Single Row Hybrid Cylindrical Roller Bearings

Detail Introduction :

Single row Hybrid cylindrical roller bearings are a type of roller bearing that is subjected to radial forces only.

Roller bearings are a type of SKF rolling bearing and are one of the most widely used components in modern machinery. It mainly relies on the rolling contact between the main components to support the rotating parts. SKF's rolling bearings have the advantages of low start-up torque, high rotational accuracy and easy selection.

SKF Single row Hybrid cylindrical roller bearing in comparison with the same size ball bearing, radial bearing capacity increased by 1.5-3 times, not only has good rigidity, impact resistance and other advantages, it is also particularly suitable for rigid support, and support short shaft, heat elongation and axial displacement of the shaft and installation and disassembly need to be separated type bearing It is particularly suitable for rigidly supported shafts, which are subject to short shafts, axial displacement due to thermal elongation, and machine attachments that require dismounting.

Single row Hybrid cylindrical roller bearings have the following characteristics.

1. Roller bearing and raceway for line contact or repair under the line contact, its radial bearing capacity is large, suitable for bearing heavy loads and shock loads.

Single row Hybrid cylindrical roller bearing friction coefficient is small, very suitable for high speed, the limit speed is close to the deep groove ball bearing.

3. Single row cylindrical roller bearing N type and NU type can move axially, can adapt to the change of relative position of shaft and shell caused by thermal expansion or mounting error, can be used as free end support.

4. Roller bearings on the shaft or seat hole processing requirements are high, bearing installation after the outer ring axis relative deflection should be strictly controlled, so as not to cause contact stress concentration.

5. The inner ring or outer ring of roller bearing can be separated to facilitate the installation and disassembly in use.

Cylindrical roller and raceway are in line contact, radial load capacity is large. Both suitable for bearing heavy load and shock load, but also suitable for high-speed rotation.

Cylindrical roller bearing raceway and rolling body are geometrically shaped. The new structure design of retaining edge and roller end face not only improves the axial bearing capacity, but also improves the lubrication condition of the roller end face and retaining edge contact area, which improves the bearing performance.

Single row Hybrid cylindrical roller bearings consists of outer ring, inner ring locking ring and cage, the outer ring has an annular stress groove in the middle of the outer wall surface, there are multiple annular locking grooves on the outer wall of the outer ring, the shape and size of the locking ring is compatible with the shape and size of the annular locking groove. The ring-shaped locking groove is equipped with a locking ring. Outer ring inner wall of the ring surface and stress groove corresponding parts with ring cage guide groove.

SKF bearing has always paid attention to the production and development of bearings, Single row Hybrid cylindrical roller bearing as a new upgraded bearing, has the advantages of easy assembly, large load bearing, high limit speed, high reliability, long service life, etc..

Of course Single row Hybrid cylindrical roller bearings are very widely used, mainly for large motors, machine tool spindles, engine front and rear support shafts, train and bus trunk shaft support, diesel engine crankshaft, automobile tractor gearboxes, etc.

In terms of precision level, cylindrical roller bearings can be divided into PO,P6,P5,P4,P2 according to the precision level, the precision level is sorted from low to high. Cylindrical roller bearings are divided into four types, and there are two types in the structure form.

Construction type

1. outer ring without stopper N0000 type and inner ring without stopper NU0000 type, cylindrical roller bearings such bearings can accept larger radial load, high limit speed, not bound shaft or shell axial displacement, can not accept the axial load.

NU0000+HJ0000 type, NJ0000+HJ0000 type, NUP0000 type bearings, can be imported in the field of axial clearance of the bearing shaft or shell two directions of axial displacement, and can accept a small one-way axial load. of the axial displacement, and can accept a smaller two-way axial load.

N, NU type

N type bearings have no retaining edge on the outer ring and retaining edge on both sides of the inner ring. NU type bearing outer ring on both sides of the baffle edge, the inner ring has no baffle edge. It can also allow the displacement between the shaft and the housing in both directions in the axial direction. Therefore, this type of structure is suitable for use as a moving end bearing.

NJ?NF type

NJ type bearing outer ring on both sides of the retaining edge, inner ring single side of the retaining edge. NF type bearing has a single side of the outer ring, the inner ring has a single side of the retaining edge. Also can bear a certain amount of one-way axial load. Therefore, this type of structure is suitable for use as a single-direction axial locating bearing.

NUP, NFP type

NUP type bearing is the outer ring on both sides of the retaining edge, the inner ring on one side with (fixed) single retaining edge, and the other side for the separable flat retaining ring. It can bear a certain amount of bi-directional axial load.

The NFP type bearing is with (fixed) single edge on one side of the outer ring, and the other side is separable flat retaining ring, and the inner ring has retaining edge on both sides. Also can bear a certain amount of two-way axial load. This type of structure bearing can limit the displacement of the shaft relative to the housing in both directions in the axial direction. Therefore, it is suitable for use as fixed end bearings.

NH (NJ+HJ) type

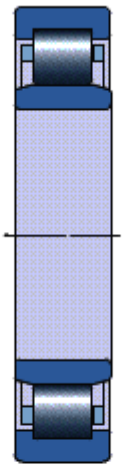
NH type bearing is the structure of NJ type bearing combined with HJ type tilting retaining ring. Since the inner ring of NUP type bearing is short, and the flat retaining ring is not fixed, it is not convenient to use, while NH type bearing can use the whole width of inner ring of NJ type bearing to keep a closer fit with the shaft. And NH type bearing is more convenient in mounting and dismounting.

NH type bearings can limit the displacement of the shaft in both directions relative to the housing in the axial direction. Therefore, they are suitable for use as fixed end bearings.

Of course, when you choose to buy bearings, you also need to know the details of all aspects of the bearings. Including the basic design and use requirements.

SKF Single row Hybrid cylindrical roller bearing

1.are separable
2.are suitable for high speeds
3.accommodate heavy radial loads
4.accommodate axial displacement (fig. 1)
5.are commonly used in electric motors, especially traction motors, and in applications running under severe operating conditions



(fig. 1)

Basic design bearings

The NU design cylindrical roller bearing, which has two integral flanges on the outer ring and no flanges on the inner ring, is the standard basic design for hybrid cylindrical roller bearings (fig. 2).

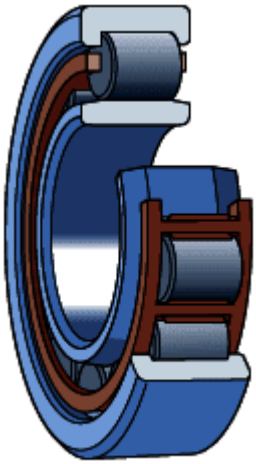


fig. 2

Hybrid bearings have rings made of bearing steel and rolling elements made of bearing grade silicon nitride (Si3N4), which make the bearings electrically insulating.

Silicon nitride rolling elements can extend bearing service life by offering enhanced bearing performance, even under difficult operating conditions.

Cages

SKF hybrid cylindrical roller bearings are fitted with one of the following cages:

a glass fibre reinforced PA66 cage, window-type, roller centred (designation suffix P)

a glass fibre reinforced PEEK cage, window-type, roller centred (designation suffix PH)

a machined brass cage, riveted, roller centred (designation suffix M)

a machined brass cage, window-type, inner or outer ring centred (depending on bearing design) (designation suffix ML)

For additional information, refer to Cages.

When used at high temperatures, some lubricants can have a detrimental effect on polyamide cages.

Hybrid bearings with special steel rings and coatings

For specific application requirements, hybrid bearings can be customized:

1.bearing rings stabilized for temperatures ? 300 °C (570 °F)

2.bearing rings made of through-hardened stainless steel for enhanced corrosion and wear-resistance and with good high-temperature properties

3.bearing rings made of through-hardened stainless steel for cryogenic temperatures

4.bearing rings made of high-temperature tool steel

5.ring coating with zinc chromate or thin dense chromium for corrosion protection
6.ring coating based on molybdenum for low friction, especially in vacuum or gas applications
For availability and detailed information, contact SKF.
1.Single row Hybrid cylindrical roller bearings Selecting bearing size
Selecting the size of a hybrid bearing can be done following the principles described in the Bearing selection process under Bearing size.
The load ratings C and C0 for hybrid bearings have been revised in accordance with ISO 20056-1 and ISO 20056-2. The rating life value for the same bearing and same operating conditions may differ from the value calculated using the previously published load ratings.
When selecting a bearing size based on the rating life, use the following quick two-step process for the best results:
1.Pre-select a suitable bearing size based on the basic rating life.
2.Verify the selection based on the SKF Generalized Bearing Life Model (GBLM) (Bearing rating life). This can be done by using SKF Bearing Select. The tool calculates the rating life of hybrid deep groove ball bearings and hybrid cylindrical roller bearings based on the SKF GBLM.
2.Single row Hybrid cylindrical roller bearings Temperature limits
The permissible operating temperature for hybrid bearings can be limited by:
1.the dimensional stability of the bearing rings
2.the cage
3.the seals
4.the lubricant
Where temperatures outside the permissible range are expected, contact SKF.
Bearing rings
The rings of SKF hybrid bearings are heat stabilized up to at least:
1.120 °C (250 °F) for basic design hybrid deep groove ball bearings
2.150 °C (300 °F) for hybrid cylindrical roller bearings and XL hybrid deep groove ball bearings
On request, SKF can supply hybrid bearings with rings stabilized for operating temperatures up to 300 °C (570 °F)

Cages

Steel, brass or PEEK cages can be used at the same operating temperatures as the bearing rings of standard hybrid bearings. For temperature limits of other polymer cages, refer to Polymer cages.
Seals
The permissible operating temperature for seals depends on the seal material:
1.NBR: –40 to +100 °C (–40 to +210 °F)
Temperatures up to 120 °C (250 °F) can be tolerated for brief periods.
2.FKM: –30 to +200 °C (–20 to +390 °F)
Temperatures up to 230 °C (445 °F) can be tolerated for brief periods.
Typically, temperature peaks are at the seal lip.

Lubricants

Temperature limits for the grease used in sealed SKF hybrid deep groove ball bearings are provided in table 1. For temperature limits of other SKF greases, refer to Selecting a suitable SKF grease.

Grease	Temperature range[1]	Thickener	Base oil type	NLGI grade	Base oil viscosity [mm²/s or cSt] at 40 °C (105 °F)	at 100 °C (210 °F)	Grease performance factor (GPF)
	–50 0 50 100 150 200 250 °C						
MT33		Lithium soap	Mineral	3	100	10	1
MT47		Lithium soap	Mineral	2	70	7.3	1
LHT23		Lithium soap	Ester	2–3	27	5.1	2
LT		Lithium soap	PAO	2	18	4.5	1
WT		Polyurea	Ester	2–3	70	9.4	4
GJN		Polyurea	Mineral	2	115	12.2	2
HT		Polyurea	Mineral	2–3	96	10.5	2
VT378		Aluminium complex soap	PAO	2	150	15.5	–[2]
GFJ		Aluminium complex soap	Synthetic hydro-carbon	2	100	14	1
GE2		Lithium soap	Synthetic	2	25	4.9	2
GFM		Calcium sulphonate complex	Mineral	2	113	5.8	1.5
	–60 30 120 210 300 390 480 °F						

table 1

When using lubricants not supplied by SKF, temperature limits should be evaluated according to the SKF traffic light concept.

3?Single row Hybrid cylindrical roller bearings Permissible speed

The speed ratings in the product tables for hybrid deep groove ball bearings and hybrid cylindrical roller bearings indicate:

1.the reference speed, which enables a quick assessment of the speed capabilities from a thermal frame of reference

2.the limiting speed, which is a mechanical limit that should not be exceeded unless the bearing design and the application are adapted for higher speeds

For additional information, refer to Operating temperature and speed.

SKF recommends oil lubrication for bearings with a ring centred cage (designation suffix ML). When these bearings are grease lubricated, the ndm value is limited to ? 250 000 mm/min.

where

dm	bearing mean diameter [mm]
	= 0,5 (d + D)
n	rotational speed [r/min]

4?Single row Hybrid cylindrical roller bearings Designation system

Refer to Designation system of the relevant standard bearing:

1.Deep groove ball bearings

2.Single row cylindrical roller bearings

Additional designation suffixes used with SKF hybrid bearings are explained in the following.

C3P	Displaced clearance range comprising the upper half of the C3 plus the lower half of the C4 clearance ran
F1	Grease fill 10–15% of the free space in the bearing
HC5	Rolling elements made of silicon nitride

S0	Bearing rings heat stabilized for operating temperatures ? 150 °C (300 °F)
VA970	Special design deep groove ball bearing for wind turbine generators
VC444	Bearing rings made of high nitrogen steel

5.Single row Hybrid cylindrical roller bearings Bearing data

	Deep groove ball bearings	C
Dimension standards	Boundary dimensions: ISO 15	
Tolerances	Normal	N
		P
For additional information ? Tolerances	Values: ISO 492 (table 1, table 2)	
Internal clearance	C3	
	Check availability of other clearance classes	
For additional information ? Internal clearance	Values: ISO 5753-1 (table 3)	V
	Values are valid for unmounted bearings under zero measuring load.	
Permissible misalignment	Identical to standard bearings	
	Bearing data	B
Permissible axial displacement	–	s
		N D A
Electrical properties	Protection against AC and DC currents	
	High impedance, even for very high frequencies, providing good protection against high frequency current and voltage peaks	
	Voltage level before the first arcing occurs through the seal/bearing contact of small hybrid deep groove ball bearings (NBR contact seal): > 2,5 kV DC	

Frequently asked questions about single row cylindrical roller bearings can be understood by the following.

1.What is Single row Hybrid cylindrical roller bearing?

Roller bearing is for spherical bearings, the rolling form of spherical bearings is to rely on the direct contact between the inner and outer ring without rolling body, while roller bearings have a lot of rolling body between the inner and outer ring, which is the roller, so that its contact resistance is much smaller and not easy to generate heat, such as the deep groove ball bearings used in bicycles inside the small ball is the rolling body that roller.

Common rolling elements are cylindrical roller, tapered roller, spherical roller, ball roller and needle roller and so on, corresponding to cylindrical roller bearings, tapered roller bearings, spherical roller

bearings, ball bearings (self-aligning ball bearings) and needle roller bearings.
Cylindrical roller and raceway is in line contact, radial load capacity, that is, suitable for bearing heavy load and shock load, also suitable for high-speed rotation N type and NU type can be axial movement, can adapt to the thermal expansion or installation error caused by the shaft and shell relative position changes, the most suitable for use as a free end bearing NJ type and NF type can withstand a certain degree of one-way axial load, NH type and NUP type can withstand a certain degree of Two-way axial load inner ring or outer ring can be separated, easy to install and disassemble NNU type and NN type radial load resistance rigidity.

2. What are the differences between rolling bearings and roller bearings?

Different in nature.
1?Roller bearing: one of the widely used parts in modern machinery.
2, ball bearing: a kind of rolling bearing, ball ball installed in the middle of the inner and outer steel ring, can withstand the larger load.
Different principles.
1, ball bearings: determine the relative position of two components (usually the shaft and housing) to ensure that they are free to rotate while transferring the load. At high speeds (e.g. in gyro ball bearings), this application can be extended to include free rotation with little or no wear on the bearing.
2?Roller bearings: rely on rolling contact to support rotating parts. Different rolling bearings can withstand different radial forces and axial forces. When choosing rolling bearings, they should be selected according to specific working conditions.

3.The seven types of bearing rollers are often said to be those?

1.Cylindrical roller
This type of roller is mainly used for cylindrical roller bearings, but also roller assembly can be used directly in machinery. This type of roller has been standardized in size, and can be used as a commodity roller for design and user selection.
2. Long cylindrical roller
This kind of roller is divided into two kinds with and without axial diameter, mainly used for long cylindrical roller bearings, and can also be used directly in the machinery roller assembly.
3.Needle roller
These rollers are mainly used for needle roller bearings, universal needle roller bearings and thrust needle roller bearings, and can also be used directly in the needle roller assembly machinery. This type of roller has been series in size for design options. According to the needs of the bearing structure, the two ends of the needle roller head shape has a tapered head shape, flat head shape, round head shape, etc.
4. Tapered roller
Is a circular truncated cone, the cone angle is usually 1 ° ~ 4 ° 20?, there are less than 1 ° or greater than 4 ° 20?, more than 2 °. Roller length generally does not exceed twice the diameter of the large end of the roller. These rollers are mostly used for tapered roller bearings, large taper angle of the roller is basically used for thrust tapered roller bearings.
5.Spherical roller
The rolling surface of the roller is spherical. Using this roller bearings have self-aligning performance, can withstand a large load. Spherical roller is divided into asymmetrical and symmetrical, generally asymmetrical large end face for the spherical surface, symmetrical shape of the two end faces for the flat end face. Symmetrical spherical roller performance is better, and asymmetrical for the elimination of the form. These rollers are used for spherical roller bearings and thrust spherical roller bearings.
6.Spiral roller
It is a special cross-section of steel strip rolled into a hollow roller, divided into two kinds of left and right rotation. This roller application is not very wide, mainly used for impact load spiral roller bearings.
7. Pillar hole roller
Pillar hole roller center with through hole, this hole is used to install pillar, in order to fix in the sheet

pillar cage. The roller shape has cylindrical, tapered, spherical, mainly used for very large bearings.

4.Single row Hybrid cylindrical roller bearing has what characteristics?

Cylindrical roller bearing on the shaft or seat hole processing requirements are high, bearing installation after the outer ring axis relative deflection to strictly control, so as not to cause contact stress concentration. Inner ring or outer ring can be separated, easy to install and disassemble. Cylindrical roller bearing characteristics: 1. roller and raceway for line contact or repair under the line contact, radial bearing capacity, suitable for bearing heavy load and shock load. 2. small friction coefficient, suitable for high speed, limit speed close to deep groove ball bearings. 3. N and NU type can axially move, can adapt to the thermal expansion or installation error caused by the shaft and shell relative position changes, can be used for free end support.

5. Single row cylindrical roller bearings structural characteristics

Cylindrical roller and raceway for line contact bearings. Large load capacity, mainly bear radial load. Rolling body and the sleeve edge friction is small, suitable for high-speed rotation. According to the sleeve with or without retaining edge, can be divided into NU, NJ, NUP, N, NF and other single row cylindrical roller bearings, and NNU, NN and other double row cylindrical roller bearings. The bearing is the structure that inner ring and outer ring can be separated.

The inner ring or outer ring without retaining edge cylindrical roller bearing, its inner ring and outer ring can make relative movement to the axial direction, so it can be used as free end bearing. In the inner and outer ring of a side of the double retaining edge, the other side of the collar has a single retaining edge of the cylindrical roller bearings, can withstand a certain degree of a direction of axial load. Generally use steel plate stamping cage, or copper alloy turned solid cage. But there is also a part of the use of polyamide forming cage.

6.When using Single row Hybrid cylindrical roller bearings, what issues should be noted?

Vibration

In normal use, vibration is quite sensitive to bearing damage. Spalling, indentation, rust, cracks, wear, etc. are reflected in the bearing vibration measurement. Therefore, by using a special bearing vibration measuring device (frequency analyzer, etc.) can measure the size of the vibration, and the frequency distribution can be inferred from the specific situation of the abnormality. The measured values vary depending on the conditions of use of the bearing or the location of the sensor installation, etc. Therefore, it is necessary to analyze and compare the measured values of each machine in advance to determine the judgment criteria.

Temperature

The use of high temperature often indicates that the cylindrical roller bearings have been in abnormal conditions. High temperatures are also detrimental to the lubricant of the bearing. Sometimes bearing overheating can be attributed to the bearing lubricant. If the bearing in more than 125 ? temperature long-term continuous rotation will reduce bearing life. Causes of high temperature bearings include: insufficient lubrication or lubrication too much, bearing raceway contains impurities, the limit speed is too high, bearing long-term overload operation, etc.

7.Single row Hybrid cylindrical roller bearing maintenance and maintenance methods

In order to make the bearings function well in daily life, in addition to the precise installation, the daily maintenance of bearings is also crucial.

The key to bearing maintenance is bearing lubrication. There are various methods of bearing lubrication, mainly divided into grease lubrication and oil lubrication. It is necessary to choose the lubrication method that is suitable for the conditions of use and the purpose of use. If you consider lubrication, the lubricity of oil lubrication is dominant, but grease lubrication can simplify the characteristics of the structure around the bearing.

Regularly clean the bearings, improve the quality of lubrication, control the pressure, temperature and flow of oil, and strengthen the oil filtration. Choose the lubricant that meets the regulations in order to benefit the long operation of the bearing, and be sure to make good appearance records when removing for cleaning if necessary to prevent installation errors.