—	P321	—	—	—	—	± 300 ± 118
—	P322	—	—	—	—	
—	P324	—	—	—	—	
—	P326	—	—	—	—	
—	P328	—	—	—	—	



Note: 1) H is height of the shaft center line.

2) This table can be applied for bearing units with dust covers.

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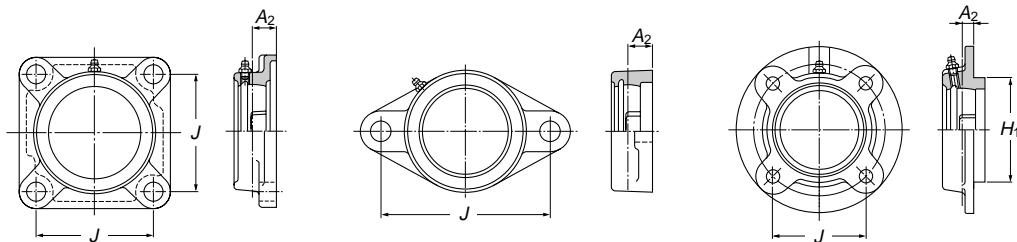


Table 3.7 Flange unit housings (F, FU, FC, FS, FL, FLU, FD)

Unit: $\mu\text{m}/0.0001$ inch

Housing numbers	J Deviations ΔJ_s	A_2 Deviations ΔA_{2s}	H_1 Deviations ΔH_{1s}						Radial runout of spigot joint Δi_s (max.)
			FC2		FS3		FCX		
			high	low	high	low	high	low	
— — — — — — — FD201									
F204 — — FC204 — FL204 — FD204			0	-46	—	—	—	—	200 79
F205 F305 FX05 FC205 FS305 FL205 FL305 FD205			0	-18	0	-46	0	-46	
F206 F306 FX06 FC206 FS306 FL206 FL306 FD206	± 700	± 500			0	-54			
F207 F307 FX07 FC207 FS307 FL207 FL307 FD207	± 276	± 197			0	-21	0	-54	
F208 F308 FX08 FC208 FS308 FL208 FL308 —			0	-54			0	-21	300 118
F209 F309 FX09 FC209 FS309 FL209 FL309 —			0	-21					
F210 F310 FX10 FC210 FS310 FL210 FL310 —					0	-63			
F211 F311 FX11 FC211 FS311 FL211 FL311 —					0	-25			
F212 F312 FX12 FC212 FS312 FL212 FL312 —							0	-63	400 157
F213 F313 FX13 FC213 FS313 FL213 FL313 —			0	-63			0	-25	
F214 F314 FX14 FC214 FS314 FL214 FL314 —			0	-25					
F215 F315 FX15 FC215 DS315 FL215 FL315 —					0	-72			
F216 F316 FX16 FC216 FS316 FL216 FL316 —					0	-28			
F217 F317 FX17 FC217 FS317 FL217 FL317 —	± 1000	± 800					0	-72	
F218 F318 FX18 FC218 FS318 FL218 FL318 —	± 394	± 315	0	-72			0	-28	
— F319 — — FS319 — FL319 —									
— F320 FX20 — FS320 — FL320 —									
— F321 — — FS321 — FL321 —					0	-18			
— F322 — — FS322 — FL322 —					0	-32			
— F324 — — FS324 — FL324 —									
— F326 — — FS326 — FL326 —					0	-89			
— F328 — — FS328 — FL328 —					0	-35			

- Note: 1) J is the bolt hole's center line dimension, A_2 is the distance between the center line of spherical bore diameter of the housing and mounting surfaces, and H_1 is outside diameter of the spigot joint.
 2) Radial runout of spigot joint is applied for flange units with spigot joints.
 3) For FU2 and FLU2 types, tolerances for F2 shall be applied.
 4) For FCX and FLX types, tolerances for FX shall be applied.
 5) This table can be applied for bearing units with dust covers.

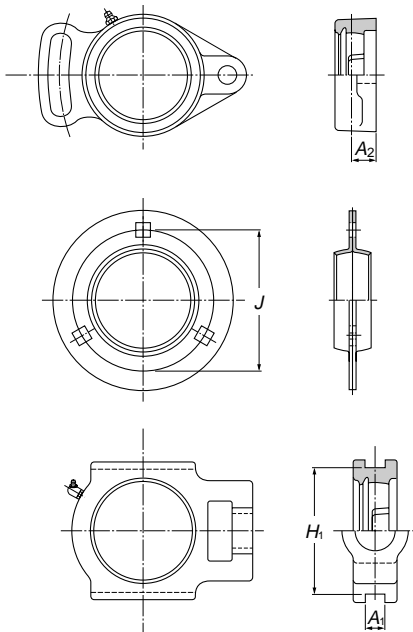


Table 3.9 Take-up unit housings (T)

Unit: $\mu\text{m}/0.0001$ inch

Housing numbers	A_1 Deviations ΔA_{1s}		H_1 Deviations ΔH_{1s}		Parallelism of guide (max.)
	high	low	high	low	
	T204 — —				
T205 T305 TX05					
T206 T306 TX06	0	+200	0	-500	500
T207 T307 TX07	0	+79	0	-197	197
T208 T308 TX08					
T209 T309 TX09					
T210 T310 TX10					
T211 T311 TX11					
T212 T312 TX12					
T213 T313 TX13					
T214 T314 TX14					600
T215 T315 TX15					236
T216 T316 TX16					
T217 T317 TX17					
— T318 —	0	+300	0	-800	
— T319 —	0	+118	0	-315	
— T320 —					700
— T321 —					276
— T322 —					
— T324 —					
— T326 —					800
— T328 —					315

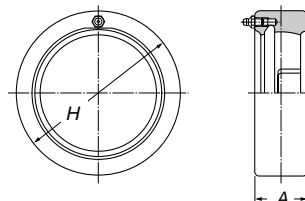
Note: 1) A_1 is the width of guide rail grooves.
 2) H_1 is the maximum span of guide rail grooves.
 3) This table can be applied for bearing units with dust covers.

Table 3.8 Flange unit housings (FH, FA, PF, PFL)

Unit: $\mu\text{m}/0.0001$ inch

Housing numbers	A_2 Deviations ΔA_{2s}	Housing numbers	H_1 Deviations ΔH_{1s}
—		PF203	
FH, FA204	± 500 ± 197	PF204	± 500 ± 197
FH, FA205		PF205	
FH, FA206		PF206	
FH, FA207		PF207	
FH, FA208		PF208	
FH, FA209		PFL203	
FH, FA210		PFL204	
FA211	± 800 ± 315	PFL205	
		PFL206	
		PFL207	

Note: 1) A_2 is distance between the center line of spherical bore diameter of housings.
 2) J is the bolt hole's center line dimension.



Housing numbers	H Deviations ΔH_s						Radial runout of outside surface (max.)	A Deviations ΔA_s
	C2		C3		CX			
	high	low	high	low	high	low		
C204 — —	0	-30	—	—	—	—		
C205 C305 CX05	0	-12						
C206 C306 CX06			0	-35	0	-35	200	
C207 C307 CX07			0	-14	0	-14	79	
C208 C308 CX08	0	-35						
C209 C309 CX09	0	-14						
C209 C309 CX09					0	-40		
C210 C310 CX10			0	-40	0	-16		
C211 C311 CX11			0	-16				
C212 C312 CX12	0	-40						
C212 C312 CX12	0	-16						
C213 C313 —								
— C314 —							300	
— C315 —							118	
— C316 —								
— C317 —			0	-46				
— C318 —			0	-18				
— C319 —					—	—		
— C320 —								
— C321 —			0	-52				
— C322 —			0	-20				
— C324 —							400	
— C326 —			0	-57				
— C328 —			0	-22			157	

Note: 1) H is the outside diameter of carriage housings.
 2) A is width of carriage housings.