

## R-Series Models RP and RH Sensors EtherCAT® Industrial Ethernet Interface



R-Series EtherCAT®

- Rugged industrial sensor
- Linear, absolute measurement
- LEDs for sensor diagnostics
- Non-contact sensing technology
- Superior accuracy, resolution down to 1 µm
- 100 µsec update rate
- Non-linearity less than 0.01%
- Repeatability within 0.001%
- Direct EtherCAT interface, displacement + speed
- Multi-magnet position measurement (up to 20 positions per sensor)

Parameters	Specifications
<b>Measured variable:</b>	Displacement / Velocity 1-5 measurement option 1-20 magnet measurement
<b>Resolution:</b>	Displacement: 1 to 1000 µm selectable Speed: 1µm/s (Quality rating) adjustable according to velocity and measuring length
<b>Update time:</b>	10 KHz (Overstampling is active while the scanning cycle is shorter than the measuring cycle)
<b>Non-linearity:</b>	<± 0.01% full scale (minimum ±50µm)
<b>Repeatability:</b>	<± 0.001% full scale (minimum ± 2.5 µm) Hysteresis: < 4 µm
<b>Outputs:</b>	Interface: EtherCAT Data format: EtherCAT 100 Base-Tx, fast Ethernet Data transmission rate: 100 Mbit/s max.
<b>Stroke length:</b>	Profile style: 50 mm (2 in.) to 5080 mm (200 in.) Rod style: 50 mm (2 in.) to 7620 mm (300 in.)
<b>Operating voltage:</b>	+24 Vdc nominal: -15 or +20% Polarity protection: up to -30 Vdc Overvoltage protection: up to 36 Vdc Current drain: 80 mA typical Dielectric withstand voltage: 500 Vdc (DC ground to machine ground)
<b>Operating temperature:</b>	Temperature: - 40 °C (-40 °F) to 75 °C, (167 °F) Relative humidity: 90% no condensation Temperature coefficient: < 15 ppm / °C

Parameters	Specifications (continued)
<b>EMC test (Pending):</b>	Emissions IEC/EN 50081-1, Immunity IEC/EN 50082-2, IEC/EN 61000-4-2/3/4/6, level 3/4 criterium A, CE qualification pending.
<b>Shock rating:</b>	100 g (single hit)/IEC standard 68-2-27 (survivability)
<b>Vibration rating:</b>	15 g/10-2000 Hz/IEC standard 68-2-6
<b>Connection type:</b>	D56 option: 2 x 4-pin connectors (M12) female. plus 1 x 4-pin connector (M8) male.

### PROFILE STYLE (MODEL RP) SENSOR

<b>Electronic head:</b>	Aluminum housing Diagnostic display (LED's located beside connectors)
<b>Sealing:</b>	IP 65
<b>Sensor extrusion:</b>	Aluminum
<b>Mounting:</b>	Adjustable mounting feet or T-slot nut (M5 threads) in base channel
<b>Magnet type:</b>	Captive-sliding magnet or open-ring magnet

### ROD STYLE (MODEL RH) SENSOR

<b>Electronic head:</b>	Aluminum housing Diagnostic display (LED's located beside connectors)
<b>Sealing:</b>	IP 67
<b>Sensor rod with flange:</b>	304L Stainless steel
<b>Operating pressure:</b>	350 bar static, 690 bar spike (5000 psi static; 10,000 psi spike)
<b>Mounting:</b>	Any orientation. Threaded flange M18 x 1.5 or 3/4-16 UNF-3A
<b>Typical mounting torque:</b>	45 N-m (33 ft. - lbs.)
<b>Magnet type:</b>	Ring magnet, open-ring magnet, or magnet float



**EtherCAT interface**

Temposonics R-Series EtherCAT sensors represent MTS Sensors' latest development in high-speed networked position feedback. EtherCAT (Ethernet for Control Automation Technology)\* is a unique interface for industrial Ethernet that provides the fastest, most deterministic industrial networking solution possible using the base Ethernet physical layer. This format, coupled with our high speed networked sensing capability, enables machine builders and automation engineers to overcome bandwidth and node limitation issues of other commercially available industrial networks.

\* Developed by Beckhoff Automation and supported by the EtherCAT Technology Group (ETG)

**EtherCAT operation modes**

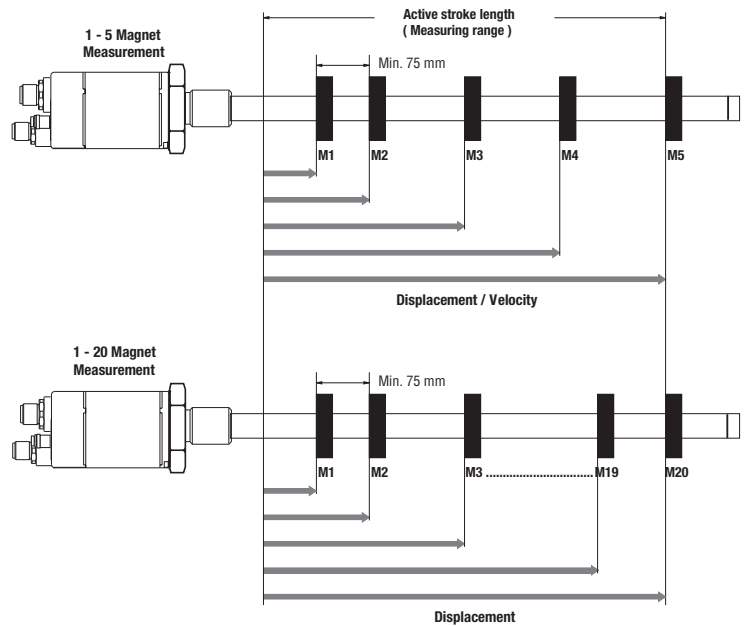
There are two versions available:

- E101 Fast update position and velocity
  - Designed for high speed motion control
  - Up to 5 simultaneous magnet measurements
  - 100 µsec update rate, (independent of stroke length)
- E102 Multi-magnet position and velocity
  - Designed for gauging systems having many magnet positions
  - Up to 20 simultaneous magnet measurements
  - Standard update rates, (stroke-length dependent)

**Sensor status and diagnostic display**

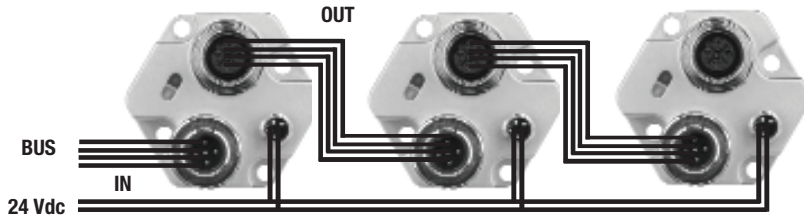
Integrated LEDs (green/red) provide basic visual feedback for normal sensor operation and troubleshooting including missing or out of range magnet and network status and activity.

Green ("Power")	Red ("Error")	Description
ON	OFF	Power applied
ON	ON	Missing or incorrect number of magnets
Flashing	OFF	Ethernet communications
Flashing	ON	Ethernet communication + magnet error (above)



**D56 connector option for “daisy chain” topologies**

A separate cable is used for the bus and for the supply voltage. Unused connectors should be covered by a protective cap.



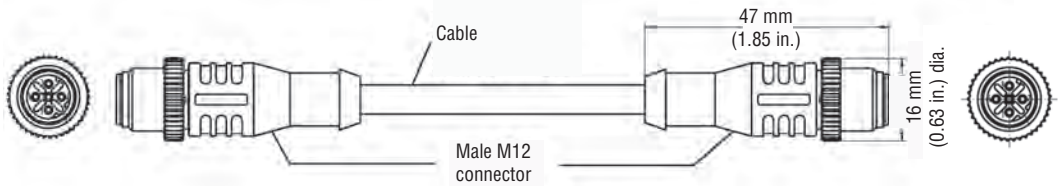
BUS In / Out	Pin	Cable	Function
	1	yellow	Tx+
	2	white	Rx+
	3	orange	Tx-
	4	blue	Rx-

Female Female  
Integral D56 connectors as viewed from end of sensor

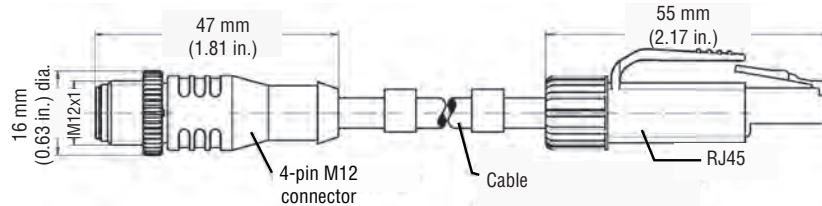
Input voltage	Pin	Cable	Supply Voltage
	1	brown	+24 Vdc (-15/+20)
	2	white	do not connect
	3	blue	0 Vdc (GND)
	4	black	do not connect

Male  
Integral power connector as viewed from end of sensor

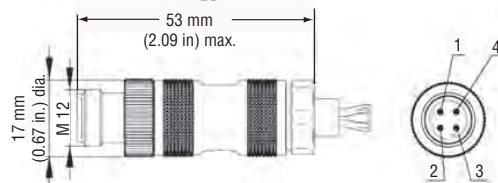
**5 m industrial Ethernet cable (Cat 5e ES) w/2 4 pin M12 connectors (D-coded) PUR jacket, green Part no. 530064**



**5 m industrial Ethernet cable (Cat 5e ES) w/RJ45 connector and M12 connector (D-coded) PUR jacket, green Part no. 530065**



**M12 connector (male, D-coded) w/IDC technology Part no. 370523**



**Shielded PUR cable w/M8 connector (female) and pigtail for 24 Vdc input, Wire gauge: 4 x 0.25 mm<sup>2</sup> shielded, 5m length Part no. 530066**

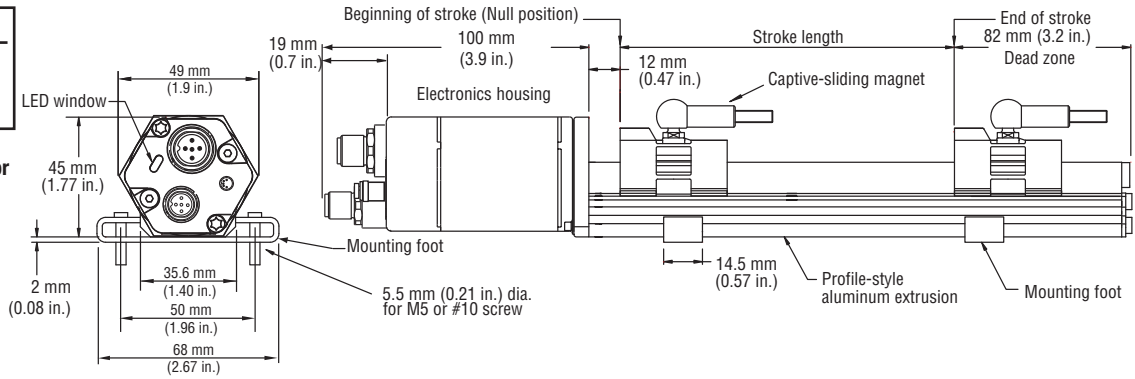


## MODEL RP PROFILE-STYLE SENSOR

### Captive-sliding magnet

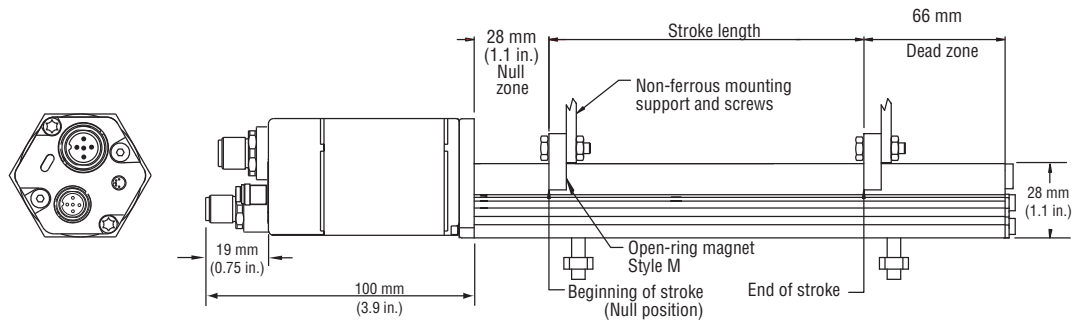
**Note:**  
See page 58 for installed magnet dimensions.

D56 connector



### Open-ring magnet

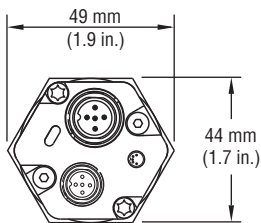
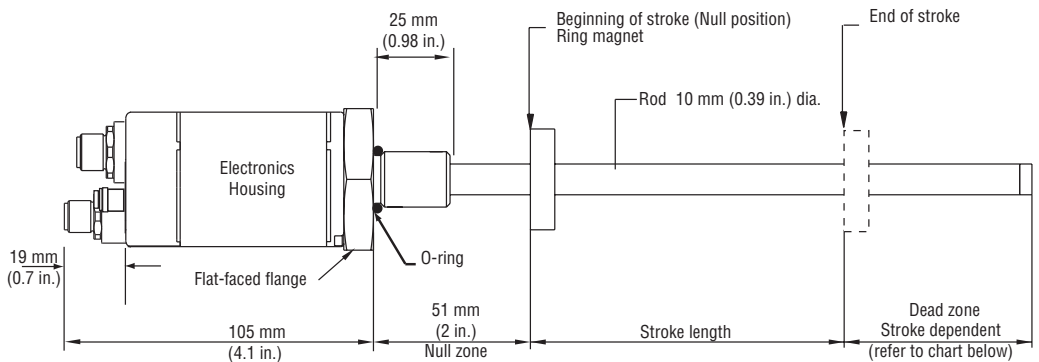
D56 connector



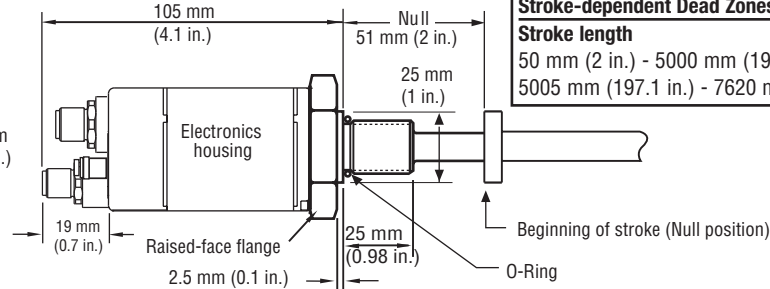
## MODEL RH ROD-STYLE SENSOR

The rod-style sensor (model RH) offers modular construction, flexible mounting configurations, and easy installation. It is designed for internal mounting in applications where high pressure conditions exist, (5000 psi continuous, 10,000 psi spike), such as hydraulic cylinders. The model RH sensor may also be mounted externally in many applications.

**Note:**  
See page 58 for installed magnet dimensions.



D56 Connector

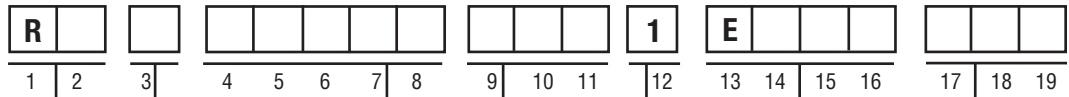


#### Stroke-dependent Dead Zones

Stroke length	Dead Zone
50 mm (2 in.) - 5000 mm (197 in.)	63.5 mm (2.5 in.)
5005 mm (197.1 in.) - 7620 mm (300 in.)	66 mm (2.6 in.)

Housing style Flange type	Description	A Flange threads	B Dimensions	C Dimensions
T	US customary threads with raised-face flange	3/4" - 16 UNF-3A	44.5 mm (1.75 in.)	51 mm (2 in.)
S	US customary threads with flat-faced flange	3/4" - 16 UNF-3A	44.5 mm (1.75 in.)	51 mm (2 in.)
M	Metric threads with flat-faced flange	M18 x 1.5	46 mm (1.81 in.)	53 mm (2.1 in.)

**HOW TO ORDER**



**SENSOR MODEL**

- RP = Profile style
- RH = Hydraulic rod-style

**HOUSING STYLE**

Model RP profile-style sensor only (magnet included):

- S = Captive-sliding magnet with joint at top (part no. 252182)
- V = Captive-sliding magnet with joint at front (part no. 252184)
- M = Open-ring magnet (part no. 251416-2)

Model RH rod-style sensor only (magnet must be ordered separately):

- T = US customary threads, raised-faced flange and pressure tube, standard
- S = US customary threads, flat-faced flange and pressure tube, standard
- U = Same as option "T", except uses fluoroelastomer seals for electronics housing
- H = Same as option "S", except uses fluoroelastomer seals for electronics housing
- M = Metric threads, flat-faced flange and pressure tube, standard
- V = Same as option "M", except uses fluoroelastomer seals for electronics housing
- B = Sensor cartridge only, no flange and pressure tube. Stroke length < 1830 mm (72 in.)

Model RF flex sensor only, (reference page 41 for flex housing style):

magnet must be ordered separately:

- S = US customary threads, flat-faced flange
- M = Metric threads, flat-faced flange

**STROKE LENGTH**

- M = Millimeters (Encode in 5 mm increments)
- . U = Inches and tenths (Encode in 0.1 in. increments)

**CONNECTION TYPE**

- D56 = 2 x 4 pin, female (M12-D), plus 4-pin male (M8).

**INPUT VOLTAGE**

- 1 = +24 Vdc (+20%, -15%)

**OUTPUT**

- E101 = EtherCAT, position and velocity, maximum 5 magnets
- E102 = EtherCAT, position and velocity, maximum 20 magnets

**NUMBER OF MAGNETS**

(For multi-position measurement only)

- Z \_ \_ = Number of magnets for output E101 (range 02 to 05), or for output E102 (range 02 to 20).  
Order additional magnets separately for multi-position measurement

**Stroke length notes:**

1. RH stroke length = 50 mm (2 in.) - 7620 mm (300 in.)
2. RP stroke length = 50 mm (2 in.) - 5080 mm (200 in.)

