

## SPECIFICATIONS

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

### PROFILE STYLE (Model RP)

Electronic head:	Aluminum die-cast housing
Sensor stroke:	Aluminum profile
Sealing:	IP65
Mounting:	Adjustable mounting feet or T-slot M5 nut in base channel
Magnet type:	Captive-sliding magnet or floating magnet

### ROD STYLE (Model RH)

Electronic head:	Aluminum die-cast housing
Sealing:	IP67
Sensor rod:	304L stainless steel
Operating pressure:	350 bar static, 690 bar spike (5000 psi static; 10,000 psi spike)
Mounting:	Threaded flange M18 x 1.5 or 3/4-16 UNF-3A
Typical mounting torque:	45 N-m (33 ft.-lbs.)
Magnet type:	Ring or floating magnet

All specifications are subject to change. Please contact MTS for specifications critical to your needs.

\* For all sensor models except the RP with the Style M magnet.

\*\* Does not include mechanical backlash with Styles V and S magnets on RP model sensors.

Go to [www.mtssensors.com](http://www.mtssensors.com) and refer to Product Specification part no. 550542 for additional information.

## OUTPUT

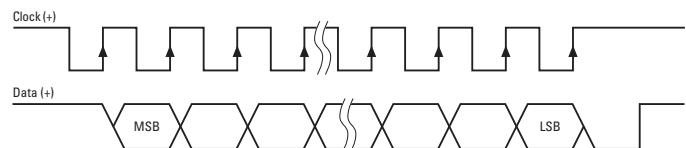
### Synchronous Serial Interface (SSI)

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 continually 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).

### SSI Timing Diagram



For Example: For 25-bit output, the timing clock must have 26 pulses.

### Sequential Measurements of SSI Timing



### Baud Rates for Data Transmission

<b>Baud rate</b>	1.5 MBd	< 400 kBd	< 300 kBd	< 200 kBd	< 100 kBd
<b>Cable length (ft.)</b>	< 10	< 160	< 320	< 650	< 1300

### 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.

### NOTE:

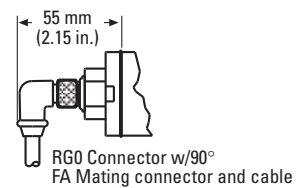
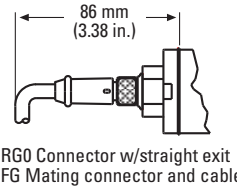
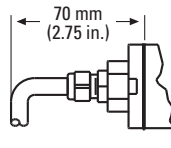
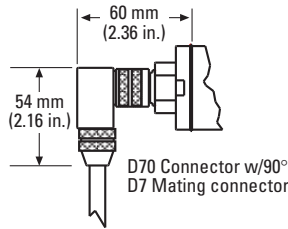
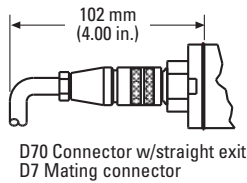
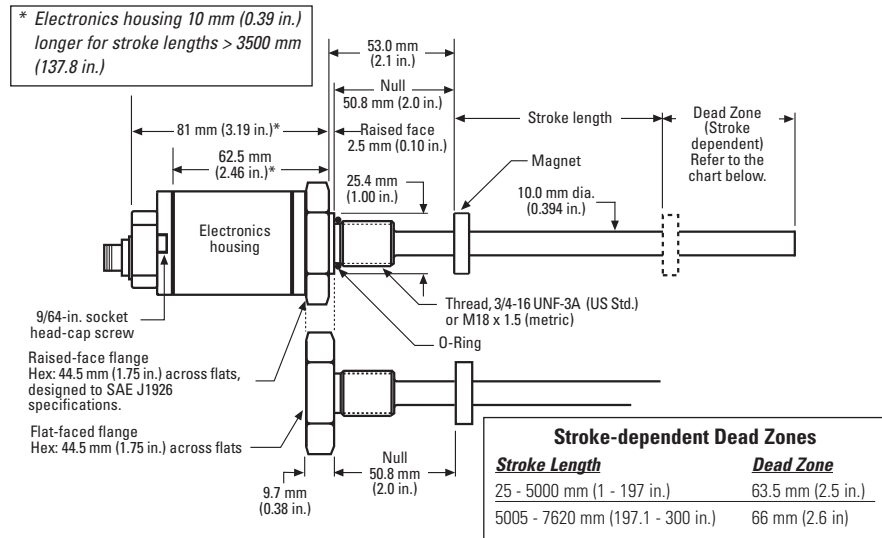
If the controller/interface does not specify synchronous mode, use the sensor in asynchronous mode.

Product specification is part no. 550542.

**ROD-STYLE (Model RH)**

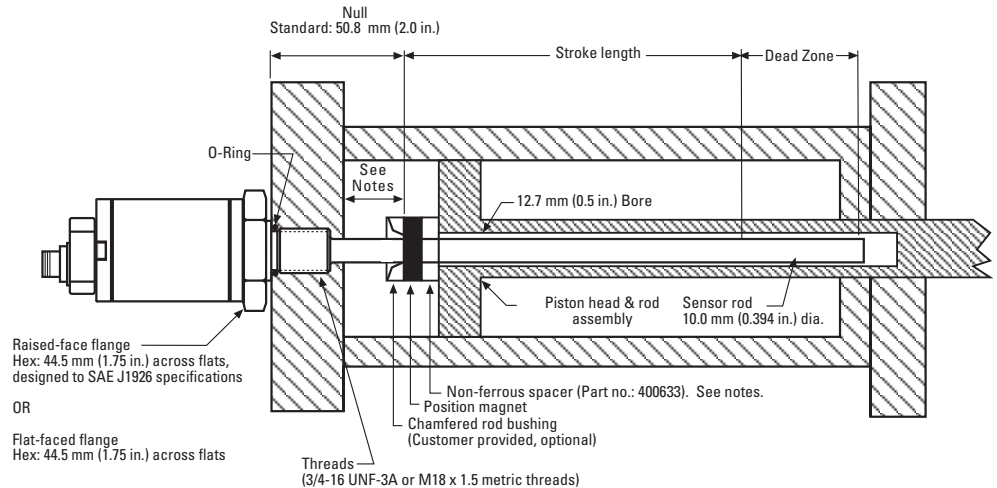
The Temposonics R Series rod-style application housing (Model RH) offers modular construction, flexible mounting configurations, and easy installation. It is designed for internal mounting in applications where high-pressure conditions exist (5000 psi continuous, 10,000 psi spike) such as hydraulic cylinders. 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 1/2 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.

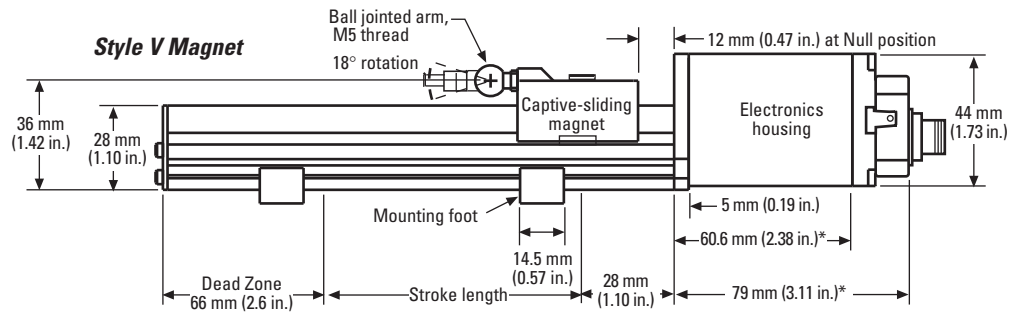
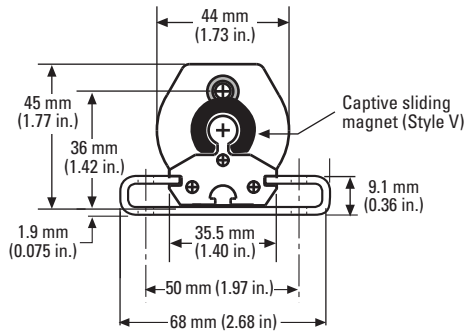
**PROFILE-STYLE (Model RP)**

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.

**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.).

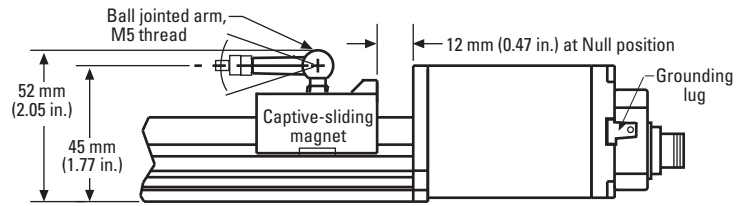
**CAPTIVE SLIDING MAGNET**

*Captive Sliding Magnet, Style V, End View (Shown with standard mounting feet)*



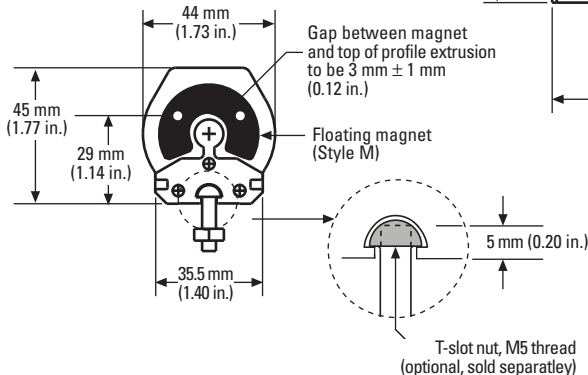
\* Electronics housing 10 mm (0.39 in.) longer for stroke lengths > 3500 mm (137.8 in.)

**Style S Magnet**

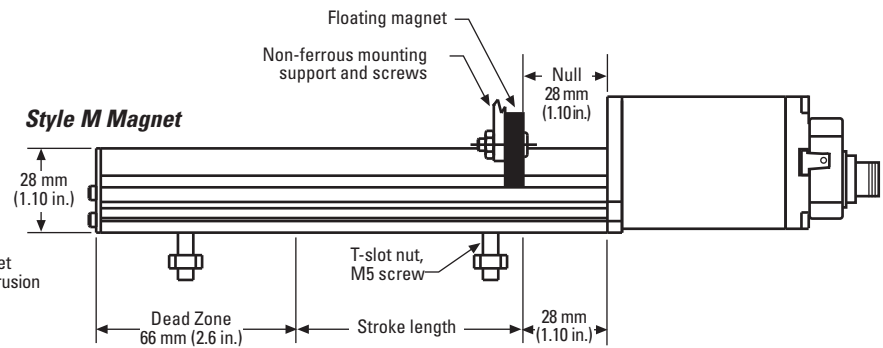


**FLOATING MAGNET**

*Floating Magnet, End View (Shown with optional T-slot mounting)*



**Style M Magnet**



**NOTE:**  
Cable and mating connector dimensions same as shown on page 2.

**SENSOR INTEGRAL CONNECTOR (D7 Male):**

(As viewed from end of Sensor)



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

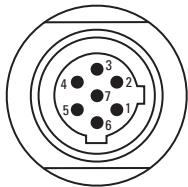
Pin no.	Wire color	Function
1	Gray	(-) Data
2	Pink	(+) Data
3	Yellow	(+) Clock
4	Green	(-) Clock
5	Brown or Red+ 24 Vdc, customer supplied	
6	White	DC ground
7	Blue	No connection*

\* 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)**

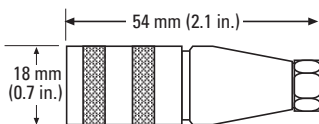
Pin no.	Wire color	Function
1	Gray	(-) Data
2	Pink	(+) Data
3	Yellow	(+) Clock
4	Green	(-) Clock
5	Brown or Red+ 24 Vdc, customer supplied	
6	White	DC ground
7	Blue	No connection*

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

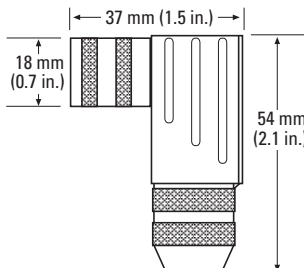
**CABLE CONNECTORS (Field-installable D7 Female):**

**Mates with Sensor Integral Connector**

**D7 Straight-exit connector**  
Part no. 560701

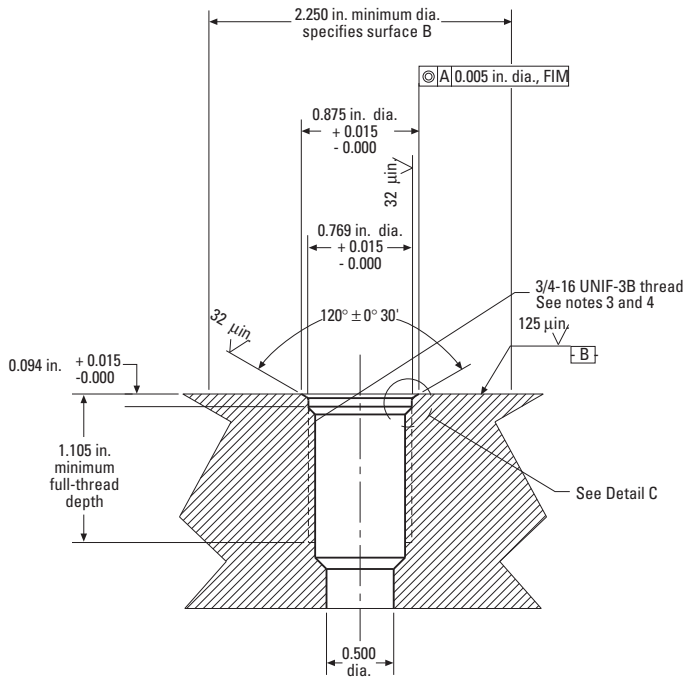


**D7 90° connector**  
Part no. 560779



# CYLINDER PORT DETAILS

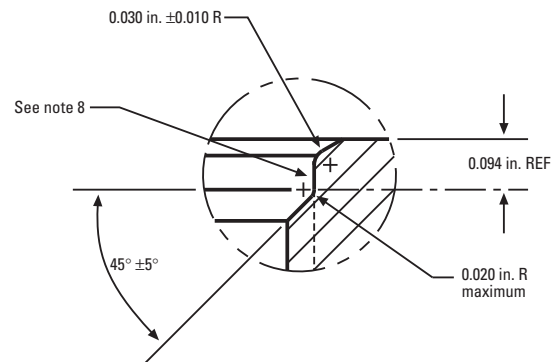
## PORT DETAIL FOR TEMPOSONICS Model RH SENSORS WITH HOUSING



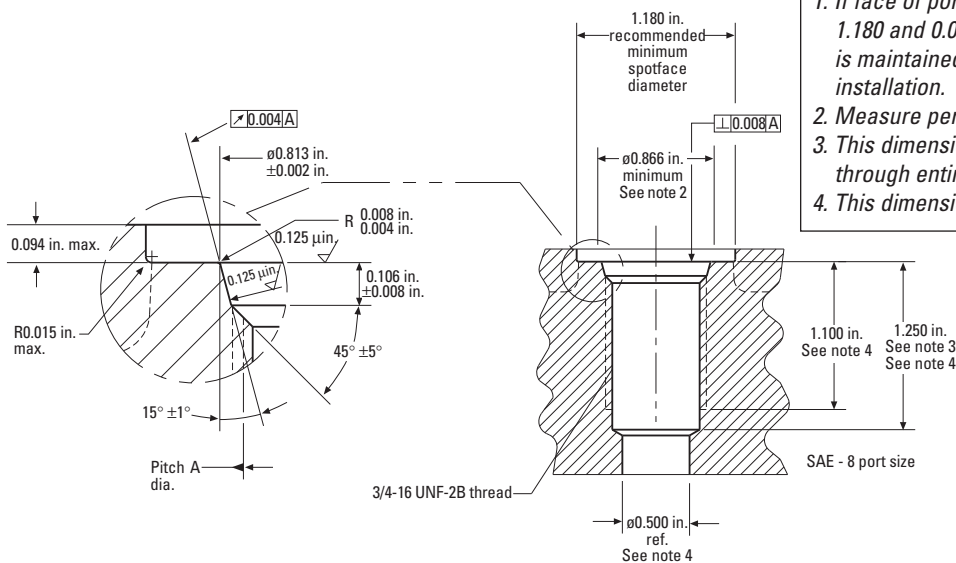
### NOTES:

1. Dimensions and tolerances based on ANSI Y14.5-1982.
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.

### Detail C



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



### NOTES:

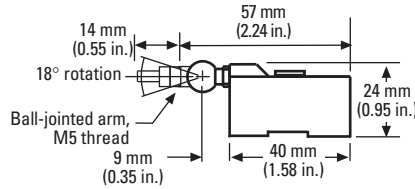
1. If face of port is on a machined surface, dimensions 1.180 and 0.094 need not apply as long as R0.008/0.004 is maintained to avoid damage to the O-Ring during installation.
2. Measure perpendicularity to A at this diameter.
3. This dimension applies when tap drill cannot pass through entire boss.
4. This dimension does not conform to SAE J1926/1.

# MAGNETS

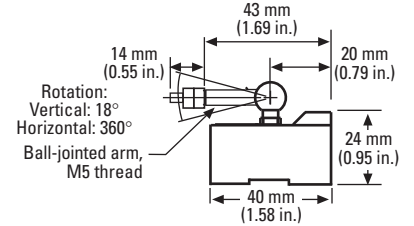
Magnets must be ordered separately with Temposonics RH sensors. The standard ring magnet (Part no. 201542) is suitable for most applications.

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.

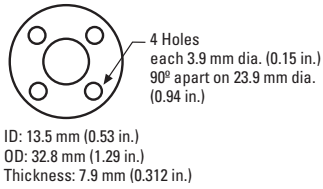
**Captive Sliding Magnet, Style V**  
Part no. 252184



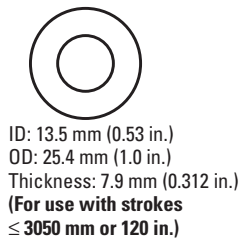
**Captive Sliding Magnet, Style S**  
Part no. 252182



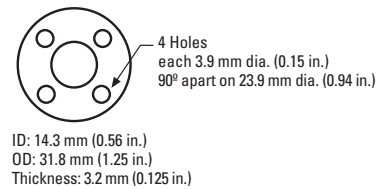
**Standard Ring Magnet**  
Part no. 201542



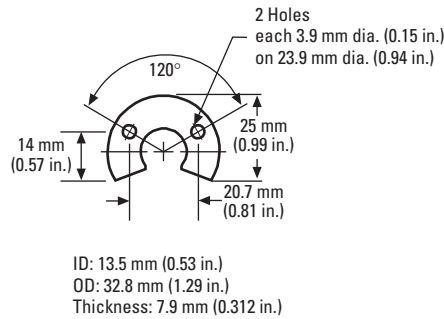
**Ring Magnet**  
Part no. 400533



**Magnet Spacer**  
Part no. 400633



**Floating Magnet, Style M**  
(May be used with Temposonics RH and RP)  
Part no. 251416



**HOW TO ORDER**

R [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] 1 S [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]

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**  
*Temposonics RH only (magnet must be ordered separately):*  
 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.)

*Temposonics RP only (magnet included):*  
 M = Floating magnet (Open ring) (Part no. 251416)  
 S = Captive-sliding magnet with joint at top (Part no. 252182)  
 V = Captive-sliding magnet with joint at front (Part no. 252184)

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

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

**STROKE LENGTH NOTE:**  
 • RH stroke range = 1 - 300 in. (25 - 7620 mm)  
 • RP stroke range = 1 - 196 in. (25 - 4975 mm)

**CONNECTION TYPE/CONNECTOR OR CABLE**

*Connector*  
 D70 = 7-pin DIN, integral, standard  
 RGO = 7-pin micro, integral, (for replacement orders only)

*Integral Cable*  
 E \_\_\_\_ = Integral standard cable with pigtail termination  
 P \_\_\_\_ = Integral high-performance cable with pigtail termination  
 F \_\_\_\_ = Integral cable, polyurethane jacket with pigtail termination

*Cable Length*  
 \_\_\_\_\_. \_\_\_\_ = Encode in feet if using US customary stroke length  
 \_\_\_\_\_. \_\_\_\_ = Encode in meters if using metric stroke length  
 Range = 1 (01) to 99 (99) ft. or 1 (01) to 30 (30) meters

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

**OUTPUT**

S  $\frac{a}{b} \frac{c}{d} \frac{e}{f}$  = SSI Output (Fill in the six blanks with the applicable codes). Consult factory for additional options.

**a) Data Length**  
 1 = 25 bits  
 2 = 24 bits

**b) Output Format**  
 B = Binary  
 G = Gray code

**c) Resolution**  
 1 = 0.0002 in. (0.005 mm)  
 2 = 0.0004 in. (0.01 mm)  
 3 = 0.002 in. (0.05 mm)  
 4 = 0.004 in. (0.1 mm)  
 5 = 0.0008 in. (0.02 mm)  
 6 = 0.00008 in. (0.002 mm)

**d) Performance**  
 1 = Standard

**e, f) Scale Orientation**  
 00 = Forward-acting  
 01 = Reverse-acting  
 02 = Forward-acting synchronized

**PRESSURE HOUSING (RH Spare Only)      EXTENSION CABLES (SSI Only)**

H [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]

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

**NOTE:**

RH spare pressure housing for stroke lengths 1 to 72 in. (25 to 1825 mm) only.

D [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] P 0

**SENSOR CONNECTION TYPE**  
 D7 = Female connector (straight exit) and high-performance cable for SSI sensors with D7 (D70) connector.  
 DR = Female connector (90° 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 (90° 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**

- P0 = Pigtail connection

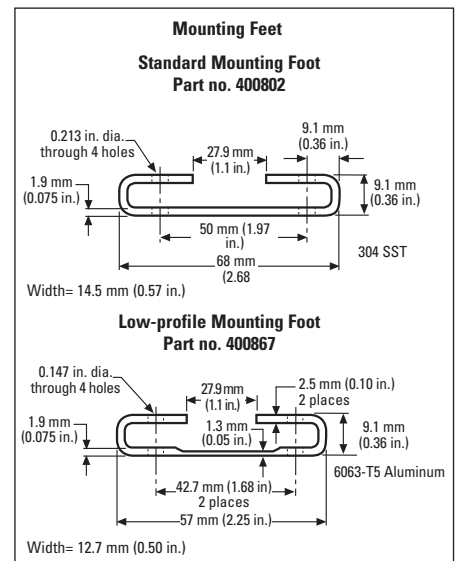
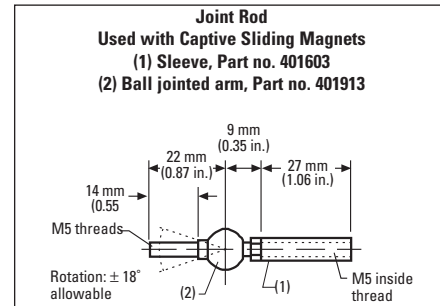
# HOW TO ORDER

## ACCESSORIES

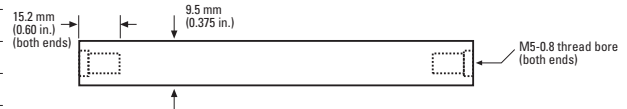
Description	Part no.	Notes
O-Ring (spare)	560315	For use with Temposonics RH sensors
Hex Jam-nut (w/ 3/4-16 UNF threads)	500015	For use with Temposonics RH sensors
Hex Jam-nut (w/ M18x 1.5 threads)	500018	For use with Temposonics RH sensors
Magnet Spacer	400633	For use with Standard Ring Magnet Part no. 201542
Magnet Mounting Screws	560357	Used to mount Standard Ring Magnet Part no. 201542 (4 screws required)
Floating Magnet, Style M	251416	Spare for Temposonics RP sensors
Captive Sliding Magnet, Style V	252184	Spare for Temposonics RP sensors, Rod joint at front of magnet
Captive Sliding Magnet, Style S	252182	Spare for Temposonics RP sensors, Rod joint at top of magnet
Joint Rod Sleeve	401603	Optional accessory for Temposonics RP sensors
Ball jointed arm	401913	Optional accessory for Temposonics RP sensors
Power Supply (24/28 Vdc, 0.5 A)	380009	Open frame style
Mounting Feet, Standard (spares for RP sensors)	400802	Temposonics RP position sensors are provided with mounting feet (see page 3)
Mounting Feet, Low-profile	400867	Optional accessory for Temposonics RP sensors
T-slot M5 Nut	401602	Optional accessory for mounting Temposonics RP sensors
D7 Field-installable Connector	560701	Female, straight exit (see page 4)
D7 Field-installable Connector	560779	Female, 90° exit (see page 4)
Cable, standard type	530026	3 twisted pairs, shielded, PVC jacket, specify desired length in feet
Cable, high-performance type	530029	7 conductor, EMC shielded; polyurethane jacket. Specify desired length in feet.

## OPTIONAL EXTENSION RODS (for use with Captive Sliding Magnet)

Extension Rod Lengths	Part no.	Extension Rod Lengths	Part no.
60.3 mm (2.375 in.)	401768-2	390.5 mm (15.375 in.)	401768-15
85.7 mm (3.375 in.)	401768-3	466.7 mm (18.375 in.)	401768-18
111.1 mm (4.375 in.)	401768-4	517.5 mm (20.375 in.)	401768-20
161.9 mm (6.375 in.)	401768-6	542.9 mm (21.375 in.)	401768-21
187.3 mm (7.375 in.)	401768-7	619.1 mm (24.375 in.)	401768-24
212.7 mm (8.375 in.)	401768-8	771.5 mm (30.375 in.)	401768-30
238.1 mm (9.375 in.)	401768-9	923.9 mm (36.375 in.)	401768-36
263.5 mm (10.375 in.)	401768-10	1076.3 mm (42.375 in.)	401768-42
314.3 mm (12.375 in.)	401768-12	1228.7 mm (48.375 in.)	401768-48
365.1 mm (14.375 in.)	401768-14	1533.5 mm (60.375 in.)	401768-60



**Extension Rod**  
Part no. 401768-XX



## SENSORS

Pioneers,  
Innovators,  
Leaders in  
Magnetostrictive  
Sensing

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displacement@temposonics.com

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