# 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

# Product Parameters-Analog Output

## Input

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

## Output

| | |
|---|---|
| Current | 4 ~ 20mA or 20 ~ 4mA(min/max load 0/5002) |
| 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 | 1KHz (range ≤ 1m), 500Hz (1m < range ≤ 2m), 333Hz (2m < range ≤ 3m), customizable |
| Temperature coefficient | ＜30ppm/℃ |

## Operating conditions

| | |
|---|---|
| Magnet velocity | Arbitrary |
| Protection level | IP67 RH Stainless Stell Rod /IP65 RP Aluminum profile |
| Operating temperature | -40℃ ~ +85℃ |
| 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

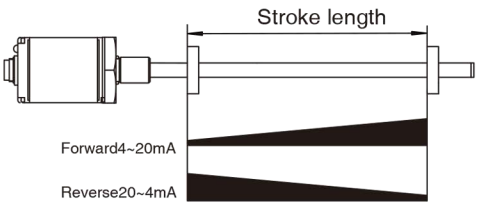
| | | |
|---|---|---|
| | Failure indication | Displayed by the LEDs on the rear cover of the electronic compartment |
| RH Series | Electronic bin | Aluminum alloy |
| | Measuring rod | 304 stainless steel |
| | Outer tube pressure | 35MPa（continuous）/70MPa（peak）or 350bar（continuous）/ 700bar（peak） |
| | 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

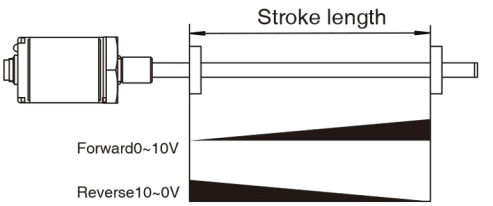
| | |
|---|---|
| Input voltage | +24Vdc±20% |
| Operating current | <80mA (varying with range) |
| Polarity protection | Max.-30Vdc |
| Overvoltage protection | Max.36Vdc |
| Insulation resistance | ＞10MΩ |
| Insulation strength | 500V |

## S s Output Characteristics-Analog Output

- The measurement accuracy of analog output magnetostrictive displacement sensor depends on the number of bits of built-in D/A module. Displacement signals can be directly output to external controllers, such as analog input of PLC.
- The sensor transforms the absolute position of the vernier magnet into a standard analog signal in real time, that is, 0~20A (or reverse), 4~20mA (or reverse) DC current or 0~5V (or reverse),-5~+5V (or reverse), 0~10V (or reverse),-10~+10 (or reverse) DC voltage, etc. The change trend of the output value is linear with the movement direction of the magnet ring, which can be set as forward and reverse output according to needs. As shown in the following figure:




Current output includes: 0~20mA (or reverse) 、4~20mA (or reverse)

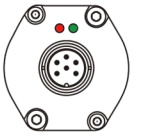



Voltage output includes: 0~5V (or reverse) 、-5~+5V (or reverse) 、0~10V (or reverse) 、-10~+10V (or reverse)

## L l LED Real-time State Monitoring and Diagnosis

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

| | | | | |
|---|---|---|---|---|
| Green light | ON | ON | ON | Flash |
| Red light | OFF | Flash | ON | ON |
| Function | Normal work | Magnet leaves Stroke length range | Magnet not detected | Programming status |



## B b Programming

- TEC sensors are field programmable using a USB converter. No need to open the electronic bin, USB port power supply, standard cable connection, fully meet customer needs. The following parameters of the sensor can be modified through the configuration software on the PC side: set the measurement direction of the sensor; set the zero point and full scale point of the sensor; graphically display the magnet ring position value; diagnose the sensor online through the error code.


USB converter
(Order No. TEC612811)


Sensor programming window

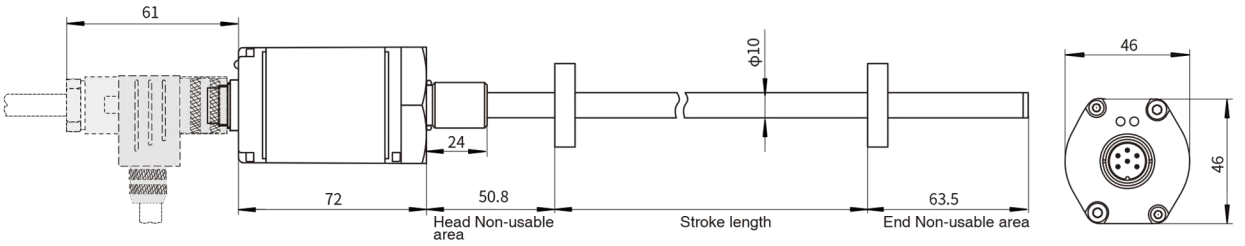
# Aa Installation Instructions-Analog Output

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 RH pressure-resistant rod sensor

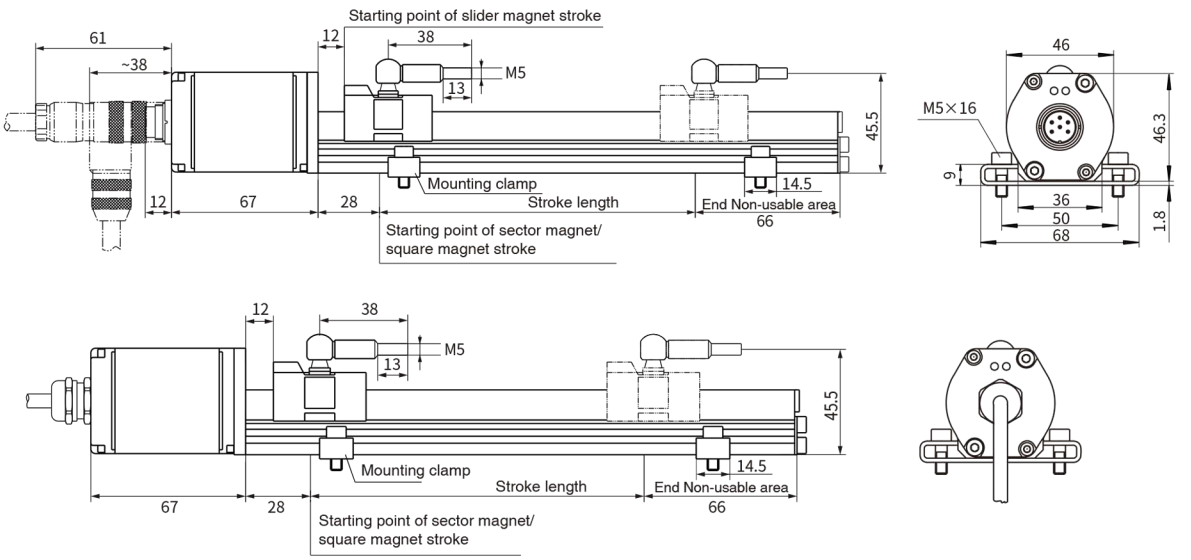
RH series pressure-resistant rodshell, built-in installation design for hydraulic system, pressure-resistant 35MPa continuous, flexible and simple installation mode.Mounting thread form M18×1.5 or M20×1.5 or 3/4"-16UNF-3A.

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 pointed out when ordering.

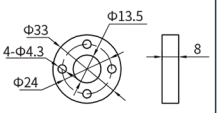
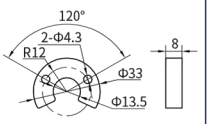
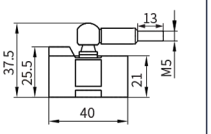


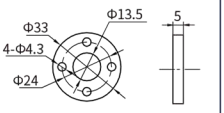
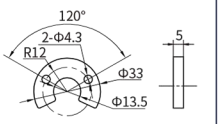
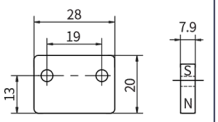

## ● Dimensions and installation guidance of RP aluminum profile sensor

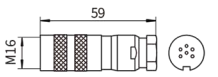
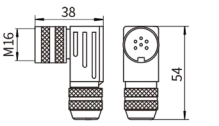
RP Series aluminum profile provides flexible and simple external installation mode, which is suitable for stroke or position detection of linear motion mechanism, and can also be used for external position detection of hydraulic cylinder.



## Common Accessories - Analog Output

| Accessory name/ model | Dimensions |
|---|---|
| Standard magnet ring Order No.: 211501 |   |
| Sector magnet Order No.: 211502 |   |
| Slider magnet Order No.: 211503 |   |

| Accessory name/ model | Dimensions |
|---|---|
| Magnetic isolation gasket |   |
| Sector magnetic isolation gasket |   |
| Square magnet Order No.: 211508 |   |

| Accessory name/ model | Dimensions |
|---|---|
| 6-pin Female Connector Order No.: 312701 |   |
| 6-pin 90 Female Connector Order No.: 312702 |   |

**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 | Reservation |
| 4 | White | Green | Reservation |
| 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 | Reservation |
| 4 | - | Reservation |
| 5 | Green | 0...10V |
| 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℃

# Selection Guide - Analog Output

R □ – M □ □ □ □ – □ □ – □ □ □ □ – □ □ □ □ – □ □

01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19

| 01-02 | Sensor shell form |
|---|---|
| RH | Pressure-resistant rod (internal or external) |
| RP | 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 | S1 | M18×1.5, measuring rod diameter 10mm, 304 material |
| | S2 | M20×1.5, measuring rod diameter 10mm, 304 material |
| | S3 | 3/4"-16UNF-3A, measuring rod diameter 10mm, 304 material |
| Only for RP series | C1 | Sector magnet |
| | C2 | Slider magnet |
| | C3 | Square magnet |

| 10-13 | Connection form |
|---|---|

| 10-11 | Cable outlet mode |
|---|---|
| DH | PUR sheath, orange,-20~90℃, end scattered, line color 1 |
| DU | PVCsheath, orange, -20~105℃, end scattered, line color 2 |
| DB | PVC sheath, orange,-20~105℃, end scattered, line color 3 |
| DI | PUR sheath, orange,-20~90℃, end with 6-pin connector |
| DV | PVC sheath, orange,-20~105℃, end with 6-pin connector |
| DC | PVC sheath, orange,-20~105℃, end with 8-pin connector |

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

Note: For supporting cables, please refer to Analog/Start-Stop Cable Accessories Selection

| 10-13 | Connector mode |
|---|---|
| PH60 | M16 male connector (6-pin) |
| PB80 | M16 male connector (8-pin) |

| 14-17 | Signal output mode |
|---|---|

| 14-15 | Output form and direction |
|---|---|
| A0 | Current output, 4 ~ 20mA |
| A1 | Current output, 20 ~ 4mA |
| A2 | Current output, 0 ~ 20mA |
| A3 | Current output, 20 ~ 0mA |
| V0 | Voltage output, 0 ~ 10V |
| V1 | Voltage output, 10 ~ 0V |
| V2 | Voltage output, -10 ~ +10V |
| V3 | Voltage output, +10 ~ -10V |
| V4 | Voltage output, 0 ~ 5V |
| V5 | Voltage output, 5 ~ 0V |
| V6 | Voltage output, -5 ~ +5V |
| V7 | Voltage output, +5 ~ -5V |

| 16 | Number of magnet rings |
|---|---|
| 1 | Single magnet ring |

| 17 | No magnet ring state |
|---|---|
| A | Keep the original value |
| B | Maximum value |
| C | Minimum value |

| 18-19 | Non-usable area at head and end, customizable |
|---|---|
| S0 | 50.8mm+63.5mm |
| B0 | 30mm+60mm |
| S1 | 28mm+66mm (used in RP series) |

- 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-M0800-S1-DH02-A01C-S0

  Indicates: the ordered product model is RH structural displacement sensor, the measuring range is 800mm, and the mounting thread form is M18×1.5; the diameter of the measuring rod is 10mm, and the material is 304; cable ouelet connection, 2m long PUR orange cable end scattered; 4~20mA current output; no magnet ring display value is the minimum value; single magnet ring; the non-usable area of the first end is 50.8mm, and the non-usable area of the end is 63.5mm.

## Selection of Analog/Start-Stop Cable Fittings

| A | S | T | – | M | | | | – | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | 02 | 03 | | 04 | 05 | 06 | 07 | | 08 | 09 | 10 |

| 01 - 03 | Type |
|---|---|
| A S T | Analog/Start-Stop 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 and 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 | H: cable type, PURsheath, orange, -20~90℃ |
| | U: Cable type, PVCsheath, orange, -20~105℃ |

- Selection example: AST-M005-H01

  Indicates: Analog or Start-Stop interface cable, cable length 5 meters, PURsheath, orange, -20~90°C, one end of the cable is 6-pin (M16) vcvfemale connector, and one end scattered.

- Selection example:AST-M010-U04

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