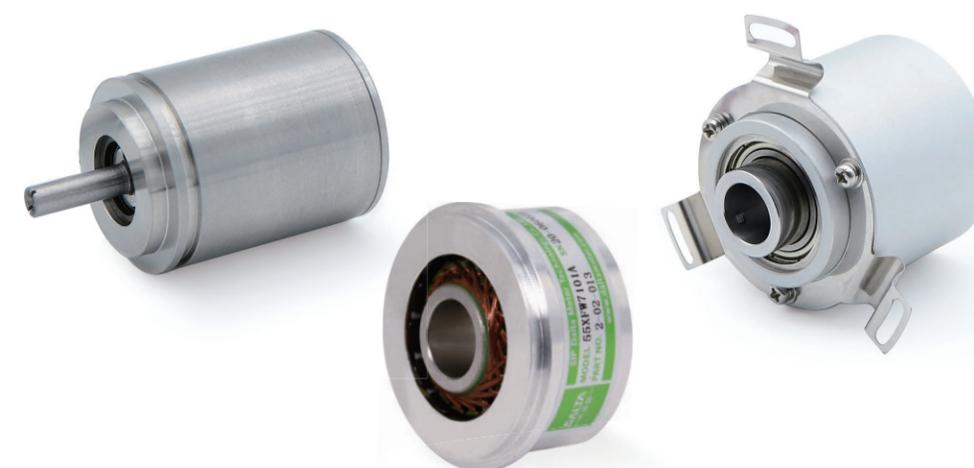# 无刷旋转变压器
BRUSHLESS RESOLVER

耐振动、耐冲击、高可靠性、高转速.......

苏州工业园区代尔塔电机技术有限公司

研制的无刷旋转变压器涵盖了工业伺服、军用航天伺服等领

域的应用，是集产学研一体的旋转变压器制造企业

苏州工业园区代尔塔电机技术有限公司
Suzhou Industrial Park Dalta Motor Technology Co.,Ltd.

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苏州工业园区代尔塔电机技术有限公司
Suzhou Industrial Park Dalta Motor Technology Co.,Ltd.
中国运载火箭技术研究院第十八研究所 联合研制

公司简介 COMPANY PROFILE

苏州工业园区代尔塔电机技术有限公司
Suzhou Industrial Park Daito Motor Technology Co.,Ltd

苏州工业园区代尔塔电机技术有限公司，总部设在苏州工业园区，是产学研产品专业制造企业。

公司致力于不断完善和发展磁阻式旋转变压器、无刷旋转变压器、多极／双通道旋转变压器、差动式RVDT角位移等产品。经过多年努力，企业规模不断扩大，产品日益多元化，技术开发能力持续增强。

目前我司研制的无刷旋转变压器涵盖了工业伺服、军用航天伺服等领域应用，从20机座号到90机座号实现全机械化批量生产，并同中国运载火箭研究院第十八研究所形成联合研制模式，按照航天伺服的可靠度要求，具备完善的研制流程。

Suzhou Industrial Park Datta Motor Technology Co.,Ltd headquartered in Suzhou Industrial Park, is a profesional manufacturer of resolver products integrating industry, University and research.

The company is committed to continuously improving and developing reluctance resolver, brushless resolver, multi pole/ dual channel resolver, differential rvdt angular displacement and other products. After years of efforts, the scale of the enterprise has been continuously expanded, the products have been increasingly diversified, and the technology development ability has been continuously enhanced.

At present, the brush less resolver developed by our company covers industrial servo, military aerospace servo and other applications. It realizes full mechanized mass production from frame No. 20 to frame No. 90, and forms a joint development mode with the 18th Research Institute of China launch vehicle research institute. It has a perfect development process according to the reliability requirements of aerospace service.

中国运载火箭技术研究院第十八研究所
The 18th Research Institute of China Academy of Launch Vehicle Technology
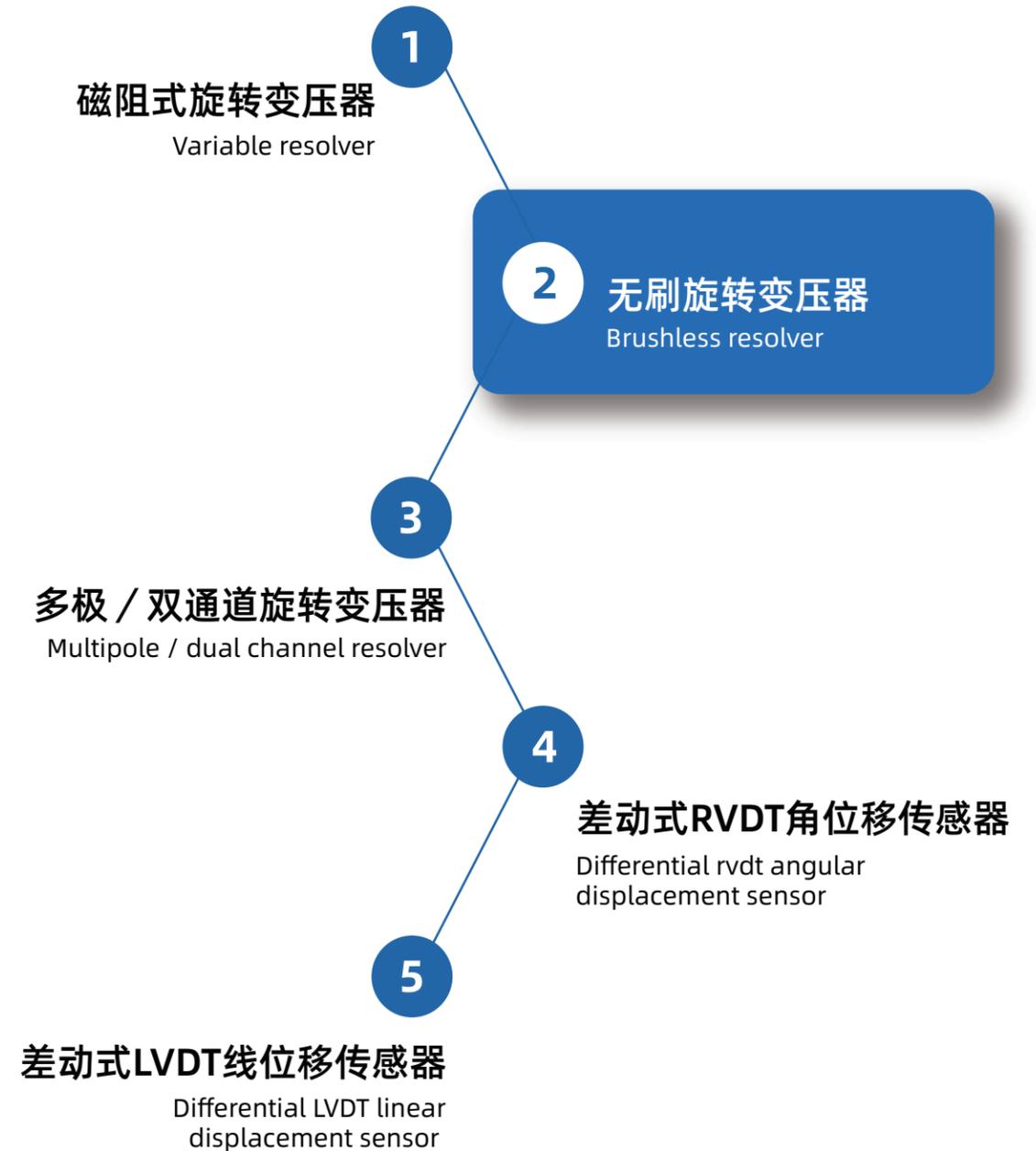
中国运载火箭技术研究院第十八研究所（北京航天伺服技术研究所），是航天系统一家具有独立法人资质的伺服技术专业研究所，隶属千中国的运载火箭及载入航天飞行器研究、设计、生产基地一中国运载火箭技术研究院，是精密机电控制设备的专业研制单位，是中国航天伺服专业技术中心。

The 18th Research Institute of China Academy of Launch Vehicle Technology (Beijing Aerospace Servo Technology Research Institute) is a professional research institute of servo technology with independent legal personality of aerospace system. It is subordinate to China Academy of launch vehicle technology, China's research, design and production base of launch vehicles and space vehicles. It is a professional research and development unit of precision electromechanical control equipment, It is China Aerospace Servo Professional Technology Center.

现有产品
Existing products

1 磁阻式旋转变压器
Variable resolver

2 无刷旋转变压器
Brushless resolver

3 多极／双通道旋转变压器
Multipole / dual channel resolver

4 差动式RVDT角位移传感器
Differential rvdt angular displacement sensor

5 差动式LVDT线位移传感器
Differential LVDT linear displacement sensor

耐环境性能优异的旋转角度传感器
Brushless resolver is highly reliable rotary measurement sensor.

产品特点
Features

1/
广泛的使用温度范围
Wide Temperature Range

2/
耐振动、耐冲击
Vibration & Shock Resistance

3/
高可靠性
High Reliability

使用温度范围 -55 ~ +155℃（※）

- 耐高温
  高温环境可以使用。

- 耐低温性
  可用于航空航天和宇航环境。

※ 适用于分装式

※ 可定制超高温版,耐辐射版

强大的环境适应能力

- 耐振动
  196m / s²{20g} 10 ~ 500HZ, 3轴各2h

- 耐冲击
  981m / s²{100g} 6ms, 6个轴各3次
  共18次

- 没有使用电子部件与光学部件,也没有电刷

- 免维护

Temperature Range -55～+155℃（※）

- **High Temperature Resistance**
  Can be used in high temperature environment such as welding robots and injection molding machines.

- **Low Temperature Resistance**
  Available in aircrafts and space.

※ Built-in type only

Superior environment resistance

- **Vibration:**
  196m/s3{20G} at 10 ~ 500Hz,- for 2 hours to each of three axes.

- **Shock:**
  981m/s2 {100G} for 6ms, 3 times to eachof 6 axes, 18 times in total.

- Does not use electrical parts, optical parts.

- Maintenance-free for its brush-less feature.

耐环境性能优异的旋转角度传感器
Brushless resolver is highly reliable rotary measurement sensor.

一、高转速

High Speed Rotation

- 分装式
  分装式为：6000～40,000min⁻¹

- Allowable rotational speed for built-in type is 6,000~40,000min⁻¹.

二、远距离传输
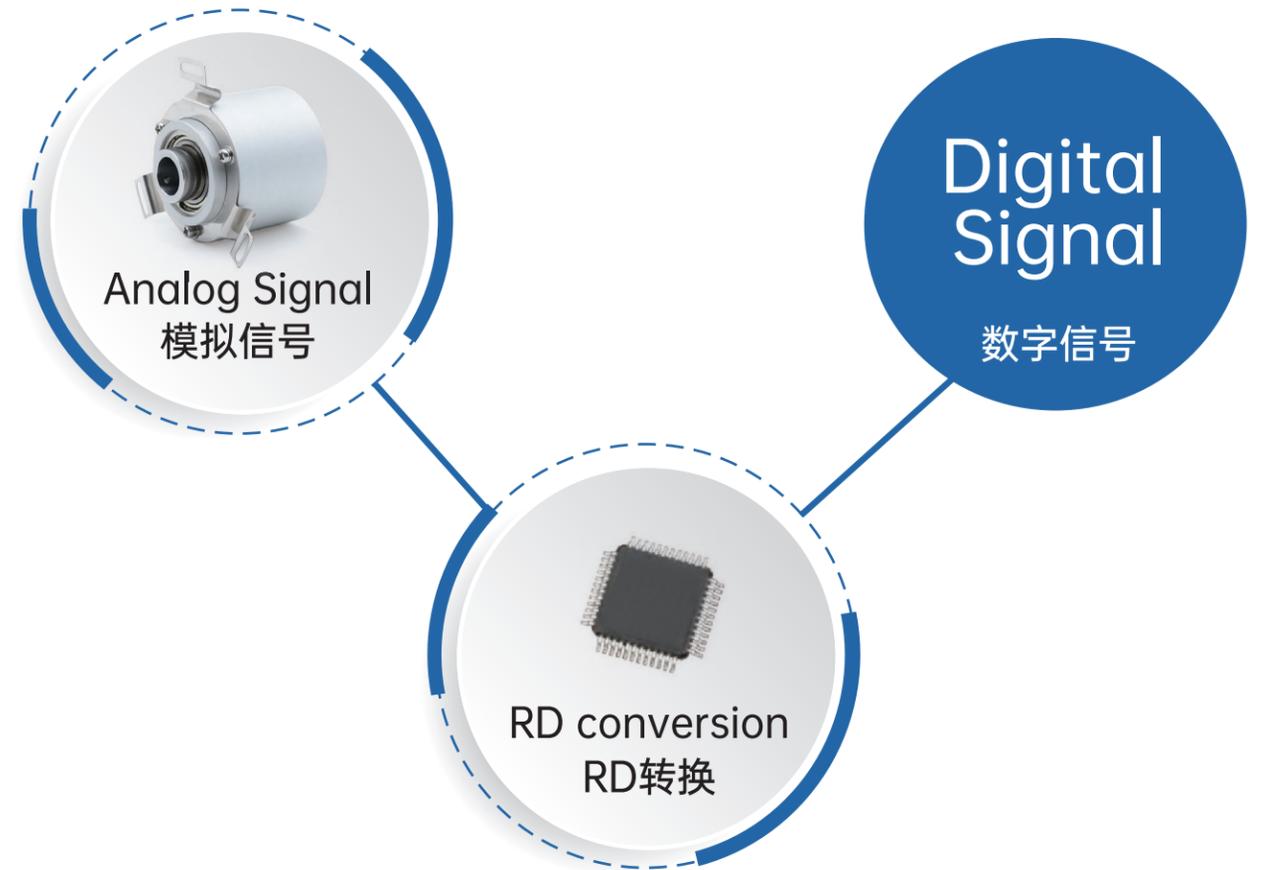
Long-distance Transmission

- 由于抗噪声能力强，可长距离传输。

- Resistant to noise and long distance transmission is possible.

三、体积小、重量轻

Small & Light Weight

- 可缩短嵌入尺寸，[φ15mm尺寸~]

- Built-in type can minimize the built-in dimension. [Size Φ15mm~]

系统结构 System configuration

Analog Signal
模拟信号

RD conversion
RD转换

Digital
Signal
数字信号

应用实例
Features

在恶劣环境中使用的机器人和各种设备正变得越来越自动化和无人操作。无刷旋变具有耐振动、耐冲击、广泛的使用温度范围的特点，因此伺服马达等旋转体的角度传感器用途在扩大。

Robots and various devices used in severe environments are becoming more automated and unmanned. Resolver application is expanding as an angle sensor for rotating bodies such as servo motors for its vibration resistance, impact resistance, and a wide range of operating temperature range features.

一、焊接机器人关节驱动电机用旋转传感器
Rotary sensor for joint motor of welding

焊接机器人被用在有粉尘、高温、电噪声等严酷环境中。而旋变器是一种耐这种条件的传感器。

Welding robots are installed in harsh environments such as dust (welding fumes), high temperature, noise due to discharge, etc. However, the resolver isa sensor that is resistant to such conditions

二、自动打螺母机
Nut runner(nut automatic fastening machine)

对于采用伺服电机的螺母锁紧，拧紧力矩可以均匀化。该旋变器有一个Φ15的型号，并将有助于该设备的小型化。

For nut runners using servomotors, tightening torque can be homogenized. The resolver has a lineup from Φ15mm and will also contibute to miniaturization of the device.

三、注塑机电机旋转传感器
Motor rotation sensor of injection molding machine

注塑机采用伺服电机进行开模、合模、注射和成型等机构，可提高响应性 和稳定性。而由于设备的高温和振动，旋变器是角度传感器而不是光学传感器的最佳选择。

Injection molding machines are expected to improve responsive ness and stability by using servo motors for opening and closing molds, mold clamping, injection and plasticization mechanisms. However, due to the high temperature and vibration of the equipment, resolvers are best for angle sensors rather than optical

四、织布机的输出、缠绕用旋转传感器
Rotation sensor for feed and take-up of weaving machine

在织布机中，旋转变压器可作为进给电机和卷取电机旋转传感器。它可以跟随高速旋转

For weaving machines, resolvers can be used as rotation sensors for the feed motor and take-up motor. It can follow high speed rotation, it is strong against vibrations and dust, and it is a maintenance free sensor for its brush less feature.

参数表
Lineup

模型 Model	尺寸 Size							页数 Page
	06	08	10	15	21	30	36	
分装式 Built-in Type	●	●	●	●	●	●	●	P13-20
允许最大工作转数 Max operating speed[min-1{rpm}]	40,000	40,000	30,000	20,000	10,000	6,000	6,000	
轴伸式 Shaft Type	–	–	●	●	●	–	–	P21-23
允许最大工作转数 Max operating speed[min-1{rpm}]	–	–	6,000	6,000	6,000	–	–	
中空轴 Hollow shaft	–	–	●	●	●	–	–	P24
允许最大工作转数 Max operating speed[min-1{rpm}]	–	–	6,000	6,000	6,000	–	–	

关于多极旋变　About multipolarization

无刷旋变的标准系列是1对极（1X），但是增加极对数的多极高精度型的也可以生产。关于极对数2X以上的规格等详细内容，请咨询。

The standard lineup of Resolver is a multiplicationfactor of angel 1X type which one electrical cycle is a mechanical one rotation, but it is also possible to produce a high precision type by increasing multiplica- tion factor of angle. Please contact us for details and other inquiries for 2X or more.

多极化可用列表 Multipolarization availability list

| 极对数（X数） Number of multiple	电气误差 Electrical error	尺寸 Size					
		06	08	10	15	21	30
1X	±10'～±30'	●	●	●	●	●	●
2X	±7'～±10'	–	●	●	●	●	–
3X	±5'～±10'	–	–	–	●	●	–
4X	±4'～±5'	–	●	●	●	●	●
5X	±3.5'～±4'（幅7'～幅8'）	–	–	–	●	●	–

原理
Principle

旋变器的原理与变压器基本相同。但它的不同之处在于它的铁芯分为转子部分和定子部分。当它被励磁绕组中的交流电压激励时，交流电压在输出绕组(定子)中产生感应。

由于输出电压随转子旋转角度的变化而变化，因此可以通过检测输出电压来检测转子的角位置。通过对励磁侧R1-R2相施加电压 $E_{R1-R2} = E \sin \omega t$，S1-S3和S2-S4分别获得与旋转角度θ成正比的正弦和余弦信号(电压)。(见图2和图3)。

在S1-S3和S2-S4获得的信号由P10页面输出方程表示。

图1 接线图

励磁绕组（转子）　　　输出绕组（定子）
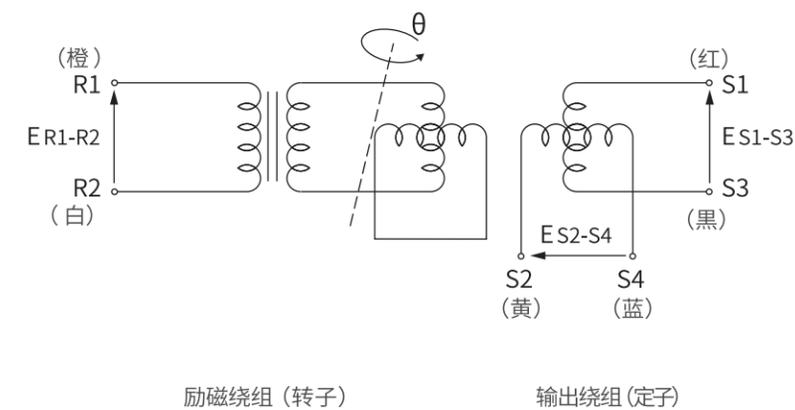
※ 极对数是指电气角度与机械角度的比值。

● 图4示出旋变器轴旋转一圈时的输出信号出现的情况称为"1x"。

● 图5示出旋变器的轴旋转1圈时的4圈输出信号出现的情况称为"4x"。

原理
Principle

The principle of resolver is almost the same as that of a transformer. But it differs in the point that its iron cores are divided into a rotor section and a stator section.

When it is excited by AC voltage in the exciting winding , AC voltage is induced in the output winding (stator).

Because the output voltage varies responding to the rotational angle of the rotor, the angular position of the rotor can be detected by sensing the output voltage.Sine and cosine signals (voltage) proportional to the rotational angle θ can be obtained at the phase S1-S3 and S2-S4 in the output winding when the phase R1-R2 in the exciting winding is excited by the voltage of ER1-R2＝E sin wt. (See Fig. 2 and Fig.3) (A resolver used in this way is called BRX type.)

Signals obtained at the phase S1-S3 and S2-S4 are expressed by the right page output equations. There are two types of equations depending on the difference of polarity.

In addition, a rotary transformer is attached to transmit signals (voltage) to the rotor. Thus resolver consists of two sections; a sensing section to detect output voltage according to the shaft angle and a rotary transformer section for transmission of signals to the rotor.

Fig.1 Wiring Diagram
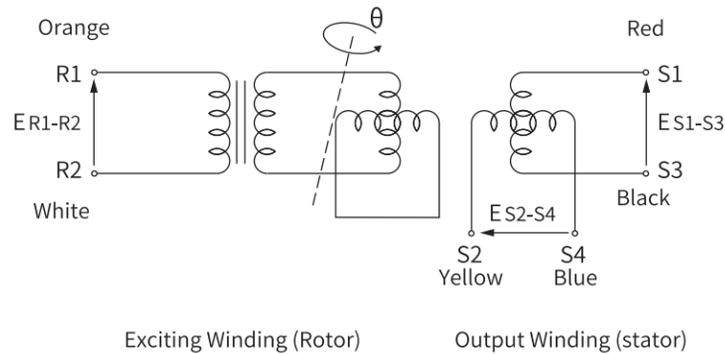
※ Multiplication factor of angle is the ratio of electrical angle to mechanical angle.
- Fig.4 shows the case for 「1X」.
  1 rotation signal will be outputted when the resolver shaft rotates 1 time.
- Fig.5 shows the case for 「4X」.
  4 rotation signal will be outputted when resolver shaft rotates 1 time.

参数表
Lineup

Output voltage equation
输出电压方程

①Output signal (+ type)输出信号

$$E_{S1-S3} ＝ K\ E_{R1-R2} \cdot \cos\theta$$
$$E_{S2-S4} ＝ K\ E_{R1-R2} \cdot \sin\theta$$

Fig.2 Characteristics of excitation/output voltage (In case of +type)
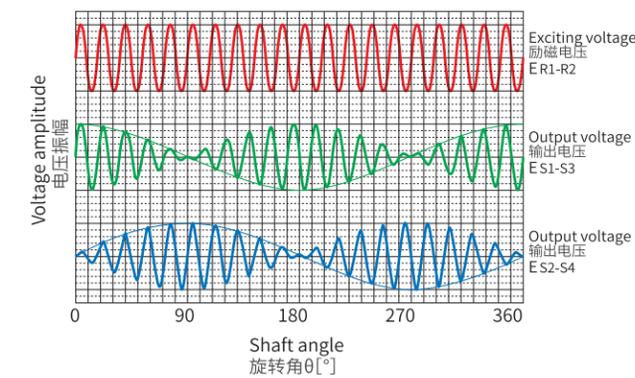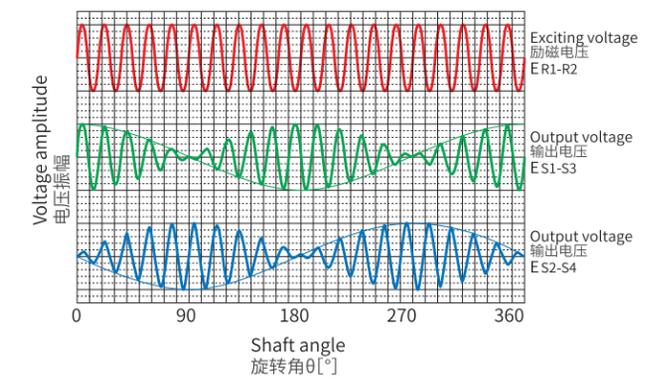图2　励磁·输出电压特性(+方向旋转)

②Output signal (-type) 输出信号

$$E_{S1-S3} ＝ K\ E_{R1-R2} \cdot \cos\theta$$
$$E_{S2-S4} ＝ - K\ E_{R1-R2} \cdot \sin\theta$$

Fig.3 Characteristics of excitation/output voltage (In case of -type)
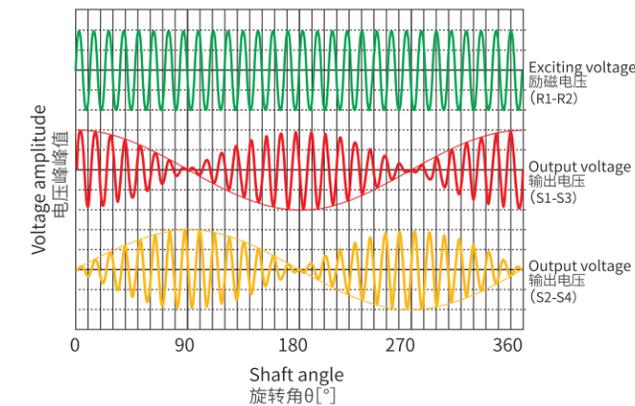图3　励磁·输出电压特性(-方向旋转)

③Output signal (1X)　输出信号（1X）

$$E_{S1-S3} ＝ K\ E_{R1-R2} \cdot \cos\theta$$
$$E_{S2-S4} ＝ K\ E_{R1-R2} \cdot \sin\theta$$
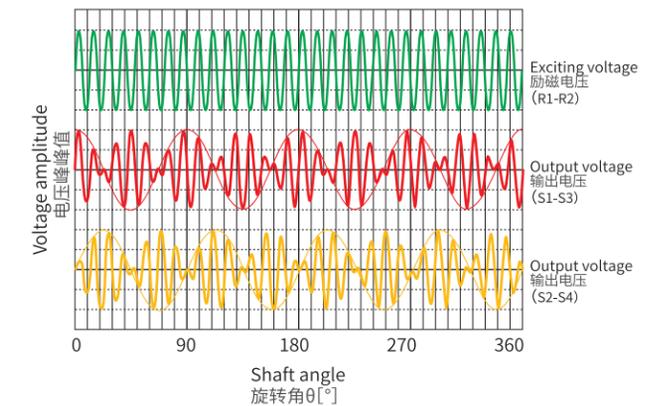
Fig.4 1X output voltage change
图4　1X的输出电压变化

④ Output signal (4X)　输出信号（4X）

$$E_{S1-S3} ＝ K\ E_{R1-R2} \cdot \cos4\theta$$
$$E_{S2-S4} ＝ K\ E_{R1-R2} \cdot \sin4\theta$$

Fig.5 4X output voltage change
图5　4X的输出电压变化

E_{R1-R2}: Excitation voltage (Phase R1-R2)　　　　E[V]: Excitation voltage ampli tude (V0-P)
E_{S1-S3}: Output voltage (Phase S1-S3)　　　　　　f[Hz]: Excitation frequency
E_{S2-S4}: Output voltage (Phase S2-S4)　　　　　　t [s]: Time
ω　: ＝2πf
K　: Transformation ratio
+θ[°]: Shaft angle (when Rotor is rotating in CCW viewed from mounting end of a resolver case.)

E_{R1-R2}: 励磁电压（R1-R2相）　　　　E[V]: 励磁电压峰峰值（Vp-p）
E_{S1-S3}: 输出电压（S1-S3相）　　　　　f[Hz]: 励磁频率
E_{S2-S4}: 输出电压（S2-S4相）　　　　　t [s]: 时间
ω　: ＝2πf
K　: 变压比
+θ[°]: 旋转角（从安装尾端侧看，转子CCW旋转时）

分装式
Built-in type

※ MTG.DIM(安装尺寸):定子和转子的安装位置尺寸
※ MTG.DIM (Mounting dimension) : Gap between a case and a Stator

规 格 Specifications

尺　　　　寸　Size	06
型　　　号　Model	15XFW7101
极　对　数　Function	1X
励　磁　方　Primary	定子侧
输　入　电　压　Input voltage	AC7Vrms10kHz
变　压　比　Transformation[k]	0.5±10%
电 气 误 差 (精度) Electrical erro (Accuracy)	30'Max
剩　　　压　Residual Voltage	20mVrms Max
相　　　移　Phase shift	+ 20°±10°
输 入 阻 抗 Inputimpedance　Z RO	120Ω±20%
输 出 阻 抗 Output impedance　Z SO	-
Z SS	130Ω±20%
最大工作转速　Max operating speed	3000min⁻¹{rpm}
工作温度范围　Operating speed	-55~+155℃
绝　缘　强　度　Dielectric strength	AC 250V rms for one minutine AC250Vrms 1min
绝　缘　电　阻　Insulaition resisitance	10MΩMin
重　　　量　Mass	0.015kg Max

Outline　外形图
Dimension : mm 单位：mm
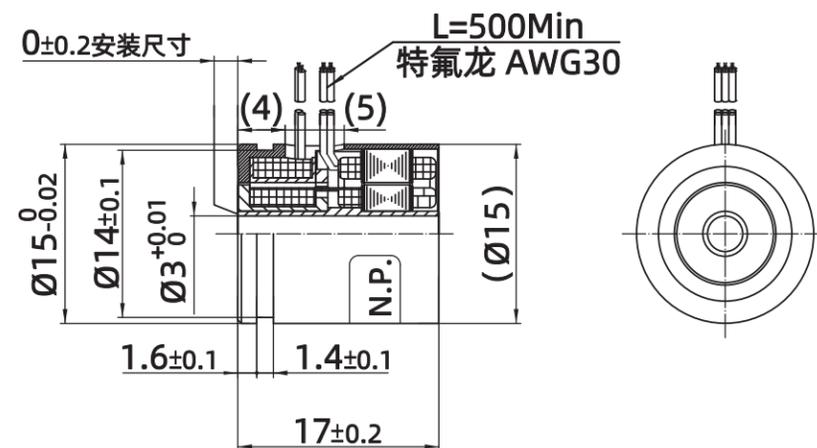
分装式
Built-in type

※ Nom：Nominal value 标称值
※ REF：Reference value 参考值

规 格 Specifications

尺　　　　寸　Size	08		
型　　　号　Model	20XFW7101	20XFW7102	20XFW7104
极　对　数　Function	1X	2X	4X
励　磁　方　Primary	定子侧		
输　入　电　压　Input voltage	AC7Vrms10kHz		
变　压　比　Transformation[k]	0.5±5%		
电 气 误 差 (精度) Electrical erro (Accuracy)	±10'Max	±8'Max	±4'Max
剩　　　压　Residual Voltage	20mVrms Max		
相　　　移　Phase shift	+10°Nom		
输 入 阻 抗 Inputimpedance　Z RO	140Ω±20%		
输 出 阻 抗 Output impedance　Z SO	-		
Z SS	130Ω±20%		
最大工作转速　Max operating speed	40000min⁻¹{rpm}		
工作温度范围　Operating speed	-55~+155℃		
绝　缘　强　度　Dielectric strength	500V AC rms for one minutine AC500Vrms 1min		
绝　缘　电　阻　Insulaition resisitance	100MΩMin		
重　　　量　Mass	0.03kg Max		

Outline　外形图
Dimension : mm 单位：mm

分装式
Built-in type
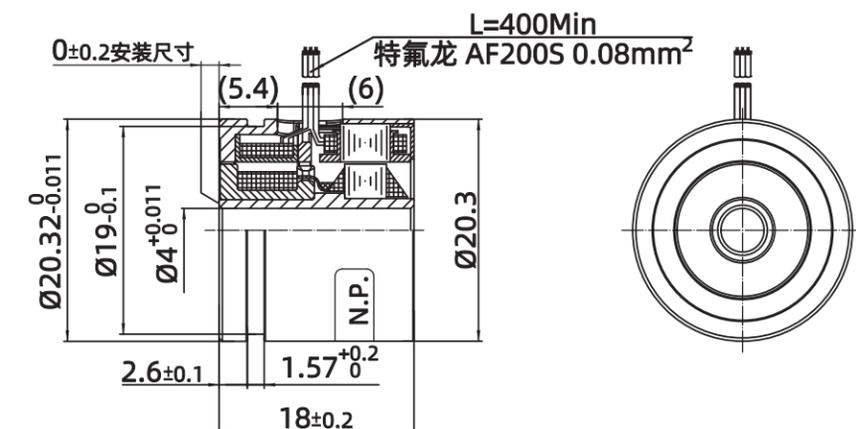
规 格 Specifications

尺 寸 Size	10		
型 号 Model	25XFW7101	25XFW7102	25XFW7104
极 对 数 Function	1X	2X	4X
励 磁 方 Primary	定子侧		
输 入 电 压 Input voltage	AC7Vrms10kHz		
变 压 比 Transformation[k]	0.5±5%		
电 气 误 差 (精度) Electrical erro (Accuracy)	±10'Max	±8'Max	±4'Max
剩 压 Residual Voltage	20mVrms Max		
相 移 Phase shift	+5°Nom		
输 入 阻 抗 Inputimpedance / Z RO	140Ω±20%		
输 出 阻 抗 Output impedance / Z SO	160Ω±20%		
Z SS	130Ω±20%		
最大工作转速 Max operating speed	30000min^{-1}{rpm}		
工作温度范围 Operating speed	-55~+155℃		
绝 缘 强 度 Dielectric strength	500V AC rms for one minutine AC500Vrms 1min		
绝 缘 电 阻 Insulaition resisitance	100MΩMin		
重 量 Mass	0.04kg Max		

Outline 外形图

Dimension : mm 单位：mm

L=500Min
特氟龙 AWG28
2.5±0.25安装尺寸
Ø30 0/-0.1
Ø25 0/-0.02
Ø6 +0.1/0
N.P.
Ø25 0/-0.1
2.5±0.1   2.5±0.1
16.5 0/-0.1
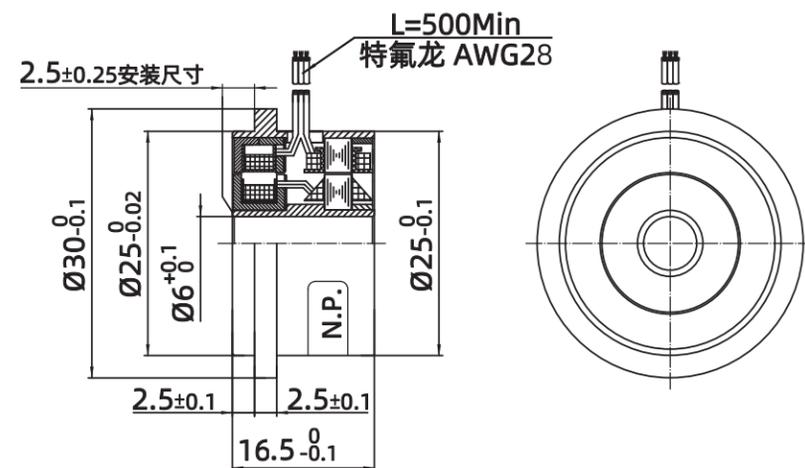
规 格 Specifications

尺 寸 Size	15				
型 号 Model	36XFW7101	36XFW7102	36XFW7103	36XFW7104	36XFW7105
极 对 数 Function	1X	2X	3X	4X	5X
励 磁 方 Primary	定子侧				
输 入 电 压 Input voltage	AC7Vrms10kHz				
变 压 比 Transformation[k]	0.5±5%				
电 气 误 差 (精度) Electrical erro (Accuracy)	±10'Max	±8'Max	±6'Max	±4'Max	±3.5'Max
剩 压 Residual Voltage	20mVrms Max				
相 移 Phase shift	0°Nom				
输 入 阻 抗 Inputimpedance / Z RO	120Ω±20%				
输 出 阻 抗 Output impedance / Z SO	-				
Z SS	350Ω±20%				
最大工作转速 Max operating speed	20000min^{-1}{rpm}				
工作温度范围 Operating speed	-55~+155℃				
绝 缘 强 度 Dielectric strength	500V AC rms for one minutine AC500Vrms 1min				
绝 缘 电 阻 Insulaition resisitance	100MΩMin				
重 量 Mass	0.065kg Max				

Outline 外形图

Dimension : mm 单位：mm

L=500Min
特氟龙 AWG28
0±0.25安装尺寸
Ø36.83 0/-0.025
Ø34.3
Ø9.52 +0.015/0
N.P.
Ø37.5Max
2.4 +0.2/-0.1   2
16 0/-0.2

分装式
Built-in type

分装式
Built-in type
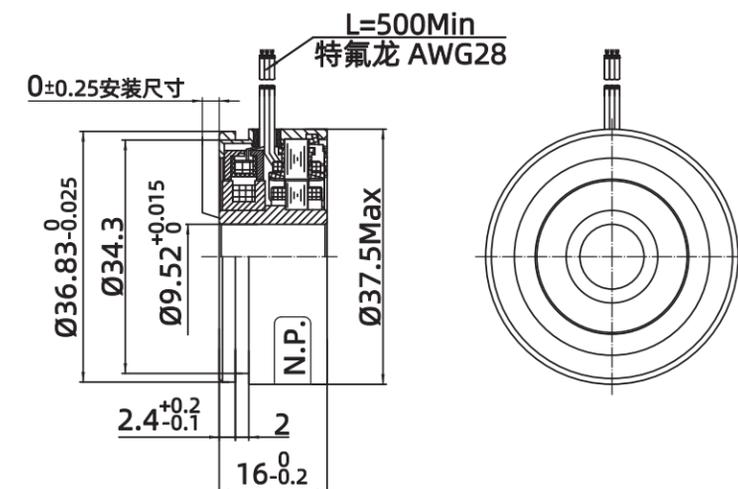
规 格 Specifications

尺　　　寸　Size		15				
型　　　号　Model		36XFW7101A	36XFW7102A	36XFW7103A	36XFW7104A	36XFW7105A
极　对　数　Function		1X	2X	3X	4X	5X
励　磁　方　Primary		定子侧				
输　入　电　压　Input voltage		AC7Vrms4.5kHz				
变　压　比　Transformation[k]		0.5±10%				
电 气 误 差 (精度)　Electrical erro (Accuracy)		±10'Max	±8'Max	±6'Max	±4'Max	±3.5'Max
剩　　　压　Residual Voltage		20mVrms Max				
相　　　移　Phase shift		+8°Nom				
输 入 阻 抗　Inputimpedance	Z RO	120Ω±20%				
输 出 阻 抗　Output impedance	Z SO	415Ω±20%				
	Z SS	365Ω±20%				
最大工作转速　Max operating speed		20000min⁻¹{rpm}				
工作温度范围　Operating speed		-55~+155℃				
绝 缘 强 度　Dielectric strength		500V AC rms for one minutine AC500Vrms 1min				
绝 缘 电 阻　Insulaition resisitance		100MΩMin				
重　　　量　Mass		0.18kg Max				
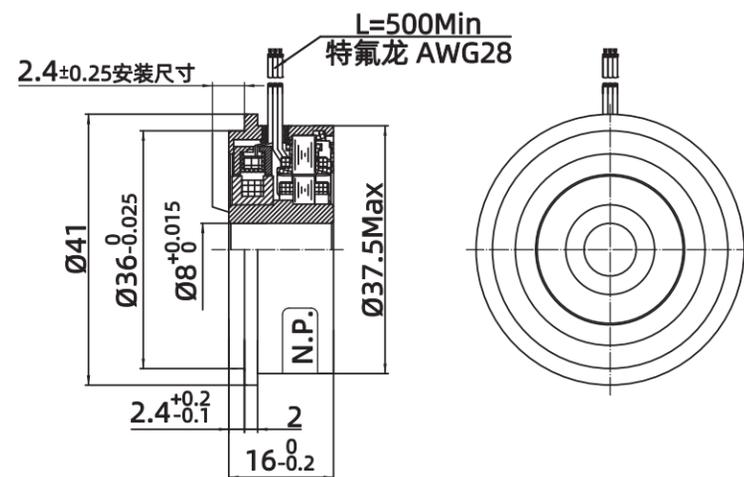
规 格 Specifications

尺　　　寸　Size		21				
型　　　号　Model		52XFW7101	52XFW7102	52XFW7103	52XFW7104	52XFW7105
极　对　数　Function		1X	2X	3X	4X	5X
励　磁　方　Primary		定子侧				
输　入　电　压　Input voltage		AC7Vrms10kHz				
变　压　比　Transformation[k]		0.5±5%				
电 气 误 差 (精度)　Electrical erro (Accuracy)		±10'Max	±8'Max	±6'Max	±4'Max	±3.5'Max
剩　　　压　Residual Voltage		20mVrms Max				
相　　　移　Phase shift		-5+10°				
输 入 阻 抗　Inputimpedance	Z RO	170Ω±20%			140Ω±20%	170Ω±20%
输 出 阻 抗　Output impedance	Z SO	-				
	Z SS	-				
最大工作转速　Max operating speed		10000min⁻¹{rpm}				
工作温度范围　Operating speed		-55~+155℃				
绝 缘 强 度　Dielectric strength		500V AC rms for one minutine AC500Vrms 1min				
绝 缘 电 阻　Insulaition resisitance		100MΩMin				
重　　　量　Mass		0.25kg Max				

Outline　外形图

Dimension : mm 单位：mm

Outline　外形图

Dimension : mm 单位：mm

DALTA 代尔塔

DALTA 代尔塔

分装式
Built-in type

分装式
Built-in type
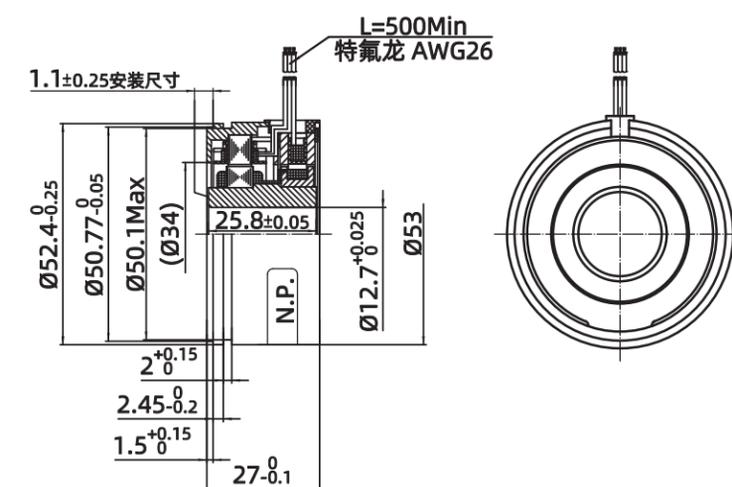
规 格　Specifications

尺　　　寸　Size	30	
型　　　号　Model	75XFW7101	75XFW7102
极　对　数　Function	1X	2X
励　磁　方　Primary	定子侧	
输　入　电　压　Input voltage	AC7Vrms10kHz	
变　压　比　Transformation[k]	0.5±10%	
电 气 误 差 (精度) Electrical erro (Accuracy)	10'Max	
剩　　　压　Residual Voltage	-	
相　　　移　Phase shift	0°±10°	
输 入 阻 抗 Inputimpedance ‖ Z RO	150Ω±20%	
输 出 阻 抗 Output impedance ‖ Z SO	-	
‖ Z SS	-	
最大工作转速　Max operating speed	6000min^{-1}{rpm}	
工作温度范围　Operating speed	-55~+155℃	
绝　缘　强　度　Dielectric strength	500V AC rms for one minutine AC500Vrms 1min	
绝　缘　电　阻　Insulaition resisitance	100MΩMin	
重　　　量　Mass	1.0kg Max	
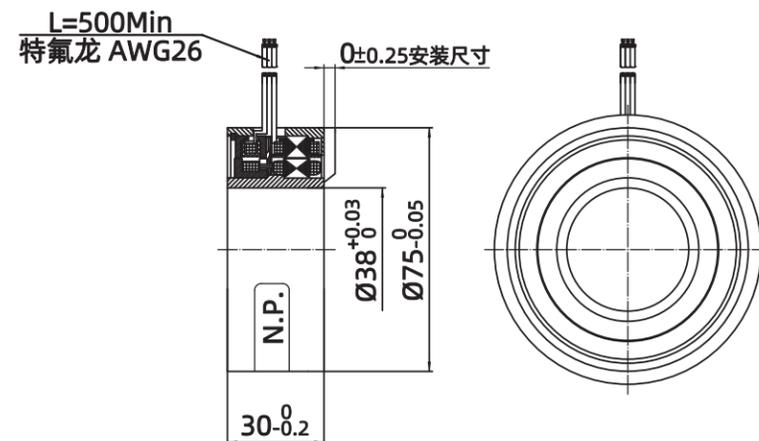
规 格　Specifications

尺　　　寸　Size	36
型　　　号　Model	110XFW7101
极　对　数　Function	1X
励　磁　方　Primary	定子侧
输　入　电　压　Input voltage	AC7Vrms10kHz
变　压　比　Transformation[k]	0.5±10%
电 气 误 差 (精度) Electrical erro (Accuracy)	30'Max
剩　　　压　Residual Voltage	20mVrms Max
相　　　移　Phase shift	-10°±10°
输 入 阻 抗 Inputimpedance ‖ Z RO	190Ω±20%
输 出 阻 抗 Output impedance ‖ Z SO	190Ω±20%
‖ Z SS	180Ω±20%
最大工作转速　Max operating speed	6000min^{-1}{rpm}
工作温度范围　Operating speed	-55~+155℃
绝　缘　强　度　Dielectric strength	AC 500V rms for one minutine AC500Vrms 1min
绝　缘　电　阻　Insulaition resisitance	100MΩMin
重　　　量　Mass	0.73kg Max

Outline　外形图

Dimension : mm 单位：mm

L=500Min 特氟龙 AWG26
0±0.25安装尺寸
$Ø38^{+0.03}_{0}$
$Ø75^{0}_{-0.05}$
N.P.
$30^{0}_{-0.2}$

Outline　外形图

Dimension : mm 单位：mm

0±0.25安装尺寸　L=500Min 特氟龙 AWG26
6-R2 均布
$Ø110^{0}_{-0.035}$
$Ø50^{+0.025}_{0}$
$Ø90^{0}_{-0.035}$
N.P.
4
45±0.05
60°
$Ø100±0.05$
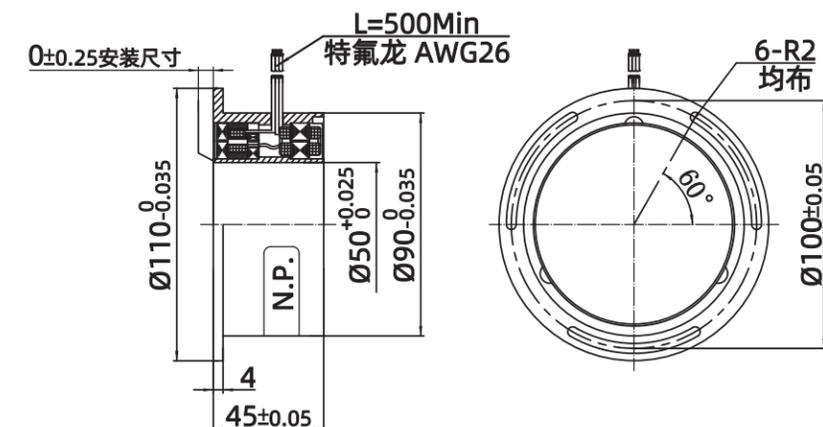
轴伸式 Shaft type

规格 Specifications

尺　　寸　Size	08
型　　号　Model	J20XFW7031
极　对　数　Function	1X
励　磁　方　Primary	R1-R2(Stator)(定子)
输　入　电　压　Input voltage	AC7Vrms3kHz
变　压　比　Transformation[k]	0.492±5%
电气误差(精度) Electrical erro (Accuracy)	±0.1°（±6'）Max
剩　　压　Residual Voltage	20mVrms Max
相　　移　Phase shift	2±5°REF
输入阻抗 Inputimpedance　Z RO	>500Ω
输出阻抗 Output impedance　Z SS	T.B.D
最大工作转速　Max operating speed	6000min^{-1}{rpm}
工作温度范围　Operating speed	-55~+75℃
绝缘强度　Dielectric strength	AC 500V rms for one minutine AC500Vrms 1min
绝缘电阻　Insulaition resisitance	100MΩMin
重　　量　Mass	0.7kg Max

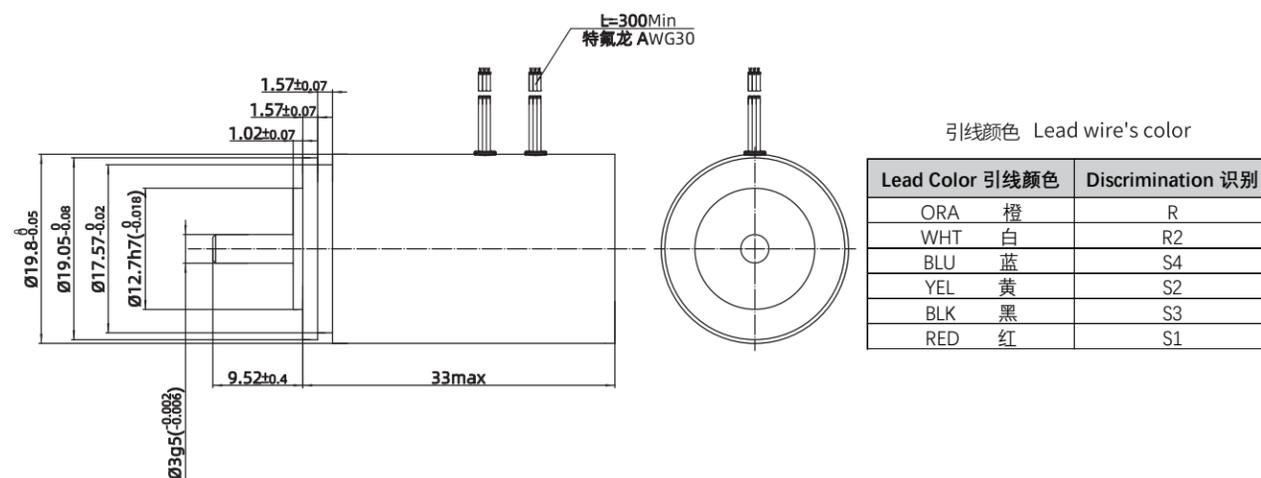### Outline 外形图　　Dimension : mm 单位：mm

L=300Min 特氟龙 AWG30

Lead Color 引线颜色	Discrimination 识别
ORA 橙	R
WHT 白	R2
BLU 蓝	S4
YEL 黄	S2
BLK 黑	S3
RED 红	S1

轴伸式 Shaft type

规格 Specifications

尺　　寸　Size	10
型　　号　Model	J26XFW7031
极　对　数　Function	1X
励　磁　方　Primary	R1-R2(Stator)(定子)
输　入　电　压　Input voltage	AC7Vrms3kHz
变　压　比　Transformation[k]	0.5±10%
电气误差(精度) Electrical erro (Accuracy)	10'Max
剩　　压　Residual Voltage	20mVrms Max
相　　移　Phase shift	±15°REF
输入阻抗 Inputimpedance　Z RO	>950Ω Nom
输出阻抗 Output impedance　Z SS	150Ω Nom
最大工作转速　Max operating speed	6000min^{-1}{rpm}
工作温度范围　Operating speed	-60~+125℃
绝缘强度　Dielectric strength	AC 500V rms for one minutine AC500Vrms 1min
绝缘电阻　Insulaition resisitance	10MΩMin
重　　量　Mass	0.12kg Max

Outline 外形图　　Dimension : mm 单位：mm

L=300Min 特氟龙 AWG28

Lead Color 引线颜色	Discrimination 识别
ORA 橙	R
WHT 白	R2
BLU 蓝	S4
YEL 黄	S2
BLK 黑	S3
RED 红	S1
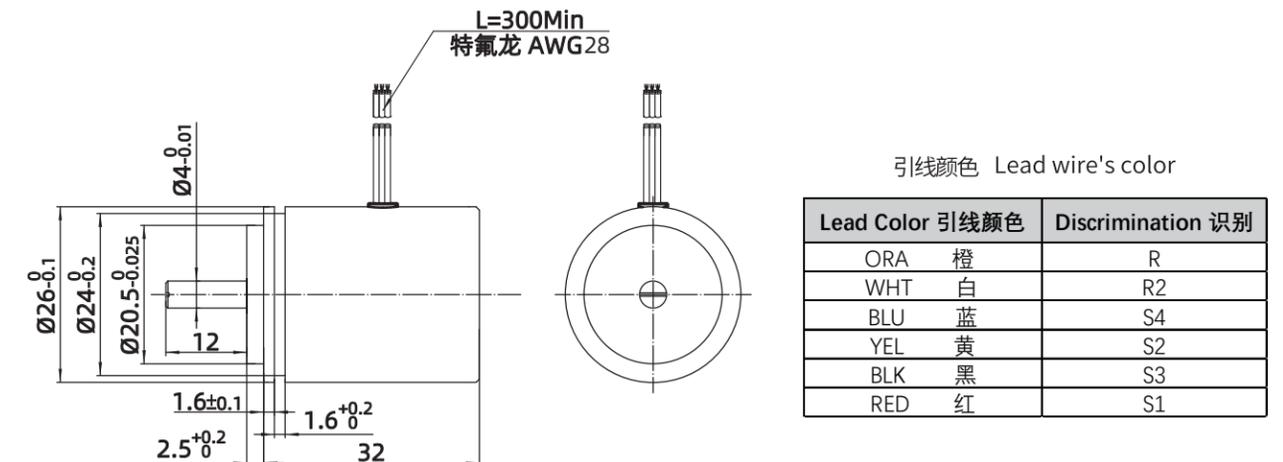
轴伸式 Shaft type

规 格 Specifications

尺　　　寸　Size	21
型　　　号　Model	51XFW7101
极　对　数　Function	1X
励　磁　方　Primary	R1-R2(Stator) (定子)
输　入　电　压　Input voltage	AC7Vrms10kHz
变　压　比　Transformation[k]	$0.5^{+15\%}_{-5\%}$
电 气 误 差 (精度)　Electrical erro (Accuracy)	10'Max
剩　　　压　Residual Voltage	20mVrms Max
相　　　移　Phase shift	±15°REF
输 入 阻 抗　Inputimpedance	Z RO	160Ω Nom
输 出 阻 抗　Output impedance	Z SS	400Ω Nom
最大工作转速　Max operating speed	6000min^{-1}{rpm}
工作温度范围　Operating speed	-40~+120℃
绝　缘　强　度　Dielectric strength	AC 500V rms for one minutine AC500Vrms 1min
绝　缘　电　阻　Insulaition resisitance	100MΩMin
重　　　量　Mass	0.32kg Max

Outline　外形图

Dimension : mm 单位：mm

引线颜色　Lead wire's color

Lead Color 引线颜色	Discrimination 识别
RED/WHT　红白	R1
YEL/WHT　黄白	R2
BLU　蓝	S4
YEL　黄	S2
BLK　黑	S3
RED　红	S1

L=300Min 特氟龙 AWG26
3-M4深8 EQS

中空轴式 Hollow shaft

规 格 Specifications

尺　　　寸　Size	21
型　　　号　Model	53XFW7101
极　对　数　Function	1X
励　磁　方　Primary	R1-R2(Stator) (定子)
输　入　电　压　Input voltage	AC7Vrms10kHz
变　压　比　Transformation[k]	$0.5^{+15\%}_{-5\%}$
电 气 误 差 (精度)　Electrical erro (Accuracy)	10'Max
剩　　　压　Residual Voltage	20mVrms Max
相　　　移　Phase shift	±15°REF
输 入 阻 抗　Inputimpedance	Z RO	160Ω Nom
输 出 阻 抗　Output impedance	Z SS	400Ω Nom
最大工作转速　Max operating speed	6000min^{-1}{rpm}
工作温度范围　Operating speed	-40~+120℃
绝　缘　强　度　Dielectric strength	AC 500V rms for one minutine AC500Vrms 1min
绝　缘　电　阻　Insulaition resisitance	100MΩMin
重　　　量　Mass	0.32kg Max

Outline　外形图

Dimension : mm 单位：mm

引线颜色　Lead wire's color

Lead Color 引线颜色	Discrimination 识别
RED/WHT　红白	R
YEL/WHT　黄白	R2
BLU　蓝	S4
YEL　黄	S2
BLK　黑	S3
RED　红	S1

L=370Min 特氟龙 AWG26
2-M3∠+90°
3-M3 深5

MORE......

安装方法及精度
Mounting method and accuracy

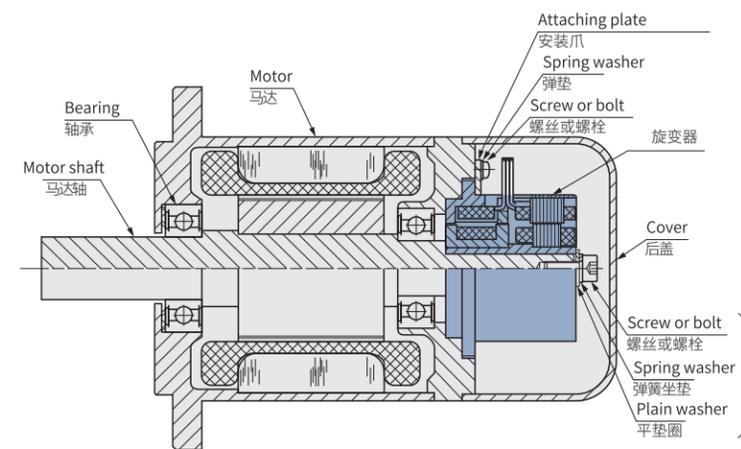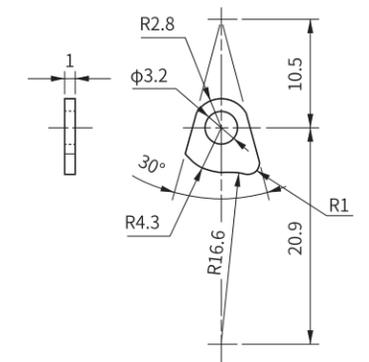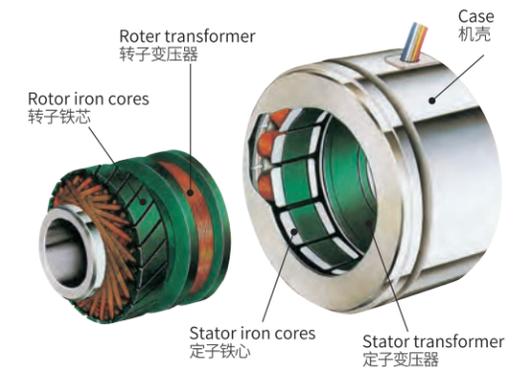**分装式**
Built-in type

安装时, 请在转子铁芯和定子铁芯相对的状态下(转子变压器和定子变压器相对的状态下)安装。(参见下图, 右侧)请注意, 反向安装时(转子铁芯与定子变压器相对的状态)不会输出信号。

In case of mounting to Resolver, the rotor iron cores and stator iron cores are need to mounting on face to face.(The roter transformer and stater transformer are need to mounting on face to face.) If mounting condition is incorrect, resolver is not work correctly.(The roter iron core and stater transformer are need to mounting on face to face.)

Attaching plate 安装爪
Spring washer 弹垫
Screw or bolt 螺丝或螺栓
旋变器
Motor 马达
Bearing 轴承
Motor shaft 马达轴
Cover 后盖
Screw or bolt 螺丝或螺栓
Spring washer 弹簧坐垫
Plain washer 平垫圈 ※

Roter transformer 转子变压器
Case 机壳
Rotor iron cores 转子铁芯
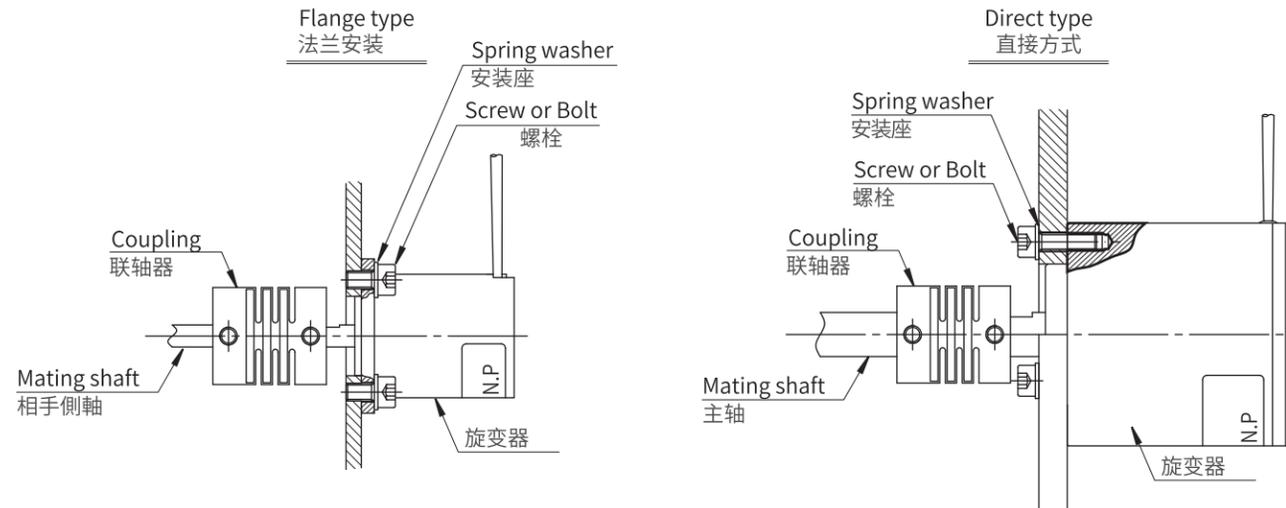Stator iron cores 定子铁心
Stator transformer 定子变压器

※Fixable by anaerobic adhesive only (e.g. Loctite 648, Three Bond 1373B, etc.) without screws and washers. Combined usage of screws and adhesive is also allowable.
也有不使用螺丝类, 只用厌氧粘合剂(例如:锁紧648、三粘合剂1373b)粘合的方法。
另外, 也有螺丝类和粘合剂并用的方法。

R2.8
φ3.2
10.5
30°
R4.3
R1
R16.6
20.9
1

Attaching plate 安装爪

安装爪

轴伸式
Shaft type

Flange type
法兰安装

Spring washer
安装座

Screw or Bolt
螺栓

Coupling
联轴器

Mating shaft
相手侧轴

N.P

旋变器

Direct type
直接方式

Spring washer
安装座

Screw or Bolt
螺栓

Coupling
联轴器

Mating shaft
主轴

N.P

旋变器

将旋变器法兰的配合直径放在配合板孔上，通过法兰螺孔拧紧螺丝。用于连接旋变器和配套轴的联轴器。

Fitting diameter of resolver flange is to be put on mating plate hole, and screws are to be tightened through the flange screw holes. Coupling to be used to connect resolver and mating shaft.

安装精度
Mounting accuracy

分装式
Built-in type

为了使旋变器的性能最大化，在安装旋变器时，请注意实现以下精度。

- 轴向跳动:电机轴的跳动不得大于ϕ0.05mm。
  (08、06型:ϕ0.03mm或以下)
- 同轴度:电机端盖安装面与电机轴的同轴度必须ϕ0.05mm或以下。
  (08、06型:ϕ0.03mm或以下)
- 垂直度:旋变器机壳安装支撑面与电机轴的垂直度必须小于0.05mm。
  (08及06型尺寸:0.03毫米或以下)
- 轴向行程:旋变器转子与定子轴向相对错位必须在+0.25毫米以内。
  (06型:±0.2毫米)

※对于轴式旋转变压器，用户所使用的联轴器的垂直度和轴向的可接受度取决于联轴器的使用情况，以螺栓式要求为准。

- Axial runout: Runout of the motor shaft must be ϕ0.05mm or less.
  (Size 08 and 06: ϕ0.03mm or less)
- Coaxiality : The coaxiality of the case mounting surface of Smartsyn with the motor shaft must be ϕ0.05mm or less.
  (Size 08 and 06: ϕ0.03mm or less)
- Perpendicularity : The perpendicularity of the case mounting support surface of Smartsyn to the motor shaft must be 0.05mm or less. (Size 08 and 06: 0.03mm or less)
- Axial travel: The relative dislocation in the axial direction between the rotor and stator of Smartsyn must be within +0. 25mm.
 (Size 06 : within±0.2mm)

※However acceptable perpendicularity and axial direction play depend on coupling that customer uses in case of shaft type and holl shaft type resolver, requirement of bult in type is to be taken as reference.

使用上的注意事项
Cautions for use

- Use Resolver within the specified input voltage and frequency, so that you can obtain the specified electrical characteristics e.g. transformation ratio, electrical error, input 1 output impedance, phase shift.
  To avoid the deterioration in the accuracy, the allowable values are as follows:
  Input voltage: +20% of the specified value.
  Input frequency: +5% of the spectfied value.

- In case a noise source is in vicinity, or in case signal transfer distance is long, twisted/shielded cables should be used. In case a noise exists on the output signals, they should be received by a differential amplifier.

- 在规定的输入电压和频率范围内使用旋变器, 可以获得规定的电气特性, 如变压比、电气误差、输入输出阻抗、相移等。
  为避免精度的恶化, 许用值如下:
  输入电压:设定值的+20%。
  输入频率:设置值的+5%。

- 附近有噪声源或信号传输距离较长时, 应使用双绞/屏蔽电缆。如果输出信号上存在噪声, 则差分放大器应接收噪声。

Example of a twisted/shielded cable configuration
双绞线和屏蔽线　配置示例

Insulator 绝缘体　Conductor 导体　Shield 盾　Sheath 透视
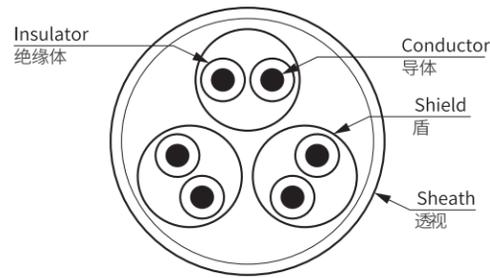
- Separate a lead or an extension shielded cable of Resolver from a power line so that noise may not generate on output voltage, and it may not deterliorate resolver .

- In case a lead of Resolver is extended with a twisted/shielded cable, amplitude of output voltage may increase due to resonance caused by stray capacitance of the shielded cable and output impedance of Resolver, or the amplitude may decrease when the stray capacitance is large.
  Because the stray capacitance varies depending on a type and length of a shielded cable, check how it varies in advance, and take such proper measures as to increase or decrease input voltage of Resolver andor to change input gain of R/D converter circuit.

- 将旋变器的引线或扩展屏蔽电缆与电源线分开, 以避免输出电压产生噪声, 也不会对旋变器造成损坏。

- 当旋变器的引线使用绞/屏蔽电缆时, 由于屏蔽电缆的杂散电容与旋变器的输出阻抗产生共振, 输出电压幅值可能会增大, 或者杂散电容较大时, 输出电压幅值可能会减小。
  由于杂散电容随屏蔽电缆的类型和长度的不同而不同, 因此需要提前检查杂散电容的变化情况, 并采取适当的措施提高或降低旋变器的输入电压, 或改变R/D转换电路的输入增益。

- Mount Resolver as described in the "Mounting method and accuracy" on page 16 so that communication errors may not take place.

- In case Resolver is not connected to the same amount of loads for each output of the two phases, the two output voltages will get disproportionate and may affect the accuracy. Therefore the loads of the two phases should be the same.

- Because a rotor and a stator of Resolver are arrangedin a pair in the same container box at the time of a delivery inspection, try to use them in the pair as much as possible. Even when the pair at the time of the delivery inspection cannot be used, try to use a pair of a rotor section and a stator section in the same container box.
  Although Resolver with a combination of a rotor and a stator from a difterent container box operates as an angle sensor, and electrical angle signals can be obtained, performance such as a transformation ratio may not satisty specified values.

- Do not combine a rotor section with a stator section of Resolver of different model numbers. Such combin ation cannot sa tisty required function and pertormance.

- In case a strong magnetic field surrounds Resolver, it may not work properly with its magnetic flux affected.

- The Resolver coil is exposed, please be careful not to damage the coil. Cause of failure (disconnection).

- 按照第16页"安装方法和准确性"的描述安装旋变器, 这样就不会发生通信错误。

- 如果旋变器的两相输出没有连接到相等的负载, 两相输出电压会变得不相称, 可能会影响精度。因此, 两相的负载应相同。

- 由于旋变器的转子和定子在出货检查时是成对排列在同一个包装箱内的, 所以要尽量成对使用。
  虽然旋变器与来自不同包装箱的转子和定子组合在一起, 可以作为角度传感器, 并可以获得电气角度信号, 但变压比等性能可能无法满足指定值。

- 不要将不同型号的旋变器的转子与定子组合。这种组合不能满足所需的功能和性能。

- 如果旋变器周围有强磁场, 可能会影响其磁通量, 导致旋变器无法正常工作。

- 旋变器线圈外露, 请小心不要损坏线圈。这是故障(断线)的原因。

- oIn case Resolver is used in high humidity as close to 100% RH for a long time, its insulation materials may deteriorate. In such a case, the use of some protective cover is recommended.

- 如果长期在接近100% RH的高湿度环境中使用, 旋变器的绝缘材料可能会失效。
  在这种情况下, 建议使用一些保护罩。