Temposonics®

Magnetostrictive Position Sensors

MTS SENSORS

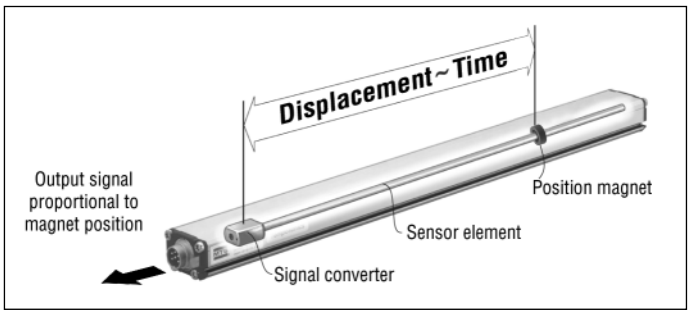
R-Series
SSI

Temposonics RP and RH
Measuring length 25 - 7600 mm

Perfect data processing
1 µm

New: Diagnostic LED

- **Rugged Industrial Sensor**
- **Linear and Absolute Measurement**
- **LEDs for Sensor Diagnostics**
- **Contactless Sensing with Highest Durability**
- **Superior Accuracy: Resolution up to 1 µm**
- **Linearity better 0,01 %**
- **Repeatability 0,001 %**
- **Direct 24/25/26 Bit SSI Output, Gray/Binary**
- **Synchronous Measurement for Real-time Sensing**



Magnetostriction	Form factor

The absolute **Temposonics®** linear position sensors are based on the MTS developed magnetostrictive measurement principle. That combines various magneto-mechanical effects and uses the physical height precise speed-measurement of an ultrasonic wave (torsion pulse in its sensor element) for position detecting. Sensor integrated signal processing transforms the measurements directly into market standard outputs. The contactless principle - an external movable magnet marks the position - eliminates the wear, noise and erroneous signal problems and guarantees the best durability without any recalibration.

The extremely robust sensor, ideal for continuous operation under harshest industrial conditions is completely modular in mechanic and electronic design.

- A profile or rod-shaped sensor housing protects the sensing element in which gives rise to the measurement signal.
- The sensor head accommodates the complete modular electronic interface with active signal conditioning. Double encapsulation ensures high operating safety and optimum EMC protection.
- The position transmitter, a permanent magnet - fixed at the mobile machine part - drives contactlessly over the sensor's stroke and starts measuring through the housing wall.

CE ISO 9001 CERTIFIED

New…a sensor diagnostic display

Integrated LEDs (green/red) provide basic visual feedback for normal sensor operation and troubleshooting.

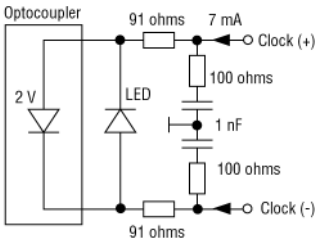
Green	Red	Description
ON	OFF	Normal function
ON	ON	Magnet not detected Wrong quantity of Magnets
ON	Flashing	Sensor not synchronous*
Flashing	ON	Programming mode

*for synchronous measurement only

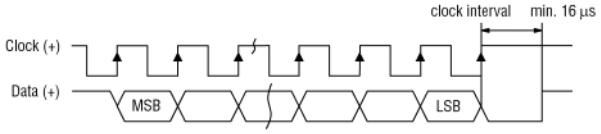
SSI (Synchronous Serial Interface)

The sensors fulfill all requirements of the SSI standard for absolute encoders. Its displacement value is encoded in a **24/25/26** code format and transmitted at high speed in SSI standard format to the control device. Main feature of SSI is the synchronized data transfer. Synchronization in a closed-loop control system is made simple. A clock pulse train from a controller is used to gate out sensor data: one bit of position data is transmitted to the controller per one clock pulse received by the sensor. The absolute, parallel position data is continually updated by the sensor and converted by the shift-register into serial information.

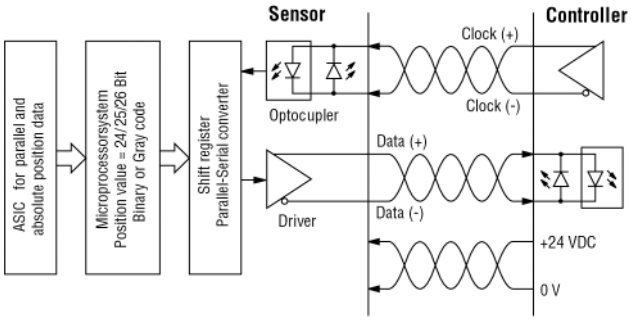
Sensor input



Timing diagram



Logic diagram

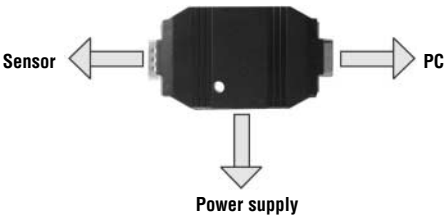


Sensor field programming

Temposonics R-Series sensors are preconfigured at the factory by model code designation. If needed, MTS offers an external service tool for modifying sensor parameters inside the active electrical stroke (minimum 25 mm between setpoints) via the standard connection cable. There is no need to open the sensors electronics.

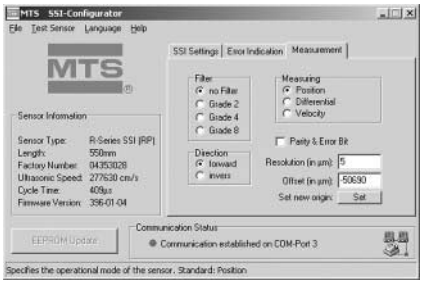
PC-Programmer R-SSI
This hardware converter is required to communicate via serial port of Windows PC to the sensor. Customized settings are possible by using a MTS programming software (CD-ROM) for:
- *Data length*
- *Data format*
- *Resolution*
- *Measuring direction*
- *Synchronous / asynchronous measurement*
- *Offset, begin of the measurement range*
- *Alarm value (Magnet outside)*
- *Measurement filter*
- *Differential measurement: Distance between two magnets*
- *Speed measurement instead of position*

Test sensor function permits a fast control of installed sensor. Its position values are shown in a diagram.



Programming-Kit, Part No. 253 135
(PC-Programmer, Power supply, Cable, Software)

Windows sensor programming

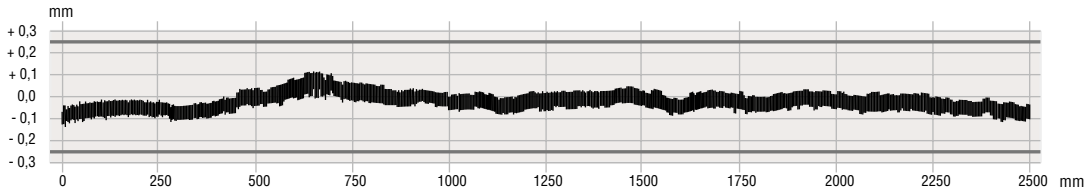


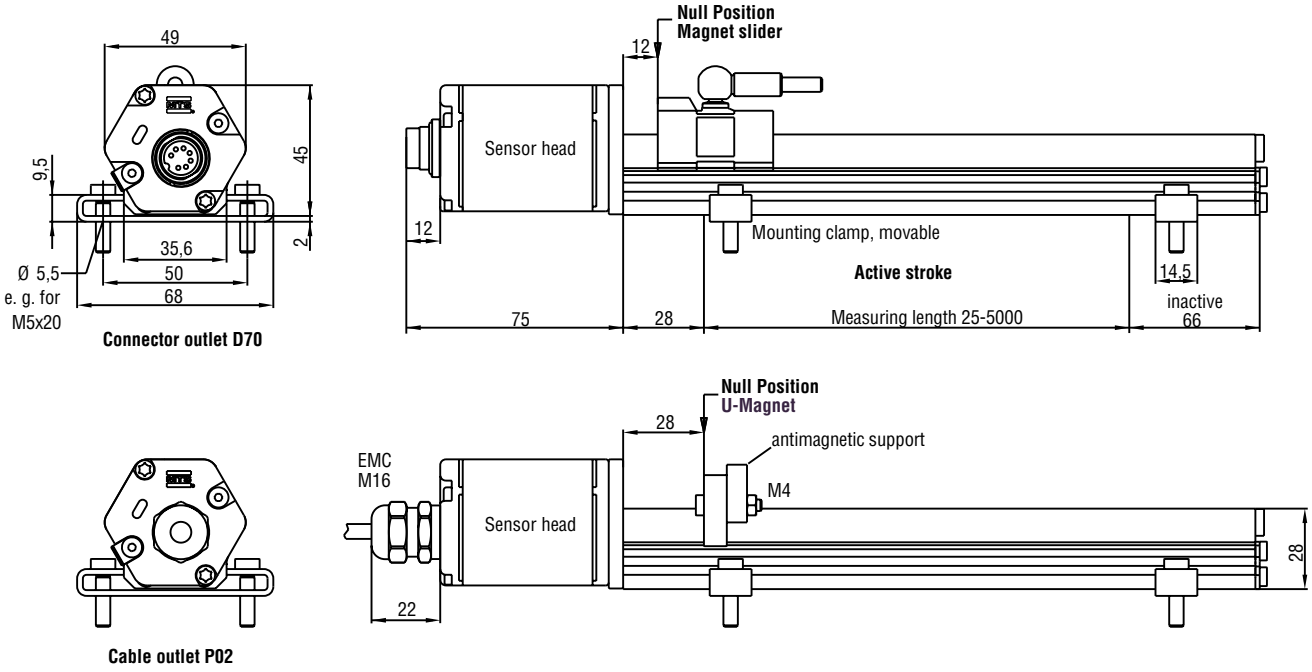
Technical Data

Input	
Measured variable	Displacement, Displacement difference between 2 magnets, Velocity
Measuring range	Profile 25 - 5000 mm / Rod 25 - 7600 mm
Output	
Interface	SSI (Synchronous Serial Interface) - Differential signal in SSI standard
Data format	Binary or Gray, optional Parity and Errorbit
Data length	8 ... 32 bit
Update time	Measuring length 300 750 1000 2000 5000 mm Measurements/sec. 3,7 3,0 2,3 1,2 0,5 kHz
Data speed	70 kBaud ... 1 MBaud, depending on cable length: Length <3 <50 <100 <200 <400 m Baud rate 1,0 MBd <400 kBd <300 kBd <200 kBd <100 kBd
Overvoltage protection	up to 36 VDC
Accuracy	
Resolution	Displacement: 1 µm, 2 µm, 5 µm, 10 µm i.a. Velocity above 10 measured values: 1 µm/s, 2 µm/s, 5 µm|s...
Linearity	< ± 0,01 % F.S. (minimum ± 40 µm)
Repeatability	< ± 0,001 % F.S. (minimum ± 2,5 µm)
Temperature coefficient	< 15 ppm/°C
Hysteresis	< 4 µm typical 2 µm
Operating conditions	
Magnet speed	Any
Operating temperature	-40° C ... +75° C
Dew point, humidity	90% rel. humidity, no condensation
Protection	Profile: IP65, Rod: IP67, IP68 for cable outlet
Shock test	100 g, single hit, IEC-Standard 68-2-27
Vibration test	15g / 10 - 2000 Hz, IEC-Standard 68-2-6
Standards, EMC test	Electromagnetic emission EN 50081-1 Electromagnetic immunity EN 50082-2 EN 61000-4-2/3/4/6, Level 3/4, Criterium A, CE-qualified
Form factor, material	
Diagnostic display	LEDs beside connector
Profile model:	
Sensor head	Aluminum
Sensor stroke	Aluminum
Position magnet	Magnet slider or removable U-magnet
Rod model:	
Sensor head	Aluminum
Rod with flange	Stainless steel 1.4301 / AISI 304
-Pressure rating	350 bar, 700 bar peak
Position magnet	Ring magnets, U-magnets
- Differentiation measurement	Min. Magnetdistance 50 mm (in the range of 50 - 75 mm double Linearity)
Installation	
Mounting position	Any orientation
Profile	Movable mounting clamps or T-slot nuts M5 in base channel
U-Magnet, removable	Mounting plate and screws from antimagnetical material
Rod	Threaded flange M18 x 1,5 or 3/4" -16 UNF-3A, Hex nut M18
Position magnet	Mounting plate and screws from antimagnetical material
Electrical connection	
Connection type	7 pin connector M16 or cable outlet
Input voltage	24 VDC (-15 / +20 %)
- Polarity protection	up to -30 VDC
- Overvoltage protection	up to 36 VDC
Current drain	100 mA typical
Ripple	< 1 % S-S
Electric strength	500 V (DC ground to machine ground)

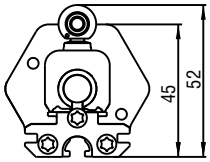
Linearity protocol

Temposonics-RP, stroke 2500 mm
Tolerance allowed: ± 0,25 mm
Tolerance measured: typical ± 0,116 mm
uncorrected

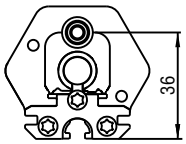




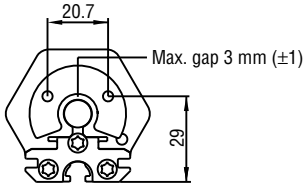
Selection of position magnets (upon delivery)



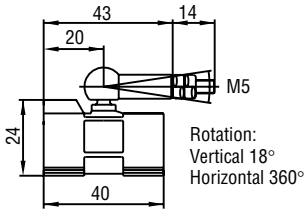
Magnet slider S
Part No. 252 182



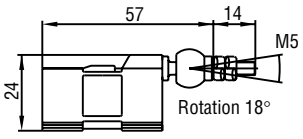
Magnet slider V
Part No. 252 184



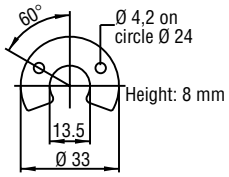
U-Magnet M OD33
Part No. 251 416-2



GFK, Magnet Hardferrite
Weigth ca. 30 g
Operating temperature:
-40 ... +75°C



GFK, Magnet Hardferrite
Weigth ca. 30 g
Operating temperature:
-40 ... +75°C



Composite PA-Ferrite-GF20
Weigth ca. 11g
Operating temperature:
-40 ... +100°C

Stable Profile Design

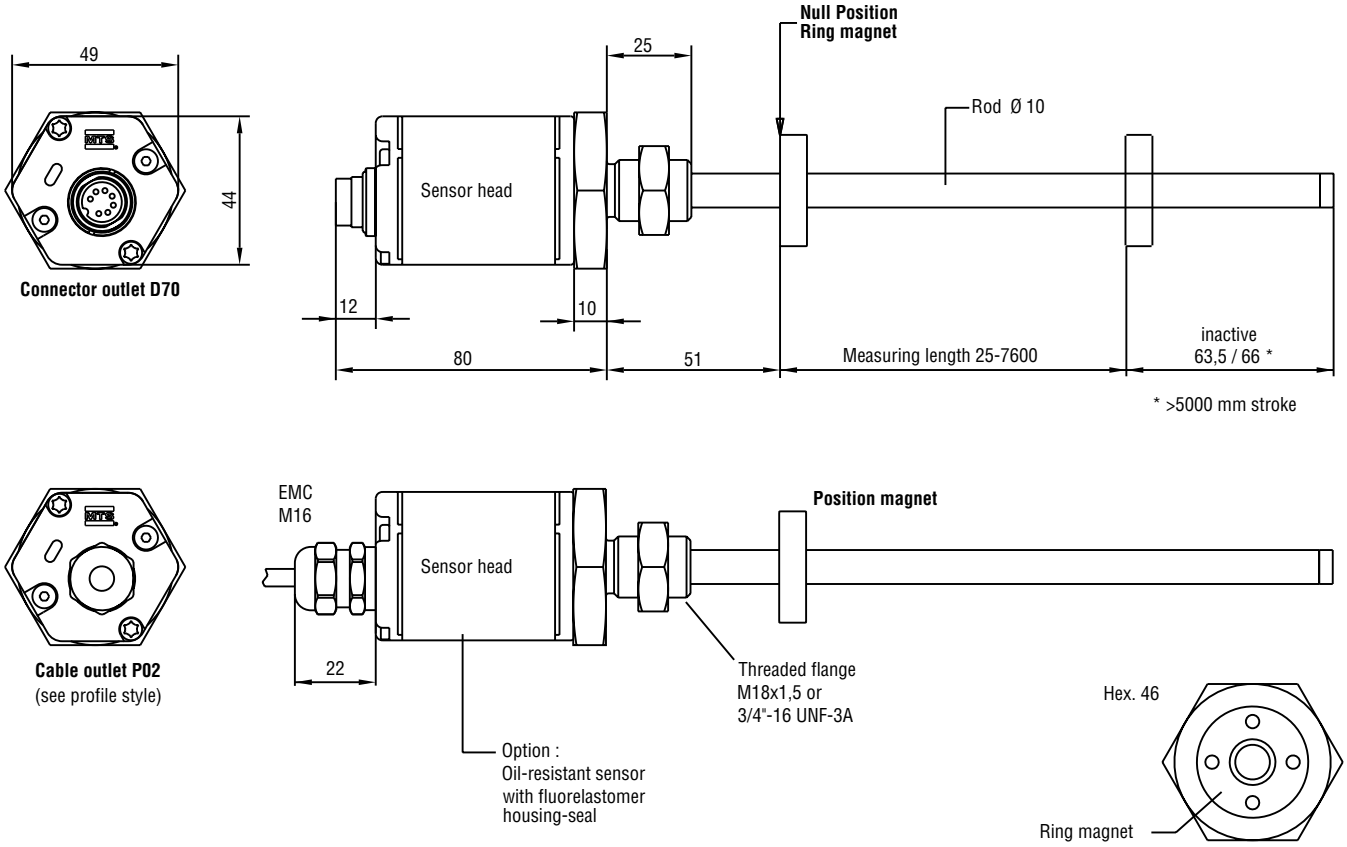
Temposonics-RP offers modular construction, flexible mounting configurations and easy installation. Position measurement is contactless via two versions of permanent magnets.
• A sliding magnet running in profile housing rails. Connection with the mobile machine part is via a ball jointed arm to taking up axial forces.
• A floating magnet, mounted directly on the moving machine part, travels over the profile at a low distance. Its air-gap allows the correction of small misalignments at installation.

Connection types

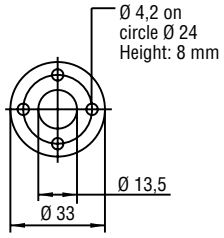
1. Connector outlet D70
7 pin male receptacle M16

2. Cable outlet P02
2 m PUR cable 7 x 0,14 mm²
Cable-Ø 7 mm
EMC shielded, 50 mm bending radius at fixed installation

All measurements in mm

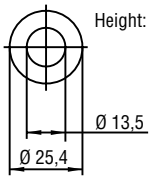


Selection of position magnets (not on delivery)



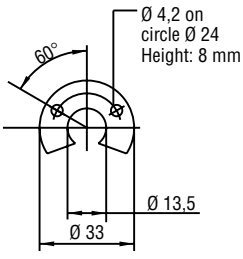
Ring magnet OD33
Part No. 201 542-2

Composite PA-Ferrite-GF20
Weigth ca. 14g
Operating temperature:
-40 ... +100°C



Ring magnet OD25,4
Part No. 400 533

Composite: PA-Ferrite
Weigth ca. 10g
Operating temperature:
-40 ... +100°C



U-magnet M OD33
Part No. 251 416-2

Composite PA-Ferrite-GF20
Weigth ca. 11g
Operating temperature:
-40 ... +100°C

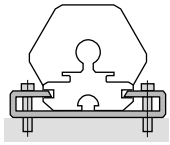
High Pressure Rod Design

Temposonics-RH with a pressure-resistant stainless steel flange and sensing rod is suitable for use in hydraulic cylinders and externally in all applications where space is a problem. Position measurement is via ring or U-magnets travelling along the sensing rod without any mechanical contact.

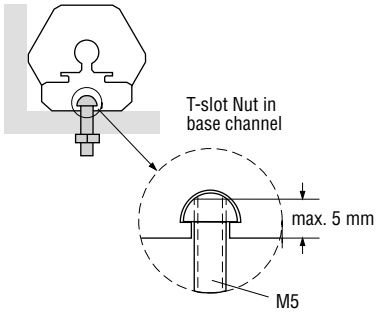
Advantage…
the completely operable sensor cartridge can be replaced for servicing easily without opening the fluid circuit.

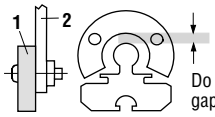
Flexible installation in any position

Profile model
Normally, the sensor is firmly installed - fixed on a straight surface of the machine with movable mounting clamps or M5 screws in base channel - whilst the magnet is mounted at the mobile machine part.



Mounting clamp with screws M5x20
Tightening torque: max. 5 Nm





Do not exceed max.
gap of 3 mm (± 1)

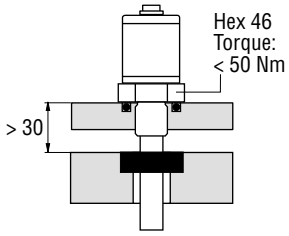
1 U-Magnet
2 Mounting plate and screws non-ferrous material

Rod model
Mount the sensor via flange thread or a hex nut. If possible, non-magnetizable material should be used for mounting support (dimensions as shown). With horizontal mounting, longer sensors (from 1 meter) must be provided with mechanical support.

Hydraulic sealing
Recommended is sealing of the flange facing with O-Ring (e.g. 22,4 x 2,65) in a cylinder cover nut or an O-Ring 15,3 x 2,2 in undercut.

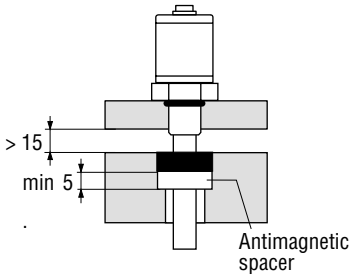
Minimum assembly distance

1. Non-magnetizable material

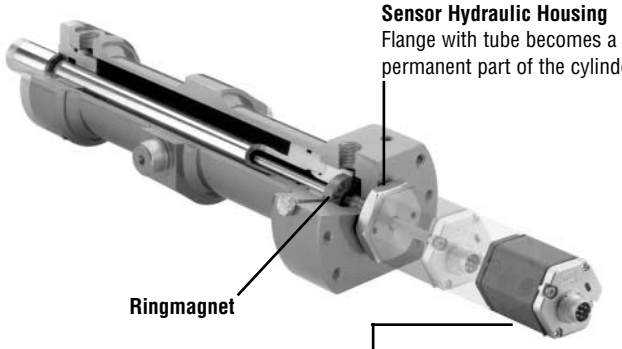


Recommended hydraulic sealing

2. Magnetizable material



Alternativesealing O-Ring 15,3 x 2,2



Sensor Hydraulic Housing
Flange with tube becomes a permanent part of the cylinder

Sensor Cartridge
Electronic head + sensor element, easy to replace in field with two screws M4 (2,5 mm hexagon socket)

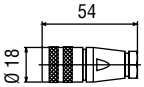
Cylinder installation

When used for direct stroke measurement in fluid cylinders, the sensor's high pressure, stainless steel rod installs into a bore in the piston head/rod assembly as illustrated. That guarantees a longlife and trouble-free operation - independent of used hydraulic fluid.
The sensor cartridge can be removed from the flange and rod housing while still installed in the cylinder. This procedure allows quick and easy sensor cartridge replacement, without the loss of hydraulic pressure.

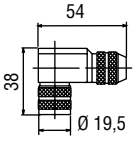
Wiring	Pin	Cable	Function
	1	grey	Data (-)
	2	pink	Data (+)
	3	yellow	Clock (+)
	4	green	Clock (-)
	5	brown	+24 VDC
	6	white	0 V (GND)
	7	n.c.	

Male insert sensor plug
rear of cable connector

Cable connector (recommended, not on delivery)



7 pin female connector M16, PG9
Part No. ST C0 9131 D07 PG9



7 pin 90° female connector M16
insert adjustable in 45° positions
Part No. ST C0 9131-7

Housing: Zinc nickel plated
Termination: Solder
Contact insert: Silver plated
Cable clamp: PG7
Max. Cable-Ø 6mm
Cable clamp: PG9, M16
Max. Cable-Ø 8 mm (PG9, M16)

Temposonics M 1 S

Sensor model
RP - Profile
RH - Rod

Form factor
Profile Temposonics-RP:
S - Magnet slider, join at top
V - Magnet slider, join at front
M - U-Magnet, OD33
Rod Temposonics-RH:
M - Flange M18 x 1,5 (Standard)
V - Flange M18 x 1,5 (Fluorelastomer housing-seal)
S - Flange 3/4" - 16 UNF - 3A

Measuring length
Profile - 0025...5000 mm
Rod - 0025...7600 mm
Standard: up to 1000 in 50 mm, greater 1000 in 250 mm steps
Ohter length upon request

Connection type
D70 - 7 pin male receptacle M16
P02 - 2 m PUR-cable w/o connector, option: P01-P10 (1-10 m)

Input voltage
1 - +24 VDC

Output
S [1][2][3][4][5][6] = Synchronous Serial Interface

[1] Data length:	**1** - 25 Bit • **2** - 24 Bit • **3** - 26 Bit
[2] Output format:	**B** - Binary • **G** - Gray
[3] Resolution (mm):	**1** - 0,005 • **2** - 0,01 • **3** - 0,05 • **4** - 0,1 • **5** - 0,02 • **6** - 0,002 mm • **8** - 0,001 mm
[4] Performance:	**1** - Standard
[5][6] Options:	**00** - Measuring direction forward • **01** - Measuring direction reverse
	02 - Measuring direction forward, synchronized measurement
	05 - Measuring direction forward, Bit 25 = Alarm, Bit 26 = Parity even, select data length 26 Bit
	12 - Differential measurement synchronized
	13 - Velocity asynchron

On delivery profile model: Sensor, Position magnet, 2 mounting clamps up to 1250 mm + 1 clamp for every additional 500 mm.
On delivery Rod model: Sensor, hex nut, pls. order magnet (see below) seperately.

Accessories (selection)	**Part No.**
Magnet slider type »S«	252 182
Magnet slider type »V«	252 184
U-Magnet OD33, corresponding type »M«	251 416
Ring magnet OD33, Standard	201 542
Ring magnet OD25,4	400 533
O-Ring 15,3 x 2,2 Fluorelastomer FPM 75	401 133
Mounting clamp	400 802
T-slot nut M5 for base channel mounting	401 602
7 pin female cable connector M16,	STC 09131 D07 PG9
7 pin 90°-female cable connector M16,	STC 09131-7
PUR-cable 7 x 0,14 mm²	K26
MTS-Servicetools	
PC-Programmer R-SSI incl. power supply (100-240 VAC/24 VDC), connection cable and programming software (CD)	253 135

www.mtssensor.de
www.temposonics-shop.de
Service Hotline: 01805 - mtssensor

MTS SENSORS

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

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

Japan
MTS Sensors Technology Corp.
Ushikubo Bldg.
737 Aihara-cho, Machida-shi
Tokyo 194-0211, Japan
Tel.: +81-42-775-3838
Fax: +81-42-775-5516
info@mtssensor.co.jp
www.mtssensor.co.jp