ABB MEASUREMENT & ANALYTICS | OPERATING INSTRUCTION | OI/TTF300-EN REV. I

TTF300

Field-mount temperature transmitter

Temperature transmitter for all communications protocols. Redundancy thanks to two inputs.

Measurement made easy

Introduction

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

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

The TTF300 implements various NAMUR recommendations, including NE 89 and NE 107.

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

Additional Information

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

Table of contents

1 Safety

General information and instructions

These instructions are an important part of the product and must be retained for future reference.
Installation, commissioning, and maintenance of the product may only be performed by trained specialist personnel who have been authorized by the plant operator accordingly. The specialist personnel must have read and understood the manual and must comply with its instructions.
For additional information or if specific problems occur that are not discussed in these instructions, contact the manufacturer.
The content of these instructions is neither part of nor an amendment to any previous or existing agreement, promise or legal relationship.
Modifications and repairs to the product may only be performed if expressly permitted by these instructions.
Information and symbols on the product must be observed. These may not be removed and must be fully legible at all times.
The operating company must strictly observe the applicable national regulations relating to the installation, function testing, repair and maintenance of electrical products.

Warnings

The warnings in these instructions are structured as follows:

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

The signal word ***'NOTICE'*** indicates possible material damage.

Note

'**Note**' indicates useful or important information about the product.

Intended use

This device is intended for the following uses:

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

The device has been designed for use exclusively within the technical limit values indicated on the name plate and in the data sheets.

- The maximum ambient temperature must not be exceeded.
- The IP rating of the housing must be observed during operation.
- For use in potentially explosive atmospheres, follow the associated guidelines.
- When using as a SIL-device in safety-relevant applications, the 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.

Software downloads

By visiting the web pages indicated below, you will find notifications about newly found software vulnerabilities and options to download the latest software. It is recommended that you visit this web pages regularly:
www.abb.com/cybersecurity

ABB Library – TTF300 – Software downloads

Manufacturer's address

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

Service address

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

2 Use in potentially explosive atmospheres in accordance with ATEX and IECEx

Ex marking

Note

- Further information on the approval of devices for use in potentially explosive atmospheres can be found in the explosion protection test certificates (at www.abb.com/temperature).
- Depending on the design, a specific marking in accordance with ATEX or IECEx applies.
- A list of standards, including the output data to which the device conforms, can be found in the examination certificate or manufacturer's declaration supplied with the device.
- In devices with several types of protection, for example TTF300-E4, observe the 'Product Identification' chapter in the operating or commissioning instruction before commissioning.

Transmitter

ATEX intrinsic safety

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

Model TTF300-E1H	
To HW-Rev.: 01.07:	
Type Examination Test Certificate	PTB 05 ATEX 2017 X
From HW-Rev.: 02.00:	
Type Examination Test Certificate	PTB 20 ATEX 2008 X
Model TTF300-E1P and TTF300-E1F	
Type Examination Test Certificate	PTB 09 ATEX 2016 X
II 1 G	Ex ia IIC T6…T1 Ga
II 2 (1) G	Ex [ia IIC Ga] ib IIC T6…T1 Gb
II 2 G (1D)	Ex [ia IIIC Da] ib IIC T6…T1 Gb

ATEX increased safety and dust explosion protection

Approved for use in zone 2 and 22.

Model TTF300-E5	
TTF300-E5H to HW-Rev.: 01.07, TTF300-E5P, TTF300-E5F:	
Manufacturer's Declaration	
II 3 G	Ex ec IIC T6...T1 Gc
II 3 D	Ex tc IIIB T133°C Dc

ATEX dust explosion protection

Approved for use in Zone 21 and 22.

TTF300-D5H model to HW-Rev.: 01.07	
Type Examination Test Certificate	BVS 06 ATEX E 029
II 2D	Ex tb IIIC T135°C Db
II 3D	Ex tc IIIC T135°C Dc

ATEX dust explosion protection | intrinsic safety

Permitted for zone 21, 22 | Zone 0, 1 and 2.

The 'D6H' coding combines 'Dust explosion protection' (TTF300-D5H) and 'Intrinsic safety' (TTF300-E1H) types of protection. Devices with several types of protection may only be operated in one of the possible types of protection. For this purpose, observe the 'Product Identification' chapter in the operating or commissioning instruction before commissioning.

TTF300-D6H model to HW-Rev.: 01.07	
Type examination test certificate	BVS 06 ATEX E 029
"Dust explosion protection", (TTF300-D5H)	
Type examination certificate	PTB 05 ATEX 2017 X
"Intrinsic safety", (TTF300-E1H)	
II 1G	Ex ia IIC T6…T1 Ga
II 2D	Ex tb IIIC T135°C Db

ATEX flameproof (enclosure)

Approved for use in Zone 1 and 2.

Model TTF300-E3	
Type Examination Test Certificate	PTB 99 ATEX 1144 X
II 1/2 G	Ex db IIC T6/T4 Ga/Gb

ATEX flameproof (enclosure) | intrinsic safety

Permitted for zone 1 and 2 (flameproof enclosure) | Zone 0, 1 and 2 (intrinsic safety).

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

Model TTF300-E4	
Type Examination Test Certificate	PTB 99 ATEX 1144 X
TTF300-E4P and TTF300-E4F:	
Type Examination Test Certificate	PTB 05 ATEX 2016 X
TTF300-E4H to HW-Rev.: 01.07:	
Type Examination Test Certificate	PTB 05 ATEX 2017 X
TTF300-E4H from HW-Rev.: 02.00:	
Type Examination Test Certificate	PTB 20 ATEX 2008 X
II 1/2 G Ex db IIC T6/T4 Ga/Gb	
II 1 G Ex ia IIC T6…T1 Ga	

IECEx intrinsic safety

Approved for use in Zone 0, 1, and 2.

Model TTF300-H1H	
To HW-Rev.: 01.07:	
IECEx Certificate of Conformity	IECEx PTB 09.0014X
From HW-Rev.: 02.00:	
IECEx certificate of conformity	IECEx PTB 20.0035X
Model TTF300-H1P and TTF300-H1F	
IECEx Certificate of Conformity	IECEx PTB 11.0108X
Ex ia IIC T6...T1 Ga	
Ex [ia IIC Ga] ib IIC T6...T1 Gb	
Ex [ia IIIC Da] ib IIC T6...T1 Gb	

IECEx dust explosion protection

Approved for use in Zone 21 and 22.

TTF300-J5H model to HW-Rev.: 01.07	
IECEx certificate of conformity	IECEx BVS 17.0065X
Ex tb IIIC T135°C Db	
Ex tc IIIC T135°C Dc	

IECEx flameproof (enclosure)

Approved for use in Zone 1 and 2.

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

LCD indicator

ATEX intrinsic safety

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

Type Examination Test Certificate	PTB 05 ATEX 2079 X
II 1G Ex ia IIC T6…T1 Ga	

IECEx intrinsic safety

Approved for use in Zone 0, 1, and 2.

IECEx certificate of conformity	IECEx PTB 12.0028X
Ex ia IIC T6…T1 Ga	

… 2 Use in potentially explosive atmospheres in accordance with ATEX and IECEx

Temperature data

Transmitter

ATEX / IECEx intrinsic safety, ATEX increased safety as well as dust explosion protection (Zone 22)

Temperature class	Permissible ambient temperature range
T6, T5	−50 to 56 °C (−58 to 132.8 °F)
T4 to T1	−50 to 85 °C (−58 to 185.0 °F)

ATEX / IECEx flameproof (enclosure)

Temperature class	Permissible ambient temperature range on the connection head
T6	−40 to 67 °C (−40 to 152 °F)
T4 to T1	−40 to 85 °C (−40 to 185 °F)

LCD indicator

ATEX / IECEx intrinsic safety

Temperature class	Permissible ambient temperature range
T6	−50 to 56 °C (−58 to 132.8 °F)
T4 to T1	−50 to 85 °C (−58 to 185 °F)

Electrical data

Transmitter

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

Supply circuit			
	TTF300-E1H TTF300-H1H	TTF300-E1P/-H1P TTF300-E1F/-H1F	
		FISCO*	ENTITY
Max. voltage	U_i = 30 V	U_i ≤ 17.5 V	U_i ≤ 24.0 V
Short-circuit current	I_i = 130 mA	I_i ≤ 183 mA*	I_i ≤ 250 mA
Max. power	P_i = 0.8 W	P_i ≤ 2.56 W*	P_i ≤ 1.2 W
Internal inductance	L_i = 160 µH**	L_i ≤ 10 µH	L_i ≤ 10 µH
Internal capacitance	C_i = 0.57 nF***	C_i ≤ 5 nF	C_i ≤ 5 nF

* II B FISCO: I_i ≤ 380 mA, P_i ≤ 5.32 W

** Only applies to HART variant. From HW-Rev.: 02.00, previously 0.5 mH

*** Only applies for HART variants. From HW-Rev.: 1.07, previously 5 nF

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

TTF300-E1H, TTF300-H1H measurement current circuit model		
	Resistance thermometers, resistors	Thermocouples, voltages
Max. voltage	U_o = 6.5 V	U_o = 1.2 V
Short-circuit current	I_o = 17.8 mA[1]	I_o = 50 mA
Max. power	P_o = 29 mW[2]	P_o = 60 mW
Internal inductance	L_i ≈ 0 mH (negligible)	L_i ≈ 0 mH (negligible)
Internal capacitance	C_i = 49 nF	C_i = 49 nF
Maximum permissible external inductance	L_o = 5 mH	L_o = 5 mH
Maximum permissible external capacitance	C_o = 1.65 µF[3]	C_o = 1.15 µF[4]

1 From HW-Rev.: 02.00, previously 25 mA

2 From HW-Rev.: 02.00, previously 38 mW

3 From HW-Rev.: 02.00, previously 1.55 µF

4 From HW-Rev.: 02.00, previously 1.05 µF

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

TTF300-E1P, TTF300-H1P, TTF300-E1F, TTF300-H1F measurement current circuit model		
	Resistance thermometers, resistors	**Thermocouples, voltages**
Max. voltage	U_o = 6.5 V	U_o = 1.2 V
Short-circuit current	I_o = 25 mA	I_o = 50 mA
Max. power	P_o = 38 mW	P_o = 60 mW
Internal inductance	L_i ≈ 0 mH (negligible)	L_i ≈ 0 mH (negligible)
Internal capacitance	C_i = 49 nF	C_i = 49 nF
Maximum permissible external inductance	L_o = 5 mH	L_o = 5 mH
Maximum permissible external capacitance	C_o = 1.55 µF	C_o = 1.05 µF

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

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

Type of protection: flameproof (enclosure) Ex db IIC

Supply circuit	
Maximum voltage	U_S = 30 V
Maximum current	I_s = 32 mA, limited by the upstream fuse (rated fuse current 32 mA)

Measurement current circuit	
Maximum voltage	U_O = 6.5 V
Maximum current	I_O = 17.8 mA
Maximum power	P_O = 39 mW

Type of protection: dust explosion protection Ex tb IIIC T135°C Db, Ex tc IIIC T135°C Dc

Non-intrinsically safe power supply

Supply circuit	
Maximum voltage	U_S = 30 V
Maximum current	I_s = 32 mA, limited by the upstream fuse (rated fuse current 32 mA)

Measurement current circuit	
Maximum permissible power dissipation in the measuring inset (sensor)	P_i = 0.5 W

Intrinsically safe power supply

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

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

Refer to **Intrinsic safety type of protection Ex ia IIC (Part 1)** on page 8.

LCD indicator

Intrinsic safety type of protection Ex ia IIC

Supply circuit	
Max. voltage	U_i = 9 V
Short-circuit current	I_i = 65.2 mA
Max. power	P_i = 101 mW
Internal inductance	L_i ≈ 0 mH (negligible)
Internal capacitance	C_i ≈ 0 nF (negligible)

… 2 Use in potentially explosive atmospheres in accordance with ATEX and IECEx

Installation instructions

ATEX / IECEx / EAC-Ex

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

Cable entries

Devices with type of protection 'Ex d' without supplied cable glands

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

Devices with type of protection 'Ex d' with cable glands

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

Cable gland data

- Thread: 2 × M20 × 1.5 or 2 × ½ in NPT
- Temperature range: −50 to 85 °C (−58 to 185 °F)
- External cable diameter: 3.2 to 8.7 mm (0.13 to 0.34 in)
- Material: Brass, nickel-plated

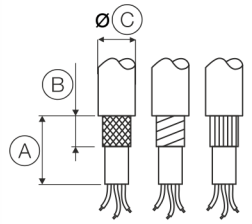
The cable entry is only suitable for fixed installations and non-reinforced cables with round and smooth plastic sleeves and suitable outside diameter. The cables must be attached appropriately in order to prevent them being pulled out or twisted.

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

Installation instructions for cable glands

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

IP rating IP66 / 67 is only achieved by installing the black neoprene sealing ring between the cable gland and the housing and by observing the tightening torque of 3.6 Nm (**Figure 2**, item ②).
Cables must be protected against extreme mechanical loads (caused by tension, torsion, crushing, and so on). Even under operating conditions, it must be ensured that the cable entry remains hermetically sealed. The customer must provide a strain relief device for the cable.



Ⓐ 40 mm
Ⓑ 12 mm
Ⓒ Ø 8.5 / 12 mm

Figure 1: Stripping the connection cables

1. Check that cable used is suitable (i.e., check the mechanical resilience, temperature range, creep resistance, resistance to chemicals, outside diameter, and so on).
2. Strip the cable in accordance with **Figure 1**.
3. Check the outer sleeve for damage and soiling.
4. Insert the cable in the cable gland.

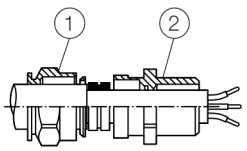


Figure 2: Tightening the cable glands

5. Tighten the cable gland until the cable is firmly enclosed by the sealing ring (**Figure 2**, item ①). Do not tighten more than 1.5--times of the specified torque on the housing (see assembly instructions for cable gland)!

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

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

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

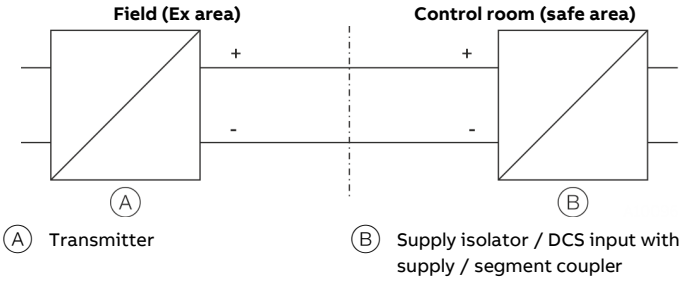
Electrical connections

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

Intrinsic safety installation check
If transmitters are operated in an intrinsically safe circuit, proof that the interconnection is intrinsically safe must be provided in accordance with IEC/EN 60079-14 as well as IEC/EN 60079-25. The supply isolators / DCS inputs must feature intrinsically safe input protection circuits in order to eliminate hazards (spark formation).
In order to provide proof of intrinsic safety, the electrical limit value must be used as the basis for the EC-type examination certificates for the equipment (devices); this includes the capacitance and inductance values of the cables.

Proof of intrinsic safety is said to have been provided if the following conditions are fulfilled when a comparison is carried out in relation to the limit values of the equipment:

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



Ⓐ Transmitter

Ⓑ Supply isolator / DCS input with supply / segment coupler

Figure 3: Intrinsic safety proof

Installation in a potentially explosive atmosphere
Transmitters can be installed in all kinds of industrial sectors. Potentially explosive systems are divided into zones, meaning that a wide range of different instruments are also required. For this, pay attention to the country-specific guidelines and certificates!

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

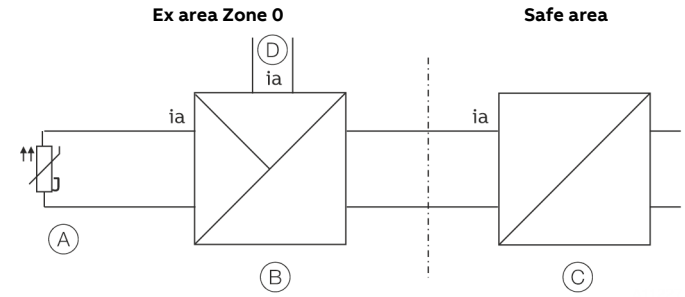
With transmitters for PROFIBUS PA and FOUNDATION Fieldbus H1 applications, FISCO interconnection methods can be used.

… 2 Use in potentially explosive atmospheres in accordance with ATEX and IECEx

… Installation instructions

ATEX – Zone 0

Marking: II 1 G Ex ia IIC T6...T1 Ga



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

Figure 4: Hookup in ATEX – Zone 0

The input for the supply isolator must be designed with ‘Ex ia’ type of protection.
Please make sure to avoid impermissible electrostatic charging of the transmitter when using it in Zone 0.
As the user, it is your responsibility to ensure that the sensor instrumentation meets the requirements of applicable explosion protection standards.

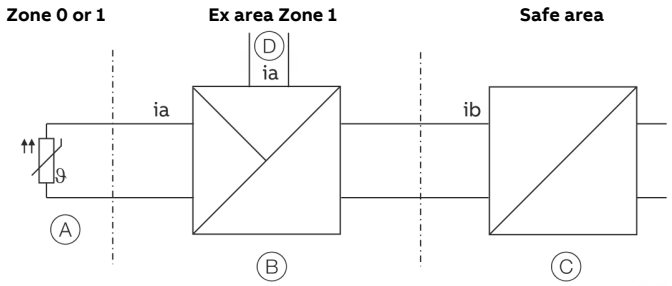
⚠ WARNING

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

Note
When operating the transmitter in Zone 0 (EPL ‘Ga’), the compatibility of the device materials with the surrounding atmosphere must be ensured.
Encapsulation material used for the transmitter:
Polyurethane (PUR)

ATEX – Zone 1 (0)

Marking: II 2 (1) G Ex [ia IIC Ga] ib IIC T6...T1 Gb



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

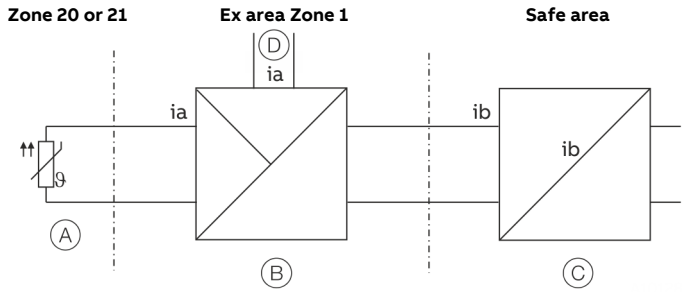
Figure 5: Hookup in ATEX - Zone 1 (0)

The input for the supply isolator must be designed with ‘Ex ib’ type of protection.
As the user, it is your responsibility to ensure that the sensor instrumentation meets the requirements of applicable explosion protection standards. The sensor can be installed in Zone 1 or Zone 0.

When using the transmitter in Zone 1, make sure that impermissible electrostatic charging of the temperature transmitter is avoided.

ATEX – Zone 1 (20)

Marking: II 2 G (1D) Ex [ia IIIC Da] ib IIC T6...T1 Gb



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

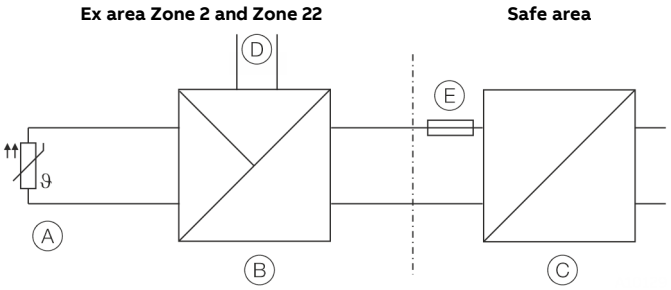
Figure 6: Hookup in ATEX - Zone 1 (20)

The input for the supply isolator must be designed with 'Ex ib' type of protection.
As the user, it is your responsibility to ensure that the sensor instrumentation meets the requirements of applicable explosion protection standards. The sensor can be installed in Zone 20 or Zone 21.

When using the transmitter in Zone 1, make sure that impermissible electrostatic charging of the temperature transmitter is avoided.

ATEX – Zone 2 and Zone 22

Marking:
II 3 G Ex nA IIC T6...T1 Gc
II 3 G Ex ec IIC T6...T1 Gc
II 3 D Ex tc IIIB T133°C Dc



Ⓐ Sensor
Ⓑ TTF300 transmitter
Ⓒ Supply isolator with voltage limit (30 V)
Ⓓ Interface for LCD indicator
Ⓔ TTF300-E5H*

Figure 7: Hookup in ATEX - Zone 2

* from HW-Rev.: 02.00.00: Fuse, 32 mA

When using the transmitter in Zone 2 and Zone 22, observe the following:

- The temperature transmitter must be installed in accordance with IP rating IP 54 (in accordance with EN 60529). Suitable cable glands must be used for this purpose.
- External measures must be made for the power supply circuit in order to prevent the rated voltage from being up-scaled by more than 40 % in the event of transient disturbances.
- The electrical connections must only be opened or closed when there is no hazardous atmosphere.
- The temperature transmitter must be installed, operated and maintained in such a way as to avoid the occurrence of electrostatic charging.
- The temperature transmitter must be integrated into the potential equalization of the system.
- The connection leads must be permanently installed and secured against tensile load.

… 2 Use in potentially explosive atmospheres in accordance with ATEX and IECEx

… Installation instructions

In addition, the following points must be observed for TTF300 HART (TTF300-E5H) from HW-Rev.: 02.00.00:
The power supply circuit of the transmitter must be limited by an upstream fuse with a fuse current rating of 32 mA and a fuse rated voltage of ≥ 30 V. The fuse can be located in the associated supply isolator or must be separately installed upstream. The breaking capacity of the fuse must be the same or greater than the maximum assumed short-circuit current at the installation site (usually 1,500 A).
The display / service interface must not be used in type of protection ‘nA’ and ‘ec’.

Note
Use in explosive hybrid mixtures, where explosive dusts and gases are present simultaneously, is not currently permitted in accordance with EN 60079-0 and EN 60079-31.

Dust explosion protection – Zone 21

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

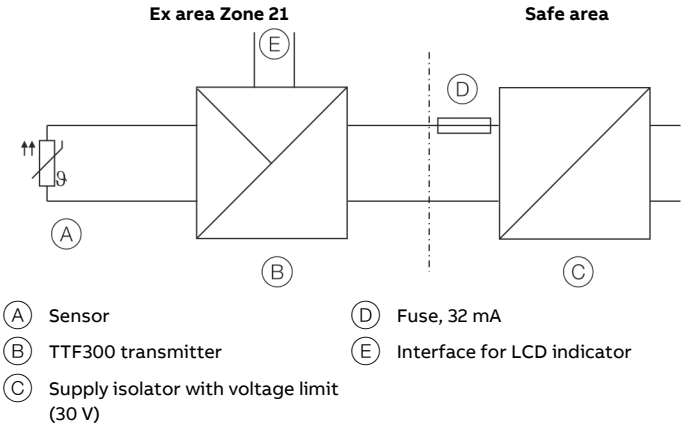
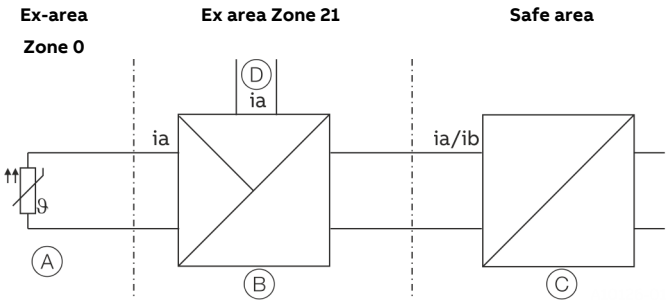


Figure 8: Hookup in Zone 21 (dust explosion protection)

The power supply circuit of the transmitter must be limited by an upstream fuse with a fuse current rating of 32 mA. This is not required if the power supply unit is designed as intrinsically safe with a ‘Ex ia / Ex ib’ type of protection.
Maximum input terminal voltage of the transmitter: 30 V DC.
The maximum permissible power dissipation in the measuring inset (sensor) is P_i = 0.5 W.
As the user, it is your responsibility to ensure that the sensor instrumentation meets the requirements of applicable explosion protection standards.

Dust explosion protection – Zone 0/21

Housing design: ATEX II 2D Ex tb IIIC T135°C Db
Transmitter design: ATEX II 1G Ex ia IIC T6...T1 Ga



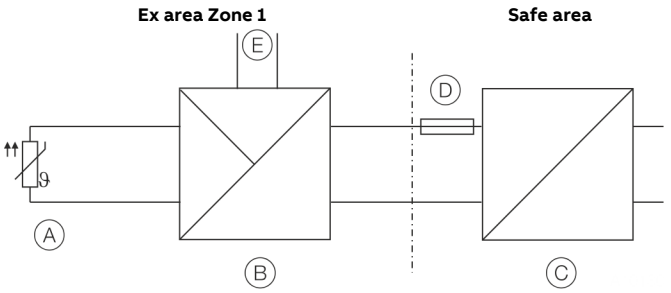
Ⓐ Sensor
Ⓑ TTF300 transmitter
Ⓒ Intrinsically safe supply isolator in 'Ex ia' or 'Ex ib' type of protection
Ⓓ Interface for LCD indicator

Figure 9: Hookup in Zone 0/21 (dust explosion protection)

When using the sensor in Zone 0 and the transmitter in Zone 21, the transmitter must be approved for Zone 21, while the sensor circuit must be designed in the 'Ex ia' type of protection and the supply circuit as well as the power supply unit in the 'Ex ia' or 'Ex ib' type of protection.
As the user, it is your responsibility to ensure that the sensor instrumentation meets the requirements of applicable explosion protection standards.

Flameproof (enclosure) – Zone 1

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



Ⓐ Sensor
Ⓑ Transmitter in Ex d-housing
Ⓒ Supply isolator with voltage limit (30 V)
Ⓓ Fuse, 32 mA
Ⓔ Interface for LCD indicator

Figure 10: Hookup in Zone 1, 'flameproof (enclosure)' type of protection

The power supply circuit of the transmitter must be limited by an upstream fuse with a fuse current rating of 32 mA.
Maximum input terminal voltage of the transmitter: 30 V DC.
The 'flameproof enclosure' type of protection is only achieved by correctly installing a specially certified cable gland with the Ex d type of protection with the corresponding marking.
The sensor instrumentation must be provided by the user in accordance with the valid Ex-standards.
As far as the installation and mounting of components is concerned (explosion-proof cable entries, connection parts), only those components are approved which at the least technically comply with the current version of the PTB 99 ATEX 1144 X type examination certificate and for which a separate examination certificate exists. At the same time, it is imperative that the operating conditions listed in the respective component certificates are complied with.

… 2 Use in potentially explosive atmospheres in accordance with ATEX and IECEx

… Installation instructions

The transmitter must be connected using suitable cable and cable entries or pipeline systems that satisfy the requirements of EN 60079-1 and for which a separate examination certificate exists. If the transmitter is connected to pipeline systems, the relevant sealing device must be affixed directly to the housing. Cable entries (PG glands) and sealing plugs of simple design must not be used.
Close unused cable entry in accordance with EN 60079.-1.
The connection lead must be routed securely and in such a way as to ensure adequate protection against damage.
If the temperature on the entry parts is over 70° C, connection leads with sufficient temperature resistance must be used.
The transmitter must be integrated into the local potential equalization of the potentially explosive area.

Commissioning

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

Operating instructions

⚠ DANGER

Risk of explosion due to hot parts

Hot parts inside the device pose an explosion hazard.

- Never open the device immediately after switch-off.
- A waiting time of at least four minutes should be observed before opening the device.

⚠ DANGER

Explosion hazard when opening the device

Explosion hazard when opening the device with activated power supply.

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

Damage to the 'Flameproof (enclosure)– Ex d' type of protection

The cover thread is used as a flameproof joint for the 'Flameproof (enclosure) – Ex d' type of protection.

- During assembly / disassembly of the device, make sure that the cover thread does not get damaged.
- Devices with damaged threads must no longer be used in potentially explosive atmospheres.

Protection against electrostatic discharges

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

⚠ WARNING

Risk of explosion!

The device must not be used in areas in which process-related electrostatic charging of the housing may occur.

- The device must be installed, maintained and cleaned such that any dangerous electrostatic charge is avoided.

Repair

⚠ DANGER

Explosion hazard

Explosion hazard due to improper repair of the device. Faulty devices must not be repaired by the operator.

- The device may only be repaired by the ABB Service Department.
- Repairs on flameproof joints are not permitted.

3 Use in potentially explosive atmospheres in accordance with cFMus, FM and CSA

Note

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

Transmitter Ex marking cFMus

cFMus Intrinsically Safe

Model TTF300-L1H for USA or TTF300-R1H for Canada	
From HW-Rev.: 02.00	
Control Drawing	TTF300-L1H
IS Class I,II,III, Div. 1,2 Group ABCDEFG T6,T4	
Zone 0 AEx/Ex ia IIC T6…T1 Ga	
Zone 1 AEx/Ex [ia Ga] ib IIC T6…T1 Gb	
Zone 1 AEx/Ex ib IIC T6…T1 Gb / [AEx/Ex ia Da] IIIC	

cFMus Non-Incendive

Model TTF300-L2H for USA or TTF300-R2H for Canada	
From HW-Rev.: 02.00	
Control Drawing	TTF300-L2H
NI Class I,II,III Div. 2 Group ABCDEFG T6,T4	
Zone 2 AEx/Ex nA IIC T6…T1 Gc	
Zone 2 AEx/Ex ec IIC T6…T1 Gc	

cFMus Explosion Proof

Model TTF300-L3H for USA or TTF300-R3H for Canada	
From HW-Rev.: 02.00	
Control Drawing	TTF300-L3H
XP Class I, Div 1,2 Group ABCD T6,T4 for Conduit Um ≤ 42VDC 32mA fused	
DIP Class II, Div 1,2 Group EFG T6,T4 Um ≤ 42VDC 32mA fused	
XP/IS Class I Div 1,2 GP ABCD T6,T4 with IS Output	
Entity Drawing TTF300-L3H	
XP/IS Class I, Div 1,2 Group ABCD T6,T4 with IS Output	
Entity Drawing TTF300-L3H	
Zone 1 AEx/Ex db [ia Ga] IIC T6…T1 Gb	

cFMus Explosion Proof and Intrinsically safe

Model TTF300-L7H (L1H +L3H) for USA, **Model TTF300-R7H (R1H + R3H) for Canada**	
From HW-Rev.: 02.00	
Control Drawing	TTF300-L3H, TTF300-L1H
XP Class I, Div 1,2 Group ABCD T6,T4 for Conduit Um <= 42VDC 32mA fused	
DIP Class II, Div 1,2 Group EFG T6,T4 Um <= 42VDC 32mA fused	
XP/IS Class I, Div 1,2 Group ABCD T6,T4 with IS Output	
Entity Drawing TTF300-L3H	
IS Class I,II,III Div 1,2 Group ABCDEFG T6,T4 with	
Entity Drawing TTF300-L1H	
Zone 1 AEx/Ex db [ia Ga] IIC T6…T1 Gb	

Transmitter Ex marking FM / CSA

FM Intrinsically Safe

Model TTF300-L1H	
Up to HW-Rev.: 01.07	
Control Drawing	SAP_214832
Model TTF300-L1P	
Control Drawing	TTF300-L1..P (IS)
Model TTF300-L1F	
Control Drawing	TTF300-L1..F (IS)
Class I, Div. 1 + 2, Groups A, B, C, D	
Class I, Zone 0, AEx ia IIC T6	

FM Non-Incendive

Model TTF300-L2H	
Up to HW-Rev.: 01.07	
Control Drawing	SAP_214830 (NI_PS)
	SAP_214828 (NI_AA)
Model TTF300-L2P	
Control Drawing	TTF300-L2..P (NI_PS)
	TTF300-L2..P (NI_AA)
Model TTF300-L2F	
Control Drawing	TTF300-L2..F (NI_PS)
	TTF300-L2..F (NI_AA)
Class I, Div. 2, Groups A, B, C, D	
Class I Zone 2 Group IIC T6	

FM Explosion proof

Model TTF300-L3
XP, DIP Class I, II, III, Div. 1 + 2, Groups A-G, factory sealed

CSA Intrinsically Safe

Model TTF300-R1H	
Up to HW-Rev.: 01.07	
Control Drawing	SAP_214825
Model TTF300-R1P	
Control Drawing	TTF300-R1..P (IS)
Model TTF300-R1F	
Control Drawing	TTF300-R1..F (IS)
Class I, Div. 1 + 2, Groups A, B, C, D	
Class I, Zone 0, Ex ia IIC	

CSA Non-Incendive

Model TTF300-R2H	
Up to HW-Rev.: 01.07	
Control Drawing	SAP_214827 (NI_PS)
	SAP_214895 (NI_AA)
Model TTF300-R2P	
Control Drawing	TTF300-R2..P (NI_PS)
	TTF300-R2..P (NI_AA)
Model TTF300-R2F	
Control Drawing	TTF300-R2..F (NI_PS)
	TTF300-R2..F (NI_AA)
Class I, Div. 2, Groups A, B, C, D	

CSA Explosion proof

Model TTF300-R3
XP, DIP Class I, II, III, Div. 1 + 2, Groups A-G, factory sealed

CSA Explosion Proof and Intrinsically Safe

Model TTF300-R7H (R1H + R3H)	
Up to HW-Rev.: 01.07	
Control Drawing	SAP_214825
Model TTF300-R7P (R1P + R3P)	
Control Drawing	TTF300-R1..P (IS)
Model TTF300-R7F (R1F + R3F)	
Control Drawing	TTF300-R1..F (IS)
XP, DIP Class I, II, III, Div. 1 + 2, Groups A-G, factory sealed	
Class I, Div. 1 + 2, Groups A, B, C, D	
Class I, Zone 0, Ex ia IIC	

LCD indicator Ex marking

FM Intrinsically Safe

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

FM Non-Incendive

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

CSA Intrinsically Safe

Control Drawing	SAP_214 749
I.S. Class I Div 1 and Div 2; Group: A, B, C, D or	
I.S Zone 0 Ex ia IIC T*	
U_i / V_{max} = 9 V, I_i / I_{max} < 65.2 mA, P_i = 101 mW, C_i < 0.4 µF, L_i = 0	

CSA Non-Incendive

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

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

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

… 3 Use in potentially explosive atmospheres in accordance with cFMus, FM and CSA

Installation instructions

The installation, commissioning, maintenance and repair of devices in areas with explosion hazard must only be carried out by appropriately trained personnel.
The operator must strictly observe the applicable national regulations with regard to installation, function tests, repairs, and maintenance of electrical devices. (e. g. NEC, CEC).

Warnings and instructions should be followed as per notes on the associated control drawing for installation in the associated hazardous area.

The control drawings are available for download under the following link. Just scan or click on the QR code:

ABB Library – TTF300 – control drawings

Electrical connections

Grounding

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

Note

When operating the transmitter in Zone 0, the compatibility of the device materials with the surrounding atmosphere must be guaranteed.
Encapsulation material used for the transmitter:
Polyurethane (PUR)

Installation in a potentially explosive atmosphere

Transmitters can be installed in all kinds of industrial sectors.Potentially explosive systems are divided into zones, meaning that a wide range of different instruments are also required.For this, pay attention to the country-specific guidelines and certificates!

Commissioning

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

Operating instructions

⚠ DANGER

Risk of explosion due to hot parts

Hot parts inside the device pose an explosion hazard.

- Never open the device immediately after switch-off.
- A waiting time of at least four minutes should be observed before opening the device.

⚠ DANGER

Explosion hazard when opening the device

Explosion hazard when opening the device with activated power supply.

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

Adverse effect on the 'Explosionproof – XP' type of protection

The cover thread is used as a flameproof joint for the 'Explosionproof – XP' type of protection.

- During assembly / disassembly of the device, make sure that the cover thread does not get damaged.
- Devices with damaged threads must no longer be used in potentially explosive atmospheres.

Protection against electrostatic discharges

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

⚠ WARNING

Risk of explosion!

The device must not be used in areas in which process-related electrostatic charging of the housing may occur.

- The device must be installed, maintained and cleaned such that any dangerous electrostatic charge is avoided.

Repair

⚠ DANGER

Explosion hazard

Explosion hazard due to improper repair of the device. Faulty devices must not be repaired by the operator.

- The device may only be repaired by the ABB Service Department.
- Repairs on flameproof joints are not permitted.

4 Design and function

TTF300 digital transmitters are communication-ready devices with microprocessor-controlled electronics.

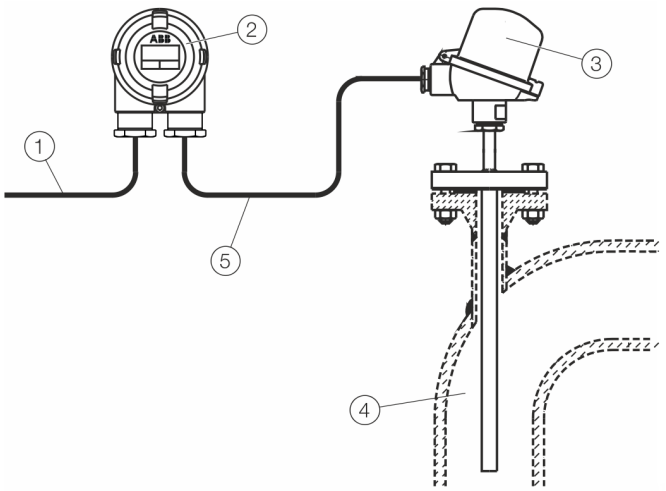
In the HART® transmitter, an FSK signal is superimposed on the 4 to 20 mA output signal in accordance with the HART standard to facilitate bidirectional communication.

With PROFIBUS PA transmitters, communication takes place in accordance with PROFIBUS – MBP (IEC 61158-2), PROFIBUS PA Profile 3.01.

With FOUNDATION Fieldbus® transmitters, communication takes place in accordance with the FOUNDATION Fieldbus H1 (IEC 61158-2), ITK Version 5.x.

The transmitters can be configured using various tools / 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. TTF300 transmitter
3. Temperature sensor
4. Thermowell
5. Sensor connection cable

Figure 11: Design

Input functionality

Sensor redundancy
To enhance system availability, the TTF300 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 29.

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.

Devices with PROFIBUS PA®, FOUNDATION Fieldbus®, and HART® to SW-Rev.: 01.03
Sensor redundancy / sensor backup for enhanced availability

With sensor redundancy (sensor backup), the temperature is always measured between both sensors, and the mean is derived from that with the same sensors.This value is provided at the output of the transmitter.If the sensors are not identical, the measured value of channel 1 (resistance thermometer) is output.If one sensor fails, the temperature measurement of the remaining sensor is transmitted seamlessly to the output of the transmitter.
A relevant diagnosis message is available via DTM, EDD, FDI Package (FIM) or on the LCD indicator.The measured value remains available and maintenance measures can be taken at the same time.

Devices with HART® from SW-Rev. 03.00
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 DTM, EDD, FDI package (FIM) or on the LCD display.
For the meaning of the diagnostic messages according to NAMUR 107, see **Error messages in the HART® LCD display** on page 48. The error messages and options for error correction are listed in **Possible error messages – HART® devices from SW-Rev.: 03.00** on page 85.

Note
Only the current output behavior and redundancy configuration can be set for the three redundancy behaviors via the HMI LCD display 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”).

… 4 Design and function

… Input functionality

Sensor drift monitoring
If two sensors are connected, sensor drift monitoring can be FDI Package (FIM) enabled via DTM, EDD or

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

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 (devices with PROFIBUS PA®, FOUNDATION Fieldbus®, and HART® to SW-Rev.: 01.03)
If drift monitoring is used for the same sensor types (2 × resistance thermometer or 2 × thermocouple), the average value calculated from the two sensors will be mapped to the transmitter output signal as a process variable in redundancy mode.

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 **Electrical connections** on page 29). The measured value of channel 1 (resistance thermometer) is mapped as a process variable at the transmitter output.

Sensor drift monitoring with redundancy operation (devices with HART® from SW-Rev.: 03.00)
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 **Electrical connections** on page 29).
The transmitter output signal always corresponds to the configured redundancy behavior, see **Sensor redundancy** on page 22.

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 TTF300 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 for HART and PROFIBUS PA, while up to two CVD characteristic curves can be stored for FOUNDATION Fieldbus.

5 Product identification

Name plate

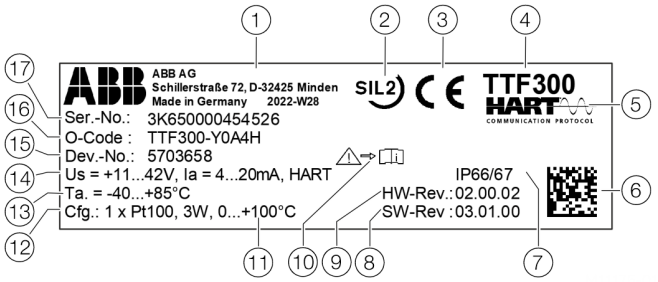
Note

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

Note

The ambient temperature range specified on the name plate refers only to the transmitter itself and not to the measuring element used in the measuring inset.

For devices with PROFIBUS PA® or FOUNDATION Fieldbus®, the device IDs are additionally specified.



1. Manufacturer, manufacturer address, country of manufacture, manufacturing year - week
2. Safety integrity level, SIL logo (optional)
3. CE mark (EU conformity), if not on additional plate
4. Type designation / model
5. Communication protocol of the transmitter (HART®, FF, PB)
6. 2D barcode for serial number in accordance with order
7. IP rating of housing
8. Software revision
9. Hardware version
10. 'Follow product documentation' symbol

11 and 12: HART® transmitter customer configuration:

11. Set measuring range of the transmitter
12. Set sensor type and circuit type

11 and 12: PROFIBUS PA® or FOUNDATION Fieldbus® transmitter customer configuration:

Ident_Number or DEVICE_ID

13. Ambient temperature range, on additional plate for Ex versions
14. Specification of the transmitter (supply voltage range, output current range, communication protocol)
15. Serial number of the device electronics (7 or 8-digit)
16. Device type: Coding of type of protection, housing/indicator, cable entry, and communication protocol (complies with the ordering information of the device).
17. Serial number of the device (serial number in accordance with order)

Figure 12: HART® name plate (example)

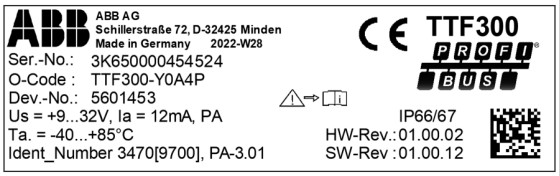


Figure 13: PROFIBUS PA® name plate (example)

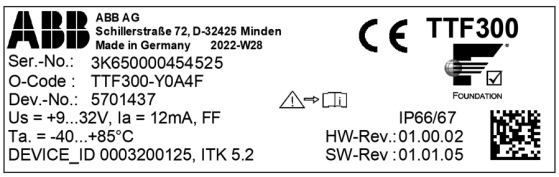


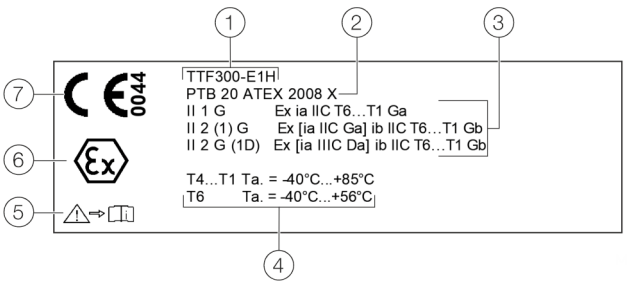
Figure 14: FOUNDATION Fieldbus® name plate (example)

Explosion protection marking for devices with one type of protection

Devices with an explosion-proof design are marked with the following additional plates.

Note

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



1. Type designation in accordance with approval
2. Approval number
3. Protection class of the explosion-proof design (explosion protection marking)
4. Temperature class of the explosion-proof design
5. 'Follow product documentation' symbol
6. CE mark (EU conformity) and notified body for quality assurance
7. Ex marking

Figure 15: Additional data plate for explosion-protected devices (example)

… 5 Product identification

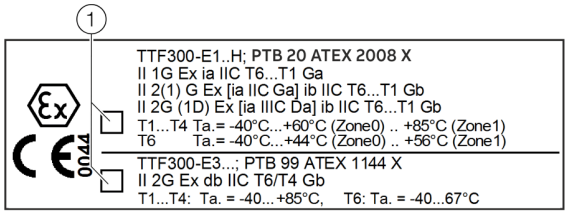
… Name plate

Explosion protection marking for devices with several types of protection

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

The ‘intrinsic safety’, ‘flameproof (enclosure)’ and ‘dust explosion protection’ types of protection can be possible for one device.

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



(1) Checkboxes for marking type of protection

Figure 16: Example of several types of protection: “Intrinsic safety” and “Flameproof (enclosure)”, coding of the type of protection: E4.

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

NOTICE

Note for temperature transmitters with multiple types of protection

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

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

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

Devices with several types of protection may only be operated in one of the possible types of protection.

Before commissioning, users must decide on one of these types of protection and their corresponding approval.

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

Additional combinations are generally possible.

Use in explosive hybrid mixtures (where explosive dusts and gases are present simultaneously) is not currently permitted in accordance with EN 60079-0 and EN 60079-31.

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

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

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

Unmarked devices must **NOT** be commissioned.

6 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 87.

7 Installation

Note
When using the device in potentially explosive atmospheres, note the additional data in **Use in potentially explosive atmospheres in accordance with ATEX and IECEx** on page 6 and **Use in potentially explosive atmospheres in accordance with cFMus, FM and CSA** on page 18!

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 explosion-proof design: 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

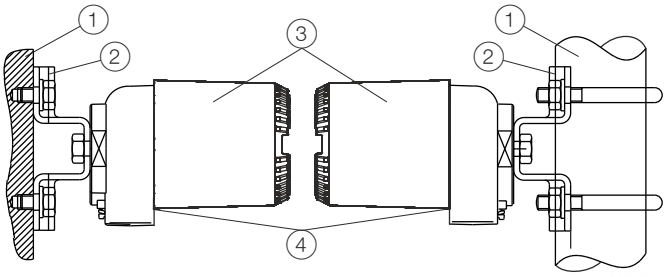
Vibration resistance in accordance with IEC 60068-2-6
10 to 2000 Hz at 5 g, during operation and transport

Shock resistance in accordance with IEC 60068-2-27
gn = 30, during operation and transport

IP rating
IP 66 and IP 67

… 7 Installation

Mounting



① Wall / Pipe
② Bracket
③ Transmitter
④ Locking screw

Figure 17: Installation variants

⚠ CAUTION

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

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

Pipe mounting:
Attach the pipe mount to the pipe using 2 pipe clamps (Ø 10 mm). The pipe mount can be fastened to a pipe with a maximum diameter of 62 mm (2.4 in)

Opening and closing the housing

⚠ DANGER

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

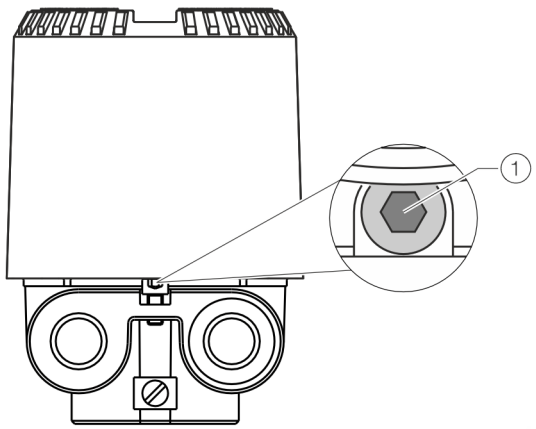


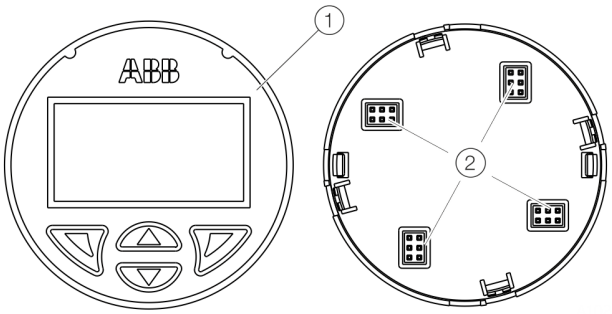
Figure 18: Cover lock (example)

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

NOTICE

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

Rotating the LCD indicator



① Front view

② Rear view of LCD indicator / plug positions

Figure 19: Rotating the LCD indicator

The position of the LCD indicator can be adjusted to suit the mounting position of the transmitter, to ensure that the display is as clearly legible as possible. There are 4 positions at increments of 90°-.
To adjust the position, proceed as follows:

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

NOTICE

Potential adverse effect on the IP rating

- Check the O-ring gasket for damage and replace it if necessary before closing the housing cover.
- Check that the O-ring gasket is properly seated when closing the housing cover.

8 Electrical connections

Safety instructions

⚠ DANGER

Improper installation and commissioning of the device carries a risk of explosion.
For use in potentially explosive atmospheres, observe the information in **Use in potentially explosive atmospheres in accordance with ATEX and IECEx** on page 6 and **Use in potentially explosive atmospheres in accordance with cFMus, FM and CSA** on page 18!

Observe the following instructions:

- The electrical connection may only be established by authorized specialist personnel and in accordance with the connection diagrams.
- The relevant regulations must be observed during electric installation.
- The electrical connection information in the instruction must be observed; otherwise, the electric IP rating may be adversely affected.
- Safe isolation of electric circuits which are dangerous if touched is ensured only if the connected devices satisfy the requirements of DIN EN 61140 (VDE 0140 Part 1) (basic requirements for safe isolation).
- To ensure safe isolation, install connection leads separate from electric circuits which are dangerous if touched, or implement additional insulation measures.
- Connections must only be established in a dead-voltage state!
- The transmitter has no switch-off elements. Therefore, overcurrent protective devices, lightning protection, or voltage disconnection options must be provided with the installation.
- The power supply and signal are routed in the same conductor and should be implemented as a SELV or PELV circuit in accordance with the relevant standard (standard version). For the explosion-proof design, the guidelines in accordance with the Ex standard must be adhered to.
- You need to check that the available power supply corresponds to the information on the name plate.

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

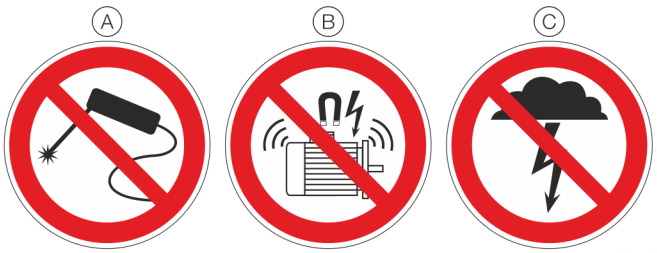
… 8 Electrical connections

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 **Recommended shielding / grounding** on page 31.

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.



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

Figure 20: Warning signs

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

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.

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.

Shielding of the sensor connecting cable

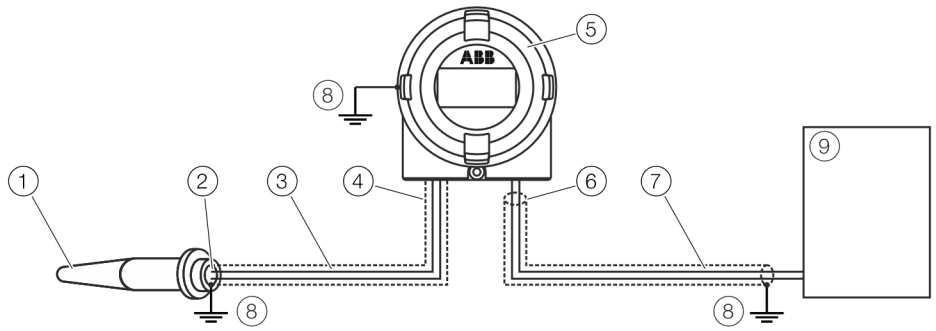
To ensure the system benefits from optimum electromagnetic interference immunity, the individual system components, and the connection cables in particular, need to be shielded.
The shield must be connected to the ground reference plane.

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 21: 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.

… 8 Electrical connections

… Shielding of the sensor connecting cable

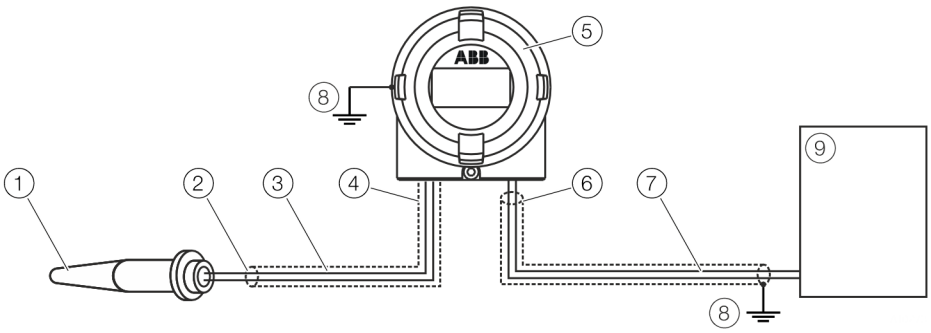
Additional examples for shielding / grounding

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

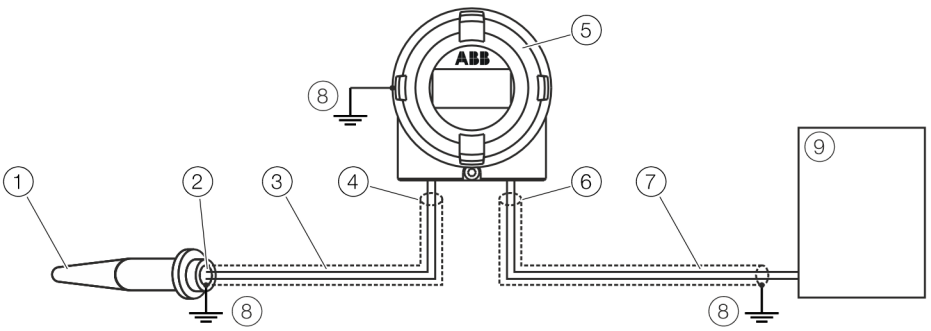
Figure 22: The shielding of the sensor connection cable and the shielding of the power supply cable are separate and each grounded at one end

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

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

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

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

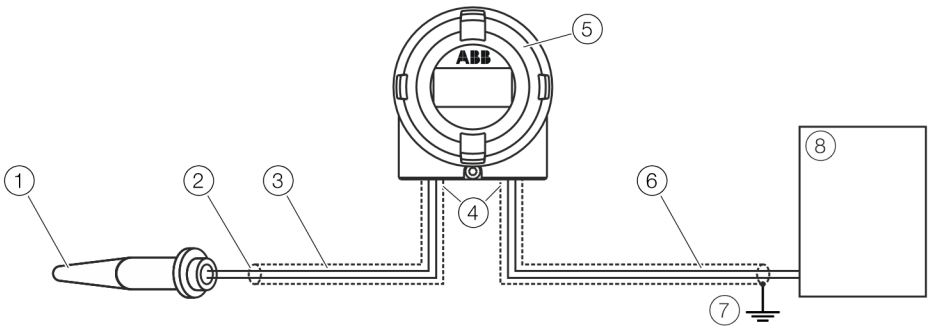


1. Temperature sensor
2. Shielding grounded via sensor
3. Sensor connection cable
4. Shielding insulated from transmitter housing
5. Transmitter housing, grounded
6. Shielding insulated from transmitter housing
7. Supply voltage cable
8. Grounding point
9. Supply isolator / DCS input

Figure 23: The shielding of the sensor connection cable and of the supply voltage cable are separate and each grounded on one side.

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.



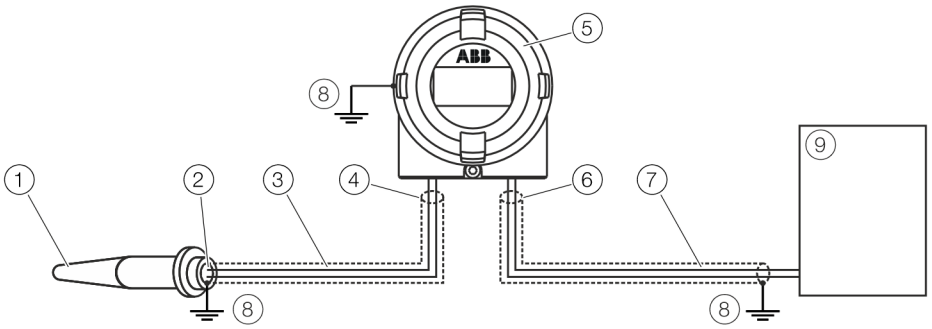
1. Temperature sensor
2. Shielding insulated from sensor
3. Sensor connection cable
4. Shielding connected electrically via transmitter housing
5. Transmitter housing, not grounded
6. Supply voltage cable
7. Grounding point
8. Supply isolator / DCS-input

Figure 24: 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 pressure sensor housing. This shielding of the power supply cable is insulated from the transmitter housing.

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



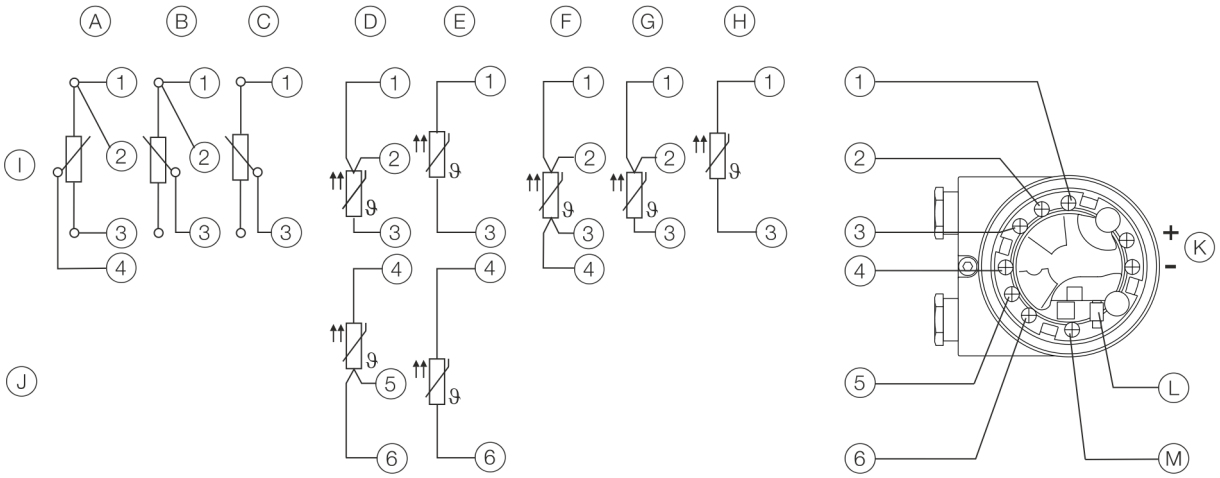
1. Temperature sensor
2. Shielding grounded via sensor
3. Sensor connection cable
4. Shielding insulated from transmitter housing
5. Transmitter housing, grounded
6. Shielding insulated from transmitter housing
7. Supply voltage cable
8. Grounding point
9. Supply isolator / DCS input

Figure 25: The shielding of the sensor connection cable and of the supply voltage cable are separate and each grounded on one side.

… 8 Electrical connections

Terminal assignment

Resistance thermometers (RTD) / resistors (potentiometer)

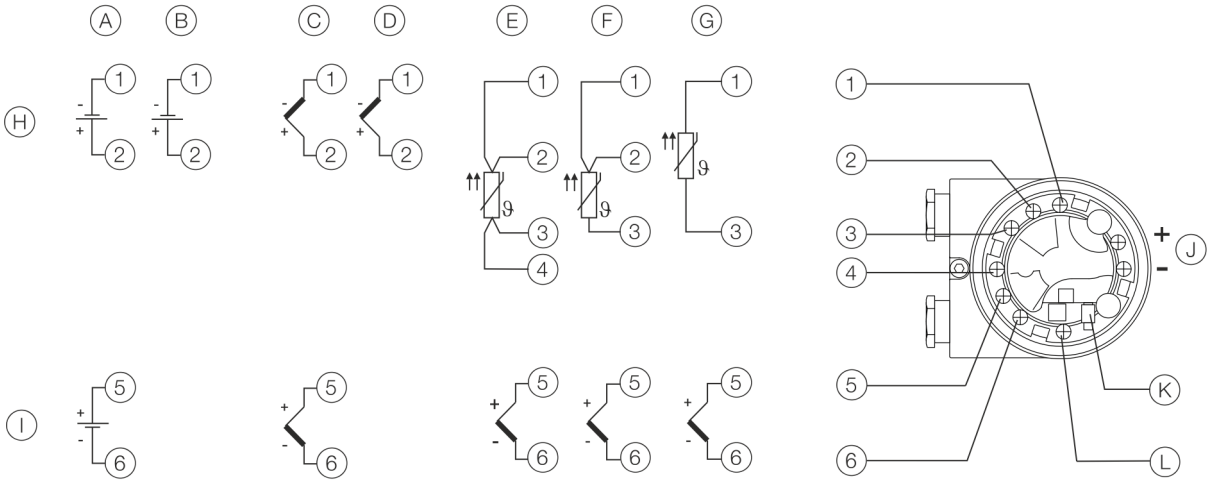


- (A) Potentiometer, four-wire circuit
- (B) Potentiometer, three-wire circuit
- (C) Potentiometer, two-wire circuit
- (D) 2 x RTD, three-wire circuit*
- (E) 2 x RTD, two-wire circuit*
- (F) RTD, four-wire circuit
- (G) RTD, three-wire circuit
- (H) RTD, two-wire circuit
- (I) Sensor 1
- (J) Sensor 2*
- (K) 4 to 20 mA HART®, PROFIBUS PA®, FOUNDATION Fieldbus®
- (L) Interface for LCD indicator and service
- (M) Ground terminal for shield support for sensors and supply / signal lines
- (1) – (6) Sensor connection (of measuring inset)

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

Figure 26: Terminal assignment Resistance thermometer (RTD) / resistances (potentiometer)

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



(A) 2 x voltage measurement*
(B) 1 x voltage measurement
(C) 2 x thermocouple*
(D) 1 x thermocouple
(E) 1 x RTD, four-wire circuit and thermocouple*
(F) 1 x RTD, three-wire circuit and thermocouple*
(G) 1 x RTD, two-wire circuit and thermocouple*
(H) Sensor 1
(I) Sensor 2*
(J) 4 to 20 mA HART®, PROFIBUS PA®, FOUNDATION Fieldbus®
(K) Interface for LCD indicator and service
(L) Ground terminal for shield support for sensors and supply / signal lines
(1) – (6) Sensor connection (of measuring inset)

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

Figure 27: Terminal assignment: Thermocouples / voltages and resistance thermometer (RTD) / thermocouple combinations

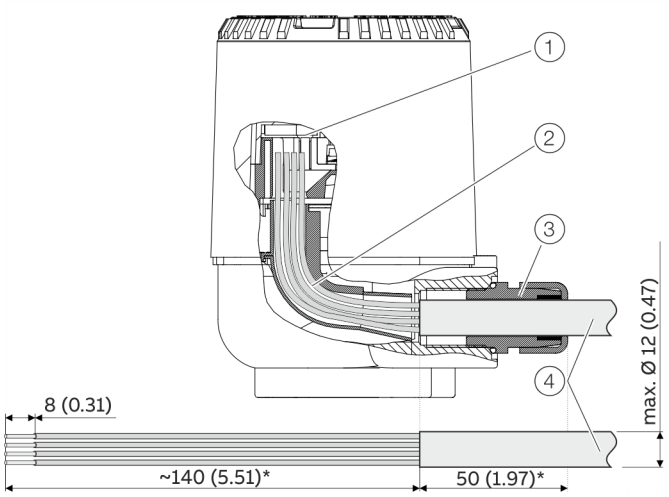
… 8 Electrical connections

Terminal for sensor connection cable

⚠ DANGER

Danger of explosion if the device is operated with the transmitter housing or terminal box open!
While using the device in potentially explosive atmospheres before opening the transmitter housing or the terminal box, note the following points:

- A valid fire permit must be present.
- Make sure that no flammable or hazardous atmospheres are present.



① Terminal compartment
② Cable entry
③ Cable gland
④ Sensor connection cable

Figure 28: Connection to the transmitter, dimensions in mm (in.)

1. Tighten the lock screw under the housing cover.
2. Unscrew the housing cover.
3. If available, pull out the LCD indicator carefully
4. Strip the sensor connection cable as shown and attach wire end sleeves.
   A line length of 190 mm should be ensured between the cable gland entry and the terminals. 140 mm should be stripped from the cable jacket along this length*.
5. Guide the sensor connection cable through the cable glands and into the housing. Then tighten the cable glands*.
6. Connect the wires as per the connection diagram.
7. If there is one, carefully insert the LCD indicator in the previous / required position.
8. Screw the housing cover back on.
9. Loosen the lock screw until the housing cover is firmly in place.

* If an increased electromagnetic interference emission is to be expected at the installation site, for increasing the interference immunity, we recommend stripping more than 140 mm (e.g. 143 mm) from the sensor cable. After inserting the sensor connection cable in the cable gland, pull back the cable from the stop by the relevant amount, then tighten the cable gland.

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

… 8 Electrical connections

… Electrical data for inputs and outputs

Output – HART®

Note

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

Transmission behavior

- Temperature linear
- Resistance linear
- Voltage linear

Output signal

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

Simulation mode

3.5 to 23.6 mA

Induced current consumption

< 3.5 mA

Maximum output current

23.6 mA

Configurable error current signal

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.

Notice – Before SW-Rev.: 03.00

The default factory setting for the error current signal is high alarm 22 mA.

- Overrange / high alarm 22 mA (20.0 to 23.6 mA)
- Underrange / low alarm 3.6 mA (3.5 to 4.0 mA)

Notice – From SW-Rev.: 03.00

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)

Output – PROFIBUS PA®

Note

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

Output signal

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

Error current signal

- FDE (Fault Disconnection Electronic)

Block structure

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

* Sensor 1, Sensor 2 or difference or mean

For detailed information see the PROFIBUS PA® interface description (COM/TTX300/PB).

Output – FOUNDATION Fieldbus®

Note

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

Output signal

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

Error current signal

- FDE (Fault Disconnection Electronic)

Block structure*

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

LAS (Link Active Scheduler) link master functionality

* For the block description, block index, execution times, and block class, refer to the interface description

** Sensor 1, Sensor 2 or difference or mean

For detailed information, see the COM/TTX300/FF FOUNDATION Fieldbus® interface description.

Power supply

Two-wire technology, polarity safe; power supply lines = signal lines

Note

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

Power supply – HART®

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

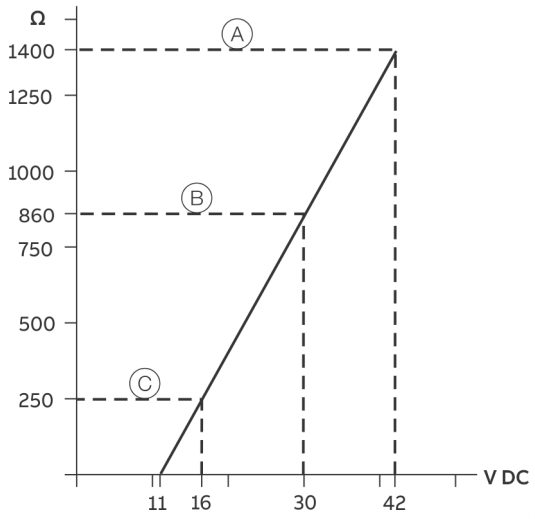
During communication this is in accordance with the HART FSK 'Physical Layer' specification.

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



Ⓐ TTF300

Ⓑ TTF300 in Ex-applications

Ⓒ HART communication resistance

Figure 29: Maximum load depending on supply voltage

Maximum power consumption

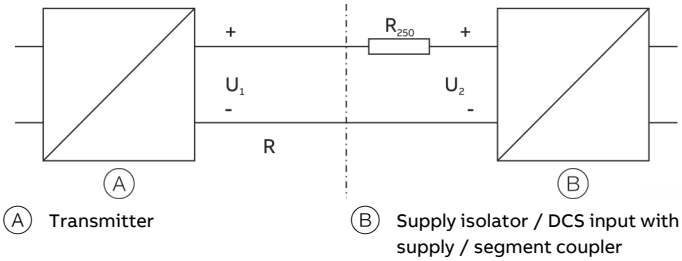
$P = U_s \times 0.022$ A

E.G. U_s = 24 V → P_{max} = 0.528 W

… 8 Electrical connections

… Electrical data for inputs and outputs

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 30: 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 **HART® Communication** on page 41 and **Hardware settings** on page 44..

Power supply – PROFIBUS / FOUNDATION Fieldbus
Supply voltage
Non-Ex application:
U_S = 9 to 32 V DC
Ex-applications with:
U_S = 9 to 17 V DC (FISCO)
U_S = 9 to 24 V DC (Fieldbus Entity model I.S.)
Current consumption:
≤ 12 mA

Standard application with PROFIBUS PA and FOUNDATION Fieldbus H1 functionality
During hookup, the following condition should be complied with:
$U_{1min} \leq U_{2min}$ – 12 mA x R

9 Commissioning

General

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

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 29.
- The ambient conditions must correspond to the information given on the name plate and in the data sheet.

Communication

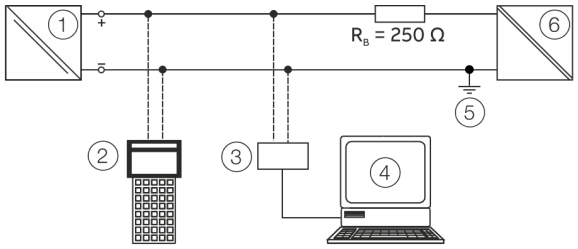
HART® Communication

Note

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

Communication with the transmitter takes place using the HART protocol. The communication signal is modulated onto both wires of the signal line in accordance with the HART FSK 'Physical Layer' specification.
The HART modem is connected at the signal line of the current output via which power is also supplied via the power supply unit.

The device is listed with the FieldComm Group.



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 31: Example of HART® interface connection

Manufacturer ID	0x1A
Device-ID*	HART 5: 0x004B (0x000B), HART 7: 0x1A4B (0x1A0B)
Profile	From SW-Rev.: 03.00 (corresponds to HW-Rev.: 02.00 and higher): HART 5.9 and HART 7.6, can be switched via • LCD indicator with configuration function • Tools • HART commands Default, if nothing else ordered: HART 7.6. To SW-Rev.: 01.03: HART 5.1 and HART 7, switchable via DIP switch. Default, if nothing else ordered: HART 5.1. SW-Rev.: 01.01: HART 5.1, previously HART 5.
Configuration	On device using LCD indicator DTM, EDD, FDI (FIM)
Transmission signal	BELL Standard 202

* From SW-Rev.: 03.01.00, previously see brackets

… 9 Commissioning

… Communication

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:

- HMI LCD indicator with configuration function

Driver-dependent:

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

Diagnosis notice

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

Extended from SW-Rev.: 03.00:

- Device status signaling according to NE 107
- Freely configurable diagnostic categorization with diagnostic history in accordance with NE 107

Tracking of events and configuration changes, from SW-Rev.: 03.00

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

The information can be output via tools:

- Event monitor for the logging of critical events
- Configuration monitor for configuration changes

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

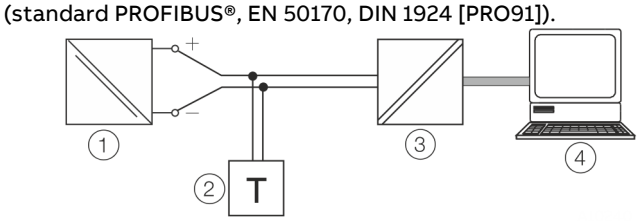
PROFIBUS® Communication

Note

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

The interface conforms to Profile 3.01

(standard PROFIBUS®, EN 50170, DIN 1924 [PRO91]).



1 Transmitter
2 Bus termination
3 Segment coupler
4 PC / DCS

Figure 32: Example of PROFIBUS PA® interface connection

Manufacturer ID	0x1A
ID number	0x3470 [0x9700]
Profile	PA 3.01 (see PROFIBUS PA® interface description (COM/TTX300/PB))
Configuration	On device using LCD indicator DTM EDD GSD
Transmission signal	IEC 61158-2

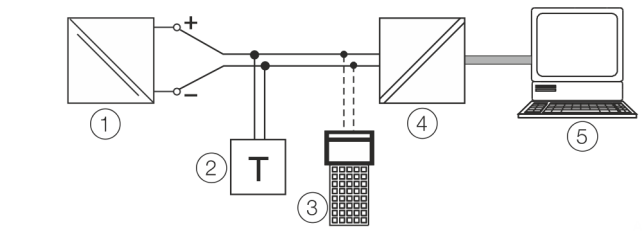
Voltage / current consumption

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

FOUNDATION Fieldbus® Communication

Note

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



1 Transmitter
2 Bus termination
3 Handheld terminal
4 Linking Device
5 PC / DCS

Figure 33: Example of FOUNDATION Fieldbus® interface connection

Device ID	000320001F...
ITK	5.x (see FOUNDATION Fieldbus® interface description (COM/TTX300/FF)
Configuration	On device using LCD indicator EDD
Transmission signal	IEC 61158-2

Voltage / current consumption

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

Basic Setup

Note

The communication and configuration of the transmitter via HART, PROFIBUS PA and FOUNDATION Fieldbus H1 are described in the separate documentation “Interface Description” for the relevant protocol (COM/TTX300/...).

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 operating buttons
  Commissioning via the LCD indicator does not require any tools to be connected to the device and is therefore the simplest way of configuring the TTF300.
  The general operation and menus of the LCD indicator are described in **Menu navigation** on page 45.

Note

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

10 Operation

Safety instructions

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

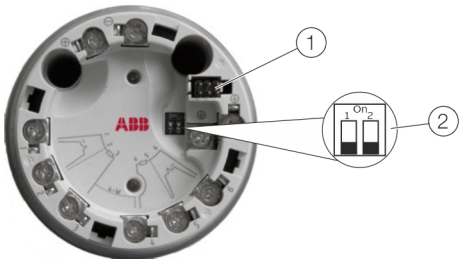
Hardware settings

Devices with HART® from HW-Rev.: 02.00 (corresponds to Software from SW-Rev.: 03.00 and higher)
HART devices from HW-Rev.: 02.00 do not have DIP switches.The desired HART profile (HART 7 or HART 5) the write protection are set via the operating buttons of the LCD display (optional), tools or HART commands.

Note
Factory setting, unless explicitly ordered otherwise:

- HART 7
- Write protection OFF

Devices with PROFIBUS PA®, FOUNDATION Fieldbus®, and HART® to HW-Rev.: 01.07



① LCD indicator interface ② DIP switch

Figure 34: DIP switch on the transmitter (not for HART devices from HW-Rev.: 02.00)

The transmitter has two DIP switches that can be accessed via a hinged cover.

- Switch 1 activates the hardware write protection.
- Switch 2 supports the FOUNDATION Fieldbus requirement for a hardware enable for simulation in accordance with ITK.

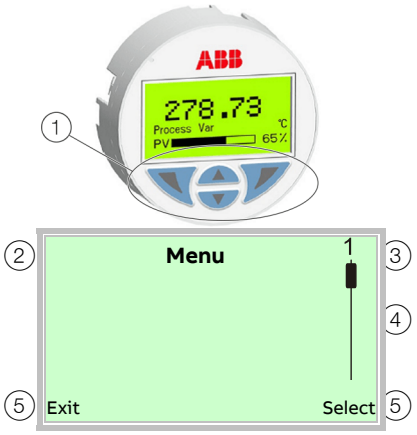
For transmitters that support HART 7, switch 2 allows the desired HART version to be set (HART 5 or HART 7).

DIP switch	Function
①	**Local write protection** Off: Local write protection deactivated On: Local write protection activated
②	**Enabling the simulation (only with FOUNDATION Fieldbus)** Off: Simulation blocked On: Simulation enabled
	Selecting the HART version (only with HART protocol) Off: HART 5 On: HART 7

Note (not for HART devices from HW-Rev.: 02.00)

- Factory settings: Both switches ‘OFF’. Local write protection deactivated and HART 5, unless explicitly ordered HART 7 (HART version) or simulation locked (FOUNDATION Fieldbus).
- With PROFIBUS PA devices, Switch 2 must always be in the ‘OFF’ position.

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 35: 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

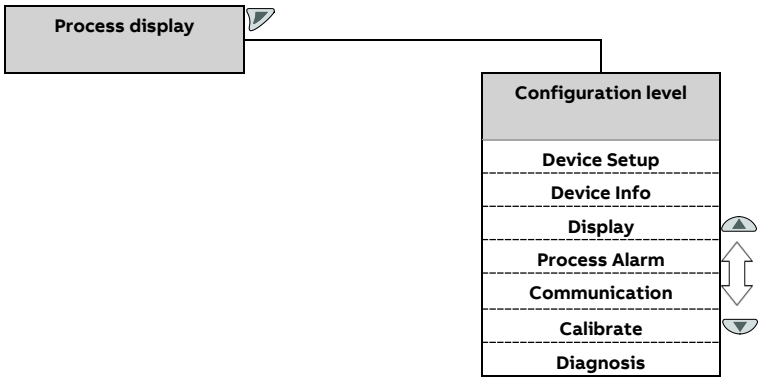
	Meaning
Exit	Exit menu
Back	Go back one submenu
Cancel	Cancel a parameter entry
Next	Select the next position for entering numerical and alphanumeric values

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

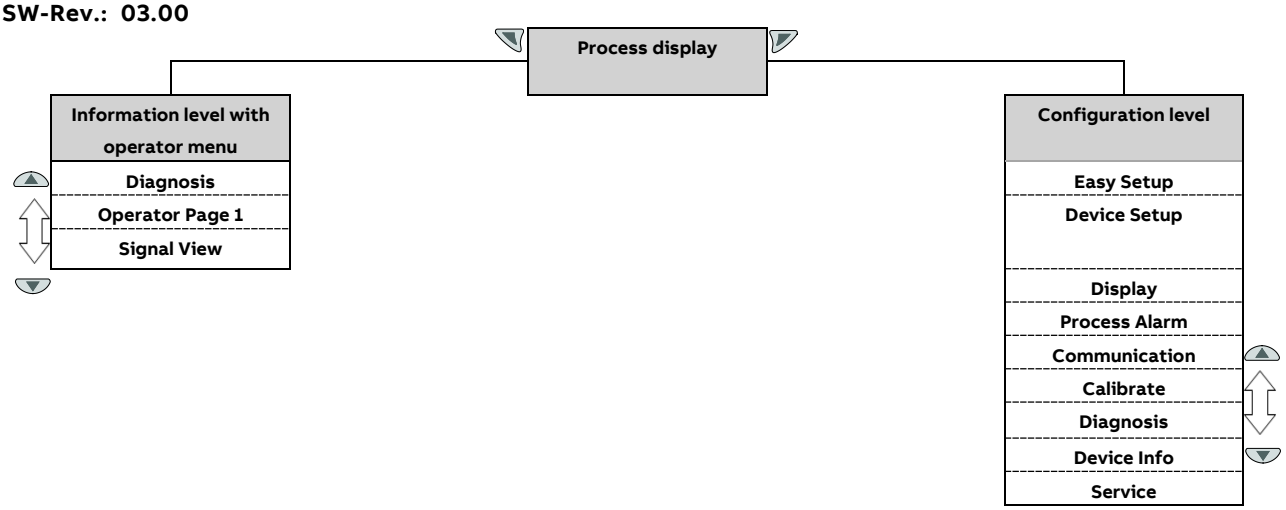
… 10 Operation

HART® menu levels

To SW-Rev.: 01.03



From SW-Rev.: 03.00



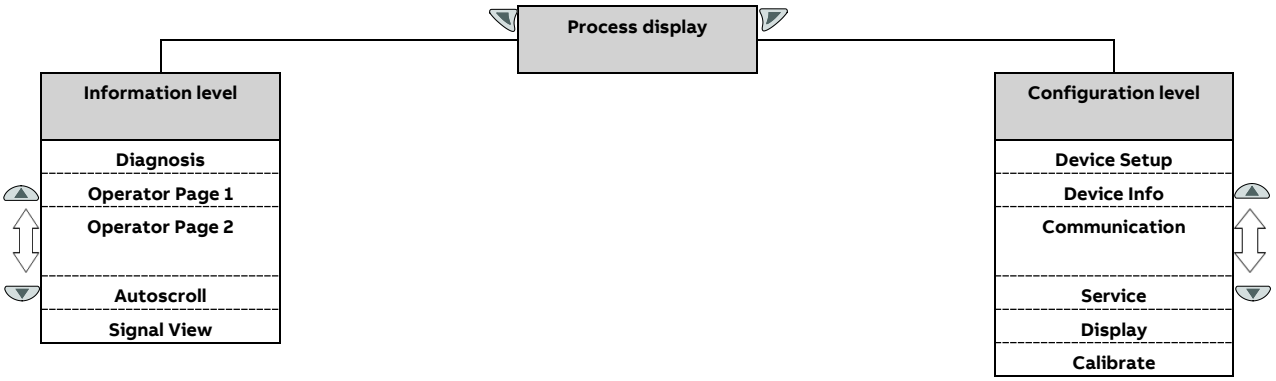
Process display
The process display shows the current process values.

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” from SW-Rev.: 03.00 enables a simplified configuration of the device.

PROFIBUS PA® and FOUNDATION Fieldbus® H1 menu levels



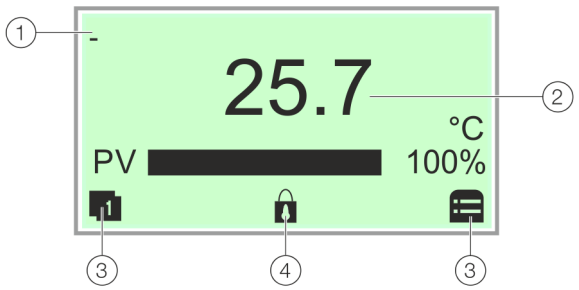
Process display
The process display shows the current process values.

Information level
The information level contains the parameters and information that are relevant for the operator.
The device configuration cannot be changed on this level.

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

… 10 Operation

Process display



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

Figure 36: Process display (example)

The process display appears on the LCD display 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.

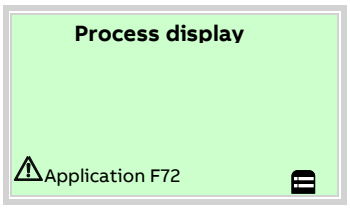
From SW-Rev.: 03.00, two process variables can also be optionally displayed: one is displayed above the other.

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

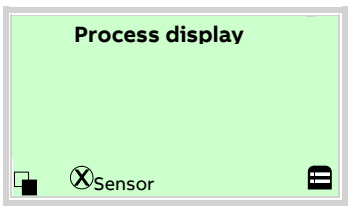
Error messages in the HART® LCD display

In the event of an error, different information appears depending on the revision:

- To SW-Rev.: 01.03: A symbol or letter (device status) and a number (DIAG.NO.)
- From SW-Rev.: 03.00: The relevant device status symbol and the associated diagnosis group.



To SW-Rev.: 01.03



From SW-Rev.: 03.00

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

* To SW-Rev.: 01.03

** From SW-Rev.: 03.00

The error can then be read in plain text via the “Diagnosis” information level (from SW-Rev.: 03.00).

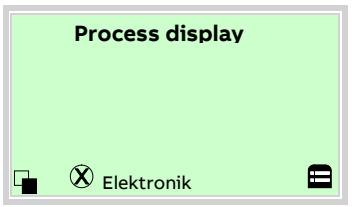
Additionally, the diagnostic messages are divided into the following areas:

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 (from SW-Rev.: 03.00)	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 81.

Error messages in the PROFIBUS PA® and FOUNDATION Fieldbus® LCD display

In the event of an error, a message consisting of a symbol and text appears at the bottom of the process screen (e. g. electronics)The text displayed provides information about the area in which the error has occurred.



The error messages are divided into four groups in accordance with the NAMUR classification scheme.The group assignment can only be changed using a DTM or EDD:

Symbol	Description
	Error / failure
	Check function
	Outside of the specification
	Maintenance required

The error can then be read in plain-text format on the ‘Diagnosis’ information level.

The error messages are also divided into the following areas:

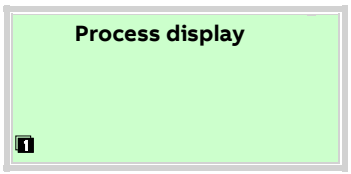
Range	Description
Electronics	Diagnosis for device hardware.
Sensor	Diagnosis for sensor elements and connection lines.
Installation / Configuration	Diagnosis for communication interface and parameterization / configuration
Operating conditions	Diagnosis for ambient and process conditions.

Note
For a detailed description of the errors and notices on troubleshooting, see **Possible error messages – PROFIBUS PA® and FOUNDATION Fieldbus®** on page 86.

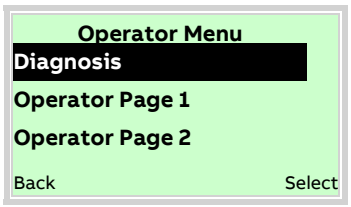
… 10 Operation

Switching to the information level

(only for PROFIBUS PA®, FOUNDATION Fieldbus®, and HART® from SW-Rev.: 03.00)
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.



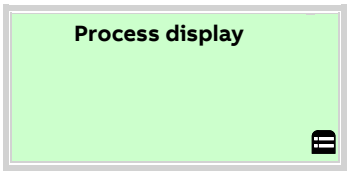
2. Select the desired submenu using / .
3. Confirm the selection with .

Menu	Description
… / Operator Menu	
Diagnosis	Selection of the “Diagnosis” submenu, see also **Error messages in the HART® LCD display** on page 48 und **Error messages in the PROFIBUS PA® and FOUNDATION Fieldbus® LCD display** on page 49.
Operator Page 1	Selection of operator page to be displayed.
Operator Page 2*	
Autoscroll*	When ‘Multiplex mode‘ is activated, automatic switching of the operator pages is initiated on the process screen.
Signal View	Selects the ‘Signal View’ submenu, in which all dynamic measured values are displayed.

* Only for PROFIBUS PA® and FOUNDATION Fieldbus®

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 .

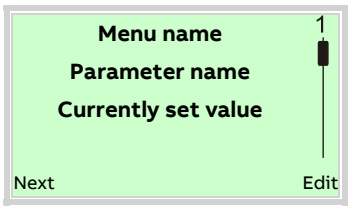
The LCD display now indicates the first menu item on the configuration level.

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

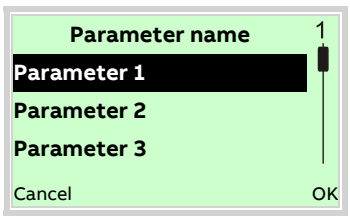
Selecting and changing parameters

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.

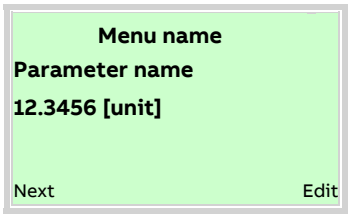


3. Select the desired value using / .
4. Confirm the selection with .

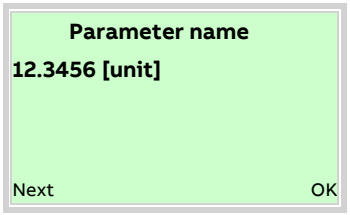
This concludes the procedure for selecting a parameter value.

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.

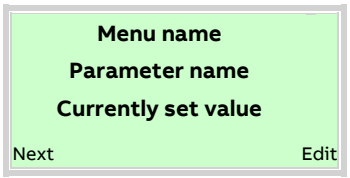


3. Use to select the decimal place to change.
4. Use / to set the desired value.
5. Use to select the next decimal place.
6. If necessary select and set additional decimal places in accordance with steps 3 to 4.
7. Use to confirm your setting.

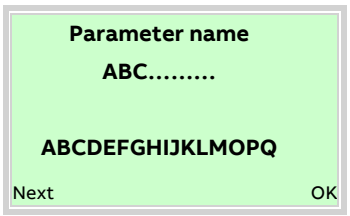
This concludes the procedure for changing a parameter value.

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.

… 10 Operation

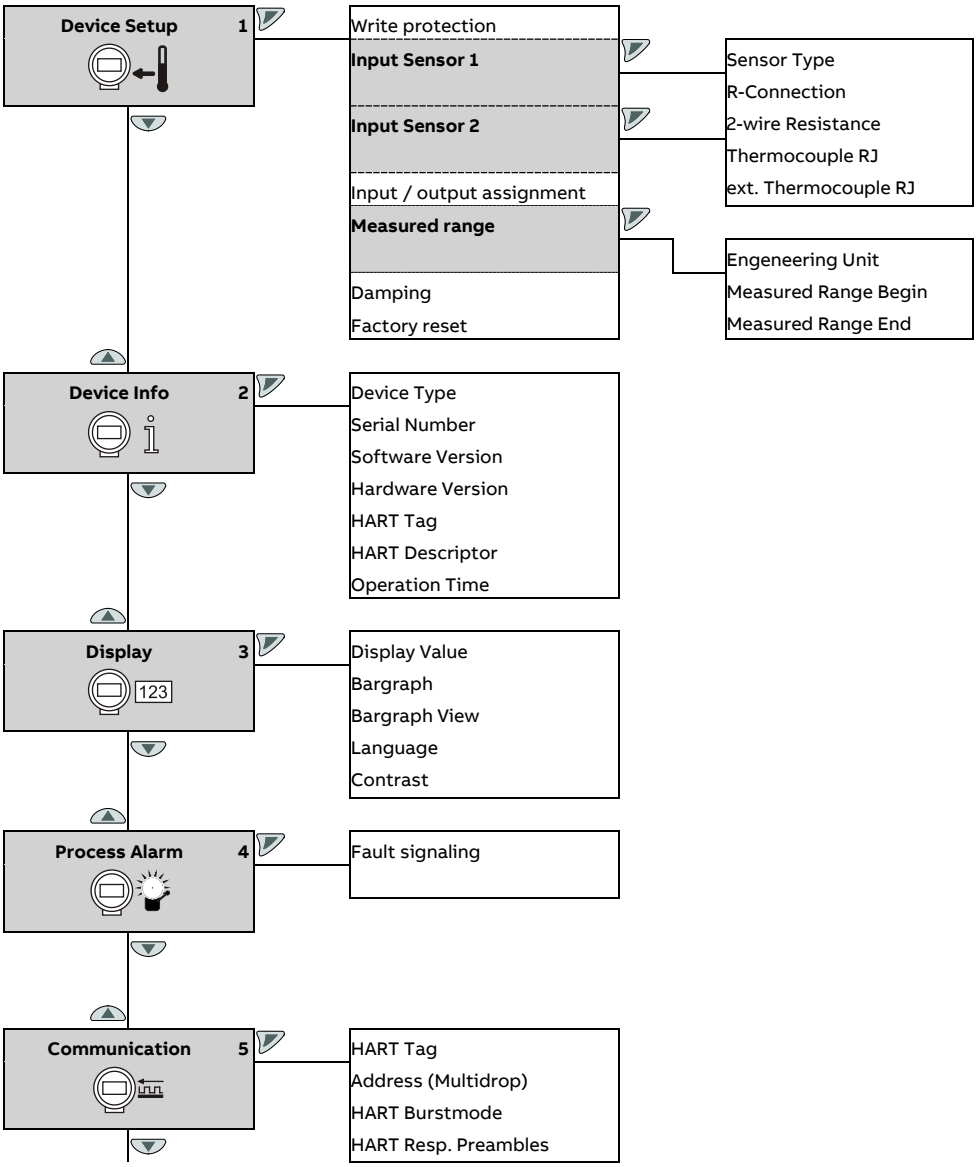
Parameter overview HART® (for devices to SW-Rev.: 01.03)

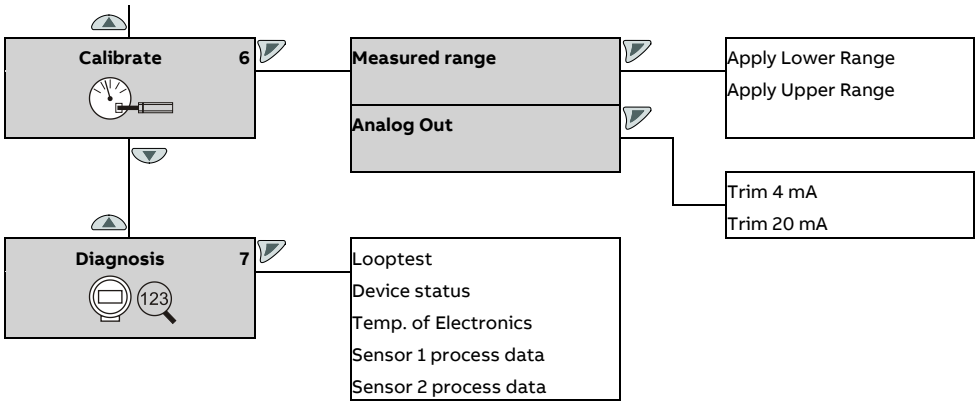
Note

This overview of parameters shows all the menus and parameters available on the device.Depending on the version and configuration of the device, not all of the menus and parameters may be visible in it.

Devices to SW-Rev.: 01.03 and from SW-Rev.: 03.00 have partly different menus and parameters.The options for showing process variables are increased from SW-Rev.: 03.00. Additional device and diagnostic information is provided.The setting and canceling of write protection has changed.

In addition, for devices from SW-Rev.: 03.00, additional information (event and configuration monitor, see HART interface description, COM/TTX300/HART) and detailed diagnostics can be displayed and configured in Tools / Drivers, such as FIM and DTM.




Calibrate
6
Measured range
Apply Lower Range
Apply Upper Range
Analog Out
Trim 4 mA
Trim 20 mA
Diagnosis
7
123
Looptest
Device status
Temp. of Electronics
Sensor 1 process data
Sensor 2 process data

… 10 Operation

Parameter description HART® (for HART®-devices to SW-Rev.: 01.03)

Menu: Device Setup

Menu / parameter	Description
… / Device Setup	
Write protection	Activates write protection for the entire device • Yes: locked Input combination:≠ 0110 • No: unlocked Input combination:0110
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 output • Sensor 1 • Sensor 2 • Difference (S1-S2) • Difference (S2-S1) • Meanvalue • Electr. Meas. S1 • Electr. Meas. S2 • Redundancy • Temp. Electronics
Measured range	Select the '**Measured range**' submenu.
Damping	Configurable τ 63% output signal damping value Value range:0 to 100 s
Factory reset	Resets configuration data, adjustment data trim high / low and DAC adjustment values to factory settings. • Yes / OK

… / Device Setup / Input Sensor 1	
… / Device Setup / Input Sensor 2	
Sensor Type	Selects sensor type: • Pt100 (IEC751):Pt100 resistance thermometer (IEC 751) • Pt1000 (IEC751):Pt1000 resistance thermometer (IEC 751) • Type K TC (IEC584):Thermocouple type K (IEC 584) • 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 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)

Menu / parameter	Description
... / Device Setup / Input Sensor 1	
... / Device Setup / Input Sensor 2	
Sensor Type	Selection of the sensor type (continued): • –125 ... 125 mV:Linear voltage measurement -125 to 125 mV • –125 ... 1100 mV:Linear voltage measurement -125 to 1100 mV • 0 ... 500Ω:Linear resistance measurement 0 to 500 Ω • 0 ... 5000 Ω:Linear resistance measurement 0 to 5000 Ω • Pt10 (IEC751):Pt10 resistance thermometer (IEC 751) • Pt50 (IEC751):Pt50 resistance thermometer (IEC 751) • Pt200 (IEC751):Pt200 resistance thermometer (IEC 751) • Pt500 (IEC751):Pt500 resistance thermometer (IEC 751) • Pt10 (JIS1604):Pt10 resistance thermometer (JIS 1604) • Pt50 (JIS1604):Pt50 resistance thermometer (JIS 1604) • Pt100 (JIS1604):Pt100 resistance thermometer (JIS 1604) • Pt200 (JIS1604):Pt200 resistance thermometer (JIS 1604) • Pt10 (IMIL24388):Pt10 resistance thermometer (MIL 24388) • 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=4270:Cu10 resistance thermometer a = 4270 • Cu100 a=4270:Cu100 resistance thermometer a = 4270 • Fixpoint Table 1:Customer-specific characteristic curve 1 • Fixpoint Table 2:Customer-specific characteristic curve 2 • Fixpoint Table 3:Customer-specific characteristic curve 3 • Fixpoint Table 4:Customer-specific characteristic curve 4 • Fixpoint Table 5:Customer-specific characteristic curve 5 • Cal.Van Dusen 1:Callendar Van Dusen coefficient set 1 • 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 • off:Sensor channel deactivated (sensor 2 only)

… 10 Operation

… Parameter description HART® (for HART®-devices to SW-Rev.: 01.03)

Menu / parameter	Description
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 RJ	• Internal: Use of internal reference junction for transmitter when using thermal compensating cable. • External - fixed:Use of external fixed reference junction of the transmitter when constant thermostat temperature is used (can be set with ext. Thermocouple RJ). • None: Without Thermocouple RJ • Sensor 1: Use of sensor 1 as reference junction for sensor 2
ext. Thermocouple RJ	Relevant for external reference junction, specification of constant external reference junction temperature. Value range: −50 to 100 °C

… / Device Setup / Measured range	
Engeneering Unit	Selects the physical unit for the sensor measuring signal Units: °C, °F, °R, K, user, mV, Ω, mA
Measured Range Begin	Defines the value for 4 mA (adjustable)
Measured Range End	Defines the value for 20 mA (adjustable)

Menu: Device Info

Menu / parameter	Description
... /Device Info	
Device Type	Displays device type.
Serial Number	Displays device serial number.
Software Version	Displays device software version.
Hardware Version	Displays device hardware version.
HART Tag	Displays the HART Tag.
HART Descriptor	Displays the HART Descriptor.
Operation Time	Displays the operation hours of the device.

Menu: Display

Menu / parameter	Description
... /Display	
Display Value	Selects the process value shown in Bargraph view of process display • Process Variable: Calculated process variable (PV) • Sensor 1: Measured value from Sensor 1 • Sensor 2: Measured value from Sensor 2 • Electr. Meas. S1: Measured value from Sensor 1 (in Ω or mV) • Electr. Meas. S2: Measured value from Sensor 2 (in Ω or mV) • Temp. Electronics: Temperature of the transmitter • Output Current: Output current of 4 to 20 mA signal • Output %: Output value as % of measuring range
Bargraph	Selects whether or not a Bargraph is shown
Bargraph View	• Output Current: Output current of the 4 to 20 mA signal • Output %: Output value as % of measuring range
Language	Selects the menu language • German • English
Contrast	Sets the display contrast Value range:0 to 100%

… 10 Operation

… Parameter description HART® (for HART®-devices to SW-Rev.: 01.03)

Menu: Process Alarm

Menu / parameter	Description
… /Process Alarm	
Fault signaling	• Underrange:In the event of an error, the current (e.g. 3.6 mA) is output. • Overrange: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
Address (Multidrop)	Address range in multidrop mode Value range:0 to15 (0 means no multidrop mode)
HART Burstmode	• Status (on / off):Switches burst mode on or off • Command # (1, 2, 3, 33):Sets the HART command to be sent cyclically
HART Resp. Preambles	Number of preambles to be used for sending Value range:5 to 20

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:0 to 23.600 mA
Device status	Diagnosis notice (maintenance required, error, etc.)
Temp. of Electronics	Drag indicator: maximum or minimum device temperature
Sensor 1 process data	Drag indicator: maximum or minimum sensor temperature for sensor 1 Reset: Resets the values
Sensor 2 process data	Drag indicator: maximum or minimum sensor temperature for sensor 2 Reset: Resets the values

Activating write protection

1. Confirm 'Device Setup' with and select the sub item 'Write protection'. Displays the current write protection setting.
2. Use the 'Edit' button to edit the current write protection configuration.
3. Use the or buttons to select at least one alphanumeric character (up to 4 may be selected) and confirm via the button.

Note

Spaces and the number combination 0110 must not be entered.

4. Write protection 'YES' is displayed.

Click the button 3 times to exit configuration mode and display 'Reading Display Mode'.

Deactivating write protection

Access the write protection edit mode according to the example. In write protection edit mode, an alphanumeric string of characters is displayed.

1. Enter the entry combination '0110'.
2. Confirm with the 'OK' button.

'Write protection NO' is displayed.

Note

Entry combination '0110', used to deactivate write protection, cannot be changed.

… 10 Operation

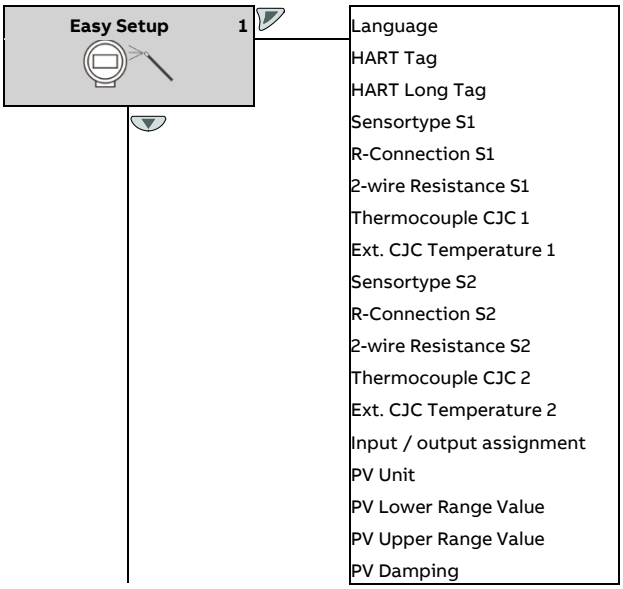
Parameter overview HART® (for HART-devices from SW-Rev.: 03.00)

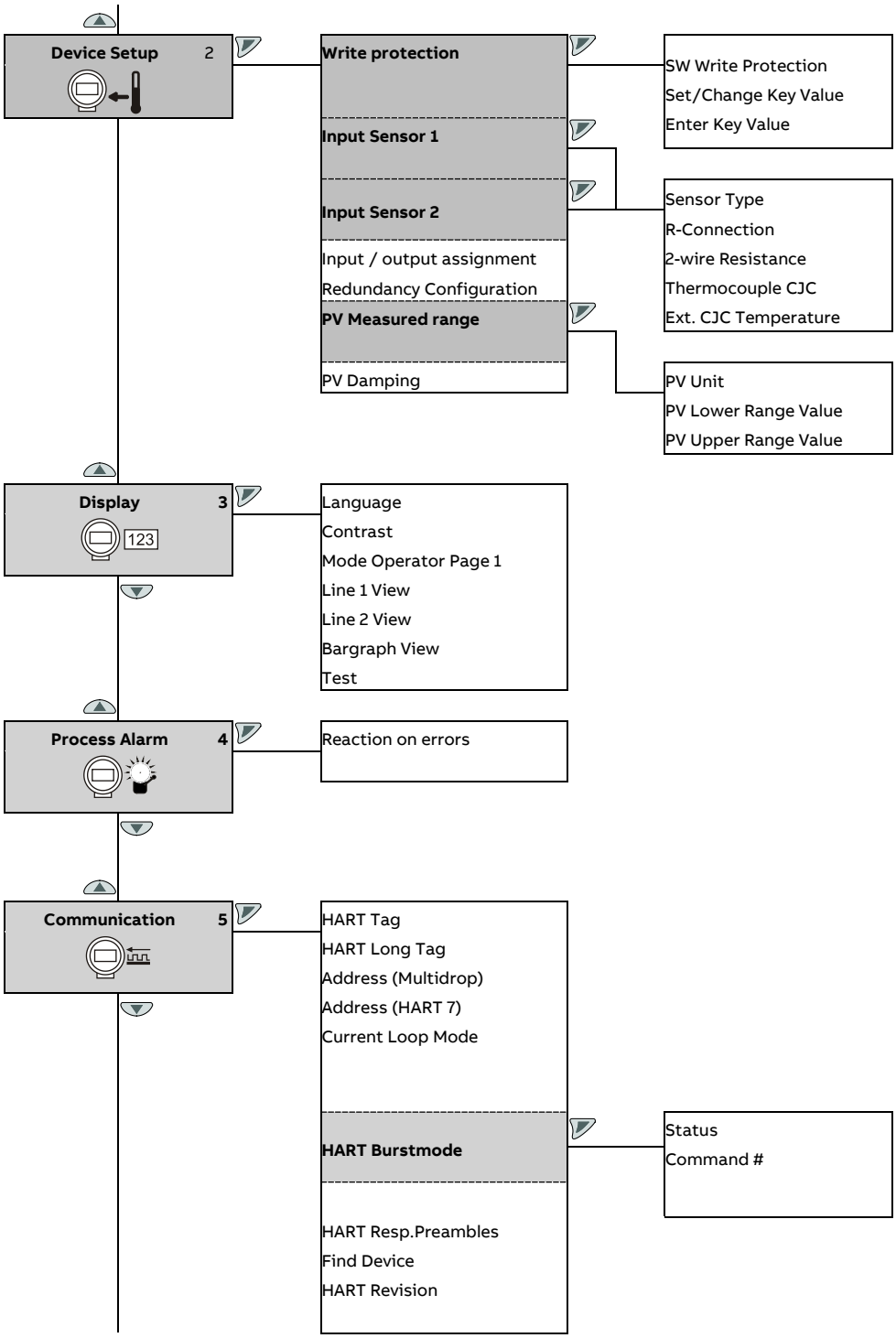
Note

This overview of parameters shows all the menus and parameters available on the device.Depending on the version and configuration of the device, not all of the menus and parameters may be visible in it.

Devices to SW-Rev.: 01.03 and from SW-Rev.: 03.00 have partly different menus and parameters.The options for showing process variables are increased from SW-Rev.: 03.00. Additional device and diagnostic information is provided.The setting and canceling of write protection has changed.

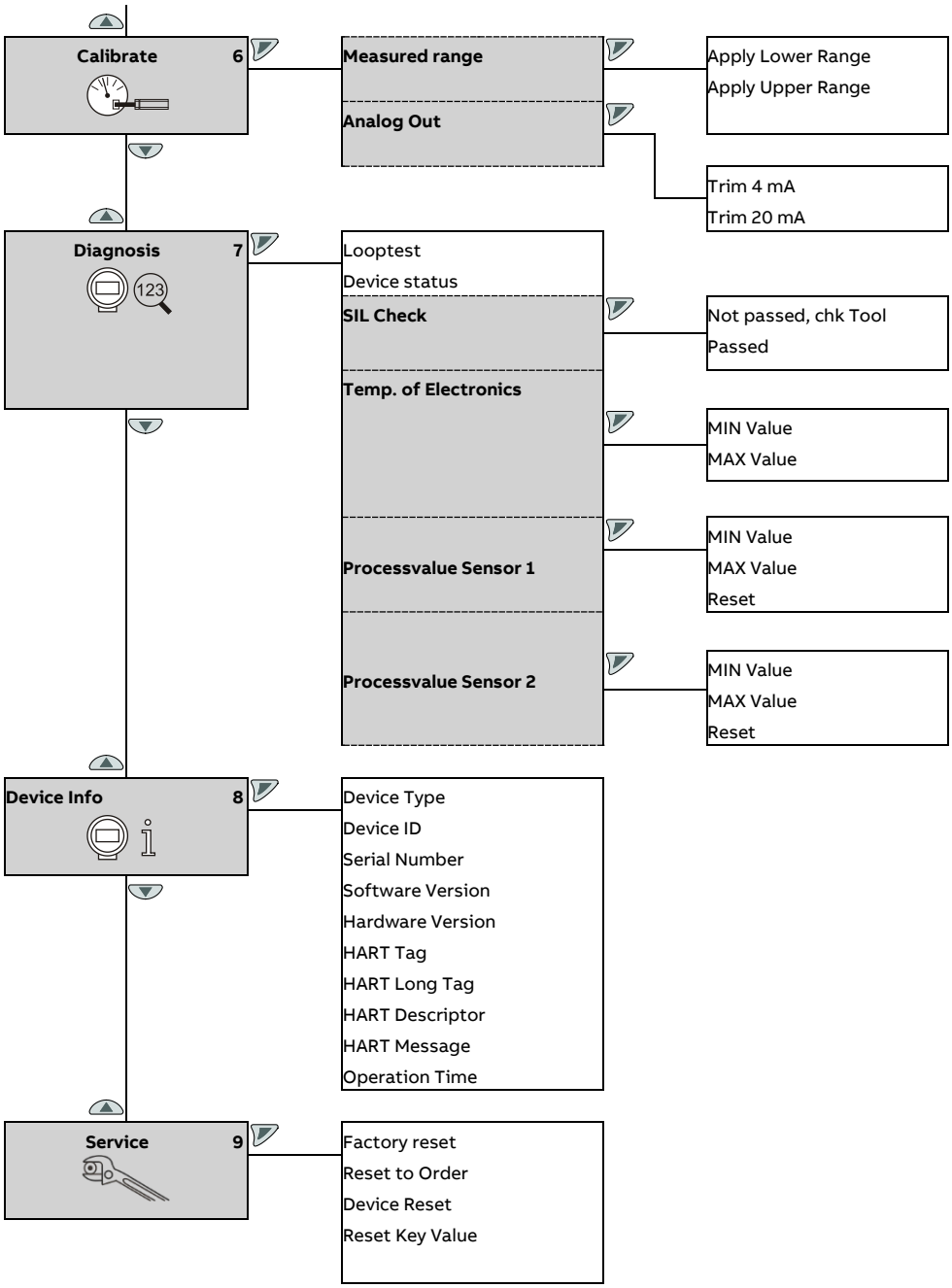
In addition, for devices from SW-Rev.: 03.00, additional information (event and configuration monitor, see HART interface description, COM/TTX300/HART) and detailed diagnostics can be displayed and configured in Tools / Drivers, such as FIM and DTM.




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 Unit
PV Lower Range Value
PV Upper Range Value
PV Damping
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)
Address (HART 7)
Current Loop Mode
HART Burstmode
Status
Command #
HART Resp.Preambles
Find Device
HART Revision

… 10 Operation

… Parameter overview HART® (for HART-devices from SW-Rev.: 03.00)



Parameter description HART® (for HART®-devices from SW-Rev.: 03.00)

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)

… 10 Operation

… Parameter description HART® (for HART®-devices from SW-Rev.: 03.00)

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

… 10 Operation

… Parameter description HART® (for HART®-devices from SW-Rev.: 03.00)

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)

… 10 Operation

… Parameter description HART® (for HART®-devices from SW-Rev.: 03.00)

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 (Multidrop)	Address range in multidrop mode (HART 5) Value range:0 to 15 (0 means no multidrop mode)
Address (HART 7)	Address range (HART 7) Value range:0 to 63 (independent of Current Loop Mode) Information HART 5: • Address = 0 (Current Loop Mode enabled – Multidrop disabled) • Address = 1 to 15 (Current Loop Mode disabled – Multidrop enabled)
Current Loop Mode	Only HART 7: • 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
HART Revision	Switch the device from HART 5 to HART 7 or from HART 7 to HART 5. After the change of HART Revision a device restart is recommended. Warning:Different drivers for tools for HART 5 and HART 7 required.

... / 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 (H7):	Device variables - only HART 7
	• 33 Dev.Variables (H5):	Device variables - only HART 5
	• 48 Add.Dev.Status:	Additional device status

… 10 Operation

… Parameter description HART® (for HART®-devices from SW-Rev.: 03.00)

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.

… 10 Operation

… Parameter description HART® (for HART®-devices from SW-Rev.: 03.00)

Software write protection

In addition to regular software write protection, devices from SW-Rev.: 03.00 feature 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.

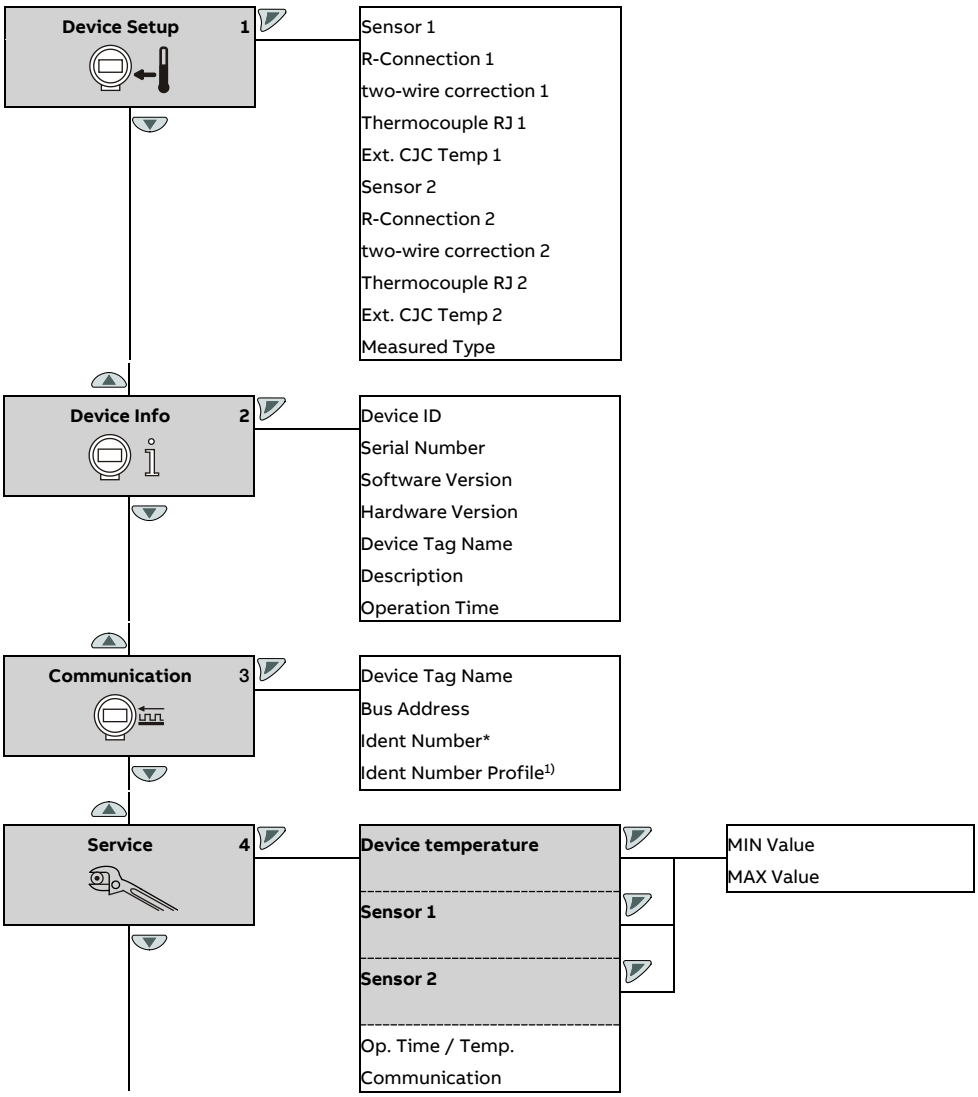
Reset key value

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.

PROFIBUS PA® und FOUNDATION Fieldbus® Parameter overview

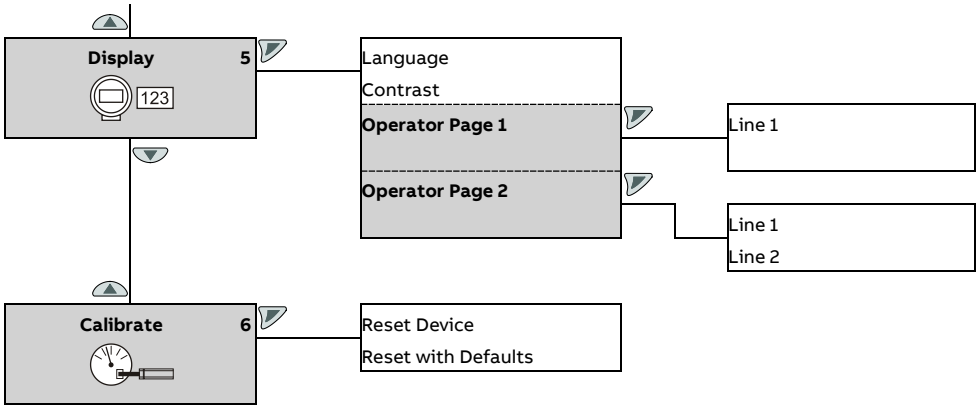
Note

This overview of parameters shows all the menus and parameters available on the device. Depending on the version and configuration of the device, not all of the menus and parameters may be visible in it.



… 10 Operation

… PROFIBUS PA® und FOUNDATION Fieldbus® Parameter overview



* PROFIBUS PA only

Parameter description PROFIBUS PA® and FOUNDATION Fieldbus®

Menu: Device Setup

Menu / parameter	Description
... /Device Setup	
Sensor 1 / Sensor 2	Selects sensor type: • Pt100 (IEC751):Pt100 resistance thermometer (IEC 751) • Pt1000 (IEC751):Pt1000 resistance thermometer (IEC 751) • Type K TC (IEC584):Thermocouple type K (IEC 584) • 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 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):Thermocouple type T (IEC 584) • Type L TC (DIN43710):Type L thermocouple (DIN43710) • Type U TC (DIN43710):Type U thermocouple (DIN43710) • –125 ...125 mV:Linear voltage measurement -125 to 125 mV • –125 ...1100 mV:Linear voltage measurement -125 to 1100 mV • 0 ...500 Ω:Linear resistance measurement 0 to 500 Ω • 0 ...5000 Ω:Linear resistance measurement 0 to 5000 Ω • Pt10 (IEC751):Pt10 resistance thermometer (IEC 751) • Pt50 (IEC751):Pt50 resistance thermometer (IEC 751) • Pt200 (IEC751):Pt200 resistance thermometer (IEC 751) • Pt500 (IEC751):Pt500 resistance thermometer (IEC 751) • Pt10 (JIS1604):Pt10 resistance thermometer (JIS 1604) • Pt50 (JIS1604):Pt50 resistance thermometer (JIS 1604) • Pt100 (JIS1604):Pt100 resistance thermometer (JIS 1604) • Pt200 (JIS1604):Pt200 resistance thermometer (JIS 1604) • Pt10 (IMIL24388):Pt10 resistance thermometer (MIL 24388) • 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)

… 10 Operation

… Parameter description PROFIBUS PA® and FOUNDATION Fieldbus®

Menu / parameter	Description (continuation)
… / Device Setup	
Sensor 1 / Sensor 2	Selection of the sensor type (continued): • 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=4270:Cu10 resistance thermometer a = 4270 • Cu100 a=4270:Cu100 resistance thermometer a = 4270 • Fixpoint Table 1:Customer-specific characteristic curve 1 • Fixpoint Table 2:Customer-specific characteristic curve 2 • Fixpoint Table 3:Customer-specific characteristic curve 3 • Fixpoint Table 4:Customer-specific characteristic curve 4 • Fixpoint Table 5:Customer-specific characteristic curve 5 • Cal.Van Dusen 1:Callendar Van Dusen coefficient set 1 • 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* • off:Sensor channel deactivated (sensor 2 only) * only for communication protocol PROFIBUS PA
R-Connection 1 / R-Connection 2	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
two-wire correction 1 / two-wire correction 2	Resistance correction of the connection lead for the connection type two-wire Value range:0 to 100 Ω
Thermocouple RJ 1 / Thermocouple RJ 2	• Internal:Use of internal reference point for transmitter when using thermal compensating cable. • External - fixed:External fixed reference junction used for transmitter when there is a constant thermostat temperature (can be set with ext. Thermocouple RJ). • None: No reference junction • Sensor 1:Use of Sensor 1 as reference junction for Sensor 2
ext. Thermocouple RJ 1 / ext. Thermocouple RJ 2	• Relevant for external reference junction, specification of constant external reference junction temperature Value range:-50 to 100 °C

Menu: Device Info

Menu / parameter	Description
... /Device Info	
Device ID	Displays device ID
Serial Number	Displays serial number
Software Version	Displays software version
Hardware Version	Displays hardware version
TAG	Displays measuring point tagging
Description	Displays a user-defined text
Operation Time	Displays operating hours

Menu: Communication

Menu / parameter	Description
... /Communication	
TAG	Measuring point tagging • 16 characters
Bus Address	Address range during bus operation Value range:0 to 125
Ident Number	PROFIBUS PA profile:Selects ID numbers that can be used Manufacturer-specific:(IDENT__NUMBER_SELECT) Only with PROFIBUS PA
Ident Number Profile	ID numbers used for profile with PROFIBUS PA • 1*AI (0x9700) • 2*AI (0x9701) • 3*AI (0x9702) • 4*AI (0x9703)

… 10 Operation

… Parameter description PROFIBUS PA® and FOUNDATION Fieldbus®

Menu: Service Menu

Menu / parameter	Description
… /Service Menu	
Device temperature	Select the '**Device temperature**' submenu.
Sensor 1	Select the '**Sensor 1**' submenu.
Sensor 2	Select the '**Sensor 2**' submenu.
Op. Time / Temp.	Displays total operating hours and the operating hours within specific ranges of the device temperature. • Total:Total operating hours • < −40 °C:Operating hours at < -40 °C • −40 to −20 °C:Operating hours at -40 °C to -20 °C • −20 to 0 °C:Operating hours at -20 °C to 0 °C • 0 to 20 °C:Operating hours at 0 to 20 °C • 20 to 40 °C:Operating hours at 20 to 40 °C • 40 to 60 °C:Operating hours at 40 to 60 °C • 60 to 85 °C:Operating hours at 60 to 85 °C • > 85 °C:Operating hours at > 85 °C
Communication	Displays the communication quality • Excellent • Very good • Good • Poor • None

… / Service Menu / Device temperature	
min	Drag indicator: minimum device temperature
max	Drag indicator: maximum device temperature

… / Service Menu / Sensor 1	
min	Drag indicator: minimum sensor temperature, sensor 1
max	Drag indicator: maximum sensor temperature, sensor 1

… / Service Menu / Sensor 2	
min	Drag indicator: minimum sensor temperature, sensor 2
max	Drag indicator: maximum sensor temperature, sensor 2

Menu: Display

Menu / parameter	Description
... /Display	
Language	Selects the menu language • German • English
Contrast	Sets the display contrast Value range:0 to 100%
Operator Page 1	Select the '**Operator Page 1**' submenu.
Operator Page 2	Select the '**Operator Page 2**' submenu.

... / Display / Operator Page 1	
Line 1	Selects the value displayed • Calculated value • Sensor 1 • Sensor 2 • Device temperature • AO Block

... / Display / Operator Page 2	
Line 1	Selects the value displayed in Line 1 • Calculated value • Sensor 1 • Sensor 2 • Device temperature • AO Block
Line 2	Selects the value displayed in Line 2 • Calculated value • Sensor 1 • Sensor 2 • Device temperature • AO Block

Menu: Calibrate

Menu / parameter	Description
... /Calibrate	
Reset Device	Device restarts without configuration changes
Reset with Defaults	Device restarts with factory settings applied

… 10 Operation

Factory settings

Firmware settings
The transmitter is configured ex works.

HART® devices from SW-Rev.: 03.00
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 or customer-specific configuration with special user characteristic BG).

The currently set HART protocol remains unchanged during “Factory reset” and “Reset to Order”.

Devices with PROFIBUS PA®, FOUNDATION Fieldbus®, and HART® (all SW revisions)
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)
		R-Connection	Three-wire
		Measured Range Begin[1)]	0
		Measured Range End[1)]	100
		Engeneering Unit	Degrees °C
		Damping	Off
Process Alarm		Fault signaling[1)]	To SW-Rev.: 01.03: Overrange / high alarm 22 mA[1)] From SW-Rev.: 03.00: Underrange / low alarm 3.5 mA[1)]
	Input Sensor 2	Sensor Type	Off
	Input / output assignment	Measurement type	Sensor 1
	TAG	–	–
	HART Descriptor[1)]	–	To SW-Rev.: 01.03: TIXXX-[1)]
Display	Display Value	–	Process Variable
	Bargraph[1)]	–	Yes, output %[1)]
	Language	–	English
	Contrast	–	50 %
Communication	HART Burstmode[1)]	Status[1)]	Off[1)]
	Bus Address[2) 3)]	–	126[2)] / 30[3)]
	Simulation mode[3)]	–	Off[3)]
	HART Protocol	–	HART 5 / 7[4)]

1) Only applies to HART transmitters

2 Only applies to PROFIBUS PA transmitters

3) Only applies to FOUNDATION Fieldbus transmitters

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

11 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 (HART devices to SW-Rev. 01.03)	Current supply voltage measured at the terminals of the transmitter in volts (± 5 %).
Loop current (HART-devices from SW-Rev.: 03.00)	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.

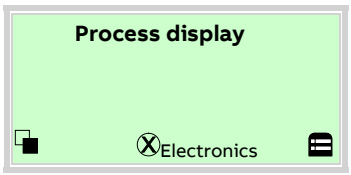
* For HART devices in tools such as FIM and DTM

… 11 Diagnosis / error messages

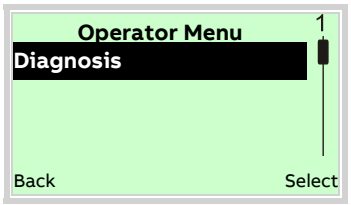
Calling up the error description

For devices with PROFIBUS PA, FOUNDATION Fieldbus and HART® from SW-Rev.:3.00

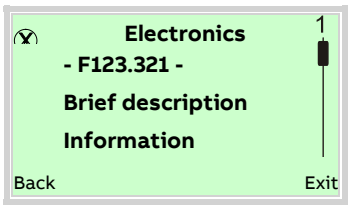
Additional details about the error that has occurred can be called up on the information level.



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.

Possible error messages – HART® devices to SW-Rev.: 01.03

Range	Displays the device status	Displays the DIAG.NO.	Cause	Remedy
Electronics	F	1	Device defective	Replace the device
Electronics	S	2	Ambient temperature overshot / undershot	Check environment; reposition measuring point if required
Electronics	F	3	EEPROM defective	Replace the device
Electronics	M	4	Electronics overload	Factory reset
Electronics	F	5	Memory error	Factory reset
Electronics	I	7	LCD display connected	Remove display
Installation / Configuration	I	8	Device write-protected	Remove write protection
Electronics	I	9	EEPROM busy	Wait for status information to finish processing
Electronics	F	12	Sensor input defective (communication)	Replace the device
Electronics	F	13	Sensor input defective (error)	Replace the device
Electronics	F	14	Sensor input defective (ADC error)	Replace the device
Installation / Configuration	C	32	Simulation mode	Exit simulation mode
Sensor	F	34	Measuring error, sensor 1	Check sensor connection
Sensor	F	35	Short-circuit, sensor 1	Check sensor connection
Sensor	F	36	Wire break, sensor 1	Check sensor connection
Sensor	F	37	Range exceeded, sensor 1	Check measuring limits
Sensor	F	38	Range undershot, sensor 1	Check measuring limits
Installation / Configuration	I	41	Single-point adjustment active, sensor 1	Terminate single-point adjustment
Installation / Configuration	I	42	Two-point adjustment active, sensor 1	Terminate two-point adjustment
Sensor	F	50	Measuring error, sensor 2	Check sensor connection
Sensor	F	51	Short-circuit, sensor 2	Check sensor connection
Sensor	F	52	Wire break, sensor 2	Check sensor connection
Sensor	F	53	Range exceeded, sensor 2	Check measuring limits
Sensor	F	54	Range undershot, sensor 2	Check measuring limits
Installation / Configuration	F	65	Configuration defective	Check configuration: A Wrong device B Measuring span is too small C Incorrect configuration data

… 11 Diagnosis / error messages

… Possible error messages – HART® devices to SW-Rev.: 01.03

Range	Displays the device status	Displays the DIAG.NO.	Cause	Remedy
Sensor	M	66	No sensor 1 detected during redundancy configuration	Check connection
Sensor	M	67	No sensor 2 detected during redundancy configuration	Check connection
Sensor	M	68	Sensors exceeded specified drift window	Calibrate sensors
Installation / Configuration	C	71	Reconfiguration is running	Terminate reconfiguration
Operating conditions	F	72	Error in the application	Check configuration, connections; reset to factory settings
Installation / Configuration	I	74	Analog output adjustment active	Terminate compensation
Installation / Configuration	C	75	Analog output in simulation	Terminate simulation
Operating conditions	S	76	Values overshot	Check parameters: A) Sensor limits overshot B) Span is too small
Operating conditions	S	77	Limit HIGH HIGH	Upper limit value:Alarm
Operating conditions	S	78	Limit LOW LOW	Lower limit value:Alarm
Operating conditions	S	79	Limit HIGH	Upper limit value:Warning
Operating conditions	S	80	Limit LOW	Lower limit value:Warning

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

Possible error messages – HART® devices from SW-Rev.: 03.00

Note
The listed causes for a device status message correspond to the delivery status.They can be configured freely in Tools 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.

… 11 Diagnosis / error messages

Possible error messages – PROFIBUS PA® and FOUNDATION Fieldbus®

Range	Device status message (on the display)	Cause	Remedy
Sensor	Sensordrift	Outside of the specification	Sensor adjustment
Sensor	S1 line resistance too high	Maintenance required	Sensor 1: Remove corrosion at the connections or reduce line length.
Sensor	S1 short-circuit	Error	Sensor 1: Rectify short-circuit or replace sensor 1
Sensor	S1 wire break	Error	Sensor 1: Rectify wire break or replace sensor 1
Sensor	S2 line resistance too high	Maintenance required	Sensor 2: Remove corrosion at the connections or reduce line length.
Sensor	S2 short-circuit	Error	Sensor 2: Rectify short-circuit or replace sensor 2
Sensor	S2 wire break	Error	Sensor 2: Rectify wire break or replace sensor 2
Operating conditions	S1 measuring range overflow	Outside of the specification	Adapt S1 measuring range to suit measuring task
Operating conditions	S1 measuring range underflow	Outside of the specification	Adapt S1 measuring range to suit measuring task
Operating conditions	S2 measuring range overflow	Outside of the specification	Adapt S2 measuring range to suit measuring task
Operating conditions	S2 measuring range underflow	Outside of the specification	Adapt S2 measuring range to suit measuring task
Operating conditions	Device temperature out of spec.	Outside of the specification	Check environment; reposition measuring point if required
Electronics	Device error	Error	Replace device
Electronics	Device not calibrated	Outside of the specification	Calibrate device
Electronics	Device being simulated	Function check	Terminate simulation
Electronics	Configuration error	Error	Validate configuration
Sensor	Sensor 1 + 2 redundancy failure	Error	Check sensor / sensor connection
Sensor	Sensor 1 redundancy: short-circuit	Maintenance required	Rectify short-circuit at sensor 1 or replace sensor 1
Sensor	Sensor 1 redundancy: wire break	Maintenance required	Rectify break at sensor 1 or replace sensor 1
Sensor	Sensor 2 redundancy: short-circuit	Maintenance required	Rectify short-circuit at sensor 2 or replace sensor 2
Sensor	Sensor 2 redundancy, wire break	Maintenance required	Rectify break at sensor 2 or replace sensor 2

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

12 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 **Protection against electrostatic discharges** on page 17.

13 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 89) 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.

14 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.

15 Specification

Note

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

16 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.

17 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

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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