ABB MEASUREMENT & ANALYTICS | OPERATING INSTRUCTION | OI/TTD300-EN REV. A

TTD300

Dual compartment temperature transmitter

World class temperature transmitter in a rugged and robust dual compartment housing.

Measurement made easy

Introduction

The TTD300 provides a rugged and robust dual compartment field housing that meets the demands of the oil, gas, and chemical industries. It is available with the HART communication protocols.

Built on the TTH300 electronics, the TTD300 has global approvals for explosion protection up to Zone 0.

The TTD300 implements various NAMUR recommendations, including NE 89 and NE 107 and is available with internal surge protection.

Additional Information

Additional documentation on TTD300 is available for download free of charge at www.abb.com/temperature.
Alternatively simply scan this code:

Table of contents

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.

Use in Potentially Explosive Atmospheres

Note

- An additional document with Ex safety instructions is available for measuring systems that are used in potentially explosive atmospheres.
- Ex safety instructions are an integral part of this manual. As a result, it is crucial that the installation guidelines and connection values it lists are also observed.
  The icon on the name plate indicates the following:

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 corresponding 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.

Warranty provisions

Using the device in a manner that does not fall within the scope of its intended use, disregarding this manual, using underqualified personnel, or making unauthorized alterations releases the manufacturer from liability for any resulting damage. This renders the manufacturer's warranty null and void.

Cyber security disclaimer

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 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.

On www.abb.com/cybersecurity under 'Additional resources', 'Alerts and notifications' you will find notifications about newly discovered software vulnerabilities. It is recommended that you visit this website regularly and activate 'Subscribe to email alerts' to receive email notifications about 'ABB cyber security alerts and notifications'.

Software downloads

By visiting the web page indicated below, you will find options to download the latest software. It is recommended that you visit this web page regularly:

ABB Library – TTD300 – Software downloads

Manufacturer's address

ABB Limited
Measurement & Analytics
Peenya Industrial Area
Bangalore-560058
India
Tel: 1800 420 0707 – Toll free
Tel: +91 80 67143000 – International
Email: contact.center@in.abb.com

Service address

Customer service center
Tel: +49 180 5 222 580
Email: automation.service@de.abb.com

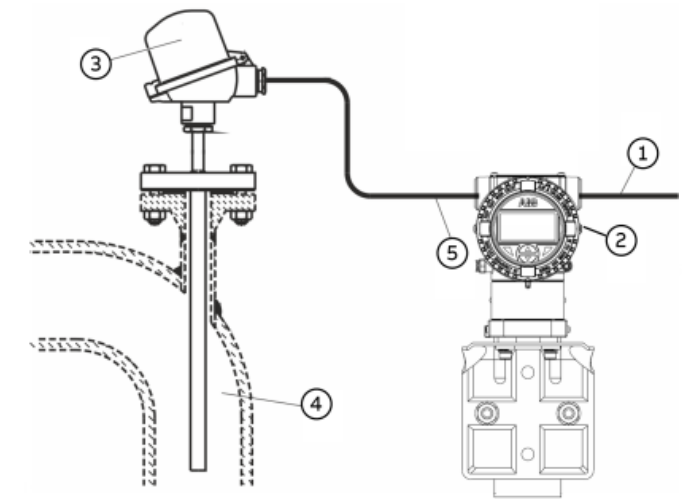
2 Design and function

TTD300 digital transmitters are communication-ready devices with microprocessor-controlled electronics.

In the HART® transmitter, an FSK signal is superimposed on the 4 to 20 mA output signal in accordance with the HART standard to facilitate bidirectional communication.

The transmitters can be configured using various tools / device drivers, status and measured values can also be queried. These include DTM, EDD and FDI Packages of the Field Information Manager (FIM).
These tools provide an event monitor and a configuration monitor for HART devices from SW-Rev.: 03.00.
This allows critical events such as exceeding or falling below specified limit values and configuration changes to be output and logged. See the HART interface description (COM/TTX300/HART).

As an option, the transmitter can be fitted with an LCD-indicator type B. It also supports configuration of the device using the operating buttons.



① Supply voltage cable
② TTD300 transmitter
③ Temperature sensor
④ Thermowell
⑤ Sensor connection cable

Figure 1: Design

Input functionality

Sensor redundancy
To enhance system availability, the TTD300 has two sensor inputs.
The second sensor input can be used redundantly for both resistance thermometers (2 × three-wire circuit or 2 × two-wire circuit) and thermocouples or a combination of both. If a combination of both is used, the resistance sensor must be connected to channel 1 and the thermocouple to channel 2, see **Electrical connections** on page 15.

In the case of HART devices, the failure of a sensor can be signaled with a configurable analog alarm pulse, see the HART® “COM/TTX300/HART” interface description.

Extended configuration options are available for redundant operation.
Redundancy behavior can be configured for:
- increased availability (standard factory setting with redundancy),
- increased safety and
- increased accuracy (output of the average value).

Redundancy behavior	Output behavior (behavior of the current output)	Current output assignment to be set (Tools: “HART Mapping”)	Redundancy configuration to be set (Tools: “Parameter setting”)	Diagnostic message to be set according to NAMUR NE 107
Increased availability (Switchover for defective sensor)	Normal operation: Output signal follows sensor 1 Sensor 1 defective: Switching seamlessly (with smooth transition) to sensor 2. Output signal remains valid. Sensor 1 and sensor 2 defective: output of set alarm current	“Redundancy”	“Availability”	Redundancy, S1 not available: “Maintenance Required” Redundancy, S2 not available: “Maintenance Required” Sensor drift detected: “Maintenance Required”
Increased safety (use of drift detection)	Normal operation: Output signal follows sensor 1 Sensor 1 or sensor 2 defective: output of set alarm current Sensor drift detected: output of set alarm current	“Redundancy”	“Safety”	Redundancy, S1 not available: “Failure” Redundancy, S2 not available: “Failure” Sensor drift detected: “Failure”
Increased accuracy (through averaging)	Output signal follows the arithmetic mean value of sensor 1 and sensor 2 Sensor 1 or sensor 2 defective: output of set alarm current	“Mean value”	not relevant	Redundancy, S1 not available: “Failure” Redundancy, S2 not available: “Failure” Sensor drift detected: “Maintenance Required”

Corresponding diagnostic messages are available via the TTx300 device drivers (FDIX/DTM/EDD) or on the LCD indicator. For the meaning of the diagnostic messages according to NAMUR 107, see **Error messages in the HART® LCD indicator** on page 30. The error messages and options for error correction are listed in **Possible error messages** on page 50.

Note

Only the current output behavior and redundancy configuration can be set for the three redundancy behaviors via the LCD indicator with configuration function. The diagnostic messages according to NAMUR NE 107 can only be changed over in the tools and remain in the default setting ex works (“Maintenance Required”).

… 2 Design and function

… Input functionality

Sensor drift monitoring
If two sensors are connected, sensor drift monitoring can be enabled via device drivers (FDIX/DTM/EDD).

The sensor drift monitoring can be activated for the following sensor types:

- 2 × resistance thermometer (RTD), two-wire circuit
- 2 × resistance thermometer (RTD), three-wire circuit
- 2 × resistors (potentiometer), two-wire circuit
- 2 × resistors (potentiometer), three-wire circuit
- 2 × thermocouple *
- 2 × voltages
- 1 × resistance thermometer (RTD), two-wire circuit, and 1 × thermocouple
- 1 × resistance thermometer (RTD), three-wire circuit, and 1 × thermocouple
- 1 × resistance thermometer (RTD), four-wire circuit, and 1 × thermocouple

*Permissible temperature deviation should not be set to less than the internal Cold Junction Error (PT1000 + 0.1K*Vsupply)

To activate sensor drift monitoring, the transmitter must first be configured for the sensor types referred to above. Following this, the maximum permissible sensor deviation must be configured, e.g., 1 K.

Since sensor response times may differ slightly, it is then necessary to configure a limit time period during which the sensor deviation has to constantly exceed the maximum set.

If the transmitter registers a larger sensor deviation over the defined period of time, the diagnostic response configured in accordance with NE 107 will be carried out (tools and LCD indicator).

Sensor drift monitoring with redundancy operation
If a thermocouple is used for resistance thermometer drift monitoring, the resistance thermometer should be connected to Channel 1 and the thermocouple to Channel 2 (see **Resistance thermometers (RTD) / resistors (potentiometer)** on page 21). The transmitter output signal always corresponds to the configured redundancy behavior, see **Electrical connections** on page 15.

Note
Before configuring the maximum permissible sensor deviation with regard to drift monitoring, sensor calibration should be carried out with reference to the sensor channel 1 value using the TTD300 device drivers (FDIX/DTM/EDD), for example.

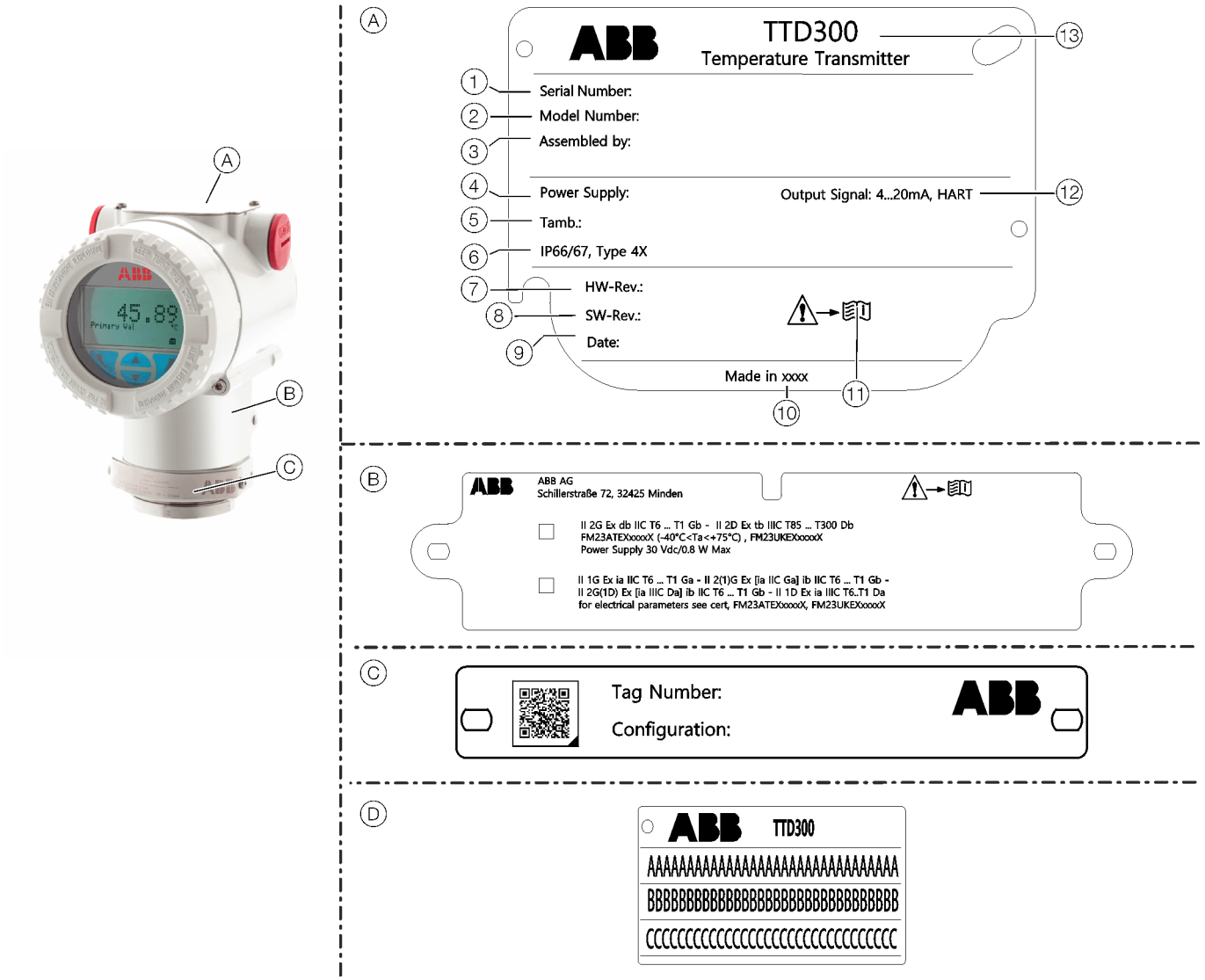
Sensor error adjustment in accordance with Callendar-Van Dusen
Under normal circumstances, the standard Pt100 characteristic curve is used for resistance thermometer measurement. However, recent advances in technology now mean that maximum measuring accuracy can be achieved where necessary by carrying out individual sensor error adjustment.

Sensor characteristic curves are optimized by using a Pt100 polynomial in accordance with IST-90 / IEC 751, and EN 60150, and by applying A, B, C, or Callendar-Van Dusen coefficients.

The device drivers (FDIX/DTM/EDD) can be used to set and store these sensor coefficients (Callendar-Van Dusen) in the transmitter as a CVD characteristic curve. Up to five different CVD characteristic curves can be stored.

3 Product identification

Name plate



- (A) Name plate
- (B) Certification plate
- (C) Tag plate (tag number)
- (D) Optional wired-on stainless steel plate
- (1) Serial number
- (2) Model number
- (3) Manufacturer adress
- (4) Power supply
- (5) Ambient temperature range, on additional plate for Ex versions
- (6) IP rating of housing
- (7) Hardware version
- (8) Software revision
- (9) Manufacturing year - week
- (10) Country of manufacture
- (11) 'Follow product documentation' symbol
- (12) Output signal and communication protocol of the transmitter
- (13) Type designation / model

Figure 2: Name and tag plates

… 3 Product identification

… Name plate

The instrument is identified by the device identification plates shown in Figure 2.

The name plate Ⓐ, always made of stainless steel, AISI 316L (1.4404) provides information concerning the model code, maximum working temperature, power supply, serial number.

The certification plate Ⓑ contains the certification related parameters for use in hazardous areas. Please refer to the appropriate Safety Instruction for the corresponding information.

Note

Unmarked devices must NOT be commissioned.

The tag plate Ⓒ provides customer tag number and calibrated range.

Both certification and tag plates are supplied as self-adhesive labels as standard. Optional these plates are available in stainless steel, AISI 316L (1.4404).

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 all information related to explosion protection, please refer to the corresponding Safety Instructions.
- The device identification plates displayed are examples. The device identification plates affixed to the device can differ from this representation.

Additional identification plate

The device can be supplied with a wired-on stainless steel plate Ⓓ which is permanently laser printed with a custom text specified in phase of order.

The available space consists in 3 lines with 30 characters per line.

4 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

For the return of devices, follow the instructions in **Repair** on page 51.

5 Installation

Use in potentially explosive atmospheres

When using the device in potentially explosive atmospheres,. please refer to the appropriate safety instruction for the corresponding information.

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 for use in potentially explosive atmospheres: see relevant 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

Temperature and humidity limits
In accordance with IEC 60068-2-30

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 60068-2-27
gn = 30, during operation and transport

IP rating
IP 66 and IP 67

… 5 Installation

Mounting

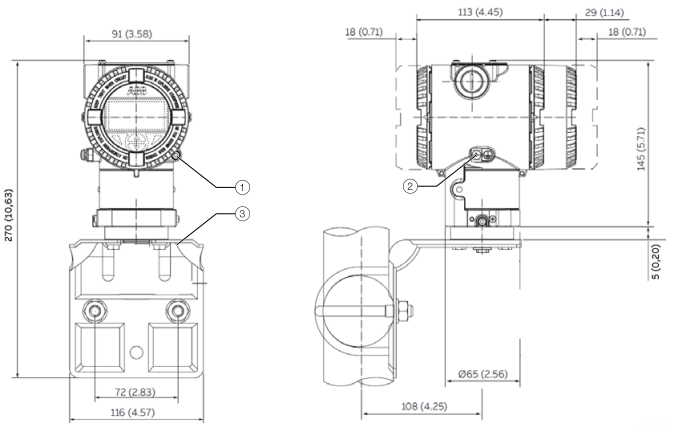


Figure 3: Installation

⚠ 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.

A mounting bracket for wall or pipe mounting (2 in pipe) is also available as an accessory.

Pipe and wall mounting bracket details
All the bolts and nuts supplied are necessary for the installation on pipe. In case of panel or wall installation, the U-bolt and the U-bolt nuts and washers do not have to be used.
The bolts for panel mounting are not within the scope of supply.

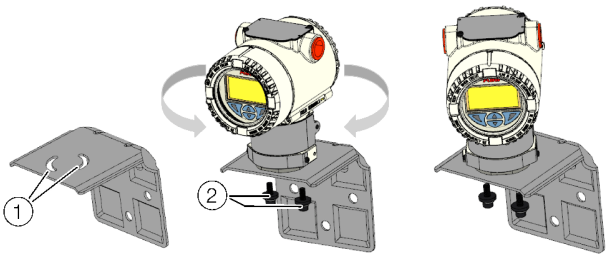
Wall mounting:
Fasten the wall bracket to the wall using 4 screws (Ø 10 mm).

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 62 mm (2.4 in).

Rotating the housing

Upon delivery, the housing is locked in position by the locking screw (see figure below). Rotation of the housing for ease of cabling is to be done by use of the adjustment slots on the mounting bracket as shown in the figure below.

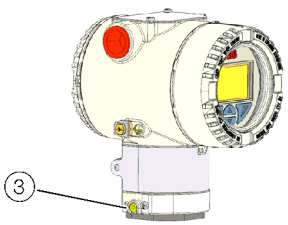
1. Loosen the mounting lock screws ② below the mounting bracket using a 5 mm Allen key.
2. Rotate the transmitter housing in the direction required.
3. Tighten the mounting lock screws ②.



① Adjustment slots on mounting bracket ② Mounting lock screws

Figure 4: Rotating the housing

Note
Do not loosen the transmitter locking screw ③ on the housing itself – it is only for maintenance purposes.



③ Transmitter locking screw

Figure 5: Transmitter locking screw of housing

Opening and closing the housing

⚠ DANGER

Danger of explosion if the device is operated with the transmitter housing or terminal box open!

Before opening the transmitter housing or the terminal box, note the following points:

- Check that a valid fire permit is available.
- Make sure that there is no explosion hazard.
- Before opening the device, switch off the power supply and wait for t > 2 minutes.

⚠ WARNING

Risk of injury due to live parts.

Improper work on the electrical connections can result in electric shock.

- Connect the device only with the power supply switched off.
- Observe the applicable standards and regulations for the electrical connection.

NOTE

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.

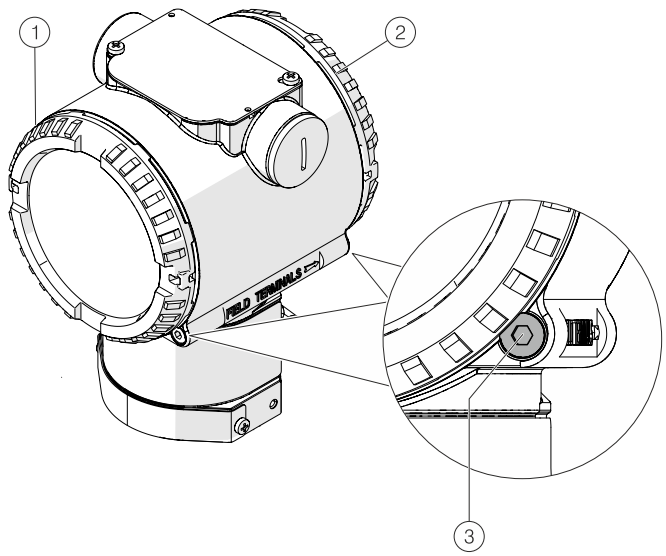


Figure 6: Cover lock (example)

(1) Housing cover (electronic / LCD indicator)
(2) Housing cover (terminal compartment)
(3) Cover lock screw

Open the housing:

1. Release the cover lock by screwing in the cover lock screw (3).
2. Unscrew cover (1) or (2).

Close the housing:

1. Screw on the cover (1) or (2).
2. After closing the housing, lock the cover by unscrewing the cover lock screw (3).

Note

After several weeks, increased force will be required to unscrew the housing cover.
This is not caused by the threads, but instead is due to the type of gasket.

Rotating the LCD indicator

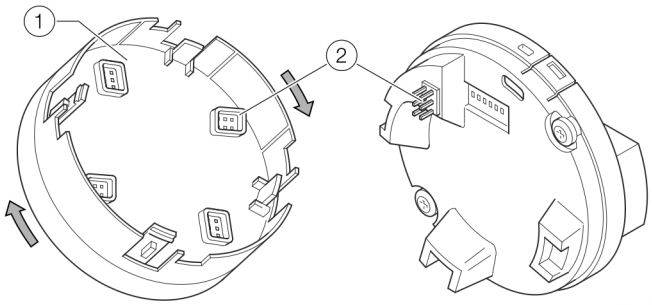
Rotating the LCD indicator

⚠ WARNING

Risk of injury due to live parts!

When the housing is open, contact protection is not provided and EMC protection is limited.

- Before opening the housing, switch off the power supply.



① LCD indicator ② Plug-in connector

Figure 7: Rotating the LCD indicator

The LCD indicator can be rotated in 90° increments to make it easier to read and operate.

1. Unscrew the front housing cover.
2. Pull out the LCD indicator and place it in the desired position.
3. Tighten the front housing cover hand-tight.

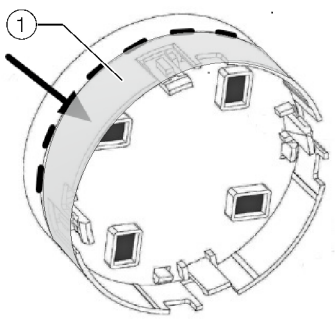
NOTE

Potential adverse effect on the IP rating!

If the O-ring gasket is seated incorrectly or is damaged, this may have an adverse effect on the IP rating.

- Check that the O-ring gasket is properly seated when closing the housing cover.

Display removal



① Lower plastic / grabbing area for display removal

Figure 8: Grabbing area for display removal

To install or remove the LCD indicator it is necessary to gently grab the entire component from the lower plastic ①.

6 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 the corresponding safety instructions.

Observe the following instructions:

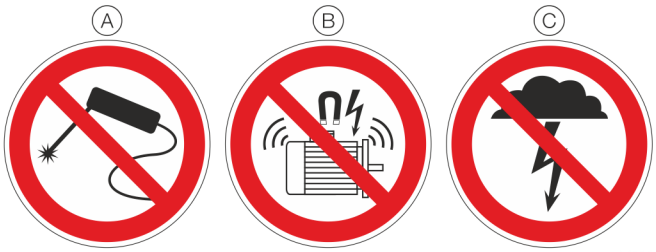
- The electrical connection may only be established by authorized specialist personnel and in accordance with the connection diagrams.
- The relevant regulations must be observed during electric installation.
- The electrical connection information in the instruction must be observed; otherwise, the 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 for safe installation.
- 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 2 pozidriv screwdriver.

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 **Shielding of the sensor connecting cable** on page 18.

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.



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

Figure 9: 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)!

… 6 Electrical connections

… Safety instructions

Suitable 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.

Surge protector equipped terminal block (optional)

The temperature transmitter housing with surge protector inside the terminal board must be connected using the grounding terminal (PE), by means of a short connection with the equipotential bonding.

The Equipotential bonding conductor must have 4.0 mm^2 (AWG 11) of maximum cross-section.

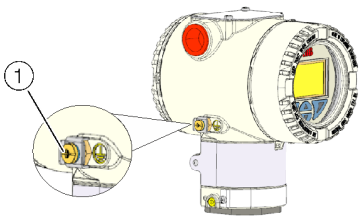
Note
The test voltage withstand capability can no longer be ensured when this protective circuit is used.

Connection on the device

Follow these steps to wire the transmitter:

1. Remove the temporary plastic cap from one of the two electrical connection ports located at both sides in the upper part of the transmitter housing.
   - These connection ports may have a ½ in internal NPT-F or M20 threads. Various adaptors and bushings can be fitted to these threads to comply with plant wiring (conduit) standards.
2. Remove the housing cover of the ‘field terminals’ side. See the indication on housing. In an Explosion-Proof/ Flame-Proof installation, do not remove the transmitter covers when power is applied to the unit.
3. Run the cable through the cable gland and the open port.
4. Connect the leads as described in **Terminal assignment** on page 21.
5. Plug and seal the electrical ports. Make sure that when the installation has been completed, the electrical ports are properly sealed against entry of rain and/or corrosive vapors and gases.
6. If applicable, install wiring with a drip loop. Arrange the drip loop so the bottom is lower than the conduit connections and the transmitter housing.
7. Before reassembling covers, the integrity of the cover O-rings must be checked. If damaged they must be replaced with an original spare part. A slight grease layer should be applied for proper lubrication.
8. Close the housing cover, turn it to seat O-ring into the housing and then continue to hand tighten until the cover contacts the housing metal-to-metal. In Ex-d (Explosion Proof) installation, lock the cover rotation by turning the cover lock screw.

Grounding



① Ground terminal

Figure 10: Ground terminal on transmitter housing

The transmitter housing should be grounded in accordance with national and local electrical codes.
The ground connection is mandatory for surge protector equipped devices in order to ensure proper functioning.

Protective grounding terminals (PE) are available outside and/or inside the housing of the transmitter. Both ground terminals are electrically connected and it up to the user to decide which one to use.
The most effective transmitter case grounding method is direct connection to earth ground with impedance equal or less of 5 Ω.

Conductor material

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

Maximum wire cross section:
2.5 mm^2 (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.

… 6 Electrical connections

Shielding of the sensor connecting cable

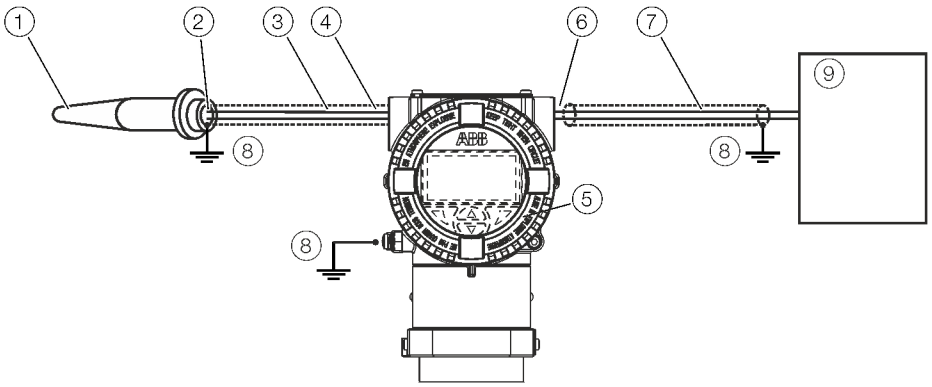
To ensure the system benefits from optimum electromagnetic interference immunity, the individual system components, and the connection cables in particular, need to be shielded.
The shield must be connected to the ground reference plane.

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.

Recommended shielding / grounding
Grounded sensor (thermocouple, mV, RTD, Ohm), transmitter housing grounded
For ideal interference immunity, the shielding of the sensor connection cable should be connected to the sensor and transmitter housing via a conductive connection. Sensor and transmitter housing have been grounded.
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.



1. Temperature sensor
2. Shielding grounded via sensor
3. Sensor connection cable
4. Shielding connected to transmitter housing via a conductive connection
5. Transmitter housing, grounded
6. Shielding insulated from transmitter housing
7. Supply voltage cable
8. Grounding point
9. Supply isolator / DCS input

Figure 11: The shielding of the sensor connection cable has been grounded on both sides via the sensor and the transmitter housing. The shielding of the supply voltage cable is separate from the sensor connection cable and housing.

Note
Make sure that no potential equalization can occur in the case of two-sided grounding. If this is to be expected, grounding must be one-sided only. The system's grounding concept as well as relevant national regulations must be complied with.

⚠ WARNING

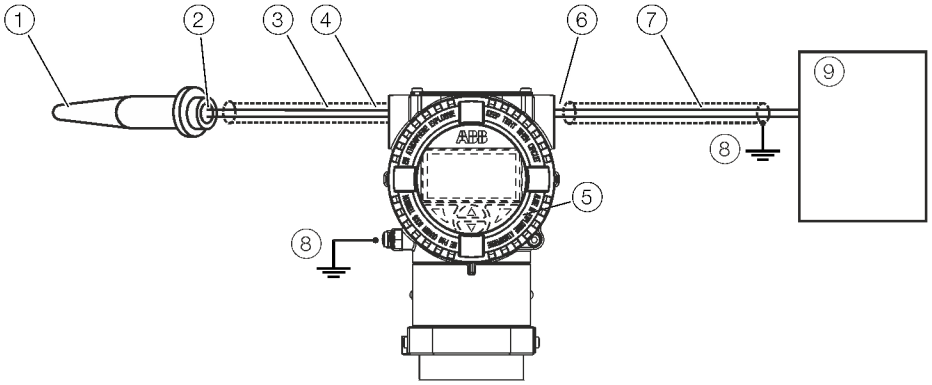
Explosion hazard
If, for functional reasons, grounding in a potentially explosive atmosphere is required by means of a connection to the potential equalization, grounding must be on one side only.

Additional examples for shielding / grounding

Insulated sensor measuring inset (thermocouple, mV, RTD, Ohm), 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.



1. Temperature sensor
2. Shielding insulated from sensor
3. Sensor connection cable
4. Shielding grounded via transmitter housing
5. Transmitter housing, grounded
6. Shielding insulated from transmitter housing
7. Supply voltage cable
8. Grounding point
9. Supply isolator / DCS input

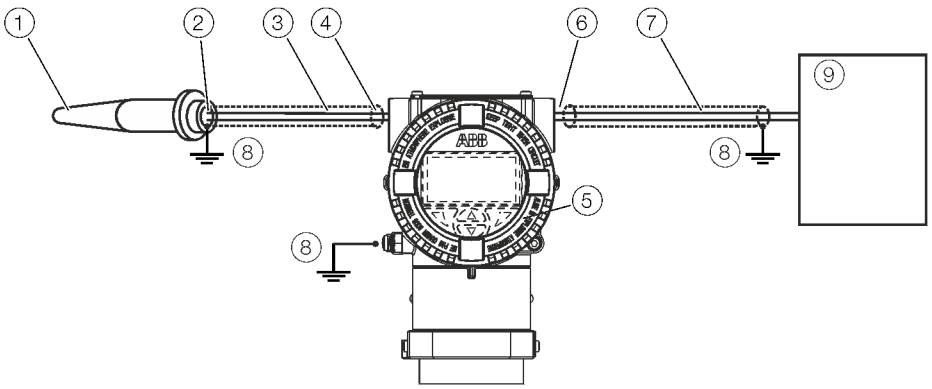
Figure 12: The shielding of the sensor connection cable and the shielding of the power supply cable are separate and each grounded at one end

Insulated sensor measuring inset (thermocouple, mV, RTD, Ohm), 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.



1. Temperature sensor
2. Shielding grounded via sensor
3. Sensor connection cable
4. Shielding insulated from transmitter housing
5. Transmitter housing, grounded
6. Shielding insulated from transmitter housing
7. Supply voltage cable
8. Grounding point
9. Supply isolator / DCS input

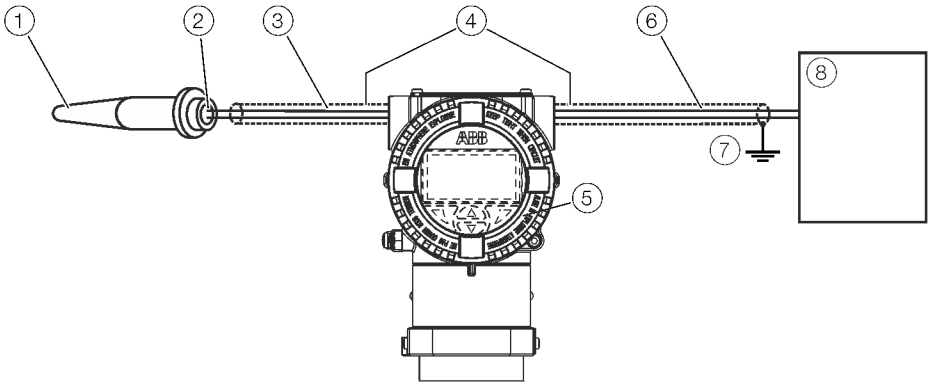
Figure 13: The shielding of the sensor connection cable and of the supply voltage cable are separate and each grounded on one side.

... 6 Electrical connections

... Shielding of the sensor connecting cable

Insulated sensor measuring inset (thermocouple, mV, RTD, Ohm), 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.



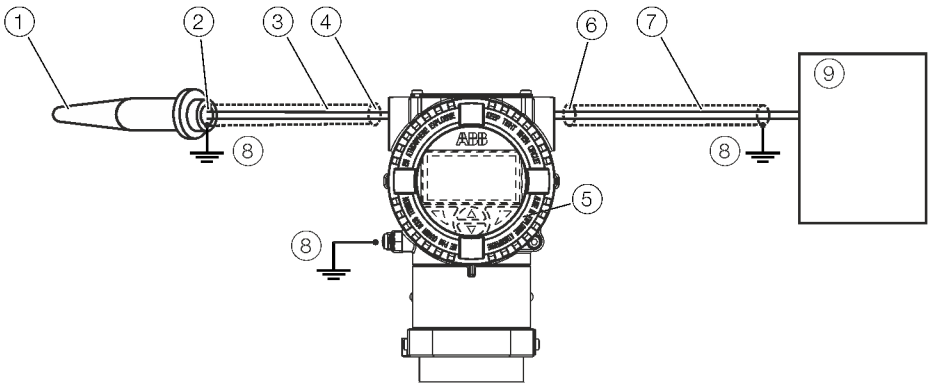
1. Temperature sensor
2. Shielding insulated from sensor
3. Sensor connection cable
4. Shielding connected electrically via transmitter housing
5. Transmitter housing, not grounded
6. Supply voltage cable
7. Grounding point
8. Supply isolator / DCS-input

Figure 14: The shielding of the sensor connection cable and the shielding of the power supply cable are connected electrically via the transmitter housing and grounded at one end

Non-insulated sensor measuring inset (thermocouple), 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 the sensor connection cable must not be connected to one another. Make sure that the shielding is not connected to ground anywhere else.

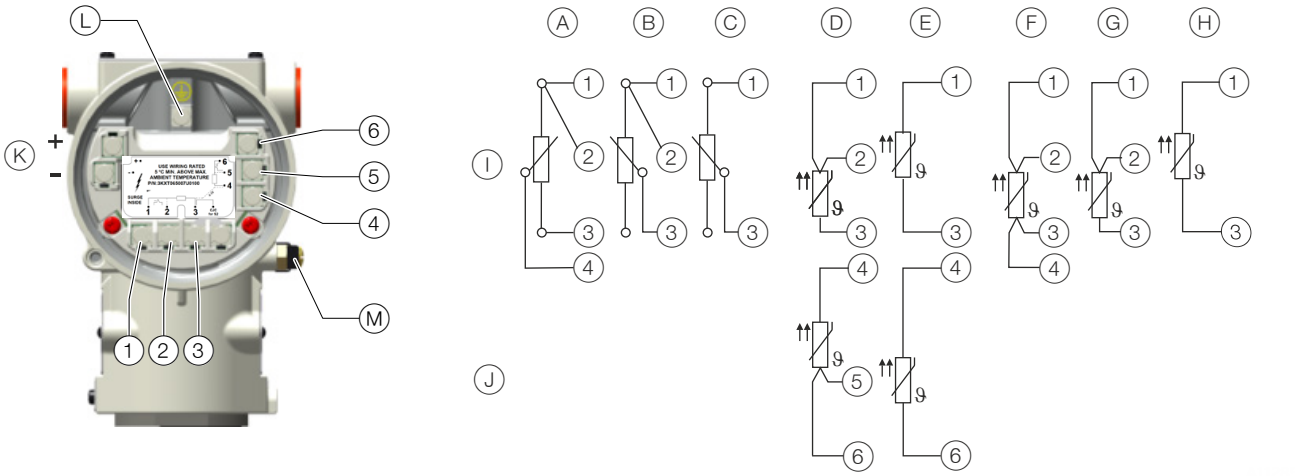


1. Temperature sensor
2. Shielding grounded via sensor
3. Sensor connection cable
4. Shielding insulated from transmitter housing
5. Transmitter housing, grounded
6. Shielding insulated from transmitter housing
7. Supply voltage cable
8. Grounding point
9. Supply isolator / DCS input

Figure 15: The shielding of the sensor connection cable and of the supply voltage cable are separate and each grounded on one side.

Terminal 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®
- (L) Internal ground terminal for shield support for sensors and supply / signal lines
- (M) External ground terminal
- (1) – (6) Sensor connection

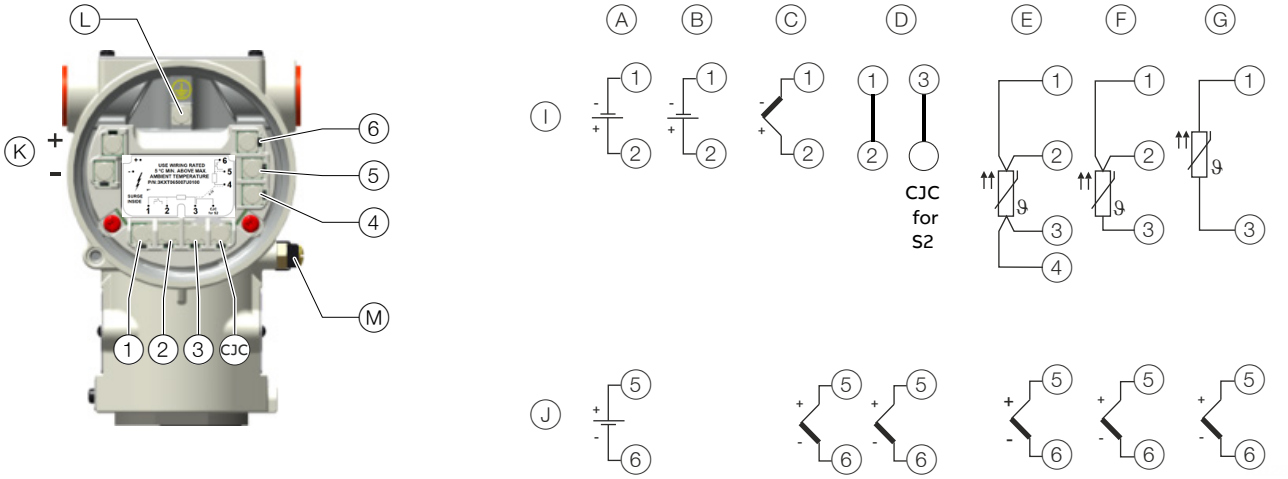
* Sensor backup / sensor redundancy, sensor drift monitoring, mean measurement, or differential measurement

Figure 16: Terminal assignment Resistance thermometer (RTD) / resistances (potentiometer)

… 6 Electrical connections

… Terminal assignment

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



(A) 2 x voltage measurement[1)]
(B) 1 x voltage measurement
(C) 2 x thermocouple[1), 2)]
(D) 1 x thermocouple, 1 x bridge for internal reference [3)]
(E) 1 x RTD, four-wire circuit and thermocouple [1), 2)]
(F) 1 x RTD, three-wire circuit and thermocouple[1), 2)]
(G) 1 x RTD, two-wire circuit and thermocouple[1), 2)]

(I) Sensor 1
(J) Sensor 2[1)]
(K) 4 to 20 mA HART®
(L) Internal ground terminal for shield support for sensors and supply / signal lines
(M) External ground terminal
(1) – (6) Sensor connection (of measuring inset)
CJC Cold Junction Compensation for Sensor 2 (Bridge)

1) Sensor backup / sensor redundancy, sensor drift monitoring, mean measurement or differential measurement.
2) Thermocouple Cold Junction Compensation (CJC) through internal reference junction on sensor electronics.
3) Thermocouple Cold Junction Compensation (CJC) through internal reference junction on terminal board with bridge connection for highest possible digital measuring accuracy.

Figure 17: Terminal assignment: Thermocouples / voltages and resistance thermometer (RTD) / thermocouple combinations

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

Detection of sensor wire break in accordance with NE 89 in all lines

Sensor error signaling

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

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 in accordance with IEC 60584 / ASTM E988
- D in accordance with ASTM E988

Voltages

- −125 to 125 mV
- −125 to 1100 mV

Connection lead

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

Detection of sensor wire break in accordance with NE 89 in all lines

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

… 6 Electrical connections

… Electrical data for inputs and outputs

Output – HART®

Note

The HART® protocol is an unsecured protocol (in terms of IT and cyber security), as such the intended application should be assessed to ensure that this protocol is suitable before implementation.

Transmission behavior

- Temperature linear
- Resistance linear
- Voltage linear

Output signal

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

Simulation mode

3.5 to 23.6 mA

Induced current consumption

< 3.5 mA

Maximum output current

23.6 mA

Configurable error current signal

Note

Regardless of the alarm setting (underrange or overrange), a high alarm or low alarm is always generated for some internal device errors (e.g. hardware errors). Detailed information about this can be found in the SIL-Safety Manual.

The default factory setting for the error current signal is low alarm 3.5 mA, in accordance with NAMUR recommendations NE 93, NE 107 and NE 131.

- Overrange / high alarm 22 mA (20.0 to 23.6 mA)
- Underrange / low alarm 3.5 mA (3.5 to 4.0 mA)

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.

Supply 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 supply voltage

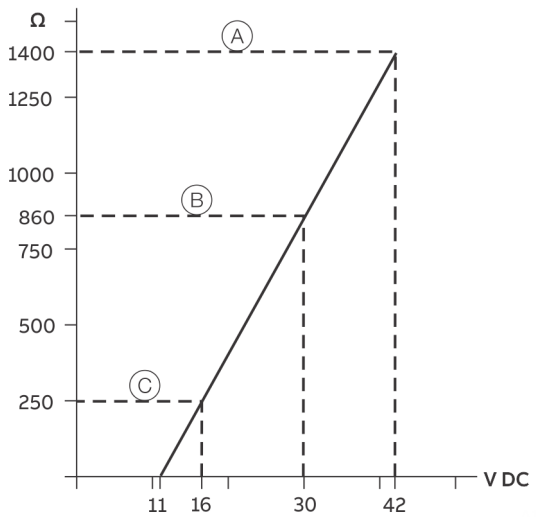
During communication this is in accordance with the HART FSK 'Physical Layer' specification.

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 = (supply voltage−11 V) / 0.022 A



Ⓐ TTD300

Ⓑ TTD300 in Ex-applications

Ⓒ HART communication resistance

Figure 18: Maximum load depending on supply voltage

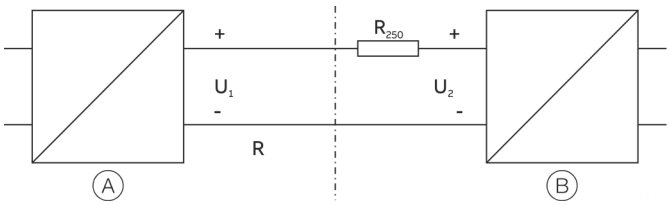
Maximum power consumption

$P = U_s \times 0.022$ A

E.G. U_s = 24 V → P_{max} = 0.528 W

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.



Ⓐ Transmitter

Ⓑ Supply isolator / DCS input with supply / segment coupler

Figure 19: HART load resistance

U_{1min}: Minimum supply voltage on the transmitter
U_{2min}: Minimum supply voltage of the supply isolator / DCS input
R: Line resistance between transmitter and supply isolator
R_{250}: Resistance (250 Ω) for HART functionality

Standard application with 4 to 20 mA functionality

When connecting these components, observe the following condition:

$U_{1min} \leq U_{2min}$ - 22 mA x R

Standard application with HART functionality

Adding resistance R_{250} increases the minimum supply voltage U_{2min}: $U_{1min} \leq U_{2min}$ - 22 mA x (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 ≥ 250 Ω (< 1100 Ω) 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.

For further information on the revision of the standard HART protocol and on switching options, see **Communication** on page 26 and **Basic Setup** on page 27.

Connections for single channel thermocouple measurements

For the highest accuracy thermocouple measurements, the cold junction compensation on the terminal board should be used.

The following steps have to be taken:

1. The thermocouple should be connected to terminal 5 and 6 (Sensor 2) as shown in connection Ⓓ (**Figure 17: Terminal assignment: Thermocouples** on page 22).
2. The metal bridge (Figure 21) that is delivered with the transmitter should be connected to terminal 3 and the CJC as shown in Figure 20.
3. The sensor can be configured using the LCD indicator or the device drivers (FDIX/DTM/EDD) as follows (see instructions for HMI operations):
   a. For Sensor 1
      i. Sensortype S1: Pt1000 (IEC751)
      ii. R-connection: two-wire
      iii. 2-wire resistance: 0 Ω
   b. For Sensor 2
      i. Sensortype S2 is configured for the selected thermocouple
      ii. Thermocouple CJC 2 Sensor 1 as reference junction temperature for Sensor 2
   c. Input/output assignment: Sensor 2

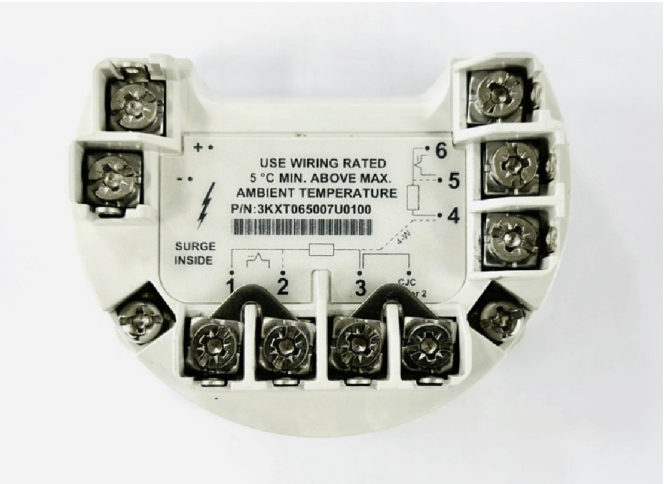


Figure 20: Bridge connection for CJC compensation for single channel thermocouple measurements

Figure 21: Bridge connection plate

7 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.

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:

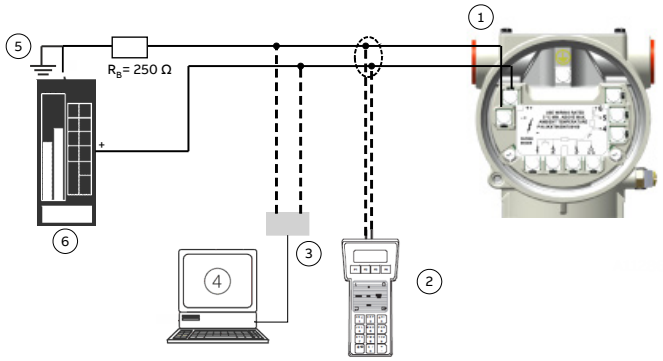
- Correct wiring in accordance with **Electrical connections** on page 15.
- The ambient conditions must correspond to the information given on the name plate and in the data sheet.

Communication

Note
The HART® protocol is an unsecured protocol (in terms of IT and cyber security), as such the intended application should be assessed to ensure that this protocol is 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.



1 Transmitter
2 Handheld terminal
3 HART® modem
4 PC with Asset Management Tool
5 Grounding (optional)
6 Power supply unit (process interface)
R_B load resistance (if necessary)

Figure 22: Example of HART® interface connection

Manufacturer ID	0x1A
Device-ID	TTx300: HART 5: 0x004B HART 7: 0x1A4B TTx300-N: HART 7: 0x1A4E
Profile	HART 5.9 and HART 7.6, can be switched via • LCD indicator with configuration function • Device drivers (FDIX/DTM/EDD) • HART commands Default, if nothing else ordered: HART 7.6.
Configuration	On device using LCD indicator Device drivers (FDIX/DTM/EDD)
Transmission signal	BELL Standard 202

Operating modes
- Point-to-point communication mode – standard (general address 0)
- HART 5: Multidrop mode (addressing 1 to 15)
- HART 7: Addressing 0 to 63, independent of current loop mode
- Burst Mode

Configuration options / tools
Driver-independent:
- LCD indicator with configuration function

Driver-dependent:
- Device configuration / Asset management tools
- FDI technology – via TTx300 FDI Device Package (Field Information Manager / FIM)
- EDD – via TTx300 EDD driver (Handheld terminal, Field Information Manager / FIM)
- FDT technology – via TTx300-DTM driver

Diagnosis notice
- Overrange / underrange in accordance with NE 43
- HART® diagnosis
- Device status signaling according to NE 107
- Freely configurable diagnostic categorization with diagnostic history in accordance with NE 107

The HART® device stores information on critical events and configuration changes.

The information can be output via device drivers :
- Event monitor for the logging of critical events
- Configuration monitor for configuration changes

For detailed information, see HART® COM/TTX300/HART interface description.

Basic Setup

Note
The communication and configuration of the transmitter via HART is described in the 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 B with configuration function:
  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 TTD300.
  The general operation and menus of the LCD indicator are described in **Menu navigation** on page 28.

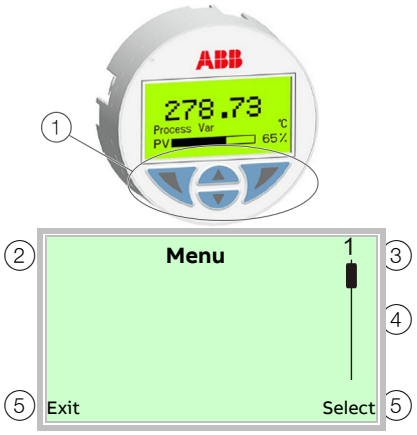
Note
Unlike configuration using the device driver, the functionality of the transmitter can only be changed to a limited extent with the LCD indicator.

8 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.

Menu navigation



1. Operating buttons for menu navigation
2. Indication of menu designation
3. Indication of menu number
4. Marking to indicate relative position within the menu
5. Indication of the current function assigned to the operating buttons and

Figure 23: LCD display (example)

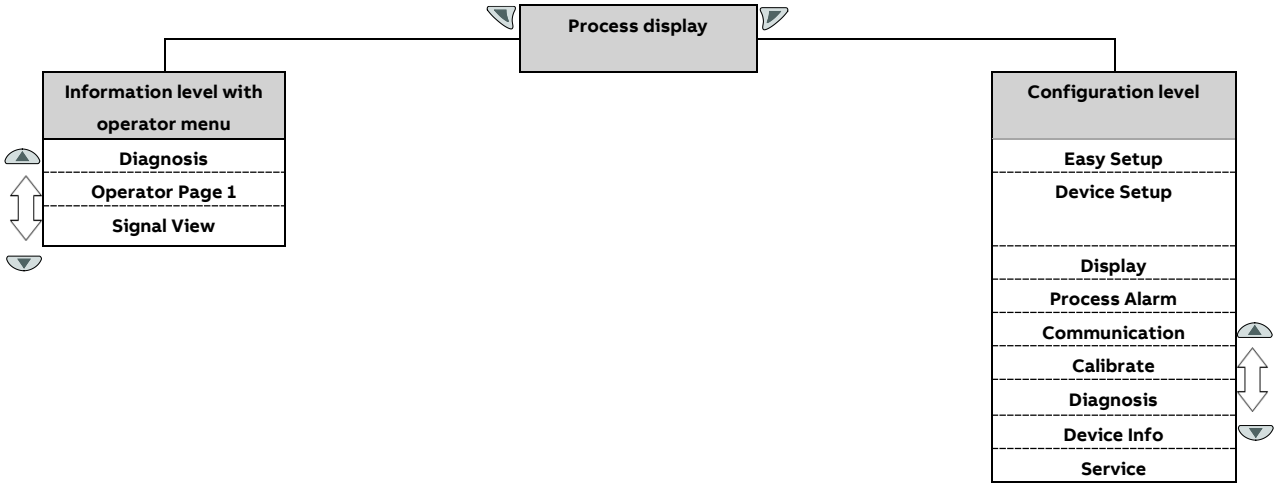
You can use the or operating buttons to browse through the menu or select a number or character within a parameter value.
Different functions can be assigned to the and operating buttons. The function (5) that is currently assigned to them is shown on the LCD display.

Control button functions

	Meaning
Exit	Exit menu
Back	Go back one submenu
Cancel	Cancel a parameter entry
Next	Select the next position for entering numerical and alphanumeric values

	Meaning
Select	Select submenu / parameter
Edit	Edit parameter
OK	Save parameter entered

HART® menu levels



Process display
The process display shows the current process values.

Operator menu
On the information level, the operator menu can be used to display diagnostic information and choose which operator pages to display.

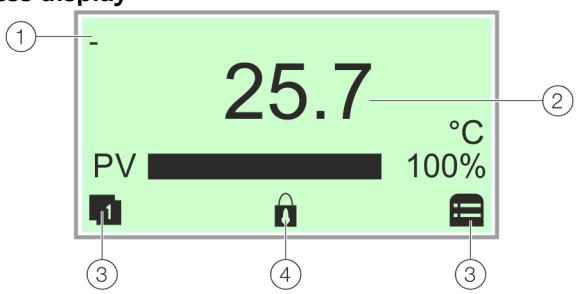
Configuration level
The configuration level contains all the parameters required for device commissioning and configuration. The device configuration can be changed on this level.

Commissioning
The menu item “Easy Setup” enables a simplified configuration of the device.

… 8 Operation

… HART® menu levels

Process display



1. Measuring point tagging (Device TAG)
2. Current process values
3. 'Button function' symbol
4. 'Parameterization protected' symbol

Figure 24: Process display (example)

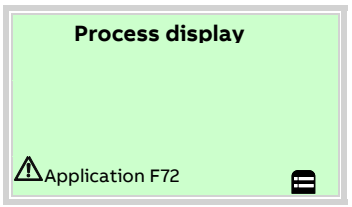
The process display appears on the LCD indicator when the device is powered on. It shows information about the device and current process values.
The way in which the current process values are shown can be adjusted on the configuration level.
The symbols at the bottom of the process display are used to indicate the functions of the operating buttons and , in addition to other information.

Optionally, two process variables can be displayed:
one is displayed above the other.

Symbol	Description
	Call up information level.
	Call up configuration level.
	The device is protected against changes in the parametrization.

Error messages in the HART® LCD indicator

In the event of an error, the relevant device status symbol and the associated diagnosis group will appear.



The diagnostic messages are divided into the following groups in accordance with the NAMUR classification scheme:

Symbol letter	Status symbols according to NAMUR NE 107	Description	
I	not applicable	OK or Information	Device is functioning or information is available
C		Check Function	Device is undergoing maintenance (for example simulation)
S		Off Specification	Device or measuring point is being operated outside of the specifications
M		Maintenance Required	Request service to prevent the measuring point from failing
F		Failure	Error; measuring point has failed

The error can then be read in plain text via the “Diagnosis” information level.

Additionally, the diagnostic messages are divided into the following areas:

Range	Description
Electronics	Diagnosis for device hardware.
Sensor	Diagnosis for sensor elements and connection lines.
Configuration	Diagnosis of the communication interface and parameterization / configuration.
Operating conditions	Diagnosis for ambient and process conditions.
Process	Notes and warnings when leaving the sensor or process temperature range.

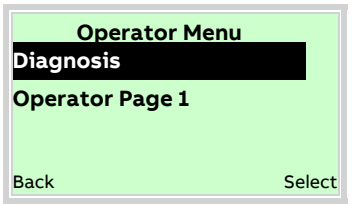
Note

For a detailed description of the errors and notices on troubleshooting, see **Diagnosis / error messages** on page 48.

Switching to the information level (operator menu)

On the information level, the operator menu can be used to display diagnostic information and choose which operator pages to display.

1. Open the using Operator Menu.



2. Select the desired submenu using / .
3. Confirm the selection with .

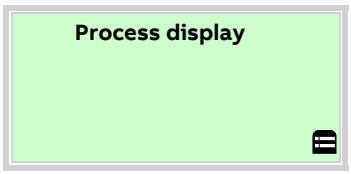
Menu	Description
... / Operator Menu	
Diagnosis	Selection of the “Diagnosis” submenu, see also **Error messages in the HART® LCD indicator** on page 30.
Operator Page 1	Selection of operator page to be displayed.
Signal View	Selects the ‘Signal View’ submenu, in which all dynamic measured values are displayed.

… 8 Operation

… HART® menu levels

Switching to the configuration level (parameterization)

The device parameters can be displayed and changed on the configuration level.



1. Switch to the configuration level using .

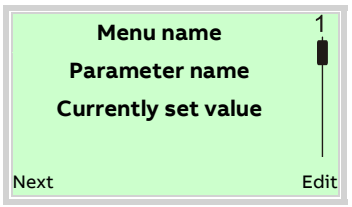
The LCD indicator now indicates the first menu item on the configuration level.

2. Select a menu using / .
3. Confirm the selection with .

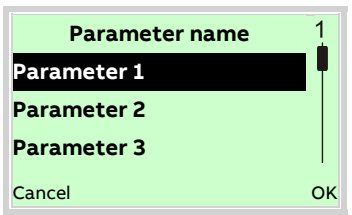
Selecting and changing parameters

Entry from table

When an entry is made from a table, a value is selected from a list of parameter values.



1. Select the parameters you want to set in the menu.
2. Use to call up the list of available parameter values. The parameter value that is currently set is highlighted.

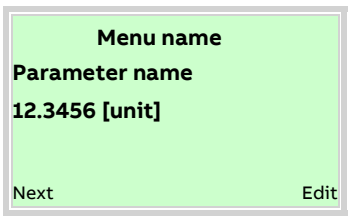


3. Select the desired value using / .
4. Confirm the selection with .

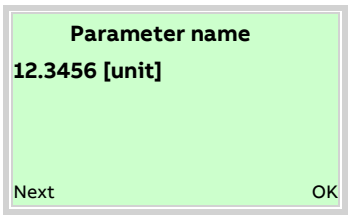
This concludes the procedure for selecting a parameter value.

Numerical entry

When a numerical entry is made, a value is set by entering the individual decimal positions.



1. Select the parameters you want to set in the menu.
2. Use to call up the parameter for editing. The decimal place that is currently selected is highlighted.

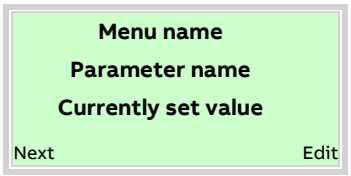


3. Use to select the decimal place to change.
4. Use / to set the desired value.
5. Use to select the next decimal place.
6. If necessary select and set additional decimal places in accordance with steps 3 to 4.
7. Use to confirm your setting.

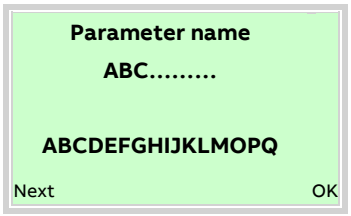
This concludes the procedure for changing a parameter value.

Alphanumeric entry

When an alphanumeric entry is made, a value is set by entering the individual decimal positions.



1. Select the parameters you want to set in the menu.
2. Use to call up the parameter for editing. The decimal place that is currently selected is highlighted.



3. Use to select the decimal place to change.
4. Use / to set the desired value.
5. Use to select the next decimal place.
6. If necessary select and set additional decimal places in accordance with steps 3 to 4.
7. Use to confirm your setting.

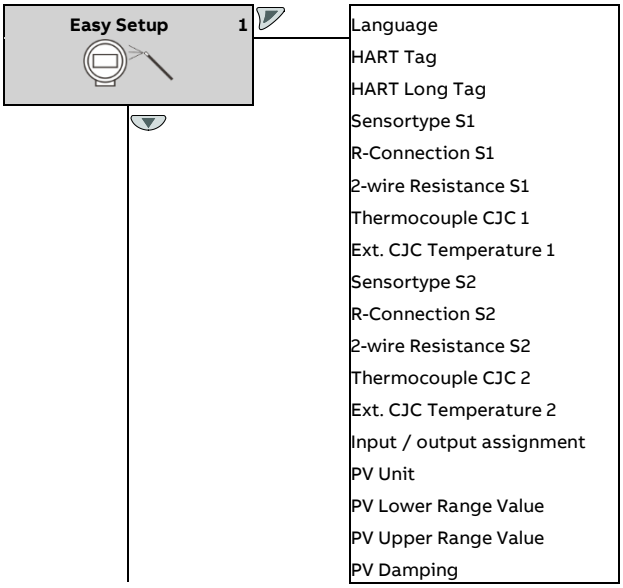
This concludes the procedure for changing a parameter value.

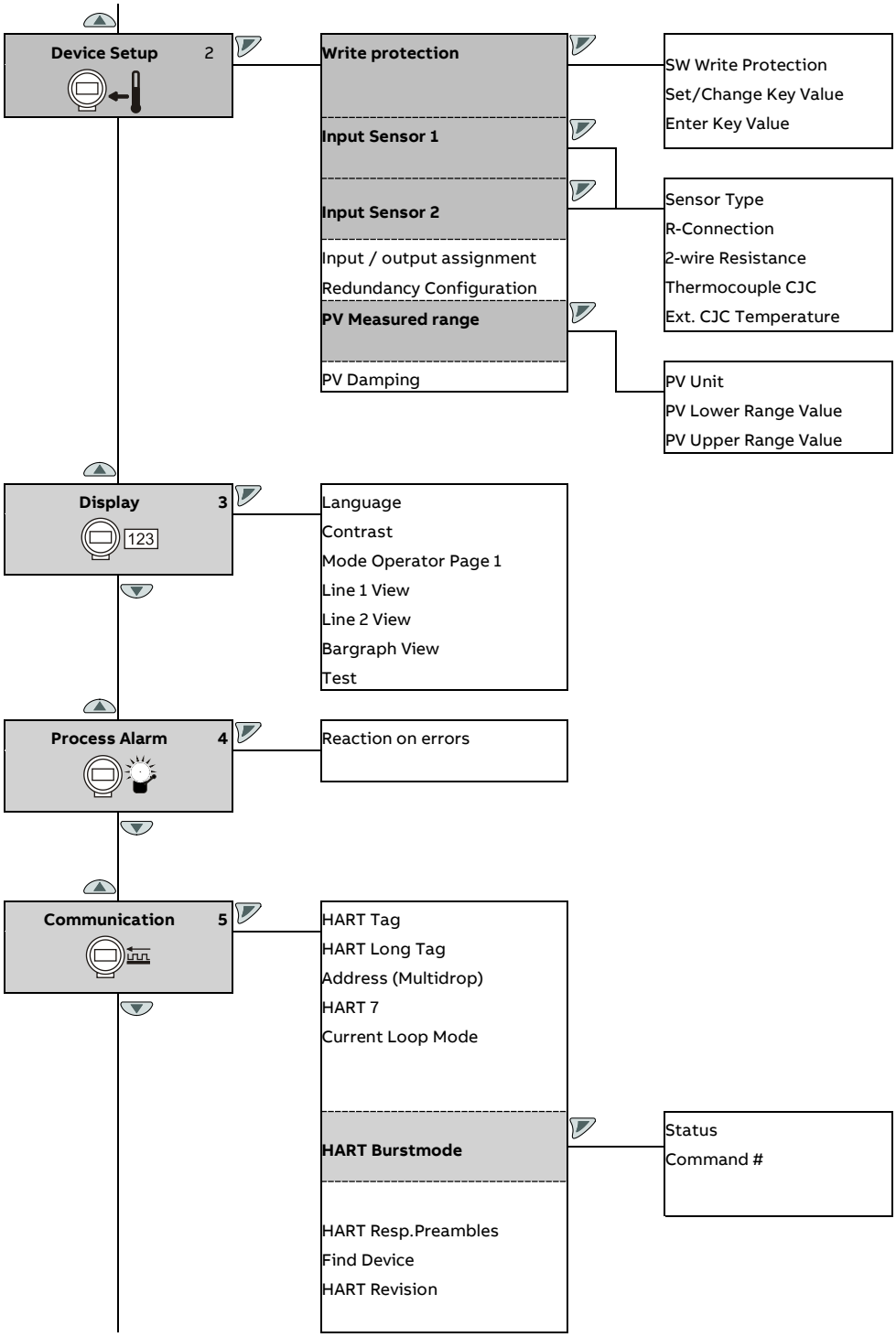
… 8 Operation

HART® Parameter Overview

Note

This overview of parameters shows all the menus and parameters available on the device.
Additional information (event and configuration monitor, see HART interface description, COM/TTX300/HART) and detailed diagnostics can be displayed and configured with the device driver.




Device Setup 2
Write protection
SW Write Protection
Set/Change Key Value
Enter Key Value
Input Sensor 1
Input Sensor 2
Sensor Type
R-Connection
2-wire Resistance
Thermocouple CJC
Ext. CJC Temperature
Input / output assignment
Redundancy Configuration
PV Measured range
PV Damping
PV Unit
PV Lower Range Value
PV Upper Range Value
Display 3
123
Language
Contrast
Mode Operator Page 1
Line 1 View
Line 2 View
Bargraph View
Test
Process Alarm 4
Reaction on errors
Communication 5
HART Tag
HART Long Tag
Address (Multidrop)
HART 7
Current Loop Mode
HART Burstmode
Status
Command #
HART Resp.Preambles
Find Device
HART Revision

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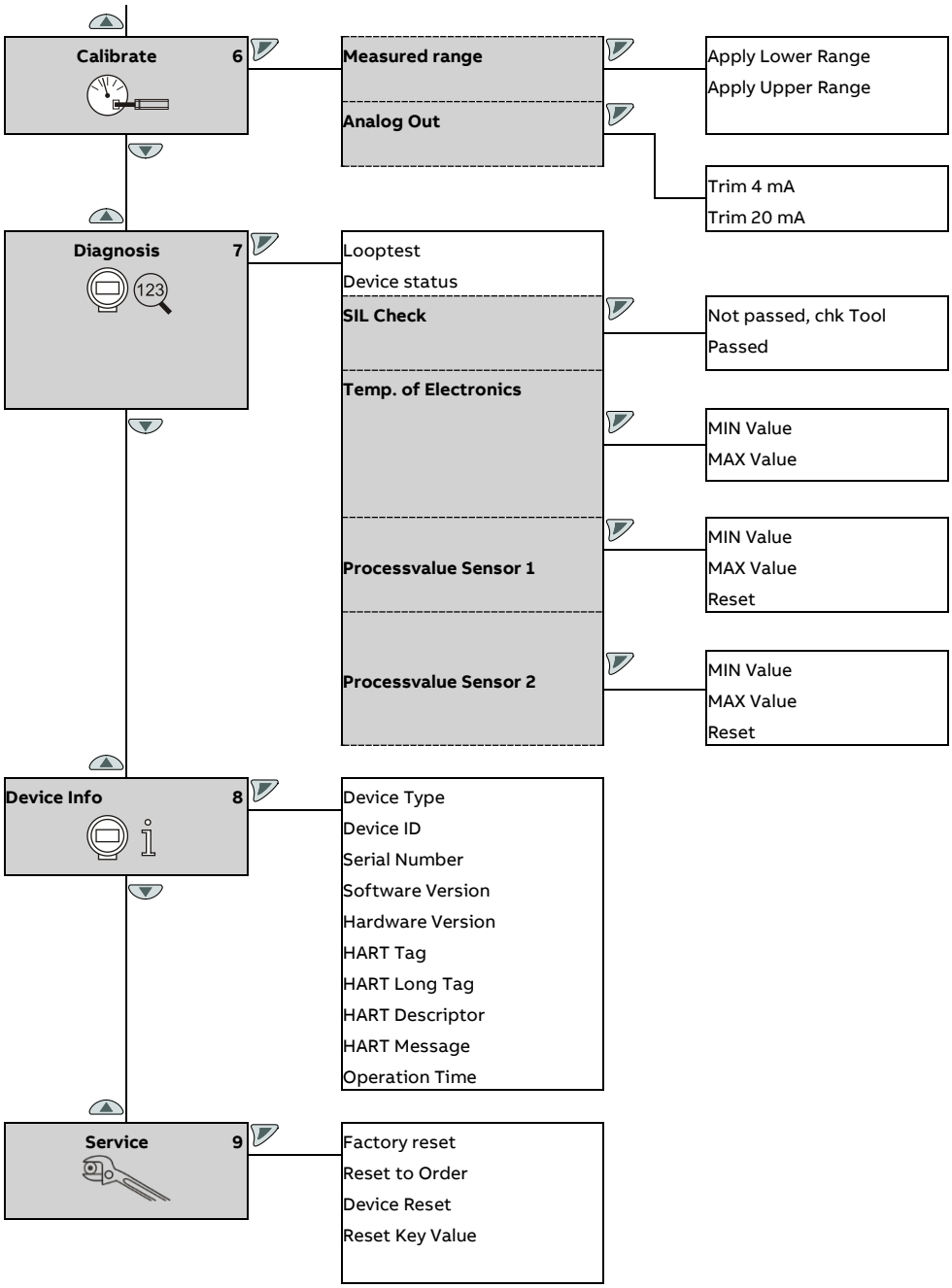
… HART® Parameter Overview



Parameter description HART®

Menu: Easy Setup

Menu / parameter	Description
... / Easy Setup	
Language	Language selects the menu language. • German • English
HART Tag	Measuring point tagging • 8 characters
HART Long Tag	Long tag:Unique device label in the plant (from HART 7) • 32 characters
Sensortype S1 (Sensortype S2)	Selects sensor type: • 0 to 500 Ω:Linear resistance measurement 0 to 500 Ω • 0 to 5000 Ω:Linear resistance measurement 0 to 5000 Ω • Cal.Van Dusen 1:Callendar Van Dusen coefficient set 1 • Pt50 (IEC751):Pt50 resistance thermometer (IEC 751) • Pt100 (IEC751):Pt100 resistance thermometer (IEC 751) • Pt200 (IEC751):Pt200 resistance thermometer (IEC 751) • Pt500 (IEC751):Pt500 resistance thermometer (IEC 751) • Pt1000 (IEC751):Pt1000 resistance thermometer (IEC 751) • Pt50 (JIS1604):Pt50 resistance thermometer (JIS 1604) • Pt100 (JIS1604):Pt100 resistance thermometer (JIS 1604) • Pt50 (IMIL24388):Pt50 resistance thermometer (MIL 24388) • Pt100 (MIL24388):Pt100 resistance thermometer (MIL 24388) • Pt200 (MIL24388):Pt200 resistance thermometer (MIL 24388) • Pt1000 (MIL24388):Pt1000 resistance thermometer (MIL 24388) • Ni50 (DIN43760):Ni50 resistance thermometer (DIN 43716) • Ni100 (DIN43760):Ni100 resistance thermometer (DIN 43716) • Ni120 (DIN43760):Ni120 resistance thermometer (DIN 43716) • Ni1000 (DIN43760):Ni1000 resistance thermometer (DIN 43716) • Cu10 a=4260:Cu10 resistance thermometer a = 4260 • Cu100 a=4260:Cu100 resistance thermometer a = 4260 • Pt10 (IEC751):Pt10 resistance thermometer (IEC 751) • Pt10 (JIS1604):Pt10 resistance thermometer (JIS 1604) • Pt10 (IMIL24388):Pt10 resistance thermometer (MIL 24388)

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… Parameter description HART®

Menu / parameter	Description
… / Easy Setup	
	Selection of the sensor type (continued): • –125 to 125 mV:Linear voltage measurement -125 to 125 mV • –125 to 1100 mV:Linear voltage measurement -125 to 1100 mV • Type B TC (IEC584): Thermocouple type B (IEC 584) • Type C TC (ASTME988): Type C thermocouple (IEC584) • Type D TC (ASTME988): Thermocouple type D (ASTME 988) • Type E TC (IEC584): Thermocouple type E (IEC 584) • Type J TC (IEC584): Type J thermocouple (IEC584) • Type K TC (IEC584): Thermocouple type K (IEC 584) • Type N TC (IEC584): Thermocouple type N (IEC 584) • Type R TC (IEC584): Type R thermocouple (IEC584) • Type S TC (IEC584): Type S thermocouple (IEC584) • Type T TC (IEC584): Type T thermocouple (IEC584) • Type L TC (DIN43710): Type L thermocouple (DIN43710) • Type U TC (DIN43710): Type U thermocouple (DIN43710) • Cal.Van Dusen 2: Callendar Van Dusen coefficient set 2 • Cal.Van Dusen 3: Callendar Van Dusen coefficient set 3 • Cal.Van Dusen 4: Callendar Van Dusen coefficient set 4 • Cal.Van Dusen 5: Callendar Van Dusen coefficient set 5 • Freestyle characteristic 1: Customer-specific characteristic curve 1 • Freestyle characteristic 2: Customer-specific characteristic curve 2 • Freestyle characteristic 3: Customer-specific characteristic curve 3 • Freestyle characteristic 4: Customer-specific characteristic curve 4 • Freestyle characteristic 5: Customer-specific characteristic curve 5 • off:Sensor channel deactivated (sensor 2 only)
R-Connection S1	Sensor connection type relevant for all Pt, Ni, Cu resistance thermometers • two-wire: Sensor connection type in two-wire technology • three-wire: Sensor connection type in three-wire technology • four-wire: Sensor connection type in four-wire technology
2-wire Resistance S1	Sensor line resistance relevant for all Pt, Ni, Cu resistance thermometers with a two-wire circuit Value range:0 to 100 Ω
Thermocouple CJC 1	Cold junction compensation for thermocouples: • Internal: Use of internal reference junction temperature of the transmitter when using thermal compensating cable. • External - fixed: Use of external fixed reference junction temperature of the transmitter when constant thermostat temperature is used (can be set with external reference junction temperature 1). • None: no reference junction compensation (CJC)
Ext. CJC Temperature 1	Relevant for external cold junction compensation , specification of constant external cold junction temperature Value range: -50 to 100 °C
Sensortype S2	Selects sensor type: see table of sensortypes … / Easy Setup / sensortype S1

Menu / parameter	Description
... / Easy Setup	
R-Connection S2	Sensor connection type relevant for all Pt, Ni, Cu resistance thermometers • two-wire: Sensor connection type in two-wire technology • three-wire: Sensor connection type in three-wire technology • four-wire: Sensor connection type in four-wire technology
2-wire Resistance S2	Sensor line resistance relevant for all Pt, Ni, Cu resistance thermometers with a two-wire circuit Value range:0 to 100 Ω
Thermocouple CJC 2	Cold junction compensation for thermocouples: • Internal: Use of internal reference junction temperature of the transmitter when using thermal compensating cable. • External - fixed: Use of external fixed reference junction temperature of the transmitter when constant thermostat temperature is used (can be set with external reference junction temperature 2). • None: no reference junction compensation (CJC) • Sensor 1 Temperature: Use of Sensor 1 as reference junction temperature for Sensor 2
Ext. CJC Temperature 2	Relevant for external reference junction compensation, specification of constant external reference junction temperature. Value range: -50 to 100 °C
In-output Assignment	Input / output assignment selects the inputs that are mapped to the current output • Sensor 1 • Electr. Meas. S1 • Temp. of Electronics • Difference (S1-S2) • Meanvalue • Sensor 2 • Electr. Meas. S2 • Redundancy • Difference (S2-S1)
PV Unit	Selects the physical unit for the sensor measuring signal Units: °C, °F, °R, K, mV, Ω, V, kΩ
PV Lower Range Value	Defines the value for 4 mA (adjustable)
PV Upper Range Value	Defines the value for 20 mA (adjustable)
PV Damping	Configurable τ 63% output signal damping value Value range:0 to 100 s

… 8 Operation

… Parameter description HART®

Menu: Device Setup

Menu / parameter	Description
… / Device Setup	
Write protection	Select the '**Write protection**' submenu.
Input Sensor 1	Select the '**Input Sensor 1**' submenu.
Input Sensor 2	Select the '**Input Sensor 2**' submenu.
Input / output assignment	Input / output assignment Selects the inputs that are mapped to the current. see table of input / output assignment … / Easy Setup / In-output assignment
Redundancy Configuration	Configures the type of redundancy • Availability:If one of two sensors fails, the measurement will continue with the functioning sensor.Also diagnostics informs about the defective sensor. • Safety:If one of two sensors fails, current output will signal alarm current.Also diagnostics informs about the defective sensor.
PV Measured range	Select the '**PV Measured range**' submenu.
PV Damping	Configurable τ 63% output signal damping value Value range:0 to 100 s

… / Device Setup / Write protection	
SW Write Protection	Activates write protection for the entire device • Enabled: Write protection active, device locked • Disabled: Write protection deactivated, device unlocked
Set/Change Key Value	Configures the key value for the advanced write protection • Enabled: Input combination ≠ "0000" • Disabled: Input combination = "0000"
Enter Key Value	Temporary deactivation of the advanced write protection after input of the correct key value

Menu / parameter	Description
... / Device Setup / Input Sensor 1	
... / Device Setup / Input Sensor 2	
Sensor Type	Selects sensor type: Table of all sensor types: see "... / Easy Setup / Sensortype S1 "
R-Connection	Sensor connection type relevant for all Pt, Ni, Cu resistance thermometers • two-wire: Sensor connection type in two-wire technology • three-wire: Sensor connection type in three-wire technology • four-wire: Sensor connection type in four-wire technology
2-wire Resistance	Sensor line resistance relevant for all Pt, Ni, Cu resistance thermometers with a two-wire circuit Value range:0 to 100 Ω
Thermocouple CJC	Cold junction compensation for thermocouples: • Internal:Use of internal reference junction temperature of the transmitter when using thermal compensating cable. • External - fixed:Use of external fixed reference junction temperature of the transmitter when constant thermostat temperature is used (can be set with external reference junction temperature 2). • None: no thermocouple cold junction compensation (CJC) • Temperature sensor 1: Use of Sensor 1 as reference junction temperature for Sensor 2
Ext. CJC Temperature	Relevant for external cold junction compensation , specification of constant external cold junction temperature Value range: -50 to 100 °C

... / Device Setup / PV Measured range	
PV Unit	Selects the physical unit for the sensor measuring signal Units: °C, °F, °R, K, mV, Ω, V, kΩ
PV Lower Range Value	Defines the value for 4 mA (adjustable)
PV Upper Range Value	Defines the value for 20 mA (can be configured)

… 8 Operation

… Parameter description HART®

Menu: Display

Menu / parameter	Description
… /Display	
Language	Language selects the menu language. • German • English
Contrast	Sets the display contrast Value range:0 to 100%
Mode Operator Page 1	Selects the mode for the operator page (main view) of the display • One Line:Show one measured value (default PV = process variable) • One Line + Bargraph:In addition to line 1, display bar graph (default:output current %) • Two Lines:Second line for an additional measured value (such as Sensor 2) • Two Lines + Bargraph:Display 2 lines and a bar graph
Line 1 View	Selects the process value shown in Bargraph view of process display • Process Variable:Calculated process variable (PV) • Sensor 1:Reading from sensor 1 • Sensor 2:Reading from sensor 2 • Difference (S1-S2):Calculate difference Sensor 1 – Sensor 2 • Difference (S2-S1):Calculate difference Sensor 2 – Sensor 1 • Average S1 S2:Calculate average Sensor 1 / Sensor 2 • Redundancy S1 S2:Redundancy Sensor 1 and Sensor 2 • Electr. Meas. S1:Reading from sensor 1 (in Ω or mV) • Electr. Meas. S2:Reading from sensor 2 (in Ω or mV) • Temp. Electronics:Temperature of transmitter • Output Current:Output current of 4 to 20 mA signal • Output %:Output value as % of measurement range
Line 2 View	Selects the process value shown in line 2 of process display (only 2 lines) Table of selectable measured values: see “… / Display /Line 1 View”
Bargraph View	Selects the process value shown in Bargraph view of process display Table of selectable measured values: see “… / Display /Line 1 View”
Test	Display test - different patterns and letter sets are shown

Menu: Process Alarm

Menu / parameter	Description
… /Process Alarm	
Reaction on errors	• Low Alarm:In the event of an error, the current (e.g. 3.5 mA) is output. • High Alarm:In the event of an error, the current (e.g. 22 mA) is output.

Menu: Communication

Menu / parameter	Description
... /Communication	
HART Tag	Measuring point tagging • 8 characters
HART Long Tag	Long tag:Unique device label in the plant (from HART 7) • 32 characters
Address	Address range Value range:0 to 63 (independent of Current Loop Mode)
Current Loop Mode	• Independent of the address • Enabled = normal operation (output current depends on process variable (PV)) • Disabled = Constant output current (like Multidrop HART 5 address 0>)
HART Burstmode	Select the '**HART Burstmode**' submenu.
HART Resp.Preambles	Number of preambles to be used for sending Value range:5 to 20
Find Device	This option helps with finding a device The HART master sends HART command #73 to search for the device. Device answeres with HART initialize Command #0 (long address) - if found Options: • Disabled: no reaction HART command #0 • Once:One-time reaction to HART command #0 • Continuous:Always switch to HART command #0

... / Communication / HART Burstmode		
Status	• Off:HART burst operating mode inactive • On:HART burst operating mode active	
Command #	Sets the HART command to be sent cyclically	
	• 1 Process value:	Process value PV
	• 2 current+%:	Output current and percentage range
	• 3 Current+Dyn.Vars:	Current output and dynamic variables PV, SV, QV, TV
	• 9 Dev.Variables :	Device variables
	• 48 Add.Dev.Status:	Additional device status

… 8 Operation

… Parameter description HART®

Menu: Calibrate

Menu / parameter	Description
… /Calibrate	
Measured range	Select the '**Measured range**' submenu.
Analog Out	Select the '**Analog Out**' submenu.

… / Calibrate / Measured range	
Apply Lower Range	The current reading (PV) is used as the lower range limit (4 mA).
Apply Upper Range	The current reading (PV) is used as the upper range limit (20 mA).

… / Calibrate / Analog Out	
Trim 4 mA	Adjusts the current output with a 4 mA setpoint Value range:3.500 to 4.500 mA
Trim 20 mA	Adjusts the current output with a 20 mA setpoint Value range:19.500 to 20.500 mA

Menu: Diagnosis

Menu / parameter	Description
… /Diagnosis	
Looptest	Simulates the current output signal Value range:3.500 to 23.600 mA 0.000 mA:Ends loop test
Device status	Diagnostic notice (maintenance required, failure, etc.)
SIL Check	Select the '**SIL Check**' submenu. • Not passed, chk Tool:Use tool for a detailed check of the current device configuration. • Passed:SIL Configuration Check successful.The device configuration is valid for SIL Safety applications.
Temp. of Electronics	Select the '**Temp. of Electronics**' submenu. Drag indicator: maximum or minimum device temperature
Processvalue Sensor 1	Select the '**Sensor 1 process data**' submenu. Drag indicator: maximum or minimum sensor temperature for sensor 1 • Reset: Resets the values
Processvalue Sensor 2	Select the '**Sensor 2 process data**' submenu. Drag indicator: maximum or minimum sensor temperature for sensor 2 • Reset: Resets the values

Menu: Device Info

Menu / parameter	Description
... /Device Info	
Device Type	Displays device type.
Device ID	7 or 8-digit serial number of the device electronic unit.
Serial Number	Serial number of the device (serial number in accordance with order)
Software Version	Displays device software version.
Hardware Version	Displays device hardware version.
HART Tag	Displays the HART Tag.
HART Long Tag	Display the HART long tag.
HART Descriptor	Displays the HART Descriptor.
HART Message	Display the HART message.
Operation Time	Displays device operating hours.

Menu: Service

Menu / parameter	Description
... /Service	
Factory reset	Device restarts with factory settings applied.
Reset to Order	Device restarts with settings according to the customer order.
Device Reset	Device restarts without configuration changes.
Reset Key Value	Key value of the advanced write protection is reset to factory setting.

… 8 Operation

… Parameter description HART®

Software write protection

In addition to regular software write protection, the device features advanced software write protection. It can be configured on the device both via the LCD indicator and via the device drivers (FDIX/DTM/EDD).

If write protection has been activated, a padlock symbol will appear in the LCD indicator or the device drivers.

If the configured key value for the advanced software write protection is entered incorrectly more than five times, the device will be permanently locked.This locking function can only be deactivated on the device via the "„Reset Key Value" function.

Enable or disable regular write protection

1. "Device Setup" can be confirmed via , then select the "Write protection" submenu.
   - The "Write protection" submenu will be displayed.
2. Select the "SW Write Protection" entry and confirm with .
   - The current write protection configuration will be displayed.
3. Use "Edit" to edit the current write protection configuration (enabled/disabled), and confirm with .
   - If the "Edit" menu item is not available, the advanced write protection has been activated.
4. The current write protection setting is displayed.

Enable advanced software write protection

1. "Device Setup" can be confirmed via , then select the "Write protection" submenu.
   - The "Write protection" submenu will be displayed.
2. Select the "Set/Change Key Value" entry and confirm with .
3. Use "Edit" to edit the current key value configuration.
4. Using / , select four alphanumeric characters, and confirm with .The key value must differ from "0000".
5. The advanced write protection has been activated, the device is write-protected.

Temporarily disable software write protection

1. "Device Setup" can be confirmed via , then select the "Write protection" submenu.
   - The "Write protection" submenu will be displayed.
2. Select the "Enter Key Value" entry and confirm with .
3. Use "Edit" to edit the current key value configuration. If the "Edit" menu item is not available, the device will be locked permanently.
4. Using / , select four alphanumeric characters, and confirm with .
5. When the correct key value has been entered, write protection will be temporarily disabled, the "Write protection" subitem shows "Disabled".
6. By activating the write protection or entering a new key value, the advanced write protection will be reactivated and the device will be write-protected.

Disable advanced software write protection

1. "Device Setup" can be confirmed via , then select the "Write protection" submenu.
   - The "Write protection" submenu will be displayed.
2. Select the "Enter Key Value" entry and confirm with .
3. Use "Edit" to edit the current key value configuration.If the "Edit" menu item is not available, the device will be locked permanently.
4. Using / , select four alphanumeric characters, and confirm with .
5. Using / , select the "Set/Change Key Value" menu item, and confirm with .
6. Using / , select the "0000" input combination, and confirm with .
7. The advanced write protection has been disabled, the device is no longer write-protected.

Reset key value

1. Confirm "Service" with and select the "Reset Key Value" item. The submenu will be displayed.
2. Confirm reset of the key value using "OK".
3. The advanced write protection has been disabled, the device is no longer write-protected.

Factory settings

Firmware settings

The transmitter is configured ex works.

These devices can be reset to the factory setting as well as to the setting according to the customer order.

- With the menu item “Factory reset” in the service menu, the settings are reset to the factory settings in accordance with the following table (corresponds to default configuration BS).
- The menu item “Reset to Order” in the service menu is used to reset the settings to the configuration ordered by the customer (default configuration BS, customer-specific configuration without special user characteristic BF).

The following table with the corresponding parameter values applies:

Menu	Designation	Parameter	Factory setting
Device Setup	Write protection	–	No
	Input Sensor 1	Sensor Type	Pt100 (IEC60751)
	Sensor Pair Value = 306	R-Connection	Three-wire
		Measured Range Begin	0
		Measured Range End[1)]	100
		Engeneering Unit	Degrees °C
		Damping	Off
Process Alarm		Fault signaling	Underrange / low alarm 3.5 mA
	Input Sensor 2	Sensor Type	Pt100 (IEC60751)
		R-Connection	Three-wire
	Input / output assignment	Measurement type	Non-invasive
	TAG	–	–
Display	Display Value	–	Process Variable
	Bargraph	–	Yes, output %
	Language	–	English
	Contrast	–	50 %
Communication	HART Burstmode	Status	Off
	HART Protocol	–	HART 5 / 7[1)]

1) The currently set HART protocol remains unchanged during all types of reset (all SW revisions).

9 Diagnosis / error messages

Diagnostic information

Monitoring of operating data

The transmitter saves the highest and lowest values for the electronic unit temperature as well as measured values from sensor 1 and sensor 2 in the non-volatile memory (‘Drag Indicator’).

Value	Description
Supply voltage	Current supply voltage measured at the terminals of the transmitter in volts (± 5 %).
Loop current	Monitoring of the 4 to 20 mA loop current.
Max. elec. temp.	Highest detected internal temperature in °C that the transmitter was subjected to. This value cannot be reset.
Min. elec. temp.	Lowest detected internal temperature in °C that the transmitter was subjected to. This value cannot be reset.
Max. reading for sensors 1 / 2	Largest measured value on Sensor 1 or 2. When changing the sensor type (e.g., Pt100 to thermocouple type K), the value is reset automatically.
Min. reading for sensors 1 / 2	Smallest measured value on Sensor 1 or 2. When changing the sensor type the value is reset automatically.
Reset	The drag indicators for the sensor readings are all reset to the current measured value in each case.

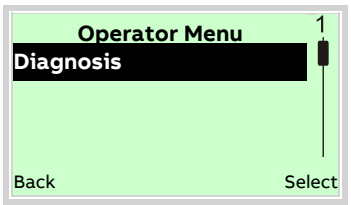
Operating hours statistics

Value	Description
Operation Time	Total hours since commissioning that the supply voltage has been switched on for the transmitter.
Operation Time (according to unit temperature)	The operating hours are categorized according to the measured internal temperature of the transmitter. Due to rounding and frequently switching the device on and off, the total of the individual values may differ slightly from the value displayed by the counter for operating hours. Values in the fields on the far left and right indicate operation of the transmitter outside the specified range. In this event, acknowledged properties of the transmitter might be limited, in particular, with respect to accuracy and service life.

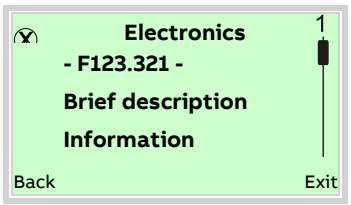
Calling up the error description

Additional details about the error that has occurred can be called up on the information level.

1. Use to switch to the information level (Operator Menu).



2. Use / to select the submenu ‘Diagnosis’.
3. Confirm the selection with .



The error message is shown on the display according to priority.
The first line shows the area in which the error has occurred.
The second line shows the unique error number. It is made up of the priority (Fxxx) and the error position (.xxx)
The next lines show a brief description of the error and information on how to remedy it.
You absolutely need to scroll the display further to read the error message in more detail.

Note
For a detailed description of the error messages and information on troubleshooting, see the following pages.

… 9 Diagnosis / error messages

Possible error messages

Note
The listed causes for a device status message correspond to the delivery status.They can be configured freely in Tools with the device driver in the “Diagnosis/NAMUR configuration” menu, see COM/TTX300/HART interface description.

Range	Device status message (on the display)	Cause	Remedy
Sensor	Line resistance S1 too high	Maintenance required	Check sensor or replace / repair sensor
Sensor	S1 short-circuit	Maintenance required	Check sensor or replace / repair sensor
Sensor	S1 Wire break / sensor break	Maintenance required	Check sensor or replace / repair sensor
Sensor	S1 Single-point trim is active	Check function	
Sensor	S1 Two-point trim is active	Check function	
Sensor	Line resistance S2 too high	Maintenance required	Check sensor or replace / repair sensor
Sensor	S2 short-circuit	Maintenance required	Check sensor or replace / repair sensor
Sensor	S2 Wire break / sensor break	Maintenance required	Check sensor or replace / repair sensor
Sensor	S2 Single-point trim active	Check function	
Sensor	S2 Two-point trim active	Check function	
Sensor	Redundancy:S1 not available	Maintenance Required	Check sensor or replace / repairsensor S1
Sensor	Redundancy:S2 not available	Maintenance Required	Check sensor or replace / repairsensor S2
Sensor	Sensor drift detected	Maintenance required	Check Sensor/ connection / trim / drift parameter
Sensor	Error in the application	Failure	Check sensor connection / check HART variable mapping
Operation	Diagnostics is simulated	Check function	Terminate / come out of simulation
Operation	Analog output fixed / simulated	Check function	Terminate / come out of simulation
Operation	Application warning	Check function	Load valid parameter restart (reset) check S1 / S2
Electronics	Electronics temp. measurement failure	Failure	Restart (RESET) or replace transmitter
Electronics	Electronics temp. out of spec.	Out of specification	Observe spec. ambient temp. range
Electronics	Non-volatile data defect	Failure	Restart (RESET) or replace transmitter
Electronics	Non-vol. Memory Write cycles exceeded	Maintenance required	Restart (RESET) or replace transmitter
Electronics	Device not calibrated	Failure	Restart (RESET) or replace transmitter
Electronics	Electronics failure	Failure	Restart (RESET) or replace transmitter
Electronics	Device locked	No Alarm	Reset key value
Process	S1 over sensor range	Maintenance required	Check sensortype use diff. sensor if required
Process	S1 under sensor range	Maintenance required	Check sensortype use diff. sensor if required
Process	S2 over sensor range	Maintenance required	Check sensortype use diff. sensor if required
Process	S2 under sensor range	Maintenance required	Check sensortype use diff. sensor if required
Process	High limit: Alarm	Out of specification	Verify process or change limit value
Process	Low limit: value Alarm	Out of specification	Verify process or change limit value
Process	High limit: Warning	Out of specification	Verify process or change limit value
Process	Low limit: Warning	Out of specification	Verify process or change limit value
Configuration	Parameterization / config. failure	Failure	Load valid param restart (RESET), reset to factory

Note
If the remedial measures listed for the error message do not improve the status of the device, please consult ABB Service.

10 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.

Cleaning

When cleaning the exterior of meters, make sure that the cleaning agent used does not corrode the housing surface and the gaskets.

When using the device in potentially explosive atmospheres, observe the notice on cleaning in **Suitable protective measures** on page 16.

11 Repair

Safety instructions

⚠ 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.

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

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 53) 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.).

Address for return shipment:
Please contact Customer Center Service acc. to page 5 for nearest service location.

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.

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

Trademarks

HART is a registered trademark of FieldComm Group, Austin, Texas, USA

Notes

ABB Measurement & Analytics

For your local ABB contact, visit:
www.abb.com/contacts

For more product information, visit:
www.abb.com/temperature

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