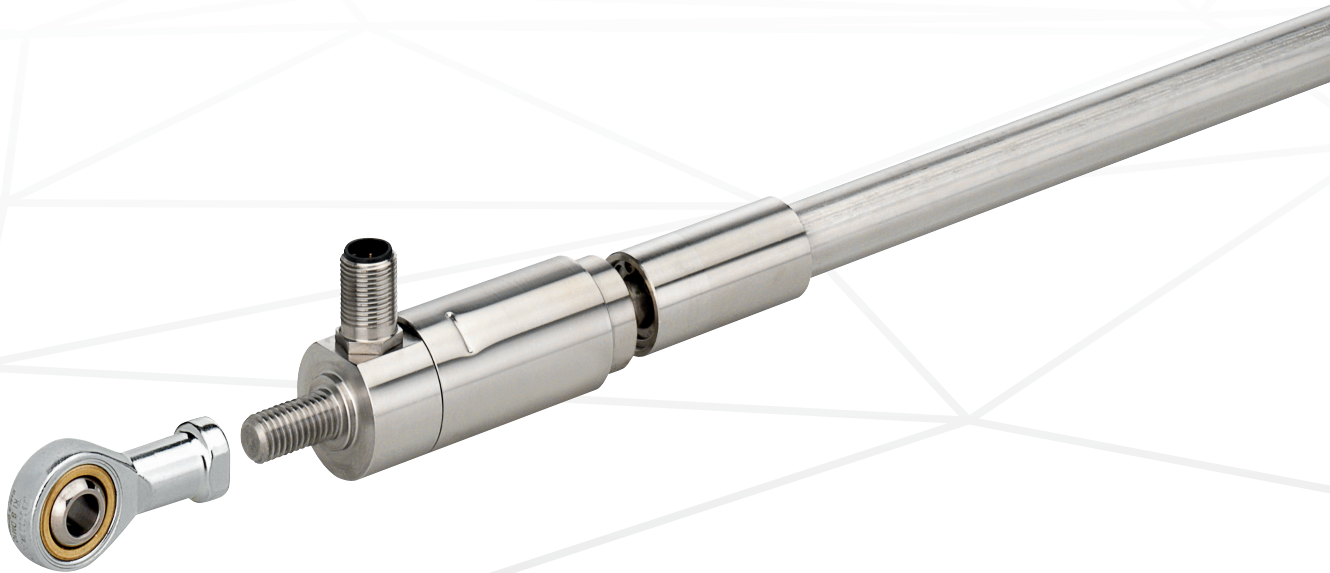


Data Sheet

MH-Series MXR

Magnetostrictive Linear Position Sensors

- External mounting for new or retrofit designs
- Rugged, up to 100 g shock and 10 g vibration levels
- Flexible, capability to measure a range from 100 to 600 mm
- CANbus and voltage output



MEASURING TECHNOLOGY

The absolute, linear position sensors provided by Temposonics rely on the company's proprietary magnetostrictive technology, which can determine position with a high level of precision and robustness. Each Temposonics® 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 beginning 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.

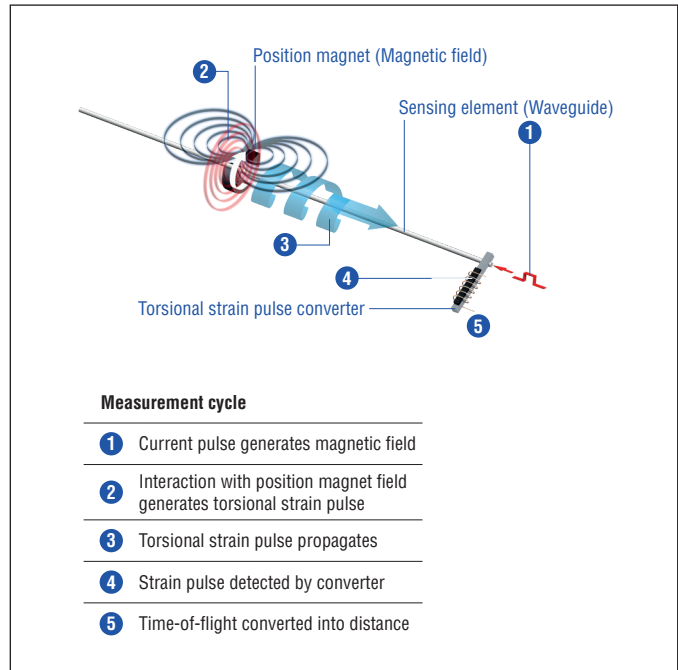


Fig. 1: Time-of-flight based magnetostrictive position sensing principle

MH-SERIES MXR

The MXR sensor provides the benefits of Temposonics magnetostrictive, non-contact, absolute position sensing technology in a mechanical package that can be externally mounted to a hydraulic cylinder or mounted in locations where a hydraulic cylinder is not present at all. The stainless steel mechanical package is designed to withstand the harsh environments encountered by off-highway equipment making it ideal for retrofits, agricultural vehicle steering, outriggers, or any machine function that needs to add position sensing. To ease installation, optional spherical eye or spherical stud mounts can also be provided pre-assembled.

The MXR sensor is available in two versions: the MXRC and the MXRS. Although the two versions are similar in both appearance and performance, there are unique features distinguishing the two sensors. The MXRC is available in four discrete stroke lengths up to 250 mm, while the MXRS is available in stroke lengths up to 600 mm (50 mm ordering increments). The MXRC works with a 5 VDC operating voltage, and provides a voltage output that is ratiometric to the operating voltage. The MXRS can work with an operating voltage of either 12 or 24 VDC, and has multiple output options available (Analog and CANbus).



Fig. 2: Typical application

TECHNICAL DATA

	MXRS	MXRC
Input		
Measured value	Linear position measurement	Linear position measurement
Stroke length	100...600 mm	109.5 mm, 148.0 mm, 217.3 mm, and 250.1 mm
Output		
Voltage	0.25...4.75 VDC, 0.5...4.5 VDC	0.1...4.9 VDC at +5 VDC supply, ratiometric with V supply
Current	4...20 mA	–
CANbus	SAE J1939, CANopen protocol according to CiA DS-301 V4.1, device profile DS-406 V3.1	–
Accuracy		
Resolution	±0.10 mm	±0.10 mm
Linearity	< ±0.04 % F.S.	±0.3 mm
Repeatability	< ±0.1 mm	< ±0.1 mm
Operating conditions		
Operating temperature	–40...+105 °C	–40...+75 °C
Humidity	90 % relative humidity, no condensation	90 % relative humidity, no condensation
Ingress protection	IP69K with M12 approved connector	IP69K with M12 approved connector
Shock test*	100 g (single hit)/ IEC standard 68-2-27 (survivability)	100 g (single hit)/ IEC standard 68-2-27 (survivability)
Vibration test*	Stroke Length > 250mm 5 g/5...2000 Hz, IEC standard 60068-2-6 Stroke Length ≤ 250mm 10 g/5...2000 Hz, IEC standard 60068-2-6	10 g/5...2000 Hz, IEC standard 60068-2-6
EMI (Immunity)	ISO 11452-2 200 V/m	ISO 11452-2 200 V/m (200-1000) MHz
Design/Material		
Sensor electronics housing	Stainless steel 1.4305 (AISI 303)	Stainless steel 1.4305 (AISI 303)
Sensor rod with flange	Stainless steel 1.4306 (AISI 304L)	Stainless steel 1.4306 (AISI 304L)
Installation		
Mounting	Threaded M10×1.5 stud Optional ball joint or spherical rod end	Threaded M10×1.5 stud Optional ball joint or spherical rod end
Electrical connection		
Connection type	M12 connector (male)	M12 connector (male)
Electrical isolation	500 VDC (DC ground to machine ground)	500 VDC (DC ground to machine ground)
Operating voltage	12/24 VDC (8...32 VDC)	5 VDC (4.75...5.5 VDC)
Current consumption	Typical ≤ 80 mA (12 VDC); Typical ≤ 40 mA (24 VDC)	Typical ≤ 40 mA (5 VDC)
Polarity protection	Up to –36 VDC	VDC to GND
Overvoltage protection	Up to 36 VDC	Up to 20 VDC

* Rating will vary depending on the stroke length and application.
Contact Temposonics for details.

TECHNICAL DRAWING

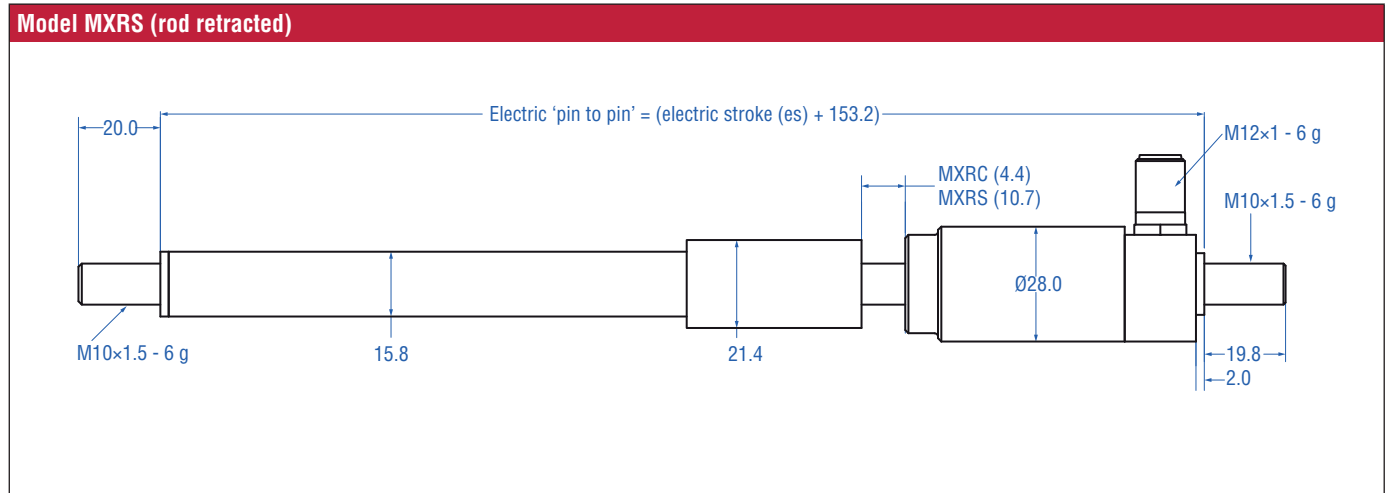


Fig. 3: Temposonics® MH-Series Model MXRS sensor

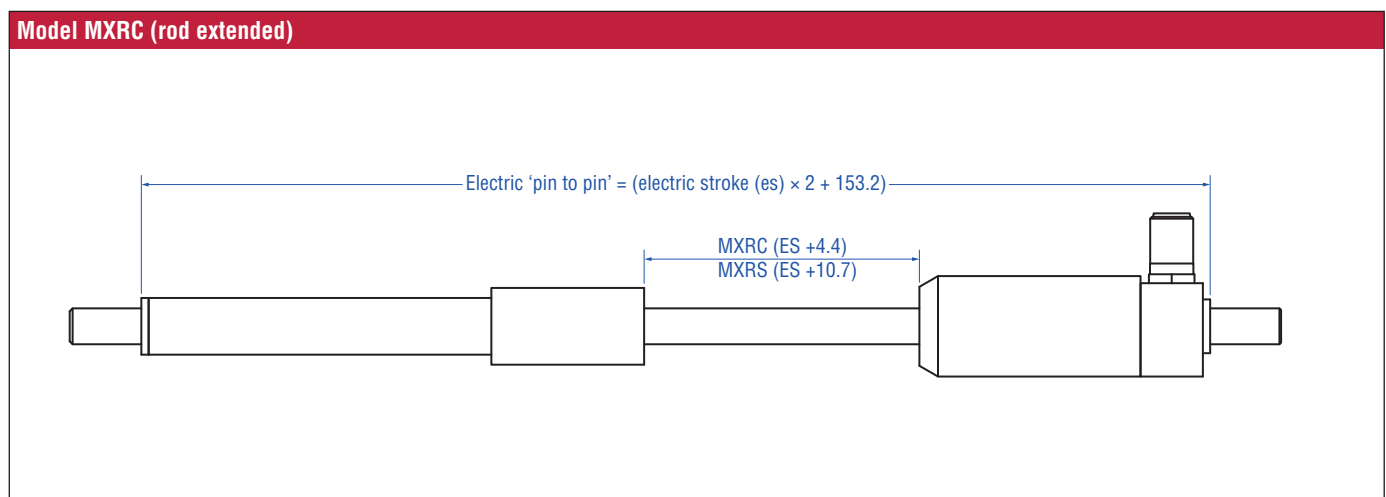


Fig. 4: Temposonics® MH-Series Model MXRC sensor

Controlling design dimensions are in millimeters

CONNECTOR WIRING – KEY ORIENTATION

The Temposonics® M12 integrated connector (shown in Figure 5), meets the most stringent protection requirements important for the difficult environmental conditions of mobile hydraulics applications. Protection type IP69K makes the robust metal housing not only completely dust and waterproof, even the harshest cleaning measures cannot damage the sensor.

CONNECTOR WIRING – KEY ORIENTATION

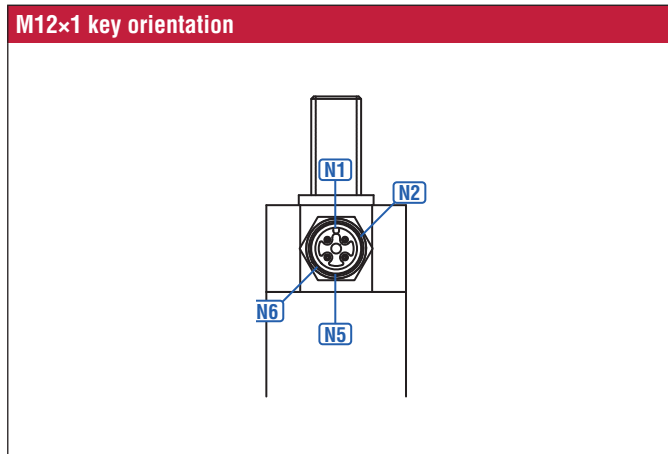


Fig. 5: M12x1 connector key orientation

CONNECTOR WIRING – CANbus OUTPUT

CANbus Output Connector Pin Assignment Reference			
	Standard	Integrated connector	PIN assignment and function
<p>View on connector</p>	N_F	5-pin M12x1	2-3-4-5; VDC, GND, CAN_H, CAN_L

Fig. 7: CANbus PIN assignments

CONNECTOR WIRING – ANALOG OUTPUT

Analog Output Connector Pin Assignment Reference			
	Standard	Integrated connector	PIN assignment and function
<p>View on connector</p>	N_E	4-pin M12x1	2-3-4; Power, ground, output
	N_G	4-pin M12x1	1-3-4; Power, ground, output
	N_H	4-pin M12x1	1-3-2; Power, ground, output

Fig. 6: Analog PIN assignments

ORDER CODE – MXR-S ANALOG

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
M	X	R	S				M	N				3			
a			b	c				d	e	f	g	h			

a Sensor model

M	X	R	Externally mounted sensor with self-contained housing
---	---	---	---

b Design

S	Version S electronics
---	-----------------------

c Stroke length

X	X	X	M	100...600 mm (in 50 mm steps)
---	---	---	---	-------------------------------

d Connector orientation

N	1	Integrated M12×1 connector, connector key at 0°
N	2	Integrated M12×1 connector, connector key at 45°
N	5	Integrated M12×1 connector, connector key at 180°
N	6	Integrated M12×1 connector, connector key at 225°

e Electrical wiring

E	(pin assignment 2-3-4)
G	(pin assignment 1-3-4)
H	(pin assignment 1-3-2)

f Mounting hardware

A	No additional hardware
B	2 × ball joint ends with 2 × M10 hex nuts
C	2 × spherical rod ends with 2 × M10 hex nuts

g Supply voltage

3	+12/24 VDC
---	------------

h Output

V	1	1	0.25...4.75 VDC
V	1	2	0.5...4.5 VDC
A	0	1	4...20 mA

DELIVERY



• Sensor

Accessories have to be ordered separately.

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

ORDER CODE – MXR-S CANbus

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
M	X	R	S				M	N		F		3						
a			b	c				d	e	f	g	h			i	j		

a	Sensor model
M X R	Externally mounted sensor with self-contained housing

b	Design
S	Version S electronics

c	Stroke length
X X X M	100...600 mm (in 50 mm steps)

d	Connector orientation
N 1	Integrated M12×1 connector, connector key at 0°
N 2	Integrated M12×1 connector, connector key at 45°
N 5	Integrated M12×1 connector, connector key at 180°
N 6	Integrated M12×1 connector, connector key at 225°

e	Electrical wiring
F	(pin assignment 2-3-4-5)

f	Mounting hardware
A	No additional hardware
B	2 × ball joint ends with 2 × M10 hex nuts
C	2 × spherical ball ends with 2 × M10 hex nuts

g	Supply voltage
3	+12/24 VDC

h	Output
C 0 1	CANopen cycle time 1 ms (default setting)
J 0 1	SAE J1939 cycle time 20 ms (default setting)

i	Baudrate
CANopen	
0	1000 kbit/s
1	800 kbit/s
2	500 kbit/s
3	250 kbit/s
4	125 kbit/s
6	50 kbit/s
7	20 kbit/s
8	10 kbit/s
SAE J1939	
2	500 kbit/s
3	250 kbit/s

j	Node ID (CANopen) / Source adress (SAE J1939)
CANopen (C01)	
	Hex 01...7F
SAE J1939 (J01)	
	Hex 01...FD

DELIVERY



• Sensor

Accessories have to be ordered separately.

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

ORDER CODE – MXR-C ANALOG

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
M	X	R	C				M	N				5	V	C	1
a			b	c				d	e	f	g	h			

a Sensor model

M	X	R	Externally mounted sensor with self-contained housing
---	---	---	---

b Design

C	Version C Electronics
---	-----------------------

c Stroke length

1	0	9	M	109.5 mm
1	4	8	M	148 mm
2	1	7	M	217.3 mm
2	5	0	M	250.1 mm

d Connector orientation

N	1	Integrated M12×1 connector, connector key at 0°
N	2	Integrated M12×1 connector, connector key at 45°
N	5	Integrated M12×1 connector, connector key at 180°
N	6	Integrated M12×1 connector, connector key at 225°

e Electrical wiring

E	(pin assignment 2-3-4)
G	(pin assignment 1-3-4)
H	(pin assignment 1-3-2)

f Mounting hardware

A	No additional hardware
B	2 × ball joint ends with 2 × M10 hex nuts
C	2 × spherical ball ends with 2 × M10 hex nuts

g Supply voltage

5	+5 VDC
---	--------

h Output

V	C	1	0.1...4.9 VDC at +5 VDC supply, output ratiometric with V supply
---	---	---	--

DELIVERY



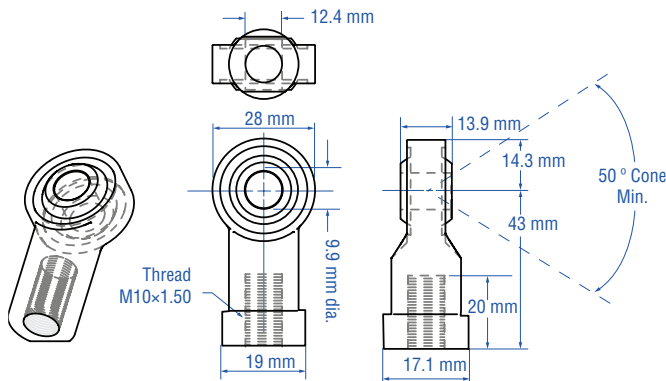
• Sensor

Accessories have to be ordered separately.

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www.temposonics.com

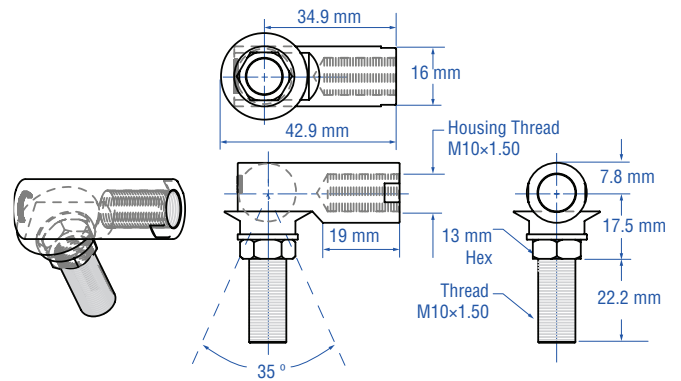
FREQUENTLY ORDERED ACCESSORIES

Position magnets



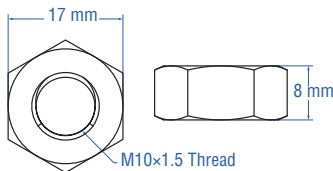
Spherical rod end
Part no. 500035

Spherical rod end kit
(includes 2 rod ends and 2 hex nuts)
Part no. 201947



Ball joint end
Part no. 500036

Ball joint end kit
(includes 2 Ball Joints and 2 hex nuts)
Part no. 201948



Hex jam nut 3/4"-16 UNF-3A
Part no. 561 788



Test kit Analog
Part no. 280 618

Kit includes:
1 x MH-Series Analog / PWM Tester
1 x 12 VDC battery charger with adapter (adapter main plug EU, adapter main plug UK)
1 x cable with M12 connector
1 x cable with pigtailed wires
1 x carrying case



Testkit CANbus
Part no. 253 879

Kit includes:
1 x USB CAN module
1 x Temposonics M12 Connector System To CAN adapter Cable
1 x Temposonics DT Connector System to M12 Adapter
1 x AC Adapter
1 x Carry Bag
1 x Software License (Download from Temposonics website)

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Document Part Number:
551601 Revision B (EN) 05//2026



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