TTF300

EN
English

Commissioning Instructions

Field-mounted temperature transmitters
TTF300

HART COMMUNICATION PROTOCOL

PROFIBUS

Fieldbus Foundation

ABB

Field Mounted Temperature Transmitter
TTF300

Commissioning Instruction - EN

CI/TTF300-EN

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Translation of the original instruction

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Contents

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

To measure the temperature of fluid, pulpy or pasty substances and gases or resistance/voltage values.

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

- The maximum operating temperature must not be exceeded.
- The permitted operating temperature must not be exceeded.
- The housing protection type must be observed.

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.

NOTICE – <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 (NOTE)

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 Name plate

1.4.3 Name plate: TTF300 - HART

The name plate is located on the transmitter housing.

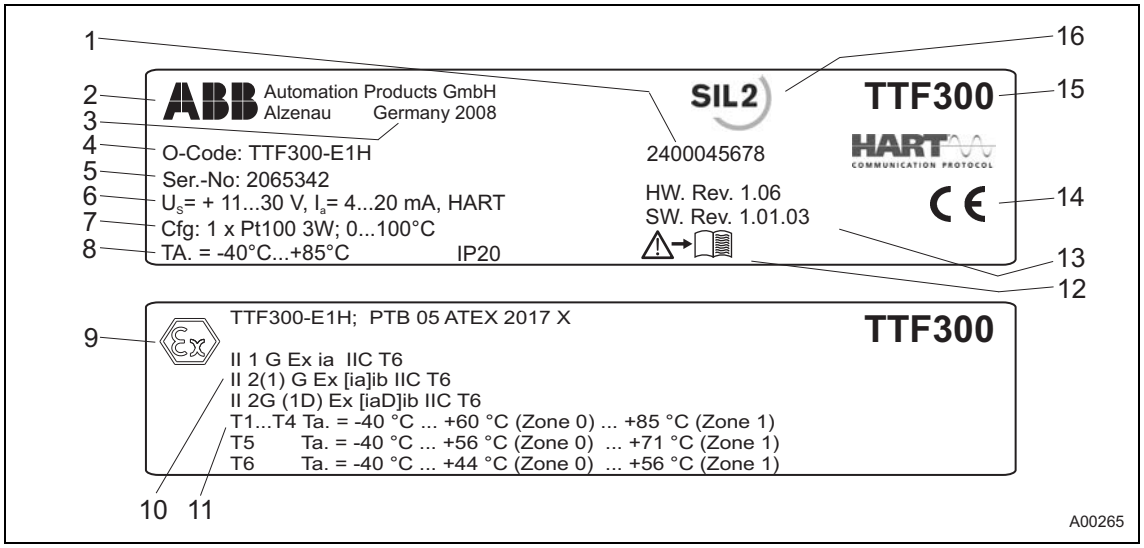


Fig. 1: Example for ATEX explosion protection

1 Project number
2 Manufacturer of transmitter
3 Country and year of manufacture
4 Order number
5 Serial number
6 Supply voltage range, typical current range, protocol
7 Customer configuration
8 Ambient temperature range / housing degree of protection
9 Ex mark (optional)
10 Protection class of hazardous area design (optional)
11 Temperature class of hazardous area design (optional)
12 Refer to product documentation
13 Software revision number / hardware revision number
14 CE mark (EC conformity)
15 Type designation
16 Safety integrity level (optional)

1.4.4 Name plate: TTF300 - PROFIBUS PA / FOUNDATION Fieldbus

The name plate is located on the transmitter housing.

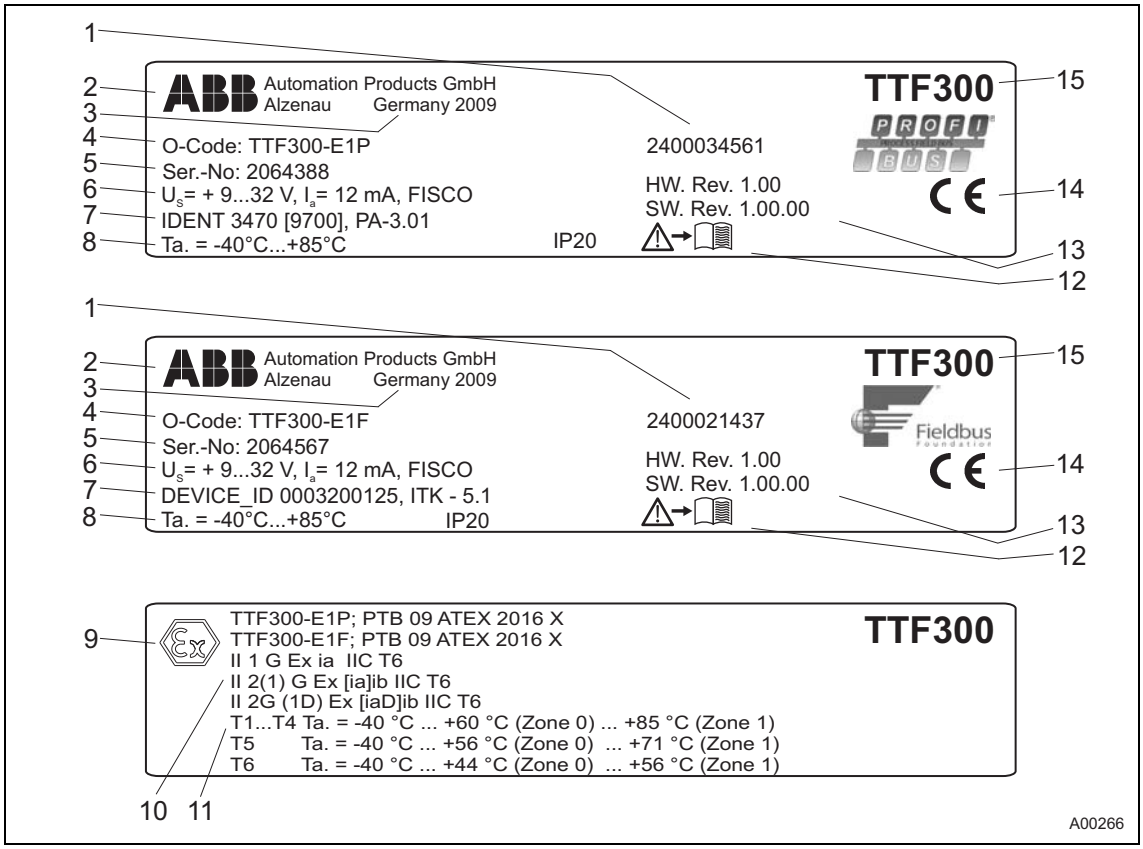


Fig. 2: Example for ATEX explosion protection

1 Project number
2 Manufacturer of transmitter
3 Country and year of manufacture
4 Order number
5 Serial number
6 Supply voltage range, typical current range, concept for intrinsically safe fieldbuses
7 PROFIBUS ID number, protocol / FOUNDATION Fieldbus device ID number
8 Ambient temperature range / housing degree of protection
9 Ex mark (optional)
10 Protection class of hazardous area design (optional)
11 Temperature class of hazardous area design (optional)
12 Refer to product documentation
13 Software revision number / hardware revision number
14 CE mark (EC conformity)
15 Type designation

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 Safety information for commissioning

The transmitter is immediately ready for operation after mounting and installation of the connections. The parameters are set at the factory.

The connected lines must be checked for firm seating. Only firmly seated lines ensure full functionality.

1.8 Operating safety information

Before switching on, ensure compliance with the ambient conditions specified in the “Specifications” chapter or data sheet and that the power supply voltage corresponds to the voltage of the transmitter.

If you suspect that safe operation is no longer possible, take the unit out of operation and secure it against unintended startup.

1.9 Returning devices

Use the original packaging or suitably secure shipping containers if you need to return the device for repair or recalibration purposes. Fill out the return form (see the Appendix) and include this with the device.

According to EC guidelines for hazardous materials, the owner of hazardous waste is responsible for its disposal or must observe the following regulations for shipping purposes:

All devices delivered to ABB Automation Products GmbH must be free from any hazardous materials (acids, alkalis, solvents, etc.).

Please contact Customer Center Service acc. to page 1 for nearest service location.

1.10 Disposal

This product is manufactured from materials that can be reused by specialist recycling companies.

1.10.1 Information on WEEE Directive 2002/96/EC (Waste Electrical and Electronic Equipment)

This product is not subject to WEEE Directive 2002/96/EC or relevant national laws (e.g., ElektroG in Germany).

The product must be disposed of at a specialist recycling facility. Do not use municipal garbage collection points. According to the WEEE Directive 2002/96/EC, only products used in private applications may be disposed of at municipal garbage facilities. Proper disposal prevents negative effects on people and the environment, and supports the reuse of valuable raw materials.

If it is not possible to dispose of old equipment properly, ABB Service can accept and dispose of returns for a fee.

1.10.2 RoHS Directive 2002/95/EC

With the Electrical and Electronic Equipment Act (ElektroG) in Germany, the European Directives 2002/96/EC (WEEE) and 2002/95/EC (RoHS) are translated into national law. ElektroG defines the products that are subject to regulated collection and disposal or reuse in the event of disposal or at the end of their service life. ElektroG also prohibits the marketing of electrical and electronic equipment that contains certain amounts of lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE) (also known as hazardous substances with restricted uses).

The products provided by ABB Automation Products GmbH do not fall within the current scope of the directive on waste from electrical and electronic equipment according to ElektroG. If the necessary components are available on the market at the right time, in the future these substances will no longer be used in new product development.

2 Use in potentially explosive atmospheres

Special regulations must be observed in potentially explosive atmospheres as regards the power supply, signal input / output and ground connections. 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 comply with IEC 60079-14 (Electrical apparatus for explosive gas atmospheres).

2.1 Approvals

Codes relating to the approvals for use in potentially explosive atmospheres can be found in the chapter titled "Ex relevant specifications" in this manual.

2.2 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.

2.3 Interconnection

If transmitters are 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.

2.4 Configuration

The transmitter can be configured in the potentially explosive atmosphere in compliance with the interconnection certificate, either within the potentially explosive atmosphere itself using approved handheld terminals or by coupling an Ex modem into the circuit outside the potentially explosive atmosphere.

2.5 Ex relevant specifications

See Chapter 5, "Ex relevant specifications" page 31.

3 Mounting

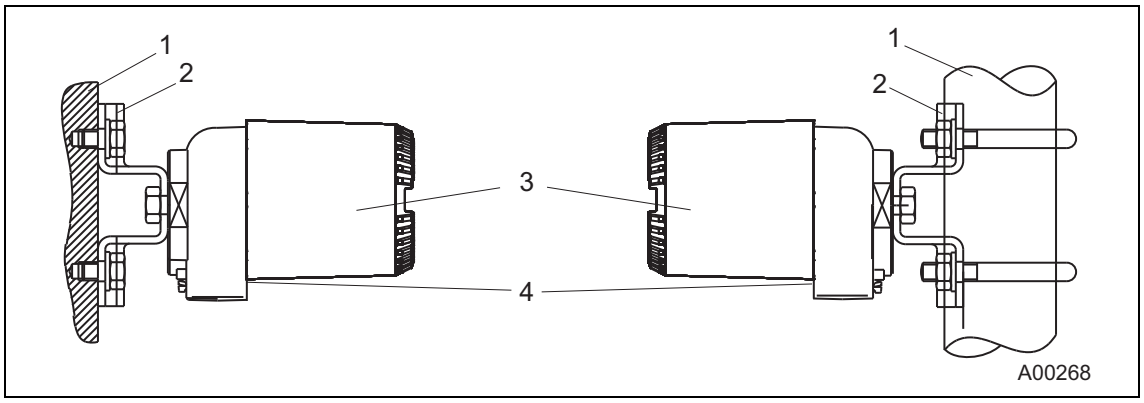


Fig. 3

1 Wall / pipe
2 Mount
3 Transmitter
4 Lock screw

Warning - General dangers!

The transmitter can fall and be damaged if not firmly attached. There is also a risk of persons being injured as a result.
Always ensure that the mount is secured to a sufficiently stable point.

Wall mounting:

Attach the wall mount to the wall using 4 screws (Ø 10 mm).

Pipe mounting:

Attach the pipe mount to the pipe using 2 pipe clamps (Ø 10 mm). The pipe mount can be attached to a pipe with a maximum diameter of 2.5“.

3.1 Position of LCD indicator

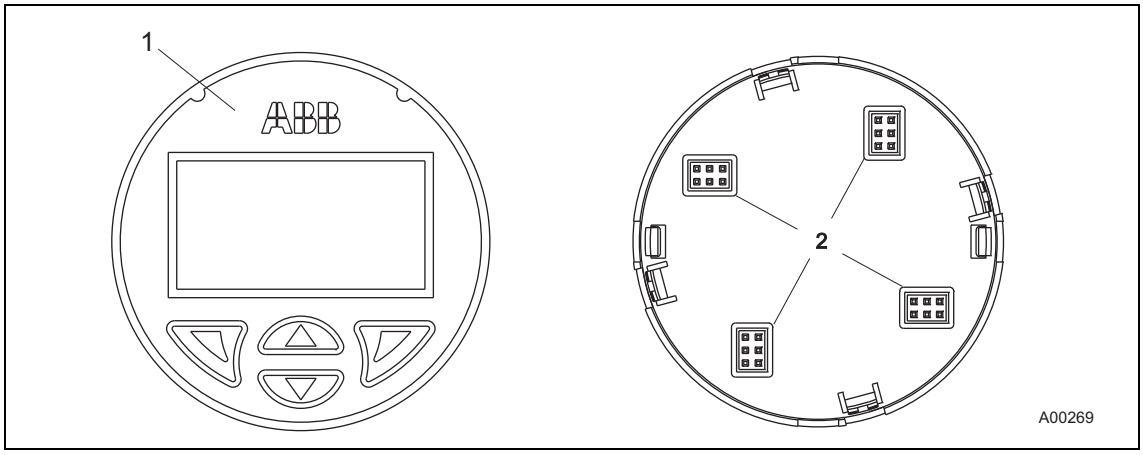


Fig. 4

1 Front view

2 Rear view of LCD indicator / plug positions

Warning - General dangers!

If the transmitter is located in an explosive atmosphere, there is a risk of explosion.
Make sure there is sufficient fresh-air ventilation.

The position of the LCD indictor can be adjusted to suit the installation position of the transmitter, to ensure that the display is as clearly legible as possible. There are 4 positions at increments of 90°.

To adjust the position, proceed as follows:

1. Tighten the lock screw under the housing cover.
2. Release the housing cover by turning it counterclockwise.
3. Carefully pull the LCD indicator to release it from its holder.
4. Carefully insert the LCD indicator in the required position.
5. Screw the housing cover back on.
6. Loosen the lock screw until the housing cover is firmly in place.

4 Electrical connections

Warning – Electrical dangers!

The relevant regulations must be observed during electrical installation. Connections must only be established in a dead-voltage state.

The transmitter has no switch-off elements. Therefore, overcurrent protective devices, lightning protection, or voltage disconnection options must be provided at the plant.

The power supply and signal are routed in the same line and must be implemented as a SELV or PELV circuit in accordance with the relevant standard (standard version). For the Ex version, the guidelines stipulated by the Ex standard must to be adhered to.

You must check that the available supply power corresponds to the information on the name plate.

4.1 Conductor material

- Maximum cable outer diameter: 12 mm (0.47 inches)
- Maximum wire cross section: 2.5 mm^2 (AWG 14)

4.1.1 Line length and installation

A line length of 190 mm should be ensured between the cable gland entry and the terminals. 140 mm should be stripped from the cable jacket along this length.

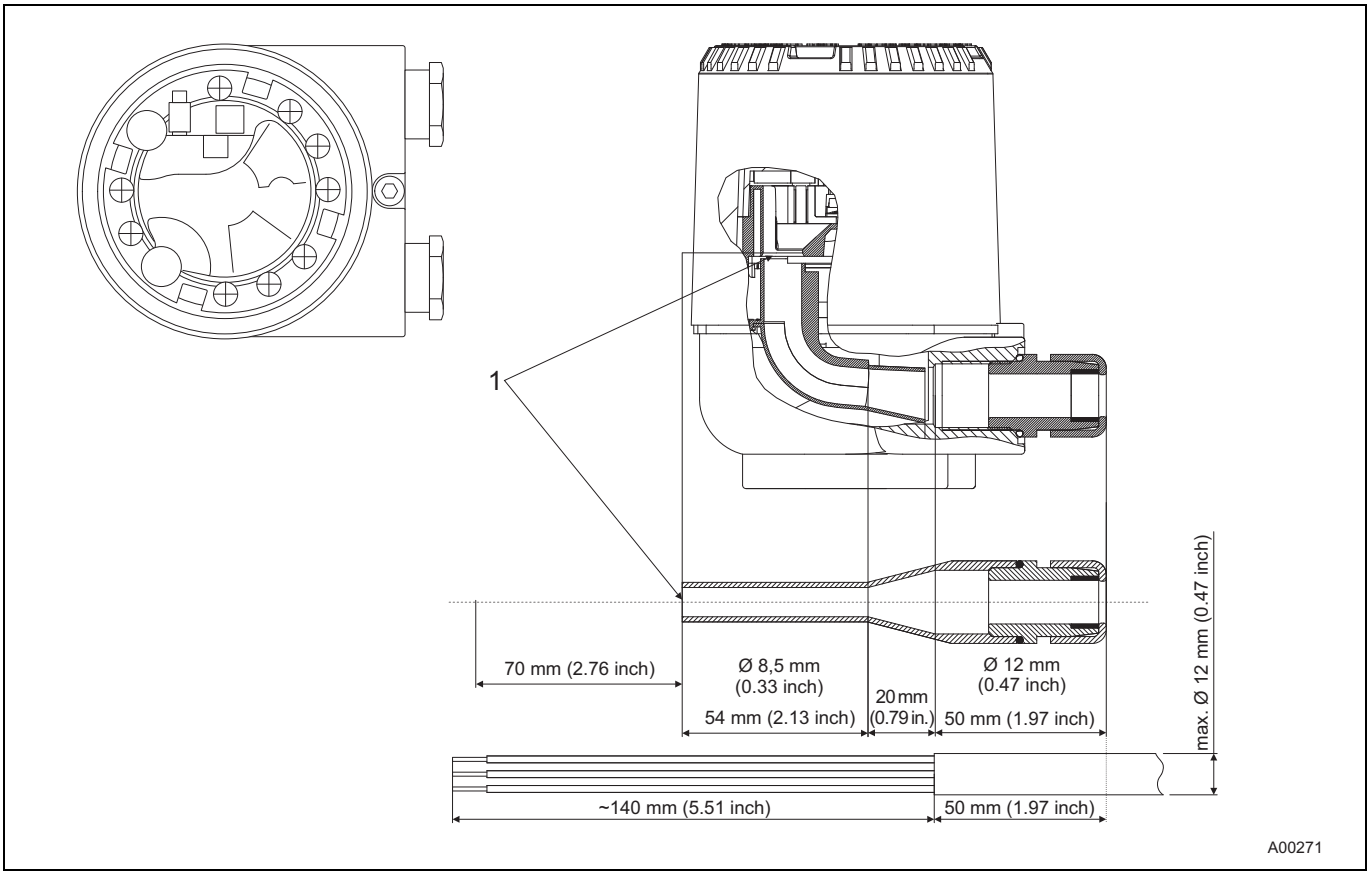


Fig. 5

1 End of cable duct

4.2 Cable glands

4.2.1 TTF300 without cable gland

The cable diameter must be appropriate for the cable gland used to ensure compliance with the requirements for IP / Nema 4x protection class. This must be checked during installation.

For delivery without cable gland (threads M20 x 1.5 or NPT 1/2"), the following points must be observed:

- Use cable glands acc. to version M20 x 1.5 or NPT 1/2".
- Observe information in data sheet / operating instructions for cable gland used.
- Check the working temperature for the cable gland used.
- Check the IP protection class IP 66 / 67 or NEMA 4X of the cable gland used.
- Check the ex relevant specifications for the cable gland used acc. to manufacturer's data sheet or Ex certificate.
- The cable gland used must be approved for the cable diameter (IP protection class).
- For tightening torque, observe information in data sheet / operating instructions for cable gland used.

4.2.2 TTF300 Ex d models without cable gland

For delivery of the product variants TTF300-E3... (ATEX Ex d / flameproof enclosure) and TTF300-E4....(ATEX Ex d and Ex ia or flameproof enclosure and intrinsic safety) without cable gland, an approved ATEX Ex d cable gland must be used according to EN 60079-1.

The ex relevant specifications for the cable gland used (M20 x 1.5 6H or 1/2" NPT, clamping range, temperature range, etc.) must comply with the requirements for PTB 99 ATEX 1144 approvals in order to ensure "d" type of protection for the TTF300.

For information on the cable gland used, refer to the relevant data sheet and operating instructions.

4.2.3 TTF300 EX d models with standard cable gland

General information

Type Capri ADE 1F	ISO threads	Outer diameter of cable	Material
816674 No. 4	M20 x 1,5	Ø 6 ... 8.5 mm	Nickel-plated brass or stainless steel
818674 No. 4	1/2“ NPT	Ø 6 ... 8.5 mm	Nickel-plated brass or stainless steel
816694 No. 5	M20 x 1,5	Ø 9 ... 12 mm	Nickel-plated brass or stainless steel
818694 No. 5	1/2“ NPT	Ø 9 ... 12 mm	Nickel-plated brass or stainless steel

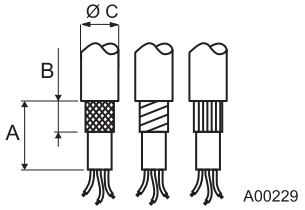
Intended use

- Group II Category 2, Zones 1 and 2 for gas, Zones 21 and 22 for dust, Exell, ExtD, ExdIIC ≤ 2,000 cm³
- Ingress protection IP 66 / 67, 10 bar
- LCIE 97 ATEX 6008 X certification
- Permanent operating temperature range: -40 ... 100 °C with neoprene gasket
- Only for fixed installations and non-reinforced cables with round and smooth plastic sleeves and suitable outer diameters
- All applicable requirements as stipulated by EN 60079-14 must be observed

Installation instructions

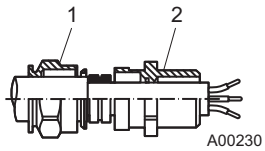
The rings will harden at low temperatures. To make them soft, keep them at a temperature of 20 °C for 24 hours prior to installation. Before fixing them onto the cable gland, bend the rings to ensure they are soft and flexible.

1. Check that a suitable cable is being used (i.e., check the mechanical resilience, temperature range, creep resistance, resistance to chemicals, outer diameter, etc.).
2. Strip the cable in accordance with the table information.



Stripping for ADE 1F N° [4] / [5]	
Position	**[mm]**
Ø C	8,5 / 12
A	40
B	12

3. Check the outer sleeve for damage and soiling.
4. Insert the cable in the cable gland.
5. Tighten the cable gland until the cable is firmly enclosed by the sealing ring. Do not tighten the cable gland any more than 1.5 times the specified torques!



Minimum tightening torques for ADE N° [4], [5] in Nm		
Position	**[4]**	**[5]**
1	7,5	12,5
2	3	3

Important (Note)

Ingress protection IP 66 / 67 is only achieved by installing the black neoprene gasket between the cable gland and the housing and by observing the tightening torque for the cable gland of 3 Nm (Position 2).

Cables must be protected against extreme mechanical loads (caused by tension, torsion, crushing, etc.). Even under operating conditions, it must be ensured that the cable entry remains hermetically sealed. The customer must provide a strain relief device for the cable.

Maintenance

Check the glands during each maintenance session. If the cable is slack, retighten the cap(s) of the glands. If it is not possible to retighten them, the gland will need to be replaced.

4.3 Connection for power supply cable/ sensor connecting cable

Notice - Potential damage to parts!

Connecting the power supply cable with the power switched on may result in a short circuit and damage to the transmitter.
Always ensure the power is switched off before connecting the power supply cable.

Important (Note)

The type of sensor connecting cable must be appropriate for the sensor type and transmitter configuration.
In the case of thermocouple sensors, make sure that the material of the sensor connecting cable is appropriate for the type of thermocouple.

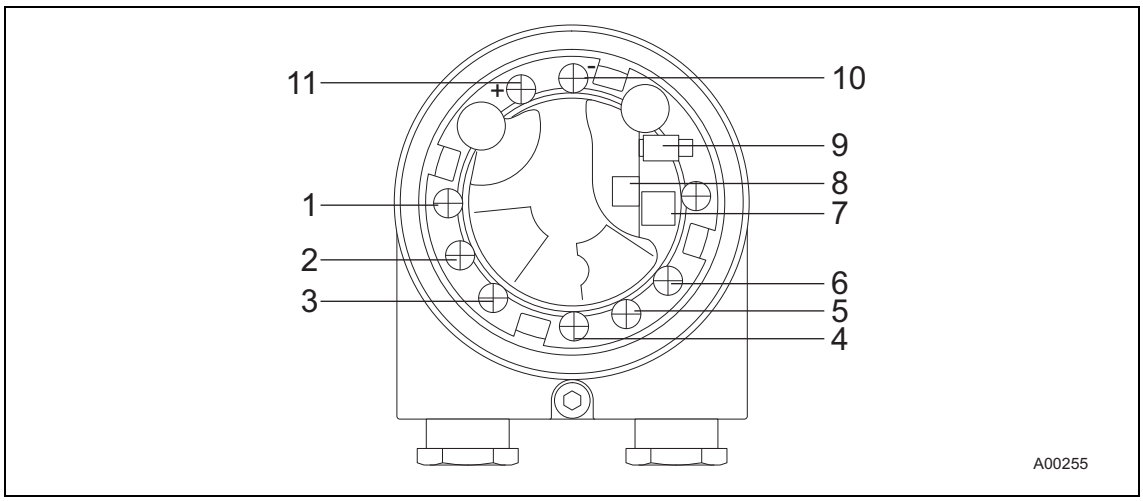


Fig. 6: Transmitter terminals with LCD indicator removed

1 … 6 Sensor connection
7 Ground connection
8 DIP switch 1: on, hardware write protection is enabled
DIP switch 2: no function
9 Plug for LCD indicator
10 … 11 Signal / supply voltage connection

Warning - General dangers!

The transmitter atmosphere may be explosive. Risk of explosion!
Make sure there is sufficient fresh-air ventilation.

1. Tighten the lock screw under the housing cover.
2. Release the housing cover by turning it counterclockwise.
3. If present, carefully pull the LCD indicator to release it from its holder.
4. Strip the cable jacket of the power supply cable / sensor connecting cable to a length of 140 mm (5.51 inches) (see also Chapter 4.1.1 Line length page 13).
5. Guide the power supply cable / sensor connecting cable through the cable glands and into the housing. Then tighten the cable glands.
6. Strip the wires and attach wire end sleeves.
7. Connect the wires as per the connection diagram.
8. If there is one, carefully insert the LCD indicator in the previous / required position.
9. Screw the housing cover back on.
10. Loosen the lock screw until the housing cover is firmly in place.

4.3.1 Connection of sensor measuring insets / Connection diagrams

Resistance thermometers (RTD) / resistors (potentiometers)

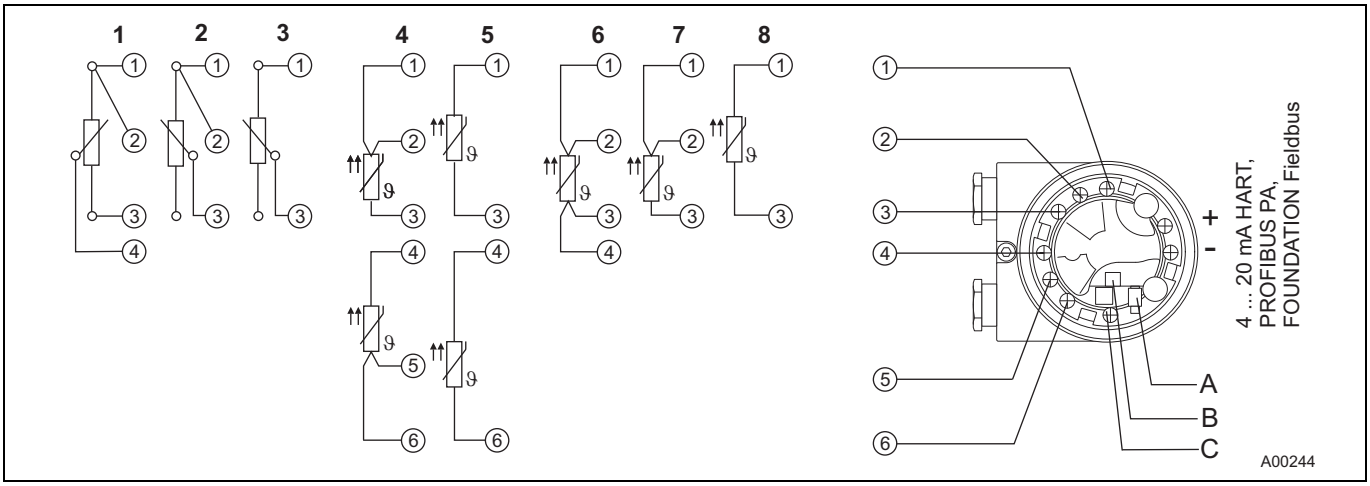


Fig. 7

A	Interface for LCD indicators and service	1	Potentiometer, four-wire circuit	5	2 x RTD, two-wire circuit [1]
B	DIP switch	2	Potentiometer, three-wire circuit	6	RTD, four-wire circuit
C	Ground terminals for sensor and supply- / signal-cable shield connection	3	Potentiometer, two-wire circuit	7	RTD, three-wire circuit
		4	2 x RTD, three-wire circuit [1]	8	RTD, two-wire circuit

1) Sensor backup / redundancy, sensor drift monitoring, mean measurement, or differential measurement

Thermocouples / voltages and resistance thermometer (RTD) / thermocouple combinations

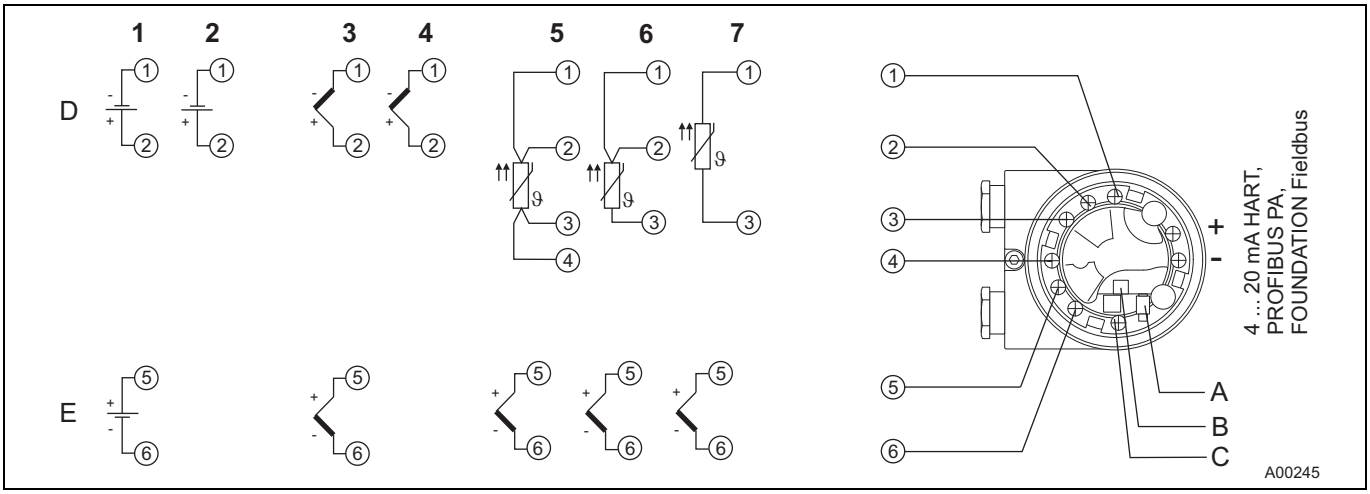


Fig. 8

A	Interface for LCD indicators and service	1	2 x voltage measurement [1]	5	1 x RTD, four-wire circuit, and thermocouple [1]
B	DIP switch	2	1 x voltage measurement	6	1 x RTD, three-wire circuit, and thermocouple [1]
C	Ground terminals for sensor and supply- / signal-cable shield connection	3	2 x thermocouple [1]	7	1 x RTD, two-wire circuit, and thermocouple [1]
D	Sensor 1	4	1 x thermocouple		
E	Sensor 2				

1) Sensor backup / redundancy, sensor drift monitoring, mean measurement, or differential temperature measurement

4.4 Shielding of the signal / power supply cable and the sensor connecting cable

To ensure the system benefits from optimum electromagnetic interference immunity, the individual system components, and the connection cables in particular, need to be shielded.

The shield must be connected to the ground reference plane.

Important (Note)

National regulations and directives must be observed when grounding system components.

Notice - Potential damage to parts!

In systems without equipotential bonding or with potential differences between the individual grounding points, multiple instances of shield grounding can result in transient currents at system frequency.

These can damage the shielding and have a significant impact on signal transmission, of bus signals in particular.

4.4.1 Examples of shielding / grounding

4.4.1.1 Insulated sensor measuring inset (thermocouple, mV, RTD, ohms), transmitter housing grounded

The shield of the sensor connecting cable is grounded via the grounded transmitter housing. This shield is insulated from the sensor.

The shield of the power supply cable is grounded at the supply isolator / PCS input directly. This shield is insulated from the transmitter housing.

The shields of the power supply cable and the sensor connecting cable must not be connected to one another.

Make sure that the shields are not connected to ground anywhere else.

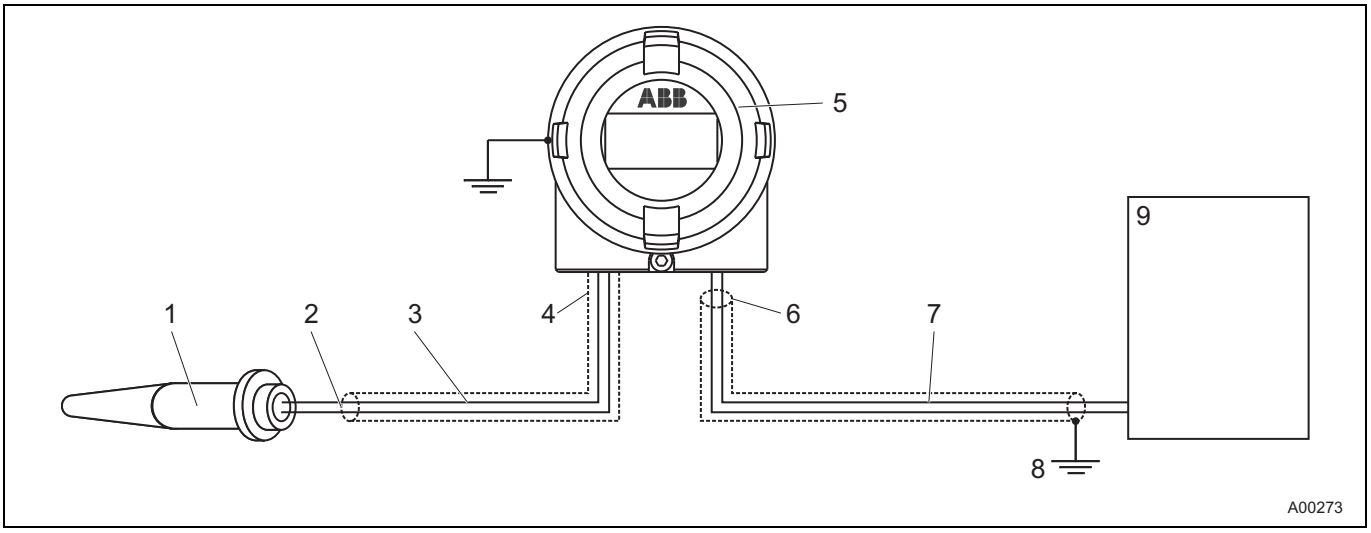


Fig. 9: Shields of the sensor connecting cable and the power supply cable are separate and each grounded at one end

1 Temperature sensor
2 Shield insulated from sensor
3 Sensor connection cable
4 Shield grounded via transmitter housing
5 Transmitter housing, grounded
6 Shield insulated from transmitter housing
7 Power supply cable
8 Grounding point
9 Supply isolator / PCS input

4.4.1.2 Insulated sensor measuring inset (thermocouple, mV, RTD, ohms), transmitter housing grounded

The shield of the sensor connecting cable is grounded via the grounded sensor housing. This shield is insulated from the transmitter housing.

The shield of the power supply cable is grounded at the supply isolator / PCS input directly. This shield is insulated from the transmitter housing.

The shields of the power supply cable and the sensor connecting cable must not be connected to one another.

Make sure that the shields are not connected to ground anywhere else.

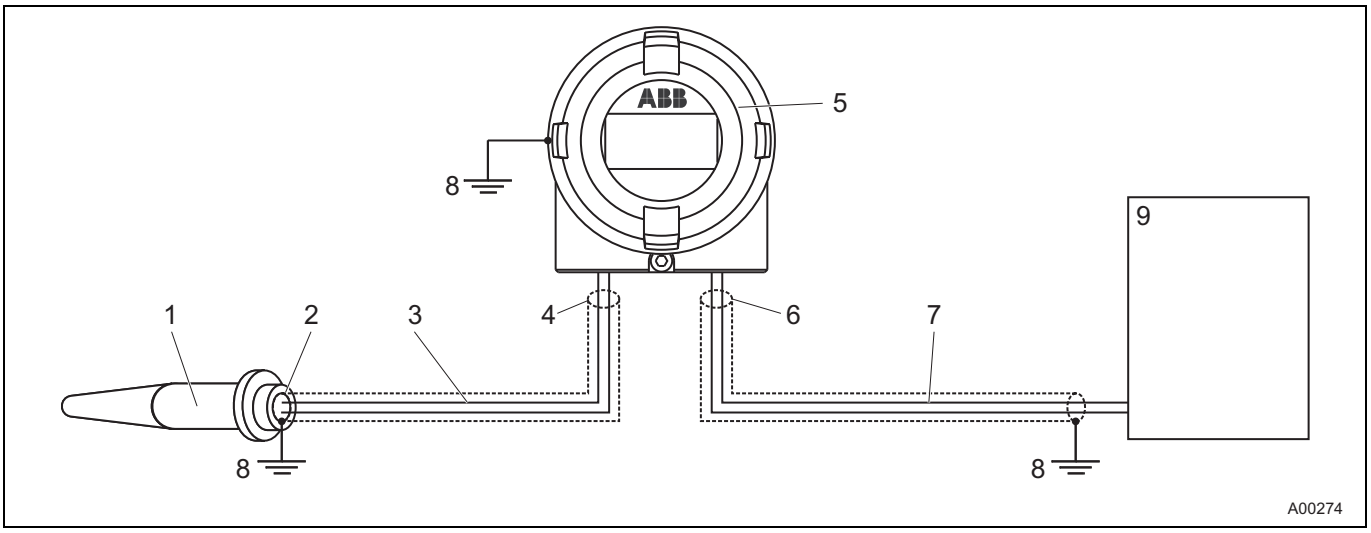


Fig. 10: Shields of the sensor connecting cable and the power supply cable are separate and each grounded at one end

1 Temperature sensor
2 Shield grounded via sensor
3 Sensor connection cable
4 Shield insulated from transmitter housing
5 Transmitter housing, grounded
6 Shield insulated from transmitter housing
7 Power supply cable
8 Grounding point
9 Supply isolator / PCS input

4.4.1.3 Insulated sensor measuring inset (thermocouple, mV, RTD, ohms), transmitter housing not grounded

The shields of the power supply cable and the sensor connecting cable are connected to one another via the transmitter housing.

The shield is grounded at one end of the power supply cable, directly at the supply isolator / PCS input.

Make sure that the shields are not connected to ground anywhere else.

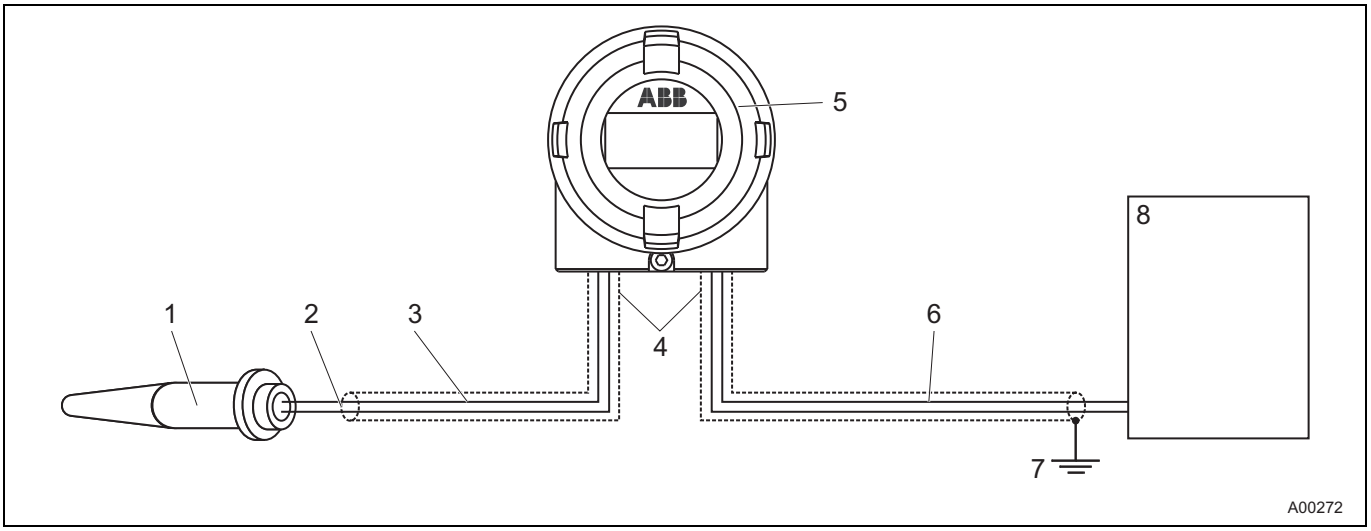


Fig. 11: Shields of the sensor connecting cable and the power supply cable are connected electrically via the transmitter housing and grounded at one end

1 Temperature sensor
2 Shield insulated from sensor
3 Sensor connection cable
4 Shields connected electrically via transmitter housing
5 Transmitter housing, not grounded
6 Power supply cable
7 Grounding point
8 Supply isolator / PCS input

4.4.1.4 Non-insulated sensor measuring inset (thermocouple), transmitter housing grounded

The shield of the sensor connecting cable is grounded via the grounded sensor housing. This shield is insulated from the transmitter housing.

The shield of the power supply cable is grounded at the supply isolator / PCS input directly. This shield is insulated from the transmitter housing.

The shields of the power supply cable and the sensor connecting cable must not be connected to one another.

Make sure that the shields are not connected to ground anywhere else.

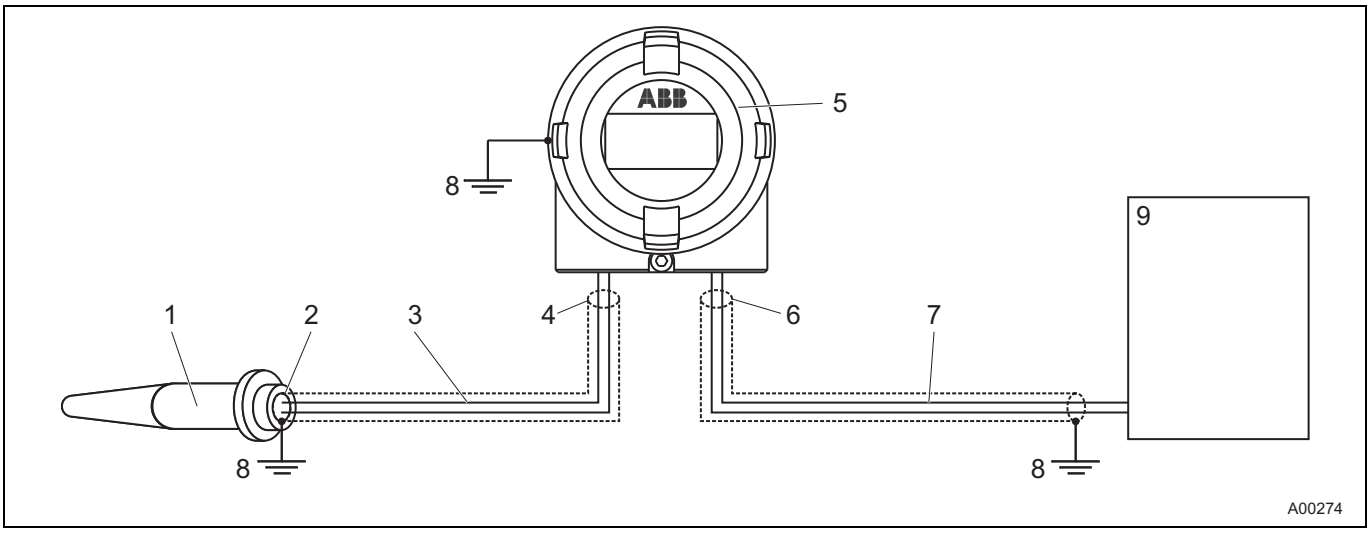


Fig. 12: Shields of the sensor connecting cable and the power supply cable are separate and each grounded at one end

1 Temperature sensor
2 Shield grounded via sensor
3 Sensor connection cable
4 Shield insulated from transmitter housing
5 Transmitter housing, grounded
6 Shield insulated from transmitter housing
7 Power supply cable
8 Grounding point
9 Supply isolator / PCS input

4.5 Electrical interconnection with standard application

4.5.1 4 ... 20 mA functionality

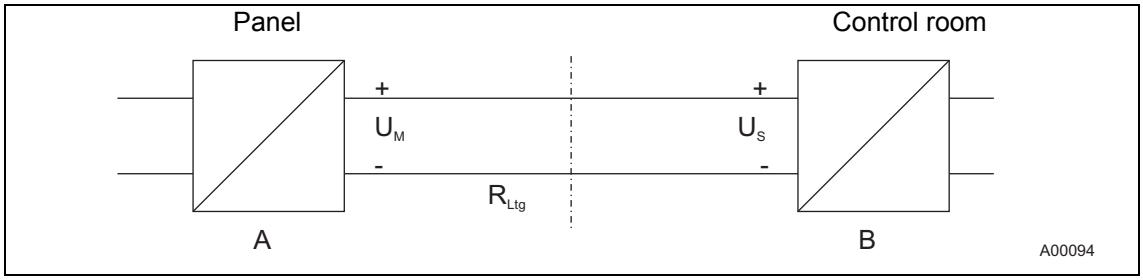


Fig. 13

A Transmitter B Supply isolator / PCS input with supply

When connecting these components, observe the following condition:

$U_{Mmin} \leq U_{Smin} + 0.022\ A \times R_{Ltg}$

Where

U_{Mmin}: Minimum operating voltage of transmitter
U_{Smin}: Minimum supply voltage of supply isolator / PCS input
R_{Ltg}: Line resistance between transmitter and supply isolator

4.5.2 HART functionality

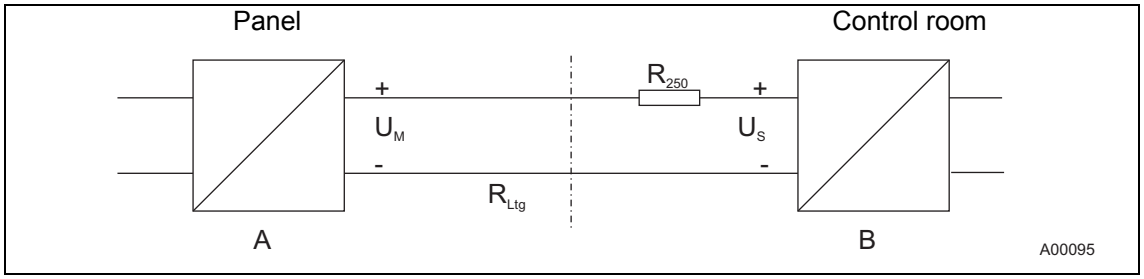


Fig. 14

A Transmitter B Supply isolator / PCS input with supply

Adding resistance R_{250} increases the minimum supply voltage:

$U_{Mmin} \leq U_{Smin} + 0.022\ A \times (R_{Ltg} + R_{250})$

Where

U_{Mmin}: Minimum operating voltage of transmitter
U_{Smin}: Minimum supply voltage of supply isolator / PCS input
R_{Ltg}: Line resistance between transmitter and supply isolator
R_{250}: Resistance of resistor for HART functionality

For HART functionality, use supply isolators or PCS input cards with a HART mark. If this is not possible, a ≥ 250 Ω (< 1100 Ω) resistor must be added to the interconnection.

The signal line can be operated with or without grounding. When establishing a ground connection (minus side), make sure that only one side of the terminal is connected to the equipotential bonding.

4.5.3 PROFIBUS PA and FOUNDATION Fieldbus H1 functionality

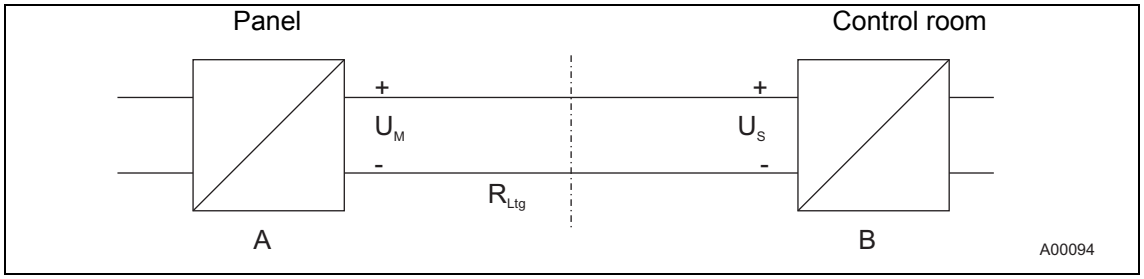


Fig. 15

A Transmitter B Segment coupler

When connecting these components, observe the following condition:

$U_{Mmin} \leq U_{Smin} + 0.012\ A \times R_{Ltg}$

Where

U_{Mmin}: Minimum operating voltage of transmitter
U_{Smin}: Minimum supply voltage of supply isolator / PCS input
R_{Ltg}: Line resistance between transmitter and supply isolator

4.6 Electrical interconnection in explosion hazardous areas

Depending on the safety requirements, special interconnections are required for use in potentially explosive atmospheres.

Important (Note)

Refer to Chapter "Ex relevant specifications".

Intrinsic safety

The supply isolators / PCS inputs must feature intrinsically safe 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 EC-type examination certificates for the equipment (devices); this includes the capacitance and inductance values of the cables. Proof of intrinsic safety is said to have been provided if the following conditions are fulfilled when a comparison is carried out in relation to the limit values of the equipment:

Transmitter (intrinsically safe equipment)		Supply isolator / PCS input (related equipment)
U_i	≥	U_o
I_i	≥	I_o
P_i	≥	P_o
$L_i + L_c$ (cable)	≤	L_o
$C_i + C_c$ (cable)	≤	C_o

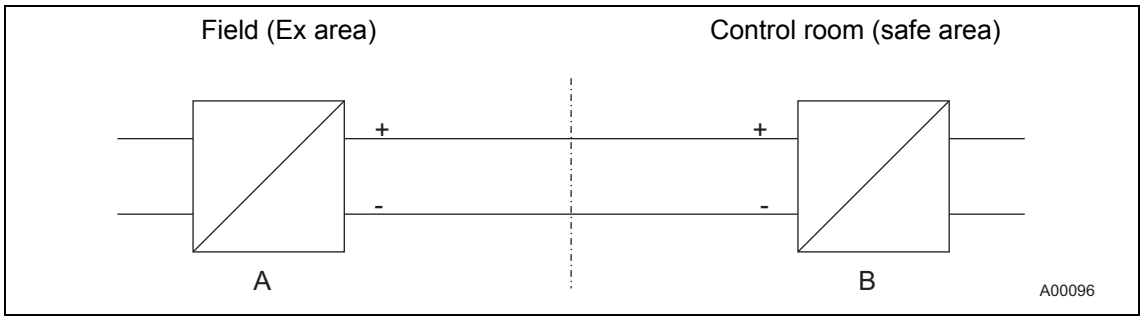


Fig. 16

A Transmitter

B Supply isolator / PCS input with supply / Segment coupler

4.6.1 Installation in a potentially explosive atmosphere

Transmitters can be installed in all kinds of industrial sectors. Potentially explosive systems are divided into zones, meaning that a wide range of different instruments are also required. Different certificates are required for these depending on region.

Important (Note)

Ex relevant specifications must be taken from the EC-type examination certificates and other relevant certificates that apply in each case.

With transmitters for PROFIBUS PA and FOUNDATION Fieldbus H1 applications, FISCO / FNICO interconnection methods can be used.

4.6.1.1 ATEX - Zone 0

Transmitter design: II 1 G Ex ia IIC T6

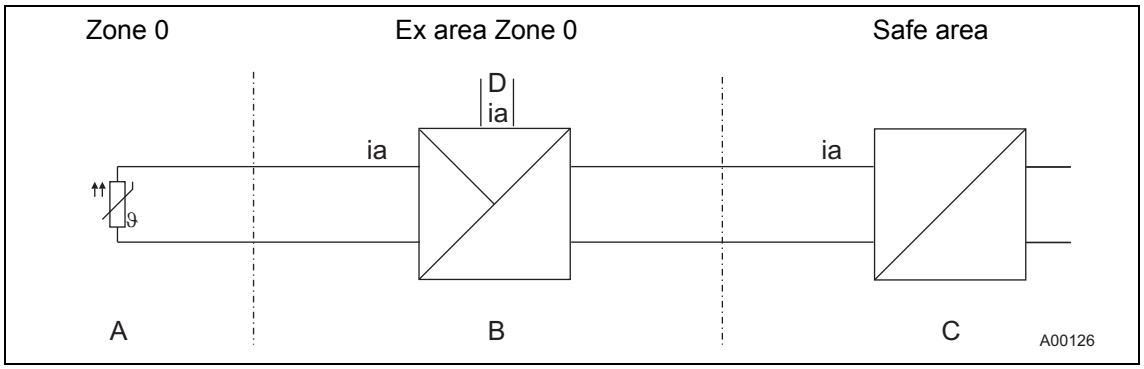


Fig. 17

A Sensor
B Transmitter TTF300
C Supply isolator [Ex ia]
D Interface for LCD indicator

The input for the supply isolator must have an "Ex ia" design.

When using the transmitter in Zone 0, you must avoid impermissible electrostatic charging of the transmitter (observe the warnings on the device).

As the user, it is your responsibility to ensure that the sensor instrumentation meets the requirements of applicable explosion protection standards.

4.6.1.2 ATEX - Zone 1 (0)

Transmitter design: II 2 (1) G Ex [ia] ib IIC T6

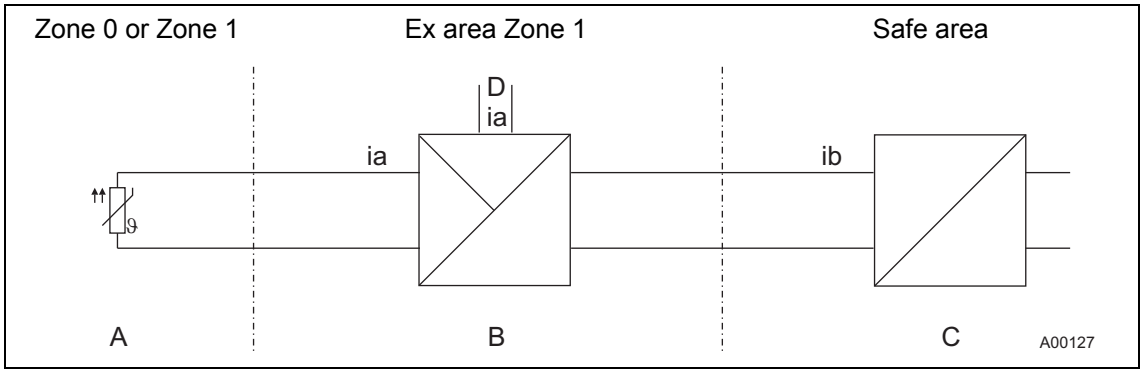


Fig. 18

A Sensor
B Transmitter TTF300
C Supply isolator [Ex ib]
D Interface for LCD indicator

The input for the supply isolator must have an [Ex ib] design.

As the user, it is your responsibility to ensure that the sensor instrumentation meets the requirements of applicable explosion protection standards. The sensor can be installed in Zone 1 or Zone 0.

4.6.1.3 ATEX - Zone 1 (20)

Transmitter design: II 2 G (1D) Ex [iaD] ib IIC T6

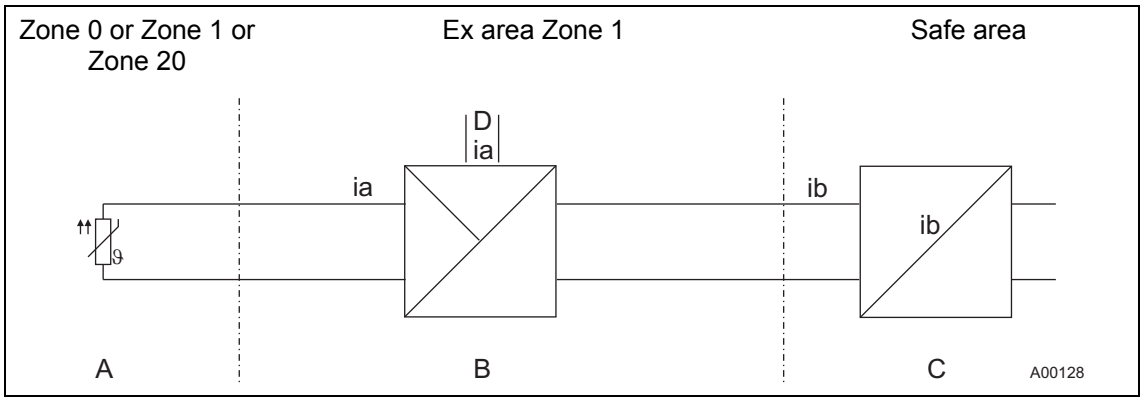


Fig. 19

A Sensor
B Transmitter TTF300
C Supply isolator [Ex ib]
D Interface for LCD indicator

The input for the supply isolator must have an [Ex ib] design.

As the user, it is your responsibility to ensure that the sensor instrumentation meets the requirements of applicable explosion protection standards. The sensor can be installed in Zone 0, Zone 1, or Zone 20.

4.6.1.4 ATEX - Zone 2

Transmitter design: II 3 G Ex nA II T6

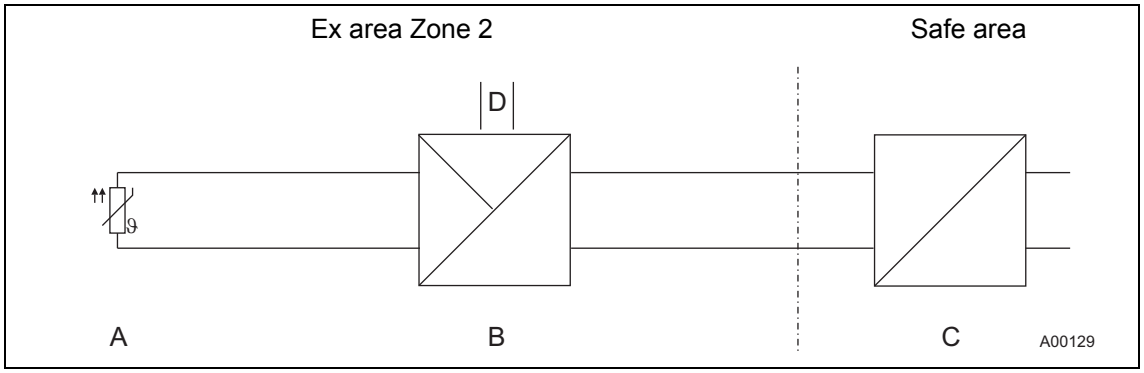


Fig. 20

A Sensor
B Transmitter TTF300
C Supply isolator
D Interface for LCD indicator

In the event of a disturbance, it must be ensured that the supply voltage cannot exceed the normal voltage by more than 40 %.

4.6.1.5 Dust explosion protection - Zone 20

Transmitter design: ATEX II 1D IP65 T135°C

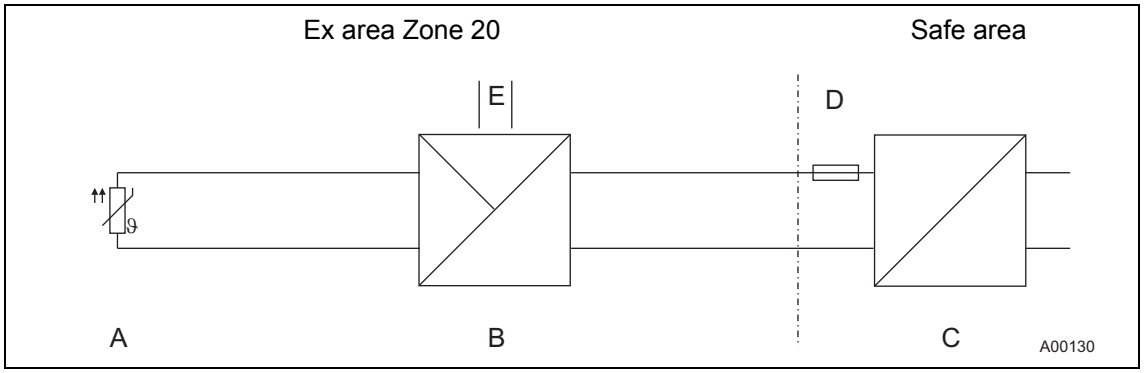


Fig. 21

A Sensor
B Transmitter TTF300
C Supply isolator
D Fuse, 32 mA
E Interface for LCD indicator

The power supply circuit of the transmitter must be limited by an upstream fuse as per IEC 127 with a fuse current rating of 32 mA. This is not required if the power supply is intrinsically safe with an [Ex ia] design.

4.6.1.6 Dust explosion protection - Zone 0/20

Housing design: ATEX II 1D IP65 T135°C

Transmitter design: ATEX II 1G Ex ia IIC T6

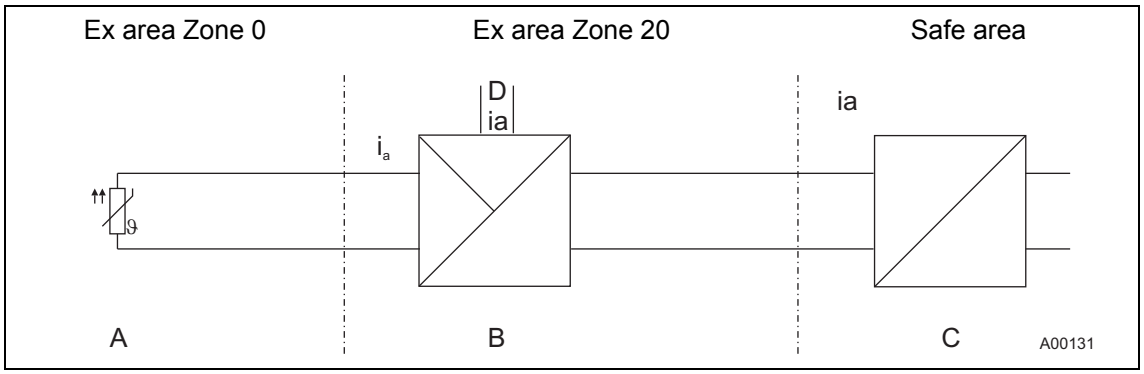


Fig. 22

A Sensor
B Transmitter TTF300
C Supply isolator
D Interface for LCD indicator

If you are using the sensor in Zone 0 and the transmitter in Zone 20, the transmitter must conform to category 1D and the circuit must be of the "ia" design.

If the transmitter is designed with intrinsic safety, the power supply must feature an intrinsically safe circuit at all times.

4.6.1.7 Flameproof enclosure - Zone 1

Housing design: ATEX II 2G Ex d IIC T6

Transmitter design: No explosion protection

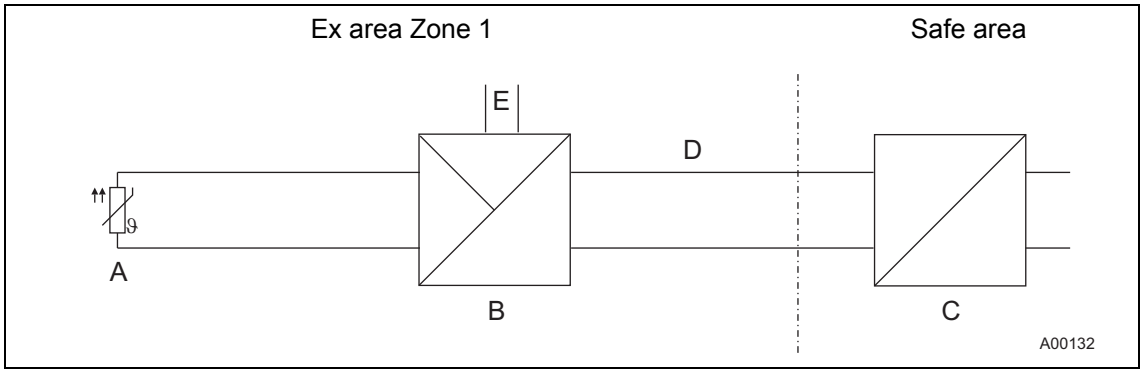


Fig. 23

A Sensor
B Transmitter in Ex d housing
C Supply isolator
D Fuse, < 32 mA
E Interface for LCD indicator

The only way to achieve the “flameproof enclosure” type of protection is through the correct installation of a specially certified cable gland with Ex d type of protection that is marked accordingly.

4.6.1.8 Flameproof enclosure - Zone 0 / 1

Housing design: ATEX II 2G Ex d IIC T6

Transmitter design: ATEX II 1G Ex ia IIC T6

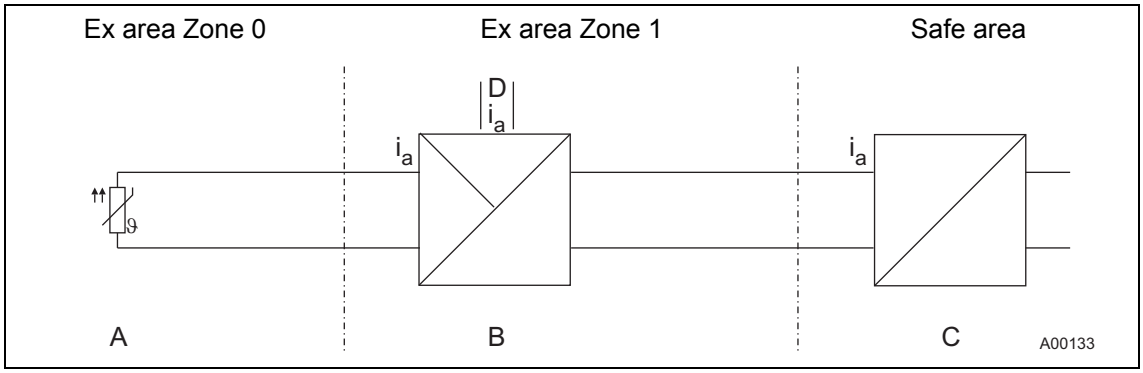


Fig. 24

A Sensor
B Transmitter in Ex d housing
C Supply isolator
D Interface for LCD indicator

The only way to achieve the “flameproof enclosure” type of protection is through the correct installation of a specially certified cable gland with Ex d type of protection that is marked accordingly.

The input for the supply isolator must have an [Ex ia] design.

As the user, it is your responsibility to ensure that sensor instrumentation meets the requirements of applicable Ex standards. The sensor can be installed in Zone 1 or Zone 0. For Zone 0, the circuit must be of the [Ex ia] design.

5 Ex relevant specifications

5.1 TTF300-E1X, intrinsic safety ATEX

Explosion protection

Approved for use in Zone 0, 1, and 2

Designation

II 1G Ex ia IIC T6 (Zone 0)
II 2(1)G Ex [ia] ib IIC T6 (Zone 1 [0])
II 2G(1D) Ex [iaD] ib IIC T6 (Zone 1 [20])

TTF300-E1H:
EC type-examination test certificate PTB 05 ATEX 2017 X
TTF300-E1P / E1F:
EC type-examination test certificate PTB 09 ATEX 2016 X

5.2 TTF300-H1X, intrinsic safety IECEx

Designation

Ex ia IIC T6
Ex [ia] ib IIC T6
Ex [iaD] ib IIC T6

TTF300-H1H:
IECEx certificate of conformity IECEx PTB 09.0014X
TTF300-H1P / H1F:
IECEx certificate of conformity

5.3 Safety specifications for Intrinsic Safety ATEX / IECEx

Temperature table

Temperature class	Permissible ambient temperature range	
	Device category 1 use	Device category 2 use
T6	-50 … 44 °C (-58 ... 111,2 °F)	-50 … 56 °C (-58 ... 132,8 °F)
T5	-50 … 56 °C (-58 ... 132,8 °F)	-50 … 71 °C (-58 ... 159,8 °F)
T4, T3, T2, T1	-50 … 60 °C (-58 ... 140,0 °F)	-50 … 85 °C (-58 ... 185,0 °F)

Intrinsic safety Ex ia IIC type of protection (part 1)

	TTF300-E1H TTF300-H1H Supply circuit	TTF300-E1P / -H1P TTF300-E1F / -H1F Supply circuit 1)	
		FISCO	ENTITY
Max. voltage	U_i = 30 V	$U_i \leq$ 17.5 V	$U_i \leq$ 24.0 V
Short-circuit current	I_i = 130 mA	$I_i \leq$ 183 mA 2)	$I_i \leq$ 250 mA
Max. power	P_i = 0.8 W	$P_i \leq$ 2.56 W 2)	$P_i \leq$ 1.2 W
Internal inductance	L_i = 0.5 mH	$L_i \leq$ 10 µH	$L_i \leq$ 10 µH
Internal capacitance	C_i = 5 nF	$C_i \leq$ 5 nF	$C_i \leq$ 5 nF

1) FISCO in accordance with IEC 60079-27
2) II B FISCO: $I_i \leq$ 380 mA, $P_i \leq$ 5.32 W

Intrinsic safety Ex ia IIC type of protection (part 2)

	Measurement current circuit: resistance thermometers, resistors	Measurement current circuit: thermocouples, voltages
Max. voltage	U_o = 6.5 V	U_o = 1.2 V
Short-circuit current	I_o = 25 mA	I_o = 50 mA
Max. power	P_o = 38 mW	P_o = 60 mW
Internal inductance	L_i = 0 mH	L_i = 0 mH
Internal capacitance	C_i = 49 nF	C_i = 49 nF
Maximum permissible external inductance	L_o = 5 mH	L_o = 5 mH
Maximum permissible external capacitance	C_o = 1.55 µF	C_o = 1.05 µF

Intrinsic safety Ex ia IIC type of protection (part 3)

	LCD indicator interface
Max. voltage	U_o = 6.2 V
Short-circuit current	I_o = 65.2 mA
Max. power	P_o = 101 mW
Internal inductance	L_i = 0 mH
Internal capacitance	C_i = 0 nF
Maximum permissible external inductance	L_o= 5 mH
Maximum permissible external capacitance	C_o= 1.4 µF

5.4 TTF300-E5X, non-sparking + dust explosion protection ATEX

Explosion protection
Approved for use in Zone 2 and Zone 22
Designation
II 3G Ex nA II T6
II 3 D IP 65 T 135 °C

ABB manufacturer's declaration in accordance with ATEX Directive

Temperature table

Temperature class	Device category 3 use
T6	-50 … 56 °C (-58 ... 132,8 °F)
T5	-50 … 71 °C (-58 ... 159,8 °F)
T4	-50 … 85 °C (-58 ... 185,0 °F)

5.5 TTF300-D1X, dust explosion protection ATEX

Explosion protection
Approved for use in Zone 20
Designation
II 1D Ex tD A20 IP66 T135°C

EC type-examination test certificate BVS 06 ATEX E 029

5.6 TTF300-D2X, dust explosion protection + intrinsic safety ATEX

Explosion protection
Approved for use in Zone 20 and Zone 0
Designation
II 1D Ex tD A20 P66 T135°C
II 1G Ex ia IIC T6

EC type-examination test certificate BVS 06 ATEX E 029
EC type-examination test certificate PTB 05 ATEX 2017 X
EC type-examination test certificate PTB 05 ATEX 2016 X

5.7 TTF300-E3X, flameproof enclosure ATEX

Explosion protection
Approved for use in Zone 1
Designation
II 2G Ex d IIC T6

EC type-examination test certificate PTB 99 ATEX 1144

5.8 TTF300-E4X, flameproof enclosure + intrinsic safety ATEX

Explosion protection
Approved for use in Zone 1
Designation
II 2G Ex d IIC T6
II 1G Ex ia IIC T6

EC type-examination test certificate PTB 99 ATEX 1144
EC type-examination test certificate PTB 05 ATEX 2017 X
EC type-examination test certificate PTB 05 ATEX 2016 X

5.9 TTF300-L1X, intrinsically safe FM

Class I, Div. 1 + 2, Groups A, B, C, D
Class I, Zone 0, AEx ia IIC
TTF300-L1H: Control Drawing: SAP_214832
TTF300-L1P: Control Drawing: TTF300-L1..P (IS)
TTF300-L1F: Control Drawing: TTF300-L1..F (IS)

5.10 TTF300-L2X, non-incendive FM

Class I, Div. 2, Groups A, B, C, D
Class I Zone 2 Group IIC T6
TTF300-L2H:
Control Drawing: SAP_214828
Control Drawing: SAP_214830
TTF300-L2P:
Control Drawing: TTF300-L2..P (NI_PS), TTF300-L2..P (NI_AA)
TTF300-L2F:
Control Drawing: TTF300-L2..F (NI_PS), TTF300-L2..F (NI_AA)

5.11 TTF300-L3X, explosion proof FM

XP,NI, DIP Class I, II, III, Div. 1 + 2, Groups A-G, factory sealed

5.12 TTF300-L7X, explosion proof + intrinsically safe FM

XP, NI, DIP Class I, II, III, Div. 1 + 2, Groups A-G, factory sealed
Class I, Div. 1 + 2, Groups A, B, C, D
Class I, Zone 0, AEx ia IIC T6
TTF300-L1H: Control Drawing: SAP_214832
TTF300-L1P: Control Drawing: TTF300-L1..P (IS)
TTF300-L1F: Control Drawing: TTF300-L1..F (IS)

5.13 TTF300-R1X, intrinsically safe CSA

Class I, Div. 1 + 2, Groups A, B, C, D
Class I, Zone 0, Ex ia IIC
TTF300-R1H: Control Drawing: SAP_214825
TTF300-R1P: Control Drawing: TTF300-R1..P (IS)
TTF300-R1F: Control Drawing: TTF300-R1..F (IS)

5.14 TTF300-R2X, non-incendive CSA

Class I, Div. 2, Groups A, B, C, D
TTF300-R2H:
Control Drawing: SAP_214827
Control Drawing: SAP_214895
TTF300-R2P:
Control Drawing: TTF300-R2..P (NI_PS), TTF300-R2..P (NI_AA)
TTF300-R2F:
Control Drawing: TTF300-R2..F (NI_PS), TTF300-R2..F (NI_AA)

5.15 TTF300-R3X, explosion proof CSA

XP,NI, DIP Class I, II, III, Div. 1 + 2, Groups A-G, factory sealed

5.16 TTF300-R7X, explosion proof + intrinsically safe CSA

XP,NI, DIP Class I, II, III, Div. 1 + 2, Groups A-G, factory sealed
Class I, Div. 1 + 2, Groups A, B, C, D
Class I, Zone 0, Ex ia Group IIC T6
TTF300-R1H: Control Drawing: SAP_214825
TTF300-R1P: Control Drawing: TTF300-R1..P (IS)
TTF300-R1F: Control Drawing: TTF300-R1..F (IS)

6 Type B LCD

CE marking

The type B LCD indicator meets all requirements as regards the CE marking in accordance with IEC 61326 (2005).

6.1 Features

Transmitter-controlled graphic (alphanumeric) LCD indicator

Character height, mode-dependent
Sign, 4 digits, 2 decimal places
Bar graph display

Display options

Sensor 1 process value
Sensor 2 process value
Electronics / ambient temperature
Output value
Output %

Display diagnostic information related to transmitter and sensor status

6.2 Specifications

Temperature range

-20 … 70 °C (-4 … 158 °F)
Restricted display function (contrast, reaction time) in the temperature ranges:
-50 … -20 °C (-58 … -4 °F)
and
70 … 85 °C (158 … 185 °F)

Humidity

0 … 100 %, condensation permitted

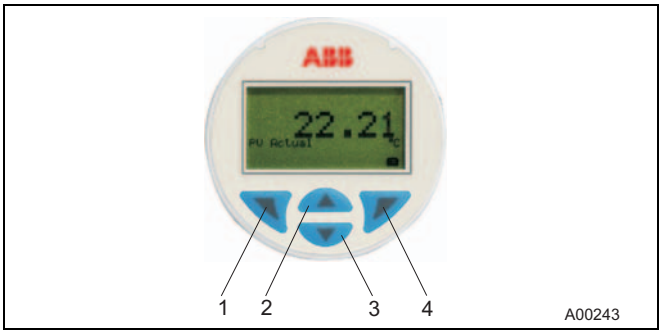


Fig. 25: Type B LCD indicator

1 Exit / Cancel
2 Scroll back
3 Scroll forward
4 Select

6.3 Configuration function

Sensor configuration for standard sensors
Measuring range
Behavior in the event of a fault (HART)
Software-write protection for configuration data
Device address for HART and PROFIBUS PA

6.4 Ex relevant specifications

6.4.1 Intrinsic safety ATEX

Explosion protection

Approved for use in Zone 0

Designation

II 1G Ex ia IIC T6

EC type-examination test certificate PTB 05 ATEX 2079 X

6.4.2 Intrinsic safety IECEx

Explosion protection

Approved for use in Zone 0

Designation

Ex ia IIC T6

IECEx certificate of conformity IECEx PTB

6.4.3 Safety specifications for intrinsic safety ATEX / IECEx

Temperature table

Temperature class	Permissible ambient temperature range	
	Device category 1 use	Device category 2 use
T6	-40 … 44 °C (-40 … 111.2 °F)	-40 … 56 °C (-40 … 132.8 °F)
T5	-40 … 56 °C (-40 … 132.8 °F)	-40 … 71 °C (-40 … 159.8 °F)
T4	-40 … 60 °C (-40 … 140 °F)	-40 … 85 °C (-40 … 185 °F)

Protection type intrinsic safety Ex ia IIC

	Supply circuit
Max. voltage	U_i = 9 V
Short circuit current	I_i = 65.2 mA
Max. power	P_i = 101 W
Internal inductance	L_i = 0 mH
Internal capacitance	C_i = 0 nF

6.4.4 Intrinsically Safe FM

I.S. Class I Div 1 and Div 2, Group: A, B, C, D or
I.S. Class I Zone 0 AEx ia IIC T*
Temp. Ident: T6 T_{amb} 56 °C, T4 T_{amb} 85 °C
U_i / V_{max} = 9V, I_i / I_{max} < 65.2 mA, P_i = 101 mW
C_i = 0.4 µF; L_i = 0
Control Drawing: SAP_214 748

6.4.5 Non-Incendive FM

N.I. Class I Div 2, Group: A, B, C, D or
Ex nL IIC T*, Class I Zone 2
Temp. Ident: T6 T_{amb} 60 °C, T4 T_{amb} 85 °C
U_i / V_{max} = 9V, I_i / I_{max} < 65.2 mA, P_i = 101 mW
C_i = 0.4 µF; L_i = 0
Control Drawing: SAP_214 751

6.4.6 Intrinsically Safe CSA

I.S. Class I Div 1 and Div 2; Group: A, B, C, D or
I.S Zone 0 Ex ia IIC T*
*Temp. Ident T6 T_{amb} 56 C, T4 T_{amb} 85 °C
U_i / V_{max} = 9V, I_i / I_{max} < 65,2 mA; P_i = 101 mW
C_i < 0,4 F_{μ}, L_i = 0
Control Drawing: SAP_214 749

6.4.7 Non-Incendive CSA

N.I. Class I Div 2, Group: A, B, C, D or
Ex nL IIC T*, Class I Zone 2
*Temp. Ident T6, T_{amb} 60 °C, T4 T_{amb} 85 °C
U_i / V_{max} = 9V, I_i / I_{max} < 65.2 mA, P_i = 101 mW
C_i < 0.4 µF, L_i = 0
Control Drawing: SAP_214 750

7 Appendix

7.1 Other applicable documents

- Data Sheet (DS/TTF300)
- Operating Instruction (OI/TTF300)
- SIL-Safety Instructions (SM/TTX3X0/SIL)
- Interface Description HART (COM/TTX300/HART)
- Interface Description PROFIBUS (COM/TTX300/PB)
- Interface Description FOUNDATION Fieldbus (COM/TTX300/FF)

7.2 Approvals and certifications

CE mark	CE	The version of the meter in your possession meets the requirements of the following European directives: - EMC directive 2004/108/EC - ATEX directive 94/9/EC
Explosion Protection	Ex IECEx FM APPROVED CSA	Identification for intended use in potentially explosive atmospheres according to: - ATEX directive (marking in addition to CE marking) - IEC standards - FM Approvals (US) - CSA International (Canada)

Important (Notice)
All documentation, declarations of conformity, and certificates are available in ABB's download area.
www.abb.com/temperature

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:*	**Temperatur Messumformer Feldgehäuse** **Temperature Transmitter Fieldhousing**
Modell- / Typebezeichnung: *Model- / type name:*	**TTF300**
Produktnummer: *Product number:*	**TTF300-...H (HART)** **TTF300-...P (Profibus PA)** **TTF300-...F (Fieldbus Foundation)**
Konform zu EG-Richtlinien: *Conform to EC-directives:*	**94/9/EG (ATEX)** **2004/108/EG(EMV/EMC)**
EG-Baumusterprüfbescheinigung: *EC-Type examination certificate:*	**PTB 05 ATEX 2017 X** **PTB 09 ATEX 2016 X** **PTB 05 ATEX 2079 X** **PTB 99 ATEX 1144** **BVS 06 ATEX E 029**
Relevante Normen: *Related Standards:*	**EN 61326-1:2006** **EN 61241-0:2006, EN 61241-1:2004** **EN 60079-0:2006, EN 60079-11:2007** **EN 60079-1:2007, EN 60079-26:2007,** **EN 60079-15:2005,EN 60079-27:2006,** **EN 1127-1:1997**
Qualitätssicherung Produktion Anerkennung: *Production Quality notification:*	**PTB 99 ATEX –Q004-...**

entspricht.
complies.

Alzenau, 28 October 2010

i.V.
I.V. Reiner Laurinat
Leiter Qualitätsmanagement
Quality Manager

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

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CI/TTF300-EN Rev. D

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