

Ball Screw Support Bearings

Assembly Manual



Assembly Procedures

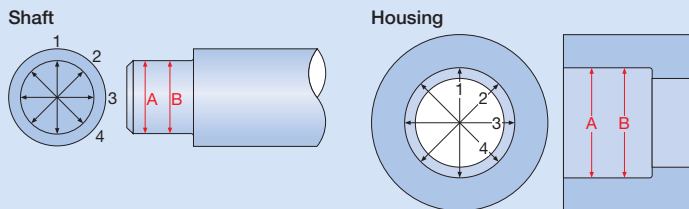
1 Preparations prior to Assembly

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](#).



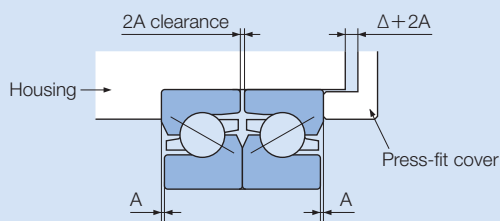
3 Grease Injection to Bearings

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](#).

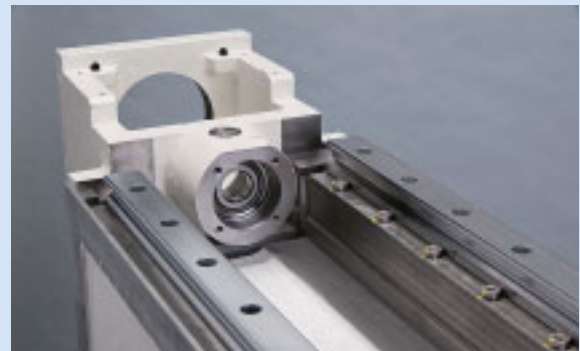


4 Mounting a Bearing

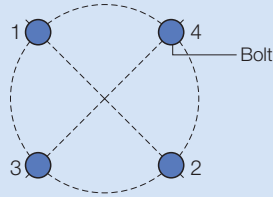
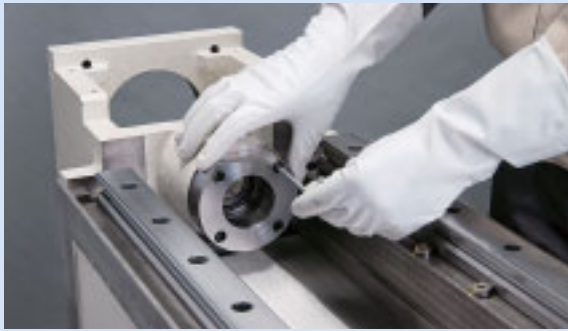
1 In order to secure the outer ring of a bearing in the axial direction, clearance is maintained between the press-fit cover and housing and a bolt is used for tightening. A back-to-back bearings outer ring clearance reduction gap (Δ) of 0.010mm to 0.020mm is recommended. Recommended clearance reduction 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 [\leq] 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.

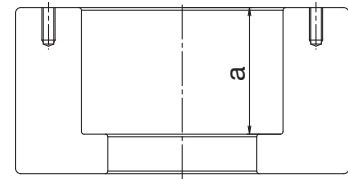


- 4** Mount a seal and insert a shaft. Shaft nut is tightened and the inner ring is fixed to a shaft. Recommended shaft nut tightening force are shown in **Table 5**.

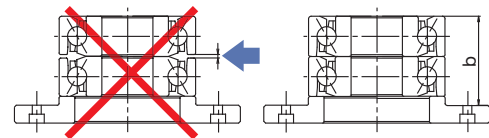


The Example of Methods for Adjustment of the Outer Ring Clearance Reduction Gap (Δ)

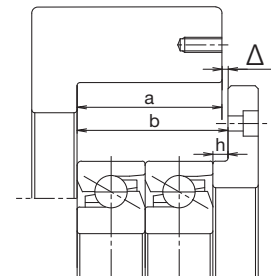
1. Measure the depth (a) of a housing.



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.



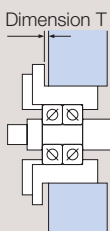
3. It is $b-a=\Delta$. Adjust the side height (h) of a press-fit cover, in order to make the outer ring clearance reduction gap (Δ) into the target value.



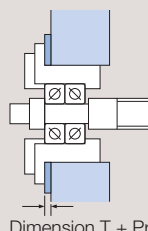
5 Test Operation

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.

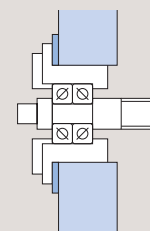
The Example of Methods for Adjustment of the Shaft Pre-tension



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 Fit

Unit : 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 Fit

Unit : 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			
20TAB04			
25TAB06	0.010~0.040	50TAB10	
30TAB06			
35TAB07			
40TAB07			
		55TAB10	0.020~0.060
		55TAB12	
		60TAB12	

Table 5 Recommended Shaft Nut Tightening Force Values and Calculation Formula

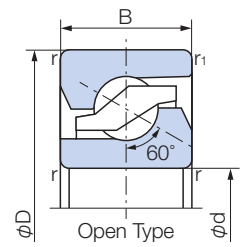
Nominal bearing bore diameter (mm)	Shaft nut tightening force F (N)
15	2500
17	2500
20	4900
25	4900
30	4900
35	4900
40	9800
45	9800
50	9800
55	14700
60	14700

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

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)
 μm : Coefficient of friction of nut bearing surface (≈ 0.15)
 P : Pitch (mm) 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

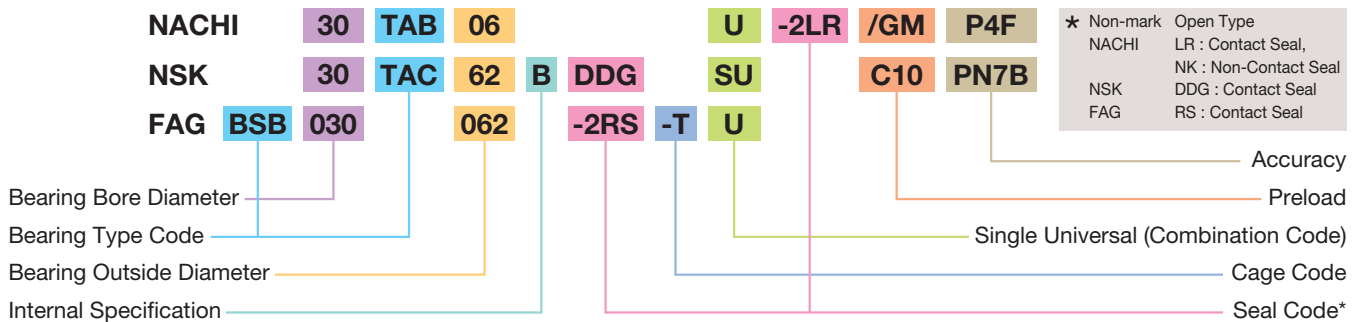


Figure 1 Compared Flush Ground Bearing Set Combinations and Combination Symbols

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		

NACHI-FUJIKOSHI CORP.

URL:<http://www.nachi-fujikoshi.co.jp>
E-mail:webmaster@nachi-fujikoshi.co.jp

Tokyo Head Office : Shiodome Sumitomo Bldg. 17F 1-9-2 Higashi-shinbashi, Minato-ku, Tokyo 105-0021, JAPAN
Tel: +81-(0)3-5568-5111 Fax: +81-(0)3-5568-5206

Toyama Head Office : 1-1-1 Fujikoshi-Honmachi, Toyama 930-8511, JAPAN Tel: +81-(0)76-423-5111 Fax: +81-(0)76-493-5211

Overseas Companies

ASIA and OCEANIA

Sales

● NACHI SINGAPORE PTE. LTD.

No.2 Joo Koon Way, Jurong Town, Singapore 628943, SINGAPORE
Tel: +65-65587393 Fax: +65-65587371

VIETNAM REPRESENTATIVE OFFICE, HO CHI MINH

4Fl., Yoco Bld., 41 Nguyen Thi Minh Khai St.,
Dist.1, Ho Chi Minh, VIETNAM
Tel: +84-8-3822-3919 Fax: +84-8-3822-3918

VIETNAM REPRESENTATIVE OFFICE, HANOI

5B Fl., Noza Bld., 243 Cau Giay St., Cau Giay
Dist., Hanoi, VIETNAM
Tel: +84-4-3767-8605 Fax: +84-4-3767-8604

● FUJIKOSHI-NACHI (MALAYSIA) SDN. BHD.

No.17, Jalan USJ 21/3, 47630 UEP Subang Jaya,
Selangor Darul Ehsan, MALAYSIA
Tel: +60-(0)3-80247900 Fax: +60-(0)3-80235884

● PT.NACHI INDONESIA

Jl.H.R.Rasuna Said Kav.X-O
Kuningan, Jakarta 12950, INDONESIA
Tel: +62-021-527-2841 Fax: +62-021-527-3029

● 那智不二越(上海)贸易有限公司

NACHI (SHANGHAI) CO.,LTD.
11F Royal Wealth Center, No.7 Lane 98 Danba
Road, Putuo District, Shanghai, 200062, CHINA
Tel: +86-(0)21-6915-2200
Fax: +86-(0)21-6915-5427

重庆分公司

CHONGQING BRANCH
Room 17-18/17-19, Tower C, Hongding Guoji
Mingyuan, Jiangbei District, Chongqing 400020, CHINA
Tel: +86-(0)23-8816-1967
Fax: +86-(0)23-8816-1968

沈阳分公司

SHENYANG BRANCH
Room 304, No.1 Yuebin Street, Shenhe District,
Shenyang 110000, CHINA
Tel: +86-(0)24-3120-2252
Fax: +86-(0)24-2250-5316

北京分公司

BEIJING BRANCH
Room 1110, Kuntai International Mansion, Building
O, Yi No.12 Chao Wai Street, Chao yang District,
Beijing 100020, CHINA
Tel: +86-(0)10-5879-0181
Fax: +86-(0)10-5879-0182

● NACHI-FUJIKOSHI CORP.

THAILAND REPRESENTATIVE OFFICE

Unit 23/109(A),Fl.24th Sorachai Bldg., 23
Sukhumvit 63 Road(Ekamai), Klongtonnua,
Wattana, Bangkok 10110, THAILAND
Tel: +66-2-714-0008 Fax: +66-2-714-0740

● NACHI-FUJIKOSHI CORP.

TAIPEI REPRESENTATIVE OFFICE

No.109, Kao Young North Rd, Lung-Tan Hsin,
Tao-Yuan Hsien, TAIWAN
Tel: +886-(0)3-411-7776
Fax: +886-(0)3-471-8402

● NACHI-FUJIKOSHI CORP.

KOREA REPRESENTATIVE OFFICE

2F Dongsan Bldg. 276-4, Sungsu 2GA-3DONG
Sungdong-Ku, Seoul 133-831, KOREA
Tel: +82-(0)2-469-2254 Fax: +82-(0)2-469-2264

● NACHI-FUJIKOSHI CORP.

INDIA REPRESENTATIVE OFFICE

Global Foyer, Unit No.3, 1st Floor, DLF Golf
Course Road, Sector-43, Gurgaon, Haryana
122002, INDIA
Tel: +91-124-493-2600 Fax: +91-124-493-2608

● NACHI (AUSTRALIA) PTY. LTD.

Unit 1, 23-29 South Street, Rydalmere, N.S.W,
2116, AUSTRALIA
Tel: +61-(0)2-9898-1511 Fax: +61-(0)2-9898-1678
URL: <http://www.nachi.com.au/>

Manufacturing

● NACHI INDUSTRIES PTE. LTD.

No.2 Joo Koon Way, Jurong Town, Singapore
628943, SINGAPORE
Tel: +65-68613944 Fax: +65-68611153
URL: <http://www.nachinip.com.sg/>

● NACHI TECHNOLOGY (THAILAND) CO., LTD.

5/5 M, 2, Rojana Industrial Estate Nongbua,
Ban Khai, Rayong, 21120, THAILAND
Tel: +66-38-961-682 Fax: +66-38-961-683

● NACHI PILIPINAS INDUSTRIES, INC.

1st Avenue, Manalac Compound, Sta. Maria
Industrial Estate, Bagumbayan, Taguig, Metro
Manila, PHILIPPINES
Tel: +63-(0)2-838-3620 Fax: +63-(0)2-838-3623

● 建越工業股份有限公司

NACHI C.Y. CORP.

No.109, Kao Young North Rd, Lung-Tan Hsin,
Tao-Yuan Hsien, TAIWAN
Tel: +886-(0)3-471-7651 Fax: +886-(0)3-471-8402

● 东莞建越精密轴承有限公司

DONGGUAN NACHI C.Y. CORPORATION

Dangyong Village, Hongmei Town Dongguan City,
Guangdong, CHINA
Tel: +86-(0)769-8843-1300
Fax: +86-(0)769-8843-1300

● 上海不二越精密轴承有限公司

SHANGHAI NACHI BEARINGS CO.,LTD.

Yitong Industry Zone 258, Fengmao Rd.
Malu Town, Jiading, Shanghai 201801, CHINA
Tel: +86-(0)21-6915-6200 Fax: +86-(0)21-6915-6202

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SHANGHAI NACHI SAW CO., LTD.

Yitong Industry Zone 258, Fengmao Rd.
Malu Town, Jiading, Shanghai 201801, CHINA
Tel: +86(0)21-6915-5899 Fax: +86(0)21-6915-5898

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Yitong Industry Zone 258, Fengmao Rd.
Malu Town, Jiading, Shanghai 201801, CHINA
Tel: +86-(0)21-6915-7200
Fax: +86-(0)21-6915-7669

● 대성나찌 유압공업(주)

DAESUNG-NACHI HYDRAULICS CO., LTD.

289-22, Yusan-Dong, Yangsan-Si, GyeongNam
626-230, KOREA
Tel: +82-(0)55-371-9700
Fax: +82-(0)55-384-3270

● NACHI MOTHERSON TOOL TECHNOLOGY LTD.

D-59-60, Sector-6, Noida-201301,
Distt. Gautam Budh Nagar, U.P. INDIA
Tel: +91-120-425-8372 Fax: +91-120-425-8374

● NACHI MOTHERSON PRECISION LTD.

179, Sector4, IMT Manesar, District Gurgaon-122 050,
Haryana, INDIA
Tel: +91-124-4936-000 Fax: +91-124-4936-022