Instruction manual
TA14, TA17, TA18

NAN-KD-0040-en_V01.01 | 21.01.2019

Issue

Information on issue	
Document ID	NAN-KD-0040-EN
Issue	V01.01
Date	January 2019

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Table of contents

1 General information

Use for intended purpose

- The product may only be used for the applications specified in this document and in the technical documentation. Transportation with due care and attention, correct storage and installation as well as careful use and maintenance during operation of the product must be ensured to guarantee trouble-free and safe operation.
- The product must be used at all times in agreement with the technical specifications. In particular, compliance with the ambient conditions recommended in the technical documentation must be ensured.

Installation, assembly, repair and maintenance work

- Observe the relevant national regulations and observe the applicable standards and directives for special applications.
- Installation, assembly, repair and maintenance work must be carried out exactly according to the installation and maintenance instructions applicable to the individual products in order to guarantee their functional reliability and avoid installation errors and damage.
- Installation, assembly, repair and maintenance work must only be performed by qualified and authorised technical personnel in accordance with the relevant documentation, especially the safety and warning information contained therein.
- Make sure that no excess parts (screws, tools, etc) are left behind in or on products after performing installation, assembly, repair or maintenance work. Non-compliance with this requirement may cause malfunctions and/or damage to the products or the system.
- Make sure a function test is carried out on completion of installation, assembly, repair and maintenance work to ensure trouble-free operation of the products.

Suitable tools and equipment

Only suitable tools and equipment, especially materials provided by NORIS, are to be used for installation, assembly, repair and maintenance work. Damaged products or components are to be replaced only by genuine NORIS components or parts. NORIS shall accept no liability whatsoever for any damage incurred as the result of using unauthorised spare parts. This will invalidate the warranty. Keep the operating instructions in a place that is accessible to all users at any time.

Modification of products

NORIS shall accept no liability whatsoever if unauthorised modifications have been made to the products. This will also invalidate the warranty. Therefore, consult our technical staff before undertaking any modifications.

Shipping, appropriate storage and packaging

Products that are sent in for repair must be appropriately packaged to prevent damage (from impacts, moisture, static charge, etc). Make sure that products and all spare parts are stored correctly. Refer to the corresponding technical information for further information.

Disclaimer

We review the contents of our technical documentation at regular intervals to ensure it agrees with our products. Nevertheless, variations cannot be completely ruled out. NORIS therefore cannot guarantee complete agreement of the documentation contents with the hardware and software. Changes and corrections will be included in subsequent issues of the technical documentation.

2 General information on this instruction manual

2.1 Scope of validity

This instruction manual applies to the Series TA[..] sensors listed below:

Sensor type	Produkt revision
TA14	C
TA17	A
TA18	A

Important information on the use of this instruction manual and supplementary information

Please note that the sensors are often adapted to customer-specific requirements. The connection cables, cable lengths, connectors etc. described in this instruction manual may vary in terms of features on your specific product. Therefore, always first refer to the information in the customer drawing for installation, commissioning and operation.

2.2 Subject of the instruction manual

The subject of this instruction manual is the installation, commissioning, operation and maintenance of Series TA[..] temperature sensors. Furthermore, this instruction manual also contains important troubleshooting information.

2.3 Use of safety and warning notes

⚠ DANGER	**Warning about the type and source of immediate imminent danger that leads to death or serious injuries when disregarding the given precautions.**
⚠ WARNING	**Warning about the type and source of danger that may possibly lead to death or serious injuries when disregarding the given precautions.**
⚠ CAUTION	**Warning about the type and source of danger that may lead to minor injuries when disregarding the given precautions.**

NOTICE **Warning about the type and source of danger that may lead to material damages when disregarding the given precautions.**

2.4 Scope of delivery

Note on customer-specific scope of delivery

The scope of delivery of your product may vary from the specifications below.

The scope of delivery is individually adapted to your specific requirements. In addition, certain items are dependent on other factors, e. g. the number of retaining clips on the cable length, the size of the retaining clips on the cable diameter. Refer to the corresponding parts list for a detailed overview of the scope of delivery for your product.

The standard scope of delivery contains:

- Temperature sensor packed in an antistatic bag/folding box
- 2 hexagon head screws for mounting the sensor
- Option: mounting material for connection cable

Available documentation:

The general technical documentation for our sensors (data sheets, instruction manuals, certificates, etc.) can be downloaded from our website www.noris-group.com. For the customer drawings of your sensor, please ask our sales team (sales@noris-group.com). On request, we also include the latest documentation in the scope of delivery. In general available for sensors Series TA[..] are:

- Data sheet
- Instruction manual for sensors Series TA[..]
- Customer drawing for your sensor

2.5 Product storage

Note the following information concerning the storage to avoid product damage:

- Store the product in the original package material in dry indoor areas.
- Do not store the product in humid or dusty environments. In case of longtime storage, precautions need to be taken to protect the connection from moisture and dust.
- Please also note the allowed storage temperature mentioned in the technical data.

2.6 Packaging and waste disposal

When unpacking the product, check the device for transport damage and in case of any damage inform the manufacturer immediately. Keep the packaging material, so you can pack your device properly in case of a future transport. In case you dispose of the packaging material, the regulations for the local waste disposal must be regarded.

2.7 Accessories and spare parts

Available accessories

In addition to the mounting material, no further accessories are available for the sensors.

Available spare parts

Available spare parts include mounting material. For detailed information, please contact our service department or sales team at sales@noris-group.com.

2.8 Type code

Type code structure										
TA	**P**	**1**	**14**	**-14**	**11**	**-X**	**05**	**-L3**	**S0**	**Example: TAP114-1411-X05-L3S0**
	Measuring principle									
		Number of measuring elements								
			Construction type							
				Nominal length N (immersion depth)						
					Sensor tube diameter					
						Electrical connection				
							Cable length			
								Wire type design		
									Shield	

Type code type TA...										
Measuring principle	**P**	Pt100								
	PT	Pt1000								
Number of measuring elements		**1**	One measuring element							
		2	Two measuring elements							
Construction type			**14**	Flange sensor, lateral 90° cable outlet						
			141	Flange sensor, lateral 90° cable outlet, increased insulation resistance						
			17	Flange sensor, 45° cable outlet						
			171	Flange sensor, 45° cable outlet, increased insulation resistance						
			18	Flange sensor, straight cable outlet						
			181	Flange sensor, straight cable outlet, increased insulation resistance						
Nominal length N (immersion depth)				**14**	75 mm					
				15	100 mm					
					Customised lengths on request					
Sensor tube diameter					**06**	Ø 12 mm				
					11	Ø 05 mm				
						Customised diameters from 4…12 mm on request				
Electrical connection						**-X**	Standard cable end (without protection hose)			
						-XP	Cable end with polyamide protection hose			
						-XGS	Cable end with special protection hose (steel mesh)			
						-XGT	Cable end with special protection hose (textile-reinforced)			
Cable length							**05**	Sheath length 2.0 m, halogen-free		
							07	Sheath length 5.0 m, halogen-free		
							09	Sheath length 10.0 m, halogen-free		
Wire type design								**_ _**	Without code means 2-wire	
								L3	3-wire type	
								L4	4-wire type	
Shield									**_ _**	Without code: Shielding is attached to the sensor housing
									S0	Shielding is not attached to the sensor housing
TA	**_**	**_**	**_ _**	**-_ _**	**_ _**	**-_ _ _**	**_ _**	**-_ _**	**_ _**	**Example: TAP114-1406-XGT05**

3 Product description

3.1 Scope of application

Temperature sensors type TA[..] are mainly used in the transport technology for temperature measurement in traction motors, gear boxes, wheelset bearings and compressor- and air conditioning systems.

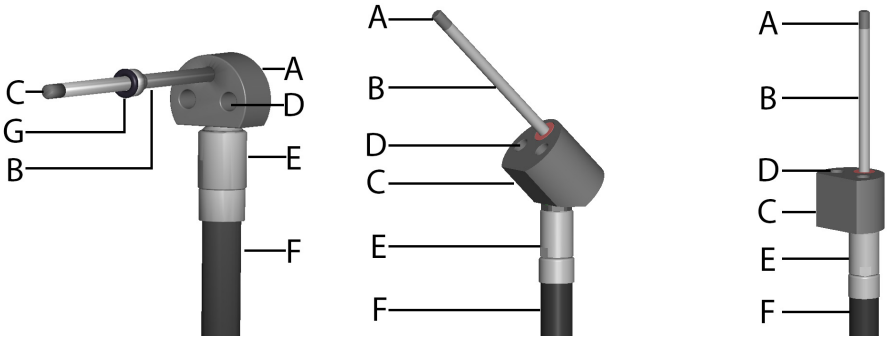
3.2 Measuring principle

Functioning of platinum measuring elements

With this measuring principle the temperature-sensitive resistance value of the measuring element is acquired. For platinum measuring elements the electrical resistance increases with increasing temperature and decreases with decreasing temperature (temperature linear). Advantages of platinum measuring elements are:

- accurate and reproducible thermoelectric characteristics
- nearly linear temperature characteristic
- easy to replace (no calibration necessary, corresponding to international standards, e. g. IEC 751 / DIN EN 60751)
- easier handling towards thermocouples as cold junction is not necessary

3.3 Temperature sensor design



Explanation to the previous illustration

A) Sensor head
B) Stainless steel sensor tube
C) Measuring tip brass nickel-plated
D) 2 holes for sensor mounting
E) Pivot (360°) for easy installation (for connection type -XGS and -XGT)
F) Connection cable
G) Option: Stepped sensor tube with O-ring

3.4 Customer-specific sensor combinations

Often several sensors are mounted in one sensor combination. The connection of this sensor combination may vary from our standard connections described in the type code (e. g. customer-specific connector). The detailed configuration of your sensor combination is described in your customer drawing.

4 Technical data

The following technical data are valid for sensor type TA14, TA17 und TA18.

Electrical connection	
Measuring current	Recommended 2.5 mA; max. 10 mA (note self heating)
Connection	Fixed connection cable, 0.33 mm² shielded, halogen-free (other on request)
Recommended cable length	≤ 100 m
Cross section used	Standard: 0.33 mm²
Output channels / Sensor elements	1 or 2 (see type code)

Signal acquisition	
Measuring principle	Pt100 with 2-, 3- or 4-wire circuit, Pt1000 with 2-wire circuit
Temperature range	Measuring tip: -40°C ... 250 °C Cable outlet: -40 ... 120 °C (short time 150 °C) Connection cable: -40 ... 120 °C (short time 150 °C)
Accuracy / Tolerance class	DIN EN 60571: class F0.3 (B) (other classes on request)
Transmission behaviour	Temperature linear
Response time	In water >0.2 m/s: t 0.5 = 5 s / t 0.9 = 12 s

Environmental influences	
Storage temperature	-40 ... 120 °C
Protection class	IP66/IP68
Vibration resistance	DIN EN 61373: 30 g eff. @ 20 ... 500 Hz (Random)
Shock resistance	DIN EN 61373: 1.000 m/s² @ 6 ms
Insulation voltage	500 VAC, 50 Hz @ 1 min
Insulation resistance	>200 MΩ @ 500 VDC
Fire protection class	EN 45545, DIN 5510, NF F 16-101
Applied standards	EN 50155, DIN EN 60571

Mechanical properties	
Material	Measuring tip: Brass nickel-plated Sensor tube: Stainless steel Housing: Aluminium anodised
Mounting	Flange mounting
Immersion depth	75 mm, 100 mm (other lengths on request)
Installation position	Any (note possible liquid inlet)
Weight	Depending on connection: approx. 400 g with 2 m cable (special protection hose) and connector HAN 3 HPR

5 Installation

5.1 Information on avoiding faults and damage

Soiling of the sensor

NOTICE

Ensure that the measuring tip of the sensor is not soiled.

A soiled measuring tip may lead to signal loss or even damage the sensor. Also note the recommendations in the “Maintenance” Section.

Sensor mounting

When mounting the sensor, make sure that the screw connections are tightened appropriately. Therefore, note the instructions in the Section “Installing the temperature sensor”.

NOTICE

Use appropriate tools and do not apply excessive force when mounting the sensor.

The sensor may otherwise be damaged.

Connection and securing connectors

When mounting the sensor, the data and information on the customer drawings always have priority over the information in this instruction manual.

NOTICE

Do not touch electronical parts of the sensor (connector pins, open cable ends, etc.) without appropriate measures to ground your body (e. g. ESD wristband).

Otherwise electrostatic discharge may damage the sensors’ electronic components.

NOTICE

Do not loosen the cable gland.

Otherwise humidity and dust may damage the sensors’ electronic components.

NOTICE

The connection are to be made and connector secured exactly as described on the customer drawings and in this manual.

Incorrect wiring and incorrectly or inappropriately tightened screw connections can result in signal loss or damage to the sensor and connection.

Cable installation

NOTICE

Make sure that the connection cable is layed correctly.

Incorrectly layed connection cables may result in signal loss or damage to the sensor.

NOTICE

Note the minimum cable bending radius when laying the cable (see customer drawing).

Otherwise the connection cable may be damaged.

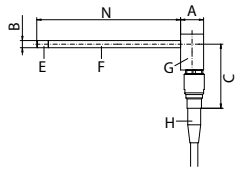
READ

You will find further information on cable installation in the Section “Connection and cable laying”.

5.2 Preparing for installation

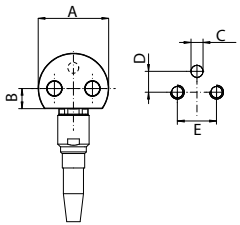
5.2.1 Dimensions

5.2.1.1 Dimensions TA14



Explanation to the illustration

N: Nominal length 75 $^{\pm 0.5}$ mm
(other lengths on request)
A: Length 16 mm
B: Ø 5 $^{\pm 0.05}$ mm
C: Length 52.5 $^{\pm 2}$ mm
(with standard cable)
E: Measuring tip nickel plated
F: Stainless steel tube
G: Sensor head aluminium anodised
H: Bend protection

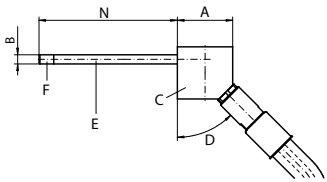


Explanation to the illustration

A: Ø 31.5 mm
B: Length 9 mm

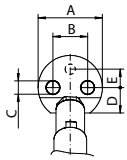
Boreholes top view:
C: Ø 5.2 ^{H11} mm
D: Length 9 mm
E: Length 17 $^{\pm 0.2}$ mm

5.2.1.2 Dimensions TA17



Explanation to the illustration

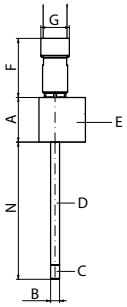
N: Nominal length 75 mm or 100 mm (other lengths on request)
A: Length 30 mm
B: Ø 5 $^{\pm 0.05}$ mm
C: Aluminium eloxiert
D: Angle 45°
E: Sensor tube stainless steel
F: Measuring tip nickel plated



Explanation to the illustration

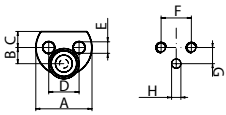
A: Ø 32 $^{-1}$ mm
B: Length 17 mm
C: Ø 6.5 mm
D: Length 12.5 mm
E: Length 9 mm

5.2.1.3 Dimensions TA18



Explanation to the illustration

N: Nominal length 75 $^{\pm 0,5}$ mm (other lengths on request)
A: Length 25 mm
B: Ø 5 $^{\pm 0,05}$ mm
C: Measuring tip nickel plated
D: Stainless steel tube
E: Sensor head aluminium anodised
F: Length 33 $^{\pm 2}$ mm
G: 15 $^{\pm 1}$ mm



Explanation to the illustration

A: Length 32 $^{-1}$ mm
B: Length 9 mm
C: Length 9 mm
D: Ø 17 mm
E: Ø 6.5 mm

Boreholes top view:
F: Length 17 $^{\pm 0.2}$ mm
G: Length 9 mm
H: Ø 5.2 ^{H11} mm

5.2.2 Checking the measuring object

NOTICE

Check the measuring object and note the following instructions. Consider also the tolerances in the technical drawings for your sensor.

Otherwise the temperature sensor may be damaged.

A. Check all mounting holes for soiling.

   ⇨ The mounting holes must not be soiled (no metal chips, old o-rings or other dirt).

B. Check the correct position of all mounting holes (see next Fig.,- Pos.4 and Pos.5).

NOTICE

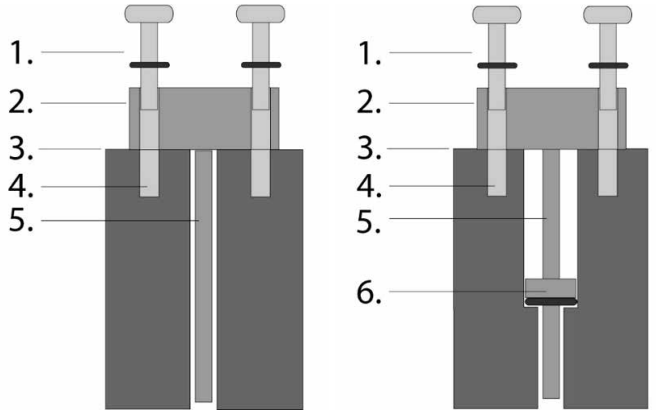
Position and dimension of all mounting holes must fit with the information in your technical drawings. The mounting hole for the sensor tube must be 1 mm longer that the nominal length of the sensor tube.

Otherwise the temperature sensor may be damaged.

HINT

Test the mounting hole by inserting carefully the sensor into the mounting hole.

The sensor head has to contact the mounting surface without any gap (no space between sensor and mounting surface, see next Fig., Pos.3).



Explanations to the previous illustration

1. Screw with spring washer
2. Sensor head
3. Mounting surface
4. Mounting holes for screws
5. Sensor tube / mounting hole
6. Pressure disc with O-Ring

5.2.3 Preparing tools and resources

For installation prepare the following tools:

- Proper screw-wrenches
- Torque wrench

5.3 Mounting the temperature sensor

Use the delivered mounting accessories (depending on scope of delivery):

- 2 screws M6x25 with spring rings.
- Mounting clips for connection cable
- O-rings for sensors with pressure disc

Follow the instructions for mounting the temperature sensor

A. This step is only necessary for sensors with pressure disc:
Push the two O-rings over the measuring tip up to the pressure disc.

B. Position the sensor in the mounting hole. For sensors with special protective tubing: To facilitate the positioning of the sensor it can be rotated via a pivot through 360°.

NOTICE

Comply with the recommended angle of 360° (+/- 180°) and do not overwind the pivot.

Otherwise, the connection wires in the sensor can twist and tear off.

C. Check the flange contact of the sensor to the surface.

⇨ No gaps between sensor head and mounting surface!

NOTICE

Do not use excessive force (e. g. a hammer) to position the sensor.

Otherwise, the sensor may be damaged and the manufacturer's warranty expires in such cases.

D. Use the torque wrench (torque of 10 Nm for M6 strength class 8.8) and screw tight the sensor with both hexagon screws and spring rings.

Remember

The responsible installation and service personnel must check the torque recommended above acc. to the application.

➡ The mounting of the temperature sensor is finished.

5.4 Connection and cable laying

5.4.1 Important information on connection and cable laying

NOTICE

Note the information on the customer drawings as well as the information and technical data on the corresponding sensor type as provided in this instruction manual. The connection instructions provided in this section apply to sensor types mentioned in the Section “Scope of Application”. Make sure your body is correctly grounded (!electrostatic discharge!) before touching the sensor connections.

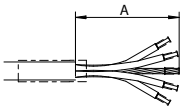
The cabling, connector or the sensor may otherwise be damaged.

- Sensors must be connected to the system with no interruptions.
- The connections must be shielded to an adequate extent and conduct well.
- Unshielded wires have to be kept as short as possible.
- Cable connections must be continuous, i.e. no terminals between sensor and system.
- Cable connections must be direct, i.e. shortest route without cable loops.
- Shielded cables must be used, as specified in the corresponding customer drawings.
- Maintain the minimum bending radius to avoid damage to the connecting cables.
- Do not exceed the maximum permissible cable length.
- Do not install the cable in the vicinity of electromagnetic fields or power lines. Signal and control lines have to be laid separately from each other to avoid coupling tracks (a minimum distance of 20 cm or more is recommended). If the local separation of sensor and motor lines is not possible, a metal plate or a metal tube has to be used for decoupling.
- In the cabinet the cables have to be laid near the cabinet housing (cabinet ground) or on the mounting plates to avoid crosstalk of the signals.
- Avoid tension, pressure and torsion stress on the cables.
- Make sure that no sharp-edged objects can touch the connection cables.
- Extensive cable shield is required.
- The sensor is always a part of the motor or machine unit. Therefore, make sure that the equipotential bonding of the sensor is part of the overall shield concept.
- Make sure that no compensating current flows via the cable shield due to the potential differences between the motor/machine and electrical ground connections. Therefore, take suitable precautions,

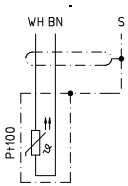
e. g. equipotential bonding lines with large cable cross section (minimum 10 mm^2). Note that the shield can be connected several times. In the switchgear cabinet, it can also be connected several times with the cabinet housing.

5.4.2 Connection variants

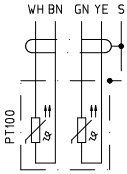
Cable end



2-wire circuit



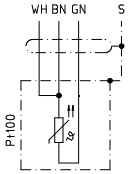
2 x 2-wire circuit



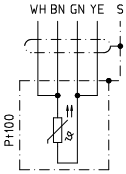
Explanation to the illustration

A: wire length 80 $^{\pm 10}$ mm

3-wire circuit

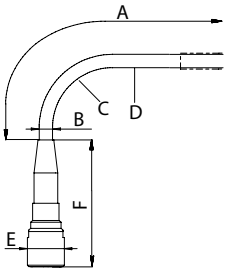


4-wire circuit



5.4.3 Cable variants

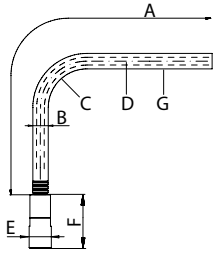
Cable standard (without protective tubing)



Explanation to the illustration

A: Length (see type code)
B: Ø 5 $^{\pm 0.5}$ mm
C: Min. bending radius R25 min.
D: Cable halogen-free, 0.33 mm² / 0.34 mm²
E: Ø 14 mm
F: Length 26 $^{\pm 2}$ mm

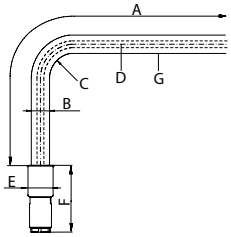
Cable with polyamide protective tubing



Explanation to the illustration

A: Length (see type code)
B: Ø 10 $^{\pm 0.5}$ mm
C: Min. bending radius R25 min.
D: Cable halogen-free, 0.33 mm² / 0.34 mm²
E: Ø 14 mm
F: Length 36 $^{\pm 2}$ mm
G: Protection hose polyamide PMA-PCST

Cable with special protective tubing



Explanation to the illustration

A: Length (see type code)
B: Ø 13.4 $^{\pm 0,7}$ mm
C: Min. bending radius R40 min.
D: Cable halogen-free, 0.33 mm² / 0.34 mm²
E: Ø 15 mm
F: Length 33 $^{\pm 2}$ mm
G: Protection hose textile-reinforced (Eaton GH585)

5.4.4 Cable length and resistance

The cable resistance depends on the cable length, the electrical conductivity and the electrical resistance of the cable and the wire cross-section. Note, that a higher wire cross-section reduces the cable resistance.

NOTICE

The cable resistance must be considered for the accurate temperature sensor installation.

Otherwise, wrong measurement results may occur and this could damage the system.

6 Maintenance

Temperature sensors contain no moving parts and are therefore classified as 'maintenance-free devices' by the manufacturer. Nevertheless, bear in mind that temperature sensors are part of a system and are therefore subject to various ambient factors (heat, cold, etc.). They are therefore included in the servicing concept as part of system maintenance. Connections and cabling their installation as well as downstream processing and evaluation components in particular are to be included in the maintenance concept.

The manufacturer recommends to check the temperature sensors at regular intervals as part of system maintenance. The sensors should be cleaned if soiled. If on inspection the temperature sensors is found to be damaged, replacement is recommended even if the damage does not directly cause failure or signal loss. Damaged connections and cabling should also be replaced immediately. Function tests should then be carried out to ensure trouble-free operation. This preventative maintenance avoids failures and consequential damage.

7 De-installation, repair and disposal

De-installation of sensors

NOTICE

If the sensor is removed for maintenance purposes, it must be stored properly to protect the sensor from moisture and dust.

Otherwise, the sensor may be damaged.

Return for repair

Before returning the sensor to NORIS Automation GmbH for repair or exchange purposes, ensure that all hazardous residuals, especially flammable and toxic fluids have been removed from the sensor tube.

⚠ CAUTION

Only return the sensor, when all hazardous fluids / objects have been removed from the sensor!

Otherwise, injuries could occur.

Disposal of defective devices

Electric devices should not be disposed of together with normal waste. Dispose of the devices in accordance with local requirements for electronic equipment.

8 Troubleshooting

8.1 Recommended procedure

When troubleshooting the system, it is essential to precisely identify the source of faults. Faults are often suspected in the wrong place. Targeted fault localisation is therefore indispensable.

HINT

A reliable method is the **exclusion procedure**:

1. Temporarily replace components that are suspected of being damaged by new components.
2. Temporarily interchange signal paths in order to locate the fault. If the fault migrates, the cause of the fault can be clearly determined in most cases.

8.2 Considerations for troubleshooting

Questions that can help you to quickly limit the scope of troubleshooting

1. **What kind of fault is it?**
   Is no measuring signal applied?
   Is the sensor defective?
   Is the signal faulty?
2. **Can the sensor be clearly identified as the cause of the fault (continue with Question 4) or could the fault be attributed to conditions on site or in the system, e.g. faulty cabling (continue with Question 3)?**
   If possible, try replacing the sensor by a new fully functional sensor to rule out the sensor as the cause of fault.
3. **Is the installation and/or cabling on site OK? (If so, continue with Question 4)**
   Further questions concerning installation and cabling:
   Have you checked whether the installation is correct (correct installation, correct distance, correct screw connection, etc.)?
   Is the cabling uninterrupted (no terminal connections, etc.)?
   Are the cables damaged (abraded, breaks, kinks, etc.)?
   Is the shielding correct? Is the system shielding concept coherent?
   Is the connector (if available) OK (e.g. no pushed-in contact pins) or the plug connection OK?
   Is the connector adequately sealed?
   Is the sensor tube clean?
4. **Are there signs of mechanical damage on the sensor? If so, what kind of damage is it? (If not, continue with Question 5)**
   If there is external damage on the sensor, it is recommended to replace the sensor to ensure reliable operation of the system and to avoid subsequent failure or consequential damage.
5. **Have you checked the sensor technically?**

A simple basic function test can already provide an indication as to whether the sensor is functioning correctly or not.

8.3 Frequent causes of fault

General causes of fault

- Is the correct type of sensor installed? Is it suitable for the temperature to be measured?
- Do the sensor operating conditions conform to the specification (environmental influences, scope of application)?

Electrical causes of fault

- Does the power source supply sufficient current (only for sensors with auxiliary voltage)?
- Is the sensor connected correctly (cable break, loose screws, etc.)?
- Have you considered the cable resistance?

Mechanical causes of fault

Check the measuring object and mounting assembly:

- Is the sensor installed correctly?
- Is the measuring object in good order and condition?

9 Service

Do you have any questions or do you require help with the installation, commissioning or maintenance? Contact our Service representatives:

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