

FK[®] Bearing Units



FK[®]
Bearing Units
Best Selling Brand
18+ million sets per year




Since 1969



Bearing Units Expert and Leading Supplier

Find solution Keep rotation



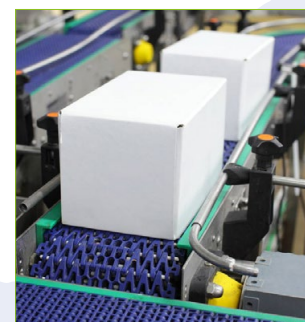
HVAC



Agricultural
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Material
Handling

FK-The preferred supplier for leading enterprise in various industries

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Bearing Units Expert and Leading Supplier



FK provides all kinds
of bearing units

FK BEARING GROUP INTRODUCTION

FK is the abbreviation of "Find solution, Keep rotation", which decides that the company should grow the business by providing products and services from the end user's point of view. Founded in 1969, FK has been focusing on bearing units research, production and integrated solutions for applications, our more than 50 years' experience in bearing units drive us to strive for Bearing Units Expert and Leading Supplier, FK Bearing Group was awarded "Manufacturing Single Item Champion Enterprise (Bearing Units)".

FK Bearing Group consists of a parent company FK Bearing Group Co., Ltd. (former Nanan Bearing Co., Ltd.) and subsidiaries OTC(Xiamen) Bearing Co., Ltd (former Xiamen Bearing Factory), and Xiamen FK IMP.& EXP. Co., Ltd. We focus on bearing units, providing suitable products and services with agile delivery to meet different demands from users, we insist on starting from pre-sales service, based on the core characteristics and needs of each user's equipment, we are the first one in the industry to propose "different solutions for different users" and provide matched solution for different application, now we have developed over 30 bearing units solutions for different sub industries, helping users avoid after-sales service for their equipment. In order to achieve the goal of "agile delivery of customized bearing units", we have built an integrated, automated, intelligent and flexible production factory with the whole industrial chain of insert bearing and housing, from strict selection of raw materials, adoption of optimized processes and excellent equipment, to self-developed specialized equipment, supplemented by automated testing and sorting, strict quality control is implemented in each process to ensure high product stability and consistency, this help us surpass competitor's one product for all industries or unknown delivery of customized products, help users create more value for their equipment. With an annual output and sales of over 20 million pieces, FK is a globally leading factory for bearing units with leading technology, biggest capacity and best sales for many years.

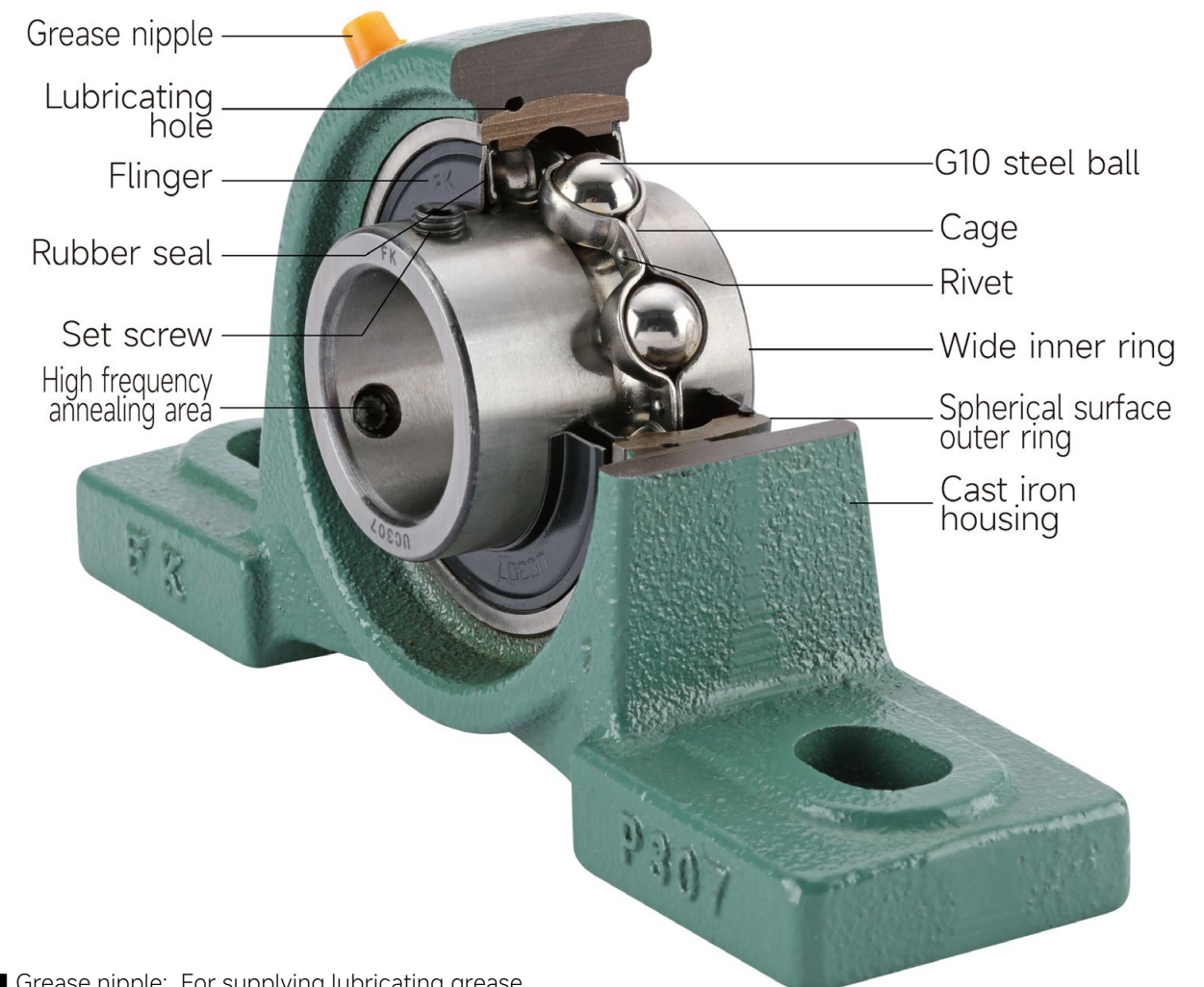
As a member of the National Rolling Bearing Standardization Technical Committee, FK Bearing Group is the main drafter of 7 China National Bearing Units Standards and 7 China Industry Bearing Units Standards. We have a provincial-level enterprise technology center in Fujian, a research institute for high-speed & mute bearing units, a testing center for long-life bearing units, and two production bases in Nanan and Xiamen. We are a national level "little giant" enterprise that focus on specialization, refinement, uniqueness and innovation and a national high-tech enterprise.

Bearing units can be mounted easily, and provide simple and effective bearing arrangements capable of accommodating moderate initial misalignment from mounting errors, they are widely used in almost all factory automation production, such as logistics machinery, environmental protection equipment, automotive inspection lines, packaging machinery, building material production lines, etc., food and pharmaceutical grade production, such as food processing production lines, beverage container and bottling production lines, mask production lines, glove production lines, etc., extreme application such as heavy dust agricultural machinery equipment, mining equipment, high-temperature heat treatment furnaces, wet fruit and vegetable cleaning lines, high pollution waste treatment systems, etc., as well as various living application such as HVAC fans, escalators, central kitchens, mechanical parking equipment, airport luggage transmission lines, etc. In order to quickly serve and deliver continuous value-added services to end users, FK have established sales and service network of 4 regional warehouse in China and 7 continental warehouse around the world with our partners.



1、Structure and feature of FK Bearing Units>>>

1.1 Bearing unit is a high precision product consists of an insert bearing and a bearing housing, which can be easily mounted onto industrial shaft, it has the characteristics of self-aligning, multiple combinations, easy mounting and wide applicability. As a mechanical basic component, it has not only universal standard parts, but also a lot of customized products. According to the different application environment requirement, different materials, loads, grease, sealing and locking methods can be used, making bearing unit is the most preferred support part in transmission and conveying.



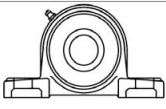
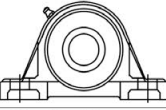
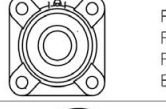
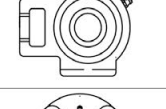
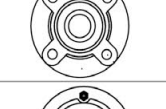
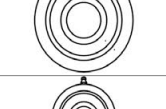
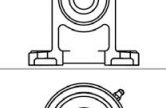
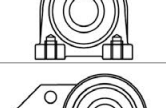
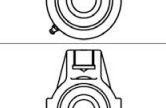
- Grease nipple: For supplying lubricating grease
- Lubricating hole: There is grease groove on outer diameter of outer ring, two lubricating holes in the grease groove provide efficient flow of grease to balls and raceways.
- Rubber seal and flinger : Prevent moisture and dust efficiently as well as preventing grease leaking.
- Set screw: Two set screws ensure insert bearing easy and firm mounting on a shaft.
- High frequency annealing area: Prevent inner ring cracking.
- Wide inner ring: Good for set screw locking and better rigidity.
- Spherical surface outer ring: Self-aligning in any direction, enable misaligned shaft to be centered and aligned without distorting seals.
- Cast iron housing: Overall structure, good rigidity, easy to mount.

1.2 Feature of FK Bearing Units

1.2.1 Insert bearing and bearing housing can be replaced, one bearing housing can be fitted with various type insert bearings, one insert bearing can be mounted into various type bearing housings. Many different bearing unit models are available.

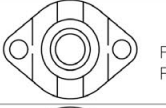
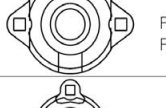
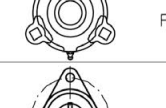
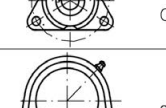
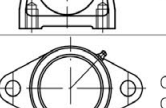
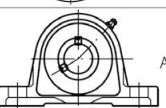
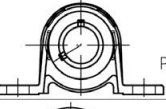
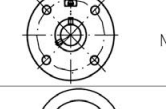
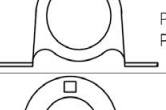
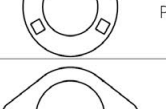
Insert bearing and bearing housing combination table

Table 1

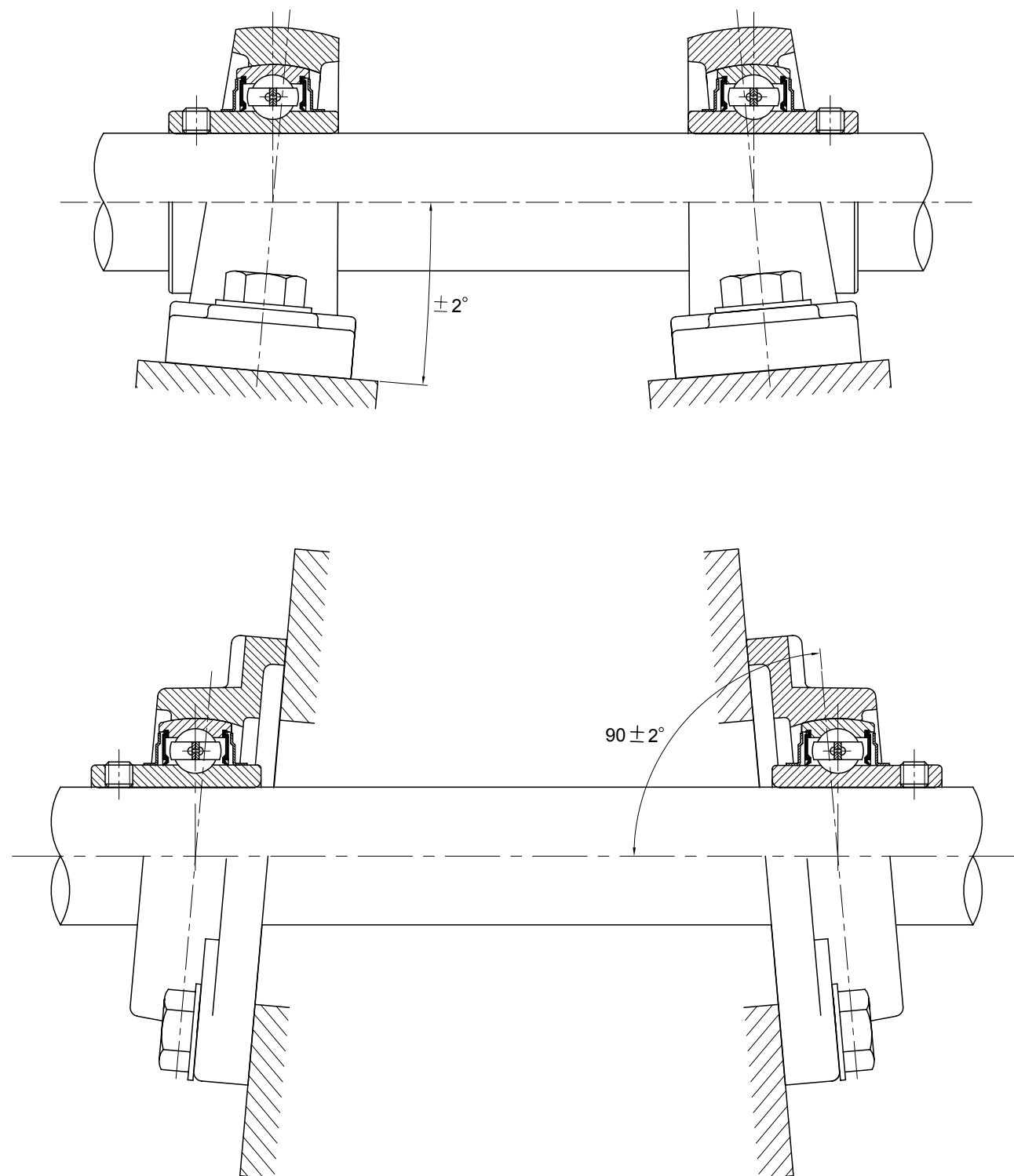
Housing Type	Insert Bearing Type					
	UC2.. UC3.. UCX..	UK2.. UK3.. UKX..	HC2.. HC3..	SA2.. FH2..	SB2.. FHS2..	NC2..
	UCP2.. UCP3.. UCLP2.. UCPX.. UCAK2.. UCPK2..	UKP2.. UKP3.. UKLP2.. UKPX..	HCP2.. HCP3.. HCLP2..	SAP2.. SALP2.. FHP2..	SBP2.. SBLP2.. FHS2..	NCP2..
	UCPE2.. UCPE2..	UKPE2.. UKPE2..	HCP2.. HCP2..	SAPE2..		NCPE2..
	UCF2.. UCF3.. UCFS2.. UCF3.. UCFX.. UCFU2.. UCFV2.. UCFV2.. UCFV3..	UKF2.. UKF3.. UKFX.. UKFU2.. UKFV2.. UKFV2.. UKFV3..	HCF2.. HCF3.. HCF2.. HCF3.. HCFU2.. HCF2.. HCFV2.. HCFV3..	SAF2.. SAFN2.. SAEF2.. SAFV2.. SAFV3.. FHF2.. FHFV2..	SBF2.. SBFN2.. SBF2.. SBFV2.. SBFV3.. FHSFV2..	NCF2.. NCFV2.. NCFV3..
	UCFL2.. UCFL3.. UCFLX.. UCFT2.. UCFLV2..	UKFL2.. UKFL3.. UKFLX.. UKFT2.. UKFLV2..	HCF2.. HCF3.. HCF2.. HCF2..	SAFL2.. SAFTN2.. SAFLV2.. FHFL2.. FHFTN2.. FHFLV2..	SBFL2.. SBFTN2.. FHSFLV2..	NCFL2.. NCFLV2..
	UCT2.. UCTX.. UCT3.. UCTX.. UCST2..	UKT2.. UKT3.. UKTX..	HCT2.. HCT3.. UCST2..	SAT2.. FHT2..	SBT2..	NCT2..
	UCFC2.. UCFCX.. UCFCV2..	UKFC2.. UKFCX.. UKFCV2..	HCF2.. HCF2..	SAFC2.. SAFCV2..	SBFC2..	NCF2.. NCFV2..
	UCC2.. UCC3.. UCCX..	UKC2.. UKC3.. UKCX..	HCC2.. HCC3.. HCCX..	SAC2..	SBC2..	
	UCPH2..	UKPH2..	HCPH2..	SAPH2..	SBPH2..	
	UCPA2.. UCPW2.. UCPG2.. UCPW2.. UCTB2..	UKPA2.. UKPW2..	HCPA2.. HCPW2..	SAPA2.. SAPW2..	SBPA2.. SBPW2..	NCPA2
	UCFB2..	UKFB2..	HCFB2..	SAFB2..	SBFB2..	
	UCFA2..	UKFA2..	HCF2..	SAFA2..	SBFA2..	
	UCHA2..	UKHA2..	HCHA2..	SAHA2..	SBHA2..	
	UCHE2..					

Insert bearing and bearing housing combination table

Table 1 (continued)

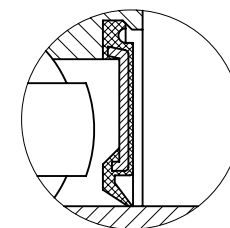
Housing Type	Insert Bearing Type					
	UC2.. UC3.. UCX..	UK2.. UK3.. UKX..	HC2.. HC3..	SA2.. FH2..	SB2.. FHS2..	NC2..
				SAFD2.. SAFW2..	SBFD2.. SBFW2..	
				SALF2..	SBLF2..	
				SAFTD2.. SAFX2..	SBFTD2.. SBFX2..	
				SAFCT2..	SBFCT2..	
				SACFTR2..	SBCFTR2..	
	UCSHE2..			SASHE2..	SBSHE2..	
	UCCJT2..		HCCJT2..			
			HCFE2..			
	UCASE2..		HCASE2..			
				SAPSD2..	SBPSD2..	
	UCME2..		HCFE2..			
				SAPP2.. SAPR2..	SBPP2.. SBPR2..	
				SAPF2..	SBPF2..	
				SAPFL2..	SBPFL2..	
				SAPFT2..	SBPFT2..	

1.2.2 The fitting surface between insert bearing and bearing housing is spherical surface, this design allows the bearing unit to self-align for shaft deviation, the allowable aligning angle of FK bearing unit is $\pm 2^\circ$, while bearing unit with cover is $\pm 1^\circ$.



1.2.3 Many kinds seals are used as the sealing device of FK bearing units. By selecting the sealing device which is most suitable to the application condition, longer bearing life can be guaranteed.

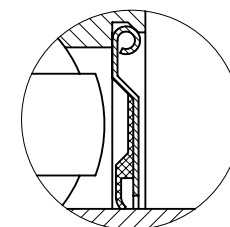
Sealing devices of FK insert bearings



J type rubber seal

J type rubber seal is adhered by baking to the core piece. It is inserted into outer ring seal groove and fitted on the inner ring outer diameter. It has low friction, high property in oil resistance and good mechanical stability.

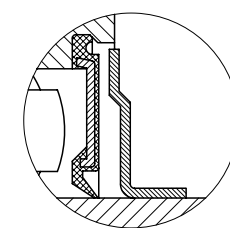
Applicable bearing: SB, SA, JB, CS series



H type metal seal

Rubber lip is baked at the inside of steel plate, and steel plated is fixed in the outer ring seal groove firmly and reliably. Rubber lip contacts inner ring outer diameter to prevent the intrusion of dust, sand etc.

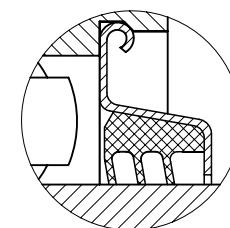
Applicable bearing: SA, SB series



SL type dual seal

Rubber seal is fixed in the seal groove of outer ring, while the flinger is set at the inner ring outer diameter. This constitutes the ideal labyrinth, effective dust-proof and preventing grease leakage is thus guaranteed.

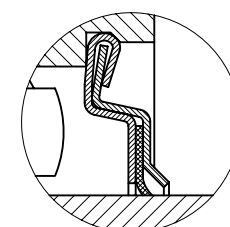
Applicable bearing: UC, HC, UK, SER series



L₃ triple-lip seal

The metal plate is firmly fixed in outer ring, three layer lips have sufficient contact with inner ring outer diameter, the foreign matters such as dust, water, sand etc. are completely shut out. This seal shows its outstanding performance under bad conditions.

Applicable bearing: UC, HC, SA, SB, SER series

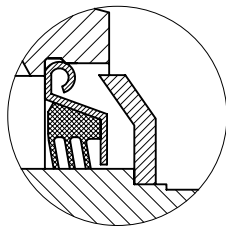


F type seal

F seal consists of inner steel plate, outer steel plate and a rubber lip, it is fixed in the outer ring seal groove, therefore, it will not be loose which may be caused by over grease or impact vibration during assembly.

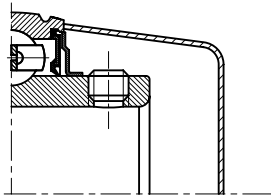
Applicable bearing: UC, HC, UK, SA, SB, SER series

Sealing devices of FK insert bearings



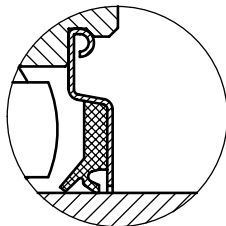
Special multiple layers seal

A protection shield or flinger is added based on triple lip seal, better seal performance is got for severe ambient conditions.



Bearing cover

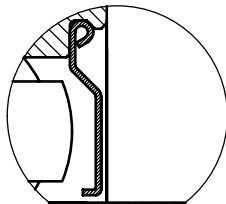
A cover is mounted on the bearing outer ring outer diameter, it can protect the bearing seal under severe ambient conditions.



M type metal seal

Two rubber lips design, outer lip prevents dust, inner lip guides grease into the working area, effectively preventing grease leakage. Generally used for long-term sealing or non-lubricating is required

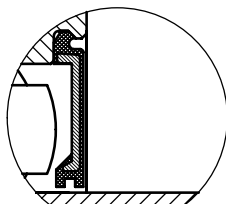
Applicable bearing: UC,HC, UK, FH series



ZZ type shield

Non-contact dust-proof metal shield, lower starting torque.

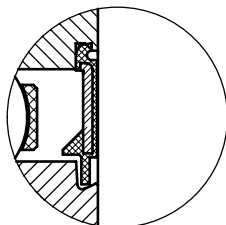
Applicable bearing: UC, HC, UK, SA, SB series



RZ type non-contact rubber seal

Non-contact rubber seal, lower starting torque.

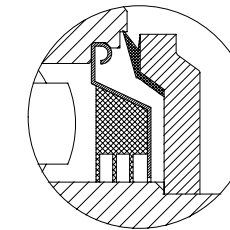
Applicable bearing: UC,HC,UK series



RST type labyrinth seal

By turning groove on inner ring, form a labyrinth seal. Good seal performance and lower starting torque.

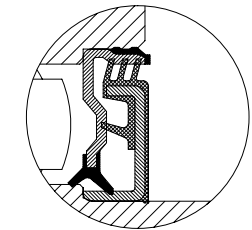
Sealing devices of FK insert bearings



Combination seal

Combination seal:

A flinger is added based on triple lip seal, and a rubber lip is adhered on the flinger, better seal performance is got for extremely severe ambient conditions.

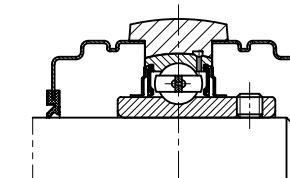


Oil seal

Oil seal:

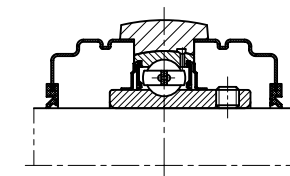
Innovative six lips seal design, outstanding seal performance for extremely severe ambient conditions.

End cover sealing devices of FK bearing housings



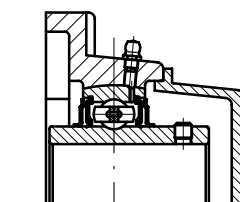
One side with closed type cover

Closed cover is mounted on the housing, results in housing cover and bearing seal double sealing devices construction. This construction can guarantee bearing life even under severe ambient conditions.



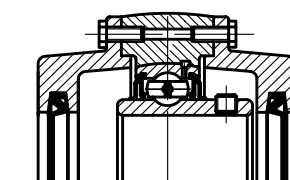
Open type cover

Open covers are mounted on the housing, results in housing cover and bearing seal double sealing device construction. This construction can guarantee bearing life even under severe ambient conditions.



Closed type cast iron cover

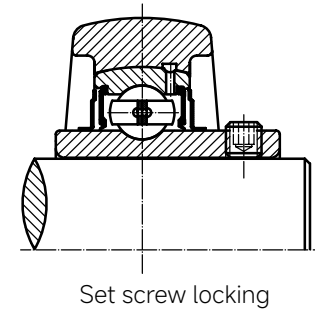
Closed type cast iron cover is mounted on the housing, cast iron cover is tightly locked, not easy to fall off. This construction can guarantee bearing life even under severe ambient conditions.



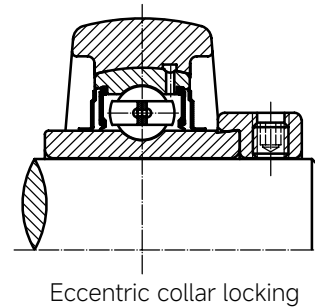
Open type cast iron cover

Open type cast iron cover is mounted on the housing, cast iron cover is tightly locked, not easy to fall off. This construction can guarantee bearing life even under severe ambient conditions.

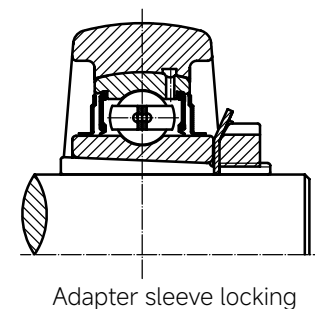
1.2.4 Insert bearings can be locked by set screws, eccentric collar, adapter sleeve, concentric collar, interference fit ,etc. making mounting or replacement of bearing extremely convenient.



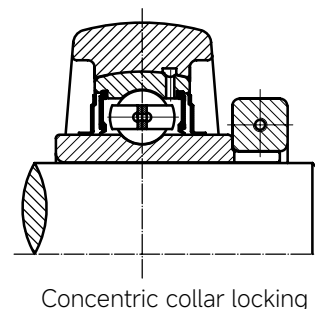
Set screw locking



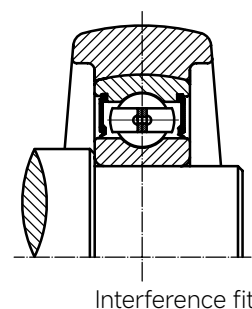
Eccentric collar locking



Adapter sleeve locking



Concentric collar locking



Interference fit

2、Materials of FK Bearing Units>>>

2.1 Materials of insert bearings:

High carbon chrome bearing steel specified in China standard GB/T18254 “High-carbon chromium bearing steel” are used in FK insert bearing rings and steel balls. To increase bearing reliability, a vacuum degassing process is executed to reduce non-metallic inclusion and any oxygen in the steel. Therefore following features are achieved.

- A.High limit of elasticity to resist large local contact stresses.
- B.High rolling fatigue strength to allow for heavy contact loads.
- C.High hardness.
- D.Good wear resistance.
- E.Good toughness against impact loads.
- F.Good dimensional stability.

Chemical composition of high carbon chrome bearing steel GCr15(%) Table 2

C	Si	Mn	P	S	Cr
0.98 ~ 1.10	0.15 ~ 0.35	<0.50	<0.025	<0.025	1.30 ~ 1.60

2.2 Materials of housings

FK housings are mainly made of cast iron, ductile iron, pressed steel, cast steel, stainless steel, forged steel . thermoplastic, rubber, etc.

Cast iron is the most popular material for housing because of its optimal characteristics of vibration absorption , excellent heat dissipation, easy forming, suitable strength. HT200 cast iron is used in FK housings.

Mechanical properties of HT200 cast iron Table 3

Main thickness(mm)	Minimum tensile strength N/mm2 (kgf/mm2)
≤ 8	200(20.4)
8 ~ 15	190(19.4)
15 ~ 30	170(17.3)
≥ 30	160(16.3)

Chemical composition of HT200 cast iron (%) Table 4

C	Si	Mn	P	S
3.1 ~ 3.4	1.5 ~ 2.0	0.6 ~ 0.9	<0.30	<0.10

2.3 Materials of housings:

Materials of accessories Table 5

Accessories	Materials
Pressed steel cage	Cold rolled carbon steel sheet and strip 08-GB/T13237
Seal	Nitrile rubber, steel plate 08-GB/T13237
Flinger	Cold rolled carbon steel sheet and strip 08-GB/T13237
Eccentric collar	Carbon steel for machine structural use #45- GB/T699
Steel ball	Chromium steel GCr15 – GB/T18254

3、Accuracy of FK Bearing Units>>>

3.1 Accuracy of insert bearings

3.1.1. Radial internal clearance of insert bearings

Radial internal clearance of insert bearing is defined as the total distance through which one bearing ring can be moved relative to the other in the radial direction. The operating clearance of bearing has an impact on the fatigue life, temperature rise, noise, vibration and other performance of bearing. Table 6 to Table 8 show standard value of radial internal clearance.

Table 6 Radial clearance of cylindrical bore insert bearings μm

diameter d mm		C2		N		C4		C5	
over	incl.	min.	max.	min.	max.	min.	max.	min.	max.
10	18	3	18	11	25	18	33	25	45
18	24	5	20	13	28	20	36	28	48
24	30	5	20	13	28	23	41	30	53
30	40	6	20	15	33	28	46	40	64
40	50	6	23	18	36	30	51	45	73
50	65	8	28	23	43	38	61	55	90
65	80	10	30	25	51	46	71	65	105
80	100	12	36	30	58	53	84	75	120
100	120	15	41	36	66	61	97	90	140
120	140	18	48	41	81	71	114	105	160

Table 7 Radial clearance of tapered bore insert bearings μm

diameter d mm		C2		N		C4	
over	incl.	min.	max.	min.	max.	min.	max.
10	18	10	25	18	33	25	45
18	24	12	28	20	36	28	48
24	30	12	28	23	41	30	53
30	40	13	33	28	46	40	64
40	50	14	36	30	51	45	73
50	65	18	43	38	61	55	90
65	80	20	51	46	71	65	105
80	100	24	58	53	84	75	120
100	120	28	66	61	97	90	140
120	140	33	81	71	114	105	160

Table 8 Radial clearance correction value under load conditions μm

diameter d mm		Measure load	Radial clearance correction value		
over	incl.	N	C2	N	C4、C5
10	18	25	4	4	5
18	30	50	5	5	6
30	50	50	4	4	5
50	80	100	6	7	7
80	100	150	8	8	9

Note: When measuring radial clearance with a load measuring instrument, a correction value must be added to the radial clearance value, as shown in Table 8

3.1.2 Accuracy of insert bearing outer ring

Outer ring tolerance is shown in table 9

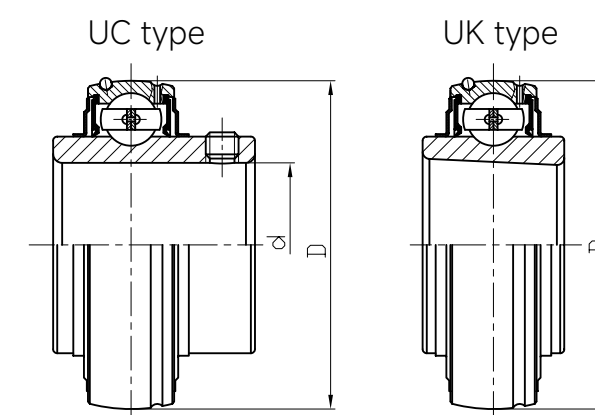


Table 9 Outer ring tolerance μm

D(mm)		ΔDmp		Kea
over	incl.	max.	min.	max.
30	50	0	-11	20
50	80	0	-13	25
80	120	0	-15	35
120	150	0	-18	40
150	180	0	-25	45
180	250	0	-30	50
250	315	0	-35	60

3.1.3 Accuracy of insert bearing inner ring

Inner ring tolerances are shown in table 10 and table 11

Table 10 Inner ring tolerance of cylindrical bore μm

Nominal diameter d mm		UC,HC,SA,SB,SER			CS			$\Delta Bs,Cs$		Kia
		Δdmp		Vdp	Δdmp		Vdp			
over	incl.	max.	min.	max.	max.	min.	max.	min.	min.	max.
10	18	+15	0	10	0	-8	6	0	-120	15
18	30	+18	0	12	0	-10	8	0	-120	18
30	50	+21	0	14	0	-12	9	0	-120	20
50	80	+24	0	16	0	-15	11	0	-150	25
80	120	+28	0	19				0	-200	30
120	180	+33	0	22				0	-250	35

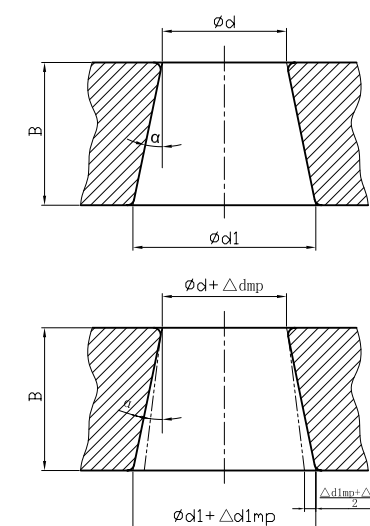


Table 11 Inner ring tolerance of tapered bore μm

mm		Δdmp		$\Delta d1mp - \Delta dmp$		Vdp
over	incl.	max.	min.	max.	min.	max.
18	30	+33	0	+21	0	13
30	50	+39	0	+25	0	15
50	80	+46	0	+30	0	19
80	120	+54	0	+35	0	25
120	180	+63	0	+40	0	31

3.2 Tolerance (accuracy) of housings

Tolerances of housings are shown in table 12 to table 17

Table 12 Fitting tolerance of spherical bore diameter of housings μm

D(mm)		Loose fit H		Transition fit J		Interference fit K	
		D1m	D1	D1m	D1	D1m	D1
over	Incl.	max.	min.	max.	min.	max.	min.
30	50	+25	0	+30	-5	+14	-11
50	80	+30	0	+36	-6	+18	-12
80	120	+35	0	+42	-7	+22	-13
120	180	+40	0	+48	-8	+26	-14
180	250	+46	0	+55	-9	+30	-16
250	315	+52	0	+62	-10	+36	-16

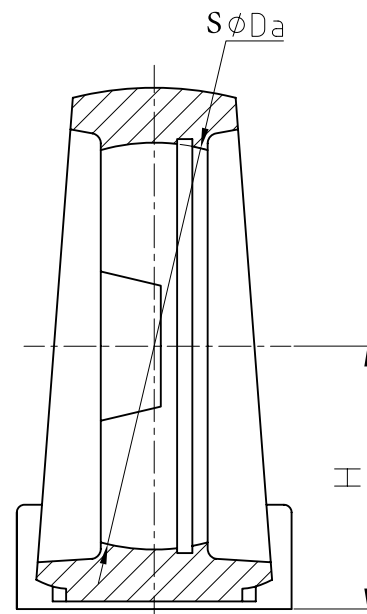


Table 13 Tolerance of pillow block center height μm

Housing No. P.L.P.PH.PA.PW.PE.PK	Tolerance of H
203-210 X05-X10 305-310	±150
211-218 X11-X18 311-318	±200
-X20 319-318	±300

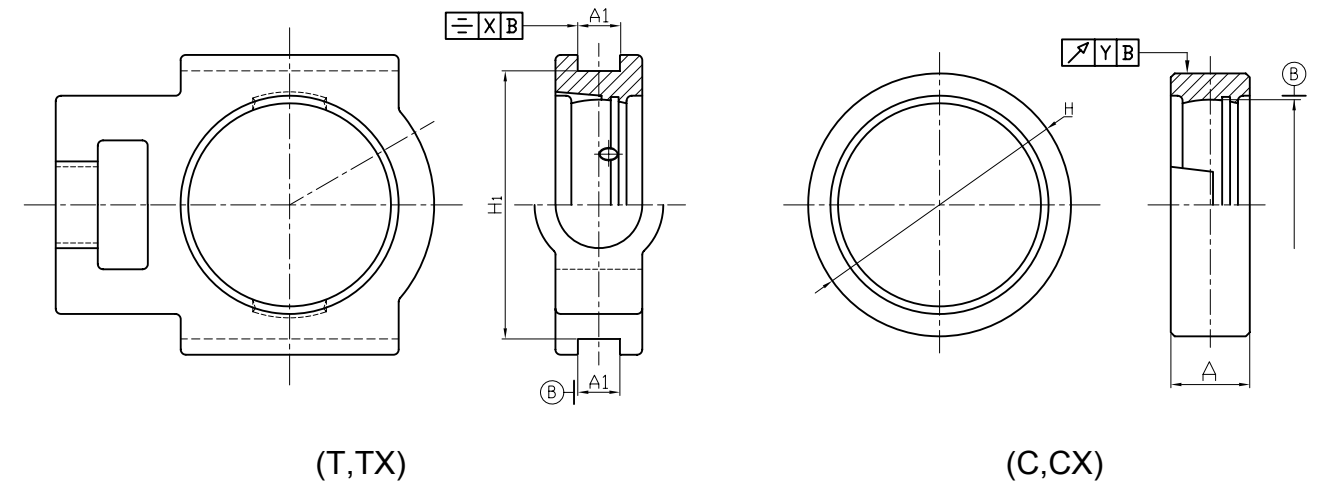


Table 14 Tolerance of housings μm

Housing No. T			△ A ₁	△ H ₂	X (≤)	Housing No. C			Dimension tolerance of outer diameter △ H						Y (≤)	△ A		
									C2..		CX..		C3..					
									max.	min.	max.	min.	max.	min.				
204			±200 0	0 500	500	204			0	-30					200	±200		
205	X05	305				205	X05	305										
206	X06	306				206	X06	306	0	-35	0	-35						
207	X07	307				207	X07	307										
208	X08	308				208	X08	308										
209	X09	309				209	X09	309										
210	X10	310				210	X10	310										
211	X11	311	±300 0	0 -800	600	211	X11	311	0	-40	0	-40	0	-40	300	±300		
212	X12	312				212	X12	312										
213	X13	313				213		313										
214	X14	314						314										
215	X15	315						315										
216	X16	316						316										
217	X17	317					317					0	-46					
		318					318											
		319			700			319										
		320						320										
		321						321			0	-52						
		322						322										
		324	800			324						0	-57	400				
		326				326												
		328				328												

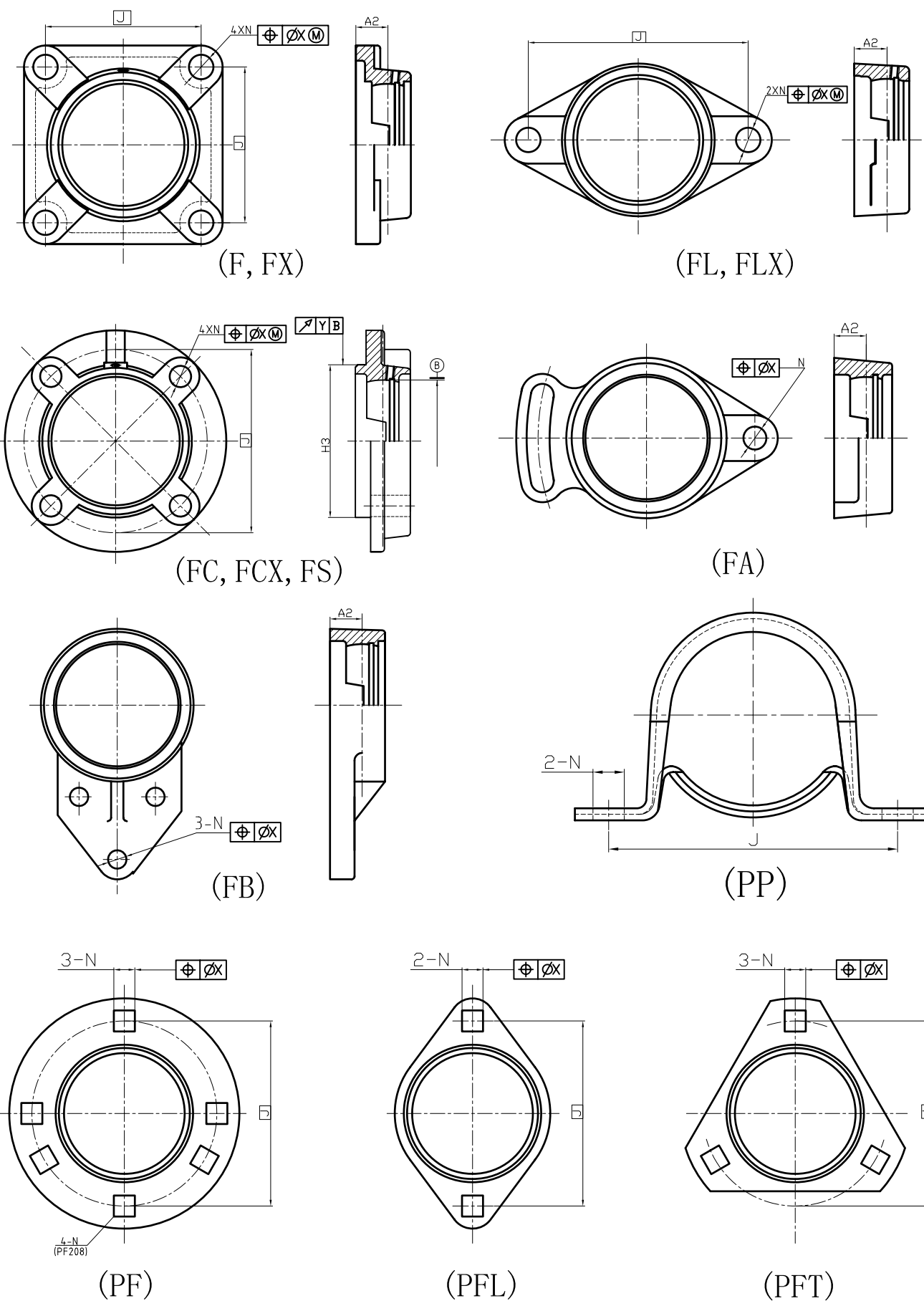


Table 15

Tolerance of housings

μm

Housing No. F,FL,FA,FB			X (≦)	△ A ₂	Housing No. FC,FS			Dimension tolerance of spigot joint △ H ₃						X (≦)	△ A ₂	Y (≦)		
								FC2..		FCX..		FS3..						
								max.	min.	max.	min.	max.	min.					
204			700	±500	204			0	-46					700	±500	200		
205	X05	305			205	X05	305					0	-46				0	-46
206	X06	306			206	X06	306											
207	X07	307			207	X07	307	0	-54	0	-54	0	-54					
208	X08	308			208	X08	308											
209	X09	309			209	X09	309											
210	X10	310			210	X10	310											
211	X11	311					211			X11	311	0	-63				0	-63
212	X12	312			212	X12	312											
213	X13	313			213	X13	313											
214	X14	314			214	X14	314											
215	X15	315			215	X15	315											
216	X16	316	1000	±800	216	X16	316			0	-72							
217	X17	317			217	X17	317											
218	X18	318			218	X18	318	0	-72			0	-72					
		319					319											
	X20	320					X20			320								
		321								321								
		322								322								
		324								324								
		326						326										
		328																

Table 16

Unspecified tolerance of casting housings

mm

Nominal dimension (length)		Dimension deviation Δ	Nominal dimension (length)		Dimension deviation Δ
over	incl.		over	incl.	
-	120	±1.5	-	-	-
120	250	±2.0	-	10	±1.5
250	400	±3.0	10	18	±2.0
400	800	±4.0	18	30	±3.0
800	1600	±6.0	30	50	±3.5

Table 17

Tolerance of pressed steel housings

mm

Housing No.	Tolerance of mounting hole diameter Δ N	Tolerance of J dimension	Housing No.	Tolerance of mounting hole diameter Δ N	Tolerance of mounting hole location X
PP203-208	±0.5	±0.4	PF203-208 PFL203-208 PFT203-208	±0.2	0.4

4、Bearing life>>>

After working for a period of time, the increase in noise and vibration, wear and tear causing a decrease in accuracy, and aging of lubricating grease will all lead to bearing failure or inability to meet the requirements of this type of machinery. This type of life before failure is called noise life, wear life, and grease life.

When bearings are used correctly, with moderate load, correct mounting, and good lubrication, the main cause of bearing failure is fatigue peeling of the rolling surface caused by alternating contact stress. The form of damage cannot be completely avoided, and this type of life is called fatigue life. This is also the general meaning of lifespan.

In addition to the above-mentioned lifespan, the reasons why bearings can no longer be used include sintering, fracture, cracking, jamming, sealing failure, etc. These should be considered as bearing failures, which is from improper selection of bearings, poor mechanical design, mounting, use, and maintenance errors, and should be considered separately from bearing life.

4.1 Basic load rating and rated life

The basic load rating is a technical indicator used to assess the load a bearing can theoretically endure, basic load rating includes basic dynamic load rating and basic static load rating. The load applied to the insert bearing operating under a speedy rotating($n > 10 \text{ r/min}$) condition is defined as dynamic load C , while the load applied to the bearing operating under a static or slow oscillating and rotating($n < 10 \text{ r/min}$) condition is defined as static load C_0 . Insert bearing is a kind of radial ball bearing, mainly take radial force. Therefore, the basic load rating is radial basic dynamic load C_r and radial basic static load C_{0r} .

Basic dynamic load rating C_r : the basic dynamic load rating is an expression of the load capacity of a bearing based on a constant load which the bearing can sustain for one million revolutions.

Basic static load rating C_{0r} : the maximum applied radial load for contact stress occurring at the rolling element and raceway contact points.

- 4600MPa for self-aligning ball bearing
- 4200MPa for radial ball bearing
- 4000MPa for radial roller bearing

The load capacity of the bearing is expressed by the basic dynamic load rating and basic static load rating which is shown in the bearing dimension pages.

Life: The life of a rolling bearing is defined as the total number of revolutions which the bearing is capable of enduring before the first evidence of fatigue flaking develops on any one of the rings or rolling elements.

Reliability: The reliability is the percentage of the bearing of a group of apparently identical bearing operating under identical conditions which can expect to attain or exceed a certain defined life. The reliability of an individual bearing is the probability of the bearing to attain or exceed a defined life.

Basic rating life: For a group of apparently identical rolling bearings operating under identical conditions, the basic rating life is defined as the total number of revolutions that 90% of the bearings can be expected to complete or exceed.

According to national standard GB/T6391-2010 (equaling to ISO281:2007), the basic rating life of radial ball bearing is calculated by following formula:

$$L_{10} = \left(\frac{C_r}{P_r} \right)^3$$

Where: L_{10} : basic rating life (10⁶ revolutions)
 C_r : basic dynamic load rating
 P_r : equivalent dynamic load
 Equivalent dynamic load P_r : the equivalent dynamic load is a constant load with a fixed direction under which the bearing life is identical to that of the bearing operating under actual load.

或 $\frac{C_r}{P_r} = L_{10}^{1/3}$

For an insert bearing operating with a constant rotation speed, the basic rating life can be expressed in terms of hours of operation, and is calculated in following formula:

$$L_{10h} = \frac{10^6}{60n} \left(\frac{C}{P} \right)^3$$

or
$$L_{10h} = \frac{10^6}{60n} L_{10}$$

$$= \frac{16666}{n} \left(\frac{C}{P} \right)^3$$

Where

L_{10h} = basic rating life (hours)

n = bearing rotation speed (r/min)

If the bearing operates under indeterminate loads and rotation speeds, the following formula should be applied when calculating bearing rating life:

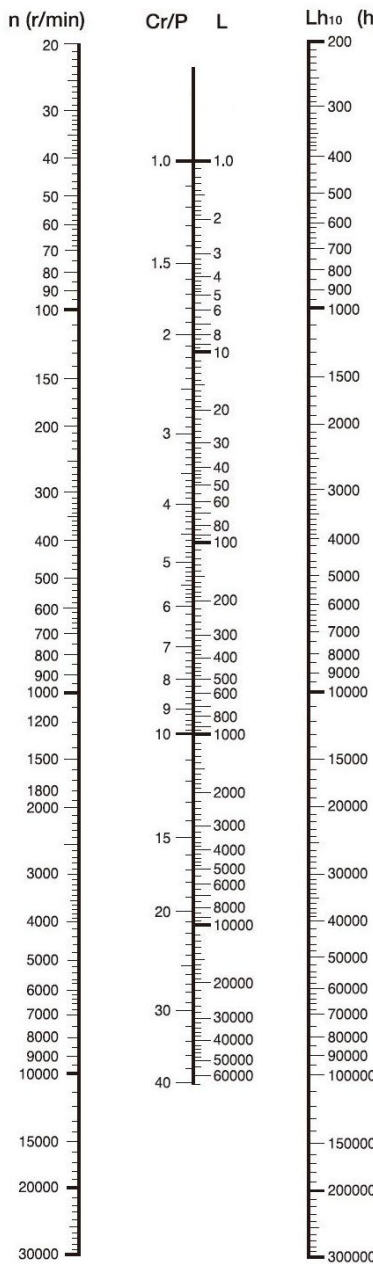
$$P_m = \sqrt[3]{\frac{\int_0^N P^3 dN}{N}}$$

Where:

P_m = mean equivalent dynamic load

P = equivalent dynamic load

N = total revolution numbers within one load changing cycle



If bearings are used at high temperature, the material structure of the bearing will change and the hardness will decrease, resulting in a decrease in the basic rated dynamic load ratio of the bearing when used at room temperature. Once structure of the bearing material changes, it will not recover even if the temperature returns to room temperature. Therefore, Once the organization of the bearing material changes, it will not recover even if the temperature returns to room temperature. Therefore, the basic load rating must be corrected if the bearing is used at higher than 150° C, the temperature correction factor is shown in table 18 :

Basic dynamic load rating temperature correction factor

Table 18

Bearing temperature (° C)	150	175	200	250
Temperature factor	1	0.95	0.9	0.75

4.2、Calculation method of equivalent dynamic load P

The basic load rating of a bearing is determined under assumed operating condition, that is the radial bearing only bears radial load. In most applications, bearings often bear both radial and axial loads, therefore, when calculating the bearing life, the actual load has to be converted into equivalent dynamic load which is in confirm with the basic dynamic load rating condition. When the radial and axial loads are constant in magnitude and direction, general equation for calculating the equivalent dynamic load:

$$P = XFr + YFa$$

Where P = equivalent dynamic load (N)

Fr = actual radial load (N)

Fa = actual axial load (N)

X= radial factor

Y= thrust factor

The axial load which insert bearing can carry is determined by the mounting method of the bearings on the shafts.

For the setscrews locking type or eccentric locking collar type bearings, if the fit between shaft and bearing is good, and the setscrews are tightened enough (see table Proper tightening torque of setscrews), the axial load Fa which the bearing can carry must not surpass 20% of the unused allowable radial load Fr.

For the adapter sleeve locking type bearing, if the nuts are properly tightened, the axial load Fa can be maximum 15% to 20% of the unused allowable radial load Fr.

The values of radial factor X and axial factor Y for insert bearings can be obtained from the following table 19

Table 19 Radial and axial factors for insert bearings

$\frac{F_a}{C_o}$	$\frac{F_a}{F_r} \leq e$ p=F _r		C2		e	N		e	C4		e
			$\frac{F_a}{F_r} > e$			$\frac{F_a}{F_r} > e$			$\frac{F_a}{F_r} > e$		
	X	Y	X	Y		X	Y		X	Y	
0.025	1	0	0.56	2.0	0.22	0.46	1.75	0.31	0.44	1.42	0.40
0.040	1	0	0.56	1.8	0.24	0.46	.62	0.33	0.44	1.36	0.42
0.070	1	0	0.56	1.6	0.27	0.46	1.46	0.36	0.44	1.27	0.44
0.130	1	0	0.56	1.4	0.31	0.46	1.30	0.41	0.44	1.16	0.48
0.250	1	0	0.56	1.2	0.37	0.46	1.14	0.46	0.44	1.05	0.53

When moment load is applied to the bearings, the equivalent dynamic bearing load is calculated by :

$$P_m = f_m \cdot P$$

Where: Pm = equivalent dynamic load when considering moment load

fm = when moment load is big: fm=2

When impact load is applied, equivalent dynamic load can be calculated by:

$$P_d = f_d \cdot P$$

Where: Pd= equivalent dynamic load when considering impact load (N)

fd= impact load factor, which is defined as follows:

when no impact load or minor impact load is applied:

$$f_d = 1 \sim 1.2$$

When adequate impact load is applied:

$$f_d = 1.2 \sim 1.8$$

4.3、Adjusted rating life

Normally the basic rating life L10 as a criterion for measuring bearing performance is sufficient to meet the requirements, which refers to the life at 90% reliability.

However, in some applications, a bearing life over 90% reliability may be required, moreover, the effect of bearing quality and operation conditions are expected to take into consideration when calculating bearing life, the adjusted bearing life Lnm [n means failure rate, (100-n) means reliability] meet these requirements.

Bearing life Lnm, is adjusted bearing life under (100-n)% reliability, specified bearing quality and operation conditions, it can be calculated by:

$$L_{nm} = a_1 a_{xyz} L_{10}$$

Life adjustment factor for reliability a1 please refer to following table 20

Table 20 Life adjustment factor for reliability a1

Reliability	Lnm	A1
90	L10m	1
95	L5m	0.62
96	L4m	0.53
97	L3m	0.44
98	L2m	0.33
99	L1m	0.21

Life adjustment factor axyz include followings:

- Material (such as cleanliness, hardness, surface structure, fatigue limit, temperature response),
- Lubrication (such as viscosity, bearing speed, bearing size, lubricant type, additives),
- Environment (such as pollution level, humidity),
- Impurity particles (such as hardness, size, shape, material),
- Internal stress in the ring (such as internal stress generated during the manufacturing process or interference caused after mounting),
- Mounting (such as damage during assembly and disassembly, or misalignment),
- Bearing load.

The bearing life is affected by any of above factors, so all factors must be taken into consideration when selecting bearing to avoid failure.

Please refer to national standard GB/T6391-2010 (equaling to ISO281:2007) for bearing life calculating method.

4.4 Example of calculation

One ball bearing is to operate at rotation speed of 800r/min, under only a radial load of $Fr=3000N$, with a basic rating life of at least 30000 hours, select the bearing.

Solution 1:

According to formula

$$L_{10h} = \frac{10^6}{60n} L_{10} = \frac{16666}{n} \left(\frac{C}{P} \right)^3$$

From $L_{10h}=30000$ hours, rotation speed= $800r/m$,

Under only a radial load, that is $P=Fr=3000N$,

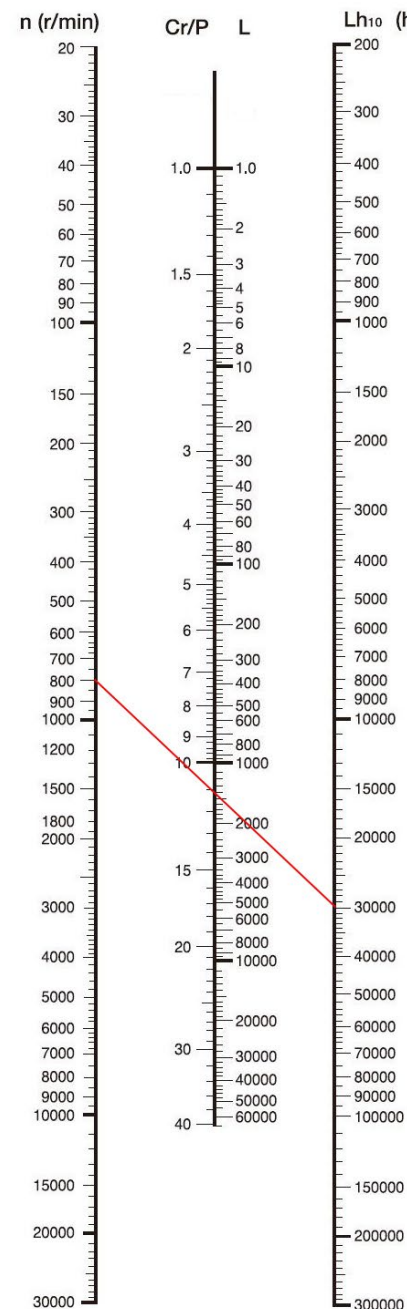
Therefore, $C=33877N$.

Solution 2:

By connecting $n(800r/min)$ and the required basic rating life L_{10h} (30000 hours) with a straight line on the fig, can find that C/P value is 11.3,

$C/P=11.3$, $P=Fr=3000N$, thus the required basic dynamic load rating is $C=33900N$

According to basic dynamic load $Cr=33900N$, check bearing catalog pages, dynamic load rating of UC210 $Cr=35000N > 33900N$, so select 210 or bigger size bearing, other locking type bearings can be selected too depends on application requirement.



5. Limiting speed of insert bearings>>>

The limiting speed of insert bearing is limited by the temperature increase mainly due to friction during bearing's operation, which is closely related to the loads, environment temperature, lubrication conditions, and service life. A good fit between the bearing and the shaft is also a guarantee for achieving high speed. Normally, clearance fit is used between setscrews locking type and eccentric collar locking type bearings and shafts, then h7 shaft tolerance is selected, h8 or h9 tolerance is applied for light load and slow speed application. And tighter j7 tolerance is applied for heavy load and high speed. The shaft applied to the adapter sleeve locking type bearing is h9, and IT5/2 cylindricity must be ensured (show js7 (h9/IT5) in following table).

The limiting speed for insert bearing of CS200 series are the same as deep groove ball bearings which are shown in following table.

The limiting speeds for insert bearings with different fits are shown in table 21.

Table 21 Limiting speed of insert bearings (reference values) r/min

d(mm)	200 series				300 series				CS200
	shaft tolerance				shaft tolerance				
	js7 (h9/IT5)	h7	h8	h9	js7 (h9/IT5)	h7	h8	h9	
12	6700	5300	3800	1400	--	--	--	--	--
15	6700	5300	3800	1400	--	--	--	--	11000
17	6700	5300	3800	1400	--	--	--	--	10000
20	6000	4800	3400	1200	--	--	--	--	9000
25	5600	4000	3000	1000	5000	3600	2600	900	8000
30	4500	3400	2400	850	4300	3000	2200	800	6700
35	4000	3000	2000	750	3800	2800	2000	700	6000
40	3600	2600	1900	670	3400	2400	1700	630	5600
45	3200	2400	1700	600	3000	2200	1500	560	5000
50	3000	2200	1600	560	2600	2000	1400	500	4800
55	2600	2000	1400	500	2400	1800	1300	450	--
60	2400	1800	1200	450	2200	1700	1100	430	--
65	2200	1700	1100	430	2000	1500	1100	400	--
70	2200	1600	1100	400	1900	1400	1000	360	--
75	2000	1500	1000	380	1800	1300	900	340	--
80	1900	1400	950	340	1700	1200	850	320	--
85	1800	1300	900	320	1600	1100	800	300	--
90	1700	1200	800	300	1500	1100	750	280	--
95	--	--	--	--	1400	1000	700	260	--
100	--	--	--	--	1300	950	670	240	--
105	--	--	--	--	1200	900	630	220	--
110	--	--	--	--	1200	800	600	200	--
120	--	--	--	--	1100	750	530	190	--
130	--	--	--	--	1000	670	480	180	--
140	--	--	---	--	900	600	430	160	--

Note: 1.The js7(h9/IT5) fit is for adapter sleeve lock type bearings, and the rest h7-h9 fit is for set screw locking type and eccentric collar locking type bearings.

2.The above table data if reference for bearings with J type seal, H type seal, SL type seal or F type seal only.

6. Housings strength >>>

FK bearing housing is designed to meet insert bearing loading capacity, and produced by high quality material, it is suitable for general application condition. However, housing strength must be taken into consideration under low speed heavy load or impact load and other special application.

6.1 Destruction strength of cast iron housing

FK housing testing lab gets following data by many years research and test. This is the average destruction strength under static load, so $\pm 30\%$ deviation must be considered. Cast iron housing has many good properties, but it is fragile under impact load, so safety factor must be considered.

Table 22 Safety factor of cast iron housing

Load type	Static load	Dynamic load		
		Repeated load	Alternating load	Variable load, impact load
Safety factor	4	6	10	15

* Some applications may have impact load, such as crane, winch, air compressor, rolling mill etc. cast steel or ductile iron housing must be considered for these applications.

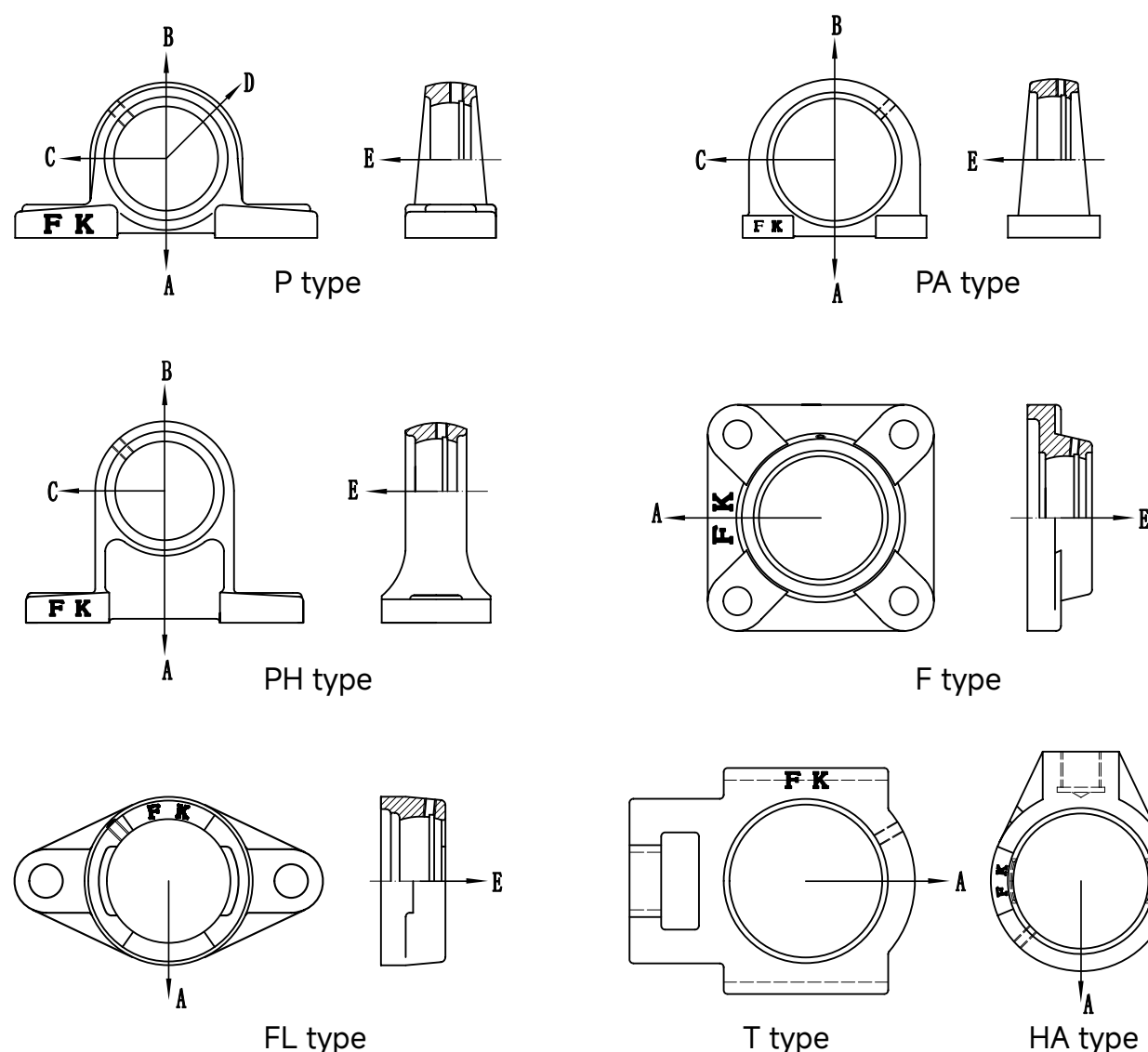


Table 23

Static destruction strength of P type cast iron housing

KN

Housing No.	Load direction					Housing No.	Load direction					Housing No.	Load direction				
	A	C	B	D	E		A	C	B	D	E		A	C	B	D	E
P203	69	50	30	23	12	PX05	133	88	58	33	19	P305	151	89	62	36	31
P204	81	55	34	26	15	PX06	156	100	62	38	25	P306	173	102	67	40	36
P205	95	64	38	28	16	PX07	175	113	69	44	31	P307	196	116	76	44	44
P206	115	74	42	31	18	PX08	196	127	79	52	35	P308	227	129	84	53	49
P207	132	86	49	35	19	PX09	219	140	87	60	37	P309	249	142	93	62	53
P208	150	100	57	41	20	PX10	244	158	96	67	42	P310	276	160	102	71	58
P209	169	112	64	47	23	PX11	273	175	104	77	48	P311	302	178	111	80	62
P210	191	126	73	51	26	PX12	300	194	117	87	54	P312	333	200	124	89	71
P211	214	141	81	57	31	PX13	325	217	129	94	60	P313	364	222	138	98	76
P212	241	157	93	66	36	PX14	358	244	146	106	69	P314	396	253	156	107	84
P213	266	173	104	73	42	PX15	398	271	162	119	79	P315	436	280	169	120	93
P214	297	193	120	84	49	PX16	438	298	183	131	88	P316	471	307	191	133	102
P215	338	216	135	93	57	PX17	487	335	206	146	106	P317	520	347	213	147	120
P216	380	243	150	104	66	PX18	537	383	231	162	142	P318	569	396	240	164	156
P217	426	278	168	119	82	PX20	663	458	279	194	183	P319	591	422	244	173	138
P218	477	327	186	128	119							P320	693	471	289	187	200
P219	530	392	208	143	143							P321	744	557	316	215	161
P220	603	401	234	158	158							P322	813	613	351	244	185
												P324	942	729	436	284	215
												P326	1129	849	502	320	253
												P328	1380	970	590	340	299

Table 24

Static destruction strength of PA type, PH type cast iron housing

KN

Housing No.	Load direction				Housing No.	Load direction			
	A	C	B	E		A	C	B	E
PA204	93	60	45	21	PH204	79	26	18	9
PA205	107	77	48	28	PH205	92	30	20	10
PA206	130	89	58	34	PH206	110	38	27	11
PA207	159	100	69	39	PH207	122	46	32	11
PA208	179	110	78	40	PH208	132	52	37	12
PA209	187	124	88	41	PH209	143	57	41	14
PA210	203	139	94	50	PH210	162	61	43	16
PA211	224	155	98	59	PH211	178	62	49	19
PA212	251	178	100	63	PH212	189	63	51	22

Table 25 Static destruction strength of F type cast iron housing KN

Housing No.	Load direction		Housing No.	Load direction		Housing No.	Load direction	
	A	E		A	E		A	E
F204	44	18	FX05	47	32	F305	73	35
F205	47	24	FX06	53	35	F306	85	42
F206	50	28	FX07	61	40	F307	96	46
F207	55	34	FX08	69	44	F308	112	54
F208	61	39	FX09	78	49	F309	127	62
F209	68	46	FX10	88	54	F310	146	65
F210	76	50	FX11	100	61	F311	158	73
F211	85	56	FX12	114	67	F312	177	77
F212	98	63	FX13	130	73	F313	196	85
F213	110	69	FX14	152	81	F314	223	92
F214	127	75	FX15	172	89	F315	250	100
F215	145	83	FX16	200	99	F316	277	112
F216	173	91	FX17	233	108	F317	300	123
F217	203	100	FX18	292	125	F318	335	138
F218	257	113	FX20	367	154	F319	369	158
F220	311	126				F320	412	192
						F321	458	231
						F322	519	273
						F324	612	338
						F326	777	419
						F328	1154	531

Table 26 Static destruction strength of FL type cast iron housing KN

Housing No.	Load direction		Housing No.	Load direction		Housing No.	Load direction	
	A	E		A	E		A	E
FL204	24	12	FLX05	32	23	FL305	45	26
FL205	28	16	FLX06	39	28	FL306	54	32
FL206	33	20	FLX07	46	31	FL307	62	36
FL207	40	24	FLX08	54	35	FL308	70	39
FL208	47	28	FLX09	62	42	FL309	78	47
FL209	55	33	FLX10	74	48	FL310	94	54
FL210	64	38				FL311	104	58
FL211	72	43				FL312	133	62
FL212	81	49				FL313	149	66
FL213	90	56				FL314	169	73
FL214	100	64				FL315	182	81
FL215	112	71				FL316	191	92
FL216	128	82				FL317	201	107
FL217	141	102				FL318	214	123
FL218	145	143				FL319	229	143
						FL320	251	165
						FL321	284	198
						FL322	321	237
						FL324	341	287
						FL326	389	358
						FL328	681	478

Table 27 Static destruction strength of T type cast iron housing KN

Housing No.	Load direction		Housing No.	Load direction		Housing No.	Load direction	
	A			A			A	
T203	27		TX05	42		T305	53	
T204	34		TX06	53		T306	64	
T205	39		TX07	64		T307	72	
T206	45		TX08	76		T308	82	
T207	51		TX09	86		T309	92	
T208	58		TX10	99		T310	104	
T209	68		TX11	108		T311	116	
T210	73		TX12	119		FT	130	
T211	82		TX13	127		T313	146	
T212	93		TX14	132		T314	164	
T213	101		TX15	141		T315	178	
T214	115		TX16	149		T316	197	
T215	130		TX17	162		T317	216	
T216	143					T318	242	
T217	159					T319	268	
T218	168					T320	292	
						T321	316	
						T322	343	
						T324	373	
						T326	403	
						T328	432	

Table 28 Static destruction strength of HA type, HE type cast iron housing KN

Housing No.	Load direction		Housing No.	Load direction	
	A			A	
HA203	30		HE203	30	
HA204	34		HE204	34	
HA205	38		HE205	38	
HA206	46		HE206	46	
HA207	53		HE207	53	
HA208	60		HE208	60	
HA209	70		HE209	70	
HA210	75		HA210	75	
HA211	85				
HA212	95				
HA213	105				
HA214	120				
HA215	130				

6.2 Strength of other material housings

Strength of ductile iron housing is 2 times of same size cast iron housing.

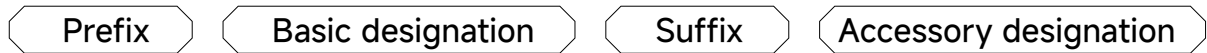
Pressed steel housing shows deformation when subjected to heavy load. The deformation depends on direction and amount of the load, form of the housing and thickness of steel plate. Therefore, the allowable load of the pressed steel housing must be such an amount that the deformation of the housing may not disturb the function.

The allowable radial load of pressed steel housing is approximately 1/6 of the insert bearing basic dynamic load rating (Cr), and allowable axial load of pressed steel housing is approximately 1/18 of the insert bearing basic dynamic load rating (Cr).

7. Identification code of FK Bearing Units>>>

7.1 Composition of bearing unit designation

FK bearing unit designation is composed of prefix, basic designation, suffix and accessory designation, arranged as follows:



7.2 Prefix

Prefix	Meaning
FJ	For air handling application
AC	For air-conditioning blower application
MF	For maintenance free application
HS	For high speed application
HTF	For high temperature air handling application
AT	For automotive inspection line application
HT20	For maximum working temperature 200° C
HT26	For maximum working temperature 260° C
HT40	For maximum working temperature 400° C
LT4	For minimum working temperature -40° C
M	Bearing ring material is AISI420 stainless steel, cage material is AISI201 stainless steel
SS	Bearing ring material is AISI440 stainless steel, cage material is AISI304 stainless steel
QT	Housing material is QT400-18 ductile iron
ZG	Housing material is ZG310-570 cast steel

7.3 Basic designation

Basic designation of bearing unit is composed of design type symbol, dimensions series number and bore diameter number, arranged as follows:

Basic designation		
Design type symbol	Dimension series number	Bore diameter number

7.3.1 Design type symbol

Design type symbol of bearing unit is composed of the design type symbol of insert bearing and the design type symbol of bearing housing:

Design type symbol	
Design type symbol of insert bearing	Design type symbol of bearing housing

7.3.1.1 Design type symbol of insert bearing is shown by upper case Latin letters, as specified in Table 29.

Table 29

FK design type symbol of insert bearing	Meaning
UC	Insert bearing with set screws, spherical O.D.
SER	Insert bearing with set screws, snap ring, cylindrical O.D.
CUC	Insert bearing with set screws, cylindrical O.D.
SB,FHS,K	Insert bearing with set screws, one side flush, spherical O.D.
CSB	Insert bearing with set screws, one side flush, cylindrical O.D.
HC	Insert bearing with eccentric collar, spherical O.D.
CHC	Insert bearing with eccentric collar, cylindrical O.D.
SA,FH,U	Insert bearing with eccentric collar, one side flush, spherical O.D.
CSA	Insert bearing with eccentric collar, one side flush, cylindrical O.D.
UK,168200	Insert bearing with tapered bore (fit with adapter sleeve), spherical O.D.
CS, ORAE	Insert bearing, both sides flush, spherical O.D.
NC	Insert bearing with concentric collar, spherical O.D.
CNC	Insert bearing with concentric collar, cylindrical O.D.
ERC	Insert bearing with concentric collar, snap ring, cylindrical O.D.

7.3.1.2 Design type symbol of bearing housing

Design type symbol of bearing housing is shown by upper case Latin letters, as specified in Table 30

Table 30

FK symbol	Design type symbol of bearing housing	National standard symbol	FK symbol	Design type symbol of bearing housing	National standard symbol
P	Cast pillow block housing	P	FTD	Light duty cast oval flanged housing	P
LP	Cast pillow block housing with low center height		LF	Light duty cast oval flanged housing	
AK	Cast pillow block housing with low center height		FX	Light duty cast oval flanged housing	
PK	Cast pillow block housing with low center height		FTN	Light duty cast oval flanged housing	
PE	Cast pillow block housing		FN	Light duty cast square flanged housing	
ASE	Cast pillow block housing		PSD	Light duty cast pillow block housing	
CP	Cast pillow block housing with end cover		FCT	Light duty cast triangular flanged housing	
PH	Cast pillow block housing with high center height	PH	CFTR	Light duty cast triangular flanged housing	
PA	Cast tapped base housing	PA	T	Cast take-up housing	
PW	Cast tapped base housing		ST	Cast take-up housing	
PG	Cast tapped base housing		CT	Cast take-up housing with end cover	
TB	Cast tapped base housing		C	Cast cartridge housing	K
SHE	Cast tapped base housing		HA	Cast hanger type housing	
F	Cast square flanged housing		HE	Cast hanger type housing	
FU	Cast square flanged housing	FU	PP	Pressed pillow block housing	PP
FS	Cast square flanged housing	FS	PF	Pressed round flanged housing	PF
CF	Cast square flanged housing with end cover		PFT	Pressed triangular flanged housing	PFT
FL	Cast oval flanged housing		PFL	Pressed oval flanged housing	PFL
FLU	Cast oval flanged housing	FLU	R	Rubber ring	
FT	Cast oval flanged housing		RC	Rubber ring	
CJT	Cast oval flanged housing		PPL	Plastic pillow block housing	
CFL	Cast oval flanged housing with end cover		FPL	Plastic square flanged housing	
FC	Cast round flanged housing with spigot joint	FC	FLPL	Plastic oval flanged housing	
ME	Cast round flanged housing with spigot joint		TBPL	Plastic tapped base housing	
FE	Cast round flanged housing with spigot joint		FBPL	Plastic bracket flanged housing	
CFC	Cast round flanged housing with spigot joint and end cover		FCPL	Plastic round flanged housing with spigot joint	
FA	Cast adjustable oval flanged housing	FA	TPL	Plastic take-up housing	
FB	Cast bracket flanged housing	FB	HPL	Plastic hanger type housing	
FD	Light duty cast oval flanged housing		PAPL	Plastic tapped base housing	
FW	Light duty cast oval flanged housing		HAPL	Plastic hanger type housing	

Note: Add prefix "M" if housing material is stainless steel, such as MP, MPF

7.3.2 Dimension series number

Dimension series number of bearing unit is shown by the dimension series of insert bearing as specified in Table 31

Table 31

Dimension series number	Dimension series
0	0 series
2	2 series
3	3 series
X	X series

7.3.3 Bore diameter number

Bore diameter number of bearing unit is shown by the bore diameter number of insert bearing, that is metric bearing is represented by the 2 digits after dimension series, inch bearing is represented by the 3 or 4 digits after dimension series, as shown in Table 32

Table 32

	Bearing nominal bore diameter	Bore diameter number	Example
Metric bearing	10~17mm	10	00
		12	01
		15	02
		17	03
	20~140mm	The quotient of the nominal bore diameter divided by 5. When the quotient is in single digits, it is necessary to add 0 to the left of the quotient, such as 07	
	Special metric dimension	Add special dimensions after the basic bore diameter code, and indicate mm after the dimensions, separated from the basic code by -	
Inch bearing		Add the quotient of the nominal inner diameter divided by 1/16 inch after the basic bore diameter code, and separate with -	
		UC201, nominal bore diameter is 12mm	
		UC207, nominal bore diameter is 35mm	
		SB202-16mm, nominal bore diameter is 16mm	
		UC208-24, nominal bore diameter is 24x25.4÷16=38.1mm	

7.4 Suffix

Suffix is a supplementary designation after basic designation when bearing unit has changes in design types, dimensions, tolerances and technical requirements, etc. Suffix is placed after basic designation and shown by upper case Latin letters (and numbers). Suffixes, their meanings and the listed sequence are as specified from Table 33 to Table 38.

Table 33

Bearing sealing design change	Meaning
SL	Contact type rubber seal and flinger on two sides of bearing
L3	Triple lip seal on two sides of bearing
ZZ	Shield (without rubber) on two sides of bearing
RZ	Non-contact rubber seal on two sides of bearing
F	F type anti-dust seal on two sides of bearing
H	H type anti-dust seal on two sides of bearing
M	M type anti-dust seal on two sides of bearing
J	Contact type rubber seal (2RS) on two sides of bearing

Bearing design change	Meaning
RG	Reversed bearing outer ring
N	Snap ring groove on bearing outer ring
WB	Without anti rotation pin on bearing outer ring
NC	Without eccentric collar
NR	Snap ring on bearing outer ring

Table 35

Housing design change	Meaning
S	Solid (full) base housing
FH	Housing with special bolt hole diameter
I	Housing is loose fit with bearing
K	Housing is interference fit with bearing

Table 36

Housing sealing design change	Meaning
C	Pressed steel open end covers on two sides of housing
C1	Pressed steel open end cover on one side of housing
D1	Pressed steel closed end cover on one side of housing
CD	Pressed steel open end cover on one side of housing, pressed steel closed end cover on the other side of housing
CF	Plastic open end covers on two sides of housing
CF1	Plastic open end cover on one side of housing
DF1	Plastic closed end cover on one side of housing
ZC	Cast open end covers on two sides of housing
ZC1	Cast open end cover on one side of housing
ZD1	Cast closed end cover on one side of housing
ZCD	Cast open end cover on one side of housing, cast closed end cover on the other side of housing

Table 37

Housing relubricating change	Meaning
G	Non-relubricate housing requires a relubrication device
NG	Housing (bearing) without relubrication device
GNB	(without grease nipple)
GNC	With B type grease nipple
PP	With C type grease nipple
	Mount plastic plug instead of grease nipple

Table 38

Special heat treatment or surface treatment	Meaning
ZP	Zinc plating bearing surface
BO	Black oxide bearing surface
SE	Electrophoretic processing housing surface

7.5 Accessory designation

Accessory designation is for adapter sleeve, back seal and self-lubricating device etc., and separated by symbol "+".

7.6 Examples of designation

UCF208-L3

- Suffix: triple lip seal on two sides of bearing
- Bore diameter number: bearing nominal bore diameter is 40mm
- Dimension series number: 2 series
- Design type symbol of bearing housing: cast square flanged housing
- Design type symbol of insert bearing: insert bearing with set screws, spherical O.D.

FJ-UKPE212+H2312

- Accessory designation: with an adapter sleeve H2312
- Bore diameter number: bearing nominal bore diameter is 60mm
- Dimension series number: 2 series
- Design type symbol of bearing housing: cast pillow block housing
- Design type symbol of insert bearing: insert bearing with tapered bore, spherical O.D.
- Prefix: for air handling application

MFQT-HCFV210-F3

- Suffix: high efficiency triple lip seal on two sides of bearing
- Bore diameter number: bearing nominal bore diameter is 50mm
- Dimension series number: 2 series
- Design type symbol of bearing housing: cast square flanged housing
- Design type symbol of insert bearing: insert bearing with eccentric collar, spherical O.D.
- Prefix: housing material is QT400-18 ductile iron
- Prefix: for maintenance free application

UCP314-L3.GNB.DGN

- Suffix: with two grease nipples
- Suffix: with B type grease nipple
- Suffix: triple lip seal on two sides of bearing
- Bore diameter number: bearing nominal bore diameter is 70mm
- Dimension series number: 3 series
- Design type symbol of bearing housing: cast pillow block housing
- Design type symbol of insert bearing: insert bearing with set screws, spherical O.D.

HCFL212-D1

- Suffix: Pressed steel closed end cover on one side of housing
- Bore diameter number: bearing nominal bore diameter is 60mm
- Dimension series number: 2 series
- Design type symbol of bearing housing: cast oval flanged housing
- Design type symbol of insert bearing: insert bearing with eccentric collar, spherical O.D.

8、 Selection of bearing units >>>

8.1 Outline of selection

8.1.1 Select bearing with appropriate inner diameter

Select bearing with appropriate inner diameter based on the load duty and expected lifespan in the application environment.

Load calculation - Expected life - Suitable shaft diameter - Suitable bearing model

FK ball bearing units are available in following bore diameters:

Table 39

Bearing type	Bore diameter range(mm)	Load
U000	10 ~ 30	Light duty
K000	10 ~ 30	Light duty
CS200	12 ~ 60	Normal duty
SA200	12 ~ 60	Normal duty
SB200	12 ~ 60	Normal duty
UC200, UCX00, UC300	12 ~ 140	Normal duty, medium duty, heavy duty
HC200, HC300	12 ~ 100	Normal duty, heavy duty
UK200, UKX00, UK300	20 ~ 90	Normal duty, medium duty, heavy duty
NC200	20 ~ 55	Normal duty

8.1.2 Select appropriate housing type

Select appropriate housing type according to the mounting position in the application environment.

Table 40

Mounting method of housing type	Corresponding housing
Vertical mounting	Pillow block housing: P,PX,PE,AK,PK
	Vertical mounting
	Tapped base housing: PA,PW,PG,TB,SHE
Side wall mounting	Square flanged housing: F,FV,EF,FX,FS,FU,FN
	Oval flanged housing: FL,FLV,EFL,FLX,FT,FTN,FD,FW,LF,PFTD
	Round flanged housing with spigot joint: FC, FCV,FCX,ME,FE
	Side wall mounting
	Hanger flanged housing: FB,FA
Take-up adjustment	Take-up housing: T,TX,ST
Hanging mounting	Hanger type housing: HA,HE

8.1.3 Comparison table of bearing and shaft mounting methods

Table 41

Locking method	Locking force direction	Inner ring roundness	Assembly and disassembly time	Tool	Damage to shaft	Speed vibration	Easy mounting
				hex wrench	Yes	+	+++
				Punch head hammer hex wrench	Yes	++	+++
				torque wrench hammer screwdriver	No	++++	+
				hex wrench	No	++++	++++

8.1.4 Select different sealing device

Select different sealing device as per different application requirement(see content 1.2.3 for detailed sealing device)
Define final selected bearing unit by following above steps.

8.2 Bearing types at different environmental temperatures

The working temperature range of FK standard bearing unit is -15 °C to 100 °C . If it exceeds this range, FK low-temperature bearing unit or FK high-temperature bearing unit should be used.

Table 42

Bearing type	Working temperature	Prefix designation
Standard	-15°C ~ 100°C	
Low temperature	-40°C ~ 120°C	LT4
High temperature 200°C	-20°C ~ 200°C	HT20
High temperature 260°C	-20°C ~ 260°C	HT26
High temperature 400°C	-20°C ~ 400°C	HT40

FK has specially designed bearing units for low and high temperature operating conditions, but users must consider the changes in rated load under high temperature environments when selecting and using them (see content 4.1.3 for details) , the shaft elongation under high temperature environment, and corresponding measures must be taken in the equipment (or mechanism), especially the lubrication period must be carried out according to the provisions of Table 51

8.3 Select bearing units for corrosion resistant environment

In environments with high humidity, strong corrosiveness, and easy growth of bacteria that can cause bearing rust and corrosion, FK has launched stainless steel insert bearings with stainless steel bearing housing or plastic bearing housing.

FK's stainless steel insert bearings are made of high-grade stainless steel material and pre-filled with food grade grease that meets H1 certification.

Refer to FK Catalog No. FK202302 CRB "FK CORROSION RESISTANT BEARING UNITS SOLUTIONS FOR THE FOOD AND BEVERAGE INDUSTRY" for detailed information.

8.4 Select bearing units for high speed mute application

High speed, low noise, low vibration, and high reliability are required in some specific applications, such as blower. FK has launched the High-speed &Mute series bearing unit for this purpose. Higher accuracy, more suitable bearing housing, better sealing structure, and preferred high-performance lubricating grease to meet the requirements of high speed, low noise, low vibration, and high reliability.

Refer to FK Catalog No. FK201802 "Air Handling Bearing Units" for detailed information.

9、Mounting and maintenance of bearing units >>>

9.1 Requirements for shaft and mounting position

9.1.1 Accuracy requirements for shaft

In normal working conditions, bearing unit and shaft usually adopts a clearance fit and the dimensional accuracy of shaft is shown in Table 43

Table 43 Dimensional accuracy of shaft used for cylindrical bore bearing (clearance fit) μm

shaft diameter(mm)		low speed h9		medium speed h8		rather high speed h7		high speed j6		high speed h6	
Over	Incl.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.
10	18	0	-43	0	-27	0	-18	+8	-3	0	-11
18	30	0	-52	0	-33	0	-21	+9	-4	0	-13
30	50	0	-62	0	-39	0	-25	+11	-5	0	-16
50	80	0	-74	0	-46	0	-30	+12	-7	0	-19
80	120	0	-87	0	-54	0	-35	+13	-9	0	-22

However, if the bearing unit is used at high rotation speed or under heavy load, a transition fit should be used between bearing unit and shaft, and the dimensional accuracy of shaft is shown in Table 44

Table 44 Dimensional accuracy of shaft used for cylindrical bore bearing (transition fit) μm

shaft diameter (mm)		rather high speed m6		rather heavy load m7		high speed n6		heavy load h7	
Over	Incl.	max.	min.	max.	min.	max.	min.	max.	min.
10	18	+18	+7	+25	+7	+23	+12	+30	+12
18	30	+21	+8	+29	+8	+28	+15	+36	+15
30	50	+25	+9	+34	+9	+33	+17	+42	+17
50	80	30	+11	+41	+11	+39	+20	+50	+20
80	120	+35	+13	+48	+13	+45	+23	+58	+23

Bearing bore of bearing unit with adapter sleeve is 1:12 tapered bore, this kind bearing unit is suitable as an intermediate support for a long shaft, and at this time the dimensional accuracy of shaft is shown in Table 45

Table 45 Dimensional accuracy of shaft used for tapered bore bearing μm

shaft diameter (mm)		low speed h9		medium speed h10	
Over	Incl.	max.	min.	max.	min.
10	18	0	-43	0	-70
18	30	0	-52	0	-84
30	50	0	-62	0	-100
50	80	0	-74	0	-120
80	120	0	-87	0	-140
120	180	0	-100	0	-160

Bearing units for industrial fans or blowers require high rotation speed. At this time, the fit requirements between bearing unit and shaft are relatively high, and the accuracy of shaft normally is class h5 or j5 as shown in Table 46

Table 46 Dimensional accuracy of shaft used for air handling bearing μm

shaft diameter (mm)		h5		j5	
Over	Incl.	max.	min.	max.	min.
18	30	0	-9	+5	-4
30	50	0	-11	+6	-5
50	80	0	-13	+6	-7
80	100	0	-15	+6	-9

9.1.2 Requirements for mounting position

In principle, the bearing housing can be mounted anywhere, but the rigidity of mounting base not only affects vibration and noise, but also causes the bearing to tighten, affecting bearing unit aligning performance, relubrication performance and normal lifespan. The mounting base for mounting bearing unit should have sufficient rigidity, and the mounting surface must be machined to a precision that doesn't cause deformation of bearing and housing. Normally the flatness requirement for mounting position is 0.10 – 0.15mm or lower, poor flatness can cause abnormal damage to housing.

The inclination angle of mounting base should not exceed $\pm 2^\circ$ relative to the centerline of shaft, otherwise it will affect relubrication function. For bearing unit with open type cover, considering impact on sealing performance, the inclination angle should not exceed $\pm 1^\circ$. In summary, although the bearing unit has aligning function, the smaller the inclination angle the better.

Insert bearing with cast cartridge housing is directly mounted as free end in the cylindrical hole of machine, generally H7 tolerance is applied. When working temperature of shaft and bearing is rather high, G7 tolerance is suggested. If there are impact loads or vibrations during machine operating, it is recommended to use special tolerance. See Table 47 for details.

Table 47

Bore diameter/mm		Mounting hole tolerance		
Over	Incl.	H7	special tolerance	G7
50	80	+30 ~ 0	+25 ~ 0	+40 ~ +10
80	120	+35 ~ 0	+29 ~ 0	+47 ~ +12
120	180	+40 ~ 0	+33 ~ 0	+54 ~ +14
180	250	+46 ~ 0	+38 ~ 0	+61 ~ +15
250	315	+52 ~ 0	+42 ~ 0	+69 ~ +17
315	400	+57 ~ 0	+47 ~ 0	+75 ~ +18

Insert bearing with cast take-up housing is mounted on parallel guide rails, the take-up housing moves on the guide rails by adjusting bolt to adjust distance to shaft center, the fit is shown in the figure.

Mounting dimension and tolerance of take-up housing are specified in Table 48

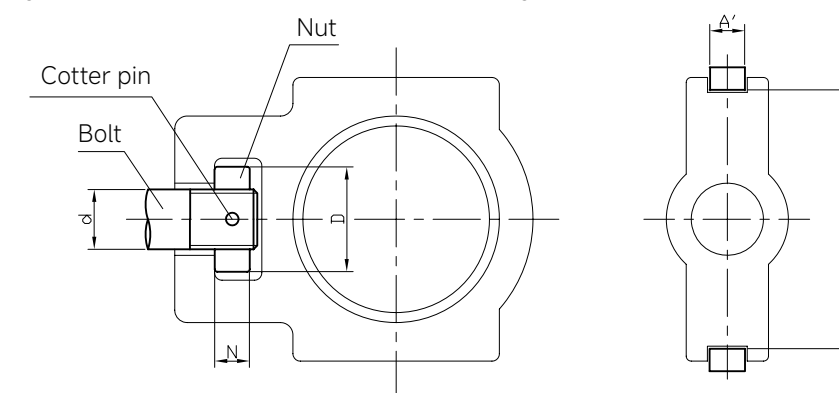


Table 48 Tolerance of take-up housing fitting surface μm

Housing No.	H' ± 0.5	A'	d	D	N
T204	77	11	16	28	12
T205	77	11	16	28	12
T206	90	11	18	32	12
T207	90	11	18	32	12
T208	103	15	24	42	14
T209	103	15	24	42	14
T210	103	15	24	42	14
T211	131	20	30	56	20
T212	131	20	30	56	26
T213	152	24	36	60	26
T214	152	24	36	60	26
T215	152	24	36	60	26
T216	167	24	36	60	26
T217	175	28	42	65	30

Housing No.	H' ± 0.5	A'	d	D	N
ST204	77	12.5	16	28	12
ST205	77	12.5	16	28	12
ST206	90	12.5	18	32	12
ST207	90	12.5	18	32	12
ST208	103	16.5	24	42	14
ST209	103	16.5	24	42	14
ST210	103	16.5	24	42	14
ST211	131	25	30	56	20
ST212	131	25	30	56	26

9.2 Mounting of bearing units

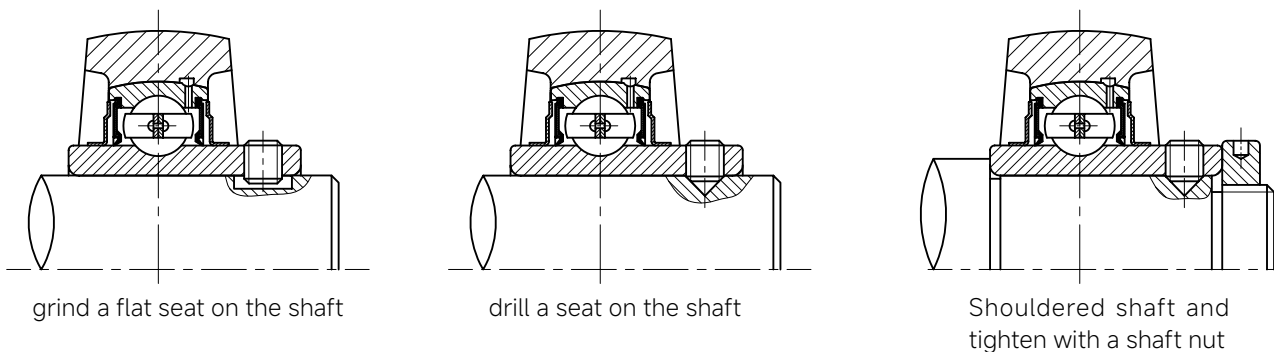
9.2.1 Mounting of bearing units with set screws

9.2.1.1 Normally, use an Allen key to tighten the two set screws. The recommended tightening torque is shown in Table 49

Table 49

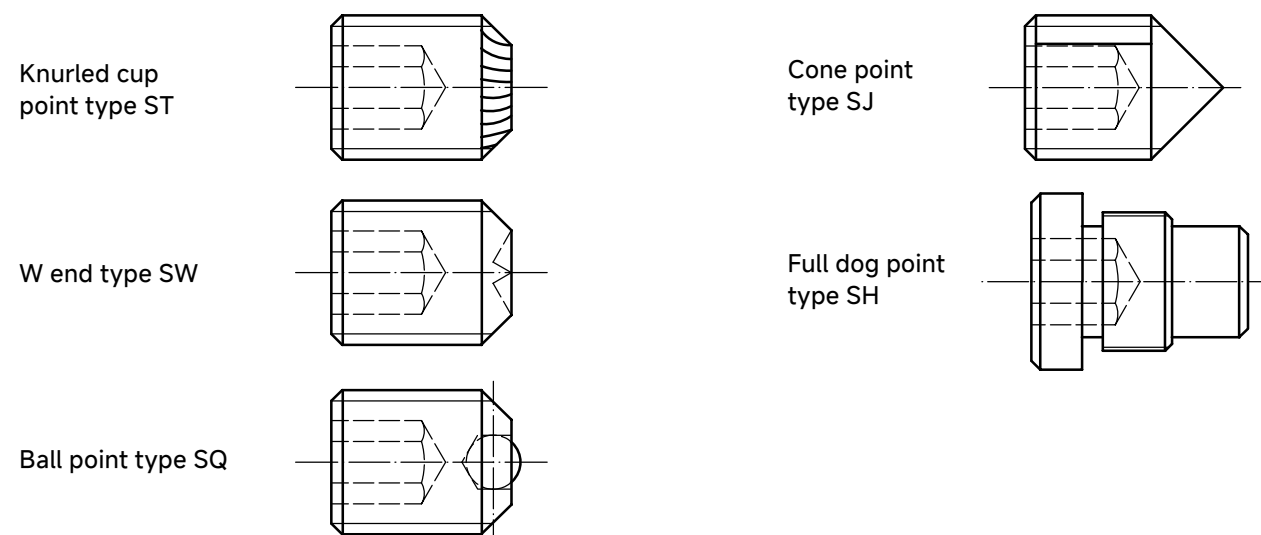
Set screws size(metric)	Recommended tightening torque N·m (max.)	Set screws size(inch)	Recommended tightening torque lbf·inch (max.)
M5×0.8	3.4	10-32UNF	30
M6×1	5.4	1/4-28UNF	48
M8×1.0	11.3	5/16-24UNF	100
M10×1.0	21.6	3/8-24UNF	192
M12×1.5	32.4	7/16-20UNF	210
M14×1.5	41.2	1/2-20UNF	287
M16×1.5	62.8	9/16-18UNF	365
M18×1.5	73.4	5/8-18UNF	556
M20×1.5	117.7		

If the bearing operates under the following conditions: 1) the bearing vibrates, or 2) The bearing has relative movement, or 3) When the load on the bearing is high or the speed is high, then grind or drill the shaft surface where it is contacted by set screws in order to create a flat seat or drilled seat (as shown in figure). If there is a large axial load, vibration or shocking, use a shouldered shaft and tighten with a shaft nut.



K can provide various types of set screws, including but not limited to the following types. Knurled cup point type is the standard for normal products. If there are any additional requirements beyond the standard, please indicate when placing an order.

Attachment: knurled cup point type ST, W end type SW, ball point type SQ, full dog point type SH, cone point type SJ



9.2.1.2 Mounting steps

(1) Before mounting the bearing unit, check dimensional accuracy of the shaft to ensure it meets the requirement, and check any bending, scratches, burrs, etc. on the shaft, apply a small amount of lubricating oil to the shaft. Check the rigidity of mounting base is sufficient, and the flatness of mounting position should not exceed 0.15mm. Check if set screws protrudes to the bearing bore.

(2) Mount bearing unit. Mount the bearing unit onto the shaft, and slide it to the specified position. During the mounting process, avoid using metal objects such as hammers to strike the bearing for mounting. Especially for bearing with flinger, striking bearing may cause the flinger move inward and contact with rubber seal, resulting in friction during operating, cause inflexible rotation or rapid temperature rising, which can burn out the bearing. When the bearing bore is tightly matched with the shaft, it is recommended to use a pressure device to press the inner ring side face for mounting.

(3) Pre-tightening the housing. Excessive tightening torque to bolt may cause deformation of the housing, appropriate tightening torque is required to tighten the bolt. FK recommends using bolt with a washer when mounting the housing, because using the bolt alone may cause damage to the housing.

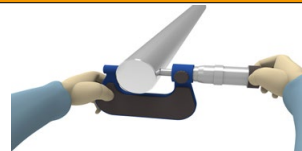
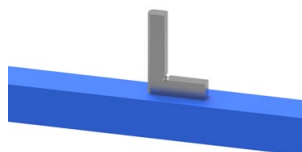
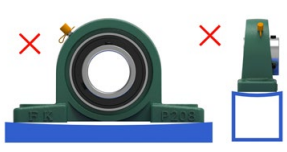
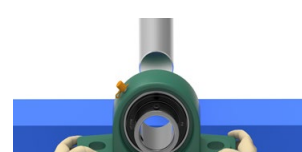
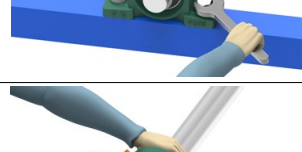
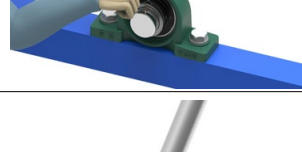
(4) Tightening set screws. According to recommended tightening torque(Table 49), evenly tighten set screws.

(5) Tightening the housing again. Excessive tightening torque to bolt may cause deformation of the housing, appropriate tightening torque is required to tighten the bolt.

(6) Rotate the shaft, check if the bearing rotates flexibly.

Mounting guide for bearing units with set screws

Table 50

Steps	Figure	Description	Remarks
1.Check dimensional accuracy of the shaft		Before mounting the bearing unit, check dimensional accuracy of the shaft to ensure it meets the requirement, and check any bending, scratches, burrs, etc. on the shaft, apply a small amount of lubricating oil to the shaft.	
2. Check the rigidity and flatness of mounting surface		Check the rigidity of mounting base is sufficient, and the flatness of mounting position should not exceed 0.15mm.	
3. Mount bearing unit		Mount the bearing unit onto the shaft, and slide it to the specified position. During the mounting process, avoid using metal objects such as hammers to strike the bearing for mounting. Especially for bearing with flinger, striking bearing may cause the flinger move inward and contact with rubber seal, resulting in friction during operating, cause inflexible rotation or rapid temperature rising, which can burn out the bearing. When the bearing bore is tightly matched with the shaft, it is recommended to use a pressure device to press the inner ring side face for mounting.	
4. Pre-tighten housing		Excessive tightening torque to bolt may cause deformation of the housing, appropriate tightening torque is required to tighten the bolt. FK recommends using bolt with a washer when mounting the housing, because using the bolt alone may cause damage to the housing.	
5.Tighten set screws.		According to recommended tightening torque(Table 50), evenly tighten set screws.	
6. Tighten the housing again		Excessive tighten torque to bolt may cause deformation of the housing, appropriate tightening torque is required to tighten the bolt.	

9.2.2 Mounting of bearing units with eccentric collar

The bearing unit with eccentric collar has an eccentric protrusion at the extended end of inner ring, and there is eccentric groove on the eccentric collar, when mounting on the shaft, the eccentric protrusion and groove should be matched, firstly tighten the eccentric collar in the direction of shaft rotation, then tighten the set screw on the eccentric collar. This bearing unit is suitable for one direction rotation.

Mounting guide for bearing units with eccentric collar

Table 51

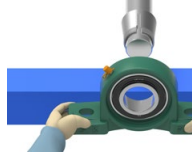
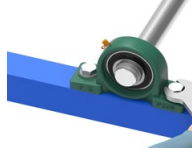
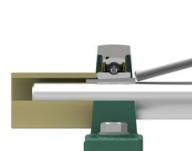
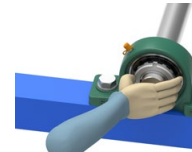
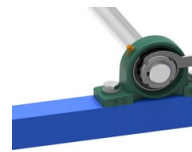
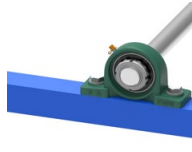
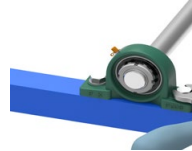
Figure	Description	Remarks
NOTE: Eccentric locking collar unit is not recommended for applications where the direction of rotation is sometimes reversed, since the eccentric collar can loosen. The preparation work for bearing units with eccentric collar is the same as that for bearing units with set screws.		
1. Mount bearing unit	Mount the bearing unit onto the shaft, and slide it to the specified position. During the mounting process, avoid using metal objects such as hammers to strike the bearing for mounting. Especially for bearing with flinger, striking bearing may cause the flinger move inward and contact with rubber seal, resulting in friction during operating, cause inflexible rotation or rapid temperature rising, which can burn out the bearing. When the bearing bore is tightly matched with the shaft, it is recommended to use a pressure device to press the inner ring side face for mounting.	
2. Pre-tighten housing	Excessive tightening torque to bolt may cause deformation of the housing, appropriate tightening torque is required to tighten the bolt. FK recommends using bolt with a washer when mounting the housing, because using the bolt alone may cause damage to the housing.	
1.Fit the eccentric collar	Fit the eccentric section of the inner ring of the bearing to the eccentric recessed section of the eccentric locking collar, and rotate the collar in the direction of shaft rotation by hands to tighten it temporarily.	
4.Rotate eccentric collar	Fit a rod in the hole on the circumference of the eccentric collar and tap it with a hammer so the collar rotates in the shaft rotating direction and tightly clamps the shaft.	
5. Tighten eccentric collar	Tighten the setscrew on the eccentric collar with the proper torque, please refer to FK catalog of the proper torque.	
6. Tighten the housing again	Excessive tighten torque to bolt may cause deformation of the housing, appropriate tightening torque is required to tighten the bolt.	

9.2.3 Mounting of bearing units with adapter sleeve

The bearing bore of this kind bearing is tapered 1:12, and adapter sleeve(sleeve, locking nut, washer) is mounted on the shaft between bearing bore and shaft. It can also ensure the reliable fixation of bearings in applications with strong vibration and impact. When the locking nut of this type of product becomes loose, the fit with the shaft during operation will become loose, and the fitting surface will slide, causing wear on the shaft and components. On the contrary, when the locking nut is too tight, the inner ring expands through the action of the tapered sleeve, causing the internal clearance of the bearing to be too small, resulting in abnormal heating and early wear and tear. Therefore, it is essential to pay great attention to the mounting of such products.

Mounting guide for bearing units with adapter sleeve

Table 52

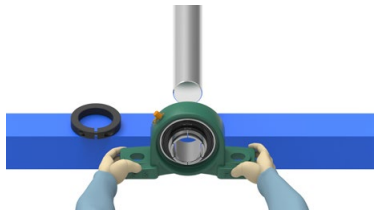
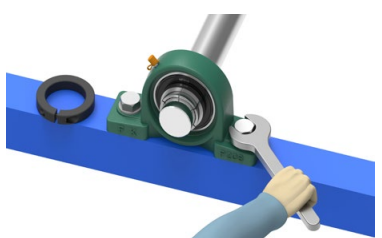
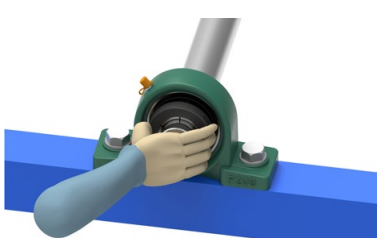
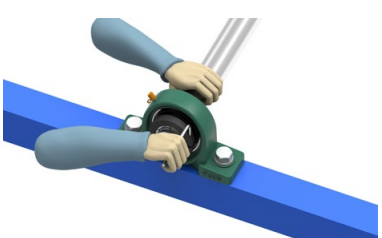
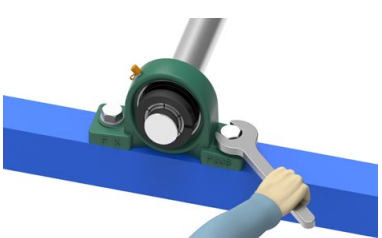
Steps	Figure	Description	Remarks
NOTE: Do not worry about the shaft and inner ring loosening, even though bearing units with adapter sleeve is under impact or vibration loads. However, bearing units with adapter sleeve is not recommended for large axial load applications The preparation work for bearing units with adapter sleeve is the same as that for bearing units with set screws.			
1 Fit the sleeve onto the shaft		Fit the sleeve onto the shaft and position it so that its tapered section is centered to the bearing. For easy fitting, expand its slow with screwdriver or similar tools.	
2 Mount bearing units		Slide the bearing unit over the sleeve	
3.Pre-tighten housing		Excessive tightening torque to bolt may cause deformation of the housing, appropriate tightening torque is required to tighten the bolt. FK recommends using bolt with a washer when mounting the housing, because using the bolt alone may cause damage to the housing.	
4. Tighten adapter sleeve		Gently tap side of sleeve along the whole circumference of the sleeve so that the bearing inner ring is closely seated on the sleeve.	
5. Fit washer and nut		Place the lock washer, and fully hand tighten the nut.	
6. Lock the nut		Use a specialized wrench to lock the locking sleeve, and the locking torque please refer to suggestion.	
6A. Lock the nut		Fit a jig or a screwdriver in one of slots on the nut, and tap it with a hammer until the nut turns 60 to 90 degree..	NEVER tap the slinger and NEVER overtighten the nut. Because this will cause deformation of the inner ring, resulting in overheating and seized.
7. Secure the nut		Bend tabs of lock washer so that it fits into slots on the nut.	Never back rotate nut to fit washer tabs, forward rotate nut to fit the washer tabs.
8. Tighten housing		Excessive tighten torque to bolt may cause deformation of the housing, appropriate tightening torque is required to tighten the bolt.	

9.2.4 Mounting of bearing units with concentric collar

The concentric collar is mounted on the slotted inner ring, the hexagonal bolt deform the concentric collar and resulting in a 360 degrees clamping force.

Mounting guide for bearing units with concentric collar

Table 53

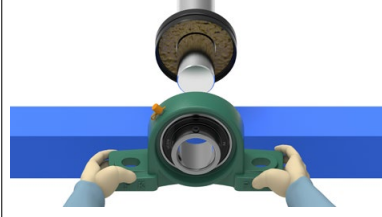
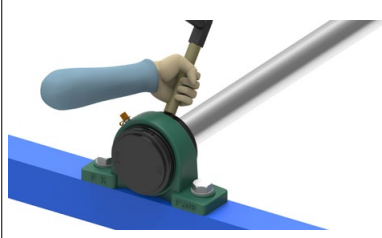
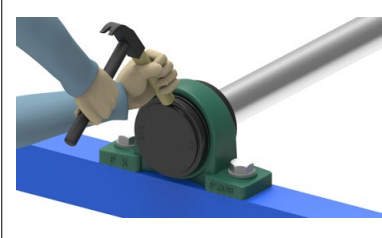
Steps	Figure	Description	Remarks
NOTE: The preparation work for bearing units with concentric collar is the same as that for bearing units with set screws.			
1. Mount bearing unit		Mount the bearing unit onto the shaft, and slide it to the specified position. During the mounting process, avoid using metal objects such as hammers to strike the bearing for mounting. Especially for bearing with flinger, striking bearing may cause the flinger move inward and contact with rubber seal, resulting in friction during operating, cause inflexible rotation or rapid temperature rising, which can burn out the bearing. When the bearing bore is tightly matched with the shaft, it is recommended to use a pressure device to press the inner ring side face for mounting.	
2. Pre-tighten housing		Excessive tightening torque to bolt may cause deformation of the housing, appropriate tightening torque is required to tighten the bolt. FK recommends using bolt with a washer when mounting the housing, because using the bolt alone may cause damage to the housing.	
3. Slide concentric collar		Slide the concentric collar on the slotted inner ring	
4. Tighten concentric collar		Tighten concentric collar, ensure the inner ring tightly clamp the shaft.	
5. Tighten housing		Excessive tighten torque to bolt may cause deformation of the housing, appropriate tightening torque is required to tighten the bolt.	

9.2.5 Mounting of bearing units with cover

Covers for bearing units are available in two types, pressed steel cover and cast iron cover.

Mounting guide for bearing units with cover

Table 54

Steps	Figure	Description	Remarks
NOTE: The preparation work, mounting of bearing onto the shaft, and mounting of bearing housing are same as standard product.			
1. Fill grease		In order to enhance dust and waterproofing effects, apply grease all around the seal lip of the cover, and fill the 2/3 internal space of the cover with grease.	
2. Mount bearing unit		Pass one cover along the shaft, then slide the bearing unit onto the shaft. The steps to mount bearing unit onto the shaft is same as the mounting steps of bearing unit with set screw. It is recommended that the end of the shaft be chamfered beforehand to avoid damaging the lips of the rubber seal.	
3. Fit cover 1		Take the cover which has been passed along the shaft and press it into the housing. Be careful not to strike surface of the cover directly with a steel hammer but use a synthetic resin or wood block. From 45 degree direction, tap it around the circumference of the cover to exert a uniform impact on the cover to fit it into the groove on the housing.	
4. Fit cover 2		Be careful not to strike surface of the cover directly with a steel hammer but use a synthetic resin or wood block. From 45 degree direction, tap it around the circumference of the cover to exert a uniform impact on the cover to fit it into the groove on the housing.	

9.2.6 Mounting caution

a. When mounting the bearing onto the shaft, if heavy tapping action is taken, there is a risk of the bearing flinger moving inward, which may cause contact between the flinger and seal, resulting in abnormal temperature rise or bearing seizure.

b. If adapter sleeve is tightened excessively, it may cause a decrease or absence of internal clearance in the bearing, which have a risk of early failure of the bearing.

c. If setscrews are tightened excessively, it may cause cracks in the inner ring. Please make sure to tighten the set screws with the recommended torque.

d. There is an anti-rotation pin on the outer ring of the bearing. When replacing the bearing or mounting the bearing into the housing, it is important to note that the anti-rotation pin must be located at the slot of the housing, otherwise it may cause cracks in the bearing outer ring or housing.

9.3 Lubrication and operating temperature of bearing units

9.3.1 Lubrication of bearing units

FK bearing units are filled with high quality grease, and use high performance seal device. Therefore, the bearing unit has long grease life under general operating conditions. However, when the application is in high temperature, dust or moisture environment, there may be premature failure of grease, the grease must be supplied periodically.

To meet your re-lubrication requirement, FK suggests you refer to following re-lubrication intervals before re-lubricating.

Re-lubrication intervals of bearing units

Table 55

Application environment	Operating temperature (°C)		Re-lubrication intervals	
	Over	Incl.	dn value under 50000	dn value over 50000
Fairly clean	—	50	No	1.5 years
	50	70	1 year	6-12 months
	70	100	4-8 months	1-3 months
	100	—	2-4 weeks	1-2 weeks
Some dust	—	50	1.5 years	6-12 months
	50	70	4-8 months	2-4 months
	70	100	3-6 weeks	2-4 weeks
	100	—	1-2 weeks	Everyweek
Dust	—	70	1-2 months	3-6 weeks
	70	100	2-4 weeks	1-2 weeks
	100	—	1-7 days	1-3 days
Dust and moisture	—	—	1-3days	Everyday

*dn value is calculated by multiplying bearing bore diameter(mm) by operating speed(RPM)

FK standard products are supplied with SINOPEC Great Wall Lithium base grease #2, please use the same grease for re-lubrication to ensure performance. Please consult to FK engineer for grease of special products.

The amount of grease initially supplied in FK bearing units is 30% to 45% of bearing internal space. If the bearing is filled with too much grease, grease's agitation resistance will be higher, and cause abnormal bearing heating and grease leakage. FK recommends following re-lubrication grease amount.

Re-lubrication grease amount

Table 56

Bearing No.	Re-lubrication grease amount(g)	Bearing No.	Re-lubrication grease amount(g)
UCS201 ~ 203	0.7 ~ 1.0	UC305	2.9 ~ 3.8
UC201 ~ 204	1.2 ~ 1.6	UC306	4.1 ~ 5.3
UC205	1.4 ~ 1.8	UC307	5.9 ~ 7.6
UC206,UCX05	2.2 ~ 2.9	UC308	7.9 ~ 10.2
UC207,UCX06	3.3 ~ 4.3	UC309	10.6 ~ 13.6
UC208,UCX07	4.3 ~ 5.5	UC310	14.6 ~ 18.7
UC209,UCX08	5.2 ~ 6.7	UC311	18.7 ~ 24.1
UC210,UCX09	5.9 ~ 7.6	UC312	22.1 ~ 28.4
UC211,UCX10	7.8 ~ 10.1	UC313	27.9 ~ 35.8
UC212,UCX11	10.0 ~ 12.9	UC314	34.4 ~ 44.2
UC213,UCX12	12.5 ~ 16.1	UC315	41.9 ~ 53.9
UC214,UCX13	14.0 ~ 18.0	UC316	50.4 ~ 64.9
UC215,UCX14	14.7 ~ 18.9	UC317	58.4 ~ 75.1
UC216,UCX15	19.5 ~ 25.1	UC318	69.2 ~ 89.0
UC217,UCX16	22.6 ~ 29.0	UC319	79.4 ~ 102.1
UC218,UCX17	29.7 ~ 38.2	UC320	97.0 ~ 124.7
UC219,UCX18	37.5 ~ 48.2	UC322	127.8 ~ 164.4
UC220	41.8 ~ 53.8	UC324	163.1 ~ 209.7
UCX20	48.0 ~ 60.0	UC326	204.5 ~ 262.9
		UC328	245.1 ~ 315.2

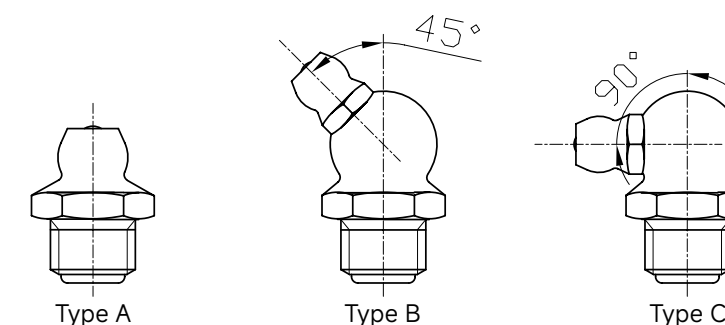
Above table applies to HC,UK,NC series bearings as well. For SA, SB series bearings, use 70% grease amount in above table.

FK can provide type A (straight), type B(45°) and type C(90°) grease nipples. Normally, type A grease nipple is mounted in FK bearing units, the grease nipple specification is show in Table 57. Other types or sizes are available to meet customers' requirement.

Standard grease nipple in FK bearing units

Table 57

Bearing housing specification			Grease nipple specification
203 (S) ~ 210	305 ~ 309	X05 ~ X09	M6×1
211 ~ 215	310 ~ 315	X10 ~ X14	M8×1
216 ~ 220	316 ~ 328	X15 ~ X20	M10×1



9.3.2 Countermeasures in high temperature environment

Usually, two or more bearing units are used on a shaft. When the mounting space between the bearing units is small or the expansion and contraction of the shaft due to temperature is relatively small, each bearing unit can be mounted as a fixed end. However, if the mounting space is large or in a high-temperature environment, the shaft will elongate in the axial direction when subjected to thermal effects, resulting in a large axial load on the bearing, which poses a risk of premature failure of the bearing unit. One bearing unit can be mounted as a fixed end to determine the position of the shaft, while other bearing units can be mounted as floating ends. The extension and contraction of the shaft can be eliminated by using floating end bearing units.

The relationship between temperature rise and shaft elongation is shown in (9.1)

$$\Delta l = \alpha \cdot \Delta t \cdot l \quad (9.1)$$

In the above equation

Δl : elongation of the shaft, mm

α : The coefficient of linear expansion of the shaft is $11-12 \times 10^{-6}$ for ordinary steel

Δt : temperature rise value, °C

L : The mounting space between bearing units, mm

When the shaft undergoes significant expansion and contraction due to thermal effects, the following measures should be taken.

(1) Use full dog point type setscrews on the floating end

When the shaft length is changed due to thermal effects, the shaft or bearing unit must be mounted to be able to move in the axial direction.

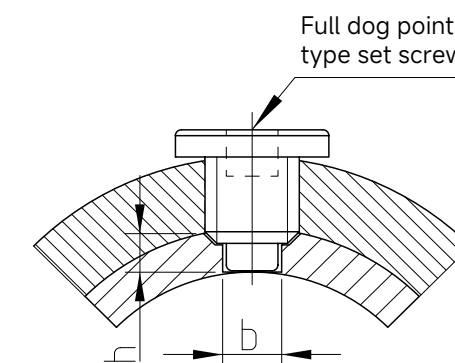
When the speed is low, the floating end bearing adopts the method of machining keyway on the shaft and mounting full dog point type setscrews (special code: SH).

Insert the pin at the top of the set screw into the keyway of the shaft, guide the axial movement of the shaft. The floating end bearing is machined with a keyway on the shaft, using full dog point type setscrews as shown in Figure 9.3.2-1. The keyway dimensions for full dog point type setscrews are shown in Table 58.

When using this method, the tolerance range of the shaft used for the floating end bearing unit is recommended to be h7.

When the temperature of the shaft is higher than that of the inner ring of the bearing, the shaft used should adopt a tolerance range that can form a larger fit clearance.

In addition, the floating end bearing unit using this method may sometimes experience wear and tear on the fit surface between the inner ring of the bearing and the shaft. To prevent abrasion, it is recommended to apply grease on the inner diameter surface of the bearing when mounting the bearing unit.



Unit mm

Keyway dimensions on the shaft to fit SH type setscrew

Table 58

Bearing No.	h (max.)	b (min.)	Bearing No.	h (max.)	b (min.)	Bearing No.	h (max.)	b (min.)
UC201	3	5	UC305	3.5	5	UCX05	3.5	5
UC202	3.5	5	UC306	4	5	UCX06	4.5	7
UC203	3.5	5	UC307	4	7	UCX07	4.5	7
UC204	3.5	5	UC308	5	8	UCX08	4.5	7
UC205	3.5	5	UC309	5	8	UCX09	5	8
UC206	4	5	UC310	4.5	10	UCX10	4	8
UC207	4.5	7	UC311	5	10	UCX11	4.5	8
UC208	4.5	7	UC312	4.5	10	UCX12	4.5	8
UC209	4.5	7	UC313	6	10	UCX13	4.5	10
UC210	5	8	UC314	5	10	UCX14	5	10
UC211	5.5	8	UC315	7	11	UCX15	6	10
UC212	5.5	8	UC316	6.5	11	UCX16	7	10
UC213	5.5	8	UC317	7	13	UCX17	6	10
UC214	6.5	10	UC318	8.5	13	UCX18	6.5	11
UC215	6.5	10	UC319	7.5	13	UCX20	7.5	13
UC216	6.5	10	UC320	7.5	14			
UC217	8	10	UC321	7	14			
UC218	7	10	UC322	9.5	14			
			UC324	8	14			
			UC326	9.5	16			
			UC328	7.5	16			

(2)In cases where the speed is high or there is vibration, it is recommended to use an cartridge housing at the floating end. The mounting hole of the equipment and the outer cylindrical surface of the bearing housing can move axially relative to each other. As shown in Figure 9.3.2-2

Figure 9.3.2-1

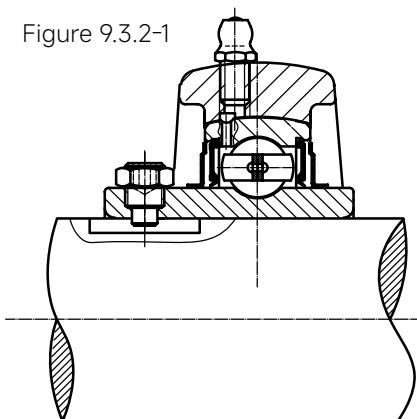
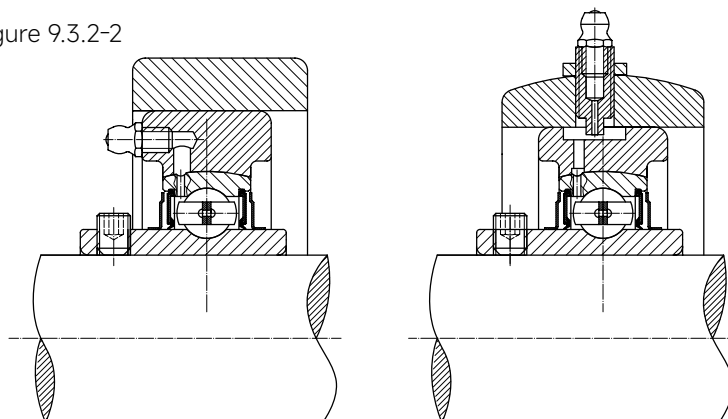


Figure 9.3.2-2



9.4 Maintenance of bearing units

9.4.1 After mounting of the bearing unit, a running test should be conducted to check whether the bearing mounting is complete. The inspection is divided into the following three steps.

- Rotate the shaft by hand, check the tightness and torque
- Run the machine at low speed under 0 load, check if there are any abnormal noises and vibrations.
- Run the machine at normal operation conditions, check working temperature rising trend and stable working temperature.

Main abnormalities and causes in the bearing unit test running

Table 59

Abnormalities	Causes
Too high torque rotation torque is unstable	① Due to poor mounting, pre-tightening force is applied on the bearing at axial direction. ② Due to mounting or using reason, seal contacts with flinger. ③ Due to the tightening of the locking nut (fastener) being too tight, bearing internal clearance is too small.
Abnormal noise Abnormal vibration	① Setscrews on the bearing or bolts on the housing are not firmly tightened. ② Bearing internal clearance is too big. ③ Shaft is bent, axis deviation of multi-diameter shafts ④ Shaft accuracy is low. ⑤ Machine mounting surface is not flat or rigid.
Abnormal temperature rise	① Bearing internal clearance is too small. ② Due to poor mounting, pre-tightening force is applied on the bearing at axial direction. ③ Too heavy load ④ Exceed limiting speed ⑤ Mounting surface flatness is not good. ⑥ Due to mounting or using reason, seal contacts with flinger.

9.4.2 Regular inspection during operation

It is necessary to regularly inspect the bearing units during operation, as it can ensure the normal operation of the machinery and ensure that the bearing unit achieve normal performance and service life. The main contents of regular inspections are as follows:

- Is there any looseness or abnormality of the bolts.
- Is there any looseness or abnormality of the setscrews.
- The stability, noise and vibration.
- The working temperature of the bearing unit.
- Re-lubrication

Main abnormalities and causes in bearing unit regular inspection in Table 60:

Main abnormalities and causes in bearing unit regular inspection

Table 60

Abnormalities	Causes
Too high(heavy) torque	① Grease degradation ② Too much grease, seal contacts with flinger ③ Deformed flinger contacts with seal ④ Abnormal load
Abnormal noise Abnormal vibration	① Setscrews or bolts loose ② Wear of fit surface between shaft and bearing inner ring ③ Foreign matter invade into bearing ④ Fatigue of bearing raceway ⑤ Indentation on bearing raceway ⑥ Shaft is bent
Abnormal temperature rise	① Grease degradation ② Too much grease, seal contacts with flinger ③ Deformed flinger contacts with seal ④ Setscrews or locking nuts (fastener) loose ⑤ Abnormal load ⑥ Fatigue of bearing raceway