Operating Instruction OI/TTH300-EN Rev. D

TTH300
Head-mount temperature transmitter

Measurement made easy

Short product description

Head-mount temperature transmitter for the measurement of the temperature of liquid and gaseous measuring media.

Further information

Additional documentation on TTH300 is available to download free of charge at www.abb.com/temperature.
Alternatively, scan this code:

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

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

Contents

1 Safety

1.1 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.

1.2 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.

i NOTICE

The signal word "NOTICE" indicates useful or important information about the product.
The signal word "NOTICE" is not a signal word indicating a danger to personnel. The signal word "NOTICE" can also refer to material damage.

1.3 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 values stated on the name plate and within the technical limit values specified on the data sheets.

— The maximum and minimum operating temperature limits must not be exceeded or undershot.
— The permissible ambient temperature must not be exceeded.
— The housing's IP rating must be observed during operation.

1.4 Improper use

The following are considered to be instances of improper use of the device:

— Material application, e.g. by painting over the name plate or welding/soldering on parts.
— Material removal, e.g. by spot drilling the housing.

1.5 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.

2 Use in potentially explosive atmospheres according to ATEX and IECEx

NOTICE

- 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.

2.1 Ex-marking

2.1.1 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	
Type examination certificate	PTB 05 ATEX 2017 X
II 1 G Ex ia IIC T6 Ga	
II 2 (1) G Ex [ia] ib IIC T6 Gb (Ga)	
II 2 G (1D) Ex [iaD] ib IIC T6 Gb (Da)	

Model TTH300-E1P and TTH300-E1F	
Type examination certificate	PTB 09 ATEX 2016 X
II 1G Ex ia IIC T6	
II 2(1)G Ex [ia] ib IIC T6	
II 2G(1D) Ex [iaD] ib IIC T6	

ATEX Non-sparking

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-E2X	
Declaration of conformity	
II 3 G Ex nA IIC T1-T6 Gc	

IECEx intrinsic safety

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

Model TTH300-H1H	
IECEx certificate of conformity	IECEx PTB 09.0014X
Model TTH300-H1P and TTH300-H1F	
IECEx certificate of conformity	IECEx PTB 11.0108X
Ex ia IIC T6	
Ex [ia] ib IIC T6	
Ex [iaD] ib IIC T6	

2.1.2 LCD indicators

ATEX intrinsic safety

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

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

ATEX Non-sparking

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

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

IECEx intrinsic safety

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

IECEx certificate of conformity	IECEx PTB 12.0028X
Ex ia IIC T6	

2.2 Temperature data

2.2.1 Transmitter

ATEX/IECEx intrinsic safety, non-sparking ATEX

Temperature class	Permissible ambient temperature range	
	Device category 1 use	Device category 2 / 3 use
T6	-50 … 44 °C (-58 … 111.2 °F)	-50 … 56 °C (-58 … 132.8 °F)
T5	-50 … 56 °C (-58 … 132.8 °F)	-50 … 71 °C (-58 … 159.8 °F)
T4-T1	-50 … 60 °C (-58 … 140.0 °F)	-50 … 85 °C (-58 … 185.0 °F)

2.2.2 LCD indicators

ATEX/IECEx intrinsic safety, non-sparking ATEX

Temperature class	Permissible ambient temperature range	
	Device category 1 use	Device category 2 / 3 use
T6	-40 … 44 °C (-40 … 111.2 °F)	-40 … 56 °C (-40 … 132.8 °F)
T5	-40 … 56 °C (-40 … 132.8 °F)	-40 … 71 °C (-40 … 159.8 °F)
T4-T1	-40 … 60 °C (-40 … 140 °F)	-40 … 85 °C (-40 … 185 °F)

2.3 Electrical data

2.3.1 Transmitter

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

	TTH300-E1H TTH300-H1H Supply circuit	TTH300-E1P/-H1P TTH300-E1F/-H1F Supply circuit [1]	
		FISCO	ENTITY
Max. voltage	U_i = 30 V	$U_i \leq$ 17.5 V	$U_i \leq$ 24.0 V
Short-circuit current	I_i = 130 mA	$I_i \leq$ 183 mA[2]	$I_i \leq$ 250 mA
Max. power	P_i = 0.8 W	$P_i \leq$ 2.56 W[2]	$P_i \leq$ 1.2 W
Internal inductance	L_i = 0.5 mH	$L_i \leq$ 10 µH	$L_i \leq$ 10 µH
Internal capacitance	C_i = 0.57 nF[3]	$C_i \leq$ 5 nF	$C_i \leq$ 5 nF

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

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

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

Intrinsic safety 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
Internal capacitance	C_i = 0 nF
Maximum permissible external inductance	L_o = 5 mH
Maximum permissible external capacitance	C_o = 1.4 µF

2.3.2 LCD indicators

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
Internal capacitance	C_i = 0 nF

2.4 Installation instructions

2.4.1 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 relevant expertise for the type of works to be executed.
When operating with combustible dusts, EN 60079-31 must be complied with.
The safety instructions for electrical apparatus in potentially explosive areas must be complied with, in accordance with the directive 2014/34/EU (ATEX) and e.g. IEC 60079-14 (Installation of equipment in potentially explosive atmospheres).
To ensure safe operation, the respectively applicable requirements must be met for the protection of workers.

2.4.2 IP protection rating of housing

The temperature transmitter and LCD indicator types A and AS must be installed such that the IP rating of at least IP20 is achieved in accordance with IEC 60529.

2.4.3 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 proof

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:

Transmitters (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

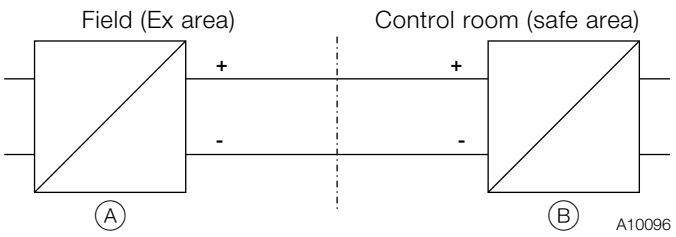


Fig. 1
Ⓐ **Transmitter** Ⓑ **Supply isolator / DCS input with supply / Segment coupler**

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!

NOTICE

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 Ga

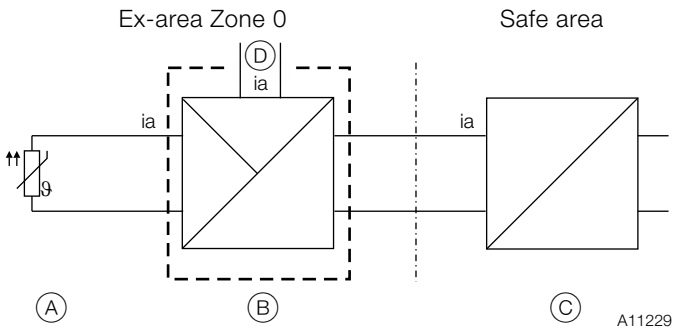


Fig. 2
Ⓐ **Sensor** Ⓑ **Transmitter in the housing with IP rating IP 20**
Ⓒ **Supply isolator [Ex ia]** Ⓓ **Interface for LCD display**

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 have an [Ex ia] design.
When using the transmitter in Zone 0, you must ensure that impermissible electrostatic charging of the temperature transmitter is prevented (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.

ATEX - Zone 1 (0)

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

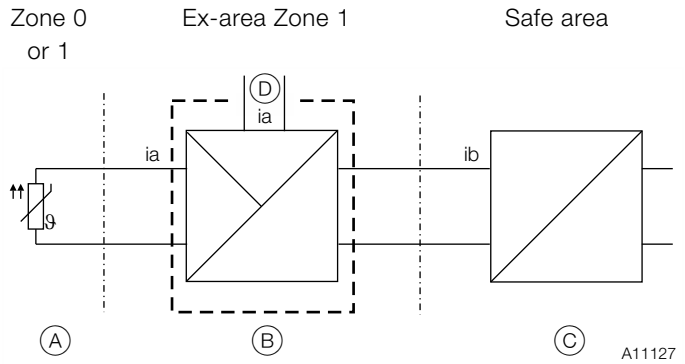


Fig. 3
(A) Sensor (B) Transmitter in the housing with IP rating IP 20
(C) Supply isolator [Ex ib] (D) Interface for LCD display

When using the transmitter in Zone 1, it must be installed in a suitable housing with IP rating IP20. The input for the supply isolator must have an [Ex ib] design.
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).
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.

ATEX - Zone 1 (20)

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

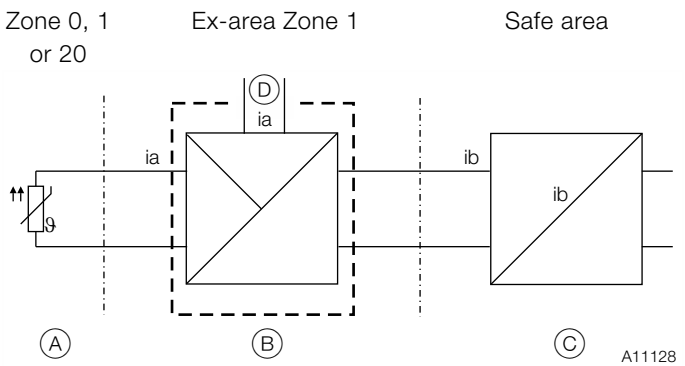


Fig. 4
(A) Sensor (B) Transmitter in the housing with IP rating IP 20
(C) Supply isolator [Ex ib] (D) Interface for LCD display

When using the transmitter in Zone 1, it must be installed in a suitable housing with IP rating IP20. The input for the supply isolator must have an [Ex ib] design.
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).
As the user, it is your responsibility to ensure that the sensor instrumentation meets the requirements of applicable explosion protection standards. The sensor can be installed in Zone 0, Zone 1, or Zone 20.

ATEX - Zone 2

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

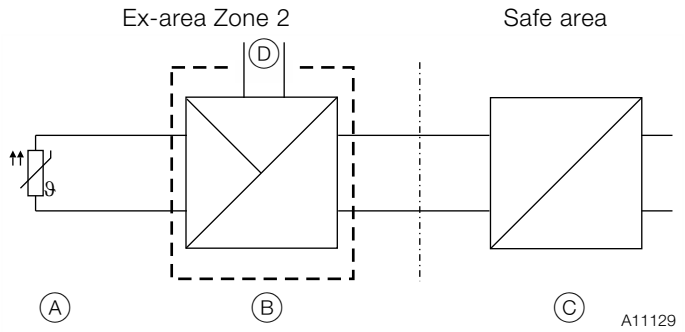


Fig. 5
(A) Sensor (B) Transmitter in the housing with IP rating IP 54
(C) Supply isolator (D) Interface for LCD display

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

- The temperature transmitter must be installed in its own housing. This housing must at least meet IP rating IP54 (in accordance with EN 60529) and the other requirements of the potentially explosive atmosphere (e. g. a certified housing).
- External measures must be made for the power supply circuit in order to prevent the rated voltage from being exceeded by more than 40% in the event of transient disturbances.
- The electrical connections may only be opened or closed when there is no hazardous atmosphere.
- When using the transmitter in Zone 2, you must ensure that impermissible electrostatic charging of the temperature transmitter is prevented (observe the warnings on the device).

2.5 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.

2.6 Operating instructions

2.6.1 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 FM and CSA

NOTICE

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

3.1 Ex-marking

3.1.1 Transmitter

FM Intrinsically Safe

Model TTH300-L1H	
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	
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	

CSA Intrinsically Safe

Model TTH300-R1H	
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 Group IIC T6	

CSA Non-Incendive

Model TTH300-R2H	
Control Drawing	SAP_214824 (Non-Incendive) 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	

3.1.2 LCD indicators

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[1)]	
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[2)], 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[1)]	
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 oder Ex nL IIC T[2)], 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	

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

3.2 Installation instructions

3.2.1 FM / CSA

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

3.2.2 IP protection rating of housing

The temperature transmitter and LCD indicator types A and AS must be installed such that the IP rating of at least IP20 is achieved in accordance with IEC 60529.

3.2.3 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 proof

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:

Transmitters (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

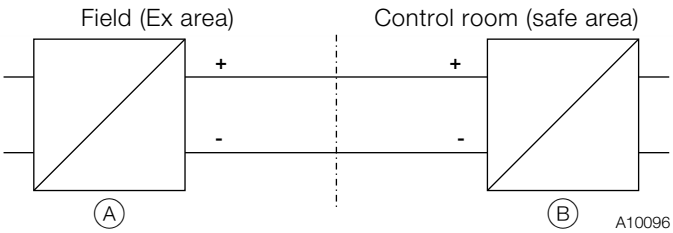


Fig. 6
(A) Transmitter (B) Supply isolator / DCS input with supply / Segment coupler

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!

NOTICE

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.

3.3 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.

3.4 Operating instructions

3.4.1 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 Function and system design

Digital transmitters are communication-ready devices with microprocessor-controlled electronics. They conform to the requirements of housing IP rating IP20 and are suitable for integration into DIN A and DIN B sensor heads.
With HART transmitters, an FSK signal is superimposed on the 4 … 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 FF transmitters, communication takes place in accordance with FOUNDATION Fieldbus H1 (IEC 61158-2), ITK Version 5.x.
The transmitters can be configured, polled, and tested using a DTM or an EDD.
As an option, the transmitter can be fitted with a type A or a type AS LCD indicator. Type AS is used exclusively for visualizing current process values. Type A also supports the option of configuring the transmitter. It is recommended that you use this combination.
The electrical connection between the LCD display and transmitter is provided by a 6-pin flat ribbon cable with a plug connector. The LCD display can only be operated when connected to transmitters that have an LC display interface.

4.1 Input functionality

4.1.1 Sensor Redundancy

To enhance system availability, the TTH300 has two sensor inputs.
The second sensor input can be used redundantly for both resistance thermometers (2 x three-wire circuit or 2 x two-wire circuit) and thermocouples, or for a mixture of the two.
Sensor redundancy (or sensor backup) always involves measuring the temperature of the two sensors and calculating the mean value on the basis of this.
This value is provided at the output of the transmitter. Should a sensor fail, the temperature measurement for the sensor that remains in operation is provided at the output of the transmitter.
A relevant diagnostic message is provided via the EDD or DTM, or shown on the display. The measured value remains available and maintenance measures can be taken at the same time.

4.1.2 Sensor drift monitoring

When two sensors are connected, sensor drift monitoring can be activated via the EDD or DTM.
The sensor drift monitoring can be activated for the following sensor types:

- 2 x resistance thermometer (RTD), two-wire circuit
- 2 x resistance thermometer (RTD), three-wire circuit
- 2 x resistor (potentiometer), two-wire circuit
- 2 x resistor (potentiometer), three-wire circuit
- 2 x thermocouple
- 2 x voltage
- 1 x resistance thermometer (RTD), two-wire circuit, and 1 x thermocouple
- 1 x resistance thermometer (RTD), three-wire circuit, and 1 x thermocouple
- 1 x resistance thermometer (RTD), four-wire circuit, and 1 x 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 records a larger sensor deviation during the defined time period, a HART, EDD, and DTM diagnostic notification - "Maintenance required" - is generated according to NE 107. At the same time, diagnostic information is shown on the LCD display.
If drift monitoring is used for the same types of sensor (2 x Pt100 or 2 x thermocouple), the mean value calculated from the two sensors is mapped to the transmitter's output signal as a process variable in redundancy mode.
If a thermocouple is used for Pt100 drift monitoring, the Pt100 sensor (see chapter "Electrical connections" on page 11) must be connected to channel 1 and the thermocouple to channel 2.
The measured value from channel 1 (Pt100) is mapped to the transmitter output as a process variable.

NOTICE

Before configuring the maximum permissible sensor deviation for drift monitoring, sensor adjustment with respect to the sensor channel 1 value must be carried out with the help of the TTH300 DTM.

4.1.3 Sensor error adjustment according to 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 DTM or 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, and up to two can be stored for FOUNDATION Fieldbus.

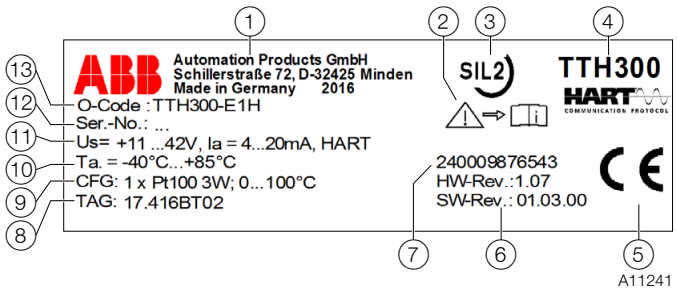


Fig. 7: HART name plate (example)

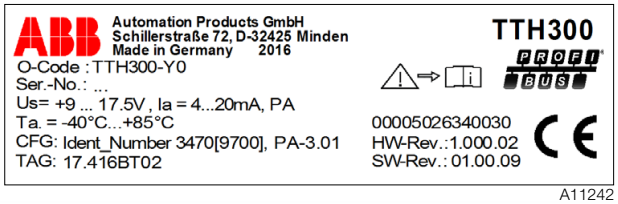


Fig. 8: PROFIBUS PA name plate (example)

5 Product identification

5.1 Name plate

NOTICE

Products that are marked with this symbol may not be disposed of through municipal garbage collection points.

NOTICE

The ambient temperature range on the name plate (10) 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-ID is also specified.

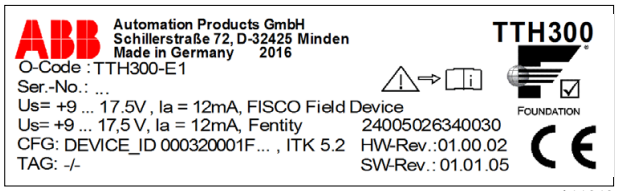


Fig. 9: FOUNDATION Fieldbus name plate (example)

(1) Manufacturer, manufacturer address, country of manufacture, production year (2) Observe product documentation (3) Safety integrity level (optional) (4) Model number (5) CE-symbols (EU conformity), if nothing is mentioned on the additional label (6) Hardware and Software Version (7) Order number (8) TAG -Number (optional) (9) Customer configuration (10) Ambient temperature range (11) Supply voltage range, typical current range, Log (12) Serial number (13) Ordering number

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

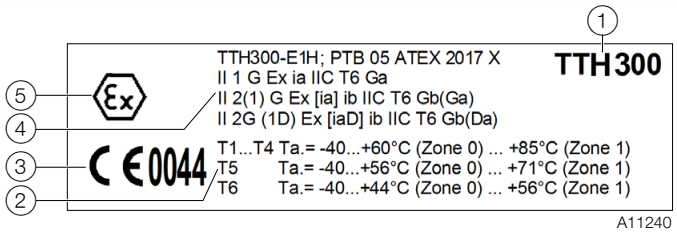


Fig. 10: Special data plate for explosion-protected devices (example)

(1) Model number (2) Temperature class explosion-proof design (3) CE-symbols (EU conformity) and specific designations of the quality assurance (4) Safety class explosion-proof design (5) Ex-marking

6 Transport and storage

6.1 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.

6.2 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, e.g., by using air-cushioned packaging.

6.3 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.

6.3.1 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!

6.4 Returning devices

For the return of devices, follow the instructions in the chapter "Repair" on page 40.

7 Installation

7.1 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

7.1.1 Installation in the cover of the connection head

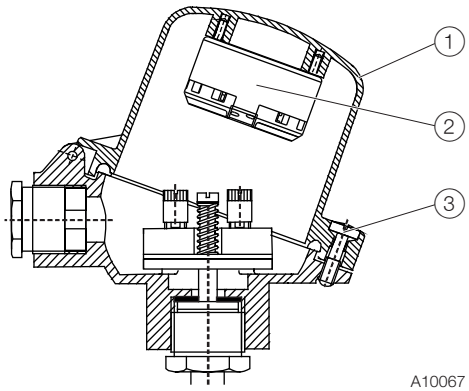


Fig. 11

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

7.1.2 Installation on the measuring inset

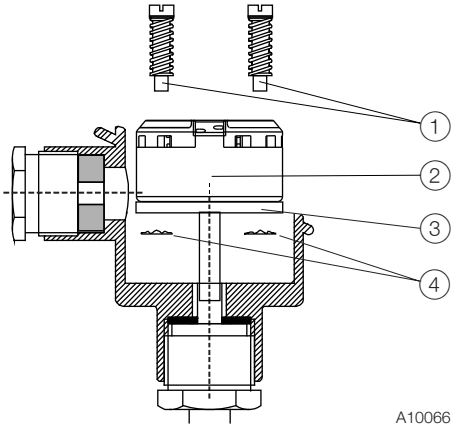


Fig. 12

NOTICE

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 (2) transmitter. 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 (4) discs 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.

NOTICE

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

7.1.3 Installation on the top-hat rail

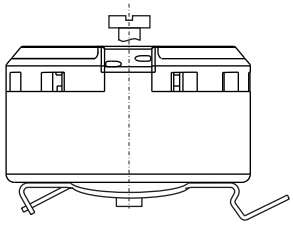


Fig. 13

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.

7.2 Installing / removing the optional LCD indicator

Thanks to the LCD indicator interface, the TTH300 can be operated using 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.

No tools are required to insert 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.

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.

CAUTION

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

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.

7.3 Electrical connections

⚠ DANGER

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

For use in potentially explosive atmospheres, observe the information in chapter "Use in potentially explosive atmospheres according to ATEX and IECEx" on page 6 and "Use in potentially explosive atmospheres in accordance with FM and CSA" on page 10!

Observe the following information:

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

i NOTICE

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).

7.3.1 Conductor material

i NOTICE

Damage to components!

The use of rigid conductor material may cause wire breaks.

Supply voltage

- Supply voltage cable: flexible standard cable material
- Maximum wire cross-section: 1.5 mm^2 (AWG 16)

Sensor connection

Depending on the sensor model, a variety of line materials can be used for sensor connections.

The integrated internal reference junction makes it possible to directly connect thermal compensating cables.

7.3.2 Pin configuration

Resistance thermometers (RTD) / resistors (potentiometers)

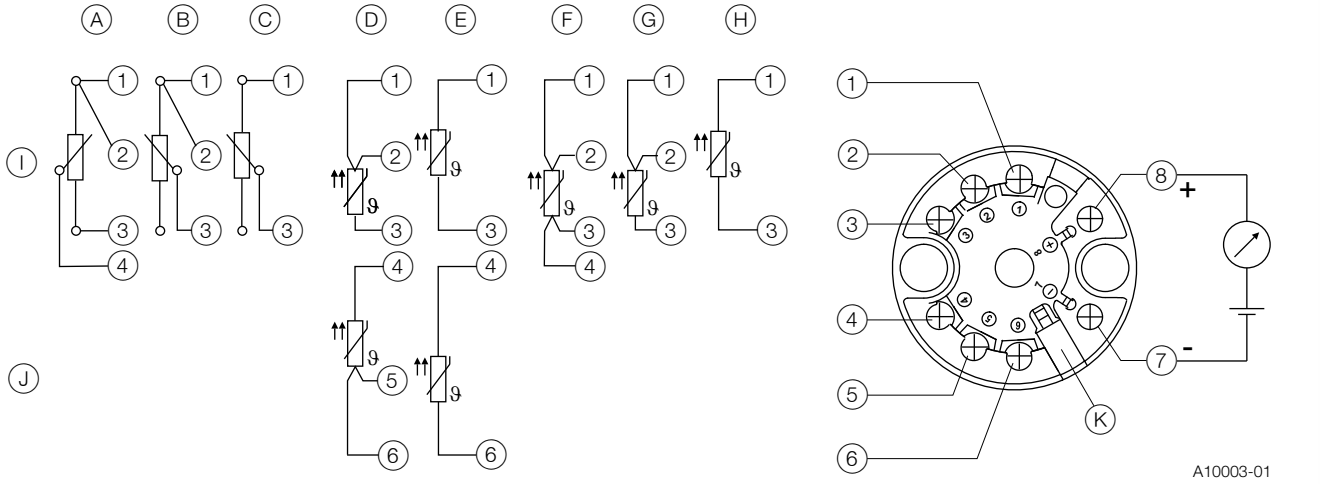


Fig. 14
(A) Potentiometer, four-wire circuit (B) Potentiometer, three-wire circuit (C) Potentiometer, two-wire circuit (D) 2 x RTD, three-wire circuit[1)]
(E) 2 x RTD, two-year wire[1)] (F) RTD, four-wire circuit (G) RTD, three-wire circuit (H) RTD, two-wire circuit (I) Sensor 1 (J) Sensor 2[1)]
(K) LCD indicator-interface
(1) – (6) Sensor connection (from measuring inset) (7) – (8) 4 ... 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus

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

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

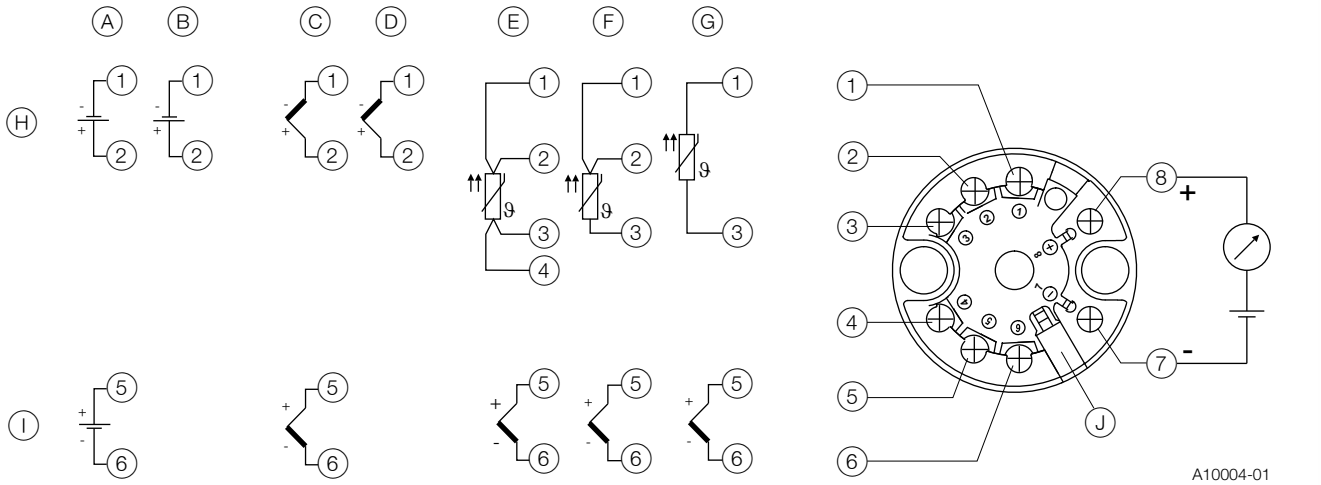


Fig. 15
(A) 2 x voltage meter[1)] (B) 1 x voltage meter (C) 2 x Thermoelement[1)] (D) 1 x Thermoelement (E) 1 x RTD, four--wire circuit and 1 x Thermoelement[1)] (F) 1 x RTD, three--wire circuit and 1 x Thermoelement[1)] (G) 1 x RTD, two--wire circuit and 1 x Thermoelement[1)]
(H) Sensor 1 (I) Sensor 2[1)] (J) LCD indicator-interface
(1) – (6) Sensor connection (from measuring inset) (7) – (8) 4 ... 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus

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

7.3.3 Electrical data for inputs and outputs

Input - resistance thermometer / resistances

Resistance thermometer
- Pt100 according to IEC 60751, JIS C1604, MIL-T-24388
- Ni according to DIN 43760
- Cu according to recommendation OIML R 84

Resistance measurement
- 0 … 500 Ω
- 0 … 5000 Ω

Sensor connection type
- Two-, Three-, Four wire-circuits

Connection lead
- Maximum sensor line resistance:
  of 50 Ω per line 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 thermometers)

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

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

Sensor error signaling
- Resistance thermometer: Sensor short circuit and sensor wire breakage
- 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, D in accordance with ASTM E-988

Voltages
- -125 ... 125 mV
- -125 ... 1100 mV

Supply line
- Maximum sensor line resistance
  1.5 kΩ per wire, 3 kΩ in total

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

Input resistance > 10 MΩ

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

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

Functionality input

Free style characteristic curve / 32-point -sampling point table
- Resistance measurement up to max. 5 kΩ
- Voltages up to max. 1.1 V

Sensor error adjustment
- Via Callendar-Van Dusen coefficients
- Via value table of 32 reference points
- Via single-point adjustment (offset adjustment)
- Via two-point adjustment

Input functionality
- 1 sensor
- 2 sensors:
  Mean measurement,
  Differential measurement,
  Sensor redundancy,
  Sensor drift monitoring

HART output

Transmission behavior
- Temperature linear
- Resistance linear
- Voltage linear

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

Simulation mode 3.5 ... 23.6 mA

Induced current consumption < 3.5 mA

Maximum output current 23.6 mA

Configurable error current signal
- Overrange 22 mA (20.0 … 23.6 mA)
- Underrange 3.6 mA (3.5 … 4.0 mA)

PROFIBUS PA output

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[1])
- 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 – enhanced diagnosis 1 (Transducer Block 3)
- Discrete Input 2 – enhanced diagnosis 2 (Transducer Block 3)

1) Sensor 1, sensor 2 or difference or mean

FOUNDATION Fieldbus output

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[1)]
- 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[2)])
- Analog Input 4 – SECONDARY_VALUE (reference junction temp.)
- Analog Output – optional HMI display (Transducer Block 2)
- Discrete Input 1 – enhanced diagnosis 1 (Transducer Block 3)
- Discrete Input 2 – enhanced diagnosis 2 (Transducer Block 3)
- PID – PID controller

LAS (Link Active Scheduler) link master functionality

1) For the block description, block index, execution times, and block class, refer to the interface description
2) Sensor 1, sensor 2 or difference or mean

7.4 Power supply

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

NOTICE

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

7.4.1 Power supply - HART

Input terminal voltage

- Non-Ex application:
  U_S = 11 ... 42 V DC
- Ex applications:
  U_S = 11 ... 30 V DC

Max. permissible residual ripple for input terminal voltage

- During communication in accordance with HART FSK "Physical Layer" specification.

Undervoltage detection on the transmitter

- If the terminal voltage on the transmitter falls below 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

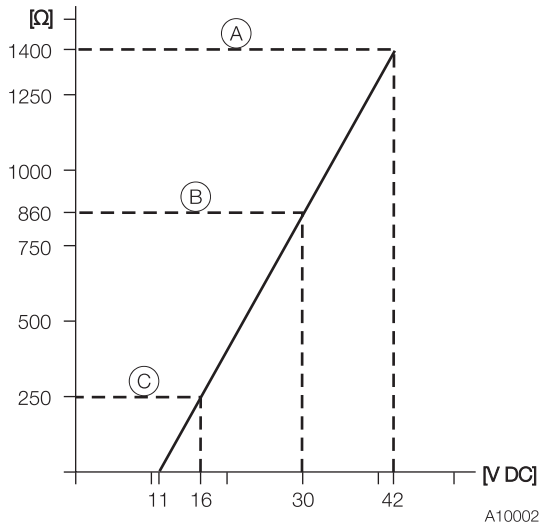


Fig. 16: Maximum load depending on input terminal voltage
(A) TTH300 (B) TTH300 in Ex ia design (C) HART communication resistance

Maximum power consumption

- P = U_s x 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.

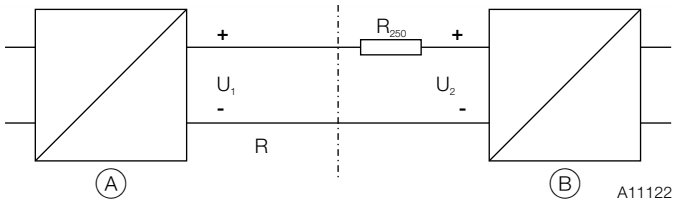


Fig. 17
(A) Transmitter (B) Supply isolator / PCS input with supply / Segment coupler

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 ... 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

By adding the resistance R_{250} , the minimum input terminal voltage U_{2min}: $U_{1min} \leq U_{2min}$ - 22 mA x (R + R_{250}) can be increased.

For HART functionality, use supply isolators or DCS input cards with a HART marking. 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 or without grounding. When establishing a ground connection (minus side), make sure that only one side of the terminal is connected to the potential equalization.
Unless the profile HART protocol Rev. 7 is exclusively selected during the ordering process, the device normally supports the profile HART protocol Rev. 5 in the delivery status. Subsequently user can change over to the profile HART protocol Rev. 7 over a miniature switch. See chapter "Hardware settings" on page 22 for more details.

7.4.2 Power supply - PROFIBUS / FOUNDATION Fieldbus

Input terminal voltage

— Non-Ex application:
  U_S = 9 ... 32 V DC
— Ex-applications with:
  U_S = 9 ... 17 V DC (FISCO)
  U_S = 9 ... 24 V DC (Fieldbus Entity model I.S.)

Current consumption ≤ 12 mA

Standard application with PROFIBUS PA and FOUNDATION Fieldbus H1 functionality

During the interconnection, following important is to be adhered to: $U_{1min} \leq U_{2min}$ - 12 mA x R

8 Commissioning

8.1 General remarks

The transmitter is ready for operation after mounting and installation of the connections in case of corresponding order. The parameters are set at the factory.
If not exclusively selected while ordering the profile HART 7, the transmitter is delivered present with the profile HART 5. The profile can be always switched to a HART 7 via a miniature switch, see chapter "Hardware settings" on page 22.
The connected lines must be checked for firm seating. Only firmly seated lines ensure full functionality.

8.2 Checks prior to commissioning

The following points must be checked before commissioning the device:

— The wiring must have been completed as described in chapter "Electrical connections" on page 16.
— The ambient conditions must meet the requirements set out on the name plate and in the Datasheet.

8.3 Basic Setup

NOTICE

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

The following configuration types are available for the transmitter:

— With DTM
  Configuration can be performed within an FDT frame application that is approved for use with the DTM.
— With EDD
  Configuration can be performed within an EDD frame application that is approved for use with the EDD.
— Via LCD display type A with operating buttons
  The 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 chapter "Menu navigation" on page 22.

NOTICE

Unlike configuration using the DTM or EDD, the functionality of the transmitter can only be changed to a limited extent if the LCD indicator is used.

9 Operation

9.1 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.

9.2 Hardware settings

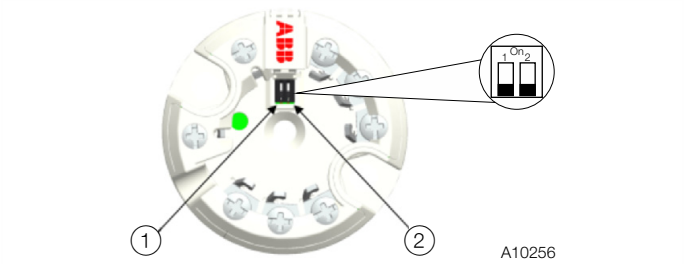


Fig. 18
① DIP-Switch 1 ② DIP-Switch 2

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 ITK simulation.
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 Activates the simulation (only FOUNDATION Fieldbus)	Off: Simulation deactivated
	On: Simulation activated
2 HART version	Off: HART 5
	On: HART 7

NOTICE

- Factory setting: both switches "OFF". Local write protection deactivated and HART 5 (HART version) or simulation locked (FOUNDATION Fieldbus).
- With PROFIBUS PA devices, switch 2 must always be in the "OFF" position.

9.3 Menu navigation

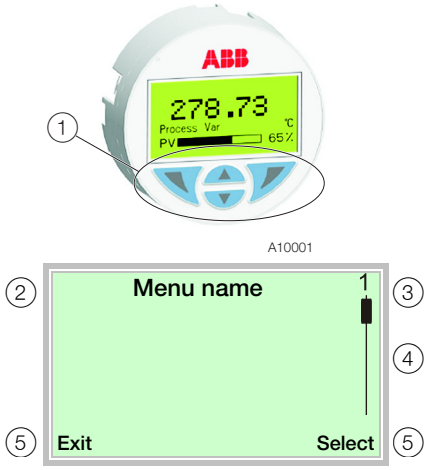


Fig. 19: LCD display (example)
① Operating keys to the menu navigation ② Display of menu name ③ Display of menu number ④ Marking for displaying the relevant positions within the menu ⑤ Display of current functions of the operating keys and

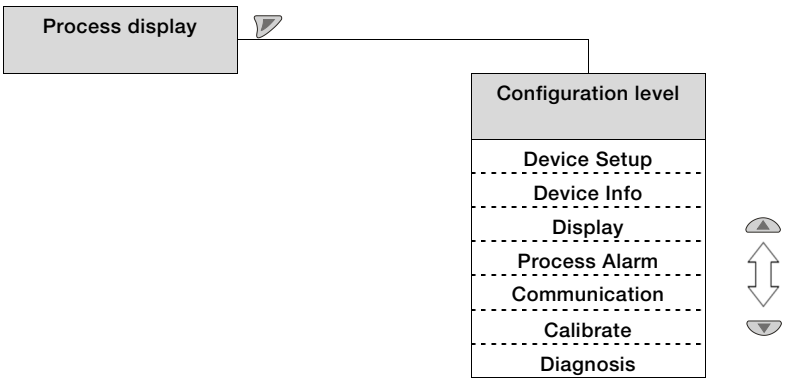
You can use the or operating buttons to browse through the menu or select a number or character within a parameter value.
Different functions can be assigned to the and operating buttons. The function ⑤ that is currently assigned to them is shown on the LCD display.

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

9.4 HART menu levels



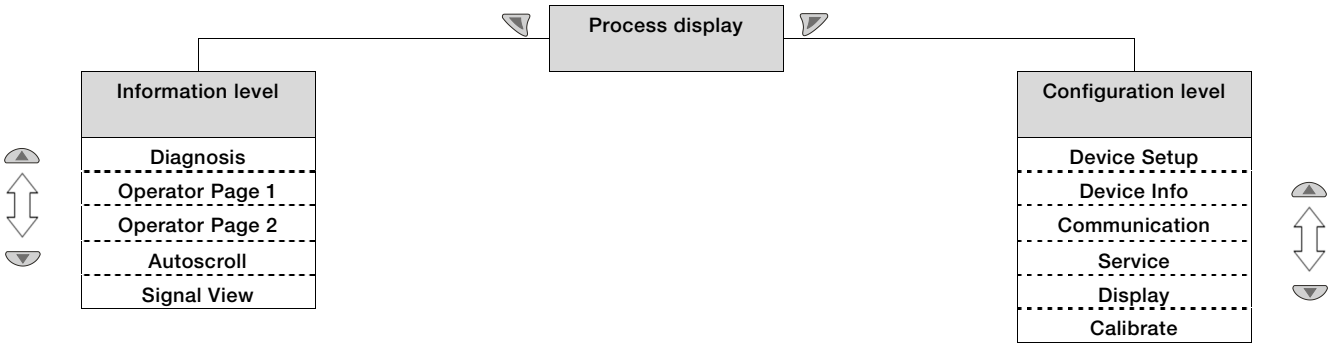
Process display

The process display shows the current process values.

Configuration level

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

9.5 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.

9.5.1 Process display

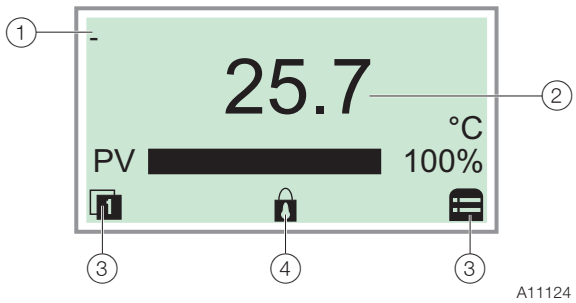
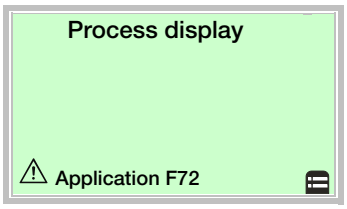


Fig. 20: Process display (example)
(1) Measuring point tagging (device TAG) (2) Current process values (3) "Button function" symbol (4) "Parameterization protected" symbol

The process display appears on the LCD display when the device is switched 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.

Symbol	Description
	Call up information level.
	Call up configuration level.
	The device is protected against changes of the parameter settings.

Error messages on the LCD display HART
If the event of an error, a message consisting of a symbol or letter (device status) and a number (DIAG NO.) will appear at the bottom of the process display.



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

Symbol - Letter	Description	
I	OK or Information	Device is functioning or information is available
C	Check Function	Device is undergoing maintenance (e. g. simulation)
S	Off Specification	Device or measuring point is being operated outside of the specifications
M	Maintenance Required	Request service to prevent the measuring point from failing
F	Failure	Error; measuring point has failed

The error can then be read in plain-text format on the "Diagnostics" information level.

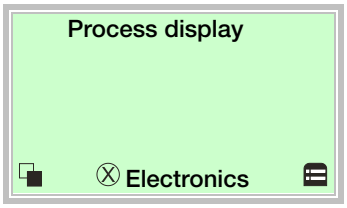
Additionally, the diagnostic messages are divided into the following areas:

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

NOTICE
For a detailed description of the errors and information on troubleshooting, see chapter "Possible HART error messages" on page 38.

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
	Function check
	Outside of the specification
	Maintenance required

The error can then be read in plain-text format on the "Diagnostics" information level.

The error messages are also divided into the following areas:

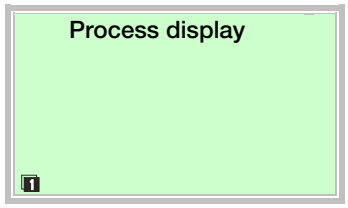
Range	Description
Electronics	Diagnosis for device hardware.
Sensor	Diagnosis for sensor elements and connection lines.
Installation / Configuration	Diagnosis for communication interface and parameterization / configuration
Operating conditions	Diagnosis for ambient and process conditions.

NOTICE

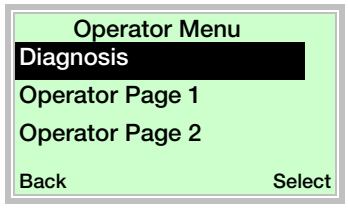
For a detailed description of the errors and information on troubleshooting, see chapter "Calling up the error description" on page 37.

9.5.2 Switching to the information level (PROFIBUS PA and FOUNDATION Fieldbus only)

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.

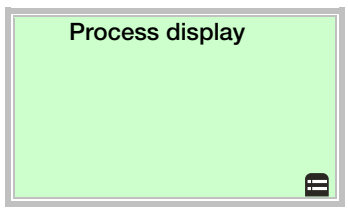


2. Select the desired submenu using / .
3. Confirm the selection with .

Menu	Description
... / Operator Menu	
Diagnosis	Selection of sub-menu "**„Diagnosis**"; see also chapter "Error messages on the LCD display HART" on page 24.
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.

9.5.3 Switching to the configuration level (parameterization)

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



1. Use to switch to the configuration level.

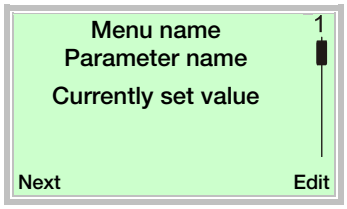
The LCD display now indicates the first menu item on the configuration level.

2. Use / to select a menu.
3. Use to confirm your selection.

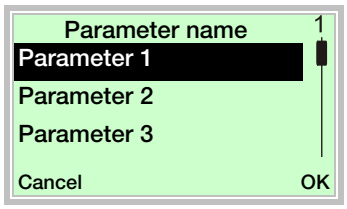
9.5.4 Selecting and changing parameters

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.

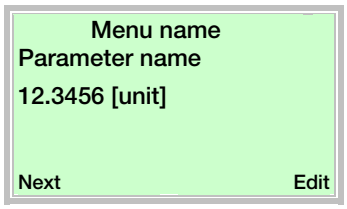


3. Select the desired value using ▲ / ▼.
4. Confirm the selection with ◤.

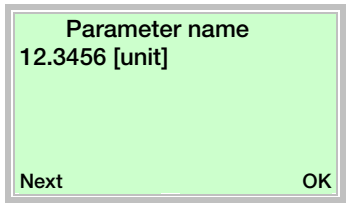
This concludes the procedure for selecting a parameter value.

Numerical entry

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



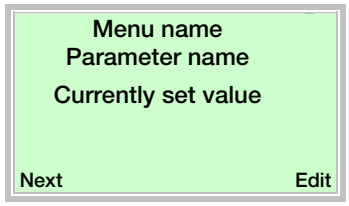
1. Select the parameters you want to set in the menu.
2. Use ◤ to call up the parameter for editing. The decimal place that is currently selected is highlighted.



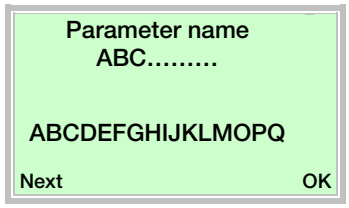
3. Use ◥ to select the decimal place to change.
4. Use ▲ / ▼ to set the desired value.
5. Use ◥ to select the next decimal place.
6. If necessary select and set additional decimal places in accordance with steps 3 to 4.
7. Use ◤ to confirm your setting.

This concludes the procedure for changing a parameter value.

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.



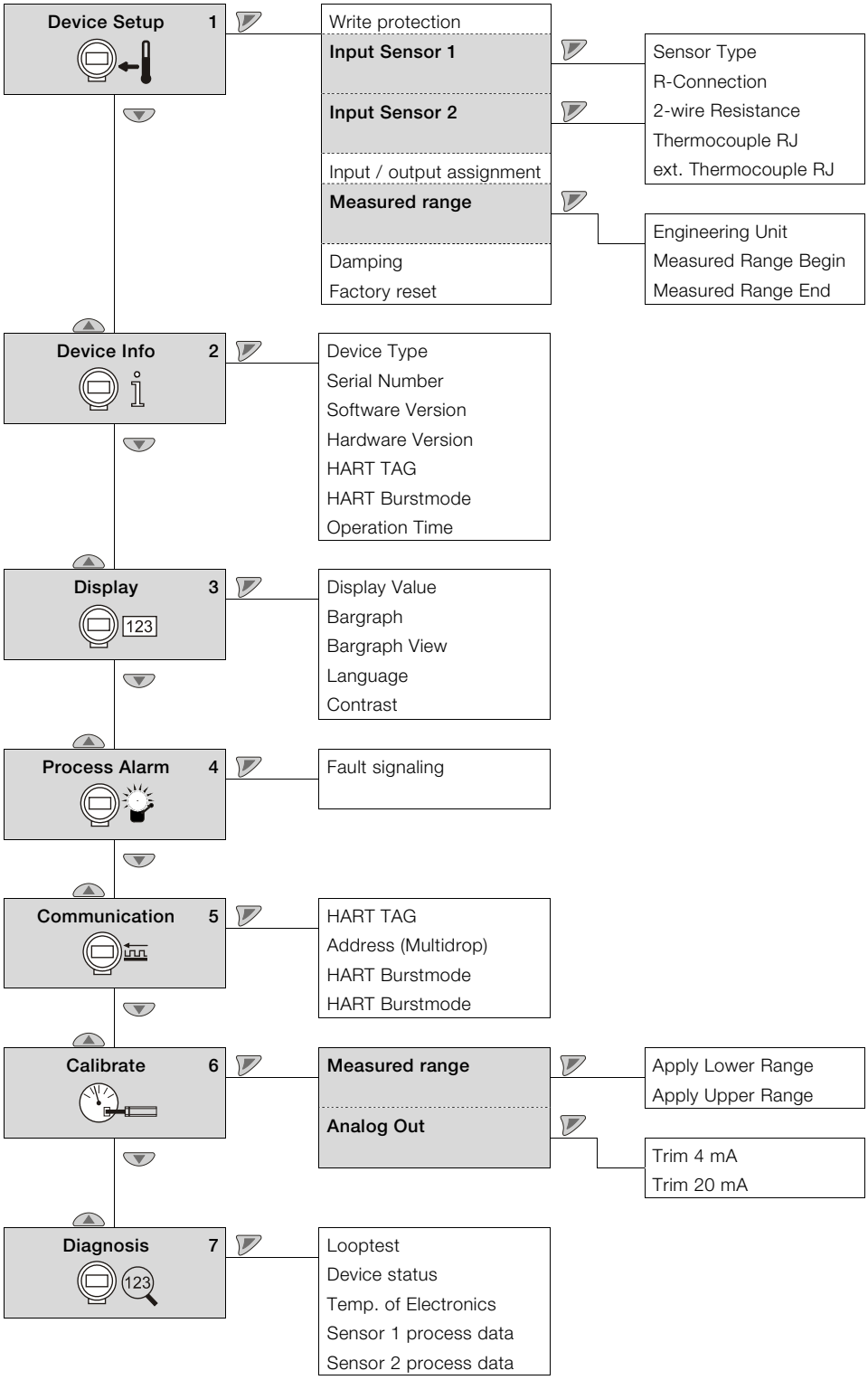
3. Use ◥ to select the decimal place to change.
4. Use ▲ / ▼ to set the desired value.
5. Use ◥ to select the next decimal place.
6. If necessary select and set additional decimal places in accordance with steps 3 to 4.
7. Use ◤ to confirm your setting.

This concludes the procedure for changing a parameter value.

9.6 HART parameter overview

NOTICE

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.



9.7 HART parameter description

Menu / parameter	Description
... / Device Setup	
Write protection	Activates write protection for the entire device — Yes: locked — Password: ≠ 0110 — No: unlocked — Enter password: 0110
Input Sensor 1	Select the "**Input Sensor 1**" submenu.
Input Sensor 2	Select the "**Input Sensor 2**" submenu.
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 ... 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): Resistance thermometer Pt100 (IEC751) — Pt1000 (IEC751): Resistance thermometer Pt1000 (IEC751) — TC type K (IEC584): Thermocouple type K (IEC584) — TC type B (IEC584): Thermocouple type B (IEC584) — TC type C (ASTME988): Thermocouple type C (IEC584) — TC type D (ASTME988): Thermocouple type D (ASTME988) — TC type E (IEC584): Thermocouple type E (IEC584) — TC type J (IEC584): Thermocouple type J (IEC584) — TC type N (IEC584): Thermocouple type N (IEC584) — TC type R (IEC584): Thermocouple type R (IEC584) — TC type S (IEC584): Thermocouple type S (IEC584) — TC type T (IEC584): Thermocouple type T (IEC584) — TC type L (DIN43710): Thermocouple type L (DIN43710) — TC type U (DIN43710): Thermocouple type U (DIN43710) — –125 ... 125 mV: Linear voltage measurement -125 ... 125 mV — –125 ... 1100 mV: Linear voltage measurement -125 ... 1100 mV — 0 ... 500 Ω: Linear resistance measurement 0 ... 500 Ω — 0 ... 5000 Ω: Linear resistance measurement 0 ... 5000 Ω — Pt10 (IEC751): Resistance thermometer Pt10 (IEC751) — Pt50 (IEC751): Resistance thermometer Pt50 (IEC751) — Pt200 (IEC751): Resistance thermometer Pt200 (IEC751) — Pt500 (IEC751): Resistance thermometer Pt500 (IEC751)

Menu / parameter	Description (continuation)
... / Device Setup / Input Sensor 1	
... / Device Setup / Input Sensor 2	
Sensor Type	Selects sensor type: — Pt10 (JIS1604): Resistance thermometer Pt10 (JIS1604) — Pt50 (JIS1604): Resistance thermometer Pt50 (JIS1604) — Pt100 (JIS1604): Resistance thermometer Pt100 (JIS1604) — Pt200 (JIS1604): Resistance thermometer Pt200 (JIS1604) — Pt10 (IMIL24388): Resistance thermometer Pt10 (MIL24388) — Pt50 (IMIL24388): Resistance thermometer Pt50 (MIL24388) — Pt100 (MIL24388): Resistance thermometer Pt100 (MIL24388) — Pt200 (MIL24388): Resistance thermometer Pt200 (MIL24388) — Pt1000 (MIL24388): Resistance thermometer Pt1000 (MIL24388) — Ni50 (DIN43760): Resistance thermometer Ni50 (DIN43716) — Ni100 (DIN43760): Resistance thermometer Ni100 (DIN43716) — Ni120 (DIN43760): Resistance thermometer Ni120 (DIN43716) — Ni1000 (DIN43760): Resistance thermometer Ni1000 (DIN43716) — Cu10 a=4270: Resistance thermometer Cu10 a=4270 — Cu100 a=4270: Resistance thermometer Cu100 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: Calendar Van Dusen coefficient set 1 — Cal. Van Dusen 2: Calendar Van Dusen coefficient set 2 — Cal. Van Dusen 3: Calendar Van Dusen coefficient set 3 — Cal. Van Dusen 4: Calendar Van Dusen coefficient set 4 — Cal. Van Dusen 5: Calendar Van Dusen coefficient set 5 — off: Sensor channel deactivated (sensor 2 only)
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 ... 100 Ω
Thermocouple RJ	— 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). — Without: no 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 ... 100 °C

... / Device Setup / Measured range	
Engineering 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)

9.7.1 Menu: Device Info

Menu / parameter	Description
... / Device Info	
Device Type	Displays the Device Type
Serial Number	Displays the Serial Number
Software Version	Displays the Software Version
Hardware Version	Displays the Hardware Version
HART TAG	Displays the HART TAG
HART Burstmode	Displays the HART Burstmode
Operation Time	Displays the Operation Time

9.7.2 Menu: Display

Menu / parameter	Description
... / Display	
Display Value	Selects the process variable shown in the 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 the 4 ... 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 4 ...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 ... 100 %

9.7.3 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

9.7.4 Menu: Communication

Menu / parameter	Description
... / Communication	
HART TAG	Measuring point tagging — 8 characters
Address (Multidrop)	Address range in multidrop mode Value range: 0 ... 15 (0 means no multidrop mode)
HART Burstmode	— Status (on / off): Switches burst operating mode on or off — Command # (1, 2, 3, 33): Sets the HART command to be sent cyclically
HART Burstmode	Number of preambles to be used for sending Value range: 5 ... 20

9.7.5 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 measured value (PV) is used as the lower range limit (4 mA)
Apply Upper Range	The current measured value (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: 3500 ... 4500 mA
Trim 20 mA	Adjusts the current output with a 20 mA setpoint Value range: 19,500 ... 20,500 mA

9.7.6 Menu: Diagnosis

Menu / parameter	Description
... / Diagnosis	
Looptest	Simulates the current output signal Value range: 0 ... 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

9.7.7 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.

NOTICE

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".

9.7.8 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 master password "0110".
2. Confirm with the "OK" button.

"Write protection NO" is displayed.

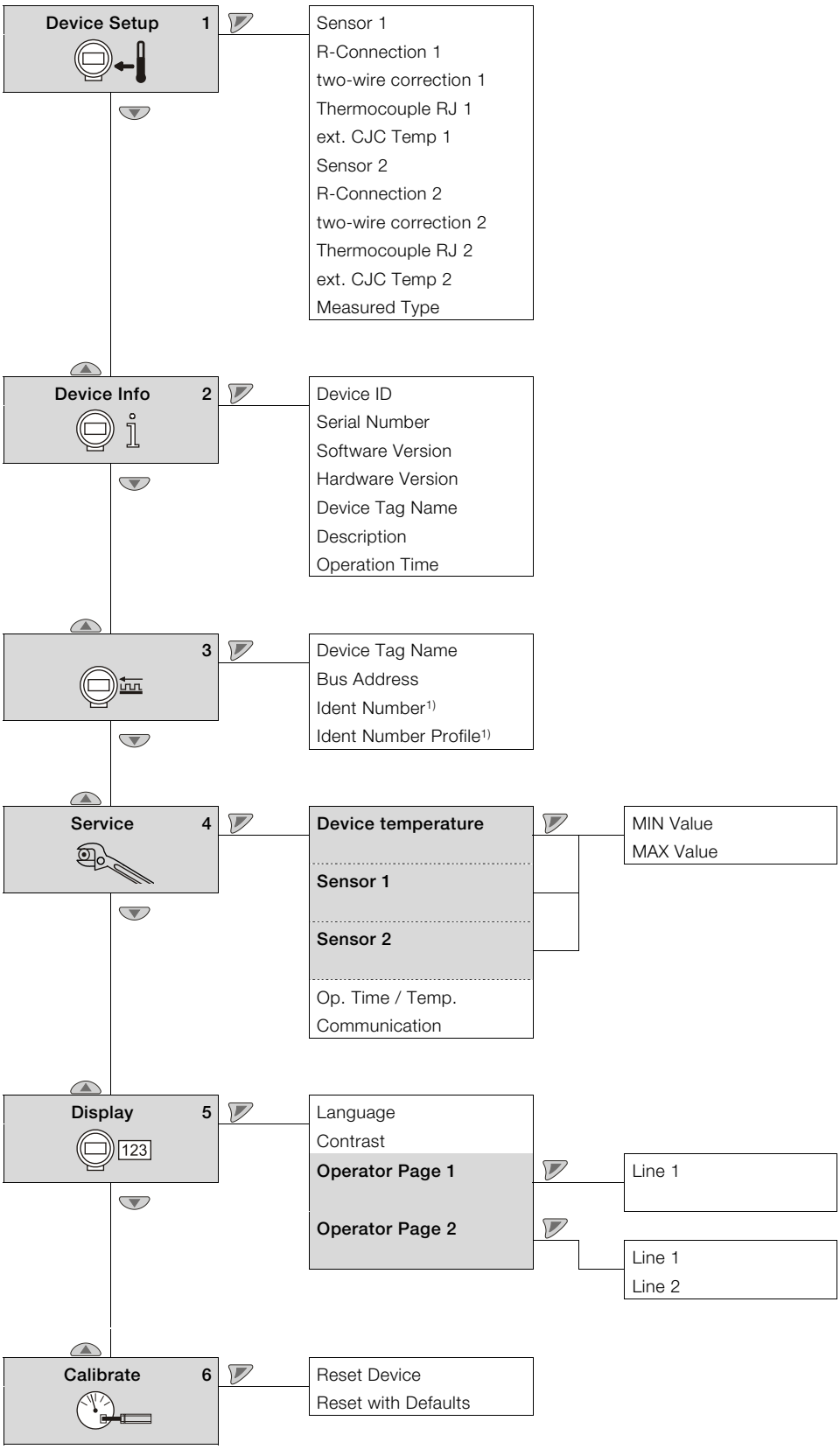
NOTICE

Master password "0110", for deactivating write protection, cannot be changed.

9.8 PROFIBUS PA and FOUNDATION Fieldbus parameter overview

NOTICE

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.



1) PROFIBUS PA only

9.9 PROFIBUS PA and FOUNDATION Fieldbus parameter description

9.9.1 Menu: Device Setup

Menu / parameter	Description
... / Device Setup	
Sensor 1 / Sensor 2	Selects sensor type: — Pt100 (IEC751): Resistance thermometer Pt100 (IEC751) — Pt1000 (IEC751): Resistance thermometer Pt1000 (IEC751) — TC type K (IEC584): Thermocouple type K (IEC584) — TC type B (IEC584): Thermocouple type B (IEC584) — TC type C (ASTME988): Thermocouple type C (IEC584) — TC type D (ASTME988): Thermocouple type D (ASTME988) — TC type E (IEC584): Thermocouple type E (IEC584) — TC type J (IEC584): Thermocouple type J (IEC584) — TC type N (IEC584): Thermocouple type N (IEC584) — TC type R (IEC584): Thermocouple type R (IEC584) — TC type S (IEC584): Thermocouple type S (IEC584) — TC type T (IEC584): Thermocouple type T (IEC584) — TC type L (DIN43710): Thermocouple type L (DIN43710) — TC type U (DIN43710): Thermocouple type U (DIN43710) — –125 ... 125 mV: Linear voltage measurement -125 ... 125 mV — –125 ... 1100 mV: Linear voltage measurement -125 ... 1100 mV — 0 ... 500 Ω: Linear resistance measurement 0 ... 500 Ω — 0 ... 5000 Ω: Linear resistance measurement 0 ... 5000 Ω — Pt10 (IEC751): Resistance thermometer Pt10 (IEC751) — Pt50 (IEC751): Resistance thermometer Pt50 (IEC751) — Pt200 (IEC751): Resistance thermometer Pt200 (IEC751) — Pt500 (IEC751): Resistance thermometer Pt500 (IEC751) — Pt10 (JIS1604): Resistance thermometer Pt10 (JIS1604) — Pt50 (JIS1604): Resistance thermometer Pt50 (JIS1604) — Pt100 (JIS1604): Resistance thermometer Pt100 (JIS1604) — Pt200 (JIS1604): Resistance thermometer Pt200 (JIS1604) — Pt10 (IMIL24388): Resistance thermometer Pt10 (MIL24388) — Pt50 (IMIL24388): Resistance thermometer Pt50 (MIL24388) — Pt100 (MIL24388): Resistance thermometer Pt100 (MIL24388) — Pt200 (MIL24388): Resistance thermometer Pt200 (MIL24388) — Pt1000 (MIL24388): Resistance thermometer Pt1000 (MIL24388) — Ni50 (DIN43760): Resistance thermometer Ni50 (DIN43716) — Ni100 (DIN43760): Resistance thermometer Ni100 (DIN43716) — Ni120 (DIN43760): Resistance thermometer Ni120 (DIN43716) — Ni1000 (DIN43760): Resistance thermometer Ni1000 (DIN43716) — Cu10 a=4270: Resistance thermometer Cu10 a=4270 — Cu100 a=4270: Resistance thermometer Cu100 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: Calendar Van Dusen coefficient set 1 — Cal. Van Dusen 2: Calendar Van Dusen coefficient set 2 — Cal. Van Dusen 3: Calendar Van Dusen coefficient set 3[1)] — Cal. Van Dusen 4: Calendar Van Dusen coefficient set 4[1)] — Cal. Van Dusen 5: Calendar Van Dusen coefficient set 5[1)] — off: Sensor channel deactivated (sensor 2 only)

1) only during communication log PROFIBUS PA

Menu / parameter	Description (continuation)
... / Device Setup	
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 allocation for the connection type two-wire Value range: 0 ... 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). — Without: no Thermocouple RJ — 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 ... 100 °C

9.9.2 Menu: Device Info

Menu / parameter	Description
... / Device Info	
Device ID	Displays the Device ID
Serial Number	Displays the Serial Number
Software Version	Displays the Software Version
Hardware Version	Displays the Hardware Version
TAG	Displays measuring point ID
Description	Displays a user-defined text
Operation Time	Displays the Operation Time

9.9.3 Menu: Communication

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

9.9.4 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.	Total: Total operating hours < -40 °C: Operating hours < -40 °C -40 to -20 °C: Operating hours – 40 °C to – 20 °C -20 to 0 °C: Operating hours – 20 °C to 0 °C 0 to 20 °C: Operating hours 0 to 20 °C 20 to 40 °C: Operating hours 20 to 40 °C 40 to 60 °C: Operating hours 40 to 60 °C 60 to 85 °C: Operating hours 60 to 85 °C > 85 °C: Operating hours > 85 °C
Communication	Displays the communication quality — Excellent — Very good — Good — Poor — None

... / ... / Device temperature	
min	Drag indicator: minimum device temperature
max	Drag indicator: maximum device temperature

... / ... / Sensor 1	
min	Drag indicator: minimum sensor temperature, sensor 1
max	Drag indicator: maximum sensor temperature, sensor 1

... / ... / Sensor 2	
min	Drag indicator: minimum sensor temperature, sensor 2
max	Drag indicator: maximum sensor temperature, sensor 2

9.9.5 Menu: Display

Menu / parameter	Description
... / Display	
Language	Selects the menu language — German — English
Contrast	Sets the display contrast Value range: 0 … 100 %
Operator Page 1	Select the „Operator Page 1“ submenu
Operator Page 2	Select the „Operator Page 2“ submenu

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

Menu / parameter	Description
... / ... / 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

9.9.6 Menu: Calibrate

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

9.10 Factory settings

Firmware settings

The transmitter is configured at the factory. The table below contains the relevant parameter values.

Menu	Description	Parameter	Factory Setting
Device Setup	Write protection	-	No
	Input Sensor 1	Sensor Type	Pt100 (IEC751)
		R-Connection	Three-wire
		Measured Range Begin[1)]	0
		Measured Range End[1)]	100
		Engineering Unit	Degrees C
		Damping	Off
Process Alarm		Fault signaling[1)]	Overrange 22 mA[1)]
	Input Sensor 2	Sensor Type	Off
	Input / output assignment	Measurement type	Sensor 1
	TAG	-	-
	HART Burstmode[1)]	-	TIXXX-[1)]
Display	Display Value	-	Process Variable
	Bargraph[1)]	-	Yes, output %[1)]
	Language	-	German
	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

1) Only applies to HART transmitters
2 Only applies to PROFIBUS PA transmitters
3) Only applies to FOUNDATION Fieldbus transmitters

10 Diagnosis / error messages

10.1 Diagnostic information

10.1.1 Monitoring of operating data

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

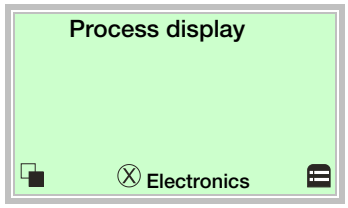
Value	Description
Supply voltage	Current supply voltage measured at the terminals of the transmitter in volts (± 5 %).
Max. elec. temp.	Highest internal temperature ever recorded that the transmitter has been exposed to, in °C. The value cannot be reset.
Min. elec. temp.	Lowest internal temperature ever recorded that the transmitter has been exposed to, in °C. The value cannot be reset.
Max. reading for sensors 1 / 2	Highest reading at 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	Lowest reading at 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.

10.1.2 Operating hours statistics

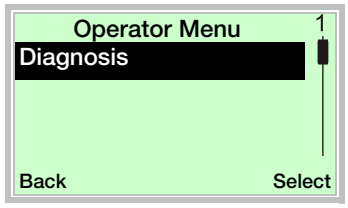
Value	Description
Operation Time	Total hours since commissioning that the supply voltage has been switched on for the transmitter.
Operation Time (in accordance with electronic unit temperature)	The operating hours are categorized according to the measured internal temperature of the transmitter. Due 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.

10.2 Calling up the error description

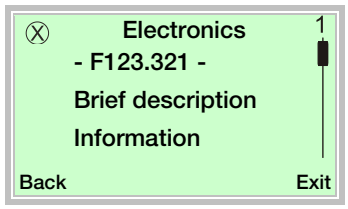
For PROFIBUS PA and FOUNDATION Fieldbus transmitters only.



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



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



The first line shows the area in which the error has occurred.
The second line shows the unique error number.
The next lines show a brief description of the error and information on how to remedy it.

NOTICE

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

10.3 Possible HART error messages

Range	Displays the device status	Displays the DIAG. NO.	Cause	Remedy
Electronics	F	1	Device defective	Replace the device
Electronics	S	2	Ambient temperature exceeded / 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) Span is too small C) Incorrect configuration data
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 compensation active	Terminate compensation
Installation / Configuration	C	75	Analog output in simulation	Terminate simulation
Operating conditions	S	76	Values exceeded	Check parameters: A) Sensor limits exceeded 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

NOTICE

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

10.4 Possible PROFIBUS PA and FOUNDATION Fieldbus error messages

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	Errors	Sensor 1: Rectify short-circuit or replace sensor 1
Sensor	S1 wire break	Errors	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	Errors	Sensor 2: Rectify short-circuit or replace sensor 2
Sensor	S2 wire break	Errors	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	Errors	Replace device
Electronics	Device not calibrated	Outside of the specification	Calibrate device
Electronics	Device being simulated	Function check	Terminate simulation
Electronics	Configuration error	Errors	Validate configuration
Sensor	Sensor 1 + 2 redundancy failure	Errors	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

NOTICE

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

11 Maintenance

⚠ WARNING

Risk of explosion!

Faulty transmitters may not be placed into operation by the user.

Repairs must be performed from ABB service.

For transmitters that are used as intended under normal operation, no maintenance is required.
No on-site repair or replacement of electronic parts is planned.

11.1 Cleaning

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

12 Repair

12.1 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 the Appendix) and include this with the device.
According to the EU Directive governing hazardous materials, the owner of hazardous waste is responsible for its disposal or must observe the following regulations for shipping purposes:
All devices delivered to ABB must be free from any hazardous materials (acids, alkalis, solvents, etc.).

Please contact Customer Center Service acc. to page 2 for nearest service location.

13 Recycling and disposal

13.1 Disposal

NOTICE

Products that are marked with this symbol may not be disposed of through municipal garbage collection points.

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:

- This product is not subject to WEEE Directive 2002/96/EC or relevant national laws (e.g. ElektroG in Germany).
- The product must be surrendered to a specialist recycling company. Do not use municipal garbage collection points. According to WEEE Directive 2002/96/EC, only products used in private applications may be disposed of at municipal garbage collection points.
- If it is not possible to dispose of old equipment properly, ABB Service can take receipt of and dispose of returns for a fee.

13.2 Information on ROHS Directive 2011/65/EC

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

14 Spare parts, consumables and accessories

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

15 Specifications

NOTICE

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

16 Declaration of conformity

NOTICE

Declarations of conformity of the device are available in the download center of ABB at www.abb.com/temperature. They are additionally enclosed with the device for ATEX certified devices.

17 Appendix

17.1 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:	E-Mail:

Device details:

Typ:	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	☐	Explosiv	☐	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

Notes

Contact us

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3KXT231001R4201
Original instruction

OI/TTH300-EN Rev. D 11.2017