

Temposonics®

The magnetostrictive Position Sensors



Operation Manual

Part 1 - Installation

Temposonics, Series R und G

Profile and Rod Style Models

1 General



identifies an important information



means that personnel damage, such as death or bodily injury, or considerable damage to property are susceptible to occur, unless appropriate precautions are taken.

The content of this technical documentation is intended to provide quick information for mounting, installation and commissioning by specialized automation personnel 1) or trained service technicians who are familiar with Temposonics sensor projecting and handling.

Please, read this documentation carefully before Temposonics sensor commissioning, and follow the safety hints.

Warranty 2)

In case of material deficiencies and faults which occur despite operation in compliance with the regulations, the warranty assumed by MTS for Temposonics position sensors is 12 months starting with the reception of the product. The MTS liability is limited to repair or replacement of every defective part of the instrument. No warranty can be assumed for deficiencies due to improper handling or above average overload of the product, and for wear parts. MTS cannot be held responsible for consequences or side effects in case of infliction against the warranty conditions²⁾, independent of whether promised or expected, not even in case of manufacturer error or negligence. In this respect, MTS explicitly precludes any further warranty. Neither MTS representatives, agents and dealers nor employees are authorized to increase or change the warranty conditions.

1) Specialized personnel means persons who

- are familiar with the automation safety concepts related to projecting
- are familiar with EMC questions and standards
- have undergone training for commissioning and servicing
- are familiarized with the operation of the instrument and know the information for correct operation provided in the product documentation.

2) see also MTS sales and delivery conditions dated March 2002

2 Safety instructions

Operation in compliance with the regulations

This product may be used only for the applications provided by the technical description and only in conjunction with third-party units and components recommended or approved by MTS. Prerequisites of correct and safe product operation are proper transport, storage, mounting, commissioning and careful operation.

1. The position measurement systems of all Temposonics series are intended exclusively for measurement in industrial, trade and laboratory applications. The position sensors are considered as system accessories and must be connected to a suitable unit for electronic evaluation as e.g. included in a PLC, IPC, indicator or other electronic control facility.

2. The position sensors must be used only in safe condition. In order to maintain this condition and to ensure safe operation, installation, connection and service may be done only by specialized and qualified personnel.

Information related to danger



Information related to danger is intended for your personal safety and for the safety against damage of the described product or instruments connected to it. Safety hints and warnings for prevention of damage to the life and health of users or repair and maintenance personnel, or for prevention of damage to property are highlighted in these instructions by the pictogram defined above.

2.1 Installation instructions

Functional trouble

If failure or disfunction of the sensor imply a risk of injury to persons or damage of production facilities, additional safety measures such as plausibility checks, limit switches, EMERGENCY OFF systems, protective devices etc. must be taken. In case of trouble, the sensor must be taken out of operation and protected against accidental operation.

Repairs

Any sensor repairs may be done only by MTS or by an organization explicitly authorized by MTS.

Installation, operation

In order to maintain the operability of the product, it is indispensable to follow the rules given below.

1. Protect the sensors against mechanical stress during installation and operation.
2. Do not open or disassemble the sensors.
3. Connect the sensors very carefully related to polarity, supply voltage and form as well as duration of control pulses.
4. Use only approved power supplies.
5. Compliance with the permissible sensor limit values for e.g. operating voltage, environmental conditions etc. as specified in the product documentation is indispensable.
6. Check the position sensor function regularly including documentation.
7. Before switching on the system, make sure that danger for persons due to starting machinery is precluded.

3 Product description

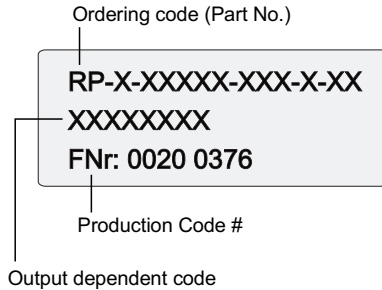


Fig. 1
Example sensor label

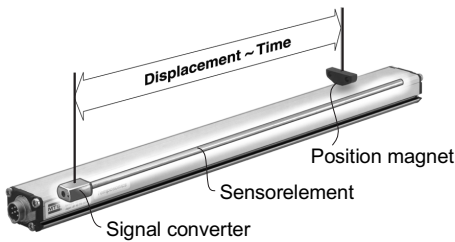


Fig. 2
Operating principle:
Magnetostrictive ultrasonic speed
measurement = Position sensing

Product types

- Position sensors Temposonics, R and G-Series

Sensor models

- Temposonics-RP / GP (Profile housing)
- Temposonics-RH / GH (Rod housing)
- Measuring range: 25 - 7600 mm
- Output signal: selectable Analog / SSI / CANbus / Profibus-DP and Digital pulse outputs (Start-Stop / PWM)

Industrial field of application

Temposonics position sensors are used for displacement measurement and conversion in mechanical and plant engineering applications.

Operating principle and system design

Temposonics are absolute position sensors for measuring linear movements. The sensor associates various magneto-mechanical effects in a magnetostrictive measurement principle, which uses the defined propagation speed of an ultrasonic wave - a torsional pulse in the sensor element - for displacement measurement.

This contactless principle features a permanent magnet without separate power supply, which marks the position point through the sensor housing wall. The torsion pulse speed measurement can be converted directly into high-accuracy standard market output signals, strictly proportional to the measured displacement.

The contactless sensors eliminate the wear, noise and erroneous signal problems and guarantee the best durability without any recalibration. Their absolute nature provides instant recognition of machine position after power loss recovery.

Modular form factor

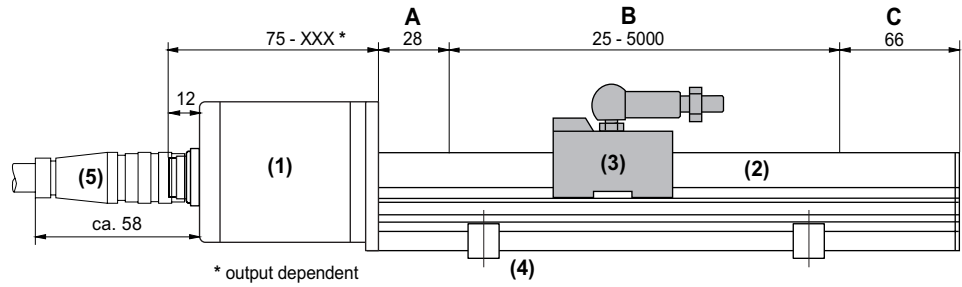
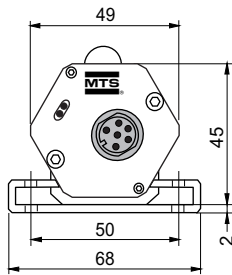
The extremely robust sensor, ideal for continuous operation under harshest industrial conditions is completely modular in mechanics and electronics design.

- 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.
- Electrical connection of sensors is by means of connector or cable

**3.1 Profile models
Temposonics-RP / GP**

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. An air-gap allows the correction of small mis-alignments at installation.

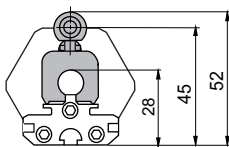


- 1 Sensor head with electronics
- 2 Sensor housing with built-in sensing element
- 3 Position magnet
- 4 Mounting clamp
- 5 Connector, output dependent
- 6 EMC M16, output dependent
- A Mounting zone
- B Measuring range / Order length
- C Inactive zone

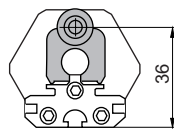
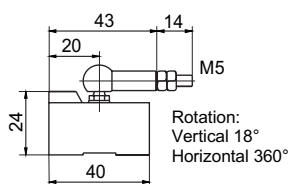


See in the corresponding data sheets for output dependent minimum variations of the sensor's head dimensions.

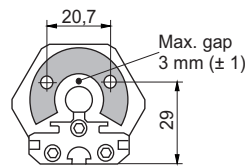
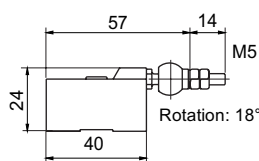
A selection of Profile position magnets



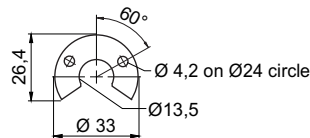
Magnet slider S



Magnet slider V



U-Magnet M

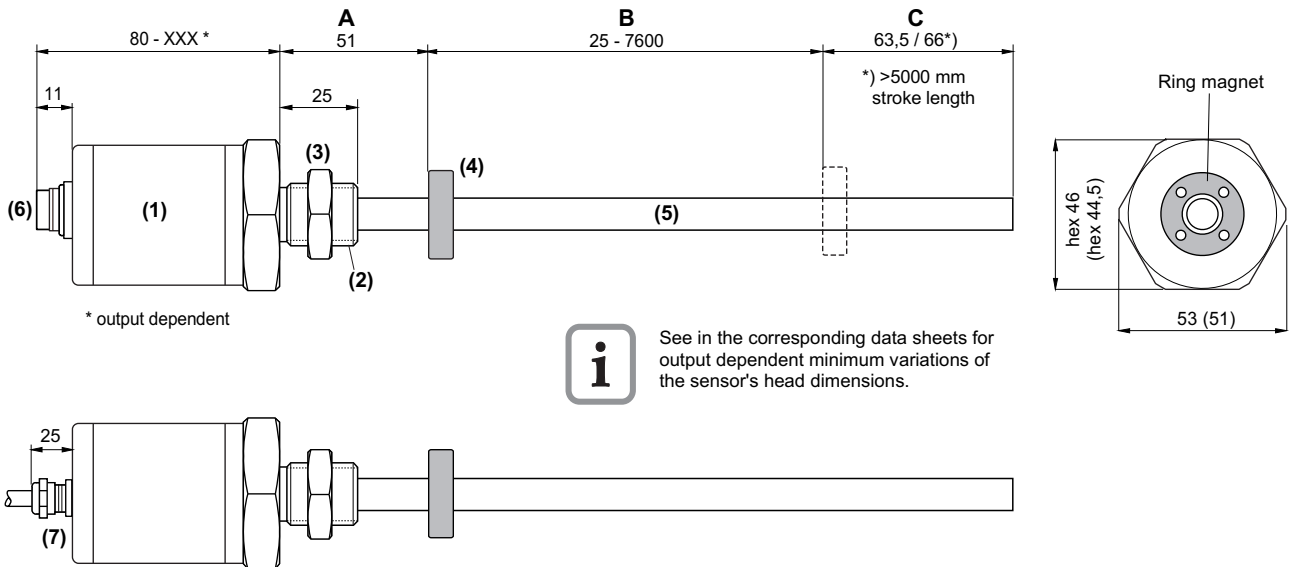


**3.2 Rod models
Temposonics-RH / GH**

The sensor 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.

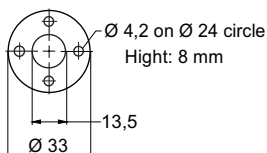
Advantage...

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

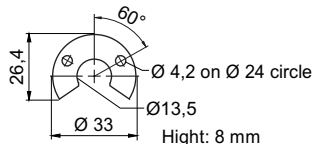


- 1 Sensor head with electronics
- 2 Threaded flange, M18 x 1,5 or 3/4"-16 UNF-3A
- 3 Hex nut M18x1,5 (hex 27)
- 4 Position magnet
- 5 Sensor rod with built-in sensing element, Ø 10
- 6 Connector, output dependent
- 7 EMC M16, output dependent
- A** Mounting zone
- B** Measuring range / Order length
- C** Inactive zone

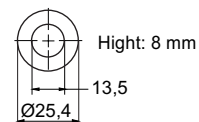
A selection of profile position magnets



Ring magnet OD33 (Standard)
Part No. Nr. 201 542-2
PA-Ferrite-GF20 composite
weight ca. 14 g, operating
temperature -40...+100 °C



U-Magnet OD33
Part No. 251 416-2
PA-Ferrite-GF20 composite
weight ca. 11 g, operating
temperature -40...+100 °C



Ring magnet OD25,4
Part No. 400 533
Composite PA-Ferrite,
weight ca. 10 g
operating temperature
-40...+100 °C

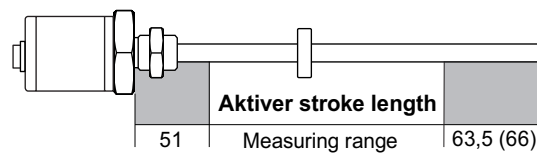
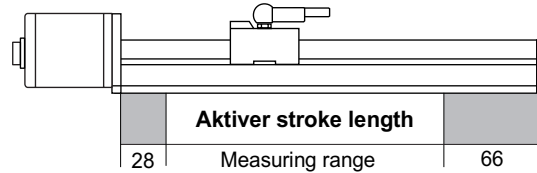
4 Installation

Measuring range

All technical data of each TEMPOSONICS sensor are checked and recorded at the final quality inspection. At the same time the active electrical stroke (see data sheet) is adjusted.



With all sensors described in the manual, the areas left and right of the stroke length are inactive (mounting area, damping) and should not be used for measurements. Nevertheless, the stroke length can be overtravelled.



Mechanical NULL

In order to guarantee the total electrical stroke is available, position magnets must be fixed as follows:

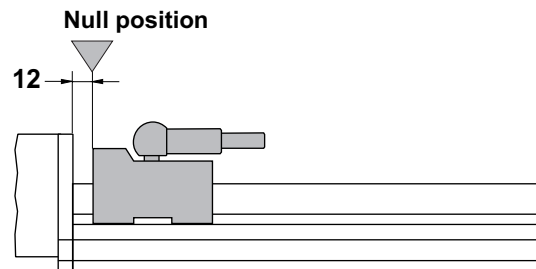


Fig. 3
Temposonics Profile models
with magnet slider »S and V«

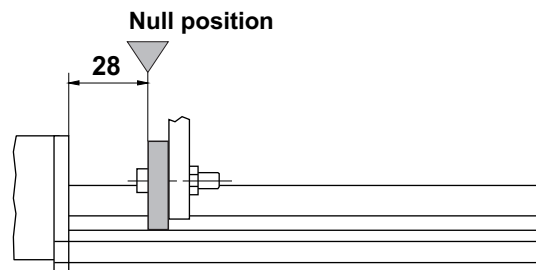


Fig. 3
Temposonics Profile models
with U-Magnet OD33
(corresponding magnet »M«)

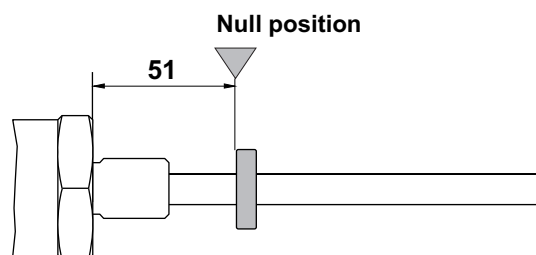


Fig. 5
Temposonics Rod models
with ring magnet

4.1 Mounting Profile sensor

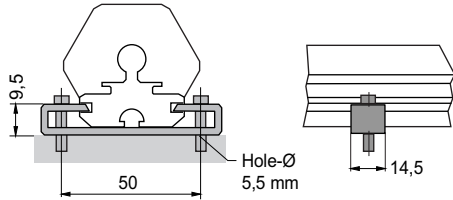


Fig. 6
Mounting clamp with screws M5x20
Tightening torque: max. 5 Nm

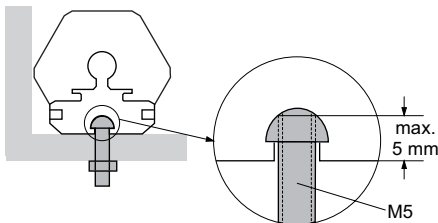


Fig. 7
T-slot Nut in base channel

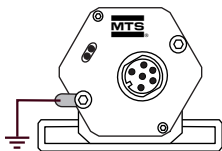


Fig. 8
Grounding profile models

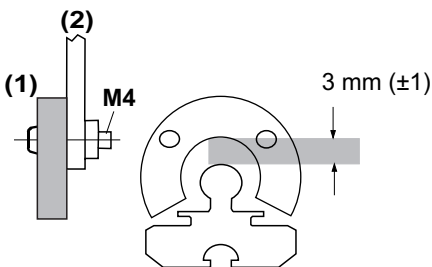


Fig. 9
U-Magnet mounting

The sensor may be operated in any position. Normally, the sensor is firmly installed, whilst the magnet head is mounted at the mobile machine part and taken over the stroke length.

The sensor is fixed on a straight surface of the machine with the movable mounting clamps. They are provided in stroke length dependent numbers and are evenly on the profile to be distributed.

We recommend screws M5 x 20 (DIN 6912) for attachment with a torque of max. **5 Nm** to be tightened.

Alternativ:

Where space is a problem, the profile sensor can be installed also over a M5 T-slot nut in the base channel (see fig.).



Ensure the sensor mounting is kept away from strong magnetic and electrical noise-fields.

To avoid damaging of slider, magnet and sensor housing be aware of a careful parallel mounting of the transducer.

Grounding!

The profile sensor is now isolated from machine ground. Ground the sensor housing with the flat pin terminal on electronics head.

Mounting U-Magnet

The floating magnet can be used for profile and rod sensors. Use non-ferrous fastening material (screws, supports etc.). Make sure magnet travels at a low distance. Its air gap allows the correction of small misalignment at installation.

- Surface pressure: max. 40 Nm/mm²
- Fastening torque of M4 screws: max. 1 Nm, possibly apply washers

- (1) U-magnet,
- (2) Non-ferrous mounting plate and screws



Do not exceed maximum gap of 3 mm (±1)

4.2 Mounting Rod sensor

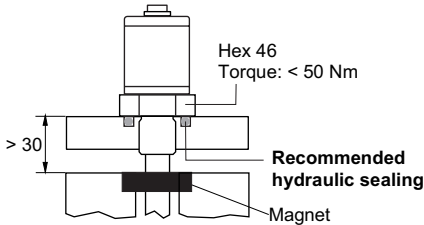


Fig. 10
Non-ferrous material

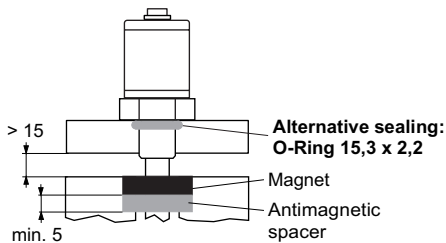


Fig. 11
Ferrous material

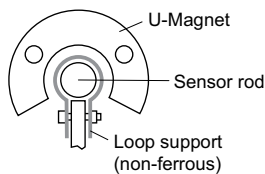


Fig. 12
Sample sensor support

The sensor can be mounted in any position. Fix the sensor directly using screws via flange M18 x 1,5 or 3/4"-16-UNF-3A or by means of the nut packed with the sensor. If possible, non-ferrous material should be used for the sensor mounting components. Taking the dimensions as shown.



For screwing in pls. use only hex flange 46 below sensor's electronic head, considering the maximum tightening torque of **50 Nm**.

Mounting ring magnet

To have a neat magnetic field for measuring, anti-magnetic material must be used for the position magnet mounting components (screws, spacers, etc.):

- Surface pressure: max. 40 N/mm²
- Fastening torque for M4 screws: max. 1 Nm, possibly supply washers

Sensors longer 1 meter

With horizontal mounting, sensors above 1000 mm measuring length must be provided with mechanical support. Use U-Magnets for sensing.

Cylinder installation

- The rod style sensor is for direct stroke measurement in a fluid cylinder.
- The position magnet, mounted on the piston bottom, drives contactlessly along the measuring stroke and marks exactly the position through the rod wall - **independent of the used hydraulic fluid** - that guarantees a longlife and trouble-free operation.
 - Into the pressure-resistant sensor housing, which fits into the bored piston, is the sensor cartridge mounted with only two screws.
 - If the electronics must be replaced, it is not necessary to open the hydraulic circuit with loss of pressure. The pressure housing remains in the cylinder and only the sensor cartridge needs to be replaced.

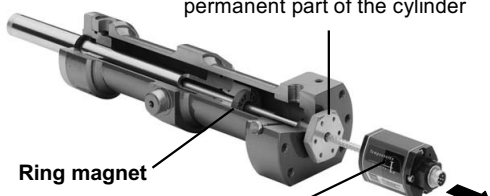
Hydraulic sealing

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 (fig.). Therefore the screw plug hole is to be completed to ISO 6149-1.



- The sensor flange surface has to be contact the cylinder surface completely
- Magnet must not slide along the sensor tube
- The bore in the piston rod and type of sealing are determined by cylinder manufacturers as these depend on hydraulic pressure and piston velocity. We recommend 13 mm boring diameter at minimum
- Do not exceed peak pressure
- Protect sensor rod from wear

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



Sensor Cartridge
Electronic head + sensor element, replace in field via 2 screws M4 with 2,5 mm hexagon socket, max. fastening torque 1,3 Nm

ATTENTION !
After changing sensor cartridge, the screws must be fastened necessarily (e.g. Loctite 243).



Sensor connection and programming can you find in the Operation Manual, Part 2 of corresponding sensor output !

Document Part Number: 030506 (EN)

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