MTS SENSORS

Temposonics®

Magnetostrictive Linear Position Sensors

ET Start/Stop

Operation Manual

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1. Introduction

1.1 Purpose and use of this manual

Before starting the operation of Temposonics® sensors read this documentation thoroughly and follow the safety information.

The content of this technical documentation and of its various annexes is intended to provide information on mounting, installation and commissioning by qualified automation personnel [1] or instructed service technicians who are familiar with the project planning and dealing with Temposonics® sensors.

1.2 Used symbols and warnings

Warnings are intended for your personal safety and for avoidance of damage to the described product or connected devices. In this documentation, safety information and warnings to avoid danger that might affect the life and health of operating as well as service personnel or cause material damage are highlighted by the preceding pictogram, which is defined below.

Symbol	Meaning
NOTICE	This symbol is used to point to situations that may lead to material damage, but not to personal injury.

2. Safety instructions

2.1 Intended use

This product may be used only for the applications defined under item 1 to item 4 and only in conjunction with the third-party devices and components recommended or approved by MTS Sensors. As a prerequisite of proper and safe operation, the product requires correct transport, storage, mounting and commissioning and must be operated with utmost care.

1. The sensor systems of all Temposonics® series are intended exclusively for measurement tasks encountered in industrial, commercial and laboratory applications. The sensors are considered as system accessories and must be connected to suitable evaluation electronics, e.g. a PLC, IPC, indicator or other electronic control unit.
2. The sensor's surface temperature class is T4.
3. The EC-Type Examination Certificates have to be taken into account including any special conditions defined therein.
4. The position sensor may be used in ATEX zones according to section 8. Any use of this product outside of these approved areas will void the warranty and all manufacturer's product responsibilities and liabilities. For non-hazardous areas MTS Sensors recommends to use the non-ATEX approved version.

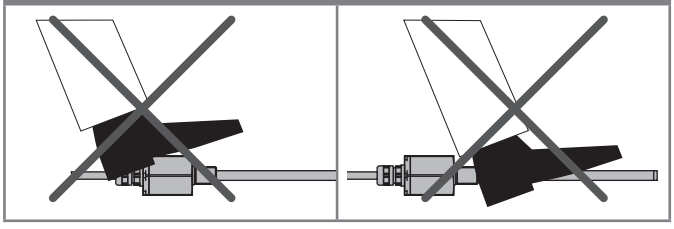
1/ The term qualified technical personnel characterizes persons who:
– are familiar with the safety concepts of automation technology applicable to the particular project,
– are competent in the field of EMC,
1/ – have received adequate training for commissioning and service operations
– are familiar with the operation of the device and know the information required for correct operation provided in the product documentation.

Zone	Explosion group
Zone 2 (Gas-Ex, category 3G, EPL Gc)	IIA, IIB and IIC
Zone 22 (Dust-Ex, category 3D, EPL Dc)	IIIA, IIIB and IIIC

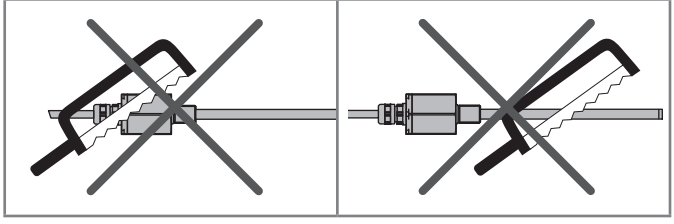
2.2 Forseeable misuse

Forseeable misuse	Consequence
Lead circulating currents via the enclosure	The sensor will be damaged
Wrong sensor connection	The sensor does not work properly or will be destroyed
Operate the sensor out off the operating temperature	No signal output The sensor can be damaged
Power supply is out of the defined range	Signal output is wrong/ no signal output/ the sensor will be damaged
Position measurement is influenced by an external magnetic field	Signal output is wrong
Cables are damaged	Short circuit – the sensor can be destroyed/sensor does not respond
Spacers are missing/ are installed in a wrong order	Error in position measurement
Wrong connection of ground/shield	Signal output is disturbed The electronics can be damaged
Use of a magnet that is not certified by MTS Sensors	Error in position measurement
Wrong gradient in controller	Error in position measurement

Do not step on the sensor!
→ The sensor might be damaged.



Do not reprocess the sensor subsequently!
→ The sensor might be damaged.



2.3 Installation, commissioning and operation

If sensor failure or a malfunction create danger of injury to people or of damage to operating equipment, additional safety measures such as plausibility checks, limit switches, EMERGENCY STOP systems, protective devices etc. must be performed. In the event of trouble, shut down the sensor and protect it against accidental operation. To maintain the sensor operability, it is mandatory to follow the instructions given below.

Safety instructions for commissioning

1. The position sensors must be used only in technically safe condition. To maintain this condition and to ensure safe operation, installation and connection service work should only be performed by qualified technical personnel, according to IEC 60079-14, IEC 60079-17, TRBS 1203 and local regulations.
2. Follow the specifications given in the technical data.
3. Ensure that equipment and associated components used in a hazardous environment are selected and installed in compliance with regulations governing the geographical location and facility. Only install equipment that complies with the types of protection relevant to the applicable zones and categories.
4. In explosive atmospheres use only such auxiliary components which meet all requirements of the European and the national standards.
5. The potential equalisation of the system has to be established according to the regulations of erection applicable in the respective country of use (VDE 0100, part 540; IEC 364-5-54).
6. MTS sensors are approved only for the intended use in industrial environments (see section 2.1). Contact the manufacturer for advice, if aggressive substances are present in the sensor environment.
7. Measures of lightning protection have to be taken by the user.
8. The user is responsible for the mechanical protection of the sensor.
9. The user is responsible for meeting the following safety conditions:
   – Installation instructions
   – Local prevailing standards and regulations
10. Any parts of the equipment which got stuck (e. g. by frost or corrosion) may not be removed by force if potentially explosive atmosphere is present.
11. The formation of ice on the equipment has to be prevented.
12. It is not allowed to open the sensor.
13. Use a connector which complies with the type of protection within hazardous areas.
14. The connecting cable has to be either led out of the hazardous area uncut or wired to outlets which comply with the type of protection required locally.
15. Use the sensor with Teflon® cable for the defined Ex zones (see chapter 8). The sensor with silicone cable can only be used in non-hazardous areas.
16. The connecting cable may only be changed by the manufacturer or by qualified persons, who have the neccessary information.

How to ensure safe commissioning

1. Protect the sensor against mechanical damage during installation and operation.
2. Do not use damaged products and secure them against unintentional commissioning. Mark damaged products as being defective.
3. Prevent electrostatic charges.
4. Do not use the sensor in cathodic systems for corrosion protection. Do not led parasitic currents via the construction.
5. Switch off the supply voltage prior to disconnecting or connecting the equipment.
6. Connect the sensor very carefully and pay attention to the polarity of connections, power supply as well as to the shape and duration of control pulses.
7. Use only approved power supplies.
8. Ensure that the specified permissible limit values of the sensor for supply voltage, environmental conditions, etc. are met.
9. Make sure that:
   – the sensor and associated components were installed according to the instructions
   – the Ex enclosure is clean
   – all screws are at place
   – the magnet does not rub against the rod. This could cause damage to the magnet and the sensor rod. 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 less or equal 1 m/s.
10. Ground the sensor via the grounding lug. Both the sensor and the moving magnet including magnet holder must be connected to protective ground (PE) to avoid electrostatic discharge (ESD).
11. Before system switch-on, ensure that nobody's safety is jeopardized by starting machines.
12. Check the function of the sensor regularly and provide documentation of the checks (see section 6.2).

2.4 Safety instructions for use in explosion-hazardous areas

The sensor has been designed for operation inside explosion-hazarded areas. It has been tested and left the factory in a condition in which it is safe to operate. Relevant regulations and European standards have been observed. According to ATEX marking, the sensor is approved only for operation in defined hazardous areas (see section 2.1).

2.5 Warranty [2]

MTS Sensors grants a warranty period for the Temposonics® position sensors and supplied accessories relating to material defects and faults that occur despite correct use in accordance with the intended application [2]. The MTS Sensors obligation is limited to repair or replacement of any defective part of the unit. No warranty can be taken for defects that are due to improper use or above average stress of the product, as well as for wear parts. Under no circumstances will MTS Sensors accept liability in the event of violations against the warranty rules, even if these have been assured or expected. Nor will MTS Sensors accept liability in the event of fault or negligence of the company.

MTS Sensors explicitly excludes any further warranties. Neither the company's representatives, agents, dealers nor employees are authorized to in- crease or change the scope of warranty.

2.6 Return

For diagnostic purposes, the sensor can be returned to MTS Sensor Technologie GmbH. Any shipment cost will be borne by the sender [2]. For a corresponding form, see chapter 9 (Annex).

2/ see also applicable MTS Sales and supply conditions, e.g. under www.mtssensors.com

3. Identification

3.1 Order structure

Temposonics® 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 version

b	Design
F	Flat faced flange, ¾"-16 UNF, rod Ø 10 mm Material sensor electronics housing and sensor rod: 1.4404, AISI 316L
M	Flat faced flange, M18×1.5, rod Ø 10 mm Material sensor electronics housing: 1.4305, AISI 303 Material sensor rod: 1.4306, AISI 304L
S	Flat faced flange, ¾"-16 UNF, rod Ø 10 mm Material sensor electronics housing: 1.4305, AISI 303 Material sensor rod: 1.4306, AISI 304L
W	Flat faced flange, M18×1.5, rod Ø 10 mm Material sensor electronics housing and sensor rod: 1.4404, AISI 316L

c	Stroke length
X X X X M	0050…3000 mm
X X X . X U	002.0…118.0 in.

Standard stroke length (mm)

Stroke length	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

Standard stroke length (in.)

Stroke length	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…118 in.	4.0 in.

d	Connection type
T X X	T02: 2 m (7 ft) Teflon® cable Option: T01…T10 (1…10 m / 3…33 ft)
V X X	V02: 2 m (7 ft) silicone cable Option: V01…V10 (1…10 m / 3…33 ft) **Note: Cable can only be used with non-ATEX certified sensor version (Option f = N)**

e	Operating voltage
1	+24 VDC (–15 / +20 %)

f	Certification
A	ATEX
N	Non-ATEX

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

3.2 Nameplate (example)

Fig. 1: Label of ATEX approved sensors

Fig. 2: Label of sensor without ATEX certification

3.3 Approvals

See chapter 8.

3.4 Scope of delivery

Sensor, O-ring
Accessories (see page 10) have to be ordered separately.

4. Product description and commissioning

4.1 Functionality and system design

Product designation
– Position sensor Temposonics® E-Series

Construction serie
– Temposonics® ET rod style
– Stroke length: 50...3000 mm (2…118 in.)
– Output signal: Start/Stop

Application
The Temposonics® sensor is used for measurement and conversion of the length (position) variable automated system and mechanical engineering.

Principle of operation and system construction
For position measurement, the absolute, linear Temposonics® position sensors make use of the properties offered by the specially designed magnetostrictive waveguide. Inside the sensor a torsional strain pulse is induced in the waveguide by momentary interaction of two magnetic fields. The interaction between these two magnetic fields produces a strain pulse, which is detected by the electronics at the head of the sensor. One field is produced by a moving position magnet, which travels along the sensor rod with the waveguide inside. The other field is generated by a current pulse applied to the waveguide. The position of the moving magnet is determined precisely by measuring the time elapsed between the application of the current pulse and the arrival of the strain pulse at the sensor head. The result is a reliable position measurement with high accuracy and repeatability.

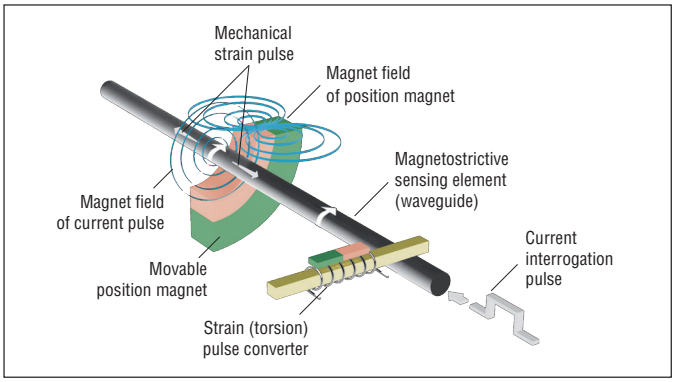


Fig. 3: Principle of operation: Magnetostrictive runtime measurement = position information

Modular mechanical and electronic construction
– The sensor rod protects the sensor element.
– The sensor electronics housing, a rugged stainless steel construction, contains the complete electronic interface with active signal conditioning.
– The external position magnet is a permanent magnet. Mounted on the mobile machine part, it travels along the sensor rod and triggers the measurement through the housing wall.
– The sensor can be connected directly to a control system. Its electronics generates a strictly position proportional signal output between zero and end position.

4.2 Styles and installation

Temposonics® ET rod style

Purpose: e.g. installation in hydraulic cylinder

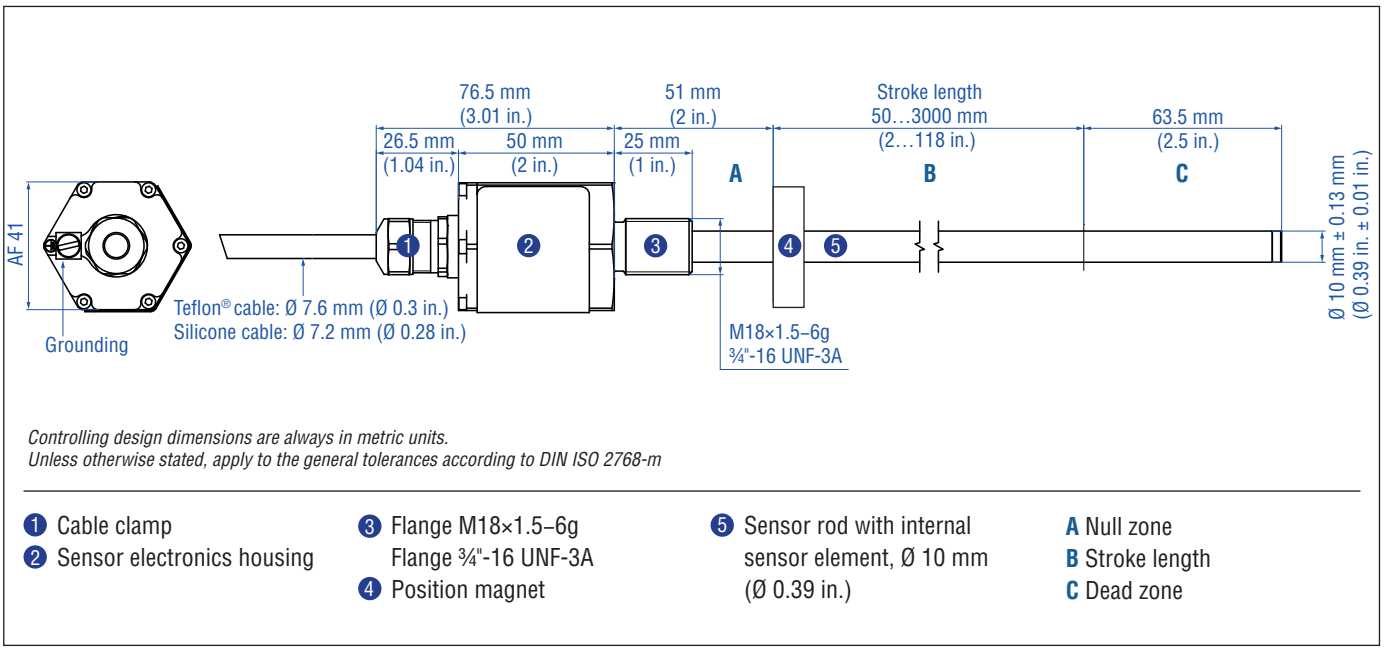


Fig. 4: Temposonics® ET

Part	Fastening torque
Earthing connection: Screw ISO 1207 – M4×8 for mounting	2.5 Nm

Active measuring range

The technical data of each sensor is checked and documented. The active stroke length (useful electrical stroke), including its start and end position, is adjusted during final inspection and testing (see dimension drawing).

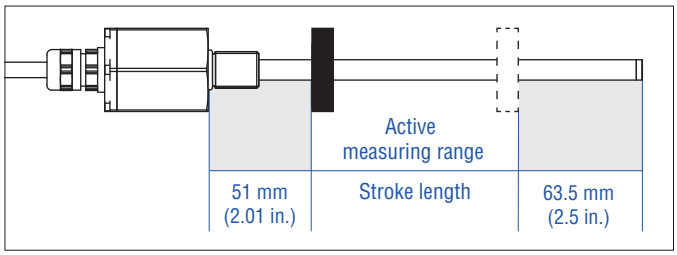


Fig. 5: Active measuring range

NOTICE

On all sensors, the areas left and right of the active stroke length are provided for mounting and damping of the measuring signal. They must not be used for measurement, but the active stroke length can be exceeded without problem.

Mechanical zero

To ensure that the entire measuring range can be used electrically, the position magnet must be mounted mechanically as follows:

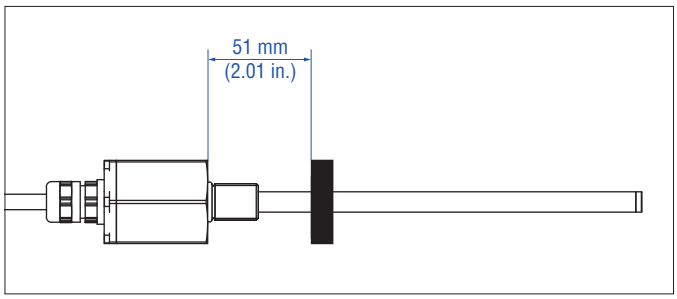


Fig. 6: Temposonics® ET with ring magnet

Installing the rod sensor in a fluid cylinder

The rod style version has been developed for direct stroke measurement in a fluid cylinder.

– For this purpose, the sensor rod immerges into the piston rod bore hole.
– Mounted on the bottom of the piston, the position magnet travels over the sensor rod contactlessly and marks the position through the rod wall – independent of the hydraulic fluid.

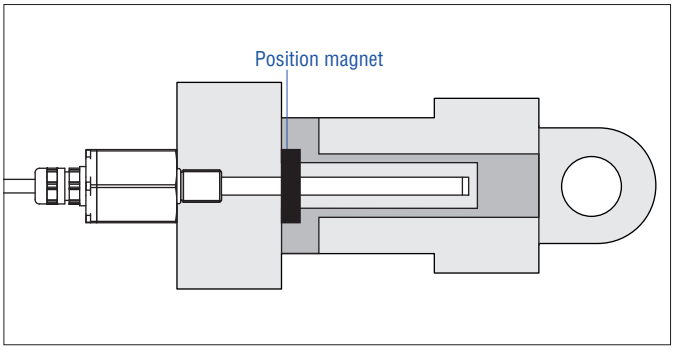


Fig. 7: The sensor rod with the sensing element immerges into the cylinder

The sensor is fastened via flange thread. Taking the dimensions (Fig. 8) into account is vital. Use material with non-magnetic properties for sensor mount. When using material with magnetic properties use a non-magnetic spacer (see Fig. 8).

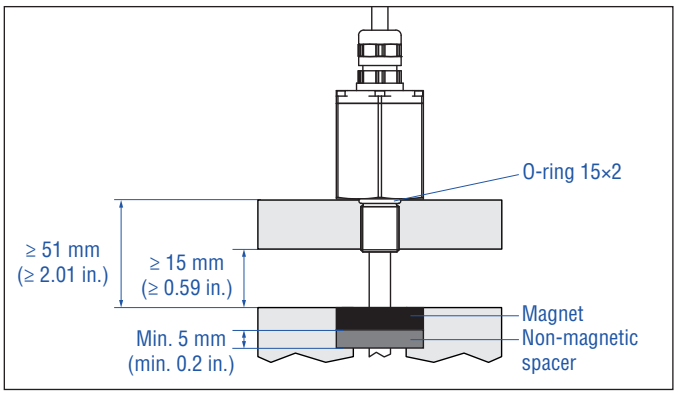


Fig. 8: Installation with magnetic material

Controlling design dimensions are always in metric units.

Mounting the ring magnet

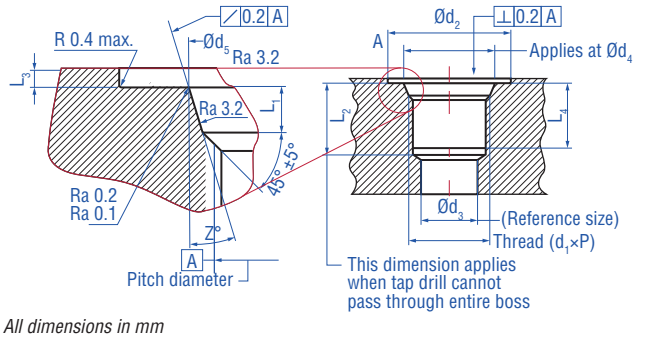
Install the magnet using material with non-magnetic properties for entrainment device, screws, spacers etc..

– Max. allowable surface pressure: 40 N/mm²
– Max. fastening torque for M4 screws: 1 Nm; use washers, if necessary

Sealing the hydraulics

The flange contact surface is sealed via a 15 × 2 mm O-ring in undercut (Fig. 8). In this case, a screw hole lean on ISO 6149-1 must be provided (Fig. 9).

– The flange contact surface must be seated completely on the cylinder mounting surface.
– The position magnet must not grind the rod.
– The plunger borehole (min. Ø 13 mm / 0.51 in.) depends on the pressure and piston speed.
– Do not exceed the operating pressure.
– Protect the measuring rod against wear.
– We recommend to support the sensor rod for stroke lengths > 1 m.



All dimensions in mm

Thread (d_1×P)	d_2	d_3	d_4	d_5	L_1	L_2	L_3	L_4	Z°
M18×1.5	55	11	24.5	19.8	2.4	28	2	≥ 25.5	15°

Fig. 9: Notice for threaded flange M18×1.5 lean on DIN ISO 6149-1

4.3 Electrical connection

Placement of installation and cabling is vital to proper performance of the sensor electromagnetic compatibility (EMC). Hence correct installation of this active electronic system and the EMC of the entire system must be ensured by using suitable metal connectors, shielded cables and grounding. Overvoltages or faulty connections can damage the electronics despite protection against wrong polarity.

NOTICE

Never connect/disconnect the sensor when voltage is applied.

Instruction for connection

– Keep control and signal leads separate from power cables and away from motor cables, frequency inverters, valve cables, switching relays, etc..
– If you use a connector, only use metal connectors.
– Keep the ground connections short and with a large cross section and avoid ground loops.
– With potential differences between the ground connection of the machine and the electronics, no compensating current flowing over the shield is allowed.
– Use only stabilized power supplies and make sure that the specified connecting values are met.

Connector wiring

Connect the sensor directly to the controller, indicator or other evaluating systems as follows:

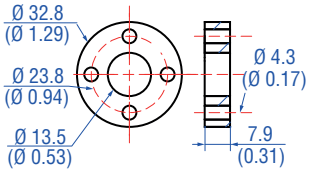
Cable	Start/Stop
GY	Stop (–)
PK	Stop (+)
YE	Start (+)
GN	Start (–)
BN	+24 VDC (–15 / +20 %)
WH	DC Ground (0 V)

Fig. 10: Connector wiring cable outlet

4.4 Accessories (More accessories see 551444)

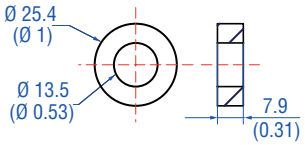
Only MTS Sensors supplied or MTS Sensors approved magnets will ensure performances and safety standards listed above.

Position magnets



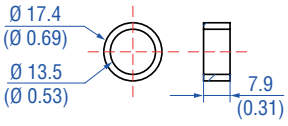
Standard ring magnet
Part no. 201 542-2

Material: PA ferrite GF20
Weight: Ca. 14 g
Operating temperature:
–40…+105 °C (–40…+221 °F)
Surface pressure: Max. 40 N/mm²
Fastening torque for M4 screws: 1 Nm



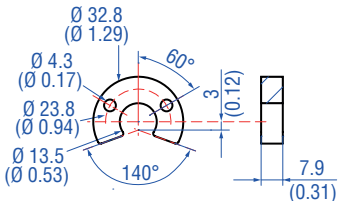
Ring magnet OD25.4
Part no. 400 533

Material: PA ferrite
Weight: Ca. 10 g
Operating temperature:
–40…+105 °C (–40…+221 °F)
Surface pressure: Max. 40 N/mm²



Ring magnet OD17.4
Part no. 401 032

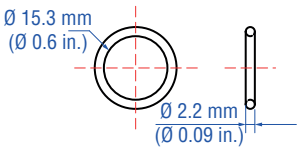
Material: PA neobind
Weight: Ca. 5 g
Operating temperature:
–40…+105 °C (–40…+221 °F)
Surface pressure: Max. 20 N/mm²



U-magnet OD33
Part no. 251 416-2

Material: PA ferrite GF20
Weight: Ca. 11 g
Operating temperature:
–40…+105 °C (–40…+221 °F)
Surface pressure: Max. 40 N/mm²
Fastening torque for M4 screws: 1 Nm

Optional installation hardware



O-ring
Part no. 401 133

Material: Fluoroelastomer
75 ± 5 durometer
Application: M-style housings

Controlling design dimensions are always in metric units.

5. Operation

5.1 Getting started

The sensor is factory-set to its order sizes and adjusted, i.e. the required output signal corresponds exactly to the selected stroke length.

NOTICE

Observe during commissioning

1. Before switching on for the first time, check the connection of the sensor carefully.
2. During initial commissioning and after magnet replacement, position the magnet in the sensor measuring range when starting the sensor.
3. Ensure that the sensor control system cannot be displaced in an uncontrolled way when switching on.
4. Ensure that the sensor is ready and in operation mode after switching on.

5.2 Programming and configuration

The functional diagram of the sensor with start/stop interface is shown in Fig. 11. The start impulse of the controller is acknowledged by the sensor with a stop impulse; the position measurement starts. At the end of the measurement the sensor generates a second stop impulse. The time between the start impulse and the second stop impulse is the travel time.

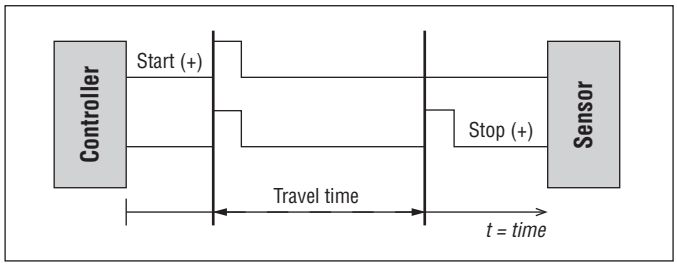


Fig. 11: Functional diagram of sensor with start/stop interface

Set the start impulse width and the cycle time according to the stroke length on the controller:

– Start impuls width: 1…2.5 µs
– Minimal cycle time:
  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

If the position magnet is out of the stroke length, the sensor does not send a reply signal. This behavior can be evaluated and used for monitoring by the controller.

NOTE

If the stroke length is exceeded only insignificantly, the sensor generates a reply signal.

Parameter upload

The parameter upload function allows transfer of sensor parameters to the controller in an easy way. So it is possible, to measure and store the sensor parameters given below using the same physical interface, without additional connections, via the communication mode to the controller.

Technical data:
Interface: RS-422
Data format: Serial, 4800 baud, 8-bit data

The diagram of the data transfer for parameter upload is shown in Fig. 12. The start pulse width has to be > 10 µs to start the parameter upload function. A start pulse width > 2.5 µs and < 10 µs is not permitted. The data is sent to the controller with the low bit first, 1 start bit “0”, 1 stop bit “1”, no parity.

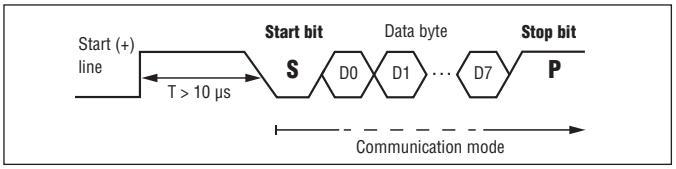


Fig. 12: Diagram of data transfer for parameter upload

The following parameters are transfered via parameter upload function:

1. Gradient
The gradient specifies the travelling speed of the measuring pulse. Gradient and travel time between start pulse and stop pulse are used to determine the position of the position magnet.

Position = gradient × travel time

The speed of the measuring signal is approx. 2780 m/s. The exact value is determined during final component checking and specified as a gradient on the sensor label.

2. Offset
Due to the construction, the travel time at span start is different from zero. The offset indicates the value of the position magnet’s position at span start. It is used as a reference value to detect when the stroke length is left and to adapt the position values.

Position = gradient × travel time – offset

NOTICE Check gradient after replacing the sensor to avoid errors in position measurement.

3. Stroke length
Indicates the useful electronic displacement of the sensor.

4. Serial number
Every sensor is provided with a unique serial number, which is printed on the sensor label and stored in the sensor.

5. Manufacturer identification
Due to the manufacturer identification, the controller can take manufacturer specific particularities into account.

6. Status
Provides information on the sensor status.

Data communication
As shown in Fig. 11 communication between controller and sensor is performed via the already provided connections. So the start lines are used for sending from the controller to the sensor, while the stop lines are used for receiving.
For data exchange using the parameter upload function the start line is set to level High. The start pulse width has to be > 10 µs to ensure that the sensor switches over safely to the communication mode. Subsequently, the required command can be transmitted to the sensor.

NOTE

Setting the start line to Low level is considered as a start bit of data transfer and treated accordingly by the sensor. Note that a bit combination which does not correspond to the controller command set is treated as a data fault and re-activates the start/stop operation.
The occurrence of a data fault can be detected subsequently by a status request.

Read Command	Code hex.	Transmitted bytes,hex.	Note
Read gradient	0×55	4	in cm/s
Read offset	0×57	4	in µm
Read stroke length	0×59	4	in mm
Read serial no.	0×5D	4	
Status	0×5F	4	
MTS Sensors manufact. recogn.	0×61	4	0
General commands			
Stop communication	0×3D	—	

Fig. 13: Command set for parameter upload function

Telegram formats
Read commands:
Data is transmitted from the sensor to the controller. For this purpose, the controller sends a request command and receives the required data, after the sensor has processed the command. Only after data transmission to the controller, the sensor is ready to receive and process further commands. The communication telegram looks like this:

1. Data request: e.g. “read gradient”
Controller ⟶ command 0×55 ⟶ sensor

2. Data reception: output of gradient (message with a length of 4 bytes)
Sensor ⟶ **Byte 3** (High byte) ⟶ controller
Sensor ⟶ **Byte 2** ⟶ controller
Sensor ⟶ **Byte 1** ⟶ controller
Sensor ⟶ **Byte 0** (Low byte) ⟶ controller

NOTE

The High byte is sent *first*!

The pause time between bytes is approx. 6 ms.

Status:
The status command is an exception, since the command can be used to retrieve current sensor status information.
After requesting the status, the controller can receive the following message:

1. Everything o.k.
Sensor ⟶ **0×00 00 00 00** ⟶ controller
The sensor did not detect an error.

2. Unknown command
Sensor ⟶ **0×00 00 00 00 AA** ⟶ controller
An unknown command which is not mentioned in Fig. 13 was received by the sensor. This can be due to trouble on the data line or malfunction of the controller. In this case, the sensor sets the status to 0×AA, leaves the communication mode and starts operating in start/stop mode for position determination and position output. After restarting the communication mode, the status byte which is reset to 0×00 can be retrieved. Thus the controller realizes that cancellation is due to trouble.

3. Defective data set in EEPROM
Sensor ⟶ **0×00 00 00 00 FF** ⟶ controller
When checking the EEPROM data set during start-up, divergence of the calculated checksum from the stored checksum was found. Consequently, there is a risk to use faulty data.
If this should be the case, the status is set to 0×FF and the sensor must be re-adjusted. Therefore it is recommended to start a status request after switching on the supply voltage.

Terminate communication
Changing from the communication mode to the start/stop mode is performed by the command “terminating the communication”:

Sensor ⟶ **0×3D** ⟶ controller

This command terminates the communication. The operation is continued with the operation in start/stop mode for position determination and position output.

6. Maintenance and troubleshooting

6.1 Error conditions, troubleshooting

Error condition	Status
Unknown command	Sensor sets the status to 0×AA

6.2 Maintenance

The required inspections need to be performed by qualified personnel according to IEC 60079-17 / TRBS 1203. These inspection should at least include a visual inspection of the housing, associated electrical equipment entrance points, retention hardware and equipment grounding. Inside the Ex-atmosphere the equipment has to be cleaned regularly. The user determines the intervals for checking according to the environmental conditions present at the place of operation. After maintenance and repair all protective devices removed for this purpose must be refitted.
In case of equipment faults, remove the equipment. The inner parts cannot be maintained by the customer. In this case send the equipment to the manufacturer for inspection.

NOTICE
It is not allowed to open the sensor.

Type of inspection	Visual inspection every 3 months	Close inspection every 6 months
Visual inspection of the sensor for intactness, removal of dust deposits	●	
Check of entire system	User's responsibility	

Fig. 14: Schedule of inspection

Maintenance: Defines a combination of any actions carried out to retain an item in, or restore it to, conditions in which it is able to meet the requirements of the relevant specification and perform its required functions.
Inspection: Defines an activity with the purpose to check a product carefully, aiming at a reliable statement on the condition of the product. The inspection is carried out without dismantling, or, if necessary, with partial dismantling, completed by measures, e.g. measurements.
Visual inspection: Optical inspection of product aims at the recognition of visible defects like missing bolts without using auxiliary equipment and tools.
Close inspection: Defines an inspection which encompasses those aspects covered by a visual inspection and, in addition, identifies those defects, such as loose bolts, which will be apparent only by the use of access equipment, for example steps, where necessary, and tools.

6.3 Repair

Repairs on the sensor may be performed only by MTS Sensors or an explicitly authorized body.

6.4 List of spare parts

No spare parts are available for this sensor.

7. Removal from service / dismantling

The product contains electronic components and must be disposed of in accordance with the local regulations.

8. Technical data

Output	
Interface	Start/Stop
Data protocol	RS-422 differential signal additionally available: serial parameter upload of stroke length, offset, gradient, status 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 [3]	< ±0.02 % FS (minimum ±60 µm)
Repeatability	0.005 % FS (minimum ±20 µm)
Operating conditions	
Operating temperature	–40…+105 °C (–40…221 °F)
Humidity	90 % humidity, no condensation
Ingress protection	Option f = A - ATEX: IP66, IP68 2 bar (29 psi) @ 30 minutes Option f = N - Non-ATEX: IP68
Shock test	100 g (single shock) / IEC-Standard 60068-2-27
Vibration test	15 g / 10…2000 Hz IEC 60068-2-6 (resonance frequencies excluded)
EMC test	Electromagnetic emission according to EN 61000-6-3 Electromagnetic immunity according to EN 61000-6-2
Magnet movement velocity [4]	Any
Design/Material	
Sensor electronics housing	Stainless steel 1.4305, AISI 303; option 1.4404, AISI 316L
Sensor rod	Stainless steel 1.4306, AISI 304L; option 1.4404, AISI 316L
Stroke length	50…3000 mm (2…118 in.)
Operating pressure	Up to 350 bar (5076 psi)
Mechanical mounting	
Mounting position	Any
Mounting instruction	Please consult the technical drawings
Electrical connection	
Connection type	Cable outlet Option f = A - ATEX: cable with Teflon® jacket [5] Option f = N - Non-ATEX: cable with Teflon® jacket, cable with silicone jacket
Operating voltage	24 VDC (–15 / +20 %)
Ripple	≤ 0.28 Vpp
Current consumption	max. 50 mA
Dielectric strength	ATEX: 700 VDC Non-ATEX: 500 VDC
Polarity protection	Up to –30 VDC
Overvoltage protection	Up to ≤ 32 VDC
Protection type	

Ⓔx II 3G Ex nC IIC T4 Gc
Ⓔx II 3D Ex tc IIIC T130 °C Dc IP66 / IP68
–40 °C ≤ Ta ≤ 105 °C

3/ With position magnet # 251 542-2
4/ 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])
5/ The sensor is ATEX certified inclusive Teflon® cable. Therefore a change of the cable is only allowed by the manufacturer. A change to another type of cable is only feasible as part of an ATEX recertification.

9. Annex

Safety Declaration

Dear Customer,
If you return one or several sensors for checking or repair, we need you to sign a safety declaration. The purpose of this declaration is to ensure that the returned items do not contain residues of harmful substances and / or that any danger to persons when handling these items is excluded.

MTS order number: _____ Sensor type(s): _____

Serial number(s): _____ Sensor length: _____

The sensor has been in contact with the following materials:

Don't specify chemical formulas.
Please, include safety data sheets of the substances, if applicable.

In the event of suspected penetration of substances into the sensor, consult MTS to determine measures to be taken before shipment, if necessary.

Short description of malfunction:

Corporate information

Company: _____

Address: _____

_____

Contact partner

Name: _____

Phone: _____

E-Mail: _____

We hereby certify that the measuring equipment has been cleaned and neutralized. Equipment handling is safe. Personnel exposure to health risks during transport and repair is excluded.

Stamp

Signature _____

Date _____

USA
MTS Systems Corporation
Sensors Division
3001 Sheldon Drive
Cary, N.C. 27513

GERMANY
MTS Sensor Technologie
GmbH & Co.KG
Auf dem Schüffel 9
58513 Lüdenscheid

JAPAN
MTS Sensors Technology Corp.
737 Aihara-machi,
Machida-shi,
Tokyo 194-0211

CHINA
MTS Sensors
Room 504, Huajing Commercial Center,
No. 188, North Qinzhou Road
200233 Shanghai, China

MTS SENSORS

EU Declaration of Conformity
EU-Konformitätserklärung
Déclaration UE de Conformité

EC15.010C

MTS Systems Corporation - Sensors Division, 3001 Sheldon Drive, 27513 Cary, NC, USA
MTS Sensor Technologie GmbH & Co. KG, Auf dem Schueffel 9, 58513 Luedenscheid, Germany

declares as manufacturer in sole responsibility that the position sensor type
erklärt als Hersteller in alleiniger Verantwortung, dass der Positionssensor Typ
déclare en qualité de fabricant sous sa seule responsabilité que les capteurs position de type

Temposonics ET-x-xxxxM-xxx-1-x-R3

comply with the regulations of the following European Directives:
den Vorschriften folgender Europäischen Richtlinien entsprechen:
sont conformes aux prescriptions des directives européennes suivantes :

2014/34/EU Equipment and protective systems for use in potentially explosive atmospheres
Geräte und Schutzsysteme zur Verwendung in explosionsgefährdeten Bereichen
Appareils et systèmes de protection à être utilisés en atmosphères explosibles

2014/30/EU Electromagnetic Compatibility
Elektromagnetische Verträglichkeit
Compatibilité électromagnétique

Applied harmonized standards:
Angewandte harmonisierte Normen:
Normes harmonisées appliquées :

EN 60079-0:2012+A11:2013, EN 60079-15:2010, EN 60079-31:2014
EN 61000-6-2:2005, EN 61000-6-3:2007+A1:2011

Manufacturer assessment report: Hersteller-Bewertungsbericht: Rapport d'évaluation du fabricant:	**ExGuide 15 ATEX 0001**
Notified body for quality assurance control: Benannte Stelle für Qualitätsüberwachung: Organisme notifié pour l'assurance qualité:	**Certification Management Limited** **Ellesmere Port CH65 4LZ, United Kingdom**
Ident number / Kennnummer / No. d'identification:	**2503**
Marking / Kennzeichnung / Marquage:	**Ex II 3G Ex nC IIC T4 Gc** **Ex II 3D Ex tc IIIC T130°C Dc IP66/IP68** **-40°C ≤ T_{amb} ≤ +105°C**

Luedenscheid, 2016-04-19

MTS Sensor Technologie GmbH & Co. KG

Thomas Muckenhaupt, M.Sc.Eng.
Head of Quality Management
ATEX Representative

MTS®
SENSORS

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LOCATIONS

USA
MTS Systems Corporation
Sensors Division
3001 Sheldon Drive
Cary, N.C. 27513, USA
Tel. +1 919 677-0100
Fax +1 919 677-0200
info.us@mtssensors.com
www.mtssensors.com

GERMANY
MTS Sensor Technologie
GmbH & Co. KG
Auf dem Schüffel 9
58513 Lüdenscheid, Germany
Tel. +49 2351 9587-0
Fax +49 2351 56491
info.de@mtssensors.com
www.mtssensors.com

JAPAN
MTS Sensors Technology Corp.
737 Aihara-machi,
Machida-shi,
Tokyo 194-0211, Japan
Tel. +81 42 775-3838
Fax +81 42 775-5512
info.jp@mtssensors.com
www.mtssensors.com

CHINA
MTS Sensors
Room 504, Huajing Commercial Center,
No. 188, North Qinzhou Road
200233 Shanghai, China
Tel. +86 21 6485 5800
Fax +86 21 6495 6329
info.cn@mtssensors.com
www.mtssensors.com

FRANCE
MTS Systems SAS
Zone EUROPARC Bâtiment EXA 16
16/18, rue Eugène Dupuis
94046 Creteil, France
Tel. +33 1 58 4390-28
Fax +33 1 58 4390-03
info.fr@mtssensors.com
www.mtssensors.com

ITALY
MTS Systems Srl.
Sensor Division
Via Diaz,4
25050 Provaglio d'Iseo (BS), Italy
Tel. +39 030 988 3819
Fax +39 030 982 3359
info.it@mtssensors.com
www.mtssensors.com

LEGAL NOTICES

ISO 9001 CERTIFIED

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