

TTF300

Field-mount temperature transmitter

Temperature transmitter for all communication protocols.
ABB common operating concept.
Redundancy when two sensors are connected.

Measurement made easy



Communication / output

- 4 to 20 mA, HART protocol, rev. 5 and rev. 7 switchable
- PROFIBUS PA
- FOUNDATION Fieldbus

Input

- RTD, resistance thermometers, resistance-type remote sensor
- Thermocouples, voltages, mV voltages

Electrical isolation of input circuit and output circuit

Input functionality

- 1 or 2 sensors
- 2 x Pt100 three wire circuit

Specific linearization

- Callendar-Van Dusen coefficients
- Table of variate pairs / 32 points

Continuous sensor monitoring and self-monitoring

- Supply voltage monitoring
- Wire break and corrosion monitoring in accordance with NE 89
- Extended diagnostics in accordance with NE 107
- Sensor drift monitoring

Functional safety

- SIL 2 / SIL 3 in accordance with IEC 61508 (for HART)

Device safety in accordance with NE 53 and NE 79

Configuration

- FIM, DTM, EDD
- Local LCD display with push buttons (optional)

Global approvals for explosion protection

- ATEX, IECEx, Zone 0
- FM, CSA
- GOST, EAC Ex
- Inmetro, NEPSI, KOSHA

For use in harsh environment

- Housing degree of protection IP 66 and IP 67, NEMA 4X, ENCL 4X
- Housing material: Aluminum or stainless steel (SST)
- Robust design of electrical connections
- Ambient temperature -40 to 85 °C

SW write protection, HW write protection

Service interface

TTF300

Field-mount temperature transmitter

Specifications

CE marking

- The device fulfills all requirements for CE marking in accordance with all applicable guidelines.

Electrical separation

- 3.5 kV DC (approx. 2.5 kV AC), 60 s, input to output

MTBF time

- 28 years at 60 °C ambient temperature

Input filter

- 50 / 60 Hz

Switch-on delay

- HART: < 10 s (I_a 3.6 mA during switch-on cycle)
- PROFIBUS: 10 s, max. 30 s
- FOUNDATION Fieldbus: < 10 s

Warm-up time

- 5 minutes

Rise time t_{90}

- 400 ... 1000 ms

Measured value update

- 10/s with 1 sensor, 5/s with 2 sensors, depending on sensor type and sensor circuit

Output filter

- Digital filter 1st order: 0 ... 100 s

Weight

- Die-cast aluminum: 1.25 kg (2.75 lb)
- Stainless steel: 2.75 kg (6.1 lb)

Material

- Housing: die-cast aluminum, epoxy-coated
- Color: gray RAL9002
- Stainless steel

Installation conditions

- Mounting position: no restrictions

Electrical connection

- Thread (selectable) 2 x M20 x 1.5 / 2 x 1/2" NPT / 2 x 3/4" NPT (via reducing piece),
- Ground screw external 6 mm², M5 internal 2 x 2.5 mm², M4 terminals for lines up to max 2.5 mm² and hand held terminal interface

Plastic cable gland 2 x M20 1.5:

- Cable outer diameter 6 ... 12 mm (0.24 ... 0.47 inch), Ex: 5 ... 10 mm (0.2 ... 0.39 inch)
- Temperature range -30 ... 80 °C (-22 ... 176 °F), Ex: -20 ... 80 °C (-4 ... 176 °F)
- For non-Ex
Polyamide gray
- For intrinsic safety design, Non-incendive and dust explosion protection-Ex
Polyamide, blue

Metal cable gland (2 x M20 x 1.5 / 2 x 1/2" NPT):

- Flameproof enclosure, explosion proof
- Cable outer diameter 3.2 ... 8.7 mm (0.13 ... 0.34 inch)
- Temperature range: -50 ... 85 °C (-58 ... 185 °F)
- Additional cable outer diameters upon request

Lightning protection

- For cable gland M20 x 1.5 (see data sheet 10/63-6.15)
- Non-Ex: type NGV220-NO
- Intrinsic safety: type NGV220-EX

Dimensions

See chapter "Dimensions" on page 13.

Ambient conditions

Ambient temperature

- Standard: -40 ... 85 °C (-40 ... 185 °F)
- Optional: -50 ... 85 °C (-58 ... 185 °F)
- Restricted range during operation with explosion-proof design: see corresponding certificate

Transport / storage temperature

- -50 ... 85 °C (-58 ... 185 °F)

Climate class in accordance with DIN EN 60654-1

- Cx -40 ... 85 °C (-40 ... 185 °F) at 5 ... 95 % relative humidity

Max. permissible humidity in accordance with IEC 60068-2-30
 — 100 % relative humidity

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

Shock in accordance with IEC 68-2-27
 — gn = 30, during operation and transport

IP rating
 — IP 66 and IP 67, NEMA 4X, ENCL 4X

Electromagnetic compatibility

Emitted interference in accordance with IEC EN 61326 (2006) and Namur NE 21 (08/2007).

Interference immune in accordance with IEC 61326 (2006) and Namur NE 21 (08/2007)

Pt100: measuring range 0 ... 100 °C (32 ... 212 °F), span 100 K

Type of test	Testing accuracy	Effect
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 supply lines	0,5 kV	No malfunction
Line to ground	1 kV	

1) Air discharge (at 1 mm (0.04 inch) distance)

SIL functional safety

Conforms with IEC 61508 as regards use in safety related applications, up to and including SIL 3 (redundant). While using the transmitter, the device fulfills the requirements in accordance with SIL 2. While using two redundant transmitters, the device fulfills the requirements in accordance with SIL 3. Applicable only for HART variant.

Type B LCD indicator

CE marking
 — The type B LCD display fulfills all requirements for CE marking in accordance with all applicable guidelines.

Properties

Transmitter-controlled graphic (alphanumeric)

LCD display

- Character height, mode-dependent
- Sign, 4 digits, 2 decimal places
- Bar graph display

Display options

- Sensor 1 process value
- Sensor 2 process value
- Electronics / ambient temperature
- Output value
- Output %

Diagnosis diagnosis information with respect to Transmitter and sensor status

Specifications

Temperature range

- -20 ... 70 °C (-4 ... 158 °F)

Restricted display function (contrast, reaction time) in the temperature ranges:

- -50 ... -20 °C (-58 ... -4 °F)
- or
- 70 ... 85 °C (158 ... 185 °F)

Humidity

- 0 ... 100 %, condensation permitted

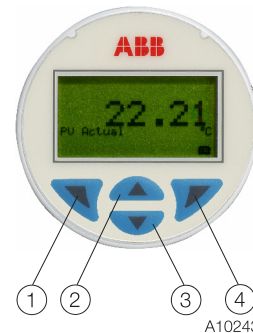


Fig. 1: Type B LCD display
 ① Leave / Abort ② Backwards ③ Forwards ④ Select

TTF300

Field-mount temperature transmitter

Configuration function

- Sensor configuration for standard sensors
- Measuring range
- Behavior in the event of a fault (HART)
- Software write protection for configuration data
- Device address for HART and PROFIBUS PA

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 μ A

Sensor short circuit < 5 Ω (for resistance thermometers)

Sensor wire break

- Measuring range: 0 ... 500 Ω > 0.6 ... 10 k Ω
- Measuring range 0 ... 5 k Ω > 5.3 ... 10 k Ω

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 k Ω per wire, 3 k Ω in total

Sensor wire break monitoring in accordance with NE 89

- Pulsed with 1 μ A outside measurement interval
- Thermocouple measurement 5.3 ... 10 k Ω
- Voltage measurement 5.3 ... 10 k Ω

Input resistance > 10 M Ω

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 k Ω
- 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 Value¹⁾)
- 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 structure¹⁾

- 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 value²⁾)
- 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

TTF300

Field-mount temperature transmitter

Power supply

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

i NOTICE

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

Power supply - HART

Input terminal voltage

- Non-Ex application:
 $U_S = 11 \dots 42 \text{ V DC}$
- Ex applications:
 $U_S = 11 \dots 30 \text{ V DC}$

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 $I_a \leq 3.6 \text{ mA}$.

Maximum load

- $R_B = (\text{supply voltage} - 11 \text{ V}) / 0.022 \text{ A}$

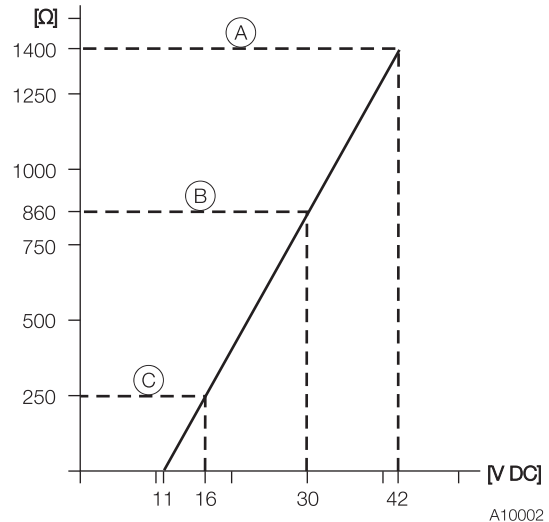


Fig. 2: Maximum load depending on input terminal voltage

(A) TTF300 (B) TTF300 In Ex ia hazardous area design (C) HART communication resistance

Maximum power consumption

- $P = U_S \times 0.022 \text{ A}$
- e. g. $U_S = 24 \text{ V} \rightarrow P_{\max} = 0.528 \text{ W}$

Power supply - PROFIBUS / FOUNDATION Fieldbus

Input terminal voltage

- Non-Ex application:
 $U_S = 9 \dots 32 \text{ V DC}$
- Ex applications:
 $U_S = 9 \dots 17.5 \text{ V DC (FISCO)}$
 $U_S = 9 \dots 24 \text{ V DC (Fieldbus Entity model I.S.)}$

Current consumption $\leq 12 \text{ mA}$

Measuring accuracy

Includes Linearity error, repeatability / hysteresis at 23 °C (73.4 °F) ± 5 K and 20 V supply voltage.

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

Sensor		Measuring range limits	Minimum span	Digital measuring accuracy (24-Bit AD-converter)	D / A measuring accuracy ¹⁾ (16-Bit D / A)
Resistance thermometer/resistor					
DIN IEC 60751	Pt10 (a=0.003850)	-200 ... 850 °C (-328 ... 1562 °F)	10 °C (18 °F)	± 0.80 °C (± 1.44 °F)	± 0.05 %
	Pt50 (a=0.003850)			± 0.16 °C (± 0.29 °F)	± 0.05 %
	Pt100 (a=0.003850) ²⁾			± 0.08 °C (± 0.14 °F)	± 0.05 %
	Pt200 (a=0.003850)			± 0.24 °C (± 0.43 °F)	± 0.05 %
	Pt500 (a=0.003850)			± 0.16 °C (± 0.29 °F)	± 0.05 %
	Pt1000 (a=0.003850)			± 0.08 °C (± 0.14 °F)	± 0.05 %
JIS C1604	Pt10 (a=0.003916)	-200 ... 645 °C (-328 ... 1193 °F)	10 °C (18 °F)	± 0.80 °C (± 1.44 °F)	± 0.05 %
	Pt50 (a=0.003916)			± 0.16 °C (± 0.29 °F)	± 0.05 %
	Pt100 (a=0.003916)			± 0.08 °C (± 0.14 °F)	± 0.05 %
MIL-T-24388	Pt10 (a=0.003920)	-200 ... 850 °C (-328 ... 1562 °F)	10 °C (18 °F)	± 0.80 °C (± 1.44 °F)	± 0.05 %
	Pt50 (a=0.003920)			± 0.16 °C (± 0.29 °F)	± 0.05 %
	Pt100 (a=0.003920)			± 0.08 °C (± 0.14 °F)	± 0.05 %
	Pt200 (a=0.003920)			± 0.24 °C (± 0.43 °F)	± 0.05 %
	Pt1000 (a=0.003920)			± 0.08 °C (± 0.14 °F)	± 0.05 %
DIN 43760	Ni50 (a=0.006180)	-60 ... 250 °C (-76 ... 482 °F)	10 °C (18 °F)	± 0.16 °C (± 0.29 °F)	± 0.05 %
	Ni100 (a=0.006180)			± 0.08 °C (± 0.14 °F)	± 0.05 %
	Ni120 (a=0.006180)				± 0.05 %
	Ni1000 (a=0.006180)				± 0.05 %
OIML R 84	Cu10 (a=0.004270)	-50 ... 200 °C (-58 ... 392 °F)	10 °C (18 °F)	± 0.80 °C (± 1.44 °F)	± 0.05 %
	Cu100 (a=0.004270)			± 0.08 °C (± 0.14 °F)	± 0.05 %
	Resistance measurement	0 ... 500 Ω	4 Ω	± 32 mΩ	± 0.05 %
		0 ... 5000 Ω	40 Ω	± 320 mΩ	± 0.05 %
Thermocouples ³⁾ /voltages					
IEC 60584	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)			± 0.05 %
	Type N (Ni14CrSi-NiSi)	-270 ... 1300 °C (-454 ... 2372 °F)			± 0.05 %
	Type T (Cu-Cu45Ni)	-270 ... 400 °C (-454 ... 752 °F)			± 0.05 %
	Type E (Ni10Cr-Cu45Ni)	-270 ... 1000 °C (-454 ... 1832 °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)				± 0.05 %
	Type B (Pt30Rh-Pt6Rh)				-0 ... 1820 °C (32 ... 3308 °F)
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)			± 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				± 0.05 %
	Voltage measurement	-125 ... 125 mV	2 mV	± 12 μV	± 0.05 %
		-125 ... 1100 mV	20 mV	± 120 μV	± 0.05 %

Long-term drift: ± 0.05 °C (± 0.09 °F) or ± 0.05 %¹⁾ per year; the larger value applies.

1) Percentages refer to the configured measuring span, omitted for PROFIBUS and FOUNDATION Fieldbus

2) Standard model

3) For digital measurement accuracy, the internal reference junction error must be added: Pt1000, DIN IEC 60751 Cl. B

TTF300

Field-mount temperature transmitter

Operating influence

The percentages refer to the configured measuring span.

Input terminal voltage effect / load effect: within the specified limit values for the voltage / load, the total influence is less than 0.001% per volt.

Differential-mode rejection ratio: > 65 dB at 50 / 60 Hz

Common-mode rejection ratio: > 120 dB at 50 / 60 Hz

Ambient temperature effect: based on 23 °C (73.4 °F) for an ambient temperature range of -40 ... 85 °C (-40 ... 185 °F)⁴⁾

Sensor		Ambient temperature effect per 1 °C (1.8 °F) deviation from 23 °C (73.4 °F) for digital measured value	Ambient temperature effect ^{1) 2)} per 1 °C (1,8 °F) deviation from 23 °C (73,4 °F) for. DA-converter
Resistance thermometer for two-, three- and four-wire circuits			
IEC, JIS, MIL	Pt10	± 0.04 °C (± 0.072 °F)	± 0.003 %
	Pt50	± 0.008 °C (± 0.014 °F)	± 0.003 %
	Pt100	± 0.004 °C (± 0.007 °F)	± 0.003 %
IEC, MIL	Pt200	± 0.02 °C (± 0.036 °F)	± 0.003 %
	Pt500	± 0.008 °C (± 0.014 °F)	± 0.003 %
	Pt1000	± 0.004 °C (± 0.007 °F)	± 0.003 %
DIN 43760	Ni50	± 0.008 °C (± 0.014 °F)	± 0.003 %
	Ni100	± 0.004 °C (± 0.007 °F)	± 0.003 %
	Ni120	± 0.003 °C (± 0.005 °F)	± 0.003 %
	Ni1000	± 0.004 °C (± 0.007 °F)	± 0.003 %
OIML R 84	Cu10	± 0.04 °C (± 0.072 °F)	± 0.003 %
	Cu100	± 0.004 °C (± 0.007 °F)	± 0.003 %
Resistance measurement			
	0 ... 500 Ω	± 0.002 Ω	± 0.003 %
	0 ... 5000 Ω	± 0.02 Ω	± 0.003 %
Thermocouple, for all defined types		± [(0.001 % x (ME[mV] / MS[mv]) + (100 % x (0.009 °C / MS [°C])) ³⁾	± 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 of the analog output signal

2) Influence of the DA-converter omitted for PROFIBUS PA and FOUNDATION Fieldbus

3) ME = voltage value of the thermocouple at the upper range value in accordance with the standard

MA = voltage value of the thermocouple at the lower range value in accordance with the standard

MS = voltage value of the thermocouple over the measuring span in accordance with the standard. MS = (ME - MA)

4) If the optional extended ambient temperature range down to -50 °C (-58 °F) applies, the causal variables are doubled in the range between -50 ... -40 °C (-58 ... -40 °F)

Electrical connections

Pin assignment

Resistance thermometers (RTD) / resistors (potentiometers)

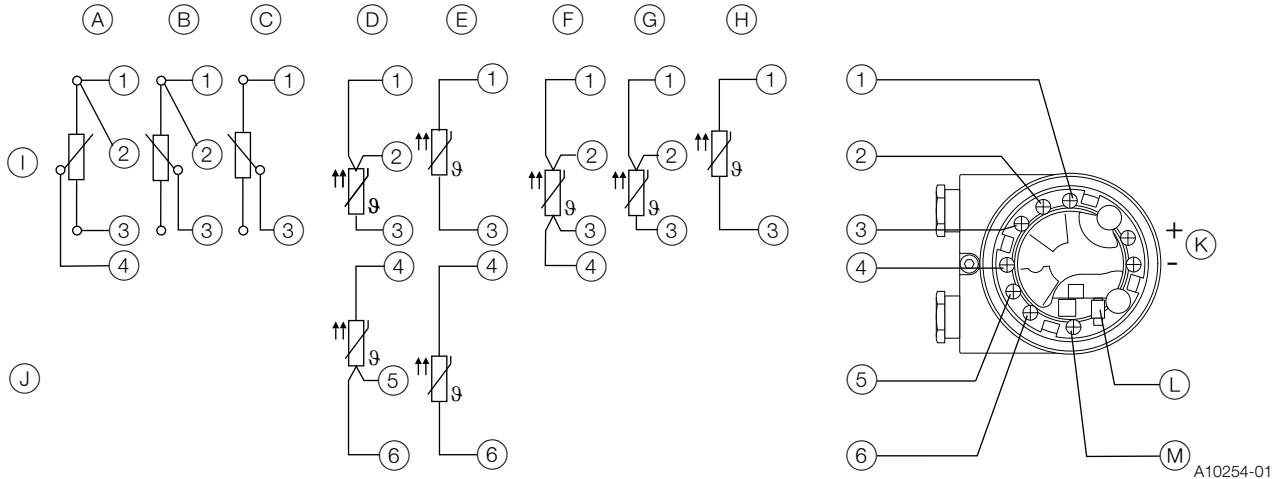


Fig. 3

(A) Potentiometer, Four-wire switch (B) Potentiometer, Three-wire switch (C) Potentiometer, Two-wire switch (D) 2 x RTD, Three-wire switch ¹⁾ (E) 2 x RTD, Two-wire switch ¹⁾ (F) RTD, Four-wire switch (G) RTD, Three-wire switch (H) RTD, Two-wire switch (I) Sensor 1 (J) Sensor 2¹⁾ (K) 4 ... 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus (L) Interface for LCD-indicator and Service (M) Grounding brackets for sensor and supply / signal line - shielding
 (1) – (6) Sensor connection (of measuring inset)

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

TTF300

Field-mount temperature transmitter

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

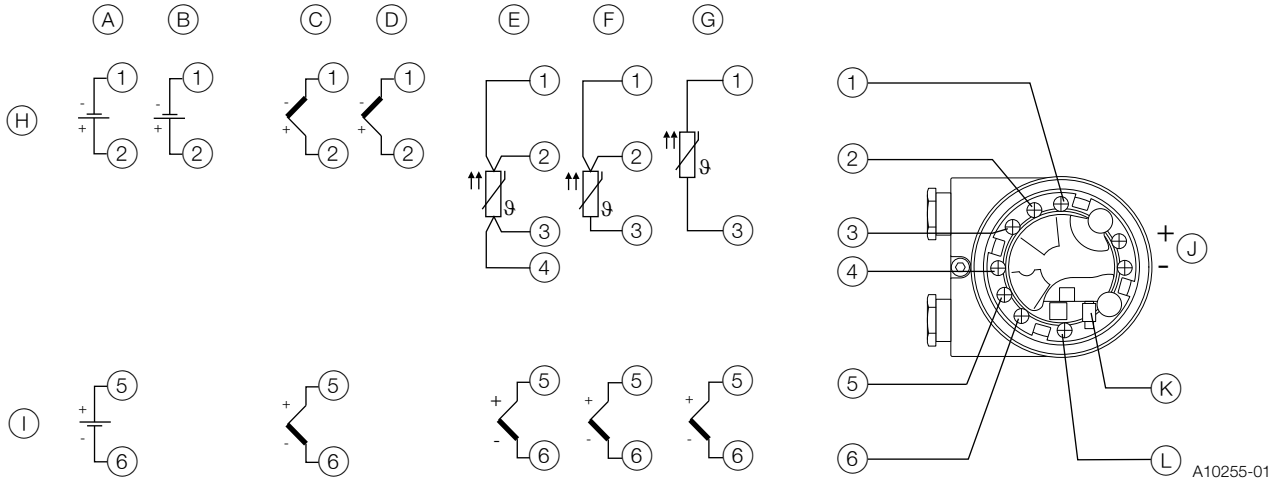


Fig. 4
 (A) 2 x Voltage measure ¹⁾ (B) 1 x Voltage measure (C) 2 x Thermocouples element¹⁾ (D) 1 x Thermocouples (E) 1 x RTD, Four-wire switch and thermocouple¹⁾ (F) 1 x RTD, Three-wire switch and thermocouple¹⁾ (G) 1 x RTD, Two-wire switch and thermocouple¹⁾ (H) Sensor 1 (I) Sensor 2¹⁾ (J) 4 ... 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus (K) Interface for LCD-indicator and service (L) Grounding brackets for sensor and supply / Signal line - shielding
 ① - ⑥ Sensor connection (of measuring inset)

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

Communication

Configuration parameters

Measurement type

- Sensor type, connection type
- Error signaling
- Measuring range
- General information, e.g. TAG number
- Damping
- Warning and alarm limits
- Output signal simulation
- Details "Order form configuration" on page 22

Write protection

- Software write protection

Diagnostic information in accordance with NE 107

Standard:

- Sensor error signaling (wire break or short circuit)
- Device error
- Over / under limit values
- Over / under measuring range
- Simulation active

Advanced:

- Sensor redundancy / sensor backup active (in case sensor fails) with configurable analog alarm pulse signaling
- Drift monitoring with configurable alarm pulse signaling
- Sensor / sensor line corrosion
- Supply voltage undershoot
- Drag indicator for sensor 1, sensor 2 and ambient temperature
- Over ambient temperature
- Under ambient temperature
- Operating hours counter

HART

The device is listed with the FieldComm Group.

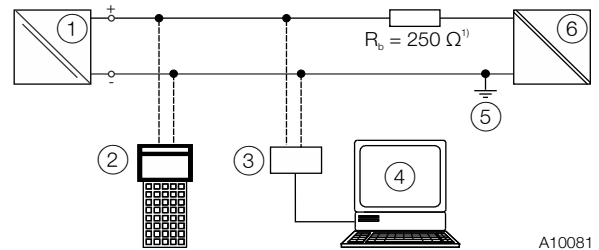


Fig. 5: Example for HART interface connection

① Transmitter ② Handheld Terminal ③ HART-Modem ④ FDT / DTM Technology ⑤ Grounding (optional) ⑥ Power supply unit (Process Interface)

1) If required

Manufacturer ID	0x1A
Device ID	0x0A
Profile	HART 5.1 (can be switched to HART 7)
Configuration	On device using LCD display DTM EDD
Transmission signal	BELL Standard 202

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 LCD display with configuration function

Driver-dependent:

- Device management / asset management tools
- FDT / DTM technology – via TTX300 DTM driver
- EDD - via TTX300 EDD driver

Diagnostic message

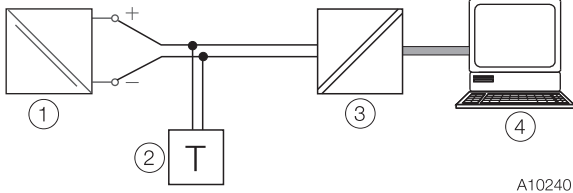
- Overrange / underrange in accordance with NE 43
- HART diagnosis

TTF300

Field-mount temperature transmitter

PROFIBUS PA

The interface conforms to profile 3.01 (PROFIBUS standard, EN 50170, DIN 1924 [PRO91]).



A10240

Fig. 6: Example for PROFIBUS PA interface connection

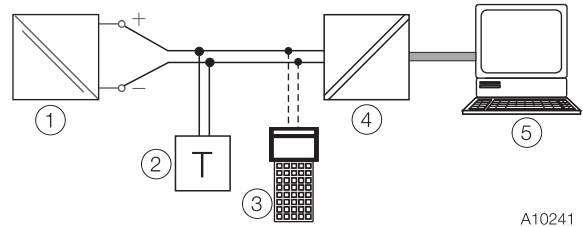
- ① Transmitter ② Bus termination ③ Segment coupler
④ PC / DCS

Manufacturer ID	0x1A
ID number	0x3470 [0x9700]
Profile	PA 3.01
Configuration	On device using LCD display DTM EDD GSD
Transmission signal	IEC 61158-2

Voltage / current consumption

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

FOUNDATION Fieldbus



A10241

Fig. 7: Example for FOUNDATION Fieldbus connection

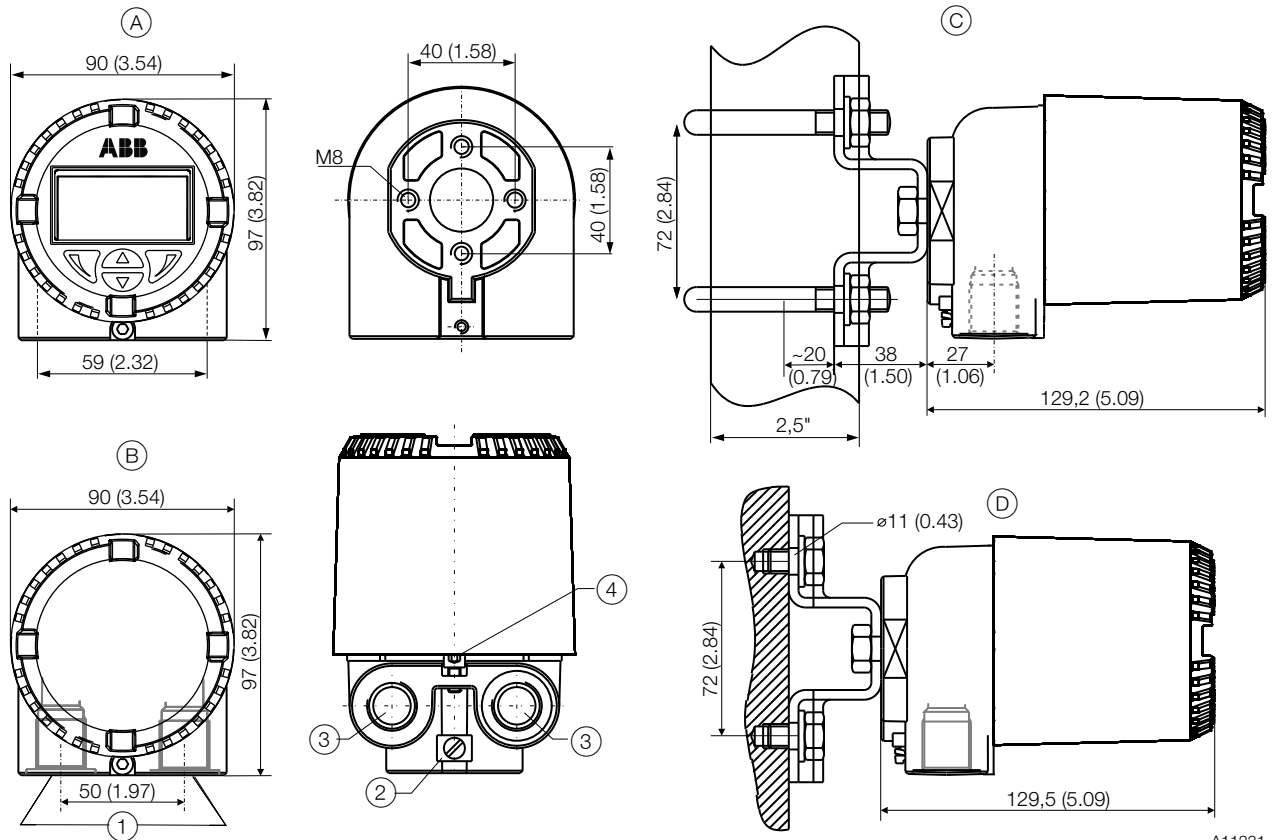
- ① Transmitter ② Bus termination ③ Handheld terminal
④ Linking Device ⑤ PC / DCS

Device ID	000320001F...
ITK	5.x
Configuration	On device using LCD EDD
Transmission signal	IEC 61158-2

Voltage / current consumption

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

Dimensions



A11231

Fig. 8: Dimensions in mm (inch)

- (A) Housing with window cover for the display (B) closed housing (C) Tube mounting (D) Wall mounting, 4-hole-wall mounting, $\varnothing 11$ mm (0.43 inch) quadratically aligned, distance 72 mm (2.84 inch)
 (1) Electrical connections (2) Equipotential bonding screw M5 (3) Thread M20 x 1.5 or 1/2"NPT (4) Lock screw

TTF300

Field-mount temperature transmitter

Use in potentially explosive atmospheres according to ATEX and IECEx

i 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.

Ex-marking Transmitter

ATEX intrinsic safety

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

Model TTF300-E1H

Type Examination Test 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 TTF300-E1P and TTF300-E1F

Type Examination Test 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 and dust explosion protection

Approved for use in Zone 2 and 22.

Model TTF300-E5X

Declaration of conformity

II 3 G Ex nA IIC T1-T6 Gc

II 3 D Ex tc IIIB T135°C Dc

ATEX dust explosion protection:

Approved for use in Zone 20, 21, and 22.

Model TTF300-D1X

Type Examination Test Certificate: BVS 06 ATEX E 029

II 1D Ex tD A20 IP66 T135°C

ATEX dust explosion protection and intrinsic safety

Permitted for zone 20, 21, 22 and Zone 0, 1 and 2.

Model TTF300-D2X

Type Examination Test Certificate: BVS 06 ATEX E 029
PTB 05 ATEX 2017 X
PTB 05 ATEX 2016 X

II 1D Ex tD A20 P66 T135°C

II 1G Ex ia IIC T6 Ga

ATEX flameproof enclosure

Approved for use in Zone 1 and 2.

Model TTF300-E3X

Type Examination Test Certificate: PTB 99 ATEX 1144

II 2G Ex d IIC T6 Gb

ATEX flameproof enclosure and intrinsic safety

Approved for use in Zone 1 and 2.

Model TTF300-E4X

Type Examination Test Certificate: PTB 99 ATEX 1144
PTB 05 ATEX 2017 X
PTB 05 ATEX 2016 X

II 2G Ex d IIC T6 Gb

II 1G Ex ia IIC T6 Ga

IECEx intrinsic safety

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

Model TTF300-H1H

IECEx certificate of conformity IECEx PTB 09.0014X

Model TTF300-H1P and TTF300-H1F

IECEx certificate of conformity IECEx PTB 11.0108X

Ex ia IIC T6...T1 Ga

Ex [ia] ib IIC T6...T1 Gb (Ga)

Ex [ia IIIC Da] ib IIC T6...T1 Gb

IECEx flameproof enclosure

Approved for use in Zone 1 and 2.

Model TTF300-H5X

IECEx certificate of conformity IECEx PTB 12.0039

Ex d IIC T1-T6 Gb

LCD indicators

ATEX intrinsic safety

The device fulfills the requirements of Directive 2014/34/EC 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	

Non-sparking ATEX

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	

Temperature data

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)

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)

Electrical data

Transmitter

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

Supply circuit	TTF300-E1H TTF300-H1H	TTF300-E1P / -H1P TTF300-E1F / -H1F	
		FISCO ¹⁾	ENTITY
Max. voltage	$U_i = 30 \text{ V}$	$U_i \leq 17,5 \text{ V}$	$U_i \leq 24,0 \text{ V}$
Short-circuit current	$I_i = 130 \text{ mA}$	$I_i \leq 183 \text{ mA}^{2)}$	$I_i \leq 250 \text{ mA}$
Max. power	$P_i = 0,8 \text{ W}$	$P_i \leq 2,56 \text{ W}^{2)}$	$P_i \leq 1,2 \text{ W}$
Internal inductance	$L_i = 0,5 \text{ mH}$	$L_i \leq 10 \mu\text{H}$	$L_i \leq 10 \mu\text{H}$
Internal capacitance	$C_i = 0,57 \text{ nF}^{3)}$	$C_i \leq 5 \text{ nF}$	$C_i \leq 5 \text{ nF}$

1) FISCO in accordance with 60079-27

2) II B FISCO: $I_i \leq 380 \text{ mA}$, $P_i \leq 5.32 \text{ W}$

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 current circuit	Resistance thermometers, resistors	Thermocouples, voltages
Max. voltage	$U_o = 6,5 \text{ V}$	$U_o = 1,2 \text{ V}$
Short-circuit current	$I_o = 25 \text{ mA}$	$I_o = 50 \text{ mA}$
Max. power	$P_o = 38 \text{ mW}$	$P_o = 60 \text{ mW}$
Internal inductance	$L_i = 0 \text{ mH}$	$L_i = 0 \text{ mH}$
Internal capacitance	$C_i = 49 \text{ nF}$	$C_i = 49 \text{ nF}$
Maximum permissible external inductance	$L_o = 5 \text{ mH}$	$L_o = 5 \text{ mH}$
Maximum permissible external capacitance	$C_o = 1,55 \mu\text{F}$	$C_o = 1,05 \mu\text{F}$

TTF300

Field-mount temperature transmitter

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

LCD indicator interface	
Max. voltage	$U_o = 6,2 \text{ V}$
Short-circuit current	$I_o = 65,2 \text{ mA}$
Max. power	$P_o = 101 \text{ mW}$
Internal inductance	$L_i = 0 \text{ mH}$
Internal capacitance	$C_i = 0 \text{ nF}$
Maximum permissible external inductance	$L_o = 5 \text{ mH}$
Maximum permissible external capacitance	$C_o = 1,4 \text{ }\mu\text{F}$

LCD indicators

Intrinsic safety type of protection Ex ia IIC

Supply circuit	
Max. voltage	$U_i = 9 \text{ V}$
Short-circuit current	$I_i = 65,2 \text{ mA}$
Max. power	$P_i = 101 \text{ mW}$
Internal inductance	$L_i = 0 \text{ mH}$
Internal capacitance	$C_i = 0 \text{ nF}$

Use in potentially explosive atmospheres in accordance with FM and CSA

i 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.

Ex-marking Transmitter

FM Intrinsically Safe

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

FM Non-Incendive

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

FM Explosion proof

Model TTF300-L3X	
XP,NI, DIP Class I, II, III, Div. 1 + 2, Groups A-G, factory sealed	

FM Explosion Proof and Intrinsically Safe

Model TTF300-L7H (L1H + L3H)	
Control Drawing	SAP_214832
Model TTF300-L7P (L1P + L3P)	
Control Drawing	TTF300-L1..P (IS)
Model TTF300-L7F (L1F + L3F)	
Control Drawing	TTF300-L1..F (IS)
XP, NI, DIP Class I, II, III, Div. 1 + 2, Groups A-G, factory sealed	
Class I, Div. 1 + 2, Groups A, B, C, D	
Class I, Zone 0, AEx ia IIC T6	

CSA Intrinsically Safe

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

CSA Non-Incendive

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

CSA Explosion proof

Model TTF300-R3X	
XP,NI, DIP Class I, II, III, Div. 1 + 2, Groups A-G, factory sealed	

CSA Explosion Proof and Intrinsically Safe

Model TTF300-R7H (R1H + R3H)	
Control Drawing	SAP_214825
Model TTF300-R7P (R1P + R3P)	
Control Drawing	TTF300-R1..P (IS)
Model TTF300-R7F (R1F + R3F)	
Control Drawing	TTF300-R1..F (IS)
XP,NI, DIP Class I, II, III, Div. 1 + 2, Groups A-G, factory sealed	
Class I, Div. 1 + 2, Groups A, B, C, D	
Class I, Zone 0, Ex ia Group IIC T6	

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⁾	
$U_i / V_{max} = 9 V, I_i / I_{max} < 65.2 mA, P_i = 101 mW, C_i = 0.4 \mu F, L_i = 0$	

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	
$U_i / V_{max} = 9 V, I_i / I_{max} < 65.2 mA, P_i = 101 mW, C_i = 0.4 \mu F, L_i = 0$	

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⁾	
$U_i / V_{max} = 9 V, I_i / I_{max} < 65.2 mA, P_i = 101 mW, C_i < 0.4 \mu F, L_i = 0$	

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	
$U_i / V_{max} = 9 V, I_i / I_{max} < 65.2 mA, P_i = 101 mW, C_i < 0.4 \mu F, L_i = 0$	

- 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

TTF300

Field-mount temperature transmitter

Ordering Information

Ordering information TTF300

Base model	TTF300	XX	X	X	X	XX
TTF300 Field Mounted Temperature Transmitter, Pt100 (RTD), thermocouples, electrical isolation						
Explosion Protection			Continued see next page			
Without explosion protection		Y0				
ATEX Intrinsic Safety type of protection: Zone 0: II 1 G Ex ia IIC T6, Zone 1 (0): II 2 (1) G Ex [ia] ib IIC T6, Zone 1 (20): II 2 G (1D) Ex [iaD] ib IIC T6		E1				
ATEX Non-sparking type of protection: Zone 2 / Zone 22: II 3 G Ex nA II T6 and II 3 D IP 65 T 135 °C (Not for application in hybrid mixtures)	1)	E5				
ATEX Dust Explosion Protection: Zone 20: II 1 D IP 65 T 135 °C		D1				
ATEX Dust Explosion Protection and Intrinsic Safety (IS): Zone 0 / Zone 20: II 1 G Ex ia IIC T6 and II 1 D IP 65 T 135 °C (Not for application in hybrid mixtures)	1)	D2				
ATEX Flameproof type of protection: Zone 1: II 2 G Ex d IIC T6		E3				
ATEX Flameproof and Intrinsic Safety type of protection: Zone 1 / Zone 0: II 2 G Ex d IIC T6 and II 1 G Ex ia IIC T6		E4				
IECEX Intrinsic Safety type of protection: Zone 0: Ex ia IIC T6, Zone 1 (0): Ex [ia] ib IIC T6, Zone 1 (20): Ex [iaD] ib IIC T6		H1				
IECEX d IIC T1 - T6 Gb		H5				
FM Intrinsic Safety (IS): Class I, Div. 1+2, Groups A, B, C, D, Class II, E, F, G, Class III, Class I, Zone 0, AEx ia IIC T6		L1				
FM Non-incendive (NI): Class I, Div. 2, Groups A, B, C, D, Class II, E, F, G, Class III		L2				
FM Explosion-proof (XP): XP, NI, DIP, Class I, II, III, Div. 1+2, Groups A-G, factory sealed		L3				
FM Explosion-proof (XP) and Intrinsic Safety (IS): XP, NI, DIP, Class I, II, III, Div. 1+2, Groups A-G, factory sealed and IS, Class I, Div. 1+2, Groups A, B, C, D, Class II, E, F, G, Class III, Class I, Zone 0, AEx ia IIC T6		L7				
CSA Intrinsic Safety (IS): Class I, Div. 1+2, Groups A, B, C, D, Class II, E, F, G, Class III		R1				
CSA Non-incendive (NI): Class I, Div. 2, Groups A, B, C, D, Class II, E, F, G, Class III		R2				
CSA Explosionproof (XP): XP, NI, DIP, Class I, II, III, Div. 1+2, Groups A-G, factory sealed		R3				
CSA Explosionproof (XP) and Intrinsic Safety (IS): XP, NI, DIP, Class I, II, III, Div. 1+2, Groups A-G, factory sealed and IS, Class I, Div. 1+2, Groups A, B, C, D, Class II, E, F, G, Class III		R7				
GOST Russia - metrological approval		G1				
GOST Russia - metrological approval and EAC-Ex, Ex i - Zone 0		P2				
GOST Russia - metrological approval and EAC-Ex, Ex d		P3				
GOST Kazakhstan - metrological approval		G3				
GOST Kazakhstan - metrological approval and EAC-Ex, Ex i - Zone 0		T2				
GOST Kazakhstan - metrological approval and EAC-Ex, Ex d		T3				
GOST Belarus - metrological approval		M5				
GOST Belarus - metrological approval and EAC-Ex, Ex i - Zone 0		U2				
GOST Belarus - metrological approval and EAC-Ex, Ex d		U3				
Inmetro Ex ia IIC T6...T4 Ga, Ex ib [ja Ga] IIC T6...T4 Gb Exib [ja IIC Da] IIC T6...T4 Gb		C1				
NEPSI Ex ia IIC T6		S1				
KOSHA Ex ia IIC T6		S5				

Main ordering information TTF300	X	X	X	XX
Housing / Display				
Single-compartment housing (aluminium) / Without display	A			
Single-compartment housing (stainless steel) / Without display	B			
Single-compartment housing (aluminium) / With LCD-display HMI	C			
Single-compartment housing (stainless steel) / With LCD-display HMI	D			
Cable Entry				
Thread 2 x M20 x 1.5	2)	1		
Thread 2 x 1/2 in. NPT			2	
Thread 2 x 3/4 in. NPT	3)	3		
Cable gland 2 x M20 x 1.5 (plastic version with limited temperature range)	4)	4		
Communication Protocol				
HART, programmable, output signal 4 ... 20 mA, dual input				H
PROFIBUS PA				P
FOUNDATION fieldbus				F
Configuration				
Standard configuration				BS
Customer-specific configuration, except user curve			5)	BF
Customer-specific configuration, including user curve				BG

TTF300

Field-mount temperature transmitter

Additional ordering information TTF300

	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX
Certificates										
SIL2 - Declaration of Conformity	6)	CS								
Declaration of compliance according EN 10204-2.1, with the order		C4								
Inspection certificate according EN 10204-3.1, visual, dimensional and functional test		C6								
Calibration Certificates										
With 5-point factory certificate		EM								
Inspection certificate according EN 10204-3.1, 5-point calibration		EP								
Handling of Certificates										
Send via e-mail			GHE							
Send via mail			GHP							
Send via mail express			GHD							
Send with instrument			GHA							
Only archived			GHS							
Mounting Bracket										
Wall mounting / 2 in. pipe mounting bracket (stainless steel)						K2				
Cable Entry Options										
Cable gland 2 x 1/2 in. NPT						7)	U5			
Extended Ambient Temperature Range										
-50 ... 85 °C (-58 ... 185 °F)							8)	SE		
Device Identification Plate										
Stainless steel									T0	
Additional Tag Plate										
Stainless steel										I1
Customer-specific Versions										
(Please specify)										Z9
Documentation Language										
German										M1
English										M5
Language package Western Europe / Scandinavia (Languages: DA, ES, FR, IT, NL, PT, FI, SV)										MW
Language package Eastern Europe (Languages: EL, CS, ET, LV, LT, HU, HR, PL, SK, SL, RO, BG)										ME

- 1) According EN 60079-0 and EN 61241-0, the application in hybrid mixtures (concomitance of potentially explosive dust and gas) is currently not allowed
- 2) Not available with Explosion Protection code L1, L2, L3, L7, R1, R2, R3, R7, D1, D2
- 3) Only available with Housing / Display code A, C
- 4) Not available with Explosion Protection code L3, L7, R3, R7
- 5) E.g. set measuring range, TAG no.
- 6) Only available with Communication Protocol code H (HART)
- 7) Only available with Cable Entry code 2
- 8) Not available with Explosion Protection code D1, D2, E3, E4, L1, L2, L3, L7, R1, R2, R3, R7, G1, P2, P3, G3, T2, T3, M5, U2, U3, C1, S1, S5

Accessories	Order code
TTF300 Commissioning Instruction, German	3KXT221001R4403
TTF300 Commissioning Instruction, English	3KXT221001R4401
TTF300 Commissioning Instruction, Language package Western Europe / Scandinavia	3KXT221001R4493
TTF300 Commissioning Instruction, Language package Eastern Europe	3KXT221001R4494

Trademarks

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

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

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

Contact us

ABB Limited

Process Automation

Howard Road, St. Neots
Cambridgeshire, PE19 8EU
UK

Tel: +44 (0)870 600 6122

Fax: +44 (0)1480 213 339

Mail: enquiries.mp.uk@gb.abb.com

ABB Inc.

Process Automation

125 E. County Line Road
Warminster, PA 18974
USA

Tel: +1 215 674 6000

Fax: +1 215 674 7183

ABB Automation Products GmbH

Process Automation

Schillerstr. 72
32425 Minden
Germany

Tel: +49 571 830-0

Fax: +49 571 830-1806

www.abb.com/temperature

Note

We reserve the right to make technical changes or modify the contents of this document without prior notice.

With regard to purchase orders, the agreed particulars shall prevail. ABB does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents – in whole or in parts – is forbidden without prior written consent of ABB.

Copyright© 2016 ABB

All rights reserved

3KXT221001R1001



Sales



Service