

EN
English

Commissioning Instructions

Temperature Sensors / Measuring insets
SensyTemp TSP / SensyTemp TSA101



Temperature Sensors / Measuring insets SensyTemp TSP / SensyTemp TSA101

Commissioning Instruction - EN

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1 Safety

1.1 General information and notes for the reader

You must read these instructions carefully prior to installing and commissioning the device.

These instructions are an important part of the product and must be kept for future reference.

These instructions are intended as an overview and do not contain detailed information on all designs for this product or every possible aspect of installation, operation and maintenance.

For additional information or if specific problems occur that are not discussed in these instructions, contact the manufacturer.

The content of these instructions is neither part of any previous or existing agreement, promise or legal relationship nor is it intended to change the same.

This product is built based on state-of-the-art technology and is operationally safe. It has been tested and left the factory in perfect working order from a safety perspective. The information in the manual must be observed and followed in order to maintain this state throughout the period of operation.

Modifications and repairs to the product may only be performed if expressly permitted by these instructions.

Only by observing all of the safety instructions and all safety/warning symbols in these instructions can optimum protection of both personnel and the environment, as well as safe and fault-free operation of the device, be ensured.

Information and symbols directly on the product must be observed. They may not be removed and must be fully legible at all times.

1.2 Intended use

The temperature sensors are used for measuring temperatures in a vast range of process applications. The resistance thermometers or thermocouples can be used with or without a thermowell.

The device is designed for use exclusively within the values stated on the name plate and in the technical specifications (see the "Specifications" chapter in the operating instructions or the data sheet).

- The maximum operating temperature must not be exceeded.
- The permissible ambient temperature must not be exceeded.
- The housing's degree of protection must be observed during operation.

1.3 Target groups and qualifications

Installation, commissioning, and maintenance of the product may only be performed by trained specialist personnel who have been authorized by the plant operator to do so. The specialist personnel must have read and understood the manual and comply with its instructions.

Prior to using corrosive and abrasive materials for measurement purposes, the operator must check the level of resistance of all parts coming into contact with the materials to be measured. ABB Automation Products GmbH will gladly support you in selecting the materials, but cannot accept any liability in doing so.

The operators must strictly observe the applicable national regulations with regards to installation, function tests, repairs, and maintenance of electrical products.

1.4 Plates and symbols

1.4.1 Safety-/ warning symbols, note symbols



DANGER – <Serious damage to health / risk to life>

This symbol in conjunction with the signal word "Danger" indicates an imminent danger. Failure to observe this safety information will result in death or severe injury.



DANGER – <Serious damage to health / risk to life>

This symbol in conjunction with the signal word "Danger" indicates an imminent electrical hazard. Failure to observe this safety information will result in death or severe injury.



WARNING – <Bodily injury>

This symbol in conjunction with the signal word "Warning" indicates a possibly dangerous situation. Failure to observe this safety information may result in death or severe injury.



WARNING – <Bodily injury>

This symbol in conjunction with the signal word "Warning" indicates a potential electrical hazard. Failure to observe this safety information may result in death or severe injury.



CAUTION – <Minor injury>

This symbol in conjunction with the signal word "Caution" indicates a possibly dangerous situation. Failure to observe this safety information may result in minor or moderate injury. This may also be used for property damage warnings.



ATTENTION – <Property damage>!

The symbol indicates a potentially damaging situation.

Failure to observe this safety information may result in damage to or destruction of the product and/or other system components.



IMPORTANT (NOTICE)

This symbol indicates operator tips, particularly useful information, or important information about the product or its further uses. It does not indicate a dangerous or damaging situation.

1.4.2 TSP1xx, TSP3xx name plate

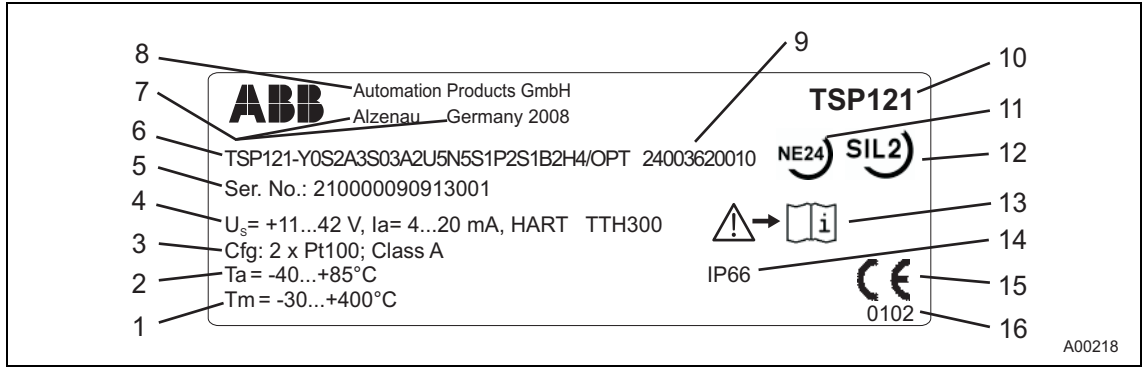


Fig. 1

- | | |
|--|---|
| 1 Medium temperature range (process temperature) | 9 Order number and item, e.g., 2400362 and 0010 |
| 2 Ambient temperature range (temperature at connection head) | 10 Model name |
| 3 Sensor configuration | 11 NE 24 conformity |
| 4 Specifications for transmitter | 12 SIL 2 |
| 5 Serial number | 13 Note: Refer to product documentation |
| 6 Order code | 14 Degree of protection |
| 7 Country / year of manufacture | 15 CE mark (EC conformity) |
| 8 Manufacturer | 16 Number of the notified body (in the case of ATEX-certified products) |

1.4.3 TSA101 name plate

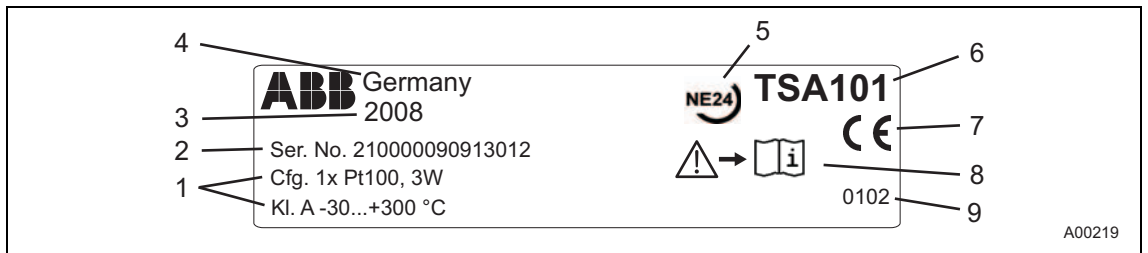


Fig. 2

- | | |
|--------------------------|--|
| 1 Sensor configuration | 6 Model name |
| 2 Serial number | 7 CE mark (EC conformity) |
| 3 Year of manufacture | 8 Note: Refer to product documentation |
| 4 Country of manufacture | 9 Number of the notified body (in the case of ATEX-certified products) |
| 5 NE 24 conformity | |

1.4.4 TSP1xx, TSP3xx approval plate

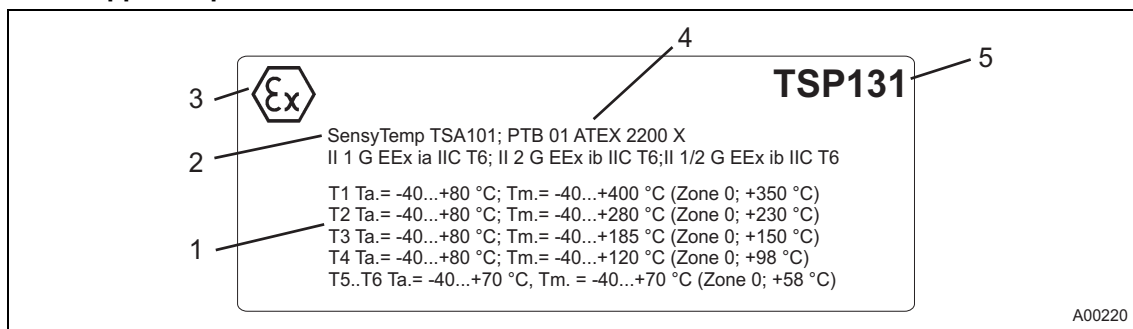


Fig. 3

- | | |
|------------------------------|-------------------|
| 1 Temperature range | 4 Approval number |
| 2 Model name as per approval | 5 Model name |
| 3 Ex designation | |

1.4.5 TSA101 approval plate

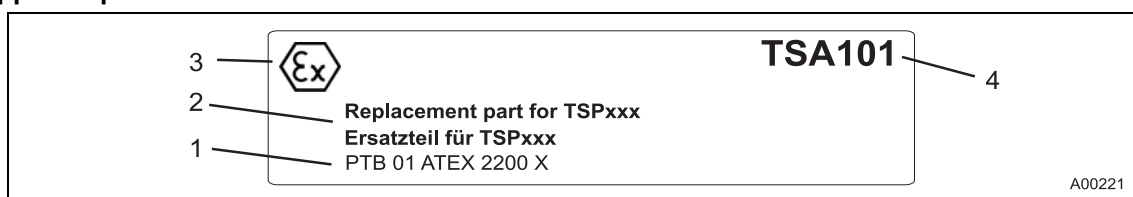


Fig. 4

- | | |
|---|------------------|
| 1 Number of approval body | 3 Ex designation |
| 2 Note: Measuring inset only for installation
in SensyTemp TSP1xx, TSP3xx
temperature sensors | 4 Model name |

Note regarding process temperature

The values specified on the name plate are maximum values and do not take process-related stress into consideration. This should be taken into consideration when working with the instruments.

1.5 Transport safety information

Observe the following information:

- Do not expose the device to moisture during transport. Pack the device accordingly.
- Pack the device so that it is protected from vibration during transport, e.g. through air-cushioned packaging.

1.6 Safety information for electrical installation

- The electrical connection may only be made by authorized specialist personnel and in accordance with the electrical circuit diagrams.
- The electrical connection information in the manual must be observed; otherwise, the type of electrical protection may be adversely affected.
- Safe isolation of electrical circuits which are dangerous if touched is only guaranteed if the connected devices satisfy the requirements of DIN EN 61140 (VDE 0140 Part 1) (basic requirements for safe isolation).
- To ensure safe isolation, install supply lines so that they are separate from electrical circuits which are dangerous if touched, or implement additional isolation measures for them.

1.7 Operating safety information

Before switching on, ensure that the specified environmental conditions in the “Technical Specifications” chapter and in the data sheet are complied with and that the power supply voltage corresponds with the voltage of the transmitter.

When there is a chance that safe operation is no longer possible, put the device out of operation and secure against unintended operation.

2 Use in potentially explosive atmospheres

In potentially explosive atmospheres, special regulations must be observed for the power supply, signal inputs/outputs, and ground connection. The information relating specifically to explosion protection that appears within the individual chapters must be observed.



Notice - Potential damage to parts!

All parts must be installed in accordance with the manufacturer's specifications, as well as relevant standards and regulations.

Commissioning and operation must be performed in accordance with ATEX 137 or BetrSichV (German Ordinance on Industrial Safety and Health), EN 60079-14 (Electrical apparatus for explosive gas atmospheres), and EN 50281-1-2 and 2/A1 (Electrical apparatus for use in the presence of combustible dust).

2.1 Degree of protection

The connection parts of the temperature sensor must be installed so that a degree of protection of at least that of the type of explosion protection used can be achieved.

2.2 Temperature classes

The temperature sensors are marked as conforming to temperature class T6 as standard. If the existing explosive gas atmosphere is to be assigned a temperature class of T5, T4, T3, T2, or T1, the temperature sensor can be used at correspondingly higher process temperatures.

2.3 Electrostatic charging

Please make sure to avoid impermissible electrostatic charging of the temperature sensor when using it in potentially explosive atmospheres.

2.4 Grounding

If, for functional reasons, the intrinsically safe circuit needs to be grounded by means of a connection to the equipotential bonding, it may only be grounded at one point.

2.5 Interconnection

If the temperature sensor is operated in an intrinsically safe circuit, proof that the interconnection is intrinsically safe must be provided in accordance with DIN VDE 0165/Part 1 (EN 60079-25/2004 and IEC 60079-25/2003). An interconnection certificate must always be provided for intrinsically safe circuits.

2.6 Configuration

The temperature sensor can be configured in the potentially explosive atmosphere in compliance with the interconnection certificate, both directly in the potentially explosive atmosphere using approved handheld HART terminals and by coupling an Ex modem into the circuit outside the potentially explosive atmosphere.

2.7 Ex relevant specifications

See Chapter 6, "Ex relevant specifications" page 24.

3 Mounting

3.1 General

- The temperature sensors (thermocouple, resistance thermometer) have to be in maximum contact with the medium to be measured.
- The Ingress Protection degree will no longer apply in the event of damage to the connection head or the threads, seals, or cable glands on the connection head.
- The connection wires must be firmly connected to the connection terminals.
- The correct polarity must be ensured if using thermocouples.
- When using resistance thermometers, take note of whether a two-, three-, or four-wire circuit is being used.
- When installing temperature sensors in existing thermowells, make sure that the measuring inset can be inserted easily. If this is not the case, the inside of the thermowell will need to be cleaned.
- The temperature sensor must be firmly and securely installed in a way that conforms to the requirements of the application process.
- Please take note of the sensor and circuit type specified.
- After clamping the connection lines using a suitable tool (screwdriver, wrench), you must ensure that the connection heads are securely closed and sealed again. When doing this, make sure that the sealing rings of the connection heads are clean and undamaged.

3.2 Cable glands

SensyTemp TSP1xx and TSP3xx temperature sensors are supplied with a M20 x 1.5 cable gland. Approved cable glands are used as appropriate for temperature sensors with Ex certification. If used correctly, these cable glands can help achieve a degree of protection of at least IP 66 (in the case of TSP1X1) or IP66 / 67 (in the case of SensyTemp TSP3X1).

Alternatively, the temperature sensor can be supplied without cable glands but with an M20 x 1.5 or 1/2" NPTF thread only. In this case, the user must take appropriate measures to ensure that the required degree of protection is achieved.

With this option it is also necessary to ensure that the measures taken satisfy the relevant requirements and standards concerning explosion protection (e.g., EN 50018) as well as the approvals for the relevant temperature sensors (e.g., PTB 99 ATEX 1144 for EEx d).

In practice, you may find the specified degree of protection can no longer be achieved if certain cables and lines are used in conjunction with the cable gland. Deviations from the test conditions as set out in the IEC 60529 standard must be checked. Check the cables' concentricity, transposition, external hardness, sheath, and surface roughness.

3.2.1 Requirements for achieving the degree of protection

- Cable glands may only be used in the specified clamping area.
- When using very soft cable types, do not use them in the lower clamping area.
- Only use round cables or cables with a slightly oval-shaped cross section.
- Frequent opening / closing is possible but may have a negative effect on the degree of protection.
- If cables are demonstrating pronounced cold flow behavior, the cable glands will need to be retightened.
- Armoured cables require special cable glands.

3.3 Insertion depth

The insertion depth of a temperature sensor affects the accuracy of measurements:

Too shallow an insertion depth can result in measurement errors due to heat dissipation via the process connection and the pipeline or tank wall. (The extent of the error depends on the ambient conditions at the measuring point.)

Recommended insertion depth (to avoid heat dissipation errors)

Medium	Depth [mm]
Fluids	8 ... 10 x Ø thermowell tip
Gases	10 ... 15 x Ø thermowell tip

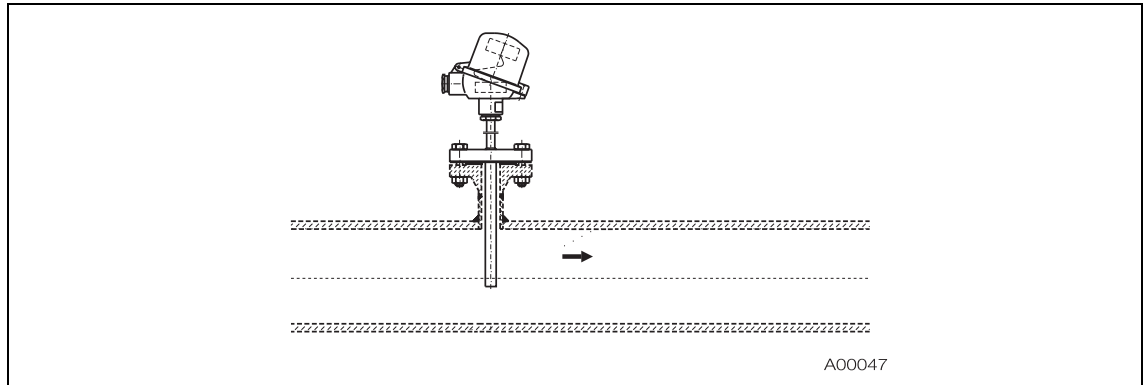


Fig. 5

3.4 Insufficient nominal diameter

In the case of pipelines with very small nominal diameters, insertion at an angle or in an elbow pipe is recommended; the thermowell tip must be positioned against the flow of the medium in this case.

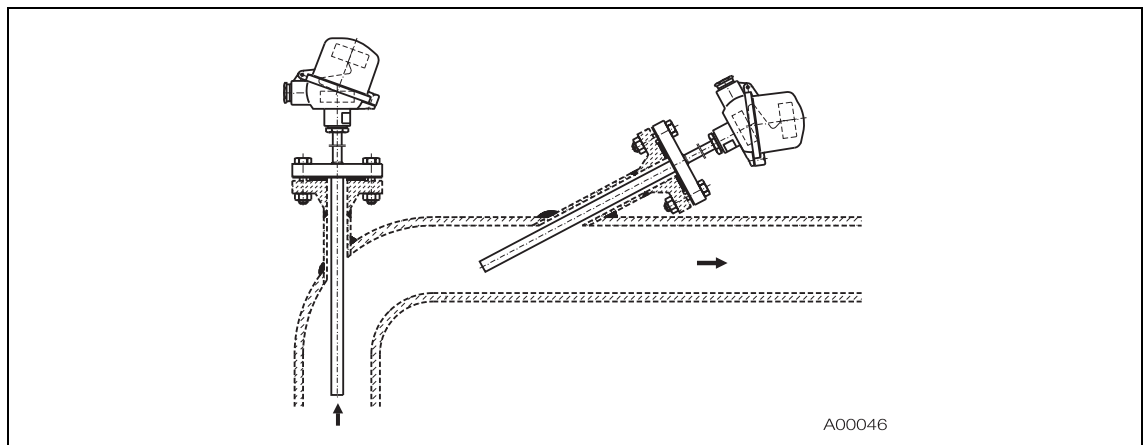


Fig. 6

3.5 Potentially explosive atmosphere

Avoid increases in the ambient temperature by ensuring equipment is at a sufficient distance from system components with excessively high temperatures. It must be ensured that heat dissipation can take place by means of unrestricted air circulation. You must avoid exceeding the maximum permissible ambient temperature as per the approved temperature class.

Installation and removal may only be performed by specialist personnel who have knowledge of the concept behind the relevant Ex types of protection. Compliance with the Ex temperature classes must be ensured by putting appropriate measures in place.

It is essential to ensure compliance with the EC-type-examination certificates for the equipment, including the documents associated with these.

The temperature sensors must be included in the equipotential bonding.

3.5.1 Intrinsic safety

ATEX II 1 G EEx ia IIC T1 ... T6, Zone 0, 1, 2

No additional specific information needs to be observed for mechanical installation.

3.5.2 Intrinsic safety acc. to NAMUR recommendation

NE 24 and ATEX II 1 G EEx ia IIC T1 ... T6

No additional specific information needs to be observed for mechanical installation.

3.5.3 Dust-ignition protection

ATEX II 1 D IP6X T133 ... T400, Zone 20, 21, 22

Installation and removal may only be performed by specialist personnel who have knowledge of the concept behind the type of protection "Electrical apparatus with protection by enclosure and with surface temperature limitation for use in areas in which combustible dust is present in sufficient quantities that it may create a risk of fire or explosion (dust-ignition protection)".

The temperature sensors are to be connected securely and tightly to the container concerned, in accordance with their mounting type (thermowell with flange, with threaded connection, with sliding connector or as welded thermowell). Choose connection elements that are suitable for the application in question (screws, seals, etc.).

Only use connection cables that satisfy the requirements of DIN EN 50281-1-2:1998 Pt. 11.

SensyTemp TSP1X1 and TSP3X1 temperature sensors must be installed in an existing thermowell.

3.5.4 Dust-ignition protection and intrinsic safety

ATEX II 1 D IP6X T133 ... T400 and ATEX II 1 G EEx ia IIC T1 ... T6, Zone 0, 1, 2, 20, 21, 22

Chapters 3.5.1 and 3.5.3 must be applied in respect of this.



Important

Use in explosive hybrid mixtures (where explosive dusts and gases are present simultaneously) is not currently permitted in accordance with EN 60079-0 and EN 61241-0.

3.5.5 Flameproof enclosure

ATEX II 1/2 G EEx d IIC T1 ... T6, Zone 1

For Zone 0, thermowells which satisfy the following requirements must be used:

- Install suitable thermowells for zone separation. SensyTemp TSP321 and TSP331 temperature sensors are supplied with an appropriate thermowell. SensyTemp TSP311 temperature sensors must be installed in an existing thermowell.
- Suitable temperature-, pressure- and corrosion-resistant sealing elements must be used.

Use only prototype-certified ABB measuring insets whose diameter matches the corresponding hole of the connection head (ignition penetration-proof seam).

If there is surface damage in the area of the ignition penetration-proof seam of the measuring inset or the connection head base, the defective components may no longer be used.

- Observe the approval and installation information for the cable gland. In the case of cable glands supplied by ABB, operating instructions 42/10-57 XU must be observed.

3.5.6 Intrinsic safety and flameproof enclosure

ATEX II 1 G EEx ia IIC T1 ... T6 and ATEX II 1/2 G EEx d IIC T1 ... T6

Chapters 3.5.1 and 3.5.5 must be applied in respect of this.

3.5.7 Dust-ignition protection and flameproof enclosure

ATEX II 1 D IP 6X T133 ... T400 and ATEX II 1/2 G EEx d IIC T1 ... T6, Zone 1, 2, 20, 21, 22

Chapters 3.5.3 and 3.5.5 must be applied in respect of this.



Important

Use in explosive hybrid mixtures (where explosive dusts and gases are present simultaneously) is not permitted in accordance with EN 60079-0 and EN 61241-0.

3.5.8 ATEX II 3 G EEx nA II T1 ... T6 and ATEX II 3 D IP6X T133 ... T300, Zone 2 and 22

No additional specific information needs to be observed for mechanical installation.



Important

Use in explosive hybrid mixtures (where explosive dusts and gases are present simultaneously) is not permitted in accordance with EN 60079-0 and EN 61241-0.

4 Electrical connections

4.1 General

The following applies to devices with a transmitter: The power supply and signal are routed in the same line and must be implemented as a Safety Extra Low Voltage (SELV) or Protective Extra Low Voltage (PELV) circuit in accordance with IEC 61508.

- The cable wires must be provided with end sleeves.
- When using PROFIBUS PA, the design must be in accordance with EN 50170 for PROFIBUS PA.
- When using FOUNDATION Fieldbus H1, the design must be in accordance with IEC 61158.
- The user is responsible for ensuring EMC-compliant cabling.

4.1.1 Electrical interconnection in potentially explosive atmospheres

Special interconnections are required for use in hazardous areas depending on the safety requirements.

Intrinsic safety

The Power supply SPS inputs must have corresponding input protection circuits available in order to eliminate a hazard (spark formation). An interconnection inspection must be performed. For proof of the intrinsic safety, the electrical limit values are to be used as the basis for the prototype test certificates of the apparatuses (devices), including capacitance and inductivity values of the wires. The proof of the intrinsic safety is given if the following conditions are fulfilled with comparison of the limit values of the apparatus.

Transmitter (intrinsically safe apparatus)		Power supply / SPS input (related apparatus)
U_i	\geq	U_o
I_i	\geq	I_o
P_i	\geq	P_o
$L_i + L_c$ (cable)	\leq	L_o
$C_i + C_c$ (cable)	\leq	C_o

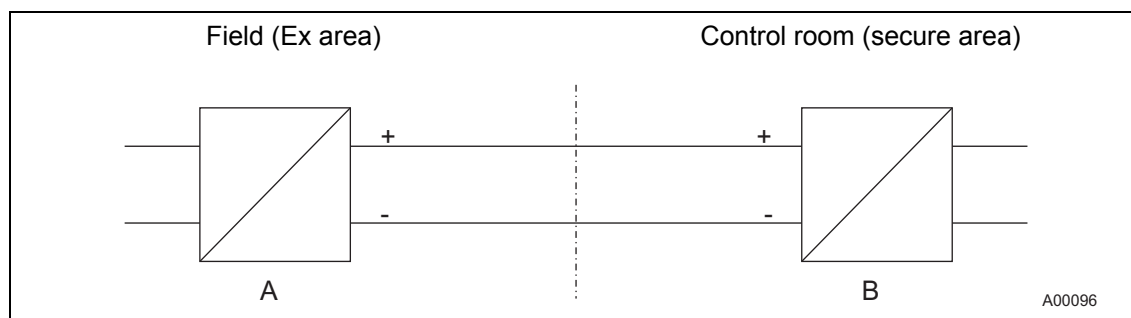


Fig. 7

A Transmitter

B Power supply / SPS input



Important

Observe the “Technical specifications” and “Explosion-protection technical data” chapters (see data sheet resp. operating instructions).

4.1.3 Harting plug connection in connection head

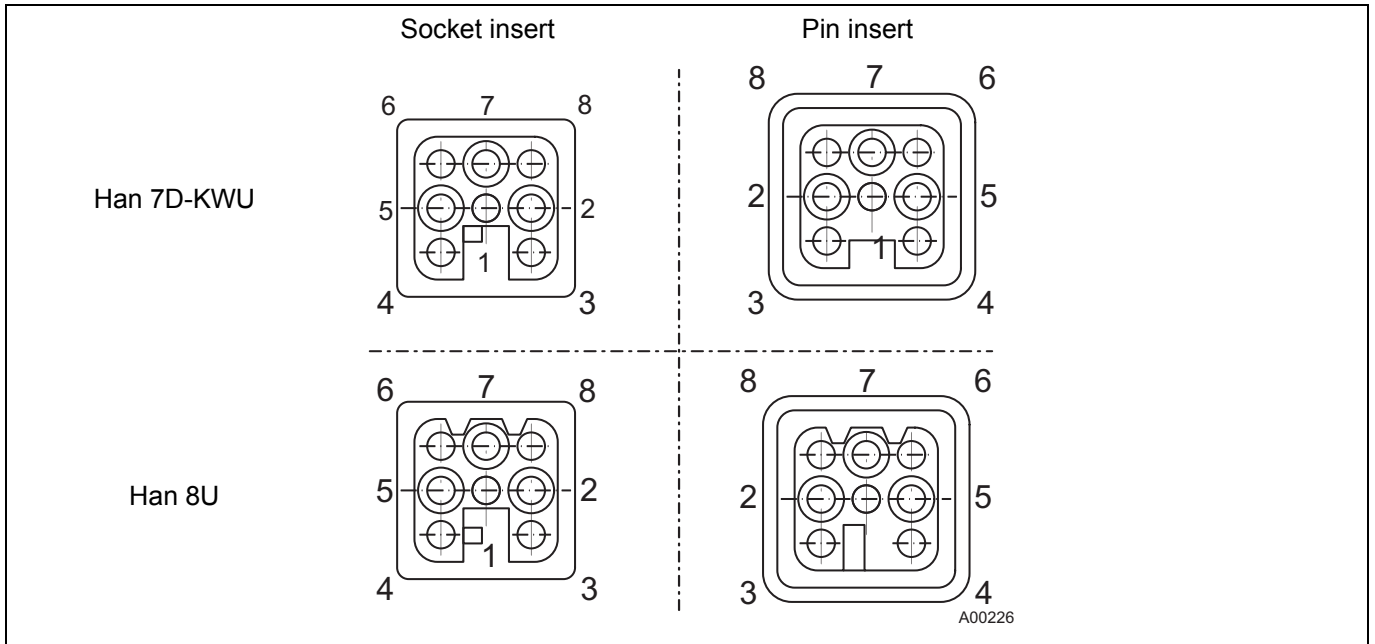


Fig. 11: External view in each case

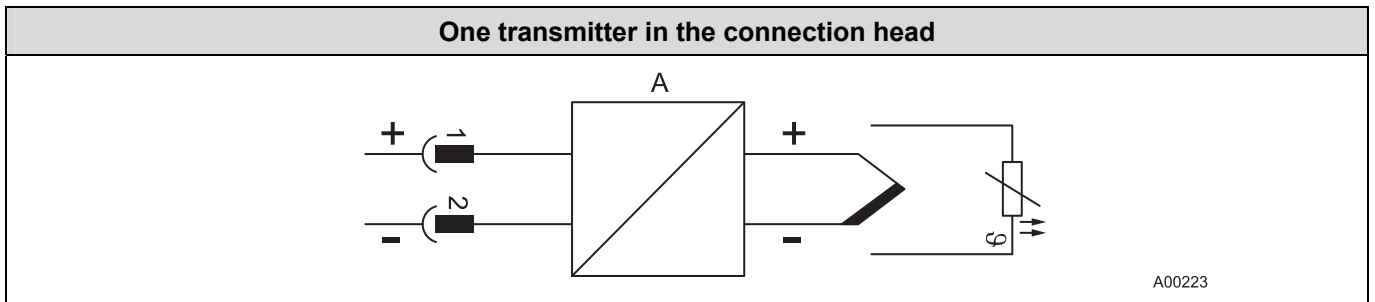


Fig. 12
A Transmitter

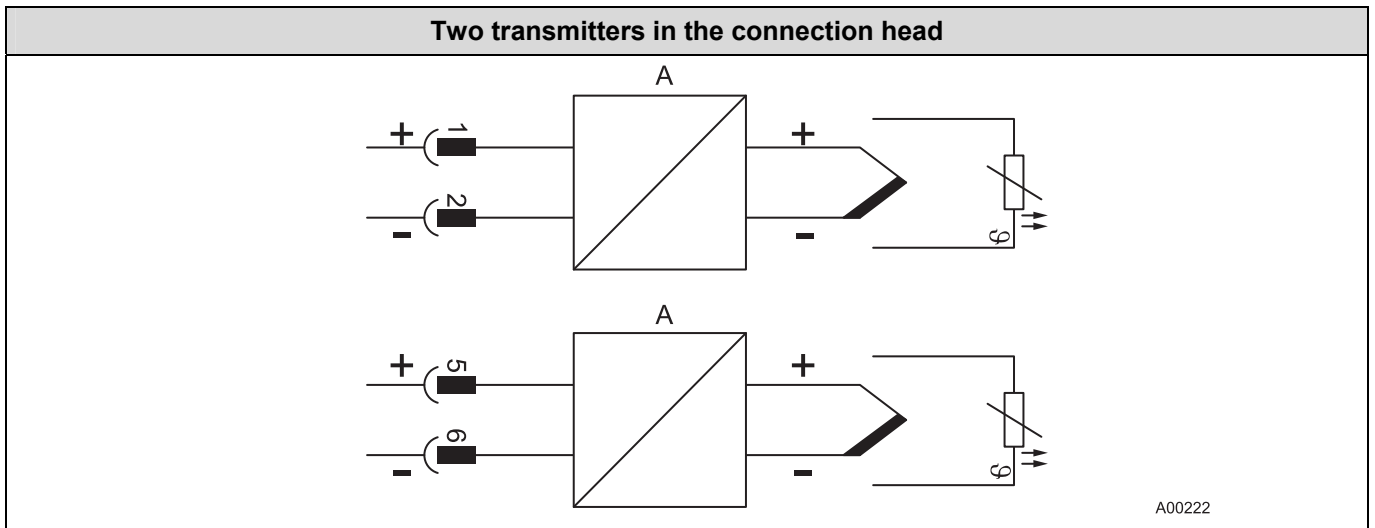


Fig. 13
A Transmitter

4.1.3.1 Resistance thermometer

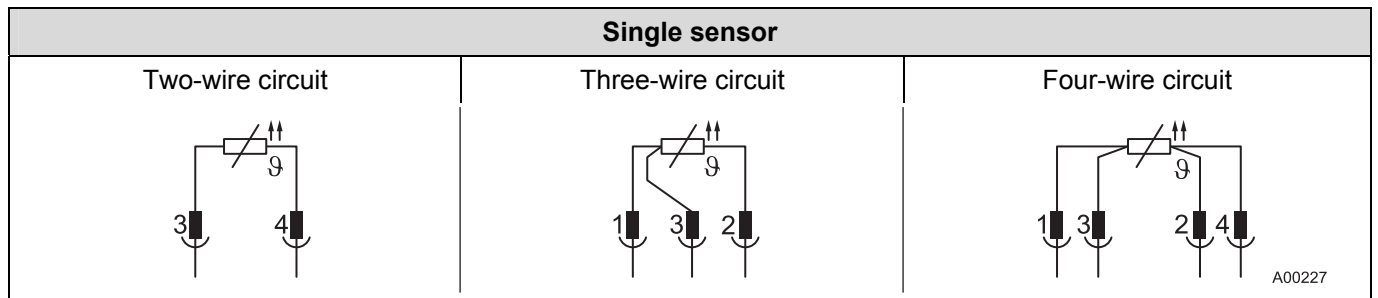


Fig. 14

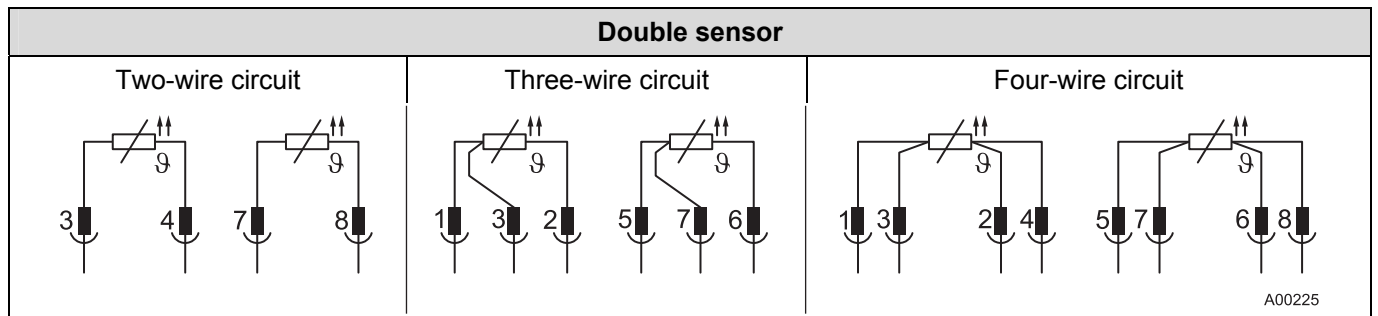


Fig. 15

4.1.3.2 Thermocouple

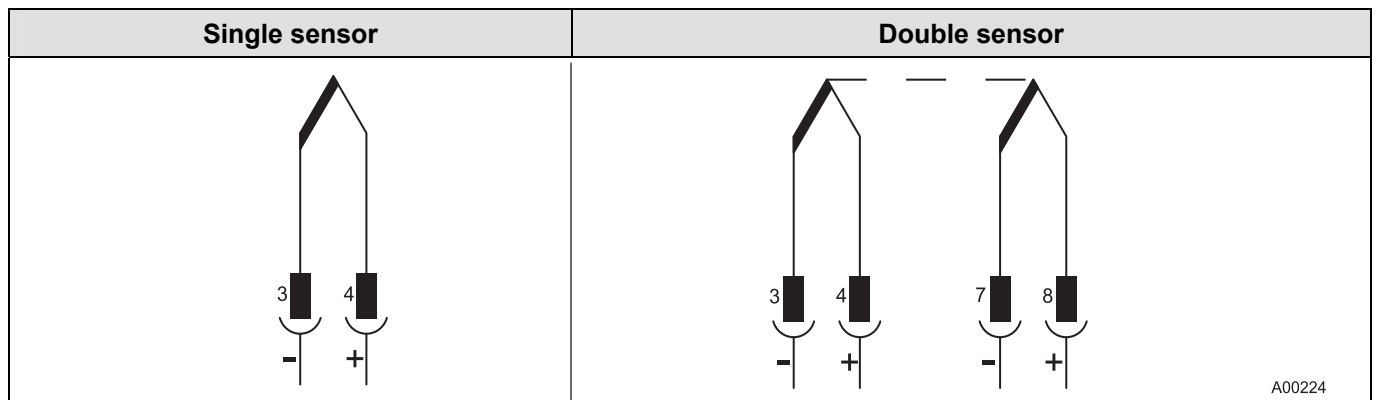


Fig. 16

4.1.4 Installation in a potentially explosive atmosphere

The temperature sensor can be installed in a huge variety of industrial locations. Plants with explosion protection (Ex plants) are divided into zones, meaning that they also require a wide range of instruments. Ex relevant specifications as outlined in the chapter titled "Ex relevant specifications" in the operating instructions must be observed.

The temperature sensor must be instrumented by the user in accordance with the valid Ex standards. This involves ensuring compliance with the electrical connection values in accordance with the associated EC-type-examination certificate.

4.1.4.1 Intrinsic safety

ATEX II 1 G EEx ia IIC T6 ... T1, Zone 0, 1, 2

In the case of the intrinsic safety type of protection, only one measuring element may be connected in Zone 0 if two measuring elements are being used (e.g., 2 x Pt100). The internal wiring in TTH300 transmitters enables 2 measuring elements to be connected since both elements are integrated into the same intrinsically safe sensor circuit.

Only certified transmitters with the maximum values specified in the operating instructions may be connected to the temperature sensors. If two transmitters are used for two intrinsically safe circuits, the sum of the values may not exceed the maximum values specified in the operating instructions. For the Zone 0 design, only one intrinsically safe sensor measurement circuit may be used.

The temperature sensor must feature appropriate input protection circuits in order to eliminate hazards (spark formation). The interconnection must be inspected. In order to provide proof of intrinsic safety, the electrical limit values must be used as the basis for the type-examination certificates for the equipment (devices); this includes the capacitance and inductance values for the connection cables.

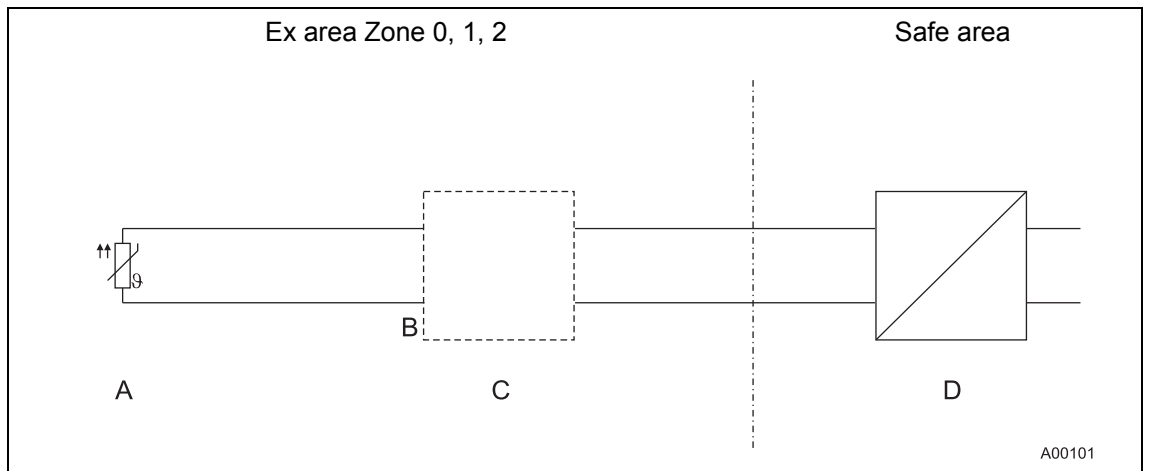


Fig. 17

- A Sensor
- B Sensor connection cables
- C Housing
- D EEx ia/ib transmitter

The transmitter must have an EEx ia (Category 1G) design to enable it to be used in Zone 0.

4.1.4.2 Intrinsic safety acc. to NAMUR recommendation

NE 24 and ATEX II 1 G EEx ia IIC T1 ... T6

See Chapter 4.1.4.1.



Important

Due to the geometric dimensions within the mineral insulated cable, double sensors may not satisfy the requirements of Point 2 of Namur recommendation NE 24.

4.1.4.3 Dust-ignition protection

ATEX II 1 D IP6X T133 ... T400, Zone 20, 21, 22

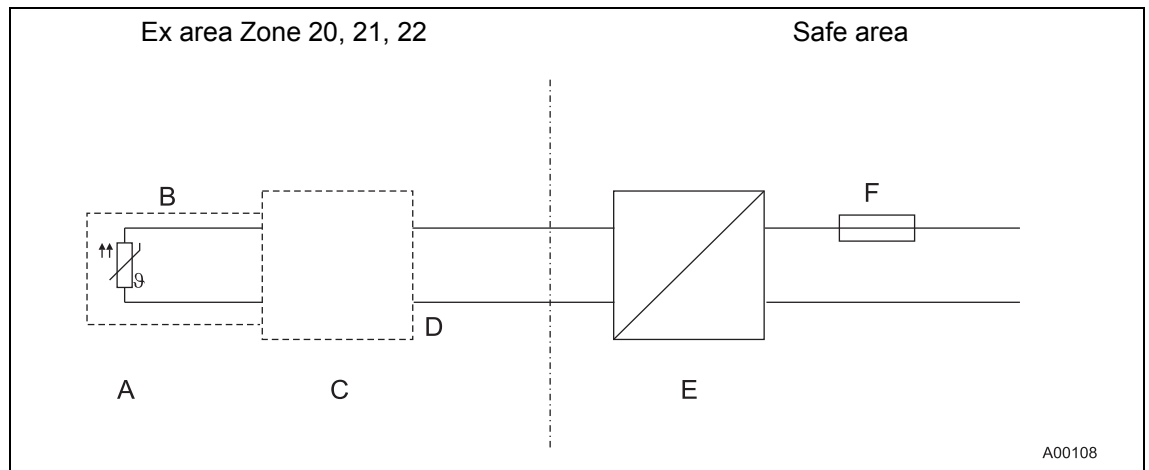


Fig. 18

- | | |
|---|----------------------------|
| A Sensor | D Sensor connection cables |
| B Thermowell | E Transmitter |
| C EEx D approved connection head with EEx D cable gland | F 32 mA fuse |

The transmitter supply current must be limited by an upstream fuse conforming to IEC 127 with a fuse nominal current of 32 mA. This is not required if the transmitter has an intrinsically safe design according to Chapter 4.1.4.1.

4.1.4.4 Dust-ignition protection and intrinsic safety

ATEX II 1 D IP6X T133 ... T400 and ATEX II 1 G EEx ia IIC T1 ... T6, Zone 0, 1, 2, 20, 21, 22

See Chapters 4.1.4.1 and 4.1.4.3.

4.1.4.5 Flameproof enclosure

ATEX II 1/2 G EEx d IIC T1 ... T6, Zone 1, 2

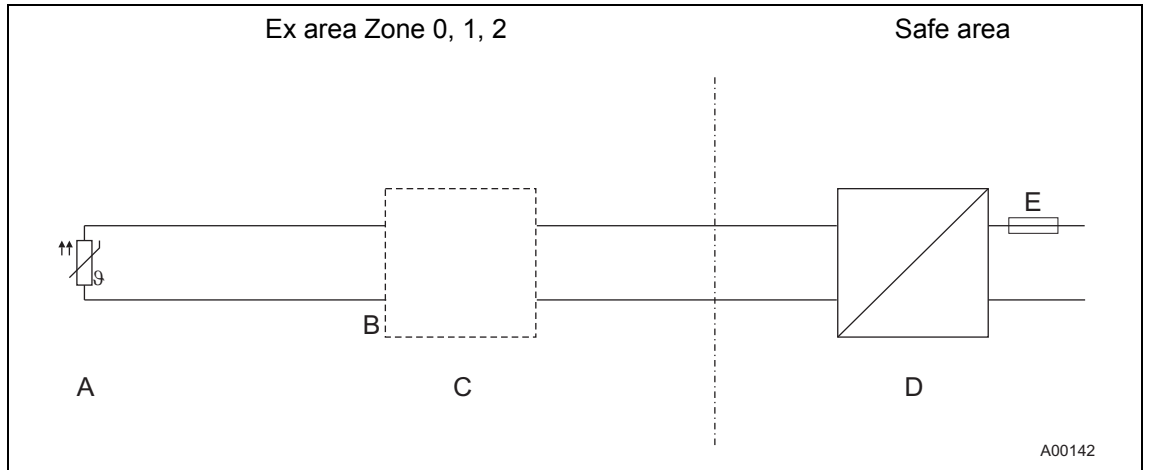


Fig. 19

- A Sensor
- B Sensor connection cables
- C EEx d housing (IP6X) with EEx d cable gland
- D EEx ia/ib transmitter
- E 32 mA fuse

The transmitter supply current must be limited by an upstream fuse conforming to IEC 127 with a fuse nominal current of 32 mA. This is not required if the transmitter has an intrinsically safe design according to Chapter 4.1.4.1.

4.1.4.6 Intrinsic safety and flameproof enclosure

ATEX II 1 G EEx ia IIC T1 ... T6 and ATEX II 1/2 G EEx d IIC T1 ... T6

See Chapters 4.1.4.1 and 4.1.4.5.

4.1.4.7 Dust-ignition protection and flameproof enclosure

ATEX II 1 D IP 6X T133 ... T400 and ATEX II 1/2 G EEx d IIC T1 ... T6, Zone 1, 2, 20, 21, 22

See Chapters 4.1.4.3 and 4.1.4.5.

4.1.4.8 ATEX II 3 G EEx nA II T1 ... T6 and ATEX II 3 D IP6X T133 ... T300, Zone 2 and 22

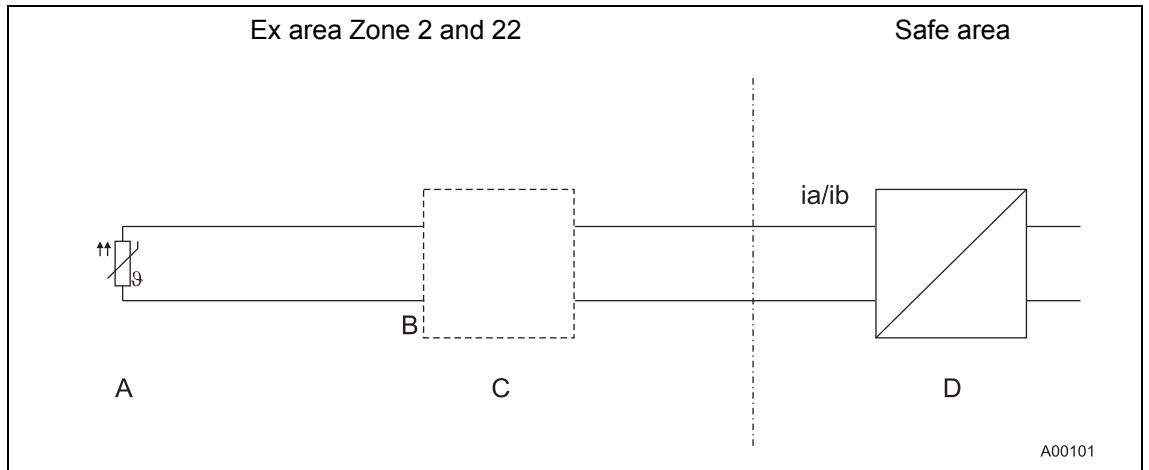


Fig. 20

- A Sensor
- B Sensor connection cables
- C Housing with IP6X
- D Transmitter

4.1.5 Installation in a potentially explosive atmosphere

4.1.5.1 Intrinsic safety

ATEX II 1 G EEx ia IIC T1 ... T6, Zone 0, 1, 2

With this instrumentation, it must be ensured that the power feed only comes from an approved intrinsically safe electrical circuit of the appropriate category. The electrical and thermal parameters may not be exceeded; see the chapter titled "Thermal data" in the operating instructions.

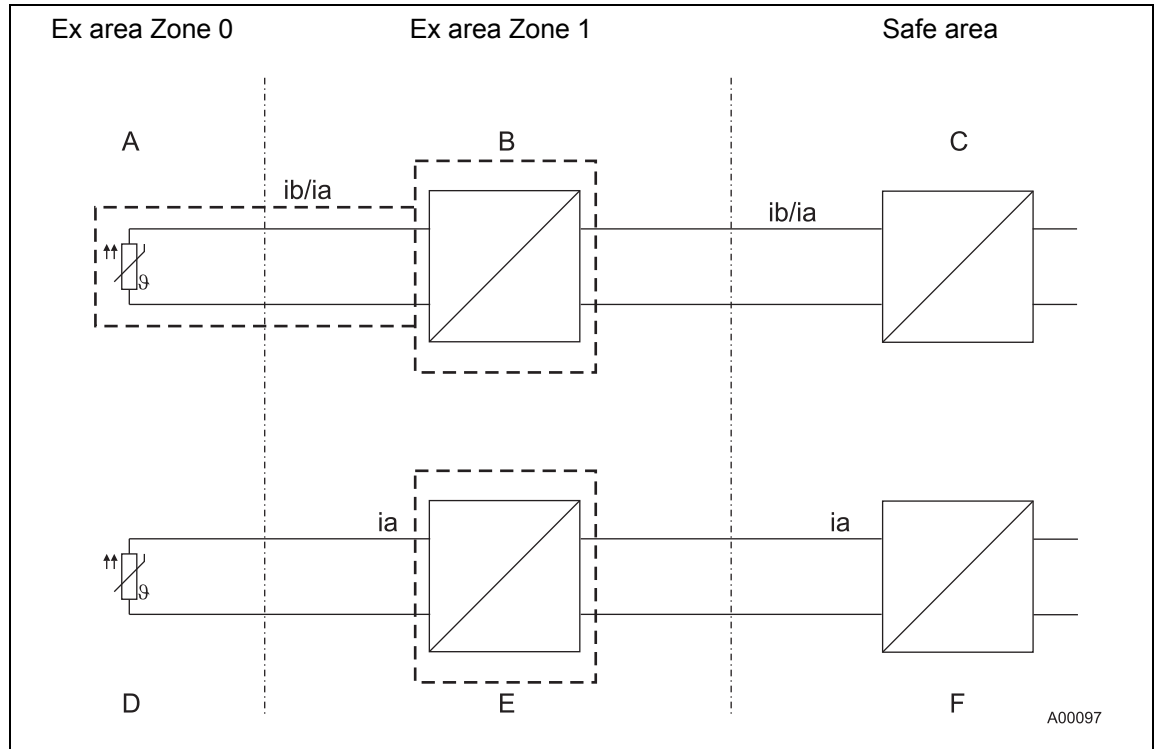


Fig. 21

- | | |
|---|---|
| A Measuring inset with thermowell | D Measuring inset |
| B EEx ib or ia transmitter in connection head | E EEx ia transmitter in connection head |
| C Supply isolator [EEx ia/ib] | F Supply isolator [EEx ia] |

4.1.5.2 Intrinsic safety acc. to NAMUR recommendation

NE 24 and ATEX II 1 G EEx ia IIC T1 ... T6

See Chapter 4.1.5.1.



Important

Due to the geometric dimensions within the plastic-sheathed cable, double sensors may not satisfy the requirements of Point 2 of Namur recommendation NE 24.

4.1.5.3 Dust-ignition protection

ATEX II 1 D IP 6X T133 ... T400, Zone 20, 21, 22

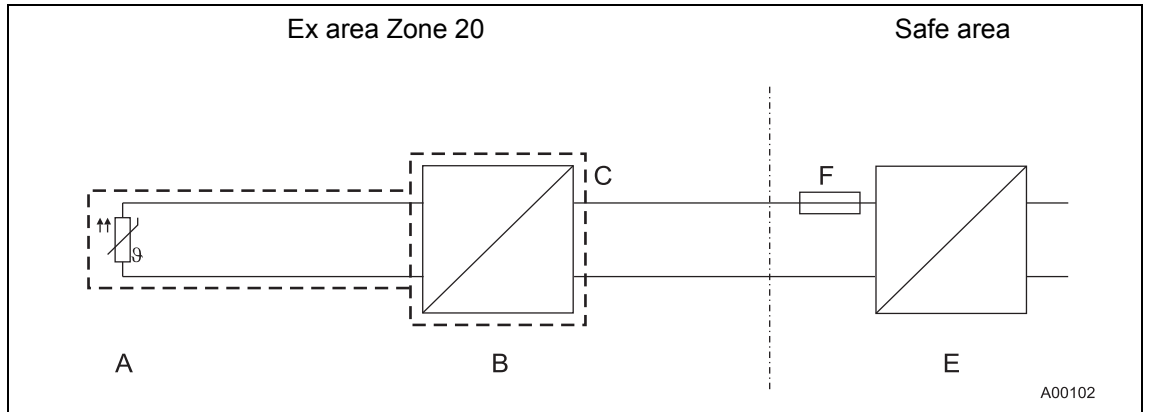


Fig. 22

- A Measuring inset with thermowell
- B Transmitter
- C EEx D approved housing with EEx D cable gland
- D Fuse
- E Supply isolator

The transmitter supply current must be limited by an upstream fuse conforming to IEC 127 with a fuse nominal current of 32 mA. This is not required if the transmitter has an intrinsically safe design according to Chapter 4.1.5.1.

4.1.5.4 Dust-ignition protection and intrinsic safety

ATEX II 1 D IP 6X T133 ... T400 and ATEX II 1 G EEx ia IIC T1 ... T6, Zone 0, 1, 2, 20, 21, 22

See Chapters 4.1.5.1 and 4.1.5.3.

4.1.5.5 Flameproof enclosure

ATEX II 1/2 G EEx d IIC T1 ... T6, Zone 1

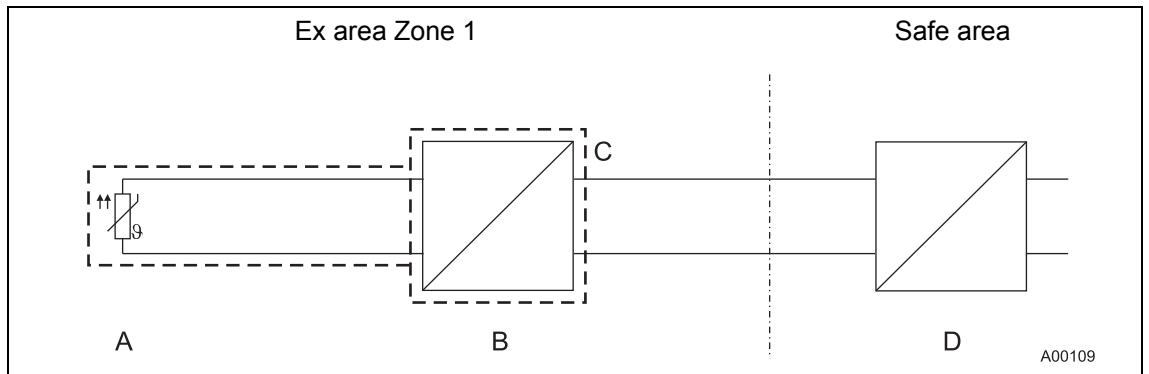


Fig. 23

- A Measuring inset with thermowell
- B Transmitter in connection head
- C EEx d housing (IP6X) with EEx d cable gland
- D Supply isolator

4.1.5.6 Intrinsic safety and flameproof enclosure

ATEX II 1 G EEx ia IIC T1 ... T6 and ATEX II 1/2 G EEx d IIC T1 ... T6

See Chapters 4.1.5.1 and 4.1.5.5.

4.1.5.7 Dust-ignition protection and flameproof enclosure

ATEX II 1 D IP6X T133 ... T400 and ATEX II 1/2 G EEx d IIC T1 ... T6, Zone 1, 2, 20, 21, 22

See Chapters 4.1.5.3 and 4.1.5.5.

4.1.5.8 ATEX II 3 G EEx nA II T1 ... T6 and ATEX II 3 D IP6X T133 ... T300, Zone 2 and 22 (non-conducting dusts)

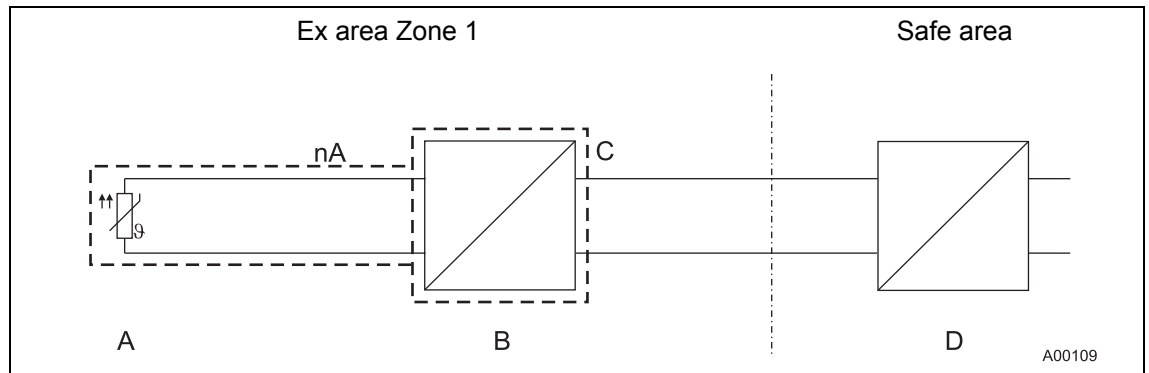


Fig. 24

A Measuring inset with or without thermowell

B EEx nA transmitter in connection head

C Housing with IP 6X

D Supply isolator

5 Commissioning

The following must be checked before commissioning:

- Thermowells and protective sleeves have been installed correctly and form a tight seal (especially when used as a separation element for Zone 0).
- Equipotential bonding line is connected.
- The electrical specifications comply with the specified Ex relevant values.
- Electrical connection and installation has been carried out correctly in accordance with the "Installation" and "Electrical connection" chapters.

Ex relevant specifications

6 Ex relevant specifications

6.1 Intrinsic safety ATEX "Ex i"

For use in thermowells, the surface temperature on the thermowell is correspondingly lower.

The operator assumes responsibility for correct and proper installation when replacing the measuring inset in a thermometer. ABB requires the manufacturing number marked on the old part so that the conformity of the ordered design can be checked with the initial delivery and the valid approvals.

Max. inner inductivity: $L_i = 15 \text{ mH/m}$

Max. inner capacitance: $C_i = 280 \text{ pF/m}$

6.1.1 Electrical power limit "EEx i"

The following electrical values must not be exceeded:

U _i (input voltage)	I _i (input current)
30 V	101 mA
25 V	158 mA
20 V	309 mA

P_i (inner power) = according to calculation using thermal resistance R_{th}
L_i (inner inductivity) = 15 μH per meter
C_i (inner capacitance) = 280 pF per meter

6.1.2 Thermal resistance

The following table lists thermal resistances for measuring insets with diameter 3.0 mm (0.12 inch) and 6.0 mm (0.24 inch). The values have been specified subject to the conditions "Gas with a flow velocity of 0 m/s" and "Measuring inset without or with an additional thermowell".

Thermal resistance R _{th}	Measuring inset Ø 3 mm (0.12 inch)	Measuring inset Ø 6 mm (0.24 inch)
Without thermowell		
Resistance thermometer	200 K/W	84 K/W
Thermocouple	30 K/W	30 K/W
With thermowell		
Resistance thermometer	70 K/W	40 K/W
Thermocouple	30 K/W	30 K/W

K/W = Kelvin per watt

6.1.3 Output power P_o

Transmitter type	P _o
TTH200 HART	≤ 38 mW
TTH300 HART	≤ 38 mW
TTH300 PA	≤ 38 mW
TTH300 FF	≤ 38 mW
TR04	≤ 383 mW

All other information required to prove intrinsic safety (U_o, I_o, P_o, L_o, C_o etc.) can be taken from the EC type-examination certificates for the relevant transmitter models.

6.1.4 Special requirements (temperature rise)

In the event of a fault, the temperature sensors will exhibit a temperature rise Δt as appropriate for the applied power. This temperature rise Δt must be taken into account with regard to the difference between process temperature and temperature class.

i Important

In the event of a fault (short circuit), the dynamic short-circuit current which occurs in the measurement circuit for a matter of milliseconds not relevant with regard to temperature rise. The permissible outer capacitance is based on the dynamic short-circuit current.

The temperature rise Δt can be calculated as follows:

$$\Delta t = R_{th} \times P_o \text{ [K/W} \times \text{W]}$$

Δt = Temperature rise

R_{th} = Thermal resistance

P_o = Output power

Example:

Resistance thermometer diameter 3 mm (0.12 inch) without thermowell

R_{th} = 200 K/W,

TTHXXX temperature transmitter P_o = 38 mW.

$$\Delta t = 200 \text{ K/W} \times 0.038 \text{ W} = 7.6 \text{ K}$$

Therefore, at a transmitter output power P_o = 38 mW, the maximum temperature rise in the event of a fault is approximately 8 K.

This results in the following maximum process temperatures T_{medium}:

Maximum process temperature T_{medium} in Zone 0:

T6 (85 °C) 80 % = 68 °C	T5 (100 °C) 80 % = 80 °C	T4 (135 °C) 80 % = 108 °C
T _{medium} = 60 °C	T _{medium} = 72 °C	T _{medium} = 100 °C
T3 (200 °C) 80 % = 160 °C	T2 (300 °C) 80 % = 240 °C	T1 (450 °C) 80 % = 360 °C
T _{medium} = 152 °C	T _{medium} = 232 °C	T _{medium} = 352 °C

The surface temperature of Category 1 devices must not exceed 80 % of the ignition temperature of a flammable gas or liquid.

Possible process temperature T_{med} in Zone 1:

T6 (85 °C) - 5 °C = 80 °C	T5 (100 °C) - 5 °C = 95 °C	T4 (135 °C) - 5 °C = 130 °C
T _{medium} = 72 °C	T _{medium} = 87 °C	T _{medium} = 122 °C
T3 (200 °C) - 5 °C = 195 °C	T2 (300 °C) - 10 °C = 290 °C	T1 (450 °C) - 10 °C = 440 °C
T _{medium} = 187 °C	T _{medium} = 282 °C	T _{medium} = 432 °C

To calculate the temperature classes for T6, T5, T4, and T3 deduct 5 K each; for T2 and T1, deduct 10 K each.

6.2 Flameproof enclosure "Ex d"

The enclosures for thermometers of this design are flameproof. An explosion inside the thermometer will not ignite the explosive atmosphere in the area in which the device is located. Alongside the use of a flameproof enclosure, this is achieved by compliance with specified ignition gap lengths and widths (between enclosure and measuring inset) and "Ex d"-certified cable entries. SensyTemp TSP300 temperature sensors can be used as "Ex d" versions in the following zones provided that the corresponding requirements are met:

- With suitable thermowell and connection head in Zone 1 / 0 (separation of zones, so measuring inset in Zone 0)
 - With connection head but without thermowell in Zone 1
- These thermometers hold EC type-examination certificate PTB 99 ATEX 1144 with Ex designation II 1/2 G Ex d IIC T1 ... T6.

Temperature ranges:

Maximum permissible ambient temperature: -40 ... 60 °C

Maximum permissible temperature in connection head:

Temperature class	Without transmitter	With transmitter
T1 ... T4	125 °C	85 °C
T5	90 °C	82 °C
T6	75 °C	67 °C

6.3.1 Thermal data

	Approved ambient temperature at connection head	Approved process temperature at thermowell	Maximum temperature at the process connection on the connection head side	Maximum surface temperature at the connection head	Maximum surface temperature at the thermowell
Category 1D or Category 1/2 with intrinsically-safe transmitter installed	-40 ... 85 °C (-40 ... 185 °F)	-40 ... 85 °C -40 ... 200 °C ¹⁾ -40 ... 300 °C ¹⁾ -40 ... 400 °C ¹⁾	85 °C 164 °C 251 °C 346 °C	120 °C	133 °C 200 °C 300 °C 400 °C
Category 1D or Category 1/2 with fuse protection of installed transmitter by means of external IEC fuse	-40 ... 85 °C (-40 ... 185 °F)	-40 ... 85 °C -40 ... 200 °C ¹⁾ -40 ... 300 °C ¹⁾ -40 ... 400 °C ¹⁾	85 °C 164 °C 251 °C 346 °C	133 °C ²⁾ 150 °C ³⁾	133 °C 200 °C 300 °C 400 °C
Category 1D or Category 1/2D Measurement circuit intrinsically-safe transmitter external or non-intrinsically-safe via external IEC fuse in the power feed circuit of the external transmitter	-40 ... 85 °C -40 ... 120 °C -40 ... 120 °C -40 ... 120 °C	-40 ... 85 °C -40 ... 200 °C -40 ... 300 °C -40 ... 400 °C	85 °C 200 °C 251 °C 346 °C	85 °C 200 °C 200 °C 200 °C	133 °C 200 °C 300 °C 400 °C

- 1) The user must take suitable measures to ensure that the maximum permissible ambient temperature of 85 °C (185 °F) at the connection head is not exceeded.
- 2) Fitted with a transmitter with and without display.
- 3) Fitted with two transmitters.

Maximum permissible media temperature:

Temperature class	Use in Zone 0	Use in Zone 1
T1	358 °C	438 °C
T2	238 °C	288 °C
T3	158 °C	193 °C
T4	106 °C	128 °C
T5	78 °C	93 °C
T6	66 °C	78 °C

6.3 Dust ignition protection (enclosure)

The power feed can come from a power supply with intrinsically-safe output circuit of protection type "EEx ia IIB" or "EEx ia IIC", or can be non intrinsically safe. In the case of a non-intrinsically-safe power feed, the current is limited by an upstream fuse conforming to IEC 127 with a fuse nominal current of 32 mA.

Highest value for connection to an intrinsically-safe power supply unit of protection type "Ex ia IIB / IIC":



Important

When using two transmitters and / or measuring insets, the sum of the voltages, currents, and outputs must not exceed the values specified in the EC type-examination certificate.



Appendix

7 Appendix

7.1 Other applicable documents

- Data sheet (DS/TSP1X1)
- Data sheet (DS/TSP3X1)
- Data sheet (DS/TSA101)
- Operating instructions (OI/TSP)
- Operating instructions TTH300 (OI/TTH300)
- Operating instructions TTH200 (OI/TTH200)
- SIL safety manual for SensyTemp TSP (SM/TSP/SIL)
- Safety specifications for cable glands (42/10-57-XU)

7.2 Approvals and certifications

CE mark		<p>The version of the meter in your possession meets the requirements of the following European directives:</p> <ul style="list-style-type: none"> - EMC directive 2004/108/EC - ATEX directive 94/9/EC
Explosion Protection		<p>Identification for intended use in potentially explosive atmospheres according to:</p> <ul style="list-style-type: none"> - ATEX directive (marking in addition to CE marking)



Important

All documentation, declarations of conformity, and certificates are available in ABB's download area.

www.abb.com/temperature



12 - 2009

EG-Konformitätserklärung
EC-Certificate of Compliance

ABB Automation Products GmbH
Borsigstr. 2
D-63755 Alzenau
Germany

Erklärt, dass die Produkte der
Geräteart:
Declare that the products of device type:

Temperaturfühler SensyTemp
Temperature Sensor SensyTemp

Modell- / Typebezeichnung:
Model- / type name:

TSP111, TSP121, TSP131
TSP311, TSP321, TSP331

Produktnummer:
Product number:

TSP111-... , TSP121-... , TSP131-... ,
TSP311-... , TSP321-... , TSP331-... ,

Konform zu den EG-Richtlinien ist:
Conform to EC-directives:

94/9/EG (ATEX)
2004/108/EG (EMV/EMC)

EG-Baumusterprüfbescheinigung:
EC-Type examination certificate:

PTB 01 ATEX 2200 X
PTB 99 ATEX 1144
BVS 06 ATEX E 029
PTB 99 ATEX 2053 X
PTB 03 ATEX 2083 X
PTB 99 ATEX 2139 X
PTB 05 ATEX 2017 X
PTB 09 ATEX 2016 X
DMT 02 ATEX E 068 X
ZELM 99 ATEX 0021
PTB 05 ATEX 2079 X

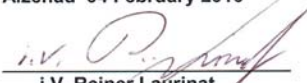
Relevante Normen:
Related Standards:

EN 61326-1:2006
EN 60079-0: 2006; EN 61241-0: 2006
EN 60079-11: 2007, EN 61241-1: 2004
EN 60079-1:2007

Anerkennung Qualitätssicherung
Produktion :
Production Quality notification:

PTB 99 ATEX -Q004-...

Alzenau 04 February 2010


i.V. Reiner Laürinat
Leiter Qualitätsmanagement
Quality Manager


i.A. Harald Müller
Leiter Hardwareentwicklung
R&D Manager Hardware

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