



浙江双飞无油轴承股份有限公司  
ZHEJIANG SF OILLESS BEARING CO.,LTD.

# 2017

## SF系列三层复合自润滑轴承 SF SERIES SELF-LUBRICATING BEARING

AN ISO9001& ISO/TS16949 ISO14001 CERTIFIED BEARING COMPANY



● 浙江双飞无油轴承股份有限公司

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## 不断地超越顾客的期望

Never Stops Exceeding the Expectations of Our Customers

企业宗旨：以质量求生存，以信誉求发展。

企业精神：团结、奋进、求实、创新。

经营理念：以科技为先导，提供尽善尽美的产品及服务。

企业使命：企业是为了满足市场需要而存在，市场是一切工作的出发点和动力。

企业目标：让“ZOB”产品遍布全世界。

双飞客户：“ZOB”所有客户，是一笔巨大的资产，我们将尽全力满足客户个性化的要求，为每位客户提供完善的服务，

创造互惠互利的完美合作关系。

双飞产品：“ZOB”将不断深入的进行技术研究，开发更多适应市场的产品，并依靠严格的品质管理体系，使每一位顾客享受品质稳定的产品。



# SF Oilless Bearing

Enterprise Principle: Quality first. Growth on reputation and trustworthy.

Enterprise Spirit: United, Assertive, Practical, Innovative.

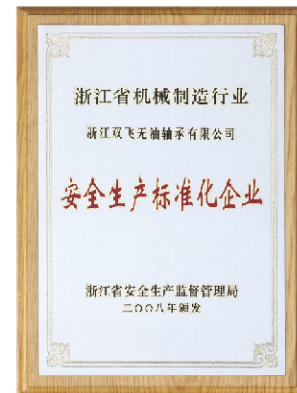
Operating Concept: Technology-oriented, strive to provide perfect products and services.

Enterprise Mission: We exist to meet the needs of the market, which are the driving forces for all our work.

Enterprise Goal: Let ZOB serve the world.

ZOB's Customers: Our customers are our invaluable assets. We will try every effort to satisfy all the individualized needs of our customers. We hope to establish a Win-Win cooperation relationship with our cherished customers.

ZOB's Products: ZOB will continue to invest heavily in R&D, develop improved and new products and, with the help of our strict quality control systems, provide every customer with high quality and reliable products.



## 公司简介 Company introduction

- 1、浙江双飞无油轴承有限公司创立于1988年。
- 2、注册商标为ZOB，同时ZOB也是公司形象的统一缩写形式。
- 3、主导产品：各种无油润滑轴承、包括汽车模具和烧结产品系列。
- 4、生产执行标准：ISO3547、DIN1494和企业内部质量标准。
- 5、各类无油轴承年生产能力超过5亿件。
- 6、公司已通过ISO9001：2000，QS9000和ISO/TS16949、ISO14000认证。
- 7、ZOB系列产品被认定为国家级重点新产品和浙江省名牌产品。
- 8、我们的产品销往全世界四十多个国家和地区，辐射美国、加拿大、德国和日本等。

1. Zhejiang SF Oilless Bearing Co., LTD was established in 1988.
2. ZOB is the registered trademark and is also the recognized abbreviation of company name.
3. Main Products: All kinds of oilless self-lubricating bearings.
4. Production Standards: ISO3547, DIN1494, and internal quality standards.
5. Annual Production Capacity: Over 500 million pieces.
6. Company is ISO9001:2000, QS9000 and ISO/TS16949, ISO14000 certified.
7. ZOB series bearings are honored as 'China National Key Products' and 'Famous Brand' in Zhejiang Province.
8. Our products are sold to and used in more than forty countries, including USA, Canada, Germany and Japan, etc.





## SF系列轴承简介

SF-1无油润滑轴承和SF-2边界润滑轴承是本公司的主导产品，SF系列产品以优异的自润滑性能，三层复合薄壁形成的低成本基础，能带给顾客明显的经济效益。产品在各种机械中的传动部位都可设计选用、已被越来越多的顾客所接受。

双飞公司生产SF系列产品已经有18年的历史，产品配方科学、工艺稳定、生产能力强、交货速度快。批量产品全部用自动线生产，保证了产品的质量控制能力。公司设备先进：有自动烧结线、带料刨边机、自动卷圆机、双面倒角机、自动整形机等。生产能力强：从1.5mm到600mm的产品都能生产。自动化程度高：10000件以上的产品都可以流水线生产。尺寸精度高：全部采用高精度钨钢模具成型。材料质量好：有检测中心控制材质。自动烧结线控制厚度公差，使带料的壁厚公差控制在 $\pm 0.01$ mm以内。

双飞公司是中国生产SF系列产品的龙头企业，公司总体质量处于国内领先，达到国际同类产品水平。我们竭诚希望与顾客建立战略合作伙伴关系，为顾客提供满意的服务。

## BRIEF INTRODUCTION OF SF SERIES BEARINGS

SF-1 self-lubricating bearings and SF-2 boundary lubricating bearings are the leading products of our company. Because of the excellent self-lubricating performance and low cost, SF bushings have been accepted by more and more users.

ZOB has 24 years' history of producing SF series bushings. It uses advanced technologies in materials composing and processing, resulting in highly consistent processes and products. Its high production capacity ensures on-time deliveries. Our bushings' ID sizes vary from 1.5 mm to 600 mm. The company has automatic production lines for bushings of IDs smaller than 50 mm and with quantity over 10 thousand pieces. We employ precision shaping moulds made of tungsten steel to closely control the OD and ID dimension to ensure both high dimensional accuracy and good surface finish for our products. All the material strips for bushing manufacturing are sintered in automatically controlled furnace systems, producing strips with thickness within a tolerance of  $\pm 0.01$  mm, which are routinely checked by a laser-optical measuring instrument.

ZOB is the leading manufacturer of SF series bushings in China. We sincerely hope to establish a mutually-beneficial strategic cooperation relationship with all our customers.



SF-1系列无油润滑轴承

SF-1 SERIES OILLESS SELF-LUBRICATING BEARINGS



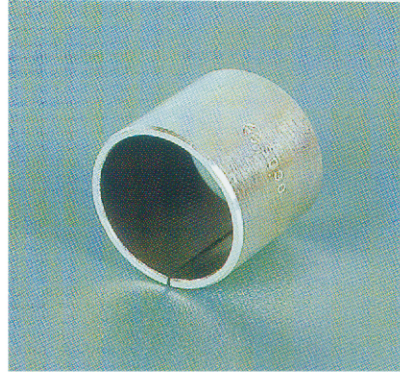
### SF-1系列无油润滑轴承

SF-1 SERIES OILLESS SELF-LUBRICATING BEARINGS

#### 材料组织结构

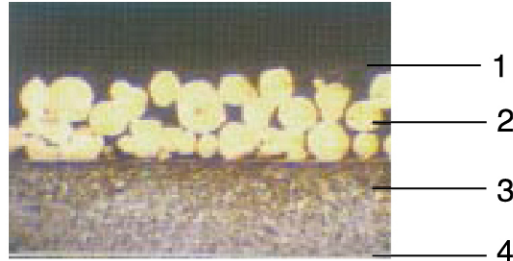
MATERIALS STRUCTURE AND THICKNESS

- 1、改性聚四氟乙烯0.01-0.03mm  
PTFE layer: 0.01 - 0.03 mm
- 2、球形青铜粉0.2-0.3mm  
Porous bronze: 0.2 - 0.3 mm
- 3、钢背0.7-2.3mm  
Steel backing: 0.7 - 2.3 mm
- 4、电镀层：镀锡层厚约0.005mm,或镀铜层厚约0.008mm  
Electroplating layer: Tin-plating about 0.005 mm, or copper-plating about 0.008 mm

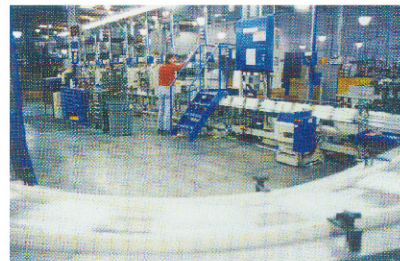


#### 应用特点

- 1、无油润滑或少油润滑，适用于无法加油或很难加油的场所，可在使用时不保养或少保养。
- 2、耐磨性能好，摩擦系数小，使用寿命长。
- 3、有适量的弹性，能将应力分布在较宽的接触面上，提高轴承的承载能力。
- 4、静动摩擦系数相近，能消除低速下的爬行，从而保证机械的工作精度。
- 5、能使用机械减少振动、降低噪音，防止污染，改善劳动条件。
- 6、在运转过程中能形成转移膜，起到保护对磨轴的作用，无咬轴现象。
- 7、对轴的硬度要求低，未经调质处理的轴都可使用，从而降低了相关零件的加工难度。
- 8、薄壁结构、质量轻，可减少机械体积。
- 9、钢背面可电镀多种金属，可在腐蚀介质中使用；目前已广泛应用于各种机械的滑动部位。



金相组织 Metallurgied structuer



应用举例 Application case

#### APPLICATION CHARACTERISTICS

- 1.Dry or only a trace amount of grease or oil will be required. Maintenance free.
- 2.Low friction with long life.
- 3.Load spreads over a wider area due to the elastic nature of the bearing materials, resulting in a higher loading capacity.
- 4.The small differences between static and dynamic coefficient of friction enhance the accuracy of machines operating at low speeds.
- 5.Low vibration, low noise and reduced-pollution during operation.
- 6.PTFE and lead can form transfer films onto the mating surface to improve performance and prevent bearing binding.
- 7.It can be used on shafts made of low hardness materials so the shafts can be manufactured at a lower cost.
- 8.The machines can be made more compact because of the thin wall and light weight of the bushes.
- 9.Electroplating can be easily applied to prevent corrosion, and is now widely used in various sliding parts.

根据SF-1系列产品材料组织结构及应用特点的差异性，我公司提供以下标准型号的产品，并根据顾客提供的特殊用途及工况要求进行非标型号产品的开发设计。

We supply the following standard SF-1 series products for a variety of applications, and we also design and develop special non-standard products to meet customers' specific needs.

型号 Type	产品照片 Photo	工作面材质 Lining	铜粉层材质 Sinter Bronze	金属背层材质 Backing	应用特点 Application Characteristic
SF-1W (P4)		PTFE+PI+MoS <sub>2</sub> + aramid fibre+Other 聚四氟乙烯、聚酰亚胺、二硫化钼、芳纶纤维等	CuSn8Zn3	SPCC 或 DC01	全能型，无铅环保 General, lead free
SF-1T		PTFE+ fibre+Other 聚四氟乙烯、纤维等	CuSn8Zn3	SPCC 或 DC01	尤其适用于齿轮泵 For gear pump
SF-1P		PTFE+Bronze+Other 聚四氟乙烯、铅青铜等	CuSn8Zn3	SPCC 或 DC01	尤其适用于往复运动 For liner movement
SF-1W		PTFE+ fibre+Other 聚四氟乙烯、纤维等	CuSn8Zn3	SPCC 或 DC01	无铅环保 lead free
SF-1B		PTFE+ fibre+Other 聚四氟乙烯、纤维等	CuSn8Zn3	CuSn6.5P0.1	耐酸碱、可靠性好 Acid-resistant and alkali-resistant, better reliability
SF-1D		PTFE+ fibre+Other 聚四氟乙烯、纤维等	CuSn8Zn3	SPCC 或 DC01	尤其适用于液压 For Hydraulic
SF-1S		聚四氟乙烯、纤维等	CuSn8Zn3	304 或 316	耐酸碱性能更强 Better acid-resistant and alkali-resistant
SF-1SS		PTFE+Other 聚四氟乙烯等	无 No	304 或 316	耐酸碱性能最强，轻载场合 Best acid-resistant and alkali-resistant, light load



SF系列主要化学性能对照表

CHEMICAL CHARACTERISTICS OF SF SERIES

轴承型号 Type	空气中 in air	真空中 in vacuum	水中 in water	蒸气中 in vapor	弱酸中 weak acid	中酸中 medium acid	强酸中 strong acid	碱性溶液中 in alkali
SF-1W(P4)	好(OK)	好(OK)	好(OK)	好(OK)	差(bad)	否(no)	否(no)	好(OK)
SF-1T	好(OK)	好(OK)	好(OK)	好(OK)	差(bad)	否(no)	否(no)	好(OK)
SF-1P	好(OK)	好(OK)	好(OK)	好(OK)	差(bad)	否(no)	否(no)	好(OK)
SF-1W	好(OK)	好(OK)	好(OK)	好(OK)	差(bad)	否(no)	否(no)	好(OK)
SF-1B	好(OK)	好(OK)	好(OK)	好(OK)	中(medium)	否(no)	否(no)	好(OK)
SF-1D	好(OK)	好(OK)	好(OK)	好(OK)	差(bad)	否(no)	否(no)	好(OK)
SF-1S	好(OK)	好(OK)	好(OK)	好(OK)	好(OK)	中(medium)	否(no)	好(OK)
SF-1SS	好(OK)	好(OK)	好(OK)	好(OK)	好(OK)	好(OK)	好(OK)	好(OK)

SF系列主要物理性能对照表

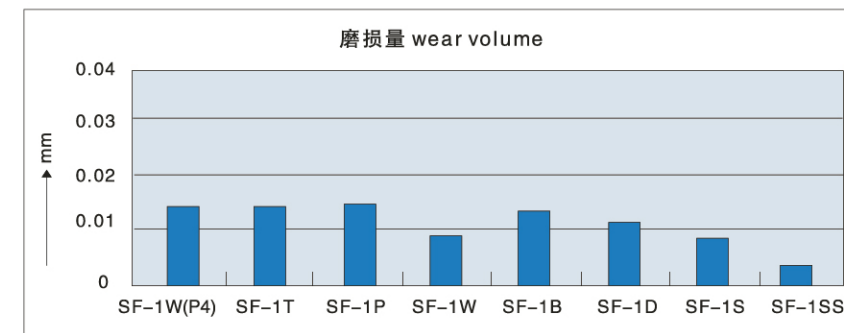
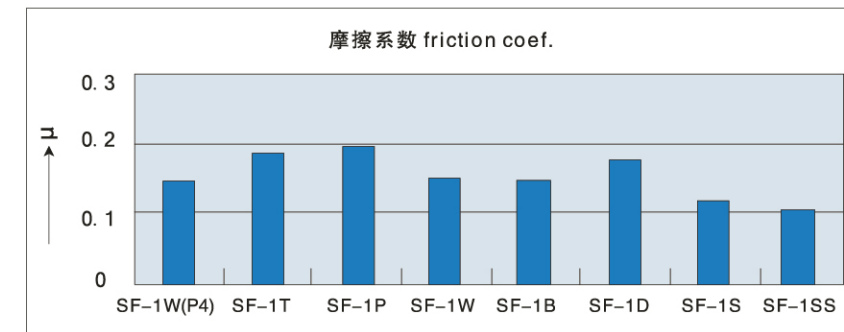
PHYSICAL CHARACTERISTICS OF SF SERIES

轴承型号 Type	最大承载 load capacity			最大PV值PVlimit		最高滑动速度 (油润滑中) speed limit (in oil)	使用温度 temp. limit °C	摩擦系数 μ friction coef.	导热系数 thermal conductivity	线胀系数 linear expansion
	静承载 static	动承载 dynamic	摇摆运动 oscillating	油润滑 oil	干摩擦 dry					
SF-1W(P4)	250N/mm <sup>2</sup>	140N/mm <sup>2</sup>	60N/mm <sup>2</sup>	60N/mm <sup>2</sup> *m/s	4.3N/mm <sup>2</sup> *m/s	10m/s	(-195°C-260°C)	0.03-0.18	13W/MK	11×10 <sup>-6</sup> /K
SF-1T	250N/mm <sup>2</sup>	140N/mm <sup>2</sup>	60N/mm <sup>2</sup>	60N/mm <sup>2</sup> *m/s	4.3N/mm <sup>2</sup> *m/s	10m/s	(-195°C-260°C)	0.04-0.18	13W/MK	11×10 <sup>-6</sup> /K
SF-1P	250N/mm <sup>2</sup>	140N/mm <sup>2</sup>	60N/mm <sup>2</sup>	50N/mm <sup>2</sup> *m/s	1.8N/mm <sup>2</sup> *m/s	2.5m/s	(-195°C-270°C)	0.04-0.2	13W/MK	11×10 <sup>-6</sup> /K
SF-1W	250N/mm <sup>2</sup>	140N/mm <sup>2</sup>	60N/mm <sup>2</sup>	50N/mm <sup>2</sup> *m/s	3.6N/mm <sup>2</sup> *m/s	5.0m/s	(-195°C-270°C)	0.04-0.2	13W/MK	11×10 <sup>-6</sup> /K
SF-1B	250N/mm <sup>2</sup>	140N/mm <sup>2</sup>	60N/mm <sup>2</sup>	60N/mm <sup>2</sup> *m/s	4.3N/mm <sup>2</sup> *m/s	5.0m/s	(-195°C-300°C)	0.04-0.18	18W/MK	21×10 <sup>-6</sup> /K
SF-1D	250N/mm <sup>2</sup>	140N/mm <sup>2</sup>	60N/mm <sup>2</sup>	50N/mm <sup>2</sup> *m/s	3.8N/mm <sup>2</sup> *m/s	3.0m/s	(-195°C-270°C)	0.04-0.18	16W/MK	11×10 <sup>-6</sup> /K
SF-1S	250N/mm <sup>2</sup>	140N/mm <sup>2</sup>	60N/mm <sup>2</sup>	50N/mm <sup>2</sup> *m/s	3.6N/mm <sup>2</sup> *m/s	4.5m/s	(-195°C-270°C)	0.04-0.2	16W/MK	15×10 <sup>-6</sup> /K
SF-1SS	250N/mm <sup>2</sup>	140N/mm <sup>2</sup>	60N/mm <sup>2</sup>	40N/mm <sup>2</sup> *m/s	3.0N/mm <sup>2</sup> *m/s	2.5m/s	(-195°C-270°C)	0.05-0.25	13W/MK	15×10 <sup>-6</sup> /K

MMD-10端面摩擦磨损试验

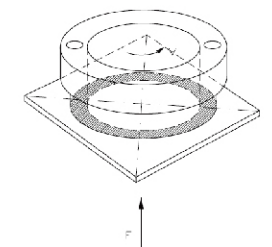
MMD-10 friction & wear test

型号 TYPE	试验时间 TIME	试验条件TEST CONDITION			摩擦系数 μ FRICTION COEF.	最终温度 TEMP.(°C)	最终磨损量 WEAR(mm)
		润滑	速度V	压力P			
SF-1W(P4)	3hr	干dry	0.4m/s	3.5N/mm <sup>2</sup>	0.141	69	0.015
SF-1T	3hr	干dry	0.4m/s	3.5N/mm <sup>2</sup>	0.185	93	0.015
SF-1P	3hr	干dry	0.4m/s	3.5N/mm <sup>2</sup>	0.193	100	0.015
SF-1W	3hr	干dry	0.4m/s	3.5N/mm <sup>2</sup>	0.156	93	0.009
SF-1B	3hr	干dry	0.4m/s	3.5N/mm <sup>2</sup>	0.151	83	0.014
SF-1D	3hr	干dry	0.4m/s	3.5N/mm <sup>2</sup>	0.175	98	0.012
SF-1S	3hr	干dry	0.4m/s	3.5N/mm <sup>2</sup>	0.117	67	0.008
SF-1SS	3hr	干dry	0.4m/s	3.5N/mm <sup>2</sup>	0.103	66	0.005



SF-1 性能试验

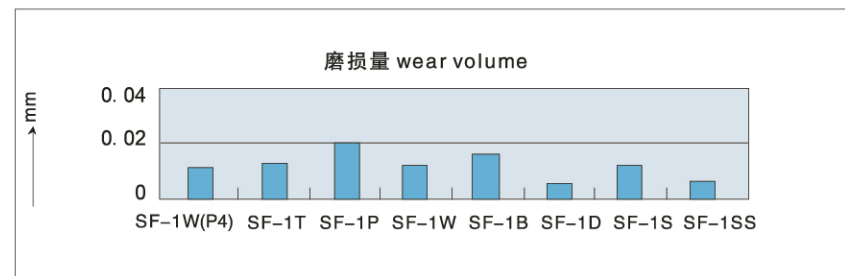
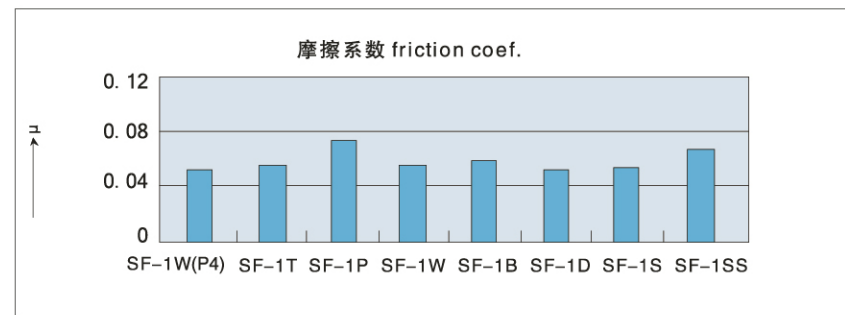
端面摩擦磨损试验  
 试验条件  
 轴承尺寸：37\*37\*2  
 对磨轴：45# HRC42~52  
 润滑：无润滑  
 试验温度：20~25 °C





MMD-10端面摩擦磨损试验  
MMD-10 friction & wear test

型号 TYPE	试验时间 TIME	试验条件TEST CONDITION			摩擦系数μ FRICTION COEF.	最终温度 TEMP.(°C)	最终磨损量 WEAR(mm)
		润滑	速度V	压力P			
SF-1W(P4)	3hr	油oil	0.4m/s	3.5N/mm <sup>2</sup>	0.055	50	0.008
SF-1T	3hr	油oil	0.4m/s	3.5N/mm <sup>2</sup>	0.058	52	0.012
SF-1P	3hr	油oil	0.4m/s	3.5N/mm <sup>2</sup>	0.074	55	0.02
SF-1W	3hr	油oil	0.4m/s	3.5N/mm <sup>2</sup>	0.056	52	0.01
SF-1B	3hr	油oil	0.4m/s	3.5N/mm <sup>2</sup>	0.058	55	0.012
SF-1D	3hr	油oil	0.4m/s	3.5N/mm <sup>2</sup>	0.054	46	0.004
SF-1S	3hr	油oil	0.4m/s	3.5N/mm <sup>2</sup>	0.053	51	0.009
SF-1SS	3hr	油oil	0.4m/s	3.5N/mm <sup>2</sup>	0.066	65	0.005



SF-1 性能试验

端面摩擦磨损试验

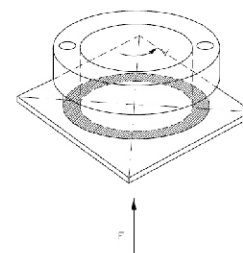
试验条件

轴承尺寸: 37\*37\*2

对磨轴: 45# HRC42~52

润滑: 浸入32#机械油

试验温度: 20~25 °C



SF-1 系列产品

可供产品  
直套  
翻边轴套(SF-1S/SF-1SS除外)  
止推垫片  
板材  
(及其它按客户要求定制产品)

SF-1 SERIES

PRODUCT AVAILABLE  
Bushes  
Flanged bushes(except SF-1S,SF-1SS bushes)  
Thrust Washers  
Strip  
(Special Product According to Your Requirements)

标准公制产品的外径公差(mm)

O.D.TOLERANCE FOR BUSHING WITH STANDARD METRIC SIZE

轴承外径 Outside diameter	外径公差 Tolerance for outside diameter
≤10	-0.055 -0.025
10<d≤18	-0.065 -0.030
18<d≤30	-0.075 -0.035
30<d≤50	-0.085 -0.045
50<d≤80	-0.100 -0.055
80<d≤105	-0.120 -0.070
105<d≤180	-0.170 -0.100
180<d≤250	-0.210 -0.130
250<d≤305	-0.260 -0.170

注: 检验方法详见28页  
Note:inspection method P28

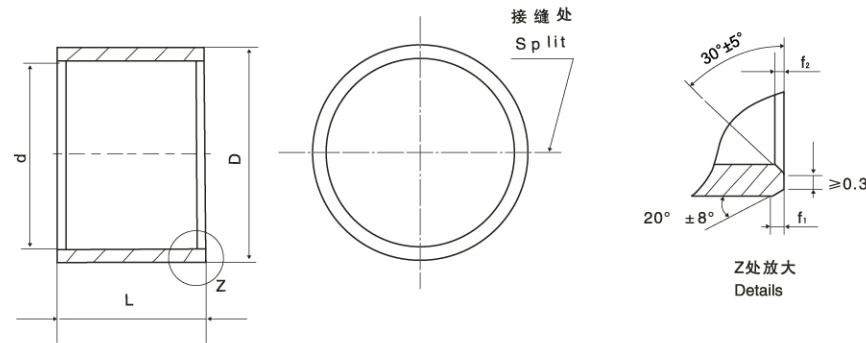
标准公制产品的壁厚公差

TOLERANCE AND THICKNESS OF STANDARD METRIC SIZE BUSH

轴承内径尺寸 Inside diameter	壁厚公称尺寸 Thickness	壁厚公差 Tolerance for wall thickness
10≤d<18	1.0	-0.020 -0.045
20≤d<28	1.5	-0.025 -0.055
28≤d<45	2.0	-0.030 -0.065
45≤d<80	2.5	-0.040 -0.085
80≤d	2.5	-0.050 -0.115



SF-1系列轴承标准尺寸



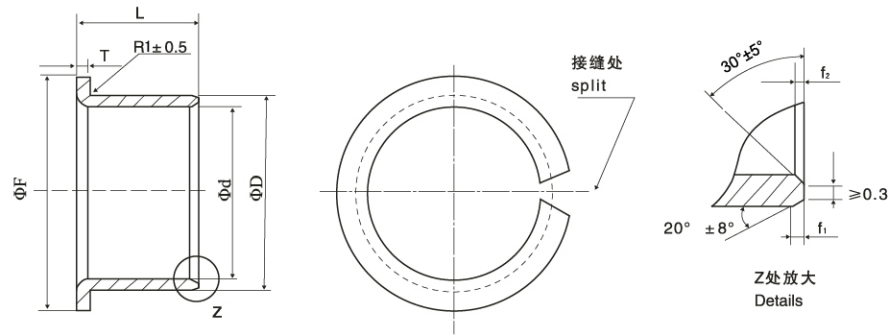
SF-1系列轴承标准尺寸

d	D	相配轴径 (Shaft Dia.) f7	相配座孔 (Housing Bore) H7	壁厚 Wall Thickness		f <sub>1</sub>	f <sub>2</sub>	L <sup>0</sup> -0.40																
				Min.	Max.			6	8	10	12	15	20	25	30	40	50							
6	8	6 <sup>-0.013</sup> <sub>-0.028</sub>	8 <sup>+0.015</sup>	0.980	1.005	0.6	0.3	0606	0608	0610														
8	10	8 <sup>-0.013</sup> <sub>-0.028</sub>	10 <sup>+0.015</sup>					0806	0808	0810	0812	0815												
10	12	10 <sup>-0.016</sup> <sub>-0.034</sub>	12 <sup>+0.018</sup>					1006	1008	1010	1012	1015	1020											
12	14	12 <sup>-0.016</sup> <sub>-0.034</sub>	14 <sup>+0.018</sup>					1206	1208	1210	1212	1215	1220	1225										
13	15	13 <sup>-0.016</sup> <sub>-0.034</sub>	15 <sup>+0.018</sup>								1310			1320										
14	16	14 <sup>-0.016</sup> <sub>-0.034</sub>	16 <sup>+0.018</sup>									1410	1412	1415	1420	1425								
15	17	15 <sup>-0.016</sup> <sub>-0.034</sub>	17 <sup>+0.018</sup>									1510	1512	1515	1520	1525								
16	18	16 <sup>-0.016</sup> <sub>-0.034</sub>	18 <sup>+0.018</sup>									1610	1612	1615	1620	1625								
17	19	17 <sup>-0.016</sup> <sub>-0.034</sub>	19 <sup>+0.021</sup>									1710	1712		1720									
18	20	18 <sup>-0.016</sup> <sub>-0.034</sub>	20 <sup>+0.021</sup>									1810	1812	1815	1820	1825								
20	23	20 <sup>-0.020</sup> <sub>-0.041</sub>	23 <sup>+0.021</sup>	1.475	1.505	0.6	0.4			2010	2012	2015	2020	2025	2030									
22	25	22 <sup>-0.020</sup> <sub>-0.041</sub>	25 <sup>+0.021</sup>							2210	2212	2215	2220	2225	2230									
24	27	24 <sup>-0.020</sup> <sub>-0.041</sub>	27 <sup>+0.021</sup>											2415	2420	2425	2430							
25	28	25 <sup>-0.020</sup> <sub>-0.041</sub>	28 <sup>+0.021</sup>									2510	2512	2515	2520	2525	2530	2540	2550					
28	32	28 <sup>-0.020</sup> <sub>-0.041</sub>	32 <sup>+0.025</sup>	1.970	2.005	1.2	0.4				2815	2820	2825	2830	2840									
30	34	30 <sup>-0.020</sup> <sub>-0.041</sub>	34 <sup>+0.025</sup>											3012	3015	3020	3025	3030	3040					
32	36	32 <sup>-0.025</sup> <sub>-0.050</sub>	36 <sup>+0.025</sup>													3220		3230	3240					
35	39	35 <sup>-0.025</sup> <sub>-0.050</sub>	39 <sup>+0.025</sup>														3512	3515	3520	3525	3530	3540	3550	
38	42	38 <sup>-0.025</sup> <sub>-0.050</sub>	42 <sup>+0.025</sup>															3815			3830	3840		
40	44	40 <sup>-0.025</sup> <sub>-0.050</sub>	44 <sup>+0.025</sup>																4012	4020	4025	4030	4040	4050

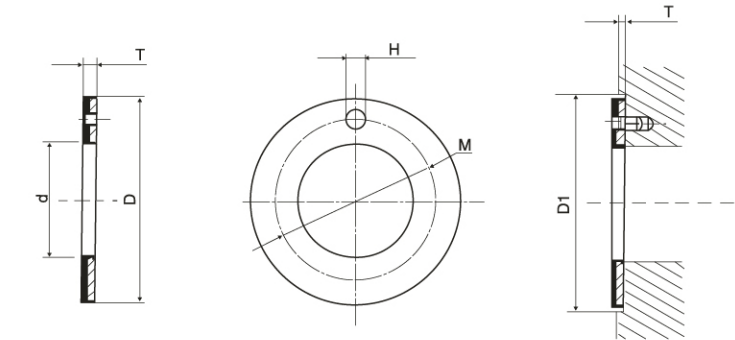
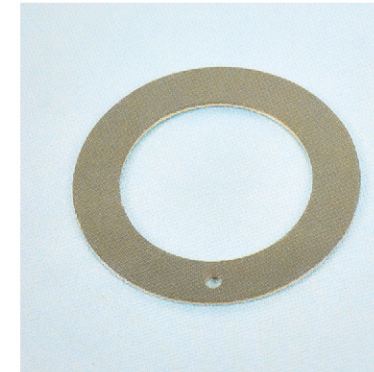
d	D	相配轴径 (Shaft Dia.) f7	相配座孔 (Housing Bore) H7	壁厚 Wall Thickness		f <sub>1</sub>	f <sub>2</sub>	L <sup>0</sup> -0.4																				
				Min.	Max.			20	25	30	40	50	60	70	80	100												
45	50	45 <sup>-0.025</sup> <sub>-0.050</sub>	50 <sup>+0.025</sup>	2.460	2.505	1.8	0.6	4520	4525	4530	4540	4550																
50	55	50 <sup>-0.030</sup> <sub>-0.060</sub>	55 <sup>+0.030</sup>					5020		5030	5040	5050	5060															
55	60	55 <sup>-0.030</sup> <sub>-0.060</sub>	60 <sup>+0.030</sup>							5530	5540	5550	5560															
60	65	60 <sup>-0.030</sup> <sub>-0.060</sub>	65 <sup>+0.030</sup>							6030	6040	6050	6060	6070														
65	70	65 <sup>-0.030</sup> <sub>-0.060</sub>	70 <sup>+0.030</sup>							6530	6540	6550	6560	6570														
70	75	70 <sup>-0.030</sup> <sub>-0.060</sub>	75 <sup>+0.030</sup>								7040	7050	7060	7070	7080													
75	80	75 <sup>-0.030</sup> <sub>-0.060</sub>	80 <sup>+0.030</sup>							7530	7540	7550	7560	7570	7580													
80	85	80 <sup>-0.035</sup>	85 <sup>+0.035</sup>	2.440	2.490	1.8	0.6			8040	8050	8060	8070	8080	80100													
85	90	85 <sup>-0.035</sup>	90 <sup>+0.035</sup>							8540		8560	8580	85100														
90	95	90 <sup>-0.035</sup>	95 <sup>+0.035</sup>							9040	9050	9060	9070	90100														
95	100	95 <sup>-0.035</sup>	100 <sup>+0.035</sup>									9550	9560	9580	95100													
100	105	100 <sup>-0.035</sup>	105 <sup>+0.035</sup>									10050	10060	10080														
105	110	105 <sup>-0.035</sup>	110 <sup>+0.035</sup>										10560	10580														
110	115	110 <sup>-0.035</sup>	115 <sup>+0.035</sup>										11060	11080														
120	125	120 <sup>-0.04</sup>	125 <sup>+0.035</sup>					2.415	2.465	1.8	0.6							12060	12080	120100								
125	135	125 <sup>-0.04</sup>	130 <sup>+0.040</sup>																			12560		125100				
130	135	130 <sup>-0.04</sup>	135 <sup>+0.040</sup>																			13060	13080	130100				
140	145	140 <sup>-0.04</sup>	145 <sup>+0.040</sup>																14060	14080	140100							
150	155	150 <sup>-0.04</sup>	155 <sup>+0.040</sup>																15050	15060	15080	150100						
160	165	160 <sup>-0.04</sup>	165 <sup>+0.040</sup>																16060	16080	160100							
180	185	180 <sup>-0.048</sup>	185 <sup>+0.048</sup>																		18080	180100						
190	195	190 <sup>-0.048</sup>	195 <sup>+0.048</sup>																			19080	190100					
200	205	200 <sup>-0.048</sup>	205 <sup>+0.048</sup>																	20060	20080	200100						
220	225	220 <sup>-0.048</sup>	225 <sup>+0.048</sup>																			22080	220100					
250	255	250 <sup>-0.052</sup>	255 <sup>+0.052</sup>																25080	250100								
260	265	260 <sup>-0.052</sup>	265 <sup>+0.052</sup>																26080	260100								
280	285	280 <sup>-0.052</sup>	285 <sup>+0.052</sup>																	28080	280100							
300	305	300 <sup>-0.052</sup>	305 <sup>+0.052</sup>																	30080	300100							



SF-1F系列标准尺寸



WCSE-1系列标准尺寸



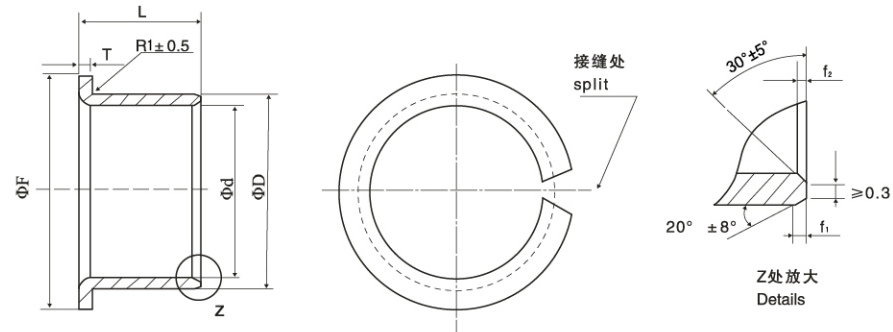
相配轴径 (Shaft Dia.)f7	相配座孔 (Housing Bore) H7	规格标志 (Part number)	尺寸(Size)					f <sub>1</sub>	f <sub>2</sub>
			d	D	F ± 0.5	L ± 0.25	T <sup>0</sup> <sub>-0.2</sub>		
6 <sup>-0.013</sup> -0.026	8 <sup>+0.015</sup>	SF-1F 06040	6	8	12	4	1	0.5	0.4
		SF-1F 06070				7			
8 <sup>-0.013</sup> -0.028	10 <sup>+0.015</sup>	SF-1F 06055	8	10	15	5.5	1	0.5	0.4
		SF-1F 08055				7.5			
10 <sup>-0.018</sup> -0.034	12 <sup>+0.018</sup>	SF-1F 10070	10	12	18	7	1	0.5	0.4
		SF-1F 10090				9			
		SF-1F 10120				12			
12 <sup>-0.018</sup> -0.034	14 <sup>+0.018</sup>	SF-1F 12070	12	14	20	7	1	0.5	0.4
		SF-1F 12090				9			
		SF-1F 12120				12			
14 <sup>-0.018</sup> -0.034	16 <sup>+0.018</sup>	SF-1F 14120	14	16	22	12	1	0.5	0.4
		SF-1F 14170				17			
		SF-1F 15090				9			
15 <sup>-0.018</sup> -0.034	17 <sup>+0.018</sup>	SF-1F 15120	15	17	23	12	1	0.5	0.4
		SF-1F 15170				17			
		SF-1F 16120				12			
16 <sup>-0.018</sup> -0.034	18 <sup>+0.018</sup>	SF-1F 16170	16	18	24	17	1	0.5	0.4
		SF-1F 18120				12			
		SF-1F 18170				17			
18 <sup>-0.018</sup> -0.034	20 <sup>+0.021</sup>	SF-1F 18120	18	20	26	20	1	0.5	0.4
		SF-1F 20115				11.5			
		SF-1F 20165				16.5			
20 <sup>-0.020</sup> -0.041	23 <sup>+0.021</sup>	SF-1F 20215	20	23	30	21.5	1.5	0.8	0.4
		SF-1F 22150				15			
		SF-1F 22200				20			
22 <sup>-0.020</sup> -0.041	25 <sup>+0.021</sup>	SF-1F 25115	22	25	32	11.5	1.5	0.8	0.4
		SF-1F 25165				16.5			
		SF-1F 25215				21.5			
25 <sup>-0.020</sup> -0.041	28 <sup>+0.021</sup>	SF-1F 30160	25	28	35	16	1.5	0.8	0.4
		SF-1F 30260				26			
		SF-1F 35160				16			
30 <sup>-0.025</sup> -0.050	34 <sup>+0.025</sup>	SF-1F 35260	30	34	42	26	2	1.0	0.5
		SF-1F 40260				26			
		SF-1F 40400				40			

规格标志 (Part number)	相配轴径 (Shft Dia.)	垫片尺寸 (Size Of Washer)				安装尺寸 (Size For Installaton)		
		d <sup>+0.25</sup>	D <sub>-0.25</sub>	T <sub>-0.25</sub>	M <sup>0.12</sup>	H <sup>+0.4</sup>	T <sup>+0.2</sup> <sub>-0.2</sub>	D1 <sup>+0.12</sup>
WC10SF-1	8	10	20	1.5	15	1.5	1	20
WC12SF-1	10	12	24	1.5	18	1.5	1	24
WC14SF-1	12	14	26	1.5	20	2	1	26
WC16SF-1	14	16	30	1.5	23	2	1	30
WC18SF-1	16	18	32	1.5	25	2	1	32
WC20SF-1	18	20	36	1.5	26	3	1	36
WC22SF-1	20	22	38	1.5	30	3	1	38
WC24SF-1	22	24	42	1.5	33	3	1	42
WC28SF-1	24	26	44	1.5	35	3	1	44
WC28SF-1	25	28	48	1.5	38	4	1	48
WC32SF-1	30	32	54	1.5	43	4	1	54
WC38SF-1	35	38	62	1.5	50	4	1	62
WC42SF-1	40	42	66	1.5	54	4	1	66
WC48SF-1	45	48	74	2	61	4	1.5	74
WC52SF-1	50	52	78	2	65	4	1.5	78
WC62SF-1	60	62	90	2	76	4	1.5	90





SF-1F系列轴承英制尺寸



尺寸 Nominal Bearing Bore	轴 Shaft Dia	座孔 Housing Bore	内径 Installed Bearing I.D.	法兰尺寸 Nominal Flange O.D.	法兰厚度 Flange Thick ness	轴承长度及轴承规格 Bearing Length and Part Number											
						1/4	3/8	1/2	5/8	3/4	1	1 1/4	1 1/2	2			
3/8	.3750 .3740	.4684 .4691	.3752 .3779	11/16	.052 .344	06/04F	06/06F	06/08F		06/12F							
1/2	.5000 .4990	.5934 .5941	.5002 .5029	13/16	.052 .044	08/04F	08/06F	08/08F		08/12F							
5/8	.6250 .6240	.7184 .7192	.6252 .6280	15/16	.052 .044		10/06F	10/08F	10/10F	10/12F							
3/4	.7500 .7488	.8747 .8755	.7502 .7534	1 1/8	.068 .060		12/06F	12/08F		12/12F	12/16F						
7/8	.8750 .8738	0.9997 1.0005	.8752 .8784	1 1/4	.068 .060			14/08F		14/12F	14/16F	14/20F					
1	1.0000 0.9988	1.1247 1.1255	1.0002 1.0034	1 3/8	.068 .060			16/08F		16/12F	16/16F	16/20F					
1 1/4	1.2500 1.2484	1.4058 1.4068	1.2502 1.2540	1 3/4	.083 .075						20/16F	20/20F	20/24F				
1	1.5000 1.4984	1.6558 1.6568	1.5002 1.5040	2	.083 .075						24/16F		24/24F	24/32F			
1 3/4	1.7500 1.7484	1.9371 1.9381	1.7502 1.7548	2 3/8	.098 .090						28/16F		28/24F	28/32F			



SF-2系列边界润滑轴承

SF-2 SERIES BOUNDARY LUBRICATING BEARINGS



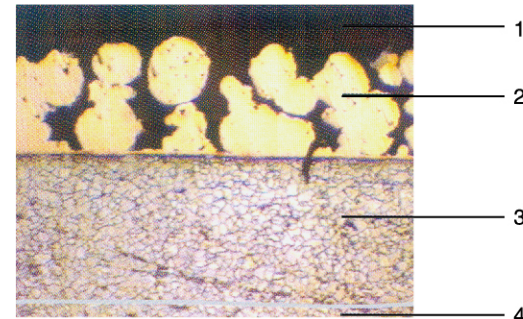
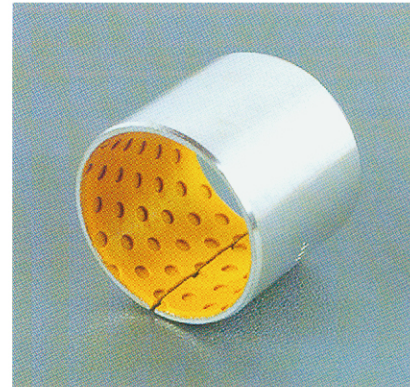
## SF-2系列边界润滑轴承

SF-2 SERIES BOUNDARY LUBRICATING BEARINGS

### 材料组织结构

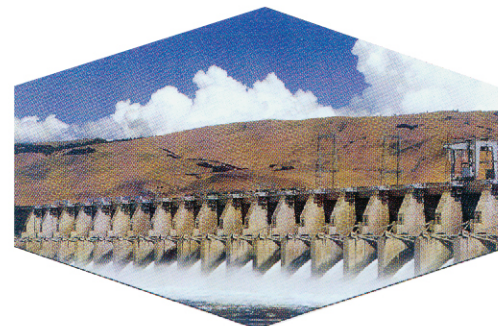
MATERIALS STRUCTURE AND THICKNESS

1. 聚甲醛与纤维混合物0.3-0.5mm  
Fiber-reinforced POM: 0.3 - 0.5 mm
2. 球形青铜粉0.2-0.3mm  
Porous bronze: 0.2 - 0.3 mm
3. 钢背0.4-2.2mm  
Steel backing: 0.4 - 2.2 mm
4. 电镀层: 镀锡层厚约0.005mm  
或镀铜层厚约0.008mm  
Electroplating layer: Tin-plating about 0.005 mm,  
or copper-plating about 0.008 mm



### 应用特点

1. 承载好,耐磨性能好.
2. 适用于低速重载的旋转运动, 摇摆运动以及频繁起动而不易形成油膜润滑的场合.
3. 在边界润滑条件下可以工作很长时间, 如在使用过程中定期加油保养, 其使用寿命可以延长.
4. 表面塑料层有可加工性. 轴承装配入座孔后, 可进行加工从而达到更好的配合精度.
5. 产品主要运用于汽车底盘、冶金机械、矿山机械、水利机械、建筑机械、农用机械、轧钢设备等.
6. 标准产品油穴表面圆滑过度, 润滑效果更显著.
7. 因其不含铅, 故可广泛运用于要求无铅的领域.



应用举例 Application case

### APPLICATION CHARACTERISTICS

1. Good load capacity and wear-resistant performance.
2. It's suitable for various high load, low speed applications of rotational, oscillating or frequent stop-start motions.
3. It can work long time without adding oil in boundary lubricating conditions. However, if oil or grease is applied intervalely, its life can be extended much longer.
4. POM is machinable, so if needed, its thickness can be easily adjusted, giving rise to a more precise fitting.
5. The products are currently being used in auto chassis, power stations, forging, steel rolling, metallurgy, construction, and mining industries.
6. In our standard products the oil groove is very smooth, so the lubricating effect is excellent.
7. Our products are widely used in areas and applications where lead in unacceptable.

根据SF-2系列产品材料组织结构及应用特点的差异性, 我公司提供以下标准型号的产品, 并可根据顾客提供的特殊用途及工况要求进行非标型号产品的开发设计。

We supply the following standard SF-2 series products for a variety of applications, and we also design and develop special non-standard products to meet customers' specific needs.

型号 Type	产品照片	工作面材质 Lining	铜粉层材质 Sinter Bronze	金属背层材质 Backing	应用特点 Application Characteristic
SF-2X		POM+Pb+Graphite+Other 聚甲醛、石墨、铅等	CuSn8Zn3	SPCC或DC01	全能型 General
SF-2Y		POM+Fibre+Other 聚甲醛、纤维等	CuSn8Zn3	SPCC或DC01	无铅环保型 Lead Free
SF-2S		POM+PTFE+Other 聚甲醛、聚四氟乙烯等	CuSn8Zn3	SPCC或DC01	短时无油润滑也能适用 For Oilless Lubricating of short time
SF-2L		POM+Fibre+Other 聚甲醛、纤维等	CuSn8Zn3	SPCC或DC01	低摩擦系数 Lower Friction coef.

### SF系列主要化学性能对照表

#### CHEMICAL CHARACTERISTICS OF SF SERIES

轴承型号 Type	空气中 in air	真空中 in vacuum	水中 in water	蒸气中 in vapor	弱酸中 weak acid	中酸中 medium acid	强酸中 strong acid	碱性溶液中 in alkali
SF-2X	好(OK)	好(OK)	好(OK)	好(OK)	差(bad)	否(no)	否(no)	好(OK)
SF-2Y	好(OK)	好(OK)	好(OK)	好(OK)	差(bad)	否(no)	否(no)	好(OK)
SF-2S	好(OK)	好(OK)	好(OK)	好(OK)	差(bad)	否(no)	否(no)	好(OK)
SF-2L	好(OK)	好(OK)	好(OK)	好(OK)	差(bad)	否(no)	否(no)	好(OK)

### SF系列主要物理性能对照表

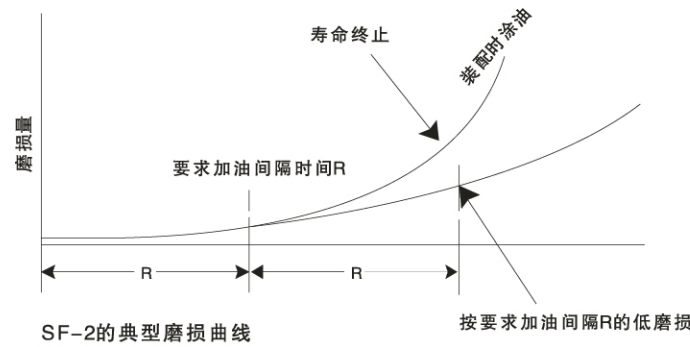
#### PHYSICAL CHARACTERISTICS OF SF SERIES

轴承型号 Type	最大承载 (load capacity)			最大PV值PVlimit		最高滑动速度 (油润滑中) speed limit (in oil)	使用温度 temp. limit °C	摩擦系数 μ friction coef.	导热系数 thermal conductivity	线胀系数 linear expansion
	静承载 static	动承载 dynamic	摇摆运动 oscillating	油润滑 oil	干摩擦 dry					
SF-2X	250N/mm <sup>2</sup>	70N/mm <sup>2</sup>	60N/mm <sup>2</sup>	22N/mm <sup>2</sup> *m/s	2.8N/mm <sup>2</sup> *m/s	2.5m/s	(-40℃~130℃)	0.05-0.25	13W/MK	11×10 <sup>-5</sup> /K
SF-2Y	250N/mm <sup>2</sup>	70N/mm <sup>2</sup>	60N/mm <sup>2</sup>	22N/mm <sup>2</sup> *m/s	2.8N/mm <sup>2</sup> *m/s	2.5m/s	(-40℃~130℃)	0.05-0.2	13W/MK	11×10 <sup>-5</sup> /K
SF-2S	250N/mm <sup>2</sup>	70N/mm <sup>2</sup>	60N/mm <sup>2</sup>	22N/mm <sup>2</sup> *m/s	2.8N/mm <sup>2</sup> *m/s	2.5m/s	(-40℃~130℃)	0.05-0.2	13W/MK	11×10 <sup>-5</sup> /K
SF-2L	250N/mm <sup>2</sup>	70N/mm <sup>2</sup>	60N/mm <sup>2</sup>	22N/mm <sup>2</sup> *m/s	2.8N/mm <sup>2</sup> *m/s	2.5m/s	(-40℃~130℃)	0.05-0.2	13W/MK	11×10 <sup>-5</sup> /K



### 磨损规律

SF-2型材料有其特殊的磨损规律，如图所示。在安装时涂油脂的情况下，能在R阶段内极微量的磨损。经过R阶段时间后失去边界油润滑条件，磨损就开始加剧。如果在此时重新加油，则可保持无显著磨损，其寿命亦就可以大大地延长。所以SF-2材料的优点就在于必须间隔R阶段时间加油一次，其间隔时间R较其它一些材料特别是金属材料的间隔时间显著地长。约为五倍左右。

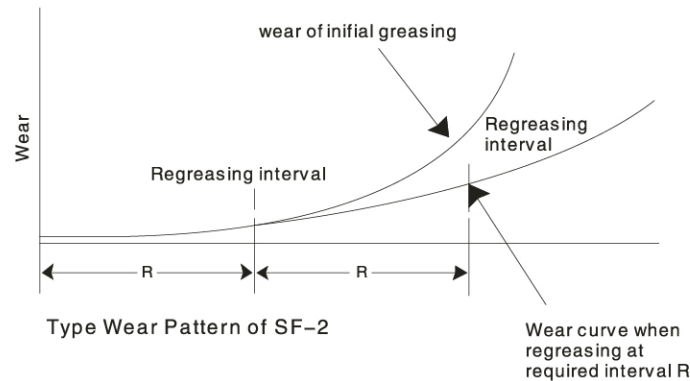


SF-2的典型磨损曲线

按要求加油间隔R的低磨损

### WEAR PATTERN

The wear pattern of SF-2 is shown in the figure on the right. Initial greased in assembly, the wear is rather small during the first 'R' period. However, at the end of the 'R' stage as shown in the figure the wear rate increases rapidly if no regreasing is applied. If regreasing takes place before the beginning of wear accelerating, the 'R' stage is normally 5 times that of conventional materials, especially compared with metals.



Type Wear Pattern of SF-2

Wear curve when regreasing at required interval R

### 寿命

当装配时涂以润滑油脂（如锂基脂或硅脂等），SF-2轴套的使用寿命，随工作所处PV值而上下，例如当PV值在2.5Mpa·m/s左右时，其使用寿命约为200小时，而当PV值在0.1Mpa·m/s，其使用寿命可达到10000小时以上（详见表）。

SF-2轴套的加油保养同其R约为寿命一年半左右。例如当PV=2.5Mpa·m/s，要求每隔100小时加油脂保养一次。

PV N/mm.m/s	使用寿命(小时)L life(hrs)	加油保养周期(小时)R Regreasing Interval(hrs)
2.5	200	100
2.0	610	310
1.5	1100	560
1.0	2400	1200
0.5	6200	3000
0.1	>1000	8000

附注：必须指出，除上述因素外，SF-2轴套的使用寿命及加油周期以及PV极限值还随工作温度，对磨件硬度及表面粗糙等的不同而有变化。温度愈高，对磨件愈粗糙，硬度愈低其寿命及PV极限值亦愈低。

NOTE: The life of SF-2 material is also influenced by the operating temperature, the surface roughness and hardness of the mating material.

### LIFE

The life of the bushes is strongly dependent on the PV value. See the table on the right, for a bush, when the PV is 2.5N/mm.m/s, its life is approximately 200 hours; when the PV is reduced to 2.5N/mm.m/s it's life is extended to over 10,000 hours.

The regreasing interval is normally at 50% of its life. In the aforementioned examples regreasing should take place at 100 hours and 5,000 hours, respectively.

### SF-2 系列产品

可供产品  
直套  
止推垫片  
板材  
(及其它按客户要求定制产品)

### SF-2 SERIES

PRODUCT AVAILABLE  
Bushes  
Thrust Washers  
Strip  
(Special Product According to Your Requirements)

### 标准公制产品的外径公差(MM)

### O.D.TOLERANCE FOR BUSHING WITH STANDARD METRIC SIZE

轴承外径 Outside diameter	外径公差 Tolerance for outside diameter
≤10	+0.055 +0.025
10<d≤18	+0.065 +0.030
18<d≤30	+0.075 +0.035
30<d≤50	+0.085 +0.045
50<d≤80	+0.100 +0.055
80<d≤105	+0.120 +0.070
105<d≤180	+0.170 +0.100
180<d≤250	+0.210 +0.130
250<d≤305	+0.260 +0.170

注：检验方法详见28页  
Note: inspection method P28

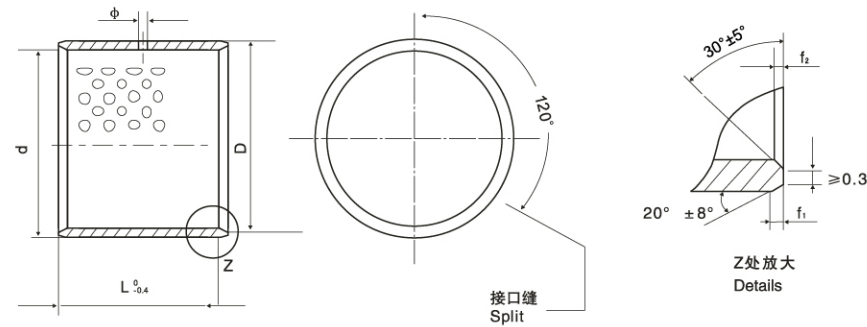
### 标准公制产品的壁厚公差

### TOLERANCE AND THICKNESS OF STANDARD METRIC SIZE BUSH

轴承内径尺寸 Inside diameter	壁厚公称尺寸 Thickness	壁厚公差 Tolerance for wall thickness
10≤d<18	1.0	-0.020 -0.045
20≤d<28	1.5	-0.025 -0.055
28≤d<45	2.0	-0.030 -0.065
45≤d<80	2.5	-0.040 -0.085
80≤d	2.5	-0.050 -0.115



SF-2系列轴承标准尺寸



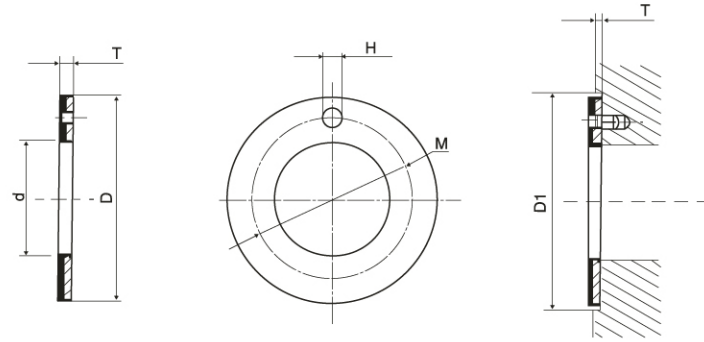
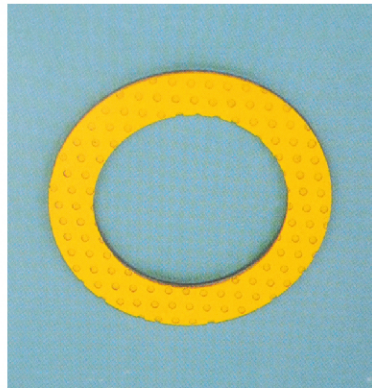
d	D	相配轴径 (shaft dia.)	相配座孔 (housing bore H7)	壁厚 wall thickness		油孔 (hole dia.)	f <sub>1</sub>	f <sub>2</sub>	L <sup>0</sup> <sub>-0.40</sub>																	
				min.	max.				10	12	15	20	25	30	35	40	45	50								
10	12	10	12	0.955	0.980	4	0.5	0.3	1010		1015	1020														
12	14	12	14			1210			1212	1215	1220															
14	16	14	16			1412			1415	1420																
15	17	15	17			1512			1515	1520	1525															
16	18	16	18						1615	1620	1625															
18	20	18	20		1815	1820	1825																			
20	23	20	23	1.445	1.475	4	0.8	0.4			2015	2020	2025	2030												
22	25	22	25						2215		2225															
25	28	25	28			6						2220	2525	2530												
28	32	28	32	1.935	1.970	6	1.0	0.5					2220		2830											
30	34	30	34							6					3020	3025	3030		3040							
35	39	35	39							6						3520		3530	3535	3540						
40	44	40	44			8							4020		4030		4040				4050					
45	50	45	50	2.415	2.460	8	1.2	0.6					4520		4530		4540	4545	4550							
50	55	50	55							8								5030		5040		5050				
55	60	55	60							8								5530		5540		5550				
60	65	60	65							8								6030		6040		6050				

SF-2系列轴承标准尺寸

d	D	相配轴径 (shaft dia.)	相配座孔 (housing bore H7)	壁厚 wall thickness		油孔 (hole dia.)	f <sub>1</sub>	f <sub>2</sub>	L <sup>0</sup> <sub>-0.40</sub>																
				min.	max.				40	45	50	60	65	80	90	95	100								
65	70	65	70	2.415	2.460	8	1.2	0.6	6540			6560													
70	75	70	75			7040				7050		7065	7080												
75	80	75	80			9.5			7540			7560		7580											
80	85	80	85	2.385	2.450	9.5	1.4	0.7	8040			8060		8080											
85	90	85	90			8540					8560		8580												
90	95	90	95			9040					9060		9080	9090											
100	105	100	105							9.5					10050			10080		10095					
105	110	105	110							9.5						10560		10580		10595	105100				
110	115	110	115							9.5						11060		11080		11095	110100				
120	125	120	125							9.5							12060		12080						120100
125	130	125	130							9.5								12560		12580					125100
130	135	130	135							130									13080						130100
140	145	140	145							9.5								13050	13060		13080				
150	155	150	155			9.5								14050	14060		14080				140100				
160	165	160	165			11								15050	15060		15080				150100				
170	175	170	175			11								16050	16060		16080				160100				
180	185	180	185			11	1.6	0.8						17050	17060		17080				170100				
190	195	190	195			11										18050	18060		18080				180100		
200	205	200	205			12								19050	19060		19080				190100				
220	225	220	225			12								20050	20060		20080				200100				
240	245	240	245			12								22050	22060		22080				220100				
250	255	250	255			12								24050	24060		24080				240100				
260	265	260	265			12								25050	25060		25080				250100				
280	285	280	285			12								26050	26060		26080				260100				
300	305	300	305			12								28050	28060		28080				280100				
														30050	30060		30080				300100				



WCSF-2 系列标准尺寸



规格标志 (pat number)	相配轴径 (shaft dia.)	垫片尺寸 (size of washer)				安装尺寸 (size for installation)			
		$d^{+0.25}$	$D_{-0.25}$	$T_{-0.08}$	$M_{-0.12}^{+0.12}$	$H_{-0.1}^{+0.1}$	$T_{-0.22}$	$D1_{-0.12}^{+0.12}$	
WC10SF-2	8	10	20	1.5	15	1.5	1	20	
WC12SF-2	10	12	24	1.5	18	1.5	1	24	
WC14SF-2	12	14	26	1.5	20	2	1	26	
WC16SF-2	14	16	30	1.5	23	2	1	30	
WC18SF-2	16	18	32	1.5	25	2	1	32	
WC20SF-2	18	20	36	1.5	28	3	1	36	
WC22SF-2	20	22	38	1.5	30	3	1	38	
WC24SF-2	22	24	42	1.5	33	3	1	42	
WC26SF-2	24	26	44	1.5	35	3	1	44	
WC28SF-2	25	28	48	1.5	38	4	1	48	
WC32SF-2	30	32	54	1.5	43	4	1	54	
WC38SF-2	35	38	62	1.5	50	4	1	62	
WC42SF-2	40	42	66	1.5	54	4	1	68	
WC48SF-2	45	48	74	2	61	4	1.5	74	
WC52SF-2	50	52	78	2	65	4	1.5	78	
WC62SF-2	60	62	90	2	76	4	1.5	90	

SF轴承的装配

SF轴承在装配前宜先用煤油或柴油清洗干净,然后在机油内浸油、沥干。轴承与座孔装配时,既要保证轴承在座孔中不发生转动和轴向移动,又要使轴承外表面与座孔充分接触,一般应保证接触面积大于70%以上,以利于承受载荷和传导摩擦热,SF轴承内表面是自润滑塑料,外表面是钢背,钢对钢的摩擦系数比钢对塑料的摩擦系数大,因此采用适当的过盈配合,既保证使用时衬套不会在座孔内发生相对移动,又不会使衬套外径过大致使衬套内孔变形过大。

对于工作压力较高的场合为避免轴套走外圆,推荐用以下二种方法:

- 1、加大轴套外径尺寸,内孔变形用校正芯棒校正。
- 2、安装时,座孔可涂ZY801厌氧胶,增强轴套与座孔的结合强度。

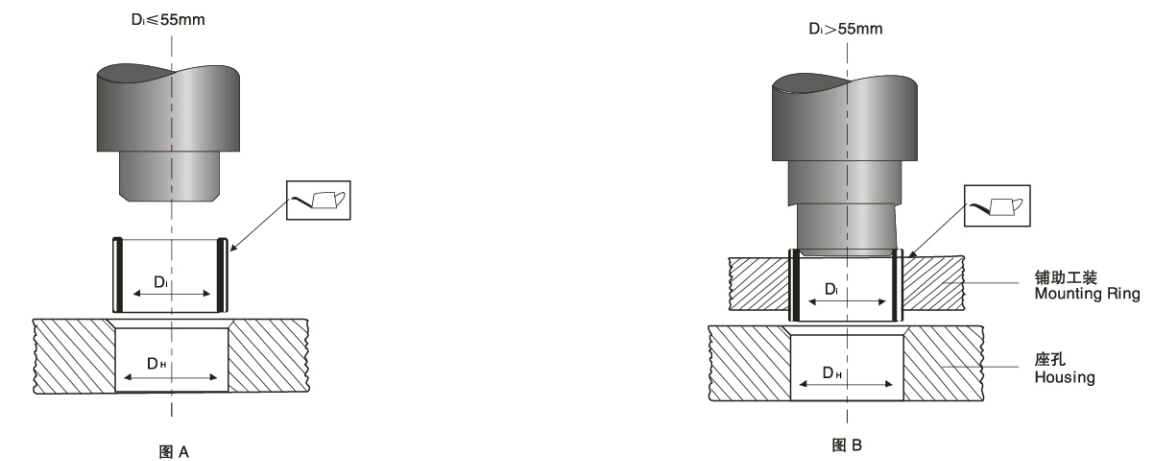
对于外径<55mm的轴承可按图A所示,利用一个带有手柄的压头轴芯,小心操作,轻轻压入座孔中。

当轴承外径>55mm时可按图B所示,利用带台肩的手柄以及一个“O”形圈和一个辅助圈小心操作,将轴承压入座孔中。

The installation of SF Bushes

SF bushes should be cleaned first in kerosene or diesel oil, then immersed in engine oil, and afterwards dried up. When installing the bush into the housing make sure the bush not rotating in the housing or moving in the axial direction and the same time make sure the outer surface contact fully to the base hole, generally with the contact area over 70%, thus to improve load capacity and friction heat transfer. The inner surface of SF bushes is made of self-lubricating plastics, the outer surface is steel backing. The friction coefficient of steel to steel is greater than that of steel to plastic. We should choose relatively small tight fit to prevent the axle sleeve from ZY801 oxygen-hatred glue in the housing to strengthen the contact joining strength between the axle sleeve and the base hole.

For bushes with outer diameter <55 mm, press the bush into the housing gently and carefully using a core axle with a handle (See Figure A). For bushes with outer diameter >55 mm, press the bush into the housing gently and carefully using a handle with a shoulder, an 'O' ring and an assisting circle (See Figure B).





## SF轴套外径检测方法

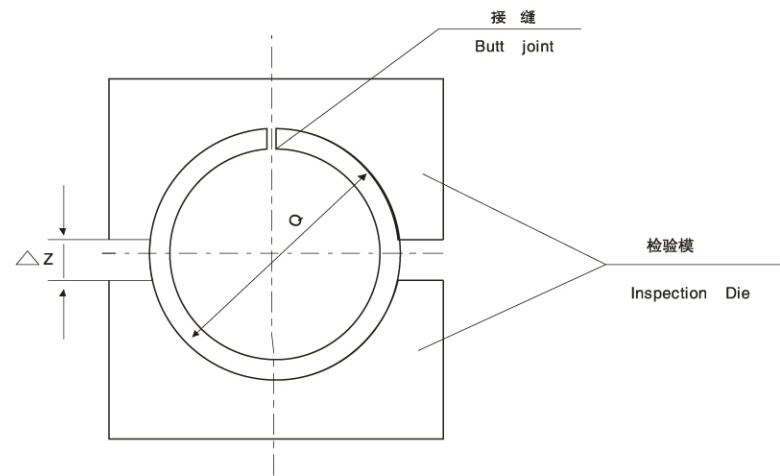
### 1. The Inspecting Methods of SF Bearing's OD

外径采用ISO3547-2中第一种方法检测，其步骤如下：

Method 1, according to ISO3547-2-A, described as follows :

1. 设定测量外径装置（如图示）。先把一个直径与检验模内径一样的调节芯轴Q放在检验模之间，然后施加一定的试验力F，在检验模之间出现间隙Z，作为最初调整值。

1. Set the measuring device (See Figure): First a core bar Q having the same diameter as the inside diameter of inspecting mold is put into the mold, then a load F is applied until clearance Z is reached, which is recorded as the reference parameter.



2. 取出调节芯轴，将被测轴套开口向上，放入检孔中，并施加同样试验力F，记录Z的变化值ΔZ。

2. Take the mandrel out of the mold, then put the to be inspected bush with the slip upward into the inspecting bore, and apply the same load F. Record the difference in the Z value ΔZ.

3. 芯轴Q和试验力F的取值和计算方法

3. Calculating Method for Q and F

D(mm)	≤6	>6-12	>12-80	>80-180
Q(mm)	$D_{max}-0.003$	$D_{max}-0.006$	$D_{max}-0.013$	$D_{max}-0.025$
F(N)	$1500 \cdot A/Q$ 取100倍数 (100 fold)	$3000 \cdot A/Q$ 取250倍数 (250 fold)	$6000 \cdot A/Q$ 取500倍数 (500 fold)	$12000 \cdot A/Q$ 取500倍数 (500 fold)

$A=L \cdot S$ , 适用SF轴套 For SF bearing.

L为轴套宽度S<sub>1</sub>为钢板厚度S<sub>2</sub>为球形青铜粉层厚度.

L: Bush Width S<sub>1</sub>: Steel Layer Thickness S<sub>2</sub>: Alloy Layer Thickness

ΔZ的确定 ( Extreme Values ) , 上限值Upper Limit=0, 下限值 Lower Limit =  $-\pi/2 \times \Delta D$

ΔD为轴套外径公差值 ( Bearing Outer Diameter Tolerance )

4. 举例 ( Example ) 轴套(Bush) SF-1 Φ30×Φ34×30 轴套高 ( Width ) L=30±0.25

外径 ( O.D. )  $D=34_{-0.04}^{+0.04}$  总壁厚(Total Thickness)  $S=2_{-0.005}^{+0.005}$  球形青铜粉层厚度(Porous Bronze Thickness)  $S_1=S_2=0.02=1.73$

(1) 调节芯棒外径(Adjusting Mandrel's O.D.)  $Q=D_{max}-0.013=34.085-0.013=34.072$

(2) 试验力(Load)  $F=6000 \times 51.9/34.072=9139$ , 取整数后 (Modulated Value)  $F=9500N$ , 其中 ( Here )  $A=L \times S_1=30 \times 1.73=51.9$

(3) ΔZ极限值(ΔZ Extreme Values) 上限(Upper Limit)  $\Delta Z=0$ , 下限(Lower Limit)  $\Delta Z=\pi/2 \cdot \Delta D=-/2 \times 0.04=-0.0628$

取整数后 (Modulated Value),  $\Delta Z=-0.63$  ( 即被测轴套外径在检验模中的允许变化值为  $0 \sim -0.063$  )

( The permissible values of O.D. is  $0 \sim 0.063$  when bush is in the inspecting gauge).

(4) 被测量轴套实际外径计算举例 ( Example of the calculation of the bush inspected ) :

如果 ( If )  $\Delta Z = -0.035$ , 则被测量轴套实际外径 ( then the actual O.D. will be )  $D=D_{max}+\Delta Z \times 2/\pi = 34.085 + (-0.035 \times 2/3.14) = 34.063$

## (二)外径采用ISO3547-2标准第二种方法检测

Method 2, according to ISO3547-2-B, described as follows :

在手的压力作用下 ( 最大值为250N ), 轴套应能推入“通”环规, 而不能进入“止”环规。“通”环规的内径应等于轴套的最大理论外径, “止”环规的内径应等于轴套的最小理论外径。此方法较简便, 通常较适应批量检测和提高工作效率, 并易使供货双方简便地达成验收协议, 也能满足装配的过程配合要求。

Under the pressure of the hand (Maximum Value 250N), bush should be able to be pushed into the 'GO' ring gauge, but can't go through the 'NO GO' ring gauge.

The ID of the 'GO' gauge should equal to maximum theoretical OD of the bush, while the ID of the 'NO GO' gauge equal to the minimum theoretical OD of the bush.

Due to its relative easiness, this method is generally more suitable for batch inspection and can improve efficiency as well. It also can make inspection agreement between the customer and the manufacturer more conveniently. Moreover, the requirement of shrink fit in installation can be easily realized.

## 二、SF轴套内径检测方法

SF轴套的内径测量方法可参考ISO3574-2中第三种方法检测, 对于产品内径小于120mm的产品, 测量方法是轴套压入一个检验座孔中 ( 座孔内径按H7中值制造, 公差为  $\pm 0.003mm$  ), 然后用三点内径千分尺或塞规来测量轴套的内径。在手的压力作用下 ( 最大值为250N ), “通”塞规应能通过轴套内孔, “止”塞规不能通过轴套内孔。“通”塞规的外径应等于轴套的最小理论内径, “止”塞规的外径应等于轴套的最大理论内径。但应本方法为破坏性测量, 产品经测量后外径尺寸会发生变化, 产品经测量后不得再次使用, 所以本测量方法只适用于批量产品的抽检。

内径大于120mm的产品, 测试方法由供需双方协商确定。

### 2. The Inspecting Method of SF Bearing's ID

For products with ID < 120 mm, the inspecting method is referenced to ISO3547-2-C, described as follows :

To check the inside diameter, the bush is pressed into a ring gauge having the ID equating to the bush' OD (made according to Class H7 middle value and tolerance + 0.003 mm), then the ID of the bush is measured with a 3-point measuring instrument. Under the pressure of the hand (Maximum Value 250N), bush should be able to be pushed into the 'GO' ring gauge, but can't go through the 'NO GO' ring gauge. The ID of the 'GO' gauge should equal to maximum theoretical OD of the bush, while the ID of the 'NO GO' gauge equal to the minimum theoretical OD of the bush. When the bush is pressed into the ring gauge, it's possible that there may be permanent deformation or reduction in its ID, therefore this test is only appropriate for sampling check of a batch of products.

For products with ID > 120 mm, the inspecting method shall be agreed upon between the supplier and the user.

