

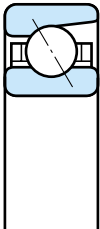
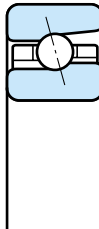
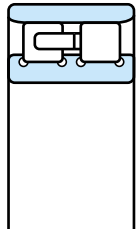
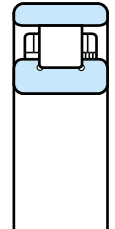
# Precision Machine Tool Bearings

Bearings selected for use in machine tools are required to have designs which will ensure high rotational speed and accurate output.

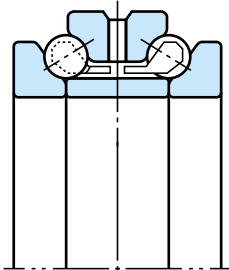
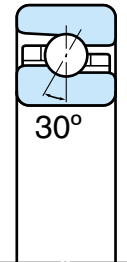
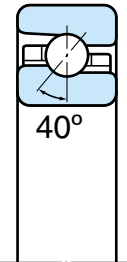
## Bearings for Machine Tool Spindles

Spindle bearings are generally classified as those that support radial load and those that support thrust loads.

**Fig 1.**  
The bearings  
for radial load

Angular Contact Ball Bearings		Cylindrical Roller Bearings	
			
70B, 70C 72B, 72C	BNH000	NN30 NN30K	N10 N10K

**Fig 2.**  
The bearings  
for axial load

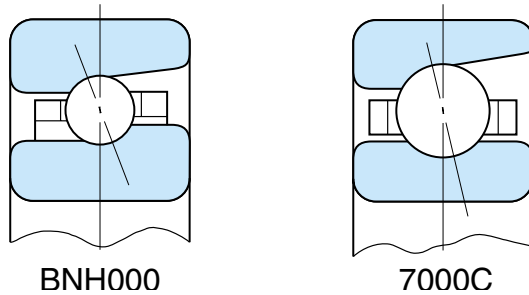
Double-direction Thrust Angular Contact Ball Bearings	Combination Angular Contact Ball Bearings	
		
TAD20	TAH10T	TBH10T



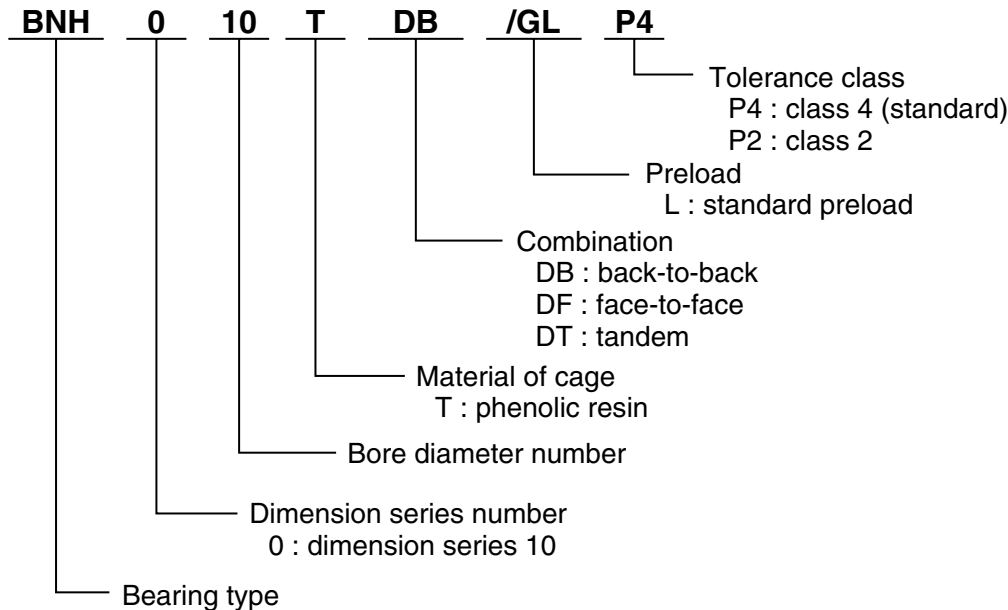
# High-speed Angular Contact Ball Bearings Type BNH000

## Feature design

Type BNH000 bearings are designed with smaller balls than Angular Contact Ball Bearings Type C. They are suitable for high-speed applications and lower heat generation and are typically used in high speed machining center spindles. (Their tolerance class is JIS (ISO) class 4 normally.)



## Bearing No.



## Standard preload

Standard preload of BNH type is designed with light preload.

Unit : N

Bore Diameter Number	BNH000
07	78.5
08	
09	98.1
10	
11	
12	147
13	
14	245
15	
16	294
17	
18	392
19	
20	490
21	
22	588
24	
26	785
28	834
30	1080
32	1180
34	1370

Note: For DB or DF combination

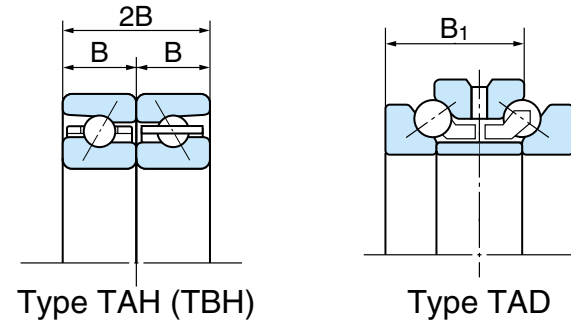


## Combination Angular Contact Ball Bearings Type TAH10, TBH10

### Feature design

The ball diameter and quantity are the same as Double-direction Thrust Angular Contact Ball Bearings type TAD20. The contact angle is 30° for TAH10 type and 40° for TBH10 type. They are suitable for high-speed.

Their Duplex Combination width 2B of type DB or DF is the same as width B1 of TAD20 type. TAD20 type are interchangeable to TAH10 type or TBH10 type by changing the method of setting to shaft.



### Tolerance of outside diameter

The outside diameter of the outer ring is made with a special tolerance for a clearance fit in the housing.

This enables the associated radial bearing to carry a radial load, like as TAD20 type.

### Tolerance of outside diameter

Unit :  $\mu\text{m}$

Nominal bearing outside diameter D (mm)		Outside diameter deviation $\Delta D_s$	
Over	Incl.	High	Low
30	50	-20	-41
50	80	-30	-49
80	120	-36	-58
120	180	-43	-68
180	250	-50	-79
250	315	-56	-88

JIS (ISO) class 4 for other tolerances



[→Continue]

## Combination Angular Contact Ball Bearings Type TAH10, TBH10

### Standard preload

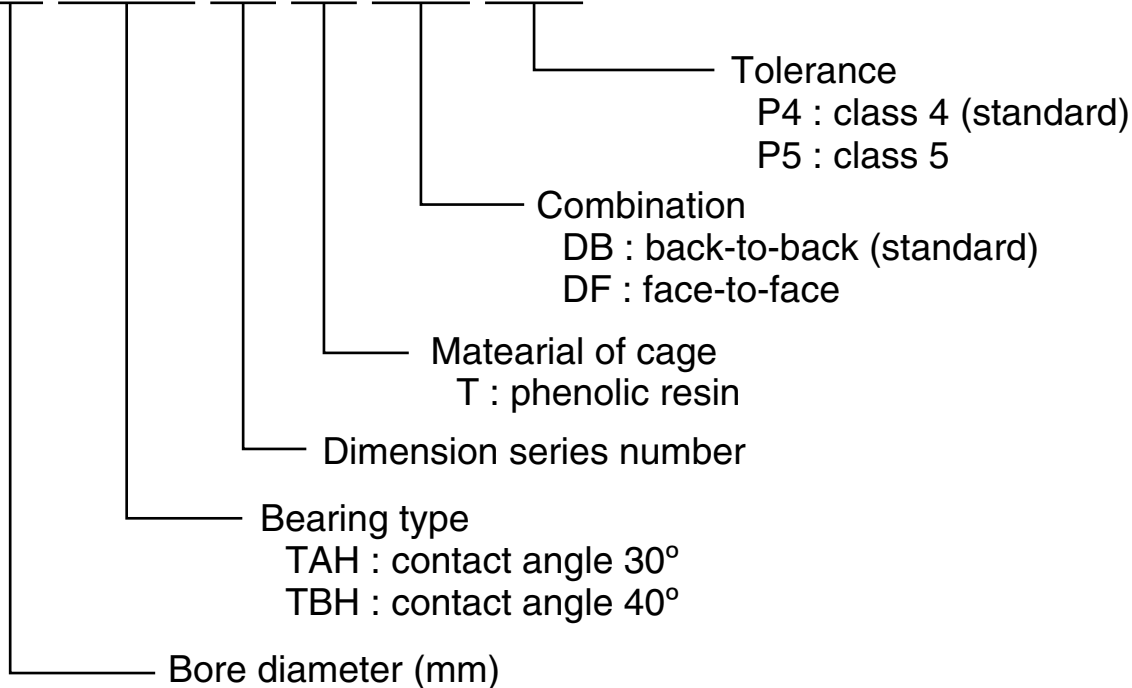
Unit : N

Bore Diameter Number	TAH	TBH
50	294	539
55		
60	392	686
65		
70	588	1080
75		
80	686	1270
85		
90		
95	1080	1860
100		
105	1180	2060
110	1370	2450
120	1470	2550
130	1860	3330
140	1960	3530
150	2450	4310
160	2650	4510
170	3040	5300

Note: For DB or DF combination

### Bearing No.

**90 TBH 10 T DB P4**



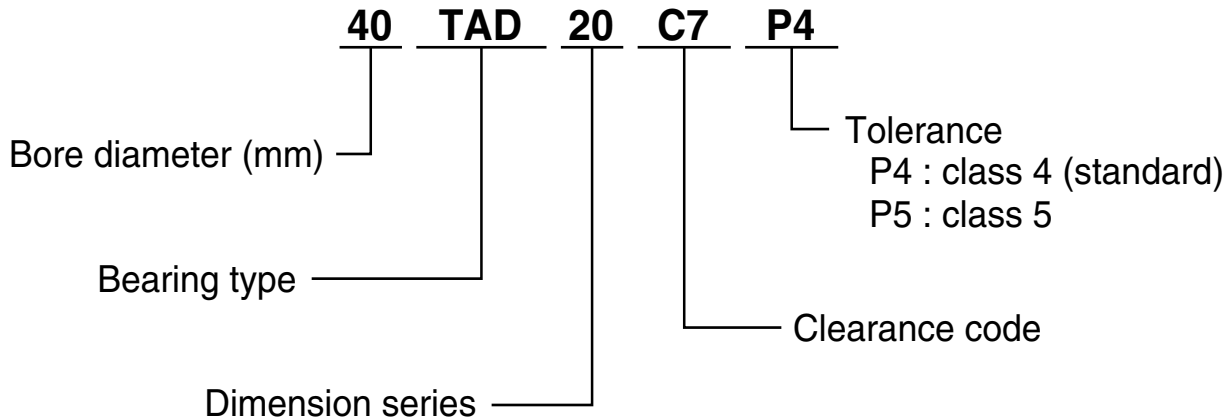
# Double-direction Thrust Angular Contact Ball Bearings Type TAD20



## Feature design

This is a two-row bearing with a one-piece outer ring. The ball assembly is arranged as a back-to-back, Angular Contact Ball Bearings with a high contact angle. This type is used as the Axial Load Bearing in conjunction with a Double-row Cylindrical Roller Bearings.

## Bearing No.



## Standard preload

Bore Diameter Number	Preload (N)	
	C7	C8
20TAD20	215	590
30TAD20	245	
35TAD20		
40TAD20	295	785
45TAD20	345	880
50TAD20		
55TAD20	390	980
60TAD20	590	1250
65TAD20		1350
70TAD20	685	1750
75TAD20		
80TAD20	1050	2150
85TAD20		
90TAD20	1150	2850
95TAD20		2950
100TAD20	1450	3450
105TAD20		
110TAD20	1650	4400
120TAD20		
130TAD20	1750	4700
140TAD20	1950	6350
150TAD20		
160TAD20	2750	6850
170TAD20	2950	8800
180TAD20		
190TAD20	3900	11800
200TAD20	4100	





**Tolerance**

The outer ring is made with a negative tolerance for a clearance fit in the housing.  
This enables the associated radial bearing to carry a radial load.

**Inner Ring and Height Tolerances**

Unit :  $\mu\text{m}$

Nominal bearing bore diameter d (mm)		Single plane mean bore diameter variation $\Delta d_{mp}$				Variation of assembled height T		Width variation of inner ring $V_{BS}$ (Max)		Side face runout with reference to bore $S_d$ (Max)		Side face runout with reference to raceway of assembled bearing inner ring and of assembled bearing outer ring $S_{ia}, S_{ea}$ (Max)		
		Class 5		Class 4										
		High	Low	High	Low									High
Over	Incl.													
18	30	0	- 6	0	- 5	0	-300	5	2.5	8	4	5	3	
30	50	0	- 8	0	- 6	0	-400	5	3	8	4	5	3	
50	80	0	- 9	0	- 7	0	-500	6	4	8	5	6	5	
80	120	0	-10	0	- 8	0	-600	7	4	9	5	6	5	
120	180	0	-13	0	-10	0	-700	8	5	10	6	8	6	
180	250	0	-15	0	-12	0	-800	10	6	11	7	8	6	

**Variation and deviation of outer ring**

Unit :  $\mu\text{m}$

Nominal bearing bore diameter D (mm)		Single plane mean outside diameter variation of outer ring $\Delta D_{mp}$		Width deviation of outer ring $V_{CS}$ (Max)		Outside inclination of outer ring $S_d$ (Max)			
		Class 5						Class 4	
		High	Low					Class 5	Class 4
18	30	-20	-27	5	2.5	8	4		
30	50	-24	-33	6	3	8	4		
50	80	-28	-38	8	4	9	5		
80	120	-33	-44	8	5	10	5		
120	180	-33	-46	8	5	10	5		
180	250	-37	-52	10	7	11	7		
250	315	-41	-59	11	7	13	8		



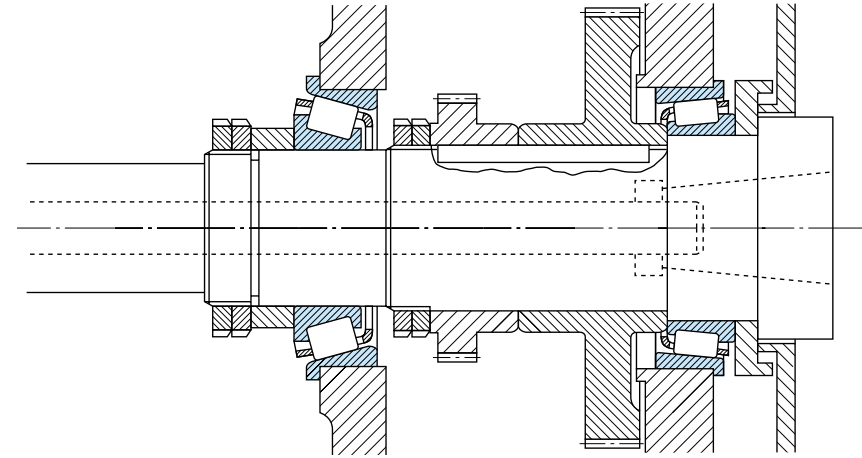


## Flanged-cup Tapered Roller Bearings

This bearing permits a simplified housing design. It is made with high precision (JIS (ISO) class 5 or 4) for applications such as machine tool spindles.

### Deviation of flange outside diameter Df Unit : $\mu\text{m}$

Df (mm)		Deviation	
Over	Incl.	High	Low
30	50	0	- 62
50	80	0	- 74
80	120	0	- 87
120	180	0	-100
180	250	0	-115
250	315	0	-130



Example of mounting of Flanged-cup Tapered Roller Bearings





## Cross Tapered Roller Bearings

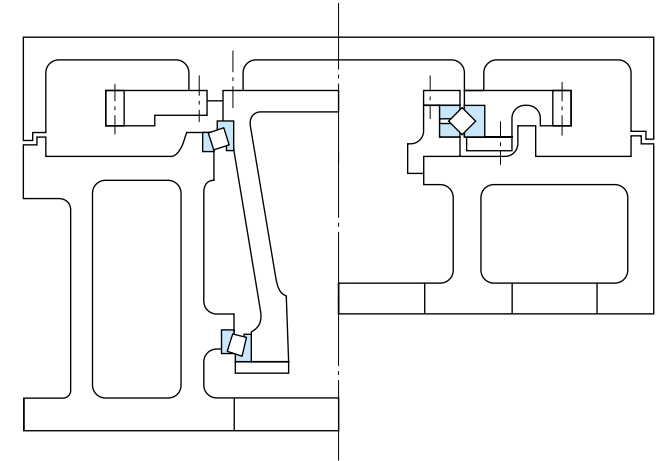
This bearing type is designed with two inner rings and one outer ring. The rolling elements (Tapered rollers) are arranged with their surfaces contact the ring raceways in an alternating pattern.

### Feature design

- This type can sustain radial, overturning moment and bi-directional axial loads.
- Change in size due to thermal growth does not affect this type of bearing. Preload is stable over the entire temperature operating range.
- Light weight, compact, easy to assemble.

### Applications

- Worktable of machining centers or vertical grinding machines
- Work-spindle of lathes or grinding machines
- The indexing mechanisms of large milling machines or drilling machines
- Turntable mechanism of parabolic antenna



Example of mounting of Tapered Roller Bearings and Cross Tapered Roller Bearing





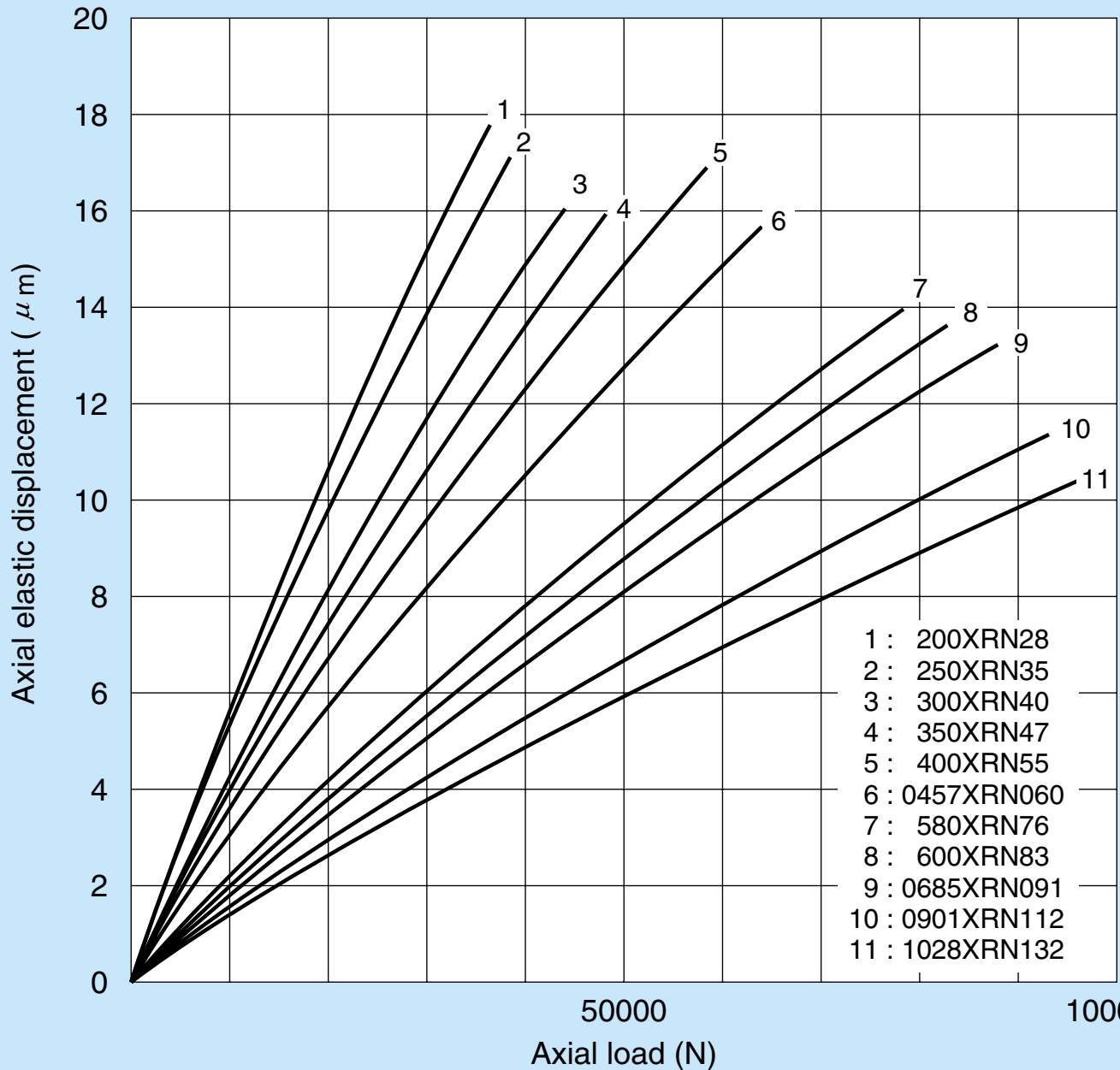
## Tolerances

Unit :  $\mu\text{m}$ 

Bearing No.	Single plane mean bore diameter variation $\Delta d_{mp}$		Single plane mean outside diameter variation of outer ring $\Delta D_{mp}$		Variation of assembled height T		Outer ring runout Max	
	High	Low	High	Low	High	Low	Radial runout	Sideface runout
	200XRN28	0	-15	0	-18	+350	-250	7
250XRN35	0	-10	0	-13	+350	-250	9	9
300XRN40	0	-13	0	-15	+350	-250	7	7
350XRN47	0	-13	0	-15	+350	-250	9	9
400XRN55	0	-13	0	-18	+350	-250	9	9
0457XRN060	+25	0	+25	0	+380	-380	9	9
580XRN76	+25	0	+38	0	+406	-406	10	10
600XRN83	+38	0	+38	0	+406	-406	12	12
0685XRN091	+38	0	+38	0	+508	-508	12	12
0901XRN112	+51	0	+51	0	+508	-508	14	14
1028XRN132	+76	0	+76	0	+760	-760	16	16



Axial Load and Axial Displacement





# Ball Screw Support Bearings

This type is used for supporting the ball screws that are used as actuators of high precision and high speed machines, precision measurement equipment, robots, etc.

This is a precision and high ability bearing.

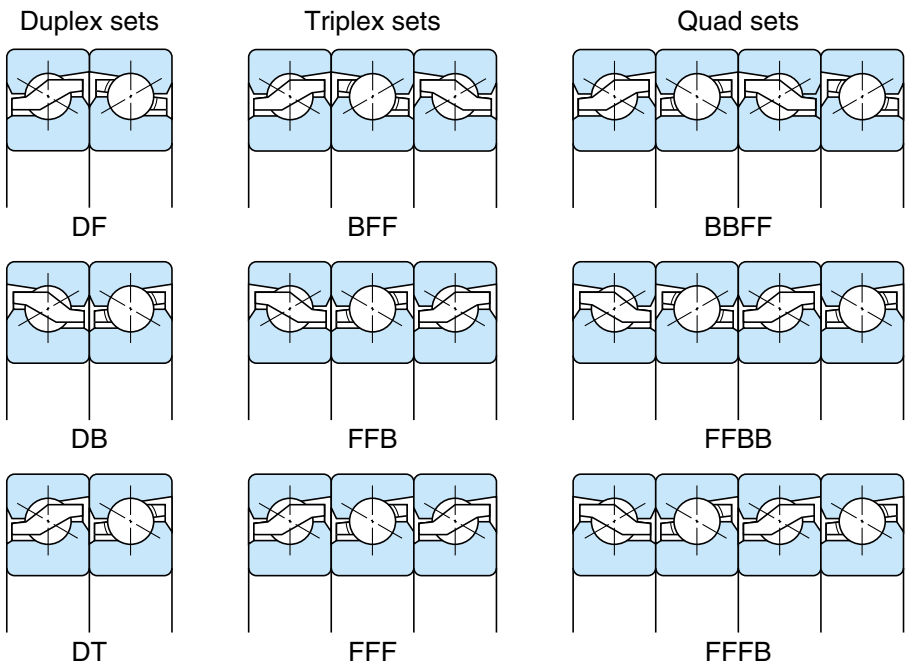
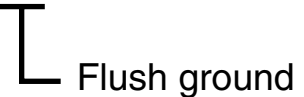
## Feature design

- High stiffness  
These bearings are designed with polyamide cages and a greater number of balls than conventional angular contact ball bearings. For these reasons, bearing stiffness is greater than conventional bearings.
- Easy fitting and adjustment  
These bearings are supplied with a pre-set preload so difficult adjustment and torque measurement is eliminated.
- Simplified bearing mounting structure  
These bearings are supplied with a 60° contact angle so radial and thrust load combinations can be sustained. This results in a simplified and compact shaft and housing design.

## Flush ground set combinations (Universal matching)

Flush ground set combination bearings are also available with a suffix U. This permits the use of random combinations where two or more bearings are mounted.

## 30 TAB 06 U / GM P4





Tolerances for inner ring

Unit :  $\mu\text{m}$

Nominal bearing bore diameter (mm)		Single plane mean bore diameter variation $\Delta d_{mp} \Delta d_s$				Bore diameter variation in a single radial plane $V_{db} (\text{Max})$		Mean bore diameter variation $V_{dmp} (\text{Max})$		Deviation of a single <sup>(1)</sup> inner ring width (or a single outer ring width) $\Delta B_s (\Delta C_s)$				Width deviation of inner ring $V_{BS} (\text{Max})$		Radial runout of assembled bearing inner ring $K_{ia} (\text{Max})$		Side face runout $S_d$ with reference to bore (Max)		Side face runout with reference to raceway of assembled bearing inner ring $S_{ia}$ and bearing outer ring $S_{ea} (\text{Max})$	
		P5		P4		P5	P4	P5	P4	P5		P4		P5	P4	P5	P4	P5	P4	P5	P4
Over	Incl.	High	Low	High	Low					High	Low	High	Low								
10	18	0	-5	0	-4	4	3	4	3	0	- 80	0	- 80	5	2.5	4	2.5	7	3	4	2
18	30	0	-6	0	-5	5	4	5	4	0	-120	0	-120	5	2.5	4	3	8	4	5	2.5
30	50	0	-8	0	-6	6	5	6	5	0	-120	0	-120	5	3	5	4	8	4	6	2.5
50	60	0	-9	0	-7	7	6	7	6	0	-150	0	-150	6	4	5	4	8	5	7	2.5

Note: (1) These deviations are for single bearing. For combination bearings, multiply these values by row number.

Tolerances for outer ring

Unit :  $\mu\text{m}$

Nominal bearing outside diameter (mm)		Single plane mean outside diameter variation of outer ring $\Delta D_{mp} \Delta D_s$				Outside diameter variation in a single radial plane $V_{Db} (\text{Max})$		Mean outside diameter variation $V_{Dmp} (\text{Max})$		Width deviation $V_{Cs}$ of outer ring (Max)		Radial runout of assembled bearing outer ring $K_{ia} (\text{Max})$		Outside inclination of outer ring $SD (\text{Max})$	
		P5		P4		P5	P4	P5	P4	P5	P4	P5	P4	P5	P4
Over	Incl.	High	Low	High	Low										
30	50	0	- 7	0	-6	5	5	4	3	5	2.5	7	5	8	4
50	80	0	- 9	0	-7	7	5	5	3.5	6	3	8	5	8	4
80	120	0	-10	0	-8	8	6	5	4	8	4	10	6	9	5



**Shaft and housing tolerance:**

①For the fit, refer to the following table.

Shaft fit	j5
Housing fit	H6

②For the squareness of a shoulder, refer to the following table.

Dimensions of shaft diameter and housing bore diameter (mm)		Squareness ( $\mu\text{m}$ )
Over	Incl.	
–	80	4
80	120	5

**Preload and Axial Spring Constant**Unit :  $\mu\text{m}$ 

Bearing No.	Preload M (N)				Axial Spring Constant (N/ $\mu\text{m}$ )			
	DF DB	BFF FFB	BBFF FFBB	BFFF FFFB	DF DB	BFF FFB	BBFF FFBB	BFFF FFFB
15TAB04	2160	2940	4310	3430	735	1080	1470	1320
17TAB04	2160	2940	4310	3430	735	1080	1470	1320
20TAB04	2160	2940	4310	3430	735	1080	1470	1320
25TAB06	3330	4510	6670	5200	981	1470	1960	1910
30TAB06	3330	4510	6670	5200	981	1470	1960	1910
35TAB07	3920	5300	7840	6180	1230	1770	2350	2300
40TAB07	3920	5300	7840	6180	1230	1770	2350	2300
40TAB09	5200	7060	10400	8140	1320	1910	2550	2500
45TAB07	4120	5590	8240	6470	1270	1910	2550	2500
45TAB10	5980	8140	12000	9410	1470	2160	2890	2790
50TAB10	6280	8530	12600	9810	1520	2260	3040	2940
55TAB10	6280	8530	12600	9810	1520	2260	3040	2940
55TAB12	7060	9610	14100	11100	1770	2550	3480	3380
60TAB12	7060	9610	14100	11100	1770	2550	3480	3380





**Axial Load and Axial Displacement**

