

Brief Instruction

MH-Series

Magnetostrictive Linear Position Sensors



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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.

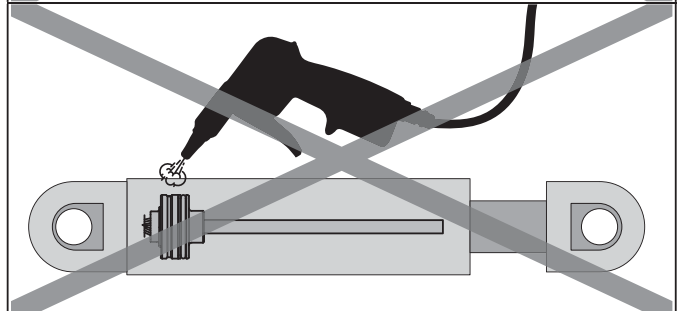
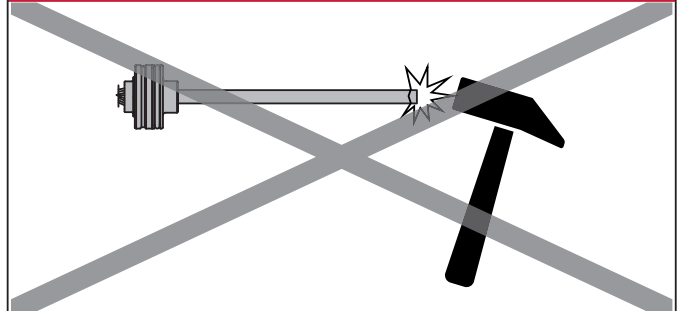
- The sensor systems of all Temposonics sensors are intended exclusively for measurement tasks encountered in mobile, commercial and laboratory applications. The sensors are considered as system accessories and must be connected to suitable evaluation electronics, e.g. a PLC, IPC, indicator or other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

- 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.

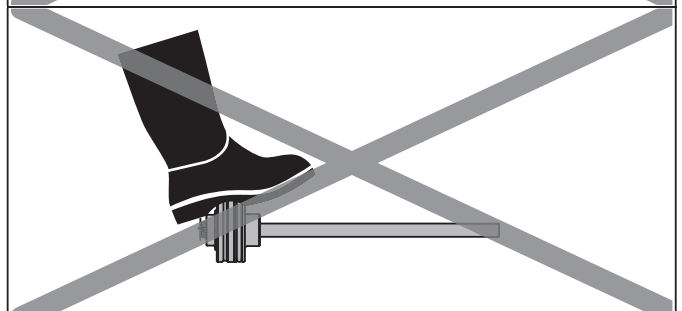
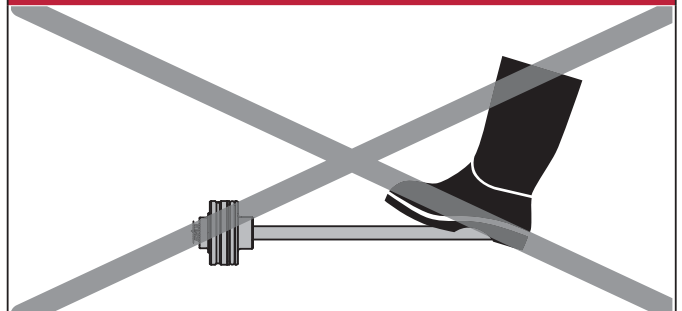
2.2 Foreseeable misuse

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

**Do not reprocess the sensor or cylinder afterwards.
→ The sensor might be damaged.**



**Do not step on the sensor.
→ The sensor might be damaged.**



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 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

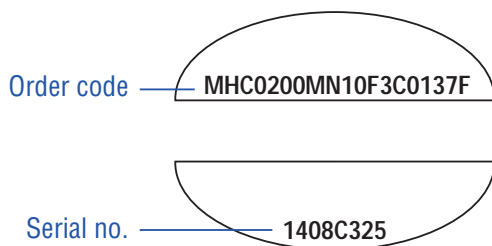
For diagnostic purposes, the sensor can be returned to Temposonics GmbH & Co. KG. Any shipment cost will be borne by the sender². For a corresponding form, see detailed operation manual (available at: www.temposonics.com).

2.6 Maintenance & removal

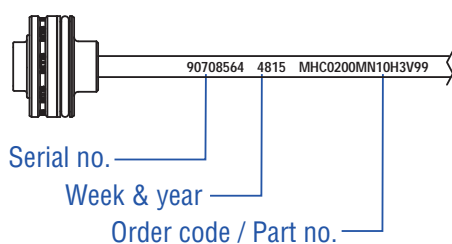
Further information about maintenance and removal is provided in the sensor specific operation manuals.

3. Identification

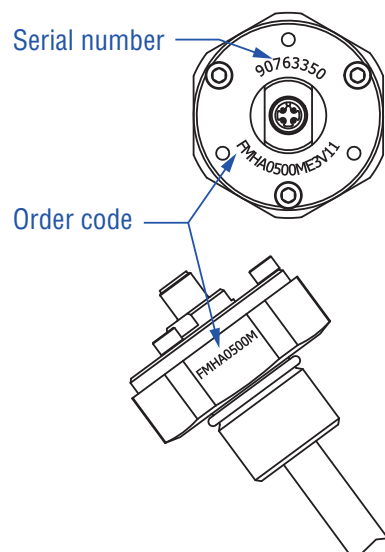
Nameplate (e.g. MH-Series MH CANopen)



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.

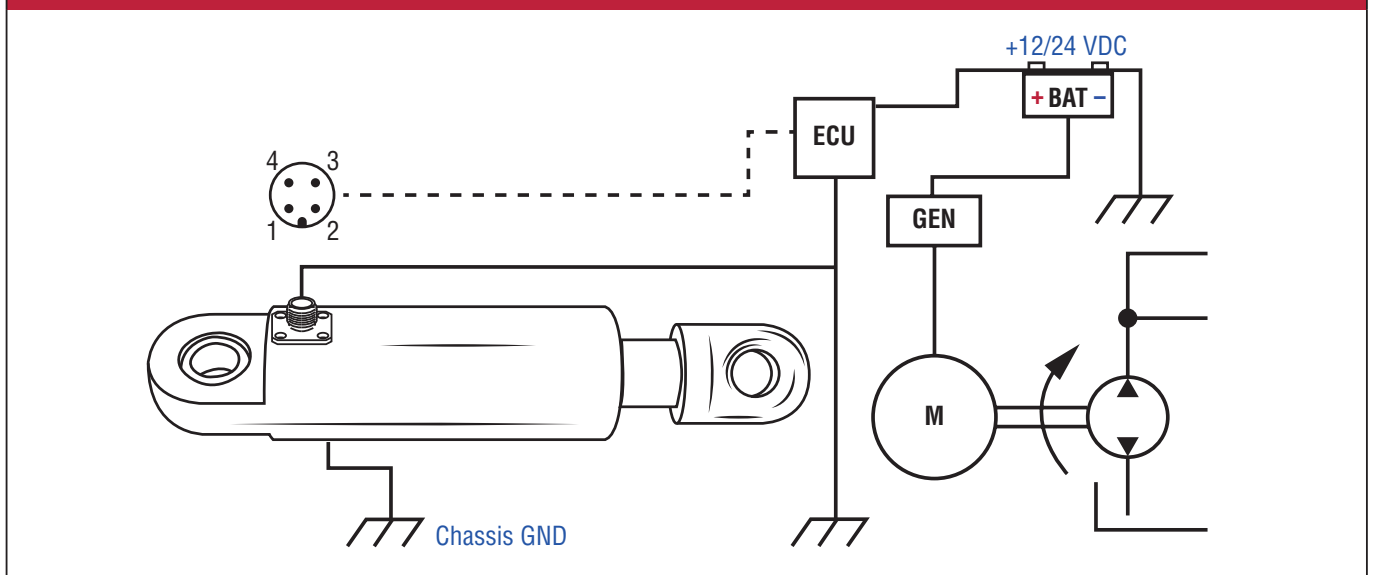
Cable shielding

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.

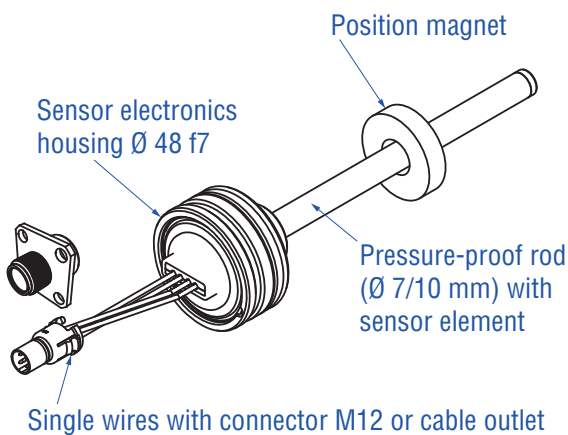
Machine ground

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



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



Available outputs:

- Analog
- CANopen
- CAN J1939
- CANopen Safety

5.1 Mounting dimensions – MH4, MH200 & MH Safety

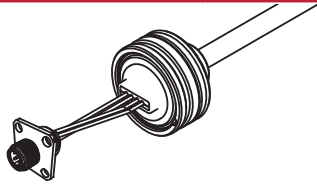
MH-C / MH-D		MH-L / MH-R		
MH-E / MH-F		MH-Q		
Sensor model	Rod Ø	End plug	Null zone	Dead zone
MH-C	10 mm	flat	30 mm	63.5 mm
MH-D	7 mm	flat	30 mm	63.5 mm
MH-E	10 mm	flat	30 mm	36.5 mm
MH-F	7 mm	flat	30 mm	36.5 mm
MH-L	10 mm	female M6 thread	30 mm	69.5 mm
MH-Q	10 mm	male M8 thread	30 mm	85.5 mm
MH-R	10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

All dimensions in mm

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

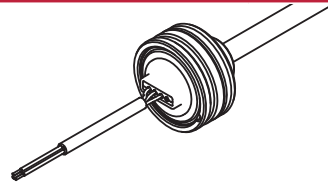
5.2 Connector wiring – MH4, MH200 & MH Safety Analog

MH4, MH200 & MH Safety Analog with M12 connector



Connector wiring	N...E	N...G	N...H	
 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

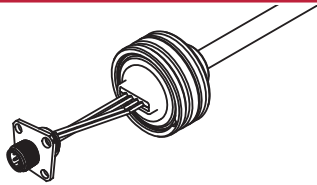
MH4, MH200 & MH Safety Analog with cable output



Wiring	T...A
	Color
	BN
	WH
	GN
	SIG

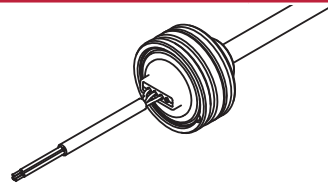
5.3 Connector wiring – MH4, MH200 & MH Safety CAN

MH4, MH200 & MH Safety CAN with M12 connector



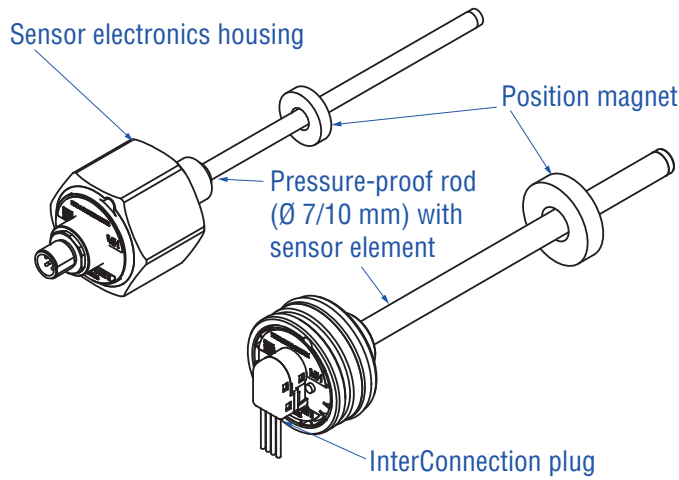
Connector wiring	N...F
 View on connector	Pin
	1
	2
	3
	4
5	

MH4, MH200 & MH Safety CAN with cable output



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

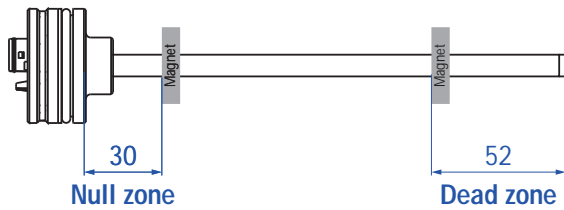
6. Temposonics® MH-Series MHRM



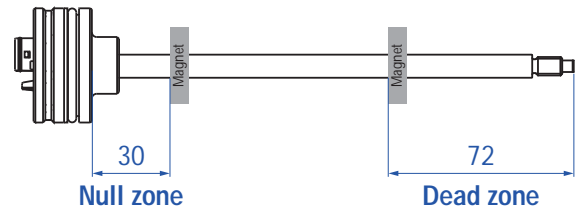
Available outputs:
• Analog

6.1 Mounting dimensions – MHRM

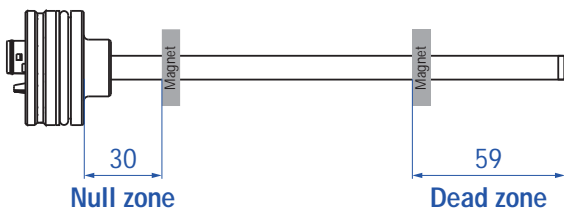
MHE-7-A / MHE-1-A



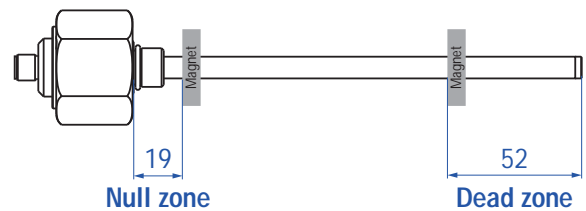
MHE-1-U



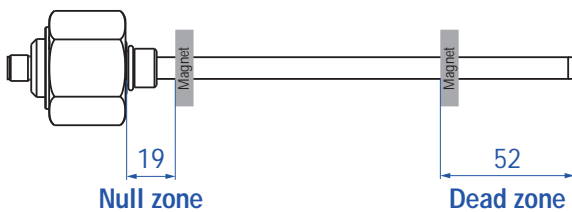
MHE-1-R



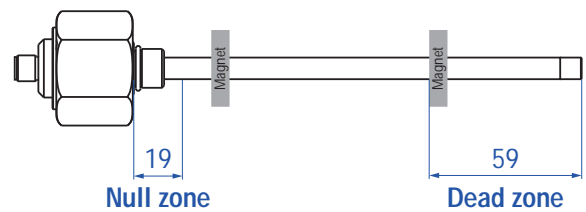
MHM-7-A / MHU-7-A



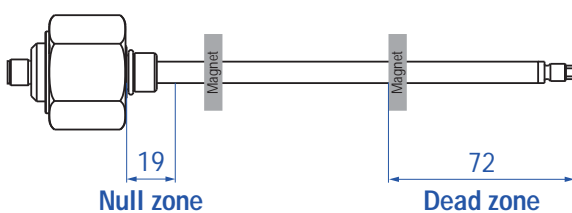
MHM-1-A / MHU-1-A



MHM-1-R / MHU-1-R



MHM-1-U / MHU-1-U

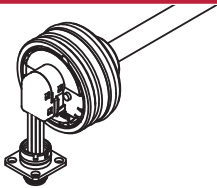


Manuals, Software & 3D models available at:
www.temposonics.com

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

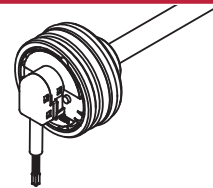
6.2 Connector wiring – MHRM Analog

MHRM Analog with M12 connector



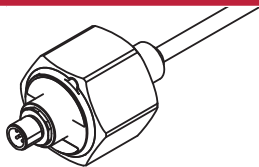
Connector wiring	L	Q
 View on connector	Pin	Function
	1	VDC
	2	SIG _{GND}
	3	VDC _{GND}
	4	SIG

MHRM Analog with M12 connector



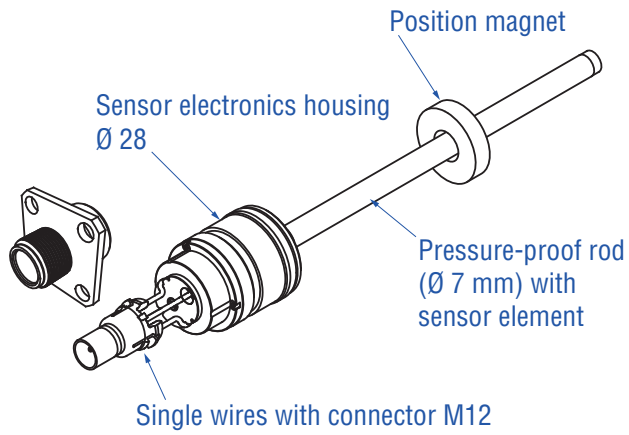
Connector wiring	L	Q
	Pin	Function
	1	VDC
	2	SIG _{GND}
	3	VDC _{GND}
	4	SIG

MHRM Threaded Analog with M12 connector



Connector wiring	L	Q
 View on connector	Pin	Function
	1	VDC
	2	SIG _{GND}
	3	VDC _{GND}
	4	SIG

7. Temposonics® MH-Series MS



Available outputs:

- Analog
- CANopen
- CAN J1939

7.1 Mounting dimensions – MS

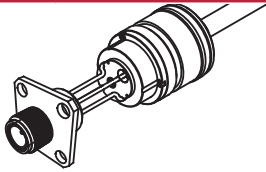
MS-D		MS-F		
Sensor model	Rod Ø	End plug	Null zone	Dead zone
MS-D	7 mm	flat	22 mm	63.5 mm
MS-F	7 mm	flat	22 mm	36.5 mm

All dimensions in mm

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

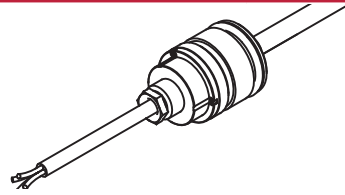
7.2 Connector wiring – MS Analog

MS 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

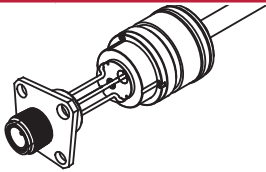
MS Analog with cable output



Wiring	T...A
	Color
	BN
	WH
	GN
	SIG

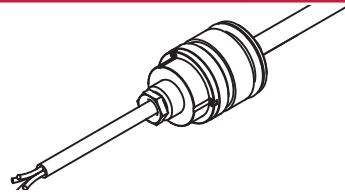
7.3 Connector wiring – MS CAN

MS CAN with M12 connector



Connector wiring	N...F	N...S	
 View on connector	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

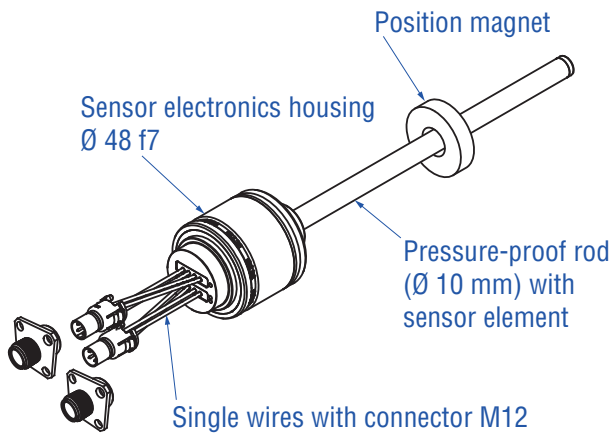


Wiring	T...A
	Color
	BN
	WH
	GN
	YE
	VDC
	GND
	CAN_L
	CAN_H

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8. Temposonics® MH-Series MT



Available outputs:

- Analog

8.1 Mounting dimensions – MT

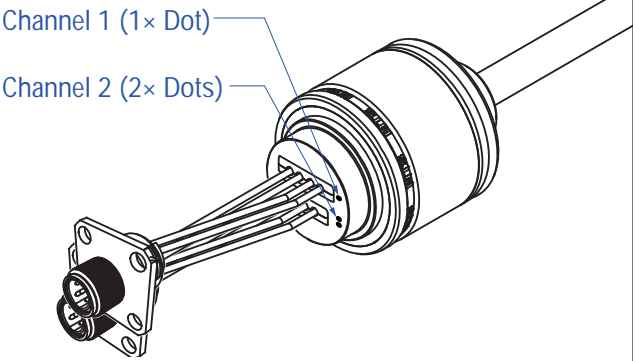
MT-C		MT-R		
Sensor model	Rod Ø	End plug	Null zone	Dead zone
MT-C	10 mm	flat	30 mm	63.5 mm
MT-R	10 mm	female M4 thread	30 mm	69 mm

All dimensions in mm

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

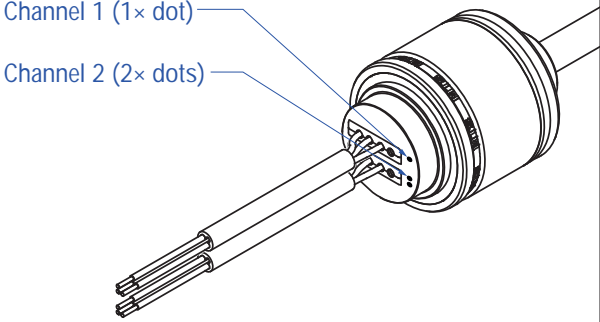
8.2 Connector wiring – MT Analog

MT Analog with M12 connector



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

MT Analog with cable outlet

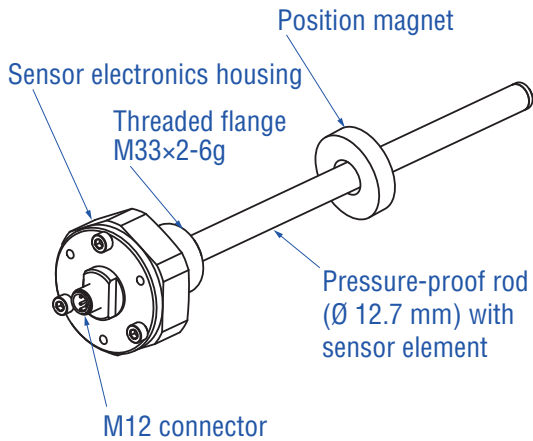


Wiring		T...A
Channel 1	Color	Function
	BN	VDC
	WH	GND
	GN	SIG
Channel 2	Color	Function
	BN	VDC
	WH	GND
	GN	SIG

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9. Temposonics® MH-Series FMH



Available outputs:

- Analog
- CANopen
- CAN J1939

9.1 Mounting dimensions – FMH

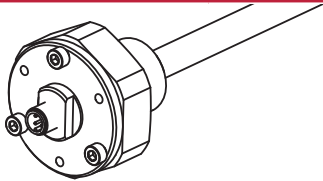
FMH-A		FMH-B		
Sensor model	Rod Ø	End plug	Null zone	Dead zone
FMH-A	12.7 mm	flat	38.9 mm	84.8 mm
FMH-B	12.7 mm	female M4 thread	38.9 mm	90.5 mm

All dimensions in mm

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

9.2 Connector wiring – FMH Analog

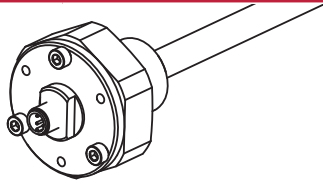
FMH analog with M12 connector



Connector wiring		E	G	H
View on connector		Pin	Function	
	1	do not connect	VDC	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

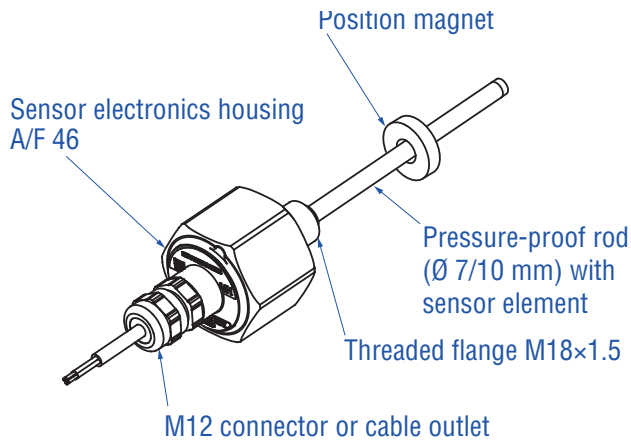


Connector wiring		F
View on connector		Pin
	1	do not connect
	2	VDC
	3	GND
	4	CAN_H
	5	CAN_L

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10. Temposonics® MH-Series MH Threaded

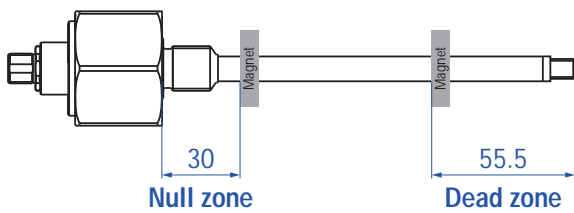


Available outputs:

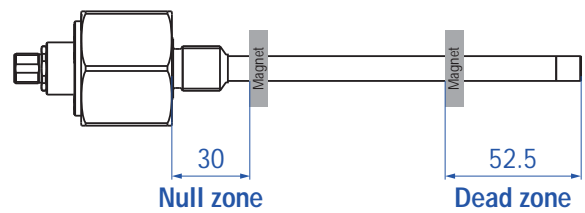
- Analog

10.1 Mounting dimensions – MH Threaded

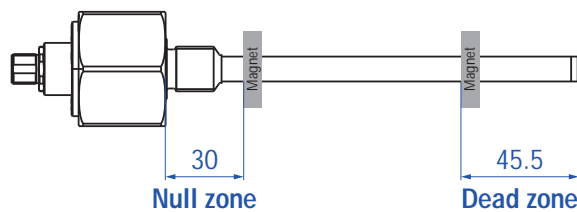
MH-G



MH-K



MH-P / MH-T



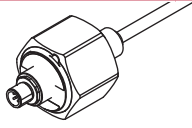
Sensor model	Rod Ø	End plug	Null zone	Dead zone
MH-G	10 mm	male M8 thread	30 mm	55.5 mm
MH-K	10 mm	female M6 thread	30 mm	52.5 mm
MH-P	7 mm	flat	30 mm	45.5 mm
MH-T	10 mm	flat	30 mm	45.5 mm

All dimensions in mm

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

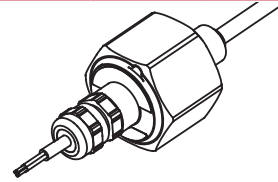
10.2 Connector wiring – MH Threaded Analog

MH Threaded Analog with M12 connector



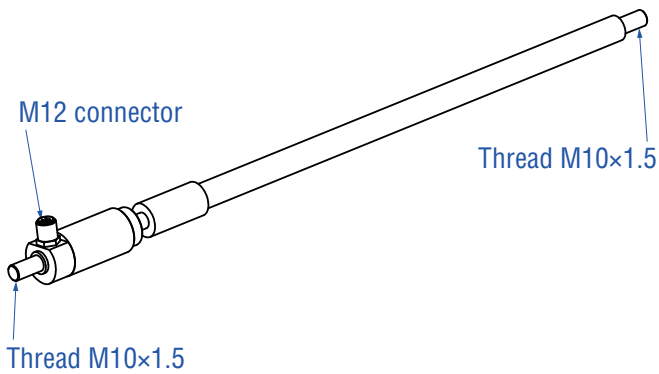
Connector wiring	M...E	M...G	M...H	
 View on connector	Pin	Function		
	1	do not connect	VDC	VDC
	2	VDC	do not connect	SIG
	3	GND	GND	GND
	4	SIG	SIG	do not connect

MH Threaded Analog with cable output



Wiring	C...A
	Color
	BN
	WH
	Function
	GND
	SIG

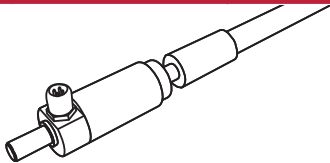
11. Temposonics® MH-Series MXR



Available outputs:
• Analog

11.1 Connector wiring – MXR Analog

MXR Analog with M12 connector

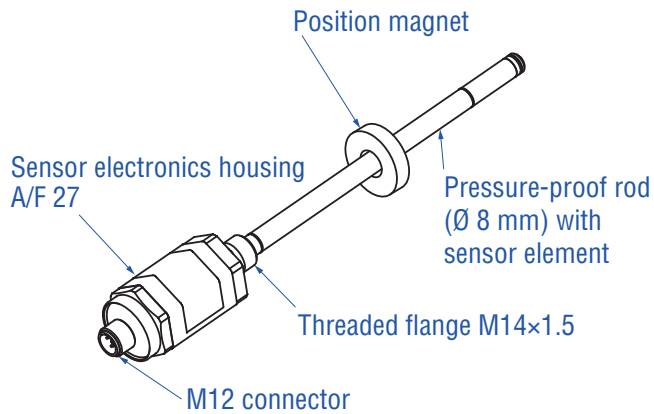


Connector wiring	N...E	N...G	N...H	
 View on connector	Pin	Function		
	1	do not connect	VDC	VDC
	2	VDC	do not connect	SIG
	3	GND	GND	GND
	4	SIG	SIG	do not connect

Temposonics® MH-Series

Brief Instructions

12. Temposonics® MH-Series MB

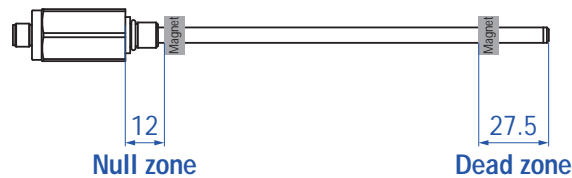


Available outputs:

- Analog

12.1 Mounting dimensions – MB

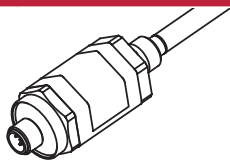
MB



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



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

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

All dimensions in mm

13. Magnet installation

Mounting the position magnets

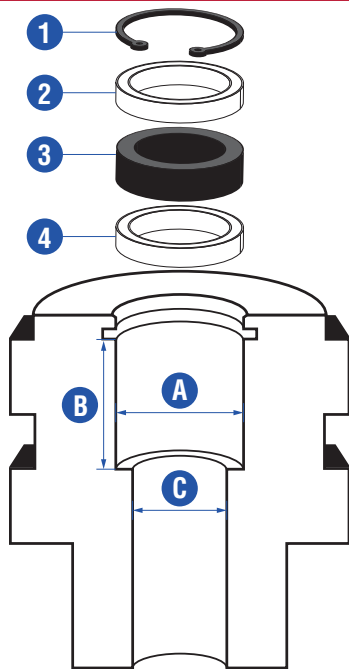
Install the magnet using non-magnetic material for mounting device, screws, spacers etc.. The magnet must not grind on the sensor rod. Alignment errors are compensated via the air gap.

- 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

	Sensor rod	Piston rod drilling
C	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

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