

Temposonics®

Magnetostrictive Linear Position Sensors

ET Start/Stop Data Sheet

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



MEASURING TECHNOLOGY

The absolute, linear position sensors provided by MTS Sensors rely on the company's proprietary Temposonics® 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.

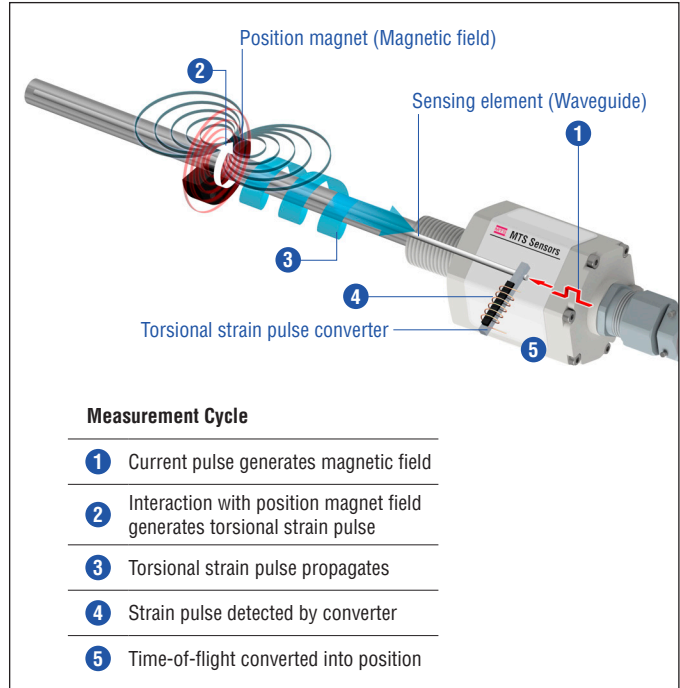


Fig. 1: Time-of-flight based magnetostrictive position sensing principle

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 MTS Sensors. 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

Fig. 2: Certification of Temposonics® ET (version A and E)



Fig. 3: Typical application: Metal processing

TECHNICAL DATA

| Output | |
|---------------------------------------|---|
| Start/Stop | RS-422 differential signal Serial parameter upload available for: Stroke length, offset, gradient, status, serial number and manufacturer number |
| Measured value | Position |
| Measurement parameters | |
| Resolution | Controller dependent |
| Cycle time | Controller and stroke length dependent 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 |
| Linearity ¹ | ≤ ±0.02 % F.S. (minimum ±60 µm) |
| Repeatability | ≤ ±0.005 % F.S. (minimum ±20 µm) typical |
| Operating conditions | |
| Operating temperature | -40...+105 °C (-40...+221 °F) |
| Humidity | 90 % relative humidity, no condensation |
| Ingress protection | With Teflon® cable (part no. 530 112): IP66 With silicone cable (part no. 530 113): IP68 (2 bar (29 psi) @ 30 min) |
| Shock test | 100 g (single shock), IEC standard 60068-2-27 |
| Vibration test | 20 g / 10...2000 Hz, IEC standard 60068-2-6 (excluding resonant frequencies) |
| 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 CE |
| Operating pressure | Up to 350 bar (5076 psi) |
| Magnet movement velocity ² | Any |
| 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 | |
| Connection type | Cable outlet |
| Operating voltage | +24 VDC (-15 / +20 %) |
| Ripple | ≤ 0.28 V _{pp} |
| Current consumption | Maximum 50 mA |
| Dielectric strength | 700 VDC (DC ground to machine ground) |
| Polarity protection | Up to -30 VDC |
| Overvoltage protection | Up to ≤ 32 VDC |

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

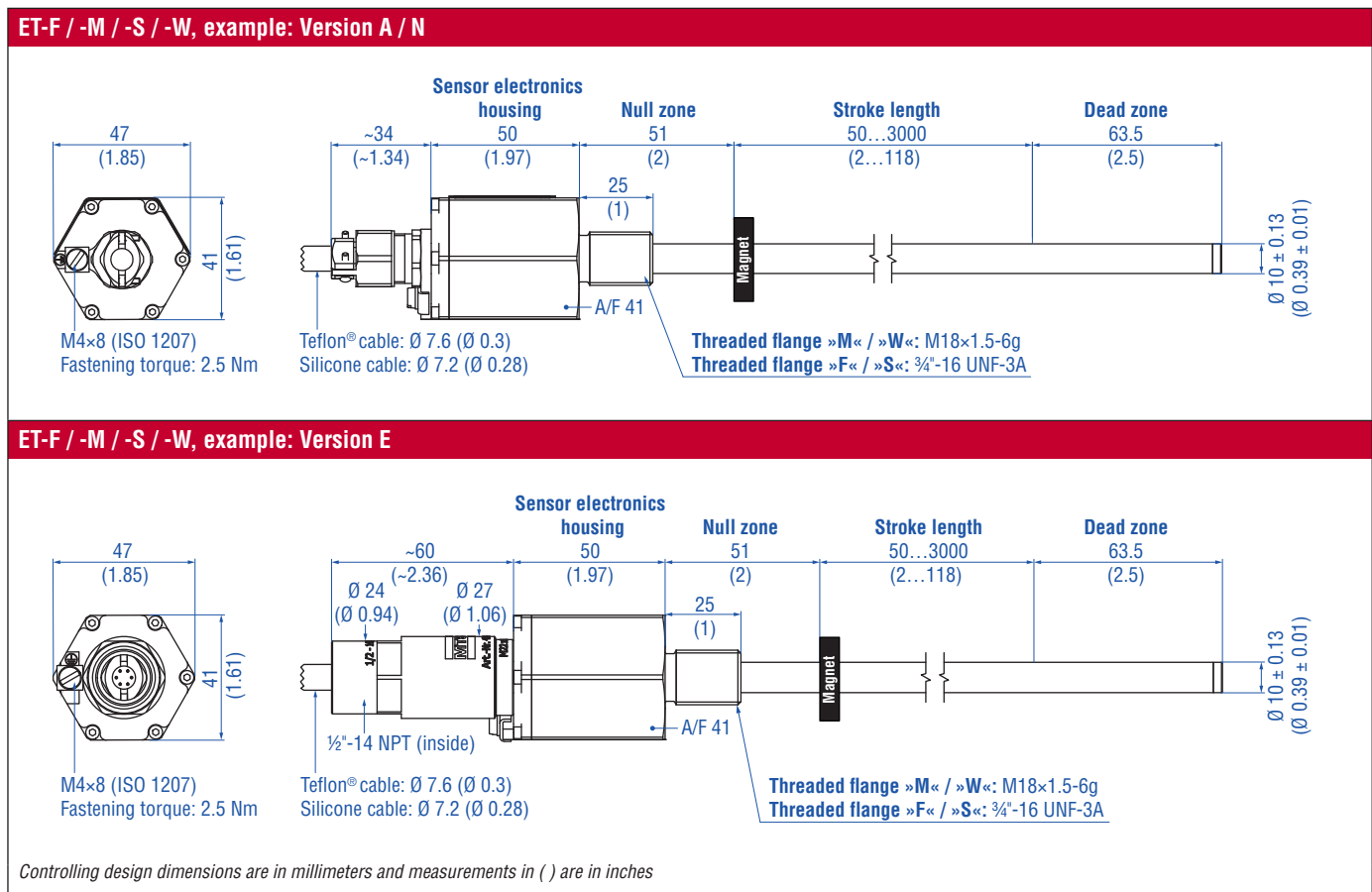


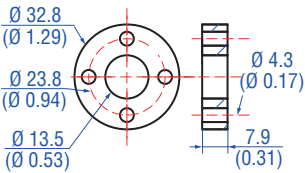
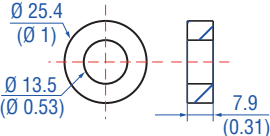
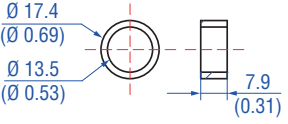
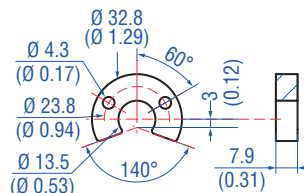
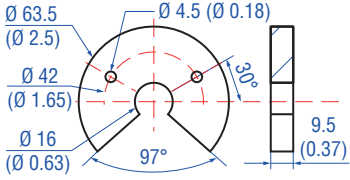
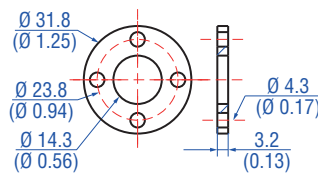
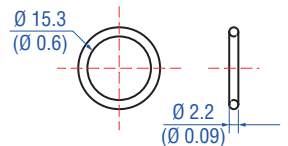
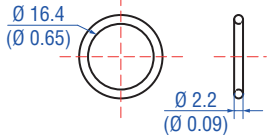
Fig. 4: Temposonics® ET with ring magnet

CONNECTOR WIRING

| TXX / VXX | | |
|-----------------------|-------|-----------------------|
| Signal + power supply | | |
| Cable | Color | Function |
| | GY | Stop (-) |
| | PK | Stop (+) |
| | YE | Start (+) |
| | GN | Start (-) |
| | BN | +24 VDC (-15 / +20 %) |
| | WH | DC Ground (0 V) |

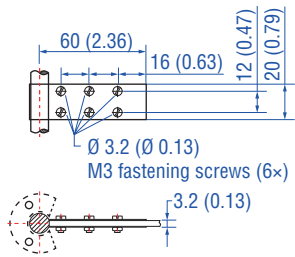
Fig. 5: Connector wiring TXX / VXX

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

| Position magnets | | | |
|--|--|---|--|
|  |  |  |  |
| <p>Ring magnet OD33 Part no. 201 542-2</p> | <p>Ring magnet OD25.4 Part no. 400 533</p> | <p>Ring magnet OD17.4 Part no. 401 032</p> | <p>U-magnet OD33 Part no. 251 416-2</p> |
| <p>Material: PA ferrite GF20 Weight: Approx. 14 g Surface pressure: Max. 40 N/mm² Fastening torque for M4 screws: 1 Nm Operating temperature: -40...+105 °C (-40...+221 °F)</p> | <p>Material: PA ferrite Weight: Approx. 10 g Surface pressure: Max. 40 N/mm² Operating temperature: -40...+105 °C (-40...+221 °F)</p> | <p>Material: PA neobind Weight: Approx. 5 g Surface pressure: Max. 20 N/mm² Operating temperature: -40...+105 °C (-40...+221 °F)</p> | <p>Material: PA ferrite GF20 Weight: Approx. 11 g Surface pressure: Max. 40 N/mm² Fastening torque for M4 screws: 1 Nm Operating temperature: -40...+105 °C (-40...+221 °F)</p> |
| Position magnet | Magnet spacer | O-rings | |
|  |  |  |  |
| <p>U-magnet OD63.5 Part no. 201 553</p> | <p>Magnet spacer Part no. 400 633</p> | <p>O-ring for threaded flange (M18x1.5-6g) Part no. 401 133</p> | <p>O-ring for threaded flange (¾"-16 UNF-3A) Part no. 560 315</p> |
| <p>Material: PA 66-GF30, magnets compound-filled Weight: Approx. 26 g Surface pressure: 20 N/mm² Fastening torque for M4 screws: 1 Nm Operating temperature: -40...+75 °C (-40...+167 °F)</p> | <p>Material: Aluminum Weight: Approx. 5 g Surface pressure: Max. 20 N/mm² Fastening torque for M4 screws: 1 Nm</p> | <p>Material: Fluoroelastomer 75 ± 5 durometer Operating temperature: -40...+204 °C (-40...+400 °F)</p> | <p>Material: Fluoroelastomer 75 ± 5 durometer Operating temperature: -40...+204 °C (-40...+400 °F)</p> |

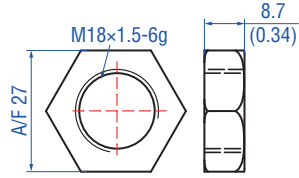
Controlling design dimensions are in millimeters and measurements in () are in inches

Optional installation hardware



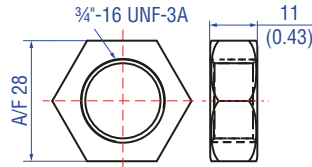
Fixing clip for rod with Ø 10 mm
Part no. 561 481

Application: Used to secure sensor rods (Ø 10 mm (Ø 0.39 in.)) when using an U-magnet or block magnet
Material: Brass, non-magnetic



Hex jam nut M18x1.5-6g
Part no. 500 018

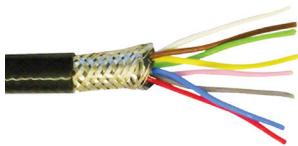
Material: Steel, zinc, plated



Hex jam nut 3/4"-16 UNF-3A
Part no. 500 015

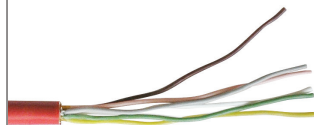
Material: Zinc plated with nylon insert

Cables



Teflon® cable
Part no. 530 112

Name of cable in order code: **T**
Material: Teflon® jacket; black
Features: Twisted pair shielded
Cable Ø: 7.6 mm (0.3 in.)
Cross section: 4 × 2 × 0.25 mm²
Bending radius: 8 – 10 × Ø
(fixed installation)
Operating temperature:
-100...+180 °C (-148...+356 °F)



Silicone cable
Part no. 530 113

Name of cable in order code: **V**
Material: Silicone jacket; red
Features: Twisted pair, shielded
Cable Ø: 7.2 mm (0.28 in.)
Cross section: 3 × 2 × 0.25 mm²
Bending radius: 5 × Ø (fixed installation)
Operating temperature:
-50...+180 °C (-58...+356 °F)

ORDER CODE

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| E | T | | | | | | | | | | 1 | | R | 3 |
| a | | b | c | | | | | d | | | e | f | g | |

| | | |
|----------|---------------------|-----|
| a | Sensor model | |
| E | T | Rod |

| | |
|---|------------------------------|
| b | Design |
| ET rod-style sensor with housing and sensor rod material stainless steel 1.4404 (AISI 316L) | |
| F | Threaded flange ¾"-16 UNF-3A |
| W | 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) | |
| M | Threaded flange M18×1.5-6g |
| S | Threaded flange ¾"-16 UNF-3A |

| | | | | | |
|--------------------------------------|----------------------|-----------------------|---|---|-------------------|
| c | Stroke length | | | | |
| X | X | X | X | M | 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 | | | |
| X | X | X | X | U | 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 | | |
| T | X | X | T01...T10 (1...10 m) ³ XX m Teflon® cable (part no. 530 112) |
| | | | T03...T33 (3...33 ft) ³ XX ft Teflon® cable (part no. 530 112) |
| V | X | X | V01...V10 (1...10 m) ³ 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 |

NOTICE
Version E (section **f**) is only available with design »M« and »S« (section **b**).

| | | |
|----------|---------------|---|
| g | Output | |
| R | 3 | Start/Stop with sensor parameters upload function |

DELIVERY



Sensor

Accessories have to be ordered separately

Manuals, Software & 3D Models available at:
www.mtssensors.com

*/ 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

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