

FCS系列减速器性能参数
THE PERFORMANCE PARAMETER OF FCS SERIES REDUCER

项目 Item	减速比 Reduction ratio	输入 2000r/min 时的额定 转矩 rated torque under 2000r/min input	起动、停止 时的容许 最大转矩 the biggest admissible- torque when start and stop	平均负载 矩的容许 最大值 the admissible maximum value of average load torque	瞬间容许 最大转矩 the instant admissible maximum torque	容许最高 输入转速 the admissible highest input rev	容许平均 输入转速 the admissible average input rev	启动转矩 Starting torque	背隙 back lash	重量 weight	设计寿命 design lifespan
型号 Model		Nm	Nm	Nm	Nm	rpm	rpm	cNm	Arc sec	Kg	Hour
14	50	5.3	17.6	6.7	34	8500	3500	4.3	≤20	0.52	10000
	80	7.6	22.5	10.8	46			2.9	≤20		15000
	100	7.6	27.4	10.8	53			2.6	≤20		15000
17	50	15.7	33	25.5	68	7200	3500	6.4	≤20	0.68	10000
	80	21.6	42	26.5	85			4.2	≤20		15000
	100	23.5	53	38	106			3.6	≤20		15000
	120	23.5	53	38	84			3.3	≤20		15000
20	50	24.5	55	33	96	6500	3500	8.2	≤20	0.98	10000
	80	33.5	72.5	46	124			5.1	≤20		15000
	100	39	80	48	144			4.5	≤20		15000
	120	39	85	48	144			4.0	≤20		15000
25	50	38	96	53	182	5500	3500	15.8	≤20	1.5	10000
	80	62	134	85	250			9.7	≤20		15000
	100	65	154	105	278			8.4	≤20		15000
	120	65	164	105	298			7.7	≤20		15000
32	50	73	212	106	374	4800	3500	33	≤20	3.2	10000
	80	116	298	164	567			20	≤20		15000
	100	134	326	212	634			19	≤20		15000
	120	134	346	212	672			16	≤20		15000



FCS-A-S

杯型分体凸轮组件(不含交叉轴承)

CUP-TYPE SPLIT CAM ASSEMBLY (WITHOUT CROSS BEARING)

由三大基本部件构成,包括柔轮、刚轮、波发生器。柔轮为杯型标准结构,输入轴直接与波发生器内孔配合,通过平键或紧定螺钉连接。

It consists of three basic components, including a flexible wheel, a rigid wheel, and a wave generator. The flexible wheel is a cup-type standard structure, and the input shaft is directly matched with the inner hole of the wave generator, and is connected by a flat key or a set screw. Comes with high precision, high rigidity cross bearing.

FCS-C-S

杯型分体凸轮组件(不含交叉轴承)

CUP-TYPE SPLIT CAM ASSEMBLY (WITHOUT CROSS BEARING)

由三大基本部件构成,包括柔轮、刚轮、波发生器。柔轮为杯型标准结构,输入轴直接与波发生器内孔配合,通过平键或紧定螺钉连接。

It consists of three basic components, including a flexible wheel, a rigid wheel, and a wave generator. The flexible wheel is a cup-type standard structure, and the input shaft is directly matched with the inner hole of the wave generator, and is connected by a flat key or a set screw. Comes with high precision, high rigidity cross bearing.

产品特点/Product characteristics

- 杯型标准结构,三大基本部件构成;
- 紧凑简洁的设计;
- 无齿隙;
- 输入输出同轴,输入轴直接与波发生器内孔配合,通过平键或紧定螺钉连接;
- 优良的定位精度和旋转精度。

- Cup type standard structure, three basic components,
- Compact and simple design,
- No backlash,
- The input and output are coaxial, and the input shaft is directly matched with the inner hole of the wave generator, and is connected by a flat key or a set screw,
- Excellent positioning accuracy and rotation accuracy.

产品特点/Product characteristics

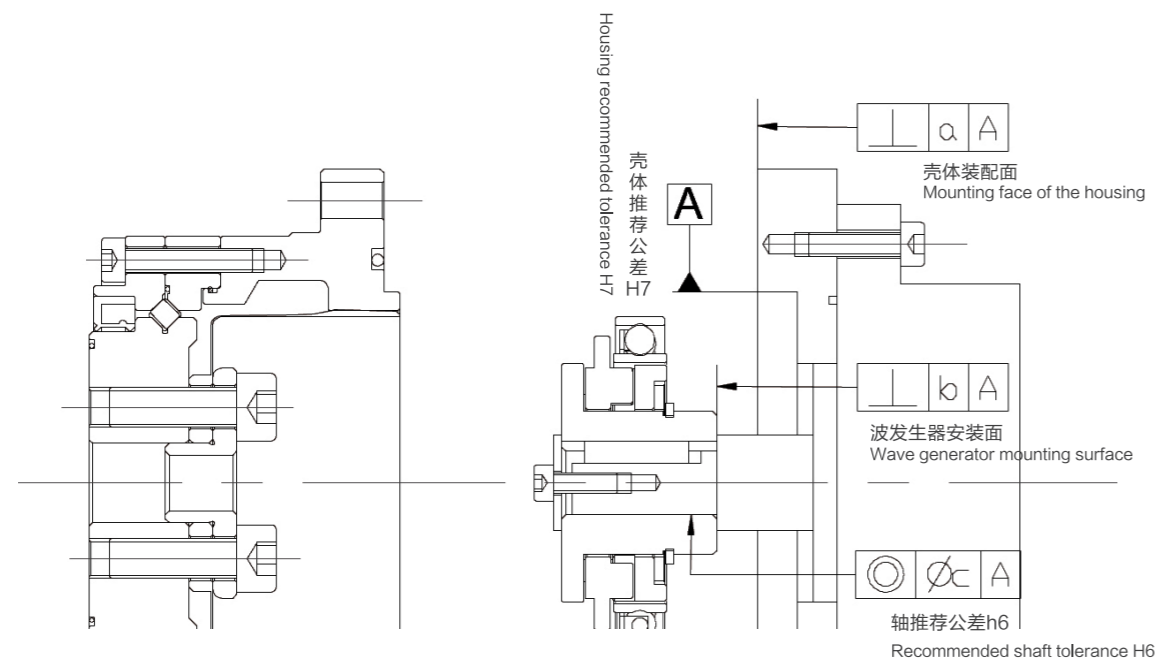
- 杯型标准结构;
- 紧凑简洁的设计;
- 无齿隙;
- 输入输出同轴,自带交叉滚子轴承;
- 优良的定位精度和旋转精度。

- Cup-shaped standard structure
- Compact and simple design
- No backlash
- Input and output coaxial, self-contained cross roller bearing
- Excellent positioning accuracy and rotation accuracy

装配精度 ASSEMBLY ACCURACY REQUIREMENTS

装配产品时, 如果存在安装面变形等异常和勉强组装, 会降低产品性能甚至损坏。如下图所示, 以下表格为组装壳体的推荐精度。

When the assembled product, if there is an abnormality such as deformation of the mounting surface and barely assembly, will reduce the performance or even damaged. As shown in the figure below, the following table shows the recommended accuracy of the assembled housing.



尺寸/ Size	14	17	20	25	32
a	0.011	0.015	0.017	0.024	0.026
b	0.017	0.020	0.020	0.024	0.024
	(0.008)	(0.010)	(0.010)	(0.012)	(0.012)
c	0.030	0.034	0.044	0.047	0.047
	(0.016)	(0.018)	(0.019)	(0.022)	(0.022)

()内的数值为一体式波发生器时的数值

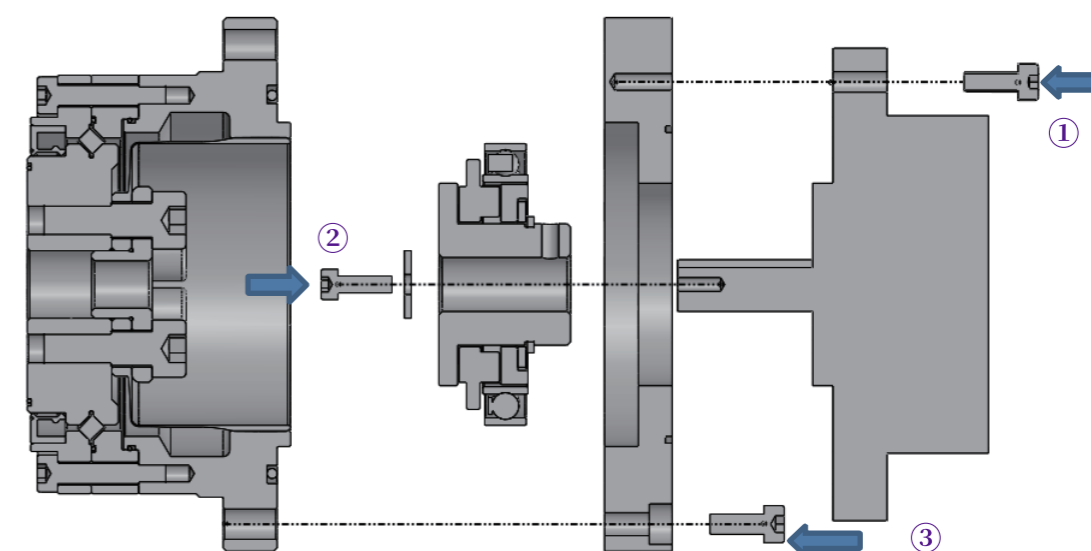
The value in () is the value of the monolithic wave generator.

安装方式及步骤 INSTALLATION METHOD AND STEPS

在将电动机安装至减速机上时, 必须使用电动机安装用法来实施安装。安装方式及步骤如下: (刚轮固定、柔轮输出, 减速比为标示减速比)

When installing the motor on the gear unit, the motor installation usage must be used to implement the installation. Installation method and steps are as follows: (The Circular spline is fixed, the Flexspline is output, and the reduction ratio is the indicated reduction ratio.)

安装方式-1
Installation method-1:

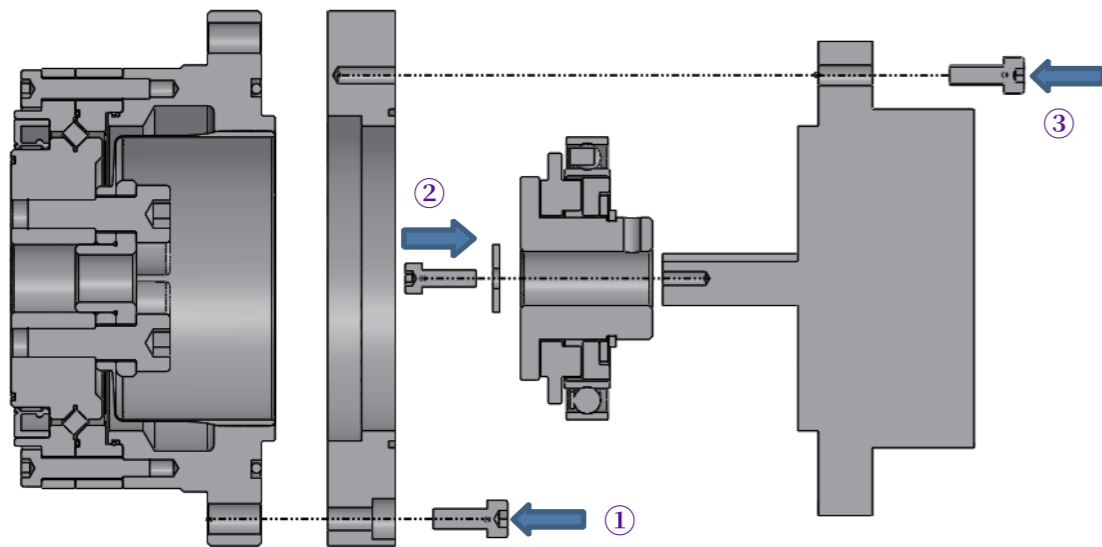


- ① 在电动机安装面上安装电机安装用法兰
- ② 将波发生器安装到电机输出轴上
- ③ 安装减速机主机
- ④ 将电机转速设定在100r/min左右, 启动电机, 螺钉以十字交叉的方式锁紧, 以四至五次均等递增至螺钉对应的锁紧力。所有连接固定的螺钉需为12.9级并需涂上乐泰242螺纹胶, 以防止螺钉失效或工作中松脱。

- ① Mounting the flange for motor mounting on the motor mounting surface
- ② Install the wave generator on the motor output shaft
- ③ Install the harmonic reducer body
- ④ Set the motor speed to about 100r/min, start the motor, and the screws are locked in a crisscross manner, and increase the locking force corresponding to the screw by four to five times. All screws with fixed connections must be grade 12.9 and need to be coated with Loctite 242 thread glue to prevent screw failure or loose work.

安装方式-2

Installation method-2:



① 将安装用法兰安装至减速机主机

② 将波发生器安装到电机输出轴上

③ 在电动机安装面上安装电机安装用法兰

④ 将电机转速设定在100r/min左右,启动电机,螺钉以十字交叉的方式锁紧,以四至五次均等递增至螺钉对应的锁紧力。所有连接固定的螺钉需为12.9级并需涂上乐泰242螺纹胶,以防止螺钉失效或工作中松脱。

注:波发生器朝上或朝下使用时,请用润滑脂填满波发生器和电机安装用法兰之间的间隙。

① Install the mounting flange to the reducer main unit

② Install the wave generator on the motor output shaft

③ Mounting the flange for motor mounting on the motor mounting surface

④ Set the motor speed to about 100r/min, start the motor, and the screws are locked in a crisscross manner, and increase the locking force corresponding to the screw by four to five times. All screws with fixed connections must be grade 12.9 and need to be coated with Loctite 242 thread glue to prevent screw failure or loose work.

Note: When using the wave generator up or down, fill the gap between the wave generator and the motor mounting flange with grease.

安装注意事项 INSTALLATION PRECAUTIONS

由于组装时的错误,减速器在运转时可能发生振动、异响等。请遵守下述注意事项实施组装。

Due to an error in assembly, the reducer may vibrate, abnormally sound, etc. during operation. Please follow the precautions below to implement the assembly.

波发生器的注意事项

Precautions for wave generator:

1. 请在组装时避免向波发生器轴承部位施加过大的力。可通过旋转使波发生器顺畅地实施插入。
2. 使用一体式波发生器时,请注意把中心偏移、歪斜的影响控制在推荐值内。

1. Please avoid applying excessive force to the bearing part of the wave generator during assembly. The wave generator can be smoothly inserted by rotation.
2. When using the integrated wave generator, be careful to control the influence of the center offset and skew within the recommended values.

刚轮、柔轮的注意事项

Precautions for Circular spline and Flexspline:

1. 确认安装面的平坦度是否良好、是否歪斜
2. 确认螺丝孔部是否隆起、有残余毛边或异物啮入。
3. 确认是否对壳体组装部实施了倒角加工以及避让加工,以避免与刚轮干涉。

1. Confirm that the flatness of the mounting surface is good, skewed or not
2. Check if the screw hole is raised, has residual burrs or foreign objects.
3. Confirm whether chamfering and avoidance machining are performed on the housing assembly to avoid interference with the rigid wheel.

润滑脂的注意事项

Precautions for Grease:

1. 柔性轴承上需要均匀涂抹润滑脂,电机与安装用法兰连接形成的腔体需注入80%润滑脂。
2. 柔轮内壁上需均匀涂抹一层润滑脂,柔轮与法兰连接形成的腔体需注入80%的润滑脂。
3. 润滑脂的性能会随温度产生变化,温度越高劣化越快。为了保证润滑脂始终处于良好状态,减速器高温段的热平衡温度应低于70°C,温升小于40°C。
4. 减速器各运动部位的磨损主要受到润滑脂性能的影响,在具备条件的情况下,谐波减速器每运行3000小时应更换润滑脂。

1. The grease should be evenly coated on the flexible bearing. The cavity formed by connecting the motor to the mounting flange should be filled with 80% grease.
2. Apply a layer of grease evenly on the inner wall of the flexible wheel. 80% of the grease should be injected into the cavity formed by the flexible wheel and the flange.
3. The performance of the grease changes with temperature, and the higher the temperature, the faster the deterioration. In order to ensure that the grease is always in good condition, the heat balance temperature of the high temperature section of the reducer should be lower than 70 °C, and the temperature rise should be less than 40 °C.
4. The wear of each moving part of the reducer is mainly affected by the performance of the grease. Under the condition of the condition, the harmonic reducer should be replaced every 3,000 hours of operation.

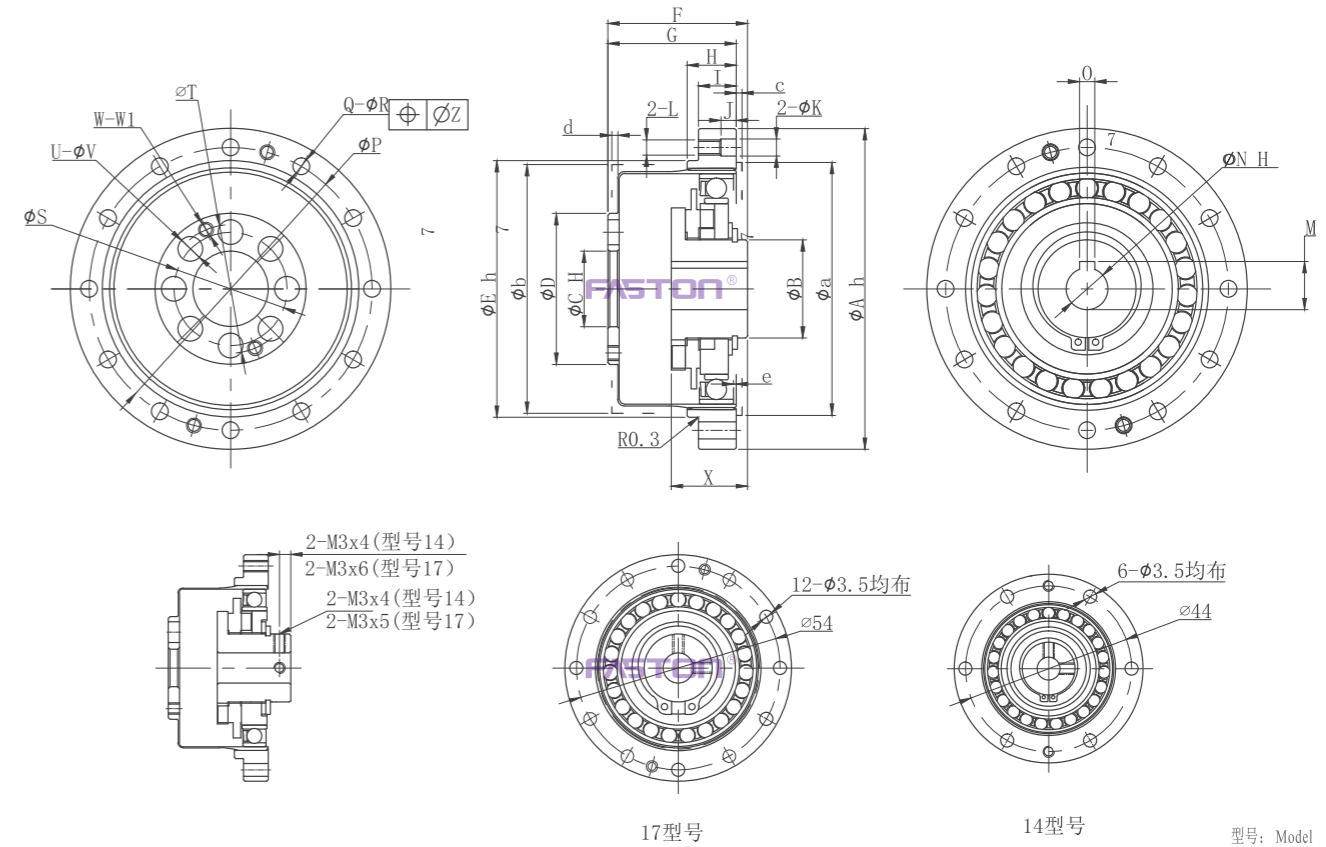
安装注意事项 INSTALLATION PRECAUTIONS

其他注意事项
Other considerations

1. 谐波减速器必须在足够清洁的环境下安装, 安装过程不能有任何异物进入减速器内部, 以免使用过程中造成损坏。
2. 请确认减速器齿面及柔性轴承部分始终保持充分润滑。不建议齿面始终朝上使用, 会影响润滑效果。
3. 组装时, 需先将刚轮和柔轮组合安装到装置上后, 再组装上波发生器。
4. 装机时, 波发生器长轴对准减速器柔轮的长轴方向, 到位后用对应的螺钉将减速器固定, 螺钉稍微带紧。
5. 安装波发生器后, 请确认柔轮与刚轮啮合是180°对称。
6. 安装完成后请先低速(100rpm)运行, 如有异常振动或异常响声, 请立即停止, 重新检查安装是否正确或与我司联系, 以免因安装不正确造成减速器的损坏。
7. 与减速器连接固定的安装平面加工要求: 平面度0.01mm, 与轴线垂直度0.01mm, 螺纹孔或通孔与轴线同心度0.1mm。
8. 为防止润滑油泄露, 以及维持减速机的耐久性, 必须针对不同的位置使用相应的密封机构, 例如: 旋转运动处使用油封、各零件配合面使用O型圈、螺孔使用螺丝胶。
9. 请严格按照图纸中减速器的避让尺寸来确定法兰和波发生器的设计尺寸, 如果超过避让尺寸, 会造成柔轮和法兰或者波发生器干涉, 影响减速器的使用寿命。
10. 请按照波发生器的安装深度要求设计减速器的安装, 减速器安装深度不同会影响到减速器的启动转矩和精度等参数。
11. 减速器表面没有实施防锈处理。需要实施防锈时请向表面涂抹防锈剂。

1. The harmonic reducer must be installed in a sufficiently clean environment. During the installation process, no foreign matter can enter the inside of the reducer to avoid damage during use.
2. Please confirm that the gear face and flexible bearing parts of the reducer are always fully lubricated. It is not recommended that the tooth surface be always facing up, which will affect the lubrication effect.
3. When assembling, the circular spline and the flexspline must be assembled on the device before assembling the upper wave generator.
4. When installing the machine, the long axis of the wave generator is aligned with the long axis direction of the reducer. When it is in place, fix the reducer with the corresponding screw and tighten the screw slightly.
5. After installing the wave generator, make sure that the flex wheel and the rigid wheel are 180° symmetrical.
6. Please run at low speed (100 rpm) after installation. If there is abnormal vibration or abnormal noise, please stop immediately, re-check whether the installa
7. Mounting plane machining requirements fixed with the reducer: flatness 0.01mm, perpendicular to the axis 0.01mm, threaded hole or through hole and axis concentricity 0.1mm.
8. In order to prevent grease leakage and maintain the durability of the reducer, the corresponding sealing mechanism must be used for different positions. For example, the oil seal is used for the rotary motion, the O-ring is used for the mating surface of each part, and the screw rubber is used for the screw hole.
9. Please strictly follow the dimensions of the reducer in the drawing to determine the design dimensions of the flange and wave generator. If it exceeds the size of the avoidance, it will cause interference between the flexible wheel and the flange or wave generator, affecting the service life of the reducer.
10. Please design the reducer according to the installation depth requirement of the wave generator. The installation depth of the reducer will affect the starting torque and accuracy of the reducer.
11. The surface of the reducer is not rust-proof. When rust prevention is required, apply a rust inhibitor to the surface.

减速机性能资料 REDUCER PERFORMANCE DATA

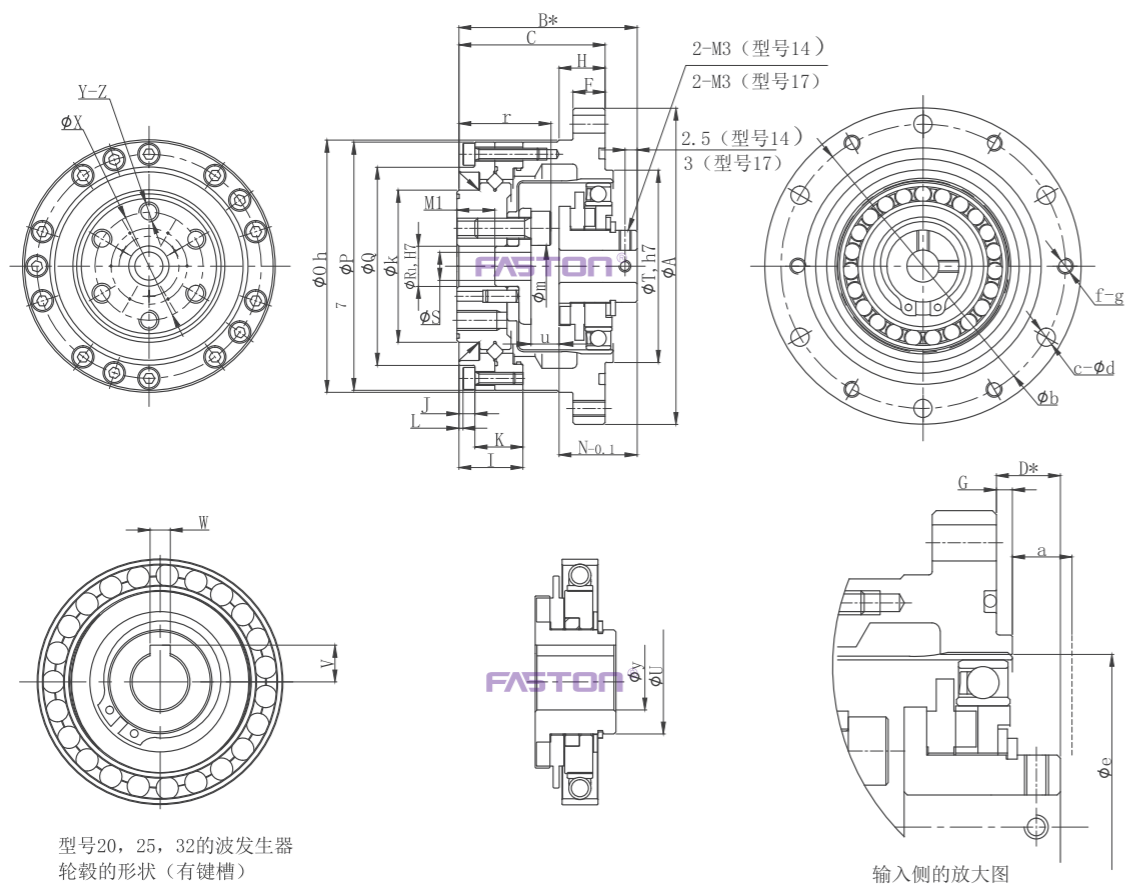


注: 1. e尺寸是波发生器和机体连接的位置尺寸和容许值, 波发生器位置安装不当会导致减速器运转寿命减短和精度降低等问题。
2. 为了避免减速器与配合的壳体发生干涉, 需要考虑小于a, b, c, d尺寸, 大于F的壳体尺寸。
3. 如有不清楚的尺寸公差, 请咨询我司技术。详情请以交货图纸为准。

Remark:
1. Dimension e is the location and admissible value between wave generator and body connection. The assemble location of the wave generator will not shorten the lifespan of the reducer and lower the precision.
2. In order to avoid the interference of the reducer and the coordinated shell, you should consider the dimension smaller than a, b, c, d and larger than the F shell.
3. If there is anything unclear about the dimension tolerance please contact our engineer. The details are subject to drawing of delivery.

FCS-A-S尺寸表 (Dimension form of FCS-A-S) Unit/单位: mm

Model	14	17	20	25	32
Dimension					
ΦAh7	50	60	70	85	110
ΦB _{0.1}	14	18	21	26	26
ΦCH7	11	10	16	20	26
ΦD	23	27.2	32	40	52
ΦEH7	38	48	54	67	90
F	28.8 ^{0.08}	32.5 ^{0.09}	33.5 ^{0.1}	37 ^{0.1}	44 ^{0.1}
G	23.5	26.5	29	34	42
H	8	9	10.5	13	17
I	6	6.5	7.5	10	14
J	6	6.5	3.5	4	7
ΦK	-	-	3.5	4.5	5.5
L	M3	M3	M3	M4	M5
M	-	-	10.4 ^{0.10}	12.8 ^{0.10}	16.3 ^{0.10}
ΦNH7	6	8	9	11	14
OJs8	-	-	3	4	5
ΦP	44	54	62	75	100
Q	6	12	12	12	12
ΦR	3.5	3.5	3.5	4.5	5.5
Z	0.25	0.25	0.25	0.25	0.25
ΦS	17	19	24	30	40
U	6	6	8	8	8
ΦV	4.5	5.5	5.5	6.6	9
ΦT	18.5	21.5	27	34	45
W	2	2	2	2	2
WI	M3	M3	M3	M4	M5
X _{0.1}	17.6	19.5	20.1	20.2	22
Φa	38	45	53	66	86
Φb	38	45	53	66	86
c	1	1	1.5	1.5	1.5
d	2.4	3	3	3	3.2
e	0.4	0.3	0.4	2.1	2.5
Weight/kg	0.1	0.18	0.26	0.43	0.9



型号20, 25, 32的波发生器
轮毂的形状 (有键槽)

输入侧的放大图

FCS-C-S



注:1. 螺栓的啮齿深度在螺纹孔深度范围内, 超出可能会干涉到减速机内部零件, 导致破损。

2. *、d、u、尺寸是波发生器和机壳连接的位置尺寸和容许值, 波发生器位置安装不当会导致减速机运转寿命减短和精度降低等问题。

3. 如有不清楚的尺寸公差, 请咨询我司技术。详情请以交货图纸为准。

Remark:

1. The mesh depth of bolt should be within the depth range of threaded hole, excess may interfere the inner component of the reducer, which may cause damage.

2. d、u dimension is the location and admissible value between wave generator and body connection. The assemble location of the wave generator will not shorten the lifespan of the reducer and lower the precision.

3. If there is anything unclear about the dimension tolerance, please contact our engineer. The details are subject to drawing of delivery.

FCS-C-S尺寸表 (Dimension form of FCS-C-S)

Unit/单位: mm

Model Dimension	14	17	20	25	32
ΦA	73	79	93	107	138
B*	41 ^{0.0} _{0.0}	45 ^{0.0} _{0.0}	45.5 ^{0.0} _{0.0}	52 ^{0.0} _{0.0}	62 ^{0.0} _{0.1}
C	34	37	38	46	57
D*	7 ^{0.0} _{0.8}	8 ^{0.0} _{0.8}	7.5 ^{0.0} _{0.0}	6 ^{0.0} _{0.0}	5 ^{0.0} _{0.1}
F	7	8	10	10	12
G	2	2	3	3	3
H	3.5	4	5	5	5
I	16.5	16.5	16.5	18.5	22.5
J	4.5	4.5	4	4.5	5.5
K	12	12	12.5	14	17
L	0.5	0.5	0.5	0.5	1
MI	9.4	9.5	9	12	15
N ^{0.1}	17.6	19.5	20.1	20.2	22
ΦO,h7	56	63	72	86	113
ΦP	56	62	70	85	112
ΦQ	42.5	49.5	58	73	96
ΦR1,H7	11	10	14	20	26
ΦS	8	7	10	15	20
ΦT,h7	38	48	56	67(68)	90
ΦU,h7	6	8	12	14	14
V	-	-	13.8 ^{0.1} ₀	16.3 ^{0.1} ₀	16.3 ^{0.1} ₀
W	-	-	4	5	5
ΦX	23	27	32	42	55
Y	6	6	8	8	8
Z	M4X8	M5X10	M6X9	M8X12	M10X15
a	1	1	1.5	1.5	1.5
Φb	65	71	82	96	125
Φc	6	6	6	8	12
Φd	4.5	4.5	5.5	5.5	6.6
Φe	38	45	53	66	86
f	6	6	6	8	12
g	M4	M4	M5	M5	M6
r	21.4	23.5	23	29	37
Φk	31	38	45	58	78
Φm	10	10.5	15.5	20	27
Φy	14	18	21	26	26
u	6	7	7.4	8.8	11
Weight/kg	0.25	0.68	0.98	1.5	3.2