Screw-in Resistance Temperature Sensor

METS-WT

Operating Manual



METS-WT

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1.1 For Your Information

- These operation instructions contain important information on handling the resistance thermometer. Working safely requires that all safety instructions and work instructions are observed.
- Skilled personnel must have carefully read and understood the operating instructions prior to beginning any work.
- The operating instructions are part of the product and must be kept in the immediate vicinity of the resistance thermometer and readily accessible to skilled personnel at any time.
- Observe the relevant local accident prevention regulations and general safety regulations for the resistance thermometer's range of use.
- If the serial number gets illegible (e.g. by mechanical damage), the retraceability of the instrument is not possible any more.
- The temperature sensors, described in this operating manual, are carefully designed and manufactured using stateof-the-art technology. Every component undergoes strict quality inspection in all stages of manufacture.
- The manufacturer's liability is void in the case of any damage caused by using the product contrary to its intended use, non-compliance with these operating instructions, unauthorised modifications to the resistance thermometer or assignment of insufficiently qualified skilled personnel.

1.2 Signs, Abbreviations



Warning!

A non-observance can cause injuries to persons and/or the demolition of the device. There can be a dangerous to life.

Attention!

A non-observance can cause a faulty operation of the device or lead to property damage.

Information!

A non-observance can have influence on the operation of the device or cause unintentional reactions of the device.



Danger!

Should the safety instructions not be observed, there is a risk of serious or fatal injury caused by electrical power.



Warning!

Possibly a dangerous situation can occur, which results in burns because of hot surfaces or liquids, if not avoided.

- U+: Positive supply connection
- U-: Negative supply connection

2 Transport, Packaging, Storage

2.1 Transport

Check the instrument for any damage that may have been caused during transportation. If, report them immediately.

2.2 Packaging

Do not remove packaging until just before mounting. Keep the packaging as it will provide optimum protection during transport (e.g. change in installation site, sending back).

2.3 Storage

For longer term storage avoid the following influences:

- Direct sunlight or proximity to hot objects
- Mechanical vibration, mechanical shock (putting it hard down)
- Soot, vapour, dust and corrosive gases

If possible store the device in ist original package or an equivalent one

9 3 Safety Instructions



Before installation, commissioning and operation ensure that the appropriate resistance thermometer has been selected in terms of measuring range, design, specific measuring conditions and appropriate wetted parts materials (corrosion).

More important safety instructions can be found in the individual chapters.

3.1 Intended Use of the Product

The resistance thermometer METS-WT is used for the measurement of temperatures from -50...200 °C in liquid and gaseous media. It can be used for pressures up to 25 bar.

The sensor has been designed and built solely for the intended use described here and may only be used accordingly.

The technical specifications contained in these operating instructions must be observed. Improper handling or operation of the instrument outside of ist technical specifications requires the instrument to be taken out of service immediately and an inspection by the manufacturer.

When the instrument is transported from a cold into a warm environment, the formation of condensation may result in the instrument malfunctioning. Before putting it back into operation, wait for the instrument temperature and the room temperature to equalise.

The manufacturer shall not be liable for claims of any type based on operation contrary to the intended use.

3.2 Personnel Qualification



Risk of injury if qualification is insufficient

Improper handling can result in considerable injury and damage to equipment.

- The activities described in these operating instructions may only be carried out by skilled personnel who have the qualifications described below.

- Keep unqualified personnel away from hazardous areas.

For installation and starting of the temperature sensor the personnel has to be familiar with the relevant regulations and directives of the country and must have the qualification required. They must have knowledge on measurement and control technology, have to be acquainted with electric circuits, are capable of carrying out the work described and can independently recognise potential hazards. Depending on the operation conditions of the application they have to have the corresponding knowledge, e.g. of aggressive media.

3.3 Special Hazards



For hazardous media such as oxygen, acetylene, flammable or toxic gases or liquids, refrigeration plants, compressors, etc., in addition to all standard regulations, the appropriate existing codes or regulations must also be followed.

If you do not observe the appropriate regulation, serious injuries and/or damage can occur!



A protection from electrostatic discharge (ESD) is required.

The proper use of grounded work surfaces and personal wrist straps is required when working with exposed circuitry (PCB, printed circuit boards), in order to prevent static discharge from damaging sensitive electronic components.



There is a danger of death caused by electric current.

Upon contact with life parts, there is a direct danger of death.

Electrical instruments may only be installed and connected by skilled electrical personnel.

Operation using a defective power supply unit (e.g. short circuit from the mains voltage to the voltage output) can result in life-threatening voltages at the instrument.



Residual media in dismounted instruments can result in a risk to personnel, the environment and equipment. Take sufficient precautionary measures.

Do not use this instrument in safety or Emergency Stop devices. Incorrect use of the instrument can result in injury.

Should a failure occur, aggressive media with extremely high temperature and under high pressure or vacuum may be present at the instrument.

Start-Up, Operation 1

Function 41

The METS-WT is fitted directly into the process via thread of the process connection. A change in resistance of the sensor element in the tip of the protecting tube is transformed into an electrical standard signal by a measuring amplifier. The signal changes proportional to the temperature and can be evaluated.

4.2 Before Mounting

Check if a completely assembled temperature sensor is supplied.

Inspect the temperature sensor for possible damage during transportation. Should there be any obvious damage, inform the transport company and supplier without delay.

Keep the packaging, as it offers optimal protection during transportation.

Ensure that the process connection thread and the connection contacts will not be damaged.

4.3 **Product Label (Example)**

Logo	ОН	0-0-0-3-0-0-08X	Σ (€
Contact	SN : 7	74.04/10-4.0-001 Art.Nr	:: 1500-00422
T : 0100 °C	OUT	: 420 mA HART	U+ :1
Tmax : -50200 °C	SUP.	:1240 VDC	U- :3
、	Date	: 14/12 Made i	n Germany

4.4 Mechanical Connection

Tools: wrench (flats 27), screw driver

OH... : Product code Tmax : Range maximum

- : Temperature range т
- U+ Supply/Loop +
- U-: Supply/Loop -
- Art.Nr.: Part number
- SN : Serial number
- Date : Date of QC
- OUT : Loop signal
- SUP. : Range of voltage



4 Start-Up, Operation (Continued)

4.5 Electrical Connection

Connect the instrument to earth via the process connection.

The ingress protection specified only apply while the pressure transmitter is connected with the female connectors that provide the corresponding ingress protection.

Ensure that the cable diameter you select fits to the cable gland of the connector. Ensure that the cable gland of the mounted connector is positioned correctly and that the sealings are available and undamaged. Tighten the threaded connection and check the correct position of the sealings to ensure ingress protection.

Make sure that the ends of cables with flying leads do not allow any ingress of moisture.

4.6 Pin Assignment

Connection	Currer 420 m U+	nt loop A HART U-
M12, 4-pole	1	3
M12, 5-pole	1	3
M12, 8-pole	1	3
Super Seal, 3-pole	1	3
Deutsch DT04, 3-pole	А	В
Deutsch DT04, 4-pole	1	3

Connection	Currer 420 m U+	nt loop A HART U-
Bayonet DIN, 4-pole	1	2
Valve (L-plug), 4-pole	1	2
Cable, 4-pole	yellow	white
Cable, 6-pole	yellow	white
MIL, 6-pole	А	С

View: plug pins of male connector

M12, 4-pole	M12, 5-pole	M12, 8-pole	Super Seal, 3-pole	Deutsch DT04, 3-pole
4• •3 1• •2	4.5.3	$ \begin{array}{c} 6 & \bullet & 4 \\ 7 \bullet & \bullet & 3 \\ 1 & 2 \end{array} $		

Deutsch DT04, 4-pole	Bayonet DIN, 4-pole	Valve (L-plug), 4-pole	MIL, 6-pole	Cable, 4-, 6-pole
 €2 3• ●1 4• 		[3⊚] 2		LIYCY 4 or 6x0,25 mm² grey

4.7 Example for Connection



Start-Up, Operation (Continued) 1

4.8 Functional Test



The output signal must be proportional to the temperature. If not, this might point to a damage of the sensor element. In that case refer to chapter Fault Recovery (page 7).



- Open process connections only after the system is without pressure.

- Observe the ambient and working conditions outlined in chapter "Technical data" (page 8)



- When touching the temperature sensor, keep in mind that the surfaces of the instrument components might get hot during operation.

4.9 **Error Detection / Error Current**

The device detects wire break and short circuit (sensor element <> measuring amplifier) as well as temperatures outside of the measuring range and indicates this with an error current in the current loop circuit.

The current output is proportional to the temperature from 3,8 to 20,5 mA. If the measured temperature would result in a current below 3,8 mA the current output is set to 3,6 mA (also for a wire short circuit). If the current would exceed 20,5 mA, the current output is set to 21 mA (also for wire break).



5 Fault Recovery



- Open pressure connections only after the system is without pressure.
- Residual media in dismounted instruments can result in a risk to personnel, the environment and equipment
- In case of damage, remove the temperature sensor from service and mark it to prevent it from being used again by accident.

Failure	Potential Cause	Procedure	
No output signal	Cable break	Check connectors and cable	
	Mechanical load too high or overtemperature	Replace the sensor with a suitable design	
No/false output signal	Incorrectly wired	Follow pin assignment (see product label / manual)	
Erroneous measured values	Sensor drift caused by overtemperature	Replace the sensor with a suitable design	
	Sensor drift caused by chemical effect	Replace the sensor with a suitable design	
Erroneous measured values (too low)	Entry of moisture into cable or plug	Replace the sensor with a suitable design	
Erroneous measured values and response time too long	Wrong mounting geometry, e.g. mounting depth too low or heat dissipation too high	The temperature-sensitive area of the sensor must be inside the medium, surface measurements must be isolated	
	Deposits on the sensor	Remove deposits	
Measurement signal "comes and goes"	Cable break in connecting cable or loose contact caused by mechanical overload	Replace the sensor with a suitable design, e.g thicker conductor cross section	
Corrosion	Composition of medium not as expected, modified composition or wrong material of protecting tube	Analyse medium and then select a more suitable material	
Signal interference	Stray currents caused by electric fields or earth loops	Use of screened connecting cables, and increase the distance to motors and power lines	
	Earth circuits	Elimination of potentials, use of supply isolators or galvanically isolated measuring amplifiers	

Note: In case of unjustified reclamation an additional charge is possible.

6 Maintenance, Dismounting, Return, Cleaning, Disposal

6.1 Maintenance

The screw-in temperature sensors METS-WT require no maintenance and contain no components which could be repaired or replaced.

6.2 Dismounting



Residual media in dismounted instruments can result in a risk of personnel, the environment and equipment. Take sufficient precautionary measures.



There is a risk of burns. Let the instrument cool down sufficiently before dismounting. During dismounting there is a risk of dangerously hot pressure media escaping. Only disconnect the resistance thermometer after the system has been depressurised.

6.3 Return



Before the return of an instrument see chapter 6.4.

When returning the instrument, use the original packaging or a suitable package.

To avoid a damage, use for example antistatic plastic film, shock-absorbent material, a marking as highly sensitive measuring instrument.

6.4 Cleaning

- Before cleaning the instrument disconnect the electrical connection.
- Clean the instrument with a moist cloth.
- Electrical connections must not come into contact with moisture.
- Wash or clean the dismounted instrument before returning it in order to protect personnel and the environment from exposure to residual media.
- Residual media in dismounted instruments can result in a risk to persons, the environment and equipment. Take sufficient precautionary measures.

6.5 Disposal

Dispose instrument components and packaging materials in accordance with the respective waste treatment and disposal regulations of the region or country to which the sensor is supplied.

7 Technical Data

Input					
Sensor RTD Pt100:	-50250 °C (n	-50250 °C (minimum range: 50°C)			
Output					
Current signal: Current range: Signal on error:	420 mA with 3,820,5 mA 3,6 mA (senso 21 mA (sensor	 420 mA with superimposed communication signal (HART), 2-wire current loop 3,820,5 mA 3,6 mA (sensor short circuit, underflow) 21 mA (sensor break, sensor open circuit, overflow) 			
Performance					
Sensor: Measuring amplifier:	RTD Pt100: Accuracy: Resolution: Filter setting: Measuring rate Configuration: Transmission I Turn-on delay	Class A / Class B / Class AA (B1/3 DIN) 0,3% of range 16 Bit 099 s e: 10 measurements/s Via software (HART communication) pehaviour: Temperature linear time: <5 s			
Supply					
Voltage: Load: Reverse battery protectio	HART current R = (U _B -12 V) n: available (no fi	HART current loop: 1240 VDC R = (U _B -12 V) / 21 mA available (no function, no damage)			
Environmental Condition	ons	- · · · · · · · · · · · · · · · · · · ·			
Temperature:	Operating range: Medium: Storing:	-20+80 °C Attention: Temperatures above 85 °C can destroy the electronics!) -50+250 °C -40 +100 °C			
Condensation:	uncritical				
Mechanics					
Dimensions: Process connection: Extension: Electrical connection:	see data sheet 1/4" /3/8" / 1/ 100 mm (option lateral Option: Plugs and cables:	t /2" / 3/4" / 1" / 1/4NPT / 3/8NPT / 1/2NPT n) upwards see data sheet			
Material:	Protecting tube: Extension: Process connection: Body: Cover:	stainless steel 1.4571 (standard Ø6 mm) stainless steel 1.4571 stainless steel 1.4571 PBT Gf30 PBT Gf30			
Gewicht: Weight: Fitting position: System pressure: Protection of device:	ca.140 g (70 mm, 1/2" approx.140 g (70 mm, any PN 25 Ingress protection: PCB	, M12x1) 1/2", M12) at least IP 65 (electronics)			