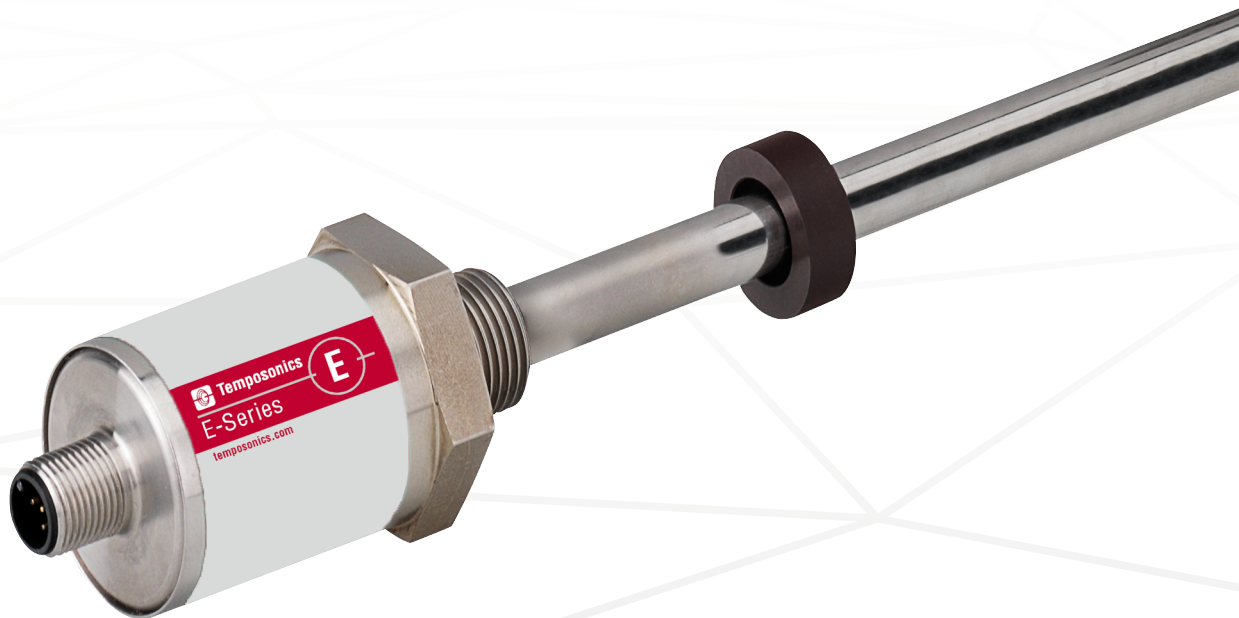


## Data Sheet

### **E-Series EH IO-Link** Magnetostrictive Linear Position Sensors

- High pressure resistant sensor rod
- Position and velocity measurements with multiple magnets
- Small & compact – Ideal for standard hydraulic cylinders



## 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 a 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.

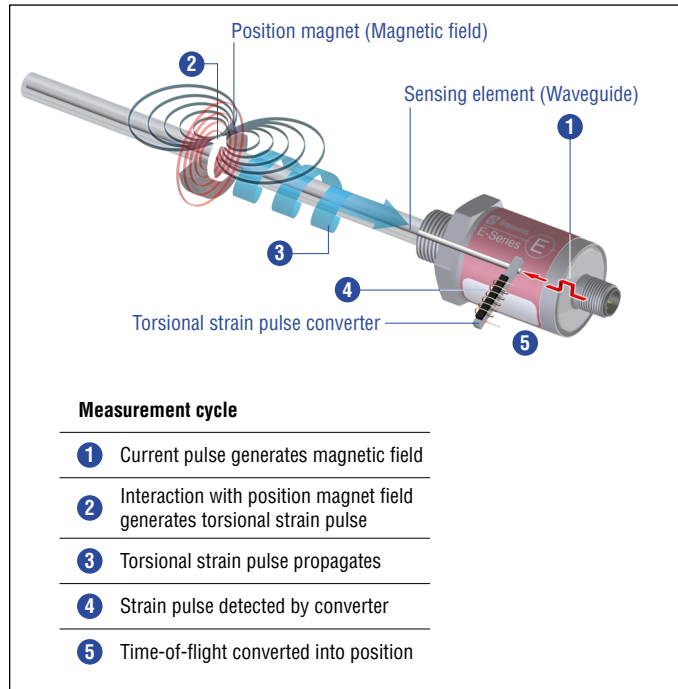


Fig. 1: Time-of-flight based magnetostrictive position sensing principle

## E-SERIES EH IO-LINK

The Temposonics® E-Series offers you a compact solution for linear position measurement. It is ideally suited for different applications in the industrial environment. The main advantages of the E-Series EH are:

- **Direct measurement in the cylinder**  
The rod version EH is designed for installation in a cylinder. This allows you to easily measure the piston movement of the cylinder directly.
- **Compact design**  
The E-Series sensors are designed to take up very little space. This means that you can also use the sensors well in limited spaces.
- **Reliable performance**  
With their performance, the sensors of the E-Series ensure reliable position measurement. Therefore, the sensors are very well suited for many different applications.
- **Robust and proven**  
The E-Series sensors are designed to be robust. The E-Series has proven in the industrial environment for many years.

## IO-LINK

IO-Link is a standardized IO technology (IEC 61131-9) for serial and bidirectional communication between sensor and controller. The E-Series IO-Link is characterized by:

- **IO-Link certified**  
The E-Series with IO-Link V1.1 and COM3 fulfills the IO-Link specification. This is the prerequisite that the sensor works on any IO-Link master.
- **8 positions simultaneously**  
The E-Series IO-Link can detect and report the positions of up to 8 magnets simultaneously.
- **Customize to your requirements**  
You can adjust important parameters at the sensor for the position measurement such as resolution, measuring direction and measuring range according to your requirements.
- **Position, velocity and switch state**  
With up to 4 magnets, the sensor reports not only the position but also the velocity. In addition, a switch state can be transmitted in parallel via the digital output. You can parameterize the switch points and the switch logic.

## TECHNICAL DATA

| Output                       |  |
|------------------------------|--|
| Interface                    | Digital  |
| Transmission protocol        | IO-Link V1.1   |
| Data format                  | Standard single-position measurement: 32 bit signed (position in $\mu\text{m}$ )<br>Advanced single-position measurement and multi-position measurement: 8 × 32 bit signed (position in $\mu\text{m}$ , velocity in $\mu\text{m/s}$ )                      |
| Data transmission rate       | COM3 (230.4 kBaud)   |
| Process data device – master | Standard single-position measurement: 4 bytes<br>Advanced single-position measurement and multi-position measurement: 32 bytes   |
| Process data master – device | 0 bytes  |
| Measured value               | Standard single-position measurement: Position<br>Advanced single-position measurement and multi-position measurement: Position and velocity   |
| Measurement parameters       |  |
| Resolution <sup>1</sup>      | 5 $\mu\text{m}$ , 10 $\mu\text{m}$ , 20 $\mu\text{m}$ , 50 $\mu\text{m}$ or 100 $\mu\text{m}$  |
| Cycle time                   | Standard single-position measurement:<br>Sensors with stroke length $\leq 1000$ mm ( $\leq 39$ in.): 1 ms<br>Sensors with stroke length $\geq 1000$ mm ( $\geq 39$ in.): 2 ms<br>Advanced single-position measurement and multi-position measurement: 4 ms |
| Linearity <sup>2</sup>       | $\leq \pm 0.02$ % F.S. (minimum $\pm 60$ $\mu\text{m}$ )   |
| Repeatability                | $\leq \pm 0.005$ % F.S. (minimum $\pm 20$ $\mu\text{m}$ )  |
| Operating conditions         |  |
| Operating temperature        | $-40 \dots +75$ °C ( $-40 \dots +167$ °F)  |
| Humidity                     | 90 % relative humidity, no condensation  |
| Ingress protection           | IP67/IP69K (connector correctly fitted)  |
| Shock test                   | 100 g (single shock), IEC standard 60068-2-27  |
| Vibration test               | 15 g/10...2000 Hz, IEC standard 60068-2-6 (resonance frequencies excluded)   |
| EMC test                     | Electromagnetic emission according to EN 61000-6-3<br>Electromagnetic immunity according to EN 61000-6-2   |
| Operating pressure           | $\varnothing 7$ mm rod: 300 bar (4351 psi), 450 bar (6527 psi) peak<br>$\varnothing 10$ mm rod: 350 bar (5076 psi), 530 bar (7687 psi) peak  |
| Magnet movement velocity     | Any  |
| Design/Material              |  |
| Sensor electronics housing   | Stainless steel 1.4305 (AISI 303); option: Stainless steel 1.4404 (AISI 316L)  |
| Sensor rod                   | $\varnothing 7$ mm rod: Stainless steel 1.4301 (AISI 304)<br>$\varnothing 10$ mm rod: Stainless steel 1.4306 (AISI 304L); option: Stainless steel 1.4404 (AISI 316L)   |
| Stroke length                | 50...2540 mm (2...100 in.)   |
| Mechanical mounting          |  |
| Mounting position            | Any  |
| Mounting instruction         | Please consult the technical drawings on page 4 and the operation manual (document number: <a href="#">551845</a> ).   |
| Electrical connection        |  |
| Connection type              | M12 male connector (4 pin)   |
| Operating voltage            | +24 VDC ( $\pm 25$ %)  |
| Ripple                       | $\leq 0.28$ V <sub>pp</sub>  |
| Current consumption          | < 50 mA  |
| Dielectric strength          | 500 VDC (DC ground to machine ground)  |
| Polarity protection          | Up to $-30$ VDC  |
| Overvoltage protection       | Up to 36 VDC   |

1/ Selectable via IO-Link master  
2/ With position magnet # 251 416-2

## TECHNICAL DRAWING

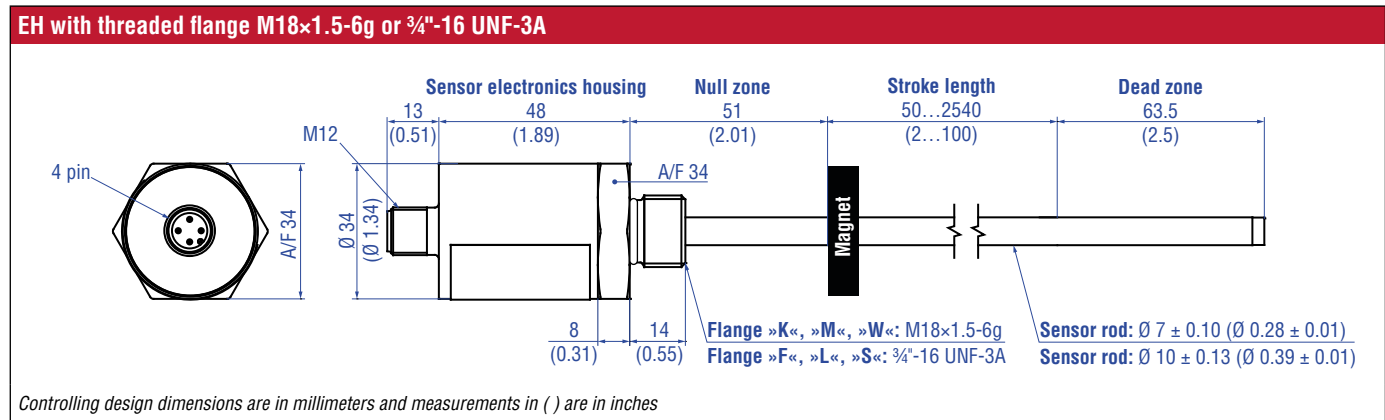


Fig. 2: E-Series EH with ring magnet

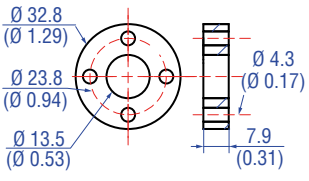
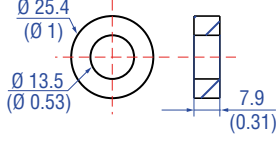
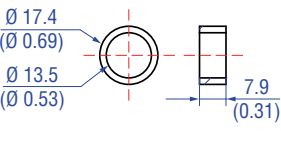
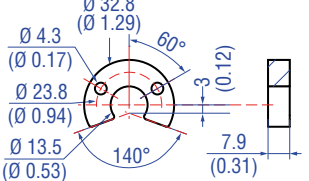
## CONNECTOR WIRING

| D44                   |     |                     |
|-----------------------|-----|---------------------|
| Signal + power supply |     |                     |
| M12 male connector    | Pin | Function            |
| <p>View on sensor</p> | 1   | +24 VDC (-15/+20 %) |
|                       | 2   | DI/DQ               |
|                       | 3   | DC Ground (0 V)     |
|                       | 4   | C/Q                 |



Fig. 3: Connector wiring D44

**FREQUENTLY ORDERED ACCESSORIES** – Additional options available in our [Accessories Guide](#)  [551444](#)

**Position magnets**

|  |  |   |  |
|--|--|---|--|
|   |   |   |   |
| <p><b>Ring magnet OD33</b><br/>Part no. 201 542-2</p>  | <p><b>Ring magnet OD25.4</b><br/>Part no. 400 533</p>  | <p><b>Ring magnet OD17.4</b><br/>Part no. 401 032</p>   | <p><b>U-magnet OD33</b><br/>Part no. 251 416-2</p>   |
| <p>Material: PA ferrite GF20<br/>Weight: Approx. 14 g<br/>Surface pressure: Max. 40 N/mm<sup>2</sup><br/>Fastening torque for M4 screws: 1 Nm<br/>Operating temperature:<br/>-40...+105 °C (-40...+221 °F)</p> | <p>Material: PA ferrite<br/>Weight: Approx. 10 g<br/>Surface pressure: Max. 40 N/mm<sup>2</sup><br/>Operating temperature:<br/>-40...+105 °C (-40...+221 °F)</p> | <p>Material: PA neobond<br/>Weight: Approx. 5 g<br/>Surface pressure: Max. 20 N/mm<sup>2</sup><br/>Operating temperature:<br/>-40...+105 °C (-40...+221 °F)</p> | <p>Material: PA ferrite GF20<br/>Weight: Approx. 11 g<br/>Surface pressure: Max. 40 N/mm<sup>2</sup><br/>Fastening torque for M4 screws: 1 Nm<br/>Operating temperature:<br/>-40...+105 °C (-40...+221 °F)</p> |

**Cables**

|   |   |
|---|---|
|    |    |
| <p><b>Cable with M12 A-coded female connector (5 pin), straight – pigtail</b><br/>Part no. 370 673</p>  | <p><b>Cable with M12 A-coded female connector (5 pin), angled – pigtail</b><br/>Part no. 370 675</p>  |
| <p>Material: PUR jacket; black<br/>Features: Shielded<br/>Cable length: 5 m (16.4 ft)<br/>Ingress protection: IP67 (correctly fitted)<br/>Operating temperature:<br/>-25...+80 °C (-13...+176 °F)</p> | <p>Material: PUR jacket; black<br/>Features: Shielded<br/>Cable length: 5 m (16.4 ft)<br/>Ingress protection: IP67 (correctly fitted)<br/>Operating temperature:<br/>-25...+80 °C (-13...+176 °F)</p> |

**NOTICE**

The wiring of the cables is available in the accessories brochure ([document no. 551444](#))

Controlling design dimensions are in millimeters and measurements in ( ) are in inches  
Color of connectors and cable jacket may change. Colors of the cores and technical properties remain unchanged.

## ORDER CODE

|   |   |   |   |   |   |   |   |   |    |    |    |    |    |          |    |    |  |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----------|----|----|--|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15       | 16 | 17 |  |
| E | H |   |   |   |   |   |   | D | 4  | 4  | 1  | K  |    |          |    |    |  |
| a |   | b | c |   |   |   |   | d |    |    | e  | f  | g  |          |    |    |  |
|   |   |   |   |   |   |   |   |   |    |    |    |    |    | optional |    |    |  |

|          |                     |
|----------|---------------------|
| <b>a</b> | <b>Sensor model</b> |
| E H      | Rod                 |

|   |   |
|---|---|
| <b>b</b>  | <b>Design</b>                             |
| <b>EH rod-style sensor with housing material 1.4305 (AISI 303) and rod material 1.4301 (AISI 304)</b>   |   |
| K   | Threaded flange M18×1.5-6g, Ø 7 mm rod    |
| L   | Threaded flange ¾"-16 UNF-3A, Ø 7 mm rod  |
| <b>EH rod-style sensor with housing material 1.4305 (AISI 303) and rod material 1.4306 (AISI 304L)</b>  |   |
| M   | Threaded flange M18×1.5-6g, Ø 10 mm rod   |
| S   | Threaded flange ¾"-16 UNF-3A, Ø 10 mm rod |
| <b>EH rod-style sensor with housing material 1.4404 (AISI 316L) and rod material 1.4404 (AISI 316L)</b> |   |
| F   | Threaded flange ¾"-16 UNF-3A, Ø 10 mm rod |
| W   | Threaded flange M18×1.5-6g, Ø 10 mm rod   |

|  |                       |
|--|-----------------------|
| <b>c</b>   | <b>Stroke length</b>  |
| X X X X M  | 0050...2540 mm        |
| <b>Standard stroke length (mm)</b>   | <b>Ordering steps</b> |
| 50... 500 mm   | 5 mm                  |
| 500... 750 mm  | 10 mm                 |
| 750...1000 mm  | 25 mm                 |
| 1000...2540 mm   | 50 mm                 |
| X X X X U  | 001.0...100.0 in.     |
| <b>Standard stroke length (in.)</b>  | <b>Ordering steps</b> |
| 1... 20 in.  | 0.2 in.               |
| 20... 30 in.   | 0.4 in.               |
| 30... 40 in.   | 1.0 in.               |
| 40...100 in.   | 2.0 in.               |
| Non-standard stroke lengths are available; must be encoded in 5 mm/0.1 in. increments. |                       |

|          |                            |
|----------|----------------------------|
| <b>d</b> | <b>Connection type</b>     |
| D 4 4    | M12 male connector (4 pin) |

|          |                          |
|----------|--------------------------|
| <b>e</b> | <b>Operating voltage</b> |
| 1        | +24 VDC (±25 %)          |

|          |               |
|----------|---------------|
| <b>f</b> | <b>Output</b> |
| K        | IO-Link       |

|          |  |
|----------|--|
| <b>g</b> | <b>Advanced single-position measurement or multi-position measurement (optional)</b>                       |
| 1 Z 0 X  | Number of magnets<br>01...04 position and velocity (1...4 magnet(s))<br>01...08 position (1...8 magnet(s)) |

### NOTICE

- The number of magnets is limited by the stroke length. The minimum allowed distance between magnets (i.e. front face of one to the front face of the next one) is 75 mm (3 in.).
- Use magnets of the same type for multi-position measurement.

## DELIVERY



- Sensor
- O-ring

Accessories have to be ordered separately.

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