摩云阁
MOVING-GOODS




# 北京摩云阁精密齿条股份有限公司

Beijing Moving-Goods Precision Racks Co., Ltd.



齿条系列产品

Racks Product Series




齿条加工工艺及设备

Rack Manufacturing Process and Equipment

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# 关于摩云阁

## About MOVING-GOODS




北京摩云阁精密齿条股份有限公司成立于2010年，是中国领先的精密齿条传动系统和桁架机器人制造商，自动化解决方案供应商。我们的产品从精密齿条/齿轮、齿条传动系统延伸到基于直线传动技术的桁架机器人、机器人行走轴及自动化生产线。

摩云阁公司总部位于北京市通州区，是北京市高新技术企业，全资子公司——摩云阁香河机器人有限公司及工厂位于河北香河经济开发区机器人小镇。公司已通过ISO9001质量体系认证，拥有强大的技术研发团队和多项核心专利，自主研发的M7150高精度数控齿条磨齿机加工精度达到国际领先水平。

摩云阁精密齿条及桁架机器人系列产品以“精密、高速、可靠”闻名，赢得了全球客户的认可与信赖，广泛应用于机床、机器人、汽车、航空航天、半导体、医疗、制药、新能源、物流、工厂自动化、激光设备、塑料机械、测量仪器、工程机械、矿山机械、农业机械、木工机械等多个行业。

Founded in 2010, Beijing Moving-Goods Precision Racks Co., Ltd. is a leading manufacturer of precision rack drive systems and gantry robots, as well as a provider of automation solutions. Characterized by innovation, high quality and modular design, our product portfolio ranges from precision racks and pinions, V-type/flat rail guideway rack drive systems to gantry robots, robot travelling axes, and automated production lines based on linear transmission technologies.

MOVING-GOODS is headquartered in Beijing, China, and is recognized as a Beijing High-Tech Enterprise. Its wholly-owned subsidiary, Moving-Goods Robot (Xianghe) Co., Ltd., together with its production base is located in Hebei. Certified with ISO 9001, the company boasts a robust R&D team and numerous core patents. Notably, our independently developed M7150 High-Precision CNC Rack Grinding Machine achieves top accuracy among global standards.

Renowned for “Precision, Speed and Reliability”, MOVING-GOODS’ racks and gantry robots series have gained recognition and trust from customers worldwide. Our products are widely used in machine tools, robotics, automotive, aerospace, semiconductor, medical, pharmaceutical, new energy, logistics, factory automation, laser, plastic, measuring and testing, construction, mining, agriculture, woodworking and many other industries.

# 荣誉资质

## Honors & Qualifications










专精特新
北京市“专精特新”中小企业
北京摩云阁精密齿条股份有限公司
有效期三年：2025.01 – 2028.01
编号：2024ZJTX3592
北京市经济和信息化局


创新型
北京市“创新型”中小企业
北京摩云阁精密齿条股份有限公司
有效期三年：2024.09 – 2027.09
编号：2024CXX1679
北京市经济和信息化局

# 发展历程
## Milestones

**2002年**

北京摩云阁建筑器材制造有限公司齿条事业部成立

Rack Division of Beijing Moving-Goods Construction Machinery Manufacturing Co., Ltd. is established.

**2009年**

自主研发M7150高精度数控齿条磨齿机，加工精度达到国际领先水平

Independently developed M7150 High-Precision CNC Rack Grinding Machine, achieving world-leading machining accuracy.

**2010年**

北京摩云阁精密齿条有限公司成立

Beijing Moving-Goods Precision Racks Co., Ltd. was founded.

**2017年**

成立全资子公司——摩云阁香河机器人有限公司，推出桁架机器人、机器人第七轴等新产品

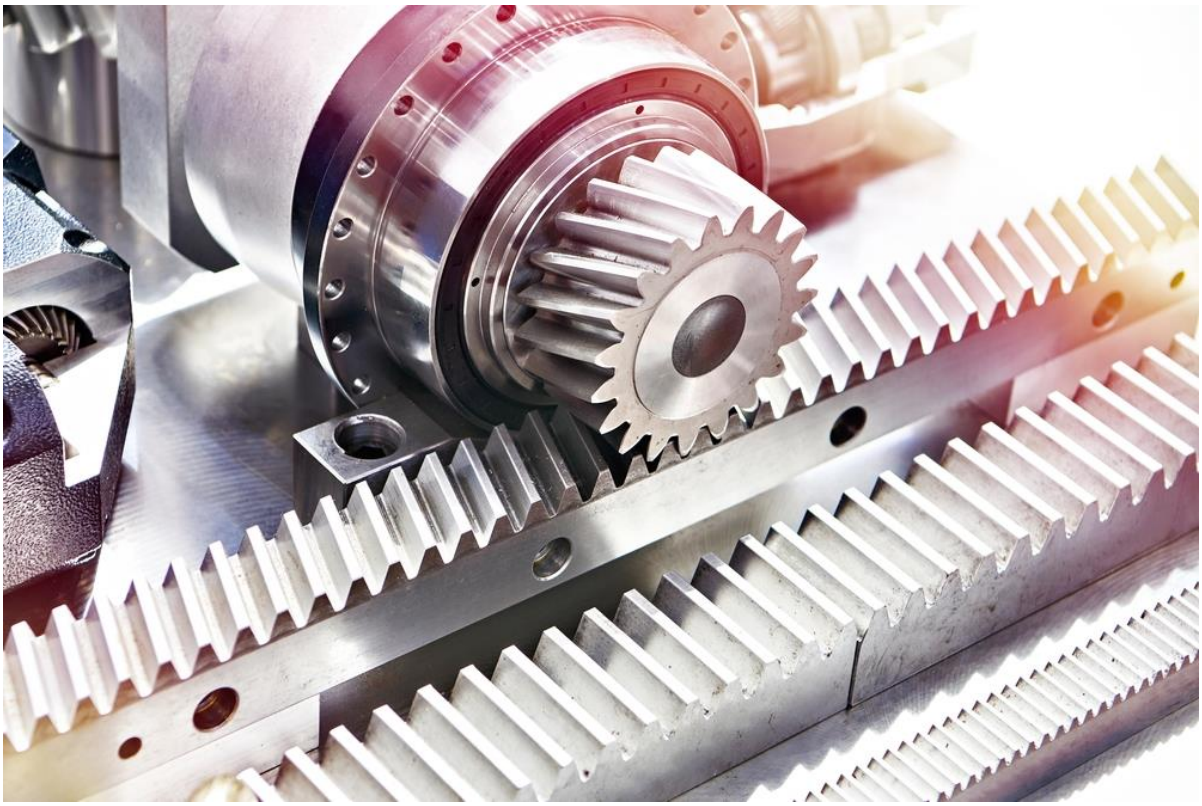
Established wholly owned subsidiary – BMG Robot (Xianghe) Co., Ltd. and launched new products including gantry robots and 7th axis for robots.

**2019年**

北京摩云阁精密齿条股份有限公司在新三板上市，股票代码：873218

Beijing Moving-Goods Precision Racks Co., Ltd. was listed on the NEEQ under Stock Code: 873218.

# 全球合作伙伴
## Global Partners



# 齿条及传动系统
## Racks & Drive Systems

摩云阁齿条及传动系统系列产品涵盖齿条及齿轮、V型导轨齿条传动系统（中载荷）、扁导轨齿条传动系统（重载荷）及润滑系统等产品，以高精度、高承载、高稳定为核心，广泛应用于各类精密直线传动场景，全面适配从小型精密工位到大型重载产线的多样化需求。

MOVING-GOODS Rack and Drive Systems Series covers racks and pinions, guideway V rack drive systems (medium duty), guideway flat rail rack drive systems (heavy duty), lubrication systems and more. Defined by high precision, high payload, and high stability, these products are widely used in various precision linear transmission applications, fully accommodating diverse needs ranging from small precision workstations to large heavy-duty production lines.



# 齿条
## Racks

摩云阁齿条系列产品精度、硬度及寿命达到国际领先水平。其中，模数0.79mm-20mm直齿/斜齿铣削齿条，精度可达德国DIN3962标准8级，长度可达2米；模数0.3mm-20mm直齿/斜齿高精度研磨齿条，精度可达德国DIN3962标准4级，长度可达1.5米。热处理工艺可选用齿面激光淬火或整体渗碳淬火，全齿硬度可达HRC55-60。

MOVING-GOODS Racks Series features world-leading precision and service life, Including milled racks (straight/helical teeth, M0.79mm-20mm, DIN 3962 Q8, length up to 2m) and ground racks (straight/helical teeth, M0.3mm-20mm, DIN 3962 Q4/Q5/Q6, length up to 1.5m). Heat treatment options include teeth laser hardened and case hardened, full-tooth hardness up to HRC55-60.

## 2. 标准齿条 Standard Racks

### 2.1 型号说明 Code Description:

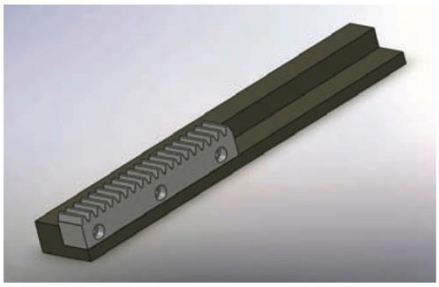
| 材料<br>Material | 齿型<br>Teeth Type | 齿部加工<br>Teeth Machining | 热处理<br>Heat Treatment | 模数<br>Module | 长度<br>Length |
|---|---|---|---|---|---|
| 1<br>C45 | 1<br>直齿<br>Straight | 1<br>磨削<br>Ground | 1<br>齿面淬火<br>Teeth Hardened | 020<br>M2 | 050<br>500mm |
| 2<br>42CrMo4 | 2<br>斜齿<br>Helical | 2<br>铣削<br>Milled | 2<br>调质<br>Quenched & Tempered | 100<br>M10 | 100<br>1000mm |

### 2.2 齿条装配须知：

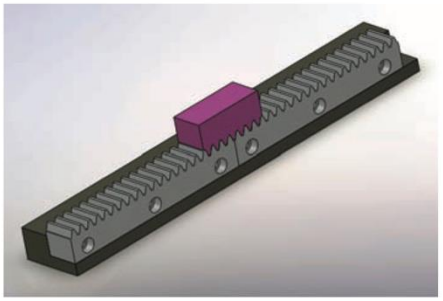
齿条可以对接安装到任意长度。装配时两根齿条之间的间隙需调整至配合齿距。安装齿条需使用定位销。

### 2.2 Assembling Instruction:

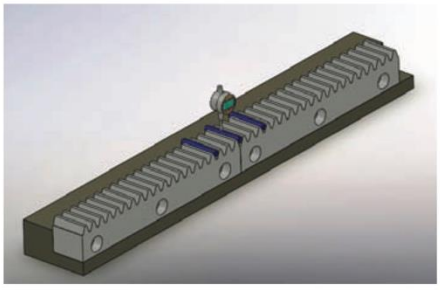
The racks can be connected to any length. The gap between two adjacent racks should be adjusted to match the pitch. Locking pins should be used when assembling the racks.



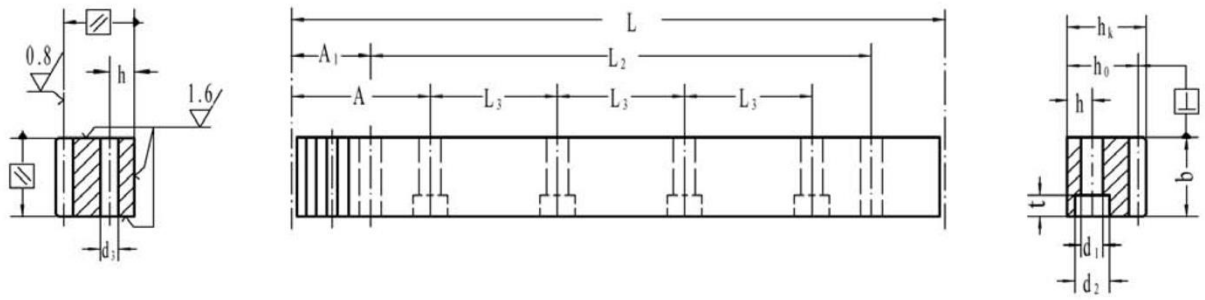
1. 定位并紧固齿条。
   Fix the rack.



2. 用反向齿规为下一根齿条定位。
   Use opposite tooth gauge to fix next rack.



3. 逐个检查每个接口，用圆棒检测齿条的平行度。
   Check every joint and measure the levelling of the racks with round bars



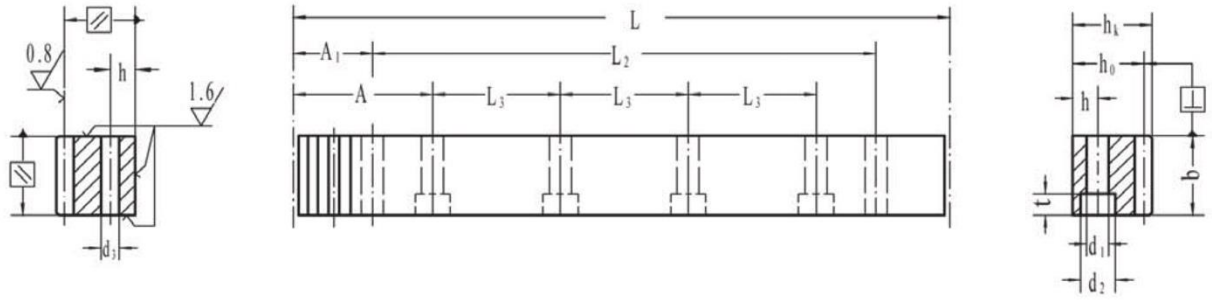

## 2.3 直齿磨削齿条, 压力角20°
## Ground racks with straight teeth, pressure angle 20°

单位/Unit: mm

| 型号 Code | 模数 M | L | 齿数 No of Teeth | b | $h_k$ | $h_0$ | A | $L_3$ | 孔数 No of Holes | h | $d_1$ | $d_2$ | t | $A_1$ | $L_2$ | $d_3$ | 累计齿距误差 Pitch Error /300mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 11 015 050 | 1.5 | 499.51 | 106 | 17 | 17 | 15.5 | 62.44 | 124.88 | 4 | 8 | 6 | 9.5 | 7 | 29 | 441.5 | 5.7 | 0.021 |
| 11 11 015 100 | 1.5 | 999.03 | 212 | 17 | 17 | 15.5 | 62.44 | 124.88 | 8 | 8 | 6 | 9.5 | 7 | 29 | 941 | 5.7 | 0.021 |
| 11 11 020 050 | 2 | 502.65 | 80 | 24 | 24 | 22 | 62.83 | 125.66 | 4 | 8 | 7 | 11 | 7 | 31.3 | 440.1 | 5.7 | 0.022 |
| 11 11 020 100 | 2 | 1005.31 | 160 | 24 | 24 | 22 | 62.83 | 125.66 | 8 | 8 | 7 | 11 | 7 | 31.3 | 942.7 | 5.7 | 0.022 |
| 11 11 030 050 | 3 | 508.94 | 54 | 29 | 29 | 26 | 63.62 | 127.23 | 4 | 9 | 10 | 15 | 9 | 34.4 | 440.1 | 7.7 | 0.024 |
| 11 11 030 100 | 3 | 1017.88 | 108 | 29 | 29 | 26 | 63.62 | 127.23 | 8 | 9 | 10 | 15 | 9 | 34.4 | 949.1 | 7.7 | 0.024 |
| 11 11 040 050 | 4 | 502.65 | 40 | 39 | 39 | 35 | 62.83 | 125.66 | 4 | 12 | 10 | 15 | 9 | 37.5 | 427.7 | 7.7 | 0.025 |
| 11 11 040 100 | 4 | 1005.31 | 80 | 39 | 39 | 35 | 62.83 | 125.66 | 8 | 12 | 10 | 15 | 9 | 37.5 | 930.3 | 7.7 | 0.025 |
| 11 11 050 050 | 5 | 502.65 | 32 | 49 | 39 | 34 | 62.83 | 125.66 | 4 | 12 | 14 | 20 | 13 | 30.1 | 442.4 | 11.7 | 0.025 |
| 11 11 050 100 | 5 | 1005.31 | 64 | 49 | 39 | 34 | 62.83 | 125.66 | 8 | 12 | 14 | 20 | 13 | 30.1 | 945.0 | 11.7 | 0.025 |
| 11 11 060 050 | 6 | 508.94 | 27 | 59 | 49 | 43 | 63.62 | 127.23 | 4 | 16 | 18 | 26 | 17 | 31.4 | 446.1 | 15.7 | 0.026 |
| 11 11 060 100 | 6 | 1017.88 | 54 | 59 | 49 | 43 | 63.62 | 127.23 | 8 | 16 | 18 | 26 | 17 | 31.4 | 955.0 | 15.7 | 0.026 |
| 11 11 080 050 | 8 | 502.65 | 20 | 79 | 79 | 71 | 62.83 | 125.66 | 4 | 25 | 22 | 33 | 21 | 26.6 | 449.5 | 19.7 | 0.027 |
| 11 11 080 100 | 8 | 1005.31 | 40 | 79 | 79 | 71 | 62.83 | 125.66 | 8 | 25 | 22 | 33 | 21 | 26.6 | 952.0 | 19.7 | 0.027 |
| 11 11 100 100 | 10 | 1005.31 | 32 | 99 | 99 | 89 | 62.83 | 125.66 | 8 | 32 | 33 | 48 | 32 | 125.7 | 753.96 | 19.7 | 0.028 |

精度等级：6h25
材质：C45
齿型：直齿
热处理：齿面淬火
齿面硬度：50-55HRC
齿面加工：磨削
四面加工：磨削
压力角：20°

Precision grade: 6h25
Material: C45
Teeth type: straight
Heat treatment: teeth hardened
Teeth hardness: 50-55HRC
Teeth machining: ground
Four sides: ground
Pressure angle: 20°



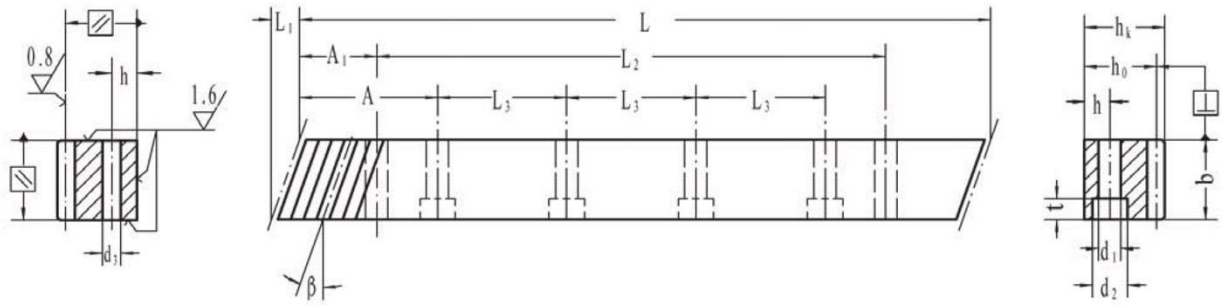

## 2.4 直齿磨削齿条, 压力角20°
## Ground racks with straight teeth, pressure angle 20°

单位/Unit: mm

| 型号 Code | 模数 M | L | 齿数 No of Teeth | b | $h_k$ | $h_0$ | A | $L_3$ | 孔数 No of Holes | h | $d_1$ | $d_2$ | t | $A_1$ | $L_2$ | $d_3$ | 累计齿距误差 Pitch Error /300mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21 11 015 050 | 1.5 | 499.51 | 106 | 17 | 17 | 15.5 | 62.44 | 124.88 | 4 | 8 | 6 | 9.5 | 7 | 29 | 441.5 | 5.7 | 0.021 |
| 21 11 015 100 | 1.5 | 999.03 | 212 | 17 | 17 | 15.5 | 62.44 | 124.88 | 8 | 8 | 6 | 9.5 | 7 | 29 | 941 | 5.7 | 0.021 |
| 21 11 020 050 | 2 | 502.65 | 80 | 24 | 24 | 22 | 62.83 | 125.66 | 4 | 8 | 7 | 11 | 7 | 31.3 | 440.1 | 5.7 | 0.022 |
| 21 11 020 100 | 2 | 1005.31 | 160 | 24 | 24 | 22 | 62.83 | 125.66 | 8 | 8 | 7 | 11 | 7 | 31.3 | 942.7 | 5.7 | 0.022 |
| 21 11 030 050 | 3 | 508.94 | 54 | 29 | 29 | 26 | 63.62 | 127.23 | 4 | 9 | 10 | 15 | 9 | 34.4 | 440.1 | 7.7 | 0.024 |
| 21 11 030 100 | 3 | 1017.88 | 108 | 29 | 29 | 26 | 63.62 | 127.23 | 8 | 9 | 10 | 15 | 9 | 34.4 | 949.1 | 7.7 | 0.024 |
| 21 11 040 050 | 4 | 502.65 | 40 | 39 | 39 | 35 | 62.83 | 125.66 | 4 | 12 | 10 | 15 | 9 | 37.5 | 427.7 | 7.7 | 0.025 |
| 21 11 040 100 | 4 | 1005.31 | 80 | 39 | 39 | 35 | 62.83 | 125.66 | 8 | 12 | 10 | 15 | 9 | 37.5 | 930.3 | 7.7 | 0.025 |
| 21 11 050 050 | 5 | 502.65 | 32 | 49 | 39 | 34 | 62.83 | 125.66 | 4 | 12 | 14 | 20 | 13 | 30.1 | 442.4 | 11.7 | 0.025 |
| 21 11 050 100 | 5 | 1005.31 | 64 | 49 | 39 | 34 | 62.83 | 125.66 | 8 | 12 | 14 | 20 | 13 | 30.1 | 945.0 | 11.7 | 0.025 |
| 21 11 060 050 | 6 | 508.94 | 27 | 59 | 49 | 43 | 63.62 | 127.23 | 4 | 16 | 18 | 26 | 17 | 31.4 | 446.1 | 15.7 | 0.026 |
| 21 11 060 100 | 6 | 1017.88 | 54 | 59 | 49 | 43 | 63.62 | 127.23 | 8 | 16 | 18 | 26 | 17 | 31.4 | 955.0 | 15.7 | 0.026 |
| 21 11 080 050 | 8 | 502.65 | 20 | 79 | 79 | 71 | 62.83 | 125.66 | 4 | 25 | 22 | 33 | 21 | 26.6 | 449.5 | 19.7 | 0.027 |
| 21 11 080 100 | 8 | 1005.31 | 40 | 79 | 79 | 71 | 62.83 | 125.66 | 8 | 25 | 22 | 33 | 21 | 26.6 | 952.0 | 19.7 | 0.027 |
| 21 11 100 100 | 10 | 1005.31 | 32 | 99 | 99 | 89 | 62.83 | 125.66 | 8 | 32 | 33 | 48 | 32 | 125.7 | 753.96 | 19.7 | 0.028 |

精度等级：6h25
材质：42CrMo4
齿型：直齿
热处理：齿面淬火
齿面硬度：50-55HRC
齿面加工：磨削
四面加工：磨削
压力角：20°

Precision grade: 6h25
Material: 42CrMo4
Teeth type: straight
Heat treatment: teeth hardened
Teeth hardness: 50-55HRC
Teeth machining: ground
Four sides: ground
Pressure angle: 20°



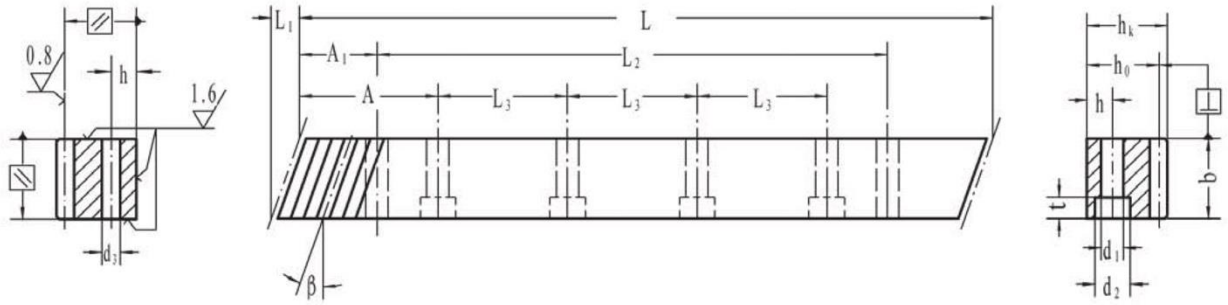

## 2.5 斜齿磨削齿条，压力角20°, 右旋19°31′42″
## Ground racks with helical teeth, pressure angle 20°, right hand angle 19°31′42″

单位/Unit: mm

| 型号 Code | 模数 M | L | $L_1$ | 齿数 No of Teeth | b | $h_k$ | $h_0$ | A | $L_3$ | 孔数 Hole No | h | $d_1$ | $d_2$ | t | $A_1$ | $L_2$ | $d_3$ | 累计齿距误差 Pitch Error /300mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 11 015 050 | 1.5 | 500 | 6.03 | 100 | 17 | 17 | 15.5 | 62.5 | 125 | 4 | 8 | 6 | 9.5 | 7 | 31.7 | 436.6 | 5.7 | 0.021 |
| 12 11 015 100 | 1.5 | 1000 | 6.03 | 200 | 17 | 17 | 15.5 | 62.5 | 125 | 8 | 8 | 6 | 9.5 | 7 | 31.7 | 936.6 | 5.7 | 0.021 |
| 12 11 020 050 | 2 | 500 | 8.5 | 75 | 24 | 24 | 22 | 62.5 | 125 | 4 | 8 | 7 | 11 | 7 | 31.7 | 436.6 | 5.7 | 0.022 |
| 12 11 020 100 | 2 | 1000 | 8.5 | 150 | 24 | 24 | 22 | 62.5 | 125 | 8 | 8 | 7 | 11 | 7 | 31.7 | 936.6 | 5.7 | 0.022 |
| 12 11 030 050 | 3 | 500 | 10.3 | 50 | 29 | 29 | 26 | 62.5 | 125 | 4 | 9 | 10 | 15 | 9 | 35.0 | 430.0 | 7.7 | 0.024 |
| 12 11 030 100 | 3 | 1000 | 10.3 | 100 | 29 | 29 | 26 | 62.5 | 125 | 8 | 9 | 10 | 15 | 9 | 35.0 | 930.0 | 7.7 | 0.024 |
| 12 11 040 050 | 4 | 506.67 | 13.8 | 38 | 39 | 39 | 35 | 62.5 | 125 | 4 | 12 | 10 | 15 | 9 | 33.3 | 433.0 | 7.7 | 0.025 |
| 12 11 040 100 | 4 | 1000 | 13.8 | 75 | 39 | 39 | 35 | 62.5 | 125 | 8 | 12 | 10 | 15 | 9 | 33.3 | 933.4 | 7.7 | 0.025 |
| 12 11 050 050 | 5 | 500 | 17.4 | 30 | 49 | 39 | 34 | 62.5 | 125 | 4 | 12 | 14 | 20 | 13 | 37.5 | 425.0 | 11.7 | 0.025 |
| 12 11 050 100 | 5 | 1000 | 17.4 | 60 | 49 | 39 | 34 | 62.5 | 125 | 8 | 12 | 14 | 20 | 13 | 37.5 | 925.0 | 11.7 | 0.025 |
| 12 11 060 050 | 6 | 500 | 20.9 | 25 | 59 | 49 | 43 | 62.5 | 125 | 4 | 16 | 18 | 26 | 17 | 37.5 | 425.0 | 15.7 | 0.026 |
| 12 11 060 100 | 6 | 1000 | 20.9 | 50 | 59 | 49 | 43 | 62.5 | 125 | 8 | 16 | 18 | 26 | 17 | 37.5 | 925.0 | 15.7 | 0.026 |
| 12 11 080 050 | 8 | 480 | 28.0 | 18 | 79 | 79 | 71 | 60.0 | 120 | 4 | 25 | 22 | 33 | 21 | 120 | 240.0 | 19.7 | 0.027 |
| 12 11 080 100 | 8 | 960 | 28.0 | 36 | 79 | 79 | 71 | 60.0 | 120 | 8 | 25 | 22 | 33 | 21 | 120 | 720.0 | 19.7 | 0.027 |
| 12 11 100 100 | 10 | 1000 | 35.11 | 30 | 99 | 99 | 89 | 62.5 | 125 | 8 | 32 | 33 | 48 | 32 | 125 | 750.0 | 19.7 | 0.028 |

精度等级：6h25
材质：C45
齿型：斜齿
热处理：齿面淬火
齿面硬度：50-55HRC
齿面加工：磨削
四面加工：磨削
压力角：20°

Precision grade: 6h25
Material: C45
Teeth type: helical
Heat treatment: teeth hardened
Teeth hardness: 50-55HRC
Teeth machining: ground
Four sides: ground
Pressure angle: 20°



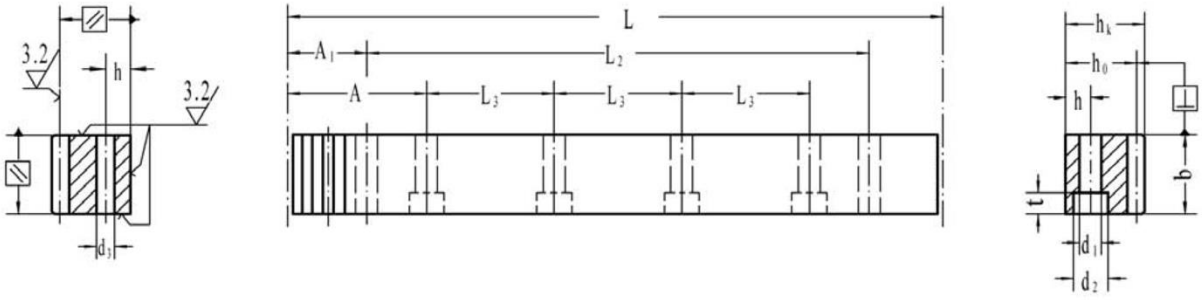

## 2.6 斜齿磨削齿条，压力角20°, 右旋19°31′42″
## Ground racks with helical teeth, pressure angle 20°, right hand angle 19°31′42″

单位/Unit: mm

| 型号 Code | 模数 M | L | $L_1$ | 齿数 No of Teeth | b | $h_k$ | $h_0$ | A | $L_3$ | 孔数 Hole No | h | $d_1$ | $d_2$ | t | $A_1$ | $L_2$ | $d_3$ | 累计齿距误差 Pitch Error /300mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 11 015 050 | 1.5 | 500 | 6.03 | 100 | 17 | 17 | 15.5 | 62.5 | 125 | 4 | 8 | 6 | 9.5 | 7 | 31.7 | 436.6 | 5.7 | 0.021 |
| 22 11 015 100 | 1.5 | 1000 | 6.03 | 200 | 17 | 17 | 15.5 | 62.5 | 125 | 8 | 8 | 6 | 9.5 | 7 | 31.7 | 936.6 | 5.7 | 0.021 |
| 22 11 020 050 | 2 | 500 | 8.5 | 75 | 24 | 24 | 22 | 62.5 | 125 | 4 | 8 | 7 | 11 | 7 | 31.7 | 436.6 | 5.7 | 0.022 |
| 22 11 020 100 | 2 | 1000 | 8.5 | 150 | 24 | 24 | 22 | 62.5 | 125 | 8 | 8 | 7 | 11 | 7 | 31.7 | 936.6 | 5.7 | 0.022 |
| 22 11 030 050 | 3 | 500 | 10.3 | 50 | 29 | 29 | 26 | 62.5 | 125 | 4 | 9 | 10 | 15 | 9 | 35.0 | 430.0 | 7.7 | 0.024 |
| 22 11 030 100 | 3 | 1000 | 10.3 | 100 | 29 | 29 | 26 | 62.5 | 125 | 8 | 9 | 10 | 15 | 9 | 35.0 | 930.0 | 7.7 | 0.024 |
| 22 11 040 050 | 4 | 506.67 | 13.8 | 38 | 39 | 39 | 35 | 62.5 | 125 | 4 | 12 | 10 | 15 | 9 | 33.3 | 433.0 | 7.7 | 0.025 |
| 22 11 040 100 | 4 | 1000 | 13.8 | 75 | 39 | 39 | 35 | 62.5 | 125 | 8 | 12 | 10 | 15 | 9 | 33.3 | 933.4 | 7.7 | 0.025 |
| 22 11 050 050 | 5 | 500 | 17.4 | 30 | 49 | 39 | 34 | 62.5 | 125 | 4 | 12 | 14 | 20 | 13 | 37.5 | 425.0 | 11.7 | 0.025 |
| 22 11 050 100 | 5 | 1000 | 17.4 | 60 | 49 | 39 | 34 | 62.5 | 125 | 8 | 12 | 14 | 20 | 13 | 37.5 | 925.0 | 11.7 | 0.025 |
| 22 11 060 050 | 6 | 500 | 20.9 | 25 | 59 | 49 | 43 | 62.5 | 125 | 4 | 16 | 18 | 26 | 17 | 37.5 | 425.0 | 15.7 | 0.026 |
| 22 11 060 100 | 6 | 1000 | 20.9 | 50 | 59 | 49 | 43 | 62.5 | 125 | 8 | 16 | 18 | 26 | 17 | 37.5 | 925.0 | 15.7 | 0.026 |
| 22 11 080 050 | 8 | 480 | 28.0 | 18 | 79 | 79 | 71 | 60.0 | 120 | 4 | 25 | 22 | 33 | 21 | 120 | 240.0 | 19.7 | 0.027 |
| 22 11 080 100 | 8 | 960 | 28.0 | 36 | 79 | 79 | 71 | 60.0 | 120 | 8 | 25 | 22 | 33 | 21 | 120 | 720.0 | 19.7 | 0.027 |
| 22 11 100 100 | 10 | 1000 | 35.11 | 30 | 99 | 99 | 89 | 62.5 | 125 | 8 | 32 | 33 | 48 | 32 | 125 | 750.0 | 19.7 | 0.028 |

精度等级：6h25
材质：42CrMo4
齿型：斜齿
热处理：齿面淬火
齿面硬度：50-55HRC
齿面加工：磨削
四面加工：磨削
压力角：20°

Precision grade: 6h25
Material: 42CrMo4
Teeth type: helical
Heat treatment: teeth hardened
Teeth hardness: 50-55HRC
Teeth machining: ground
Four sides: ground
Pressure angle: 20°



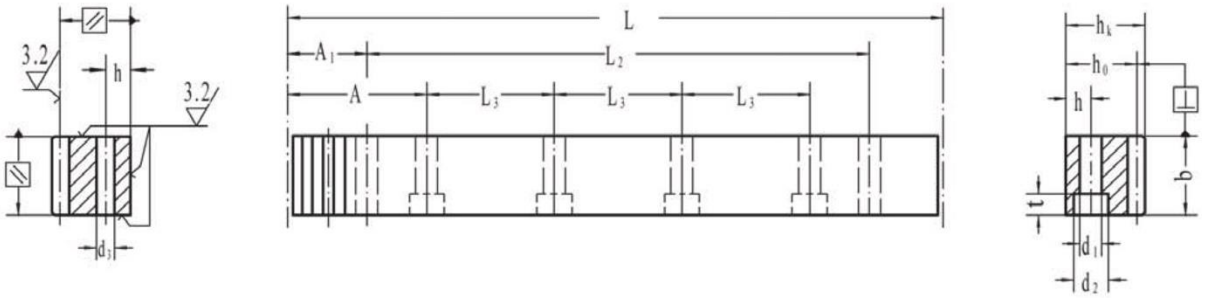

## 2.7 直齿铣削齿条, 压力角20°
**Milled racks with straight teeth, pressure angle 20°**

单位/Unit: mm

| 型号 Code | 模数 M | L | 齿数 No of Teeth | b | $h_k$ | $h_0$ | A | $L_3$ | 孔数 Hole No | h | $d_1$ | $d_2$ | t | $A_1$ | $L_2$ | $d_3$ | 累计齿距误差 Pitch Error /300mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 22 015 050 | 1.5 | 499.51 | 106 | 17 | 17 | 15.5 | 62.44 | 124.88 | 4 | 8 | 6 | 9.5 | 7 | 29 | 441.5 | 5.7 | 0.042 |
| 11 22 015 100 | 1.5 | 999.03 | 212 | 17 | 17 | 15.5 | 62.44 | 124.88 | 8 | 8 | 6 | 9.5 | 7 | 29 | 941 | 5.7 | 0.042 |
| 11 22 020 050 | 2 | 502.65 | 80 | 25 | 24 | 22 | 62.83 | 125.66 | 4 | 8 | 7 | 11 | 7 | 31.3 | 440.1 | 5.7 | 0.044 |
| 11 22 020 100 | 2 | 1005.31 | 160 | 25 | 24 | 22 | 62.83 | 125.66 | 8 | 8 | 7 | 11 | 7 | 31.3 | 942.7 | 5.7 | 0.044 |
| 11 22 030 050 | 3 | 508.94 | 54 | 30 | 29 | 26 | 63.62 | 127.23 | 4 | 9 | 10 | 15 | 9 | 34.4 | 440.1 | 7.7 | 0.046 |
| 11 22 030 100 | 3 | 1017.88 | 108 | 30 | 29 | 26 | 63.62 | 127.23 | 8 | 9 | 10 | 15 | 9 | 34.4 | 949.1 | 7.7 | 0.046 |
| 11 22 040 050 | 4 | 502.65 | 40 | 40 | 39 | 35 | 62.83 | 125.66 | 4 | 12 | 10 | 15 | 9 | 37.5 | 427.7 | 7.7 | 0.048 |
| 11 22 040 100 | 4 | 1005.31 | 80 | 40 | 39 | 35 | 62.83 | 125.66 | 8 | 12 | 10 | 15 | 9 | 37.5 | 930.3 | 7.7 | 0.048 |
| 11 22 050 050 | 5 | 502.65 | 32 | 49 | 39 | 34 | 62.83 | 125.66 | 4 | 12 | 14 | 20 | 13 | 30.1 | 442.4 | 11.7 | 0.050 |
| 11 22 050 100 | 5 | 1005.31 | 64 | 49 | 39 | 34 | 62.83 | 125.66 | 8 | 12 | 14 | 20 | 13 | 30.1 | 945.0 | 11.7 | 0.050 |
| 11 22 060 050 | 6 | 508.94 | 27 | 59 | 49 | 43 | 63.62 | 127.23 | 4 | 16 | 18 | 26 | 17 | 31.4 | 446.1 | 15.7 | 0.055 |
| 11 22 060 100 | 6 | 1017.88 | 54 | 59 | 49 | 43 | 63.62 | 127.23 | 8 | 16 | 18 | 26 | 17 | 31.4 | 955.0 | 15.7 | 0.055 |
| 11 22 080 050 | 8 | 502.65 | 20 | 79 | 79 | 71 | 62.83 | 125.66 | 4 | 25 | 22 | 33 | 21 | 26.6 | 449.5 | 19.7 | 0.060 |
| 11 22 080 100 | 8 | 1005.31 | 40 | 79 | 79 | 71 | 62.83 | 125.66 | 8 | 25 | 22 | 33 | 21 | 26.6 | 952.0 | 19.7 | 0.060 |
| 11 22 100 100 | 10 | 1005.31 | 32 | 99 | 99 | 89 | 62.83 | 125.66 | 8 | 32 | 33 | 48 | 32 | 125.7 | 753.96 | 19.7 | 0.065 |

精度等级：8e27
材质: C45
齿型：直齿
热处理：调质
齿面加工：铣削
四面加工：铣削
压力角：20°

Precision grade: 8e27
Material: C45
Teeth type: straight
Heat treatment: quenched & tempered
Teeth machining: milled
Four sides: milled
Pressure angle: 20°



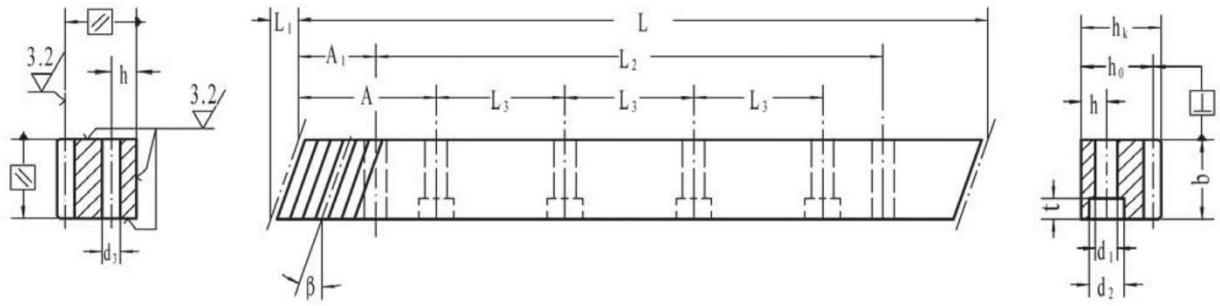

## 2.8 直齿铣削齿条, 压力角20°
**Milled racks with straight teeth, pressure angle 20°**

单位/Unit: mm

| 型号 Code | 模数 M | L | 齿数 No of Teeth | b | $h_k$ | $h_0$ | A | $L_3$ | 孔数 Hole No | h | $d_1$ | $d_2$ | t | $A_1$ | $L_2$ | $d_3$ | 累计齿距误差 Pitch Error /300mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21 22 015 050 | 1.5 | 499.51 | 106 | 17 | 17 | 15.5 | 62.44 | 124.88 | 4 | 8 | 6 | 9.5 | 7 | 29 | 441.5 | 5.7 | 0.042 |
| 21 22 015 100 | 1.5 | 999.03 | 212 | 17 | 17 | 15.5 | 62.44 | 124.88 | 8 | 8 | 6 | 9.5 | 7 | 29 | 941 | 5.7 | 0.042 |
| 21 22 020 050 | 2 | 502.65 | 80 | 25 | 24 | 22 | 62.83 | 125.66 | 4 | 8 | 7 | 11 | 7 | 31.3 | 440.1 | 5.7 | 0.044 |
| 21 22 020 100 | 2 | 1005.31 | 160 | 25 | 24 | 22 | 62.83 | 125.66 | 8 | 8 | 7 | 11 | 7 | 31.3 | 942.7 | 5.7 | 0.044 |
| 21 22 030 050 | 3 | 508.94 | 54 | 30 | 29 | 26 | 63.62 | 127.23 | 4 | 9 | 10 | 15 | 9 | 34.4 | 440.1 | 7.7 | 0.046 |
| 21 22 030 100 | 3 | 1017.88 | 108 | 30 | 29 | 26 | 63.62 | 127.23 | 8 | 9 | 10 | 15 | 9 | 34.4 | 949.1 | 7.7 | 0.046 |
| 21 22 040 050 | 4 | 502.65 | 40 | 40 | 39 | 35 | 62.83 | 125.66 | 4 | 12 | 10 | 15 | 9 | 37.5 | 427.7 | 7.7 | 0.048 |
| 21 22 040 100 | 4 | 1005.31 | 80 | 40 | 39 | 35 | 62.83 | 125.66 | 8 | 12 | 10 | 15 | 9 | 37.5 | 930.3 | 7.7 | 0.048 |
| 21 22 050 050 | 5 | 502.65 | 32 | 49 | 39 | 34 | 62.83 | 125.66 | 4 | 12 | 14 | 20 | 13 | 30.1 | 442.4 | 11.7 | 0.050 |
| 21 22 050 100 | 5 | 1005.31 | 64 | 49 | 39 | 34 | 62.83 | 125.66 | 8 | 12 | 14 | 20 | 13 | 30.1 | 945.0 | 11.7 | 0.050 |
| 21 22 060 050 | 6 | 508.94 | 27 | 59 | 49 | 43 | 63.62 | 127.23 | 4 | 16 | 18 | 26 | 17 | 31.4 | 446.1 | 15.7 | 0.055 |
| 21 22 060 100 | 6 | 1017.88 | 54 | 59 | 49 | 43 | 63.62 | 127.23 | 8 | 16 | 18 | 26 | 17 | 31.4 | 955.0 | 15.7 | 0.055 |
| 21 22 080 050 | 8 | 502.65 | 20 | 79 | 79 | 71 | 62.83 | 125.66 | 4 | 25 | 22 | 33 | 21 | 26.6 | 449.5 | 19.7 | 0.060 |
| 21 22 080 100 | 8 | 1005.31 | 40 | 79 | 79 | 71 | 62.83 | 125.66 | 8 | 25 | 22 | 33 | 21 | 26.6 | 952.0 | 19.7 | 0.060 |
| 21 22 100 100 | 10 | 1005.31 | 32 | 99 | 99 | 89 | 62.83 | 125.66 | 8 | 32 | 33 | 48 | 32 | 125.7 | 753.96 | 19.7 | 0.065 |

精度等级：8e27
材质: 42CrMo4
齿型：直齿
热处理：调质
齿面加工：铣削
四面加工：铣削
压力角：20°

Precision grade: 8e27
Material: 42CrMo4
Teeth type: straight
Heat treatment: quenched & tempered
Teeth machining: milled
Four sides: milled
Pressure angle: 20°



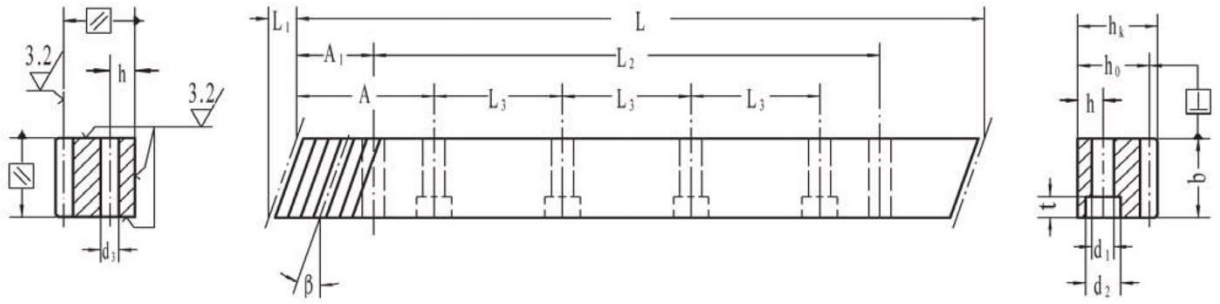

## 2.9 斜齿铣削齿条，压力角20°, 右旋19°31′42″
## Milled racks with helical teeth, pressure angle 20°, right hand angle 19°31′42″

单位/Unit: mm

| 型号 Code | 模数 M | L | $L_1$ | 齿数 No of Teeth | b | $h_k$ | $h_0$ | A | $L_3$ | 孔数 Hole No | h | $d_1$ | $d_2$ | t | $A_1$ | $L_2$ | $d_3$ | 累计齿距误差 Pitch error /300mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 22 015 050 | 1.5 | 500 | 6.03 | 100 | 17 | 17 | 15.5 | 62.5 | 125 | 4 | 8 | 6 | 9.5 | 7 | 31.7 | 436.6 | 5.7 | 0.042 |
| 12 22 015 100 | 1.5 | 1000 | 6.03 | 200 | 17 | 17 | 15.5 | 62.5 | 125 | 8 | 8 | 6 | 9.5 | 7 | 31.7 | 936.6 | 5.7 | 0.042 |
| 12 22 020 050 | 2 | 500 | 8.9 | 75 | 25 | 24 | 22 | 62.5 | 125 | 4 | 8 | 7 | 11 | 7 | 31.7 | 436.6 | 5.7 | 0.044 |
| 12 22 020 100 | 2 | 1000 | 8.9 | 150 | 25 | 24 | 22 | 62.5 | 125 | 8 | 8 | 7 | 11 | 7 | 31.7 | 936.6 | 5.7 | 0.044 |
| 12 22 030 050 | 3 | 500 | 10.6 | 50 | 30 | 29 | 26 | 62.5 | 125 | 4 | 9 | 10 | 15 | 9 | 35.0 | 430.0 | 7.7 | 0.046 |
| 12 22 030 100 | 3 | 1000 | 10.6 | 100 | 30 | 29 | 26 | 62.5 | 125 | 8 | 9 | 10 | 15 | 9 | 35.0 | 930.0 | 7.7 | 0.046 |
| 12 22 040 050 | 4 | 506.67 | 14.2 | 38 | 40 | 39 | 35 | 62.5 | 125 | 4 | 12 | 10 | 15 | 9 | 33.3 | 433.0 | 7.7 | 0.048 |
| 12 22 040 100 | 4 | 1000 | 14.2 | 75 | 40 | 39 | 35 | 62.5 | 125 | 8 | 12 | 10 | 15 | 9 | 33.3 | 933.4 | 7.7 | 0.048 |
| 12 22 050 050 | 5 | 500 | 17.7 | 30 | 50 | 39 | 34 | 62.5 | 125 | 4 | 12 | 14 | 20 | 13 | 37.5 | 425.0 | 11.7 | 0.050 |
| 12 22 050 100 | 5 | 1000 | 17.7 | 60 | 50 | 39 | 34 | 62.5 | 125 | 8 | 12 | 14 | 20 | 13 | 37.5 | 925.0 | 11.7 | 0.050 |
| 12 22 060 050 | 6 | 500 | 20.9 | 25 | 59 | 49 | 43 | 62.5 | 125 | 4 | 16 | 18 | 26 | 17 | 37.5 | 425.0 | 15.7 | 0.055 |
| 12 22 060 100 | 6 | 1000 | 20.9 | 50 | 59 | 49 | 43 | 62.5 | 125 | 8 | 16 | 18 | 26 | 17 | 37.5 | 925.0 | 15.7 | 0.055 |
| 12 22 080 050 | 8 | 480 | 28.0 | 18 | 79 | 79 | 71 | 60.0 | 120 | 4 | 25 | 22 | 33 | 21 | 120 | 240.0 | 19.7 | 0.060 |
| 12 22 080 100 | 8 | 960 | 28.0 | 36 | 79 | 79 | 71 | 60.0 | 120 | 8 | 25 | 22 | 33 | 21 | 120 | 720.0 | 19.7 | 0.060 |
| 12 22 100 100 | 10 | 1000 | 35.1 | 30 | 99 | 99 | 89 | 62.5 | 125 | 8 | 32 | 33 | 48 | 32 | 125 | 750.0 | 19.7 | 0.065 |

精度等级：8e27
材质：C45
齿型：斜齿
热处理：调质
齿面加工：铣削
四面加工：铣削
压力角：20°

Precision grade: 8e27
Material: C45
Teeth type: helical
Heat treatment: quenched & tempered
Teeth machining: milled
Four sides: milled
Pressure angle: 20°




## 2.10 斜齿铣削齿条，压力角20°, 右旋19°31′42″
## Milled racks with helical teeth, pressure angle 20°, right hand angle 19°31′42″

单位/Unit: mm

| 型号 Code | 模数 M | L | $L_1$ | 齿数 No of Teeth | b | $h_k$ | $h_0$ | A | $L_3$ | 孔数 Hole No | h | $d_1$ | $d_2$ | t | $A_1$ | $L_2$ | $d_3$ | 累计齿距误差 Pitch error /300mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 22 015 050 | 1.5 | 500 | 6.03 | 100 | 17 | 17 | 15.5 | 62.5 | 125 | 4 | 8 | 6 | 9.5 | 7 | 31.7 | 436.6 | 5.7 | 0.042 |
| 22 22 015 100 | 1.5 | 1000 | 6.03 | 200 | 17 | 17 | 15.5 | 62.5 | 125 | 8 | 8 | 6 | 9.5 | 7 | 31.7 | 936.6 | 5.7 | 0.042 |
| 22 22 020 050 | 2 | 500 | 8.9 | 75 | 25 | 24 | 22 | 62.5 | 125 | 4 | 8 | 7 | 11 | 7 | 31.7 | 436.6 | 5.7 | 0.044 |
| 22 22 020 100 | 2 | 1000 | 8.9 | 150 | 25 | 24 | 22 | 62.5 | 125 | 8 | 8 | 7 | 11 | 7 | 31.7 | 936.6 | 5.7 | 0.044 |
| 22 22 030 050 | 3 | 500 | 10.6 | 50 | 30 | 29 | 26 | 62.5 | 125 | 4 | 9 | 10 | 15 | 9 | 35.0 | 430.0 | 7.7 | 0.046 |
| 22 22 030 100 | 3 | 1000 | 10.6 | 100 | 30 | 29 | 26 | 62.5 | 125 | 8 | 9 | 10 | 15 | 9 | 35.0 | 930.0 | 7.7 | 0.046 |
| 22 22 040 050 | 4 | 506.67 | 14.2 | 38 | 40 | 39 | 35 | 62.5 | 125 | 4 | 12 | 10 | 15 | 9 | 33.3 | 433.0 | 7.7 | 0.048 |
| 22 22 040 100 | 4 | 1000 | 14.2 | 75 | 40 | 39 | 35 | 62.5 | 125 | 8 | 12 | 10 | 15 | 9 | 33.3 | 933.4 | 7.7 | 0.048 |
| 22 22 050 050 | 5 | 500 | 17.7 | 30 | 50 | 39 | 34 | 62.5 | 125 | 4 | 12 | 14 | 20 | 13 | 37.5 | 425.0 | 11.7 | 0.050 |
| 22 22 050 100 | 5 | 1000 | 17.7 | 60 | 50 | 39 | 34 | 62.5 | 125 | 8 | 12 | 14 | 20 | 13 | 37.5 | 925.0 | 11.7 | 0.050 |
| 22 22 060 050 | 6 | 500 | 20.9 | 25 | 59 | 49 | 43 | 62.5 | 125 | 4 | 16 | 18 | 26 | 17 | 37.5 | 425.0 | 15.7 | 0.055 |
| 22 22 060 100 | 6 | 1000 | 20.9 | 50 | 59 | 49 | 43 | 62.5 | 125 | 8 | 16 | 18 | 26 | 17 | 37.5 | 925.0 | 15.7 | 0.055 |
| 22 22 080 050 | 8 | 480 | 28.0 | 18 | 79 | 79 | 71 | 60.0 | 120 | 4 | 25 | 22 | 33 | 21 | 120 | 240.0 | 19.7 | 0.060 |
| 22 22 080 100 | 8 | 960 | 28.0 | 36 | 79 | 79 | 71 | 60.0 | 120 | 8 | 25 | 22 | 33 | 21 | 120 | 720.0 | 19.7 | 0.060 |
| 22 22 100 100 | 10 | 1000 | 35.1 | 30 | 99 | 99 | 89 | 62.5 | 125 | 8 | 32 | 33 | 48 | 32 | 125 | 750.0 | 19.7 | 0.065 |

精度等级：8e27
材质：42CrMo4
齿型：斜齿
热处理：调质
齿面加工：铣削
四面加工：铣削
压力角：20°

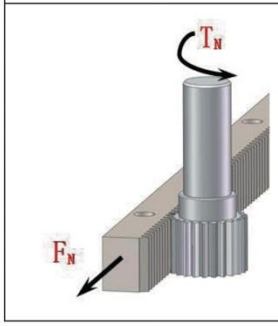
Precision grade: 8e27
Material: 42CrMo4
Teeth type: helical
Heat treatment: quenched & tempered
Teeth machining: milled
Four sides: milled
Pressure angle: 20°

## 2.11 模数齿轮齿条传动选型负载表
## Selection and Load Tables for Modular Rack and Pinion Drives

### 直齿，模数制 Straight tooth, modular pitch

| P（mm） | 齿距pitch | 4.71 | 6.28 | 7.85 | 9.42 | 12.56 | 15.71 | 18.84 | 25.12 |
|---|---|---|---|---|---|---|---|---|---|
| m（mm） | 模数module | 1.5 | 2.0 | 2.5 | 3.0 | 4.0 | 5.0 | 6.0 | 8.0 |

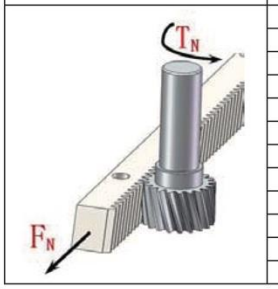
$L_2$齿面宽度 face width

| | | | | | 硬齿面 磨削淬火 hardened and ground | | 硬齿面 精铣淬火 precision cut and hardened | | 调质 精铣 Q+T precision cut | |
|---|---|---|---|---|---|---|---|---|---|---|
| | P | Module | Z | $L_2$ | $F_N$（N） | $T_N$（Nm） | $F_N$（N） | $T_N$（Nm） | $F_N$（N） | $T_N$（Nm） |
|  | 4.712 | 1.5 | 16 | 20 | 2250 | 27 | 1417 | 17 | 583 | 7 |
| | 4.712 | 1.5 | 20 | 20 | 2267 | 34 | 1533 | 23 | 733 | 11 |
| | 6.283 | 2.0 | 16 | 20 | 3688 | 59 | 2000 | 32 | 938 | 15 |
| | 6.283 | 2.0 | 20 | 20 | 4100 | 82 | 2300 | 46 | 1150 | 23 |
| | 7.854 | 2.5 | 20 | 25 | 6680 | 167 | 4040 | 101 | 1840 | 46 |
| | 9.425 | 3.0 | 16 | 30 | 9083 | 218 | 5667 | 136 | 2158 | 52 |
| | 9.425 | 3.0 | 20 | 30 | 10867 | 326 | 6400 | 192 | 2700 | 81 |
| | 12.566 | 4.0 | 20 | 40 | 20150 | 806 | 12588 | 503 | 5350 | 214 |
| | 15.708 | 5.0 | 20 | 50 | 32140 | 1607 | 24080 | 1204 | 8680 | 434 |
| | 18.850 | 6.0 | 20 | 60 | 47300 | 2838 | 37067 | 2224 | 13150 | 789 |
| | 25.133 | 8.0 | 20 | 80 | 86850 | 6950 | 54961 | 4396 | 27325 | 2186 |
| | 31.416 | 10.0 | 20 | 100 | 132001 | 13200 | 116784 | 11678 | 39500 | 3950 |

### 斜齿，模数制 Helical tooth, modular pitch

| P（mm） | 端面齿距traverse pitch | 5.00 | 6.66 | 8.33 | 10.00 | 13.33 | 16.66 | 20.00 | 26.66 |
|---|---|---|---|---|---|---|---|---|---|
| m（mm） | 模数module | 1.5 | 2.0 | 2.5 | 3.0 | 4.0 | 5.0 | 6.0 | 8.0 |

$L_2$齿面宽度 face width

| | | | | | 硬齿面磨削淬火 hardened and ground | | 硬齿面 精铣淬火 precision cutand hardened | | 调质 精铣 Q+T precision cut | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $P_S$ | Module | Z | $L_2$ | $F_N$（N） | $T_N$（Nm） | $F_N$（N） | $T_N$（Nm） | $F_N$（N） | $T_N$（Nm） |
|  | 5.00 | 1.5 | 16 | 20 | 3138 | 40 | 1976 | 24 | 813 | 10 |
| | 5.00 | 1.5 | 20 | 20 | 4524 | 72 | 2138 | 33 | 1022 | 15 |
| | 6.66 | 2.0 | 16 | 20 | 5301 | 90 | 2874 | 47 | 1348 | 22 |
| | 6.66 | 2.0 | 20 | 20 | 6974 | 148 | 3912 | 82 | 1956 | 41 |
| | 8.33 | 2.5 | 20 | 25 | 11574 | 307 | 7000 | 185 | 2760 | 73 |
| | 10.00 | 3.0 | 16 | 30 | 13430 | 342 | 8379 | 213 | 3190 | 80 |
| | 10.00 | 3.0 | 20 | 30 | 16965 | 540 | 9463 | 300 | 3992 | 126 |
| | 13.33 | 4.0 | 20 | 40 | 32044 | 1360 | 20018 | 848 | 8508 | 360 |
| | 16.66 | 5.0 | 20 | 50 | 50856 | 2698 | 38102 | 2021 | 13734 | 727 |
| | 20.00 | 6.0 | 20 | 60 | 63000 | 4010 | 49370 | 3142 | 17514 | 1114 |
| | 26.66 | 8.0 | 20 | 80 | 105500 | 8950 | 66503 | 5644 | 33192 | 2817 |
| | 33.33 | 10.0 | 20 | 100 | 148054 | 15709 | 126000 | 13369 | 42000 | 4456 |

## 2.12 选型计算示例(在具有充分润滑的条件下)
## Calculation Example (with adequate lubrication)

### 载荷系数 Load factor

| 输出轴所受冲击<br>shocks at output shaft<br>$f_B$ | 均匀冲击<br>uniform<br>1.0 | 中等冲击<br>moderate<br>1.2 | 较大冲击<br>heavy<br>1.5 |
|---|---|---|---|

### 启动系数 Starting factor

| 启动频率<br>Starting frequency<br>$f_A$ | ≤10/h<br>1.0 | ≤60/h<br>1.1 | ≤360/h<br>1.2 | ≤1000/h<br>1.3 |
|---|---|---|---|---|

### 温度系数 Temperature factor

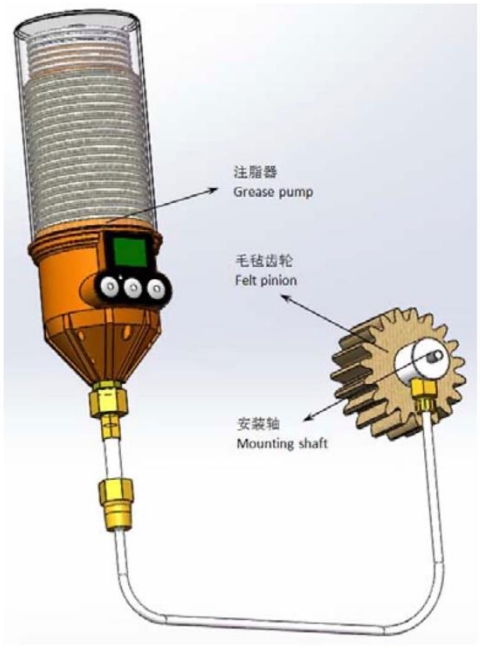
| 环境温度<br>Ambient temperature<br>Ft | ≤20℃<br>1.0 | ≤30℃<br>1.3 | ≤40℃<br>1.5 | ≤50℃<br>1.9 |
|---|---|---|---|---|

### 负载系数 Duty factor

| 负载比<br>Duty cycle each day<br>$f_{ed}$ | ≤40%<br>1.0 | ≤70%<br>1.2 | ≤100%<br>1.4 |
|---|---|---|---|

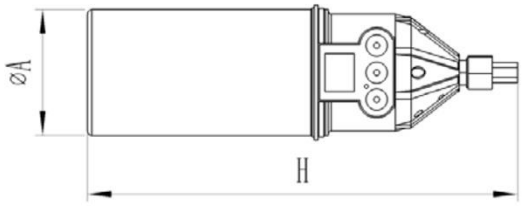
| | |
|---|---|
| 1.已知条件<br>轴向载荷<br>载荷重量 m = 500 kg<br>运转速度 v = 1.25 m/s<br>加速时间 $t_a$ = 0.31 s<br>重力加速度 g = 9.81 $m/s^2$<br>摩擦系数 μ = 0.10<br>电机转速 $n_1$ = 3000 r/min<br>载荷系数 $f_B$ = 1.2<br>启动系数 $f_A$ = 1.1<br>温度系数 $f_t$ = 1.0<br>负载系数 $f_{ed}$ = 1.2<br>安全系数 $S_B$ = 1.0<br>齿距累计误差$F_P$(1000mm) = 0.05 | **1.Determine knowns**<br>**Axial load**<br>Load weight m = 500 kg<br>Running speed v = 1.25 m/s<br>Acceleration time $t_a$ = 0.31 s<br>Gravity acceleration g = 9.81 $m/s^2$<br>Friction factor μ = 0.10<br>Motor speed $n_1$ = 3000 r/min<br>Load factor $f_B$ = 1.2<br>Starting factor $f_A$ = 1.1<br>Temperature factor $f_t$ = 1.0<br>Duty factor $f_{ed}$ = 1.2<br>Safety factor $S_B$ = 1.0<br>Cumulative pitch error $F_P$(1000mm) = 0.05 |
| 2.确定未知数<br>齿条、齿轮和减速器的尺寸 | **2.Determine unknowns**<br>Dimensions of rack, pinion and servo gearbox. |
| 3.作用在驱动系统上的力<br>3.1 加速度<br>$a = \frac{v}{t_a} = \frac{1.25}{0.31} = 4\ m/s^2$<br>3.2 水平牵引力<br>$F_u = m \cdot g \cdot \mu + m \cdot a = 500 \cdot (9.81 \cdot 0.1 + 4) = 2490.5$ N<br>3.3 所需驱动力<br>$F_{erf} = f_B \cdot F_u = 1.2 \cdot 2490.5 = 2989.0$ N | **3.Forces acting on the drive system**<br>3.1 Acceleration speed<br>$a = \frac{v}{t_a} = \frac{1.25}{0.31} = 4\ m/s^2$<br>3.2 Horizontal traction forces<br>$F_u = m \cdot g \cdot \mu + m \cdot a = 500 \cdot (9.81 \cdot 0.1 + 4) = 2490.5$ N<br>3.3 Required drive forces<br>$F_{erf} = f_B \cdot F_u = 1.2 \cdot 2490.5 = 2989.0$ N |
| 4.齿条齿轮的选择<br>4.1 在SB=1.0时$F_N$从齿轮齿条选型表格中选择，<br>且满足：$F_{2N} \geqq F_{erf}$<br><br>本例选择m = 4 z=20 直齿硬齿面磨削齿轮<br>m = 4 直齿调质精铣齿条 | **4. Selection of racks and pinions**<br>4.1 $F_N$ from selection and load tables with $S_B$=1.0<br>Condition: $F_{2N} \geqq F_{erf}$<br>In this case select<br>m = 4, z = 20 pinion, straight tooth, hardened and ground<br>m = 4 rack, straight tooth, Q+T precision cut |
| 5.减速器的选择<br>5.1减速比<br>$n_2 = \frac{v}{D_0 \cdot \pi} \cdot 60000 = \frac{1.25}{80\pi} \cdot 60000 = 298$ r/min<br>$i_{Getr} = \frac{n_1}{n_2} = \frac{3000}{298} = 10:1$<br>5.2 输出扭矩<br>$T_2 = \frac{F \cdot D_0}{2000} = \frac{2491 \cdot 80}{2000} = 99.6$ Nm<br>5.3 所需扭矩<br>$T_{2erf} = T_2 \cdot f_B \cdot f_A \cdot f_t \cdot f_{ed}$<br>$= 99.6 \cdot 1.2 \cdot 1.1 \cdot 1.0 \cdot 1.2 = 157.8$ Nm | **5. Selection of gearbox**<br>5.1 Ratio<br>$n_2 = \frac{v}{D_0 \cdot \pi} \cdot 60000 = \frac{1.25}{80\pi} \cdot 60000 = 298$ r/min<br>$i_{Getr} = \frac{n_1}{n_2} = \frac{3000}{298} = 10:1$<br>5.2 Output torque<br>$T_2 = \frac{F \cdot D_0}{2000} = \frac{2491 \cdot 80}{2000} = 99.6$ Nm<br>5.3 Required torque<br>$T_{2erf} = T_2 \cdot f_B \cdot f_A \cdot f_t \cdot f_{ed}$<br>$= 99.6 \cdot 1.2 \cdot 1.1 \cdot 1.0 \cdot 1.2 = 157.8$ Nm |

## 2.13 润滑系统 Lubrication System




注脂器 Grease pump

| 型号 Code | A | H |
|---|---|---|
| MSP250 | 86 | 233 |
| MSP500 | 86 | 291 |



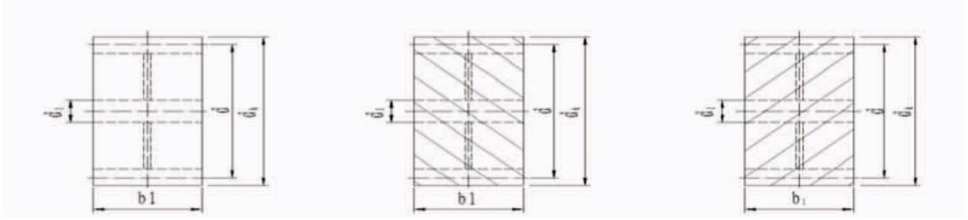




图1 Fig. 1　　图2 Fig.2　　图3 Fig.3

直齿毛毡齿轮 Felt pinion, straight-tooth

| 型号 Code | 图号 Fig. | 模数 Module | Z | d | $d_K$ | $d_1$ | $b_1$ | 质量m (g) |
|---|---|---|---|---|---|---|---|---|
| FP1526S | 1 | 1.5 | 26 | 39.0 | 42 | 12 | 15 | 7.2 |
| FP2019S | 1 | 2 | 19 | 38.0 | 42 | 12 | 25 | 11 |
| FP2522S | 1 | 2.5 | 22 | 55.0 | 60 | 12 | 25 | 25 |
| FP3019S | 1 | 3 | 19 | 57.0 | 63 | 12 | 30 | 37 |
| FP4019S | 1 | 4 | 19 | 76.0 | 84 | 12 | 40 | 98 |
| FP5018S | 1 | 5 | 18 | 90.0 | 100 | 20 | 50 | 133 |
| FP6018S | 1 | 6 | 18 | 108.0 | 120 | 20 | 60 | 234 |

斜齿毛毡齿轮右旋 Felt pinion, helical-tooth, RH

| 型号 Code | 图号 Fig. | 模数 Module | Z | d | $d_K$ | $d_1$ | $b_1$ | 质量m (g) |
|---|---|---|---|---|---|---|---|---|
| FP1524RH | 2 | 1.5 | 24 | 38.2 | 42 | 12 | 25 | 7.0 |
| FP2018RH | 2 | 2 | 18 | 38.2 | 42 | 12 | 25 | 11 |
| FP3018RH | 2 | 3 | 18 | 57.3 | 63 | 12 | 30 | 36 |
| FP4018RH | 2 | 4 | 18 | 76.5 | 84 | 12 | 40 | 97 |
| FP5017RH | 2 | 5 | 17 | 90.2 | 100 | 20 | 50 | 133 |
| FP6017RH | 2 | 6 | 17 | 108.2 | 120 | 20 | 60 | 234 |

斜齿毛毡齿轮左旋 Felt pinion, helical-tooth, LH

| 型号 Code | 图号 Fig. | 模数 Module | Z | d | $d_K$ | $d_1$ | $b_1$ | 质量m (g) |
|---|---|---|---|---|---|---|---|---|
| FP1524LH | 3 | 1.5 | 24 | 38.2 | 42 | 12 | 25 | 7.0 |
| FP2018LH | 3 | 2 | 18 | 38.2 | 42 | 12 | 25 | 11 |
| FP3018LH | 3 | 3 | 18 | 57.3 | 63 | 12 | 30 | 36 |
| FP4018LH | 3 | 4 | 18 | 76.5 | 84 | 12 | 40 | 97 |
| FP5017LH | 3 | 5 | 17 | 90.2 | 100 | 20 | 50 | 133 |
| FP6017LH | 3 | 6 | 17 | 108.2 | 120 | 20 | 60 | 234 |

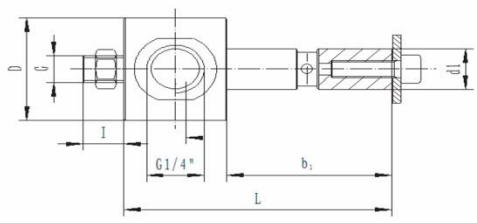



图4 Fig.4

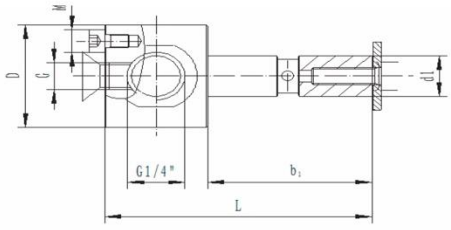



图5 Fig.5

安装轴 Mounting shaft

| 型号 Code | 图号 Fig. | 模数 Module | $d_1$ | D | $b_1$ | L | I | G | 质量m (g) |
|---|---|---|---|---|---|---|---|---|---|
| HS15440 | 4 | 1.5 | 12 | 30 | 15 | 40 | 10 | M8 | 135 |
| HS20450 | 4 | 2 | 12 | 30 | 25 | 50 | 10 | M8 | 143 |
| HS20550 | 5 | 2 | 12 | 30 | 25 | 50 | - | M8 | 140 |
| HS20562 | 5 | 2 | 12 | 30 | 25 | 62 | - | M8 | 150 |
| HS30455 | 4 | 3 | 12 | 30 | 30 | 55 | 10 | M8 | 147 |
| HS30555 | 5 | 3 | 12 | 30 | 30 | 55 | - | M8 | 145 |
| HS30566 | 5 | 3 | 12 | 30 | 30 | 66 | - | M8 | 155 |
| HS40465 | 4 | 4 | 12 | 30 | 40 | 65 | 10 | M8 | 154 |
| HS40565 | 5 | 4 | 12 | 30 | 40 | 65 | - | M8 | 150 |
| HS40572 | 5 | 4 | 12 | 30 | 40 | 72 | - | M8 | 160 |
| HS50475 | 4 | 5 | 20 | 50 | 50 | 75 | 15 | M12 | 520 |
| HS50575 | 5 | 5 | 20 | 40 | 50 | 75 | - | M8 | 510 |
| HS50585 | 5 | 5 | 20 | 40 | 50 | 85 | - | M8 | 520 |
| HS60485 | 4 | 6 | 20 | 50 | 60 | 85 | 15 | M12 | 545 |
| HS60585 | 5 | 6 | 20 | 40 | 60 | 85 | - | M8 | 535 |
| HS60597 | 5 | 6 | 20 | 40 | 60 | 97 | - | M8 | 550 |

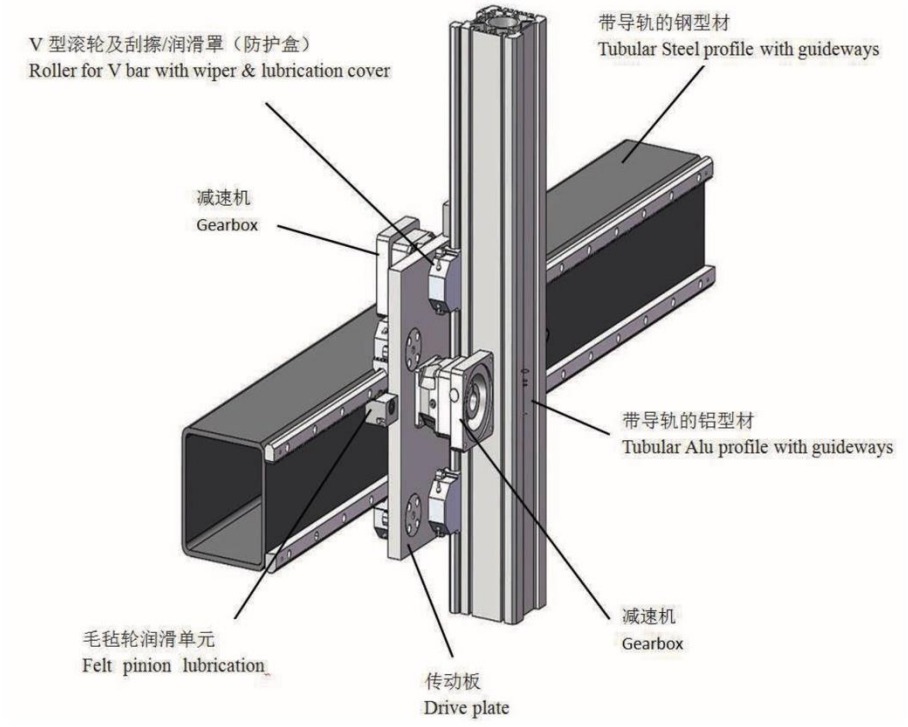
# 3.V型导轨齿条传动系统 (中载荷)
# Guideway V Bar Rack Drive System (Medium Duty)

### 3.1 简介
V型导轨齿条传动系统包括V型导轨、V型导轨齿条(导轨的背面是齿条)、滚轮、传动板、铝型材、钢型材等模块化部件，适合中载荷的应用。滚轮与导轨之间为线性接触，摩擦力小，传动速度高，噪音低，精度高。

本系统标准型号有15、20、25、35四种型号，特殊型号可以定制。为了避免圆周率带来的影响，齿条均为CP齿条。齿条有精铣和研磨两种，精铣齿条精度为DIN8e27, 齿面为调质硬度；研磨齿条精度为DIN6h25，齿面淬火，硬度为HRC55-60。所有导轨面均作高频淬火，硬度HRC55-60。

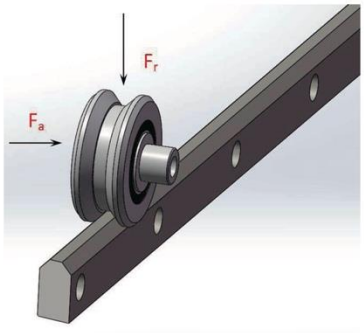
### 3.1 Introduction
The guideway V bar rack drive system includes modular components like guideway V bar, guideway V bar rack, roller, drive plate, aluminum profile, steel profile, etc. Such system is suitable for medium duty application. The contact between the roller and the guideway is linear, ensuring high speed, low noise and precise positioning.

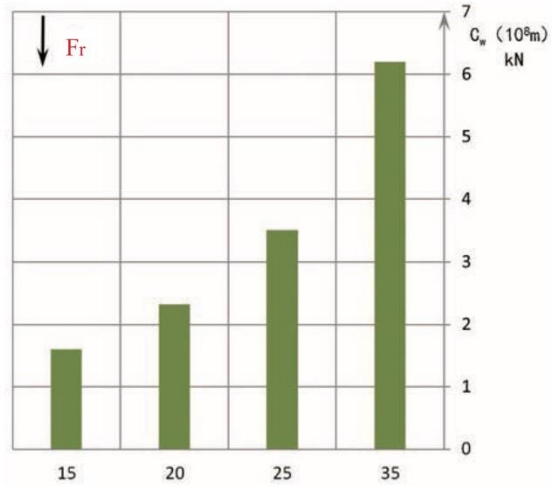
Now our standard models include 15, 20, 25, 35 sizes. We can also make non standard models according to customer's requirement. To avoid cumulative pitch tolerance due to pi, we use CP racks. We have milled racks to DIN8e27 and ground racks to DIN6h25 with tooth hardened to HRC55-60. The guideways are induction hardened to HRC55-60.



### 3.2 型号选择

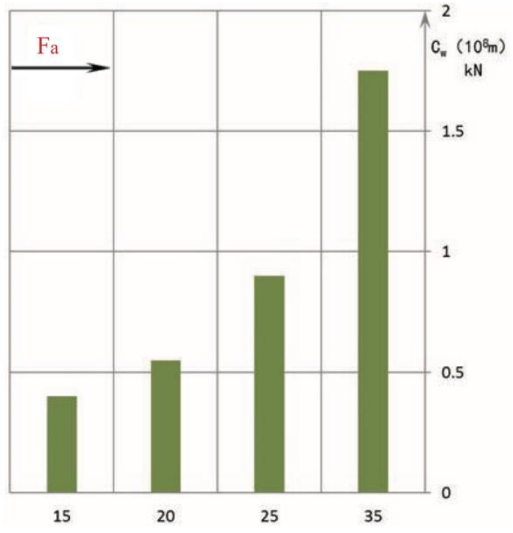
这些数据给出了所需导轨系统型号的大致选择。$C_W$给出了在额定100 000千米使用寿命下，相应滚轮的径向或轴向净负载。在滚轮的尺寸表中列出了$C_{OW}$和$C_W$。在多向受力和冲击的情况下，须考虑第54页的计算数据，或者向工厂索要计算证明。



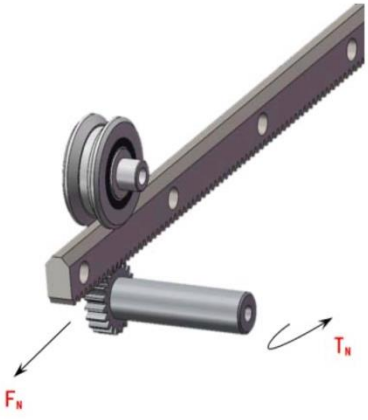

### 3.2 Size Selection

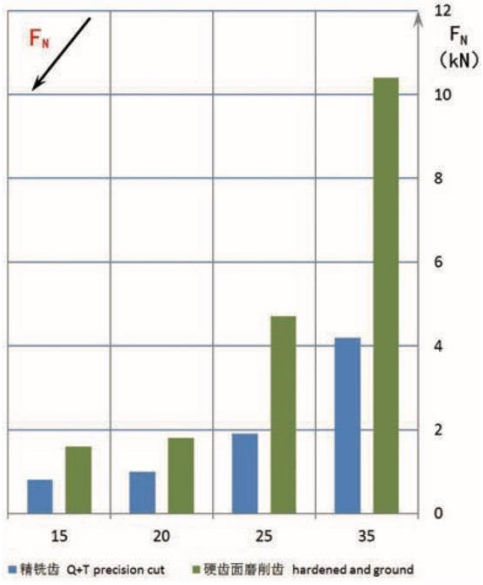
This data allows for a rough selection of the size of the required guideway system. The $C_W$ values are listed in this table for a nominal service life of $10^8$m (100 000km), and refer to a roller with pure radial or axial loading. In the dimensional tables for the rollers, the values for $C_{OW}$ and $C_W$ ($10^6$m) are also given. In cases of combined loading and shock, the calculation data on Page 54 must be consulted, or a calculation verification can be requested from the manufacturer.



### 3.3 驱动力的选择

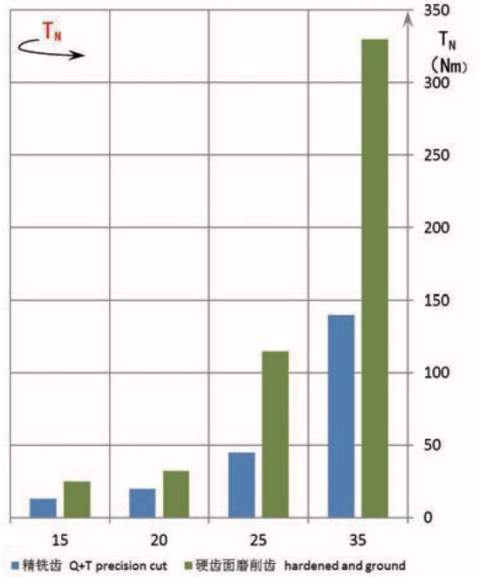
在选择齿条以后，必须检查齿轮齿数是否和所需驱动力及扭矩相匹配。
我们提供精铣和硬齿面磨削两种齿条。
此处列出的数据只适用于无振动、润滑良好和齿轮布置严谨的工况。
此处齿根应力安全系数取$S_F \geq 1.4$，赫兹应力安全系数取$S_H \geq 1.0$。
安全系数$S_B \approx 1.0 \ldots 4.0$，由用户根据经验选取。
牵引力$F_N$与齿轮齿数z有关。



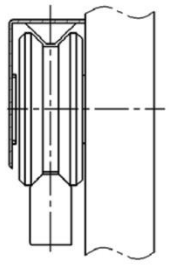
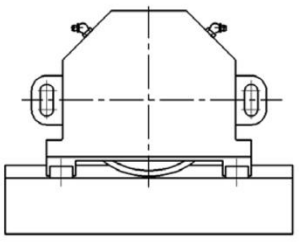




### 3.3 Selection of Drive Forces

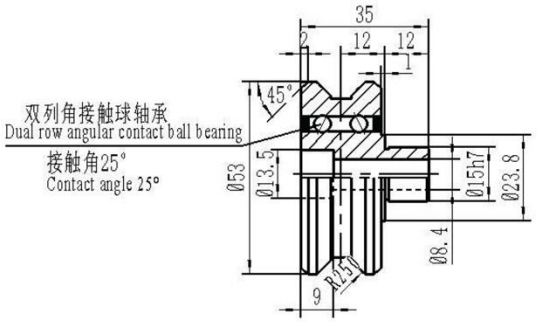
After selecting the rack, the pinion tooth number must be checked for compatibility with the required drive forces and torques.
The rack can be supplied precision cut or hardened and ground.
The values given are for shock-free operation, good lubrication and stiff arrangement of the pinion.
A safety factor for tooth root stress $S_F \geq 1.4$ and a safety factor for Hertzian stress $S_H \geq 1.0$ is taken in account.
Depending on your experience and application, a safety factor $S_B \approx 1.0 \ldots 4.0$ has to be considered.
The traction force $F_N$ is related to the number of teeth z of the pinion.

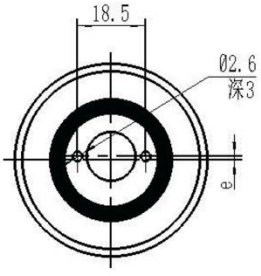


### 3.4.1 15型V型滚轮、法兰、防护盒
**Size 15 Roller for guideway V bars; Mounting flange; Wiper & lubrication unit**

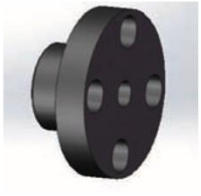


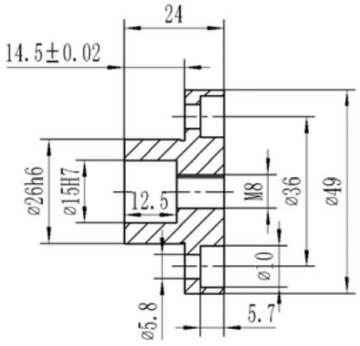


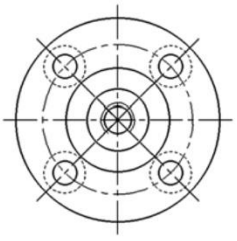




V型滚轮
Roller for guideway V bars

| 型号 Code | 偏心量 Excenter | 游隙Ga (μm) | 材料 Mat. | 质量m (Kg) | 载荷Load capacity | | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|---|
| | | | | | $C_{OW}$(N) | $N_{max}$(min$^{-1}$) | |
| VR15E | 1mm | -3/+5 | GCr15 | 0.25 | 6100 | 9000 | M8×35 8.8级 |
| VR15 | 0 | -3/+5 | GCr15 | 0.25 | 6100 | 9000 | M8×35 8.8级 |



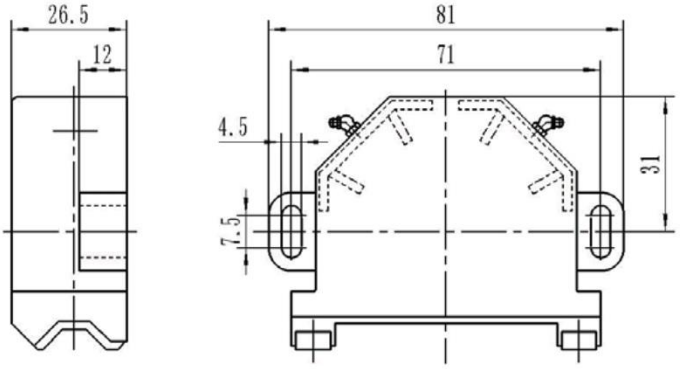


法兰
Mounting flange

| 型号 Code | 材料 Mat. | 质量m (Kg) | 螺栓型号 bolt size |
|---|---|---|---|
| FL15 | C45 | 0.15 | M5×16 8.8级 |

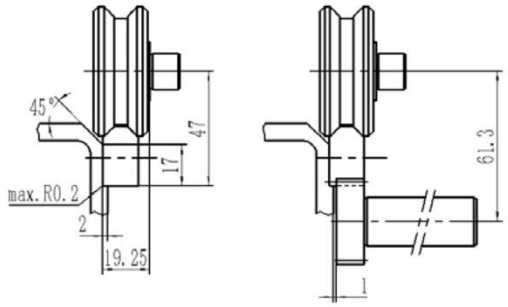


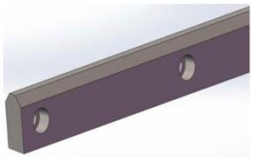


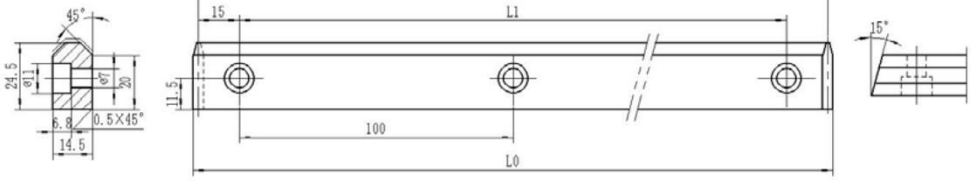

防护盒
Wiper & lubrication unit

| 型号 Code | 材料 Mat. | 质量m (Kg) | 螺栓型号 bolt size |
|---|---|---|---|
| VWL15 | 301 | 0.1 | M4×18 8.8级 |

### 3.4.2 15型V型导轨、齿条
**Size 15 Guideway V bar; Guideway V bar rack**

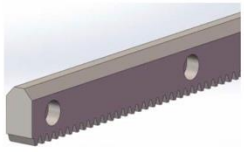


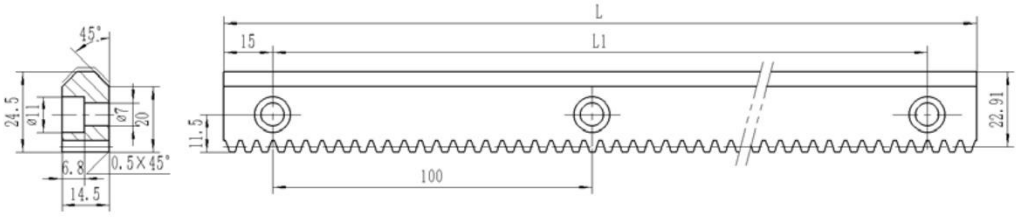






V型导轨
Guideway V bar

| 型号 Code | L | L0 | L1 | 材料 Mat. | 质量m (Kg) | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|
| VB15 | 1030 | 1033.89 | 1000 | 42CrMo | 2.6 | M6×16 8.8级 |
| VB15 | 630 | 633.89 | 600 | 42CrMo | 1.6 | M6×16 8.8级 |
| VB15 | 330 | 333.89 | 300 | 42CrMo | 0.85 | M6×16 8.8级 |






V型导轨齿条
Guideway V bar rack

| 型号 Code | L | L1 | 模数Module | 齿距P | 材料 Mat. | 质量m (Kg) | 精度等级 Quality | 加工方法 Cutting method |
|---|---|---|---|---|---|---|---|---|
| VBR15 | 1030 | 1000 | 1.5915 | 5.0 | 42CrMo | 2.4 | DIN8e27 | 铣削Q+T precision cut |
| VBR15 | 630 | 600 | 1.5915 | 5.0 | 42CrMo | 1.5 | DIN8e27 | 铣削 Q+T precision cut |
| VBR15 | 330 | 300 | 1.5915 | 5.0 | 42CrMo | 0.8 | DIN8e27 | 铣削 Q+T precision cut |
| VBR15G | 1030 | 1000 | 1.5915 | 5.0 | 42CrMo | 2.4 | DIN6h25 | 磨削 hardened & ground |
| VBR15G | 630 | 600 | 1.5915 | 5.0 | 42CrMo | 1.5 | DIN6h25 | 磨削 hardened & ground |
| VBR15G | 330 | 300 | 1.5915 | 5.0 | 42CrMo | 0.8 | DIN6h25 | 磨削 hardened & ground |



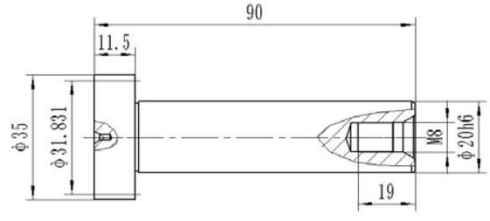



图1 Fig. 1

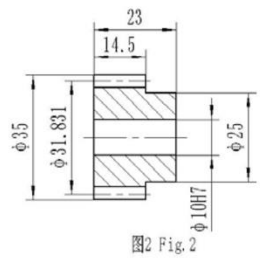
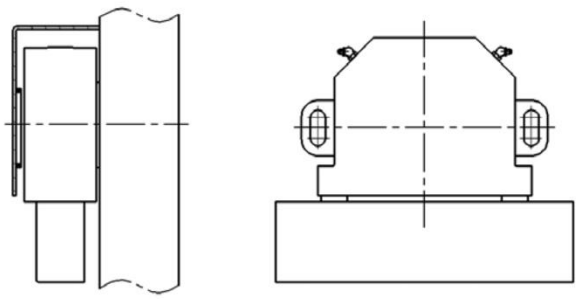



图2 Fig. 2

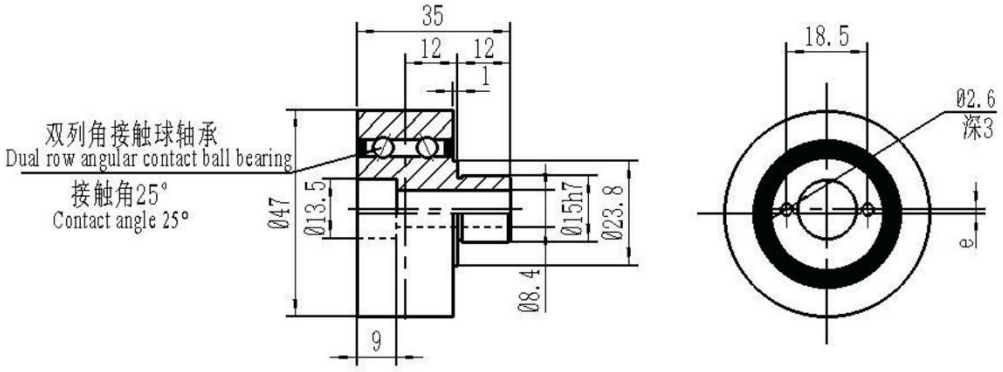
齿轮
Drive pinion

| 型号 Code | 齿数 Z | 模数 Module | 齿距 P | 图 Fig. | 材料 Mat. | 质量m (Kg) | 精度等级 Quality | 最大驱动力 Max.drive force |
|---|---|---|---|---|---|---|---|---|
| PS15 | 20 | 1.5915 | 5.0 | 1 | 20CrMnTi | 0.25 | DIN6e25 | 3kN |
| P15 | 20 | 1.5915 | 5.0 | 2 | 20CrMnTi | 0.1 | DIN6e25 | 4kN |

### 3.4.3 15型平滚轮、法兰、防护盒
**Size 15 Plain roller; Mounting flange; Wiper & lubrication unit**



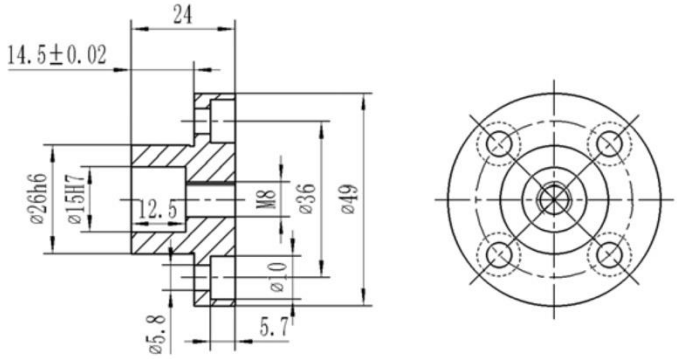





平滚轮
Plain roller

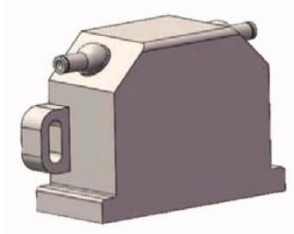
| 型号 Code | 偏心量 Excenter | 游隙Ga (μm) | 材料 Mat. | 质量m (Kg) | 载荷Load capacity | | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|---|
| | | | | | $C_{OW}$(N) | $N_{max}$($min^{-1}$) | |
| PR15E | 1mm | -3/+5 | GCr15 | 0.18 | 6100 | 9000 | M8×35 8.8级 |
| PR15 | 0 | -3/+5 | GCr15 | 0.18 | 6100 | 9000 | M8×35 8.8级 |

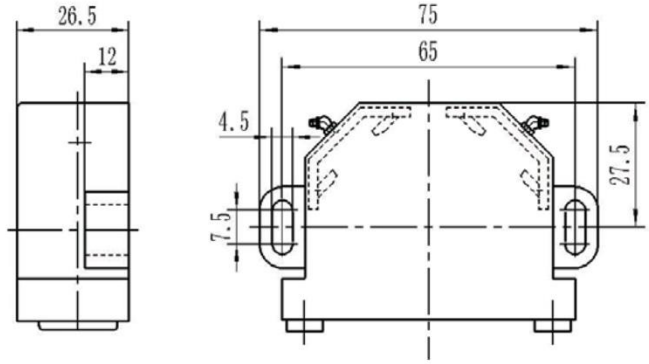





法兰
Mounting flange

| 型号 Code | 材料 Mat. | 质量m (Kg) | 螺栓型号 bolt size |
|---|---|---|---|
| FL15 | C45 | 0.15 | M5×16 8.8级 |

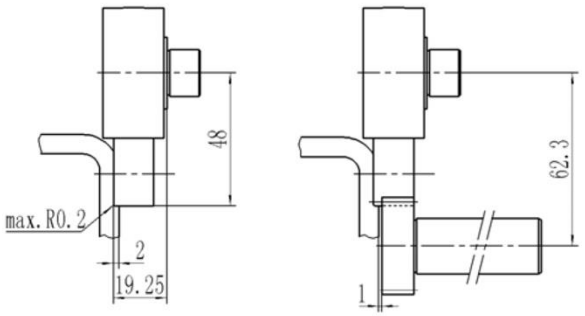


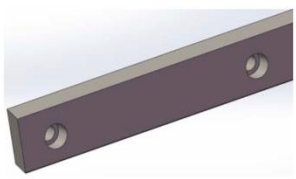


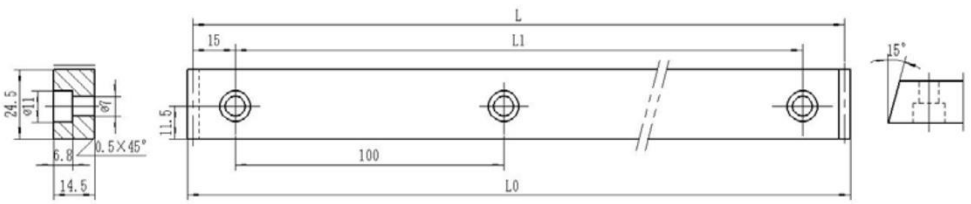

防护盒
Wiper & lubrication unit

| 型号 Code | 材料 Mat. | 质量m (Kg) | 螺栓型号 bolt size |
|---|---|---|---|
| PWL15 | 301 | 0.1 | M4×18 8.8级 |

### 3.4.4 15型平导轨、齿条、齿轮
**Size 15 Guideway flat rail; Guideway flat rail rack; Pinion**

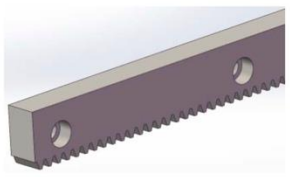


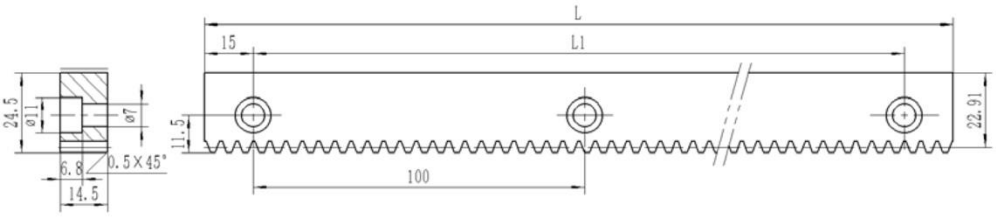






平导轨
Guideway flat rail

| 型号 Code | L | L0 | L1 | 材料 Mat. | 质量m (Kg) | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|
| PB15 | 1030 | 1033.89 | 1000 | 42CrMo | 2.8 | M6×16 8.8级 |
| PB15 | 630 | 633.89 | 600 | 42CrMo | 1.7 | M6×16 8.8级 |
| PB15 | 330 | 333.89 | 300 | 42CrMo | 0.9 | M6×16 8.8级 |






平导轨齿条
Guideway flat rail rack

| 型号 Code | L | L1 | 模数 Module | 齿距P | 材料 Mat. | 质量m (Kg) | 精度等级Quality | 加工方法 Cutting method |
|---|---|---|---|---|---|---|---|---|
| PBR15 | 1030 | 1000 | 1.5915 | 5.0 | 42CrMo | 2.6 | DIN8e27 | 铣削Q+T precision cut |
| PBR15 | 630 | 600 | 1.5915 | 5.0 | 42CrMo | 1.6 | DIN8e27 | 铣削Q+T precision cut |
| PBR15 | 330 | 300 | 1.5915 | 5.0 | 42CrMo | 0.85 | DIN8e27 | 铣削Q+T precision cut |
| PBR15G | 1030 | 1000 | 1.5915 | 5.0 | 42CrMo | 2.6 | DIN6h25 | 磨削 hardened & ground |
| PBR15G | 630 | 600 | 1.5915 | 5.0 | 42CrMo | 1.6 | DIN6h25 | 磨削 hardened & ground |
| PBR15G | 330 | 300 | 1.5915 | 5.0 | 42CrMo | 0.85 | DIN6h25 | 磨削 hardened & ground |



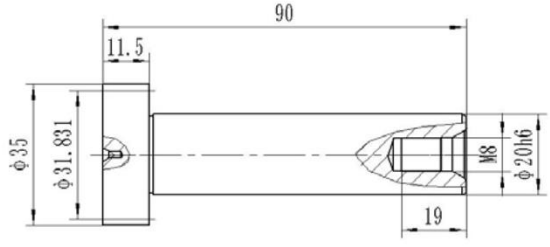



图1 Fig.1

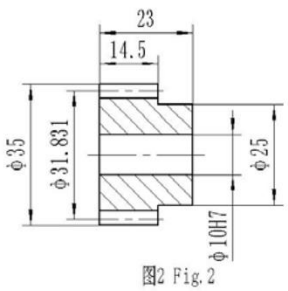
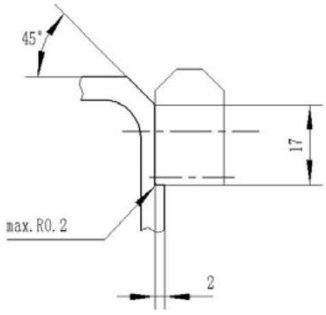


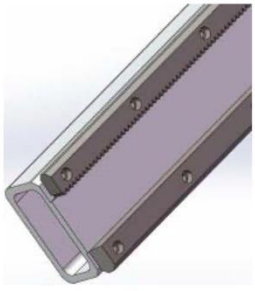

图2 Fig.2

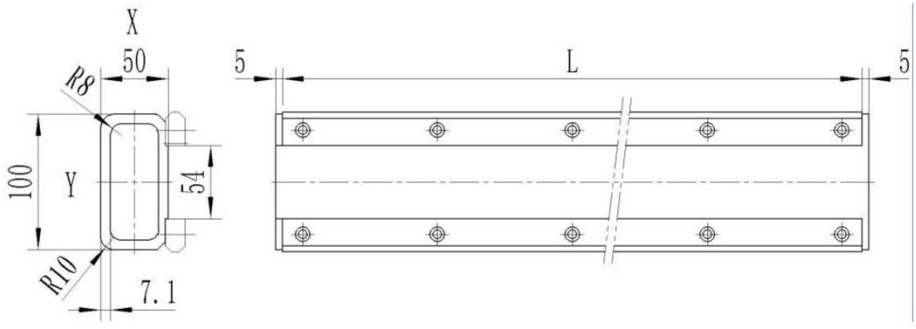
齿轮
Drive pinion

| 型号 Code | 齿数 Z | 模数 Module | 齿距 P | 图 Fig. | 材料 Mat. | 质量m (Kg) | 精度等级 Quality | 最大驱动力 Max.drive force |
|---|---|---|---|---|---|---|---|---|
| PS15 | 20 | 1.5915 | 5.0 | 1 | 20CrMnTi | 0.25 | DIN6e25 | 3kN |
| P15 | 20 | 1.5915 | 5.0 | 2 | 20CrMnTi | 0.1 | DIN6e25 | 4kN |

### 3.4.5 15型钢型材
**Size 15 Tubular steel profile with guideways**

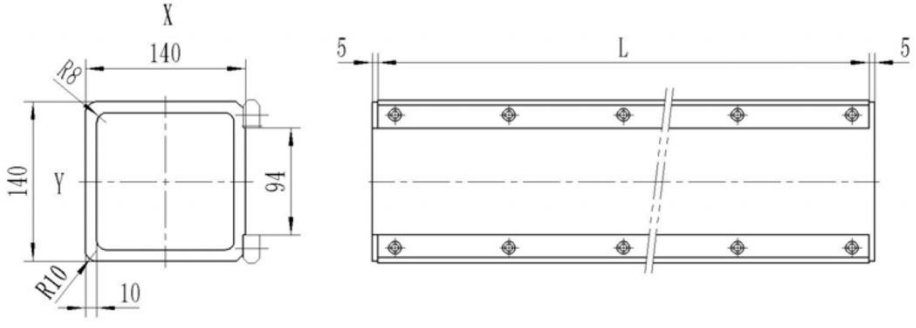




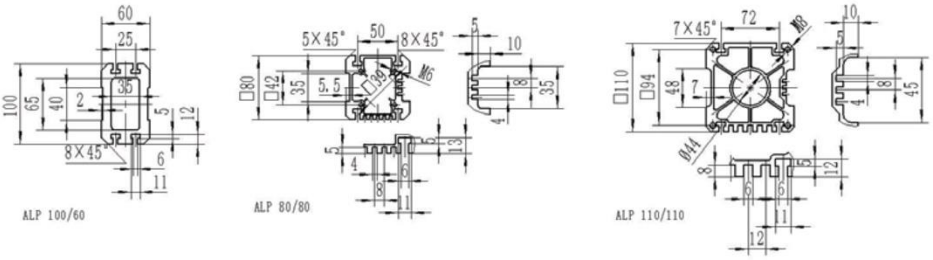

| 型号 Code | 材料 Mat. | m①(Kg/m) | m②(Kg/m) | $L_x$①($cm^4$) | $L_x$②($cm^4$) | $L_y$①($cm^4$) | $L_y$②($cm^4$) | $L_z$($cm^4$) |
|---|---|---|---|---|---|---|---|---|
| SP100/50 | Q345 | 14.8 | 20.4 | 69 | 111 | 218 | 306 | 169 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |



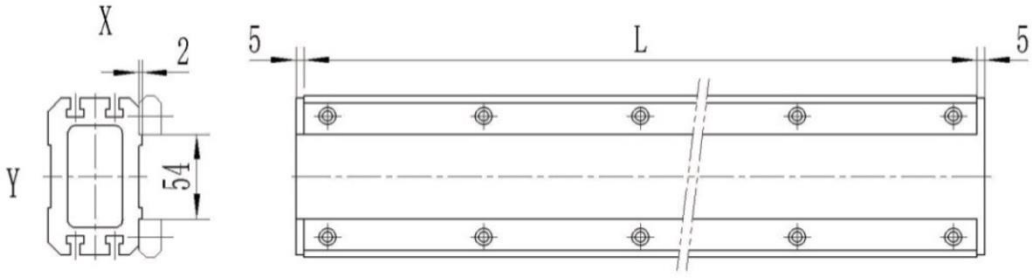



| 型号 Code | 材料 Mat. | m①(Kg/m) | m②(Kg/m) | $L_x$①($cm^4$) | $L_x$②($cm^4$) | $L_y$①($cm^4$) | $L_y$②($cm^4$) | $L_z$($cm^4$) |
|---|---|---|---|---|---|---|---|---|
| SP140/140 | Q345 | 39.6 | 45.2 | 1400 | 1660 | 1400 | 1550 | 2250 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

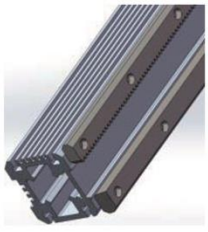
### 3.4.6 15型铝型材
**Size 15 Tubular alu profile with guideways**

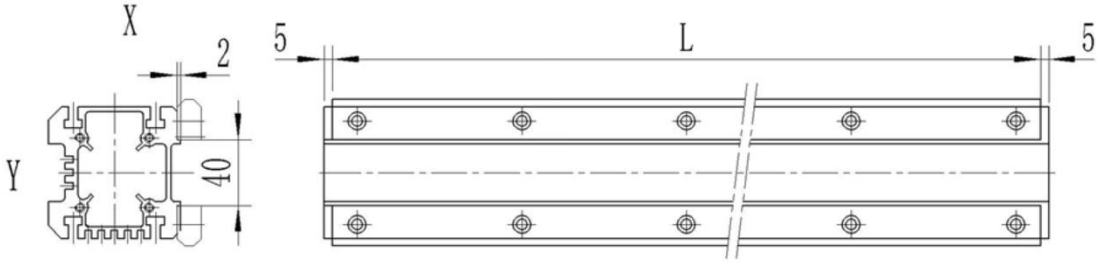




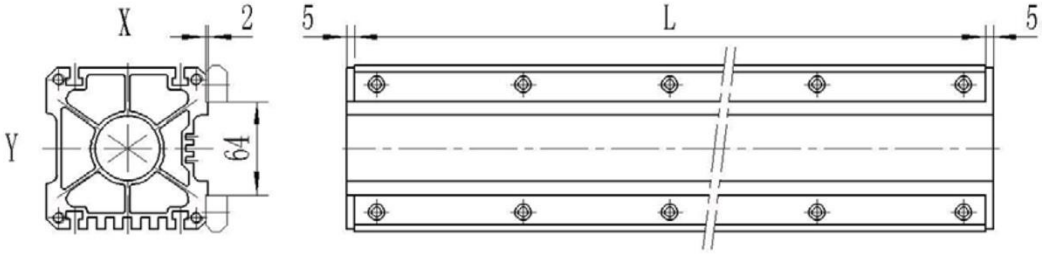

| 型号 Code | 材料 Mat. | $m^{①}$(Kg/m) | $m^{②}$(Kg/m) | $L_x^{①}$($cm^4$) | $L_x^{②}$($cm^4$) | $L_y^{①}$($cm^4$) | $L_y^{②}$($cm^4$) | $L_z$($cm^4$) |
|---|---|---|---|---|---|---|---|---|
| ALP100/60 | 6063 | 8.3 | 13.9 | 128 | 190 | 319 | 402 | 137 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |





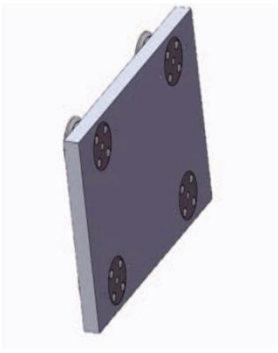

| 型号 Code | 材料 Mat. | $m^{①}$(Kg/m) | $m^{②}$(Kg/m) | $L_x^{①}$($cm^4$) | $L_x^{②}$($cm^4$) | $L_y^{①}$($cm^4$) | $L_y^{②}$($cm^4$) | $L_z$($cm^4$) |
|---|---|---|---|---|---|---|---|---|
| ALP80/80 | 6063 | 6.8 | 12.4 | 179 | 279 | 181 | 227 | 79 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

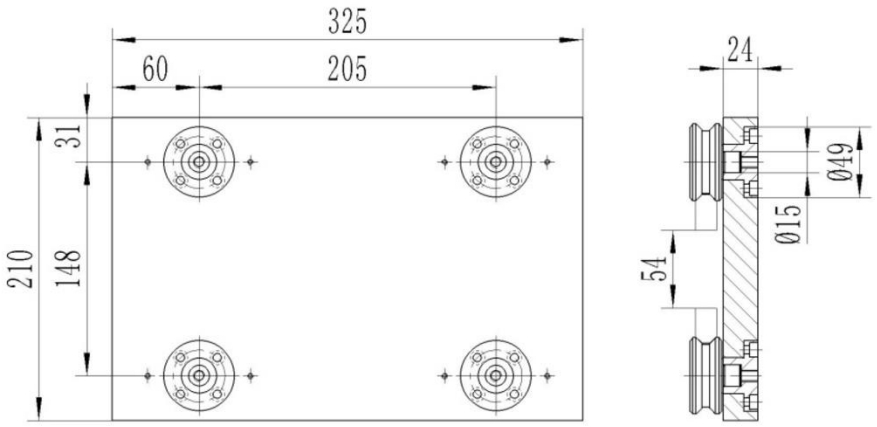




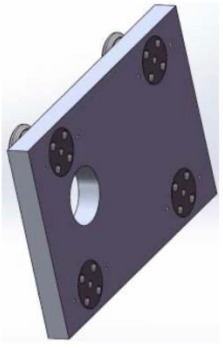

| 型号 Code | 材料 Mat. | $m^{①}$(Kg/m) | $m^{②}$(Kg/m) | $L_x^{①}$($cm^4$) | $L_x^{②}$($cm^4$) | $L_y^{①}$($cm^4$) | $L_y^{②}$($cm^4$) | $L_z$($cm^4$) |
|---|---|---|---|---|---|---|---|---|
| ALP110/110 | 6063 | 12.3 | 17.9 | 606 | 788 | 609 | 705 | 341 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

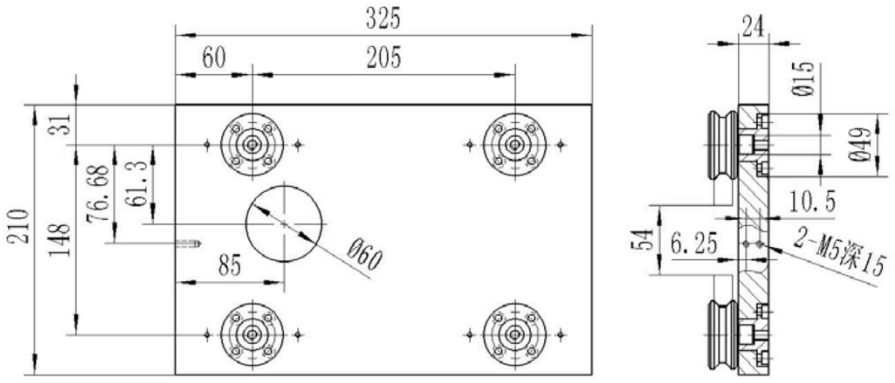
### 3.4.7 15型传动板
**Size 15 Drive plate**



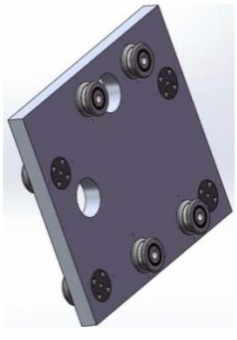


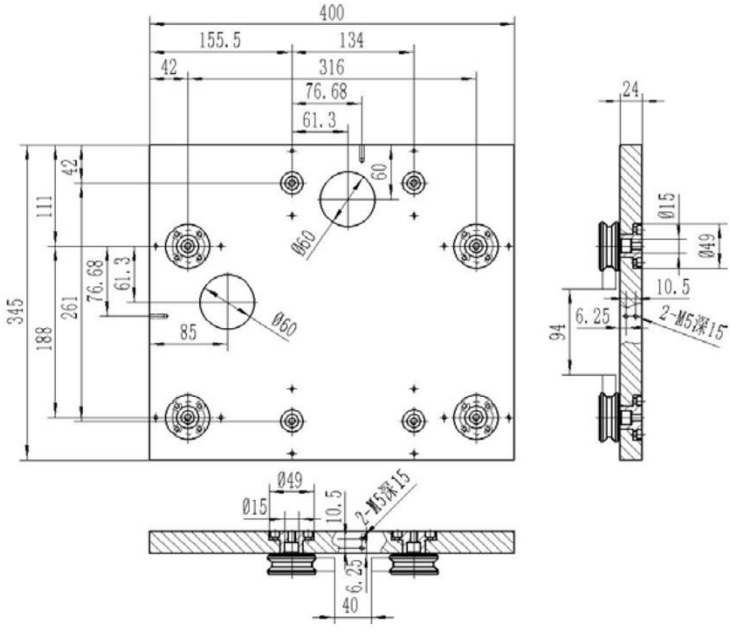

| 型号 Code | 材料 Mat. | 质量m (Kg) |
|---|---|---|
| DP15-1 | 5083 | 4.1 |





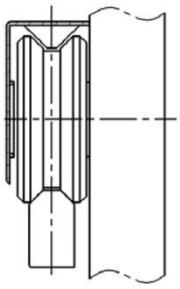

| 型号 Code | 材料 Mat. | 质量m (Kg) |
|---|---|---|
| DP15-2 | 5083 | 3.9 |

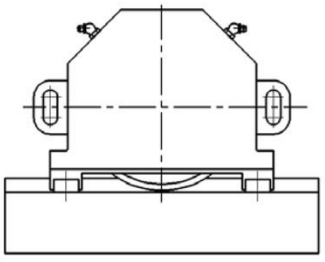




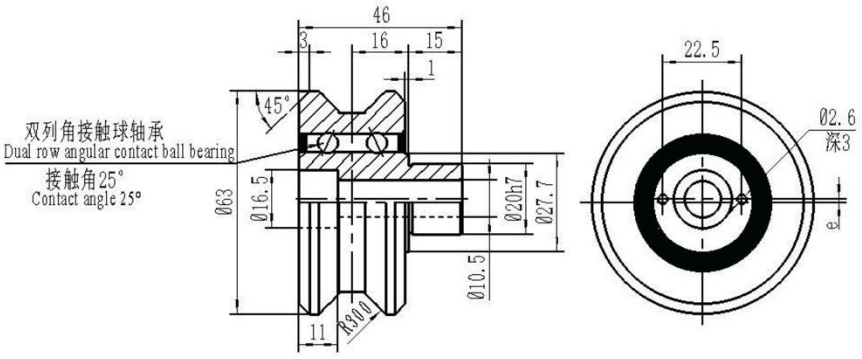

| 型号 Code | 材料 Mat. | 质量m (Kg) |
|---|---|---|
| DP15-3 | 5083 | 7.9 |

### 3.5.1 20型V型滚轮、法兰、防护盒
**Size 20 Roller for guideway V bars; Mounting flange; Wiper & lubrication unit**





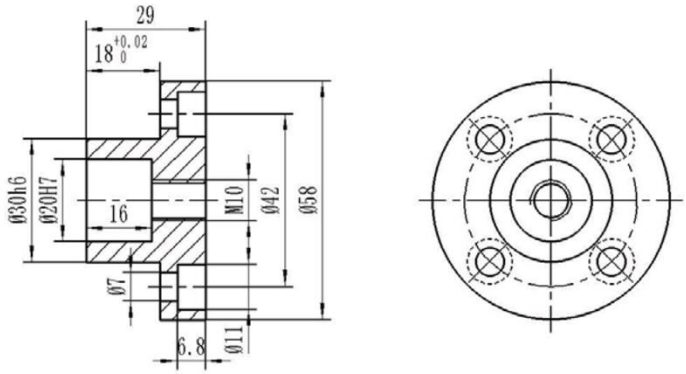





V型滚轮
Roller for guideway V bars

| 型号 Code | 偏心量 Excenter | 游隙Ga (μm) | 材料 Mat. | 质量m (Kg) | 载荷Load capacity | | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|---|
| | | | | | $C_{OW}$(N) | $N_{max}$($min^{-1}$) | |
| VR20E | 1mm | -3/+5 | GCr15 | 0.5 | 8600 | 7000 | M10×50 8.8级 |
| VR20 | 0 | -3/+5 | GCr15 | 0.5 | 8600 | 7000 | M10×50 8.8级 |

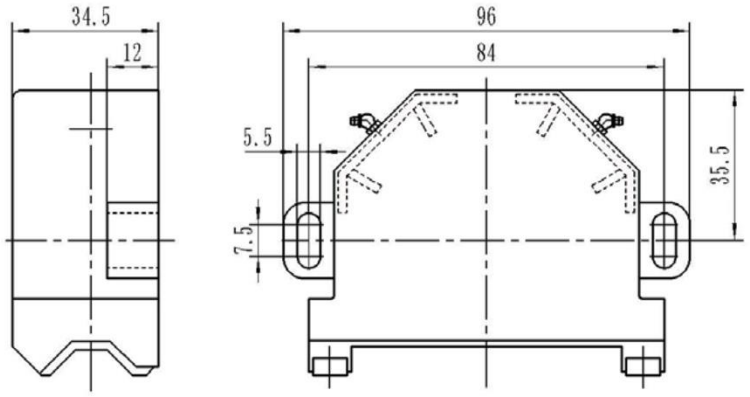





法兰
Mounting flange

| 型号 Code | 材料 Mat. | 质量m (Kg) | 螺栓型号 bolt size |
|---|---|---|---|
| FL20 | C45 | 0.25 | M6×16 8.8级 |

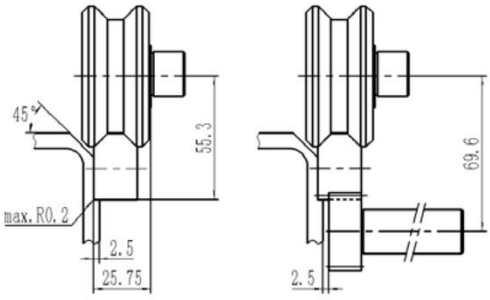


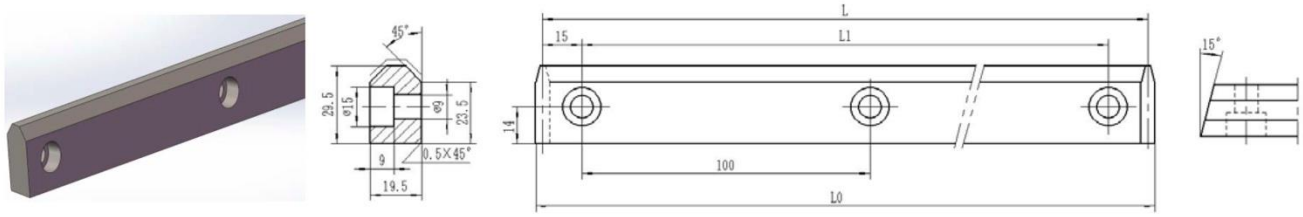



防护盒
Wiper & lubrication unit

| 型号 Code | 材料 Mat. | 质量m (Kg) | 螺栓型号 bolt size |
|---|---|---|---|
| VWL20 | 301 | 0.1 | M5×20 8.8级 |

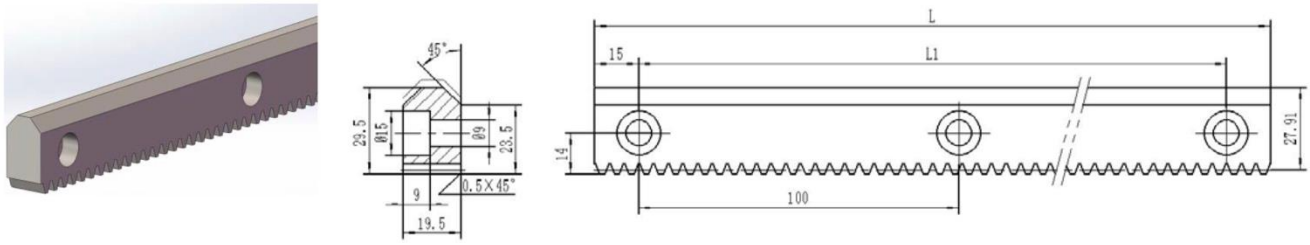
### 3.5.2 20型V型导轨、齿条、齿轮
**Size 20 Guideway V bar; Guideway V bar rack; Pinion**




V型导轨
Guideway V bar

| 型号 Code | L | L0 | L1 | 材料 Mat. | 质量m (Kg) | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|
| VB20 | 1030 | 1035.23 | 1000 | 42CrMo | 4.0 | M8×20 8.8级 |
| VB20 | 630 | 635.23 | 600 | 42CrMo | 2.5 | M8×20 8.8级 |
| VB20 | 330 | 335.23 | 300 | 42CrMo | 1.3 | M8×20 8.8级 |




V型导轨齿条
Guideway V bar rack

| 型号 Code | L | L1 | 模数 Module | 齿距P | 材料 Mat. | 质量m (Kg) | 精度等级Quality | 加工方法 Cutting method |
|---|---|---|---|---|---|---|---|---|
| VBR20 | 1030 | 1000 | 1.5915 | 5.0 | 42CrMo | 3.9 | DIN8e27 | 铣削Q+T precision cut |
| VBR20 | 630 | 600 | 1.5915 | 5.0 | 42CrMo | 2.4 | DIN8e27 | 铣削Q+T precision cut |
| VBR20 | 330 | 300 | 1.5915 | 5.0 | 42CrMo | 1.25 | DIN8e27 | 铣削Q+T precision cut |
| VBR20G | 1030 | 1000 | 1.5915 | 5.0 | 42CrMo | 3.9 | DIN6h25 | 磨削 hardened & ground |
| VBR20G | 630 | 600 | 1.5915 | 5.0 | 42CrMo | 2.4 | DIN6h25 | 磨削 hardened & ground |
| VBR20G | 330 | 300 | 1.5915 | 5.0 | 42CrMo | 1.25 | DIN6h25 | 磨削 hardened & ground |



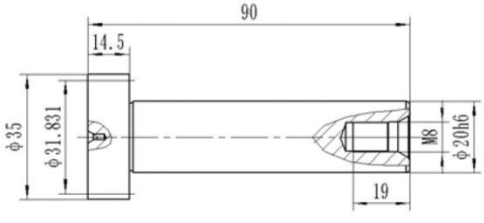


图1 Fig.1

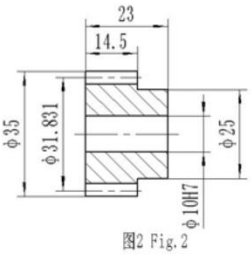
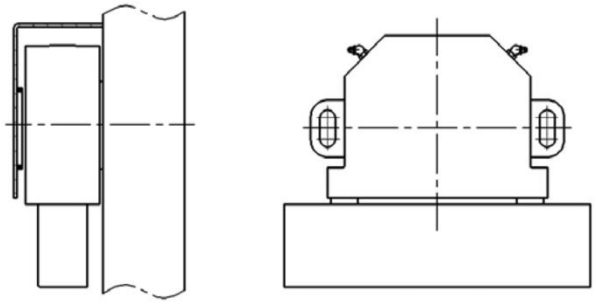


图2 Fig.2

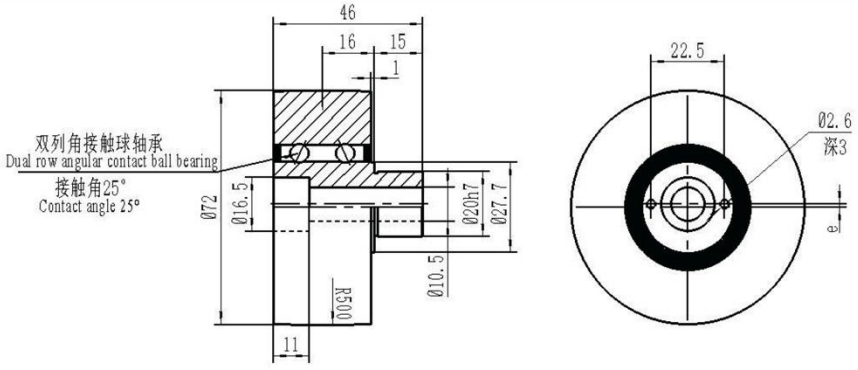
齿轮
Drive pinion

| 型号 Code | 齿数 Z | 模数 Module | 齿距 P | 图 Fig. | 材料 Mat. | 质量m (Kg) | 精度等级 Quality | 最大驱动力 Max.drive force |
|---|---|---|---|---|---|---|---|---|
| PS20 | 20 | 1.5915 | 5.0 | 1 | 20CrMnTi | 0.3 | DIN6e25 | 4kN |
| P20 | 20 | 1.5915 | 5.0 | 2 | 20CrMnTi | 0.1 | DIN6e25 | 4kN |

### 3.5.3 20型平滚轮、法兰、防护盒
**Size 20 Plain roller; Mounting flange; Wiper & lubrication unit**



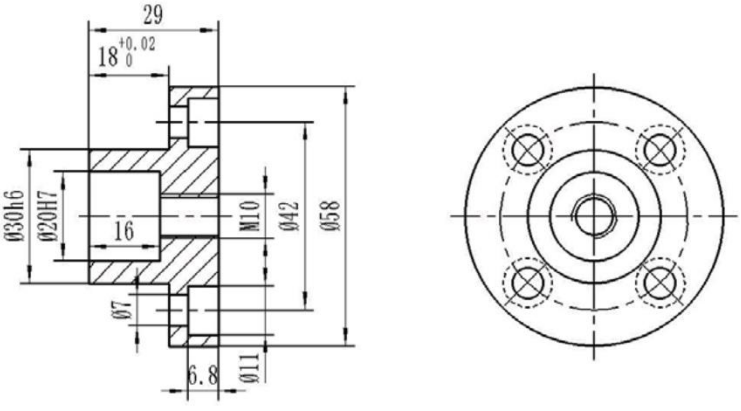





平滚轮
Plain roller

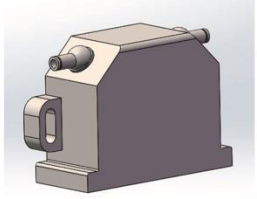
| 型号 Code | 偏心量 Excenter | 游隙Ga (μm) | 材料 Mat. | 质量m (Kg) | 载荷Load capacity | | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|---|
| | | | | | $C_{OW}$(N) | $N_{max}$($min^{-1}$) | |
| PR20E | 1mm | -3/+5 | GCr15 | 0.7 | 8600 | 7000 | M10×50 8.8级 |
| PR20 | 0 | -3/+5 | GCr15 | 0.7 | 8600 | 7000 | M10×50 8.8级 |

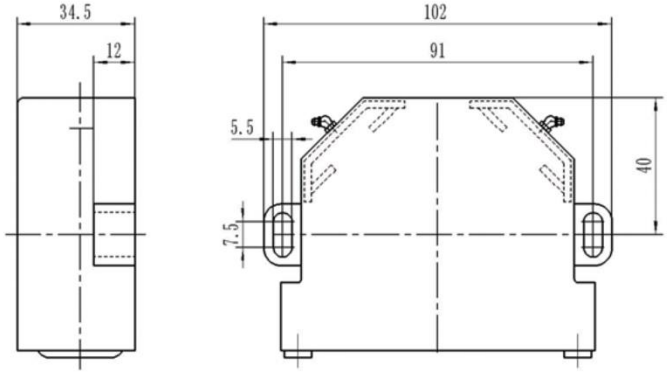





法兰
Mounting flange

| 型号 Code | 材料 Mat. | 质量m (Kg) | 螺栓型号 bolt size |
|---|---|---|---|
| FL20 | C45 | 0.25 | M6×16 8.8级 |

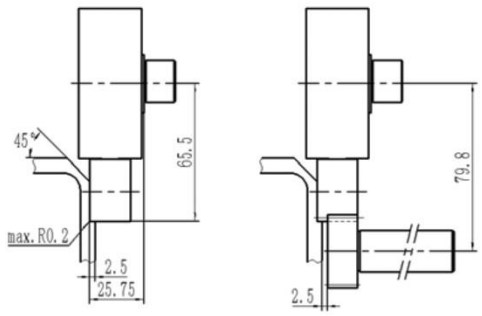


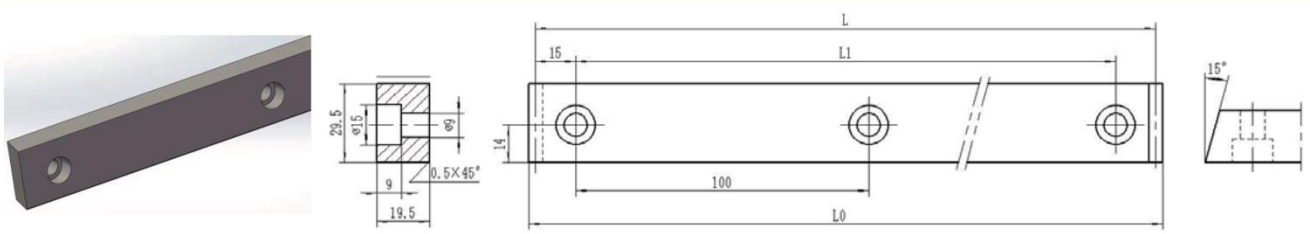



防护盒
Wiper & lubrication unit

| 型号 Code | 材料 Mat. | 质量m (Kg) | 螺栓型号 bolt size |
|---|---|---|---|
| PWL20 | 301 | 0.1 | M5×20 8.8级 |

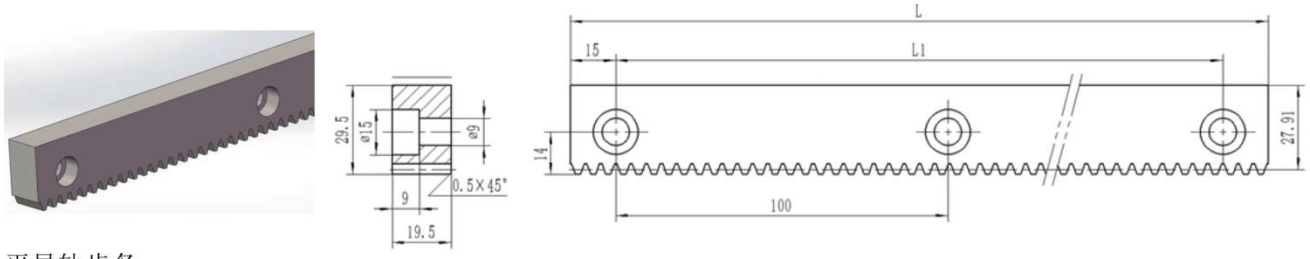
### 3.5.4 20型平导轨、齿条、齿轮
**Size 20 Guideway flat rail; Guideway flat rail rack; Pinion**




平导轨
Guideway flat rail

| 型号 Code | L | L0 | L1 | 材料 Mat. | 质量m (Kg) | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|
| PB20 | 1030 | 1035.23 | 1000 | 42CrMo | 4.4 | M8×20 8.8级 |
| PB20 | 630 | 635.23 | 600 | 42CrMo | 2.7 | M8×20 8.8级 |
| PB20 | 330 | 335.23 | 300 | 42CrMo | 1.5 | M8×20 8.8级 |




平导轨齿条
Guideway flat rail rack

| 型号 Code | L | L1 | 模数(m) | 齿距(P) | 材料 Mat. | 质量m (Kg) | 精度等级 Quality | 加工方法 Cutting method |
|---|---|---|---|---|---|---|---|---|
| PBR20 | 1030 | 1000 | 1.5915 | 5.0 | 42CrMo | 4.2 | DIN8e27 | 铣削Q+T precision cut |
| PBR20 | 630 | 600 | 1.5915 | 5.0 | 42CrMo | 2.6 | DIN8e27 | 铣削Q+T precision cut |
| PBR20 | 330 | 300 | 1.5915 | 5.0 | 42CrMo | 1.35 | DIN8e27 | 铣削Q+T precision cut |
| PBR20G | 1030 | 1000 | 1.5915 | 5.0 | 42CrMo | 4.2 | DIN6h25 | 磨削 hardened & ground |
| PBR20G | 630 | 600 | 1.5915 | 5.0 | 42CrMo | 2.6 | DIN6h25 | 磨削 hardened & ground |
| PBR20G | 330 | 300 | 1.5915 | 5.0 | 42CrMo | 1.35 | DIN6h25 | 磨削 hardened & ground |



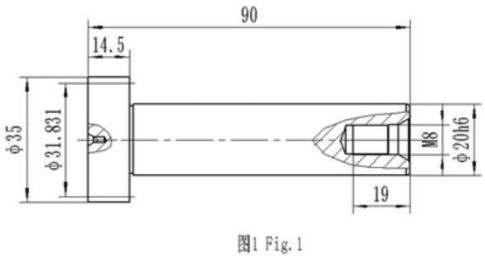


图1 Fig.1

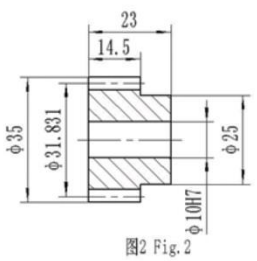
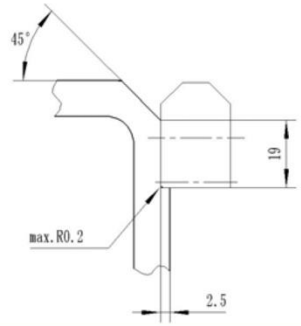


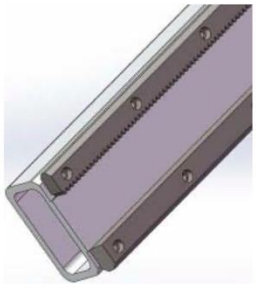
图2 Fig.2

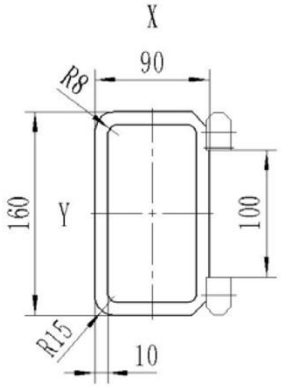
齿轮
Drive pinion

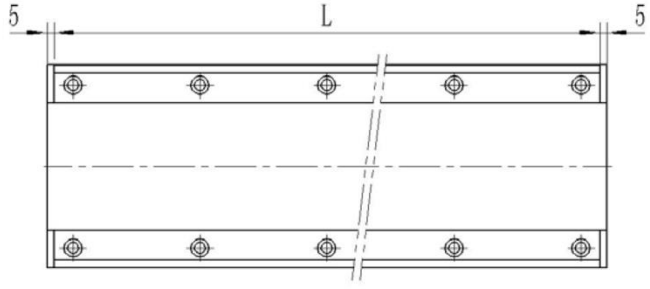
| 型号 Code | 齿数 Z | 模数 Module | 齿距 P | 图 Fig. | 材料 Mat. | 质量m (Kg) | 精度等级 Quality | 最大驱动力 Max.drive force |
|---|---|---|---|---|---|---|---|---|
| PS20 | 20 | 1.5915 | 5.0 | 1 | 20CrMnTi | 0.3 | 6e25 | 4kN |
| P20 | 20 | 1.5915 | 5.0 | 2 | 20CrMnTi | 0.1 | 6e25 | 4kN |

### 3.5.5 20型钢型材
**Size 20 Tubular steel profile with guideways**

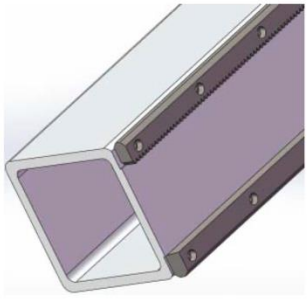


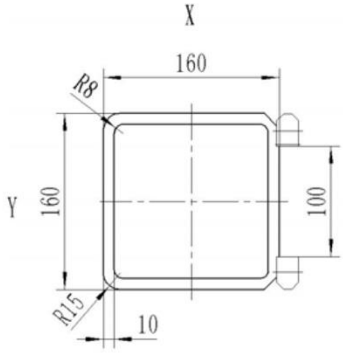



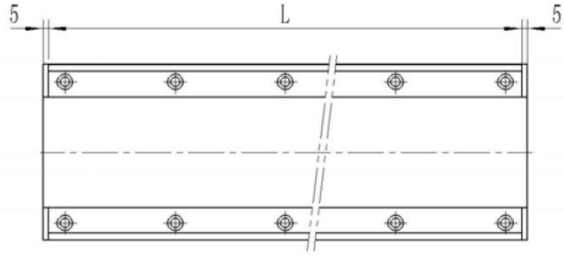



| 型号 Code | 材料 Mat. | m①(Kg/m) | m②(Kg/m) | $L_x$①($cm^4$) | $L_x$②($cm^4$) | $L_y$①($cm^4$) | $L_y$②($cm^4$) | $L_z$($cm^4$) |
|---|---|---|---|---|---|---|---|---|
| SP160/90 | Q345 | 34.1 | 43.1 | 524 | 737 | 1310 | 1710 | 1280 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

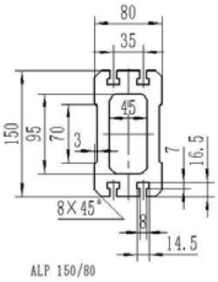


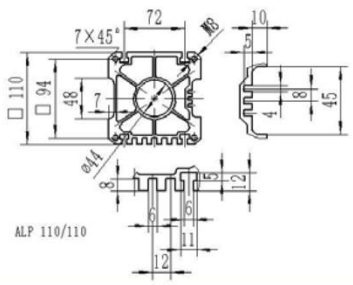


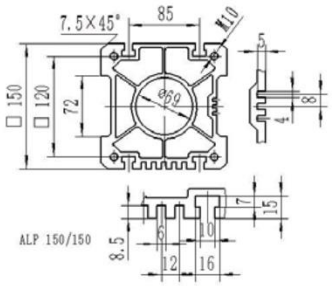




| 型号 Code | 材料 Mat. | m①(Kg/m) | m②(Kg/m) | $L_x$①($cm^4$) | $L_x$②($cm^4$) | $L_y$①($cm^4$) | $L_y$②($cm^4$) | $L_z$($cm^4$) |
|---|---|---|---|---|---|---|---|---|
| SP160/160 | Q345 | 45.1 | 54.1 | 2100 | 2690 | 2100 | 2460 | 3470 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

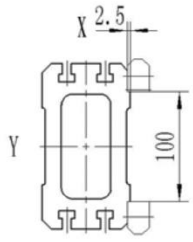
### 3.5.6 20型铝型材
### Size 20 Tubular alu profiles with guideways

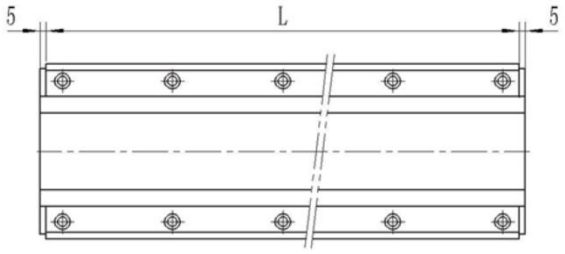


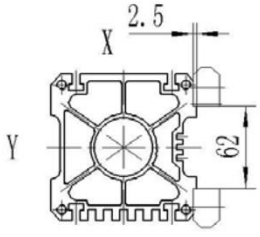


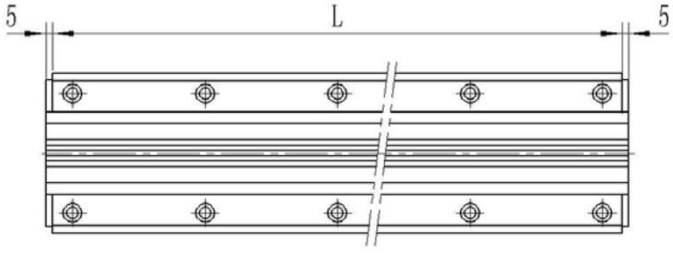




| 型号 Code | 材料 Mat. | $m^{①}$(Kg/m) | $m^{②}$(Kg/m) | $L_x^{①}$($cm^4$) | $L_x^{②}$($cm^4$) | $L_y^{①}$($cm^4$) | $L_y^{②}$($cm^4$) | $L_z$($cm^4$) |
|---|---|---|---|---|---|---|---|---|
| ALP150/80 | 6063 | 17.7 | 26.7 | 469 | 660 | 1550 | 1880 | 626 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

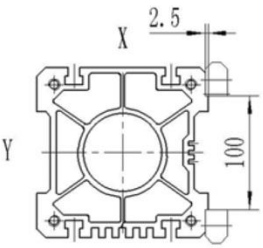


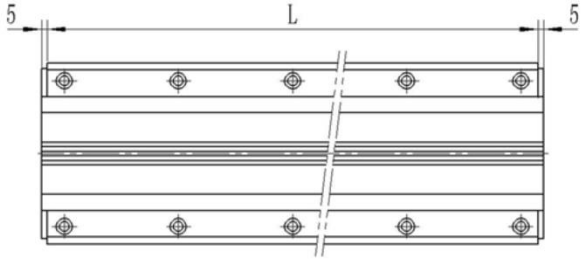



| 型号 Code | 材料 Mat. | $m^{①}$(Kg/m) | $m^{②}$(Kg/m) | $L_x^{①}$($cm^4$) | $L_x^{②}$($cm^4$) | $L_y^{①}$($cm^4$) | $L_y^{②}$($cm^4$) | $L_z$($cm^4$) |
|---|---|---|---|---|---|---|---|---|
| ALP110/110 | 6063 | 12.3 | 21.3 | 606 | 922 | 609 | 763 | 341 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

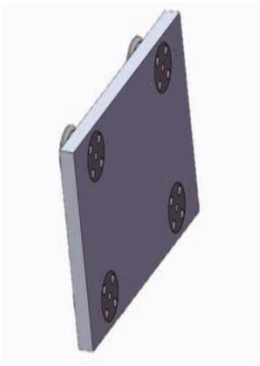


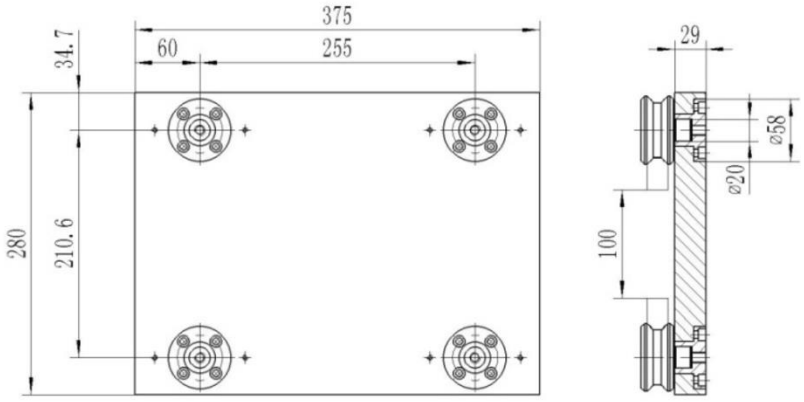


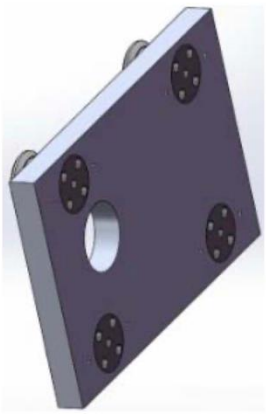

| 型号 Code | 材料 Mat. | $m^{①}$(Kg/m) | $m^{②}$(Kg/m) | $L_x^{①}$($cm^4$) | $L_x^{②}$($cm^4$) | $L_y^{①}$($cm^4$) | $L_y^{②}$($cm^4$) | $L_z$($cm^4$) |
|---|---|---|---|---|---|---|---|---|
| ALP150/150 | 6063 | 23 | 32 | 2080 | 2640 | 2270 | 2560 | 1250 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

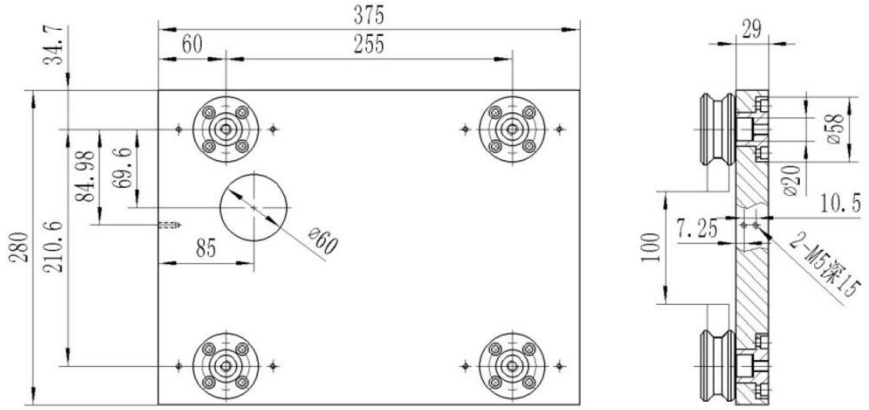
### 3.5.7 20型传动板
### Size 20 Drive plate



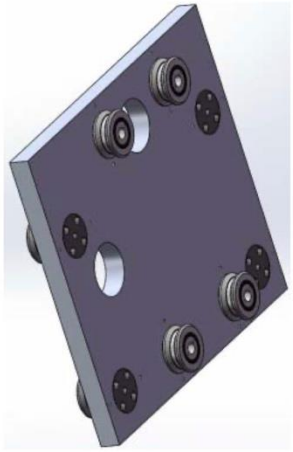


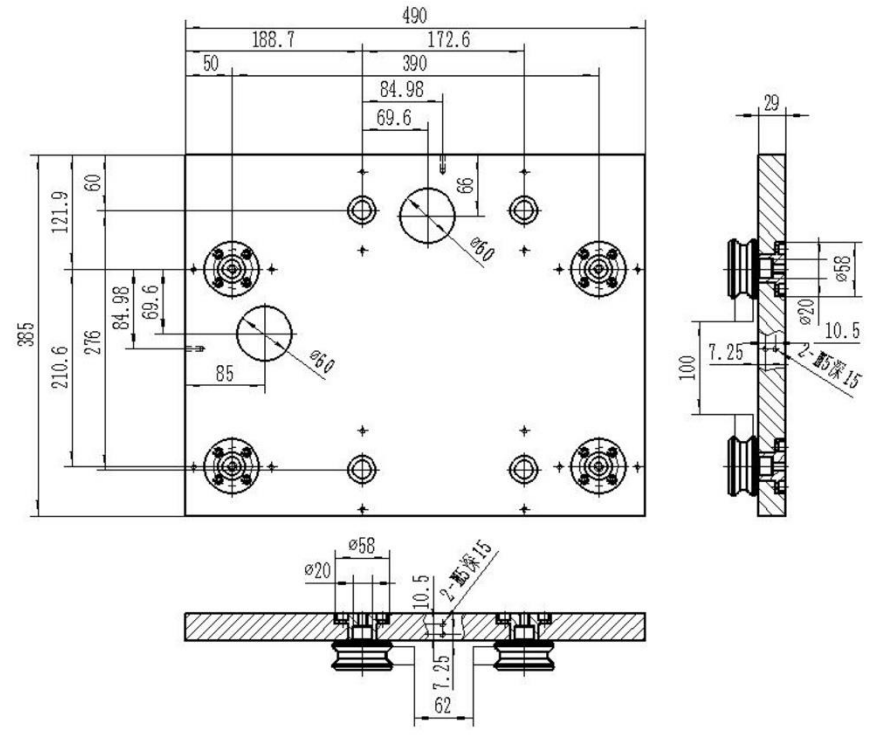

| 型号 Code | 材料 Mat. | 质量m (Kg) |
|---|---|---|
| DP20-1 | 5083 | 8.3 |





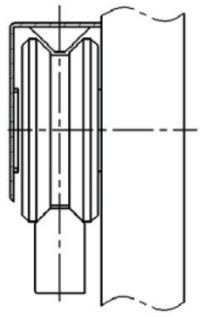

| 型号 Code | 材料 Mat. | 质量m (Kg) |
|---|---|---|
| DP20-2 | 5083 | 8.0 |

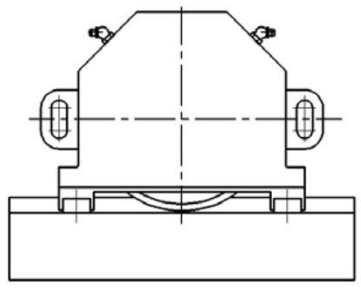




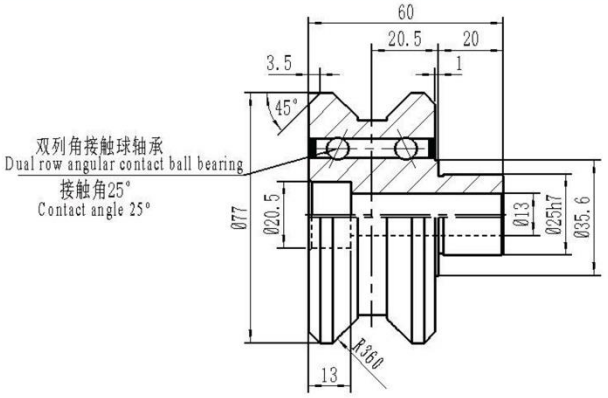

| 型号 Code | 材料 Mat. | 质量m (Kg) |
|---|---|---|
| DP20-3 | 5083 | 12.0 |

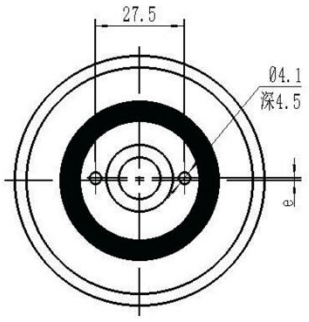
### 3.6.1 25型 V型滚轮、法兰、防护盒
**Size 25 Roller for guideway V bars; Mounting flange; Wiper & lubrication unit**







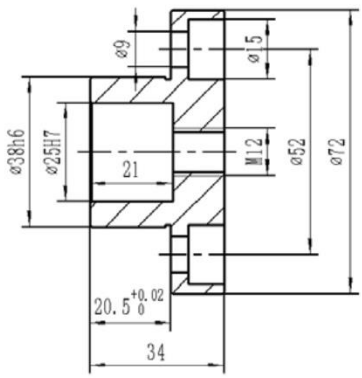


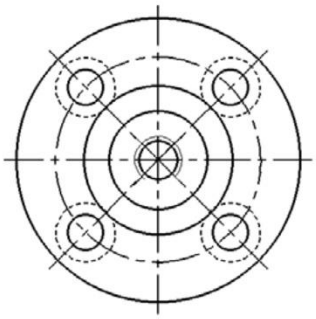




V型滚轮
Roller for guideway V bars

| 型号 Code | 偏心量 Excenter | 游隙Ga (μm) | 材料 Mat. | 质量m (Kg) | 载荷Load capacity | | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|---|
| | | | | | $C_{OW}$(N) | $N_{max}$(min$^{-1}$) | |
| VR25E | 1mm | -3/+5 | GCr15 | 1.1 | 13500 | 5600 | M12×60 8.8级 |
| VR25 | 0 | -3/+5 | GCr15 | 1.1 | 13500 | 5600 | M12×60 8.8级 |



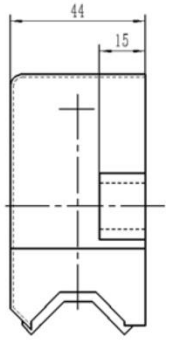


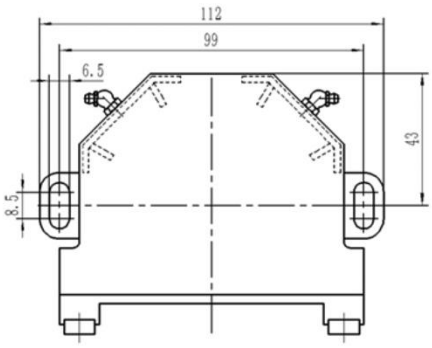



法兰
Mounting flange

| 型号 Code | 材料 Mat. | 质量m (Kg) | 螺栓型号 bolt size |
|---|---|---|---|
| FL25 | C45 | 0.5 | M8×20 8.8级 |



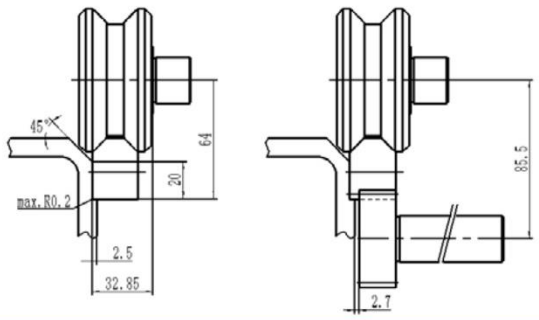


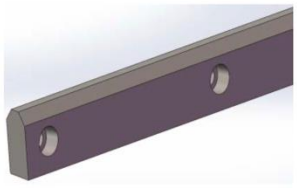



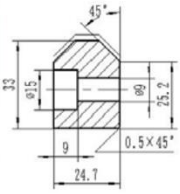

防护盒
Wiper & lubrication unit

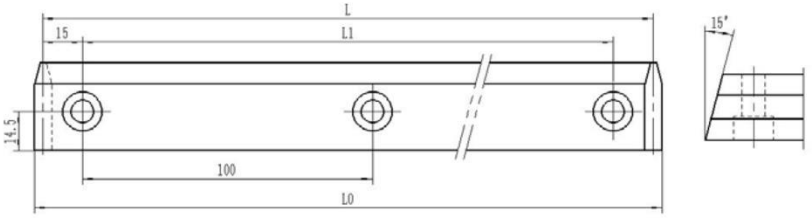
| 型号 Code | 材料 Mat. | 质量m (Kg) | 螺栓型号 bolt size |
|---|---|---|---|
| VWL25 | 301 | 0.1 | M6×25 8.8级 |

### 3.6.2 25型V型导轨、齿条
**Size 25 Guideway V bar; Guideway V bar rack; Pinion**



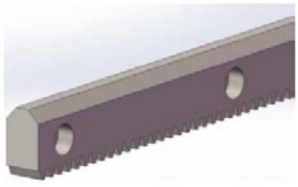



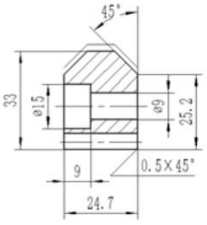


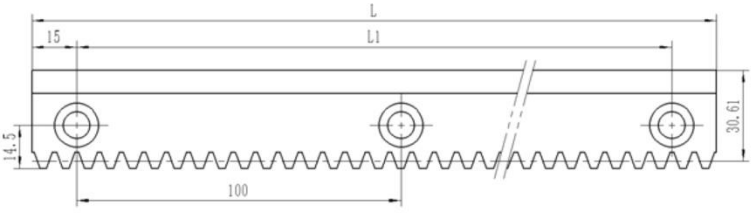




V型导轨
Guideway V bar

| 型号 Code | L | L0 | L1 | 材料 Mat. | 质量m (Kg) | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|
| VB25 | 1230 | 1236.62 | 1200 | 42CrMo | 7.0 | M8×25 8.8级 |
| VB25 | 930 | 936.62 | 900 | 42CrMo | 5.3 | M8×25 8.8级 |
| VB25 | 630 | 636.62 | 600 | 42CrMo | 3.6 | M8×25 8.8级 |
| VB25 | 330 | 336.62 | 300 | 42CrMo | 1.9 | M8×25 8.8级 |






V型导轨齿条
Guideway V bar rack

| 型号 Code | L | L1 | 模数 Module | 齿距P | 材料 Mat. | 质量m (Kg) | 精度等级 Quality | 加工方法 Cutting method |
|---|---|---|---|---|---|---|---|---|
| VBR25 | 1230 | 1200 | 2.3873 | 7.5 | 42CrMo | 6.4 | DIN8e27 | 铣削Q+T precision cut |
| VBR25 | 930 | 900 | 2.3873 | 7.5 | 42CrMo | 4.85 | DIN8e27 | 铣削Q+T precision cut |
| VBR25 | 630 | 600 | 2.3873 | 7.5 | 42CrMo | 3.25 | DIN8e27 | 铣削Q+T precision cut |
| VBR25 | 330 | 300 | 2.3873 | 7.5 | 42CrMo | 1.7 | DIN8e27 | 铣削Q+T precision cut |
| VBR25G | 1230 | 1200 | 2.3873 | 7.5 | 42CrMo | 6.4 | DIN6h25 | 磨削 hardened & ground |
| VBR25G | 930 | 900 | 2.3873 | 7.5 | 42CrMo | 4.85 | DIN6h25 | 磨削 hardened & ground |
| VBR25G | 630 | 600 | 2.3873 | 7.5 | 42CrMo | 3.25 | DIN6h25 | 磨削 hardened & ground |
| VBR25G | 330 | 300 | 2.3873 | 7.5 | 42CrMo | 1.7 | DIN6h25 | 磨削 hardened & ground |



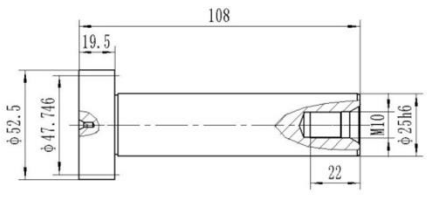


图1 Fig.1

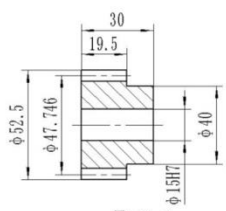
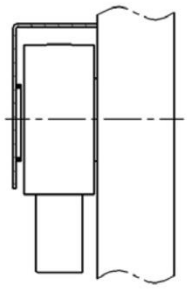


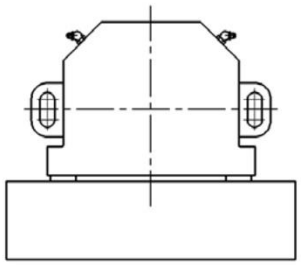
图2 Fig.2

齿轮
Drive pinion

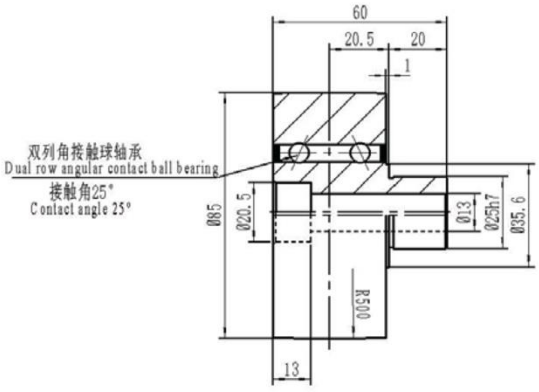
| 型号 Code | 齿数 Z | 模数 Module | 齿距 P | 图 Fig. | 材料 Mat. | 质量m (Kg) | 精度等级 Quality | 最大驱动力 Max.drive force |
|---|---|---|---|---|---|---|---|---|
| PS25 | 20 | 2.3873 | 7.5 | 1 | 20CrMnTi | 0.6 | DIN6e25 | 3kN |
| P25 | 20 | 2.3873 | 7.5 | 2 | 20CrMnTi | 0.35 | DIN6e25 | 4kN |

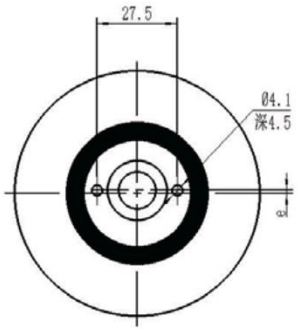
### 3.6.3 25型平滚轮、法兰、防护盒
**Size 25 Plain roller; Mounting flange; Wiper & lubrication unit**







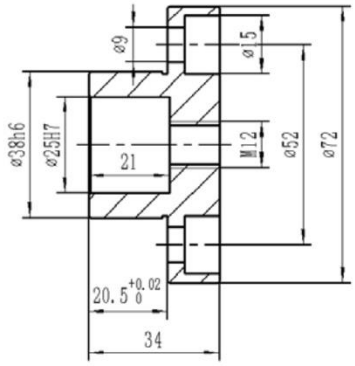


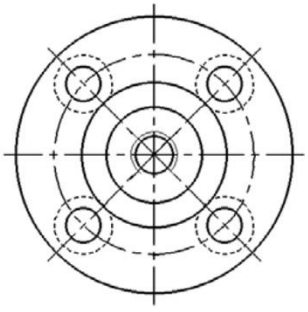




平滚轮
Plain roller

| 型号 Code | 偏心量 Excenter | 游隙Ga (μm) | 材料 Mat. | 质量m (Kg) | 载荷Load capacity | | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|---|
| | | | | | $C_{OW}$(N) | $N_{max}$(min$^{-1}$) | |
| PR25E | 1mm | -3/+5 | GCr15 | 1.1 | 13500 | 5600 | M12×60 8.8级 |
| PR25 | 0 | -3/+5 | GCr15 | 1.1 | 13500 | 5600 | M12×60 8.8级 |

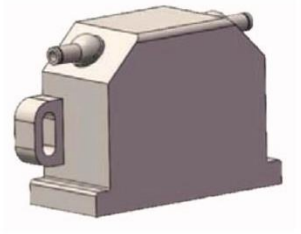


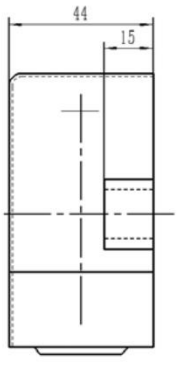


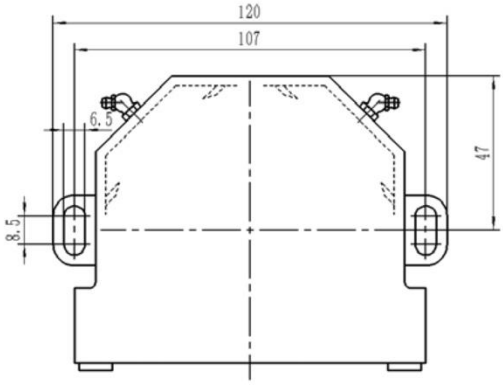



法兰
Mounting flange

| 型号 Code | 材料 Mat. | 质量m (Kg) | 螺栓型号 bolt size |
|---|---|---|---|
| FL25 | C45 | 0.5 | M8×20 8.8级 |



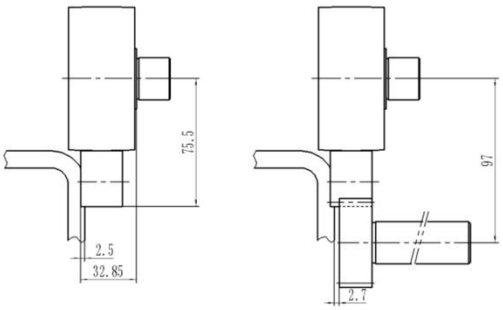


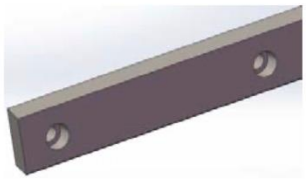



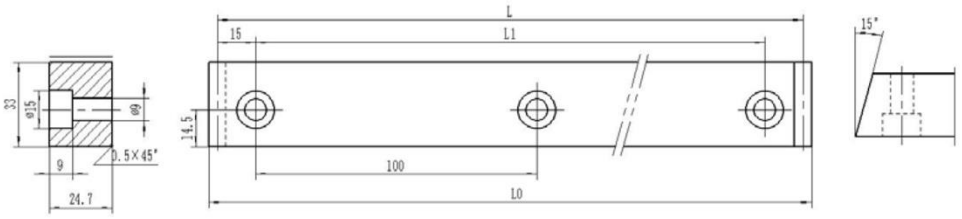

防护盒
Wiper & lubrication unit

| 型号 Code | 材料 Mat. | 质量m (Kg) | 螺栓型号 bolt size |
|---|---|---|---|
| PWL25 | 301 | 0.1 | M6×25 8.8级 |

### 3.6.4 25型平导轨、齿条、齿轮
**Size 25 Guideway flat rail; Guideway flat rail rack; Pinion**

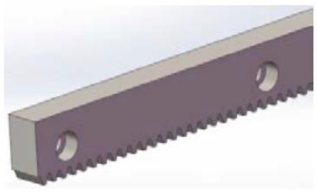


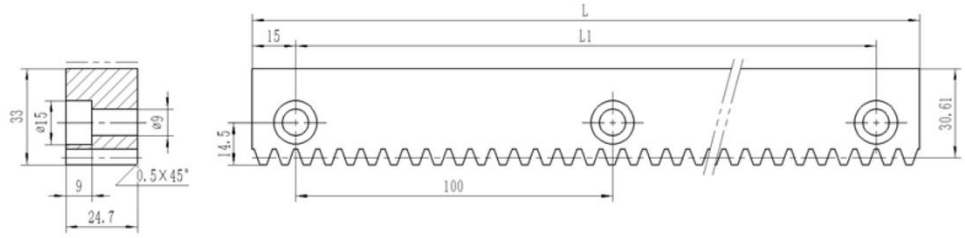






平导轨
Guideway flat rail

| 型号 Code | L | L0 | L1 | 材料 Mat. | 质量m (Kg) | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|
| PB25 | 1230 | 1236.62 | 1200 | 42CrMo | 7.6 | M8×25 8.8级 |
| PB25 | 930 | 936.62 | 900 | 42CrMo | 5.75 | M8×25 8.8级 |
| PB25 | 630 | 636.62 | 600 | 42CrMo | 3.8 | M8×25 8.8级 |
| PB25 | 330 | 336.62 | 300 | 42CrMo | 1.95 | M8×25 8.8级 |






平导轨齿条
Guideway flat rail rack

| 型号 Code | L | L1 | 模数 Module | 齿距P | 材料 Mat. | 质量m (Kg) | 精度等级 Quality | 加工方法 Cutting method |
|---|---|---|---|---|---|---|---|---|
| PBR25 | 1230 | 1200 | 2.3873 | 7.5 | 42CrMo | 7.0 | DIN8e27 | 铣削Q+T precision cut |
| PBR25 | 930 | 900 | 2.3873 | 7.5 | 42CrMo | 5.25 | DIN8e27 | 铣削Q+T precision cut |
| PBR25 | 630 | 600 | 2.3873 | 7.5 | 42CrMo | 3.6 | DIN8e27 | 铣削Q+T precision cut |
| PBR25 | 330 | 300 | 2.3873 | 7.5 | 42CrMo | 1.9 | DIN8e27 | 铣削Q+T precision cut |
| PBR25G | 1230 | 1200 | 2.3873 | 7.5 | 42CrMo | 7.0 | DIN6h25 | 磨削 hardened & ground |
| PBR25G | 930 | 900 | 2.3873 | 7.5 | 42CrMo | 5.25 | DIN6h25 | 磨削 hardened & ground |
| PBR25G | 630 | 600 | 2.3873 | 7.5 | 42CrMo | 3.6 | DIN6h25 | 磨削 hardened & ground |
| PBR25G | 330 | 300 | 2.3873 | 7.5 | 42CrMo | 1.9 | DIN6h25 | 磨削 hardened & ground |



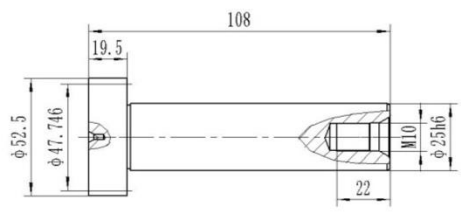


图1 Fig.1

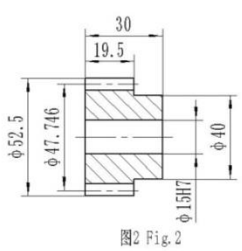
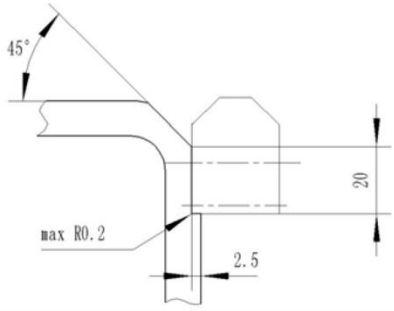


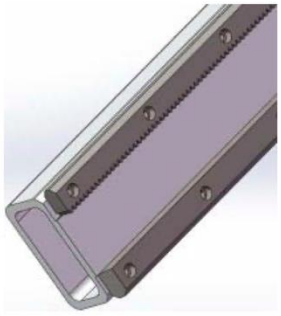
图2 Fig.2

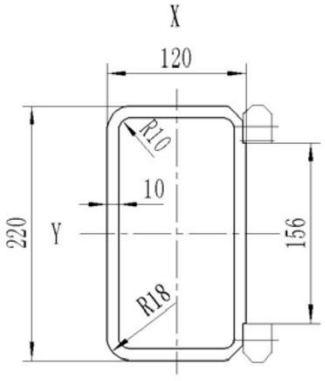
齿轮
Drive pinion

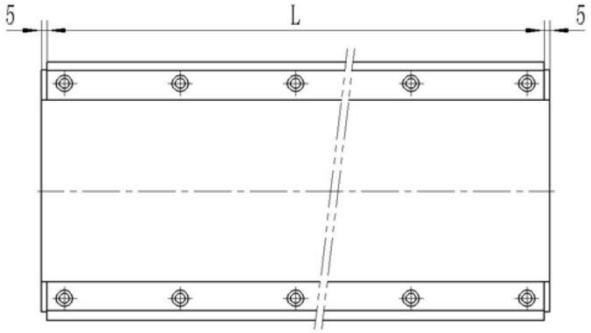
| 型号 Code | 齿数 Z | 模数 Module | 齿距 P | 图 Fig. | 材料 Mat. | 质量m (Kg) | 精度等级 Quality | 最大驱动力 Max. drive force |
|---|---|---|---|---|---|---|---|---|
| PS25 | 20 | 2.3873 | 7.5 | 1 | 20CrMnTi | 0.6 | 6e25 | 3kN |
| P25 | 20 | 2.3873 | 7.5 | 2 | 20CrMnTi | 0.35 | 6e25 | 4kN |

### 3.6.5 25型钢型材
**Size 25 Tubular steel profile with guideways**

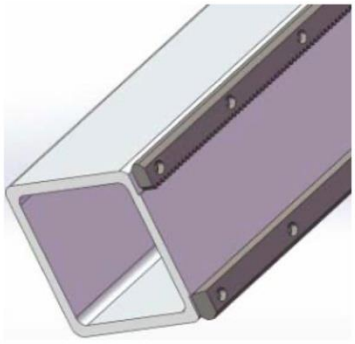


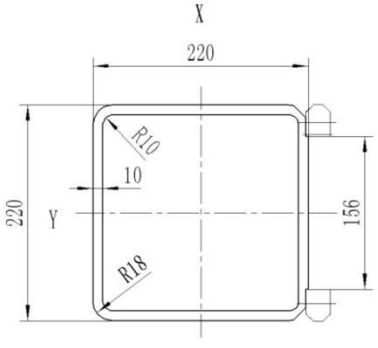



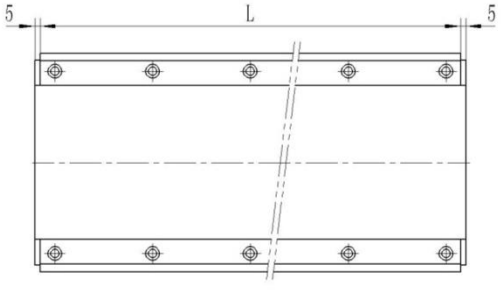



| 型号 Code | 材料 Mat. | m①(Kg/m) | m②(Kg/m) | $L_x$①($cm^4$) | $L_x$②($cm^4$) | $L_y$①($cm^4$) | $L_y$②($cm^4$) | $L_z$($cm^4$) |
|---|---|---|---|---|---|---|---|---|
| SP220/120 | Q345 | 48.2 | 61.1 | 1410 | 1940 | 3680 | 4860 | 3420 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

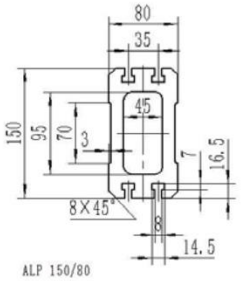


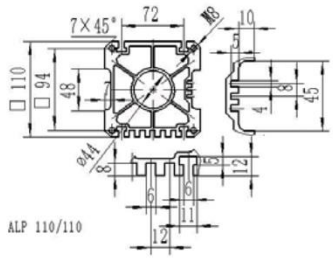


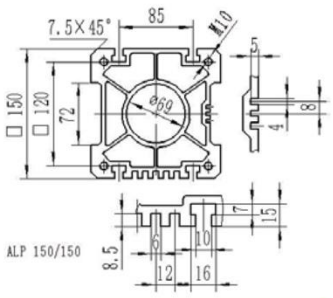




| 型号 Code | 材料 Mat. | m①(Kg/m) | m②(Kg/m) | $L_x$①($cm^4$) | $L_x$②($cm^4$) | $L_y$①($cm^4$) | $L_y$②($cm^4$) | $L_z$($cm^4$) |
|---|---|---|---|---|---|---|---|---|
| SP220/220 | Q345 | 63.9 | 76.7 | 5890 | 7450 | 5890 | 6960 | 9470 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

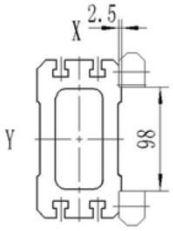
### 3.6.6 25型铝型材
### Size 25 Tubular alu profiles with guideways

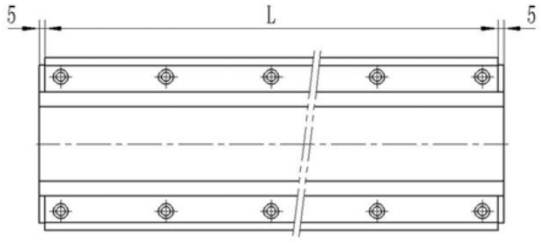


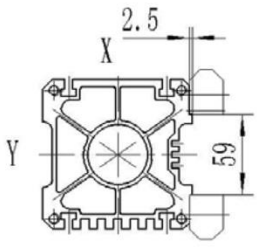


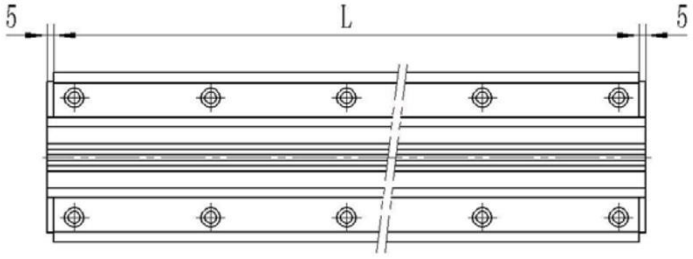




| 型号 Code | 材料 Mat. | m①(Kg/m) | m②(Kg/m) | $L_x$①($cm^4$) | $L_x$②($cm^4$) | $L_y$①($cm^4$) | $L_y$②($cm^4$) | $L_z$($cm^4$) |
|---|---|---|---|---|---|---|---|---|
| ALP150/80 | 6063 | 17.7 | 30.5 | 469 | 767 | 1550 | 2020 | 626 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

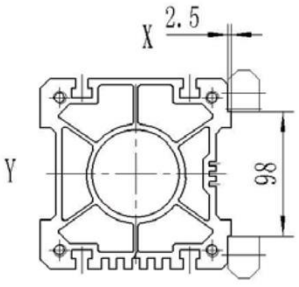


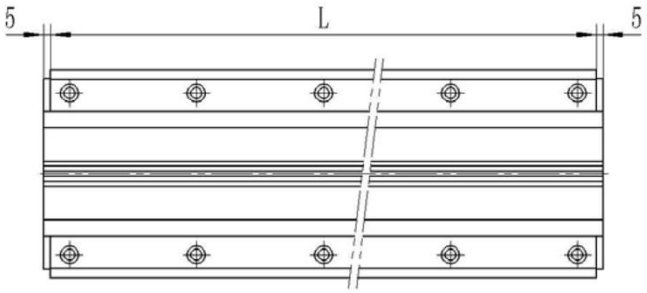



| 型号 Code | 材料 Mat. | m①(Kg/m) | m②(Kg/m) | $L_x$①($cm^4$) | $L_x$②($cm^4$) | $L_y$①($cm^4$) | $L_y$②($cm^4$) | $L_z$($cm^4$) |
|---|---|---|---|---|---|---|---|---|
| ALP110/110 | 6063 | 12.3 | 25.1 | 606 | 1070 | 609 | 822 | 341 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

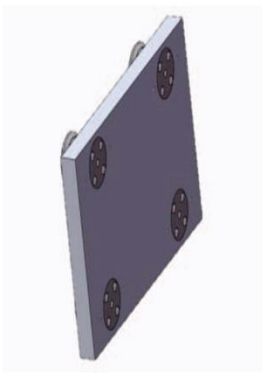


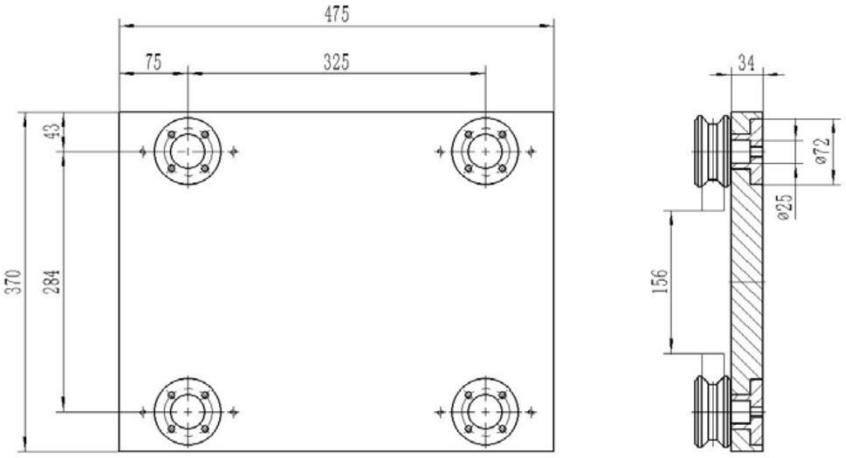


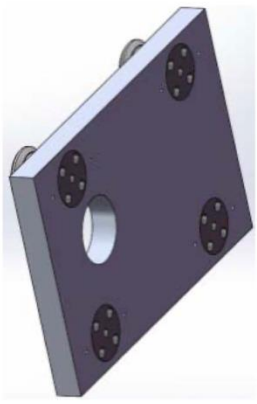

| 型号 Code | 材料 Mat. | m①(Kg/m) | m②(Kg/m) | $L_x$①($cm^4$) | $L_x$②($cm^4$) | $L_y$①($cm^4$) | $L_y$②($cm^4$) | $L_z$($cm^4$) |
|---|---|---|---|---|---|---|---|---|
| ALP150/150 | 6063 | 23 | 35.7 | 2080 | 2930 | 2270 | 2700 | 1250 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

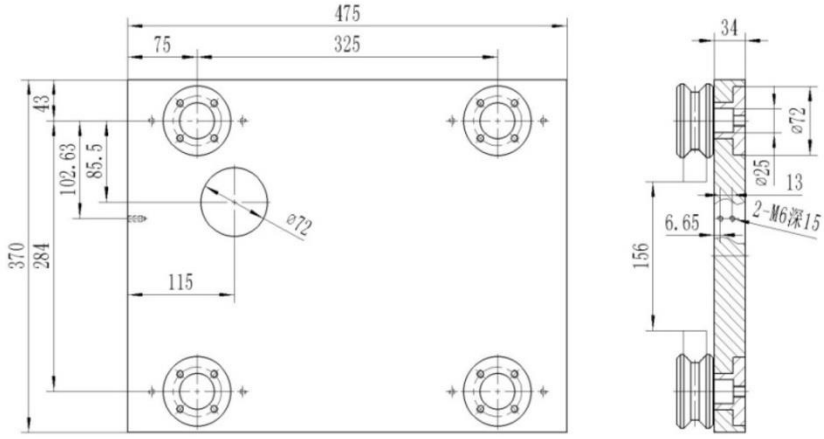
### 3.6.7 25型传动板
**Size 25 Drive plate**



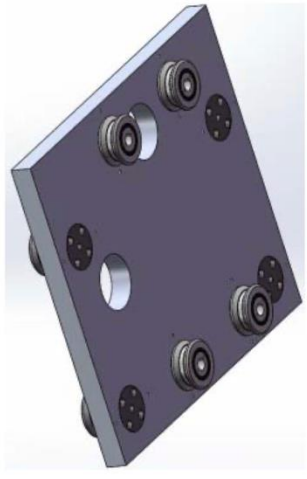


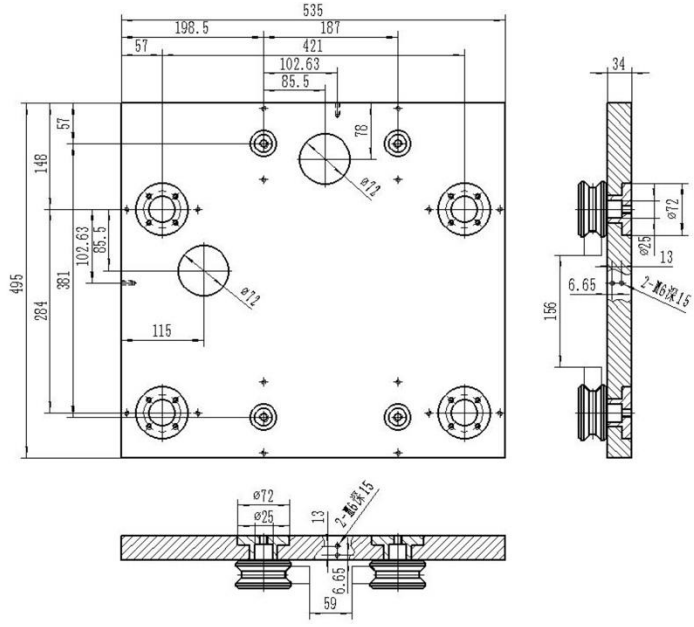

| 型号 Code | 材料 Mat. | 质量m (Kg) |
|---|---|---|
| DP25-1 | 5083 | 16.2 |





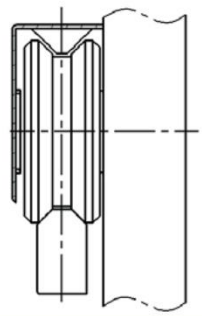

| 型号 Code | 材料 Mat. | 质量m (Kg) |
|---|---|---|
| DP25-2 | 5083 | 15.8 |

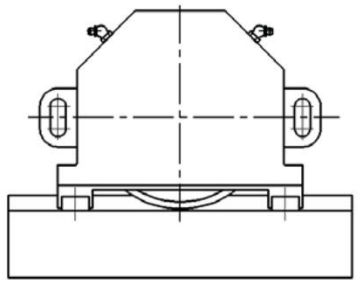




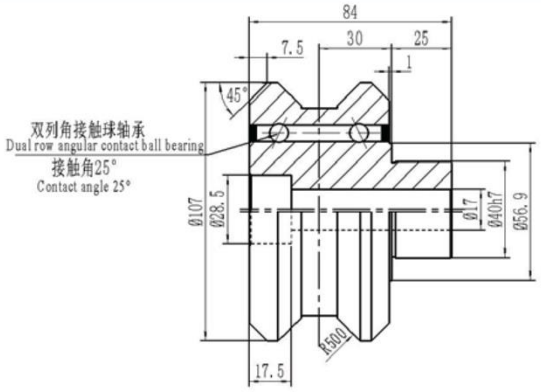

| 型号 Code | 材料 Mat. | 质量m (Kg) |
|---|---|---|
| DP25-3 | 5083 | 20.5 |

### 3.7.1 35型 V型滚轮、法兰、防护盒
**Size 35 Roller for guideway V bars; Mounting flange;Wiper & lubrication unit**









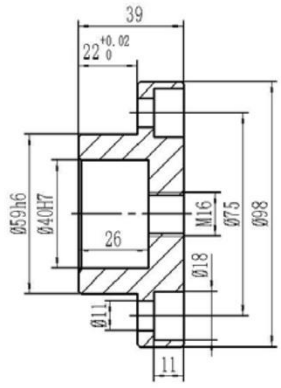


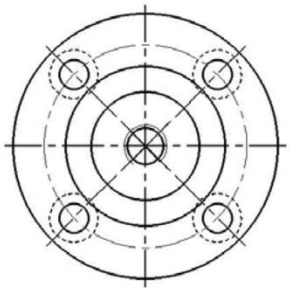


V型滚轮
Roller for guideway V bars

| 型号 Code | 偏心量 Excenter | 游隙Ga (μm) | 材料 Mat. | 质量m (Kg) | 载荷Load capacity | | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|---|
| | | | | | $C_{OW}$(N) | $N_{max}$($min^{-1}$) | |
| VR35E | 1mm | -3/+5 | GCr15 | 2.8 | 28800 | 3600 | M16×80 8.8级 |
| VR35 | 0 | -3/+5 | GCr15 | 2.8 | 28800 | 3600 | M16×80 8.8级 |



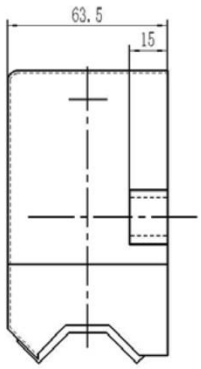


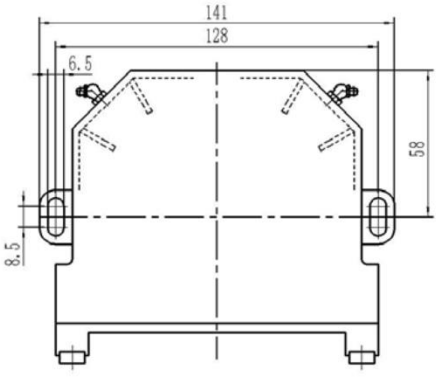



法兰
Mounting flange

| 型号 Code | 材料 Mat. | 质量m (Kg) | 螺栓型号 bolt size |
|---|---|---|---|
| FL35 | C45 | 1.1 | M10×25 8.8级 |



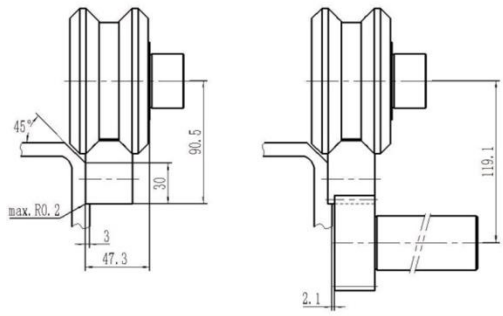


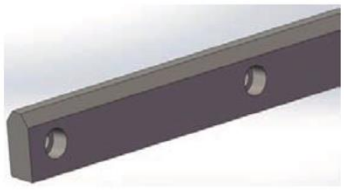



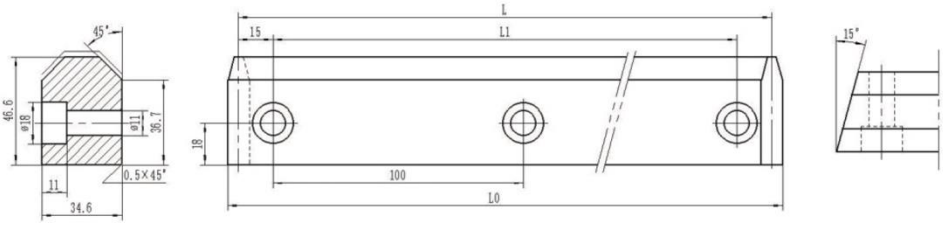

防护盒
Wiper & lubrication unit

| 型号 Code | 材料 Mat. | 质量m (Kg) | 螺栓型号 bolt size |
|---|---|---|---|
| VWL35 | 301 | 0.1 | M6×25 8.8级 |

### 3.7.2 35型 V型导轨、齿条、齿轮
### Size 35 Guideway V bar; Guideway V bar rack; Pinion

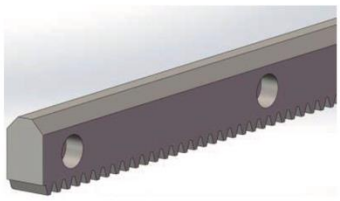


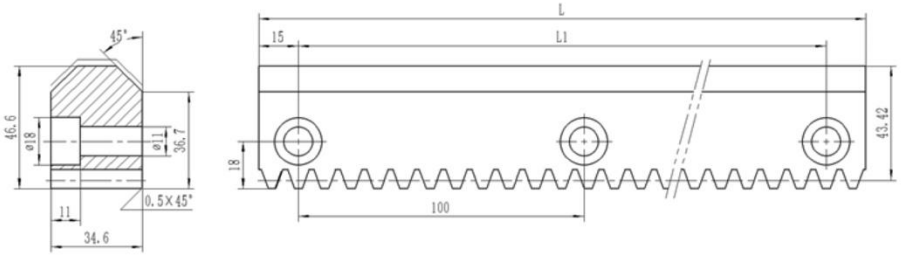






V型导轨
Guideway V bar

| 型号 Code | L | L0 | L1 | 材料 Mat. | 质量m (Kg) | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|
| VB35 | 1230 | 1239.27 | 1200 | 42CrMo | 13.9 | M10×35 8.8级 |
| VB35 | 930 | 939.27 | 900 | 42CrMo | 10.5 | M10×35 8.8级 |
| VB35 | 630 | 639.27 | 600 | 42CrMo | 7.1 | M10×35 8.8级 |
| VB35 | 330 | 339.27 | 300 | 42CrMo | 3.7 | M10×35 8.8级 |






V型导轨齿条
Guideway V bar rack

| 型号 Code | L | L1 | 模数 Module | 齿距P | 材料 Mat. | 质量m (Kg) | 精度等级 Quality | 加工方法 Cutting method |
|---|---|---|---|---|---|---|---|---|
| VBR35 | 1230 | 1200 | 3.1831 | 10.0 | 42CrMo | 13.0 | DIN8e27 | 铣削 Q+T precision cut |
| VBR35 | 930 | 900 | 3.1831 | 10.0 | 42CrMo | 9.8 | DIN8e27 | 铣削 Q+T precision cut |
| VBR35 | 630 | 600 | 3.1831 | 10.0 | 42CrMo | 6.65 | DIN8e27 | 铣削 Q+T precision cut |
| VBR35 | 330 | 300 | 3.1831 | 10.0 | 42CrMo | 3.5 | DIN8e27 | 铣削 Q+T precision cut |
| VBR35G | 1230 | 1200 | 3.1831 | 10.0 | 42CrMo | 13.0 | DIN6h25 | 磨削 hardened & ground |
| VBR35G | 930 | 900 | 3.1831 | 10.0 | 42CrMo | 9.8 | DIN6h25 | 磨削 hardened & ground |
| VBR35G | 630 | 600 | 3.1831 | 10.0 | 42CrMo | 6.65 | DIN6h25 | 磨削 hardened & ground |
| VBR35G | 330 | 300 | 3.1831 | 10.0 | 42CrMo | 3.5 | DIN6h25 | 磨削 hardened & ground |



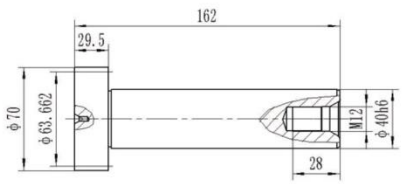


图1 Fig.1

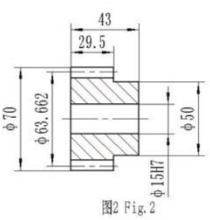
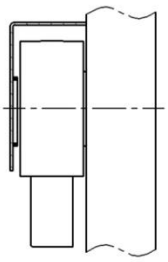


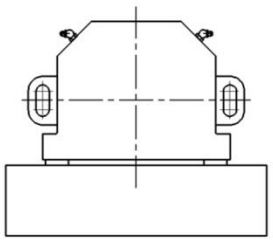
图2 Fig.2

齿轮
Drive pinion

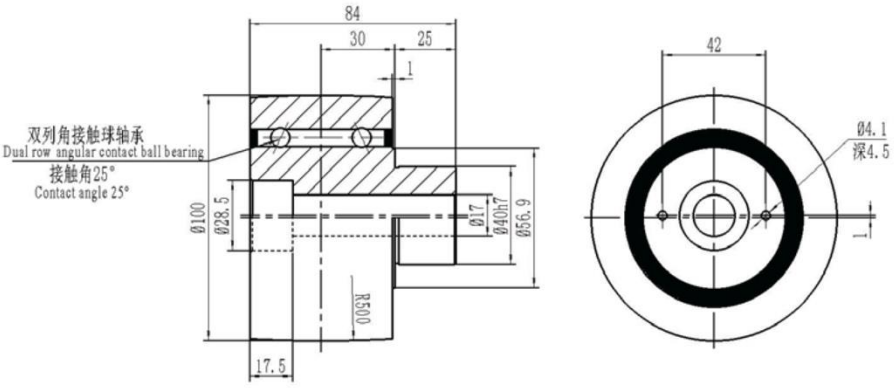
| 型号 Code | 齿数 Z | 模数 Module | 齿距 P | 图 Fig. | 材料 Mat. | 质量m (Kg) | 精度等级 Quality | 最大驱动力 Max. drive force |
|---|---|---|---|---|---|---|---|---|
| PS35 | 20 | 3.1831 | 10.0 | 1 | 20CrMnTi | 1.95 | DIN6e25 | 18.5kN |
| P35 | 20 | 3.1831 | 10.0 | 2 | 20CrMnTi | 0.9 | DIN6e25 | 18.5kN |

### 3.7.3 35型平滚轮、法兰、防护盒
**Size 35 Plain roller; Mounting flange;**
**Wiper & lubrication unit**





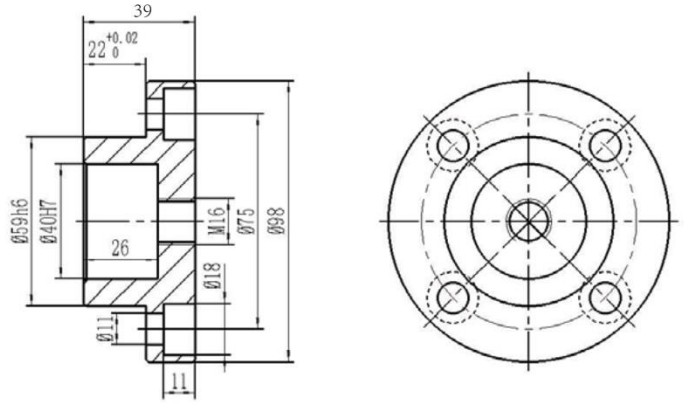





平滚轮
Plain roller

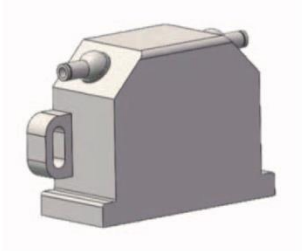
| 型号 Code | 偏心量 Excenter | 游隙Ga (μm) | 材料 Mat. | 质量m (Kg) | 载荷 Load capacity | | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|---|
| | | | | | $C_{OW}$(N) | $N_{max}$($min^{-1}$) | |
| PR35E | 1mm | -3/+5 | GCr15 | 3.0 | 28800 | 3600 | M16×80 8.8级 |
| PR35 | 0 | -3/+5 | GCr15 | 3.0 | 28800 | 3600 | M16×80 8.8级 |

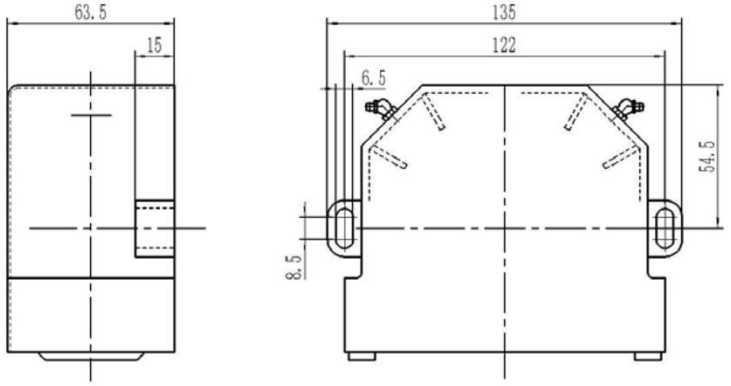





法兰
Mounting flange

| 型号 Code | 材料 Mat. | 质量m (Kg) | 螺栓型号 bolt size |
|---|---|---|---|
| FL35 | C45 | 1.1 | M10×25 8.8级 |

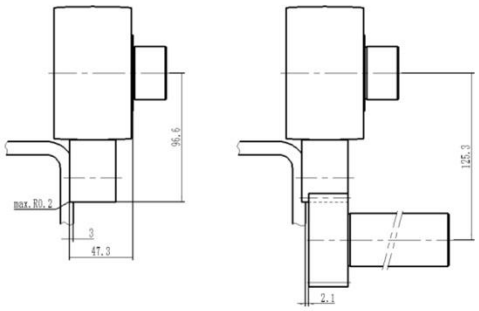


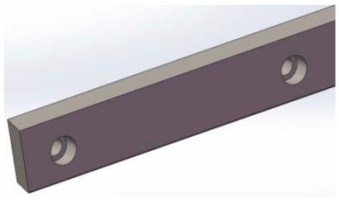


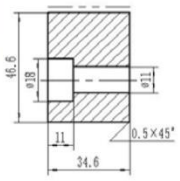

防护盒
Wiper & lubrication unit

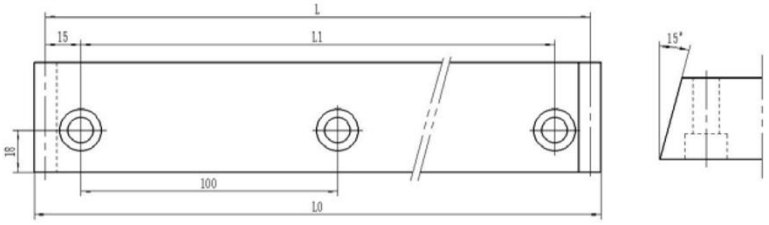
| 型号 Code | 材料 Mat. | 质量m (Kg) | 螺栓型号 bolt size |
|---|---|---|---|
| PWL35 | 301 | 0.1 | M6×25 8.8级 |

### 3.7.4 35型平导轨、齿条、齿轮
**Size 35 Guideway flat rail; Guideway flat rail rack; Pinion**



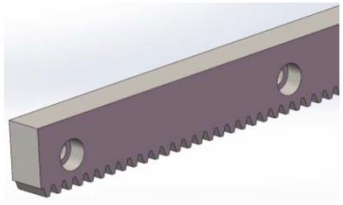



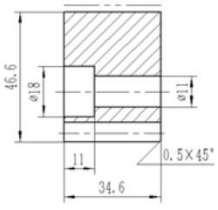


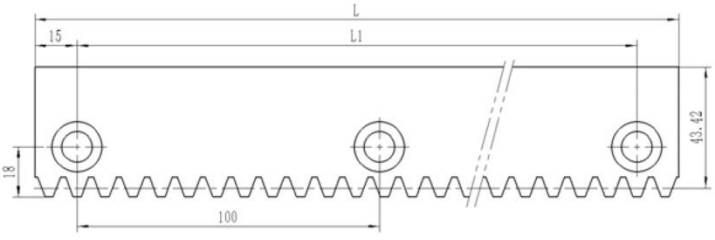




平导轨
Guideway flat rail

| 型号 Code | L | L0 | L1 | 材料 Mat. | 质量m (Kg) | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|
| PB35 | 1230 | 1239.27 | 1200 | 42CrMo | 14.9 | M10×35 8.8级 |
| PB35 | 930 | 939.27 | 900 | 42CrMo | 11.3 | M10×35 8.8级 |
| PB35 | 630 | 639.27 | 600 | 42CrMo | 7.5 | M10×35 8.8级 |
| PB35 | 330 | 339.27 | 300 | 42CrMo | 3.9 | M10×35 8.8级 |






平导轨齿条
Guideway flat rail rack

| 型号 Code | L | L1 | 模数 Module | 齿距P | 材料 Mat. | 质量m (Kg) | 精度等级 Quality | 加工方法 Cutting method |
|---|---|---|---|---|---|---|---|---|
| PBR35 | 1230 | 1200 | 3.1831 | 10.0 | 42CrMo | 13.9 | DIN8e27 | 铣削 Q+T precision cut |
| PBR35 | 930 | 900 | 3.1831 | 10.0 | 42CrMo | 10.5 | DIN8e27 | 铣削 Q+T precision cut |
| PBR35 | 630 | 600 | 3.1831 | 10.0 | 42CrMo | 7.1 | DIN8e27 | 铣削 Q+T precision cut |
| PBR35 | 330 | 300 | 3.1831 | 10.0 | 42CrMo | 3.7 | DIN8e27 | 铣削 Q+T precision cut |
| PBR35G | 1230 | 1200 | 3.1831 | 10.0 | 42CrMo | 13.9 | DIN6h25 | 磨削 hardened & ground |
| PBR35G | 930 | 900 | 3.1831 | 10.0 | 42CrMo | 10.5 | DIN6h25 | 磨削 hardened & ground |
| PBR35G | 630 | 600 | 3.1831 | 10.0 | 42CrMo | 7.1 | DIN6h25 | 磨削 hardened & ground |
| PBR35G | 330 | 300 | 3.1831 | 10.0 | 42CrMo | 3.7 | DIN6h25 | 磨削 hardened & ground |



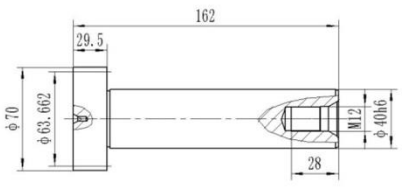


图1 Fig.1

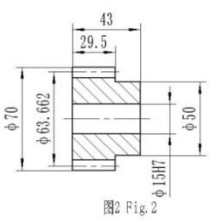
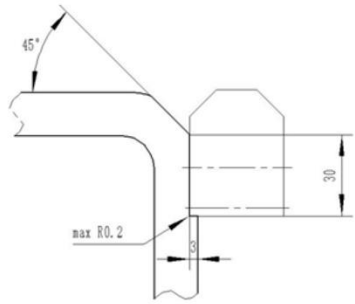


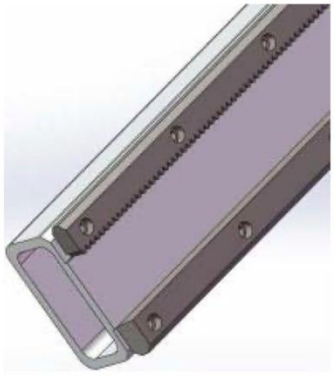
图2 Fig.2

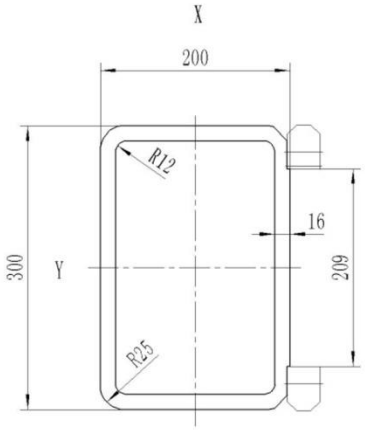
齿轮
Drive pinion

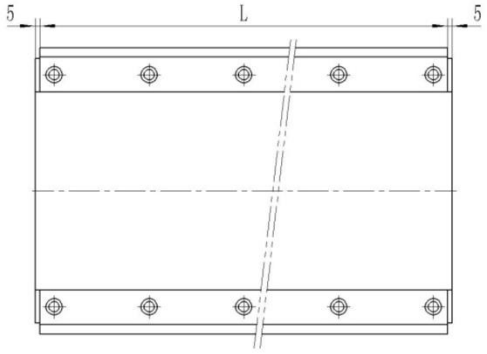
| 型号 Code | 齿数 Z | 模数 Module | 齿距 P | 图 Fig. | 材料 Mat. | 质量m (Kg) | 精度等级 Quality | 最大驱动力 Max. drive force |
|---|---|---|---|---|---|---|---|---|
| PS35 | 20 | 3.1831 | 10.0 | 1 | 20CrMnTi | 1.95 | DIN6e25 | 18.5kN |
| P35 | 20 | 3.1831 | 10.0 | 2 | 20CrMnTi | 0.9 | DIN6e25 | 18.5kN |

### 3.7.5 35型钢型材
**Size 35 Tubular steel profile with guideways**

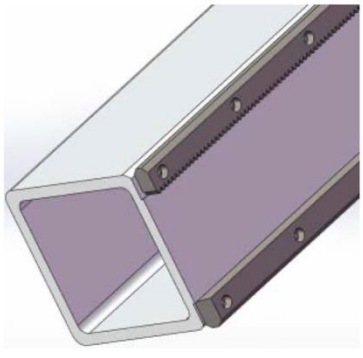


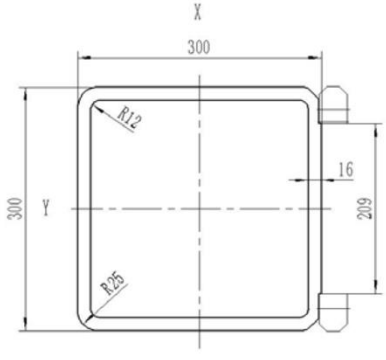



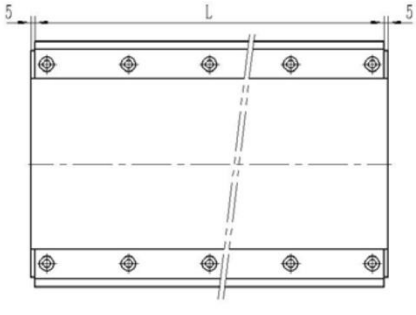



| 型号 Code | 材料 Mat. | m①(Kg/m) | m②(Kg/m) | $L_x$①($cm^4$) | $L_x$②($cm^4$) | $L_y$①($cm^4$) | $L_y$②($cm^4$) | $L_z$($cm^4$) |
|---|---|---|---|---|---|---|---|---|
| SP300/200 | Q345 | 112.3 | 137.6 | 8790 | 11600 | 16600 | 20700 | 19100 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

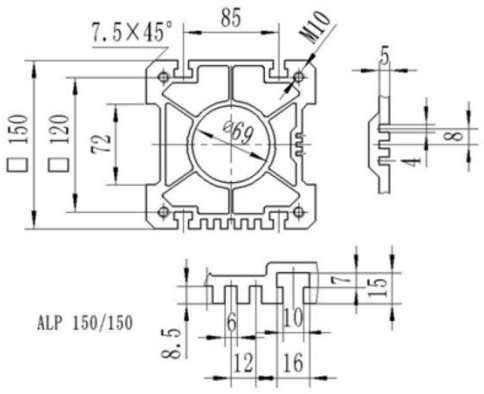




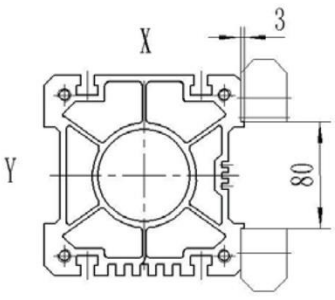



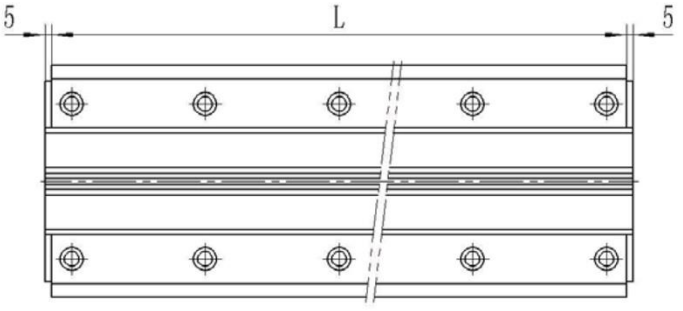

| 型号 Code | 材料 Mat. | m①(Kg/m) | m②(Kg/m) | $L_x$①($cm^4$) | $L_x$②($cm^4$) | $L_y$①($cm^4$) | $L_y$②($cm^4$) | $L_z$($cm^4$) |
|---|---|---|---|---|---|---|---|---|
| SP300/300 | Q345 | 137.4 | 162.7 | 23000 | 28900 | 23000 | 26900 | 37500 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

### 3.7.6 35型铝型材
**Size 35 Tubular alu profiles with guideways**



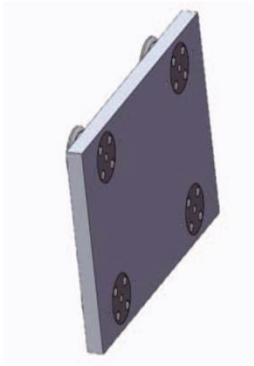


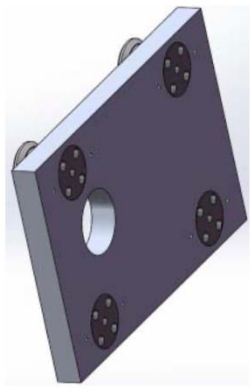




| 型号<br>Code | 材料<br>Mat. | m①(Kg/m) | m②(Kg/m) | $L_x$①($cm^4$) | $L_x$②($cm^4$) | $L_y$①($cm^4$) | $L_y$②($cm^4$) | $L_z$($cm^4$) |
|---|---|---|---|---|---|---|---|---|
| ALP150/150 | 6063 | 23 | 48.3 | 2080 | 3800 | 2270 | 3030 | 1250 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

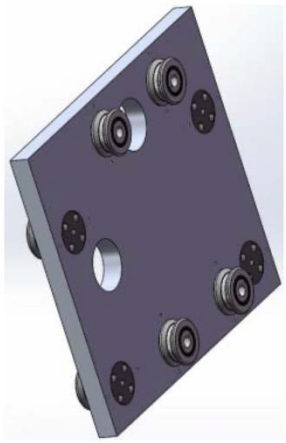
### 3.7.7 35型传动板
### Size 35 Drive plate



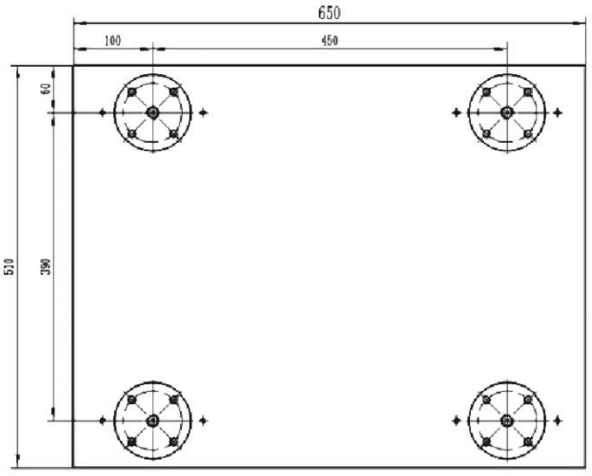
| 型号<br>Code | 材料<br>Mat. | 质量m<br>(Kg) |
|---|---|---|
| DP35-1 | 5083 | 34.8 |

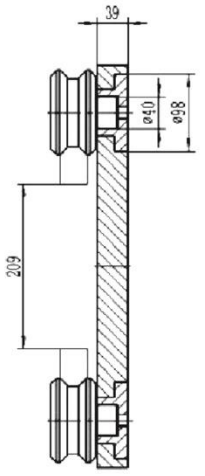


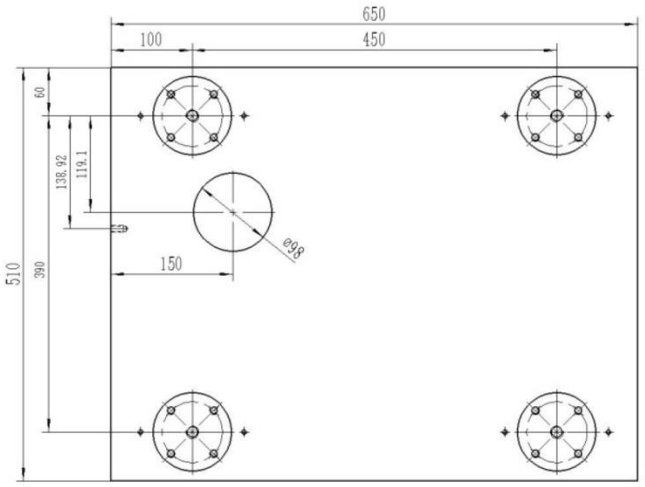
| 型号<br>Code | 材料<br>Mat. | 质量m<br>(Kg) |
|---|---|---|
| DP35-2 | 5083 | 34.0 |

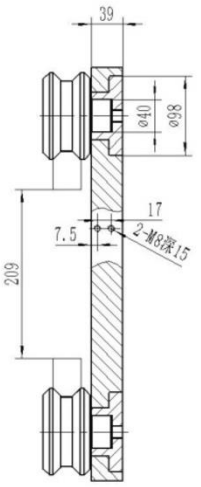


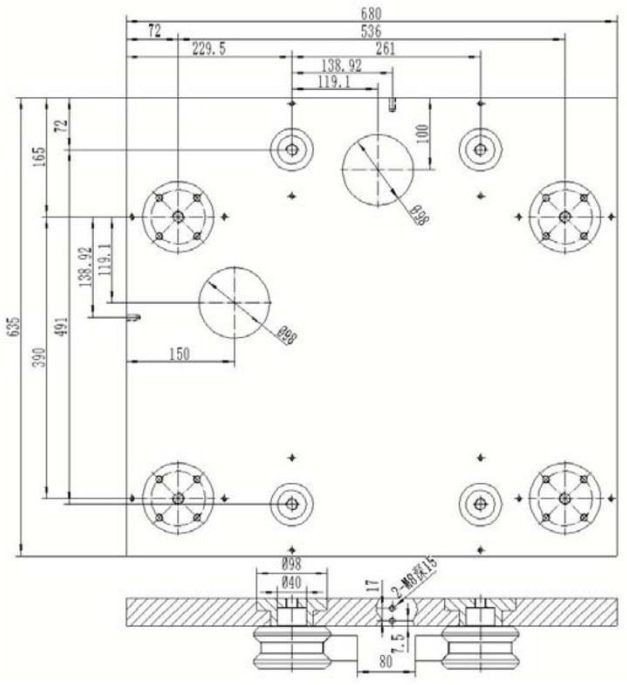
| 型号<br>Code | 材料<br>Mat. | 质量m<br>(Kg) |
|---|---|---|
| DP35-3 | 5083 | 45.0 |

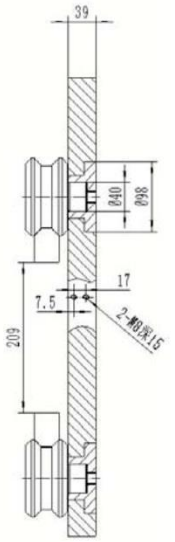


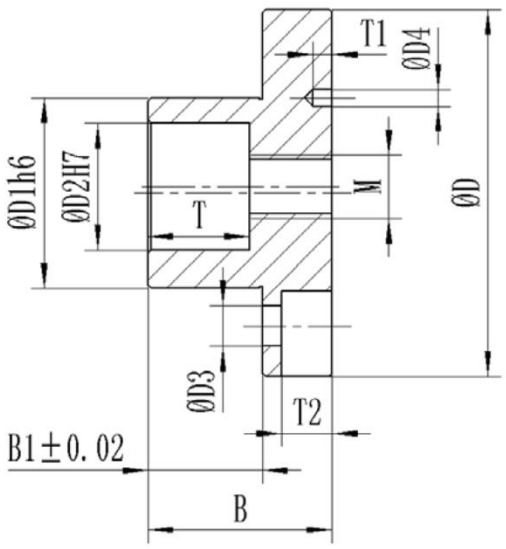



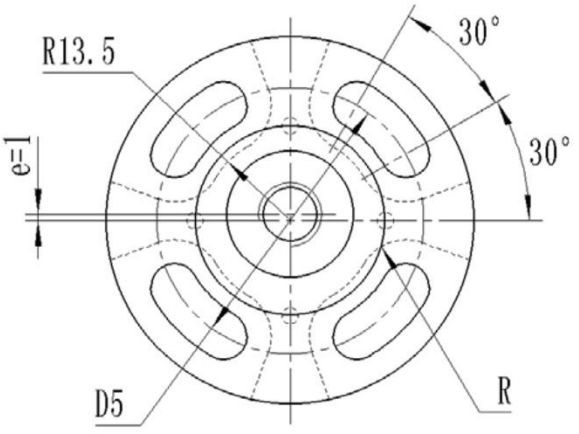



### 3.8 偏心法兰
**Eccentric fixing flange for roller**

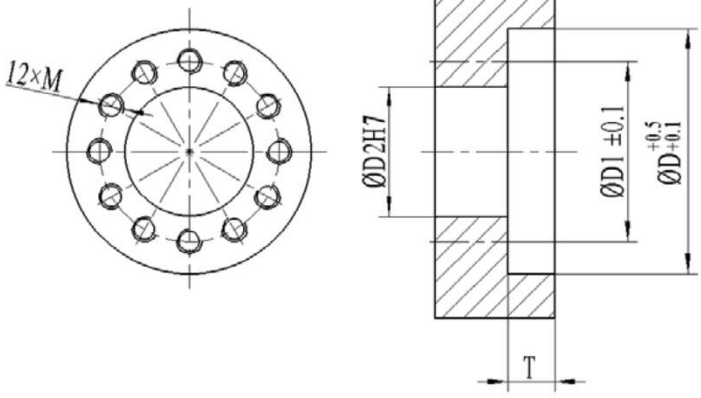



| 类型 Code | 材质 Mat. | 质量 m(kg) | B | B1 | D | D1 | D2① | D3 | D4 | D5 | M① | R | T | T1 | T2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FLE15 | C45 | 0.11 | 24.0 | 14.5 | 49.0 | 26.0 | 15.0 | 5.3 | 2.6 | 36.0 | 8.0 | 6.5 | 12.5 | 3.0 | 6.3 |
| FLE20 | C45 | 0.18 | 29.0 | 18.0 | 58.0 | 30.0 | 20.0 | 6.4 | 2.6 | 42.0 | 10.0 | 7.5 | 16.0 | 3.0 | 7.9 |
| FLE25 | C45 | 0.32 | 34.0 | 20.5 | 72.0 | 38.0 | 25.0 | 8.4 | 4.1 | 52.0 | 12.0 | 9.0 | 21.0 | 4.5 | 9.9 |
| FLE35 | C45 | 0.78 | 39.0 | 22.0 | 98.0 | 59.0 | 40.0 | 10.5 | 4.1 | 75.0 | 16.0 | 12.0 | 26.0 | 4.5 | 12.3 |

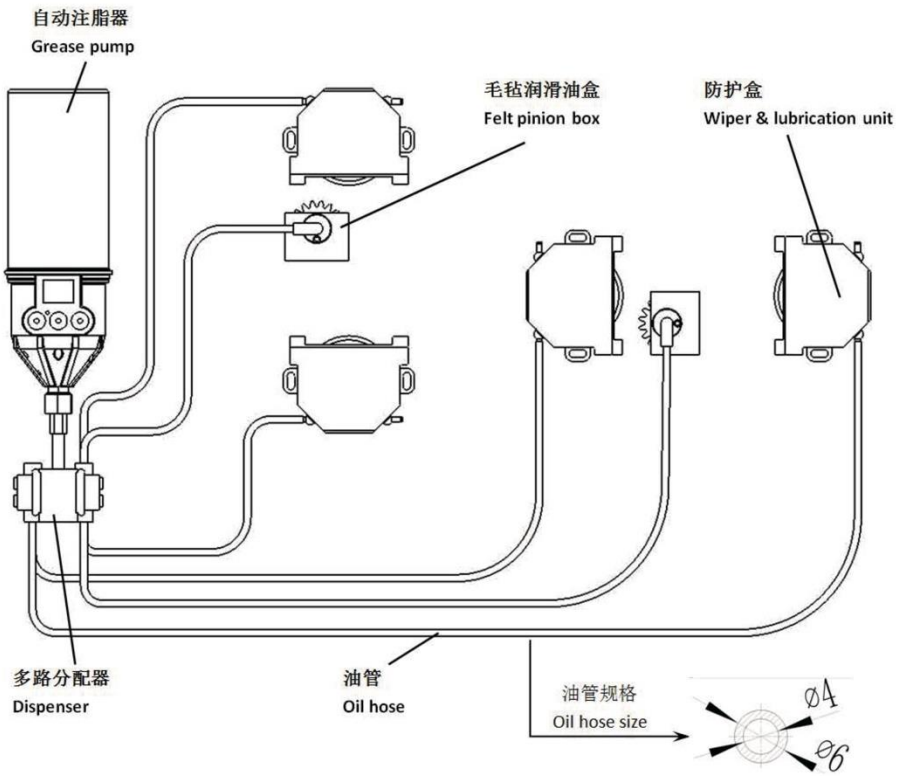
① Eccentric 偏心

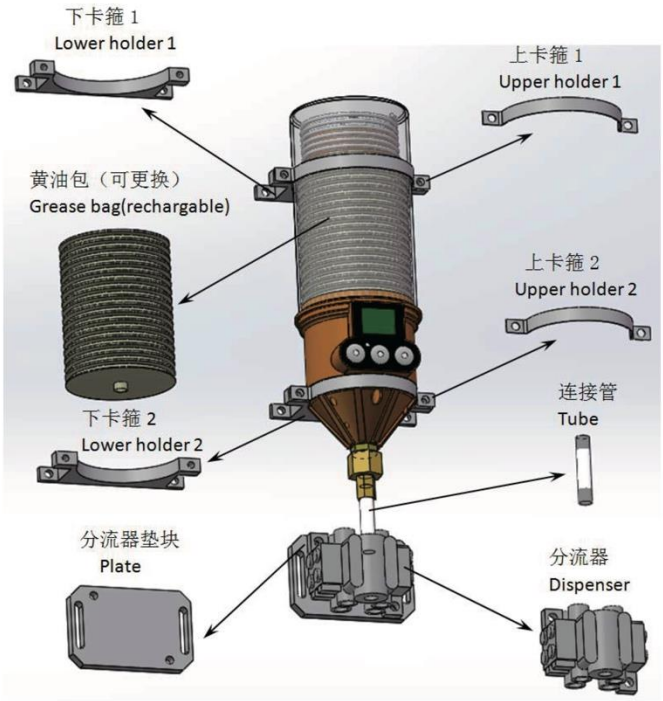
在使用偏心法兰的情况下，传动板的打孔方式：
Holes in the drive plate for the eccentric flange:

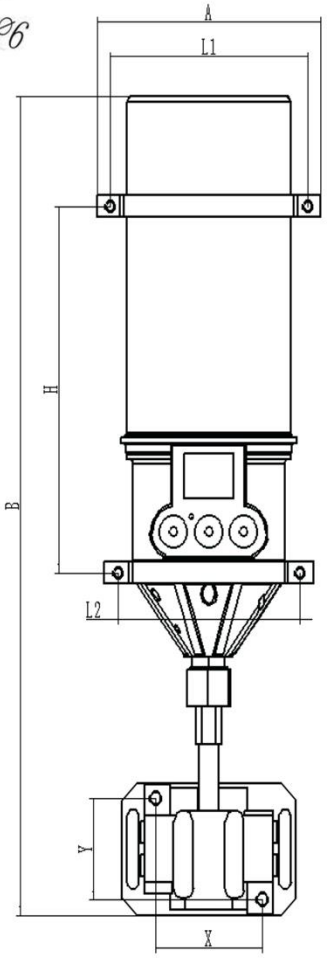



| 型号 Code | D | D1 | D2 | T | M |
|---|---|---|---|---|---|
| FL15 | 49 | 36 | 26 | 9.5 | 5 |
| FL20 | 58 | 42 | 30 | 11.0 | 6 |
| FL25 | 72 | 52 | 38 | 13.5 | 8 |
| FL35 | 98 | 75 | 59 | 17.0 | 10 |

## 3.9 多点自动润滑系统 Multi-point Lubrication System



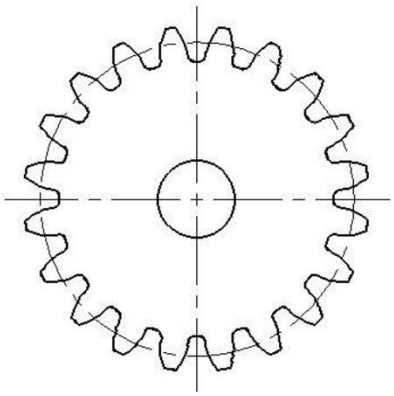



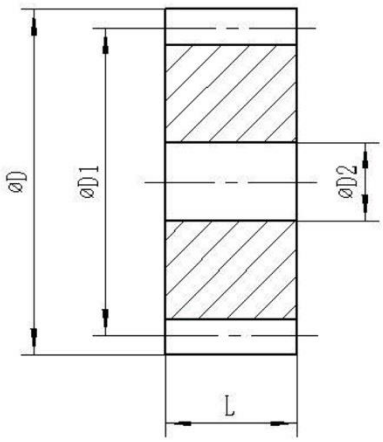




注脂器Grease pump

| 型号 Code | A | B | L1 | L2 | H | X | Y |
|---|---|---|---|---|---|---|---|
| MSP250 | 118 | 319 | 104 | 96 | 120 | 55 | 46 |
| MSP500 | 118 | 381 | 104 | 96 | 165 | 55 | 46 |

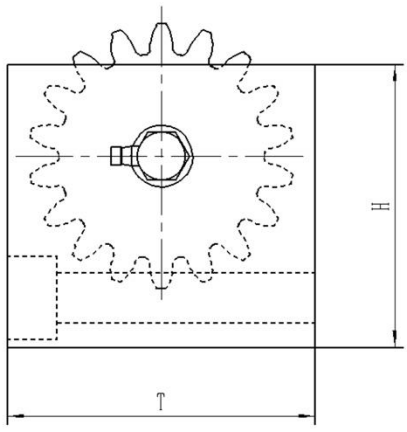
毛毡齿轮
Felt pinion

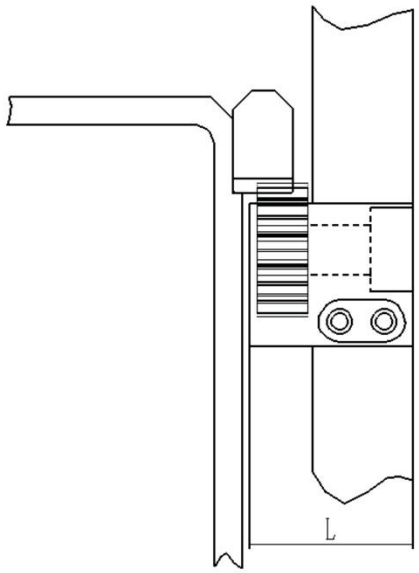


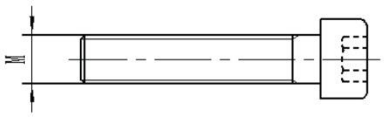



| 型号 Code | 模数 Module | 齿数 Z | D | D2 | L |
|---|---|---|---|---|---|
| FP15 | 1.5915 | 18 | 31.83 | 12 | 12 |
| FP20 | 1.5915 | 18 | 31.83 | 12 | 15 |
| FP25 | 2.3873 | 18 | 47.746 | 12 | 20 |
| FP35 | 3.1831 | 18 | 63.662 | 12 | 30 |

油盒
Felt pinion box




| 类型 Code | $H^{+0.3}_{+0.1}$ | T | L | M |
|---|---|---|---|---|
| FPB15 | 34 | 37 | 39 | M5 |
| FPB20 | 36 | 39 | 47 | M5 |
| FPB25 | 41 | 54 | 55 | M5 |
| FPB35 | 55 | 70 | 75 | M6 |

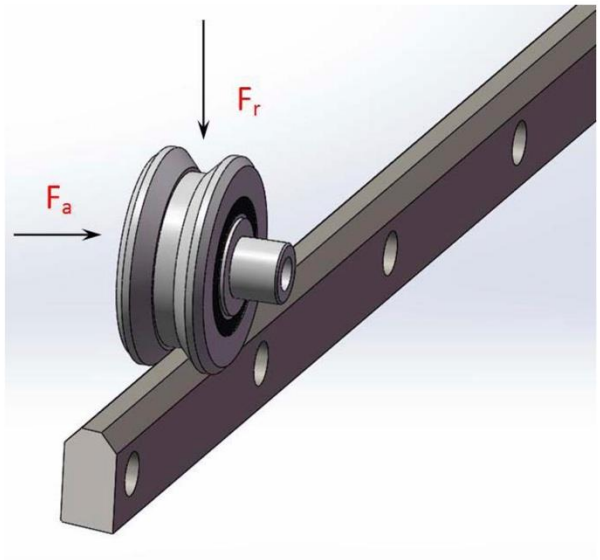
### 3.10 型号验证 Size Verification

$$P=Fr+3 \cdot Fa \quad (kN)$$

$$Pw=f \cdot P \quad (kN)$$

$$L = Kr \cdot \frac{C_w^{\ 3}}{P_w} \cdot 10^5 \quad (m)$$

$$fs = 0.7 \cdot \frac{C_{OW}}{f \cdot (Fr + 3 \cdot Fa)} \quad f_s \geqslant 1$$




$F_a$: 外部轴向力 （kN）External axial force per roller (kN)
$F_r$: 外部径向力 （kN）External radial force per roller (kN)
P : 当量动载荷 （kN）Equivalent dynamic load (kN)
$C_w$: 有效的基本动载荷水平 Effective basic dynamic load rating (kN)
L: 额定寿命 Nominal life time (m)
$K_r$: 尺寸系数 Size factor
f : 载荷系数 Load factor
均匀冲击 uniform shocks: 1.0 ~ 1.2
中等冲击 moderate shocks: 1.2 ~1.5
较大冲击 heavy shocks: 1.5 ~2.5
$f_s$: 静载荷系数 Static loading factor
$C_{ow}$: 最大容许静态径向力(kN) Max. admissible static radial force (kN)

| VR | $K_r$ | PR | $K_r$ |
|---|---|---|---|
| 15 | 1.555 | 15 | 1.447 |
| 20 | 1.882 | 20 | 2.262 |
| 25 | 2.199 | 25 | 2.670 |
| 35 | 3.075 | 35 | 3.142 |

材料Mat: GCr15

| VR | $C_W$ ( kN) | PR | $C_W$ (kN) |
|---|---|---|---|
| 15 | 13.4 | 15 | 13.1 |
| 20 | 18 | 20 | 18 |
| 25 | 27 | 25 | 27 |
| 35 | 42 | 35 | 43 |

材料Mat: GCr15

| VR/PR | $C_{ow}$ (kN) |
|---|---|
| 15 | 6.8 |
| 20 | 9.5 |
| 25 | 15 |
| 35 | 32 |

# 4 扁导轨齿条传动系统 (重载荷)
# Guideway Flat Rail Rack Drive System (Heavy Duty)

## 4.1 简介

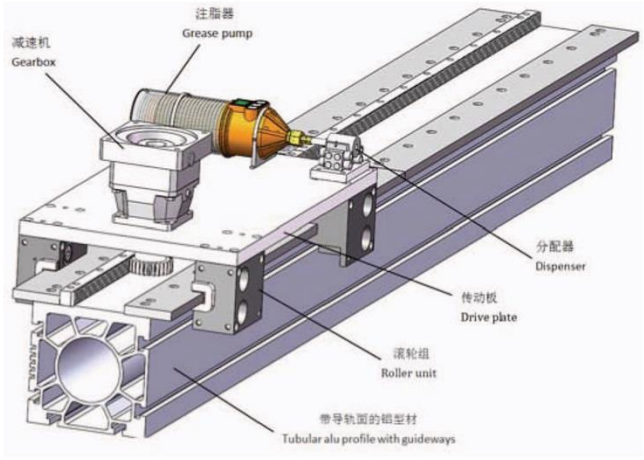
扁导轨齿条传动系统包括扁导轨、扁导轨齿条、滚轮座(含滚轮)、传动板、铝型材、钢型材等模块化部件，适合重载荷的应用。既可用于重型桁架机器人，也可用于机器人第七轴的直线传动。

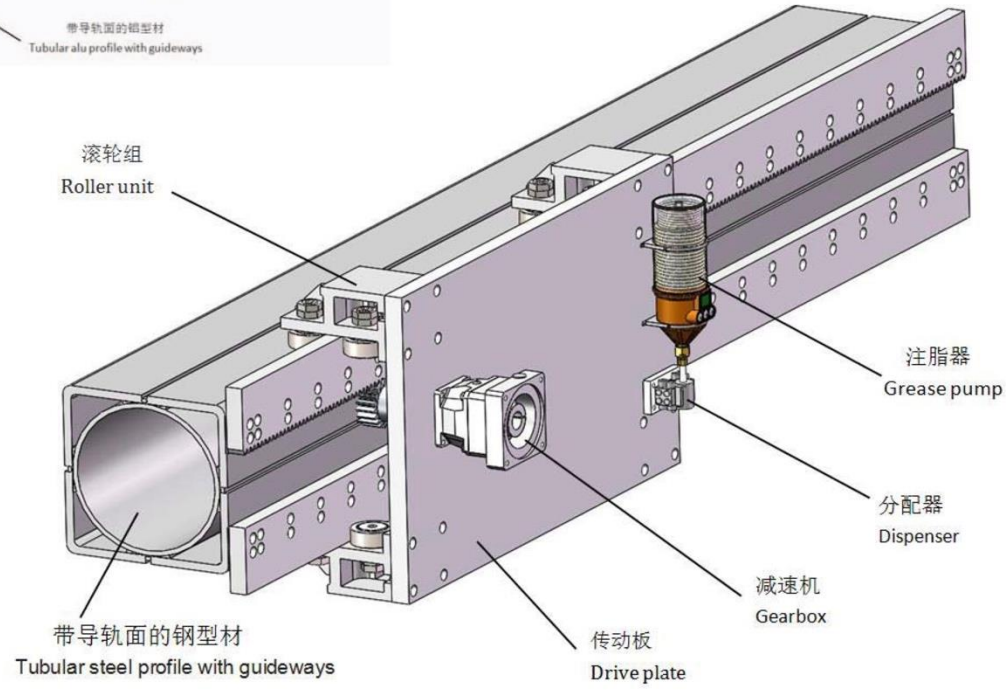
本系统标准型号有Ø40、Ø52、Ø62、Ø72、Ø90五种型号，特殊型号可以定制。为了避免圆周率带来的影响，齿条均为CP齿条。齿条有精铣和研磨两种，精铣齿条精度为DIN8e27, 齿面为调质硬度；研磨齿条精度为DIN6h25，齿面淬火，硬度为HRC55-60。所有导轨面均作高频淬火，硬度HRC55-60。

## 4.1 Introduction

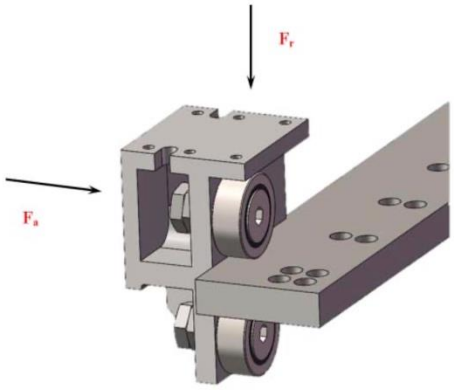
Guideway flat rail rack drive system includes modular components like guideway flat rail, guideway flat rail rack, rollers support, drive plate, aluminum profile, steel profile, etc. Such system is suitable for heavy duty application. It can be used for heavy duty gantry robot, as well as the ground travelling base for robot.

Now our standard models includes Ø40, Ø52, Ø62, Ø72, Ø90 sizes. We can also make non standard models according to customer's requirement. To avoid cumulative pitch tolerance due to pi, we use CP racks. We have milled racks to DIN8e27 and ground racks to DIN6h25 with tooth hardened to HRC55-60. The guideways are inductioned hardened to HRC55-60.

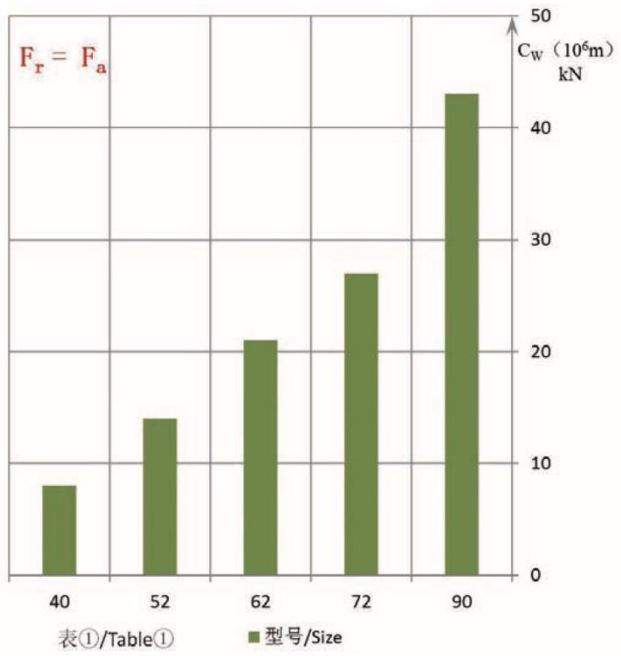


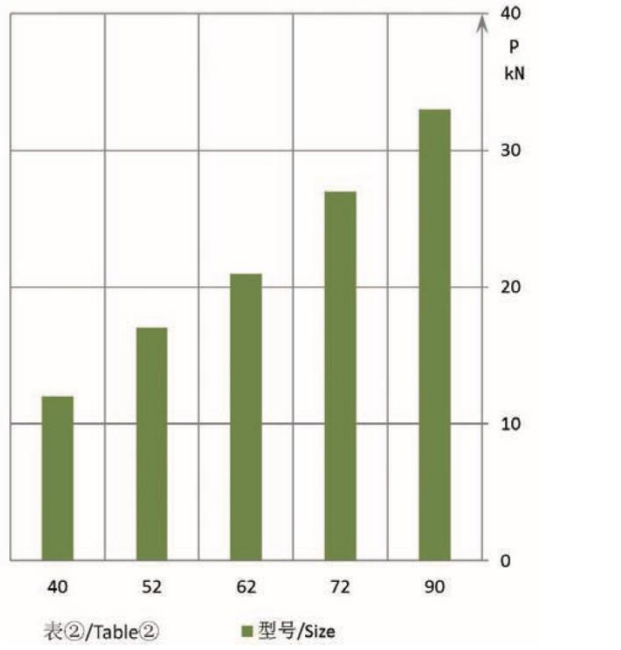
## 4.2 型号选择 Size Selection



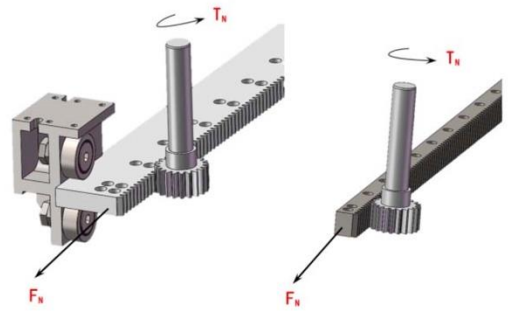

这些数据给出了所需导轨系统规格的大致选择。表①中列出了在使用寿命$10^6$m(1000公里)条件下滚轮的径向载荷。滚轮尺寸表中也给出了$C_{OW}$和$C_W$($10^8$m)的数值。表②为允许赫兹应力为1600 $Nmm^{-2}$时的载荷。
在多向受力和冲击的情况下，须参考P91页的计算数据，或者向工厂索要验算证明。
载荷主要作用在没有偏心轮毂的滚轮上。
在悬挂布置的工况下最大容许径向载荷降低为以下数值：
RB40 : 7 kN　RB52 : 12 kN　RB62 : 13 kN
RB72 : 17 kN　RB90 : 33 kN




This data allows for a rough selection of the size of the required guideway system. The $C_W$ values are listed in table ① for a nominal service life of $10^6$ m (1 000km), and refer to a roller with radial loading. In the dimensional tables for the rollers, the values for $C_{OW}$ and $C_W$ ($10^8$ m) are also given. Table ② indicates the load values for an admissible Hertz'ian stress of 1600 $Nmm^{-2}$.
In cases of combined loading and shock, the calculation data on Page 91 must be consulted, or a calculation verification can be requested from the manufacturer.
The main loads are to be taken by track rollers without eccentric hub. In case of suspended arrangement the maximum admissible radial load has to be reduced to the following values.
RB40 :7 kN　RB52 : 12 kN　RB62 : 13kN
RB72 : 17 kN　RB90 : 33 kN

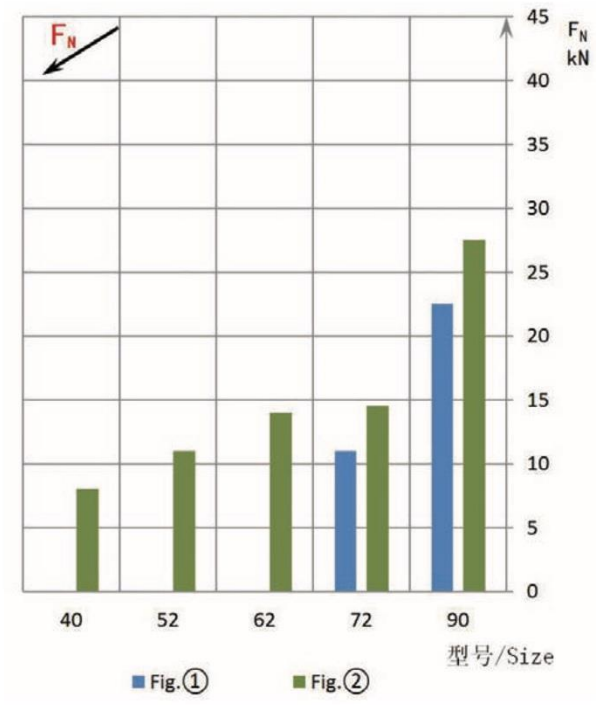


## 4.3 驱动力选择 Selection of Drive Forces

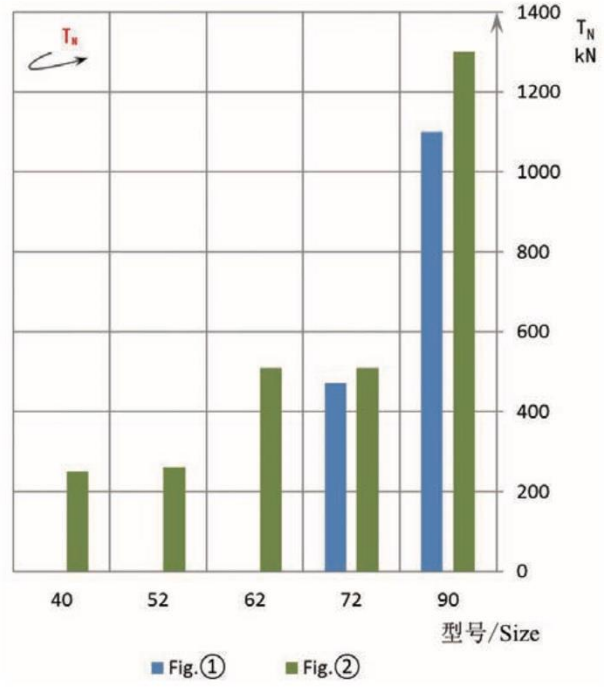



① ②

在选择齿条以后，必须检查齿轮齿数是否和所需驱动力及扭矩相匹配。
我们提供精铣和硬齿面磨削两种齿条。
此处列出的数据只适用于无振动、润滑良好和齿轮布置严谨的情况。
此处齿根应力安全系数取$S_F \geq 1.4$，赫兹应力安全系数取$S_H \geq 1.0$。
安全系数$S_B \approx 1.0 \ldots 4.0$，由用户根据经验选取。
牵引力$F_N$与齿轮齿数z有关。

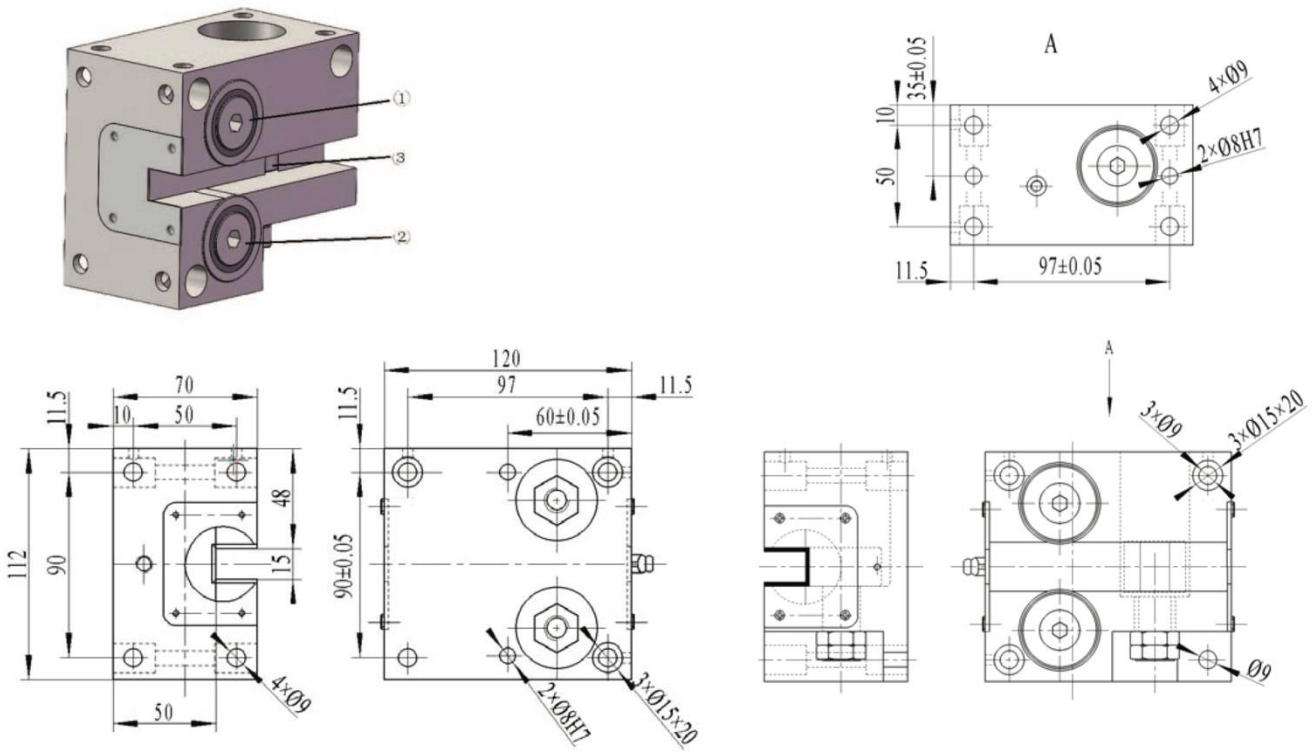



After selecting the rack, the gear teeth of the guideway system must be checked for compatibility with the required drive forces and torques.
The rack can be supplied precision cut or hardened and ground.
The values given are values for shock-free operation, good lubrication and stiff arrangement of the pinion.
A safety factor for tooth root stress $S_F \geq 1.4$ and a safety factor for Hertzian stress $S_H \geq 1.0$ is taken in account.
Depending on your experience and application a safety factor $S_B \approx 1.0 \ldots 4.0$ has to be considered.
The traction force $F_N$ is related to the number of teeth z of the pinion.

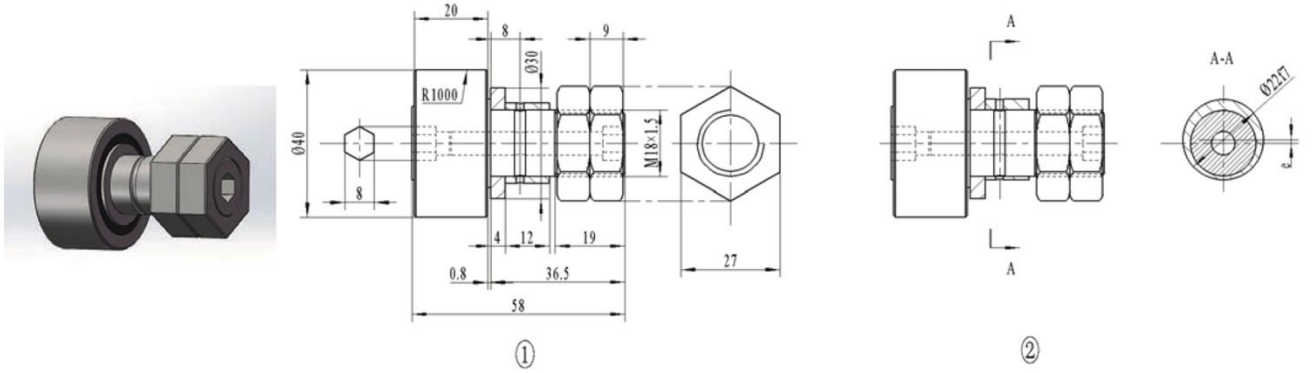


### 4.4.1 ø40型滚轮组 Ø 40 Roller unit

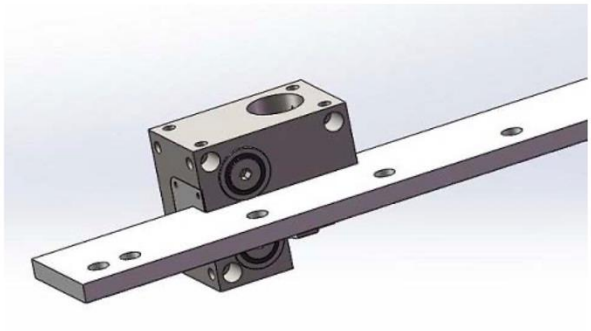
滚轮支座(右侧支座) Rollers support (Right hand version)

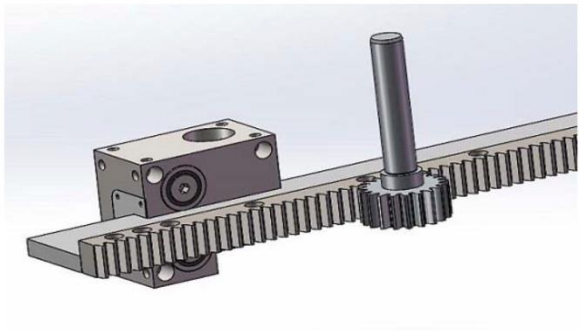



| 型号 Code | ① | ② | ③ | 材料 Mat. | 质量m (kg) | 负载能力Load carrying capacity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $C_{0W}$（N） | $C_W$①（N） | $C_W$②（N） | $n_{max}$（$min^{-1}$） |
| RB40.1R | BR | ER | ER | 7075 | 2.5 | 13800 | 7000 | 1800 | 5000 |
| RB40.2R | BR | ER | BR | 7075 | 2.5 | 13800 | 7000 | 1800 | 5000 |
| RB40.3R | ER | BR | ER | 7075 | 2.5 | 13800 | 7000 | 1800 | 5000 |
| | | | | | | 距离 Distance：① $10^6$m ② $10^8$m | | | |



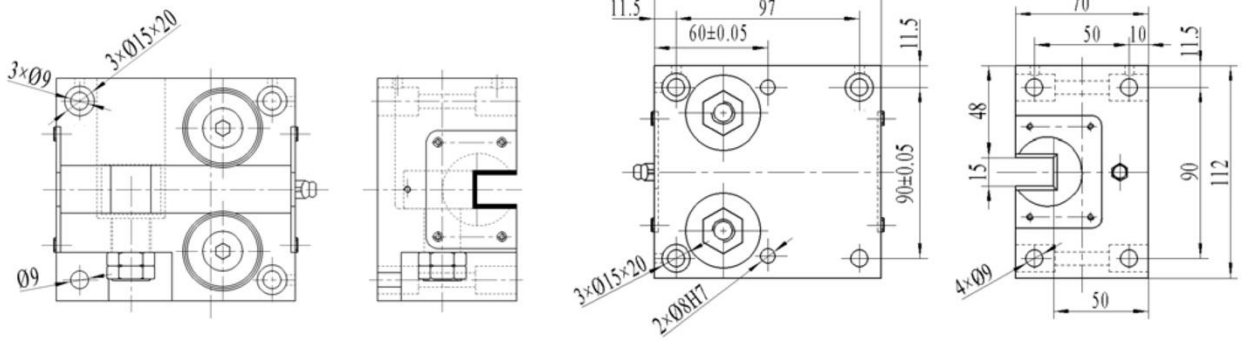

| 型号 Code | 图 Fig. | 偏心量 Excenter | 材料 Mat. | 质量m（Kg） | 螺母拧紧力矩 MA（Nm） |
|---|---|---|---|---|---|
| BR40 | ① | — | GCr15 | 0.258 | 87 |
| ER40 | ② | 1 | GCr15 | 0.258 | 87 |
| MA (Nm): Nut tightening torque | | | | | |





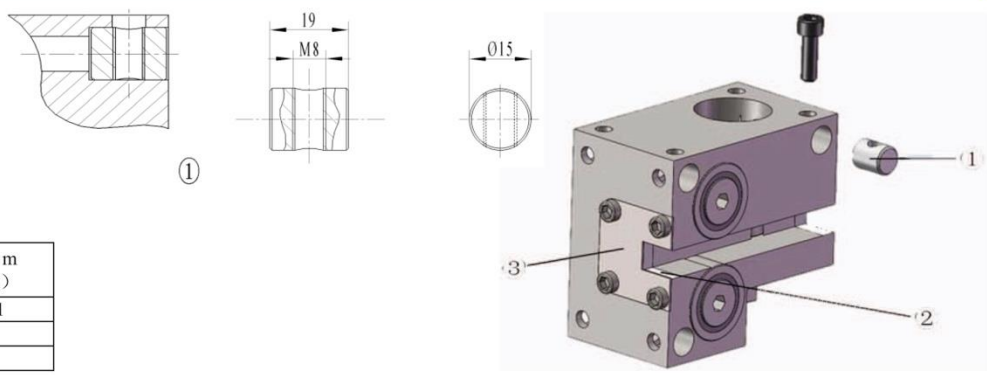
滚轮支座(左侧支座) Rollers support (Left hand version)





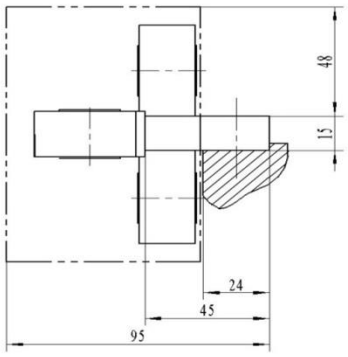

| 型号 Code | ① | ② | ③ | 材料 Mat. | 质量 m(kg) | 负载能力Load carrying capacity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $C_{0W}$（N） | $C_W$①（N） | $C_W$②（N） | $n_{max}$（$min^{-1}$） |
| RB40.1L | BR | ER | ER | 7075 | 2.5 | 13800 | 7000 | 1800 | 5000 |
| RB40.2L | BR | ER | BR | 7075 | 2.5 | 13800 | 7000 | 1800 | 5000 |
| RB40.3L | ER | BR | ER | 7075 | 2.5 | 13800 | 7000 | 1800 | 5000 |
| | | | | | | 距离 Distance：① $10^6$m ② $10^8$m | | | |

附件/配件Accessories/Spare parts

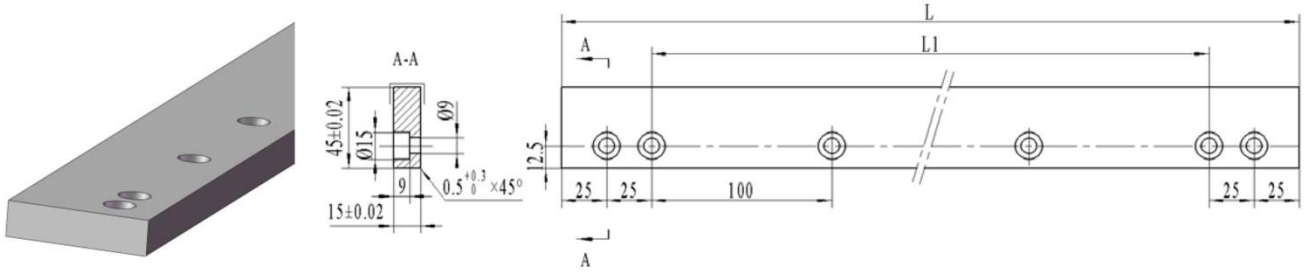



| 图 Fig. | 材料 Mat. | 质量 m（Kg） |
|---|---|---|
| ① | C45 | 0.01 |
| ② | 毛毡felt | |
| ③ | Q345B | |

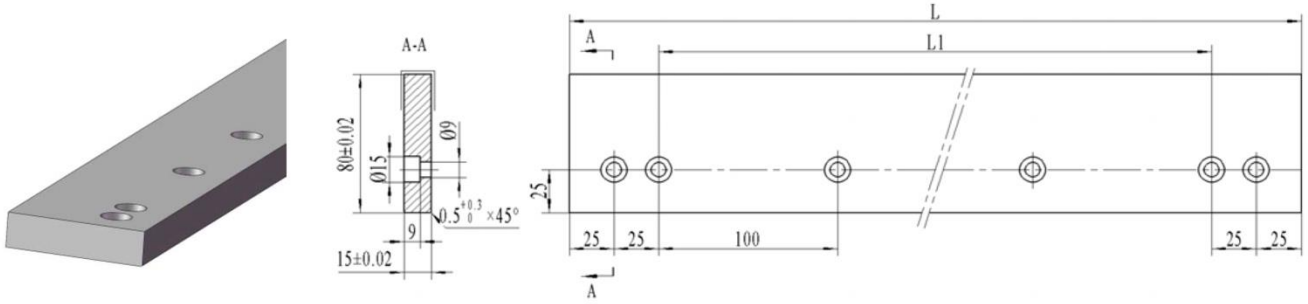
### 4.4.2 Ø40型扁导轨、齿条 Ø40 Guideway flat rail, rack



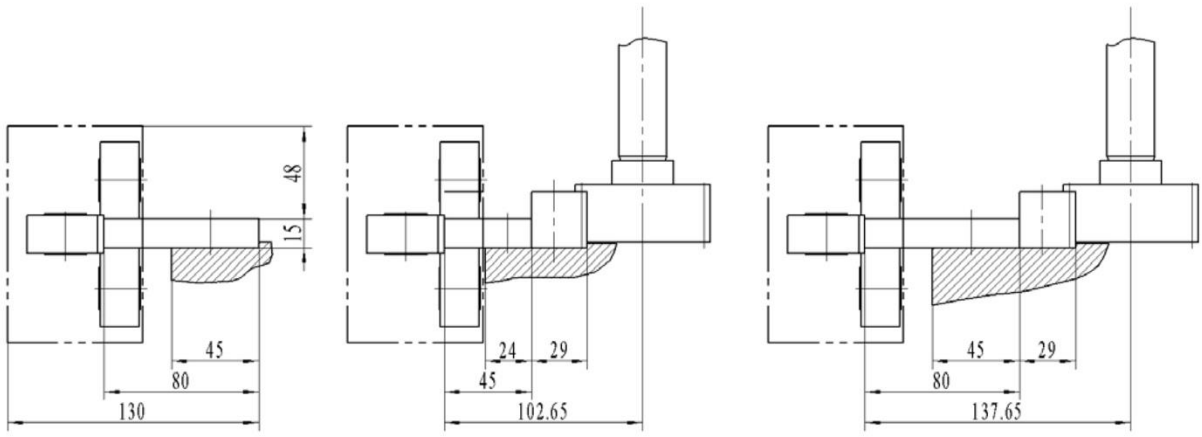

扁导轨Guideway flat rail



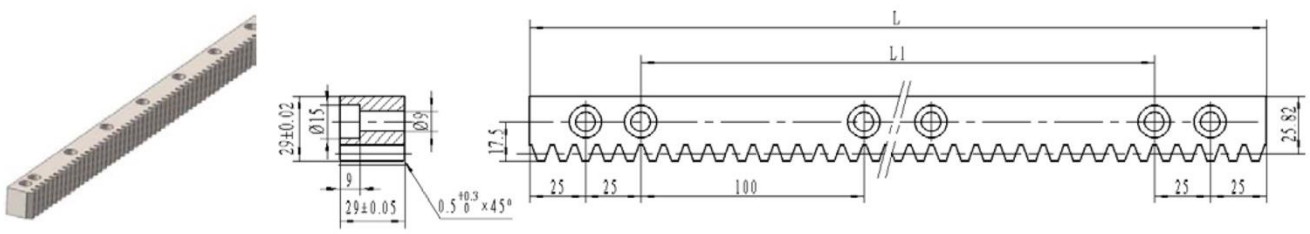

| 型号 Code | L | L1 | 材料 Mat. | 质量m （Kg） | 螺栓型号 bolt size |
|---|---|---|---|---|---|
| PB40.1 | 1000 | 900 | 42CrMo | 4.8 | M8×20 8.8级 |




| 型号 Code | L | L1 | 材料 Mat. | 质量m （Kg） | 螺栓型号 bolt size |
|---|---|---|---|---|---|
| PB40.2 | 2000 | 1900 | 42CrMo | 18.0 | M8×20 8.8级 |
| | 1200 | 1100 | 42CrMo | 10.8 | M8×20 8.8级 |
| | 800 | 700 | 42CrMo | 7.2 | M8×20 8.8级 |



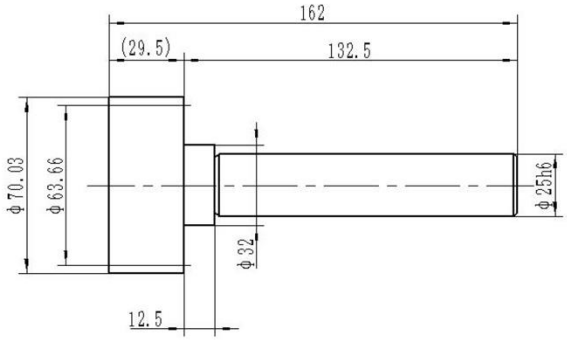

齿条 Rack



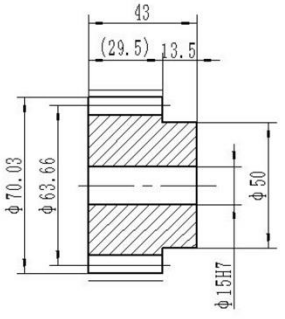

| 型号 Code | L | L1 | 模数 module | 齿距P （mm） | 材料 Mat. | 质量m （Kg） | 精度等级 Quality | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|---|---|
| PBR40 | 2000 | 1900 | 3.1831 | 10.0 | 42CrMo | 12.0 | DIN6h25 | M8×35 8.8级 |
| | 1200 | 1100 | 3.1831 | 10.0 | 42CrMo | 7.2 | DIN6h25 | M8×35 8.8级 |
| | 800 | 700 | 3.1831 | 10.0 | 42CrMo | 4.8 | DIN6h25 | M8×35 8.8级 |

驱动齿轮 Drive pinion





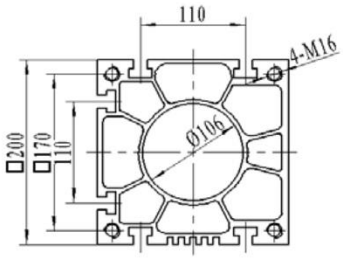

①

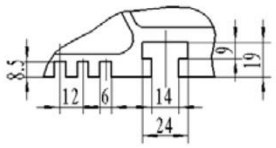



②

| 型号 Code | 齿数 Z | 模数 module | 齿距P （mm） | 图 Fig. | 材料 Mat. | 质量m （Kg） | 精度等级 Quality |
|---|---|---|---|---|---|---|---|
| PSD40-CP10 | 20 | 3.1831 | 10.0 | ① | 20CrMnTi | 1.95 | DIN6e25 |
| PD40-CP10 | 20 | 3.1831 | 10.0 | ② | 20CrMnTi | 0.90 | DIN6e25 |

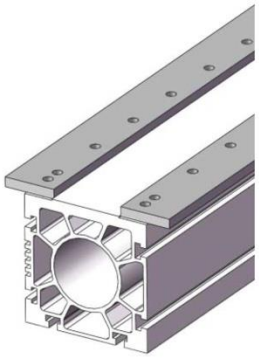
### 4.4.3 ∅40型铝型材 ∅40 Aluminum profile

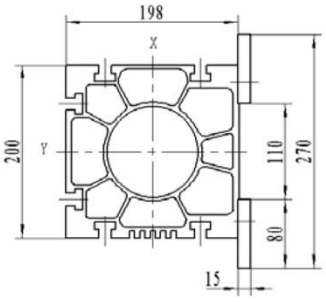


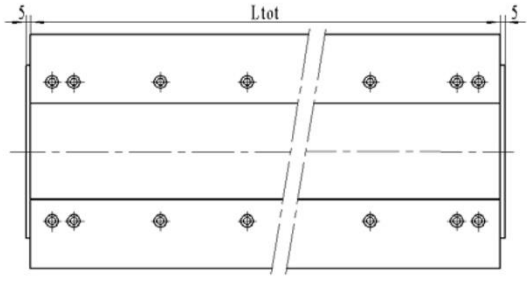




ALP 200/200

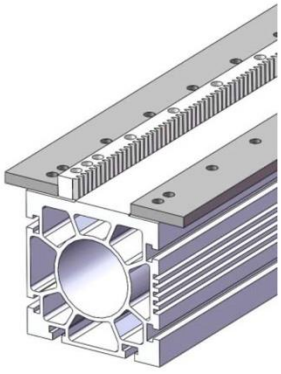
带导轨面的铝型材 Tubular alu profiles with guideways

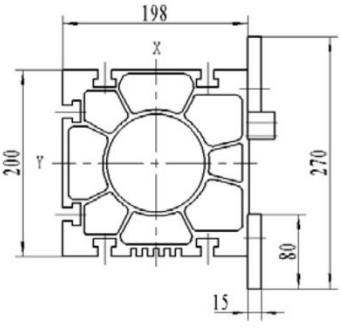


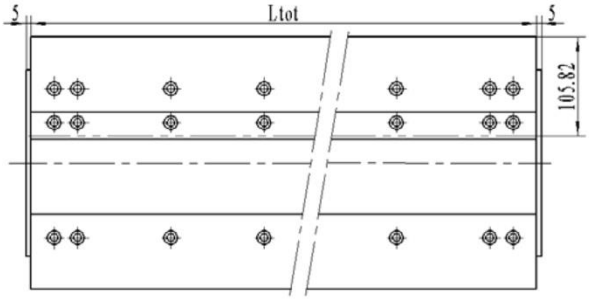



| 型号 Code | 材料 Mat. | m① （Kg/m） | m② （Kg/m） | $l_X$① （$cm^4$） | $l_X$② （$cm^4$） | $l_y$① （$cm^4$） | $l_y$② （$cm^4$） | $l_Z$ （$cm^4$） |
|---|---|---|---|---|---|---|---|---|
| ALP200/200 | 6063 | 36.2 | 55.0 | 6670 | 8490 | 6390 | 8250 | 12658 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

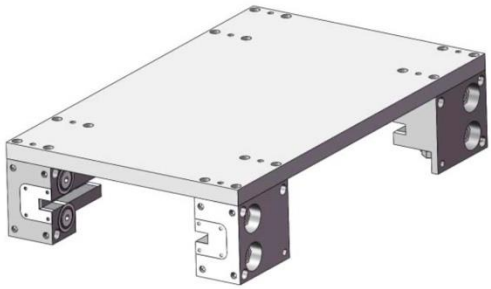




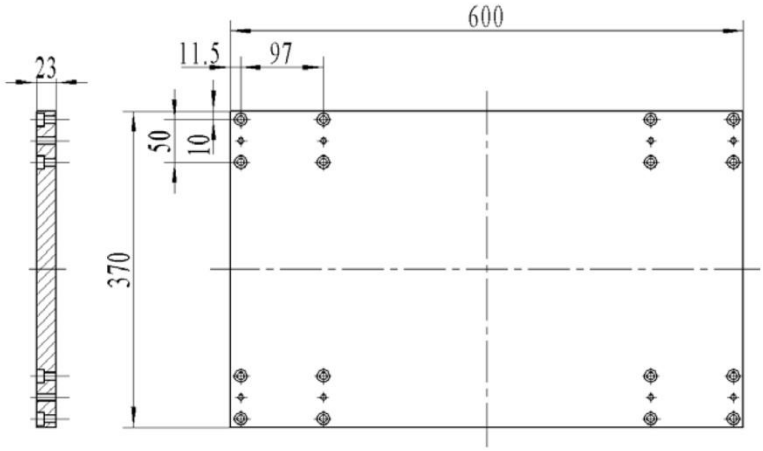



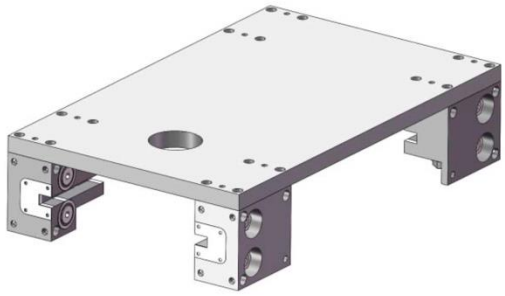

| 型号 Code | 材料 Mat. | m① （Kg/m） | m② （Kg/m） | $l_X$① （$cm^4$） | $l_X$② （$cm^4$） | $l_y$① （$cm^4$） | $l_y$② （$cm^4$） | $l_Z cm^4$） |
|---|---|---|---|---|---|---|---|---|
| ALP200/200 | 6063 | 36.2 | 62.1 | 6670 | 9260 | 6390 | 8390 | 12658 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

### 4.4.4 ∅40型传动板 ∅40 Drive plate

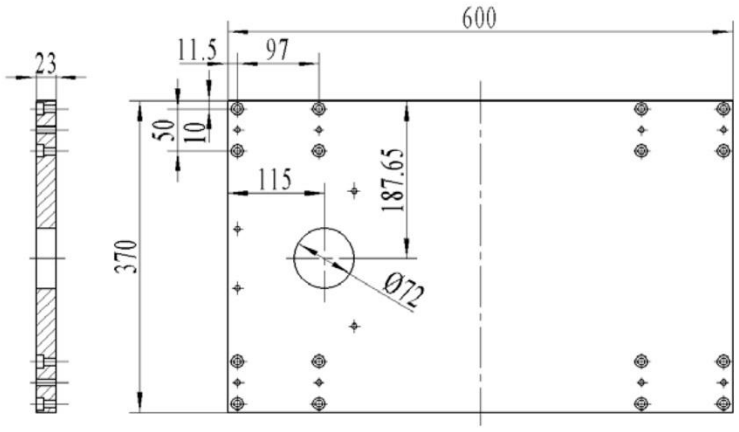


①



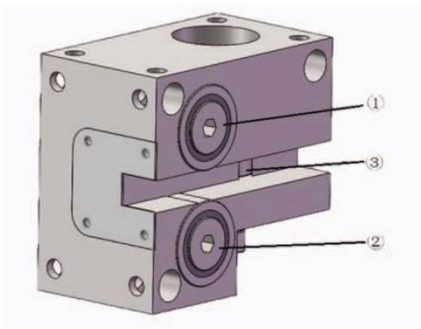
②

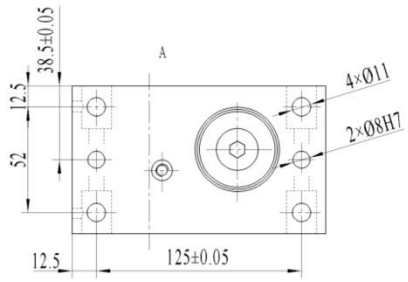


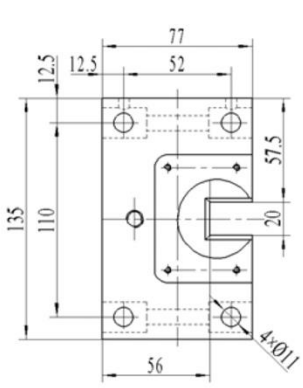

| 型号<br>Code | 图<br>Fig. | 材料<br>Mat. | 质量m<br>（Kg） |
|---|---|---|---|
| DP40.1 | ① | 5083 | 13.8 |
| DP40.2 | ② | 5083 | 13.5 |

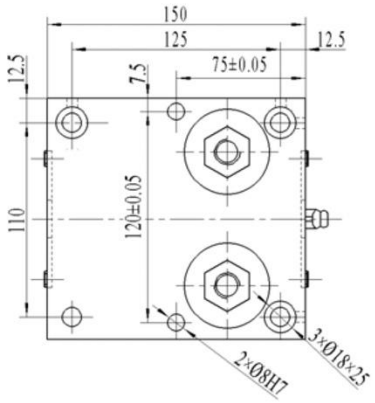
### 4.5.1 Ø52型滚轮组 Ø52 Roller unit

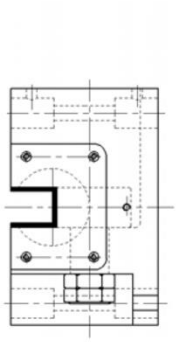
滚轮支座(右侧支座) Rollers support (Right hand version)

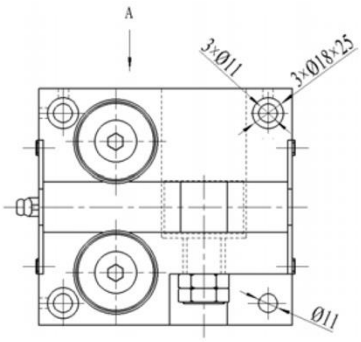


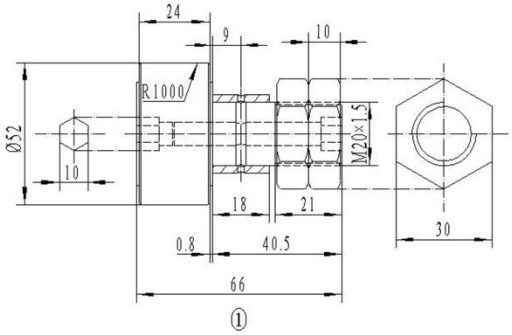





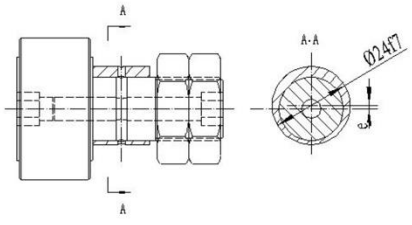

| 型号 Code | ① | ② | ③ | 材料 Mat. | 质量m (kg) | 负载能力Load carrying capacity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $C_{0w}$（N） | $C_W$①（N） | $C_W$②（N） | $n_{max}$（$min^{-1}$） |
| RB52.1R | BR | ER | ER | 7075 | 4.0 | 28000 | 14000 | 3500 | 3800 |
| RB52.2R | BR | ER | BR | 7075 | 4.0 | 28000 | 14000 | 3500 | 3800 |
| RB52.3R | ER | BR | ER | 7075 | 4.0 | 28000 | 14000 | 3500 | 3800 |
| | | | | | | 距离 Distance：① $10^6$m ② $10^8$m | | | |

螺栓型滚轮Stud roller



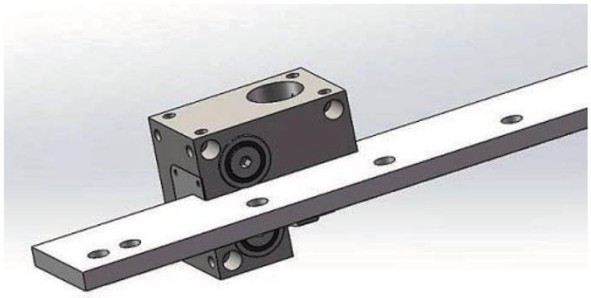


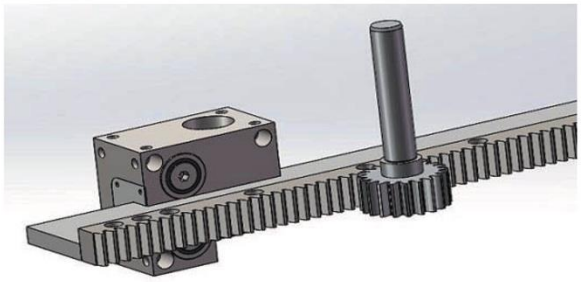

①



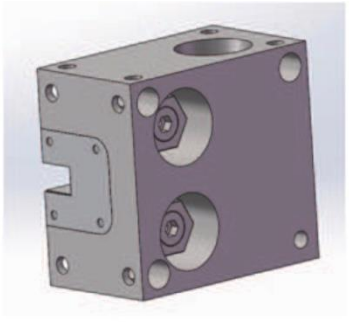

②

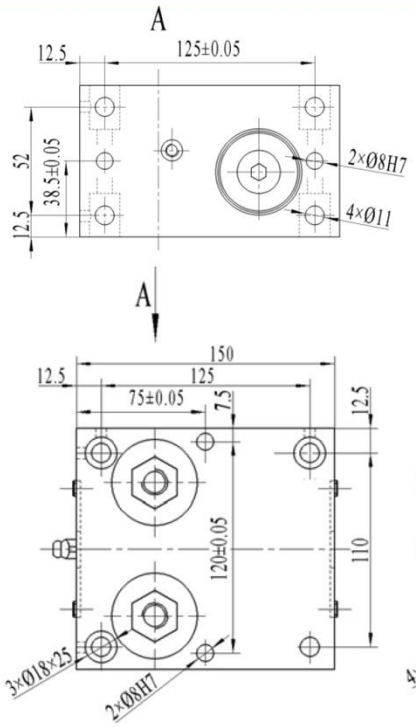
| 型号 Code | 图 Fig. | 偏心量 Excenter | 材料 Mat. | 质量m （Kg） | 螺母拧紧力矩 MA（Nm） |
|---|---|---|---|---|---|
| BR52 | ① | — | GCr15 | 0.47 | 120 |
| ER52 | ② | 1 | GCr15 | 0.47 | 120 |
| MA (Nm): Nut tightening torque | | | | | |





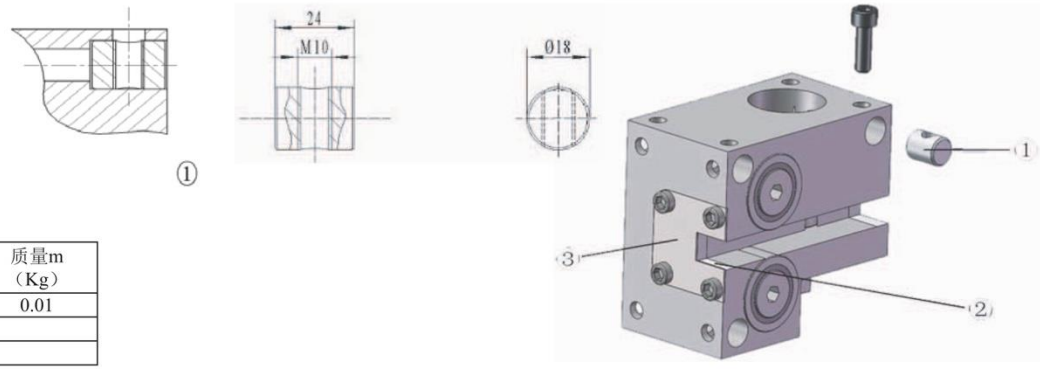
滚轮支座(左侧支座) Rollers support (Left hand version)





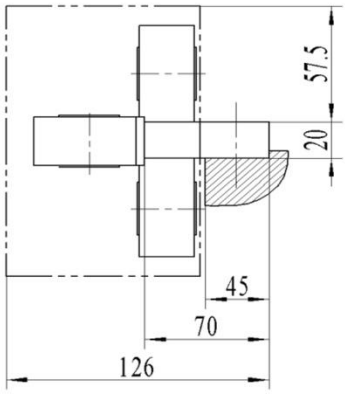

| 型号 Code | ① | ② | ③ | 材料 Mat. | 质量m (kg) | 负载能力Load carrying capacity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $C_{0w}$（N） | $C_w$①（N） | $C_w$②（N） | $n_{max}$（$min^{-1}$） |
| RB52.1L | BR | ER | ER | 7075 | 4.0 | 28000 | 14000 | 3500 | 3800 |
| RB52.2L | BR | ER | BR | 7075 | 4.0 | 28000 | 14000 | 3500 | 3800 |
| RB52.3L | ER | BR | ER | 7075 | 4.0 | 28000 | 14000 | 3500 | 3800 |
| | | | | | | 距离 Distance：① $10^6$m ② $10^8$m | | | |

附件/配件 Accessories/Spare parts

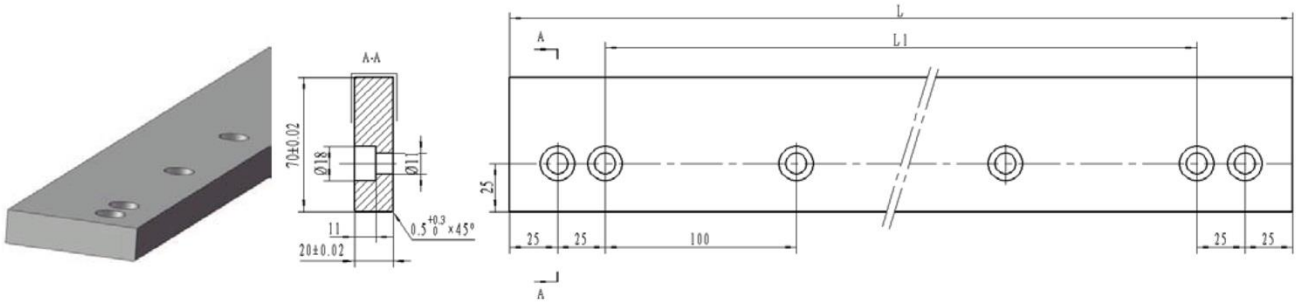



| 图 Fig. | 材料 Mat. | 质量m（Kg） |
|---|---|---|
| ① | C45 | 0.01 |
| ② | 毛毡 felt | |
| ③ | Q345B | |

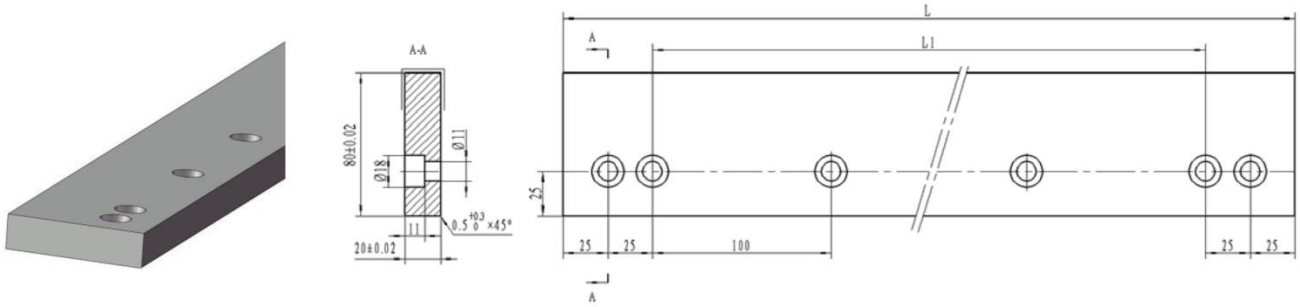
### 4.5.2 ∅52型扁导轨、齿条 ∅52 Guideway flat rail, rack



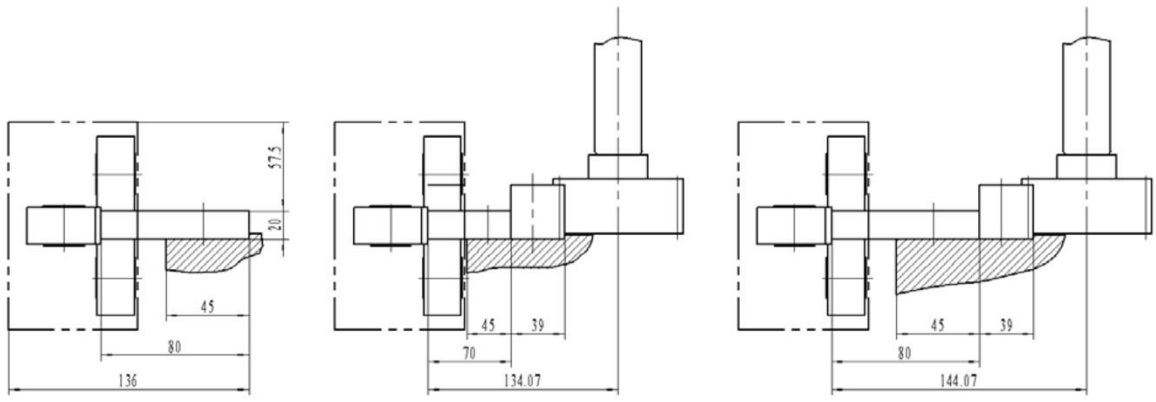

扁导轨 Guideway flat rail



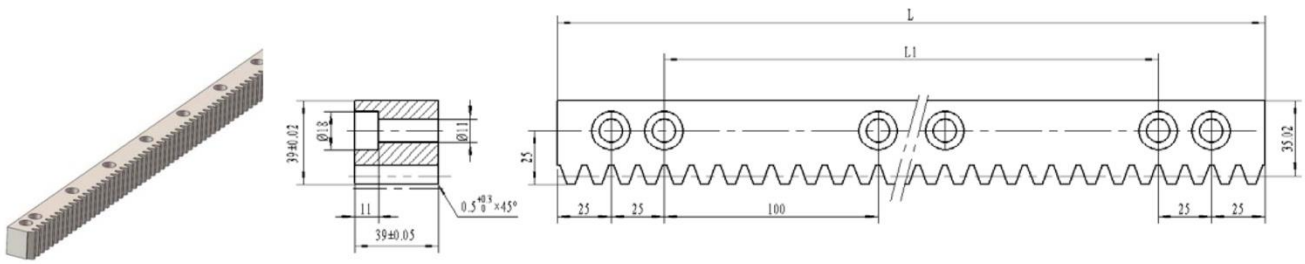

| 型号 Code | L | L1 | 材料 Mat. | 质量m （Kg） | 螺栓型号 bolt size |
|---|---|---|---|---|---|
| PB52.1 | 2000 | 1900 | 42CrMo | 21.0 | M10×25 8.8级 |
| | 1200 | 1100 | 42CrMo | 12.6 | M10×25 8.8级 |
| | 800 | 700 | 42CrMo | 8.4 | M10×25 8.8级 |




| 型号 Code | L | L1 | 材料 Mat. | 质量m （Kg） | 螺栓型号 bolt size |
|---|---|---|---|---|---|
| PB52.2 | 2000 | 1900 | 42CrMo | 22.9 | M10×25 8.8级 |
| | 1200 | 1100 | 42CrMo | 13.7 | M10×25 8.8级 |
| | 800 | 700 | 42CrMo | 9.2 | M10×25 8.8级 |



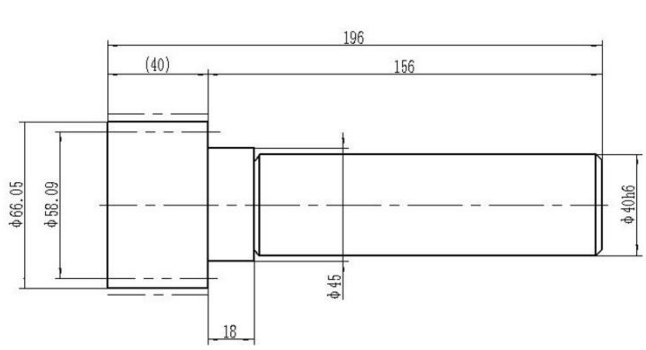

齿条 Rack



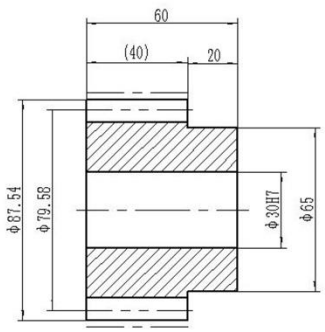

| 型号 Code | L | L1 | 模数 module | 齿距P（mm） | 材料 Mat. | 质量m（Kg） | 精度等级 Quality | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|---|---|
| PBR52 | 2000 | 1900 | 3.9789 | 12.5 | 42CrMo | 22.5 | DIN6h25 | M10×40 8.8级 |
| | 1200 | 1100 | 3.9789 | 12.5 | 42CrMo | 13.5 | DIN6h25 | M10×40 8.8级 |
| | 800 | 700 | 3.9789 | 12.5 | 42CrMo | 9.8 | DIN6h25 | M10×40 8.8级 |

驱动齿轮 Drive pinion





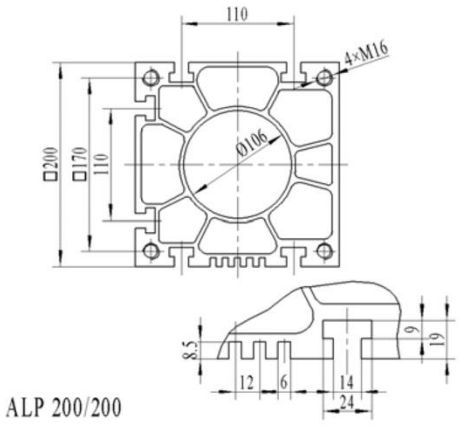

①




②

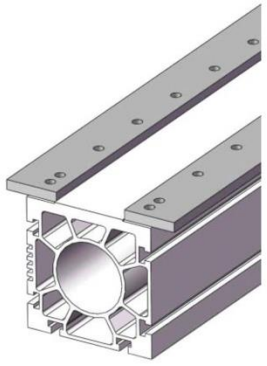
| 型号 Code | 齿数 Z | 模数 module | 齿距P（mm） | 图 Fig. | 材料 Mat. | 质量m（Kg） | 精度等级 Quality |
|---|---|---|---|---|---|---|---|
| PSD52-CP12.5 | 14 | 3.9789 | 12.5 | ① | 20CrMnTi | 5.0 | DIN6e25 |
| PD52-CP12.5 | 20 | 3.9789 | 12.5 | ② | 20CrMnTi | 1.8 | DIN6e25 |

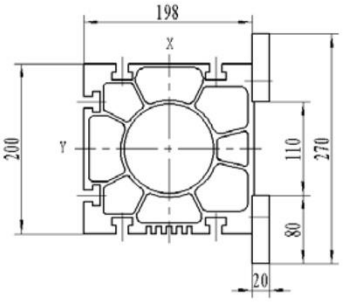
### 4.5.3 Ø52型铝型材 Ø52 Aluminum profile

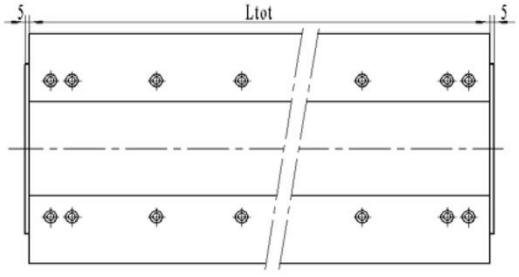



ALP 200/200

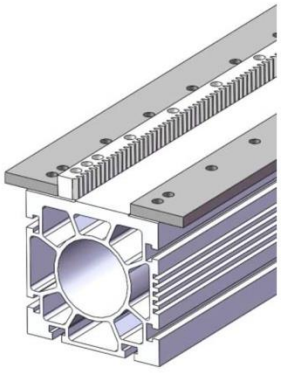
带导轨面的铝型材 Tubular alu profiles with guideways

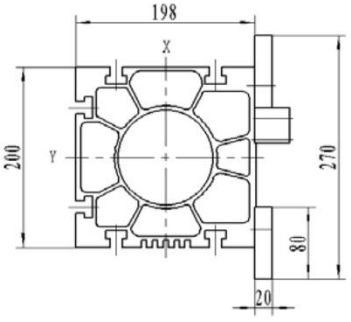


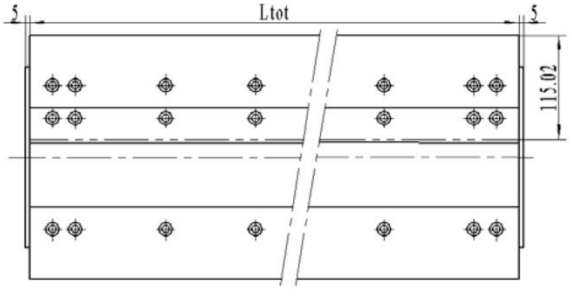



| 型号 Code | 材料 Mat. | m① （Kg/m） | m② （Kg/m） | $I_X$① （$cm^4$） | $I_X$② （$cm^4$） | $I_y$① （$cm^4$） | $I_y$② （$cm^4$） | $I_Z$ （$cm^4$） |
|---|---|---|---|---|---|---|---|---|
| ALP200/200 | 6063 | 36.2 | 61.3 | 6670 | 9210 | 6390 | 8980 | 12658 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

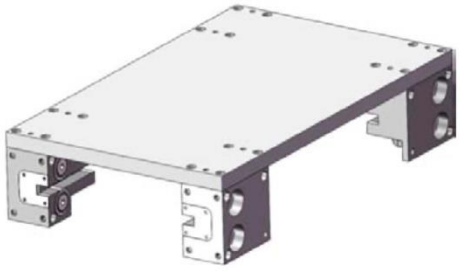




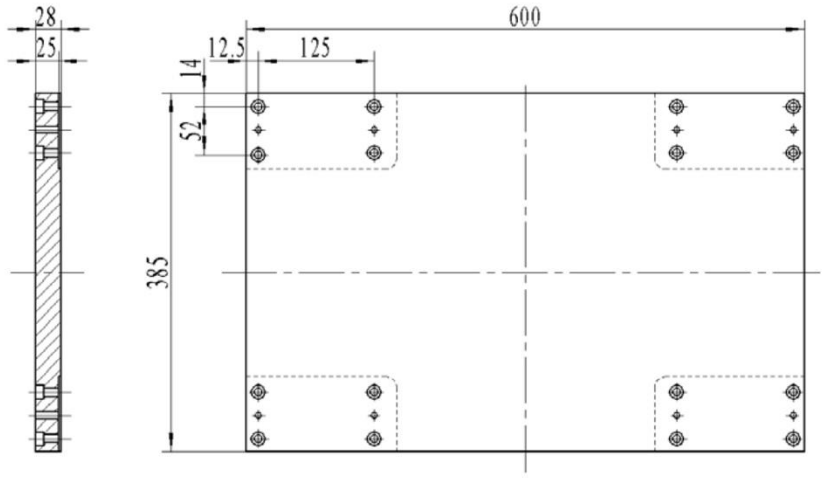




| 型号 Code | 材料 Mat. | m① （Kg/m） | m② （Kg/m） | $I_X$① （$cm^4$） | $I_X$② （$cm^4$） | $I_y$① （$cm^4$） | $I_y$② （$cm^4$） | $I_Z$ （$cm^4$） |
|---|---|---|---|---|---|---|---|---|
| ALP200/200 | 6063 | 36.2 | 73.9 | 6670 | 10500 | 6390 | 9190 | 12658 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

### 4.5.4 Ø52型传动板 Ø52 Drive plate

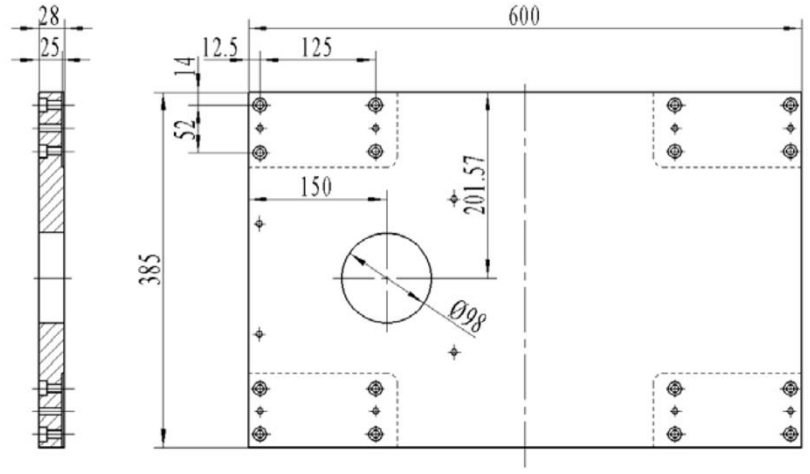


①





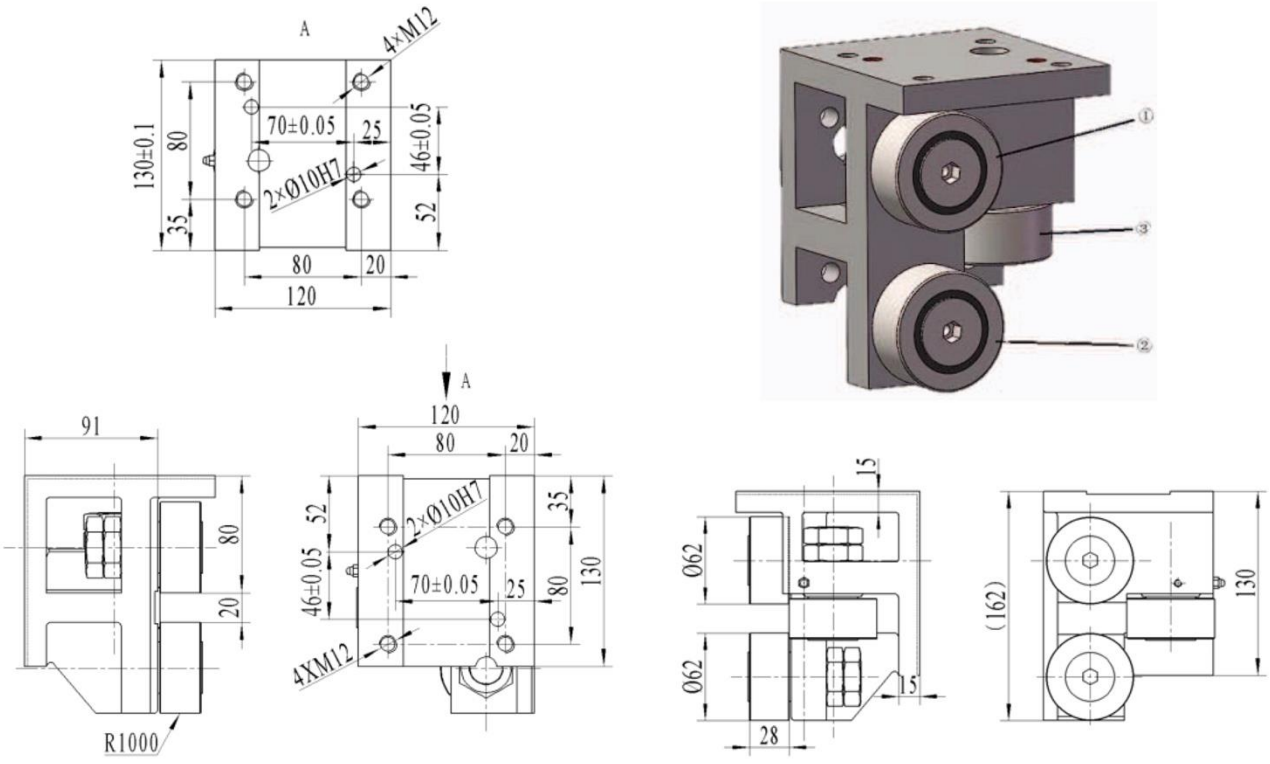

②




| 型号<br>Code | 图<br>Fig. | 材料<br>Mat. | 质量m<br>（Kg） |
|---|---|---|---|
| DP52.1 | ① | 5083 | 17.5 |
| DP52.2 | ② | 5083 | 16.9 |

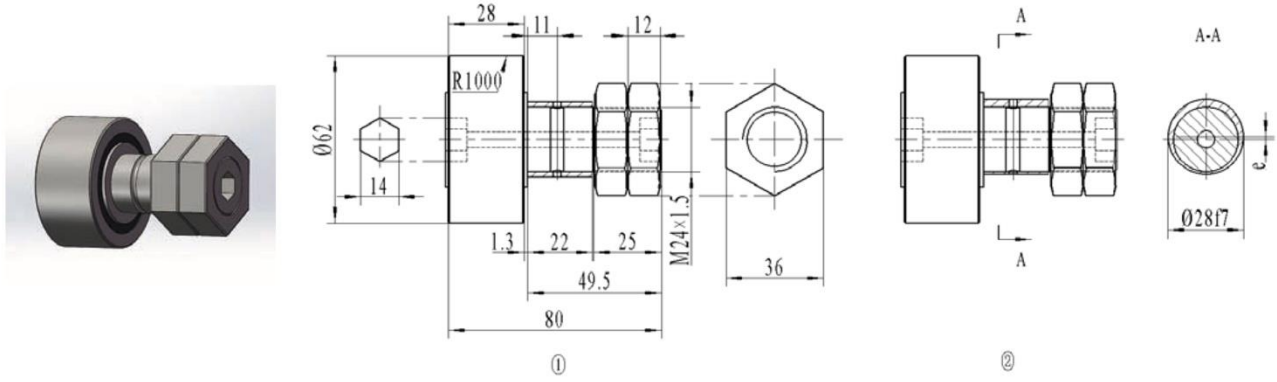
### 4.6.1 Ø62型滚轮组　Ø62 Roller unit

滚轮支座(右侧支座) Rollers support (Right hand version)

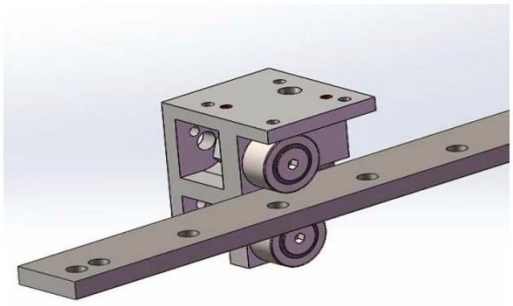


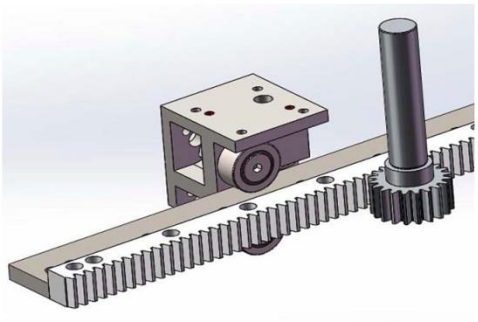

| 型号 Code | ① | ② | ③ | 材料 Mat. | 质量m (kg) | 负载能力Load carrying capacity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $C_{0W}$（N） | $C_W$①（N） | $C_W$②（N） | $n_{max}$（$min^{-1}$） |
| RB62.1R | BR | ER | ER | QT-400 | 7.0 | 39500 | 21400 | 5400 | 2200 |
| RB62.2R | BR | ER | BR | QT-400 | 7.0 | 39500 | 21400 | 5400 | 2200 |
| RB62.3R | ER | BR | ER | QT-400 | 7.0 | 39500 | 21400 | 5400 | 2200 |
| | | | | | | 距离 Distance：① $10^6$m　② $10^8$m | | | |

螺栓型滚轮 Stud roller

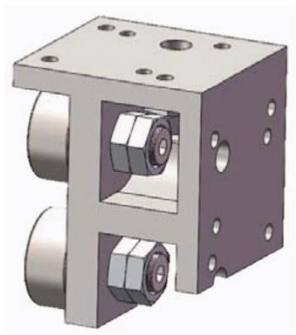


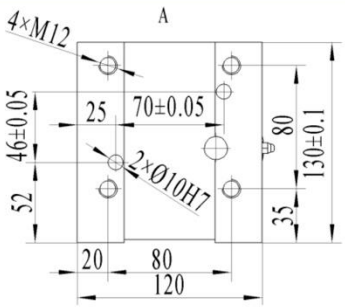

| 型号 Code | 图 Fig. | 偏心量 Excenter | 材料 Mat. | 质量m （Kg） | 螺母拧紧力矩 MA（Nm） |
|---|---|---|---|---|---|
| BR62 | ① | — | GCr15 | 0.82 | 220 |
| ER62 | ② | 1 | GCr15 | 0.82 | 220 |
| MA (Nm):Nut tightening torque | | | | | |

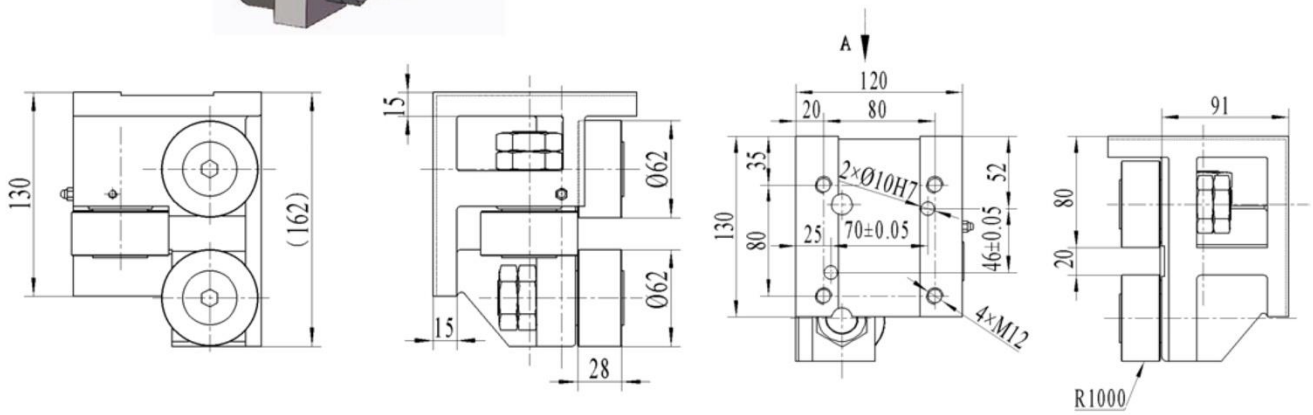




滚轮支座(左侧支座) Rollers support (Left hand version)

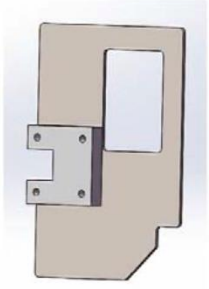


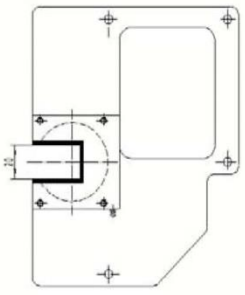


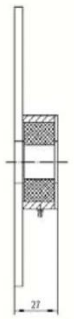




| 型号 Code | ① | ② | ③ | 材料 Mat. | 质量m (kg) | 负载能力Load carrying capacity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $C_{0W}$（N） | $C_W$①（N） | $C_W$②（N） | $n_{max}$（$min^{-1}$） |
| RB62.1L | BR | ER | ER | QT-400 | 7.0 | 39500 | 21400 | 5400 | 2200 |
| RB62.2L | BR | ER | BR | QT-400 | 7.0 | 39500 | 21400 | 5400 | 2200 |
| RB62.3L | ER | BR | ER | QT-400 | 7.0 | 39500 | 21400 | 5400 | 2200 |
| | | | | | | 距离 Distance：① $10^6$m ② $10^8$m | | | |

刮擦和润滑单元 Wiper and lubrication unit

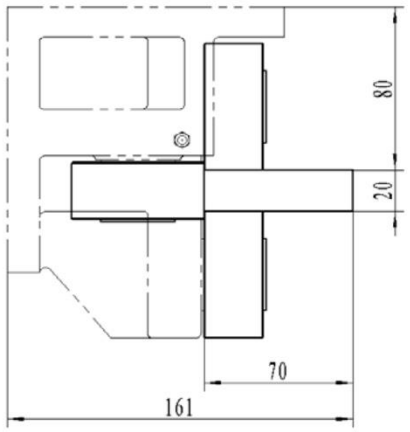




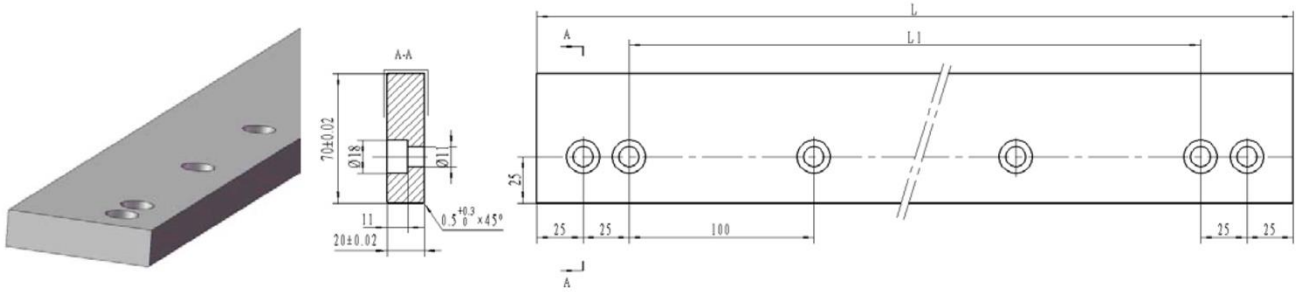


| 型号 Code | 质量m （Kg） |
|---|---|
| RA62R | 0.3 |
| RA62L | 0.3 |

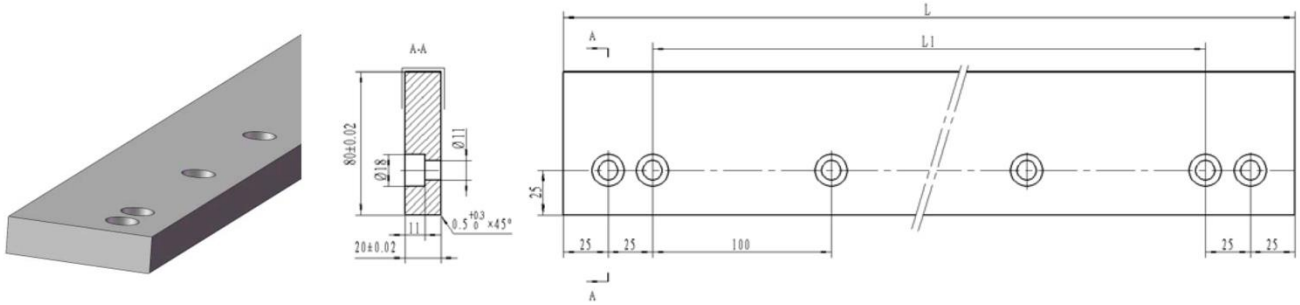
### 4.6.2 ∅62型扁导轨、齿条 ∅62 Guideway flat rail, rack



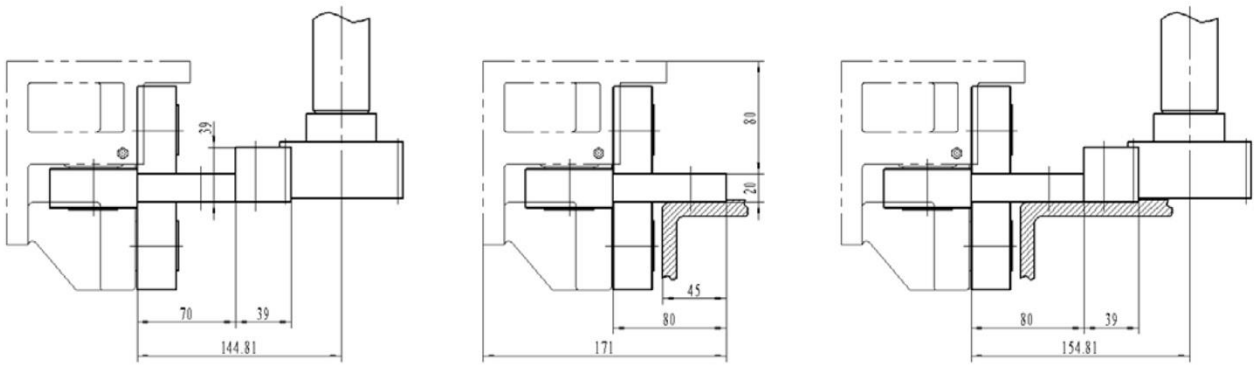

扁导轨 Guideway flat rail



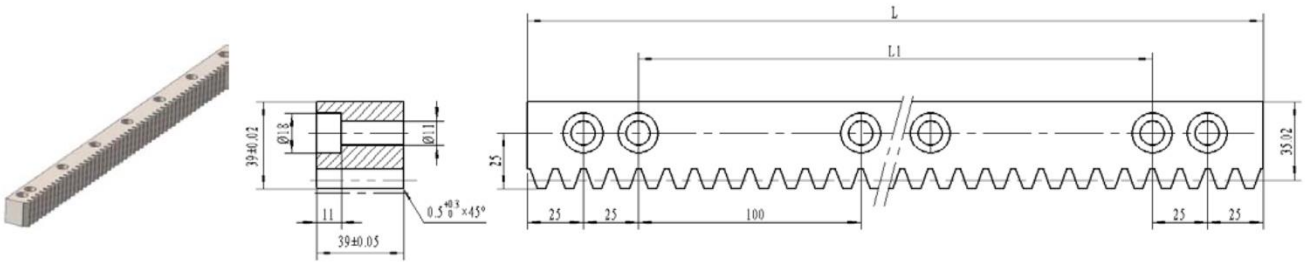

| 型号 Code | L | L1 | 材料 Mat. | 质量m （Kg） | 螺栓型号 bolt size |
|---|---|---|---|---|---|
| PB62.1 | 2000 | 1900 | 42CrMo | 21.0 | M10×25 8.8级 |
| | 1200 | 1100 | 42CrMo | 12.6 | M10×25 8.8级 |
| | 800 | 700 | 42CrMo | 8.4 | M10×25 8.8级 |




| 型号 Code | L | L1 | 材料 Mat. | 质量m （Kg） | 螺栓型号 bolt size |
|---|---|---|---|---|---|
| PB62.2 | 2000 | 1900 | 42CrMo | 22.9 | M10×25 8.8级 |
| | 1200 | 1100 | 42CrMo | 13.7 | M10×25 8.8级 |
| | 800 | 700 | 42CrMo | 9.2 | M10×25 8.8级 |



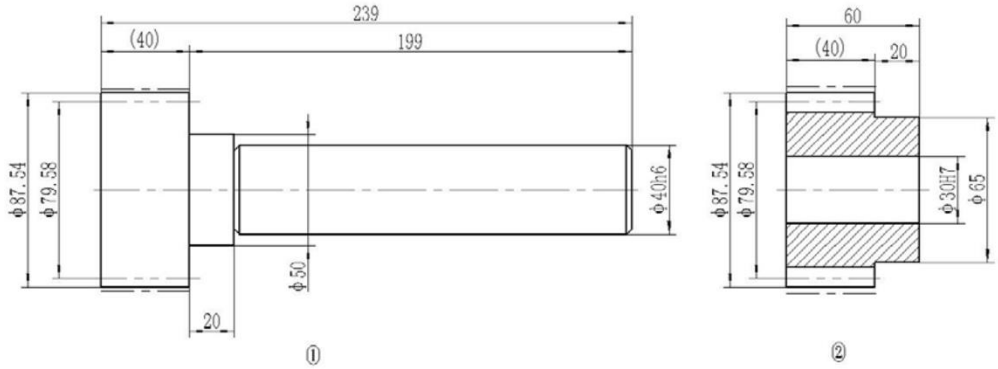

齿条 Rack




| 型号 Code | L | L1 | 模数 module | 齿距P （mm） | 材料 Mat. | 质量m （Kg） | 精度等级 Quality | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|---|---|
| PBR62 | 2000 | 1900 | 3.9789 | 12.5 | 42CrMo | 22.5 | DIN6h25 | M10×45 8.8级 |
| | 1200 | 1100 | 3.9789 | 12.5 | 42CrMo | 13.5 | DIN6h25 | M10×45 8.8级 |
| | 800 | 700 | 3.9789 | 12.5 | 42CrMo | 9.8 | DIN6h25 | M10×45 8.8级 |

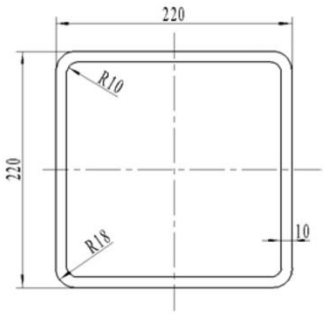
驱动齿轮 Drive pinion





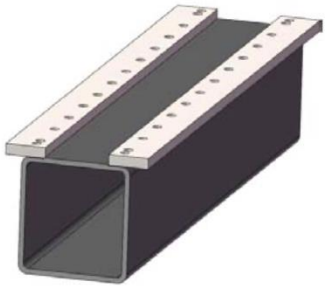

| 型号 Code | 齿数 Z | 模数 module | 齿距P （mm） | 图 Fig. | 材料 Mat. | 质量m （Kg） | 精度等级 Quality |
|---|---|---|---|---|---|---|---|
| PSD62-CP12.5 | 20 | 3.9789 | 12.5 | ① | 20CrMnTi | 6.0 | DIN6e25 |
| PD62-CP12.5 | 20 | 3.9789 | 12.5 | ② | 20CrMnTi | 1.8 | DIN6e25 |

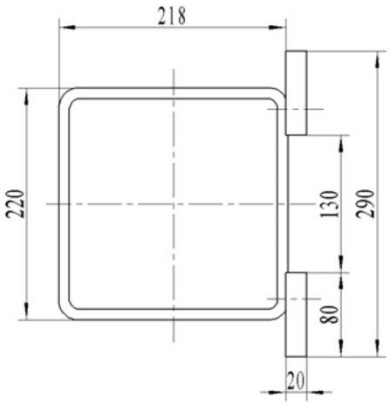
### 4.6.3 ∅62型钢型材 ∅62 Steel profiles

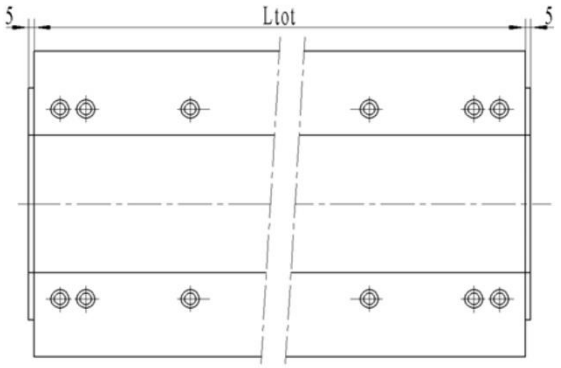



LP 220/220

带导轨面的钢型材 Tubular steel profile with guideways

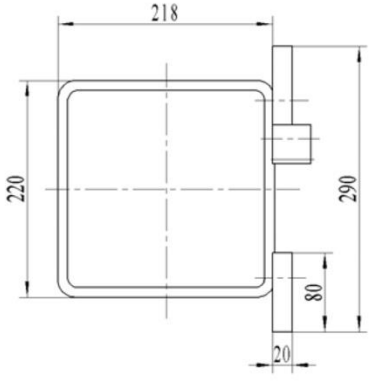


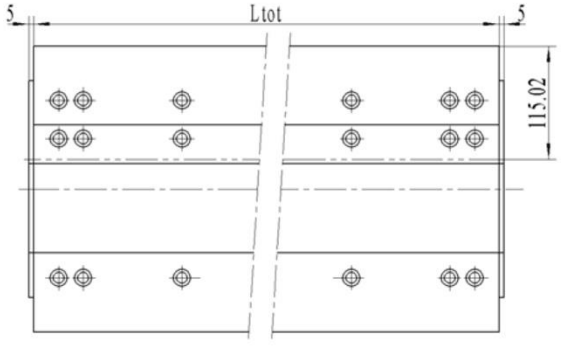



| 型号 Code | 材料 Mat. | m① （Kg/m） | m② （Kg/m） | $I_X$① （$cm^4$） | $I_X$② （$cm^4$） | $I_y$① （$cm^4$） | $I_y$② （$cm^4$） | $I_z$ $cm^4$） |
|---|---|---|---|---|---|---|---|---|
| LPS220/220 | Q345B | 63.9 | 89.0 | 5890 | 8640 | 5890 | 9100 | 9470 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

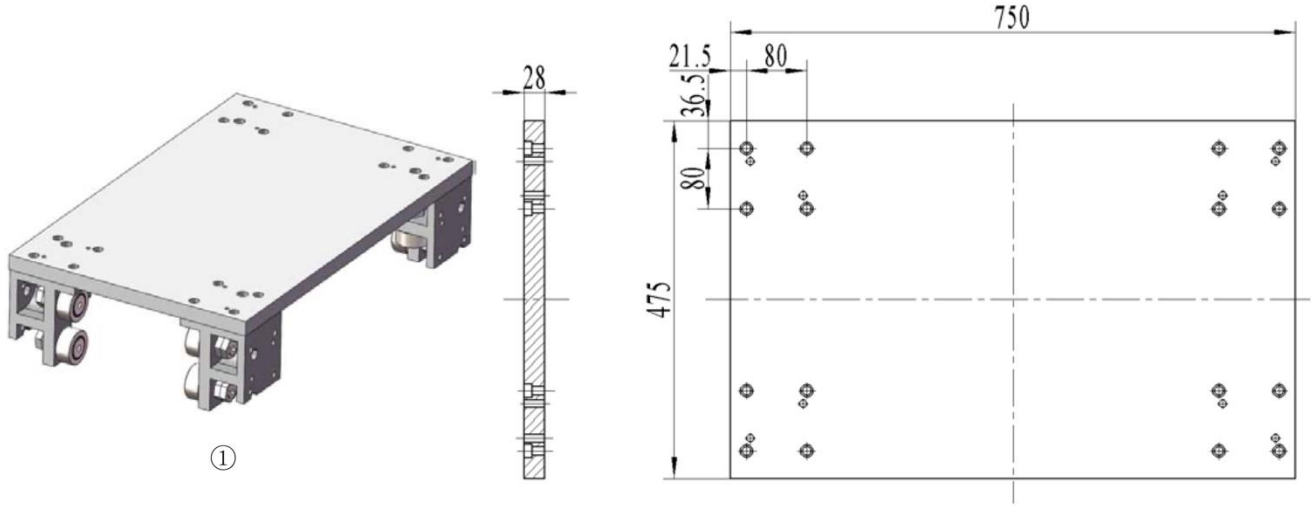


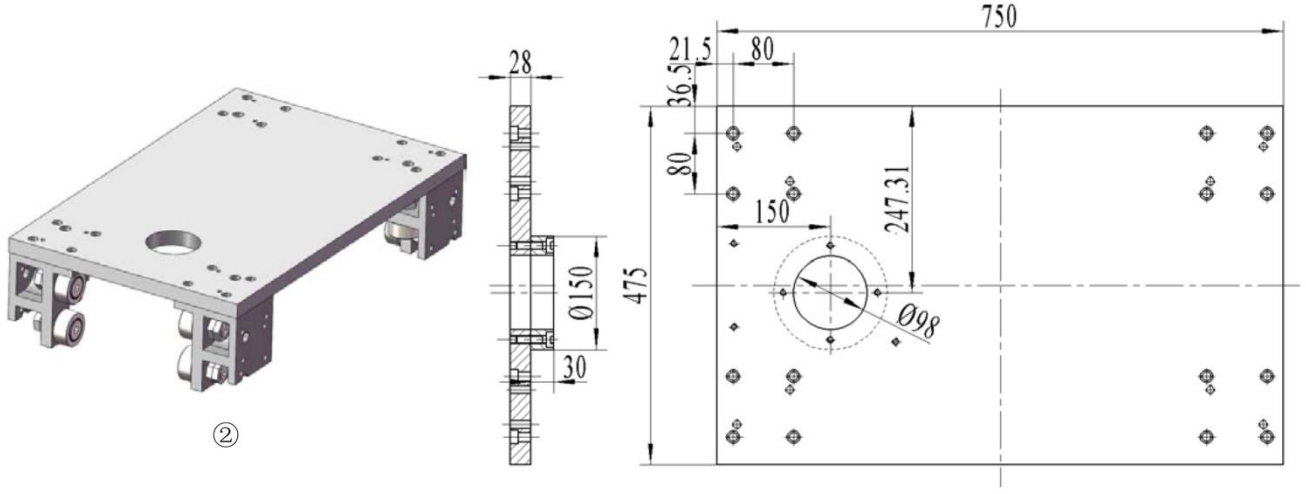



| 型号 Code | 材料 Mat. | 质量① （Kg/m） | 质量② （Kg/m） | $I_X$① （$cm^4$） | $I_X$② （$cm^4$） | $I_y$① （$cm^4$） | $I_y$② （$cm^4$） | $I_z$ （$cm^4$） |
|---|---|---|---|---|---|---|---|---|
| LPS220/220 | Q345B | 63.9 | 101.6 | 5890 | 9800 | 5890 | 9420 | 9470 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

### 4.6.4 Ø62型传动板 Ø62 Drive plate

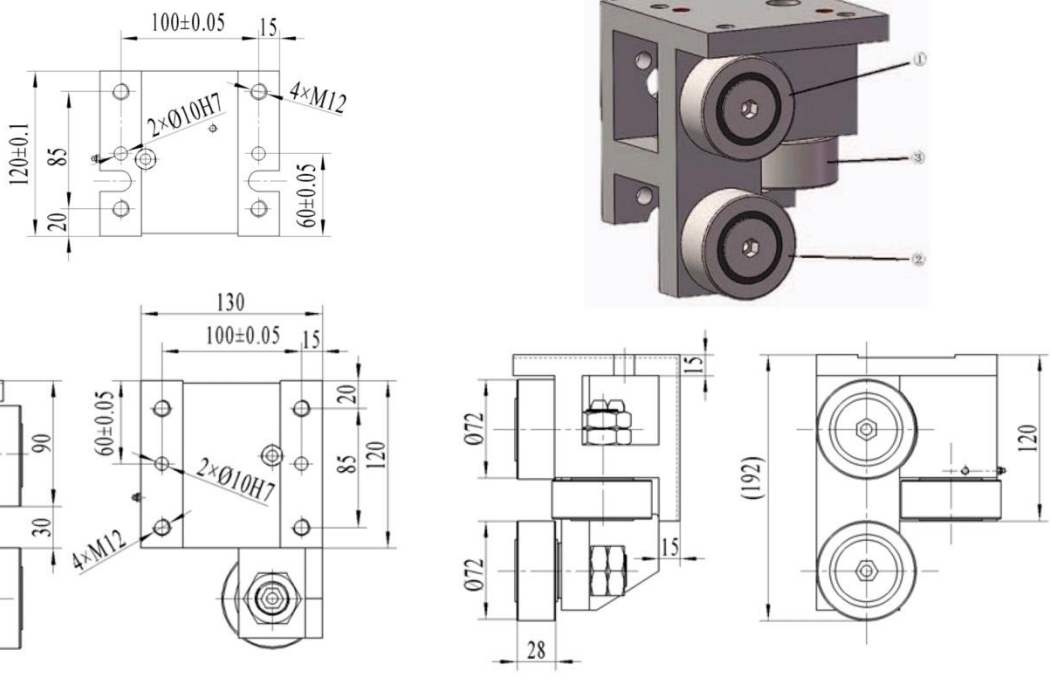



| 型号<br>Code | 图<br>Fig. | 材料<br>Mat. | 质量m<br>（Kg） |
|---|---|---|---|
| DP62.1 | ① | 5083 | 26.9 |
| DP62.2 | ② | 5083 | 27.4 |

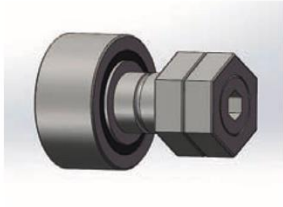
### 4.7.1 Ø72型滚轮组 Ø72 Roller unit

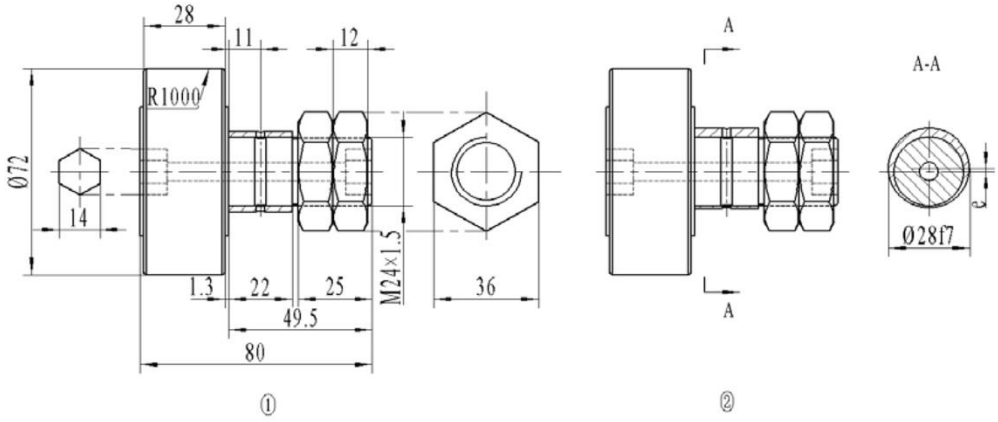
滚轮支座(右侧支座) Rollers support (Right hand version)



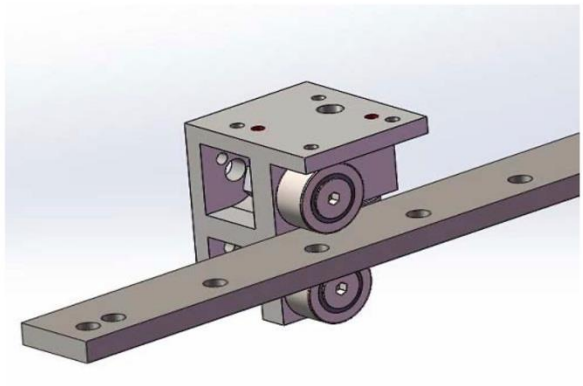

| 型号 Code | ① | ② | ③ | 材料 Mat. | 质量m (kg) | 负载能力Load carrying capacity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $C_{0W}$（N） | $C_W$①（N） | $C_W$②（N） | $n_{max}$（$min^{-1}$） |
| RB72.1R | BR | ER | ER | QT-400 | 9.0 | 46500 | 24600 | 6200 | 2200 |
| RB72.2R | BR | ER | BR | QT-400 | 9.0 | 46500 | 24600 | 6200 | 2200 |
| RB72.3R | ER | BR | ER | QT-400 | 9.0 | 46500 | 24600 | 6200 | 2200 |
| | | | | | | 距离 Distance：① $10^6$m ② $10^8$m | | | |

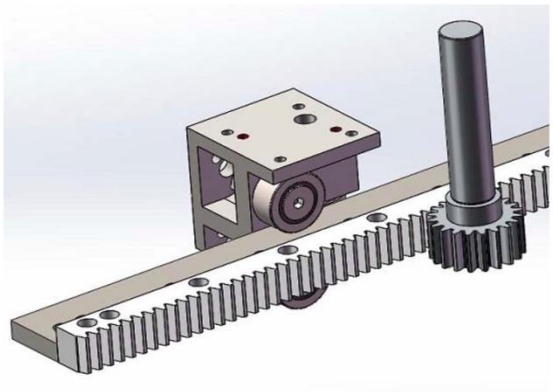
螺栓型滚轮 Stud roller



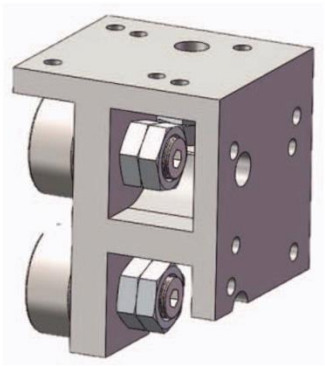


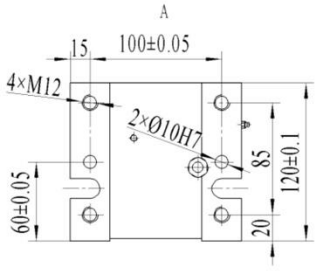

| 型号 Code | 图 Fig. | 偏心量 Excenter | 材料 Mat. | 质量m （Kg） | 螺母拧紧力矩 MA（Nm） |
|---|---|---|---|---|---|
| BR72 | ① | — | GCr15 | 1.05 | 220 |
| ER72 | ② | 1 | GCr15 | 1.05 | 220 |
| MA (Nm): Nut tightening torque | | | | | |

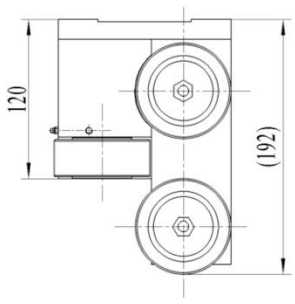


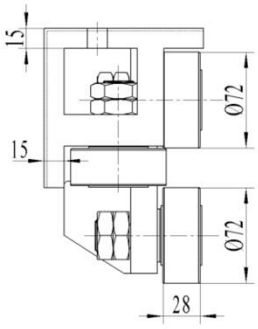


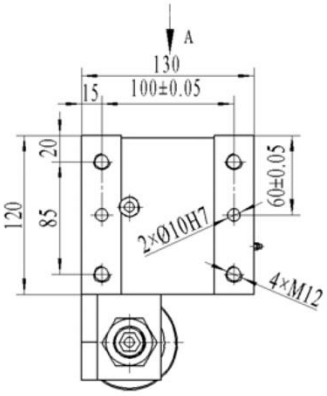
滚轮支座(左侧支座) Rollers support (Left hand version)

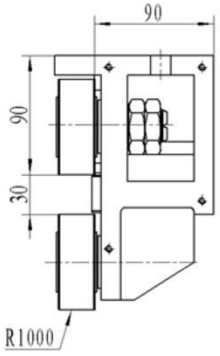




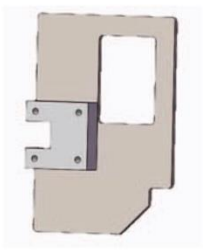



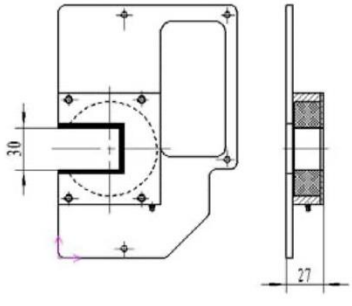




| 型号 Code | ① | ② | ③ | 材料 Mat. | 质量m (kg) | 负载能力Load carrying capacity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $C_{0W}$（N） | $C_W$①（N） | $C_W$②（N） | $n_{max}$（$min^{-1}$） |
| RB72.1L | BR | ER | ER | QT-400 | 9.0 | 46500 | 24600 | 6200 | 2200 |
| RB72.2L | BR | ER | BR | QT-400 | 9.0 | 46500 | 24600 | 6200 | 2200 |
| RB72.3L | ER | BR | ER | QT-400 | 9.0 | 46500 | 24600 | 6200 | 2200 |
| | | | | | | 距离 Distance：① $10^6$m ② $10^8$m | | | |

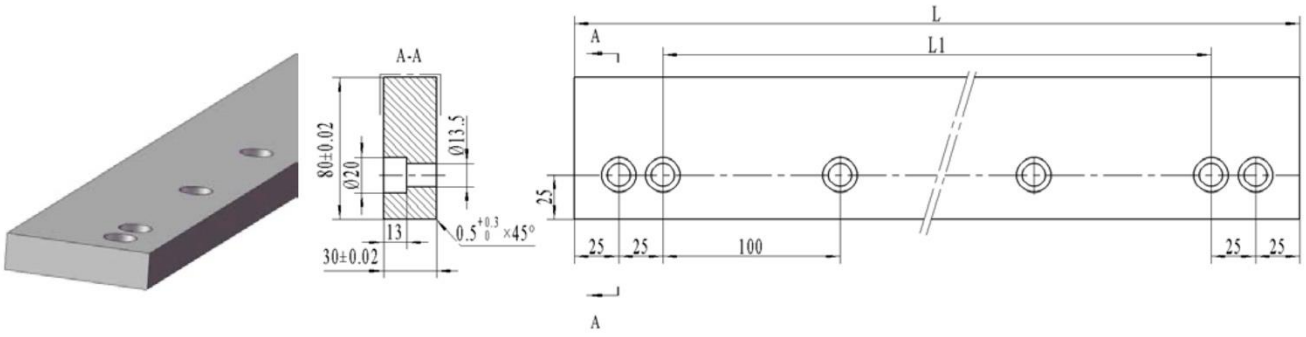
刮擦和润滑单元 Wiper and lubrication unit

| 型号 Code | 质量m （Kg） |
|---|---|
| RA72R | 0.3 |
| RA72L | 0.3 |

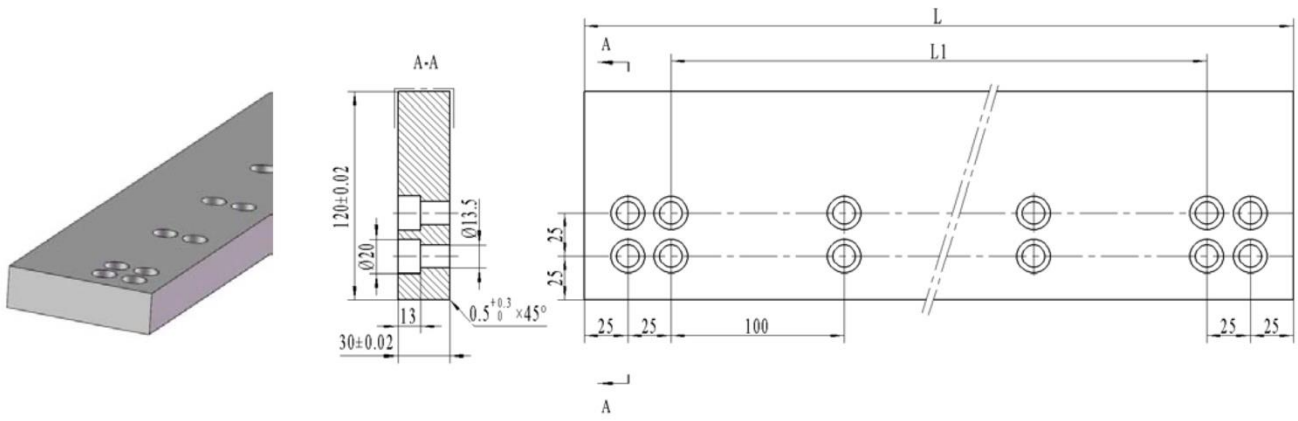




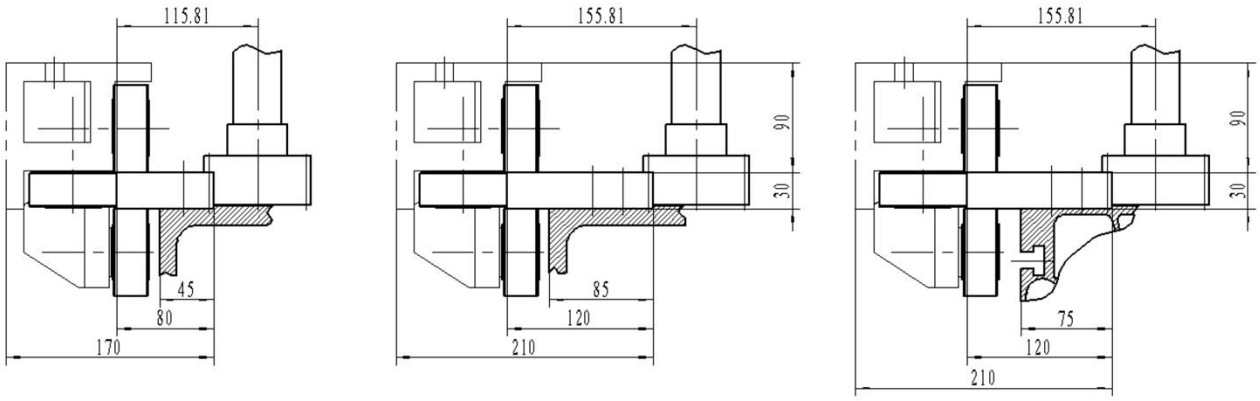
### 4.7.2 扁导轨 Guideway flat rail



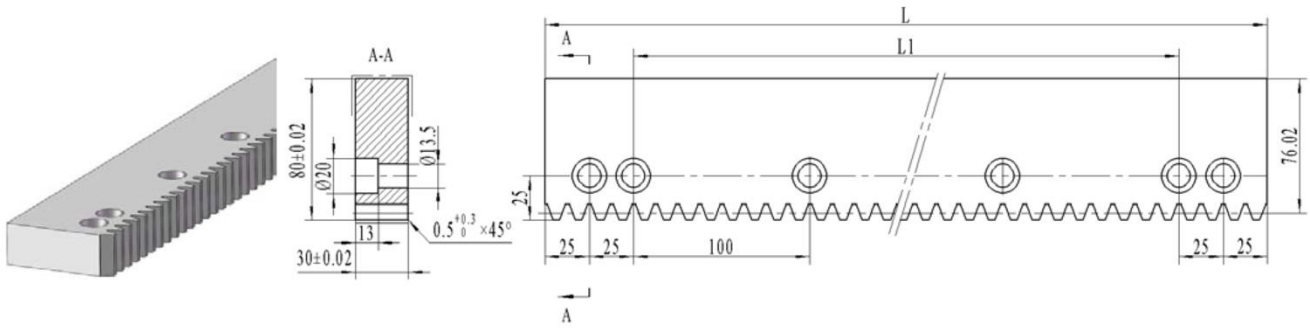

| 型号 Code | L | L1 | 材料 Mat. | 质量m （Kg） | 螺栓型号 bolt size |
|---|---|---|---|---|---|
| PB72.1 | 2000 | 1900 | 42CrMo | 34.7 | M12×35 8.8级 |
| | 1200 | 1100 | 42CrMo | 20.8 | M12×35 8.8级 |
| | 800 | 700 | 42CrMo | 15.0 | M12×35 8.8级 |



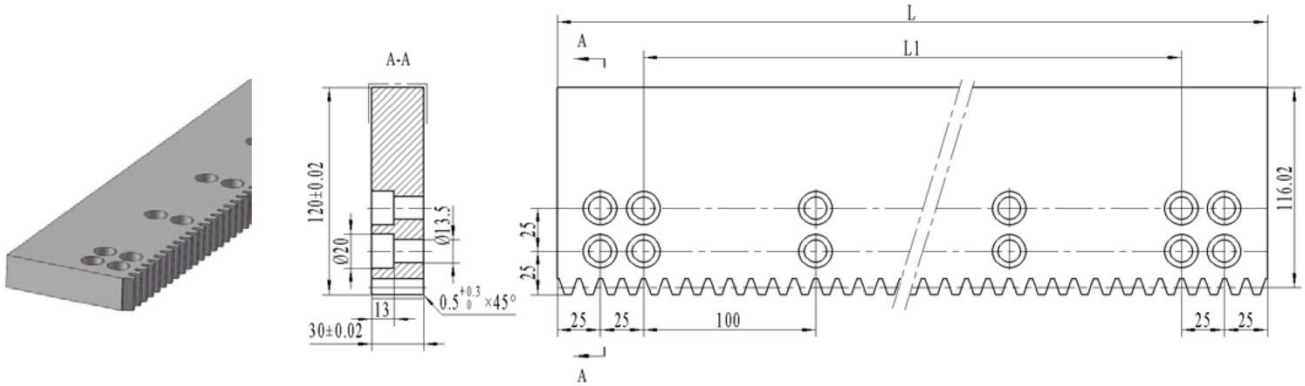

| 型号 Code | L | L1 | 材料 Mat. | 质量m （Kg） | 螺栓型号 bolt size |
|---|---|---|---|---|---|
| PB72.2 | 2000 | 1900 | 42CrMo | 56.1 | M12×35 8.8级 |
| | 1200 | 1100 | 42CrMo | 33.7 | M12×35 8.8级 |
| | 800 | 700 | 42CrMo | 22.5 | M12×35 8.8级 |




导轨齿条 Guideway flat rail rack

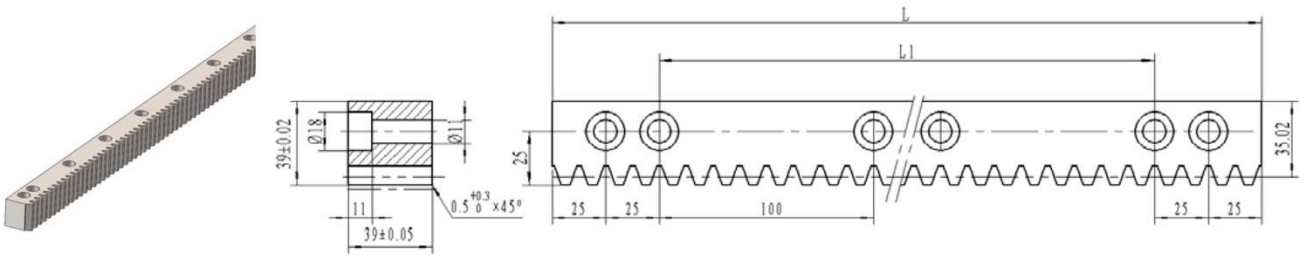



| 型号 Code | L | L1 | 模数 module | 齿距P （mm） | 材料 Mat. | 质量m （Kg） | 精度等级 Quality | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|---|---|
| PBR72.1 | 2000 | 1900 | 3.9789 | 12.5 | 42CrMo | 35.6 | DIN6h25 | M12×35 8.8级 |
| | 1200 | 1100 | 3.9789 | 12.5 | 42CrMo | 21.4 | DIN6h25 | M12×35 8.8级 |
| | 800 | 700 | 3.9789 | 12.5 | 42CrMo | 14.3 | DIN6h25 | M12×35 8.8级 |



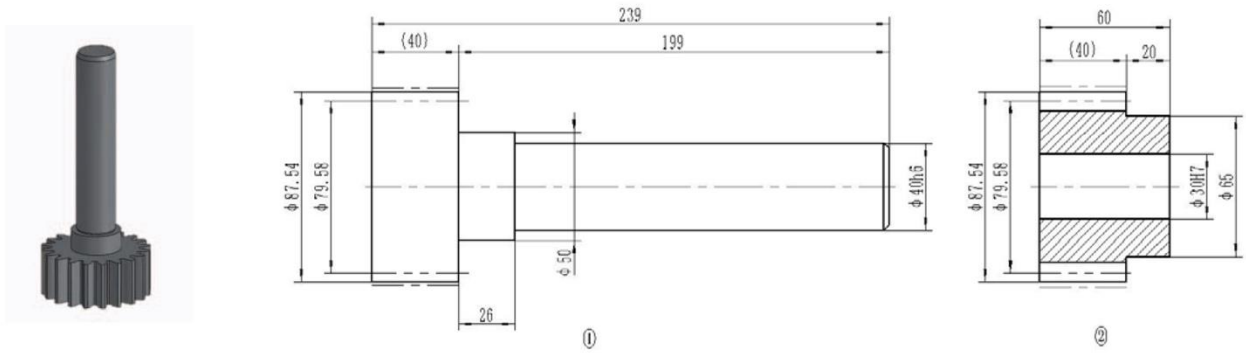

| 型号 Code | L | L1 | 模数 module | 齿距P （mm） | 材料 Mat. | 质量m （Kg） | 精度等级 Quality | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|---|---|
| PBR72.2 | 2000 | 1900 | 3.9789 | 12.5 | 42CrMo | 54.3 | DIN6h25 | M12×35 8.8级 |
| | 1200 | 1100 | 3.9789 | 12.5 | 42CrMo | 32.6 | DIN6h25 | M12×35 8.8级 |
| | 800 | 700 | 3.9789 | 12.5 | 42CrMo | 21.7 | DIN6h25 | M12×35 8.8级 |

## 齿条 Rack



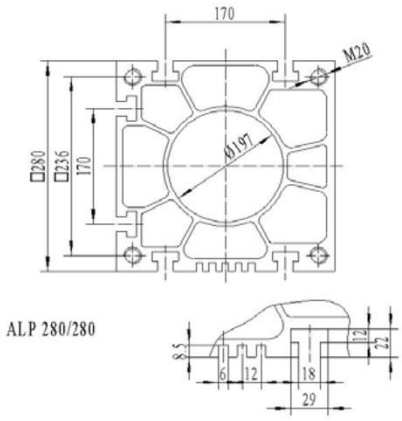

| 型号 Code | L | L1 | 模数 module | 齿距P （mm） | 材料 Mat. | 质量m （Kg） | 精度等级 Quality | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|---|---|
| PBR72.3 | 2000 | 1900 | 3.9789 | 12.5 | 42CrMo | 22.5 | DIN6h25 | M10×45 8.8级 |
| | 1200 | 1100 | 3.9789 | 12.5 | 42CrMo | 13.5 | DIN6h25 | M10×45 8.8级 |
| | 800 | 700 | 3.9789 | 12.5 | 42CrMo | 9.8 | DIN6h25 | M10×45 8.8级 |

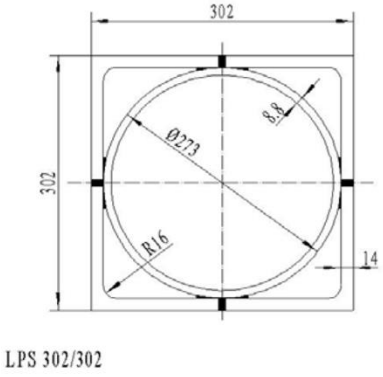
## 驱动齿轮 Drive pinion



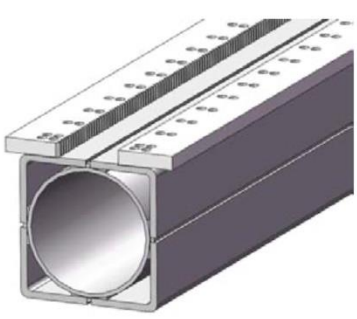

| 型号 Code | 齿数 Z | 模数 module | 齿距P （mm） | 图 Fig. | 材料 Mat. | 质量m （Kg） | 精度等级 Quality |
|---|---|---|---|---|---|---|---|
| PSD72-CP12.5 | 20 | 3.9789 | 12.5 | ① | 20CrMnTi | 6.0 | DIN6e25 |
| PD72-CP12.5 | 20 | 3.9789 | 12.5 | ② | 20CrMnTi | 1.8 | DIN6e25 |

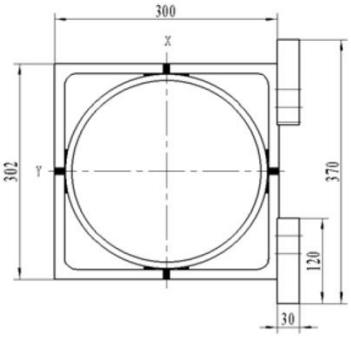
### 4.7.3 Ø72型铝型材、钢型材 Ø72 Aluminum profiles, steel profiles

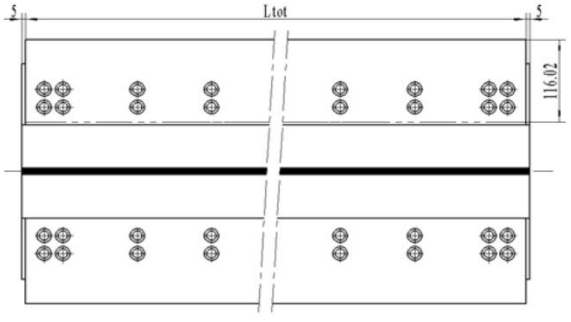



带导轨面的钢型材 Tubular steel profile with guideways

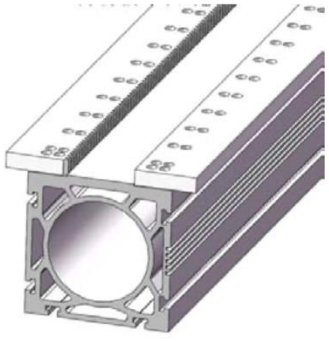


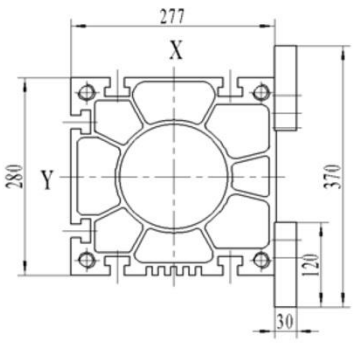


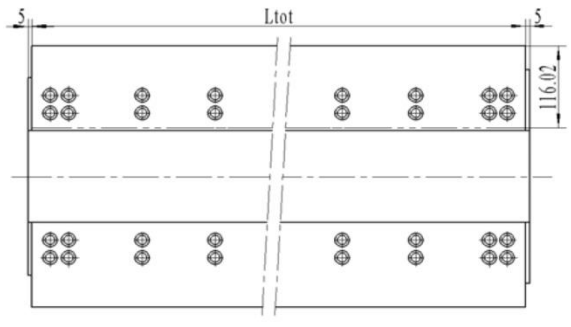




| 型号 Code | 材料 Mat. | m① （Kg/m） | m② （Kg/m） | $I_x$① （$cm^4$） | $I_x$② （$cm^4$） | $I_y$① （$cm^4$） | $I_y$② （$cm^4$） | $I_z$ （$cm^4$） |
|---|---|---|---|---|---|---|---|---|
| LPS302/302 | Q345B | 183.9 | 240.5 | 28700 | 41400 | 28700 | 38700 | 46200 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

带导轨面的铝型材 Tubular alu profiles with guideways

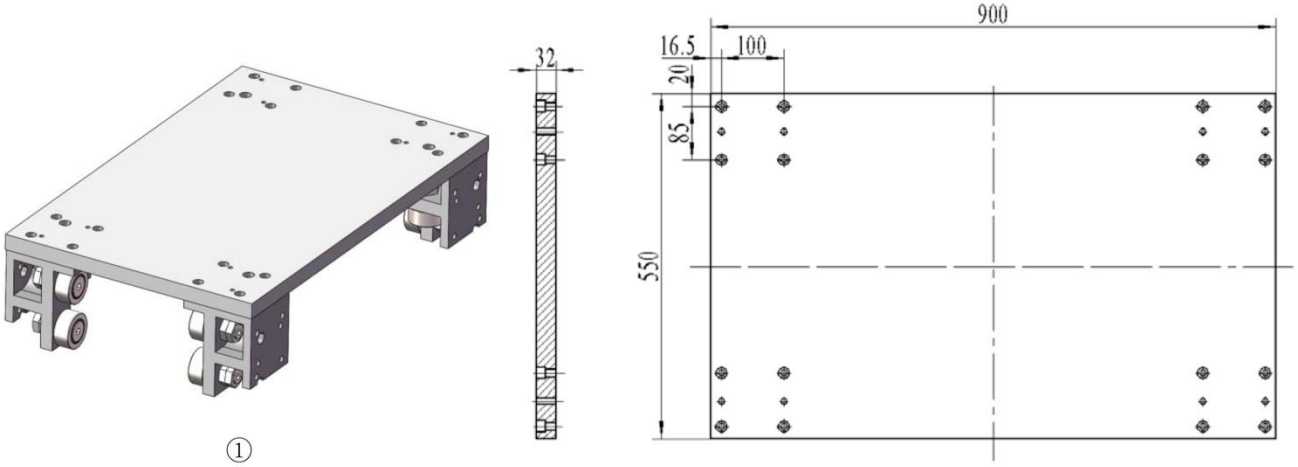




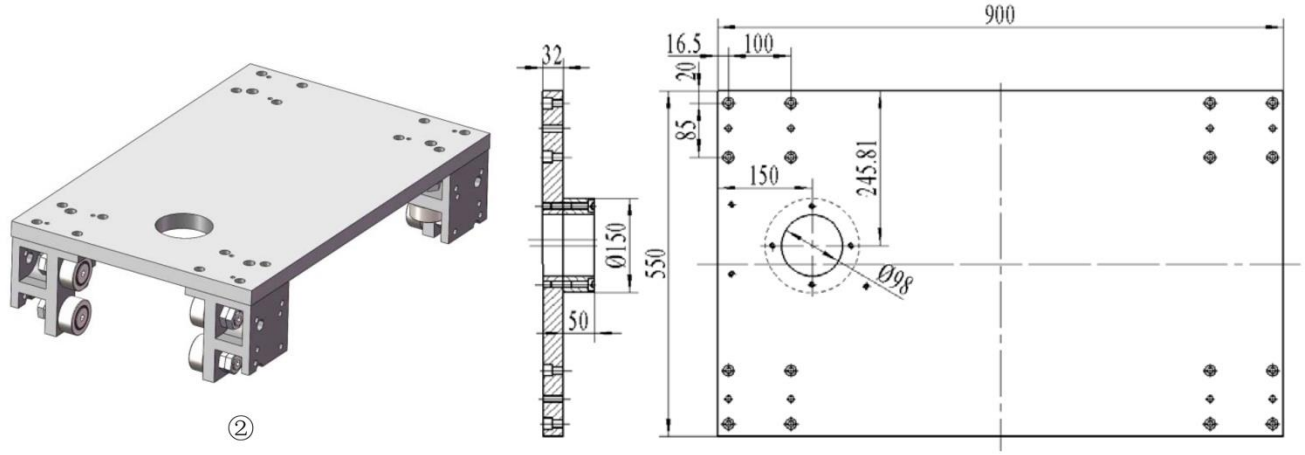




| 型号 Code | 材料 Mat. | m① （Kg/m） | m② （Kg/m） | $I_x$① （$cm^4$） | $I_x$② （$cm^4$） | $I_y$① （$cm^4$） | $I_y$② （$cm^4$） | $I_z$ （$cm^4$） |
|---|---|---|---|---|---|---|---|---|
| ALP280/280 | 6063 | 59.2 | 115.7 | 22800 | 33600 | 22200 | 32600 | 17000 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

### 4.7.4 ∅72型传动板 ∅72 Drive plate




①

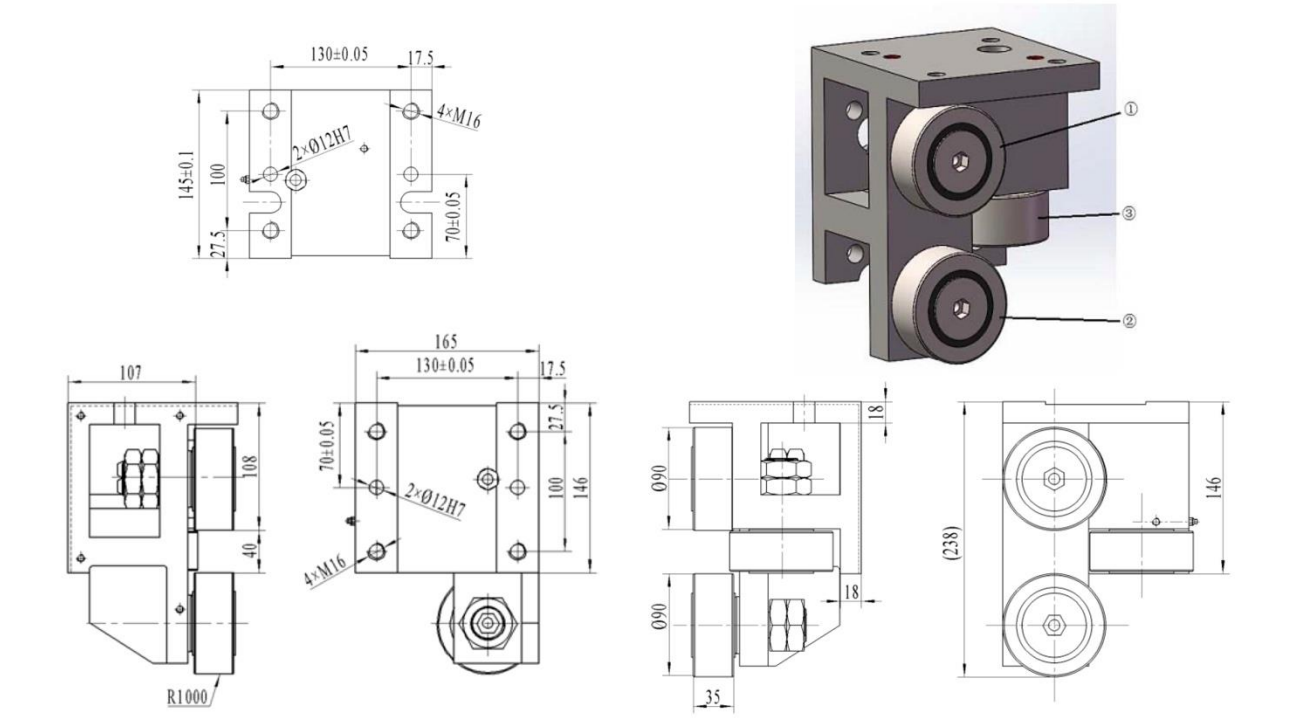



②

| 型号<br>Code | 图<br>Fig. | 材料<br>Mat. | 质量m<br>（Kg） |
|---|---|---|---|
| DP72.1 | ① | Q345B | 124 |
| DP72.2 | ② | Q345B | 124 |

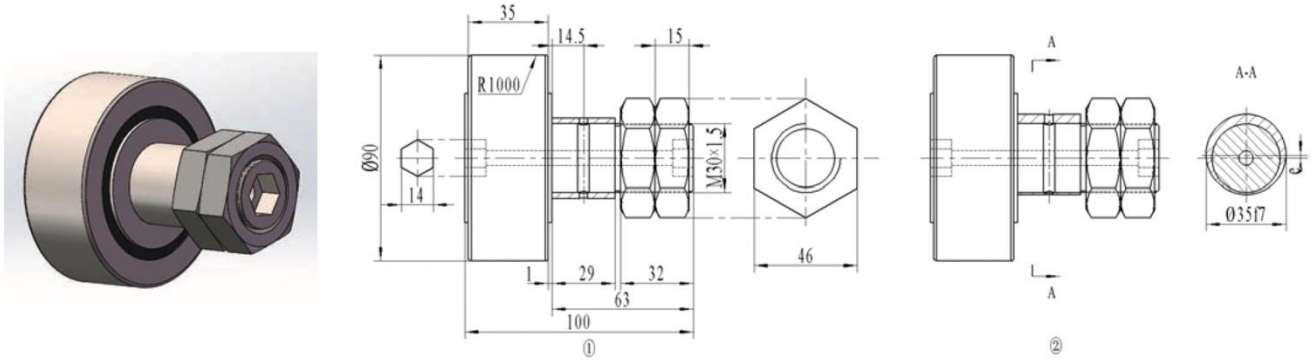
### 4.8.1 Ø90型滚轮组　Ø90 Roller unit

滚轮支座(右侧支座) Rollers support (Right hand version)

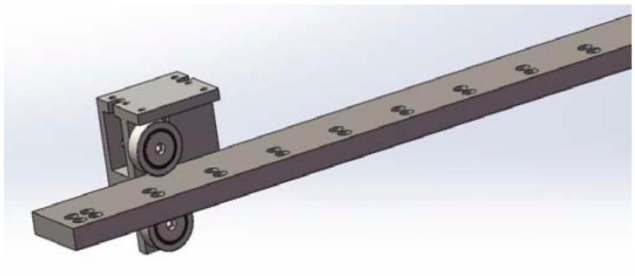


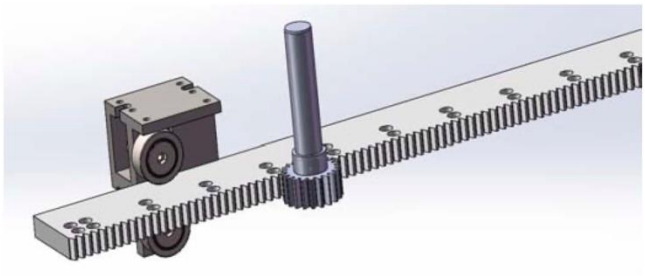

| 型号 Code | ① | ② | ③ | 材料 Mat. | 质量m (kg) | 负载能力Load carrying capacity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $C_{0W}$（N） | $C_W$①（N） | $C_W$②（N） | $n_{max}$（$min^{-1}$） |
| RB90.1R | BR | ER | ER | QT-400 | 15.0 | 82000 | 43100 | 10800 | 1800 |
| RB90.2R | BR | ER | BR | QT-400 | 15.0 | 82000 | 43100 | 10800 | 1800 |
| RB90.3R | ER | BR | ER | QT-400 | 15.0 | 82000 | 43100 | 10800 | 1800 |
| | | | | | | 距离 Distance：① $10^6$m　② $10^8$m | | | |

螺栓型滚轮 Stud roller

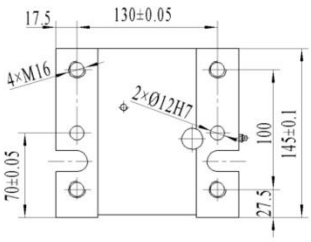


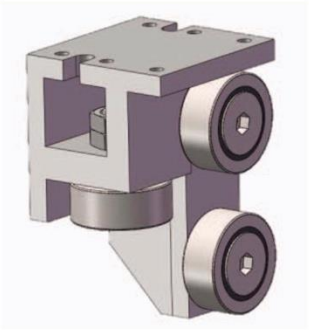

| 型号 Code | 图 Fig. | 偏心量 Excenter | 材料 Mat. | 质量m（Kg） | 螺母拧紧力矩 MA（Nm） |
|---|---|---|---|---|---|
| BR90 | | — | GCr15 | 2.02 | 450 |
| ER90 | | 1 | GCr15 | 2.02 | 450 |
| MA (Nm): Nut tightening torque | | | | | |

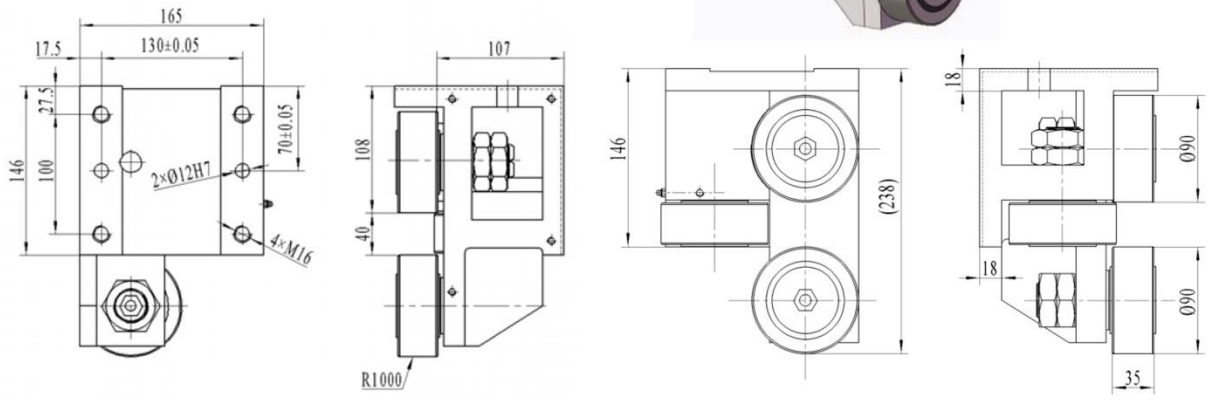




滚轮支座(左侧支座) Rollers support (Left hand version)



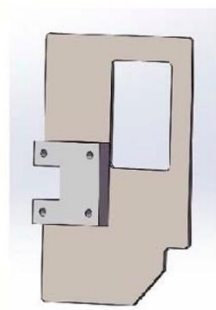



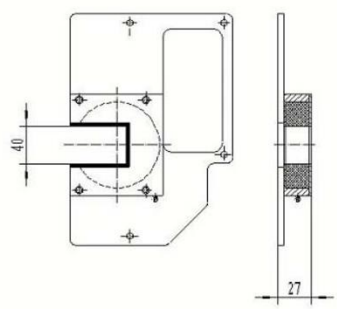



| 型号 Code | ① | ② | ③ | 材料 Mat. | 质量m (kg) | 负载能力Load carrying capacity | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $C_{0w}$（N） | $C_w$①（N） | $C_w$②（N） | $n_{max}$（$min^{-1}$） |
| RB90.1L | BR | ER | ER | QT-400 | 15.0 | 82000 | 43100 | 10800 | 1800 |
| RB90.2L | BR | ER | BR | QT-400 | 15.0 | 82000 | 43100 | 10800 | 1800 |
| RB90.3L | ER | BR | ER | QT-400 | 15.0 | 82000 | 43100 | 10800 | 1800 |
| | | | | | | 距离 Distance：① $10^6$m ② $10^8$m | | | |

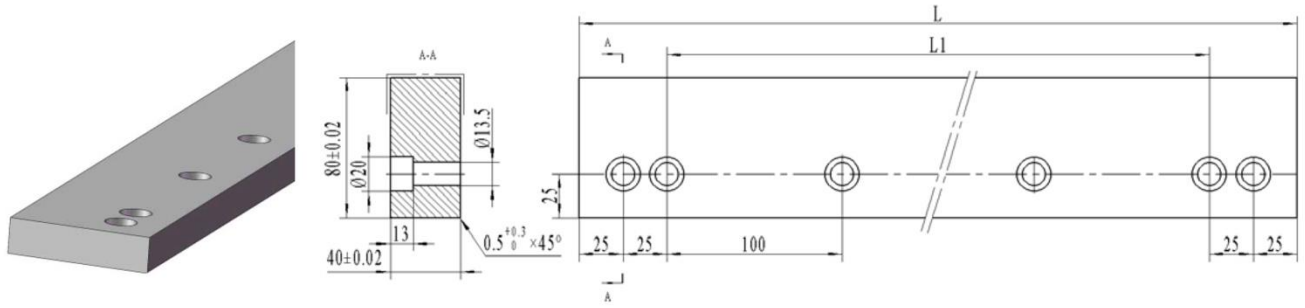
擦拭刷和润滑单元 Wiper and lubrication unit

| 型号 Code | 质量m （Kg） |
|---|---|
| RA90R | 0.4 |
| RA90L | 0.4 |

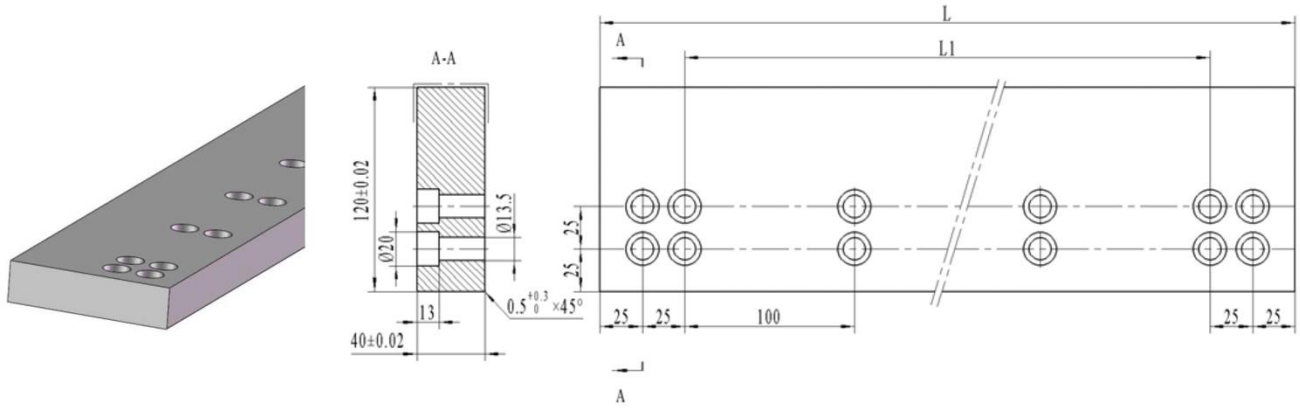




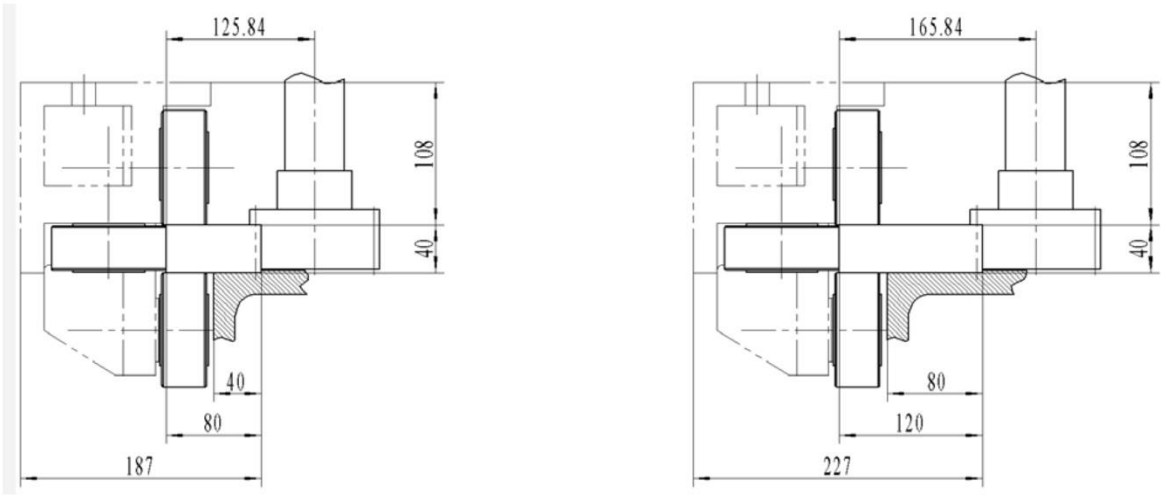
### 4.8.2 扁导轨 Guideway flat rail



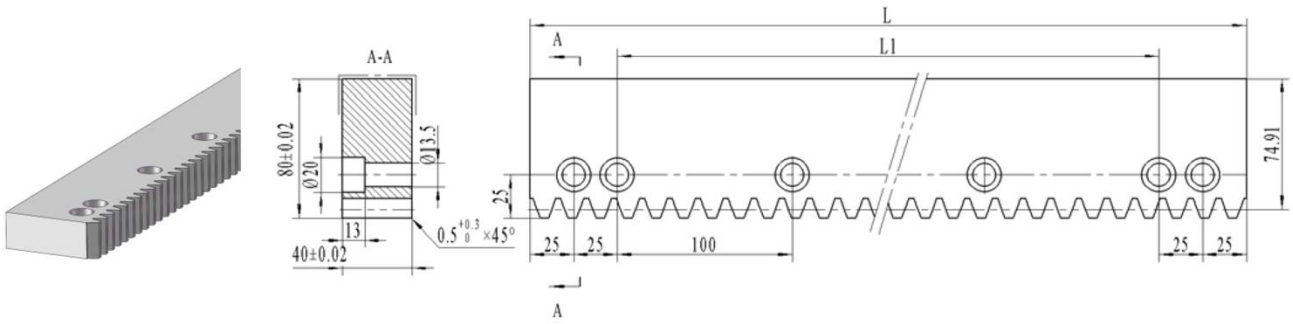

| 型号<br>Code | L | L1 | 材料<br>Mat. | 质量m<br>（Kg） | 螺栓型号<br>bolt size |
|---|---|---|---|---|---|
| PB90.1 | 2000 | 1900 | 42CrMo | 49.9 | M12×45 8.8级 |
| | 1200 | 1100 | 42CrMo | 30.0 | M12×45 8.8级 |
| | 800 | 700 | 42CrMo | 20.0 | M12×45 8.8级 |



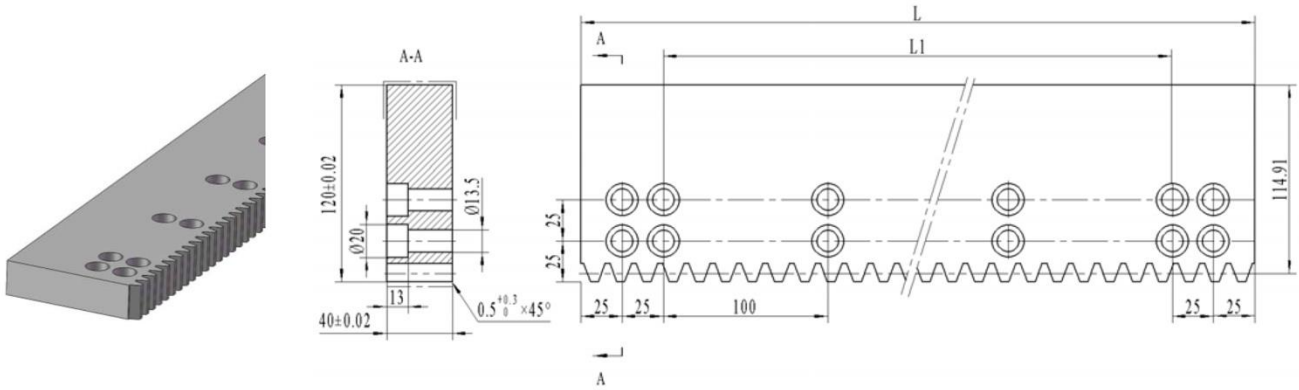

| 型号<br>Code | L | L1 | 材料<br>Mat. | 质量m<br>（Kg） | 螺栓型号<br>bolt size |
|---|---|---|---|---|---|
| PB90.2 | 2000 | 1900 | 42CrMo | 74.8 | M12×45 8.8级 |
| | 1200 | 1100 | 42CrMo | 44.9 | M12×45 8.8级 |
| | 800 | 700 | 42CrMo | 29.9 | M12×45 8.8级 |




导轨齿条 Guideway flat rail rack

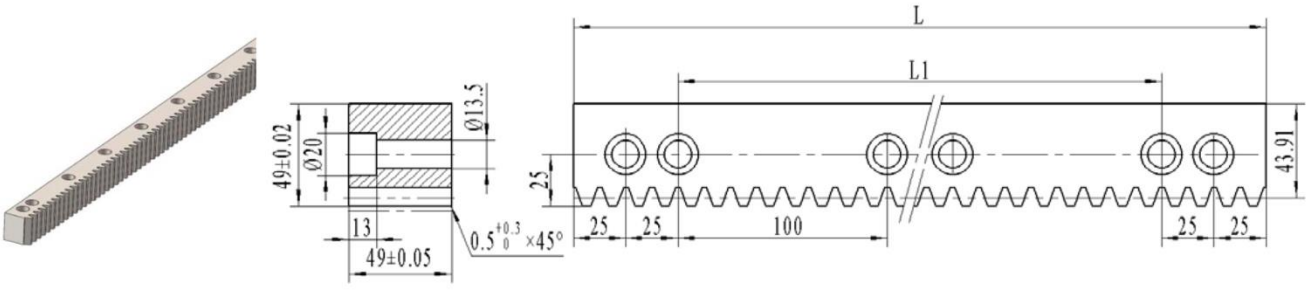



| 型号 Code | L | L1 | 模数 module | 齿距P （mm） | 材料 Mat. | 质量m （Kg） | 精度等级 Quality | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|---|---|
| PBR90.1 | 2000 | 1900 | 5.0930 | 16.0 | 42CrMo | 46.8 | DIN6h25 | M12×45 8.8级 |
| | 1200 | 1100 | 5.0930 | 16.0 | 42CrMo | 28.8 | DIN6h25 | M12×45 8.8级 |
| | 800 | 700 | 5.0930 | 16.0 | 42CrMo | 18.7 | DIN6h25 | M12×45 8.8级 |



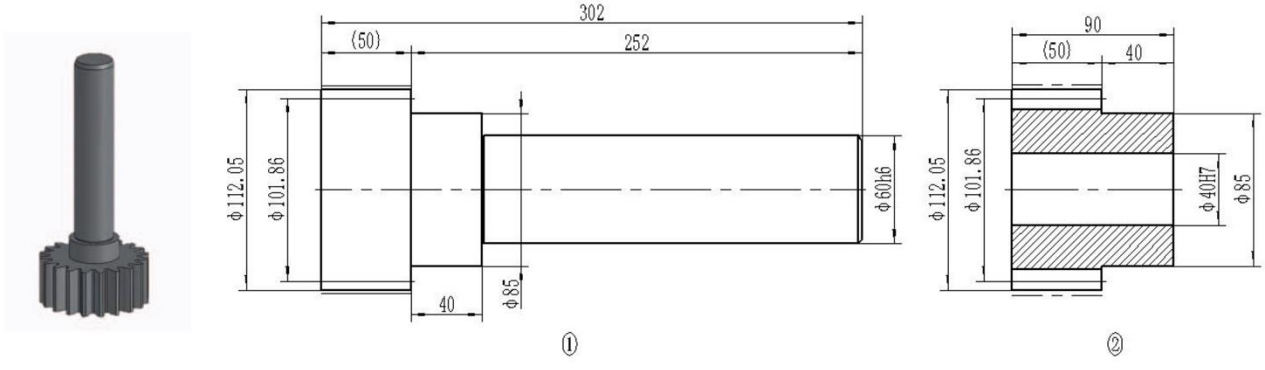

| 型号 Code | L | L1 | 模数 module | 齿距P （mm） | 材料 Mat. | 质量m （Kg） | 精度等级 Quality | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|---|---|
| PBR90.2 | 2000 | 1900 | 5.0930 | 16.0 | 42CrMo | 71.7 | DIN6h25 | M12×45 8.8级 |
| | 1200 | 1100 | 5.0930 | 16.0 | 42CrMo | 43.0 | DIN6h25 | M12×45 8.8级 |
| | 800 | 700 | 5.0930 | 16.0 | 42CrMo | 28.7 | DIN6h25 | M12×45 8.8级 |

## 齿条 Rack



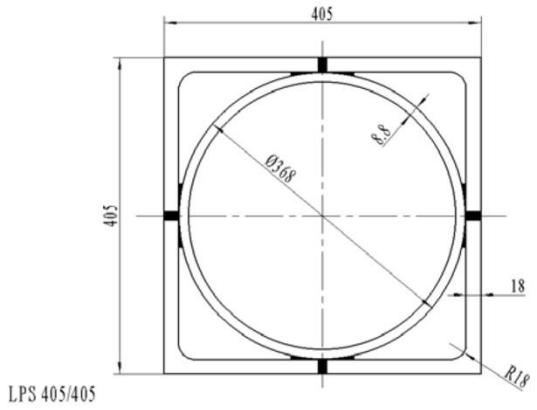

| 型号 Code | L | L1 | 模数 module | 齿距P （mm） | 材料 Mat. | 质量m （Kg） | 精度等级 Quality | 螺栓型号 bolt size |
|---|---|---|---|---|---|---|---|---|
| PBR90.3 | 2000 | 1900 | 5.0930 | 16.0 | 42CrMo | 35.3 | DIN6h25 | M12×55 8.8级 |
| | 1200 | 1100 | 5.0930 | 16.0 | 42CrMo | 21.2 | DIN6h25 | M12×55 8.8级 |
| | 800 | 700 | 5.0930 | 16.0 | 42CrMo | 14.2 | DIN6h25 | M12×55 8.8级 |

## 驱动齿轮 Drive pinion

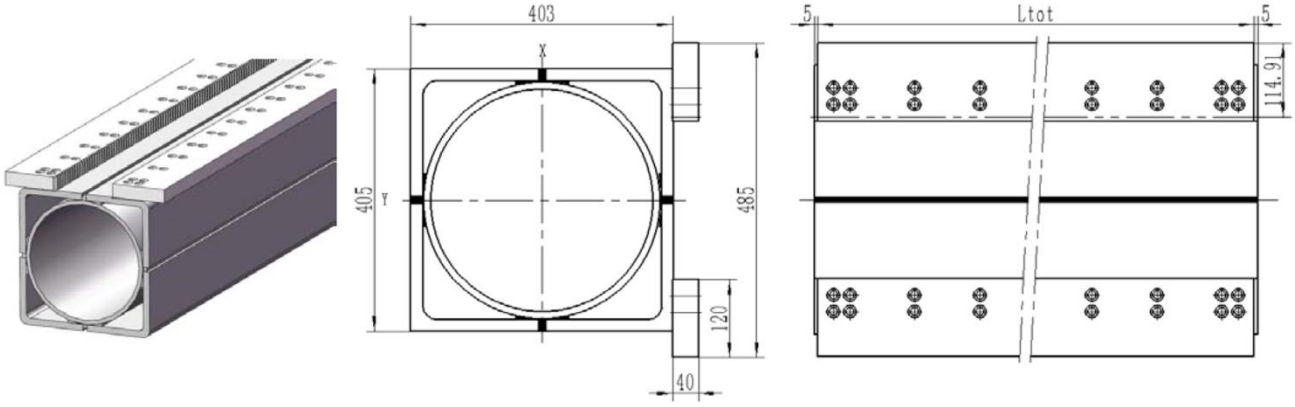



| 型号 Code | 齿数 Z | 模数 module | 齿距P （mm） | 图 Fig. | 材料 Mat. | 质量m （Kg） | 精度等级 Quality |
|---|---|---|---|---|---|---|---|
| PSD90-CP16 | 20 | 5.0930 | 16.0 | ① | 20CrMnTi | 9.0 | DIN6e25 |
| PD90-CP16 | 20 | 5.0930 | 16.0 | ② | 20CrMnTi | 2.5 | DIN6e25 |

### 4.8.3 ∅90型钢型材 ∅ 90 Steel profiles

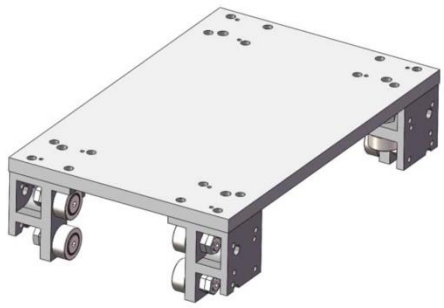



带导轨面的钢型材 Tubular steel profile with guideways

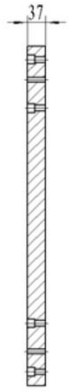


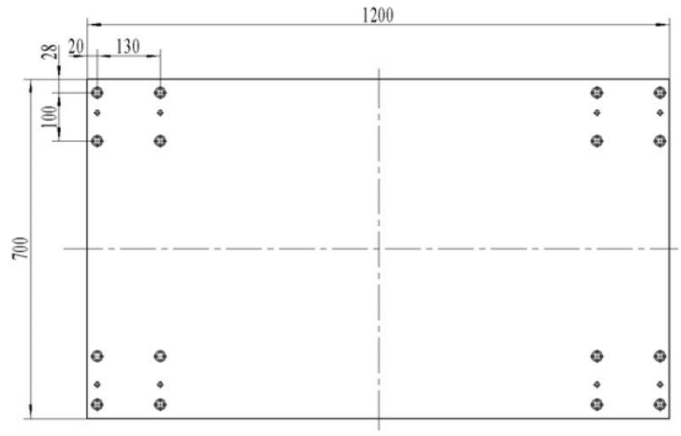

| 型号<br>Code | 材料<br>Mat. | m① （Kg/m） | m② （Kg/m） | $I_x$① （$cm^4$） | $I_x$② （$cm^4$） | $I_y$① （$cm^4$） | $I_y$② （$cm^4$） | $I_z$ （$cm^4$） |
|---|---|---|---|---|---|---|---|---|
| LPS405/405 | Q345B | 296.7 | 372.0 | 85700 | 116000 | 85700 | 112000 | 136000 |
| ① 不带导轨和齿条Without guideway bars | | | | | | | | |
| ② 带导轨和齿条With guideway bars | | | | | | | | |

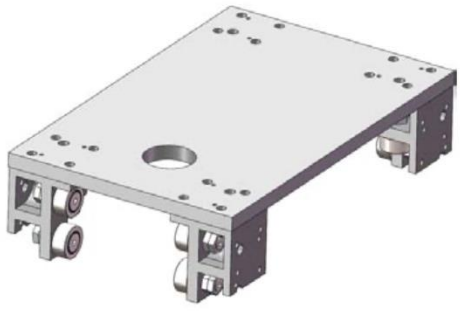
### 4.8.4 ∅90型传动板　∅90 Drive plate



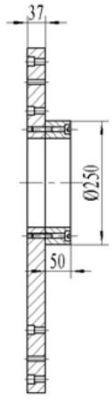
①

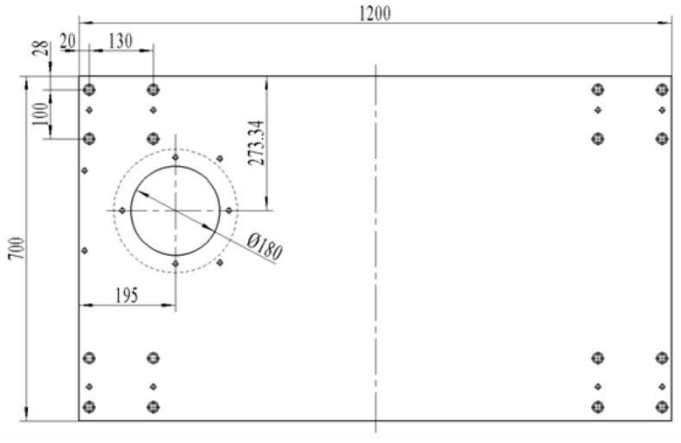


②




| 型号<br>Code | 图<br>Fig. | 材料<br>Mat. | 质量m<br>（Kg） |
|---|---|---|---|
| DP90.1 | ① | Q345B | 244 |
| DP90.2 | ② | Q345B | 240 |

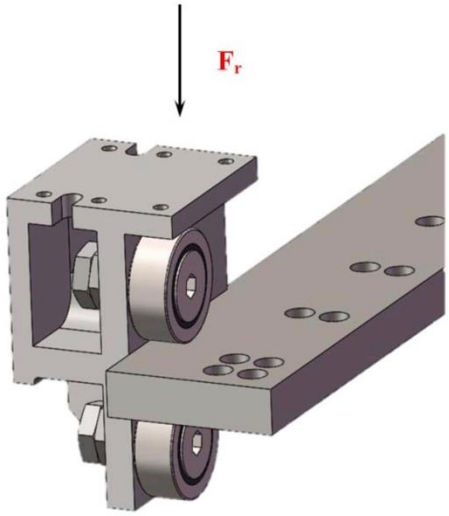
## 4.9 型号验证 Size Verification

$$P = Fr \quad (kN)$$

$$P_W = f \bullet P \quad (kN)$$

$$L = K_r \bullet \left(\frac{C_w}{P_w}\right)^{\frac{10}{3}} \bullet 10^5 \quad (m)$$

$$fs = 0.7 \bullet \frac{C_{OW}}{P_W} \quad f_s \geqslant 1$$




$F_r$: 外部径向力（kN）External radial force per roller (kN)
P : 当量动载荷（kN）Equivalent dynamic load (kN)
$C_w$: 有效的基本动载荷水平 Effective basic dynamic load rating(kN)
L : 额定寿命 Nominal life time (m)
$K_r$ : 尺寸系数 Size factor
f: 载荷系数 Load factor

| | |
|---|---|
| 均匀冲击 | uniform shocks: 1.0 ~ 1.2 |
| 中等冲击 | moderate shocks: 1.2 ~ 1.5 |
| 较大冲击 | heavy shocks: 1.5 ~ 2.5 |

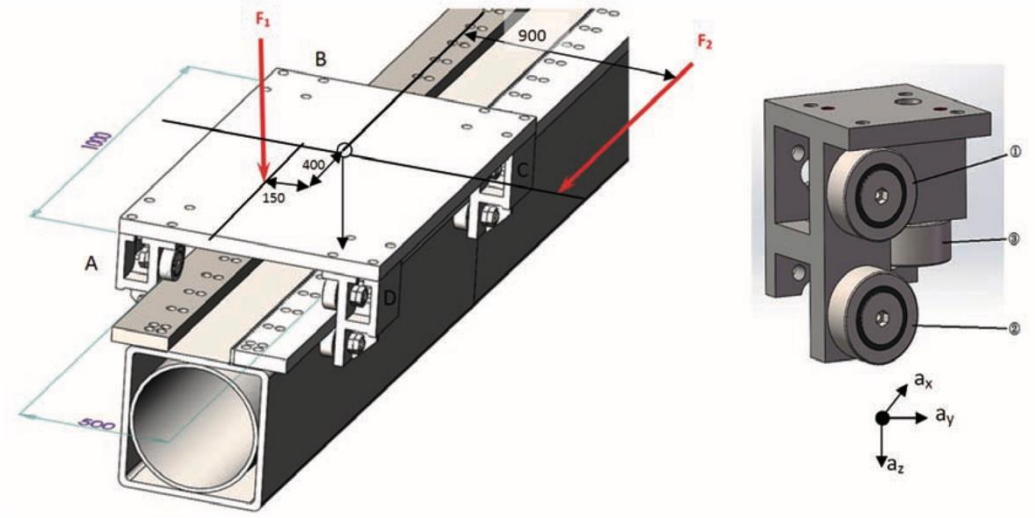
$f_s$: 静载荷系数 Static loading factor
$C_{OW}$: 最大容许静态径向力(kN) Max. admissible static radial force (kN)

| BR/ER | $C_w$(kN) | $K_r$ |
|---|---|---|
| 40 | 13.2 | 1.257 |
| 52 | 24.2 | 1.634 |
| 62 | 35.0 | 1.948 |
| 72 | 38.5 | 2.262 |
| 90 | 63.0 | 2.827 |

## 4.10 计算选型示例 Calculation Example

选择滚轮支座时，在以下情况下应达到10000Km的寿命水平，导轨厚度应不大于30mm。

Choice of the roller support, which under the following conditions should achieve a life rating of about 10000 km, whereby the rail thickness should not exceed 30mm.




1、确定已知数 Determine knowns
$F_1$ = 16000(N)
$F_2$ = 2000(N)
f = 1.1
$L_{min}$ = 10000(km)
$f_s \geqslant 1$

2、确定未知数 Determine unknowns
P =？ (kN)
L =？ (km)

3、初步选择 Select preliminary
滚轮组: 72 roller support: 72
导轨: PB72.1 guideway bar: PB72.1

4、样本值 Catalogue values
D =72(mm)
$C_w$ = 41.5(kN)
$C_{ow}$ = 48(kN)

5、计算过程 Calculation according
F1作用下，滚轮1和2所受负载Load of rollers 1 and 2 because F1
(F2=0时，滚轮1和2所受负载) (Load of rollers 1 and 2 because F2=0)

$$P_{A1;A2} = 16 \bullet \left(\frac{1}{2} - \frac{(-150)}{500}\right) \bullet \left(\frac{1}{2} - \frac{(-400)}{1000}\right) + \frac{0}{2} \bullet \frac{0}{1000} + \frac{0}{2} \bullet \frac{0}{500} = 11.52kN \quad P_{A1} = 11.52\ kN$$

$$P_{B1;B2}=16\bullet\left(\frac{1}{2}-\frac{(-150)}{500}\right)\bullet\left(\frac{1}{2}+\frac{(-400)}{1000}\right)-\frac{0}{2}\bullet\frac{0}{1000}+\frac{0}{2}\bullet\frac{0}{500}=1.28kN\quad P_{B1}=1.28\ kN$$

$$P_{C1;C2}=16\bullet\left(\frac{1}{2}+\frac{(-150)}{500}\right)\bullet\left(\frac{1}{2}-\frac{(-400)}{1000}\right)+\frac{0}{2}\bullet\frac{0}{1000}-\frac{0}{2}\bullet\frac{0}{500}=2.88kN\quad P_{C1}=2.88\ kN$$

$$P_{D1;D2}=16\bullet\left(\frac{1}{2}+\frac{(-150)}{500}\right)\bullet\left(\frac{1}{2}+\frac{(-400)}{1000}\right)-\frac{0}{2}\bullet\frac{0}{1000}-\frac{0}{2}\bullet\frac{0}{500}=0.32kN\quad P_{D1}=0.32\ kN$$

请注意：因为所有的负载均是正的，滚轮1总是在受力状态
Please note: Because all values are positive, roller 1 is always under load.

当F1=0时，滚轮3所受负载 Load of rollers 3 because F1=0
在F2作用下，滚轮3所受负载 Load of rollers 3 because F2

$$P_{A3;C3}=0\bullet\left(\frac{1}{2}-\frac{0}{1000}\right)+(-2)\bullet\frac{900}{1000}=-1.8\ kN\quad P_{C3}=1.8kN$$

$$P_{B3;D3}=0\bullet\left(\frac{1}{2}-\frac{0}{1000}\right)-(-2)\bullet\frac{900}{1000}=1.8\ kN\quad P_{B3}=1.8kN$$

6、滚轮A1寿命计算 Life time calculation of roller A1

$$P_W=f\bullet P_{A1}=1.1\bullet 11.52=12.67\ kN\quad P_W=12.67kN$$

$$L=K_r\bullet\left(\frac{C_W}{P_W}\right)^{\frac{10}{3}}\bullet 10^5=2.262\bullet\left(\frac{41.5}{12.67}\right)^{\frac{10}{3}}\bullet 10^5=11798742\ m\quad L=11800km$$

$$L_{min}=10000km<L=11800km$$

7、验证静载荷系数 Verify static loading factor

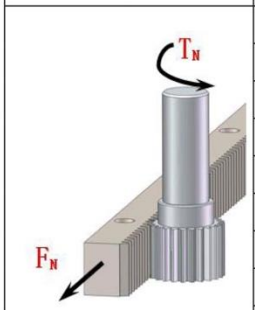
$$fs=0.7\bullet\frac{C_{ow}}{P_w}=0.7\bullet\frac{48}{12.67}=2.65\quad fs=2.65$$

$$fs=2.65>fs_{min}=1$$

## 4.11 CP齿轮齿条传动选型负载表
## Selection and Load Tables for CP Rack and Pinion Drives

直齿，公制Straight tooth, metric pitch

| P（mm） | 齿距pitch | 5.0 | 7.5 | 10.0 | 12.5 | 16.0 | 20.0 | 25.0 |
|---|---|---|---|---|---|---|---|---|
| m（mm） | 模数module | 1.592 | 2.387 | 3.183 | 3.979 | 5.093 | 6.366 | 7.958 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| $L_2$ 齿面宽度 face width | | | | | | | | | | |
| | | 硬齿面 磨削淬火 hardened and ground | | | 硬齿面 磨削淬火 hardened and ground | | 硬齿面 精铣淬火 precision cut and hardened | | 调质 精铣 Q+T precision cut | |
| | P | Module | Z | $L_2$ | $F_N$（N） | $T_N$（Nm） | $F_N$（N） | $T_N$（Nm） | $F_N$（N） | $T_N$（Nm） |
|  | 5.0 | 1.592 | 20 | 11.5 | 1440 | 23 | | | 630 | 11 |
| | 5.0 | | 20 | 14.5 | 1822 | 29 | | | 942 | 15 |
| | 7.5 | 2.387 | 20 | 19.5 | 4775 | 114 | | | 1927 | 46 |
| | 10.0 | 3.183 | 20 | 29.5 | 10430 | 332 | 6660 | 212 | 4398 | 140 |
| | 12.5 | 3.979 | 14 | 40.0 | | | 8761 | 244 | 5027 | 140 |
| | 12.5 | | 20 | 40.0 | | | 12340 | 491 | 5202 | 207 |
| | 16.0 | 5.093 | 20 | 50.0 | | | 22639 | 1153 | | |
| | 20.0 | 6.366 | 20 | 60.0 | | | 37966 | 2417 | | |
| | 25.0 | 7.958 | 20 | 80.0 | | | 72900 | 5800 | | |



选型计算示例
**Calculation Example**

载荷系数 **Load factor**

| 输出轴所受冲击 shocks at output shaft | 均匀冲击 uniform | 中等冲击 moderate | 较大冲击 Heavy |
|---|---|---|---|
| $f_B$ | 1.0 | 1.2 | 1.5 |

启动系数 **Starting factor**

| 启动频率 Starting frequency | ≤10/h | ≤60/h | ≤360/h | ≤1000/h |
|---|---|---|---|---|
| $f_A$ | 1.0 | 1.1 | 1.2 | 1.3 |

温度系数 **Temperaturefactor**

| 环境温度 Ambient temperature | ≤20℃ | ≤30℃ | ≤40℃ | ≤50℃ |
|---|---|---|---|---|
| Ft | 1.0 | 1.3 | 1.5 | 1.9 |

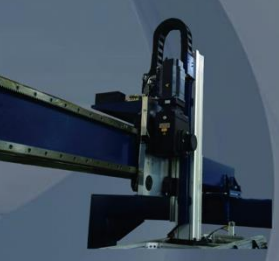
负载系数 **Duty factor**

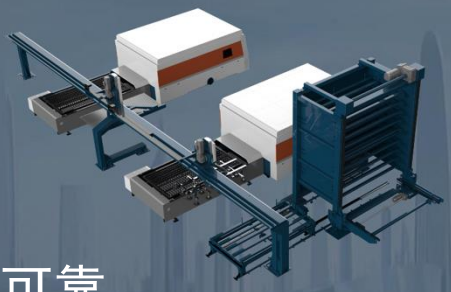
| 负载比 Duty cycle each day | ≤40% | ≤70% | ≤100% |
|---|---|---|---|
| $f_{ed}$ | 1.0 | 1.2 | 1.4 |

| | |
|---|---|
| 1.已知条件<br>轴向载荷<br>载荷重量 m = 500 kg<br>运转速度 v = 1.25 m/s<br>加速时间 $t_a$ = 0.31 s<br>重力引数 g = 9.81 m/s²<br>摩擦系数 μ = 0.10<br>电机转速 $n_1$ = 3000 r/min<br>使用系数 $f_B$ = 1.2<br>启动系数 $f_A$ = 1.1<br>温度系数 $f_t$ = 1.0<br>工作系数 $f_{ed}$ = 1.2<br>应用安全系数 $S_B$ = 1.0<br>齿距累计误差 $F_P$(1000mm) = 0.05 | **1.Determine knowns**<br>**Axial load**<br>Load weight m = 500 kg<br>Running speed v = 1.25 m/s<br>Acceleration time $t_a$ = 0.31s<br>Gravity acceleration g = 9.81 m/s²<br>Friction factor μ = 0.10<br>Motor speed $n_1$ = 3000 r/min<br>Load factor $f_B$ = 1.2<br>Starting factor $f_A$ = 1.1<br>Temperature factor $f_t$ = 1.0<br>Duty factor $f_{ed}$ = 1.2<br>Safety factor $S_B$ = 1.0<br>Cumulative pitch error $F_P$(1000mm) = 0.05 |
| 2.确定未知数<br>齿条、齿轮和减速器的尺寸 | **2.Determine unknowns**<br>Dimensions of rack, pinion and servo gearbox. |
| 3.传动系统中的力<br>3.1 加速度<br>$a = \frac{v}{t_a} = \frac{1.25}{0.31} = 4\ m/s^2$<br>3.2 水平牵引力<br>$F_u = m \cdot g \cdot \mu + m \cdot a = 500 \cdot (9.81 \cdot 0.1 + 4) = 2490.5\ N$<br>3.3 所需驱动力<br>$F_{erf} = f_B \cdot F_u = 1.2 \cdot 2490.5 = 2989.0\ N$ | **3.Forces acting on the drive system**<br>3.1Acceleration<br>$a = \frac{v}{t_a} = \frac{1.25}{0.31} = 4\ m/s^2$<br>3.2 Horizontal traction forces<br>$F_u = m \cdot g \cdot \mu + m \cdot a = 500 \cdot (9.81 \cdot 0.1 + 4) = 2490.5\ N$<br>3.3 Required drive forces<br>$F_{erf} = f_B \cdot F_u = 1.2 \cdot 2490.5 = 2989.0\ N$ |
| 4.齿条齿轮的选择<br>4.1 在SB=1.0时$F_N$从齿轮齿条选型表格中选择，<br>且满足：$F_{2N} \geqq F_{erf}$<br>本例选择p = 12.5 z = 20 直齿硬齿面磨削齿轮<br>p = 12.5 直齿软齿面精铣齿条 | **4. Selection of racks and pinions**<br>4.1 $F_N$ from selection and load tables with $S_B$=1.0<br>Condition: $F_{2N} \geqq F_{erf}$<br>In this case select<br>p= 12.5, z=20 pinion, straight tooth, hardened and ground<br>p = 12.5 rack, straight tooth, precision cut |
| 5.减速器的选择<br>5.1 减速比<br>$n_2 = \frac{v}{D_0 \cdot \pi} \cdot 60000 = \frac{1.25}{79.577 \cdot \pi} \cdot 60000 = 300\ r/min$<br>$i_{Getr} = \frac{n_1}{n_2} = \frac{3000}{300} = 10:1$<br>5.2 输出扭矩<br>$T_2 = \frac{F_u \cdot D_0}{2000} = \frac{2491 \cdot 79.577}{2000} = 99.1\ Nm$<br>5.3 所需扭矩<br>$T_{2erf} = T_2 \cdot f_B \cdot f_A \cdot f_t \cdot f_{ed}$<br>$= 99.1 \cdot 1.2 \cdot 1.1 \cdot 1.0 \cdot 1.2 = 157\ Nm$ | **5. Selection of gearbox**<br>5.1 Ratio<br>$n_2 = \frac{v}{D_0 \cdot \pi} \cdot 60000 = \frac{1.25}{79.577 \cdot \pi} \cdot 60000 = 300\ r/min$<br>$i_{Getr} = \frac{n_1}{n_2} = \frac{3000}{300} = 10:1$<br>5.2 Output torque<br>$T_2 = \frac{F_u \cdot D_0}{2000} = \frac{2491 \cdot 79.577}{2000} = 99.1\ Nm$<br>5.3 Required torque<br>$T_{2erf} = T_2 \cdot f_B \cdot f_A \cdot f_t \cdot f_{ed}$<br>$= 99.1 \cdot 1.2 \cdot 1.1 \cdot 1.0 \cdot 1.2 = 157\ Nm$ |

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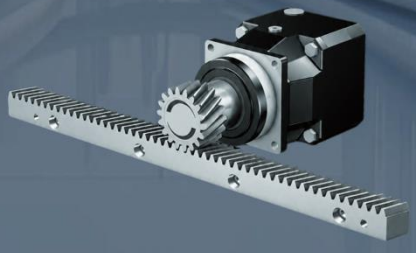


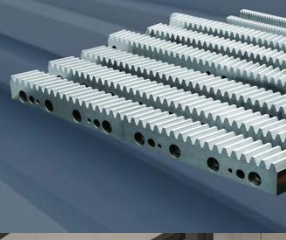


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