

Data Sheet

MH-Series MH Threaded Analog Magnetostrictive Linear Position Sensors

- Stroke length up to 2500 mm
- With M18×1.5 thread
- Sensor rod with Ø 7 mm or Ø 10 mm
- Rugged to withstand off-highway shock and vibration
- M12 connector or cable output



MEASURING TECHNOLOGY

The absolute, linear position sensors provided by Tempsonics rely on the company’s proprietary magnetostrictive technology, which can determine position with a high level of precision and robustness. Each Tempsonics position sensor consists of a ferromagnetic waveguide, a position magnet, a strain pulse converter and supporting electronics. The magnet, connected to the object in motion in the application, generates a magnetic field at its location on the waveguide. A short current pulse is applied to the waveguide. This creates a momentary radial magnetic field and torsional strain on the waveguide. The momentary interaction of the magnetic fields releases a torsional strain pulse that propagates the length of the waveguide. When the ultrasonic wave reaches the end of the waveguide it is converted into an electrical signal. Since the speed of the ultrasonic wave in the waveguide is precisely known, the time required to receive the return signal can be converted into a linear position measurement with both high accuracy and repeatability.

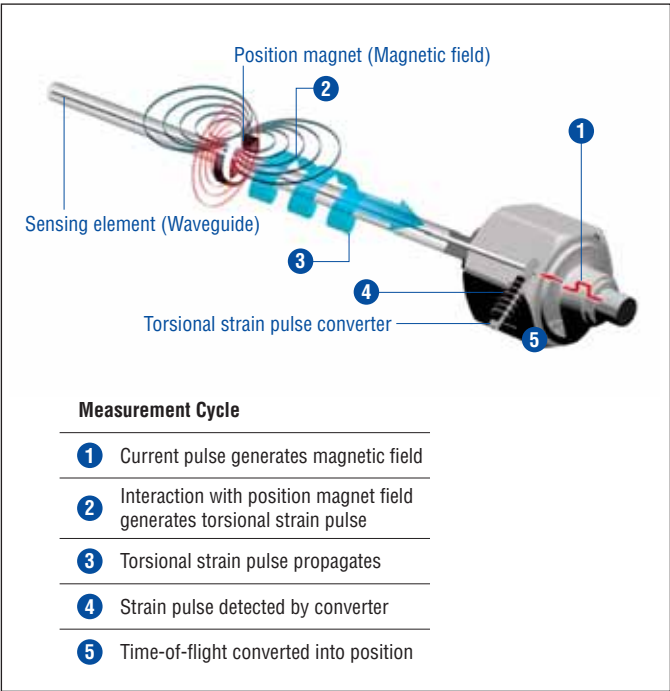


Fig. 1: Time-of-flight based magnetostrictive position sensing principle

MH THREADED SENSOR

The Tempsonics® MH-Series sensors are specifically designed for direct stroke measurement in hydraulic cylinders. The MH Threaded sensor extends the rugged design of the Tempsonics® MH Series sensors to external threaded installations. An M12 connector system ensures protection to IP69K. The inherent absolute capabilities ensure that the MH Threaded sensor is always ready. With two connections styles, the responsive magnetostrictive linear position sensors can be integrated into most installations.

Tempsonics® MH Threaded sensors can be used in applications where access is available from the outside of the cylinder. Example applications include lift and tilt cylinders, hydraulic jacks, and hydraulic steering systems in agricultural and construction machinery.



Fig. 2: Typical application: Agricultural sprayer

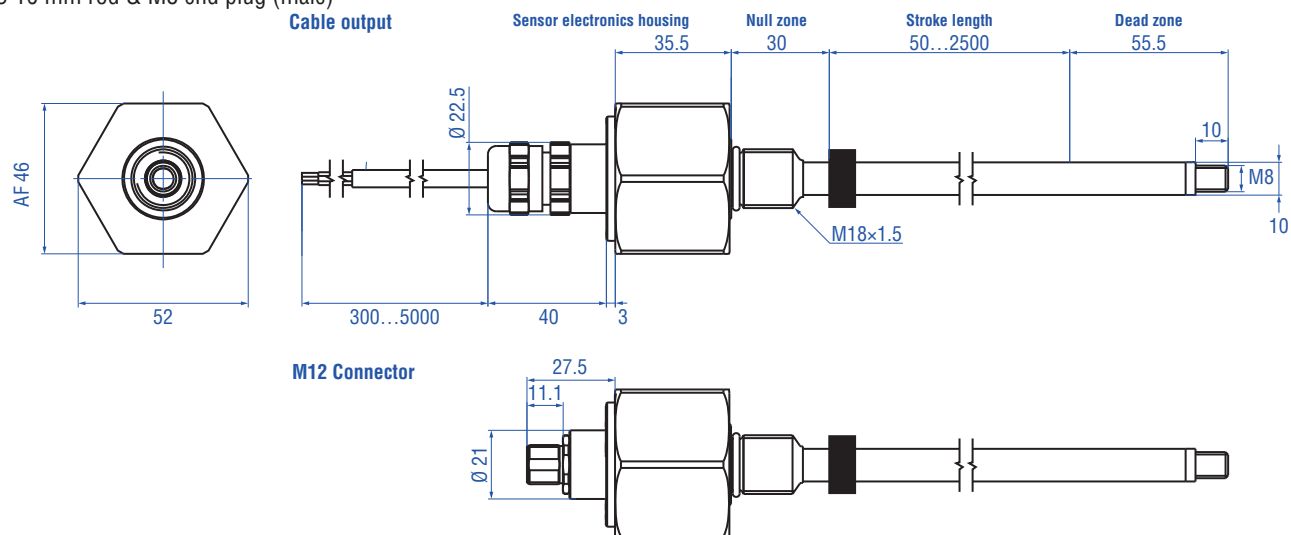
TECHNICAL DATA

Output		
Current	4...20 mA	
Voltage	0.25...4.75 VDC; 0.5...4.5 VDC	
Measured value	Position	
Signal characteristic	Analog output restricted by noise and ADC	
Measurement parameters		
Resolution	Typ. 0.1 mm	
Internal sample rate	2 ms	
Linearity	0050...0250 mm ≤ ±0.1 mm 0255...2000 mm ±0.04 % (F.S.) 2005...2500 mm ≤ ±0.8 mm	
Hysteresis	±0.1 mm	
Setpoint tolerance	< 1 mm	
Operating conditions		
Mounting position	Any	
Operating temperature	−40...+85 °C	
Storage temperature	−25...+65 °C	
Humidity	EN60068-2-30, 90 % rel. humidity, no condensation	
Ingress protection – M12 connector	IP69K with M12 connector and mating plug	
Ingress protection – Cable output	IP69K	
Shock test	IEC 60068-2-27, 100 g (6 ms) single shock, 50 g (11 ms) at 1000 shocks per axis	
Vibration test	Vibrations: IEC 60068-2-64, 15 g (r.m.s.) Ø 7 mm rod (10...2000 Hz) - resonance frequencies excluded 20 g (r.m.s.) Ø 10 mm rod (10...2000 Hz) - resonance frequencies excluded	
EMC test	2009/64/EG Road vehicles 2009/19/EG Agricultural and Forest machines ISO 14982 Emissions/Immunity ISO 7637-1/2 Transient Impulses ISO / TR 10605 Electrostatic Discharge (E.S.D.)	
Pressure impulse test according DIN EN ISO 19879	Ø 7 mm rod	Ø 10 mm rod
Operation pressure (P _N)	300 bar	350 bar
Operation pressure (P _{max})	400 bar	450 bar
Operation pressure (P _{static})	525 bar	625 bar
Design/Material		
Sensor electronics housing	Stainless steel 1.4305 (AISI 303)	
Sensor rod	Ø 7 mm: Stainless steel 1.4301 (AISI 304) / Ø 10 mm: Stainless steel 1.4306 (AISI 304L)	
Stroke length	50...2500 mm	
Sealing	O-ring 15.4 × 2.1, NBR 90 black	
Electrical connection		
Connection type	M12 connector or cable output	
Operating voltage	+12/24 VDC (8...32 VDC)	
Current consumption	12 VDC: typ. < 100 mA; 24 VDC: typ. < 50 mA	
Load (output VDC)	R _L ≥ 10 kΩ	
Loud (output mA)	12 VDC: R _L ≤ 250 Ω; 24 VDC: R _L ≤ 500 Ω	
Inrush current	12 VDC: max. 2.5 A/2 ms; 24 VDC: max. 4.5 A/2 ms	
Supply voltage ripple	< 1 % _{PP}	
Power drain	< 1 W	
Over voltage protection (VDC-GND)	Up to +36 VDC	
Polarity protection (GND-VDC)	Up to −36 VDC	
Electric strength	500 VDC (DC GND to chassis GND)	

TECHNICAL DRAWING

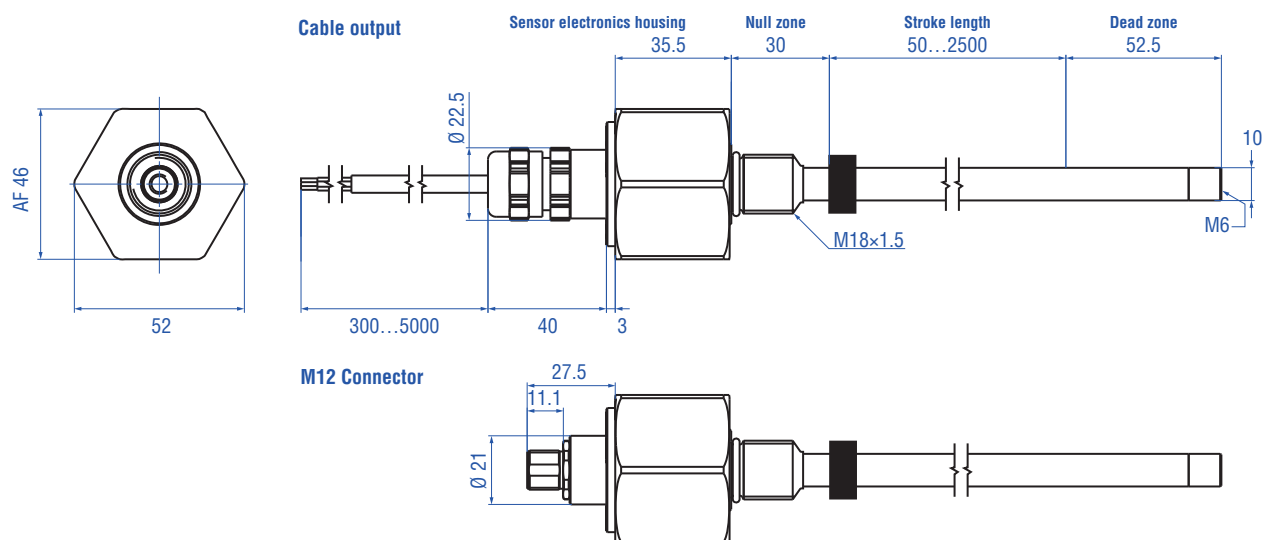
Form Factor G

Ø 10 mm rod & M8 end plug (male)



Form Factor K

Ø 10 mm rod & M6 end plug (female)



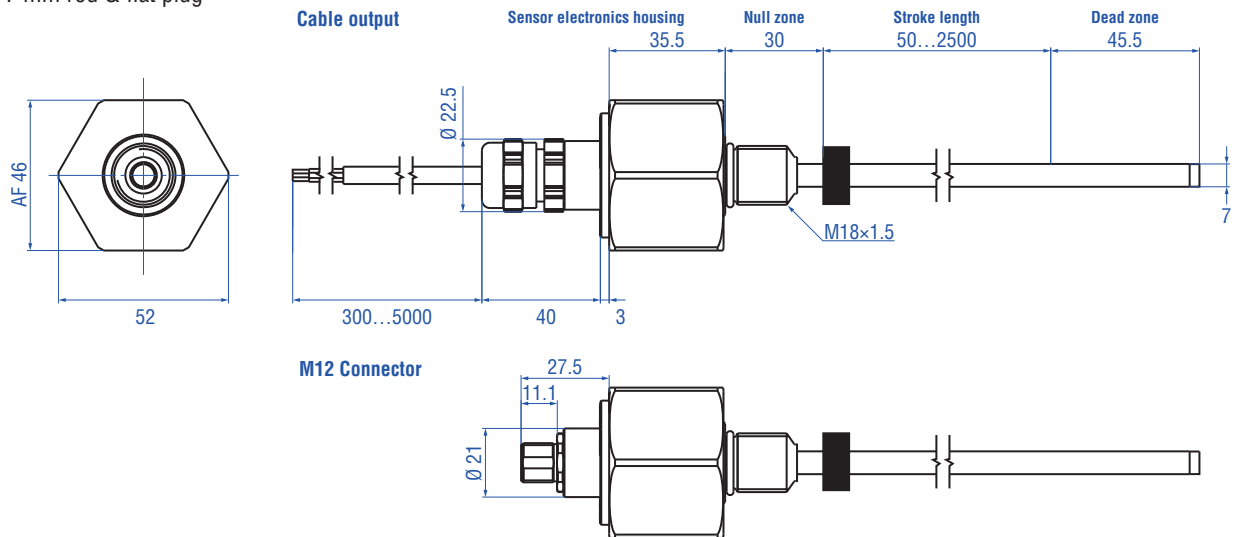
Controlling design dimensions are in millimeters

Unless otherwise stated, apply to the general tolerances according to DIN ISO 2768-m

TECHNICAL DRAWING

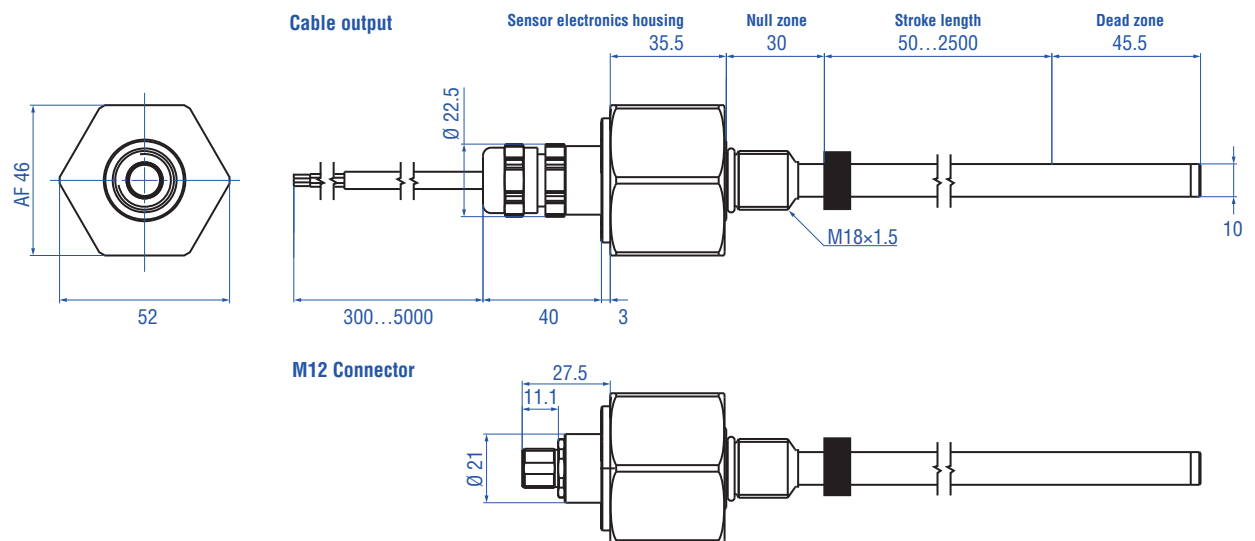
Form Factor 1

Ø 7 mm rod & flat plug



Form Factor T

Ø 10 mm rod & flat plug

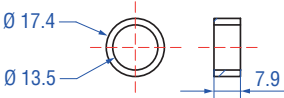
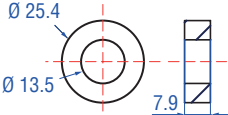
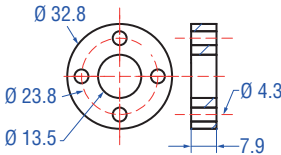
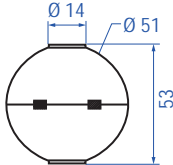


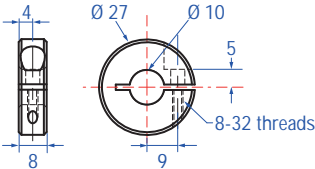

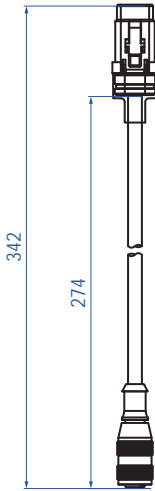
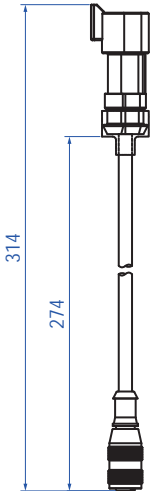
Controlling design dimensions are in millimeters
Unless otherwise stated, apply to the general tolerances according to DIN ISO 2768-m

CONNECTOR WIRING

4-pin connector				Color coding	
Pin	E	G	H	Color	
	1	not connected	VDC	VDC	WH
	2	VDC	not connected	SIG	GN
	3	GND	GND	GND	–


FREQUENTLY ORDERED ACCESSORIES

R2001202 ma20012			F20at
			
R2001202 ma20012 Part no. 200 200 200	R2001202 ma20012 Part no. 200 200 200	R2001202 ma20012 Part no. 200 200 200	F20at Part no. 200 200 200
Material: PA neobind Weight: Ca. 5 g Operating temperature: -40...+100 °C Surface pressure: Max. 20 N/mm²	Material: PA ferrite Weight: Ca. 10 g Operating temperature: -40...+100 °C Surface pressure: Max. 40 N/mm²	Material: PA ferrite GF20 Weight: Ca. 14 g Operating temperature: -40...+100 °C Surface pressure: Max. 40 N/mm² Fastening torque for M4 screws: 1 Nm	Material: Stainless steel AISI 304 Density: 720 kg/m³ Specific gravity: 0.61 maximum Max. pressure: 40 bar Weight: Ca. 42 g Operation temperature: -40...+125 °C For sensors with Ø 10 mm rod For sensors with up to 2000 mm stroke length

Co2ar	T221 221	Cord sets and adapter cables	
			
Co2ar Part no. 200 200 200	T221 221 Part no. 200 200 200	4 pin M12 to DTM06 connector Part no. 254 597	4 pin M12 to DT04 connector Part no. 254 600
Material: Stainless steel 1.4301 (AISI 304) Weight: Ca. 30 g Hex key 7/64" required For sensors with Ø 10 mm rod	K21 221 221 221 221 <ul style="list-style-type: none">12 VDC battery charger with adapter (EU & UK)Cable with M12 connectorCable with pigtailed wiresCarrying case	M12 connector: Brass/Nickel DT connector: DTM06 3 pin Material: PVC Jacket Cable length: 275 mm Cable Ø: 5 mm Operating temperature: -40...+105 °C	M12 connector: Brass/Nickel DT connector: DT04 3 pin Material: PVC Jacket Cable length: 275 mm Cable Ø: 5 mm Operating temperature: -40...+105 °C

H??ra???c? ??a?????

Screw hole based on ISO 6149-1



Sealing via O-ring
in the flange undercut

- Note the fastening torque of 50 Nm.
- The flange contact surface must be seated completely on the cylinder mounting surface.
- The cylinder manufacturer determines the pressure-resistant gasket (copper gasket, O-ring, etc.).
- The position magnet should not make contact with the sensor rod.
- The peak pressure should not be exceeded.
- Protect the sensor rod against wear.

- The plunger borehole:
 - Ø 7 mm rod: $\geq \text{Ø } 10 \text{ mm}$
 - Ø 10 mm rod: $\geq \text{Ø } 13 \text{ mm}$
 depends on the pressure and piston speed.
- The bore depth in piston:
 Null zone + Stroke length + Dead zone + $> 3 \text{ mm}$

[illegible]

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

Part 2		
A	> 17.4	> 25.4
B	≥ 18	≥ 18
C	Ro 2	Ro 2
	Ø 7	≥ Ø 10
	Ø 10	≥ Ø 13

The diagram shows a cross-section of a tank with a liquid level. A vertical tube is connected to the top of the tank. The tube has a float valve (B) at the liquid level and a pressure sensor (A) at the top. The tube is filled with a liquid (E) and has a scale (C) on the left side. The distance from the tank bottom to the float valve is labeled D.

- | | |
|----------|--------------------|
| A | MH threaded sensor |
| B | Float |
| C | Stroke length |
| D | Dead zone |
| E | Stop collar |

ORDER CODE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	H														
a			c												

a	or mo														
H	Rod														

	Form factor														
G	Threaded port M18×1.5, rod Ø 10 mm, M8 plug (male)														
K	Threaded port M18×1.5, rod Ø 10 mm, M6 plug (female)														
	Threaded port M18×1.5, rod Ø 7 mm, flat plug														
T	Threaded port M18×1.5, rod Ø 10 mm, flat plug														

c	rod range mm														
				0050...2500 mm (in 5 mm steps)											


	Electrical														
connector DC GND IG															
			E	4 pin (2-3-4)											
			G	4 pin (1-3-4)											
			H	4 pin (1-3-2)											

Cable outfit															
C			A	300 mm pigtailed wire termination											
C			A	500 mm pigtailed wire termination											
C			A	1000 mm pigtailed wire termination											
C			A	2000 mm pigtailed wire termination											
C			A	3000 mm pigtailed wire termination											
C			A	5000 mm pigtailed wire termination											

	Power supply														
	+12/24 VDC (8...32 VDC)														

	Output														
				0.25...4.75 VDC											
				0.5...4.5 VDC											
				4.75...0.25 VDC											
				4.5...0.5 VDC											
A				4...20 mA											
A				20...4 mA											

DELIVER

 Position sensor,
O-ring

Accessories have to be ordered
separately.

Operation manuals & software are available at:
[temposonics.com](#)



Temposonics

AN AMPHENOL COMPANY

UNITED STATES
Temposonics LLC
Americas & APAC Region
3001 Sheldon Drive
Cary, N.C. 27513
Phone: +1 919 677-0100
E-mail: info.us@temposonics.com

GERMANY
Temposonics GmbH & Co. KG
EMEA Region & India
Auf dem Schüffel 9
58513 Lüdenscheid
Phone: +49 2351 9587-0
E-mail: info.de@temposonics.com

ITALY
Branch Office
Phone: +39 030 988 3819
E-mail: info.it@temposonics.com

FRANCE
Branch Office
Phone: +33 6 14 060 728
E-mail: info.fr@temposonics.com

UK
Branch Office
Phone: +44 79 44 15 03 00
E-mail: info.uk@temposonics.com

CANDINAIA
Branch Office
Phone: + 46 70 29 91 281
E-mail: info.sca@temposonics.com

CHINA
Branch Office
Phone: +86 21 2415 1000 / 2415 1001
E-mail: info.cn@temposonics.com

JAPAN
Branch Office
Phone: +81 3 6416 1063
E-mail: info.jp@temposonics.com

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