

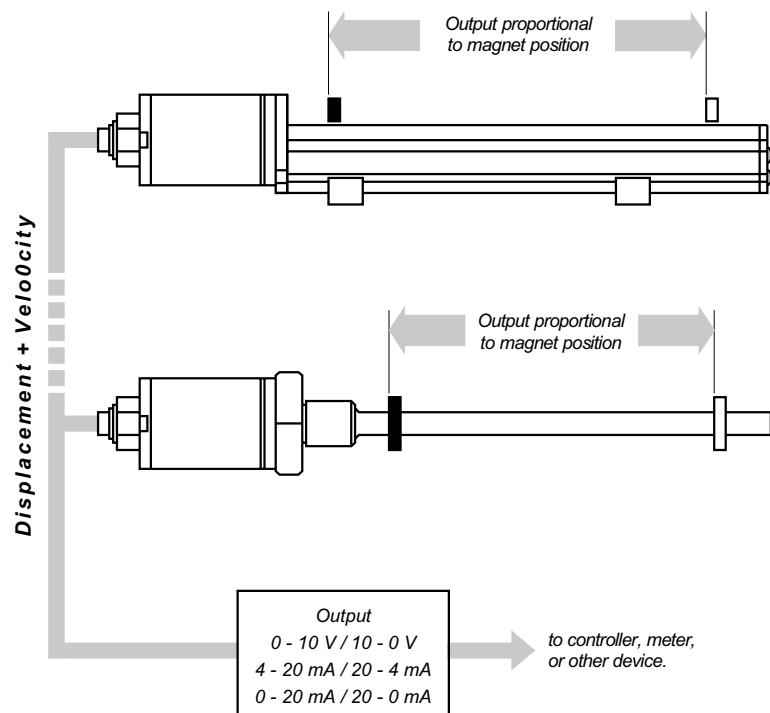
Temposonics R-Series Sensor Models RP/RH Analog

Operating Instructions

Analog Measurement System

Temposonics are linear position sensors. Measurement values are absolute and available without error immediately without reference measurement even after power recovery. Position measurement is contactless via a position magnet which does not need to be energized. The wear-free sensor function combines high operating safety and a long service life.

This **Temposonics** sensor with built-in analog output is connected to the controller without an additional evaluating unit. Position and velocity can be measured. Operations with one or two magnets are possible.



Preface

The general safety instructions given below are intended to ensure the personnel safety and to avoid damage. Temposonics are state-of-the-art position measurement systems built in accordance with the standard safety regulations. Nevertheless, hazards to the life and health of the user or other persons, or impairments of the sensor or other objects may arise in conjunction with the use of Temposonics Sensors.

Application

1. The position measurement systems of all series Temposonics may be used only for the purposes for which they were designed, i.e. they may be used exclusively for measurement tasks in industrial, commercial and laboratory applications. E.g. positions, displacements and speeds can be measured (more detailed information is given in the relevant product documentation). The position sensors are accessories

of an installation and must be connected to a suitable evaluating unit as included in a PLC, IPC, indicator or other electronic control unit. Correct use for the intended purpose implies that all instructions given in the product documentation are followed. Using sensor Temposonics beyond these limits is incorrect. MTS Sensor Technologie GmbH & Co. KG refuse any liability for damage resulting from incorrect use.

2. The displacement sensors may be used only in safe condition. In order to maintain this condition and to ensure safe operation, installation, connection and service work may be done only by trained and qualified personnel *), whereby the relevant instructions for accident prevention and safety as well as the information given in the product documentation must be followed.

Functional trouble

Hazards to the safety of persons or risks of damage to operating facilities due to sensor failure or malfunction must be avoided by additional safety measures such as plausibility checks, limit switches, emergency off systems, protective devices, etc.

In case of trouble, the sensor must be shut down and protected against accidental operation.

Repair

Repair of the sensor may be done only by MTS or an explicitly authorized organization.

Installation and operation

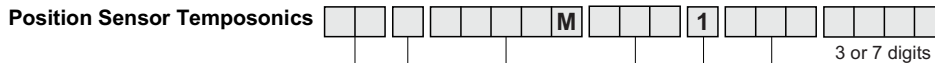
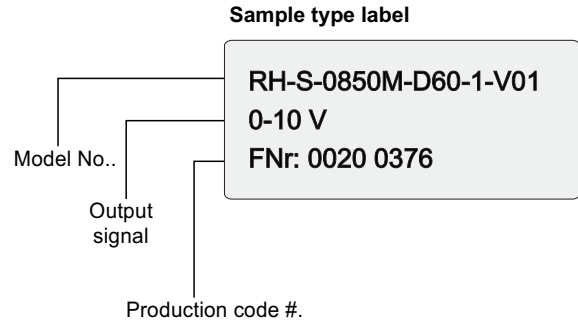
To ensure perfect functioning, following the information given below is indispensable:

1. Protect the sensors against mechanical damage during installation and operation.
2. Do not open or dismantle the sensors.
3. Connect the sensors with utmost care related to polarity of connections, supply voltage as well as type and duration of control pulses.
4. Use only approved power supplies.
5. Meeting the permissible sensor limit values e.g. for supply voltage, environmental conditions etc. specified in the product documentation is indispensable.
6. Check the correct function of the position sensors at regular intervals and provide test documentation.
7. Before switching on the installation, ensure that the starting machine does not threaten the safety and health of persons.

*) Trained personnel means persons who

- related to projecting, are familiar with the safety concepts of automation,
- are informed of the electromagnetic compatibility,
- have received a special training for commissioning and servicing,
- are familiar with the operation of the unit and informed of the specifications for correct operation given in the product documentation.

The following description is valid for all R-Series Temposonics position sensors with ANALOG Interfaces (Profile or Rod style) with measuring ranges of 25 - 7600 mm. Their model number is shown on each sensor type label with following ordering code (see right).



Sensor Model
 RP = Profile housing
 RH = Hydraulic Rod with threaded flange

Style
1. Temposonics-RP (Profile)
 S = Captive sliding magnet, joint at top
 V = Captive sliding magnet, joint at front
 M = Floating magnet, Ø 33 mm (open ring)

2. Temposonics-RH (Rod)
 M = Flange with metric thread M18 x 1,5 (Standard)
 S = Flange with english thread 3/4" - 16 UNF - 3A

Measuring Range/Order Length
 0050 - 5000 mm (Profile model)
 0050 - 7600 mm (Rod model)

Connection Type
 D60 = 6 pin DIN male receptacle
 R02 = 2 m pigtailed PVC cable w/o connector (Option: 01 - 10 m)

Input Voltage
 1 = +24 Vdc

Output

1-Magnet Sensor

1. Position	2. Position + Velocity	3. Position + Velocity
V01 = 0 - 10	V01 XXX,X = 0 - 10 V	V41 XXX,X = 0 - 10 V
V11 = 10 - 0 V	V11 XXX,X = 10 - 0 V	V51 XXX,X = 10 - 0 V
A01 = 4 - 20 mA	A01 XXX,X = 4 - 20 mA	A41 XXX,X = 4 - 20 mA
A11 = 20 - 4 mA	A11 XXX,X = 20 - 4 mA	A51 XXX,X = 20 - 4 mA
A21 = 0 - 20 mA	A21 XXX,X = 0 - 20 mA	A61 XXX,X = 0 - 20 mA
A31 = 20 - 0 mA	A31 XXX,X = 20 - 0 mA	A71 XXX,X = 20 - 0 mA

Velocity (Vmax): 000,1- 010,0 m/s
 Sample:
 (5,5 ← 0 → 5,5 m/s = 10 ← 0 → 10 V) = V01 0055
 (1,0 ← 0 → 1,0 m/s = 4 ← 12 → 20 mA) = A41 0010
 Velocity output for VO1 - A71 (see above)
 Measuring direction: Revers - Null - Forward

2-Magnet Sensor

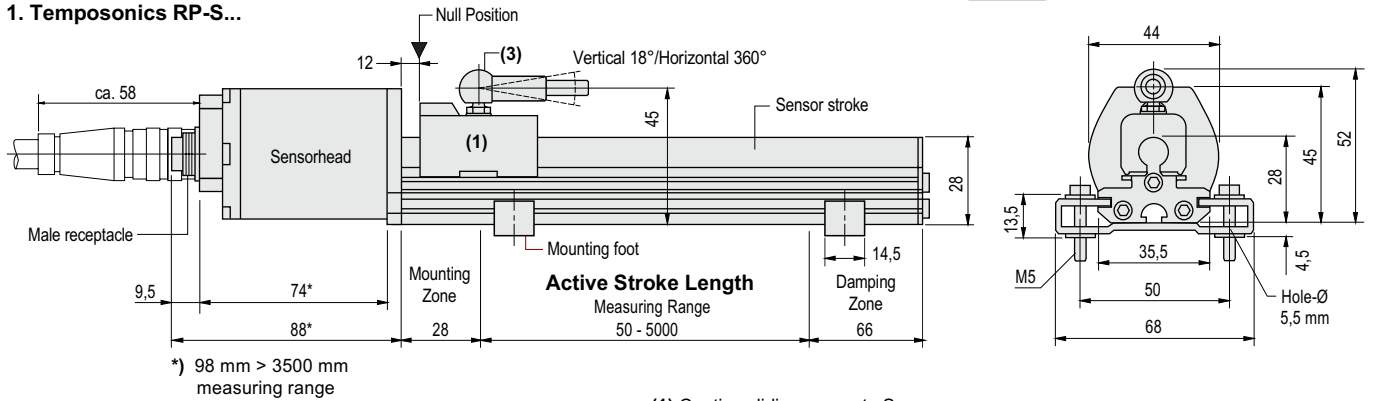
Position 1 + 2

V02 = 0 - 10 V	V12 = 10 - 0 V	A02 = 4 - 20 mA	A12 = 20 - 4 mA	A22 = 0 - 20 mA	A32 = 20 - 0 mA
V41 = 0 ← 5 → 10 V	V51 = 10 ← 5 → 0 V	A41 = 4 ← 12 → 20 mA	A51 = 20 ← 12 → 4 mA	A61 = 0 ← 10 → 20 mA	A71 = 20 ← 10 → 0 mA

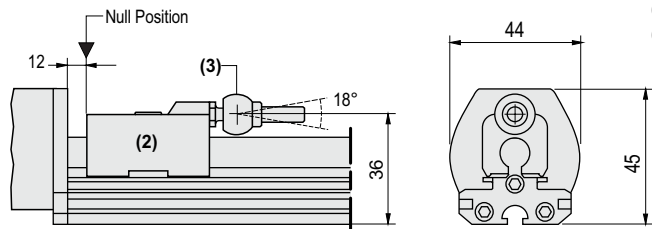
Temposonics-RP / Measuring Range: 50 - 5000 mm

mm

1. Temposonics RP-S...

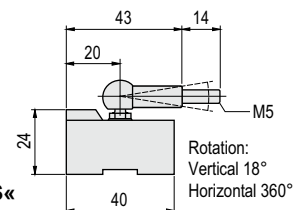


2. Temposonics RP-V...

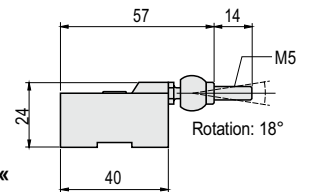


- (1) Captive sliding magnet »S«
- (2) Captive sliding magnet »V«
- (3) Ball jointed arm, M5 thread
- (4) Floating magnet »M«
- (5) Non-magnetic mounting plate and screws

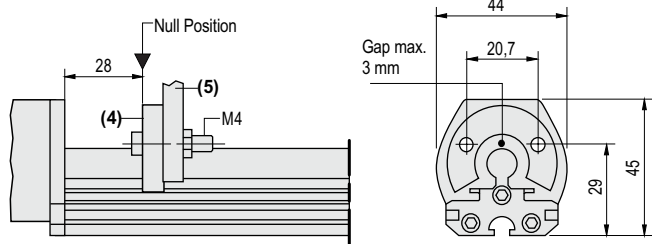
Sliding magnet »S«
Part No. 252 182



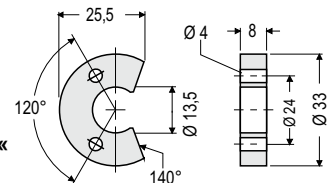
Sliding magnet »V«
Part No. 252 184



3. Temposonics RP-M...

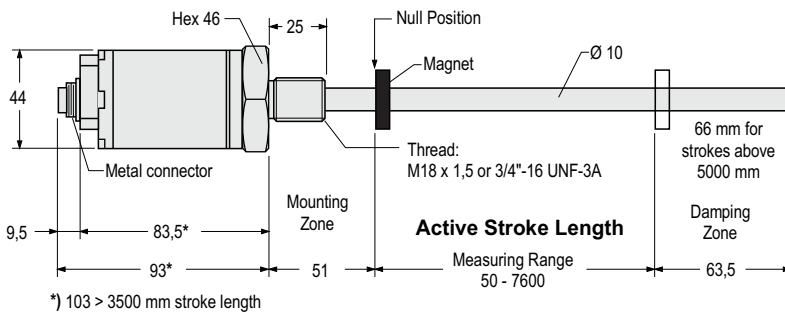


Floating magnet »M«
Part No. 251 416

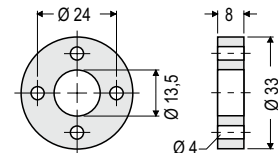


Temposonics-RH / Measuring Range: 50 - 7600 mm

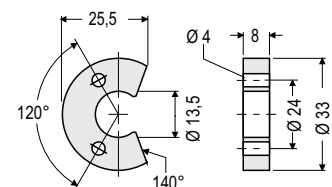
mm



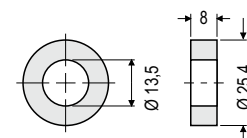
Ringmagnet No. 201 542 (Standard)



Open Magnet No. 251 416



Ringmagnet No. 400 533



CAUTION!

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

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 tube contactlessly.

Attention!

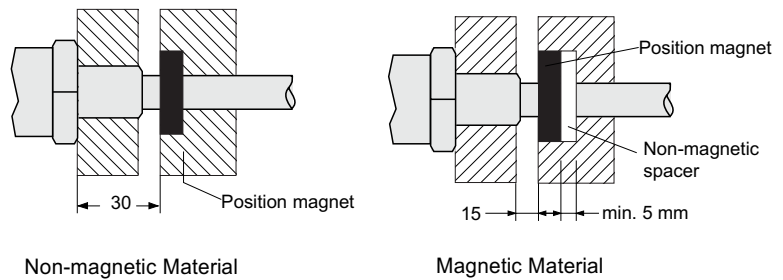
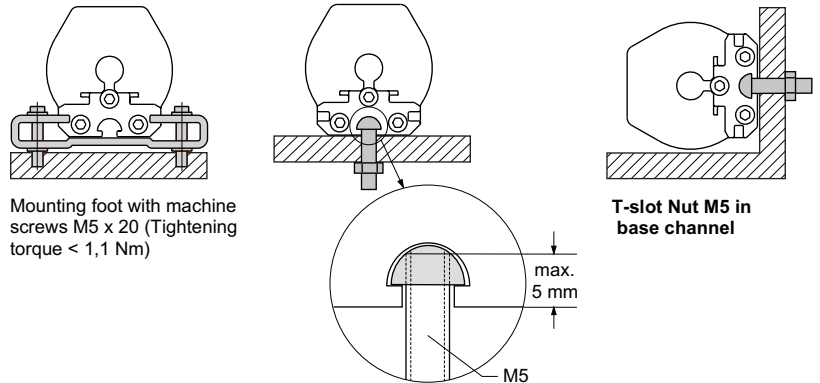
To avoid damaging of slider, magnet and sensor be aware of a careful parallel mounting of the transducer.

Profile-Style

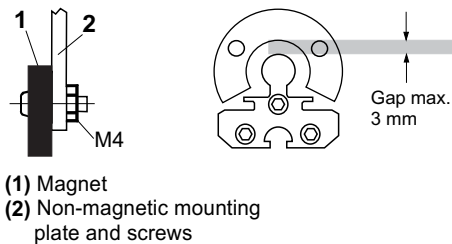
The sensor requires at least 2 mounting feet which simply slide on to the transducer and are held in place with screws M5 x 20 (DIN 6912) or M5 screws in base channel. Mount the floating style magnet using non-magnetic material and screws.

Rod-Style

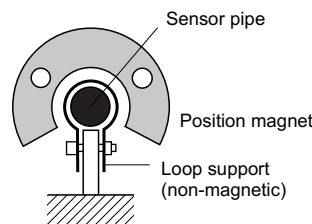
The sensor can be mounted in any position. Note the minimum clearances (right). Use non-magnetic screws, supports etc. Sensors above 1000 mm measuring stroke may require mechanical supports at horizontal mounting.



Open Ringmagnet, removable



Example: Sensor Supports



Cylinder Installation

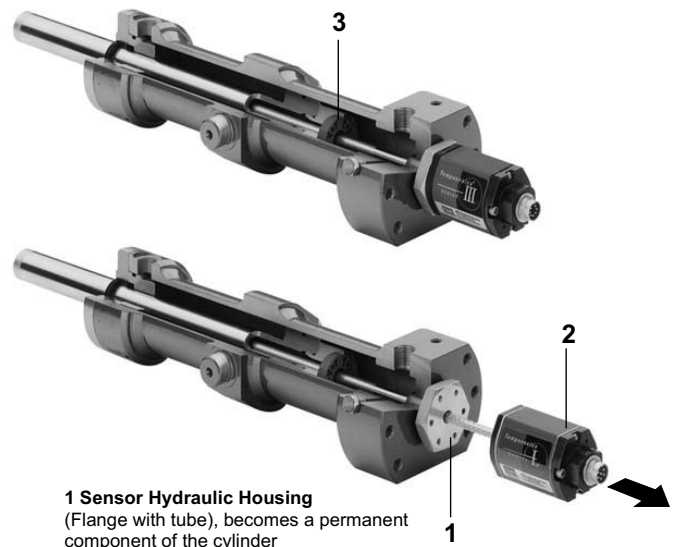
The basic sensor unit comprising electronic head and sensing element is mounted in the high pressure sensor housing (flange with rod) with only 2 screws and fits into the piston rod. The magnet on the bottom of the piston floats contactlessly over the sensor rod and marks the measuring point through the rod wall. Due to this construction, the sensor tube is part of the cylinder and the hydraulic system has not to be opened in case of service.

When installing the sensor in the cylinder notice following:

1. Magnet must not slide along the sensor tube.
2. 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 bore hole diameter at minimum and O-rings or copper gaskets for sealing.
3. Do not exceed peak pressure of 530 bar.
4. Protect the sensor rod from wear.

ATTENTION

After chagement of sensor cartridge, the screws must be fastened with e.g. Loctite 243.



1 Sensor Hydraulic Housing
(Flange with tube), becomes a permanent component of the cylinder

2 Sensor Cartridge
(Electronic head + Sensing element): Easy to replace in the field with 2 screws Torx 20

3 Position magnet

Profile and Rod-Models

WARNING!

Temposonics sensors are active electronic systems. When installing the transducer it is essential that correct sensor connections are ensured.

Before turn-on, please, check if the sensor was connected correctly, in order to prevent destruction of the sensor electronics by voltage peaks or faulty connection.

Dependent on version, the sensor must be connected via the 6 pin connector or via the in-tegrated cable. Connection is dependent on application:

- Position measurement (1 magnet sensor)
- Position measurements 1 + 2 (2 magnets sensor)
- Velocity measurement (1 magnet sensor)

CAUTION!

During wiring, disconnection from all voltage sources must be ensured.

To prevent interference affecting the electronic measuring equipment, the connecting cables must be installed with utmost care. Therefore,

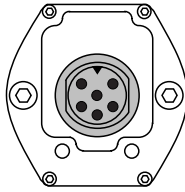
- Keep cables away from motor cables,

Attention!

Note supplement to CE labeling!

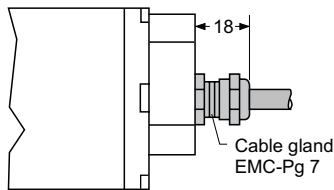
Be care for a flawless sensor machine grounding. The cable shield must be connected to the cable connector and has to be connected to machine ground on the controller electronic side. Typical ground connections are shown in the examples right.

Connector Output



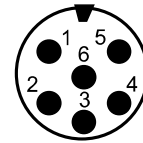
6 pin male connector, metal

Integral cable



2 m PVC cable 6 x 0,14 mm², EMC shield, bending radius: 50 mm at fixed installation

Wiring



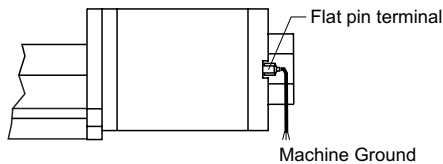
Front face of pin insert or rear (solder tag) of cable connector's female insert

Pin	Cable	Function
1	gray	Output No. 1: Position 0 - 10 V / 10 - 0 V 4 - 20 mA / 20 - 4 mA 0 - 20 mA / 20 - 0 mA
2	pink	DC Ground / Return
3	yellow	Output No. 2: Position or Velocity 0 - 10 V / 10 - 0 V 4 - 20 mA / 20 - 4 mA 0 - 20 mA / 20 - 0 mA
4	green	DC Ground / Return
5	brown	+24 Vdc (-15%/+20%)
6	white	DC Ground (0 V)

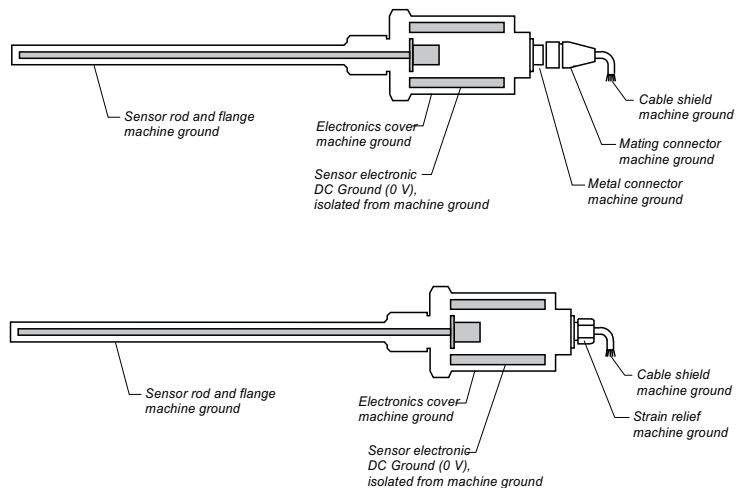
IMPORTANT!

If using Output # 1 only, the cable wires yellow and green of Output # 2 must be isolated absolutely.
ATTENTION: SHORT CIRCUIT

Typical grounding profile style



Typical grounding rod style



All **Temposonics** sensors are factory calibrated and should not require calibration. However, if your application requires that the Zero and Span settings or velocity output be modified, use the appropriate procedure below.

Sensor programming means the location of setpoints SP1 and SP2 (Fig. 3) and adjustment of the outputs (V or mA) at these points.

Use the two pushbuttons (right) in the sensor head for new setpoints and the choice of operation modes.

For programming, remove the two protective screws above pushbuttons PB1 and PB2 and press the switches by means of the programming tool delivered with the sensor.

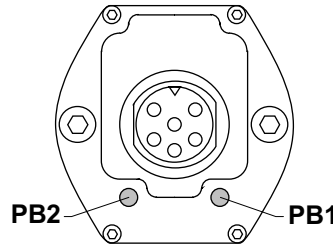


Fig. 1
Top view sensor head
with pushbutton locations

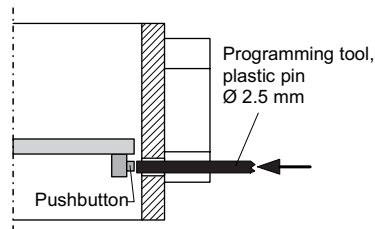


Fig. 2
Axial section sensor head

Attention
Do not use peaked or sharp-edged tools for actuating pushbuttons. They can destroy the switches.

Measuring Range

ATTENTION!

Independent on measuring direction, location of setpoints is always:

- SP1 at Sensor head
- SP2 at Rod end

When programming sensors, make sure that setpoints are within the active stroke length of the sensor.

NOTE

Sensors will be adjusted at factory according to the order specifications and delivered with

- one current output or
- one voltage output or
- two current outputs or
- two voltage outputs

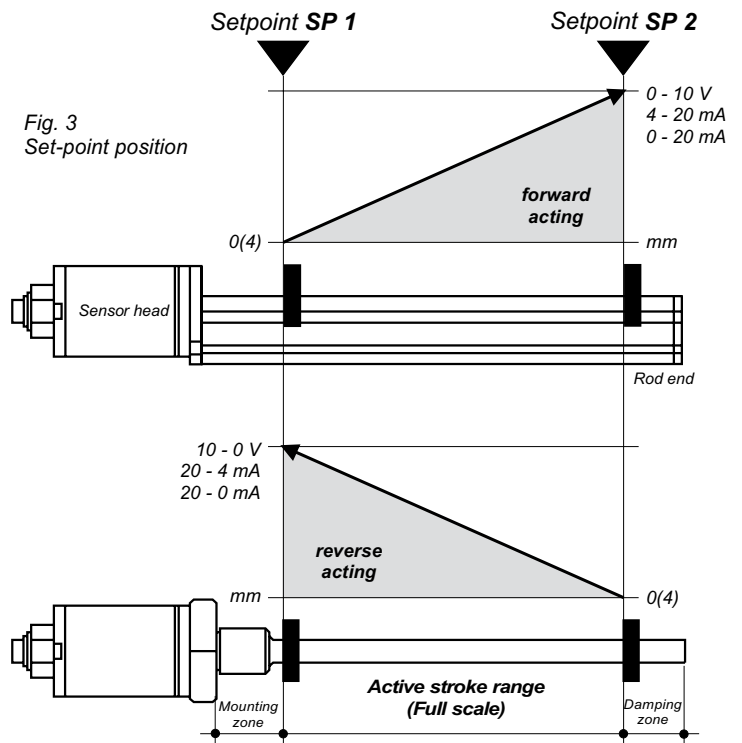


Fig. 3
Set-point position

Operation Modes

The sensor will support three available operation modes. Determined output values of a connected multimeter confirm setting of the desired mode (below).

Operation Mode 1: Position Output (Single magnet) Display: appx. 5,5 V or 11,0 mA

Operation Mode 2: Position Output 1+2 (Dual magnet) Display: appx. 3,0 V or 6,8 mA

Attention: Operation mode 2-magnets needs two magnets. One magnet only does not work.

Operation Mode 3: Position + Velocity Output (Single magnet) ... Display: appx. 8,0 V or 15,5 mA

OPERATION MODE 1: Displacement Measurement (Single Magnet)

Measuring direction: FORWARD ACTING

Output: 0-10 V / 4-20 mA / 0-20 mA

Action	Display Output • Connector Pin: 1 and 2 • Cable Color: gray and pink	Note
1) Remove screws to access push-buttons PB1 and PB2		
2) Connect a multimeter (V/A) across Output 1 (see page 6)		
3) Turn the power ON		Attention! Switch on sensor approx. 5 minutes before programming.
Operation Mode Selection Display: 5.5 V / 11.0 mA	4) Move the magnet to desired set point SP2 (towards rod end)	Important! Do not move the magnet anymore.
	5) Press and release PB1	jumps to appx. 5.5 V (11.0 mA)
	6) Press and release PB2	jumps to appx. 10.5 V (20.0 mA)
	7) Press and release PB2	remains at appx. 10.5 V (20.0 mA)
Setpoint SP2 Adjustment	8) Press PB1 (increase) or PB2 (decrease) for setting	10.000 V (20.000 mA) or the desired Output Value
	9) Move the magnet to desired set point SP1 (towards sensor head) Alternative: Press PB1 + PB2 together	jumps to appx. 1.000 V (2.000 mA) Attention! Needs a minimum magnet speed of approx. 3.5 mm/sec.
Setpoint SP1 Adjustment	10) Press PB1 (increase) or PB2 (decrease) for setting	0.050 V, 4.000 mA, 0.050 mA or the desired Output Value
	11) Move the magnet towards SP2 (rod end) Alternative: Press PB1 + PB2 together	10.000 V (20.000 mA) or adjusted Output Value Attention! Needs a minimum magnet speed of approx. 3.5 mm/sec. Moving the magnet automatically exits programming and puts the sensor in operating mode.
Checkup	12) Move the magnet towards SP1 (sensor head)	0.050 V, 4.000 mA, 0.050 mA or adjusted Output Value
	13) Place the magnet at the middle of the measuring range	5.025 V, 12.000 mA or 10.025 mA
	14) Move the magnet inside the active stroke	Output values must be displayed continuously.
Programming of »forward acting« is complete		
	15) Screw in the protective screws with Loctite 243	

Note!

Temposonics sensors are supplied with either Vdc or mA output from the factory and cannot be reprogrammed in the field. When programming Temposonics sensors, make sure that the setpoints are within the active stroke length of sensor.

OPERATION MODE 1: Displacement Measurement (Single Magnet)

Measuring direction: **REVERSE ACTING**

Output: **0-10 V / 4-20 mA / 0-20 mA**

Action	Display Output • Connector Pin: 1 and 2 • Cable Color: gray and pink	Note
1) Remove screws to access push-buttons PB1 and PB2		
2) Connect a multimeter (V/A) across Output 1 (see page 6)		
3) Turn the power ON		Attention! Switch on sensor approx. 5 minutes before programming.
Operation Mode Selection Display: 5.5 V / 11.0 mA	4) Move the magnet to desired set point SP2 (towards rod end)	Important! Do not move the magnet anymore.
	5) Press and release PB1	jumps to appx. 5.5 V (11.0 mA)
	6) Press and release PB2	jumps to appx. 10.5 V (20.0 mA)
	7) Press and release PB1	jumps to appx. 0.5 V (1.5 mA)
	8) Press and release PB2	remains at appx. 0.5 V (1.5 mA)
		Shows displacement measurement »revers acting« mode is selected.
		Confirms selected operating mode
Setpoint SP2 Adjustment	9) Press PB1 (decrease) or PB2 (increase) for setting	0.050 V, 4.000 mA, 0.050 mA or the desired Output Value
	10) Move the magnet to desired set point SP1 (towards sensor head) Alternative: Press PB1 + PB2 together	jumps to appx. 10.0 V (20.0 mA) Attention! Needs a minimum magnet speed of approx. 3.5 mm/sec.
Setpoint SP1 Adjustment	11) Press PB1 (decrease) or PB2 (increase) for setting	10.000 V (4.000 mA) or the desired Output Value
	12) Move the magnet towards SP2 (rod end) Alternative: Press PB1 + PB2 together	0.050 V, 4.000 mA, 0.050 mA or adjusted Output Value Attention! Needs a minimum magnet speed of appx. 3.5 mm/sec. Moving the magnet automatically exits programming and puts the sensor in operating mode.
Checkup	13) Move the magnet towards SP1 (sensor head)	10.000 V (20.000 mA) or adjusted Output Value
	14) Place the magnet at the middle of the measuring range	5.025 V, 12.000 mA or 10.025 mA
	15) Move the magnet inside the active stroke	Output values must be displayed continuously.
Programming of »reverse acting« is complete		
16) Screw in the protective screws with Loctite 243		

Note!

Temposonics sensors are supplied with either Vdc or mA output from the factory and cannot be reprogrammed in the field. When programming Temposonics sensors, make sure that the setpoints are within the active stroke length of sensor.

Recommendation!

At present reprogramming of Operation Modes 2 and 3 should be done at MTS factory.