



# Magnetostrictive Displacement Sensor

## RHC Series Product manual

杭州浙达精益机电技术股份有限公司  
Hangzhou Zheda Jingyi Electromechanical Technology Corporation Limited



中国创造·创造中国

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# Company Profile

We are a technological innovation enterprise born out of Zhejiang University. It is a national high-tech enterprise, the fourth batch of "small giant" enterprises of the Ministry of Industry and Information Technology, and a special enterprise of Zhejiang Province. Our company has more than 180 employees, including 4 overseas talents, 4 professors, and 2 associate professors. There are also 12 doctors, and more than 86% of employees with a bachelor degree or above.



We are committed to intelligent manufacturing, high-end equipment, intelligent sensing, intelligent detection, military industry and other fields. Most of our company's products are independently researched and developed, and the market share ranks in the forefront of the domestic industry. A variety of equipment is the first set in China, which breaks the long-term monopoly of foreign companies.

We are a national high-tech enterprise integrating scientific research, product development, engineering design, and technical consulting. Besides, the company has obtained 45 invention patents, 29 utility model patents, 10 software copyrights, and 4 registered trademarks.

Taking "Created in China, Create China" as our ideal, we are committed to building a century-old national brand. Our development goal is to become a well-known leading technology and strength-based enterprise in China's high-end equipment and intelligent inspection industries.

# Honorary Qualification



# TEC Magnetostriction Development

The magnetostrictive displacement sensor project is included in the national torch plan project

IN 2008

National Natural Science Foundation of China (Youth Fund), "Basic research on the application of GMM self-sensing components integrating sensors and actuators"

IN 2002

The international exchange and cooperation conference on ultrasonic guided wave technology was held in Hangzhou. Our company officially launched the first set of magnetostrictive ultrasonic guided wave detectors in China.

IN 2011

IN 1997

The National Natural Science Foundation of China, the first domestic and foreign giant magnetostrictive actuator for non-circular shaped pin hole processing

IN 2009

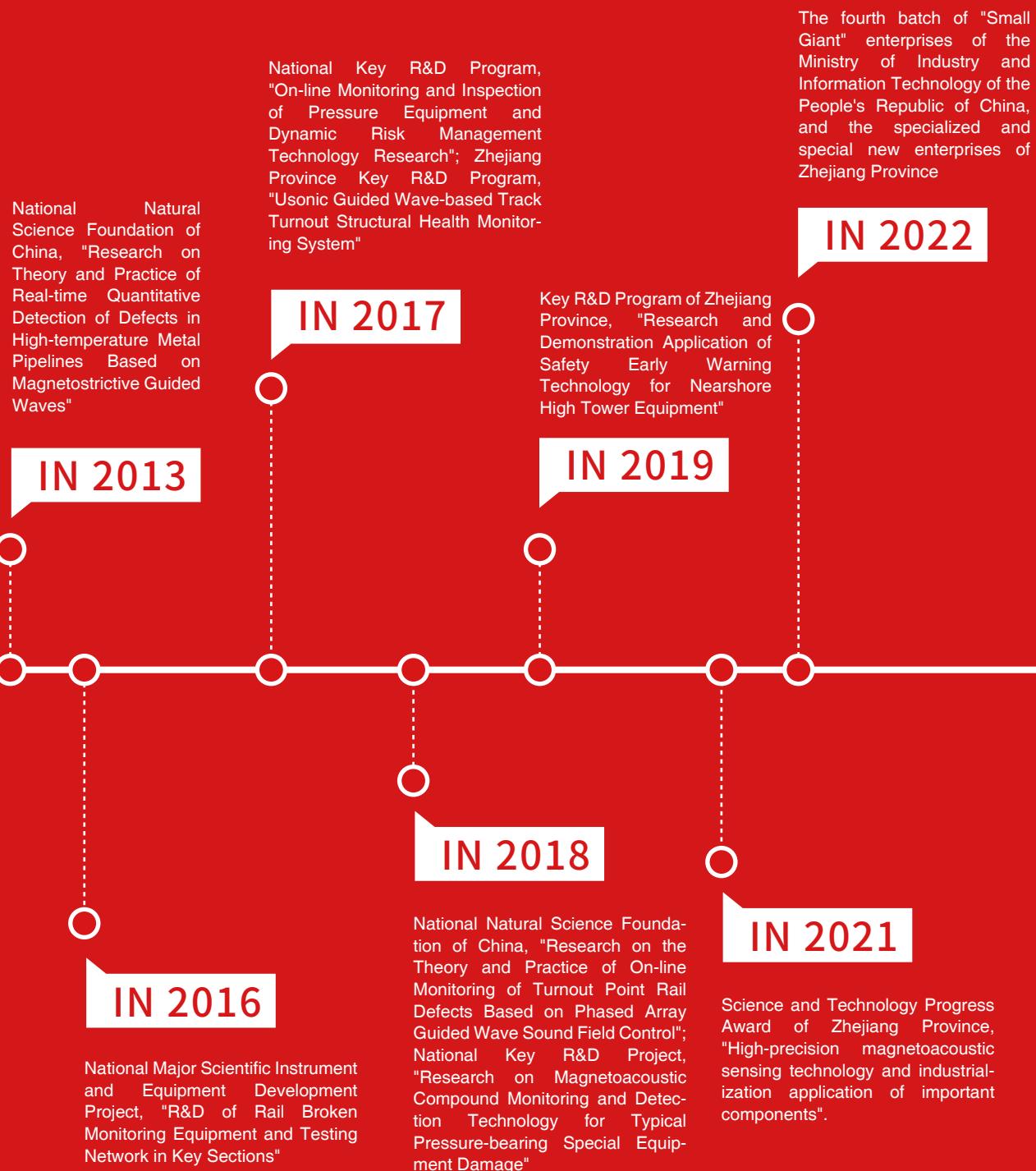
The magnetostrictive displacement sensor project won the Golden Bridge Award issued by the National Technology Association;  
National Natural Science Foundation of China (Youth Fund), "Research on the Basic Theory of New Technology of Giant Magnetostrictive and Magnetorheological Compound Damping"

IN 2006

China Postdoctoral Science First-Class Funding Project

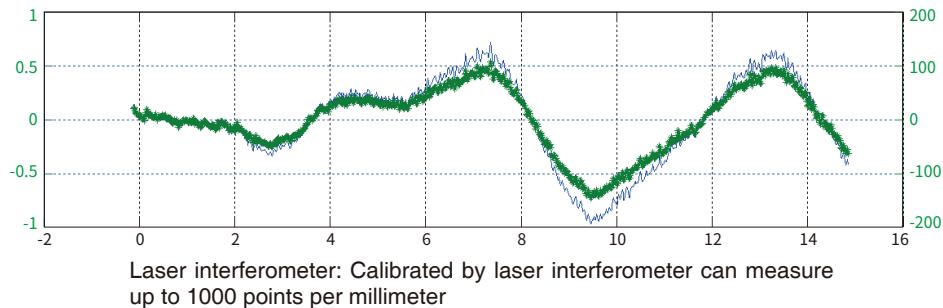
IN 2012

National Natural Science Foundation of China, "On-line detection method for corrosion and broken wires of arch bridge hangers based on the principle of magnetostrictive guided wave dynamic focusing";  
National Natural Science Foundation of China, "Research on the Theory and Practice of Real-time Quantitative Detection of Defects in High-temperature Metal Pipelines Based on Magnetostrictive Ultrasonic Guided Waves";  
Major Science and Technology Project in Zhejiang Province, "Magnetostrictive Ultrasonic Guided Wave Pipeline In-Service Non-destructive Testing Technology and Instruments"



# Quality Assurance

After years of experience and precipitation, TEC magnetostrictive displacement sensor has built a modern, automatic and standardized production line, which ensures the reliability, stability and consistency of products. Before the new series of products are put into the market, they must pass EMC, vibration, impact, high and low temperature tests. Sensors need to go through signal verification before and after each manufacturing process. After assembly, they are tested and screened one by one. Finally, they pass the calibration and linearity detection of laser interferometer, and the detection results are uploaded to the database for subsequent tracking of products



# Parts Test

## Electro Magnetic Compatibility (EMC)

Electrostatic discharge immunity	( GB/T17626.2, IDT IEC61000-4-2 )
Radiation immunity of radio frequency electromagnetic field	( GB/T17626.3, IDT IEC61000-4-3 )
Immunity of electrical fast transient	( GB/T17626.4, IDT IEC61000-4-4 )
Surge (shock) immunity	( GB/T17626.5, IDT IEC61000-4-5 )
RF field induced conducted disturbance immunity	( GB/T17626.6, IDT IEC61000-4-6 )
Power frequency magnetic field immunity	( GB/T17626.8, IDT IEC61000-4-8 )

## Temperature Test

Low temperature	( GB/T2423.1, IDT IEC60068-2-1 )
High temperature	( GB/T2423.2, IDT IEC60068-2-2 )
Constant damp heat	( GB/T2423.3, IDT IEC60068-2-78 )
Alternating damp heat	( GB/T2423.4, IDT IEC60068-2-30 )
Temperature change	( GB/T2423.22, IDT IEC60068-2-14 )

## Other Tests

Explosion-proof test	( GB3836.1, IDT IEC60079-0 )
Explosion-proof test	( GB3836.2, IDT IEC60079-1 )
Explosion-proof test	( GB3836.4, IDT IEC60079-11 )
Insulation resistance, insulation strength	( GB/T15479 )
Impact test	( GB/T2423.5, IDT IEC68-2-27 )
Free drop test	( GB/T2423.8, IDT IEC68-2-32 )
Vibration test	( GB/T2423.10, IDT IEC68-2-6 )
Highly accelerated life test	( HALT )
Enclosure protection test	( GB/T4208-2017 )

# Technical Terminology

## ● Absolute position

The output of the sensor is relative to a fixed reference point, which does not need to be reset when power supply is restored after power failure; this position is an absolute position. However the general incremental sensor, such as incremental encoder and incremental grating ruler, which needs to find the reference point again.

## ● Environmental conditions

For normal Operating conditions of displacement sensors, the industry has the following standards:

a ) Temperature:25°C ( $\pm 10^\circ\text{C}$ )

b ) Relative humidity: 90% or less

Generally, the environment for calibrating and testing sensors is more stringent than the standard requirements.

## ● Measuring range

For the sensor, the physical quantity to be measured is indicated by upper and lower limits. The measurement range is the full scale of motion.

## ● Full scale

Full scale (abbreviated as "F.S") (see measuring range).

## ● Resolution

Refers to the minimum amount of sensor output that can be distinguished. The highest resolution of TEC magnetostrictive displacement sensor can reach 1μm.

## ● Nonlinearity

Nonlinearity is the absolute deviation as a percentage of the Stroke length length. In a magnetostrictive sensor, this change is caused by the difference in the propagation velocity of the return signal propagating in the waveguide medium.

## ● Non-contact

Magnetostrictive displacement sensor uses non-contact magnetic induction technology to measure position. Non-contact measurement does not exist mechanical wear and mechanical vibration, which improves the reliability and service life of the sensor.

## ● Temperature coefficient

The temperature coefficient unit is ppm/ $^\circ\text{C}$  (one millionth per degree Celsius). It refers that the ambient temperature changes by 1 degree Celsius, the amount of change in the position value output by the sensor.

## ● Update time

The time interval between two measurements made by the sensor. The larger the range of the sensor, the longer the update time required.

## ● Multiple position measurement

Measure the position of multiple magnet rings on the sensor stroke shaft or guide rail at the same time.

## ● Precision

The difference between the indicated measured value and the true value can be calculated from the root mean square of the nonlinear deviation, repeatability, and hysteresis.

## ● Hysteresis

The difference in displayed position when reaching the same point from opposite directions along the length of stroke (Note: Magnetostrictive displacement sensors have very little hysteresis and are therefore negligible in most applications).

## ● Drift

Drift refers to the change of output signal or output value under the influence of surrounding environment, such as time or temperature. Please refer to "preheating period" and "temperature coefficient" at the same time.

## ● Shell protection class

The IP (Ingress Protection) standard for shell intrusion protection issued by the International Electrotechnical Commission. For specific IP standard instructions, please refer to the official website of IEC. The optional protection levels of sensors are IP65, IP67 and IP68.

## ● Preheating period

The time required for the sensor to be energized until the output is stable, this deviation can be seen from the calibration curve of the sensor.

## ● Load impedance

The impedance when the external circuit is connected to the output end of the sensor.

## ● Repetition accuracy

The difference in sensor output when the magnet repeatedly reaches the same position from the same direction when measured along the stroke.

# Technical Characteristics

## C C Product Introduction

TEC magnetostrictive displacement sensor is a new generation of linear displacement sensor independently developed by Zheda Jingyi. It can provide users with real-time, reliable, accurate and continuous linear displacement signals under harsh working environment, and is widely used in metallurgical equipment, wind power equipment, construction machinery, rubber machinery, port machinery, energy and other industrial automation fields.

## C C Product Characteristics

### High precision

The highest resolution and repetition accuracy can reach  $0.1\mu\text{m}$

### Extra long stroke

Up to 23 meters

### Never wear

Non-contact measurement, maintenance-free and calibration-free, and the detection accuracy is always as new.

### Various signal output forms

Analog (voltage, current)、SSI、Start/Stop、Profibus-DP、CANopen、Profinet、EtherCAT

### Strong adaptability

It can work in harsh environment such as high and low temperature, humidity, vibration, impact, corrosion, dust and so on. It can work in harsh environment such as high and low temperature, humidity, vibration, impact, corrosion, dust and so on.

### Strong shell

The 304 stainless steel tube shell is precision welded, with pressure resistance, dust resistance, pollution resistance, and electrical protection grades up to IP65, IP67, and IP68.

### Easy to use

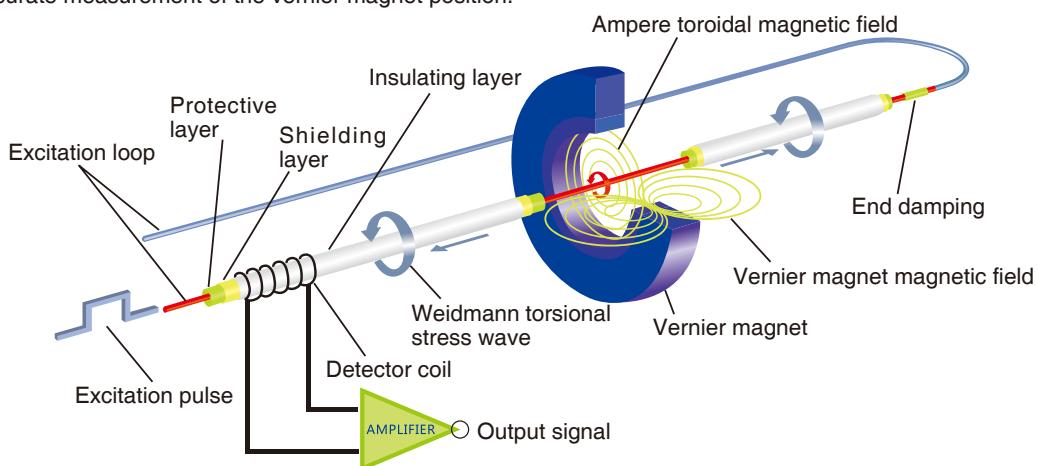
M 18×1.5、M 20×1.5、3/4"-16UNF-3A threaded installation is optional. When replacing the sensor, only the electronic compartment can be replaced without removing the pressure measuring rod.

### Reliable operation

The core components have been tested for durability, impact, vibration, temperature and absolute displacement, and are not affected by power failure.

## G g Working Principle

The detection mechanism of the magnetostrictive displacement sensor is based on the "Weidmann effect" between the magnetostrictive waveguide wire and the vernier magnet which is the core detection element of the sensor. The excitation module in the sensor electronic bin will apply a query pulse at both ends of the loop where the sensitive detection element (magnetostrictive waveguide wire) is located, and the pulse forms a circumferential ampere annular magnetic field around the waveguide wire at speed of light. The magnetic field is coupled with the permanent magnet magnetic field at the position of the vernier magnet, and a "Weidmann effect" torsional stress wave is formed on the surface of the waveguide wire. The torsional wave transmitted to the end is absorbed by the damping device, and the signal transmitted to the excitation end is received by the detection device. The control module calculates the time difference between the inquiry pulse and the received signal, and multiplies it by the propagation speed of torsional stress wave in the waveguide material, so as to calculate the distance between the torsional wave occurrence position and the measurement reference point, and realize the real-time accurate measurement of the vernier magnet position.



Working principle of magnetostrictive linear displacement sensor

# RH/RP Displacement Sensor- Analog Output



## Technical Characteristics

- Rugged and fully enclosed design
- Non-wear, non-contact measurement method
- Easy to use, standard analog signal output
- No need to return to zero, absolute position output
- Easy diagnosis, LED real-time condition monitoring
- Low power consumption design effectively reduces system heating
- Stable and reliable, using digital analog technology
- The start and end position of the measurement can be adjusted in full scale

## C c Product Parameters-Analog Output

### • Input

Measurement data	Position magnet ring
Stroke length	25~5500 mm, customized according to customer needs
Number of measurements	2

### • Output

Current	4 ~ 20mA or 20 ~ 4mA(min/max load 0/500Ω)														
Voltage	0 ~ 10Vdc or 0~5Vdc (min load resistance ≥10K)														
Resolution	16-bit D/A or 0.0015% of full scale (min 1um)														
Nonlinearity	<±0.01% of full scale, min±50um														
Repetition accuracy	<±0.001% of full scale, min ±1um														
Hysteresis	<10um														
Update time	<table border="1"> <tr> <td>Measuring range</td> <td>≤200mm</td> <td>≤350mm</td> <td>≤1200mm</td> <td>≤2400mm</td> <td>≤4800mm</td> <td>≤7620mm</td> </tr> <tr> <td>Update time</td> <td>0.25ms</td> <td>0.333ms</td> <td>0.5ms</td> <td>1.0ms</td> <td>2.0ms</td> <td>5.0ms</td> </tr> </table>	Measuring range	≤200mm	≤350mm	≤1200mm	≤2400mm	≤4800mm	≤7620mm	Update time	0.25ms	0.333ms	0.5ms	1.0ms	2.0ms	5.0ms
Measuring range	≤200mm	≤350mm	≤1200mm	≤2400mm	≤4800mm	≤7620mm									
Update time	0.25ms	0.333ms	0.5ms	1.0ms	2.0ms	5.0ms									
Temperature coefficient	<30ppm/°C														

### • Operating conditions

Magnet velocity	Arbitrary
Protection level	IP67 RH Stainless Steel Rod /IP65 RP Aluminum profile
Operating temperature	-40°C ~ +85°C
Humidity/dew point	Humidity 90%, no condensation
Shock index	GB/T2423.5 100g(6ms)
Vibration index	GB/T2423.10 20g/10~2000Hz
EMC test	GB/T17626.2/3/4/6/8, Grade 4/3/4/3/3, Class A, CE Certification

### • Structure and Materials

Failure indication	Displayed by the LEDs on the rear cover of the electronic compartment	
RHC Series	Electronic bin	Aluminum alloy
	Measuring rod	304 stainless steel
	Outer tube pressure	35MPa (continuous) /70MPa (peak) or 350bar (continuous) / 700bar (peak)
RPC Series	Position magnet	Standard magnet ring and various ring magnets
RPC Series	Electronic bin	Aluminum alloy
	Measuring rod	Aluminum alloy
	Position magnet	Slider magnet, square magnet, sector magnet
	Mounting thread form	M18×1.5、M20×1.5、3/4"-16UNF-3A (customizable)
	Installation direction	Any direction
	Outgoing mode	Cable outlet or Connector

### • Electrical Connections

Input voltage	+24Vdc±20%
Operating current	<120mA (varying with range)
Polarity protection	Max.-30Vdc
Oversupply protection	Max.36Vdc
Insulation resistance	>10MΩ

Insulation strength 500V

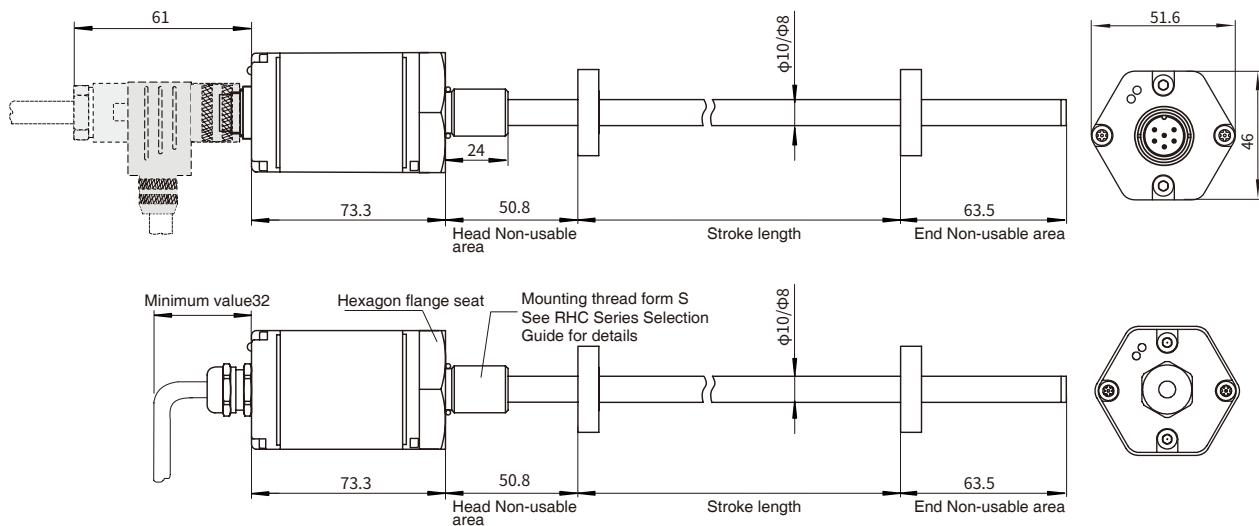
## A a Installation Instructions-Analog Output

Analog output magnetostrictive displacement sensor, suitable for real-time and precise measurement of moving parts stroke, it can measure the absolute displacement or stroke of vernier magnet, expressed in the form of standard analog quantity, including: 0~20MA (or reverse), 420MA (or reverse) DC current or 0~5V (or reverse), -5~+5V (or reverse), 0~10V (or reverse), -10~+10V (or reverse) DC voltage, etc. Sensors have built-in and external two different installation methods, built-in type is suitable for the built-in installation of hydraulic cylinders, compact structure; the external type adopts aluminum profile, which is installed outside the moving parts and convenient to use.

- Dimensions and installation guidance of RHC pressure-resistant rod sensor

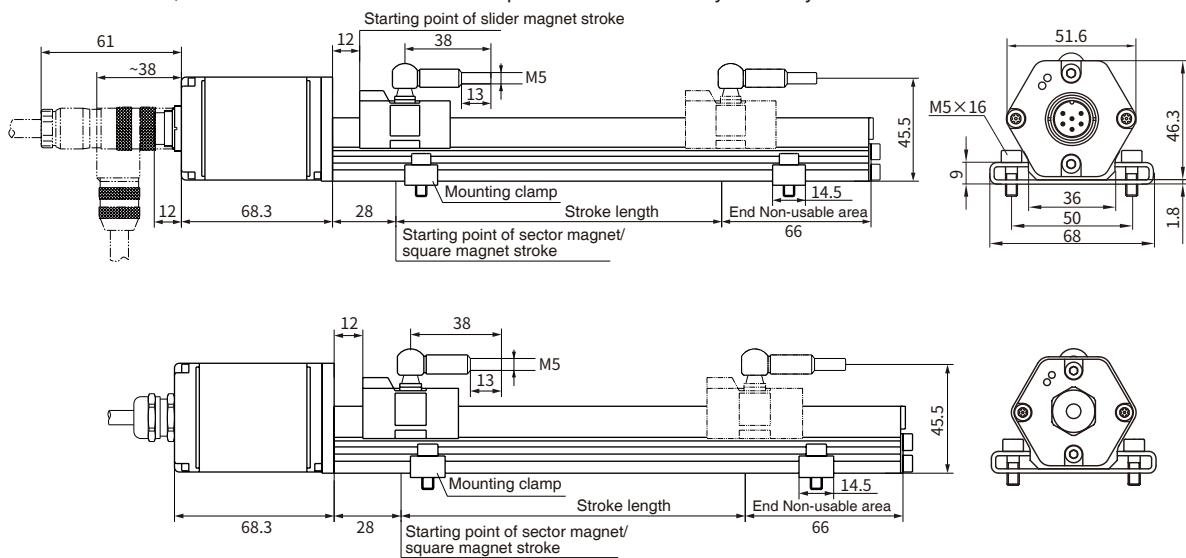
RH series pressure-resistant rodshell, built-in installation design for hydraulic system, pressure-resistant 35MPa continuous, flexible and simple installation mode. Mounting thread form M18×1.5 or M20×1.5 or 3/4"-16UNF-3A.

Note: The measurement Non-usable area shown in the figure indicates that the output value of the sensor in this area is zero or unreliable. The default values of the first and last measurement Non-usable areas of this product are 50.8mm and 63.5mm respectively. The value of the measurement Non-usable area can be appropriately modified according to the needs of customers, please point out when ordering.

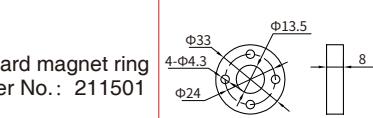
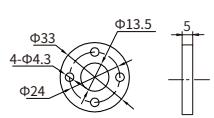
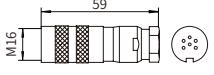
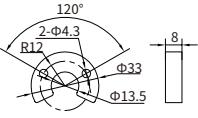
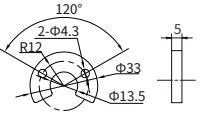
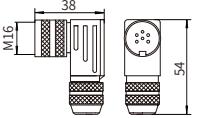
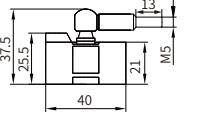
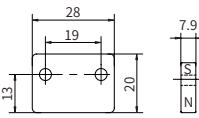


- Dimensions and installation guidance of RPC aluminum profile sensor

RPC Series aluminum profile provides flexible and simple external installation mode, which is suitable for stroke or position detection of linear motion mechanism, and can also be used for external position detection of hydraulic cylinder.



## C c Common Accessories - Analog Output

Accessory name/ model	Dimensions	Accessory name/ model	Dimensions	Accessory name/ model	Dimensions
Standard magnet ring Order No.: 211501		Magnetic isolation gasket		6-pin Female Connector Order No.: 312701	
Sector magnet Order No.: 211502		Sector magnetic isolation gasket		6-pin 90 Female Connector Order No.: 312702	
Slider magnet Order No.: 211503		Square magnet Order No.: 211508			

**Note:** Please refer to "Magnet ring Selection" for details of magnet ring kit and other models.

### • Wiring mode

When the sensor is a connector output, refer to the pin definition in the following table for wiring mode; when the sensor is cable outlet output, refer to the line color definition in the following table for connection mode



#### • 6-pin male connector arrangement (facing the sensor head)

Pin	Line color 1*	Line color 2*	Pin/wire function definition
1	Blue	Grey	No. 1 magnet ring position signal(+)
2	Green	Pink	No. 1 magnet ring position signal(-)
3	Yellow	Yellow	No.2 magnet ring position (No.1 magnet ring speed) signal (+)
4	White	Green	No.2 magnet ring position (No.1 magnet ring speed) signal (-)
5	Red	Brown	+24Vdc power supply (-20%~+20%)
6	Black	White	0 Vdc (power supply circuit)

#### • 8-pin male connector arrangement (facing the sensor head)

Pin	Line color 3*	Pin/wire function definition
1	Yellow	Current output
2	Grey	0Vdc(Current/Voltage Loop)
3	Pink	Voltage/current
4	-	Reservation
5	Green	Voltage
6	Blue	0 Vdc (power supply circuit)
7	Brown	+24Vdc power supply (-20%~+20%)
8	White	Reservation

**Note:** \* Line color 1: cable PUR sheath, orange, -20~90°C  
\* Line color 2/3: cable PVC sheath orange,-20~105°C

## X X Selection Guide - Analog Output

R 01 02 03 C - M 04 05 06 07 08 - 09 10 11 - 12 13 14 15 - 16 17 18 19 20 - 21 22 - 23 24 25 - 26 27

**01 - 03** Sensor shell form

R H C Pressure-resistant rod (internal or external)

R P C Aluminum profile (external only)

**04 - 08** Measuring range

Four-bit, less than four-bit are preceded by zero, M means metric system, unit mm

**09 - 10** Magnet ring type/mounting thread form

Only for RHC Series	S	1	Hexagon flange type, M18 x 1.5, measuring rod diameter 10mm, material of 304
	S	2	Hexagon flange type, M20 x 1.5, measuring rod diameter 10mm, material of 304
	S	3	Hexagon flange type, 3/4 "-16UNF-3A, measuring rod diameter 10mm, material 304
Only for RPC Series	C	1	Sector magnet
	C	2	Slider magnet ring
	C	3	Square magnet

**11** Mechanical selection

0 Standard

**12 - 15** Connection form

**12 - 13** Outgoing line type: straight-out cable mode

D H	PUR sheath, orange, -20 ~ 90°C, end scattered, cable color 1
D U	PVC sheath, orange, -20 ~ 105°C, end scattered, cable color 2
D B	PVC sheath, orange, -20 ~ 105°C, end scattered, cable color 3
D I	PUR sheath, orange, -20 ~ 90°C, end with 6-pin connector
D V	PVC sheath, orange, -20 ~ 105°C, end with 6-pin connector
D C	PVC sheath, orange, -20 ~ 105°C, end with 8-pin connector
14 - 15	Cable outlet mode: cable length, 01 ~ 99 meters
12 - 15	Connector form
P H 6 0	M16 male plug (6-pin)

**Note:** For supporting cables, please refer to Analog Cable Accessories Selection

**16 - 19** Signal output mode

16 Output

A Current

V Voltage

**17** Function

1 Position (1 magnet, 1 output)

2 Position (2 magnets, 2 outputs)

3 Position and speed (1 magnet, 2 outputs)

4 Position and rate (1 magnet, 2 outputs)

5 Forward position and reverse position (1 magnet, 2 outputs)

6 Position and internal temperature of electronic compartment (1 magnet, 2 outputs)

7 Displacement difference (2 magnets, 1 output)

**18** Output range

0 0...10VDC or 4...20mA

1 10...0VDC or 20...4mA

2 0...20mA

3 20...0mA

**19** Non-magnet ring state

A Keep the original value

B Maximum value

C Minimum value

D Customize

**20** Options

0 Standard

**21 - 22** Non-used area at head and end, customizable

S 0 50.8mm+63.5mm

B 0 30mm+60mm

S 1 28mm+66mm (used in RPC series)

**23 - 25** Maximum speed or rate value (optional: "function" is 3 or 4 is used)

The coding speed is in m/s, and the value is 0.01 to 9.99 m/s (001.999)

**26-27** Country

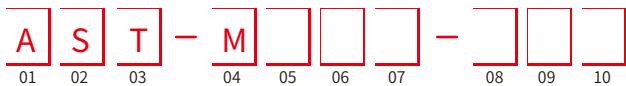
Refer to the country list, page 23.

● Note: The forward output of the sensor means that when the magnet ring moves away from the electronic bin, the output value increases and decreases when the magnet ring moves in the reverse direction.

● Examples of selection: RHC-M0300-S10-PH60-A10B-S0

Indicates: the ordered product model is RHC structural displacement sensor, the measuring range is 300mm, and the mounting thread form is M18x1.5; the diameter of the measuring rod is 10mm, and the material is 304; 6-pin connector outlet form, without cable plug, 4-20mA output (1 magnet ring, 1 position output) the non-used area of the first end is 50.8mm, and the non-used area of the end is 63.5mm.

## M M Selection of Analog Cable Fittings



01 - 03	Type
A S T	Analog quantity
04 - 07	Cable length
M * * *	Less than 3-bit are preceded by zeros, and M means metric system, unit m
08 - 10	Cable type, outlet mode
H 0 1	One end of 6-pin (M16) female connector, and one end scattered
H 0 3	One end of 6-pin (M16) right angle female connector, and one end scattered
U 0 1	One end of 6-pin (M16) female connector, and one end scattered
U 0 2	One end of 8-pin (M16) female connector, and one end scattered
U 0 3	One end of 6-pin (M16) right angle female connector, and one end scattered
U 0 4	One end of 8-pin (M16) right angle female connector, and one end scattered
Note	<p>H: Cable type, PUR sheath, orange,-20 ~ 90°C</p> <p>U: Cable type, PVC sheath, orange,-20 ~ 105°C</p>

- Selection example: AST-M005-H01

Indicates: Analog interface cable, 5m long, PUR sheath, orange, -20~90°C, one end of the cable is a 6-pin (M16) right angle female connector, and one end scattered

- Selection example: AST-M010-U04

Indicates: Analog interface cable, 10 meters long, PVC sheath, orange,-20 ~ 105°C, one end of the cable is a 8-pin (M16) right angle female connector, and one end scattered

# RHC/RPC Displacement Sensor - SSI Output



## Technical Characteristics

- Rugged and fully enclosed design
- Non-wear, non-contact measurement method
- Linear measurement, absolute output
- High resolution, up to  $0.5\mu\text{m}$
- Easy diagnosis, LEDs real-time condition monitoring
- Real-time induction and synchronous measurement
- Direct SSI signal output can directly replace encoder

## C C Product Parameters - SSI Output

• Input	
Measurement data	Position magnet ring
Stroke length	25~5500 mm, customized according to customer needs
Number of measurements	2
• Output	
Interface	SSI Synchronous Serial Interface
Data Format	Binary or Gray code
Data length	8~32bit
Resolution	0.1/0.5 / 1 / 2 / 5 / 10 / 20 / 40/ 50 / 100 µm
Nonlinearity	<±0.01% of full scale, minimum ±50µm
Repetition accuracy	<±0.001% of full scale or the same resolution
Transmission rate	50KBD~1MBD line length <3 <50 <100 <200 <400 (m) Rate 1000 <400 <300 <200 <100 (KBD)
Update time (High update rate)	Stroke: 300 750 1000 2000 5000 mm Frequency: 3.7 3.0 2.3 1.2 0.5 kHz
Update time (general)	1KHz (range ≤ 1m) 500Hz (1m < range ≤ 2m) 250Hz (2m < range ≤ 3m), customizable
Hysteresis	<10µm
Temperature coefficient	<15ppm/°C
Working mode	Asynchronous, Synchronous (Sync 1)
• Structure and Materials	
Failure indication	Electronic bin coverwith LEDs display
RH Series	Electronic bin Aluminum alloy
	Measuring rod 304 stainless steel
	Outer tube pressure 35MPa (continuous)/70MPa (peak value) (measuring rod diameter φ10)
	Position magnet Standard magnet ring and various ring magnets
RP Series	Electronic bin Aluminum alloy
	Measuring rod Aluminum alloy
	Position magnet Slider magnet, square magnet, sector magnet
Mounting thread form	M18×1.5、 M20×1.5、 3/4"-16UNF-3A (customizable)
Installation direction	Any direction, Threaded mounting (thread size optional)
Outgoing mode	Cable outlet(Loose wire connection) or Connector(M16)
• Operating conditions	
Magnet velocity	Arbitrary
Protection level	IP67RHC Stainless Steel Rod/IP65RPC Aluminum profile
Operating temperature	-40 °C ~ +85 °C
Humidity/dew point	Humidity 90%, no condensation
Shock index	GB/T2423.5 100g(6ms)
Vibration index	GB/T2423.10 15g/10~2000Hz
EMC Test	GB/T17626.2/3/4/6/8, Grade3/3/3/2/3, Class A, CE Certification
• Electrical Connections	
Input voltage	+24Vdc±20%
Operating current	<80mA (varying with range)
Polarity protection	Max.-30Vdc
Overshoot protection	Max.36Vdc
Insulation resistance	>10MΩ
Insulation strength	500V

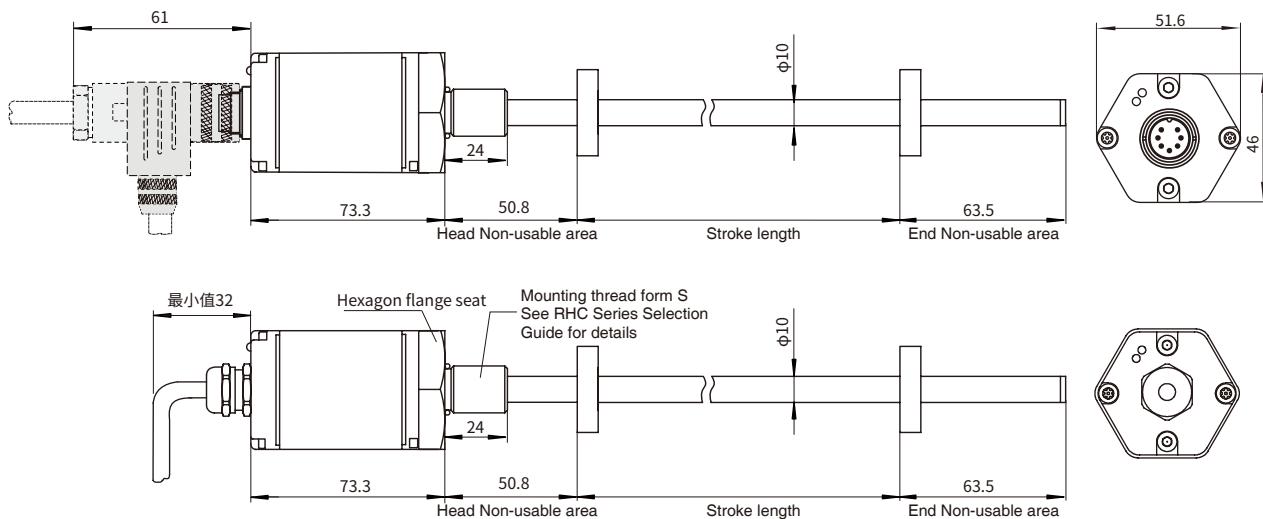
## A a Installation Instructions SSI Output

SSI output magnetostrictive linear displacement sensor provides synchronous serial signal output, which can convert the real-time position of vernier magnet into 24, 25 or 26-bit (binary or Gray code) data form, and transmit the data to the controller by serial communication after receiving the clock signal provided by the controller. The data format of SSI output is identical with absolute output encoder, and it can be connected directly with the function module of PLC, so it can be conveniently used to replace absolute encoder.

- Dimensions and installation guidance of RHC pressure-resistant rod sensor

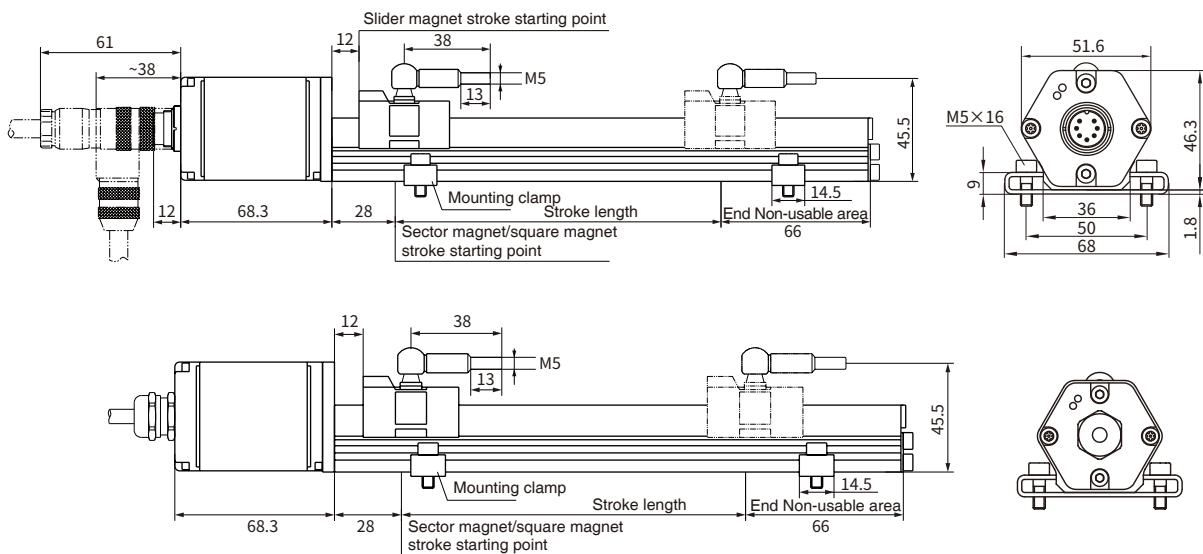
RHC series pressure-resistant rod shell, built-in installation design for hydraulic system, pressure-resistant 35MPa continuous, flexible and simple installation mode, mounting thread form M18×1.5 or M20×1.5 or 3/4" -16UNF-3A.

Note: The measurement non-useable area shown in the figure indicates that the output value of the sensor in this area is zero or unreliable. The default values of the first and last measurement non-useable areas of this product are 50.8mm and 63.5mm respectively. The value of the measurement non-useable area can be appropriately modified according to the needs of customers, please pointed out when ordering.

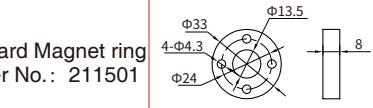
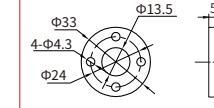
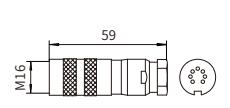
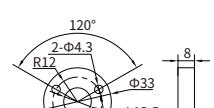
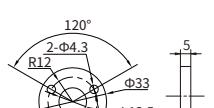
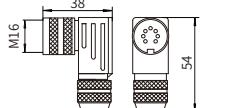
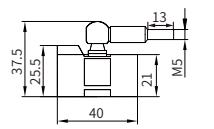
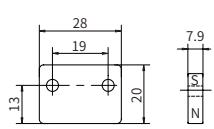


- Dimensions and installation guidance of RPC aluminum profile sensor

RPC Series aluminum profile provides flexible and simple external installation mode, which is suitable for stroke or position detection of linear motion mechanism, and can also be used for external position detection of hydraulic cylinder.



## C c Common Accessories - SSI Output

Accessory name/ model	Dimensions	Accessory name/ model	Dimensions	Accessory name/ model	Dimensions
Standard Magnet ring Order No.: 211501		Magnetic isolation gasket		7-pin Female Connector Order No.: 312703	
Sector magnet Order No.: 211502		Sector magnetic isolation gasket		7-pin 90 Female Connector Order No.: 312704	
Slider magnet Order No.: 211503		Square magnet Order No.: 211508			

Note: Please refer to "Magnet ring Selection" for details of magnet ring kit and other models.

### • Wiring mode

When the sensor is connector output, refer to the pin definition in the following table for wiring mode; when the sensor is cable outlet output, refer to the line color definition in the following table for connection mode



• 7-pin male connector arrangement (facing the sensor head)			
Pin	Line color 1*	Line color 2*	Pin/wire function definition
1	White	Grey	Data (-)
2	Yellow	Pink	Data (+)
3	Blue	Yellow	Clock (+)
4	Green	Green	Clock (-)
5	Red	Brown	+24Vdc power supply (-20%~+20%)
6	Black	White	0 Vdc
7	-	-	Do not connect

• 8-pin male connector arrangement (facing the sensor head)		
Pin	Line color 3*	Pin/wire function definition
1	Yellow	Clock (+)
2	Grey	Data (+)
3	Pink	Clock (-)
4	-	Reservation
5	Green	Data (-)
6	Blue	0 Vdc (power supply circuit)
7	Brown	+24Vdc power supply (-20%~+20%)
8	White	Reservation

Note: \* Line color 1: cable PUR sheath, orange, -20~90°C  
 \* Line color 2/3: Cable PVC sheath, orange, -20~105°C

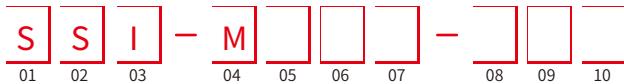
## C c Selection Guide - SSI Output

R		C	-	M					-			-			S	1	0			-			-																											
01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26																									
<b>01 - 03</b>		Sensor shell form																																																
R H C		Pressure-resistant rod (internal or external)																																																
R P C		Aluminum molded shell (external only)																																																
<b>04 - 08</b>		Measuring range																																																
Four-bit, less than four-bit are preceded by zero, M means metric system, unit mm																																																		
<b>09 - 10</b>		Magnet ring type/mounting thread form																																																
Only for RHC Series	S	1	M 18 x 1.5, measuring rod diameter 10mm, 304 material																																															
	S	2	M20 x 1.5, measuring rod diameter 10mm, 304 material																																															
	S	3	3/4 "-16UNF-3A, measuring rod diameter 10mm, 304 material																																															
	T	1	M18X1.5, measuring rod diameter 8mm, 304 material																																															
	T	2	M20X1.5, measuring rod diameter 8mm, 304 material																																															
	T	3	3/4 "-16UNF-3A, measuring rod diameter 8mm, 304 material																																															
Only for RPC Series	C	1	Sector magnet																																															
	C	2	Slider magnet ring																																															
	C	3	Square magnet																																															
<b>11 - 14</b>		Connection form																																																
<b>11- 12</b>		Outgoing line type: straight-out cable mode																																																
D	H	PUR sheath, orange, -20 ~ 90°C, end scattered, cable color 1																																																
D	U	PVC sheath, orange, -20~105°C, loose wire at the end, cable color 2																																																
D	B	PVC sheath, orange, -20 ~ 105°C, end scattered, cable color 3																																																
D	I	PUR sheath, orange, -20 ~ 90°C, end 7-pin connector																																																
D	V	PVC sheath, orange, -20 ~ 105°C, end 7-pin connector																																																
D	C	PVC sheath, orange, -20 ~ 105°C, end 8-pin connector																																																
<b>13 - 14</b>		Cable outlet mode: cable length, 01 ~ 99 meters																																																
<b>11 - 14</b>		Connector form																																																
P	H	7	0	M16 male plug (7 pins)																																														

Note: See SSI cable fittings selection for supporting cables

- Note: The forward output of the sensor means that when the magnet ring moves away from the electronic bin, the output value increases and decreases when the magnet ring moves in the reverse direction.
- Selection example: R HC - M 0 3 0 0 - S 1 - P H 7 0 - S 1 0 1 B 7 0 0 - S 0 0  
Indicates: R HC rod structure series, 3 0 mm effective stroke, M 18 X 1.5 mounting thread, measuring rod diameter 1 0 mm, 3 0 4 material, connector outlet form, no cable plug, S S I protocol output (position output, data length 2 4 bits, data format binary, resolution 0. 0 0 1 mm, forward output, asynchronous mode), head non-used area 5 0. 8 mm, end non-used area 6 3. 5 mm.

## S S SSI Cable accessories selection Guide



01 - 03	Type
S S I	SSI interface
04 - 07	Cable length
M * * *	Less than 3 digits are preceded by zeros, and M means metric system, unit m
08 - 10	Cable type, outlet mode
H 0 1	One end of 7-pin (M16) is female connector, and one end scattered
H 0 3	One end of 7-pin (M16) right angle female connector, and one end scattered
U 0 1	One end of 7-pin (M16) is female connector, and one end scattered
U 0 2	One end of 8-pin (M16) is female connector, and one end scattered
U 0 3	One end of 7-pin (M16) right angle female connector, and one end scattered
U 0 4	One end of 8-pin (M16) right angle female connector, and one end scattered
Note	H: Cable type, PURsheath, orange, -20~90°C U: Cable type, PVC sheath, orange, -20~105°C

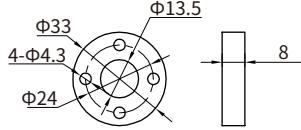
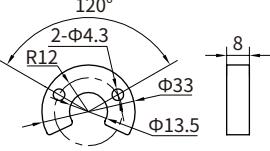
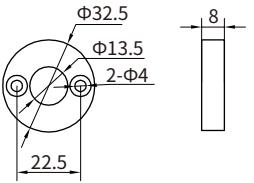
- Selection example: SSI-M005-H01

Indicates: SSI interface cable, cable length 5 meters, PURsheath, orange, -20~90°C, one end of the cable is 7-pin (M16) female connector, and one end scattered.

- Selection example: SSI-M010-U04

Indicates: SSI interface cable, cable length 10 meters, PVC sheath, orange, -20~105°C, one end of the cable is an 8-pin (M16) right angle female connector, and one end scattered.

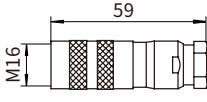
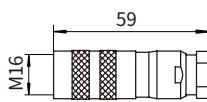
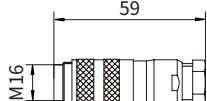
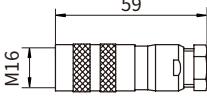
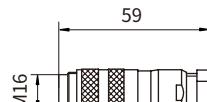
# Magnet ring Selection

Accessory name/model	Dimensions	Description/application
 Standard magnet ring Kit Order No.: 288501	 <p>Φ33 Φ13.5 Φ24 4-Φ4.3 120° R12 Φ33 Φ13.5 2-Φ4.3 22.5</p>	Magnetic insulation gasket: size same as magnet ring, thickness 5mm Screw: GB/T70.1, M4X18, Material 304 Spring gasket: GB/T 93, Φ 4, Material304 Includes: 1 Magnet, 1 gasket, 4 screws with spring washer Application: RHC/RF/FBGB/RS/RD/RB
 Sector magnet kit Order No.: 288502	 <p>120° R12 Φ33 Φ13.5 2-Φ4.3</p>	Magnetic insulation gasket: size same as magnet ring, thickness 5mm Screw: GB/T70.1, M4X18, Material 304 Spring gasket: GB/T 93, Φ 4, Material 304 Includes: 1 Magnet, 1 gasket, 2 screws with spring washer Application: RPC
 Weak magnet Magnet ring 32 kit Order No.: 288519	 <p>Φ32.5 Φ13.5 2-Φ4 22.5</p>	Magnetic insulation gasket: size same as magnet ring, thickness 5mm Screw: GB/T70.1, M4X20, Material 304 Spring gasket: GB/T93, Φ4, material 304 Includes: 1 Magnet, 1 gasket, 2 screws with spring washer Application: RHC/RF/FBGB/RS/RD/RB

# Cable Selection

Accessory name/model	Dimensions	Application
 Standard Cable (H) Order No.: 511802	3P×0.25mm <sup>2</sup> ; Φ7.2mm Conductor: 6-core, red/black, blue/green, yellow/white Sheath: Orange, PUR Shielding layer: tinned copper wire mesh + aluminum foil Application characteristics: soft, oil resistance and bending resistance Temperature: (-20~90°C)	Interface: Analog/SSI Interface/Start/Stop Structure: RHC/RPC/RF/FBGB/RS/RB/RD
 Orange European Standard Cable (U) Order No.: 511807	7x0.25mm <sup>2</sup> ; Φ7mm Conductor: 7-core, white/brown/green/yellow/gray/pink/blue Sheath: Orange, modified PVC Shielding layer: tinned copper wire mesh + aluminum foil Application characteristics: Extremely soft, oil resistance, bending resistance, high temperature resistance compliant with European colour code Temperature: (-20~105°C)	Interface: Analog/SSI Interface/Start/Stop Structure: RHC/RPC/RF/FBGB/RS/RB/RD

# Connector Selection

Accessory name/model	Dimensions	Application
 Six-pin female connector female Order No.: 312701		Analog
 Seven-pin female connector Order No.: 312703		SSI
 Seven-pin male connector Order No.: 312718		SSI
 Eight-pin female connector Order No.: 312720		SSI
 Eight-pin male connector Order No.: 312721		SSI/Analog

**Note:** Please contact other accessories such as magnet rings, connectors and cables of other specifications!

# Industrial Application



Metallurgical industry



Port machinery



Hydraulic machinery



Wind power industry



Injection molding machinery



Vulcanizing machinery



Die casting machinery



Vertical mill machinery



Construction machinery



Papermaking machinery



Liquid level tank



Forming machinery

# Country list

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- |   |  |
|---|--|
| AF - Afghanistan 阿富汗                        | CV - Cape Verde 佛得角                    |
| AL - Albania 阿尔巴尼亚                          | KY - Cayman Islands 开曼群岛               |
| DZ - Algeria 阿尔及利亚                          | CF - Central African Republic 中非       |
| AS - American Samoa 东萨摩亚                    | TD - Chad 乍得                           |
| AD - Andorra 安道尔                            | CL - Chile 智利                          |
| AO - Angola 安哥拉                             | CN - China 中国                          |
| Av - Anguilla 安圭拉岛                          | CX - Christmas Island 圣诞岛              |
| AQ - Antarctica 南极洲                         | CC - Cocos (Keeling) Islands 可可斯群岛     |
| AG - Antigua and Barbuda 安提瓜和巴布达            | CO - Colombia 哥伦比亚                     |
| AR - Argentina 阿根廷                          | KM - Comoros 科摩罗                       |
| AM - Armenia 亚美尼亚                           | CG - Congo 刚果                          |
| AA - Aruba 阿鲁巴                              | CD - Congo, Democratic Republic 刚果     |
| AU - Australia 澳大利亚                         | CK - Cook Islands 库克群岛                 |
| AT - Austria 奥地利                            | CR - Costa Rica 哥斯达黎加                  |
| AZ - Azerbaijan 阿塞拜疆                        | CI - Cote D'Ivoire (Ivory Coast) 象牙海岸  |
| <br>  | HR - Croatia (Hrvatska) 克罗地亚           |
| BF - Bahamas 巴哈马                            | CU - Cuba 古巴                           |
| BH - Bahrain 巴林                             | CY - Cyprus 塞普路斯                       |
| BB - Barbados 巴巴多斯                          | CZ - Czech Republic 捷克                 |
| BD - Bangladesh 孟加拉                         | CS - Czechoslovakia (former) 捷克斯洛伐克    |
| BY - Belarus 白俄罗斯                           | <br>                                   |
| BE - Belgium 比利时                            | DK - Denmark 丹麦                        |
| BZ - Belize 伯里兹                             | DJ - Djibouti 吉布提                      |
| BJ - Benin 贝宁                               | DM - Dominica 多米尼加共和国                  |
| BM - Bermuda 百慕大                            | DO - Dominican Republic 多米尼加联邦         |
| BS - Bahamas 巴哈马                            | <br>                                   |
| BT - Bhutan 不丹                              | TP - East Timor 东帝汶                    |
| BW - Botswana 博茨瓦纳                          | EC - Ecuador 厄瓜多尔                      |
| BO - Bolivia 玻利维亚                           | EG - Egypt 埃及                          |
| BA - Bosnia and Herzegovina 波黑              | SV - El Salvador 萨尔瓦多                  |
| BV - Bouvet Island 布韦岛                      | GQ - Equatorial Guinea 赤道几内亚           |
| BR - Brazil 巴西                              | ER - Eritrea 厄立特里亚                     |
| IO - British Indian Ocean Territory 英属印度洋领地 | EE - Estonia 爱沙尼亚                      |
| BN - Brunei Darussalam 文莱布鲁萨兰               | ET - Ethiopia 埃塞俄比亚                    |
| BG - Bulgaria 保加利亚                          | <br>                                   |
| BF - Burkina Faso 布基纳法索                     | FK - Falkland Islands (Malvinas) 福兰克群岛 |
| BI - Burundi 布隆迪                            | FO - Faroe Islands 法罗群岛                |
| <br>  | FJ - Fiji 斐济                           |
| KH - Cambodia (Internet) 柬埔寨                | FI - Finland 芬兰                        |
| CB - Cambodia (CIA World Fact Book) 柬埔寨     | FR - France 法国                         |
| CM - Cameroon 喀麦隆                           | FX - France, Metropolitan              |
| CA - Canada 加拿大                             | GF - French Guiana 法属圭亚那               |
|   | PF - French Polynesia 法属玻里尼西亚          |

TF - French Southern Territories 法国南部领地	KP - Korea (North) 朝鲜
MK - F.Y.R.O.M. (Macedonia)	KR - Korea (South) 韩国
GA - Gabon 加蓬	KW - Kuwait 科威特
GM - Gambia 冈比亚	KG - Kyrgyzstan 吉尔吉斯斯坦
GE - Georgia 格鲁吉亚	LA - Laos 老挝
DE - Germany 德国	LV - Latvia 拉托维亚
GH - Ghana 加纳	LB - Lebanon 黎巴嫩
GI - Gibraltar 直布罗陀	LI - Liechtenstein 列支顿士登
GB - Great Britain (UK) 英国	LR - Liberia 利比里亚
GR - Greece 希腊	LY - Libya 利比亚
GL - Greenland 格陵兰岛	LS - Lesotho 莱索托
GD - Grenada 格林纳达	LT - Lithuania 立陶宛
GP - Guadeloupe 法属德洛普群岛	LU - Luxembourg 卢森堡
GU - Guam 关岛	MO - Macau 中国澳门特区
GT - Guatemala 危地马拉	MG - Madagascar 马达加斯加
GN - Guinea 几内亚	MW - Malawi 马拉维
GW - Guinea-Bissau 几内亚比绍	MY - Malaysia 马来西亚
GY - Guyana 圭亚那	MV - Maldives 马尔代夫
HT - Haiti 海地	ML - Mali 马里
HM - Heard and McDonald Islands 赫德和麦克唐纳群岛	MT - Malta 马耳他
HN - Honduras 洪都拉斯	MH - Marshall Islands 马绍尔群岛
HK - Hong Kong 中国香港特区	MQ - Martinique 法属马提尼克群岛
HU - Hungary 匈牙利	MR - Mauritania 毛里塔尼亚
IS - Iceland 冰岛	MU - Mauritius 毛里求斯
IN - India 印度	YT - Mayotte
ID - Indonesia 印度尼西亚	MX - Mexico 墨西哥
IR - Iran 伊朗	FM - Micronesia 米克罗尼西亚
IQ - Iraq 伊拉克	MC - Monaco 摩纳哥
IE - Ireland 爱尔兰	MD - Moldova 摩尔多瓦
IL - Israel 以色列	MA - Morocco 摩洛哥
IT - Italy 意大利	MN - Mongolia 蒙古
JM - Jamaica 牙买加	MS - Montserrat 蒙塞拉特岛
JP - Japan 日本	MZ - Mozambique 莫桑比克
JO - Jordan 约旦	MM - Myanmar 缅甸
KZ - Kazakhstan 哈萨克斯坦	NA - Namibia 纳米比亚
KE - Kenya 肯尼亚	NR - Nauru 瑙鲁
KI - Kiribati 基里巴斯	NP - Nepal 尼泊尔
	NL - Netherlands 荷兰
	AN - Netherlands Antilles 荷属安德列斯
	NT - Neutral Zone 中立区(沙特-伊拉克间)
	NC - New Caledonia 新卡里多尼亚

NZ - New Zealand (Aotearoa) 新西兰	SG - Singapore 新加坡
NI - Nicaragua 尼加拉瓜	SI - Slovenia 斯罗文尼亚
NE - Niger 尼日尔	SK - Slovak Republic 斯洛伐克
NG - Nigeria 尼日利亚	Sb - Solomon Islands 所罗门群岛
NU - Niue 纽爱	SO - Somalia 索马里
NF - Norfolk Island 诺福克岛	ZA - South Africa 南非
MP - Northern Mariana Islands 北马里亚纳群岛	ES - Spain 西班牙
NO - Norway 挪威	LK - Sri Lanka 斯里兰卡
OM - Oman 阿曼	SH - St. Helena
PK - Pakistan 巴基斯坦	PM - St. Pierre and Miquelon 圣皮埃尔和密克隆群岛
PW - Palau 帕劳	SD - Sudan 苏丹
PA - Panama 巴拿马	SR - Suriname 苏里南
PG - Papua New Guinea 巴布亚新几内亚	SJ - Svalbard and Jan Mayen Islands 斯瓦尔巴特和扬马延岛
PY - Paraguay 巴拉圭	SZ - Swaziland 斯威士兰
PE - Peru 秘鲁	SE - Sweden 瑞典
PH - Philippines 菲律宾	CH - Switzerland 瑞士
PN - Pitcairn 皮特克恩岛	SY - Syria 叙利亚
PL - Poland 波兰	TW - Taiwan 中国台湾省
PT - Portugal 葡萄牙	TJ - Tajikistan 塔吉克斯坦
PR - Puerto Rico 波多黎各	TZ - Tanzania 坦桑尼亚
QA - Qatar 卡塔尔	TH - Thailand 泰国
RE - Reunion 法属留尼汪岛	TG - Togo 多哥
RO - Romania 罗马尼亚	TK - Tokelau 托克劳群岛
RU - Russian Federation 俄罗斯	TO - Tonga 汤加
RW - Rwanda 卢旺达	TT - Trinidad and Tobago 特立尼达和多巴哥
GS - S. Georgia and S. Sandwich Isls.	TN - Tunisia 突尼斯
KN - Saint Kitts and Nevis 圣基茨和尼维斯	TR - Turkey 土耳其
LC - Saint Lucia 圣卢西亚	TM - Turkmenistan 土库曼斯坦
VC - Saint Vincent and the Grenadines 圣文森特和格林纳丁斯	TC - Turks and Caicos Islands 特克斯和凯科斯群岛
WS - Samoa 西萨摩亚	TV - Tuvalu 图瓦卢
SM - San Marino 圣马力诺	UG - Uganda 乌干达
ST - Sao Tome and Principe 圣多美和普林西比	UA - Ukraine 乌克兰
SA - Saudi Arabia 沙特阿拉伯	AE - United Arab Emirates 阿联酋
SN - Senegal 塞内加尔	UK - United Kingdom 英国
SC - Seychelles 塞舌尔	US - United States 美国
SL - Sierra Leone 塞拉利昂	UM - US Minor Outlying Islands 美国海外领地
	UY - Uruguay 乌拉圭

SU - USSR (former) 前苏联

UZ - Uzbekistan 乌兹别克斯坦

VU - Vanuatu 瓦努阿鲁

VA - Vatican City State (Holy See) 梵蒂岗

VE - Venezuela 委内瑞拉

VN - Viet Nam 越南

VG - Virgin Islands (British) 英属维京群岛

VI - Virgin Islands (U.S.) 美属维京群岛

WF - Wallis and Futuna Islands 瓦里斯和福

图纳群岛

EH - Western Sahara 西撒哈拉

YE - Yemen 也门

YU - Yugoslavia 南斯拉夫

ZM - Zambia 赞比亚

(ZR - Zaire) - See CD Congo, Democratic  
Republic 扎伊尔

ZW - Zimbabwe 津巴布韦

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