Technical documentation

技术资料

密封环
FLUOR-S/SC 导向带/导轨软带
泛塞

Slipper rings
FLUOR S/SC tapes
Spring energized seals

FLUORTEN®

我们的历史

自1966年成立以来，FLUORTEN公司一直以提供高品质的产品而著称。

这些年来，公司一直保持稳定的发展，经济和技术实力不断提高。

随着与客户的共同成长，公司业务从最初生产氟的聚合物产品，逐步扩大到加工其他工业聚合物的部件。

FLUORTEN公司的商业哲学---通过与每个客户共同解决项目设计和生产中的难题来获得有竞争力的产品，不断的推动公司增加对人才和技术的投入。

目前，FLUORTEN 公司的生产包括非常现代化的项目设计，挤出、模压和机械加工厂，同时通过技术人员的监控和可靠的标准来确保内部加工质量，从而为客户提供最高等级的PTFE的半成品和成品以及注塑模压的工业聚合物产品，这些在其他地方很难获得。

Our history

Since its foundation in 1966, FLUORTEN has always identified itself with the brand that distinguishes high Quality products.
Over the years, the Company has been able to develop solidly, with a growth compatible to its own technical and economic capacities.
The activity started with fluoropolymers has been gradually expanded with the processing of technical parts in technopolymers, closely developed with the Customer.
FLUORTEN corporate “philosophy” to work with each Customer to solve project design and production problems to obtain a competitive product, has continuously driven the Company to invest in people and technologies.
Currently FLUORTEN production is composed of very modern project design, extrusion, moulding and mechanical processing plants to supply semi-finished or finished products in PTFE and injection moulded Technopolymers of the highest Quality as well as technicians that can guarantee an internal process with monitoring and reliability standards that are difficult to find elsewhere.

密封环

Slipper Rings

介 绍

PTFE 填充材料制成的密封环最早是在美国开发应用于太空领域的，近些年在欧洲的介绍也越来越多，开始时由于其完全不产生粘滑现象因此成功应用于伺服系统领域，之后由于其具有减小的尺寸，良好的密封容积，较长的使用寿命和可靠性，因此又成功应用于液压电机领域。由于以上这些特性，以及易于安装和成本较低，密封环现在已经成为活塞，液压缸，汽压缸等的最佳密封产品，成为替代传统橡胶环的具有更多功能的和更经济的选择。

Introduction

The slipper gaskets in filled modified PTFE were first developed in the USA for aeronautical purposes. Introduced more recently in Europe, they were first used successfully in the servosystem field because of the complete absence of stick-slip effects, and then in the hydraulic motor field because of their reduced dimensions, great sealing capacity, long durability and reliability. Thanks to these characteristics, together with the simplicity of assembly and low cost, slipper gaskets have become the optimum seal in pistons and hydraulic and pneumatic cylinders, leading to a more functional and economic alternative to the traditional elastomer gasket.

描 述

密封环由一段PTFE填充材料的部件，和一个人造橡胶环，通常是O型圈组成。PTFE部件形成密封的动态部分，人造橡胶环确保持续的弹性能量，以确保密封在很长的一个时间段内能够保持贴合。

在密封环的概念中，先进的PTFE材料由于具有低摩擦性和耐磨性以及抗挤出性，在动态密封领域替代了传统的橡胶产品，并且显著提高了相关密封产品的技术指标。

由于PTFE材料的高性能水平，以及易于安装和尺寸非常小，因此密封环成为现代项目中满足高质量要求的最佳选择。

Description

The Slipper gasket is made up of a filled PTFE segment forming the dynamic part of the seal, and of an elastomer ring, normally an O-ring, which ensures the constant elastic energy required to guarantee the fit of the seal over a long period of time.
Within the concept of Slipper rings, advanced PTFE formulations, characterized by low friction and resistance to wear and extrusion, replace traditional rubber in the dynamic areas. This considerably raises the overall technical limits involved in the concept of sealing.
Due to its high performance level, the Slipper gasket is a great asset in modern projects where primary needs are met, thanks to the simplicity of installation of this gasket and its very small dimensions.

应 用

中高压和高速条件下，即使没有润滑的流体动力系统，相似物和控制调节装置的流体动力系统，通常具有高分辨力的定位液压伺服系统，以及提供长期良好可靠性的系统。

密封环经常用于旋转和慢旋转–平移运动中，也可以在静态和半静态密封的过压状态下做为抗挤出装置。

FLUOR–S 导向带是这种密封环的理想补充。

Applications

Fluid dynamics for medium-high pressures and high speeds, even without lubrication, fluid dynamics for analog and control regulation devices, servosystems and in generai, in positioning hydraulics with high resolution power, as well as in systems offering great reliability over long periods of time.
The Slipper gasket is frequently used on rotary and slow rotary-translation movements, and also as an anti-extrusion device for overspressures in static and semi-static seals.
Fluor S bearing are the ideal complement to this gasket.

* Politetrafluoroetilene (Teflon®, Fluon®, Algoflon®, ecc.)
** Politetrafluoroetilene (Teflon®, Fluon®, Algoflon®, ecc.)*
TEFLON®, il fluoropolimero Dupont.
TEFLON®,il fluoropolimero Dupont.

密封环 Slipper Rings

优 势

- 使用寿命长
- 绝对可靠
- 即使没有润滑条件下，静态和动态的摩擦系数都介于最低
- 双效密封
- 无粘滑现象
- 长期不工作或低温状态下不粘合
- 高刮垢效果，取决于水力翼型的选择

- 良好的抗挤出性和耐柴油性
- 较宽范围的耐化学性
- 在封闭的凹槽中安装，只需很小的轴向和径向尺寸

- 尺寸范围很广

Advantages

- *Long life service.*
- *Absolutely reliable.*
- *Static and dynamic friction coefficient among the lowest, even without lubrication.*
- *Double acting seal.*
- *No stick-slip effect.*
- *No glueing due to long inactivity or to low temperature.*
- *High scraping effect, dependent on the choice of the hydrodynamic profile.*
- *Great resistance to extrusion and to diesel effect.*
- *Wide spectrum of chemical resistance.*
- *Assembly in closed groove, minimum axial and radial dimensions.*
- *Very wide dimensional range available.*

性 能

最大压力：在特殊控制条件下，从400bar 到1000bar

温度：–40℃到+120℃。这个范围可以通过使用适当橡胶材质的O型圈提高到–60℃到+200℃

最高速度：在有润滑的线性运动条件下可达15米/秒。
在有润滑的旋转运动条件下可达2米/秒。
接触表面：如提示数值，密封环产生动态效果的表面，要求具有表面硬度HRc ≥ 45和Ra为0.2–0.6 μ m。

Performance

MAX PRESSURE: 400 bar and up to 1000 bar under specially controlled conditions.
TEMPERATURE: from -40 to +120°C. This range can be increased to -60 and +200°C by using an O-ring made of a suitable elastomer.
MAX SPEED: up to 15m/sec with lubricated linear motion. Up to 2 m/sec with lubricated rotary motion.
COUNTERSURFACES: as indicative values, the surfaces on which the Slipper ring has a dynamic effect have a surface hardness HRc≧ 45 and a Ra 0.2÷0.6 μm finish.

材料选择

下表列出了 FLUORTEN 公司根据密封环的特殊功能，标准化的PTFE化合物产品。使用这些产品几乎能够成功解决所有流体密封的问题。
表中列出了这些PTFE化合物的成分和物理化学性能。FLUORTEN公司产品范围中的其他一些产品可以在我们的小册子《工业聚合物》中找到。
由于一些密封条件是不常见的，因此没有在表中列出。但是FLUORTEN公司的其他许多PTFE化合物可供采用，以使密封环具有优秀的特殊性能。
请联系FLUORTEN公司的技术服务部，以获取关于特殊应用的信息，或者请提供技术参数以确定您的需求。

Choice of materials

The following table shows the PTFE compounds which FLUORTEN has «standardized» according to the specific function of the Slipper gasket segment and with which it is possible to solve almost all fluid seal problems successfully.
The compositions and physical-chemical properties of the PTFE compounds recommended in the table can be found, among other constituents of the Fluorten production range, in our leaflet «TECHNOPOLYMERS».
In cases where the sealing conditions are unusual, and therefore not given in the table, many other PTFE FLUORTEN compounds can be used, making it possible for the Slipper gasket to take on highly specific characteristics.
Contact the FLUORTEN Technical Service for special applications or requirements with data at limit levels.

密封环

Slipper Rings

流体 *Fluid*	矿物油 液压油 润滑油 *MINERAL OIL HYDRAULIC OIL TRANSMISSION OIL*	合成防火 液压油刹车油 *SYNTETIC FIREPROF HIDRAULIC OIL BRAKE OIL*	油-水（HFA&B） 水-乙二醇乳剂（HFC） *WATER HFA & B OIL EMULSION WATER GLYCOL HFC EMULSIONS*	药物和食品产品 *PHARMACEUTICAL AND FOOD PRODUCTS*	不反应的有润滑的 空气或气体 *NON-REACTIVE LUBRICATED AIR OR GAS*	不反应的干的空气或气体 *NON-REACTIVE DRY AIR OR GAS*	热水 水蒸气 *HOT WATER WATER VAPOUR*	酸*碱* 燃料溶剂 *ACIDS* BASES* FUELS SOLVENTS*
指定O型圈橡胶，ASTM D1418 *<<O-R>> ELASTOMER Designation ASTM D1418*	NBR	EPR	NBR	NBR特殊VMQ	NBR	NBR	EPR	FKM (EPR)
接触表面 *COUNTERSURFACE*	PTFE化合物							
HRC≤30–45的钢 马氏体硬化不锈钢 HRB≤200的铸铁 *HRC≦30÷45 steel Stainless martensitic hardened steel HRB≦200 cast iron*	BM-C-CrO	BM-C-CrO	C-CrO	P-CrO	BM-C	BM-C	C	CrO
HRC > 45的钢 HRB > 200的铸铁 不含镍的铸铁 *HRC > 45 steel HRB > 200 cast iron Ni resist cast iron*	BM-Vo-CrO	BM-Vo-CrO	BM-C-Vo	P-CrO	BM-C-Vo	C-Vo	C-Vo	CrO
HV > 700的流电的和化学添加材料 铬铜 *HV > 700 galvanic and chemical added material Chromium bronze*	C-Vo-Cro	C-Vo-Cro	C-CrO	C-P-CrO	C-CrO	C-CrO	C-Vo-Cro	C-P-CrO
青铜 黄铜 *Bronze, Brass*	C-P	C-P	C	C-P	C	C	C	C
加工过的铝 *Treated aluminium*	C-Vo-Cro	C-Vo-Cro	C-CrO	C-P-CrO	C-CrO	C	C	C
奥氏体不锈钢 *Austenitic stainless steel*	C-P-CrO	C-P-CrO	C-CrO	C-P-CrO	C-CrO	C-CrO	C-CrO	C-P-CrO
玻璃 *Glass*	CrO	CrO	C-P-CrO	C-P-CrO	C-CrO	C-CrO	C-CrO	C-P-CrO

*为普通指导，请参阅特殊兼容性表。
**General indications,please check the specific compatibility tables.*

密封环 Slipper Rings

材料特性

PTFE	订货代码	颜色	ASTM D2440 萧氏硬度	磨损系数* $\frac{cm.^3 \cdot min}{dN \cdot m \cdot h} \cdot 10^{-8}$	使用时的特性（要获取进一步的技术参数，请参阅我们的小册子《工业聚合物》）
纯PTFE	P	白	51	>1000	• 最小的摩擦系数 • 对所有工业产品具有完全的耐化学性 • 低耐磨损性 • 应用：中压和低覆盖密封
CrO	CrO	淡蓝	53	~100	• 最小的摩擦系数 • 对所有工业产品具有完全的耐化学性 • 无毒 • 比纯PTFE具有更好的耐磨损性 • 应用：中压和中低覆盖密封
V/ChO-82306	Vo	蓝	55	16~19	• 优秀的耐化学性，只有当化合物中有玻璃纤维时才有所限制 • 良好的耐磨损性和抗挤出性 • 应用：中高压和硬接触表面和/或少润滑的中高覆盖密封
C-755	C	黑	66	14	• 优秀的耐化学性，只有当化合物中有碳(六边形晶体)时才有所限制 • 良好的耐磨损性和抗挤出性 • 应用：中高压和软接触表面的中高覆盖密封
BM-57806 B-8/04GH	BM B8	棕 绿	58	7	• 不耐酸和碱，也不耐活跃的离子；对于烃基化合物和溶剂具有较好的耐受性 • 优秀的耐磨损性和抗挤出性 • 应用：中高压和中等硬度接触表面的高覆盖密封

* 磨损系数K：这个表示PTFE化合物的实验块在与硬化钢的表面无润滑运动接触时产生的容积损失，与PV条件和测试持续的时间有关。

O型圈橡胶	指定		萧氏硬度 A ±5°	操作温度（℃）	最小使用寿命（年*）	使用时的特性
	ASTM D 1418	ISO 1629				
丁腈橡胶	NBR	NBR	70	-40°+125°	2 - 5	• 这是在液压和汽压垫圈上应用最广泛的橡胶。 • 耐矿物液压油，油–水(HFA&B)和水–乙二醇(HFC)乳剂和酯基油的腐蚀 • 耐碳氢化合物，如甲烷，乙烷，丙烷，丁烷，燃料，煤油，柴油和最高70℃水的腐蚀
丁腈橡胶（高）	NBR (2)	NBR	75	-30°+150°	2 - 5	• 同上，同时对于液体燃料具有更好的耐腐蚀性。 • 具有非常低的压缩形变
乙烯丙烯	EPR	EPDM	80	-50°+150°	5 - 10	• 对于很多稀释的酸和碱，很热的水，蒸汽和一些溶剂具有耐腐蚀性。 • 对于防火的，磷酯基的液压流体，制动流体，硅树脂油脂和油具有耐腐蚀性 • 对矿物基的油和油脂不具有耐腐蚀性
氯丁二烯	CR	CR	70	-50°+150°	5 - 10	• 对于低温流体（氟里昂，氨水），具有高Analine 点的矿物油，植物油和植物脂肪具有耐腐蚀性。 • 对于大气介质和海水具有优秀的抗老化性。
硅树脂	VMQ	MVQ	70	-60°+230°	10 - 20	• 对于热空气，具有高苯胺点的油，和极端温度下的很多气体都具有耐腐蚀性。 • 具有很低的长期压缩形变和优秀的抗老化性 • 无毒
氟–碳	FKM	FPM	75	-20°+230°	10 - 20	• 耐高温 • 对于一般的碳氢化合物，酯基液压流体，一些磷酯基流体，硅树脂油和油脂，芳香溶剂，卤化碳氢化合物和许多酸都具有耐腐蚀性。 • 在高温下具有很低的压缩形变。

* Valori orientativi e prudenziali ricavati da tab. MIL-HDBK-695B

Anelli Slipper

Slipper Rings

Material Properties

PTFE	ORDER REF. CODE	COLOUR	ASTM D 2240 Shore D HARDNESS	WEAR COEFFICIENT* $\frac{cm.^3 \cdot min}{dN \cdot m \cdot h} \cdot 10^{-8}$	CHARACTERISTICS DURING USAGE (For further technological data, please refer to our leaflet <<TECHNOPOLYMERS>>)
PURE PTFE	P	White	51	>1000	• Minimum friction coefficient. • Complete chemical resistance to all industrial products. • Low wear resistance. • Use: medium pressure and low coverage seals.
CrO	CrO	Pale Blue	53	~100	• Minimum friction coefficient• Chemical resistance the same as pure PTFE• Non-toxic. • Better wear resistance than the previous type.• Use: medium pressure and medium-low coverage seals.
V/ChO-82306	Vo	Blue	55	16÷19	• Excellent chemical resistance, only limited by the presence of glass fibres in the compound. • Good resistance to wear and extrusion. • Use: medium-high pressure and medium-high coverage seals on hard countersurfaces and/or with poor lubrication.
C-755	C	Black	66	14	• Excellent chemical resistance,only limited by the presence of carbon (hexagonal crystal) in the compound. • Good resistance to wear and extrusion. • Use: medium-high pressure and medium-high coverage seals on soft countersurfaces.
BM-57806 B-8/04 GH	BM B_8	Brown Green	58	7	• Poor chemical resistance to acids and bases or, in any case, to reactive ions; good resistance to hydrocarbons and solvents. • Excellent resistance to wear and extrusion. • Use: medium and high pressure and high coverage seals on countersurfaces with medium hardness.

* Wear coefficient K: This expresses the loss in volume of a PTFE compound test-piece in kinetic relation to a hardened steel surface, without lubrication, in relation to the PV conditions and duration of the test.

O-R ELASTOMER	DESIGNATION		Shore A ±5° HARDNESS	OPERATING TEMPERATURE IN °C	MINIMUM AGEING LIMIT IN YEARS*	CHARACTERISTICS DURING USAGE
	ASTM D 1418	ISO 1629				
NITRILE BUTADIENE	NBR	NBR	70	-40°+125°	2 - 5	• This is the most widely used elastomer for hydraulic and pneumatic gaskets. • Resistant to mineral hydraulic oils, oil-water (HFA& B) and water-glycol (HFC) emulsions and ester-based oils. • Resistant to hydrocarbons such as Methane, Ethane, Propane, Butane, Fuel, Kerosene, Diesel and water up to 70°C.
NITRILE BUTADIENE (High)	NBR (2)	NBR	75	-30°+150°	2 - 5	• As above, but with better resistance to liquid fuels. • It has a very low compression-set.
ETHYLENE PROPYLENE	EPR	EPDM	80	-50°+150°	5 - 10	• Resistant to many diluted acids and bases, very hot water, steam and some solvents. • Resistant to fireproof, phosphorousester-based hydraulicfluids, brakefluids, silicone greases and oils. • Non-resistant to mineral-based oils and greases.
CHLOROPRENE	CR	CR	70	-50°+150°	5 - 10	• Resistant to cryogenic liquids (Freon, Ammonia), mineral oils with a high analine point and to vegetable oils and fats. • Excellent resistance to ageing by atmospheric agents and sea water.
SILICONE	VMQ	VMQ	70	-60°+230°	10 - 20	• Resistant to hot air, to oils with a high aniline point and to many gases at extreme temperatures. • It has a very low long-term compression-set and excellent resistance to ageing. • Non-toxic.
FLUORO-CARBON	FKM	FKM	75	-20°+230°	10 - 20	• Resistant to high temperatures. • Resistant to hydrocarbons in general, to ester-based hydraulic fluids, to some phosphorous ester-based ones,to silicone oils and greases, aromatic solvents, halogenated hydrocarbons and many acids. It has a very low compression-set at high temperatures.

* Indicative conservative values taken from table MIL-HDBK-695B.

形状选择

凭借40多年的经验，FLUORTEN公司通过开发广泛系列的密封垫圈，使密封垫圈的形状更精密，以使每一个特殊需求都能获得最适应的性能，从而成功满足了流体动力行业不断变化的需求。

密封环解决方案是根据每一个应用所需性能而特殊设计的，下表中FLUORTEN公司建议了一个标准化的形状表，也概述了这些基本形状通常应用的领域。

Choice of profile

With forthy years' experience, Fluorten has succeeded in fulfilling the changing requirements of fluid dynamics industries, by proposing a wide range of variants to the basic concept of Slipper gaskets, making the shape more sophisticated to obtain optimum performances for each specific use.

Together with the Slipper ring solutions specifically designed for the characteristics of each single application, in the following tables Fluorten proposes a standardization of profiles, where the basic shapes are summarized into their generai field of usage.

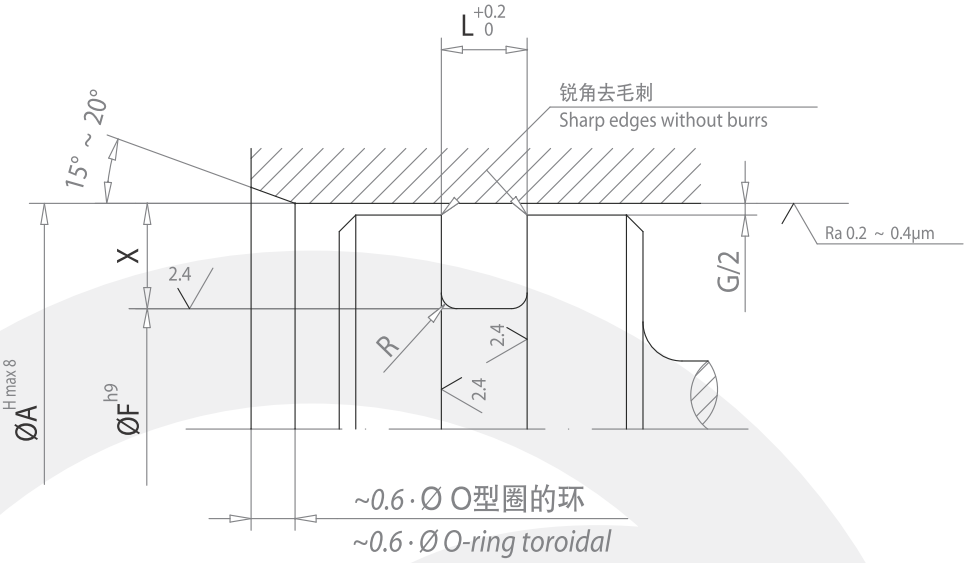
横截面 *CROSS-SECTION*	系列 *SERIES*	功能特性 *FUNCTIONAL CHARACTERISTICS*
	NP NC *NP* *NC*	双效密封形状 • 气体密封：它是应用最常见的形状 • 液体密封：它在动态相位中产生较低的转换膜 *DOUBLE ACTING SEAL PROFILE* *• Gas seal: this is the most commonly used profile.* *• Liquid seal: this produces a low transfer film during the dynamic phase.*
	NPS NCS *NPS* *NCS*	双效密封形状 • 气体密封：它比 NP-NC 系列产生更微小的损失。 • 液体密封：它比 NP-NC 系列产生更大的转换膜，并且会随着速度的增加而增大。更大的转换膜相应会使密封环产生更小的摩擦和更少的磨损。低速时它可以提供大角度的密封。 *DOUBLE ACTING SEAL PROFILE* *• Gas seal: this offers a lower microloss than the NP-NC type.* *• Liquid seal: this produces a greater transfer film than the NP-NC type, which rises as speed increases. A greater film corresponds to less friction and less wear of the Slipper ring.* *At low speeds it givesa very high degree ot sealing.*
	NPR NCR *NPR* *NCR*	单程性密封形状 • 气体密封：它产生最微小的损耗，以及在分离器活塞中气体和液体之间产生最少的乳剂。 • 液体密封：它在一个方向上产生较低的转换膜，同时相反的方向上产生液体覆盖。它通常在输出轴上一前一后使用，以获得更好的刮垢效果。 *ESSENTIALLY ONE-WAY SEAL PROFILE* *• Gas seal: this offers the lowest microloss and the least emulsion between gas and liquid in the separator pistons.* *• Liquid seal: this produces a very low transfer film in one direction, whilst the liquid covering is helped in the apposite direction. It is usually used in tandem on outgoing rods to obtain a better «scraping» ettect.*
	NR *NR*	摩擦块 • 这是密封垫圈概念的一个变化，设计用来除去输出轴上的研磨剂和杂质。 *SCRAPER* *• This is a variation on the Slipper gasket concept, designed to remove abrasive and contaminating agents from outgoing rods.*
	NR / C *NR / C*	摩擦块 • 具有如上述的密封功能，同时具有更佳的摩擦功能。 *SCRAPER* *• Seal as mentioned above but with greater abrating function*
	NPS/R NCS/R *NPS/R* *NCS/R*	旋转密封形状 *ROTARY SEAL PROFILE*

Mod. NPS - NP

活塞上的安装
Installation on piston

NP

NPS



沟槽的尺寸
Groove dimensions

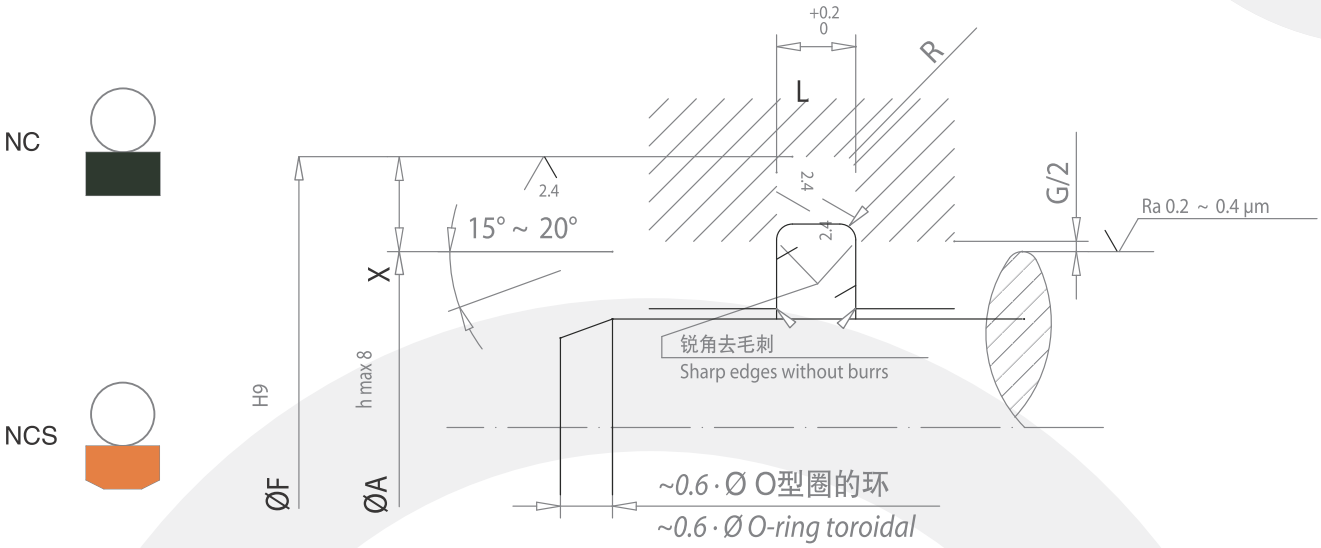
Φ > 1000或特殊尺寸，请联系我们的技术部门
For Ø > 1000 or special dimensions. contact our technical department

孔的尺寸 A H max 8 *BORE DIMENSIONS* A H max 8			F	X	L	R	G		OR O型圈
NP / P NPS / P 重型系列 *HEAVY SERIES*	NP NPS 标准系列 *STANDARD SERIES*	NP / L NPS / L 轻型系列 *LIGHT SERIES*	沟槽直径 GROOVE DIA h9	沟槽深度 *GROOVE DEPTH*	沟槽宽度 GROOVE WIDTH +0.2 0	半径（除尖角） *RADIUS (BREAK CORNER)*	直径间隙 *DIAMETRAL CLEARANCE* (0~200 bar)	(200~400 bar)	Ø环 *Ø TOROIDAL*
/	8.0~14.9	15.0~39.9	A-4.9	2.45	2.2	0.4	0.6~0.4	0.4~0.3	1.78
/	15.0~39.9	40.0~79.9	A-7.5	3.75	3.2	0.6	0.8~0.5	0.5~0.3	2.62
15.0~39.9	40.0~79.9	80.0~132.9	A-11.0	5.5	4.2	0.8	0.8~0.5	0.5~0.3	3.53
40.0~79.9	80.0~132.9	133.0~329.9	A-15.5	7.75	6.3	1.0	1.0~0.6	0.6~0.4	5.33
80.0~132.9	133.0~329.9	330.0~669.9	A-21.0	10.5	8.1	1.5	1.0~0.6	0.6~0.4	6.99
133.0~329.9	330.0~669.9	670.0~999.9	A-24.5	12.25	8.1	1.5	1.2~0.7	0.7~0.5	6.99
330.0~669.9	670.0~999.9	/	A-28.0	14.0	9.5	2.0	1.4~0.8	0.8~0.6	8.40

Mod. NC - NCS

汽缸上的安装

Installation on cylinder



沟槽的尺寸

Groove dimensions

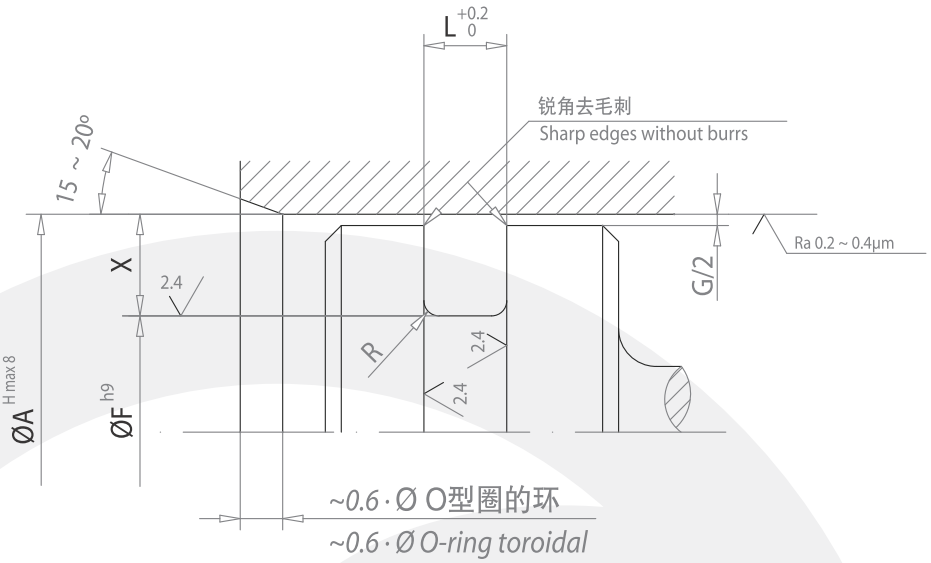
Φ > 1000或特殊尺寸，请联系我们的技术部门
For Ø > 1000 or special dimensions. contact our technical department

杆的尺寸A h max 8 *ROD DIMENSIONS A h max 8*			F	X	L	R	G		O型圈
NC / P NCS / P 重型系列 *HEAVY SERIES*	NC NCS 标准系列 *STANDARD SERIES*	NC / L NCS / L 轻型系列 *LIGHT SERIES*	沟槽直径 GROOVE DIA H9	沟槽深度 *GROOVE DEPTH*	沟槽宽度 GROOVE WIDTH +0.2 0	半径（除尖角） *RADIUS (BREAK CORNER)*	直径间隙 DIAMETRAL CLEARANCE (0~200 bar)	(200~400 bar)	Ø 环 *Ø TOROIDAL*
/	3.0~7.9	8.0~18.9	A+4.9	2.45	2.2	0.4	0.6~0.4	0.4~0.3	1.78
/	8.0~18.9	19.0~37.9	A+7.3	3.65	3.2	0.6	0.8~0.5	0.5~0.3	2.62
8.0~18.9	19.0~37.9	38.0~199.9	A+10.7	5.35	4.2	0.8	0.8~0.5	0.5~0.4	3.53
19.0~37.9	38.0~199.9	200.0~255.9	A+15.1	7.55	6.3	1.0	1.0~0.6	0.6~0.4	5.33
38.0~199.9	200.0~255.9	256.0~649.9	A+20.5	10.25	8.1	1.5	1.0~0.6	0.6~0.5	6.99
200.0~255.9	256.0~649.9	650.0~999.9	A+24.0	12.0	8.1	1.5	1.2~1.0	0.8~0.6	6.99
256.0~649.9	650.0~999.9	/	A+27.3	13.65	9.5	2.0	1.4~1.0	1.0~0.7	8.40

Mod. NPR

活塞上的安装
Installation on piston

NPR



沟槽的尺寸
Groove dimensions

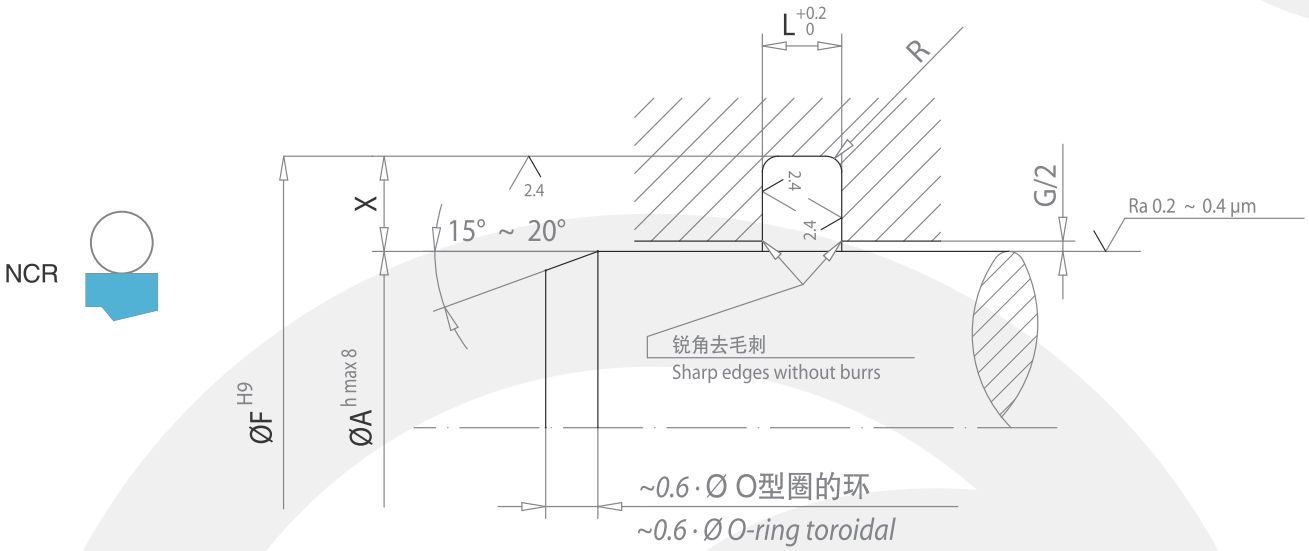
Φ > 1000或特殊尺寸，请联系我们的技术部门
For Ø > 1000 or special dimensions. contact our technical department

孔的尺寸 A H max 8 *BORE DIMENSIONS* A H max 8			F	X	L	R	G		O型圈
NPR / P 重型系列 *HEAVY SERIES*	NPR 标准系列 *STANDARD SERIES*	NPR / L 轻型系列 *LIGHT SERIES*	沟槽直径 GROOVE DIA h9	沟槽深度 *GROOVE DEPTH*	沟槽宽度 *GROOVE WIDTH* +0.2 0	半径（除尖角） *RADIUS (BREAK CORNER)*	直径间隙 *DIAMETRAL CLEARANCE* (0~200 bar)	(200~400 bar)	Ø 环 *Ø TOROIDAL*
/	8.0~16.9	17.0~26.9	A-4.9	2.45	2.2	0.4	0.6~0.4	0.4~0.3	1.78
/	17.0~26.9	27.0~59.9	A-7.3	3.65	3.2	0.6	0.8~0.5	0.5~0.3	2.62
17.0~26.9	27.0~59.9	60.0~199.9	A-10.7	5.35	4.2	0.8	0.8~0.5	0.5~0.4	3.53
27.0~59.9	60.0~199.9	200.0~255.9	A-15.1	7.55	6.3	1.0	1.0~0.6	0.6~0.4	5.33
60.0~199.9	200.0~255.9	256.0~669.9	A-20.5	10.25	8.1	1.5	1.0~0.6	0.6~0.4	6.99
200.0~255.9	256.0~669.9	670.0~999.9	A-24.0	12.00	8.1	1.5	1.2~0.7	0.7~0.5	6.99
256.0~669.9	670.0~999.9	/	A-27.3	13.65	9.5	2.0	1.4~0.8	0.8~0.6	8.40

Mod. NCR

汽缸上的安装

Installation on cylinder



沟槽的尺寸

Groove dimensions

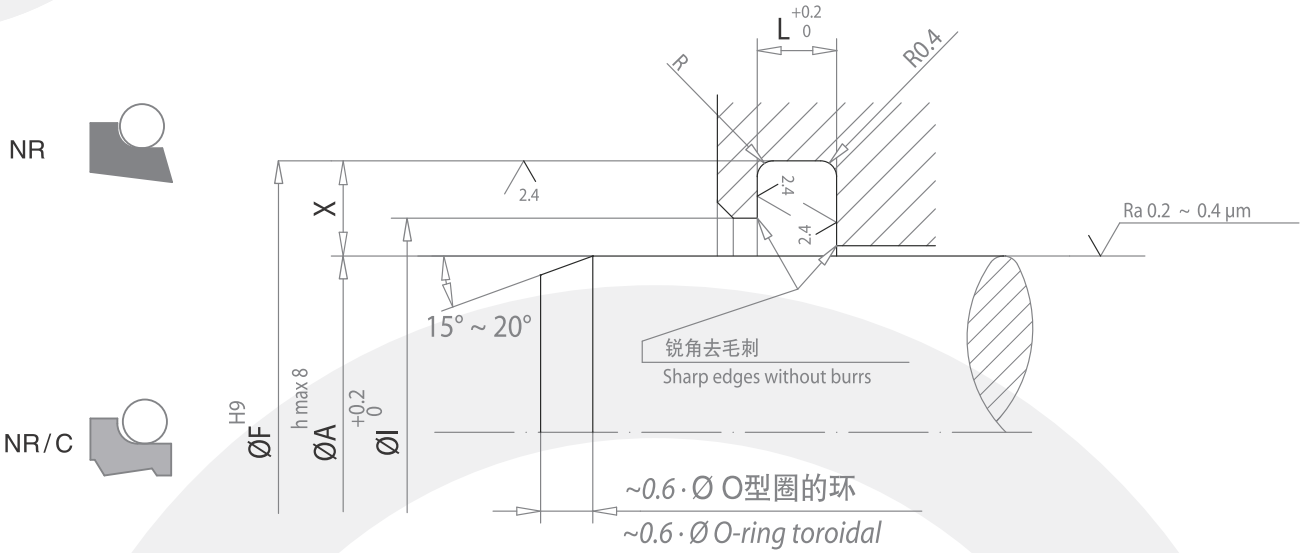
Φ > 1000或特殊尺寸，请联系我们的技术部门
For Ø > 1000 or special dimensions. contact our technical department

杆的尺寸A h max 8 ROD DIMENSIONS A h max 8			F	X	L	R	G		O型圈
NCR / P 重型系列 *HEAVY SERIES*	NCR 标准系列 *STANDARD SERIES*	NCR / L 轻型系列 *LIGHT SERIES*	沟槽直径 *GROOVE DIA* H9	沟槽深度 *GROOVE DEPTH*	沟槽宽度 GROOVE WIDTH +0.2 0	半径（除尖角） *RADIUS (BREAK CORNER)*	直径间隙 *DIAMETRAL CLEARANCE* (0~200 bar)	(200~400 bar)	Ø环 *Ø TOROIDAL*
/	3.0~7.9	8.0~18.9	A+4.9	2.45	2.2	0.4	0.6~0.4	0.4~0.3	1.78
/	8.0~18.9	19.0~37.9	A+7.3	3.65	3.2	0.6	0.8~0.5	0.5~0.3	2.62
8.0~18.9	19.0~37.9	38.0~199.9	A+10.7	5.35	4.2	0.8	0.8~0.5	0.5~0.4	3.53
19.0~37.9	38.0~199.9	200.0~255.9	A+15.1	7.55	6.3	1.0	1.0~0.6	0.6~0.4	5.33
38.0~199.9	200.0~255.9	256.0~649.9	A+20.5	10.25	8.1	1.5	1.0~0.6	0.6~0.5	6.99
200.0~255.9	256.0~649.9	650.0~999.9	A+24.0	12.0	8.1	1.5	1.2~1	0.8~0.6	6.99
256.0~649.9	650.0~999.9	/	A+27.3	13.65	9.5	2.0	1.4~1	1.0~0.7	8.40

Mod. NR - NR/C

汽缸上的安装

Installation on cylinder



沟槽的尺寸

Groove dimensions

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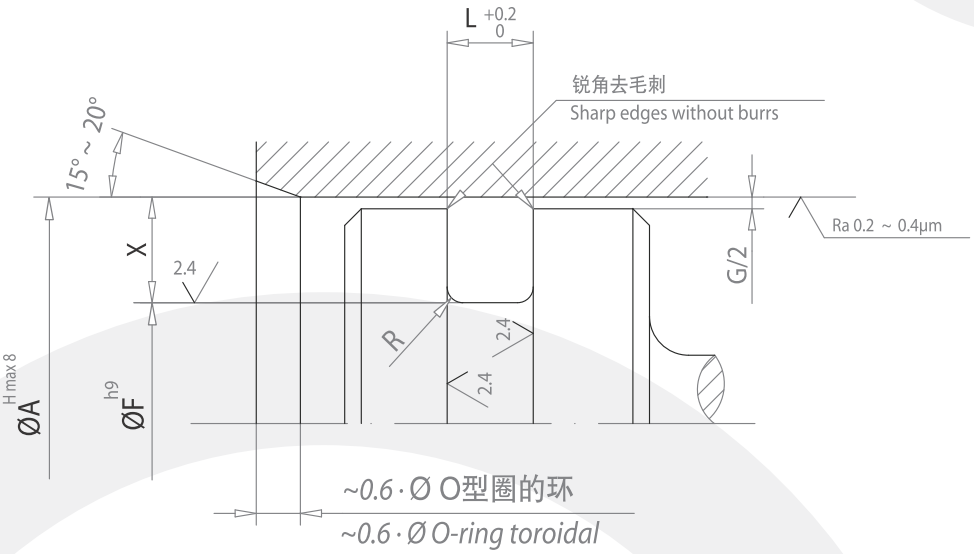
For Ø > 1000 or special dimensions. contact our technical department

杆的尺寸A h max 8 *ROD DIMENSIONS A h max 8*	F	X	L	I	R	O型圈
NR / CNR标准系列 *STANDARD SERIES*	沟槽直径 GROOVE DIA H9	沟槽深度 *GROOVE DEPTH*	沟槽宽度 GROOVE WIDTH +0.2 0	孔直径 BORE DIA +0.2 0	半径（除尖角） *RADIUS (BREAK CORNER)*	Ø 环 *Ø TOROIDAL*
6.0~11.9	A+4.8	2.4	3.7	S+1.5	0.4	1.78
12.0~64.9	A+6.8	3.4	5.0	S+1.5	0.7	2.62
65.0~250.9	A+8.8	4.4	6.0	S+1.5	1.0	3.53
251.0~420.9	A+12.2	6.1	8.4	S+2.0	1.2	5.33
421.0~650.9	A+16.0	8.0	11.0	S+2.0	1.5	6.99
651.0~999.9	A+20.0	10.0	14.0	S+2.5	2.0	8.40

Mod. NPS/R

活塞上的安装
Installation on piston

NPS / R



沟槽的尺寸
Groove dimensions

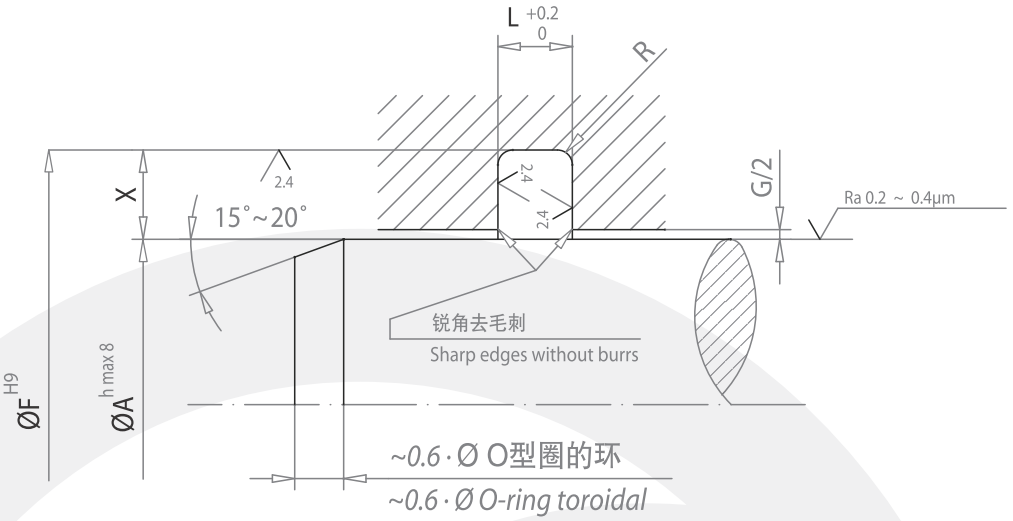
Φ > 1000或特殊尺寸，请联系我们的技术部门
For Ø > 1000 or special dimensions. contact our technical department

孔的尺寸A H max 8 *BORE DIMENSIONS A H max 8*	F	X	L	R	G		O型圈
NPS / R标准系列 *STANDARD SERIES*	沟槽直径 *GROOVE DIA* h 9	沟槽深度 *GROOVE DEPTH*	沟槽宽度 *GROOVE WIDTH* +0.2 0	半径（除尖角） *RADIUS (BREAK CORNER)*	直径间隙 *DIAMETRAL CLEARANCE*		Ø 环 *Ø TOROIDAL*
					(0~100 bar)	(200~300 bar)	
8.0~135.0	A-4.9	2.45	2.2	0.3	0.4~0.3	0.2~0.15	1.78
14.0~250.0	A-7.5	3.75	3.2	0.5	0.6~0.45	0.3~0.2	2.62
22.0~460.0	A-11.0	5.5	4.2	0.7	0.6~0.45	0.3~0.2	3.53
40.0~675.0	A-15.5	7.75	6.3	1.2	0.8~0.6	0.4~0.3	5.33
133.0~690.0	A-21.0	10.5	8.1	1.5	0.8~0.6	0.4~0.3	6.99
690.0 ~999.9	A-28.0	14.0	9.5	2.0	1.2~0.9	0.6~0.5	8.40

Mod. NCS/R

汽缸上的安装
Installation on cylinder

NCS / R



沟槽的尺寸
Groove dimensions

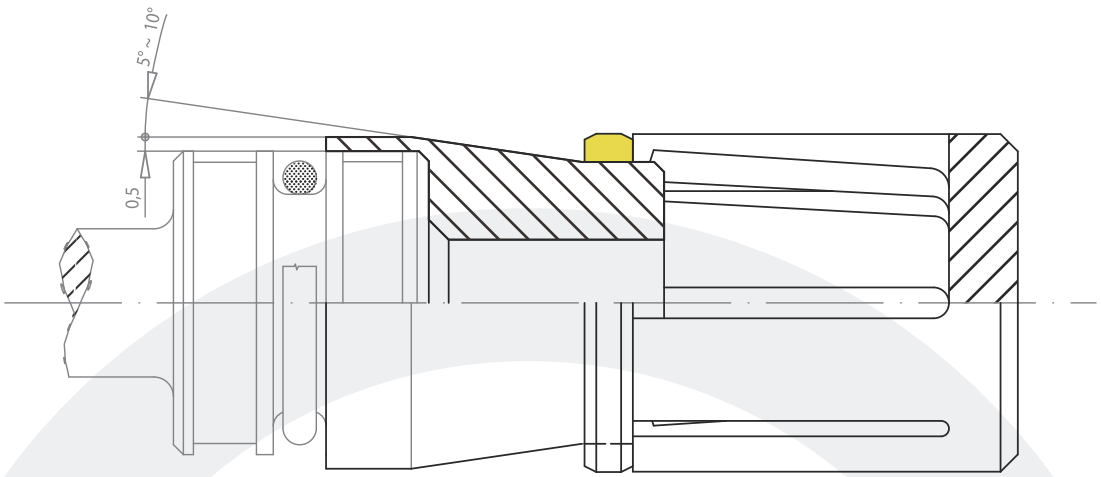
Φ > 1000或特殊尺寸，请联系我们的技术部门
For Ø > 1000 or special dimensions. contact our technical department

杆的尺寸A H max 8 *ROD DIMENSIONS A H max 8*	F	X	L	R	G		O型圈
NCS / R标准系列 *STANDARD SERIES*	沟槽直径 *GROOVE DIA* H9	沟槽深度 *GROOVE DEPTH*	沟槽宽度 *GROOVE WIDTH* +0.2 0	半径 （除尖角） *RADIUS (BREAK CORNER)*	直径间隙 *DIAMETRAL CLEARANCE*		Ø 环 *Ø TOROIDAL*
					(0~100 bar)	(200~300 bar)	
6.0~130.0	A+4.9	2.45	2.2	0.3	0.4~0.3	0.2~0.15	1.78
10.0~245.0	A+7.5	3.75	3.2	0.5	0.6~0.45	0.3~0.2	2.62
19.0~455.0	A+11.0	5.5	4.2	0.7	0.6~0.45	0.3~0.2	3.53
38.0~655.0	A+15.5	7.75	6.3	1.2	0.8~0.6	0.4~0.3	5.33
120.0~655.0	A+21.0	10.5	8.1	1.5	0.8~0.6	0.4~0.3	6.99
650.0 ~999.9	A+28.0	14.0	9.5	2.0	1.2~0.9	0.6~0.5	8.40

密封环 Slipper Rings

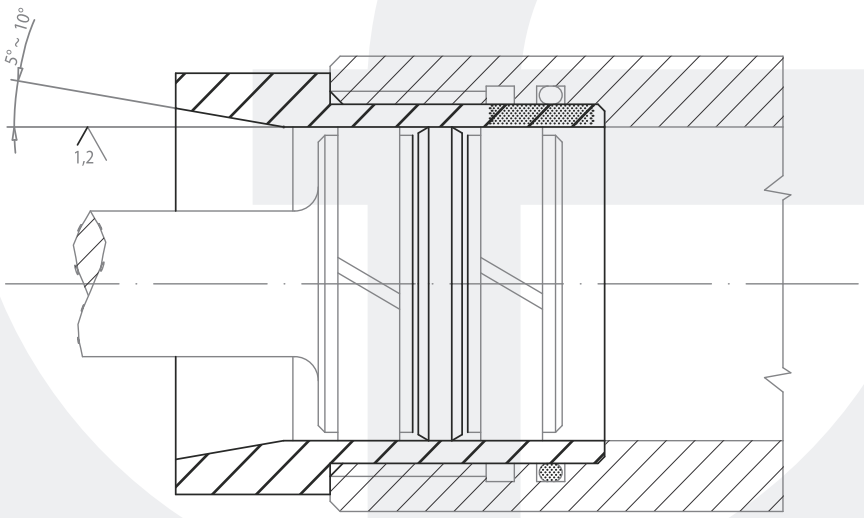
密封环安装指导
活塞上的安装 <NP，NPS，NPR，NPS / R系列>

Slipper ring assembly instructions installation on piston «NP, NPS, NPR, NPS/R SERIES»



如果NP系列的密封环要安装在一个封闭的沟槽里，简单正确的安装需要一个合适的工具，如图所示的一个带弹性的推入装置，可由聚合物，如聚酰胺，聚乙炔，聚酯等制成。这个推入装置可以很简单的由一个纵向的切刀带一个衬套制成。

If the NP series Slipper ring is installed in a closed groove, for simple and correct assembly a fitting tool is required with an elastic thrust device, as shown in the figure, made of polymers such as polyamide, polyacetyl, polyester, etc. A thrust device can be made quite simply as a bush with a single lengthwise cut.



如果密封环不能很快插入沟槽，直径会持久增大，这可以通过使用一个校正套管来进行纠正，如图所示。这个套管用来在安装时碰到锐角转角，沟槽或螺纹时可以保护密封环。

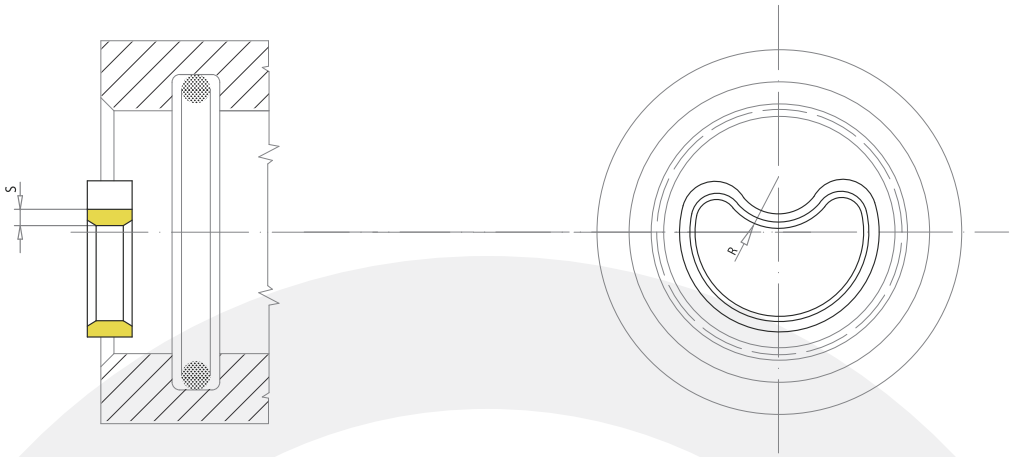
When insertion of the Slipper ring into the groove does not take place rapidly, a permanent increase in diameter may occur and this can be corrected using a calibration sleeve as indicated in the figure. This sleeve is useful to protect the Slipper ring when the assembly must pass over sharp corners, grooves or threads.

密封环

Slipper Rings

汽缸上的安装 <NC，NCS，NCR，NR，NR / C，NCS / R系列>

Installation on cylinder «NC, NCS, NCR, NR, NR/C, NCS / R SERIES»

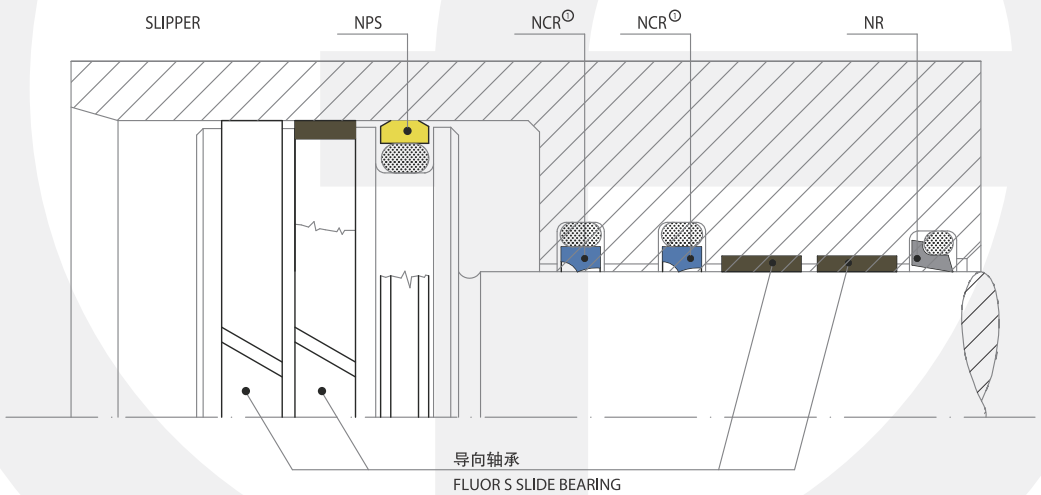


NC系列的密封环可以安装在直径不小于20–25mm的封闭的沟槽里。
如图所示，可以把密封环形成肾形进行安装。做为一个原则，要注意R的值不能少于S值的3–4倍。

The NC Slipper ring can be installed in a closed groove with diameter of not less than 20-25 mm.
Insertion is achieved by forming the Slipper ring into a kidney shape as shown in the figure. As a guide line, care should be taken to ensure that the value R does not fall more than 3-4 times below that of S.

使用示例

Example of usage



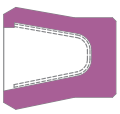
两个NCR 1的密封环连续安装在输出杆上这种方式已经在很多液压回路中证明是有利的，这样可以使液压产生的过压得到利用来加强在转换膜上的刮垢效果，随之可以显著降低对外的微漏损失。

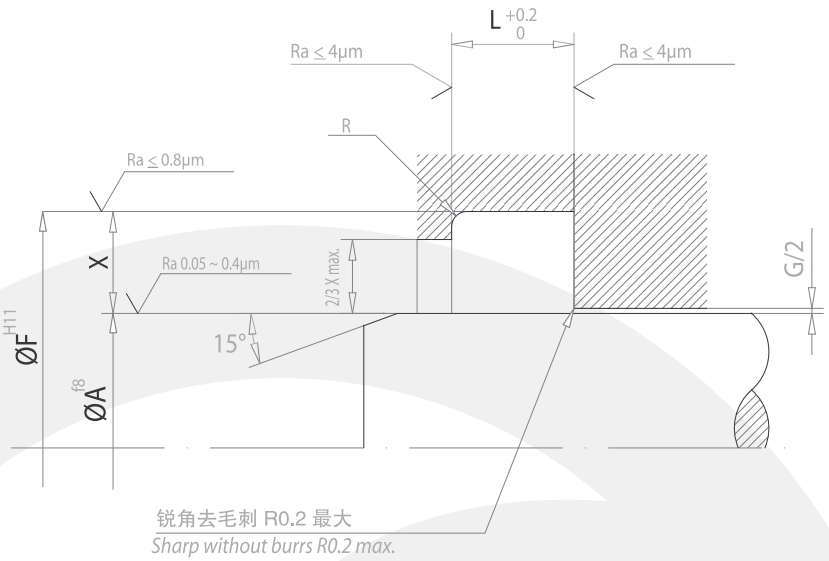
NCR 1 Two NCR Slipper rings positioned in series on an outgoing rod prove advantageous in many hydraulic circuits since this means that pockets of hydrodynamically generated overpressure can be exploited to accentuate the scraping effect on transfer film with a consequent marked reduction in microlosses towards the outside.

泛塞
Spring energized seals

汽缸上的安装
Installation on cylinder

泛塞
SPRING ENERGIZED SEAL





沟槽的尺寸
Groove dimensions

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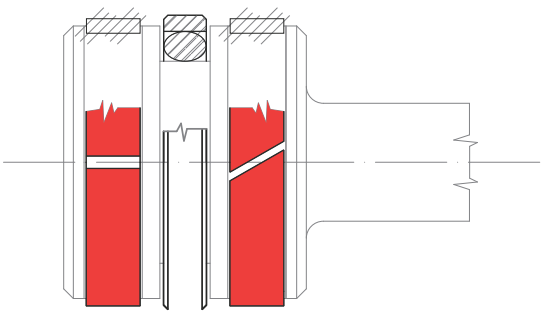
For Ø > 400 or special dimensions. contact our technical department

杆的尺寸 A^{f8} *ROD DIMENSION* A^{f8}	F	X	L	R	G		不锈钢弹簧 *STAINLESS STEEL SPRING*
泛塞 *SPRING ENERGIZED SEALS* 标准系列 *STANDARD SERIES*	沟槽直径 *GROOVE DIA* H11	沟槽深度 *GROOVE DEPTH*	沟槽宽度 *GROOVE WIDTH* +0.2 0	半径（除尖角） *RADIUS (BREAK CORNER)*	直径间隙 *DIAMETRAL CLEARANCE*		横截面 *CROSS SECTION*
					(0+200 bar)	(200+400 bar)	
4.0~9.9	A+2.9	1.45	2.4	0.4	0.40~0.60	0.16~0.10	1.2x1.3
10.0~19.9	A+4.5	2.25	3.6	0.4	0.50~0.30	0.20~0.14	1.9x2.0
20.0~39.9	A+6.2	3.1	4.8	0.6	0.70~0.40	0.30~0.16	2.8x2.8
40.0~119.9	A+9.4	4.7	7.1	0.8	1.00~0.50	0.40~0.20	4.5x4.5
120.0~400.9	A+12.2	6.1	9.5	0.8	1.20~0.60	0.50~0.24	6.5x6.0

FLUOR S 导向带
FLUORS Tapes

较准轴承导向带
CALIBRATED BEARING RING TAPES



介绍

PTFE 填充材料制成的 FLUOR-S 导向带已经成功应用于获得自润滑的活塞和连杆的轴承环，它通过避免金属与金属之间的动态摩擦而将磨损降到最小。

操作优势（自润滑的能力）

在润滑不规律或缺乏润滑的风动应用中，以及有油的动态应用，但是其中使用的一些流体由于性能的原因，在一些困难工作条件下不能保证持续润滑的情况下，FLUOR-S 导向带都能够在干摩擦的情况下良好运行。

适应性

FLUOR-S 导向带允许活塞/汽缸的联轴器有轻微的交迭，既是因为降低碰撞的必要性，也因为可以在偶尔发生尺寸和/或几何上的误差时，由于PTFE 填充材料具有较小的安装容量要求，而不产生任何抱牢，刻痕或阻塞的危险。

混合性

PTFE 填充材料对于流体中出现的研磨粒子都会反应较小，加上前面提到的它的自润滑的性能，因此对汽缸中的密封元件和导向带自身都有益处，从而使汽缸具有较长的使用寿命。

不粘滑

FLUOR-S 导向带尤其为不连续工作的设备，如液压汽缸的截止阀或电液压伺服系统等提供最佳的解决方案。这是因为 PTFE 具有低摩擦系数，完全不产生粘滑现象。

经济性

FLUOR-S 导向带由于它的经济性应用越来越广泛。从构造的角度看，沟槽简单，就可以使用不是由特殊铸铁或青铜制造的活塞。从安装的角度看，导向带可以直切或斜切并快速安装，因此可以在现场通过简单的切割操作，就可以加工出各种直径的轴承环，从而使机器或工厂停转的时间减小到了很短。

Introduction

The Fluor S calibrated tapes in filled PTFE (polytetrafluoroethylene) produced by us have been used successfully for obtaining self-lubricating piston and rod bearing rings which reduce wear to a minimum by avoiding kinetic metal-metal contact.

Operational advantages (self-lubricating capacity)

Both in pneumatic applications with irregular or total absence of lubrication and in oleodynamic applications when some of the fluids used are not capable of guaranteeing persistency of the lubrication channels under hard working conditions due to their characteristics, the Fluor S tapes can function correctly with dry friction.

Adaptability

The Fluor S tapes allow slightly overlapping piston/cylinder couplings, both because of the necessity for reducing play and because of accidental dimensional and/or geometric errors, without creating any danger of seizure, scoring or blocking thanks to the low adaptation capacity of filled PTFE.

Incorporating capacity

Filled PTFE reacts in a «soft» way to any eventual abrasive particles present in the fluids and this, together with the self-lubricating capacity already mentioned, gives long life to the original finishing of the cylinder surfaces with obvious benefit to the sealing organs and to the bearing rings themselves.

Absence of stick-slip

The Fluor S bearing ring offers the best solution, particularly with equipment working discontinuously such as stop valve cylinders of hydraulic or electrohydraulic servosystems. This is due to the low PTFE coefficient of friction and to total absence of stick-slip.

Economic advantages

Fluor S bearing ring tapes are being used more and more thanks to their interesting economic aspects. From the construction point of view, there is in fact the simplicity of

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the grooves and the possibility of using pistons not made of special cast iron or bronze. From the assembly point of view, the bearing ring is rapidly installed both with straight and angle cut and the machine or plant being stopped is reduced to very short periods since, using our calibrated tape, it is possible to prepare bearing rings of any diameter on the spot by means of very simple cutting operations.

制成FLUOR–S导向带的PTFE填充材料的特性

表1中列出了我们特制并经常使用的两种PTFE填充材料的平均特性：BM–57806和C–755。

Characteristics of filled ptfe for Fluor S calibrated tape

In Table 1 we have indicated the average characteristics of two types of filled PTFE produced with our particular formula and frequently used: BM-57806 and C-755.

特性 *CHARACTERISTICS*	标准 *STANDARDS*	单位 *UNIT*	BM-5 7806 *BM-57806*	C-755 *C-755*
成份 *Composition*	/	/	PTFE+铜粉+金属盐 *PTFE+bronze +metal salts*	PTFE+碳粉+石墨 *PTFE+carbon +graphite*
抗拉伸应力 *Resistance to tensile stress*	ASTM D 1457	Mpa	13	13
极限延伸率 *Ultimate elongation*	ASTM D 1457	%	200	100
24小时，14Mpa, 25℃条件下的变形 *Deform. under compress. of 14 Mpa at 25°C for 24 h*	ASTM D 621 修正版	%	6	4,8
24小时，14Mpa, 25℃条件下的永久残留变形 *Permanent residual deform. of 14 Mpa at 25°C for 24 h*	ASTM D 621 修正版	%	3	2,1
24小时，14Mpa, 260℃条件下的变形 *Deform. under compress. of 14 Mpa at 260°C for 24 h*	ASTM D 621 修正版	%	17	10,8
24小时，14Mpa, 260℃条件下的永久残留变形 *Permanent residual deform. of 14 Mpa at 260°C for 24 h*	ASTM D 621 修正版	%	8	7,1
1%松驰下的压缩应力 *Compression stress for 1% of relaxation*	ASTM D 695	Mpa	8,1	8,5
压缩下的弹性系数 *Coefficient of elasticity to compression*	ASTM D 695	Mpa	770	840
热膨胀系数 *Coefficient of thermal expansion*	ASTM D 696	$°C^{-1}$	$9{,}5 \cdot 10^{-5}$	$8{,}5 \cdot 10^{-5}$
热传导系数 *Coefficient of thermal conductivity*	ASTM D 177	$Wm^{-1} \cdot °C^{-1}$	0,46	0,58

Tabella 1 *Table 1*

还有其他特殊的PTFE填充材料可供选择用于生产FLUOR–S 导向带。我们的技术部门会根据高腐蚀介质，蒸汽，液体等，与钢，特殊铸铁，处理过的轻合金，青铜，陶瓷，表面镀锌，表面金属硬化等表面接触的使用情况下提供专业建议。

Other types of special formula filled PTFE are prepared for producing Fluor S bearing ring tapes. Our Technical Department will give advice on their use in the presence of highly agressive gases, vapours and solutions, with surfaces in steel or special cast iron, with treated light alloys, with bronze, with ceramics etc., and with galvanized hard-facings, metalization etc.

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使用条件

表面完成度

为获得较长的使用寿命和最好的功能，金属滑动表面的粗糙度必须保持在0.2~0.4 μ m范围内。

温度范围

通常FLUOR-S 导向带使用的温度范围为-100 ~ +250℃ 。

公差

除了 FLUOR-S 导向带的厚度和标准宽度公差，表2中还列出了构造轴承密封环(开发，切割宽度)和汽缸(直径，外壳)时关系到的一些数据。

润滑

润滑会提高FLUOR-S导向带的性能。速度在15 ~ 20m/min以下时，这种提高可以忽略不计。速度高于15 ~ 20m/min时，显著增大的液压支持决定了随之产生的磨损率的下降。

抗摩擦

FLUOR-S导向带的摩擦系数取决于很多不同的因素。在无润滑的条件下，中等负荷，速度为Ra 0.4 μ m运转时测试，摩擦系数为 0.10 ~ 0.15 。而在相似的摩擦条件下，带有38mm^2 · S^{-1}的润滑剂时，摩擦系数降为0.04 ~ 0.075

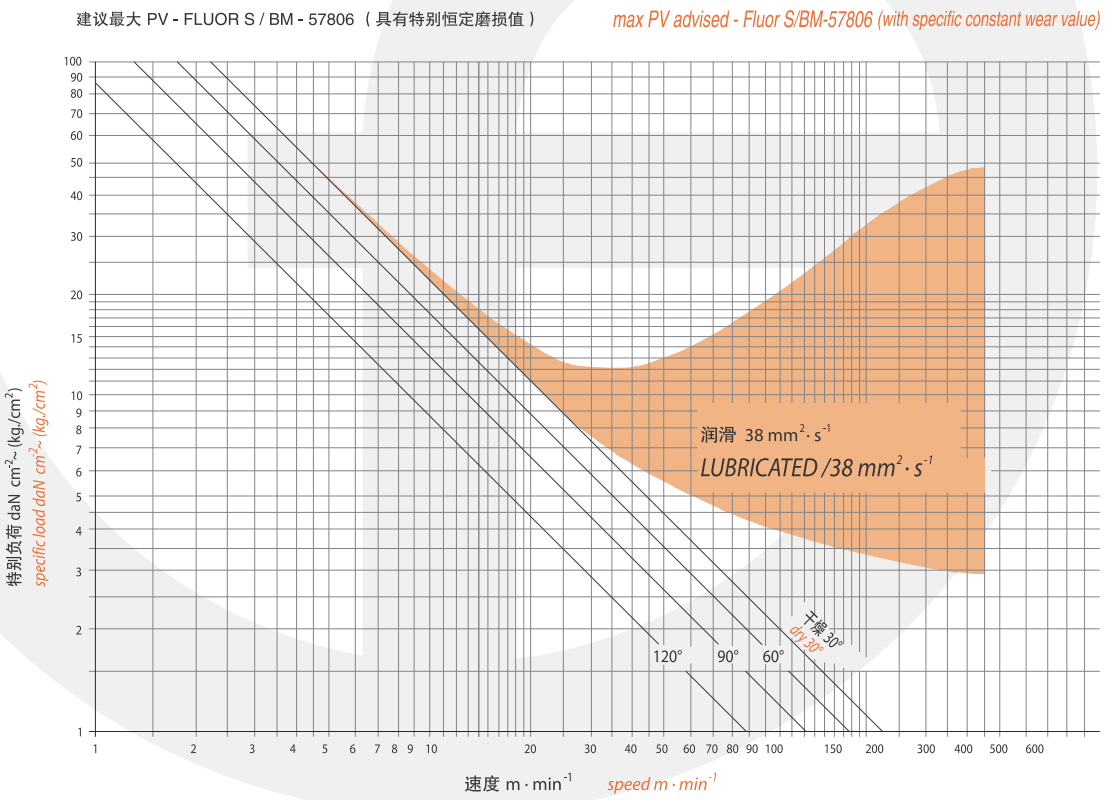
PV

图1 中给出了在一些特殊的持续磨损条件下，以及不同温度，无润滑或有润滑的条件下的PV最大值。

尺寸（垂直缸）

表2可以用来确定垂直缸或不使杆产生明显弯曲作用的汽缸所用FLUOR S导向带的尺寸。

图 1
FIGURE 1



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CONDITIONS OF USE

Degree of surface finishing

To obtain long life and best function, the metal sliding surface roughness must be kept within 0,2÷0,4 µm.

Utilization temperature

As a generai indication, the range of temperatures between -100 and + 250 °C is that for which Fluor S bearing ring tapes can be used.

Tolerances

Apart from the thickness and standard width tolerances or Fluor S bearing ring tapes, Table 2 also shows those to be respected during the construction stage for the bearing ring (development,cut width) and for the cylinder (diameter,housing).

Lubrication

Lubrication improves the Fluor S tape performance. This improvement is negligible for speed under 15÷20 m/min. For higher speeds,the noticeable build-up hydrodynamic support determines the consequent fall in the wearing rates.

Friction resistance

The coefficient of friction for Fluor S tapes depends on many different factors. Under dry conditions, with medium load and speed values, after running in on Ra 0,4 µm, a value of 0.10÷0,15 was obtained during testing, whereas under similar conditions of friction mixed with lubricant 38 $mm^2 \cdot S^{-1}$, the values lowered to 0,04÷0,075.

PV

In the diagram of figure 1 the max PV advised under conditions of specific constant wear are shown, with different temperatures, both dry and with lubrication.

Sizing (vertical cylinders)

Table 2 can be used for sizing the Fluor S bearing rings for cylinders functioning vertically or those which do not in any case cause notable bending moments on the rod.

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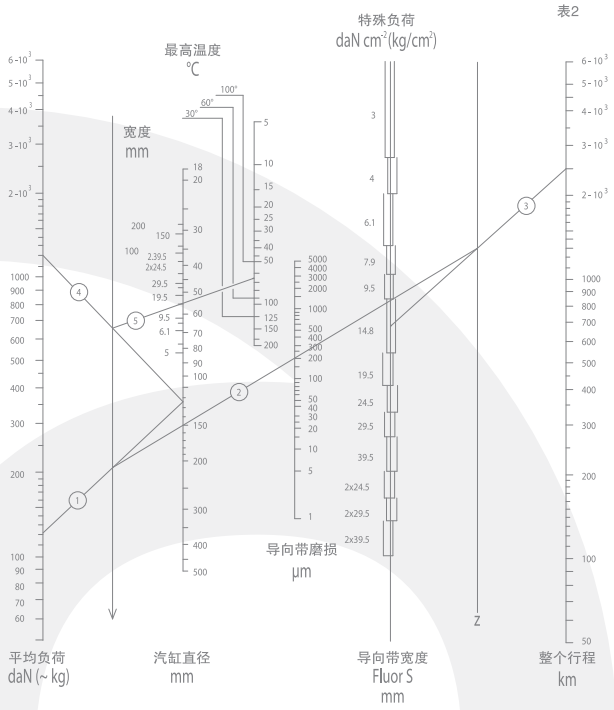
卧式汽缸

对于大部分都是卧式工作的重型汽缸，和/或在连杆上会产生弯曲作用的汽缸，与图2中的值近似时，可以根据下列例子来确定导向带的尺寸：

- 液压缸：ϕ125mm；$0.4\sqrt{160HRb}$
- 导向带上的平均径向负荷：120 daN
- 导向带上的最大负荷：1200 daN
- 要求使用寿命：5000小时
- 平均冲程：~ 1250mm
- 每小时冲程的平均数量：400
- 安装导向带运行5000小时后，允许的最大磨损：0.2mm
- 环境：50℃时液压油38mm^2·S^{-1}，最高温度40℃。

FLUOR-S导向带BM-57806的尺寸确认表
无润滑，0.2 HRc， 38~40号钢，
最高温度50℃



方法

1. 描绘出负荷直径的线路。
2. 磨损点1的Y形回路是对角的。
3. 完整的运转是确定的。

400冲程/小时・1.25m冲程・5000小时=2500 km。
从2500km的点连到点22描绘出来，直到找到FLUOR-S 导向带的宽度=14.8mm。
确认最大负荷（通常连杆完全伸出）时按如下进行：

4. 最大负荷直径的连线是对角的。
5. FLUOR-S 导向带的宽度–点4的Y形回路描绘出来，会标示出轴承密封环的最大特殊压力约为65 N/cm^2，温度允许最高达80℃。

温度因素：
- 60℃时，磨损会比图中标示出来的高25%。
- 90℃时，会高70%；120℃时会高150%。

Cr = 径向负荷，Kg（daN）
Cs = FLUOR-S导向带上的特殊负荷，
Kg/cm^2（daN·cm^{-2}）
* = FLUOR-S 导向带的数量
D = 连杆或汽缸的直径

FLUOR-S 导向带，BM57806 宽度确定的简单方法。

要确定安装在连杆上或汽缸里的导向带尺寸，可以应用下面的公式：

$$Z = \frac{Cr}{Cs \times 2^* \times D}$$

其中：
Z = FLUOR-S 导向带的宽度，cm

例如连杆的安装：
D 直径= 10 cm
Cr径向负荷 = 大约400Kg
平均速度 = 15米/分
从PV表中，可以确定速度为15米/分时，相应的特殊负荷为15Kg / cm^2，所以：

$$Z = \frac{400}{15 \times 2 \times 10} = 1{,}3 \text{ cm}$$

这说明是一个标准的宽度14.8 mm（图2）。

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Horizontal cylinders

For heavy cylinders which mostly function horizontally and/or which have bending moments induced on the rod, with fair approximation the nomograph in figure 2 can be used for sizing, according to the following example:

- *Hydraulic cylinder: Ø125 mm; $\sqrt[0,4]{}$160 HRb*
- *Average radial load on the bearing ring: 120 daN*
- *Max. load on the bearing ring: 1200 daN*
- *Required life: 5000 hours*
- *Average stroke: ~ 1250 mm*
- *Average number of strokes per hour: 400*
- *Max. wear allowed after running in, after 5000 hours: 0,2 mm*
- *Environment: hydraulic oil 38 mm²·S $^{-1}$ at 50°C; max. temp. 40°C*

Method

1. The Load-Diameter connection is traced
2. The Wear-Point 1Y loop is subtended
3. The overall run is determined:
400 strokes/hour .1.25 m stroke .5000 hours = 2500 km. From point 2500 km the connection with point 22 is traced until the Fluor S tape width is found = 14.8mm.

To check with maximum load (usually with the rod «completely out») proceed as follows:
4. The max. Load-Diameter connection is subtended.
5. The Fluor S Width-Point 4Y loop is traced which will indicate a maximum specific pressure on the bearing ring of about 65 N/cm2 allowable up to 80°C.
Corrective temp. factors:

- *at 60°C the wear will be 25%more than that indicated*
- *at 90°C 70% and at 120°C 150%.*

Simply Fluor S tapes width sizing BM-57806.

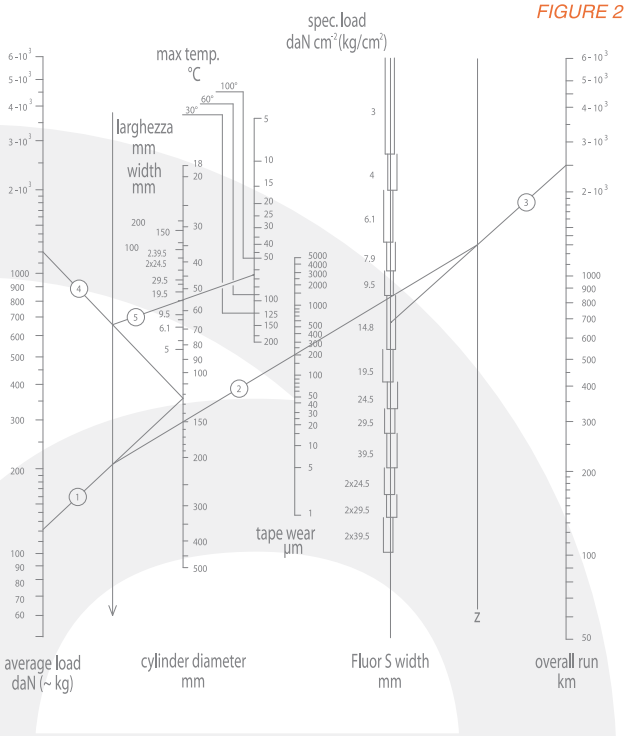
To size a Fluor S tape to be assembled onto rod or into cylinder the following formula can be applied :

$$Z = \frac{Cr}{Cs \times 2^{*} \times D}$$

Where :
Z = Fluor S tape width in cm
Cr = radial load Kg abt. (daN)

nomograph for sizing Fluor S tapes Filled PTFE BM-57806 dry on 0,2 HRc 38÷40 steel max. temp. 50°C

FIGURE 2



Cs = specific load on Fluor S tape development in Kg/cm² abt. (daN · cm^{-2})
** = number of Fluor S tapes*
D = rod or cylinder diameter
Example for rod assembling :

Diameter = 10 cm
Radial load = abt. 400 Kg
Average speed = 15 m/min.
From max suggested PV diagram it can be verified that for a speed of 15 m/min. corresponds a specific load of 15 Kg/cm² so:

$$Z = \frac{400}{15 \times 2 \times 10} = 1,3 \text{ cm}$$

That means a standard width of 14,8 mm (figure 2).

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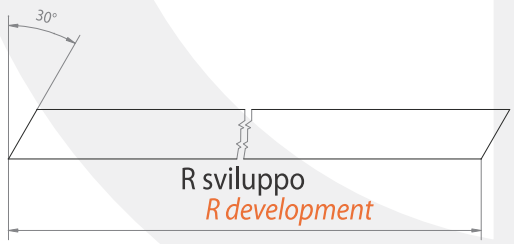
项目 Ref.	Ø D	Ø B	S	L 外壳 L housing	G	Z	Ø F	R 发展 R development	标准 FLUOR–S 导向带宽度 Standard Fluor S tape width*
公差 Tole-rances	H8到H10 From H8 to H10	j8 到 h8 From j8 to h8	+0 -0.05		最大 0.4 S	对应 Conse-quentaly	j8到H8 From j8 to H8	+0 -0.3%	h12
FS18	18-30	A-2S	1.5	3.2	主要依据所用垫圈的类型和操作条件来选择 Chosen mainly in relation to the type of gasket used and to the operating conditions	1	D + 2S	M (D+S)-Z	3
FS30	30-50			4.2		1.5			4
FS50	50-80			6.3		2			6.1
FS80	80-120			8.1		2.5			7.9
FS120	120-150		2.5	9.7		3.5			9.5
FS150	150-200			12.7		4			12.5
FS200	200-250			15		4.5			14.8
FS250	250-315			20		5.5			19.5
FS315	315-400			25		6.5			24.5
FS400	400-500			30		8			29.5

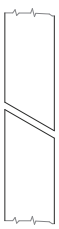
表2指图A和图B
TABLE 2 referred to dwg A and B.

*可以根据特殊需求提供各种不同的宽度。
** Different widths can be supplied on request for specific applications.*



图A：切下的FLUOR–S导向带，以获得正确的长度。
cut layout of FLUOR S tape to obtain right length

图A：
DWG. «A»



斜切用于线性运动。
angle cut for linear motions

直切用于旋转运动。
straight cut for rotary actions

阶梯式切割用于特殊应用。
step cut for special applications

图B：
DWG. «B»

FLUOR S 导向带
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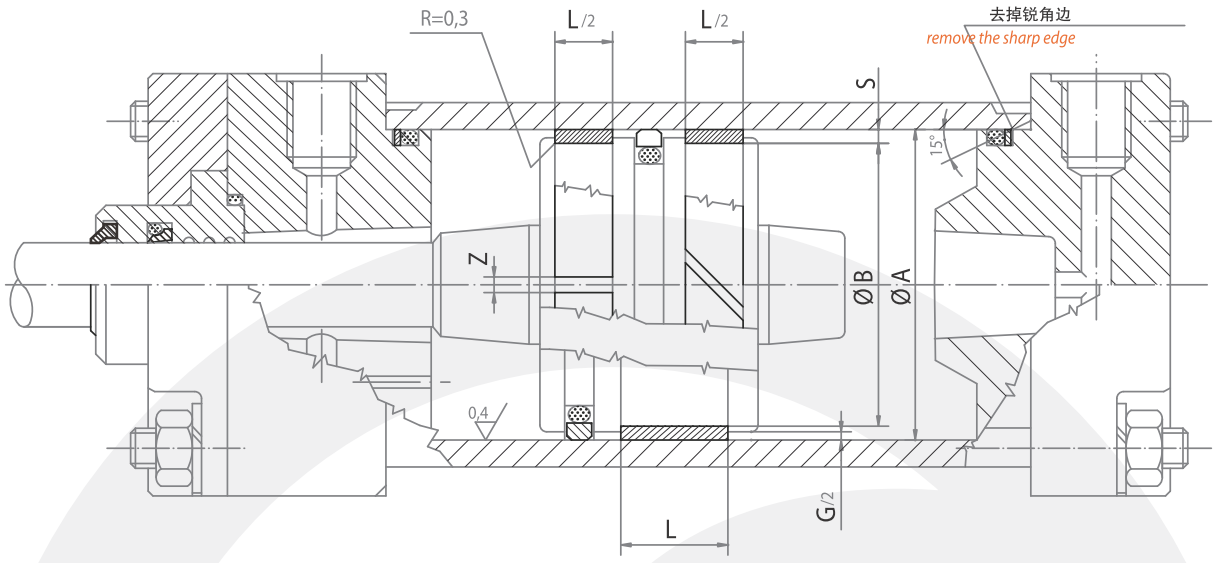
双效应用在汽缸上

Application on cylinders with double effect

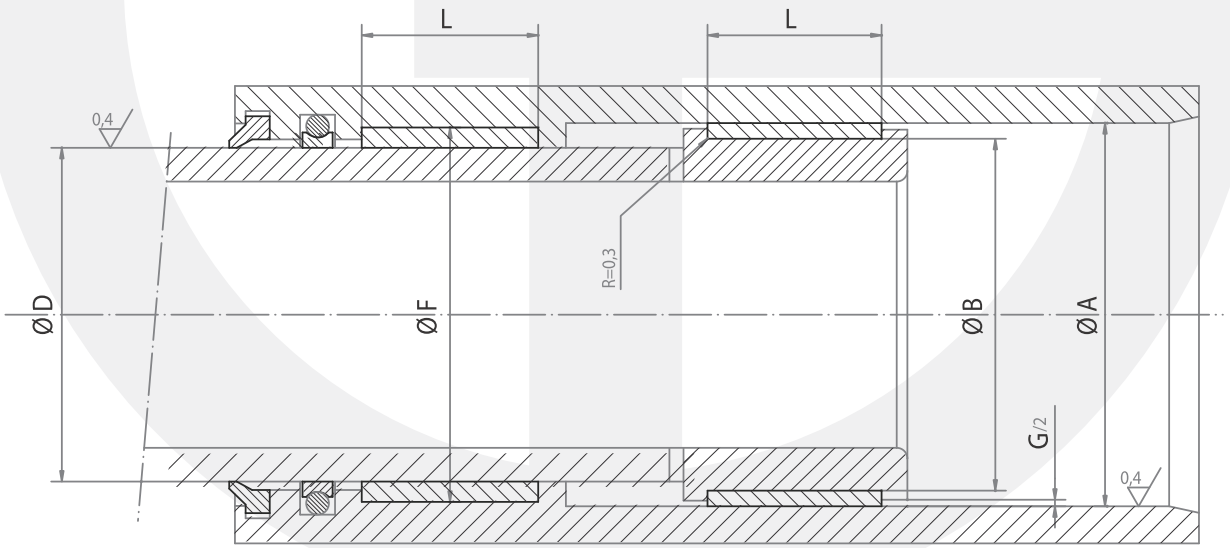


图A：

DWG. «A»

应用在柱塞和伸缩式汽缸上

Application on plunger and telescopic cylinders



图B：

DWG. «B»

FLUOR SC 导轨软带
FLUOR SC Tapes

可粘贴的较准轴承带

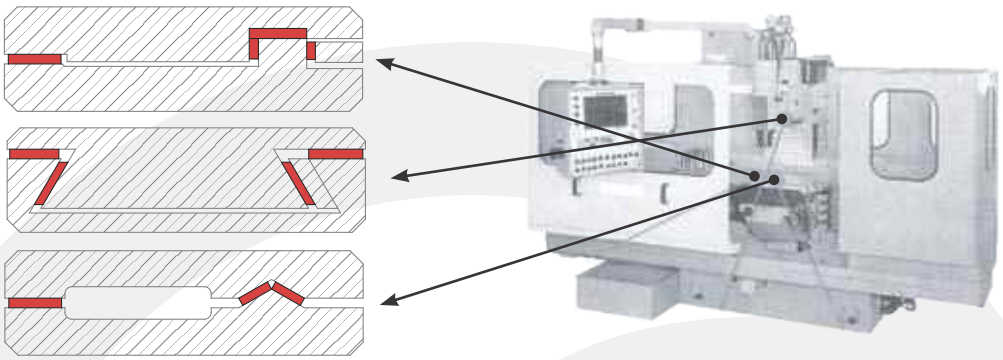
CEMENTABLE CALIBRATED BEARING TAPES

介绍

我们生产的FLUOR-SC导轨软带，用 PTFE（聚四氟乙烯）添加青铜粉和薄片状的金属氧化物制成，经过恰当的处理，可以用胶水粘贴到金属的表面，早已成功应用于获取自润滑的轴承带上。

Introduction

The Fluor SC calibrated tapes we produce in PTFE (polytetrafluoroethylene) with additives of bronze and metal oxides with laminar structure, suitably treated far being glued to metal, have been used successfully for some time for obtaining self-lubricating bearing tapes.



操作优势

FLUOR-SC导轨软带由于其具有很小的摩擦性以及以下优点，因此做为滑动轴承广泛应用于机器工具领域。

- 表面经过处理后，可以通过适当的粘合剂很容易的进行粘贴。
- 具有最佳并保持不变的摩擦系数，从而保持平滑的运动及精确并可重复的定位。
- 无论有或没有润滑，甚至在特殊负荷变化的情况下，磨损都最小。
- 可以自润滑，因此不需要维护。
- 具有较高的静态和动态特殊负荷容量。
- 即使在没有充分互补的几何体中，也可以进行线性负荷分布。
- 可以在联轴器上预加负荷，以消除摇动。
- 抗振动应力和抗明显的衰减容量。
- 当出现研磨污染介质时，导轨软带会使其成球状进而起到保护作用。
- 与所有机器工具使用的润滑和冷却流体都兼容。

Operational advantages

The Fluor SC bearing tapes have found wide utilization in the machine tool field as sliding bearings with razing friction tanks to the following advantages:

- *They can easily be glued on with suitable adhesives after surface preparation*
- *Optimum and constant coefficient of friction with consequent smooth movements and precise and repeatable positioning*
- *Minimum wear, with or without lubrication, even with variation of the specific load*
- *Self-lubricating, therefore do not require main tenance*
- *High static and kinetic specific load capacity*
- *Linear load distribution even between geometries which are not perfectly complementary*
- *Possibility of preloading the couplings for elimination of play*
- *Resistance to vibratory stresses and perceptible capacity far damping*
- *Protection of the bearing tape in the presence of abrasive contaminating agents which are conglobated by the tape*
- *Compatible with all the lubricating and cooling fluids used with machine tools*

在没有或润滑减少的特殊情况下工作时：

- 较高的精确度让流体宽度不发生变化，或者在轴承带上“飘浮”一样的滑动。
- 由于轴承带上的研磨粉的作用，污垢会消失。

In particular, working without or with reduced lubrication:

- *A higher degree of precision causes elimination of the variations in width of the fluid channel, or rather the «floating» of the slide on the bearing tape*
- *Elimination of dirt due to adhesion of abrasive powders on the bearing tape*

FLUOR SC 导轨软带
FLUOR SC Tapes

生产FLUOR-SC 导轨软带的PTFE填充材料的特性

表1中列出了我们特制并经常使用的两种PTFE填充材料的平均特性：BM–57806和C–755。

Characteristics of filled ptfe for Fluor SC calibrated tape

In Table 1 we have indicated the average characteristics of two types of filled PTFE produced with our particular formula and frequently used: BM-57806 and C-755.

特性 *CHARACTERISTICS*	标准 *STANDARDS*	单位 *UNIT*	BM-57806	C-755
成份 *Composition*	/	/	PTFE+青铜 +金属盐 *PTFE+bronz +metal salts.*	PTFE+碳粉 +石墨 *PTFE+carbon +graphite*
抗拉伸应力 *Resistance to tensile stress*	ASTM D 1457	Mpa	13	13
极限延伸率 *Ultimate elongation*	ASTM D 1457	%	200	100
24小时，14Mpa, 25℃条件下的变形 *Deform. under compress. of 14 Mpa at 25°C for 24 h*	ASTM D 621 Mod.	%	6	4,8
24小时，14Mpa, 25℃条件下的永久残留变形 *Permanent Residual deform. of 14 Mpa at 25°C for 24 h*	ASTM D 621 Mod.	%	3	2,1
24小时，14Mpa, 260℃条件下的变形 *Deform. under compress. of 14 Mpa at 260°C for 24 h*	ASTM D 621 Mod.	%	17	10,8
24小时，14Mpa, 260℃条件下的永久残留变形 *Permanent Residual deform. of 14 Mpa at 260°C for 24 h*	ASTM D 621 Mod.	%	8	7,1
1%松驰下的压缩应力 *Compression stress for 1% of relaxatio*	ASTM D 695	Mpa	8,1	8,5
压缩下的弹性系数 *Coefficient of elasticity to compression*	ASTM D 695	Mpa	770	840
热膨胀系数 *Coefficient of thermal expansion*	ASTM D 696	$°C^{-1}$	$9{,}5 \cdot 10^{-5}$	$8{,}5 \cdot 10^{-5}$
热传导系数 *Coefficient of thermal conductivity*	ASTM D 177	$Wm^{-1} \cdot °C^{-1}$	0,46	0,58

表 1 *Table 1*

其他类型特殊用途的PTFE填充材料可根据需要提供。

Other types of filled PTFE for special uses can be supplied on request.

FLUOR SC 导轨软带
FLUOR SC Tapes

使用条件

Conditions of use

压力下的变形

图1中的曲线表示FLUOR-SC 导轨软带BM-57806厚度为1.5mm和2.5mm，在压力下的变形。

Deformation under compression

In figure 1 the curves relative to crushing the Fluor SC tape BM-57806 under compression for thicknesses 1,5 and 2,5 mm are shown.

FLUOR-SC 导轨软带BM-57806在24小时负荷压力下的弹性变形

elastoplastic deformation under compression of Fluor SC/BM-57806 calibrated tapes after 24 hours under load

温度：23℃

导轨软带用FCB150胶粘贴到轴承垫上

temperature 23°C
tape glued on to bearing pad with FCB 150 adhesive

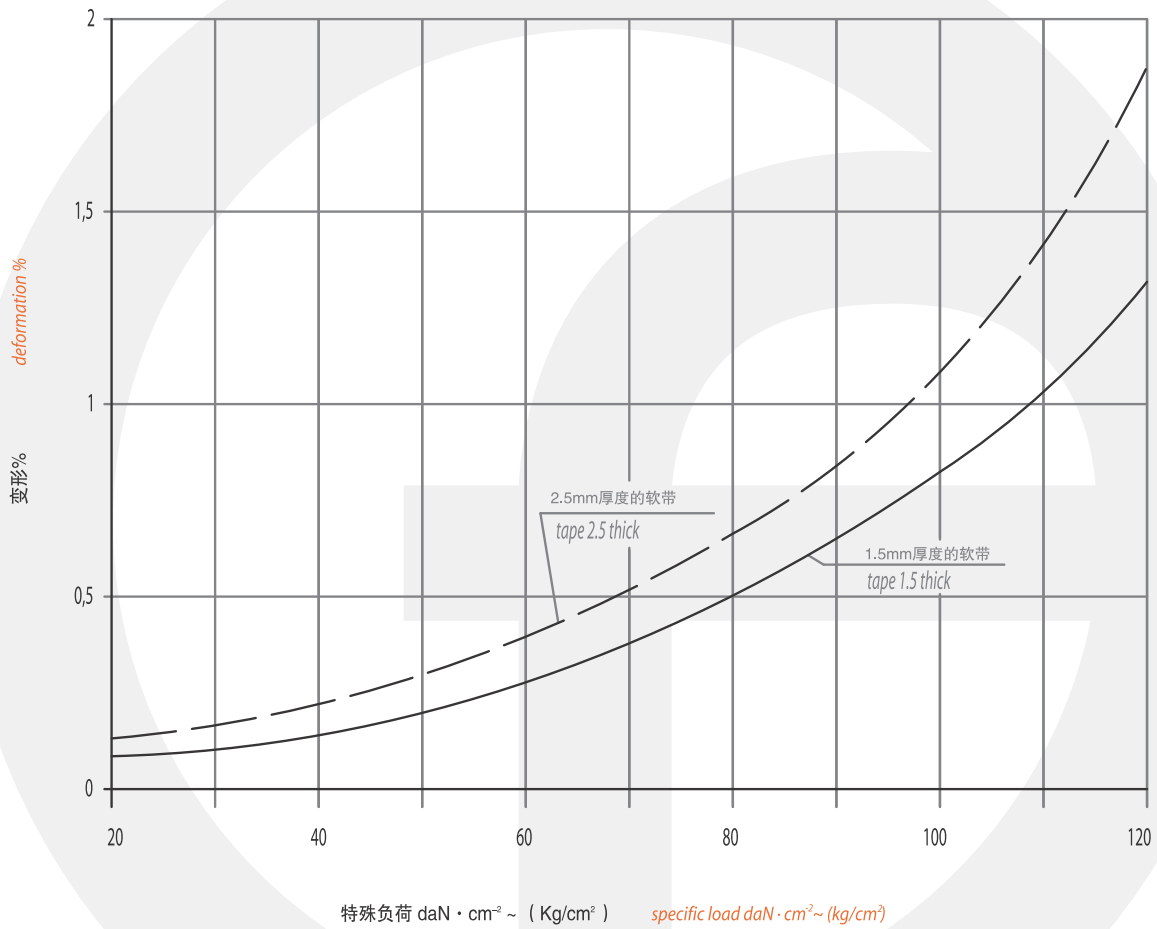


图1

Figure 1

FLUOR SC 导轨软带
FLUOR SC Tapes

摩擦

从图2可以看出，当速度接近于0时，摩擦系数事实上是保持不变的，这证明在FLUOR–SC导轨软带和接触表面之间不会产生粘滑现象。

摩擦系数不会太低有助于使运动平滑，这点可以在流体静力系统或球形循环系统中看到。

这些摩擦特性在数控运动中做为轴承带时尤其重要。

恒定且较低的摩擦减轻了机电或电液装置中预设的应力，减少再生的次数接近水平，同时提高再现性。

由于存在不是非常低的摩擦系数，以及不产生粘滑现象，导致运动惯性的衰减可以保证高确定性的解决方案，一个非常重要的事实就是在二维或三维曲线中可以产生持续的点。

Friction

From the diagram in figure 2 it can be seen that for speeds nearing zero the coefficient of friction remains practically constant which confirms the absence of stick-slip effects between the Fluor SC and the countersurface.

The coefficient of friction not being excessively low helps to make the movements smooth as can be seen in the fluid-static or balls circulation systems.

These friction characteristics are particularly important in bearing tapes for movements under numerical control.

The low and constant friction relieves the stresses in the electromechanical or electrohydraulic devices preset far activation and it reduces the regeneration times near level and improves reproducibility of this.

Damping of motion inertia due to the presence of a coefficient of friction which is not excessively low and the absence of stick-slip permit high definite solution. a fact of particular importance in the generation for successive points of bi or tridimensional curves.

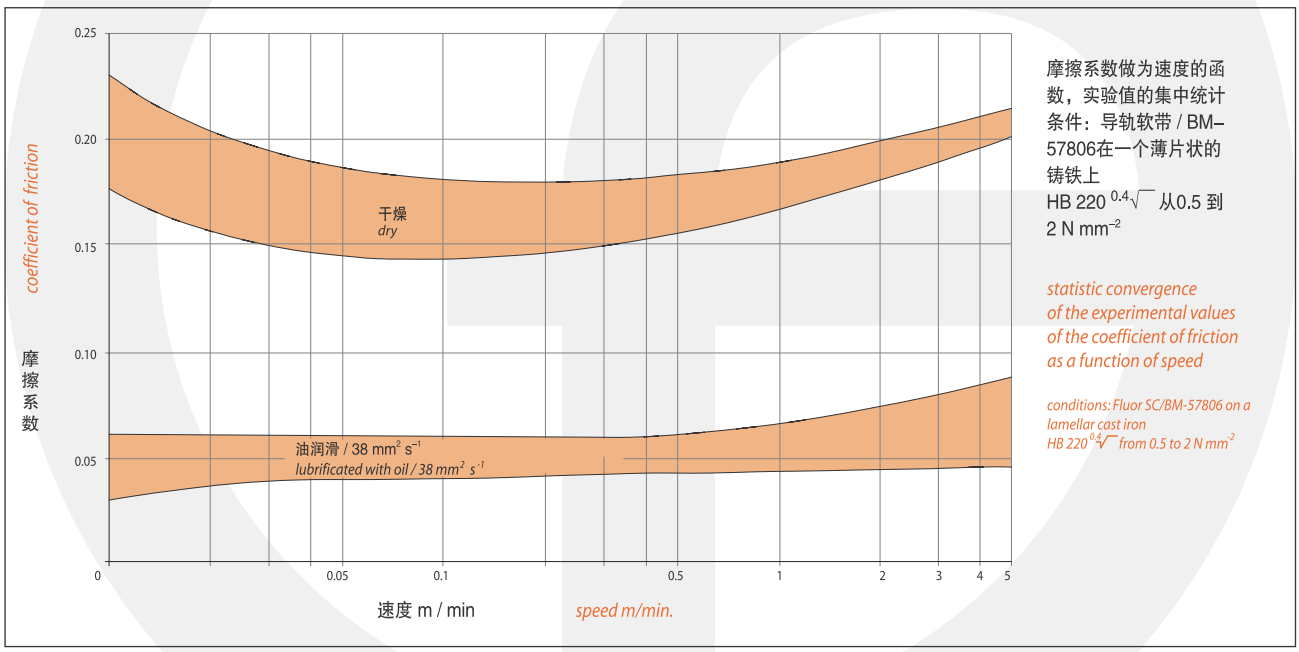


图2

Figure 2

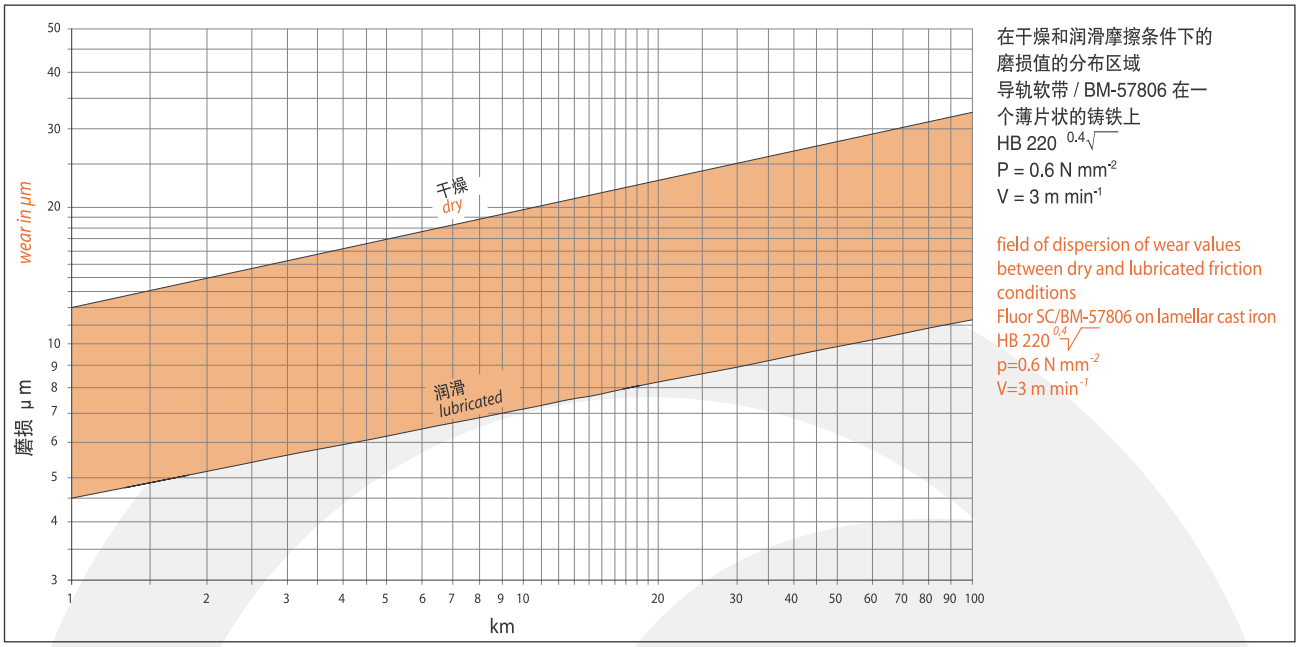
FLUOR SC 导轨软带
FLUOR SC Tapes

摩擦

图3中的曲线显示的是滑动产生的磨损值的分布区域.

Wear

Figure 3 gives the graph which shows the field of dispersion of the wear values from sliding.



在干燥和润滑摩擦条件下的
磨损值的分布区域
导轨软带 / BM-57806 在一
个薄片状的铸铁上
HB 220 $\sqrt[0.4]{}$
P = 0.6 N mm^{-2}
V = 3 m min^{-1}

field of dispersion of wear values
between dry and lubricated friction
conditions
Fluor SC/BM-57806 on lamellar cast iron
HB 220 $\sqrt[0.4]{}$
p=0.6 N mm^{-2}
V=3 m min^{-1}

图 3 Figure 3

PV

图4中的图表指出了在特殊恒定磨损的条件下，不同温度，以及干燥和润滑条件下的建议最大PV值。

PV

In the diagram in figure 4 the max. PV advised are indicated for conditions of specific constant wear, at different temperatures and both dry and with lubrication.

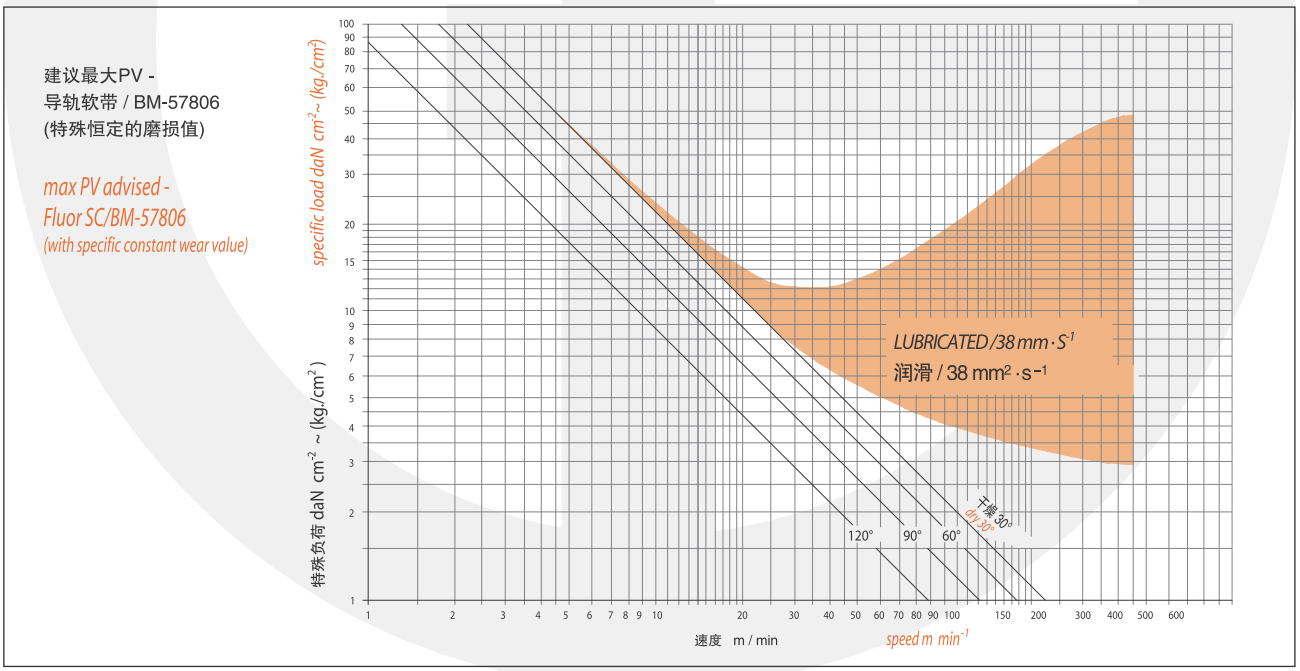


图 4 Figure 4

FLUOR SC 导轨软带
FLUOR SC Tapes

安装

介绍

导轨软带通过使用适当的粘合剂，可以很容易的粘贴到任何适当的准备好的表面，而且跟传统的机械固定系统比较具有显著的经济性。最重要的是这种材料经过粘合剂固定后耐压性得到提高。

表面准备

表面不能有超过12 μ m的粗糙度，不能有氧化和油脂。氧化痕迹可用喷砂或砂纸处理，也可以用脱脂溶液，如三氯乙烷（陶氏化学公司），三氯乙烯，全氯乙烯，或丙酮。

脱脂可用一块衬垫浸泡溶剂后，去除表面先前机械酸洗处理后残留的粉末。

对于已经使用过了的铸铁轴承圈，因为注过油，表面必须用火处理，使残余碳化，然后再用溶剂清洗。

不建议使用压缩气体来加速轴承圈表面溶剂的蒸发，因为气体经常会被润滑油污染。

清洗后，注意不要用手去触摸轴承圈的表面。

有必要在干燥的环境中进行工作，以避免在轴承圈的表面形成浓缩的膜，这可能会影响粘贴的效果。这个风险在冬天更大。

如果有必要，可以先对轴承软带进行预热。

导轨软带的准备

如果有必要，软带需要粘合的表面（即处理过的一面使其易于粘贴，表面有花纹，颜色较深）可以进行脱脂处理，最好用丙酮，操作时与轴承圈的注意事项相同。

粘合剂

通常使用双成份的环氧基粘合剂来粘合 FLUOR-SC 轴承软带。

我们建议使用FCB 130粘合剂，和相应的FI 130硬化剂。

可选形状

FLUOR-SC导轨软带厚度为1.5 mm（特殊用途使用2.5 mm），公差为 +/– 0.1 mm，宽度为 20 – 30 – 40 – 50 – 60 – 80 – 100 – 120 mm。特殊尺寸可根据需求提供。FLUOR-SC导轨软带粘贴的表面即使已经颜色较深，还标有花纹，使其更易于识别。

INSTALLATION

Introduction

The Fluor SC can be glued without difficulty to any suitably prepared surface using an appropriate adhesive and is noticeably economical compared with traditional mechanical fixing systems. Resistance to compression of the material is above all improved with fixing by means of adhesive.

Surface preparation

The surface, which must not have a raughness of over 12μm, must be absolutely free of traces of oxidation and grease. The traces of oxidation are removed by sand blasting or sand papering, whereas for degreasing solvents such as chlorothene NU (Dow Chemical Corp.), trichloraethylene, perchloraethylene or acetane can be used.
Degreasing is done with a pad soaked with solvent to remove the powdery remains of the previous mechanical pickling treatment.
For cast iron bearing rings which have already been used and which are therefore impregnated with oil, the surface must be treated with a naked flame to carbonize any residue and then be washed with solvent.
The use of compressed air is not advised to speed up evaporation of the solvent from the bearing ring surface because the air is often polluted with traces of lubricating oil.
After washing, be careful not to touch the bearing ring surface with your hands.
It is necessary to work in a dry environment so as to avoid the formation of a film of condensation on the surface of the bearing rings, which might jeopardise the adhesive result. This risk is greater in winter.
If necessary, preheat the bearing tapes.

Preparation of the Fluor SC tape

If necessary, the cementable surface of the tape (i.e.the one treated to make it sensitive to adhesives, marked with embossings and of a darker colour) can be degreased, preferably with acetane, and handled with the same attention as the bearing rings.

Adhesive

A double component epoxy based adhesive is usually used far glueing the Fluor SC bearing tapes.
We advise the use of FCB 130 adhesive and the relative FI 130 hardener.

Shapes available

The Fluor SC tape is produced in a thickness of 1,5 mm (2.5mm in special cases) with a tolerance of ±0.1 and 20-30-40-50-60-80-100-120 mm widths. Special dimensions are available on request. The Fluor SC tape cementable surface is marked with embossings to make it more easily identifiable, even if it is already darker in colour.

怎样订购 How to order

密封圈 Slipper Rings

NP, NC, NPS, NCS, NPR, NCR, NR, NR/C

NPS	80	I	BM	NBR
NPS	80	I	BM	NBR

- NBR — O型圈材料 O-Ring MATERIAL
- BM — 密封圈材料 SLIPPER MATERIAL
- I — 槽* NOTCHES *
- 80 — 孔的直径 BORE DIAMETER
- NPS — 类型：双效密封外形 TYPE: DOUBLE ACTING SEAL PROFILE

NPS/R, NCS/R

NPS/R	80	4,2	I	BM	NBR
NPS/R	80	4,2	I	BM	NBR

- NBR — O型圈材料 O-Ring MATERIAL
- BM — 密封圈材料 SLIPPER MATERIAL
- I — 槽* NOTCHES *
- 4,2 — 孔的宽度 BORE WIDTH
- 80 — 孔的直径 BORE DIAMETER
- NPS/R — 类型：双效密封外形 TYPE: DOUBLE ACTING SEAL PROFILE

槽*

根据需要，径向轴的锥形槽可以在密封圈一侧提供，这可以在订单中说明。槽的目的是为了在压力方向倒置后，缩短密封圈的安装瞬时现象。槽也可以防止压力下的一侧由于机械运动产生的粘滑现象。

NOTCHES

On request, conoidal notches with radial axis can be supplied on the sides of the Slipper rings, which can be coded in the order reference. The purpose of the notches is to shorten the settling transients of the Slipper ring after inversion of the direction of pressure. The notches also prevent «sticking» which can occur due to mechanical action on the side under pressure. Normally realizes for diameter >30mm.

泛塞 Spring energized seals

泛塞	80	安装在活塞上	I	CrO	301
SPRING ENERGIZED SEALS	80	INSTALLATION ON PISTON	I	CrO	301

- 301 — O型圈材料 O-Ring MATERIAL
- CrO — 密封材料 SEAL MATERIAL
- I — 槽* NOTCHES*
- INSTALLATION ON PISTON — 组装活塞 ASSEMBLY POSITION
- 80 — 孔的直径 BORE DIAMETER
- SPRING ENERGIZED SEALS — 类型：泛塞 TYPE: S PRINGENERGIZEDSEAL

槽*

根据需要，径向轴的锥形槽可以在泛塞基础上提供，这可以在订单中说明。槽的目的是为了在压力方向倒置后，缩短泛塞的安装瞬时现象。槽也可以防止压力下的一侧由于机械运动产生的粘滑现象。通常可实现直径 > 30mm。

**NOTCHES*

On request, conoidal notches with radial axis can be supplied on the base of the Spring energized seals, which can be coded in the order reference. The purpose of the notches is to shorten the settling transients of the energized seal after inversion of the direction of pressure. The notches also prevent «sticking» which can occur due to mechanical action on the side under pressure. Normally realizes for diameter >30mm.

FLUOR S导向带–FLUOR SC导轨软带 FLUOR S - FLUOR SC Tapes

FLUOR S	9,5	2,5	BM
FLUOR S	9,5	2,5	BM

- BM — 带子材料 TAPE MATERIAL
- 2,5 — 带子厚度 TAPE THICKNESS
- 9,5 — 带子宽度 TAPE WIDTH
- FLUOR S — 类型：非粘合的 TAPE TYPE: NOT CEMENTABLE

产品

FLUORTEN公司根据客户需求开发了一系列标准的和特殊的产品。包括：

- PTFE 和RULON® 的成品和半成品。
- 用氟化聚合物(FEP，PFA，PVDF，PCTFE等)或高科技产品（VICTREX® PEEK™，聚亚氨酯，聚碳酸酯，PPS等）注塑模压生产的机械部件。
- 模具的设计与加工。
- 油压和风动部件使用的密封圈和FLUOR-S导向带，FLUOR-SC导轨软带。
- PTFE，PEEK™和HPP制成的泛塞和压缩机密封。
- PTFE，FEP，PFA，PVDF，PEEK™等制成的阀座和组件。
- 杜邦™ VESPEL® - 意大利正式的经销商。

VESPEL® 是杜邦公司的注册商标
RULON® 是圣戈班高能塑料公司的注册商标

The products

FLUORTEN develops a range of standard and specific products requested by the customer. These include:

- *Semifinished and finished products in PTFE and Rulon®*
- *Injection moulding of technical parts in fluorinated (FEP, PFA, PVDF, PCTFE etc.) and in technopolymers of high technological contents (VICTREX® PEEKTM, Polyurethane, Polycarbonate, PPS etc.)*
- *Moulds designing and manufacturing*
- *Slipper rings and FLUOR-S/SC tapes for hydraulic and pneumatic applications*
- *Spring energized seals and compressor seals in PTFE, PEEK™ and HPP*
  Valve seats and components in PTFE, FEP, PFA, PVDF, PEEK™ etc.
- *DuPont™ Vespel® - Official Italian distributor*

RULON® is a registered trade mark of Saint-Gobain Performance Plastics

ISO 9001:2000 - CERTIFICATE N. 21

ISO 14001:2004 - CERTIFICATE N. 27

fluorten® s.r.l.
PTFE and Technopolymers manufacturing

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