

Ball Screw Support Bearings

Assembly Manual



Assembly Procedures

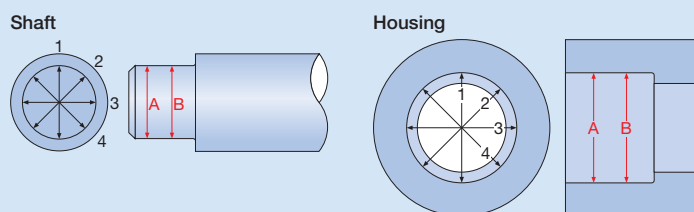
1 Preparations prior to Assembly

First choose a clean location.
And all of the necessary tools and equipment should be on hand before beginning any bearing mounting procedure.



2 Checking the Shaft and Housing

The shaft and housing should not have dirt or chips.
Then measure and record the values to confirm correct size, roundness, taper, and surface roughness, as well as shoulder squareness and corner radii for the shaft and housing to ensure they are within the designed specifications.
Recommended shaft fit and housing fit are shown in [Tables 1.1 and 1.2](#).



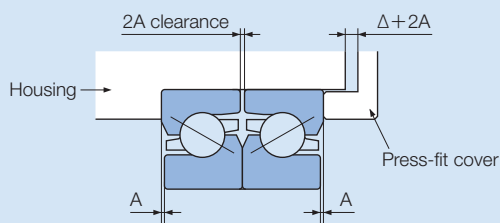
3 Grease Injection to Bearings

Select the proper grease. For examples of the main types of grease used for machine tool bearings, see [Table 2](#).
A greasing amount of 40 to 50% of the bearing internal space volume is recommended for a ball screw support bearing (open type). For information about internal space volume of bearings and calculation formula for grease amount, see [Table 3](#).

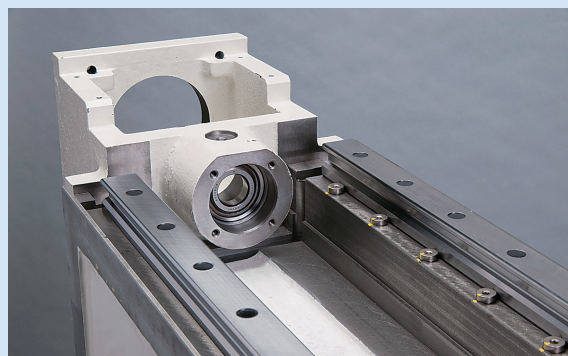


4 Mounting a Bearing

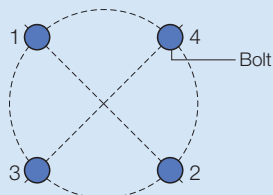
- 1 In order to secure the outer ring of a bearing in the axial direction, clearance is maintained between the press-fit cover and housing and a bolt is used for tightening. A back-to-back bearings outer ring clearance reduction gap (Δ) of 0.010mm to 0.020mm is recommended. Recommended clearance reduction gap values for a face-to-face bearings are shown in [Table 4](#). The example of methods for adjustment of the outer ring clearance reduction gap (Δ) is shown in the next page.



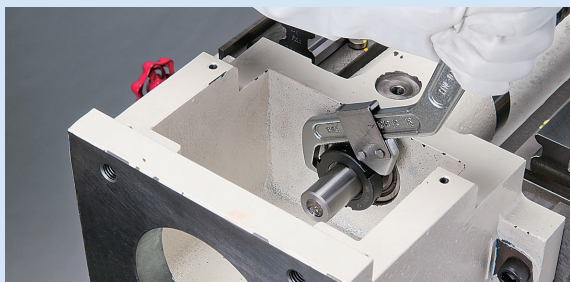
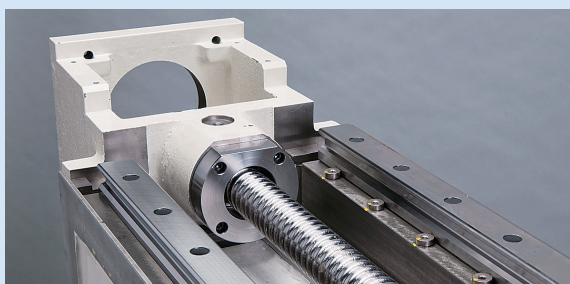
- 2 Mount a bearing in housing. At this time, be careful of a bearing direction. For the flush ground type, a combination [$\angle$] mark is put on the outside surface of the outer ring. For information about set combinations and the combination marks, see [Figure 1](#).



- 3** Bolt the press-fit cover to the housing. The bolts are tightened in a diagonal and several times.

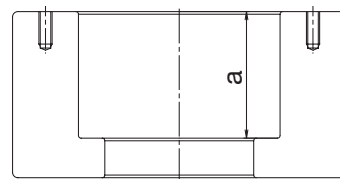


- 4** Mount a seal and insert a shaft. Shaft nut is tightened and the inner ring is fixed to a shaft. Recommended shaft nut tightening force are shown in **Table 5**.

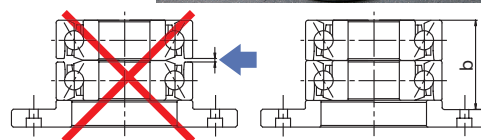


The Example of Methods for Adjustment of the Outer Ring Clearance Reduction Gap (Δ)

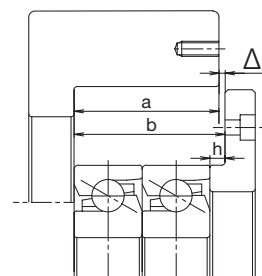
1. Measure the depth (a) of a housing.



2. After piling the bearings in the same direction on a press-fit cover, measure the height (b) from the end face of a press-fit cover. Because exact height cannot be measured if an oil film is between bearings when piling the bearings, push bearings strongly. When measuring the height, always pile the bearings in the same direction, because the 2A clearance is measured additionally if the bearings are mounted in actual direction.



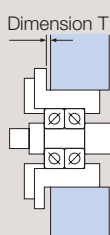
3. It is $b-a=\Delta$. Adjust the side height (h) of a press-fit cover, in order to make the outer ring clearance reduction gap (Δ) into the target value.



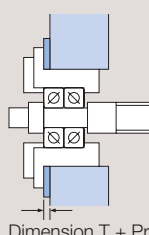
5 Test Operation

After assembly is finished, you should never immediately start the equipment at maximum rotation speed. First operate manually or at low speeds and make sure that there is free rotation and no abnormal noise. If there are no initial problems, the same check at medium speeds and high speeds. Then assembly is completed after sufficient running-in.

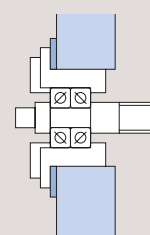
The Example of Methods for Adjustment of the Shaft Pre-tension



1. Assemble and fix the bearings which does not shim adjustment (opposite side of figure).
2. Assemble the bearings which shim adjustment, without setting a shim.



3. Loosen a shaft nut and set a shim of dimension (T) + pre-tension dimension.



4. Reassemble

Table 1.1 Shafts and Recommended FitUnit : μm

Shaft diameter (mm)	Bearing accuracy class			
	Class 5		Class 4 / Class 2	
	Desired fit	Shaft tolerance	Desired fit	Shaft tolerance
For all shaft diameters	0~10L	h5	0~10L	h5

Table 1.2 Housings and Recommended FitUnit : μm

Housing bore diameter (mm)	Bearing accuracy class			
	Class 5		Class 4 / Class 2	
	Desired fit	Shaft tolerance	Desired fit	Shaft tolerance
Overall housing bore	10~20L	H6	10~20L	H6

Table 2 Main Grease Used for a Ball Screw Support Bearing

Grease brand	Manufacturer	Base oil	Thickener	Recommended operation temperature range C°
Alvania Grease S No.2	Showa Shell Oil	Mineral Oil	Lithium	-25~+120
Multemp PS No.2	Kyodo Yushi	Diester Oil+Hydrocarbon Oil	Lithium	-55~+130

Table 3 Ball Screw Support Bearing (TAB Series) Internal Space Volume & Calculation Formula for Grease Amount

Bearing No.	Internal space Volume [cc/each]	Bearing No.	Internal space Volume [cc/each]
15TAB04	3.8	40TAB09	14
17TAB04	3.8	45TAB07	6.5
20TAB04	3.8	45TAB10	15
25TAB06	4.8	50TAB10	16
30TAB06	4.8	55TAB10	16
35TAB07	5.8	55TAB12	19
40TAB07	5.8	60TAB12	19

Table numbers are 100% internal volume.

Grease Amount (g)= [Grease specific gravity] × [Internal Space Volume] × V%

Grease specific gravity : Standard grease is 0.9. Special grease, such as fluorine type, is different
V : NACHI recommendation volume as follows, Ball Screw Support Bearing is 40~50% (Open Type)

Table 4 Recommended Clearance Reduction Gap Values

Bearing No.	Outer ring clearance reduction gap Δ (mm)	Bearing No.	Outer ring clearance reduction gap Δ (mm)
15TAB04	0.010~0.030	40TAB09	0.020~0.050
17TAB04		45TAB07	
20TAB04		45TAB10	
25TAB06	0.010~0.040	50TAB10	
30TAB06		55TAB10	
35TAB07		55TAB12	0.020~0.060
40TAB07		60TAB12	

Table 5 Recommended Shaft Nut Tightening Force Values and Calculation Formula

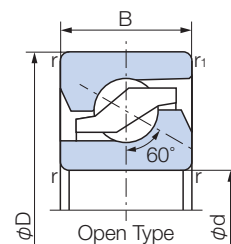
Nominal bearing bore diameter (mm)	Shaft nut tightening force F (N)
15	2500
17	2500
20	4900
25	4900
30	4900
35	4900
40	9800
45	9800
50	9800
55	14700
60	14700

$$F \approx \frac{Mn}{\frac{d_2}{2} \tan(\beta + \rho) + \frac{dn}{2}} \cdot \mu m$$

F : Tightening force (N) ρ : Thread surface friction angle
Mn : Tightening torque (N·mm) $\tan \rho = \frac{\mu}{\cos \alpha}$
d₂ : Thread nominal diameter (mm)
 β : Lead angle α : Half-angle of thread
 $\tan \beta = \frac{P}{\pi d_2}$ dn : Mean diameter of nut bearing surface (mm)
P : Pitch (mm) μm : Coefficient of friction of nut bearing surface (≈ 0.15)
 μ : Coefficient of friction of thread surface (≈ 0.15)

Ball Screw Support Bearing TAB Series

Bearing no.	Boundary dimensions (mm)					Axial limiting load ⁽²⁾ (kN)	Rotation speed limit ⁽³⁾ (rpm)	
	d	D	B	r (Min)	r ₁ (Min)		Grease lubrication	Oil lubrication
15TAB04	15	47	15	1 ⁽¹⁾	0.6	32.0	6300	8000
17TAB04	17	47	15	1	0.6	32.0	6300	8000
20TAB04	20	47	15	1	0.6	32.0	6300	8000
25TAB06	25	62	15	1	0.6	46.4	4650	6000
30TAB06	30	62	15	1	0.6	46.4	4650	6000
35TAB07	35	72	15	1	0.6	54.3	3750	5000
40TAB07	40	72	15	1	0.6	54.3	3750	5000
40TAB09	40	90	20	1	0.6	101	3150	4000
45TAB07	45	75	15	1	0.6	59.5	3400	4500
45TAB10	45	100	20	1	0.6	113	2850	3500
50TAB10	50	100	20	1	0.6	119	2700	3500
55TAB10	55	100	20	1	0.6	119	2700	3500
55TAB12	55	120	20	1	0.6	137	2300	3000
60TAB12	60	120	20	1	0.6	137	2300	3000



Note (1) Minimum r for inner ring bore is 0.6.

(2) When the axial load is on a 2-row or 3-row arrangement, the values in the table should be multiplied by 2 and 3 respectively.

(3) Rotation speed limit for medium preload (preload code GM).

Bearing Number Designation

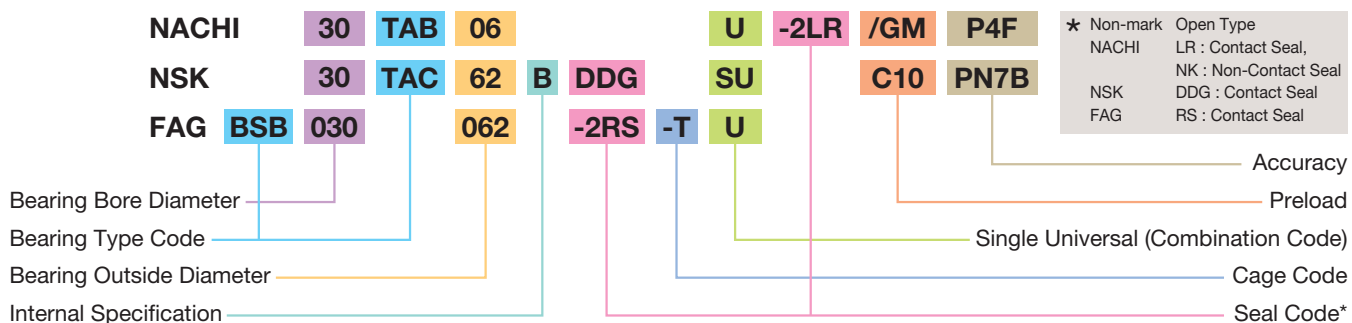
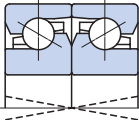
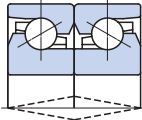
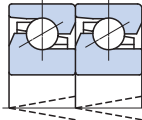
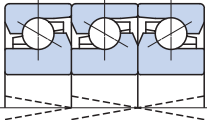
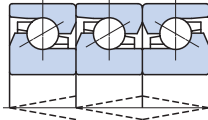
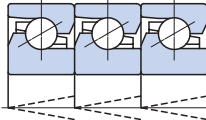
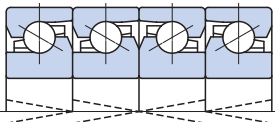
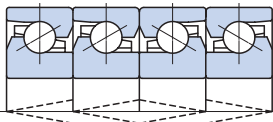
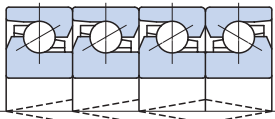
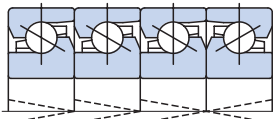


Figure 1 Compared Flush Ground Bearing Set Combinations and Combination Symbols

Duplex sets					
	NACHI	DF	DB	DT	
	NSK	DF	DB	DT	
Triplex sets					
	NACHI	BFF	FFB	FFF	
	NSK	DFD	DBD	DTD	
Quad sets					
	NACHI	BBFF		FFBB	
	NSK	DBB		DBB	
					
	NACHI	FFFB		BFFF	
	NSK	DBT		DFT	

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