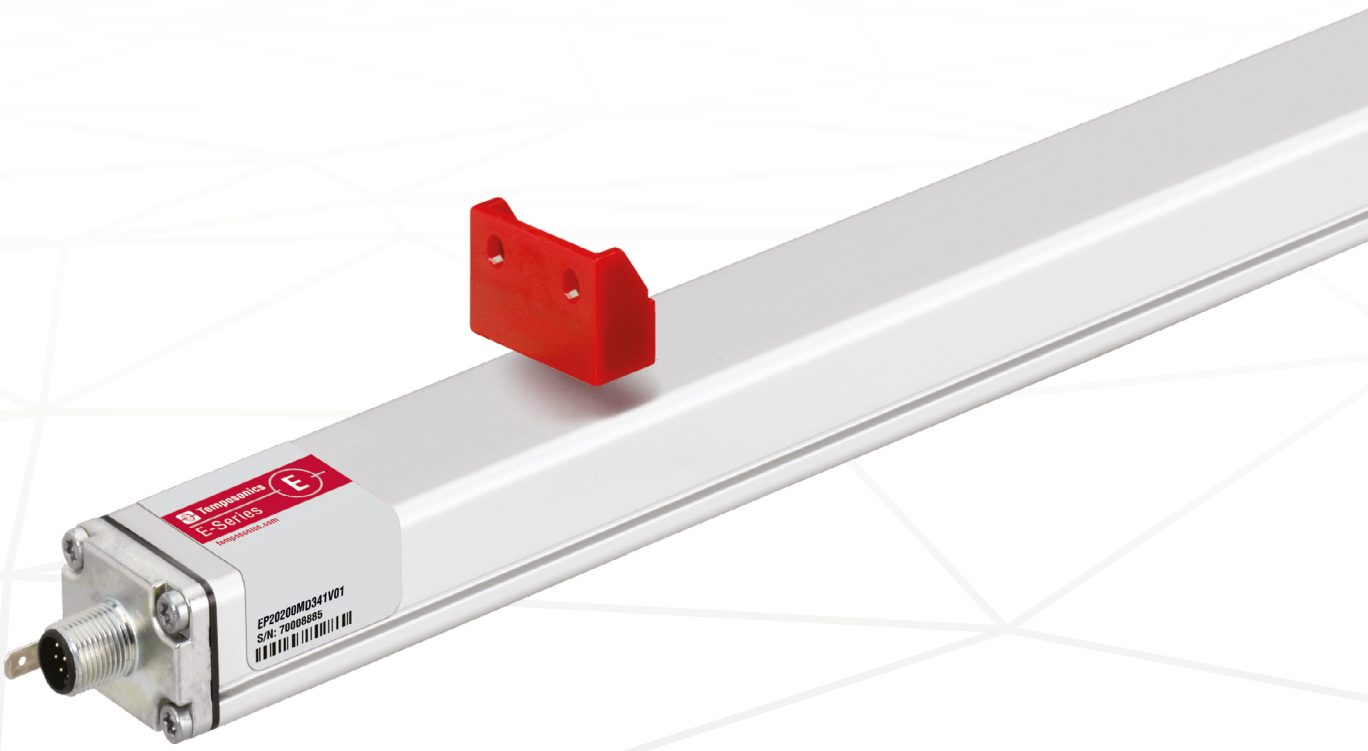
Temposonics
AN AMPHENOL COMPANY

Data Sheet

# E-Series EP2 Analog

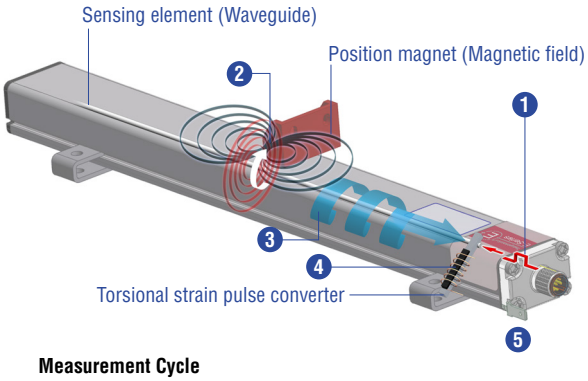
## Magnetostrictive Linear Position Sensors

- Optimal price-/performance ratio
- Position measurement with more than one magnet
- Flat & compact



## 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.




**Measurement Cycle**

| | |
|---|---|
| 1 | Current pulse generates magnetic field |
| 2 | Interaction with position magnet field generates torsional strain pulse |
| 3 | Torsional strain pulse propagates |
| 4 | Strain pulse detected by converter |
| 5 | Time-of-flight converted into position |

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

## EP2 SENSOR

Robust, non-contact and wear free, the Temposonics® linear position sensor provide high durability and precise position measurement feedback in harsh industrial environments. Measurement accuracy is tightly controlled by the quality of the waveguide manufactured exclusively by Temposonics.

The compact and flat aluminum profile offers flexible mounting options and easy installation. Moreover, the position magnet can travel along the entire flat housing profile. The EP2 has an attractive price-/performance ratio and is ideal for industrial applications including plastics molding and processing, factory automation and packaging.

*Fig. 2: Plastic granulate for injection molding or extrusion*

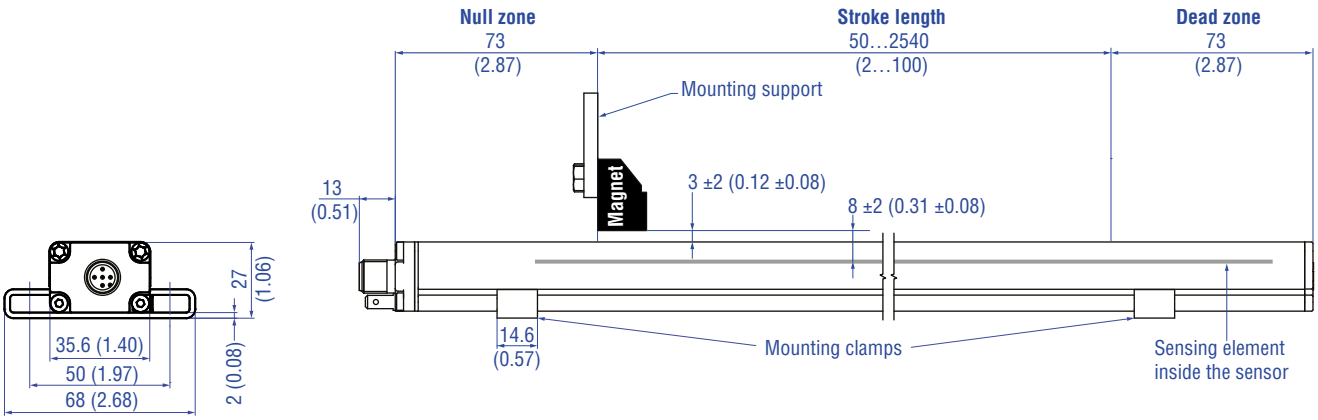
## TECHNICAL DATA

| | |
|---|---|
| **Output** | |
| Analog | Voltage: 0…10 VDC/10…0 VDC (controller input resistance $R_L$ > 5 kΩ)<br>Current: 4…20 mA/20…4 mA (minimum/maximum load: 0/500 Ω) |
| Measured value | Position/option: Multi-position measurement (2 positions) |
| **Measurement parameters** | |
| Resolution | Infinite |
| Cycle time | Typical 0.3 ms < t < 2 ms (depending on stroke length) |
| Linearity deviation [1] | ≤ ±0.02 % F.S. (minimum ±90 µm) |
| Repeatability | ≤ ±0.005 % F.S. (minimum ±20 µm) |
| **Operating conditions** | |
| Operating temperature | –40…+75 °C (–40…+167 °F) |
| Humidity | 90 % relative humidity, no condensation |
| Ingress protection [2] | IP67 (connectors correctly fitted) |
| Shock test | 100 g (single shock), IEC standard 60068-2-27 |
| Vibration test | 8 g/10…2000 Hz, IEC standard 60068-2-6 (excluding resonant frequencies) |
| EMC test | Electromagnetic emission according to EN 61000-6-3<br>Electromagnetic immunity according to EN 61000-6-2<br>The EP2 sensors fulfill the requirements of the EMC directives 2014/30/EU, UKSI 2016 Nr. 1091 and TR ZU 020/2011 |
| Magnet movement velocity | Any |
| **Design/Material** | |
| Sensor lid | Zinc die-cast |
| Sensor profile | Aluminum |
| RoHS compliance | The used materials are compliant with the requirements of EU directive 2011/65/EU and EU regulation 2015/863 as well as UKSI 2022 No. 622 with amendments |
| Stroke length | 50…2540 mm (2…100 in.) |
| **Mechanical mounting** | |
| Mounting position | Any |
| Mounting instruction | Please consult the technical drawing on page 4 |
| **Electrical connection** | |
| Connection type | M12 male connector (5 pin) |
| Operating voltage | +24 VDC (–15/+20 %); The EP2 sensors must be power supplied via an external Class 2 power source in accordance with the UL approval |
| Ripple | ≤ 0.28 $V_{PP}$ |
| Current consumption | 50…140 mA |
| Dielectric strength | 500 VDC (DC ground to machine ground) |
| Polarity protection | Up to –30 VDC |
| Overvoltage protection | Up to 36 VDC |

**1/** With block magnet # 403 448
**2/** The IP rating IP67 is only valid for the sensor electronics housing, as water and dust can get inside the profile.

## TECHNICAL DRAWING

**EP2**




*Controlling design dimensions are in millimeters and measurements in ( ) are in inches*

*Fig. 3: Temposonics® EP2 with block magnet*

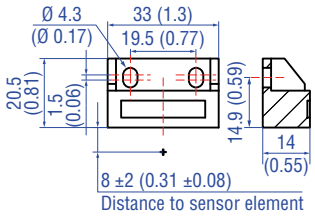
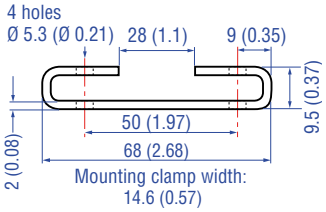
## CONNECTOR WIRING

**D34**

| Signal + power supply | | |
|---|---|---|
| **M12 male connector (A-coded)** | **Pin** | **Function** |
|  View on sensor | 1 | +24 VDC (–15/+20 %) |
| | 2 | Output 1 |
| | 3 | DC Ground (0 V) |
| | 4 | Output 2 |
| | 5 | Signal Ground for Output 1/2 |

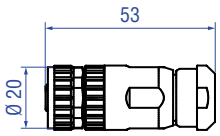
*Fig. 4: Connector wiring D34*

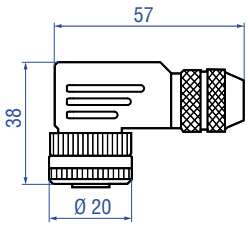
## FREQUENTLY ORDERED ACCESSORIES – Additional options available in our Accessories Catalog 551444

| Position magnet | Mounting accessory |
|---|---|
|  |  |
| **Block magnet L**<br>**Part no. 403 448** | **Mounting clamp**<br>**Part no. 403 508** |
| Material: Plastic carrier with neodymium magnet<br>Weight: Approx. 20 g<br>Fastening torque for M4 screws: 1 Nm<br>Operating temperature:<br>–40…+75 °C (–40…+167 °F)<br><br>This magnet may influence the sensor performance specifications for some applications. | Material: Stainless steel 1.4301/1.4305 (AISI 304/303) |

*Controlling design dimensions are in millimeters and measurements in ( ) are in inches*

## Kabelsteckverbinder*



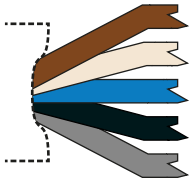




| **M12-A-codierte Buchse (4 pol./5 pol.), gerade**<br>**Artikelnr. 370 677** | **M12-A-codierte Buchse (5 pol.), gewinkelt**<br>**Artikelnr. 370 678** |
|---|---|
| Material: GD-Zn, Ni<br>Anschlussart: Schraubanschluss<br>Kontakteinsatz: CuZn<br>Kabel Ø: 4…8 mm<br>Ader: max. 1,5 mm² (16 AWG)<br>Betriebstemperatur: –30…+85 °C<br>Schutzart: IP67 (fachgerecht montiert)<br>Anzugsmoment: 0,6 Nm | Material: GD-Zn, Ni<br>Anschlussart: Schraubanschluss<br>Kontakteinsatz: CuZn<br>Kabel Ø: 5…8 mm<br>Ader: max 0,75 mm² (18 AWG)<br>Betriebstemperatur: –25…+85 °C<br>Schutzart: IP67 (fachgerecht montiert)<br>Anzugsmoment: 0,4 Nm |

## Kabelsets

| **Kabel mit M12-A-codierter Buchse (5 pol.), gerade – offenes Kabelende**<br>**Artikelnr. 370 673** | **Kabel mit M12-A-codierter Buchse (5 pol.), gewinkelt – offenes Kabelende**<br>**Artikelnr. 370 675** |
|---|---|
| Material: PUR-Ummantelung; schwarz<br>Eigenschaft: Geschirmt<br>Kabellänge: 5 m<br>Schutzart: IP67 (fachgerecht montiert)<br>Betriebstemperatur: –25…+80 °C | Material: PUR-Ummantelung; schwarz<br>Eigenschaft: Geschirmt<br>Kabellänge: 5 m<br>Schutzart: IP67 (fachgerecht montiert)<br>Betriebstemperatur: –25…+80 °C |

### Anschlussbelegung

| Adern | Farbe | | Pol. | M12-A-codierte Buchse (5 pol.) |
|---|---|---|---|---|
|  | BN | ↔ | 1 |  |
| | WH | ↔ | 2 | |
| | BU | ↔ | 3 | |
| | BK | ↔ | 4 | |
| | GY | ↔ | 5 | |



*/ Beachten Sie die Montagehinweise des Herstellers
*Farbe der Stecker und Kabelmantel können sich ggf. ändern. Dabei bleiben Farben der Adern sowie technische Eigenschaften unverändert*
*Alle Maße in mm*

## ORDER CODE

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E | P | 2 | | | | | | D | 3 | 4 | 1 | | | |
| a | | | b | | | | | c | | | d | e | | |

| a | Sensor model | |
|---|---|---|
| E | P | 2 | Smooth profile |

| b | Stroke length | | | | | |
|---|---|---|---|---|---|---|
| X | X | X | X | M | 0050…2540 mm | |
| **Standard stroke length (mm)** | | | | | **Ordering steps** | |
| 50… 500 mm | | | | | 25 mm | |
| 500…2540 mm | | | | | 50 mm | |
| X | X | X | X | U | 002.0…100.0 in. | |
| **Standard stroke length (in.)** | | | | | **Ordering steps** | |
| 2… 20 in. | | | | | 1.0 in. | |
| 20…100 in. | | | | | 2.0 in. | |
| Non-standard stroke lengths are available; must be encoded in 5 mm/0.1 in. increments. | | | | | | |

| c | Connection type | |
|---|---|---|
| D | 3 | 4 | M12 male connector (5 pin) |

| d | Operating voltage | |
|---|---|---|
| 1 | +24 VDC (–15/+20 %) | |

| e | Output | |
|---|---|---|
| **Voltage** | | |
| V | 0 | 1 | 0…10 VDC (1 output channel with 1 position magnet) |
| V | 1 | 1 | 10…0 VDC (1 output channel with 1 position magnet) |
| V | 0 | 2 | 0…10 VDC (2 output channels with 2 position magnets) |
| V | 1 | 2 | 10…0 VDC (2 output channels with 2 position magnets) |
| V | 0 | 3 | 0…10 VDC and 10…0 VDC (2 output channels with 1 position magnet) |
| **Current** | | |
| A | 0 | 1 | 4…20 mA (1 output channel with 1 position magnet) |
| A | 1 | 1 | 20…4 mA (1 output channel with 1 position magnet) |
| A | 0 | 2 | 4…20 mA (2 output channels with 2 position magnets) |
| A | 1 | 2 | 20…4 mA (2 output channels with 2 position magnets) |

***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
- 2 × mounting clamps up to 1250 mm (50 in.) stroke length + 1 × mounting clamps for each 500 mm (20 in.) additional stroke length

Accessories have to be ordered separately.

**Manuals, Software & 3D models available at: www.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 21 83 05 86
E-mail: info.uk@temposonics.com

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

**CHINA**
Branch Office
Phone: +86 21 3405 7850
E-mail: info.cn@temposonics.com

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



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