Introduction

The TTF300 is available with the HART, PROFIBUS PA and FOUNDATION Fieldbus communication protocols.

The TTF300 has global approvals for explosion protection up to Zone 0.

Safety-relevant applications up to SIL 3 (redundant) are supported in accordance with IEC 61508.

The TTF300 is approved for custody transfer measurements by MID certificate in accordance with the Measuring Instruments Directive 2014/32/EU.

Additional Information

Additional documentation on TTF300 is available for download free of charge at www.abb.com/temperature. Alternatively simply scan this code:
# Table of contents

1 **Safety** ................................................................. 4
   - General information and instructions ................. 4
   - Warnings ......................................................... 4
   - Intended use .................................................. 5
   - Improper use .................................................. 5
   - Notes on data safety ........................................ 5
   - Manufacturer’s address .................................... 5
   - Customer service center ................................. 5

2 **Use in potentially explosive atmospheres in accordance with ATEX and IECEx** ........... 6
   - Ex marking ..................................................... 6
     - Transmitter ................................................. 6
     - LCD indicator ............................................. 7
   - Temperature data ............................................ 8
     - Transmitter ................................................. 8
     - LCD indicator ............................................. 8
   - Electrical data ............................................... 8
     - Transmitter ................................................. 8
     - LCD indicator ............................................. 9
   - Installation instructions .................................. 10
     - ATEX / IECEx ............................................... 10
     - Cable entries .............................................. 10
   - Electrical connections .................................... 11
   - Commissioning ................................................ 16
   - Operating instructions .................................... 16
     - Damage to the 'Flameproof (enclosure)– Ex d’ type of protection ............................................. 16
     - Protection against electrostatic discharges ..... 16
   - Repair ............................................................ 16

3 **Use in potentially explosive atmospheres in accordance with FM and CSA** ........... 17
   - Ex marking ..................................................... 17
     - Transmitter ................................................. 17
     - LCD indicator ............................................. 18
   - Installation instructions .................................. 18
     - FM / CSA ...................................................... 18
   - Electrical connections .................................... 18
   - Commissioning ................................................ 19
   - Operating instructions .................................... 19
     - Adverse effect on the 'Explosionproof – XP’ type of protection ............................................. 19
     - Protection against electrostatic discharges ..... 19
   - Repair ............................................................ 20

4 **Product identification** ........................................ 21
   - Name plate ..................................................... 21
     - Explosion protection marking for devices with one type of protection .................................. 21
     - Explosion protection marking for devices with a combination of explosion protection types .... 22

5 **Transport and storage** ........................................ 23
   - Inspection ....................................................... 23
   - Transporting the device .................................... 23
   - Storing the device ........................................... 23
     - Ambient conditions ........................................ 23
     - Returning devices ......................................... 23

6 **Installation** ...................................................... 24
   - Ambient conditions ........................................ 24
   - Mounting ....................................................... 24
   - Opening and closing the housing ...................... 25
   - Rotating the LCD indicator .............................. 25

7 **Electrical connections** ....................................... 26
   - Safety instructions .......................................... 26
     - Protection of the transmitter from damage caused by highly energetic electrical interferences ...... 26
   - Conductor material ......................................... 27
     - Power supply cable ...................................... 27
   - Cable glands .................................................. 27
   - Shielding of the sensor connecting cable ............ 27
     - Examples of shielding / grounding .................. 28
   - Pin assignment ............................................... 30
   - Terminal for sensor connection cable ................. 32
   - Electrical data for inputs and outputs ................... 32
     - Input - resistance thermometer / resistances ... 32
     - Resistance thermometer ................................ 32
     - Resistance measurement ............................... 32
     - Sensor connection type .................................. 32
     - Connection lead .......................................... 32
     - Measurement current .................................... 32
     - Sensor short circuit ...................................... 32
     - Sensor wire break ........................................ 32
     - Corrosion detection in accordance with NE 89 ... 32
     - Sensor error signaling ................................... 32
     - Input - thermocouples / voltages ..................... 33
     - Types ......................................................... 33
     - Voltages ...................................................... 33
     - Connection lead .......................................... 33
     - Sensor wire break monitoring in accordance with NE 89 ......................................................... 33
   - Input resistance .............................................. 33
   - Internal reference junction Pt1000, IEC 60751 Cl. B ... 33
   - Sensor error signaling ................................... 33
   - Output – HART® .............................................. 33
   - Output – PROFIBUS PA® .................................. 34
   - Output – FOUNDATION Fieldbus® .................... 34
   - Power supply .................................................. 35
   - Power supply – HART® .................................... 35
   - Power supply – PROFIBUS / FOUNDATION Fieldbus 36

8 **MID Certification** .............................................. 37
   - TTF300 with MID certification .......................... 37
     - General ....................................................... 37
     - Areas of application, conditions and requirements ... 37
     - Installation and Operation .............................. 37
9 Commissioning ........................................................ 38
   General ........................................................................... 38
   Checks prior to commissioning ...................................... 38
   Communication .................................................................. 38
      HART® Communication .................................................... 38
      Operating modes ................................................................ 38
      Configuration options / tools........................................... 38
      Diagnosis notice ................................................................. 38
      PROFIBUS® Communication ............................................ 39
      Voltage / current consumption ...................................... 39
      FOUNDATION Fieldbus® Communication ....................... 39
      Voltage / current consumption ...................................... 39
   Basic Setup ............................................................................. 40

10 Operation ................................................................. 41
   Safety instructions ................................................................. 41
   Hardware settings ................................................................. 41
   Menu navigation ................................................................. 41

11 Maintenance ............................................................. 42
   Safety instructions ................................................................. 42

12 Recycling and disposal ............................................ 42

13 Specification ............................................................ 42

14 Additional documents ............................................ 42

15 Appendix ................................................................... 43
   Return form ............................................................................. 43
1 Safety

General information and instructions

These instructions are an important part of the product and must be retained for future reference.
Installation, commissioning, and maintenance of the product may only be performed by trained specialist personnel who have been authorized by the plant operator accordingly. The specialist personnel must have read and understood the manual and must comply with its instructions.
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 nor an amendment to any previous or existing agreement, promise or legal relationship.
Modifications and repairs to the product may only be performed if expressly permitted by these instructions.
Information and symbols on the product must be observed.
These may not be removed and must be fully legible at all times.
The operating company must strictly observe the applicable national regulations relating to the installation, function testing, repair and maintenance of electrical products.

Warnings

The warnings in these instructions are structured as follows:

⚠️ DANGER
The signal word ‘DANGER’ indicates an imminent danger.
Failure to observe this information will result in death or severe injury.

⚠️ WARNING
The signal word ‘WARNING’ indicates an imminent danger.
Failure to observe this information may result in death or severe injury.

⚠️ CAUTION
The signal word ‘CAUTION’ indicates an imminent danger.
Failure to observe this information may result in minor or moderate injury.

NOTICE
The signal word ‘NOTICE’ indicates possible material damage.

Note
‘Note’ indicates useful or important information about the product.
Intended use

This device is intended for the following uses:
• To measure the temperature of fluid, pulpy or pasty substances and gases or resistance/voltage values.

The device has been designed for use exclusively within the technical limit values indicated on the name plate and in the data sheets.
• The maximum ambient temperature must not be exceeded.
• The IP rating of the housing must be observed during operation.
• For use in potentially explosive atmospheres, follow the associated guidelines.
• When using as a SIL-device in safety-relevant applications, the SIL Safety Manual should be observed.

Improper use

The following are considered to be instances of especially improper use of the device:
• For use as a climbing aid, for example for mounting purposes.
• For use as a bracket for external loads, for example as a support for piping, etc.
• Material application, for example by painting over the housing, name plate or welding/soldering on parts.
• Material removal, for example by spot drilling the housing.

Notes on data safety

This product is designed to be connected to and to communicate information and data via a network interface. It is operator’s sole responsibility to provide and continuously ensure a secure connection between the product and your network or any other network (as the case may be). Operator shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc.) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and / or theft of data or information. ABB Automation Products GmbH and its affiliates are not liable for damages and / or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and / or theft of data or information.

Manufacturer’s address

ABB Automation Products GmbH
Measurement & Analytics
Schillerstr. 72
32425 Minden
Germany
Tel:  +49 571 830-0
Fax: +49 571 830-1806

Customer service center

Customer service center
Tel:  +49 180 5 222 580
Email: automation.service@de.abb.com
2 Use in potentially explosive atmospheres in accordance with ATEX and IECEx

Ex marking

Note
- Further information on the approval of devices for use in potentially explosive atmospheres can be found in the explosion protection test certificates (at www.abb.com/temperature).
- Depending on the design, a specific marking in accordance with ATEX or IECEx applies.
- In devices with combined types of protection, for example TTF300-E4, observe the ‘Product Identification’ chapter in the operating or commissioning instruction before commissioning.

ATEX intrinsic safety
The device fulfills the requirements of Directive 2014/34/EU in case of corresponding purchase orders and is approved for use in Zone 0, 1 and 2.

<table>
<thead>
<tr>
<th>Model TTF300-E1H</th>
<th>Type Examination Test Certificate</th>
<th>PTB 05 ATEX 2017 X</th>
</tr>
</thead>
<tbody>
<tr>
<td>II 1 G</td>
<td>Ex ia IIC T6 Ga</td>
<td></td>
</tr>
<tr>
<td>II 2 (1) G</td>
<td>Ex [ia IIC Ga] lb IIC T6 Gb</td>
<td></td>
</tr>
<tr>
<td>II 2 G (1D)</td>
<td>Ex [ia IIC Da] lb IIC T6 Gb</td>
<td></td>
</tr>
</tbody>
</table>

Model TTF300-E1P and TTF300-E1F
Type Examination Test Certificate | PTB 09 ATEX 2016 X
II 1 G | Ex ia IIC T6 Ga
II 2 (1) G | Ex [ia IIC Ga] lb IIC T6 Gb
II 2 G (1D) | Ex [ia IIC Da] lb IIC T6 Gb

ATEX non-sparking and dust explosion protection
Approved for use in Zone 2 and 22.

Model TTF300-E5
Declaration of conformity
II 3 G | Ex nA IIC T1-T6 Gc
II 3 D | Ex tc IIIb T135°C Dc

ATEX dust explosion protection
Approved for use in Zone 21 and 22.

Model TTF300-D5H
Type Examination Test Certificate | BVS 06 ATEX E 029
II 2D | Ex tb IIIC T135°C Db
II 1G | Ex ia IIC T6 Ga

ATEX dust explosion protection and intrinsic safety
Approved for zone 21, 22 and Zone 0, 1 and 2.

The ‘D6H’ coding combines the following types of protection: ‘Intrinsic safety’ (TTF300-E1H) and ‘Dust explosion protection’ (TTF300-DSH). Devices with combined types of protection may only be operated in one of the possible types of protection. For this purpose, observe the ‘Product Identification’ chapter in the operating or commissioning instruction before commissioning.

Model TTF300-DSH
Type Examination Test Certificate | PTB 05 ATEX 2017 X
II 2D | Ex tb IIIC T135°C Db
II 1G | Ex ia IIC T6 Ga

ATEX flameproof (enclosure)
Approved for use in Zone 1 and 2.

Model TTF300-E3
Type Examination Test Certificate | PTB 99 ATEX 1144 X
II 2G | Ex db IIC T6/T4 Gb

ATEX flameproof (enclosure) and intrinsic safety
Approved for use in Zone 0 (intrinsic safety only), 1 and 2.

The ‘E4’ coding combines the following types of protection: ‘Intrinsic safety’ (TTF300-E1) and ‘Flameproof (enclosure)’ (TTF300-E3). Devices with combined types of protection may only be operated in one of the possible types of protection. For this purpose, observe the ‘Product Identification’ chapter in the operating or commissioning instruction before commissioning.

Model TTF300-E4
Type Examination Test Certificate | PTB 99 ATEX 1144 X
PTB 05 ATEX 2017 X
PTB 05 ATEX 2016 X
II 2G | Ex db IIC T6/T4 Gb
II 1G | Ex ia IIC T6 Ga

Model TTF300-D6H
Type Examination Test Certificate | BVS 06 ATEX E 029
PTB 05 ATEX 2017 X
II 2D | Ex tb IIIC T135°C Db
II 1G | Ex ia IIC T6 Ga
IECEx intrinsic safety
Approved for use in Zone 0, 1, and 2.

Model TTF300-H1H
IECEx certificate of conformity IECEx PTB 09.0014X
Ex ia IIC T6...T1 Ga
Ex [ia IIC Ga] [ib IIC T6...T1 Gb
Ex [ia IIC Da] [lb IIC T6...T1 Gb

Model TTF300-H1P and TTF300-H1F
IECEx certificate of conformity IECEx PTB 11.0108X
Ex ia IIC T6...T1 Ga
Ex [ia IIC Ga] [lb IIC T6...T1 Gb
Ex [ia IIC Da] [lb IIC T6...T1 Gb

IECEx dust explosion protection
Approved for use in Zone 21 and 22.

Model TTF300-J5H
IECEx certificate of conformity IECEx BVS 17.0065X
Ex tb IIC T135°C Db
Ex tc IIC T135°C Dc

IECEx flameproof (enclosure)
Approved for use in Zone 1 and 2.

Model TTF300-H5
IECEx certificate of conformity IECEx PTB 12.0039 X
Ex db IIC T6/T4 Gb

LCD indicator

ATEX intrinsic safety
The device fulfills the requirements of Directive 2014/34/EU in case of corresponding purchase orders and is approved for use in Zone 0, 1 and 2.

Type Examination Test Certificate PTB 05 ATEX 2079 X
II 1G Ex ia IIC T6 Ga

Non-sparking ATEX
The device fulfills the requirements of Directive 2014/34/EU in case of corresponding purchase orders and is approved for use in Zone 2.

Declaration of conformity
II 3 G Ex nA IIC T1-T6 Gc

IECEx intrinsic safety
Approved for use in Zone 0, 1, and 2.

IECEx certificate of conformity IECEx PTB 12.0028X
Ex ia IIC T6
**... 2  Use in potentially explosive atmospheres in accordance with ATEX and IECEx**

### Temperature data

**Transmitter**

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Permissible ambient temperature range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ATEX / IECEx intrinsic safety, ATEX non-sparking</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Device category</strong></td>
<td><strong>1 use</strong></td>
</tr>
<tr>
<td>T6</td>
<td>-50 to 44 °C (-58 to 111.2 °F)</td>
</tr>
<tr>
<td>T4 to T1</td>
<td>-50 to 60 °C (-58 to 140.0 °F)</td>
</tr>
</tbody>
</table>

**ATEX / IECEx Flameproof (Enclosure)**

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Permissible ambient temperature range on the connection head</th>
</tr>
</thead>
<tbody>
<tr>
<td>T6</td>
<td>-40 to 67 °C (-40 to 152 °F)</td>
</tr>
<tr>
<td>T4 to T1</td>
<td>-40 to 85 °C (-40 to 185 °F)</td>
</tr>
</tbody>
</table>

**LCD indicator**

**ATEX / IECEx intrinsic safety, ATEX non-sparking**

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Permissible ambient temperature range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Device category</strong></td>
<td><strong>1 use</strong></td>
</tr>
<tr>
<td>T6</td>
<td>-40 to 44 °C (-40 to 111.2 °F)</td>
</tr>
<tr>
<td>T4 to T1</td>
<td>-40 to 60 °C (-40 to 140 °F)</td>
</tr>
</tbody>
</table>

### Electrical data

**Transmitter**

**Intrinsic safety type of protection Ex ia IIC (Part 1)**

<table>
<thead>
<tr>
<th>Supply circuit</th>
<th>TTF300-EIH</th>
<th>TTF300-HIH</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FISCO</strong></td>
<td>*</td>
<td><strong>ENTITY</strong></td>
</tr>
<tr>
<td>Max. voltage</td>
<td>$U_i \leq 30$ V</td>
<td>$U_i \leq 17.5$ V</td>
</tr>
<tr>
<td>Short-circuit current</td>
<td>$I_i \leq 130$ mA</td>
<td>$I_i \leq 183$ mA**</td>
</tr>
<tr>
<td>Max. power</td>
<td>$P_i \leq 0.8$ W</td>
<td>$P_i \leq 2.56$ W**</td>
</tr>
<tr>
<td>Internal inductance</td>
<td>$L_i \leq 0.5$ mH</td>
<td>$L_i \leq 10$ μH</td>
</tr>
<tr>
<td>Internal capacitance</td>
<td>$C_i \leq 0.57$ nF***</td>
<td>$C_i \leq 5$ nF</td>
</tr>
</tbody>
</table>

* FISCO in accordance with 60079-27
** II B FISCO: $I_i \leq 380$ mA, $P_i \leq 5.32$ W
*** Only applies for HART variants. From HW Rev. 1.07, previously 5 nF

**Intrinsic safety type of protection Ex ia IIC (Part 2)**

**Measurement current circuit**

<table>
<thead>
<tr>
<th>Resistance Thermocouples, voltages, thermometers</th>
<th>TTF300-E1F / -H1F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. voltage</td>
<td>$U_o \leq 6.5$ V</td>
</tr>
<tr>
<td>Short-circuit current</td>
<td>$I_o \leq 25$ mA</td>
</tr>
<tr>
<td>Max. power</td>
<td>$P_o \leq 38$ mW</td>
</tr>
<tr>
<td>Internal inductance</td>
<td>$L_o \leq 0$ mH</td>
</tr>
<tr>
<td>Internal capacitance</td>
<td>$C_o \leq 49$ nF</td>
</tr>
<tr>
<td>Maximum permissible external inductance</td>
<td>$L_o \leq 5$ mH</td>
</tr>
<tr>
<td>Maximum permissible external capacitance</td>
<td>$C_o \leq 1.55$ μF</td>
</tr>
</tbody>
</table>

**Intrinsic safety type of protection Ex ia IIC (Part 3)**

**LCD indicator interface**

| Max. voltage | $U_o \leq 6.2$ V |
| Short-circuit current | $I_o \leq 65.2$ mA |
| Max. power | $P_o \leq 101$ mW |
| Internal inductance | $L_i \leq 0$ mH |
| Internal capacitance | $C_i \leq 0$ nF |
| Maximum permissible external inductance | $L_o \leq 5$ mH |
| Maximum permissible external capacitance | $C_o \leq 1.4$ μF |
**Type of protection flameproof (enclosure) Ex db IIC**

<table>
<thead>
<tr>
<th>Supply circuit</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum voltage</td>
<td>( U_s = 30 \text{ V} )</td>
</tr>
<tr>
<td>Maximum current</td>
<td>( I_s = 32 \text{ mA} ), limited by the upstream fuse (rated fuse current 32 mA)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measurement current circuit</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum voltage</td>
<td>( U_o = 6.5 \text{ V} )</td>
</tr>
<tr>
<td>Maximum current</td>
<td>( I_o = 17.8 \text{ mA} )</td>
</tr>
<tr>
<td>Maximum power</td>
<td>( P_o = 39 \text{ mW} )</td>
</tr>
</tbody>
</table>

**Dust explosion protection type of protection**

- **Ex tb IIC T135°C Db**, **Ex tc IIC T135°C Dc**

**Non-intrinsically safe power supply**

<table>
<thead>
<tr>
<th>Supply circuit</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum voltage</td>
<td>( U_s = 30 \text{ V} )</td>
</tr>
<tr>
<td>Maximum current</td>
<td>( I_s = 32 \text{ mA} ), limited by the upstream fuse (rated fuse current 32 mA)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measurement current circuit</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum permissible power</td>
<td>( P_l = 0.5 \text{ W} )</td>
</tr>
<tr>
<td>dissipation in the measuring inset (sensor)</td>
<td></td>
</tr>
</tbody>
</table>

**Intrinsically safe power supply**

If in the dust explosion protection type of protection, the transmitter is supplied with power from a power supply unit which is designed as intrinsically safe in the ‘Ex ia’ or ‘Ex ib’ type of protection, a limitation of the power supply circuit by an upstream fuse is not required.

In this case, the electric data of the transmitter for the intrinsic safety type of protection Ex ia IIC (Part 1) for TTF300-E1H and TTF300-H1H, Ex ia IIC (Part 2) as well Ex ia IIC (Part 3) should be complied with.

Refer to **Transmitter** on page 8.

**LCD indicator**

**Intrinsic safety type of protection Ex ia IIC**

<table>
<thead>
<tr>
<th>Supply circuit</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. voltage</td>
<td>( U_i = 9 \text{ V} )</td>
</tr>
<tr>
<td>Short-circuit current</td>
<td>( I_i = 65.2 \text{ mA} )</td>
</tr>
<tr>
<td>Max. power</td>
<td>( P_i = 101 \text{ mW} )</td>
</tr>
<tr>
<td>Internal inductance</td>
<td>( L_i = 0 \text{ mH} )</td>
</tr>
<tr>
<td>Internal capacitance</td>
<td>( C_i = 0 \text{ nF} )</td>
</tr>
</tbody>
</table>
... 2 Use in potentially explosive atmospheres in accordance with ATEX and IECEx

Installation instructions

ATEX / IECEx
The installation, commissioning, maintenance and repair of devices in potentially explosive atmospheres must only be carried out by appropriately trained personnel. Works may be carried out only by persons, whose training has included instructions on different types of protection and installation techniques, concerned rules and regulations as well as general principles of zoning. The person must possess the appropriate competences for the type of work to be conducted.
When operating with combustible dusts, comply with EN 60079-31.
The safety instructions for electrical apparatus in potentially explosive areas must be in accordance with Directive 2014/34/EU (ATEX) and IEC 60079-14 (Installation of electrical equipment in potentially explosive areas).
Comply with the applicable regulations for the protection of employees to ensure safe operation.

Cable entries

Devices with type of protection 'Ex d' without supplied cable glands
For devices with the ‘Ex d – flameproof (enclosure)’ type of protection which are supplied without cable glands, observe the instructions in Flameproof (enclosure) – Zone 1 on page 15.
For information on the cable gland used, refer to the relevant data sheet and operating instructions.

Devices with type of protection 'Ex d' with cable glands
If devices in ‘Ex d – flameproof (enclosure)’ type of protection with cable gland are ordered, an Ex d certified cable gland is factory-installed.

Cable gland data
- Thread: 2 x M20 x 1.5 or 2 x \( \frac{1}{2} \) in NPT
- Temperature range: \(-50\) to \(85\) °C (\(-58\) to \(185\) °F)
- Cable outside diameter: \(3.2\) to \(8.7\) mm (\(0.13\) to \(0.34\) in)
- Material: nickel-plated brass

The cable entry is only suitable for fixed installations and non-reinforced cables with round and smooth plastic sleeves and suitable outside diameter. The cables must be attached appropriately in order to prevent them being pulled out or twisted.

The operating instruction and approvals supplied with the cable glands, as well as any applicable requirements in accordance with EN 60079-14 must be taken into account accordingly.

Installation instructions for cable glands
The sealing rings of the cable glands harden at low temperatures. Before installation, bring the sealing rings to a temperature of at least 20 °C for 24 hours. Before inserting the sealing rings and fixing them onto the cable gland, knead the rings to ensure they are soft and flexible.

IP rating IP66 / 67 is only achieved by installing the black neoprene sealing ring between the cable gland and the housing and by observing the tightening torque of 3.6 Nm (Figure 2, item 2).
Cables must be protected against extreme mechanical loads (caused by tension, torsion, crushing, and so on). 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.

1. Check that cable used is suitable (i.e., check the mechanical resilience, temperature range, creep resistance, resistance to chemicals, outside diameter, and so on).
2. Strip the cable in accordance with Figure 1.
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 (Figure 2, item 2). Do not tighten more than 1.5–times of the specified torque on the housing (see assembly instructions for cable gland)!
**Maintenance**

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

**M20 × 1.5 plastic cable gland for various types of protection**

The optionally supplied M20 × 1.5 plastic cable gland has a limited temperature range. The permissible ambient temperature range of the cable gland is −20 to 80 °C (−4 to 176 °F). When using the cable gland, make sure that the ambient temperature is within this range.

The cable gland must be installed in the housing with a tightening torque of 3.8 Nm. On the cable side, when installing the connection of the cable gland and cable, check for integrity to ensure that the required IP rating is met.

**Electrical connections**

**Grounding**

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

**Intrinsic safety installation check**

If transmitters are operated in an intrinsically safe circuit, proof that the interconnection is intrinsically safe must be provided in accordance with IEC/EN 60079-14 as well as IEC/EN 60079-25. The supply isolators / DCS inputs must feature intrinsically safe input protection circuits in order to eliminate hazards (spark formation).

In order to provide proof of intrinsic safety, the electrical limit value 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:

<table>
<thead>
<tr>
<th>Transmitter (intrinsically safe equipment)</th>
<th>Supply isolator / DCS input (related equipment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$U_{i} \geq U_{o}$</td>
<td></td>
</tr>
<tr>
<td>$I_{i} \geq I_{o}$</td>
<td></td>
</tr>
<tr>
<td>$P_{i} \geq P_{o}$</td>
<td></td>
</tr>
<tr>
<td>$L_{i} + L_{c}$ (cable) \leq L_{o}$</td>
<td></td>
</tr>
<tr>
<td>$C_{i} + C_{c}$ (cable) \leq C_{o}$</td>
<td></td>
</tr>
</tbody>
</table>

**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. For this, pay attention to the country-specific guidelines and certificates!

**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 interconnection methods can be used.
2 Use in potentially explosive atmospheres in accordance with ATEX and IECEx

Installation instructions

ATEX – Zone 0

Designation: II 1 G Ex ia IIC T6 Ga

Ex area Zone 0

Safe area

Figure 4: Hookup in ATEX – Zone 0

The input for the supply isolator must be designed with ‘Ex ia’ type of protection.

When using the transmitter in Zone 0, make sure that impermissible electrostatic charging of the transmitter is avoided (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.

⚠️ WARNING

Risk of explosion!

When using the device in areas which require the ‘Ga’ equipment protection level - EPL (Zone 0), the TTF300 types should be installed with aluminum housings to protect against mechanical impact loads or friction.

Note

When operating the transmitter in Zone 0 (EPL ‘Ga’), the compatibility of the device materials with the surrounding atmosphere must be ensured.

Encapsulation material used for the transmitter:

Polyurethane (PUR), WEVO PU-417

ATEX – Zone 1 (0)

Marking: II 2 (1) G Ex [ia IIC Ga] ib IIC T6 Gb

Zone 0 or 1

Ex area Zone 1

Safe area

Figure 5: Hookup in ATEX - Zone 1 (0)

The input for the supply isolator must be designed with ‘Ex ib’ type of protection.

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.

When using the transmitter in Zone 1, you must ensure that impermissible electrostatic charging of the temperature transmitter is prevented (observe the warnings on the device).
ATEX – Zone 1 (20)

Marking: II 2 G (1D) Ex [ia III C Da] ib IIC T6 Gb

Zone 20 or 21  
Ex area Zone 1  
Safe area  

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

Figure 6: Hookup in ATEX - Zone 1 (20)

The input for the supply isolator must be designed with ‘Ex ib’ type of protection.
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 20 or Zone 21.

When using the transmitter in Zone 1, make sure that impermissible electrostatic charging of the temperature transmitter is avoided (observe the warnings on the device).

ATEX – Zone 2

Designation: II 3 G Ex nA IIC T1-T6 Gc

Ex area Zone 2  
Safe area  

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

Figure 7: Hookup in ATEX - Zone 2

When using the transmitter in Zone 2, observe the following:
- The temperature transmitter must be installed in accordance with IP rating IP 54 (in accordance with EN 60529). Suitable cable glands must be used for this purpose.
- External measures must be made for the power supply circuit in order to prevent the rated voltage from being up-scaled by more than 40 % in the event of transient disturbances.
- The electrical connections must only be opened or closed when there is no hazardous atmosphere.
- The temperature transmitter must be integrated into the potential equalization of the system.
2 Use in potentially explosive atmospheres in accordance with ATEX and IECEx

Installation instructions

Dust explosion protection – Zone 21

Marking:
II 2D Ex tb IIIC T135°C Db
II 3D Ex tc IIIC T135°C Dc

The power supply circuit of the transmitter must be limited by an upstream fuse with a fuse current rating of 32 mA. This is not required if the power supply unit is designed as intrinsically safe with a ‘Ex ia / Ex ib’ type of protection.

Maximum input terminal voltage of the transmitter: 30 V DC

The maximum permissible power dissipation in the measuring inset (sensor) is $P_i = 0.5$ W.

Dust explosion protection – Zone 0/21

Housing design: ATEX II 2D Ex tb IIIC T135°C Db
Transmitter design: ATEX II 1G Ex ia IIC T6 Ga

When using the sensor in Zone 0 and the transmitter in Zone 21, the transmitter must comply with Category 2D, while the sensor circuit must be designed in the ‘Ex ia’ type of protection and the supply circuit and power supply unit in the ‘Ex ia’ or ‘Ex ib’ type of protection.
Flameproof (enclosure) – Zone 1

Housing design: ATEX II 2G Ex db IIC T6/T4 Gb

The transmitter must be connected using suitable cable and cable entries or pipeline systems that satisfy the requirements of EN 60079-1 and for which a separate examination certificate exists. If the transmitter is connected to pipeline systems, the relevant sealing device must be affixed directly to the housing. Cable entries (PG glands) and sealing plugs of simple design must not be used.

Close unused cable entry in accordance with EN 60079.-1.

The connection lead must be routed securely and in such a way as to ensure adequate protection against damage.

If the temperature on the entry parts is over 70° C, connection leads with sufficient temperature resistance must be used.

The transmitter must be integrated into the local potential equalization of the potentially explosive area.

The power supply circuit of the transmitter must be limited by an upstream fuse with a fuse current rating of 32 mA.

Maximum input terminal voltage of the transmitter: 30 V DC

The ‘flameproof enclosure’ type of protection is only achieved by correctly installing a specially certified cable gland with the Ex d type of protection with the corresponding marking.

The sensor instrumentation must be provided by the user in accordance with the valid Ex-standards.

As far as the installation and mounting of components is concerned (explosion-proof cable entries, connection parts), only those components are approved which at the least technically comply with the current version of the PTB 99 ATEX 1144 X type examination certificate and for which a separate examination certificate exists. At the same time, it is imperative that the operating conditions listed in the respective component certificates are complied with.
... 2  Use in potentially explosive atmospheres in accordance with ATEX and IECEx

Commissioning
The commissioning and parameterization of the device may also be carried out in potentially explosive atmospheres using a handheld terminal that has been approved accordingly under consideration of an intrinsic safety installation check. Alternatively, an Ex modem can be connected to the circuit outside the potentially explosive atmosphere.

Operating instructions

⚠️ DANGER
Risk of explosion due to hot parts
Hot parts inside the device pose an explosion hazard.
- Never open the device immediately after switch-off.
- A waiting time of at least four minutes should be observed before opening the device.

⚠️ DANGER
Explosion hazard when opening the device
Explosion hazard when opening the device with activated power supply.
- Before opening the device, switch off the power supply.

Damage to the ‘Flameproof (enclosure)– Ex d’ type of protection
The cover thread is used as a flameproof joint for the ‘Flameproof (enclosure) – Ex d’ type of protection.
- During assembly / disassembly of the device, make sure that the cover thread does not get damaged.
- Devices with damaged threads must no longer be used in potentially explosive atmospheres.

Protection against electrostatic discharges
The painted surface of the housing and the plastic parts inside the device can store electrostatic charges.

⚠️ WARNING
Risk of explosion!
The device must not be used in areas in which process-related electrostatic charging of the housing may occur.
- The device must be maintained and cleaned so that any dangerous electrostatic charge is avoided.

Repair

⚠️ DANGER
Explosion hazard
Explosion hazard due to improper repair of the device. Faulty devices must not be repaired by the operator.
- The device may only be repaired by the ABB Service Department.
- Repairs on flameproof joints are not permitted.
3 Use in potentially explosive atmospheres in accordance with FM and CSA

Note
- Further information on the approval of devices for use in potentially explosive atmospheres can be found in the explosion protection test certificates (at www.abb.com/temperature).
- Depending on the design, a specific marking in accordance with FM or CSA applies.

Ex marking

**Transmitter**
**FM Intrinsically Safe**

<table>
<thead>
<tr>
<th>Model</th>
<th>Control Drawing</th>
<th>Class</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TTF300-L1H</td>
<td>SAP_214832</td>
<td>Class I, Div. 1 + 2, Groups A, B, C, D</td>
<td></td>
</tr>
<tr>
<td>TTF300-L1P</td>
<td>TTF300-L1..P (IS)</td>
<td>Class I, Zone 0, Ex ia IIC</td>
<td></td>
</tr>
<tr>
<td>TTF300-L1F</td>
<td>TTF300-L1..F (IS)</td>
<td>Class I, Zone 0, Ex ia IIC</td>
<td></td>
</tr>
</tbody>
</table>

**FM Non-Incendive**

<table>
<thead>
<tr>
<th>Model</th>
<th>Control Drawing</th>
<th>Class</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TTF300-L2H</td>
<td>SAP_214830 (NI_PS)</td>
<td>Class I, Div. 2, Groups A, B, C, D</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SAP_214828 (NI_AA)</td>
<td>Class I Zone 2 Group IIC</td>
<td></td>
</tr>
<tr>
<td>TTF300-L2P</td>
<td>TTF300-L2..P (NI_PS)</td>
<td>Class I, Div. 2, Groups A, B, C, D</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TTF300-L2..P (NI_AA)</td>
<td>Class I Zone 2 Group IIC</td>
<td></td>
</tr>
<tr>
<td>TTF300-L2F</td>
<td>TTF300-L2..F (NI_PS)</td>
<td>Class I, Div. 2, Groups A, B, C, D</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TTF300-L2..F (NI_AA)</td>
<td>Class I Zone 2 Group IIC</td>
<td></td>
</tr>
</tbody>
</table>

**FM Explosion proof**

<table>
<thead>
<tr>
<th>Model</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TTF300-L3</td>
<td>XP, NI, DIP Class I, II, III, Div. 1 + 2, Groups A-G, factory sealed</td>
</tr>
</tbody>
</table>

**CSA Intrinsically Safe**

<table>
<thead>
<tr>
<th>Model</th>
<th>Control Drawing</th>
<th>Class</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TTF300-R1H</td>
<td>SAP_214825</td>
<td>Class I, Div. 1 + 2, Groups A, B, C, D</td>
<td></td>
</tr>
<tr>
<td>TTF300-R1P</td>
<td>TTF300-R1..P (IS)</td>
<td>Class I, Zone 0, Ex ia IIC</td>
<td></td>
</tr>
<tr>
<td>TTF300-R1F</td>
<td>TTF300-R1..F (IS)</td>
<td>Class I, Zone 0, Ex ia IIC</td>
<td></td>
</tr>
</tbody>
</table>

**CSA Non-Incendive**

<table>
<thead>
<tr>
<th>Model</th>
<th>Control Drawing</th>
<th>Class</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TTF300-R2H</td>
<td>SAP_214827 (NI_PS)</td>
<td>Class I, Div. 2, Groups A, B, C, D</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SAP_214895 (NI_AA)</td>
<td>Class I Zone 2 Group IIC</td>
<td></td>
</tr>
<tr>
<td>TTF300-R2P</td>
<td>TTF300-R2..P (NI_PS)</td>
<td>Class I, Div. 2, Groups A, B, C, D</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TTF300-R2..P (NI_AA)</td>
<td>Class I Zone 2 Group IIC</td>
<td></td>
</tr>
<tr>
<td>TTF300-R2F</td>
<td>TTF300-R2..F (NI_PS)</td>
<td>Class I, Div. 2, Groups A, B, C, D</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TTF300-R2..F (NI_AA)</td>
<td>Class I Zone 2 Group IIC</td>
<td></td>
</tr>
</tbody>
</table>

**CSA Explosion proof**

<table>
<thead>
<tr>
<th>Model</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TTF300-R3</td>
<td>XP, NI, DIP</td>
</tr>
</tbody>
</table>

**CSA Explosion Proof and Intrinsically Safe**

<table>
<thead>
<tr>
<th>Model</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TTF300-R7H</td>
<td>Class I, Div. 1 + 2, Groups A-G, factory sealed</td>
</tr>
<tr>
<td>TTF300-R7P</td>
<td>Class I, Div. 1 + 2, Groups A-G, factory sealed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TTF300-R7F</td>
<td>Class I, Zone 0, Ex ia Group IIC</td>
</tr>
</tbody>
</table>
... 3 Use in potentially explosive atmospheres in accordance with FM and CSA

Ex marking

LCD indicator

**FM Intrinsically Safe**

Control Drawing SAP_214 748

<table>
<thead>
<tr>
<th>I.S. Class</th>
<th>Div 1 and Div 2, Group: A, B, C, D or</th>
<th>I.S. Zone 0 Ex ia IIC T*</th>
</tr>
</thead>
<tbody>
<tr>
<td>( U_i / V_{max} = 9 \text{ V}, I_i / I_{max} &lt; 65.2 \text{ mA}, P_i = 101 \text{ mW}, C_i = 0.4 \mu F, L_i = 0 )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**FM Non-Incendive**

Control Drawing SAP_214 751

<table>
<thead>
<tr>
<th>N.I. Class</th>
<th>Div 2, Group: A, B, C, D oder Ex nL IIC T**, Class I Zone 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>( U_i / V_{max} = 9 \text{ V}, I_i / I_{max} &lt; 65.2 \text{ mA}, P_i = 101 \text{ mW}, C_i = 0.4 \mu F, L_i = 0 )</td>
<td></td>
</tr>
</tbody>
</table>

**CSA Intrinsically Safe**

Control Drawing SAP_214 749

<table>
<thead>
<tr>
<th>I.S. Class</th>
<th>Div 1 and Div 2, Group: A, B, C, D or</th>
<th>I.S. Zone 0 Ex ia IIC T*</th>
</tr>
</thead>
<tbody>
<tr>
<td>( U_i / V_{max} = 9 \text{ V}, I_i / I_{max} &lt; 65.2 \text{ mA}, P_i = 101 \text{ mW}, C_i &lt; 0.4 \mu F, L_i = 0 )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CSA Non-Incendive**

Control Drawing SAP_214 750

<table>
<thead>
<tr>
<th>N.I. Class</th>
<th>Div 2, Group: A, B, C, D oder Ex nL IIC T**, Class I Zone 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>( U_i / V_{max} = 9 \text{ V}, I_i / I_{max} &lt; 65.2 \text{ mA}, P_i = 101 \text{ mW}, C_i &lt; 0.4 \mu F, L_i = 0 )</td>
<td></td>
</tr>
</tbody>
</table>

* Temp. Ident: T6 T_{amb} 56 °C, T4 T_{amb} 85 °C
** Temp. Ident: T6 T_{amb} 60 °C, T4 T_{amb} 85 °C

Installation instructions

FM / CSA

The installation, commissioning, maintenance and repair of devices in areas with explosion hazard must only be carried out by appropriately trained personnel.

The operator must strictly observe the applicable national regulations with regard to installation, function tests, repairs, and maintenance of electrical devices. (e. g. NEC, CEC).

M20 × 1.5 plastic cable gland for various types of protection

The optionally supplied M20 × 1.5 plastic cable gland has a limited temperature range. The permissible ambient temperature range of the cable gland is -20 to 80 °C (-4 to 176 °F). When using the cable gland, make sure that the ambient temperature is within this range.

The cable gland must be installed in the housing with a tightening torque of 3.8 Nm. On the cable side, when installing the connection of the cable gland and cable, check for integrity to ensure that the required IP rating is met.

Electrical connections

Grounding

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

Intrinsic safety installation check

If transmitters are operated in an intrinsically safe circuit, proof that the interconnection is intrinsically safe must be provided in accordance with IEC/EN 60079-14 as well as IEC/EN 60079-25. The supply isolators / DCS inputs must feature intrinsically safe input protection circuits in order to eliminate hazards (spark formation).

In order to provide proof of intrinsic safety, the electrical limit value 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.

Note

When operating the transmitter in Zone 0, the compatibility of the device materials with the surrounding atmosphere must be guaranteed.

Encapsulation material used for the transmitter: Polyurethane (PUR), WEVO PU-417
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:

<table>
<thead>
<tr>
<th>Transmitter (intrinsically safe equipment)</th>
<th>Supply isolator / DCS input (related equipment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$U_i \geq U_o$</td>
<td></td>
</tr>
<tr>
<td>$I_i \geq I_o$</td>
<td></td>
</tr>
<tr>
<td>$P_i \geq P_o$</td>
<td></td>
</tr>
<tr>
<td>$L_i + L_c$ (cable) $\leq L_o$</td>
<td></td>
</tr>
<tr>
<td>$C_i + C_c$ (cable) $\leq C_o$</td>
<td></td>
</tr>
</tbody>
</table>

Figure 11: Intrinsic safety installation check

**Commissioning**

The commissioning and parameterization of the device may also be carried out in potentially explosive atmospheres using a handheld terminal that has been approved accordingly under consideration of an intrinsic safety installation check. Alternatively, an Ex modem can be connected to the circuit outside the potentially explosive atmosphere.

**Operating instructions**

⚠️ **DANGER**

**Risk of explosion due to hot parts**
Hot parts inside the device pose an explosion hazard.
- Never open the device immediately after switch-off.
- A waiting time of at least four minutes should be observed before opening the device.

⚠️ **DANGER**

**Explosion hazard when opening the device**
Explosion hazard when opening the device with activated power supply.
- Before opening the device, switch off the power supply.

**Adverse effect on the ‘Explosionproof – XP’ type of protection**
The cover thread is used as a flameproof joint for the ‘Explosionproof – XP’ type of protection.
- During assembly / disassembly of the device, make sure that the cover thread does not get damaged.
- Devices with damaged threads must no longer be used in potentially explosive atmospheres.

**Protection against electrostatic discharges**
The painted surface of the housing and the plastic parts inside the device can store electrostatic charges.

⚠️ **WARNING**

**Risk of explosion!**
The device must not be used in areas in which process-related electrostatic charging of the housing may occur.
- The device must be maintained and cleaned so that any dangerous electrostatic charge is avoided.
... 3 Use in potentially explosive atmospheres in accordance with FM and CSA

Repair

⚠️ DANGER

Explosion hazard
Explosion hazard due to improper repair of the device. Faulty devices must not be repaired by the operator.
- The device may only be repaired by the ABB Service Department.
- Repairs on flameproof joints are not permitted.
4 Product identification

Name plate

Note
The name plates displayed are examples. The device identification plates affixed to the device can differ from this representation.

Note
The ambient temperature range specified on the name plate refers only to the transmitter itself and not to the measuring element used in the measuring inset. For devices with PROFIBUS PA® or FOUNDATION Fieldbus®, the device IDs are additionally specified.

Figure 12: HART® name plate (example)

Figure 13: PROFIBUS PA® name plate (example)

Figure 14: FOUNDATION Fieldbus® name plate (example)

Explosion protection marking for devices with one type of protection
Devices with an explosion-proof design are marked with the following additional plates.

Note
- Further information on the approval of devices for use in potentially explosive atmospheres can be found in the explosion protection test certificates at [www.abb.com/temperature](http://www.abb.com/temperature).
- Depending on the design, a specific marking in accordance with ATEX or IECEx applies.

Figure 15: Additional plate for explosion-protected apparatus (example)
... 4 Product identification

... Name plate

Explosion protection marking for devices with a combination of explosion protection types

Coding of the type of protection of the device in accordance with order information can also refer to a combination of different explosion approvals for various types of protection.

The ‘intrinsic safety’, ‘flameproof (enclosure)’ and ‘dust explosion protection’ types of protection can be combined with each other.

The following example shows the explosion protection marking for the combination of the ‘intrinsic safety’ and ‘flameproof (enclosure)’ types of protection:

![Figure 16: Combination of 'Intrinsic safety' and 'Flameproof (enclosure)' types of protection, coding of type of protection: E4.]

Measures required before the use of devices with combined types of protection

**NOTICE**

Note for temperature transmitters with combined approval

Before the transmitter is installed, the selected type of protection must be indelibly marked on the explosion protection certification plate.

The transmitter can then only be operated with this degree of protection throughout its entire service life.

- If two protection types are indelibly marked on the explosion protection certification plate, the transmitter must not be used in areas categorized as hazardous.

Devices with combined types of protection may only be operated in one of the possible types of protection. Before commissioning, users must decide on one of these types of protection and their corresponding approval.

- The ‘E4’ coding combines the following types of protection: ‘Intrinsic safety’, type ‘TTF300-E1’ and ‘Flameproof (enclosure)’, type ‘TTF300-E3’.
- The ‘D6’ coding combines the following types of protection: ‘Intrinsic safety’, type ‘TTF300-E1’ and ‘Dust explosion protection’, type ‘TTF300-D5’.

Additional combinations are generally possible.

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.

The additional plate has two checkboxes (see Figure 16) for marking.

It is absolutely necessary to mark one of the checkboxes on the left side indelibly in accordance with the selected type of protection of the application. This has to be done before the TTF300 is commissioned in the application.

The marking must be applied in a permanent and indelible manner, for example by using a caustic or acidic pencil or by stamping the marking on a metallic plate.

Unmarked devices must **NOT** be commissioned.
5 Transport and storage

Inspection

Check the devices immediately after unpacking for possible damage that may have occurred from improper transport. Details of any damage that has occurred in transit must be recorded on the transport documents. All claims for damages must be submitted to the shipper without delay and before installation.

Transporting the device

Observe the following instructions:

• Do not expose the device to humidity during transport. Pack the device accordingly.
• Pack the device so that it is protected against vibrations during transport, for example, by using air-cushioned packing.

Storing the device

Bear the following points in mind when storing devices:

• Store the device in its original packaging in a dry and dust-free location.
• Observe the permitted ambient conditions for transport and storage.
• Avoid storing the device in direct sunlight.
• In principle, the devices may be stored for an unlimited period. However, the warranty conditions stipulated in the order confirmation of the supplier apply.

Ambient conditions

The ambient conditions for the transport and storage of the device correspond to the ambient conditions for operation of the device. Adhere to the device data sheet!

Returning devices

Use the original packaging or a secure transport container of an appropriate type if you need to return the device for repair or recalibration purposes. Fill out the return form (see Return form on page 43) and include this with the device.

In accordance with the EU Directive governing 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 must be free from any hazardous materials (acids, alkalis, solvents, etc.).

Please contact Customer Center Service acc. to page 5 for nearest service location.
6 Installation

Note
When using the device in potentially explosive atmospheres, note the additional data in *Use in potentially explosive atmospheres in accordance with ATEX and IECEx* on page 6 and *Use in potentially explosive atmospheres in accordance with FM and CSA* on page 17!

Ambient conditions

Ambient temperature
- Standard: −40 to 85 °C (−40 to 185 °F)
- Optional: −50 to 85 °C (−58 to 185 °F)
- Limited temperature range during operation with LCD indicator: −20 to 70 °C (−4 to 158 °F)
- Limited temperature range with explosion-proof design: see corresponding certificate
- Limited temperature range with MID certification: see corresponding certificate

Transport / Storage temperature
−50 to 85 °C (−58 to 185 °F)

Climate class in accordance with DIN EN 60654-1
Cx −40 to 85 °C (−40 to 185 °F) at 5 to 95 % relative air humidity

Max. permissible humidity in accordance with
IEC 60068-2-30
100 % relative air humidity

Vibration resistance in accordance with IEC 60068-2-6
10 to 2000 Hz at 5 g, during operation and transport

Shock resistance in accordance with IEC 68-2-27
gn = 30, during operation and transport

IP rating
IP 66 and IP 67, NEMA 4X, ENCL 4X

Mounting

![Mounting diagram]

CAUTION

Risk of injury!
There is a risk of injury if the transmitter falls out due to improper mounting.
- Make sure that transmitter is securely fastened.

Wall mounting:
Fasten the wall bracket 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 fastened to a pipe with a maximum diameter of 63.5 mm (2.5 in)
Opening and closing the housing

DANGER
Danger of explosion if the device is operated with the transmitter housing or terminal box open!
While using the device in potentially explosive atmospheres before opening the transmitter housing or the terminal box, note the following points:
• A valid fire permit must be present.
• Make sure that no flammable or hazardous atmospheres are present.

To open the housing, release the cover lock by screwing in the Allen screw 1.
After closing the housing, lock the housing cover by unscrewing the Allen screw 1.

NOTICE
Potential adverse effect on the IP rating
• Check the O-ring gasket for damage and replace it if necessary before closing the housing cover.
• Check that the O-ring gasket is properly seated when closing the housing cover.

Rotating the LCD indicator

The position of the LCD indicator can be adjusted to suit the mounting 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 bracket.
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.

NOTICE
Potential adverse effect on the IP rating
• Check the O-ring gasket for damage and replace it if necessary before closing the housing cover.
• Check that the O-ring gasket is properly seated when closing the housing cover.
7 Electrical connections

Safety instructions

**DANGER**

Improper installation and commissioning of the device carries a risk of explosion.

For use in potentially explosive atmospheres, observe the information in Use in potentially explosive atmospheres in accordance with ATEX and IECEx on page 6 and Use in potentially explosive atmospheres in accordance with FM and CSA on page 17!

Observe the following instructions:

- The electrical connection may only be established by authorized specialist personnel and in accordance with the connection diagrams.
- The relevant regulations must be observed during electric installation.
- The electrical connection information in the instruction must be observed; otherwise, the electric IP rating may be adversely affected.
- Safe isolation of electric circuits which are dangerous if touched is ensured only 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 connection leads separate from electric circuits which are dangerous if touched, or implement additional insulation measures.
- 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 with the installation.
- The power supply and signal are routed in the same conductor and should be implemented as a SELV or PELV circuit in accordance with the relevant standard (standard version). For the explosion-proof design, the guidelines in accordance with the Ex standard must be adhered to.
- You need to check that the available power supply corresponds to the information on the name plate.

**Note**
The signal cable wires must be provided with wire end sleeves. The slotted screws of the connection terminals are tightened with a size 1 screwdriver (3.5 or 4 mm).

Protection of the transmitter from damage caused by highly energetic electrical interferences

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

For the shielding and grounding of the device and the connection cable, observe Examples of shielding / grounding on page 28.

**NOTICE**

Temperature transmitter damage!

Overvoltage, overcurrent and high-frequency interference signals on the supply connection as well as sensor connection side of the device can damage the temperature transmitter.

![Warning signs]

A Do not weld
B No high-frequency interference signals / switching operations of large consumers
C No overvoltage due to lightning

Figure 20: Warning signs

Overcurrent and overvoltage can occur through for example welding operations, switching operations of large electric consumers, or lightning in the vicinity of the transmitter, sensor, as well as connector cables. Temperature transmitters are sensitive devices on the sensor side as well. Long connector cables to the sensor can encourage damaging interference. This can already happen if temperature sensors are connected to the transmitter during installation, but are not yet integrated into the system (no connection to the supply isolator / DCS)!
Suited protective measures
The following items should be observed to protect the transmitter from sensor-side damage:

- In the vicinity of the transmitter, sensor and sensor connector cable in case of a connected sensor, high-energy overvoltage, overcurrent and high-frequency interference signals due to welding operations, lightning, circuit breakers or large consumers of electricity among others should be absolutely avoided.
- The connection cable of the sensor on the transmitter should be disconnected when performing welding work in the vicinity of the installed transmitter, sensor, as well as supply lines from the sensor to the transmitter.
- This correspondingly also applies to the supply side, if there is a connection there.

Conductor material
Power supply cable
Maximum cable outer diameter: 12 mm (0.47 in)

Maximum wire cross section: 2.5 mm² (AWG 16)

Cable glands
The cable diameter must be appropriate for the cable gland used so that IP rating IP 66 / IP 67 or NEMA 4X can be maintained. This must be checked during installation.

For delivery without cable gland (thread M20 × 1.5 or NPT ½ in), the following points must be observed:

- Use cable glands in accordance with version M20 × 1.5 or NPT ½ in.
- Observe information in the data sheet for the cable gland used.
- Check the working temperature for the cable gland used.
- Check the IP rating IP 66 / IP 67 or NEMA 4X of the cable gland used.
- Check the Ex relevant specifications for the cable gland used in accordance with the manufacturer data sheet or the Ex declaration.
- The cable gland used must be approved for the cable diameter (IP rating).
- Observe tightening torque in accordance with information in data sheet / operating instructions for the cable gland used.

Shielding of 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.

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

NOTICE
Damage to components!
In systems without potential equalization or with potential differences between the individual grounding points, multiple instances of shield grounding can result in transient currents at mains frequency. These can damage the shielding, influence the measurements and have a significant impact on signal transmission, of bus signals in particular.
... 7 Electrical connections

... Shielding of the sensor connecting cable

Examples of shielding / grounding

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

The shielding of the sensor connection cable is grounded via the grounded transmitter housing. This shielding is insulated from the sensor.

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

The shielding of the power supply cable and the shielding of sensor connection cable must not be connected to one another. Make sure that the shielding is not connected to ground anywhere else.

![Diagram of sensor and cable connections]

**Figure 21:** The shieldings of the sensor connection cable and the supply voltage cable are separate and each grounded at one end

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

The shielding of the sensor connection cable is grounded via the grounded sensor housing. This shielding of the power supply cable is insulated from the transmitter housing.

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

The shielding of the power supply cable and the shielding of sensor connection cable must not be connected to one another. Make sure that the shielding is not connected to ground anywhere else.

![Diagram of sensor and cable connections]

**Figure 22:** The shieldings of the sensor connection cable and the supply voltage cable are separate and each grounded at one end
Insulated sensor measuring inset (thermocouple, mV, RTD, ohms), transmitter housing not grounded

The shielding of the power supply cable and the shielding of the sensor connection cable are connected to one another via the transmitter housing. The shielding is grounded at one end of the power supply cable, directly at the supply isolator / DCS input. Make sure that the shielding is not connected to ground anywhere else.

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

The shielding of the sensor connection cable is grounded via the grounded pressure sensor housing. This shielding of the power supply cable is insulated from the transmitter housing.

The shielding of the power supply cable is grounded at the supply isolator / DCS input directly. This shielding is insulated from the transmitter housing. The shielding of the power supply cable and the shielding of the sensor connection cable must not be connected to one another. Make sure that the shielding is not connected to ground anywhere else.
... 7 Electrical connections

Pin assignment

Resistance thermometers (RTD) / resistors (potentiometer)

A Potentiometer, four-wire circuit
B Potentiometer, three-wire circuit
C Potentiometer, two-wire circuit
D 2 x RTD, three-wire circuit*
E 2 x RTD, two-wire circuit*
F RTD, four-wire circuit
G RTD, three-wire circuit
H RTD, two-wire circuit

I Sensor 1
J Sensor 2*
K 4 to 20 mA HART®, PROFIBUS PA®, FOUNDATION Fieldbus®
L Interface for LCD indicator and service
M Ground terminals for shield support for sensors and supply / signal lines
1–6 Sensor connection (of measuring inset)

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

Figure 25: Terminal assignment resistance thermometer (RTD) / resistors (potentiometer)
Thermocouples / voltages and resistance thermometer (RTD) / thermocouple combinations

A 2 x voltage measurement*
B 1 x voltage measurement
C 2 x thermocouple*
D 1 x thermocouple
E 1 x RTD, four-wire circuit and thermocouple*
F 1 x RTD, three-wire circuit and thermocouple*
G 1 x RTD, two-wire circuit and thermocouple*

H Sensor 1
I Sensor 2*
J 4 to 20 mA HART®, PROFIBUS PA®, FOUNDATION Fieldbus®
K Interface for LCD indicator and service
L Ground terminals for shield support for sensors and supply / signal lines
T – I Sensor connection (of measuring inset)

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

Figure 26: Terminal assignment thermocouples / voltages and resistance thermometer (RTD) / thermocouple combinations
... 7 Electrical connections

Terminal for sensor connection cable

**DANGER**

Danger of explosion if the device is operated with the transmitter housing or terminal box open!
While using the device in potentially explosive atmospheres before opening the transmitter housing or the terminal box, note the following points:
- A valid fire permit must be present.
- Make sure that no flammable or hazardous atmospheres are present.

Electrical data for inputs and outputs

Input - resistance thermometer / resistances

**Resistance thermometer**
- Pt100 in accordance with IEC 60751, JIS C1604, MIL-T-24388
- Ni in accordance with DIN 43760
- Cu in accordance with recommendation OIML R 84

**Resistance measurement**
- 0 to 500 Ω
- 0 to 5000 Ω

**Sensor connection type**
Two-, three-, four-wire circuit

**Connection lead**
- Maximum sensor line resistance per line 50 Ω in accordance with NE 89
- Three-wire circuit:
  - Symmetrical sensor line resistances
- Two-wire circuit:
  - Compensation up to 100 Ω total lead resistance

**Measurement current**
- < 300 μA

**Sensor short circuit**
- < 5 Ω (for resistance thermometer)

**Sensor wire break**
- Measuring range: 0 to 500 Ω > 0.6 to 10 kΩ
- Measuring range: 0 to 5 Ω > 5.3 to 10 kΩ

**Corrosion detection in accordance with NE 89**
- Three-wire resistance measurement > 50 Ω
- Four-wire resistance measurement > 50 Ω

**Sensor error signaling**
- Resistance thermometer:
  - Sensor short circuit and sensor wire break
- Linear resistance measurement:
  - Sensor wire break

---

1. Tighten the lock screw under the housing cover.
2. Unscrew the housing cover.
3. If available, pull out the LCD indicator carefully.
4. Strip the sensor connection cable as shown and attach wire end sleeves.
   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.
5. Guide the sensor connection cable through the cable glands and into the housing. Then tighten the cable glands.
6. Connect the wires as per the connection diagram.
7. If there is one, carefully insert the LCD indicator in the previous / required position.
8. Screw the housing cover back on.
9. Loosen the lock screw until the housing cover is firmly in place.
Input - thermocouples / voltages

Types
- B, E, J, K, N, R, S, T in accordance with IEC 60584
- U, L in accordance with DIN 43710
- C, D in accordance with ASTM E-988

Voltages
- -125 to 125 mV
- -125 to 1100 mV

Connection lead
- Maximum sensor line resistance: per line 1.5 kΩ, total 3 kΩ

Sensor wire break monitoring in accordance with NE 89
- Pulsed with 1 µA outside measurement interval
- Thermocouple measurement 5.3 to 10 kΩ
- Voltage measurement 5.3 to 10 kΩ

Input resistance
> 10 MΩ

Internal reference junction Pt1000, IEC 60751 Cl. B
(no additional jumpers necessary)

Sensor error signaling
- Thermocouple:
  Sensor wire break
- Linear voltage measurement:
  Sensor wire break

Functionality input
Freestyle characteristic / 32-points-sampling point table
- Resistance measurement up to a maximum of 5 kΩ
- Voltages up to maximum 1.1 V

Sensor error adjustment
- Through Callendar-Van Dusen coefficients
- Through value table, 32 support points
- Through single-point adjustment (offset adjustment)
- Through two-point adjustment

Input functionality
- 1 Sensor
- 2 Sensors:
  mean measurement,
  differential measurement,
  sensor redundancy,
  Sensor drift monitoring

Output – HART®

Note
The HART® protocol is an unsecured protocol, as such the intended application should be assessed to ensure that these protocols are suitable before implementation.

Transmission characteristics
- Temperature linear
- Resistance linear
- Voltage linear

Output signal
- Configurable 4 to 20 mA (standard)
- Configurable 20 to 4 mA
  (Dynamic range: 3.8 to 20.5 mA in accordance with NE 43)

Simulation mode
3.5 to 23.6 mA

Induced current consumption
< 3.5 mA

Maximum output current
23.6 mA

Configurable error current signal
- Overrange 22 mA (20.0 to 23.6 mA)
- Underrange 3.6 mA (3.5 to 4.0 mA)
... 7 Electrical connections

... Electrical data for inputs and outputs

Output – PROFIBUS PA®

Note
The PROFIBUS PA® protocol is an unsecured protocol, as such the intended application should be assessed to ensure that these protocols are suitable before implementation.

Output signal
- PROFIBUS – MBP (IEC 61158-2)
- Baud rate 31.25 kBit/s
- PA-Profile 3.01
- FISCO compliant (IEC 60079-27)
- ID-Number: 0x3470 [0x9700]

Error current signal
- FDE (Fault Disconnection Electronic)

Block structure
- Physical Block
- Transducer Block 1 – Temperature
- Transducer Block 2 – HMI (LCD indicator)
- Transducer Block 3 – enhanced diagnosis
- Analog Input 1 – Primary Value (Calculated Value*)
- Analog Input 2 – SECONDARY VALUE_1 (Sensor 1)
- Analog Input 3 – SECONDARY VALUE_2 (Sensor 2)
- Analog Input 4 – SECONDARY VALUE_3 (reference junction temperature)
- Analog Output – optional HMI display (Transducer Block 2)
- Discrete Input 1 – extended diagnosis 1 (Transducer Block 3)
- Discrete Input 2 – extended diagnosis 2 (Transducer Block 3)
* Sensor 1, Sensor 2 or difference or mean

Output – FOUNDATION Fieldbus®

Note
The FOUNDATION Fieldbus® protocol is an unsecured protocol, as such the intended application should be assessed to ensure that these protocols are suitable before implementation.

Output signal
- FOUNDATION Fieldbus H1 (IEC 611582-2)
- Baud rate 31.25 kBit/s, ITK 5.x
- FISCO compliant (IEC 60079-27)
- Device ID: 000320001F...

Error current signal
- FDE (Fault Disconnection Electronic)

Block structure*
- Resource Block
- Transducer Block 1 – Temperature
- Transducer Block 2 – HMI (LCD indicator)
- Transducer Block 3 – enhanced diagnosis
- Analog Input 1 – PRIMARY_VALUE_1 (Sensor 1)
- Analog Input 2 – PRIMARY_VALUE_2 (Sensor 2)
- Analog Input 3 – PRIMARY_VALUE_3 (Calculated Value**)
- Analog Input 4 – SECONDARY_ VALUE (reference junction temperature)
- Analog Output – optional HMI display (Transducer Block 2)
- Discrete Input 1 – extended diagnosis 1 (Transducer Block 3)
- Discrete Input 2 – extended diagnosis 2 (Transducer Block 3)
- PID – PID controller

LAS (Link Active Scheduler) link master functionality

* For the block description, block index, execution times, and block class, refer to the interface description
** Sensor 1, Sensor 2 or difference or mean
Power supply
Two-wire technology, polarity safe; power supply lines = signal lines

Note
Following calculations apply for standard applications. This should be taken into consideration when working with a higher maximum current.

Power supply – HART®

Input terminal voltage
Non-Ex application:
$U_s = 11$ to $42$ V DC
Ex applications:
$U_s = 11$ to $30$ V DC

Maximum permissible residual ripple for input terminal voltage
During communication this is in accordance with the HART FSK ‘Physical Layer’ specification.

Undervoltage detection on the transmitter
If the terminal voltage on the transmitter down-scales a value of 10 V, this may lead to an output current of $I_a \leq 3.6$ mA.

Maximum load
$R_B = (\text{supply voltage} - 11$ V $) / 0.022$ A

Voltage drop on the signal line
When connecting the devices, note the voltage drop on the signal line. The minimum supply voltage on the transmitter must not be undershot.

Undervoltage detection on the transmitter

Standard application with 4 to 20 mA functionality
When connecting these components, observe the following condition:
$U_{1\text{min}} \leq U_{2\text{min}} - 22$ mA $\times R$

Standard application with HART functionality
Adding resistance $R_{250}$ increases the minimum supply voltage
$U_{2\text{min}}: U_{1\text{min}} \leq U_{2\text{min}} - 22$ mA $\times (R + R_{250})$

For HART functionality, use supply isolators or DCS input cards with a HART mark. If this is not possible, a resistance of $\geq 250$ $\Omega$ ($< 1100$ $\Omega$) must be added to the interconnection.

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

Unless the profile HART protocol Rev. 7 is specifically selected during the ordering process, the device normally supports the profile HART protocol Rev. 5 in the delivery status. The user can later change at any time to the HART Protocol Rev. 7 profile via a miniature switch. For additional information, see Hardware settings on page 41.
... 7 Electrical connections

... Electrical data for inputs and outputs

Power supply – PROFIBUS / FOUNDATION Fieldbus

Input terminal voltage
Non-Ex application:
\( U_S = 9 \text{ to } 32 \text{ V DC} \)
Ex-applications with:
\( U_S = 9 \text{ to } 17 \text{ V DC} \) (FISCO)
\( U_S = 9 \text{ to } 24 \text{ V DC} \) (Fieldbus Entity model I.S.)
Current consumption:
\( \leq 12 \text{ mA} \)

Standard application with PROFIBUS PA and FOUNDATION
Fieldbus H1 functionality
During hookup, the following condition should be complied with:
\( U_{1\text{min}} \leq U_{2\text{min}} - 12 \text{ mA} \times R \)
8 MID Certification

TTF300 with MID certification

The temperature transmitter TTF300 is certified by an MID Parts Certificate in accordance with the Measuring Instruments Directive 2014/32/EU (MID) and the standard WELMEC 7.2. The device with the appropriate configuration is therefore approved for ‘Custody Transfer’ measurements (fiscal metering). The MID certification emphasizes the high accuracy, reliability and durability of the TTF300.

Note
This chapter provides basic information on the MID-certified transmitter TTF300. Before commissioning the device, full information should be consulted in the supplied MID documents (Parts Certificate and associated ‘Description’). Any generally applicable statements on the transmitter TTF300, especially pertaining to explosion protection and device safety, remain unaffected.

General
Devices with MID certification have their own EU declaration of conformity. In addition to the declaration, the ‘Parts Certificate’ and the associated ‘Description’ are enclosed with the device. It is compulsory and imperative that the described areas of application, requirements and restrictions are complied with for the intended use of the device!

The requirements of explosion protection and functional safety (SIL) remain unaffected by the MID certification.

The number of the partial certificate (TC10833) of the notified body NMI Certin B.V. and the checksum (0x46c9) of the certified SW revision 01.03.00 are printed on the name plate of the device.

Areas of application, conditions and requirements
The temperature transmitter TTF300 with MID certification for custody transfer measurements is especially suited for measurement and control systems in the oil and gas industry. In addition to gas, any liquids except for water are permitted for measurement.

The MID certification refers to a special configuration of the transmitter. This must not be modified! An extract of the conditions and requirements stated in the certificate follows below:

- Communication protocol: HART 5, HART 7
- HW revision: 1.07
- SW revision: 01.03.00 with checksum 0x46c9
- The checksum of the software (firmware) is printed on the name plate of the device
- On sensor Pt100 in a four-wire circuit
- Permissible measuring range: −50 to 150 °C (−58 to 302 °F)
- Ambient temperature range with and without LCD indicator: −10 to 70 °C (14 to 158 °F)

Note
The MID certification can generally be combined with all certifications of explosion protection. The ambient temperature and measuring range named in the corresponding explosion protection certificate, however, limit the ranges permitted in the MID certificate.

Installation and Operation
The following should be observed in particular during installation and operation of the device:

- Protection against overwrite:
  - Local write protection (DIP switch 1) should be activated after installation and configuration.
  - After closing the housing, lock the housing cover by unscrewing the appropriate Allen screw. Afterwards, seal the housing of the device by applying the supplied seal over the gap between the housing cover and housing base.

![Figure 30: TTF300 Allen screw and seal (example)](image-url)
9 Commissioning

General

In case of corresponding order the transmitter is ready for operation after mounting and installation of the connections. The parameters are set at the factory.

If not exclusively selected while ordering the profile HART 7, the transmitter is delivered present with the profile HART 5. The profile can be always switched to HART 7 via a miniature switch, see Hardware settings on page 41.

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

Checks prior to commissioning

The following points must be checked before commissioning the device:

- Correct wiring in accordance with Electrical connections on page 26.
- The ambient conditions must correspond to the information given on the name plate and in the data sheet.

Communication

HART® Communication

Note

The HART® protocol is an unsecured protocol, as such the intended application should be assessed to ensure that these protocols are suitable before implementation.

Communication with the transmitter takes place using the HART protocol. The communication signal is modulated onto both wires of the signal line in accordance with the HART FSK ‘Physical Layer’ specification.

The HART modem is connected at the signal line of the current output via which power is also supplied via the power supply unit.

The device is listed with the FieldComm Group.

<table>
<thead>
<tr>
<th>Manufacturer ID</th>
<th>0x1A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device ID</td>
<td>HART 5: 0x000B, HART 7: 0x1A0B</td>
</tr>
<tr>
<td>Profile</td>
<td>HART 5.1 (can be switched to HART 7)</td>
</tr>
<tr>
<td>Configuration</td>
<td>On device using LCD indicator DTM, EDD, FDI (FIM)</td>
</tr>
<tr>
<td>Transmission signal</td>
<td>BELL Standard 202</td>
</tr>
</tbody>
</table>

Operating modes

- Point-to-point communication mode – standard (general address 0)
- Multidrop mode (addressing 1 to 15)
- Burst Mode

Configuration options / tools

Driver-independent:
- HMI LCD indicator with configuration function

Driver-dependent:
- Device management / Asset management tools
- FDT technology – via TTX300-DTM driver (Asset Vision Basic / DAT200)
- EDD – via TTX300 EDD driver (Handheld terminal, Field Information Manager / FIM)
- FDI technology – via TTX300 package (Field Information Manager / FIM)

Diagnosis notice

- Overrange- / underrange in accordance with NE 43
- HART diagnosis
**PROFIBUS® Communication**

**Note**
The PROFIBUS PA® protocol is an unsecured protocol, as such the intended application should be assessed to ensure that these protocols are suitable before implementation.

The interface complies with Profile 3.01 (Standard PROFIBUS®, EN 50170, DIN 1924 [PRO91]).

![Diagram](image)

**Figure 32: Example for PROFIBUS PA® connection**

<table>
<thead>
<tr>
<th>Manufacturer ID</th>
<th>0x1A</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID number</td>
<td>0x3470 (0x9700)</td>
</tr>
<tr>
<td>Profile</td>
<td>PA 3.01</td>
</tr>
<tr>
<td>Configuration</td>
<td>On device using LCD indicator</td>
</tr>
<tr>
<td>DTM</td>
<td></td>
</tr>
<tr>
<td>EDD</td>
<td></td>
</tr>
<tr>
<td>GSD</td>
<td></td>
</tr>
</tbody>
</table>

**Voltage / current consumption**

- Mean current consumption: 12 mA.
  
  In the event of an error, the FDE function (= Fault Disconnection Electronic) integrated in the device makes sure that the current consumption cannot exceed a maximum of 20 mA.

---

**FOUNDATION Fieldbus® Communication**

**Note**
The FOUNDATION Fieldbus® protocol is an unsecured protocol, as such the intended application should be assessed to ensure that these protocols are suitable before implementation.

![Diagram](image)

**Figure 33: Example for FOUNDATION Fieldbus® connection**

<table>
<thead>
<tr>
<th>Device ID</th>
<th>0003200001F...</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITK</td>
<td>5.x</td>
</tr>
<tr>
<td>Configuration</td>
<td>On device using LCD indicator</td>
</tr>
<tr>
<td>DTM</td>
<td>EDD</td>
</tr>
<tr>
<td>EDD</td>
<td>GSD</td>
</tr>
</tbody>
</table>

**Transmission signal**

IEC 61158-2

**Voltage / current consumption**

- Mean current consumption: 12 mA.
  
  In the event of an error, the FDE function (= Fault Disconnection Electronic) integrated in the device makes sure that the current consumption cannot exceed a maximum of 20 mA.
... 9 Commissioning

Basic Setup

Note
Transmitter communication and configuration via HART, PROFIBUS PA, and FOUNDATION Fieldbus H1 are described in separate documentation (‘Interface description’).

The following configuration types are available for the transmitter:

- With DTM:
  Configuration can be performed within an FDT frame application that is approved for use with the DTM.

- With EDD:
  Configuration can be performed within an EDD frame application that is approved for use with the EDD.

- With FDI-Package (FIM):
  Configuration is possible within an FDI frame applications (Field Information Manager / FIM) for which the FDI packages are released.

- With LCD indicator Type A with operating buttons
  Commissioning via the LCD indicator does not require any tools to be connected to the device and is therefore the simplest way of configuring the TTF300.

  The general operation and menus of the LCD indicator are described in Menu navigation on page 41.

Note
Unlike configuration using the DTM, EDD or FDI-Package (FIM) the functionality of the transmitter can only be changed to a limited extent with the LCD indicator.
10 Operation

Safety instructions
If there is a chance that safe operation is no longer possible, take the device out of operation and secure it against unintended startup.

Hardware settings

Located on the top of the transmitter next to the LCD indicator interface are two DIP switches.

Switch 1 activates the hardware write protection.

Switch 2 supports the request of the FOUNDATION Fieldbus for a hardware release for simulation in accordance with ITK.

For transmitters that support HART 7, switch 2 allows the desired HART version to be set (HART 5 or HART 7).

<table>
<thead>
<tr>
<th>DIP switch</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Local write protection</td>
</tr>
<tr>
<td></td>
<td>Off: Local write protection deact.</td>
</tr>
<tr>
<td></td>
<td>On: Local write protection act.</td>
</tr>
<tr>
<td>2</td>
<td>Release of the simulation</td>
</tr>
<tr>
<td></td>
<td>(FOUNDATION Fieldbus only)</td>
</tr>
<tr>
<td></td>
<td>Off: Simulation deact.</td>
</tr>
<tr>
<td></td>
<td>On: Simulation act.</td>
</tr>
<tr>
<td>2</td>
<td>HART version</td>
</tr>
<tr>
<td></td>
<td>Off: HART 5</td>
</tr>
<tr>
<td></td>
<td>On: HART 7</td>
</tr>
</tbody>
</table>

Note
- Factory setting: both switches set to ‘OFF’. Local write protection deactivated and HART 5, unless explicitly ordered HART 7 (HART version) or simulation locked (FOUNDATION Fieldbus).
- In PROFIBUS PA devices, Switch 2 must always be set to the ‘OFF’ position.

Menu navigation

You can use the  or  operating buttons to browse through the menu or select a number or character within a parameter value.

Different functions can be assigned to the  and  operating buttons. The function that is currently assigned to them is shown on the LCD display.

Control button functions

<table>
<thead>
<tr>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exit</td>
</tr>
<tr>
<td>Back</td>
</tr>
<tr>
<td>Cancel</td>
</tr>
<tr>
<td>Next</td>
</tr>
<tr>
<td>Select</td>
</tr>
<tr>
<td>Edit</td>
</tr>
<tr>
<td>OK</td>
</tr>
</tbody>
</table>

Note
For detailed information on the parameterization of the device, consult the associated operating instructions.
11 Maintenance

Repair and maintenance activities may only be performed by authorized customer service personnel. When replacing or repairing individual components, use original spare parts.

Safety instructions

⚠️ **DANGER**

Explosion hazard
Explosion hazard due to improper repair of the device.
- Faulty devices may not be repaired by the operator.
- The device may only be repaired by the ABB Service Department.

If transmitters are used as intended under normal operating conditions, no maintenance is required.

On-site repair of the transmitter or exchange of electronic components is not permissible.

**Note**

For detailed information on the maintenance of the device, consult the associated operating instructions (OI)!

12 Recycling and disposal

**Note**

Products that are marked with the adjacent symbol may not be disposed of as unsorted municipal waste (domestic waste). They should be disposed of through separate collection of electric and electronic devices.

This product and its packaging are manufactured from materials that can be recycled by specialist recycling companies.

Bear the following points in mind when disposing of them:
- As of 8/15/2018, this product will be under the open scope of the WEEE Directive 2012/19/EU and relevant national laws (for example, ElektroG - Electrical Equipment Act - in Germany).
- The product must be supplied to a specialist recycling company. Do not use municipal waste collection points. These may be used for privately used products only in accordance with WEEE Directive 2012/19/EU.
- If there is no possibility to dispose of the old equipment properly, our Service can take care of its pick-up and disposal for a fee.

13 Specification

**Note**

The device data sheet is available in the ABB download area at www.abb.com/temperature.

14 Additional documents

**Note**

Declarations of conformity of the device are available in the download area of ABB at www.abb.com/temperature. In addition, these are also included with the device in case of ATEX-certified devices.

Trademarks

HART is a registered trademark of FieldComm Group, Austin, Texas, USA
PROFIBUS and PROFIBUS PA are registered trademarks of PROFIBUS & PROFINET International (PI)
FOUNDATION Fieldbus is a registered trademark of FieldComm Group, Austin, Texas, USA.
15 Appendix

Return form

Statement on the contamination of devices and components

Repair and/or maintenance work will only be performed on devices and components if a statement form has been completed and submitted. Otherwise, the device/component returned may be rejected. This statement form may only be completed and signed by authorized specialist personnel employed by the operator.

Customer details:
Company: 
Address: 
Contact person: Telephone: 
Fax: Email: 

Device details:
Type: Serial no.: 
Reason for the return/description of the defect: 

Was this device used in conjunction with substances which pose a threat or risk to health?
☐ Yes ☐ No 

If yes, which type of contamination (please place an X next to the applicable items):
☐ biological ☐ corrosive / irritating ☐ combustible (highly / extremely combustible) 
☐ toxic ☐ explosive ☐ other toxic substances 
☐ radioactive 

Which substances have come into contact with the device?
1. 
2. 
3. 

We hereby state that the devices/components shipped have been cleaned and are free from any dangerous or poisonous substances.

__________
Town/city, date 

__________
Signature and company stamp
TTF300
Field-mount temperature transmitter

Introduction
The TTF300 is available with the HART, PROFIBUS PA and FOUNDATION Fieldbus communication protocols. The TTF300 has global approvals for explosion protection up to IIC Ex e and EEx ia iIC Ex d T5. The transmitter is suitable for custody transfer measurements by MID certificate in accordance with the Measuring Instruments Directive 2014/32/EU.

Additional Information
Additional documentation on TTF300 is available for download free of charge at www.abb.com/temperature. Alternatively simply scan this code:

We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents – in whole or in parts – is forbidden without prior written consent of ABB.

© ABB 2019 3KXT221001R4401