

# Roller Bearing Pillow Block Units

## Detail Introduction :

Roller bearing is one of the rolling bearings, is one of the widely used parts in modern machinery, roller bearings are dependent on the rolling contact between the main components to support the rotating parts, different roller bearings can withstand different radial and axial forces, in the selection of roller bearings, should be based on the specific working conditions to make a choice, nowadays roller bearings have been mostly standardized.

Roller bearing pillow block units consist of spherical or tapered roller bearings mounted in non-dissecting housings that can be bolted to the supporting surface.

Roller bearing pillow block units provide excellent support and protection for the bearings, thus demonstrating their superiority in practical use.

## Specific advantages of roller bearing pillow block units.

Roller bearing pillow block units have a wide range of types, including vertical, flanged, keyway, round, etc., and are made of gray cast iron, ductile iron, and sheet steel. Ductile iron seat, steel plate stamping seat, stainless steel seat and plastic seat, etc., the specific advantages are.

1. The use of additional design bearing box, small size, simple structure, can be directly mounted on the host design parts with bolts, easy to use.
2. Simple and practical: bearing housing for the overall structure, large load-bearing capacity, good rigidity, bearing and housing can be interchangeable, that is, the same bearing housing can be installed with different types of bearings; the same, the same type of bearing can be selected from a variety of types of bearing housing.
3. Automatic adjustable: Roller bearing pillow block unit can work in the case of two bearing blocks with different axes, and the maximum automatic adjustment angle can reach  $2^\circ$ .
4. High precision: Roller bearing unit with seat has good rotational accuracy.
5. Small working environment requirements: Roller bearing pillow block units are generally pre-filled with grease, using double or triple lip seal form, suitable for use in dust, mud and water, corrosive media more occasions, conducive to the work of the host.
6. Accessory auxiliary: the inner diameter of the pillow block unit adopts "+" tolerance, and the shaft forms a clearance fit, through the inner ring on some of the top wire, eccentric sleeve or tightening sleeve, the bearing is fixed on the shaft, reducing the accuracy requirements of the shaft, installation or replacement of bearings is extremely convenient.

In addition, roller bearings mainly have spherical roller bearings, thrust spherical roller bearings, tapered roller and cylindrical roller bearings and other structural types, different bearing types are suitable for different working environments, each bearing has a very wide range of applications.

## The main applications of Roller bearing pillow block units.

The roller bearing pillow block units belong to separated bearing, the inner and outer ring of the bearing have tapered raceway, this type of bearing is divided into single row, double row and four row tapered roller bearings and other different structure types according to the number of the installed rollers, single row tapered roller bearings can bear radial load and single direction axial load, when the bearing bear radial load, will produce an axial force, so when another bearing is needed to bear the opposite direction When the bearing is subjected to radial load, an axial force will be generated, so when another bearing is needed to bear the opposite direction of the axial force to balance.

Based on this characteristic, Roller bearing pillow block unit is widely used in mechanical equipment, water and electricity, engineering, railroad, automobile, steel, electric power, textile, packaging, medical, metallurgy, mining, petroleum, electricity, paper, electronic computer, motor, sports equipment, office equipment, instrumentation, automotive motor, precision instruments and other fields.

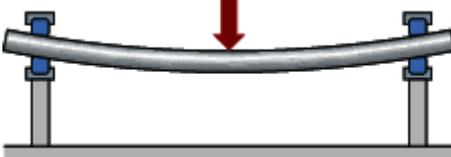
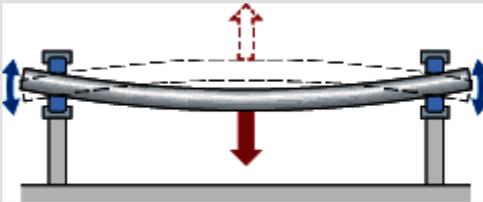
The Roller bearing pillow block units developed and produced by Skf have very significant advantages in terms of quality and practicality, and have won the unanimous approval of the industry.

In the years of development, SKF has become the world's leading bearing manufacturer, serving many customers and many famous enterprises, making outstanding contributions to the development of the world economy.

About Roller bearing pillow block units you can learn more about the following.

### 1. Roller bearing pillow block units Permissible misalignment

Permissible misalignment depends on the type of misalignment that the unit is subjected to. The types of misalignment are described in table 1.

|                      |  |   |
|----------------------|--|---|
| Static misalignment  | There is an initial alignment error between the two supports of a shaft.   |   |
|                      | Shaft deflection creates misalignment between bearing inner and outer rings that is constant in magnitude and direction.                     |   |
| Dynamic misalignment | Varying shaft deflection creates misalignment between bearing inner and outer rings that is continuously changing in magnitude or direction. |  |

SKF units incorporating spherical roller bearings can accommodate 1.5° of static misalignment when loads are light to normal ( $P \leq 0.1C$ ). Dynamic misalignment can cause additional sliding, reducing permissible misalignment to a few tenths of a degree.

SKF units incorporating tapered roller bearings can only accommodate minute misalignment. If misalignment cannot be avoided, contact the SKF application engineering service. Any misalignment increases bearing noise and reduces bearing service life.

### 2. Roller bearing pillow block units Locating / non-locating support



Generally, two bearings are required to support a rotating machine component – typically by an arrangement that includes one locating and one non-locating bearing unit (fig. 1):



fig. 1

### Locating support

Locating units, which are typically positioned at the drive side of the arrangement, support the shaft radially and locate it axially in both directions. Designation suffixes for locating bearing units are listed in the table below.

### Non-locating support

Non-locating units provide radial support and accommodate axial displacement of the shaft relative to the housing, as a result of thermal elongation or inaccuracies from mounting. They are typically placed at the shaft end position. The values of the possible displacement  $\pm S$  (from the centre position) and the designation suffixes for non-locating bearing units are listed in the table below.

### Available variants

| Unit series | Locating support | Non-locating support |
|-------------|------------------|----------------------|
|             |                  |                      |

|   | Designation suffix | Designation suffix   | Possible axial displacement ± S |        |
|---|--------------------|--|---------------------------------|--------|
|   |                    |  | mm                              | in.    |
| Units incorporating spherical roller bearings,<br>metric series | F                  | L  | ± 2.5                           | ± 3/32 |
| inch series   |                    |  |                                 |        |
| Units incorporating spherical roller bearings,<br>inch series   | H                  | E  | ± 0.8                           | ± 1/32 |
| metric series   |                    |  |                                 |        |
| Units incorporating tapered roller bearings,<br>inch series     | H                  | Not available  |                                 |        |
| metric series   |                    | Axial displacement is accommodated by the axial internal clearance of the units (table 1). Axial displacement that exceeds the axial clearance must be accommodated by the surrounding structural components or other solutions, e.g. linear guidings. |                                 |        |

| Bore diameter |     | Axial internal clearance |        |      |      |
|---------------|-----|--------------------------|--------|------|------|
| d             |     |                          |        |      |      |
| ?             | ?   | min.                     | max.   | min. | max. |
| in            |     | in                       |        | ?m   |      |
| 1 3/16        | 3   | 0.002                    | 0.014  | 50   | 355  |
| 3 3/16        | 5   | 0.008                    | 0.012  | 200  | 305  |
| mm            |     | in                       |        | ?m   |      |
| 35            | 75  | 0.0014                   | 0.0023 | 35   | 65   |
| 80            | 125 | 0.0018                   | 0.0031 | 45   | 80   |

### 3. Roller bearing pillow block units Loads

#### Equivalent bearing loads

Equivalent bearing loads are used in the process of selecting the bearing size .

The equivalent dynamic bearing load P can be obtained from:

$$P = Fr + Y1Fa \quad \text{when } Fa/Fr \leq e$$

$$P = 0,67Fr + Y2Fa \quad \text{when } Fa/Fr > e$$

The equivalent static bearing load P0 can be obtained from:

$$P0 = Fr + Y0Fa$$

where

|            |  |
|------------|--|
| P          | equivalent dynamic bearing load [kN]   |
| P0         | equivalent static bearing load [kN]  |
| Fa         | axial component of the bearing load [kN]   |
| Fr         | radial component of the bearing load [kN]  |
| Y1, Y2, Y0 | axial load calculation factors for the bearing (see technical specification for each unit - product table) |
| e          | limiting value for Fa/Fr (see technical specification for each unit - product table)                       |

### Minimum bearing load

To provide satisfactory operation, rolling bearings must always be subjected to a given minimum load. The requisite minimum load for units incorporating spherical roller bearings can be obtained from:

$$P_m = 0.01 C_0$$

The requisite minimum load for units incorporating tapered roller bearings can be obtained from:

$$F_{rm} = 0.02 C$$

where

|     |  |
|-----|--|
| Pm  | requisite equivalent minimum load [kN]   |
| Frm | requisite radial minimum load [kN]   |
| C   | basic dynamic load rating [kN] (see technical specification for each unit - product table) |
| C0  | basic static load rating [kN] (see technical specification for each unit - product table)  |

### Permissible radial housing loads

SKF pillow block housings are intended for loads acting perpendicularly to the support surface. If the housing is supported over its entire base and the loads are purely perpendicular, permissible loads are limited only by the bearing. If radial loads acting in other directions occur (fig. 1), be sure that the magnitude of the load is permissible for the housing and the attachment bolts.



fig. 1

#### Metric series units

For metric roller bearing units, guideline values for the breaking loads of the housing are provided in the technical specification for each unit. A safety factor of 6 is typically used.

#### Inch series units

For inch roller bearing units, guideline values for the safe loads of the housings are provided in the technical specification for each unit. To avoid the risk of fracture, the specified safe loads include a safety factor of 5. For P2BA and P4BA units incorporating spherical roller bearings, the permissible housing loads are at least as high as for the corresponding SAF pillow block housings, which they can replace.

If the bearing unit is not supported over its entire base, the load carrying capacity for perpendicular loads may be affected. For additional information, contact SKF.

### Axial holding force of the locking mechanism

The axial holding force of SKF ConCentra roller bearing units depends on the friction between the

shaft and locking device. It therefore also depends on the number of set screws in the mounting collar. Maximum values for the axial holding force are listed in the technical specification for each product.

For units with set screw locking, the axial holding force is determined by the size of the set screws. Maximum values for the axial holding force are listed in the technical specification for each product. The values are valid for unhardened shafts after the set screws have been tightened to the recommended torque value.

However, the axial load carrying capacity of the unit can be limited by the incorporated bearing.

### **Loads parallel to the support surface**

When the load angle acting on the housing is between 55° and 120° (fig. 2), or when the axial load exceeds 25% of the safe load  $P_{180^\circ}$  or 5% of the breaking load  $P_{180^\circ}$  (see technical specification for each product), one of the following precautions should be taken:

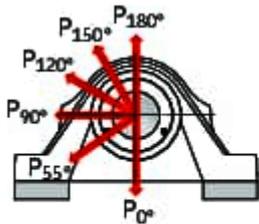


fig. 2

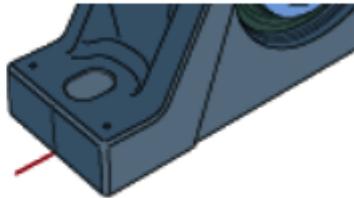


fig. 3

Stops should be provided in the direction of the load.

The housings should be dowelled to the support surface.

The units have dimples indicating dowel pin positions (fig. 3). Make sure that the dowel pins are sufficiently strong to accommodate the loads acting parallel to the support surface.

### **Comparative load ratings for units with tapered roller bearings**

The comparative load rating CF is listed in the technical specifications for each product (product table). This load rating is intended for reference only. It should not be used to calculate bearing rating life. The comparative load rating is similar to the C90 load rating published by other manufacturers of type E roller bearing units. It is based on a rating life of 90 million revolutions (500 r/min for 3 000 operating hours).

### **4. Roller bearing pillow block units Temperature limits**

The permissible operating temperature for roller bearing units is limited by:

the seals and end covers

the lubricant

The housing material does not limit the operating temperature range, except for very low temperature applications where impact strength could be a factor.

Where temperatures outside the permissible range are expected, contact SKF.

#### **Seals and end covers**

Some sealing solutions and end covers limit the operating temperature range due to the nature of the material from which they are made. These are:

Bearing sealing solutions using NBR - radial lip or heavy-duty seals (units incorporating spherical roller bearings):

-20 to +110 °C (-5 to +230 °F)

Temperatures up to 120 °C (250 °F) can be tolerated for brief periods.

Typically, temperature peaks are at the seal lip.

Bearing sealing solutions using HNBR - heavy-duty seals (units incorporating tapered roller bearings):

-30 to +125 °C (-20 to +255 °F)

Typically, temperature peaks are at the seal lip.

End covers from PP material (ECY series):

max. 100 °C (210 °F)

All other sealing solutions or end covers do not limit the operating temperature range.

#### **Lubricants**

Temperature limits for the greases used in roller bearing units are provided in table 1.

Relubrication-free units use grease GEF; other units use LGEP2.

| SKF Designation | Temperature range |   |    |     |     |     |     | Thickener    | Base oil type  | NLGI grade | Base oil viscosity [mm <sup>2</sup> /s] |                    |
|-----------------|-------------------|---|----|-----|-----|-----|-----|--------------|----------------|------------|---|--------------------|
|                 | -50               | 0 | 50 | 100 | 150 | 200 | 250 |              |                |            | at 40 °C (105 °F)                       | at 100 °C (210 °F) |
| LGEP2           |                   |   |    |     |     |     |     | Lithium soap | Mineral        | 2          | 200                                     | 16                 |
| GEF             |                   |   |    |     |     |     |     | Lithium soap | Semi-synthetic | 2-3        | 41.9                                    | 7.5                |

table 1

## Complete guide to Roller bearing pillow block units.

Skf bearings provide high quality bearings for the development of society, each bearing has a very broad use prospects, to industrial manufacturing provides a very strong technical support, won the recognition of the community.

The following will introduce you to some common questions about Roller bearing pillow block units.

### 1. What is Roller bearing pillow block units?

Roller bearing pillow block unit is a kind of bearing unit that combines rolling bearing and housing together. Most of the outer spherical bearings are made with spherical outer diameter and mounted together with imported bearing housing with spherical bore, with various structural forms and good versatility and interchangeability.

At the same time, these bearings are also designed with a certain degree of alignment, easy to install, with a double structure of the sealing device, can work in harsh environments. Bearing seat is generally used casting molding. Commonly used seat has vertical seat (P), square seat (F), tab square seat (FS), tab round seat (FC), diamond-shaped seat (FL), ring seat (C), slide seat (T), etc..

### 2. What are the advantages of Roller bearing pillow block units?

1. With automatic centering function: the outer diameter of the bearing and the inner diameter of the housing with each other, between the two have automatic centering function, can compensate for the installation error generated by the axis does not coincide and the deformation of the installation bottom surface.
2. Large load capacity: Because the internal structure of the bearing with seat is the same as 6200 and 6300 series deep groove ball bearings, so the bearing with seat can not only bear radial load, but also can bear certain axial load, while the bearing work noise is small.
3. Good sealing performance: Roller bearing pillow block units effectively prevent the external foreign matter from entering the bearing, and can resist the external pressure to protect the bearing. It can keep the perfect working performance under the harsh working environment.
4. Long service life: grease re-lubrication is carried out in appropriate time interval for the bearing with seat, and fresh grease is used to replace the deteriorated grease, while the bearing with seat are equipped with oil nozzle, which can be re-lubricated to ensure perfect performance and long service life in any working environment.
5. Easy to install: Roller bearing pillow block unit can be easily locked on the shaft, there are four ways to lock the bearing, the common method is to lock the inner ring elongated end of the two fastening screws.

### 3. Notes on the use of Roller bearing pillow block units.

Roller bearing pillow block units are very good in quality and other aspects, but because the bearing is a precision part, it must be used carefully. No matter how high performance the bearing is used, if it is not used properly, you will not get the expected high performance and it may even lead to bearing failure. You need to strictly observe the following points.

1. Keep Roller bearing pillow block units and their surroundings clean: Even small dust that is invisible to the eye can have a bad effect on the bearing. So keep the surrounding clean so that dust does not invade the bearings.

2. Careful use: Giving strong impact to Roller bearing pillow block units in use can produce scars and indentations, which can be the cause of accidents. In serious cases, cracks and fractures can occur, so care must be taken.

3. Use proper operating tools: Avoid replacing existing tools and use proper tools.

4. Pay attention to the rust of Roller bearing pillow block units: When operating the bearings, sweat on your hands can become the cause of rust, so pay attention to operating with clean hands, and it is best to wear gloves as much as possible.

#### **4. What should I pay attention to when installing Roller bearing pillow block unit?**

Adjustment of axial play For the installation of Roller bearing pillow block units axial play can be adjusted by the adjusting nut on the journal, the adjusting shim and the thread in the bearing housing hole, or by the preload spring. The size of the axial clearance, and bearing installation arrangement, the distance between bearings, shaft and bearing housing materials, can be determined according to the working conditions.

For high load high speed Roller bearing pillow block units, adjust the clearance, must consider the temperature rise on the axial clearance, the temperature rise caused by the clearance reduction is estimated, that is to say, the axial clearance should be properly adjusted to a larger.

For low speed and bearing vibration, should take no clearance installation, or apply preload installation. The purpose is to make Roller bearing pillow block units roller and raceway produce good contact, load uniform distribution, prevent the roller and raceway by vibration impact damage, after adjustment, the size of the axial clearance with a micrometer test.

#### **5. How should I maintain Roller bearing pillow block units when using?**

1. Cleaning: When removing the Roller bearing pillow block unit for inspection, first take pictures and other methods to record the appearance. In addition, the amount of remaining lubricant should be confirmed and the lubricant should be sampled, and then the bearings should be cleaned.

2. Inspection: In order to distinguish whether the dismantled bearing can be used from the beginning, we should check its standard accuracy, rotational accuracy, internal clearance and the wear of collaborative surface, raceway surface, holding frame and sealing ring. About the inspection effect, can be used by the habitual bearing or know bearing reasonable user to distinguish judgment, in addition can according to its mechanical function use and related factors importance is different, so its inspection cycle and testing parameters are also different. If there is above damage, can not meet the re-use requirements, bearing shall not be used from the beginning, should be timely replacement.

#### **6. The size of the bearing with seat and classification?**

Mainly divided into the following categories.

1. Miniature bearings ---- nominal outer diameter size range of 26mm or less bearings;

2. Small bearings ---- with nominal outer diameter size range of 28-55mm;

3. Small and medium-sized bearings ---- with nominal outer diameter size range of 60-115mm;

4. Medium and large size bearings ---- with nominal outer diameter size range of 120-190mm

5. Large size bearings ---- with nominal outer diameter size range of 200-430mm;

6. Extra large size bearings ---- with the nominal outer diameter size range of 440-2000mm bearings;

7. Major bearings ---- with the nominal outer diameter size range of 2000mm or more.

Of course, there are also distinguished according to the aperture, such as aperture 10mm or less for miniature bearings.

#### **7. The limiting speed of bearing with housing.**

The ultimate speed of bearing is related to various factors such as bearing type, size, load, lubrication, precision, clearance, cage and cooling condition. However, the most important factor is the working temperature allowed by the lubricant or bearing material.

When the bearing in  $P > 0.1C$  load conditions, due to rolling body and raceway contact surface between the contact stress increases, resulting in bearing working temperature increases, the performance of the lubricant relative deterioration, therefore, the bearing limit speed will be correspondingly reduced.

For  $C/P > 10$  range, due to the limit speed reduction is very small, so can not be considered, that is, according to  $f_1 = 1$  to take the value.

For the radial bearing with combined load, due to its load bearing rolling body number increases, friction resistance increases, heat generation rises, lubrication and cooling conditions become worse, and the force acting on the cage also increases, therefore, according to the bearing type and the size of the load angle, the bearing limit speed multiplied by a reduction factor  $f_2$  to adjust.

If you use the Roller bearing pillow block units limit speed can not reach your requirements, you can improve the bearing tolerance level, appropriate to increase the clearance, change the use of special materials and improve the structure of the cage, change the lubrication, improve the cooling conditions, etc. to be improved.

### **8.How to avoid the damage of Roller bearing pillow block unit?**

In the case of correct use, the bearing can be used until it reaches fatigue life, but there will be some premature damage, can not be resistant to the use of the situation. This early damage, as opposed to fatigue life, is the quality of use limit called failure or accident. Mostly because of installation, use, lubrication on the inattention, from the external invasion of foreign bodies, for the shaft, shell of the thermal impact of the study is not enough.

About the bearing damage state such as: roller bearing collar, retaining edge of the jam, as the reason can be considered, lubricant is not enough, unsuitable, supply and drainage structure defects, foreign body invasion, bearing installation error, shaft deflection too much, also will have these reasons overlap.

Therefore, it is difficult to know the real cause of the damage by investigating the bearing damage only. However, if we know the use of the bearing machinery, the conditions of use, the structure around the bearing, and understand the situation before and after the accident, we can effectively prevent the recurrence of similar accidents by examining the damage state and several causes in combination with the bearing.