

# Temposonics®

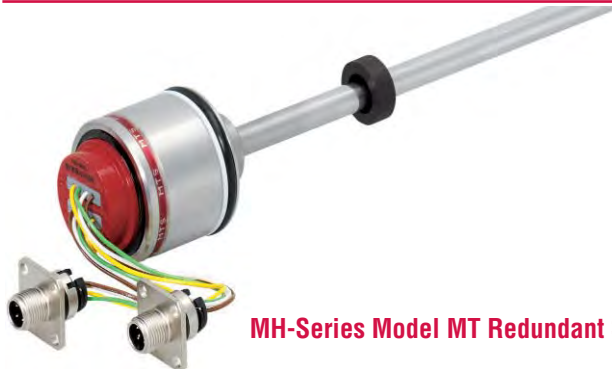
Magnetostrictive, Absolute, Non-contact  
Linear-Position Sensors



## MH-Series Mobile Hydraulic in-Cylinder Sensor

Model MT, Redundant - Analog Output

### Data Sheet



MH-Series Model MT Redundant Sensor



Cylinder Application Example

#### FEATURES

- Linear, Absolute Position Sensors
- Non-Contact Sensing Technology
- Superior Accuracy,  $< \pm 0.04\%$  F.S.
- Repeatability,  $< \pm 0.005\%$  F.S.
- Compact Design for Embedded Cylinder Applications
- Dual, Electrically Redundant Analog Outputs:  
Current and Voltage
- Stroke length: 50 mm (2 in.) to 1500 mm (59 in.)
- Voltage input: 12/24 Vdc
- Shock Rating: 100 g (single hit) / IEC 68-2-27
- Vibration Rating 15 g / 10-2000 Hz/IEC 68-2-6
- 100 V/m EMI Immunity

#### BENEFITS

- Rugged Industrial Sensor
- Dual, Electrically Redundant Analog Outputs

#### APPLICATIONS

- Continuous Operation In Harsh Mobile Conditions
- High Pressure Conditions
- For Welded and Tie-rod Cylinder Applications

#### TYPICAL INDUSTRIES

- Construction
- Agriculture
- Off-highway Machinery

#### Product overview

The MH-Series Model MT sensor is designed with the “mobile” world in mind and applies specifically to applications that require redundancy. The Model MT sensor is validated in the field by customers worldwide. Performance is second-to- none; high accuracy, 100 V/m EMI, position output. Ruggedness is “designed in”; 100 g shock and 15 g vibration rating. The model MT redundant sensor can be fully sealed and embedded in a cylinder to ensure a long operating life.

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## Product Specifications and Output Options

### Product specifications

Parameters	Specifications
<b>OUTPUT</b>	
<b>Measured variable:</b>	Linear Position measurement
<b>Resolution:</b>	<b>Range:</b> 50 to 500 mm 150 mm 1,000 mm 1,250 mm 1,500 mm
	<b>Resolution:</b> 0.1 mm 0.18 mm 0.24 mm 0.3 mm 0.38 mm
<b>Outputs:</b>	<b>Voltage:</b> 0.25 to +1.75 Vdc 0.5 to 4.5 Vdc <b>Reverse:</b> 4.75 to 0.25 Vdc 4.5 to 0.5 Vdc > 10k $\Omega$ at 12/24 Vdc power supply
	<b>Current:</b> 4 to 20 mA <b>Reverse:</b> 20 to 4 mA $\leq$ 250 $\Omega$ at 12/24 Vdc power supply
<b>Stroke length:</b>	50 mm to 1500 mm (2 in. to 59 in.) Measured in 5 mm (0.20 in.) increments
<b>Linearity uncorrected:</b>	< $\pm$ 0.04% full stroke (minimum $\pm$ 0.100 mm 0.003 in.)
<b>Repeatability:</b>	< $\pm$ 0.005% of full stroke
<b>Hysteresis:</b>	$\pm$ 0.1 mm (0.003 in.)
<b>Outputs:</b>	Analog, dual electrically redundant:  $\ddagger$ Voltage: 0.25 to 4.75 Vdc , 0.5 to 4.5 Vdc (reverse: 4.75 to 0.25 Vdc, 4.5 to 0.5 Vdc) $\ddagger$ Current: 4 to 20 mA (reverse: 20 to 4 mA)
<b>Operating voltage:</b>	12/24 Vdc (8-32 Vdc)
<b>Power consumption:</b>	1 W maximum (per sensor)
<b>ELECTRONICS</b>	
<b>Electrical isolation:</b>	500 Vdc (DC ground to machine ground)
<b>Polarity protection:</b>	Up to -36 Vdc
<b>Overvoltage protection:</b>	Up to 36 Vdc

Parameters	Specifications
<b>ENVIRONMENTAL</b>	
<b>Operating conditions:</b>	<b>Operating:</b> -40 °C (-40 °F) to +105 °C (221 °F) <b>Storage:</b> -30 °C (-22 °F) to +105 °C (221 °F) 90% relative humidity, no condensation
<b>EMC test:</b>	100 V/m: ISO 11452-5 ISO 14982 to Agriculture and forest machinery
<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>	One 4-pin and one 5-pin with the M12 x 1 connector and flange (provides IP69K environmental protection when installed in a cylinder).
<b>ROD STYLE SENSOR (MODEL MT)</b>	
<b>Material:</b>	<b>Sensor rod:</b> Stainless steel 1.4306 / AISI 304L <b>Housing:</b> Stainless steel 1.4305 / AISI 303 <b>Mechanical assembly:</b> Flange housing 48 mm (1.89 in.) dia., O-ring 40.87 x 3.53 mm NBR 80, backup ring 42.6 x 48 x 1.4 PTFE
<b>Sealing:</b>	IP67 (IP69k when installed inside a cylinder with M12 x 1 in. connection type)
<b>Pressure rating:</b>	<b>Sensor rod, 10 mm (0.39 in.):</b> Operating, 350 bar (5076 psi) Peak, 530 bar (7687 psi)
<b>Magnet type:</b>	Ring magnet,
$\ddagger$ Output range is factory programmable through entire stroke and is fully reversible.	

### Output options

The MH-Series Model MT position analog sensor provides two, analog, electrically redundant outputs:

- Voltage; 0.25 to 4.75 Vdc, 0.5 to 4.50 Vdc (reverse acting: 4.75 to 0.25 Vdc, 4.5 to 0.5 Vdc)
- Current; 4 to 20 mA (reverse acting: 20 to 4 mA)

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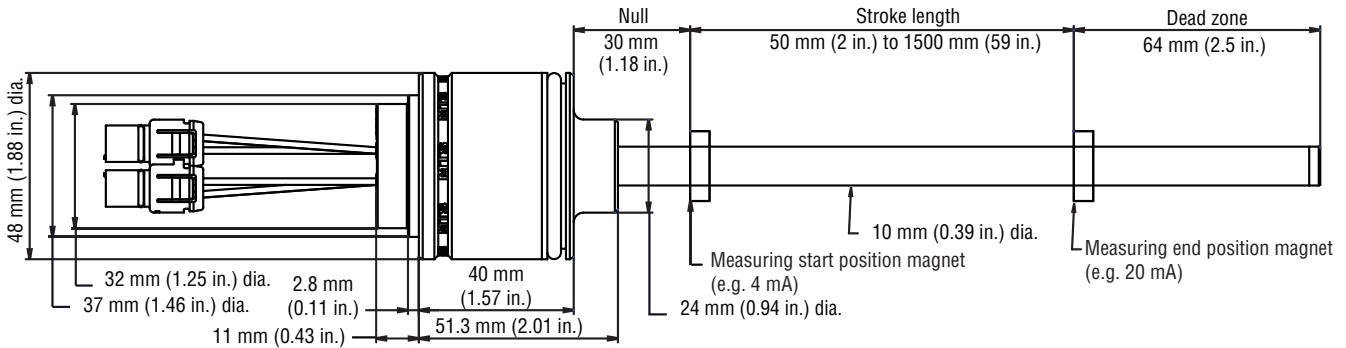
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## Model MT redundant sensor dimension references

**Model MT, rod-style Redundant Sensor** Drawing is for reference only, contact applications engineering for tolerance specific information.



**Figure 1.** MH-Series Model MT rod-style sensor dimension reference

## Standard magnet selections (Model MT)

### SELECTION OF POSITION MAGNETS (MAGNET AND MAGNET SPACER MUST BE ORDERED SEPARATELY)

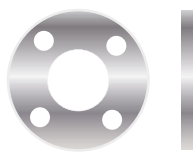
A choice of three magnets are available with the Model MT rod-style sensor. Magnets must be ordered separately with Model MT position sensors. The standard ring magnet (part number 201542-2) is suitable for most applications.

#### STANDARD RING MAGNET Part number 201542-2



**Material:** Ferrite PA  
**I.D.:** 13.5 mm (0.53 in.)  
**O.D.:** 33 mm (1.3 in.)  
**Thickness:** 8 mm (0.3 in.)  
**Operating temperature:**  
 - 40 °C (-40 °F) to  
 - 105 °C to (221 °F)

#### MAGNET SPACER Part number 400633



**Material:** Non-ferrous, used with  
 ring magnet (part no.: 201542-2)  
**I.D.:** 14 mm (0.56 in.)  
**O.D.:** 32 mm (1.25 in.)  
**Thickness:** 3.2 mm (0.125 in.)

#### RING MAGNET Part number 400533



**Material:** Ferrite PA  
**I.D.:** 13.5 mm (0.53 in.)  
**O.D.:** 25.4 mm (1 in.)  
**Thickness:** 8 mm (0.3 in.)  
**Operating temperature:**  
 - 40 °C (-40 °F) to  
 - 105 °C to (221 °F)

#### RING MAGNET Part number 401032



**Material:** Ferrite PA  
**I.D.:** 13.5 mm (0.53 in.)  
**O.D.:** 17 mm (0.68 in.)  
**Thickness:** 8 mm (0.31 in.)  
**Operating temperature:**  
 - 40 °C (-40 °F) to  
 - 105 °C to (221 °F)

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## Model MT Rod-Style Sensor

### Installation

#### Model MT redundant sensor installation references

The robust Temposonics Model MT Redundant sensor's new stainless-steel position sensor is designed for direct stroke measurement in mobile hydraulic cylinders. The Temposonics Model MT Redundant sensor can be installed from the head side or the rod side of the cylinder depending on the cylinder design.

#### Installation Notes:

1. Use a non-ferrous circlip to fix the magnet.
2. The piston rod bore is dependent on hydraulic pressure and piston velocity. Minimum drilling for a (10 mm rod) should be 13.5 mm.

**Model MT, rod-style redundant sensor mechanical installation** Drawing is for reference only, contact applications engineering for tolerance specific information.

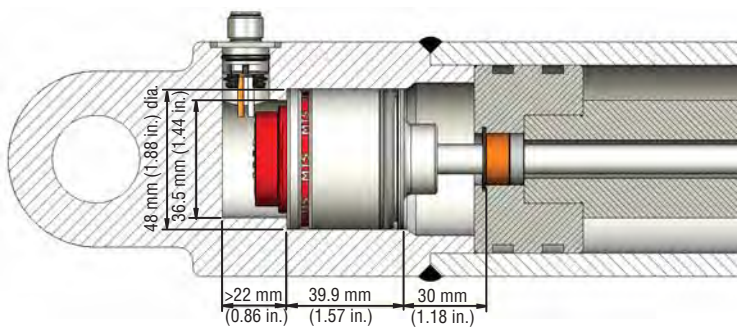


Figure 2. MH-Series Model MT rod-style sensor mechanical installation example

**Model MT, rod-style redundant sensor installation** Drawings are for reference only, contact applications engineering for tolerance specific information.

Installation methods are possible in magnetic and non-magnetic applications (shown in Figures 3 and 4) and are entirely dependent on the cylinder design. While the most common method of installation is from the rod side of the cylinder, installation from the head side of the cylinder is also possible. In both installation methods, the sensor seals the cylinder by using an O-Ring and backup ring which is installed on the sensor housing.

#### Magnetic material installation reference

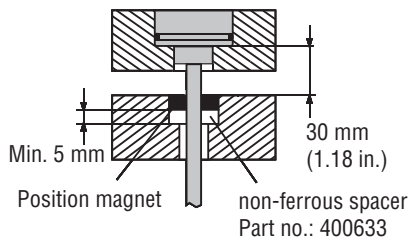


Figure 3. Model MT installation in magnetic material using magnet spacer, part number 400633

#### Non-magnetic material installation reference

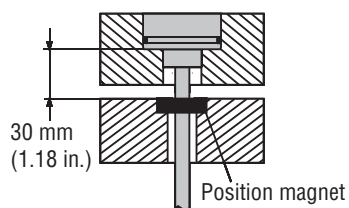
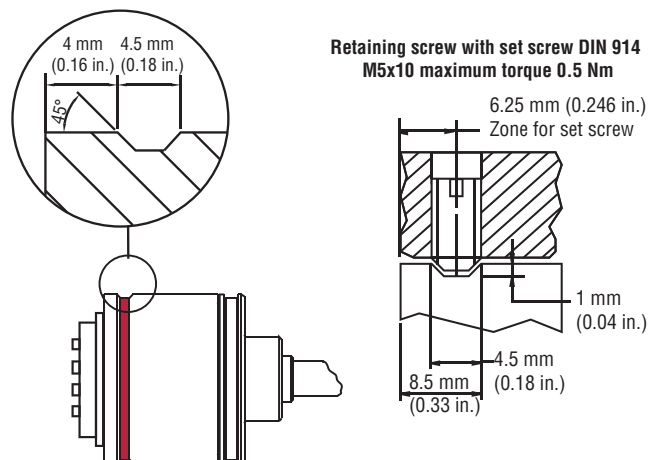


Figure 4. Model MT installation in non-magnetic material (without magnet spacer, part number 400633)

#### Set screw detail

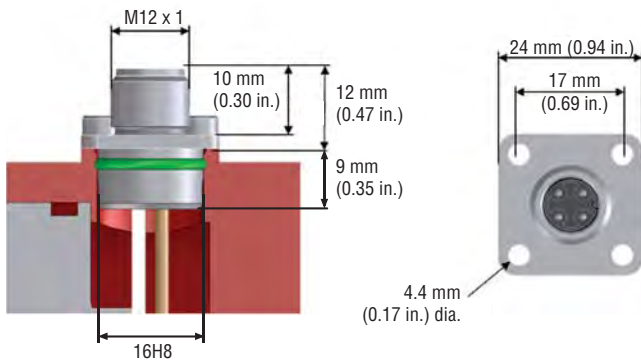


## Connections and wiring

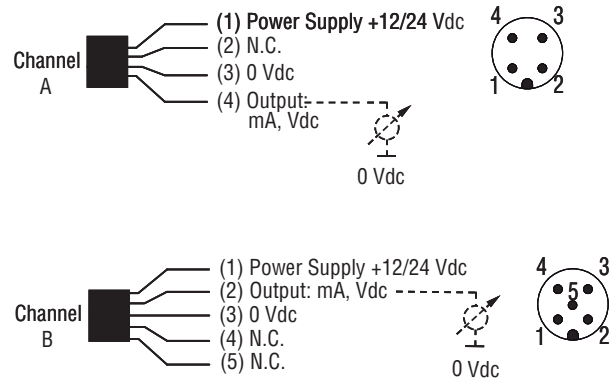
### CONNECTION TYPE

The Temposonics® M12 connector system (shown in *Figures 7, 8, 9 and 10*), meets the most stringent protection requirements important for the difficult environmental conditions of mobile hydraulics applications. Protection type IP69K makes the robust metal housing not only completely dust- and waterproof, even the harshest cleaning measures cannot damage the sensor.

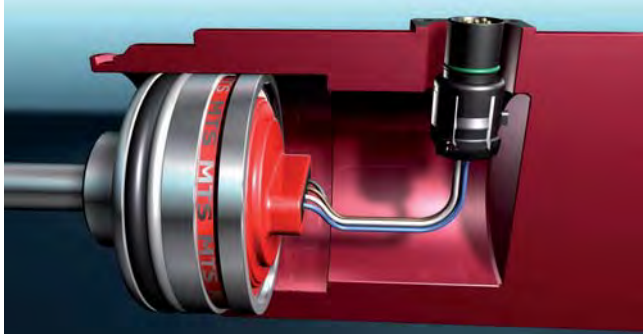
**Model MT, rod-style redundant Sensor connector and pin assignments** *Drawings are for reference only, contact applications engineering for tolerance specific information.*



**Figure 5.** Model MT sensor connection dimensions



### MOUNTING THE CONNECTOR SYSTEM TO THE CYLINDER



**Figure 7.** The MH sensor is delivered by MTS together with the new connector system: The connector insert carrier is already connected to the sensor electronics, i.e. no soldering, any color or connection mistake.



**Figure 9.** Four standard screws must be tightened to mount the connector flange on the cylinder.



**Figure 8.** The connector insert is taken out of the cylinder through a bore hole. The flange housing can be snapped into position easily from outside.



**Figure 10** With a corresponding mating molded plug the connector system fulfills an ingress protection (IP) of 69K.

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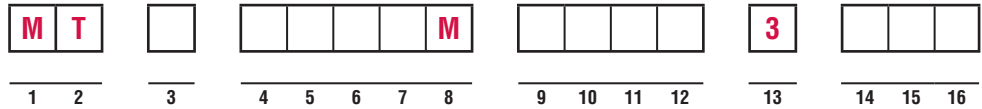
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# Model MT Rod-Style Sensor

## Ordering Information

### MH-Series Model MT ordering information

Use the table below to configure your sensor part number.



**SENSOR MODEL** \_\_\_\_\_ = **M T** 1-2  
**MT** = Rod-style with pressure fit flange housing 48 mm (1.9 in.) dia.

**SENSOR STYLES** \_\_\_\_\_ = \_\_\_\_\_ 3  
**C** = Rod-style 10 mm (0.39 in.) dia.  
**R** = Rod-style 10 mm (0.39 in.) dia. with welded threaded end plug M4

**STROKE LENGTH (ORDER LENGTH)** \_\_\_\_\_ = \_\_\_\_\_ 4-8  
 \_\_\_\_\_ **M** = Millimeters  
 50 to 1500 mm (2 in. to 59 in.) (in 5 mm increments)

**CONNECTION TYPE** \_\_\_\_\_ = \_\_\_\_\_ 9-12  
**N\_\_R** = Channel A: 4 single wires, M12 IP69K, 4 pin (pin assignment 2 x 1-3-4)  
 Channel B: 4 single wires, M12 IP69K, 5 pin (pin assignment 2 x 1-2-3)  
**N06R** - 60 mm min. wire length  
**N25R** - 250 mm max. wire length

**INPUT VOLTAGE** \_\_\_\_\_ = **1** 13  
**3** = +12/24 Vdc

**OUTPUT** \_\_\_\_\_ = \_\_\_\_\_ 14-16

	<b>CHANNEL A</b>	<b>CHANNEL B</b>
<b>V11</b>	= 0.25 to 4.75 Vdc	0.25 to 4.75 Vdc
<b>V12</b>	= 0.5 to 4.5 Vdc	0.5 to 4.5 Vdc
<b>V13</b>	= 4.75 to 0.25 Vdc	4.75 to 0.25 Vdc
<b>V14</b>	= 4.5 to 0.5 Vdc	4.5 to 0.5 Vdc
<b>V21</b>	= 0.25 to 4.75 Vdc	4.75 to 0.25 Vdc
<b>V22</b>	= 0.5 to 4.5 Vdc	4.5 to 0.5 Vdc
<b>A01</b>	= 4 to 20 mA	4 to 20 mA
<b>A04</b>	= 20 to 4 mA	20 to 4 mA
<b>A21</b>	= 4 to 20 mA	20 to 4 mA

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## Magnet selections and optional test kit

Magnets and the MH-Series Analog/PWM tester must be ordered separately. Refer to the table below for ordering information.

Magnet selections	Part no.
Ring magnet, O.D. 17.4 mm	401032
Ring magnet, O.D. 25.4 mm	400533
Ring magnet, O.D. 33 mm	201542-2
Magnet spacer	400633

Optional accessory	Part no.
MH-Series Analog/PWM tester	280618
The MH-Series Tester includes:	
<ul style="list-style-type: none"><li>• MH-Series analog / PWM Tester</li><li>• 12 Vdc battery charger with adapter</li><li>• (adapter main plug EU, adapter main plug UK)</li><li>• Cable with M12 x 1 connector</li><li>• Cable with pigtailed wires</li><li>• Carrying case</li><li>• CD-Rom with user's guide</li></ul>	



MH-Series Analog/PWM tester, part no.: 280618

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