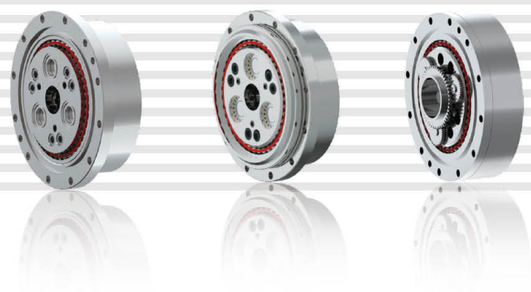
Wankie drive

万 基 传 动

BXJ

BXJ Precision Reducer 精密减速器



江苏泰隆机械集团公司
JIANGSU TAILONG MACHINERY GROUP COMPANY

江苏万基传动科技有限公司
JIANGSU WANKIE DRIVE CO.,LTD.

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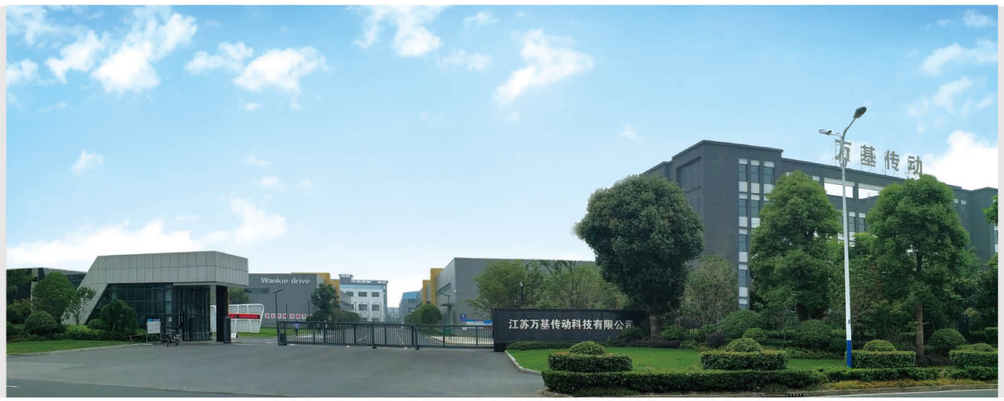
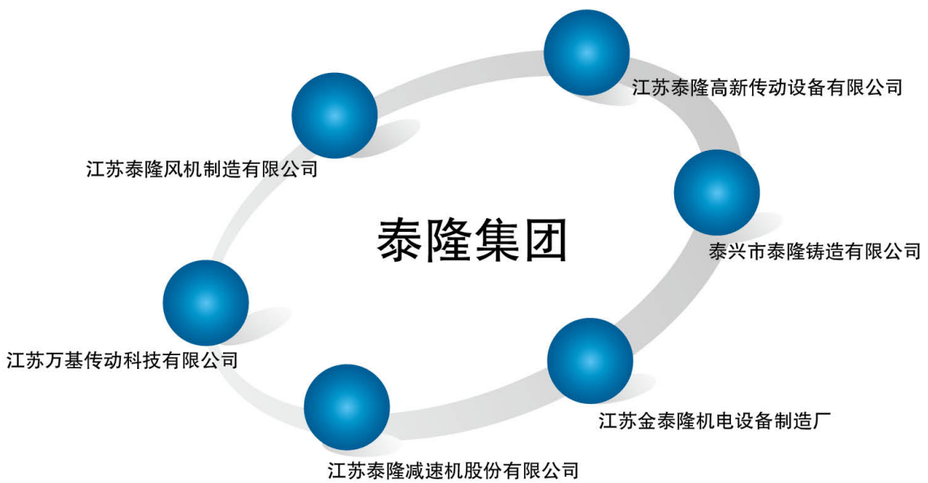
免费咨询电话(Tel): 400-000-4728
服务热线(Tel): +86-0523-87558081 87557791
网址(Website): www.cnwankie.com
邮箱(E-mail): wankie@tailong.com
邮编(P.C.): 225400

江苏万基传动科技有限公司
JIANGSU WANKIE DRIVE CO.,LTD.

集团概况 Group Introduction





泰隆集团

泰隆集团地处扬子江河畔的泰兴市区，是泰兴人引以为豪的国家大型企业。泰隆集团东临沪宁高速，西靠南京禄口机场，南有江阴大桥，交通便捷，物流畅通，具有得天独厚的区位优势。集团现拥有总资产21亿元，占地面积80万平方米，现有员工2088人，其中工程技术人员380人。拥有各类通用、专用生产、检测设备1900余台(套)，从美国、德国、日本、瑞士等国家购进了数控磨齿机、数控镗铣床、蜗杆磨床、热处理炉等一批高精尖的生产设备和检测设备。建立了全国同行业中检测功能全、仪器先进的3000kW测试中心，创建了国家级博士后科研工作站、全国减速机标委会秘书处、江苏省传动机械与控制工程技术研究中心。近几年获得专利160余件，其中发明专利29件。公司2015年开始研发的精密减速器，可替代同类进口产品，广泛应用于工业机器人、机床、搬运装置和装配装置等领域。

TAILONG GROUP

Tailong Group,located in Taixing city along riverside of the Yangzi River,is a national giant enterprise which Taixing people are proud of.Tailong Group is east to the Highway of Shanghai-Nanjing,west to the Nanjing LuKou airport and south to the Jiangyin Bridge.Convenient transportation and smooth physical distribution build the unparalleled location advantages for Tailong Group.At present,the group has total assets of RMB 2100million and covers an area of 800000 square meters.There are 2088 workers in our group,308 of them are engineering technicians.We have many kinds of general use,special use and testing equipments,it totals more than 1900 sets.Sophisticated and advanced manufacturing equipments and testing equipments,such as large CNS gear grinding machine,large CNC boring and milling machine,worm grinder,maching center and heat treatment furnace that are imported from USA,Germany,Japan,Switzerland and so on.We have established a 3000Kw testing center with complete testing function and advanced instruments of the industry national wide.We have also created national level post-doctor scientific research workstation,national committee on standardization of reducers,mechanical transmission and control Engineering research Center of Jiangsu Province. In recent years,we have achieved more than 160 patents,29 of them are patents for invention.From year 2015,company started to research and develop high precision reducers which can replace similar imported products,widely used in industry robots,machine tools,handling device, assmbly device and other fields.

经营理念 Business Philosophy

以德立信，以信致远，诚信为本，真情无价。

Building Credibility by Virtue, Develping Sustainably by Credibility, Faith-Oriented, and Priceless True Feelings.

核心价值观 Core Values

追求卓越，不断创新，以人为本，

诚信守法，铸造品牌，奉献社会。

In Search of Excellence, Constantly Innovating, People-Oriented,

Being Honest and Law Abiding, Forging the Brand, Contributing to Society.

企业精神 Enterprise Spirit

团结、勤奋、诚信、务实

United, Diligent, Faithful and Pragmatic

文化理念 *Cultural Concept*

公司使命 Company Mission

做中国减速机行业的领跑者。

Be the leader of Chinese reducer industry.

公司愿景 Company Vision

品牌国际化、股份社会化、组织协作化、生产自动化、人才专业化、营销网络化、市场服务化、文化本土化、未来现代化

Brand Internationalization, Share Socialization, Organization Coordination, Production Automation, Talent Specialization, Marketing Networkization, Market Servicilization, Cultural Localization, Future Modernization

企业理念 Enterprise Philosophy

为工业传动调速，为民族振兴加油。

Regulating Speed for Industrial Drives, Refueling the National Revival.

志存高远，精益求精

Infinite ambitions, try for the best

——泰隆集团

精益求“静”

静益求“精”

产品目录
Product catalog

About BXJ reducer
关于BXJ减速器

- >> 低振动 Low Vibration
- >> 高刚性 High Stiffness
- >> 高精度 High Precision
- >> 高效率 High Efficiency
- >> 高耐久性 High Durability
- >> 高加速性能 High Acceleration Performance
- >> 大速比 High Reduction Ratios

BXJ减速器是利用封闭差动原理进行减速传动的高精密减速器。BXJ减速器内部的摆线轮同时与多个针齿进行啮合，这种结构使得BXJ减速器具有良好的刚性和优越的承载能力。此外，BXJ减速器具有间隙小、惯性小、振动低的特性，这些特性使得BXJ减速器运行平稳、传动精确。BXJ减速器广泛应用于工业机器人、机床、搬运装置和装配装置等领域。

BXJ reducer is a novel high precision reducer that use planocentric way to decelerate and drive. The cycloidal disc meshes with a plurality of pins at the same time so that the BXJ reducer shows high stiffness and excellent bearing capacity. In addition, thanks to the characteristics of small clearance, little inertia and low vibration, BXJ reducer can run steadily and accurately. BXJ reducer is widely used in industrial robots, machine tools, handling device, assmbly device and other fields.

BXJ
BXJ Precision Reducer 精密减速器

型号表示
Model Designations

BXJ — 20 E — 121 — A

减速器类型
Reducer Type

转矩值（参考额定值表）
Torque (Reference Rated Value Table)

机型 Model
E系列——中实型 E series Medium Solid
C系列——中空型 C series Medium Hollow

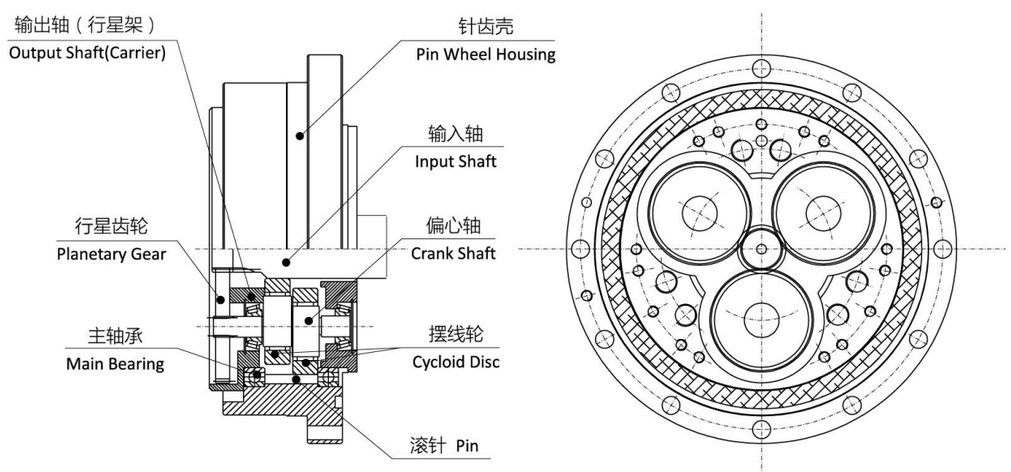
速比值R
Speed Ratio Value R

输入轴形状
Input shaft shape
E系列 E series:
A 标准尺寸产品（粗轴型 适用于大型电机） Standard Size Product(For large motor)
B 标准尺寸产品（细轴型 适用于小型电机） Standard Size Product(For small motor)
Z 特殊（根据客户要求定制） Special(According to customer's requirements to customize)
C系列 C series:
A 标准双联齿轮 Standard Duplicate Gear

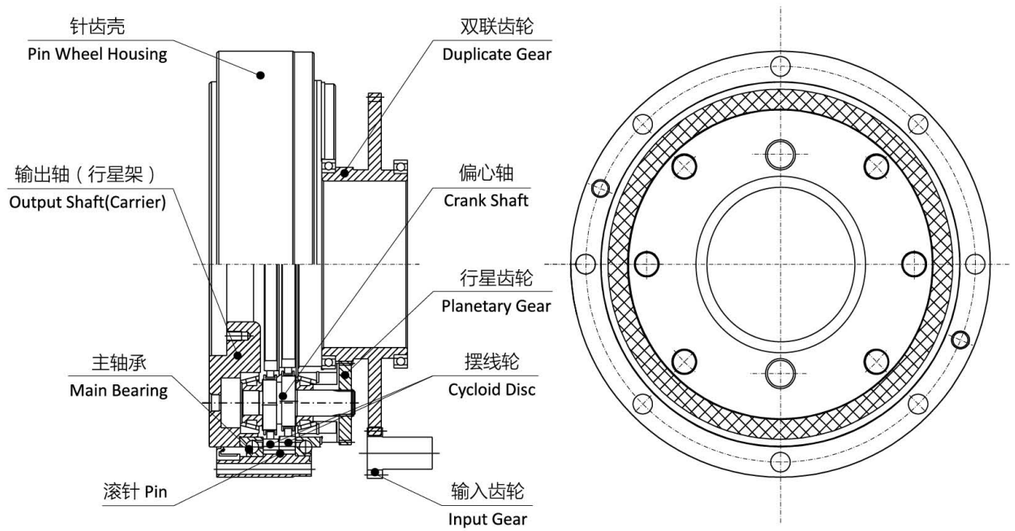
1–2 工作原理 Operating Principle

1–2–1 构造图 Structure Diagram

中实型构造图如下所示 The structure diagram of medium solid type is shown below.

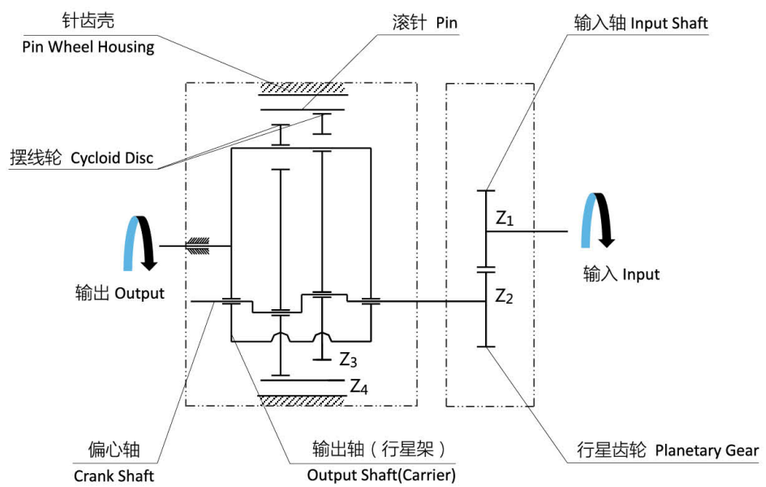


中空型构造图如下所示 The structure diagram of medium hollow type is shown below.



1–2–2 传动比的计算 Ratio

中实型传动原理图如下所示 The transmission principle diagram of medium solid type is shown below.



行星架输出时速比：

$$R = 1 + \frac{Z_2}{Z_1} \cdot Z_4$$

- R：速比值
- Z_1：输入轴齿数
- Z_2：行星齿轮齿数
- Z_3：摆线轮齿数
- Z_4：滚针根数

The Ratio When Carrier Output:

$$R = 1 + \frac{Z_2}{Z_1} \cdot Z_4$$

- R ：Ratio value
- Z_1 ：Input shaft teeth
- Z_2 ：Planetary gear teeth
- Z_3 ：Cycloid disc teeth
- Z_4 ：Number of pins

BXJ中实型减速器是由一级行星齿轮减速和一级摆线针轮减速共同组成的二级减速器。转动输入轴，带动行星轮和偏心轴同步转动，使得摆线轮做偏心运动，由于滚针的约束，摆线轮按与偏心轴旋转方向相反方向进行自转，进而驱动行星架（输出轴）同步自转。若将行星架固定，针齿壳作为输出端，此时的速比值为：

The medium solid type is a two-stage gear reducer which consists of a planetary gear reducer and a cycloidal pinwheel reducer. Rotating the input shaft, the planetary gear and the crank shaft will rotate synchronously. Then the cycloid disc will do eccentric motion and be forced by the pins to rotate in the direction opposite to that of the crank shaft. Finally the rotation will be output to the carrier(output shaft). If the carrier is fixed and set the pin wheel housing as the output end, the ratio should be:

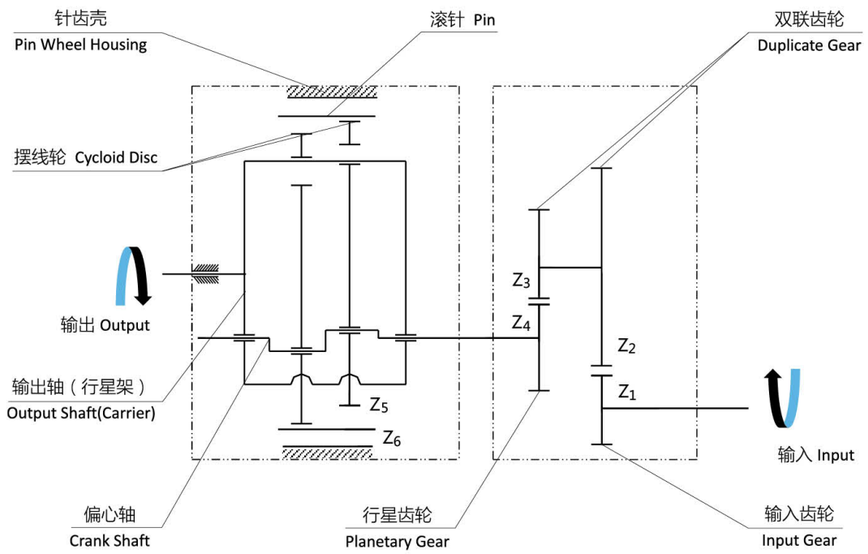
$$R = -\frac{Z_2}{Z_1} \cdot Z_4$$

注 Attentions：

1."-"表示输出方向与输入方向相反。"-" indicates that the output direction is opposite to the input directions.

2.减速比$i=\frac{1}{R}$。Reduction ratio $i=\frac{1}{R}$.

中空型传动原理图如下所示 The transmission principle diagram of medium hollow type is shown below.



行星架输出时速比：

$$R_1 = -\left(1+\frac{Z_4}{Z_3}\cdot Z_6\right) \qquad R = -R_1 \cdot \frac{Z_2}{Z_1}$$

- R_1：速比值
- R：总速比值
- Z_1：输入齿轮齿数
- Z_2：双联齿轮大齿轮齿数
- Z_3：双联齿轮小齿轮齿数
- Z_4：行星齿轮齿数
- Z_5：摆线轮齿数
- Z_6：滚针根数

The Ratio When Carrier Output:

$$R_1 = -\left(1+\frac{Z_4}{Z_3}\cdot Z_6\right) \qquad R = -R_1 \cdot \frac{Z_2}{Z_1}$$

- R_1 : Ratio value
- R : Total ratio value
- Z_1 : Input gear teeth
- Z_2 : Big gear teeth of duplicate gear
- Z_3 : Small gear teeth of duplicate gear
- Z_4 : Planetary gear teeth
- Z_5 : Cycloid disc teeth
- Z_6 : Number of pins

BXJ中空型减速器是由一级平行轴齿轮减速、一级行星齿轮减速和一级摆线针轮减速共同组成的三级减速器。转动输入齿轮，带动双联齿轮转动，进而带动行星轮和偏心轴同步转动，使得摆线轮做偏心运动，由于滚针的约束，摆线轮按与偏心轴旋转方向相反方向进行自转，最终驱动行星架（输出轴）同步自转。若将行星架固定，针齿壳作为输出端，此时的速比值为：

BXJ is a three-stage gear reducer which consists of a parallel shaft gear reducer, a planetary gear reducer and a cycloidal pin-wheel reducer. Rotating the input gear, the duplicate gear will rotate. The planetary gear and the crank shaft will rotate synchronously due to the rotation of the duplicate gear. Then the cycloid disc will do eccentric motion and be forced by the pins to rotate in the direction opposite to that of the crank shaft. Finally the rotation will be output to the carrier(output shaft). If the carrier is fixed and set the pin wheel housing as the output end, the ratio should be:

$$R = (-R_1 - 1) \cdot \frac{Z_2}{Z_1}$$

BXJ
BXJ Precision Reducer 精密减速器
E系列 E-series

特性 *Features*

>> 中实 & 扁平Medium Solid and Flat
>> 高精度High Precision
>> 高耐久性High Durability
>> 高加速性能High Acceleration Performance

BXJ-110E及以上型号外观
Appearance of BXJ-110E and the bigger

BXJ-80E及以下型号外观
Appearance of BXJ-80E and the smaller

背面 Back

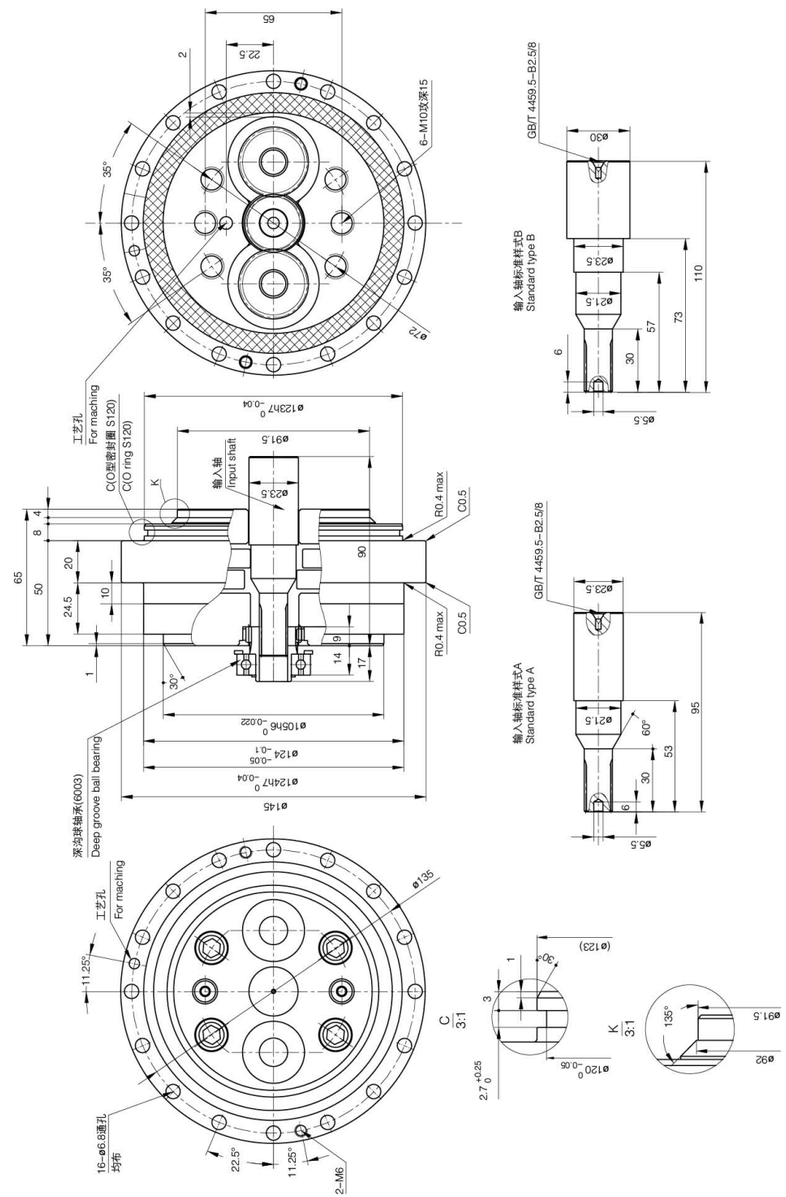
型号 Model	20E	40E	80E	110E	160E	320E	450E
标准速比R[1] Ratio	57 81 105 121 141 161	57 81 105 121 153	57 81 101 121 153	81 111 161 175.28[2]	81 101 129 145 171	81 101 118.5 129 141 171 185	81 101 118.5 129 154.84[2] 171 192.42[2]
额定转矩(Nm) Rated Torque (Nm)	165	415	780	1,080	1,570	3,133	4,412
启动停止许用转矩(Nm) Start-stop Allowable Torque (Nm)	413	1,032	1,958	2,696	3,922	7,843	11,020
瞬时最大许用转矩(Nm) Instantaneous Allowable Torque (Nm)	831	2,059	3,915	5,392	7,838	15,675	22,048
额定输出转速(rpm) Rated Output Speed (rpm)	15	15	15	15	15	15	15
许用输出转速： 稼动率 40%（参考值）(rpm) Allowable Output Speed: Utilization Rate 40% (rpm)	75	70	68	50	46	35	24
额定寿命（h） Rated Life (h)	6,000	6,000	6,000	6,000	6,000	6,000	6,000
齿隙/空程(arcmin) Backlash/Idle Stroke (arcmin)	≤1/1	≤1/1	≤1/1	≤1/1	≤1/1	≤1/1	≤1/1
扭转刚度(Nm/arcmin) Torsional Stiffness (Nm/arcmin)	48	110	195	296	393	984	1,180
许用倾覆力矩(Nm) Allowable Tilting Moment(Nm)	881	1,669	2,163	2,951	3,937	7,073	8,845
瞬时最大倾覆力矩(Nm) Max. Instantaneous Tilting Moment (Nm)	1,785	3,420	4,360	5,750	7,750	14,200	17,100
许用推力(N) Allowable Thrust(N)	3,900	5,150	7,800	10,800	14,600	19,500	24,300
传动精度θ_{er}(arcmin) Angular Transmission Accuracy (arcmin)	±0.5	±0.5	±0.5	±0.5	±0.5	±0.5	±0.5

注 Notes:
[1].标准速比R指针齿壳固定，行星架输出时的速比值，若把针齿壳作为输出端，此时的速比值为R-1。
The ratio here is the ratio when the pin wheel housing is fixed and the carrier is output end, if set the pin wheel housing as the output end, the ratio should be R-1.
[2].该速比值不能整除，精确速比值如下所示。
The ratio cannot be divisible, the exact ratio value is shown below.

$175.28=\frac{1,227}{7}$ $154.84=\frac{2,013}{13}$ $192.42=\frac{1,347}{7}$

型号代码:BXJ-20E-[57]-[A/B]
速比值 Ratio
code

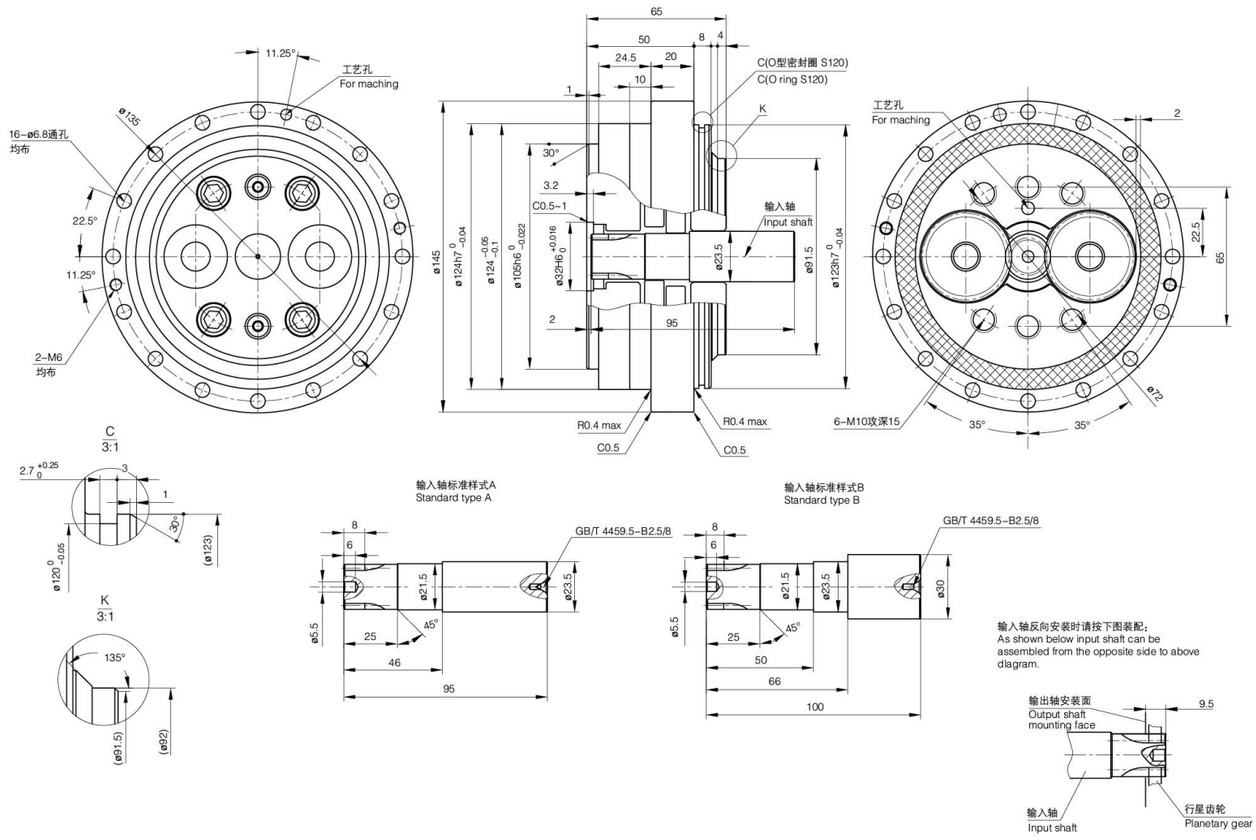
BXJ-20E输出轴螺栓紧固型外形尺寸图（不能贯通的速比）
Dimension(Unreachable speed ratio)



注 Notes：
1) 可根据厂家具体使用要求定制与不同伺服电机轴配合使用的输入轴。
1) Input shafts matched to different servo motor shafts can be customized according to the using requirements.
2) 规格和尺寸可能会发生变更，恕不另行通知。
2) Specifications and dimensions are subject to change without notice.

BXJ-20E输出轴螺栓紧固型外形尺寸图
Dimension

型号代码:BXJ-20E-□-A/B
code 速比值 Ratio



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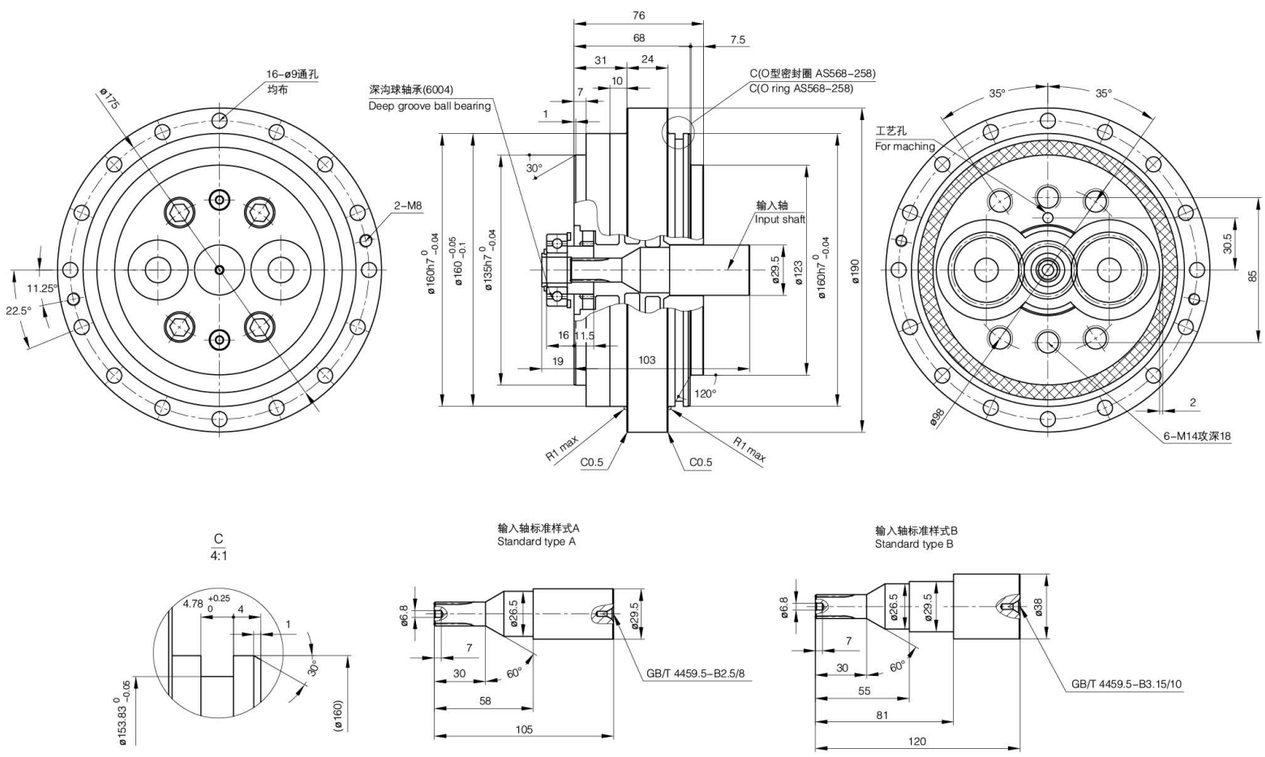
2) Specifications and dimensions are subject to change without notice.

BXJ-40E输出轴螺栓紧固型外形尺寸图（不能贯通的速比）
Dimension(Inreachable speed ratio)

型号代码：BXJ-40E-57-A/B
code 速比值 Ratio



注 Notes：
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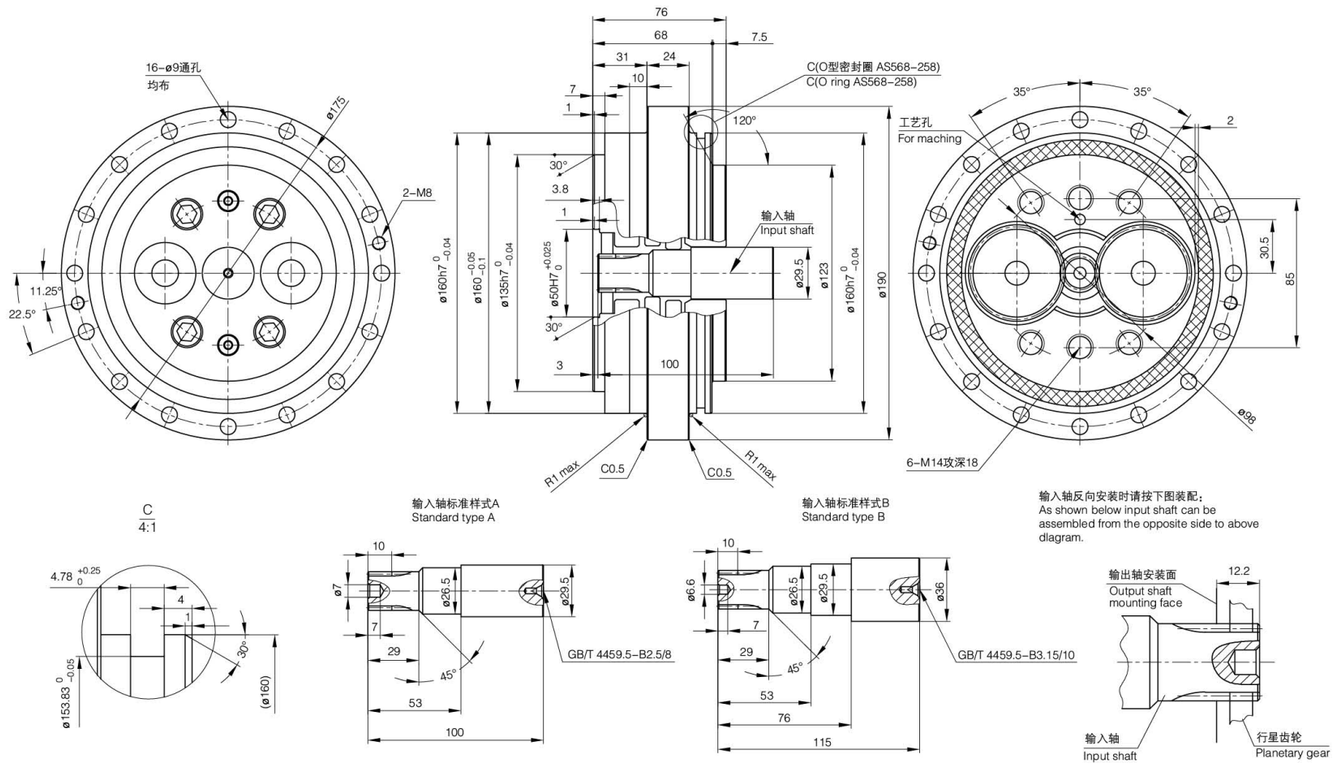
1) Input shafts matched to different servo motor shafts can be customized according to the using requirements.
2) 规格和尺寸可能会发生变更，恕不另行通知。
2) Specifications and dimensions are subject to change without notice.

BXJ-40E输出轴螺栓紧固型外形尺寸图
Dimension

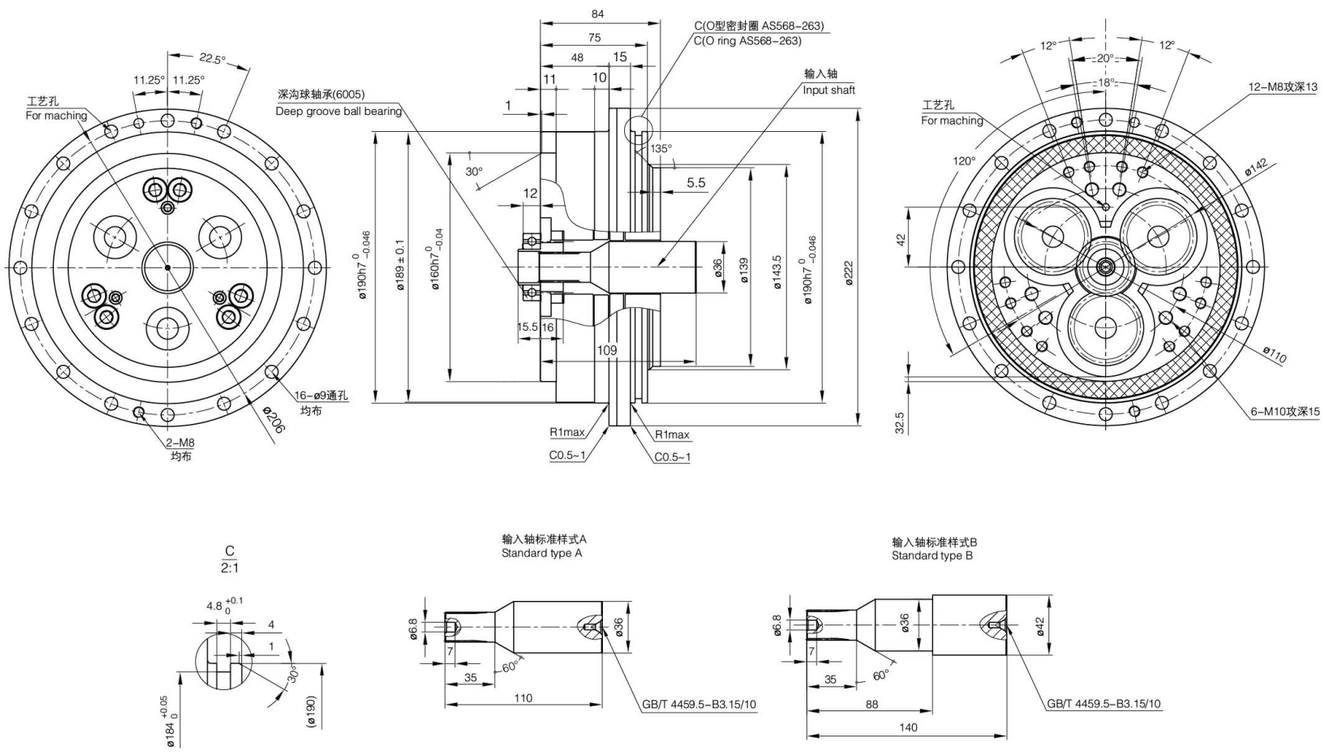
型号代码:BXJ-40E- □ - A/B
code 速比值 Ratio



注 Notes：
1) 可根据厂家具体使用要求定制与不同伺服电机轴配合使用的输入轴。
1) Input shafts matched to different servo motor shafts can be customized according to the using requirements.
2) 规格和尺寸可能会发生变更，恕不另行通知。
2) Specifications and dimensions are subject to change without notice.

BXJ-80E输出轴螺栓紧固型外形尺寸图（不能贯通的速比）
Dimension(Inreachable speed ratio)

型号代码:BXJ-80E- 57 - A/B
code 速比值 Ratio



注 Notes：
1) 可根据厂家具体使用要求定制与不同伺服电机轴配合使用的输入轴。
1) Input shafts matched to different servo motor shafts can be customized according to the using requirements.
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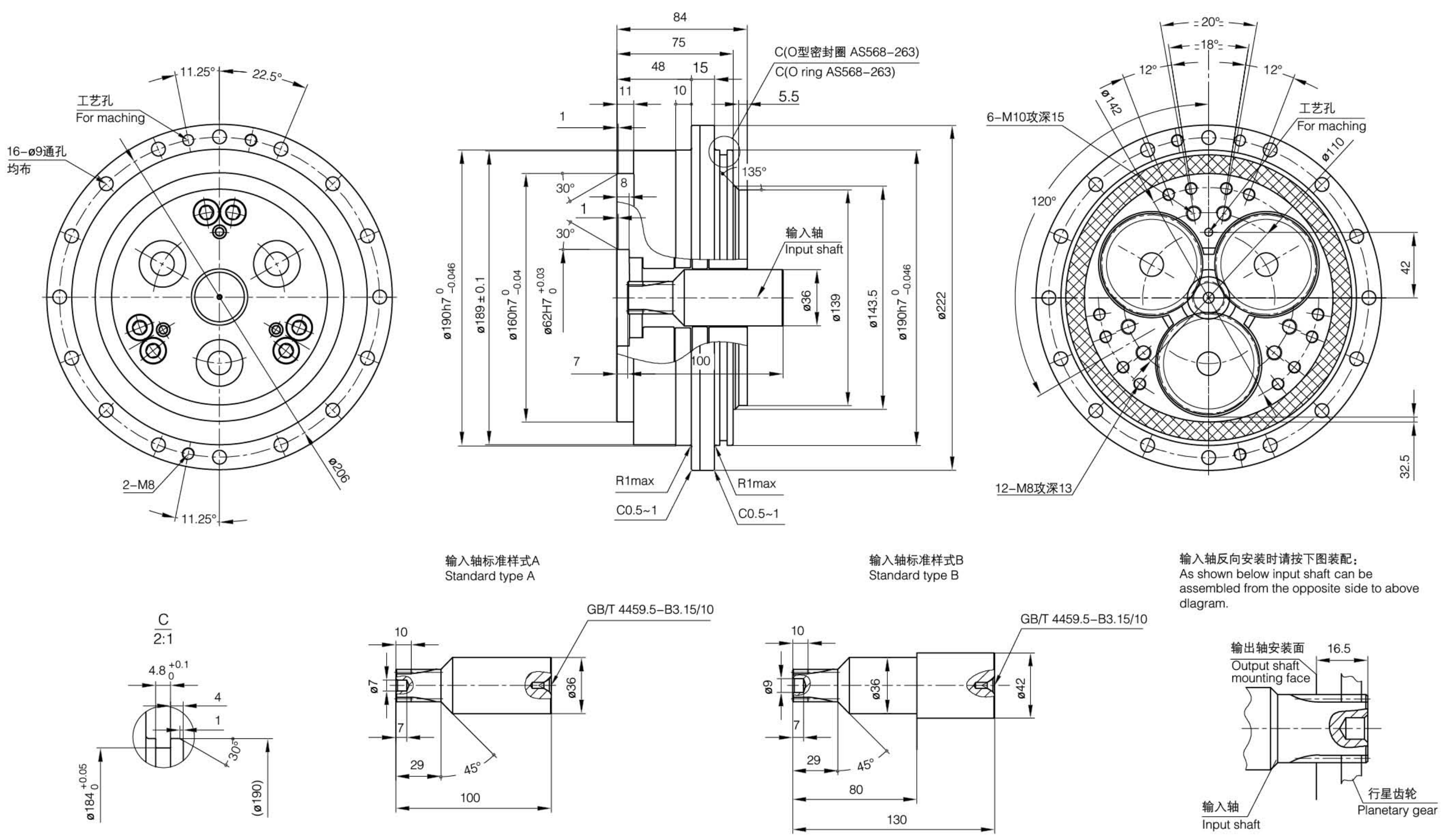
2) Specifications and dimensions are subject to change without notice.

BXJ-80E输出轴螺栓紧固型外形尺寸图
Dimension

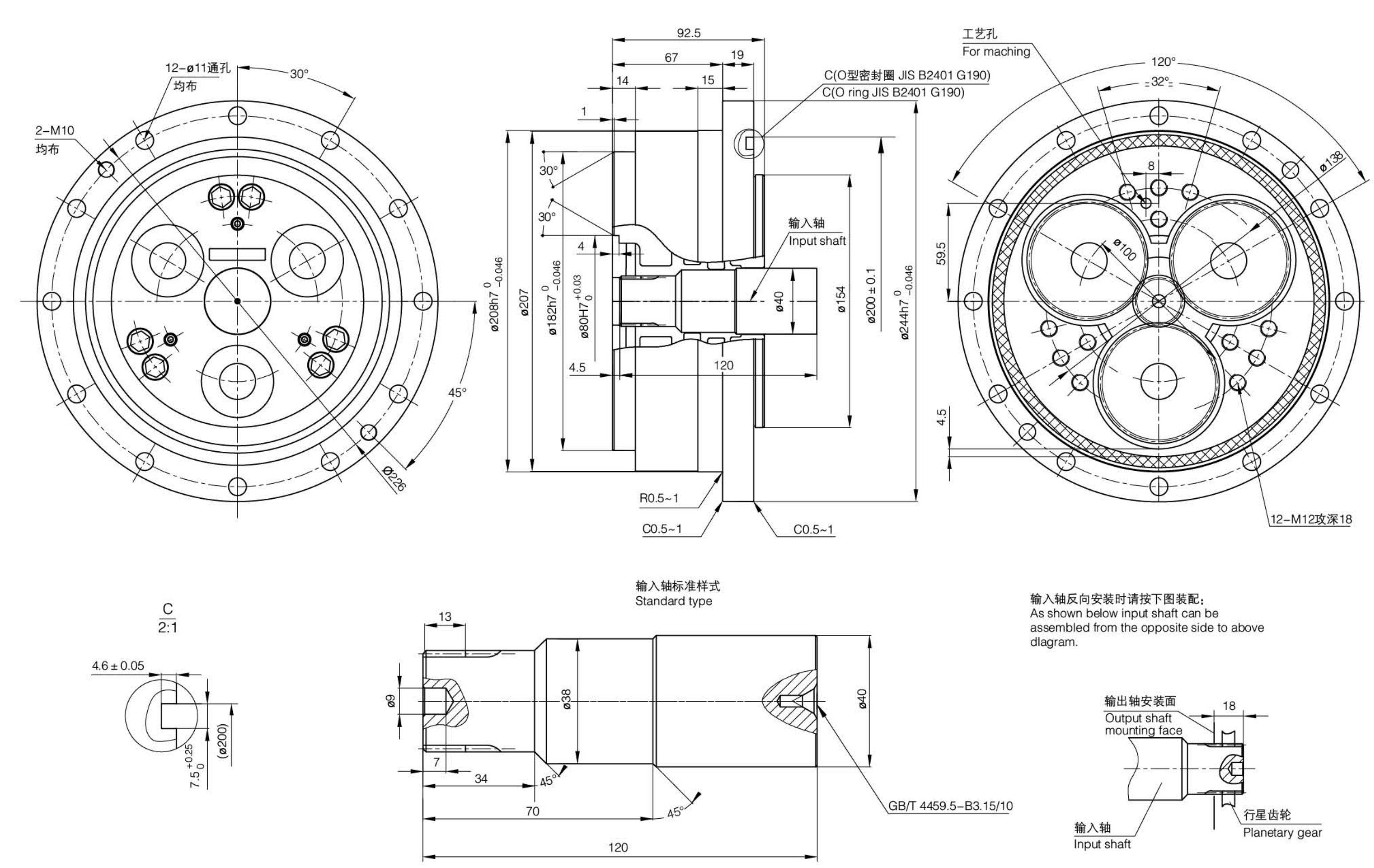
型号代码:BXJ-80E-□-A/B 速比值
code Ratio



注 Notes：
1) 可根据厂家具体使用要求定制与不同伺服电机轴配合使用的输入轴。
1) Input shafts matched to different servo motor shafts can be customized according to the using requirements.
2) 规格和尺寸可能会发生变更，恕不另行通知。
2) Specifications and dimensions are subject to change without notice.

BXJ-110E输出轴螺栓紧固型外形尺寸图
Dimension

型号代码:BXJ-110E-□-A 速比值
code Ratio



注 Notes：
1) 可根据厂家具体使用要求定制与不同伺服电机轴配合使用的输入轴。
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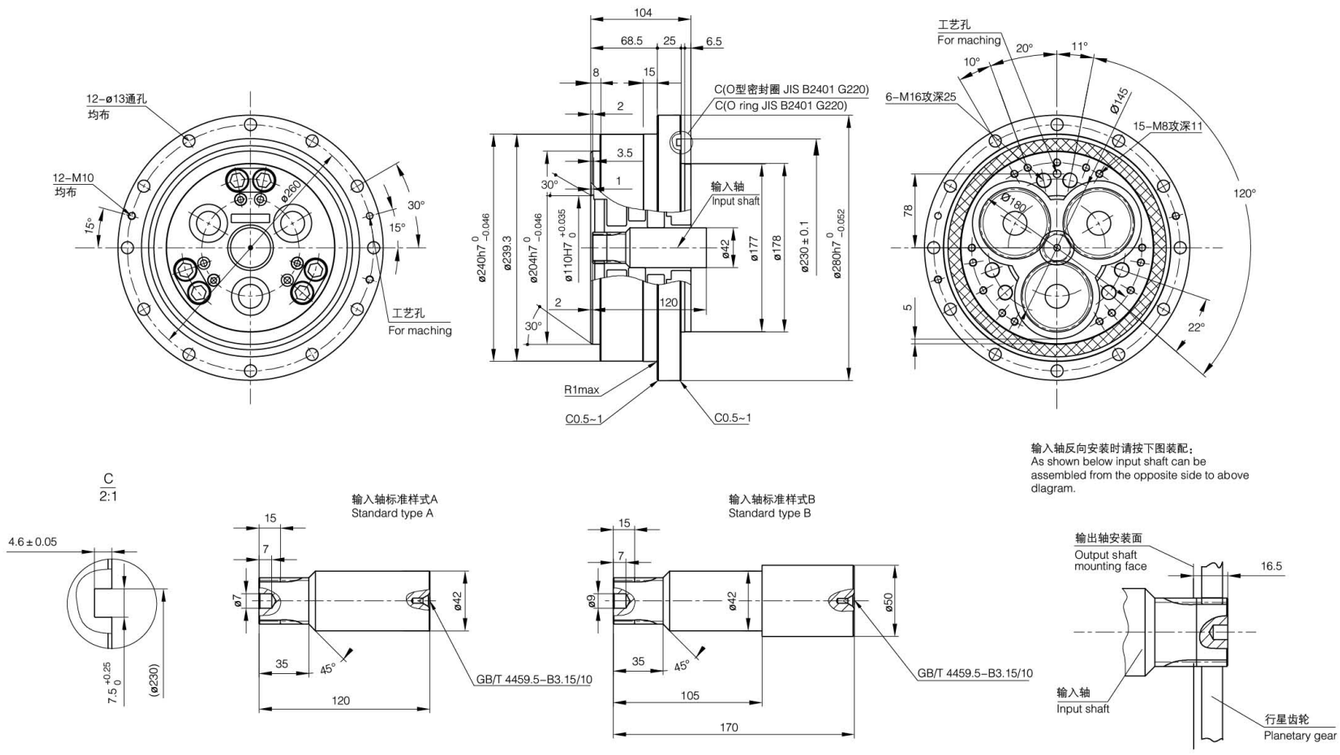
2) 规格和尺寸可能会发生变更，恕不另行通知。
2) Specifications and dimensions are subject to change without notice.

BXJ-160E输出轴螺栓紧固型外形尺寸图
Dimension

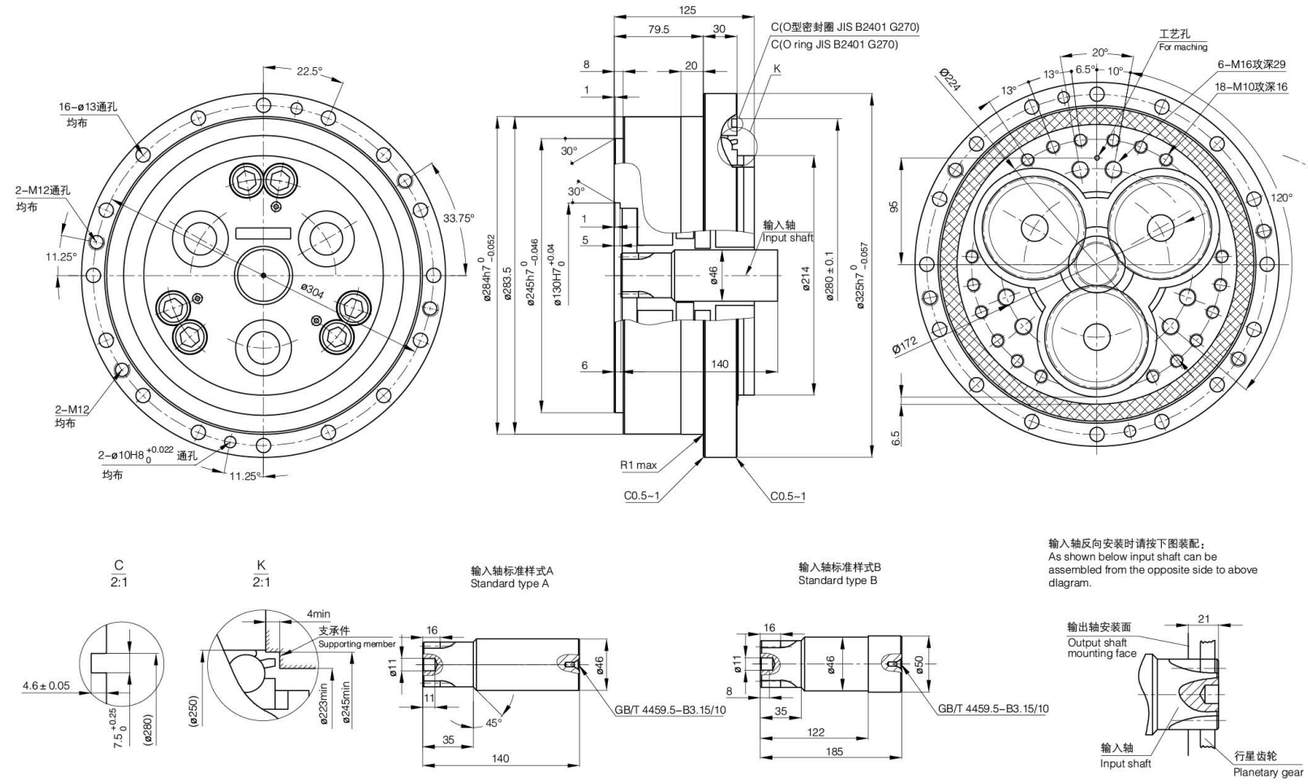
型号代码:BXJ-160E- □ - A/B
code 速比值 Ratio



注 Notes：
1) 可根据厂家具体使用要求定制与不同伺服电机轴配合使用的输入轴。
1) Input shafts matched to different servo motor shafts can be customized according to the using requirements.
2) 规格和尺寸可能会发生变更，恕不另行通知。
2) Specifications and dimensions are subject to change without notice.

BXJ-320E输出轴螺栓紧固型外形尺寸图
Dimension

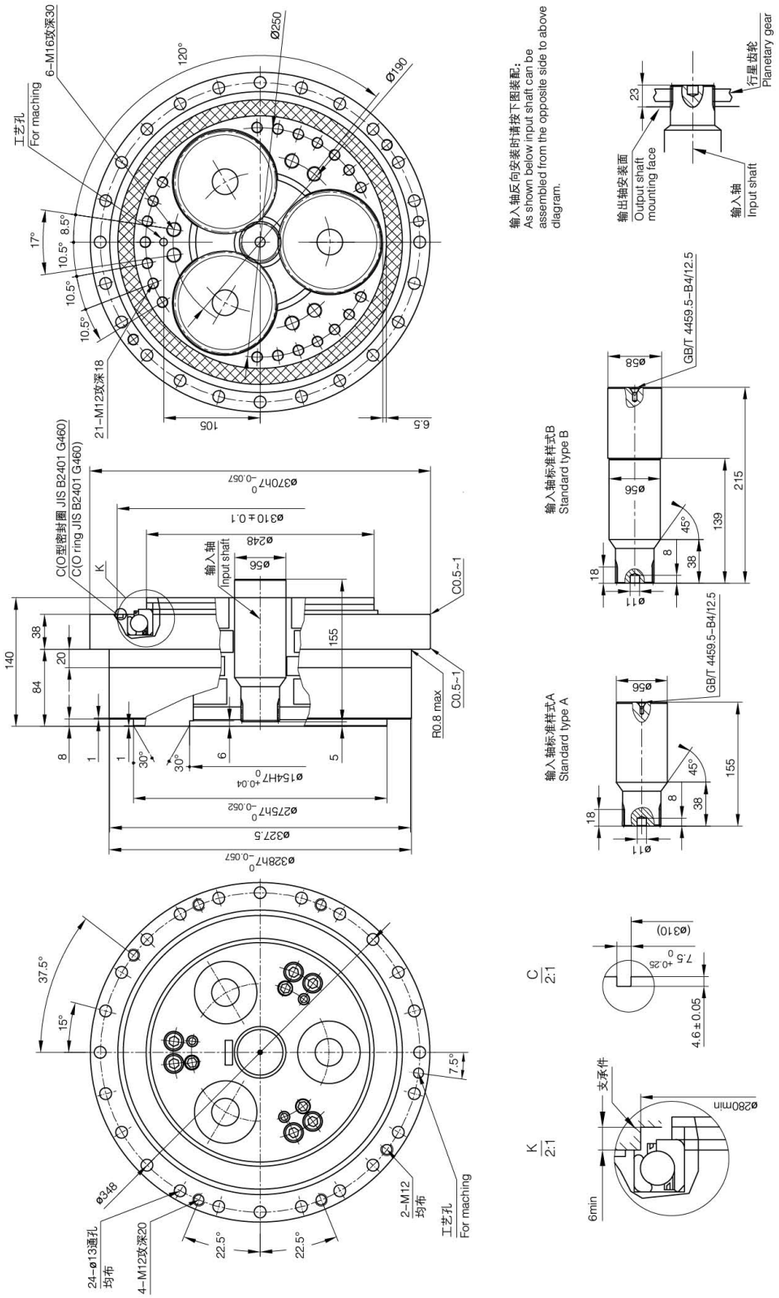
型号代码:BXJ-320E- □ - A/B
code 速比值 Ratio



注 Notes：
1) 可根据厂家具体使用要求定制与不同伺服电机轴配合使用的输入轴。
1) Input shafts matched to different servo motor shafts can be customized according to the using requirements.
2) 规格和尺寸可能会发生变更，恕不另行通知。
2) Specifications and dimensions are subject to change without notice.

BXJ-450E输出轴螺栓紧固型外形尺寸图
Dimension

型号代码:BXJ-450E-□-A/B
速比值 Ratio
code

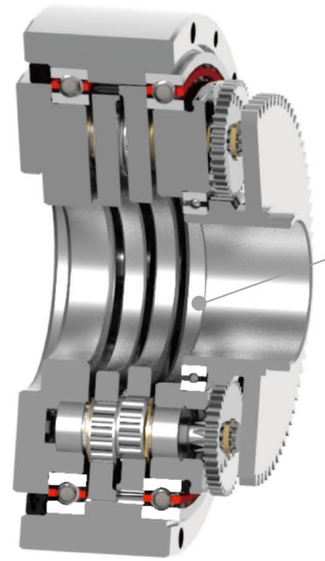


注 Notes：
1) 可根据厂家具体使用要求定制与不同伺服电机轴配合使用的输入轴。
1) Input shafts matched to different servo motor shafts can be customized according to the using requirements.
2) 规格和尺寸可能会发生变更，恕不另行通知。
2) Specifications and dimensions are subject to change without notice.

BXJ
BXJ Precision Reducer 精密减速器
C系列 C-series

特性 *Features*

- >> 中空Medium Hollow
- >> 高精度High Precision
- >> 高耐久性High Durability
- >> 高加速性能High Acceleration Performance



可在减速器内部穿插电缆等，节约空间
Cable and others can be inserted inside the reducer to save space

BXJ-C系列截面图
BXJ-C Series Cross Section

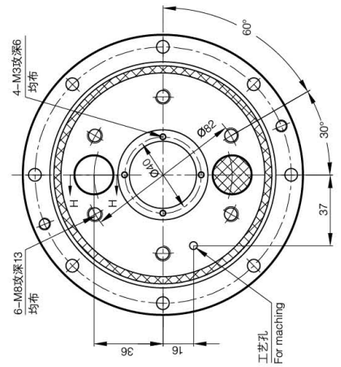
BXJ-C系列外观
Appearance of BXJ- C

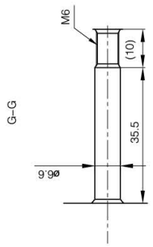
型号 Model	10C	27C	50C	100C	200C	320C	500C
标准速比R[1] Ratio	27	36.57[2]	32.54[2]	36.75	34.86[2]	35.61[2]	37.34[2]
额定转矩(Nm) Rated Torque (Nm)	97	264	492	982	1,965	3,135	4,900
启动停止许用转矩(Nm) Start-stop Allowable Torque (Nm)	240	663	1,230	2,450	4,900	7,850	12,300
瞬时最大许用转矩(Nm) Instantaneous Allowable Torque (Nm)	495	1,320	2,455	4,950	9,850	15,700	24,550
额定输出转速(rpm) Rated Output Speed (rpm)	15	15	15	15	15	15	15
许用输出转速： 稼动率 40%（参考值）(rpm) Allowable Output Speed: Utilization Rate 40% (rpm)	80	60	50	40	30	25	20
额定寿命（h） Rated Life (h)	6,000	6,000	6,000	6,000	6,000	6,000	6,000
齿隙/空程(arcmin) Backlash/Idle Stroke (arcmin)	≤1/1	≤1/1	≤1/1	≤1/1	≤1/1	≤1/1	≤1/1
扭转刚度(Nm/arcmin) Torsional Stiffness (Nm/arcmin)	48	145	256	509	985	1,950	3,450
许用倾覆力矩(Nm) Allowable Tilting Moment(Nm)	687	983	1,774	2,460	8,815	20,600	34,500
瞬时最大倾覆力矩(Nm) Max. Instantaneous Tilting Moment (Nm)	1,350	1,980	3,625	4,960	17,800	39,100	78,400
许用推力(N) Allowable Thrust(N)	5,900	8,800	11,750	13,700	19,500	29,500	39,100
传动精度θ_{er}(arcmin) Angular Transmission Accuracy (arcmin)	±0.5	±0.5	±0.5	±0.5	±0.5	±0.5	±0.5

注 Notes:
[1].标准速比R_1指针齿壳固定，行星架输出时的速比值，若把针齿壳作为输出端，此时的速比值为R_1-1。(R_1：参照P9 Please refer to page 9)
The ratio here is the ratio when the pin wheel housing is fixed and the carrier is output end, if set the pin wheel housing as the output end, the ratio should be R_1-1.
[2].该速比值不能整除，精确速比值如下所示。
The ratio cannot be divisible, the exact ratio value is shown below.

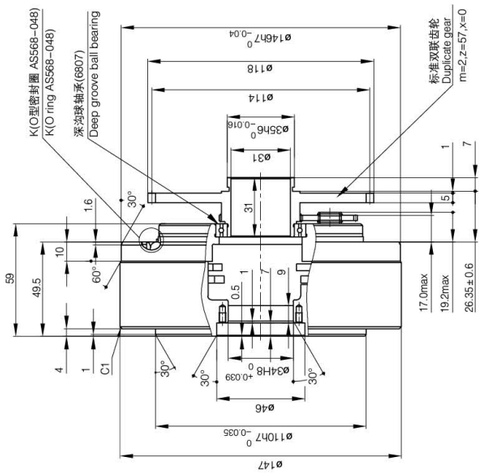
36.57= $\frac{1,390}{38}$ 32.54= $\frac{1,985}{61}$ 34.86= $\frac{1,499}{43}$ 35.61= $\frac{2,778}{78}$ 37.34= $\frac{3,099}{83}$

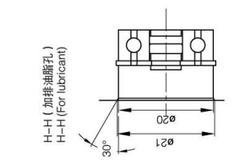
型号代码:BXJ-10C- 27 - A
速比值 Ratio
code

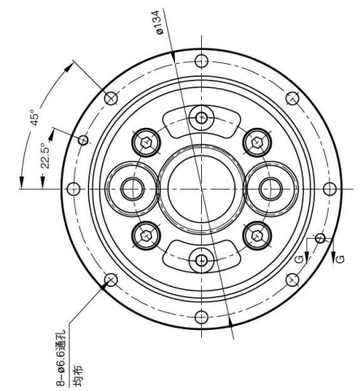


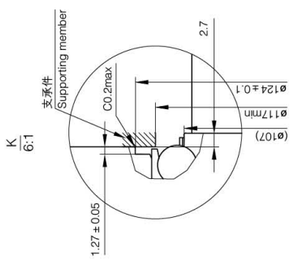


BXJ-10C输出轴螺栓紧固型外形尺寸图
Dimension







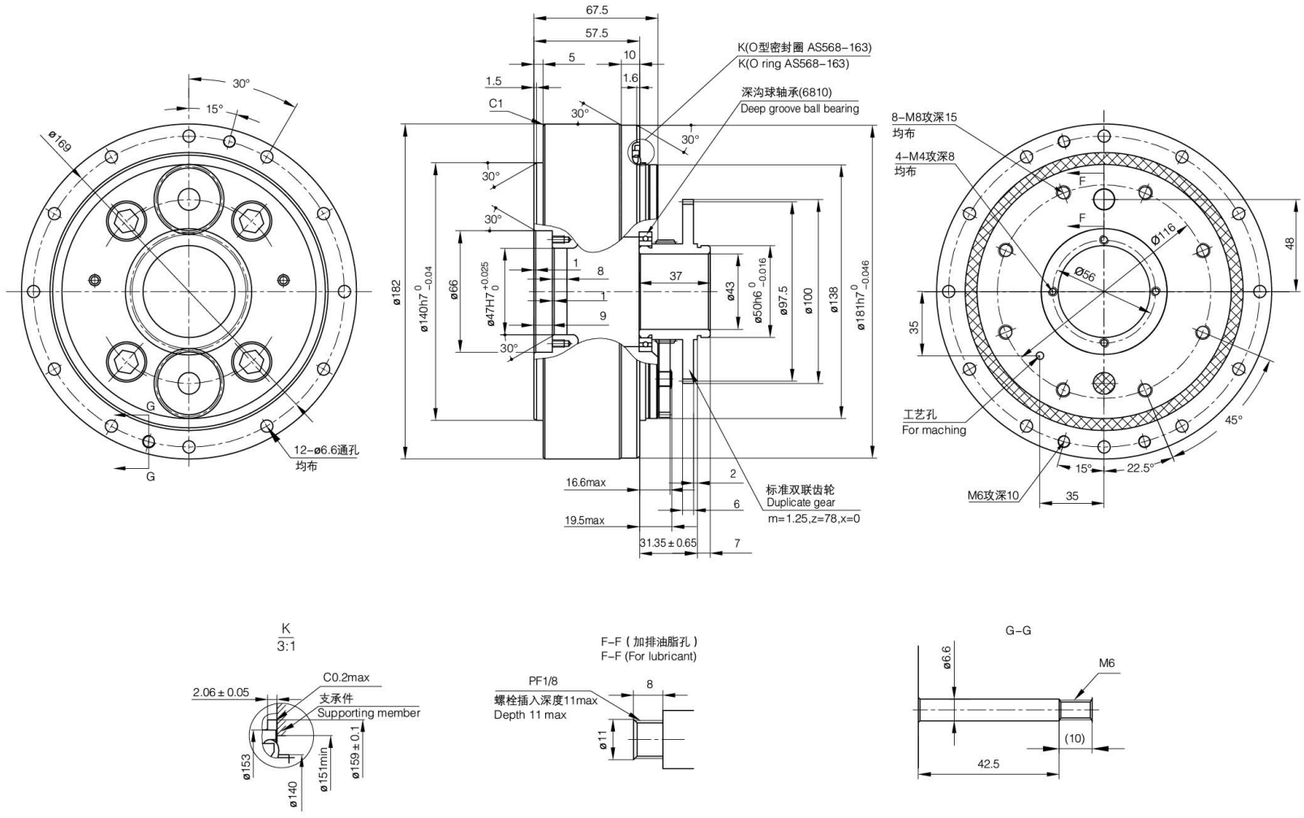


注 Notes：
规格和尺寸可能会发生变更，恕不另行通知。
Specifications and dimensions are subject to change without notice.

C系列 C-series

BXJ-27C输出轴螺栓紧固型外形尺寸图
Dimension

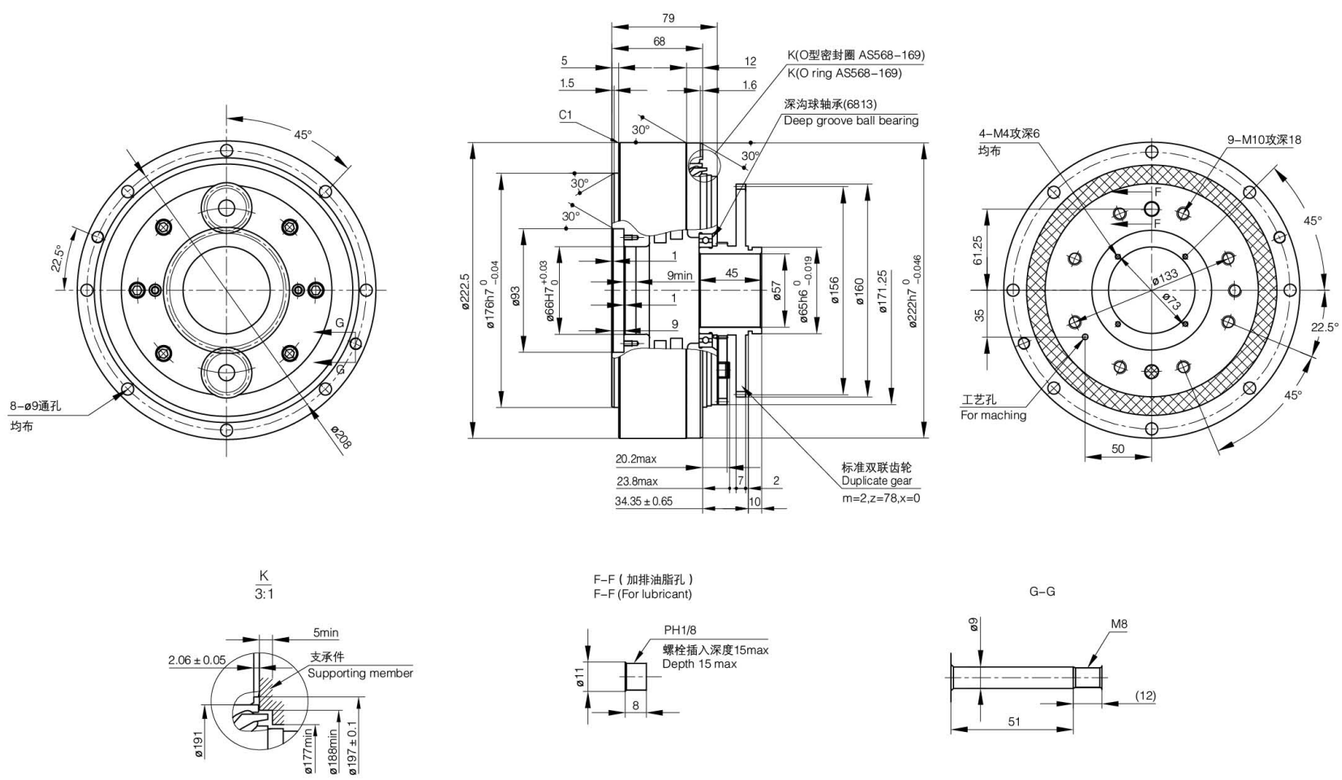
型号代码:BXJ-27C- 速比值 36.57 - A
code Ratio



注 Notes：
规格和尺寸可能会发生变更，恕不另行通知。
Specifications and dimensions are subject to change without notice.

BXJ-50C输出轴螺栓紧固型外形尺寸图
Dimension

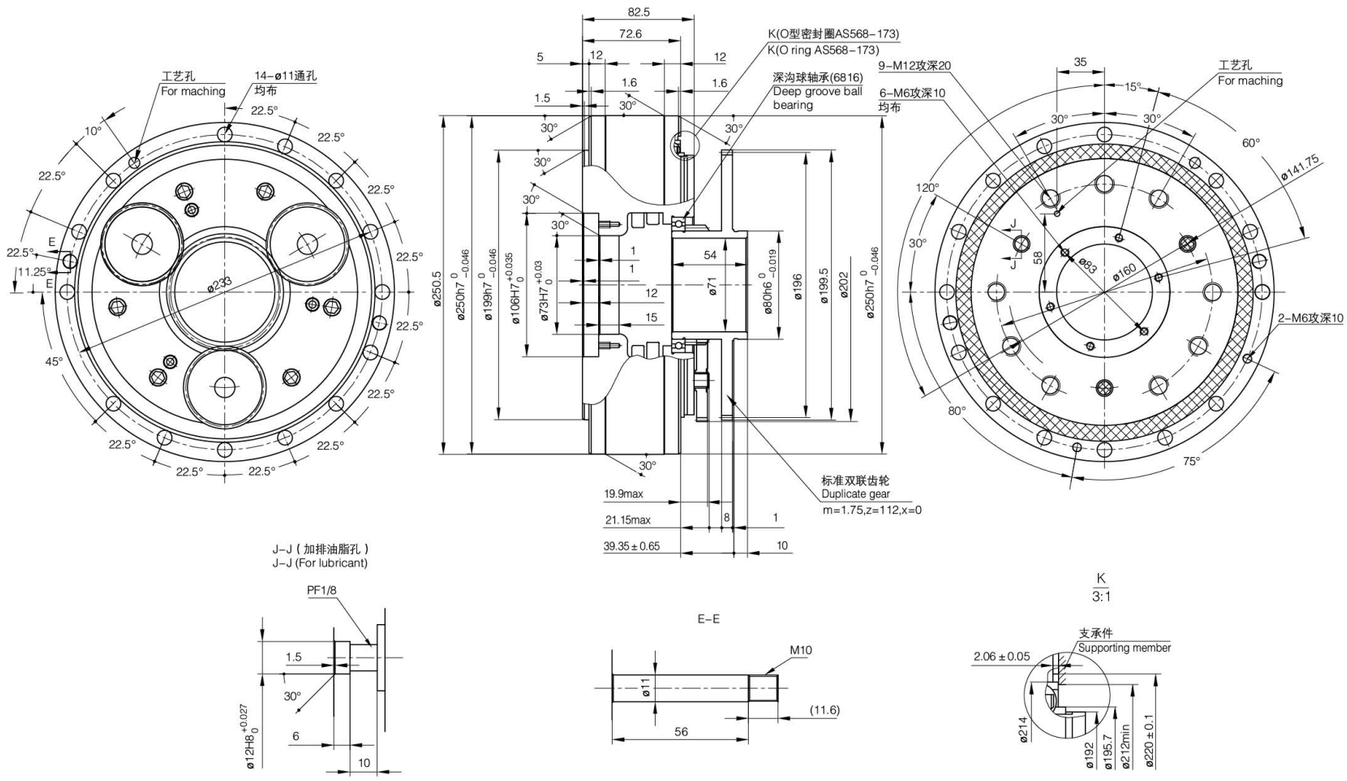
型号代码:BXJ-50C- 速比值 32.54 - A
code Ratio



注 Notes：
规格和尺寸可能会发生变更，恕不另行通知。
Specifications and dimensions are subject to change without notice.

BXJ-100C输出轴螺栓紧固型外形尺寸图
Dimension

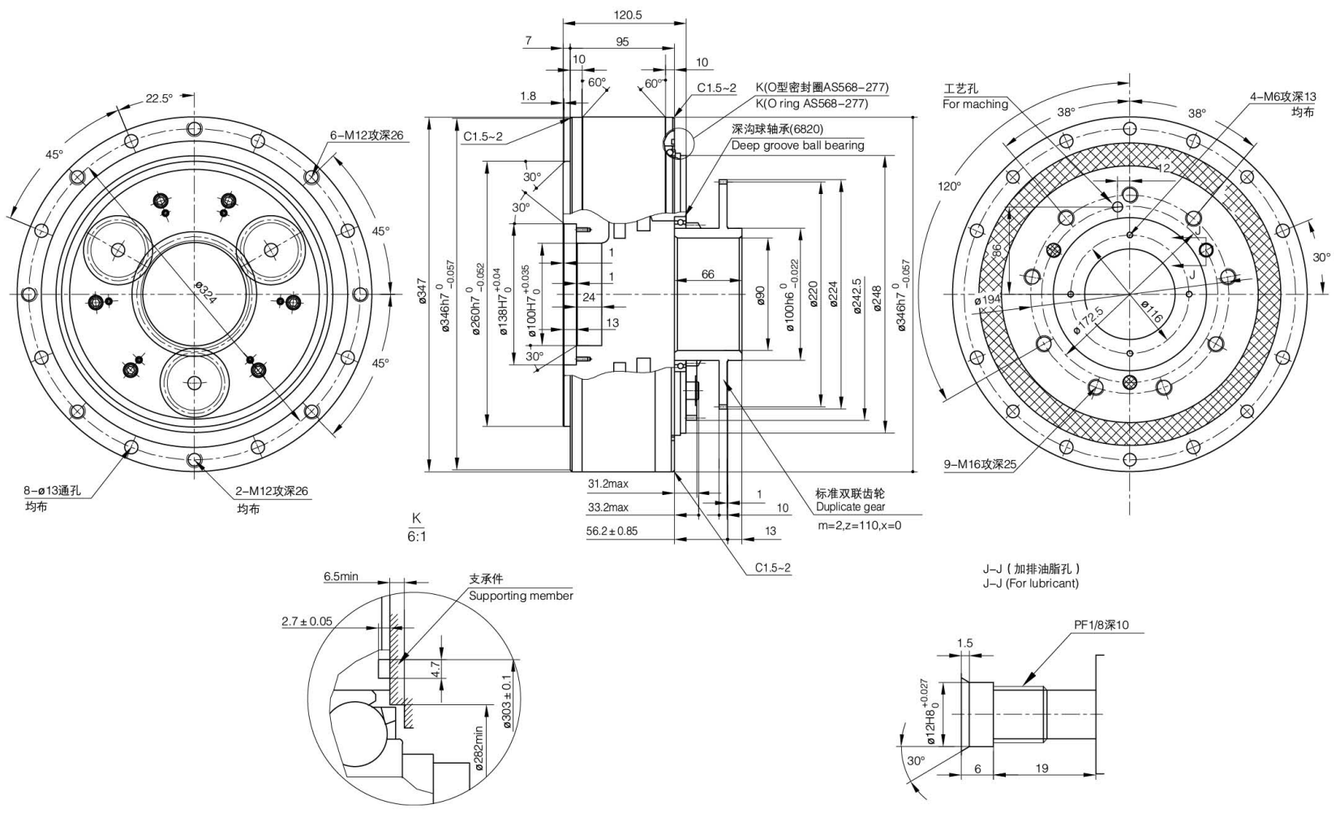
型号代码:BXJ-100C- 36.75 - A
code 速比值 Ratio



注 Notes：
规格和尺寸可能会发生变更，恕不另行通知。
Specifications and dimensions are subject to change without notice.

BXJ-200C输出轴螺栓紧固型外形尺寸图
Dimension

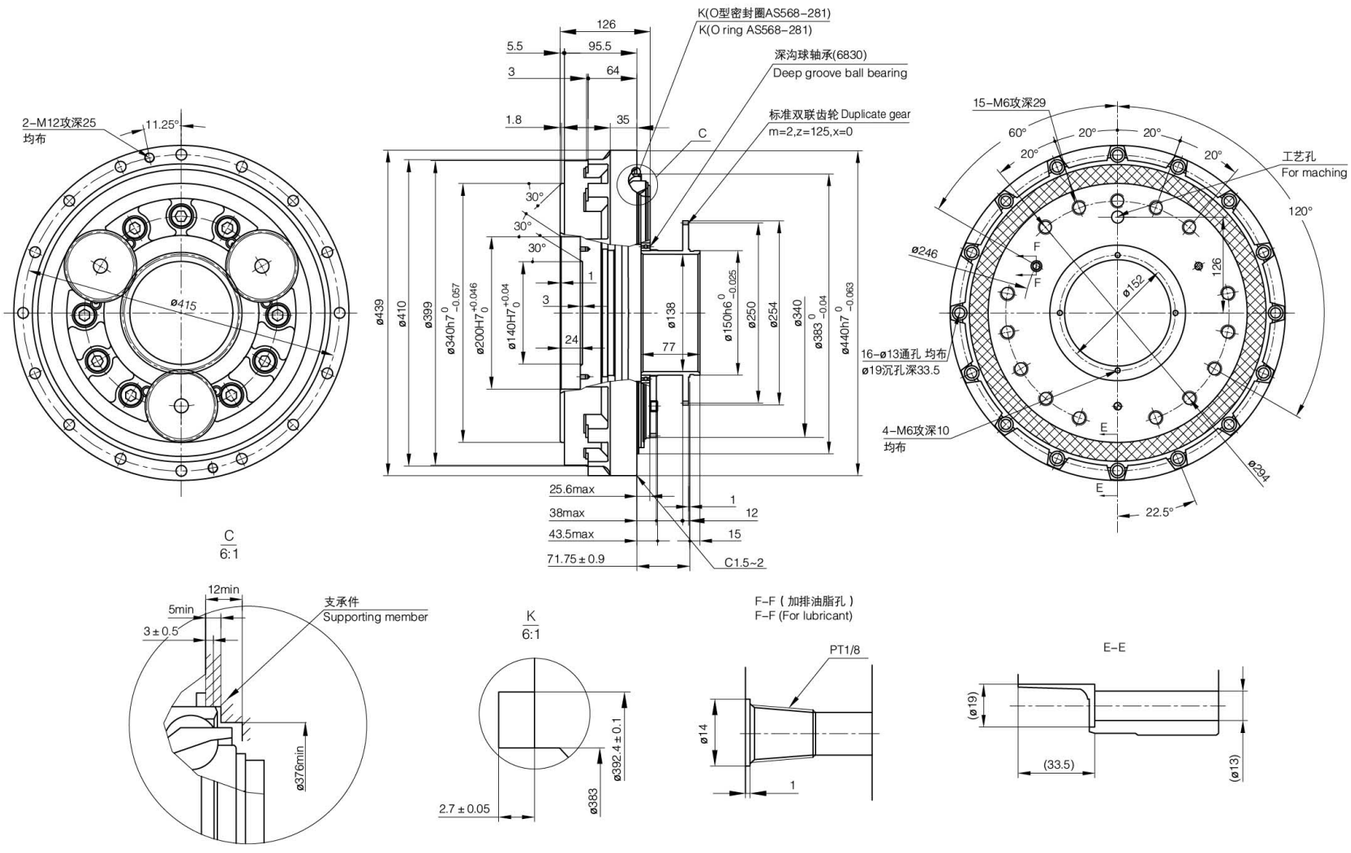
型号代码:BXJ-200C- 34.86 - A
code 速比值 Ratio



注 Notes：
规格和尺寸可能会发生变更，恕不另行通知。
Specifications and dimensions are subject to change without notice.

BXJ-320C输出轴螺栓紧固型外形尺寸图
Dimension

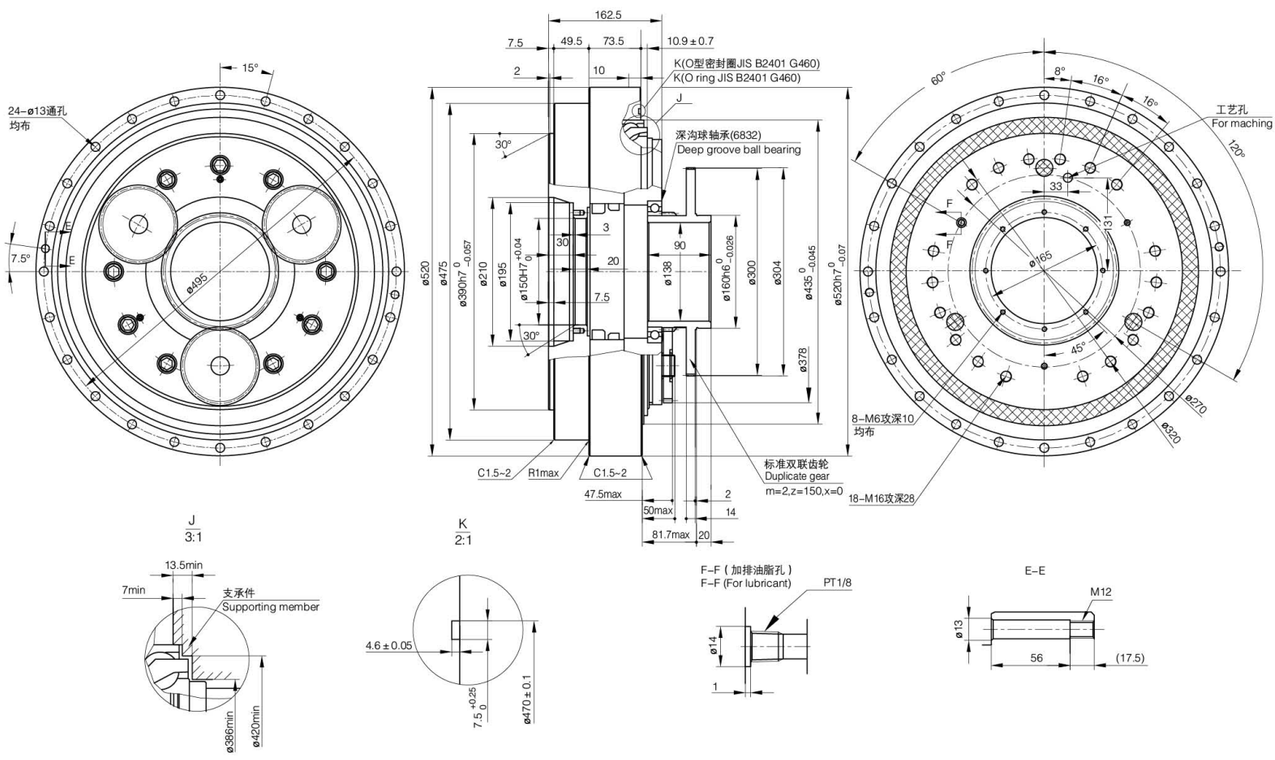
型号代码:BXJ-320C- 35.61 - A
code 速比值 Ratio



注 Notes：
规格和尺寸可能会发生变更，恕不另行通知。
Specifications and dimensions are subject to change without notice.

BXJ-500C输出轴螺栓紧固型外形尺寸图
Dimension

型号代码:BXJ-500C- 37.34 - A
code 速比值 Ratio



注 Notes：
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Specifications and dimensions are subject to change without notice.

BXJ

BXJ Precision Reducer 精密减速器

性能参数
Performance Characteristics

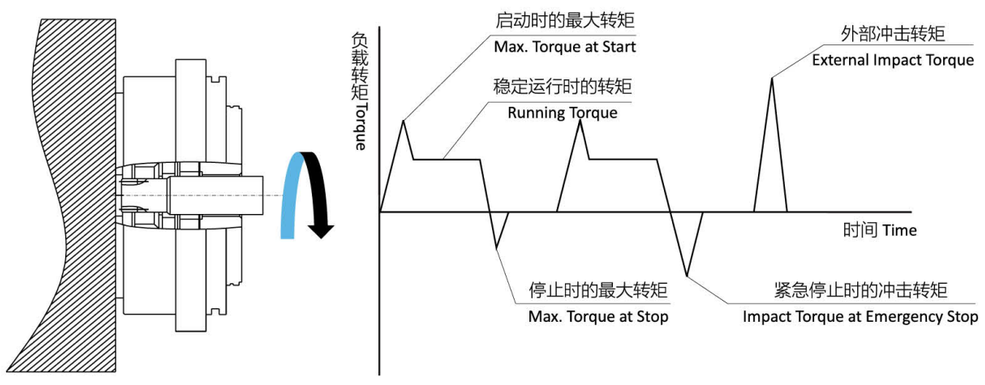
4–1 启动停止转矩和瞬时最大许用转矩
Start-stop allowable torque and instantaneous allowable torque

启动停止许用转矩：减速器在启动和停止时，由于载荷的惯性作用，减速器将承受比额定转矩更大的转矩，这个转矩的许用值称为启动停止许用转矩。通常，启动停止许用转矩约为额定转矩的2.5倍。

Start-stop Allowable Torque: When starts and stops, the reducer will bear a torque greater than the rated value due to the inertia of the load. The allowable value of the torque called the start-stop allowable torque. Normally, start-stop allowable torque is the 2.5 times of the rated torque.

瞬时最大许用转矩：由于紧急停止或者外部冲击载荷作用，减速器会在某个瞬间承受比额定转矩更大的转矩，这个转矩的许用值称为瞬时最大许用转矩。通常，瞬时最大许用转矩约为额定转矩的5倍。在使用时，冲击转矩不能超过许用值，并且不能超过限定次数。BXJ系列减速器的允许冲击次数可以按照下面公式计算：

Instantaneous Allowable Torque: Because of an emergency stop or an external impact load, the reducer will bear a torque greater than the rated value in a moment. The allowable value of the torque called instantaneous allowable torque. Normally, instantaneous allowable torque is the 5 times of the rated torque, and it can't beyond the limited cycle. The number of allowable operation cycles of BXJ reducer can be calculated as follows:



$$C_e = \frac{775\times(\frac{5\times T_0}{T_e})^{\frac{10}{3}}}{Z_4\times\frac{N_e}{60}\times t_e}$$

Z_4: 滚针根数 Number of pins
C_e: 允许冲击次数 Number of allowable operation cycles
T_0: 额定转矩 Rated torque (Nm)
T_e: 急停转矩 Emergency torque (Nm)
N_e: 急停转速 Emergency speed (rpm)
t_e: 急停时间 Emergency time (sec.)

4–2 无载驱动转矩 Unloaded driving torque

无载驱动转矩： 使减速器无载旋转所需输入轴（输入齿轮）的转矩称为无载驱动转矩。

Unloaded Driving Torque: The torque of the input shaft(input gear) required to rotate the reducer at the unloaded condition is call unloaded driving torque.

下图所示的无载驱动转矩均为输出轴转矩值，如有需要请根据下列公式计算电动机轴转矩值：

The unloaded driving torque shown below is the output shaft torque value. If necessary, calculate the motor shaft torque value according to the following formula:

$$T_M = \frac{T_S}{R} \qquad (Ⅰ)$$

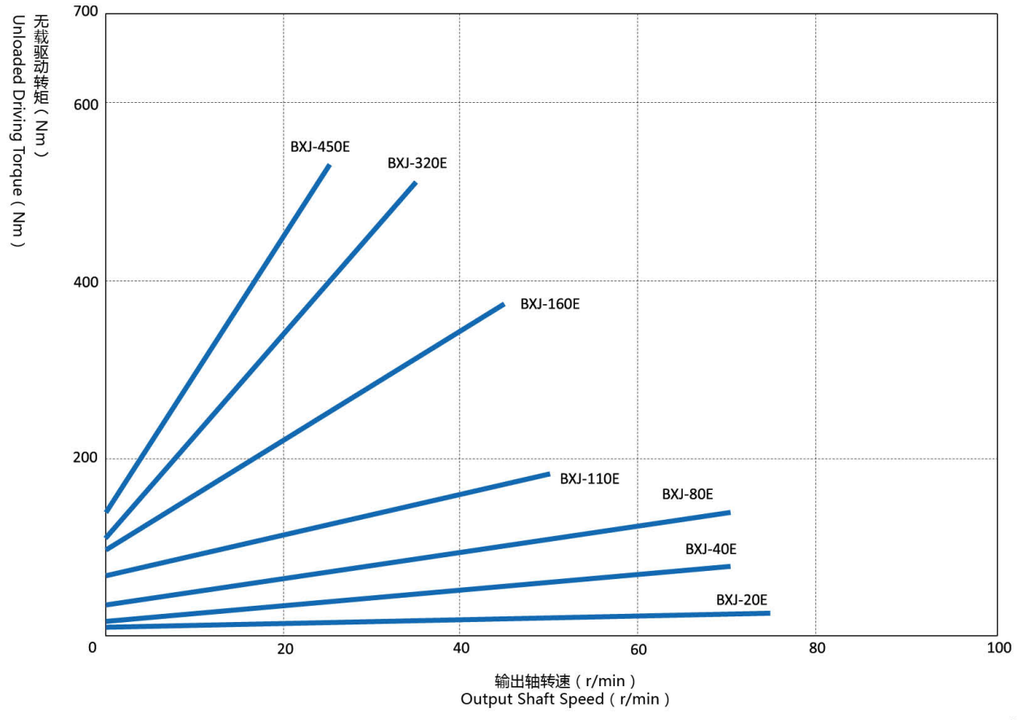
$$T_M = \frac{T_S}{R_1}\cdot\frac{Z_1}{Z_2} + T_F \qquad (Ⅱ)$$

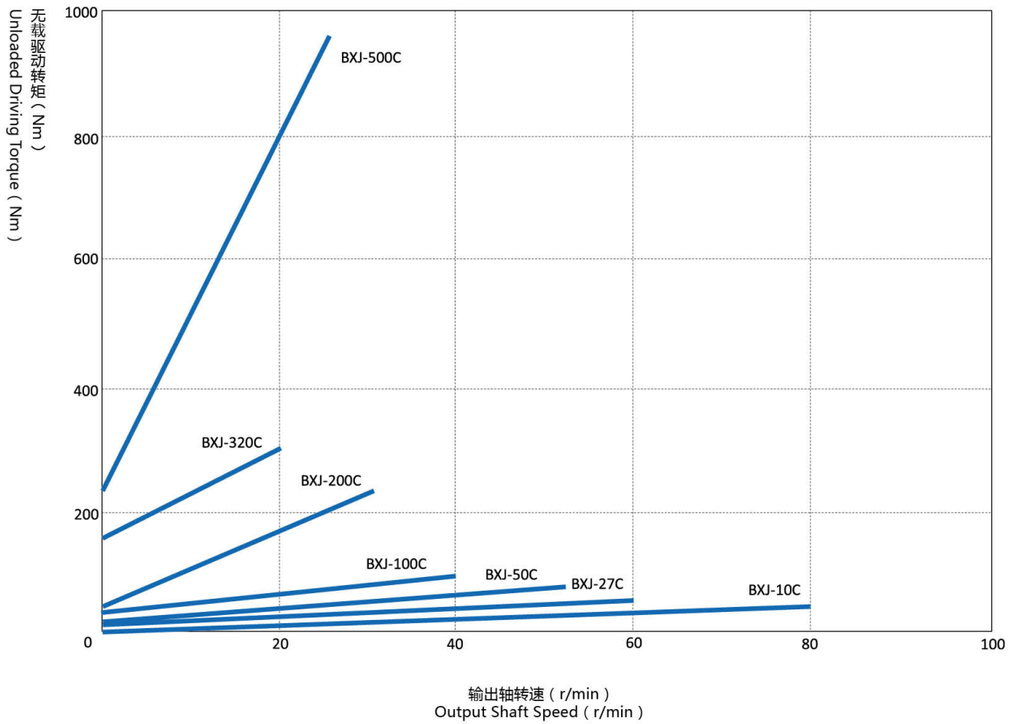
T_M：电动机轴转矩 Motor shaft torque (Nm)
T_S：输出轴转矩 Output shaft torque(Nm)
R、R_1：速比值 Ratio value
Z_1：输入齿轮齿数 Input gear teeth
Z_2：双联齿轮大齿轮齿数 Big gear teeth of duplicate gear
T_F：双联齿轮搅动阻力 Duplicate gear resistance(Nm)

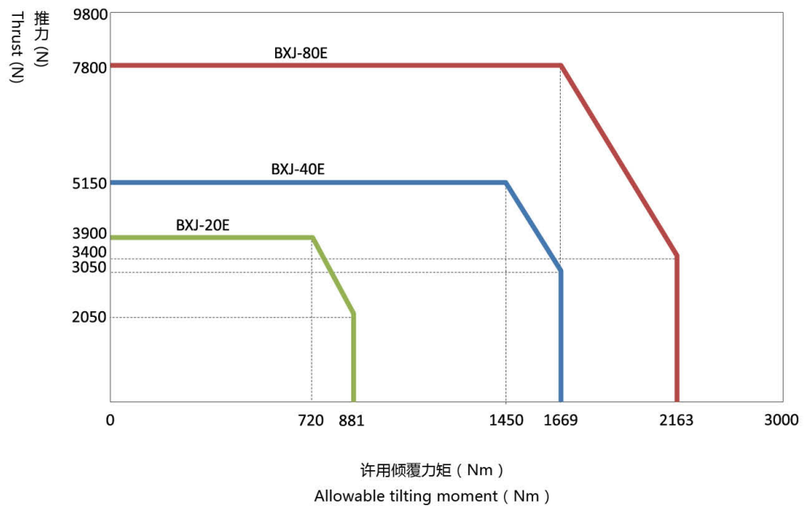
公式(I)用于中实机型的计算，公式(II)用于中空机型的计算。
Formula (I) is used for the calculation of the medium solid type and Formula (II) is used for the calculation of the medium hollow type.

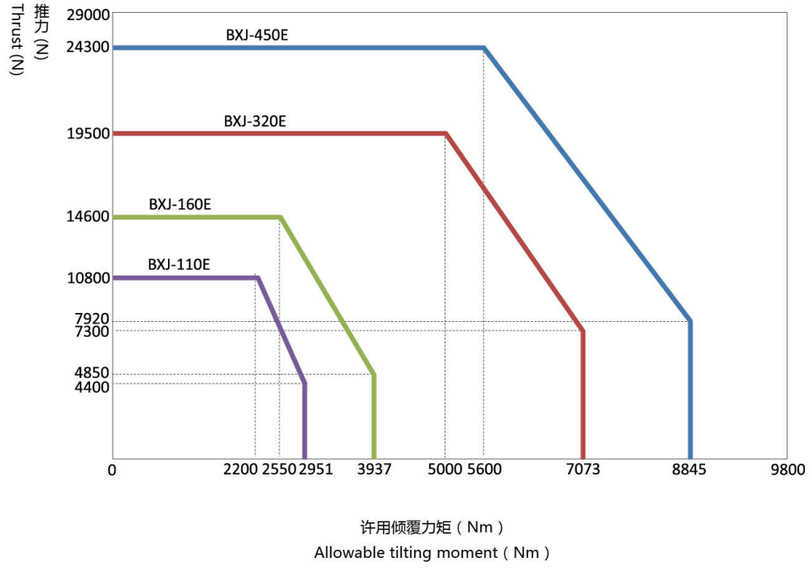
测试条件 Test conditions
1.外壳温度：30℃
Case temperature:30℃
2.润滑：油脂(MolyWhiteRE00)
Lubricant: grease(MolyWhiteRE00)
3.装配精度：参考P41 装配精度
Assembly accuracy: refer to page 41

无载驱动转矩线图 Unloaded driving torque diagram
注：下图所示的无载驱动转矩为减速器单体磨合运转后的平均值。
Notes : The value in the figure below is the average value of the running-in reducer.









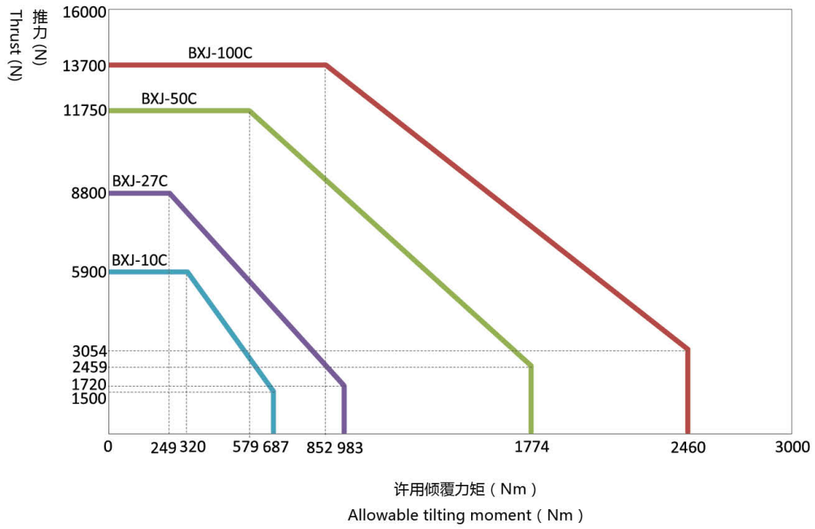
4–3 许用倾覆力矩和瞬时最大倾覆力矩
Allowable tilting moment and max. instantaneous tilting moment

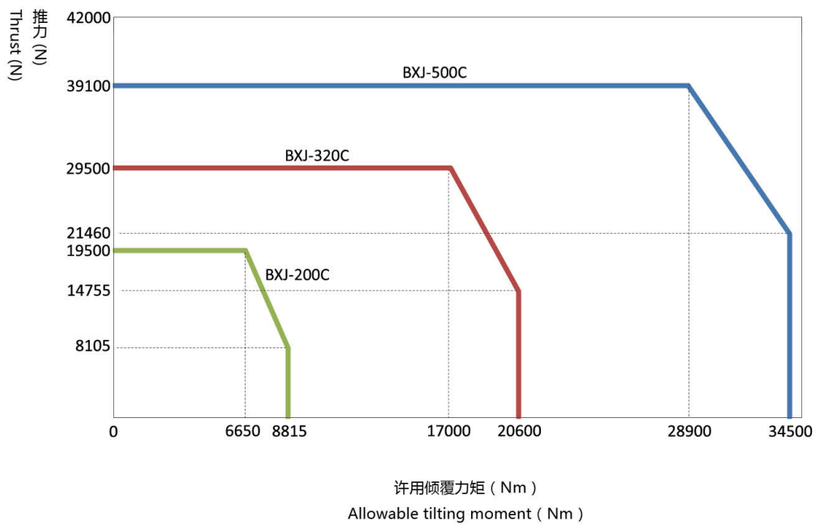
许用倾覆力矩：减速器在日常运转中（包括启动、停止时）时所承受的倾覆力矩的许用值称为许用倾覆力矩。请在许用倾覆力矩线图范围内使用。

Allowable Tilting Moment: The allowable value of the tilting moment the reducer bears in daily operation (include starting and stopping) is allowable tilting moment. Please use in the range of allowable tilting moment diagram.

瞬时最大倾覆力矩：减速器在遭到紧急停止或外部冲击载荷作用时，减速器所承受的倾覆力矩的最大值称为瞬时最大倾覆力矩。通常瞬时最大倾覆力矩为许用倾覆力矩的两倍。

Max. Instantaneous Tilting Moment: The maximum moment the reducer can bear when subjected to external impact or emergency stop. Normally, the max. instantaneous tilting moment is the 2 times of the allowable tilting moment.





4–4 倾覆刚度 Tilting stiffness

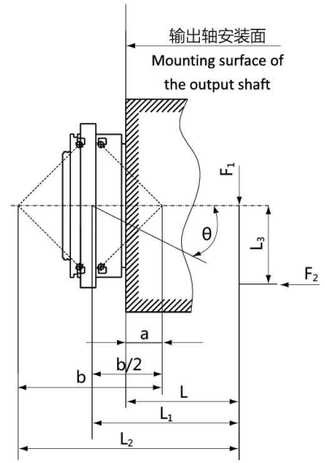
当减速器因外部载荷而产生倾覆力矩时，输出轴(行星架)将与倾覆力矩成正比地倾斜。倾覆刚度用单位倾斜角度(1 arcmin)所需的负载弯矩值表示。倾覆刚度可由下表中的数据以及公式求得：

When an external load is applied to the output shaft (carrier), its deflection angle is proportional to the tilting moment. The tilting stiffness is represented by the value of load moment required by unit angle (1 arcmin). Tilting stiffness can be obtained from the following table and formula:

$$K_t = \frac{F_1L_1 + F_2L_3}{\theta \times 10^3}$$

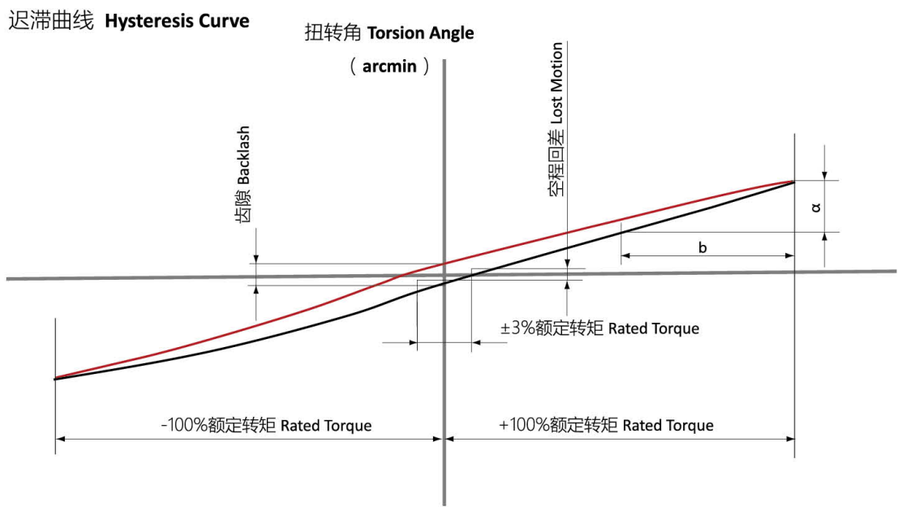
K_t：倾覆刚度 Tilting stiffness (Nm/arcmin)
θ：输出轴的倾斜角度 Deflected angle of output shaft (arcmin)
F_1、F_2：负荷 Load(N)
L_1、L_3：到负荷作用点的距离 Arm length (mm)
L_1：L + b/2 - a (mm)
L：输出轴安装面到负荷点的距离 The distance between the output shaft mounting surface and the loading point (mm)

注Notes：
输出轴倾斜角度θ请利用上述公式进行计算。
Please use the above formula to calculate the deflected angle of output shaft.



型号 Model	倾覆刚度代表值 Tilting stiffness（Nm/arcmin）	尺寸 Dimension(mm)		型号 Model	倾覆刚度代表值 Tilting stiffness（Nm/arcmin）	尺寸 Dimension(mm)	
		a	b			a	b
BXJ-20E	325	20.2	113.4	BXJ-40E	932	29.6	143.8
BXJ-80E	1,170	33.5	166.1	BXJ-110E	1,460	32.3	176.5
BXJ-160E	2,933	47.9	211	BXJ-320E	4,800	56.5	251.5
BXJ-450E	7,480	69.1	292.8	BXJ-10C	421	28.1	119.1
BXJ-27C	1,068	38.3	150.3	BXJ-50C	1,960	50.5	187.2
BXJ-100C	2,813	58.7	207.7	BXJ-200C	9,800	76.0	280.5
BXJ-320C	12,740	114.6	360.6	BXJ-500C	24,500	125.1	413.5

4–5 扭转刚度、空程回差和齿隙
Torsional stiffness, lost motion and backlash



将输入轴固定，然后对输出轴（行星架）施加转矩，则输出轴会产生与转矩相应的扭转角，通过加载和卸载得到的转矩与扭转角的关系线图叫做迟滞曲线。从迟滞曲线上可以获得扭转刚度、空程回差和齿隙。

Fixing the input shaft and applying a torque to the output shaft(carrier), the output shaft will have a torsion angle corresponding to the torque. The diagram of torque and torsion angle obtained by loading and unloading is named hysteresis curve. Torsional stiffness, lost motion and backlash can be obtained from the hysteresis curve.

扭转刚度 **Torsional stiffness:**

$$K_\theta = \frac{b}{\alpha}$$

b：50%额定转矩 50% rated torque (Nm)

α：b转矩范围内在迟滞曲线上对应的扭转角 The torsion angle of b on the hysteresis curve (arcmin)

空程回差：±3%额定转矩处的迟滞曲线宽度中间点对应的扭转角的差。

Lost motion: The difference value between the torsional angle at the midpoint of the hysteresis curve width at +3% of rated torque and that at -3% of rated torque.

齿隙：迟滞曲线上，转矩“零”处的扭转角的差。

Backlash: The difference value between two torsion angles when the torque indicated by the hysteresis curve is zero.

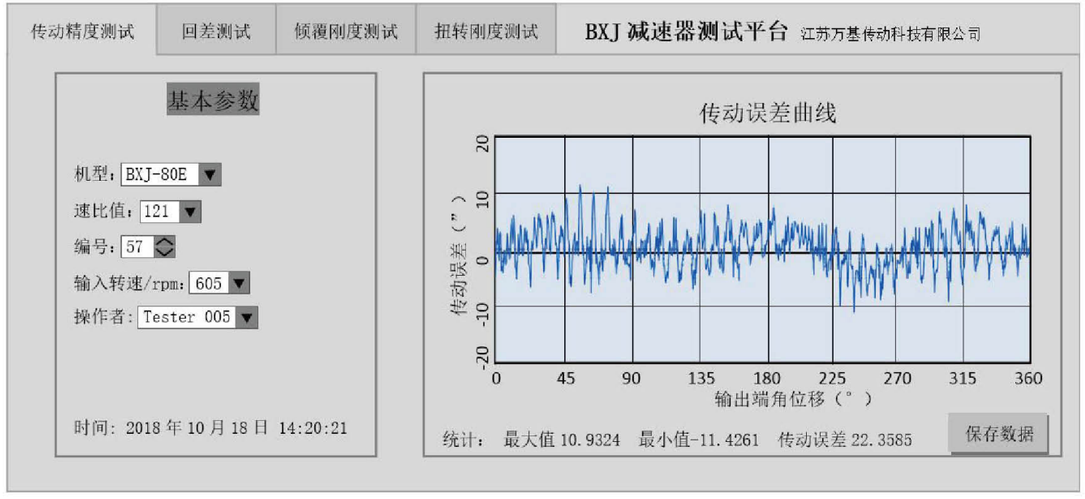
4–6 传动精度 Angular transmission accuracy

传动精度也叫角度传递误差（θer），指在任意输入旋转角（θin）时，减速器理论输出旋转角与实际输出旋转角（θout）之间的差。

Angular transmission accuracy refers to a difference between the theoretical output revolution angle and the actual revolution angle（θout）when any revolution angle（ θin）is the input, and is expressed as an angular transmission error（θer）.

$$\theta er = \frac{\theta in}{R} - \theta out \quad （R：速比值Ratio value）$$

实测示例（BXJ-80E）如下图所示 The measured example is shown below

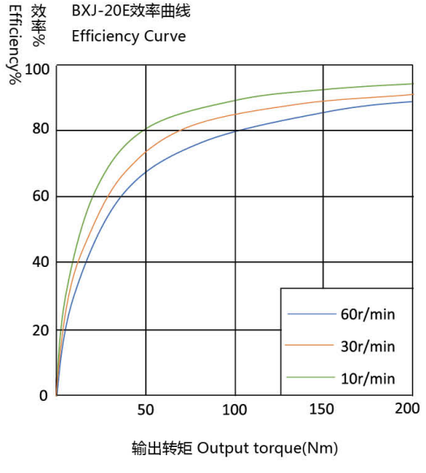


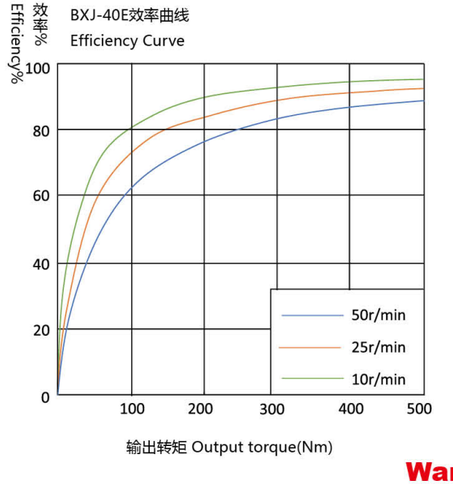
4–7 效率 Efficiency

测试条件 Test conditions

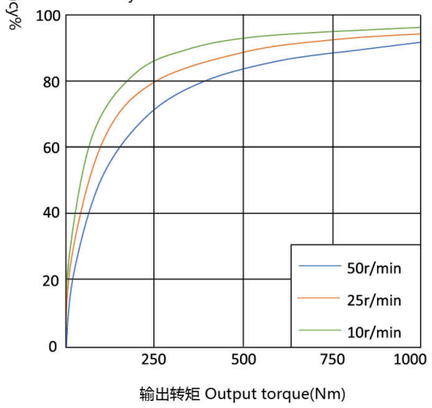
1.外壳温度：30℃
Case temperature:30℃
2.装配精度：参考P41 装配精度
Assembly accuracy: refer to page 41
3.润滑：油脂 MolyWhiteRE00
Lubricant: grease MolyWhiteRE00
4.C系列不包括中心齿轮的损耗
Loss at center gear is not included.

所有BXJ系列减速器在各输出转速下，效率均大于70%。各型号效率图如下所示。
At each output speed, the efficiency of any reducer is more than 70%. The efficiency diagram for each type is shown below.

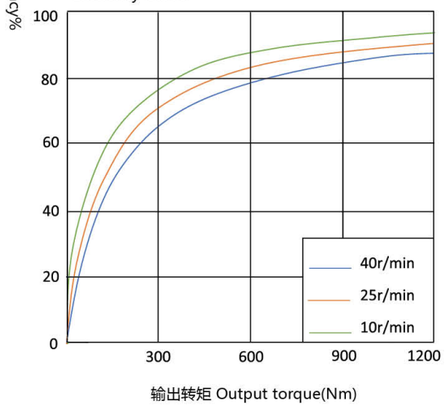




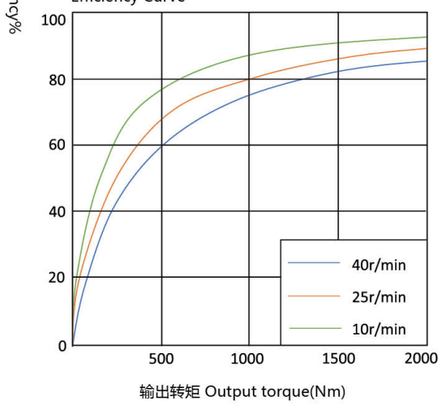
BXJ-80E效率曲线
Efficiency Curve



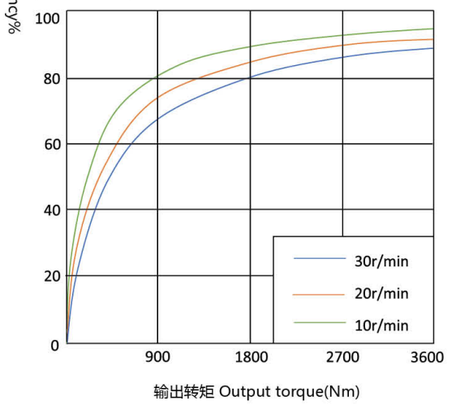
BXJ-110E效率曲线
Efficiency Curve



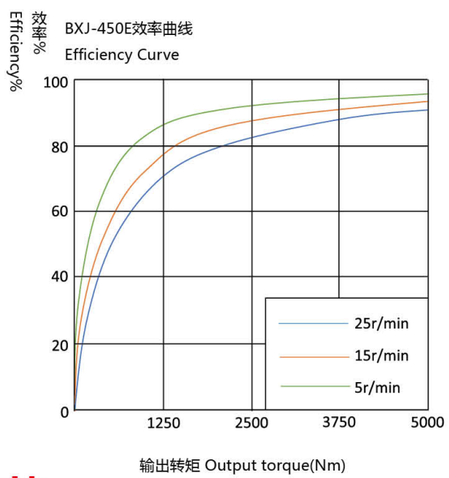
BXJ-160E效率曲线
Efficiency Curve



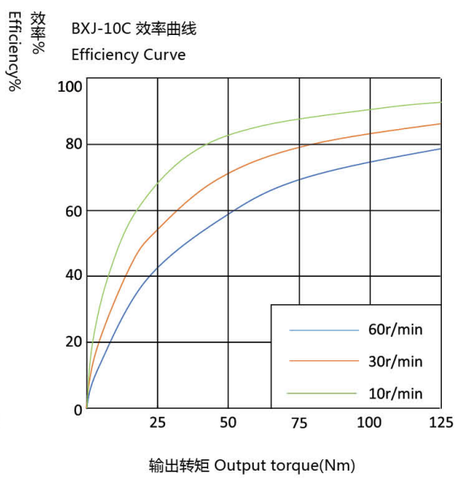
BXJ-320E效率曲线
Efficiency Curve



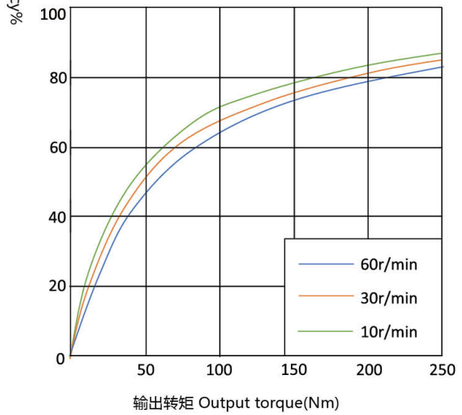
BXJ-450E效率曲线
Efficiency Curve



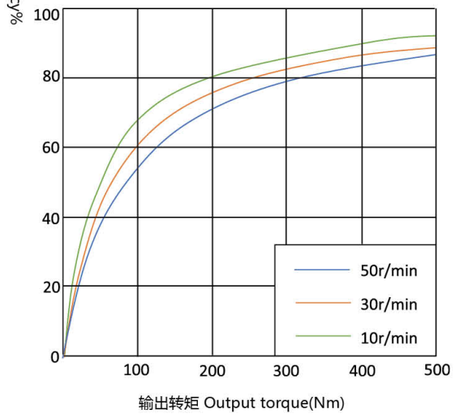
BXJ-10C 效率曲线
Efficiency Curve



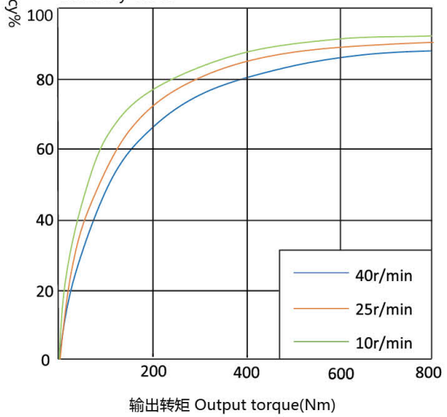
BXJ-27C 效率曲线
Efficiency Curve



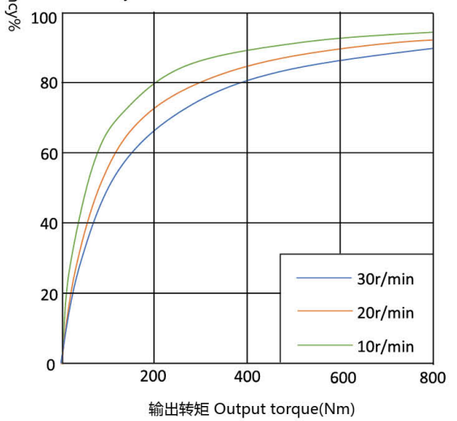
BXJ-50C 效率曲线
Efficiency Curve



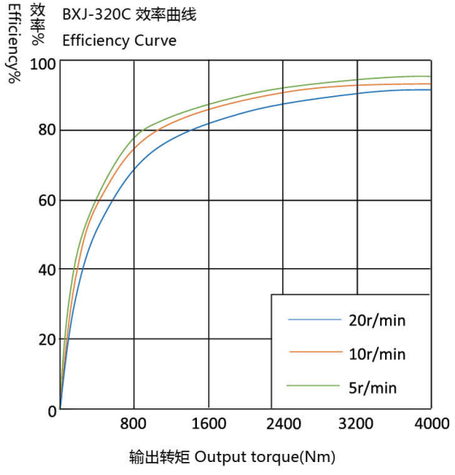
BXJ-100C 效率曲线
Efficiency Curve



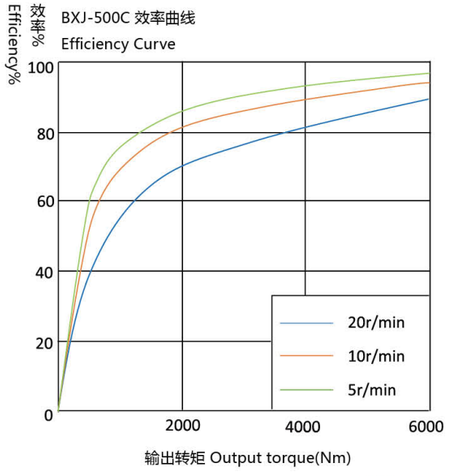
BXJ-200C 效率曲线
Efficiency Curve



BXJ-320C 效率曲线
Efficiency Curve



BXJ-500C 效率曲线
Efficiency Curve

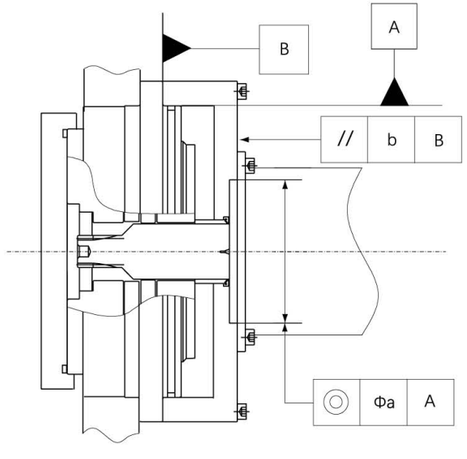


5–1 装配精度 Assembly accuracy

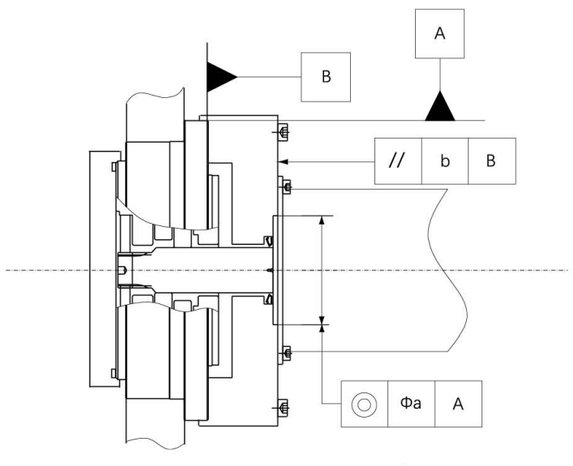
减速器装配时，其安装侧部件请按以下精度进行设计。如果安装精度不良，则易产生振动、噪声等影响。
When assemble the reducer, please design the mounting side parts according to tolerances in the following table. Poor assembly accuracy always causes vibration, noise and so on.

BXJ-E 系列

型号Model	同心度公差 Concentricity tolerance a(mm)	平行度公差 Parallelism tolerance b(mm)
BXJ-20E	MAX0.03	MAX0.03
BXJ-40E	MAX0.03	MAX0.03
BXJ-80E	MAX0.03	MAX0.03
BXJ-110E	MAX0.03	MAX0.03
BXJ-160E	MAX0.05	MAX0.05
BXJ-320E	MAX0.05	MAX0.05
BXJ-450E	MAX0.05	MAX0.05



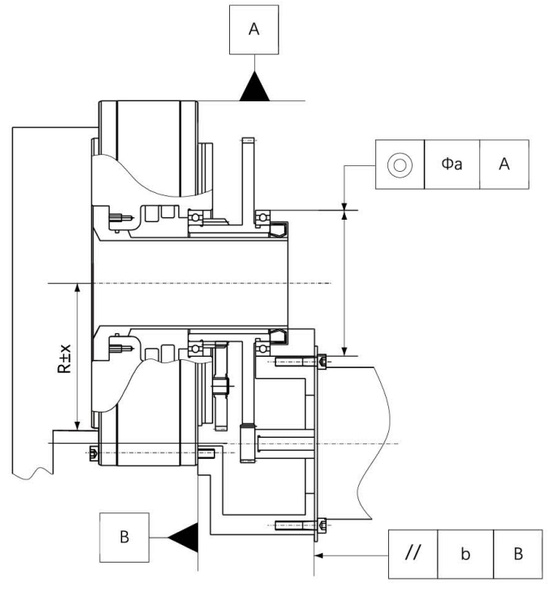
BXJ-80E及其以下型号装配精度示意图
The assembly diagram of BXJ-80E and the smaller



BXJ-110E及其以上型号装配精度示意图
The assembly diagram of BXJ-110E and the bigger

BXJ-C 系列

型号 Model	中心距离公差 Tolerance of center-to-center distance x(mm)	同心度公差 Concentricity tolerance a(mm)	平行度公差 Parallelism tolerance b(mm)
BXJ-10C	±0.03	MAX0.03	MAX0.03
BXJ-27C			
BXJ-50C			
BXJ-100C			
BXJ-200C			
BXJ-320C			
BXJ-500C			



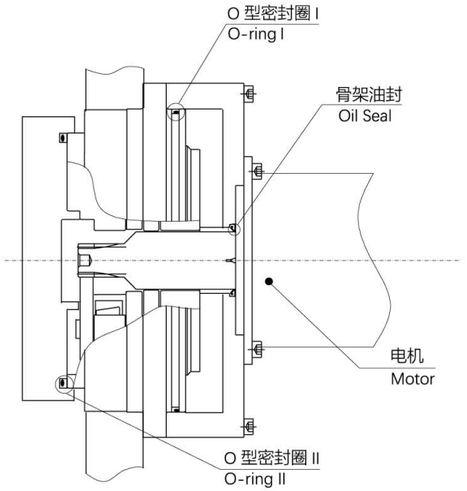
注Notes：
R是减速器中心到电机中心的距离。R is the distance from the center of the reducer to the center of the motor.

BXJ-C系列装配精度示意图
The assembly diagram of BXJ-C

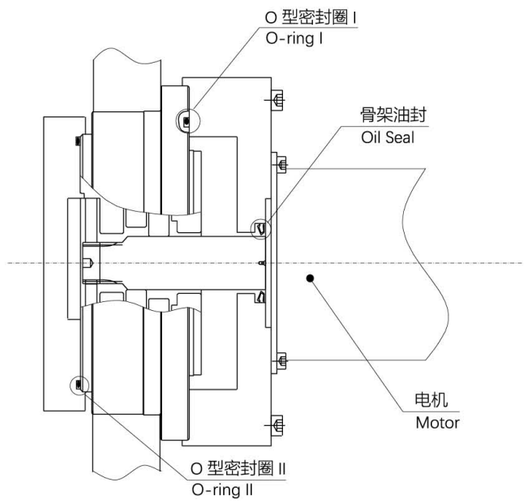
5–2 O型圈的安装 Installation example of O-ring

下图表示了各系列的密封位置，请在参照O型圈选型表（表1）和O型圈II凹槽尺寸表（表2）的基础上在安装侧进行密封设计，若结构上无法使用“O”型圈，请使用推荐液状密封剂表（表3）中的液体填料等密封剂。

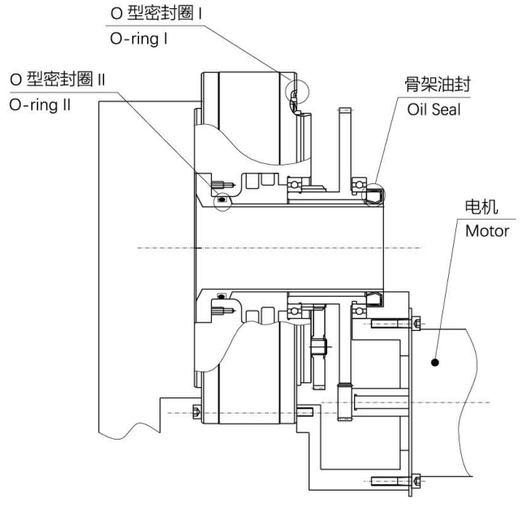
The following diagrams show the sealing position of each series, please design seals on the mounting side on the basic of referring to O-ring seal selection table(Table 1) and Groove of O-ring II dimension table (Table 2). If use of an O-ring seal is impossible because of structural constraints, please use gasket sealant shown in Recommended gasket sealant table(Table 3).



BXJ-80E及以下型号密封示意图
The seal diagram of BXJ-80E and the smaller



BXJ-110E及以上型号密封示意图
The seal diagram of BXJ-110E and the bigger



BXJ-C系列密封示意图
The seal diagram of BXJ-C

表1 O型圈选型

Table 1 O-ring selection table

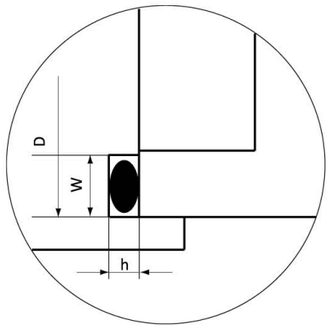
型号 Model	O型圈（I） O-ring seal (I)	O型圈（II） O-ring seal (II)
BXJ-20E	S120	AS568-045
BXJ-40E	AS568-258	S132
BXJ-80E	AS568-263	AS568-163
BXJ-110E	JIS B2401 G190	AS568-167
BXJ-160E	JIS B2401 G220	AS568-265
BXJ-320E	JIS B2401 G270	AS568-271
BXJ-450E	JIS B2401 G300	AS568-275
BXJ-10C	AS568-048	自行设计Design by self[1]
BXJ-27C	AS568-163	
BXJ-50C	AS568-169	
BXJ-100C	AS568-173	
BXJ-200C	AS568-277	
BXJ-320C	AS568-281	
BXJ-500C	JIS B2401 G460	

注Notes：

1.S、AS型为NOK制造的O型圈。Type S and type AS are O-rings made by NOK.

2. [1]BXJ-C系列在用油封和O型圈II进行密封后，无需对输出轴安装侧进行密封，O型圈II规格及凹槽尺寸请自行设计。

[1] The BXJ-C series after using the oil seal and O ring II to seal, do not need to consider the output shaft mounting side and please design O-ring II and the groove dimension by self.



E系列 O 型圈 II 局部放大图
The O-ring seal II of E series details

表2 O型圈II凹槽尺寸表（参考）
Table 2 Groove of O-ring II dimension table(reference)

型号 Model	凹槽尺寸 Groove dimension		
	外径 Outside diameter D(mm)	深度 Depth h(mm)	宽度 Width W(mm)
BXJ-20E	ø105 $^{+0.05}_{0}$	1.25±0.05	2.39 $^{+0.25}_{0}$
BXJ-40E	ø135 $^{+0.05}_{0}$	1.5 $^{0}_{-0.1}$	2.7 $^{+0.25}_{0}$
BXJ-80E	ø160 $^{+0.05}_{0}$	2.06±0.05	3.58 $^{+0.25}_{0}$
BXJ-110E	ø182 $^{+0.05}_{0}$	2.06±0.05	3.58 $^{+0.25}_{0}$
BXJ-160E	ø204 $^{+0.05}_{0}$	2.82±0.05	4.78 $^{+0.25}_{0}$
BXJ-320E	ø243 $^{+0.05}_{0}$	2.82±0.05	4.78 $^{+0.25}_{0}$
BXJ-450E	ø273 $^{+0.05}_{0}$	2.82±0.05	4.78 $^{+0.25}_{0}$
BXJ-10C~500C	自行设计Design by self		

表3 推荐液状密封剂表
Table 3 Recommended gasket sealant table

名称（制造商） Name(Manufacturer)	性质、用途 Character＆Uses
Three Bond 1211 （Three Bond）	● 硅系无溶剂型 Silicon is not solvent ● 半干性填密片 Half dry packing piece
Herme Seal SS-60F (Nihon Hermetics)	● 无溶剂弹性密封剂 Solvent-free elastic sealant ● 金属接触面（法兰面）的密封 Contact surface of metal seal(flange face) ● 与Three Bond 1211 为同类产品 The same as Three Bond 1211
Locktite 515 (Henkel)	● 厌氧型法兰面密封剂 Anaerobic sealant(flange face) ● 金属接触面（法兰面）的密封 Contact surface of metal seal(flange face)

注Notes：
1.当配套部件为铜或铜合金时，请勿使用。Do not use when the components are made of copper or copper alloy.
2.在强碱或高温蒸汽工作条件下，请与本公司取得联系。Please contact us in the condition of strong alkali or high temperature steam.
3.使用液状密封剂时，请防止密封剂进入减速机内部或从螺栓孔中渗漏。
Please prevent the sealant from entering the reducer and leaking through the bolt hole when using gasket sealant.

5–3 螺栓紧固扭矩、允许传递扭矩
Bolt tightening torque, allowing transfer torque

关于BXJ减速器的紧固请使用内六角螺栓，并按照以下紧固扭矩进行紧固。另外，为了防止内六角螺栓的松动以及螺栓断面的损伤，建议使用内六角螺栓用碟簧垫圈。

Use hexagonal socket bolts to assemble the BXJ reducer and tighten with the tightening torque in the following table. The belleville spring washer is recommended to prevent the bolt from loosening and protect the bolt.

内六角螺栓 公称×节距 Hexagonal socket bolt nominal size ×pitch (mm)	紧固扭矩 Tightening torque （Nm）	紧固力（R） Tightening force （N）	螺栓规格 Bolt specification
M5×0.8	9±0.5	9,300	内六角螺栓 Hexagonal socket bolt GB/T 70.1-2008 强度划分Strength GB/T 3098.1 12.9 螺纹Thread GB/T 197 6g
M6×1.0	15.5±0.8	13,160	
M8×1.25	37±1.9	23,950	
M10×1.5	74±3.5	38,100	
M12×1.75	128.5±6.4	55,150	
M14×2.0	205±10.5	75,880	
M16×2.0	318±16	103,400	
M18×2.5	440±22	126,700	

螺栓的允许传递扭矩公式：
Calculation of allowable transmission torque of bolts:

$$T_1 = F \times \frac{D_1}{2} \times \mu \times n_1$$

T_1: 螺栓允许传递扭矩 Allowable transmission torque of bolts (Nmm)
F: 螺栓紧固力 Bolt tightening force (N)
D_1: 螺栓安装中心直径 Bolt P.C.D.(mm)
μ: 摩擦系数 Friction coefficient
μ=0.15（吻合面附着润滑脂 Lubricants remained）
μ=0.2（吻合面脱脂 Without lubricant）
n_1: 螺栓根数 Number of bolts

5–4 润滑 Lubrication

为了充分发挥BXJ减速器的性能，建议使用MolyWhiteRE00润滑脂（润滑脂密度ρ=0.9g/cc），使用时请勿与其他润滑脂混合使用， 工作温度范围-10℃～40℃。

To maintain the performance of the BXJ reducer, MolyWhiteRE00(grease density ρ=0.9g/cc) is recommended. Working temperature range is -10℃～40℃.

5–4–1 润滑脂注入量

The quantity of grease required for the BXJ reducer

BXJ减速器在出厂时未填充润滑脂，在安装时，请按表中注入量填充。表中注入量是仅考虑减速器内部空间（未考虑轴和电机安装侧空间）的润滑脂注入量.

The BXJ reducer is not injected with grease, the user must inject the grease according to the quantity in following table when assembling the BXJ reducer. The quantity in table is only considered the internal space of the reducer(the space of the shaft and motor mounting side is not included).

BXJ-E 系列

型号 Model	减速器内部空间 Internal space of the reducer(cc)	安装水平轴 Horizontal installation		安装垂直轴 Vertical installation	
		注入量Quantity		注入量Quantity	
		cc	g	cc	g
BXJ-20E	106	88	79	101	91
BXJ-40E	237	196	176	225	203
BXJ-80E	463	385	347	440	396
BXJ-110E	522	433	390	496	446
BXJ-160E	733	631	568	696	626
BXJ-320E	1,256	1,043	939	1,194	1,075
BXJ-450E	1,929	1,599	1,439	1,833	1,650

BXJ-C系列

型号 Model	减速器内部空间 Internal space of the reducer(cc)	安装水平轴 Horizontal installation		安装垂直轴 Vertical installation	
		注入量Quantity		注入量Quantity	
		cc	g	cc	g
BXJ-10C	177	148	133	168	151
BXJ-27C	322	267	240	306	275
BXJ-50C	603	500	450	573	516
BXJ-100C	905	757	681	860	774
BXJ-200C	2,187	1,834	1,651	2,078	1,870
BXJ-320C	4,264	3,540	3,186	4,051	3,646
BXJ-500C	7,265	5,935	5,342	6,902	6,212

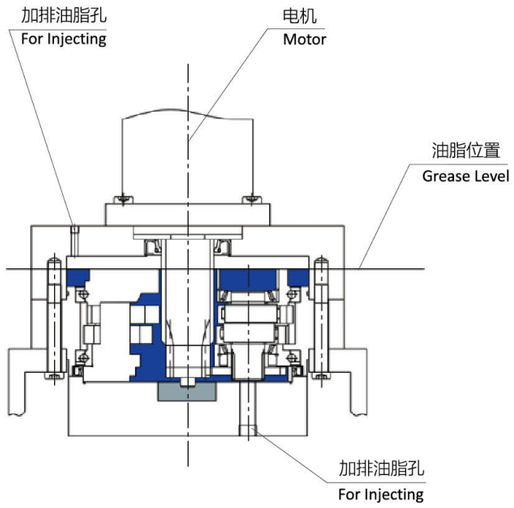
5–4–2 润滑脂注入位置

Grease injection position in BXJ reducer

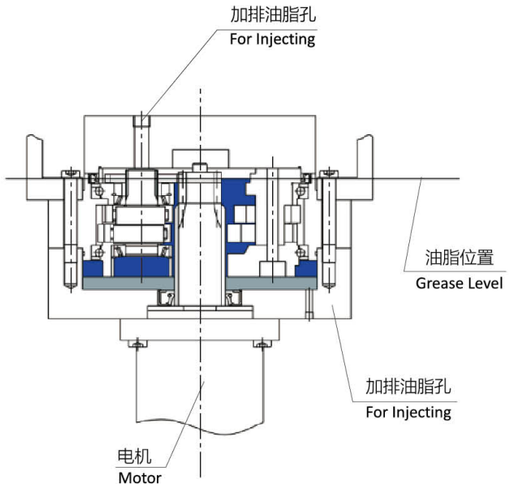
图中 ■ 区域为上文注入量所对应的润滑脂注入位置，其余空间（轴和电机安装侧的空间）也需注入润滑脂，其注入位置为图中 ■ 区域。在润滑脂填充完毕后，确保注入润滑脂总量占总空间（减速器内部空间和安装侧空间）的90%左右。润滑脂注入量不宜过多，否则会导致油压过高，损坏油封。

The ■ area in the figure is the grease injection position corresponding to the quantity in above table, other space(the space of the shaft and motor mounting side) also need to be injected with the grease and the grease injection position is the ■ area in the figure. Please inject enough grease and ensure that the total quantity of grease accounts for about 90% of the total space(the sum of the internal space of the reducer and the space of mounting side). Do not inject too much, otherwise the reducer internal oil pressure will be too high and even damage the oil seal.

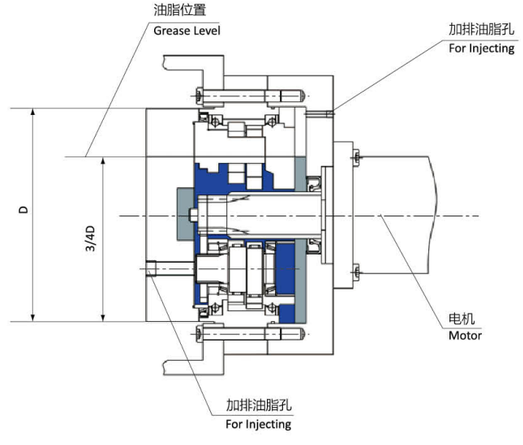
BXJ-E 系列



安装垂直轴 1
Vertical installation 1

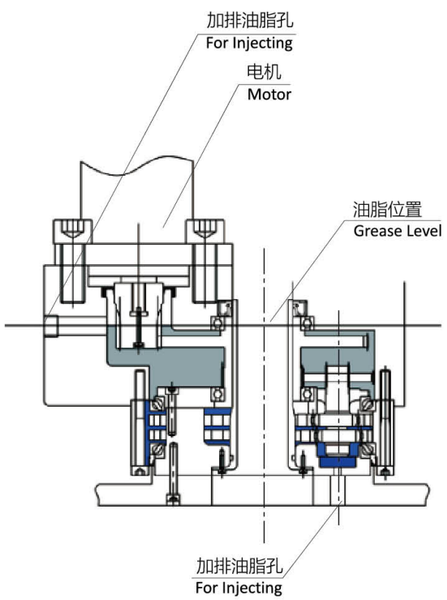


安装垂直轴 2
Vertical installation 2

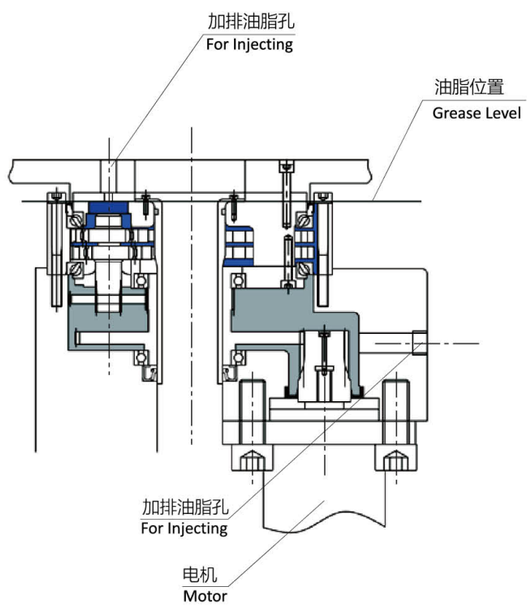


安装水平轴
Horizontal installation

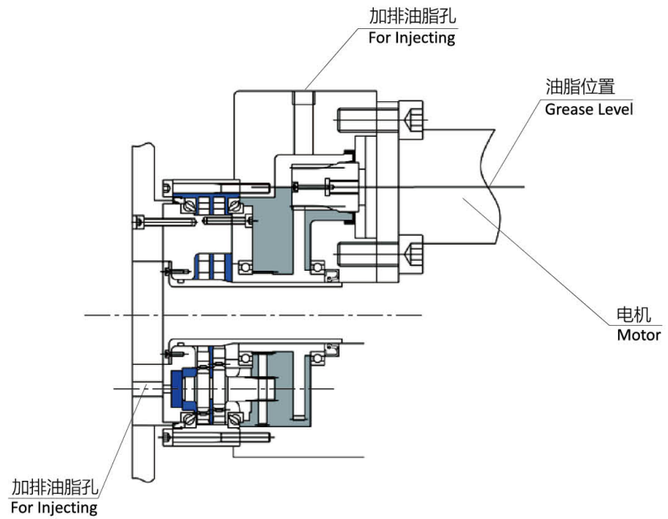
BXJ-C 系列



安装垂直轴 1
Vertical installation 1



安装垂直轴 2
Vertical installation 2



安装水平轴
Horizontal installation

5–4–3 润滑脂更换时间
Interval between grease changes

在减速器正常运转情况下，根据润滑脂的老化情况，标准更换时间为20,000小时。若减速器在运行时表面温度达到40℃以上或润滑脂污损，请及时检查润滑剂的老化、受污染情况，并进行更换。

In normal conditions, the grease can be used for 20,000 hours in consideration of the lifetime of grease. If the surface temperature of the reducer is above 40℃ or the grease is contaminated during operation, please check and replace it in time.

5–4–4 磨合运转
Running-in operation

在注入推荐润滑脂后建议进行磨合运转，根据润滑脂特性，在运转时可能会发生异响和转矩不均等现象，如果这些症状在实施磨合运转30分钟以上后消失（减速器表面温度低于50℃），则没有质量问题。

Please run in after sealing the recommended grease. According to the grease characteristics, abnormal sound and uneven torque maybe occur during operation. If these symptoms disappear after 30 minutes (the surface temperature of the reducer is less than 50℃), the reducer should be qualified.

M E M O

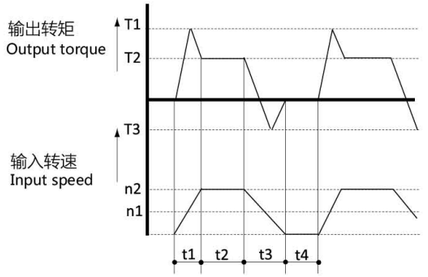
M E M O

M E M O

Ordering parameters confirm

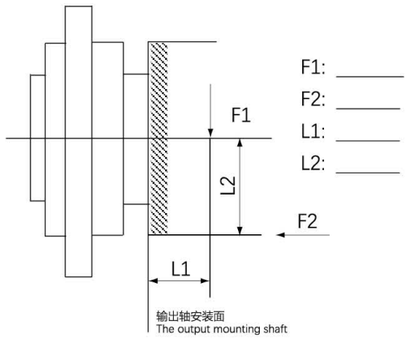
订购减速器相关技术参数确认表

1.使用行业 Application area: □工业机器人 Industrial robot
□机床 Machine tools □机械设备 Mechanical equipment □AGV
□RGV □液压与气动 Fluid drive □工程机械 Project machine
□其他 others
设备名称 Device name: _____
应用场合 Applications: _____
2.选用型号 Choose model: _____
3.负载条件 Conditions of load: _____



	启动 Start	稳定 Stable	停止 Stop	间歇 Interval
负载转矩(Nm) Load torque(Nm)	T1:___	T2:___	T3:___	
转速(r/min) Speed(r/min)	n1:___	n2:___	n3:___	
时间(sec) Time(sec)	t1:___	t2:___	t3:___	t4:___

4.外部负载 External load conditions



5.使用环境 Temperature: 环境温度 Environment temperature _____℃
6.安装方式 Installation: □水平安装 Horizontal
□垂直安装（电机在上）Vertical（upper motor）
□垂直安装（电机在下）Vertical（lower motor）

安装图
Illustration for installation：

7.输入轴 Input gear: □标准 Standard；
□非标 Non-standard
(长度 length:_____；直径 diameter:_____)

输入轴要求尺寸图
Required dimension of input gear：

8.驱动参数 Driving portion
功率 Capacity:_____kw；转速 Speed:_____r/min；
额定转矩 Rated torque:_____Nm；
□伺服电机 Servo motor
□直流伺服电机 DC Servo motor

电机轴尺寸图
The motor shaft：