

Temposonics®

Magnetostrictive Linear-Position Sensors

R-Series Model RP and RH Sensors
DeviceNet Output

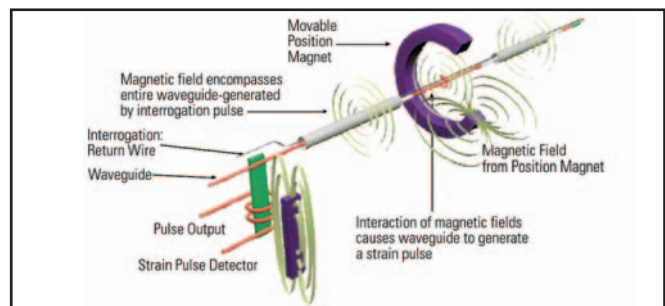


550651 E

Product Specification



- Rugged industrial sensor
- Linear, absolute measurement
- LEDs for sensor diagnostics
- Non-contact sensing technology
- Superior accuracy, resolution up to 2 μm
- Non-linearity less than 0.01%
- Repeatability within 0.001%
- Direct DeviceNet output



R-Series linear-position sensors

- R-Series model RH and RP sensors are extremely robust and are ideal for continuous operation under harsh industrial conditions.
- Two standard sensor housings are available. 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 sliding magnets.
- 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.

The benefits of magnetostrictive sensing

Temposonics linear 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 movable 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 ultrasonic 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. Using the elapsed time to determine position of the permanent magnet provides an absolute position reading that never needs recalibration or re-homing after a power loss. Non-contact sensing eliminates wear, and guarantees the best durability and output repeatability.



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

Temposonics R-Series sensors with DeviceNet communications

Controller Area Network (CAN) is a standard for device level communications and the foundation of fieldbus systems like DeviceNet, CANOpen and CANbus. These fieldbus systems can provide high speed transmission appropriate for position indication and for motion control in industrial applications.

DeviceNet allows users to interface up to 64 devices using a single cable, thus eliminating the need for conventional methods of multiple wire runs. DeviceNet provides a way to define how, and in which priority, data will be transmitted over the network. The result is a lower complexity, cost-effective communications network linking industrial measurement and control devices. Together, the open DeviceNet protocol and the MTS “smart” R-Series sensors offer an effective, high-precision data transfer system that is well suited for industrial automation.

Parameter	Specification
Measured variable:	Displacement
Resolution:	2 µm or 5 µm
Non-linearity:	< ± 0.01% full scale (minimum ± 40 µm)
Repeatability:	< ± 0.001% full scale (minimum ± 2.5 µm) Hysteresis < 4 µm
Output:	Interface: CAN-Fieldbus system ISO 11898 Data protocol: DeviceNet release 2.0 Baud rate, kBit/s: 500 250 125 Cable length, m: <100 <250 <500 The sensor will be supplied with ordered Baud rate which can be changed by the customer.
Measuring range:	Profile style: 50 to 5080 mm (2 to 200 in.) Rod style: 50 to 7620 mm (2 to 300 in.)
Operating voltage:	+24 Vdc nominal (-15% or +20%) Polarity protection: up to -30 Vdc Overvoltage protection: up to 36 Vdc Current drain: 90 mA typical Dielectric withstand voltage: 500 Vdc (DC ground to machine ground) Connection type: 5-pin male D51 DeviceNet connector
Operating temperature:	- 40 to +75 °C, (-40 to +167 °F) Relative humidity: 90% no condensation Temperature coefficient <15 ppm/ °C
EMC test:	Emissions IEC/EN 50081-1, Immunity IEC/EN 50082-2, IEC/EN 61000-4-2/3/4/6, level 3/4 criterium A, CE qualified
Shock rating:	100 g (single hit)/IEC standard 68-2-27 (survivability)
Vibration rating:	15 g/10-2000 Hz/IEC standard 68-2-6
Update time:	0.5 ms up to 1200 mm, 1.0 ms up to 2400 mm, 2.0 ms up to 4800 mm, 4.0 ms up to 7600 mm stroke length

PROFILE STYLE (RP MODEL)

Electronic head:	Aluminum housing Diagnostic display (LED's beside connector)
Sealing:	IP 65
Sensor extrusion:	Aluminum (Temposonics profile style)
Mounting:	Adjustable mounting feet or T-slot nut (M5 threads) in base channel
Magnet type:	Captive-sliding magnet or floating (open ring) magnet

ROD STYLE (RH MODEL)

Electronic head:	Aluminum housing Diagnostic display (LEDs beside connector)
Sealing:	IP 67
Sensor rod with flange:	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 magnet, floating (open ring) magnet, or magnet float

DeviceNet output

DeviceNet protocol

Temposonics R-Series models RP and RH linear-position sensors as slave devices, fulfill all requirements of the CANbus (ISO 11898) standard. The sensors electronics and integrated software implement the DeviceNet protocol to convert the displacement measurements into bus oriented outputs and transfer this data directly to the controller. The DeviceNet protocol is appropriate for serial data transfer up to 500 kBit/sec.

For Temposonics sensors, the DeviceNet protocol always includes, but is not limited to the following:

- Position
- Error Detection
- Polling & bit-strobe communications modes

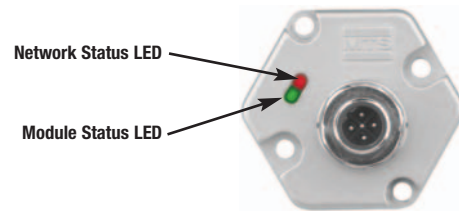
Plug and Play

R-Series sensors with DeviceNet output can be directly connected to a DeviceNet network. The plug and play design makes installation quick and easy. The sensor acts as a “slave” device that transmits its position and status data upon request to the “master” device such as a PLC or IPC. After initial system configuration, the user is not required to have extensive knowledge concerning network timing and sensor technology to execute operations within DeviceNet environment. Sensor-specific parameters are installed into the network using the Electronic Data Sheet (EDS) file available at www.mtssensors.com.

There are only two programmable parameters, which are, the node identifier and the baud rate. If desired, a PC programming tool, such as DeviceNet Manager offered by Allen Bradley, can be used to change their values. The node identifier is factory set at node 63.

Enhanced monitoring and diagnostics

Bi-color LEDs in the cover of the sensor head provide visual feedback for normal sensor operation and for DeviceNet communications.



Network Status LED

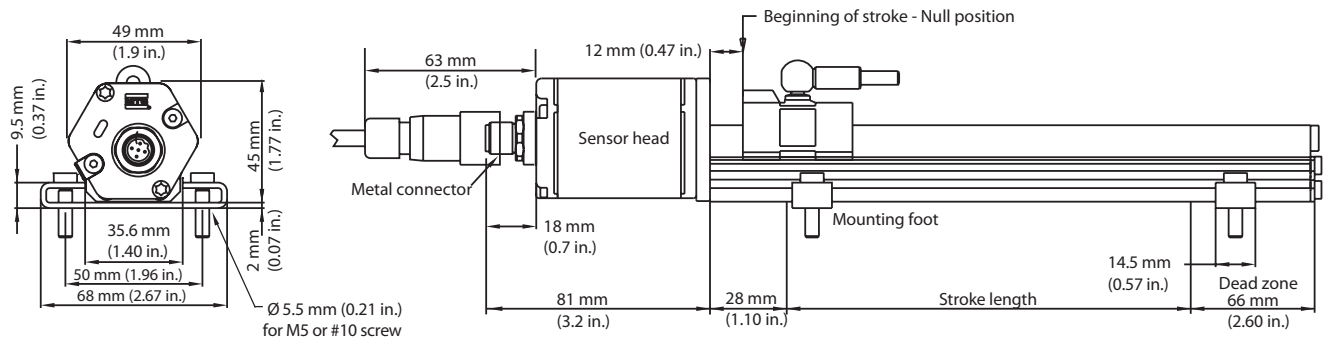
Green	Normal function
Green flashing	Waiting for instructions from DeviceNet master.
Red	Initialing error
Red flashing	No answer from DeviceNet master

Module Status LED

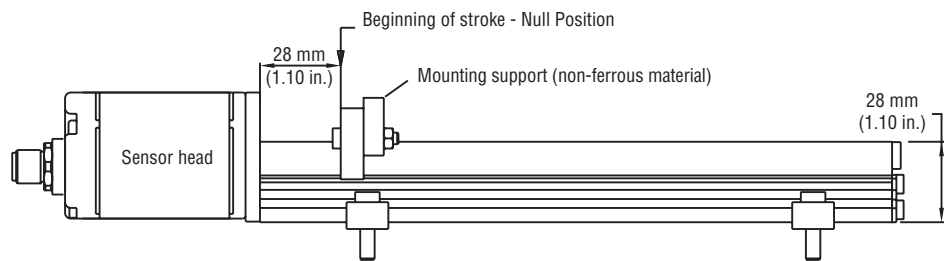
green	Normal function
Red	No Magnet detected

Model RP profile-style sensor

Captive-sliding magnet



Floating magnet (open ring)



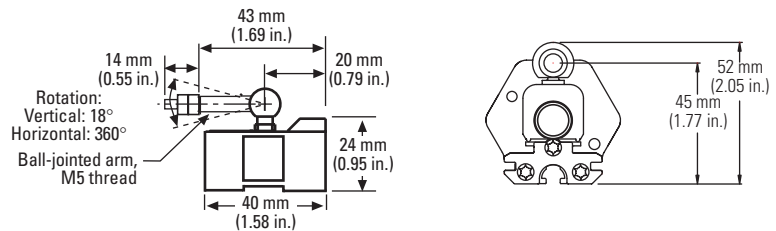
Selection of position magnets (included with sensor)

A choice of two magnet mounting configurations are available with the profile-style sensor; the captive-sliding magnet or the floating (open ring) magnet.

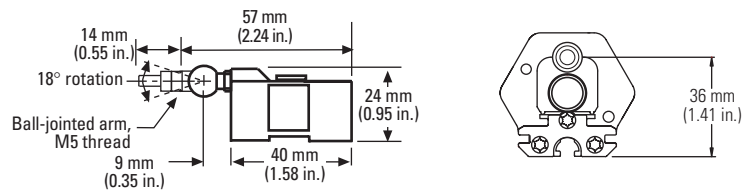
Captive-sliding magnets utilize slide bearings of special material that reduce friction, and if required, help mitigate dirt build up. The slide bearings are designed to operate dry, requiring no external lubrication or maintenance.

The floating magnet (open ring) mounts on the moving machine part and travels just above the sensor's profile extrusion. The open ring magnet (style M) 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.

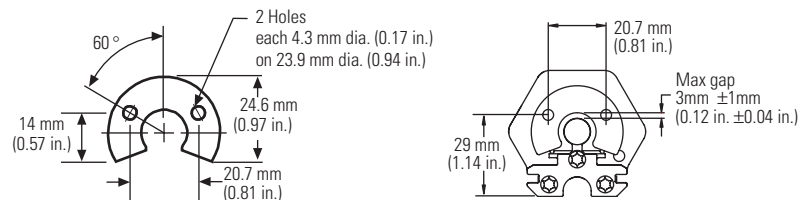
Captive-sliding magnet, style S part no. 252182



Captive-sliding magnet, style V part no. 252184



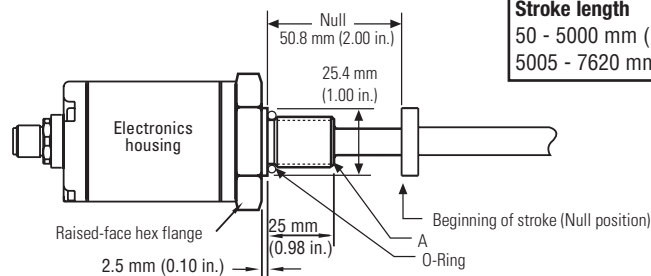
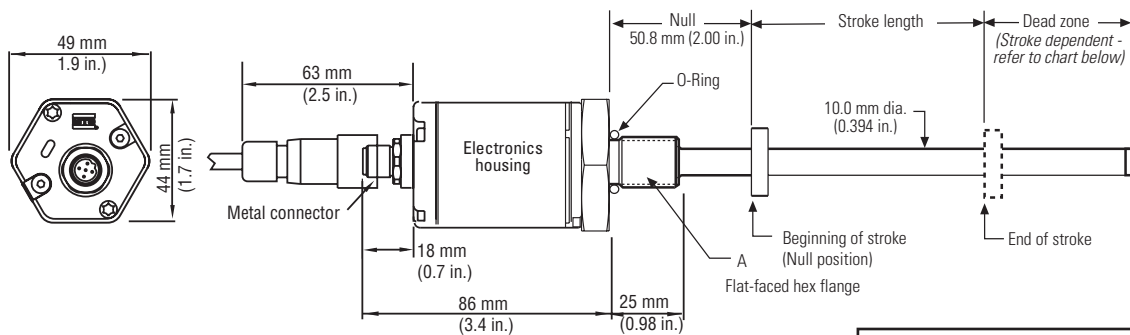
Floating (open ring) magnet, style M part no. 251416-2



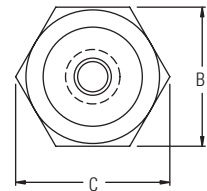
ID: 13.5 mm (0.53 in.)
OD: 32.8 mm (1.29 in.)
Thickness: 7.9 mm (0.312 in.)

Model RH rod-style sensor

The Temposonics R-Series 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.



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

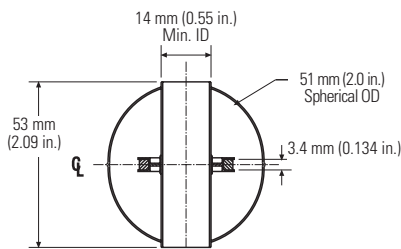


Housing style Flange type	Description	A Flange threads	B Dimensions	C Dimensions
T	US customary threads with raised-face hex	3/4"-16 UNF-3A	44.5 mm (1.75 in.)	51 mm (2.0 in.)
S	US customary threads with flat-faced hex	3/4"-16 UNF-3A	44.5 mm (1.75 in.)	51 mm (2.0 in.)
M	Metric threads with flat-faced hex	M18 x 1.5	46 mm (1.81 in.)	53 mm (2.1 in.)

Selection of position magnets (must order separately)

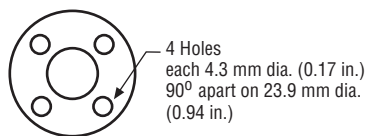
Magnets must be ordered separately with model RH position sensors. The standard ring magnet (part number 201542-2) is suitable for most applications.

Magnet Float (Level Sensing Application) Part No. 251447



Specific Gravity: 0.70 max.
Pressure: 870 psi max.
(Float for use with rod-style sensors in hydraulic fluid or fresh water applications only)

Standard-ring magnet part no. 201542-2



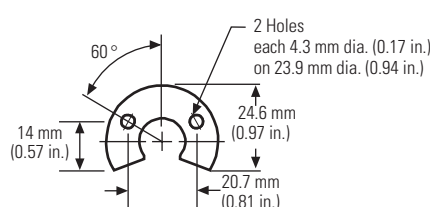
ID: 13.5 mm (0.53 in.)
OD: 32.8 mm (1.29 in.)
Thickness: 7.9 mm (0.312 in.)

Ring magnet part no. 400533



ID: 13.5 mm (0.53 in.)
O.D.: 25.4 mm (1.0 in.)
Thickness: 7.9 mm (0.312 in.)

Floating (open ring) magnet, style M part no. 251416-2



ID: 13.5 mm (0.53 in.)
OD: 32.8 mm (1.29 in.)
Thickness: 7.9 mm (0.312 in.)

Magnet spacer (non-ferrous spacer for use with standard ring magnet) part no. 400633



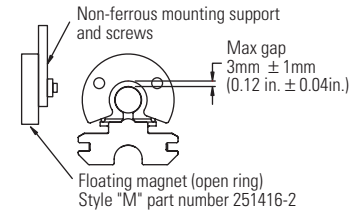
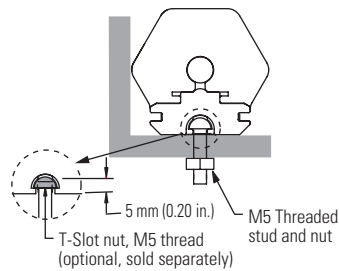
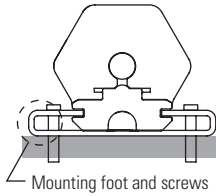
ID: 14.3 mm (0.56 in.)
O.D.: 31.8 mm (1.25 in.)
Thickness: 3.2 mm (0.125 in.)

Mounting, wiring and magnets

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.

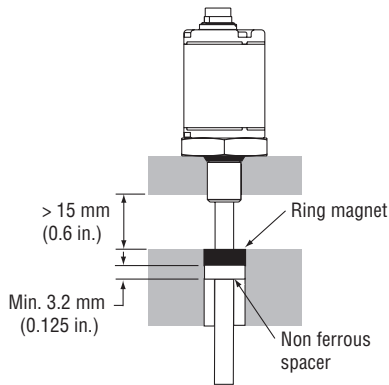


Note:

Temposonics Model 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.).

Rod-style sensor mounting

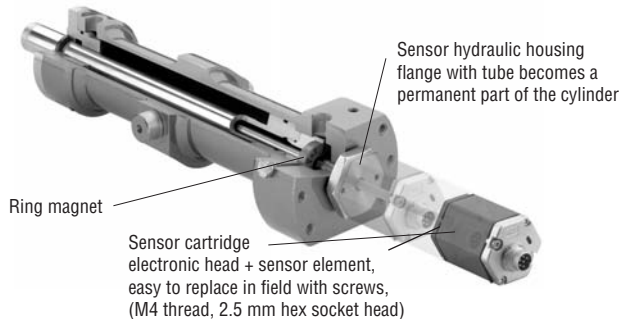
The position magnet requires minimum distances away from ferrous metals to allow proper sensor output. The minimum distance from the front of the magnet to the cylinder end cap is 15 mm (0.6 in.). The minimum distance from the back of the magnet to the piston head is provided by the non-ferrous spacer, i.e. 3.2 mm (0.125 in.).



Cylinder installation

When used for direct stroke measurement in fluid cylinders, the sensor's stainless steel rod installs into a bore in the piston head/rod assembly as illustrated. This method guarantees a longlife and trouble-free operation.

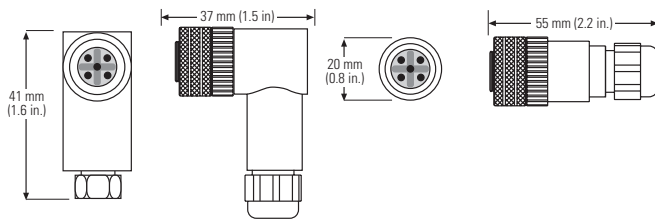
The sensor cartridge can be removed from the flange and rod housing while still installed in the cylinder. This procedure allows quick and easy sensor cartridge replacement, without the loss of hydraulic pressure.



Cable connectors (field-installed female micro DeviceNet)

Micro 90° connector part no. 370376

Micro straight-exit connector part no. 370375

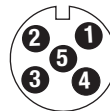


Notes:

1. Appropriate grounding of cable shield is required at the controller end.
2. Molded extension cables are available from third-party vendors.

Sensor integral connector (D51 Male)

Wiring



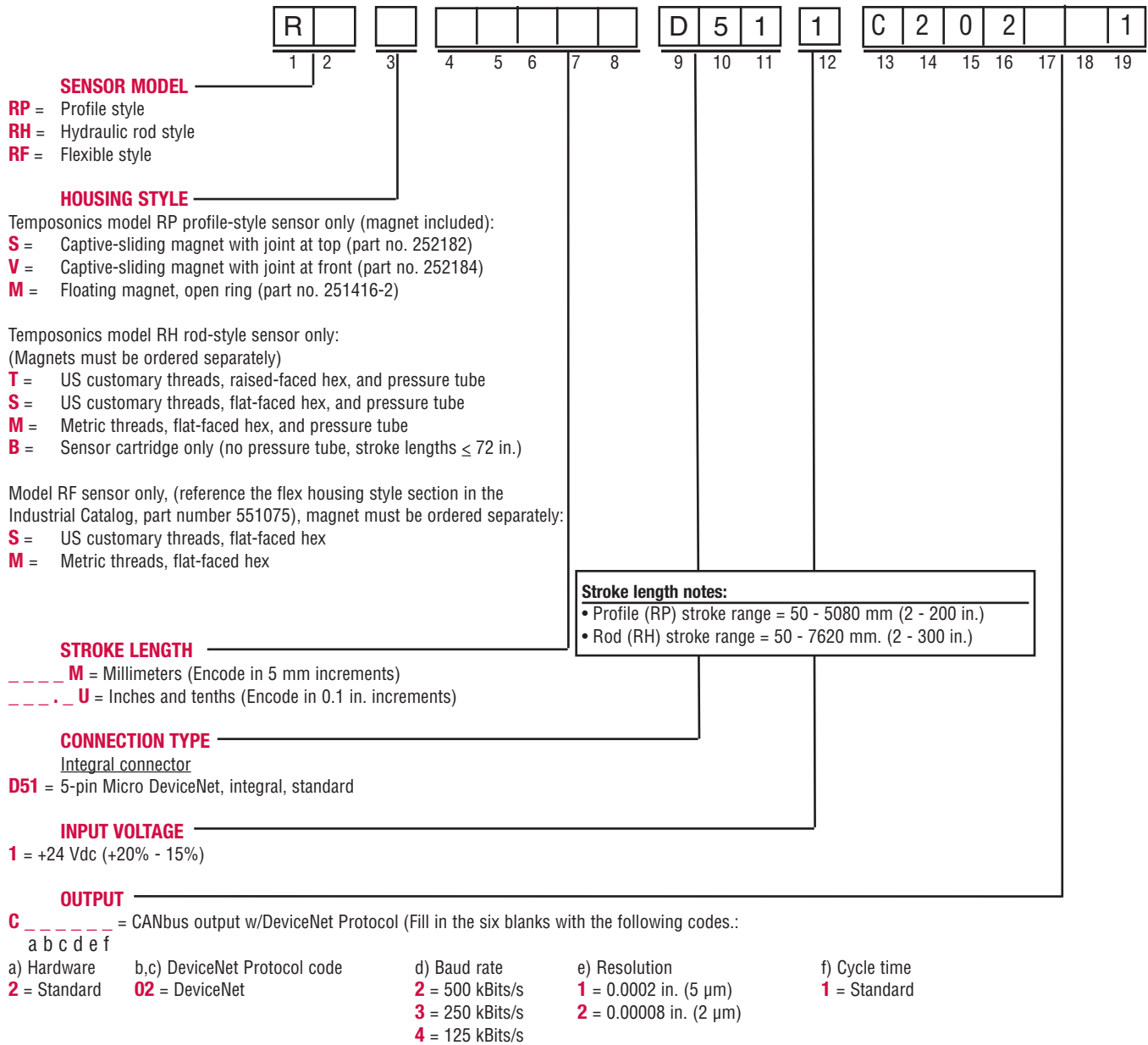
Male D51 connector pin-out as viewed from the end of the sensor.

Pin no.

Function

Pin no.	Function
1	Shield
2	+24 Vdc (+20% / -15%)
3	DC Ground (for supply)
4	CAN (+)
5	CAN (-)

How to order



DeviceNet EDS files are available on the Temposonics website at www.mtssensors.com

How to order (continued)

Accessories

Description	Function/Notes	Part no.
Mounting feet, standard (spares)	Model RP sensors come with mounting feet (see page 6).	400802
Base channel T-slot nut	Nut for mounting model RP sensors. Requires M5 screw (see page 6).	401602
O-Ring (spare)	For use with model RH sensors with style "T" or "S" housing	560315
O-Ring (spare)	For use with model RH sensors with style "M" housing	401133
Joint-rod Sleeve (1 in.)	For use with model RP sensors with "S" or "V" style magnets	401603
Ball-jointed arm, straight	For use with model RP sensors with "S" or "V" style magnets	401913

Magnets and float options

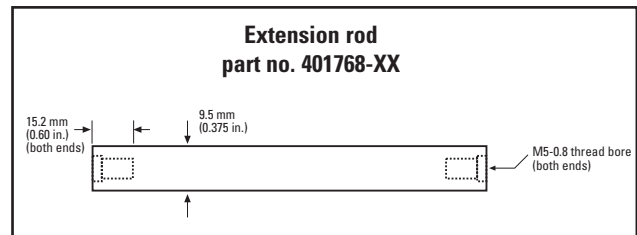
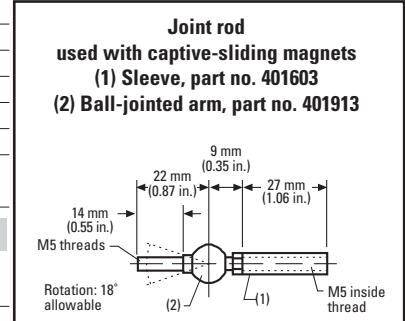
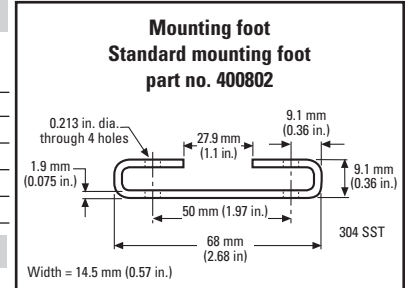
Description	Function/Notes	Part no.
Small open ring (model RP spare)	Magnet style M, "floating" magnet used with model RH and RP sensors.	251416-2
Small ring magnet	Standard magnet for model RH sensors.	201542-2
Magnet float	For use with RH sensors used to measure liquid level.	251447
Captive-sliding magnet (spare)	Style S captive-sliding magnet with joint at top. Comes with RP sensors.	252182
Captive-sliding magnet (spare)	Style V captive-sliding magnet with joint at front. Comes with RP sensors.	252184
Magnet spacer	For use with standard ring magnet, part no. 201542-2.	400633
Collar	Provides end of stroke "stops" for magnet float, part no. 251447.	560777
Magnet mounting screws	Used to mount the standard ring magnet, part no. 201542-2. (4 screws required)	560357

Field-installed connectors

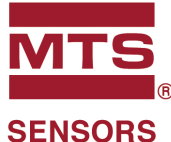
Description	Function/Notes	Part no.
5-Pin connector, straight	Female, straight exit, mates to D51 connection type. See page 6.	370375
5-Pin Micro connector, 90°	Female, 90° exit, mates to D60 connection type. See page 6.	370376

Optional extension rods (for use with captive-sliding magnets)

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



Part Number: 09-06 550651 Revision E
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 All Temposonics sensors are covered by US patent number 5,545,984. Additional patents are pending.
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UNITED STATES
 MTS Systems Corporation
 Sensors Division
 3001 Sheldon Drive
 Cary, NC 27513
 Tel: (800) 633-7609
 Fax: (919) 677-0200
 (800) 498-4442
 www.mtssensors.com
 sensorsinfo@mts.com

GERMANY
 MTS Sensor Technologie
 GmbH & Co. KG
 Auf dem Schuffel 9
 D-58513 Lüdenscheid
 Tel: +49 / 23 51 / 95 87-0
 Fax: +49 / 23 51 / 56 491
 www.mtssensor.de
 info@mtssensor.de

JAPAN
 MTS Sensors Technology
 Corporation
 Ushikubo Bldg.
 737 Aihara-cho, Machida-shi
 Tokyo 194-0211, Japan
 Tel: + 81 (42) 775 / 3838
 Fax: + 81 (42) 775 / 5512
 www.mtssensor.co.jp
 info@mtssensor.co.jp