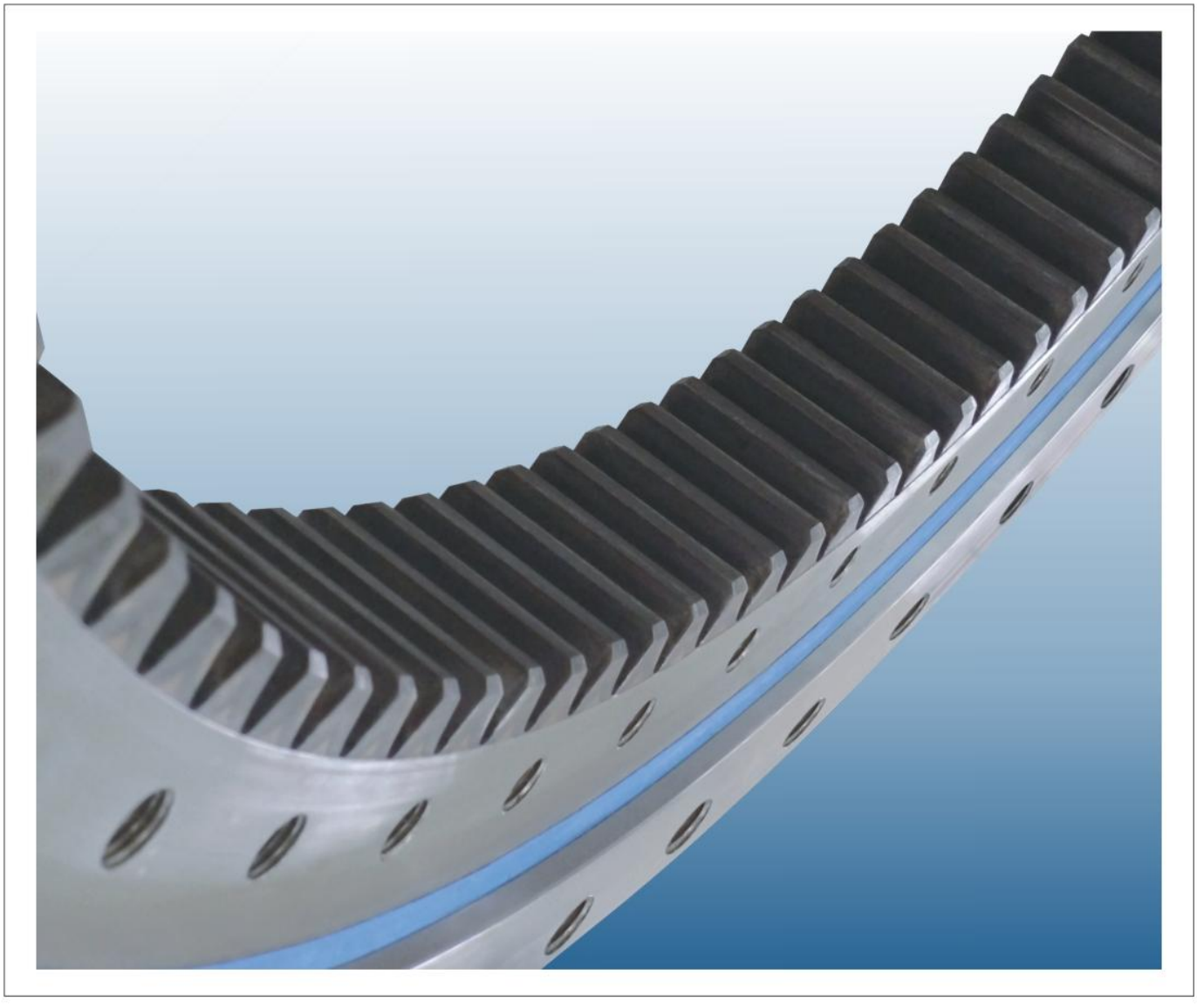
SLEWING BEARING

ZYS
轴研科技

转 盘 轴 承

洛阳轴研科技股份有限公司
洛阳轴承研究所有限公司
LUOYANG BEARING SCIENCE & TECHNOLOGY CO.,LTD.
LUOYANG BEARING RESEARCH INSTITUTE CO.,LTD.



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一、公司简介

洛阳轴研科技股份有限公司是重点为国民经济建设各领域关键主机及国防建设研制“高、精、尖、专、特”轴承产品的高新技术企业。2005年在深圳证券交易所挂牌上市，证券代码：002046。其主营业务为精密及特种轴承、高速机床主轴、轴承专用工艺装备和检测仪器以及轴承特种材料的研究、开发、生产和销售。

公司秉承“引领轴承工业科技，提升世界装备水平”的企业宗旨，始终保持着滚动接触理论、轴承设计、制造、材料、试验及信息标准等方面的综合优势，占据着航空航天、舰船兵器、矿山冶金、风力发电、机床工具、机械装备用精密轴承、轴承工业成套装备及检测仪器、电主轴等研究、开发、试验的领先地位，是我国轴承科技创新的龙头和产业基地。圆满完成了我国航天发展史上具有里程碑意义的第一颗“东方红”人造地球卫星、“神舟”一号到“神舟”七号系列载人飞船、“嫦娥”探月工程的轴承及组件的配套任务。

公司坚持“内外求精为客户，动静求稳报国家”的质量方针，2003年通过GB/T19001–2000（idtISO9001：2000）、GJB/Z9001A–2001、GJB9001A–2001质量管理体系认证，并将长期军品轴承研制过程中积累的高精尖技术和严格的军工质量管理体系，贯彻到民品生产当中，产品的可靠性达到世界同类产品技术水平。

公司先后建成了以研发中心为科技创新基地，第一和第二产业园为产业化基地的“产、学、研”结合的科研生产布局。第一产业园占地面积180亩，主要实施电主轴、精密机床轴承、特种轴承和轴承工艺装备等产品的产业化项目。第二产业园占地面积198亩，总投资4.38亿元，主要实施精密型重型机械轴承产业化项目，配置数控立式车床、数控插齿机床、高速数控铣齿机床、高速数控钻孔机床、数控表面淬火机床、进口数控立式磨床等一大批高、精、尖设备。产品可以满足风电、盾构、矿山、冶金、港口吊装、工程机械、军工等多个领域高精度、高品质轴承的需求。

公司荣获“中国机械500强”、“国防军工协作配套先进单位”、“国防科技创新团队”、“全国企事业知识产权示范单位”、“中国商标优秀企业”“2009年《福布斯》‘中国最具潜力企业200强’”、“河南省50户高成长型高新技术企业”等荣誉；2009年，“ZYS”商标荣膺“中国驰名商标”。

洛阳轴承研究所有限公司是洛阳轴研科技股份有限公司的全资子公司。

Introduction

Luoyang Bearing Science & Technology Co., Ltd is a high-tech enterprise, which focuses on research and development of "high-tech, precise, specialized and top" bearing products for various fields' mainframes in national economic construction and national defense construction. Luoyang Bearing Science & Technology Co., Ltd was listed at Shenzhen Stock Exchange with stock code 002046 in 2005. Main business of the company includes research, development, production and marketing of special precision bearing, electrical spindle for high-speed machine tool, special processing equipment, special measuring instrument and special material for bearing.

We adhere to our tenet "to lead the science and technology development of bearing industry, to improve the world's equipment level". Luoyang Bearing Science & Technology Co., Ltd has comprehensive advantages in contact theory of rolling bearing, bearing design, production, materials, testing, and bearing standards and etc. Luoyang Bearing Science & Technology Co., Ltd is in the leading position in research, development and testing in the following areas: aerospace, spaceflight, ship weapon, mining, metallurgy, machine tools, precision bearing for machinery and equipment, bearing assembly, measuring instrument, electrical spindle and etc. The company is the pioneer of numerous technology and relevant theories in bearing industry in China. ZYS is the leading enterprise in aerospace bearing industry of China and it has successfully accomplished the task of bearing assemblies for "Dongfanghong-1", the first man-made satellite of China, manned spacecraft series from "Shenzhou Ⅰ" to "Shenzhou Ⅶ" and "Chang'E" moon exploration project.

We also adhere to our quality policy "precise as possible for our clients, stable for our nation". Luoyang Bearing Science and Technology Co., Ltd has passed through Quality Control Systems GB/T19001-2000 (idtISO9001: 2000), GJB/Z9001A-2001 and GJB9001A-2001 in 2003。ZYS implements the advanced technology, which is accumulated in the research and manufacture process of military bearing, and strict military quality control system in civil bearing to achieve as high reliability as advanced international level of similar products.

ZYS high values the application of technology achievements in actual production. ZYS established a structure constituting "manufacturing, research and learning" in which R&D center as the innovation base, the First and Second Industrial Park as industrialized production base. The First Park covers an area of 100,000 m^2 which produces electrical spindle, precise bearing for high precision machine, special bearing, bearing process equipment and etc. The Second Industrial Park, which produces large size heavy duty precision bearings, covers an area of 133,333 m^2 and the total investment is 438 million RMB. We have a large batch of precise and advanced equipments like CNC vertical lathes, CNC gear shapers, high-speed CNC cutting machines, high-speed CNC drilling machines, CNC hardening machines and imported CNC vertical grinders etc. We can produce high quality and high precision bearings and our bearings are used in the fields of wind power mining, tunnel boring machine, metallurgy, harbor hoisting, general mechanical engineering and military defense etc.

The company has successively won many honors such as: Top 500 in Chinese mechanical enterprise, award for outstanding contributions to the national high-tech work, advanced unit in the cooperation with national defense, advanced units in the national intellectual property rights, outstanding units in trademark of China, China's top 200 promising companies in Forbes 2009, Top 50 high-growth high-tech enterprises of Henan Province. In 2009, ZYS won "Chinese famous trademark".

Luoyang Bearing Research Co., Ltd is the wholly owned subsidiary company of Luoyang Bearing Science & Technology Co., Ltd.

二、转盘轴承代号 Slewing bearing code

2.1 代号的构成

Bearing code composition

轴承代号由基本代号和后置代号组成。

Generally, slewing bearing code consists of basic code and suffix.

2.2 基本代号构成

Basic number composition

基本代号分为三部分，前部为结构型式和传动型式代号，中部为滚动体直径（对两排以上滚动体的轴承为最大滚动体直径），后部为滚动体中心圆直径（对两排以上滚动体的轴承为最大滚动体中心圆直径）。

Basic code includes three parts. The front part is numbers indicating bearing structure and drive mode, middle part stands for rolling element diameter (for bearing with more than one row, it stands the max diameter of rolling elements.) and back part is the pitch circle diameter (for bearing with more than one row, it stands the max pitch circle diameter).

2.2.1 结构型式代号

Bearing structure code

结构型式代号按表1的规定。

Bearing structure is indicated in table 1.

表 1 结构型式代号 Table 1 Bearing structure code

结构型式代号 Bearing structure code	结构型式 Bearing structure
01	四点接触球轴承 Single row four point contact ball slewing bearing
02	双排异径球轴承 Double row different ball diameter slewing bearing
11	交叉圆柱滚子轴承 Single row cross roller slewing bearing
13	三排圆柱滚子组合轴承 Three row cylindrical roller slewing bearing

2.2.2 传动型式代号

Drive mode code

传动型式代号按表2的规定。

Drive mode is indicated in table 2.

2.2.3 基本代号编制规则

Rule of basic number

基本代号编排时，结构型式代号和传动型式代号连写，前部、中部和后部之间用“.”隔开。

Use “·” to inosculate the front part, middle part and back part, in which the front part includes bearing structure and drive mode.

表2 传动型式代号 Table 2 Drive mode code

传动型式代号 Drive mode code	传动型式 Drive mode
0	无齿式 Without gear
1	渐开线圆柱齿轮外齿较小模数 Involute spur external gear with smaller module
2	渐开线圆柱齿轮外齿较大模数 Involute spur external gear with bigger module
3	渐开线圆柱齿轮内齿较小模数 Involute spur inner gear with smaller module
4	渐开线圆柱齿轮内齿较大模数 Involute spur inner gear with bigger module

2.2.4 后置代号

Suffix

2.2.4.1 后置代号排列顺序

Suffix sequence

后置代号是在轴承的材料及热处理方式、公差等级、尺寸、密封、技术要求等有改变时，在基本代号后添加的补充代号。其排列按表3。

Suffix is the code added behind basic code when bearing material, heat treatment, tolerance grade, size, seal or technical requirement changes, as listed in Table 3.

表 3 后置代号 Table 3 Suffix

1	2	3	4
轴承材料 Bearing material	密封、套圈变型、技术要求等 Sealing, ring deforming and technical requirements etc.	公差等级 Tolerance grade	齿轮改变 Gear alter

2.2.4.2 后置代号含义及编制规则

Drawing method of suffix and its indication.

2.2.4.2.1 材料及热处理方法代号按表 4，在其代号前用“.”和基本代号隔开。

Symbol numbers indicated material and heat treatment are listed in Table 4, which follows the basic number with“·”.

表 4 材料及热处理方法代号 Table 4 Material and heat treatment

代 号 Symbol number	03	04	11	12	13
材 料 material	42CrMoT	42CrMoZ	50MnT[a]	50MnZ[b]	其它材料 Other materials

a：T 表示材料应调质处理
T stands for hardening and tempering treatment

B：Z表示材料应正火处理
Z stands for normalizing treatment

2.2.4.2.2 当密封、套圈变形或技术要求等有变化时，用“K 和数字”表示，如“K1”，“K2”等。其代号与材料代号空半个汉字距。

When sealing, ring deforming and technical requirement changes, use “K+number”, for example “K1”, “K2”, which is inosculated by “blank” to place behind material and heat treatment code to indicate these changes.

2.2.4.2.3 公差等级分为 0、6、5 三级，从前到后依次升高。在其代号前用“/”与前面代号分开，公差等级为 0 级时，可不标注。

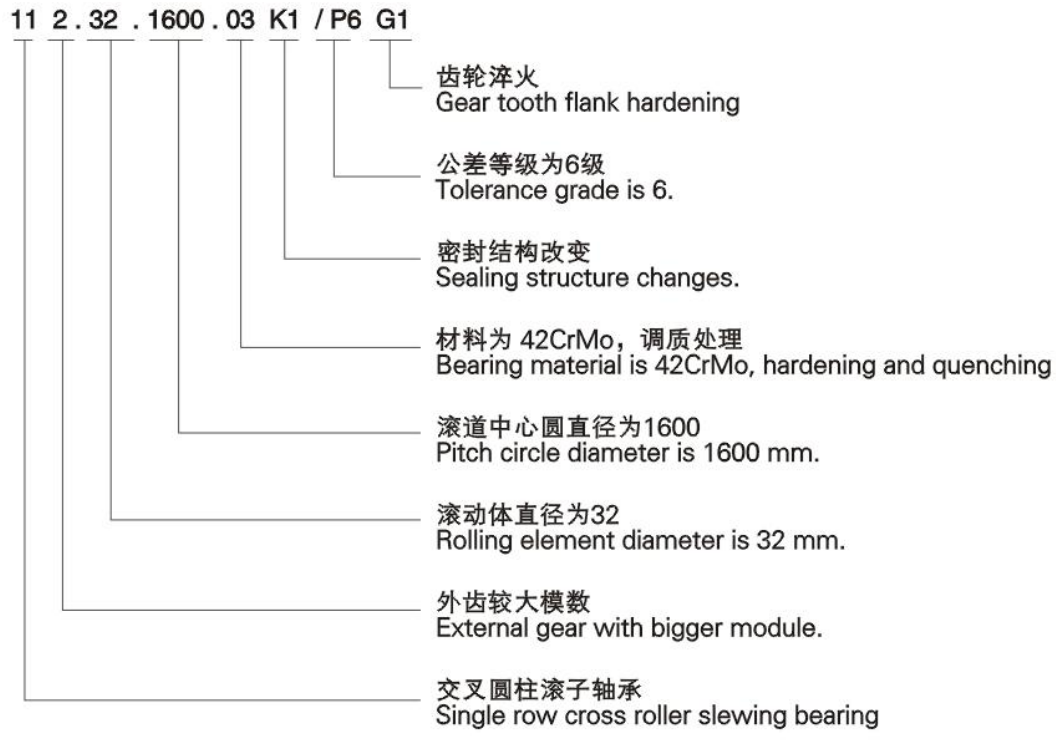
Tolerance grade is divided into Grade 0,6 and 5 whose precision is increasing accordingly. The code is inosculated with the front code by “/”. When tolerance grade is 0, 0 can be omitted.

2.2.4.2.4 当齿轮有变化时，如参数有变化或齿轮需要表面淬火等，用“G 和数字”表示，其代号与公差等级代号空半个汉字距。

Use “G+number” following tolerance grade with “blank” to inosculate to indicate any changes of gear, for Example, parameter variation or tooth contour hardening and etc.

2.2.5 代号示例

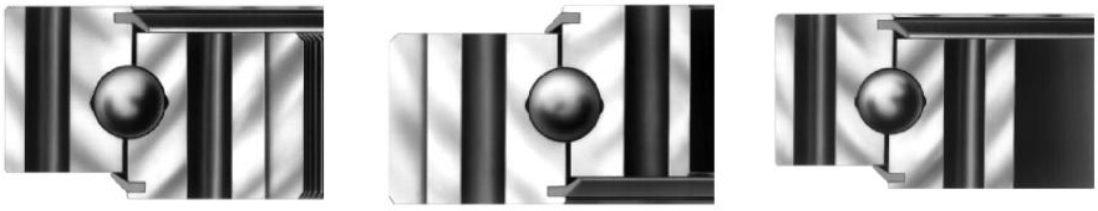
Drawing number example



三、转盘轴承类型 Slewing bearing type

ZYS的转盘轴承按结构类型可分为：单排四点接触球转盘轴承、单排交叉滚子转盘轴承、双排异径球转盘轴承、三排圆柱滚子组合转盘轴承、球柱联合转盘轴承等。上述各类轴承按其是否带齿及齿所在的位置又分为无齿式、外齿式和内齿式。

ZYS slewing bearings can be divided into the following types according to their structures as single row four point contact ball slewing bearing, single row cross roller slewing bearing, double row different ball diameter slewing bearing, three row cylindrical roller slewing bearing and roller/ball combination slewing bearing. These types of bearings can be further divided into bearings without gears, bearings with external gears and bearings with internal gears.



单排四点接触球转盘轴承
Single row four point contact ball slewing bearing

特点：具有较高的动载荷承载能力，能够承受径向力、轴向力以及较大的倾覆力矩。这类轴承主要应用在起重设备，吊装设备，通用工程机械等领域。

Features：This kind of slewing bearings can support high dynamic loads, transmitting axial and radial forces simultaneously as well as the resulting tilting moments. Applications of this kind of bearings are hoisting, mechanical handling and general mechanical engineering etc.

单排交叉滚子转盘轴承
Single row cross roller slewing bearing

特点：能承受较大的径向力，中等大小的轴向力和倾覆力矩，能满足小游隙或“零”游隙要求。这类轴承主要应用在起重设备、吊装设备和通用工程机械等领域。

Features：This kind of bearings can support combinations of large radial force, medium axial force and tilting moment with small or zero clearance. Main applications of this kind of bearings are hoisting and mechanical handling and general mechanical engineering etc.

转盘轴承 SLEWING BEARING

双排异径球转盘轴承
Double row different ball diameter slewing bearing

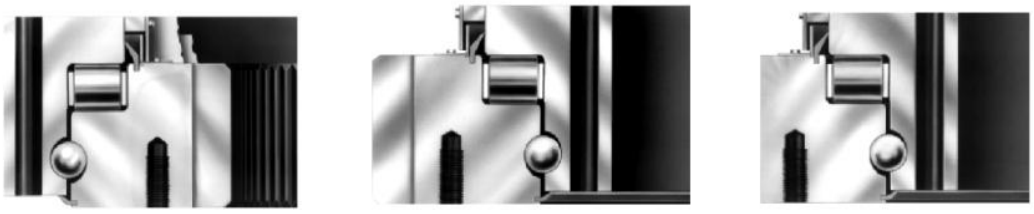
特点：该类轴承的结构简单而且静承载能力强。这类轴承主要用于载荷位置和方向快速变化且连续回转的场合，如：船用吊装设备，采矿吊装设备及材料运输等。

Features：This kind of bearings can support high static loads with simple structures. They are mainly used in situations with variational load position and direction and continuously rotating. Main applications of this kind of bearings are deck hoisting， mining and material handling etc.

三排圆柱滚子组合转盘轴承
Three row cylindrical roller slewing bearing

特点：具有高承载能力，各种载荷分别由不同滚道和滚子组承受，所以在同等受力条件下，其轴承直径可大大缩小，使主机更为紧凑。主要用于起重设备、吊装机械、采矿设备及材料运输、海上作业和通用工程机械等领域。

Features：This kind of bearings has high load carrying capacity. Under same loads, this kind of bearings has much smaller diameters which can make the installation much compact, as different kinds of loads are supported by different races and rollers. Main applications of this kind of bearings are hoisting, mechanical handling, mining and materials–handling, offshore technology and general mechanical engineering etc.



球柱联合转盘轴承
Roller/ball combination slewing bearings

特点：可承受较高的轴向载荷和较小的倾覆力矩，通常直径比较大。主要用于采矿业及材料加工业等领域。

Features： This kind of bearings can support high axial load and low tilting moments. Usually they are large diameter slewing bearings. Applications of this kind of bearings are mining and materials handling etc.

四、转盘轴承材料 Materials of slewing bearing

1.套圈材料

Material of slewing ring

ZYS生产的转盘轴承，通常，其套圈均采用高质量的42CrMo材料制成，滚道表面进行淬火处理。当用户有特殊要求时，可根据用户提供的具体使用条件选择其它牌号的表面淬硬钢种。

42CrMo is generally used for ZYS slewing ring with surface quenching treatment of the raceway. Other kinds of surface quenched steel can also be used according to customer specification and operating conditions.

2.滚动体材料

Material of rolling element

ZYS转盘轴承用滚动体均采用整体淬硬的高碳铬轴承钢，牌号为GCr15或GCr15SiMn钢制造。

The material of rolling elements in ZYS bearing is GCr15 or GCr15SiMn steel.

3.保持架材料

Material of cage

ZYS转盘轴承所用保持架型式有整体式保持架、分段式保持架或隔离块式保持架等不同的结构型式。其中整体式保持架或分段式保持架采用20号钢或ZL102铸造铝合金制造。隔离块式保持架采用聚酰胺1010树脂、ZL102铸造铝合金、QA110–3–1.5铝青铜或GRPA66–25尼龙制造。

Various types of cage are used in ZYS slewing bearing, which can be divided into integrated cage, segmented cage, spacer and etc. 20 steel or ZL102 cast aluminum alloy is used for integrated cage and segmented cage. For spacer, the material is polyamide 1010 resin, ZL102 aluminum bronze, QA110–3–1.5 aluminum bronze or GRPA66–25 nylon.

4.密封圈材料

Material of sealing ring

ZYS转盘轴承密封圈采用耐油丁晴橡胶制造。

The sealing ring is made of NBR.

五、转盘轴承承受的载荷情况 Load transmission of slewing bearing

转盘轴承可同时承受轴向、径向载荷及倾覆力矩。

Slewing bearings can support axial, radial forces and tilting moments。

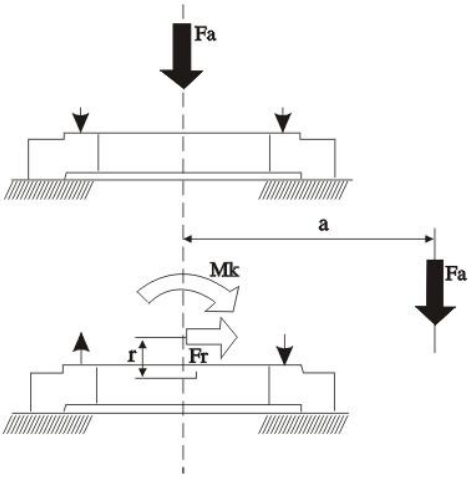


图 1：转盘轴承通常安装在支承结构上面

Fig. 1: Slewing bearings are generally installed on the supporting structure

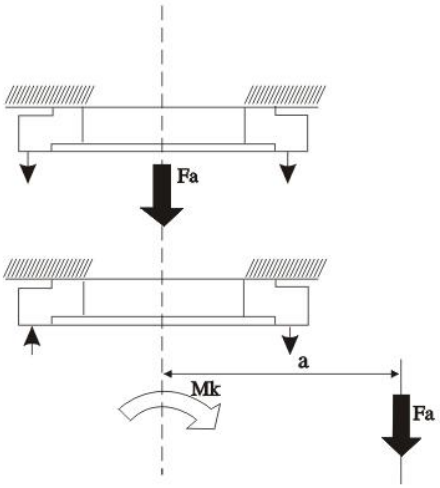


图 2：悬挂式安装

Fig. 2: Suspension installation

注：本手册中的螺栓承载曲线不适用于图2所示的悬挂式安装方式。对于悬挂式安装的有关计算，请咨询ZYS。

Note: the bolt loading curves shown in the catalogue do not apply in the case of Fig.2. For calculation of suspension installation, please consult ZYS.

六、转盘轴承选型计算 Calculation of slewing bearing selection

轴承选型时的重要参数有：

Important parameters for choosing the right bearing:

1 承受的载荷

2 载荷对应的作用时间百分比

3 转速或转数，即载荷作用下单位时间内转过的角度

4 齿轮传递的周向力

5 轴承外形尺寸

6 其它工况条件

1. Loads

2. The percentages of collective loads with respective time

3. Speed or number of movements, that is the angle rotated within the time unit

4. Circumferential forces transmitted by the gear

5. Bearing dimension

6. Other operating conditions.

轴承选型时，请您填写本手册中的“用户调查表”，我们根据表中的有关数据，帮您选择满足您要求的转盘轴承。“用户调查表”的填写越详细、越完整，越能使我们更加充分了解您的要求，可以最大程度地为您提供更经济，更适用的转盘轴承选型建议。

Please complete our applications questionnaire with all necessary data when selecting of the appropriate bearing. Full completion of the form will enable us know your requests well, so we may prepare more economical and applicable slewing bearing selection proposal.

6.1 轴承选型

Bearing selection

本手册所列的ZYS转盘轴承都有对应的静承载曲线，用以确定转盘轴承的静承载能力。在确定轴承承载能力时，载荷应乘以安全系数，安全系数按表5选取。若不指定应用场合，应根据工作模式选取相应系数。

ZYS slewing bearings listed in this catalogue are allocated critical load curves for their static load capacity. When defining the required bearing load capacity, the determined loads must be multiplied by the ” load factors” indicated in Table 5 for the various application cases. If no applications are indicated, the factors will be selected according to the mode of operation.

表 5 轴承选型时的载荷安全系数 Table 5 Load Safety Factors for Bearing Selection

应用场合 Application			静载荷安全系数 Static load factor f_s	寿命安全系数 Life factor f_e	全负荷运转寿命转数 Service Time in Full Load Revolution L_f
船用浮吊（运载货物）、汽车吊（运载货物）、抓斗式甲板吊、回转台（使用时要求连续回转） Floating Crane (Cargo), Mobile Crane (Cargo), Ship Deck Crane (Grab), Welding Positioner, Turntable (Permanent Rotation)			1.10	1.0	30，000
塔式起重机 Tower Crane	轴承安装在塔架上* Bearing at top*	$M_f \leq 0.5\ M$	1.25	1.0	30，000
		$0.5\ M \leq M_f \leq 0.8\ M$		1.15	45，000
		$M_f \geq 0.8\ M$		1.25	60，000
	轴承安装在基础上 Bearing at base			1.0	30，000
港口龙门吊、船用起重机 Slewing Crane (Cargo), Shipyard Crane, Rotatable Trolley (Cargo) Shiploader/ Ship Unloader				1.15	45，000
冶金工厂起重机 Steel Mill Crane			1.45**	1.5	100，000
汽车吊（抓斗式或重载）、回转式起重机（抓斗式或吸盘式）、轮式起重机（抓斗式或吸盘式）、桥式起重机（抓斗式或吸盘式）、浮吊（抓斗式或吸盘式） Mobile Crane (Grab or heavy handling service), Slewing Crane (Grab/Magnet), Rotatable Trolley (Grab/Magnet), Bridge Crane (Grab/Magnet), Floating Crane (Grab/Magnet)				1.7	150，000
绳索式挖掘机、堆取料机 排式货物运输机 Main slewing gear of Bucket Wheel Excavator, Reclaimer, Stacker, Boom Conveyor				2.15	300，000
近海起重机 Offshore Crane			参见专用特殊标准 subject to special criteria		

原则上，必须以作用在轴承上的最大载荷作为静态计算值，这个载荷必须包括附加载荷和试验载荷。

对于特殊情况，没有我们的书面许可，不得减小静载荷安全系数（fs例如在竖直载荷下及更大的测试载荷下）。fe是寿命安全系数，是由经验和测试得出的，其值是在最大工作载荷下得出的。若用载荷谱的平均载荷来得到全负荷运行转数，工作时间值应相应增大。

对于没有列出的应用场合，选用类似条件下的值。

*）轴承安装在塔式起重机上：

M_f是空载时的倾覆力矩

M是最大工作幅度时的倾覆力矩

**）对f_s= 1.45的场合，由于这种场合下的平均载荷高和繁重的工作任务，建议优先选用多排滚道的轴承。

Static rating principally requires taking into account the maximum occurring loads which must include additional loads and test loads. Static safety factors (fs. e.g. for erection loads, higher test loads etc.) must not be reduced without prior written approval from us for exceptional cases.

The "fe" is a dynamic safety factor which is obtained from operating experience and tests. The value of "fe" is calculated under the max. operating load. If a load spectrum with an assumed average load is used to obtain the required full load revolutions, the service time values must be increased accordingly.

For applications not listed in the chart, guidance values for similar operating conditions and comparable applications may be used.

*) Tower Cranes with bearing at top:

M_f = tilting moment without load

M = Moment at max. radius with load

**) For applications requiring a rating of f_s= 1.45, multi–row designs should be given preference because of the high average loads and arduous operating conditions.

应用场合 Application		静载荷安全系数 Static load factor f_s	寿命安全系数 Life factor f_e	全负荷运转寿命转数 Service Time in Full Load Revolution L_f
铁路起重机 Railway Crane		1.10	咨询ZYS Consult with ZYS	
甲板起重机（运载货物） Deck Crane (Cargo)		1.00		
升降机 悬臂式货物运输机 小型货物运输车 Stacker Boom Conveyor Conveyor Waggon		1.10	咨询ZYS Consult with ZYS	
绳索式挖掘机 回转式挖掘机 Cable Excavator/Dragline Swing Shovel		1.25		
液压挖掘机 Hydraulic Excavator	采用双排异径球转盘轴承 Double-row ball bearing	1.25		
	其他类型轴承 当斗容量 < 1.5m³时 Other bearing types: bucket capacity < 1.5m³	1.45		
	当斗容量≥1.5m³时 bucket capacity ≥ 1.5 m³	参见专用特殊标准 subject to special criteria		
钢包车 Ladle Car		1.75		

注：
这些应用场合下，运行条件尤其是运行时间，回转过程中的载荷变化比较大。不经常转动的场合可能仅需静态校验即可。相反的，连续运转或反复回转需动态校验。对于这种状态下工作的轴承，其选型应基于动态工作时间，悬臂式货物运输机卸货就是这种情况。

Note:
In these applications, the operating conditions, particularly the operating time and the loads during the rotation, vary considerably. Infrequent slewing motions, e.g. occasional positioning for certain jobs, may permit a rating on static criteria alone. On the contrary, continuous rotation or oscillating motions requires a rating on the basis of service time criteria, and for bearings under such conditions, the type selection should be based on service time such as the discharge boom conveyors in bucket wheel units.

6.2 静载荷

Static load capacity

载荷应乘以与使用场合有关的安全系数fs。若（Fac，Mc）位于所选轴承对应的静承载曲线下方，就可以满足要求。

The determined loads must be multiplied with a factor fs allocated to the application.（Fac，Mc）must locate below the static critical load curve of the selected bearing.

6.3 轴承承载能力计算

Calculation of bearing loads

转盘轴承所承受的载荷包括：轴向载荷Fa、径向载荷Fr和倾覆力矩M。在选型计算时，静态工况和动态工况下所承受的载荷应分别计算。

The slewing bearing loads include axial load Fa, radial load Fr and tilting moment M. Load calculation should be carried out separately as static and dynamic situation.

6.3.1 轴承当量载荷的计算方法

Calculation method of bearing equivalent loads

转盘轴承当量载荷的计算方法按表6的规定。

The calculation of bearing equivalent load should be in accordance with the Table 6.

6.3.2 静载荷安全系数及寿命的计算方法

Static load safety factor and life calculation

6.3.2.1 静载荷安全系数的计算方法

Calculation of static load safety factor

$$F_s = F_{aoc} / F_{ao} = M_{oc} / M_o$$

式中： f_s——轴承静载荷安全系数；

F_{aoc}——承载曲线坐标原点与静载荷点联线在静载荷承载曲线上交点对应的轴向载荷，单位为 kN；

M_{oc}——承载曲线坐标原点与静载荷点联线在静载荷承载曲线上交点对应的倾覆力矩，单为为 kN·m；

Here: f_s – static load safety factor

F_{aoc} – The axial load of the intersection point between the line connecting origin point and static load point and the static load curve, kN.

M_{oc} – The tilting moment of the intersection point between line connecting origin point and static load point and static load curve, kN·m.

6.3.2.2 轴承使用寿命的计算

Bearing life calculation

6.3.2.2.1 寿命载荷系数f_e的计算

Life load factor f_e

$$f_e = F_{aoc} / F_{ac} = M_{oc} / M_c$$

式中：F_{aoc}——承载曲线坐标原点与动载荷点联线在动载荷承载曲线上交点对应的轴向载荷，单位为 kN。

M_{oc}——承载曲线坐标原点与动载荷点联线在动载荷承载曲线上交点对应的倾覆力矩，单位为 kN·m。

Here: F_{aoc}——The axial load of the intersection point between line connecting origin point and dynamic load point and dynamic load curve, kN.

M_{oc}——The tilting moment of the intersection point between line connecting origin point and dynamic load point and dynamic load curve, kN.

6.3.2.2.2 轴承使用寿命L_f的计算

Bearing life L_f

$$L_f = (f_e)^{\varepsilon} \times 30000$$

式中： L_f——轴承360° 回转时的使用寿命，单位为转；

f_e——轴承寿命载荷系数；

ε——寿命指数，球轴承 ε =3，滚子轴承 ε =10/3。

$$f_e = F_{aoc} / F_{ac} = M_{oc} / M_c$$

Here: L_f——Bearing life when bearing rotate in 360° , unit:circle

f_e——life load factor

ε——life index, for ball bearing, ε =3; for roller bearing, ε =10/3

表 6 轴承当量载荷的计算方法 Table 6 Calculation of Bearing Equivalent Loads

轴承结构型式 SlewingBearingType	按静态工况选型时 当量静载荷的计算 Static equivalent load calculation in static working condition	按动态工况预测寿命时 当量动载荷的计算 Dynamic equivalent load calculation for life estimation in dynamic working condition
四点接触球轴承 $\alpha=45°$ Single row four point contact ball slewing bearing $\alpha=45°$	$F_{ao}=F_a+2.3F_r/K_o$ $M_o=M$	当$F_r>0.8K_cF_a$时 $F_{ac}=0.59F_a+1.18F_r/K_c$ 当$F_r\leqslant 0.8K_cF_a$时 $F_{ac}=F_a+0.66F_r/K_c$ $M_c=M$ For $F_r>0.8K_cF_a$, $F_{ac}=0.59Fa+1.18F_r/K_c$; For $F_r\leqslant 0.8K_cF_a$, $F_{ac}=F_a+0.66F_r/K_c$ $M_c=M$
双排异径球轴承 $\alpha=90°$ Double row different ball diameter slewing bearing $\alpha=90°$	当$F_r\leqslant 0.1K_oF_a$时 $F_{ao}=F_a$ 当$F_r>0.1K_oF_a$时需选用接触角 $<90°$ 的轴承 $M_o=M$ For $F_r\leqslant 0.1K_oF_a$, $F_{ao}=F_a$ For $F_r>0.1K_oF_a$, bearing with contact angle $<90°$ should be used $M_o=M$	当$Fr\leqslant 0.1KcFa$时 $Fac=Fa$ 当$Fr>0.1KcFa$时需选用接触角 $<90°$ 的轴承 $Mc=M$ For $Fr\leqslant 0.1KcFa$, $Fac=Fa$ For $Fr>0.1KcFa$,bearing with contact angle $<90°$ should be used $Mc=M$
交叉圆柱滚子轴承 $\alpha=45°$ Single row cross roller slewing bearing $\alpha=45°$	$F_{ao}=F_a+2.3F_r/K_o$ $M_o=M$	当$F_r>0.67K_cF_a$时 $F_{ac}=0.67F_a+1.5F_r/K_c$ 当$F_r\leqslant 0.67K_cF_a$时 $F_{ac}=F_a+F_r/K_c$ $M_c=M$ For $F_r>0.67K_cF_a$, $F_{ac}=0.67F_a+1.5F_r/K_c$; For $F_r\leqslant 0.67K_cF_a$ $F_{ac}=F_a+F_r/K_c$ $M_c=M$
三排圆柱滚子组合轴承 Three row cylindrical roller slewing bearing	$F_{ao}=F_a$ $M_o=M$	$F_{ac}=F_a$ $M_c=M$
	径向载荷Fr由承受径向载荷的一列滚子承受 Radial load Fr is supported by rollers in the middle row	

F_a ——轴承所承受的总轴向载荷，单位为kN；
F_r ——在力矩作用平面，轴承所承受的总径向载荷，单位为kN；
M ——轴承所承受的总倾覆力矩，单位为kN·m；
F_{ac}——动态工况下轴承的当量轴向载荷，单位为kN；
M_c——动态工况下轴承的当量倾覆力矩，单位为kN·m；
F_{ao}——静态工况下轴承的当量轴向载荷，单位为kN；
M_o——静态工况下轴承的当量倾覆力矩，单位为kN·m；
K_o ——轴承偏心轴向静载荷与中心轴向静载荷关系系数（见表7）；
K_c ——轴承偏心轴向动载荷与中心轴向动载荷关系系数（见表7）

F_a ——Total axial load of the bearing, kN
F_r ——Total radial load of the bearing in the tilting moment plane, kN
M ——Total tilting moment of the bearing, kN·m
F_{ac}——Equivalent axial load under dynamic working condition, kN
M_c——Equivalent tilting moment under dynamic working condition, kN·m
F_{ao}——Equivalent axial load under static working condition, kN
M_o——Equivalent tilting moment under static working condition, kN·m
K_o ——factor referring to relation of eccentricity axial static load and core axial static load, see Table 7
K_c ——factor referring to relation of eccentricity axial dynamic load and core axial dynamic load, see Table 7

表 7 轴承偏心轴向载荷与中心轴向载荷关系系数 Table 7 Ko and Kc

点接触 Point Contact			线接触 Line Contact		
$\frac{2M}{D_{wp}F_a}$	Ko	Kc	$\frac{2M}{D_{wp}F_a}$	Ko	Kc
0	1	1	0	1	1
0.0831	1.168	1.014	0.0611	1.122	1.009
0.1849	1.381	1.064	0.1372	1.276	1.048
0.308	1.648	1.164	0.2334	1.471	1.134
0.4538	1.983	1.389	0.3600	1.732	1.275
0.600	2.356	1.501	0.5238	2.076	1.487
0.6317	2.45	1.546	0.5742	2.189	1.554
0.6713	2.564	1.602	0.6341	2.313	1.626
0.7247	2.709	1.675	0.7143	2.483	1.736
0.8005	2.903	1.772	0.8229	2.711	1.872
0.913	3.178	1.922	0.9763	3.031	2.084
1.092	3.595	2.152	1.21	3.512	2.376
1.403	4.303	2.559	1.602	4.318	2.927
2.046	5.734	3.481	2.391	5.931	4.037
2.264	6.215	3.735	2.654	6.468	4.423
2.537	6.817	4.121	2.984	7.143	4.966
2.890	7.593	4.625	3.408	8.006	5.529
3.361	8.628	5.389	3.974	9.166	6.377
4.023	10.081	6.276	4.767	10.776	7.565
5.019	12.255	7.743	5.926	13.175	9.352
6.682	15.898	10.227	7.939	17.182	12.357
7.149	16.92	10.927	8.459	18.387	13.237
7.710	18.149	11.768	9.114	19.685	14.242
8.346	19.531	12.719	9.889	21.277	15.443
9.102	21.186	13.856	10.783	23.095	16.813
10.0	23.148	15.208	11.868	25.316	18.494
11.11	25.575	16.88	13.188	28.011	20.532
12.48	28.571	18.946	14.821	31.348	23.06
14.31	32.573	21.71	16.896	35.587	26.274
16.67	37.736	25.272	19.711	41.322	30.62
20	45.045	30.329	23.81	49.505	36.827

注：中间值由线性内插法求得
Note：For values between，use linear interpolation

七、轴承选型举例 Example of bearing selection

最大载荷的计算应按下面式子进行。轴承选型前，各载荷都要乘以各自的安全系数（见表 7）。本例中用到的安全系数为：

载重时：载荷安全系数f_s = 1.25

抓斗： 载荷安全系数f_s = 1.45

The calculation of maximum load should be determined according to the for mulae listed below. The loads must be multiplied by the load factors (see Table 7) before the bearing selection. The following factors will apply to the examples given:

Cargo duty: Load safety factor f_s = 1.25

Grab duty: Load safety factor f_s = 1.45

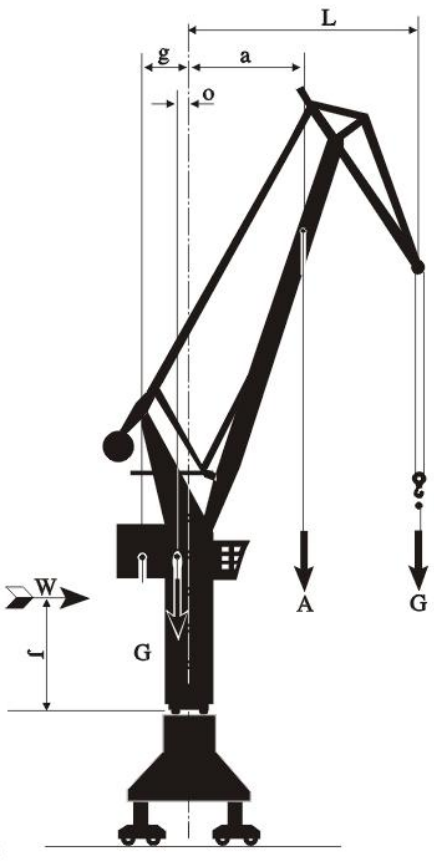


图 3

1、最大半径时的起重载荷

Lifting load at maximum radius

1.1）考虑风力作用下的最大工作载荷：

Max. working load including wind:

轴向载荷 $F_a = Q_1+A+O+G$

倾覆力矩 $M = Q_1 \cdot l_{max}+A \cdot a_{max}+W \cdot r -O \cdot o-G \cdot g$

Axial load $F_a = Q_1 + A + O + G$

Tilting moment $M = Q_1 \cdot l_{max} +A \cdot a_{max} +W \cdot r- O \cdot o-G \cdot g$

1.2）不考虑风力作用，含25%超载的载荷

Load incl. 25 % test load without wind:

轴向载荷 $F_a = 1.25 \cdot Q_1+A+O+G$

倾覆力矩 $M = 1.25 \cdot Q_1 \cdot l_{max}+A \cdot a_{max} -O \cdot o-G \cdot g$

Axial load $F_a = 1.25 \cdot Q_1 + A +O + G$ Tilting Moment $M = 1.25 \cdot Q_1 \cdot l_{max}+A \cdot a_{max}-O \cdot o-G \cdot g$

2、最小半径时的起重载荷

Lifting load at minimum radius

2.1）考虑风力作用下的最大工作载荷：

Max. working load including wind:

轴向载荷 $F_a = Q_2+A+O+G$ 倾覆力矩 $M = Q_2 \cdot I_{min}+A \cdot a_{min}+ W \cdot r-O \cdot o-G \cdot g$

Axial load $F_a = Q_2+A+O+G$ Tilting moment $M = Q_2 \cdot I_{min}+A \cdot a_{min}+W \cdot r-O \cdot o-G \cdot g$

2.2) 不考虑风力作用， 含25%超载的载荷

Load incl. 25 % test load without wind:

轴向载荷 $F_a = 1.25 \cdot Q_2+A+O+G$ 倾覆力矩 $M = 1.25 \cdot Q_2 \cdot I_{min}+A \cdot a_{min}-O \cdot o-G \cdot g$

Axial load $F_a = 1.25 \cdot Q_2 + A + O + G$ Tilting moment $M = 1.25 \cdot Q_2 I_{min}+A \cdot a_{min}- O \cdot o-G \cdot g$

吊车最大工作半径时

Crane for cargo duty at maximum working radius

Q = 250 kN　　A = 70 kN　　O = 450 kN　　G = 900 kN　　W = 26 kN

l_{max} = 23 m　　a_{max} = 11 m　　o = 0.75 m　　g = 3 m　　r = 6.5 m

1）考虑风力作用下的最大工作载荷：

Maximum working load including wind

F_a = Q+A+O+G= 250 +70+ 450 + 900 = 1670 kN

M = Q · l_{max}+A · a_{max}+W · r –O · o–G · g = 250 · 23 + 70 · 11+ 26 · 6.5 – 450 · 0.75 – 900 · 3

= 3651.5 kNm

因此 F_a = 1670 kN　　M = 3651.5 kNm

2) 不考虑风力作用，含25%超载的载荷

Load incl. 25 % test load without wind

F_a = Q · 1.25+A+O+G= 312.5 + 70 + 450 + 900 =1732.5 KN

M = Q · 1.25 · l_{max}+A · a_{max}–O · o–G · g = 312.5 · 23 + 70 · 11– 450 · 0.75 – 900 · 3 =4920 kNm

因此 F_a = 1732.5 kN　　M = 4920.0 kNm

3）不考虑风力作用时的最大工作载荷

Maximum working load without wind

F_a = 1670 kN

M = Q · l_{max}+A · a_{max} – O · o– G · g = 250 · 23 + 70 · 11– 450 · 0.75 –900 · 3 = 3482.5 kNm

因此 F_a = 1670 kN　　M = 3482.5 kNm

轴承选型时可用载荷类型2）进行静态评定。以“极限载荷承载曲线”来校验轴承的静载荷，安全系数为f_s = 1.25的当量载荷：

载荷类型 2)　F_{ac} = 1732.5 kN · 1.25 = 2165.625 kN　　M_c = 4920 kNm · 1.25 = 6150 kNm

因此，可按下面不带安全系数的最大载荷确定螺栓数及螺栓等级：

载荷类型 2）F_a = 1732.5 kN　　M = 4920 kNm

按上述计算结果，在承载曲线中选择，可选用02*.50.2500。

When selecting the bearing, load case 2) could be used for static evaluation. The static load capacity of the bearing, taking into account load safety factor fs = 1.25, is checked against the “static limiting load curve”, reference load:

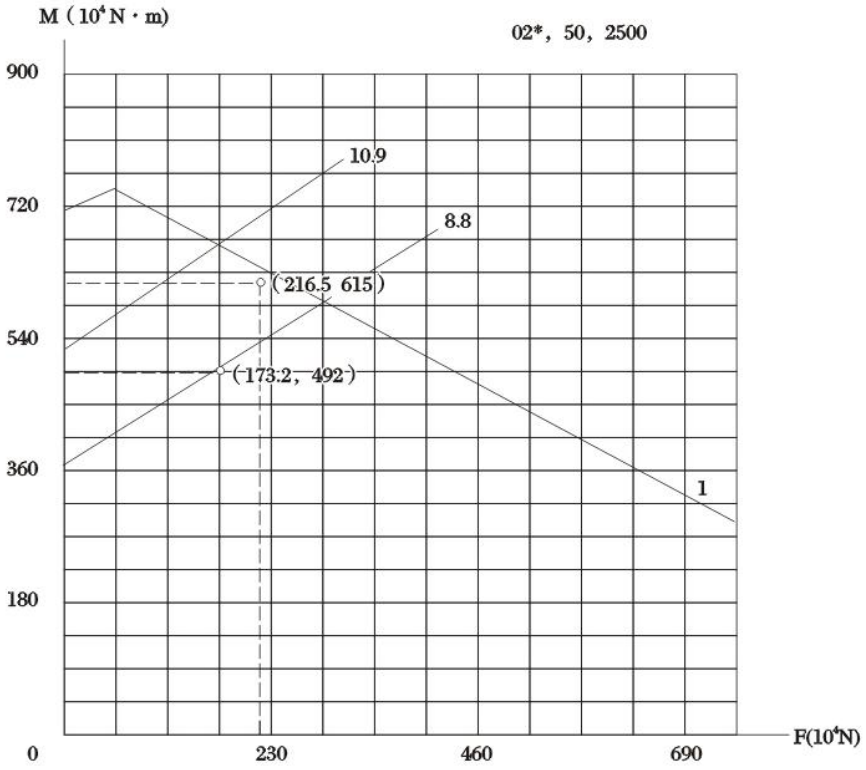
Load case 2) F_{ac} = 1732.5 kN · 1.25 = 2165.625 kN

M_c = 4920 kNm · 1.25 = 6150 kNm

The number of bolts and strength class will be determined according to the max. load without safety factor:

Load case 2) F_a = 1732.5 kN　　M = 4920 kNm

According to the above calculation results and load curves, bearing 02*.50.2500 can be selected.



抓斗式起重机最大工作半径时

Grabbing crane at maximum working radius

Q = 160 kN　A = 110 kN　O = 450 kN　G = 900 kN　W = 26 kN

l_{max} = 19 m　a_{max} = 9 m　o = 0.75 m　g = 3 m　r = 6.5 m

1) 考虑风力的最大工作载荷

Maximum operating load including wind

Fa = Q+A+O+G= 160 +110+ 450 + 900= 1620 kN

$M = Q \cdot l_{max} \cdot + A \cdot a_{max} + W \cdot r - O \cdot o - G \cdot g = 160 \cdot 19 + 110 \cdot 9 + 26 \cdot 6.5 - 450 \cdot 0.75 - 900 \cdot 3 = 1161.5$ kNm

2) 不考虑风力，含25%超载的载荷

Load case incl. 25 % test load without wind

$F_a = Q \cdot 1.25 + A + O + G = 200 + 110 + 450 + 900 = 1660$KN

$M = Q \cdot 1.25 \cdot I_{max} + A \cdot a_{max} - O \cdot o - G \cdot g = 200 \cdot 19 + 110 \cdot 9 - 450 \cdot 0.75 - 900 \cdot 3 = 1752.5$ kNm

3) 不含风力的最大工作载荷

Maximum operating load without wind

F_a = 1620 kN

$M = Q \cdot l_{max} + A \cdot a_{max} - O \cdot o - G \cdot g = 160 \cdot 19 + 110 \cdot 9 - 450 \cdot 0.75 - 900 \cdot 3 = 992.5$ kNm

轴承选型时可用载荷类型2）进行静态评定。以“极限载荷承载曲线”来校验轴承的静载荷，安全系数为f_s= 1.45的当量载荷：

载荷类型 2） F_{ac} = 1660 kN · 1.45 = 2407 kN

M_c = 1752.5 kNm · 1.45 = 2541.125 kNm

可确定不带安全系数时的最大载荷螺栓数及螺栓等级

载荷类型 2） F_a = 1660 kN　　M = 1752.5 kNm

按上述计算结果，在承载曲线中选择，可选用13*.40.1250。

When selecting the bearing, load case 2) should be used for static evaluation. The static load capacity of the bearing, taking into account load safety factor fs = 1.45, is checked against the "static limiting load curve", reference load:

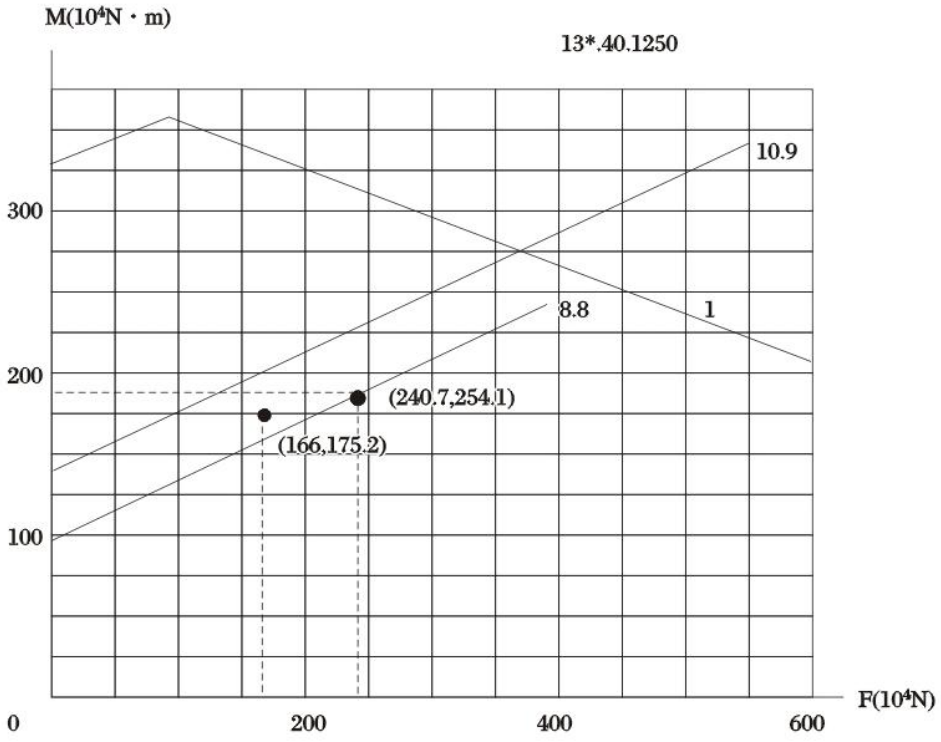
Load case 2) F_{ac} = 1660 kN · 1.45 = 2407 kN

M_c = 1752.5 kNm · 1.45 = 2541.125 kNm

Number of bolts and strength class will be determined for maximum load without safety factor:

Load case 2) F_a = 1660 kN　　M = 1752.5 kNm

For the above–mentioned load cases, the following bearings may be selected: 13*.40.1250.



八、转盘轴承的安装及维护保养
Installation and maintenance of the slewing bearing

8.1 装卸与贮运

Transport and storage

·回转支承必须小心装卸。

·运输和贮存以水平放置为宜，贮存必须放在干燥的室内。

·吊装宜用吊环螺钉，以水平方式进行，切勿碰撞，特别是径向方向的碰撞。

·回转支承外表面涂有防锈剂，其防锈期一般为六个月，对于超过六个月的贮存期的（如作配件）应重新进行防锈包装或采取其它贮存措施。

· Slewing bearings require careful handling.

· Slewing bearings should always be transported and stored in horizontal position and be stored in dry roofed areas.

· Use eyebolts for horizontal handling. Impact, particularly in radial direction, must be avoided.

· The surface of slewing bearing should be applied with anti–corrosion oil, and the anti–corrosion period is 6 months. Longer storage (as backup, for example) periods will require special preservation.

8.2 安装支架的要求

Requirements on Supporting Structures

·安装配合支架与滚道中心对齐。

·为防止回转支承局部过载，保证其灵活运转，安装支架应在所有焊接工序后进行消除内应力处理，并对安装平面进行机械加工，其平面度（包括水平面的角偏差）应控制在一定范围内，见表8。

· The support in the companion structures must be kept aligned to the track center.

· In order to prevent local overload and ensure smooth rotation, the supporting structures should be processed to remove internal stress after all the welding procedures. The contact surfaces for the bearing should be machined carefully and should be within flatness tolerances, see Table 8.

表8：包含角偏差在内的平面度许可值
Table 8 Tolerated out–of–flatness including the angular deviation “P” of the machined contact surfaces

滚道中心圆直径 D_L(mm) Track diameter	安装支架平面偏差P（mm） Out–of–flatness including slope “P” per support surface		支架所允许的最大偏差值（mm） Maximum permissible out–of flatness of the support
	球式支承 Support for ball bearing	滚柱式支承 Support for roller bearing	
500 1000	0.10 0.15	0.10 0.12	0.4 0.5
1500 2000	0.19 0.22	0.15 0.18	0.8 1.0
2500 3000 3500	0.25 0.30 0.34	0.20 0.22 0.24	1.3 1.6 1.8

注：表8中的数值为最大值。在180° 的扇形区内只允许有一处波峰达到该值，并在0° ~90° ~180° 区域内平稳上升或下降。不允许忽升忽降，以避免峰值负荷。

Note: The values listed in the table 8 are maximum admissible flatness deviations. To avoid larger deviations and the occurrence of peaks in smaller sectors, any deviation in the range of 0° ~ 90° ~180° may only rise or fall gradually. The occurrence of peaks in 180° range must not be more than once.

· 安装支架还应具有良好的刚性。在最大允许负荷下，挠曲变形量应控制在表9规定的范围内。

· Generally it applies that the companion structures for slewing bearings must be rigid.Under maximum admissible load, the deflection should be within the permissible limits in Table 9.

表9 最大允许负荷下的挠曲变形量 Table 9 Deflection under maximum admissible load

滚道中心圆直径D_L(mm) Track central diameter	~1000	>1000~1500	>1500~2000	>2000~2500	>2500~3000	>3000~3500	>3500~4000	>4000~4500	>4500~5000	>5000~5500	>5500~6000
支架平面最大挠度A_{max}(mm) Maximum deflection of contact surface	0.6	0.8	1.0	1.3	1.6	2.0	2.5	3.0	3.6	4.2	4.8

· 安装支架的螺栓孔按GB/T5277–2000中级精度加工，并与回转支承安装孔对齐。

· Bolt holes in the supporting structures are machined according to GB/T5277–1985 in medium precision , and should be positioned in line with installation holes of the slewing bearings.

8.3 安装螺栓副

Fastening bolts

· 回转支承所用螺栓尺寸应符合GB/T5782–2000和GB/T5783–2000的规定，其强度等级不低于GB/T3098.1–2000规定的8.8级，并根据支承受力情况选择合适的强度等级。

· 螺母尺寸应符合GB/T6170–2000 和 GB/T6175–2000规定，其机械性能应符合GB3098.2–2000规定。

· 垫圈尺寸应符合GB/T97.1–1985和GB/T97.2–1985，需调质处理。不得使用弹簧垫圈。

· 螺栓预紧方式按主机设计规定，应保证一定的预紧力，除非特殊规定，一般预紧力应为螺栓屈服极限的0.7倍。拧紧时允许在螺纹处涂少许油。预紧扭矩或预紧力见表10。

· 螺栓夹紧长度$L_K \geq 5d$(d–螺栓直径)。

· The bolt dimensions should be in accordance with GB/T5782–2000 and GB/T5783–2000 and their strength classes should not be less than 8.8 of GB/T3098.1–2000. Strength class should be determined according to different load.

· Nut dimensions should be in accordance with GB/T6170–2000 and GB/T6175–2000, and mechanical property should comply with GB/T3098.2–2000.

· Washer dimensions should be in accordance with GB/T97.1–1985 and should be hardened and tempered according to GB/T97.2–1985. Spring washers are not recommended

· Bolt pretension pattern is based on main machine' s design requirement and certain pretension force should be maintained. Generally bolts are prestressed to 70% of the yield point. While bolts are tightened, a small quantity of oil is allowed on the screw. Tightening forces and tightening torques for bolts are listed in Table 10.

· Clamping length $L_K \geq 5d$(d is bolt diameter).

表10 预紧扭矩或预紧力 Table 10 Pretightening force or torque

螺栓规格（GB/T5782–2000 GB/T5783–2000）Bolt nominal diameter	安装孔直径（mm）Mounting hole diameter	螺栓强度等级（GB/T3098.1–2000）Bolt Strength Class	
		8.8	10.9
		螺栓材料的屈服强度极限 σ_{smin}(N/mm²) Bolt material yield point	
		640	900
		预紧扭矩M_A（Nm）Pretightening torque	
M10	11	44	62
M12	13.5	77.5	110
M14	15.5	120	170
M16	18	190	265
M18	20	260	365
M20	22	370	520
M22	24	500	700
M24	26	640	900
M27	30	950	1350
M30	33	1300	1800
		预紧力F_A（103N）	Pretightening force
M33	36	293	412
M36	39	344	484
M39	42	414	581
M42	45	473	665
M45	48	553	777
M48	52	623	876
M52	56	749	1054
M56	62	863	1214
M60	66	1008	1418

注：（1）当螺栓尺寸不符合GB/T5782–2000或GB/T5783–2000时，表值需另行计算。

（2）螺栓头部与被夹紧面之间的总摩擦系数 μ =0.14，螺纹涂以少许油。

Note:（1）For values that are not coincide with GB/T5782–2000 and GB/T5783–2000, calculation should be carried out.

（2）Friction coefficient of the contact surface(slightly oiled) between bolt and clamping face is μ =0.14.

8.4 安装

Installation

·安装前，回转支承安装基准面和支架安装平面必须清理干净，去除油污、毛刺、油漆以及其它异物。

·回转支承滚道淬火软带（外部标记“S”或堵塞孔处）应置于非负荷区或非经常负荷区。

·回转支承吊装到位后，应用塞尺检查贴合平面的平面度。如有间隙应重新进行机械加工，若确实无法加工可以采用填塑或局部垫片充实，以防螺栓拧紧后支承变形，影响回转支承性能。

·安装螺栓拧紧前，根据齿轮节圆径向跳动最高点（三个涂有绿色漆标记齿）调节齿侧间隙，并于螺栓拧紧后，在全部齿圈上检查齿侧间隙。

·拧紧螺栓采用“星形”图法拧紧，可在整个圆周上获得均匀的紧固效果，如下图。

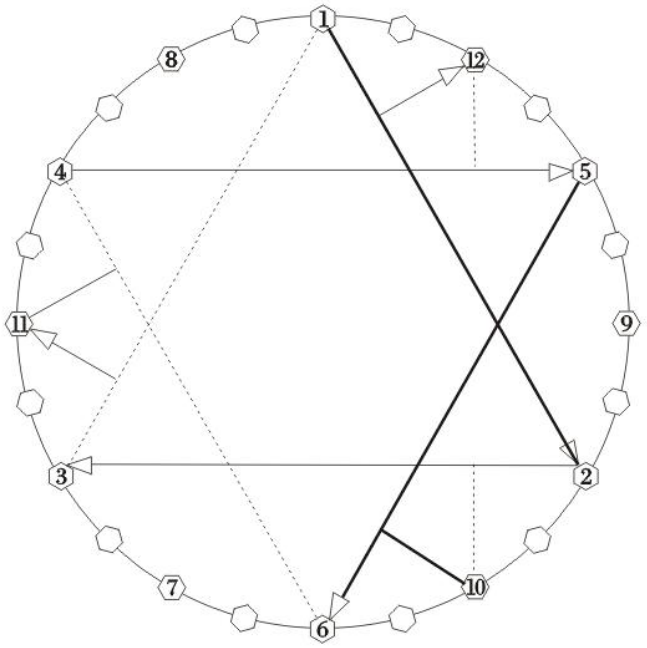
· Before installation, bearing surfaces and contact areas should be cleaned, remove oil, burrs and strong paints etc.

· The soft zone between the beginning and end of the hardened region of the raceway is identified by a punched–in letter “S” which should be positioned outside the main load–carrying areas.

· Examine the flatness of the bearing connecting surfaces with a feeler gauge. In case any clearance is detected, the plane must be re–machined. In case the re–working of spacious mating structures could not be done. Plastic filling or partial filler may be used to prevent bearing deformation after bolts are tightened, which may impact the performance of slewing bearings.

· The backlash is adjusted at 3 teeth marked in green. After the final tightening of the bearing the backlash should be rechecked over the entire circumference.

· After positioning the bearing, cross–tighten the bolts in triangle direction to ensure that all the bolts are tightened to the same level.



8.5 润滑与使用维护

Lubrication and Maintenance

·回转支承出厂时滚道内涂有少量的S_2Mo极压锂基润滑脂（GB/T7324），启用时用户应根据不同的工作条件，重新充满新的润滑脂。

·回转支承滚道应定期加注润滑脂。一般球类支承每运转100小时加油一次，滚柱类支承每50小时加油一次，特殊工作环境，如热带、湿度大、灰尘多、温度变化大及连续工作时，应缩短润滑周期。机器长期停运前后也必须加足新的润滑脂。每次润滑必须将滚道内注满润滑脂，直至从密封处渗出为止。注润滑脂时，要慢慢转动回转支承，使润滑脂填充均匀。

·齿面应经常清除杂物，并涂以相应的润滑脂。

·用户也可根据具体要求自行选择最佳润滑脂。

·回转支承首次运行100小时后，应检查螺栓的预紧力。以后每运转500小时检查一次，必须保持足够的预紧力。

·使用中注意回转支承的运转情况，如发现噪声、冲击、电流、功率突然增大，应立即停机检查，排除故障，必要时需拆检。

·使用中禁止用水直接冲刷回转支承，以防水进入滚道。严防较硬异物接近或进入齿啮合区。

·经常查看密封的完好情况，如果发现密封带破损应及时更换。如发现脱落应及时复位。

· Slewing bearing raceway is filled with a small quantity of S_2Mo EP Lithium grease(GB7324–1994) before delivery. When slewing bearing is installed, it should be filled with new lubricant according to different operating conditions.

· The raceway of slewing bearing should be greased regularly. Generally ball slewing bearing is about every 100 operating hours. Roller slewing bearings is about every 50 operating hours. Shorter lubrication periods will be needed under special working condition, such as in the tropics, in high humidity, dusty, strong temperature changes, as well as continuous rotation. If there are standstill times between bearing installation and equipment start–up, respective maintenance procedures will be required. The bearing should be filled with enough lubricate oil until they overflow from the seal. The bearing should be rotated during relubrication.

· The gear should always be cleaned and have sufficient grease.

· Users can select lubricate oil according to their own conditions.

· The first inspection of bolt pre–tension torque should be carried out after 100 operating hours. For each subsequent inspection, the intervals should be 500 operating hours. The bolt connection has to keep a sufficient pre–tension during the whole bearing life.

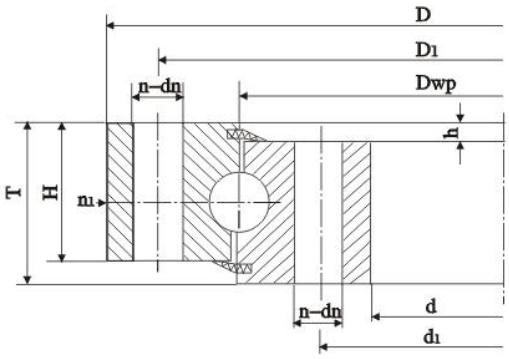
· As for maintenance, the point we should pay attention to is when the noise, impact or power increases suddenly, the power supply of the machine should be cut immediately and examine where the fault is.

· It is forbidden to use water washing the slewing bearing directly to prevent it enter the raceway. Prevent any stiff matter enter into the gear mesh area.

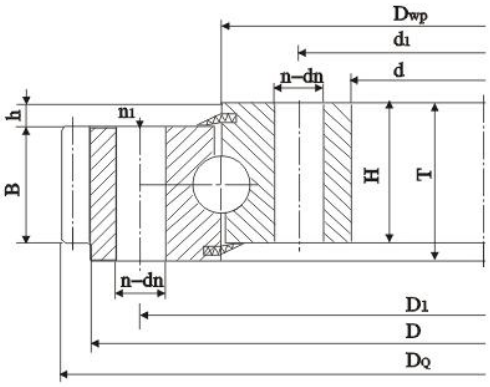
· Regularly examine the seals, if they are broken, replace with new seals in time, if they are dropped off, reposition them.

九、单排四点接触球转盘轴承结构参数及承载曲线

Structural Parameter and Limit Load Curve of Single-row Four-point Contact BallSlewing Bearing

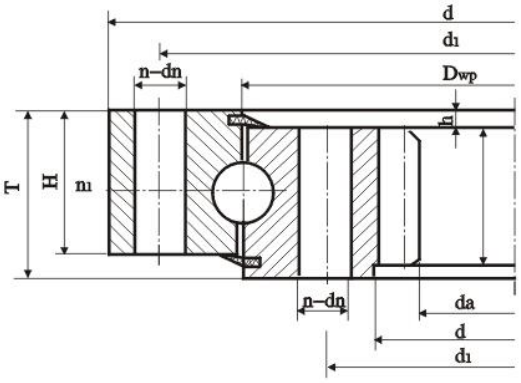


无齿式单排四点接触球轴承（010）
Without Gear



外齿式单排四点接触球轴承（011，012）
With External Gear

基本代号 Basic Code			外形尺寸 Size										齿轮参数 Gear	
无齿式 Without Gear	外齿式 External Gear	内齿式 Inner Gear	D	d	T	D1	d1	n	dn	n1	H	h	b	m
010.30.500	011.30.500	013.30.500	602	398	80	566	434	20	18	4	70	10	60	5
	012.30.500	014.30.500												6
010.30.560	011.30.560	013.30.560	662	458	80	626	494	20	18	4	70	10	60	5
	012.30.560	014.30.560												6
010.30.630	011.30.630	013.30.630	732	528	80	696	564	24	18	4	70	10	60	6
	012.30.630	014.30.630												8
010.30.710	011.30.710	013.30.710	812	608	80	776	644	24	18	4	70	10	60	6
	012.30.710	014.30.710												8
010.40.800	011.40.800	013.40.800	922	678	100	878	722	30	22	6	90	10	80	8
	012.40.800	014.40.800												10
010.40.900	011.40.900	013.40.900	1022	778	100	978	822	30	22	6	90	10	80	8
	012.40.900	014.40.900												10
010.40.1000	011.40.1000	013.40.1000	1122	878	100	1078	922	36	22	6	90	10	80	10
	012.40.1000	014.40.1000												12
010.40.1120	011.40.1120	013.40.1120	1242	998	100	1198	1042	36	22	6	90	10	80	10
	012.40.1120	014.40.1120												12
010.45.1250	011.45.1250	013.45.1250	1390	1110	110	1337	1163	40	26	5	100	10	90	12
	012.45.1250	014.45.1250												14
010.45.1400	011.45.1400	013.45.1400	1540	1260	110	1487	1313	40	26	5	100	10	90	12
	012.45.1400	014.45.1400												14

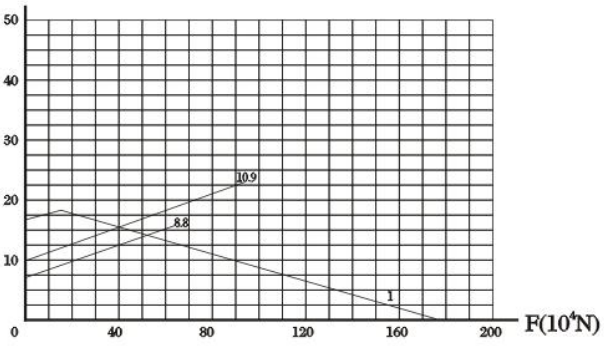


内齿式单排四点接触球轴承（013，014）
With Inner Gear

外齿参数 External Gear		内齿参数 Inner Gear		质量 Mass kg
Da	z	da	z	
629	123	367	74	75.8
628.8	102	368.4	62	
689	135	427	86	94
688.8	112	428.4	72	
772.8	126	494.4	83	110
774.4	94	491.2	62	
850.8	139	572.4	96	120
854.4	104	571.2	72	
966.4	118	635.2	80	256
968	94	634	64	
1062.4	130	739.2	93	240
1068	104	734	74	
1188	116	824	83	305
1185.6	96	820.8	69	
1298	127	944	95	300
1305.6	106	940.8	79	
1449.6	118	1048.8	88	420
1453.2	101	1041.6	75	
1605.6	131	1192.8	100	480
1607.2	112	1195.6	86	

承载曲线图编号 1 Static limiting load curve 1

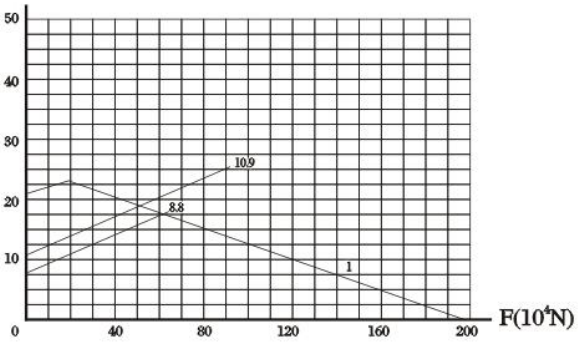
M(10^4N · m)



01*.30.500

承载曲线图编号 2 Static limiting load curve 2

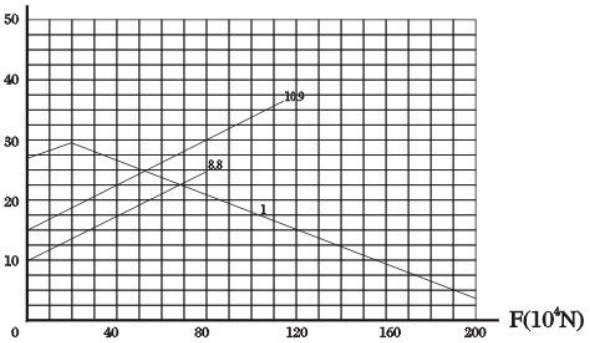
M(10^4N · m)



01*.30.560

承载曲线图编号 3 Static limiting load curve 3

M(10^4N · m)



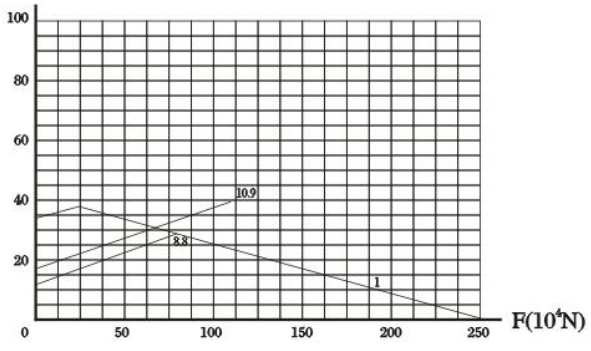
01*.30.630

转盘轴承 SLEWING BEARING

基本代号 Basic Code			外形尺寸 Size										齿轮参数 Gear	
无齿式 Without Gear	外齿式 External Gear	内齿式 Inner Gear	D	d	T	D_1	d_1	n	d_n	n_1	H	h	b	m
010.45.1600	011.45.1600	013.45.1600	1740	1460	110	1687	1513	45	26	5	100	10	90	14
	012.45.1600	014.45.1600												16
010.45.1800	011.45.1800	013.45.1800	1940	1660	110	1887	1713	45	26	5	100	10	90	14
	012.45.1800	014.45.1800												16
010.60.2000	011.60.2000	013.60.2000	2178	1825	144	2110	1891	48	33	8	132	12	120	16
	012.60.2000	014.60.2000												18
010.60.2240	011.60.2240	013.60.2240	2418	2065	144	2350	2131	48	33	8	132	12	120	16
	012.60.2240	014.60.2240												18
010.60.2500	011.60.2500	013.60.2500	2678	2325	144	2610	2391	56	33	8	132	12	120	18
	012.60.2500	014.60.2500												20
010.60.2800	011.60.2800	013.60.2800	2978	2625	144	2910	2691	56	33	8	132	12	120	18
	012.60.2800	014.60.2800												20
010.75.3150	011.75.3150	013.75.3150	3376	2922	174	3286	3014	56	45	8	162	12	150	20
	012.75.3150	014.75.3150												22
010.75.3550	011.75.3550	013.75.3550	3776	3322	174	3686	3414	56	45	8	162	12	150	20
	012.75.3550	014.75.3550												22
010.75.4000	011.75.4000	013.75.4000	4226	3772	174	4136	3864	60	45	10	162	12	150	22
	012.75.4000	014.75.4000												25
010.75.4500	011.75.4500	013.75.4500	4726	4272	174	4636	4364	60	45	10	162	12	150	22
	012.75.4500	014.75.4500												25

承载曲线图编号 4 Static limiting load curve 4

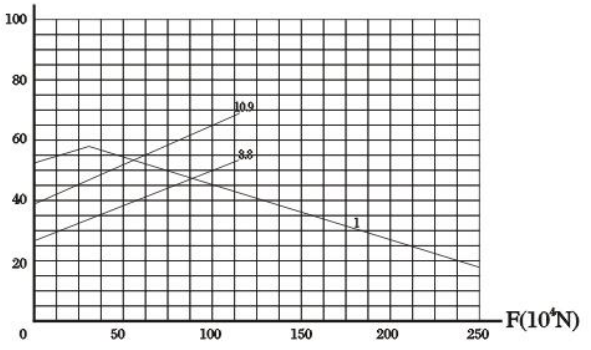
M(10^4N · m)



01*.30.710

承载曲线图编号 5 Static limiting load curve 5

M(10^4N · m)

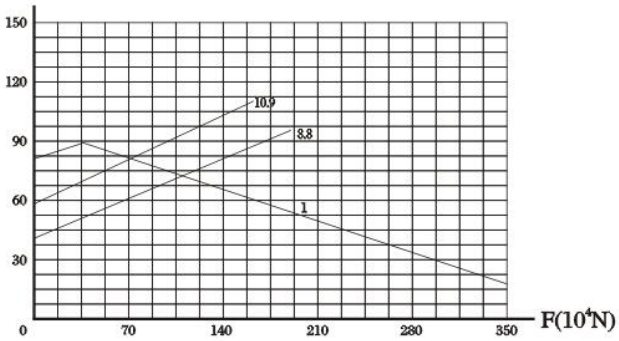


01*.40.800

外齿参数 External Gear		内齿参数 Inner Gear		质量 Mass kg
Da	z	da	z	
1817.2	127	1391.6	100	550
1820.8	111	1382.4	87	
2013.2	141	1573.6	113	610
2012.8	123	1574.4	99	
2268.8	139	1734.4	109	1100
2264.4	123	1735.2	97	
2492.8	153	1990.4	125	1250
2498.4	136	1987.2	111	
2768.4	151	2239.2	125	1400
2776	136	2228	112	
3074.4	168	2527.2	141	1600
3076	151	2528	127	
3476	171	2828	142	2800
3471.6	155	2824.8	129	
3876	191	3228	162	3200
3889.6	174	3220.8	147	
4329.6	194	3660.8	167	3600
4345	171	3660	147	
4835.6	217	4166.8	190	4000
4845	191	4160	167	

承载曲线图编号 7 Static limiting load curve 7

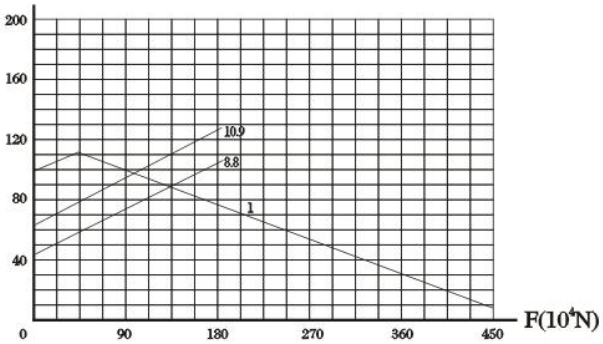
M(10^4N · m)



01*.40.1000

承载曲线图编号 8 Static limiting load curve 8

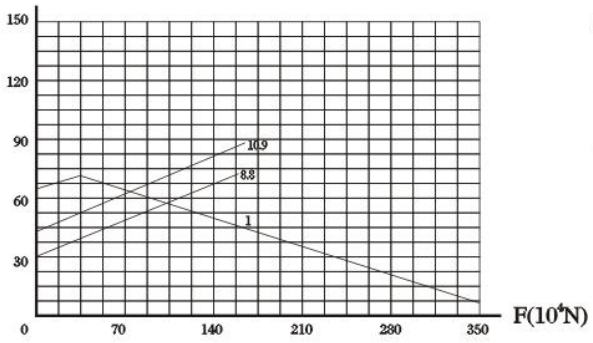
M(10^4N · m)



01*.40.1120

承载曲线图编号 6 Static limiting load curve 6

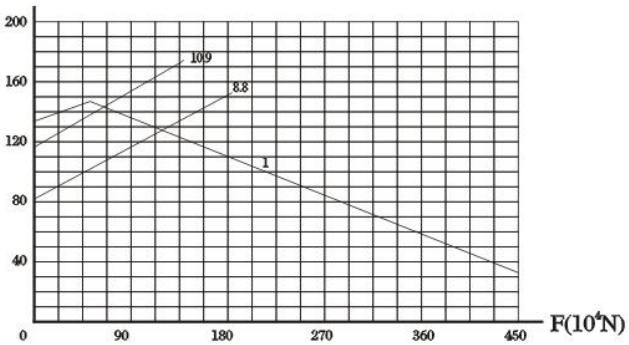
M(10^4N · m)



01*.40.900

承载曲线图编号 9 Static limiting load curve 9

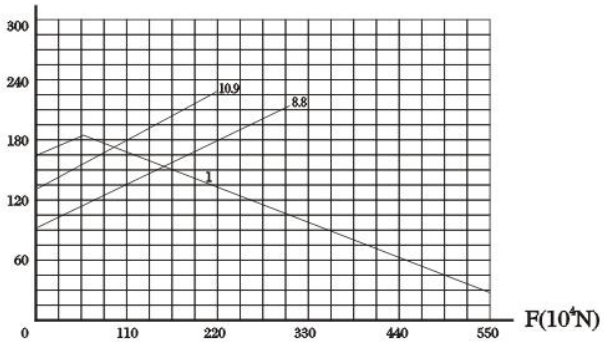
M(10^4N · m)



01*.45.1250

承载曲线图编号 10 Static limiting load curve 10

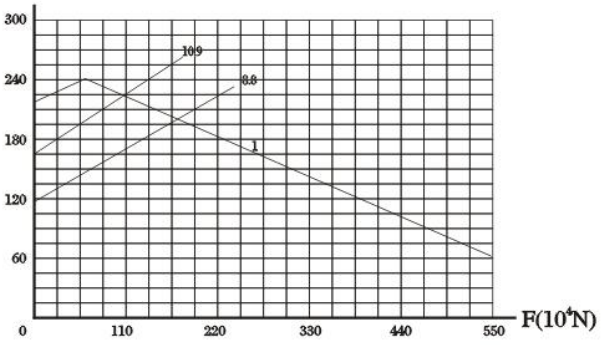
M(10^4N · m)



01*.45.1400

承载曲线图编号 11 Static limiting load curve 11

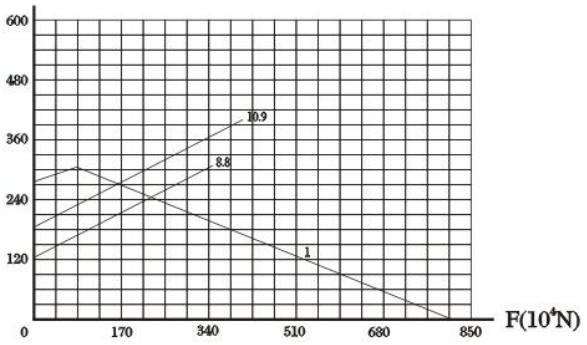
M(10^4N · m)



01*.45.1600

承载曲线图编号 12 Static limiting load curve 12

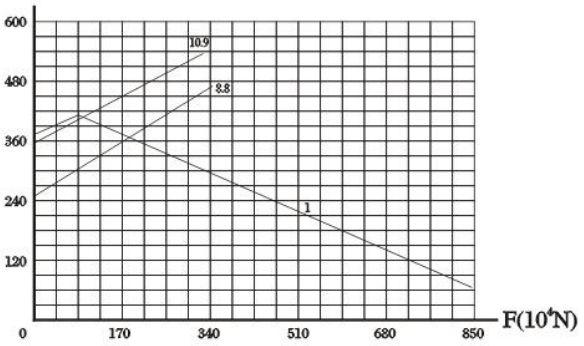
M(10^4N · m)



01*.45.1800

承载曲线图编号 13 Static limiting load curve 13

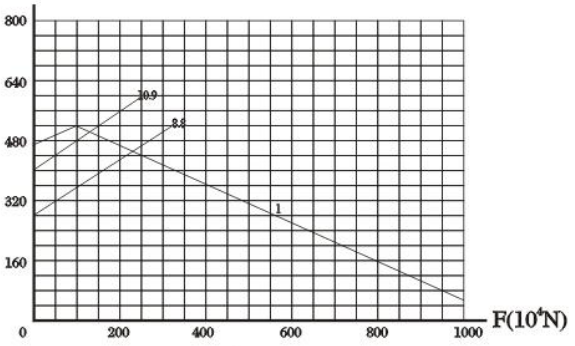
M(10^4N · m)



01*.60.2000

承载曲线图编号 14 Static limiting load curve 14

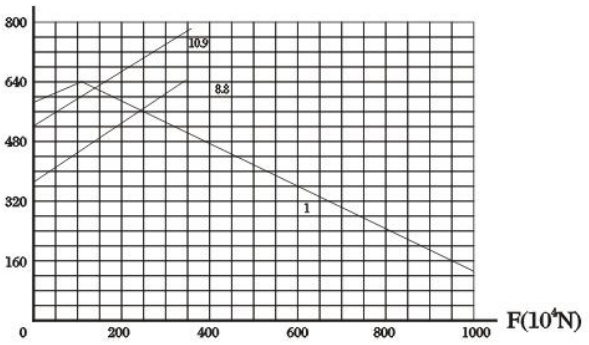
M(10^4N · m)



01*.60.2240

承载曲线图编号 15 Static limiting load curve 15

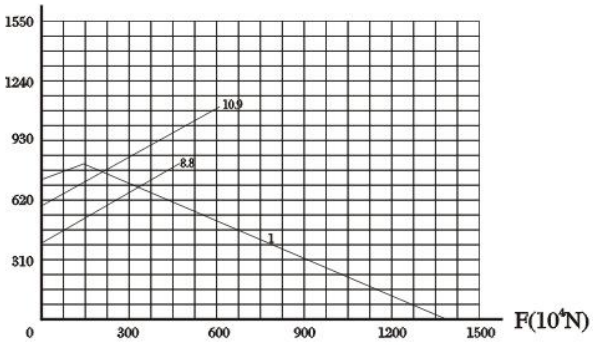
M(10^4N · m)



01*.60.2500

承载曲线图编号 16 Static limiting load curve 16

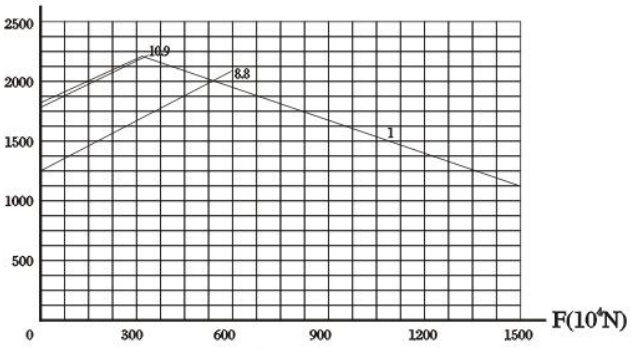
M(10^4N · m)



01*.60.2800

承载曲线图编号 19 Static limiting load curve 19

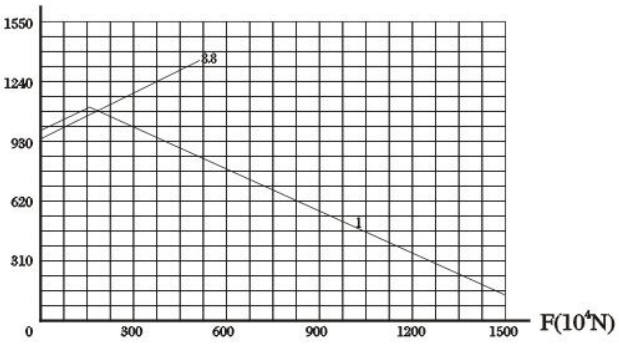
M(10^4N · m)



01*.75.4000

承载曲线图编号 17 Static limiting load curve 17

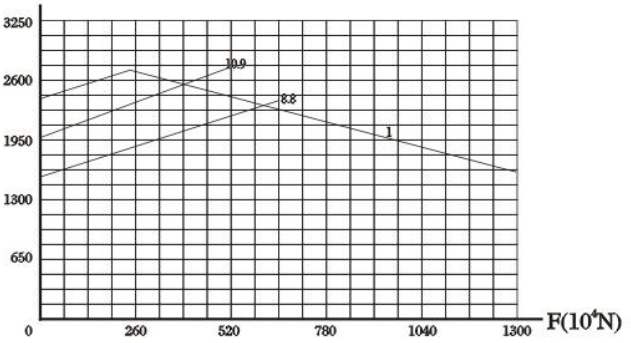
M(10^4N · m)



01*.75.3150

承载曲线图编号 20 Static limiting load curve 20

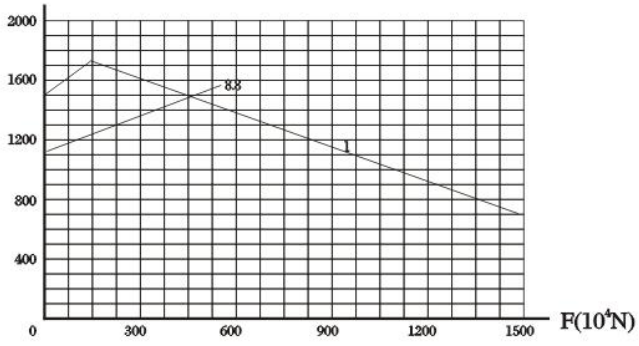
M(10^4N · m)



01*.75.4500

承载曲线图编号 18 Static limiting load curve 18

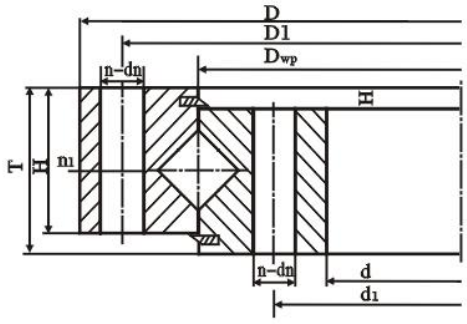
M(10^4N · m)



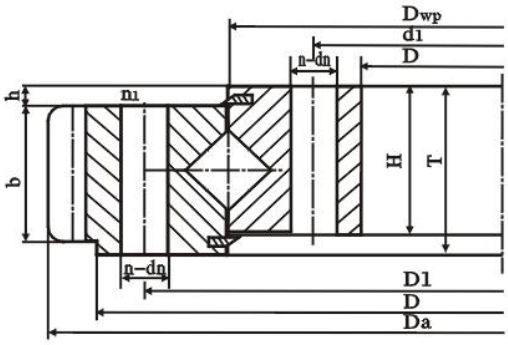
01*.75.3550

十、单排交叉滚子转盘轴承结构参数及承载曲线

Structural Parameter and Limit Load Curve of Single-row Cross Roller Slewing Bearing

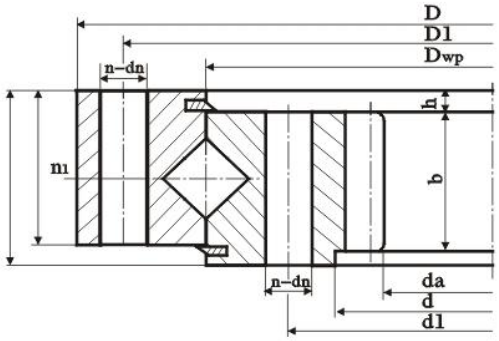


无齿式交叉圆柱滚子轴承（110）
Cross Roller Bearing without Gear



外齿式交叉圆柱滚子轴承（111，112）
Cross Roller Bearing with External Gear

基本代号 Basic Code			外形尺寸 Size										齿轮参数 Gear	
无齿式 Without Gear	外齿式 External Gear	内齿式 Inner Gear	D	d	T	D_1	d_1	N	d_n	n_1	H	h	b	m
110.25.500	111.25.500	113.25.500	602	398	75	566	434	20	18	4	65	10	60	5
	112.25.500	114.25.500												6
110.25.560	111.25.560	113.25.560	662	458	75	626	494	20	18	4	65	10	60	5
	112.25.560	114.25.560												6
110.25.630	111.25.630	113.25.630	732	528	75	696	564	24	18	4	65	10	60	6
	112.25.630	114.25.630												8
110.25.710	111.25.710	113.25.710	812	608	75	776	644	24	18	4	65	10	60	6
	112.25.710	114.25.710												8
110.28.800	111.28.800	113.28.800	922	678	82	878	722	30	22	6	72	10	65	8
	112.28.800	114.28.800												10
110.28.900	111.28.900	113.28.900	1022	778	82	978	822	30	22	6	72	10	65	8
	112.28.900	114.28.900												10
110.28.1000	111.28.1000	113.28.1000	1122	878	82	1078	922	36	22	6	72	10	65	10
	112.28.1000	114.28.1000												12
110.28.1120	111.28.1120	113.28.1120	1242	998	82	1198	1042	36	22	6	72	10	65	10
	112.28.1120	114.28.1120												12
110.32.1250	111.32.1250	113.32.1250	1390	1110	91	1337	1163	40	26	5	81	10	75	12
	112.32.1250	114.32.1250												14

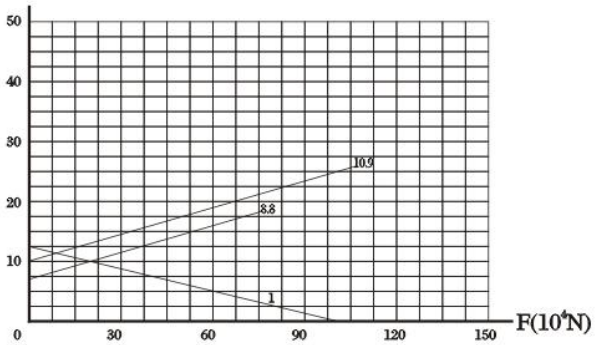


内齿式交叉圆柱滚子轴承（113，114）
Cross Roller Bearing with Inner Gear

外齿参数 External Gear		内齿参数 Inner Gear		质量 Mass kg
Da	z	da	z	
629	123	367	74	80
628.8	102	368.4	62	
689	135	427	86	90
688.8	112	428.4	72	
772.8	126	494.4	83	100
774.4	94	491.2	62	
850.8	139	572.4	96	110
854.4	104	571.2	72	
966.4	118	635.2	80	170
968	94	634	64	
1062.4	130	739.2	93	190
1068	104	734	74	
1188	116	824	83	210
1185.6	96	820.8	69	
1298	127	944	95	230
1305.6	106	940.8	79	
1449.6	118	1048.8	88	350
1453.2	101	1041.6	75	

承载曲线图编号 1 Static limiting load curve 1

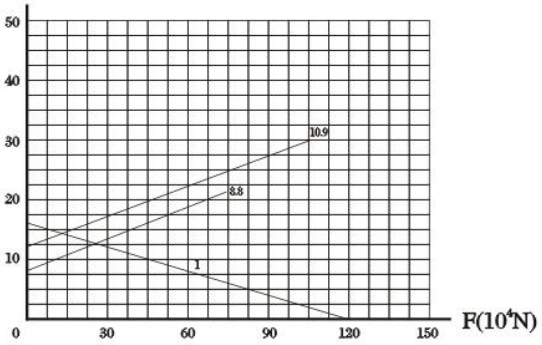
M(10^4N · m)



11*.25.500

承载曲线图编号 2 Static limiting load curve 2

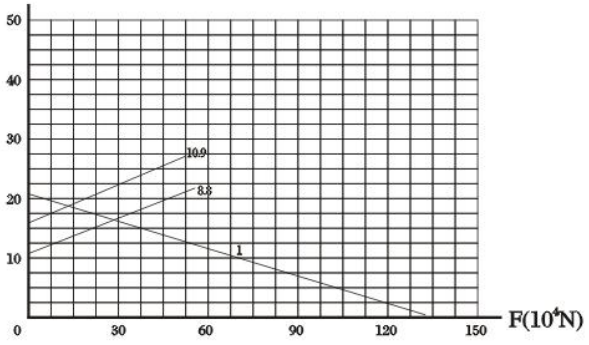
M(10^4N · m)



11*.25.560

承载曲线图编号 3 Static limiting load curve 3

M(10^4N · m)

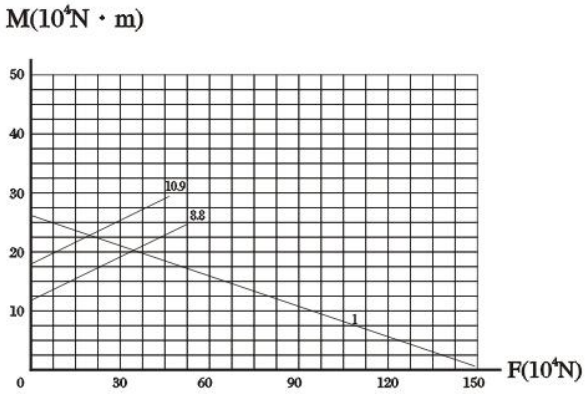


11*.25.630

转盘轴承 SLEWING BEARING

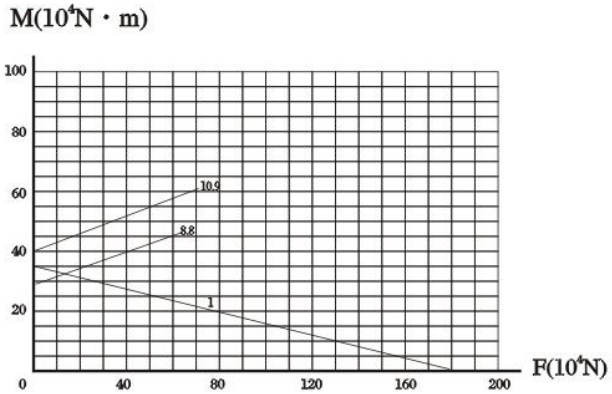
基本代号 Basic Code			外形尺寸 Size										齿轮参数 Gear	
无齿式 Without Gear	外齿式 External Gear	内齿式 Inner Gear	D	d	T	D_1	d_1	n	d_n	n_1	H	h	b	m
110.32.1400	111.32.1400	113.32.1400	1540	1260	91	1487	1313	40	26	5	81	10	75	12
	112.32.1400	114.32.1400												14
110.32.1600	111.32.1600	113.32.1600	1740	1460	91	1687	1513	45	26	5	81	10	75	14
	112.32.1600	114.32.1600												16
110.32.1800	111.32.1800	113.32.1800	1940	1660	91	1887	1713	45	26	5	81	10	75	14
	112.32.1800	114.32.1800												16
110.40.2000	111.40.2000	113.40.2000	2178	1825	112	2110	1891	48	33	8	100	12	90	16
	112.40.2000	114.40.2000												18
110.40.2240	111.40.2240	114.40.2240	2418	2065	112	2350	2131	48	33	8	100	12	90	16
	112.40.2240	113.40.2240												18
110.40.2500	111.40.2500	113.40.2500	2678	2325	112	2610	2391	56	33	8	100	12	90	18
	112.40.2500	114.40.2500												20
110.40.2800	114.40.2800	113.40.2800	2978	2625	112	2910	2691	56	33	8	100	12	90	18
	112.40.2800	114.40.2800												20
110.50.3150	111.50.3150	114.50.3150	3376	2922	134	3286	3014	56	45	8	122	12	110	20
	112.50.3150	113.50.3150												22
110.50.3550	111.50.3550	113.50.3550	3776	3322	134	3686	3414	56	45	8	122	12	110	20
	112.50.3550	114.50.3550												22
110.50.4000	111.50.4000	113.50.4000	4226	3772	134	4136	3864	60	45	10	122	12	110	22
	112.50.4000	114.50.4000												25
110.50.4500	111.50.4500	113.50.4500	4726	4272	134	4636	4364	60	45	10	122	12	110	22
	112.50.4500	114.50.4500												25

承载曲线图编号 4 Static limiting load curve 4



11*.25.710

承载曲线图编号 5 Static limiting load curve 5

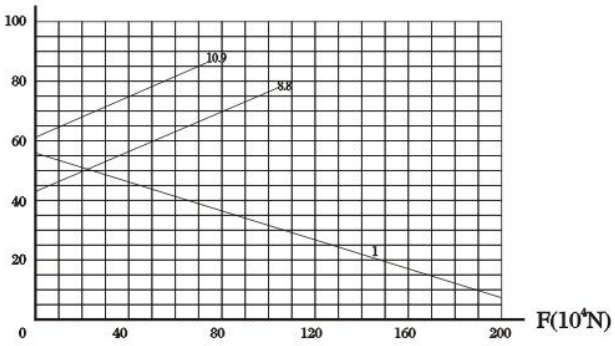


11*.28.800

外齿参数 External Gear		内齿参数 Inner Gear		质量 Mass kg
Da	z	da	z	
1605.6	131	1192.8	100	400
1607.2	112	1195.6	86	
1817.2	127	1391.6	100	440
1820.8	111	1382.4	87	
2013.2	141	1573.6	113	500
2012.8	123	1574.4	99	
2268.8	139	1734.4	109	900
2264.4	123	1735.2	97	
2492.8	153	1990.4	125	1000
2498.4	136	1987.2	111	
2768.4	151	2239.2	125	1095
2776	136	2228	112	
3074.4	168	2527.2	141	1250
3076	151	2528	127	
3476	171	2828	142	2150
3471.6	155	2824.8	129	
3876	191	3228	162	2470
3889.6	174	3220.8	147	
4329.6	194	3660.8	167	2800
4345	171	3660	147	
4835.6	217	4166.8	190	3100
4845	191	4160	167	

承载曲线图编号 7 Static limiting load curve 7

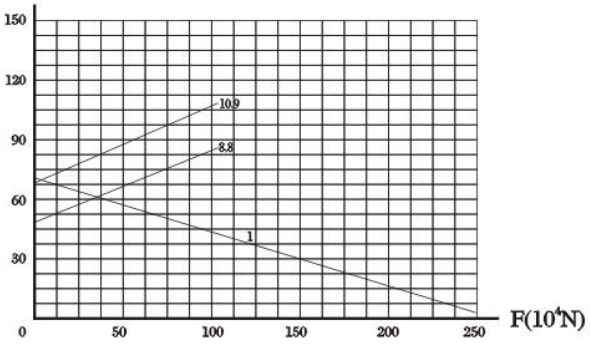
M(10^4N · m)



11*.28.1000

承载曲线图编号 8 Static limiting load curve 8

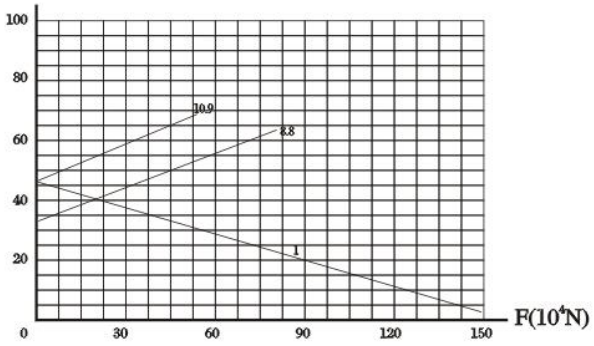
M(10^4N · m)



11*.28.1120

承载曲线图编号 6 Static limiting load curve 6

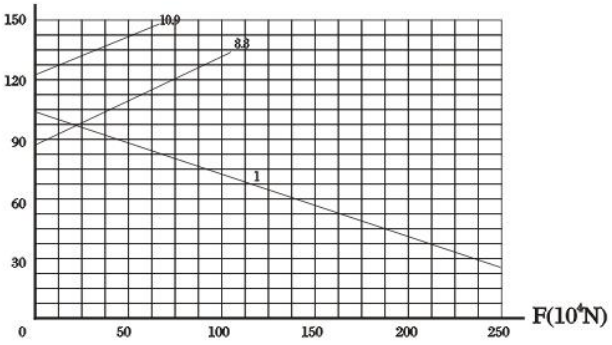
M(10^4N · m)



11*.28.900

承载曲线图编号 9 Static limiting load curve 9

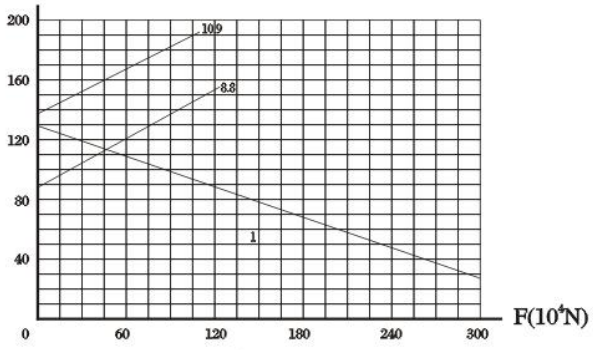
M(10^4N · m)



11*.32.1250

承载曲线图编号 10 Static limiting load curve 10

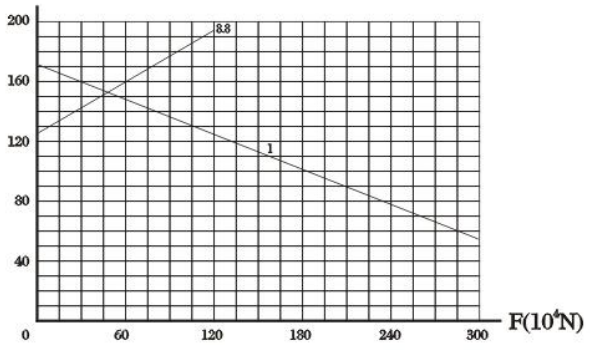
M(10^4N · m)



11*.32.1400

承载曲线图编号 11 Static limiting load curve 11

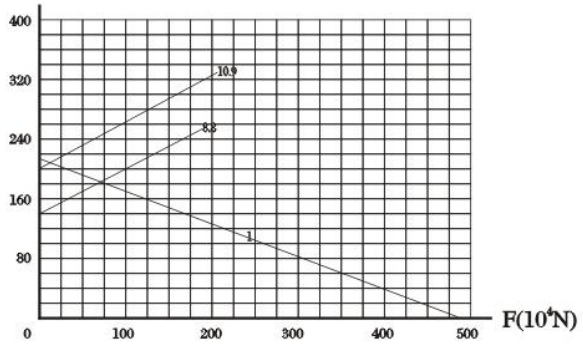
M(10^4N · m)



11*.32.1600

承载曲线图编号 12 Static limiting load curve 12

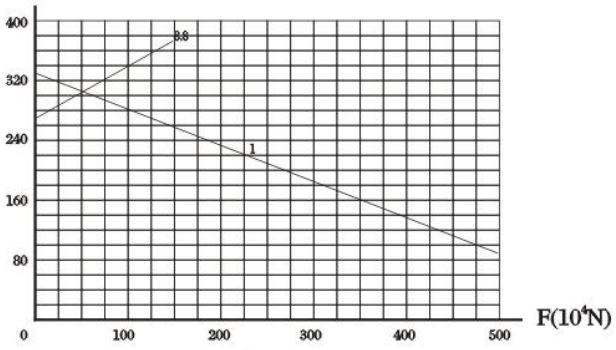
M(10^4N · m)



11*.32.1800

承载曲线图编号 13 Static limiting load curve 13

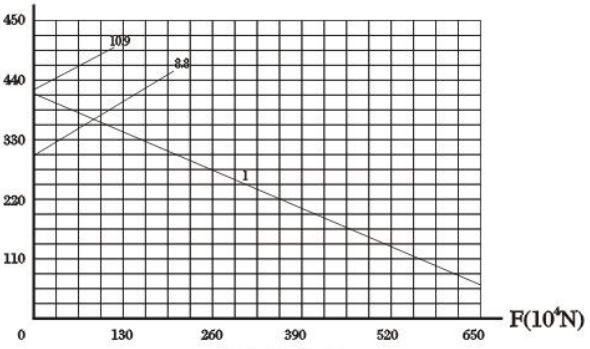
M(10^4N · m)



11*.40.2000

承载曲线图编号 14 Static limiting load curve 14

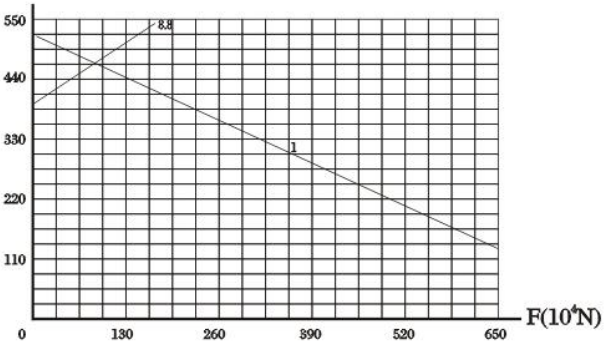
M(10^4N · m)



11*.40.2240

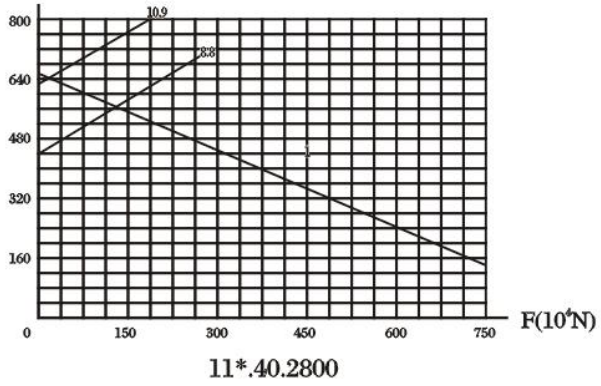
承载曲线图编号 15 Static limiting load curve 15

M(10^4N · m)



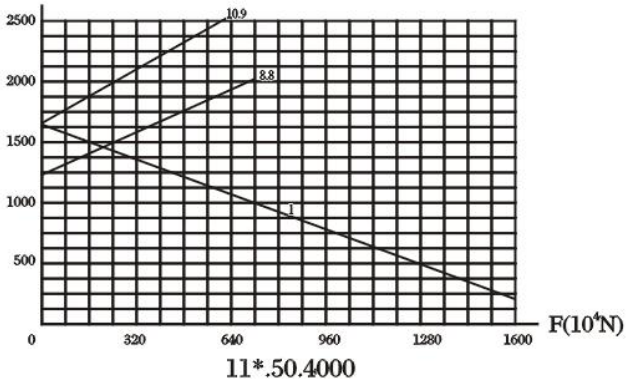
11*.40.2500

承载曲线图编号 16 Static limiting load curve 16



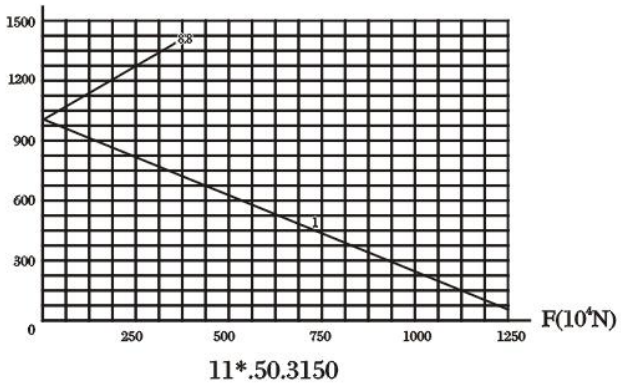
11*.40.2800

承载曲线图编号 19 Static limiting load curve 19



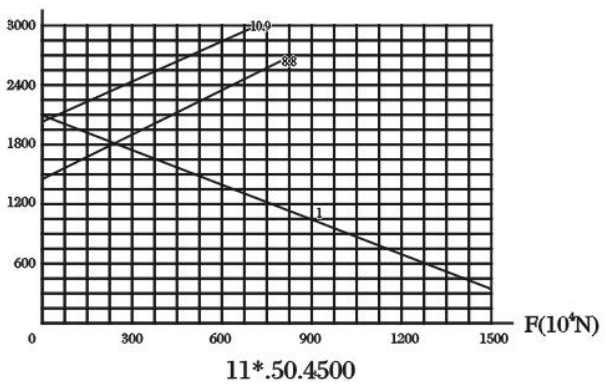
11*.50.4000

承载曲线图编号 17 Static limiting load curve 17



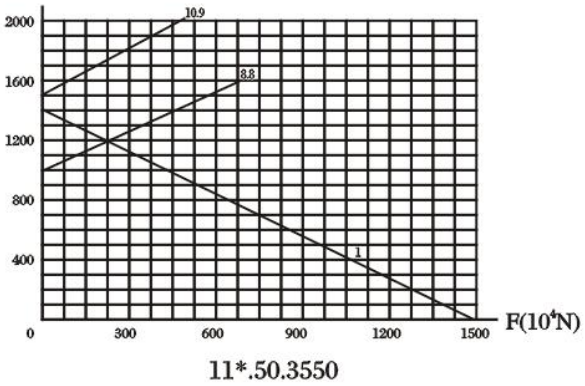
11*.50.3150

承载曲线图编号 20 Static limiting load curve 20



11*.50.4500

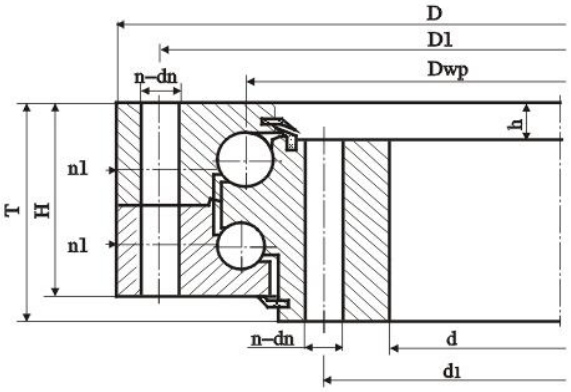
承载曲线图编号 16 Static limiting load curve 16



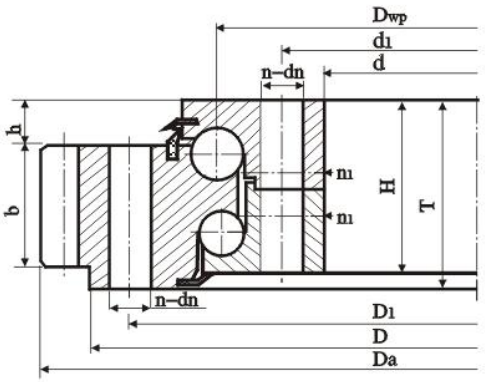
11*.50.3550

十一、双排异径球转盘轴承结构参数及承载曲线

Structural Parameter and Limit Load Curve of Double-row Different Ball Diameter Slewing Bearing

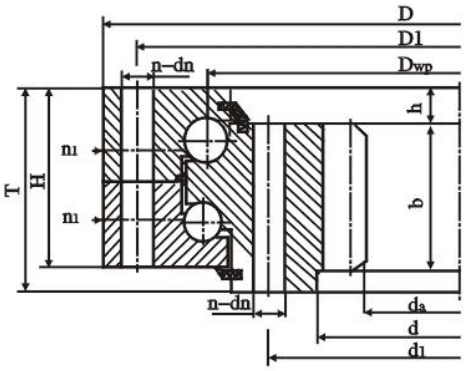


无齿式双排异径球轴承（020）
Without Gear



外齿式双排异径球轴承（021，022）
With External Gear

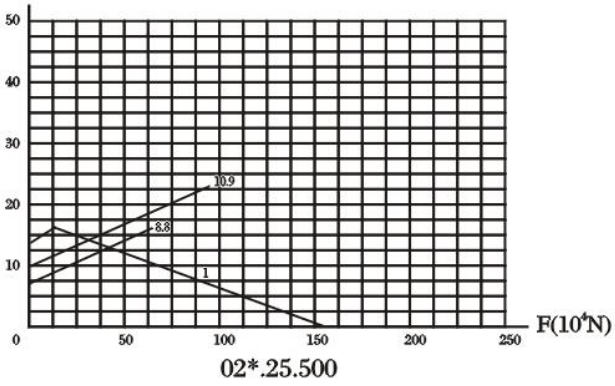
基本代号 Basic Code			外形尺寸 Size										齿轮参数 Gear	
无齿式 Without Gear	外齿式 External Gear	内齿式 Inner Gear	D	d	T	D_1	d_1	n	d_n	n_1	H	h	b	m
020.25.500	021.25.500	023.25.500	616	384	106	580	420	20	18	4	96	26	60	5
	022.25.500	024.25.500												6
020.25.560	021.25.560	023.25.560	676	444	106	640	480	20	18	4	96	26	60	5
	022.25.560	024.25.560												6
020.25.630	021.25.630	023.25.630	746	514	106	710	550	24	18	4	96	26	60	6
	022.25.630	024.25.630												8
020.25.710	021.25.710	023.25.710	826	594	106	790	630	24	18	4	96	26	60	6
	022.25.710	024.25.710												8
020.30.800	021.30.800	023.30.800	942	658	124	898	702	30	22	6	114	29	80	8
	022.30.800	024.30.800												10
020.30.900	021.30.900	023.30.900	1042	758	124	998	802	30	22	6	114	29	80	8
	022.30.900	024.30.900												10
020.30.1000	021.30.1000	023.30.1000	1142	858	124	1098	902	36	22	6	114	29	80	10
	022.30.1000	024.30.1000												12
020.30.1120	021.30.1120	023.30.1120	1262	978	124	1218	1022	36	22	6	114	29	80	10
	022.30.1120	024.30.1120												12
020.40.1250	021.40.1250	023.40.1250	1426	1074	160	1374	1126	40	26	5	150	39	90	12
	022.40.1250	024.40.1250												14



内齿式双排异径球轴承（023，024）
With Inner Gear

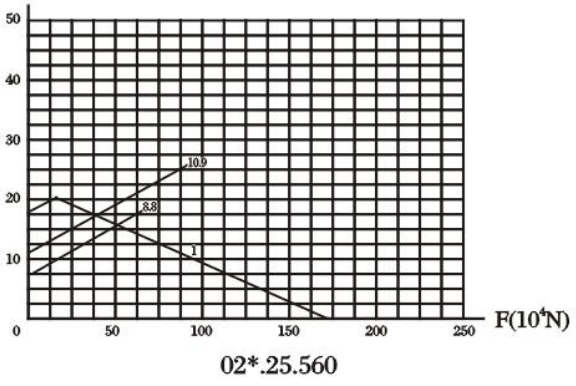
外齿参数 External Gear		内齿参数 Inner Gear		质量 Mass kg
Da	z	da	z	
644	126	357	72	100
646.8	105	350.4	59	
704	138	417	84	115
706.8	115	410.4	69	
790.8	129	482.4	81	130
790.4	96	475.2	60	
862.8	141	560.4	94	140
862.4	105	555.2	70	
982.4	120	619.2	78	200
988	96	614	62	
1086.4	133	715.2	90	250
1088	106	714	72	
1198	117	814	82	300
1197.6	97	796.8	67	
1318	129	924	93	340
1317.6	107	916.8	77	
1497.6	122	1012.8	85	580
1495.2	104	1013.6	73	

承载曲线图编号 1 Static limiting load curve 1



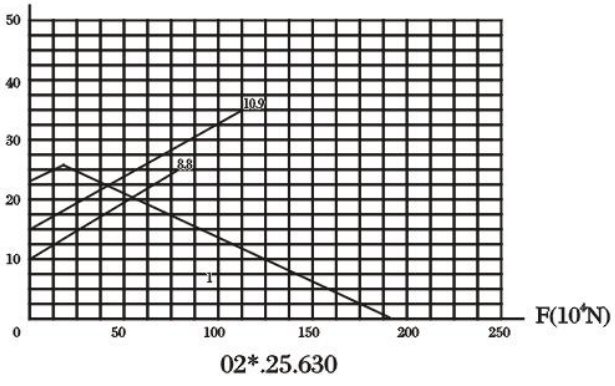
02*.25.500

承载曲线图编号 2 Static limiting load curve 2



02*.25.560

承载曲线图编号 3 Static limiting load curve 3



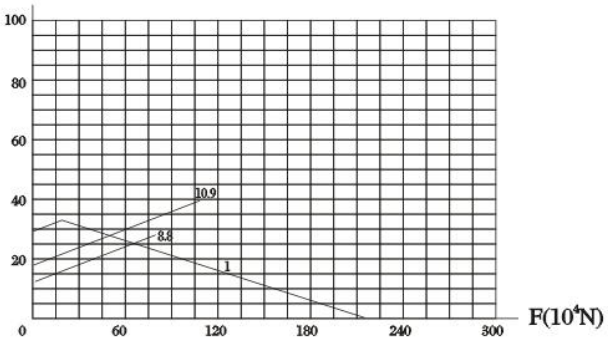
02*.25.630

转盘轴承 SLEWING BEARING

基本代号 Basic Code			外形尺寸 Size										齿轮参数 Gear	
无齿式 Without Gear	外齿式 External Gear	内齿式 Inner Gear	D	d	T	D_1	d_1	n	d_n	n_1	H	h	b	m
020.40.1400	021.40.1400	023.40.1400	1576	1224	160	1524	1272	40	26	5	150	39	90	12
	022.40.1400	024.40.1400												14
020.40.1600	021.40.1600	023.40.1600	1776	1424	160	1724	1476	45	26	5	150	39	90	14
	022.40.1600	024.40.1600												16
020.40.1800	021.40.1800	023.40.1800	1976	1624	160	1924	1676	45	26	5	150	39	90	14
	022.40.1800	024.40.1800												16
020.50.2000	021.50.2000	023.50.2000	2215	1785	190	2149	1851	48	33	8	178	47	120	16
	022.50.2000	024.50.2000												18
020.50.2240	021.50.2240	023.50.2240	2455	2025	190	2389	2091	48	33	8	178	47	120	16
	022.50.2240	024.50.2240												18
020.50.2500	021.50.2500	023.50.2500	2715	2285	190	2649	2351	56	33	8	178	47	120	18
	022.50.2500	024.50.2500												20
020.50.2800	021.50.2800	023.50.2800	3015	2585	190	2949	2651	56	33	8	178	47	120	18
	022.50.2800	024.50.2800												20
020.60.3150	021.60.3150	023.60.3150	3428	2872	226	3338	2962	56	45	8	214	56	150	20
	022.60.3150	024.60.3150												22
020.60.3550	021.60.3550	023.60.3550	3828	3272	226	3738	3362	56	45	8	214	56	150	20
	022.60.3550	024.60.3550												22
020.60.4000	021.60.4000	023.60.4000	4278	3722	226	4188	3812	60	45	10	214	56	150	22
	022.60.4000	024.60.4000												25
020.60.4500	021.60.4500	023.60.4500	4778	4222	226	4688	4312	60	45	10	214	56	150	22
	022.60.4500	024.60.4500												25

承载曲线图编号 4 Static limiting load curve 4

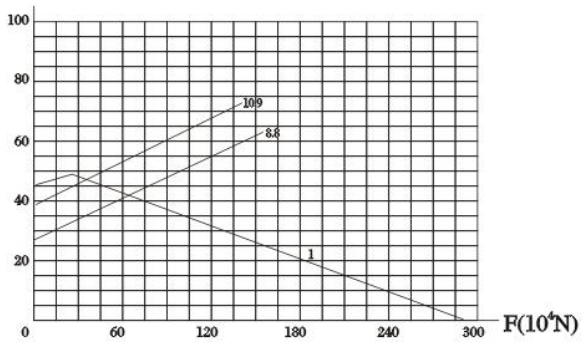
$M(10^4N \cdot m)$



02*.25.710

承载曲线图编号 5 Static limiting load curve 5

$M(10^4N \cdot m)$

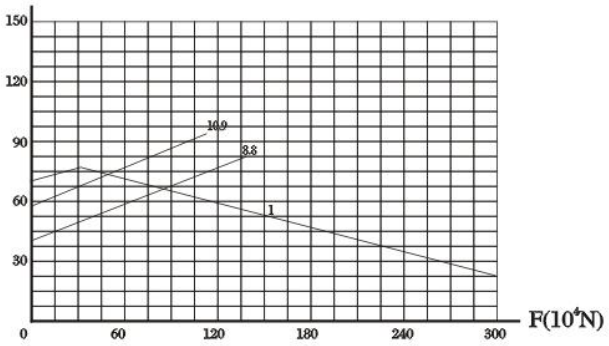


02*.30.800

外齿参数 External Gear		内齿参数 Inner Gear		质量 Mass kg
Da	z	da	z	
1641.6	134	1156.8	97	650
1649.2	115	1153.6	83	
1845.2	129	1349.6	97	750
1852.8	113	1350.4	85	
2055.2	144	1545.6	111	820
2060.8	126	1542.4	97	
2300.8	141	1702.4	107	1150
2300.4	125	1699.2	95	
2540.8	156	1942.4	122	1500
2552.4	139	1933.2	108	
2804.4	153	2203.2	123	1500
2816	138	2188	110	
3110.4	170	2491.2	139	1900
3116	153	2488	125	
3536	174	2768	139	3300
3537.6	158	2758.8	126	
3936	194	3168	159	3700
3933.6	176	3176.8	145	
4395.6	197	3616.8	165	4200
4395	173	3610	145	
4879.6	219	4122.8	188	4700
4895	193	4110	165	

承载曲线图编号 7 Static limiting load curve 7

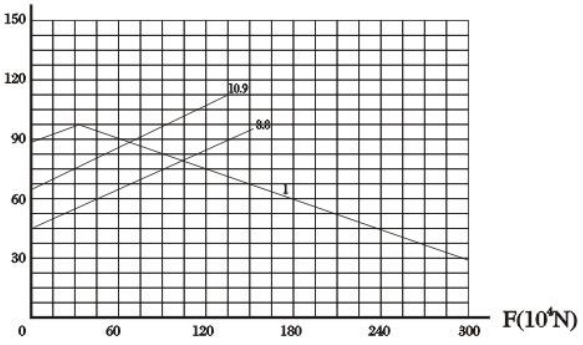
$M(10^4N \cdot m)$



02*.30.1000

承载曲线图编号 8 Static limiting load curve 8

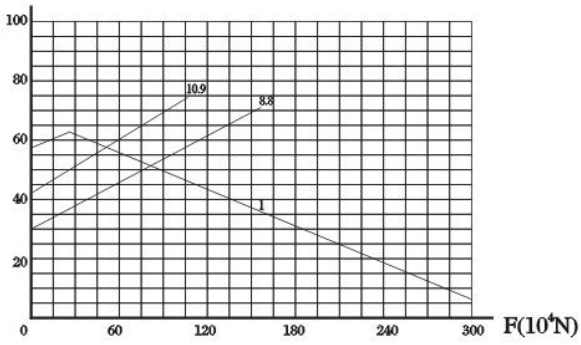
$M(10^4N \cdot m)$



02*.30.1120

承载曲线图编号 6 Static limiting load curve 6

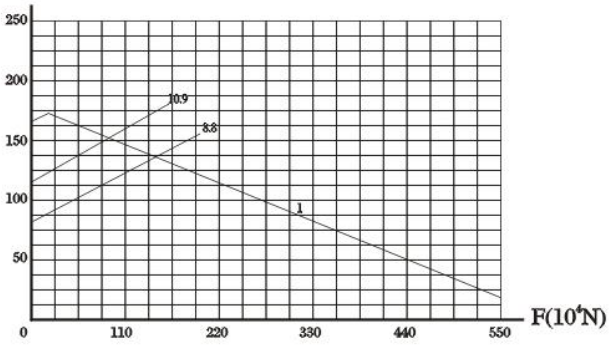
$M(10^4N \cdot m)$



02*.30.900

承载曲线图编号 9 Static limiting load curve 9

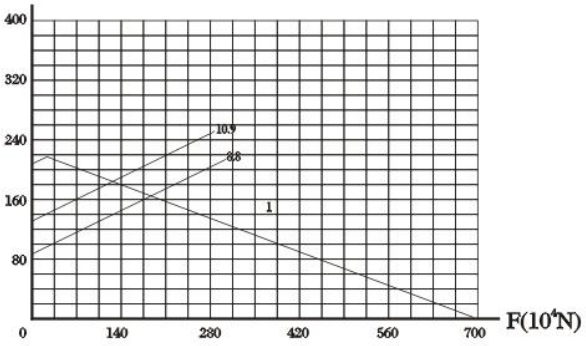
$M(10^4N \cdot m)$



02*.40.1250

承载曲线图编号 10 Static limiting load curve 10

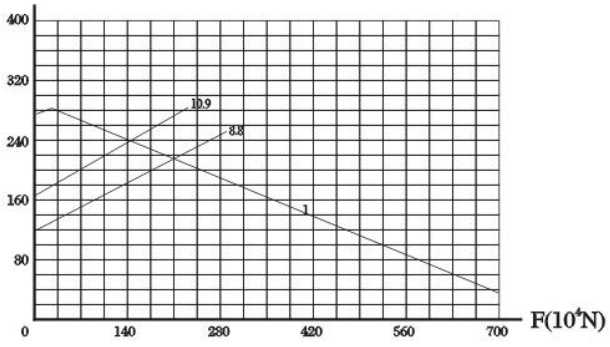
M(10^4N · m)



02*.40.1400

承载曲线图编号 11 Static limiting load curve 11

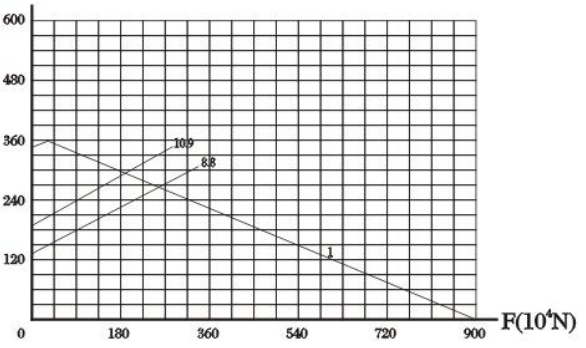
M(104N · m)



02*.40.1600

承载曲线图编号 12 Static limiting load curve 12

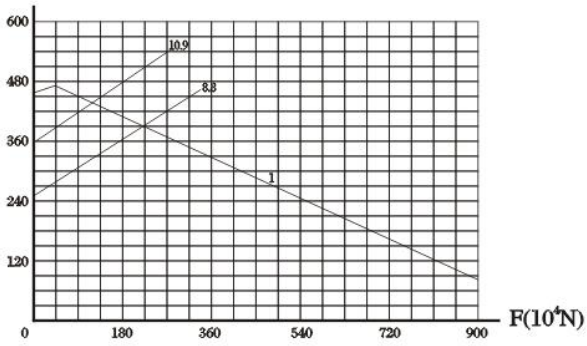
M(104N · m)



02*.40.1800

承载曲线图编号 13 Static limiting load curve 13

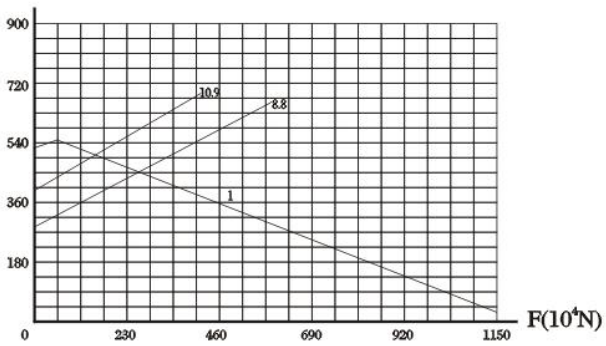
M(10^4N · m)



02*.50.2000

承载曲线图编号 14 Static limiting load curve 14

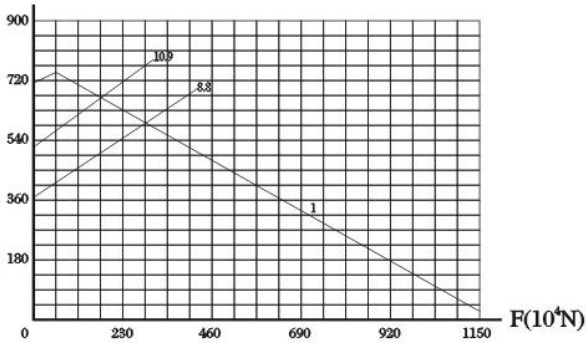
M(10^4N · m)



02*.50.2240

承载曲线图编号 15 Static limiting load curve 15

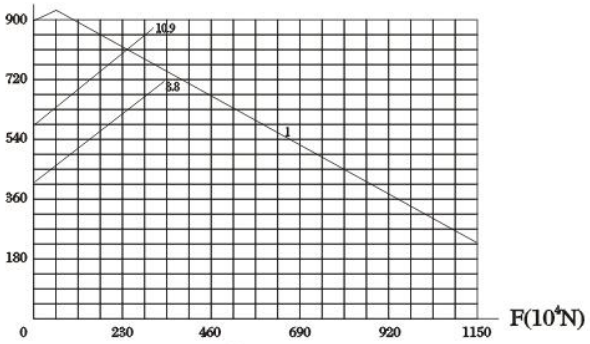
M(10^4N · m)



02*.50.2500

承载曲线图编号 16 Static limiting load curve 16

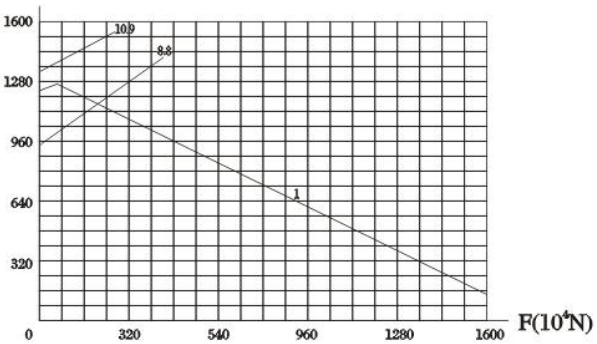
M(10^4N · m)



02*.50.2800

承载曲线图编号 17 Static limiting load curve 17

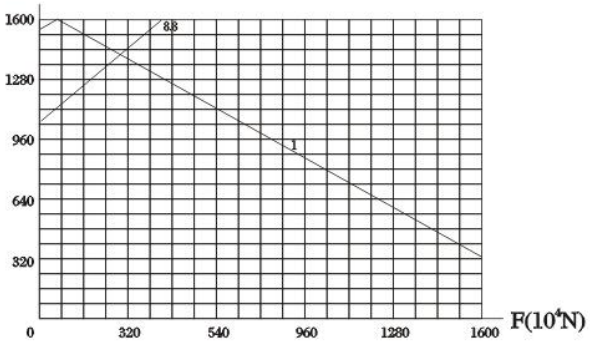
M(10^4N · m)



02*.60.3150

承载曲线图编号 18 Static limiting load curve 18

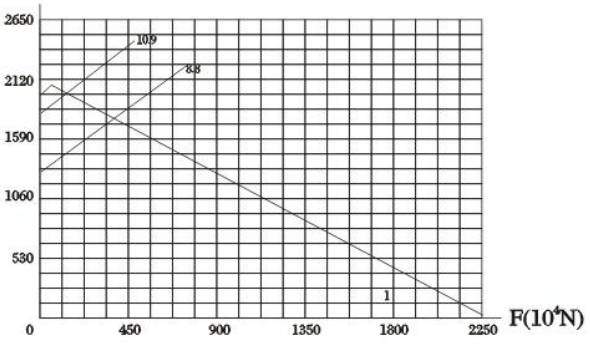
M(10^4N · m)



02*.60.3550

承载曲线图编号 19 Static limiting load curve 19

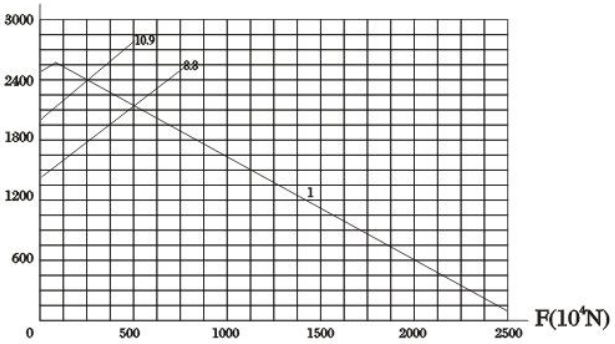
M(10^4N · m)



02*.60.4000

承载曲线图编号 20 Static limiting load curve 20

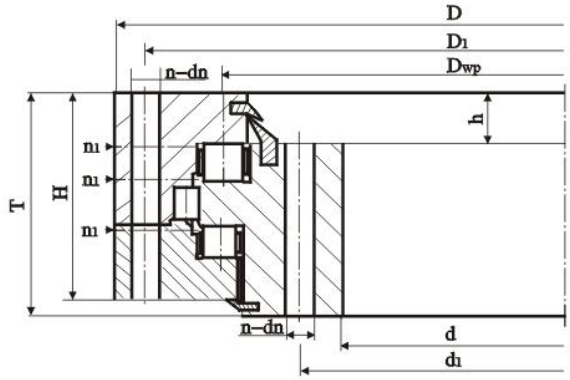
M(10^4N · m)



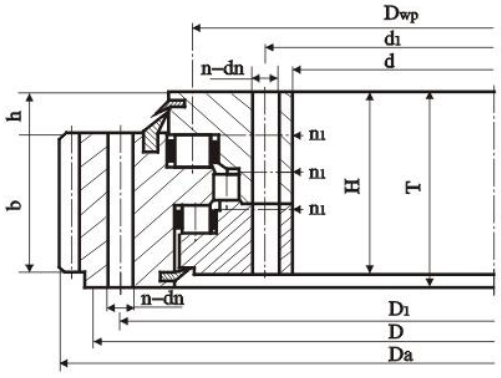
02*.60.4500

十二、三排圆柱滚子组合转盘轴承结构参数及承载曲线

Structural Parameter and Limit Load Curve of Three-row Cylindrical Roller Slewing Bearing

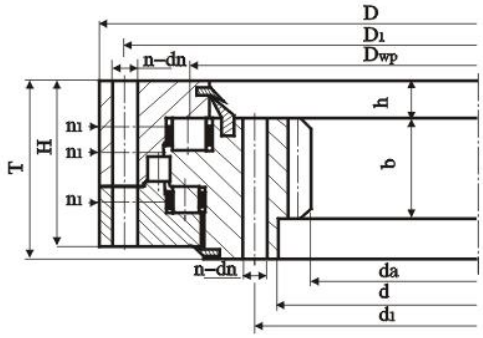


无齿式三排圆柱滚子组合轴承（130）
Without Gear



外齿式三排圆柱滚子组合轴承（131，132）
With External Gear

基本代号 Basic Code			外形尺寸 Size										齿轮参数 Gear	
无齿式 Without Gear	外齿式 External Gear	内齿式 Inner Gear	D	d	T	D1	d1	n	dn	n1	H	h	b	m
130.25.500	131.25.500	133.25.500	634	366	148	598	402	24	18	4	138	32	80	5
	132.25.500	134.25.500												6
130.25.560	131.25.560	133.25.560	694	426	148	658	462	24	18	4	138	32	80	5
	132.25.560	134.25.560												6
130.25.630	131.25.630	133.25.630	764	496	148	728	532	28	18	4	138	32	80	6
	132.25.630	134.25.630												8
130.25.710	131.25.710	133.25.710	844	576	148	808	612	28	18	4	138	32	80	6
	132.25.710	134.25.710												8
130.32.800	131.32.800	133.32.800	964	636	182	920	680	36	22	4	172	40	120	8
	132.32.800	134.32.800												10
130.32.900	131.32.900	133.32.900	1064	736	182	1020	780	36	22	4	172	40	120	8
	132.32.900	134.32.900												10
130.32.1000	131.32.1000	133.32.1000	1164	836	182	1120	880	40	22	5	172	40	120	10
	132.32.1000	134.32.1000												12
130.32.1120	131.32.1120	133.32.1120	1284	956	182	1240	1000	40	22	5	172	40	120	10
	132.32.1120	134.32.1120												12
130.40.1250	131.40.1250	133.40.1250	1445	1055	220	1393	1107	45	26	5	210	50	150	12
	132.40.1250	134.40.1250												14

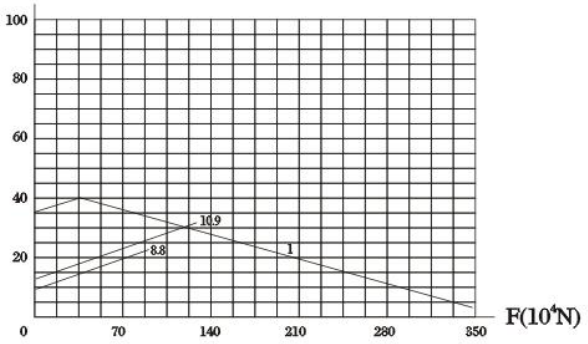


内齿式三排圆柱滚子组合轴承（133，134）
With Inner Gear

外齿参数 External Gear		内齿参数 Inner Gear		质量 Mass kg
Da	z	da	z	
664	130	337	68	224
664.8	108	338.4	57	
724	142	397	80	240
724.8	118	398.4	67	
808.8	132	458.4	77	270
806.4	98	459.2	58	
886.8	145	536.4	90	300
886.4	108	539.2	68	
1006.4	123	595.2	75	500
1008	98	594	60	
1102.4	135	691.2	87	600
1108	108	694	70	
1218	119	784	79	680
1221.6	99	784.8	66	
1338	131	904	91	820
1341.6	109	904.8	76	
1509.6	123	988.8	83	1200
1509.2	105	985.6	71	

承载曲线图编号 1 Static limiting load curve 1

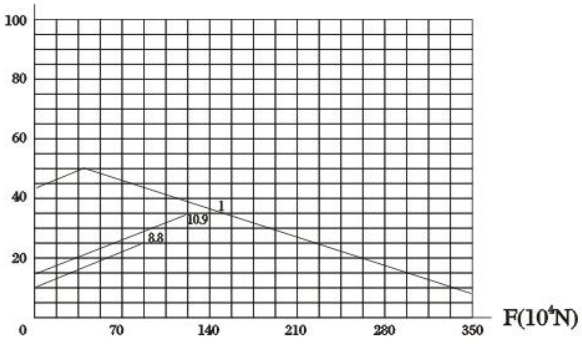
M(104N · m)



13*.25.500

承载曲线图编号 2 Static limiting load curve 2

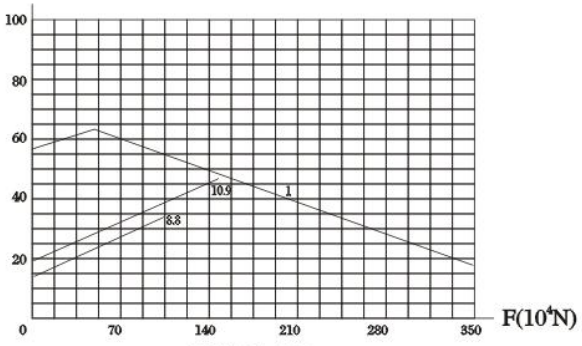
M(104N · m)



13*.25.560

承载曲线图编号 3 Static limiting load curve 3

M(104N · m)



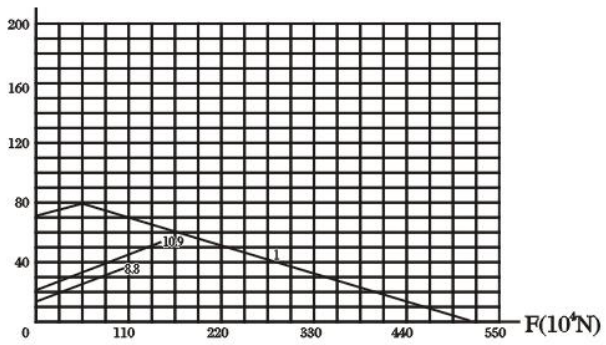
13*.25.630

转盘轴承 SLEWING BEARING

基本代号 Basic Code			外形尺寸 Size										齿轮参数 Gear	
无齿式 Without Gear	外齿式 External Gear	内齿式 Inner Gear	D	d	T	D_1	d_1	n	d_n	n_1	H	h	b	m
130.40.1400	131.40.1400	133.40.1400	1595	1205	220	1543	1257	45	26	5	210	50	150	12
	132.40.1400	134.40.1400												14
130.40.1600	131.40.1600	133.40.1600	1795	1405	220	1743	1457	48	26	6	210	50	150	14
	132.40.1600	134.40.1600												16
130.40.1800	131.40.1800	133.40.1800	1995	1605	220	1943	1657	48	26	6	210	50	150	14
	132.40.1800	134.40.1800												16
130.45.2000	131.45.2000	133.45.2000	2221	1779	231	2155	1845	60	33	6	219	54	160	16
	132.45.2000	134.45.2000												18
130.45.2240	131.45.2240	133.45.2240	2461	2019	231	2395	2085	60	33	6	219	54	160	16
	132.45.2240	134.45.2240												18
130.45.2500	131.45.2500	133.45.2500	2721	2279	231	2655	2345	72	33	8	219	54	160	18
	132.45.2500	134.45.2500												20
130.45.2800	131.45.2800	133.45.2800	3021	2579	231	2955	2645	72	33	8	219	54	160	18
	132.45.2800	134.45.2800												20
130.50.3150	131.50.3150	133.50.3150	3432	2868	270	3342	2958	72	45	8	258	65	180	20
	132.50.3150	134.50.3150												22
130.50.3550	131.50.3550	133.50.3550	3832	3268	270	3742	3358	72	45	8	258	65	180	20
	132.50.3550	134.50.3550												22
130.50.4000	131.50.4000	133.50.4000	4282	3718	270	4192	3808	80	45	8	258	65	180	22
	132.50.4000	134.50.4000												25
130.50.4500	131.50.4500	133.50.4500	4782	4218	270	4692	4308	80	45	8	258	65	180	22
	132.50.4500	134.50.4500												25

承载曲线图编号 4 Static limiting load curve 4

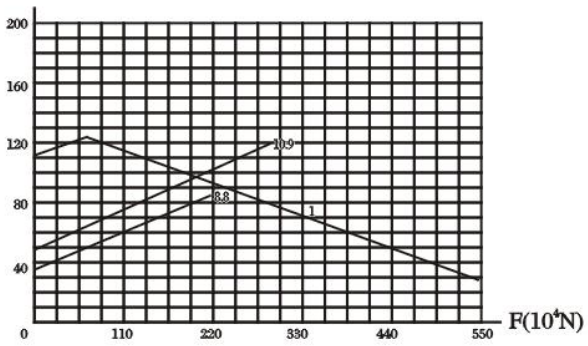
M(104N · m)



13*.25.710

承载曲线图编号 5 Static limiting load curve 5

M(104N · m)

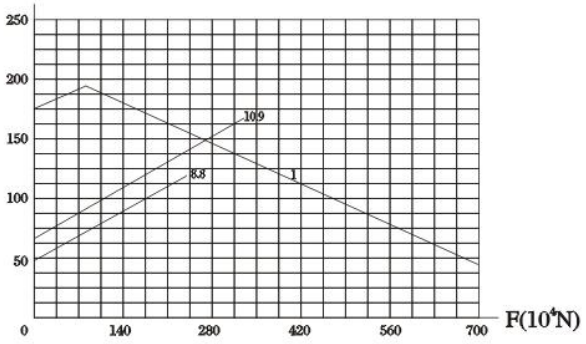


13*.32.800

外齿参数 External Gear		内齿参数 Inner Gear		质量 Mass kg
Da	z	da	z	
1665.6	136	1144.8	96	1300
1663.2	116	1139.6	82	
1873.2	131	1335.6	96	1520
1868.8	114	1334.4	84	
2069.2	145	1531.6	110	1750
2076.8	127	1526.4	96	
2300.8	141	1702.4	107	2400
2300.4	125	1699.2	95	
2556.8	157	1926.4	121	2700
2552.4	139	1933.2	108	
2822.4	154	2185.2	122	3000
2816	138	2188	110	
3110.4	170	2491.2	139	3400
3116	153	2488	125	
3536	174	2768	139	5000
3537.6	158	2758.8	126	
3936	194	3168	159	5600
3933.6	176	3154.8	144	
4395.6	197	3616.8	165	6400
4395	173	3610	145	
4901.6	220	4122.8	188	6942
4895	193	4110	165	

承载曲线图编号 7 Static limiting load curve 7

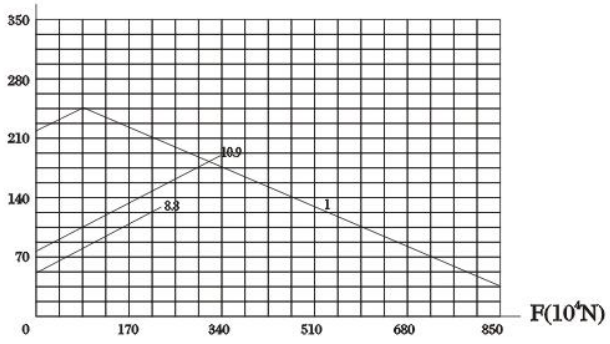
M(104N · m)



13*.32.1000

承载曲线图编号 8 Static limiting load curve 8

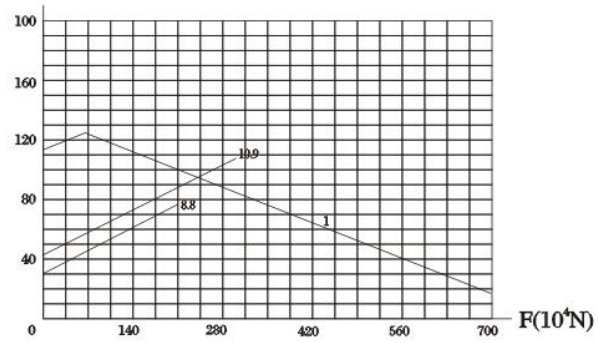
M(104N · m)



13*.32.1120

承载曲线图编号 6 Static limiting load curve 6

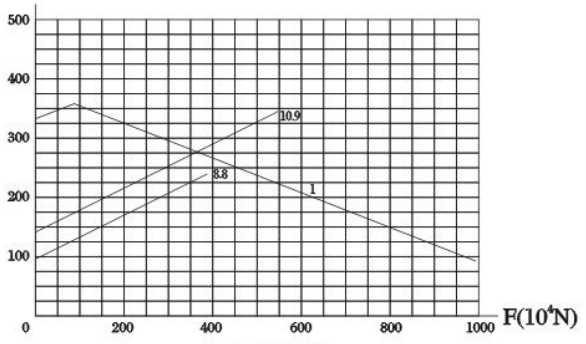
M(104N · m)



13*.32.900

承载曲线图编号 9 Static limiting load curve 9

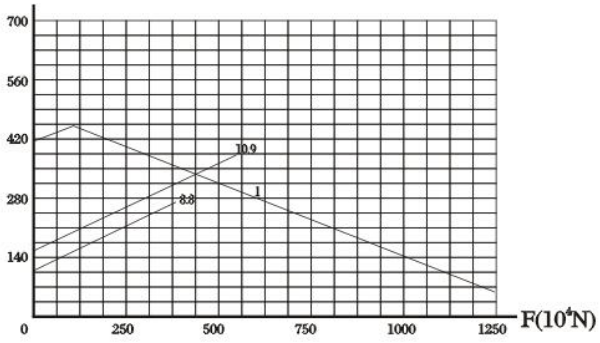
M(104N · m)



13*.40.1250

承载曲线图编号 10 Static limiting load curve 10

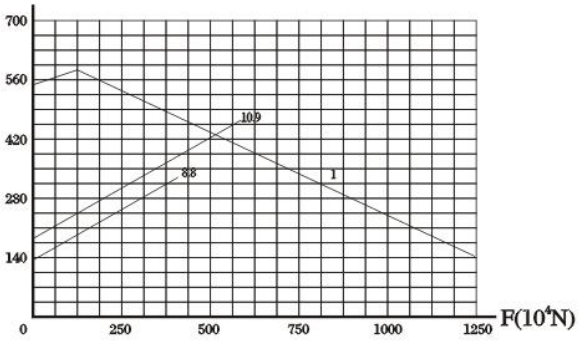
M(10^4N · m)



13*.40.1400

承载曲线图编号 11 Static limiting load curve 11

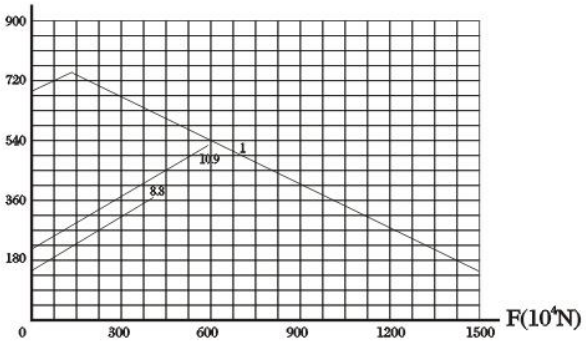
M(104N · m)



13*.40.1600

承载曲线图编号 12 Static limiting load curve 12

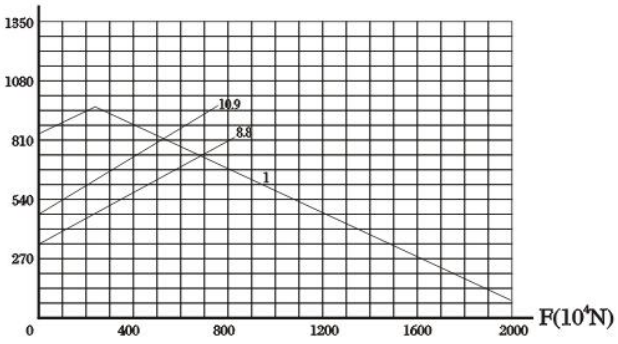
M(104N · m)



13*.40.1800

承载曲线图编号 13 Static limiting load curve 13

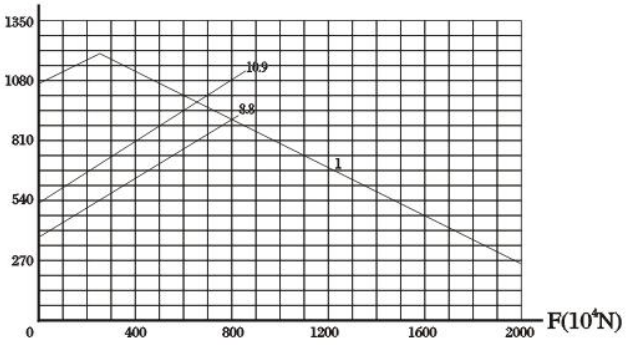
M(10^4N · m)



13*.45.2000

承载曲线图编号 14 Static limiting load curve 14

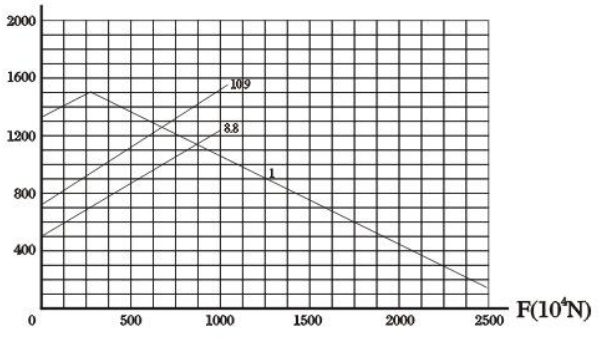
M(104N · m)



13*.45.2240

承载曲线图编号 15 Static limiting load curve 15

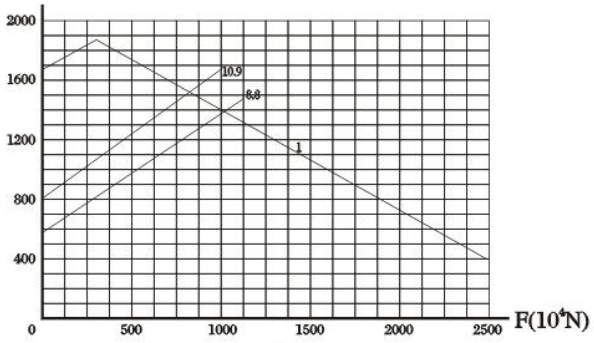
M(104N · m)



13*.45.2500

承载曲线图编号 16 Static limiting load curve 16

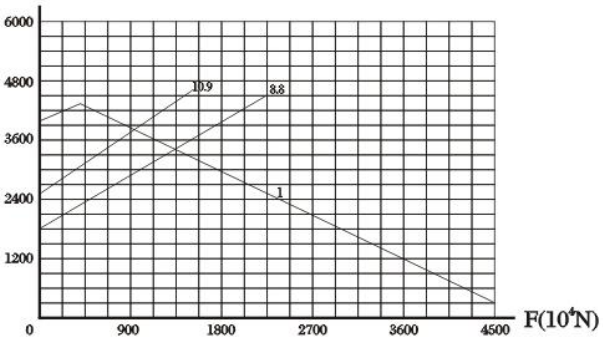
M(10^4N · m)



13*.45.2800

承载曲线图编号 19 Static limiting load curve 19

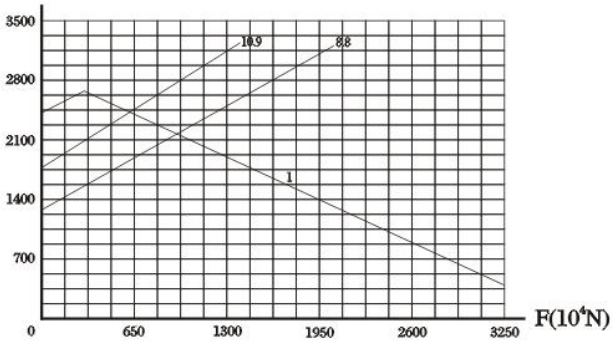
M(10^4N · m)



13*.50.4000

承载曲线图编号 17 Static limiting load curve 17

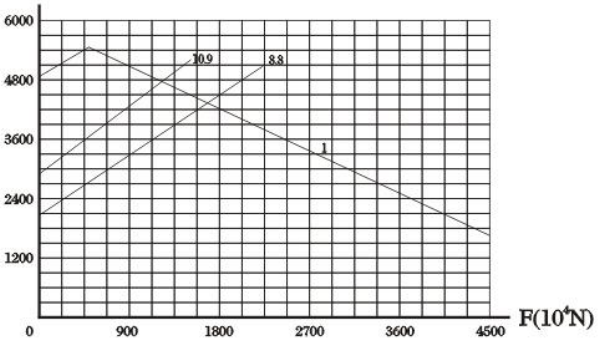
M(104N · m)



13*.50.3150

承载曲线图编号 20 Static limiting load curve 20

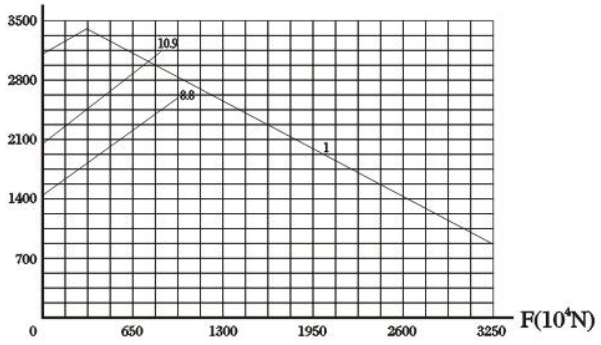
M(104N · m)



13*.50.4500

承载曲线图编号 18 Static limiting load curve 18

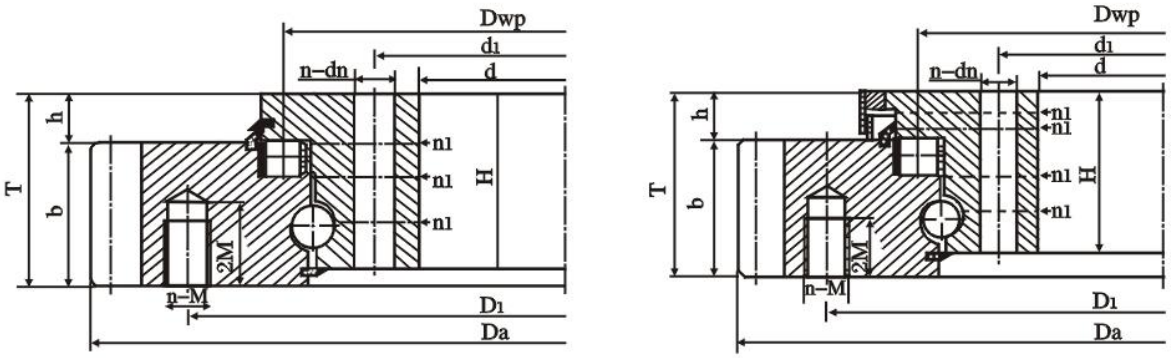
M(104N · m)



13*.50.3550

十三、球柱联合转盘轴承的结构参数

Structural Parameter and Limit Load Roller/Ball Combination Slewing Bearing

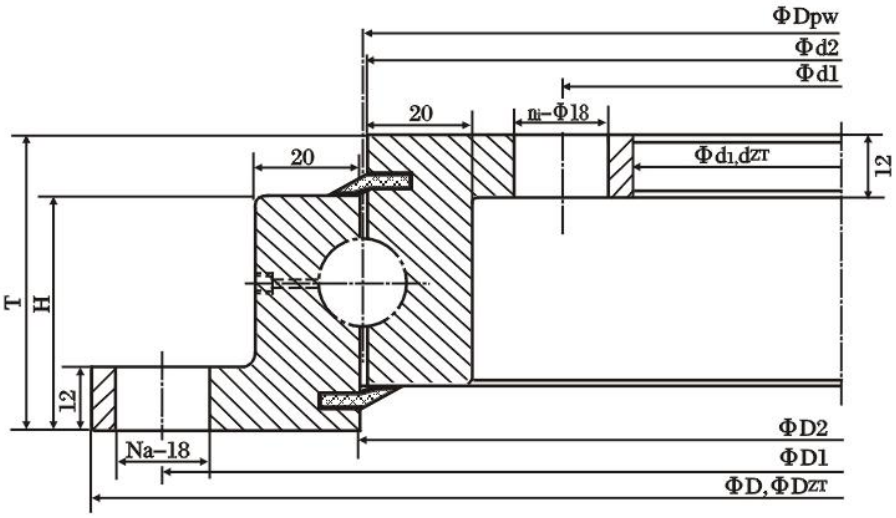


球柱联合式轴承（22*）
Roller/Ball Combination Slewing Bearing

单位：mm Unit:mm

轴承型号 Bearing Code	外形尺寸 Size			安装尺寸 Installation Dimension						结构尺寸 Structural Size			齿轮参数 Gear		质量 Mass kg
	Da	d	T	D1	d1	n	dn	M	n1	H	h	b	m	z	
221.32.3550	3772.8	3358	159	3638	3418	76	30	27	10	143	50	109	16	232	2028
221.32.3750	3980.8	3558	159	3846	3618	80	30	27	10	143	50	109	16	246	2186
221.32.4000	4220.8	3808	159	4086	3868	84	30	27	12	143	50	109	16	261	2278
221.32.4250	4476.8	4058	159	4342	4118	90	30	27	12	143	50	109	16	276	2455
221.36.4000	4244.4	3792	175	4095	3858	76	33	30	12	159	50	125	18	232	2792
211.36.4250	4496.4	4042	175	4347	4108	80	33	30	12	159	50	125	18	247	2981
221.36.4500	4748.4	4292	175	4599	4358	84	33	30	14	159	50	125	18	261	3173
221.36.4750	5000.4	4542	175	4851	4608	90	33	30	14	159	50	125	18	275	3363
221.40.4500	4776	4276	183	4612	4348	72	36	33	14	167	50	133	20	236	3673
221.40.4750	5016	4526	183	4852	4598	76	36	33	14	167	50	133	20	248	3796
221.40.5000	5276	4776	183	5112	4848	80	36	33	16	167	50	133	20	261	4082
221.40.5300	5576	5076	183	5412	5148	84	36	33	16	167	50	133	20	276	4329
221.45.5000	5297.6	4747	203	5117	4825	76	39	36	16	187	50	153	22	238	5201
221.45.5300	5605.6	5047	203	5425	5125	80	39	36	16	187	50	153	22	252	5602
221.45.5600	5891.6	5347	203	5711	5425	84	39	36	18	187	50	153	22	265	5764
221.45.6000	6287.6	5747	203	6107	5825	90	39	36	18	187	50	153	22	282	6129

十四、专用转盘轴承的外形尺寸
Dimensions of some special slewing bearing

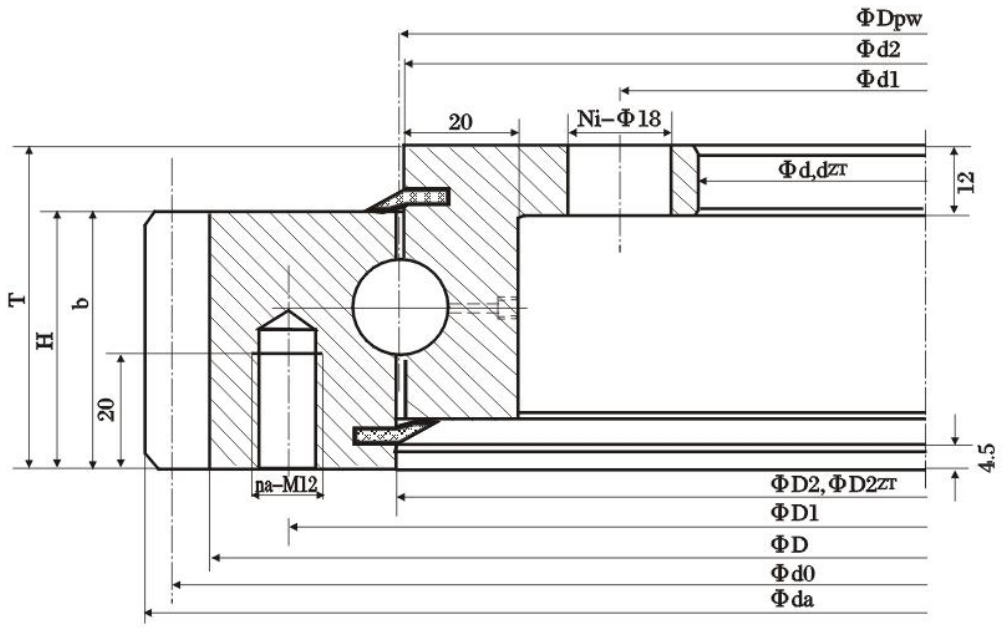


轴承型号 Bearing Code	重量 Weight Kg	外形尺寸 Dimensions												
		D	dZT +IT8	d	dZT +IT8	T	D_2	d_2	D_1	n_a	d_1	n_i	n_1	H
ZYS–010.20.414	24	$518_{-0.5}$	516	$304^{+0.5}$	306	56	$415.5^{+0.5}$	$412.5_{-0.5}$	490	8	332	12	4	47.5
ZYS–010.20.544	31	$648_{-0.5}$	646	$434^{+0.5}$	436	56	$545.5^{+0.5}$	$542.5_{-0.5}$	620	10	462	14	4	47.5
ZYS–010.20.644	37	$748_{-0.6}$	746	$534^{+0.6}$	536	56	$645.5^{+0.6}$	$642.5_{-0.6}$	720	12	562	16	4	47.5
ZYS–010.20.744	43	$848_{-0.6}$	846	$634^{+0.6}$	636	56	$745.5^{+0.6}$	$742.5_{-0.6}$	820	12	662	16	4	47.5
ZYS–010.20.844	48	$948_{-0.6}$	946	$734^{+0.6}$	736	56	$845.5^{+0.6}$	$842.5_{-0.6}$	920	14	762	18	4	47.5
ZYS–010.20.944	54	$1048_{-0.7}$	1046	$834^{+0.7}$	836	56	$945.5^{+0.7}$	$942.5_{-0.7}$	1020	16	862	20	4	47.5
ZYS–010.20.1094	63	$1198_{-0.7}$	1196	$984^{+0.7}$	986	56	$1095.5^{+0.7}$	$1092.5_{-0.7}$	1170	16	1012	20	4	47.5

表中后缀 ZT表示定位尺寸

Suffix ZT indicates centering dimension

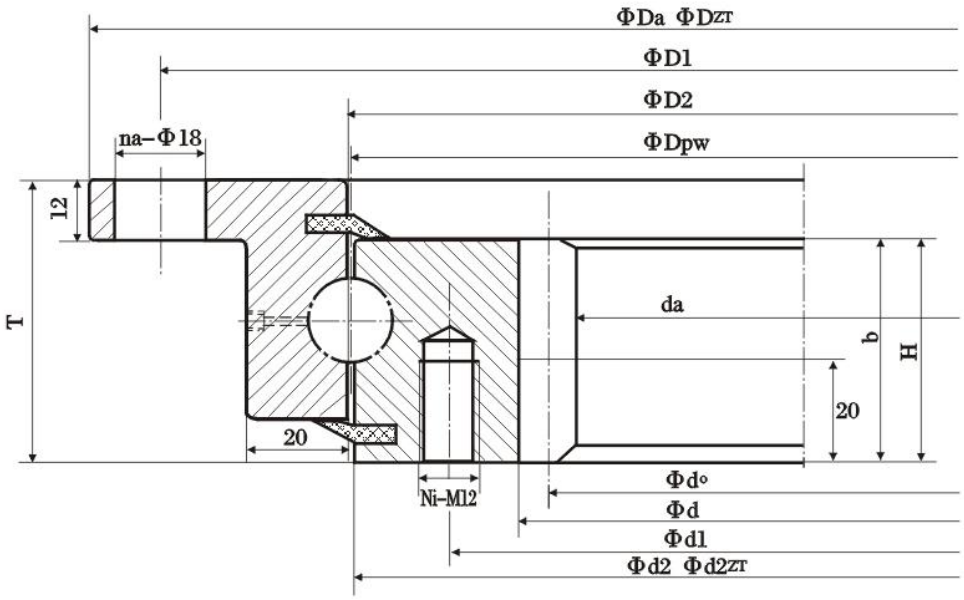
转盘轴承 SLEWING BEARING



轴承型号 Bearing Code	重量 Weight Kg	外形尺寸 Dimensions													齿轮参数 Gear Parameter			
		D_a	d	dZT +IT8	T	D_2	D_2ZT +IT8	d_2	D_1	n_a	d_1	n_l	n_1	H	m	z	b	d_0
ZYS–012.20.414	30	503.3	$304^{+0.5}$	306	56	$415.5^{+0.5}$	417	$412.5_{-0.5}$	455	10	322	12	4	44.5	5	99	40	495
ZYS–012.20.544	42	640.3	$434^{+0.5}$	436	56	$545.5^{+0.5}$	547	$542.5_{-0.5}$	585	14	462	14	4	44.5	6	105	44.5	630
ZYS–012.20.644	49	742.3	$534^{+0.6}$	536	56	$645.5^{+0.6}$	647	$642.5_{-0.6}$	685	16	562	16	4	44.5	6	122	44.5	732
ZYS–012.20.744	55	838.1	$634^{+0.6}$	636	56	$745.5^{+0.6}$	747	$742.5_{-0.6}$	785	18	662	16	4	44.5	6	138	44.5	828
ZYS–012.20.844	66	950.1	$734^{+0.6}$	736	56	$845.5^{+0.6}$	847	$842.5_{-0.6}$	885	18	762	18	4	44.5	8	117	44.5	936
ZYS–012.20.944	72	1046.1	$834^{+0.7}$	836	56	$945.5^{+0.7}$	947	$942.5_{-0.7}$	985	20	862	20	4	44.5	8	129	44.5	1032
ZYS–012.20.1094	84	1198.1	$984^{+0.7}$	986	56	$1095.5^{+0.7}$	1097	$1092.5_{-0.7}$	1135	22	1012	20	4	44.5	8	148	44.5	1184

表中后缀 ZT表示定位尺寸

Suffix ZT indicates centering dimension



轴承型号 Basic Code	重量 Weight Kg	外形尺寸 Dimensions													齿轮参数 Gear Parameter			
		D_a	dZT +IT8	d_a	T	D_2	d_2	D_2ZT +IT8	D_1	n_a	d_1	n_l	n_1	H	m	z	b	d0
ZYS–014.20.414	28	518–0.5	516	325	56	$415.5^{+0.5}$	$412.5_{-0.5}$	411	490	8	375	12	4	47.5	5	67	40	335
ZYS–014.20.544	38	648–0.5	646	444	56	$545.5^{+0.5}$	$542.5_{-0.5}$	541	620	10	505	16	4	47.5	6	76	44.5	456
ZYS–014.20.644	45	748–0.6	746	546	56	$645.5^{+0.6}$	$642.5_{-0.6}$	641	720	12	605	18	4	47.5	6	93	44.5	558
ZYS–014.20.744	52	848–0.6	846	648	56	$745.5^{+0.6}$	$742.5_{-0.6}$	741	820	12	705	20	4	47.5	6	110	44.5	660
ZYS–014.20.844	62	948–0.6	846	736	56	$845.5^{+0.6}$	$842.5_{-0.6}$	841	920	14	805	20	4	47.5	8	94	44.5	752
ZYS–014.20.944	68	1048–0.7	1046	840	56	$945.5^{+0.7}$	$942.5_{-0.7}$	941	1020	16	905	22	4	47.5	8	107	44.5	856
ZYS–014.20.1094	82	1198–0.7	1196	984	56	$1095.5^{+0.7}$	$1092.5_{-0.7}$	1091	1170	16	1055	24	4	47.5	8	125	44.5	1000

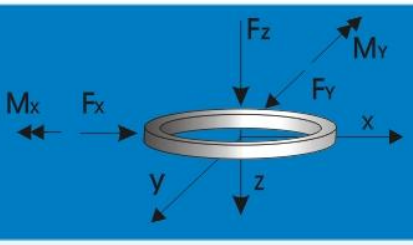
表中后缀 ZT表示定位尺寸

Suffix ZT indicates centering dimension

十五、用户调查表 Application questionnaire

应用 Application	
旋转轴位置：度 Axis of rotation (Unit: Degree)	
安装位置 Mounting position	平置 Horizontal ☐ 倾挂式 Suspend ☐ 垂直 Vertial ☐
发动机个数 Number of motors	
发动机安装在臂杆上位置：度 Position of motor on lever (Unit: Degree)	

载荷 Load

	1	2	3	4
	正常工作载荷 Operating load	最大工作载荷 Max. working load	试验载荷 Testing load	极限载荷 （非工作载荷） Extreme load (out of operation)
轴向力 Axial force Fz KN				
径向力 Radial force Fx KN				
径向力 Radial force Fy KN				
力矩 Moment Mx KNm				
力矩 Moment My KNm				
承载集合运行时间 Load percentage				
比例——百分比 Ratio Percentage				

运行条件 Operating condition

尘埃、水份、海水、化学物质的影响及其它 Environment (dust, water, seawater, chemical substances, and etc)	
运行温度： ℃ Operating temperature	
运行时间: 小时/天 Working time: hour/day	
回转运行的实际时间 % Rotation time	
回转交换次数 1/小时 Oscillating frequency: 1/hour	
每次工作交换的平均回转角度： 度 Mean rotating degree each oscillating movement: Degree	

■ 缔造品质 创造价值 创新发展

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