

## Brief Instruction

### **MH-Series**

Magnetostrictive Linear Position Sensors



# Temposonics® MH-Series

## Brief Instructions

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## 1. Introduction

### 1.1 Purpose and use of this manual

Before starting the operation of Temposonics® sensors read this documentation thoroughly and follow the safety information. Keep the manual for future reference!

The content of this technical documentation and its appendix is intended to provide information on mounting, installation and commissioning by qualified technical personnel 1 or instructed service technicians who are familiar with the project planning and dealing with Temposonics position sensors.

### 1.2 Used symbols and warnings

Warnings are intended for your personal safety and for avoidance of damage to the described product or connected devices. In this documentation, safety information and warnings to avoid dangers that might affect the life and health of operating or service personnel or cause material damage are highlighted by the preceding pictogram, which is defined below.

Symbol	Meaning
<b>NOTICE</b>	This symbol is used to point to situations that may lead to material damage, but not to personal injury.

## 2. Safety instructions

### 2.1 Intended use

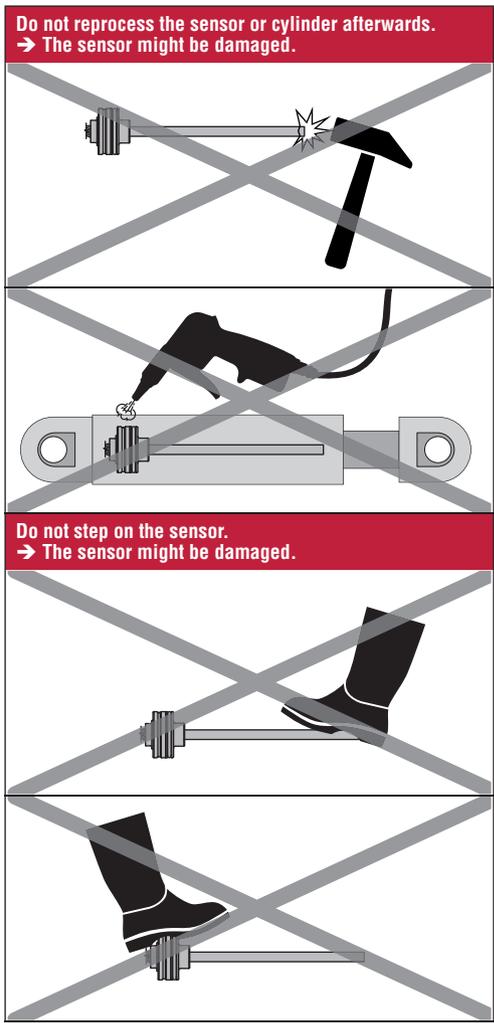
This product may be used only for the applications defined under item 1 and only in conjunction with the third-party devices and components recommended or approved by Temposonics. As a prerequisite of proper and safe operation the product requires correct transport, storage, mounting and commissioning and must be operated with utmost care.

1. The sensor systems of all Temposonics sensors are intended exclusively for measurement tasks encountered in mobile, commercial and laboratory applications. The sensors are considered as system accessories and must be connected to suitable evaluation electronics, e.g. a PLC, IPC, indicator or other electronic control unit.

- 1/ The term qualified technical personnel characterizes persons who:
  - are familiar with the safety concepts of automation technology applicable to the particular project,
  - are competent in the field of EMC,
  - have received adequate training for commissioning and service operations
  - are familiar with the operation of the device and know the information required for correct operation provided in the product documentation.

**2.2 Foreseeable misuse**

Foreseeable misuse	Consequence
Wrong sensor connection	The sensor will not work properly or will be destroyed
Operate the sensor out of the operating temperature range	No signal output / The sensor can be damaged
Power supply is out of the defined range	Signal output is wrong / no signal output / the sensor will be damaged
Position measurement is influenced by an external magnetic field	Signal output is wrong
Cylinder bore hole too small	Component damage due to excessive installation force required.
Cylinder bore hole after welding too small	Component damage due to excessive installation force required.
Sharp edges	Damage to cables and conductors
Rough sensor handling	Destruction of internal components
Welding after installation	High energy voltage peaks or currents are fed to the sensor, damaging housing or electronic components.
Cables are damaged	Short circuit – the sensor can be destroyed / sensor does not respond
Loose connectors	Liquid can penetrate into the sensor into the sensor housing through cables or strands and cause short circuit or corrosion of electronics components
Spacers are missing or installed in a wrong order	Error in position measurement
Wrong connection of ground / shield	Signal output is disturbed / The electronics can be damaged
Use of a magnet that is not certified by Temposonics	Error in position measurement



Manuals, Software & 3D models available at:  
[www.temposonics.com](http://www.temposonics.com)

# Temposonics® MH-Series

## Brief Instructions

### 2.3 Installation, commissioning and operation

The position sensors must be used only in technically safe condition. To maintain this condition and to ensure safe operation, installation, connection and service, work may be performed only by qualified technical personnel. If danger of injury to persons or of damage to operating equipment is caused by sensor failure or malfunction, additional safety measures such as plausibility checks, limit switches, EMERGENCY STOP systems, protective devices etc. are required. In the event of trouble, shut down the sensor and protect it against accidental operation.

#### Safety instructions for commissioning

To maintain the sensor operability, it is mandatory to follow the instructions given below.

1. Protect the sensor against mechanical damage during installation and operation.
2. Do not open or dismantle the sensor.
3. Connect the sensor very carefully and pay attention to the polarity of connections and power supply.
4. Use only approved power supplies.
5. It is imperative that the specified permissible limit values of the sensor for operating voltage, environmental conditions, etc. are met.
6. Check the function of the sensor regularly and provide documentation of the checks.
7. Before applying power, ensure that nobody's safety is jeopardized by starting machines.

### 2.4 Warranty

Temposonics grants a warranty<sup>2</sup> period for the Temposonics® position sensors and supplied accessories relating to material defects and faults that occur despite correct use in accordance with the intended application. The Temposonics obligation is limited to repair or replacement of any defective part of the unit. No warranty can be taken for defects that are due to improper use or above average stress of the product, as well as for wear parts. Under no circumstances will Temposonics accept liability in the event of offense against the warranty rules, no matter if these have been assured or expected, even in case of fault or negligence of the company. Temposonics explicitly excludes any further warranties. Neither the company's representatives, agents, dealers nor employees are authorized to increase or change the scope of warranty.

### 2.5 Return

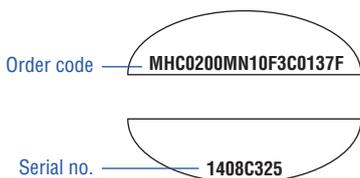
For diagnostic purposes, the sensor can be returned to Temposonics GmbH & Co. KG. Any shipment cost will be borne by the sender<sup>2</sup>. For a corresponding form, see detailed operation manual (available at: [www.temposonics.com](http://www.temposonics.com)).

### 2.6 Maintenance & removal

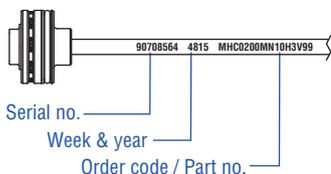
Further information about maintenance and removal is provided in the sensor specific operation manuals.

## 3. Identification

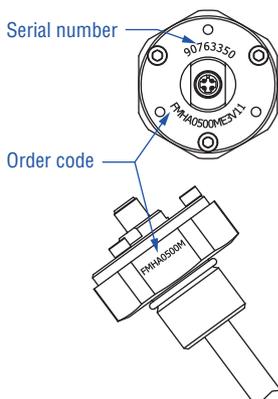
#### Nameplate (e.g. MH-Series MH CANopen)



#### Laser etched (e.g. MH-Series Analog)



#### Laser etched (e.g. MH-Series Flexible MH Analog)



#### Approvals and certificates

You will find approvals and certificates in the sensor specific operation manuals.

<sup>2/</sup> See also applicable Temposonics sales and supply conditions, e.g. under [www.temposonics.com](http://www.temposonics.com)

## 4. Electrical connections

Placement of installation and cabling have decisive influence on the sensor EMC. Hence correct installation of this active electronic system and the EMC of the entire system should be ensured by using suitable metal connectors, shielded cables and grounding if necessary. Overvoltages or faulty connections can damage its electronics despite protection against wrong polarity.

### NOTICE

Never connect / disconnect the sensor when voltage is applied.

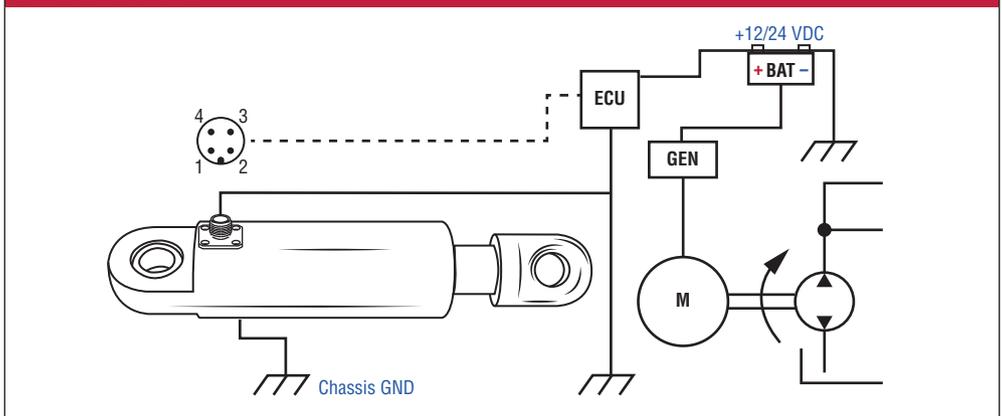
### Cable shielding

In the installed condition, the sensor is shielded sufficiently by the metal hydraulic cylinder. For this reason, no separate shielding is taken via the M12 connector. If a shielded cable is used, certain applications may require checking, if both ends of the shielding must be connected to the machine ground. When checking, the effect of any high voltage and high frequency field in the vicinity on the shield and on the signals in the cable should be taken into account.

### Machine ground

To ensure proper operation of the sensor, the hydraulic cylinder must be connected to the machine ground. Grounding is often ensured by the mechanical contact between the cylinder and other machine elements. If the cylinder is connected with the machine separately, separate grounding, for example via a grounding strap directly on the cylinder must be ensured.

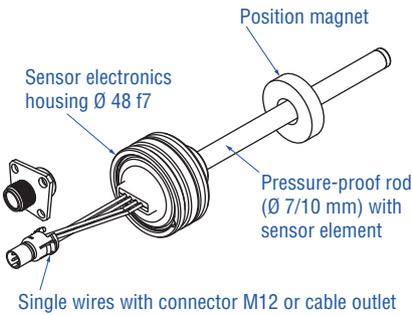
### Connection schematics



# Temposonics® MH-Series

## Brief Instructions

### 5. Temposonics® MH-Series MH4, MH200 & MH Safety



#### Available outputs:

- Analog
- CANopen
- CAN J1939
- CANopen Safety

#### 5.1 Mounting dimensions – MH4, MH200 & MH Safety

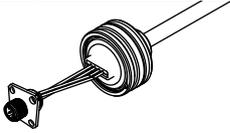
MH-C / MH-D		MH-L / MH-R		
	30 Null zone	63.5 Dead zone		
	30 Null zone	69.5 Dead zone		
MH-E / MH-F		MH-Q		
	30 Null zone	36.5 Dead zone		
	30 Null zone	85.5 Dead zone		
Sensor model	Rod Ø	End plug	Null zone	Dead zone
MH-C	10 mm	flat	30 mm	63.5 mm
MH-D	7 mm	flat	30 mm	63.5 mm
MH-E	10 mm	flat	30 mm	36.5 mm
MH-F	7 mm	flat	30 mm	36.5 mm
MH-L	10 mm	female M6 thread	30 mm	69.5 mm
MH-Q	10 mm	male M8 thread	30 mm	85.5 mm
MH-R	10 mm	female M4 thread	30 mm	69.5 mm

All dimensions in mm

Manuals, Software & 3D models available at:  
[www.temposonics.com](http://www.temposonics.com)

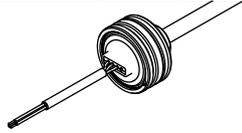
### 5.2 Connector wiring – MH4, MH200 & MH Safety Analog

#### MH4, MH200 & MH Safety Analog with M12 connector



Connector wiring	N...E	N...G	N...H	
 View on connector	<b>Pin</b>	<b>Function</b>		
	1	do not connect	VDC	VDC
	2	VDC	do not connect	SIG
	3	GND	GND	GND
	4	SIG	SIG	do not connect

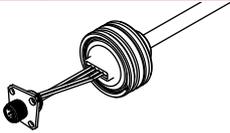
#### MH4, MH200 & MH Safety Analog with cable output



Wiring	T...A	
	<b>Color</b>	<b>Function</b>
	BN	VDC
	WH	GND
	GN	SIG

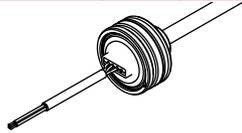
### 5.3 Connector wiring – MH4, MH200 & MH Safety CAN

#### MH4, MH200 & MH Safety CAN with M12 connector



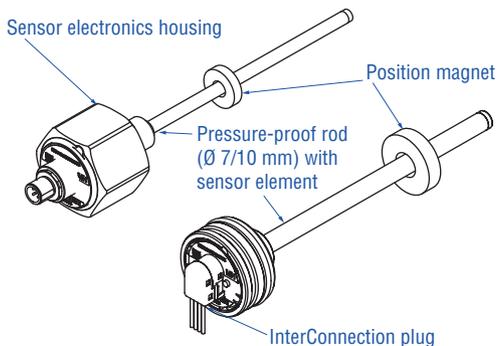
Connector wiring	N...F	
 View on connector	<b>Pin</b>	<b>Function</b>
	1	do not connect
	2	VDC
	3	GND
	4	CAN_H
	5	CAN_L

#### MH4, MH200 & MH Safety CAN with cable output



Wiring	T...A	
	<b>Color</b>	<b>Function</b>
	BN	VDC
	WH	GND
	GN	CAN_L
	YE	CAN_H

**6. Temposonics® MH-Series MHRM**



**Available outputs:**  
• Analog

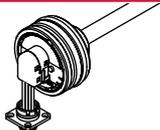
**6.1 Mounting dimensions – MHRM**

<p><b>MHE-7-A / MHE-1-A</b></p> <p>30 Null zone</p> <p>52 Dead zone</p>	<p><b>MHE-1-U</b></p> <p>30 Null zone</p> <p>72 Dead zone</p>
<p><b>MHE-1-R</b></p> <p>30 Null zone</p> <p>59 Dead zone</p>	<p><b>MHM-7-A / MHU-7-A</b></p> <p>19 Null zone</p> <p>52 Dead zone</p>
<p><b>MHM-1-A / MHU-1-A</b></p> <p>19 Null zone</p> <p>52 Dead zone</p>	<p><b>MHM-1-R / MHU-1-R</b></p> <p>19 Null zone</p> <p>59 Dead zone</p>
<p><b>MHM-1-U / MHU-1-U</b></p> <p>19 Null zone</p> <p>72 Dead zone</p>	<p>Manuals, Software &amp; 3D models available at: <a href="http://www.temposonics.com">www.temposonics.com</a></p>

Sensor model	Rod Ø	End plug	Null zone	Dead zone
MHE-7-A	7 mm	flat	30 mm	52 mm
MHE-1-A	10 mm	flat	30 mm	52 mm
MHE-1-R	10 mm	M6 female thread	30 mm	59 mm
MHE-1-U	10 mm	M8 male thread	30 mm	72 mm
MHM-7-A	7 mm	flat	19 mm	52 mm
MHU-7-A	7 mm	flat	19 mm	52 mm
MHM-1-A	10 mm	flat	19 mm	52 mm
MHU-1-A	10 mm	flat	19 mm	52 mm
MHM-1-R	10 mm	M6 female thread	19 mm	59 mm
MHU-1-R	10 mm	M6 female thread	19 mm	59 mm
MHM-1-U	10 mm	M8 male thread	19 mm	72 mm
MHU-1-U	10 mm	M8 male thread	19 mm	72 mm

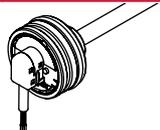
**6.2 Connector wiring – MHRM Analog**

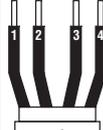
**MHRM Analog with M12 connector**



Connector wiring	L	Q
 View on connector	<b>Pin</b>	<b>Function</b>
	1	VDC
	2	SIG <sub>GND</sub>
	3	VDC <sub>GND</sub>
	4	SIG <sub>GND</sub>

**MHRM Analog with M12 connector**



Connector wiring	L	Q
	<b>Pin</b>	<b>Function</b>
	1	VDC
	2	SIG <sub>GND</sub>
	3	VDC <sub>GND</sub>
	4	SIG <sub>GND</sub>

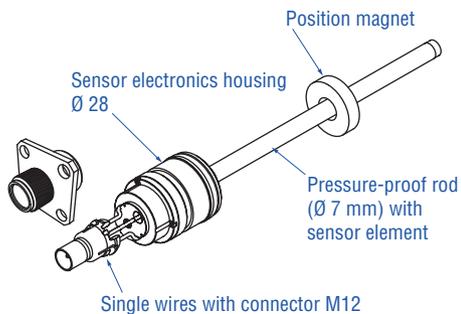
**MHRM Threaded Analog with M12 connector**



Connector wiring	L	Q
 View on connector	<b>Pin</b>	<b>Function</b>
	1	VDC
	2	SIG <sub>GND</sub>
	3	VDC <sub>GND</sub>
	4	SIG <sub>GND</sub>

**Temposonics® MH-Series**  
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**7. Temposonics® MH-Series MS**

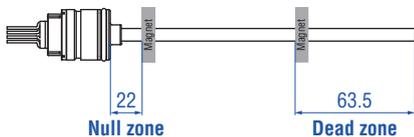


**Available outputs:**

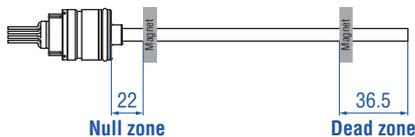
- Analog
- CANopen
- CAN J1939

**7.1 Mounting dimensions – MS**

**MS-D**



**MS-F**



Sensor model	Rod Ø	End plug	Null zone	Dead zone
MS-D	7 mm	flat	22 mm	63.5 mm
MS-F	7 mm	flat	22 mm	36.5 mm

All dimensions in mm

Manuals, Software & 3D models available at:  
[www.temposonics.com](http://www.temposonics.com)

7.2 Connector wiring – MS Analog

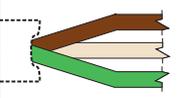
**MS Analog with M12 connector**



Connector wiring	N...E	N...G	N...H	
 <p>View on connector</p>	<b>Pin</b>	<b>Function</b>		
	1	do not connect	VDC	VDC
	2	VDC	do not connect	SIG
	3	GND	GND	GND
	4	SIG	SIG	do not connect

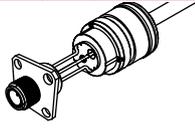
**MS Analog with cable output**



Wiring	T...A	
	<b>Color</b>	<b>Function</b>
	BN	VDC
	WH	GND
	GN	SIG

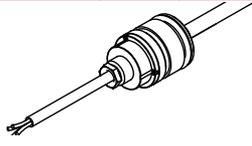
7.3 Connector wiring – MS CAN

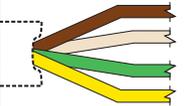
**MS CAN with M12 connector**



Connector wiring	N...F	N...S	
 <p>View on connector</p>	<b>Pin</b>	<b>Function</b>	
	1	do not connect	VDC
	2	VDC	CAN_L
	3	GND	GND
	4	CAN_H	CAN_H
	5	CAN_L	do not connect

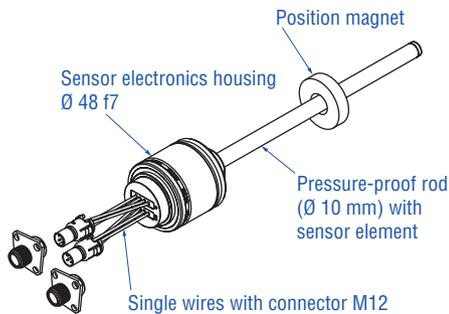
**MS CAN with cable output**



Wiring	T...A	
	<b>Color</b>	<b>Function</b>
	BN	VDC
	WH	GND
	GN	CAN_L
	YE	CAN_H

**Temposonics® MH-Series**  
Brief Instructions

**8. Temposonics® MH-Series MT**



**Available outputs:**

- Analog

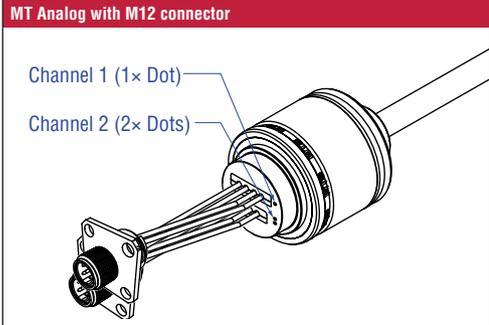
**8.1 Mounting dimensions – MT**

MT-C		MT-R		
Sensor model	Rod Ø	End plug	Null zone	Dead zone
MT-C	10 mm	flat	30 mm	63.5 mm
MT-R	10 mm	female M4 thread	30 mm	69 mm

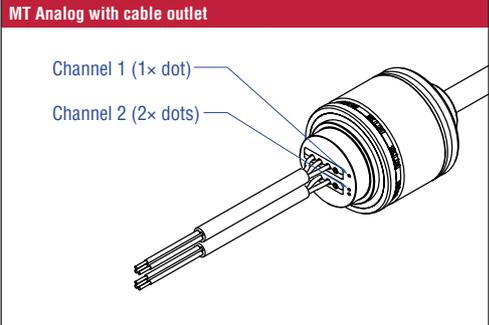
All dimensions in mm

Manuals, Software & 3D models available at:  
[www.temposonics.com](http://www.temposonics.com)

8.2 Connector wiring – MT Analog



Connector wiring		N...R	
<p>View on connector</p>	<b>Channel 1</b>	<b>Pin</b>	<b>Function</b>
		1	VDC
		2	do not connect
		3	GND
	4	SIG	
<p>View on connector</p>	<b>Channel 2</b>	<b>Pin</b>	<b>Function</b>
		1	VDC
		2	SIG
		3	GND
		4	do not connect
	5	do not connect	

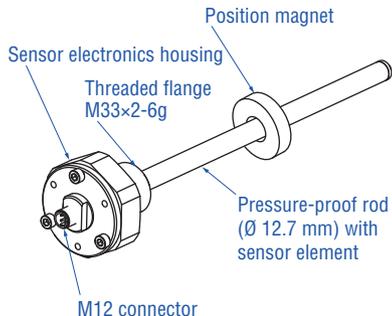


Wiring		T...A	
	<b>Channel 1</b>	<b>Color</b>	<b>Function</b>
		BN	VDC
		WH	GND
	GN	SIG	
	<b>Channel 2</b>	<b>Color</b>	<b>Function</b>
		BN	VDC
		WH	GND
	GN	SIG	

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### 9. Temposonics® MH-Series FMH



**Available outputs:**

- Analog
- CANopen
- CAN J1939

#### 9.1 Mounting dimensions – FMH

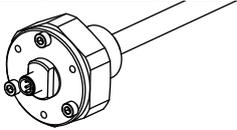
FMH-A			FMH-B	
Sensor model	Rod Ø	End plug	Null zone	Dead zone
FMH-A	12.7 mm	flat	38.9 mm	84.8 mm
FMH-B	12.7 mm	female M4 thread	38.9 mm	90.5 mm

All dimensions in mm

Manuals, Software & 3D models available at:  
[www.temposonics.com](http://www.temposonics.com)

9.2 Connector wiring – FMH Analog

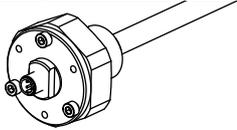
FMH analog with M12 connector



Connector wiring	E	G	H																				
 <p>View on connector</p>	<table border="1"> <thead> <tr> <th>Pin</th> <th colspan="3">Function</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>do not connect</td> <td>VDC</td> <td>VDC</td> </tr> <tr> <td>2</td> <td>VDC</td> <td>do not connect</td> <td>SIG</td> </tr> <tr> <td>3</td> <td>GND</td> <td>GND</td> <td>GND</td> </tr> <tr> <td>4</td> <td>SIG</td> <td>SIG</td> <td>do not connect</td> </tr> </tbody> </table>	Pin	Function			1	do not connect	VDC	VDC	2	VDC	do not connect	SIG	3	GND	GND	GND	4	SIG	SIG	do not connect		
Pin	Function																						
1	do not connect	VDC	VDC																				
2	VDC	do not connect	SIG																				
3	GND	GND	GND																				
4	SIG	SIG	do not connect																				

9.3 Connector wiring – FMH CAN

FMH CAN with M12 connector

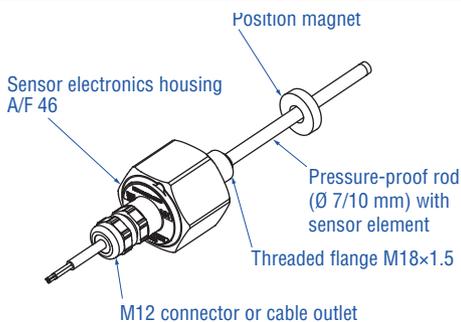


Connector wiring	F												
 <p>View on connector</p>	<table border="1"> <thead> <tr> <th>Pin</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>do not connect</td> </tr> <tr> <td>2</td> <td>VDC</td> </tr> <tr> <td>3</td> <td>GND</td> </tr> <tr> <td>4</td> <td>CAN_H</td> </tr> <tr> <td>5</td> <td>CAN_L</td> </tr> </tbody> </table>	Pin	Function	1	do not connect	2	VDC	3	GND	4	CAN_H	5	CAN_L
Pin	Function												
1	do not connect												
2	VDC												
3	GND												
4	CAN_H												
5	CAN_L												

# Temposonics® MH-Series

## Brief Instructions

### 10. Temposonics® MH-Series MH Threaded



#### Available outputs:

- Analog

#### 10.1 Mounting dimensions – MH Threaded

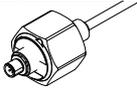
MH-G		MH-K		
Sensor model	Rod Ø	End plug	Null zone	Dead zone
MH-G	10 mm	male M8 thread	30 mm	55.5 mm
MH-K	10 mm	female M6 thread	30 mm	52.5 mm
MH-P	7 mm	flat	30 mm	45.5 mm
MH-T	10 mm	flat	30 mm	45.5 mm

All dimensions in mm

Manuals, Software & 3D models available at:  
[www.temposonics.com](http://www.temposonics.com)

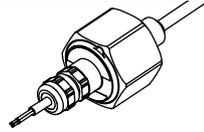
10.2 Connector wiring – MH Threaded Analog

MH Threaded Analog with M12 connector



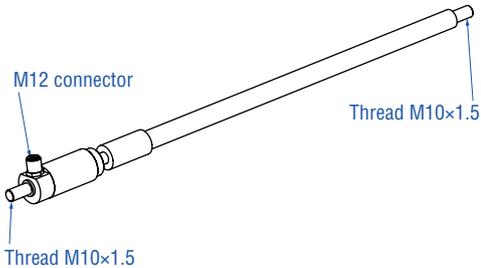
Connector wiring	M...E	M...G	M...H	
 View on connector	<b>Pin</b>	<b>Function</b>		
	1	do not connect	VDC	VDC
	2	VDC	do not connect	SIG
	3	GND	GND	GND
	4	SIG	SIG	do not connect

MH Threaded Analog with cable output



Wiring	C...A
	<b>Color</b>
	BN
	WH
	<b>Function</b>
	VDC
	GND
	SIG

11. Temposonics® MH-Series MXR

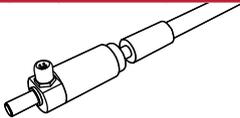


Available outputs:

- Analog

11.1 Connector wiring – MXR Analog

MXR Analog with M12 connector

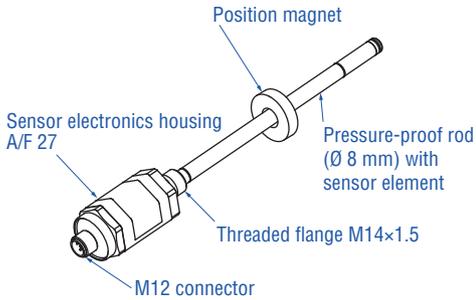


Connector wiring	N...E	N...G	N...H	
 View on connector	<b>Pin</b>	<b>Function</b>		
	1	do not connect	VDC	VDC
	2	VDC	do not connect	SIG
	3	GND	GND	GND
	4	SIG	SIG	do not connect

# Temposonics® MH-Series

## Brief Instructions

### 12. Temposonics® MH-Series MB



#### Available outputs:

- Analog

#### 12.1 Mounting dimensions – MB

MB				
Sensor model	Rod Ø	End plug	Null zone	Dead zone
MB	8 mm	flat	12 mm	27.5 mm

#### 12.2 Connector wiring – MB Analog

MB Analog with M12 connector				
Connector wiring	410G	410H		
 View on connector	Pin	Function		
	1	VDC	VDC	
	2	do not connect	SIG	
	3	GND	GND	
4	SIG	do not connect		

All dimensions in mm

Manuals, Software & 3D models available at:  
[www.temposonics.com](http://www.temposonics.com)

### 13. Magnet installation

#### Mounting the position magnets

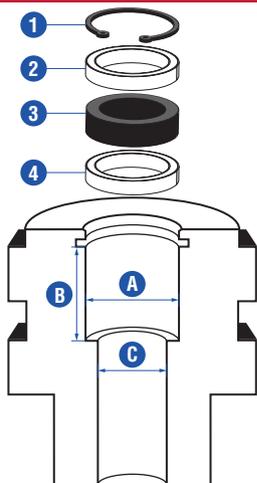
Install the magnet using non-magnetic material for mounting device, screws, spacers etc.. The magnet must not grind on the sensor rod. Alignment errors are compensated via the air gap.

- Permissible surface pressure: Max. 40 N/mm<sup>2</sup>
- Fastening torque for M4 screws: 1 Nm; use washers, if necessary

#### NOTE

Horizontally installed sensor rods should be supported mechanically at the rod end. Without the use of a support, rod and position magnet may be damaged. A false measurement result is also possible. Longer rods require evenly distributed mechanical support over the entire length.

#### Assembly sequence



- 1 Circlip
- 2 Non-magnetic spacer (≥ 5 mm)
- 3 Position magnet
- 4 Non-magnetic spacer (≥ 5 mm)

#### Position magnet (Part no.)

	201 542-2	400 533	401 032	402 316	403 974
<b>A</b>	32.9 <sup>+0.1</sup>	25.5 <sup>+0.1</sup>	17.5 <sup>+0.1</sup>	30.6 <sup>+0.1</sup>	32.1 <sup>+0.1</sup>
<b>B</b>	≥ 17.9	≥ 17.9	≥ 17.9	≥ 17.6	≥ 22.0
<b>C</b>	<b>Sensor rod</b>	<b>Piston rod drilling</b>			
	Ø 7	Ø 10			
	Ø 8	Ø 12			
	Ø 10	Ø 13			
	Ø 12.7	Ø 16			

All dimensions in mm

Manuals, Software & 3D models available at:  
[www.temposonics.com](http://www.temposonics.com)

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