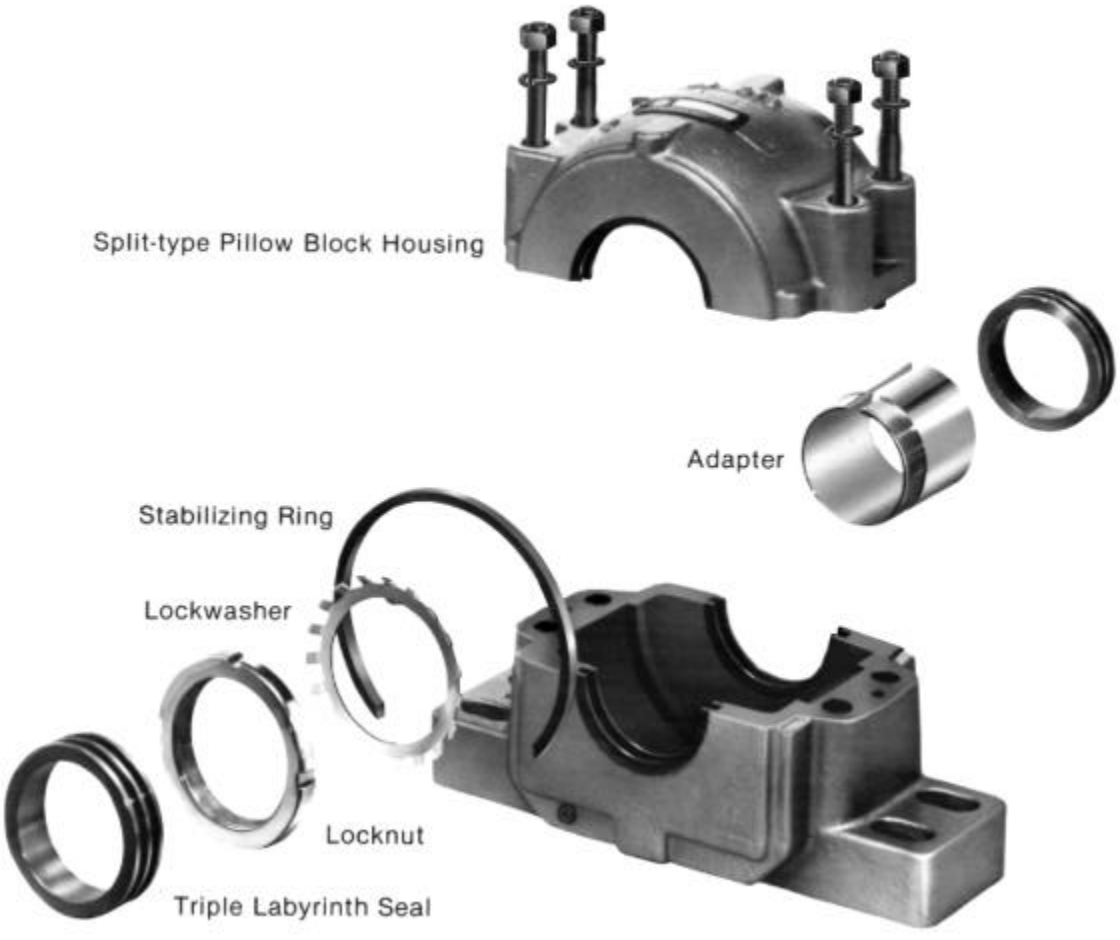
The Smart Alternative

Koyo®

MOUNTING AND HANDLING INSTRUCTIONS



Pillow Block Bearings

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Fits and Clearances for Pillow Block Bearings

1.0 Bearing Fits

If a bearing is to function satisfactorily, fitting tolerances should be carefully selected for the inner and outer rings. Generally, either one of these rings is tight fit to a shaft or housing such that neither ring slides relative to the shaft or housing. Such sliding may cause excessive heat, wear and eventual bearing failure. The proper fitting practice depends on the bearing type and operating condition.

1) Whether shaft or housing rotates
2) Nature and magnitude of loads
3) Temperature difference in operation
4) Bearing radial clearance
5) Shaft and housing finish
6) Method of mounting and dismounting
7) Accommodation of thermal expansion of the shaft
8) Type and dimensions of bearing

1.1 Clearance

Since the bearing clearance greatly influences bearing performance and life, it is important to select the proper clearance. Table (1-2) shows four radial clearance levels for Koyo spherical roller bearings. The one level that will provide optimum clearance during operation should be chosen. Selection should take into account, the following factors:

1) Clearance reduction due to fit
2) Clearance reduction due to temperature differential between the inner and outer ring in operation
3) Clearance reduction due to thermal expansion of rolling elements
4) Optimum clearance in operation
5) Other special operating conditions

In mounting a tapered bore bearing, clearance reduction can be used as a guide to know if the bearing has been adequately mounted on the shaft or adapter sleeve. Table (1-2) shows such clearance reduction and minimum mounted clearance for ordinary applications.

MOUNTING PROCEDURES FOR KOYO PILLOW BLOCK BEARINGS
READ ALL INSTRUCTIONS CAREFULLY BEFORE ASSEMBLY

2.0 Inspection Prior to Installation

1) Collect the necessary tools and lubricant (as shown in Fig. 2.0).
2) Check the components of the pillow block for missing or incorrect components (Fig. 2.1).
3) Clean the shaft with a lint-free cloth and check as follows:
   (Note 1) The shaft must be free from rust, nicks, dents, burrs, etc. Remove with sand paper, oilstone or file.

   (Note 2) When an oil seal is to be used, additional provisions should be made to ensure the maximum performance of the seal. Coat the seal contact surface with grease prior to installation so that an oil film can be maintained between the shaft and the seal lip in operation. Otherwise, heat can be built up at the seal, resulting in an in-adequate seal. The shaft must have the indicated tolerance, surface finish and hardness, as they influence the sealing ability.

   Tolerance: h9 or closer

   Eccentricity: 0.1 mm or (.003)

   Hardness: HRC 30 minimum (HRC 50 or greater is required in case of high speeds or abrasive environment)

   Finish: 1.5 to 3S (surface texture must not be spiral)

   (Note 3) Caps and bases are machined as "matched sets" do not inter mix parts between units

   If split housing pillow blocks with oil seals are to be used in extreme temperatures, a Koyo Applications Engineer should be consulted.

4) Clean and check the machined areas of the housing (flat bottom, bore, mating face and dowel hole).
5) In case of a spherical roller bearing, check the radial clearance before mounting as follows:

   Place the bearing on a horizontal surface as shown (Fig. 2-2). Insert a feeler gage between the outer ring raceway and top of rollers.

   Do not force the gage in, or rotate the bearing during measurement

Figure 2-0

Figure 2-1

Figure 2-2

MOUNTING PROCEDURES FOR KOYO PILLOW BLOCK BEARINGS
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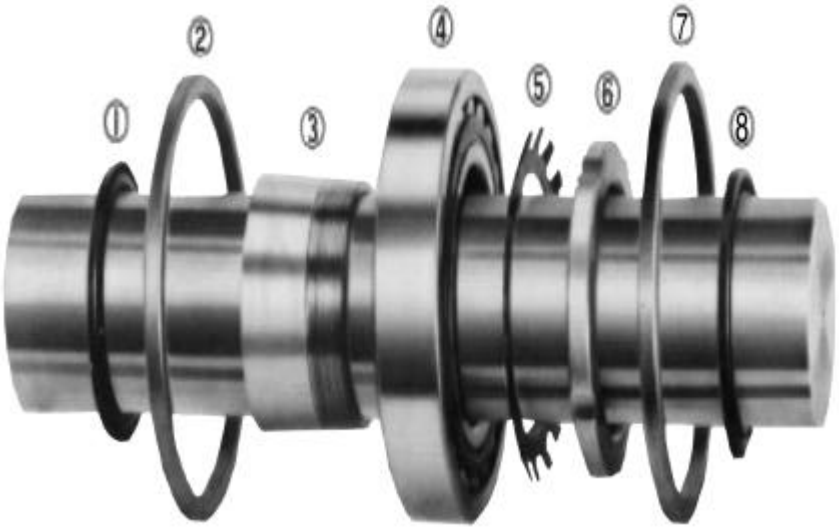
2.1 Installation of Bearing and Accessories



❶ LER Seal Ring
❷ Stabilizing Ring
❸ Adapter Sleeve
❹ Bearing
❺ Lock Washer
❻ Locknut
❼ Stabilizing Ring
❽ LER Seal Ring

Figure 2-4

1) **Installation of Tapered Bore Bearing with Adapter** (Fig. 2-4, 2-5)

Mount the LER seal ring (1) stabilizing ring (2) and adapter sleeve (3) in order on the shaft. Fit the bearing (4) on the adapter sleeve firmly. Mount the lock washer (5) on the adapter sleeve and tighten the locknut (6). Fill the bearing with grease (in case of grease lubrication) and finally mount the stabilizing ring (7) and the LER seal ring (8).

(Note-1) The stabilizing rings (2) and (7) are used only for the fixed Pillow Block bearing and not required for the floating Pillow Block bearing. Some bearings require only one locating ring and others two. Where only one locating ring is required, the ring (2) in the above example is not required and mount only ring (7).

(Note-2) The LER seal ring should be mounted in proper order.

(Note-3) Before tightening the locknut, find the required mounted clearance from the original clearance already measured and the clearance reduction shown in Table 1-2. Gradually tighten the locknut while checking the radial clearance until the required clearance is obtained. Then bend a prong of the washer into a slot of the locknut.

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2.2 Assembly of Split Housing Pillow Blocks

1) Mount the lower housing to the mounting surface and tighten temporarily. (Fig. 2-7)

   (Note): Be certain that there is no play between the housing and the mounting shaft surface.

2) Install the bearing assembly in the lower housing. (Fig. 2-8, 2-9)

   For the floating Pillow Block (no stabilizing rings), adjust so that the bearing will be positioned in the center.

3) After making sure that the bearing can rotate smoothly, tighten down the mounting bolts.

   (Note): Mounting errors may give unfavorable result on the oil seal or cause the shaft to interfere with the housing, resulting in the interference of smooth rotation. Be sure the clearance between the shaft and the housing end bores are even. (Fig. 2-11)

4) Fill the housing with lubricant. For grease lubrication, fill the grease 1/3 to ½ the space between the housing and the shaft. An excess of grease may cause heat generation. For oil lubrication, fill with oil up to the center of the rolling element (in lowest position) with the bearing at rest.

5) Install the upper housing and firmly tighten with bolts. (Fig. 2-10)

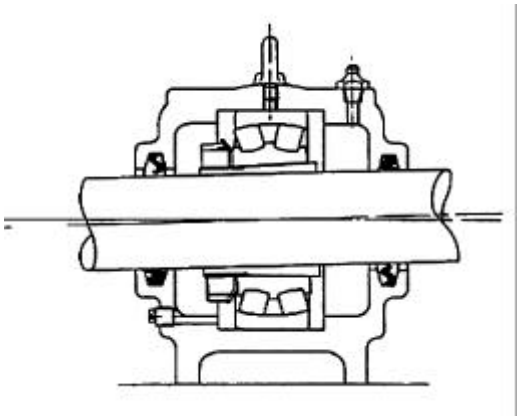

Figure 2-11
Example of Poor Installation

Figure 2-7

Figure 2-8

Figure 2-9

Figure 2-10

2.3 Running Test

On completion of installation, conduct a running test to check whether the installation is adequate. For small machines, initially turn the machines by hand to check the installation of the pillow block bearing. The machines may then be used with power.
(Large machines must usually be run with power from the beginning).

Start with low speeds and no load, then gradually increase to a given speed. Whenever an irregularity is observed, immediately inspect and, if necessary, remove, clean and reinstall the bearing.

General inspection points are:
1. Whether the bearing rotates lightly and whether the sealing system is too tight.
2. Whether the slinger or the labyrinth is in contact with the mating part or other parts.
3. Whether physical inspection detects roughness when turned by hand. In such situation dust or foreign matter may be trapped or rolling contact faces may have flaws.
4. Uneven running torque is frequently caused by mounting errors.
5. In the running test with power, conduct a diagnosis by noise and heat generation. In checking noise, use a sound detection rod. A clear metallic sound indicates insufficient lubricant while an irregular noise frequently indicates trapped foreign matter. Heat generation is usually caused by inadequate lubricant, excessive lubricant, or poor installation.

If any irregularities are observed by the procedure outlined above, locate the cause and take corrective action to replace the parts which may be damaged.

Replace grease at regular intervals referring to Table 2-1.

Table 2-1 Grease Supply Period Standards

Grease	Bearing Temp. (°C)	Condition	Supply* Period
For General Use (Li-Soap Mineral Oil)	60 or less	Clean	8 (m) ~ 2 (y)
		Dusty	1 (m) ~ 3 (m)
		Water spray High humidity	2 (w) ~ 3 (w)
	60 ~ 100	Clean	1 (m) ~ 6 (m)
		Dusty	2 (w) ~ 4 (w)
	100 or more	Clean	2 (w) ~ 4 (w)
		Dusty	1 (w) ~ 2 (w)
For High-Temperature Use (Non-Soap Mineral Oil)	60 ~ 100	Clean	2 (m) ~ 8 (m)
		Dusty	1 (m) ~ 2 (m)
	100 ~ 120	Clean	1 (m) ~ 2 (m)
		Dusty	2 (w) ~ 4 (w)
	120 or more	Clean	2 (w) ~ 4 (w)
		Dusty	1 (w) ~ 2 (w)
For Low-Temperature Use (Li-Soap Synthetic Oil)	−40 ~ 60	Clean	1 (y) ~ 2 (y)
		Dusty	1 (m) ~ 3 (m)
		Water spray High Humidity	1 (w) ~ 2 (w)
	60 ~ 100	Clean	1 (m) ~ 6 (m)
		Dusty	2 (w) ~ 4 (w)
	100 or more	Clean	2 (w) ~ 4 (w)
		Dusty	1 (w) ~ 2 (w)

* w: week m: month y: year

2.4 Inspection

For consistent operation of equipment, periodic inspections should be conducted to prevent bearing failure that would cause serious damage to equipment.

1. Inspection During Run
– Running sound of the bearing
– Vibration of the shaft
– Temperature of the bearing and housing
– Grease leakage and wear of the oil seal
– Looseness of fastening and mounting bolts

2. Inspection of Unit at Rest (remove the upper housing)
– External appearance of the bearing for irregularities
– Inside of the housing irregularities
– Loosened adapter sleeve
– Broken prong from the washer
– Deterioration of grease or irregular grease level
– Intrusion of foreign matter
– Wear and damage to seals
– Shaft wear at the face in contact with the seal

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Table 1-1 Reduction of Radial Clearances During Mounting of Spherical Roller Bearings with Tapered bore

Bore Diameter d(mm)		Decrease in Radial Clearances(in)	Amount of Axial Movement(in)	Minimum Residual Clearances (in)		
Over	Including		Taper 1:12	Normal	C3	C4
24	30	0.0006 - 0.0008	0.0106 - 0.0138	0.0004	0.0008	0.0014
30	40	0.0008 - 0.0010	0.0126 - 0.0157	0.0006	0.0010	0.0016
40	50	0.0010 - 0.0014	0.0157 - 0.0197	0.0008	0.0012	0.0018
50	65	0.0012 - 0.0016	0.0177 - 0.0236	0.0010	0.0014	0.0022
65	80	0.0014 - 0.0020	0.0217 - 0.0295	0.0014	0.0016	0.0028
80	100	0.0016 - 0.0022	0.0256 - 0.0335	0.0016	0.0020	0.0033
100	120	0.0022 - 0.0028	0.0335 - 0.0413	0.0018	0.0026	0.0039
120	140	0.0026 - 0.0035	0.0394 - 0.0472	0.0022	0.0031	0.0043
140	160	0.0030 - 0.0039	0.0433 - 0.0531	0.0022	0.0035	0.0051
160	180	0.0031 - 0.0043	0.0472 - 0.0591	0.0024	0.0039	0.0059
180	200	0.0035 - 0.0047	0.0551 - 0.0669	0.0028	0.0043	0.0067
200	225	0.0039 - 0.0051	0.0610 - 0.0728	0.0031	0.0047	0.0075
225	250	0.0043 - 0.0055	0.0669 - 0.0807	0.0035	0.0051	0.0083
250	280	0.0047 - 0.0063	0.0709 - 0.0906	0.0039	0.0055	0.0091
280	315	0.0051 - 0.0071	0.0787 - 0.0984	0.0043	0.0059	0.0098
315	355	0.0059 - 0.0079	0.0906 - 0.1102	0.0047	0.0067	0.0106
355	400	0.0067 - 0.0087	0.0984 - 0.1220	0.0051	0.0075	0.0118
400	450	0.0075 - 0.0094	0.1102 - 0.1339	0.0055	0.0083	0.0130
450	500	0.0083 - 0.0106	0.1220 - 0.1496	0.0063	0.0091	0.0142

Table 1-2 Radial Clearances for Tapered Bore Spherical Roller Bearings

Bore Diameter d (mm/inch)		Clearances (micron/inch)							
		C 2		Normal		C 3		C 4	
Over	Incl.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
18	24	0.0006	0.0010	0.0010	0.0014	0.0014	0.0018	0.0018	0.0024
24	30	0.0008	0.0012	0.0012	0.0016	0.0016	0.0022	0.0022	0.0030
30	40	0.0010	0.0014	0.0014	0.0020	0.0020	0.0026	0.0026	0.0033
40	50	0.0012	0.0018	0.0018	0.0024	0.0024	0.0031	0.0031	0.0039
50	65	0.0016	0.0022	0.0022	0.0030	0.0030	0.0037	0.0037	0.0047
65	80	0.0020	0.0028	0.0028	0.0037	0.0037	0.0047	0.0047	0.0059
80	100	0.0022	0.0031	0.0031	0.0043	0.0043	0.0055	0.0055	0.0071
100	120	0.0026	0.0039	0.0039	0.0053	0.0053	0.0067	0.0067	0.0087
120	140	0.0031	0.0047	0.0047	0.0063	0.0063	0.0079	0.0079	0.0102
140	160	0.0035	0.0051	0.0051	0.0071	0.0071	0.0091	0.0091	0.0118
160	180	0.0039	0.0055	0.0055	0.0079	0.0079	0.0102	0.0102	0.0134
180	200	0.0043	0.0063	0.0063	0.0087	0.0087	0.0114	0.0114	0.0146
200	225	0.0047	0.0071	0.0071	0.0098	0.0098	0.0126	0.0126	0.0161
225	250	0.0055	0.0079	0.0079	0.0106	0.0106	0.0138	0.0138	0.0177
250	280	0.0059	0.0087	0.0087	0.0118	0.0118	0.0154	0.0154	0.0193
280	315	0.0067	0.0094	0.0094	0.0130	0.0130	0.0169	0.0169	0.0213
315	355	0.0075	0.0106	0.0106	0.0142	0.0142	0.0185	0.0185	0.0232
355	400	0.0083	0.0118	0.0118	0.0157	0.0157	0.0205	0.0205	0.0256
400	450	0.0091	0.0130	0.0130	0.0173	0.0173	0.0224	0.0224	0.0283
450	500	0.0102	0.0146	0.0146	0.0193	0.0193	0.0248	0.0248	0.0311
500	560	0.0114	0.0161	0.0161	0.0213	0.0213	0.0268	0.0268	0.0343
560	630	0.0126	0.0181	0.0181	0.0236	0.0236	0.0299	0.0299	0.0386
630	710	0.0138	0.0201	0.0201	0.0264	0.0264	0.0335	0.0335	0.0429
710	800	0.0154	0.0224	0.0224	0.0295	0.0295	0.0378	0.0378	0.0480
800	900	0.0173	0.0252	0.0252	0.0331	0.0331	0.0421	0.0421	0.0539
900	1000	0.0193	0.0280	0.0280	0.0366	0.0366	0.0469	0.0469	0.0598

WARNING WARNING

Warning Statement for SAF Pillow Block Mounting Guide

The preceding instructions are provided with the shipment of the SAF units. These instructions are guidelines to use for the installation of the SAF units. All loads, conditions, installations and maintenance must be considered when evaluating the correct selection. If any questions arise upon selection, please contact the Koyo Corporation of USA engineering department at Ph: (440) 835-1000 during normal business hours (8:00 AM to 5:00 PM Eastern time).