Data Sheet
DS/TTH300-EN

Head mounted Temperature Transmitter TTH300

HART,
Pt100 (RTD), thermocouples,
galvanic isolation

- **Input**
  - Resistance thermometers
  - Thermocouples
  - Resistance-remote signalling unit (0 ... 5000 Ω))
  - Voltages, mV transmitter (-125 ... 1100 mV)
- **Input functionality**
  - 1 or 2 sensors (e.g. 2 x Pt100 3-L)
  - Sensor backup/redundancy
  - Sensor drift monitoring
- **Output**
  - 2-wire technique
  - 4 ... 20 mA temperature linear
  - HART signal
- **Measurement error**
  - 0,1 K
- **Specific linearization**
  - Callendar van Dusen coefficients
  - Customer specific curve / 32 tie points
- **Continuous sensor and self-monitoring**
  - Supply voltage monitoring
  - Wire break and corrosion monitoring (NE 89)
  - Extended diagnostics (NE 107)
- **Device safety in accordance with NE 53, NE 79**
- **Approvals for explosion protection**
  - intrinsically safe: ATEX EEx ia (Zone 0), FM, CSA
  - non-incendive: ATEX EEx n A
- **Configuration**
  - Display with TTH300 configuration function
  - FDT/DTM
  - SMART VISION DSV401
  - EDD

HART® FIELD COMMUNICATIONS PROTOCOL

Sensor adjustment
Redundancy 2 x Pt100 3-L
Sensor drift monitoring

Contents

1 Technical data

1.1 Input

1.1.1 Resistance

RTD resistance thermometer

Pt100 in acc. with DIN IEC 60751, JIS, MIL, Ni in acc. with DIN 43760, Cu (for additional information, see the section "Measuring accuracy")

Resistance measurement

0 … 500 Ω

0 … 5000 Ω

Sensor connections

2-, 3-, 4-wire circuit

Connecting cables

2-, 3-, 4-wire max. sensor line resistance (R_W) for each wire 50 Ω in acc. with NE 89 (March 2003);

(3-wire balanced, 2-wire circuit compensation up to 100 Ω sensor total line resistance)

Measurement current

< 300 µA

Sensor short-circuit

< 5 Ω (for RTD)

Sensor wire break (temperature resistance measurement 2-, 3-, 4-wire)

Measuring range 0 ... 500 Ω	> 0.6 ... 10 kΩ
Measuring range 0 ... 5 kΩ	> 5.3 ... 10 kΩ

Corrosion detection in accordance with NAMUR NE 89

3-wire resistance reading > 50 Ω

4-wire resistance reading > 50 Ω

1.1.2 Thermocouples/Voltages

Types

B, E, J, K, L, N, R, S, T, U, C, D

(see "Measuring accuracy")

Voltages

-125 mV ... 125 mV

-125 mV ... 1100 mV

Connecting cables

Max. sensor line resistance (R_W) for each line 1.5 kΩ, total 3 kΩ

Sensor wire break monitoring in accordance with Namur NE 89

pulsed with 1 µA outside the measurement interval

Thermoelement measurement	5.3 ... 10 kΩ
Voltage measurement	5.3 ... 10 kΩ

Input resistance

> 10 MΩ

Internal reference junction

Pt100, DIN IEC 60751 Cl. B

(no jumpers necessary)

Customer specific curve, 32-tie points

Resistance measurement up to max. 5 kΩ

Voltages up to max. 1.1 V

Sensor matching

via Callendar van Dusen coefficients

via table of 32 sampling points

via single point (offset adjustment)

via two point adjustment

Input functionality

1 Sensor

2 Sensors:

mean measurement

Differential measurement: Zero point where Ia = 4 mA

Differential measurement: Zero point where Ia = 12 mA

Sensor redundancy

Sensor fault signaling

RTD sensor:	Short circuit and wire break
Linear resistance measurement:	Wire break
Thermocouple:	Wire break
Linear voltage measurement:	Wire break

1.2 Output

Transmission characteristics

temperature linear

resistance linear

voltage linear

Output signal

Configurable 4 ... 20 mA (standard)

Configurable 20 ... 4 mA

(NE43 dynamic range: 3.8 ... 20.5 mA)

Simulation mode

3.5 ... 23.6 mA

Induced current consumption

< 3.5 mA

Maximum output current

23.6 mA

Configurable error current signal

override	22 mA (20.0 … 23.6 mA)
underdrive	3.6 mA (3.5 … 4.0 mA)

1.3 Power supply (polarity safe)

(2-wire technique; power lines = signal lines)

Supply voltage

Non ignition-proof application with or without LC display[1]:

U_S = 11 ... 42 V DC

Ignition-proof applications with or without LC display[1]:

U_S = 11 ... 30 V DC

[1] TTH300 with LC display, built into thermometer, see data sheets DS/TSP1X1 and DS/TSP3X1

Max. permissible residual ripple for supply voltage

Max. permissible ripple for supply voltage during communication in accordance with HART FSK "Physical Layer" specification, version 8.1 (08/1999) Section 8.1

Undervoltage detection

$U_{Terminal-Mu}$ < 10 V results in I_a = 3.6 mA

Max. load

R_{load} = (supply voltage: 11 V)/0.022 A

Max. load (Ω) depending on supply voltage (V DC)

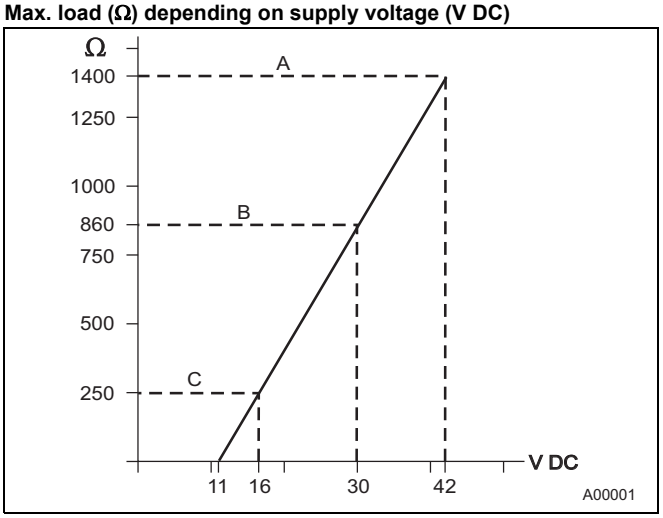

Fig. 1:

A TTH300
B TTH300 in EEx ia design
C HART communication resistance

Max. power consumption

P = U_S x 0.022 mA

e.g., U_s = 24 V $\rightarrow$ P_{max} = 0.528 W

2 General information

Galvanic isolation (input/output)	3.5 kV AC (approx. 2.5 KV DC) 60 s
MTBF time	28 years at 60 °C ambient temperature
Input filter	50 / 60 Hz
Switch-on delay	< 10 s (I_a ≤ 3.6 mA during starting cycle)
Warm-up time	5 min.
Responce time t90	400 … 1000 ms
Output update rate[1]	10/s with 1 sensor, 5/s with 2 sensors
Output filter	Digital filter 1st order: 0 ... 100 s

[1] depending on sensor type and sensor circuit

2.1 Ambient conditions

Ambient temperature:	Standard: -40 … 85 °C / -40 … 185 °F Optional: -50 … 85 °C / -58 … 185 °F For use with LC display HMI type A[1]: -20 … 70 °C / -4 … 158 °F For ignition-proof design, see prototype test certificate PTB 05 ATEX 2079.
Transport / storage temperature:	-40 … 85 °C / -40 … 185 °F
Climate class:	Cx (-40 … 85 °C / -40 … 185 °F, 5 … 95% relative humidity) DIN EN 60654-1
Max. permissible humidity:	100% relative humidity, (for isolated sensor terminals) condensation permitted in accordance with IEC 68-2-6
Vibration resistance*:	10 … 2000 Hz at 5 g acc. to IEC 68-2-6
Shock*:	gn = 30 in accordance with IEC 68-2-27
Earthquake resistance:	acc. to EN 1473
Type of protection:	IP20, or IP class of bay

* applies to operation and transport

[1] TTH300 with LC display, built into thermometer, see data sheets DS/TSP1X1 and DS/TSP3X1

2.2 Electromagnetic compatibility

Emitted interference in accordance with IEC 61326 (2002) and Namur NE21 (02/2004)

2.3 Interference immunity

Interference immune in accordance with IEC 61326 (2002) and Namur NE21 (02/2004)

Pt100: Measuring range 0 ... 100 °C, span 100 K

Type of test	Testing accuracy	Influence
Burst to signal/data lines	2 kV	< 0.5%
Static discharge		
• Contact plate (indirect)	8 kV	no
• Supply terminals[1]	6 kV	no
• Sensor terminals[1]	4 kV	no
Radiated field 80 MHz ... 2 GHz	10 V/m	< 0.5%
Coupling 150 kHz … 80 MHz	10 V	< 0.5%
Surge between the lines	0.5 kV	no malfunction
Line to earth	1 kV	no malfunction

[1] Air discharge (at 1 mm distance)

2.4 Measuring accuracy

Includes linearity deviation, reproducibility/hysteresis at 23 °C ± 5 K and 20 V supply voltage

Information on measuring accuracy corresponds to 3 σ (Gaussian distribution)

Input element		Measuring range limits	Minimum span	Digital measuring accuracy (24-bit A/D converter)	D/A accuracy[1] (16-bit DA)
Standard	**Sensor**				
Resistance sensors/potentiometer					
DIN IEC 60 751	RTD Pt10 (a=0,003850)	-200 ... 850 °C / -328 ... 1562 °F	10 °C / 18 °F	± 0,80 °C / ± 1,44 °F	± 0,05 %
	RTD Pt50 (a=0,003850)	-200 ... 850 °C / -328 ... 1562 °F	10 °C / 18 °F	± 0,16 °C / ± 0,29 °F	± 0,05 %
	RTD Pt100 (a=0,003850)[2]	**-200 ... 850 °C / -328 ... 1562 °F**	10 °C / 18 °F	± 0,08 °C / ± 0,14 °F	± 0,05 %
	RTD Pt200 (a=0,003850)	-200 ... 850 °C / -328 ... 1562 °F	10 °C / 18 °F	± 0,24 °C / ± 0,43 °F	± 0,05 %
	RTD Pt500 (a=0,003850)	-200 ... 850 °C / -328 ... 1562 °F	10 °C / 18 °F	± 0,16 °C / ± 0,29 °F	± 0,05 %
	RTD Pt1000 (a=0,003850)	-200 ... 850 °C / -328 ... 1562 °F	10 °C / 18 °F	± 0,08 °C / ± 0,14 °F	± 0,05 %
JIS C1604-81	RTD Pt10 (a=0,003916)	-200 ... 645 °C / -328 ... 1193 °F	10 °C / 18 °F	± 0,80 °C / ± 1,44 °F	± 0,05 %
	RTD Pt50 (a=0,003916)	-200 ... 645 °C / -328 ... 1193 °F	10 °C / 18 °F	± 0,16 °C / ± 0,29 °F	± 0,05 %
	RTD Pt100 (a=0,003916)	-200 ... 645 °C / -328 ... 1193 °F	10 °C / 18 °F	± 0,08 °C / ± 0,14 °F	± 0,05 %
MIL-T-24388	RTD Pt10 (a=0,003920)	-200 ... 850 °C / -328 ... 1562 °F	10 °C / 18 °F	± 0,80 °C / ± 1,44 °F	± 0,05 %
	RTD Pt50 (a=0,003920)	-200 ... 850 °C / -328 ... 1562 °F	10 °C / 18 °F	± 0,16 °C / ± 0,29 °F	± 0,05 %
	RTD Pt100 (a=0,003920)	-200 ... 850 °C / -328 ... 1562 °F	10 °C / 18 °F	± 0,08 °C / ± 0,14 °F	± 0,05 %
	RTD Pt200 (a=0,003920)	-200 ... 850 °C / -328 ... 1562 °F	10 °C / 18 °F	± 0,24 °C / ± 0,43 °F	± 0,05 %
	RTD Pt1000 (a=0,003920)	-200 ... 850 °C / -328 ... 1562 °F	10 °C / 18 °F	± 0,08 °C / ± 0,14 °F	± 0,05 %
DIN 43760	RTD Ni50 (a=0,006180)	-60 ... 250 °C / -76 ... 482 °F	10 °C / 18 °F	± 0,16 °C / ± 0,29 °F	± 0,05 %
	RTD Ni100 (a=0,006180)	-60 ... 250 °C / -76 ... 482 °F	10 °C / 18 °F	± 0,08 °C / ± 0,14 °F	± 0,05 %
	RTD Ni120 (a=0,006180)	-60 ... 250 °C / -76 ... 482 °F	10 °C / 18 °F	± 0,08 °C / ± 0,14 °F	± 0,05 %
	RTD Ni1000 (a=0,006180)	-60 ... 250 °C / -76 ... 482 °F	10 °C / 18 °F	± 0,08 °C / ± 0,14 °F	± 0,05 %
	RTD Cu10 (a=0,004270)	-50 ... 200 °C / -58 ... 392 °F	10 °C / 18 °F	± 0,80 °C / ± 1,44 °F	± 0,05 %
	RTD Cu100 (a=0,004270)	-50 ... 200 °C / -58 ... 392 °F	10 °C / 18 °F	± 0,08 °C / ± 0,14 °F	± 0,05 %
	Resistance measurement	0 ... 500 Ω	4 Ω	± 32 mΩ	± 0,05 %
	Resistance measurement	0 ... 5000 Ω	40 Ω	± 320 mΩ	± 0,05 %
Thermocouples[3]/voltages					
IEC 584	Type K (Ni10Cr-Ni5)	-270 ... 1372 °C / -454 ... 2502 °F	50 °C / 90 °F	± 0,35 °C / ± 0,63 °F	± 0,05 %
	Type J (Fe-Cu45Ni)	-210 ... 1200 °C / -346 ... 2192 °F	50 °C / 90 °F	± 0,35 °C / ± 0,63 °F	± 0,05 %
	Type N (Ni14CrSi-NiSi)	-270 ... 1300 °C / -454 ... 2372 °F	50 °C / 90 °F	± 0,35 °C / ± 0,63 °F	± 0,05 %
	Type T (Cu-Cu45Ni)	-270 ... 400 °C / -454 ... 752 °F	50 °C / 90 °F	± 0,35 °C / ± 0,63 °F	± 0,05 %
	Type E (Ni10Cr-Cu45Ni)	-270 ... 1000 °C / -454 ... 1832 °F	50 °C / 90 °F	± 0,35 °C / ± 0,63 °F	± 0,05 %
	Type R (Pt13Rh-Pt)	-50 ... 1768 °C / -58 ... 3215 °F	100 °C / 180 °F	± 0,95 °C / ± 1,71 °F	± 0,05 %
	Type S (Pt10Rh-Pt)	-50 ... 1768 °C / -58 ... 3215 °F	100 °C / 180 °F	± 0,95 °C / ± 1,71 °F	± 0,05 %
	Type B (Pt30Rh-Pt6Rh)	- 0 ... 1820 °C / +32 ... 3308 °F	100 °C / 180 °F	± 0,95 °C / ± 1,71 °F	± 0,05 %
DIN 43710	Type L (Fe-CuNi)	-200 ... 900 °C / -328 ... 1652 °F	50 °C / 90 °F	± 0,35 °C / ± 0,63 °F	± 0,05 %
	Type U (Cu-CuNi)	-200 ... 600 °C / -328 ... 1112 °F	50 °C / 90 °F	± 0,35 °C / ± 0,63 °F	± 0,05 %
ASTM E 988	Type C	- 0 ... 2315 °C / +32 ... 4200 °F	100 °C / 180 °F	± 1,35 °C / ± 2,43 °F	± 0,05 %
	Type D	- 0 ... 2315 °C / +32 ... 4200 °F	100 °C / 180 °F	± 1,35 °C / ± 2,43 °F	± 0,05 %
	Voltage measurement	-125 mV ... 125 mV	2 mV	± 12 µV	± 0,05 %
	Voltage measurement	-125 mV ... 1100 mV	20 mV	± 120 µV	± 0,05 %

[1] percentages refer to the configured measuring span
[2] Standard model
[3] include the internal reference junction error for digital accuracy: Pt100, DIN IEC 60751 Cl. B
[4] without reference junction error

Total accuracy = digital measuring accuracy [°C] + (D/A measuring accuracy [%] x I conf. measuring span [°C] I /100%)
(refer to the block diagram on next page)

Example 1:
Pt100 (IEC 60751), conf. measuring range 0 ... 100 °C, conf. measuring span = measurement end – measurement start = 100 °C
Digital measuring accuracy: ± 0,08 °C
D/A measuring accuracy ± 0.05% x (100 °C/100%) = ± 0,05 °C
Total accuracy: Digital accuracy + D/A accuracy; ± 0,08 °C + (± 0,05 °C) = ± 0,13 °C

Example 2:
Thermocouple type K, conf. measuring range 0 ... 1000 °C, conf. measuring span = measurement end – measurement start = 1000 °C
Digital measuring accuracy: ± 0,35 °C
D/A measuring accuracy ± 0.05% x (1000 °C/100%) = ± 0,50 °C
Total accuracy[4]: Digital accuracy + D/A accuracy; ± 0,35 °C + (± 0,50 °C) = ± 0,85 °C

Long-term drift
± 0.05 °C or ± 0.05%[1] per year, the larger value applies.

2.4.1 Block diagram

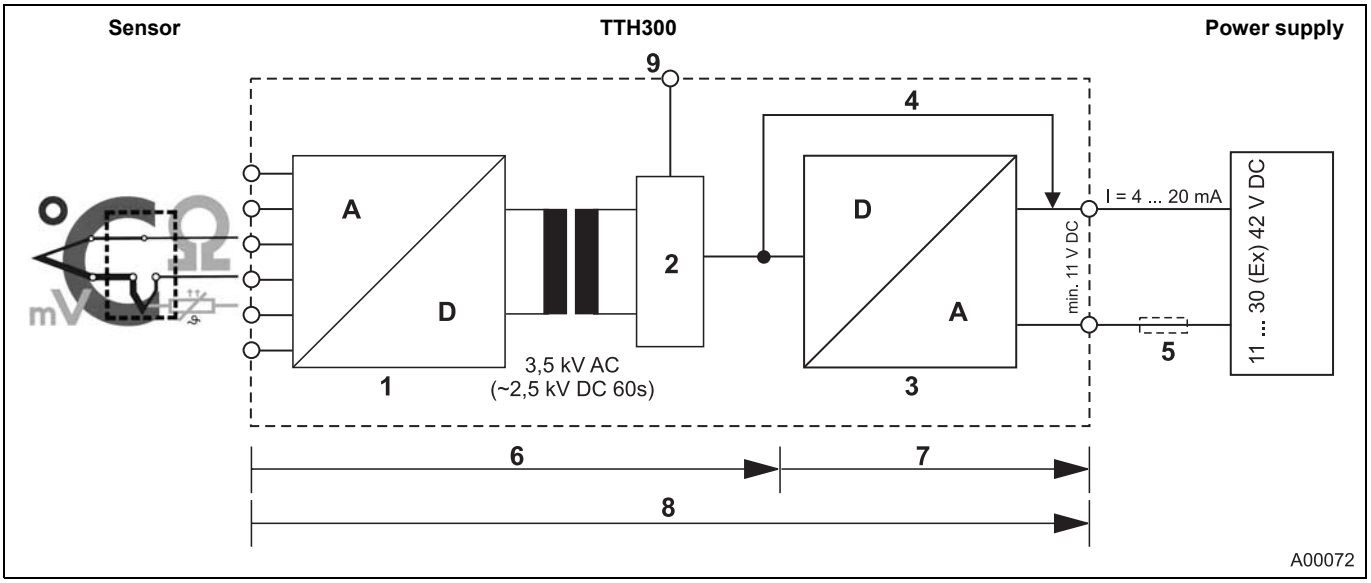

Fig. 1

1 24-bit A/D converter
2 Microcontroller
3 16-bit D/A converter
4 HART signal
5 Load (observe voltage drop, refer to the section "Terminal connection diagrams")
6 Digital accuracy
7 D/A accuracy
8 Overall accuracy
9 Display interface

2.5 Operating conditions

The percentages refer to the configured measuring span.

Supply voltage influence/load influence: within the specified limits for the voltage/load the total influence is less than 0.001% per volt

Common-mode interference no influence up to 100 V Veff (50 Hz) or 50 VDC

Ambient temperature influence: based on 23 °C / 73.4 °F (ambient temperature range: -40 ... 85 °C / -40 °F ... 185 °F)

Sensor	**Ambient temperature influence For 1 °C / 1.8 °F dev. to 23 °C / 73,4 °F for digital readings**	**Ambient temperature influence[1)] For 1 °C / 1.8 °F dev. to 23 °C / 73,4 °F for D/A converter**
2-, 3-, 4-wire circuit		
RTD Pt10 IEC, JIS, MIL	± 0.04 °C / ± 0.072 °F	± 0.003 %
RTD Pt50 IEC, JIS, MIL	± 0.008 °C / ± 0.014 °F	± 0.003 %
RTD Pt100 IEC, JIS, MIL	± 0.004 °C / ± 0.007 °F	± 0.003 %
RTD Pt200 IEC, MIL	± 0.02 °C / ± 0.036 °F	± 0.003 %
RTD Pt1000 IEC, MIL	± 0.004 °C / ± 0.007 °F	± 0.003 %
RTD Ni50 DIN 43760	± 0.008 °C / ± 0.014 °F	± 0.003 %
RTD Ni100 DIN 43760	± 0.004 °C / ± 0.007 °F	± 0.003 %
RTD Ni120 DIN 43760	± 0.003 °C / ± 0.005 °F	± 0.003 %
RTD Ni1000 DIN 43760	± 0.004 °C / ± 0.007 °F	± 0.003 %
Resistance measurement 0 ... 500 Ω	± 0.002 Ω	± 0.003 %
Resistance measurement 0 ... 5000 Ω	± 0.02 Ω	± 0.003 %
Thermoelement for all defined types	± [(0.001% x (ME[mV] / MS[mV]) + (100% x (0.009 °C / MS [°C])] [1)]	± 0.003 %
Voltage measurement		
-125 ... 125 mV	± 1.5 µV	± 0.003 %
-125 ... 1100 mV	± 15 µV	± 0.003 %

[1)] percentages refer to the configured measuring span
ME - Measuring end, MS - Measuring span

Example 1
Pt100 configured measuring range 0 ... 100 °C, (measuring span 100 °C), ambient temperature 33 °C
Dev. from standard temperature: 33 ... 23 °C (reference) = 10 °C
Affect of ambient temperature on digital measurement: 10 °C x ± 0.004 °C / °C = ± 0.04 °C
Affect of ambient temperature on D/A converter: 10 °C x (± 0.003 % / °C) x (100 °C / 100 %) = ± 0.03 °C

Example 2
TC type K, conf. measuring range 0 ... 1000 °C, (measuring span 1000 °C), ambient temperature 33 °C
Measuring start 0 °C corresponds to 0.0 mV; measuring end = 1000 °C corresponds to 41.6 mV; measuring span = 1000 °C or 41.6 mV
Dev. from standard temperature: 33 ... 23 °C (reference) = 10 °C
Affect of ambient temperature on digital measurement: 10 °C x [(± 0.001% x 41.6 mV / 41.6 mV) + (100% x ± 0.009 °C / 1000°C)] x (1000°C / 100%)] / °C = ± 0.19 °C
Affect of ambient temperature on D/A converter: 10 °C x [± 0.003 % x 1000 °C / 100 %] / °C = ± 0.3 °C

Worst case total error analysis
Max. possible total error = SQR [(digital accuracy)^2 + (D/A accuracy) + (digital value temp. influence) + (D/A temp. influence)]
Example 1: Pt100, 0 ... 100°C at 33 °C ambient temperature = $\sqrt{(0.08\,°C)^2 + (0.05\,°C)^2 + (0.04\,°C)^2 + (0.03\,°C)^2} = 0.10\,°C$
Example 2: Thermoelement type K, 0 ... 1000 °C at 33 °C ambient temperature = $\sqrt{(0.35\,°C)^2 + (0.50\,°C)^2 + (0.19\,°C)^2 + (0.3\,°C)^2} = 0.70\,°C$
(without reference junction error)

2.6 Mechanical design

Dimensions:	Refer to dimensioned drawings
Weight:	50 g
Material:	• Housing: Makrolon • Color: gray RAL9002 • Sealing compound: Polyurethane
Installation conditions:	• Installation position: No limitations • Installation options: Connection heads acc. to DIN 43729 form B, field-mount housing
Electrical connection:	• Terminals (captive screws) incl. soldering tags • Lines up to max. 1.5 mm^2 • Connection for HART hand-held operator terminals

3 Communication

HART protocol version 5

The system is registered with the HART Communication Foundation.

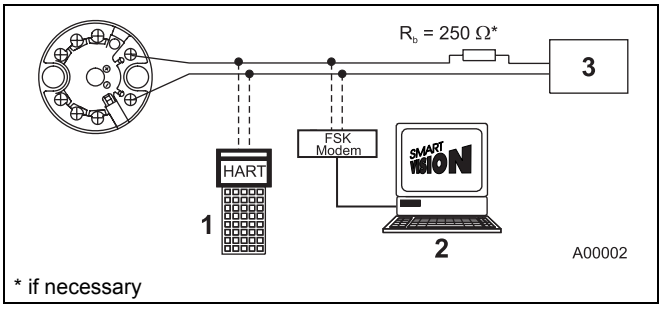

Fig. 2

1 Hand-held terminal
2 FDT/DTM technology
3 Ground connection (optional)
4 Power supply (process interface)

Operating modes

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

Configuration options and tools

Driver-independent:

- HMI indicator type A with configuration function

Driver-dependent:

- Device management/asset management tools
- FDT/DTM technology
- DSV401 (SMART VISION) via TTX300-DTM driver
- EDD

Configuration parameters

Measurement type

- Sensor type, connection type
- Fault signaling
- Measuring range
- General information, e.g., TAG number
- Damping
- Warning and alarm limits
- Signal simulation of output
- See "Order form configuration"

Write protection

- Software write protection via HART/indicator

Diagnostic information (NE107)

Standard

- Sensor error (wire break or short circuit)
- Device error
- Over/under alarm limits
- Over/under measuring range
- Simulation activated

Extended mode

- Redundancy/sensor backup active (in case sensor fails) with configurable analog alarm pulse signaling (see the operating instructions)
- Drift monitoring with configurable alarm pulse signaling (see the operating instructions)
- Sensor/sensor line corrosion
- Supply voltage undershoot
- Drag indicator for sensor 1, sensor 2 and ambient temperature
- Ambient temperature overshoot (> 85 °C)
- Ambient temperature undershoot (< 40°C)
- Operating hours counter

4 Explosion-protection relevant information

4.1 TTH300-E1… (intrinsically safe)

Approved for use in zone 0.

Designation:

- II 1G EEx ia IIC T6 (Zone 0)
- II 2 (1) G EEx [ia] ib IIC T6 (zone 1 [0])
- II 2 G (1D) Ex [iaD] ib IIC T6 (zone 1 [20])

Note
The Ex or ignition-proof designation is provided on the name plate.

EC prototype test certificate: Refer to PTB 05 ATEX2017 X.

Temperature table

Temperature class	Permissible ambient temperature range	
	Device category 1 use	Device category 2 use
T6	-50 … 44 °C	-50 … 56 °C
T5	-50 … 56 °C	-50 … 71 °C
T4	-50 … 84 °C	-50 … 85 °C

Safety-relevant data

Intrinsically safe EEx ia IIC explosion protection

	Supply circuit	Measurement current circuit / passive transducer (RTD)	Measurement current circuit / active transducer (RTD)	Display interface
Max. voltage	U_i = 30 V	U_o = 6,5 V	U_o = 1,2 V	U_o = 6,2 V
Short-circuit current	I_i = 130 mA	I_o = 25 mA	I_o = 50 mA	I_o = 65,2 mA
Max. power	P_i = 0,8 W	P_o = 38 mW	P_o = 60 mW	P_o = 101 mW
Internal inductance	L_i = 0,5 mH	L_i = 0 mH	L_i = 0 mH	L_i = 0 mH
Internal capacitance	C_i = 5 nF	C_i = 49 nF	C_i = 49 nF	C_i = 0 nF
Maximum permissible external inductance		L_o= 5 mH	L_o = 5 mH	L_o= 5 mH
Maximum permissible external capacitance		C_o= 1,55 µF	C_o= 1,05 µF	C_o= 1,4 µF

4.2 TTH300-E2… (nonincendive)

Approved for use in zone 2.

Designation:

- II 3 G EEx n A II T6

Note
The Ex or ignition-proof designation is provided on the name plate.

ABB statement of conformity in accordance with ATEX directive

Temperature table

Temperature class	Device category 2 use
T6	-50 … 56 °C
T5	-50 … 71 °C
T4	-50 … 85 °C

CSA and FM approvals

Intrinsically Safe

FM	Class I, Div. 1 + 2, Groups A, B, C, D T6 Class II, Groups E, F, G; Class III Class I, Zone 0, AEx ia IIC T6 Product variant: TTF300-L1 Control drawing: 214832
CSA	Class I, Div. 1 + 2, Groups A, B, C, D Class II, Groups E, F, G; Class III Product variant: TTF300-R1 Control drawing: 214825

Non-incendive

FM	Class I, Div. 2, Groups A, B, C, D (Class II, Groups E, F, G; Class III Product variant: TTF300-L2 Control drawing: 214830 (IS & non-incendive) Control drawing: 214828 (non-incendive)
CSA	Class I, Div. 2, Groups A,B,C,D (Class II, Groups E, F, G; Class III Product variant: TTF300-R2 Control drawing: 214827 (IS & non-incendive) Control drawing: 214895 (non-incendive)

SIL: Functional safety (optional)

acc. to IEC 61508.
Device with certificate of conformity for use in safety-relevant applications, including SIL Level 2.
For additional information, refer to the safety manual for the TTH300/TTF300.

5 Approvals

CE mark:

The TTH300 meets all requirements for the CE mark in accordance with IEC 61326 (2002).

Low voltage directive:

The TTH300 complies with low voltage directive 73/72/EC.

Ignition protection:

The TTH300 meets requirements for ATEX, FM and CSA. For additional information, refer to the section "Explosion-protection relevant information").

6 Terminal connection diagrams

RTD resistance sensors

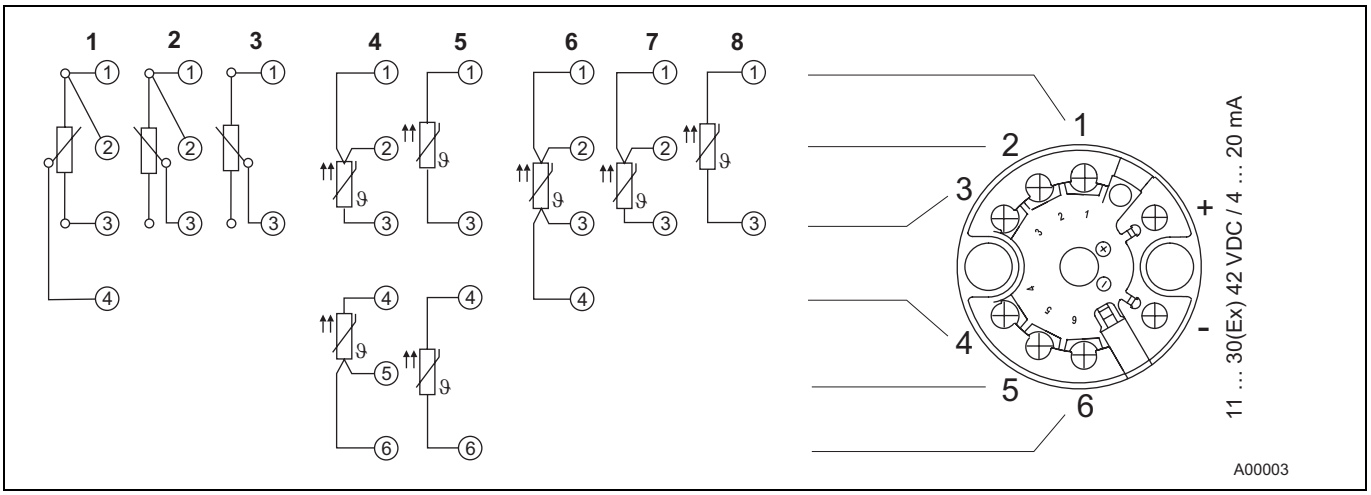

Fig. 3

Potentiometer: 0 … 500 Ω or 0 … 5000 Ω

1 Potentiometer, 4-wire circuit
2 Potentiometer, 3-wire circuit
3 Potentiometer, 2-wire circuit

4 2 x RTD, 3-wire circuit (sensor backup/redundancy, sensor drift monitoring, average value or differential temperature measurement)
5 2 x RTD, 2-wire circuit (sensor backup/redundancy, sensor drift monitoring, average value or differential temperature measurement)

6 RTD, 4-wire circuit
7 RTD, 3-wire circuit
8 RTD, 2-wire circuit

Thermocouples/Voltages

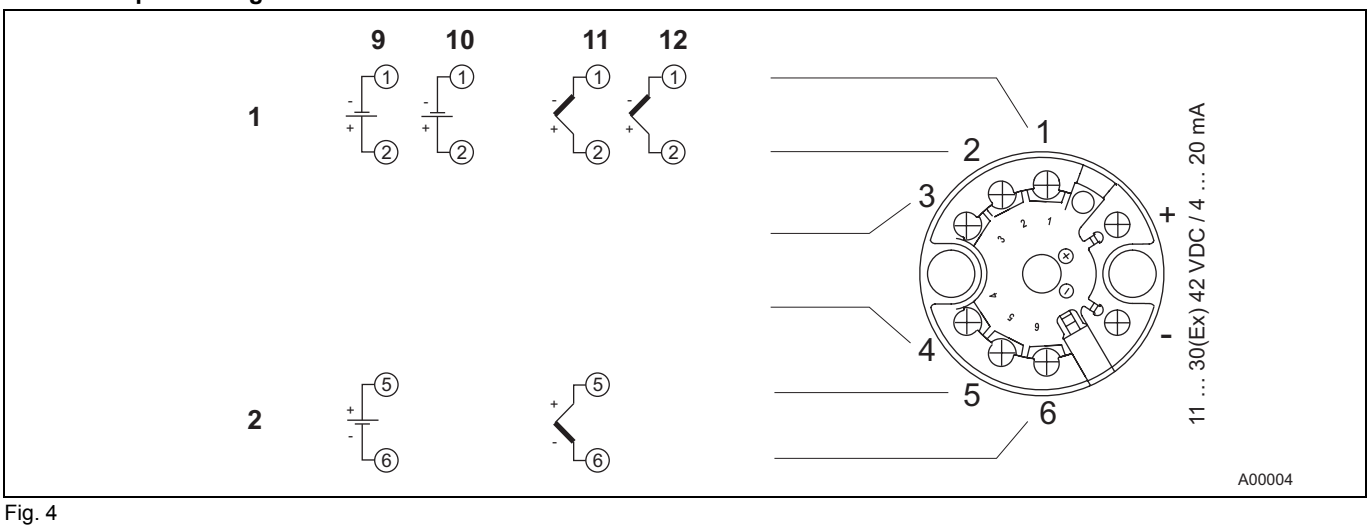

Fig. 4

1 Sensor 1
2 Sensor 2

9 2 x voltage measurement (sensor backup/redundancy, sensor drift monitoring, average value or differential temperature measurement)
10 Voltage measurement

11 2 x thermocouple (sensor backup/redundancy, sensor drift monitoring, average value or differential temperature measurement)
12 Thermocouple

RTD/thermocouples configuration

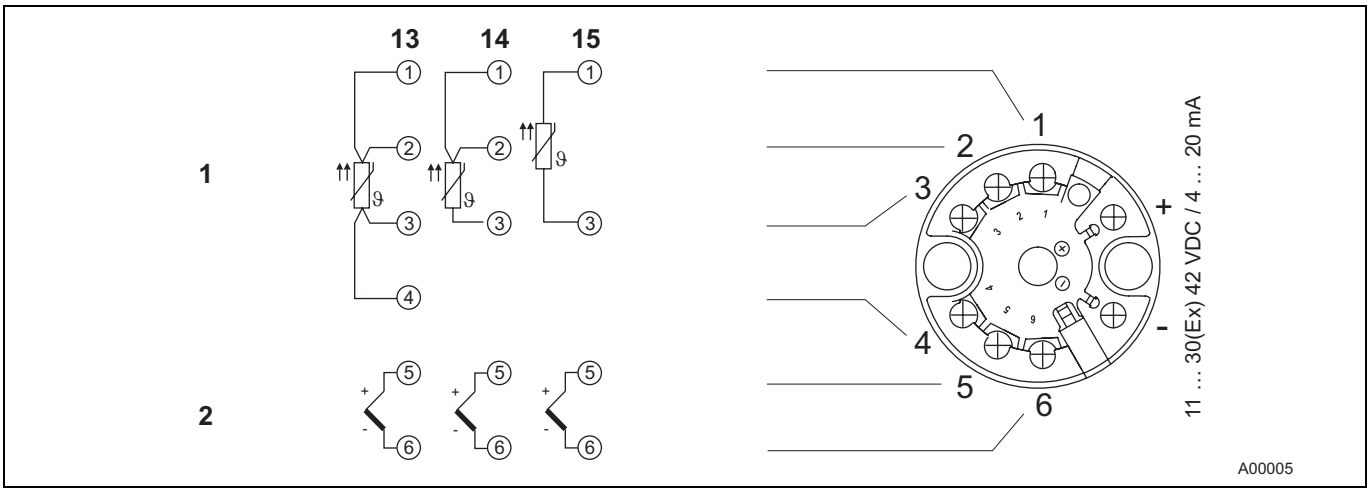

Fig. 5

1 Sensor 1
2 Sensor 2

13 1 x RTD, 4-wire circuit and thermocouple (sensor backup/redundancy, sensor drift monitoring, average value or differential temperature measurement)
14 1 x RTD, 3-wire circuit and thermocouple (sensor backup/redundancy, sensor drift monitoring, average value or differential temperature measurement)
15 1 x RTD, 2-wire circuit and thermocouple (sensor backup/redundancy, sensor drift monitoring, average value or differential temperature measurement)

7 Dimensioned drawing

7.1 TTH300

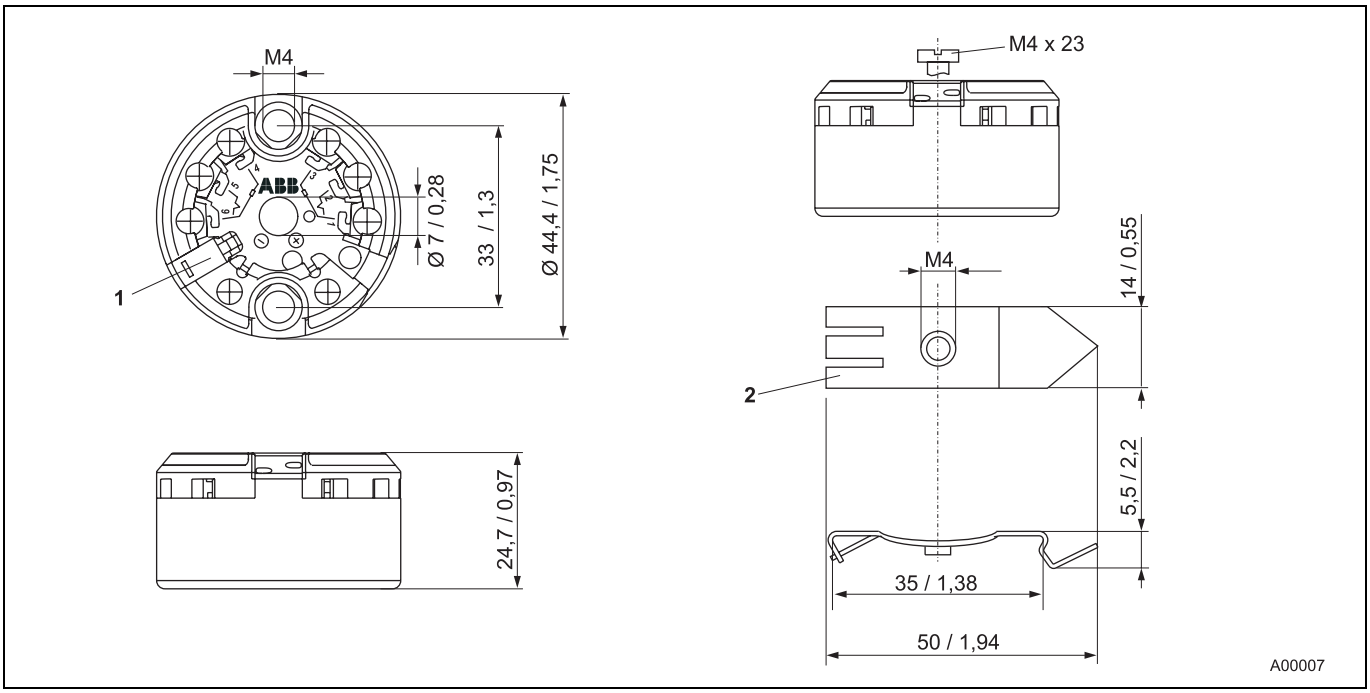

Fig. 6: Measurements in mm/inches

1 Latching base for 35 mm mounting rails acc. to EN 60175

8 Ordering information

Head mounted Temperature Transmitter			Variant digit No.	1 - 7	8 9	Code			
TTH300			Catalog No.	**TTH300-**					
Explosion Protection									
TTH300	Without explosion protection				Y 0				
Type of protection: intrinsically safe ATEX									
TTH300	ATEX	Zone 0:	II 1 G EEx ia IIC T6		E 1				
		Zone 1 (0):	II 2 (1) G EEx [ia] ib IIC T6						
		Zone 1 (20):	II 2 G (1D) Ex [iaD] ib IIC T6						
Type of protection: non sparking (nA) ATEX									
TTH300	ATEX	Zone 2:	II 3 G EEx nA II T6		E 2				
Type of protection: intrinsically safe FM & CSA									
TTH300	FM	IS, Class I, Div. 1+2, Groups A, B, C, D			L 1				
		Class I, Zone 0, AEx ia IIC T6							
	FM	nonincendive, Class I, Div. 2, Groups A, B, C, D			L 2				
TTH300	CSA	IS, Class I, Div. 1+2, Groups A, B, C, D			R 1				
	CSA	nonincendive, Class I, Div. 2, Groups A, B, C, D			R 2				

Additional ordering information

		Code			
Configuration					
Customer specific configuration with report, except user curve (i. e. TAG number)		BF			
Customer specific configuration with report, including user curve		BG			
Certificates					
SIL2 - Declaration of conformity		CS			
Calibration Certificate					
With 5-point works calibration certificate		EM			
Extended Ambient Temperature range	-50 ... 85 °C 1)	SE			
Customer specific model acc. to NL no.	(please specify)	Z9			

Accessories

	Catalog No.	Code			
Snap-on fixing set for 35 mm rail acc. to EN 60175 (incl. fixing screw) pack with 10 pcs.	3KXT231310L0001				

1) Not available with Explosion Protection code L1, L2, R1, R2

9 Order form configuration

Information on customer-specific configuration of temperature transmitter TTH300.

Configuration		Selection
Number of sensors		☐ **1 senso**r (standard) ☐ 2 sensors
Measurement type (for 2-sensor selection only)		☐ Redundancy/sensor backup ☐ Sensor drift monitoring .....°C / K Sensor drift differential ....s time limit for drift overshoot ☐ Differential measurement: Zero point where Ia = 4 mA ☐ Differential measurement: Zero point where Ia = 12 mA ☐Mean
DIN IEC 60 751 JIS C1604-81 MIL-T-24388 DIN 43760 Cu	RTD	☐ Pt10 ☐ Pt50 ☐ **Pt100** (standard) ☐ Pt200 ☐ Pt500 ☐ Pt1000 ☐ Pt10 ☐ Pt50 ☐ Pt100 ☐ Pt10 ☐ Pt50 ☐ Pt100 ☐ Pt200 ☐ Pt1000 ☐ Ni50 ☐ Ni100 ☐ Ni120 ☐ Ni1000 ☐ Cu10 ☐ Cu100
	Linear Resistance measurement	☐ 0 … 500 Ω ☐ 0 … 5000 Ω
IEC 584 DIN 43710 ASTME 988	Thermocouple	☐ Type K ☐Type J ☐Type N ☐Type R ☐Type S ☐ Type T☐ Type E ☐Type B ☐Type L ☐Type U ☐Type C ☐Type D
	Linear voltage measurement	☐ -125 mV … 125 mV ☐ -125 mV … 1100 mV
Sensor circuit (for RTD + resistance measurement only)		☐2-wire ☐ **3-wire** (standard) ☐4-wire 2-wire circuit: Compensation of sensor-wire resistance max. 100 Ω ☐ Sensor 1: .....Ω ☐ Sensor 1: .....Ω
Reference junction (for thermocouples only)		☐ Internal (for standard thermocouple, except type B) ☐ no (TC type B) ☐ External/temp.:.....°C
Measuring range		☐Measurement start: ..... (Standard: **0**) ☐Measurement end: ..... (Standard: **100**)
Unit		☐ **Celsius** (standard) ☐Fahrenheit ☐Rankine ☐Kelvin
Characteristic behaviour		☐ **rising 4...20mA** (standard) ☐ falling 20....4mA
Failure signalisation		☐ **Overrange/22 mA** (standard) ☐ Underrange/3.6 mA
Damping (T_{63})		☐ **Off** (standard) ☐Seconds (1 sec. … 100 sec.)
Sensor number		☐ Sensor 1..... ☐ Sensor 2.....
Resistor value at 0°C / R_o Callendar van Dusen coefficient A Callendar van Dusen coefficient B Callendar van Dusen coefficient C (optional for RTD/Pt sensors only)		Sensor 1: R_o: ..... Sensor 2: R_o: ..... A: …… A: …… B: …… B: …… C: …… C: ……
User characteristics based on linearization table		☐ based on attached table of variate pairs
TAG number		☐ ... . (max. 8 characters)
Software write protection		☐ **Off** (standard) ☐ On
"Maintenance required" alarm pulse or continuous signaling (NE107)		☐ **Off** (standard) pulse width .....s (0.5 .... .59.5 s increment 0.5 s) ☐ continuous signal

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