Temposonics®

Magnetostrictive, Absolute, Non-contact
Linear-Position Sensors

E-Series Model EH
CANopen Output

Data Sheet

MTS SENSORS

Document Part Number:
551313 Revision D

Model EH rod-style position sensor
Stroke Length: 50 mm to 2500 mm (or 2 in. to 100 in.)

FEATURES

- Linear, Absolute Measurement
- Non-Contact Sensing Technology
- Linearity Deviation Less Than 0.02% F.S.
- Repeatability Within 0.005% F.S.
- CANopen Interface:
  - Direct Position Output
  - Velocity Output
- Single or Dual Magnet Measurements
- Stroke Length Range: 50 mm to 2500 mm (or 2 in. to 100 in.)
- Hermetically-Sealed Stainless Steel For IP69K Ingress Protection
- EMI Shielded and CE Certified
- Also with Stainless Steel 1.4404 / AISI 316L available

BENEFITS

- Compact Stainless Steel Position Sensor, Designed For Use In Hydraulic Cylinders
  - Standard 10 mm dia. Sensor Rod For Typical Applications
  - Optional 7 mm dia. Sensor Rod For Use In Small Bore Cylinders
- Simultaneous Multi-position Measurements for 2 Magnets
- Over Voltage Protection to 36 Vdc and Polarity Protection up to -30 Vdc

APPLICATIONS

- Clevis Mounted or Space Limited Cylinder Applications
- Harsh Industrial Conditions
- High-Pressure Washdown
- Gates and Valve Control

TYPICAL INDUSTRIES

- Fluid Power
- Factory Automation
- Steel Mills
- Material Handling and Packaging
- Water Management

c UL us CE ISO 9001 CERTIFIED

E-Series Model EH Sensor, CANopen Output
Product Overview/Specifications

Product overview

MTS Sensors continues to establish new performance standards for low-cost, fully-industrial, durable position sensors using the widely preferred magnetostrictive technology. This principle for accurate and non-contact measurement of linear-position sensing was developed 30 years ago by MTS and is used with outstanding success in a large variety of industrial applications. The Temposonics model EH sensor provides as much performance as you need for your application - you benefit from the advantages of magnetostrictive position measurement at optimum costs.

The Temposonics® Model EH sensor features a pressure resistant sensor rod for direct stroke measurement inside hydraulic cylinders. With its minimized sensor head and either a 7 mm or 10 mm rod, it is the ideal solution when space is critical. For long strokes, the model EH is available with measuring ranges up to 2500 mm (or 100 in.).

The model EH sensor offers completely sealed stainless-steel housing for long life position measurement for rugged environments. When installed with the appropriate mating connector and cable, it features protection up to IP69K and is suitable for high-pressure washdown applications.

Product specifications

Parameters	Specifications
OUTPUT	
Measured output variables:	Position, Velocity for single or dual magnets
Resolution:	**Position:** 10 µm, 20 µm **Velocity:** 1mm/s
Update times:	1.0 ms up to 2400 mm
Linearity deviation:	< ± 0.02% full stroke (minimum ± 60 µm)
Repeatability:	< ± 0.005% full stroke (minimum ± 10 µm)
Outputs:	**Interface:** CAN-Fieldbus System according to ISO/DIS 11898 **Data protocol:** CANopen Encoder Profile DS 406 V3.1 CiA Standard DS 301 v3.0

Baud rate, kBit/s:	1000	800	500	250	125
Cable length, m:	< 25	< 50	< 100	< 250	< 500

Stroke length:	**Range:** 50 mm to 2500 mm (or 2 in. to 100 in.)
ELECTRONICS	
Operating voltage:	**+24 Vdc nominal:** -15% or +20% * **Polarity protection:** ≥ -30 Vdc **Over voltage protection:** ≤ 36 Vdc **Current drain:** 40 to 60 mA *(Stroke length dependent)* **Dielectric withstand voltage:** 500 Vdc (DC ground to machine ground)

Parameters	Specifications
ENVIRONMENTAL	
Operating conditions:	**Operating temperature:** -40 °C (-40 °F) to 75 °C (167 °F) **Relative humidity:** 90% no condensation **Ingress protection:** IP69K *(when appropriate mating connector is correctly fitted)* **
EMC test:	**Electromagnetic emission:** EN 61000-6-4 (for use in industrial environment) **Electromagnetic immunity:** EN 61000-6-2. The sensor meets the requirements of the EC directives and is marked with CE.
Shock rating:	100 g (single hit)/ IEC standard EN 60068-2-27
Vibration rating:	15 g/10 to 2000 Hz, IEC standard EN 60068-2-6 (resonance frequencies excluded)
WIRING	
Connection type:	5-pin (M12) male integral connector
ROD-STYLE SENSOR (MODEL EH)	
Sensor housing:	Stainless Steel 1.4305 / AISI 303; Stainless Steel 1.4404 / AISI 316L
Sensor rod:	Stainless Steel 1.4301 / AISI 304; Stainless Steel 1.4404 / AISI 316L for 10 mm diameter rod only
Operating pressure:	**7 mm Rod:** 300 bar static, 350 bar peak (4350 psi static , 5076 psi peak) **10 mm rod:** 350 bar static, 450 bar peak (5076 psi static , 6526 psi peak)
Mounting:	Any orientation. Threaded flange M18x1.5 or 3/4-16 UNF-3A
Typical mounting torque:	45 N-m (33 ft. - lbs.)
Magnet types:	Ring magnet, open-ring magnet or magnet float

* UL Recognition requires an approved power supply with energy limitation (UL 61010-1), or Class 2 rating according to the National Electrical Code (USA) / Canadian Electrical Code.

** The IP rating is not part of the UL Recognition.

CANopen communication and functionality

Temposonics linear-position sensors fulfill all requirements of CANbus (ISO 11898). The sensor's electronics convert the position measurements into bus oriented outputs and transfer this data directly to the controller. The CANbus interface is appropriate for serial data transfer up to 1 Mbps maximum. Sensor integrated software supports bus profile CANopen. This communication protocol allows for a comprehensive customized configuration of the sensor-bus system.

TEMPOSONICS E-SERIES SENSORS WITH CANOPEN INTERFACE

E-Series sensors with CANopen protocol are based as bus-nodes on the OSI reference model and are available with application data for single or dual-magnet measurements:

APPLICATION DATA:

- Position measurement
- Velocity measurement
- Setpoints
- Status

CANopen corresponds to encoder profile 'DS-406 V3.1 (CiA Draft standard DS-301 V3.0)'. The CANopen functionality is described below in the following communication objects.

CANopen CONFIGURATION TOOL

The EDS (Electronic Data Sheet) download is available at www.mtssensors.com for configuration.

SERVICE DATA OBJECT (SDO)

The SDO is mainly used for sensor configuration. SDO messages are used for read and write access to all entries in the object directory.

Selectable parameters are as follows:

- Operational range setup for magnets 1 and 2
- Zero adjustment preset for magnets 1 and 2
- 4 set points for each magnet

PROCESS DATA OBJECT (PDO)

The PDO provides data transfer of sensor measurements in up to 8-byte data blocks. The sensor uses PDO's to relay parameters for each magnet in one or two PDO's

DATA FORMATS:

- Position
- Velocity
- Limit status
- Limit status of operational range

PDO TRANSMISSION TYPES

- Asynchronous (cycle time of 1 to 65.535 ms) or synchronous
- Synchronization Object (SYNC) messages are sent from the controller to the sensor, the sensor then transmitts measurement values

SYNC OBJECT

Is responsible for synchronized bus communication

EMERGENCY OBJECT

Emergency messages are transmitted as:

- Sensor signal breakdown
- Communication fault

Dual magnet outputs

MEASUREMENT OPTIONS

E-Series sensors provide options for simultaneous multi-position measurements by using up to two magnets per sensor.

The options for single-magnet or dual-magnets is specified in the sensor model number when ordered. For single-magnet sensors the sensor's full active stroke length is utilized by the one magnet. For example when using forward-acting outputs, the output is 0% of its value when the magnet is at the null position (start of stroke) and 100% of its value when at the edge of the dead zone (end of stroke), *(see 'Figure 1')*.

However, for dual-magnet sensors the sensor's active stroke length must be shared by the two magnets, and a separation > or = to 75 mm (3 in.) must be maintained between the two magnets (front side of the first magnet to front side of the second magnet). This minimum distance between magnets is needed to maintain proper sensor output. Therefore, for the second magnet the start of stroke (0% output) is set at 75 mm away from the sensor's null position. Likewise, for the first magnet the end of stroke (100% output) is now set 75 mm away from the edge of the dead zone *(see 'Figure 1')*.

The result of using the dual-magnet E-Series options is that the stroke length available for each magnet is 75 mm less (or 3 inches less when specifying stroke length in inches) than the sensor's full active stroke length as indicated in the model number.

When ordering the single-magnet E-Series sensor the minimum stroke length available is 50 mm or 2 inches. However when ordering dual magnet E-Series sensors the minimum stroke length available is 125 mm (i.e. 50 mm minimum, plus 75 mm for the minimum distance between magnets). Likewise, when specifying stroke length in inches the minimum stroke length available is 5 inches (i.e. 2 inch minimum, plus 3 inches for the minimum distance between magnets).

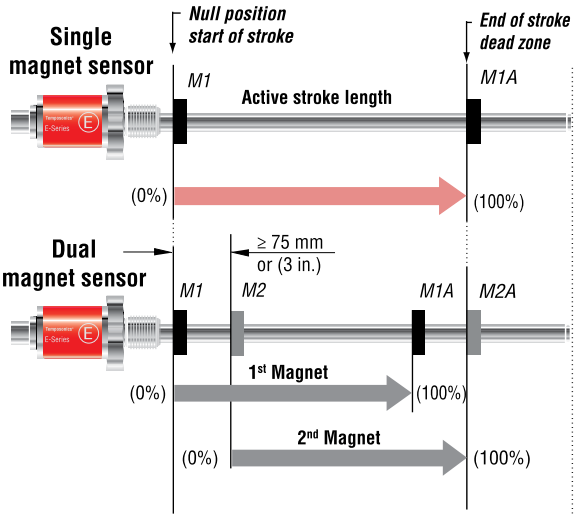

Figure 3. Single and dual-magnet measurements

Sensor dimension references

Drawings are for reference only, contact applications engineering for tolerance specific information.

The model EH sensor shown in *'Figure* 2' can be ordered with flange styles M18 x1.5 or 3/4 -16 UNF-3A and a 7 mm or 10 mm diameter sensor rod. Magnets must be purchased separately; refer to *'Standard magnet Selections (Model EH)'* for standard magnet ordering information.

MODEL EH

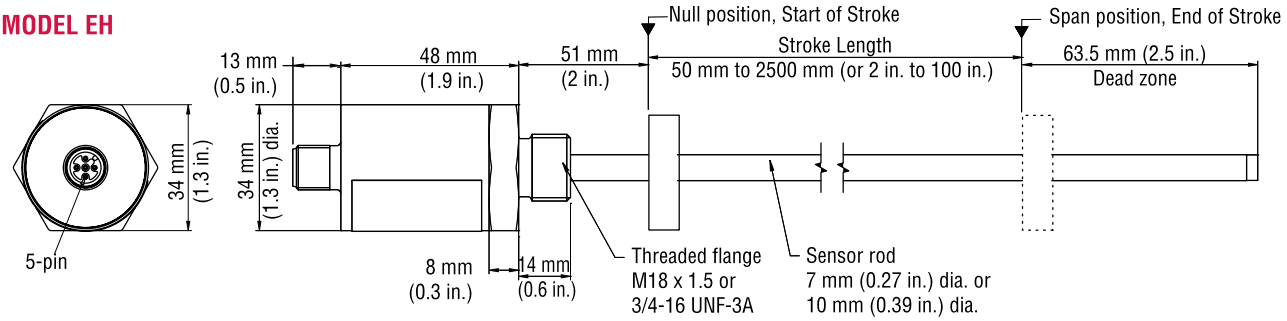

Figure 2. *E-Series model EH sensor dimension reference*

Refer to the model EH sensor ordering information for rod housing and flange types

Standard magnets, mounting and installation (Model EH)

Magnets must be ordered separately with Model EH rod-style sensors. The standard ring magnet (part number 201542-2) is suitable for most applications.

Refer to the Accessories section of this catalog for magnet selections and detailed mounting and installation information.

Connections and wiring (Model EH)

SENSOR INTEGRAL CONNECTOR (D34) PINOUT/WIRE COLOR CODES

The E-Series Model EH sensor connects directly to a controller or interface module with the standard male, 5-pin integral connector and an extension cable as described in *'Table 1'*

Integral D34 connector (male) as viewed from the end of the sensor

Pin no.	Signal/function CANopen outputs
1	Shield
2	+24 Vdc
3	DC ground (for power return)
4	CAN (+)
5	CAN (-)

Integral D34 sensor connector

E-Series Model EH Sensor, CANopen Output
Ordering Information

E	H						D	3	4	1	C		0	4			1	Z		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

(Use the order matrix above to configure your Model EH sensor order number)

SENSOR MODEL = E H — 1 - 2

EH = E-Series model EH rod-style sensor (Magnet(s) must be ordered separately)

HOUSING STYLE = ☐ — 3

K = Flange M18 x 1.5 / Rod 7 mm dia.
M = Flange M18 x 1.5 / Rod 10 mm dia.
W = Flange M18 x 1.5 / Rod 10 mm dia. (316L)
L = Flange 3/4 in. -16 / Rod 7 mm dia.
S = Flange 3/4 in. -16 / Rod 10 mm dia.
F = Flange 3/4 in. -16 / Rod 10 mm dia. (316L)

STROKE LENGTH = ☐☐☐☐☐ — 4 - 8

_ _ _ _ M = Millimeters (Encode in 5, 10, 25 or 50 mm increments) as indicated in *'Stroke length notes'* below.
_ _ _ . _ U = Inches (Encode in 0.2, 0.5, 1 or 2 in. increments) as indicated in *'Stroke length notes'* below.

Stroke Length Notes:

Stroke length ranges:
M = 50 mm to 2500 mm
U = 2 in. to 100 in.

The increment size between standard stroke lengths vary as shown below:

Stroke length (mm)	Ordering increment
≤ 500 mm	5 mm
> 500 mm and ≤ 750 mm	10 mm
> 750 mm and ≤ 1000 mm	25 mm
> 1000 mm and ≤ 2500 mm	50 mm
Stroke length (IN)	**Ordering increment**
≤ 20 in.	0.2 in.
> 20 mm and ≤ 30 mm	0.5 in.
> 30 mm and ≤ 40 mm	1 in.
> 40 in. and ≤ 100 in.	2 in.

SENSOR CONNECTION TYPES = D 3 4 — 9 - 11

D34 = 5-Pin (M12), male, (CANopen output)

INPUT VOLTAGE = 1 — 12

1 = + 24 Vdc (+20%, -15%), standard

OUTPUT = C 0 4 1 — 13-19

C _ _ _ _ _ _ = CANopen output - Enter the 6-digit output code (1-6) defined by the selections below:
[1] [2] [3] [4] [5] [6]

[1] [2] [3] Protocol		[4] Baud rate		[5] Resolution		[6] type	
304	= CANopen 1 or 2 magnets	1	= 1000 kBit/s	4	= 10 µm	1	= Standard
404	= CANopen 1 or 2 magnets with integrated bus terminator resistor (120 Ohms)	2	= 500 kBit/s	5	= 20 µm		
		3	= 250 kBit/s				
		4	= 125 kBit/s				

NUMBER OF MAGNETS (20-22) FOR MULTI-POSITION MEASUREMENT ONLY = Z ☐☐ — 20-22

Z + Enter a 2-digit code
Z _ _ = Enter 02 for 2 magnets