



# Magnetostrictive Displacement Sensor

## R Series Product manual



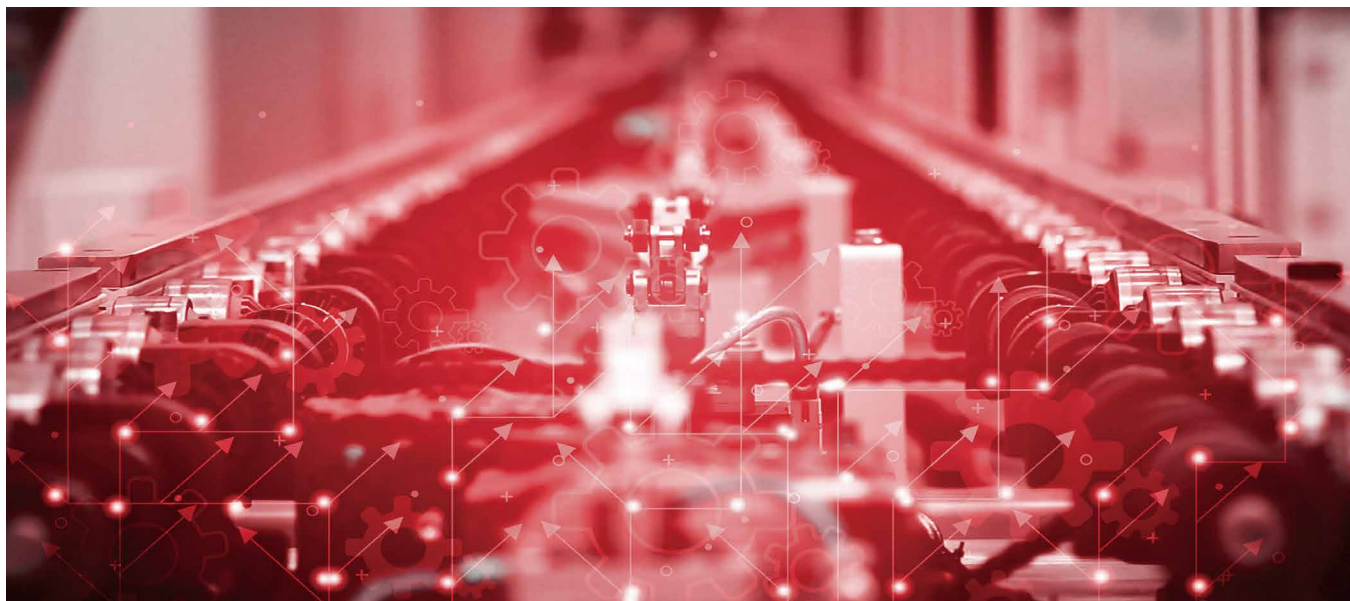
• High quality • High precision • Long service life

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# Company Profile

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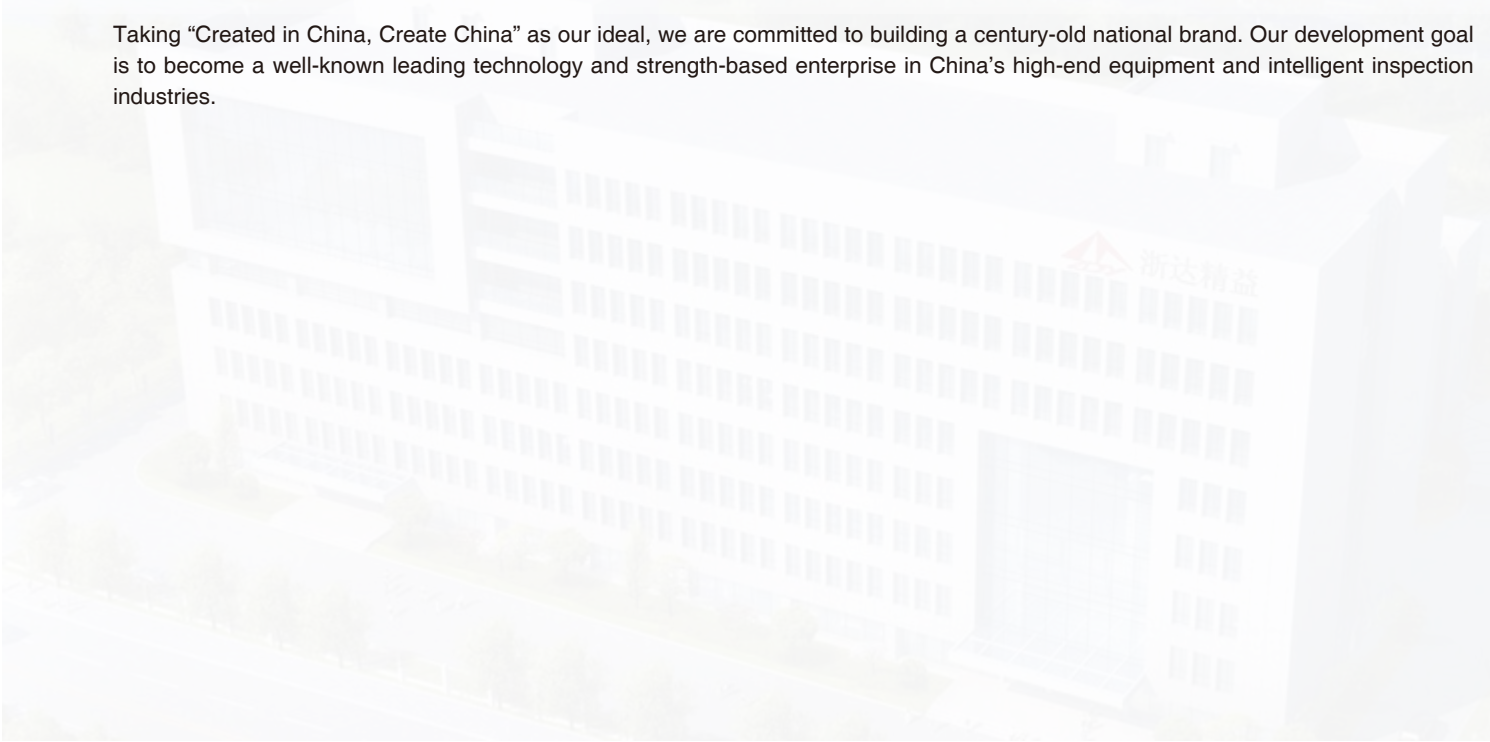
As a technological innovation enterprise born out of Zhejiang University, our company has more than 180 employees, including 4 overseas talents, 4 professors, and 2 associate professors. There are also 12 doctors, and more than 86% of employees with a bachelor degree or above.



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



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# RH/RP Displacement Sensor - SSI Output

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## Technical Characteristics

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- Rugged and fully enclosed design
- Non-wear, non-contact measurement method
- Linear measurement, absolute output
- High resolution, up to 0.1µm
- Easy diagnosis, LEDs real-time condition monitoring
- Repeatability is less than 0.001%FS
- Digital technology, stable and reliable
- Real-time induction and synchronous measurement
- Direct SSI signal output can directly replace encoder



## CC Product Parameters - SSI Output

### • Input

Measurement data	Position magnet ring
Stroke length	25~5500 mm, customized according to customer needs
Number of measurements	1

### • Output

Interface	SSI Synchronous Serial Interface				
Data Format	Binary or Gray code				
Data length	24/25/26bit				
Resolution	0.1/0.5 / 1 / 2 / 5 / 10 / 20 / 40/ 50 / 100 $\mu$ m				
Nonlinearity	< $\pm$ 0.01% of full scale, minimum $\pm$ 50 $\mu$ m				
Repetition accuracy	< $\pm$ 0.001% of full scale, minimum $\pm$ 1 $\mu$ m				
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 $\leq$ 1m) 500Hz (1m < range $\leq$ 2m)				
	250Hz (2m < range $\leq$ 3m), customizable				
Hysteresis	<10 $\mu$ m				
Temperature coefficient	<15ppm/°C				

### • Operating conditions

Magnet velocity	Arbitrary
Protection level	IP67RH Stainless Stell Rod/IP65RP 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, Grade4/3/4/3/3, Class A, CE Certification

### • 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) or 350bar continuous)/700bar (peak)
	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
Outgoing mode		Cable outlet or Connector

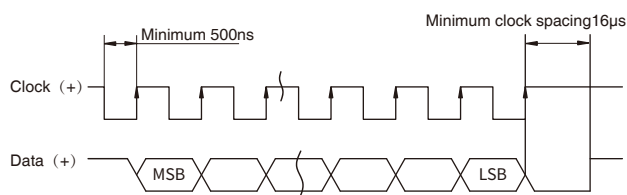
### • Electrical Connections

Input voltage	+24Vdc $\pm$ 20%
Operating current	< 80mA (varying with range)
Polarity protection	Max.-30Vdc
Overvoltage protection	Max.36Vdc
Insulation resistance	> 10M $\Omega$
Insulation strength	500V

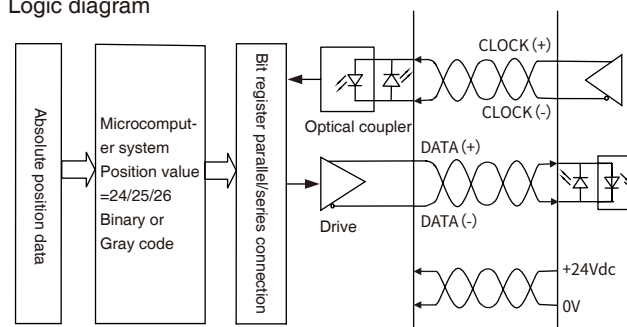
## SS Output Characteristics-SSI Output

- SSI output magnetostrictive displacement sensor can provide Synchronized Serial Interface (SSI), which can convert the real-time position of vernier magnet into 24-bit, 25-bit or 26-bit (binary or Gray code) serial data format, and transmit the data to the controller by serial communication after receiving the clock signal provided by the controller. The format of SSI output data is identical to absolute output encoder, and it can be directly connected with PLC function modules (such as SM338 or SM138 of Siemens), which can be conveniently used to replace absolute encoder.

Timing diagram



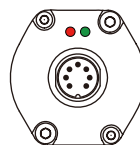
Logic diagram



## LED Real-time State Monitoring and Diagnosis

- Red and green LEDs built into the sensor head cover provide sensor working condition and diagnostic function.

Green light	ON	ON	Flash
Red light	OFF	ON	ON
Function	Normal work	The magnet leaves the Stroke length range or the magnet cannot be detected	Programming state



## BB Programming

- The TEC sensor can be programmed in the field using a USB converter. No needs to open the electronic bin, USB port power supply, standard cable connection, fully meet the needs of customers. The following parameters of the sensor can be modified by the configuration software of PC; Set sensor parameters (data length, data format, measurement direction); Graphical display of magnet position value; The user arbitrarily sets the sensor zero point and the measurement display value; Diagnose the sensor online by error code.



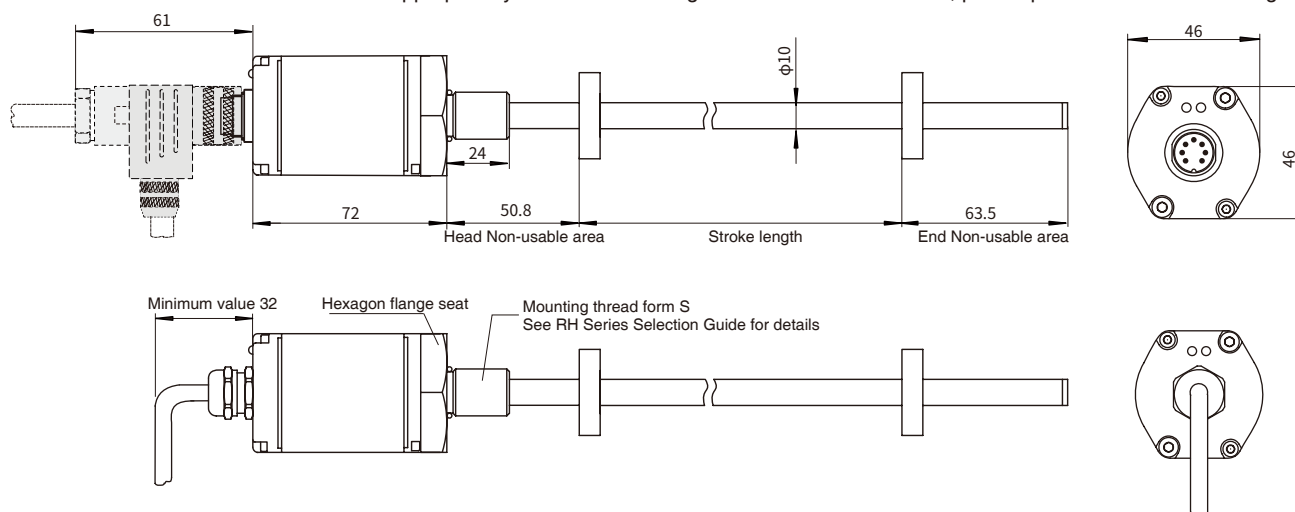
## A a Installation Instructions SSI Output

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 RH pressure-resistant rod sensor

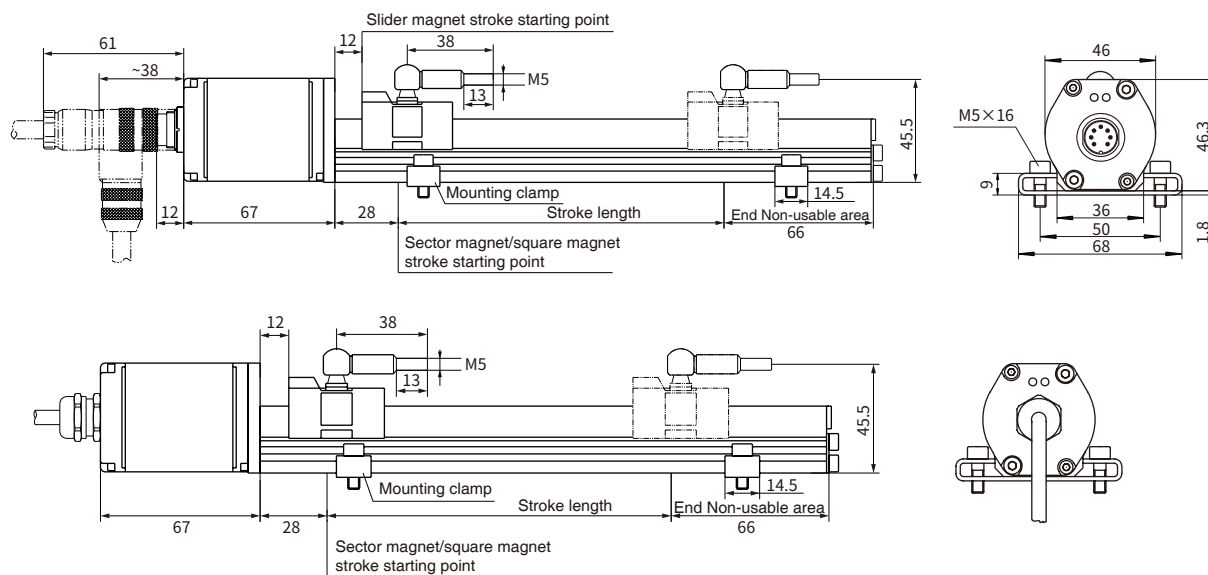
RH series pressure-resistant rod shell, built-in installation design for hydraulic system, pressure-resistant 35MPa continuous, flexible and simple installation mode, mounting thread form M18×1.5 or M20×1.5 or 3/4" -16UNF-3A.

Note: The measurement non-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 pointed out when ordering.



### • Dimensions and installation guidance of RP aluminum profile sensor

RP 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 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



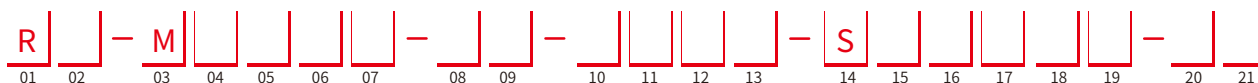
• 7-pin male connector arrangement (facing the sensor head)			
Pin	Line color 1*	Line color 2*	Pin/wire function definition
1	White	Grey	Data (-)
2	Yellow	Pink	Data (+)
3	Blue	Yellow	Clock (+)
4	Green	Green	Clock (-)
5	Red	Brown	+24Vdc power supply (-20%~+20%)
6	Black	White	0 Vdc
7	-	-	Do not connect



• 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℃  
\* Line color 2/3: Cable PVC sheath, orange, -20~105℃

## C Selection Guide-SSI Output



### 01 - 02 Sensor shell form

R	H	Pressure-resistant rod (internal or external)
R	P	Aluminum profile (external only)

### 03 - 07 Measuring range

Four digits, less than four digits are preceded by zero, M means metric system, unitmm

### 08 - 09 Magnet ring Type / Mounting Thread Form

Only for RH series	S	1	M 18×1.5, measuring rod diameter 10mm, 304 material
	S	2	M20×1.5, measuring rod diameter 10mm, 304 material
	S	3	3/4 "-16UNF-3A, measuring rod diameter 10mm, 304 material
Only for RP series	C	1	Sector magnet
	C	2	Slider magnet
	C	3	Square magnet

### 10 - 13 Connection form

#### 10- 11 Cable outlet mode

D	H	PUR sheath, orange,-20~90℃, end scattered, line color 1
D	U	PVC sheath, orange,-20~105℃, and one end scattered, line color 2
D	B	PVC sheath, orange,-20~105℃, and one end scattered, line color 3
D	I	PUR sheath, orange,-20~90℃, end with 6-pin connector
D	V	PVC sheath, orange,-20~105℃, end with 6-pin connector
D	C	PVC sheath, orange,-20~105℃, end with 8-pin connector

### 12 - 13 Cable outlet mode: cable length, 01~99 meters

### 10 - 13 Connector mode

P	H	7	0	M16 male connector (7-pin)
P	B	8	0	M16 male connector (8-pin)

### 14 - 19 Signal output mode

#### 15 Data length

1	24-bit	2	25-bit	3	26-bit*
* 26-bit parity bits and 25-bit status bits					

#### 16 Data Format

B	Binary	G	Gray code
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#### 17 Resolution

1	0.1mm	2	0.05mm
3	0.02mm	4	0.01mm
5	0.005mm	6	0.002mm
7	0.001mm	8	0.04mm
9	0.0005mm	0	0.0001mm

#### 18 Direction

0	Forward	1	Reverse
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#### 19 Mode

0	Regular	1	Synchronization	2	High update rate
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### 20 - 21 Non-usable area at head and end, customizable

S	0	50.8mm+63.5mm
B	0	30mm+60mm
S	1	28mm+66mm (used in RP series)

Note: See SSI cable accessories 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: RH-M0500-S1-PH70-S2B700-S0

Indicates: The ordered product model is RH series displacement sensor, the measuring range is 500mm, the mounting thread form is M18×1.5, the measuring rod diameter is 10mm, 304 material, 7-pin M16 connector connection, no cable, SSI output (data bit length is 25-bit, output format is binary, resolution is 0.001mm, forward output, asynchronous mode), and the head non-usable area is 50.8mm and the end non-usable area is 63.5mm.

## SS SSI Cable accessories selection Guide

SSI - M -

01 02 03 04 05 06 07 08 09 10

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

- Selection example: SSI-M005-H01

Indicates: SSI interface cable, cable length 5 meters, PURsheath, orange, -20~90℃, 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℃, one end of the cable is an 8-pin (M16) right angle female connector, and one end scattered.

