**PARAMETER SPECIFICATION**

<table>
<thead>
<tr>
<th>Measured variable:</th>
<th>Displacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>Up to 0.002 mm (0.00008 in.)</td>
</tr>
<tr>
<td>Non-linearity:</td>
<td>&lt; ± 0.01% of full stroke or ± 0.04 mm (0.0016 in.), whichever is greater*</td>
</tr>
<tr>
<td>Repeatability:</td>
<td>&lt; ± 0.001% of full scale or ± 0.0025 mm (0.0001 in.), whichever is greater</td>
</tr>
<tr>
<td>Hysteresis (magnetic**):</td>
<td>&lt; 0.004 mm (0.00016 in.)</td>
</tr>
<tr>
<td>Output format:</td>
<td>24 or 25-bit binary or gray code</td>
</tr>
<tr>
<td>Measuring range:</td>
<td>Profile-style sensors (RP): 25 to 5000 mm (1 to 196 in.)</td>
</tr>
<tr>
<td></td>
<td>Rod-style sensors (RH): 25 to 7620 mm (1 to 300 in.)</td>
</tr>
<tr>
<td>Operating voltage:</td>
<td>+24 Vdc (+ 20%, - 15%)</td>
</tr>
<tr>
<td>Power consumption:</td>
<td>100 mA (typical)</td>
</tr>
<tr>
<td>Operating temperature:</td>
<td>Head Electronics: - 40 to 75 °C (-40 to 167 °F)</td>
</tr>
<tr>
<td></td>
<td>Sensing Element: - 40 to 105 °C (-40 to 221 °F)</td>
</tr>
<tr>
<td>EMC test:</td>
<td>DIN IEC 801-4, Type 4, CE certified;</td>
</tr>
<tr>
<td></td>
<td>DIN EN 50081-1 (Emissions), DIN EN 50082-2 (Immunity)</td>
</tr>
<tr>
<td>Shock rating:</td>
<td>100 g (single hit)/IEC standard 68-2-27 survivability</td>
</tr>
<tr>
<td>Vibration Rating:</td>
<td>5 g/10-150 Hz/IEC standard 68-2-6</td>
</tr>
</tbody>
</table>

**OUT PUT**

**Synchronous Serial Interface (SSI)**

SSI is a widely used serial interface between an absolute position sensor and a controller. SSI uses a clock pulse train from a controller to gate out sensor data: one bit of position data is transmitted to the controller per one clock pulse received by the sensor. The absolute position data is continuously updated by the sensor and converted by the shift register into serial information. Between each clock pulse train there is a minimum dwell of 25 µs during which data is moved into the register. The data is then shifted out when the sensor receives a pulse train from the controller. When the Least Significant Bit (LSB) goes HIGH and the minimum dwell time has elapsed, new data is available to read. Refer to the SSI Timing Diagram and Sequential Measurements of SSI Timing illustration for more information.

Position data from the sensor is encoded in a 24 or 25-bit binary or gray code format and transmitted at very high speed. Update frequencies are available up to 7500 measurements per second (length dependent) in asynchronous mode; and 1000 measurements per second in synchronous mode (up to 82 inches).

**NOTE:**

If the controller/interface does not specify synchronous mode, use the sensor in asynchronous mode.

**DEFINITIONS:**

**Synchronous mode:** A synchronous pulse from the control system starts the measuring time of the sensor, the measured result is available before the next synchronizing pulse is generated.

**Asynchronous mode:** SSI takes measurements at its fastest internal interrogation rate (length dependent) and provides information upon request.

**PRODUCT SPECIFICATION (part no. 550542)**
**ROD-STYLE (Model RH)**

The Temposonics R Series rod-style application housing (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. Temposonics RH may also be mounted externally in many applications.

In addition, the RH housing offers the ability to quickly and easily replace the sensor cartridge in the field (up to 72 inches).

**CYLINDER INSTALLATION**

The rod-style Temposonics R Series position sensor (Model RH) is designed for installation into hydraulic cylinders. The sensor’s high-pressure, stainless steel tube installs into a ½ inch bore in the piston head and rod assembly as shown.

**NOTES:**

- 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 provided by the non-ferrous spacer, i.e. 3.2 mm (0.125 in.).
- The illustration above represents a typical installation. Some installation requirements may be application specific.
**PROFILE-STYLE (Model RP)**

The Temposonics RP profile-style position sensor offers modular construction, flexible mounting configurations, and easy installation. A choice of two magnet mounting configurations are available with the profile housing: captive sliding magnet or floating magnet.

**Captive Sliding Magnet**

![Captive Sliding Magnet, Style V, End View (Shown with standard mounting feet)](image)

- Gap between magnet and top of profile extrusion to be 3 mm ± 1 mm (0.12 in.)
- 35.5 mm (1.40 in.)
- 44 mm (1.73 in.)
- 45 mm (1.77 in.)
- 29 mm (1.14 in.)
- 28 mm (1.10 in.)

**Floating Magnet**

![Floating Magnet, End View (Shown with optional T-slot mounting)](image)

- 35.5 mm (1.40 in.)
- 44 mm (1.73 in.)
- 45 mm (1.77 in.)
- 29 mm (1.14 in.)

**Style V Magnet**

![Style V Magnet](image)

- Captive sliding magnet (Style V)
- 36 mm (1.42 in.)
- 28 mm (1.10 in.)
- 1.9 mm (0.075 in.)
- 36 mm (1.42 in.)
- 68 mm (2.68 in.)
- 12 mm (0.47 in.) at Null position
- 79 mm (3.11 in.)
- 50 mm (1.97 in.)
- 45 mm (1.77 in.)
- 5 mm (0.19 in.)
- 44 mm (1.73 in.)
- 14.5 mm (0.57 in.)

**Style S Magnet**

![Style S Magnet](image)

- Floating magnet (Style S)
- 52 mm (2.05 in.)
- 45 mm (1.77 in.)
- 28 mm (1.10 in.)

**Style M Magnet**

![Style M Magnet](image)

- Floating magnet (Style M)
- 5 mm (0.20 in.)
- T-slot nut, M5 thread (optional, sold separately)
- Dead Zone 66 mm (2.6 in.)
- Stroke length 28 mm (1.10 in.)
- Gap between magnet and top of profile extrusion to be 3 mm ± 1 mm (0.12 in.)
- 35.5 mm (1.40 in.)
- 44 mm (1.73 in.)
- 28 mm (1.10 in.)

**NOTE:**

Temposonics RP sensors include two mounting feet (Part no. 400802) for sensors up to 1250 mm (50 in.). One additional mounting foot is included for every additional 500 mm (20 in.).

**NOTE:**

Cable and mating connector dimensions same as shown on page 2.
WIRING

SENSOR INTEGRAL CONNECTOR (D7 Male):

(As viewed from end of Sensor)

D7 CONNECTOR PINOUT & WIRE COLOR CODE (Integral Cable or Extension Cable)

<table>
<thead>
<tr>
<th>Pin no.</th>
<th>Wire color</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gray</td>
<td>(-) Data</td>
</tr>
<tr>
<td>2</td>
<td>Pink</td>
<td>(+) Data</td>
</tr>
<tr>
<td>3</td>
<td>Yellow</td>
<td>(+) Clock</td>
</tr>
<tr>
<td>4</td>
<td>Green</td>
<td>(-) Clock</td>
</tr>
<tr>
<td>5</td>
<td>Brown or Red+ 24 Vdc, customer supplied</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>White</td>
<td>DC ground</td>
</tr>
<tr>
<td>7</td>
<td>Blue</td>
<td>No connection*</td>
</tr>
</tbody>
</table>

* Extension cables using the standard cable (Styles DS and DT) do not have a 7th wire.

NOTE:
Appropriate grounding of cable shield is required at the controller end.

SENSOR INTEGRAL CONNECTOR (RG Male):

(As Viewed from End of Sensor)

RG CONNECTOR PINOUT & WIRE COLOR CODE (Extension Cable)

<table>
<thead>
<tr>
<th>Pin no.</th>
<th>Wire color</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gray</td>
<td>(-) Data</td>
</tr>
<tr>
<td>2</td>
<td>Pink</td>
<td>(+) Data</td>
</tr>
<tr>
<td>3</td>
<td>Yellow</td>
<td>(+) Clock</td>
</tr>
<tr>
<td>4</td>
<td>Green</td>
<td>(-) Clock</td>
</tr>
<tr>
<td>5</td>
<td>Brown or Red+ 24 Vdc, customer supplied</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>White</td>
<td>DC ground</td>
</tr>
<tr>
<td>7</td>
<td>Blue</td>
<td>No connection*</td>
</tr>
</tbody>
</table>

NOTE:
Appropriate grounding of cable shield is required at the controller end.

CABLE CONNECTORS (Field-installable D7 Female):

Mates with Sensor Integral Connector

D7 Straight-exit connector
Part no. 560701

D7 90° connector
Part no. 560779
PORT DETAIL FOR TEMPOSONICS Model RH SENSORS WITH HOUSING

NOTES:
2. MTS has extracted all pertinent information from MS33649 to generate this document.
3. PD must be square with surface B within 0.005 FIM across 2.250 dia. minimum.
4. PD must be concentric with 2.250 dia. within 0.030 FIM and with 0.769 dia. within 0.005 FIM.
5. Surface texture ANSI B46.1-1978
6. Use O-ring MTS part number 560315 for correct sealing.
7. The thread design shall have sufficient threads to meet strength requirements of material used.
8. Finish counter-bore shall be free from longitudinal and spiral tool marks. Annular tool marks up to 32 microinches maximum will be permissible.

PORT DETAIL (SAE J1926/1) FOR TEMPOSONICS Model RH SENSORS WITH HOUSING

NOTES:
1. If face of port is on a machined surface, dimensions 1.180 and 0.094 need not apply as long as R0.008/0.004 is maintained to avoid damage to the O-Ring during installation.
2. Measure perpendicularity to A at this diameter.
3. This dimension applies when tap drill cannot pass through entire boss.
4. This dimension does not conform to SAE J1926/1.
Magnets must be ordered separately with Temposonics RH sensors. The standard ring magnet (Part no. 201542) is suitable for most applications.

Magnets are included with the order of Temposonics RP sensors. Temposonics RP can be configured with one of two magnet configurations: captive sliding magnet or floating magnet.
When placing an order, build the desired model number using the model number guide (right). A wide range of Temposonics R Series Sensor configurations are available to meet the demands of your particular application. For detailed information about how to order extension cables and accessories, see the bottom section of this page and page 8.

If you have any questions about how to apply MTS Temposonics R Series position sensors, please contact one of our Application Engineers or your local MTS distributor—they are available to help you design an effective position sensing system to fit your application.

### Sensor Model
- **RH** = Hydraulic Rod Style
- **RP** = Profile Style

### Housing Style
- **T** = US customary threads, raised-faced hex, and pressure tube
- **S** = US customary threads, flat-faced hex, and pressure tube
- **M** = Metric threads, flat-faced hex, and pressure tube
- **N** = Metric threads, raised-faced hex, and pressure tube
- **B** = Sensor cartridge only (No application housing, stroke lengths ≤ 72 in.)

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

### Connection Type/Connector or Cable
- **Connector**
  - **D70** = 7-pin DIN, integral, standard
  - **RG0** = 7-pin micro, integral, (for replacement orders only)

- **Integral Cable**
  - **E** = Integral standard cable with pigtail termination
  - **F** = Integral cable, polyurethane jacket with pigtail termination

- **Cable Length**
  - **Range** = 1 (01) to 99 (99) ft. or 1 (01) to 30 (30) meters

### Input Voltage
- **1 = +24 Vdc (+20%, -15%)**

### Output
- **S** = SSI Output (Fill in the six blanks with the applicable codes). Consult factory for additional options.

#### Data Length
- **1 = 25 bits**
- **2 = 24 bits**

#### Output Format
- **B** = Binary
- **C** = 8-bit code
- **D** = 16-bit code
- **E** = Gray code

#### Resolution
- **1 = 0.0002 in. (0.005 mm)**
- **2 = 0.0004 in. (0.01 mm)**
- **3 = 0.0006 in. (0.015 mm)**
- **4 = 0.0008 in. (0.02 mm)**
- **5 = 0.0010 in. (0.025 mm)**
- **6 = 0.0012 in. (0.03 mm)**

#### Performance
- **a)** Scale Orientation
  - **00** = Forward-acting
  - **01** = Reverse-acting
  - **02** = Forward-acting synchronized

### Stroke Length Note:
- **RH stroke range** = 1 - 300 in. (25 - 7620 mm)
- **RP stroke range** = 1 - 196 in. (25 - 4975 mm)

### Pressure Housing (RH Spare Only)

#### Sensor Connection Type
- **S** = US customary threads, flat-faced hex
- **T** = US customary threads, raised-face hex
- **M** = Metric threads, flat-faced hex
- **N** = Metric threads, raised-face hex

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

### Pressure Cable (RH Spare Only)

#### Sensor Connection Type
- **D** = Female connector (straight exit) and high-performance cable for SSI sensors with D7 (D70) connector
- **DR** = Female connector (90º exit) and high-performance cable for SSI sensors with D7 (D70) connector
- **DS** = Female connector (straight exit) and standard cable for SSI sensors with D7 (D70) connector
- **DT** = Female connector (90º exit) and standard cable for SSI sensors with D7 (D70) connector

#### Cable Lengths
- **For standard length cables up to 100 feet**
  - **005** = 5 ft.
  - **015** = 15 ft.
  - **025** = 25 ft.
  - **050** = 50 ft.
  - **100** = 100 ft.

- **For custom length cables over 100 feet**
  - **Custom cable length** (in feet). Maximum cable length is dependent upon baud rate (see page 1).

#### Cable Termination
- **P** = Pigtail connector
ACCESSORIES

<table>
<thead>
<tr>
<th>Description</th>
<th>Part no.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>O-Ring (spare)</td>
<td>560015</td>
<td>For use with Temposonics RH sensors</td>
</tr>
<tr>
<td>Hex Jam-nut (hex 3/4-16 UNF threads)</td>
<td>500015</td>
<td>For use with Temposonics RH sensors</td>
</tr>
<tr>
<td>Hex Jam-nut (hex M10x1.5 threads)</td>
<td>500018</td>
<td>For use with Temposonics RH sensors</td>
</tr>
<tr>
<td>Magnet Spacer</td>
<td>406833</td>
<td>For use with Standard Ring Magnet Part no. 201542</td>
</tr>
<tr>
<td>Magnet Mounting Screws</td>
<td>560267</td>
<td>Used to mount Standard Ring Magnet Part no. 201542 (4 screws required)</td>
</tr>
<tr>
<td>Floating Magnet, Style M</td>
<td>251416</td>
<td>Spare for Temposonics RP sensors</td>
</tr>
<tr>
<td>Captive Sliding Magnet, Style V</td>
<td>251784</td>
<td>Spare for Temposonics RP sensors, Rod joint at front of magnet</td>
</tr>
<tr>
<td>Captive Sliding Magnet, Style S</td>
<td>251782</td>
<td>Spare for Temposonics RP sensors, Rod joint at top of magnet</td>
</tr>
<tr>
<td>Joint Rod Sleeve</td>
<td>401603</td>
<td>Optional accessory for Temposonics RP sensors</td>
</tr>
<tr>
<td>Ball jointed arm</td>
<td>401913</td>
<td>Optional accessory for mounting Temposonics RP sensors</td>
</tr>
<tr>
<td>Power Supply (14/28 Vdc, 0.5 A)</td>
<td>380089</td>
<td>Open frame style</td>
</tr>
<tr>
<td>Mounting Feet, Standard (spares for RP sensors)</td>
<td>400802</td>
<td>Temposonics RP position sensors are provided with mounting feet (see page 3)</td>
</tr>
<tr>
<td>Mounting Feet, Low-profile</td>
<td>400867</td>
<td>Optional accessory for Temposonics RP sensors</td>
</tr>
<tr>
<td>T-slot MS Nut</td>
<td>401602</td>
<td>Optional accessory for mounting Temposonics RP sensors</td>
</tr>
<tr>
<td>D7 Field-installable Connector</td>
<td>560701</td>
<td>Female, straight exit (see page 4)</td>
</tr>
<tr>
<td>D7 Field-installable Connector</td>
<td>560702</td>
<td>Female, 90° exit (see page 4)</td>
</tr>
<tr>
<td>Cable, standard type</td>
<td>530026</td>
<td>3 twisted pairs, shielded, PVC jacket, specify desired length in feet</td>
</tr>
<tr>
<td>Cable, high-performance type</td>
<td>530029</td>
<td>7 conductor, EMC shielded; polyurethane jacket. Specify desired length in feet</td>
</tr>
</tbody>
</table>

OPTIONAL EXTENSION RODS (for use with Captive Sliding Magnet)

<table>
<thead>
<tr>
<th>Extension Rod Lengths Part no.</th>
<th>Extension Rod Lengths Part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>60.3 mm (2.375 in.) 401768-2</td>
<td>390.5 mm (15.375 in.) 401768-15</td>
</tr>
<tr>
<td>89.7 mm (3.575 in.) 401768-3</td>
<td>466.7 mm (18.375 in.) 401768-18</td>
</tr>
<tr>
<td>111.1 mm (4.375 in.) 401768-4</td>
<td>517.5 mm (20.375 in.) 401768-20</td>
</tr>
<tr>
<td>161.9 mm (6.375 in.) 401768-6</td>
<td>542.9 mm (21.375 in.) 401768-21</td>
</tr>
<tr>
<td>187.3 mm (7.375 in.) 401768-7</td>
<td>619.1 mm (24.375 in.) 401768-24</td>
</tr>
<tr>
<td>212.7 mm (8.375 in.) 401768-8</td>
<td>771.5 mm (30.375 in.) 401768-30</td>
</tr>
<tr>
<td>238.1 mm (9.375 in.) 401768-9</td>
<td>923.9 mm (36.375 in.) 401768-36</td>
</tr>
<tr>
<td>263.5 mm (10.375 in.) 401768-10</td>
<td>1076.3 mm (42.375 in.) 401768-42</td>
</tr>
<tr>
<td>314.3 mm (12.375 in.) 401768-12</td>
<td>1228.7 mm (48.375 in.) 401768-48</td>
</tr>
<tr>
<td>365.1 mm (14.375 in.) 401768-14</td>
<td>1533.5 mm (60.375 in.) 401768-60</td>
</tr>
</tbody>
</table>

Sensors

UNITED STATES
MTS Systems Corporation
Sensors Division
3001 Sheldon Drive
Cary, NC 27513
Tel: 800.633.7609
Fax: 919.677.0200
www.mtssensors.com
displacement@temposonics.com

GERMANY
MTS Systems Corporation
Sensors Technologie
Auf dem Schuffel 5, D-58513 Lüdenscheid, Germany
Postfach 8130
D-58489 Lüdenscheid, Germany
Tel: +49 2351 95870
Fax: +49 2351 56491
www.mtssensor.de

JAPAN
MTS Systems Corporation
Sensors Technology
Ushikubo Bldg. 733 Aihara-cho, Machida-shi
Tokyo 194-0211, Japan
Tel: +81 (42) 775.3838
Fax: +81 (42) 775.5512

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