

机械压装 Pressure assembly

通常情况下，轴承可以采用压力装配的方式进行安装，装配时应采用芯轴慢慢压入，禁止直接击打轴承以免产生变形，装配前应确保座孔内表面光洁无异物。

In most applications, Dernore bearings can be fitted by press. For this procedure, a mandrel and a press machine are used, it is forbidden to hit the bearing in order to avoid deformation of bearings. The housing inner side should smooth without contamination.

冷冻装配 Frozen assembly

通过液氮或干冰采用冷装配压装相比采用机械压装方式更为有效，此时标准的冷冻温度为 -40℃ ~-70℃，冷冻时间一般为 1 小时以上，具体需根据零件的壁厚和配合公差。

The cooling fit uses liquid nitrogen or dry ice, compared to press fitting, cooling fit is efficient and achieves more accurate installarion. The standard cooling temperature is -40℃ ~-70℃ , cooling time should be more than one hour, details according to the bushing wall thickness and interference design.

轴承的收缩量可以根据以下公式计算：

Calculation of bearing shrinkage amount of outer diameter:

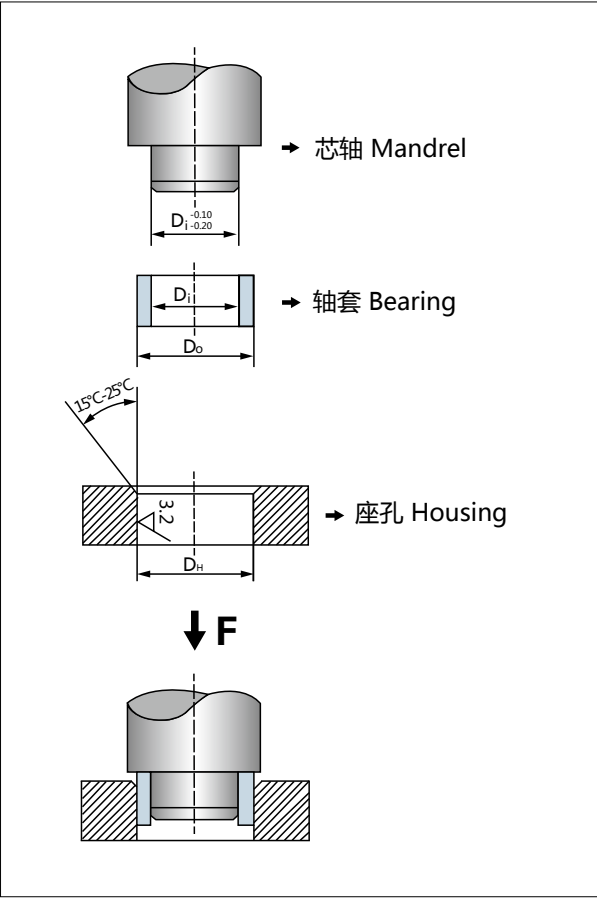
$$\Delta D = D \times \alpha \times \Delta T$$

$\Delta D$  : 外径收缩量 Shrinkage of bearing OD

D : 轴承外径 Bearing OD

$\alpha$ : 线性膨胀系数 ( 1/105K )

$\Delta T$  : 温度差 Temperature difference

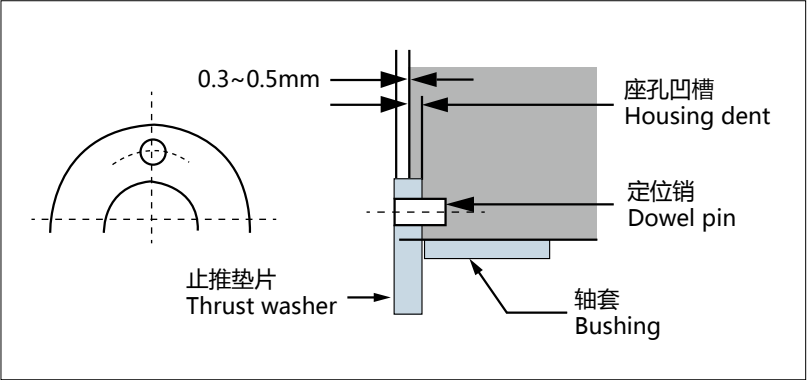


止推垫片和滑板的安装 Thrust washers and plate fit

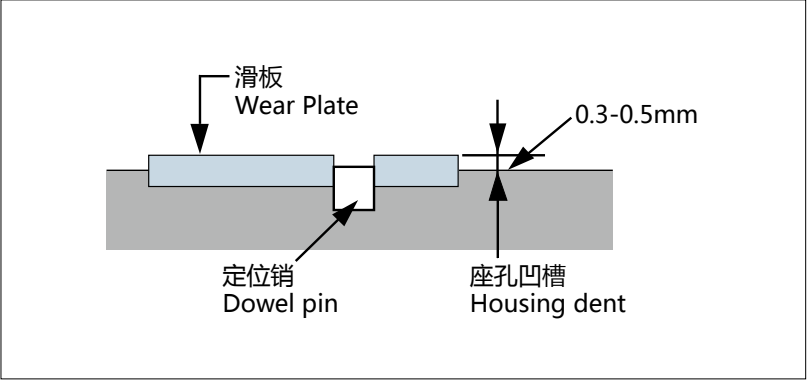
止推垫片和滑板应当安装在座孔的凹槽内，为了避免零件的移动建议使用定位销或沉头螺丝加以固定。

It is recommend to install the thrust washers and sliding plates with the hollow indented housings. To avoid the moving of such parts, a dowel pins is recommended to be installed.

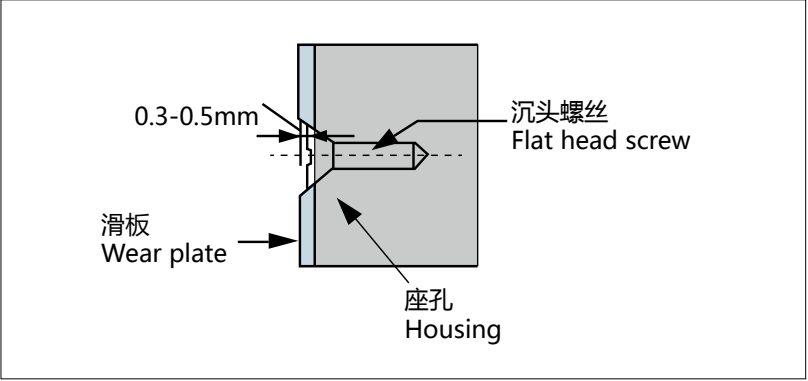
1. 定位销安装 Dowel pin application(thrust washer)



2. 镶嵌式安装 Inlaid installation(plate)



3. 沉头螺丝安装 Flat head screw application



卷制类产品的制造工艺决定了开口缝的存在，使得产品在自由状态下没有很好的圆整度，同时轴套外径和座孔之间为过盈配合，轴套要最大限度地适应座孔的形状，因此不能在自由状态下直接测量产品的内外径而必须使用特殊的测量仪和设备才能检测； ISO3547 标准第 2 部分中对卷制类产品的公差检验作了明确的规定， 包括：

检验方法 A：哈夫规检验外径；

检验方法 B：止通规检验外径；

检验方法 C：止通规检验内径；

检验方法 D：测量尺检验大规格产品外径

以及替代检验方法 C 的壁厚检验方法， 壁厚检验方法和检验方法 C 不能同时使用。

Rolled products in the manufacturing process determine the existence of open joints, making products in the free state not habe a good whole circle shape, while sleeve diameter and the seat for the interference fit between the holes, sleeve adapted to maximize Block hole shape can not be directly measured in the free state the inner/ outside diameter of the product only can be by a special measuring instrument; In ISO3547 standards measured Part 2 of the rolled products made clear tolerance test requirements, including :

Test Method A: Huff regulatory test outside diameter;

Test method B: use stop-pass gauge to test the outside diameter;

Test method C: use stop-pass gauge to test the inside diameter;

Test method D: Measure the outer diameter of large scale product and use wall-thickness test to replace test method C. (Wall-thickness test and test method C can not be used at the same time.)

外径检验方法    External diameter test methods

检验方法 A (ISO3547-2: Test A)

采用如右视图的上下两哈夫规对外径进行检验，检验时产品的开口缝朝上哈夫规相向施加检验载荷 Fch，该载荷使卷制轴套能够按符合要求的方式就位于检验模。 检验中， 由于弹性变形卷制轴套外径会变小但不会产生永久变形。 产品的外径可以通过检验模之间的距离 Z 的变化量△ Z 来计算。

Test A of ISO 3547 Part 2

Check the outside diameter of a wrapped bush using measuring equipment as shown to the right, with a checking block consisting of upper and lower halves and setting plugs, at a determined checking load of Fch, during the test the outside diameter of the bush is made smaller by the elastic reduction, however it is not a permanent deformation. The bushes outside diameter can be calculated from the difference in the value of z (△Z)

检验方法 B (ISO3547-2: Test B)

检验采用两个环规即通规和止规，用手以最大力 250N 可将轴套推入并通过通规；在相同情况下无法进入和通过止规。在某些情况下检验精度可能受到影响，比如轴套不圆或闭合开口缝的力本身已超过 250N，此时建议采用检验方法 A 或测压入力或壁厚相结合的检验方法。

Test B of ISO 3547 Part 2

The test is carried out with two ring gauggs, a Go gauge and a No Go gauge whose diameter Shall be chosen empirically from with Table 6 of ISO3547-1:1999 and agreed upon. It shall be possible to press the bushes into the GO gauge and then push them through with hand pressure (maximum force 250N). On the other hand with the same force, it shall not be possible for them to go into and through the NO GO gauge (See ISO 12307-1)

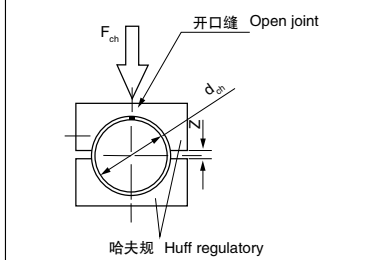
检验方法 D (ISO3547-2: Test D)

采用精确的测量尺来测量外径， 一般针对大规格的轴套外径检测。

Test D (ISO 3547-2)

The test is carried out by means of a precision measuring tape.

检验方法 A Test A of ISO



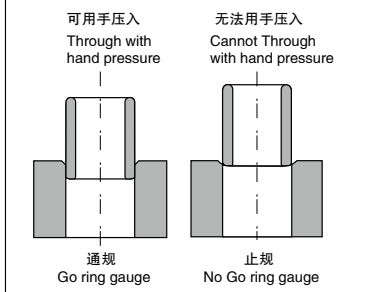
哈夫规和芯棒  $d_{ch}= \text{___mm}$   
Checking block and setting mandrel

检验压力  $F_{ch}= \text{___N}$   
Torce test

极限值  $\Delta z= \text{___and___mm}$   
Limiting value

外径公差  $D_o= \text{___to___mm}$   
OD tolerance

检验方法 B Test B of ISO



可用手压入 Through with hand pressure  
无法用手压入 Cannot Through with hand pressure

通规 Go ring gauge    止规 No Go ring gauge

内径检验方法 Internal diameter test methods

检验方法 C (ISO3547-2: Test C)

将轴套压入基准环规后检查轴套的内径， 内径的检测可以采用三点测量装置或通、 止塞规检验。从实际使用考虑一般建议采用通、 止塞规检验， 此时在用手最大推力不超过 250N 时通端塞规可以通过轴套内孔， 在相同情况下止端塞规应当无法通过轴套内孔。 当轴套压入基准环规后， 轴套外径可能会引起永久变形而无法正常使用。

Test C (ISO3547-2: Test C)

To check the inside diameter, the bush is to be pressed into a ring gauge, whose nominal diameter corresponds to the dimension specified in ISO3547-1:1999. The inside diameter shall be measured with a 3-point measuring instrument or checked with a GO and NO GO plug gauge. The GO plug gauge shall be inserted by a minimum effort; the NO GO plug gauge shall not be inserted by manual pressure(maximum force 250N). In order to enable the manufacturer and the customer to compare results of this test it should be agreed whether results should be obtained by measuring or by gauging.

止推片检验方法 Thrust washer test method

除了厚度公差以外， 垫片的平行度对于垫片和对磨件的使用寿命同样重要。 我们使用比较有效的检验方法来检测垫片的平行度， 让垫片依靠自重来通过两个平行块； 当然平行块必须大于垫片本身的规格。

Beside the thickness, the flatness of washer is also important for washer and grinding parts' usage age. We use very helpful test in which the washer falls through the gap between two plain parallel plates of a gauge under its dead weight. The plates must be big enough to cover the whole washer.

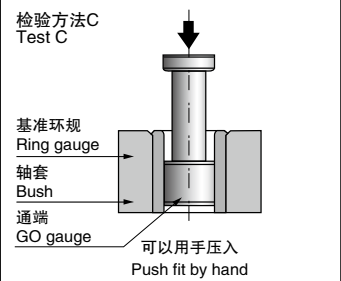
壁厚检测方法 Wall Thickness test method

作为检验方法 C 的替代方案两则不能同时使用， 壁厚根据轴套尺寸在轴向进行测量。

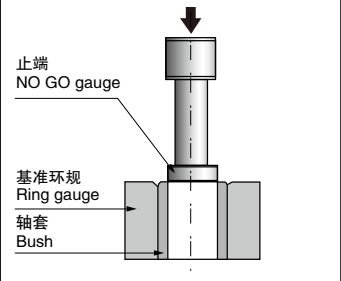
The wall thickness is measured at once,two or three positions axially according to the bearing dimensions.The wall thickness and the inside diameter shall not be specified together on the same drawing.

B[mm]	X[mm]	测量点 measurement position
$B \leq 15$	$B/2$	1
$15 < B \leq 50$	4	2
$50 < B \leq 90$	6 and $B/2$	3
$B > 90$	8 and $B/2$	3

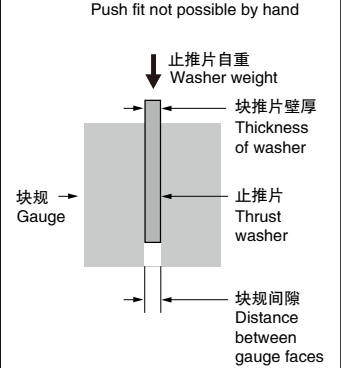
检验方法C Test C



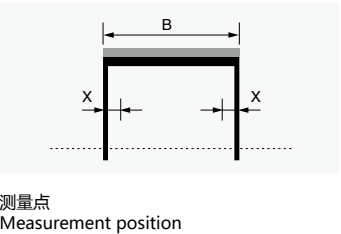
基准环规 Ring gauge  
轴套 Bush  
通端 GO gauge  
可以用手压入 Push fit by hand



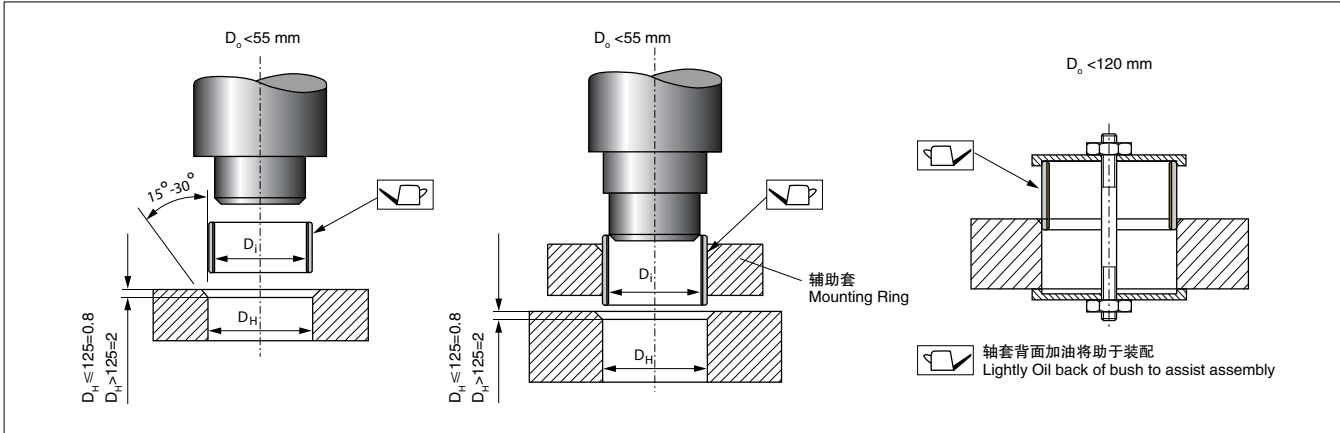
止端 NO GO gauge  
无法用手压入 Push fit not possible by hand



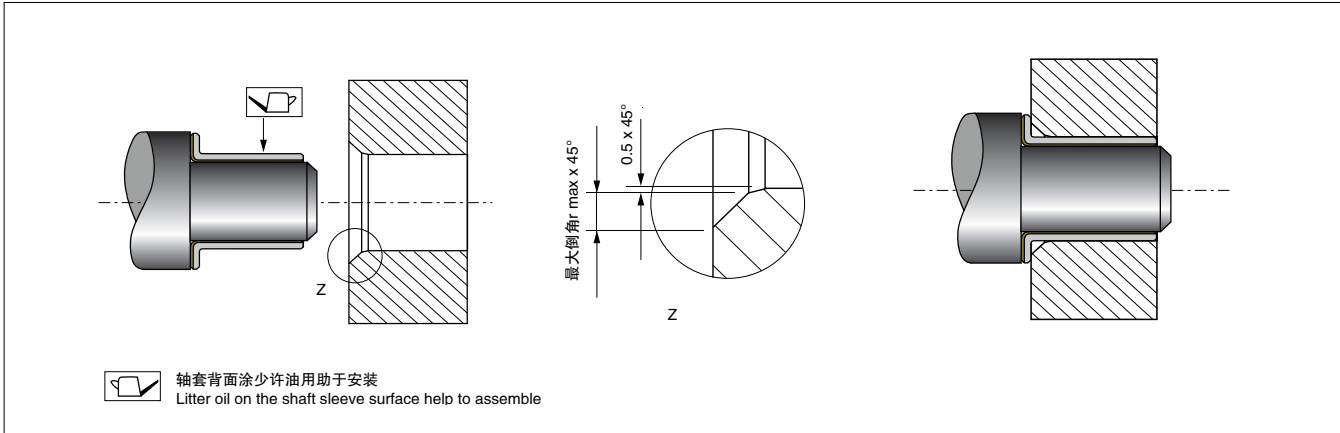
止推片自重 Washer weight  
块推片壁厚 Thickness of washer  
止推片 Thrust washer  
块规 Gauge  
块规间隙 Distance between gauge faces



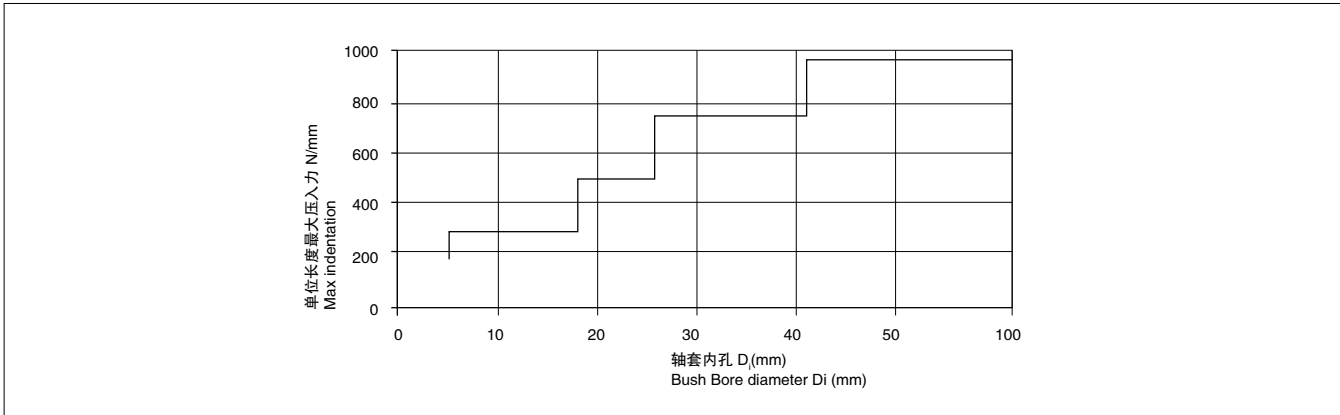
直套安装 Straight set of installation



翻边套安装 Flange set of installation



压入力计算 Indentation Calculation



同轴度 Concentricity

精确的同轴度对于轴承的正常使用非常重要，要求轴套在一个或者两个长度内的不同轴度以及在翻边或止推片直径内的不同轴度控制在 0.02mm 内。

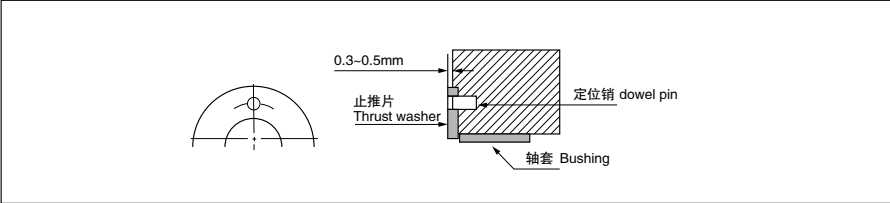
Degree of precision coaxial bearing the normal use for a very important requirement sleeve length in one or two degrees of the different axes and in the flange or thrust washer diameter of the different degree of control shaft within 0.02mm.

垫片和滑板的安装 Thrust washers and sliding plates installation

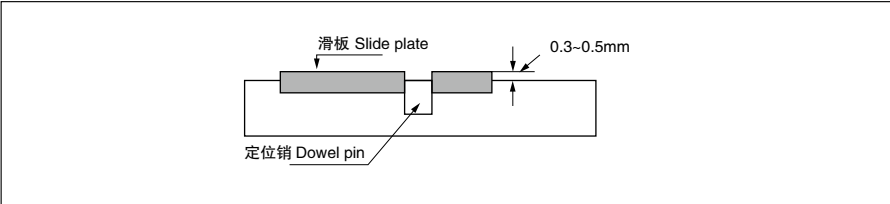
建议垫片和滑板安装在凹陷的座孔内，为了避免移动，同时建议采用定位销加以固定。

It is recommended to install the thrust washers and sliding plates with the hollow indented housing. To avoid the moving of such parts, a Dowel pins is recommended to be installed.

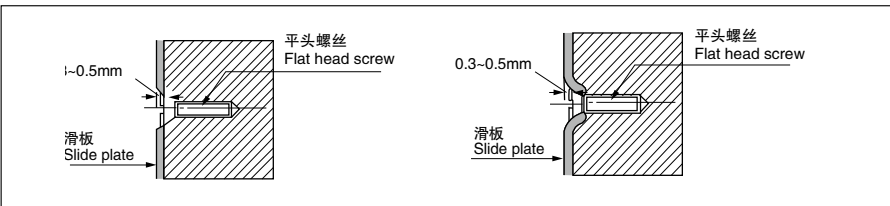
1. 定位销在垫片上的使用 Dowel pin application (thrust washer)



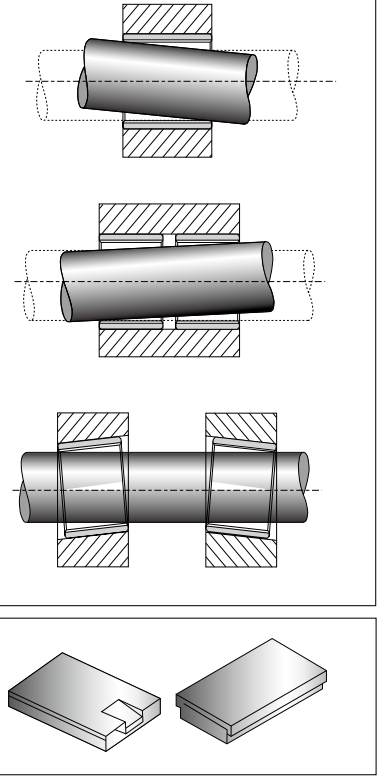
2. 定位销在滑板上的使用 Dowel pin used on slide plate



3. 平头螺丝的使用 Flat head screw application



同轴度要求  
Concentricity requirements



其他固定方法 Other fixation methods

当无法使用定位销时，可以采用激光焊接，粘结剂和钎焊（温度 < 320℃）的方法加以固定；此时必须注意使用的温度不能超过轴承材料本身能够承受的范围，轴套工作面防止与粘合剂接触。

When the pin is not available, you can use laser welding, adhesives and brazing (temperature < 320 °C ) method to be fixed; while do in this way, temperature used must not higher then the bearing material itself can be standed, the cleave face should be prevent from contacting with adhesives.

PTFE 基轴承的加工和安装注意事项 Processing and installation considerations of PTFE-based bearing

PTFE 基轴承一般都是成品零件, 组装后内孔不再进行较、镗等加工, 若座孔按推荐的尺寸加工时, 卷制类轴承内径的真圆度完全能满足使用要求; 如果客户可以接受干摩擦性能大幅度降低, 可以对 PTFE 基轴承在安装后进行内孔挤压以达到更高的精度, 强烈建议对挤压芯棒表面进行热处理 (深度 0.6mm, HRC > 55) 并抛光处理至 Rz1;

当轴承的比压力小或摆动小而要求运行平稳时, 可以增大工作间隙, 在高温下使用时, 每升高 100℃时建议轴径减少 0.008mm;

若轴承座材质是青铜、铝或锌合金时, 建议减少轴承座孔以增加轴承装配过盈量; 为保证轴承座的刚性, 轴承座外径通常为轴承外径的 1.5 倍, 薄壁座孔使用时需要考虑压装和使用过程的产生的变形;

PTFE 轴承需要加工时, 为了避免毛刺的产生建议从 PTFE 一侧进行加工或钻孔, 在钻孔过程中轴套应当有足够的支撑已确保不会由于钻孔压力导致变形; 带材的加工方法可以通过剪切、水切割、激光切割等方法。

PTFE-based bearings are generally finished parts, assembled in the hole without the hinge, and other processing, if the bore size of the recommended process, the rolling type bearings with bore roundness can meet the requirements;

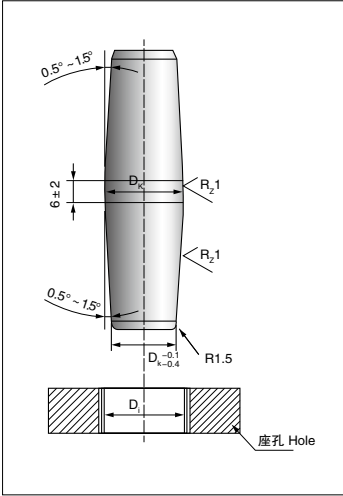
If the client can accept a significant reduction of dry friction, extruding the inner holes on the PTFE-based bearing after the compression to achieve higher accuracy, we strongly recommend the extrusion mandrel surface treatment (depth of 0.6mm, HRC > 55) and polished to Rz1;

When the bearing's specific pressure is small and required to run a smooth swing, you can increase the working space, when used at high temperatures, it is increased by 100 °C, the proposed reduction of shaft diameter 0.008mm;

If the material of bearing is bronze, aluminum or zinc alloy, it is recommended to reduce the bearing hole to increase the amount of interference bearing assembly; to ensure the bearing rigidity, The base of bearing's diameter is usually 1.5 times to the bearing's diameter, thin-walled bore with pressure to consider when installed and used in the process of the deformation;

PTFE bearings need processing, in order to avoid the generation of burrs from the PTFE side of the proposed processing or drilling in the drilling process should have sufficient support sleeve has been to ensure that no pressure leads to deformation of the borehole; processing methods strip can cut, water jet cutting, laser cutting and other methods.

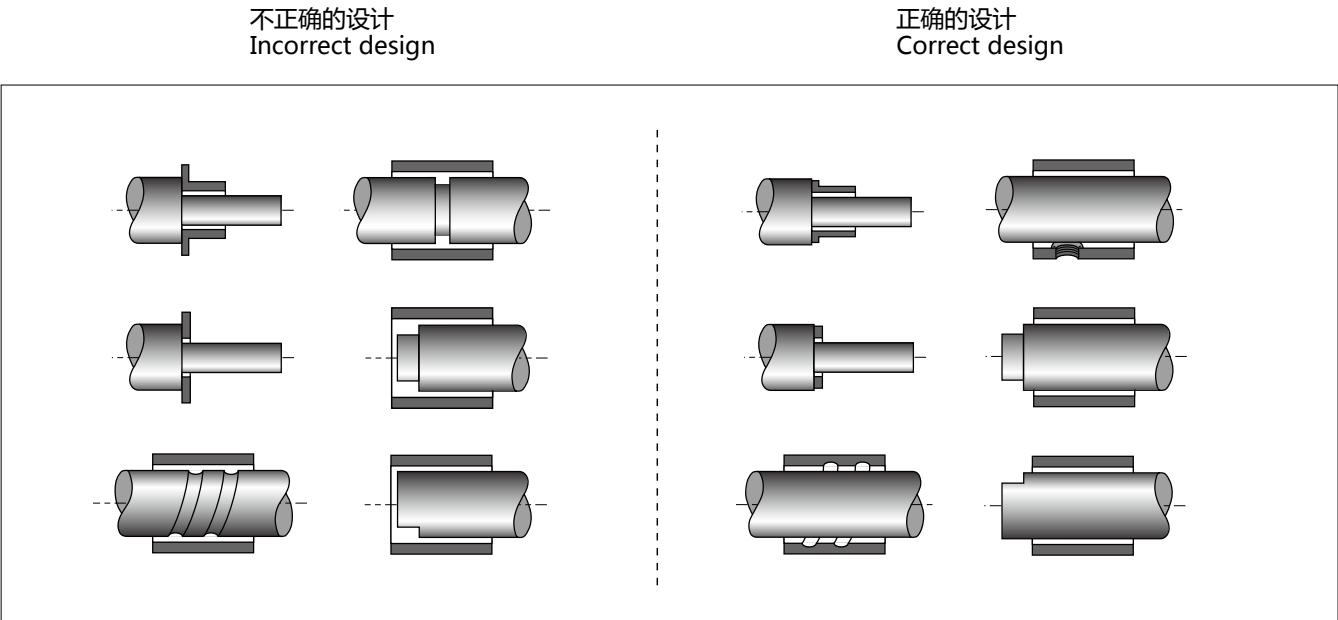
轴承内径 Dia of the axis d	要求内径 Required ID dE	整形工具直径 Diameter of the shaping tools dk
	d	d+0.03
d	d+0.02	d+0.06
	d+0.03	d+0.08
	d+0.04	d+0.10



对磨轴 The Shaft

对磨件的材料、表面硬度、表面粗糙度以及表面处理方式对于轴承的使用寿命的影响很大, 一般情况下我们建议轴的硬度在 HRC > 50, 表面粗糙度 Ra0.4 以下; 在潮湿或易腐蚀的场合建议使用不锈钢、硬质铬镀层。

Grinding pieces of material, surface hardness, surface roughness and surface treatments have a great impact on the life of bearing, in general, we recommend that the hardness of the shaft HRC > 50, surface roughness below Ra0.4; We suggest using stainless steel, hard chrome plating in the wet or corrosive place.



密封 Seal

金属塑料基自润滑轴承允许一些不会损害轴承表面材料的异物进入, 但当异物的侵入增加或高磨损型物质进入时应当安装核实的密封圈以提高轴承的使用寿命。

If increased levels of contamination occur or the bearing is used in an aggressive environment, the bearing section should be protected from dust and containment. The normal solution is to re-design the surrounding structure so that the contamination cannot reach the bearing section. If the contamination is critical, a collar of grease or a shaft seal is recommended.

