

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 |
|---------------|--|
| NOTICE | 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

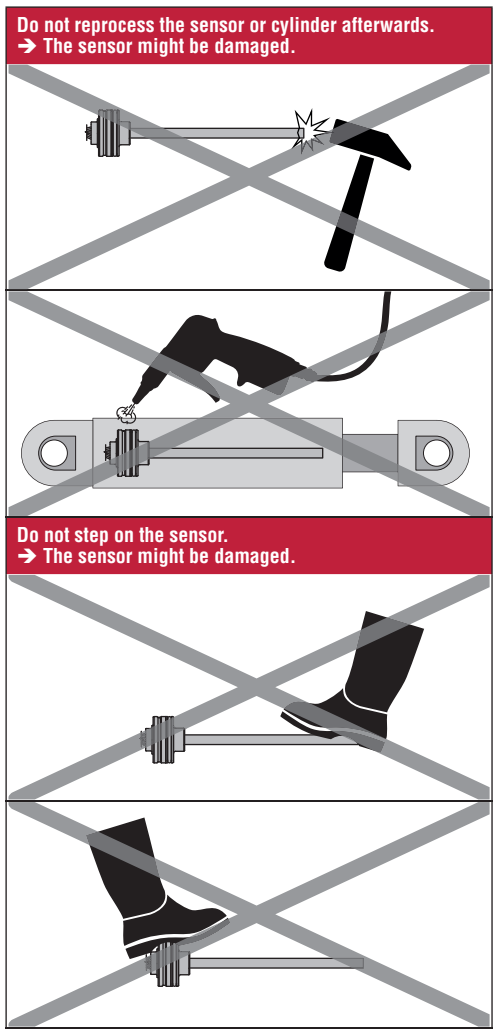
This product may be used only for the applications defined under item 1 and only in conjunction with the third-party devices and components recommended or approved by Temposonics. As a prerequisite of proper and safe operation the product requires correct transport, storage, mounting and commissioning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

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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 warranty² 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

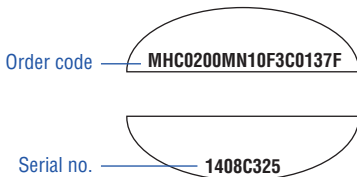
For diagnostic purposes, the sensor can be returned to Temposonics GmbH & Co. KG. Any shipment cost will be borne by the sender². For a corresponding form, see detailed operation manual (available at: www.temposonics.com).

2.6 Maintenance & removal

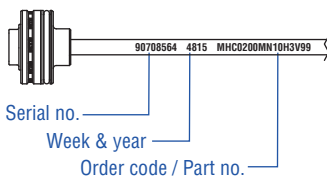
Further information about maintenance and removal is provided in the sensor specific operation manuals.

3. Identification

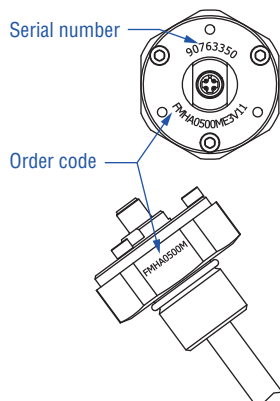
Nameplate (e.g. MH-Series MH CANopen)



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.

^{2/} See also applicable Temposonics sales and supply conditions, e.g. under 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.

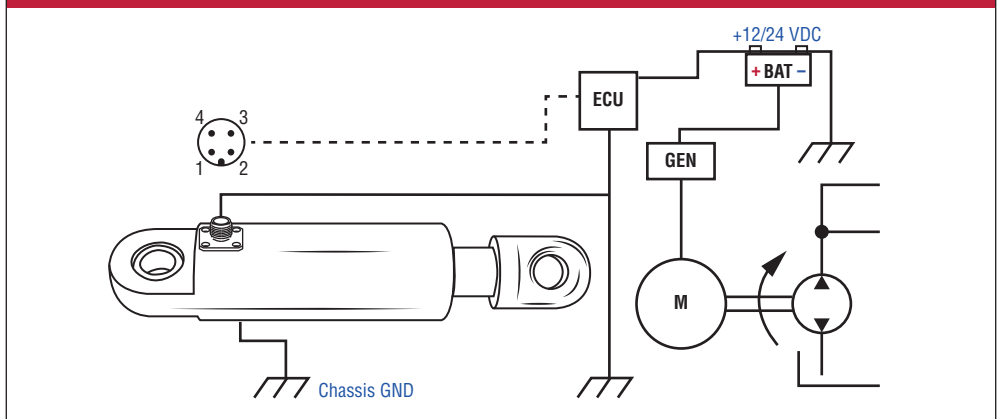
Cable shielding

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.

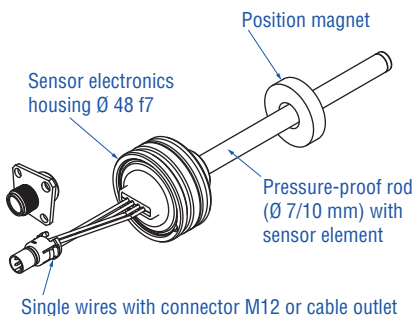
Connection schematics



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



Available outputs:

- Analog
- CANopen
- CAN J1939
- CANopen Safety

5.1 Mounting dimensions – MH4, MH200 & MH Safety

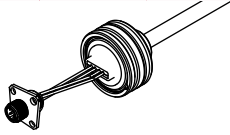
| MH-C / MH-D | | MH-L / MH-R | | |
|--------------|-----------------|-------------------|-----------|-----------|
| | 30 Null zone | 63.5 Dead zone | | |
| | 30 Null zone | 69.5 Dead zone | | |
| MH-E / MH-F | | MH-Q | | |
| | 30 Null zone | 36.5 Dead zone | | |
| | 30 Null zone | 85.5 Dead zone | | |
| 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

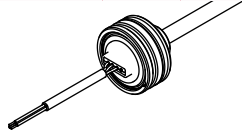
5.2 Connector wiring – MH4, MH200 & MH Safety Analog

MH4, MH200 & MH Safety Analog with M12 connector



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

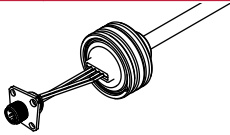
MH4, MH200 & MH Safety Analog with cable output



| Wiring | T...A |
|--------|-----------------|
| | Color |
| | BN |
| | WH |
| | Function |
| | VDC |
| | GND |
| | SIG |

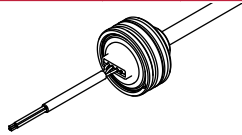
5.3 Connector wiring – MH4, MH200 & MH Safety CAN

MH4, MH200 & MH Safety CAN with M12 connector



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

MH4, MH200 & MH Safety CAN with cable output

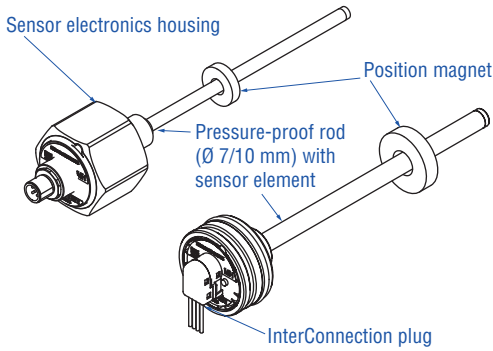


| Wiring | T...A |
|--------|-----------------|
| | Color |
| | BN |
| | WH |
| | GN |
| | Function |
| | VDC |
| | GND |
| | CAN_L |
| | CAN_H |

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6. Temposonics® MH-Series MHRM



Available outputs:

- Analog

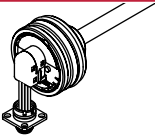
6.1 Mounting dimensions – MHRM


| | |
|---|---|
| <p>MHE-7-A / MHE-1-A</p> <p>30 Null zone</p> <p>52 Dead zone</p> | <p>MHE-1-U</p> <p>30 Null zone</p> <p>72 Dead zone</p> |
| <p>MHE-1-R</p> <p>30 Null zone</p> <p>59 Dead zone</p> | <p>MHM-7-A / MHU-7-A</p> <p>19 Null zone</p> <p>52 Dead zone</p> |
| <p>MHM-1-A / MHU-1-A</p> <p>19 Null zone</p> <p>52 Dead zone</p> | <p>MHM-1-R / MHU-1-R</p> <p>19 Null zone</p> <p>59 Dead zone</p> |
| <p>MHM-1-U / MHU-1-U</p> <p>19 Null zone</p> <p>72 Dead zone</p> | <p>Manuals, Software & 3D models available at: www.temposonics.com</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 |

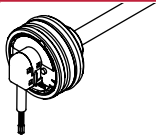
6.2 Connector wiring – MHRM Analog

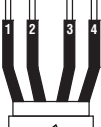
MHRM Analog with M12 connector



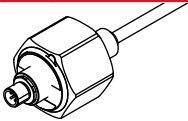
| Connector wiring | L | Q | |
|---|------------|--------------------|--------------------|
|  <p>View on connector</p> | Pin | Function | |
| | 1 | VDC | VDC |
| | 2 | SIG _{GND} | SIG |
| | 3 | VDC _{GND} | VDC _{GND} |
| | 4 | SIG | SIG _{GND} |


MHRM Analog with M12 connector



| Connector wiring | L | Q | |
|--|------------|--------------------|--------------------|
|  | Pin | Function | |
| | 1 | VDC | VDC |
| | 2 | SIG _{GND} | SIG |
| | 3 | VDC _{GND} | VDC _{GND} |
| | 4 | SIG | SIG _{GND} |

MHRM Threaded Analog with M12 connector

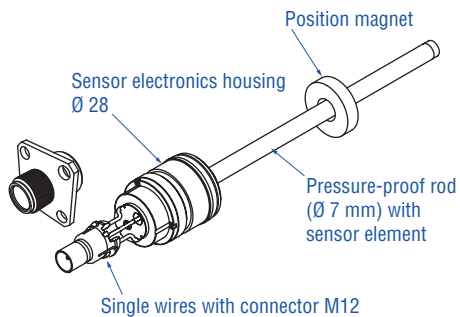


| Connector wiring | L | Q | |
|---|------------|--------------------|--------------------|
|  <p>View on connector</p> | Pin | Function | |
| | 1 | VDC | VDC |
| | 2 | SIG _{GND} | SIG |
| | 3 | VDC _{GND} | VDC _{GND} |
| | 4 | SIG | SIG _{GND} |

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7. Temposonics® MH-Series MS

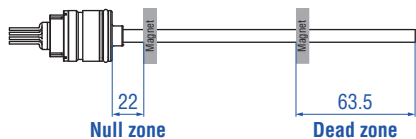


Available outputs:

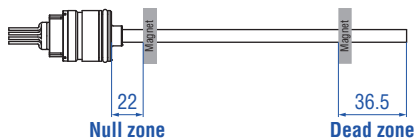
- Analog
- CANopen
- CAN J1939

7.1 Mounting dimensions – MS

MS-D



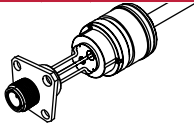
MS-F



| 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 |

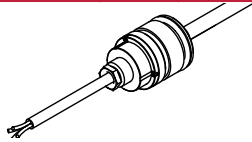
7.2 Connector wiring – MS Analog

MS Analog with M12 connector



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

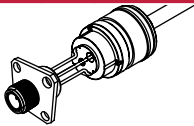
MS Analog with cable output



| Wiring | T...A | |
|--------|--------------|-----------------|
| | Color | Function |
| | BN | VDC |
| | WH | GND |
| | GN | SIG |

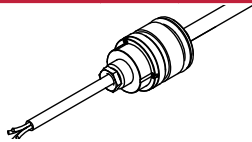
7.3 Connector wiring – MS CAN

MS CAN with M12 connector



| Connector wiring | N...F | N...S | |
|--------------------------|------------|-----------------|----------------|
| <p>View on connector</p> | Pin | Function | |
| | 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

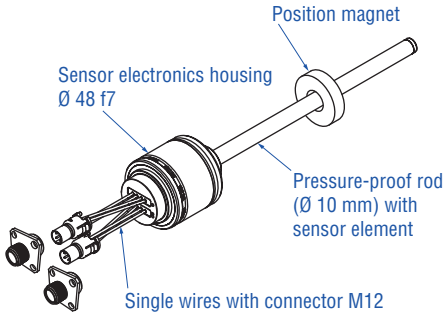


| Wiring | T...A | |
|--------|--------------|-----------------|
| | Color | Function |
| | BN | VDC |
| | WH | GND |
| | GN | CAN_L |
| | YE | CAN_H |

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8. Temposonics® MH-Series MT



Available outputs:

- Analog

8.1 Mounting dimensions – MT

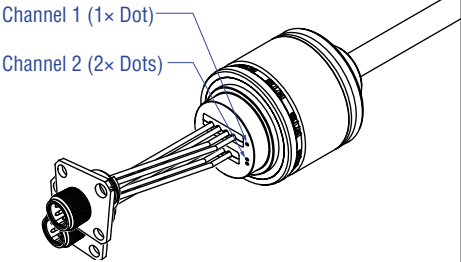
| MT-C | | MT-R | | |
|--------------|-------|------------------|-----------|-----------|
| | | | | |
| Sensor model | Rod Ø | End plug | Null zone | Dead zone |
| MT-C | 10 mm | flat | 30 mm | 63.5 mm |
| MT-R | 10 mm | female M4 thread | 30 mm | 69 mm |

All dimensions in mm

Manuals, Software & 3D models available at:
www.temposonics.com

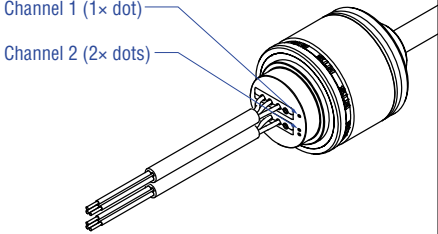
8.2 Connector wiring – MT Analog

MT Analog with M12 connector



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

MT Analog with cable outlet

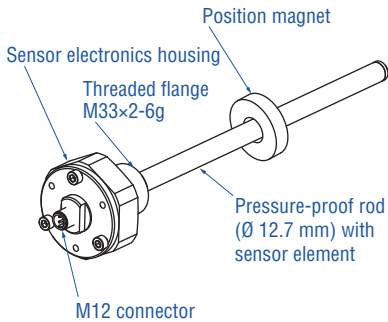


| Wiring | | T...A | |
|--------|------------------|--------------|-----------------|
| | Channel 1 | Color | Function |
| | | BN | VDC |
| | | WH | GND |
| | GN | SIG | |
| | Channel 2 | Color | Function |
| | | BN | VDC |
| | | WH | GND |
| | GN | SIG | |

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9. Temposonics® MH-Series FMH



Available outputs:

- Analog
- CANopen
- CAN J1939

9.1 Mounting dimensions – FMH

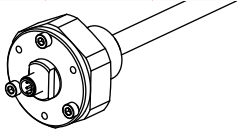
| FMH-A | | | FMH-B | |
|--------------|---------|------------------|-----------|-----------|
| | | | | |
| Sensor model | Rod Ø | End plug | Null zone | Dead zone |
| FMH-A | 12.7 mm | flat | 38.9 mm | 84.8 mm |
| FMH-B | 12.7 mm | female M4 thread | 38.9 mm | 90.5 mm |

All dimensions in mm

Manuals, Software & 3D models available at:
www.temposonics.com

9.2 Connector wiring – FMH Analog

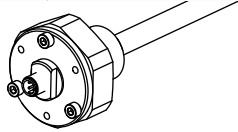
FMH analog with M12 connector



| Connector wiring | E | G | H |
|-----------------------|------------|-----------------|----------------|
| View on connector | Pin | Function | |
| | 1 | do not connect | VDC |
| | 2 | VDC | do not connect |
| | 3 | GND | GND |
| | 4 | SIG | SIG |
| | | | do not connect |

9.3 Connector wiring – FMH CAN

FMH CAN with M12 connector



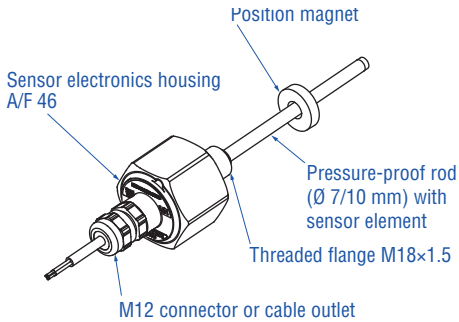
| Connector wiring | F |
|-----------------------|------------|
| View on connector | Pin |
| | 1 |
| | 2 |
| | 3 |
| | 4 |
| | 5 |

| 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

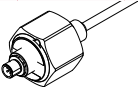
| MH-G | | MH-K | | |
|--------------|-------|------------------|-----------|-----------|
| | | | | |
| | | | | |
| Sensor model | Rod Ø | End plug | Null zone | Dead zone |
| MH-G | 10 mm | male M8 thread | 30 mm | 55.5 mm |
| MH-K | 10 mm | female M6 thread | 30 mm | 52.5 mm |
| MH-P | 7 mm | flat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

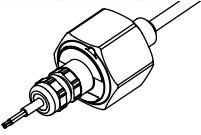
10.2 Connector wiring – MH Threaded Analog

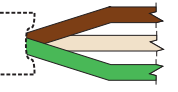
MH Threaded Analog with M12 connector



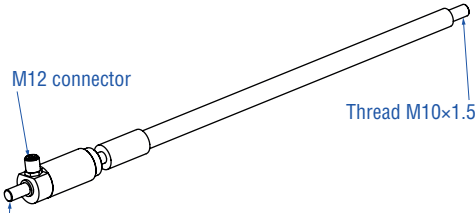
| Connector wiring | M...E | M...G | M...H | |
|---|------------|-----------------|----------------|----------------|
|  View on connector | Pin | Function | | |
| | 1 | do not connect | VDC | VDC |
| | 2 | VDC | do not connect | SIG |
| | 3 | GND | GND | GND |
| | 4 | SIG | SIG | do not connect |

MH Threaded Analog with cable output



| Wiring | C...A | |
|---|--------------|-----------------|
|  | Color | Function |
| | BN | VDC |
| | WH | GND |
| | GN | SIG |

11. Temposonics® MH-Series MXR



M12 connector

Thread M10×1.5

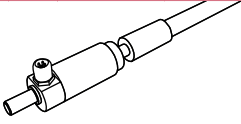
Thread M10×1.5


Available outputs:

- Analog

11.1 Connector wiring – MXR Analog

MXR Analog with M12 connector

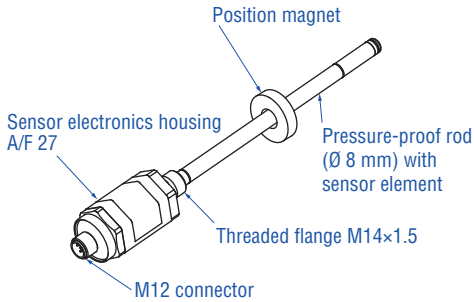


| Connector wiring | N...E | N...G | N...H | |
|---|------------|-----------------|----------------|----------------|
|  View on connector | Pin | Function | | |
| | 1 | do not connect | VDC | VDC |
| | 2 | VDC | do not connect | SIG |
| | 3 | GND | GND | GND |
| | 4 | SIG | SIG | do not connect |

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 | |
|--------------------------|------------|-----------------|----------------|
| <p>View on connector</p> | 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:
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13. Magnet installation

Mounting the position magnets

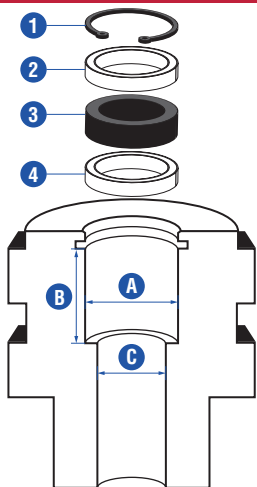
Install the magnet using non-magnetic material for mounting device, screws, spacers etc.. The magnet must not grind on the sensor rod. Alignment errors are compensated via the air gap.

- Permissible surface pressure: Max. 40 N/mm²
- 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 |
|----------|----------------------|----------------------------|----------------------|----------------------|----------------------|
| A | 32.9 ^{+0.1} | 25.5 ^{+0.1} | 17.5 ^{+0.1} | 30.6 ^{+0.1} | 32.1 ^{+0.1} |
| B | ≥ 17.9 | ≥ 17.9 | ≥ 17.9 | ≥ 17.6 | ≥ 22.0 |
| C | Sensor rod | Piston rod drilling | | | |
| | Ø 7 | Ø 10 | | | |
| | Ø 8 | Ø 12 | | | |
| | Ø 10 | Ø 13 | | | |
| | Ø 12.7 | Ø 16 | | | |

All dimensions in mm

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