

# 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.

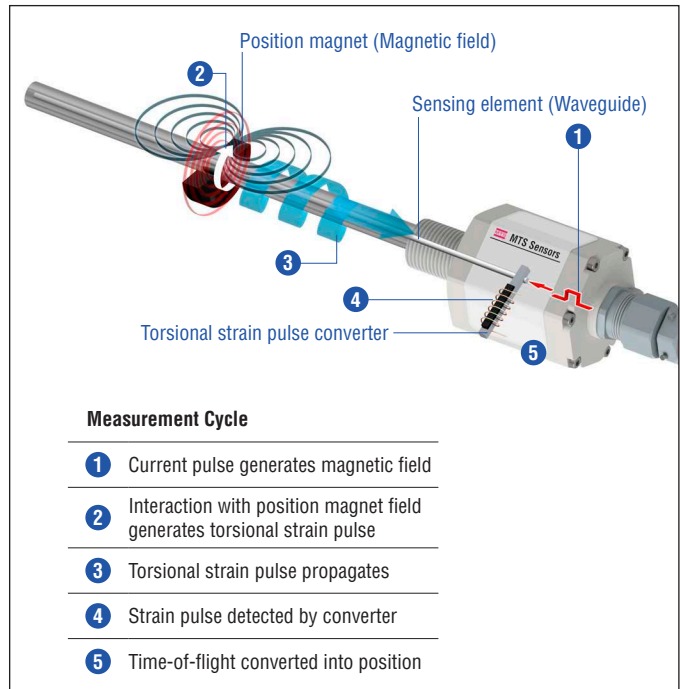


Fig. 1: Time-of-flight based magnetostrictive position sensing principle

## 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 <sup>1</sup>	≤ ±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	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 61000-6-3 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 (2...118 in.)
Mechanical mounting	
Mounting position	Any
Mounting instruction	Please consult the technical drawings and the operation manual (document number: <a href="#">551677</a> )
Electrical connection	
Connection type	Cable outlet
Operating voltage	+24 VDC (-15 / +20 %)
Ripple	≤ 0.28 V <sub>pp</sub>
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

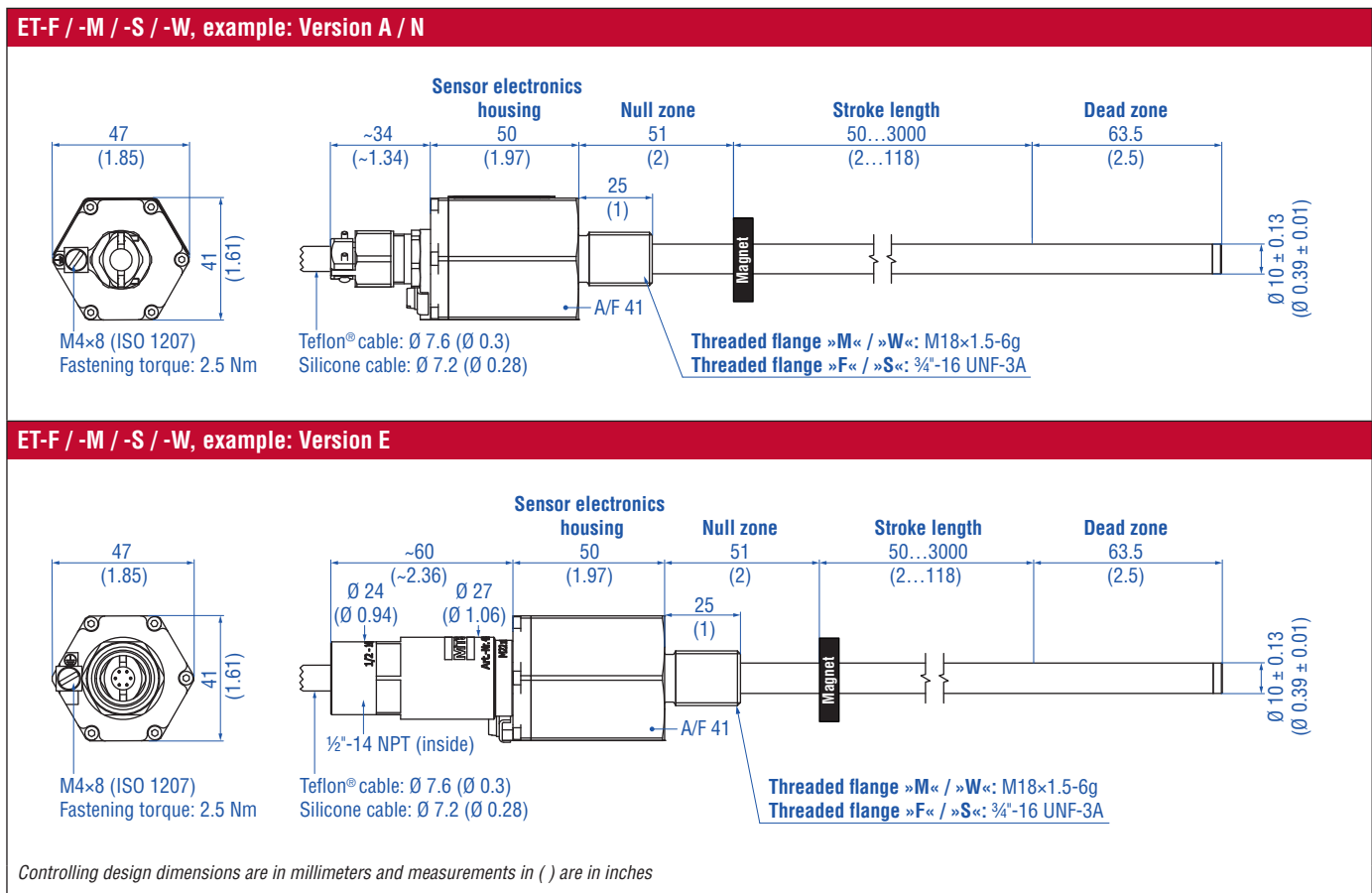


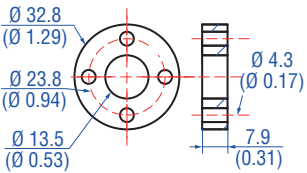
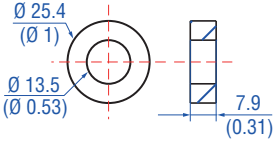
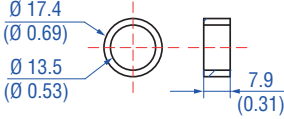
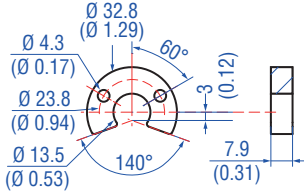
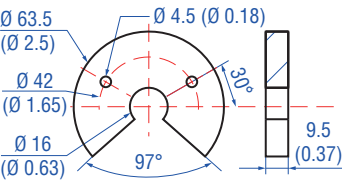
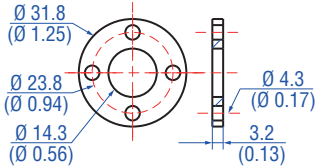
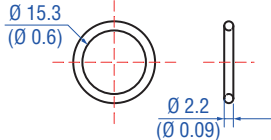
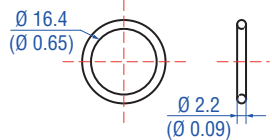
Fig. 4: Temposonics® ET with ring magnet

## 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

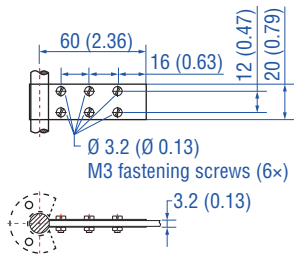
**FREQUENTLY ORDERED ACCESSORIES** – Additional options available in our [Accessories Guide](#)  [551444](#)

Position magnets					
					
<p><b>Ring magnet OD33</b> Part no. 201 542-2</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><b>Ring magnet OD25.4</b> Part no. 400 533</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><b>Ring magnet OD17.4</b> Part no. 401 032</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><b>U-magnet OD33</b> Part no. 251 416-2</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>		
Position magnet		Magnet spacer		Optional installation hardware	
					
<p><b>U-magnet OD63.5</b> Part no. 201 553</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><b>Magnet spacer</b> Part no. 400 633</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><b>O-ring for threaded flange M18x1.5-6g</b> Part no. 401 133</p> <p>Material: Fluoroelastomer 75 ± 5 durometer Operating temperature: -40...+204 °C (-40...+400 °F)</p>	<p><b>O-ring for threaded flange 3/4"-16 UNF-3A</b> Part no. 560 315</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)

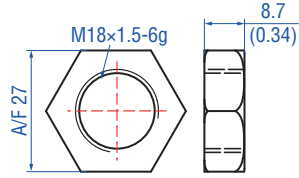
Controlling design dimensions are in millimeters and measurements in ( ) are in inches

**Optional installation hardware**



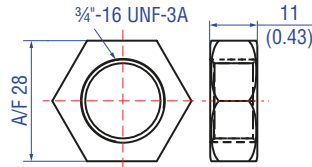
**Fixing clip for rod with Ø 10 mm**  
**Part no. 561 481**

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



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

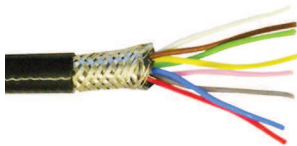
Material: Steel, zinc, plated



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

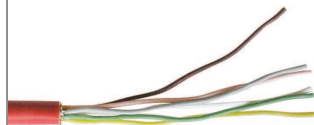
Material: Zinc plated with nylon insert

**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.)  
Dimensions: 4 × 2 × 0.25 mm<sup>2</sup>  
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 (0.3 in.)  
Dimensions: 3 × 2 × 0.25 mm<sup>2</sup>  
Bending radius: 5 × Ø  
(fixed installation)  
Operating temperature:  
-50...+180 °C (-58...+356 °F)

**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

## 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	

<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) <sup>3</sup> XX m Teflon® cable (part no. 530 112)
			T03...T33 (3...33 ft) <sup>3</sup> XX ft Teflon® cable (part no. 530 112)
V	X	X	V01...V10 (1...10 m) <sup>3</sup> XX m silicone cable (part no. 530 113)
			V03...V33 (3...33 ft) <sup>3</sup> 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>
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](http://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

**Document Part Number:**  
551676 Revision C (EN) 10/2017

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