Data Sheet

ET Start / Stopp
Magnetostrictive Linear Position Sensors

- High operating temperature
- Compact sensor housing
- ATEX / IECEx / CEC / NEC certified
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 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.

ET SENSOR

Robust, non-contact and wear free, the Temposonics linear position sensors provide best durability and accurate position measurement solutions in harsh industrial environments. The position measurement accuracy is tightly controlled by the quality of the waveguide which is manufactured by Temposonics. The position magnet is mounted on the moving machine part and travels contactlessly over the sensor rod with the built-in waveguide.

ET sensor specifications:
- High operating temperature up to +105 °C (+221 °F)
- Compact sensor housing
- ATEX / IECEx / CEC / NEC certified
- Sensor parameters upload function

Certification

II 3G Ex nC IIC T4 Gc
II 3D Ex tc IIIC T130 °C Dc IP66 / IP68
Class I/II/III Div 2 T4 ABCDFG
Class I Zone 2 T4 IIC
Zone 22 AEx tc T4 IIIC Dc
-40 °C ≤ Ta ≤ 105 °C, Type: 4X
## TECHNICAL DATA

### Output

<table>
<thead>
<tr>
<th>Start/Stop</th>
<th>RS-422 differential signal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Serial parameter upload available for: Stroke length, offset, gradient, status, serial number and manufacturer number</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measured value</th>
<th>Position</th>
</tr>
</thead>
</table>

### Measurement parameters

<table>
<thead>
<tr>
<th>Resolution</th>
<th>Controller dependent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle time</td>
<td>Controller and stroke length dependent</td>
</tr>
</tbody>
</table>

**Recommendation:**

- Stroke length 50…1000 mm (2…40 in.): 500 µs
- Stroke length 1001…2000 mm (40…79 in.): 900 µs
- Stroke length 2001…3000 mm (79…118 in.): 1250 µs

<table>
<thead>
<tr>
<th>Linearity</th>
<th>≤ ±0.02 % F.S. (minimum ±60 μm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeatability</td>
<td>≤ ±0.005 % F.S. (minimum ±20 μm) typical</td>
</tr>
</tbody>
</table>

### Operating conditions

<table>
<thead>
<tr>
<th>Operating temperature</th>
<th>−40…+105 °C (−40…+221 °F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humidity</td>
<td>90 % relative humidity, no condensation</td>
</tr>
</tbody>
</table>

**Ingress protection:**

- With Teflon® cable (part no. 530 112): IP66 |
- With silicone cable (part no. 530 113): IP68 (2 bar (29 psi) @ 30 min)

<table>
<thead>
<tr>
<th>Shock test</th>
<th>100 g (single shock), IEC standard 60068-2-27</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vibration test</td>
<td>20 g / 10…2000 Hz, IEC standard 60068-2-6 (excluding resonant frequencies)</td>
</tr>
</tbody>
</table>

**EMC test:**

- Electromagnetic emission according to EN 61000-6-3 |
- Electromagnetic immunity according to EN 61000-6-2 |

The sensor meets the requirements of the EU directives and is marked with ✎

<table>
<thead>
<tr>
<th>Operating pressure</th>
<th>Up to 350 bar (5076 psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnet movement velocity</td>
<td>Any</td>
</tr>
</tbody>
</table>

### Design / Material

| Sensor electronics housing | Stainless steel 1.4305 (AISI 303); option: Stainless steel 1.4404 (AISI 316L) |
| Flange | Stainless steel 1.4305 (AISI 303); option: Stainless steel 1.4404 (AISI 316L) |
| Sensor rod | Stainless steel 1.4306 (AISI 304L); option: Stainless steel 1.4404 (AISI 316L) |
| Stroke length | 50…3000 mm (2…118 in.) |

### Mechanical mounting

| Mounting position | Any |
| Mounting instruction | Please consult the technical drawings and the operation manual (document number: 551677) |

### Electrical connection

<table>
<thead>
<tr>
<th>Connection type</th>
<th>Cable outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage</td>
<td>+24 VDC (−15 / +20 %)</td>
</tr>
<tr>
<td>Ripple</td>
<td>≤ 0.28 Vpp</td>
</tr>
<tr>
<td>Current consumption</td>
<td>Maximum 50 mA</td>
</tr>
<tr>
<td>Dielectric strength</td>
<td>700 VDC (DC ground to machine ground)</td>
</tr>
<tr>
<td>Polarity protection</td>
<td>Up to −30 VDC</td>
</tr>
<tr>
<td>Overvoltage protection</td>
<td>Up to ≤ 32 VDC</td>
</tr>
</tbody>
</table>

1/ With position magnet # 251 416-2
2/ If there is contact between the moving magnet including the magnet holder and the sensor rod, make sure that the maximal speed of the moving magnet is ≤ 1 m/s (ATEX requirement due to ESD [Electro Static Discharge])
TECHNICAL DRAWING

ET-F / -M / -S / -W, example: Version A / N

Sensor electronics housing
Null zone
Stroke length
Dead zone

~34
50
50…3000
63.5

(−1.34)
(1.97)
(2…118)
(2.5)

M18×1.5-6g
¾”-16 UNF-3A

Teflon® cable: Ø 7.6 (Ø 0.3)
Silicone cable: Ø 7.2 (Ø 0.28)

Magnet

41
47

(1.61)
(1.85)

M4×8 (ISO 1207)
Fastening torque: 2.5 Nm

ET-F / -M / -S / -W, example: Version E

Sensor electronics housing
Null zone
Stroke length
Dead zone

~60
50
50…3000
63.5

(−2.36)
(1.97)
(2…118)
(2.5)

M18×1.5-6g
¾”-16 UNF-3A

Teflon® cable: Ø 7.6 (Ø 0.3)
Silicone cable: Ø 7.2 (Ø 0.28)

Magnet

41
47

(1.61)
(1.85)

M4×8 (ISO 1207)
Fastening torque: 2.5 Nm

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

Fig. 4: Temposonics® ET with ring magnet

CONNECTOR WIRING

TXX / VXX

<table>
<thead>
<tr>
<th>Cable</th>
<th>Color</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>GY</td>
<td>Stop</td>
<td>(−)</td>
</tr>
<tr>
<td>PK</td>
<td>Stop</td>
<td>(+)</td>
</tr>
<tr>
<td>YE</td>
<td>Start</td>
<td>(+)</td>
</tr>
<tr>
<td>GN</td>
<td>Start</td>
<td>(−)</td>
</tr>
<tr>
<td>BN</td>
<td>+24 VDC</td>
<td>(−15 / +20 %)</td>
</tr>
<tr>
<td>WH</td>
<td>DC Ground</td>
<td>(0 V)</td>
</tr>
</tbody>
</table>

Fig. 5: Connector wiring TXX / VXX
### FREQUENTLY ORDERED ACCESSORIES

- Additional options available in our Accessories Guide

#### Position magnets

<table>
<thead>
<tr>
<th>Ring magnet OD33</th>
<th>Ring magnet OD25.4</th>
<th>Ring magnet OD17.4</th>
<th>U-magnet OD33</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part no. 201 542-2</td>
<td>Part no. 400 533</td>
<td>Part no. 401 032</td>
<td>Part no. 251416-2</td>
</tr>
</tbody>
</table>

- **Material:** PA ferrite GF20  
- **Weight:** Approx. 14 g  
- **Surface pressure:** Max. 40 N/mm²  
- **Operating temperature:** −40…+105 °C (−40…+221 °F)  
- **Position magnet**
- **Magnet spacer**
- **O-rings**

#### Position magnet

- **OD 63.5 (Ø 2.5)**
- **Material:** PA 66-GF30, magnets compound-filled  
- **Weight:** Approx. 14 g  
- **Surface pressure:** 20 N/mm²  
- **Operating temperature:** −40…+75 °C (−40…+167 °F)

#### Magnet spacer

- **OD 31.8 (Ø 1.25)**
- **Material:** Aluminum  
- **Weight:** Approx. 5 g  
- **Surface pressure:** Max. 20 N/mm²  
- **Operating temperature:** −40…+204 °C (−40…+400 °F)

#### O-rings

- **OD 15.3 (Ø 0.6)**
- **Material:** Fluoroelastomer  
- **Durometer:** 75 ± 5  
- **Operating temperature:** −40…+204 °C (−40…+400 °F)

### Controlling design dimensions are in millimeters and measurements in ( ) are in inches
### Optional installation hardware

<table>
<thead>
<tr>
<th>Fixing clip for rod with Ø 10 mm Part no. 561 481</th>
<th>Hex jam nut M18×1.5-6g Part no. 500 018</th>
<th>Hex jam nut ¾”-16 UNF-3A Part no. 500 015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application: Used to secure sensor rods (Ø 10 mm (Ø 0.39 in.)) when using an U-magnet or block magnet</td>
<td>Material: Steel, zinc, plated</td>
<td>Material: Zinc plated with nylon insert</td>
</tr>
</tbody>
</table>

### Cables

<table>
<thead>
<tr>
<th>Teflon® cable Part no. 530 112</th>
<th>Silicone cable Part no. 530 113</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of cable in order code: T</td>
<td>Name of cable in order code: V</td>
</tr>
<tr>
<td>Material: Teflon® jacket; black Features: Twisted pair shielded Cross section: 4 × 2 × 0.25 mm² Bending radius: 8 – 10 × Ø (fixed installation) Operating temperature: -100…+180 °C (−148…+356 °F)</td>
<td>Material: Silicone jacket; red Features: Twisted pair, shielded Cross section: 3 × 2 × 0.25 mm² Bending radius: 5 × Ø (fixed installation) Operating temperature: -50…+180 °C (−58…+356 °F)</td>
</tr>
</tbody>
</table>

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

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</thead>
<tbody>
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<td>13</td>
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<tr>
<td>E</td>
<td>T</td>
<td>a</td>
<td>b</td>
<td>c</td>
<td>d</td>
<td>e</td>
<td>f</td>
<td>g</td>
<td>3</td>
<td></td>
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</tbody>
</table>

**a** Sensor model

ET Rod

**b** Design

ET rod-style sensor with housing and sensor rod material stainless steel 1.4404 (AISI 316L)

- Threaded flange ¾”-16 UNF-3A
- Threaded flange M18×1.5-6g

ET rod-style sensor with housing material stainless steel 1.4305 (AISI 303) and sensor rod material stainless steel 1.4306 (AISI 304L)

- Threaded flange M18×1.5-6g
- Threaded flange ¾”-16 UNF-3A

**c** Stroke length

<p>| | | | | |</p>
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<tr>
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<tbody>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>M</td>
</tr>
</tbody>
</table>
| 0050…3000 mm

Standard stroke length (mm)* Ordering steps

- 50 … 500 mm  5 mm
- 500 … 750 mm  10 mm
- 750 … 1000 mm  25 mm
- 1000 … 2500 mm  50 mm
- 2500 … 3000 mm  100 mm

<p>| | | | | |</p>
<table>
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</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>U</td>
</tr>
</tbody>
</table>
| 002.0…118.0 in.

Standard stroke length (in.)* Ordering steps

- 2 … 20 in.  0.2 in.
- 20 … 30 in.  0.5 in.
- 30 … 40 in.  1.0 in.
- 40 … 100 in.  2.0 in.
- 100 … 116 in.  4.0 in.

**d** Connection type

- T01…T10 (1…10 m)² XX m Teflon® cable (part no. 530 112)
- T03…T33 (3…33 ft)³ XX ft Teflon® cable (part no. 530 112)
- V01…V10 (1…10 m)² XX m silicone cable (part no. 530 113)
- V03…V33 (3…33 ft)³ XX ft silicone cable (part no. 530 113)

**e** Operating voltage

1 +24 VDC (−15 / +20 %)

**f** Version (see “Certification of Temposonics® ET (version A and E)” on page 2 for further information)

- A ATEX / IECEx / CEC / NEC
- E ATEX / IECEx / CEC / NEC with ½” NPT adapter
- N Not approved

**g** Output

R 3 Start/Stop with sensor parameters upload function

**NOTICE**

Version E (section R) is only available with design »M« and »S« (section U).

**DEVELOPMENT**

Sensor

Manuals, Software & 3D Models available at: [www.temposonics.com](http://www.temposonics.com)

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* Non standard stroke lengths are available; must be encoded in 5 mm / 0.1 in. increments

3/ Encode in meters if using metric stroke length. Encode in feet if using US customary stroke length