TTH300

Head-mount temperature transmitter

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

Measurement made easy

Introduction

The TTH300 is available with the HART, PROFIBUS PA and FOUNDATION Fieldbus communications protocols.

The transmitter has global approvals for explosion protection up to zone 0.

The TTH300 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 TTH300 is available for download free of charge at www.abb.com/temperature.
Alternatively simply scan this code:

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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:

- 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 – TTH300 – 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

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.

Ex marking

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 TTH300-E1H	
To HW-Rev.: 01.07:	
Type Examination Test Certificate	PTB 05 ATEX 2017 X
From HW-Rev.: 02.00.00:	
Type Examination Test Certificate	PTB 20 ATEX 2008 X
Model TTH300-E1P and TTH300-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 non-sparking and increased safety

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

Model TTH300-E2H	
To HW-Rev.: 01.07:	
Manufacturer's Declaration	
II 3 G Ex nA IIC T6...T1 Gc	
From HW-Rev.: 02.00.00:	
Type Examination Test Certificate	PTB 20 ATEX 2008 X
II 3 G Ex ec IIC T6...T1 Gc	
TTH300-E1P and TTH300-E1F	
Manufacturer's Declaration	
II 3 G Ex nA IIC T6...T1 Gc	
II 3 G Ex ec IIC T6...T1 Gc	

IECEx intrinsic safety

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

Model TTH300-H1H	
To HW-Rev.: 01.07:	
IECEx certificate of conformity	IECEx PTB 09.0014X
From HW-Rev.: 02.00.00:	
IECEx certificate of conformity	IECEx PTB 20.0035X
Model TTH300-H1P and TTH300-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	

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	

Temperature data

Transmitter

ATEX / IECEx intrinsic safety, ATEX non-sparking and increased safety

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

LCD indicator

ATEX / IECEx intrinsic safety, ATEX non-sparking and increased safety

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

Electrical data

Transmitter

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

Supply circuit [1]			
	TTH300-E1H TTH300-H1H	**TTH300-E1P/-H1P TTH300-E1F/-H1F**	
		FISCO [1]	**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 [2]	I_i ≤ 250 mA
Max. power	P_i = 0.8 W	P_i ≤ 2.56 W [2]	P_i ≤ 1.2 W
Internal inductance	L_i = 160 µH [3]	L_i ≤ 10 µH	L_i ≤ 10 µH
Internal capacitance	C_i = 0.57 nF [4]	C_i ≤ 5 nF	C_i ≤ 5 nF

1) FISCO in accordance with EN 60079-27
2) II B FISCO:Ii ≤ 380 mA, Pi ≤ 5.32 W
3) Only applies to HART variants.
   From HW-Rev.: 02.00.00, previously 0.5 mH
4) Only applies to HART variants. From HW-Rev.: 1.07, previously 5 nF

Intrinsic safety type of protection Ex ia IIC (Part 2) TTH300-E1H, TTH300-H1H

Measurement current circuit		
	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.: 02.00.00, previously 25 mA
2) From HW-Rev.: 02.00.00, previously 38 mW
3) From HW-Rev.: 02.00.00, previously 1.55 µF
4) From HW-Rev.: 02.00.00, previously 1.05 µF

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

… Electrical data

Intrinsic safety type of protection Ex ia IIC (Part 2) TTH300-E1P, TTH300-H1P, TTH300-E1F, TTH300-H1F

Measurement current circuit		
	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 non-sparking and increased safety TTH300-E2H from HW-Rev.: 02.00.00

Supply circuit	
Max. voltage	U_S = 30 V
Rated fuse current	I_i = 32 mA
Measurement current circuit	
Max. voltage	U_b = 6.5 V
Max. output current	I_b = 17.8 mA
Max. output power	P_b = 29 mW
LCD indicator interface	Use not permitted

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)

Installation instructions

ATEX / IECEx

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

IP protection rating of housing

The temperature transmitter and type A or type AS LCD indicator must be installed according to type of protection 'intrinsic safety' (Ex i) such that an IP rating of at least IP 20 is achieved in accordance with IEC 60529.

Perform installation according to type of protection 'non-sparking' (Ex nA) or type of protection 'increased safety' (Ex ec) such that an IP rating of at least IP 54 and a degree of contamination of 2 or better is achieved in accordance with IEC 60664-1.

Electrical connections

Grounding

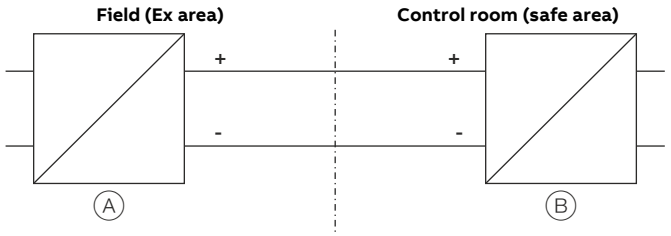
If, for functional reasons, the intrinsically safe circuit needs to be grounded by means of a connection to the potential equalization, it may only be grounded at one point.

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 1: Intrinsic safety proof

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

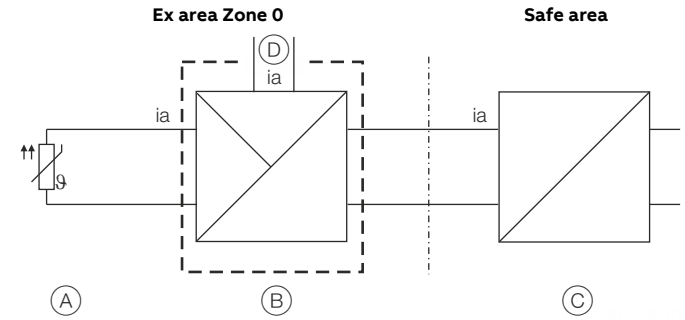
… Installation instructions

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.

ATEX – Zone 0
Marking:II 1 G Ex ia IIC T6...T1 Ga



(A) Sensor
(B) Transmitter in housing with IP-rating IP 20
(C) Supply isolator [Ex ia]
(D) Interface for LCD indicator

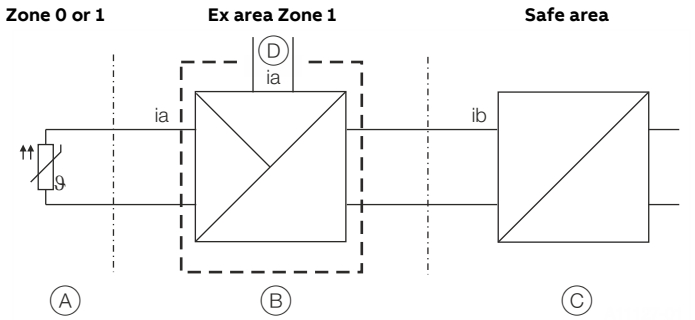
Figure 2: Hookup in ATEX – Zone 0

When using the transmitter in Zone 0, it must be installed in a suitable housing with IP -rating IP 20.
The input for the supply isolator must be designed with ‘Ex ia’ type of protection.
When using the transmitter in Zone 0, make sure that impermissible electrostatic charging of the transmitter is avoided (observe the warnings on the device).
As the user, it is your responsibility to ensure that the sensor instrumentation meets the requirements of applicable explosion protection standards.

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



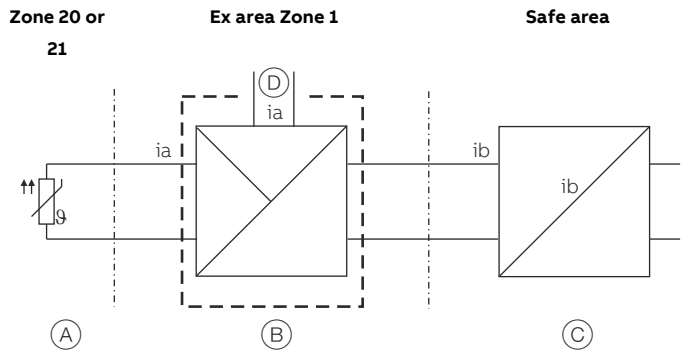
(A) Sensor
(B) Transmitter in housing with IP rating IP 20
(C) Supply isolator [Ex ib]
(D) Interface for LCD indicator

Figure 3: Hookup in ATEX – Zone 1 (0)

When using the transmitter in Zone 1, it must be installed in a suitable housing with IP -rating IP 20.
The input of the supply isolator must be designed with ‘Ex ib’ type of protection.
As the user, it is your responsibility to ensure that the sensor instrumentation meets the requirements of applicable explosion protection standards.The sensor can be installed in Zone 1 or Zone 0.

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

ATEX – Zone 1 (20)
Marking:II 2 G (1D) Ex [ia IIIC Da] ib IIC T6...T1 Gb



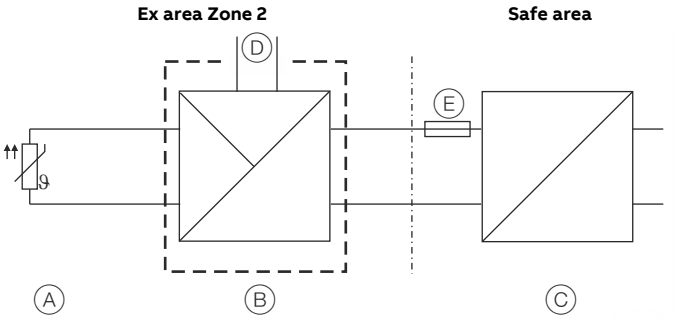
(A) Sensor
(B) Transmitter in housing with IP rating IP 20
(C) Supply isolator [Ex ib]
(D) Interface for LCD indicator

Figure 4: Hookup in ATEX – Zone 1 (20)

When using the transmitter in Zone 1, it must be installed in a suitable housing with IP -rating IP 20.
The input for the supply isolator must be designed with 'Ex ib' type of protection.
As the user, it is your responsibility to ensure that the sensor instrumentation meets the requirements of applicable explosion protection standards.The sensor can be installed in Zone 20 or Zone 21.

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

ATEX – Zone 2
Marking:
II 3 G Ex nA IIC T6...T1 Gc
II 3 G Ex ec IIC T6...T1 Gc



(A) Sensor
(B) Transmitter in housing with IP rating IP 54
(C) Supply isolator with voltage limit (max. 30 V)
(D) Interface for LCD indicator
(E) Fuse 32 mA (from HW-Rev.: 02.00.00)

Figure 5: Hookup in ATEX – Zone 2

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

- The temperature transmitter must be installed in a suitable housing that reaches at least IP rating IP 54 in accordance with IEC 60529 and a degree of contamination of 2 or better in accordance with IEC 60664-1.
- In addition to the housing, suitable cable glands must be used.
- The other requirements specified for potentially explosive atmospheres must be met.
- 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.
- When using the transmitter in Zone 2, make sure that impermissible electrostatic charging of the temperature transmitter is prevented (observe the warnings on the device).
- 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

Note
In addition, the following points for TTH300 HART (TTH300-E2H) from HW-Rev.: 02.00.00 must be observed:

- 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 ‘Ex nA’ and ‘Ex ec’.

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

Protection against electrostatic discharges
The plastic parts inside the device can store electrostatic charges.
Make sure that no electrostatic charges can accumulate when handling the device.

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 TTH300-L1H for USA or TTH300-R1H for Canada	
From HW-Rev.: 02.00	
Control Drawing	TTH300-L1H
IS Class I, Div. 1,2 Group ABCD 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 TTH300-L2H for USA or TTH300-R2H for Canada	
From HW-Rev.: 02.00	
Control Drawing	TTH300-L2H
NI Class I, Div. 2 Group ABCD T6, T4	
Zone 2 AEx/Ex nA IIC T6…T1 Gc	
Zone 2 AEx/Ex ec IIC T6…T1 Gc	

Transmitter Ex marking FM / CSA

FM Intrinsically Safe

Model TTH300-L1H	
Up to HW-Rev.: 01.07:	
Control Drawing	SAP_214829
Model TTH300-L1P	
Control Drawing	TTH300-L1P (IS)
Model TTH300-L1F	
Control Drawing	TTH300-L1F (IS)
Class I, Div. 1 + 2, Groups A, B, C, D	
Class I, Zone 0, AEx ia IIC T6	

FM Non-Incendive

Model TTH300-L2H	
Up to HW-Rev.: 01.07:	
Control Drawing	214831 (Non-Incendive)
Model TTH300-L2P	
Control Drawing	TTH300-L2P (NI_PS)
	TTH300-L2P (NI_AA)
Model TTH300-L2F	
Control Drawing	TTH300-L2F (NI_PS)
	TTH300-L2F (NI_AA)
Class I, Div. 2, Groups A, B, C, D	

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

… Transmitter Ex marking FM / CSA

CSA Intrinsically Safe

Model TTH300-R1H	
Up to HW-Rev.: 01.07:	
Control Drawing	214826
Model TTH300-R1P	
Control Drawing	TTH300-R1P (IS)
Model TTH300-R1F	
Control Drawing	TTH300-R1F (IS)
Class I, Div. 1 + 2, Groups A, B, C, D	
Class I, Zone 0, Ex ia IIC T6	

CSA Non-Incendive

Model TTH300-R2H	
Up to HW-Rev.: 01.07:	SAP_214824 (Non-Incendive)
Control Drawing	SAP_214896 (Non-Incendive)
Model TTH300-R2P	
Control Drawing	TTH300-R2P (NI_PS)
	TTH300-R2P (NI_AA)
Model TTH300-R2F	
Control Drawing	TTH300-R2F (NI_PS)
	TTH300-R2F (NI_AA)
Class I, Div. 2, Groups A, B, C, D	

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

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 – TTH300 – control drawings

IP protection rating of housing

The temperature transmitter and LCD indicator Type A and Type AS must be installed such that an IP rating of at least IP 20 is achieved in accordance with IEC 60529.

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

Protection against electrostatic discharges

The plastic parts inside the device can store electrostatic charges.
Make sure that no electrostatic charges can accumulate when handling the device.

4 Product identification

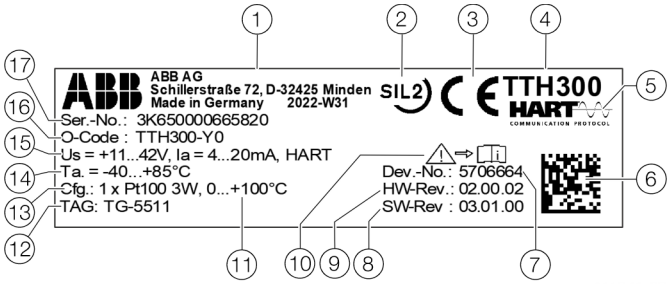
Name plate

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.

Note

The ambient temperature range (14) provided on the name plate refers only to the transmitter itself and not to the sensor element used in the measuring inset.
For devices with PROFIBUS PA or FOUNDATION Fieldbus, the device-ID is also specified.



(1) Manufacturer, manufacturer address, manufacturing year - week
(2) Safety integrity level, SIL logo (optional with HART transmitter)
(3) CE mark (EU conformity), if not on additional plate
(4) Type designation / model
(5) Transmitter communications protocol (HART, FF, PA)
(6) 2D barcode for serial number in accordance with order
(7) Serial number of the device electronics (7 or 8 digits)
(8) Software revision
(9) Hardware version
(10) 'Follow product documentation' symbol
(11)(12)(13) **HART transmitter:**
(11) Set measuring range of the transmitter
(12) Measuring point tag (TAG) in accordance with order (optional)
(13) Set sensor type and circuit type
(12)(13) **Transmitter FOUNDATION Fieldbus or PROFIBUS PA:**
(12) Measuring point tag (TAG) in accordance with order (optional)
(13) DEVICE_ID or Ident_Number
(14) Ambient temperature range, on additional plate for Ex versions
(15) Transmitter specification (supply voltage range, output current range, communications protocol)
(16) Coding of the type of protection of the device (in accordance with ordering information)
(17) Serial number of the device (serial number in accordance with order)

Figure 6: HART name plate (example)

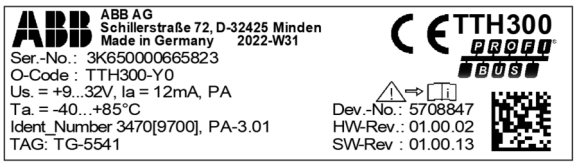


Figure 7: PROFIBUS PA name plate (example)

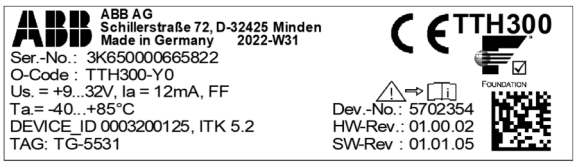
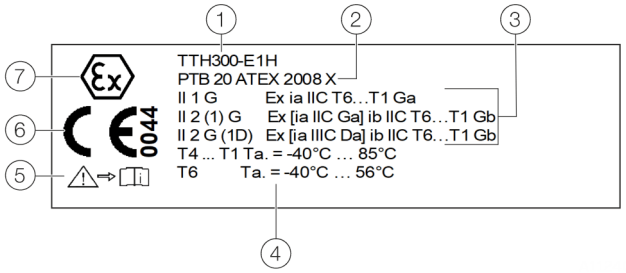


Figure 8: FOUNDATION Fieldbus name plate (example)

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



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

Note

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

5 Transport and storage

Inspection

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

Transporting the device

Observe the following instructions:

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

Storing the device

Bear the following points in mind when storing devices:

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

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

Returning devices

Use the original packaging or a secure transport container of an appropriate type if you need to return the device for repair or recalibration purposes.
Fill out the return form (see **Return form** on page 37) 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.

6 Installation

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 13!

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
- Power supply circuit:IP 20
- Measurement current circuit:IP 00 or IP-rating of installation housing

Installation options

There are three options for installing the transmitter:
- Installation in the cover of the connection head (without springs)
- Direct installation on the measuring inset (with springs)
- Installation on a top-hat rail

Installation on the measuring inset

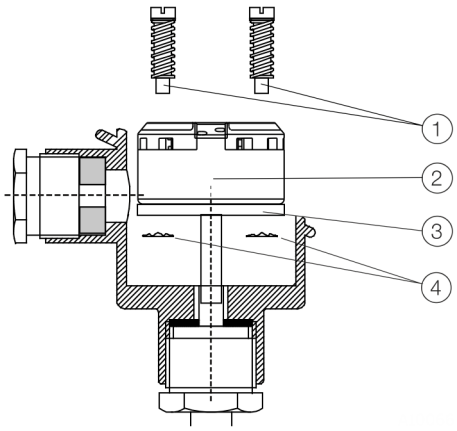


Figure 10: Mounting examples

Note
Before mounting the transmitter on the measuring inset, remove the ceramic block on the measuring inset and the captive screws in the transmitter.

To install the transmitter on the measuring inset, cambered toothed discs and the corresponding mounting screws are required; these must be ordered as separate accessories:
Measuring inset installation set (2 fixing screws, 2 springs, 2 toothed discs) order number:263750

1. Remove the ceramic block from the measuring inset (3).
2. Remove the screws from the transmitter (2).Remove the sleeves from the screw holes and then remove the screws.
3. Insert new fixing screws (1) from above in the fixing holes of the transmitter.
4. Place the cambered toothed discs (4) with curve facing upward on the downward protruding screw thread.
5. Connect the power supply cable to the transmitter according to connection diagram.
6. Place the transmitter in the housing on the measuring inset and secure it.

Note
The toothed discs between measuring inset and transmitter are straightened when the screws are tightened.This enables them to grip the mounting screws.

Installation in the cover of the connection head

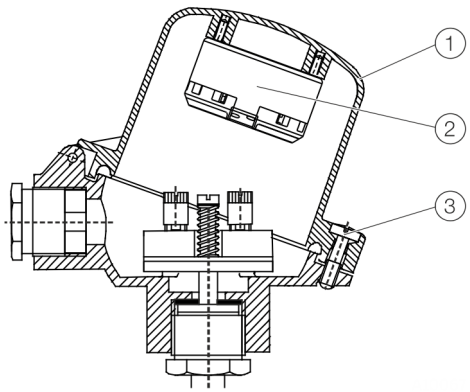


Figure 11: Mounting examples

1. Release the screw plug (3) for the cover of the connection head.
2. Open the cover (1).
3. Secure the transmitter (2) at the proper position on the cover, using the captive screws found in the transmitter.

Installation on the top-hat rail

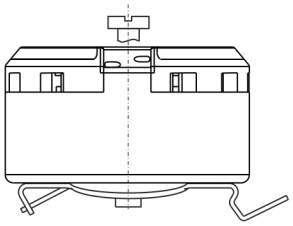


Figure 12: Mounting examples

When mounted on a top-hat rail, the transmitter can be placed at a distance from the sensor in a housing that is suitable for the ambient conditions.

Installing / removing the optional LCD indicator

The transmitter can be optionally equipped with an LCD indicator.

NOTICE

Damage to the LCD indicator caused by incorrect installation / disassembly

The flat ribbon cable of the LCD indicator can become damaged due to incorrect installation / disassembly.

- Make sure the flat ribbon cable does not get twisted or torn when installing / disassembling or rotating the LCD indicator.

Disassembling the LCD indicator

The indicator must be removed to enable connection of the sensor line or supply line:

Carefully remove the LCD indicator from the transmitter inset. The LCD indicator is held firmly in place, meaning that you may have to use the tip of a screwdriver to pry it loose. Take care to avoid any mechanical damage.

Installing the LCD indicator

No tools are required to install the LCD indicator.

1. Carefully insert the guide pins for the LCD indicator in the guide holes of the transmitter inset. Make sure the black connection socket fits into the terminal on the transmitter inset.
2. Then press the LCD indicator in as far as it will go. Make sure that the guide pins and connection socket are fully inserted.

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 twelve positions at increments of 30°.

1. Carefully turn the LCD indicator to the left to release it from its holder.
2. Carefully turn the LCD indicator until the required position is reached.
3. Insert the LCD indicator into its holder again and turn it to the right into the required position until it snaps into place.

7 Electrical connections

Safety instructions

⚠ DANGER

Improper installation and commissioning of the device carries a risk of explosion.
For use in potentially explosive atmospheres, observe the information in **Use in potentially explosive atmospheres in accordance with ATEX and IECEx** on page 6 and **Use in potentially explosive atmospheres in accordance with cFMus, FM and CSA** on page 13!

Observe the following instructions:

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

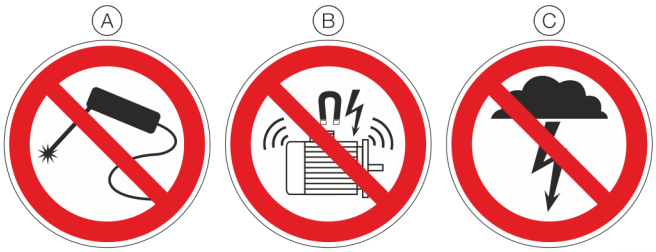
Note
The signal cable wires must be provided with wire end sleeves. The slotted screws of the connection terminals are tightened with a size 1 screwdriver (3.5 or 4 mm).

Protection of the transmitter from damage caused by highly energetic electric 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 **Terminal assignment** on page 22.

NOTICE

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



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

Figure 13: 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

NOTICE

Danger of wire break!
The use of stiff cable material can lead to wire breaks in the cables.

- Only use cable material with stranded wires.

Supply voltage
Power supply cable:
Flexible standard cable material

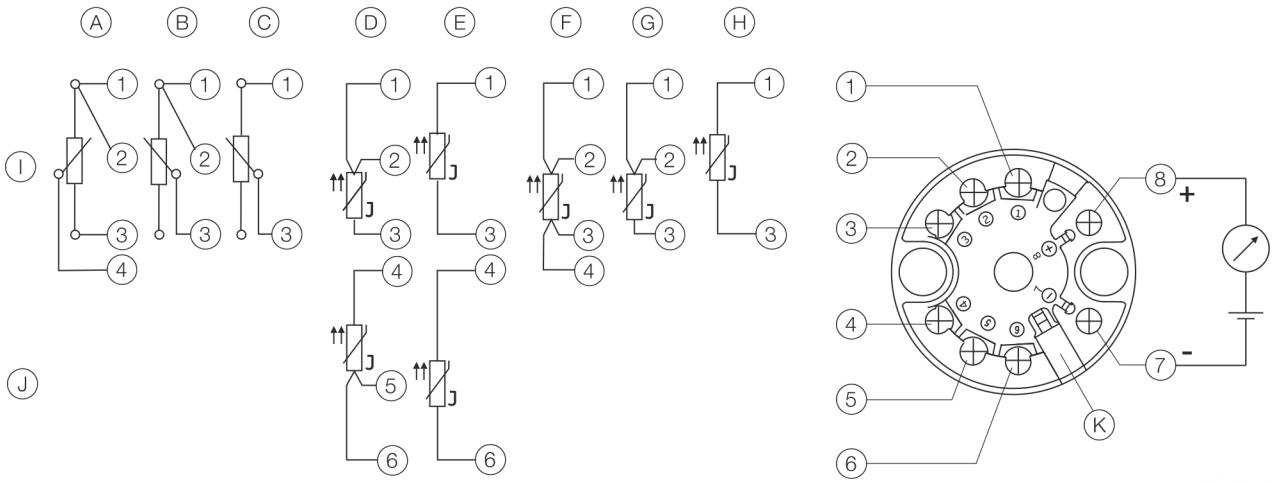
Maximum wire cross section:
1.5 mm^2 (AWG 16)

Sensor connection
Depending on the type of sensor, a variety of cable materials can be used for connections.
The integrated internal reference junction makes it possible to directly connect thermal compensating cables.

… 7 Electrical connections

Terminal assignment

Resistance thermometers (RTD) / resistors (potentiometer)

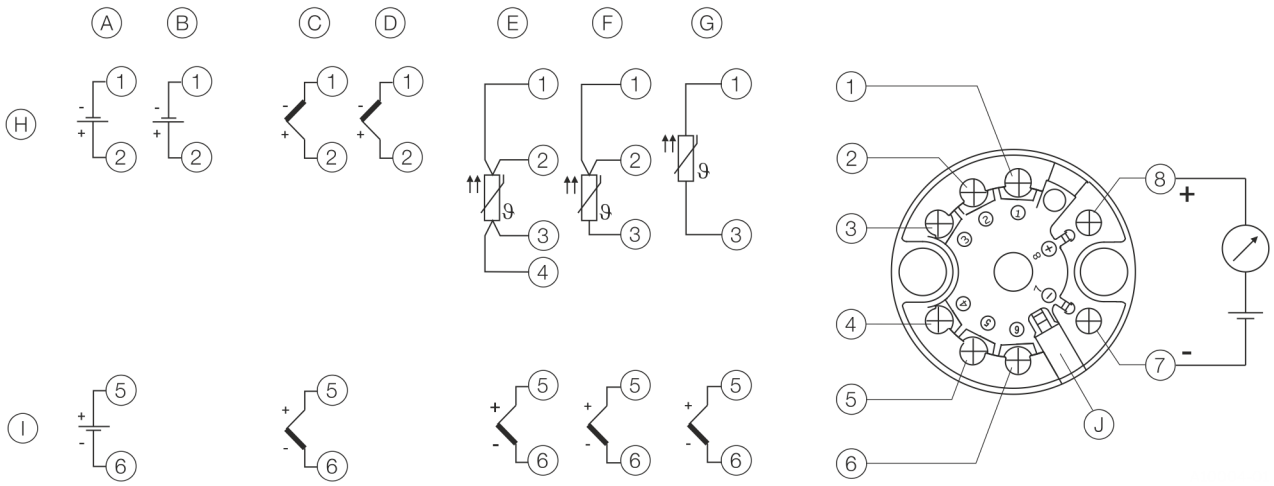


(A) Potentiometer, four-wire circuit
(B) Potentiometer, three-wire circuit
(C) Potentiometer, two-wire circuit
(D) 2 × RTD, three-wire circuit*
(E) 2 × RTD, two-wire circuit*
(F) RTD, four-wire circuit
(G) RTD, three-wire circuit
(H) RTD, two-wire circuit
(I) Sensor 1
(J) Sensor 2*
(K) Interface for LCD indicators and service
(1) – (6) Sensor connection (of measuring inset)
(7) – (8) 4 to 20 mA HART®, PROFIBUS PA®, FOUNDATION Fieldbus®

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

Figure 14: Terminal assignment for resistance thermometers (RTD) / resistors (potentiometers)

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



(A) 2 × voltage measurement*
(B) 1 × voltage measurement
(C) 2 × thermocouple*
(D) 1 × thermocouple
(E) 1 × RTD, four-wire circuit and 1 x thermocouple*
(F) 1 × RTD, three-wire circuit and 1 x thermocouple*
(G) 1 × RTD, two-wire circuit and 1 x thermocouple*
(H) Sensor 1
(I) Sensor 2*)
(J) Interface for LCD indicators and service
(1) – (6) Sensor connection (of measuring inset)
(7) – (8) 4 to 20 mA HART®, PROFIBUS PA®, FOUNDATION Fieldbus®

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

Figure 15: Terminal assignment for thermocouples / voltages and resistance thermometers (RTD) / thermocouple combinations

… 7 Electrical connections

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

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).

… 7 Electrical connections

… Electrical data for inputs and outputs

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

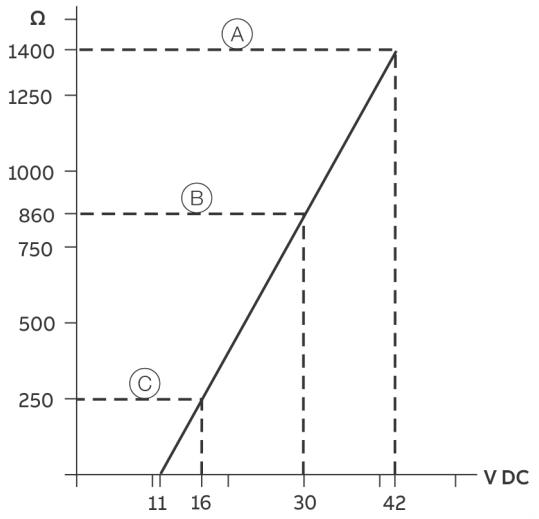
During communication this is in accordance with the HART FSK 'Physical Layer' specification.

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



Ⓐ TTH300

Ⓑ TTH300 in Ex-applications

Ⓒ HART communication resistance

Figure 16: Maximum load depending on supply voltage

Maximum power consumption

$P = U_s \times 0.022$ A

E.G. U_s = 24 V → P_{max} = 0.528 W

Voltage drop on the signal line

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

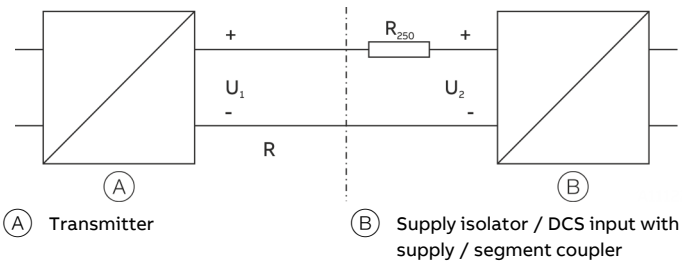


Figure 17: HART load resistance

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 28 and **Hardware settings** on page 31..

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

8 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 20.
- The ambient conditions must correspond to the information given on the name plate and in the data sheet.

Communication

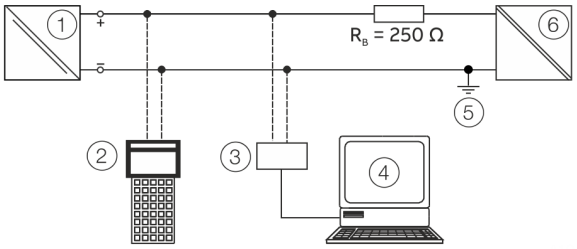
HART® Communication

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 18: 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

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

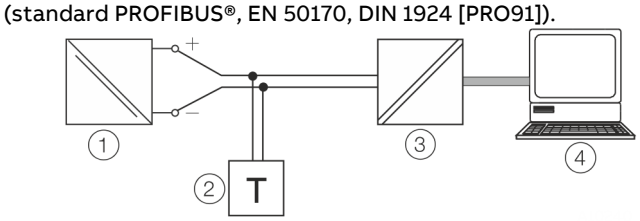
For detailed information, see HART® COM/TTX300/HART interface description.

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 19: 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.

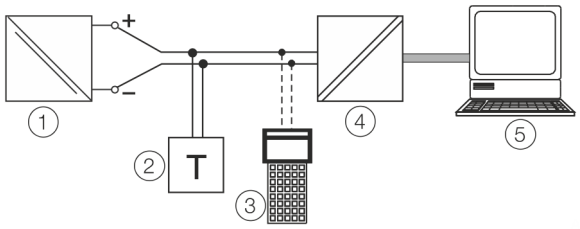
… 8 Commissioning

… Communication

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 20: 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 A with operating buttons
  Commissioning via the LCD indicator does not require any tools to be connected to the device and is therefore the simplest way of configuring the TTH300.
  The general operation and menus of the LCD indicator are described in **Menu navigation** on page 32.

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.

9 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.

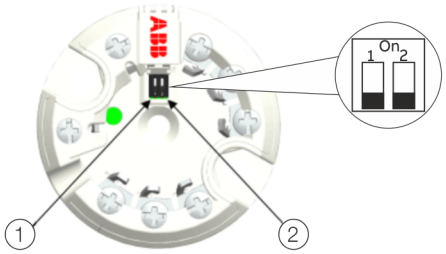
Hardware settings

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 DIP switch 1 ② DIP switch 2

Figure 21: 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).

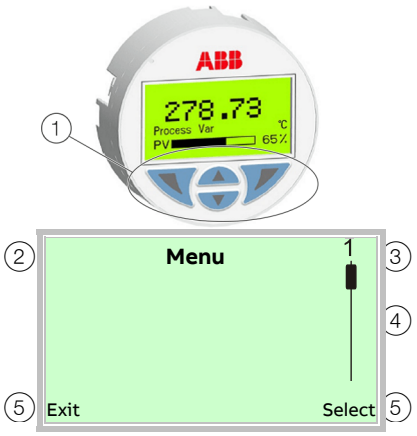
DIP switch	Function
①	**Local write protection** Off: Local write protection deactivated On: Local write protection activated
②	**Enabling the simulation (only with FOUNDATION Fieldbus)** Off: Simulation blocked On: Simulation enabled
	Selecting the HART version (only with HART protocol) Off: HART 5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

… 9 Operation

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 22: 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.

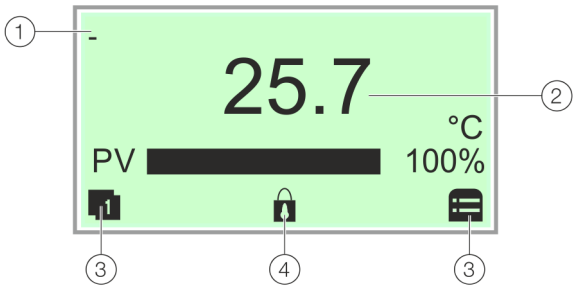
Control button functions

	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

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

Process display



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

Figure 23: 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.

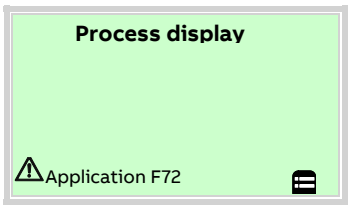
From SW-Rev.: 03.00, two process variables can also be optionally displayed: one is displayed above the other.

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

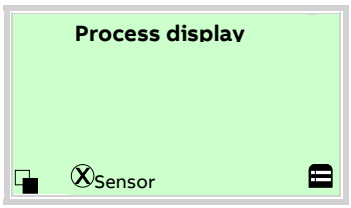
Error messages in the HART® LCD display

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.

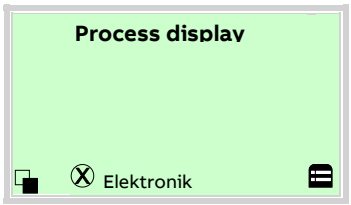
Note

For a detailed description of the errors and notices on troubleshooting, see **"Diagnosis / error messages" in the operating instruction**.

… 9 Operation

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 **"Diagnosis / error messages" in the operating instruction**.

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).

10 Maintenance

Safety instructions

⚠ CAUTION

Risk of burns due to hot measuring media

The device surface temperature may exceed 70 °C (158 °F), depending on the measuring medium temperature!

- Before starting work on the device, make sure that it has cooled sufficiently.

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

Note

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

11 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.

12 Specification

Note

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

13 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.

"Diagnosis / error messages" in the operating instruction

14 Appendix

Return form

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

Customer details:

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

Device details:

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

Was this device used in conjunction with substances which pose a threat or risk to health?

☐ Yes ☐ No

If yes, which type of contamination (please place an X next to the applicable items):

☐ biological	☐ corrosive / irritating	☐ combustible (highly / extremely combustible)
☐ toxic	☐ explosive	☐ other toxic substances
☐ radioactive		

Which substances have come into contact with the device?

1.
2.
3.

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

Town/city, date	Signature and company stamp

Trademarks

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

PROFIBUS and PROFIBUS PA are registered trademarks of PROFIBUS & PROFINET International (PI)

FOUNDATION Fieldbus is a registered trademark of FieldComm Group, Austin, Texas, USA.

Notes

ABB Measurement & Analytics

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

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

3KXT231001R4401

CI/TTH300-EN Rev. I 03.2023