

# Temposonics®

Magnetostrictive Linear Position Sensors

## ET SSI 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.

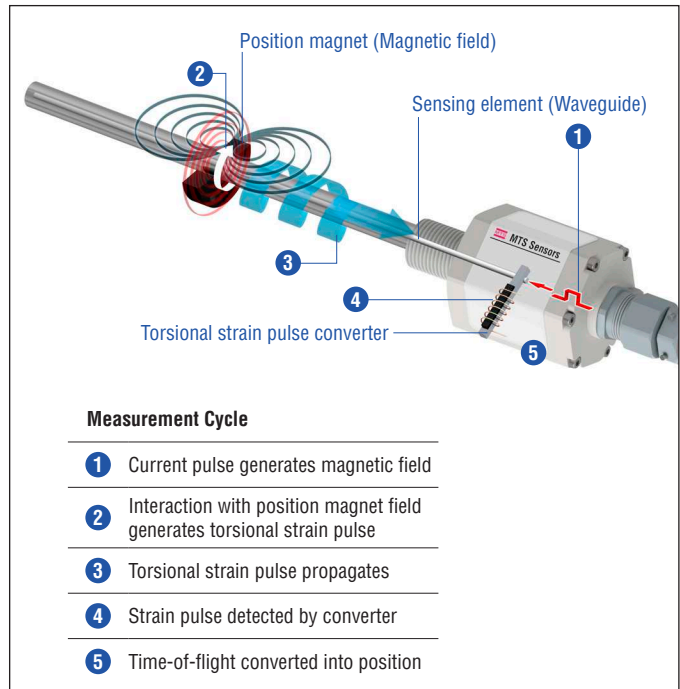


Fig. 1: Time-of-flight based magnetostrictive position sensing principle

## 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 +90 °C (+194 °F)
- Compact sensor housing
- ATEX / IECEx / CEC / NEC certified
- Configurable via programming kit

### 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 ≤ 90 °C, Type: 4X

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



Fig. 3: Typical application: Metal processing

## TECHNICAL DATA

Output	
Interface	SSI (Synchronous Serial Interface) – Differential signal in SSI standard
Data format	Binary, gray
Data length	24 bit / 25 bit
Measured value	Position
Measurement parameters	
Resolution	5 µm / 10 µm / 20 µm / 50 µm / 100 µm
Cycle time	Up to 3.7 kHz, depending on stroke length
Linearity <sup>1</sup>	≤ ±0.02 % F.S. (minimum ±60 µm)
Repeatability	≤ ±0.005 % F.S. (minimum ±20 µm) typical
Operating conditions	
Operating temperature	–40...+90 °C (–40...+194 °F)
Humidity	90 % relative humidity, no condensation
Ingress protection	Version A and E with Teflon® cable (part no. 530 112): IP66 Version A, E and N 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	15 g / 10...2000 Hz, IEC standard 60068-2-6 (resonance frequencies excluded)
EMC test	Electromagnetic emission according to EN 61000-6-4 Electromagnetic immunity according to EN 61000-6-2 The sensor meets the requirements of the EU directives and is marked with <b>CE</b>
Operating pressure	Up to 350 bar (5076 psi)
Magnet movement velocity <sup>2</sup>	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 (1...118 in.)
Mechanical mounting	
Mounting position	Any
Mounting instruction	Please consult the technical drawings and the operation manual (document number: <a href="#">551889</a> )
Electrical connection	
Connection type	Cable outlet
Operating voltage	+24 VDC (–15 / +20 %)
Ripple	≤ 0.28 V <sub>pp</sub>
Current consumption	90 mA typical, dependent on stroke length
Dielectric strength	700 VDC (DC ground to machine ground)
Polarity protection	Up to –30 VDC
Overvoltage protection	Up to 36 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

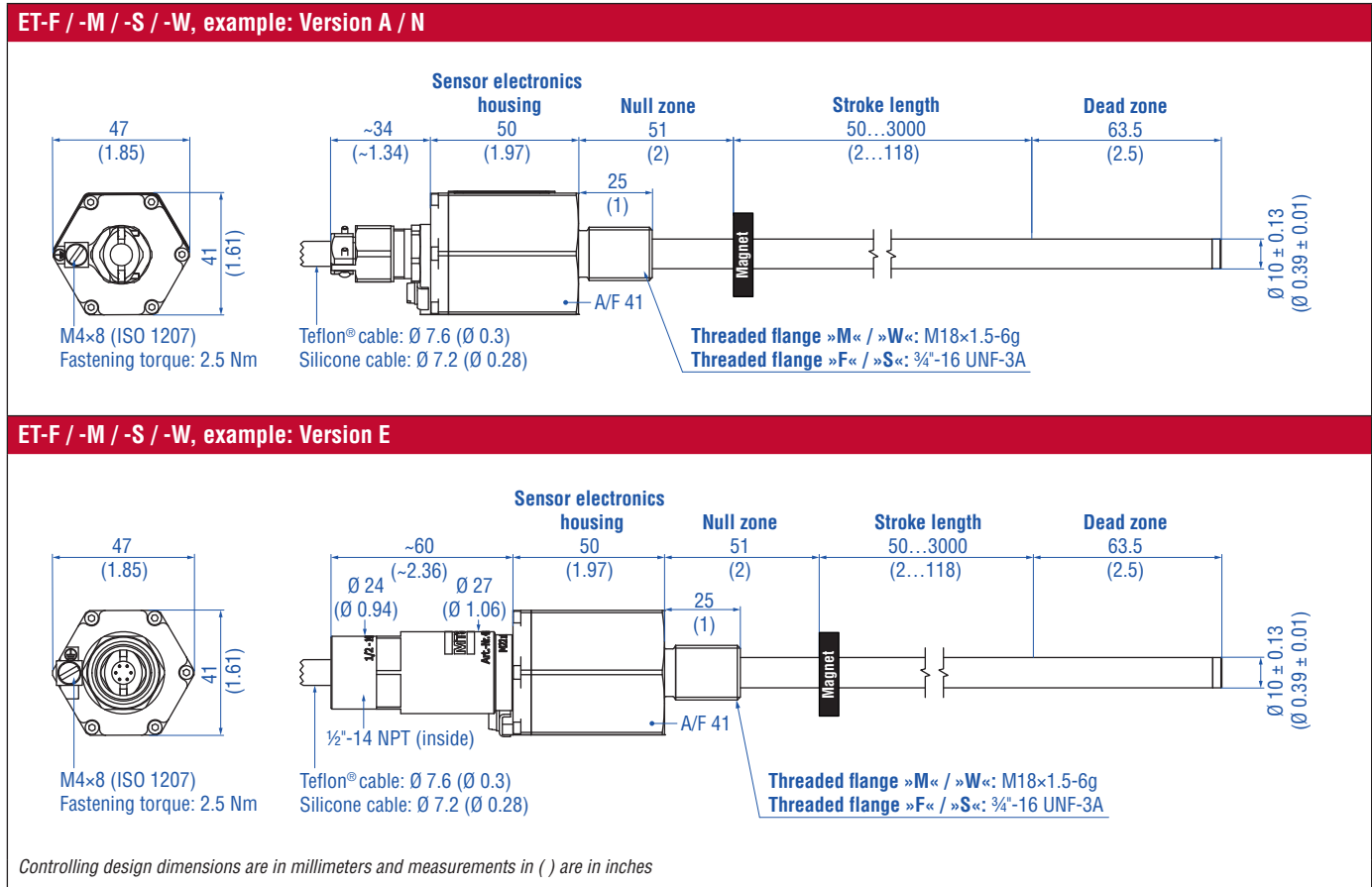


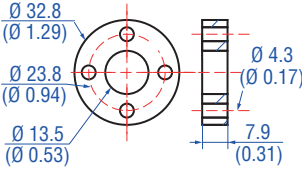
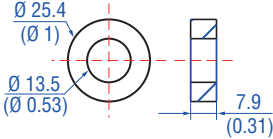
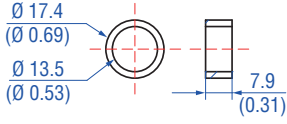
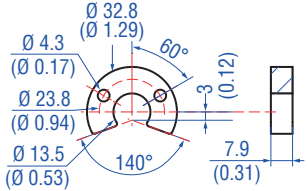
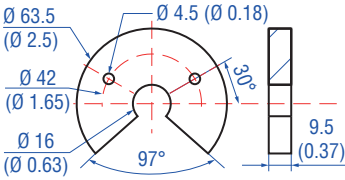
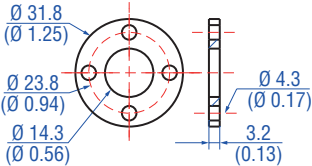
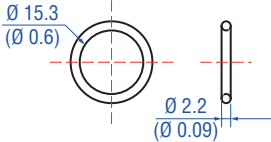
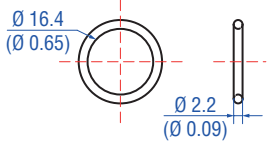
Fig. 4: Temposonics® ET with ring magnet

## CONNECTOR WIRING

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

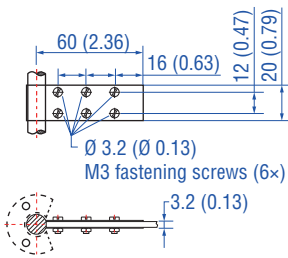
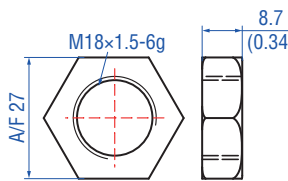
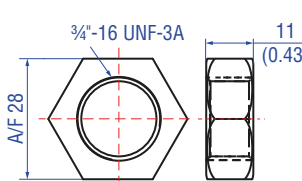
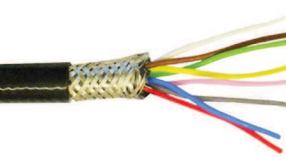
Fig. 5: Connector wiring TXX / VXX



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

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

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

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

Optional installation hardware	Cable		
 <p>60 (2.36) 16 (0.63) 12 (0.47) 20 (0.79) Ø 3.2 (Ø 0.13) M3 fastening screws (6×) 3.2 (0.13)</p>	 <p>M18×1.5-6g AF 27 8.7 (0.34)</p>	 <p>¾"-16 UNF-3A AF 28 11 (0.43)</p>	
<p><b>Fixing clip for rod with Ø 10 mm</b> Part no. 561 481</p>	<p><b>Hex jam nut M18×1.5-6g</b> Part no. 500 018</p>	<p><b>Hex jam nut ¾"-16 UNF-3A</b> Part no. 500 015</p>	<p><b>Teflon® cable</b> Part no. 530 112</p>
<p>Application: Used to secure sensor rods (Ø 10 mm (Ø 0.39 in.)) when using an U-magnet Material: Brass, non-magnetic</p>	<p>Material: Steel, zinc, plated</p>	<p>Material: Zinc plated with nylon insert</p>	<p>Name of cable in order code: T Material: Teflon® jacket; black Features: Twisted pair shielded Cable Ø: 7.6 mm (0.3 in.) Dimensions: 4 × 2 × 0.25 mm<sup>2</sup> Bending radius: 8 – 10 × Ø (fixed installation) Operating temperature: –100...+180 °C (–148...+356 °F)</p>

Cable	Programming tool <sup>3</sup>
	
<p><b>Silicone cable</b> Part no. 530 113</p> <p>Name of cable in order code: <b>V</b></p> <p>Material: Silicone jacket; red Features: Twisted pair, shielded Cable Ø: 7.2 mm (0.3 in.) Dimensions: 3 × 2 × 0.25 mm<sup>2</sup> Bending radius: 5 × Ø (fixed installation) Operating temperature: –50...+180 °C (–58...+356 °F)</p>	<p><b>Programming kit</b> Part no. 254 590</p> <p>Kit includes: Interface converter box, power supply, cable software is available at: <a href="http://www.mtssensors.com">www.mtssensors.com</a></p>

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[www.mtssensors.com](http://www.mtssensors.com)

Controlling design dimensions are in millimeters and measurements in ( ) are in inches  
3/ The programming tool is not approved for use in hazardous environments

## ORDER CODE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
E	T										1		S							
a		b	c					d			e	f	g							

<b>a</b>	<b>Sensor model</b>
E T	Rod

<b>b</b>	<b>Design</b>
<b>ET rod-style sensor with housing and sensor rod material stainless steel 1.4404 (AISI 316L)</b>	
F	Threaded flange ¾"-16 UNF-3A
W	Threaded flange M18×1.5-6g
<b>ET rod-style sensor with housing material stainless steel 1.4305 (AISI 303) and sensor rod material stainless steel 1.4306 (AISI 304L)</b>	
M	Threaded flange M18×1.5-6g
S	Threaded flange ¾"-16 UNF-3A

<b>c</b>	<b>Stroke length</b>
X X X X M	0050...3000 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...2500 mm	50 mm
2500...3000 mm	100 mm
X X X X U	002.0...118.0 in.
<b>Standard stroke length (in.)*</b>	
	<b>Ordering steps</b>
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.

<b>d</b>	<b>Connection type</b>
T X X	T01...T10 (1...10 m) 4 XX m Teflon® cable (part no. 530 112) T03...T33 (3...33 ft) 4 XX ft Teflon® cable (part no. 530 112)
V X X	V01...V10 (1...10 m) 4 XX m silicone cable (part no. 530 113) V03...V33 (3...33 ft) 4 XX ft silicone cable (part no. 530 113)

<b>e</b>	<b>Operating voltage</b>
1	+24 VDC (-15 / +20 %)

<b>f</b>	<b>Version (see "Certification of Temposonics® ET (version A and E)" on page 2 for further information)</b>
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**).

<b>g</b>	<b>Output</b>
<b>S (15) (16) (17) (18) (19) (20)</b> = Synchronous Serial Interface	
<b>Data length (box no. 15)</b>	
1	25 bit
2	24 bit
<b>Output format (box no. 16)</b>	
B	Binary
G	Gray
<b>Resolution (box no. 17)</b>	
1	0.005 mm
2	0.01 mm
3	0.05 mm
4	0.1 mm
5	0.02 mm
<b>Filtering performance (box no. 18)</b>	
1	No filter
2	Average filter 2
3	Average filter 4
4	Average filter 8
<b>Signal options (box no. 19, 20)</b>	
0 0	Measuring direction forward, asynchronous mode
0 1	Measuring direction reverse, asynchronous mode
0 2	Measuring direction forward, synchronous mode
0 3	Measuring direction reverse, synchronous mode

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

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

## **DELIVERY**

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Sensor

Accessories have to be ordered separately

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



**Document Part Number:**  
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