Tempsonics® G-Series
Brief Instructions

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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. Keep the manual for future reference!

The content of this technical documentation is intended to provide information on mounting, installation and commissioning by qualified automation personnel 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 or service personnel or cause material damage are highlighted by the preceding pictogram, which is defined below.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOTICE</td>
<td>This symbol is used to point to situations that may lead to material damage, but not to personal injury.</td>
</tr>
</tbody>
</table>

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 electromagnetic compatibility (EMC),
- 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.
2. Safety instructions

2.1 Intended use

This product may be used only for the applications defined under item 1 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.

2.2 Forseeable misuse

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

Do not reprocess the sensor afterwards. ➔ The sensor might be damaged.

Do not step on the sensor. ➔ The sensor might be damaged.

Manuals, Software & 3D models available at: www.mtssensors.com
**2.3 Installation, commissioning and operation**

The position sensors must be used only in technically safe condition. To maintain this condition and to ensure safe operation, installation, connection and service, work may be performed only by qualified technical personnel.

If danger of injury to persons or of damage to operating equipment is caused by sensor failure or malfunction, additional safety measures such as plausibility checks, limit switches, EMERGENCY STOP systems, protective devices etc. are required. In the event of trouble, shut down the sensor and protect it against accidental operation.

**Safety instructions for commissioning**

To maintain the sensor’s operability, it is mandatory to follow the instructions given below.

1. Protect the sensor against mechanical damage during installation and operation.
2. Do not open or dismantle the sensor.
3. Connect the sensor very carefully and pay attention to the polarity of connections and power supply.
4. Use only approved power supplies.
5. It is indispensable to ensure that the specified permissible limit values of the sensor for operating voltage, environmental conditions, etc. are met.
6. Check the function of the sensor regularly and provide documentation of the checks.
7. Before system switch-on, ensure that nobody’s safety is jeopardized by starting machines.

**2.4 Safety instructions for use in explosion-hazardous areas**

The sensors are not suitable for operation in explosion-hazardous areas.

**2.5 Warranty**

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. The MTS Sensors obligation is limited to repair or replacement of any defective part of the unit. No warranty can be provided 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 offense against the warranty rules, no matter if these have been assured or expected, even in case 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 increase or change the scope of warranty.

**2.6 Return**

For diagnostic purposes, the sensor can be returned to MTS Sensor Technologie GmbH & Co. KG. Any shipment cost is the responsibility of the sender. For a corresponding form, see detailed operation manual (available at: www.mtssensors.com).

**2.7 Maintenance & removal**

**Maintenance**

The sensor is maintenance-free.

**Repair**

Repairs on the sensor may be performed only by MTS Sensors or a repair facility explicitly authorized by MTS Sensors.

**List of spare parts**

No spare parts are available for this sensor.

**Transport and storage**

The conditions of transport and storage of the sensor match the operating conditions mentioned in this document.

**Removal from service / dismantling**

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

2/ See also applicable MTS Sensors sales and supply conditions, e.g. at www.mtssensors.com
3. Identification

Nameplate (e.g. G-Series GP Analog)

<table>
<thead>
<tr>
<th>Sensor model</th>
<th>Stroke length (e.g. 850 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GP-S-0850M-D60-1-V0</td>
<td>0 - 10 V</td>
</tr>
<tr>
<td>FNr. 1601 0376</td>
<td></td>
</tr>
</tbody>
</table>

Approvals and certificates
You will find approvals and certificates in the sensor specific operation manuals.

3.1 Temposonics® G-Series GP (profile sensor)

Available outputs:
- Analog
- Start / Stop

3.2 Temposonics® G-Series GH (rod sensor)

Available outputs:
- Analog
- Start / Stop

Manuals, Software & 3D models available at: www.mtssensors.com
3.3 Temposonics® G-Series GT2 / GT3 (rod sensor with redundant electronics)

Available output:
- Analog

Manuals, Software & 3D models available at: www.mtssensors.com
4. Installation & mounting

Typical use of magnets

**Ring magnet**
- For: RH, RD4, RT4 & RF
- Rotationally symmetrical magnetic field

**U-magnet**
- For: RP, RH, RD4, RT4 & RF
- The magnet can be lifted off RP
- Height tolerances can be compensated

**Block magnet**
- For: RP, RH & RF
- The magnet can be lifted off
- Height tolerances can be compensated

**Magnet slider**
- For: RP
- The magnet is guided by the profile
- The ideal distance is maintained between the magnet and the waveguide.
- Easy coupling via the ball joint

4.1 Magnet installation

Install the magnet using non-magnetic material for mounting device, screws, spacers etc.. The magnet must not grind on the sensor rod. Alignment errors are compensated via the air gap.
- Max. permissible surface pressure: 40 N/mm²
- Max. fastening torque for M4 screws: 1 Nm; use washers, if necessary

**NOTICE**
Mount the ring magnet and U-magnet concentrically. Mount the block magnet centrically.
The maximum permissible air gap must not be exceeded.
Take care to mount the primary sensor axis in parallel to the magnet path in order to avoid damage to the carriage, magnet and sensor rod.

**Concentric mounting of U-magnet**

<table>
<thead>
<tr>
<th>Concentric mounting of U-magnet</th>
<th>Centered mounting of block magnet</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
</tbody>
</table>

- **Part no.** 251 416-2: 1.75 ±1 (0.07 ±0.04)
- **Part no.** 201 553: 3 ±1 (0.12 ±0.04)

**Magnet mounting with magnetic material**
When using magnetic material the dimensions in the drawing beneath must be observed. If the position magnet is set further into the piston rod install another non-magnetic spacer above the magnet.

**Magnet mounting with magnetic material**

<table>
<thead>
<tr>
<th>Sensors with stroke lengths ≥ 1 meter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support horizontally installed sensors with a stroke length from 1 meter mechanically at the rod end. Without the use of a support, rod and position magnet may be damaged. A false measurement result is also possible. Longer rods require evenly distributed mechanical support over the entire length (e.g. part no. 561 481). Use an U-magnet for measurement.</td>
</tr>
</tbody>
</table>

Controlling design dimensions are in millimeters and measurements in ( ) are in inches
### 4.2 Mounting dimensions of G-Series

#### G-Series GP with U-magnet

- Sensor electronics housing
- Reference edge of mounting
- Start position

<table>
<thead>
<tr>
<th>Stroke length</th>
<th>28 (1.1)</th>
<th>66 / 71* (2.6 / 2.8*)</th>
</tr>
</thead>
</table>

* Stroke length > 5000 mm (196.85 in.)

#### G-Series GP with block magnet

- Sensor electronics housing
- Reference edge of mounting
- Start position: 25.5 (1)

<table>
<thead>
<tr>
<th>Stroke length</th>
<th>28 (1.1)</th>
<th>66 / 71* (2.6 / 2.8*)</th>
</tr>
</thead>
</table>

* Stroke length > 5000 mm (196.85 in.)

#### G-Series GH with block magnet

- Sensor electronics housing
- Reference edge of mounting
- Start position: 48.5 (1.91)

<table>
<thead>
<tr>
<th>Stroke length</th>
<th>51 (2.01)</th>
<th>63.5 / 66* (2.5 / 2.6*)</th>
</tr>
</thead>
</table>

* Stroke length > 5000 mm (196.85 in.)

#### G-Series GH with U-/ring-magnet

- Sensor electronics housing
- Reference edge of mounting
- Start position

<table>
<thead>
<tr>
<th>Stroke length</th>
<th>51 (2.01)</th>
<th>63.5 / 66* (2.5 / 2.6*)</th>
</tr>
</thead>
</table>

* Stroke length > 5000 mm (196.85 in.)

#### G-Series GT2 / GT3 with U-/ring-magnet

- Sensor electronics housing
- Reference edge of mounting
- Start position

<table>
<thead>
<tr>
<th>Stroke length</th>
<th>51 (2.01)</th>
<th>63.5 (2.5)</th>
</tr>
</thead>
</table>

### Manual, Software & 3D models available at: www.mtssensors.com

*Controlling design dimensions are in millimeters and measurements in ( ) are in inches*
**4.3 Multi-position measurement distances**

Multi-position measurement with G-Series GP / GH sensors and Start / Stop output is possible, with a simultaneous measuring up to 9 positions.
The stroke length influences the maximum number of magnets. Note the minimum distance between the magnets.

**NOTICE**

Use only the same magnet type for multi-position measurement!

**G-Series GP with U-magnet**

\[ \geq 75 \ (\geq 3) \]

**G-Series GP with block magnet**

\[ \geq 75 \ (\geq 3) \]

**G-Series GH with block magnet**

\[ \geq 75 \ (\geq 3) \]

**G-Series GP with magnet slider »S«, »N«, »V«, »G«**

\[ \geq 75 \ (\geq 3) \]

**G-Series GH with ring-/U-magnet**

\[ \geq 75 \ (\geq 3) \]

**5. Electrical connections**

Placement of installation and cabling have decisive influence on the sensor’s 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 its electronics despite protection against wrong polarity.

**NOTICE**

Never connect / disconnect the sensor when voltage is applied.

**Instructions for connection**

- Use low-resistant twisted pair and shielded cables. Connect the shield to ground externally via the controller equipment.
- Keep control and signal cables separate from power cables and sufficiently far away from motor cables, frequency inverters, valve lines, relays, etc.
- Use only connectors with metal housing and connect the shielding to the connector housing.
- Keep the connection surface at both shielding ends as large as possible. Connect the cable clamps to function as a ground.
- Keep all non-shielded leads as short as possible.
- Keep the earth connection as short as possible with a large cross section. Avoid ground loops.
- With potential differences between machine and electronics earth connections, no compensating currents are allowed to flow across the cable shielding.

**Recommendation:**

Install potential compensating leads with large cross section, or use cables with separate double shielding, and connect only one end of the shield.

**NOTICE**

Do not mount the sensors in an area of strong magnetic or electric noise fields. Sensors must be grounded via ground lug on the sensor electronics housing.

**Sensor grounding**

Controlling design dimensions are in millimeters and measurements in ( ) are in inches.
5.1 Analog

**D60**

<table>
<thead>
<tr>
<th>M16 connector</th>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Position</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>DC Ground</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>USB programmer</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>USB programmer</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>+24 VDC (−15 / +20 %)</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>DC Ground (0 V)</td>
</tr>
</tbody>
</table>

**HXX / RXX**

<table>
<thead>
<tr>
<th>Cable</th>
<th>Color</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>GY</td>
<td>Stop (−)</td>
<td></td>
</tr>
<tr>
<td>PK</td>
<td>Stop (+)</td>
<td></td>
</tr>
<tr>
<td>YE</td>
<td>Start (+)</td>
<td></td>
</tr>
<tr>
<td>GN</td>
<td>Start (−)</td>
<td></td>
</tr>
<tr>
<td>BN</td>
<td>+24 VDC (−15 / +20 %)</td>
<td></td>
</tr>
<tr>
<td>WH</td>
<td>DC Ground (0 V)</td>
<td></td>
</tr>
</tbody>
</table>

---

Analog LED status

<table>
<thead>
<tr>
<th>Green</th>
<th>Red</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>OFF</td>
<td>Normal function</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>Magnet not detected</td>
</tr>
<tr>
<td>Flashing</td>
<td>OFF</td>
<td>Serial programming mode</td>
</tr>
</tbody>
</table>

---

5.2 Start / Stop

**D60**

<table>
<thead>
<tr>
<th>M16 connector</th>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Stop (−)</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Stop (+)</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>Start (+)</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>Start (−)</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>+24 VDC (−15 / +20 %)</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>DC Ground (0 V)</td>
</tr>
</tbody>
</table>

**HXX / RXX**

<table>
<thead>
<tr>
<th>Cable</th>
<th>Color</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>GY</td>
<td>Stop (−)</td>
<td></td>
</tr>
<tr>
<td>PK</td>
<td>Stop (+)</td>
<td></td>
</tr>
<tr>
<td>YE</td>
<td>Start (+)</td>
<td></td>
</tr>
<tr>
<td>GN</td>
<td>Start (−)</td>
<td></td>
</tr>
<tr>
<td>BN</td>
<td>+24 VDC (−15 / +20 %)</td>
<td></td>
</tr>
<tr>
<td>WH</td>
<td>DC Ground (0 V)</td>
<td></td>
</tr>
</tbody>
</table>

---

Start/Stop LED status

<table>
<thead>
<tr>
<th>Green</th>
<th>Red</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>OFF</td>
<td>Normal function</td>
</tr>
<tr>
<td>ON</td>
<td>Flashing</td>
<td>Missing external start signal</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>Magnet not detected</td>
</tr>
<tr>
<td>Flashing</td>
<td>OFF</td>
<td>Serial programming mode</td>
</tr>
</tbody>
</table>

---

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