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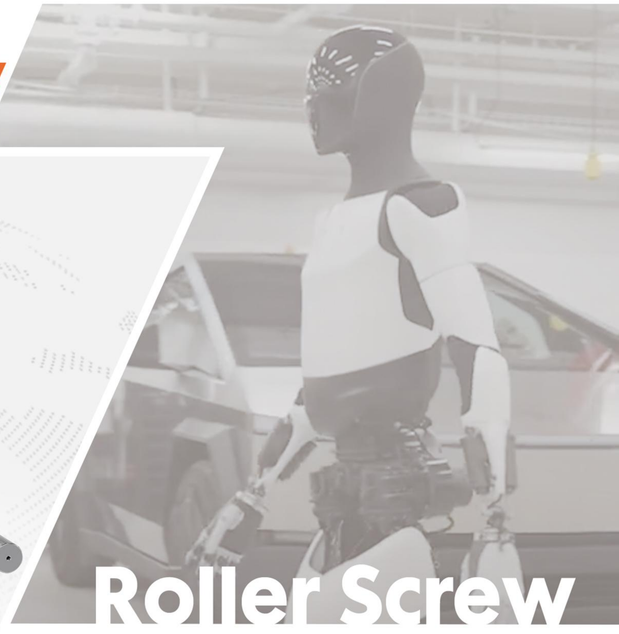

Roller Screw

PLANETARY ROLLER SCREW

行星滚柱丝杠

上海狄兹精密机械有限公司
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关于我们 / About Us

上海狄兹精密机械有限公司成立于2008年，是国内领先的直线模组滑台制造商，拥有1.8万㎡生产基地和200余名员工。公司荣获国家级高新技术企业及专精特新小巨人称号，并通过ISO9001/14001认证，持有80余项专利和2项软著。

KGG产品广泛应用于3C电子、半导体、新能源、医疗、汽车及航空航天等领域。

未来，我们将持续加大研发，以创新技术和“诚信、共赢”理念为客户提供优质解决方案。

Established in 2008, Shanghai Dizi Precision Machinery Co., Ltd. is a leading manufacturer of linear actuators in China, with 18,000 square meters of production base and more than 200 employees. We have passed ISO9001/14001 management system certification and hold more than 80 patents.

KGG products are widely used in 3C electronics, semiconductor, new energy, medical, automotive and aerospace fields.

In the future, we will continue to increase R&D and provide quality solutions to our customers with innovative technology, integrity and excellent service capabilities.

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专利数量
Number Of Patents

10+
多年行业项目经验
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实力厂家 / Factory

自动化解决方案供应商
Automation Solution Provider

生产车间 / Workshop

先进设备 6S管理体系
Advanced Equipment&6S Management System

市场开拓 / Market development

KGG产品销往美国、德国、日本、韩国、俄罗斯、意大利、土耳其
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KGG products are sold to the United States, Germany, Japan, Korea,Russia, Italy,
Turkey, Singapore, India and other countries and regions.

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ISO9001 Quality Management System

ISO14001环境管理体系认证
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National Specialized, Refined, Unique and New Little Giant Enterprise

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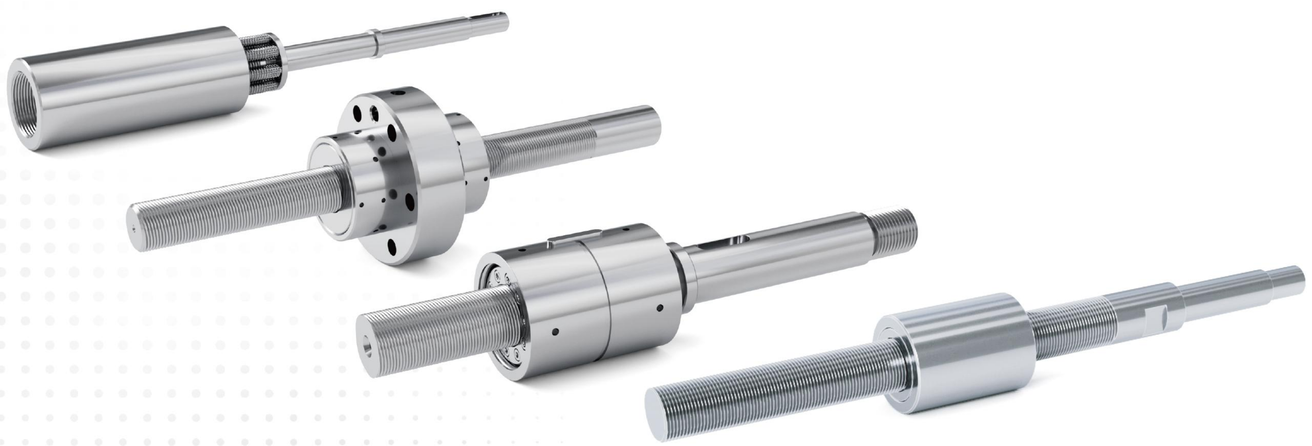


www.kggfa.com KGG Planetary Roller Screws

公称型号 Nominal Model

RS R 26 10 S - 350 R 480 G1 - 0
1 2 3 4 5 6 7 8 9 10

1 KGG型号
RS:标准式行星滚柱丝杠
RSI:反转式行星滚柱丝杠
RSD:差动式行星滚柱丝杠
RSC:循环式行星滚柱丝杠
RSH:重载行星滚柱丝杠

1 KGG Model
RS:Planetary Roller Screws
RSI:Inverted Planetary Roller Screws
RSD:Differential Planetary Roller Screws
RSC:Cyclic Planetary Roller Screws
RSH:Heavy Load Planetary Roller Screws

2 螺母形式
R=圆柱螺母设计
S=螺母单侧法兰设计
M=螺母中间法兰设计
F=非标螺母设计

2 Nut Form
R=Cylindrical Nut Design
S=Nut Single Side Flange Design
M=Nut Center Flange Design
F=Non-standard Nut Design

3 丝杆直径(mm)

3 Screw Diameter(mm)

4 导程(mm)

4 Lead (mm)

5 螺母类型
S=单螺母
D=双螺母
P=预紧螺母
I=内部预紧螺母

5 Nut Type
S=Single Nut
D=Double Nut
P=Prestressing Nut
I=Internal Preload Nut

6 螺纹长度(mm)

6 Thread Length (mm)

7 螺纹方向(mm)
R=右旋
L=左旋
B=右旋+左旋

7 Thread Direction(mm)
R=Right
L=Left
B=Right+Left

8 丝杠总长(mm)

8 Total Length of Screw(mm)

9 螺纹精度
G1:6μm/300mm
G3:12μm/300mm
G5:23μm/300mm
G7:52μm/300mm

9 Thread Accuracy
G1:6μm/300mm
G3:12μm/300mm
G5:23μm/300mm
G7:52μm/300mm

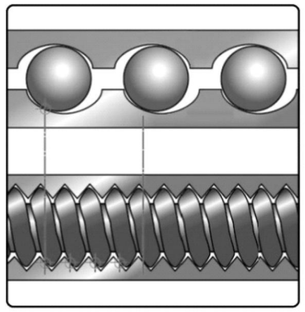
10 密封
0=无刮油器
1=含刮油器
(可提供仅单侧含刮油器)

10 Sealant
0=No Oil Wiper
1=Includes Oil Wiper
(Available With Wiper On One Side Only)

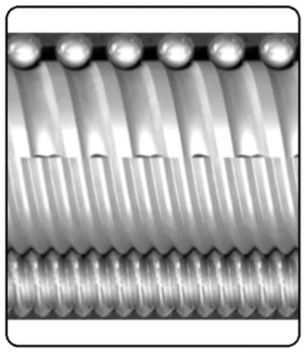
行星滚柱丝杠的优势 Advantages Of Planetary Roller Screws

行星丝杠与滚珠丝杠的主要区别是负载的传递单元使用螺纹滚柱而不是滚珠。主要的优点为更多的接触点以及螺纹角度的设计使负载等同于更大直径的滚珠丝杠。这种设计允许有非常小的导程，但具有较高的承载能力和轴向刚度。这种机械方面的优势最大限度地降低了输入扭矩，提高了应用的分辨率和性能。这样可以简化整个传动系统并提高传动系统的刚度。它们通常用于涉及先进技术的应用，在这种先进技术应用中，可靠的最佳性能至关重要。

The main difference between the planetary screw and the ball screw is that the load transmission unit uses the threaded roller instead of the ball. The main advantages are more contact points and thread angles designed to make the load equivalent to a larger diameter ball screw. This design allows for very small leads, but with a higher carrying capacity and axial stiffness. This mechanical advantage minimizes the input torque and improves the applied resolution and performance. This simplifies the entire transmission system and improves the stiffness of the transmission system. They are commonly used for applications involving advanced technologies, in which reliable optimum performance is critical.



- 行星滚柱丝杠和滚珠丝杠相比，行星滚柱丝杠允许更高的动态负载和静态负载。
- 行星滚柱丝杠可以提供更高的转速。
- 行星滚柱丝杠的加速度比滚珠丝杠的更高，可以达到3g。
- 行星滚柱丝杠在方向不断变化的应用中具有良好的操作性，摩擦扭矩稳定。
- 行星滚柱丝杠的承载能力强、轴向刚度高，这是具有类似导程和直径的普通滚珠丝杠所无法达到的。



- Planetary Roller Screws allow higher dynamic loads and static loads compared to Ball Screws.
- Planetary roller screws can provide higher speeds.
- The acceleration of planetary roller screws is higher than that of ball screws and can reach 3g.
- Planetary Roller Screws have good operability in applications with changing directions and stable friction torque.
- Planetary Roller Screws have a high load carrying capacity and high axial stiffness that cannot be achieved by ordinary Ball Screws with similar leads and diameters.

应用范围 Scope Of Application

电动缸、半导体制造、医疗、激光设备、光学仪器、汽车制造、机器人、航天、军工、测量仪器、绘图设备、印刷/3D打印、机器人、石油化工、望远镜、核工业、阀门控制、注塑机、冲压机、机床、压铸机、折弯机等。

Electric cylinder, semiconductor manufacturing, medical, laser equipment, optical instruments, automotive manufacturing, robotics, aerospace, military, measuring instruments, drafting equipment, printing/3D printing, robotics, petrochemical, telescope, nuclear industry, valve control, injection moulding machine, stamping presses, machine tools, die-casting machines, bending machines, etc.

性能表现 Performance

精度等级 Accuracy Level

行星丝杠的公差等级划分定义根据ISO3408-3，决定因素为300mm螺纹长度的导程误差V_{300p}。
The tolerance level division of the planetary wire is defined according to ISO3408-3, determined by the lead error V_{300p} of 300mm thread length.

相对的公差等级为：
The relative tolerance rank is as follows

公差等级 tolerance level	V_{300p}
G1	6μm/300mm
G3	12μm/300mm
G5	23μm/300mm
G7	52μm/300mm

行星丝杠标准精度等级为G1、G3、G5、G7，更高精度等级可按要求非标生产。
The standard accuracy grade of planetary screw is G1, G3, G5,G7, higher accuracy grade can be produced according to the requirements of non-standard.

JBT 12604-2016 导程精度注解

p	→公称导程
e_0	→需求导程和公称导程的差异
V_{300p}	→300mm行程内允许的行程变动量
e_p	→目标行程公差
V_{up}	→有效行程内允许的行程变动量
$V_{2\pi p}$	→2π弧度内允许的行程变动量
L_u	→有效行程

JBT 12604 - 2016 Lead Accuracy Annotation

Nominal lead
Difference between required and nominal leads
Permissible travel variation in 300mm travel
Target travel tolerance
Permissible travel variation within the effective travel
Allowable travel variation in 2π radians
Valid travel

导程误差 Lead error

导程误差e_p,与有效行程 L_u有关，计算公式如下：
The lead error e_p is related to the effective travel L_u and is calculated as follows

$$e_p = 2 \cdot \frac{L_u}{300} \cdot V_{300p}$$

行星丝杠的导程误差e_p。如右图所示，G1及G3精度的导程与扭矩曲线图随产品提供。
The lead error e_p of planetary screws is shown on the right, and the lead vs. torque graphs for G1 and G3 accuracy are supplied with the product.

导程检测通过CMM测试设备检测。(右侧的图中为e_p精度误差等级μm)
Lead detection is detected by CMM test equipment.
(In the figure on the right, e_p stands for accuracy error level μm)

L_u		e_p精度误差等级(μm) Accuracy error level		
From	to	G1	G3	G5
	315mm	6	12	23
315mm	400mm	7	13	25
400mm	500mm	8	15	27
500mm	630mm	9	16	30
630mm	800mm	10	18	35
800mm	1000mm	11	21	40
1000mm	1250mm	13	24	46
1250mm	1600mm	15	29	54
1600mm	2000mm			65
2000mm	2500mm			77
2500mm	3150mm			93

图形中使用的符号
Symbols used in graphics

l_u	有效行程 Valid travel
l_e	过量行程（不要求导程精度） Excessive travel (lead accuracy not required)
l_m	实际平均行程（用最小二乘法与实际行程的最佳拟合线） Actual average travel (line of best fit to actual travel by least squares)
l_0	名义行程 Nominal travel
l_s	指定行程 Designated travel
c	行程补偿 Travel Compensation （客户定义的l_s和l_0之差） (Difference between l_s and l_0 as defined by the customer)
e_p	指定行程的平均行程偏差(导程误差) Average travel deviation (lead error) for the specified stroke
e_a	指定行程的实际（测量）平均行程偏差 Actual (measured) average travel deviation for the specified stroke
V	行程变化（或允许的带宽） Travel variation (or permissible bandwidth)
V_{300p}	300mm距离的最大允许行程变化 Maximum permissible travel variation for a distance of 300 mm
V_{up}	有效行程l_u范围内的最大允许行程变化 Maximum permissible travel variation within the effective travel range
V_{300a}	300mm距离内测得的行程变化 Travel variation measured at a distance of 300mm
V_{ua}	l_u距离内测得的行程变化 Travel variation measured over a distance of l_u
$V_{2\pi p}$	2π弧度内的最大允许行程变化 Maximum permissible travel variation in 2π radians
$V_{2\pi a}$	2π弧度内测得的实际行程变化 Actual travel variation measured in 2π radians

Fig. 15 图15
螺纹误差测量的定义
Definition of Thread tolerance Measurement

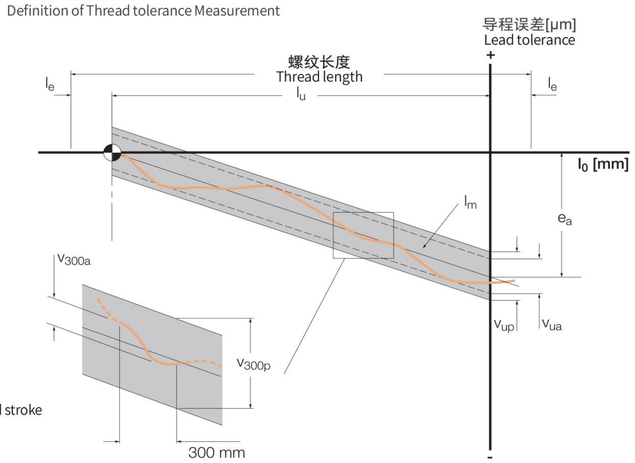


Fig. 16 图16
在没有行程补偿的情况下
Without travel compensation

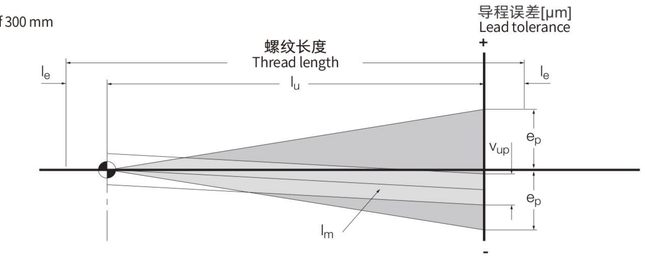
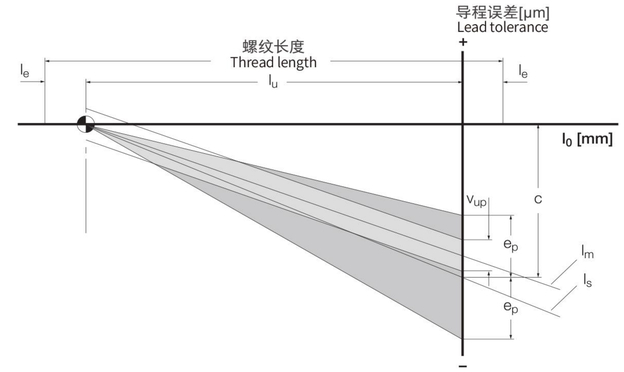


Fig. 17 图17
在有负向行程补偿的情况下
With travel compensation



2π弧度内的允许行程变化$V_{2\pi p}$（一圈）

对于某些精度非常高的应用来说，每转一圈的最大允许行程变化$V_{2\pi p}$是一个重要参数。
图18对该导程精度参数V_{2pp}进行了说明。表17中给出了符合ISO3408-3的值。
KGG可根据要求测量并提供公称直径最高40mm，长度最高1000mm的丝杠每转一圈的实际行程变化V_{2pa}。

并行工作丝杠行程偏差的匹配

当一台设备上并行使用两根或更多根丝杠时，须匹配它们的导程偏差。
M值定义为一组丝杠中任何一个丝杠平均行程的最大差值。如果装有三根或更多根丝杠，M表示丝杠组中两根最极端平均行程的最大差值。（见表18）
图19、图20和图21代表3个典型的应用示例。

Allowable travel change $V_{2\pi p}$ in 2π radians (one revolution)

The maximum allowable travel change $V_{2\pi p}$ per revolution is an important parameter for certain applications with very high accuracy.
This lead accuracy parameter V_{2pp} is illustrated in Figure 18. Values according to ISO 3408-3 are given in Table 17.
KGG can measure and supply the actual travel variation V_{2pa} per revolution of a screw with a nominal diameter of up to 40 mm and a length of up to 1000 mm on request.

Matching of Travel Deviations of Screws Working in Parallel

When two or more screws are used in parallel on a machine, their lead deviations must be matched.
The M value is defined as the maximum difference in the average travel of any one screw in a group. If three or more screws are installed, M represents the maximum difference between the two most extreme average travels of a group of screws. (See Table 18.)
Figure 19, Figure 20 and Figure 21 represent 3 typical application examples.

Table 17 表17

在2π rad内的最大允许行程偏离
Maximum allowable travel deviation within 2π rad

导程精度等级 Lead accuracy class	$V_{2\pi p}$ μm
G1	4
G3	6
G5	8

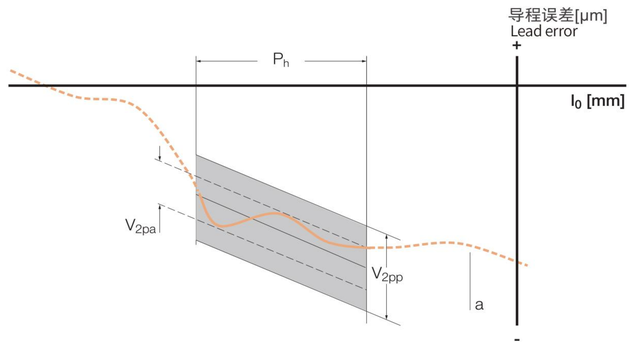
Table 18 表18

最大平均行程偏离
Maximum average travel deviation

同步驱动的丝杠数量 Number of synchronized drive screws	M μm
2	V_{up}
> 2	1,5 V_{up}

Fig. 18 图18

在2πrad内的行程偏离
Travel deviation within 2πrad

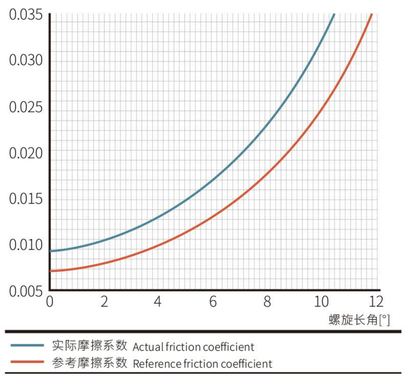


a是真实的行程偏离
a is the true travel deviation

效率η Efficiency η

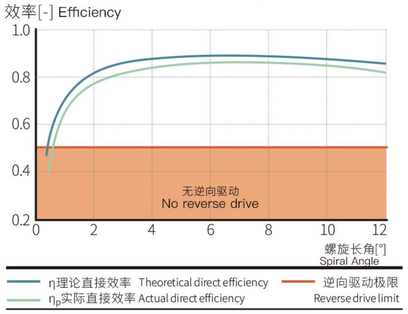
丝杠的性能主要取决于接触面的几何形状、光洁度和螺纹的螺旋角。
也取决于工况作条件（负载、速度、润滑、预紧载、校准等）。直接效率η用来定义将一个部件的旋转转化为另一个部件的平移所需要的输入扭矩（见图表2）。
相反，间接效率η'用来定义将一个部件的平移转化为另一个部件的旋转所需的轴向载荷。它还用于定义防止旋转所需的制动力矩（见图表3）。
当润滑、校准等处于极佳的工况条件下，可以达到摩擦参考系数μ_{ref}值，并且它会产生理论上的直接效率η，或者理论上的间接效率η'。因为在实际应用中不会遇到这样的实验室条件，所以我们定义了一个实用的摩擦系数μ_{prac}来估计实际效率η_p和η'_p。
实际效率介于新安装丝杠的启动效率和正常运行丝杠的启动效率之间。这种实际效率值是用摩擦系数μ_{prac}的实际值计算的。
考虑到实际安装、运行条件和实际应用经验，该实际摩擦系数μ_{prac}相当于在参考摩擦系数μ_{ref}的基础上增加了30%（见图表1）。
该方法使丝杠的实际效率相对于其理论效率降低了约5%。
一般来说，实际效率随着速度的提高而提高，随着时间的推移，实际运行效率也会提高。

图表Figure1
参考和实际摩擦系数 Reference and actual coefficient of friction

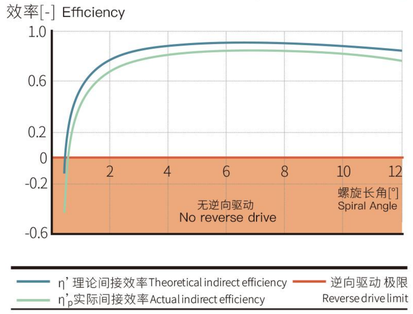


The performance of the screw mainly depends on the geometry of the contact surface, the finish and the spiral angle of the thread. It also depends on the working conditions (load, speed, lubrication, preload, calibration, etc,.). The direct efficiency η is used to define the input torque required to convert the rotation of one component into the translation of another component (Figure 2).
Instead, the indirect efficiency η' is used to define the axial load required to convert the translation of one component into the rotation of the other. It is also used to define the braking torque required to prevent rotation (Figure 3).
When the lubrication, calibration and other operations are under excellent working conditions, the friction reference coefficient μref value can be achieved, and it will generate a theoretical direct efficiency η or a theoretical indirect efficiency η'. Since such laboratory conditions would not been countered in practice, we have defined a practical friction coefficient μ_{prac} to estimate the actual efficiencies η_p and η'_p.
The actual efficiency lies between the starting efficiency of a newly installed screw and that of a normally operating screw. This actual efficiency value is calculated using the actual value of the friction coefficient μ_{prac}.
Considering the actual installation, operating conditions and practical application experience, the actual friction coefficient μ_{prac} is equivalent to the reference friction coefficient μ_{ref} which has increased by 30% on the basis of (Figure 1).

图表Figure2
理论和实际直接效率 Theoretical and practical direct efficiency



图表Figure3
理论与实际间接效率 Theoretical and practical indirect efficiency



预紧 Preload

为避免轴向间隙的产生并提高产品的刚性强度效果，应对螺母进行预紧。预紧应调到必要的上下限紧度，这样整个产品就能达到最高的传动效率和最长的使用寿命。(见图 13)。在计算平均负载值 F_{ma} 时，除了单个负载力 $F\cdots F_n$ 外还要考虑到预紧力 F_V 的作用。这样就产生新的单个负载 F_{1V} … F_{nV}。在无间隙要求的情况下对各个负载的计算需将预紧力 F_V 预设为最大系统预紧力才行。

In order to avoid the axial clearance and improve the rigid strength effect of the product, the nut should be preloaded.
The preloaded should be adjusted to the necessary upper and lower limits, so that the whole product can achieve the highest transmission efficiency and the longest service life.(Figure 13). When calculating the average load value F_{ma}, the role of preload F F_V is considered in addition to the single load force $F\ldots F_n$. This creates a new single load $F_{1V}\ldots F_{nV}$. In the calculation of each load without clearance requirements, the pretension force F_V is preset to the maximum system pretension force.

$$F_V = \frac{F_{max}}{2.83}\ [N]$$

$$F_V = \frac{F_n}{2.83}\ [N]$$

若丝杠间隙公差是由某一特定的承载力来设定，则 F_V 值就相对于 F_{max}。

If the screw clearance tolerance is set by a specific load carrying capacity, the F_V value is relative to F_{max}.

通常情况下，若没有其它特殊的要求，将对分段螺母和合并双螺母附加5%的动力承载进行预紧。

Normally, if there are no other special requirements, a power load of 5% will be added to the segmented nut and the combined double nut for preloading.

在预紧力 F_V 前提下，承载力的计算结果

Calculation of the load carrying capacity subject to the preload force F_V

通过预紧螺母系统的轴向受力后，螺母的半个侧面因受其影响受到附加预紧力，而另一个半面所受的力被撤去。剩下的受力情况则可通过下列几个公式核算出来。

After the axial force has been applied through the preloaded nut system, half of the side of the nut is subjected to an additional preload force due to its influence, while the force applied to the other half is withdrawn. The remaining forces are accounted for by the following formulas.

举例，受负载的半个螺母:

当 $F_n < 2.83 \cdot F_v$ [N]

$F_{nv(1)} = F_v + 0.65 \cdot F_n$ [N]

当 $F_n \geq 2.83 \cdot F_v$ [N]

$F_{nv(1)} = F_v$ [N]

撤去负载后的半个螺母:

当 $F_n < 2.83 \cdot F_v$ [N]

$F_{nv(2)} = F_v - 0.35 \cdot F_n$ [N]

当 $F_n \geq 2.83 \cdot F_v$ [N]

$F_{nv(2)} = 0$ [N]

Example of a half-nut under load.

When $F_n < 2.83 \cdot F_v$ [N]

$F_{nv(1)} = F_v + 0.65 \cdot F_n$ [N]

When $F_n \geq 2.83 \cdot F_v$ [N]

$F_{nv(1)} = F_v$ [N]

Half nut when the load is removed.

When $F_n < 2.83 \cdot F_v$ [N]

$F_{nv(2)} = F_v - 0.35 \cdot F_n$ [N]

When $F_n \geq 2.83 \cdot F_v$ [N]

$F_{nv(2)} = 0$ [N]

前提条件

$F_1 \ldots F_n$ [N]： 在不同或相同时间段内及各种转速境况下作用在丝杠上对合力产生影响的各单个力

F_v [N]： 预紧力

F_{nv} [N]： 单个力及预紧力的合力

F_{ma} [N]： 在考虑预紧力情况下的平均受力

Prerequisites

Individual forces acting on the screw at different or the same time period and at various speeds affecting the combined force.

Preload force

Combined force of the individual forces and the preload force

Average force with preload taken into account

转速和轴向负载 Speed And Axial Load

转速和轴向负载的允许值

滚柱丝杠在涉及到转速和轴向负载方面系统受到一定的限制。具体来说：由螺母的内部设计结构所影响的转速极限值，丝杠轴的轴承及弯曲振动状态下的临界转速值 n_{kr}。

允许转速值如下：

RS : $d_0 \cdot n \leq 140{,}000$

Permissible values for speed and axial load

Roller Screws are subject to certain limitations when it comes to rotational speeds and axial loads. Specifically: the limit values of rotational speed influenced by the internal design structure of the nut, the critical rotational speed value n_{kr} for the bearing and bending vibration condition of the screw shaft.

The permissible speed values are as follows:

RS : $d_0 \cdot n \leq 140{,}000$

轴向负载 F_n=0 时,临界转速 n_{kr}

由于临界转速值受到轴向所受力的影响，在每次计算滚柱丝杠值的时候都要进行测试。因为想通过选择合适的轴承支座来达到理想的转速这一方式不能起到对在丝杠主轴末端的轴承极限转速的影响，因此临界转速值 n_{kr} 只有通过弯曲振动来计算。来自弯曲振动的临界转速值 n_{kr} 可通过下面的公式计算出。修正系数 f_{kr} 受支座结构及因此而产生的夹紧关系影响。

When the axial load F_n=0, the critical speed n_{kr}

Since the value of the critical speed is influenced by the forces in the axial direction, it is necessary to carry out a test each time a roller screw value is calculated. Since the selection of a suitable bearing support to achieve the desired speed does not influence the limiting speed of the bearing at the end of the screw spindle, the critical speed value n_{kr} can only be calculated by means of bending vibration. The critical speed value n_{kr} from bending vibration can be calculated using the following formula. The correction factor f_{kr} is influenced by the support structure and the resulting clamping relationship.

计算条件

丝杠在径向方向无轴向影响因素介入，同时，主轴末端的支座在径向反向方面可视为静止不动。

$$n_{kr} = 108 \cdot 10^6 \cdot d_0 \cdot \ell / \ell^2 \quad [min^{-1}]$$

由此，在考虑了支座类型前提下即可计算出临界转速允许值：

$$n_{krzul} = 0.8 \cdot n_{kr} \cdot f_{kr} \quad [min^{-1}]$$

Calculation condition

The screw has no axial influence in the radial direction, while the support at the end of the spindle can be regarded as stationary in the radial reverse direction.

$$n_{kr} = 108 \cdot 10^6 \cdot d_0 \cdot \ell / \ell^2 \quad [min^{-1}]$$

The permissible critical speed can thus be calculated before the type of support is taken into account:

$$n_{krzul} = 0.8 \cdot n_{kr} \cdot f_{kr} \quad [min^{-1}]$$

其中：

n [min^{-1}] : 转速

n_{kr} [min^{-1}] : 临界转速

n_{krzul} [min^{-1}] : 临界转速允许值

ℓ [mm] : 丝杠最大导程

d_0 [mm]: 丝杠轴公称直径

f_{kr} [-] : 对不同支座类型的修正系数

0.8 [-] : 安全系数

Where:

n [min^{-1}] : rotational speed

n_{kr} [min^{-1}] : critical speed

n_{krzul} [min^{-1}] : allowable critical speed

ℓ [mm] : Maximum lead of the screw

d_0 [mm] : nominal diameter of the screw shaft

f_{kr} [-] : correction factor for different support types

0.8 [-] : safety factor

平均转速和平均轴向负载 Average Speed And Average Axial Load

当转速和负载值发生变化时，计算产品使用寿命必须代入平均值n_m和F_m。

When the rotational speed and load values change, the average values n_m and F_m must be substituted into the calculation of the product's service life.

当转速变化而负载恒定时，转速值n就等于平均转速值n_m (图10)。

When the rotational speed changes while the load remains constant, the rotational speed value n is equal to the average rotational speed value n_m (Fig. 10).

$$n_m = \frac{q_1}{100} \cdot n_1 + \frac{q_2}{100} \cdot n_2 + \ldots \; [min^{-1}]$$

当转速不变而负载变化时，等于平均负载F_m (图 11)。

When the rotational speed remains constant while the load changes, it is equal to the average load F_m (Fig. 11).

$$F_m = \sqrt[3]{F_1^3 \cdot \frac{q_1}{100} + F_2^3 \cdot \frac{q_2}{100} + \ldots} \; [N]$$

当转速和负载变化时，等于平均负载值F_m。

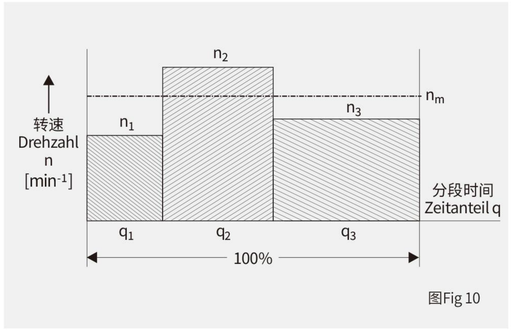
When the rotational speed and load change, it is equal to the average load value F_m.

$$F_m = \sqrt[3]{F_1^3 \cdot \frac{q_1}{100} \cdot \frac{n_1}{n_m} + F_2^3 \cdot \frac{q_2}{100} \cdot \frac{n_2}{n_m} + \ldots} \; [N]$$

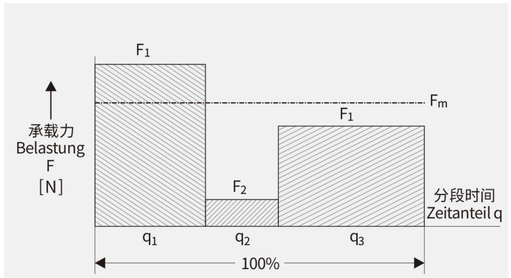
当负载线性变化而转速不变时，等于平均负载值F_m (图 12)。

When the load changes linearly while the rotational speed remains constant, it is equal to the average load value F_m (Fig. 12).

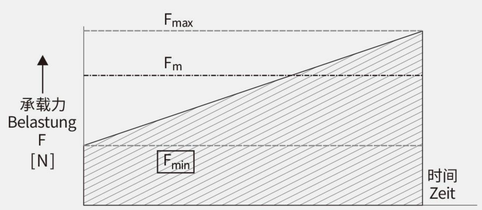
$$F_m = \frac{F_{min} + 2 \cdot F_{max}}{3} \; [N]$$



图Fig 10



图Fig 11



图Fig 12

式中： In the formula:

n_m	[min-1]	：平均转速值	Average RPM value
$n_1 \ldots n_n$	[min-1]	：单个转速	Individual RPM
$q_1 \ldots q_n$	[%]	：时间分段	Time segment
F_m	[N]	：平均负载	Average load
$F; F_1; \ldots F_n; F_{min}; F_{max}$	[N]	：有效作用力	Effective force

寿命 Lifespan

理论使用寿命
Theoretical service life

滚柱丝杠产品理论使用寿命L_{10}及 L_h可理解为产品的一般使用寿命。根据经验概率它一般可以达到 90%左右。

The theoretical service life of Roller Screws L_{10} and L_h can be interpreted as the general service life of the product. According to empirical probability, it is generally around 90%.

若要提高产品的可靠性，理论使用寿命 L_{10}及 L_h还必须乘以可靠性系数 f_r(图 14)。

To increase the reliability of the product, the theoretical service life L_{10} and L_h must be multiplied by the reliability factor f_r (fig. 14).

考虑系数后的使用寿命
Service life after taking into account the coefficient

$$L_n = L_{10} \cdot f_r \; [旋转 \; Rotation]$$

$$L_{hn} = L_h \cdot f_r \quad [h]$$

Dependability

可靠性 %	f_r
90	1
95	0.62
96	0.53
97	0.44
98	0.33
99	0.21

预紧后的螺母理论使用寿命

在螺母预紧状态下必须首先结合相应的动态负载C和平均轴向负载F_{ma}(在考虑预紧的情况下) 后再对螺母的半侧进行其使用寿命的计算。通过对使用寿命值$L_{10(1)}$以及$L_{10(2)}$(在旋转的状态下)的计算可导出螺母在预紧后的使用寿命L_{10}。

$$L_{10(1)} = \left(\frac{C}{F_{ma(1)}}\right)^3 \cdot 10^6 \; [旋转] \; Rotate$$

$$L_{10} = \left(L_{10(1)}^{-10/9} + L_{10(2)}^{-10/9}\right)^{-9/10} \; [旋转] \; Rotate$$

带间隙的单个螺母的理论寿命
Theoretical life of a single nut with clearance

公式计算：
Formula calculation:

$$L_{10} = \left(\frac{C}{F_m}\right)^3 \cdot 10^6 \; [旋转] \; Rotate$$

$$L_h = \frac{L_{10}}{n_m \cdot 60} \; [h]$$

在限定使用寿命前提下，动态承载能力按下列公式计算出：
Under the premise of a limited service life, the dynamic bearing capacity is calculated by the following formula:

$$C = F_m \cdot \sqrt[3]{\frac{L_{10}}{10^6}} \; [N]$$

以小时 L_{hN} 来计算使用寿命的公式如下：
The formula for calculating the service life in terms of hours L_{hN} is as follows:

$$L_{hN} = \frac{L_h}{f_N} \; [h]$$

使用参数 f_N可从下列公式导出：
The parameter f_N can be derived from the following formula:

$$f_N = \frac{滚柱丝杠运行时间 \; Running \; time \; of \; roller \; screw}{机器设备计划运行时间 \; Planned \; running \; time \; of \; machinery \; and \; equipment}$$

Theoretical service life of a preloaded nut

The theoretical service life of the nut in the preloaded condition must be calculated for the nut half in conjunction with the corresponding dynamic load C and the average axial load F_{ma} (in the case of preloading). By calculating the service life values $L_{10(1)}$ and $L_{10(2)}$ (in the rotated state), the service life of the nut after preloading can be derived as L_{10}.

$$L_{10(2)} = \left(\frac{C}{F_{ma(2)}}\right)^3 \cdot 10^6 \; [旋转] \; Rotate$$

其中 Where：

L_{10}	[旋转]	：	变化后的使用寿命(旋转) Service life after changes (revolutions)
L_{hn}	[h]	：	变化后的使用寿命(小时) Service life after changeover (hours)
L_{10}	[旋转]	：	理论使用寿命(转换) Theoretical service life (conversion)
L_h	[h]	：	理论使用寿命(小时) Theoretical service life (hours)
L_{hN}	[h]	：	以运行小时来表示的使用寿命 Service life expressed in operating hours
f_r	[-]	：	可靠性参数 Reliability parameters
C	[N]	：	动态承载 Dynamic load bearing
F_m	[N]	：	平均受力值(有间隙的单个螺母) Average force value (single nut with clearance)
F_{ma}	[N]	：	平均受力值(预紧的螺母) Average force value (preloaded nut)
n_m	[min-1]	：	平均转速 Average speed
f_N	[-]	：	使用系数 Utilization factor

刚性 Rigidity

行星滚柱丝杠的刚性强度
Rigidity strength of planetary roller screws

滚柱丝杠总的刚性强度C_{ges}由下列各单项刚性强度组成：

The total rigid strength C_{ges} of the roller screw consists of the following individual rigid strengths:

C_{me} 螺母的刚性强度
Rigidity strength of the nut

C_{sp} 丝杠刚性强度
Rigidity strength of the screw

C_L 支座的刚性强度
Rigidity strength of support

C_u 周边设计结构刚性强度
Rigidity strength of peripheral design structure

丝杠的刚性强度C_s
Rigidity strength C_s of the screw

丝杠的刚性强度C_s可通过下列简化公式得出：

The Rigidity strength C_s of the screw can be derived from the following simplified formula:

$$C_S = 164 \cdot \frac{d_0^2}{1} \quad [N/\mu m]$$

转速n=0 状态下，允许折弯力F_{knzul}
Allowable bending force F_{knzul} at speed n = 0

计算公式如下:
is calculated as follows.

$$F_{knzul} = 0{,}8 \cdot 101{,}6 \cdot f_{kn} \cdot \frac{d_0^4}{l^2} \quad [kN]$$

螺母的刚性强度C_{me}
Rigidity strength of the nut C_{me}

整个滚柱丝杠的刚性强度C_{me}可通过下列的公式计算出它的近似值。

The rigidity strength of the entire roller screw, C_{me}, can be approximated by the following formula.

$$C_{me} = f_m \cdot f_k \cdot F_n^{1/3} \quad [N/\mu m]$$

f_m 单个螺母 single nut ES = 0.75

f_m 分段柱状螺母 Segmented Column Nut EF = 1

f_m 合并双螺母 Combined double nut ED = 1.5

在标准预紧力状态下，下表中的C_{me} - 值要求F_n的值符合下列条件:

In the standard preload condition, the C_{me} - values in the following table require the value of F_n to be in accordance with the following conditions.

$$F_n = 2.83 \cdot F_V \quad [N]$$

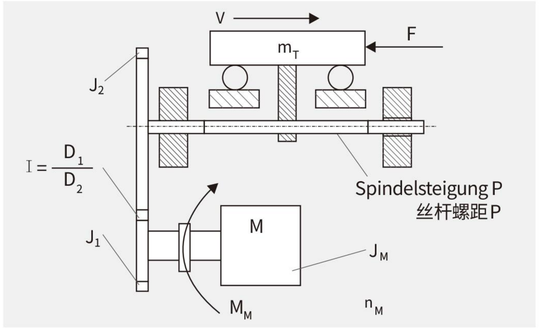
其中Where:

F_V	[N]	: 预紧力 Preload force		fm	[-]	:	修正系数 Correction factor
F_n	[N]	: 轴向负载 Axial load		ℓ	[mm]	:	剩余的螺杆长度 Remaining screw length
C_{me}	[N/µm]	: 螺母刚性强度 Rigidity Strength Of Nut		d_0	[mm]	:	丝杠公称直径 Nominal screw diameter
C_s	[N/µm]	: 丝杠刚性强度 Rigidity Strength Of Screw		F_{knzul}	[N]	:	允许弯折力 Allowable bending force
f_k	[N⅔/µm]	: 刚性强度系数 Rigidity strength factor		f_{kn}	[-]	:	对于支座的修改系数 Modification factor for supports

传动力矩 Transmission torque

从下列公式中可以推导出一系列计算扭矩所需要的值。需要推导的值有：在螺母预紧状态下的空转扭矩 M(均在预紧力 F_V 作用下所产生的)。

A series of values required for the calculation of the torque can be deduced from the following equations. The values to be derived are: the freewheeling torque M in the preloaded condition of the nut (all generated under the action of the preload force F_V).



对带有间隙的单个螺母：
For single nuts with clearance:

$$M_V = 0 \ [Nm]$$

在恒定转速状态下电机的传动力矩 M_M
Transmission torque of the motor at constant speed M_M

空转时的扭矩 Torque at freewheeling
$$M_v = \frac{F_v \cdot p \cdot i \cdot c}{2000 \cdot \pi} \quad [Nm]$$

受力力矩“顶起” Torque "Pushing up"
$$M_{L1} = \frac{p \cdot i \cdot c}{2000 \cdot \pi \eta_1} \quad [Nm]$$

受力力矩“释放” Torque "Release"
$$M_{L1} = \frac{p \cdot i \cdot F \cdot \eta_2}{2000 \cdot \pi} \quad [Nm]$$

在进给力 F 中必须考虑到引导滑块的摩擦力。
The friction of the guide slide must be taken into account in the feed force F.

电机传动力矩 Motor torque
$$M_M = (M_V + M_{L1,2} + M_R \cdot i) \quad [Nm]$$

当电机传动力矩转为负值时(在释放过程中有可能会出现)，必须对驱动马达采取制动措施。
If the motor torque becomes negative (which may occur during the release process), the drive motor must be braked.

电机传动功率 Motor drive power
$$P_M = \frac{M_M \cdot n_M}{9.55} \quad [w]$$

在加速状态下的电机传动力矩 M_{ma}
Motor torque under acceleration M_{ma}

对丝杠轴转动惯性力矩数值 J_R 的计算比较粗略。精确计算可按要求进行。
The calculation of the value J_R for the rotational moment of inertia of the screw shaft is rough. Precise calculations are available on request.

受力力矩 Moment of force
$$M_{La} = \frac{p \cdot i \cdot (F + F_2)}{2000 \cdot \pi \cdot \eta_1} \quad [Nm]$$

平移惯性力矩 Translational moment of inertia
$$J_T = m_T \cdot \left(\frac{p}{2 \cdot \pi}\right)^2 \cdot 10^{-6} \quad [kgm^2]$$

转动惯性力矩 (丝杠) Rotational moment of inertia (Screw)
$$J_R = 4.8 \cdot (d_1 + d_2)^4 \cdot \ell \cdot 10^{-14} \ [kgm^2]$$
(钢制材料) (Steel material)

减弱的惯性力矩总和 Sum of attenuated moments of inertia	J	$= J_M + J_1 + i^2 (J_R + J_T + J_2)$	$[kgm^2]$
电机转速 Motor speed	n_M	$= \frac{v \cdot 6 \cdot 10^4}{P \cdot i}$	$[min^{-1}]$
加速力矩 M_B f (n_M) Acceleration torque	M_B	$= \frac{n_M \cdot J}{9.55 \cdot t_B \cdot \eta}$	[Nm]
加速力矩 M_B = f (s_B) Acceleration torque	M_B	$= \frac{4 \cdot \pi \cdot s_B \cdot J}{P \cdot i \cdot t_B^2 \cdot \eta}$	[Nm]
加速时间 t, = f (nm) Acceleration time	t_B	$= \frac{n_M \cdot J}{9{,}55 \cdot M_B \cdot \eta}$	[s]
加速时间 t_B f (s_B) Acceleration time	t_B	$= \sqrt{\frac{4 \cdot \pi \cdot s_B \cdot J}{P \cdot i \cdot M_B \cdot \eta}}$	[s]
加速之后所达到的转速 Speed achieved after acceleration	n_M	$= \frac{120 \cdot s_B}{P \cdot i \cdot t_B}$	$[min^{-1}]$
在加速时所产生的位移 Displacement during acceleration	s_B	$= \frac{n_M \cdot t_B \cdot P \cdot i}{120}$	[mm]
电机传动力矩 Motor drive torque	M_{Ma}	$= (M_v + M_{La} + M_R \cdot i + M_B)$	[Nm]
电机驱动功率 Motor drive power	P_{Ma}	$= \frac{M_{Ma} \cdot n_M}{9.55}$	[W]

其中Where:

d_1 [mm] : 丝杠主轴 – 外径 Screw spindle - outer diameter

d_2 [mm] : 丝杠主轴 – 内径 Screw spindle - inner diameter

P [mm] : 丝杠主轴螺距 Screw spindle pitch

ℓ [mm] : 丝杠长度 Screw length

m_T [kg] : 运动物体的质量 Mass of moving object

D_1 [mm] : 传动轮的直径 Diameter of drive wheel

D_2 [mm] : 从动轮的直径 Diameter of driven wheel

i [-] : 减速比 Reduction ratio74

F [N] : 进给力 Feed force

F_V [N] : 预紧力 Preload force

F_a [N] : 加速力 Acceleration force

M_V [Nm] : 空转力矩 Idle torque

M_{L1} [Nm] : 受力力矩 « 顶起 » 在匀速状态下 Moment "jacking up" at constant velocity

M_{L2} [Nm] : 受力力矩 « 释放 » 在匀速状态下 Moment "Release" at constant velocity

M_M [Nm] : 电机驱动力矩

M_{La} [Nm] : 加速状态下的受力力矩 Moment at acceleration

M_B [Nm] : 加速力矩 Acceleration moment

M_{Ma} [Nm] : 加速状态下电机驱动力矩 Motor driving moment under acceleration

M_R [Nm] : 主轴支座的摩擦力力矩 Friction moment of spindle support

J_m [kgm^2] : 电机的惯性力矩 Moment of inertia of motor

J_R [kgm^2] : 丝杠主轴的转动惯性力矩 Rotational moment of inertia of screw spindle

J_T [kgm^2] : 丝杠主轴的平移惯性力矩 Translational moment of inertia of screw spindle

J [kgm^2] : 惯性力矩 Moment of inertia

J_1 [kgm^2] : 驱动轮的惯性力矩 Moment of inertia of driving wheel

J_2 [kgm^2] : 被驱动轮的惯性力矩 Moment of inertia of driven wheel

P_M [W] : 匀速状态下电机驱动功率 Motor driving power at constant speed

P_{Ma} [W] : 加速状态下驱动功率 Drive power under acceleration

s_B [mm] : 加速位移 Acceleration displacement

t_B [s] : 加速时间 Acceleration time

v [m/s] : 推进速度 Propulsion speed

n_M [min^{-1}] : 驱动电机转速

η [-] : 机械传动效率 Drive motor speed Mechanical transmission efficiency

η_1 [-] : 丝杠« 顶起 »时的机械传动效率 Mechanical transmission efficiency when the screw is "lifted". $\eta_1 = 0.71...0.89$

η_2 [-] : 丝杠« 释放 »时的机械传动效率 Mechanical transmission efficiency when the screw is "released". $\eta_2 = 0{,}61...0{,}85$

c [-] : 在预紧作用下的摩擦系数 Friction coefficient under preload $c = 0.1...0.19$

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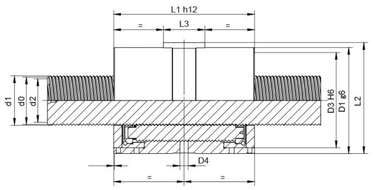
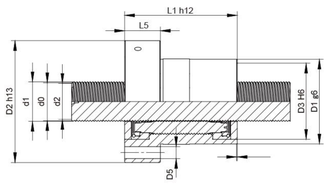
MEMO

RS系列 – 行星滚柱丝杠 Type RS – Planetary Roller Screws



RSR



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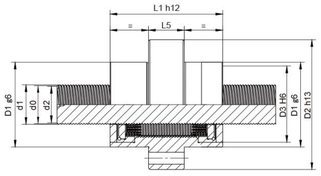

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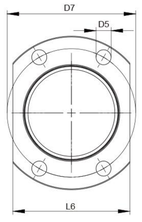

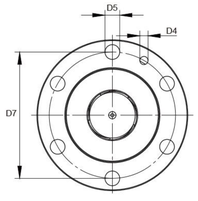

Unit(单位): mm

型号 Model	参考直径×导程 D×P Reference Diameter X Lead		丝杠头数 N Number of Roller Screw	螺旋升角 [°] Spiral Angle	单螺母 Single Nut				双螺母 Double Nut					预紧螺母 Preload Nut					正转效率 Positive Rotation Efficiency	反转效率 Negative Rotation Efficiency
					动态负载 Ca[kN] Dynamic Load	静态负载 C0a[kN] Static Load	刚度系数 Fk [N/3μm] Rigidity Coefficient	轴向间隙 Axial Clearance	动态负载 Ca[kN] Dynamic Load	静态负载 C0a[kN] Static Load	刚度系数 Fk [N/3μm] Rigidity Coefficient	预紧力 Fv[N] Preload Force	预紧扭矩 Mv[Nm] Preload Torque	动态负载 Ca[kN] Dynamic Load	静态负载 C0a[kN] Static Load	刚度系数 Fk [N/3μm] Rigidity Coefficient	预紧力 Fv[N] Preload Force	预紧扭矩 Mv[Nm] Preload Torque		
RS	15x	4	5	4.85	26.8	49.5	43.3	0.03	26.8	49.5	64.9	466	0.10	14.8	24.7	27.3	466	0.10	0.88	0.87
		5		6.06	28.9	51.5	39.4	0.04	28.9	51.5	59.1	394	0.10	15.9	25.7	24.8	394	0.10	0.88	0.88
		10		11.98	29.5	48.7	26.7	0.05	-	-	-	-	-	-	-	-	-	-	0.80	0.75
RS	21x	4	5	3.47	56.7	105.5	61.3	0.02	56.7	105.5	91.9	983	0.25	31.2	52.8	38.6	983	0.25	0.87	0.85
		5		4.33	59.4	104.8	54.2	0.03	59.4	104.8	81.3	886	0.25	32.7	52.4	34.2	886	0.25	0.88	0.86
		10		8.62	63.5	92.2	35.1	0.05	63.5	92.2	52.7	472	0.25	35.0	46.1	22.1	472	0.25	0.89	0.87
RS	25x	5	5	3.79	81.3	161.2	66.0	0.03	81.3	161.5	99.0	1160	0.35	44.8	80.8	41.6	1160	0.35	0.87	0.85
		10		7.55	89.6	148.1	43.6	0.05	89.6	148.1	65.4	686	0.35	49.4	74.1	27.5	686	0.35	0.89	0.88
		15		11.25	95.5	144.4	35.0	0.05	95.5	144.4	52.5	364	0.35	52.6	72.2	22.1	364	0.35	0.87	0.85
RS	30x	5	5	3.04	107.2	224.7	75.5	0.03	107.2	224.7	113.3	1446	0.50	59.0	112.3	47.6	1446	0.50	0.86	0.83
		10		6.06	126.3	226.5	52.9	0.04	126.3	226.5	79.3	983	0.50	69.6	113.3	33.3	983	0.50	0.89	0.88
		20		11.98	156.8	229.8	35.2	0.05	156.8	229.8	52.9	363	0.50	86.4	114.9	22.2	363	0.50	0.86	0.83
RS	39x	5	5	2.34	159.4	372.0	93.2	0.03	159.4	372.0	139.8	1912	0.80	87.8	186.0	58.7	1912	0.80	0.83	0.80
		10		4.67	185.5	365.7	64.5	0.04	185.5	365.7	96.8	1464	0.80	102.2	182.8	40.6	1464	0.80	0.88	0.87
		20		9.27	234.3	374.5	42.9	0.05	234.3	374.5	64.4	728	0.80	129.1	187.2	27.0	728	0.80	0.88	0.87
RS	48x	5	5	1.90	218.6	556.2	111.6	0.03	218.6	556.2	167.4	2430	1.20	120.4	278.1	70.3	2430	1.20	0.81	0.76
		20		7.55	360.1	659.2	55.9	0.05	360.1	659.2	83.8	1176	1.20	198.4	329.6	35.2	1176	1.20	0.89	0.88
		25		9.41	332.3	579.6	46.1	0.05	332.3	579.6	69.2	867	1.20	183.1	289.8	29.1	867	1.20	0.88	0.87

* 可根据要求降低轴向间隙。
Axial clearance can be reduced as required.

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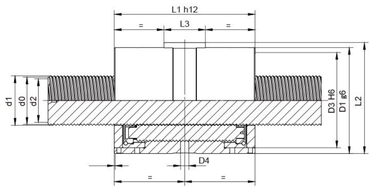
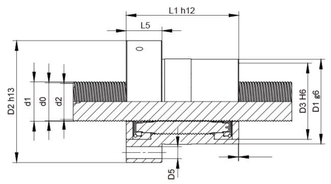
RS系列 – 行星滚柱丝杠 Type RS – Planetary Roller Screws



RSR



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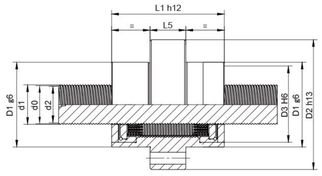

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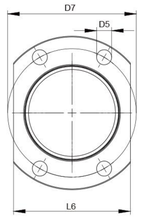
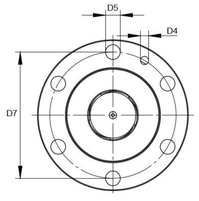


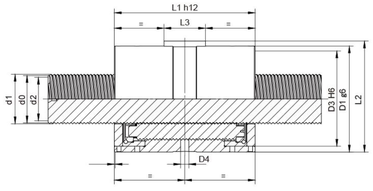


Unit(单位): mm

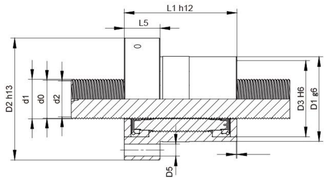
型号 Model	参考直径×导程 D×P Reference Diameter X Lead		丝杠 Screw			螺母 Nut													
			丝杠外径 Ød1 Screw Outer Diameter	公称直径 Ød0 Nominal Diameter	丝杠根径 Ød2 Screw Root Diameter	ØD1	ØD2	ØD3	ØD4		ØD5	ØD7	无刮油器 Without Wiper L1	有刮油器 With Wiper L1	L2	L3	L4	L5	L6
RS	15x	4	15.26	15	14.61	34	56	30	5	M6	M6	45	40	50	35.7	14	4	18	36
		5	15.32		14.51														
		10	15.56		13.94														
RS	21x	4	21.27	21	20.62	45	67	41	5	M6	M6	56	55	66	47	20	5	18	47
		5	21.33		20.52														
		10	21.59		19.97														
RS	25x	5	24.34	24	23.53	53	84	48	5	M6	M6	70	64	78	55.5	25	6	20	55
		10	24.61		22.99														
		15	24.81		22.38														
RS	30x	5	30.34	30	29.53	62	92	58	5	M6	M6	77	71	85	64.7	20	6	27	64
		10	30.63		29.01														
		20	31.05		27.81														
RS	39x	5	39.35	39	38.54	80	116	72	5	M6	M6	98	90	100	82.7	28	6	25	82
		10	39.66		38.04														
		20	40.15		36.91														
RS	48x	5	48.29	48	47.62	86	122	80	7	M8×1	M8×1	104	87	99	88.7	45	6	35	88
		20	49.00		46.30														
		25	49.43		45.38	100	150	94	7	M8×1	M8×1	127	115	127	103	45	8	37	102

* 可根据要求降低轴向间隙。
Axial clearance can be reduced as required.

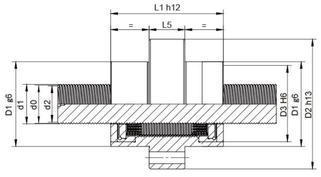
RS系列 – 行星滚柱丝杠 Type RS – Planetary Roller Screws



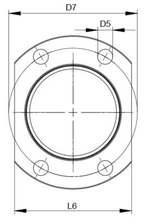
RSR

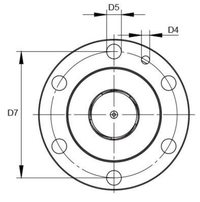


RSS



RSM



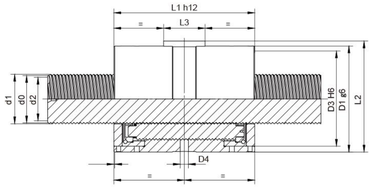


Unit(单位): mm

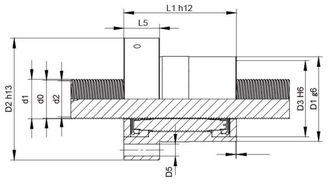
型号 Model	参考直径×导程 D×P Reference Diameter X Lead		丝杠头数 N Number of Roller Screw	螺旋升角 [°] Spiral Angle	单螺母 Single Nut				双螺母 Double Nut					预紧螺母 Preload Nut					正转效率 Positive Rotation Efficiency	反转效率 Negative Rotation Efficiency
					动态负载 Ca [kN] Dynamic Load	静态负载 C0a [kN] Static Load	刚度系数 Fk [N2/3μm] Rigidity Coefficient	轴向间隙 Axial Clearance	动态负载 Ca [kN] Dynamic Load	静态负载 C0a [kN] Static Load	刚度系数 Fk [N2/3μm] Rigidity Coefficient	预紧力 Fv [N] Preload Force	预紧扭矩 Mv [Nm] Preload Torque	动态负载 Ca [kN] Dynamic Load	静态负载 C0a [kN] Static Load	刚度系数 Fk [N2/3μm] Rigidity Coefficient	预紧力 Fv [N] Preload Force	预紧扭矩 Mv [Nm] Preload Torque		
RS	56x	6	6	1.95	219.5	584.9	119.0	0.03	219.5	584.9	178.5	2763	1.60	120.9	292.5	75.5	2763	1.60	0.81	0.77
		12		3.90	256.1	575.9	82.2	0.03	256.1	575.9	123.4	2243	1.60	141.1	288.0	51.8	2243	1.60	0.87	0.86
		30		9.68	355.7	648.1	51.4	0.05	355.7	648.1	77.1	946	1.60	195.9	324.0	32.4	946	1.60	0.88	0.86
RS	60x	10	5	3.04	380.1	925.8	96.5	0.04	380.1	925.8	144.8	2601	1.80	209.4	462.9	60.8	2601	1.80	0.86	0.83
		20		6.06	500.4	1057.1	68.4	0.04	500.4	1057.1	102.6	1769	1.80	275.7	528.5	43.1	1769	1.80	0.89	0.88
		30		9.04	495.5	1029.9	55.1	0.07	495.5	1034.1	82.6	1108	1.80	273.0	517.1	34.7	1108	1.80	0.88	0.87
RS	75x	10	5	2.43	497.8	1452.7	116.7	0.04	-	-	-	-	-	-	-	-	-	-	0.84	0.80
		20		4.85	639.5	1666.1	82.7	0.04	-	-	-	-	-	-	-	-	-	-	0.88	0.87
		30		7.26	643.2	1637.3	66.8	0.05	-	-	-	-	-	-	-	-	-	-	0.89	0.88
RS	100x	12	6	2.19	790.2	2649.7	153.2	0.05	-	-	-	-	-	-	-	-	-	-	0.82	0.79
		30		5.45	857.8	2563.9	94.0	0.05	-	-	-	-	-	-	-	-	-	-	0.89	0.87
		20	5	3.68	1063.3	3605.5	116.4	0.05	-	-	-	-	-	-	-	-	-	-	0.87	0.85

* 可根据要求降低轴向间隙。
Axial clearance can be reduced as required.

RS系列 – 行星滚柱丝杠 Type RS – Planetary Roller Screws



RSR



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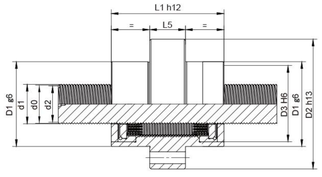
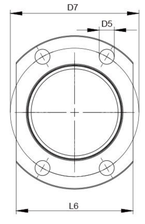
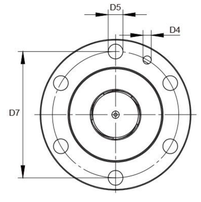


RSM



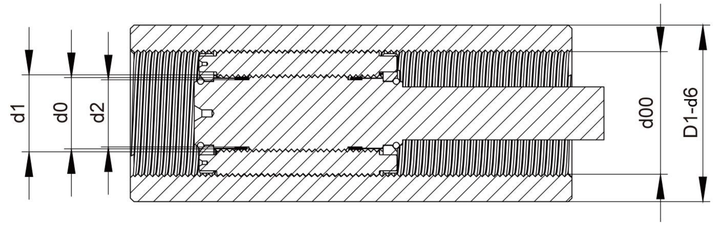


Unit(单位): mm

型号 Model	参考直径×导程 D×P Reference Diameter X Lead		丝杠 Screw			螺母 Nut													
			丝杠外径 Ød1 Screw Outer Diameter	公称直径 Ød0 Nominal Diameter	丝杠根径 Ød2 Screw Root Diameter	ØD1	ØD2	ØD3	ØD4		ØD5	ØD7	无刮油器 Without Wiper L1	有刮油器 With Wiper L1	L2	L3	L4	L5	L6
RS	56x	6	56.35	56	55.54	100	150	93	7	M8×1	M8×1	127	100	112	103	40	8	37	102
		12	56.67		55.05														
		30	57.4		53.35														
RS	60x	10	60.57	60	59.22	110	150	100	10.5	M8×1	M8×1	130	106	124	113.2	40	8	30	112
		20	61.05		58.35														
		30	61.74		56.88	122	180	110	10.5	M8×1	M8×1	150	140	152	125.7	45	10	40	124
RS	75x	10	75.70	75	74.08	150	210	140	10.5	M8×1	M8×1	180	175	191	153	63	10	45	152
		20	76.31		73.07														
		30	76.83		71.97														
RS	100x	12	100.70	100	99.08	185	260	172	10.5	M8×1	M8×1	225	200	220	188	63	10	50	187
		30	101.60		97.55														
		20	101.35	99	97.11	200	275	186	15	M8×1	M8×1	240	250	271	203	63	10	50	202

* 可根据要求降低轴向间隙。
Axial clearance can be reduced as required.

RSI系列 – 反转式行星滚柱丝杠 Type RSI – Inverted Planetary Roller Screws

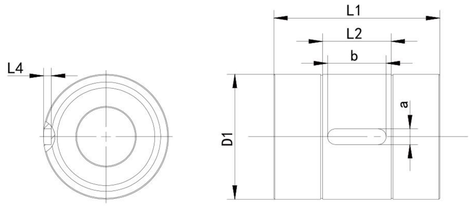


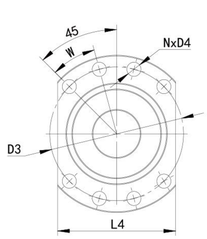
Unit(单位): mm

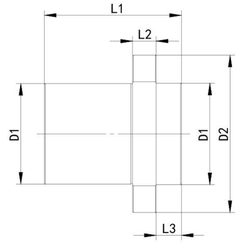
型号 Model	参考直径×导程 D×P Reference Diameter X Lead		丝杠头数 N Number of Roller Screw	螺旋升角 [°] Spiral Angle	单螺母 Single Nut				正转效率 Positive Rotation Efficiency	反转效率 Negative Rotation Efficiency	丝杠外径 Ød1 Screw Outer Diameter	公称直径 Ød0 Nominal Diameter	丝杠根径 Ød2 Screw Root Diameter	螺母公称直径 Ød00 Nut Nominal Diameter	最小外径 ØD1 Min. Outer Diameter
					动态负载 Ca[kN] Dynamic Load	静态负载 C0a[kN] Static Load	刚度系数 Fk [N2/3μm] Rigidity Coefficient	轴向间隙 Axial Clearance							
RSI	7.8x	2	3	4.66	8.9	17.4	31.2	0.03	0.78	0.71	8.00	7.8	7.46	13.0	18.0
RSI	10.5x	2	3	3.47	13.4	20.8	32.6	0.02	0.87	0.85	10.70	10.5	10.16	17.5	24.0
RSI	12x	1	3	1.52	13.9	26.8	52.1	0.02	0.78	0.71	12.11	12.0	11.84	20.0	26.0
		2		3.04	16.5	27.1	36.5	0.02	0.86	0.83	12.20		11.66		
RSI	15x	1	3	1.22	23.7	56	74.1	0.02	0.74	0.65	15.11	15.0	14.84	25.0	32.0
		2		2.43	27.7	55.2	51.0	0.02	0.84	0.80	15.21		14.67		
		3		3.64	29.1	51.5	39.4	0.03	0.87	0.85	15.29		14.48		
RSI	18x	1	3	1.01	30.6	76.8	85.1	0.02	0.71	0.58	18.12	18.0	17.85	30.0	38.0
		2		2.03	36.2	77.2	59.0	0.02	0.82	0.77	18.22		17.68		
		3		3.04	39.1	74.9	46.9	0.03	0.86	0.83	18.30		17.49		
RSI	21x	2	3	1.74	54.5	6.0	67.5	0.02	0.80	0.74	21.22	21.0	20.68	35.0	45.0
		3		2.60	59.6	104.8	54.2	0.03	0.84	0.81	21.31		20.50		
		4		3.47	63.3	103.7	46.5	0.03	0.87	0.85	21.39		20.31		
RSI	30x	2	3	1.22	97.2	224.1	93.4	0.02	0.74	0.65	30.23	30.0	29.69	50.0	60.0
		3		1.82	107.3	224.7	75.5	0.03	0.80	0.75	30.33		29.52		
		4		2.43	113.6	220.8	64.3	0.03	0.84	0.80	30.42		29.34		
		5		3.04	119.2	219.2	57.0	0.03	0.86	0.83	30.50		29.15		
		6		3.64	126.9	226.5	52.9	0.04	0.87	0.85	30.58		28.96		
RSI	36x	2	4	1.01	86.9	215.4	111.7	0.02	0.71	0.58	36.18	36.0	35.77	54.0	64.0
		3		1.52	95.4	214.0	89.3	0.02	0.78	0.71	36.26		35.65		
		4		2.03	101.8	212.6	76.7	0.03	0.82	0.77	36.34		35.53		
		5		2.53	106.2	209.2	67.7	0.03	0.84	0.81	36.41		35.40		
		6		3.01	111.0	209.8	61.7	0.03	0.86	0.83	36.48		35.26		
		7		3.54	117.8	218.1	58.0	0.03	0.87	0.85	36.54		35.13		

* 可根据要求降低轴向间隙。
Axial clearance can be reduced as required.

RSD系列 – 差动式行星滚柱丝杠 Type RSD – Differential Planetary Roller Screws







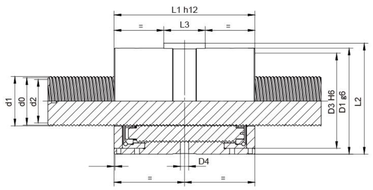
尺寸(圆柱形)
Dimensions(cylindrical type) Unit(单位): mm

型号 Model	Dg6	L1	L2	a	b	t
RSD 10 x..-A1	27	35	15	3	12	1.8
RSD 12 x..-A1	35	45.5	17	4	14	2.5
RSD 16 x..-A1	38	49	19	4	16	2.5
RSD 20 x..-A1	49	62	25	5	20	3
RSD 25 x..-A1	54	69.5	27.5	6	22	3.5
RSD 32 x..-A1	70	87	35	8	30	4
RSD 44 x..-A1	100	122	50	12	40	5
RSD 63 x..-A1	130	160	On request			
RSD 73 x..-A1	155	190				
RSD 100 x..-A1	185	190				

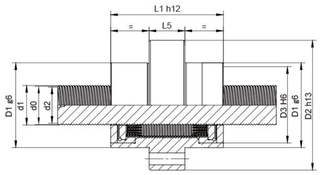
尺寸(平边法兰型)
Dimensions(flat-sided flange type) Unit(单位): mm

型号 Model	D1g6	D2	D3	D4	L1	L2	L3	L4	N	W
RSD 10 x..-A2	26	39	32.5	3.4	35	6	5	29	6	45°
RSD 12 x..-A2	33	49	41	4.5	45.5	8	7	36	6	45°
RSD 16 x..-A2	37	56	47	5.5	49	9	8.5	42	6	45°
RSD 20 x..-A2	48	72	60	6.6	62	11	9.5	52	6	45°
RSD 25 x.-A2	54	78	66	6.6	69.5	12	10	60	6	45°
RSD 32 x..-A2	70	100	85	9	87	15	12	75	6	45°
RSD 44 x..-A2	100	136	118	11	122	20	16	110	8	30°
RSD 63 x..-A2	127	172	150	13.5	155	27	22	135	10	22.5°
RSD 73 x..-A2	155	On request			160	On request				
RSD 100 x..-A2	185	240	210	17.5	190	30	25	187	14	15°

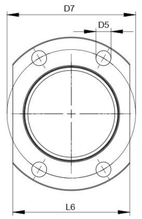
RSC系列 – 循环式行星滚柱丝杠 Type RSC – Cyclic Planetary Roller Screws

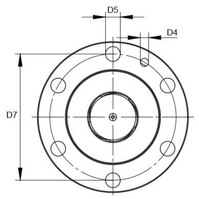


RSCR



RSCM



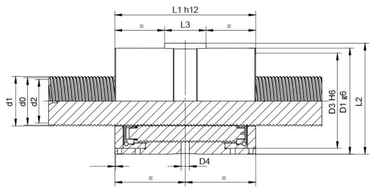


Unit(单位): mm

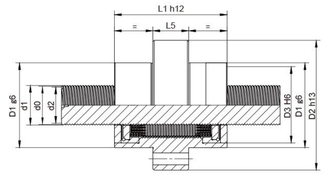
型号 Model	参考直径×导程 D×P Reference Diameter X Lead		丝杠头数 N Number of Roller Screw	螺旋升角 [°] Spiral Angle	单螺母 Single Nut				双螺母 Double Nut					预紧螺母 Preload Nut					正转效率 Positive Rotation Efficiency	反转效率 Negative Rotation Efficiency
					动态负载 Ca [kN] Dynamic Load	静态负载 C0a [kN] Static Load	刚度系数 Fk [N/3μm] Rigidity Coefficient	轴向间隙 Axial Clearance	动态负载 Ca [kN] Dynamic Load	静态负载 C0a [kN] Static Load	刚度系数 Fk [N/3μm] Rigidity Coefficient	预紧力 Fv [N] Preload Force	预紧扭矩 Mv [Nm] Preload Torque	动态负载 Ca [kN] Dynamic Load	静态负载 C0a [kN] Static Load	刚度系数 Fk [N/3μm] Rigidity Coefficient	预紧力 Fv [N] Preload Force	预紧扭矩 Mv [Nm] Preload Torque		
RSC	10×	1	1	1.89	14.1	17.8	21.4	0.03	14.1	17.8	32.1	810	0.08	8.1	8.9	13.5	810	0.08	0.81	0.76
		2	2	3.78	14.1	17.8	21.4	0.03	14.1	17.8	32.1	665	0.08	8.1	8.9	13.5	665	0.08	0.87	0.85
RSC	12×	1	1	1.57	16.1	21.3	23.8	0.03	16.1	21.3	35.6	860	0.10	9.3	10.6	15.0	860	0.10	0.78	0.72
		2	2	3.13	16.1	21.3	23.8	0.03	16.1	21.3	35.6	740	0.10	9.3	10.6	15.0	740	0.10	0.86	0.84
RSC	16×	1	1	1.17	19.4	28.2	28.2	0.03	19.4	28.2	42.3	990	0.15	11.1	14.1	17.8	990	0.15	0.73	0.63
		2	2	2.33	19.4	28.2	28.2	0.03	19.4	28.2	42.3	895	0.15	11.1	14.1	17.8	895	0.15	0.83	0.80
RSC	20×	1	1	0.93	27.1	49.7	37.5	0.03	27.1	49.7	56.3	1070	0.20	15.6	24.8	23.7	1070	0.20	0.69	0.55
		2	2	1.86	27.1	49.7	37.5	0.03	27.1	49.7	56.3	995	0.20	15.6	24.8	23.7	995	0.20	0.80	0.76
RSC	25×	1	1	0.74	39.7	85.2	48.3	0.03	39.7	85.2	72.5	1295	0.30	22.8	42.6	30.4	1295	0.30	0.64	0.44
		2	2	1.48	39.7	85.2	48.3	0.03	39.7	85.2	72.5	1228	0.30	22.8	42.6	30.4	1228	0.30	0.77	0.70
RSC	32×	1	1	0.58	60.8	148.9	61.0	0.02	60.8	148.9	91.6	1698	0.50	34.9	74.4	38.4	1698	0.50	0.58	0.29
		2	2	1.15	60.8	148.9	61.0	0.03	60.8	148.9	91.6	1635	0.50	34.9	74.4	38.4	1635	0.50	0.73	0.63
		4		2.33	73.5	144.7	42.6	0.03	73.5	144.7	63.9	1493	0.50	42.2	72.4	26.8	1493	0.50	0.83	0.80

* 可根据要求降低轴向间隙。
Axial clearance can be reduced as required.

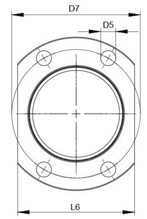
RSC系列 – 循环式行星滚柱丝杠 Type RSC – Cyclic Planetary Roller Screws

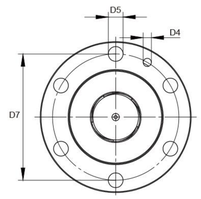


RSCR



RSCM



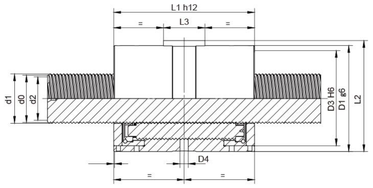


Unit(单位): mm

型号 Model	参考直径×导程 D×P Reference Diameter X Lead		丝杠 Screw			螺母 Nut														
			丝杠外径 Ød1 Screw Outer Diameter	公称直径 Ød0 Nominal Diameter	丝杠根径 Ød2 Screw Root Diameter	ØD1	ØD2	ØD3	ØD4		ØD5	ØD7	无刮油器 Without Wiper L1	有刮油器 With Wiper L1	L2	L3	L4	L5	L6
RSC	10×	1	10	9.63	9.19	22	43	18.5	5	M5	4.8	33	31	41	22.8	12	2	13	24
		2		9.63	9.19														
RSC	12×	1	12	11.63	11.19	24	46	20	5	M5	4.8	36	31	41	24.8	12	2	13	26
		2		11.63	11.19														
RSC	16×	1	16	15.63	15.19	29	51	25	5	M6	4.8	41	31	41	30.2	12	3	13	31
		2		15.63	15.19														
RSC	20×	1	20	19.63	19.19	34	58	28	5	M6	5.8	46	37	47	35.2	16	3	18	36
		2		19.63	19.19														
RSC	25×	1	25	24.63	24.19	42	68	36	5	M6	5.8	56	44	54	43.5	20	4	18	44
		2		24.63	24.19														
RSC	32×	1	32	31.63	31.19	53	83	46	5	M6	7.0	70	55	67	55.2	20	4	20	55
		2		31.63	31.19														
		4		31.26	30.38														

* 可根据要求降低轴向间隙。
Axial clearance can be reduced as required.

RSC系列 – 循环式行星滚柱丝杠 Type RSC – Cyclic Planetary Roller Screws



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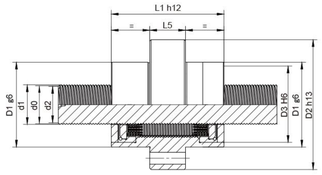

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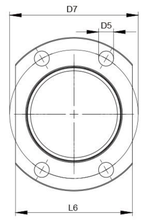
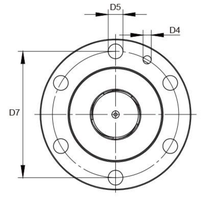


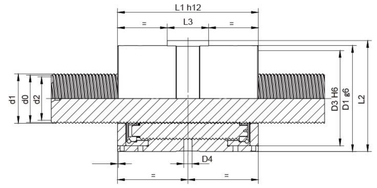


Unit(单位): mm

型号 Model	参考直径×导程 D×P Reference Diameter X Lead		丝杠头数 N Number of Roller Screw	螺旋升角 [°] Spiral Angle	单螺母 Single Nut				双螺母 Double Nut					预紧螺母 Preload Nut					正转效率 Positive Rotation Efficiency	反转效率 Negative Rotation Efficiency
					动态负载 Ca [kN] Dynamic Load	静态负载 C0a [kN] Static Load	刚度系数 Fk [N/2μm] Rigidity Coefficient	轴向间隙 Axial Clearance	动态负载 Ca [kN] Dynamic Load	静态负载 C0a [kN] Static Load	刚度系数 Fk [N/2μm] Rigidity Coefficient	预紧力 Fv [N] Preload Force	预紧扭矩 Mv [Nm] Preload Torque	动态负载 Ca [kN] Dynamic Load	静态负载 C0a [kN] Static Load	刚度系数 Fk [N/2μm] Rigidity Coefficient	预紧力 Fv [N] Preload Force	预紧扭矩 Mv [Nm] Preload Torque		
RSC	36×	1	1	0.51	73.8	180.5	64.1	0.03	73.8	180.5	96.2	1815	0.60	42.4	90.2	40.4	1815	0.60	0.56	0.20
		2		1.03	86.5	171.5	44.2	0.03	86.5	171.5	66.3	1775	0.60	49.7	85.7	27.9	1775	0.60	0.71	0.59
RSC	40×	1	1	0.46	79.8	206.9	69.5	0.03	79.8	206.9	104.3	1908	0.70	45.8	103.5	43.8	1908	0.70	0.53	0.11
		2	2	0.92	79.8	206.9	69.5	0.03	79.8	206.9	104.3	1857	0.70	45.8	103.5	43.8	1857	0.70	0.69	0.54
		4		1.86	97.3	199.0	47.7	0.03	97.3	199.0	71.5	1740	0.70	55.9	99.5	30.0	1740	0.70	0.80	0.76
RSC	50×	1	1	0.37	134.1	410.4	93.6	0.03	134.1	410.4	140.3	1969	0.90	77.0	205.2	58.9	1969	0.90	0.52	0.06
		2	2	0.73	139.9	424.4	94.6	0.03	134.1	410.4	140.3	1930	0.90	80.3	212.2	59.6	1930	0.90	0.64	0.44
		3		1.11	160.0	429.0	76.9	0.03	160.0	429.0	115.4	1888	0.90	91.9	214.5	48.5	1888	0.90	0.72	0.62
		4		1.48	168.2	407.6	64.7	0.03	168.2	407.6	97.1	1842	0.90	96.6	203.8	40.8	1842	0.90	0.77	0.70

* 可根据要求降低轴向间隙。
Axial clearance can be reduced as required.

RSC系列 – 循环式行星滚柱丝杠 Type RSC – Cyclic Planetary Roller Screws



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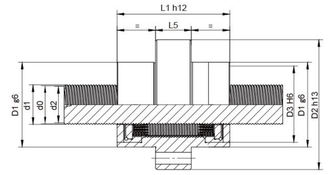
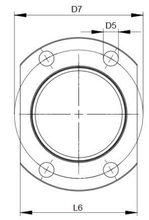
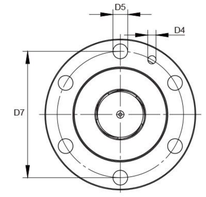


RSCM



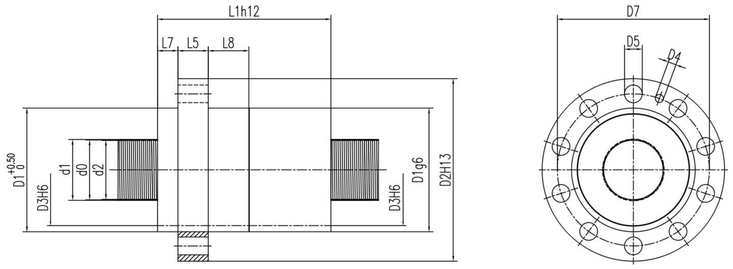


Unit(单位): mm

型号 Model	参考直径×导程 D×P Reference Diameter X Lead		丝杠 Screw			螺母 Nut													
			丝杠外径 Ød1 Screw Outer Diameter	公称直径 Ød0 Nominal Diameter	丝杠根径 Ød2 Screw Root Diameter	ØD1	ØD2	ØD3	ØD4		ØD5	ØD7	无刮油器 Without Wiper L1	有刮油器 With Wiper L1	L2	L3	L4	L5	L6
RSC	36×	1	36	35.63	35.19	61	90	53	5	M6	9.0	75	62	75	63.7	28	6	17	63
		2		35.26	34.38														
RSC	40×	1	40	39.63	39.19	70	104	58	5	M6	9.0	85	66	80	72.7	28	6	26	72
		2		39.63	39.19														
		4		39.26	38.38														
RSC	50×	1	50	49.63	49.19	82	124	74	8	M6	11.0	102	85	101	84.7	32	6	28	84
		2		49.63	49.19														
		3		49.45	48.79														
		4		49.26	48.38														

* 可根据要求降低轴向间隙。
Axial clearance can be reduced as required.

RSH系列 – 重载行星滚柱丝杠 Type RSH – Heavy Load Planetary Roller Screws

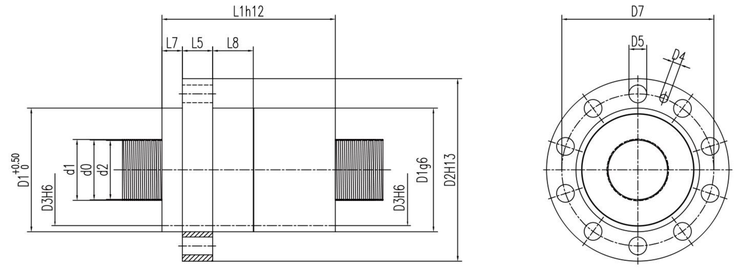


Unit(单位): mm

型号 Model	参考直径×导程 D×P Reference Diameter X Lead		丝杠头数 N Number of Roller Screw	螺旋升角 [°] Spiral Angle	单螺母 Single Nut				正转效率 Positive Rotation Efficiency	反转效率 Negative Rotation Efficiency
					动态负载 Ca[kN] Dynamic Load	静态负载 C0a[kN] Static Load	刚度系数 Fk [N2/3μm] Rigidity Coefficient	轴向间隙 Axial Clearance		
RSH	60×	15	5	4.55	654.9	1512.4	88.9	0.04	0.88	0.87
		20		6.06	655.8	1498.0	76.4	0.04	0.89	0.88
		25		7.55	665.2	1522.3	68.9	0.04	0.89	0.88
		30		9.04	650.9	1469.2	62.0	0.04	0.88	0.87
RSH	75×	15	5	3.64	842.5	2449.6	108.9	0.04	0.87	0.85
		20		4.85	862.0	2480.3	95.0	0.04	0.88	0.87
		25		6.06	866.9	2462.0	84.4	0.04	0.89	0.88
		30		7.26	858.0	2395.2	76.0	0.04	0.89	0.88
RSH	87×	15	5	3.14	1074.0	3531.7	127.9	0.04	0.86	0.84
		20		4.19	1087.0	3510.3	110.2	0.04	0.88	0.86
		25		5.23	1106.3	3545.9	99.1	0.04	0.89	0.87
		30		6.26	1099.7	3467.5	89.1	0.04	0.89	0.88
RSH	100×	15	5	2.76	1301.0	4708.0	145.1	0.05	0.85	0.82
		20		3.68	1323.9	4716.1	124.9	0.05	0.87	0.85
		25		4.06	1323.5	4658.9	111.2	0.05	0.88	0.87
		30		5.51	1354.7	4732.1	102.2	0.05	0.89	0.87
		35		6.42	1347.3	4642.4	93.4	0.05	0.89	0.88
RSH	112×	15	5	2.43	1440.8	5442.7	153.3	0.05	0.84	0.80
		20		3.24	1460.5	5415.6	131.4	0.05	0.86	0.84
		25		4.05	1480.1	5425.0	117.3	0.05	0.88	0.86
		30		4.85	1483.0	5361.5	106.6	0.05	0.88	0.87
		35		5.66	1482.6	5298.0	98.0	0.05	0.89	0.88

* 可根据要求降低轴向间隙。
Axial clearance can be reduced as required.

RSH系列 – 重载行星滚柱丝杠 Type RSH – Heavy Load Planetary Roller Screws

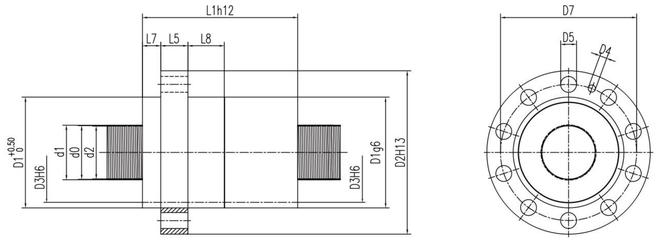


Unit(单位): mm

型号 Model	参考直径×导程 D×P Reference Diameter X Lead		丝杠 Screw			螺母 Nut									
			丝杠外径 Ød1 Screw Outer Diameter	公称直径 Ød0 Nominal Diameter	丝杠根径 Ød2 Screw Root Diameter	ØD1	ØD2	ØD3	ØD4	ØD5	ØD7	L1	L5	L7	L8
RSH	60×	15	60.99	60	58.56	122	180	110	M8×1	17.5	150	171	30	20	40
		20	61.26		58.02										
		25	61.51		57.46										
		30	61.74		56.88										
RSH	75×	15	76.01	75	73.58	150	210	140	M8×1	17.5	180	213	35	25	40
		20	76.31		73.07										
		25	76.58		72.53										
		30	76.83		71.97										
RSH	87×	15	88.03	87	85.60	175	235	162	M8×1	17.5	200	245	40	25	40
		20	88.33		85.09										
		25	88.62		84.57										
		30	88.89		84.03										
RSH	100×	15	100.04	99	97.61	200	245	186	M8×1	17.5	224	280	50	25	40
		20	100.35		97.11										
		25	100.65		96.60										
		30	100.93		96.07										
		35	101.19		95.52										
RSH	112×	15	113.55	112.5	111.12	230	285	210	M10×1	17.5	260	300	50	30	60
		20	113.86		110.62										
		25	114.17		110.12										
		30	114.46		109.60										
		35	114.74		109.07										

* 可根据要求降低轴向间隙。
Axial clearance can be reduced as required.

RSH系列 – 重载行星滚柱丝杠 Type RSH – Heavy Load Planetary Roller Screws



Unit(单位): mm

型号 Model	参考直径×导程 D×P Reference Diameter X Lead		丝杠头数 N Number of Roller Screw	螺旋升角 [°] Spiral Angle	单螺母 Single Nut				正转效率 Positive Rotation Efficiency	反转效率 Negative Rotation Efficiency
					动态负载 Ca[kN] Dynamic Load	静态负载 C0a[kN] Static Load	刚度系数 Fk [N/2/3μm] Rigidity Coefficient	轴向间隙 Axial Clearance		
RSH	120×	15	5	2.28	1598.9	6370.3	164.3	0.05	0.83	0.79
		20		3.04	1634.0	6419.5	141.6	0.05	0.86	0.83
		25		3.79	1656.2	6429.5	126.3	0.05	0.87	0.85
		30		4.55	1648.2	6283.1	114.1	0.05	0.88	0.87
		35		5.30	1668.7	6332.0	106.0	0.05	0.89	0.87
		40		6.06	1673.8	6302.8	98.7	0.05	0.89	0.88
RSH	135×	15	5	2.03	2061.7	9351.8	198.3	0.07	0.82	0.77
		20		2.70	1968.1	8494.9	160.4	0.07	0.85	0.82
		25		3.37	1988.6	8461.7	142.4	0.07	0.86	0.84
		30		4.05	2030.1	8605.9	130.8	0.07	0.88	0.86
		35		4.72	2054.8	8661.2	121.7	0.07	0.88	0.87
		40		5.39	2049.7	8539.1	112.9	0.07	0.89	0.87
		50		6.72	2031.9	8295.8	99.3	0.07	0.89	0.88
RSH	150×	15	5	1.82	2235.9	10488.5	206.4	0.07	0.80	0.75
		20		2.43	2155.4	9675.9	168.8	0.07	0.84	0.80
		25		3.04	2164.8	9542.5	148.8	0.07	0.86	0.83
		30		3.64	2181.9	9506.5	135.2	0.07	0.87	0.85
		35		4.25	2215.7	9616.2	125.9	0.07	0.88	0.86
		40		4.85	2218.4	9531.5	117.3	0.07	0.88	0.87
		50		6.06	2216.3	9362.4	103.7	0.07	0.89	0.88
RSH	180×	20	5	2.03	3204.3	17663.4	225.0	0.10	0.82	0.77
		30		3.04	3101.2	16220.8	171.8	0.10	0.86	0.83
		40		4.05	3155.2	16249.9	148.4	0.10	0.88	0.86
		50		5.05	3195.3	16278.8	133.0	0.10	0.89	0.87
RSH	210×	30	5	2.60	3893.4	22704.7	202.0	0.10	0.84	0.81
		40		3.47	3723.7	20709.1	163.5	0.10	0.87	0.85
		50		4.33	3773.0	20743.4	146.3	0.10	0.88	0.86

* 可根据要求降低轴向间隙。
Axial clearance can be reduced as required.

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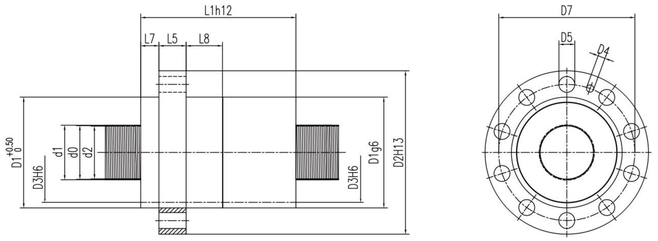
RSH系列 – 重载行星滚柱丝杠 Type RSH – Heavy Load Planetary Roller Screws



Unit(单位): mm

型号 Model	参考直径×导程 D×P Reference Diameter X Lead		丝杠 Screw			螺母 Nut								
			丝杠外径 Ød1 Screw Outer Diameter	公称直径 Ød0 Nominal Diameter	丝杠根径 Ød2 Screw Root Diameter	ØD1	ØD2	ØD3	ØD4	ØD5	ØD7	L1	L5	L7	L8
RSH	120×	15	121.05	120	118.62	240	300	220	M10×1	17.5	270	346	55	40	60
		20	121.37		118.13										
		25	121.68		117.63										
		30	121.98		117.12										
		35	122.26		116.59										
		40	122.53		116.05										
RSH	135×	15	136.06	135	133.63	280	345	260	M12	20.0	315	370	60	35	80
		20	136.38		133.14										
		25	136.70		132.65										
		30	137.00		132.14										
		35	137.30		131.63										
		40	137.58		131.10										
		50	138.10		130.00										
RSH	150×	15	151.06	150	148.63	320	385	280	M12	20.0	355	412	70	50	80
		20	151.39		148.15										
		25	151.71		147.66										
		30	152.03		147.17										
		35	152.33		146.66										
		40	152.61		146.13										
		50	153.16		145.06										
RSH	180×	20	181.41	180	178.17	390	470	330	M12	24.0	433	528	90	55	100
		30	182.06		177.20										
		40	182.67		176.19										
		50	183.25		175.15										
RSH	210×	30	212.08	210	207.22	440	530	398	M12	26.0	490	570	100	55	100
		40	212.71		206.23										
		50	213.31		205.21										

* 可根据要求降低轴向间隙。
Axial clearance can be reduced as required.

安装说明 How to install

启动丝杠 Starting the Screw

在对组件进行清洁、安装和润滑后，让螺母在低速（<50 r/min）和轻载（不超过滚柱丝杠动态负载能力的5%）下进行几个完整行程，以检查限位开关或换向机构位置是否正确。此后，可以施加正常负载和采取正常速度。

After cleaning, mounting and lubricating the assembly, allow the nut to make a few full strokes at low speed (<50 r/min) and light load (not exceeding 5% of the dynamic load capacity of the Roller Screw) to check that the limit switches or commutation mechanism are correctly positioned. Thereafter, normal loads can be applied and normal speeds taken.

磨合期 Break-in period

在运行的最初几个小时内，未预紧滚柱丝杠将进行磨合。
建议在磨合后，给螺母注入一半量的润滑脂，以更新可能被磨合颗粒污染的润滑剂。

Unpreloaded Roller Screws will break-in during the first few hours of operation.
It is recommended to fill the nut with half the amount of grease after break-in to renew any lubricant that may have been contaminated by break-in particles.

监测丝杠寿命 Monitoring of screw life

在丝杠使用寿命结束时，可观察到以下情况：疲劳剥落、轴向间隙增加、运转性能恶化、驱动扭矩增加和工作温度升高。此外，润滑剂有明显污染迹象。这些迹象是监测滚柱丝杠状况的重要方法。建议在丝杠使用寿命结束时立即更换，以避免对设备造成任何损坏。

At the end of the roller screw's service life, the following conditions can be observed: fatigue spalling, increased axial clearance, deterioration of operating performance, increased drive torque and elevated operating temperature. In addition, there are obvious signs of contamination of the lubricant. These signs are important methods for monitoring the condition of the roller screw. It is recommended to replace the screw immediately at the end of its service life to avoid any damage to the equipment.

重要提示 Important Tip

润滑剂质量差或缺少润滑剂、应力异常、错位和倾斜以及超出规范要求的操作会提高滚柱丝杠的工作温度。监测丝杠的工作温度有助于检测任何异常情况。

Poor quality or lack of lubricant, abnormal stresses, misalignment and tilting, and operation outside of specification requirements can increase the operating temperature of a Roller Screw. Monitoring the operating temperature of the screw will help detect any abnormalities.

可追踪性 Traceability

每个滚柱丝杠轴和螺母都有其出厂代码，KGG会记录丝杠的尺寸数据、导程精度、轴向间隙、预紧扭矩等，并存档，便于在需要查询这些记录时及时调取。

Each roller screw shaft and nut has its own factory code. KGG will record the size data of the screw, lead accuracy, axial clearance, preload torque, etc., and archive them for timely retrieval when these records need to be accessed.

支撑轴承组件 Support bearing assembly

1、在安装支撑轴承前，请检查安装方向（法兰位置）
2、如有必要，用专用加热器将支撑轴加热至80°C
3、将支撑轴安装到丝杠上（检查它是否与丝杠的法兰表面吻合）
4、准备锁紧螺母，并松开锁紧螺钉四分之一圈
5、安装锁紧螺母：
· 拧紧至产品表中所列拧紧力矩的1.5倍
· 松开螺母
· 将锁紧螺母重新拧紧至产品表中列出的扭矩值，并拧紧锁紧螺钉
6、检查加工端的径向跳动，并标记上点
7、如果跳动量超出公差范围，松开最靠近先前标记上点的径向锁紧螺钉并重新拧紧
8、再次检查径向跳动
9、检查支撑轴承的操作。

1、Check the mounting direction (flange position) before mounting the support bearing
2、If necessary, use a special heater to heat the support shaft to 80°C.
3、Mount the support shaft onto the screw (check whether it matches the flange surface of the screw)
4、Prepare the lock nut and loosen the lock screw by a quarter turn
5、Install the lock nut:
· Tighten to 1.5 times the tightening torque listed in the product table
· Loosen the nut
· Retighten the lock nut to the torque value listed in the product table and tighten the lock screw.
6. Check the radial runout of the machined end and mark the upper point.
7. If the runout is out of tolerance, loosen the radial locking screw closest to the previously marked upper point and retighten.
8. Check the radial runout again
9、Check the operation of the support bearing.

与法兰螺母一起使用的螺栓建议 Bolt recommendations for use with flange nuts

KGG建议使用符合ISO 12.9级的标准钢制螺栓。
KGG recommends the use of standard steel bolts conforming to ISO class 12.9.

对准 Alignment

应检查KGG直线导向系统是否正确对准，以避免滚柱丝杠承受非轴向负载。

如果外部直线导向系统不符合要求，我们建议在耳轴上安装滚柱丝杠螺母，或在自动调心轴承上安装丝杠轴。KGG建议按照下列操作程序进行装配，该程序适用于带有旋转轴螺钉和固定螺母的组件。

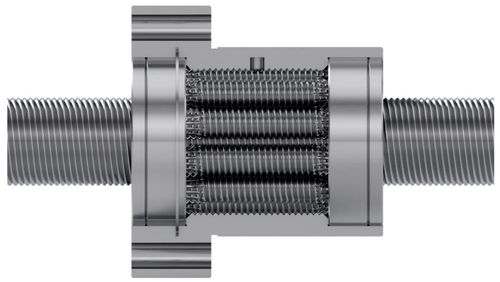
必须按照所选导向系统的建议要求正确安装直线导轨。

The KGG linear guidance system should be checked for correct alignment to avoid non-axial loads on the Roller Screw.

If the external linear guidance system does not meet the requirements, we recommend mounting the Roller Screw Nut on a trunnion or the Screw Shaft on a self-aligning bearing.KGG recommends that assembly be carried out in accordance with the following operating procedure, which applies to assemblies with swivel shaft screws and retaining nuts.

The linear guide must be correctly mounted in accordance with the recommended requirements of the selected guidance system.

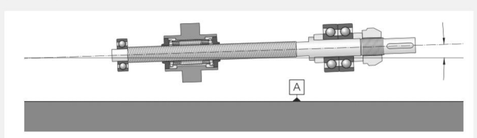
支撑轴承组件
Support bearing assembly:



1、将丝杠轴与直线导轨对齐
Align the screw shaft with the linear guideway

将支撑轴承箱与导轨对齐，以获得丝杠轴相对于直线导轨的平行度。在两个垂直平面内，支撑轴承轴相对于直线导轨的倾斜度必须小于1/2 000弧度（0.03°），理想目标是1/5 000弧度（0.011°）

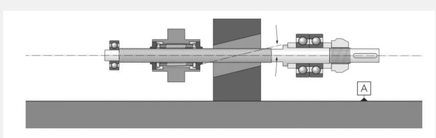
Align the support bearing box with the guideway to obtain parallelism of the screw shaft relative to the linear guideway. The inclination of the support bearing shaft relative to the linear guideway must be less than 1/2,000 radians (0.03°) in both vertical planes, with an ideal target of 1/5,000 radians (0.011°)



2、将螺母座与直线导轨对齐
Align the nut holder with the linear guideway

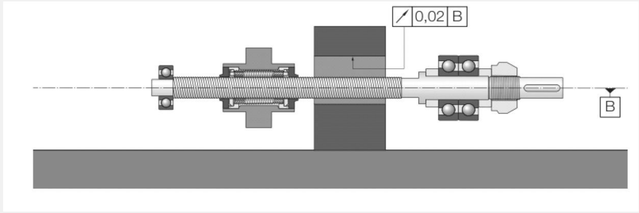
将滚柱丝杠螺母座与直线导轨的轴线对齐，使螺母轴线与直线导轨平行。斜度必须小于1/2 000（0.03°），理想目标是1/5000（0.011）。有负载时必须保证该公差。

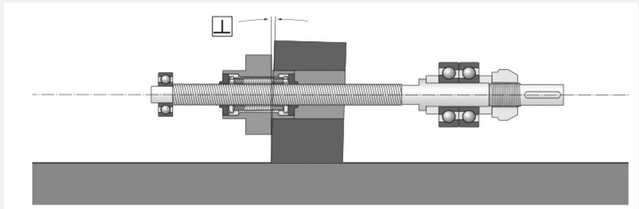
Align the roller screw nut holder with the axis of the linear guide so that the nut axis is parallel to the linear guide. The skew must be less than 1/2,000 (0.03°), with an ideal target of 1/5000 (0.011). This tolerance must be guaranteed when there is a load.



3、检查螺母座孔与支撑轴承的同心度
3、Check the concentricity of the nut seat hole and the support bearing

KGG建议检查螺母座相对于轴的支撑轴承没有偏心。否则，螺母座过度偏心会导致滚柱丝杠上产生不可接受的径向负载。螺母座内径和支撑轴承轴线之间的两个垂直平面的径向偏心度不得超过0.02mm。





KGG recommends checking that the nut seat is not eccentric with respect to the support bearing of the shaft. Otherwise, excessive eccentricity of the nut seat can lead to unacceptable radial loads on the roller screw. The radial eccentricity of the two vertical planes between the inner diameter of the nut seat and the axis of the support bearing must not exceed 0.02 mm.

润 滑 Lubrication

润滑的主要目的 The main purpose of lubrication

·防止滚动表面之间金属与金属的接触，并将金属疲劳降至最低防止腐蚀
·尽量减少磨损
·延长滚柱丝杠的使用寿命
·达到给定工作条件（温度、湿度、真空环境、腐蚀环境等）的性能要求。
在标准交付条件下，滚柱丝杠不润滑。用于齿轮和轴承润滑的润滑脂或润滑油由于与滚珠丝杠有类似的摩擦条件，因此大多数齿轮和轴承润滑建议使用的润滑油也适用于滚柱丝杠的润滑。

·Prevent metal-to-metal contact between rolling surfaces and minimize metal fatiguePrevent corrosion
·Minimize wear as much as possible
·Extend the service life of the Roller Screw
·Meet performance requirements for given operating conditions (temperature, humidity, vacuum environments, corrosive environments, etc.).
Under standard delivery conditions, roller screws are not lubricated. Greases or oils used for gear and bearing lubrication are suitable for lubricating Roller Screws as most of the lubricants recommended for gear and bearing lubrication are also suitable for lubricating Roller Screws due to the similar friction conditions as Roller Screws.

重要提示 Important Tip

滚柱丝杠在装运前涂有防锈剂。防锈剂不是润滑剂。根据不同用途所选择的润滑剂的不同，可能有必要在使用润滑剂之前清除防锈剂，以消除不兼容风险。需要先进的处理方法在清理防锈剂薄膜时，KGG建议采取以下步骤：

· 用溶剂清洗滚柱丝杠组件
· 让溶剂渗入螺母组件
· 让溶剂从滚柱丝杠组件中完全排出

KGG给滚柱丝杠涂抹的防锈剂与以下润滑剂不兼容：

· 聚乙二醇基础油
· 酯基油
· 硅酮基础油
· 铝复合皂

如果使用上述任何一种润滑剂，请在使用润滑剂之前按照上述操作程序清除防锈剂。

润滑剂主要有三种类型，润滑脂、润滑油和干性润滑剂。大多数应用会选择润滑脂或润滑油。

Roller Screws are coated with a rust inhibitor prior to shipment. The rust preventive is not a lubricant. Depending on the lubricant selected for each application, it may be necessary to remove the rust inhibitor prior to applying the lubricant to eliminate the risk of incompatibility. Advanced Treatment Required When cleaning rust inhibitor films, KGG recommends the following steps:

· Clean the roller screw assembly with solvent
· Allow the solvent to penetrate the nut assembly
· Allow the solvent to completely drain from the roller screw assembly

The rust inhibitor applied to roller screws by KGG is not compatible with the following lubricants:

· Polyethylene glycol base oils
· Ester-based oils
· Silicone base oils
· Aluminum complex soaps

If any of the above lubricants are used, follow the procedure above to remove the rust inhibitor before applying the lubricant.

There are three main types of lubricants, greases, lubricants and dry lubricants. Most applications will choose either grease or lubricant.

不同润滑剂的优缺点 Pros and cons of different lubricants

润滑剂类型 Lubricant Type	用户优势 User Advantages	使用限制 Limitations of use
润滑脂 Grease	滚柱丝杠最实用、最常用的润滑解决方案 The most practical and commonly used lubrication solution for roller screws.	需要重新润滑 Requires re-lubrication.
润滑油 Lubricants	对滚柱丝杠具有更好的润滑性能循环油有助于清洁滚柱丝杠机构和稳定工作温度 Better lubrication properties for roller screws. Circulating oil helps to clean the roller screw mechanism and stabilize the operating temperature.	需要更复杂的设备安装。需要特别注意设备的清洁度和密封性 Requires more complex equipment in stallation. Special attention needs to be paid to the cleanliness and sealing of the equipment.
干涂层 Dry Coating	适用于某些特定应用或不能使用液体润滑剂环境的润滑解决方案 Lubrication solutions for specific applications or environments where liquid lubricants cannot be used.	需要先进的处理方法滚柱丝杠可能需要特种钢材质成本更高 需要明确的操作条件才能达到预期性能 Advanced handling methods are required. Roller screws may require specialty steel materials.Higher costs. Requires defined operating conditions to achieve desired performance.

脂润滑 Grease Lubrication

润滑脂是丝杠最常用的润滑剂。润滑脂类型主要根据工作温度、负载水平、速度以及环境要求来选择。

润滑脂由基础油（平均占润滑脂总体积的80%）和添加剂组成，基础油是润滑剂，包含在增稠剂基质或皂中，添加剂具有一些特殊性能。

Grease is the most commonly used lubricant for screws. The type of grease is selected primarily based on operating temperature, load level, speed, and environmental requirements.

Grease consists of a base oil (on average 80% of the total volume of the grease), which is the lubricant and is contained in a thickener base or soap, and additives, which have a number of special properties.

润滑脂选择

合成基础油润滑脂优于矿物基础油润滑脂，因为合成基础油润滑脂具有随时间推移稳定性更高、粘度随温度变化更小的优点。

以下合成油对滚柱丝杠应用具有很好的效果：

·聚α烯烃（PAO）

·聚乙二醇（PAG）

在许多可以的替代产品中，以下增稠剂对滚柱丝杠应用具有很好的效果：

锂或复合锂

钡或复合钡

动态粘度用于表征润滑油在丝杠接触面之间形成足够厚的流体动力膜的能力。

润滑剂数据表的粘度通常是基础油在40°C和100°C时的粘度。

一般来说，KGG建议当应用达到其正常工作温度时，采用粘度为100Cst左右的润滑剂。

正常工作温度由滚柱丝杠产生的热量、外部施加的热量以及能够从丝杠传递出去的热量决定。

大多数应用适用的润滑脂稠度或NLGI等级为0（半流体）至2（软）。对于自动润滑系统，KGG建议检查系统正常工作所需的稠度。

对于由于离心力的作用可能会导致润滑剂飞溅或从轴上倾泻而下的高速应用和垂直应用，建议使用能牢固粘附到轴上的润滑剂。在这方面，钡皂和复合金属皂具有很好的粘性。在这种条件下，也建议采用NLGI 2级以达到要求的粘性。

然而，当转速较低（低于10 r/min）时，建议使用高粘度润滑剂，以便在滚动表面之间形成足够厚的流体动力膜，并限制负载下的摩擦。KGG通常建议在工作温度下高于300 Cst的粘度。

流体动力润滑膜的剪切力与负载水平成正比。一般来说，对于大于滚柱丝杠动态承载能力25%的外部负载水平，KGG推荐使用极压（EP）添加剂润滑脂。

在250千克的重量下通过“四球焊接负载试验”的润滑脂，在重载应用中表现良好。

以下工作条件需要采用特种润滑脂：

·食品工业

·真空应用

·含水

·有振动

·有微小运动、振动等

KGG润滑系统可适用于大多数自动注入润滑脂的滚柱丝杠。

Grease Selection

Synthetic base oil greases are superior to mineral base oil greases because they offer the advantages of greater stability over time and less variation in viscosity with temperature.

The following synthetic oils work well for roller screw applications:

· Polyalphaolefin (PAO)

· Polyethylene glycol (PAG)

Among the many alternatives available, the following thickeners work well for roller screw applications:

Lithium or lithium complex

Barium or barium complex

Dynamic viscosity is used to characterize the ability of a lubricant to form a sufficiently thick hydrodynamic film between the contact surfaces of a screw.

The viscosities in the lubricant data sheets are typically the viscosities of the base oils at 40Cst and 100Cst.

In general, KGG recommends a lubricant with a viscosity of about 100Cst when the application reaches its normal operating temperature.

The normal operating temperature is determined by the heat generated by the roller screw, the heat applied externally and the heat that can be transferred from the screw.

The applicable grease consistency or NLGI grade for most applications is 0 (semi-fluid) to 2 (soft). For automatic lubrication systems, KGG recommends checking the consistency required for proper system operation.

For high speed applications and vertical applications where the lubricant may splash or pour off the shaft due to centrifugal force, it is recommended to use a lubricant that adheres firmly to the shaft. In this regard, barium soaps and complex metal soaps provide excellent adhesion. Under these conditions, NLGI Grade 2 is also recommended to achieve the required adhesion.

However, at lower speeds (below 10 r/min), a high viscosity lubricant is recommended in order to form a sufficiently thick hydrodynamic film between the rolling surfaces and to limit friction under load.KGG usually recommends viscosities higher than 300 Cst at operating temperatures.

The shear force of the hydrodynamic lubricant film is proportional to the level of load. In general, for external load levels greater than 25% of the dynamic load carrying capacity of a Roller Screw, KGG recommends the use of Extreme Pressure (EP) additive greases.

Greases that pass the "Four Ball Weld Load Test" at 250 kg perform well in heavy-duty applications.

The following operating conditions require special greases:

· Food industry

· Vacuum applications

· Water containing

· Vibration

· With small movements, vibrations, etc.

KGG lubrication systems are available for most roller screws with automatic grease injection.

润滑计划和操作程序

KGG推荐采用以下润滑计划和操作程序：

1、调试和初始润滑

新滚柱丝杠在使用前必须进行润滑。

1.1、轴的润滑程序：

在轴的螺纹长度上，用刷子涂抹一定量的润滑脂。

每种丝杠尺寸每米螺纹长度上应涂抹的油脂量Zs，使用以下公式估算润滑脂的体积量：

$Zs = 4.4 \times 10^{-4} d_0 l_1$

其中

Zs = 润滑脂体积[cm^3]

d_0 = 丝杠的公称直径[mm]

l_1 = 丝杠的螺纹长度[mm]

1.2、螺母的润滑程序：

带法兰螺母的滚柱丝杠上有一个用于注入油脂的螺纹孔。带有圆柱形螺母的滚柱丝杠有一个中心槽和一个可以通过座连接到油道的润滑孔。在初始润滑时，KGG建议给螺母注入1/3自由空间的油脂。

分几个步骤注入润滑脂，在两次润滑脂注入之间旋转轴上的螺母或螺母中的轴（转几圈），以便将润滑脂涂抹在滚子上并将其涂抹在螺母长度上。

2、第一次重新润滑

对于不预紧丝杠，KGG建议工作100000转后加注。

3、润滑维护计划（第一次重新润滑后）

下列方法介绍了，在初次润滑和第一次重新润滑之后，为保障滚柱丝杠的使用寿命，加注润滑脂应遵循的润滑维护计划和操作程序。该建议可以优化滚柱丝杠的性能，并延长滚柱丝杠的使用寿命。该方法适用于在工业环境、车间、无外部污染物和环境温度不超过40℃下工作的丝杠。

不完全符合应用要求的润滑剂重新润滑的时间间隔要缩短。

为避免发生与润滑脂的兼容性（混溶性）相关的问题，请务必始终使用同一型号的润滑脂。如果出于某种原因须更换不同型号的润滑脂，请仔细检查混溶性。

若有所怀疑，请彻底清洗螺母和丝杠轴。

注：

涂在螺纹长度上的油脂通常不受保护，该油脂的老化和氧化会加速。

决定重新润滑时间间隔的参数有：

·速度：应用的最大转速

·负载：应用中丝杠承受的平均轴向负载。

·温度：螺母机构的内部温度，通常是在螺母外表面测量的温度加上15℃。

如果闲置时间与工作时间相比非常长，润滑脂的自然老化和氧化会改变润滑脂的状况，使重新润滑的时间间隔减短。这种情况不在以下方法的范围内。

润滑脂的初始用量是涂在轴上的体积加上注入螺母的体积。

润滑间隔的计算考虑了丝杠运动时的实际工作时间（该计算不考虑闲置时间）。

润滑脂初次注入后到再次加注前的时间：$t_g = t_s K_T K_F$

其中

t_g = 润滑脂初始量完全更新之前的工作时间

t_s = 与最大值速度相关的基本再润滑间隔。

K_T = 与滚柱丝杠最大内部工作温度相关的修正系数。

K_F = 与丝杠平均工作负载相关的修正系数。K_F考虑到等效动负载与动态承载能力F_m/C_a的比值。

Lubrication Plans and Operating Procedures

KGG recommends the following lubrication program and operating procedures:

1. Commissioning and initial lubrication

New Roller Screws must be lubricated before use.

1.1. Shaft lubrication program:

Apply a quantity of grease with a brush to the length of the shaft threads.

The amount of grease to be applied per meter of thread length for each screw size, Zs, is estimated using the following formula for the volume of grease:

$Z_S = 4.4 \times 10^{-4} d_0 l_1$

where

Z_S = volume of grease [cm^3]

d_0 = Nominal diameter of the screw [mm].

l_1 = thread length of the screw [mm].

1.2 Lubrication procedure for nuts:

Roller screws with flanged nuts have a threaded hole for grease injection. Roller Screws with cylindrical nuts have a center groove and a lubrication hole that can be connected to the grease passage through the seat. For initial lubrication, KGG recommends filling the nut with grease in 1/3 of the free space.

Inject the grease in several steps, rotating the nut on the shaft or the shaft in the nut (a few revolutions) between grease injections in order to apply the grease to the rollers and spread it over the length of the nut.

2. First relubrication

For non-pre-tensioned screws, KGG recommends refilling after 100,000 operating revolutions.

3、Lubrication maintenance program (after the first relubrication)

The following method describes the lubrication maintenance program and operating procedures that should be followed for greasing Roller Screws after the initial lubrication and the first re-lubrication in order to safeguard the service life of the Roller Screws. This recommendation optimizes the performance of the Roller Screw and extends the service life of the Roller Screw. It applies to screws operating in industrial environments, in workshops, without external contaminants and at ambient temperatures up to 40°C. The methodology is based on the use of lubricants that are not fully compatible with the application.

The time interval for relubrication of lubricants that do not fully meet the requirements of the application is reduced.

To avoid problems related to grease compatibility (miscibility), always use the same type of grease. If for some reason you have to change to a different type of grease, double check the miscibility.

If in doubt, clean the nut and screw shaft thoroughly.

Note:

The grease applied to the length of the threads is usually not protected and the aging and oxidation of this grease is accelerated.

The parameters that determine the relubrication interval are:

-Speed: maximum speed of the application

-Load: the average axial load to which the screw is subjected in the application.

-Temperature: the internal temperature of the nut mechanism, usually the temperature measured on the outer surface of the nut plus 15°C.

If the idle time is very long compared to the working time, the natural aging and oxidation of the grease will change the condition of the grease and shorten the re-lubrication intervals. This situation is not covered by the following method.

The initial amount of grease is the volume applied to the shaft plus the volume injected into the nut.

The calculation of the lubrication interval takes into account the actual operating time when the screw is in motion (this calculation does not take into account idle time).

The time between the initial injection of grease and the time before refilling:

$t_g = t_s K_T K_F$

where

t_g = operating time before the initial amount of grease is completely renewed

t_s = basic relubrication interval in relation to the maximum speed.

K_T = Correction factor related to the maximum internal operating temperature of the roller screw.

K_F = Correction factor related to the average working load of the screw K_F takes into account the ratio of the equivalent dynamic load to the dynamic load carrying capacity F_m/C_a.

重要提示 Important Tip

润滑脂的更新应逐步进行。一旦确定了再润滑量和总间隔，就必须按照时间间隔按规定量加注。KGG建议经常涂抹少量润滑油，而不要一次涂抹全部油脂。

如果所有的油脂都立即更新（不建议这样做），低速操作滚柱丝杠，使油脂涂抹在丝杠的整体长度上。如果润滑脂的稠度或粘度变化很快，或者如果温度没有稳定在可接受的水平，则必须缩短再润滑间隔，或者润滑脂不适合应用条件，必须更换润滑脂类型。

在定期润滑过程中，始终旋转轴，以便在螺母和轴中均匀地分布润滑脂。旋转轴也可以防止滚子堵塞进油孔。

Grease renewal should be done gradually. Once the amount of relubrication and the total intervals have been determined, it must be refilled at the intervals and in the specified amounts.KGG recommends that a small amount of lubricant be applied frequently rather than applying all of the grease at once.

If all grease is renewed immediately (which is not recommended), operate the Roller Screw at low speeds so that the grease is applied over the entire length of the screw. If the consistency or viscosity of the grease changes rapidly, or if the temperature is not stabilized at an acceptable level, the relubrication intervals must be shortened, or the grease is not suitable for the application conditions and the type of grease must be changed.

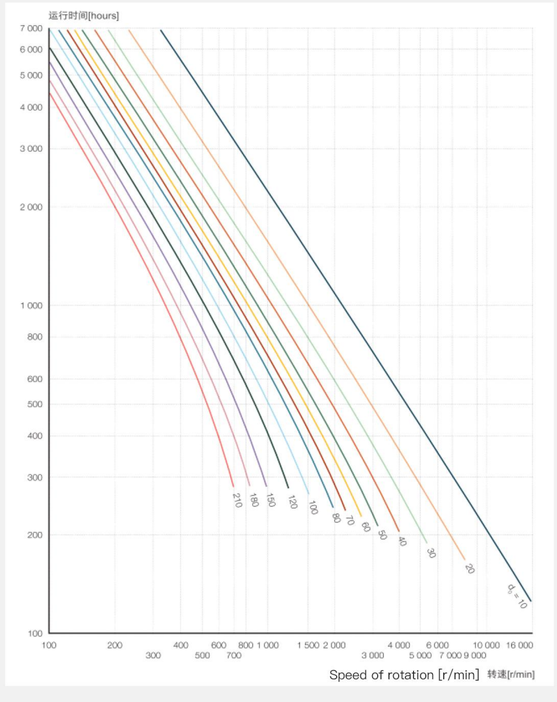
Always rotate the shaft during periodic lubrication to evenly distribute the grease in the nut and shaft. Rotating the shaft also prevents the rollers from clogging the grease inlet holes.

基本再润滑间隔t_s，是关于如下变量的函数

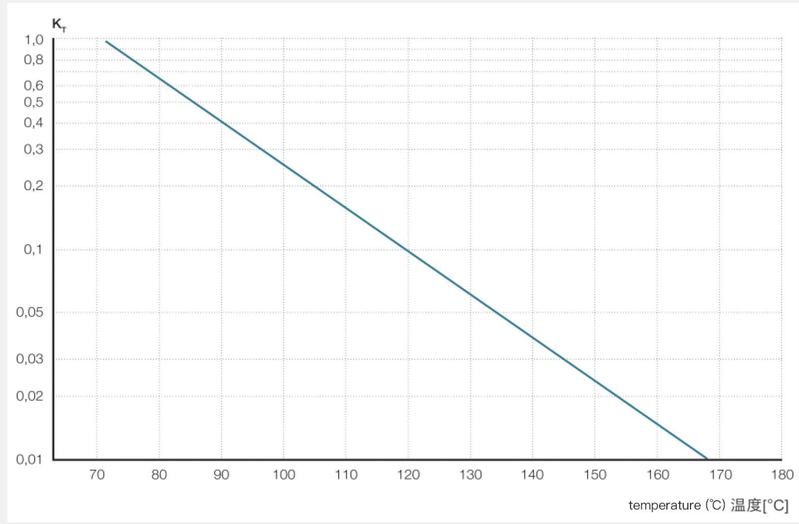
· 转速[r/min]
· 运行时间
· 公称直径d_0[mm]

The basic relubrication interval, t_s, is a function of the following variables

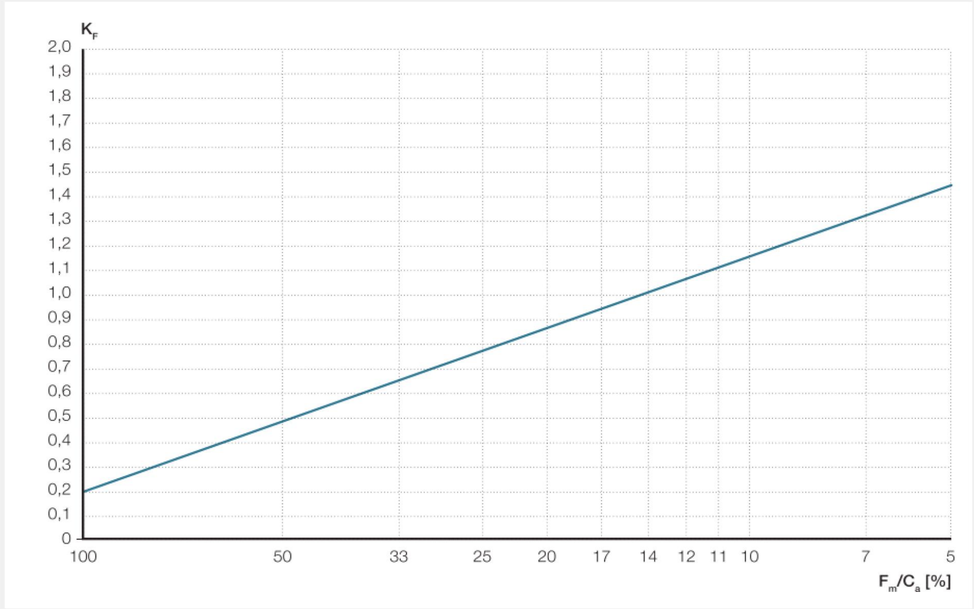
· Speed of rotation [r/min]
· running time
· Nominal diameter d_0 [mm]



运行温度修正系数
Operating temperature correction factor



平均运行载荷修正系数
K_F Average operating load correction factor K_F



油润滑 Oil Lubrication

与脂润滑相比，油润滑具有以下优点。

润滑油比润滑脂散热更高效，尤其是在重载循环和/或高速运转时。

它有助于清除污染物，并有助于清洁滚柱丝杠螺母。

滚柱丝杠的油润滑通常是使用集中循环油系统完成。此类型系统为理想型，可不断地用来自油箱的冷却过滤油替换螺母中的油。建议使用该系统来控制润滑剂的流量，清除污染物和避免过热。

Oil lubrication offers the following advantages over grease lubrication.

Oil lubrication dissipates heat more efficiently than grease, especially during heavy duty cycles and/or high speeds.

It aids in the removal of contaminants and helps clean the Roller Screw nut.

Oil lubrication of Roller Screws is usually accomplished using a centralized circulating oil system. This type of system is ideal for constantly replacing the oil in the nut with cooled, filtered oil from an oil tank. This system is recommended to control lubricant flow, remove contaminants and avoid overheating.

润滑油选择 Lubricant selection

用于润滑其他旋转部件（如轴承，尤其是齿轮）的润滑油也可用于润滑滚柱丝杠。使用液压油会危害产品的性能、状况和寿命。

润滑油的性能受转速、工作温度和负载水平的影响。

在工作温度下，油的粘度应为100Cst。在低速（低于10r/min）时，工作温度下润滑油的粘度应为=300 Csto推荐使用极压添加剂来提高油膜的强度。

还推荐使用抗腐蚀添加剂和稳定添加剂。建议使用合成油（PAO、聚乙二醇基或酯基润滑油），以延长使用寿命和保证在高温下稳定运行。

Lubricants used to lubricate other rotating parts such as bearings and especially gears can also be used to lubricate roller screws. The use of hydraulic fluids can jeopardize the performance, condition and life of the product.

Lubricant performance is affected by speed, operating temperature and load level.

The viscosity of the oil at operating temperature should be 100 Cst. At low speeds (less than 10 r/min), the viscosity of the lubricant at operating temperature should be = 300 Csto recommend the use of extreme pressure additives to increase the strength of the oil film.

Anti-corrosion additives and stabilizing additives are also recommended. Synthetic oils (PAO, polyethylene glycol-based or ester-based lubricants) are recommended to extend service life and ensure stable operation at high temperatures.

油量 Oil quantity

注油量取决于滚柱丝杠的尺寸、速度、占空比和刮刷器的密封效率。注油量可以在0.5到100cm^3/小时之间变化，少量注射量为0.1到1 cm^3。根据经验，最好调节油流，以获得正确的稳定温度。

The amount of oil injection depends on the size of the roller screw, the speed, the duty cycle and the sealing efficiency of the wiper. The oil injection volume can vary between 0.5 and 100 cm^3/hour, with small amounts of 0.1 to 1 cm^3. As a rule of thumb, it is advisable to regulate the oil flow to obtain the correct stabilized temperature.

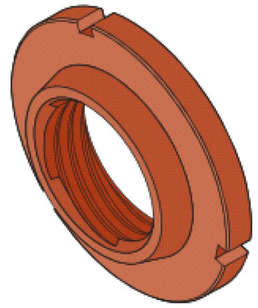
刮刷器 Brush wiper

刮刷器是安装在螺母末端的复合部件，功用是防止污染并保持润滑剂在适当的位置。刮刷器是影响滚柱丝杠性能和使用寿命的重要部件。值得注意的是，标准刮水器的性能类似迷宫式密封，而不像吊耳式密封。根据产品系列的不同，刮刷器有的是标配，有的是选配。

标准刮刷器由乙酰树脂制成，连续工作温度达110°C，峰值温度达140°C。

The wiper is a composite part mounted on the end of the nut to prevent contamination and keep the lubricant in place. The wiper is an important component that affects the performance and longevity of the roller screw. It is important to note that standard wipers perform like labyrinth seals, not like lug seals. Depending on the product line, the wiper is either standard or optional.

The standard wiper is made of acetyl resin and has a continuous operating temperature of up to 110°C and a peak temperature of up to 140° C. The standard wiper is made of acetyl resin.



刮刷器 Brush wiper

重要提示 Important Tip

通常情况下，螺纹刮刷器不是轴向固定在螺母上的。如果顾及最大行程位置，刮刷器的边缘会超出丝杠的非螺纹部分，这样刮刷器可能会脱离螺母，也有可能会卡住。因此，用户应顾及最大行程位置。

刮刷器可以根据要求轴向固定在螺母上，以防止刮刷器在工作过程中脱开。

Under normal circumstances, threaded brush scrapers are not axially fixed to the nut. If the maximum stroke position is taken into account, the edge of the wiper will extend beyond the unthreaded portion of the screw, which may cause the wiper to disengage from the nut and possibly jam. Therefore, the user should consider the maximum stroke position.

The brush scraper can be axially secured to the nut as required to prevent the scraper from disengaging during operation.

干性润滑剂 Dry lubricants

当不允许使用湿性润滑或湿性润滑无效时（应用示例：卫星、实验室），干性润滑剂具有以下优点：

· 出气率低（例如，卫星应用）

· 摩擦系数与速度和温度无关

· 定位稳定性好

· 老化速度慢（例如在长期储存期间）

干性润滑剂可以通过喷射、电解沉积或物理汽相沉积来施用。

KGG推荐采用支持低摩擦系数的薄沉积物：这种干性润滑剂通常基于聚四氟乙烯、二硫化钼、二硫化钨和石墨。这种涂层不耐腐蚀，在选择原材料时必须特别小心。

KGG还推荐使用增强耐磨性的薄沉积物。这种干性润滑剂通常基于碳化钨、类金刚石碳或镀铬。例如，它们不具有聚四氟乙烯的低摩擦系数。干性润滑剂（单独使用）不适合工业级或重型应用，也不能达到脂润滑或油润滑的滚动疲劳寿命。

When wet lubrication is not allowed or is ineffective (application examples: satellite, laboratory), dry lubricants offer the following advantages:

· Low outgassing (example: satellite applications)

· Friction coefficient independent of speed and temperature

· Good positional stability

· Slow aging (e.g. during long-term storage)

Dry lubricants can be applied by spraying, electrolytic deposition or physical vapor deposition.

KGG recommends thin deposits that support a low coefficient of friction: such dry lubricants are usually based on PTFE, molybdenum disulfide, tungsten disulfide and graphite. Such coatings are not corrosion-resistant and special care must be taken when selecting raw materials.

KGG also recommends the use of thin deposits that enhance wear resistance. Such dry lubricants are usually based on tungsten carbide, diamond-like carbon or chromium plating. They do not have the low coefficient of friction of PTFE, for example. Dry lubricants (used alone) are not suitable for industrial grade or heavy duty applications and will not achieve the rolling fatigue life of grease or oil lubrication.

注 Notes：

产品交付后在客户工厂进行的润滑不在KGG的控制范围内。但KGG提供了上述指南，以帮助客户选择润滑剂和进行正确地维护，使产品具有最高的性能和寿命。

有关润滑剂和润滑系统的更多信息，请与您当地的KGG代表联系。

Lubrication performed at the customer's plant after product delivery is not under KGG's control. However, KGG has provided the above guidelines to assist customers in selecting lubricants and performing proper maintenance to maximize product performance and life.

For more information on lubricants and lubrication systems, please contact your local KGG representative.

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MEMO