

# Temposonics®

Magnetostrictive, Absolute, Non-contact  
Linear-Position Sensors



**R-Series Models RP and RH**  
CANbus Outputs (CANopen/CANbasic)

Document Part Number  
550991 Revision D

## Data Sheet



Model RP Profile-style position sensor

Model RH Rod-style position sensor

### FEATURES

- Linear, Absolute Measurement
- LEDs For Sensor Diagnostics
- Superior Accuracy, Resolution down to 2  $\mu\text{m}$
- Non-Contact Sensing Technology
- Linearity Deviation Less Than 0.01%
- Repeatability Within 0.001%
- Direct CAN Output (Position + Velocity)

### BENEFITS

- Rugged Industrial Sensor
- Selectable Bus Termination (CANopen)
- CANopen with Heartbeat Function

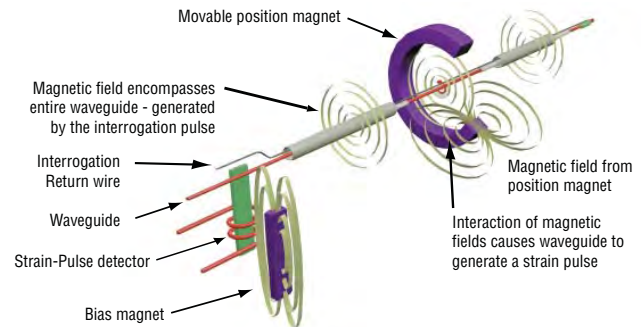
### APPLICATIONS

- Continuous Operation In Harsh Industrial Conditions
- High Pressure Conditions
- For Accurate, Multi-Magnet Position Measurement (up to 20 positions per sensor)

### TYPICAL INDUSTRIES

- Factory Automation
- Fluid Power
- Plastic Injection and Blow Molding
- Material Handling and Packaging

### Time-based Magnetostrictive position sensing principle



### Benefits of Magnetostriction

Temposonics linear-position sensors use the time-based magnetostrictive position sensing principle developed by MTS. Within the sensing element, a sonic-strain pulse is induced in a specially designed magnetostrictive waveguide by the momentary interaction of two magnetic fields. One field comes from a moveable permanent magnet that passes along the outside of the sensor. The other field comes from an “interrogation” current pulse applied along the waveguide. The resulting strain pulse travels at sonic speed along the waveguide and is detected at the head of the sensing element.

The position of the magnet is determined with high precision and speed by accurately measuring the elapsed time between the application of the interrogation pulse and the arrival of the resulting strain pulse with a high-speed counter. The elapsed time measurement is directly proportional to the position of the permanent magnet and is an absolute value. Therefore, the sensor's output signal corresponds to absolute position, instead of incremental, and never requires recalibration or re-homing after a power loss. Absolute, non-contact sensing eliminates wear, and guarantees the best durability and output repeatability.

Sold & Serviced By:



Toll Free Phone (877) SERV098  
Toll Free Fax (877) SERV099  
www.electromate.com  
sales@electromate.com

## Product Overview and Specifications

### Product overview

R-Series model RH and RP sensors are extremely robust and are ideal for continuous operation under harsh industrial conditions.

MTS offers two standard sensor housings, rod and profile extrusion. The rod housing is capable of withstanding high pressures such as those found in hydraulic cylinders.

The profile extrusion housing provides convenient mounting options and captive sliding magnets which utilize slide bearings of special material that reduce friction, and help mitigate dirt build up.

The sensor head contains the active signal conditioning and a complete integrated electronics interface. Double shielding is used to ensure EMI protection for unsurpassed reliability and operating safety.

### Product specifications

| Parameters                        | Specifications  |
|-----------------------------------|---|
| <b>OUTPUT</b>                     |   |
| <b>Measured output variables:</b> | Position, velocity, optional multi-magnet position measurements (up to 20 magnet positions simultaneously)  |
| <b>Resolution:</b>                | <b>CANopen:</b><br><b>Position:</b> 5 µm<br>2 µm<br><b>CANbasic:</b><br><b>Position:</b> 5 µm<br>2 µm<br><b>Velocity:</b> 0.5 mm/s<br>0.2 mm/s<br><b>Velocity:</b> 1.0 mm/s<br>0.1 mm/s   |
| <b>Update times::</b>             | 1.0 ms up to 2400 mm,<br>2.0 ms up to 4800 mm,<br>4.0 ms up to 7600 mm stroke length<br>Add 0.5 ms for CANbasic up to 1200 mm   |
| <b>Linearity deviation:</b>       | < ± 0.01% full stroke (minimum ± 40 µm) (Linearity Correction Option (LCO) available)   |
| <b>Repeatability:</b>             | < ± 0.001% full stroke (minimum ± 2.5 µm)   |
| <b>Hysteresis:</b>                | < 4 µm  |
| <b>Outputs:</b>                   | <b>Interface:</b> CAN-Fieldbus system ISO DIS 11898<br><b>Data protocol CANopen:</b> CIA standard DS-301 V4.02<br>encoder profile DS-406 V3.1<br><b>CANbasic:</b> CAN 2.0 A   |
| <b>Baud rate, kBit/s:</b>         | 1000 800 500 250 125 50 20  |
| <b>Cable length, m:</b>           | <25 <50 <100 <250 <500 <1000 <2500<br><i>Sensors will be supplied with ordered Baud rate which can be changed by the customer.</i>  |
| <b>Stroke length:</b>             | <b>Range (Profile style):</b> 25 mm to 5080 mm (1 in. to 200 in.)<br><b>Range (Rod style):</b> 25 mm to 7620 mm (1 in. to 300 in.)  |
| <b>ELECTRONICS</b>                |   |
| <b>Operating voltage:</b>         | <b>+24 Vdc nominal:</b> -15% or +20%<br><b>Polarity protection:</b> up to -30 Vdc<br><b>Over voltage protection:</b> up to 36 Vdc<br><b>Current drain:</b> 100 mA typical<br><b>Dielectric withstand voltage:</b> 500 Vdc (DC ground to machine ground) |

| Parameters                             | Specifications  |
|--|---|
| <b>ENVIRONMENTAL</b>                   |   |
| <b>Operating conditions:</b>           | <b>Operating temperature:</b> -40 °C (-40 °F) to +75 °C (+167 °F)<br><b>Relative humidity:</b> 90% no condensation<br><b>Temperature coefficient:</b> < 15 ppm/ °C    |
| <b>EMC test:</b>                       | <b>Electromagnetic emission:</b> IEC/EN 50081-1<br><b>Electromagnetic susceptibility:</b> IEC/EN 50082-2, IEC/EN 61000-4-2/3/4/6, level 3/4 criterium A, CE qualified |
| <b>Shock rating:</b>                   | 100 g (single hit)/IEC standard 68-2-27 (survivability)   |
| <b>Vibration rating:</b>               | 15 g / 10 to 2000 Hz / IEC standard 68-2-6  |
| <b>WIRING</b>                          |   |
| <b>Connection type:</b>                | Single or dual 6-pin male D60 (M16) connector or two 5-pin Male/Female D54 (M12) connectors with 4-pin male (MS) connector or integral cable                          |
| <b>PROFILE STYLE SENSOR (MODEL RP)</b> |   |
| <b>Electronic head:</b>                | Aluminum housing with diagnostic LED display (LEDs located beside connector/cable exit)   |
| <b>Sealing:</b>                        | IP 65   |
| <b>Sensor extrusion:</b>               | Aluminum (Temposonics, profile style)   |
| <b>Mounting:</b>                       | Any orientation. Adjustable mounting feet or T-slot nut (M5 threads) in bottom groove   |
| <b>Magnet types:</b>                   | Captive-sliding magnet or open-ring magnet  |
| <b>ROD STYLE SENSOR (MODEL RH)</b>     |   |
| <b>Electronic head:</b>                | Aluminum housing with diagnostic LED display (LEDs located beside connector/cable exit)   |
| <b>Sealing:</b>                        | IP 67 or IP 68 for integral cable models  |
| <b>Sensor rod:</b>                     | 304L stainless steel  |
| <b>Operating pressure:</b>             | 350 bar static, 690 bar peak (5000 psi static, 10,000 psi peak)   |
| <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 types:</b>                   | Ring magnet, open-ring magnet, or magnet float  |

Sold & Serviced By:



Toll Free Phone (877) SERV098  
Toll Free Fax (877) SERV099  
www.electromate.com  
sales@electromate.com

## Enhanced monitoring and diagnostics

### SENSOR STATUS AND DIAGNOSTIC DISPLAY

Integrated diagnostic LEDs (green/red), located on top of the sensor housing (see 'Figure 1'), provide basic visual monitoring for normal sensor operation and troubleshooting. Diagnostic display LEDs indicate four modes described in 'Table 1'.



Figure 1. R-Series sensor Integrated diagnostic LEDs

| Green    | Red      | Operation status/mode                            |
|----------|----------|--|
| ON       | OFF      | Normal function (operation mode)                 |
| ON       | ON       | Magnet not detected or wrong quantity of magnets |
| OFF      | ON       | Initialization error                             |
| Flashing | Flashing | Power out of range (high or low)                 |

Table 1. Diagnostic display indicator modes

### CANbus protocol

Temposonics R-Series models RP and RH linear-position sensors, as slave devices, fulfill all requirements of the CANbus (ISO 11898) protocol. The sensor's electronics convert the position measurements into bus oriented outputs and transfer this data directly to the controller.

The bus interface is appropriate for serial data transfer up to 1 Mbps maximum. Sensor integrated software supports bus profiles CANopen, CANbasic and DeviceNet for a comprehensive customized configuration of the sensor-bus system.

DeviceNet documentation is available from the MTS website at <http://www.mtssensors.com/products/linear-position-sensors/index.html>.

### OPERATION MODES

R-Series sensors with CANbus protocol provide the following single or multi-magnet measurements:

#### Standard measurements:

- CANbasic; Position + velocity (using one magnet)
- CANopen; Position + velocity (using one to four magnets) + sensor internal electronics temperature

#### Multi-magnet measurement:

CANbasic; Positions for each of two to twenty magnets simultaneously.

When using multiple magnets, the minimum allowed distance between magnets is 75 mm (3 in.) to maintain proper sensor output (see 'Figure 2').

### Single-magnet sensor

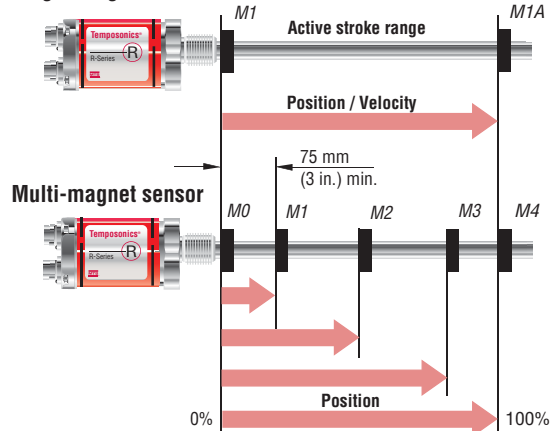


Figure 2. Single and multi-magnet output diagram

### CANopen communication and functionality

CANopen corresponds to encoder profile 'DS-406 V3.1 (CIA standard DS-301 V4.02)'. The CANopen functionality is described below in the following communication objects.

#### Note:

Conformance Test Certificate No. CiA199902-301V30/I-004 is provided by the CANbus user organization CiA (CAN in Automation) for MTS CANopen sensors.

### LINEARITY CORRECTION OPTION (LCO)

The Linearity Correction Option (LCO) provides improved sensor output accuracy. For most stroke lengths linearity accuracy is improved up to a factor of 5 resulting in deviations from actual position of less than +/- 20 microns (0.0008 in.). For stroke lengths over 5000 mm (197 in.), the linearity accuracy is improved up to a factor of 10. Selecting the sensor style and magnet is important (both must be matched together). Contact the factory for assistance when designing for the LCO in your application.

### SERVICE DATA OBJECT (SDO)

The SDO is mainly used for sensor configuration. Selectable parameters are as follows:

- Resolution for position + velocity
- 4 set points
- Preset of the operation range and the null position for four magnets

### PROCESS DATA OBJECT (PDO)

The PDO provides real-time data transfer of sensor measurements in up to 8-byte data blocks. The sensor uses PDO's to relay information about magnet position, velocity, limit status, cam control and operation range for up to four magnets.

#### Data formats:

- 32-bits for position
- 16-bits for velocity
- 8-bits for value limit.

Sold & Serviced By:

 **ELECTROMATE**

Toll Free Phone (877) SERV098

Toll Free Fax (877) SERV099

[www.electromate.com](http://www.electromate.com)

[sales@electromate.com](mailto:sales@electromate.com)

## Advanced communication and programmability (cont)

### Field Programming

#### CANbus outputs

---

##### PDO TRANSMISSION TYPE

**Asynchronous (cycle time of 1 to 65.535 ms) or synchronous**

- Synchronization Object (SYNC)
- Emergency Object
- Nodeguard Object
- Heartbeat function
- Selectable bus termination
- Monitoring for the sensor internal electronics temperature

#### CANopen communication and functionality

---

##### CANOPEN CONFIGURATION

A software file is used as an Electronic Data Sheet (EDS) for sensor configuration. The EDS file is available on the R-Series Setup software mini diskette, part number: 551052 that comes with the sensor. To download the latest software go to MTS website at: <http://www.mtssensors.com>.

#### CANbasic (MTS)

---

*CANbasic (MTS)* allows a simple, flexible adaptation to customized profiles with a short bus access. The CANbasic protocol complies with CAN the 2.0A standard and includes applications data for single-magnet measurement (position, velocity, sensor status and five setpoints).

#### CANbasic (Multi-magnet measurement)

---

*CANbasic (Multi-magnet measurement)* provides position measurement on a single sensor using a maximum of twenty magnets. Setup and operation are accomplished through the on-site control system.

#### CANopen handheld address programmer

---

The *CANopen Handheld Address Programmer* (see 'Figure 3') is offered as an accessory used to setup the Node-Address for sensors with the CANopen interface. This setup is usually completed by the bus' LMT/LSS-Service. If the master system or customer controller does not support this service, connecting the CANopen Handheld Address Programmer to the sensor will bypass the service and allow direct setup.



**Figure 3.** R-Series CANopen Handheld Address Programmer (part no. 252382-D62) Installation Instructions (part no.: 551192)

Sold & Serviced By:

 **ELECTROMATE**

Toll Free Phone (877) SERV098

Toll Free Fax (877) SERV099

[www.electromate.com](http://www.electromate.com)

[sales@electromate.com](mailto:sales@electromate.com)

## Model RP profile-style sensor dimension references

### MODEL RP, PROFILE-STYLE SENSOR WITH CAPTIVE-SLIDING MAGNET

Drawing is for reference only, contact applications engineering for tolerance specific information.

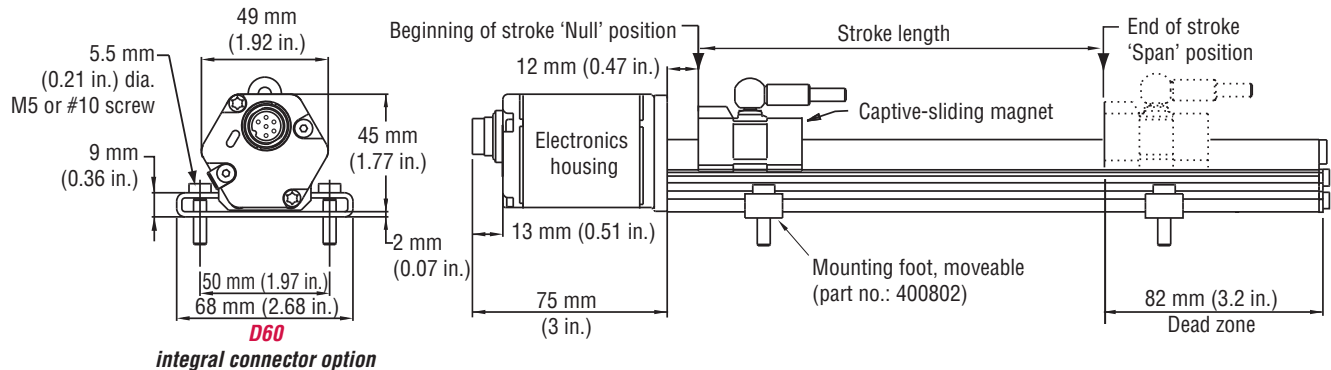


Figure 4. R-Series Model RP Profile-style sensor dimension reference (Shown with the **D60** integral connector option)

### MODEL RP, PROFILE-STYLE SENSOR WITH OPEN-RING MAGNET

Drawing is for reference only, contact applications engineering for tolerance specific information.

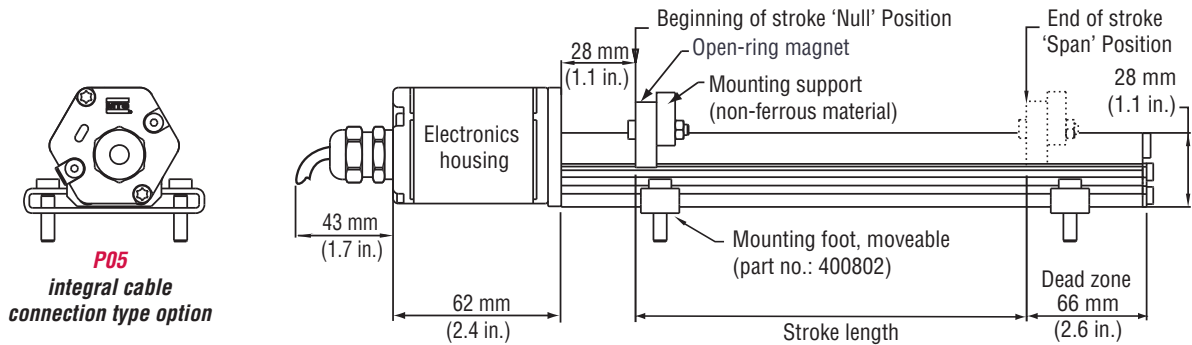


Figure 5. R-Series Model RP Profile-style sensor dimension reference (Shown with the **P05** integral cable option)

### MODEL RP, PROFILE-STYLE SENSOR WITH CAPTIVE-SLIDING MAGNET

Drawing is for reference only, contact applications engineering for tolerance specific information.

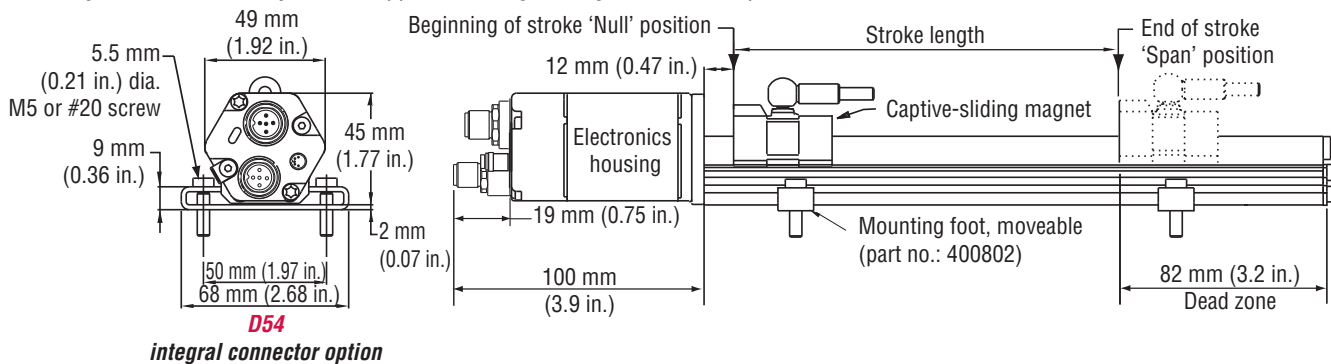


Figure 6. R-Series Model RP Profile-style sensor dimension reference (Shown with the **D54** integral connector option)

Sold & Serviced By:

**ELECTROMATE**

Toll Free Phone (877) SERV098

Toll Free Fax (877) SERV099

www.electromate.com

sales@electromate.com

**Model RP Profile-Style Sensor**  
**Standard Magnet Selections and Mounting**

**Standard magnet selections (Model RP)**

**SELECTION OF POSITION MAGNETS (ONE MAGNET INCLUDED WITH MODEL RP SENSOR)**

A choice of two magnet mounting configurations are available with the profile-style sensor; A 'captive-sliding' magnet, *Styles S or V* or an 'open-ring' magnet, *Style M*. Captive-sliding magnets utilize slide bearings of special material that reduce friction, and if required, help mitigate dirt build up. The slide bearings are designed to operate dry, requiring no external lubrication or maintenance.

The *Style M* 'open-ring' magnet mounts on the moving machine part and travels just above the sensor's profile extrusion. The open-ring magnet requires a minimum distance away from ferrous metals to allow proper sensor output. It must be mounted using non-ferrous screws and a non-ferrous support bracket, or utilize a non-ferrous spacer of at least 5 mm (0.2 in.) thickness.

**POSITION MAGNET SELECTIONS (ONE MAGNET INCLUDED WITH EACH MODEL RP SENSOR)**

(Drawing dimensions are for reference only)

| Magnet dimensions and mounted magnet dimensions | Description   | Part number     |
|---|---|-----------------|
|   | <p><b>Captive-sliding magnet, Style S</b><br/>           For Model RP profile-style sensor</p>  | <p>252182</p>   |
|   | <p><b>Captive-sliding magnet, Style V</b><br/>           For Model RP profile-style sensor</p>  | <p>252184</p>   |
|   | <p><b>Open-ring magnet, Style M</b><br/> <b>I.D.:</b> 13.5 mm (.53 in.)<br/> <b>O.D.:</b> 33 mm (1.29 in.)<br/> <b>Thickness:</b> 8 mm (0.31 in.)<br/> <b>Operating temperature:</b><br/>           - 40 °C to 100 °C</p> <p>This magnet may influence the sensor performance specifications for some applications.</p> | <p>251416-2</p> |

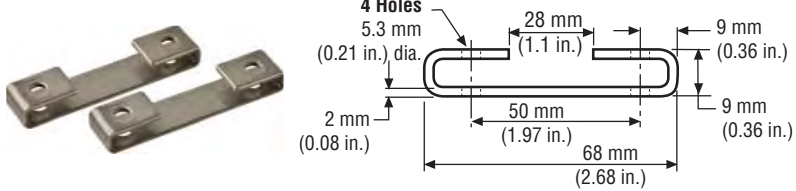
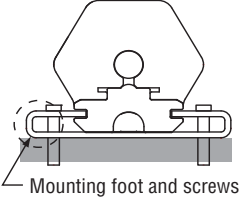
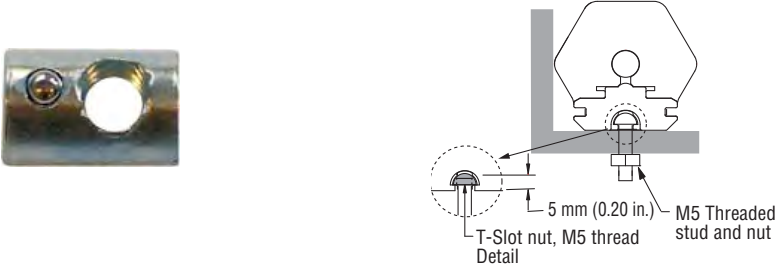
## Sensor mounting

### Model RP profile-style sensor mounting *flexible installation in any position!*

Temposonics Model RP profile-style sensors offer two basic mounting methods; side grooves for use with mounting feet or a bottom groove that accepts special T-Slot nuts. Both the mounting feet and T-Slot nuts can be positioned along the sensor extrusion to best secure the sensor for each particular application.

#### Notes:

1. Model RP sensors include two mounting feet, (part no. 400802) for sensors stroke lengths up to 1250 mm (50 in.)
2. One additional mounting foot is included for stroke lengths over 1250 mm (50 in.) and for each additional 500 mm (20 in.), thereafter.
3. MTS recommends using 10-32 cap screws (*customer supplied*) at a maximum torque of 44 in. lbs. when fastening mounting feet.

| Profile-Style sensor mounting and installation reference   | Mounting method  | Part number                                  |
|--|--|--|
|  <p>(Width = 14.5 mm (0.57 in.))</p>  | <p><b>Mounting feet, standard (304 SS)</b><br/>Profile-style sensor mounting for sensor model RP</p> | <p>400802</p>                                |
| <p>(10 - 32 Cap screws)<br/>Recommended<br/>(Customer supplied)</p>  <p>Mounting foot and screws</p> | <p><b>Mounting feet and screws</b><br/>Profile-style sensor foot installation</p>                    | <p>See Mounting Feet part number: 400802</p> |
|  <p>T-Slot nut, M5 thread<br/>Detail</p> <p>5 mm (0.20 in.)<br/>M5 Threaded stud and nut</p>        | <p><b>T-Slot nut</b><br/>Nut for mounting model RP sensor. (M5 threaded) using bottom groove</p>     | <p>401602</p>                                |

Sold & Serviced By:

 **ELECTROMATE**

Toll Free Phone (877) SERV098

Toll Free Fax (877) SERV099

www.electromate.com

sales@electromate.com

## Model RH rod-style sensor dimension reference

The Temposonics R-Series rod-style sensor (Model RH) offers modular construction, flexible mounting configurations, and easy installation. The Model RH sensor is designed for mounting in applications where high pressure conditions exist, (5000 psi continuous, 10,000 psi spike), such as inside hydraulic cylinders. The Model RH sensor (see Figure 7) may also be mounted externally in many applications.

### Stroke-dependent Dead Zones:

| Stroke length:                        | Dead zone:        |
|---------------------------------------|-------------------|
| 25 mm (1 in.) - 5000 mm (197 in.)     | 63.5 mm (2.5 in.) |
| 5005 mm (197 in.) - 7620 mm (300 in.) | 66 mm (2.6 in.)   |

### MODEL RH, ROD-STYLE SENSOR WITH RING MAGNET (MAGNET ORDERED SEPARATELY)

Drawing is for reference only, contact applications engineering for tolerance specific information.

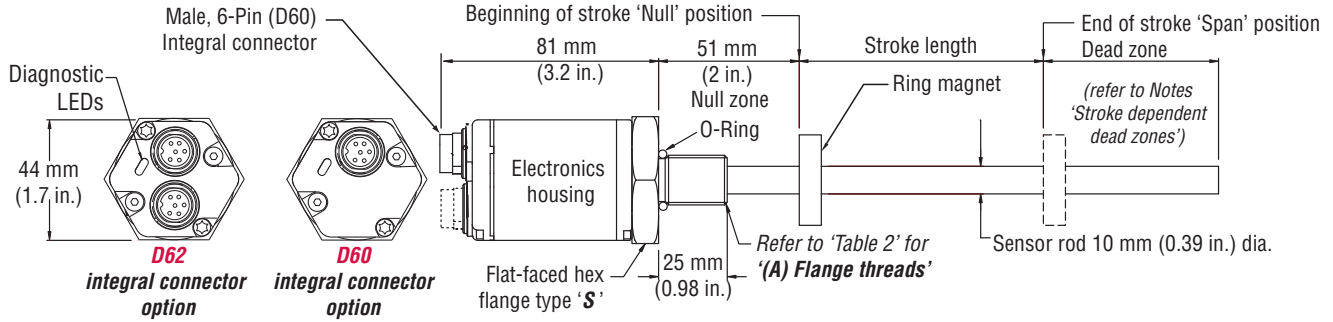


Figure 7. Model RH Rod-style sensor dimension reference (shown with **D60 / D62** integral connector options)

### MODEL RH, ROD-STYLE SENSOR

Drawing is for reference only, contact applications engineering for tolerance specific information.

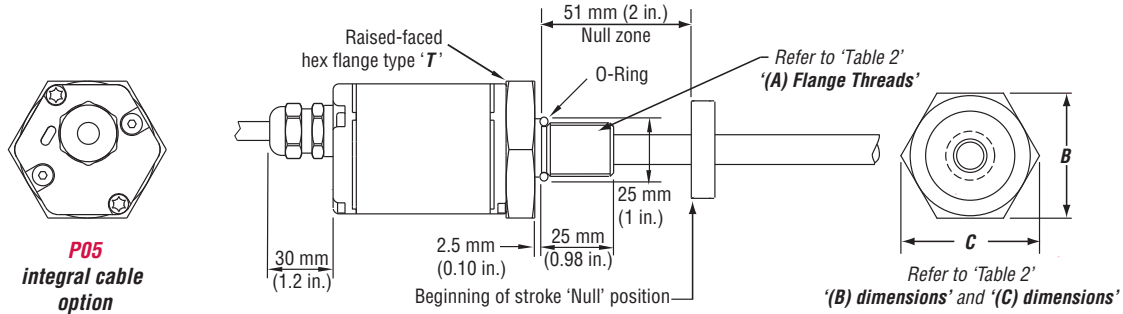


Figure 8. Model RH Rod-style sensor dimension reference (shown with **P05** integral cable option)

### MODEL RH, ROD-STYLE SENSOR WITH RING MAGNET (MAGNET ORDERED SEPARATELY)

Drawing is for reference only, contact applications engineering for tolerance specific information.

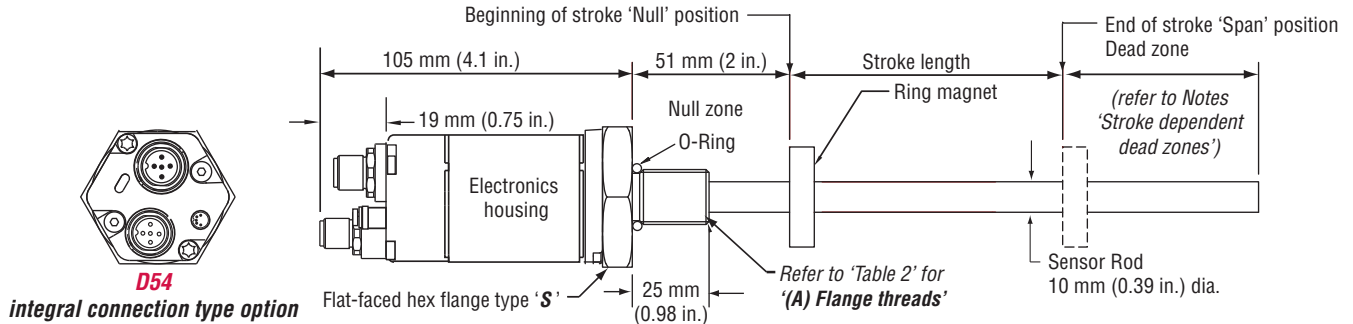


Figure 9. Model RH Rod-style sensor dimension reference (Shown with the **D54** Integral cable connection type option)

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

Table 2. Model RH Rod-style sensor housing style and flange type references


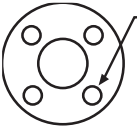

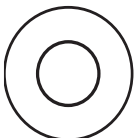

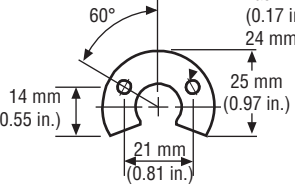

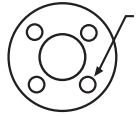


## Standard magnet selections (Model RH)

Magnets must be ordered separately with Model RH position sensors. The standard ring magnet (part number 201542-2) is suitable for most applications.


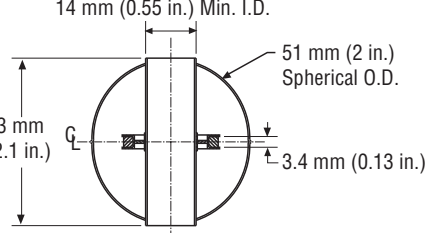
### POSITION MAGNET SELECTIONS

(Drawing dimensions are for reference only)

| Magnet and magnet dimensions  | Description  | Part number   |
|---|--|---|
|    |  <p><b>4 Holes</b><br/>Each 4.3 mm (0.17 in.) dia.<br/>90° apart on<br/>24 mm (0.94 in.) dia.</p>   | <p><b>Standard ring magnet</b><br/>I.D.: 13.5 mm (0.53 in.)<br/>O.D.: 33 mm (1.3 in.)<br/>Thickness: 8 mm (0.3 in.)<br/>Operating temperature:<br/>- 40 °C to 100 °C</p> <p>201542-2</p>  |
|    |   | <p><b>Ring magnet</b><br/>I.D.: 13.5 mm (0.53 in.)<br/>O.D.: 25.4 mm (1 in.)<br/>Thickness: 8 mm (0.3 in.)<br/>Operating temperature:<br/>- 40 °C to 100 °C</p> <p>400533</p>   |
|    |  <p><b>2 Holes</b><br/>Each 4.3 mm<br/>(0.17 in.) dia. on<br/>24 mm (0.94 in.) dia.<br/>60°<br/>14 mm<br/>(0.55 in.)<br/>25 mm<br/>(0.97 in.)<br/>21 mm<br/>(0.81 in.)</p> | <p><b>Open-ring magnet, Style M</b><br/>I.D.: 13.5 mm (0.53 in.)<br/>O.D.: 33 mm (1.3 in.)<br/>Thickness: 8 mm (0.3 in.)<br/>Operating temperature:<br/>- 40 °C to 100 °C</p> <p>This magnet may influence the sensor performance specifications for some applications.</p> <p>251416-2</p> |
|  |  <p><b>4 Holes</b><br/>Each 4.3 mm (0.17 in.) dia.<br/>90° apart on<br/>24 mm (0.94 in.) dia.</p>   | <p><b>Magnet spacer</b><br/><b>(Non-ferrous, use with ring magnet</b><br/><b>Part no.: 201542-2)</b><br/>I.D.: 14 mm (0.56 in.)<br/>O.D.: 32 mm (1.25 in.)<br/>Thickness: 3.2 mm (0.125 in.)</p> <p>400633</p>  |

### MAGNET FLOAT SELECTION

(Drawing dimensions are for reference only)

|   |  |   |
|---|--|---|
|  |  <p>14 mm (0.55 in.) Min. I.D.<br/>51 mm (2 in.) Spherical O.D.<br/>53 mm (2.1 in.)<br/>3.4 mm (0.13 in.)</p> | <p><b>Magnet float</b><br/><b>(Level sensing applications)</b><br/>Specific gravity: .70 maximum<br/>Pressure: 870 psi maximum</p> <p>(This float is used with the Model RH Rod-style sensors for hydraulic fluid or fresh water applications only)</p> <p>251447</p> |
|---|--|---|

Sold & Serviced By:

 **ELECTROMATE**

Toll Free Phone (877) SERV098

Toll Free Fax (877) SERV099

www.electromate.com

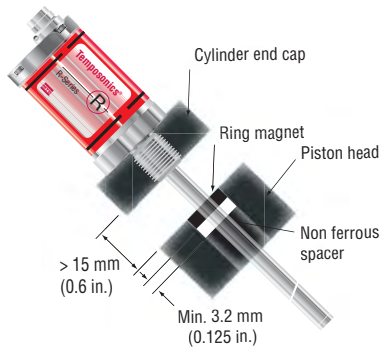
sales@electromate.com

## Model RH Rod-Style sensor mounting

### MODEL RH SENSOR MOUNTING

The position magnet requires minimum distances away from ferrous metals to allow proper sensor output. The minimum distance from the front of the magnet to the cylinder end cap is 15 mm (0.6 in.).

The minimum distance from the back of the magnet to the piston head is 3.2 mm (0.125 in.). However, a minimum distance of at least 5 mm (0.197 in.) is preferred for added performance margin. The non-ferrous spacer (part no. 400633), provides this minimum distance when used along with the standard ring magnet (part no.: 201542-2) as shown in *Figure 10*.



**Figure 10.** Model RH rod-style mounting

## Connections and wiring

### STANDARD MALE (M16) INTEGRAL CONNECTOR FOR SINGLE (D60) AND DUAL (D62) TYPE CONNECTIONS



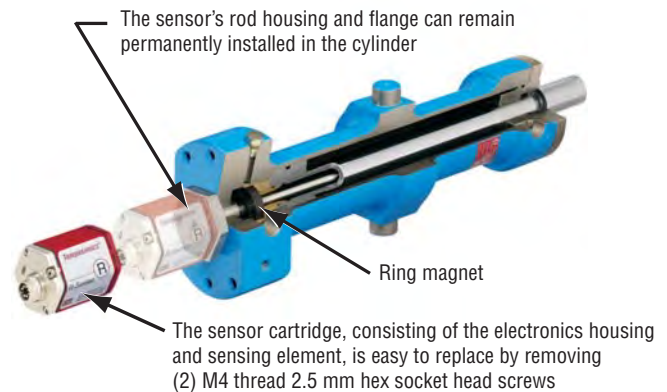
Male, 6-pin (D60) integral connector pin-out as viewed from the end of the sensor

| Pin number | Cable Wire color | Function / CANbus outputs |
|------------|------------------|---------------------------|
| 1          | Gray             | CAN (-)                   |
| 2          | Pink             | CAN (+)                   |
| 3          | Yellow           | N.C.                      |
| 4          | Green            | N.C.                      |
| 5          | Red or Brown     | +24 Vdc (-15/+20%)        |
| 6          | White            | DC ground (for supply)    |

## Cylinder installation

When used for direct-stroke measurement in fluid cylinders, the sensor's high pressure, stainless steel rod installs into a bore in the piston head/rod assembly as shown in *Figure 11*. This method guarantees a long-life and trouble-free operation.

The sensor cartridge can be removed from the flange and rod housing while still installed in the cylinder. This procedure allows quick and easy sensor cartridge replacement, without the loss of hydraulic pressure.

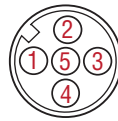


**Figure 11.** Fluid cylinder installation

### MALE/FEMALE (M12) INTEGRAL CONNECTORS FOR (D54) TYPE CONNECTIONS



Male, 5-pin (D54) integral connector pin-out as viewed from the end of the sensor



Female, 5-pin (D54) integral connector pin-out as viewed from the end of the sensor

| Pin number | Function / CANbus outputs |
|------------|---------------------------|
| 1          | Shield                    |
| 2          | N.C.                      |
| 3          | N.C.                      |
| 4          | CAN (+)                   |
| 5          | (CAN (-))                 |



Input voltage, male, 4-pin (D54) integral connector pin-out as viewed from the end of the sensor

| Pin number | Cable wire color | Function               |
|------------|------------------|------------------------|
| 1          | Brown            | +24 Vdc (-15/+20%)     |
| 2          | White            | N.C.                   |
| 3          | Blue             | DC ground (for supply) |
| 4          | Black            | N.C.                   |

Sold & Serviced By:

**ELECTROMATE**

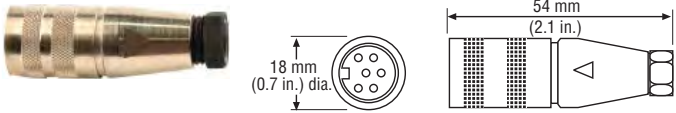
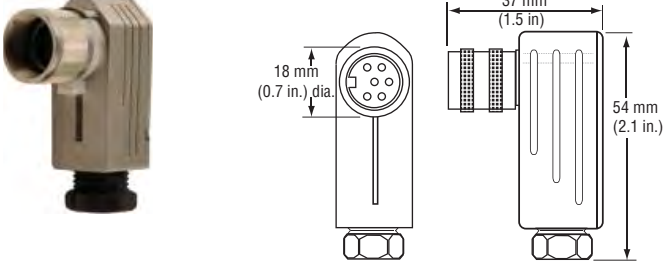
Toll Free Phone (877) SERV098

Toll Free Fax (877) SERV099

www.electromate.com

sales@electromate.com

**Models RP and RH Sensors  
Extension Cables with Connectors**

| Connector and connector dimensions  | Description   | Part number |
|---|---|-------------|
|  | <p><b>Female Cable Connector, Straight Exit (Field installable)</b><br/>6-Pin DIN (D60)<br/>(Mates with standard male (M16) integral connector)</p> | 560700      |
|  | <p><b>Female Cable Connector, 90° Exit (Field installable)</b><br/>6-Pin DIN (D60)<br/>(Mates with standard male (M16) integral connector)</p>      | 560778      |

**EXTENSION CABLE WITH CONNECTORS FOR D6, (D60), CONNECTION TYPES**

| Extension cable and connector assemblies  | Description  | Connection type |
|---|--|-----------------|
|    | <p><b>Female Connector, Straight Exit with Standard PVC Jacket Cable</b><br/>(Assembly Includes D6 Connector, Part No.: 560700 and Cable, Part No.:530026)</p>   | D6              |
|  | <p><b>Female Connector, 90° Exit with Standard PVC Jacket Cable</b><br/>(Assembly Includes D6 Connector, Part no.: 560778 and Cable, Part no.:530026)</p>  | DA              |
|  | <p><b>Female Connector, Straight Exit with Black Polyurethane Jacket Cable (for higher resistance to moisture, oil and temperatures)</b><br/>(Assembly Includes D6 Connector, Part no.: 560700 and Cable, Part no.:530052)</p> | DJ              |
|  | <p><b>Female Connector, 90° Exit with Black Polyurethane Jacket Cable (for higher resistance to moisture, oil and temperatures)</b><br/>(Assembly Includes D6 Connector, Part no.: 560778 and Cable, Part no.:530052)</p>      | DK              |

Sold & Serviced By:



Toll Free Phone (877) SERV098  
Toll Free Fax (877) SERV099  
www.electromate.com  
sales@electromate.com

**How to order an extension cable with connector for connection types (D60) and (D62)**

|   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|
| D |   |   |   |   |   |   |   |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

**SENSOR CONNECTION TYPES**

- D6** = Female connector, straight exit (part no. 560700), and PVC jacket cable (*part no.: 530026*)
- DA** = Female connector, 90° exit (part no. 560778), and PVC jacket cable (*part no.: 530026*)
- DJ** = Female connector, straight exit (part no. 560700), and black polyurethane jacket cable (*part no. 530052*)
- DK** = Female connector, 90° exit (part no. 560778), and black polyurethane jacket cable (*part no.: 530052*)

= 

|   |  |
|---|--|
| D |  |
|---|--|

**1 - 2**

**CABLE LENGTHS**

**For standard length cables up to 100 ft**

- 005** = 5 ft
- 015** = 15 ft
- 025** = 25 ft
- 050** = 50 ft
- 100** = 100 ft

**R-SERIES CANBUS EXTENSION CABLE LENGTH LIMITATIONS**

| Baud rate | Maximum cable or bus length |       |
|-----------|-----------------------------|-------|
| 1.0 MBd   | 80 ft.                      | 25 m  |
| 500kBd    | 320 ft.                     | 100 m |
| 250 kBd   | 820 ft.                     | 250 m |
| 125 kBd   | 1640 ft.                    | 500 m |

= 

|  |  |  |
|--|--|--|
|  |  |  |
|--|--|--|

**3 - 5**

**For custom length cables over 100 ft**

\_\_\_\_ = Cable length (maximum cable length is dependent on the output selected; consult MTS Applications Engineering)

**CABLE TERMINATION**

- P0** = Pigtail cable without connector (2 digit code)
- D6M** = D6 male connector, (straight exit). Only available with the D6 option above.
- D6F** = D6 female connector, (straight exit). Only available with the D6 option above.
- DAF** = D6 female connector, (90° exit). Only available with the DA option above.

= 

|  |  |  |
|--|--|--|
|  |  |  |
|--|--|--|

**6 - 8**

Sold & Serviced By:



Toll Free Phone (877) SERV098

Toll Free Fax (877) SERV099

www.electromate.com

sales@electromate.com

## Models RP and RH Sensors Ordering Information

|   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|
| R |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |

**SENSOR MODEL** \_\_\_\_\_ = R **1-2**

**RP** = Profile style                                 **RH** = Hydraulic rod style

**HOUSING STYLE** \_\_\_\_\_ =  **3**

**Model RP profile-style sensor (includes one magnet):**

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

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

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

**S** = US customary threads, flat-faced flange and pressure tube, standard     **H** = Same as option "S", except uses fluoroelastomer seals for the electronics housing

**M** = Metric threads, flat-faced flange and pressure tube, standard     **V** = Same as option "M", except uses fluoroelastomer seals for the electronics housing

**STROKE LENGTH** \_\_\_\_\_ =  **4-8**

\_\_\_\_\_ **M** = Millimeters  
(Encode in 5 mm increments)

\_\_\_\_\_ **U** = Inches and tenths  
(Encode in 0.1 in. increments)

**Stroke Length Notes:**

1. Profile-style sensor (model RP) stroke range = 25 mm (1 in.) - 5080 mm. (200 in.)
2. Rod-style sensor (model RH) stroke range = 25 mm (1 in.) - 7620 mm (300 in.)

**CONNECTION TYPE** \_\_\_\_\_ =  **9-11**

**Integral connector:**

**D60** = 6-pin DIN (M16), male, standard

**D62** = 6-pin DIN (M16), male, dual

**D54** = 5-pin DIN (M12), male/female and 4-pin (M8) male

**Integral cable:**

**P** \_\_\_\_\_ = Integral cable, Orange polyurethane jacket with pigtail termination

**Cable length:**

Encode in feet if using US customary stroke length  
Encode in meters if using metric stroke length

→ \_\_\_\_\_ = 3 (**03**) to 98 (**98**) ft. or 1 (**01**) to 30 (**30**) meters.

**Cable Length Note:**

MTS recommends the maximum integral cable length to be 10 meters (33 ft.). Cables greater than 10 m (33 ft.) in length are available, however, proper care must be taken during handling and installation.

**INPUT VOLTAGE** \_\_\_\_\_ = 1 **12**

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

**OUTPUT (13 - 19)** \_\_\_\_\_ = C **13-19**

**C** \_\_\_\_\_ = CANbus output - Enter the 6 digit output code (1-6) defined by the following selections  
[1] [2] [3] [4] [5] [6]

| [1] [2] [3] Protocol  | [4] Baud rate          | [5] Resolution                    | [6] Type            |
|---|------------------------|-----------------------------------|---------------------|
| <b>101</b> = CANbasic (MTS)                                 | <b>1</b> = 1000 kBit/s | <b>1</b> = 0.005 mm (0.0002 in.)  | <b>1</b> = Standard |
| <b>207</b> = Multi-position measurement                     | <b>2</b> = 500 kBit/s  | <b>2</b> = 0.002 mm (0.00008 in.) |                     |
| <b>304</b> = CANopen  | <b>3</b> = 250 kBit/s  |                                   |                     |
| <b>504</b> = CANopen with Linearity Correction Option (LCO) | <b>4</b> = 125 kBit/s  |                                   |                     |

**NUMBER OF MAGNETS (20 - 22) FOR MULTI-POSITION MEASUREMENT ONLY** \_\_\_\_\_ = Z **20-22**

**Z** + Enter a 2 digit code  
Enter range (02 - 20) 20 magnets maximum